SIEMENS

APPLICATION GUIDELINES

MICROPROCESSOR BASED MODEL 4000 GRADE CROSSING PREDICTOR FAMILY

APRIL 2010, REVISED FEBRUARY 2018

DOCUMENT NO. SIG-00-08-06
VERSION C.2

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The equipment covered in this manual has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

DOCUMENT HISTORY

Version	Release Date	Details of Change
A	06-25-08	Initial Release per inspection
A.1	10-22-08	Updated per release inspection NG-F618
B	02-08-09	Changed per Tech Pubs Approval emails and signatures 02/18/09
C	02-03-10	Updated per release inspection NG-F680
C.1	10-31-14	Updated to Siemens standard layout
C.2	02-20-18	Section 1 Pg. 1-3, Fig. 1-1 Update Display, Rebrand Pg. 1-4, Fig. 1-2 Update Display, Rebrand Pg. 1-5, Fig. 1-3 Update Display, Rebrand Pg. 1-6, Fig. 1-4 Update Display, Rebrand Pg. 1-7, Fig. 1-5 Update Display, Rebrand Pg. 1-8, Fig. 1-6 Update Display, Rebrand Pg. 1-9, Fig. 1-7 Update Display, Rebrand Pg. 1-13, Table 1-4 Add A80485 Display info Pg. 1-16, Table 1-6 Add A80485 Display info Section 2 Pg. 2-64, Fig 2-40 Rebrand Section 3 Pg. 3-3, Sec. 3.1.1 Add A80485 Display info Pg. 3-7, Sec 3.2.2 Add A80485 Display Info Pg. 3-8, Sec 3.2.4 Add A80485 Display info Add A80485 to Fig 3-5 Pg. 3-9, Update Table 3-1 Pg. 3-10, Sec 3.4 Add OCE info and manual reference Sec 3.4.1 Add DT to title Pg. 3-12, Sec 3.5 Add DT tot the Title Section 4 No Changes Section 5 Pg. 5-62, Fig. 5-78 Rebrand Section 6 Pg. 6-52, Sec 6.3.1.6 Add text for 2-09 MCF Pg. 6-53, Add text for 2-09 MCF, change Warning text 2-08 MCF Pg. 6-54, Fig. 6-63 add screen D Sec 6.3.1.7 Add second train logic Add text to Note Pg. 6-55, First paragraph, add second train logic Pg. 6-84, Fig. 6-105 Rebrand Section 7 Pg. 7-3, Fig. 7-1 Rebrand Pg. 7-7. Fig. 7-2 Rebrand Pg. 7-11, Fig. 7-5 Rebrand Pg. 7-14, Fig. 7-7 Rebrand Pg. 7-15, Fig. 7-8 Rebrand Pg. 7-53, Fig. 7-29 Rebrand Pg. 7-54, Fig. 7-30 Rebrand Pg. 7-59, Fig. 7-34 Rebrand

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NOTES, CAUTIONS, AND WARNINGS

Throughout this manual, notes, cautions, and warnings are frequently used to direct the reader's attention to specific information. Use of the three terms is defined as follows:

WARNING
INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY. WARNINGS ALWAYS TAKE PRECEDENCE OVER NOTES, CAUTIONS, AND ALL OTHER INFORMATION.

CAUTION
REFERS TO PROPER PROCEDURES OR PRACTICES WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN A POTENTIALLY HAZARDOUS SITUATION AND/OR POSSIBLE DAMAGE TO EQUIPMENT. CAUTIONS TAKE PRECEDENCE OVER NOTES AND ALL OTHER INFORMATION, EXCEPT WARNINGS.

NOTE
Generally used to highlight certain information relating to the topic under discussion.

If there are any questions, contact Siemens Industry Inc., Rail Automation Application Engineering.

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

Static electricity can damage electronic circuitry, particularly low voltage components such as the integrated circuits commonly used throughout the electronics industry. Therefore, procedures have been adopted industry-wide which make it possible to avoid the sometimes invisible damage caused by electrostatic discharge (ESD) during the handling, shipping, and storage of electronic modules and components. Siemens Industry, Inc., Rail Automation has instituted these practices at its manufacturing facility and encourages its customers to adopt them as well to lessen the likelihood of equipment damage in the field due to ESD. Some of the basic protective practices include the following:

- Ground yourself before touching card cages, assemblies, modules, or components.
- Remove power from card cages and assemblies before removing or installing modules.
- Remove circuit boards (modules) from card cages by the ejector lever only. If an ejector lever is not provided, grasp the edge of the circuit board but avoid touching circuit traces or components.
- Handle circuit boards by the edges only.
- Never physically touch circuit board or connector contact fingers or allow these fingers to come in contact with an insulator (e.g., plastic, rubber, etc.).
- When not in use, place circuit boards in approved static-shielding bags, contact fingers first. Remove circuit boards from static-shielding bags by grasping the ejector lever or the edge of the board only. Each bag should include a caution label on the outside indicating static-sensitive contents.
- Cover workbench surfaces used for repair of electronic equipment with static dissipative workbench matting.
- Use integrated circuit extractor/inserter tools designed to remove and install electrostatic-sensitive integrated circuit devices such as PROM's (OK Industries, Inc., Model EX-2 Extractor and Model MOS-40 Inserter (or equivalent) are highly recommended).
- Utilize only anti-static cushioning material in equipment shipping and storage containers.

For information concerning ESD material applications, please contact the Technical Support Staff at 1-800-793-7233. ESD Awareness Classes and additional ESD product information are also available through the Technical Support Staff.

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SECTION 1 – MODEL 4000 GCP OVERVIEW

1.1 SYSTEM CONFIGURATIONS

The 4000 Grade Crossing Predictor (GCP) is a modular microprocessor-controlled predictor system that is deployed to continually monitor the approach(es) to railroad grade crossings and to control the lamps, gates and bells associated with those crossings. It also has provision for an optional plug-in SEAR event recorder. The Model 4000 GCP is available in several case configurations.

1.2 STANDARD FEATURES

The Model 4000 GCP can have up to 6 Track Modules for train detection, with each Track Module having nine track predictors that are configurable as motion sensors or predictors. The Track Module Prime Predictor is generally used for control of local crossings. The Track Module DAX A through DAX G Predictors are generally used for control of remote crossings. The Track Module Preempt Predictor is generally used for interconnection with traffic signal systems. Each track module has two vital inputs and two vital outputs. In addition to predictors, each track module is capable of providing a multifrequency island circuit.

Using internal crossing controller(s), the GCP can control the bells and gates of a crossing and up to 40 amps of lights. Each SSCC IIIi module has 5 vital outputs. The GCP can utilize internal PSO Modules that have the ability to detect drain direction on a bidirectional track circuit that allows the control of remote crossings (DAXing). Each PSO Module has three vital outputs and two vital inputs. The GCP can utilize RIO modules to extend I/O capability via the RIO's four vital inputs and four vital outputs. The GCP has redundant Main/Standby operation for CPU, Track, PSO, and RIO modules.

The GCP can perform independent event recording, using the SEAR2i. The SEAR2i options include programmable alarms and automated performance of crossing test functions. The GCP generates test result reports in several formats. The GCP also interfaces to the Wayside Alarm Management System (WAMS)

The GCP utilizes Echelon communications for radio DAXing to other locations via spread spectrum radio and single person calibration and monitoring using VHF communicator. The GCP has a display module for configuration, monitoring and troubleshooting the system.

1.2.1 GCP Case Configurations

The 4000 Grade Crossing Predictor (GCP) System is available in the following case configurations:

- A80445 Single Track, Figure 1-1
- A80455 Basic Crossing, Figure 1-2
- Single Five Track, A80440, Figure 1-3
- Dual Two Track, A80465, Figure 1-4
- Dual Three Track, A80475, Figure 1-5
- Dual Four Track, A80400, Figure 1-6
- Dual Six Track, A80460, Figure 1-7

The features of each configuration are given in Table 1-1.

Table 1-1:
Case Configurations

FEATURE	CASE CONFIGURATION						
	80445[4]	**80455**	**80440**	**80465**	**80475**	**80400**	**80460**
Track Modules	1 track	1 track	1 to 5 tracks	1 or 2 tracks	1 to 3 tracks	1 to 4 tracks	1 to 6 tracks
Main/ Standby Transfer System	no	no	no	yes	Yes	yes	yes
Internal SSCC3i Crossing Control[1]	no	0, 1 or 2	0, 1 or 2	0, 1 or 2	no	0, 1 or 2	0, 1 or 2
Internal SEAR2i Recorder	no	no	yes	yes	yes	yes	Yes
Internal PSO Module[2]	no	no	0, 1, 2 or 3	0 or 1	0 or 1	0, 1, 2 or 3	0, 1, 2 or 3
I/O Expansion[3]	no	no	0, 1 or 2	0 or 1	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
Echelon LAN Functions	yes	yes	yes	yes	yes	yes	yes

[1] SSCC3i module controls Gates, Flashing Light Signals and Bells

[2] Phase Shift Overlay (PSO) Module can be used in lieu of Track Module in the 1st, 3rd,and/or 4th track slot

[3] Relay Input Output (RIO) Module can be used in lieu of Track Module in the 2nd, 5th and/or 6th track slot

[4] The A80445 Single Track configuration may utilize the A80500 DiagView Display Unit to provide the user with a Display Terminal (DT).

For detailed Description of the various cases and modules, refer to Section 10, Case and Module Descriptions.

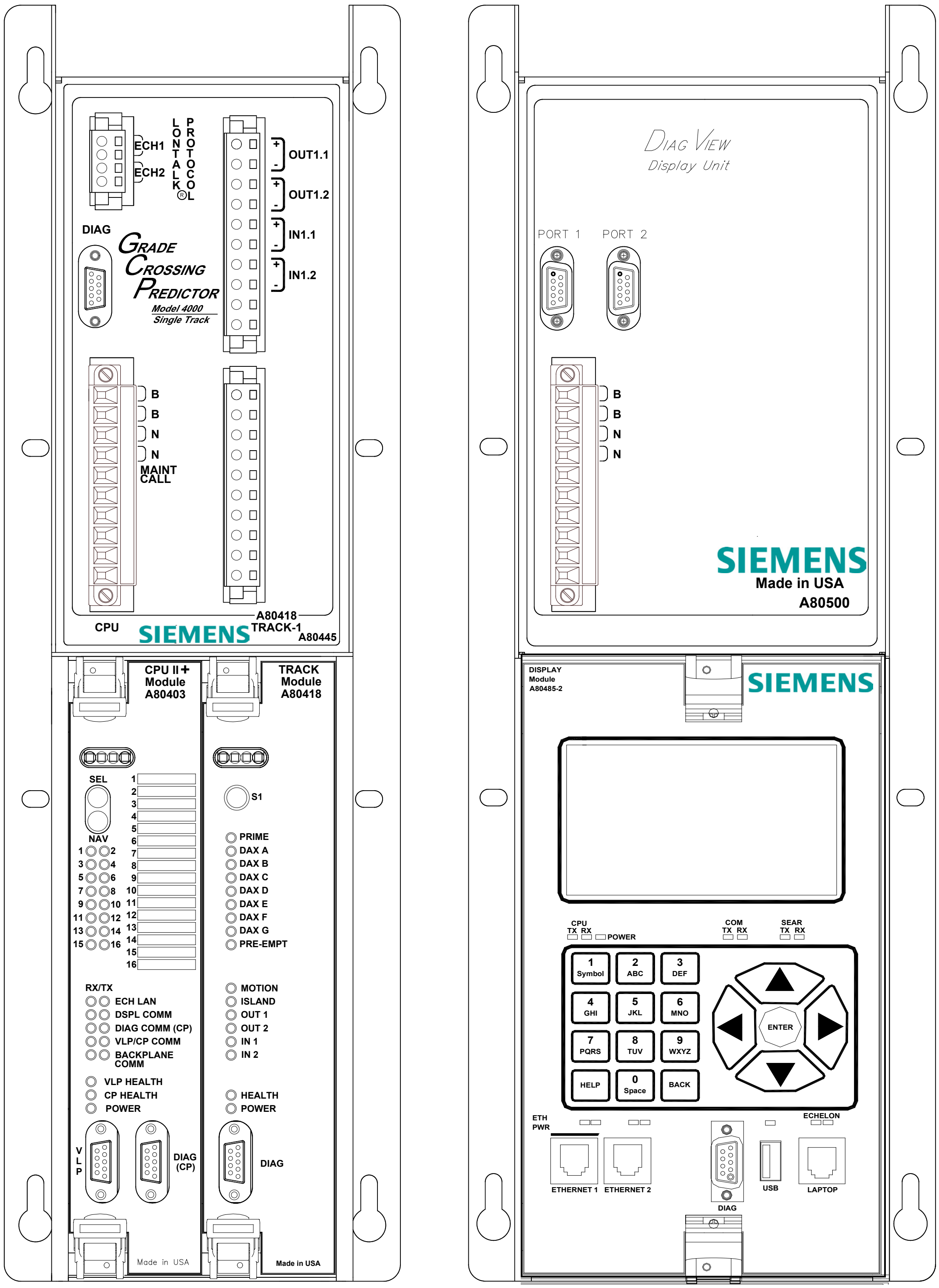


Figure 1-1:
A80445 Single Track Configuration And A80500 DiagView Display Unit

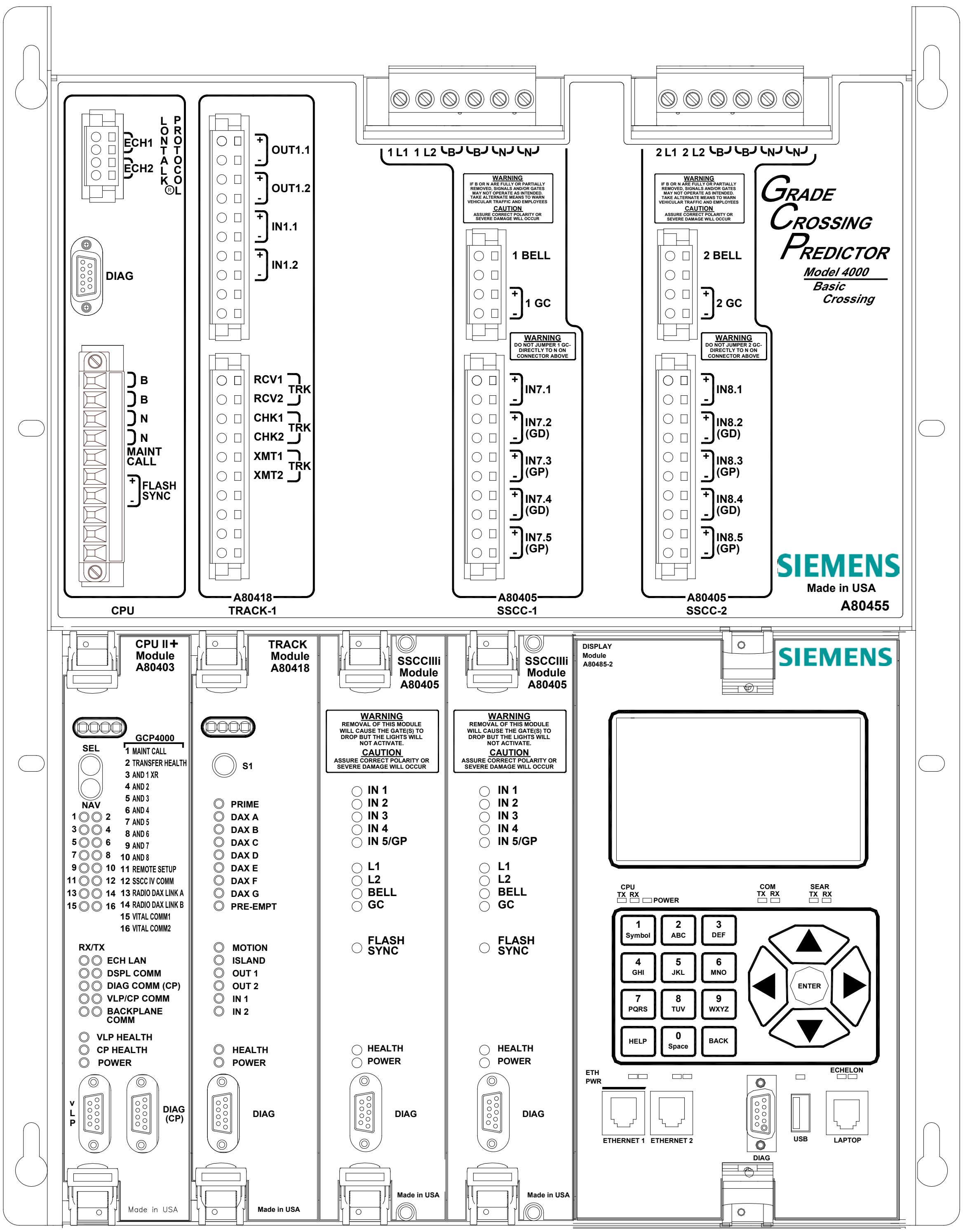


Figure 1-2:
A80455 Basic Crossing Configuration

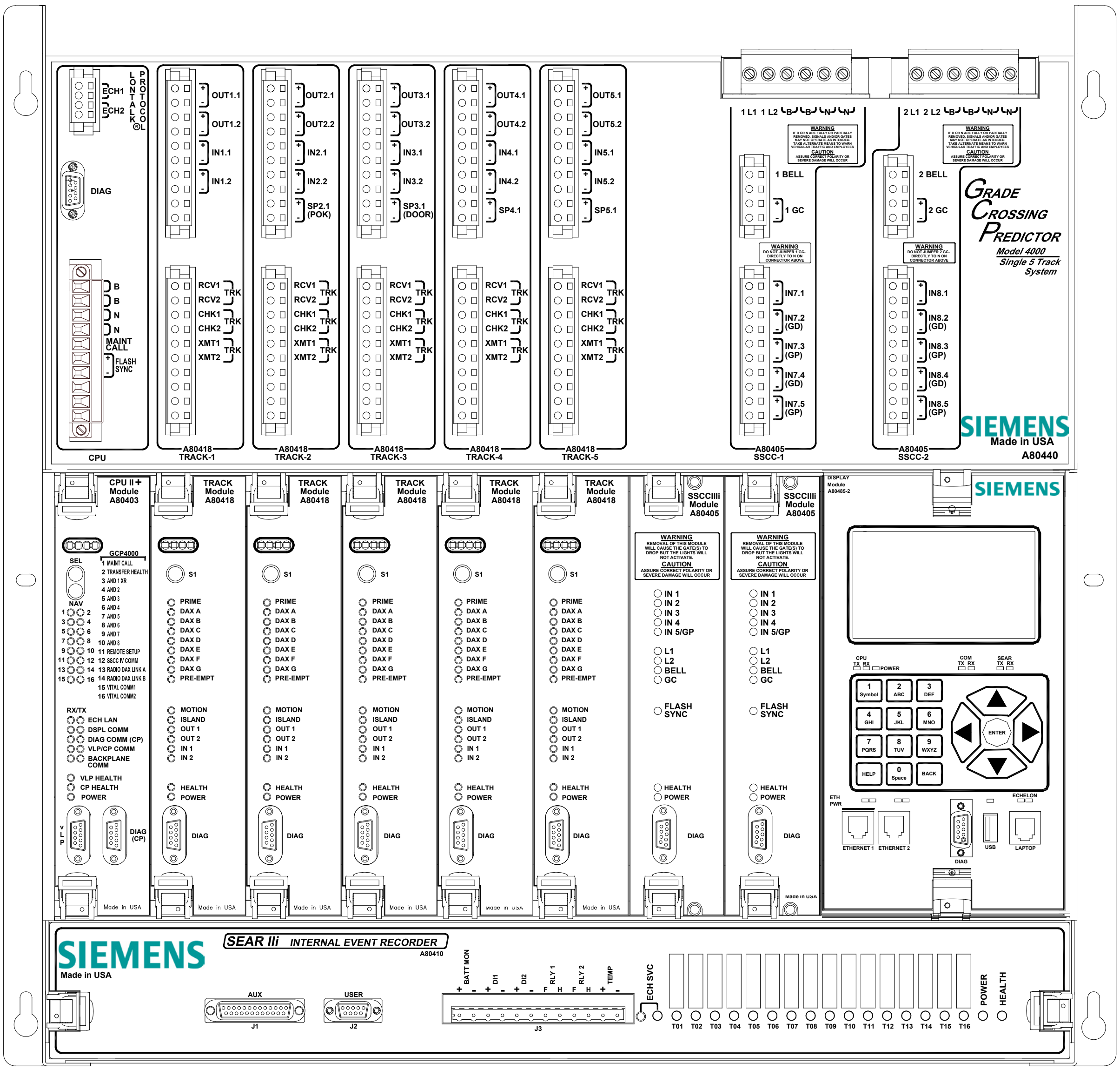


Figure 1-3:
A80440 Single Five-Track Configuration

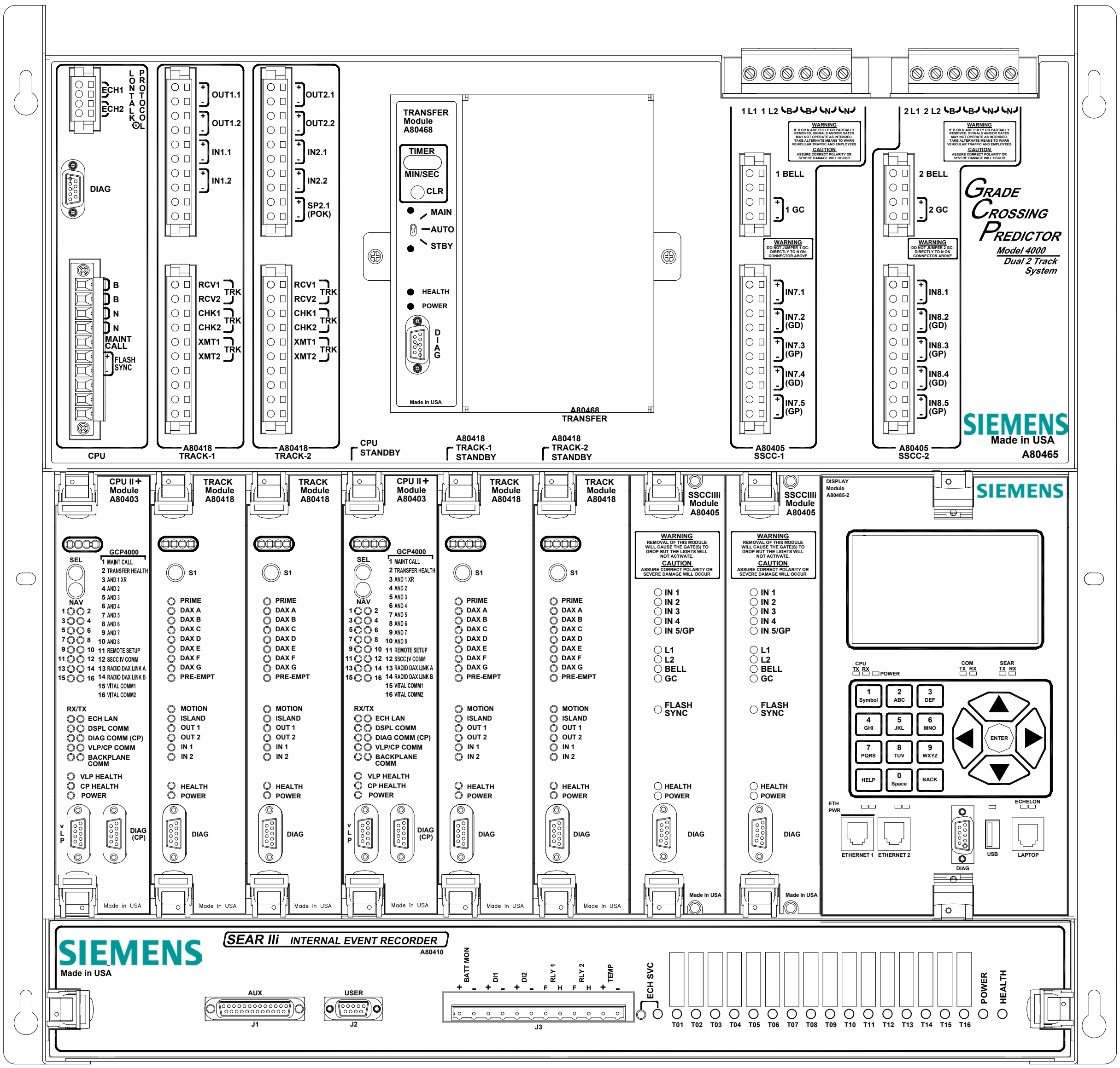


Figure 1-4:
A80465 Dual Two-Track Configuration

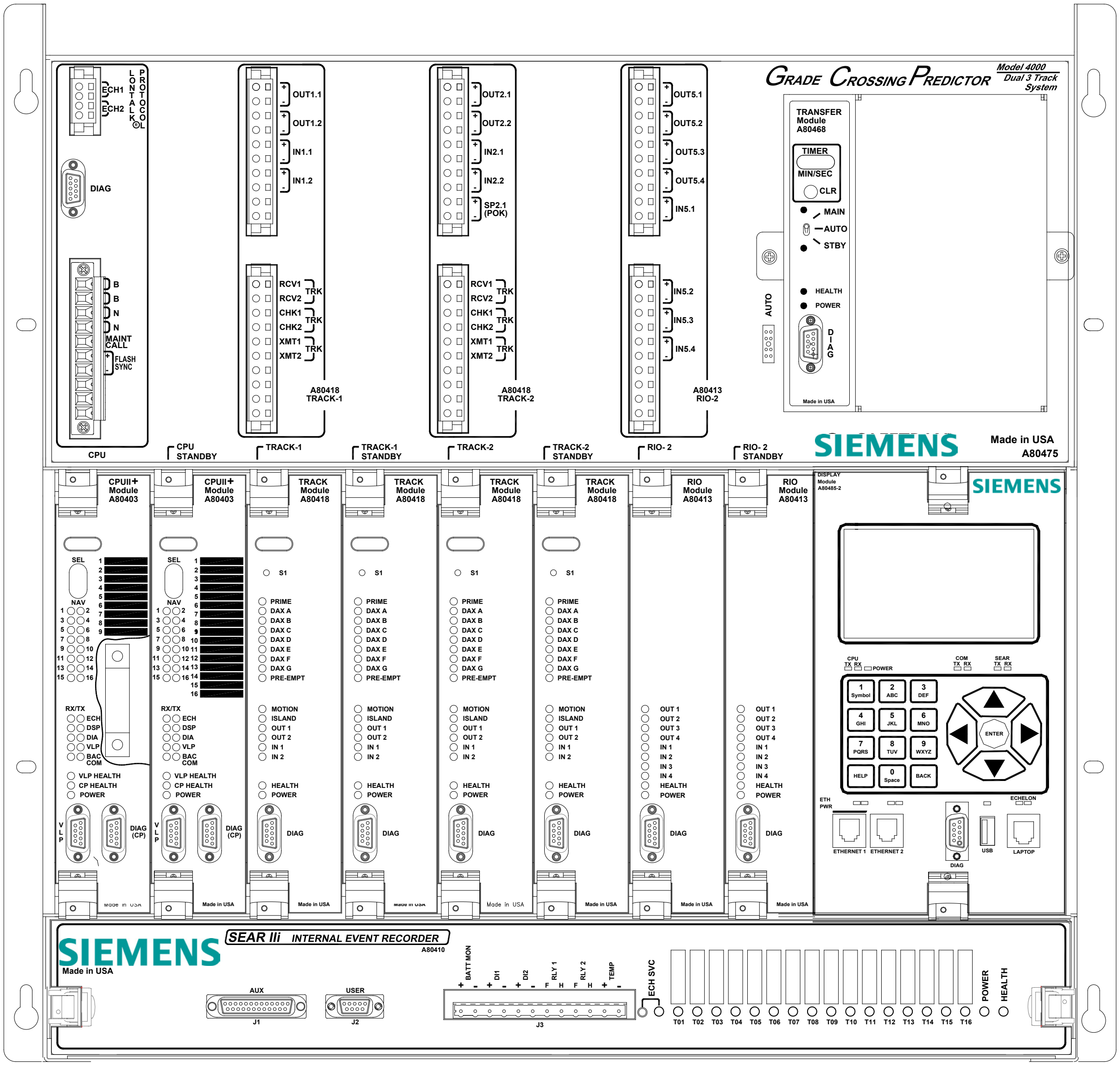


Figure 1-5:
A80475 Dual Three-Track Configuration

NOTE

On the A80475 chassis only, the third track is referred to as Track-5.

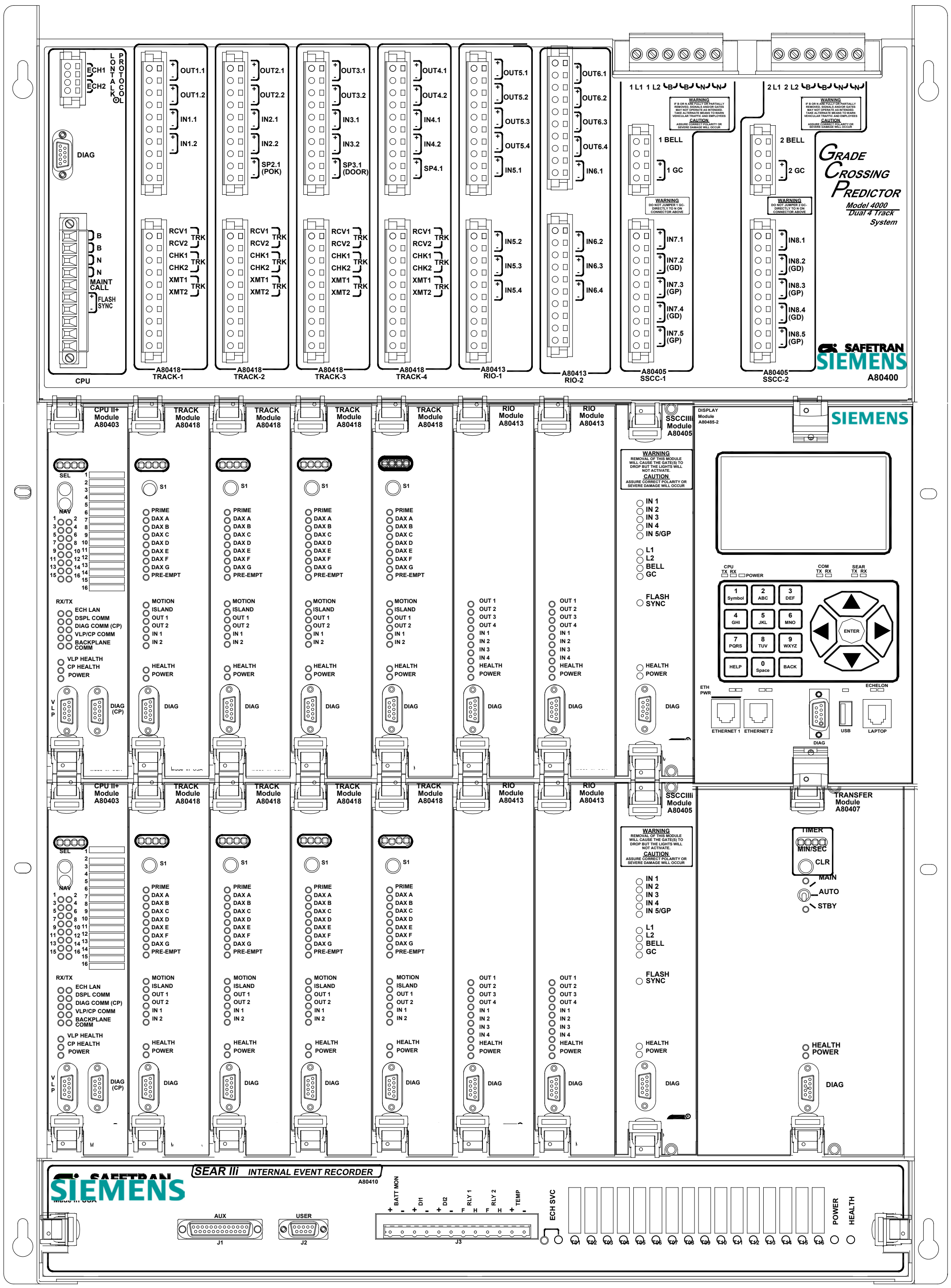


Figure 1-6:
A80400 Dual Four-Track Configuration

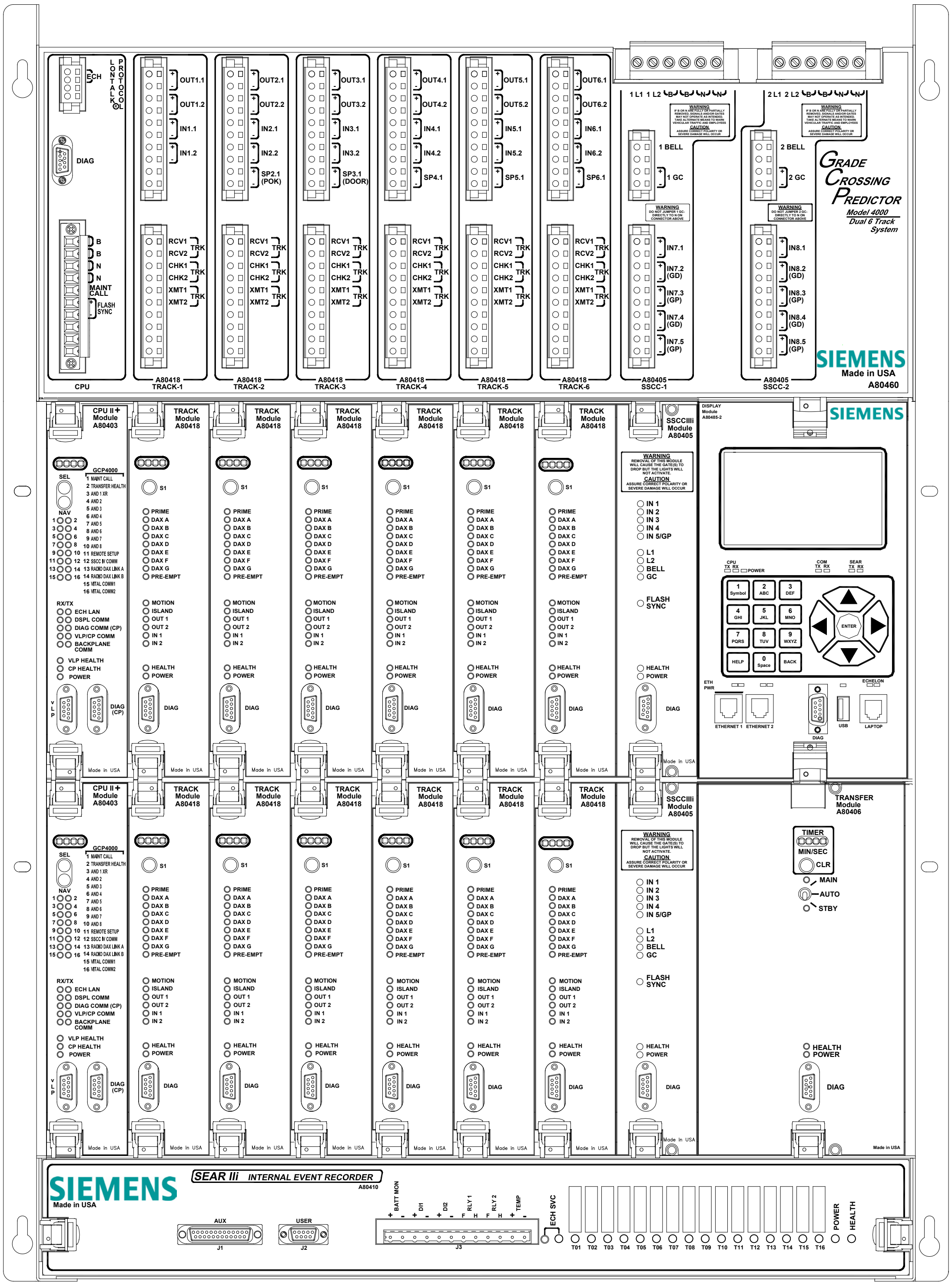


Figure 1-7:
A80460 Dual Six-Track Configuration

1.3 GCP OPERATIONAL PARAMETERS

The Model 4000 GCP supports Unidirectional track circuits, Bidirectional track circuits, and Simulated Bidirectional track circuits. The number of tracks that may be monitored is determined by the Model 4000 GCP case configuration, the number of Track Modules installed, track configurations, and available I/O.

In the Predictor mode, the GCP detects approaching trains, computes the relative train speed and distance, predicts train arrival time at the crossing, and activates crossing-warning devices based on a programmed warning time

In the Motion Sensor (MS) mode, the GCP detects the motion of an approaching train when its speed exceeds a set (programmed) motion detection threshold and activates crossing-warning devices at time of train detection.

The GCP communicates with other ATCS devices via Echelon® LAN. These other devices may include a Spread Spectrum Radio (SSR), the Safetran® Event Analyzer/Recorder II (SEAR2), HD/LINK, a VHF Communicator, an iLOD, SSCC IV, and/or a second Model 4000 GCP.

The integrated Siemens SEARIIi Internal Event Recorder records 180,000 events and is expandable to 390,000, controls non-vital I/O, and can optionally issue alarms.

NOTE

The recorded speed information is intended solely as a maintenance tool. The speed values are relative and may be affected by track parameters that include:

- Insulated joint proximity
- Insulated joint couplers
- Overlapping termination shunts
- Lumped ballast loads

The speed values are only intended to assist maintenance personnel in:

- identifying slow versus fast train movements
- distinguishing between accelerating, decelerating, and relatively constant speed train movements

The primary function of the recording is to document warning time. Speed values are secondary and may not be consistent with recordings made by devices specifically designed to record train speed.

1.4 TRAIN DETECTION

The Model 4000 GCP applies a constant current audio frequency (AF) signal to the track and measures the level of the resulting voltage. The GCP approach track signal magnitude (EZ) varies with approach track impedance. The approach track impedance corresponds to the distance of the train from the crossing. When unoccupied the approach circuit has maximum impedance. When a train enters the approach and moves towards the crossing, the track circuit impedance continually decreases due to the low resistance shunt created by the train's wheels. When a train reaches the crossing, the approach circuit is reduced to minimum impedance. As a train moves away from the crossing, the track impedance continually increases. When the train exits the approach the circuit again has maximum impedance.

The EZ is proportional to the relative distance the train is from the crossing. When no train is on a calibrated approach, the EZ is approximately 100 (see Figure 1-8). The EZ value rate of change is proportional to the speed of the train. The rate of change is sensed by the Model 4000 GCP and used to determine relative train speed and to predict when to activate the crossing warning devices

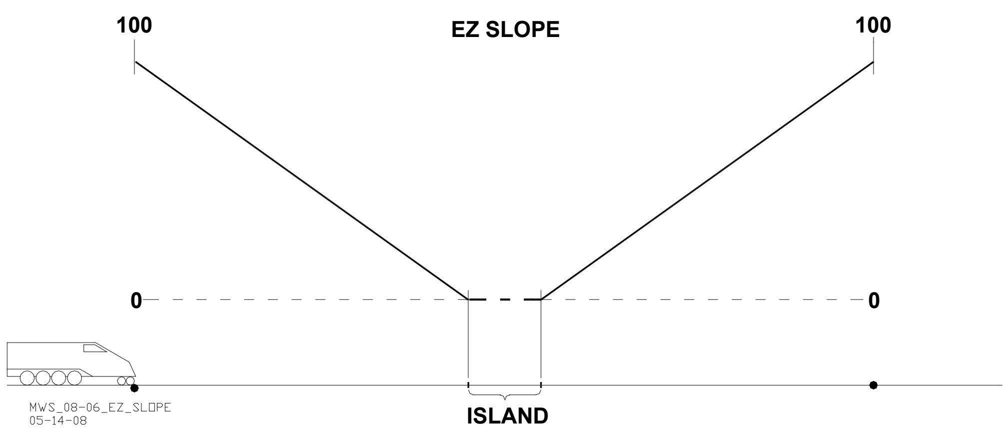


Figure 1-8:
Diagram of EZ Level Compared to Train Shunt Location

1.4.1 Track Ballast Condition

The EX value is a numerical indication of track ballast conditions. The EX corresponds to electrical leakage through track ballast. An EX value of 100 represents optimum track ballast conditions. The standard low EX operating threshold for the Model 4000 GCP is 39. EX is nominally between 70 and 100.

1.4.2 Track Ballast Changes

The EX value can be affected by the presence of water, mud, salt or other contaminates deposited in the track ballast. High concentrations of these contaminates at a crossing can cause excessive leakage (lump loading). Model 4000 GCP provides automatic compensation of EZ for a wide range of lump loading conditions.

1.4.3 GCP Signal Frequencies

The constant current audio frequency (AF) signal for each track can be programmed for any of 11 Siemens standard frequencies, any of 29 offset frequencies or 18 other frequencies.

Table 1-2:
Model 4000 GCP Frequencies Available

PARAMETER	RANGE OF VALUES
Standard frequencies:	86, 114, 156, 211, 285, 348, 430, 525, 645, 790, or 970 Hz
Offset frequencies:	85.5, 86.5, 87, 113, 113.5, 114.5, 115, 155, 155.5, 156.5, 157, 210, 212, 284, 286, 347, 349, 429, 431, 523, 527, 643, 647, 788, 792, 968, and 972 Hz
Other frequencies:	44, 45, 46, 151, 250, 267, 326, 392, 452, 522, 560, 630, 686, 753, 816, 881, 979, or 999 Hz
Frequency Stability:	±0.01 percent
Track Module Island Frequencies Available	2.14, 2.63, 3.24, 4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5, or 20.2 kHz (frequencies are programmable)
Island Circuit Length	120 feet (36.58 meters) (minimum) to 350 feet (106.68 meters) (maximum)

1.5 SYSTEM SPECIFICATIONS

Table 1-3:
Input Power Specifications

PARAMETER	RANGE OF VALUES
Battery Voltage	
On CPU Connector:	9.0-16.5 VDC
On SSCC3i Connector:	9.0-16.5 VDC
Maximum Ripple:	1.0V p-p

Table 1-4:
Model 4000 GCP Input Current Requirements

Table 1-3: Model 4000 GCP Input Current Requirements			
COMPONENT	**CPU BATTERY CONNECTOR @10V**	**CPU BATTERY CONNECTOR @13.2 V**	**CPU BATTERY CONNECTOR @16.5V**
CPU2+:	0.4 A	0.5 A	0.6 A
Track:	1.7 A @ medium transmit power 1.90 A @ high transmit power Current increases by 200 mA when one 250 ohm relay output is energized and increases by 450 mA when two outputs are energized	1.05 A @ medium transmit power 1.15 A @ high transmit power Current increases by 80 mA when one 250 ohm relay output is energized and increases by 150 mA when two outputs are energized	800 mA @ medium transmit power 850 mA @ high transmit output Current increases by 60 mA when one 250 ohm relay output is energized and increases by 130 mA when two outputs are energized
PSO	1.2 A @ low transmit power 1.4 A @ high transmit power Current increases by 200 mA when one 250 ohm relay output is energized, by 300 mA with two outputs are energized and by 350 mA with three outputs are energized.	750 mA @ low transmit power 900 mA @ high transmit power Current increases by 50 mA when one 250 ohm relay output is energized, by 80 mA with two outputs are energized and by 100 mA with three outputs are energized.	550 mA @ low transmit power 700 mA @ high transmit power Current increases by 40 mA when one 250 ohm relay output is energized, by 65 mA with two outputs are energized and by 80 mA with three outputs are energized.
RIO:	200 mA with no relay output Current increases by 106 mA when one 500 ohm relay output is energized	186 mA with no relay output Current increases by 79 mA when one 500 ohm relay output is energized	186 mA with no relay output Current increases by 69 mA when one 500 ohm relay output is energized
SSCC3i current draw from CPU battery connector:	0.020A	0.015 A	0.015 A
SSCC3i current draw from SSCC3i battery connector:	0.540A (with no load) When crossing activated add lamp, bell, and gate control currents.	0.560 A (with no load) When crossing activated add lamp, bell, and gate control currents.	0.600 A (with no load) When crossing activated add lamp, bell, and gate control currents.
A80485 Display:	770 mA 740 mA hibernating	660 mA 640 mA hibernating	600 mA 590 mA hibernating

Table 1-3: Model 4000 GCP Input Current Requirements			
COMPONENT	**CPU BATTERY CONNECTOR @10V**	**CPU BATTERY CONNECTOR @13.2 V**	**CPU BATTERY CONNECTOR @16.5V**
A80407 Display:	0.41 A with Backlight off and heater off	0.31 A with Backlight off and heater off	0.25 A with Backlight off and heater off
Transfer:	0.109 A on Main 0.191A on Standby	0.116 A on Main 0.230 A on Standby	0.117 A on Main 0.230 A on Standby
SEAR2i:	1.15A	0.8 A	0.65 A
Single Track Chassis	2.2 A (medium power) 2.4 A (high power)	1.77 A (medium power) 1.97 A (high power)	1.6 A (medium power) 1.8 A (high power)
Six Track, Dual Bay Chassis With Full Complement Of Modules: CPU2+; Track (6 each) SSCC3i (2 each); Display Transfer; and SEAR2i	12.909 A (medium transmit power and no heater) 14.109 A (high transmit power and no heater)	9.376 A (medium transmit power and no heater) 10.576 A (high transmit power and no heater)	7.647 A (medium power) 8.847 A (high power)

Table 1-5:
Model 4000 GCP General Parameters

PARAMETER	VALUES	
MS/GCP Response Time	5 seconds	
Relay Drive Outputs (VO):	400 to 1000-ohm load	
Minimum Output Current @ medium transmit power:	200 mA	
Minimum Output Current @ high transmit power:	400 mA	
Surge Protection:	Built-in secondary surge protection for all connections. Requires external arresters and equalizers on track wires as primary surge protection. Surge panels or their electrical equivalent are required. Refer to paragraph 2.18 for battery and external cable surge protection.	
Typical Monitoring and Storage:	CPU2+	SEAR2i
IO State Changes:	3000 minimum	180,000 minimum
Train Moves:	100 minimum	1,800 minimum
Mounting:	All Model 4000 GCP chassis can be wall, rack, or shelf mounted	
Temperature Range:	-40 °F to +160 °F (-40 °C to 70 °C)	

Table 1-6:
Physical Dimension Data

Table 1-6: Physical Dimension and Weight Data		
PARAMETER	VALUES	
Chassis Dimensions:		
Single Track (A80445)		
Width:	5.94 In.	(15.09 cm)
Depth:	12.38 In.	(31.45 cm)
Height:	19.09 In.	(23.09 cm)
Basic Crossing (A80455)		
Width:	15.0 In.	(38.1 cm)
Depth:	12.38 In.	(31.45 cm)

Table 1-6: Physical Dimension and Weight Data		
PARAMETER	VALUES	
Height:	19.09 In.	(23.09 cm)
Five Track (A80440), Dual Two Track (A80465), & Dual Three Track (A80475)		
Width:	23.25 In.	(59.06 cm)
Depth:	12.38 In.	(31.45 cm)
Height:	22.15 In.	(56.26 cm)
Dual Four Track (A80400) & Dual Six Track (A80460)		
Width:	23.25 In.	(59.06 cm)
Depth:	12.38 In.	(31.45 cm)
Height:	31.47 In.	(79.93 cm)
DiagView Display Unit (A80500)		
Width:	7.09 In.	(18.01 cm)
Depth:	12.38 In.	(31.45 cm)
Height:	19.09 In.	(23.09 cm)
Chassis Weight:		
	Empty	Full Module Complement
Single Track (A80445)	8.25 lbs (3.71 kg)	10.5 lbs (4.73 kg)
Basic Crossing (A80456)	13.33 lbs (6.0 kg)	26.7 lbs (12.02 kg)
Five Track (A80440)	26.01 lbs (11.7 kg)	48.6 lbs (21.87 kg)
Dual Two Track (A80465)	25.73 lbs (11.58 kg)	50.1 lbs (22.55 kg)
Dual Three Track (A80475)	25.73 lbs (11.58 kg)	44.86 lbs (20.35 kg)
Dual Four Track (A80400)	35.59 lbs (16.02 kg)	67.34 lbs (30.3 kg)
Dual Six Track (A80460)	35.59 lbs (16.02 kg)	66.84 lbs (30.08 kg)
DiagView Display Unit (A80500)	8.50 lbs (3.86 kg)	12.38 lbs (5.61 kg)
Module Weight:		
CPU2+ (A80403)	1.25 lbs (0.56 kg)	
Track (A80418)	1.00 lbs (0.45 kg)	
PSO (A80418-03)	1.00 lbs (0.45 kg)	
RIO (A80413)	1.13 lbs (0.51 kg)	
GCP PSO (A80428-03)	1.13 lbs (0.51 kg)	
SSCC3i (A80405)	3.63 lbs (1.63 kg)	
Display (A80485) (A80407)	A80485: 1.90 lbs. (0.86 kg) A80407: 3.88 lbs. (1.76 kg)	
Transfer (A80406)	0.38 lbs (0.17 kg)	
Transfer (A80468)	1.50 lbs (0.68 kg)	
SEAR2i (A80410)	5.25 lbs (2.36 kg)	

Table 1-7:
Crossing Controller Module Specifications

PARAMETER	RANGE OF VALUES
Environmental	
▪ Temperature Range:	-40 °F to +158 °F (-40 °C to +70 °C)
▪ Humidity:	95% non-condensing
Connector Wire Size Requirements	
▪ Battery Wires:	Double 10 AWG wire for B and N
▪ Lamp Wires:	10 AWG
▪ Gate Control, Bell, and Input Wires:	16 to 12 AWG
▪ External Battery Charger (customer supplied):	As required by the application
▪ Maximum Ripple Voltage:	1.0V peak-to-peak
Power Requirements	
▪ Input Voltage:	13.2 to 16.5 VDC Nominal.
▪ Operating Current	540 to 600 mA
▪ Maximum Lamp Current:	20 amps (eight 25-watt lamps)
Gate Control (GC)	
▪ Gate DC Output Drive Voltage:	12 VDC nominal
▪ Gate DC Drive Current:	10 amps Initial current dropping to 6 amps after 10 seconds
▪ Programmable Gate Delay:	3 to 20 seconds programmable in 1-second increments
Crossing Control Vital Inputs	
▪ Input Voltage:	20.0 VDC maximum; 12 VDC Nominal
▪ Input States:	Energized at voltages of 7.5 VDC and above; deenergized when input voltage drops below nominal 4.0 VDC
▪ Impedance:	1kΩ nominal
Bell Output	
▪ Duration	Continuous upon activation
▪ Voltage:	12 VDC nominal
▪ Current:	2 amperes maximum
▪ Built-in Isolation:	2000 VAC

Table 1-8:
GCP PSO Module System Specifications

PARAMETER	RANGE OF VALUES
Frequency Stability:	±0.01% (Hz) of the selected frequency
Modulation	Frequency Modulation with 8-bit serial address
Receiver Selectivity	Minimum 60 dB down on adjacent channels
Track Circuit Shunt	Typical values are between 0.06 ohm and 0.5 ohm sensitivity, other values are application dependent
Track Transmitter Load	25 Ohm
Track Receiver Load	250 Ohm
Relay Coil Resistance	400 to 1,000 Ohms
Input Power Supply	9.0 VDC to 16.5 VDC, 12.0 VDC nominal (via GCP case)

SECTION 2 – GENERAL GCP APPLICATION INFORMATION

2.1 MODEL 4000 GCP TRACK SIGNALS

The Model 4000 GCP applies a constant current audio frequency (AF) signal to the track.

2.1.1 Frequency Selection

Approach distance and track ballast resistance generally determines GCP signal frequency selection. Track circuit types, track configurations, and other factors must also be taken into consideration when determining frequency. If difficulties are encountered when setting up track circuits, the generic application may not be correct for that particular site and further investigation and mitigation may be required.

2.1.2 GCP Frequency Range

The Model 4000 GCP application program shows a list of selectable frequencies between 44 and 999 Hz.

2.1.3 GCP Signal Attenuation

GCP transmitted frequencies are attenuated by track ballast resistance: the higher the frequency, the greater the attenuation. The useful approach distance tends to be inversely proportional to the signal frequency.

2.2 MODEL 4000 GCP STANDARD FREQUENCIES

Siemens recommends eleven standard frequencies. Using these frequencies is dependent on approach distance requirements and track ballast conditions.

Table 2-1:
Siemens Standard Frequencies

86	114	156	211	285	348
430	525	645	790	970	

2.3 GCP FREQUENCY VERSES OPERATING DISTANCE

GCP frequency versus the operating distance at 2, 4, and 6 Ohms per 1000 ft. (304.80 meters) of ballast resistance is provided in Table 2-2 (Bidirectional and Simulated Bidirectional) and Table 2-3 (Unidirectional). The minimum distances provided are based on use of hardwire or wideband shunts.

**Table 2-2:
Ballast Resistance vs. Approach Distance by Frequency,
Bidirectional and Simulated Bidirectional Applications**

MODEL 4000 GCP OPERATING FREQUENCY (HZ)	BIDIRECTIONAL APPROACH DISTANCE IN FEET (METERS)					
	2 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		4 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		6 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
86	1,000 (304.8)	5,350 (1,630.7)	1,000 (304.8)	7,950 (2,423.2)	1,000 (304.8)	9,280 (2,362.2)
114	750 (228.6)	4,525 (1,379.2)	750 (228.6)	6,450 (1,966.0)	750 (228.6)	7,448 (2,270.2)
156	600 (182.9)	3,925 (1,196.3)	600 (182.9)	5,550 (1,691.6)	600 (182.9)	6,349 (1,935.2)
211	475 (144.8)	3,350 (1,021.1)	475 (144.8)	4,800 (1,463.0)	475 (144.8)	5,494 (1,674.6)
285	400 (121.9)	2,950 (899.2)	400 (121.9)	4,225 (1,287.8)	400 (121.9)	4,762 (1,451.5)
348	400 (121.9)	2,625 (800.1)	400 (121.9)	3,675 (1,120.1)	400 (121.9)	4,151 (1,265.2)
430	400 (121.9)	2,300 (701.0)	400 (121.9)	3,350 (1,021.1)	400 (121.9)	3,785 (1,153.7)
525	400 (121.9)	2,150 (655.3)	400 (121.9)	3,150 (960.1)	400 (121.9)	3,541 (1,179.3)
645	400 (121.9)	1,950 (594.4)	400 (121.9)	2,800 (853.4)	400 (121.9)	3,175 (967.7)
790	400 (121.9)	1,725 (525.8))	400 (121.9)	2,475 (753.4)	400 (121.9)	2,807 (855.9)
970	400 (121.9)	1,550 (472.4)	400 (121.9)	2,175 (662.9)	400 (121.9)	2,472 (753.5)

**Table 2-3:
Ballast Resistance vs. Approach Distance by Frequency,
Unidirectional Applications**

MODEL 4000 GCP OPERATING FREQUENCY (HZ)	UNIDIRECTIONAL APPROACH DISTANCE IN FEET (METERS					
	2 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		4 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		6 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
86	700 (213.4)	4,375 (1,333.5)	700 (213.4)	6,175 (1,882.1)	700 (213.4)	7,080 (2,158.0)
114	525 (160.0)	3,850 (1,173.5)	525 (160.0)	5,550 (1,691.6)	525 (160.0)	6,360 (1,938.5)
156	420 (128.0)	3,325 (1,013.5)	420 (128.0)	4,875 (1,485.9)	420 (128.0)	5,520 (1,682.5)
211	400 (121.9)	2,750 (838.2)	400 (121.9)	4,100 (1,249.7)	400 (121.9)	4,680 (1,426.5)
285	400 (121.9)	2,250 (686.8)	400 (121.9)	3,500 (1,066.8)	400 (121.9)	3,960 (1,207.0)
348	400 (121.9)	1,925 (586.7)	400 (121.9)	3,025 (922.0)	400 (121.9)	3,420 (1,042.4)
430	400 (121.9)	1,725 (525.8)	400 (121.9)	2,650 (807.7)	400 (121.9)	3,000 (914.4)
525	400 (121.9)	1,500 (457.2)	400 (121.9)	2,275 (693.4)	400 (121.9)	2,580 (786.4)
645	400 (121.9)	1,300 (396.2)	400 (121.9)	1,950 (594.4)	400 (121.9)	2,220 (676.7)
790	400 (121.9)	1,125 (342.9)	400 (121.9)	1,650 (502.9)	400 (121.9)	1,860 (566.9)
970	400 (121.9)	1,050 (320.0)	400 (121.9)	1,550 (472.4)	400 (121.9)	1,710 (521.2)

Lumped loads in the GCP approach can affect the linearity (slope) of EZ over the length of the approach. For further information, refer to Table 9, Model 4000 GCP Field Manual, SIG-00-08-10.

2.4 TRACK CIRCUIT OPERATING FREQUENCY RESTRICTIONS

The following track circuits are subject to the specified operating frequency restrictions:

NOTE

Refer to Paragraph 2.14, Track Circuit Isolation Devices, for applicable battery isolation and AC filter requirements. Contact Siemens Technical Support for assistance as required at (800) 793-7233.

2.4.1 Relay Coded DC Track Circuits

WARNING

THE SINGLE POLARITY DC CODED TRACK CIRCUIT MUST BE CAREFULLY REVIEWED TO ENSURE THAT ALL TRANSMIT AND RECEIVE CODES ARE OF THE SAME POLARITY PRIOR TO INSTALLING ANY 6A342-1 UNIT.

IF THE POLARITY IS IN DOUBT, INSTALL TWO 6A342-3 ISOLATION UNITS AT EACH END OF THE TRACK CIRCUIT USING THE SAME INSTALLATION AS THE DUAL POLARITY CODED TRACK CIRCUIT.

CONTACT SIEMENS TECHNICAL SUPPORT AT (800) 793-7233 FOR DETAILS.

In Relay Coded DC track circuits, select frequencies of 86 Hz or higher. When using frequencies between 86 Hz and 211 Hz use maximum transmit level

2.4.2 Electronic Coded DC Track Circuits

In Electric Coded DC track Circuits, select frequencies of 86 Hz or higher. When using frequencies between 86 Hz and 211 Hz use maximum transmit level

2.4.3 100 Hz Non-coded Cab Signal Circuits

In 100 Hz Non-coded Cab Signal Circuits, select frequencies of 156 Hz or higher. Use maximum transmit level

2.4.4 60 Hz AC Coded Track or Coded Cab Signal Circuits

In 60 Hz AC Coded Track or Coded Cab Signal Circuits, select 86 Hz or higher. Use maximum transmit level

2.4.5 100 Hz AC Coded Track or Coded Cab Signal Circuits

In 100 Hz AC Coded Track or Coded Cab Signal Circuits, select 211 Hz or higher. Use maximum transmit level

2.5 TRACK CIRCUIT FREQUENCY SELECTION

Siemens equipment is compatible with most motion sensing and constant warning time units supplied by other manufacturers, provided audio frequency separation and compatibility are maintained.

WARNING

WHEN SELECTING THE MODEL 4000 GCP TRACK FREQUENCY, ACCOUNT FOR ANY EXISTING AUDIO FREQUENCY TRACK CIRCUIT SIGNALS.

2.5.1 Frequency Selection Restrictions

Before selecting the Model 4000 GCP frequency, determine if any high-level audio frequency (AF) is present on the track. Avoid using any Model 4000 GCP Frequency that is within 15% of any AF signal present. For additional restrictions on the use of overlapping GCP frequencies, see para 2.8.

2.6 GCP APPROACH DISTANCE CALCULATIONS

The approach is defined by the location of the termination shunts.

2.6.1 Approach Distance Calculations

WARNING

THE MODEL 4000 GCP APPROACH DISTANCE CALCULATIONS ARE BASED ON MINIMUM WARNING TIME REQUIREMENTS. ADDITIONAL TIME CAN BE ADDED AS NEEDED TO ACCOUNT FOR ANGLED CROSSINGS, MULTIPLE TRACK, ADVANCE TRAFFIC SIGNAL PREEMPTION, AND SO ON. WHEN PREEMPTING TRAFFIC SIGNALS FOR THE SAME CROSSING AS THE MODEL 4000 GCP, THE APPROACH DISTANCE MUST BE BASED ON THE ADVANCE PRE-EMPTION TIME PLUS THE SYSTEM RESPONSE TIME. IN AREAS WHERE POOR SHUNTING IS EXPECTED ADD FIVE SECONDS OF ADDITIONAL APPROACH DISTANCE.

IN APPLICATIONS WITH SHORT APPROACHES, VERIFY THAT THE ISLAND LENGTH (MINIMUM 120 FT / 36.6 M) DOES NOT EXCEED 30 PERCENT (30%) OF THE LONGEST GCP APPROACH. IF GREATER THAN 30%, INCREASE THE LENGTH. WHERE NOT POSSIBLE (E.G. INSULATED JOINTS)

INCREASE THE APPROACH LENGTH WITH A DUMMY LOAD IN SERIES WITH THE TERMINATION SHUNT. ENSURE THAT THE RESULTING TOTAL LENGTH MEETS THE LENGTH VERSUS FREQUENCY REQUIREMENTS.

Table 2-4:
Warning Time vs. Maximum Speed Distance Table

MAXIMUM SPEED																
MPH		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
ft/s		7.3	14.7	22.0	29.3	36.7	44.0	51.3	58.7	66.0	73.3	80.7	88.0	95.3	102.7	110.0
DISTANCE TRAVELED IN FEET																
TOTAL WARNING TIME IN SECONDS	1	7	15	22	29	37	44	51	59	66	73	81	88	95	103	110
	2	15	29	44	59	73	88	103	117	132	147	161	176	191	205	220
	3	22	44	66	88	110	132	154	176	198	220	242	264	286	308	330
	4	29	59	88	117	147	176	205	235	264	293	323	352	381	411	440
	5	37	73	110	147	183	220	257	293	330	367	403	440	477	513	550
	10	73	147	220	293	367	440	513	587	660	733	807	880	953	1027	1100
	15	110	220	330	440	550	660	770	880	990	1100	1210	1320	1430	1540	1650
	20	147	293	440	587	733	880	1027	1173	1320	1467	1613	1760	1907	2053	2200
	25	183	367	550	733	917	1100	1283	1467	1650	1833	2017	2200	2383	2567	2750
	30	220	440	660	880	1100	1320	1540	1760	1980	2200	2420	2640	2860	3080	3300
	35	257	513	770	1027	1283	1540	1797	2053	2310	2567	2823	3080	3337	3593	3850
	40	293	587	880	1173	1467	1760	2053	2347	2640	2933	3227	3520	3813	4107	4400
	45	330	660	990	1320	1650	1980	2310	2640	2970	3300	3630	3960	4290	4620	4950
	50	367	733	1100	1467	1833	2200	2567	2933	3300	3667	4033	4400	4767	5133	5500
	55	403	807	1210	1613	2017	2420	2823	3227	3630	4033	4437	4840	5243	5647	6050
	60	440	880	1320	1760	2200	2640	3080	3520	3960	4400	4840	5280	5720	6160	6600
	65	477	953	1430	1907	2383	2860	3337	3813	4290	4767	5243	5720	6197	6673	7150
	70	513	1027	1540	2053	2567	3080	3593	4107	4620	5133	5647	6160	6673	7187	7700
	75	550	1100	1650	2200	2750	3300	3850	4400	4950	5500	6050	6600	7150	7700	8250
	80	587	1173	1760	2347	2933	3520	4107	4693	5280	5867	6453	7040	7627	8213	8800
	85	623	1247	1870	2493	3117	3740	4363	4987	5610	6233	6857	7480	8103	8727	9350
	90	660	1320	1980	2640	3300	3960	4620	5280	5940	6600	7260	7920	8580	9240	9900
	95	697	1393	2090	2787	3483	4180	4877	5573	6270	6967	7663	8360	9057	9753	10450
	100	733	1467	2200	2933	3667	4400	5133	5867	6600	7333	8067	8800	9533	10267	11000
	105	770	1540	2310	3080	3850	4620	5390	6160	6930	7700	8470	9240	10010	10780	11550
	110	807	1613	2420	3227	4033	4840	5647	6453	7260	8067	8873	9680	10487	11293	12100
	115	843	1687	2530	3373	4217	5060	5903	6747	7590	8433	9277	10120	10963	11807	12650
	120	880	1760	2640	3520	4400	5280	6160	7040	7920	8800	9680	10560	11440	12320	13200
Note: Where the length of the track is known, the Total Warning Time In Seconds can be determined by dividing the length in feet by the "Feet/Sec" at the train speed selected.																

Table 2-5:
Warning Time vs. Maximum Speed Distance Table (Metric {KPH-M/S})

	MAXIMUM SPEED														
KPH	5	10	15	20	25	30	40	50	60	70	80	90	100	110	120
m/s	1.4	2.8	4.2	5.6	6.9	8.3	11.1	13.9	16.7	19.4	22.2	25.0	27.8	30.6	33.3
TOTAL WARNING TIME IN SECONDS	DISTANCE TRAVELED IN METERS														
1	1	3	4	6	7	8	11	14	17	19	22	25	28	31	33
2	3	6	8	11	14	17	22	28	33	39	44	50	56	61	67
3	4	8	13	17	21	25	33	42	50	58	67	75	83	92	100
4	6	11	17	22	28	33	44	56	67	78	89	100	111	122	133
5	7	14	21	28	35	42	56	69	83	97	111	125	139	153	167
10	14	28	42	56	69	83	111	139	167	194	222	250	278	306	333
15	21	42	63	83	104	125	167	208	250	292	333	375	417	458	500
20	28	56	83	111	139	167	222	278	333	389	444	500	556	611	667
25	35	69	104	139	174	208	278	347	417	486	556	625	694	764	833
30	42	83	125	167	208	250	333	417	500	583	667	750	833	917	1000
35	49	97	146	194	243	292	389	486	583	681	778	875	972	1069	1167
40	56	111	167	222	278	333	444	556	667	778	889	1000	1111	1222	1333
45	63	125	188	250	313	375	500	625	750	875	1000	1125	1250	1375	1500
50	69	139	208	278	347	417	556	694	833	972	1111	1250	1389	1528	1667
55	76	153	229	306	382	458	611	764	917	1069	1222	1375	1528	1681	1833
60	83	167	250	333	417	500	667	833	1000	1167	1333	1500	1667	1833	2000
65	90	181	271	361	451	542	722	903	1083	1264	1444	1625	1806	1986	2167
70	97	194	292	389	486	583	778	972	1167	1361	1556	1750	1944	2139	2333
75	104	208	313	417	521	625	833	1042	1250	1458	1667	1875	2083	2292	2500
80	111	222	333	444	556	667	889	1111	1333	1556	1778	2000	2222	2444	2667
85	118	236	354	472	590	708	944	1181	1417	1653	1889	2125	2361	2597	2833
90	125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
95	132	264	396	528	660	792	1056	1319	1583	1847	2111	2375	2639	2903	3167
100	139	278	417	556	694	833	1111	1389	1667	1944	2222	2500	2778	3056	3333
105	146	292	438	583	729	875	1167	1458	1750	2042	2333	2625	2917	3208	3500
110	153	306	458	611	764	917	1222	1528	1833	2139	2444	2750	3056	3361	3667
115	160	319	479	639	799	958	1278	1597	1917	2236	2556	2875	3194	3514	3833
120	167	333	500	667	833	1000	1333	1667	2000	2333	2667	3000	3333	3667	4000

Note: Where the length of the track is known, the Total Warning Time In Seconds can be determined by dividing the length in meters by the "Meters/Sec" at the train speed selected.

NOTE

System response time is 5 seconds.

The approach distance for a GCP installation with or without an island circuit is the distance from the GCP track wire connections on the rail to the termination shunt connections. Figure 2-1 provides a depiction of approach distances. The required approach distance is calculated using the following factors:

- Maximum speed of trains through the approach in feet per second/meters per second
- Highest crossing warning time requirement in seconds. This is based n crossing operation time or traffic signal preemption time as well as the Model 4000 GCP response time in seconds

2.6.2 Approach Distance Calculation Example

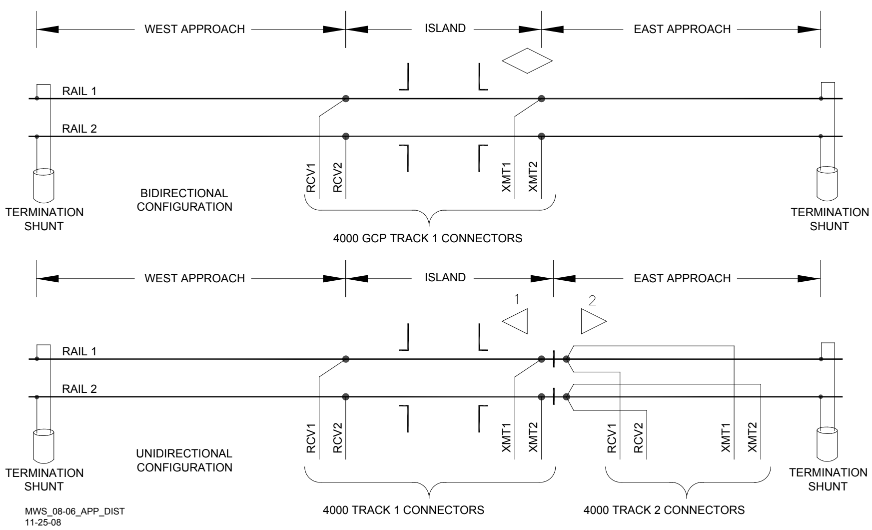


Figure 2-1:
Approach Distance

Given:

- Speed Conversion Factor:
    - 1 mile per hour (MPH) = 1.47 feet per second (ft/s)
    - 1 kilometer per hour (KPH) = 0.27.62 meters per second (m/s)
- Maximum train speed = 50 MPH or 80 KPH
- Typical MS4000 response time = 5 seconds
- Total warning time = 30 seconds

Conversion Formulas:

- Maximum train speed:
    - Measured in ft/s = speed in MPH multiplied by 1.47
    - Measured in m/s = speed in KPH multiplied by 0.28
- Total approach time = Typical MS4000 response time plus (+) Total warning time
- Total approach distance = maximum train speed in ft/s (m/s) multiplied by total approach time

Calculations:

- Maximum train speed:
  - 50 MPH X 1.47 = 73.3 ft/sec
  - 80 KPH X 0.28 = 22.2 m/s
- Total approach time = 5 seconds + 30 seconds = 35 seconds
- Required approach distance:
  - 73.3 ft/sec X 35 seconds = 2567 feet
  - 22.2 m/s X 35 seconds = 777.62 meters

NOTE

The required approach distance is the distance from the island track wires to the shunt termination. Refer to the above figure for further information

2.7 USING NARROW-BAND SHUNTS AND OVERLAPPING APPROACHES

When crossings are close together, it may be necessary to overlap the GCP approaches as well as use adjacent GCP frequencies. Restrictions on the use of adjacent GCP frequencies and the type of termination shunt used are covered in the following paragraphs.

2.7.1 Using Narrow-Band Termination Shunts

A narrow-band shunt must be used to terminate each overlapping approach as shown in Figure 2-2.

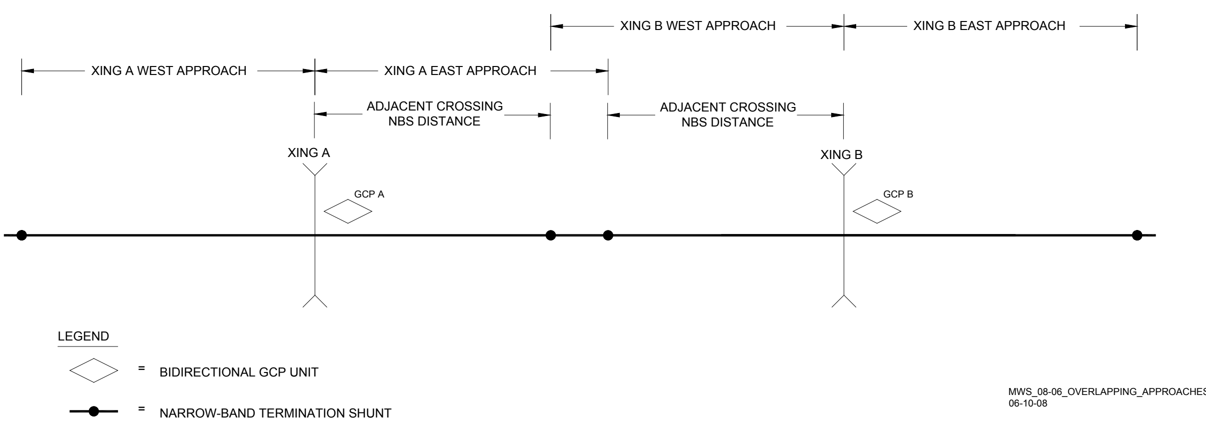


Figure 2-2:
Overlapping Approaches

2.7.2 Types of Narrow-Band Shunts

The following sections detail the types of narrow-band shunts can be used with the Model 4000 GCP.

2.7.2.1 62775 Single Frequency Narrow-Band Shunt

Primary termination shunt for both bidirectional and unidirectional applications. The 62775-f Single Frequency Narrow Band Shunt is available in the following termination frequencies:

Table 2-6:
62775-f Single Frequency Narrow Band Shunt Available Frequencies

86	**156**	267	392	525	686	881
100	172	285	430	560	753	970
114	210	326	452	630	790	979
151	211	348	522	645	816	
Siemens Standard Model 4000 GCP frequencies are shown in **bold**.						

WARNING

THE 62775 NARROW-BAND SHUNT CANNOT BE USED IF A MODEL 4000 GCP APPROACH OVERLAPS A MODEL 300 OR MODEL 400 GCP APPROACH. USE THE 62780 SHUNT INSTEAD.

2.7.2.2 62775 Multifrequency Narrow-Band Shunt

The 62775 Multifrequency Narrow Band Shunt is the primary multi-frequency termination shunt for both bidirectional and unidirectional applications.

Available in the termination frequencies shown in Table 2-7.

Table 2-7:
Multifrequency Narrow-band Shunt, 62775

<table>
<tr><th>SHUNT PART NUMBER</th><th>FREQUENCY (HZ)</th><th>SHUNT PART NUMBER</th><th>FREQUENCY (HZ)</th></tr>
<tr><td rowspan="5">62775-8621</td><td>86</td><td rowspan="5">62775-2152</td><td>211</td></tr>
<tr><td>114</td><td>285</td></tr>
<tr><td>156</td><td>348</td></tr>
<tr><td rowspan="2">211</td><td>430</td></tr>
<tr><td>525</td></tr>
<tr><td rowspan="6">62775-1543</td><td>156</td><td rowspan="6">62775-3497</td><td>348</td></tr>
<tr><td>211</td><td>430</td></tr>
<tr><td>285</td><td>525</td></tr>
<tr><td>348</td><td>645</td></tr>
<tr><td rowspan="2">430</td><td>790</td></tr>
<tr><td>970</td></tr>
</table>

2.7.2.3 62780-f Narrow-band Shunt

The 62780-f Narrow-band Shunt is used in overlapping areas where adjacent frequency narrow-band shunts produce excessive loading when used with the 62775 shunt. It produces less loading effect on adjacent frequencies than 62775-f narrow-band shunt, but does not terminate as well as 62775-f narrow-band shunt. The 62780-f Narrow-band Shunt is used in installations with overlapping Model 300 and Model 400 GCP approaches and is available in the frequencies listed for the 62775-f narrow-band shunt except 172 Hz.

2.7.3 Adjacent Frequency Use In Overlapping Bidirectional Or Simulated Bidirectional Approaches

When overlapping two or more adjacent GCP frequencies in bidirectional and simulated-bidirectional applications the frequency of the overlapping narrow-band termination shunt must be selected to ensure optimum Model 4000 GCP operation. The acceptable adjacent narrow-band shunt frequency is determined by the length of the approach, the track frequency of the approach, and the location of the overlapping termination shunts in their respective approaches.

Charts using these factors are provided to determine if the selected adjacent frequency narrow-band shunt locations are allowed for use in your application.

- Charts for 62775-f narrow-band shunt are shown in Figure 2-3, Figure 2-4, and Figure 2-5.
- Charts for 62780-f narrow-band shunt are shown in Figure 2-6, Figure 2-7, and Figure 2-8.
- A chart is provided for each Model 4000 GCP crossing frequency with its adjacent frequency acceptance information.
- Each chart relates approach distance with the distance from the track wires to the adjacent approach narrow-band shunt
- Shading indicates the distance area near the GCP track wires that adjacent frequency narrow-band shunt distances should not be used.

2.7.4 Adjacent Frequency Narrow-Band Shunt Distance Example

As an example, a crossing GCP is operating at 114 Hz with bidirectional approaches set at 4000 feet (1219.2 m). The overlapping approach narrow-band frequency is 86 Hz. (The 62775-f Narrow Band Shunt chart for 114 Hz with adjacent frequencies of 86 and 156 Hz is shown in Figure 2-3, sheet 1).

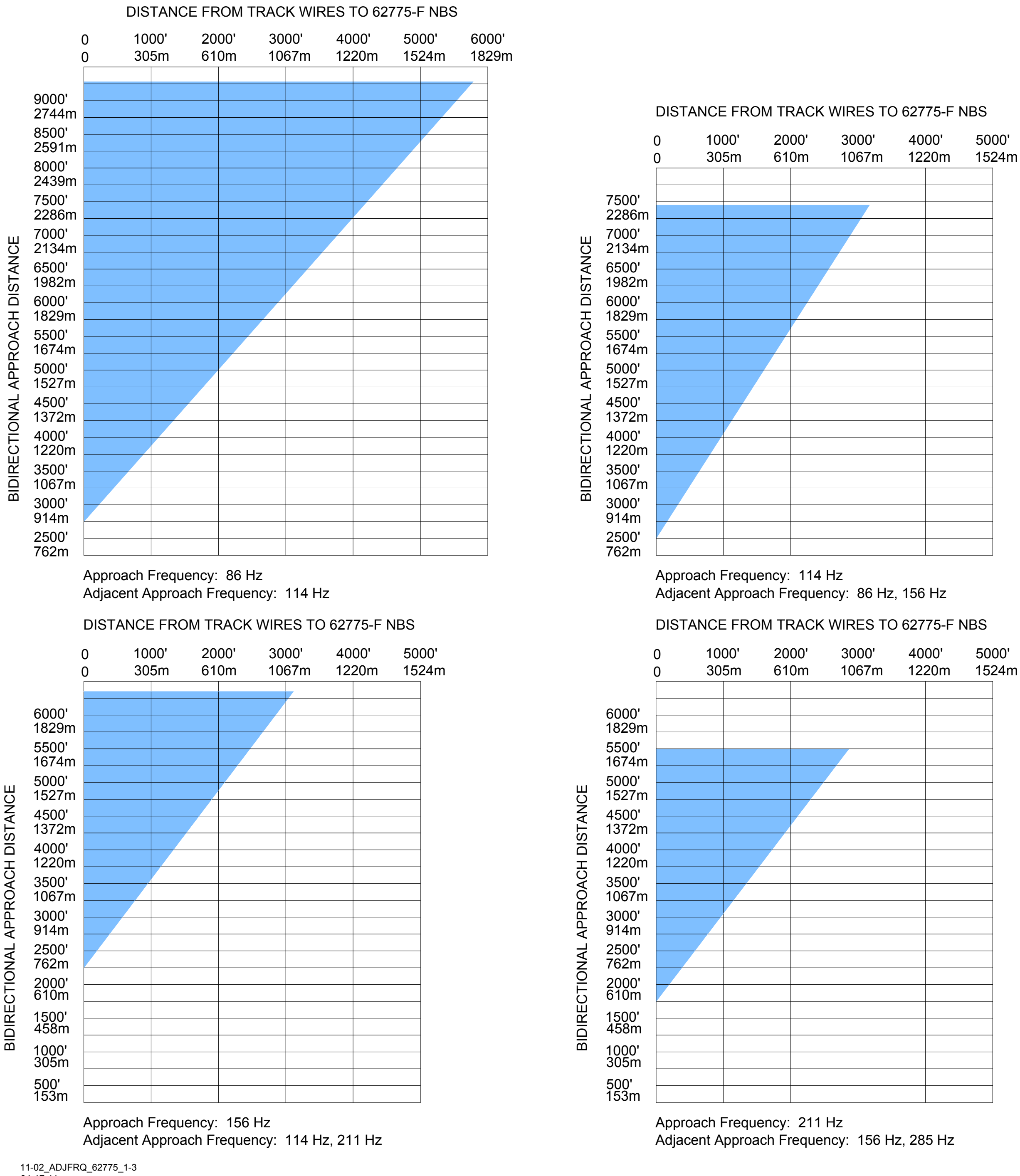
The 114 Hz chart shows that 62775-f Narrow-band Shunts for 86 Hz should be located no closer than 1,000 feet (304.8 m) to the 114 Hz GCP track wires.

If a 62780 shunt is used at 86 Hz (see Figure 2-6) the chart shows the 62780 shunt should be located no closer than 300 feet (91.4 m) to the 114 Hz GCP track wires.

2.7.5 Adjacent Frequency Use with Unidirectional Applications

When adjacent Model 4000 GCP operating frequencies are used for overlapping unidirectional approaches, narrow-band shunts can be used in accordance with the following:

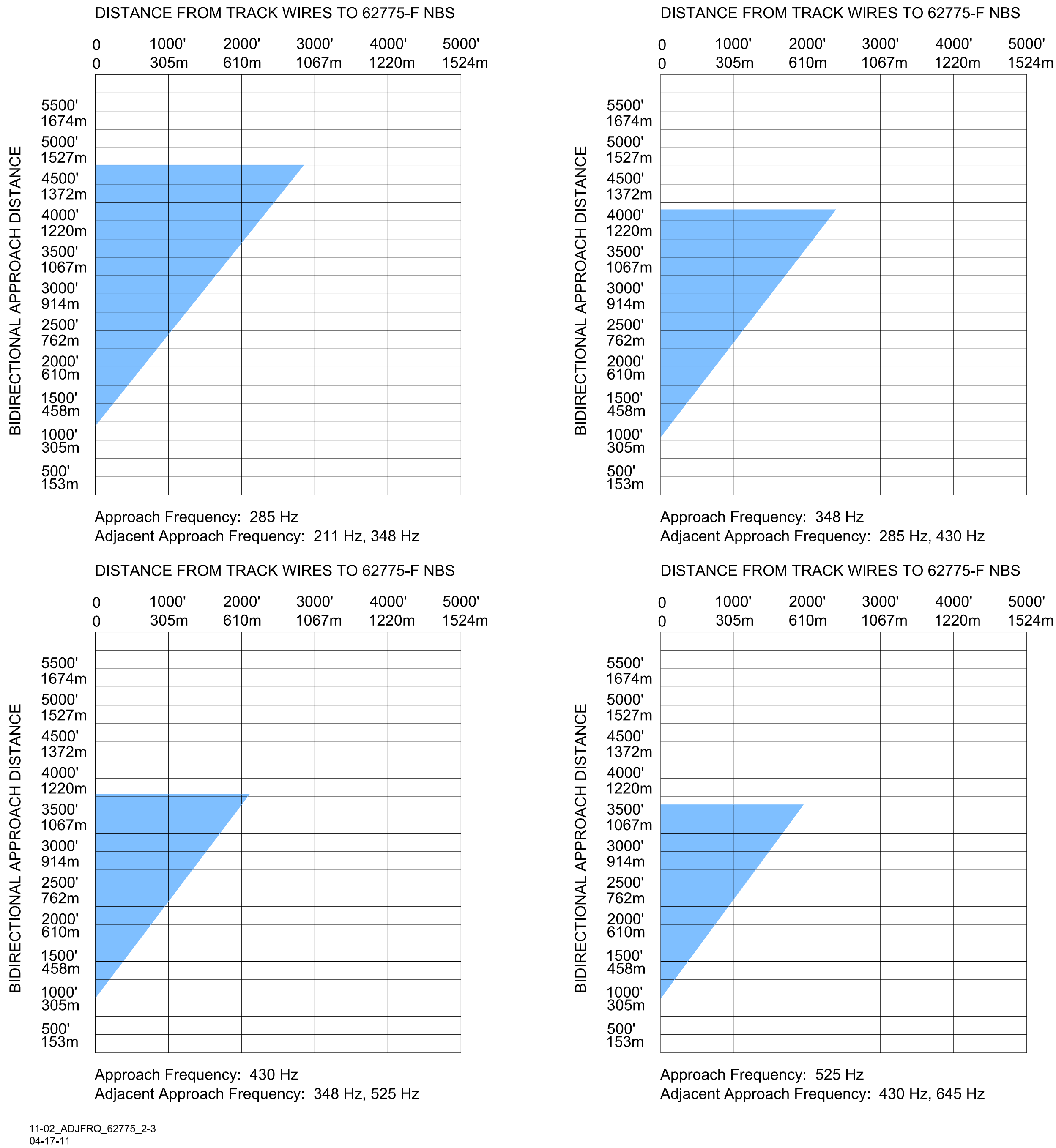
- Adjacent frequency shunts 62775 should only be located in the outer 50% of a unidirectional approach.
- When closer than 50%, change the unidirectional application to simulated bidirectional operation and use Figure 2-3 to determine the allowable shunt location.



DO NOT USE 62775-f NBS AT COORDINATES WITHIN SHADED AREAS

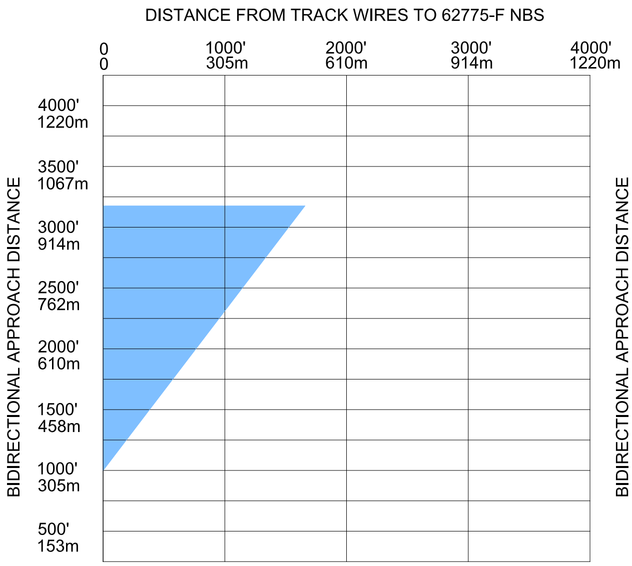
Figure 2-3:

Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 1 of 3)

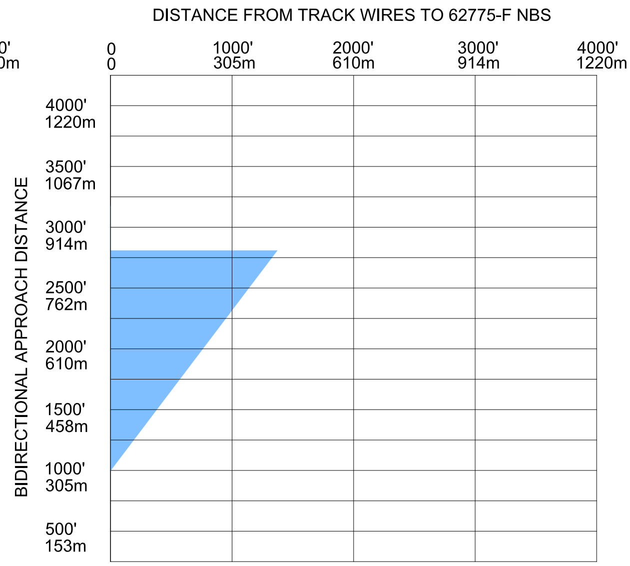


DO NOT USE 62775-f NBS AT COORDINATES WITHIN SHADED AREAS

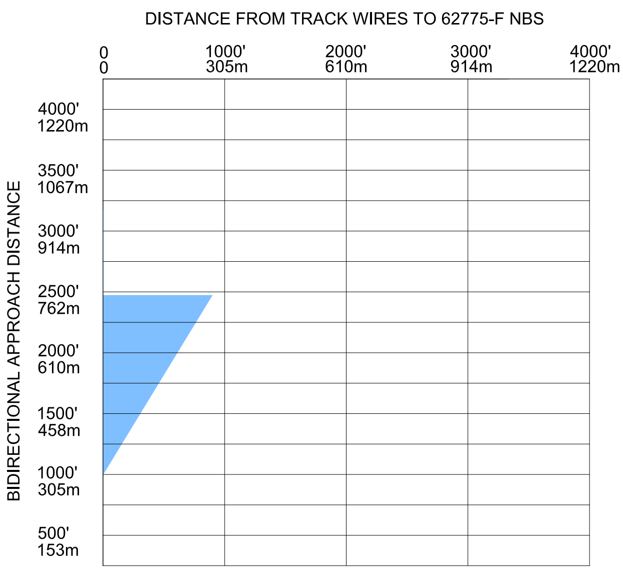
Figure 2-4:
Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 2 of 3)



Approach Frequency: 645 Hz
Adjacent Approach Frequency: 525 Hz, 790 Hz



Approach Frequency: 790 Hz
Adjacent Approach Frequency: 645Hz, 970 Hz



Approach Frequency: 970 Hz
Adjacent Approach Frequency: 790 Hz

11-02_ADJFRQ_62775_3-3
04-17-11

DO NOT USE 62775-f NBS AT COORDINATES WITHIN SHADED AREAS

Figure 2-5:
Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 3 of 3)

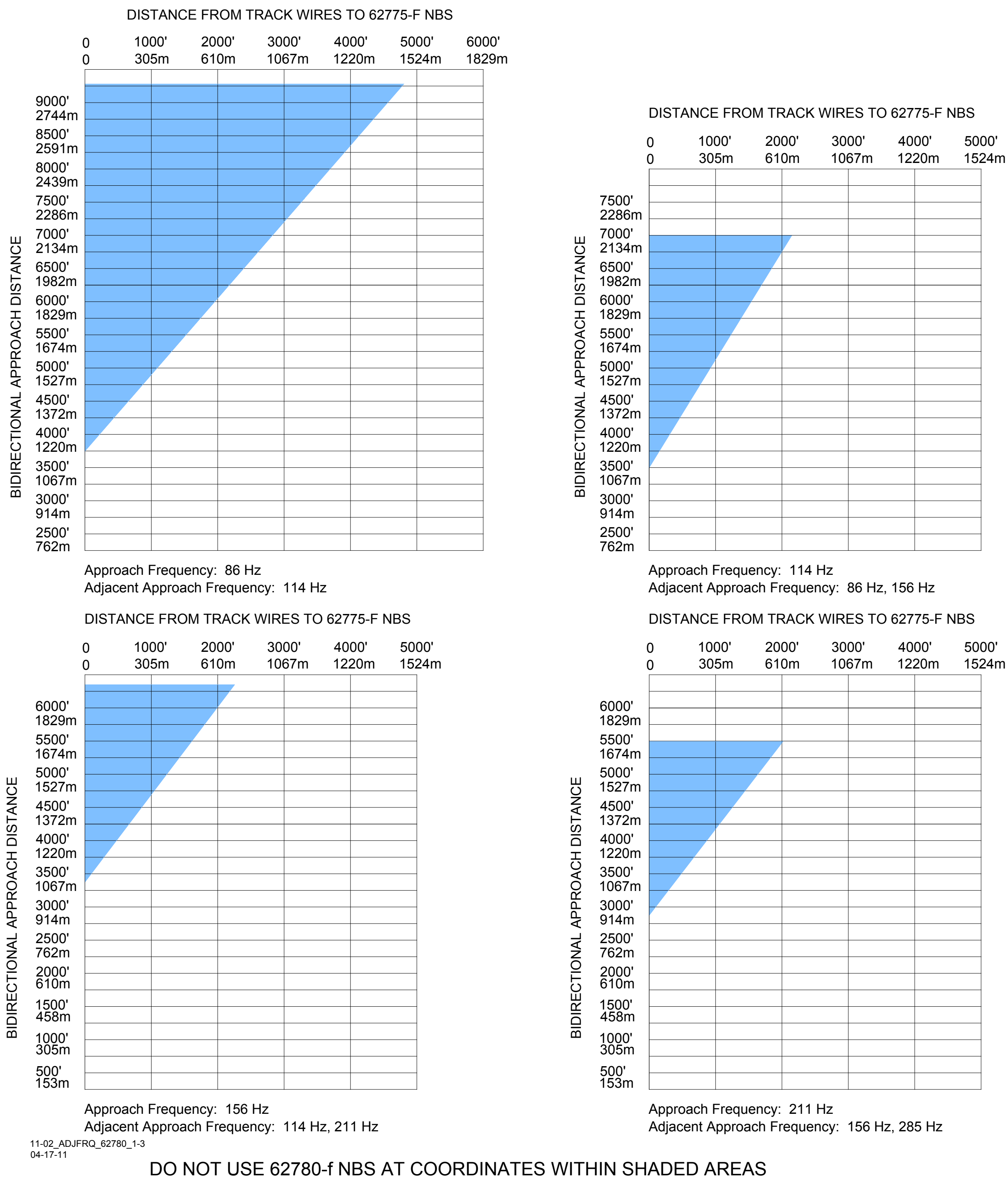
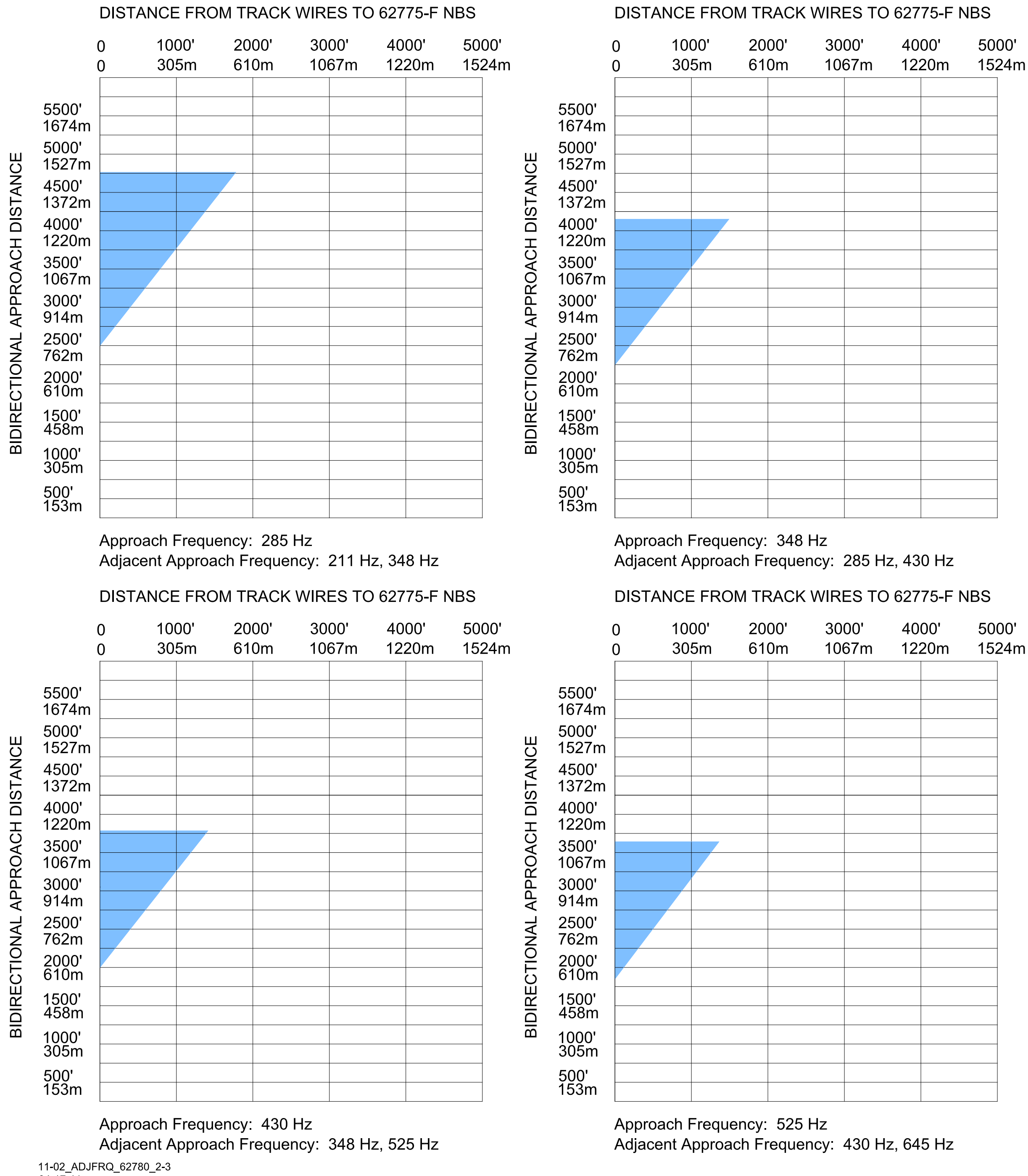
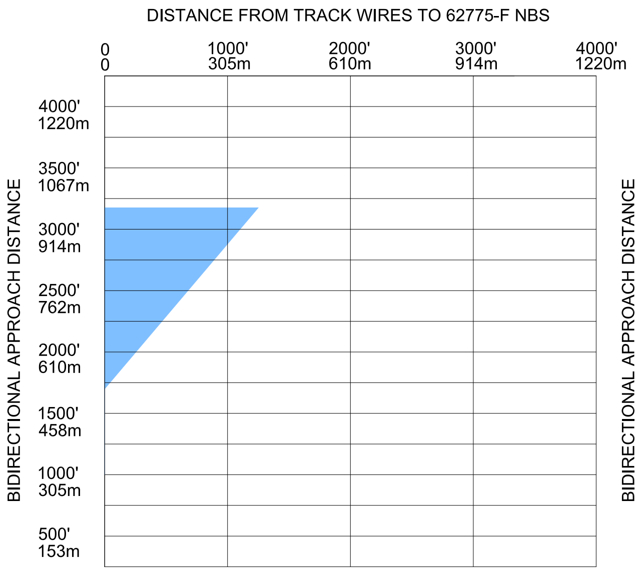


Figure 2-6:
Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 1 of 3)

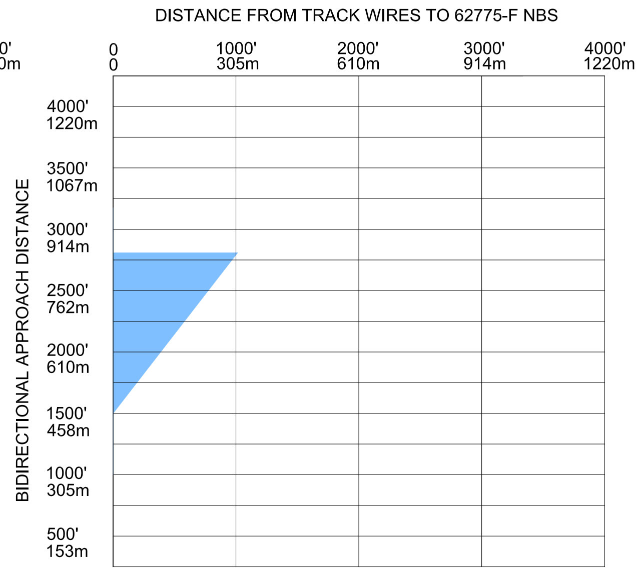


DO NOT USE 62780-f NBS AT COORDINATES WITHIN SHADED AREAS

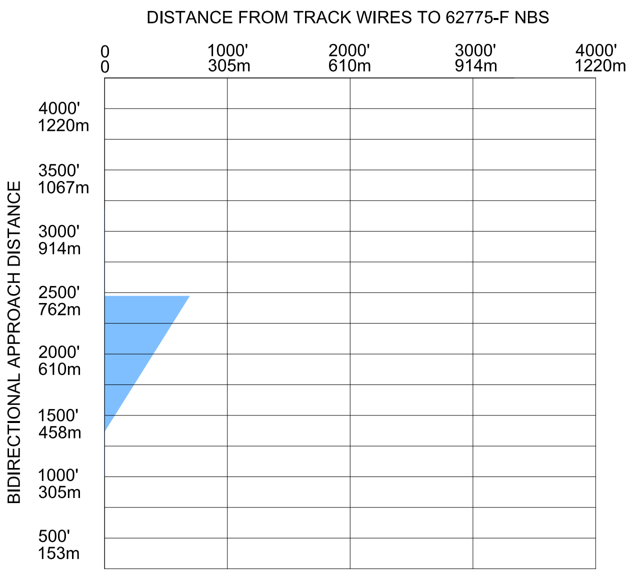
Figure 2-7:
Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 2 of 3)



Approach Frequency: 645 Hz
Adjacent Approach Frequency: 525 Hz, 790 Hz



Approach Frequency: 790 Hz
Adjacent Approach Frequency: 645Hz, 970 Hz



Approach Frequency: 970 Hz
Adjacent Approach Frequency: 790 Hz

11-02_ADJFRQ_62780_3-3
04-17-11

DO NOT USE 62780-f NBS AT COORDINATES WITHIN SHADED AREAS

Figure 2-8:
Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 3 of 3)

2.8 REPEATING MODEL 4000 GCP OPERATING FREQUENCIES

2.8.1 Insulated Joints Requirements

In general, do not operate two Model 4000 GCPs at the same frequency on a common track unless the units are separated by insulated joints. If necessary, frequencies can be repeated without insulated joints, provided the Model 4000 GCP approaches do not overlap and the minimum separation distances specified in Table 2-8 exist between termination shunts, and/or one of the GCPs uses an offset frequency. In some cases of extremely high ballast conditions, it may not be possible to repeat the frequencies without insulated joints.

NOTE

The distances specified in Table 2-8 vary according to frequency and type of terminating shunt.

Use greater distances between shunts where possible. When repeating frequencies in the same block section where the approaches do not overlap, set one Model 4000 GCP track frequency as normal and the other to the lower offset frequency.

Example: When a frequency of 285 Hz is selected, set one Model 4000 GCP to 285 Hz and the other to 284 Hz.

Table 2-8:
Minimum Distance Between Termination Shunts When Repeating Model 4000 GCP Operating Frequencies

STANDARD 4000 GCP FREQUENCY (HZ)	SEPARATION DISTANCE IN FEET (METERS) 62775-F & 62780-F NBS / 8A076A WIDEBAND SHUNTS
86	5200/1200 (1585.0/365.8)
114	4500/1000 (1371.6/304.8)
156	3500/750 (1066.8/228.6)
211	3000/450 (914.4/137.2)
285	2000/225 (609.6/68.6)
348	500/150 (152.4/45.7)
430	400/100 (121.9/30.5)
525	350/75 (106.7/22.9)
645	300/50 (91.4/15.2)
790	250/25 (76.2/7.6)
970	250/25 (76.2/7.6)

2.8.2 Offset Frequencies

A list of the available Model 4000 GCP offset frequencies is provided in Table 2-9.

Table 2-9:
Model 4000 GCP Offset Frequencies (Hz)

85.5	155	286	643
86.5	155.5	347	647
87	156.5	349	788
113	157	429	792
113.5	210	431	968
114.5	212	523	972
115	284	527	

2.9 TERMINATION SHUNTS

Termination shunts are required for all Model 4000 GCP installations. They must be connected across the rails at sufficient distances from the GCP track wire connection points to provide full crossing signal operating time (see paragraph 2.6).

WARNING

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS.

2.9.1 Hard-Wire Shunt

Use a hard-wire shunt only when no other signals (AC or DC) are present on the rails.

2.9.2 Wideband Shunt

Use the Wideband shunt only with steady energy DC track circuits and no other AC signals present on the rails. The Siemens Part Number for the Wideband Shunt is 8A076A

NOTE

The use of dual wideband couplers, part number 8A077, is not required for GCP 4000 applications.

2.9.3 Narrow-Band Shunts

Use a Narrow-band Shunt when other AC signals or coded AC or DC is present on the rails.

2.9.3.1 62775 Single-Frequency Narrow-Band Shunt

The 62775 Single-Frequency Narrow-band Shunt is the primary termination shunt for both bidirectional and unidirectional applications, and is available in the following fixed termination frequencies:

Table 2-10:
Narrow-band Shunt, 62775, Fixed Termination Frequencies

86	151	210	**285**	392	522	630	753	881
100	**156**	**211**	326	**430**	**525**	**645**	**790**	**970**
114	172	267	**348**	452	560	686	816	979

Siemens Standard GCP frequencies are shown in **bold**.

2.9.3.2 62775 Multifrequency Narrow-Band Shunt

The 62775 Multifrequency Narrow-band Shunt is available in four multi-frequency versions (see Table 2-11). The frequency is selected by means of seven standard AREMA terminals. The Siemens Part Number is 62775-XXXX.

Table 2-11:
Multifrequency Narrow-band Shunt, 62775

<table>
<tr><th>SHUNT PART NUMBER</th><th>FREQUENCY (HZ)</th><th>SHUNT PART NUMBER</th><th>FREQUENCY (HZ)</th></tr>
<tr><td rowspan="5">62775-8621</td><td>86</td><td rowspan="5">62775-2152</td><td>211</td></tr>
<tr><td>114</td><td>285</td></tr>
<tr><td>156</td><td>348</td></tr>
<tr><td rowspan="2">211</td><td>430</td></tr>
<tr><td>525</td></tr>
<tr><td rowspan="6">62775-1543</td><td>156</td><td rowspan="6">62775-3497</td><td>348</td></tr>
<tr><td>211</td><td>430</td></tr>
<tr><td>285</td><td>525</td></tr>
<tr><td>348</td><td>645</td></tr>
<tr><td rowspan="2">430</td><td>790</td></tr>
<tr><td>970</td></tr>
</table>

2.9.3.3 62780-f Narrow-Band Shunt

The 62780-f Narrow-Band Shunt is used in territories where overlapping adjacent frequency 62775-f Narrow-Band Shunts produce too much loading effect. The 62780-f NBS must be used when overlapping into Model 300 and Model 400 GCP approaches. The 62780-f NBS produces less loading effect on adjacent frequencies than the 62775-f Shunt does.

The 62780-f Narrow-band Shunt is available in the following fixed termination frequencies:

Table 2-12:
62780-f Narrow-band Shunt Fixed Termination Frequencies

86	151	**211**	326	**430**	**525**	**645**	**790**	**970**
100	**156**	267	**348**	452	560	686	816	979
114	210	**285**	392	522	630	753	881	

Siemens Standard GCP frequencies are shown in **bold**.

2.9.3.4 62780 Multifrequency Narrow-Band Shunt

WARNING

THE 62780 NBS MUST BE USED WHEN OVERLAPPING INTO MODEL 300 AND MODEL 400 GCP APPROACHES.

The 62780 Multifrequency Narrow-band Shunt is used in territories where overlapping adjacent frequency 62775 Narrow-band Shunts provide too much loading effect. It is available in three multi-frequency versions, as depicted in Table 2-13. The frequency is selected by means of seven standard AREMA terminals.

Table 2-13:
62780 Multifrequency Narrow-band Shunt,

<table>
<tr><th>SHUNT PART NUMBER</th><th>FREQUENCY (HZ)</th><th>SHUNT PART NUMBER</th><th>FREQUENCY (HZ)</th></tr>
<tr><td rowspan="4">62780-8621</td><td>86</td><td rowspan="8">62780-1543</td><td>156</td></tr>
<tr><td>114</td><td>211</td></tr>
<tr><td>156</td><td>285</td></tr>
<tr><td>211</td><td>348</td></tr>
<tr><td rowspan="4">62780-5297</td><td>525</td><td rowspan="4">430</td></tr>
<tr><td>645</td></tr>
<tr><td>790</td></tr>
<tr><td>970</td></tr>
</table>

2.9.4 Termination Shunt Installation

On open track locate termination shunts near the rail with leads as short as practical. Where not at insulated joints avoid wire runs of over 25 feet (7.62 meters). Shunt wires should be 6 AWG.

To afford maximum protection from physical damage, place Wideband and Narrow-band Shunts in a protective enclosure or buried at an appropriate depth, but it is not necessary to bury shunt below the frost line. At insulated joints the termination shunt may be located within the house or signal enclosure.

NOTE

The A62776 MS/GCP Termination Shunt Burial Kit protects shunts while they are buried. For additional information on Siemens Shunts and the A62776 Burial Kit, refer to the Section 9, Auxiliary Equipment.

2.10 COUPLING AROUND INSULATED JOINTS

Track separated by insulated joints can be coupled only under the specific conditions described in the following paragraphs.

WARNING

THE FEEDPOINT INSULATED JOINTS OF A UNIDIRECTIONAL OR A SIMULATED BIDIRECTIONAL APPROACH MUST NOT BE BYPASSED WITH ANY COUPLING DEVICE.USE ONLY INSULATED JOINT BYPASS COUPLER, 62785-F WITH THE MODEL 4000 GCP.

WHEN AC TRACK CIRCUITS OR CAB SIGNALS ARE PRESENT, DO NOT COUPLE AROUND THE INSULATED JOINTS WITH ANY TYPE OF COUPLER.

LEAD WIRE LENGTH SHOULD NOT EXCEED 10 FEET (3.05 METERS) AND SHOULD NOT BE SMALLER THAN 6 AWG.

WHEN ADDING OR REPLACING INSULATED JOINT COUPLERS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE INSULATED JOINT COUPLER DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS

2.10.1 Bypassing Insulated Joints Using Wideband Shunt

The 8A076A Wideband Shunt presents low impedance to all GCP frequencies and any other audio signals present. It is only for use with steady energy DC track circuits

WARNING

THE 8A076A WIDEBAND SHUNT MUST NOT BE USED TO BYPASS INSULATED JOINTS IN DC CODED TRACK CIRCUITS, AC TRACK CIRCUITS, AND/OR CODED AC TRACK CIRCUITS.

NOTE

The use of dual wideband couplers, part number 8A077, is not required for GCP 4000 applications.

A total of five insulated joints can be bypassed in an approach using a wideband shunt.

When insulated joints are located very near the crossing and are bypassed with wideband shunts, if possible, place the GCP island circuit track wire connections to the rails beyond the insulated joints.

This includes the wideband shunts in the actual island circuit.

2.10.2 Tunable Insulated Joint Bypass Coupler

The 62785-f Tunable Insulated Joint Bypass Coupler Is available in the standard Siemens operating frequencies of 156 Hz through 970 Hz. The coupler must be located within 10 feet (3.05 meters) of the insulated joints that it is coupling. It can be used in Model 4000 GCP applications that require using an insulated joint bypass coupler as long as:

- No CAB signals, AC, or coded AC track circuits are present.
- In DC coded track circuits, the insulated joints within an approach can be bypassed using the 62785-f coupler, provided the minimum distances specified in Table 2-14 are observed.
- As a general rule, a maximum of two sets of insulated joints in each approach can be bypassed using the 62785-f.
- The 62785-f coupler must be field adjusted to pass the Model 4000 GCP operating frequency around the insulated joints, as field tuning enables precise frequency adjustment for proper GCP operation.
- The 62785-f couplers must be adjusted in conjunction with GCP calibration.
- In motion sensor applications only, you can use the 62785-f coupler when insulated joints are located in general anywhere within the approach. When used in a motion sensor application, the 62785-f couplers must be adjusted in conjunction with GCP calibration

WARNING

THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN TABLE 2-14 APPLY ONLY TO SIEMENS MODEL 4000 GCP'S.

WHEN THE MODEL 4000 GCP IS PROGRAMMED AS A PREDICTOR, APPLICATION RULES FOR THE 62785-F ARE SPECIFIED IN THE TABLE 2-14. WHEN APPROACH LEGNTHS ARE SHORTER THAN THOSE SPECIFIED IN TABLE 2-14, THE 62785-F COUPLER MUST NOT BE LOCATED WITHIN THE INNER TWO-THIRDS OF THAT APPROACH.

USE ONLY THE INSULATED JOINT BYPASS COUPLER, 62785-F WITH THE MODEL 4000 GCP.

TUNED COUPLERS CANNOT BE USED TO BYPASS INSULATED JOINTS IN CAB SIGNAL OR AC TRACK CIRCUITS.

Table 2-14:
Minimum Distance to Insulated Joints Bypassed With The 62785-f Coupler

FREQUENCY (HZ)	MINIMUM DISTANCE TO 1ST SET OF INSULATED JOINTS IN FEET (METERS)*	MINIMUM DISTANCE TO 2ND SET OF INSULATED JOINTS IN FEET (METERS)*
151 to 211	1500 (457.2)	2200 (670.6)
212 to 348	1000 (304.8)	1400 (426.7)
349 to 560	700 (213.4)	1000 (304.8)
561 to 790	500 (152.4)	800 (243.8)
791 to 979	400 (121.9)	700 (213.4)
* Distance applies to insulated joints located on the same side of the crossing. NOTE: Frequencies of 86 and 114 Hz are not normally used with the 62785-f coupler. Contact Siemens Technical Support at 1-800-793-7233 for these applications.		

2.11 INSTALLING BYPASS SHUNTS AND COUPLERS

When installing wide band shunts and tuned couplers to bypass insulated joints, connect the devices directly to the rails with leads as short as practical and encase the devices in a protective enclosure or buried at an appropriate depth as shown in Figure 2-9.

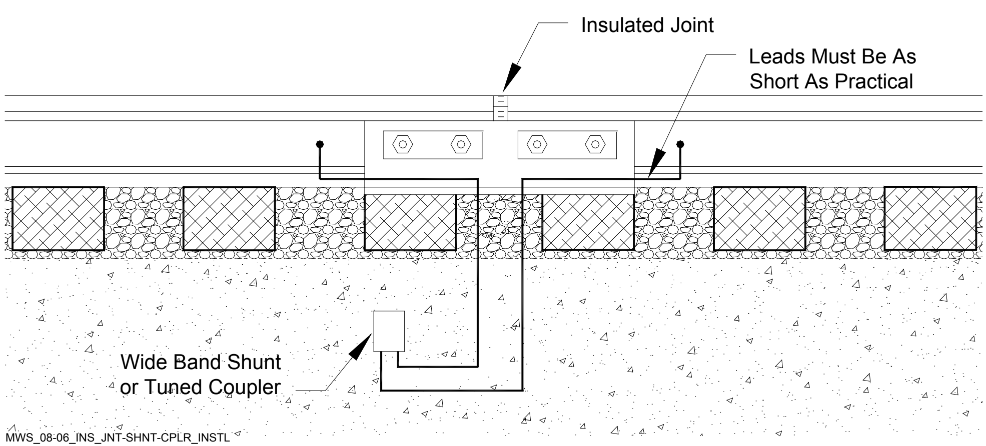


Figure 2-9:
Insulated Joint, Shunt, or Coupler Installation

NOTE

The A62776 MS/GCP Termination Shunt Burial Kit is designed to protect shunts while they are buried. For additional information, refer to Section 9, Auxiliary Equipment.

2.12 ISLAND CIRCUITS

The Model 4000 GCP provides a high frequency island track circuit with excellent cutoff and shunting characteristics under varying ballast conditions.

2.12.1 Island Circuit Approach Length

Siemens recommends that the minimum length of an island track circuit should be 120 feet (36.6 meters) between track connections, or longer if required to ensure island circuit shunting for the operating car fleet and to comply with the operating practices of the railroad. To ensure proper GCP operation, the maximum island length (measured between the track wire connections on either side of the crossing) should be 350 feet (106.7 meters) and must not exceed 30 percent of the longest GCP approach. The 30 percent figure applies to approach circuits that are 1,000 feet (304.80 meters) or shorter.

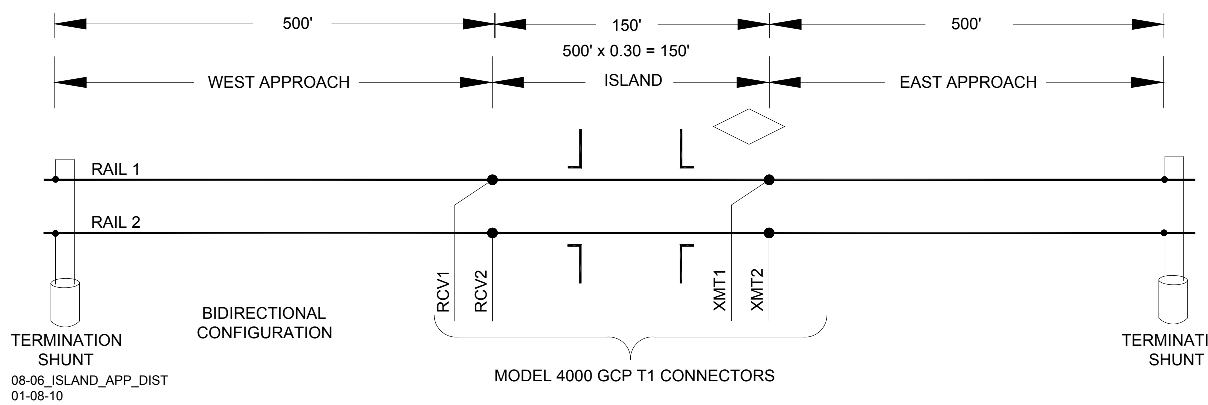


Figure 2-10:
Determining Island Approach Length

For Model 4000 GCP track approaches utilizing an internal island and with track approaches that are less than 800 feet (243.8m), it is permissible to connect the RX and RX CHK wires to the same pair of track wires from the crossing house. This activity will provide a similar benefit to making a six-wire connection for remote applications.

In applications that cannot meet either of the above guidelines, either:

- Use a standard six-wire connection where the Model 4000 GCP RX CHK wires are connected to the TX wires adjacent to the track side connections, or

- Extend or lengthen the approach(es) to a length that meets the 30% rule. This may be accomplished either by extending the approaches or adding dummy loads in series with the termination shunts.

2.12.2 Track Circuit Compatibility

The Model 4000 GCP Island is compatible with most track circuits, including DC and AC coded track.

2.12.3 Island Frequencies

Table 2-15:
Model 4000 GCP Island Frequencies (kHz)

2.14	3.24	4.90	7.10	10.00	13.20	17.50
2.63	4.00	5.90	8.30	11.50	15.20	20.20

WARNING

AT MULTIPLE TRACK INSTALLATIONS, USE DIFFERENT FREQUENCIES FOR EACH ISLAND CIRCUIT.

IN THE SAME TRACK SECTION, DO NOT REPEAT ISLAND FREQUENCIES WITHIN 5000 FEET (1524.0 METERS) UNLESS SEPARATED BY INSULATED JOINTS.

ON ADJACENT TRACKS, DO NOT REPEAT ISLAND FREQUENCIES WITHIN 1500 FEET (457.2 M).

NOTE

Use frequencies of 10.0 kHz and lower when required island length is over 200 feet (61.0 meters), or lumped ballast loading at the street is anticipated.

2.12.4 Island Shunting Sensitivity

The island can be calibrated to respond to a shunting sensitivity of 0.12, 0.3, 0.4 or 0.5 ohms. A hardwire shunt is used for calibration.

NOTE

The island circuit shunting sensitivity adjustment procedure is in the Model 4000 GCP Field Manual, SIG-00-08-10.

Island track circuit calibration is generally performed using 0.12 ohm shunting sensitivity. In an area where poor shunting is experienced or anticipated, a minimum of 0.3-ohm shunting sensitivity is recommended.

In areas of passenger operation, a minimum of 0.3-ohm shunting sensitivity is recommended.

2.12.5 Island Circuit Wiring

Use #6 AWG for track wires. Use twisted pair wires with at least two turns per foot for connections between the track and the GCP bungalow. Provide as much separation between transmit and receive wire pairs as practical. Total wire length from the bungalow to transmit wire rail connections and bungalow to receive wire connections should not exceed 600 ft. (182.9m).

CAUTION

USE PROPER PRIMARY SURGE PROTECTION ON THE TRACK WIRES, GCP BATTERY WIRES, AND ALL GCP LINE CIRCUITS.

2.13 TRACK CONNECTIONS

Track wire (lead) connection requirements are based on the track circuit configuration and the distance between the Model 4000 GCP bungalow and the transmitter lead connections at the track.

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT OR AUXILIARY TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A GCP/MS TRACK CIRCUIT THAT DOES NOT HAVE AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH 2.13.7.

2.13.1 Four-Wire Connections For Bidirectional Applications

In most installations where a Model 4000 GCP is operating at a crossing, four track leads (wires) connect the GCP to the track. Two transmitter leads are connected on the side of the crossing nearest the instrument bungalow. The transmitter leads must be as short as possible and not exceed the maximum lengths specified in Table 2-16. Two receiver leads are connected to the rails on the opposite side of the crossing. Two check channel receiver leads are routed to the surge panel where they are connected to the corresponding transmitter leads as shown in Figure 2-11.

CAUTION

THE MAXIMUM TRANSMITTER LEAD LENGTHS SPECIFIED IN TABLE 2-16 ARE FOR THE TRANSMITTER PAIR OF WIRES MEASURED BETWEEN THE BUNGALOW AND THE RAILS CONNECTIONS. FAILURE TO DO SO MAY RESULT IN CHECK RECEIVER ERRORS AND FALSE ACTIVATION.

NOTE

For information pertaining to PSO Module track connection options including four-wire and six-wire track wire track connections, see Section 6.12, Bidirectional DAXing Operations.

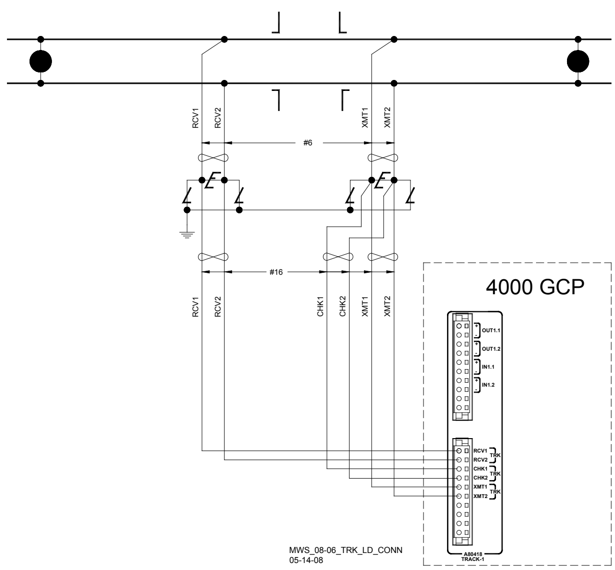


Figure 2-11:
Track Lead Connections

Table 2-16:
Maximum Transmitter Track Wire Length For 4-Wire Applications

STANDARD SIEMENS GCP FREQUENCY (HZ)	MAXIMUM TRANSMIT LEAD LENGTH IN FEET (METERS)
86	100 (30.5)
114	125 (38.1)
156	150 (45.7)
211	200 (61.0)
285-970	250 (76.2)

2.13.2 Four Track Wire Unidirectional and Simulated Bidirectional Applications Rail Connections

In unidirectional or simulated bidirectional installations, locate the transmitter leads adjacent to the insulated joints wherever possible.

2.13.3 Track Lead Routing

Track wires are routed between the GCP track connectors on the 4000 front panel and the Surge Panel and between the Surge Panel and the rails as shown in Figure 2-11. The leads between the Model 4000 GCP and the Surge Panel use number 16 AWG to 12 AWG wire. The transmitter and receiver leads between the Surge Panel and the rails must be twisted and have a minimum wire size of number 6 AWG

NOTE

When using an island circuit, physically separate the GCP transmitter pair as far as practical from the receiver pair, both below ground and within the bungalow.

When splicing track wire connections, use a crimped or welded splice.

2.13.4 Track Lead Length

In general, limit the total track lead length to 600 feet (182.9 meters), where possible. This includes the actual length of the transmitter and the receiver twisted pairs added together. Twist each pair of wires at least two turns per foot. Track lead length is measured from the bungalow to the rail connections.

2.13.5 Six-Wire Connections

When the transmit leads must exceed the maximum lengths specified in Table 2-16, a six-wire track hookup must be used. In a six-wire hookup, the maximum wire length allowed is 3500 feet (1067 meters).

2.13.6 Six-Wire Transmitter and Check Receiver Track Connection Requirements

In a six-wire application there must be a six-wire to four- wire conversion near the rail connection so that only two transmitter wires and two receive wires are actually connected to the track. Each of the two Check wires must be connected to the corresponding Transmitter wire:

- Within 25 feet (7.62 meters) of the rail connections.
- Outside the ballast line or area damaged by track machinery.
- Both transmitter/check pairs are connected to the rail by single wires.
- A typical Model 4000 GCP six-wire to four-wire conversion operating in unidirectional mode is shown in Figure 2-12.

WARNING

IN A SIX-WIRE APPLICATION, TWO CHECK WIRES ARE CONNECTED TO THE CORRESPONDING TRANSMITTER TRACK WIRES IN THE UNDERGROUND TO PROVIDE REMOTE SENSING OF THE TRANSMIT SIGNAL. THE CONNECTION IS MADE WITHIN 25 FEET (7.62 METERS) OF THE TRANSMITTER FEED POINTS BUT NOT AT THE RAIL CONNECTIONS AND NOT WHERE THE CONNECTION CAN BE DAMAGED BY TRACK MACHINERY OR DRAGGING EQUIPMENT.

THE CORRESPONDING XMT AND CHK WIRES MUST BE CONNECTED TOGETHER AS SHOWN IN FIGURE 2-12.

ENSURE THAT THE CORRESPONDING XMT AND RCV WIRES ARE NOT CONNECTED TOGETHER OR OPEN TRACK WIRE DETECTION WILL NOT OPERATE CORRECTLY.

THE LOCATION OF THE TRANSMITTER/CHECK CONNECTION SHOULD BE LOCATED AWAY FROM THE TRACK AND IN A MANNER THAT MINIMIZES THE RISK OF THE CHECK AND RECEIVE WIRES BEING DAMAGED SIMULTANEOUSLY BY TRACK MACHINERY OR DRAGGING EQUIPMENT.

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT OR AUXILIARY TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A GCP/MS TRACK CIRCUIT THAT DOES NOT HAVE AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH 2.13.7.

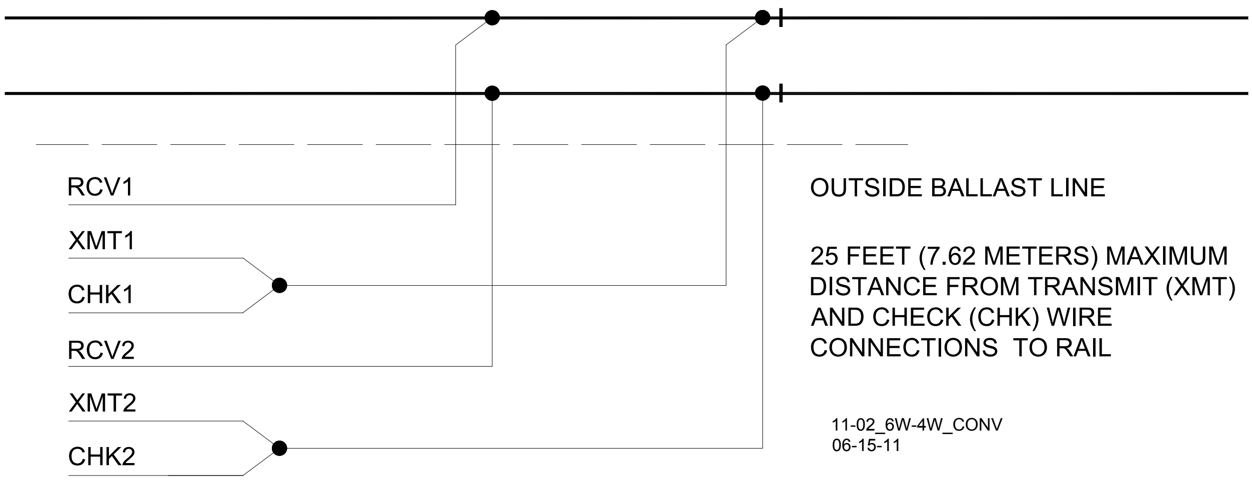


Figure 2-12:
Six-Wire To Four Wire Conversion

2.13.7 Sharing Track Wires with External Track Circuit Equipment

When any external track circuit equipment or auxiliary track circuit equipment shares track wires with a GCP/MS track circuit that does not have an active internal island for that track circuit or output, such as a DAX or Prime Prediction Offset, then the track circuit equipment must be connected in one of two ways:

The external track circuit equipment or auxiliary track circuit equipment may be connected across the receiver wires directly, or

When connected to the Transmitter/Check Receiver wires the external track circuit equipment or auxiliary track circuit equipment must be connected as identified in paragraphs 2.13.7.1 and 2.13.7.2.

2.13.7.1 Six-Wire Connections

The external equipment must be connected to the Check Receiver wires only (refer to Figure 2-14, GCP2)

WARNING

FOR 6 WIRE CONNECTIONS, DO NOT CONNECT ANY EXTERNAL TRACK CIRCUIT EQUIPMENT ACROSS THE TRANSMITTER WIRES.

2.13.7.2 Four-Wire Connections

The Check Channel Receiver wires may connect either to the Transmitter wires at the same point or prior to connecting to the other track circuit equipment (refer to Figure 2-13), or

The Check Channel Receiver wires may connect to the external track circuit equipment prior to connecting to the transmitter track wires (refer to Figure 2-14, GCP 1)

WARNING

DO NOT CONNECT ANY EXTERNAL TRACK CIRCUIT EQUIPMENT ACROSS THE TRANSMITTER PRIOR TO CONNECTING IT TO THE CHECK CHANNEL RECEIVER WIRES.

CONNECTIONS MUST BE ARRANGED SO THAT AN OPEN WIRE OR OPEN CONNECTION WILL NOT RESULT IN THE TRANSMITTER WIRES BEING CONNECTED TO THE AUXILIARY TRACK CIRCUIT EQUIPMENT UNLESS THE CHECK RECEIVER IS ALSO CONNECTED (REFER TO FIGURE 2-13).

NOTE

External track circuit equipment includes, but is not limited to, 80049 DC Exciter Panels, Electronic Coded Track, AFO Track circuits, Track batteries or relays, surge suppressors (not including air gap arresters) or Bidirectional Simulation Couplers.

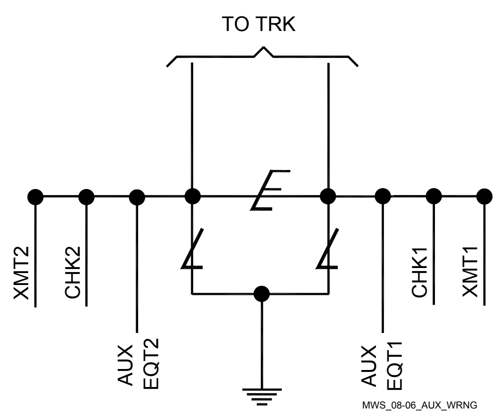


Figure 2-13:
Proper Connections of Track Wires

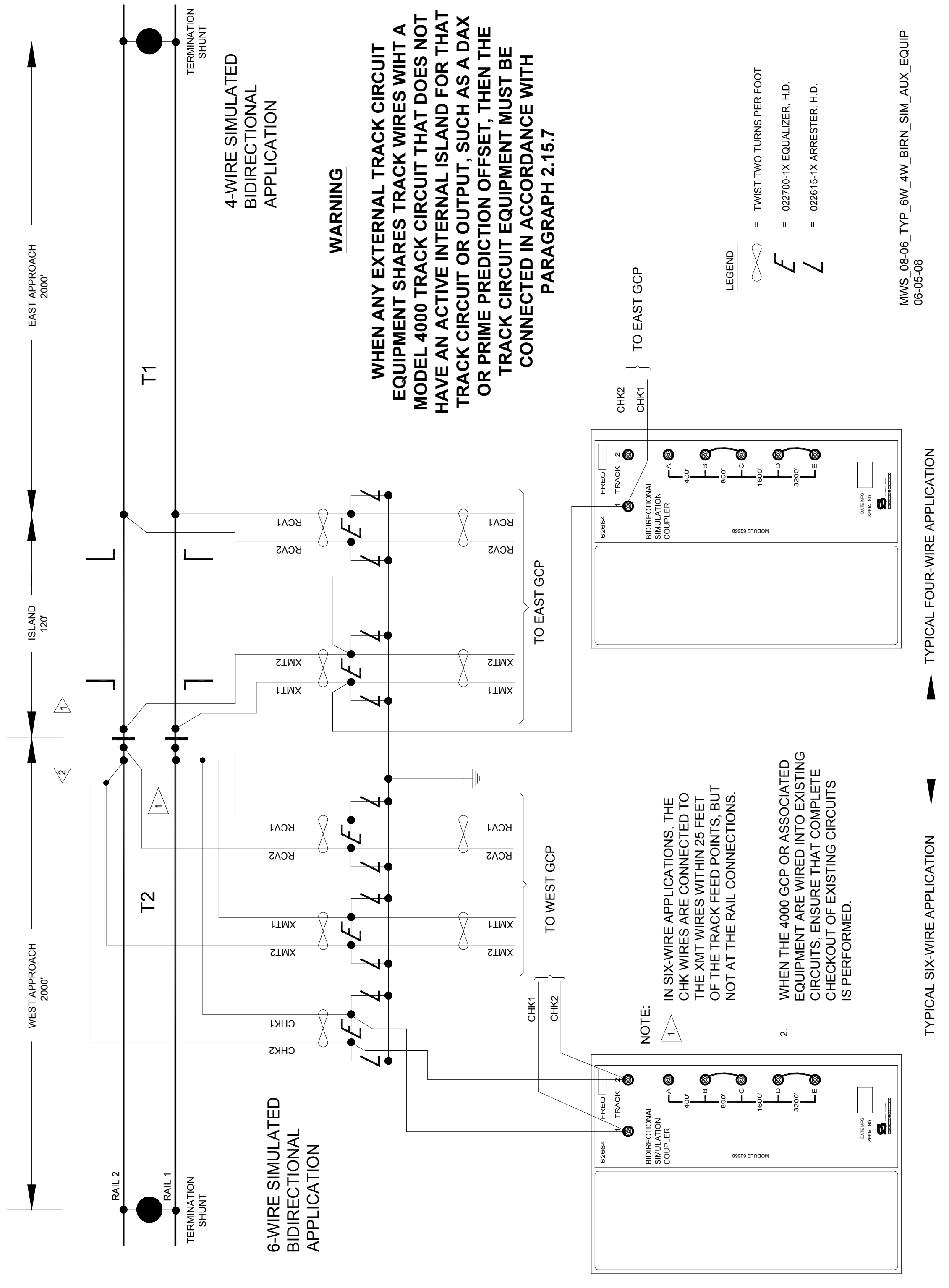


Figure 2-14:
Proper 4-Wire & 6-Wire Connections When Using Auxiliary Track Circuit Equipment

NOTE

Customer Service Bulletin 4-94, dated 3-8-94, concerned multiple track wire failures and it recommended connecting the transmitter and check receiver track wires “at or near the bootleg connection and then running a single wire to the rails. The single wire was limited to a maximum of 50 feet (16 meters).

Customer Service Bulletin 3-06B.01, dated 12-8-06, amended 12/19/06, indicates in Figures 2 and 3 that “the CHK wires are connected to the XMT wires within 25 feet (7.62 meters) of the track feed points, but not at the rail connections.”

Current practice is to connect the CHK and XMT wires within 25 feet (7.62 meters) of the track feed points, which further reduces the potential for check receiver errors. Existing locations that are between 25 and 50 feet (8 – 16 meters) and do not experience check receiver errors may remain at their location.

2.14 TRACK CIRCUIT ISOLATION DEVICES

Several types of track circuit isolation devices are available for both DC and AC coded track applications. The following discussions are grouped by non-coded and coded track circuit type.

NOTE

The recommendations listed in the following paragraphs are general in nature and no attempt is made to cover all applications.

Battery chokes and code isolation devices described here are designed for mounting inside a weatherproof enclosure.

If there are any questions concerning these recommendations or applications, contact Siemens Technical Support for assistance.

2.14.1 Steady Energy DC Track Circuits

A DC track circuit should be equipped with a battery choke when its battery is located within the Model 4000 GCP approach and it is less than 1,000 feet (304.80 meters) beyond the approach termination.

NOTE

If the track connections for the DC track circuit are 1,000 feet (304.80 meters) or more beyond the GCP approach termination shunt, a battery choke is not required (see Section 9, Auxiliary Equipment).

2.14.1.1 Battery Chokes

WARNING

IN APPLICATIONS WHERE THE CHOKE IS LOCATED WITHIN AN ADJACENT MODEL 300 OR MODEL 400 GCP APPROACH, THE 8A065A BATTERY CHOKE MUST BE USED.

WHEN PLACING THE WIDEBAND SHUNT, 8A076A, AS SHOWN IN FIGURE 2-16 ENSURE THAT THE SHUNT IS PLACED ON THE BATTERY SIDE OF THE INDUCTOR.

CAUTION

IN LONG DC TRACK CIRCUITS, THE DC RESISTANCE OF THE 8A065A BATTERY CHOKE CAN ADVERSELY AFFECT TRACK CIRCUIT OPERATION AT LOW BALLAST. USE THE 62648 BATTERY CHOKE IN THIS TYPE OF CIRCUIT.

WHEN USING A GCP OPERATING FREQUENCY OF 114 HZ IN A DC TRACK CIRCUIT WITH A RECTIFIED 60 HZ SOURCE, USE A 8A076A WIDEBAND SHUNT WITH THE BATTERY CHOKE TO ELIMINATE THE 120-HZ RIPPLE PRODUCED (SEE FIGURE 2-16).

NOTE

For additional information on Siemens Battery Chokes, refer to the Section 9, Auxiliary Equipment.

Two Siemens Battery Chokes can be used in DC track circuits. The part number and DC resistance for each choke is listed below:

Table 2-17:
Siemens Battery Chokes

PART NUMBER	DC RESISTANCE
62648	0.10 ohm
8A065A	0.40 ohm

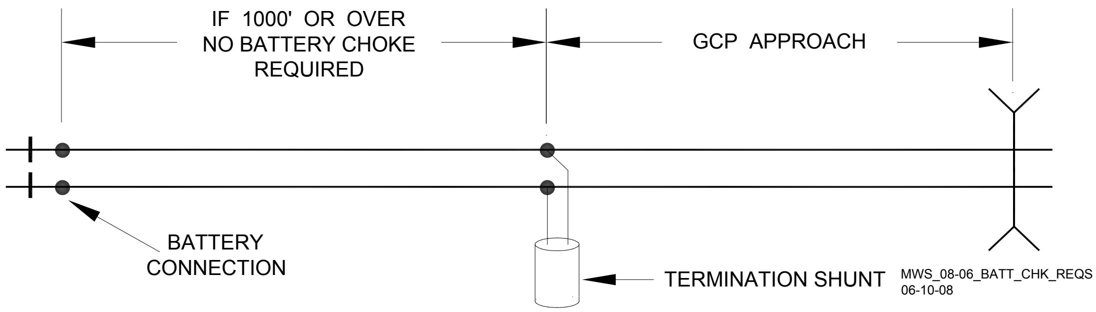


Figure 2-15:
Battery Choke Requirements

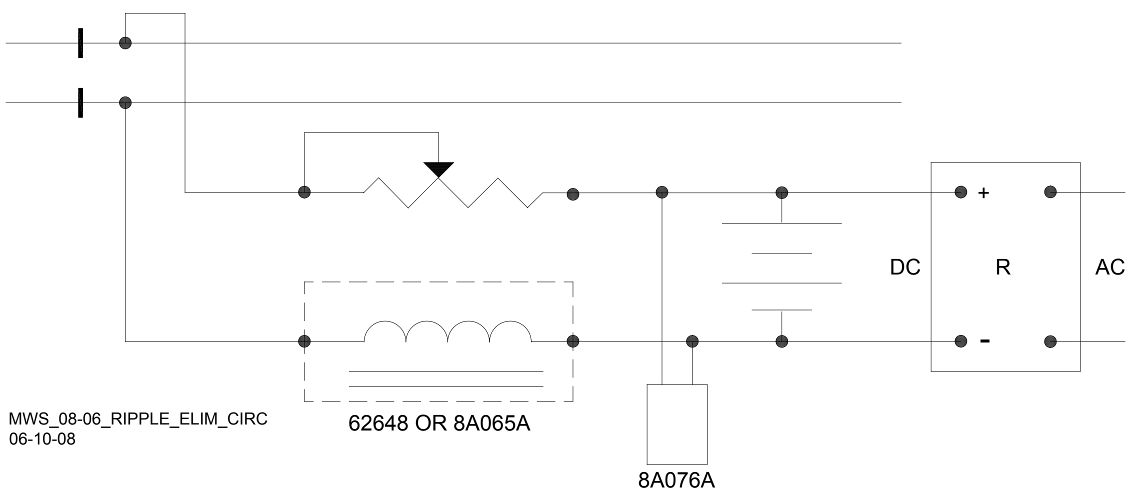


Figure 2-16:
Ripple Elimination Circuit

2.14.2 Siemens GEO Coded DC Track Circuit

Standard GCP frequencies of 86 Hz and higher are compatible with GEO. Isolation circuits are not required in the GEO transmitter rail connections.

Frequencies of 86, 114, 156, and 211 Hz require using maximum track drive, and installation of GEO Track Noise Suppression Filter, A53232. The GEO Filter must be installed at the signal location for the above mentioned frequencies.

2.14.3 Electronic Coded DC Track Circuit

Standard GCP frequencies of 86 Hz and above can normally be used with electronic DC coded track systems; e.g., ElectroCode, GenraKode™, MicroTrax®, and E-Code. All frequencies of 211 Hz and lower require using maximum GCP track drive.

When signals from other equipment are present on the track, GCP transmit level should be set to maximum.

NOTE

Under some circumstances, an external track filter may be required when electronic coded track is located within the Model 4000 GCP approach.

As with any coded track system, the lower the transmit level, the less interference to GCP units.

2.14.4 Relay Coded DC Track Circuit

WARNING

THE SINGLE POLARITY RELAY DC CODED TRACK CIRCUIT MUST BE CAREFULLY REVIEWED TO ENSURE THAT ALL TRANSMIT AND RECEIVE CODES ARE OF THE SAME POLARITY PRIOR TO INSTALLING ANY 6A341-1 UNIT. IF THE POLARITY IS IN DOUBT, INSTALL TWO 6A342-3 ISOLATION UNITS AT EACH END OF THE TRACK CIRCUIT

SAME INSTALLATIONS AS THE DUAL POLARITY CODED TRACK CIRCUIT.

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

CONTACT SIEMENS TECHNICAL SUPPORT AT 1-800-793-7233 FOR MORE DETAILS.

Most relay coded DC track installations require DC Code Isolation units. A code isolation unit is a special battery choke that aids in preventing coded track battery and track relays from causing high interference with the Model 4000 GCP. The Siemens 6A342-1 DC Code Isolation unit is used in most single polarity code systems. The Siemens 6A342-1 DC Code Isolation unit is also used in GRS Trakode (dual polarity) relay systems, as long as the GRS TD relay is also used.

2.14.4.1 Single (Fixed) Polarity Systems

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

NOTE

To limit current losses to the track relay during low track ballast conditions, use number 6 AWG wires to terminals 1 and 2 on the Isolation units.

A fixed polarity code system must have the same received and transmitted polarities to use the 6A342-1 DC Code Isolation unit. 75, 120, 180-ppm rate code systems are generally fixed polarity systems. A typical fixed polarity code system using the 6A342-1 Code Isolation unit is shown in Figure 2-17.

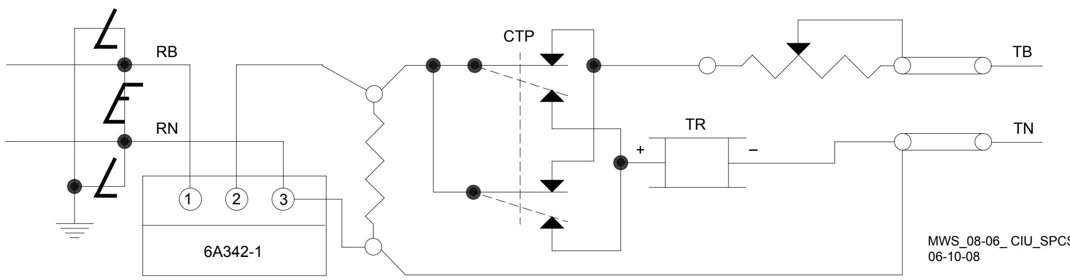


Figure 2-17:
Code Isolation Unit in a Single Polarity Code System

2.14.4.2 GRS Trakode (Dual Polarity) Systems:

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

TO INSTALL THE UNIT AS SHOWN IN FIGURE 2-18, A TRANSFER DELAY (TD) RELAY MUST BE USED.

DO NOT INSTALL ANY CODE ISOLATION CIRCUIT IN GRS TRAKODE WITHOUT USING THE TD RELAY.

NOTE

To limit current losses to the track relay during low track ballast conditions, use #6 AWG wires to terminals 1 and 2 on the Isolation units.

The GRS Trakode (dual polarity) system is the only dual polarity system that can use the 6A342-1 code isolation unit as installed. This application requires that a GRS TD relay also be used when installing a 6A342-1 unit. Figure 2-18 shows the 6A342-1 Code Isolation unit installed in a GRS Trakode system.

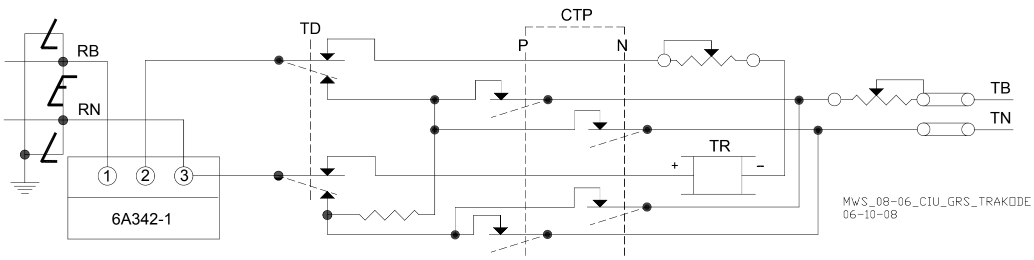


Figure 2-18:
Code Isolation Unit Installation In GRS Trakode System

2.14.4.3 Dual Polarity (Polar) Coded Track Systems Other Than GRS Trakode

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

NOTE

For additional information on Siemens DC Code Isolation units, refer to Section 7, Auxiliary Equipment.

Contact Siemens Technical Support for at 1-800-793-7233 for assistance in dual polarity code systems.

A dual polarity system is one in which the received code polarity is opposite to that of the transmitted code.

When used in a dual polarity system, two 6A342-3 Code Isolation units must be placed at each end of the circuit for proper filtering. The application depends upon the track circuit configuration.

2.14.5 AC Code Isolation Units

CAB signal track circuit installations require an AC Code Isolation unit. AC Code Isolation units are designed to minimize harmonic frequencies from being applied to the track and provide a higher impedance to GCP frequencies. The part number and isolation frequency for each Siemens AC Code Isolation unit is listed below:

Table 2-18:
Siemens AC Code Isolation Units

PART NUMBER	ISOLATION FREQUENCY
8A466-3	60 Hz
8A470-100	100 Hz

2.14.5.1 CAB Signal AC:

WARNING

ALWAYS VERIFY PROPER CAB SIGNAL OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

Application of Model 4000 GCP systems in cab territory using the 8A466-3, 60 Hz AC Code Isolation Unit or the 8A470-100, 100 Hz Isolation Unit is shown in Figure 2-19.

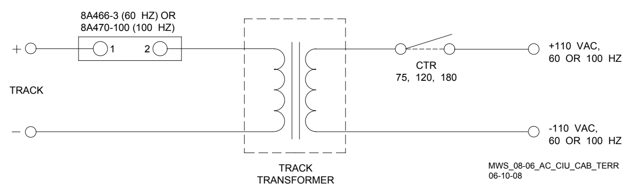


Figure 2-19:
AC Code Isolation Unit Used in CAB Territory

2.15 APPROACH CONFIGURATIONS

2.15.1 Bidirectional Configuration

The bidirectional configuration is the simplest of the approach applications. This configuration allows:

- a single Model 4000 GCP track module to monitor train movement in both approaches to a crossing
- longest approach distance for each operating frequency
- bidirectional approach distances are less affected by low ballast resistance than unidirectional applications

A typical bidirectional application consists of an island and two approaches (see Figure 2-2). The Island is defined by the location of the rail connections. The approach length is defined by the location of the termination shunt rail connections.

2.15.2 Bidirectional Approach Length Balancing

Bidirectional approach length must be balanced within ±10 percent. Where approach distances differ by more than 10 percent, due to the presence of un-bypassed insulated joints in one of the approaches, simulated track must be added in series with the termination shunt of the shorter approach to bring it within 10% of the longer approach.

2.15.3 Simulated Track

Simulated track can consist of either of the following:

- 8V617 Simulated Track Inductor of the proper value, which is normally installed within the Multifrequency Narrow-band Shunt
- 8A398-6 Adjustable Inductor

2.15.4 Unidirectional Installations

WARNING

DO NOT BYPASS THE FEEDPOINT INSULATED JOINTS OF A UNIDIRECTIONAL OR A SIMULATED BIDIRECTIONAL APPROACH WITH ANY COUPLING DEVICE.

When configured for unidirectional operation:

- A Track module monitors train movements in a single approach due to insulated joints being present
- When insulated joints are at a crossing, two Track modules are required to monitor both approaches
- Insulated joints are sometimes used to separate crossing approaches (see Figure 2-20).
- Using insulated joints permits GCP frequencies to be repeated in adjacent approaches.
- Locate insulated joints opposite each other, as close as practical.

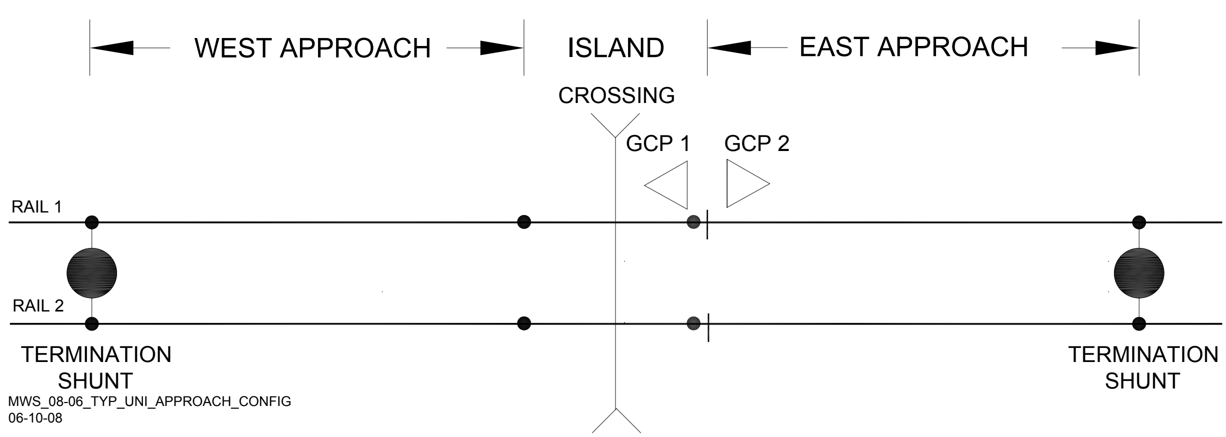


Figure 2-20:
Typical Unidirectional Approach Configuration

Unidirectional installations are generally used:

- When the signal system dictates them
- when closely following trains are expected

- at crossings where standing cars or trains can occupy opposite approach circuits
- with remote GCPs in coded track and cab signal territory to extend crossing approaches beyond existing track circuit limits.

2.15.5 Simulated Bidirectional Installations

WARNING

FOR SIMULATED BIDIRECTIONAL OPERATION, THE MODEL 4000 GCP MUST BE PROGRAMMED FOR SIMULATED BIDIRECTIONAL OPERATION.

NOTE

In general, where unidirectional GCP approaches longer than 2,000 feet (609.6 meters) are required, use the simulated bidirectional application. This ensures optimum GCP operation over varying ballast conditions.

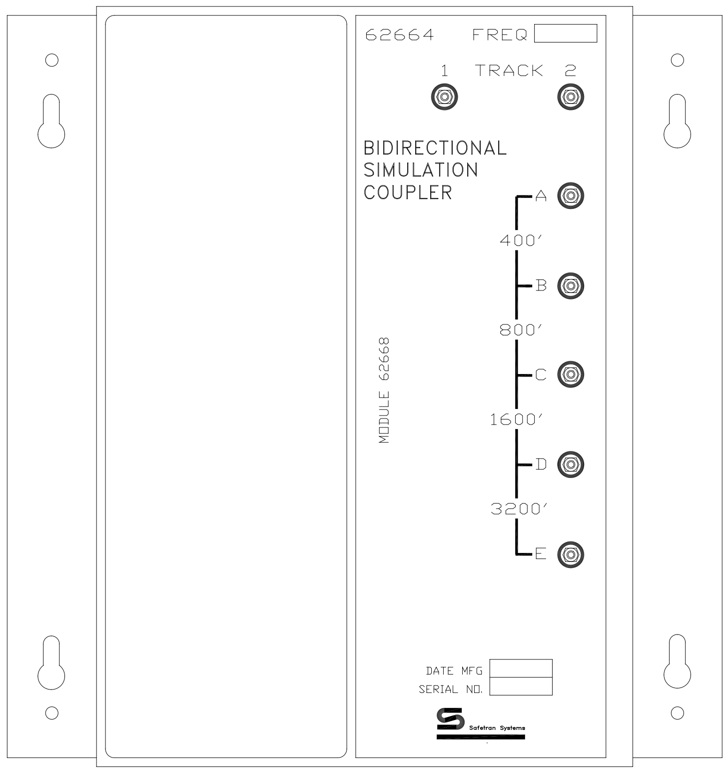
The simulated bidirectional configuration is applied to a unidirectional installation to obtain the low ballast and adjacent frequency overlap operating benefits of a bidirectional application. Bidirectional applications are less affected by low ballast (EX) than unidirectional applications. In the simulated bidirectional configuration, a narrow-band shunt is connected in series with an adjustable inductor.

This combination is generally connected in parallel across the track connections in the bungalow and is adjusted to be electrically equal in distance to that of the actual track approach circuit. Both approach circuits appear equal in length to the Model 4000 GCP.

2.15.6 Simulated Approach

A simulated bidirectional approach can consist of any of the following:

- 62664-f Bidirectional Simulation Coupler adjusted to the proper distance (Figure 2-21).
- 8V617 Simulated Track Inductor in series with a Multi-frequency Narrow-band Shunt. The inductor distance must be equal within 10% to that of the track approach.
- 8A398-6 Simulated Track Inductor in series with a Narrow-band Shunt.



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06-10-08

Figure 2-21:
Bidirectional Simulation Coupler

The 62664-mf Bidirectional Simulation Coupler contains a Narrow-band Shunt at the GCP termination frequency and an adjustable simulated track inductor that simulates a specific track length and is tapped and connected to front panel terminals.

The front panel terminals allow simulated approach distances to be selected that closely match the actual track approach. Approach distances ranging from 400 to 6,000 feet (121.9 – 1829 meters) in 400 foot (121.9 meter) increments can be selected using terminal shorting straps adjustable within ± 200 feet (61.0 meters) of the GCP approach

WARNING

IN STANDARD FOUR-WIRE SIMULATED BIDIRECTIONAL INSTALLATIONS, THE BIDIRECTIONAL SIMULATION COUPLER (62664-MF) MUST BE CONNECTED TO THE TWO TRANSMITTER (XMT) TRACK LEADS AS SHOWN FOR T1 IN FIGURE 2-22. DO NOT USE THIS COUPLER AS A STANDARD TERMINATION SHUNT ON THE TRACK.

NOTE

For additional information on the 62664-mf Bidirectional Simulation Coupler, refer to Section 7, Auxiliary Equipment.

2.15.7 Six-Wire Simulated Bidirectional Applications Connections

When a unidirectional Model 4000 GCP is connected in a six-wire simulated bidirectional configuration (see paragraph 2.15.5) the bidirectional simulation coupler must be connected to the check (CHK) wires as shown in Figure 2-22.

WARNING

IN A STANDARD SIX-WIRE BIDIRECTIONAL CONFIGURATION THE BIDIRECTIONAL SIMULATION COUPLER (62664-MF) MUST BE CONNECTED TO THE TWO CHECK (CHK) TRACK LEADS AS SHOWN FOR T2 IN FIGURE 2-22 AND NOT BE CONNECTED TO THE TRANSMIT (XMT) TRACK LEADS.

IF THE COUPLER IS INCORRECTLY CONNECTED TO THE TRANSMIT (XMT) WIRES OF THIS CONFIGURATION, AN OPEN TRANSMITTER TRACK WIRE MAY NOT BE DETECTED. THIS CAN ADVERSELY AFFECT GCP OPERATION.

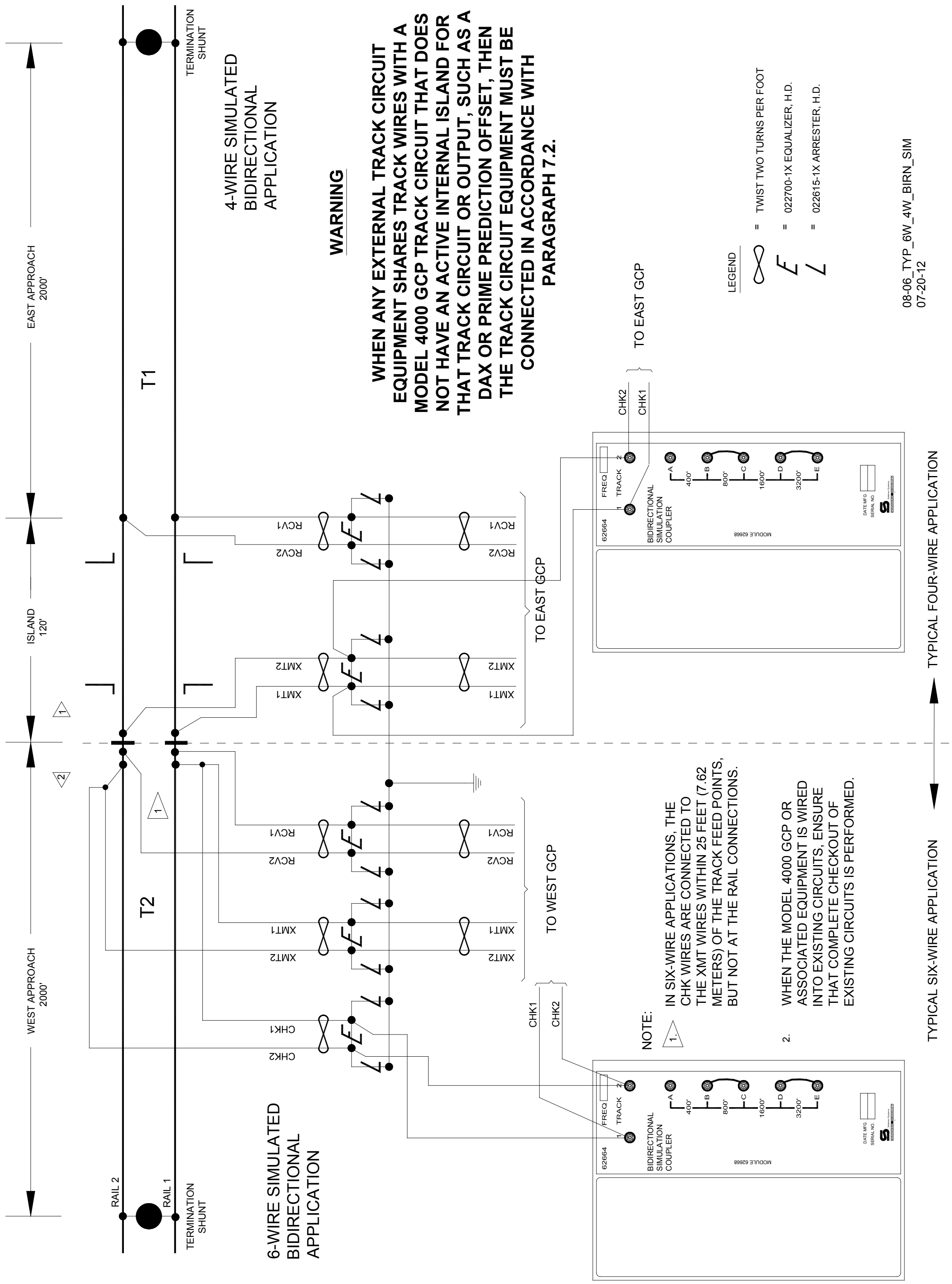


Figure 2-22:
4 and 6-Wire Simulated-Bidirectional Applications

2.16 REMOTE PREDICTION GUIDELINES

Remote Prediction (also known as DAX) effectively extends approaches beyond the limits imposed by insulated joints. Remote prediction is the transfer of prediction information from a GCP at a remote location to a GCP at a crossing. Transfer may be via cable or by means of spread spectrum radio (SSR).

2.16.1 Remote Prediction Use Requirements

Remote prediction is used where an approach is too short to provide the required warning time or preempt prediction.

2.16.2 Remote Prediction Capability

Each Track Module of the 4000 GCP may be programmed to provide up to nine prediction output signals:

- DAX A through DAX G
- Prime
- Preempt

2.16.3 Remote Prediction Configuration

A GCP providing remote prediction from a set of insulated joints must be configured for unidirectional or simulated bidirectional operation. Where applicable, a Model 4000 GCP may provide Bidirectional DAXing when configured with the appropriate software and hardware configuration.

2.16.3.1 Warning Time

The required crossing warning time is programmed into the remote prediction unit.

2.16.3.2 Predictor Input

NOTE

When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, Dax, or pre-empt will switch to motion sensor operation.

When the UAX or DAX ENABLE energize, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation

The GCP receiving the remote prediction must be enabled to receive the individual predictor outputs from the remote unit:

- DAX A through DAX G Enable

- Prime UAX
- Preempt Enable

The available local inputs must be configured for the required pickup delay.

2.16.3.3 Remote Prediction Via SSR

Data transfer between 4000 GCP and SSR is via Echelon® LAN. There are two communication channels: Radio DAX Link A and Radio DAX Link B. All active vital signals are transmitted via SSR over one of the two links.

2.16.4 Typical Remote Prediction Operation

Remote prediction operation is normally initiated from either an adjacent crossing or a remote location that has insulated joints.

- A typical GCP controlled from a remote location other than a crossing as shown in Figure 2-23.

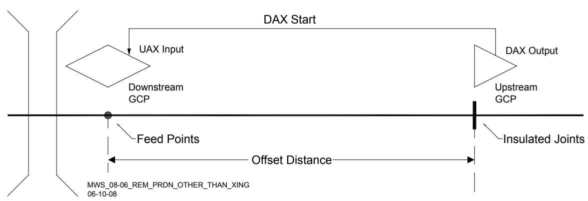


Figure 2-23:
Remote Prediction From A Remote Location Other Than A Crossing

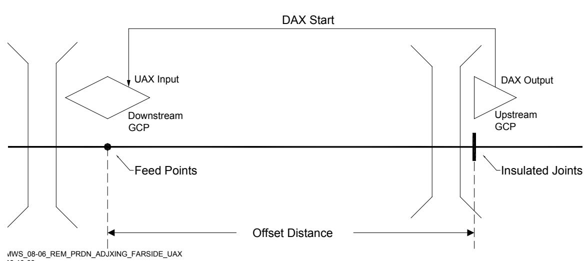


Figure 2-24:
Remote Prediction From An Upstream Crossing - Joints On Far Side

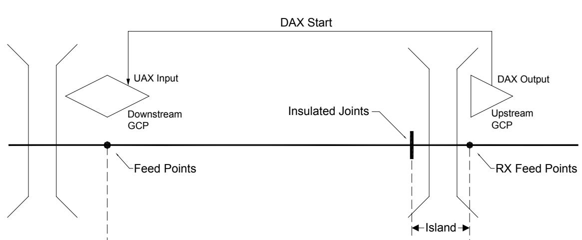


Figure 2-25:
Remote Prediction From An Upstream Crossing – Joints On Near Side

2.16.5 DAX Offset Distance

The distance between the crossing feed points and the remote 4000 GCP location is the remote offset distance. This value is programmed in the remote prediction unit. The offset distance is field measured from the crossing feed points to either the DAX insulated joints as illustrated in Figure 2-23 and Figure 2-24 or to the DAX receiver feed wires as shown in Figure 2-25.

2.16.6 Remote Approach Distance calculations

The remote approach distance required is the crossing Full Approach Distance minus the DAX Offset Distance as shown in figure A. For Example:

- Full crossing approach = 3600 ft. / 1098 m
- DAX offset distance = 2200 ft / 671 m
- DAX Approach distance = 3600 – 2200 = 1400 ft. / 427 m

DAX approach distance (in this case 1400 ft. / 427 m) can be designed longer if desired but not shorter or warning time for fastest trains will become shorter.

WARNING

DAX MINIMUM APPROACH DISTANCE IS A CRITICAL DISTANCE FOR ADEQUATE WARNING TIMES. MINIMUM DAX APPROACH DISTANCE IS GENERALLY 1000 FT (304.8 M), BUT THERE ARE EXCEPTIONS.

FOR EXCEPTIONS, SEE PARAGRAPH 5.3, MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS.

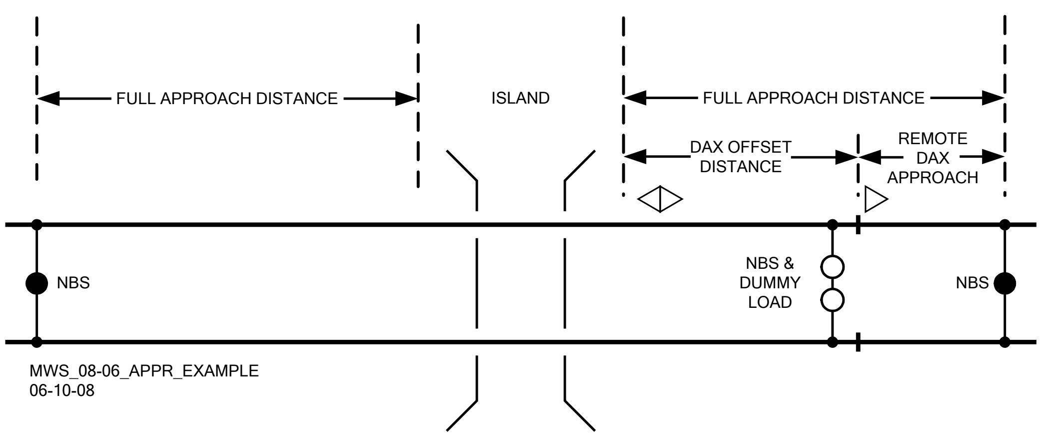


Figure 2-26:
Approach Example with DAX Offset and Remote DAX Approach Distances

2.17 SURGE PROTECTION

2.17.1 Primary Surge Protection for Track and I/O Wiring Between Bungalows

All 4000 track wires, output and input line or cable circuit wires that leave or enter the bungalow must have primary surge protection provided. Primary surge protection for 4 and 6 track wires requires arrestors and equalizer as shown in Figure 2-46. Primary surge protection for all I/O wiring between bungalows is shown in Figure 2-47.

2.17.2 Battery Surge Protection and Power Wiring

Primary battery surge protection for the GCP requires careful power wiring from the charger to battery, from battery to surge arrestors and from surge arrestors to 4000 equipment. Primary arrestors, equalizers and power wiring are shown in Figure 2-48.

Note: SSCC surge protection is discussed in Appendix D.

2.18 TYPICAL APPLICATION DRAWINGS

This section provides drawings to show each of the following Model 4000 GCP applications:

- Single Track, Bidirectional (Figure 2-27)
- Two Track, Bidirectional (Figure 2-28)
- Single Track, Back-to-Back, Unidirectional (Figure 2-29)
- Two Track, Back-to-Back, Unidirectional (Figure 2-30)
- Single Track, Bidirectional, And Remote Single Track, Unidirectional (Figure 2-31)
- Single Track, Bidirectional, And Remote Single Track (Six Wire), Unidirectional, In Single GCP Case (Figure 2-32)
- Single Track, Back-to-Back, Unidirectional, In Simulated Bidirectional Operation (Figure 2-33)
- Single Track, Back-to-Back, Unidirectional, In Simulated Bidirectional Six Track Wire Operation (Figure 2-34)
- Single Track, Two Overlapping Crossings, Using Remote Prediction (Figure 2-35)
- Single Track, Two Overlapping Crossings, Using 80049-1 DC Shunting Enhancer Panels (Figure 2-36)
- Three Track, Bidirectional (Figure 2-37)
- Four Track Bidirectional (Figure 2-38)
- Single Track, Remote Prediction via Radio DAX link (Sheet 1 of 2) (Figure 2-39)
- Single Track, Remote Prediction via Radio DAX link (Sheet 2 of 2) (Figure 2-40)
- Single Track, Remote Prediction with Advanced Preemption (Figure 2-41)
- Single Track, Remote Prediction for Two Overlapping Bidirectional Crossings (Figure 2-42)
- Typical Single Track, Vital IO Bidirectional DAX Application (Figure 2-43)
- Typical Single Track, Internal PSO Bidirectional DAX Four-Wire Application (Figure 2-44)
- Typical Single Track, Center Fed Bidirectional DAX Six-Wire Application (Figure 2-45)
- Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections Figure 2-46)
- Typical Surge Protection Requirements When Cabling Between Remote DAX Unit and Crossing Unit (Figure 2-47)
- Recommended Battery Surge Protection Wiring for Model 4000 GCPs (Figure 2-48)

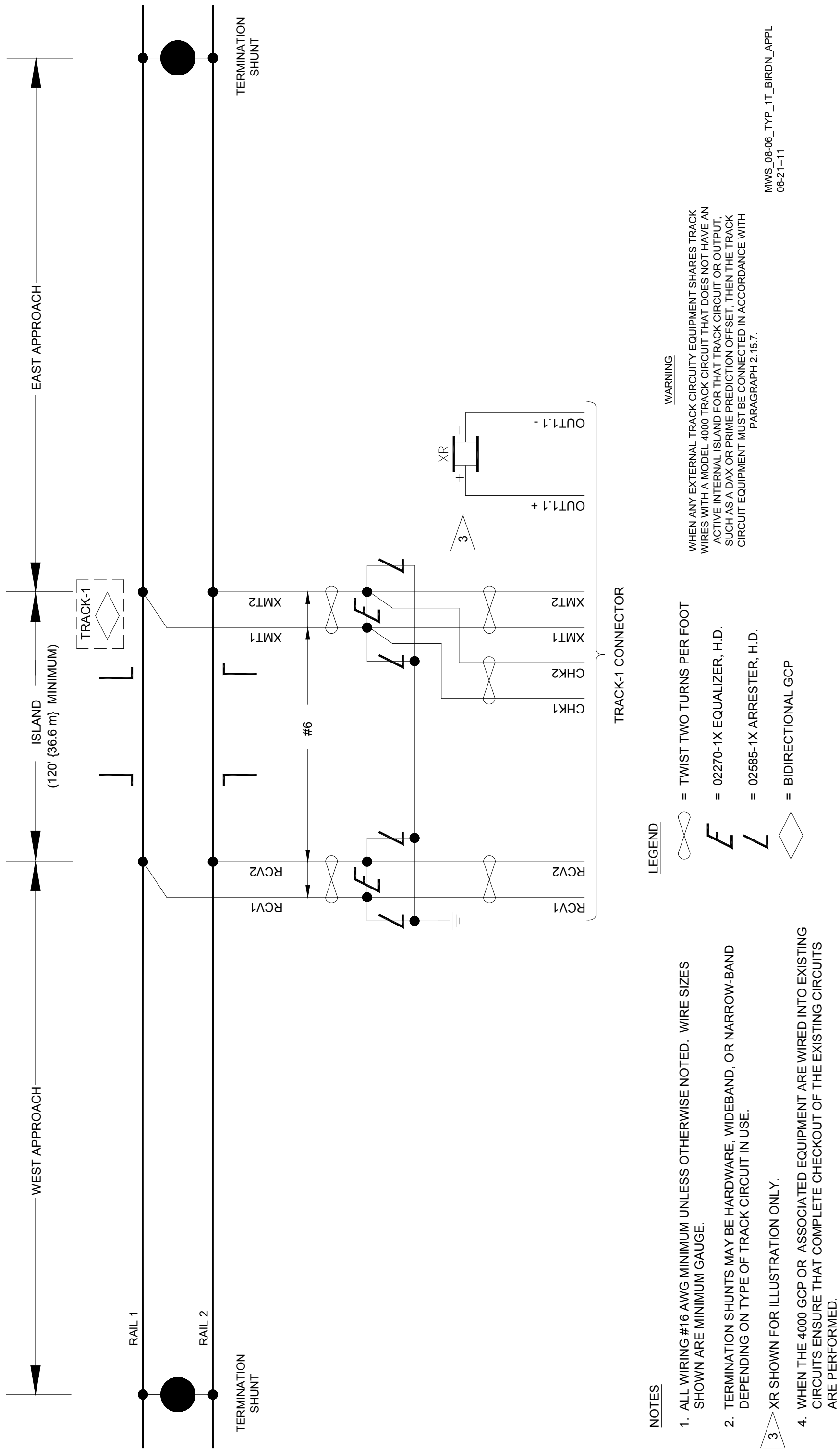


Figure 2-27:
Typical Single Track Bidirectional Application

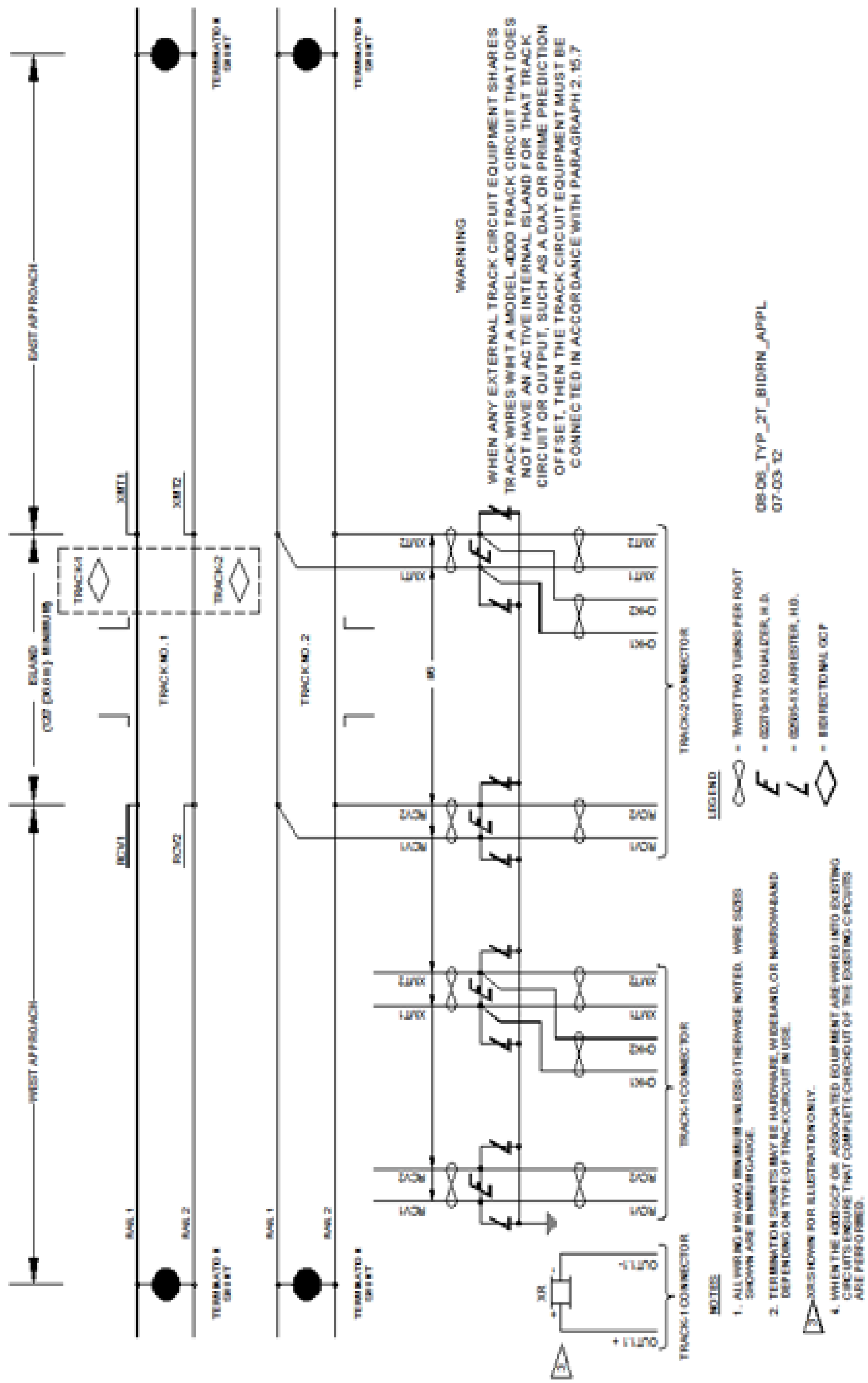


Figure 2-28:
Typical Two Track Bidirectional Application

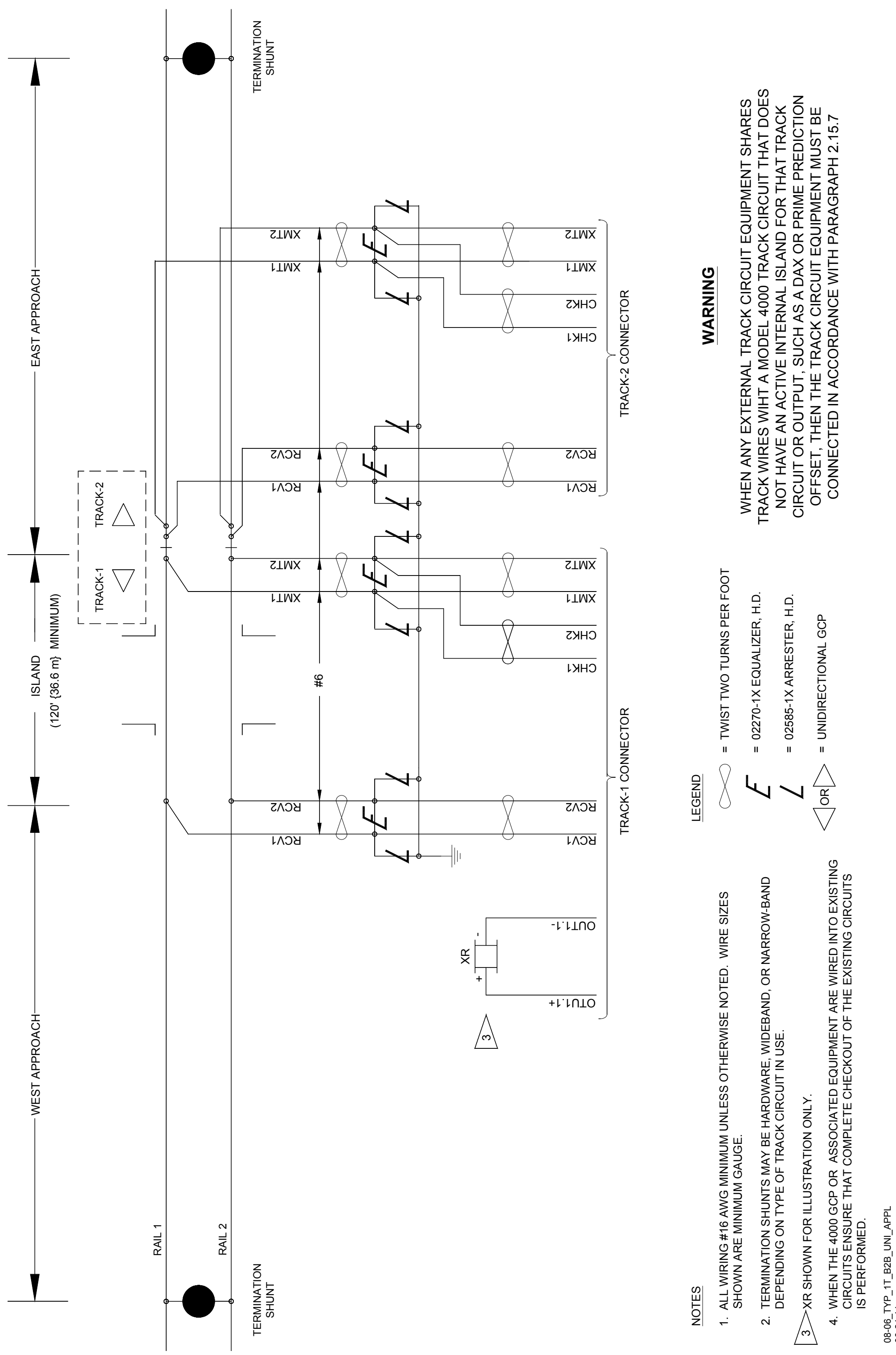


Figure 2-29:
Typical Single Track, Back-to-Back, Unidirectional Application

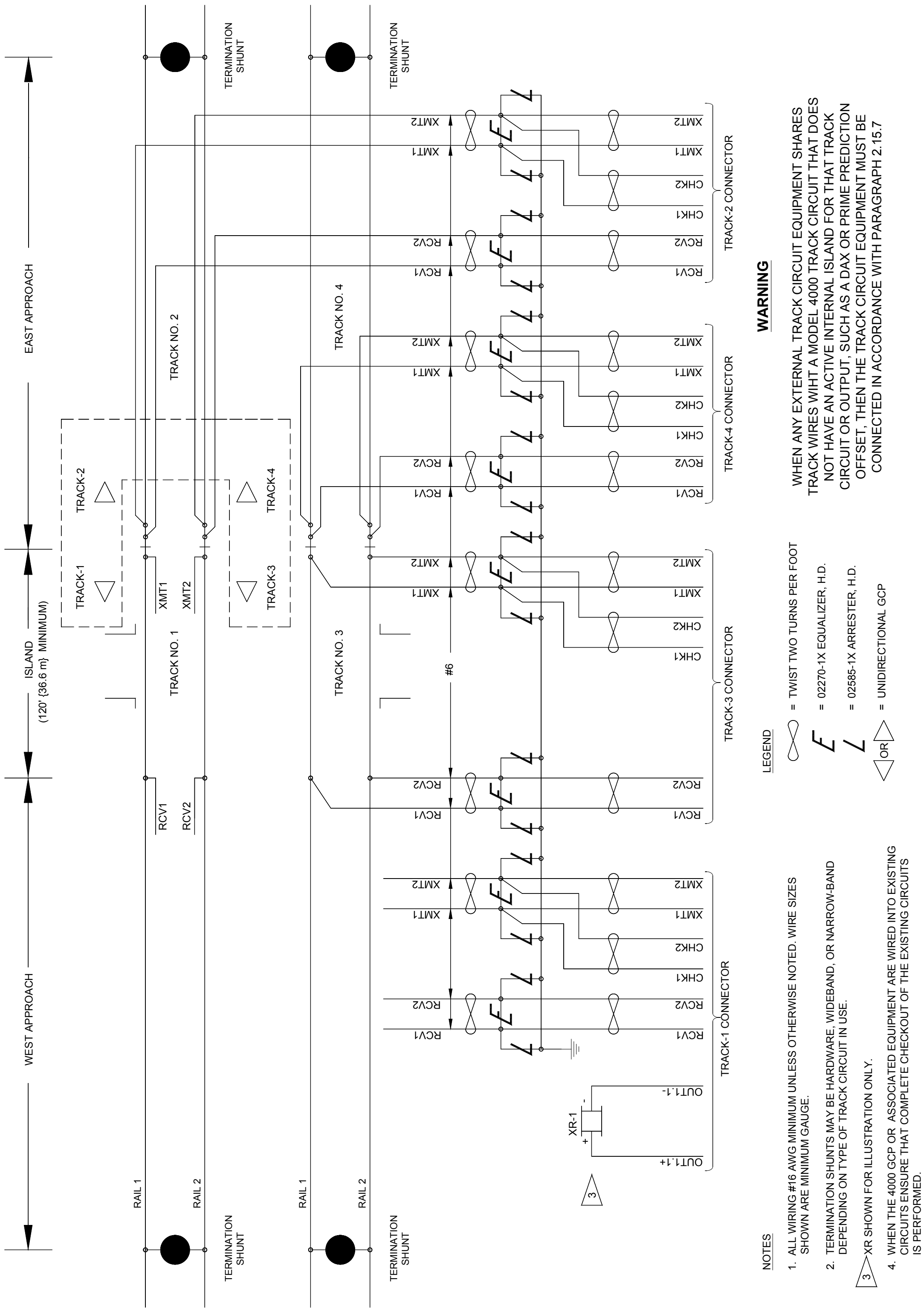


Figure 2-30:
Typical Two Track, Back-to-Back, Unidirectional Application

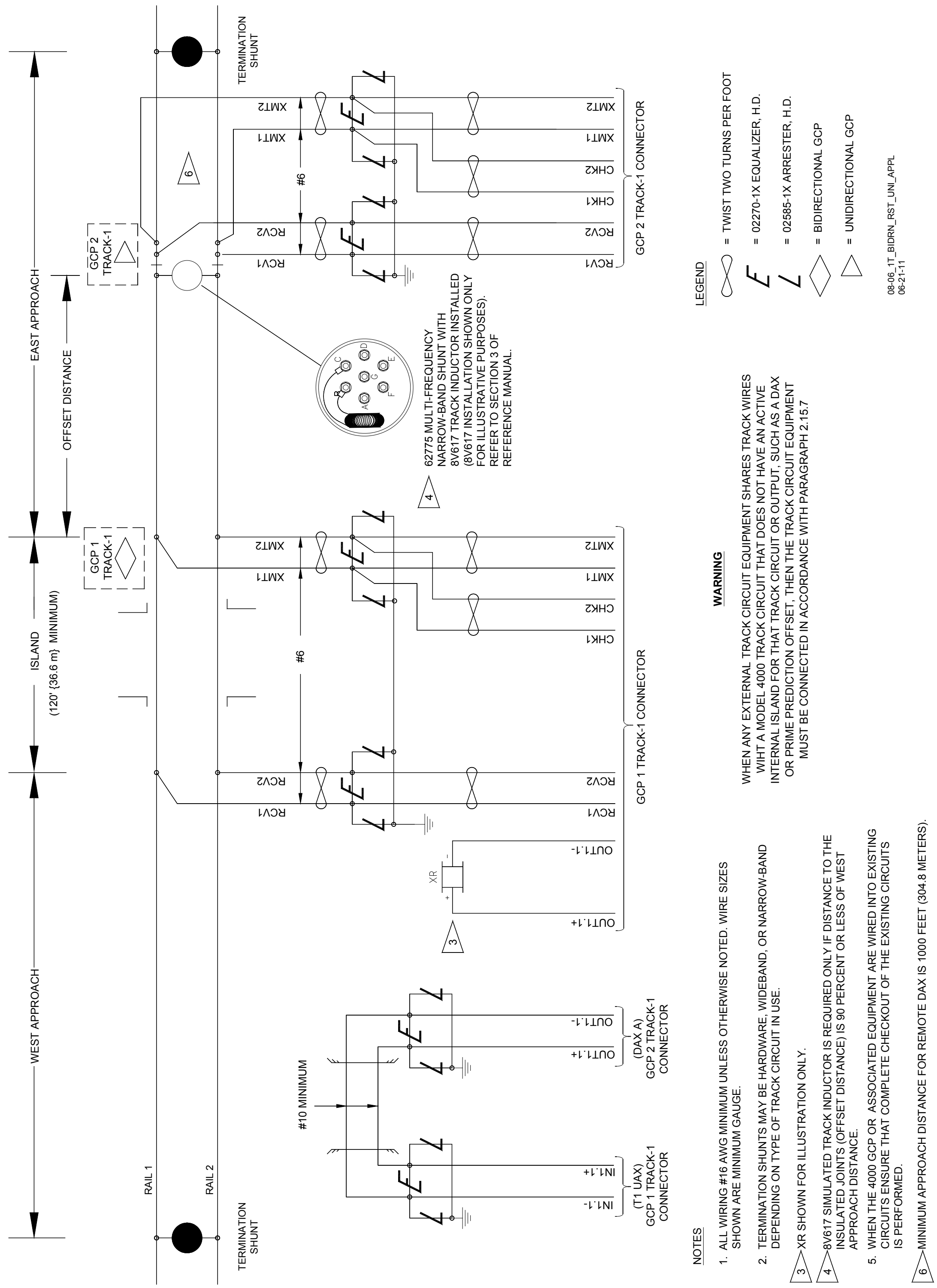


Figure 2-31:
Typical Single Track, Bidirectional, and Remote Single Track, Unidirectional Application

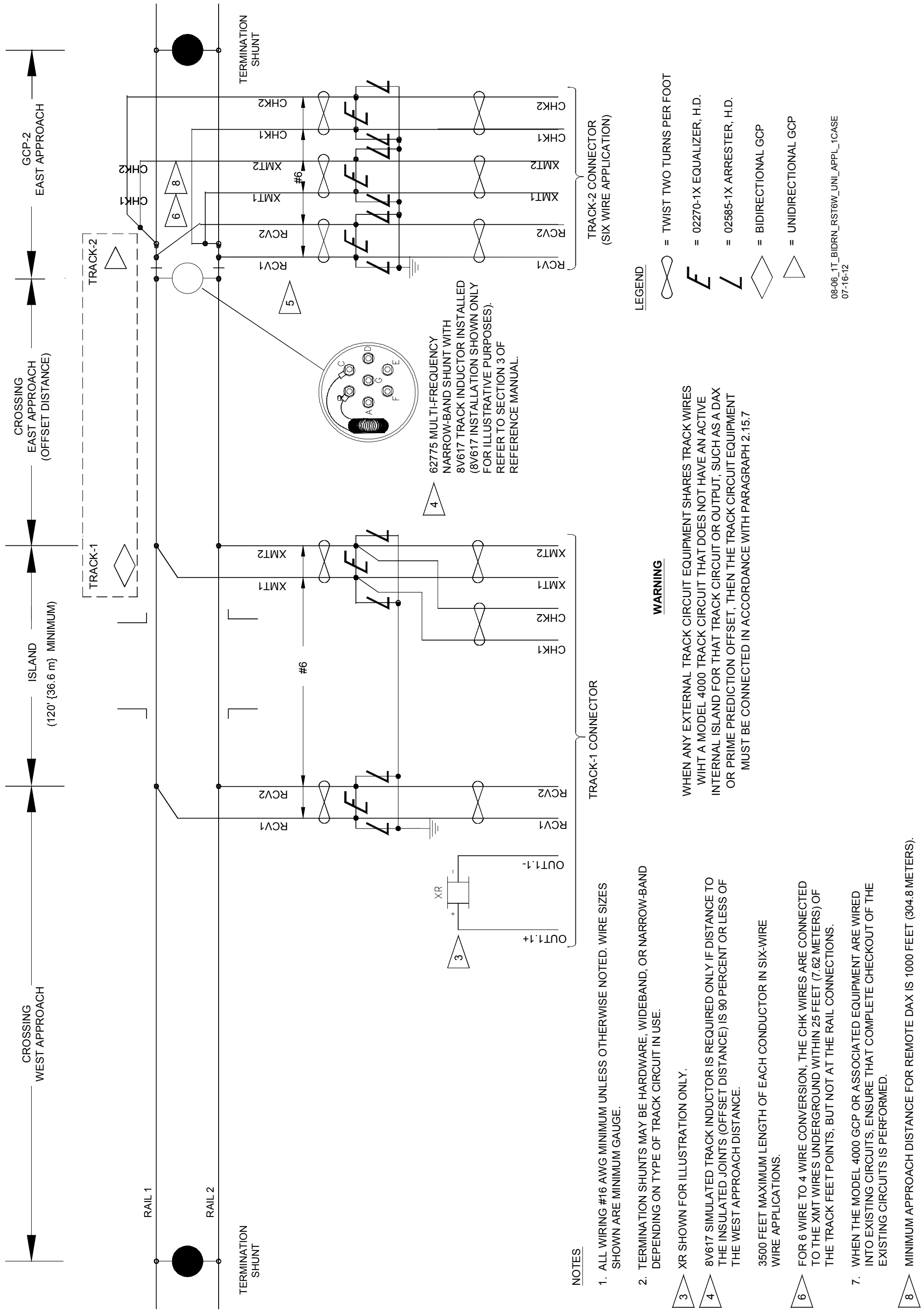


Figure 2-32:
Typical Single Track, Bidirectional, and Remote Single Track (Six Wire), Unidirectional Application, In Single GCP Case.

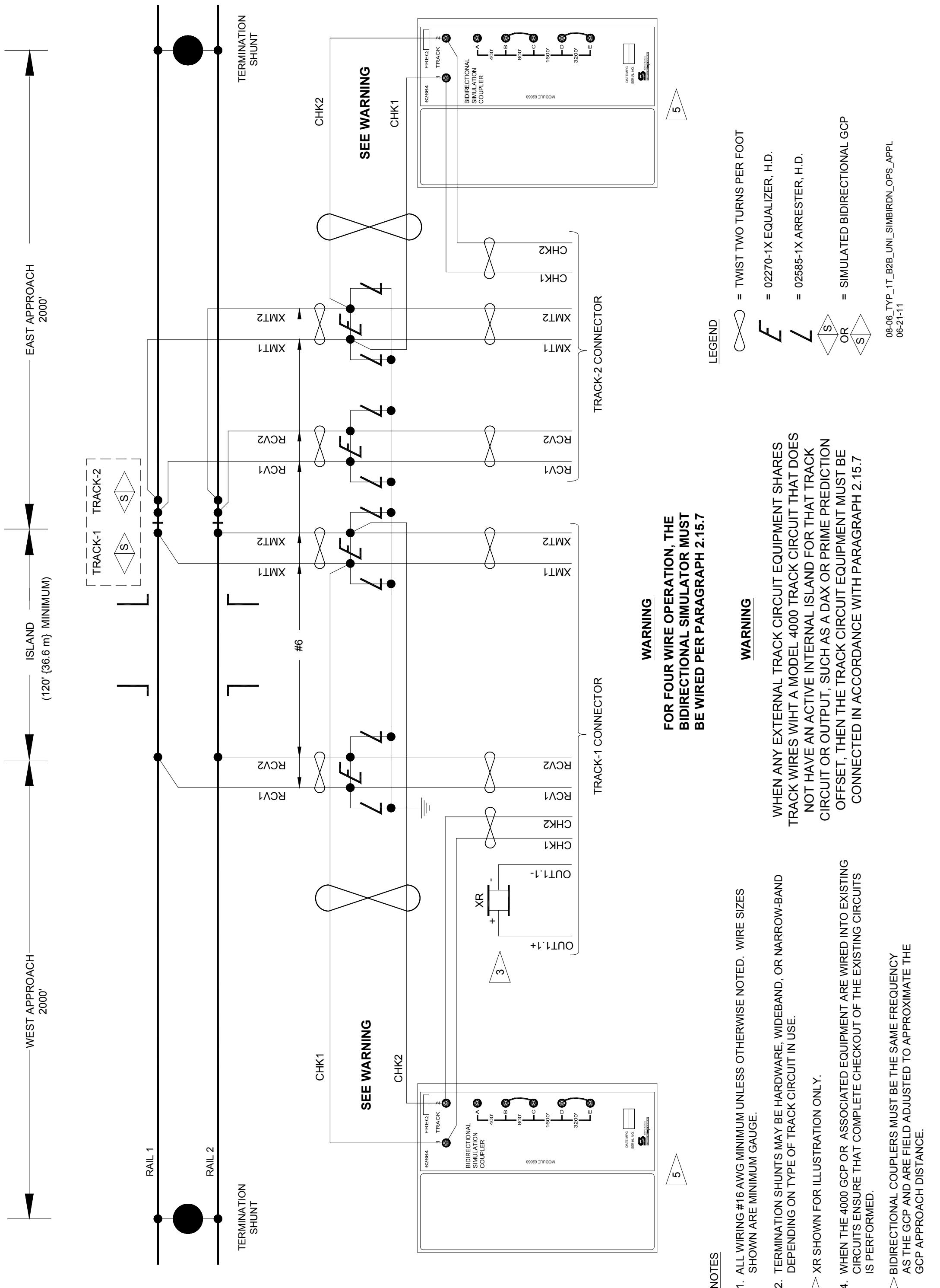


Figure 2-33:
Typical Single Track, Back-to-Back,
Unidirectional, In Simulated Bidirectional Operation Application

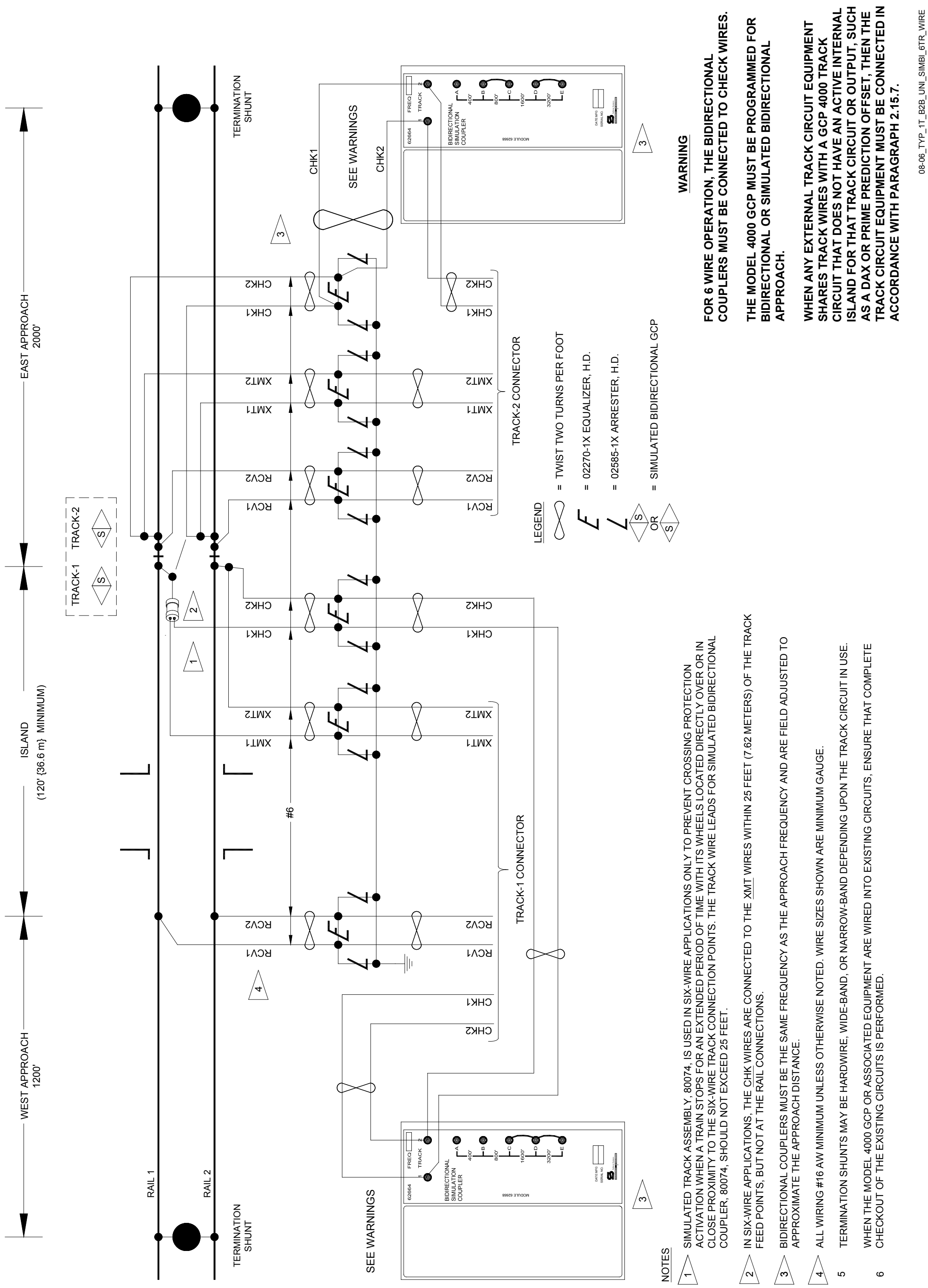


Figure 2-34:
Typical Single Track, Back-to-Back, Unidirectional,
In Simulated Bidirectional, Six Track Wire Operation

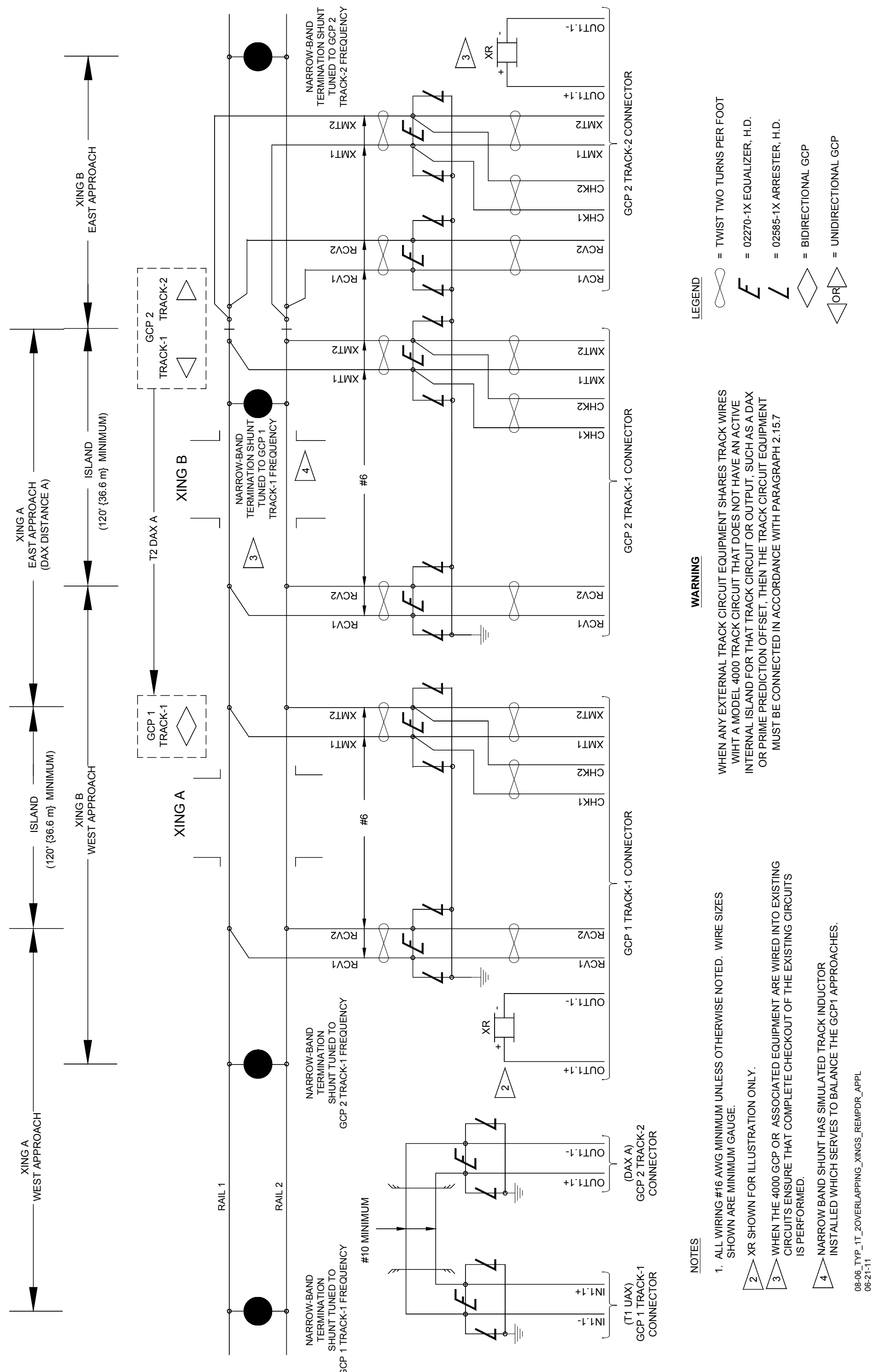


Figure 2-35:
Typical Single Track, Two Overlapping Crossings, Using Remote Prediction Application

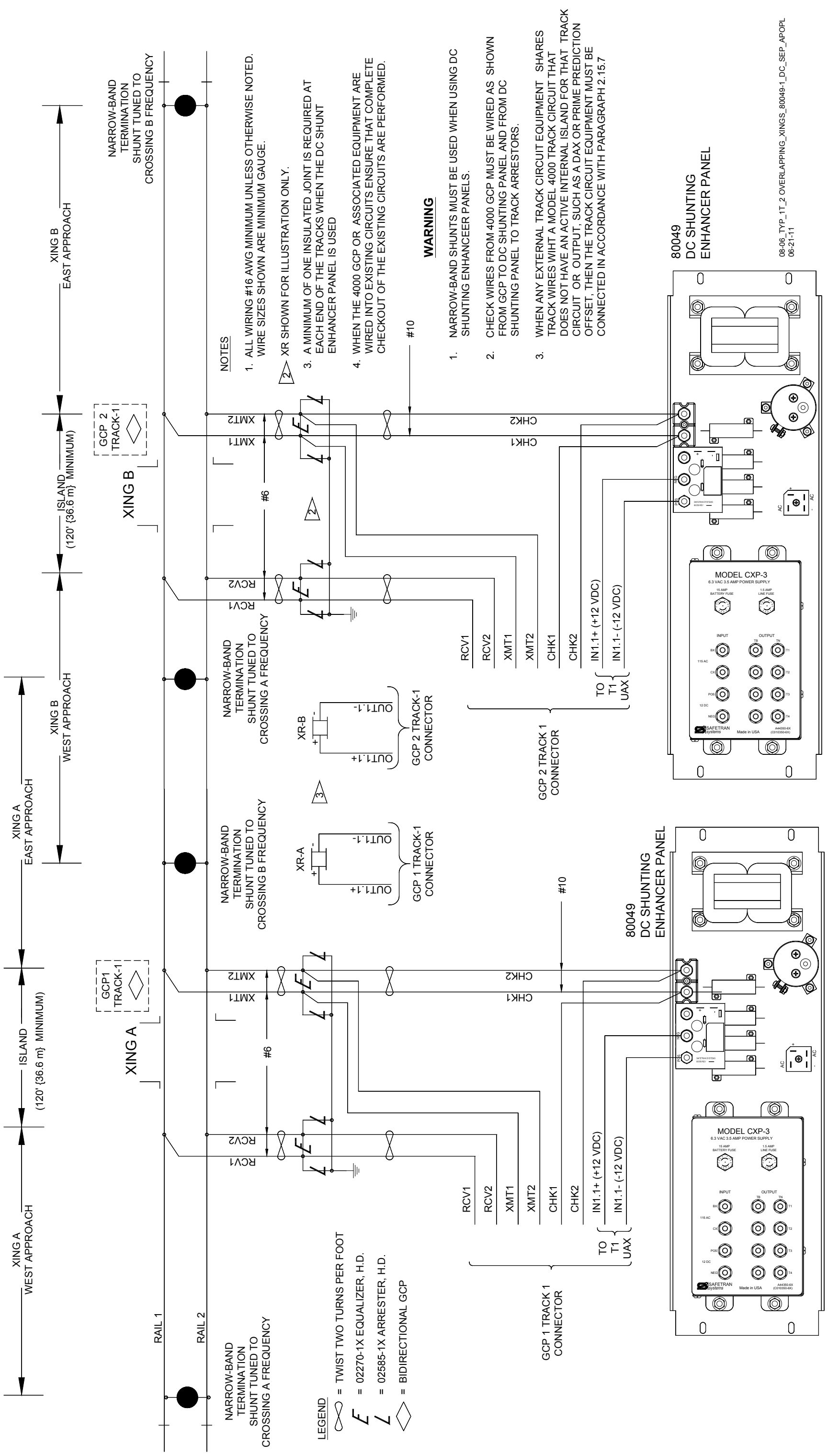


Figure 2-36:
Typical Single Track, Two Overlapping Crossings,
Using 80049-1 DC Shunting Enhancer Panels, Application

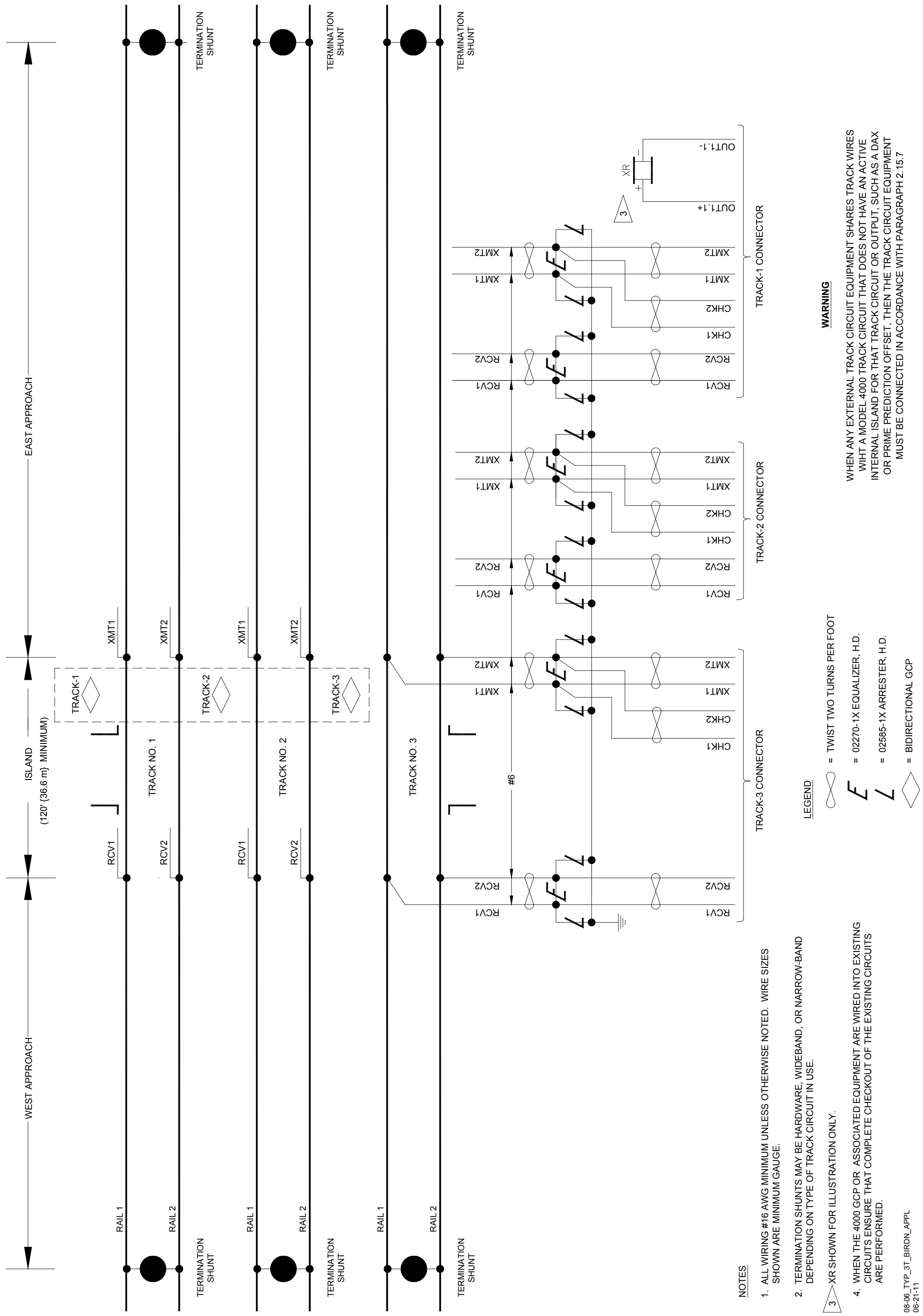


Figure 2-37:
Typical Three Track, Bidirectional Application

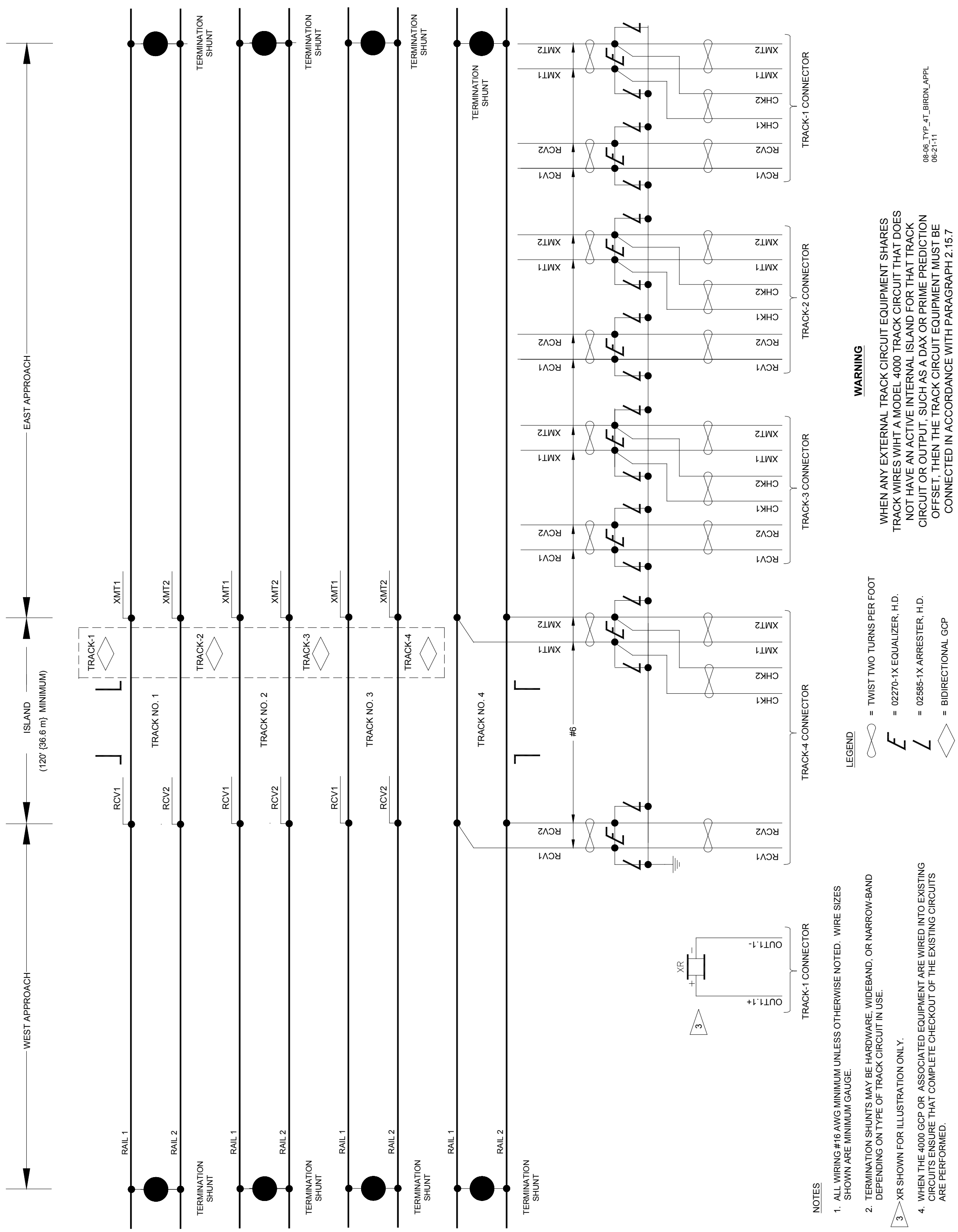


Figure 2-38:
Typical Four Track, Bidirectional Application

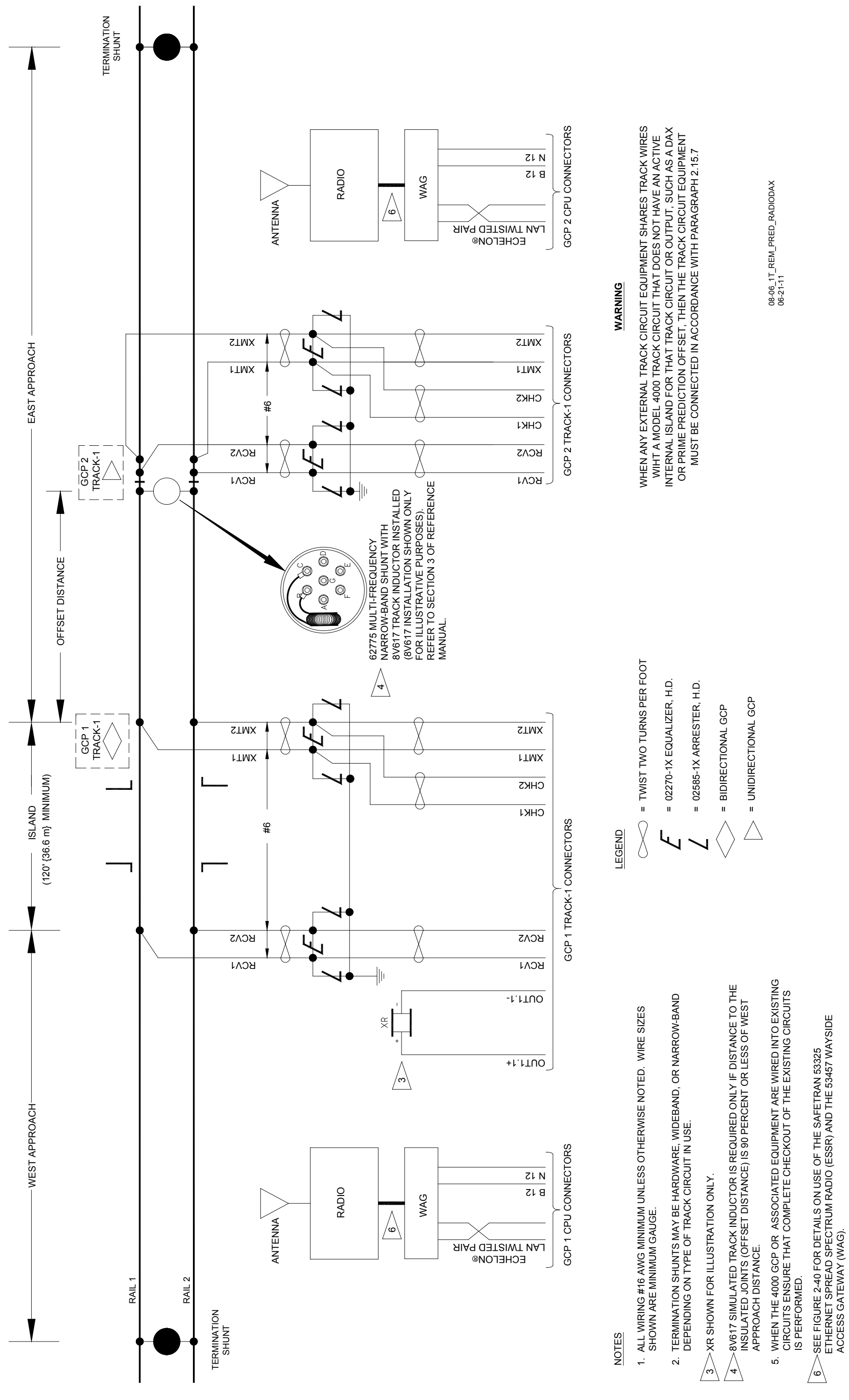


Figure 2-39:
Single Track, Remote Prediction via
Radio DAX Link (Sheet 1 of 2)

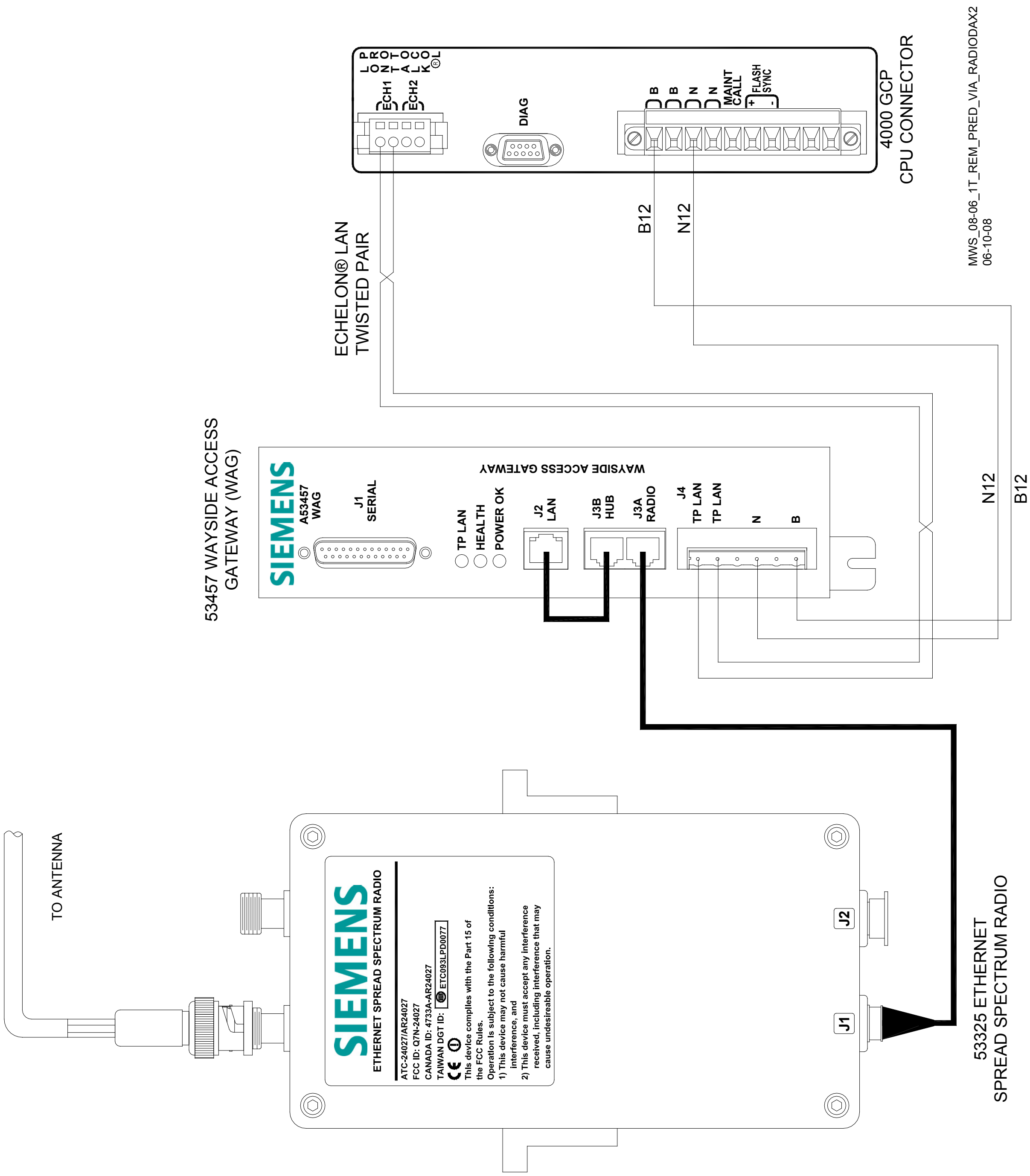


Figure 2-40:
Single Track, Remote Prediction
via Radio DAX link (Sheet 2 of 2)

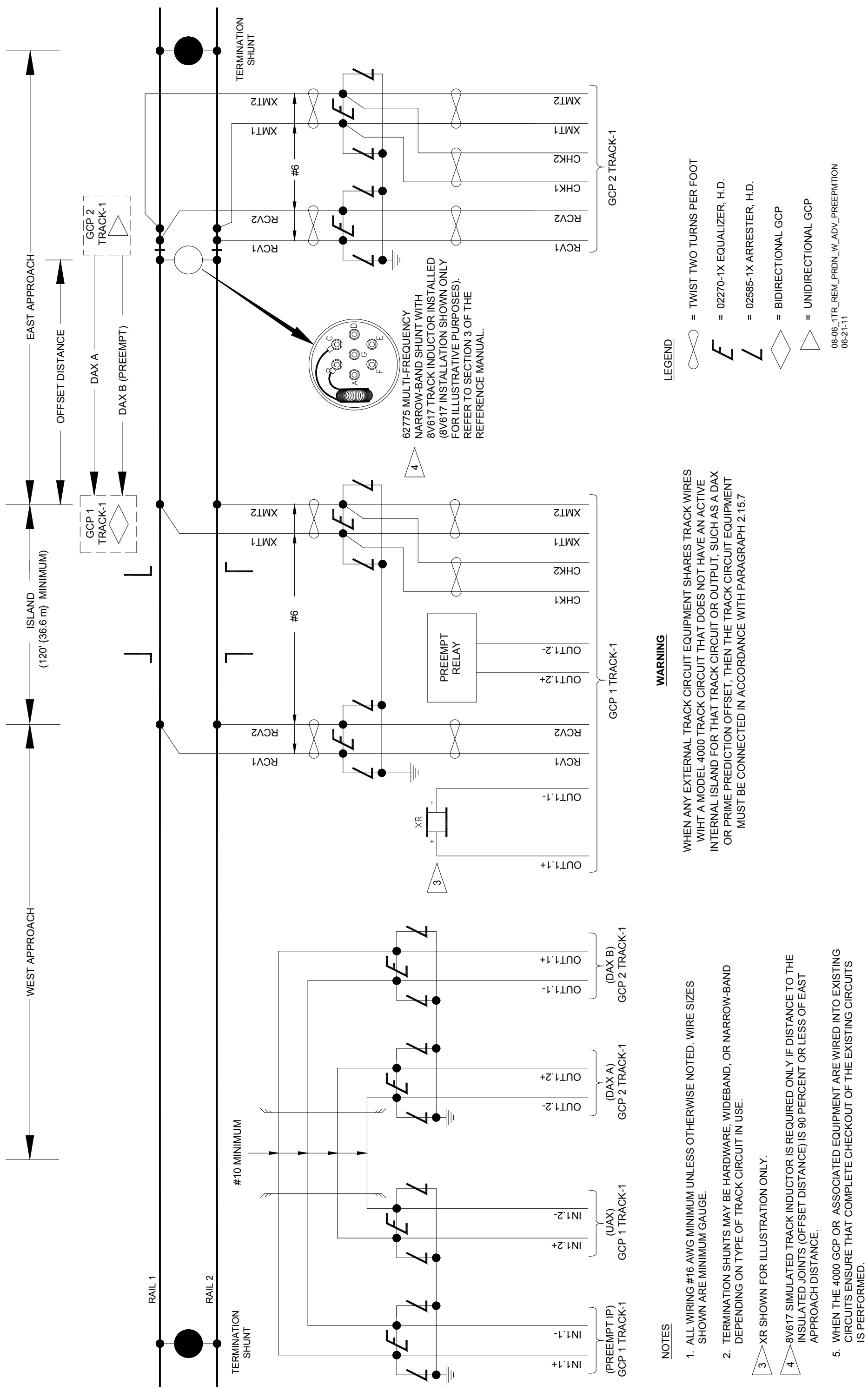


Figure 2-41:
Single Track, Remote Prediction with Advanced Preemption

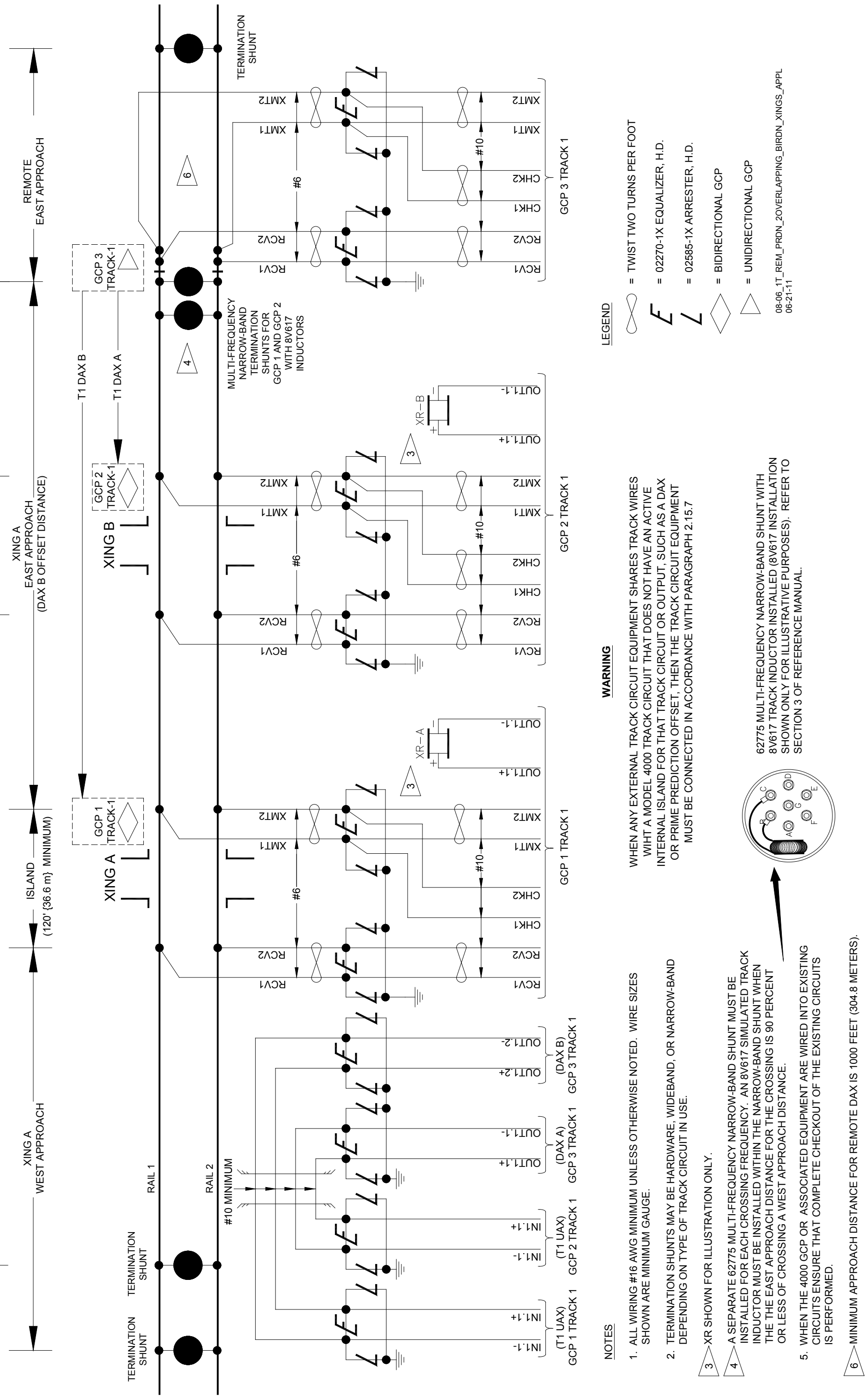


Figure 2-42:
Typical Single Track, Remote Prediction for Two Overlapping Bidirectional Crossings, Application

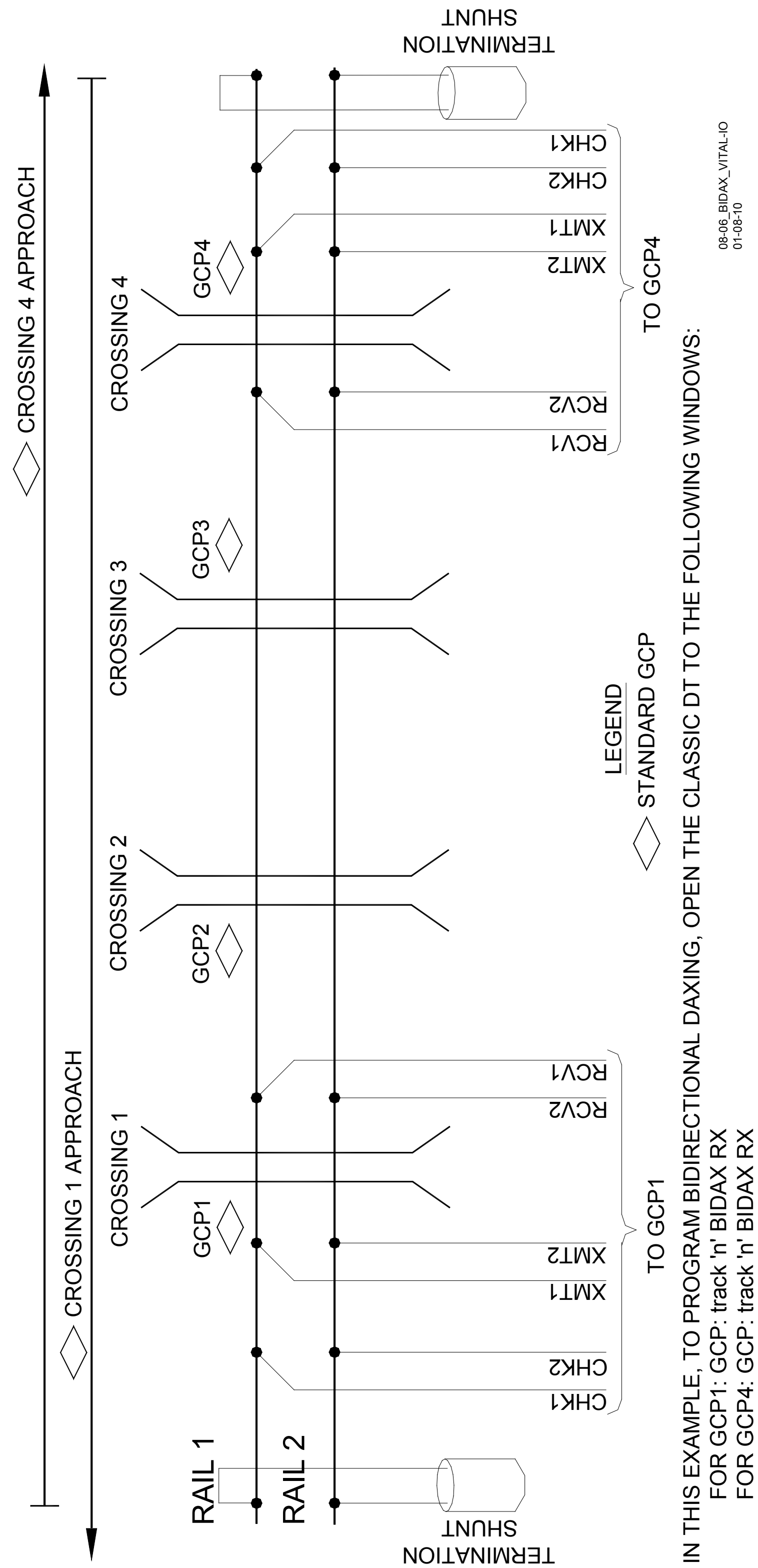


Figure 2-43:
Typical Single Track Vital IO Bidirectional DAX Application

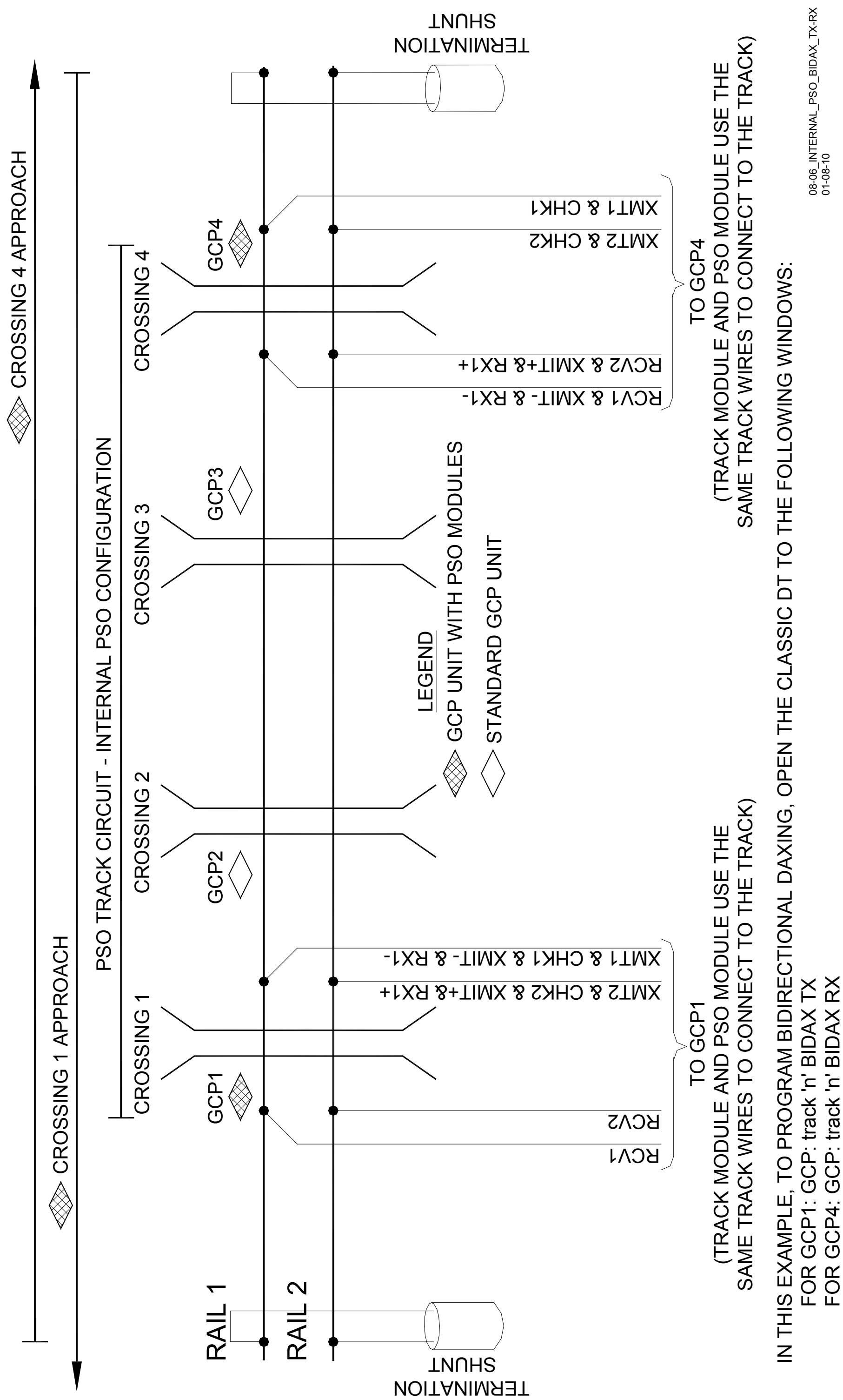


Figure 2-44:
Typical Single Track, Internal PSO
BIDAX TX – BIDAX RX Four-Wire Application

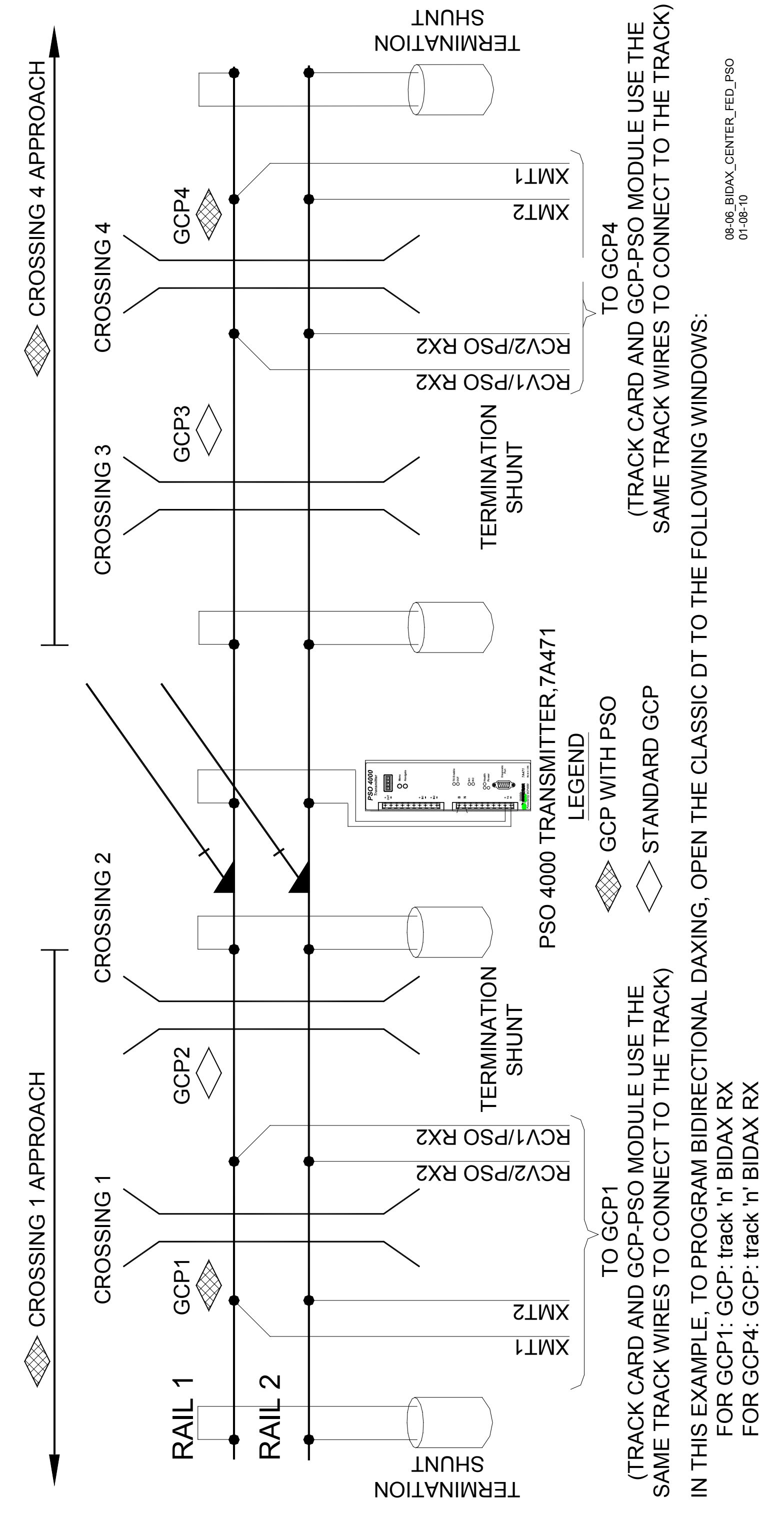


Figure 2-45:
Typical Single Track Center Fed
PSO Bidirectional DAX Application

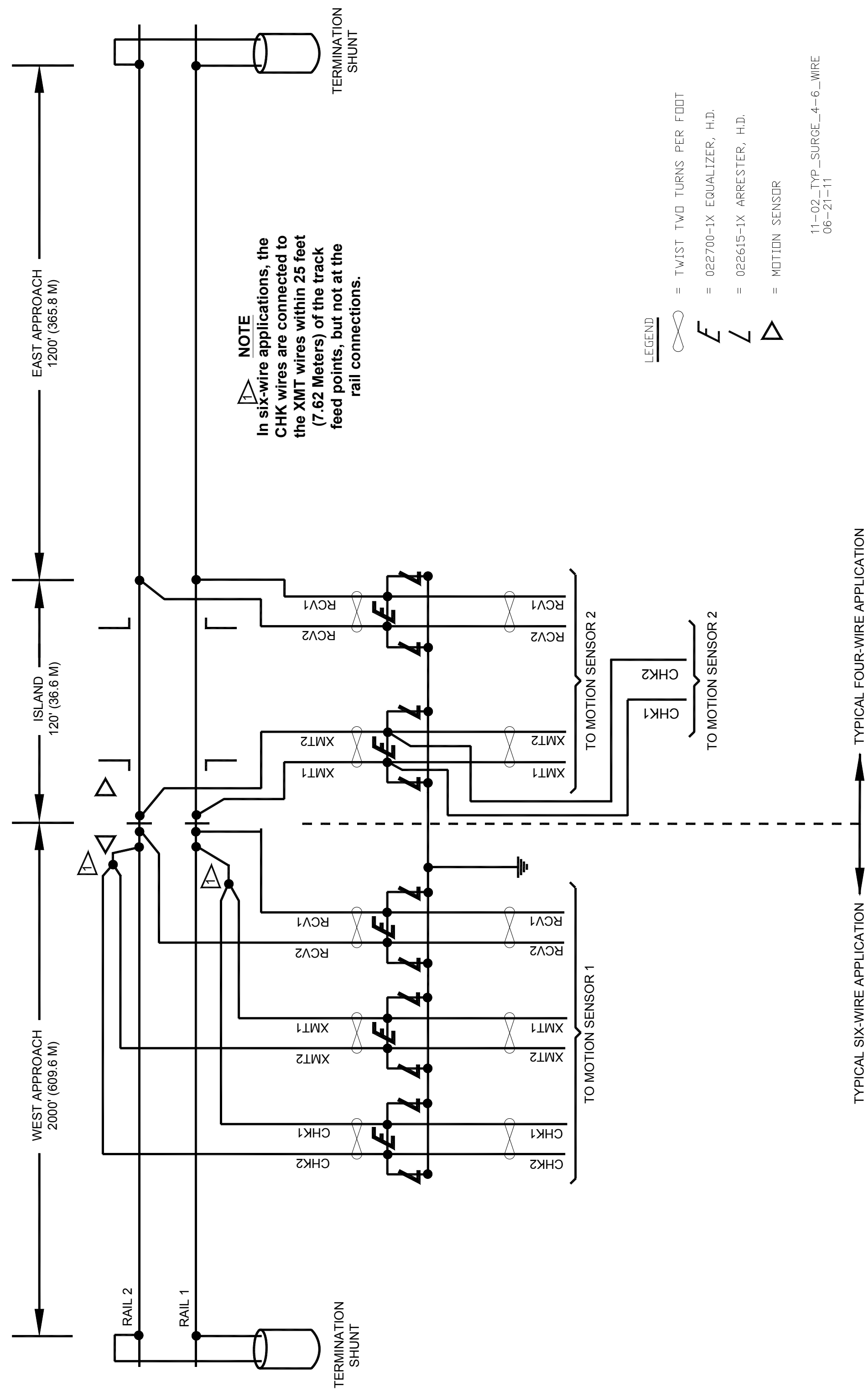


Figure 2-46:
Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections

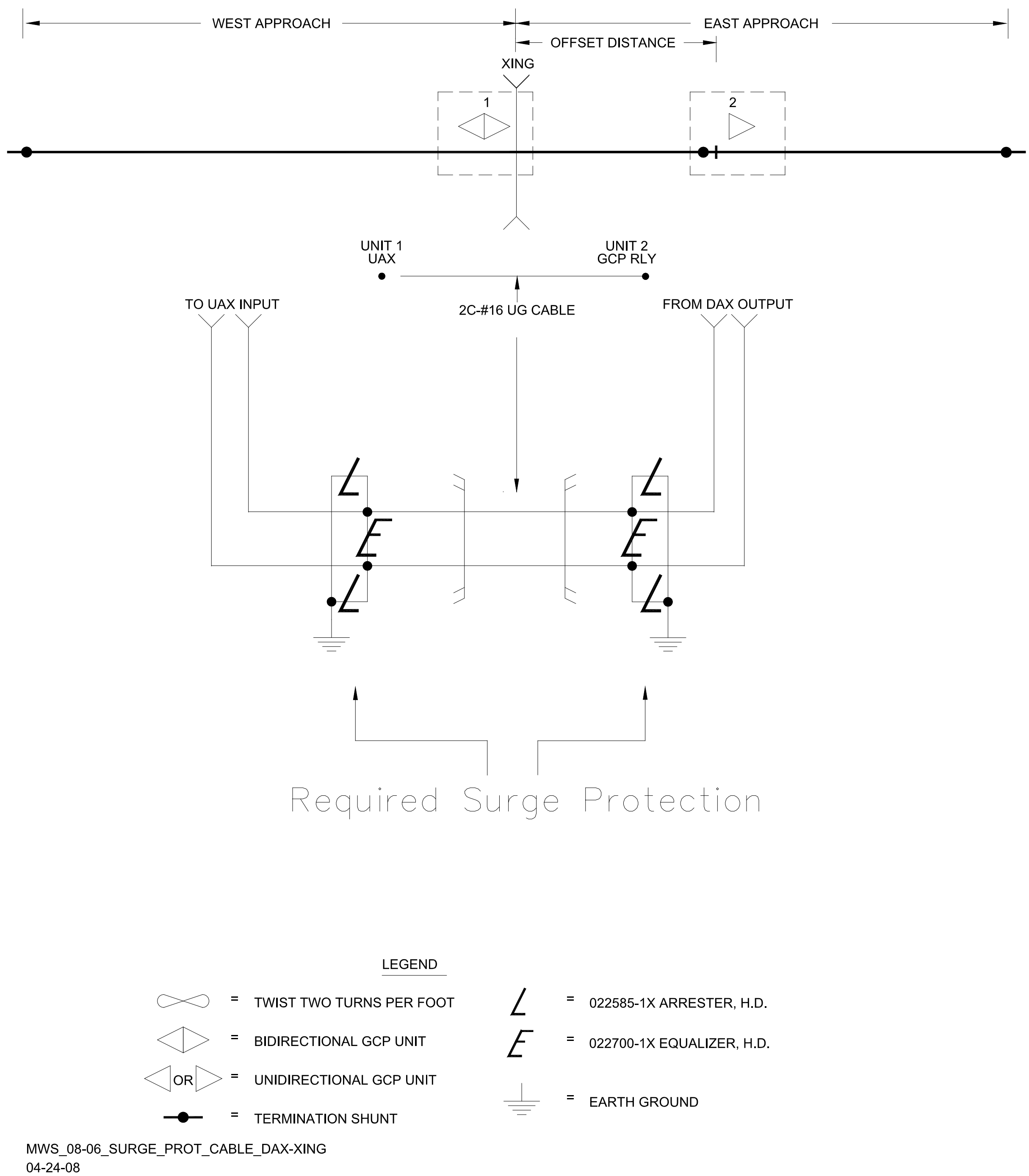


Figure 2-47:
Typical Surge Protection Requirements When Cabling Between Remote DAX Unit and Crossing Unit

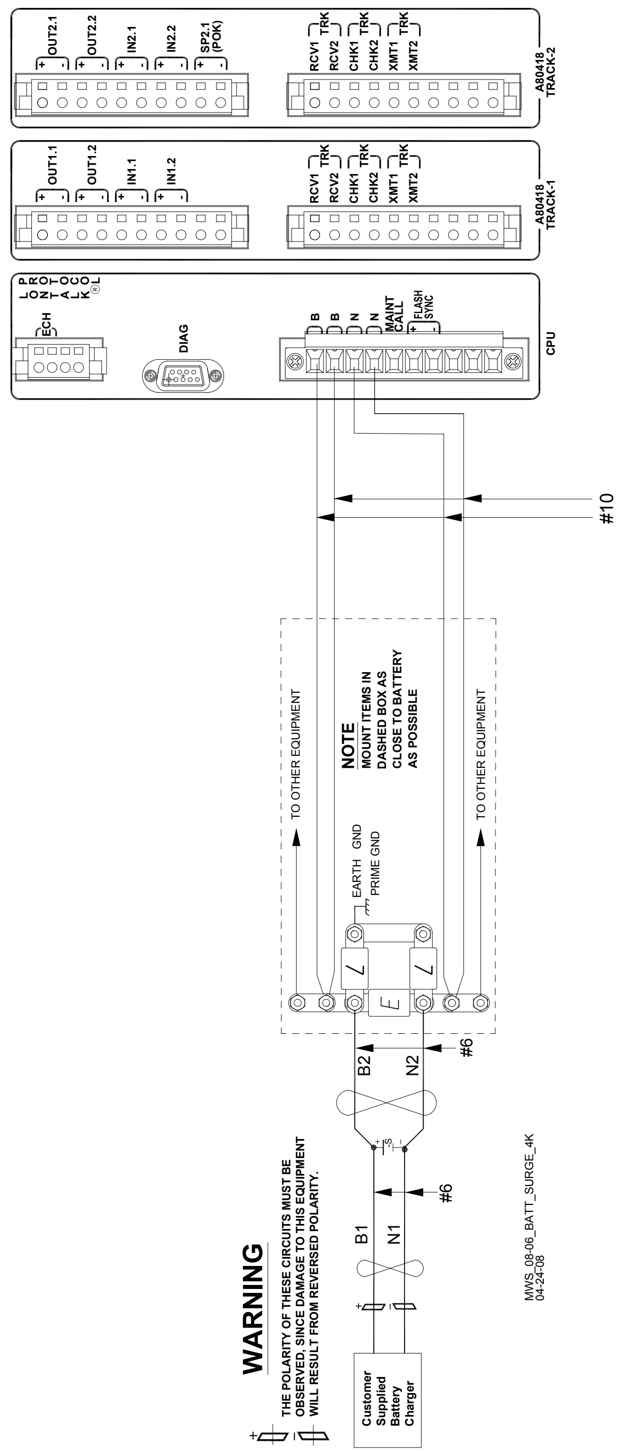


**Figure 2-48:
Recommended Battery Surge
Protection Wiring for Model 4000 GCPs**

SECTION 3 –
DIAGNOSTIC TERMINAL AND OFFICE CONFIGURATION EDITOR

3.1 DIAGNOSTIC TERMINAL

The Diagnostic Terminal (DT) is a Siemens developed Windows® based software that is available on CD from Siemens Customer Service. The Diagnostic Terminal (DT) provides the user interface that allows:

- 4000 GCP configuration
  - Upload a configuration package (Pac) file to the CPU2+ from the Display Module's USB drive or a PC,
  - Download the configuration package (Pac) file from the CPU2+ and save it on The Display Module's USB drive or a PC.
- Save the Status and/or Summary logs from all cards
- Save the Maintainers Log, Train History and Diagnostic logs
- Save SEAR Reports, histories, and incidents
- Upload MEFs from the Display Module's USB drive or a PC
- Upload an MCF from the Display Module's USB drive or a PC,
- Set MCF CRC,
- Clear CIC and ECD.
- Track calibration
- Approach distance computation
- Approach linearization
- Island calibration
- Application programming
- Track status display
- Siemens Event Analyzer Recorder (SEAR IIi) configuration
- HD/Link configuration
- Diagnostics and Troubleshooting

NOTE

When troubleshooting the Model 4000 GCP, there are certain conditions under which the final process step in trying to correct an error is to perform a Set to Default. Call Siemens Technical Support at (800) 793-7233 for assistance in performing Set to Default.

Other new features include some major changes to the Diagnostic Terminal (DT) and its display as well as the creation of the Office Configuration Editor (OCE). The DT now has a USB port, which allows the DT to recognize when a USB drive is plugged into the display module. When a USB drive is detected the DT software will enable options to: 1) Save the configuration package (Pac) file to the USB drive; 2) Save Status Log and Summary Logs to the USB drive; 3) Save the Maintainers Log, Train History and Diagnostic log to the USB drive; 4) Save SEAR2i reports, histories, and incidents to the USB drive; 5) Upload a configuration package (Pac) file to the CP from the USB drive; 6) Upload MEFs from the USB drive to other modules; 7) Upload an MCF from the USB drive to the CPU module; 8) Set MCF CRC; and 9) Clear the memory of the CIC and ECD. Additionally, the latest release of the software prevents the DT from showing an EZ of 0 on opening of a termination shunt.

The OCE is able to create a configuration package file (Pac file), and allows the user to save it to a USB drive. The OCE also computes the configuration check number (CCN), which is a 32 bit CRC of each configuration record for each card in the MCF. The CCN is stored in the Pac file, and is present on various reports.

The OCE also computes the Office Configuration Check Number (OCCN), which is a 32bit CRC that includes the configuration record for each MCF card, but with certain parameters are excluded; specifically excluded are those values set by the maintainer using the Field Password. The purpose of the OCCN is to create a configuration check over the properties that the office sets, but exclude the properties that the user sets in the field.

The GCP computes the Track Check Number (TCN) for each configured Track Module in a Model 4000 GCP chassis and the number is displayed on the DT. This number cannot be calculated in an offline mode. The TCN encompasses the following data/parameters:

- GCP frequency
- Approach distance
- Uni/Bi/Simulated BI
- GCP transmit level
- Island distance
- Computed distance
- Linearization steps
- All Track calibration parameters (internally stored and calculated values)
- Date and time of last approach calibration
- Compensation level
- Warning time ballast compensation

If a track module in the system contains software that does not calculate TCNs, the GCP displays that module's TCN as dashes rather than numbers.

The GCP also computes the PSO Check Number (PCN) for each configured PSO Module in a Model 4000 GCP chassis and the number is displayed on the DT. This number cannot be calculated in an offline mode. The PCN encompasses the following data/parameters:

- All PSO calibration parameters
- Date and Time of last PSO calibration
- PSO TX Mode
- PSO TX Frequency
- PSO TX Level

With these changes the Diagnostic Terminal allows the user to view the following:

- the current OCCN,
- the current CCN
- The current TCN
- The current PCN
- the CCN from the last Pac file upload, if one is present,
- the OCCN from the last Pac file upload, if one is present

As an option, the Display DT allows the user to select to turn-on or turn-off the saving of the EZ/EX data for selected Track modules. The Display DT saves the EZ/EX data to the USB drive. The DT (PC) saves the EZ/EX data to a selected permanent or removable computer drive.

The Main DT Display view indicates when:

- SSCC modules are flashing
- A track wrap input is energized
- An AND function is wrapped.

A detailed Track Status view indicates when a track wrap input is energized. In a similar manner, the AND Detail View indicates when an AND function is wrapped. The System I/O view depicts the state and assigned name for internal I/O states.

3.1.1 DT Programs

The Siemens Diagnostics Terminal program is required for GCP units not using an 80485 Display Module (or the 80407 Display Module which is no longer available). There are two separate DT programs; one for Personal Computers (PCs), desktops or laptops, and for the Display Module (A80485 or A80407-3), both can implement 4000 GCP configuration and display functions.

The displays for each DT program are identical in most respects except for screen height to width ratio. In this section, Display Module DT displays are shown for each program function. PC based program displays are shown only where the corresponding displays of each DT program differ.

3.1.2 PC Installed DT to GCP Communication

The PC-installed DT communicates with the 4000 GCP using the 9-pin RS-232 **DIAG** connector on the chassis. Communication is through a straight 9-pin female to 9-pin male cable as shown in Figure 3-1.

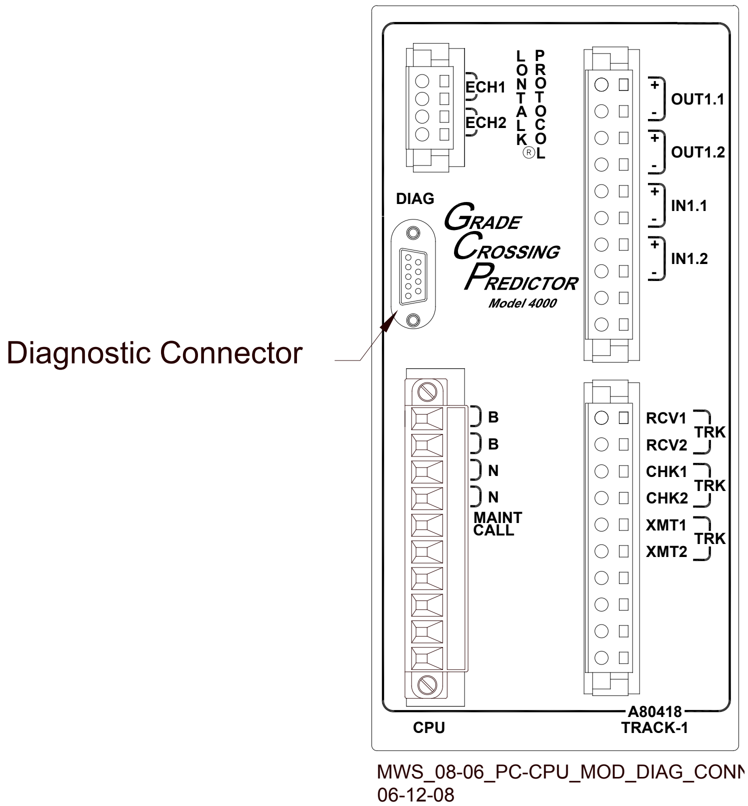


Figure 3-1:
PC to CPU Module Diagnostic Connector

3.1.3 DT Program Initiation

NOTE

The RS-232 communications cable must be in place before the PC based DT is started.

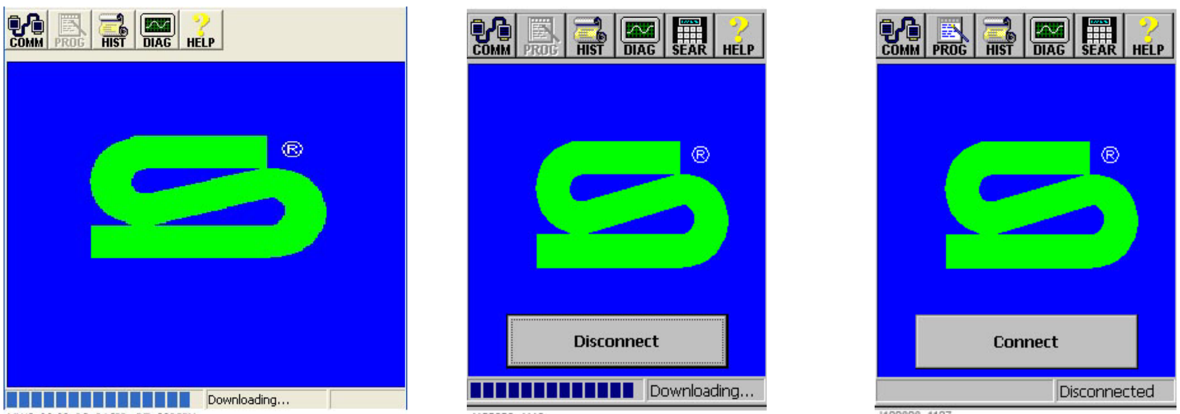
On the PC based DT, the Model 4000 GCP must complete the boot up sequence before the DT program will begin its boot up sequence.

DT startup is different for the PC based DT and the Display based DT. The PC based DT resident program is manually started. The Display based DT program is started each time power is applied to the 4000 GCP.

3.1.4 DT Startup sequence

While either DT program is opening the display appears as shown in Figure 3-2 A and B.

- A progress bar appears at the bottom of the screen.
- Status messages appear in the message box at the bottom right of the screen.
- A Connect / Disconnect button has been added to the Display based DT as shown in Figures 4-2 B and C.
  - When the Display is connecting or connected to the Communication Processor (CP) on the CPU, the Disconnect button is displayed.
  - When the Display is not communicating with the CP, the Connect button is displayed.
  - When the CP is communicating with the PC based DT, the Display is disconnected from the CP.



A **B - Connecting** **C - Disconnected**

PC Based DT Screen **Display Based DT Screens**

Figure 3-2:
DT Start-Up Screens

3.2 DISPLAY DT USB WIZARD

WARNING

DURING MODULE CHANGEOUT, SOFTWARE REVISION, REBOOT AND CALIBRATION PROCEDURES, WARNING DEVICES MAY NOT OPERATE AS INTENDED. TAKE ALTERNATE MEANS TO WARN VEHICULAR TRAFFIC, PEDESTRIANS, AND EMPLOYEES. TESTS MUST BE PERFORMED TO VERIFY PROPER OPERATION PRIOR TO PLACING THE SYSTEM BACK IN SERVICE.

NOTE

Follow railroad specific procedures for installing software in vital signal equipment. Companies may restrict who may install software and what additional documentation and operational checks are required.

The USB Wizard is solely a function on the Display Module, A80485, based Diagnostic Terminal (DT) and is not supported on the PC based DT.

- The feature provides a Windows® based wizard that allows the user to save GCP 4000 files to, or upload files from, an USB drive.
- The following GCP 4000 file types can be saved to a USB drive connected to the Display Module:
    - Configuration Package Files (pac files)
    - Train History
    - Maintenance Logs
    - Status Logs
    - Summary Logs
    - SEAR2i
    - Reports
    - History
    - Incidents
- The following GCP 4000 file types can be uploaded from an USB drive connected to the Display Module:
    - Configuration pac files
    - Module Executable Files (MEF)
    - Module Configuration Files (MCF)
    - SEAR2i
    - HD/Link
    - Executive Software
    - Control Descriptor Language (CDL)
    - Ladder Logic Executive file (LLW)
    - Ladder Logic Label file (LLB)

3.2.1 USB Drive Recommendation

Siemens recommends the use of a 512 MB USB drive.

3.2.2 Display DT USB Menu A80485 Display Module

The USB menu has eight sub-menus shown in Figure 3-3. The Software Updates menu has two sub-menus, one for software updates for modules and the second for the Display module Executive software update. The other USB menu sub-menus provide for downloading of configuration reports, display/event logs, GCP logs, train history, and uploading or downloading configuration files. The GCP’s current configuration information can be downloaded to the USB drive. A new configuration can also be uploaded to the GCP via the USB drive. Refer to the appropriate manual for your GCP unit for details for uploading and downloading configuration information into the GCP.

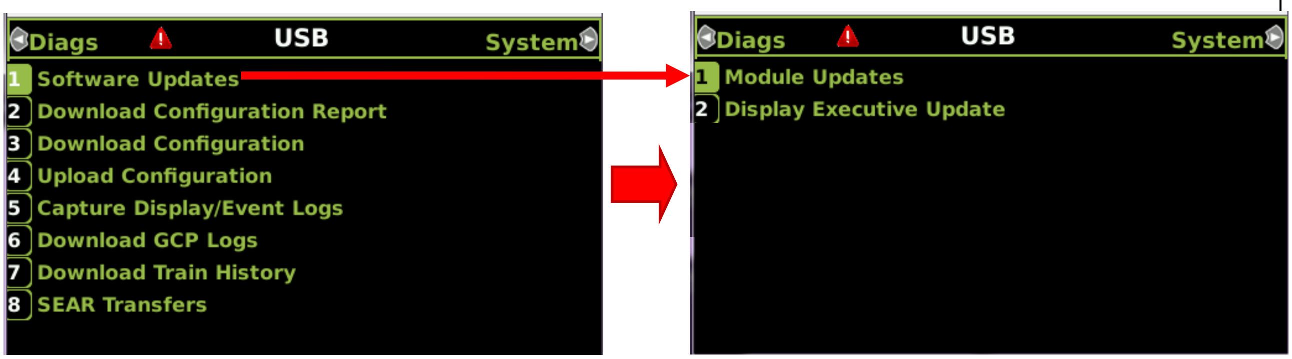


Figure 3-3 USB Menu Screens A80485 Display Module

3.2.3 Display DT USB Wizard Menu A80407-3 Display Module

When a USB drive device is inserted into the Display Module, A80407-3, the WIZ button is made active and the WIZARD menu is automatically opened.

- In Figure 3-4A the WIZ button is on the top line of the main status screen.
- The WIZARD menu is shown in Figure 3-4B

To select a function, touch the function on the screen and then press NEXT

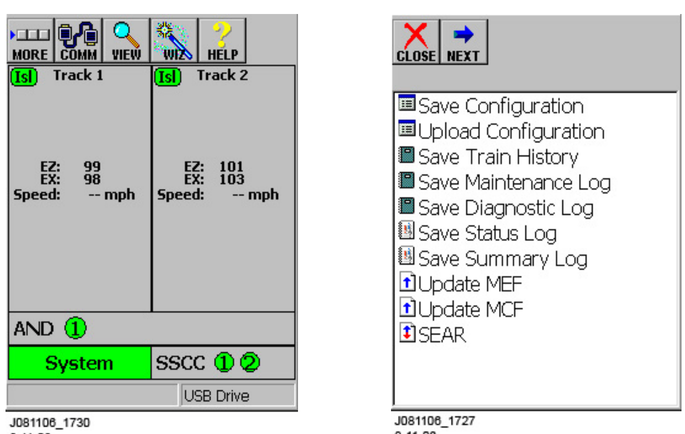


Figure 3-4:
Wizard WIZ Button and USB WIZARD Menu A80407-3 Display Module

3.2.4 File Transfers with USB Drive

To save, upload, or update a file to an USB drive, insert the USB drive in the USB port on the Display Module. Refer to Figure 3-4 for the location of the USB port.

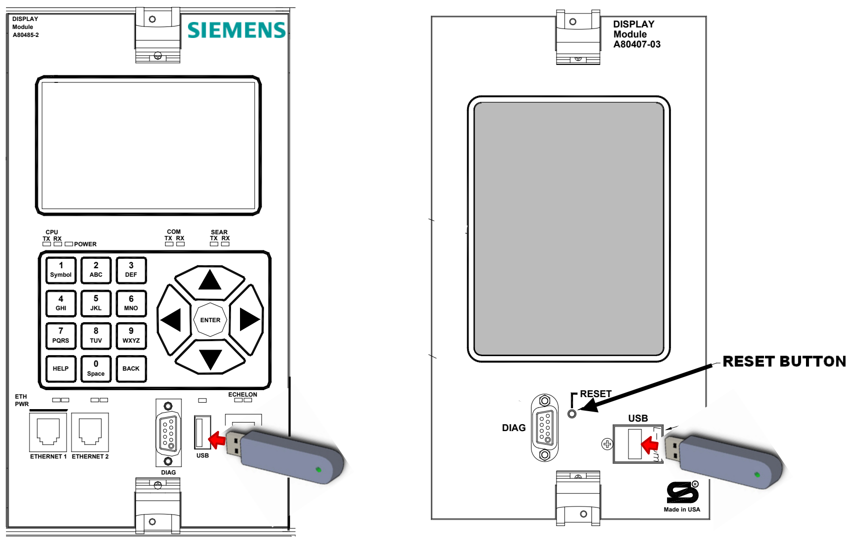


Figure 3-5:
Display Module USB Port Location A80485 and A80407-3

3.3 CONFIGURATION CHECK NUMBER (CCN) AND THE OFFICE CCN (OCCN)

The software used in the Model 4000 GCP generates a 32-bit Cyclical Redundancy Check (CRC) number to determine that the software data has not been corrupted. Corrupted data would display a different CRC value. The Model 4000 GCP takes the CRC of all configuration data and derives a Configuration Check Number (CCN) from that. Since there are values that are set in the field, the software derives an Office Configuration Check Number (OCCN), which is the 32-bit CRC of the configuration data, excluding items that are protected by the Field Password.

3.3.1 Parameters now Excluded from OCCN

The following values have been excluded from OCCN and are covered by the Field Password:

Table 3-1:
Field Password Values (Parameters excluded from OCCN)

GCP-t6x-01-4 and earlier	Gcp-t6x-02-0 to Gcp-t6x-02-4	Gcp-t6x-02-5 and later
	GCP Freq Category	GCP Freq Category
GCP Frequency	GCP Frequency	
Approach Distance	Approach Distance	
GCP Transmit Level	GCP Transmit Level	GCP Transmit Level
	Prime Offset Distance	
	Preempt Offset Distance	
	DAX A..G Offset Distance	
Island Frequency	Island Frequency	
	Island Distance	Island Distance
	Inbound PS Sensitivity	Inbound PS Sensitivity
	Outbound False Activation Level	Outbound False Activation Level
	Outbound PS Timer	Outbound PS Timer
	Trailing Switch Logic	Trailing Switch Logic
	Adv Appr Predn Start EZ	Adv Appr Predn Start EZ
	Adv Appr Predn Stop EZ	Adv Appr Predn Stop EZ
	Positive Start Level	Positive Start Level
	Positive Start Offset	Positive Start Offset
	Sudden Shnt Det Level	Sudden Shnt Det Level
	Sudden Shnt Det Offset	Sudden Shnt Det Offset
	Low EZ Detection Level	Low EZ Detection Level
	MS Sensitivity Level	MS Sensitivity Level
	Compensation Level	Compensation Level
	Warn Time-Ballast Comp	Warn Time-Ballast Comp
	Low EX Adjustment	Low EX Adjustment
	False Act on Train Stop	False Act on Train Stop
	EX Limiting Used	EX Limiting Used
	EZ Correction Used	EZ Correction Used
	Track 1..6:MS Restart EZ Level	Track 1..6:MS Restart EZ Level
	OOS Timeout	OOS Timeout
	SSCC 1 / 2 Low Battery Detection	SSCC 1 / 2 Low Battery Detection
	SSCC 1 / 2 Low Battery Level	SSCC 1 / 2 Low Battery Level
	Lamp Neutral Test	
	Radio Subnode	Radio Subnode
	Field Password	Field Password

3.4 OFFICE CONFIGURATION EDITOR

The Office Configuration Editor is available in two forms:

a). A program based on the Diagnostic Terminal.

b). A stand-alone program that uses a Web Browser style user interface.

The OCE allows:

- configuration parameters and their current values to be captured from an MCF while disconnected from the 4000 GCP and then saved as a configuration package file
- configuration parameters of existing configuration package files to be reviewed and edited

These features allow the circuit designers to create a configuration package file (Pac file) for a specific GCP unit. The Pac file can be uploaded to the GCP 4000 using a USB drive connected to the display. Loading the Pac file is an efficient method of programming office design into a field 4000 GCP unit, as it minimizes the field programming steps and eliminates field errors in transferring programming from plans to unit.

Utilization of the Office Configuration Editor features dramatically reduces the number of parameters that must be entered in the field. This allows office designer to designate most configuration parameters. Only site specific parameters must be determined and entered in the field.

The web based OCE program features, installation, and operation are detailed in the OCE manual, document number SIG-00-11-15.

3.4.1 DT Office Configuration Editor Operation

The functions of the DT Office Configuration Editor are accessed by means of the **PROG** button (see Figure 3-5A) of the Startup Screen. When the **PROG** button is selected the DT buttons are replaced by a group of four buttons (see Figure 3-5B).

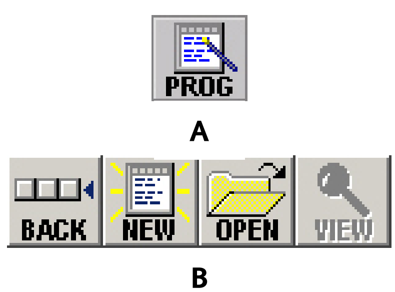


Figure 3-6:
Opening the DT for Report Generation

- The **BACK** button returns the display to the initial DT buttons
- The **NEW** button opens a window that allows MCFs (*.mcf) to be located and selected.
- The **OPEN** button opens a window that allows an existing configuration package file (*.pac) to be located and selected.
- The **View** button opens the **Report View Drop-down Menu** (see Figure 3-6). When opened, the following reports may be viewed and/or printed:
    - Software Info
    - Hardware Info
    - Temple
    - Program
    - Min Program Steps
    - All (System Configuration
- When a configuration pack file is selected the **MAIN PROGRAM** menu window, Figure 3-10, is opened for that file.

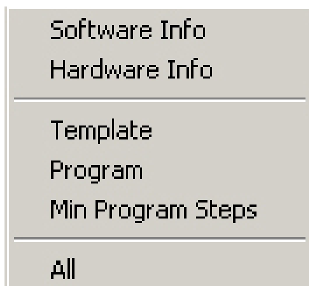


Figure 3-7:
The report View Drop-down Menu Window (with DT Disconnected from 4000 GCP)

This window provides access to the template selection and programming functions described in Section 5. Selecting **CFG FILE** button opens the Configuration File drop-down menu described below.

3.4.2 Configuration Drop-Down Menu

The Configuration File drop-down menu allows:

- A configuration package file to be saved
- Upload a configuration file
- Configuration file parameters to be imported into the configuration file to be saved
- General comments to be added to the Minimum Program Steps Report of a configuration file or to be saved in configuration package file.
- Configuration reports to be displayed
    - Software Information Report
    - Hardware Information Report
    - Template Report
    - Program Report
    - Minimum Program Steps Report
    - System Configuration Report (View All)

MWS_08-06_CONFIG_DD_MENU
06-12-08

Figure 3-8:
Configuration Drop-down Menu Window (with DT Connected to 4000 GCP)

3.5 DT OFFICE CONFIGURATION EDITOR REPORTS

3.5.1 Menu Button Capture Functions

When the DT is disconnected from the 4000 GCP and the **CFG FILE** button is selected, the active menu display items depend on the capture function used. For example:

- when the **NEW** button is used to select and open a *.mcf file only the first three item are active
  - configuration parameters and their current values may be captured and saved to a *.pac file by selecting the **Save to File** menu item
  - configuration parameters from another *.pac file may be incorporated into the new configuration file by selecting the **Import Configuration** item
  - comments may be added to the Minimum Program Steps Report of the configuration file by selecting the **Add Comments** menu item
  - saved in configuration package file
- when the **OPEN** button is used to select and open an existing *.pac file all items except **View Hardware Info** are active

Configuration file reports are generated after creating a package (Pac) file. The OCE saves each individual Pac file created with a unique file name. The Pac file is named using: the type of file (Configuration), the DOT ID number of the site (001234A); and the date that the pac file was created (2008Mar14). In this example the file name would be: CONFIG-001234A-2008Mar14. The following actions may be performed:

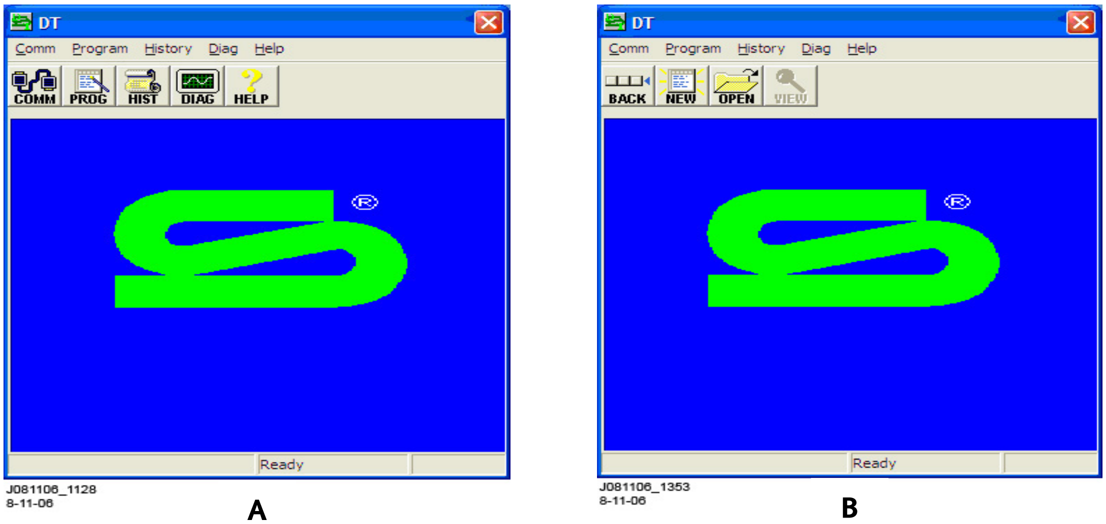
- MCF Parameter Capture
- Importing Configuration Parameters Into Open Configuration Package File
- Adding Comments To Open Configuration Package File
- Editing Configuration Package Files

3.5.2 MCF Parameter Capture

The steps required to create a configuration package file from an MCF are provided in procedure 5-1.

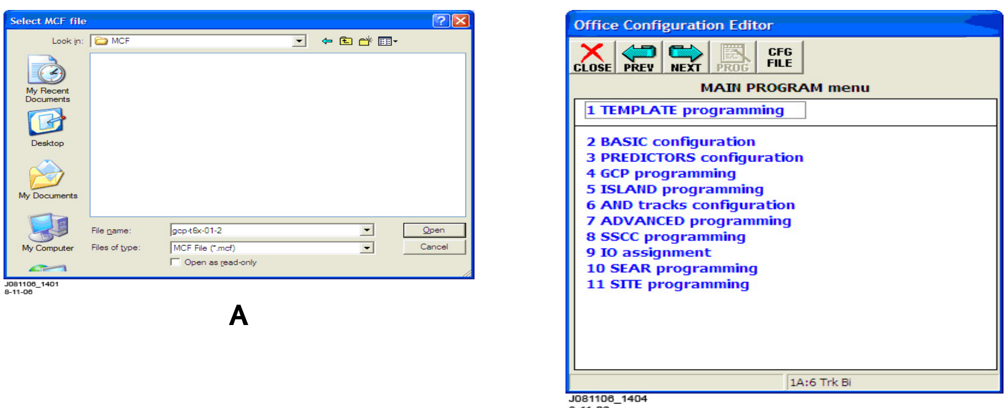
Procedure 3-1. MCF Parameter Capture	
Step 1	Start the PC resident DT program. • The DT Startup Screen displays (see Figure 3-8A).
Step 2	Select the **PROG** button at the top the DT Start-up Screen. • The DT buttons change to the configuration shown in Figure 3-8B.
Step 3	Select the **NEW** DT button. • The **Select MCF file** window opens (Figure 3-9A).
Step 4	Select an *.mcf from the displayed files or from another location as required. • The **Select MCF file** window closes and the **MAIN PROGRAM menu** of the selected MCF displays (Figure 3-9B).
Step 5	Select the track configuration template and program the required operational parameters as described in Section 5.
Step 6	Select the **CFG FILE** button. • The Configuration drop-down menu displays.
Step 7	Select the **Save Configuration** menu item. A **Save File As** window opens.
Step 8	Enter the name in the **File name:** box.

Step 9	Select the **SAVE** button.
	• The **Save File As** window closes and the display returns to the active menu window.
	  • The window is deactivated (grayed out) as the configuration file is created.
	• When the file is saved:
	  • the window returns to the active state
	  • a text file for each active Configuration drop-down menu report item is created



A B

Figure 3-9:
PC DT Display (Office Configuration Editor)



A B

Figure 3-10:
Select MCF File and MAIN PROGRAM menu Windows

3.5.3 Importing Parameters Into Open Pac File

NOTE

When importing PAC files, care must be taken to ensure compatibility between the software levels of the MCFs. MCFs gcp_t6x_01_2.mcf and earlier may be installed into GCP 4000s using any "...t6x_01_x.mcf". MCFs gcp_t6x_02_0.mcf and later may be installed into GCP 4000s using any "...t6x_02_x.mcf".

The steps required to import configuration parameters into the open configuration package file are provided in procedure 5-2. The import configuration allows conversion of a PAC file that was created with one version of an MCF into a new MCF. Open a new PAC file with the new MCF. Import the previous PAC file and resave it.

Procedure 3-2. Importing Configuration Parameters Into Open Configuration Package File	
Step 1	• From the **MAIN PROGRAM menu** (Figure 3-9B) select the **CFG FILE** button. The Configuration drop-down menu displays.
Step 2	Select the **Import Configuration** entry. An Open Configuration Package File window opens.
Step 3	Enter the name of the Pac file to import.
Step 4	Select the **OPEN** button. • The Package Progress window displays which card (module) parameters are imported from the selected Pac file. • When the import process is completed, **Package Imported** displays at the bottom of the list of imported module parameters.
Step 5	Select the **CLOSE** button. • The Package Progress window closes and the display returns to the **MAIN PROGRAM menu**.
Step 6	Select the **CFG FILE** button. The Configuration drop-down menu displays.
Step 7	Select the **Save Configuration** menu item. A **Save File As** window opens.
Step 8	Enter the name of the Pac file to save.
Step 9	Select the **SAVE** button. A **Save File As** dialog window opens.
Step 10	Select the **Yes** button The **Save File As** dialog window closes and display returns to the **MAIN PROGRAM menu**. A text file for each active Configuration drop-down menu report item is saved for the Pac file.

3.5.4 Adding Comments To Open Configuration Package File

The steps required to add comments to the Minimum Program Steps Report of an open configuration package file are provided in procedure 5-3.

Procedure 3-3. Adding Comments To Open Configuration Package File	
Step 1	Select the **CFG FILE** button. The Configuration drop-down menu displays.
Step 2	Select **ADD COMMENTS** from the drop-down menu. • The **Comments** text window displays.
Step 3	Enter the comments in the text window. • Use **Ctrl + Enter** to enter each additional line of text (pressing **Enter**, selects **OK** and closes the window).
Step 4	Select the **OK** button, or press **Enter**. The window closes and the display returns to the currently selected menu window, but the change has not been saved.
Step 5	Select the **CFG FILE** button. The Configuration drop-down menu displays.
Step 6	Select the **Save Configuration** menu item. • A **Save File As** window opens.
Step 7	Enter the name of the Pac file to be saved.
Step 8	Select the **SAVE** button. A **Save File As** dialog window opens.
Step 9	Select the Yes button. The comments are saved to the Minimum Program Steps Report. The display returns to the **MAIN PROGRAM menu**.

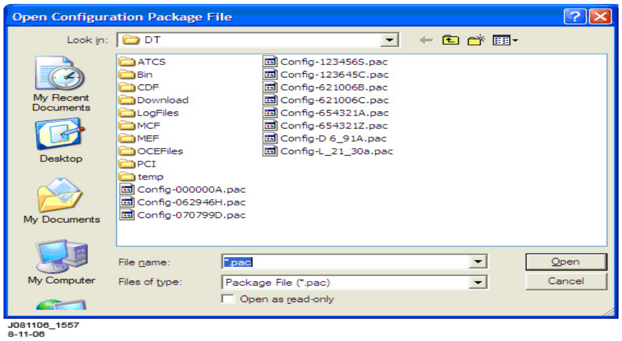
3.5.5 Editing Configuration Package Files

The steps required to modify the operational parameters of a Configuration Package File, which reprograms a 4000 GCP, are provided in procedure 5-4.

Procedure 3-4. Editing Configuration Package Files

Step 1	Start the PC resident DT program. • The DT Startup Screen displays (see Figure 3-8A).
Step 2	Select the **PROG** button at the top the DT Start-up Screen. • The DT buttons change to the configuration shown in Figure 3-9B.
Step 3	Select the **OPEN** button. • An **Open Configuration Package File** window opens (Figure 3-10A).
Step 4	Select a configuration file from the displayed files or from another location as required. • The **Open Configuration Package File** window closes and the **MAIN PROGRAM menu** (Figure 3-10B) of the selected Pac file displays.
Step 5	Select the track configuration template, or program menus 2 through 11, and modify the required operational parameters as described in Section 5.
Step 6	Select the **CFG FILE** button. • The Configuration drop-down menu displays.
Step 7	Select the **Save Configuration** menu item. A **Save File As** window opens.
Step 8	Enter the name in the **File name:** box.

Step 9	Select the **SAVE** button.
	• The **Save File As** window closes and the display returns to the active menu window.
	  • The window is deactivated (grayed out) as the configuration file is saved.
	• When the file is saved:
	  • the window returns to the active state
	  • **Package Open** appears at the bottom of the window
	  • a text file for each active Configuration drop-down menu report item is created



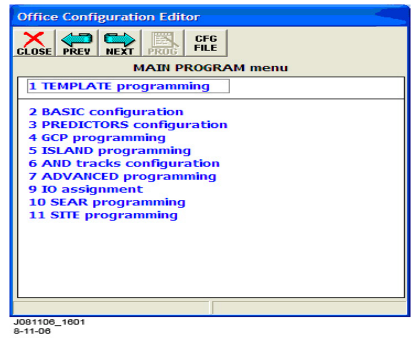


Figure 3-11:
Opening a Pac File on the OCE

3.5.6 Individual Configuration Package File Reports

All reports generated by a configuration package may be viewed by selecting the corresponding configuration Menu entry. The displays and the complete printout for each report menu item are shown in Figure 3-11 through Figure 3-23. To save an individual report file, select the **SAVE** button at the top of the report.

NOTE

All report files are automatically saved when the **Save to File** menu item is selected while the DT is disconnected from the 4000 GCP.

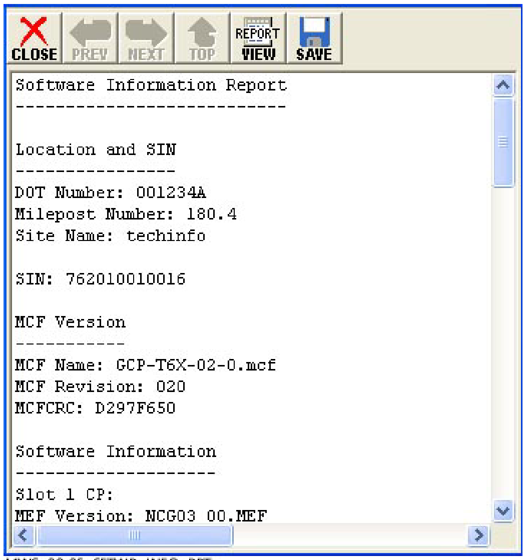
To obtain a printout of a report:

- Open the report file using a text editor such as the Notepad and select the desired file.
- The text file for each report is identified by the configuration file name followed by the report designation (e.g., the software report for ConfigFileTyler.pac is identified as ConfigFileTyler_SWInfo)
- Select **Print** from the **File** drop-down menu

Depicted below are examples of each type of report available. Each report provides the following information:

- Software Information Report (Figure 3-11) – Data regarding module software
- Hardware Information Report (Figure 3-12) – Data regarding hardware modules
- Template Information Report (Figure 3-13) – Information regarding template used
- Program Information Report (Figure 3-14) – Information regarding programming parameters selected
- Minimum Program Steps Report (Figure 3-17) – Programming steps to be completed in the field.
- System Configuration Report (Figure 3-18) – All parameters loaded into 4000 GCP

3.5.6.1 Example Software Information Report



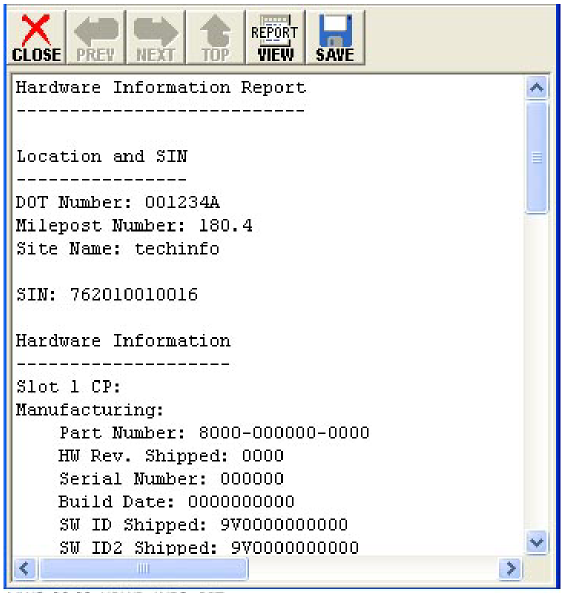
MWS_08-06_SFTWR_INFO_RPT
06-12-08

```
Software Information Report
---------------------------

Location and SIN
----------------
DOT Number: 001234A
Milepost Number: 180.4
Site Name: techinfo

SIN: 762010010016

MCF Version
-----------
MCF Name: GCP-T6X-02-0.mcf
MCF Revision: 020
MCFCRC: D297F650

Software Information
--------------------
Slot 1 CP:
MEF Version: NCG03_00.MEF
MEF ID Number: 9V792a01.T
MEF CRC: 9B31
BOOTCODE ID Number: 9V852A01.D
BOOTCODE CRC: 8155

Slot 1 VLP2:
MEF Version: VPH03_00.MEF
MEF ID Number: 9V689a01.AA
MEF CRC: 188D
BOOTCODE ID Number: 9V455A01.C
BOOTCODE CRC: D04E
```

```
Slot 2 Trk:
MEF Version: GCP03_00
MEF ID Number: 9V788a01.Y
MEF CRC: 22B2
XILINX ID Number: 80418 A01.7
XILINX CRC: 6E2F
Bootcode ID Number: 9V795A01.A
Bootcode CRC: 2341

Slot 3 Trk:
MEF Version: GCP03_00
MEF ID Number: 9V788a01.Y
MEF CRC: 22B2
XILINX ID Number: 80418 A01.7
XILINX CRC: 6E2F
Bootcode ID Number: 9V795A01.A
Bootcode CRC: 2341

Slot 8 SSCC3i:
MEF Version: XNG03_00.MEF
MEF ID Number: 9V686a01.L
MEF CRC: E58
Bootcode ID Number: 9V681A01.A
Bootcode CRC: E092
Slave1 ID Number: 9V816A01.B
Slave1 CRC: 554E
Slave1 Boot ID Number: 9V817-A01.A
Slave1 Boot CRC: FC9A
Slave2 ID Number: 9V816A01.B
Slave2 CRC: 554E
Slave2 Boot ID Number: 9V817-A01.A
Slave2 Boot CRC: FC9A

Configuration Package File
--------------------------
Filename: CONFIG-001234A-2008Mar14.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 3/14/2008 11:02:10
DT Version: 4.7.5
```

Figure 3-12:
Typical Software Information Report

3.5.6.2 Example Hardware Information Report

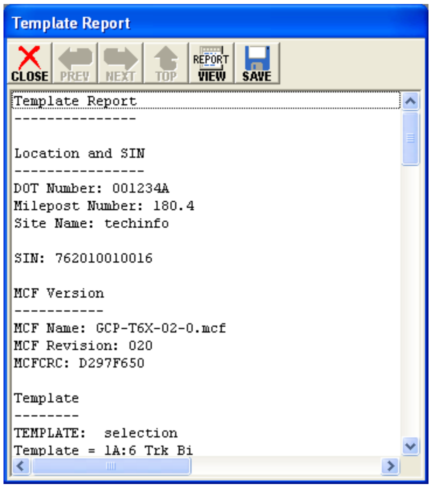


MWS_08-06_HDWR_INFO_RPT
06-12-08

```
Hardware Information Report
---------------------------

Location and SIN
----------------
DOT Number: 001234A
Milepost Number: 180.4
Site Name: techinfo

SIN: 762010010016

Hardware Information
--------------------
Slot 1 CP:
Manufacturing:
    Part Number: 8000-000000-0000
    HW Rev. Shipped: 0000
    Serial Number: 000000
    Build Date: 0000000000
    SW ID Shipped: 9V0000000000
    SW ID2 Shipped: 9V0000000000

Slot 2 Trk:
Manufacturing:
    Part Number: 8000-80418-0001
    HW Rev. Shipped: D4
    Serial Number: 5676
    Build Date: 5/9/2006
    SW ID Shipped: 9V788-A01U
Latest HW Revision: D4
Customer 1:
    Sales Order Number: 2ER000115
    Customer: ENG. REQ.
    Safety Level: 0000
    Warranty Date: MAY/2008

Slot 3 Trk:
Manufacturing:
    Part Number: 8000-80418-0001
    HW Rev. Shipped: D4
    Serial Number: 5695
    Build Date: 5/9/2006
    SW ID Shipped: 9V788-A01U
Latest HW Revision: D4
Customer 1:
    Sales Order Number: 2ER000115
    Customer: ENG. REQ.
    Safety Level: 0000
    Warranty Date: MAY/2008

Slot 8 SSCC3i:
Manufacturing:
    Part Number: 8000-000000-0000
    HW Rev. Shipped: 0000
    Serial Number: 000000
    Build Date: 0000000000
    SW ID Shipped: 9V0000000000
    SW ID2 Shipped: 9V0000000000

Configuration Package File
--------------------------
Filename: CONFIG-001234A-2008Mar14.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 3/14/2008 11:02:10
DT Version: 4.7.5
```

Figure 3-13:
Typical Hardware Information Report

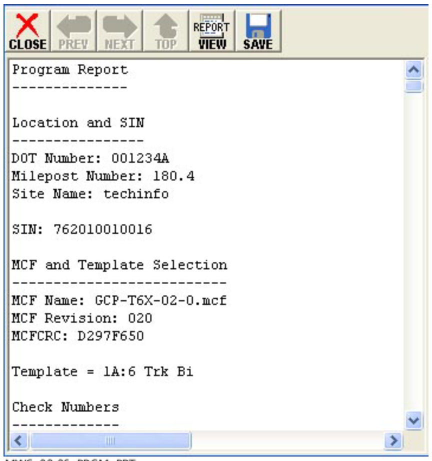
3.5.6.3 Example Template Report




```
Template Report
---------------
Location and SIN
----------------
DOT Number: 001234A
Milepost Number: 180.4
Site Name: techinfo

SIN: 762010010016

MCF Version
-----------
MCF Name: GCP-T6X-02-0.mcf
MCF Revision: 020
MCFCRC: D297F650

Template
TEMPLATE:  selection
Template = 1A:6 Trk Bi

TEMPLATE:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC 1 Slot = SSCC3i
SSCC 2 Slot = Not Used
SEAR Used = Yes

TEMPLATE:  preemption
Preempt Logic = No

TEMPLATE:  track 1-Bi, Island
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft
Track 1 : Prime Warning Time = 35 sec
Track 1 : Prime UAX = Not Used
Track 1 : GCP Transmit Level = Medium
Track 1 : Isl Frequency = 4.0 kHz

TEMPLATE:  track 2-Bi, Island
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft
Track 2 : Prime Warning Time = 35 sec
Track 2 : Prime UAX = Not Used
Track 2 : GCP Transmit Level = Medium
Track 2 : Isl Frequency = 10.0 kHz

TEMPLATE: AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 XR Track 2 = Prime
AND 1 Enable Used = No

TEMPLATE:  SSCC
Gates Used = Yes
SSCC1+2 GPs Coupled = Yes
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 2
SSCC 1 : Lamp Neutral Test = Off

TEMPLATE:  OOS
OOS Control = Display
OOS Timeout = Yes
OOS Timeout = 1 hrs

TEMPLATE:  OP assignment 1
OUT 1.1 = Not Used
OUT 1.2 = Not Used
OUT 2.1 = Not Used
OUT 2.2 = Not Used

TEMPLATE:  IP assignment 1
IN 1.1 = Not Used
IN 1.2 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used

TEMPLATE:  IP assignment SSCC
IN 7.1 = Not Used
IN 7.2 = GD 1.2
IN 7.3 = Not Used
IN 7.4 = GD 1.1
IN 7.5 = GP 1.1

TEMPLATE:  SEAR
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

Configuration Package File
--------------------------
Filename: CONFIG-001234A-2008Mar14.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 3/14/2008 11:02:10
DT Version: 4.7.5
```

Figure 3-14:
Typical Template Information Report

3.5.6.4 Example Program Report



MWS_08-06_PRGM_PRT
06-12-08

```
Program Report
--------------
Location and SIN
----------------
DOT Number: 001234A
Milepost Number: 180.4
Site Name: techinfo

SIN: 762010010016

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-0.mcf
MCF Revision: 020
MCFCRC: D297F650

Template = 1A:6 Trk Bi

Check Numbers
-------------
Office Check No. (DT 4.6.0): 71872924
Office Check Number: 2C950404
Config. Check Number: 0693E4D9
(Based on MCF Revision 020)

Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = Not Used
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal
Track 2 : Island Used = Internal

BASIC:  preemption
Preempt Logic = No

BASIC:  radio Dax links
Radio DAX link A Used = No
Radio DAX link B Used = No
BASIC:  Vital Comms links
Vital Comms link 1 Used = No
Vital Comms link 2 Used = No

PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = No
Track 1 : Dax B Used = No
Track 1 : Dax C Used = No
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No

PREDICTORS:  track 2
Track 2 : Prime Used = Yes
Track 2 : Dax A Used = No
Track 2 : Dax B Used = No
Track 2 : Dax C Used = No
Track 2 : Dax D Used = No
Track 2 : Dax E Used = No
Track 2 : Dax F Used = No
Track 2 : Dax G Used = No

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 199 ft
Track 1 : Computed Distance = 2974 ft
Track 1 : Linearization Steps = 100

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 prime
Track 1 : Prime Warning Time = 35 sec
Track 1 : Prime Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prime MS/GCP Mode = Pred
Track 1 : Prime Pickup Delay = 15 sec
Track 1 : Prime UAX = Not Used
```

Figure 3-15:
Typical Program Information Report, Sheet 1 of 3

```
GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No

GCP:  track 1 MS Control
Track 1 : MS/GCP Ctrl IP Used = No
Track 1 : MS Sensitivity Level = 0
Track 1 : Compensation Level = 1300
Track 1 : Warn Time-Ballast Comp = High
Track 1 : Low EX Adjustment = 39
Track 1 : Bidirn Dax Passthru = No
Track 1 : False Act on Train Stop = No
Track 1 : EX Limiting Used = Yes
Track 1 : EZ Correction Used = Yes

GCP:  track 2
Track 2 : GCP Freq Category = Standard
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft
Track 2 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 2 : GCP Transmit Level = Medium
Track 2 : Island Connection = Isl 2
Track 2 : Island Distance = 199 ft
Track 2 : Computed Distance = 2980 ft
Track 2 : Linearization Steps = 100

GCP:  track 2 enhanced det
Track 2 : Inbound PS Sensitivity = High
Track 2 : Speed Limiting Used = Yes
Track 2 : Outbound False Act Lvl = Normal
Track 2 : Outbound PS Timer = 20 sec
Track 2 : Trailing Switch Logic = On
Track 2 : Post Joint Detn Time = 15 sec
Track 2 : Adv Appr Predn = No
Track 2 : Cancel Pickup Delay = This Isl

GCP:  track 2 prime
Track 2 : Prime Warning Time = 35 sec
Track 2 : Prime Offset Distance = 0 ft
Track 2 : Switch MS EZ Level = 10
Track 2 : Prime MS/GCP Mode = Pred
Track 2 : Prime Pickup Delay = 15 sec
Track 2 : Prime UAX = Not Used
GCP:  track 2 pos start
Track 2 : Positive Start = Off
Track 2 : Sudden Shnt Det Used = No
Track 2 : Low EZ Detection Used = No

GCP:  track 2 MS Control
Track 2 : MS/GCP Ctrl IP Used = No
Track 2 : MS Sensitivity Level = 0
Track 2 : Compensation Level = 1300
Track 2 : Warn Time-Ballast Comp = High
Track 2 : Low EX Adjustment = 39
Track 2 : Bidirn Dax Passthru = No
Track 2 : False Act on Train Stop = No
Track 2 : EX Limiting Used = Yes
Track 2 : EZ Correction Used = Yes

ISLAND:  track 1
Track 1 : Isl Frequency = 4.0 kHz
Track 1 : Pickup Delay (2s +) = 0 sec
Track 1 : Isl Enable IP Used = No

ISLAND:  track 2
Track 2 : Isl Frequency = 10.0 kHz
Track 2 : Pickup Delay (2s +) = 0 sec
Track 2 : Isl Enable IP Used = No

AND:  track Anding
AND 1 XR Used = Yes
AND 2 Used = No
AND 3 Used = No
AND 4 Used = No
AND 5 Used = No
AND 6 Used = No
AND 7 Used = No
AND 8 Used = No

AND:  AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 XR Track 2 = Prime
AND 1 Enable Used = No
AND 1 Wrap Used = No

ADVANCED:  MS restart
MS/GCP Restart Used = No

ADVANCED:  out of service
OOS Control = Display
OOS Timeout = Yes
OOS Timeout = 1 hrs

ADVANCED:  track wrap circuits
Wrap LOS Timer = 5 sec
Track 1 Wrap Used = No
Track 2 Wrap Used = No

ADVANCED:  trk 1 overrides
Track 1 : All Predictors Override Used = No

ADVANCED:  trk 2 overrides
Track 2 : All Predictors Override Used = No

ADVANCED:  OR logic
OR 1 Used = No
OR 2 Used = No
OR 3 Used = No
OR 4 Used = No

ADVANCED:  internal I/O 1
Pass Thrus = No
Int.1 Sets = Not Used
Int.1 Set by = Not Used
Int.2 Sets = Not Used
Int.2 Set by = Not Used
Int.3 Sets = Not Used
Int.3 Set by = Not Used
Int.4 Sets = Not Used
Int.4 Set by = Not Used
```

Figure 3-16:
Typical Program Information Report, Sheet 2 of 3

```
ADVANCED:  internal I/O 2
Int.5 Sets = Not Used
Int.5 Set by = Not Used
Int.6 Sets = Not Used
Int.6 Set by = Not Used
Int.7 Sets = Not Used
Int.7 Set by = Not Used
Int.8 Sets = Not Used
Int.8 Set by = Not Used

ADVANCED:  internal I/O 3
Int.9 Sets = Not Used
Int.9 Set by = Not Used
Int.10 Sets = Not Used
Int.10 Set by = Not Used
Int.11 Sets = Not Used
Int.11 Set by = Not Used
Int.12 Sets = Not Used
Int.12 Set by = Not Used

ADVANCED:  internal I/O 4
Int.13 Sets = Not Used
Int.13 Set by = Not Used
Int.14 Sets = Not Used
Int.14 Set by = Not Used
Int.15 Sets = Not Used
Int.15 Set by = Not Used
Int.16 Sets = Not Used
Int.16 Set by = Not Used

ADVANCED:  site options
Daylight Savings = Off
Units = Standard
Maint Call Rpt IP Used = No
Emergency Activate IP = No
EZ/EX Logging = Change
EZ/EX Point Change = 3

SSCC
Gates Used = Yes
Min Activation = 0 sec
Rmt Activation Cancel = 2 min
Bell On Gate Rising = No
Mute Bell On Gate Down = No
SSCCIV Controller Used = No

SSCC:  1
SSCC-1 Activation = AND 1 XR
SSCC-1 Gate Delay = 4 sec
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 2
SSCC 1 : Flash Rate = 50
SSCC 1 : Low Battery Detection = No
SSCC 1 : Flash Sync = master
SSCC 1 : Invert Gate Output = No
SSCC 1 : Lamp Neutral Test = Off
Aux-1 Xng Ctrl Used = No

OUTPUT:  assignment page 1
OUT 1.1 = Not Used
OUT 1.2 = Not Used
OUT 2.1 = Not Used
OUT 2.2 = Not Used

INPUT:  assignment page 1
IN 1.1 = Not Used
IN 1.2 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used

IO:  assignment SSCC
OUT GC 1 = Gate Output 1
IN 7.1 = Not Used
IN 7.2 = GD 1.2
IN 7.3 = Not Used
IN 7.4 = GD 1.1
IN 7.5 = GP 1.1

SEAR
SEAR Subnode = 99
DI 1 = Not Used
DI 2 = Not Used
Rly 1 = Not Used
Rly 2 = Not Used

SEAR:  inputs
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

SEAR:  slot 1-4 inputs
IN 1.1 = Not Used
IN 1.2 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used
IN 3.1 = Not Used
IN 3.2 = Not Used
IN 4.1 = Not Used
IN 4.2 = Not Used

SEAR:  inputs slot 5
IN 5.1 = Not Used
IN 5.2 = Not Used

SEAR:  inputs slot 6
IN 6.1 = Not Used
IN 6.2 = Not Used

SEAR:  slot 7-8 inputs
IN 7.1 = Not Used
IN 7.3 = Not Used
IN 8.1 = Not Used
IN 8.2 = Not Used
IN 8.3 = Not Used
IN 8.4 = Not Used
IN 8.5 = Not Used

SITE:  programming
Radio Subnode = 1
Field Password = Off
Low Battery Enabled = Off
--------------------------
Filename: CONFIG-001234A-2008Mar14.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 3/14/2008 11:02:10
```

Figure 3-17:
Typical Program Information Report, Sheet 3 of 3

3.5.6.5 Example Minimum Program Steps Report

The application designer can use the Minimum Program Steps report to simplify field programming. Explanatory notes are provided to identify the information provided by the report.

The entries listed in appear in the Minimum Program Report even if they are left at their default value because the exact values are determined in the field. These values are not used in computing the office check number calculation.

- GCP Frequency
- Approach Distance
- GCP Transmit Level
- Island Frequency
- Lamp Neutral Test
- Module Configurations

Certain entries are associated with built in instructions.

3.5.6.5.1 See Plans Instruction

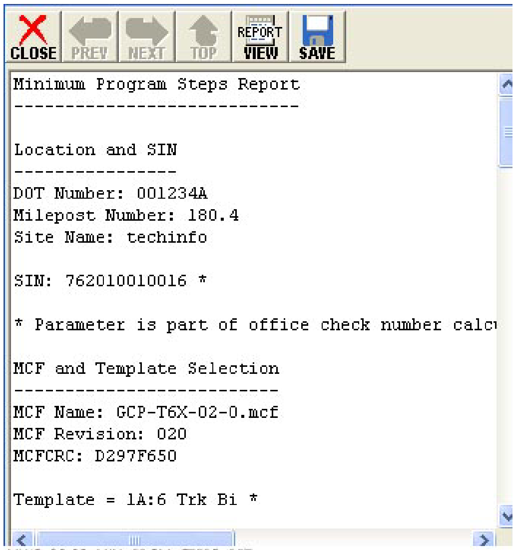
The **See Plans** instruction may appear with GCP Frequency, Island Frequency, and Approach Distance entries.

- Directs the field user to refer to the plans for the required parameters.
- The designer may choose to leave these entries at their default values.

3.5.6.5.2 Set in Field Instruction

The **Set In Field** instruction may appear with DAX Offset Distances and Island Distances.

- Directs the user to measure these distances in the field and enter the correct values.
- The designer may choose to either leave these entries at their default values or specify the nominal or expected values.

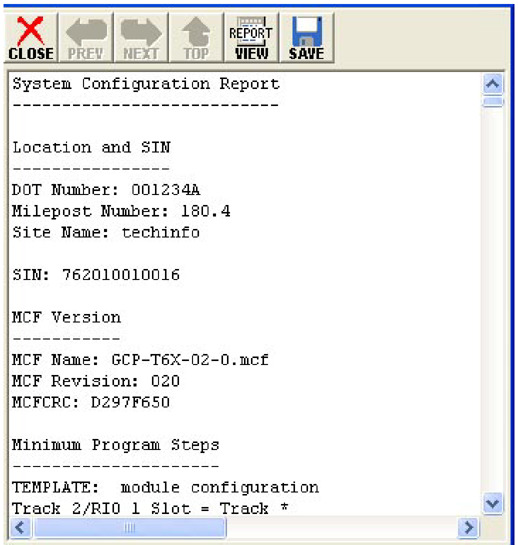


MWS_08-06_MIN_PRGM_STEPS_RPT
06-12-08

```
Minimum Program Steps Report
----------------------------
Location and SIN
----------------
DOT Number: 001234A
Milepost Number: 180.4
Site Name: techinfo

SIN: 762010010016 *

* Parameter is part of office check number
calculation.

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-0.mcf
MCF Revision: 020
MCFCRC: D297F650

Template = 1A:6 Trk Bi *

* Parameter is part of office check number
calculation.

Minimum Program Steps
---------------------
TEMPLATE:  module configuration
Track 2/RIO 1 Slot = Track *
SSCC 2 Slot = Not Used *

TEMPLATE:  track 1-Bi, Island
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft (See
Plans)
Track 1 : GCP Transmit Level = Medium (Set
in Field)
Track 1 : Isl Frequency = 4.0 kHz

TEMPLATE:  track 2-Bi, Island
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft (See
Plans)
Track 2 : GCP Transmit Level = Medium (Set
in Field)
Track 2 : Isl Frequency = 10.0 kHz

TEMPLATE:  SSCC
SSCC 1 : Lamp Neutral Test = Off (Set in
Field)

* Parameter is part of office check number
calculation.

Check Numbers
-------------
Office Check No. (DT 4.6.0): 71872924
Office Check Number: 2C950404
Config. Check Number: 0693E4D9
(Based on MCF Revision 020)

Parameters not part of office check number
calculation:

Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft (See
Plans)
Track 1 : GCP Transmit Level = Medium (Set
in Field)
Track 1 : Isl Frequency = 4.0 kHz
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft (See
Plans)
Track 2 : GCP Transmit Level = Medium (Set
in Field)
Track 2 : Isl Frequency = 10.0 kHz
SSCC 1 : Lamp Neutral Test = Off (Set in
Field)

Comments
--------
<none>

Configuration Package File
--------------------------
Filename: CONFIG-001234A-2008Mar14.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 3/14/2008 11:02:10
DT Version: 4.7.5
```

Figure 3-18:
Typical Minimum Program Steps Information Report

3.5.6.6 Example System Configuration Report



MWS_08-06_SYS_CONFIG_RPT
06-12-08

```
 System Configuration Report
---------------------------

Location and SIN
----------------
DOT Number: 001234A
Milepost Number: 180.4
Site Name: techinfo

SIN: 762010010016

MCF Version
-----------
MCF Name: GCP-T6X-02-0.mcf
MCF Revision: 020
MCFCRC: D297F650

Minimum Program Steps
---------------------
TEMPLATE:  module configuration
Track 2/RIO 1 Slot = Track *
SSCC 2 Slot = Not Used *

TEMPLATE:  track 1-Bi, Island
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft
(See Plans)
Track 1 : GCP Transmit Level = Medium
(Set in Field)
Track 1 : Isl Frequency = 4.0 kHz

TEMPLATE:  track 2-Bi, Island
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft
(See Plans)
Track 2 : GCP Transmit Level = Medium
(Set in Field)
Track 2 : Isl Frequency = 10.0 kHz

TEMPLATE:  SSCC
SSCC 1 : Lamp Neutral Test = Off (Set
in Field)

* Parameter is part of office check
number calculation.

Check Numbers
-------------
Office Check No. (DT 4.6.0): 71872924
Office Check Number: 2C950404
Config. Check Number: 0693E4D9
(Based on MCF Revision 020)

Parameters not part of office check
number calculation:

Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft
(See Plans)
Track 1 : GCP Transmit Level = Medium
(Set in Field)
Track 1 : Isl Frequency = 4.0 kHz
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft
(See Plans)
Track 2 : GCP Transmit Level = Medium
(Set in Field)
Track 2 : Isl Frequency = 10.0 kHz
SSCC 1 : Lamp Neutral Test = Off
(Set in Field)

Template
--------
TEMPLATE:  selection
Template = 1A:6 Trk Bi

TEMPLATE:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC 1 Slot = SSCC3i
SSCC 2 Slot = Not Used
SEAR Used = Yes

TEMPLATE:  preemption
Preempt Logic = No
```

Figure 3-19:
System Configuration Report Window, Page 1 of 6

```
TEMPLATE:  track 1-Bi, Island
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft
Track 1 : Prime Warning Time = 35 sec
Track 1 : Prime UAX = Not Used
Track 1 : GCP Transmit Level = Medium
Track 1 : Isl Frequency = 4.0 kHz

TEMPLATE:  track 2-Bi, Island
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance = 3000 ft
Track 2 : Prime Warning Time = 35 sec
Track 2 : Prime UAX = Not Used
Track 2 : GCP Transmit Level = Medium
Track 2 : Isl Frequency = 10.0 kHz

TEMPLATE: AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 XR Track 2 = Prime
AND 1 Enable Used = No

TEMPLATE:  SSCC
Gates Used = Yes
SSCC1+2 GPs Coupled = Yes
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 2
SSCC 1 : Lamp Neutral Test = Off

TEMPLATE:  OOS
OOS Control = Display
OOS Timeout = Yes
OOS Timeout = 1 hrs

TEMPLATE:  OP assignment 1
OUT 1.1 = Not Used
OUT 1.2 = Not Used
OUT 2.1 = Not Used
OUT 2.2 = Not Used

TEMPLATE:  IP assignment 1
IN 1.1 = Not Used
IN 1.2 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used

TEMPLATE:  IP assignment SSCC
IN 7.1 = Not Used
IN 7.2 = GD 1.2
IN 7.3 = Not Used
IN 7.4 = GD 1.1
IN 7.5 = GP 1.1

TEMPLATE:  SEAR
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used
```

```
Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = Not Used
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal
Track 2 : Island Used = Internal

BASIC:  preemption
Preempt Logic = No

BASIC:  radio Dax links
Radio DAX link A Used = No
Radio DAX link B Used = No

BASIC:  Vital Comms links
Vital Comms link 1 Used = No
Vital Comms link 2 Used = No

PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = No
Track 1 : Dax B Used = No
Track 1 : Dax C Used = No
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No

PREDICTORS:  track 2
Track 2 : Prime Used = Yes
Track 2 : Dax A Used = No
Track 2 : Dax B Used = No
Track 2 : Dax C Used = No
Track 2 : Dax D Used = No
Track 2 : Dax E Used = No
Track 2 : Dax F Used = No
Track 2 : Dax G Used = No
```

Figure 3-20:
System Configuration Report Window, Page 2 of 6

```
GCP:  track 1
Track 1 : GCP Freq Category =
Standard
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 3000 ft
Track 1 : Uni/Bi/Sim-Bidirnl =
Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 199 ft
Track 1 : Computed Distance = 2974 ft
Track 1 : Linearization Steps = 100

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity =
High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl =
Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15
sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This
Isl

GCP:  track 1 prime
Track 1 : Prime Warning Time = 35 sec
Track 1 : Prime Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prime MS/GCP Mode = Pred
Track 1 : Prime Pickup Delay = 15 sec
Track 1 : Prime UAX = Not Used

GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No

GCP:  track 1 MS Control
Track 1 : MS/GCP Ctrl IP Used = No
Track 1 : MS Sensitivity Level = 0
Track 1 : Compensation Level = 1300
Track 1 : Warn Time-Ballast Comp =
High
Track 1 : Low EX Adjustment = 39
Track 1 : Bidirn Dax Passthru = No
Track 1 : False Act on Train Stop =
No
Track 1 : EX Limiting Used = Yes
Track 1 : EZ Correction Used = Yes
```

```
GCP:  track 2
Track 2 : GCP Freq Category =
Standard
Track 2 : GCP Frequency = 525 Hz
Track 2 : Approach Distance =
3000 ft
Track 2 : Uni/Bi/Sim-Bidirnl =
Bidirnl
Track 2 : GCP Transmit Level = Medium
Track 2 : Island Connection = Isl 2
Track 2 : Island Distance = 199 ft
Track 2 : Computed Distance = 2980 ft
Track 2 : Linearization Steps = 100

GCP:  track 2 enhanced det
Track 2 : Inbound PS Sensitivity =
High
Track 2 : Speed Limiting Used = Yes
Track 2 : Outbound False Act Lvl =
Normal
Track 2 : Outbound PS Timer = 20 sec
Track 2 : Trailing Switch Logic = On
Track 2 : Post Joint Detn Time = 15
sec
Track 2 : Adv Appr Predn = No
Track 2 : Cancel Pickup Delay = This
Isl

GCP:  track 2 prime
Track 2 : Prime Warning Time = 35 sec
Track 2 : Prime Offset Distance = 0 ft
Track 2 : Switch MS EZ Level = 10
Track 2 : Prime MS/GCP Mode = Pred
Track 2 : Prime Pickup Delay = 15 sec
Track 2 : Prime UAX = Not Used

GCP:  track 2 pos start
Track 2 : Positive Start = Off
Track 2 : Sudden Shnt Det Used = No
Track 2 : Low EZ Detection Used = No

GCP:  track 2 MS Control
Track 2 : MS/GCP Ctrl IP Used = No
Track 2 : MS Sensitivity Level = 0
Track 2 : Compensation Level = 1300
Track 2 : Warn Time-Ballast Comp =
High
Track 2 : Low EX Adjustment = 39
Track 2 : Bidirn Dax Passthru = No
Track 2 : False Act on Train Stop =
No
Track 2 : EX Limiting Used = Yes
Track 2 : EZ Correction Used = Yes
```

Figure 3-21:
System Configuration Report Window, Page 3 of 6

```
ISLAND:  track 1
Track 1 : Isl Frequency = 4.0 kHz
Track 1 : Pickup Delay (2s +) = 0
sec
Track 1 : Isl Enable IP Used = No

ISLAND:  track 2
Track 2 : Isl Frequency = 10.0 kHz
Track 2 : Pickup Delay (2s +) = 0
sec
Track 2 : Isl Enable IP Used = No

AND:  track Anding
AND 1 XR Used = Yes
AND 2 Used = No
AND 3 Used = No
AND 4 Used = No
AND 5 Used = No
AND 6 Used = No
AND 7 Used = No
AND 8 Used = No

AND:  AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 XR Track 2 = Prime
AND 1 Enable Used = No
AND 1 Wrap Used = No

ADVANCED:  MS restart
MS/GCP Restart Used = No

ADVANCED:  out of service
OOS Control = Display
OOS Timeout = Yes
OOS Timeout = 1 hrs

ADVANCED:  track wrap circuits
Wrap LOS Timer = 5 sec
Track 1 Wrap Used = No
Track 2 Wrap Used = No

ADVANCED:  trk 1 overrides
Track 1 : All Predictors Override
Used = No

ADVANCED:  trk 2 overrides
Track 2 : All Predictors Override
Used = No

ADVANCED:  OR logic
OR 1 Used = No
OR 2 Used = No
OR 3 Used = No
OR 4 Used = No

ADVANCED:  internal I/O 1
Pass Thrus = No
Int.1 Sets = Not Used
Int.1 Set by = Not Used
Int.2 Sets = Not Used
Int.2 Set by = Not Used
Int.3 Sets = Not Used
Int.3 Set by = Not Used
Int.4 Sets = Not Used
Int.4 Set by = Not Used

ADVANCED:  internal I/O 2
Int.5 Sets = Not Used
Int.5 Set by = Not Used
Int.6 Sets = Not Used
Int.6 Set by = Not Used
Int.7 Sets = Not Used
Int.7 Set by = Not Used
Int.8 Sets = Not Used
Int.8 Set by = Not Used

ADVANCED:  internal I/O 3
Int.9 Sets = Not Used
Int.9 Set by = Not Used
Int.10 Sets = Not Used
Int.10 Set by = Not Used
Int.11 Sets = Not Used
Int.11 Set by = Not Used
Int.12 Sets = Not Used
Int.12 Set by = Not Used

ADVANCED:  internal I/O 4
Int.13 Sets = Not Used
Int.13 Set by = Not Used
Int.14 Sets = Not Used
Int.14 Set by = Not Used
Int.15 Sets = Not Used
Int.15 Set by = Not Used
Int.16 Sets = Not Used
Int.16 Set by = Not Used

ADVANCED:  site options
Daylight Savings = Off
Units = Standard
Maint Call Rpt IP Used = No
Emergency Activate IP = No
EZ/EX Logging = Change
EZ/EX Point Change = 3

SSCC
Gates Used = Yes
Min Activation = 0 sec
Rmt Activation Cancel = 2 min
Bell On Gate Rising = No
Mute Bell On Gate Down = No
SSCCIV Controller Used = No
```

Figure 3-22:
System Configuration Report Window, Page 4 of 6

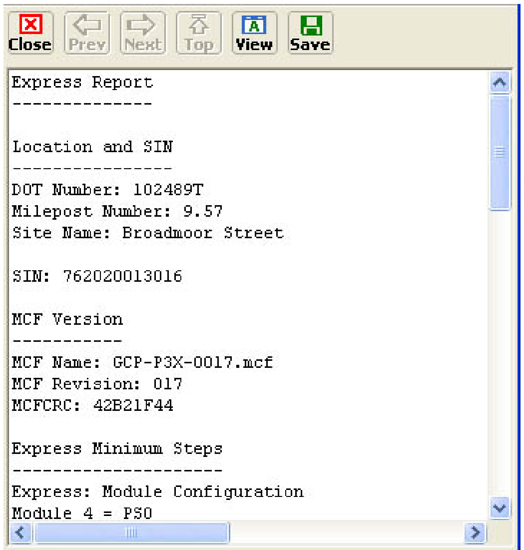
```
SSCC:  1
SSCC-1 Activation = AND 1 XR
SSCC-1 Gate Delay = 4 sec
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 2
SSCC 1 : Flash Rate = 50
SSCC 1 : Low Battery Detection = No
SSCC 1 : Flash Sync = master
SSCC 1 : Invert Gate Output = No
SSCC 1 : Lamp Neutral Test = Off
Aux-1 Xng Ctrl Used = No

OUTPUT:  assignment page 1
OUT 1.1 = Not Used
OUT 1.2 = Not Used
OUT 2.1 = Not Used
OUT 2.2 = Not Used

INPUT:  assignment page 1
IN 1.1 = Not Used
IN 1.2 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used

IO:  assignment SSCC
OUT GC 1 = Gate Output 1
IN 7.1 = Not Used
IN 7.2 = GD 1.2
IN 7.3 = Not Used
IN 7.4 = GD 1.1
IN 7.5 = GP 1.1

SEAR
SEAR Subnode = 99
DI 1 = Not Used
DI 2 = Not Used
Rly 1 = Not Used
Rly 2 = Not Used

SEAR:  inputs
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

SEAR:  slot 1-4 inputs
IN 1.1 = Not Used
IN 1.2 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used
IN 3.1 = Not Used
IN 3.2 = Not Used
IN 4.1 = Not Used
IN 4.2 = Not Used

SEAR:  inputs slot 5
IN 5.1 = Not Used
IN 5.2 = Not Used

SEAR:  inputs slot 6
IN 6.1 = Not Used
IN 6.2 = Not Used

SEAR:  slot 7-8 inputs
IN 7.1 = Not Used
IN 7.3 = Not Used
IN 8.1 = Not Used
IN 8.2 = Not Used
IN 8.3 = Not Used
IN 8.4 = Not Used
IN 8.5 = Not Used

SITE:  programming
Radio Subnode = 1
Field Password = Off
Low Battery Enabled = Off

Software Information
--------------------
Slot 1 CP:
MEF Version: NCG03_00.MEF
MEF ID Number: 9V792a01.T
MEF CRC: 9B31
BOOTCODE ID Number: 9V852A01.D
BOOTCODE CRC: 8155

Slot 1 VLP2:
MEF Version: VPH03_00.MEF
MEF ID Number: 9V689a01.AA
MEF CRC: 188D
BOOTCODE ID Number: 9V455A01.C
BOOTCODE CRC: D04E

Slot 2 Trk:
MEF Version: GCP03_00
MEF ID Number: 9V788a01.Y
MEF CRC: 22B2
XILINX ID Number: 80418 A01.7
XILINX CRC: 6E2F
Bootcode ID Number: 9V795A01.A
Bootcode CRC: 2341

Slot 3 Trk:
MEF Version: GCP03_00
MEF ID Number: 9V788a01.Y
MEF CRC: 22B2
XILINX ID Number: 80418 A01.7
XILINX CRC: 6E2F
Bootcode ID Number: 9V795A01.A
Bootcode CRC: 2341
```

Figure 3-23:
System Configuration Report Window, Page 5 of 6

```
Slot 3 Trk:
MEF Version: GCP03_00
MEF ID Number: 9V788a01.Y
MEF CRC: 22B2
XILINX ID Number: 80418 A01.7
XILINX CRC: 6E2F
Bootcode ID Number: 9V795A01.A
Bootcode CRC: 2341

Slot 8 SSCC3i:
MEF Version: XNG03_00.MEF
MEF ID Number: 9V686a01.L
MEF CRC: E58
Bootcode ID Number: 9V681A01.A
Bootcode CRC: E092
Slave1 ID Number: 9V816A01.B
Slave1 CRC: 554E
Slave1 Boot ID Number: 9V817-A01.A
Slave1 Boot CRC: FC9A
Slave2 ID Number: 9V816A01.B
Slave2 CRC: 554E
Slave2 Boot ID Number: 9V817-A01.A
Slave2 Boot CRC: FC9A

Hardware Information
--------------------
Slot 1 CP:
Manufacturing:
    Part Number: 8000-000000-0000
    HW Rev. Shipped: 0000
    Serial Number: 000000
    Build Date: 0000000000
    SW ID Shipped: 9V0000000000
    SW ID2 Shipped: 9V0000000000

Slot 2 Trk:
Manufacturing:
    Part Number: 8000-80418-0001
    HW Rev. Shipped: D4
    Serial Number: 5676
    Build Date: 5/9/2006
    SW ID Shipped: 9V788-A01U
Latest HW Revision: D4
Customer 1:
    Sales Order Number: 2ER000115
    Customer: ENG. REQ.
    Safety Level: 0000
    Warranty Date: MAY/2008

Slot 3 Trk:
Manufacturing:
    Part Number: 8000-80418-0001
    HW Rev. Shipped: D4
    Serial Number: 5695
    Build Date: 5/9/2006
    SW ID Shipped: 9V788-A01U
Latest HW Revision: D4
Customer 1:
    Sales Order Number: 2ER000115
    Customer: ENG. REQ.
    Safety Level: 0000
    Warranty Date: MAY/2008

Slot 8 SSCC3i:
Manufacturing:
    Part Number: 8000-000000-0000
    HW Rev. Shipped: 0000
    Serial Number: 000000
    Build Date: 0000000000
    SW ID Shipped: 9V0000000000
    SW ID2 Shipped: 9V0000000000

Configuration Package File
--------------------------
Filename: CONFIG-001234A-2008Mar14.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 3/14/2008 11:02:10
DT Version: 4.7.5
```

Figure 3-24:
Typical System Configuration Report, Sheet 6 of 6

3.5.6.7 Example System Express Report



08-10_EXPRESS_REPORT
01-06-10

```
Express Report
--------------

Location and SIN
----------------
DOT Number: 102489T
Milepost Number: 9.57
Site Name: Broadmoor Street

SIN: 762020013016

MCF Version
-----------
MCF Name: GCP-P3X-0017.mcf
MCF Revision: 017
MCFCRC: 42B21F44

Express Minimum Steps
---------------------
Express: Module Configuration
Module 4 = PSO
SEAR Used = No

Express: track 1 configuration
Track 1 : GCP Frequency = 348 Hz (TCN)
Track 1 : Approach Distance = 2010 ft
(TCN)

Express: track 1 pred select
Track 1 : Dax A Used = Yes
Express: track 1, Prime
Track 1 : Prime UAX = IP

Express: track 1, Dax A
Track 1 : Dax A Warning Time = 30 sec
Track 1 : Dax A Offset Distance = 5 ft

Express: track 1, Island
Track 1 : Isl Frequency = 4.9 kHz

Express Minimum Steps (Classic DT)
----------------------------------
BASIC:  Vital Comms links
Vital Comms link 1 Used = Yes

BASIC:  Vital Comms link 1
HDLink 1 : GGG Offset = 2

GCP:  track 1
Track 1 : Computed Distance = 2020 ft
(TCN)

GCP:  track 1 BIDAX RX
Track 1 : BIDAX To RX Appr = Center Fed
PSO
PSO Used = PSO 3
PSO 3 : Rx2 Frequency = 790 Hz (PCN)

ADVANCED:  internal I/O 1
Int.1 Sets = Vital Link 1 IP 1
Int.1 Set by = T1 Dax A
Int.2 Sets = T1 Prime UAX
Int.2 Set by = Vital Link 1 OP 1

Configuration Package File
--------------------------
Filename: RDAX_Config.pac
Path: C:\Safetran\DT\
Date/Time: 1/04/2010 6:26:29
DT Version: 5.0.7
```

Figure 3-25:
Typical System Express Report, Sheet 1 of 1

SECTION 4 –
TEMPLATE OVERVIEW AND GUIDELINES

4.1 TEMPLATE OVERVIEW

The Model 4000 GCP system consists of several products (e.g., constant warning time train detection, crossing controller, etc.) that require programming for site specific applications. To simplify the programming, Siemens has developed Templates that represent common arrangements of track circuits.

Each template:

- provides the simplified programming menus and the programming defaults for a typical track arrangement and application
- predefines default programming parameters for the train detection feature of the Model 4000 GCP system
- has rules that specify which:
  - track circuits are unidirectional and bidirectional
  - track circuits have active islands (indicated by an *)
  - one back-to-back track circuit has an island while the other track is automatically connected to that island
  - track circuits are remote and DAX towards the crossing
  - track circuits are remote and DAX away from the crossing

NOTE

Track circuits are logically ANDed together to control the crossing activation.

The default settings for each template of the set are provided in Appendix A.

4.1.1 TEMPLATE Programming Applications

The two-track bidirectional, Figure 4-1A, and the End of Siding DAXing to a crossing, Figure 4-1B, are typical Model 4000 GCP applications.

For each application:

- The crossing designer selects the appropriate template using the diagrams provided in paragraph 4.4, Template Diagrams. For example:
  - Figure 4-1A is programmed using template 1A
  - Figure 4-1B is programmed using template 2D
- An asterisk indicates the presence of an active island circuit.

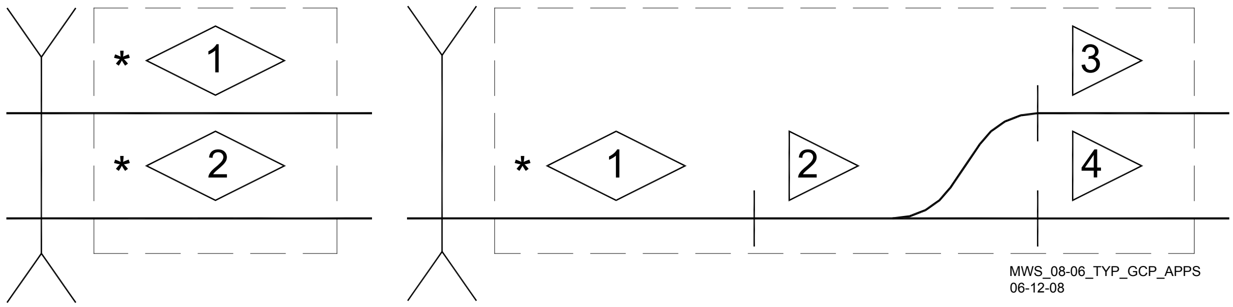


Figure 4-1:
Typical GCP Applications

4.1.1.1 <u>Template Selection</u>

The crossing designer conveys the basic design information to the field by specifying a template and by indicating exceptions to the template defaults.

- The Model 4000 GCP default settings are set automatically.
- The track and GCP layout corresponds to that of the template diagram.
- The number of field programming steps will be minimized when the template that most closely represents the track circuit arrangement is selected.

<u>NOTE</u>

Changing a template selection resets all program settings to their default settings and changes all GCP and island frequencies to “Not Set”. Complete reprogramming and calibration are then required.

4.1.1.2 <u>Template Menu</u>

The template menu displays only the configuration items and settings that are usually required for standard applications.

- The default settings may be changed as required.
- Figure 4-2 shows a typical template menu window.

<u>NOTE</u>

Template parameters are a subset of the main program and have defaults that will result in certain parameters being hidden.

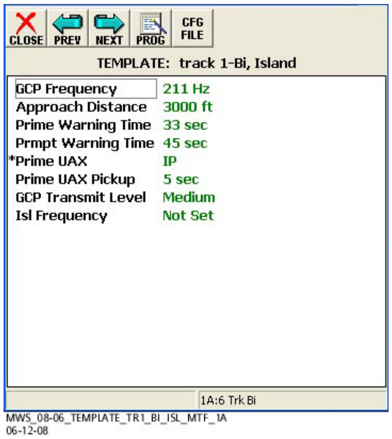


Figure 4-2:
Typical Template Programming Menu Window

4.1.1.3 Changing Settings

If application changes are required beyond the program options available in the template menu, the complete set of programming options are available in items 2 through 11 of the **MAIN PROGRAM menu** (see Figure 4-3).

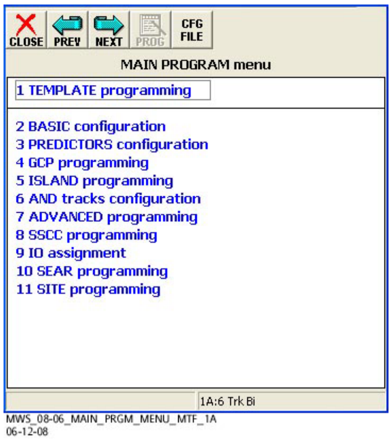


Figure 4-3:
Main Program Menu

4.1.1.4 Template Programming Options

Each template:

- Pre-programs each of six Track Modules. When a template is first selected the enabled Track Modules vary from one to six tracks
- Has a template diagram to show the tracks and GCP layout of the crossing
    - These diagrams provide valuable help for crossing design.

- Any of the GCP tracks shown in the template diagram can be used.
- Between one and six tracks may be selected as required.
- Configuration is based on all 6 tracks operating from a single 4000 case.
- Specifies whether the:
  - GCP Track Modules are configured as unidirectional and/or bidirectional
  - GCP Track Modules have active islands
  - One back-to-back track circuit has an island while the other track is automatically connected to that island
  - Track Modules are remote and DAX to the local crossing
  - Track Modules are remote and DAX to another crossing
  - Prime Predictors are logically combined (ANDed) for local crossing control

4.2 TEMPLATE PROGRAMMING CONFIGURATIONS

The Model 4000 GCP uses a number of template programs arranged in five functional groups (see Table 4-1).

Each template program has a:

- template file name; e.g., **MTF_1A** (Generally designated as Template 1A)
- an associated template diagram
- The template diagram is displayed within the **Select Template Set Parameter** window when a template program is selected from the **Select Template** menu list

Table 4-1:
Template Functional Groups

TEMPLATE DESIGNATIONS	GROUP FUNCTION
1A, 1B, 1C, 1D	All GCP Track Modules are connected at the local crossing.
2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H	GCP Track Modules are mixed between the local crossing and remote tracks. All remote tracks DAX to the local crossing.
3A, 3B, 3C, 3D, 3E, 3F, 3G	GCP Track Modules are mixed between the local crossing and remote tracks. The remote tracks DAX in opposite directions.
4A	All GCP Track Modules are remote and unidirectional. All modules DAX in the same direction.
5A	All GCP Track modules are remote and unidirectional. All modules are arranged in unidirectional pairs that DAX in opposite directions.

NOTE

The template diagram indicates the physical relationship between GCP track circuits and the crossing(s), including island circuits, and the relative location of insulated joints and remote track circuit.

Rules for making variations to template layout are covered in paragraph 4.7.

- The following paragraphs provide illustrations that:
  - show the possible configurations for each template program
  - may be used to select the template program that most closely resembles the required layout
  - An asterisk indicates the presence of an active island circuit.

4.2.1 Template Programs MTF_1A through MTF_1D

These template programs are used in configurations where all GCP Track Modules are connected at the local crossing.

Examples of configurations for these templates are shown in Figure 4-4 through Figure 4-7.

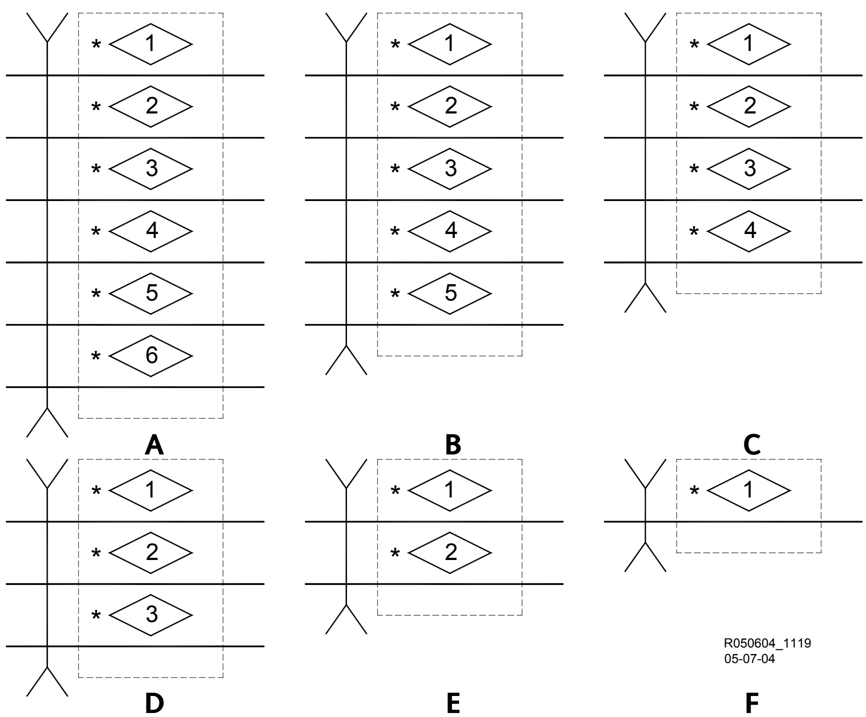


Figure 4-4:
Template 1A (MTF_1A) Configurations

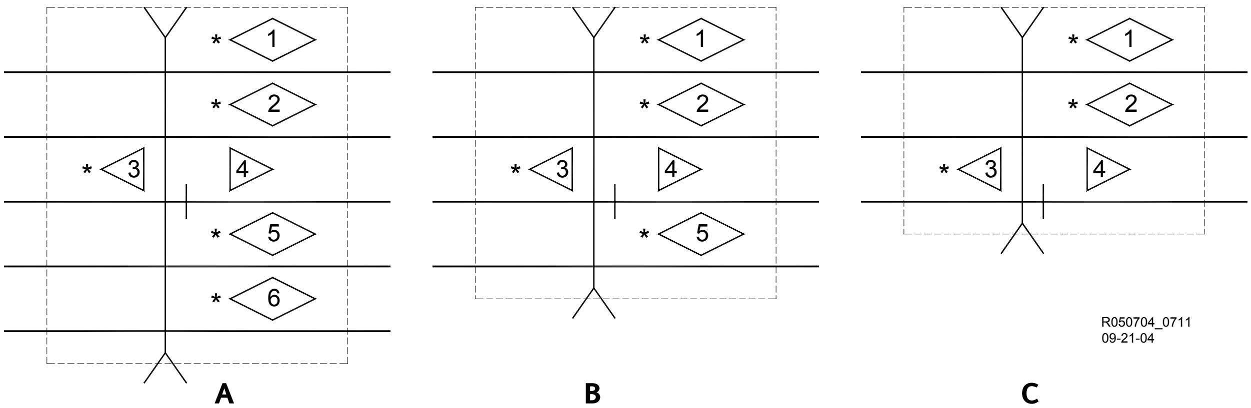


Figure 4-5:
Template 1B (MTF_1B) Configurations

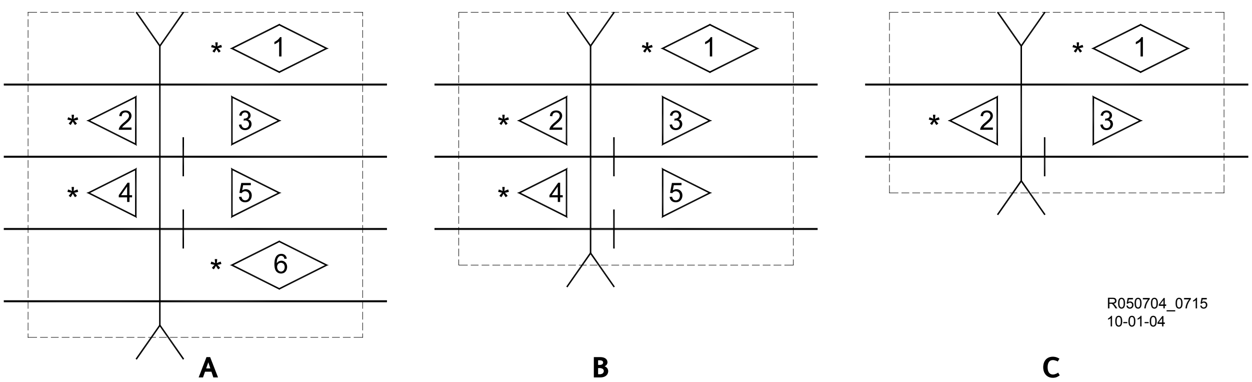


Figure 4-6:
Template 1C (MTF_1C) Configurations

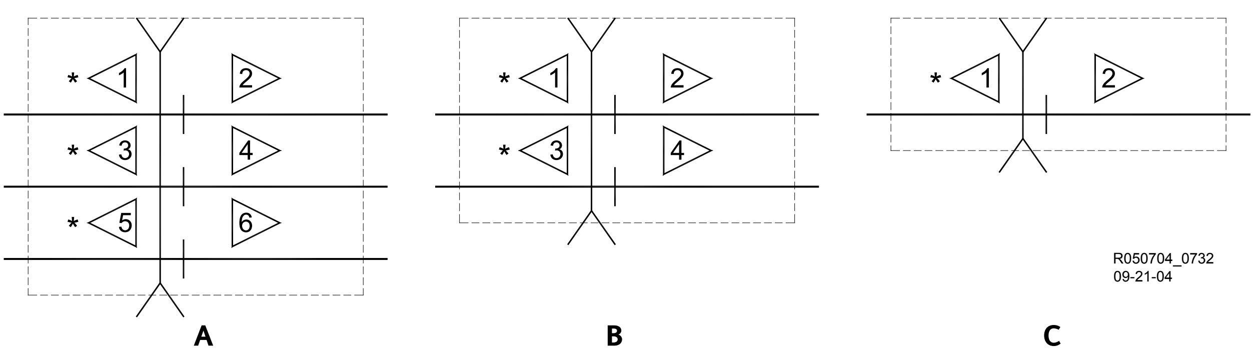


Figure 4-7:
Template 1D (MTF_1D) Configurations

4.2.2 Template Programs MTF_2A through MTF_2H

These template programs are used in track configurations where:

- the GCP Track Modules are mixed between the local crossing and remote tracks
- all remote tracks DAX to the local crossing

Examples of configurations for these templates are shown in Figure 4-8 through Figure 4-15.

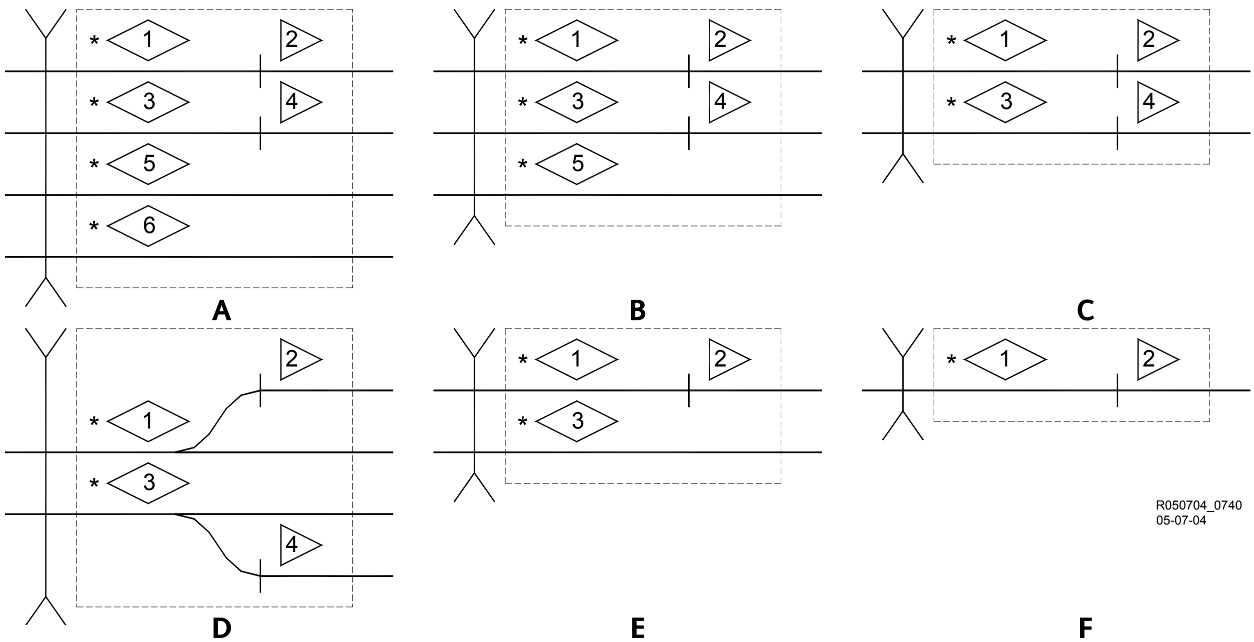


**Figure 4-8:
Template 2A (MTF_2A) Configurations**

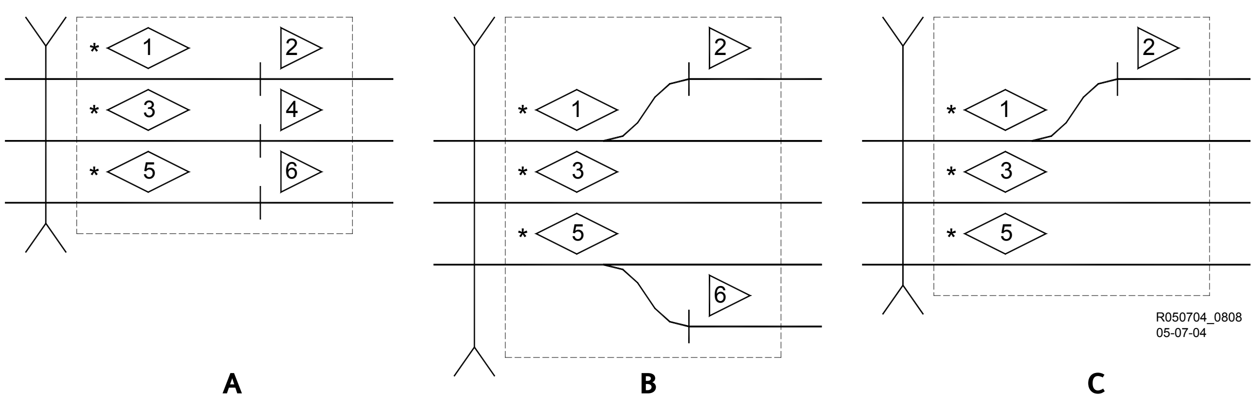


**Figure 4-9:
Template 2B (MTF_2B) Configurations**

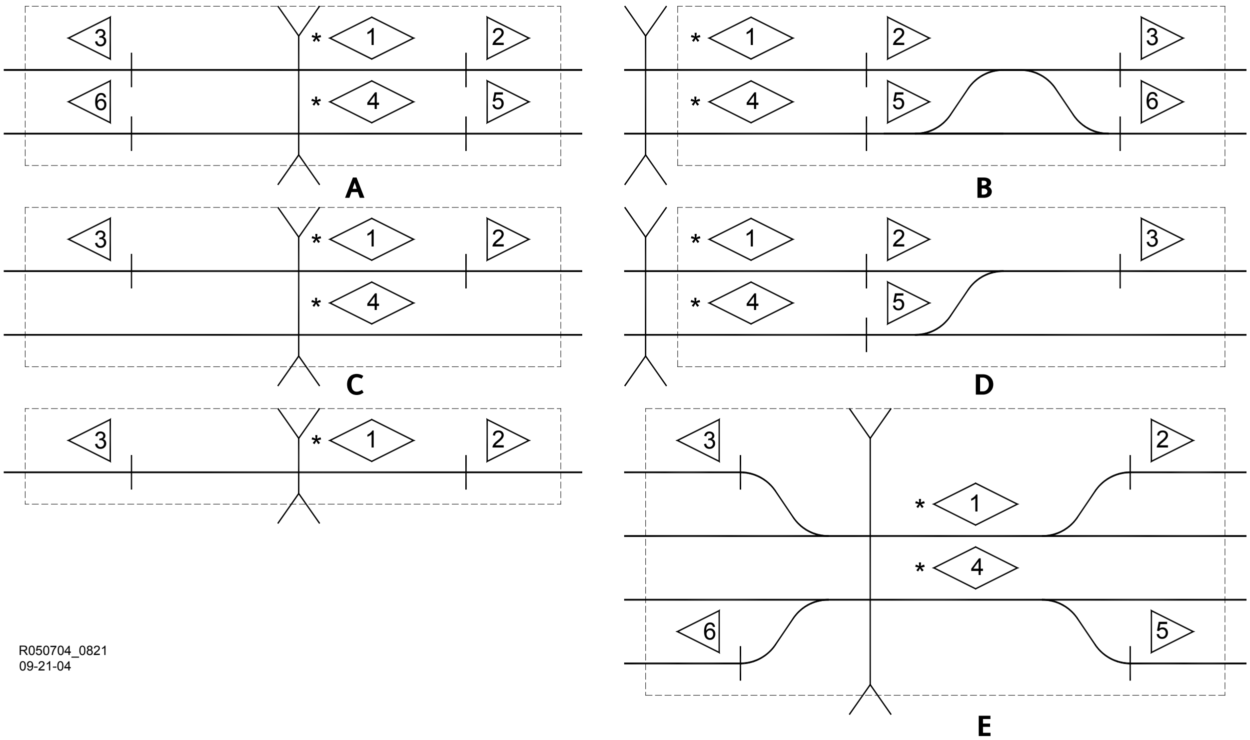


Figure 4-10:
Template 2C (MTF_2C) Configurations

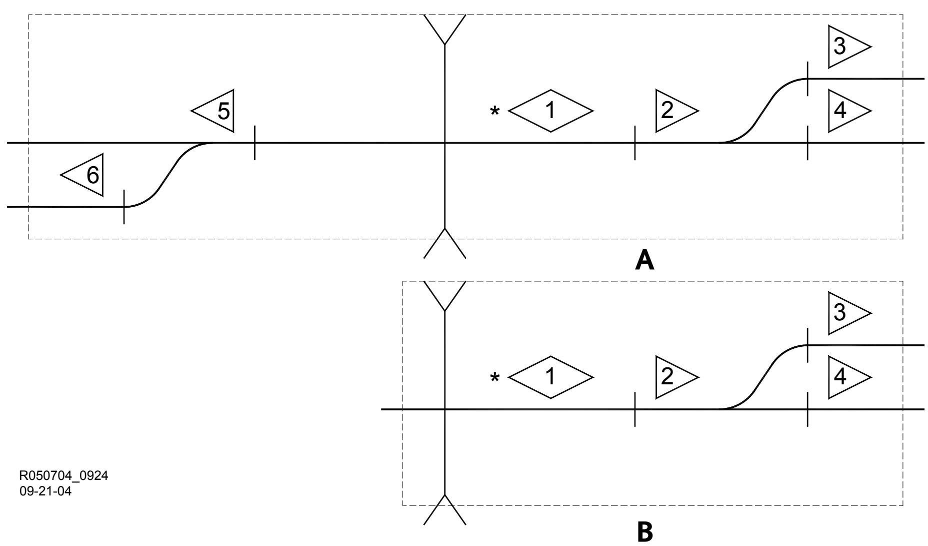


Figure 4-11:
Template 2D (MTF_2D) Configurations

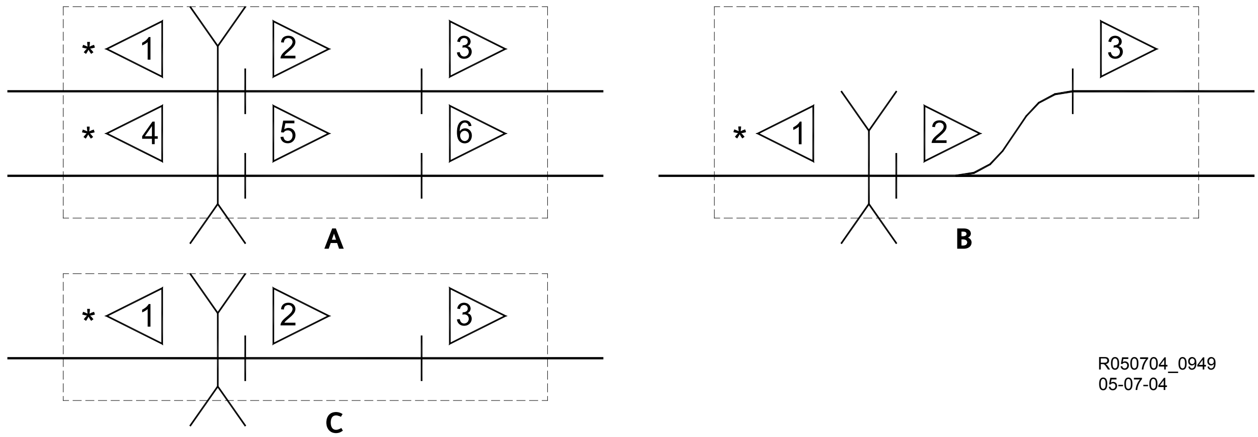


Figure 4-12:
Template 2E (MTF_2E) Configurations

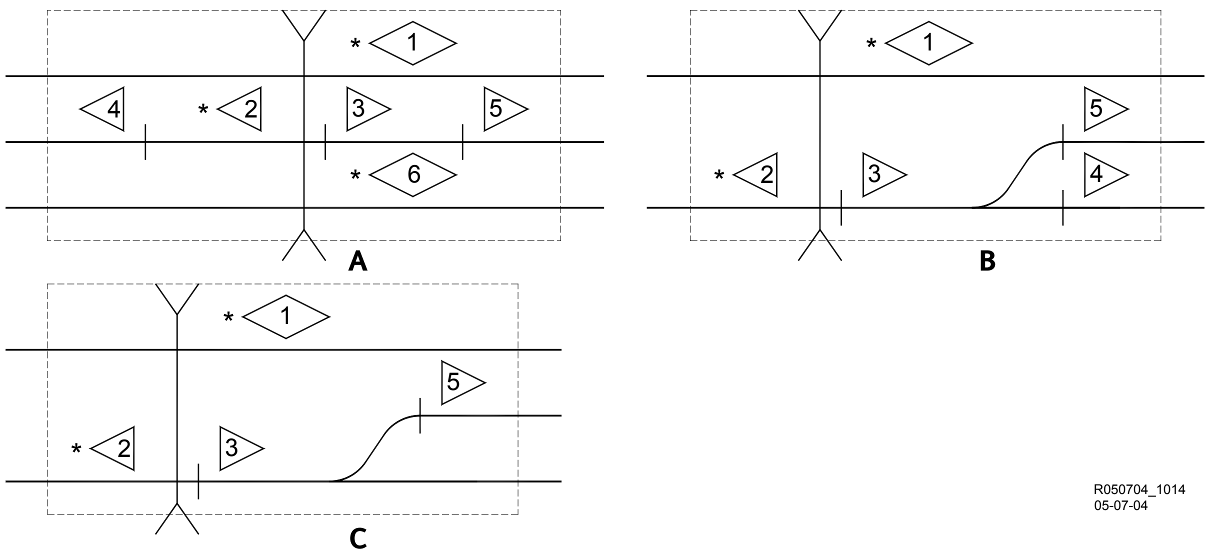


Figure 4-13:
Template 2F (MTF_2F) Configurations

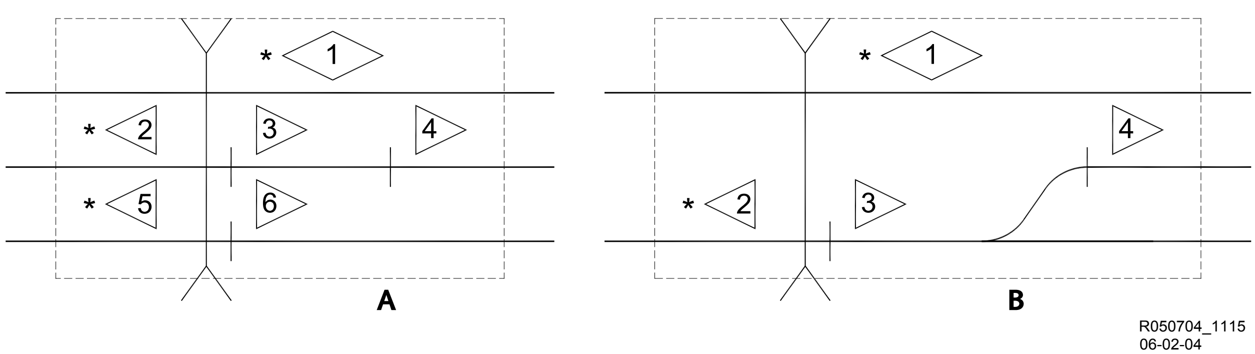


Figure 4-14:
Template 2G (MTF_2G) Configurations

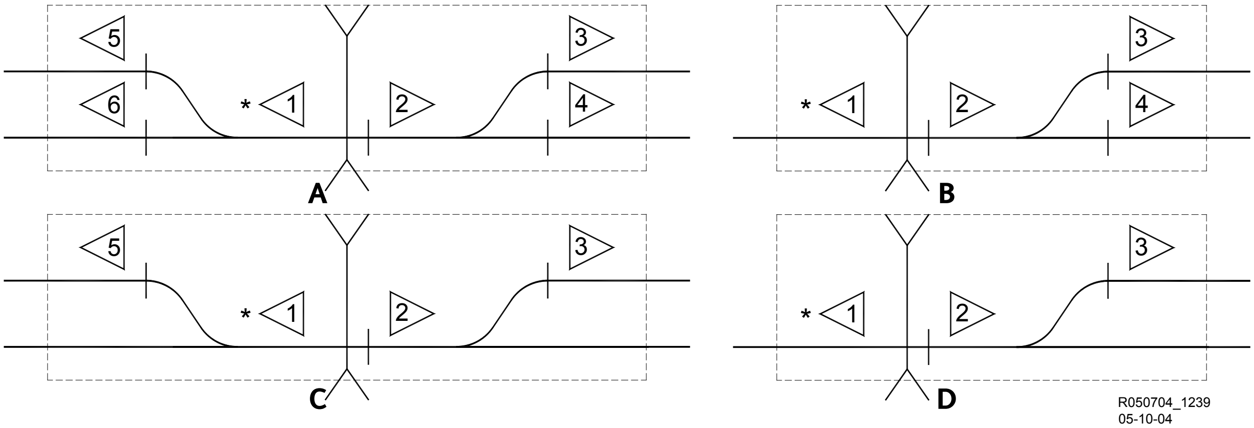


Figure 4-15:
Template 2H (MTF_2H) Configurations

4.2.3 Template Programs MTF_3A through MTF_3G

These template programs are used in track configurations where:

- the GCP Track Modules are mixed between the local crossing and remote tracks
- the remote tracks DAX in opposite directions to both local and adjacent crossings

Examples of configurations for these templates are shown in Figure 4-16through Figure 4-22.

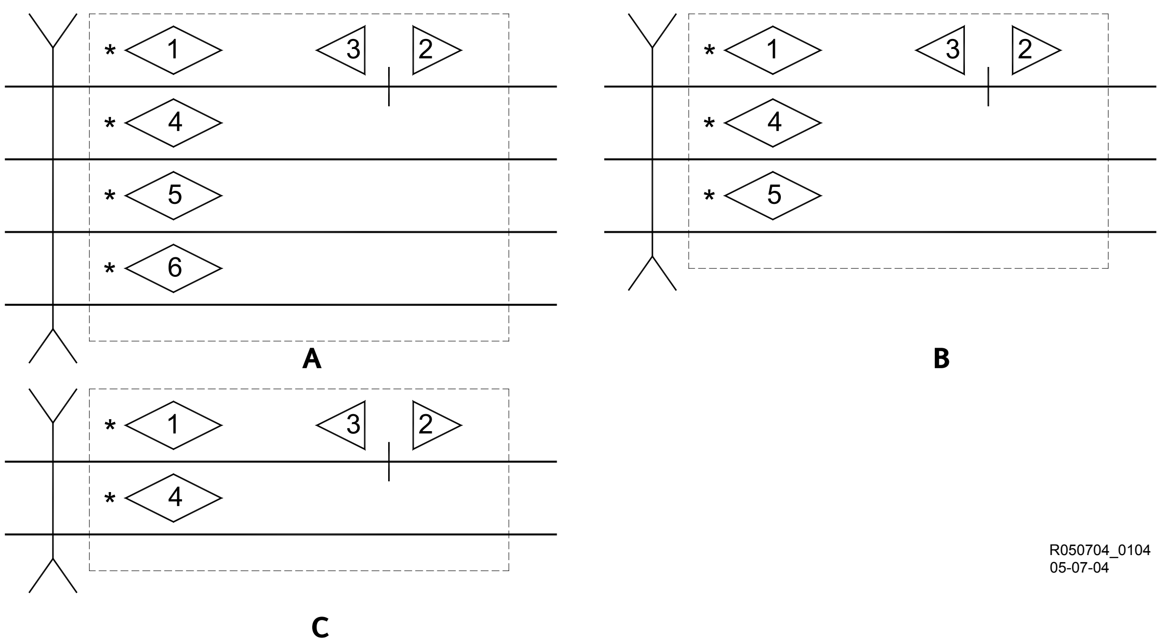


Figure 4-16:
Template 3A (MTF_3A) Configurations

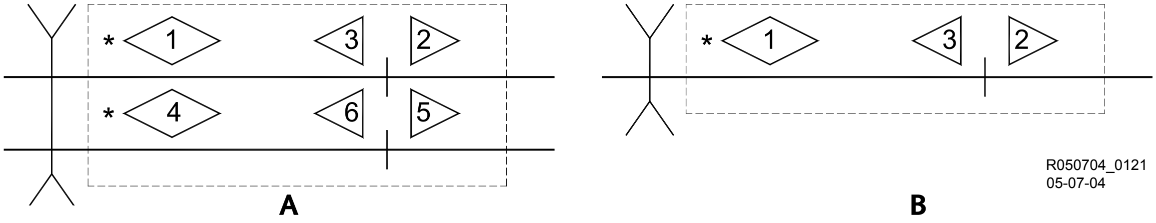


Figure 4-17:
Template 3B (MTF_3B) Configurations

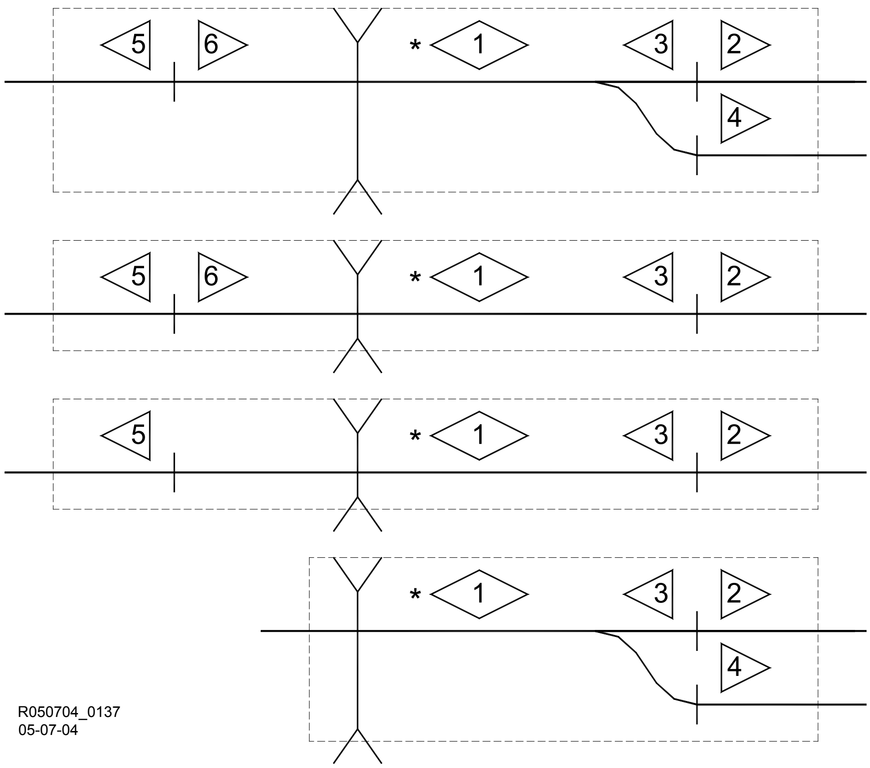


Figure 4-18:
Template 3C (MTF_3C) Configurations

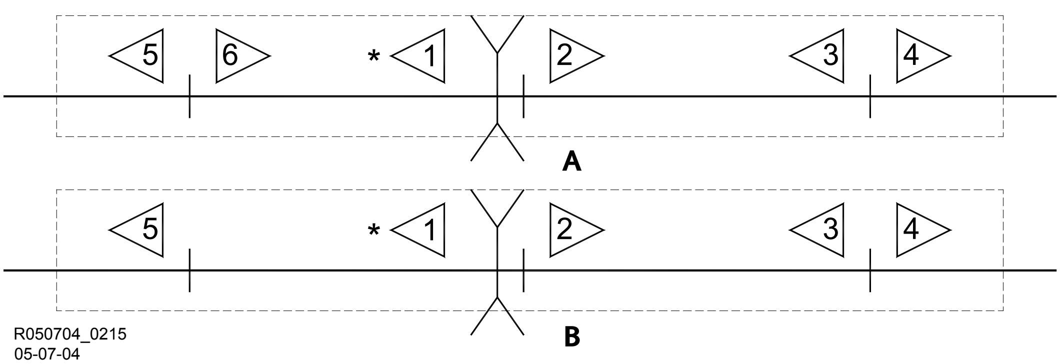


Figure 4-19:
Template 3D (MTF_3D) Configurations

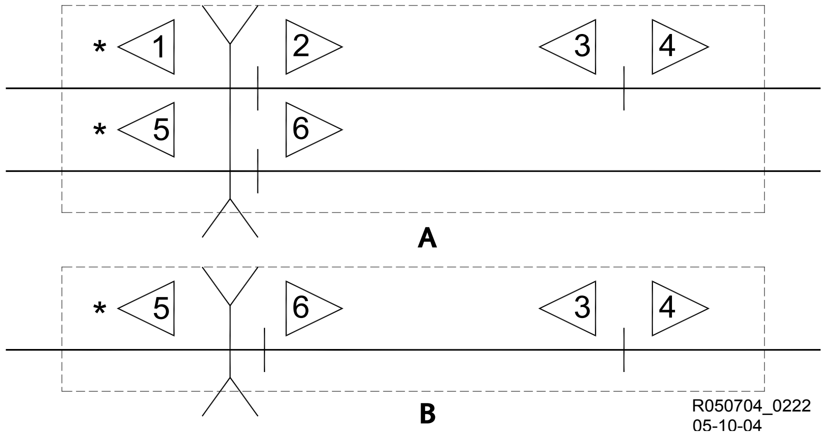


Figure 4-20:
Template 3E (MTF_3E) Configurations

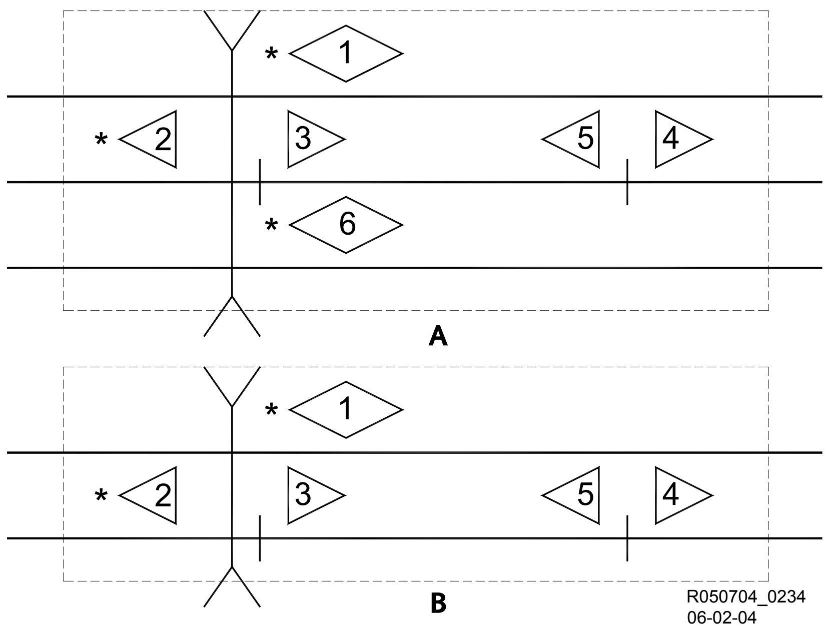


Figure 4-21:
Template 3F (MTF_3F) Configurations

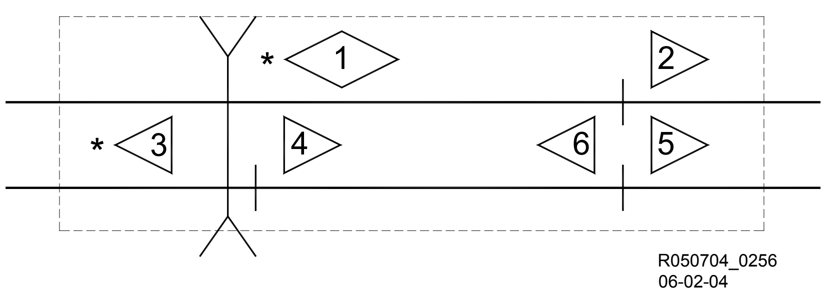


Figure 4-22:
Template 3G (MTF_3G) Configurations

4.2.4 Template Program MTF_4A

This template program is used in track configurations where:

- all GCP Track Modules are remote tracks
- The remote tracks DAX in the same direction.

Examples of configurations for this template are shown in Figure 4-23.

NOTE

The default AND 1 XR setting for Template 4A is GCP DAX A of all used tracks ANDed into AND 1 XR, which assumes all tracks DAX to the same location. If DAXing to multiple locations, it will be necessary to program separate outputs and/or additional ANDs as outputs (e.g., AND 2, etc.) for each remote location.

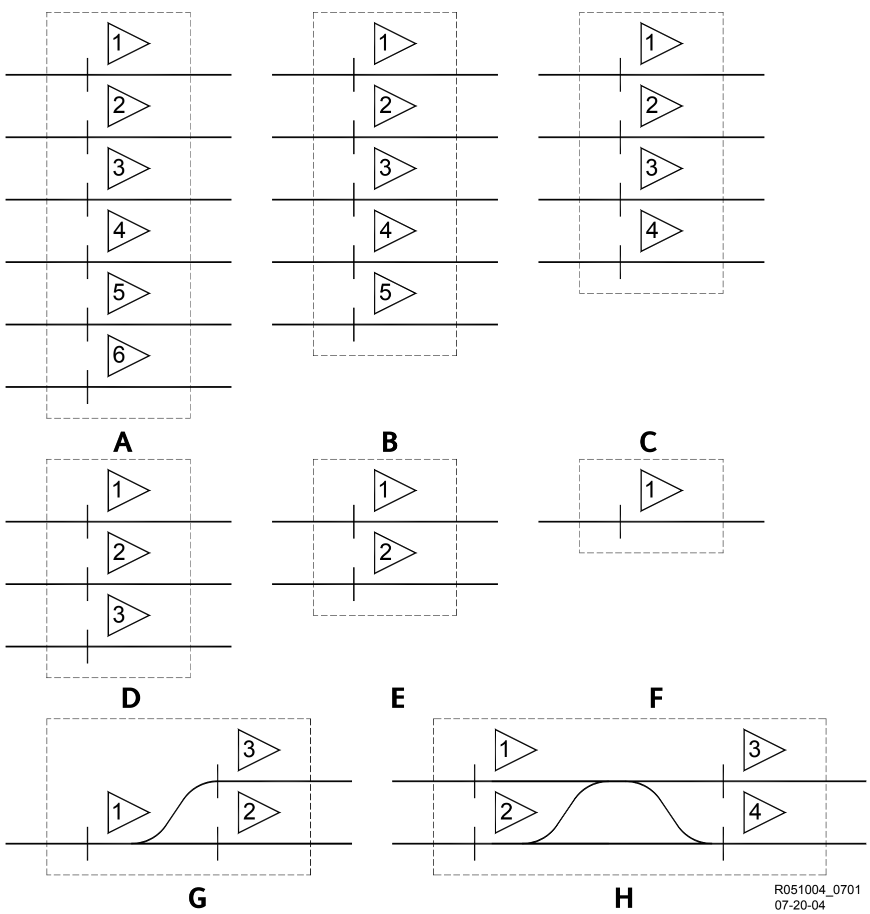


Figure 4-23:
Template 4A (MTF_4A) Configurations

4.2.5 Template Program MTF_5A

This template program is used in track configurations where:

- all GCP Track Modules are remote tracks (no SSCC3i modules are used)
- The remote tracks DAX in opposite directions.

Examples of configurations for this template are shown in Figure 4-24j.

WARNING

WHEN USING THE DEFAULT SETTINGS IN TEMPLATE 5A, AND 1 XR IS NEITHER CONFIGURED NOR USED. IF THE AND 1 XR FUNCTION IS REQUIRED FOR AN APPLICATION, IT MUST BE COMPLETELY REPROGRAMMED, TO INCLUDE ITS INPUTS AND OUTPUTS.

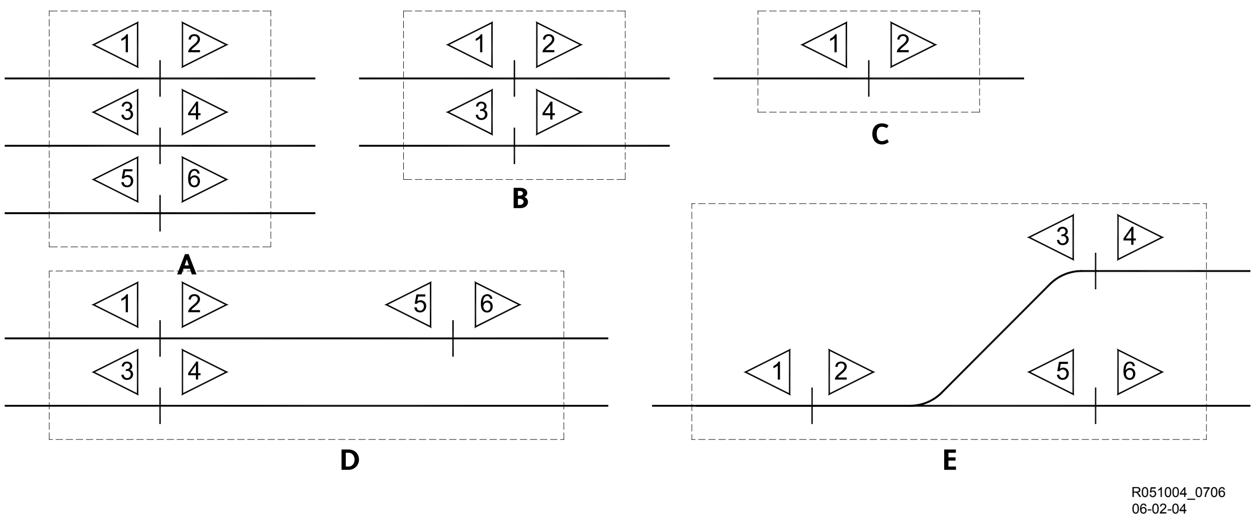


Figure 4-24:
Template 5A (MTF_5A) Configurations

4.3 TEMPLATE SELECTION AND FLEXIBILITY

Templates provide the basic layout for common track arrangements. When a Template is selected, the number of tracks provided by the template may be increased or decreased. When the proper template is selected, the basic preset application parameters should not have to be changed. These parameters determine which:

- GCP tracks are unidirectional
- GCP tracks are bidirectional
- GCP tracks have active islands at the crossing
  - back-to-back GCP track has an island while the other track is automatically connected to that island

- GCP tracks are remote and DAX to the local crossing
- GCP tracks are remote but DAX in the opposite direction to another crossing

The templates cover design for most GCP crossing applications

4.4 TEMPLATE DIAGRAMS

Selecting the right template to use is very important. To aid in template selection, a template diagram is provided with each template menu item. This template diagram depicts the GCP track layout set by each template.

The template track layout diagrams are provided in paragraphs 4.2 and 4.7.

4.5 TEMPLATE GUIDELINE OVERVIEW

When a template is programmed, the number of modules installed in the Model 4000 GCP is specified. Up to six Track Modules and two SSCC Modules may be selected and a SEAR module may also be selected

In many applications, most of the six available tracks may not be required because of the specific crossing layout. The unneeded tracks may be disabled by setting the corresponding Track Slot position to **Not Used** in the **Template: module configuration** menu. Depending on layout, the template can disable the unneeded tracks starting with the higher Track Slot positions or, if the unneeded track is not in Track Slot position 6, disable another track module so that the layout represents the track configuration that is needed (i.e., in Figure 4-26 Tracks 4 and 5 may be eliminated and Track 6 may remain).

On Template diagrams,

- An asterisk indicates which GCP tracks have an active island assigned.
- The GCPs on the same track may be reoriented (left to right) as long as the relationships to islands and insulated joints remain the same (refer to Figure 4-25A and Figure 4-25B).
- The GCPs assigned to adjacent (non-connected) tracks may be shifted to accommodate the requirements of the tracks (refer to Figure 4-26A and Figure 4-262B).

WARNING

WHEN TEMPLATE PROGRAMMING, TRACK NUMBERS MUST CORRESPOND EXACTLY WITH THOSE SPECIFIED BY THE TEMPLATE.

ISLAND CONNECTIONS ARE MADE AUTOMATICALLY WHEN A TEMPLATE IS SELECTED.

'AND' CIRCUIT RELATIONSHIPS ARE MADE AUTOMATICALLY WHEN A TEMPLATE IS SELECTED.

NOTE

Always perform Set to Default prior to beginning Template Programming.

4.6 CONFIGURING TEMPLATE OPTIONS

From the Main Program menu, select TEMPLATE and then a template number that best fits the crossing layout. The template parameters must be programmed to precisely match the template track layout. The following provides a brief overview of Template Programming.

4.6.1 Track Slot Assignment

The first programming step is module slot assignment. This step enables the utilization of each installed module, which may include:

- one to six track modules
- zero to two SSCC modules
- zero to three RIO modules, which may be used for extra inputs and outputs
- zero or one SEAR recorder

Specifying this information ensures that subsequent programming steps include information only for the modules that are actually used.

4.6.2 Preemption

Traffic signal preemption is an optional programming step. If Advanced Preemption is selected, a Preempt predictor is automatically enabled for each track prime predictor of the local crossing. This enables additional program steps for setting:

- preempt warning times
- preempt offset distances, if preempt predictors are remote
- preempt delay timer, which sets the advance preemption time interval

All tracks with preempt predictors are automatically ANDed internally using the Adv Preempt AND function. The Advanced Preempt Relay is driven from a Model 4000 GCP physical output. This Output must be assigned to **Adv Preempt** in the **TEMPLATE: OP assignment** window.

4.6.3 Predictor ANDing

Templates automatically AND the Prime predictors of the Track Modules that are predicting for a crossing. This Prime AND function is designated AND1 XR. AND1 XR automatically controls the internal SSCC to activate the crossing. If the SSCC is not used, AND1 XR must be assigned to a physical output for control of external crossing activation; e.g., OUT 1.1.

4.6.4 DAX Assignment

Each unidirectional track has three pre-assigned DAX functions: DAX A, B, and C. Each **DAX Used** is initially set to **No** (not used). When a **DAX Used** is set to **Yes,** the DAX function becomes active. **Warning Time**, **Offset Distance**, and **Enable** programming entries become available. When a DAX is enabled, it must also be assigned to a physical output for it to control other remote crossings. Additional DAX may be enabled and programmed from the Main Program Menu Window.

4.6.5 Track Directional Assignment

Templates set unidirectional or bidirectional tracks. Some templates include a combination of both. If a template assigns unidirectional tracks, a programming option allows the unidirectional track assignment to be changed to simulated bidirectional, as required.

4.6.6 Inputs and Outputs

When a Model 4000 GCP is programmed, all required input and output assignments must be manually programmed:

- UAX inputs
- XR relay outputs for local crossing control
- DAX outputs for control of other crossings
- Preemption Outputs
- Preemption Health Inputs
- AND 1 XR Enable
- Emergency Activation Input

4.7 TEMPLATE DIAGRAM TRACK VARIATION RULES

The following paragraphs provide an overview of how the template rules may be applied to exactly fit the desired crossing and track arrangement. For specific crossing design examples, refer to Section 5.

4.7.1 Back-to-Back GCPs at the Crossing

Some templates provide a back-to-back unidirectional pair at a crossing as shown in Figure 4-25A. In

Template 1B, the island circuit is assigned to T3. When designing a new crossing, the insulated joints for T3 and T4 may be on the opposite side of the street. In this case, the template requires that T3 still have the island so T3 and T4 must switch positions as shown in Figure 4-25.

The general rule is that, regardless of the side of the street the insulated joints are located on, any track with an island must retain the island and look through the street.

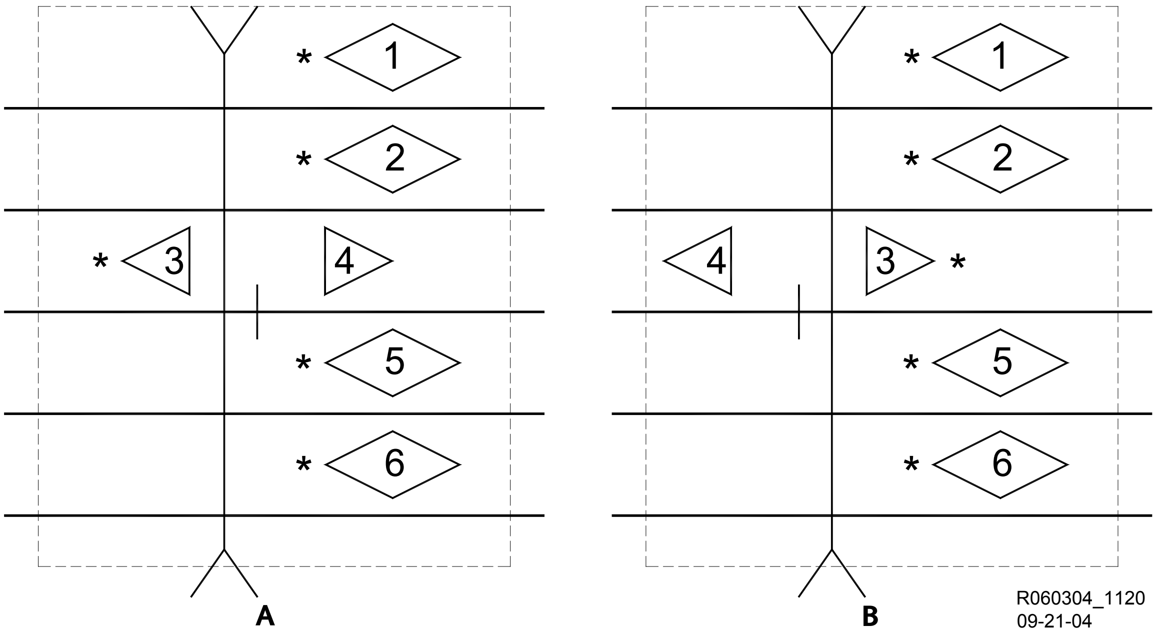


Figure 4-25:
Template 1B

4.7.2 Back-to-Back GCPs and Island Connections

A template can have back-to-back unidirectional pairs at a crossing as shown in Figure 4-26. In this configuration, T3 is automatically linked to the T2 island. The T3 Island Connection = Island 2. This ensures that T3 pickup delay is truncated as a train leaves the crossing. This same rule applies to T4 and T5 and to all templates with back-to-back GCPs at a crossing. No external wiring of T3 and T5 island outputs are required. Tracks such as the T4 and T5 pair can be moved to fit an application as shown in Figure 4-26B.

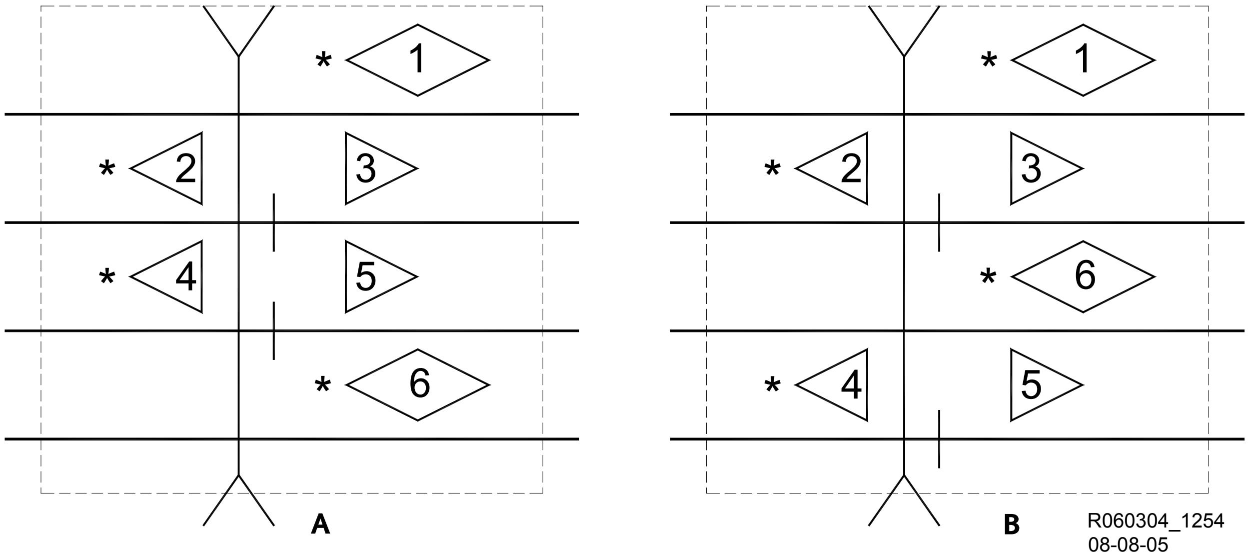


Figure 4-26:
Template 1C

4.7.3 Working with Remotes

A template can have a crossing GCP with a remote GCP on its approach, as shown in Figure 4-27A. The remote can be located on either side of the crossing as shown in Figure 4-27B. Each remote can be used to DAX to any of the crossing GCP's as shown in Figure 4-27C.

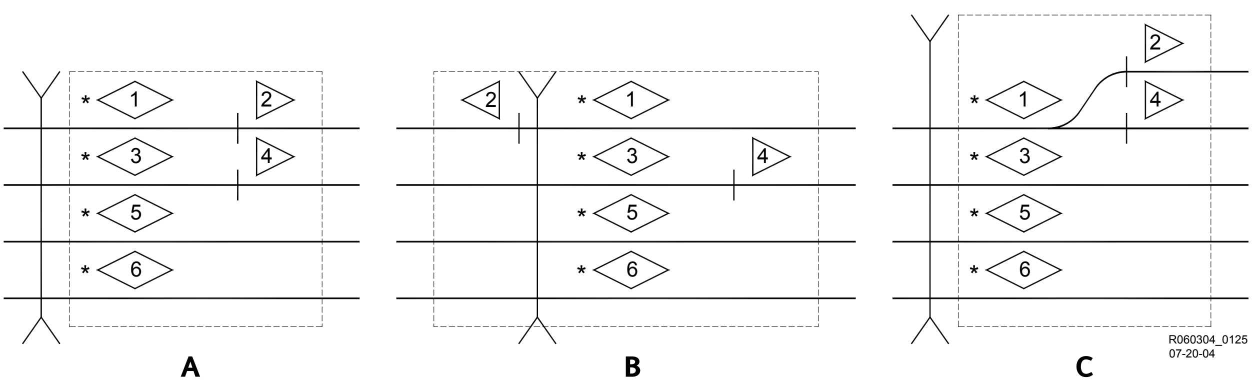


Figure 4-27:
Template 2A

4.7.4 Back-to-Back GCPs and Remotes

A template can have back-to-back GCPs at a crossing with a remote GCP on its approaches.

The remote GCP can be located on either side of the crossing. For example, in Figure 4-28A, the T3 remote is DAXing to the T1/T2 pair located at the crossing. In Figure 4-28B, the remote T3 is located on the other side of the crossing. The T3 remote GCP can also be a remote side track as shown in Figure 4-28C. The location of T6 follows the same rules as T3. Each remote can be used to DAX to any of the crossing GCP's as shown in Figure 4-28D.

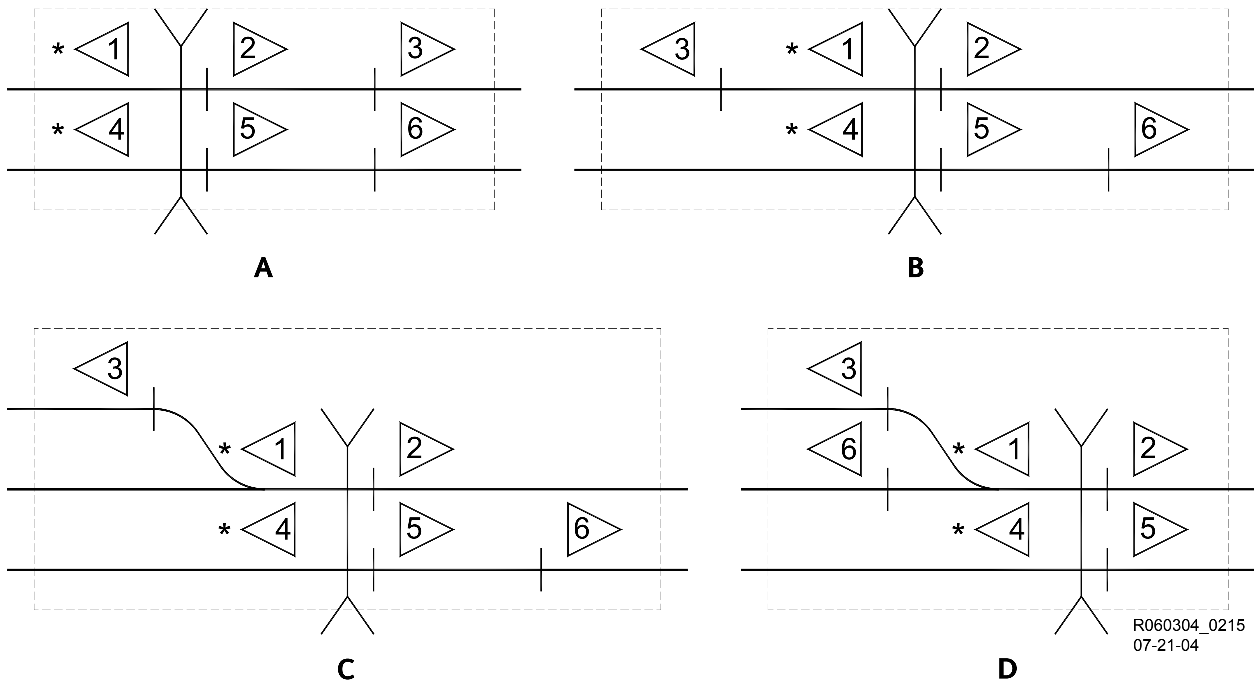


Figure 4-28:
Template 2E

4.7.5 Double Crossover Layouts

Some templates offer additional layout flexibility in design such as shown in Figure 4-29A. The 2C layout can be reconfigured as a double crossover with all remotes on the right side of the crossing as shown in Figure 4-29B. Remotes T2 and T3 DAX to T1 while remotes T5 and T6 DAX to T4.

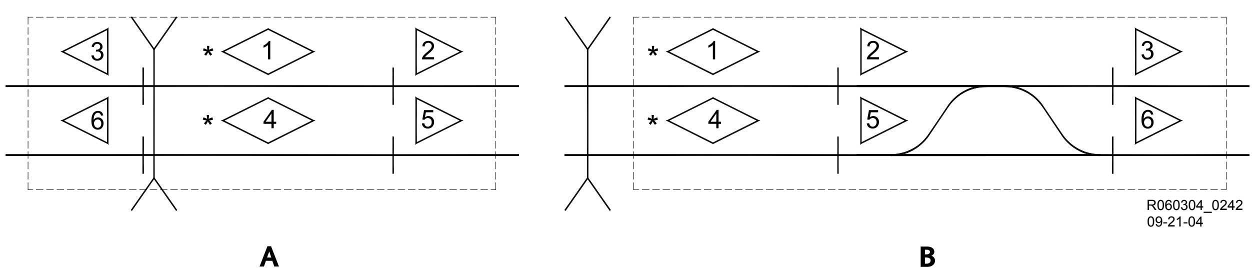


Figure 4-29:
Template 2C

4.7.6 All Remotes DAXing

When only remote GCP circuits are in a 4000 case as shown in Figure 4-30A, the 4A template offers additional flexibility in design. The 4A layout can also be reconfigured as an all remote:

- end of siding as shown in Figure 4-30B
- double crossover as shown in Figure 4-30C.

When the 4000 case contains all remote GCP circuits, there is no requirement that the remote GCPs DAX to a particular GCP circuit (T1-T6) at the crossing.

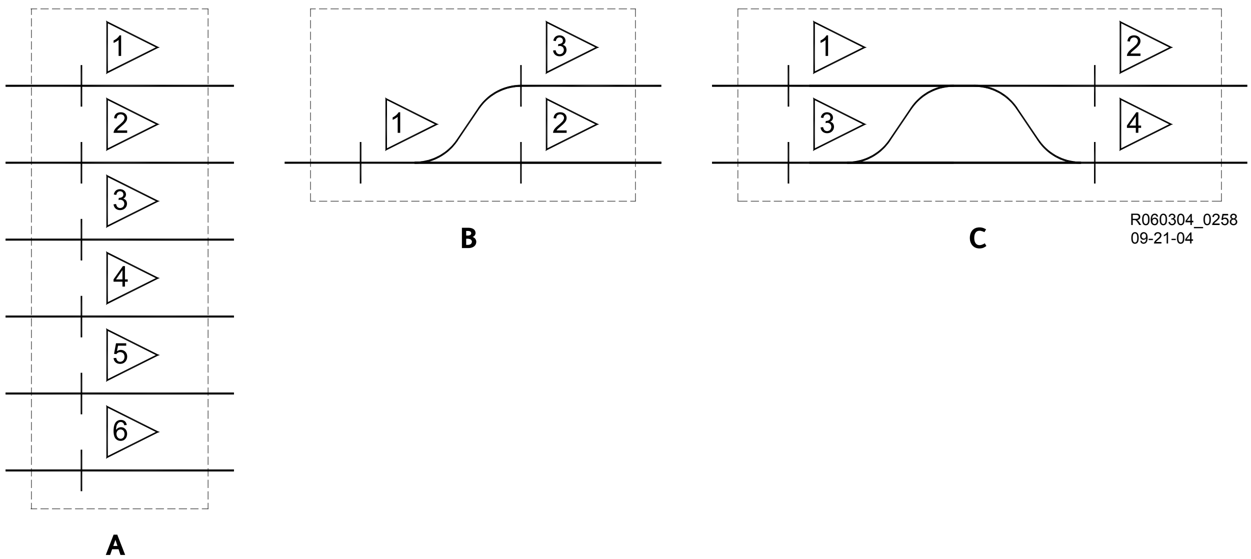


Figure 4-30:
Template 4A

4.7.7 Combining Remotes Using AND Function

Depending on the template layout of remote GCPs, it is sometimes desirable to combine remotes using the internal AND function. This reduces the number of DAX control pairs running to a second crossing. Template 2A is shown in Figure 4-31A. In Figure 4-31B, T2 and T4 DAX to a second crossing. T2 DAX A and T4 DAX A can be combined using an internal AND function such as AND 2. By assigning the AND function to one physical output, only a single control cable pair is required for the second crossing.

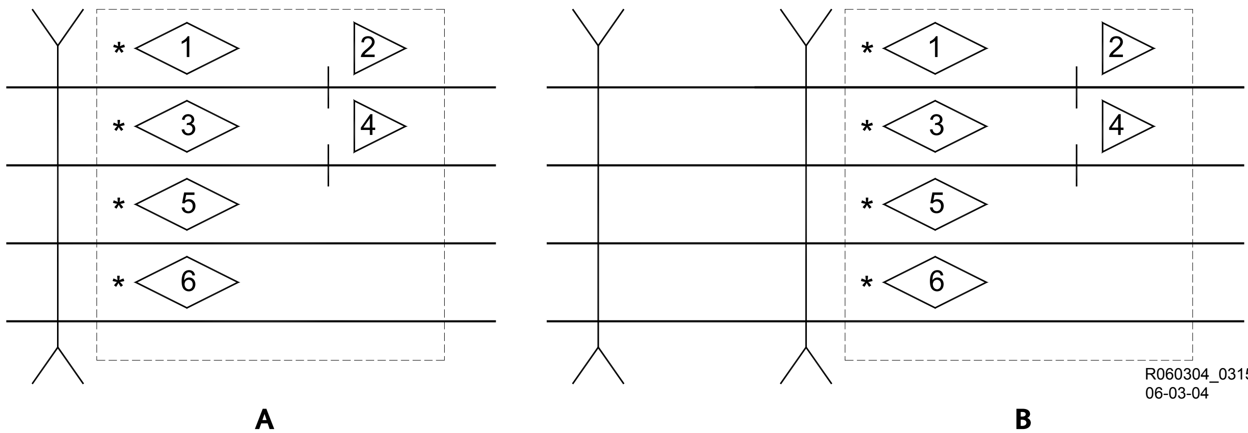


Figure 4-31:
Template 2A

SECTION 5 –
BASIC APPLICATION PROGRAMMING

5.1 INTRODUCTION AND OVERVIEW

The Model 4000 Grade Crossing Predictor (GCP) allows many application functions to be configured in soft.ware, reducing the equipment and wiring needed to install and maintain a crossing. Extensive reduction in the number of relays utilized by crossings is achieved through the use of various soft.ware routines. The soft.ware utilizes predictors and track templates to ease in the planning and programming of the GCP. In this section, how predictors are planned and programmed is explained and examples of GCP programming are provided.

The examples of this Section demonstrate the flexibility of Model 4000 GCP in programming both simple and complex applications. Each example selects the template that best fits the crossing layout. When selected, a template sets all Track and SSCC Module param to specific default values that best fit the particular template application layout, programs the Model 4000 GCP for the required functionality, and utilizes all applicable items of the Main Program Menu.

5.2 BASIC PREDICTION APPLICATIONS USING THE MODEL 4000 GCP

WARNING

IN TRACK MODULE MEFS GCP02_00.MEF AND EARLIER, IF A PREDICTOR TRACK CIRCUITS HAS AN ISLAND, THEN THERE SHOULD NOT BE ANY PRIME PREDICTION OFFSET DISTANCE PROGRAMMED GREATER THAN ZERO. IF IT OCCURS, IT MAY RESULT IN A SHORTENED WARNING TIME OR CROSSING ACTIVATION FAILURE.

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, THEN IN VERY LIMITED CIRCUMSTANCES WITH TRAIN DECELERATION THE CROSSING WARNING SYSTEM MAY BRIEFLY TIMEOUT IF THE DAX DOES NOT UTILIZE THE PRIME UAX INPUT (THE UAX PARAMETER IS SET TO “NOT USED”). THIS SITUATION RESULTS FROM THE “AUTOMATED PICKUP DELAY” IN THE REMOTE TRACK CIRCUIT EXPIRING PRIOR TO THE CROSSING GCP PREDICTING FOR THE TRAIN. REFER TO SECTION 6.2.5, SPECIAL PROVISIONS FOR SHORT DAX OFFSET DISTANCE (UAX NOT USED), FOR CORRECTIVE ACTIONS.

NOTE

When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, DAX, or preempt will switch to motion sensor operation to ensure the fastest prediction possible.

When the UAX or DAX ENABLE energize, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation.

The purpose of the Model 4000 Grade Crossing Predictor is train detection and prediction. A general understanding of prediction is required to fully exercise Model 4000 GCP functionality. This section provides the required information for basic planning and programming of the Model 4000 GCP. Advanced planning and programming of Model 4000 GCP DAX applications, including Bidirectional DAXing, are discussed in Section 6.

Remote Prediction (also known as DAXing) effectively extends approaches beyond the limits imposed by either insulated joints or, for Bidirectional DAXing applications, a crossing's approach termination. Remote prediction transfers prediction information from a GCP at a remote location to a GCP at a crossing. Transfer may be via cable or by means of spread spectrum radio (SSR).

When the design of the warning system uses two unidirectional track modules, a set of insulated joints is located on one side of the street. These insulated joints cannot be bypassed with couplers of any type. Therefore, when the approach distance between adjacent, unidirectionally equipped crossings is not sufficient to provide the required warning time, the Model 4000 GCP provides a means of extending the controls through the use of three types of remote predictors: DAX, prime prediction offset, or preemption.

5.2.1 Remote Prediction Use Requirements

Remote prediction is generally used where insulated joints limit an approach and the approach is too short to provide the required warning time or preempt prediction. However, new Model 4000 GCP functionality is also available that enables remote prediction from bidirectional GCP locations, providing that all hardware and soft.ware configuration criteria are met.

5.2.2 Remote Prediction Capability

Each Track Module of the 4000 GCP may be programmed to provide up to nine prediction output signals:

- DAX A through DAX G
- Prime
- Preempt

Each predictor on each track module has a configurable enable input that is ANDed with the prediction result from its local track. If the enable input is to a Prime predictor, it is called the **Prime UAX**. If the enable input is to a DAX predictor, it is called the **DAX Enable**. If the enable input is to a preempt predictor, it is called the **Preempt Enable**. The enable inputs bring in prediction information from remote sites to control:

- the local crossing
  - Prime UAX input
- other remote crossings
  - DAX Enable input

The **Prime UAX** and **DAX Enables** are track and predictor specific. For example, **T1 DAX A Enable** affects only T1 DAX A outputs and the **AND** functions that use it.

5.2.3 Remote Prediction Configuration

The track modules providing the remote prediction function must be configured for unidirectional or simulated bidirectional operation.

5.2.3.1 Warning Time

The required crossing warning time plus any added time factors are programmed into the remote prediction unit.

5.2.3.2 Predictor Input

NOTE

When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, DAX, or preempt will switch to motion sensor operation.

When the UAX or DAX ENABLE energize, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation

The GCP receiving the remote prediction must have its inputs enabled to receive the individual predictor outputs from the remote unit:

- DAX A through DAX G Enable
- Prime UAX
- Preempt Enable

The available local inputs must be configured for the required pickup delay.

5.2.3.3 Remote Prediction Via Spread Spectrum Radio (SSR) {53301} or Ethernet Spread Spectrum Radio (eSSR) {53325}

Data transfer between 4000 GCP and ESSR is via Echelon® LAN. There are two communication channels: Radio DAX Link A and Radio DAX Link B. All active vital signals are transmitted via ESSR over one of the two links.

5.2.4 Typical Remote Prediction Operation

Remote prediction operation is normally initiated from either an adjacent crossing or a remote location that has insulated joints. See Section 6, Advanced Application Programming, for a description of Bidirectional DAXing.

- A typical GCP controlled from a remote location other than a crossing as shown in Figure 5-1.

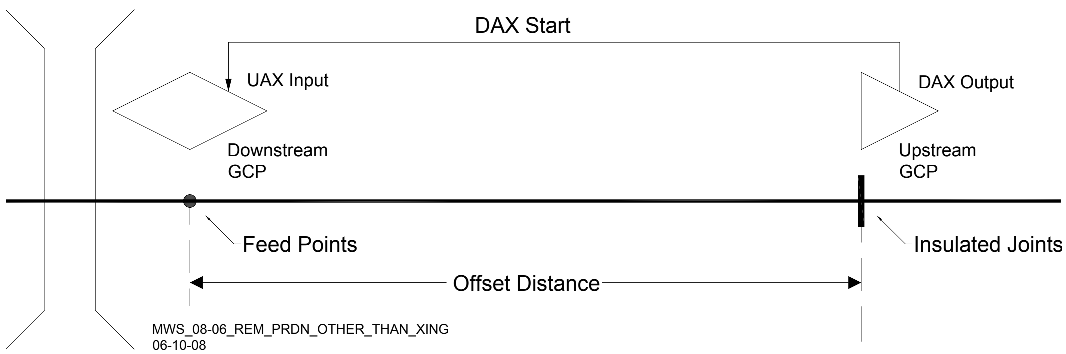


Figure 5-1:
Remote Prediction From A Remote Location Other Than A Crossing

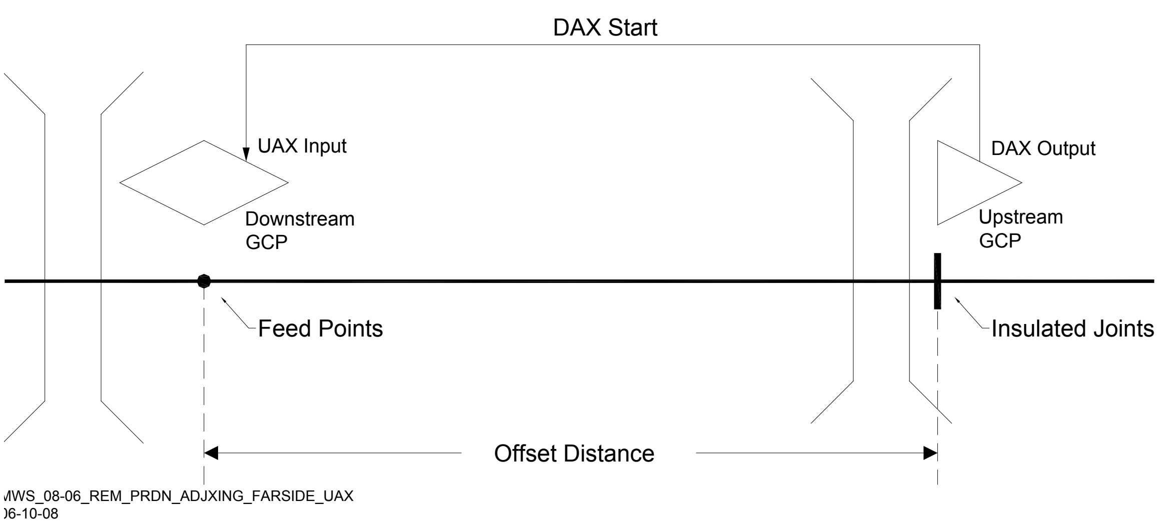


Figure 5-2:
Remote Prediction From An Upstream Crossing - Joints On Far Side

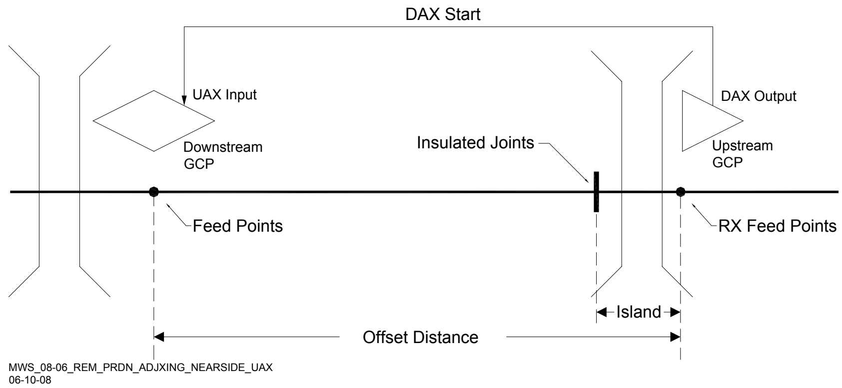


Figure 5-3:
Remote Prediction From An Upstream Crossing – Joints On Near Side

5.2.5 DAX Offset Distance

The distance between the crossing feed points and the remote 4000 GCP location is the remote offset distance. This value is programmed in the remote prediction unit. The offset distance is field measured from the crossing feed points to either the DAX insulated joints as illustrated in Figure 5-1 and Figure 5-2 or to the DAX receiver feed wires as shown in Figure 5-3.

5.2.6 Remote Approach Distance calculations

The remote approach distance required is the crossing Full Approach Distance minus the DAX Offset Distance as shown in Figure 5-4. For Example:

- Full crossing approach = 3600 ft.(1097.3 m)
- DAX offset distance = 2200 ft. (670.6 m)
- DAX Approach distance = 3600 – 2200 = 1400 ft. (1097.3 – 670.6 = 426.7 m)

DAX approach distance (in this case 1400 ft. or 426.7 m) can be designed longer if desired but not shorter or warning time for fastest trains will become shorter.

WARNING

DAX MINIMUM APPROACH DISTANCE IS A CRITICAL DISTANCE FOR ADEQUATE WARNING TIMES. MINIMUM DAX APPROACH DISTANCE IS GENERALLY 1000 FT. (304.8 M), BUT THERE ARE EXCEPTIONS.

FOR EXCEPTIONS, SEE PARAGRAPH 5.3, MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS.

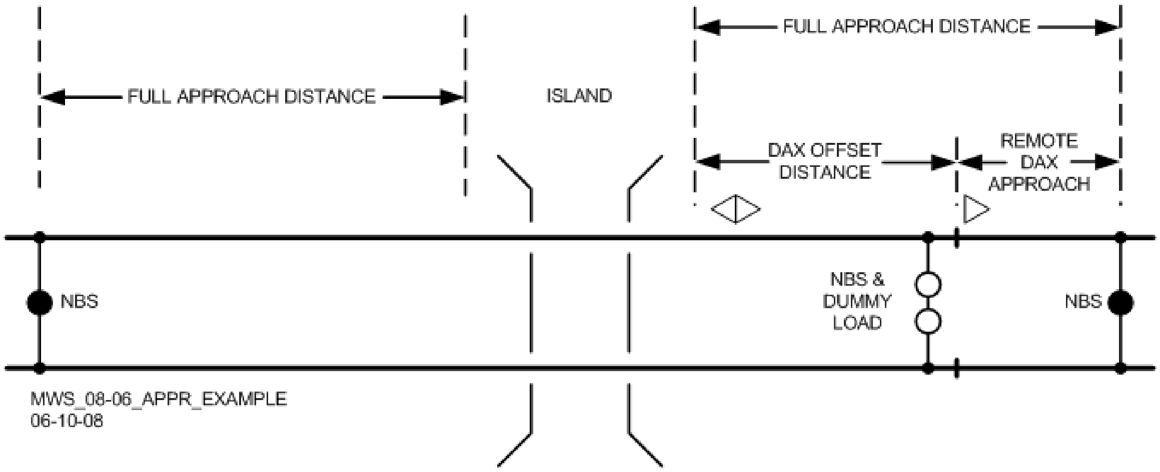


Figure 5-4:
Approach Example with DAX Offset and Remote DAX Approach Distances

5.3 MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS

Generally the minimum approach distance for a track module that has one or more predictors with an offset distance other than zero is 1000 ft. (304.8 m). However, the approach distance may be less under the following conditions:

5.3.1 Scenario #1

In Figure 5-5, if the T2 designed approach distance is less than 1000 ft. (304.8 m), then:

- The T2 approach distance can be as short as 500 ft. (152.4 m) when:
  - A narrow band termination shunt is used and
  - The approach distance (actual distance between A and B) divided by the fastest speed train expected (in feet or meters per second) is 10 seconds or more. If it is less than 10 seconds, extend the T2 approach so there is a minimum of 10 seconds.

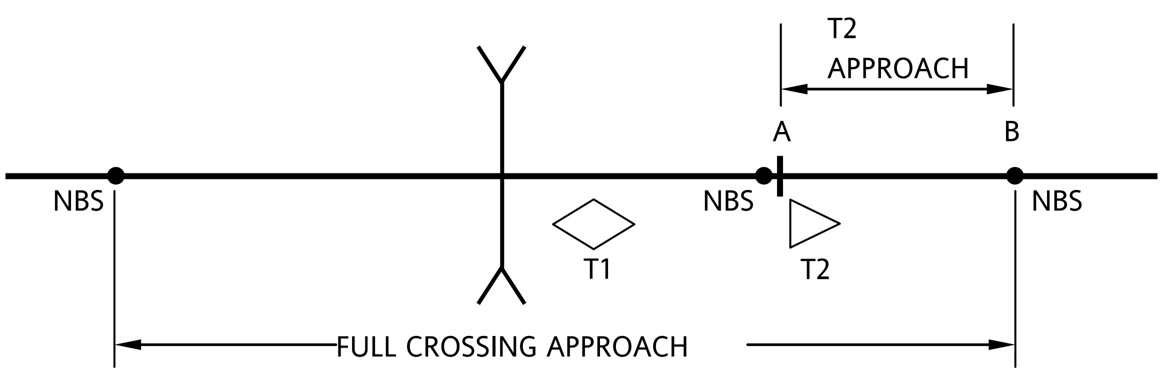


Figure 5-5:
Scenario 1, T2 Approach as Short as 500 Ft.

5.3.2 Scenario #2

For the end of siding shown in Figure 5-6, the T2 and T4 approach are the actual track distance when:

- A narrow band termination shunt is used and
- Sufficient simulated track is added to the termination shunt so that the actual track approach distance plus simulated track distance add up to between 800 – 1200 ft. (243.8 – 365.8 m) and
- If T3 and T5 are not used, the approach distance (actual distance between A and B or C and D) divided by the fastest speed train expected (in feet or meters per second) is 10 seconds or more.
- If the approaches in the OS cannot be extended to 10 seconds due to the second set of insulated joints, then in addition to the above requirements, then install a second set of predictors (T3 and T5) beyond the insulated joints.
- The minimum approach distances for T3 and T5 follow the rules in paragraph 5.3.

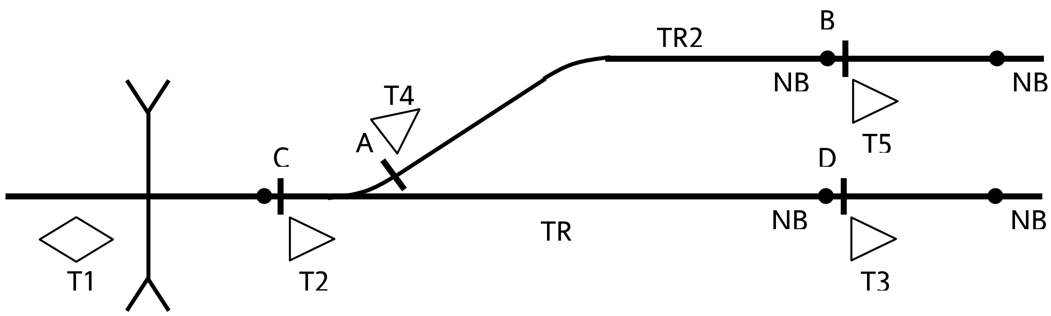


Figure 5-6:
Scenario B, T2 & T4 Special OS Application

5.3.3 Scenario #3

In Figure 5-7, when the designed approach distance for T2 or T3 is less than 1000 ft. or 304.8 m (similar to Figure 5-5 in scenario #1), then there are two alternatives:

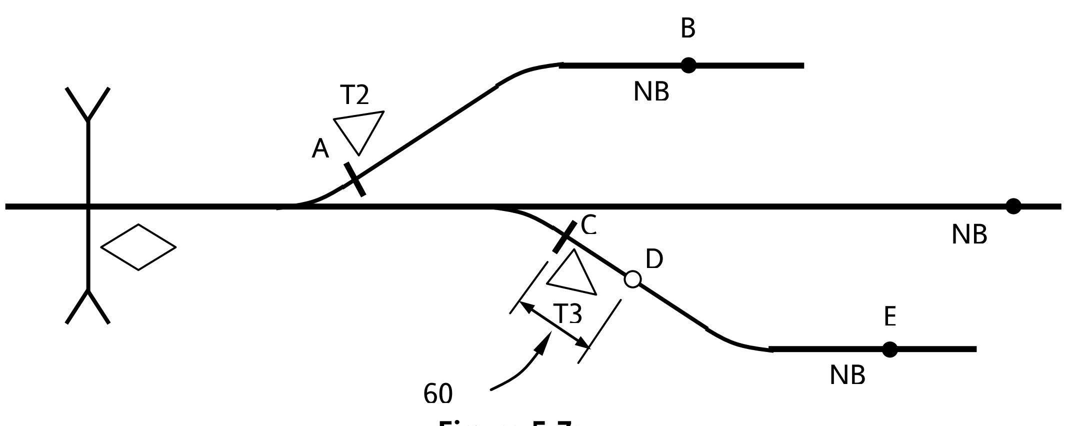


Figure 5-7:
T2 or T3 Less Than 1000 Ft.

Alternative 1

The designed approach distance can be as short as 500 ft. (152.4 m) when:

- A narrow band termination shunt is used and
- The approach distance (e.g., A to B) divided by the fastest speed train expected (in feet or meters per second) is 10 seconds or more. (If it is less than 10 seconds, extend the T2 approach so there is a minimum of 10 seconds).

Alternative 2

The designed approach distance can be as short as 350 ft. (106.7 m) when:

- the remote DAX receiver track wires are connected 60 ft. (18.3 m) from the transmit wires which are located at the insulated joints and
- the approach distance divided by the fastest speed train expected (in feet or meters per second) is 10 seconds or more.

The DAX approach distance is measured from the DAX receiver track wires to the termination shunt (D to E). If it is less than 10 seconds, extend the T2 approach so there is a minimum of 10 seconds. Additional requirements are:

- The DAX offset distance is measured from the crossing track wires to the DAX insulated joints at C plus the 60 ft. (18.3 m) to the receiver wires (D).
- Even though there is no island present, program the DAX track module for an island distance of 60 ft. (18.3 m).

5.4 DAX OPERATIONS

5.4.1 Common Dax Application Guidelines From An Insulated Joint Location

The two application areas discussed in paragraph 5.3 differ in certain aspects; however, the following guidelines apply to both.

1. The GCP equipped for DAXing must be installed as a unidirectional or simulated bidirectional system at a set of insulated joints. No coupler of any kind (i.e., wideband, narrow-band, or audio overlay bypass couplers) may be installed around these insulated joints.
2. The DAX relay drive output is connected to the controlled crossing by a two wire line/cable circuit or radio and is normally connected to the UAX input terminals, or the DAX relay drive output must have sufficient pickup delay time programmed if the UAX input is not available. Radio DAXing may also be used; refer to Section 8 for further information regarding Radio DAXing.
3. Bidirectional simulation should be used to take advantage of the bidirectional operating characteristics when wide changing ballast conditions are encountered, or other conditions warrant its use.

5.4.2 Programming For Dax Operation

The Model 4000 GCP is programmed for DAX operation using the Display Terminal. Required DAX information includes island length, predictors used on each track, UAX used, UAX pickup, DAX warning time, DAX offset distance, DAX pickup delay time, and DAX enable. The DAX operating param are programmed as described in the following paragraphs.

5.4.2.1 Island (Distance)

This parameter is the island length measured between GCP track wires for the track. Siemens recommends a minimum island track circuit length of 120 ft. (36.6 m) and a maximum high frequency island circuit length of 350 ft. (106.7 m) but not to exceed 30 percent of the longest GCP approach when approach distance is less than 1000 ft. (304.8 m) (see Figure 5-8). When there is no island, set the Track X Island Connection parameter to No Islands.

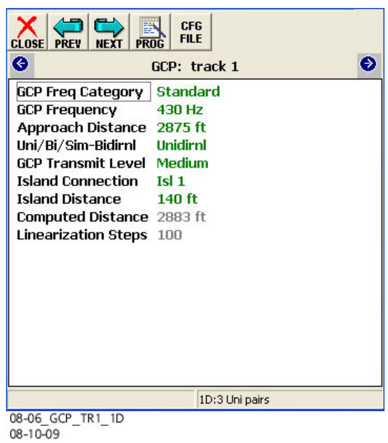


**Figure 5-8:
Island Distance**

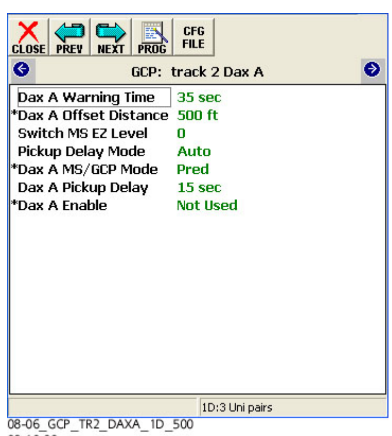


**Figure 5-9:
Primary DAX Param**

Given the example in Figure 5-7, T2 is a remote unit and T2 DAX A is assigned. The programming screen for T2 is depicted in Figure 5-9. If used, DAX B through DAX G for T2 is depicted on similar display screens. The following param are found on the DAX screens discussed in Section 5.5.

5.4.2.2 DAX Warning Time

This entry indicates the warning time (in seconds) for the associated DAX. The DAX warning time is generally selected to be the same or up to 5 seconds longer than the prime or crossing warning time.

When the indicated DAX is used for the traffic signal preemption function, the preempt warning time (Figure 5-10) is generally selected to be 10 to 15 seconds longer than the prime warning time. (Figure 5-11).

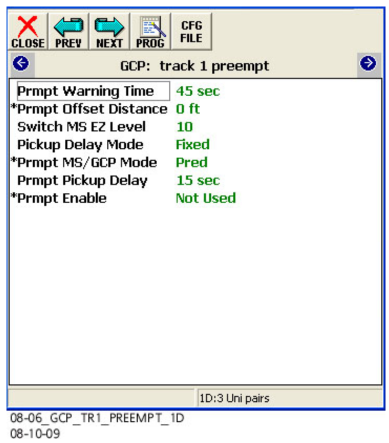


Figure 5-10:
GCP: track 1 preempt Window: Prempt Warning Time

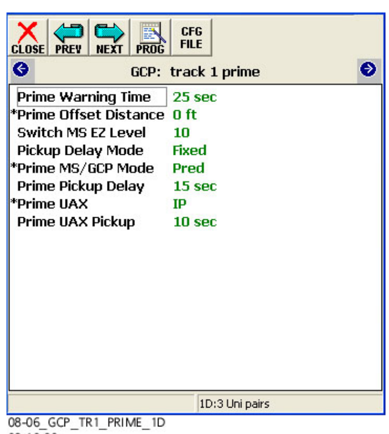


Figure 5-11:
GCP: track 1 prime Screen Prime Warning Time

5.4.2.3 DAX Offset Distance

This entry indicates the approach distance (in ft. only, current revisions of the DT will not calculate the distance in m) between crossings, or between the remote location and the crossing to be DAXed.

The distance is measured from the track wire connections at the nearest edge of the street at downstream GCP to the insulated joints at the upstream GCP (Figure 5-1), to the insulated joints on the far side of the upstream crossing GCP (Figure 5-2), or to the receiver track leads located on the far side of the upstream crossing when a GCP is "looking" through a street and the insulated joints are on the near side of the crossing (Figure 5-3).

5.4.2.4 DAX Pickup Delay Time

This programming variable has a default value of 15 seconds. This value is generally not changed in most applications.

5.4.3 General Remote Prediction Applications

WARNING

THE FEEDPOINT INSULATED JOINTS OF A UNIDIRECTIONAL OR A SIMULATED BIDIRECTIONAL APPROACH MUST NOT BE BYPASSED WITH A FREQUENCY-COUPLING DEVICE IN ANY WAY.

THE GCP PROVIDING REMOTE PREDICTION FROM AN INSULATED JOINT LOCATION MUST BE CONFIGURED FOR UNIDIRECTIONAL OR SIMULATED BIDIRECTIONAL OPERATION.

Remote prediction applications can be divided into two categories:

- Activating one or more crossings from a remote GCP location other than a crossing
- Activating a crossing from a second crossing where insulated joints are present at the second crossing

5.5 DAX PROGRAMMING EXAMPLES

Examples of DAX operation include:

- DAX start from a remote location using two GCP cases (see Figure 5-12).
- DAX start from an adjacent crossing that has insulated joints (Figure 5-17)

5.5.1.1 DAX Start from a Remote Location, Two GCP Cases

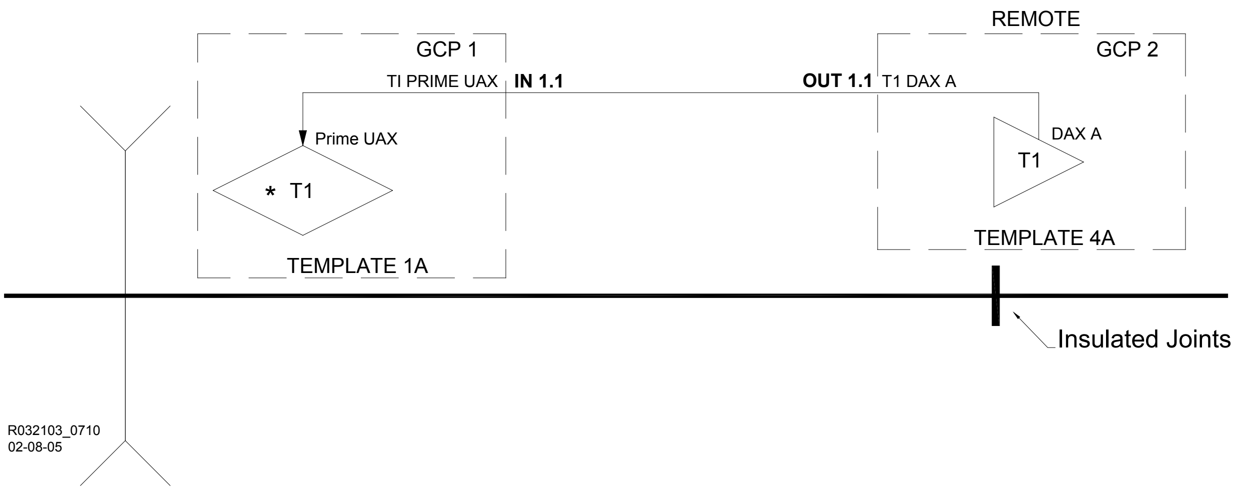


Figure 5-12:
DAX Start From Remote Location, Two GCP Cases

Figure 5-12 depicts a DAX that is started from a remote location, e.g., a remote GCP.

Programming GCP 1 to receive the DAX information from GCP 2 in Figure 5-12 requires the following entries:

- On the **GCP: T1 prime** screen (see Figure 5-13A):
  - Program Prime UAX=IP
  - Program Prime UAX Pickup=5 sec (or whatever the required pickup delay is)
- On the **INPUT: assignment page 1** screen (see Figure 5-13B):
  - Program IN 1.1=T1 Prime UAX

Programming GCP 2 to send the DAX information to GCP 1 requires the following entries:

- On the **PREDICTORS: track 1** screen (see Figure 5-14A):
  - Program DAX A Used=Yes
- On the **GCP: track 1 DAX A** screen (see Figure 5-14B):
  - Program DAX A Warning Time=35 sec (or whatever the required warning time is)
  - Program DAX A Offset Distance=349 ft. (or whatever the measured distance is)
  - Program DAX A MS/GCP Mode=Pred
  - Program DAX A Pickup Delay=15 (or whatever the required pickup delay is)
- On the **OUTPUT: assignment page 1** screen (see Figure 5-14C):
  - Program OUT 1.1=T1 DAX A

The following figures (Figure 5-13 for GCP 1 and Figure 5-14 for GCP 2) reflect the required programming steps for DAX start from a remote location when using two GCPs:

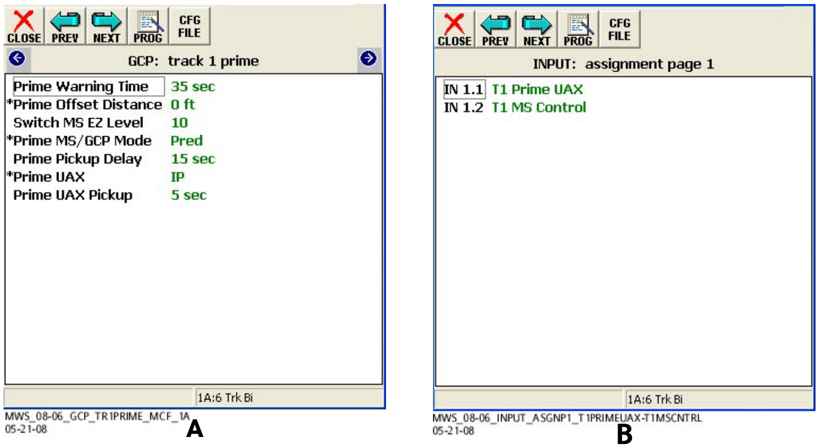


Figure 5-13:
GCP 1 Settings: A: GCP: track 1 prime; B: INPUT: assignment page 1

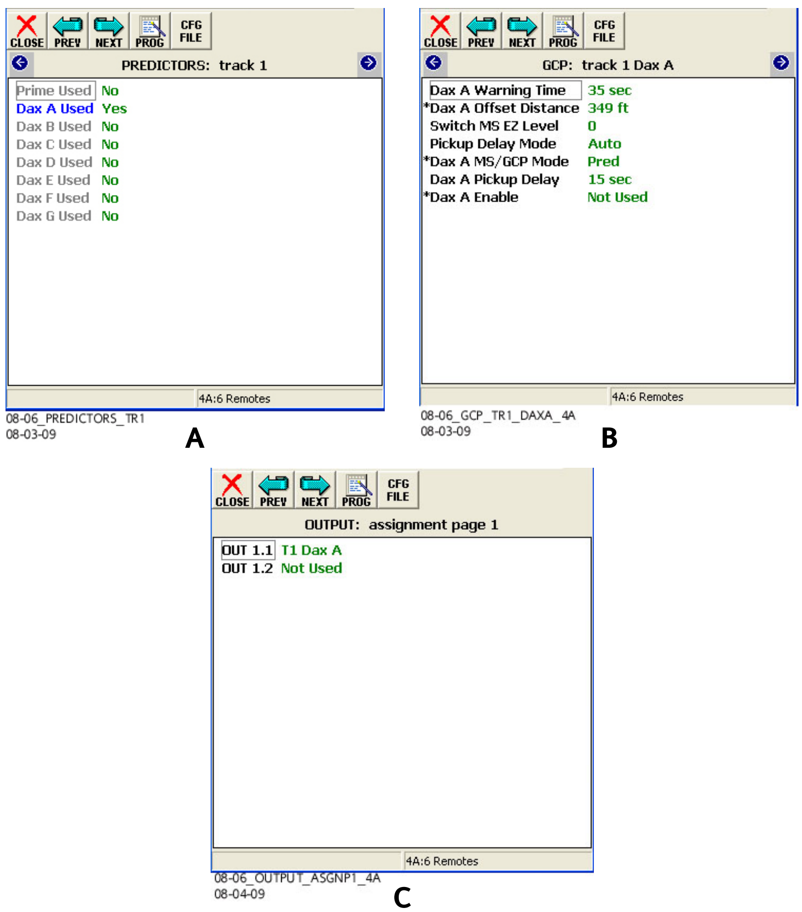


Figure 5-14:
GCP 2 Settings: A: Predictors: Track 1; B: GCP: Track 1 DAX A;
C: AND: AND 1 XR; D: Output: Assignment 1

5.5.1.2 DAX Start from a Remote Location, Single GCP Case

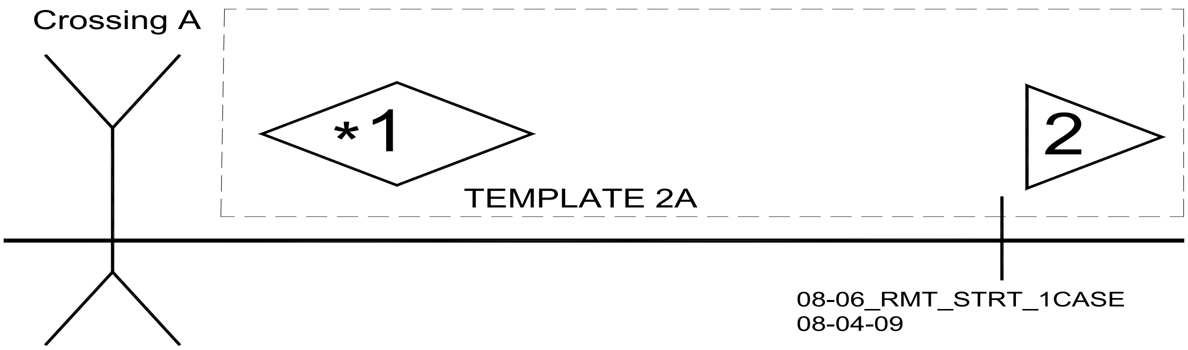


Figure 5-15:
DAX Start From Remote Location, Single GCP Case

Program the GCP param as stated below and shown in Figure 5-16A & -B:

- On the **GCP: Track 1 Prime** screen (Figure 5-16A)
  - Program T1 Prime UAX=IP
  - Program Prime UAX Pickup=5 seconds (or whatever the required pickup delay is)
- On the **GCP: Track 2 Prime** screen (Figure 5-16B)
  - Leave Pickup Delay Mode=Auto
  - Program T2 Prime Offset Distance= Distance between T1 track wires and insulated joint at T2. For this example, that distance is 1350 ft.

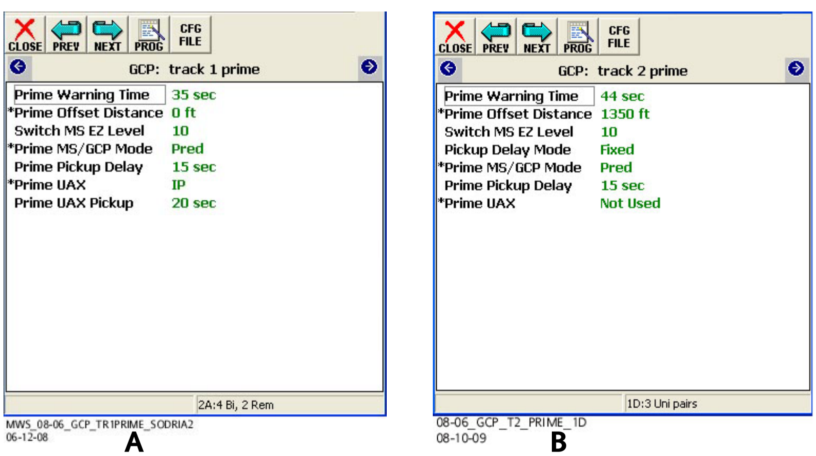


Figure 5-16:
A: GCP: T1 Prime; B: GCP: T2 Prime

5.5.1.3 DAX Start from an Adjacent Crossing with Insulated Joints

Programming GCP 1 UAX to receive the DAX output from GCP 2 requires the following entries:

- On the **GCP: track 1 prime** screen (see Figure 5-18A):
  - Program Prime UAX=IP
  - Program Prime UAX Pickup=5 sec (or whatever the required pickup delay is)

- On the **INPUT: assignment page 1** screen (seeFigure 5-18B):
  - Program IN 1.1=T1 Prime UAX

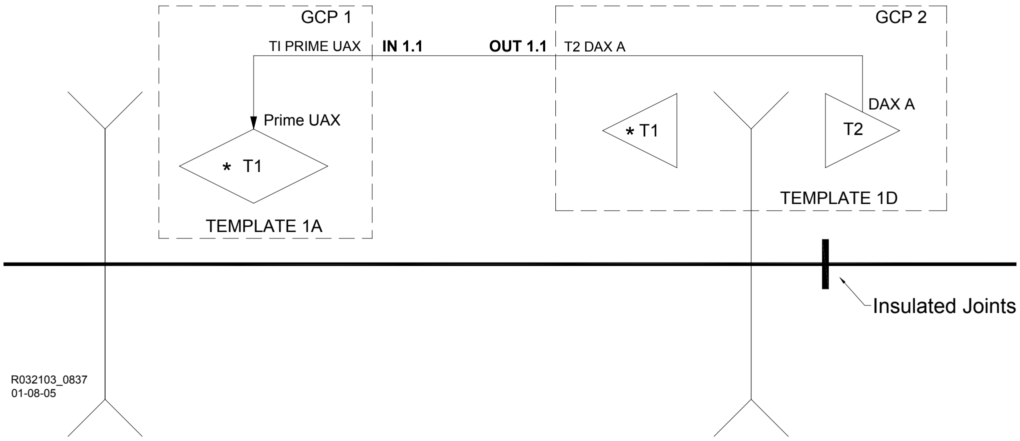


Figure 5-17:
DAX Start From Adjacent Crossing

Programming GCP 2 T2 to send the DAX A output to GCP 1requires the following entries:

- On the **PREDICTORS: track 2** screen (see Figure 5-19A):
  - Program DAX A Used=Yes
- On the **GCP: track 2 DAX A** screen (see Figure 5-19B):
  - Program DAX A Warning Time=35 sec (or whatever the required warning time is)
  - Program DAX A Offset Distance=99 ft. (or whatever the required distance is)
  - Program DAX A MS/GCP Mode=Pred
  - Program DAX A Pickup Delay=15 (or whatever the required pickup delay is)
- On the **OUTPUT: assignment page 1** screen (see Figure 5-19C):
  - Program OUT 1.1=T2 DAX A

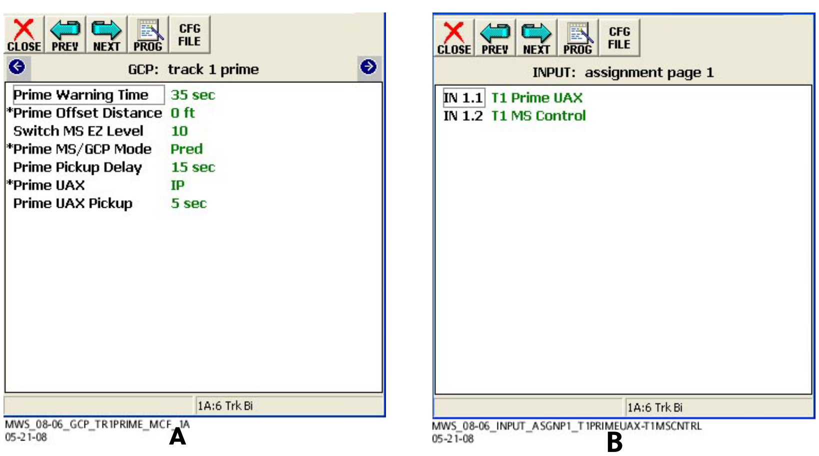


Figure 5-18:
GCP 1 Settings: A: GCP: track 1 prime; B: INPUT: assignment page 1

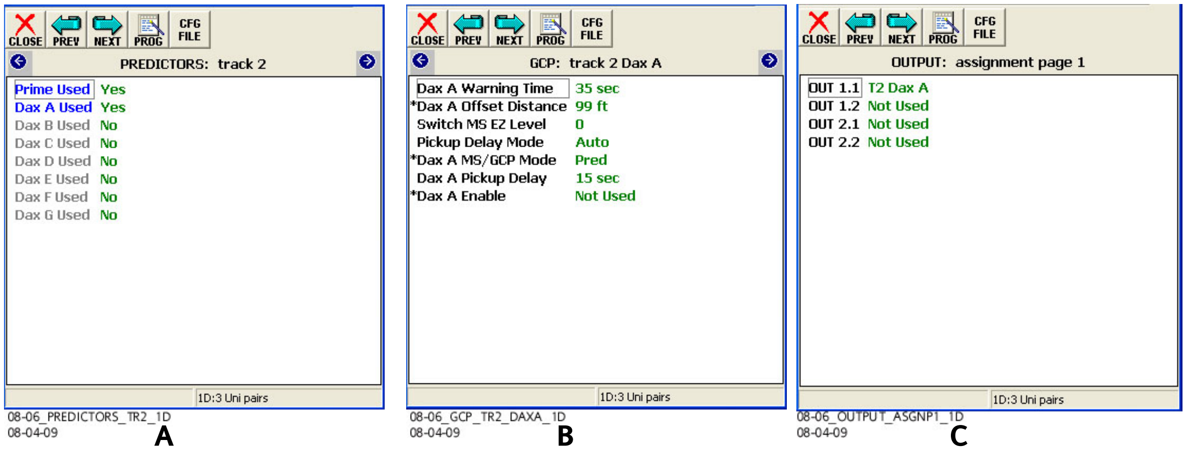


Figure 5-19:
GCP 2 Settings: A: PREDICTORS: track 2;
B: GCP: track 2 DAX A; C OUTPUT: assignment page 1

5.5.2 Remote DAXing to Multiple Bidirectional Crossings

Remote prediction for two bidirectional crossings is shown in Figure 5-20. T1 DAX A initiates start for T1 (GCP 2) at crossing B. T1 DAX B initiates start for T1 (GCP 1) at crossing A. Warning time and offset distance param are individually programmed for each DAX start. Each Model 4000 GCP is individually programmed to provide the appropriate interface connections: physical inputs and outputs.

5.5.3 DAXing Between Crossings Separated by Insulated Joints

Remote prediction for two adjacent crossings where the crossings are separated by insulated joints is shown in Figure 5-21. A two-track Model 4000 GCP is installed at each crossing. Both GCP tracks are configured for unidirectional operation (only the westbound (T1) circuits are shown). Warning time and offset distance individually programmed at street C. T1 DAX A (GCP 3) is set for warning time and offset distance to T1 (GCP 2) at crossing B. T1 DAX B (GCP 3) is set for warning time and offset distance to T1 (GCP 1) at crossing A.

Each Model 4000 GCP is individually programmed to provide the appropriate interface connections to physical inputs and outputs. Crossings are controlled by internal SSCC3i modules. T1 DAX A (GCP 3) initiates GCP 2 Crossing B start. T1 DAX B (GCP 3) initiates T1 DAX A enable (GCP 2) which initiates T1 Prime UAX at GCP 1and starts Crossing A. T1 DAX A (GCP 2) can also initiate GCP 1 start. GCP 2 DAX A enable de-energizes when DAX B at GCP 3 predicts. DAX A enable at GCP 2, when de-energized, causes DAX A to de-energize, which initiates GCP 1 start. DAX A at GCP 2 when it predicts sustains crossing A DAX start when a train enters approach to street B

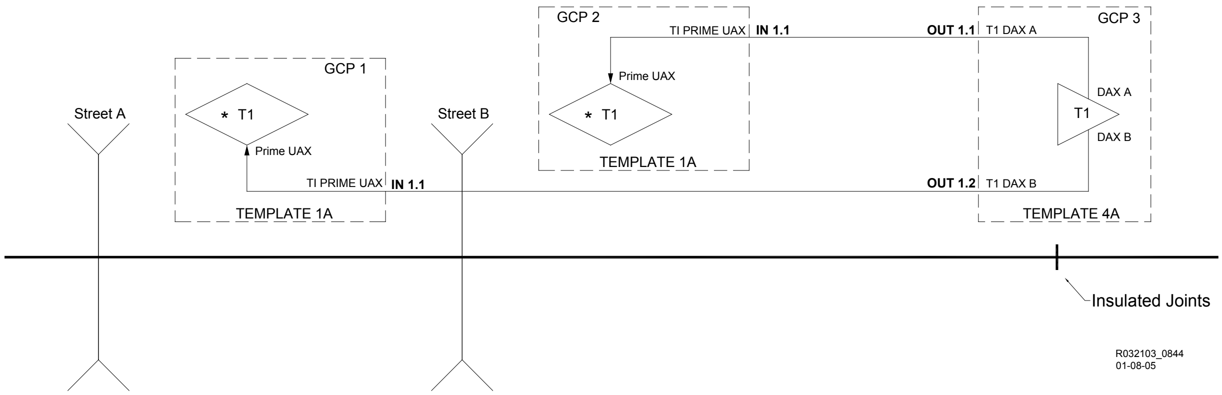


Figure 5-20:
Remote Prediction For Multiple Bidirectional Crossings

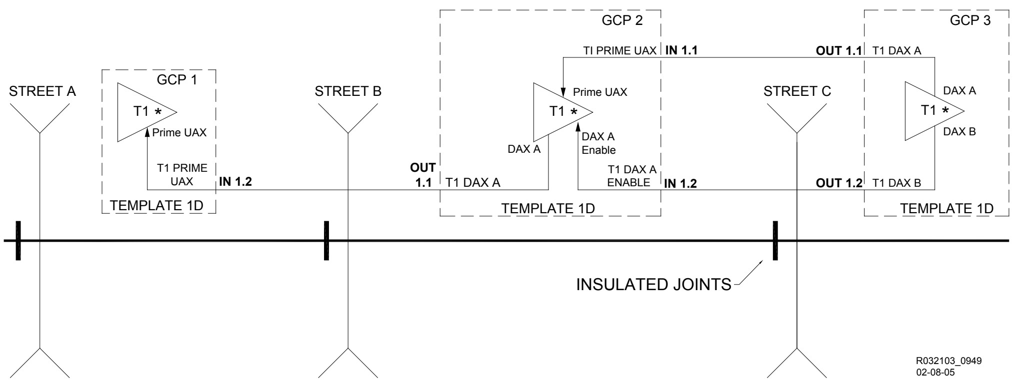


Figure 5-21:
Remote Prediction between Multiple Crossings Separated by Insulated Joints

5.5.4 Remote GCP Operation in an OS Track

WARNING

USE THESE PROCEDURES ONLY WHEN THE SWITCH POINTS ARE ADJACENT TO THE INSULATED JOINTS (EZ OF APPROXIMATELY 10).

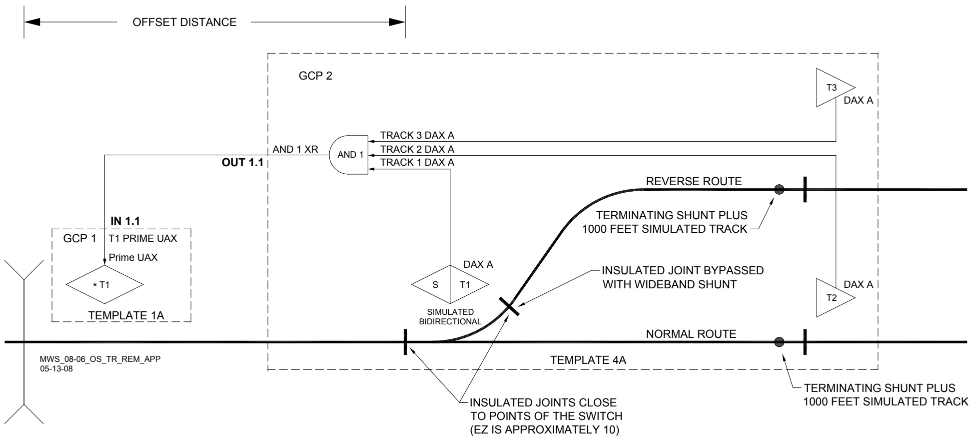


Figure 5-22:
OS Track Remote Prediction Application

A track circuit contained within interlocking limits is commonly referred to as OS (on-station) track (see Figure 5-22).

5.5.4.1 Approach Configuration Requirements

WARNING

A SPECIAL REMOTE GCP APPLICATION INSIDE AN OS TRACK IS SHOWN IN THIS APPLICATION COMBINES DAX FUNCTIONS WITH A BIDIRECTIONAL CIRCUIT. T1 IN THE OS IS OPERATING AS A BIDIRECTIONAL UNIT EVEN THOUGH THE GCP IS CONNECTED TO THE TRACK AT INSULATED JOINTS.

THIS PARTICULAR APPLICATION REQUIRES PARALLEL OS TRACK CIRCUITS. DO NOT USE A SERIES OS CIRCUIT.

NOTE

Take the following factors into consideration when designing Model 4000 GCPs, inside and around an OS:

- the proximity of the OS track to the crossing
- the maximum train speeds through the OS track

For GCP operation in this OS configuration, the OS track layout circuits should be configured as follows:

- Insulated joints in the turnout of the reverse route are bypassed using wideband shunts. Track circuit must be steady DC.
- 1000 ft. (304.8 m) of simulated track is placed in series with the termination shunts in both the normal and reverse routes.
- T1 of GCP 2 must be programmed for simulated bidirectional operation; however, no simulated bidirectional coupler is required due to the two actual approaches.

In this example, all remote tracks are in one Model 4000 GCP unit.

5.5.4.2 OS Track Remote Prediction Programming

To implement remote GCP 2, track 1 must be programmed for Simulated Bidirectional operation, have an approach length equal to the interlocking distance (the computed approach calibration will take into account the 1000 ft. (304.8 m) of simulated track), and a DAX distance equal to the distance from the crossing GCP track wires to the insulated joints at GCP 2.

5.5.4.3 OS Track Remote Prediction Operation

Detection of a train by any one of the GCP 2 tracks (track 1, track 2 or track 3) DAX A predictors initiates a crossing start at the crossing controlled by GCP 1 (see Figure 5-22).

The OS track circuit should be formed using two DC track circuits energizing relays that are controlled by a battery at the switch point end of the circuit and relays at the fouling ends. A repeater relay circuit is then formed to interface with the signal control circuits.

Independent track batteries may also be used to power the individual track circuits, in which case it may be necessary to use wideband shunts to couple the GCP operating frequency around insulated joints in the turnout.

When a GCP is installed within the limits of an existing series OS circuit, the OS circuit should be converted to a parallel or two relay circuit since installation of inductors in series OS track circuits has frequently resulted in marginal operation. Siemens recommends the use of the two relay or parallel relay circuit. See Figure 5-22 for a typical GCP and OS installation diagram.

5.6 ASSOCIATING ISLANDS WITH GCP TRACKS

NOTE

In MCF gpc-t6x-02-0.MCF and later, the parameter "External Island" has been replaced by "Island Enable" to simplify island programming. In earlier MCFs, the external island input could only be used when the island was set to external. The 02-0 MCF added this external method to drop the island, whether internal or external.

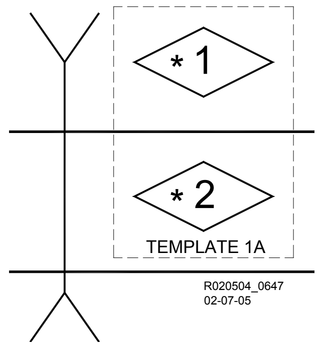


Figure 5-23:
Bidirectional Mode at Two-Track Crossing

Each 80418 track module can perform MS/GCP Operations (predicting the arrival of trains) and Island Operations (detection of trains on the island circuit). When the Track Module is in bidirectional mode at a crossing, the island function on that card usually provides the island circuit. An asterisk indicates the presence of an active island circuit as shown in Figure 5-23.

5.6.1 Island Association

Figure 5-24:
GCP: Track 1 Window

Associating an Island to a GCP is always made using the program menus. To make a track association, go to the corresponding **GCP: Track** window and set the **Island Connection** field to the required island. A typical setting for a track 1 bidirectional application is shown in Figure 5-24.

If the GCP Island Connection indicates an Island is connected, but no island is turned on, the system will declare an Island Connection error.

5.6.2 Automatic Islands ANDing

AND 1 XR for the unidirectional pair shown in Figure 5-25 includes track 1 and track 2 Prime predictors. Each track prime predictor includes the island state (energized or de-energized). Island 1 is operational on track 1. The template automatically connects Track Module 2 prime to island 1 of Track Module 1. This ensures that the T2 pickup delay is truncated as a train leaves the island going out the T2 approach.

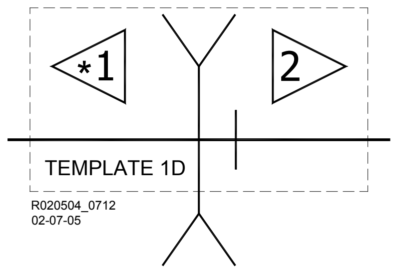


Figure 5-25:
Back-to-Back Unidirectional GCP Pair at A Crossing

When island 1 is occupied, it de-energizes both T1 and T2 prime predictors, which de-energizes the AND 1 XR function. The AND 1 XR Window for two active Track Modules is shown in Figure 5-26.

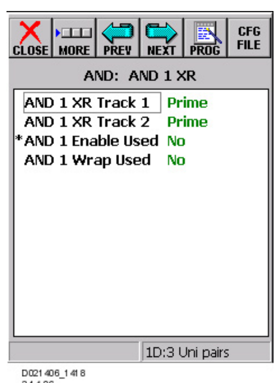


Figure 5-26:
AND 1 XR Window For Unidirectional Pair At A Crossing

5.6.2.1 Unidirectional Island Association

For back-to-back unidirectional units at the crossing only one island is used, as is depicted in Figure 5-27A. The island is located in the track module that looks through the street (Track 1 in Figure 5-27A). Island 1 of track 1 is turned on and the Island for track 2 is turned off as shown in Figure 5-27B, which is the default setting for unidirectional template applications.

The required **Island Connection** parameter for track 1 is shown in Figure 5-28A. The GCP portion of track module 2 must receive the island occupancy information from Island 1 to truncate the pickup delay on track 2. To insure that the island occupancy is received by the track 2 module the **Island Connection** parameter for track 2 must be set to **Isl 1** as shown in Figure 5-28B.

NOTE

An island may be turned off by changing the corresponding **Island Used** field on the **BASIC: Island Operation** window from **Internal** to **No**.

Unless otherwise indicated as shown in Figure 5-25, all track modules shown are in the same Model 4000 GCP case as indicated by dashed line.

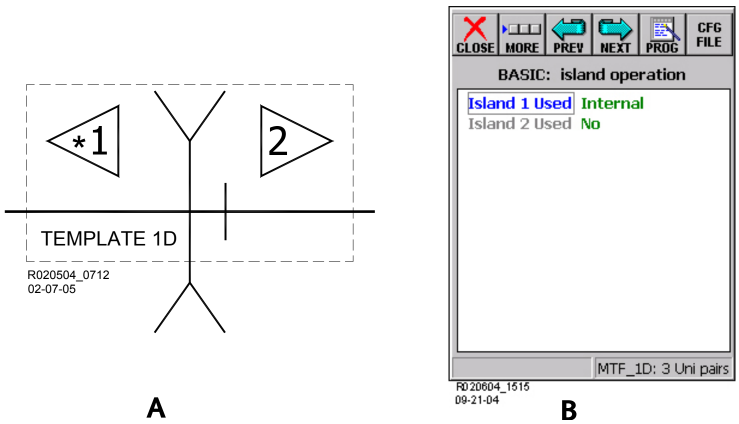


Figure 5-27:
Back-to-Back Unidirectional Configuration

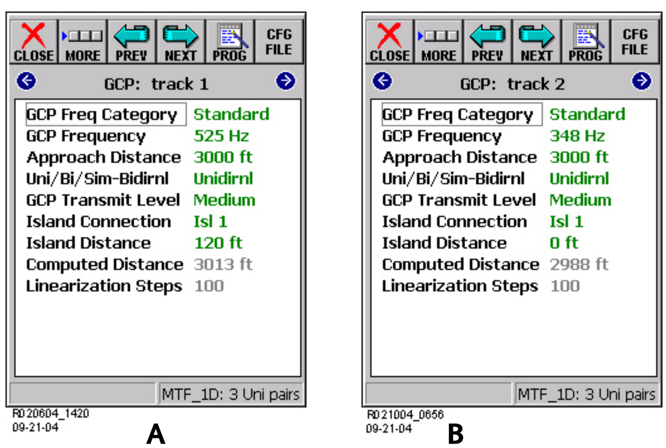


Figure 5-28:
GCP track 1 and 2 programming

5.6.2.2 Island Occupancy State

For most applications, it is not necessary to assign the occupancy state to an output. The SEAR receives internal island occupancy state messages from the CPU. When the island occupancy state is required outside of the Model 4000 GCP, it can be assigned to any of the track or RIO outputs.

5.6.2.3 Island Param Selection

Use the **Island Programming** menus to select the following param for an internal island: Island Frequency, Pickup Delay, and Isl Enable Pickup Used. When Isl Enable Pickup Used is set to Yes, the Isl Enable Pickup Delay parameter is visible (see Figure 5-29).

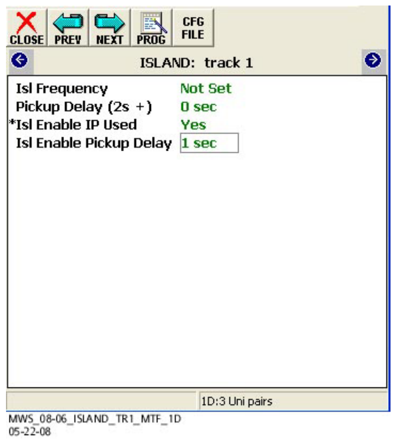


Figure 5-29:
The ISLAND: track 1 Window

5.6.2.3.1 Island Frequencies

The Island Frequencies depicted in Table 5-1 are available with the Model 4000 GCP.

Table 5-1:
Model 4000 GCP Island Frequencies

Not Set	4.9kHz	11.5kHz
2.14kHz	5.9kHz	13.2kHz
2.63kHz	7.1kHz	15.2kHz
3.24kHz	8.3kHz	17.5kHz
4.0kHz	10.0kHz	20.2kHz

5.6.2.3.2 Pickup Delay

Pickup Delay (Loss of Shunt time): Valid delay range: **0** to **6** seconds (This is in addition to the inherent 2-second island delay).

5.6.2.3.3 Isl Enable IP Used

Island Enable Input Used: Valid range is Yes and No. This parameter allows the user to select to have an external island enable used in conjunction with an existing internal island. This can be used to allow truncation of pickup delays when an internal island is used, from an external input.

5.6.2.3.4 Isl Enable Pickup Delay

Island Enable Pickup Delay (Loss of Shunt time): Valid delay range: **0** to **500** seconds.

5.7 EXTERNAL ISLANDS

When an input is required from an island circuit external to the Model 4000 GCP, such as a DC island, designate the corresponding **Island Used** as **External** as shown in Figure 5-30 and Figure 5-31. Assign the input as shown in Figure 5-31.

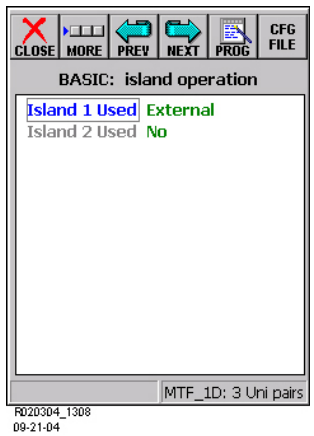


Figure 5-30:
BASIC: Island Operation Window with External Island Selected

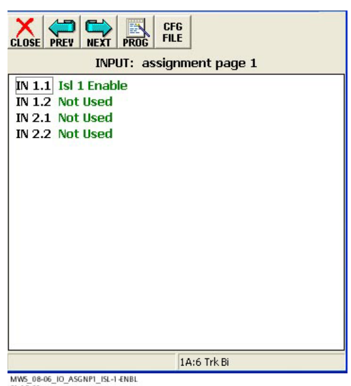


Figure 5-31:
Input Assignment For External Island Configuration

The LOS pickup delay for an external island is set using the **Pickup Delay** entry of the corresponding **ISLAND: track** window as shown in Figure 5-32. Configuration range: 0 to 6 seconds.

Figure 5-32:
ISLAND: track 1 Window

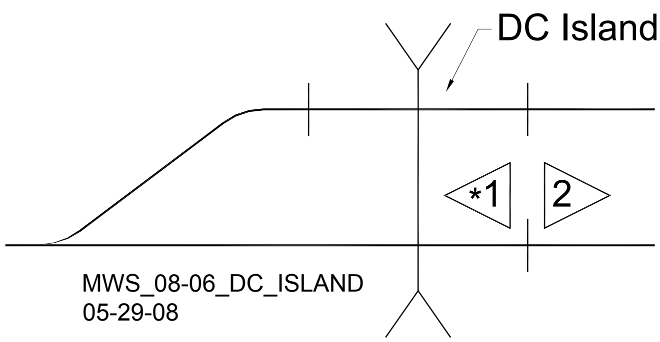


Figure 5-33:
External Island Example

NOTE

When an external island is located on another track that does not have a GCP, the crossing may be activated without programming the external island function. Instead, the siding may be set to activate the crossing by:

- Setting AND 1 Enable Used to Yes
- Connecting external island output to an external input
- Assigning the external input to **AND 1 XR Enable**
- If required, setting **AND 1 Enable Pickup** delay to at least 2 seconds

With this setup the crossing will activate each time the siding external island circuit is activated and provides a loss of shunt pickup delay, if required.

5.8 PROGRAMMING FOR TRAINS THAT STOP IN A GCP APPROACH

When trains have a normal stop in a GCP approach such as a station stop or at a signal location, it is important to consider the following:

- How close to the crossing does the stop occur
- Does the stop occur in a remote DAX approach
- Will trains accelerate fast enough from the stop to affect warning time

Station stops are generally for short commuter trains that have brief stops at a station and when leaving, accelerate fast. Station stops unlike stops at signal (near GCP track wires), may be located anywhere within a GCP approach.

When a station stop is located in the crossing or remote approach, it may be desirable to maintain the crossing activated during the stop or temporarily switch some or all predictors to motion sensing operation. Motion sensing provides the fastest train detection possible when trains begin accelerating from a station stop toward the crossing. Motion sensing operation may be implemented in one of several optional ways depending on the application.

5.8.1 Station Stop Option #1: Positive Start (Maintains the Crossing Activated)

If the station stop is very close to a crossing, (generally less than 1000 ft./304.8 m), it may be desirable to maintain the crossing activated. This may be implemented by means of the Positive Start feature. Positive start holds any predictor set to zero offset in the de-energized state when EZ is less than the programmed value. Positive start recovers when the:

- Train passes the island circuit
- Train backs up 5 points higher than the EZ Positive Start level value.
- Positive Start timed mode is selected and the timer exceeds its programmed value

NOTE:

If bidirectional approaches are used, Positive Start is active for both directions of train traffic.

For uni-directional applications, a new Positive Start option “**Positive Start Offset”** is now selectable with MCF gcp-t6x-02-0 and newer. This option allows Positive Start to deenergize DAXes. When EZ is less than the Positive Start EZ level, DAXes with offsets > 0 that have an offset distance less than the configured **Positive Start Offset** value will be de-energized. Positive Start does not affect DAXes on reverse train moves. The Offset values available are in the menu range between 0 and 9999 ft. The default is 0 ft.

When a DAX Positive Start Offset is used and positive start occurs, the DAX will always start its programmed pickup delay once it recovers from positive start. The DAX recovers and starts its programmed pickup delay when the:

- train passes the island circuit (when DAX is at a crossing)
- EZ goes 5 points higher than the EZ Positive Start trigger value.

- Positive Start timed mode is selected and the timer exceeds its programmed value.

NOTE:

If the crossing is too close to the remote location (small offset distance), it may be desirable to change the remote DAX to Fixed mode and the pickup delay to 10 seconds to prevent overrings on short fast trains that do not stop.

The Positive Start function depends on the operating mode selected (ON or TIMED).

When in the ON (non-timed) mode:

- The prime (zero offset) predictor deenergizes when EZ drops below its configured level without any reaction time delay
- If the train stops, Prime Predictor stays deenergized as long as EZ is below its configured level
- The prime predictor (zero offset) recovers when train passes the island circuit or EZ rises 5 points above its configured level and the programmed pickup time expires.

When in the timed mode:

- the prime predictor (zero offset) deenergizes when EZ drops below its configured level
- the positive start timer starts when EZ drops to a value that is less than its configured level
- the prime predictor recovers when train passes the island circuit or both the programmed Positive Start timer and the prime Pickup delay timer have elapsed, provided no other prediction processes are in process

A Positive Start timer value of 1 to 99 minutes may be specified.

Positive Start param may be programmed as shown in Figure 5-34.

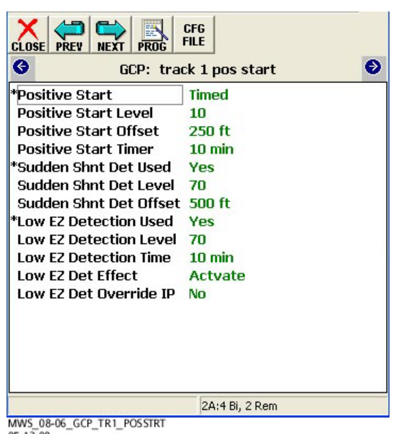


Figure 5-34:
Positive Start Programming Window

NOTE

When Positive Start is used, slow trains may cause a long warning time if the Positive Start EZ level activation point is located well out in the approach.

If bidirectional approaches are used, Positive Start is active for both directions of train traffic

If movement through a trailing switch causes EZ to be below the Positive Start threshold, crossing activation will result.

5.8.2 Station Stop Option #2: Switch MS EZ Level Function (EZ Switch to MS Operation)

Switching from predictor to motion sensor operation may be initiated using the Switch MS EZ Level function. This function with new soft.ware may now be selectable for DAX predictors (non-zero offsets).

This function enables selected predictors to switch to motion sensor operation when the track EZ falls below the programmed EZ switch to MS level (see Figure 5-35 A and B). The Switch MS EZ level does not affect the DAX on a reverse train move.2222222222222222222222223

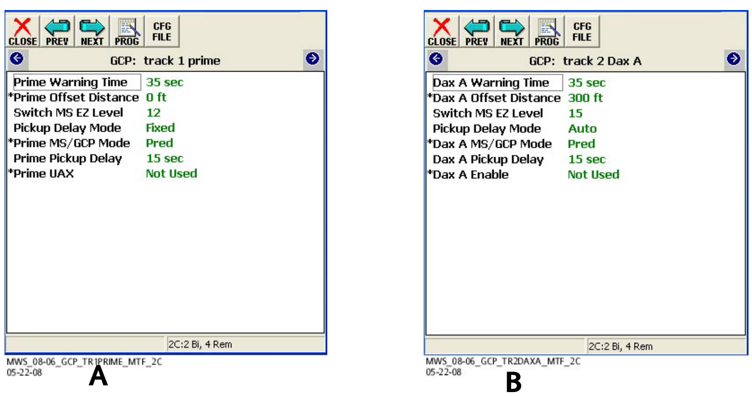


Figure 5-35:
A: Prime Switch MS EZ Level Function & B: DAX A Switch MS EZ Level Function

When a station stop is close to the crossing, the Switch MS EZ Level parameter can be set to an EZ value that is slightly higher than the EZ level at the station.

For example, if the track EZ value at a station stop is 12, set the Switch MS EZ Level to 15. This will help insure that motion sensor operation is implemented when the train starts to move.

The disadvantages of using the Switch MS EZ Level function are:

- A slow train that does not stop within the approach may cause a longer than the programmed warning time if the set EZ level occurs well out in the approach.
- When switching to motion sensing, DAXes will be active on both slow and fast trains

- If bidirectional approaches are used, the EZ switch to MS level is active on both directions of train traffic .

5.8.3 Station Stop Option 3: MS/GCP MS Restart (Switch to MS aft.er Station Stop)

In general, a preferred way to implement motion-sensing operation in the crossing approach or the remote approach is by means of the MS restart function. With this function enabled, motion-sensing operation is initiated only when a train stop is detected which is indicated by an “M” appearing on the main track display.

A Train Stop is detected when:

• Continuous inbound train motion is detected for at least 5 seconds followed by the detection of no motion for at least 10 seconds and

• The train stop EZ is lower than the programmed EZ Restart Level value.

Once the train stop is detected, motion sensing will be cancelled when:

- train passes the island circuit or
- EZ goes above 80 or
- If used, the Restart timer times out

The MS restart function is enabled by setting the **MS/GCP Restart Used** field to **Yes** as shown in Figure 5-36.

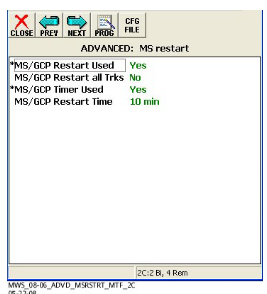


Figure 5-36:
MS/GCP Restart Function

When the MS restart function is enabled three additional fields display within the window:

5.8.3.1 <u>MS/GCP Restart all Trks</u>

- When set to Yes, this field designates that the restart affects the selected predictors on all tracks
- When set to No, this field designates that the restart affects only the track with the train stop.

5.8.3.2 <u>MS/GCP Timer Used</u>

- When set to Yes, this field designates that the Restart Timer is used and affects the selected predictors

- When set to No, Restart time menu is hidden and when a train stop is detected, motion sensing will remain indefinitely until:
  - Train passes the island circuit or
  - EZ goes above 80

5.8.3.3 MS/GCP Restart Time

- This is used to set the time that the selected predictors function as motion sensors aft.er a train stop is detected.
- A restart timer value of 0 to 60 minutes may be set.
- The time value should be set for the maximum time that a train is expected to stop at the station plus an additional 2 to 3 minutes.

When the MS restart function is enabled as shown in Figure 5-36, it also enables additional windows dedicated to each track module used. An example of track 2 is shown in Figure 5-37.

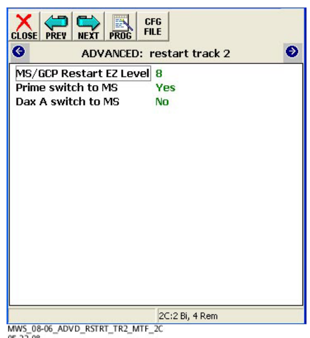


Figure 5-37:
Prime Switch to MS on Track 2

5.8.4 MS/GCP Restart Track Settings

Each track window provides two or more fields for enabling track predictors that will be affected by the restart function as shown in Figure 5-38.

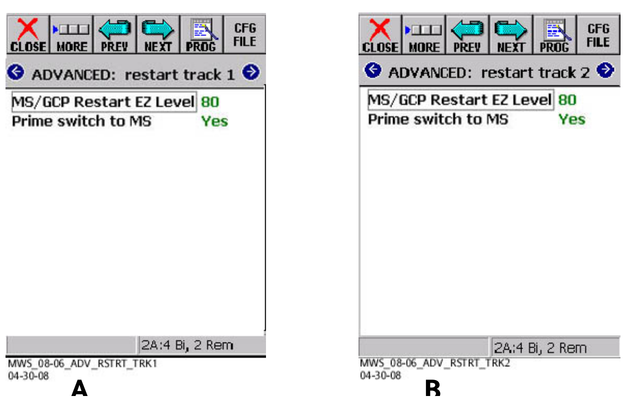


Figure 5-38:
MS Restart Track 1 and 2 Windows

5.8.4.1 MS/GCP Restart EZ level

See Figure 5-38.

- When EZ is below the programmed restart EZ level, a station stop is permitted to be detected and selected predictors switched to motion sensor operation.
- There should not be a trailing switch between the station stop and the GCP track wires as it would also be detected as a station stop if a train takes the switch.
- If there are trailing switches beyond the station stop then set the EZ Level to the track EZ value measured just beyond the station stop area.
- When trains do not stop in the approaches (no switches present) the Restart EZ level may be set to 80.
- When trains only stop at a signal, then set the Restart EZ level to between 5 and 10.

5.8.4.2 Prime Switch to MS

See Figure 5-38.

5.8.4.3 DAX A Switch to MS

- The number of predictors shown depends on the number of predictors enabled.
- The predictor fields allow selection of the predictors that will be switched to motion sensor operation when a train stop is detected. See Figure 5-38.

5.8.5 MS Restart Programming

The following discusses three application options for MS/GCP Restart programming.

- Option 3A has the station stop in the crossing approach.
- Option 3B has the station stop in a remote approach and the crossing and remote units are in separate 4000 cases.
- Option 3C has a station stop in the remote approach and the crossing and remote units are in the same 4000 case.

5.8.5.1 Option 3A: Station stop is in the crossing approach

To program MS restart operation: Select the MS restart function param as shown in Figure 5-36. Select track predictors to be affected by the restart timer param as shown in Figure 5-38A andFigure 5-38B.

- See Figure 5-39 for the corresponding track configuration.

NOTE

The Restart EZ level for the station stop in Figure 5-38 can be set to 80. However, if there are trailing switches beyond the station stop in the approach, set the EZ Level to the track EZ value measured just beyond the station stop area.

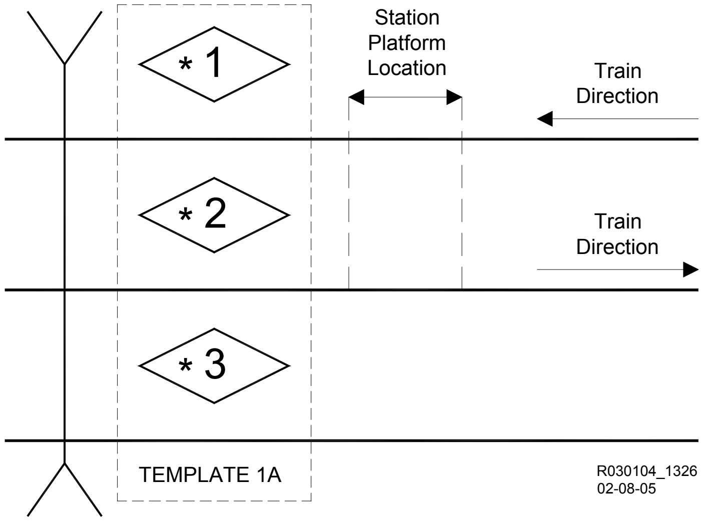


Figure 5-39:
MS Restart Track Configuration

For the track configuration shown in Figure 5-39, a train may stop at the station on tracks 1 or 2 and may stop for up to 3 minutes on either track. There is no station stop on track 3 so **MS/GCP Restart all Trks** is set to **No** as shown in Figure 5-36. MS restart timer affects only tracks 1 and 2 so the **Prime Switch to MS** for track 3 is set to **No** as shown in Figure 5-40. Therefore the MS restart timer is disabled for track 3. A train move on track 3 with trains sitting at the station on tracks 1 or 2 does not switch the GCP3 to MS operation. This avoids long warning time initiation.

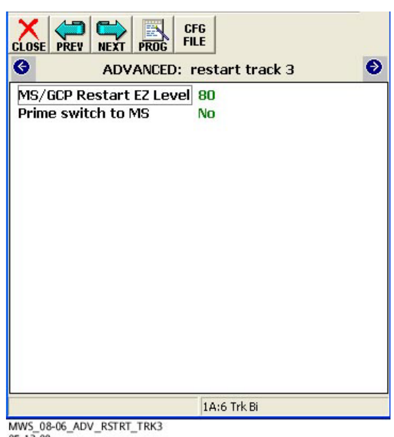


Figure 5-40:
MS Restart Track 3 Window

5.8.5.2 <u>Option 3B MS Restart for a Station Stop in Remote Approach (Separate 4000 cases)</u>

When a station stop is in a remote approach and the remote provides DAX control of multiple crossings, it may either be programmed to switch to motion sensor restart operation or to keep the selected crossing activated for trains that stop at the station.

5.8.5.2.1 Programming MS Restart for the Remote 4000 Unit

For the track configuration shown in Figure 5-41, the switch to motion sensor restart option should be selected for both the GCP at the Remote and at the crossing.

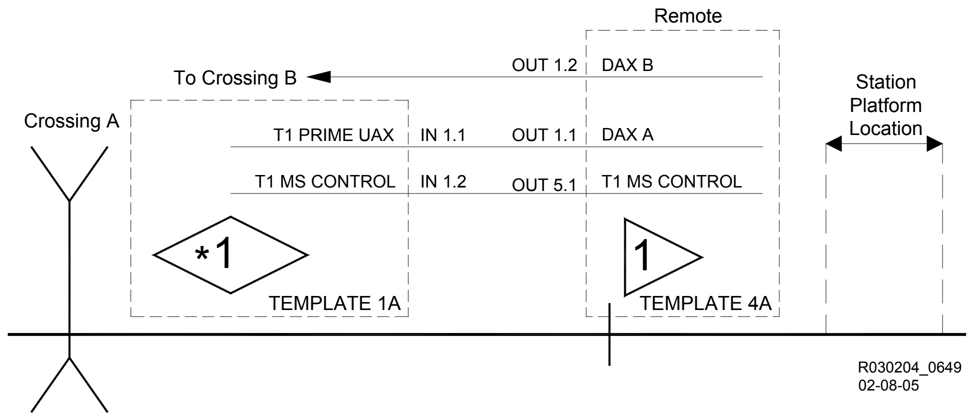


Figure 5-41:
Remote MS Restart for Crossing A

In this example, Crossing B is considered far enough away that it does not require the switch to MS operation.

To select the switch to MS option, program the remote for Restart operation as shown in Figure 5-42 A and B.

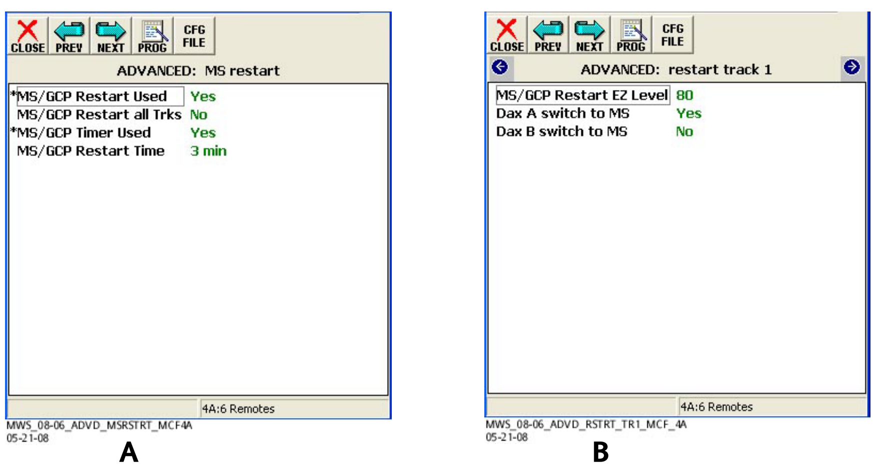
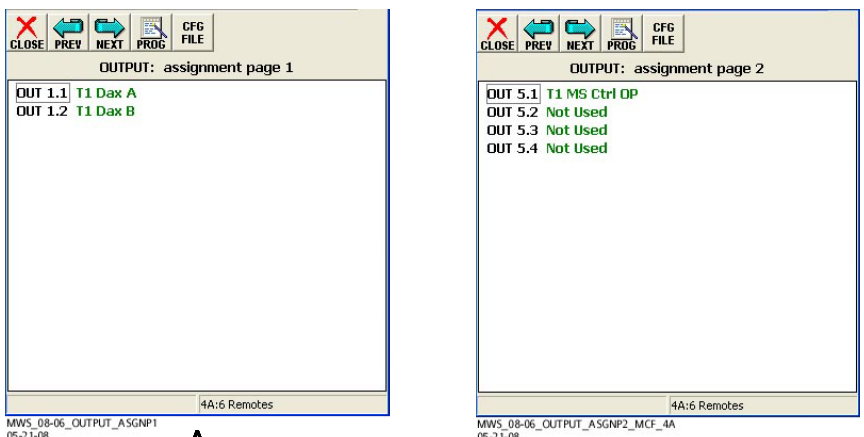


Figure 5-42:
Remote Restart Configuration

Three remote output signals are required to implement the track configuration shown in Figure 5-41. To obtain the third output, install a RIO module in the Track 5/RIO 2 Slot of the remote Model 4000 GCP. Aft.er installing the RIO module, assign **RIO** to Track 5/RIO 2 Slot as shown in Figure 5-43.

Figure 5-43:
Slot 5 RIO Assignment

Predictors and MS Controls are assigned to the three remote outputs as shown in Figure 5-44 A and B.



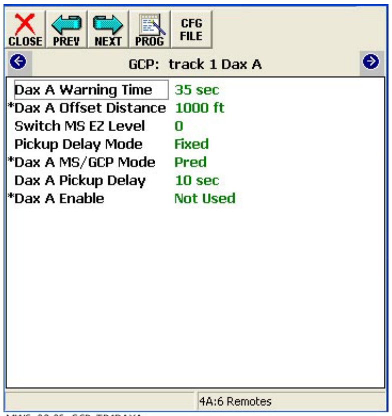
A B

Figure 5-44:
Remote A and B Output Assignment

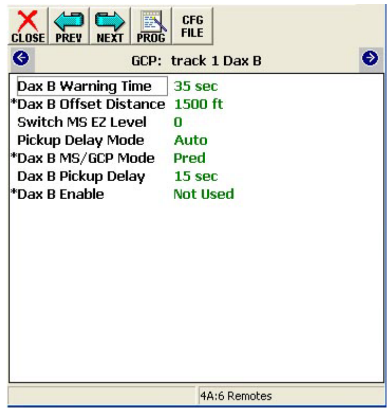
The T1 MS Control function assigned to the remote RIO output is used to trigger the MS Restart Timer at the crossing. When a train stop is detected at the remote, the MS Control output de-energizes for the duration of the MS Restart timer. The MS Restart timer at the remote is truncated when EZ rises above 80.

In station stop applications, set the Remote DAX pickup delay mode (of the DAXes that switches to MS) to Fixed mode. In this application, set DAX A to Fixed and the DAX A pickup delay to 10 seconds as shown in Figure 5-45 A.

The DAX B may remain in AUTO mode with a 15 second pickup delay since it does not switch to motion sensing as shown in Figure 5-42B.



MWS_08-06_GCP_TR1DAXA
05-13-08
A

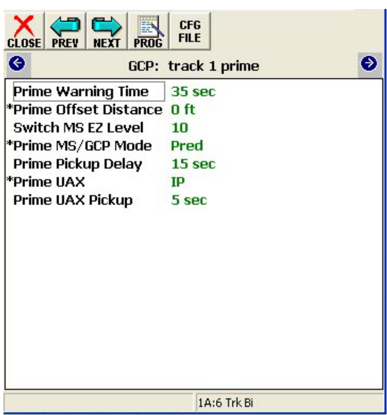


MWS_08-06_GCP_TR1DAXB
05-13-08
B

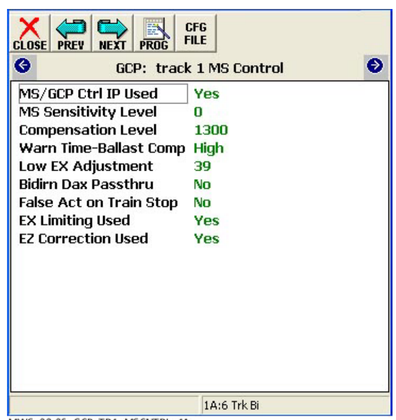
Figure 5-45:
Remote DAX Pickup Delay Mode Set to Fixed

5.8.5.2.2 Programming MS Restart for the Crossing 4000 Unit

- Set Prime UAX to IP as shown in Figure 5-46 A
- Set MS/GCP Ctrl Used to Yes as shown in Figure 5-46 B



MWS_08-06_GCP_TR1PRIME_MCF_1A
05-21-08
A



MWS_08-06_GCP_TR1_MSCNTRL_1A
05-21-08
B

Figure 5-46:
Crossing A input enable assignments

Program the crossing A inputs as shown in Figure 5-47

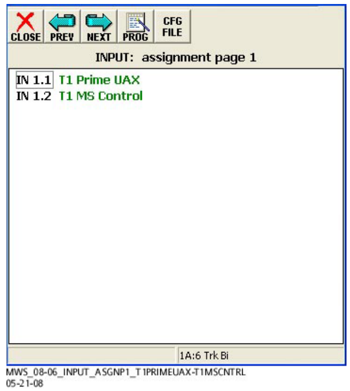
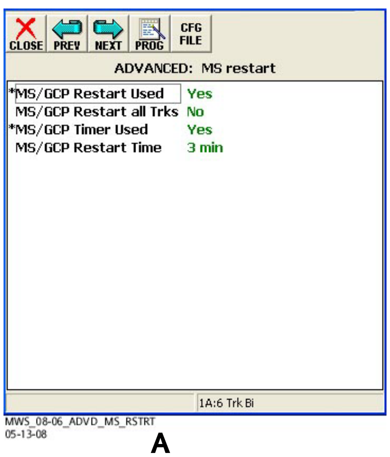


Figure 5-47:
Crossing A Input Programming assignments

Program the crossing A motion restart function as shown in Figure 5-48 A and B. The crossing Restart Timer is generally set for the same time as the remote Restart Timer (in this case 3 minutes).



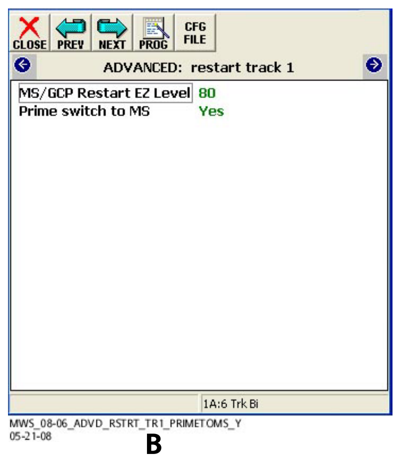


Figure 5-48:
Crossing A MS Restart Programming

NOTE

If there are switching moves in the crossing approach, the Restart EZ level for the crossing in Figure 5-48B can be set to a low value such as 5 since there is no station stop in the crossing approach. Trains momentarily stopping while doing switching moves will not cause a switch to motion sensor operation. However, a stop at the station in the remote approach will still cause the restart timer at the crossing to switch to Motion sensing operation.

Operation of the T1 MS Control input at the crossing is as follows:

- When T1 MS Control input goes low, the predictors enabled in the ADVANCED: MS restart window change to motion sensors.
- When the input returns to high, the MS Restart timer is started at the crossing.
- The selected predictors continue to function as motion sensors while the restart timer is running.

In the application example shown in Figure 5-41, the transition of the MS Control input from low to high occurs because the remote restart timer and the MS Control output are truncated when the train leaves the remote approach and EZ goes > 80. When this transition occurs, track 1 Prime continues to function as a motion sensor for an additional 3 minutes. The Restart timer at the crossing is truncated when the train passes the island circuit or leaves through a switch and EZ goes above 80.

Set the crossing MS Sensitivity Level to 50 as shown in Figure 5-49. This allows motion to be detected near the end of the approach when slower trains enter the crossing approach from a remote station stop. This can prevent a possible momentary deactivation of the crossing on slower train moves.

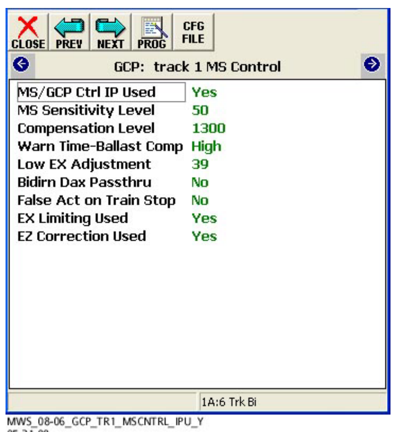


Figure 5-49:
MS Sensitivity Level at Crossing Unit

5.8.5.2.3 Continuous Activation Option for Station Stop in the Remote (crossing and remote in separate 4000 case)

When the crossing is very close to the remote DAXes (located within 1000 ft./304.8 m of the crossing), it may be better to keep the crossing activated when the train is stopped at the station.

This can be accomplished by changing the track configuration I/O of Option B. The following changes are required to implement continuous activation and are shown in Figure 5-51:

- Set MS/GCP Restart Used to No as shown in Figure 5-51A
- Modify Input assignments as shown Figure 5-51B
- In addition, change the **Prime UAX Pickup** delay time to **30** seconds as shown in Figure 5-52:

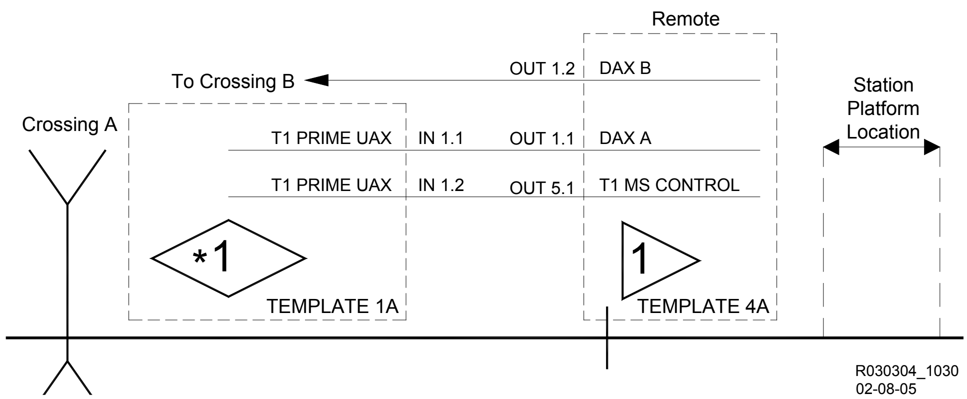


Figure 5-50:
Continuous Crossing Activation

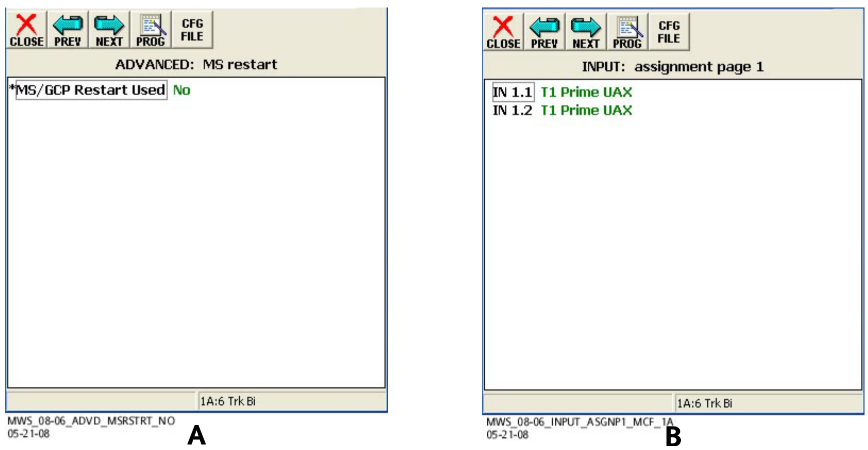


Figure 5-51:
Crossing A Input Programming

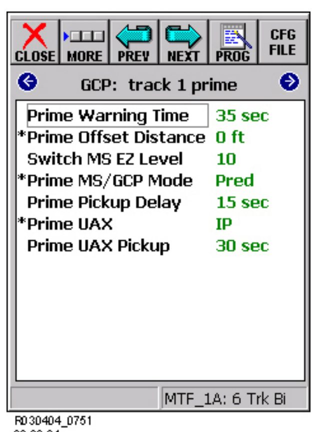


Figure 5-52:
Crossing A Prime UAX Pickup With extended PU Delay

The continuous crossing activation application operates as follows:

- For a straight through move:
  - DAX A at the remote predicts and drops the Prime UAX connected to IN 1.1 at the crossing, causing AND 1 XR to drop and activate the crossing.
  - The Remote DAX pickup delay runs out just before the train arrives at the crossing, and the Prime UAX starts its pickup delay timer.
  - This pickup delay time is truncated as the train passes the island.
  - The crossing recovers normally.
- For a station stop:
  - The train stops at the station causing T1 MS Control to go low shortly aft.er the stop.
  - In response, Prime UAX at the crossing de-energizes, activating the crossing.
  - T1 MS Control stays low for the 3 minute MS Restart time while the train is at the station.
  - Aft.er the train starts moving and fully crosses the insulated joints at the remote, T1 MS Control energizes, causing Prime UAX to energize and start its 30 second pickup delay.
  - The remaining pickup delay time is truncated as the train leaves the island.
  - The crossing recovers normally

5.8.5.3 <u>Option 3C: MS Restart for a Station Stop in Remote Approach (crossing and remote are in same 4000 case)</u>

When remote predictors are in the same Model 4000 case as the crossing predictor, those outputs are usually connected to the Prime UAX via internal logic rather than through external wiring. Additional functions (DAX, MS/GCP Control) can also be connected via internal logic rather than external wiring..

5.8.5.3.1 Restart Switch to Motion Sensor Programming for Remote T2

For the track configuration shown in Figure 5-53 the switch to motion sensor restart option when selected will operate in both the Remote T2 and the crossing T1 modules.

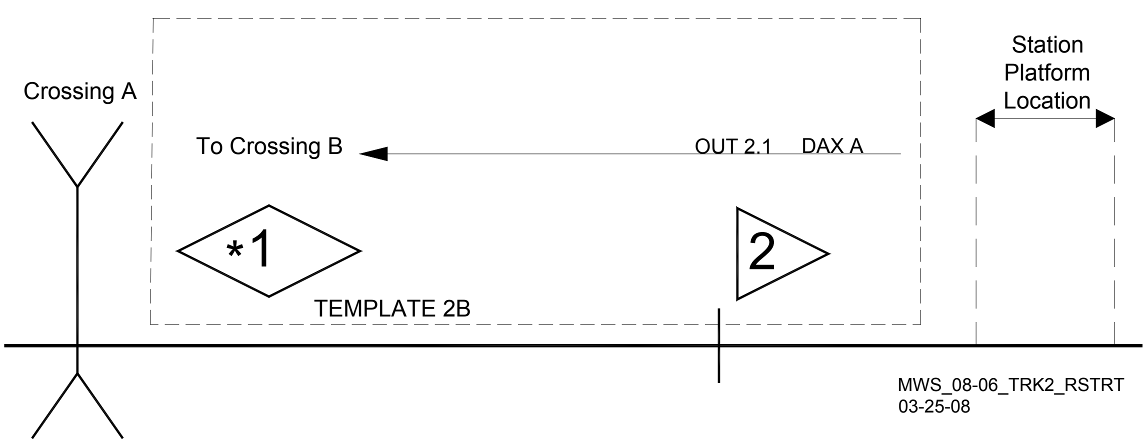


Figure 5-53:
Remote MS Restart (Crossing and Remote in the Same 4000 Case)

Figure 5-53 is the same application as shown in Figure 5-41 of option 3B, except the crossing and remote modules are in the same 4000 case. By programming internal I/O connections between the remote and the crossing modules, almost all external wiring is eliminated. The major differences between these two applications are:

- The Rio module is not required
- T2 prime controls the crossing instead of DAX A
- T2 DAX A controls crossing B instead of DAX B
- By default, the template sets AND 1 XR to include the T2 Prime predictors (used with offset)
- AND 1 XR receives the T2 prime status by internal messages
- Internal I/O provides internal connections between T2 and T1 for MS Restart Control and UAX operation.

To select the switch to motion sensor Restart option for T1 and T2, program the Restart as shown in Figure 5-54A , Figure 5-54B and Figure 5-54C.

NOTE

If station stop times can vary considerably, the MS/GCP Timer Used can be selected to No. In that case, when a train stops, the T2 DAX will remain a motion sensor indefinitely until the train leaves the station and EZ rises above 80.

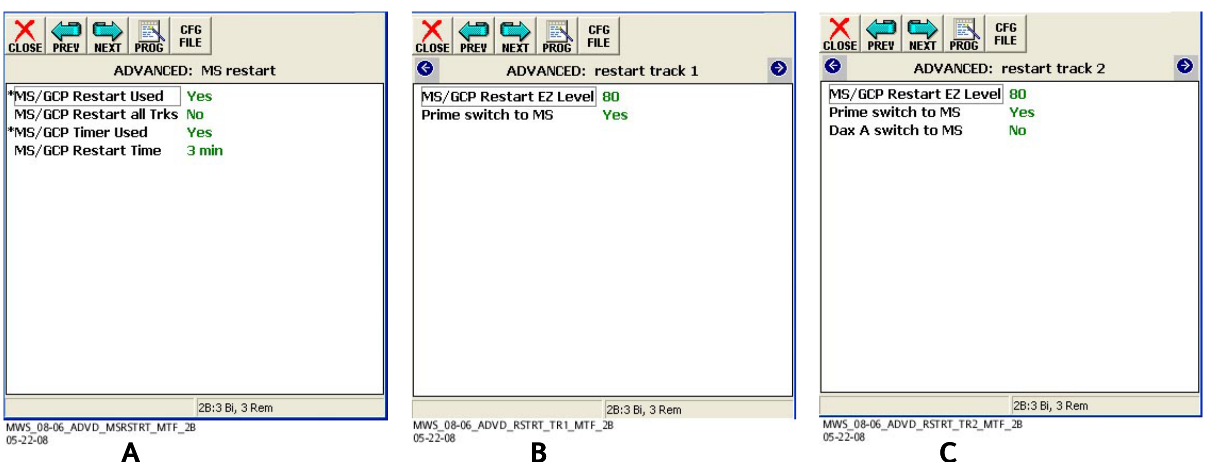


Figure 5-54:
MS/GCP Restart is Used

The configuration shown in Figure 5-55 shows that only one output signal is required.

- **OUT 2.1** to **T2 DAX A** going to crossing B. Program this output as shown in Figure 5-55.

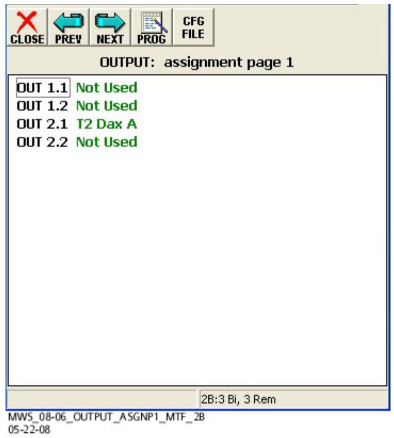


Figure 5-55:
Remote Unit Output Assignment

- Set the remote T2 prime pickup delay mode to Fixed and Prime Pickup Delay to 10 seconds as shown in Figure 5-56. A relatively short pickup delay of approximately 10 seconds should be used to prevent a possible overring on short fast trains that do not stop.

Figure 5-56:
T2 Prime is Fixed 10 Second Pickup Delay

5.8.6 Restart Switch to Motion Sensor programming for crossing T1 Unit

Program crossing A track 1 to respond to the remote **T2 MS/GCP Ctrl** output by first setting Track 1: **MS/GCP Ctrl IP Used** to **Yes** as shown in Figure 5-57.

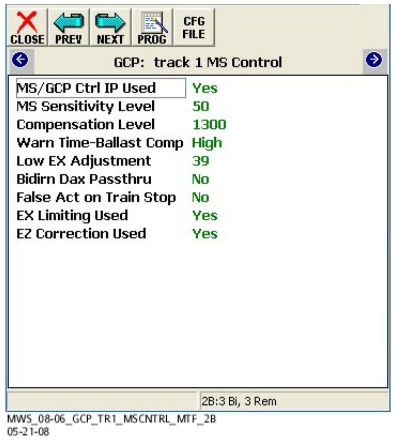


Figure 5-57:
MS/GCP Ctrl IP Enabled

Operation of the T1 MS Control input at the crossing is as follows:

When the remote detects a train stop, T1 MS Control input will go low changing theT1 prime predictor to a motion sensor. When the input returns to high, the MS Restart timer is started in track 1. However, the T1 prime predictor continues to function as motion sensors while the restart timer is running. Program the following as shown in Figure 5-58

- T1 Prime UAX to IP
- T1 Prime UAX Pickup to 30 sec

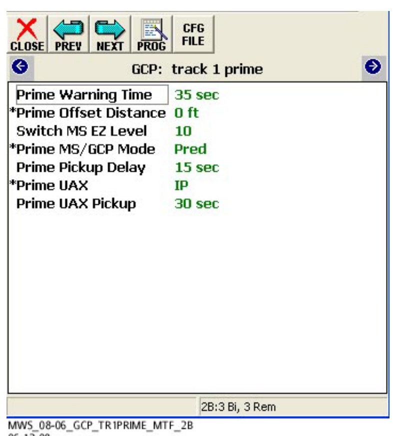


Figure 5-58:
Prime Programming Assignment

The Track 1 MS Sensitivity Level is set to 50 as shown in Figure 5-59. This allows T1 motion to be detected sooner at the far end of the approach when slower trains enter the crossing approach from a station stop. This change can help prevent a momentary deactivation of the crossing on slow train moves.

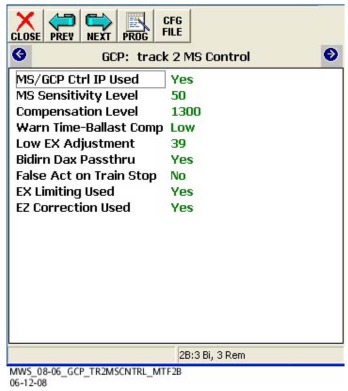


Figure 5-59:
MS Sensitivity Level

Program the Internal I/O between T2 and T1 as shown in Figure 5-60

- Int.1 Set by T2 MS Ctrl OP to Int.1 Sets T1 MS control
- Int.2 Set by T2 Prime to Int.2 Sets T1 Prime UAX

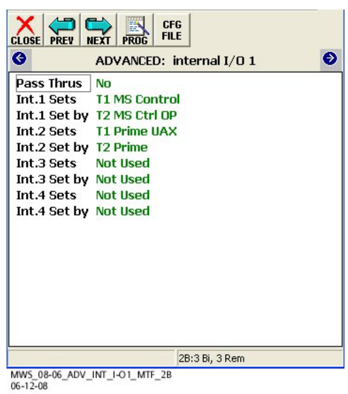


Figure 5-60:
Crossing A Track 1 Internal I/O Programming Assignment

NOTE

The I/O connection status may be viewed in the field by doing the following:

- From the track status display, select MORE > VIEW > Internal States.
- The Green or Red LED indicators show status of each internal I/O connection.

5.8.6.1 Continuous Activation Option for Crossing A

When the crossing is close to the remote location, it may be better to keep the crossing activated while the train is stopped briefly at the station.

This can be accomplished by adding an additional internal I/O connection to Option C:

- T2 MS Ctrl OP to T1 Prime UAX

The complete internal I/O assignment is shown in Figure 5-61.

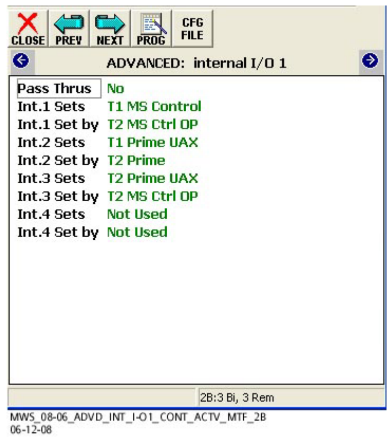


Figure 5-61:
Internal I/O asssignment for Continuous Activation

The continuous crossing activation application operates as follows:

- For a straight through move:
  - Prime with offset at the remote predicts and T1 Prime UAX drops AND 1 XR activating the crossing.
  - The Remote prime pickup delay runs out just before the train arrives at the crossing,
  - This prime pickup and UAX delays at the crossing are truncated as the train leaves the island.
  - The crossing recovers normally.
- For a station stop:
  - The train stops at the station causing T2 MS Control to go low shortly aft.er the train stops causing both T1 and T2 to switch to MS operation
  - In response, Prime UAX at the crossing de-energizes, activating the crossing.
  - T2 MS Control stays low during the MS Restart time of 3 minutes while the train is at the station.
  - Aft.er the train starts moving and fully crosses the insulated joints at the remote, T2 MS Control output energizes, causing Prime UAX to energize and start its 30 second pickup delay.
  - T1 prime predicts while T1 is still in MS mode
  - Any remaining UAX pickup delay time and the MS restart Mode are truncated as the train leaves the island.
  - The crossing recovers normally.

5.8.7 Overview of MS Sensitivity Level Adjustment

In general, this adjustment option does not require changing from the default value of 0. However, when the **MS/GCP Ctrl IP Used** is set to **Yes,** the motion sensitivity should generally be set at 50. This allows the crossing GCP to detect motion of slower speed trains when a train enters the approach aft.er a station stop has occurred at a remote unit.

Motion sensing sensitivity can be adjusted on each track using the **MS Sensitivity Level** field parameter as shown in Figure 5-62. This parameter has a range of 0 to 100 and its default is 0. Table 5-2 shows the variation in motion sensing detection relative to train speed at the far end of the approach. As an example:

- A value of 0 provides motion sensitivity of approximately 30 mph at end of a 3000-foot approach but always has 1 mph near the feed points.
- A value of 100 provides motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach.

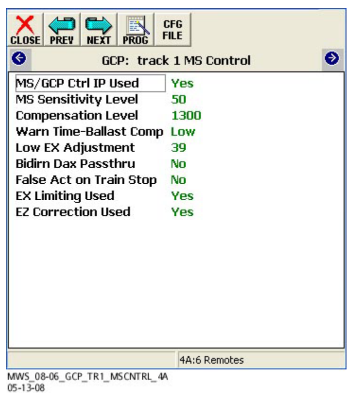


Figure 5-62:
MS Sensitivity Level Parameter Adjustment Window

Table 5-2:
MS Detection Threshold Relative To Sensitivity Level Setting For 3000 Foot Approach

MOTION SENSITIVITY LEVEL VALUE	MOTION SENSING DETECTION THRESHOLD IN MPH
0	30
50	15
80	6
100	1

NOTE

Motion sensitivity is always 1 MPH near the GCP feed point regardless if the sensitivity adjustment is 0 or 100.

5.8.8 Trains that Stop at a Signal within a GCP Approach

When trains stop at a signal, the stop is a relatively a short distance from the signal/insulated joints. However, depending on the application and how close the stopped train is to the signal, the GCP at the signal may or may not have sufficient time to predict even as a motion sensor once the signal clears and the train begins to move.

Therefore, when the signal location is near the crossing, there are several options available to insure early crossing activation. The options are:

- MS Restart can activate the crossing as soon as the train begins to move if there is sufficient distance and time to predict before the train arrives at the insulated joints.
- Positive Start can activate the crossing as soon as the train passes the insulated joints. However, care must be taken if:
  - the crossing is bidirectional since Positive Start is active for both directions of train traffic
  - trains stop prior to entering the island, the crossing will remain activated
- A new feature, **Sudden Shunt Detection,** can immediately activate the crossing when the train first passes the remote insulated joints and will allow the crossing to recover should the train stop before entering the island.

When quick detection of a train stopped at a signal or stopped at a station stop (located at the insulated joints) is required, the combination of MS Restart (**option 3B or 3C: MS Restart For a Station Stop in Remote Approach)** and the new soft.ware feature **Sudden Shunt Detection** can both be used to provide the quickest crossing activation possible.

5.8.9 Sudden Shunt detection

When a signal is located close to a crossing, Sudden Shunt can activate the crossing immediately when the first wheels of the train pass the remote DAX insulated joints into the crossing approach. See the application in Figure 5-63. Sudden Shunt will activate the crossing on all inbound trains (slow or fast) that pass the signal location so care should be taken in the application of this option.

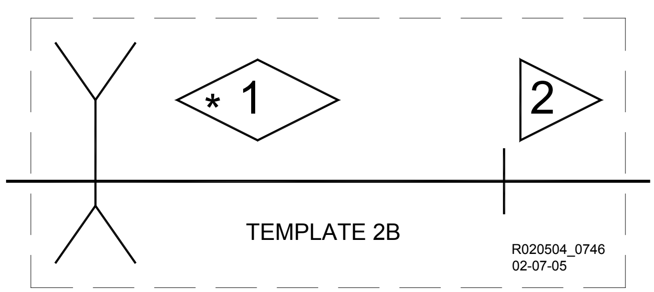
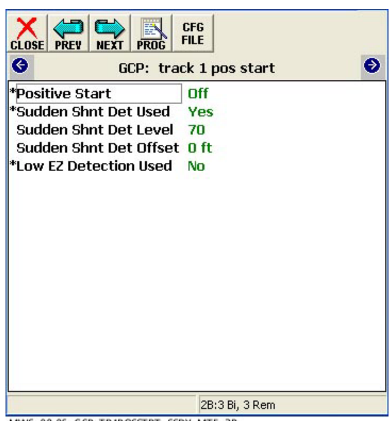


Figure 5-63:
Track application

The sudden shunt option allows the user to configure the crossing unit so that the prime predictor (zero offset) and optionally DAXes to de-energize when a sudden shunt is detected. Sudden Shunt when enabled operates as follows:

- Sudden Shunt is detected when EZ drops instantaneously from above 80 to below a configured Sudden Shunt EZ level
- EZ drops due to the termination shunt having simulated track in series with it to balance or extend the approach distance
- Prime (zero offset) predictors will drop immediately when EZ drops to below the configured level and EZ has not fallen below 5
- DAXes (non zero offset) predictors when enabled will drop aft.er 2 seconds if EZ drops to below the configured level and EZ has not fallen below 11
- Once Sudden Shunt has activated the crossing, if the train stops short of the island, the predictors will run their programmed pickup delays and the crossing will then recover
- When the crossing is unidirectional and has Sudden shunt enabled, a reverse move train although providing the Sudden Shunt detection conditions will not trigger Sudden Shunt operation

The Sudden Shunt function is enabled by setting the **Sudden Shunt Det Used** field to **Yes** as shown in Figure 5-64.



MWS_08-06_GCP_TR1POSSTRT_SSDY_MTF_2B
06-12-08

Figure 5-64:
Sudden Shunt Det Option

When the Sudden Shunt function is enabled, two additional fields display within the window as shown in Figure 5-64.

- Sudden Shnt Det Level (EZ level)
- Sudden Shnt Det Offset (in ft.)

5.8.9.1 <u>Track 1, Sudden Shunt Det Level</u>

To determine the Sudden Shunt Detector EZ Level value:

- A hardwire shunt is placed on the track on the crossing side of the remote DAX insulated joints and the EZ value noted.

- The Sudden Shunt Det Level should be set 5 EZ point higher than the EZ value noted with the hardwire shunt
- The EZ value noted with the hardwire shunt must not be less than 5 for Sudden Shunt to be detected.
- The detector EZ level configuration setting is from an EZ of 5 to 75

5.8.9.2 <u>Track 1, Sudden Shunt Detector Offset:</u>

When the crossing is uni-directional and the crossing unit has one or more DAXes in operation, the user may wish with Sudden Shunt to also drop DAXes that have small offset values but not ones with large offset values. This option allows selected DAXes to drop when a sudden Shunt is detected when their offset distance is less than the configured Sudden Shunt Det Offset value.

For DAXes with non zero offset, the EZ value noted with the hardwire shunt must be higher than 11 for DAXes to respond to a Sudden Shunt..

NOTE

When Sudden Shunt is used, there should not be any trailing switches that are close enough on either side of the crossing if bidirectional to cause EZ to drop below the programmed Sudden Shunt EZ level. If so, this would cause a crossing activation each time a train comes out of the trailing switch.

5.8.10 False Activation on Train Stop

This option diminishes the possibility of false activations of the crossing due to frequency interference when a train stops in a GCP approach.

When trains stop close to the crossing or at a station stop or signal location and are switched to motion sensing operation, the GCP will be in a highly sensitive motion sensor mode. If there is inordinate amount of frequency interference on the track, there is a remote possibility that motion might be falsely detected from time to time. Should this occur, this option is useful to help insure that false activation does not occur.

To select the False Activation on train stop option, program **False Activation on train stop** to **Yes** as shown in Figure 5-65.

When set to yes, the prediction persistency test to activate the crossing is extended from 2 seconds to 3.5 seconds but only occurs when a train stop is detected in the approach and EZ is less than 85. The persistency extension returns to 2 seconds when EZ > 85.

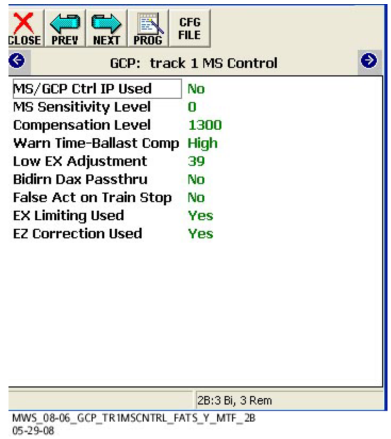


Figure 5-65:
False Act on Train Stop/

5.9 PROGRAMMING FOR POOR SHUNTING OPERATION (ENHANCED DETECTION)

MCF gcp-t6x-02-0.MCF and newer provides for advanced poor shunting logic.

The Poor shunting programming is divided into two parts, Inbound and Outbound train movements. There are 3 inbound and 3 outbound programming menus. The menu items are:

5.9.1 Inbound train movements

- Inbound PS Sensitivity (Inbound Poor Shunting Sensitivity)
- Speed Limiting Used
- Adv Appr Predn (Advanced Approach Prediction)

5.9.2 Outbound train movement

- Outbound False Act Lvl (Outbound False Activation Level)
- Outbound PS Timer (Outbound Poor Shunting Timer)
- Trailing Switch Logic

Five of the six menus items are template defaulted to ON (in-operation) for all train moves. They may remain in-operation for most general applications. Only Adv Appr Predn is turned Off by default and is only used in specific applications.

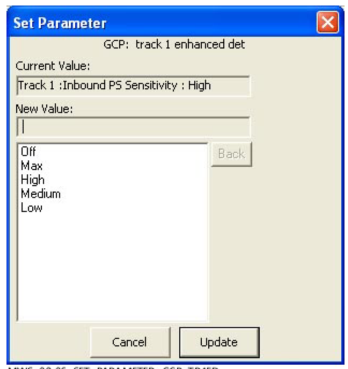
5.9.3 Inbound Poor Shunting Programming

Both **Inbound PS Sensitivity** and **Speed Limiting Used** are defaulted to the On state (in-operation) so when poor shunting occurs, it can be detected and processed.

5.9.3.1 Inbound PS Sensitivity:

Allows use of 4000 GCP in areas where poor track shunting conditions may occur. With the new soft.ware release, **Inbound PS Sensitivity** is template defaulted to **High**.

To change the High setting, select **High** and a parameter set window occurs as shown in Figure 5-66.



MWS_08-06_SET_PARAMETER_GCP_TR1ED
06-13-08

Figure 5-66:
Set Inbound PS Sensitivity Parameter Window

Maximum provides the highest sensitivity for detecting poor shunting while **Low** provides the least sensitivity and Off turns it off. The default setting of **High** is generally used for most applications and is shown in Figure 5-67.

When Inbound PS detects a poor shunting event, the associated Track Module:

- Immediately causes all predictors into prediction and automatically switches all predictors to highly sensitive motion sensor operation
- The term "ed" is displayed on the associated main track display
- Detection of poor shunting is caused by nonlinear fluctuations of track EZ signal (speed variation detection)
- Continues to operate as conventional grade crossing predictor as long as poor shunting conditions are not detected

WARNING

INBOUND PS, WHEN DETECTED, CAN RESULT IN LONGER THAN PROGRAMMED WARNING TIMES AT:

- **REMOTE PREDICTION (DAX) LOCATIONS**
- **CROSSINGS WHERE SLOWER TRAINS ARE ENCOUNTERED.**

INBOUND PS SHOULD BE USED WHERE PASSENGER TRAINS, COMMUTER, OR OTHER LIGHT RAIL VEHICLES OPERATE.

5.9.4 Speed Limiting Used

This is a new feature with the release of the new soft.ware that is very useful when poor shunting or track related discontinuities occur in EZ.

Speed Limiting Used is template defaulted to **Yes** (in-operation) and is shown in Figure 5-67

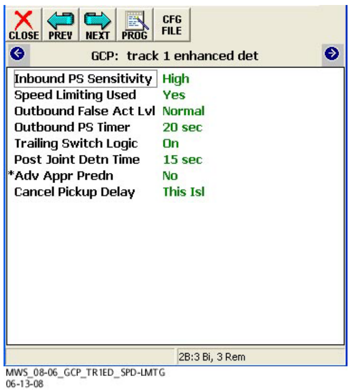


Figure 5-67:
Track N ED Speed Limiting Used

With MCF gcp-t6x-02-0.MCF or newer, an additional highly sensitive motion detection operation is now in use to detect inbound motion when trains first enter an approach. When this inbound train motion is detected, the GCP switches from computing of standard train speed to speed limiting train speed.

Poor shunting causes train speeds to vary erratically. Speed limiting stores the highest train speed detected. The system collects data every half second, storing the highest speed and allowing reductions that reflect train braking profiles.

If an inbound train stops in the approach, the GCP will revert back to standard speed detection until the train begins moving. Once inbound motion is detected, speed Limiting will go back into operation.

5.9.5 Adv Appr Predn (Default is No)

When selected to Yes these additional menu options are displayed:

- Adv Appr Predn Time: (Default is 20 sec) varies between 8 and 100 sec
- Adv Appr Predn Strt EZ: (default is 85) varies between 0 and 85
- Adv Appr Predn Stop EZ: (Default is 0) varies between 0 and 80

Advanced Approach Prediction (Adv Appr Predn) can be used to augment Speed Limiting in applications with poor shunting. Generally, this will be for locations with constant speed trains throughout the crossing's approach. In this application, Adv Appr Predn scales poor shunting increases in speed to a corresponding decrease in range distance measurement for inbound trains.

The combination of increased speed and decreased range distance has the general effect of increasing warning time.

In order to use the Adv Appr Predn feature, select the menu from No to Yes and use the default values for the three menu options shown above.

The AUTO mode for DAXes should generally be selected for most Adv Appr Predn applications.

NOTE

Adv Appr Predn is also used in a double crossover application. It provides continuous prediction capability while a train is passing through the dead zone of the crossover nearest the crossing See section 6.2.7 for details.

5.9.6 Outbound train movements

Poor shunting logic is always in operation for outbound trains. There are 3 menus items that are used to support that logic. All three are defaulted to in-operation. Only Trailing Switch Logic may be turned off.

5.9.6.1 Outbound False Act Lvl

There are three options available in the menu, Normal, Medium and High. It is template defaulted to NORMAL and only requires reprogramming if tail rings occur on straight through moves. To change the Normal setting:

- Select Normal and a parameter set window opens as shown in Figure 5-68.

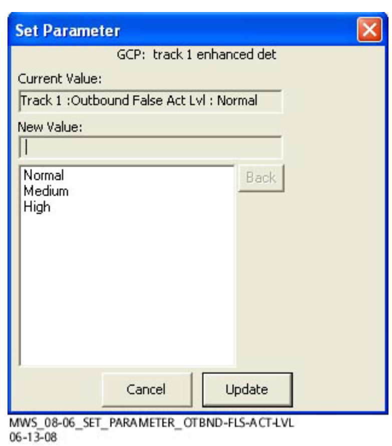


Figure 5-68:
Set Outbound False Act Lvl Parameter Window

When Normal, Medium or High is selected, each option progressively adds additional persistency test time to motion and Prediction to help insure a tail ring does not occur.

5.9.6.2 <u>Outbound PS Timer</u>

It is template defaulted to 20 seconds. The range is 10 to 120 seconds. It requires reprogramming only if tail rings occur aft.er an outbound train stops in the GCP approach and then continues outbound.

To change the time, select the time presently displayed and a Parameter Set window occurs as shown in Figure 5-69. Select the time required by use of the keyboard in the window.

Figure 5-69:
Set Outbound PS Timer Parameter Window

5.9.6.3 <u>Trailing Switch Logic</u>

It is defaulted to ON. It helps prevent tail rings due to poor shunting on trains that enter the GCP approach from a trailing switch and can be left. on for most applications.

To change the setting to Off, select On and a parameter set window occurs as shown in Figure 5-70 and select Off and then Update.

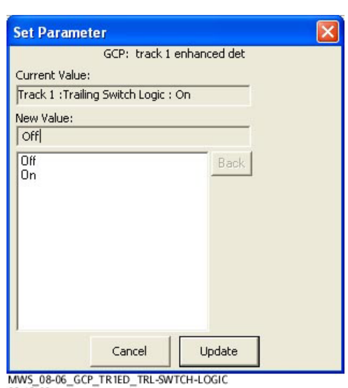


Figure 5-70:
Set Trailing Switch Logic Parameter Window

5.9.7 Low EZ Detection

Low EZ Detection is used to detect a significant reduction of EZ. The valid range of settings are No and Yes. The default value is No.

- The EZ signal may decrease for various reasons including a false shunt
- Low EZ detection occurs when the EZ level drops below the programmed EZ level threshold (default is 70) for a period of time exceeding the low EZ detection timer value.
- Once low EZ detection occurs and depending on user selection, the crossing is continuously activated or the GCP is changed to motion sensing operation until EZ rises 5 points above the EZ level threshold.

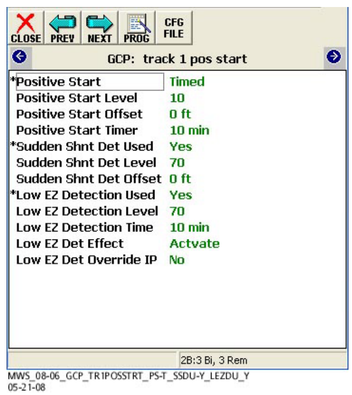


Figure 5-71:
Low EZ Detection Options

When Low EZ Detection Used is set to Yes, it provides four submenus as shown in Figure 5-71:

- Low EZ Detection Level – Valid range is an EZ between 50 and 80. Default setting is 70.
- Low EZ Detection Time – Valid range is between 2 and 99 minutes. Default setting is 10 minutes.
- Low EZ Detection Effect Default is Activate.
- Low EZ Detection Override IP. Default is No.

5.9.7.1 Low EZ Detection Level

- This sets the threshold level for low EZ detection. It is generally set at the default level of 70 for most applications.

5.9.7.2 Low EZ Detection Time

- The valid range of entry is between 2 and 99 minutes. The default is 10 minutes.
- The low EZ detection timer is generally programmed for a time interval longer than trains would normally remain in the GCP approach. In this example (Figure 5-71), time is set for 10 minutes.

5.9.7.3 Low EZ Detection Effect

The valid range of entries in the Low EZ Detection Effect menu is: **Activate**, **MS**, and **Act+MS**. The default setting is **Activate**.

When a low EZ condition is detected (low EZ Error occurs), the designer can choose one of the following effect options:

- When Activate is selected it activates the crossing(s) by de-energizing all predictors on the associated track.
- When MS is selected, predictors do not deenergize but the operating mode changes from predictor to motion sensor on the associated track..
- When Act + MS is selected it changes the operating mode from predictor to motion sensors but only if motion is being detected when the low EZ error occurs otherwise it activates the crossing(s) on the associated track.

5.9.7.4 Low EZ Detection Override IP

The valid range of entries in the Low EZ Detection Override IP are No and Yes. The default setting is **No**.

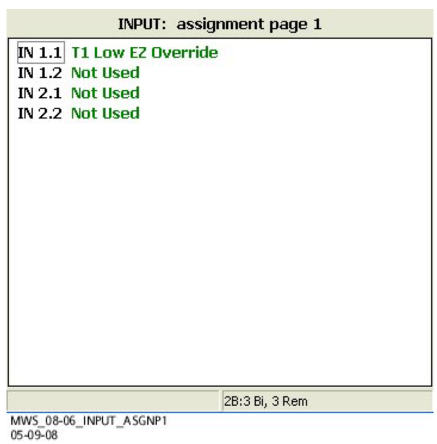


Figure 5-72:
Low EZ Override Assignment

An external input can be used by maintenance personnel to override a low EZ detection. When the input is energized, the low EZ timer is stopped. If a Low EZ condition already exists, it is overridden aft.er the error timer times out. When the input is deenergized, if EZ is below the low EZ threshold, the timer will restart the timing sequence. See Figure 5-72 for an example of assigning the external Override input.

5.9.8 Motion Sensing Control

When a train stops within an approach and then starts to move again, faster detection may be obtained by implementing motion sensor operation.

Adjustment of the Motion Sensing Level Control allows the train to be detected at a slower speed near the entering end of the GCP approach.

Each Motion Sensing setting is found on the **GCP: track N MS Control** window.

5.9.8.1 MS Sensitivity Level

This parameter has a range of 0 to 100 and a default setting of 0. In most general applications, the control is left. at 0.

Motion sensing sensitivity can be adjusted on each track using the MS Sensitivity Level field parameter as shown in Figure 5-73A and Figure 5-73B. Table 5-3 shows the variation in motion sensing detection relative to train speed at the far end of the approach.

As an example:

- A value of 0 provides motion sensitivity of approximately 30 mph at end of a 3000-foot approach and approximately 1 mph at the feed points.
- A value of 100 provides motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach.

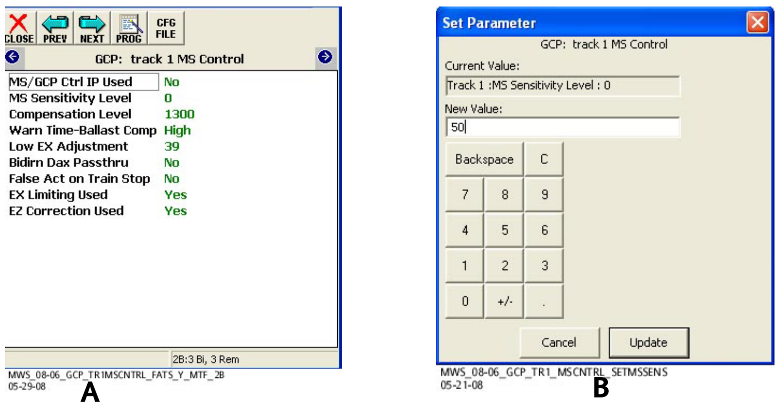


Figure 5-73:
A: Track 1 MS Control Window; B: MS Sensitivity Level Parameter Adjustment Window

Table 5-3:
MS Detection Threshold Relative to Sensitivity Level Setting for 3000 Foot Approach

MOTION SENSITIVITY LEVEL VALUE	MOTION SENSING DETECTION THRESHOLD IN MPH
0	30
50	15
80	6
100	1

In addition to the MS Sensitivity Level control already found on Figure 5-73A & B display windows, there are four additional new submenus. They are:

- Warn Time-Ballast Comp
- False Act on Train Stop
- EX Limiting Used
- EZ Correction Used.

5.9.8.2 Warn Time-Ballast Comp

The valid range of settings is: None, Low, Med, and High. The default is **High** for tracks with island and **Low** for tracks with no island.

This option provides additional compensation to warning time as ballast decreases.

5.9.8.3 False Act on Train Stop

The valid range of settings are No and Yes. The default setting is **No**.

This option diminishes the possibility of false activations of the crossing due to frequency interference when a train stops in the approach.

5.9.8.4 EX Limiting Used

This option is used to reduce the effect of bad bonds, couplers etc, (track conditions that cause EX to decrease instead of increase on inbound train). The valid range of settings are No and Yes. The default setting is **Yes**.

5.9.8.5 EZ Correction Used

The valid range of settings are No and Yes. The default setting is **Yes**.

With no trains present, this feature corrects any small drift. of EZ within + or – 10% of the nominal EZ of 100. Any drift. due to ballast changes will cause EZ to correct back to a nominal 100 from approximately 90 to 110. This will help maintain EZ consistently at 100 and diminish undesired field recalibration of the GCP.

The 10 correction steps occur in 1 minute intervals until the nominal EZ is obtained. One step is approximately 1 point of EZ. The correction is stopped by motion being detected, EZ < 85 or EZ > 115 or a system error.

At any time, the maintainer may view the number of steps of drift. by going to the Detailed Status View and observe the "EZ Steps:". The steps are shown as + or - 0 to 10. The + and - indicate the direction of correction. A + indicates a correction increase while a – indicates a decrease by the number of steps indicated.

The steps are reset to 0 whenever the track is GCP calibrated, EZ raises > 115, GCP is powered on or EZ Correction is programmed to No.

5.10 EXTERNAL CROSSING CONTROLLERS

An external crossing controller may be used with the Model 4000 GCP to replace the internal crossing controllers or to supplement the lamp current provided by the internal crossing controllers. An appropriate crossing controller such as the SSCCIII, SSCCIII Plus, or SSCCIV may be used.

5.10.1 External Crossing Controller or Relay Based Control

To accommodate an external crossing controller or relay based control the AND 1 XR signal of the Model 4000 GCP must be assigned to an external output as shown in Figure 5-74.

- The external output can be connected to an XR relay.
- The external output can be connected to the appropriate activation input of the crossing controller.

For more information, see Section 7, SSCC Application Programming Guidelines.

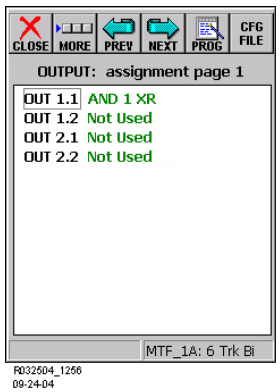


Figure 5-74:
Assigning Outputs For External Crossing Controller

5.10.2 External Crossing Controller for Additional Lamp Current

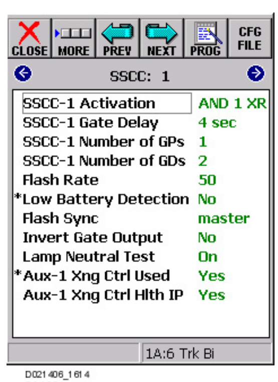


Figure 5-75:
SSCC Crossing Controller Configuration

Where the lamp current requirements of the crossing exceed the 40 amp combined capacity of the two internal crossing controller modules, an external controller may be used to provide supplemental lamp current. Either SSCC-1 or SSCC-2 may be used to activate the external controller (see Figure 5-78). The setup to enable activation by SSCC-1 is as follows:

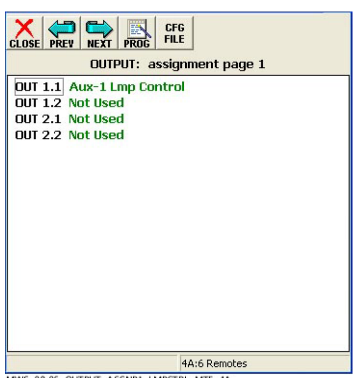
- Set the **Aux-(1) Xng Ctrl Used** entry of the SSCC to **Yes** and the **Aux-(1) Xng Ctrl Hlth IP** to **Yes** as shown in Figure 5-75.
- When the **Aux-(1) Xng Ctrl Used** entry is set to **Yes,** this enables two additional outputs, **AUX-1 Xing Control** and **AUX-1 LMP Control.**
- Assign **Aux-1 Lmp Control** to an output as shown in Figure 5-76A. Connect this output to the appropriate gate position input of the external crossing controller.
- Set an input to **Aux-1 Xng Ctrl Hlth** as shown in Figure 5-76B. Connect this input to the gate output of the external SSCC.

Sync the lamps on the external controller by:

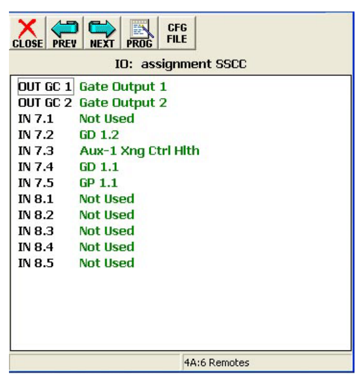
- Connecting the **Flash Sync** output from the Model 4000 GCP CPU connector to the external SSCC's **Flash Sync** input.
- Configuring the external unit as a Flash Sync Slave to receive the Flash **Sync** input.

NOTE

The **Aux-1 Lmp Control** output de-energizes whenever the lamps on SSCC-1 flash, either due to activation, gate position or SSCC health. If the external controller fails, its gate output will de-energize, causing the Aux-1 Xng Ctrl Hlth to de-energize and the internal crossing controllers to activate.



MWS_08-06_OUTPUT_ASGNP1_LMPCTRL_MTF_4A
06-13-08
A



MWS_08-06_IO_ASGN_SSCC_MTF4A
06-13-08
B

Figure 5-76:
SSCC Supplemental Crossing Controller IO Assignment

Connect the flash sync output of the GCP to the flash sync I/O of the external crossing controller as follows:

- Connect the **FLASH SYNC +** output of the GCP chassis to the **FLASH SYNC I/O** on the external crossing controller.
- Connect the **FLASH SYNC -** output of the GCP to **N** of the external crossing controller. (The power returns for the GCP and the external crossing controller do not have to be connected.)
- When used, connect **MAINT CALL** of the GCP with **MAINT CALL** of the external crossing controller as described in paragraph 5.11.

NOTE

SSCC3i Modules Rev D and later have an isolated flash sync output.

Where battery isolation must be maintained and SSCC3i Modules of Rev C or earlier are used, contact Siemens Technical Support for application information.

5.11 MAINTENANCE CALL OUTPUT

The maintenance call output may be controlled by the Model 4000 GCP, an external SSCC, or other equipment at the crossing via an input.

5.11.1 Internal Deactivation

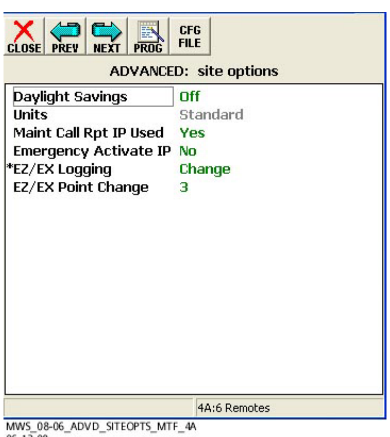
The maintenance call output is deactivated by the Model 4000 GCP if:

- An unhealthy state is detected within either SSCC Module
- The battery on the crossing controllers is low
- The CPU detects a low battery condition
- The SEAR detects that POK (power off indicator) is low

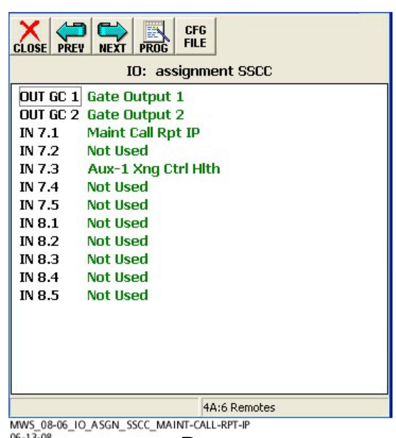
User specific SEAR application program can have special provisions

5.11.2 Deactivation by an External SSCC

The maintenance call output may be programmed to respond to the maintenance call output of an external SSCC. To do this:



A



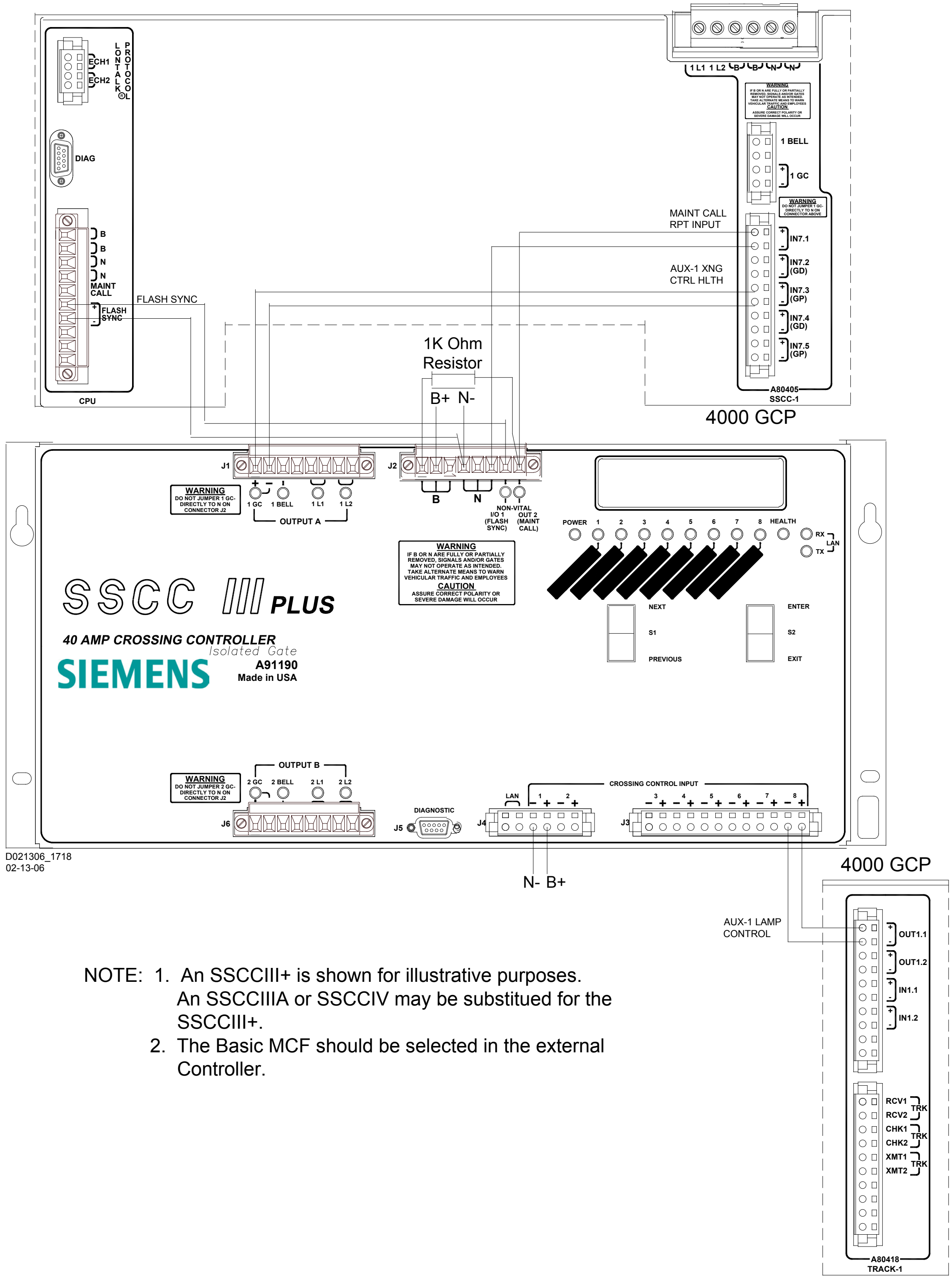
B

Figure 5-77:
External Maintenance Call Input Configuration and Assignment

- Configure **Maint Call Rpt IP Used** to **Yes** as shown in Figure 5-77A.
- Configure **Aux-(1) Xng Ctrl Used** entry of the SSCC to **Yes** as shown in Figure 5-75

- Assign **Aux-1 Lmp Control** to an output as shown in Figure 5-76A.
- Connect this output to the **CROSSING CONTROL INPUT** of the external crossing controller as shown in Figure 5-78.
- Assign **Maint Call Rpt IP** to the **IN 7.1** SSCC input as shown in Figure 5-77B.
- Connect this input to the **MAINT CALL** output of the external crossing controller as shown in Figure 5-78.
- Assign **AUX-1 Xng Ctrl Hlth** to the **IN 7.3** SSCC input as shown in Figure 5-77B.
- Connect this input to the **1 GC** output of the external crossing controller as shown in Figure 5-78.
- Connect the **FLASH SYNC** output of the GCP to the **FLASH SYNC I/O** of the external crossing controller as shown in Figure 5-78.

With this configuration the state of the external equipment is reflected in the maintenance call output of the Model 4000 GCP.



NOTE: 1. An SSCCIII+ is shown for illustrative purposes. An SSCCIIIA or SSCCIV may be substitued for the SSCCIII+.
2. The Basic MCF should be selected in the external Controller.

Figure 5-78:
Connection Between Model 4000 GCP and External SSCC For Additional Lamp Load

5.12 TAKING TRACKS "OUT OF SERVICE"

WARNING

THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A TRACK CIRCUIT OUT OF SERVICE SHALL BE FOLLOWED. THE INSTRUCTIONS IN THIS SECTION MAY BE FOLLOWED ONLY IF ALLOWED BY THE RAILROAD.

REQUIRED OPERATIONAL TESTS SHALL BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES WHEN RESTORING TRACKS TO SERVICE.

THE RAILROAD PROCEDURES FOR APPLYING TEMPORARY JUMPERS MUST BE FOLLOWED WHEN ENERGIZING THE "OUT OF SERVICE" INPUT(S).

NOTE

If one or more tracks are taken out of service, the Out of Service Timeout covers all tracks taken out of service with one time interval.

If the timer is running for one or more tracks out of service, and it is desired to take another track out of service for an added amount of time, do the following:

- Return all tracks to service.
- Edit the Out of Service Timeout to the new value.
- Take the tracks out of service.

If the Transfer Module transfers while a track is out of service, the track will be returned to service and may activate the warning devices.

There are four Out Of Service (OOS) programming options for taking a track out of service. Each option provides unique OOS operation requirements. The options vary in the number of steps necessary to take a track out of service as well as the degree to which the GCP functionality is taken out of service.

5.12.1 Out Of Service (OOS) Options

The four programming options are:

- Display
- Display +OOS IP (Display plus Out of Service Input)
- OOS IP (Out of Service Input only)
- 4000 Case OOS IP (4000 Case Out of Service Input only).

The last three options require the addition of user programmed Out of Service input(s) with 12 VDC applied for OOS operation to be effective. All Templates default to the Display option

To view or change the current OOS programming option:

- Select the **PROG** button
- Then select **ADVANCED programming** (Figure 5-79A)
- Then select **Out Of Service** (Figure 5-79B).

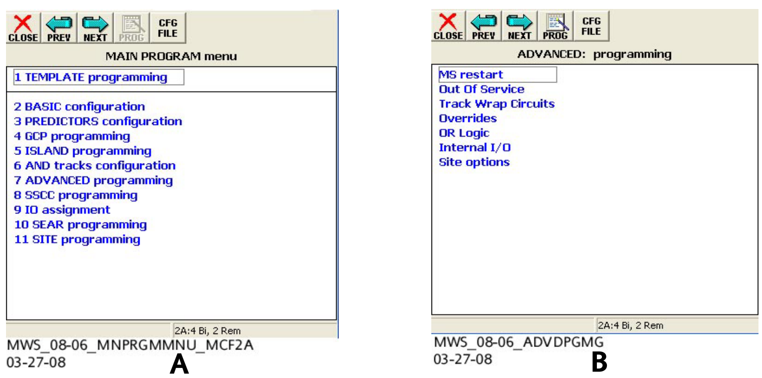


Figure 5-79:
Out Of Service Programming Access Screens

A screen similar to that shown in Figure 5-80A appears. To change the OOS programming option, select the green text field to the right of **OOS Control**. The screen in Figure 5-80B appears. Select the appropriate OOS programming option followed by the **Update** button.

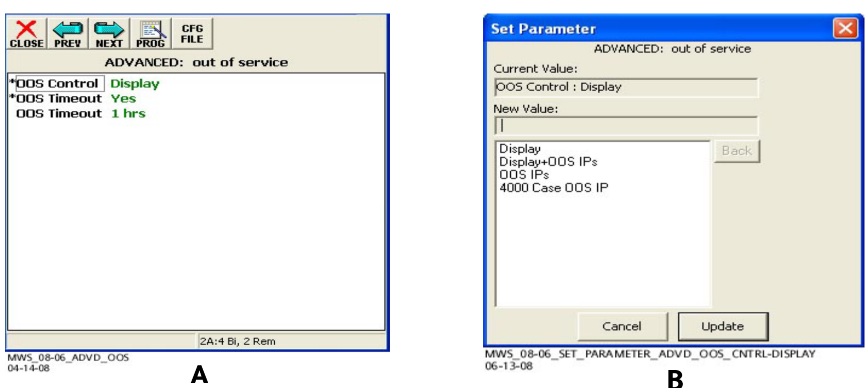


Figure 5-80:
Viewing and Changing the OOS Programming Option

NOTE

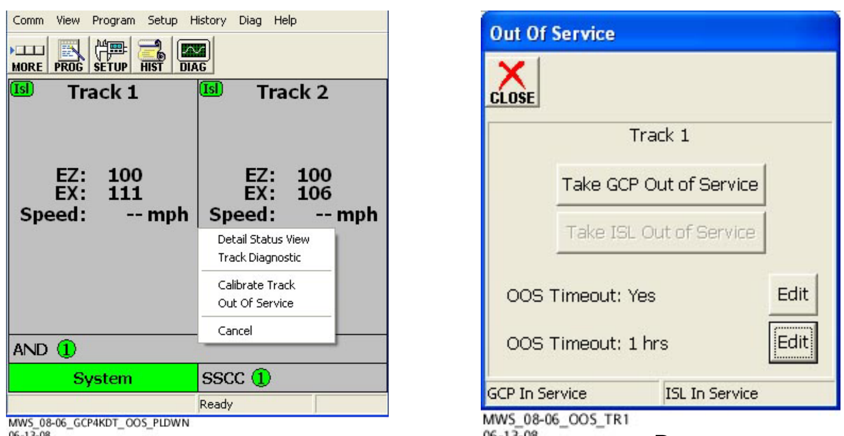
When **Display** or **Display+OOS IP** option is selected, an optional timeout feature becomes available, which can automatically place an OOS track back into service aft.er a user configurable timer runs out.

5.12.1.1 Display" Option

To take a track Out of Service when using the "Display" option:

- Select the track on the Main Status Screen (Figure 5-81A),
- Select **Out of Service** from pop-up menu.

The OOS display that appears provides buttons that enable the track and the island to be taken out of service separately (Figure 5-81B). The user is prompted to be sure that the track/island is to be taken out of service.



A B

Figure 5-81:
Taking A Track Out of Service – Display Option

5.12.1.2 "Display" Timeout Option

As shown in Figure 5-80A and Figure 5-81B, the **Display** OOS programming option includes an **OOS Timeout** feature. The **OOS Timeout** feature will automatically place the OOS track back in service when an OOS timer runs out. Timer function stops when the track is manually placed back into service from the OOS screen (Figure 5-81B) or the **OOS Timeout** timer runs out.

To be used, the **OOS Timeout** feature must be selected **Yes** and time set prior to taking a track OOS. If the **OOS Timeout** feature is not to be used, it must be selected **No** and the timer function disabled. This feature can be enabled and the associated timer can be programmed from either of two screens:

- From the OOS display (Figure 5-81B),
- From the **ADVANCED: out of service** screen (Figure 5-80A).

The **OOS Timeout** options are **Yes** and **No.** This enables or disables the timeout feature. The default setting is **Yes.** The **OOS Timeout** timer feature sets a time ranging from 1 hour to 23 hours in 1-hour increments. While a track is OOS, the **OOS Timeout** timer duration cannot be changed. The default setting is **1 hr**.

When more than one track is taken out of service, the OOS time interval begins when the first track is taken out of service.

5.12.1.2.1 Main Status Screen Indications When A Track Is Out Of Service

On the Main Status Screen, the track status area of OOS tracks continuously flashes dark gray and blue with either **GCP** (Figure 5-82A & B) or **GCP-ISL** (Figure 5-82C & D) **Out Of Service** is indicated.

5.12.1.2.2 Display Out Of Service Operation Explained

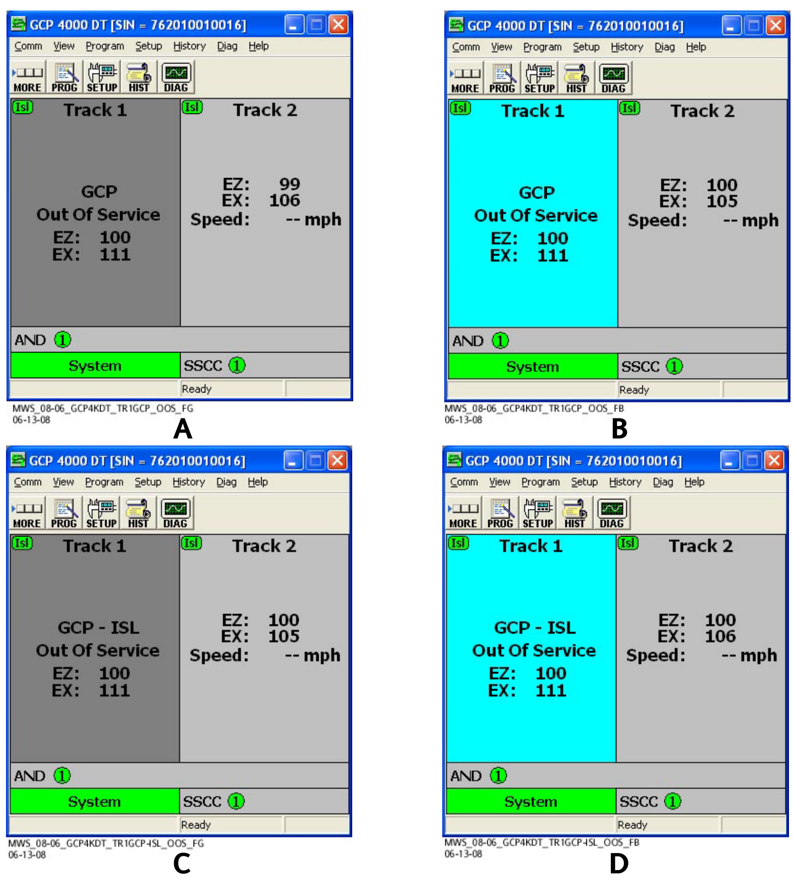


Figure 5-82:
OOS Track Status Indications on Main Status Screen

This parameter requires no physical OOS input. Each track is taken OOS one at a time by the user. When more than one track is taken out of service, and the timer feature is used, the OOS time interval begins when the first track is taken out of service. User can select GCP or GCP and ISLAND out of service.

When a track is out of service, the display will remain ON and not go into the sleep mode. The track module predictor outputs remain energized (no crossing activation). Module predictor LEDs and island LED remain ON during train movements. Predictor inputs are ignored (such as UAX, DAX Enables). Most OOS Track module failures and all corresponding rail failures are ignored. Failures are displayed on the Main Status Screen as a red SYSTEM bar. OOS tracks do not turn red when in failure. Failure types and causes can be reviewed by selecting the DIAG button. The Island is ignored when island is selected OOS. Maintenance call light is turned off. Status log shows OOS EZ changes, EX and train speeds on train moves but no predictors deenergize or display warning times.

If 4000 switches over between MAIN and STANDBY modules, OOS tracks will be placed in-service and will remain in-service until user selects tracks OOS again.

WARNING

AT CROSSINGS USING SSCC MEF XNG01_2.MEF AND EARLIER, GATES WILL BEGIN TO LOWER IMMEDIATELY (WITHOUT GATE DELAY TIME) WHEN THE TRANSFER SWITCH IS USED TO SWAP BETWEEN HEALTHY UNITS. USE CAUTION WHEN TRANSFERRING CONTROL TO AVOID GATES HITTING VEHICLES OR PEDESTRIANS.

NOTE

If Emergency Activation (EA) is programmed ON and its physical input is de-energized, OOS tracks will be returned to service and will remain in-service until user selects tracks OOS again.

User can select a track back into service from the same display screen used to take a track OOS (see Figure 5-81B). No change to XR wiring on the 4000 case is required when taking a track OOS. The crossing will activate if

- AND Enable is programmed ON and the input is de-energized.
- Advanced Preempt logic is ON and Adv Preempt IP input is deenergized.

NOTE

When a GCP is OOS but the island remains in service, the crossing will activate when the island is occupied.

5.12.1.3 "Display+OOS IP" (Display Plus Out Of Service Input)

This OOS programming option (Figure 5-83A) operates identical to the **Display** programming option described above with the additional requirements and features described in the following paragraphs.

WARNING

INPUTS FOR "OUT OF SERVICE" SHOULD BE WIRED IN A PERMANENT MANNER IN ACCORDANCE WITH CIRCUIT PLANS.

DO NOT USE TEST TERMINALS OR SWITCHES THAT CAN VIBRATE CLOSED TO ENERGIZE OOS INPUTS.

5.12.1.3.1 "Display+OOS IP" Out Of Service Operation Explained

This parameter requires a physical input to be programmed to OOS. The input must be energized before a track can be taken OOS from the OOS screen (Figure 5-81B). Maintenance call light is turned off when:

- any track is out of service
- OOS input is energized, even if no tracks are OOS.

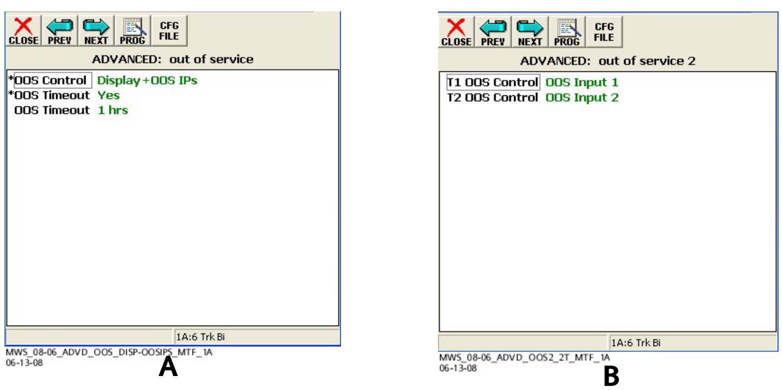


Figure 5-83:
Display + OOS IP Programming Option Screens

5.12.1.3.2 Additional Programming Option

With the **Display+OOS IP** programming option selected (Figure 5-83A), use the **NEXT** button at the top of the screen to display the **ADVANCED: out of service 2** screen. This screen is used to assign an independent OOS control input per track (Figure 5-83B), or to assign one physical input for OOS control of grouped (multiple) tracks (Figure 5-84).

Grouped tracks on a single OOS input are still taken out of service one at a time.

The template default for **Display+OOS IP** grouping of tracks is a unique OOS input number assigned for each track.

Two examples of group OOS Control are shown in Figure 5-84 for three tracks with unidirectional pairs of GCPs.

- Figure 5-84A shows all six GCPs grouped to be taken out of service with one OOS input. All are assigned to Out of Service Input 1.
- Figure 5-84B shows three groups with two GCP tracks in each group. Each group is assigned a separate OOS input number.

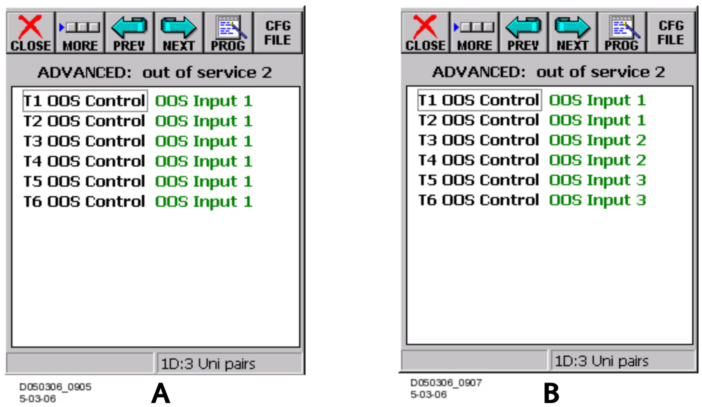


Figure 5-84:
OOS Control Input Grouping Options

5.12.1.3.3 When A Track Is Out Of Service

Display will remain ON and will not go into the sleep mode. OOS tracks on Main Status Screen continuously flash dark gray to blue as indicated above. De-energizing an OOS physical input places all tracks controlled by that input back into service and they will remain in service until the user selects the tracks OOS again. When OOS timer is used, it will automatically place all tracks controlled by that physical input back into service when the timer runs out. Tracks will remain in service until the user selects the tracks OOS again. When more than one track is taken out of service, and the timeout option is used, the OOS time interval begins when the first track is taken out of service.

5.12.1.3.4 When a Track Is Never to be taken Out Of Service

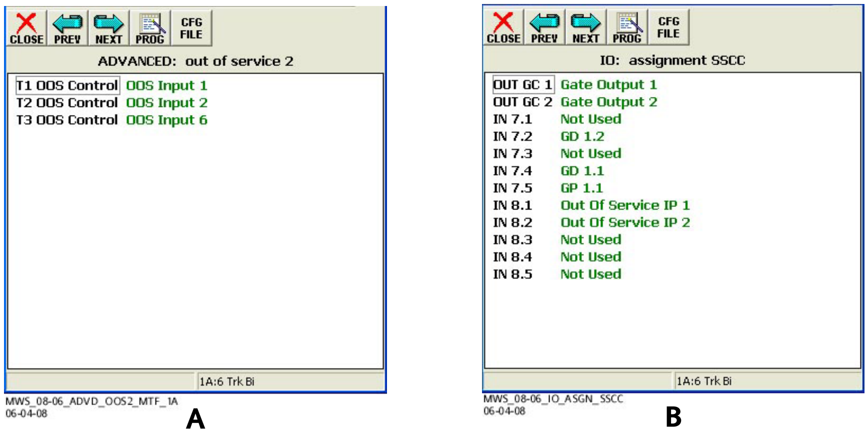


Figure 5-85:
Setting a Track to Never be Taken OOS (MCF gcp_t6x_01_2.MCF and earlier)

In applications where it is not desired to take a track OOS by any input, such as the Track Module only predicts for an adjacent street, the following procedures may be used:

MCF GCP_T6X_01_2.MCF AND EARLIER:

- In this example it is not desired to take track 3 OOS. Assign track 3 an OOS Control such as OOS Input 6 (see Figure 5-85A), but do not map OOS Input 6 to a physical input on the Input Assignment screen (see Figure 5-85B).

MCF GCP_T6X_02_0.MCF AND LATER:

- Assign T3 OOS Control to None.

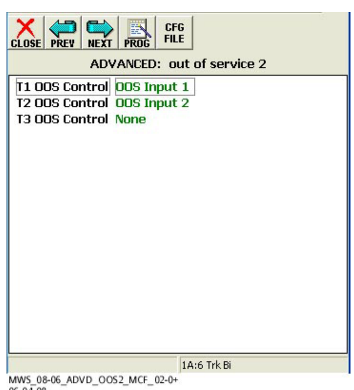


Figure 5-86:
Setting a Track to Never be Taken OOS (MCF gcp_t6x_02_0.MCF and later)

5.12.1.4 “OOS IP” Option (Out Of Service Input Option)

The Out of Service Input (**OOS IP**) option uses only an input to take a track or groups of tracks out of service. **OOS IP** is pre-programmed and thus programmed tracks are taken OOS by energizing a corresponding physical input. The display screen is not used with the **OOS IP** option.

WARNING

INPUTS FOR “OUT OF SERVICE” SHOULD BE WIRED IN A PERMANENT MANNER IN ACCORDANCE WITH CIRCUIT PLANS.

DO NOT USE TEST TERMINALS OR SWITCHES THAT CAN VIBRATE CLOSED TO ENERGIZE OOS INPUTS.

5.12.1.4.1 Additional Programming Option

With the **OOS IP** programming option selected (Figure 5-87A), use the **NEXT** button at the top of the screen to display the **ADVANCED: out of service 2** screen. This screen can be used to:

- Assign an independent OOS control input per track (Figure 5-83B),
- Assign one physical input for OOS control of multiple tracks (groups) (Figure 5-84). Grouped tracks controlled by a single OOS input are all taken out of service once the corresponding physical input is energized.
- Select each track for either **GCP Only** or **GCP and Island** OOS operation.

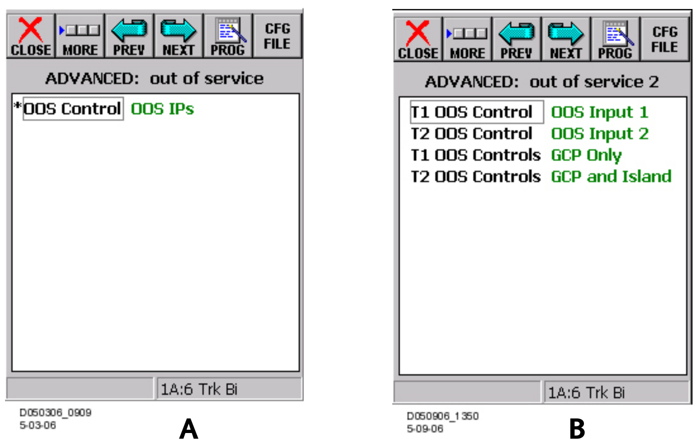


Figure 5-87:
OOS IP Programming Option Screens

5.12.1.4.2 Pre-programmed Tracks Out Of Service Operation

Pre-programmed groups or individual tracks are taken OOS by energizing the corresponding OOS physical input. Pre-programmed OOS tracks also follow selection of **GCP Only** or **GCP and Island** OOS programming.

5.12.1.4.3 Additional Differences in OOS Operation

If Model 4000 GCP switches over between MAIN and STANDBY, any OOS track will continue OOS once the 4000 has completed switchover and modules have booted.

NOTE

If Emergency Activation (EA) is programmed ON and its physical input is de-energized, OOS tracks will be returned to service. Once the EA input is energized, tracks previously OOS will return to OOS.

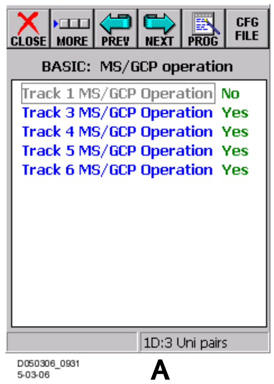
Deenergizing an OOS physical input causes tracks controlled by that input to be placed back into service. If input is re-energized, corresponding tracks will return to OOS. The template default for **OOS IP** is:

- unique OOS input assigned for each track
- **GCP and Island** selected for each track or **GCP Only** if no island is used on the track
    - Figure 5-88 shows an example of Island Only configuration.
    - Figure 5-88A shows **Track 1 MS/GCP Operation** set to **No**
    - Figure 5-88B shows **T1 OOS Controls** set to **Island Only**

The **Island Only** option is only available when MS/GCP operation is set to **No**. The OOS Input mode controls follow the Template layout for GCP or GCP + Island. If the template indicates the GCP has the island, **GCP and Island** will be an available selection. If the template indicates the GCP does not have an island, only the **GCP Only** selection will be available. No timeout option is available

5.12.1.4.4 When a Track Is Out Of Service

Display will remain ON and will not go into the sleep mode. OOS track status areas on Main Status Screen continuously flash dark gray to blue while displaying either **GCP** or **GCP-ISL Out Of Service.** All track module predictor outputs remain energized. Predictor inputs are ignored (such as UAX, DAX Enables).



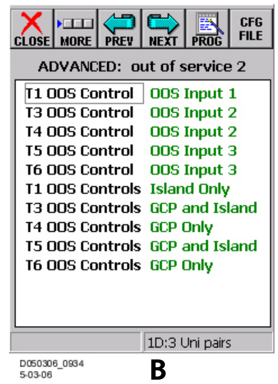


Figure 5-88:
Example of Island Only OOS Configuration Programming

OOS track module failures and corresponding rail failures are ignored. Any failures are indicated on the Main Status Screen by a red colored system bar. The track status area for OOS track modules does not turn red when a module is in failure. Failure types and causes can be diagnosed by selecting the **DIAG** button at the top of the Main Status screen. The Island output is ignored when island is selected OOS. The display will remain ON and will not go to sleep. The Maintenance Call light is turned off. No change of XR wiring to the 4000 case is required when taking a track OOS. The crossing will activate if:

- AND Enable is programmed on and the input is de-energized
- Advanced Preempt logic is ON and Adv Preempt IP input is de-energized

NOTE

When a GCP is OOS but the island remains in service, the crossing is activated when the island is occupied.

5.12.1.4.5 Additional Design Considerations

The designer needs to be careful when considering how things are taken out of service and how the system responds to inputs. The following are some examples:

- If a shunt enhancer panel health input is brought into **T1 Prime UAX,** then taking T1 OOS will also disable the health input, which may or may not be intended.
- Bringing **AND 1 XR Enable** into a Track Module input would still operate as intended when the track module is OOS. However; if the intent was to remove a defective card while it was OOS, the crossing devices will be activated when the module is removed.

If no Out of Service option is wanted for the entire crossing or not wanted on selected tracks, the following may be implemented (in this example T1, T2, T3 and T4 will be allowed to be taken OOS. Track 5 and T6 cannot be taken OOS):

- Select the OOS Input feature for all tracks (Figure 5-89A).

- Assign inputs to only the OOS Inputs that are allowed to be taken out of service (Figure 5-89B).
- T1 and T2 are taken OOS by **IN 1.1**
- T3 and T4 are taken OOS by **IN 1.2**
- OOS Input 3 is not assigned to a physical input and cannot be activated.

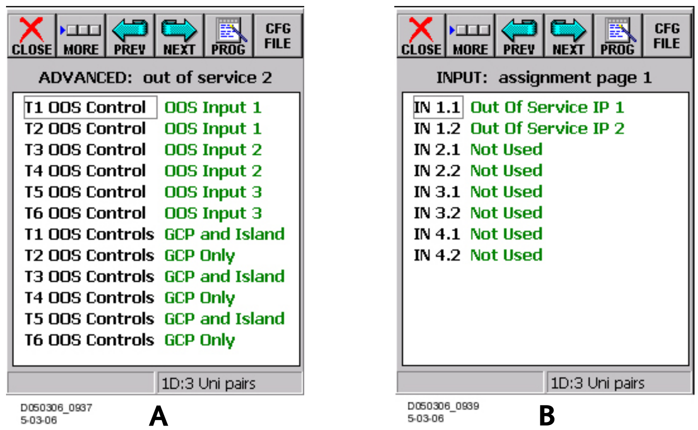


Figure 5-89:
Example: Preventing T5 and T6 From Being Taken OOS

5.12.1.5 <u>"4000 CASE OOS IP" Option</u>

This option takes all track modules and the 4000 case OOS when the **4000 CASE OOS IP** input is energized.

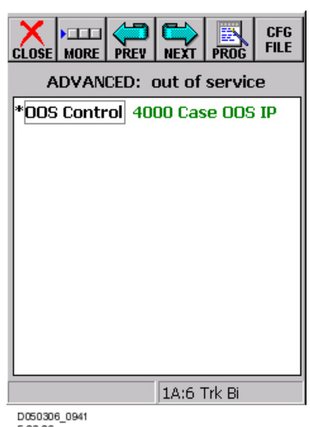


Figure 5-90:
4000 Case OOS IP Programming Option Screen

5.12.1.5.1 Out Of Service Operation

Requires one physical input to be programmed and energized to take all track modules, all ANDs and the Model 4000 GCP case out of service. All track status areas on Main Status Screen continuously flash dark gray to blue while indicating either **GCP** or **GCP-ISL Out Of Service**. All AND outputs on Main Status Screen are energized and the AND function status bar flashes blue. Display will remain ON and will not go into the sleep mode. All GCP and island outputs on all track modules are energized. All GCP inputs including AND Enables are ignored. All Advanced preemption inputs are ignored. The Maintenance Call light is turned off.

5.12.1.5.2 Additional Differences in OOS Operation

If 4000 is switched over between MAIN and STANDBY, all OOS tracks will continue OOS once the 4000 has completed switch-over and modules have booted. No timeout option is available

NOTE

If Emergency Activation (EA) is programmed ON and its physical input is de-energized, all tracks will be returned to service with outputs deenergized. Once the EA input is energized, tracks previously OOS will return to OOS.

5.12.1.5.3 Additional Design Considerations

If no Out of Service option is wanted for the entire crossing, the following may be implemented. Select the **4000 Case OOS IP** programming option (Figure 5-91A). Do NOT assign inputs to the **4000 Case OOS IP** (Figure 5-91B and C). Ensure that **Not Used** is selected rather than **4000 Case OOS IP.**

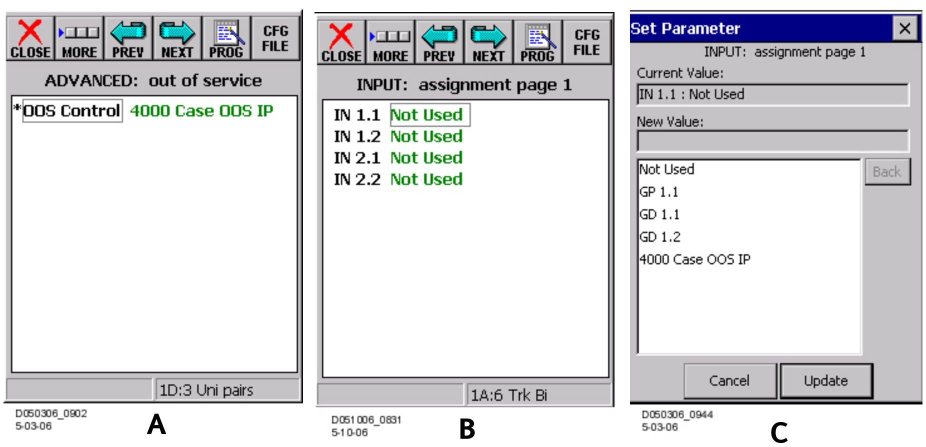


Figure 5-91:
Example: Preventing Any Track From Being Taken OOS

5.13 CUT OVER PHASING BETWEEN OLD AND NEW INSTRUMENT HOUSING

In certain situations upgrading a crossing warning system, it is desired to cutover the crossing train detection circuits separately from the crossing controls and warning devices.

5.13.1 Cutting over the new signals working on the existing train detection.

In this situation, an input from the existing XR circuit will be needed to activate the SSCC3i in the new house, which ignores the GCP 4000 track circuits.

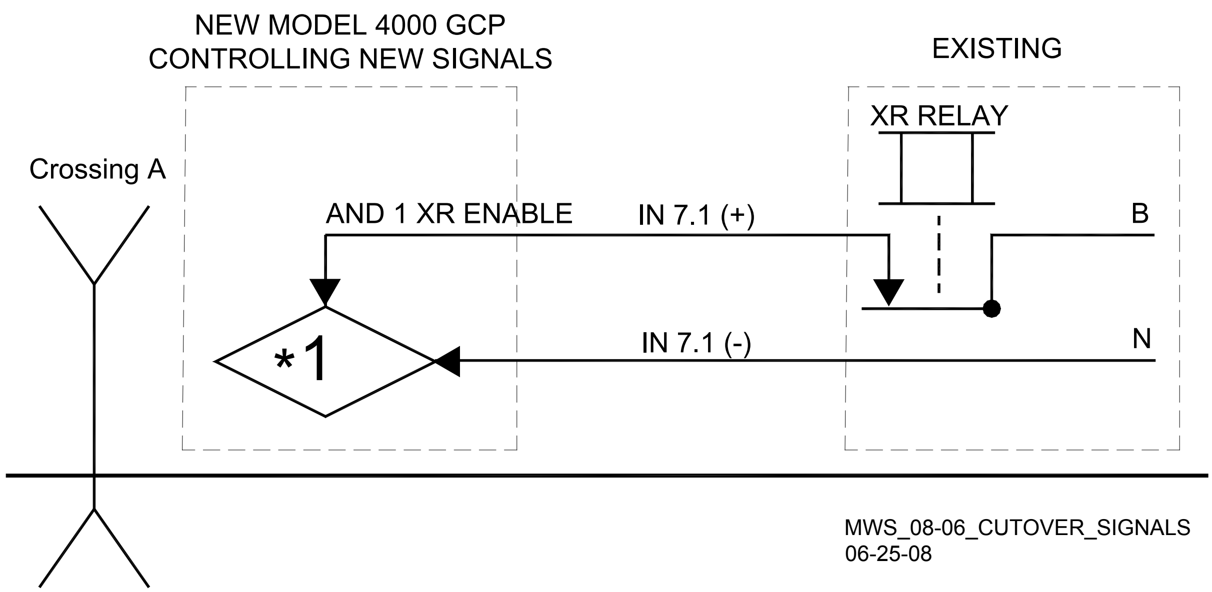


Figure 5-92:
New Warning Devices and SSCCIIi
Controlled by Existing Train Detection

In the Basic: Module Configuration screen set the Track modules to Not Used (see Figure 5-93).

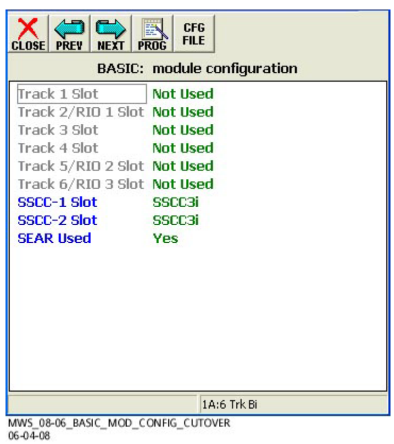


Figure 5-93:
Basic Module Configuration During Cutover (Train Detection)

In the AND: AND 1 XR screen set the AND 1 XR Enable Used to YES. The AND 1 Enable Pickup may be changed in accordance with the existing design (see Figure 5-94).

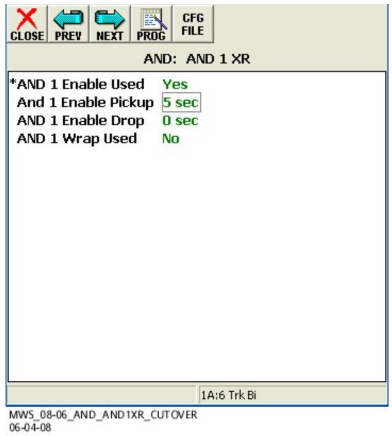


Figure 5-94:
AND 1 XR Configuration During Cutover (Train Detection)

In the IO: Assignment SSCC set an input to AND 1 XR Enable. Connect a contact of the existing XR relay to that input (see Figure 5-95).

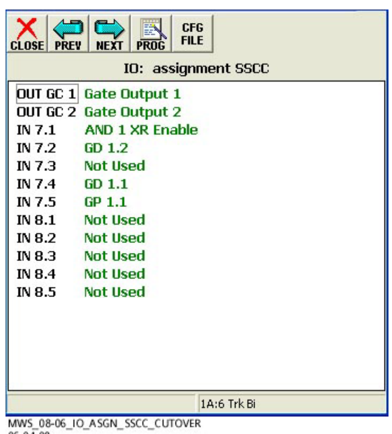


Figure 5-95:
I/O SSCC Assignment During Cutover (Train Detection)

5.13.2 Cutting over the new GCP track circuits controlling the existing warning devices

In this situation, an output from the new 4000 GCP is needed to control the existing XR circuit.

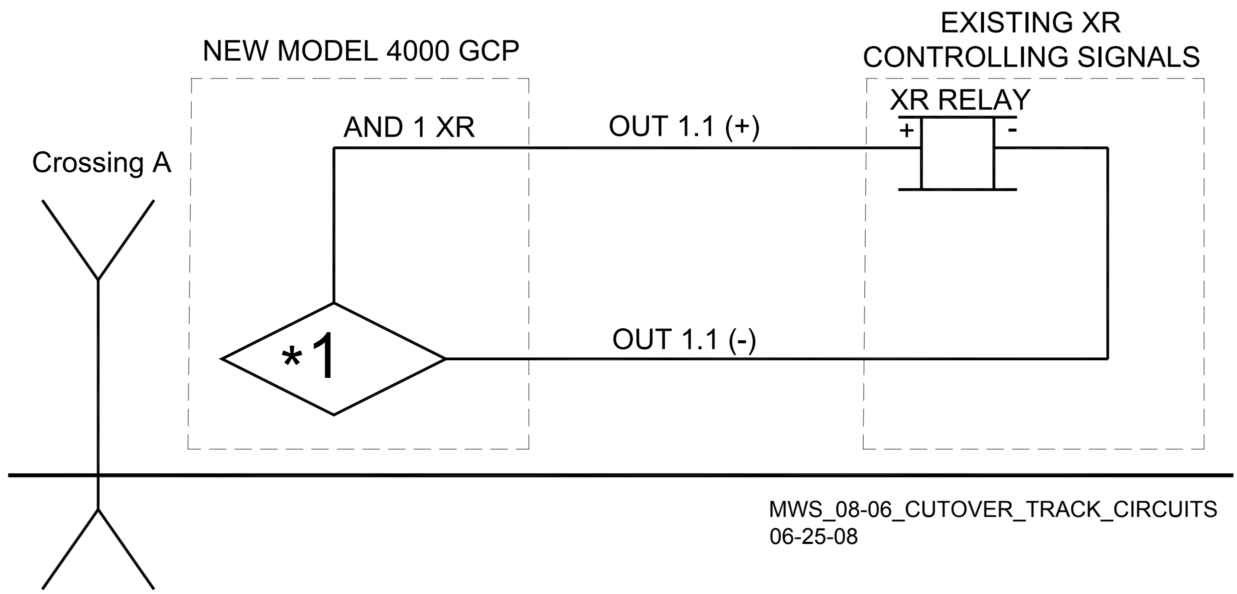


Figure 5-96:
New Model 4000 GCP Track Circuits
Controlling Existing Warning Devices

In the Basic: Module Configuration screen set the SSCC-'n' modules to Not Used (see Figure 5-97A and Figure 5-97B).

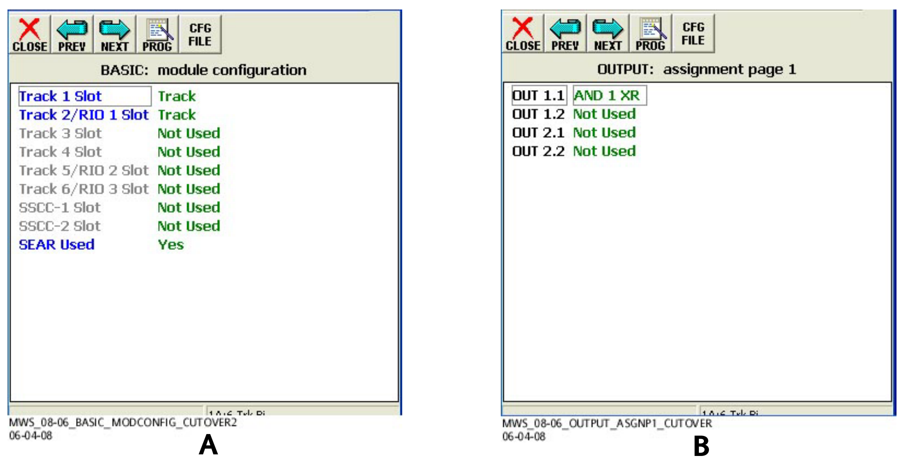


Figure 5-97:
Device Configuration During Cutover: A: Modules and B: Output Assignments

In the OUTPUT: assignment page 1, set an output to AND 1 XR. Connect the existing XR relay to that output.

SECTION 6 –
ADVANCED APPLICATION PROGRAMMING

6.1 ANDING TRACK PREDICTORS

Track predictors may be combined using AND functions to provide control of local and adjacent crossings.

6.1.1 ANDing Track Predictors Outputs

The Model 4000 GCP system can include up to 6 track modules. Program assignments determine which Track Module predictors are combined using AND functions. To reduce DAX cabling between crossings, the Model 4000 GCP can be configured to AND different track predictors internally to a physical output, instead of using external AND gates or relays. The Model 4000 GCP provides eight configurable AND functions:

- AND 1 XR
- AND 2 through AND 8.

The AND 1 XR function controls the local crossing. It is equivalent to the XR relay. If the Model 4000 GCP contains SSCC3i modules, AND 1 XR is the internal function that activates the crossing. It is usually not necessary to provide a XR relay drive output from the 4000 system. (For more information, see Appendix B, SSCC3i Programming Guides).

The SSCC3i modules are used to directly control the crossing gates, lights and bells

The selected template automatically configures which track prime predictors are ANDed in AND 1 XR. The track module numbers must exactly follow those specified in the template. For more information about templates, refer to Section 4, Template Overview and Guidelines.

6.1.2 ANDing Predictor Primes

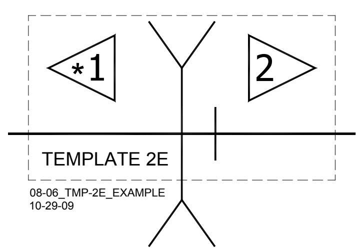


Figure 6-1:
Back-to-Back Unidirectional GCP Pair at A Crossing

The follow examples show how two AND Prime predictors to control the crossing.

6.1.2.1 <u>Example 1: Crossing Activated By All Track Modules</u>

The prime predictor from any Track Module activates the crossing.

The AND 1 XR setup is shown in Figure 6-2 and the corresponding track configuration is shown in Figure 6-3.

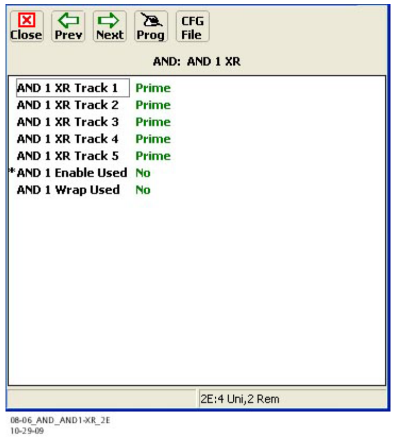


Figure 6-2:
AND 1 XR Configuration for Figure 6-1 Circuits

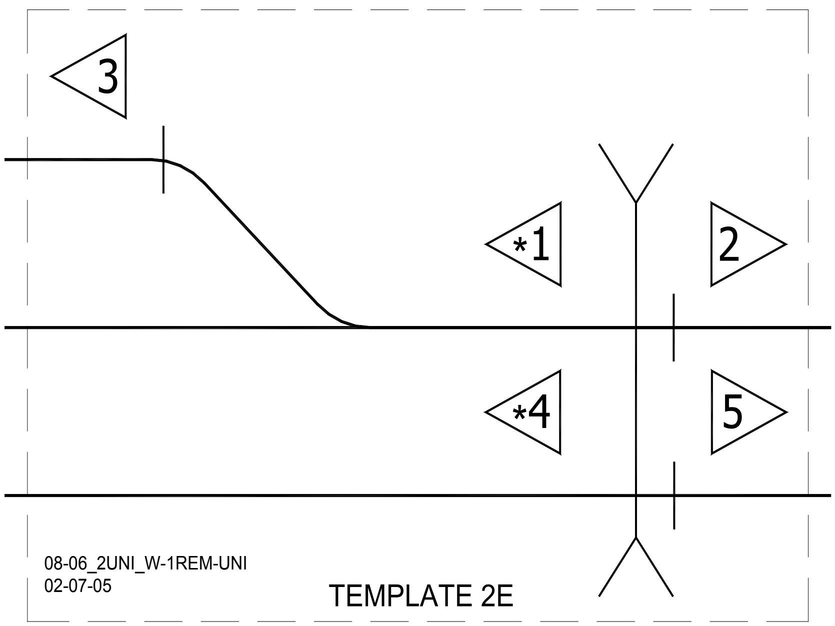


Figure 6-3:
Two Unidirectional Pairs at Crossing with Single Remote Unidirectional

Track Modules that are not used, such as track 6 in this example, do not bring down AND 1XR and are excluded from the AND equation. Track Modules that are turned on are automatically included in the AND 1 XR equation.

6.1.2.2 Example 2: Local and Remote Track Modules Predicting for the Same Crossing

In Figure 6-4, the track wires for track 2 and track 6 are six wired to the remote insulated joints and track 4 is programmed as not used.

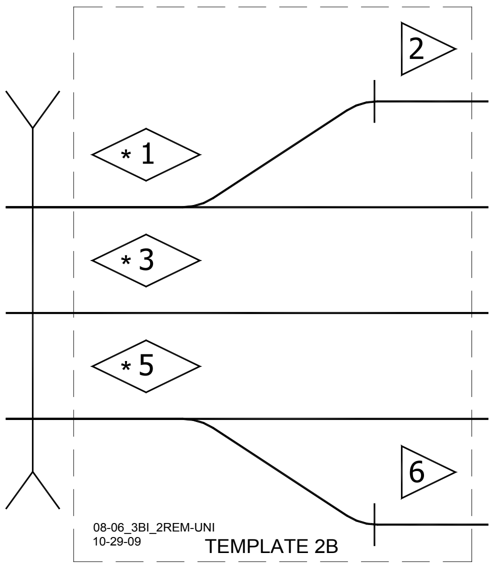


Figure 6-4:
Three Bidirectional at Crossing with Two Remote Unidirectional

Crossing control is implemented by ANDing the prime predictors of tracks 1, 3, and 5; ANDing the prime offset predictors from tracks 2 and 6; setting track 2 and 6 prime predictors to the correct offset distances (ANDing of the prime predictors from all 5 active tracks is shown in Figure 6-5).

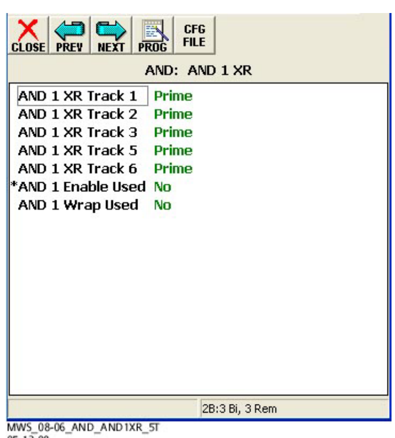


Figure 6-5:
AND 1 XR Configuration For Figure 6-4

NOTE

When remote tracks are combined with tracks at the crossing out of the same Model 4000 GCP case, the convention is to use the prime predictors of the remote Track Modules to control the local crossing, programmed with offsets, and DAX predictors are used to control adjacent crossings in a different 4000 case.

6.1.2.3 Example 3: Local and Remote Track Modules Predicting For Local and Adjacent Crossings

In Figure 6-6, **track 1**, **2** and **4** are ANDed to control the local crossing. Track 3 is excluded from the AND equation and controls a different (adjacent) crossing

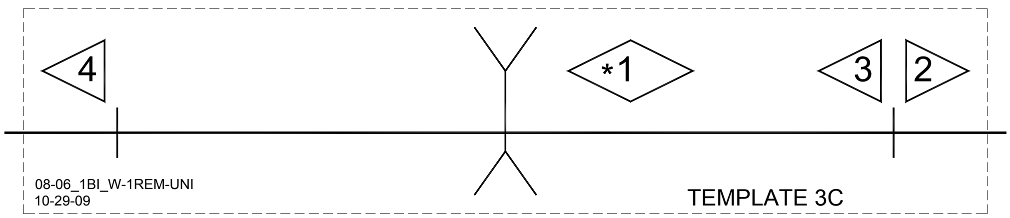


Figure 6-6:
Single Bidirectional at Crossing with Remote Unidirectional

This configuration is implemented by changing **AND 1 XR Track 3** to **Not Used** as shown in Figure 6-7.

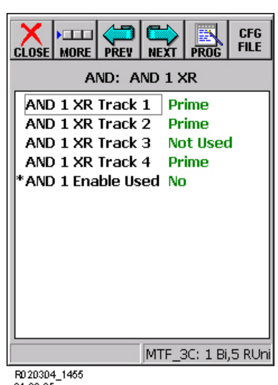


Figure 6-7:
AND 1 XR Configuration with Track 3 Set To Not Used

6.1.3 DAX ANDing

The following examples show how DAX predictors of the same case can be ANDed.

6.1.3.1 Example 1

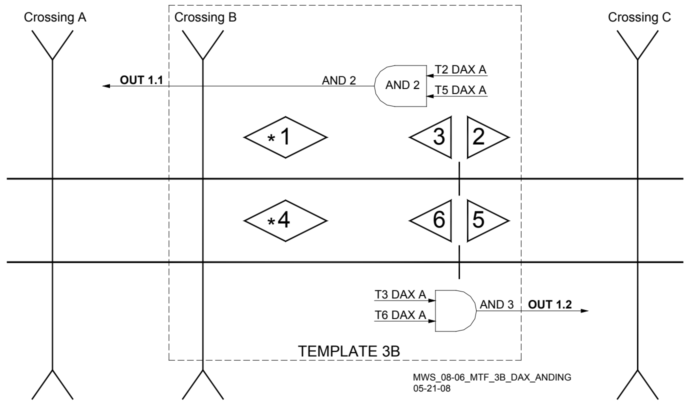


Figure 6-8:
ANDing DAX Predictors For Three Adjacent Crossings

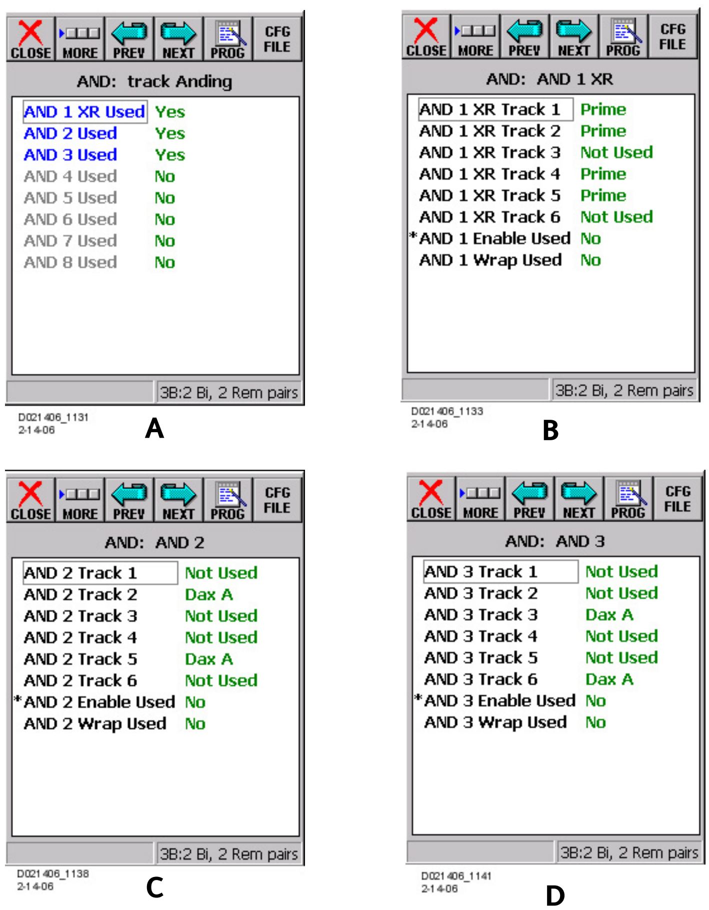


Figure 6-9:
DAX ANDing Configurations For Figure 6-8

In Figure 6-8, Track 2 and track 5 DAX to crossings A and B. Track 3 and track 6 **DAX** to crossing C. A single pair of wires runs from crossing B to crossing A and from crossing B to crossing C. Configure the **And** functions as follows:

- Enable **DAX A Used** for tracks 2 and 5.
  - Enable the AND functions as shown in Figure 6-9A.
- Set the **AND: AND 1 XR** inputs as shown in Figure 6-9B.
  - Controls crossing B
- Set the **AND: AND 2** inputs as shown in Figure 6-9C.
  - Controls crossing A
- Set the **AND: AND 3** inputs as shown in Figure 6-9D.
  - Controls crossing C

In this configuration, AND 1 XR controls crossing B and AND 2 and AND 3 may be assigned (connected) to physical outputs to control crossings A and C.

The assigning may be done as follows:

- AND 2 is assigned to OUT 1.1
- AND 3 is assigned to OUT 1.2

Once assigned to a physical output each output can be connected to line circuits that run to crossings A and C.

6.1.3.2 Example 2

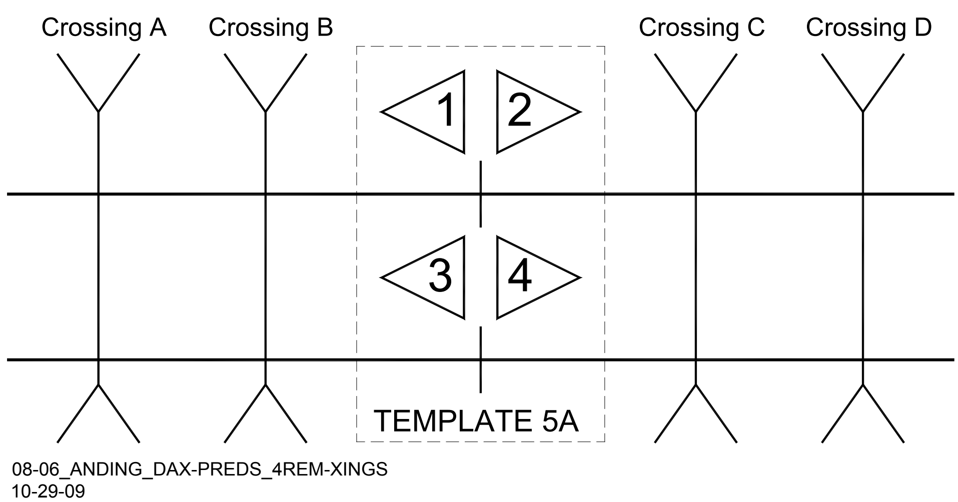


Figure 6-10:
ANDing DAX Predictors For Four Remote Crossings

In the previous example, AND 1 XR controls the local crossing.

In this configuration, by utilizing a remote Model 4000 GCP case with all remote tracks as shown in Figure 6-10, AND 1 XR can be used to AND the **DAX** A predictors from the Track 1 and Track 3 Modules.

Prime predictors are generally not used in **AND 1 XR** in remote 4000 cases. They are generally used with DAXes.

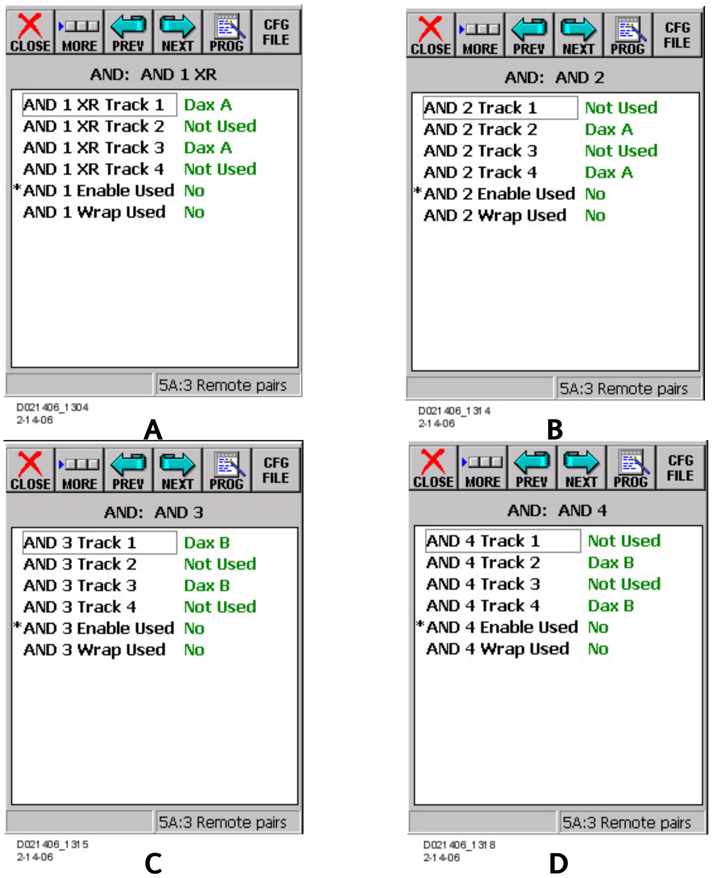


Figure 6-11:
DAX ANDing Configurations For Figure 6-10

For example, if the DAX A predictors are controlling crossings B and C and the DAX B predictors are controlling crossings A and D, set the AND functions as shown in Figure 6-11.

To implement this configuration the AND functions are assigned to physical outputs as follows:

- AND 1 XR is assigned to OUT 1.1
  - Controls crossing C
- AND 2 is assigned to OUT 2.1
  - Controls crossing B
- AND 3 is assigned to OUT 3.1
  - Controls crossing D
- AND 4 is assigned to OUT 4.1
  - Controls crossing A

6.2 ISLAND OPERATION WITHOUT MS/GCP FUNCTION

Island operation using a Track Module may be implemented without an active MS/GCP function, e.g., track 1 on the siding shown in Figure 6-12 requires only island operation.

Island only operation may be implemented by setting **Track 1 MS/GCP Operation** in the **BASIC: MS/GCP Operation** window to **No** (see Figure 6-13A) and setting **Island 1 Used** in the **BASIC: Island Operation** window to **Internal** (see Figure 6-13B).

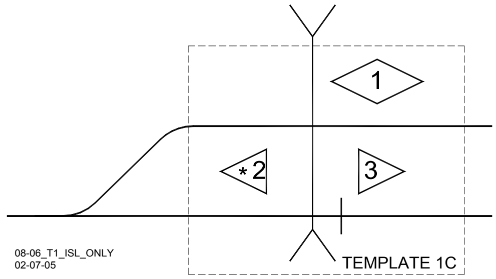


Figure 6-12:
Track Configuration to Support Island Only Operation on Track 1

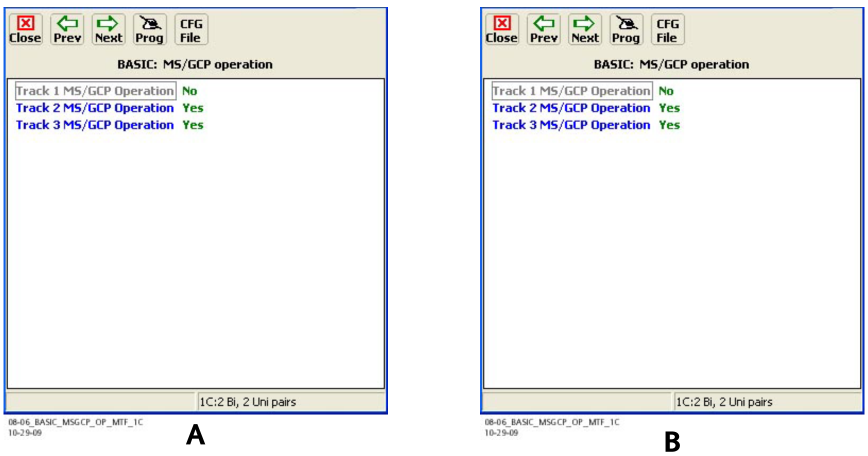


Figure 6-13:
Basic Program Configuration For Figure 6-12

The island for track 1 must also be included in the AND 1 XR control of the crossing. This requires selection of the **ISL Only** option for the **AND 1 XR Track 1** field as shown in Figure 6-14.

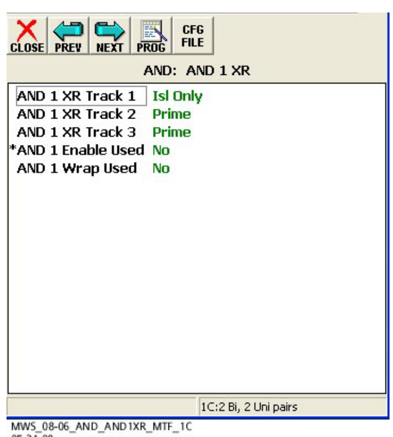


Figure 6-14:
AND 1 XR Track 1 Field Set To Island Only

6.2.1 AND Enable Inputs and Cascading DAX

When a remote GCP is required to DAX to another GCP located in a separate case at a crossing, the GCP at the crossing must be configured to receive the DAX information through a UAX or Enable mechanism.

6.2.1.1 UAX and DAX Enable Inputs

The Model 4000 GCP allows either individual DAX line circuits to be brought in from multiple tracks to the crossing or the DAX lines are ANDed at the crossing (Model 4000 GCP using multiple Prime UAX inputs or **AND** Enable inputs. See Section 5 for a discussion of Predictor UAX and DAX Enable inputs).

DAX signals may be ANDed at the remote site and then brought to the crossing Model 4000 GCP as a single UAX input.

6.2.1.2 AND Enable Inputs

BODY

When ANDing Tracks, as in Figure 6-16, the AND 1 XR Enable is not taken out of service. When a main track is taken out of service (OOS) consideration should be given to the OOS function when designing DAX circuits. If it is desired to be able to take only one main track out of service at a crossing, the DAX circuits should control the individual Track Prime UAX input.

Each AND function has a configurable Enable input. AND 1 XR through AND 6 also provide a configurable pickup delay. The pickup delay displays only when the AND 1 Enable Used is set to Yes (see Figure 6-15).

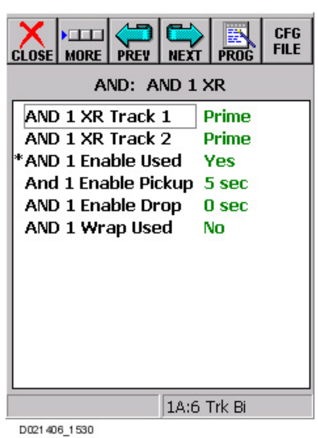


Figure 6-15:
AND 1 XR With Pickup Delay Enabled

Unlike UAX pickup delays, AND pickup delays cannot be truncated by the train leaving the island. The delay is kept short at 2-5 seconds, because the pickup delay is normally provided by the remote DAX. (For more information about basic DAXing, see Section 5)

An example of a remote 4000 DAXing to a crossing and cascading DAX is shown in Figure 6-16. In this example, the **DAX** A predictors at the Remote site are ANDed at remote GCP 2 to control crossing A via AND 1 XR Enable, AND 1 XR Enable is cascaded with the Prime predictors of GCP 1 as shown in Figure 6-17A. The **DAX** B predictors at remote GCP 2 are ANDed to control crossing B via AND 2 Enable. AND 2 Enable is cascaded with the Track 2 and Track 4 DAX A predictors of GCP 1 as shown in Figure 6-16B. Crossing B is controlled via AND 2 (Enable).

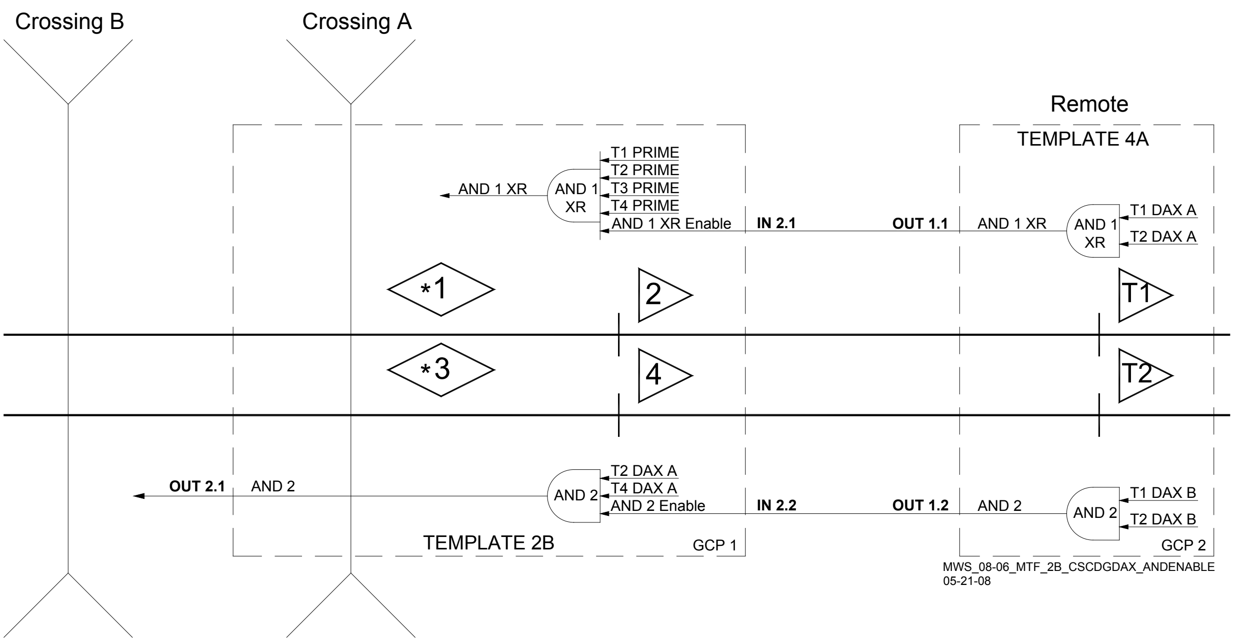


Figure 6-16:
Cascading DAX using AND Enable Inputs

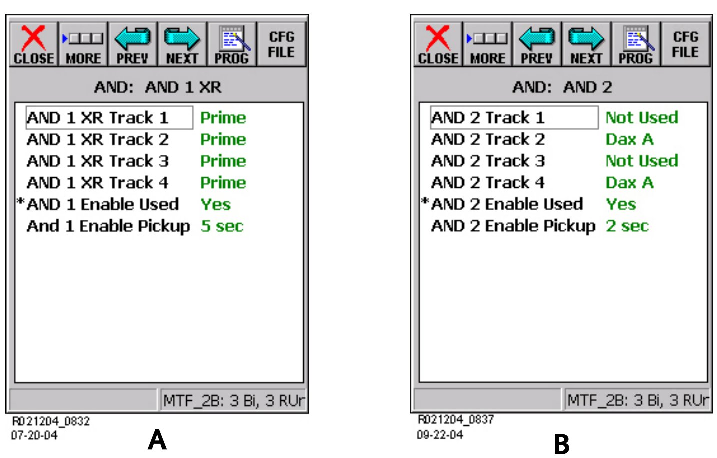


Figure 6-17:
AND Configuration for Figure 6-16

The inputs and outputs at the crossing may be assigned as follows:

- **AND 2** output to crossing B is assigned to **OUT 2.1**
- **OUT 2.2** is assigned as Not Used
- **AND 1 XR Enable** is assigned to IN 2.1, which receives DAX output from remote GCP DAX A predictors
- **AND 2 Ena**ble is assigned to IN 2.2, which receives input from remote GCP DAX B predictors

6.2.2 Out of Service ANDing of Predictors

WARNING

OUT OF SERVICE TRACKS WILL NOT RESPOND TO TRAIN OPERATION. TAKE ALTERNATE MEANS TO WARN VEHICULAR TRAFFIC, PEDESTERIANS, AND EMPLOYEES.

Tracks are taken out of service using the Model 4000 GCP. The MS/GCP operation may be taken out of service and the Island left in service for a particular track, or both island and MS/GCP may be taken out of service. When the MS/GCP is taken out of service on a Track Module, all nine predictors on that module are treated as being energized. If the island is left in service:

- The crossing activates only when the island is occupied
- The prime predictor LED (**PRIME**) on the module remains lit even though the island is occupied and the island light is out

For further information regarding taking tracks Out Of Service, see Section 5.

6.2.3 Cascading DAX with Individual Line Controls

Each DAX predictor output at a remote GCP unit may be sent to a crossing using individual line pairs as shown in Figure 6-18.

This configuration is a variation of the DAX line ANDing configuration shown in Figure 6-16.

WARNING

WHEN DAX CIRCUITS ARE CASCADED, ONE SECOND IS ADDED TO THE CROSSING TIME FOR EACH CASCADED DAX.
ADDITIONAL APPROACH DISTANCE MAY ALSO BE REQUIRED FOR BOTH THE CROSSING AND REMOTE GCPS.

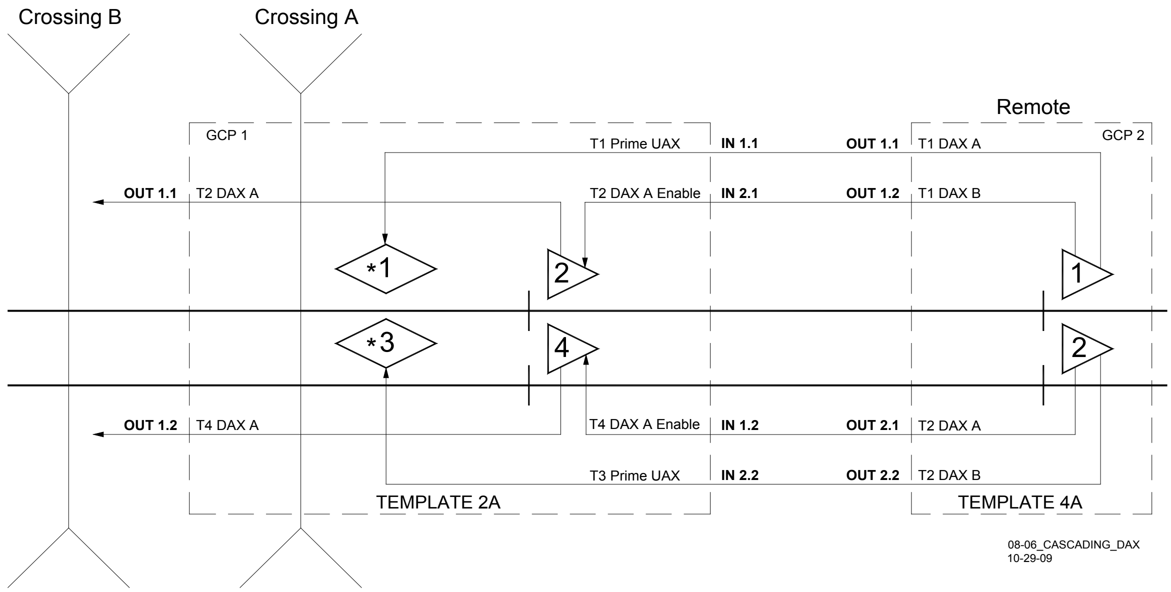


Figure 6-18:
Cascading DAX with Individual Controls

At the Remote GCP, four individual DAX outputs are brought out to control crossing A and crossing B. The output assignments required to implement this operation is shown in Figure 6-19.

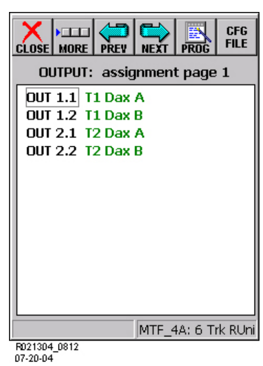


Figure 6-19:
Output Assignment For Figure 6-18

At crossing A, track 1 and track 3 Prime UAXes are enabled as inputs as shown in Figure 6-20A and Figure 6-20B.

From the choices available for each Prime UAX input: select IP. The UAX pickup delay time for T1 and T3 is set to 5 seconds.

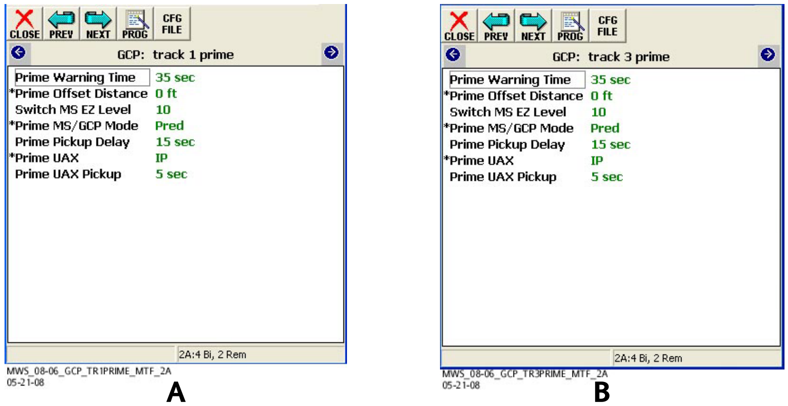


Figure 6-20:
Track 1 and Track 3 Prime UAX Input Assignments For Figure 6-18

At crossing A, track 2 and track 4 DAX A Enables are enabled as inputs as shown in Figure 6-21A and Figure 6-21B. From the choices available for each DAX Enable input select IP. The DAX Enable Pickup delay time for T2 and T4 is set to 2 seconds.

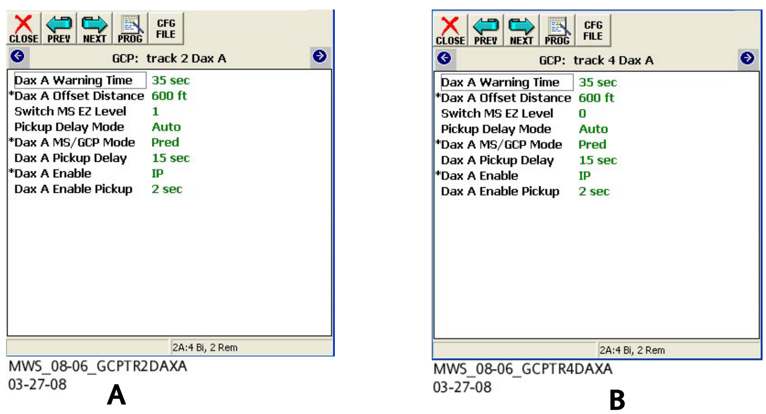


Figure 6-21:
Track 2 and Track 4 DAX Enable Input Assignments For Figure 6-18

6.2.3.1 <u>Connection Assignment for Cascading DAX Signals</u>

Assigning the inputs as shown in Figure 6-22 makes the connections between the remote GCP and the crossing GCP.

DAX A output signals received from the remote GCP are assigned to the **track 1** and **track 3 Prime UAX** inputs

DAX B output signals received from the remote GCP are assigned to the track 2 and track 4 **DAX A Enable** input

DAX Enable allows the two remote DAX B outputs to be cascaded individually into the crossing T2 and T4 DAX A predictors.

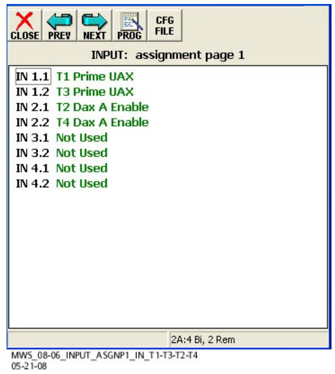


Figure 6-22:
Input Assignments For Cascading DAX

The DAX A predictors from crossing A are assigned to outputs as shown in Figure 6-23. This allows the outputs to be connected to crossing B via a line circuit.

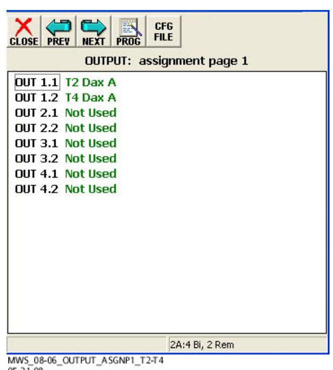


Figure 6-23:
Output Assignments For Cascading DAX

6.2.3.2 Advantages of Using DAX

There are advantages in using individual track DAX line circuits rather than using ANDs:

- The Train History shows which track the train was on.
- The train history shows which track’s UAX/Enable was de-energized; making it clear which remote track started the crossing.
- A train going through the island associated with that track can truncate the pickup delay of a UAX or a DAX Enable, if the Prime or DAX has zero offset distance.
- The AND Enables cannot be truncated and will run full time, even if the time is short.

6.2.3.3 Configurable Pickup Delay

The following UAX/Enable functions have a configurable pickup delay:

- Prime UAX
- DAX A Enable
- DAX B Enable
- Preempt Enable

There is no pickup delay provided for DAX C Enable through DAX G Enable. Each DAX Enable pickup delay is usually set to 2 seconds. The required pickup delay is normally provided by Model 3000 GCP or Model 4000 GCP DAX output. When using Prime UAX or Preempt Enable, the pickup delay at the crossing is normally set to a value greater than zero.

6.2.3.4 Cascading DAX Using ANDing and Individual Track Controls

Individual DAX and AND functions can be mixed in a particular application as required. Figure 6-24 is an example of a back-to-back remote application where all Model 4000 GCP track modules are configured as remotes (MTF 5A).

The remote Model 4000 GCP provides DAX signals to crossings A, B, and C in one direction and to crossing D in the other direction. Crossing D has 2 separate Model 3000 GCPs cases with back-to-back GCPs on 2 tracks. The track 1 DAX C output to crossing C may be allocated to a physical output without ANDing. Track 1 and track 3 DAX A predictors must be ANDed to control crossings A and B as shown in Figure 6-25A and Figure 6-25B.

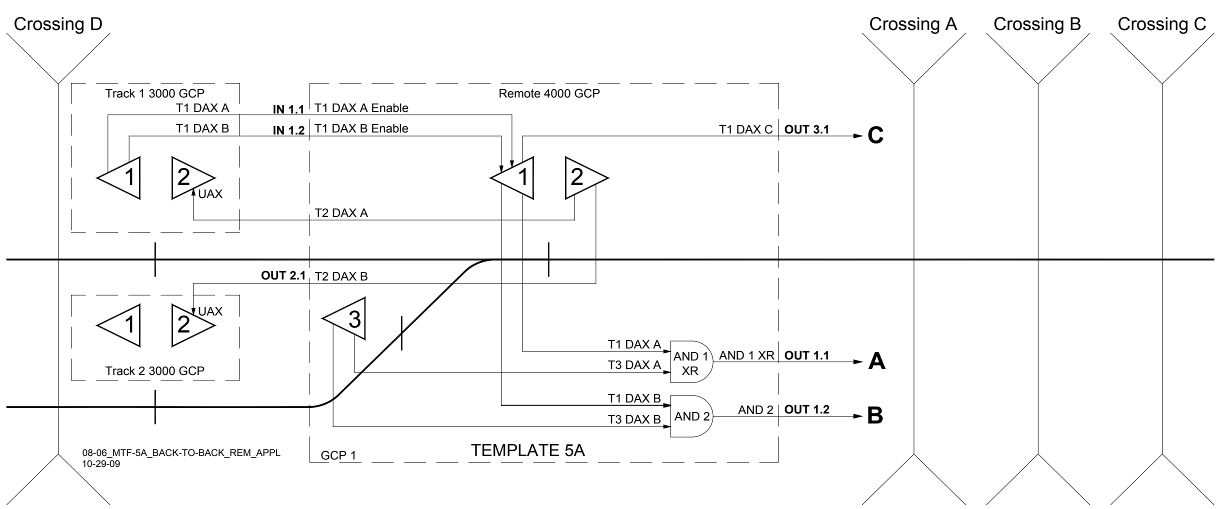
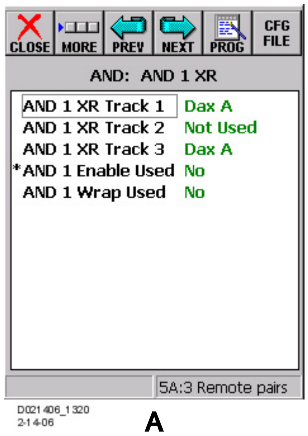


Figure 6-24:
Cascading DAX



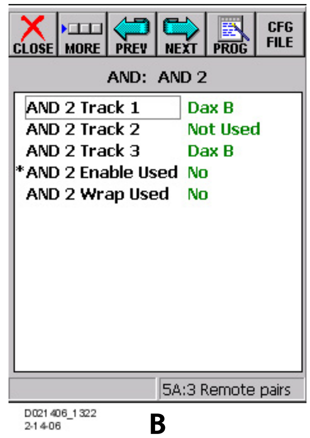


Figure 6-25:
AND Configuration For Figure 6-24

The remote Model 4000 GCP receives DAX signals from crossing D that are cascaded with the remotes track 1 and 3 DAX signals to provide DAX signals to crossings A and B. Because train speeds are slow through the turnout, track 3 at the remote is not required to DAX to crossing C. The DAX outputs from crossing D are cascade ANDed in with track 1 DAX A and DAX B at the remote by assigning:

- Track 1 DAX A Enable and track 1 DAX B Enable to input (**IP**)
- Physical inputs to connect the DAX outputs from crossing D to the DAX Enables as shown in Figure 6-26.

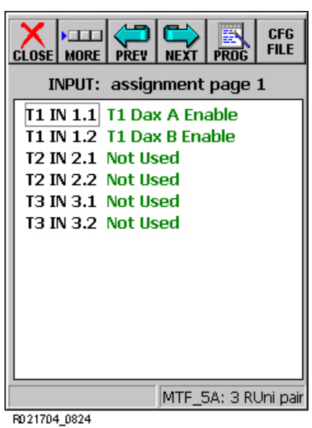


Figure 6-26:
Input Assignment For Figure 6-24

The cascaded DAX outputs of the remote are assigned as shown in Figure 6-27.

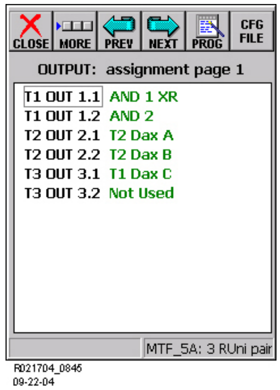


Figure 6-27:
Output Assignment For Figure 6-24

6.2.4 DAXing Pickup Delay Consideration

Templates automatically set all predictor pickup delays at 15 seconds but can be manually programmed to any value between 8 and 500 seconds. The Pickup delay operates for all predictor functions when a train predicts and then stops in the approach. DAX offsets are only displayed in the template menu when DAX's are enabled in the main menu.

6.2.4.1 Predictors with zero offset distance

WARNING

IN TRACK MODULE MEFS GCP02_00.MEF AND EARLIER, IF A PREDICTOR TRACK CIRCUIT HAS AN ISLAND, THEN THERE SHOULD NOT BE ANY PRIME PREDICTION OFFSET DISTANCE PROGRAMMED GREATER THAN ZERO. IF IT OCCURS, IT MAY RESULT IN A SHORTENED WARNING TIME OR CROSSING ACTIVATION FAILURE.

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, THEN IN VERY LIMITED CIRCUMSTANCES WITH TRAIN DECELERATION THE CROSSING WARNING SYSTEM MAY BRIEFLY TIMEOUT IF THE DAX DOES NOT UTILIZE THE PRIME UAX INPUT (THE UAX PARAMETER IS SET TO "NOT USED"). THIS SITUATION RESULTS FROM THE "AUTOMATED PICKUP DELAY" IN THE REMOTE TRACK CIRCUIT EXPIRING PRIOR TO THE CROSSING GCP PREDICTING FOR THE TRAIN. REFER TO SECTION 6.7.8 FOR CORRECTIVE ACTIONS.

All predictors with zero offset distance have the pickup delay truncated by the Track Module when a train goes through the approach and the island energizes. These include the Prime predictors, the Preempt predictors, and the DAX predictors.

The prime pickup delay configuration for a Track 1 prime predictor is shown in Figure 6-28.

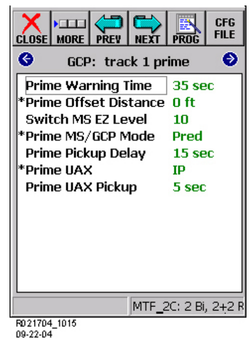


Figure 6-28:
Pickup Delay Configuration For Track 1 Prime Predictor

6.2.4.2 <u>Predictors with non-zero Offset distances (unidirectional and Simulated Bidirectional applications)</u>

In MCF gcp-t6x-02-0.MCF and earlier, on a straight through train move, the Pickup delay for a predictor with a non-zero offset distance (prime or DAX) is controlled by the **Pickup Delay Mode** (AUTO or FIXED) parameter setting of the corresponding **GCP: track DAX** window (see Figure 6-29). If the Prime predictor has an offset distance greater than zero and has an island connected, the system will declare a Prime Offset Error.

6.2.4.3 <u>DAX Pickup Delay Determination</u>

The pickup delay time for DAX predictors is determined by the Pickup Delay Mode setting (either AUTO or FIXED) that is set when the predictor is programmed with an offset distance (other than zero) and the train does not stop in the approach following prediction.

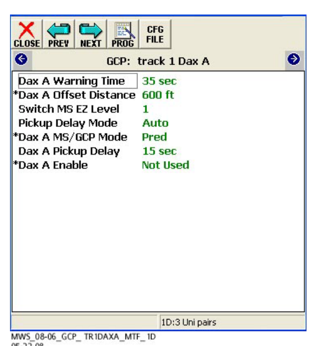


Figure 6-29:
Pickup Delay Parameters For DAX With Non-Zero Offset Distance

6.2.4.3.1 Auto Mode:

When programmed to Auto (default setting), a DAX predictor pickup delay time for through move trains is automatically computed based on train speed and offset distance. Train speed is measured just before the train reaches the DAX insulated joints. Pickup delay timer starts when the train reaches the DAX insulated joints. The DAX predictor energizes when the train arrives in the vicinity of the crossing receiving the DAX. The AUTO pickup delay time varies from a minimum of 8 seconds to a maximum delay time equal to the selected warning time. The minimum delay time allows sufficient time for the next GCP circuit to predict before the DAX output energizes.

The minimum pickup delay time occurs when the DAX insulated joints are located close to the crossing and there are fast train moves.

The maximum pickup delay time occurs on slow train moves where the DAX predicts very close to the DAX insulated joints. However, the DAX will still recover when the train arrives in the vicinity of the crossing receiving the DAX.

6.2.4.3.2 Fixed Mode:

When programmed to Fixed mode, the DAX predictor pickup delay for through move trains is a computed fixed time based on the programmed pickup delay time. The DAX pickup delay timer starts when the train reaches the DAX insulated joints. In the FIXED mode, the DAX predictor pickup delay can be manually programmed to any value between 8 and 500 seconds.

The Auto mode is used for most DAX applications

NOTE

The Prime/DAX A.G/Preempt Pickup Delay Mode is generally set to Auto when Adv Appr prediction is used.

6.2.4.4 Setting DAX Pickup Delay to Prevent Overring

When short passenger trains are operating, sometimes the automatic pickup delay calculation can lead to an overring at the crossing, i.e., when a train stops close to the insulated joints of the remote GCP and starts to move again, it may accelerate towards the insulated joints but not get to full speed until sometime after passing the joints. Because the Track Module at the remote measures the train traveling at less than its full speed, it may calculate that the train will reach the crossing later than it actually does. In this case, the DAX may remain down for a period of time after a short fast train passes the crossing.

To prevent this from happening, set the Pickup Delay Mode field to Fixed and manually program the pickup delay to the required value.

Predictors at the crossing can truncate the UAX pickup delay, but the remote cannot truncate its DAX pickup delay. For this reason the pickup delays may be shared between the crossing UAX and DAX pickup, rather than setting all the delay in the remote units DAX. For example, for a total pickup delay of 10 seconds:

- **DAX A Pickup Delay** of the remote unit may be set for fixed value to **8** seconds as shown in Figure 6-30A.
- **Prime UAX Pickup** of the crossing unit may be set to value of **5** seconds as shown in Figure 6-30B.

NOTE

In software version gcp-t6x-02-0.MCF and newer, Prime/DAX A…G/Preempt MS/GCP Mode remains editable when a non-zero offset distance is entered, allowing DAXes to be set to Motion Sensors without first setting their offsets to zero. Setting to MS mode will not affect DAXes on reverse moves.

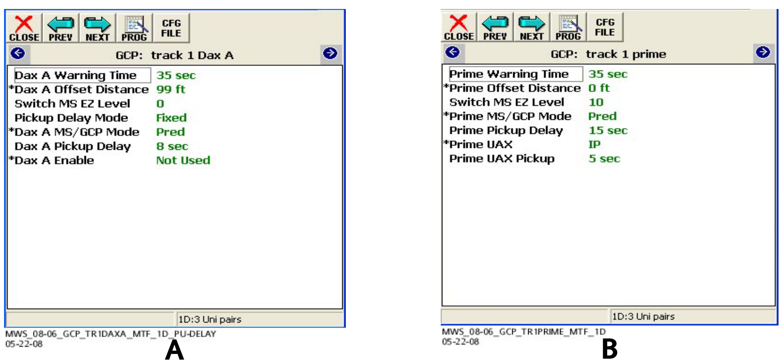


Figure 6-30:
DAX And UAX Combined Pickup Delay Assignments

6.2.5 Special Provisions for Short DAX Offset Distance (UAX Not Used)

WARNING

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, THEN IN VERY LIMITED CIRCUMSTANCES WITH TRAIN DECELERATION THE CROSSING WARNING SYSTEM MAY BRIEFLY TIMEOUT IF THE DAX DOES NOT UTILIZE THE PRIME UAX INPUT (THE UAX PARAMETER IS SET TO "NOT USED"). THIS SITUATION RESULTS FROM THE "AUTOMATED PICKUP DELAY" IN THE REMOTE DAX TRACK CIRCUIT EXPIRING PRIOR TO THE CROSSING GCP PREDICTING FOR THE TRAIN.

NOTE

The name DAX includes any remote prime predictor that is used as a DAX (has an offset distance programmed to a value greater than zero).

For this condition to happen, a very narrow window in time and train behavior has to occur. In general terms this involves the train reducing speed in the inner 10% of the approach. Train speeds would be expected to be less than 25 mph with up to a 15% reduction in speed.

The general recommendation for correcting this condition is to connect the DAX output to the crossing UAX input. The reason is that when the UAX de-energizes it changes the crossing GCP into motion sensing (1 MPH/1.6 KPH sensitivity) and rapid detection occurs even with speed reduction. The UAX also adds additional pickup delay time. When using the UAX, the crossing will remain activated, regardless of whether or not the DAX pickup delay should time out, because the crossing GCP (once motion is detected) will remain a motion sensor as long as the train is moving inbound at more than 1 MPH/1.6 KPH.

In some applications, Positive Start may also be used to correct this condition. However, if likelihood exists that a train may stop within the positive start area, warning devices will remain active, unless Positive Start Timeout is programmed on and the time has expired.

NOTE

When the GCP at the crossing is bidirectional then Positive Start (PS) will operate on both approaches to the crossing. The PS activate distance will extend in both directions approximately the programmed short offset distance of the DAX.

The following subsections provide alternative solutions for this short DAX offset distance application. The options include:

- Option 1: Use of Positive Start. This option may be used:
  - When the crossing and DAX modules are in the same Model 4000 GCP chassis
  - May not be used with Advanced Preemption

NOTE:

Option 2 uses internal I/O logic (software) to connect the DAX output to the crossing prime UAX.

- Option 2: Use of Internally Connected UAX. This option may be used:
  - When the crossing and DAX Modules are in the same Model 4000 GCP chassis
  - May not be used with Advanced Preemption
- Option 3: Use of Externally Wired UAX. This option may be used:
  - When the crossing and DAX modules are in the same or separate Model 4000 GCP chassis

- With or without Advanced Preemption

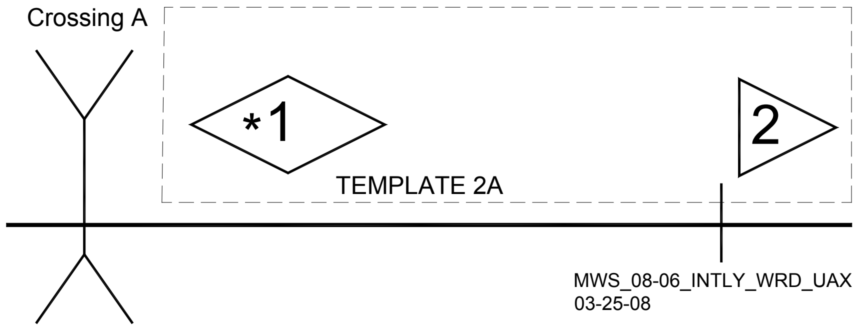


Figure 6-31:
Crossing with Model 4000 GCP and DAX in Same Chassis

NOTE:

The following subsections assume that T1 is at the crossing and T2 is a remote DAX (prime with offset) in the same 4000 chassis (see Figure 6-31). When crossing and remote DAX are in separate 4000 chassis, use the standard DAX to crossing UAX applications (discussed in Section 6.7.8.3).

6.2.5.1 Option 1: Use of Positive Start

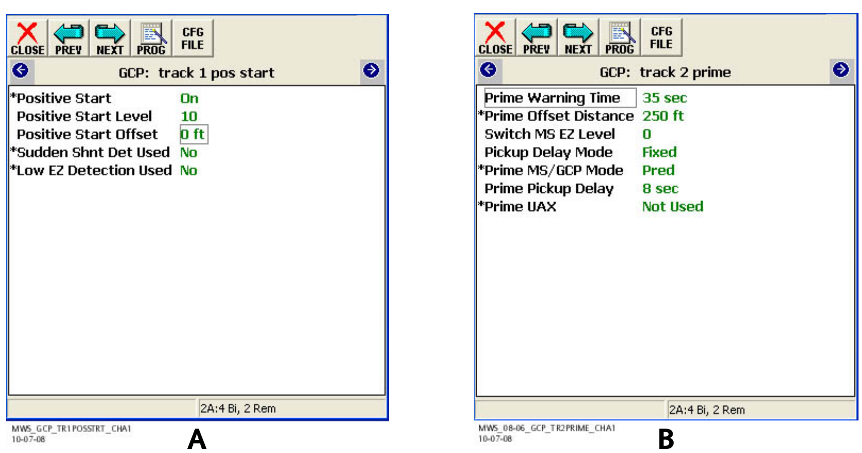


Figure 6-32:
A: Track 1 (T1) Positive Start settings; B: Track 2 (T2) Prime settings

When the GCP at the crossing is bidirectional, then Positive start will operate on both approaches to the crossing. Program the GCP parameters as stated below and shown in Figures 6-49 A & B:

- GCP: Track 1 Positive Start (Figure 6-32A):
  - Program Positive Start=On (If Positive Start=Timed, then set the Positive Start Timer to the desired interval)
  - Program Positive Start Offset=0 ft

- Program the Positive Start Value to be equal to or slightly higher than the EZ value at the insulated joints.
- GCP: Track 2 Prime (Figure 6-32B):
  - Program Prime Offset Distance=250 ft
  - Program Pickup Delay Mode=Fixed
  - Program Prime Pickup Delay=8 sec

6.2.5.2 Option 2: Use of Internally Connected UAX

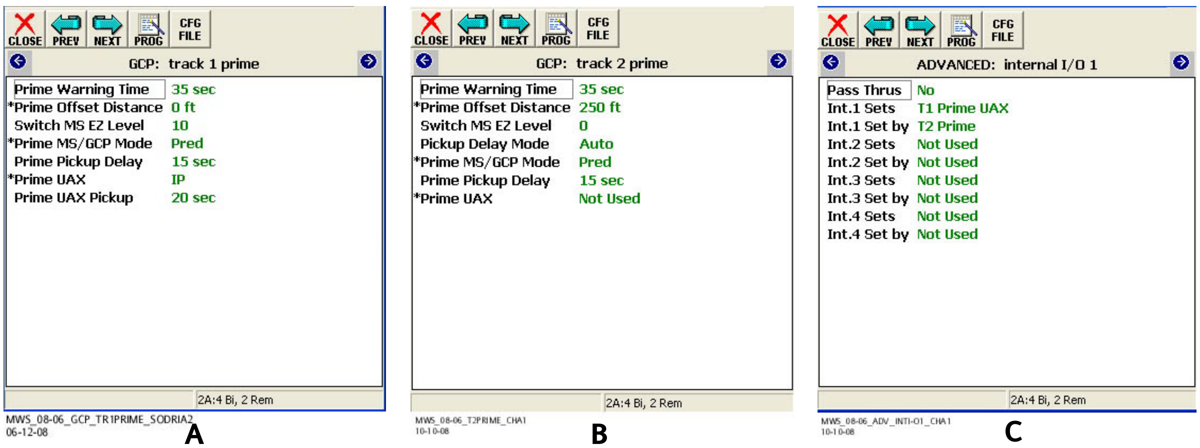


Figure 6-33:
A: GCP: T1 Prime; B: GCP: T2 Prime; C: ADVANCED: Internal I/O 1;

When Model 4000 GCP crossing and remote DAX modules are in the same GCP chassis, an “Internally Connected UAX” can be created using internal I/O logic which requires no additional external chassis wiring. Program the GCP parameters as stated below and shown in Figures 6-50 A, B, C, D, & E:

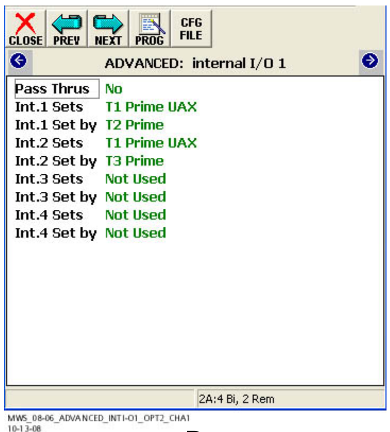
- GCP: Track 1 Prime (Figure 6-33A)
  - Program T1 Prime UAX=IP
  - Program Prime UAX Pickup=20 seconds
- GCP: Track 2 Prime (Figure 6-33B)
  - Program T2 Prime Offset Distance = Distance between T1 track wires and insulated joint at T2. For this example, that distance is 265 feet.
  - Leave Pickup Delay Mode=Auto
- ADVANCED: internal I/O 1(Figure 6-33C)
  - Program Int.1 Sets=T1 Prime UAX

If there is a second DAX to the crossing in the same 4000 crossing chassis then add the following parameter settings:

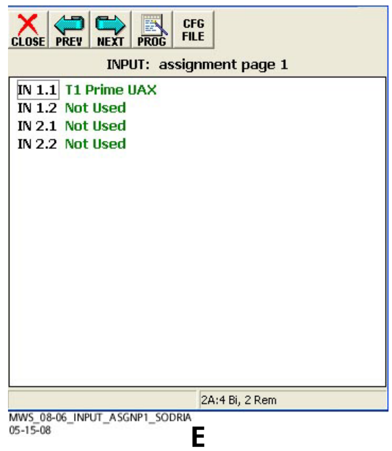
- ADVANCED: Internal I/0 1 (Figure 6-50D)
  - Program Int.2 Sets=T1 Prime UAX
  - Program Int.2 Set by=T3 Prime
  - Program Int.1 Set by=T2 Prime

If the second Dax is in a separate chassis then skip programming of Figure 6-50D. Instead, program a crossing input as follows:

- INPUT: assignment page 1(Figure 6-50E)
  - Program IN1.1=T1 Prime UAX (all inputs set to T1 prime UAX are internally ANDed together)



D



E

Figure 6-33 (cont.)
D: ADVANCED: Internal I/O; F: INPUT: Assignment Page 1

Program the remote DAX (in the separate Model 4000 GCP chassis) to standard DAX programming and wire that remote DAX output to the crossing chassis IN1.1 (Prime UAX).

6.2.5.3 Option 3: Use of Externally Wired UAX

In Model 4000 GCP applications (with or without traffic signal preemption), an "Externally Wired UAX" connection can be used. The UAX is controlled by either a remote DAX in the same crossing chassis or from a remote DAX in a separate chassis, This application (DAX in same chassis) does require the addition of external wiring from the DAX output to the UAX input on the crossing GCP chassis.

NOTE

When the remote DAX is in a separate chassis, prime is generally not used for DAXing (default is DAX A). Therefore, DAX A is used to DAX to the crossing UAX.

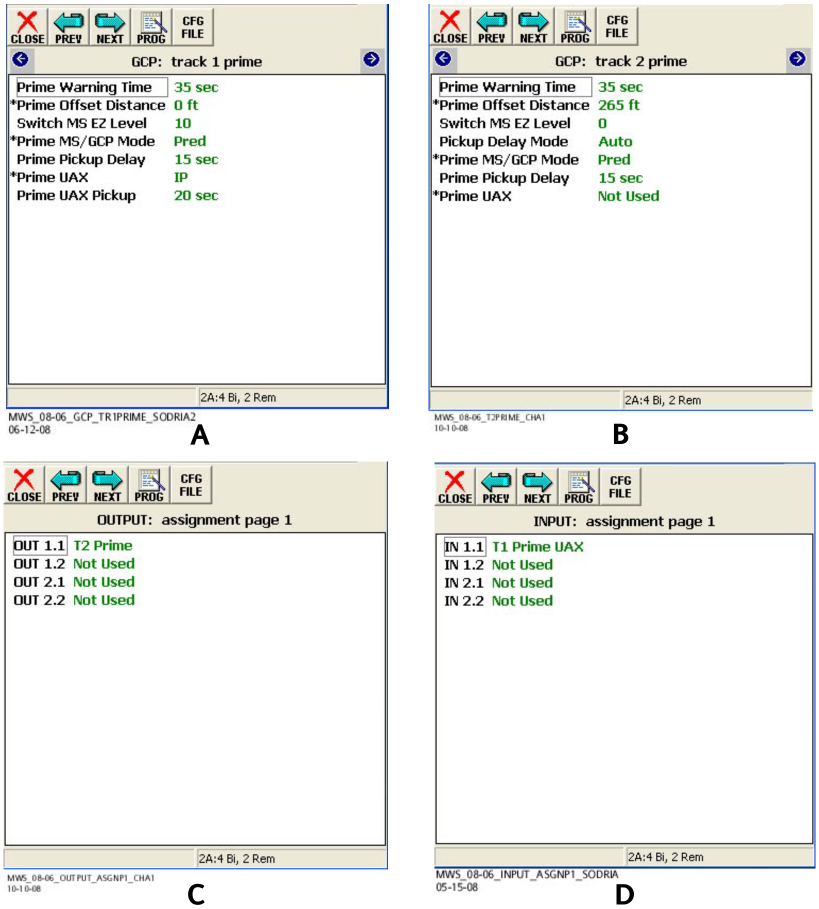
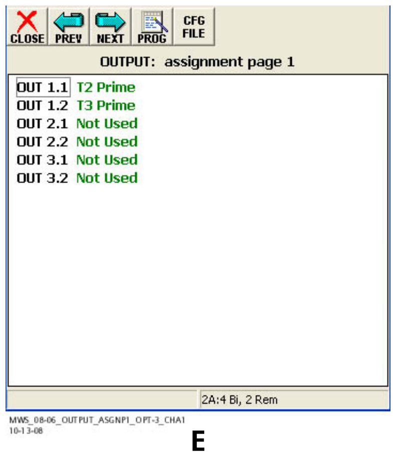


Figure 6-34:
A: GCP: T1 Prime; B: GCP: T2 Prime;
C: OUTPUT: Assignment Page 1; D: INPUT: Assignment Page 1

When the remote is in the same chassis as the crossing GCP, program the GCP parameters as stated below and shown in Figures 6-51 A, B, C, D, E, & F:

- GCP: Track 1 Prime (Figure 6-34A)
  - Program T1 Prime UAX=IP
  - Program Prime UAX Pickup=20 seconds
- GCP: Track 2 Prime (Figure 6-34B)
  - Leave Pickup Delay Mode=Auto
  - Program T2 Prime Offset Distance= Distance between T1 track wires and insulated joint at T2. For this example, that distance is 265 feet.
- OUTPUT: Assignment Page 1(Figure 6-34C):
  - Program OUT1.1=T2 Prime
- INPUT: Assignment Page 1 (Figure 6-34D)

  - Program IN1.1=T1 Prime UAX
- Add external wires on the crossing Model 4000 GCP chassis from:
  - OUT1.1 (+) to IN1.1 (+)
  - OUT1.1 (-) to IN1.1 (-)



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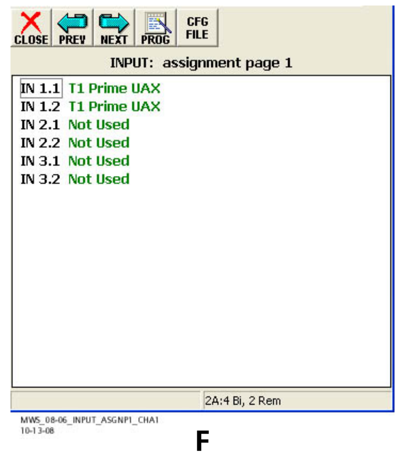


F

Figure 6-34 (cont.)
E: ADVANCED: Internal I/O 1; F: INPUT: Assignment Page 1

If there is a second DAX to the crossing in the same 4000 crossing chassis then add the following parameter settings:

- OUTPUT: Assignment Page 1 (Figure 6-34E)
  - Program OUT1.2=T3 Prime
- INPUT: Assignment Page 1 (Figure 6-51F)
  - Program IN1.2=T1 Prime UAX
- Add external wires on the crossing Model 4000 GCP chassis from:
  - OUT1.2 (+) to IN1.2 (+)
  - OUT1.2 (-) to IN1.2 (-)

If the second Dax is in a separate chassis then skip the programming of Figure 6-51E. Instead, program a second crossing input as follows:

- INPUT: assignment page 1 (Figure 6-34F)
  - Program IN 1.2=T1 Prime UAX

Program the remote DAX (in the separate Model 4000 GCP chassis) to standard DAX programming and wire that remote DAX output to the crossing chassis IN1.2 Prime UAX.

6.2.6 DAX Utilizing Post Joint Prediction (PJP)

The Model 4000 GCP provides Post Joint Prediction (PJP) automatically for all predictors (DAX operation) that have an Offset Distance other than zero (0) feet. The PJP provides a seamless and automated DAX prediction handover process from the DAXing GCP to the downstream GCP. It also provides prediction coverage for dead sections such as in crossovers or across track diamonds.

When a train passes a remote GCP and the GCP DAX has not predicted, it will continue calculating if the crossing signals need to activate within the next 15 seconds. If required, the GCP DAX will activate the crossing warning devices during those 15 seconds. This PJP is automatic in the Model 4000 GCP. The post joint prediction duration has two PJP times (15 and 7 seconds) depending on application programming. In the AUTO Pickup delay mode the time duration is 15 seconds. In the FIXED Pickup delay mode the time duration is 7 seconds. In general, AUTO pickup delay is used for PJP. However, FIXED pickup delay can be used if very short trains accelerate significantly after passing the remote DAX insulated joints causing an over-ring to occur at the crossing. Over-rings typically occur due to the AUTO DAX pickup delay not recovering by the time the tail end of the train passes the crossing island circuit.

NOTE

In a double crossover application, there are now two application designs available for the crossover closest to the crossing. The first application design, (discussed in paragraph 0, depicted in Figure 6-36 as Crossover1, titled Double Crossover using DAX Post Joint Prediction {PJP}) is used with software version gcp-t6x-01-2.MCF and older. The second application design, (discussed in paragraph 6.2.7.4.1, depicted in Figure 6-39 as Crossover1; titled Double Crossover Using DAX Advanced Approach Prediction {Adv Appr Predn}), is only available with units that have software version gcp-t6x-02-0.MCF or newer. Both the previous and new application guidelines are provided.

6.2.6.1 Programming requirement with Island operation

When there is a unidirectional or simulated bidirectional Track with an internal or external island in operation, correct PJP timing requires the following:

- Accurately measure the island distance between the GCP track wires located on either side of the street.
- Program this island distance in the Island Distance menu for the track module with the island circuit.

6.2.6.2 Calculations for Post Joint Prediction Time

Whenever there is a crossover section of track that a GCP does not monitor for train movement, the following calculation must be applied. The formulas will provide the minimum to maximum train speeds through the crossover section of track that could result in diminished warning time (WT) (refer to Figure 6-35 for example layout). Diminished time can occur if the required delayed signal activation time exceeds the 15 seconds of the PJP. If the required PJP time is in excess of 15 seconds, the following calculations will provide an island distance to be programmed in the remote predictor, which will automatically increase the PJP 15 seconds to the required amount.

WARNING

THERE CAN BE OTHER DEAD SECTIONS IN AN APPLICATION, EACH MUST BE CHECKED. IN THIS SECTION, RANGES OF TRAIN SPEEDS THAT MAY RESULT IN SHORTENED WARNING TIMES BECAUSE OF A DEAD SECTION ARE CALCULATED OR ACCOUNTED FOR.

NOTE

In the following procedures, the term “old” and “new” software is used. Old software refers to software version gcp-t6x-01-2.MCF and older. New refers to gcp-t6x-02-0.MCF or newer.

6.2.6.2.1 Single Crossover Using DAX Post Joint Prediction (PJP)

NOTE

In this section, the locations of insulated joints in the figures are to illustrate the limits of a dead section. Additional insulated joints are required to complete track circuits in the turnouts and crossovers.

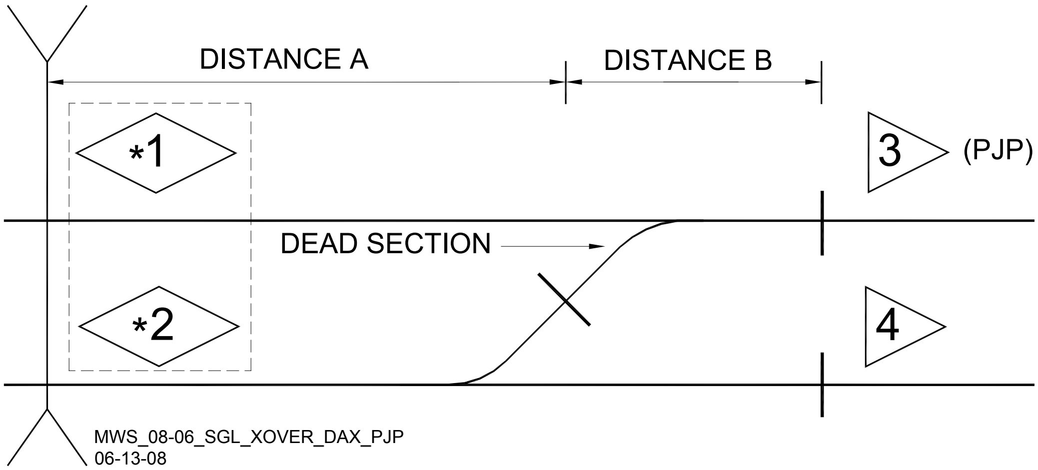


Figure 6-35:
Single Crossover Using DAX Post Joint Prediction (PJP)

Procedure 6-1: Single Crossover Using DAX Post Joint Prediction (PJP)	
	The predictor dead zone in Crossover1 in Figure 6-35 is covered by PJP in remote GCP 3 and is calculated in the following: A = distance from edge of road to effective insulated joints near end of dead section. A = __________ ft. or ____________ m B = distance from effective insulated joints near end of dead section to remote GCP. B = __________ft. . or ____________ m C = seconds of total approach, (WT + Reaction Time (5 secs) + Clearance Time + Advance Pre-emption additional Time). C = __________ sec. Formula for GCP 3:
Step 1	A divided by C = ___________ ft/sec divided by 1.467 = __________ min mph or A divided by C = ___________ m/sec multiplied by 3.6 = __________ min kmph.
Step 2	(A + B) divided by C = ___________ ft/sec divided by 1.467 = __________ max mph. (A + B) divided by C = ___________ m/sec multiplied by 3.6 = __________ max kmph. The ft/sec or m/sec values are used in other equations. The minimum to maximum mph/kmph is the range of train speeds that could result in shortened warning time.
NOTE:	In steps 3 and 4, if FIXED pickup delay is used, substitute 7 sec. for the 15 sec. If distances were measured in meters, multiply **Step 1 m/sec** by 3.281 = _________ **ft/sec**
Step 3	B divided by ft/sec of Step 1 = __________ sec. If 15 sec or less, the PJP timing is adequate. If more than 15 sec go to step 4A if old software used or 4B if new software used.
Step 4A	If over 15 seconds, subtract 15 secs from step 3 (sec) = _________ sec, then multiply by the ft/sec or m/sec in Step 1. Result = ____________ feet. Add result feet to the Island Distance in GCP 3 programming (even if the remote unit does not have an island).
Step 4B	Program “Post Joint Detn Time” to the value in seconds determined in step 3.

6.2.6.2.2 Double Crossover Using DAX Post Joint Prediction (PJP)

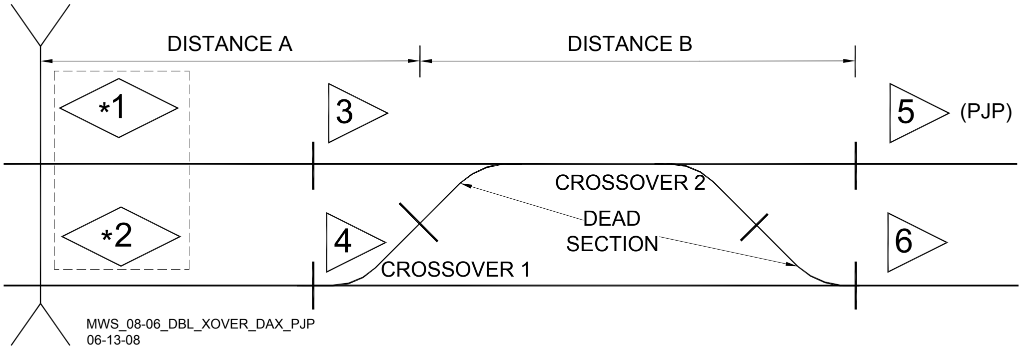


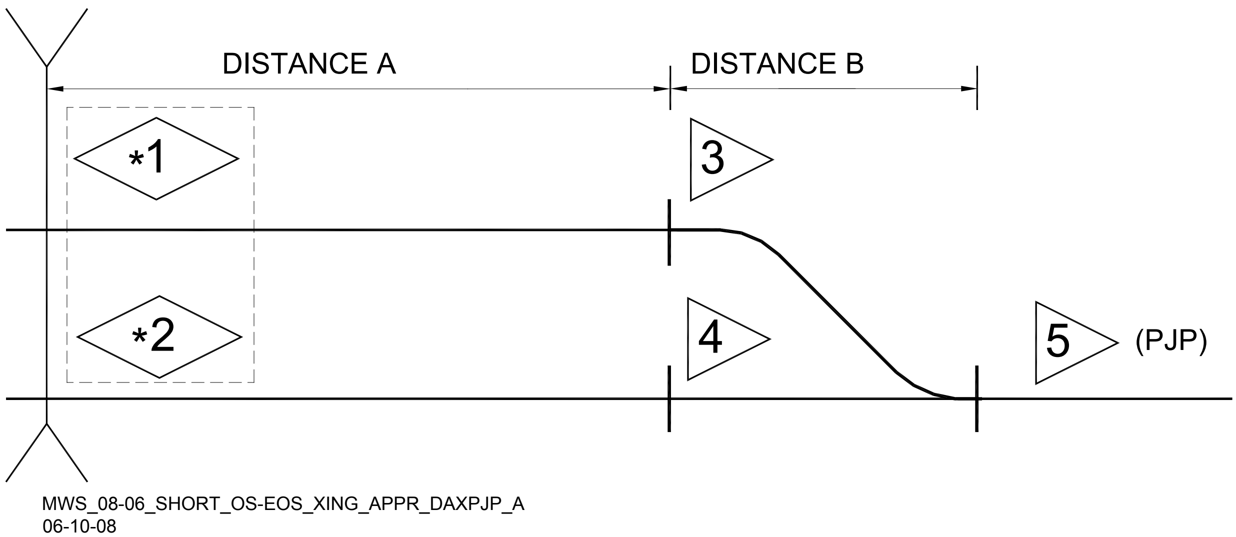
Figure 6-36:
Double Crossover Using DAX Post Joint Prediction (PJP)

Procedure 6-2: Double Crossover Using DAX Post Joint Prediction (PJP)	
	The predictor dead zone in for Crossover1 is covered by PJP in remote GCP 5 and is calculated in the following: A = distance from edge of road to effective insulated joints in Crossover1 A = _________ft. or __________ m B = distance from effective insulated joints in Crossover1 to remote units. B = _________ft. or __________ m C = seconds of total approach, (WT + Reaction Time (5 secs) + Clearance Time + Advance Pre-emption additional Time). C = _________ sec. Formula for GCP 5 (Crossover1):
Step 1	A divided by C = __________ ft/sec divided by 1.467 = _________ min mph or A divided by C = __________ m/sec multiplied by 3.6 = _________ min kmph.
Step 2	(A + B) divided by C = __________ ft/sec divided by 1.467 = _________ max mph. (A + B) divided by C = __________ m/sec multiplied by 3.6 = _________ max kmph. The ft/sec or m/sec values are used in other equations. The minimum to maximum mph/kmph is the range of train speeds that could result in shortened warning time.
NOTE:	In steps 3 and 4, if FIXED pickup delay is used, substitute 7 sec. for the 15 sec. If distances were measured in meters, multiply **Step 1 m/sec** by 3.281 = ________ **ft/sec**
Step 3	**B** divided by **ft/sec or m/sec** of Step 1 = _________ sec. If 15 sec or less, this completes the calculations. If more than 15 sec go to step 4A if old software used or 4B if new software used.
Step 4A	If over 15 seconds, subtract 15 sec from step 3 (sec) = ________ sec, then multiply by the **ft/sec** in Step 1. **Result** = __________ feet. Add result feet to the Island Distance in GCP 5 programming (even if the remote unit does not have an island). Formula for GCP 6 (Crossover2): The predictor dead zone for Crossover2 is covered by PJP in remote GCP 6 and requires using Procedure 6-1 Single Crossover formulas for GCP 3 for the calculations.
Step 4B	Program "Post Joint Detn Time" to the value in seconds determined in step 3. Formula for GCP 6 (Crossover2): The predictor dead zone for Crossover2 is covered by PJP for remote GCP 6 and requires using Procedure 6-1 Single Crossover formulas for GCP 3 for the calculations.

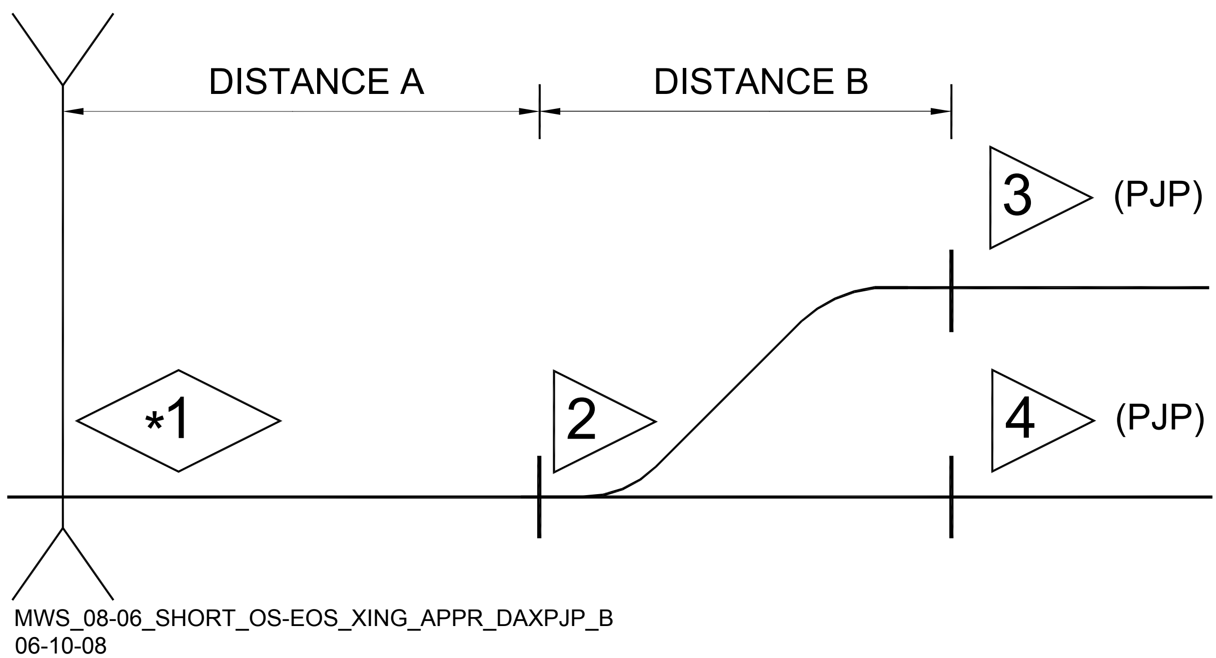
NOTE

Using MCF GCP-T6X-02-0 or newer, Advanced Approach Prediction can also be used for Double Crossover applications (see paragraph 0)

6.2.6.2.3 Short OS (End of Siding) in Crossing Approach Using DAX Post Joint Prediction (PJP)



Layout A



Layout B

Figure 6-37:
Short OS (End of Siding) in Crossing Approach Using DAX PJP

Procedure 6-3: SHORT OS (END OF SIDING) IN CROSSING APPROACH USING DAX PJP	
	If there is a short OS track circuit on the main track(s) as shown in Figure 6-37 A and B, (with a GCP remote(s) on the far side of the OS track circuit and GCP at the crossing), then predictors inside the OS may not be required. This depends on the approach distance to the OS and distance in the OS. The following formulas will determine If GCPs are required in the OS and if PJP island distance values are required for remote GCPs outside the OS. NOTE: When GCP units are required in OS, the PJP time is already preset for these GCP units and no additional PJP time is required. A = distance from edge of road to the near end of the OS track circuit. A = __________ ft. or ____________ m B = the length of the OS track circuit. B = __________ ft. or ____________ m C = seconds of total approach, (WT + Reaction Time (5 secs) + Clearance Time + Advance Pre-emption additional Time). C = __________ sec. Formula for GCP 5 in Figure 6-37 A and GCPs 3 and 4 in Figure 6-37 B:
Step 1	A divided by C = ___________ ft/sec divided by 1.467 = __________ min mph or A divided by C = ___________ m/sec multiplied by 3.6 = __________ min kmph.
Step 2	(A + B) divided by C = ___________ ft/sec divided by 1.467 = __________ max mph. (A + B) divided by C = ___________ m/sec multiplied by 3.6 = __________ max kmph. The ft/sec or m/sec values are used in other equations. The minimum to maximum mph/kmph is the range of train speeds that could result in shortened warning time.
Step 3	Multiply ft/sec or m/sec of step 1 by 7 seconds = _________ feet/meters (7 sec is reaction time + 2 second buffer).
Step 4	Subtract the ft/meters in step 3 from distance B ft, Result = ______________ feet/meters. If the result is less than zero, GCP units are not required in OS but PJP calculations are required. Continue PJP Calculations with steps 5 and 6. If result is greater than zero, install GCP unit(s) in OS track section and no additional PJP Time is required (skip steps 5 and 6).
NOTE:	In steps 5 and 6, if FIXED pickup delay is used, substitute 7 seconds for the 15 seconds. If distances were measured in meters, multiply **Step 1 m/sec** by 3.281 = _________ **ft/sec**
Step 5	B divided by the ft/sec in Step 1 = __________ sec. If 15 sec or less, the PJP timing is adequate. If more than 15 sec go to step 6A if old software used or step 6B if new software used.
Step 6A	If over 15 seconds, subtract 15 sec from step 5 (sec) = _________ sec, then multiply by the ft/sec in Step 1. Result = ____________ feet. Add result feet to the Island Distance in the DAX programming for GCP 3 and 4 of Figure 6-37 (Layout B) or GCP 5 of Figure 6-37 (Layout A) (even if the remote units do not have an island).
Step 6B	Program “Post Joint Detn Time” to the value in seconds determined in step 5.

6.2.7 Advanced Approach Prediction (Adv Appr Prdn) In Double Crossover Applications

NOTE

In a double crossover application, there are now two application designs available for the crossover closest to the crossing. The first application design, (discussed in paragraph 0, depicted in Figure 6-36 as Crossover1, titled Double Crossover using DAX Post Joint Prediction {PJP}) is used with software version gcp-t6x-01-2.MCF and older. The second application design, (discussed in paragraph 6.2.7.4.1, depicted in Figure 6-39 as Crossover1; titled Double Crossover Using DAX Advanced Approach Prediction {Adv Appr Predn}), is only available with units that have software version gcp-t6x-02-0.MCF or newer. Both the previous and new application guidelines are provided.

The Advanced Approach Prediction (Adv Appr Pred) program menu provides greater application flexibility. When this option is programmed to YES, three additional menu items are displayed: Adv Appr Predn Time, Adv Appr Predn Strt EZ and Adv Appr Predn Stop EZ as shown in Figure 6-38.

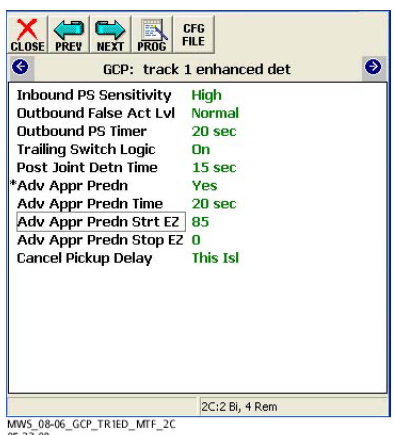


Figure 6-38:
The GCP: track 1 enhanced det "Adv Appr Predn" Window

6.2.7.1 Advance Approach Prediction (Adv Appr Predn)

The main purpose of Adv Appr Predn (process is called extrapolation) in a crossover application is to continue the prediction process even though the train enters a crossover (prediction dead zone) which normally causes the EZ to stop decreasing and inbound speed to go to zero. However, the extrapolation process allows the continuation of the EZ and speed computations and if required, both the Prime and DAX predictors will predict in the crossover. For a through move where the crossover is not taken, normal operation occurs.

6.2.7.2 Adv Appr Predn Start EZ Value

When EZ drops below the programmed Adv Appr Predn Start EZ value, the extrapolation EZ and speed data begins to be computed each half second. The data is then used to continue the prediction process should EZ stop changing as the train takes the crossover. The programmed EZ start value is determined by placing a hardwire shunt on the track at the switch then noting the EZ value on the display and adding an additional 10 EZ points.

6.2.7.3 Adv Appr Predn Stop EZ value

When EZ drops below the programmed Adv Appr Predn Stop EZ value, the extrapolation EZ and speed data is discontinued. To start Extrapolation requires that it begin within the Start and Stop EZ values. Once started, it will continue for the duration of the programmed time or until extrapolation EZ arrives at zero. The programmed EZ Stop value in this application is often set 10 points below the EZ value on the display (hardwire placed on the track at the switch).

6.2.7.4 Calculations for Adv Appr Predn Time

When the train takes the crossover and normal EZ stops decreasing, the extrapolation process and programmed time will begin count down. When the time runs to zero, the extrapolation process is discontinued and no further predictions will occur. This time is set for the slowest speed train, (that will not have predicted prior to entering the crossover), to completely pass through the crossover.

6.2.7.4.1 Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)

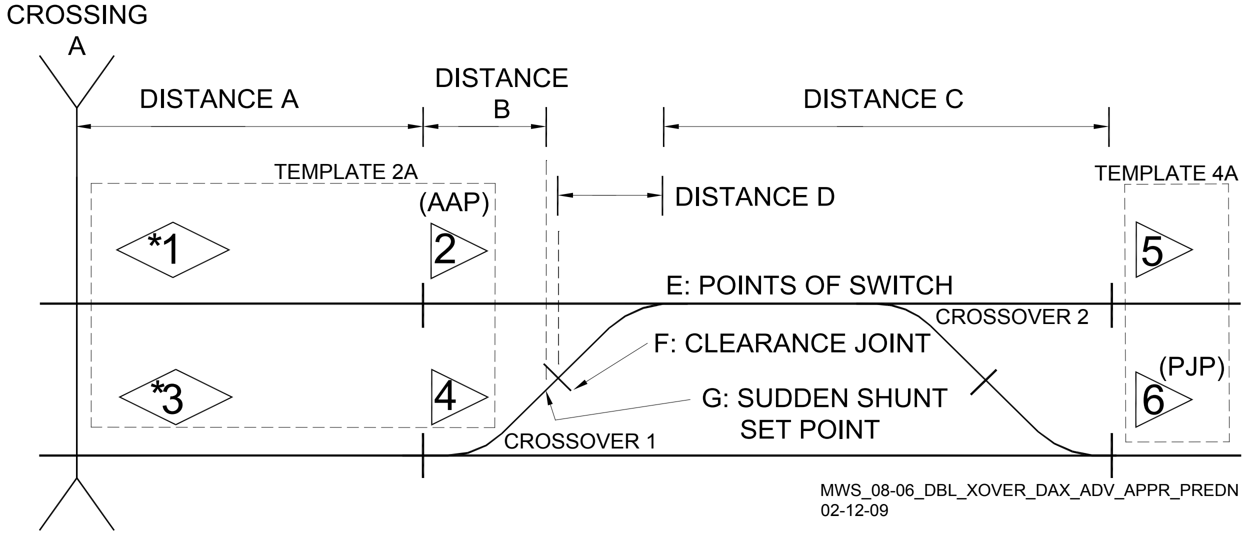


Figure 6-39:
Remote Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)

Procedure 6-4: Remote Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)	
	When the double crossover is remote from the crossing, the predictor dead zone in Figure 6-39 for Crossover1 is covered by Adv Appr Predn programmed into remote GCP 2 and is calculated as follows: **A** = Distance from insulated joints at GCP 4 to crossing island. **A** = ___________ ft. or ____________ m **NOTE** Distance A will be zero when crossover insulated joints are at the crossing as shown in Figure 6-41. **B** = Distance from insulated joints (GCP 4) to shunt detect point G. **B** = ___________ ft. or ____________ m **C** = Distance from far points E to termination shunt. **C** = ___________ ft. or ____________ m **D** = Distance from clearance joint F to far points E. **D** = ___________ ft. or ____________ m **T1** = Seconds of total approach, (WT + Reaction Time (5 secs) + Clearance Time + Advance Pre-emption additional Time). **T1 =** ___________ sec. **T2** = WT + 1 sec. **T2** = ___________ sec.

Procedure 6-4: Remote Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)	
WARNING **THE ADVANCE APPROACH PREDICTION START, STOP, AND TIME MUST BE PROGRAMMED ACCURATELY OR SHORT WARNING TIME MAY OCCUR.**	
	Calculations for GCP 2 (Crossover1):
Step 1	Calculate Speed (feet per sec) (ft/s) for (Dist C) / (10 seconds). Speed = _______ ft/s Calculate Speed (meters per sec) (m/s) for (Dist C) / (10 seconds). Speed = _______ m/s
Step 2	Calculate Speed (ft/s) for (Dist A + B) / (Time T1) Speed = ______ ft/s Calculate Speed (m/s) for (Dist A + B) / (Time T1) Speed = ______ m/s
Step 3	Verify (ft/s or m/s from Step 1) is greater than (ft/s or m/s from Step 2)
Step 4	Calculate Total Occupancy Time (Dist D) / (ft/s or m/s from step 2) Time = ______sec
Step 5	Calculate MINIMUM AAP time by adding 20 second buffer time to the step 4 time. • Total AAP Time = ___________sec
	If Time in Step 5 is greater than 100 seconds then perform step 6 , 7 & 8: If 100 or less, skip to step 9.
Step 6	Calculate speed (ft/s) for (Dist D) / (Time T2) = ________ ft/s Calculate speed (m/s) for (Dist D) / (Time T2) = ________ m/s
Step 7	Calculate Total Occupancy Time (Dist D) / (ft/s from Step 6). Time = _________ sec. Calculate Total Occupancy Time (Dist D) / (m/s from Step 6). Time = _________ sec.
Step 8	If time from Step 5 is greater than 100 and time from Step 7 is less than 100 then use Sudden Shunt Detection in GCP 4 at Shunt detect point G and AAP Time from Step 7 in GCP 2. The field instructions are shown in the following steps.
Step 9	The following are field programming steps of **Adv Appr Predn Start EZ, Stop EZ and timer** value for **GCP 2**. 1. Program GCP 2 Adv Appr Predn Used to YES • 2. Place Hard wire shunt at points of switch (E) and **note** the EZ value. • EZ = ___________. Remove the shunt. • 3. Program Adv Appr Predn **Start** EZ value to be 15 EZ points higher than the noted EZ value. • 4. Program Adv Appr Predn **Stop** EZ value to be 15 EZ points lower than the noted EZ value. • 5. Program Adv Appr Predn **Time** to value of step 5 if steps 6, 7, and 8 were skipped or step 7 if not skipped.

Procedure 6-4: Remote Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)	
Step 10	If the time in step 5 is 100 seconds or less, skip to step 11. If the time is greater than 100 seconds, continue with step 10 and use AAP Time from step 7 in GCP 2. The following is field programming of **Sudden shunt detection Level and Offset**. • 1. In GCP 4 on the other track, program Sudden Shnt Det Used to YES. • 2. Place a hardwire shunt in crossover 1 at point “G” (Figure 6-56A) on the GCP 4 side of the clearance insulated joints and **note** the EZ value. • EZ = ___________. Remove the shunt. • 3. Program Sudden Shnt Det Level to be 10 EZ points **HIGHER** than the noted EZ value. • 4. Program Sudden Shnt Det Offset to be 100 ft **GREATER** than Crossing A DAX offset distance (distance A). However, if GCP 4 has an additional DAX present for another crossing and it has an offset distance of up to 300 ft or no more than 300 ft greater than Distance A, change the Sudden Shnt Det Offset to be 100 ft **GREATER** than this second DAX offset distance. • 5. Continue to Step 11.
<u>WARNING</u> **THE SUDDEN SHUNT DETECTION LEVEL AND OFFSET DISTANCE MUST BE PROGRAMMED ACCURATELY OR SHORT WARNING TIME MAY OCCUR.**	
Step 11	Formula for GCP 6 (Crossover 2): The predictor dead zone for Crossover 2 is covered by PJP in remote GCP 6 and requires using Procedure 6-1 Single Crossover formulas for the calculations (see paragraph 6.2.6.2.1.)

6.2.7.4.2 Example Remote Double Crossover Using Advance Approach Prediction

The layout distances shown in Figure 6-40 provide example for calculating AAP timer values.

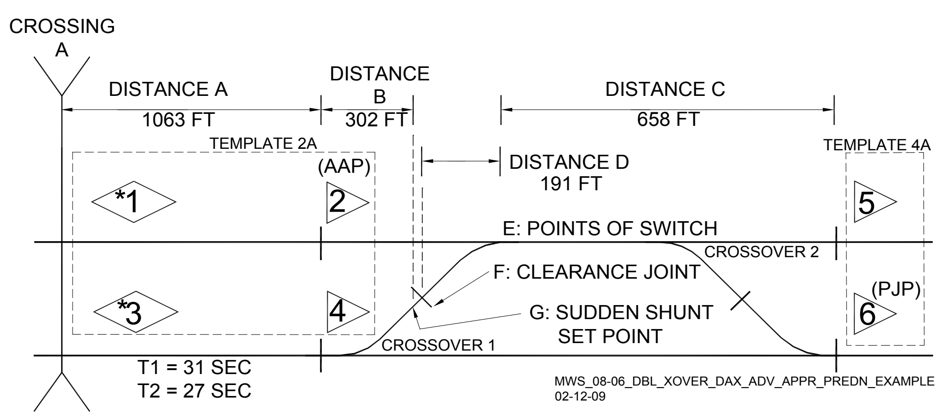


Figure 6-40:
Example Remote Double Crossover Using Advanced Approach Prediction (AAP)

Procedure 6-5: Example Remote Double Crossover Using Advanced Approach Prediction	
	A = Distance from insulated joints at GCP 4 to crossing island. **A** = 1063 ft. or 324.0 m **B** = Distance from insulated joints (GCP 4) to shunt detect point G. **B** = 302 ft. or 92.0 m **C** = Distance from far points E to termination shunt. **C** = 658 ft. or 200.6 m **D** = Distance from clearance joint F to far points E. **D** = 191 ft. or 58.2 meters **T1** = Seconds of total approach, (WT + Reaction Time (5 secs) + Clearance Time + Advance Pre-emption additional Time). **T1 =** (26 + 5) = 31 sec. **T2** = WT + 1 sec. **T2** = (26 + 1) = 27 sec.
Step 1	Calculate Speed (ft/s) for (Dist C) / (10 seconds) = (658/10). Speed = 65.8ft/s Calculate Speed (m/s) for (Dist C) / (10 seconds). = (324.0/10). Speed = 32.4 m/s
Step 2	Calculate Speed (ft/s) for (Dist A + B) / (Time T1) = (1063 + 302)/31. Speed = 44.0 ft/s Calculate Speed (m/s) for (Dist A + B) / (Time T1) = (324 + 92)/31. Speed = 13.4 m/s
Step 3	Verify (ft/s from Step 1) is greater than (ft/s from Step 2) - - - - VERIFIED
Step 4	Calculate Total Occupancy Time (Dist D) / (ft/s from step 2) = (191/44.0). Time = 4.3 sec Calculate Total Occupancy Time (Dist D) / (m/s from step 2) = (58.2/13.4). Time = 4.3 sec
Step 5	Calculate MINIMUM AAP time by adding 20 second buffer time to step 4. • Total AAP Time = (4.3 + 20) = 25sec
	If Time in Step 5 is greater than 100 seconds then perform step 6 , 7, & 8; If 100 or less, skip to step 9.

Since Total AAP Time in Step 5 is less than 100 seconds, Steps 6, 7, & 8 are not required. The Adv Appr Predn Time should be programmed for 25 seconds in GCP 2.

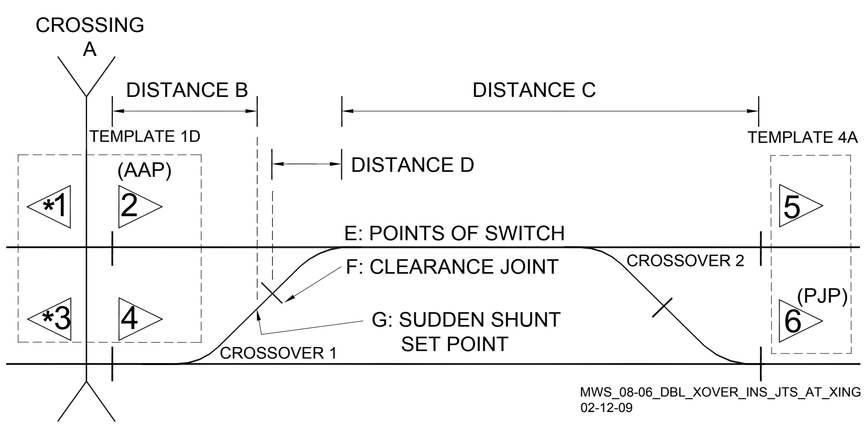


Figure 6-41:
Double Crossover Where Insulated Joints are Located at the Crossing

For further information regarding Advanced Approach Predictions (Adv Appr Predn) see paragraph 6.2.7.

6.2.7.4.3 Cancel Pickup Delay

The Cancel Pickup Delay function (default is “This Isl”) is used for crossover applications where the crossover is situated within the crossing GCP approaches. Examples of this are GCP2 and GCP4 in Figure 6-41.

When a crossover is located near the crossing in the crossing GCP approaches, it is useful to program the “Any Isl” option in the GCP where the near crossover begins. By selecting “Any Isl”, this allows the GCP pickup delay to be truncated by the islands of other tracks in the same GCP chassis. In the case of Figure 6-41, GCP 2 is truncated by GCP3 Island. The programming for GCP 1, 3 and 4 is “This Isl” while GCP 2 is “Any Isl”. Generally, “This Isl” is used for most all other applications.

In Figure 6-41, if a short fast train predicts on GCP 2 and takes the crossover, the train will then pass through the island of GCP 3. There may be times that GCP 2 pickup delay could still be running when GCP 3 island picks up which would produce an overring. This may occur because the pickup delay of GCP 2 is not truncated (due to no island operation) as the tail end of the train leaves GCP 3 Island. By programming T2 to “Any Isl”, this allows the island of GCP3 (programmed to “this isl”) to truncate the pickup delay of GCP 2 predictors that have 0 offset distance. However, truncation of T2 will only occur if all other GCP track modules used in AND 1 XR have:

- No train present (EZ >80)
- No inbound motion detected on any other track used in AND 1 XR.

NOTE

When a track using “Any Isl” programming is truncated by another track, it does not allow truncation of any UAX pickup delay time that may be running.

6.3 TRAFFIC PREEMPTION

A Model 4000 GCP Preemption output may be interconnected to traffic signal equipment. This interconnect is used to initiate a preemption sequence that systematically clears vehicular traffic from the crossing area. A preemption cycle can be initiated either in advance of crossing signals activating using Advance Preemption or at the same time as the crossing signals activating using Simultaneous Preemption.

6.3.1 Advance Preemption

The Advance preemption function is initiated by selecting the **BASIC: preemption** window and setting the **Preempt Logic** field to **Advncd**. With the Advance preemption function selected the **BASIC: preemption** window displays six additional menus as shown in Figure 6-42. The preempt predictors of each Track Module that predicts for the local crossing are ANDed to provide an Advance Preempt Output signal. Preempt predictors follow the logic functions established for AND 1 XR. The Advance Preempt is programmed to an output that is wired to an external traffic-signal-preemption-control relay. The advance preempt delay timer of each Track Module is enabled and each module timer uses the value set by the **Adv Preempt Delay** field (see Figure 6-42).

When a preempt predicts, the external traffic signal preemption relay de-energizes, starting a traffic signals preemption cycle and the advance preempt delay timer starts for that track.

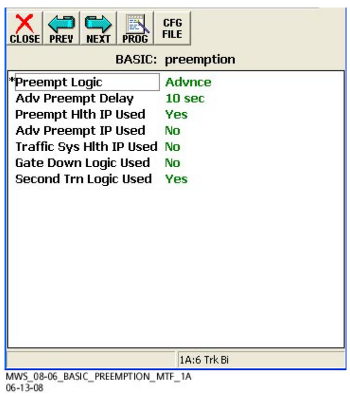


Figure 6-42:
Advance Preempt Function Window

When an advance preempt delay timer expires it de-energizes the Prime predictor for the corresponding track, causing AND 1 XR to de-energize and the crossing to activate.

WARNING

THE ADVANCE PREEMPTION TIME DELAY IS DETERMINED BY THE HIGHWAY AGENCY AFTER AN ENGINEERING STUDY OF THE INTERSECTION AND GRADE CROSSING.
WHEN THE ADVANCE PREEMPT DELAY TIMER EXPIRES, "AND 1 XR" DEENERGIZES ONLY IF THE PRIME PREDICTORS ARE ASSIGNED TO THE "AND 1 XR" FUNCTION.
DO NOT CHANGE THE "AND 1 XR" INPUTS TO OTHER PREDICTORS WITHOUT PERFORMING A COMPLETE SYSTEM TEST.

6.3.1.1 Advance Preemption Timer Delay

Where only the preempt and prime predictors are used at a crossing (no Advanced Preemption Timer used), the time between the start of the traffic signal preemption cycle and the start of the crossing signals is determined by the:

- preempt predictor warning time
- prime predictor warning time
- train speed variation following preempt prediction

For example, with preempt predictor warning time set to 40 seconds, crossing prime warning time set to 30 seconds, and advance preempt delay set to 10 seconds: A train traveling at a constant speed through the approach will result in an advance traffic preemption interval of 10 seconds.

WARNING

IF NO PREEMPTION TIME INTERVAL DELAY WERE USED, A TRAIN THAT SLOWS AFTER THE PREEMPT PREDICTS WOULD RESULT IN AN ADVANCE TRAFFIC PREEMPTION INTERVAL THAT IS GREATER THAN THAT OF THE CONSTANT SPEED TRAIN.
THIS LONGER THAN DESIRED TIME INTERVAL COULD ALLOW THE TRAFFIC SIGNAL TO CHANGE BACK TO RED BEFORE THE CROSSING SIGNALS ACTIVATE.
IF THIS HAPPENED, VEHICLES COULD PROCEED ON THE TRACKS AND BE STOPPED BY THE RED TRAFFIC SIGNAL.
THE "ADVANCE PREEMPTION TIMER" SHOULD BE USED TO PREVENT THIS POSSIBILITY.

If the Adv preempt timer was not used and a train decelerates after the preempt predicts, this would result in an advance traffic preemption interval that is longer than that of the constant speed train.

The advance preemption timer ensures that the time between the start of the traffic signal preemption cycle and the start of the crossing signals is never longer than the programmed interval. Where a train slows after the preempt predicts, the expired advance preempt timer will activate the crossing prior to the prime predicting.

However, where a train accelerates while the preempt timer is running, the prime will predict prior to the advance preemption timer expiring causing the crossing to activate slightly ahead of the timer.

For example, the advance preemption timer set at 10 seconds might run for only 8 seconds before the 30-second prime predictor predicts, overriding the preempt timer and activating the crossing.

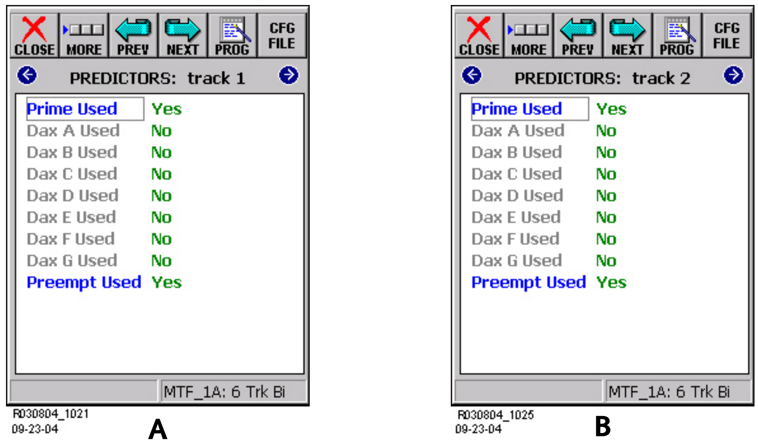


Figure 6-43:
Track Predictor Menu Windows
With Preempt Used Fields Displayed

6.3.1.2 Configuring Advance Preemption

To minimize the delay interval reduction caused by accelerating trains, the following process should be used: set **Preemption Logic** to **Advnce** and **Adv Preempt Delay** to **10 sec** as shown in Figure 6-42 (the preempt automatically appears in the Track Predictor menu windows as shown in Figure 6-43), set the warning time for each track Prime predictor for 2 to 3 seconds below their normal value as shown in Figure 6-44A, set the preempt warning times to 40 seconds as shown in Figure 6-44B.

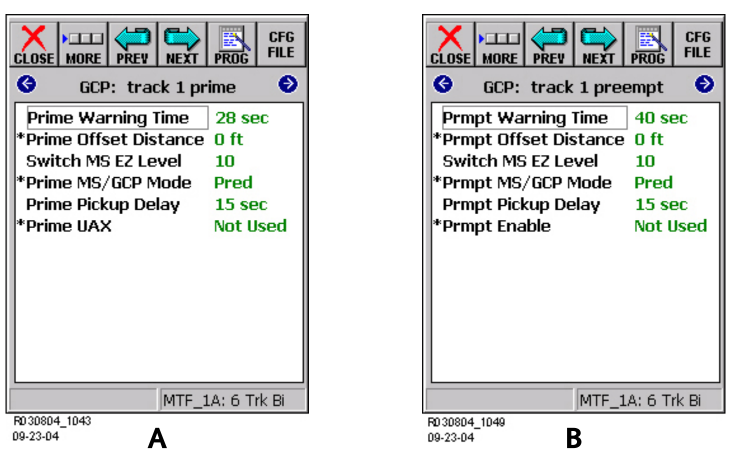


Figure 6-44:
Predictor Settings for Accelerating Trains

To control the Advance preemption relay, assign the advance preempt output to a physical output a shown in Figure 6-45.

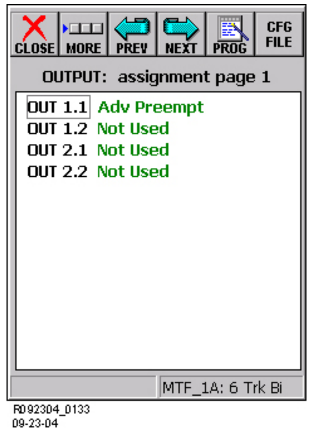


Figure 6-45:
Advance Preemption Output Assignment

6.3.1.3 <u>False Traffic Signal Preemption</u>

False traffic light preemption can occur if the preemption relay coil or the wire to the preemption relay coil opens. Falsely preempting the traffic signal without activating the crossing warning devices will result in traffic being stopped indefinitely at the traffic signal

6.3.1.3.1 Preemption Relay Health Detection (Default is Yes)

To detect a false traffic signal preemption, the Model 4000 GCP may be configured to make a health check of the preemption relay circuit. This check monitors the relays front contacts and the relay coil drive to check that they are energized at the same time. When the preemption relay contacts are falsely open, the crossing system will be operated continuously until the problem is repaired.

6.3.1.3.2 Preemption Relay Health Check Configuration

To configure the Model 4000 GCP to perform a continuous correspondence check:

- Set the Preempt Health IP Used field to **Yes** as shown in Figure 6-42.
- Program a physical input to Preempt Health as shown in Figure 6-46.
- Apply Battery B through a front contact of the preemption relay and back to the assigned input.

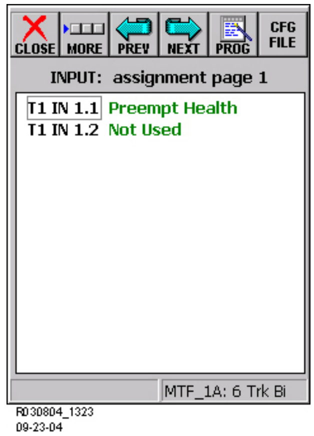


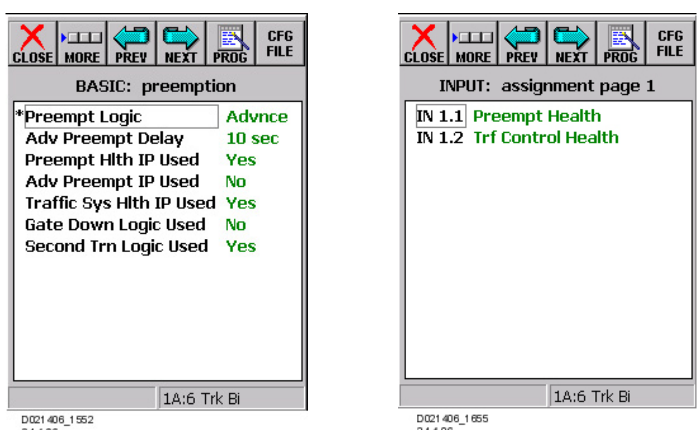
Figure 6-46:
Preemption Health Assigned to Input

6.3.1.4 <u>Traffic System Health</u>

When a traffic signal system provides a traffic system health output relay, a contact of this relay can be connected to an input of the Model 4000 GCP to monitor traffic system health. When the traffic system is unhealthy (either dark or in an all-flash mode), vehicle traffic in the crossing will not have a green signal to clear them off the tracks. With this relay connected, the advance preemption continues to operate as normal while the traffic system is healthy; but, when the traffic system is unhealthy, the Model 4000 GCP switches to simultaneous preemption and activates the warning devices as soon as a track module preempt predictor predicts.

To activate this monitor function

- Set the **Traffic Sys Hlth IP Used** field to **Yes** as shown in Figure 6-47A.
- Program a physical input to **Trf Control Health** as shown in Figure 6-47B.



A B

Figure 6-47:
Traffic System Health Configuration Settings

6.3.1.5 Advance Preemption from a Remote Location

Advance preemption can be initiated from a GCP at a remote location

6.3.1.5.1 Remote Advance Preemption Between Modules of the Same GCP Case

An advance preemption application where the Track Modules for the crossing and the Track Modules for the remote location are in the same Model 4000 GCP case is shown in Figure 6-48.

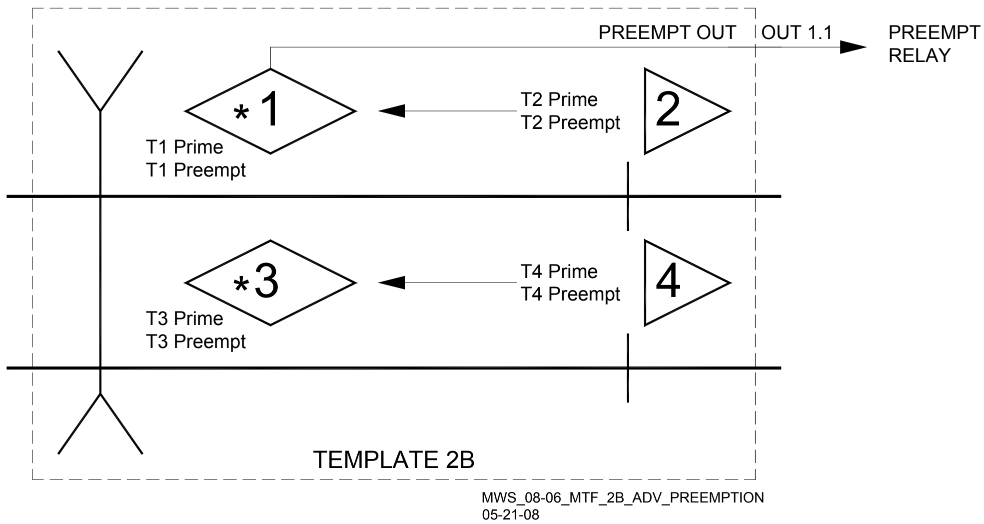


Figure 6-48:
Remote Advance Preemption Between Modules of the Same Case

The advance preempt setup for this configuration is shown in Figure 6-49.

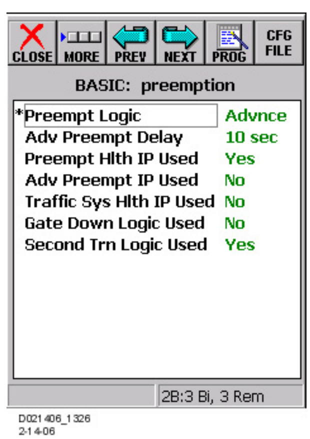


Figure 6-49:
Remote Advance Preempt Configuration Setup

The Prime and Preempt predictors of each Track Module are enabled. The setup for tracks 1 and 2 are shown in Figure 6-50A through Figure 6-50D. The setup for tracks 3 and 4 are identical to the setup for tracks 1 and 2.

Figure 6-50:
Remote Preemption From The Same Case

Set the module output and input assignments as shown in Figure 6-51A and Figure 6-51B.

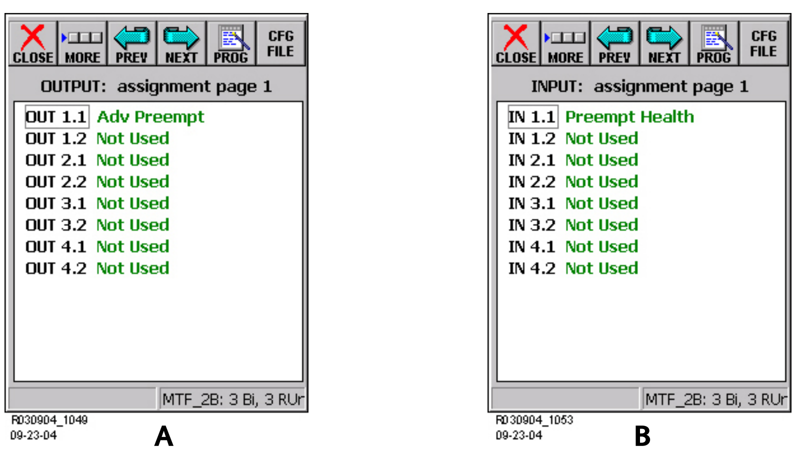


Figure 6-51:
I/O Assignments for Remote Preemption From The Same Case

6.3.1.5.2 Remote Advance Preemption Between Separate GCP Cases

When the remote predictors are in a separate 4000 case, the track configuration is as shown in Figure 6-52.

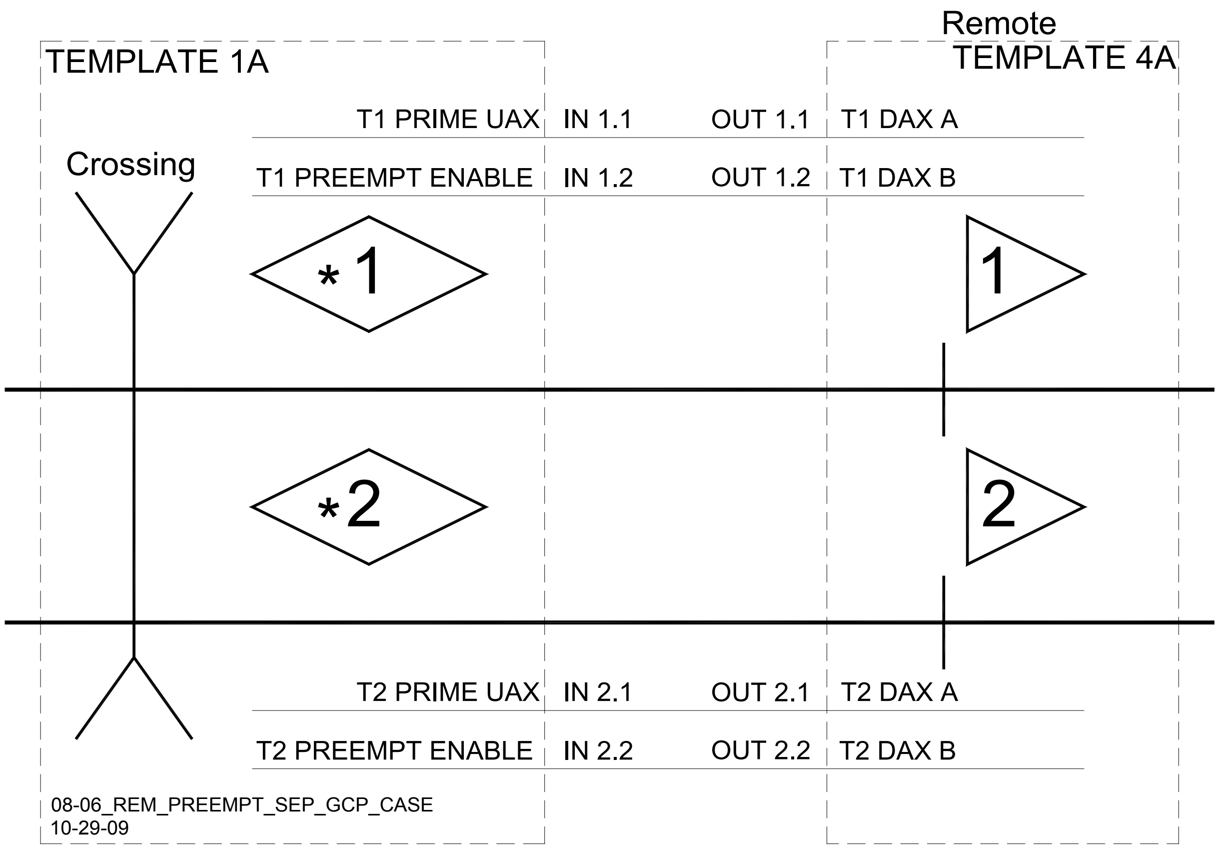


Figure 6-52:
Remote Preemption From Separate Model 4000 GCP Case

To implement this configuration, set the Track Modules at the remote site to provide two DAX predictors as shown in Figure 6-53, with DAX A to start the crossing and DAX B to start the Advance Preemption process.

Figure 6-53:
DAX Configuration For Remote Preemption Start

Individually assign the DAX predictors to the physical outputs on the GCP front panel as shown in Figure 6-54. Preempt logic at remote is set to **No**.

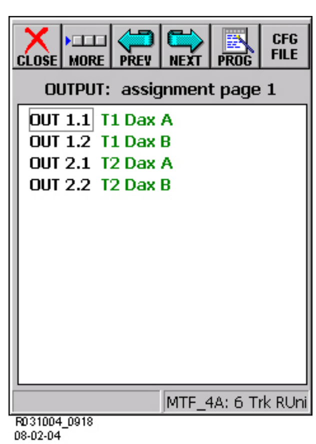


Figure 6-54:
DAX Output Assignment

Set the prime and preempt parameters at the crossing as shown in Figure 6-55A through Figure 6-55D. Assign Prime UAX and Preempt Enable to IP. Assign the physical inputs to the crossing as shown in Figure 6-56. The Prime UAX inputs are connected to the DAX A outputs from the remote tracks. The Preempt Enable inputs are connected to the DAX B outputs from the remote tracks. The advance preempt timer starts when either DAX B output is de-energized.

Figure 6-55:
Crossing Configuration For Remote Preemption Start

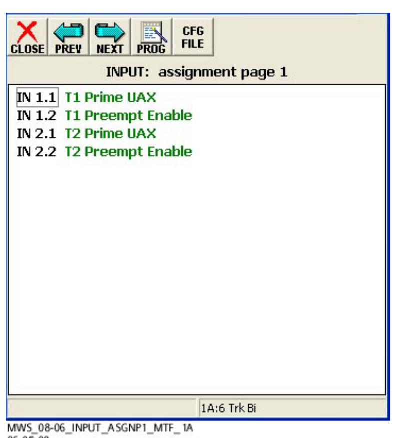


Figure 6-56:
Input Assignment For Advance Preemption Crossing

6.3.1.5.3 Preempt Relay Health Check (Alternatives)

In the configuration shown in Figure 6-52, all available inputs are used and none are available to assign a Preempt Health input for the Preempt Relay Check function. However, if SSCC3i modules are installed, additional inputs may be allocated for the Preempt Health input as shown in Figure 6-57

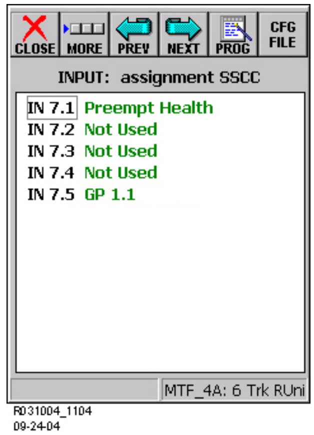


Figure 6-57:
SSCC Preempt Health Input Assignment

An alternate way to implement the Preempt Relay Check function without the use of additional modules is to configure the application as shown in Figure 6-58. Instead of bringing the individual DAX signals from the remote to the crossing, the DAX signals are combined in the AND functions to provided two output signals. The DAX A signals are combined in AND 1 XR as shown in Figure 6-59A. The DAX B signals are combined in AND 2 as shown in Figure 6-59B.

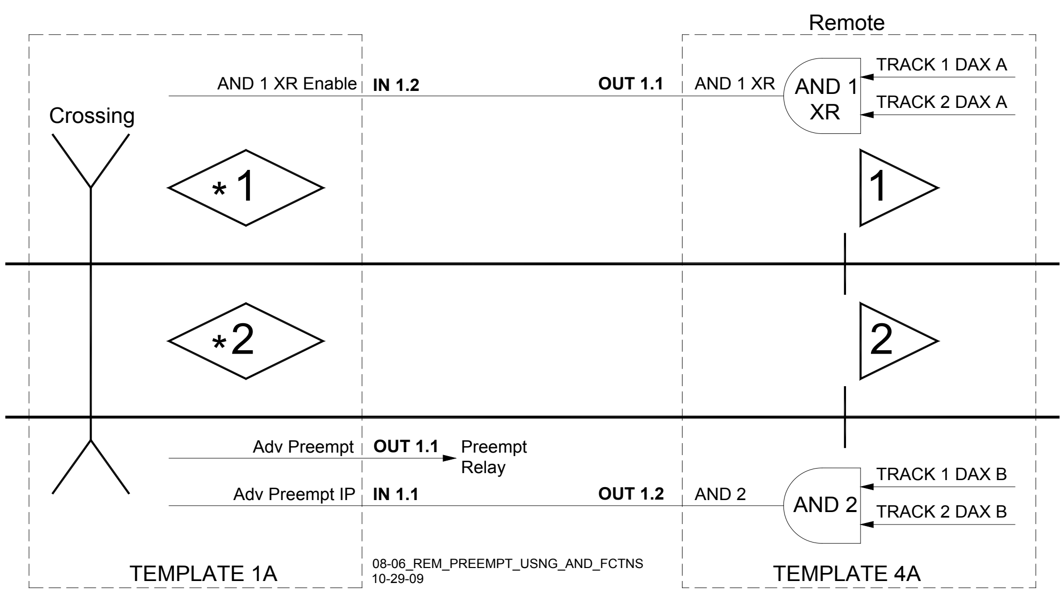


Figure 6-58:
Remote Preemption From Separate Model 4000 GCP Case Using AND Functions

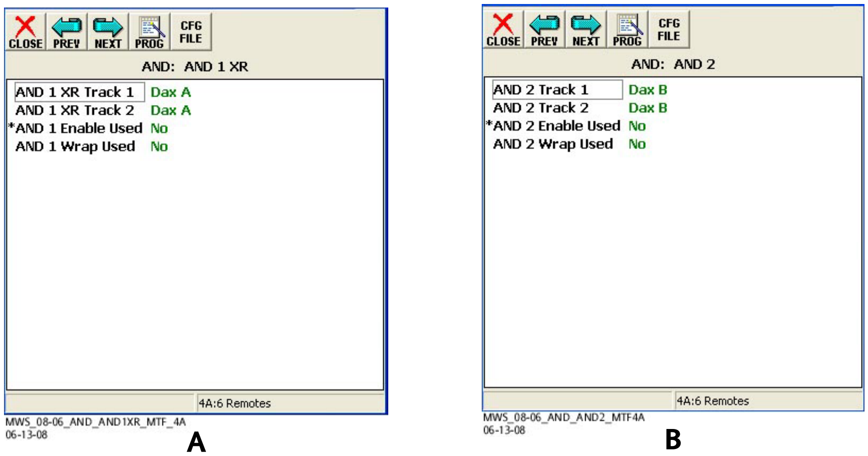


Figure 6-59:
Remote AND Allocation

Assign the AND function outputs to the physical outputs on the track modules connectors, as shown in Figure 6-60.

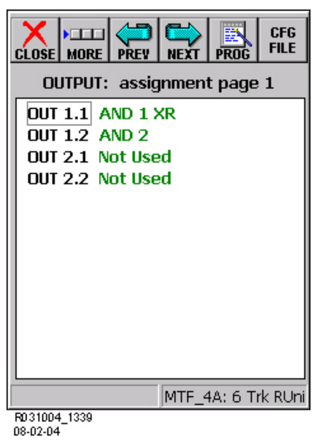


Figure 6-60:
Remote Output Assignments

At the crossing, set **AND 1 XR Enable** to **Yes** as shown in Figure 6-61A, set **Preempt Logic** to **Advnce, Advance Preempt to IP, and Preempt IP Used to Yes** as shown in Figure 6-61B, assign **Adv Preempt IP**, **AND 1 XR Enable**, and **Preempt Health** to the physical inputs shown in Figure 6-62. The advance preempt timer starts when the Advance preempt IP Control input goes low.

The Preempt Relay Health Check Configuration is described in paragraph 6.3.1.3.2.

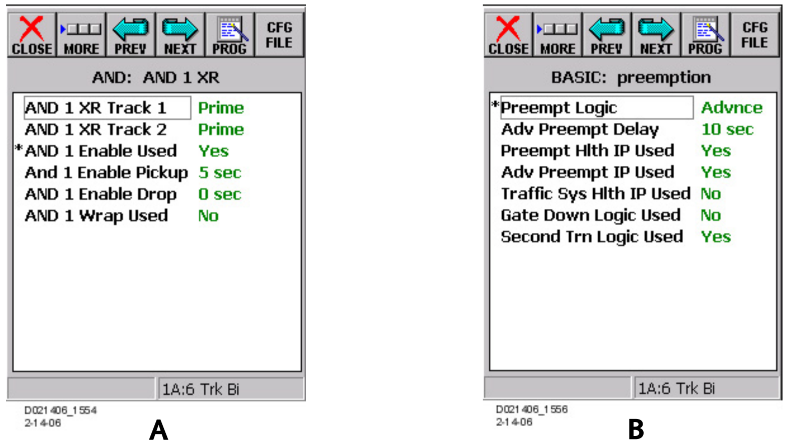


Figure 6-61:
Crossing Functions

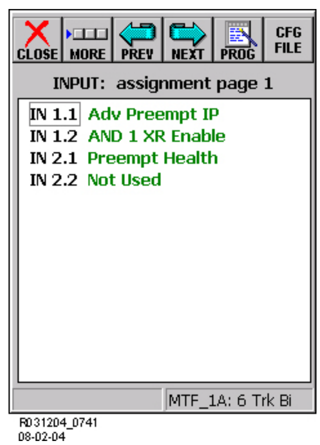


Figure 6-62:
Crossing Input Assignment

6.3.1.6 Gate Down Logic for Terminating Track Clearance Green

When advance preemption is enabled and **Gate Down Logic Used** is set to **Yes** (Figure 6-63A), a **Gate Dwn Indication** output is provided by the system. This output is energized when the advance preempt output has de-energized and either of the following conditions exist:

- an island is occupied
  - If an internal island is used, the occupancy must be caused by a shunt
    - An occupancy indication caused by an island or track error will not cause the output to energize.
- all **GD** (gate down) inputs are energized
  - Only GD inputs from gates controlling movement toward the preempted intersection must be used in the gate down logic.
  - When using MCFs GCP-T6X-02-8 or earlier only assign GDs to vital inputs on the crossing controllers that are in the direction of travel as shown in Figure 6-63B.

- When using MCF GCP-T6X-02-9 or later, the user can assign all Gate Downs to inputs as normal, but then select which Gate Down inputs are to be used in the Gate Down Logic as shown in Figure 6-63D. This screen will only show the GDs that have been enabled on the SSCC:1 and SSCC:2 programming screens.
- Also note that when using MCF GCP-T6X-02-9 or later, the advance preemption timer is no longer shown when gate down logic is used, as this function is not necessary when gate down logic is used.

When assigned to a physical output **Gate Dwn Indication** may be connected to the traffic system to terminate clear-out-green operation (see Figure 6-63C).

WARNING

WHEN USING MCFS GCP-T6X-02-8.MCF OR EARLIER:
DO NOT USE THE "GATE DWN INDICATION" FOR TRAFFIC SIGNAL PREEMPTION WHEN GD INPUTS ARE ENABLED FOR GATES USED FOR OTHER DIRECTIONS OF TRAFFIC. CONTACT SIEMENS TECHNICAL SUPPORT FOR PROGRAMMING INSTRUCTIONS IF "GATE DWN LOGIC" IS NEEDED WHEN "MUTE BELL ON GATE DOWN" OR FOUR-QUADRANT GATES ARE USED.

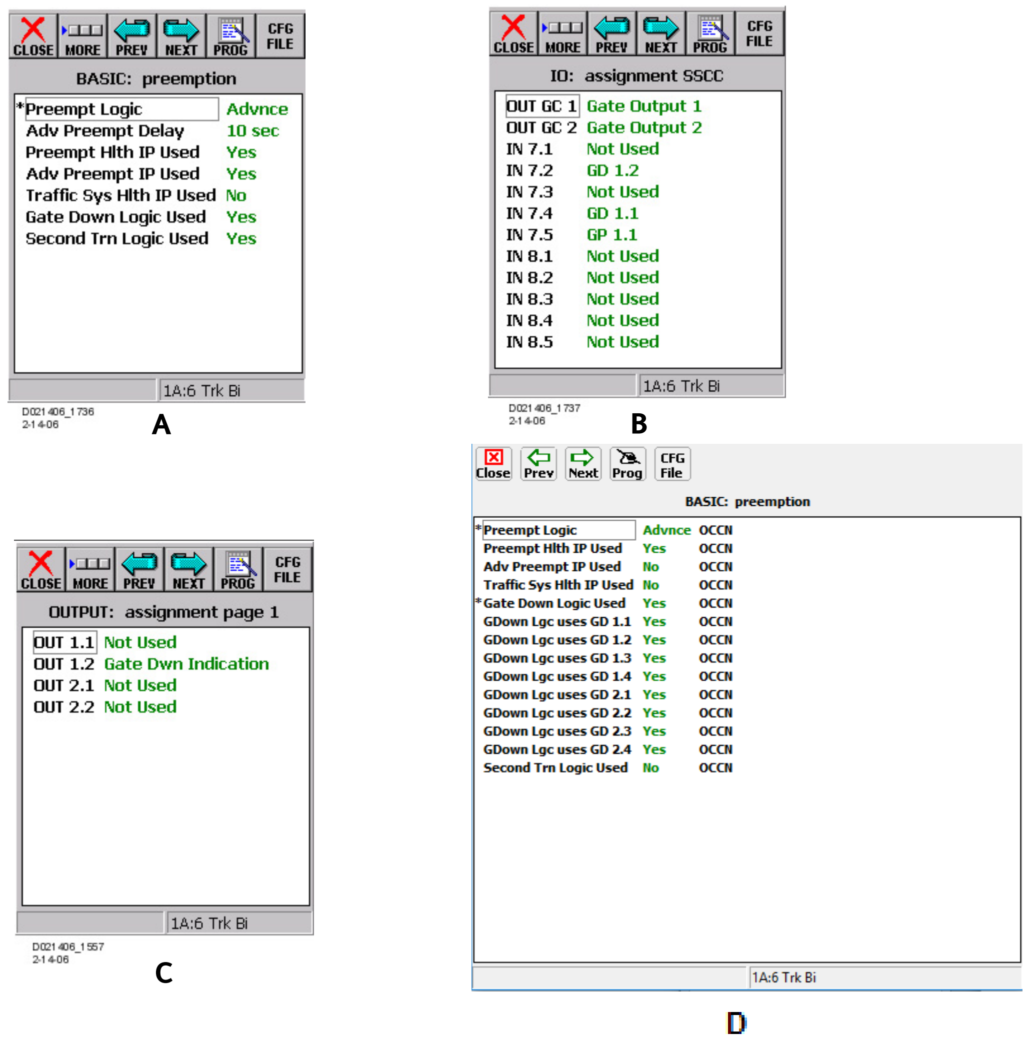


Figure 6-63:
Preemption Gate Down Logic Activation

6.3.1.7 <u>Second Train Logic</u>

The **BASIC: preemption** window provides the option of enabling second train logic. The second train logic status determines whether the preempt predictor of a second train will affect crossing recovery when:

- first train has gone through the crossing and its island has cleared while a second train has been detected by the preempt predictor on another track
- The second train logic is controlled by the setting of the **Second Train Logic Used** status field to Yes (see Figure 6-63A).

For MCF GCP-T6X-02-8 or earler, **Second Trn Logic** is only available when **Preempt Logic** is set to **Advnce** and has the default of Yes.

For MCF GCP-T6X-02-09 or later, **Second Trn Logic** is available independently of whether **Preempt Logic** is set to **Advnce or not**. In this case, if **Preempt Logic** is not set to **Advnce** and **Second Trn Logic used** is set to **Yes**, the Preempt predictors are available to be configured.

Under the above conditions, when the field **Second Trn Logic Used** is set to:

- **No** the crossing, will recover unless the second train's prime has predicted
- **Yes** (default) the crossing will not recover if the second train's preempt has predicted

If the second train preempt does not predict prior to first train prime recovery, the crossing will respond to the normal preempt timer cycle.

NOTE

For MCFs GCP-T6X-02-8 and earlier: Second train logic may be used in the same manner for multiple track crossings that are not interconnected to traffic signals. The programming steps are the same except **Preempt Hlth IP** and **Traffic Sys Hlth IP** checks are not used and are set to **No**.

6.3.2 Simultaneous Preemption

Simultaneous preemption initiates the traffic signals clear out green at the same time that the crossing signals are activated. It is implemented by:

- setting the **Preemption Logic** to **Simult** as shown in Figure 6-64A
- assigning **Sim Preempt** to a physical output as shown in Figure 6-64B

Output is used to control the traffic relay. To set **Preempt Health IP** (Default is Yes). Refer to paragraph 6.3.1.3.1.

To enable Advance Preemption features, such as Second Train Logic or Gate Down Logic while having simultaneous preemption, set **Preemption Logic** to **Advnce** and the **Adv Preempt Delay** to **0** seconds.

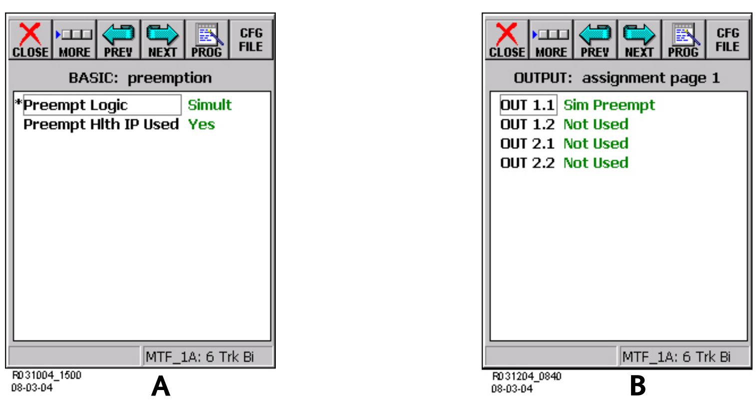


Figure 6-64:
Simultaneous Preemption Programming

6.4 WRAP CIRCUITS

NOTE

To facilitate in-service testing of WRAP logic, designers should consider using a UAX input to de-energize the GCP Trk 'n' Prime that is being wrapped.

This programming option allows a track module's function to be bypassed by use of a "wrap circuit". The wrap circuit provides the train detection for a track circuit, or combination of track circuits, which generally extend to or beyond the limits of a GCP approach. Front contacts of these track relays energize a physical wrap input when the wrap circuits are not occupied. When no trains are present, a wrap prevents crossing activation even if the track module is in failure.

6.4.1 Track Wrap Circuit Menu Selection:

On the 4000 GCP DT Window, select the **PROG** button (see Figure 6-65).

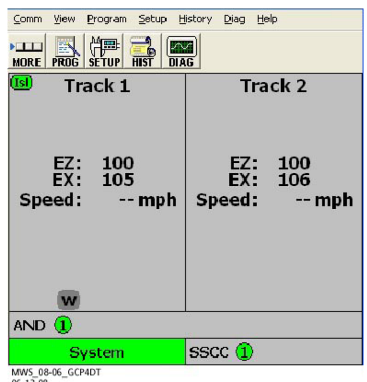


Figure 6-65:
4000 GCP DT Window

- Enter the Password, then select **OK** (if required). The **MAIN PROGRAM menu** Window opens (see Figure 6-66).

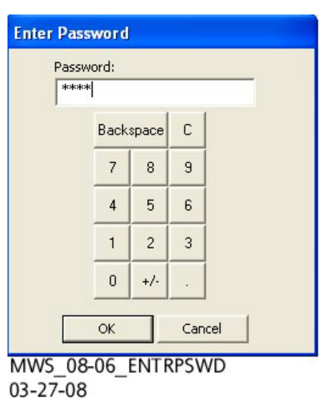
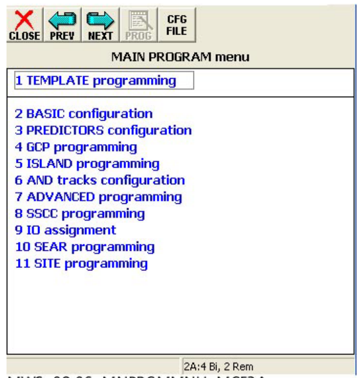


Figure 6-66:
The Enter Password Window

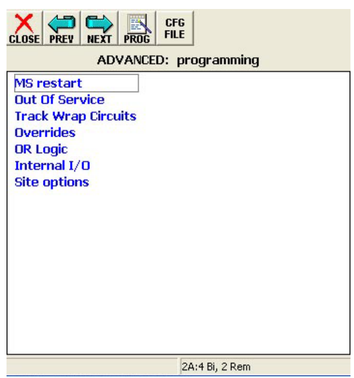
- On the **MAIN PROGRAM menu** Window, select **7 ADVANCED programming**. The **ADVANCED: programming** Window, depicting MCF-2A, opens (see Figure 6-67).



MWS_08-06_MNPRGMMNU_MCF2A
03-27-08

Figure 6-67:
The MAIN PROGRAM menu Window

- On the **ADVANCED: programming** Window, select **Track Wrap Circuits**. The **ADVANCED: track wrap circuits** Window opens (see Figure 6-68).



MWS_08-06_ADVDPGMG
03-27-08

Figure 6-68:
The ADVANCED: programming Window, MCF-2A

- On the **ADVANCED: track wrap circuits** Window, enter the desired LOS timer setting, and select whether or not to use each Track # Wrap (see Figure 6-69).

MWS_08-06_ADVDTWCS
03-27-08

Figure 6-69:
The ADVANCED: track wrap circuits, MCF-2A

6.4.2 Wrapped Track Module Operation

Track modules, while wrapped, do not activate the crossing. A track module becomes wrapped as soon as its physical wrap input is energized by track circuit relay contacts. A Track module becomes unwrapped by de-energizing the wrap input when a train is present in any part of the GCP track module approach. Each track module can be individually wrapped by the user. Wrap track circuits may be signal track circuits or modulated audio overlay circuits such as PSO. Each track module wrap has a programmable loss of shunt timer provided. Wrap LOS time default is 5 seconds (recommended minimum time).

6.4.2.1 When a Track is Wrapped

Track module predictor outputs remain energized (no crossing activation). Module predictor LED and island LED de-energize on train movements, but their outputs are ignored by the internal logic. The island and track predictor inputs are ignored (such as UAX, DAX Enables). Module input LEDs show deenergized when inputs deenergize, but are ignored. Wrapped track module failures and corresponding rail failures are ignored. Failures are displayed on the Main Menu as a red track and red system bar. Failure types and causes can be reviewed by selecting the DIAG button. Wrapped tracks are indicated on the main track display with a “W” when the track relay is energized. Status of the wrap input is constantly depicted on the system IO view. Island operation is ignored.

If the Model 4000 GCP switches over between MAIN and STANDBY modules and no train is present, any wrapped track will continue wrapped once the 4000 has completed switch-over and the modules have rebooted.

If Emergency Activation (EA) is programmed ON and its physical input is de-energized, wrapped tracks will change to unwrapped. Once EA is energized, tracks previously wrapped will return to wrapped if no trains are present.

The crossing will activate while wrapped if:

- AND 1 XR Enable is programmed ON and the AND 1 XR input is de-energized
- Advanced Preempt logic is ON and Adv Preempt IP input is deenergized

If Track module is in failure when wrap input becomes deenergized, warning devices are immediately activated without any system reaction time delay.

6.4.3 4000 Wrap Design Considerations

WARNING

FOR PROPER CROSSING OPERATION, THE WRAP CIRCUIT LENGTH MUST EXTEND TO A POINT THAT INCLUDES THE FULL WARNING TIME OR DAX WARNING TIME.

Track circuits used for wrapping each track module must extend over the entire approach distance of the track module. Audio frequency overlay wrap circuits must extend at least a distance that will provide the minimum warning time for the design train speed. In the following examples TR1 through TR4 are track circuits:

6.4.3.1 Single Track—Same GCP

When 4000 track modules (including DAXes) are located in same 4000 crossing unit (Figure 6-70), the Track circuit repeater used for wrapping the remote track must be available at the crossing GCP location. In Figure 6-70, template 2A is used.

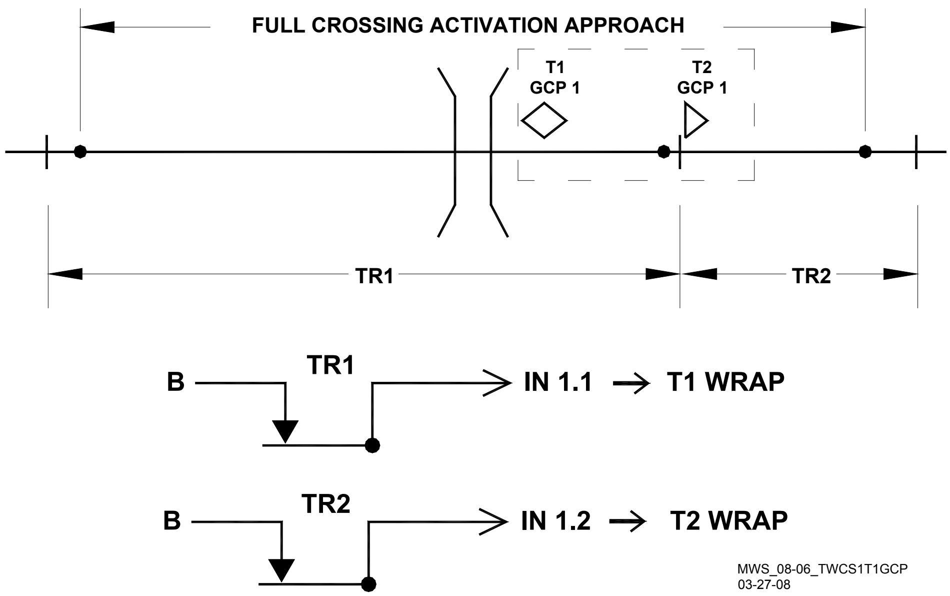


Figure 6-70:
Single Track--When 4000 Track Modules Located In Same 4000 Crossing Unit

6.4.3.2 Single Track—Remote GCP

When a DAX module is in a separate remote 4000 unit (see Figure 6-71), connect the remote DAX A physical output at GCP 2 to AND 1 XR enable at GCP 1 as shown in Figure 6-71 (with a minimum of 5 seconds of pickup delay).

WARNING

CONNECT THE REMOTE DAX A PHYSICAL OUTPUT AT GCP 2 TO AND 1 XR ENABLE AT GCP 1. FROM THE REMOTE GCP, USE THE AND1 XR ENABLE AND DO NOT USE THE T1 UAX OR THE T1 DAX ENABLE AT CROSSING GCP 1 SINCE THEY ARE BOTH STILL WRAPPED WHILE THE TRAIN IS IN THE REMOTE DAX APPROACH.

"AND" outputs including "AND Enable" inputs are not wrapped when wrap inputs are energized. In Figure 6-71, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

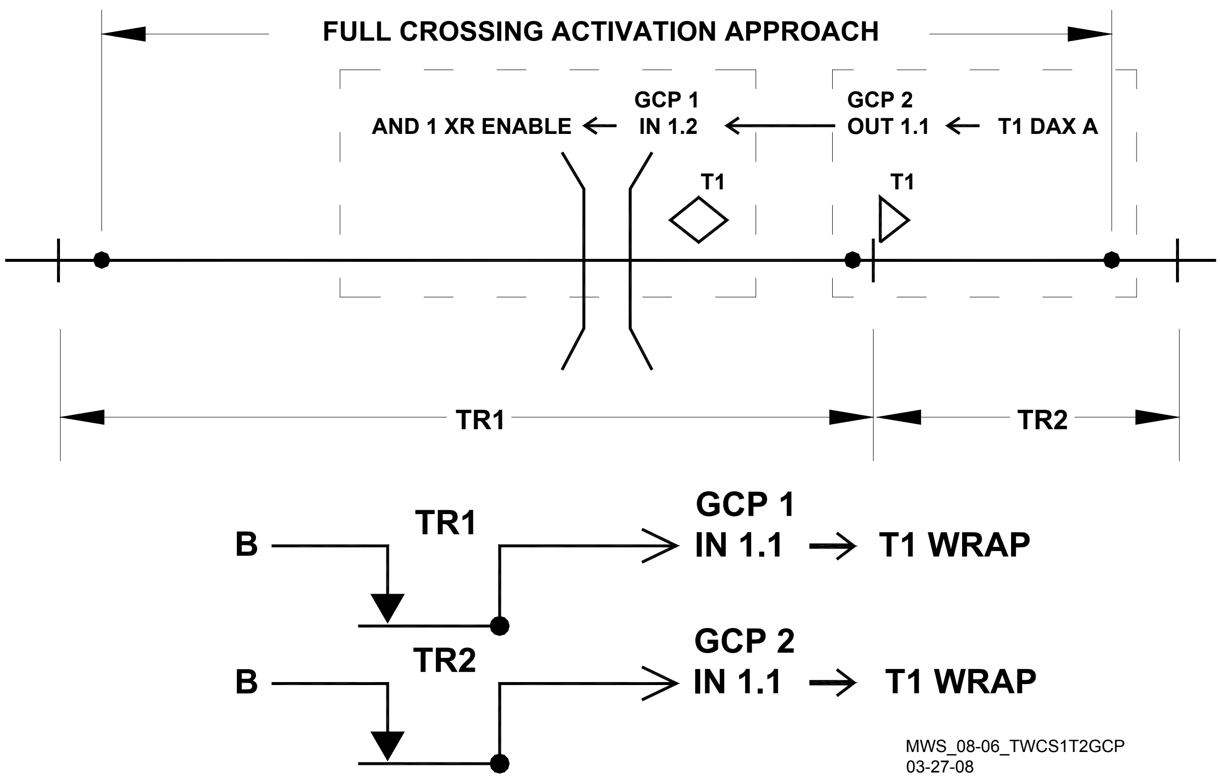


Figure 6-71:
Single Track--When A DAX Module Is In A Separate Remote 4000 Unit

6.4.3.3 Double Track—Same GCP

When the GCP 4000 track modules including DAXes are located in same 4000 crossing unit (Figure 6-72), the track circuit repeaters used for wrapping the remote GCP must be available at the crossing GCP location. In Figure 6-72, template 2A is used.

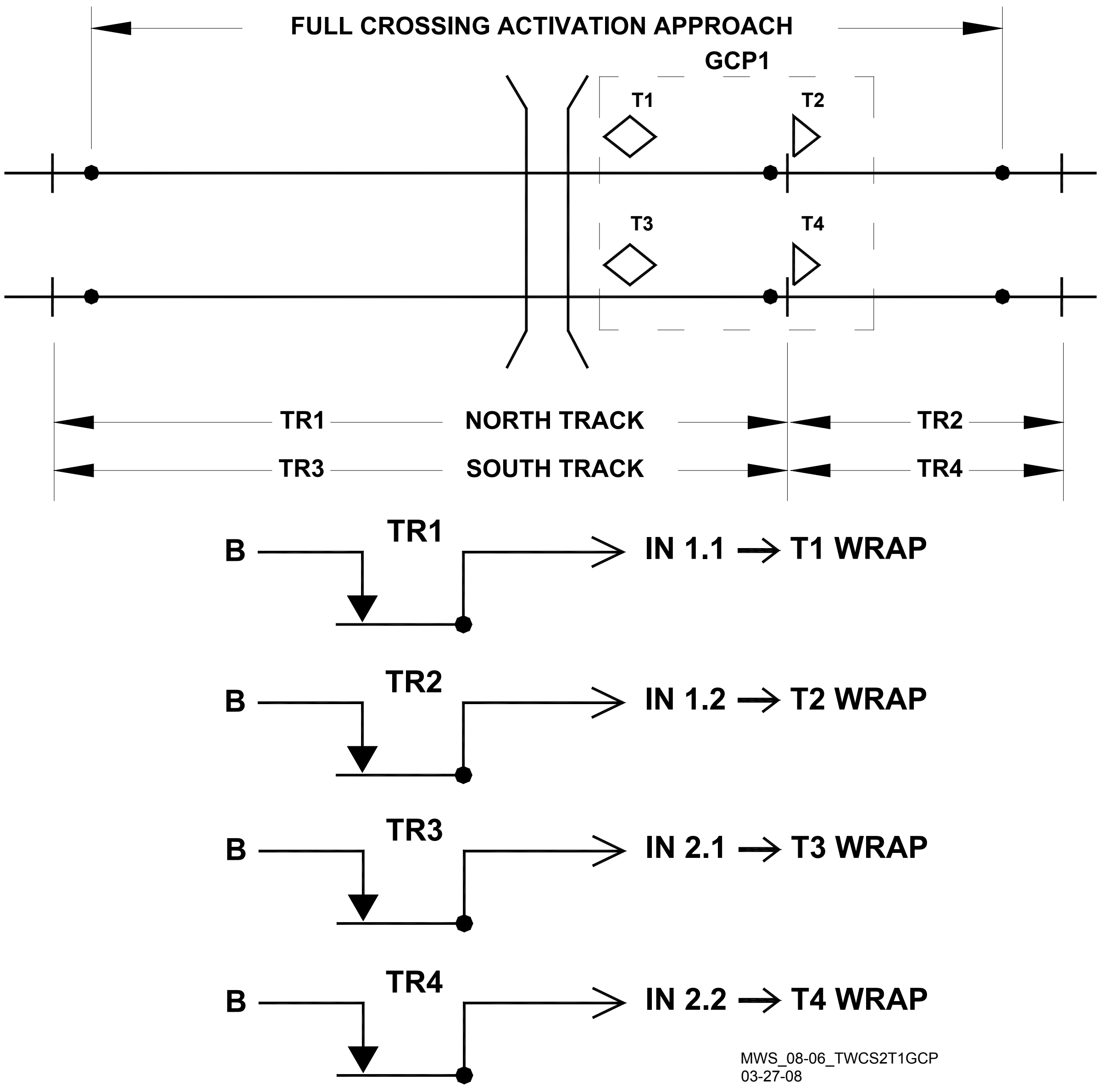


Figure 6-72:
Double Track—All 4000 Track Modules Located In Same 4000 Crossing Unit

6.4.3.4 Double Track—GCP2 with T1 & T2 Remote, Single Line Pair

In this example GCP 2, with track modules T1 and T2, is a remote Model 4000 GCP unit. To utilize a single line pair from the remote DAX location to the crossing, use the AND 1 output at GCP 2 (Figure 6-73). AND 1 XR at GCP 2 is controlled by T1 DAX A and T2 DAX A. Remote GCP 2 case contains remote T1 and T2. In Figure 6-73, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

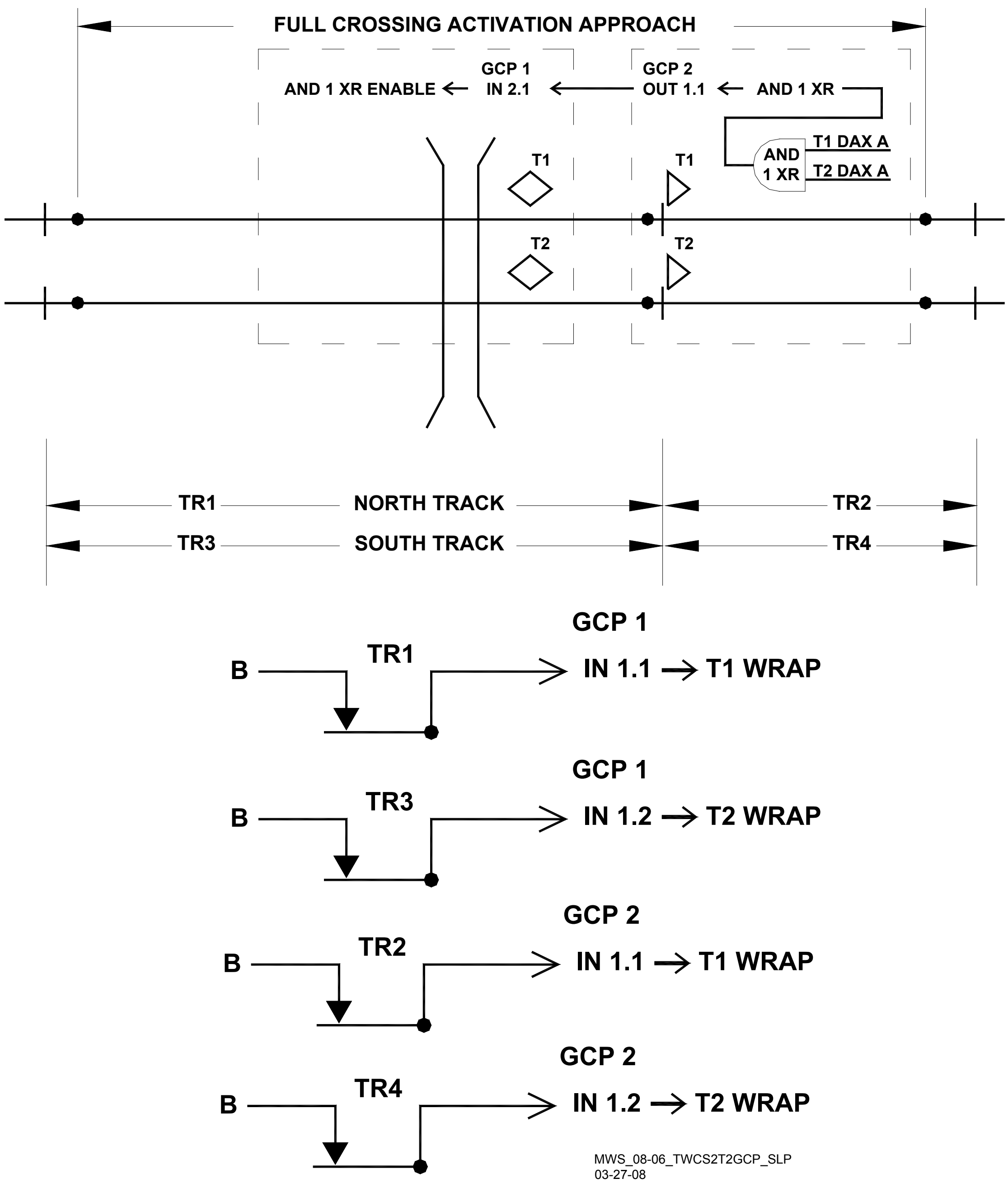


Figure 6-73:
Double Track—With Single Line Pair From Remote GCP 2 to Crossing GCP 1

6.4.3.5 Double Track—GCP2 with T1 & T2 Remote, Double Line Pair

When two independent line pairs are desired from the remote to the crossing, use T1 DAX A and T2 DAX A outputs at the remote (GCP 2) (Figure 6-74). At the crossing (GCP 1), program **AND 1 Enable** to **Yes**. Program two physical inputs to **AND 1 XR Enable**, **IN 2.1** connected to T1 DAX A and **IN 2.2** connected to T2 DAX A. These two pairs are interfaced from the remote GCP. Either input de-energized will cause the crossing to Activate (Figure 6-74). In Figure 6-74, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

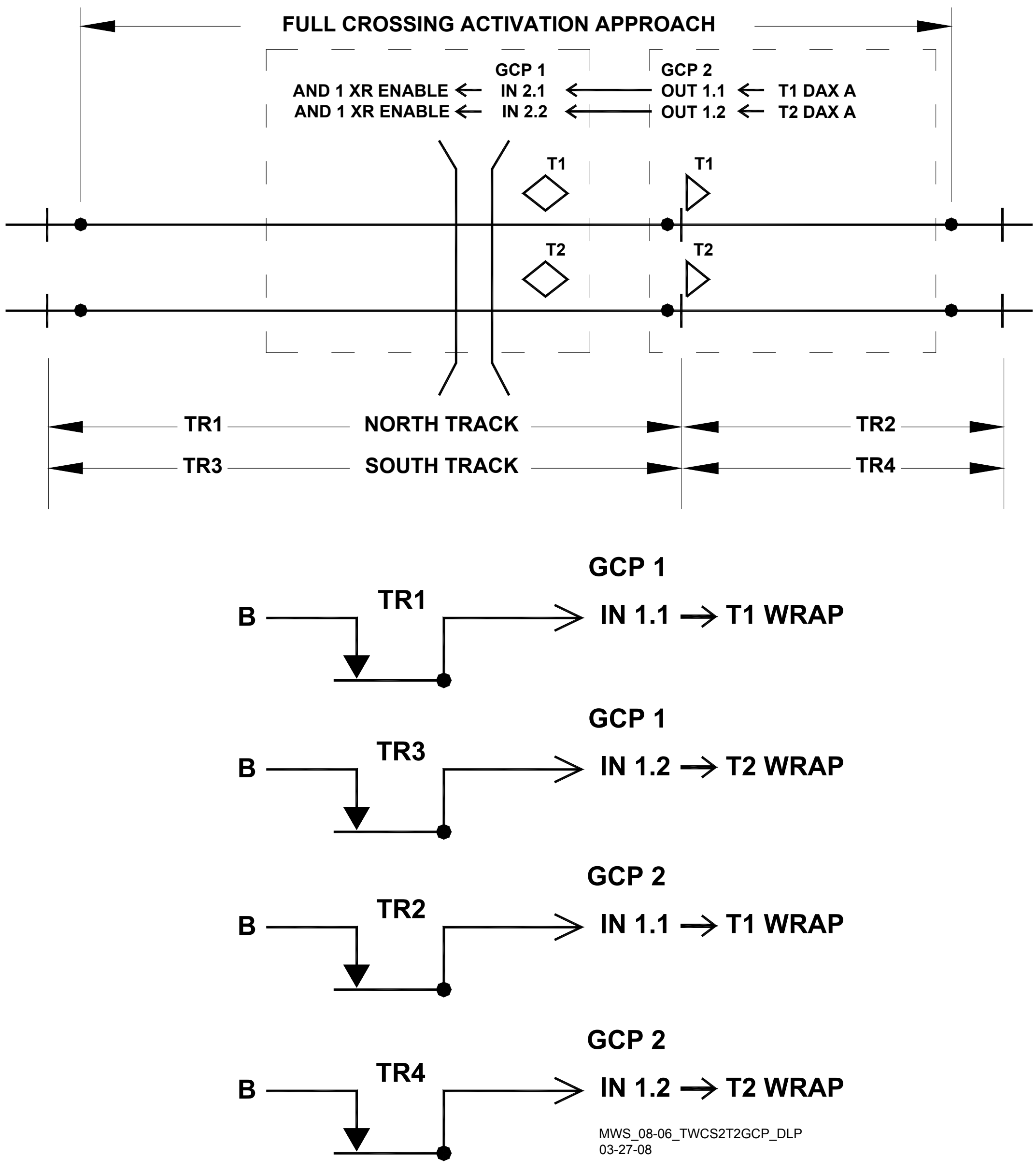


Figure 6-74:
Double Track—With Two Line Pair From Remote GCP 2 to Crossing GCP 1

Once the GCP is correctly programmed, when a train drops the Wrap Circuit, a shaded “W” appears in the appropriate Track description block on the **4000 GCP DT** Window (see Figure 6-75).

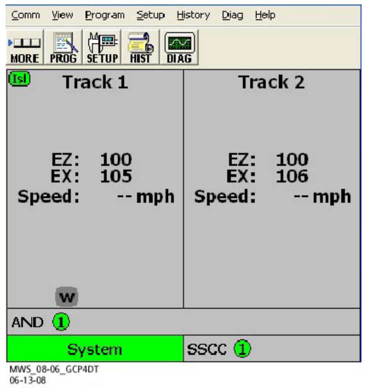


Figure 6-75:
GCP 4000 DT Window with Track 1 Wrap On

6.5 GCP APPROACH OVERRIDE

6.5.1 Override Operation

An override becomes effective immediately once 12 VDC is applied to the programmed override input. When an input is de-energized the override is removed immediately from the selected track module predictors. When an override is applied, the track module predictor LEDs will still deenergize on train movement but they are ignored. If the Model 4000 GCP switches over between MAIN and STANDBY modules while override is in effect, the override will continue once the 4000 has completed switch-over and the modules have booted, as long as the RWP remains energized. When an override input is energized, the corresponding track module will override:

- Prediction process for the predictors selected for override
- UAX and DAX enables for predictors selected for override
- Positive start (all predictor override only)
- Advanced Preemption (all predictor override only)
- MS Restart (all predictor override only)
- Enhanced Detection (all predictor override only)

When an override input is energized, the corresponding track module will NOT override:

- Island operation (deenergizes AND 1)
- Track related errors such as high EZ and low EX
- Module and system errors
- Low EZ detection when detected
- AND Enable inputs
- Adv Preempt IP (deenergizes AND 1 and ADV Preempt output)
- Preempt Hlth IP (deenergizes AND 1)
- Emergency activation

6.5.2 Track Override Option

NOTE

To facilitate in-service testing and quarterly testing of OVERRIDE logic in accordance with FRA 234.269, designers should consider using a UAX input to de-energize the GCP Trk 'n' Prime or DAX Enables to de-energize the DAX outputs that are being overridden.

When a trailing switch is in the reverse position in a GCP approach and the spur track beyond the switch does not go through the crossing, it may be desirable to prevent an inbound train from activating the crossing before it goes out the reversed switch (see Figure 6-76).

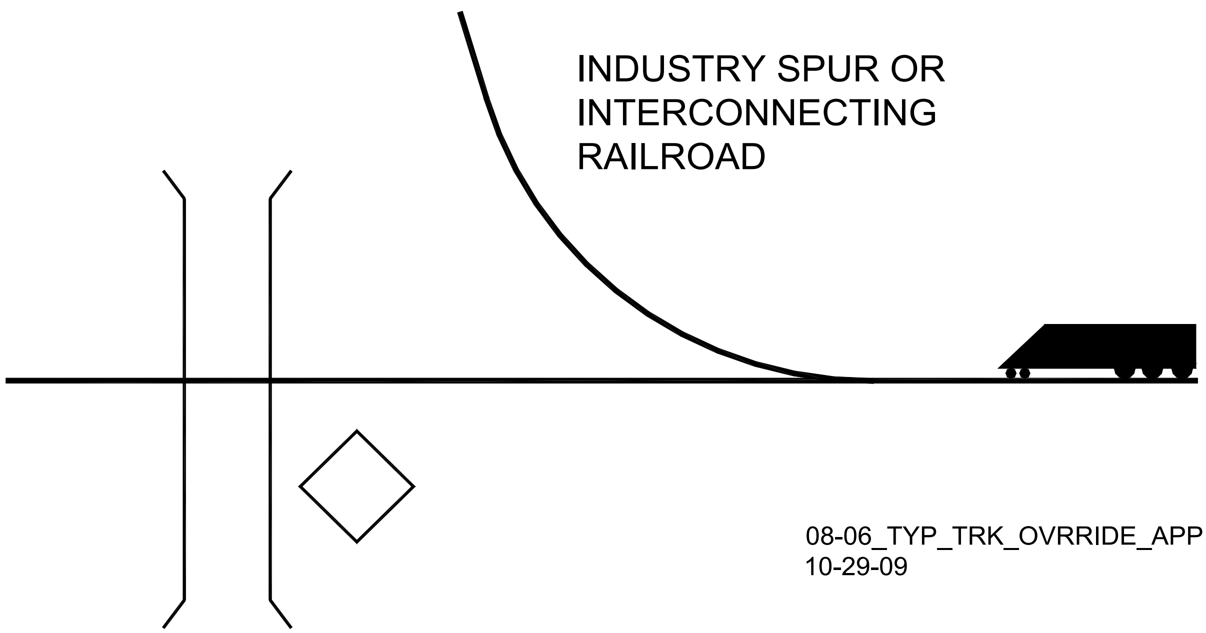


Figure 6-76:
Typical Track Override Application

This programming option allows a track prediction process to be overridden when a train is approaching the crossing and the trailing switch is in the reverse position. A repeater of the reverse switch relay (RWP) is required at the crossing. Front contacts of the reverse switch repeater are used to energize a physical override input when the switch is reversed and locked.

6.5.3 Overrides Menu Selection

On the 4000 GCP DT Window, select the **PROG** button (see Figure 6-77).

Enter the Password, then select **OK** (if required). The **MAIN PROGRAM menu** Window opens (see Figure 6-78).

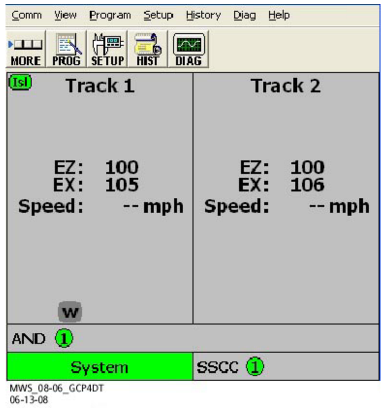


Figure 6-77:
4000 GCP DT Window

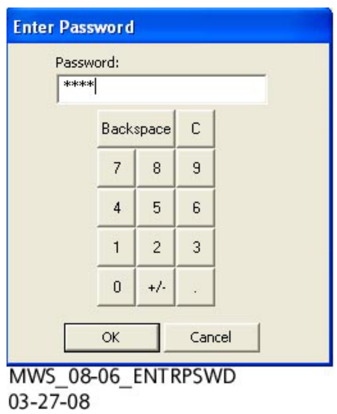


Figure 6-78:
The Enter Password Window

- On the **MAIN PROGRAM menu** Window, select **7 ADVANCED programming**. The **ADVANCED: programming** Window, depicting MCF-2A, opens (see Figure 6-79).

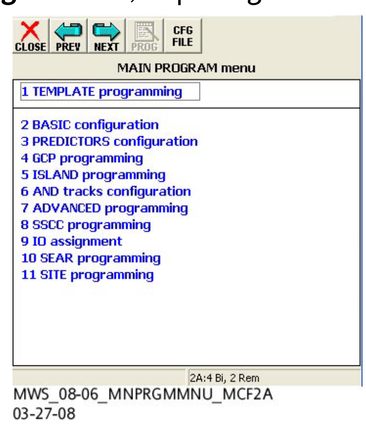


Figure 6-79:
The MAIN PROGRAM menu Window

- On the **ADVANCED: programming** Window, select **Overrides**. The **ADVANCED: track 1 overrides** Window opens (see Figure 6-80).

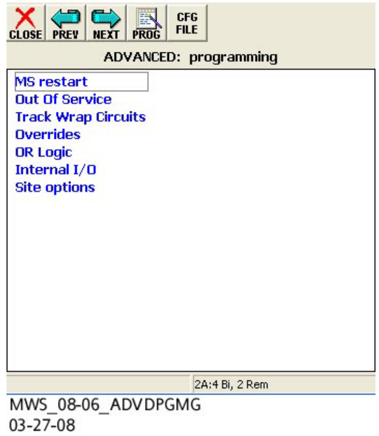


Figure 6-80:
The ADVANCED: programming Window

- On the **ADVANCED: track 1 overrides** Window, select **Yes** or **No** on the **All Predictors Override Used** parameter. If **No**, select whether or not to use the applicable DAX Overrides (see Figure 6-81).

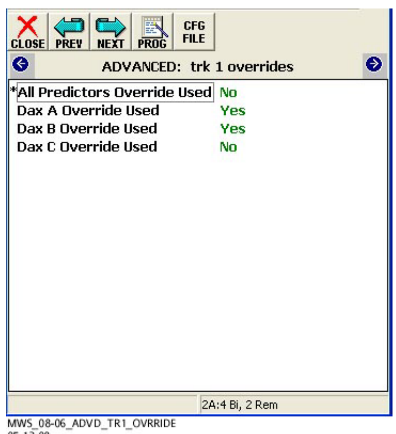


Figure 6-81:
The ADVANCED: trk 1 overrides Window

6.5.3.1 Override Options

The user can select the Override option independently for each GCP track module as required by the application design. There are up to four override options possible for each track module (Figure 6-81):

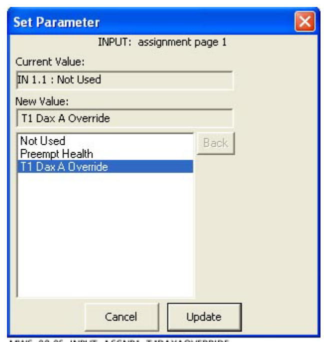
- All Predictors Override Used
- DAX A Override Used
- DAX B Override Used
- DAX C Override Used

The DAX overrides can be selected in any combination from one to all three. The "All predictors Override", when selected, hides the DAX A, B and C options from the display.

When **All Predictors Override Used** is set to **Yes** and the input is energized, it will override (maintain energized) the inbound train prediction processes on all 9 predictors on the module as well as the UAX input. Once **All Predictor Override Used** is set to **Yes**, a physical input must be assigned to the corresponding track number such as **T1 Pred Override**. The **All Predictor Override Used** function requires only one energized physical input to override all predictors on the track module.

6.5.3.2 Override Inputs

When **DAX A**, **DAX B** and/or **DAX C Overrides Used** are set to **Yes** for a track module, each DAX will require an individual physical input to be programmed (Figure 6-82) e.g., **T1 DAX A Override** and/or **T1 DAX B Override**.



MWS_08-06_INPUT_ASGNP1_T1DAXAOVERRIDE
05-29-08

Figure 6-82:
Override Input Assignment

6.5.3.3 Override Operation

An override becomes effective immediately once 12 VDC is applied to the programmed override input. When an input is de-energized the override is removed immediately from the selected track module predictors. When an override is applied, the track module predictor LEDs will still deenergize on train movement but they are ignored. If the Model 4000 GCP switches over between MAIN and STANDBY modules while override is in effect, the override will continue once the 4000 has completed switch-over and the modules have booted, as long as the RWP remains energized. When an override input is energized, the corresponding track module will override:

- Prediction process for the predictors selected for override
- UAX and DAX enables for predictors selected for override
- Positive start (all predictor override only)
- Advanced Preemption (all predictor override only)
- MS Restart (all predictor override only)
- Enhanced Detection (all predictor override only)

When an override input is energized, the corresponding track module will NOT override:

- Island operation (deenergizes AND 1)
- Track related errors such as high EZ and low EX
- Module and system errors

- Low EZ detection when detected
- AND Enable inputs
- Adv Preempt IP (deenergizes AND 1 and ADV Preempt output)
- Preempt Hlth IP (deenergizes AND 1)
- Emergency activation

6.5.3.4 4000 Override Design Considerations

WARNING

EXTREME CARE MUST BE TAKEN WHEN USING OVERRIDE.
IF MOVEMENT SHOULD OCCUR WHILE IN OVERRIDE, THE CROSSING WILL NOT ACTIVATE UNTIL THE ISLAND DE-ENERGIZES.

A repeater of the reverse switch relay (RWP) is required at the crossing. The RWP line circuit entry into the bungalow requires full surge protection. Figure 6-83, Figure 6-84 and Figure 6-85 demonstrate examples of Override programming.

Figure 6-83 shows:

- Single track application
- Override switch is in GCP 1
- T1 approach
- Template used is 1A
- Program as follows for override:
- Program Track 1 All Predictors Override Used to Yes
- Program input IN 1.1 to T1 Pred Override

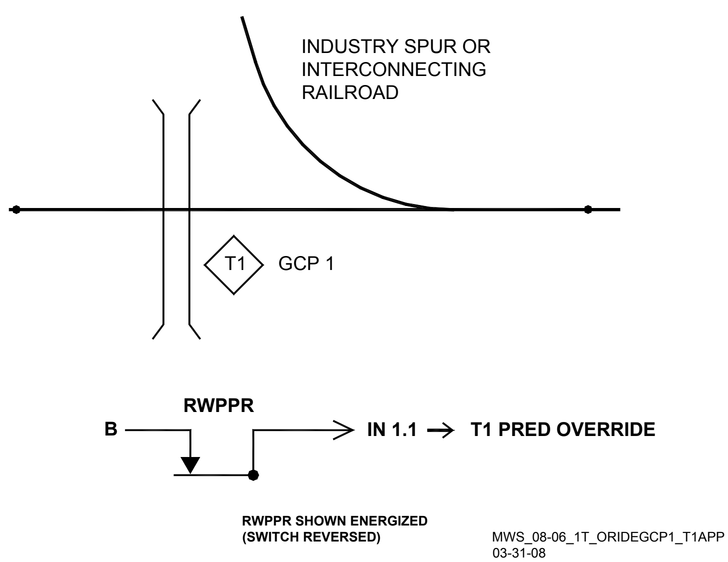


Figure 6-83:
Single Track Application, Override Switch In GCP 1, T1 Approach

Figure 6-84 shows:

- Single track application
- DAX in same 4000 unit
- Override switch is in T2 approach
- Template used is 2A
- Program as follows for override of T2:
- Program Track 2 All Predictors Override Used to Yes
- Program input IN 2.1 to T1 Pred Override

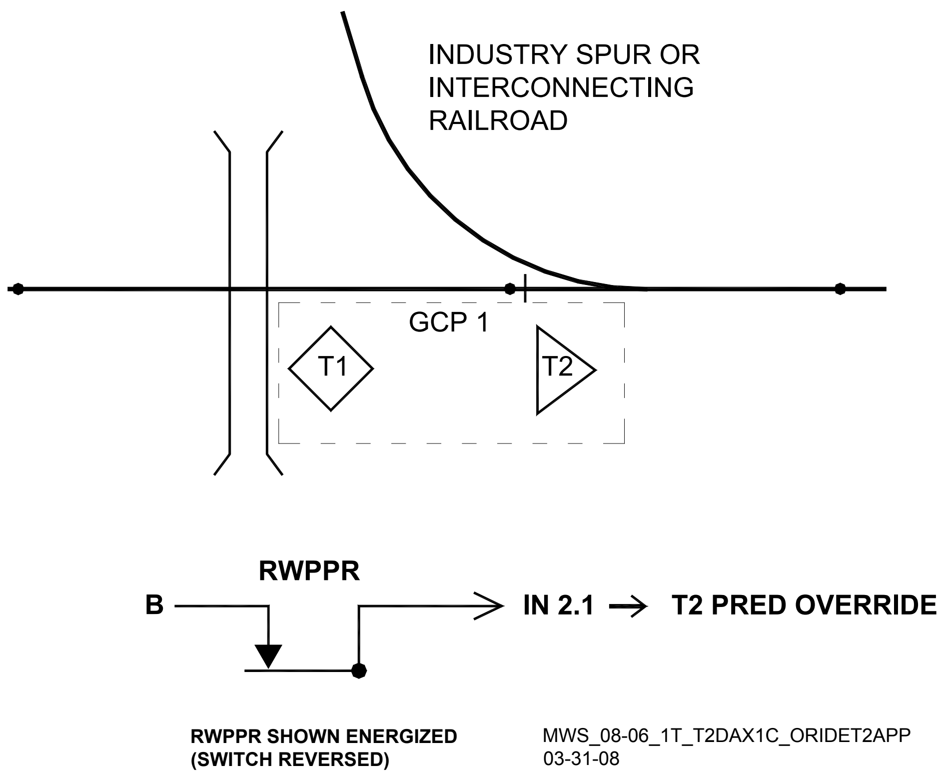


Figure 6-84:
Single Track, T2 DAX In Same 4000 Case, Override Switch In T2 Approach

Figure 6-85 shows:

- Single track remote T1 application
- DAX in remote 4000 unit
- Override switch is in remote approach
- Template used is 1A for GCP 1 and 4A in GCP 2
- Program as follows for override of GCP 2, T1 DAX A:
- Program GCP 2 Track 1 All Predictors Override Used to No
- Program GCP 2 Track 1 **DAX A Override Used** to **Yes**
- Program GCP 2 IN 1.1 to T2 DAX A Override
- Program GCP 2 **OUT 1.1** to **T1 DAX A**
- Program GCP 1 Track 1 **Prime UAX** to **IP**

6.5.4 Program GCP 1 IN 1.1 to T1 Prime UAX

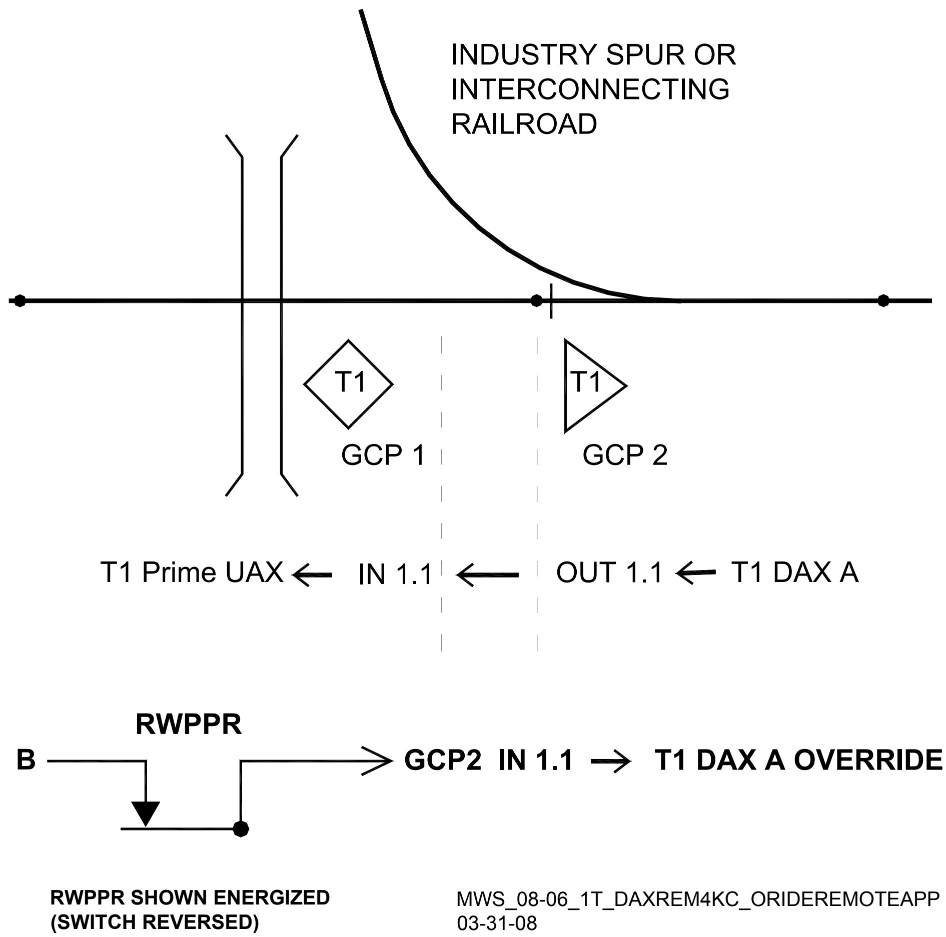


Figure 6-85:
Single Track, DAX In Remote 4000 Case, Override Switch In Remote Approach

6.6 LOGIC PROGRAMMING

The Model 4000 GCP provides programming options to do some basic logic functions, reducing the need for external wiring between inputs and outputs and wiring to external relays. These options include:

- Programmable AND gates
- AND gate Enable Pickup delays
- AND gate Enable Drop delays
- NOT AND outputs
- AND Wraps
- Programmable OR gates
- Internal I/O states
- Passthru states

WARNING

ANY INPUT NOT USED OR NOT PROGRAMMED IS CONSIDERED ENERGIZED IN THE "AND" INPUT TO THE MODEL 4000 GCP. PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO ADVANCED LOGIC FEATURES, THE MODEL 4000 GCP OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.

On the 4000 GCP DT Window, select the **PROG** button (see Figure 6-86). The **Enter Password** Window opens (see Figure 6-87).

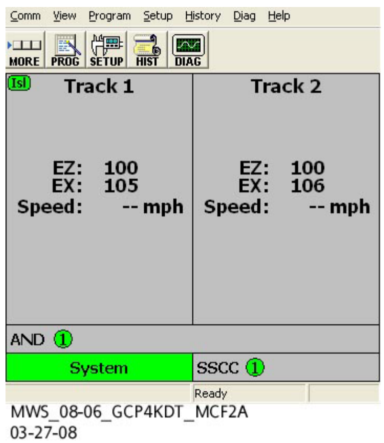


Figure 6-86:
4000 GCP DT Window

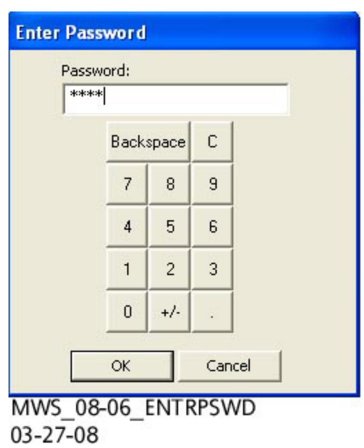
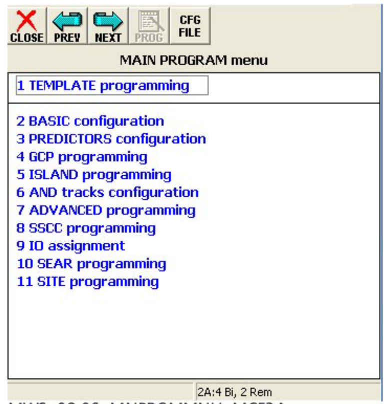


Figure 6-87:
The Enter Password Window

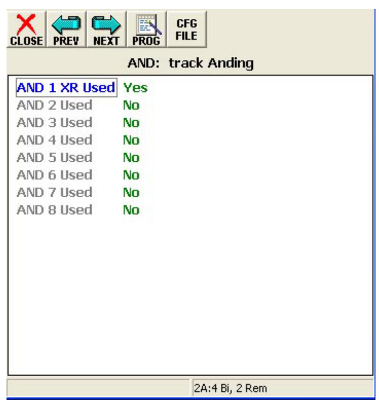
- Enter the Password, then select **OK** (if required). The **MAIN PROGRAM menu** Window opens (see Figure 6-88).



MWS_08-06_MNPRGMMNU_MCF2A
03-27-08

Figure 6-88:
The MAIN PROGRAM menu Window

- On the **MAIN PROGRAM menu** Window, select **6 AND tracks configuration**. The **AND: track Anding** Window opens, depicting MCF-2A, opens (see Figure 6-89).



MWS_08-06_AND_TRACKANDING
03-31-08

Figure 6-89:
The AND: track Anding Window

- On the **AND: track Anding** Window, enter which AND will be used.

6.6.1 AND Gates

The Model 4000 GCP provides eight configurable AND gates:

- AND 1 XR
- AND 2 through AND 8

Section 6.1 describes how to use the AND gates to AND track predictors. Section 6.2.1.2 describes how to use the **AND Enable** inputs. Figure 6-90 shows the terms that contribute to the **AND 1 XR** output:

- Programmed predictor for each of the 6 tracks, if the track is used,
- Expiration of the **Advanced Preemption Timer**, if advance preemption is turned on,
- AND 1 Enable input, if AND 1 Enable is used,

- Crossing test, if the either SSCC has **AND 1** as an activation,
- Emergency Activation input, if used,

The AND 1 Wrap input wraps the track predictors, AND 1 Enable and Advance Preemption but not the Xng Test or Emergency Activation. The 4000 Case OOS IP input wraps the track predictors, AND Enable, Advance Preemption and Xng Test, but not Emergency Activation. To energize the output of an AND Gate, all of the inputs must be energized. To energize the output of an OR Gate, one or more of the inputs must be energized. Any input not used is considered energized.

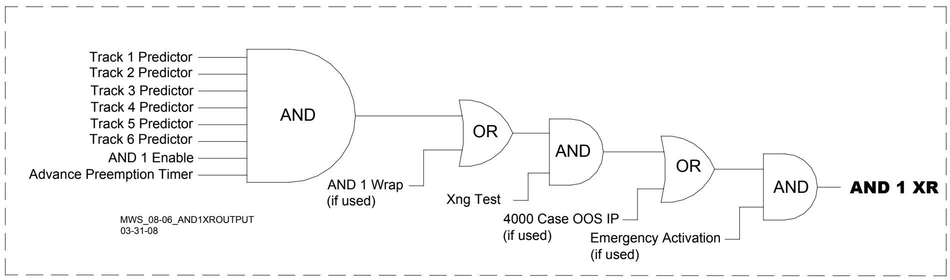


Figure 6-90:
AND 1 XR Output

Figure 6-91 shows the terms that contribute to the **AND 2** output (AND 3 and AND 4 are similar):

- Programmed predictor for each of the 6 tracks, if the track is used,
- AND 2 Enable input, if AND 2 Enable is used,
- Crossing test, if either SSCC has **AND 2** as an activation,
- Emergency Activation input, if used,
- The **AND 2 Wrap** input wraps the track predictors and **AND 2 Enable**, but not the **Xng Test** or **Emergency Activation**.

The 4000 Case OOS IP input wraps the track predictors, AND 2 Enable, Xng Test, but not Emergency Activation.

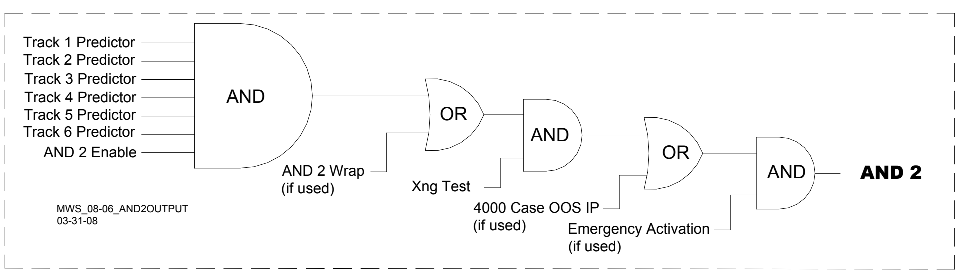


Figure 6-91:
AND 2 Output

Figure 6-92 shows the terms that contribute to the **AND 5** output (AND 6, 7 and 8 are similar):

- programmed predictor for each of the 6 tracks, if the track is used,
- AND 5 Enable input, if AND 5 Enable is used,
- emergency activation input, if used,

- The **AND 5 Wrap** input wraps the track predictors and **AND 5 Enable**, but not the Emergency Activation.

The **4000 Case OOS IP** input wraps the track predictors, and **AND 5 Enable**, but not **Emergency Activation**.

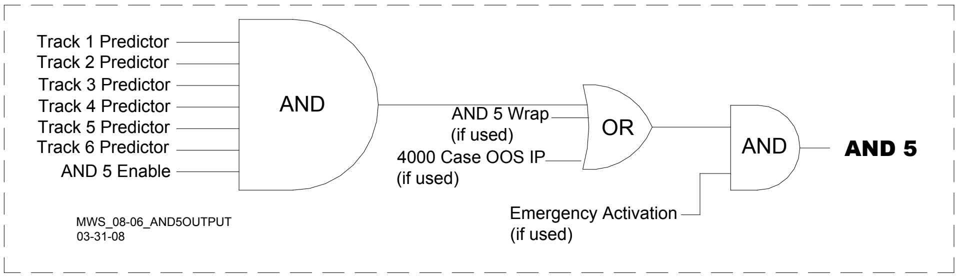


Figure 6-92:
AND 5 Output

6.6.1.1 <u>AND Enable Pickup Delays</u>

AND 1 XR and **AND 2** through **AND 6 Enable** inputs have a programmable pickup delay with a range of 0 to 500 seconds.

6.6.1.2 <u>AND Enable Drop Delays</u>

<u>WARNING</u>

INCORRECT USE OF "AND" "PICKUP" "OR" DROP DELAYS MAY RESULT IN LATE OR NO ACTIVATION OF THE CROSSING WARNING DEVICES. PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO AND DROP DELAYS, THE MODEL 4000 GCP OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.

AND 1 XR and **AND 2** through **AND 6 Enable** inputs have a programmable drop delay with a range of 0 to 500 seconds.

6.6.1.3 <u>NOT AND Outputs</u>

For each AND gate output, there is a corresponding NOT AND output, which is found in the **I/O OUTPUT** menu. The **NOT ANDs** are the inverse of the AND statement. For example:

- When **AND 1 XR** is energized, then the **NOT AND 1 XR** output is deenergized

Figure 6-93A shows the programming screens when the **AND Enable** is set for a 10-second pickup, a 5-second dropout delay and the **AND Wrap** is used. Figure 6-93B shows the assignment of **AND 1 XR** and **NOT AND 1 XR** to an output.

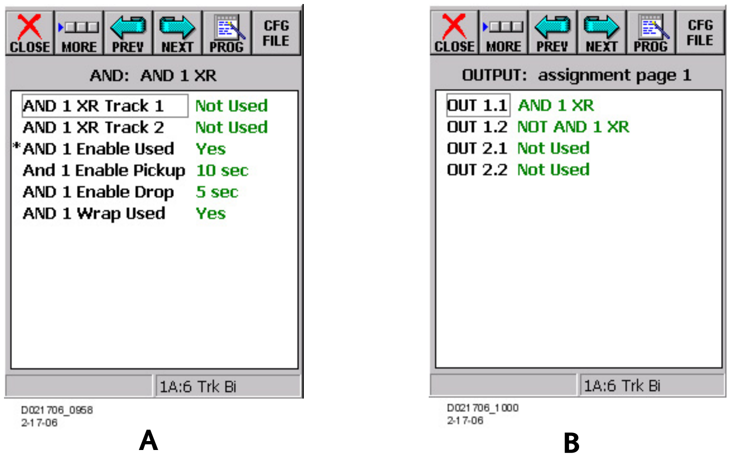


Figure 6-93:
(A) AND 1 Programming; (B) AND 1, NOT AND 1 Output Assignments

6.6.1.4 AND Wraps

WARNING

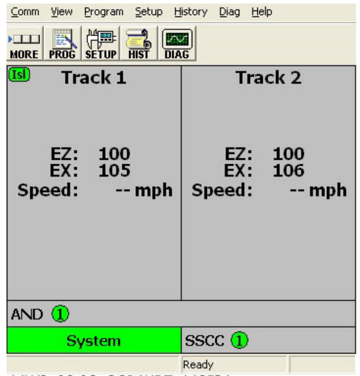
INCORRECT USE OF "AND WRAPS" MAY RESULT IN LATE OR NO ACTIVATION OF THE CROSSING WARNING DEVICES. PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO "AND WRAPS", MODEL 4000 GCP SYSTEM OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.

Each of the eight AND gates has an optional AND wrap input. When the AND wrap input is used, and the AND Wrap input is energized, the AND will not be deenergized by its track predictors or AND Enable inputs (see Figure 6-90, Figure 6-91 and Figure 6-92).

6.6.1.5 OR Gates

WARNING

ANY INPUT NOT USED OR NOT PROGRAMMED IS CONSIDERED DE-ENERGIZED IN THE "OR" INPUT TO THE MODEL 4000 GCP. PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO ADVANCED LOGIC FEATURES, THE MODEL 4000 GCP OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.



MWS_08-06_GCP4KDT_MCF2A
03-27-08

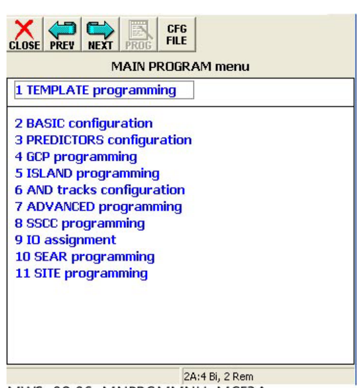
Figure 6-94:
4000 GCP DT Window

On the 4000 GCP DT Window, select the **PROG** button (see Figure 6-94).

MWS_08-06_ENTRPSWD
03-27-08

Figure 6-95:
The Enter Password Window

- Enter the Password, then select **OK** (if required). The **MAIN PROGRAM menu** Window opens (see Figure 6-96).



MWS_08-06_MNPRGMMNU_MCF2A
03-27-08

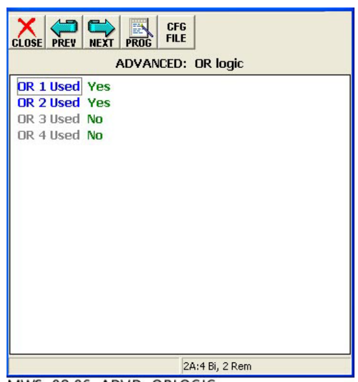
Figure 6-96:
The MAIN PROGRAM menu Window

- On the **MAIN PROGRAM menu** Window, select **7 ADVANCED programming**. The **ADVANCED: programming** Window, depicting MCF-2A, opens (see Figure 6-97).

MWS_08-06_ADVDPGMG
03-27-08

Figure 6-97:
The ADVANCED: programming Window

- On the **ADVANCED: programming** Window, select **OR Logic**. The **ADVANCED: OR Logic** Window opens (see Figure 6-98).



MWS_08-06_ADVD_ORLOGIC
03-31-08

Figure 6-98:
OR Gate Selection Screen

- On the **ADVANCED: OR Logic** Window, enter the desired **OR** Gates to be used (see Figure 6-98).

The Model 4000 GCP provides four configurable OR gates: OR 1 through OR 4. Each OR gate has up to 4 inputs. Each input to the OR gate can be any one of the available system outputs. A system input can be used as an input to the OR by using Passthru states. When all inputs are low the OR output is low. When any input is high the OR output is high. Figure 6-98 shows the screen for selecting which OR gates are used.

6.6.1.5.1 OR Example 1

An output is required that is deenergized only when all islands are occupied. Figure 6-99 shows the screen for programming the inputs to an OR gate. In this case the two island states are ORed together.

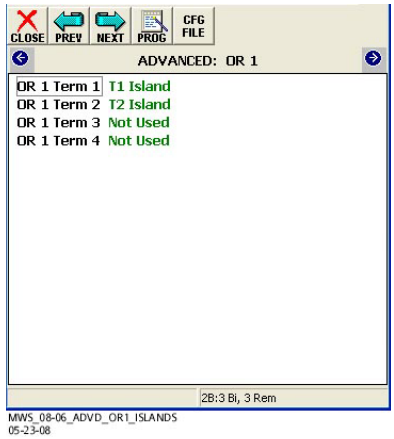


Figure 6-99:
OR Example: Islands ANDed

6.6.1.6 <u>Internal I/O States</u>

The internal states can be used to assign an output of the system back to an input without having to use physical inputs and outputs or to provide an alternate way of ANDing outputs together. The Model 4000 GCP provides 16 internal I/O States. Each of these states is:

- Set by a selected system output
- Sets a selected system input

6.6.1.6.1 Internal I/O: Example 1- DAXing / UAXing

If a crossing is using template 2A (see below), tracks 2 and 4 are remote tracks in the same Model 4000 GCP as the crossing tracks 1, 3, 5 and 6. By default the template sets AND 1 XR to include the Prime predictors (used with offset) from tracks 2 and 4.

If on track 1 there is considerable accelerating and decelerating train traffic, it may be useful to have the T2 DAX connected to the T1 prime UAX for additional pickup delay. However, for remote DAX predictors that are in the same 4000 case as the crossing predictors, the DAXes are not connected by line circuit to the Prime UAX. This can be corrected by using internal I/O which can connect the DAX internally to the UAX as follows:

- Set the track 1 **Prime UAX** to **IP** and set UAX time to 10 seconds (Figure 6-101A).
- Set the state on Internal state 1 (**Int.1 Set by**) with **T2 Prime** (Figure 6-101B).
- Set the state of **T1 Prime UAX** with Internal State 1 (**Int.1 Sets**) Figure 6-101B).

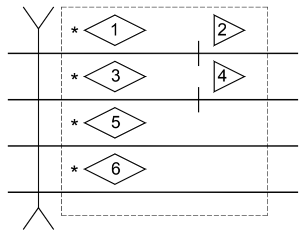


Figure 6-100:
Template 2A (Shown For Reference Only)

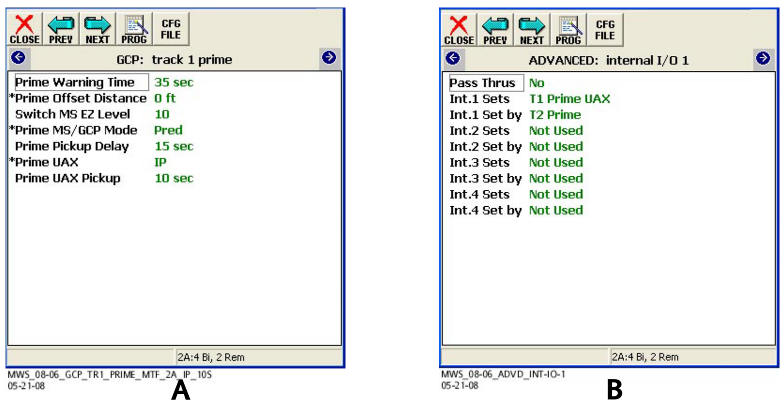


Figure 6-101:
Internal I/O Example 1: (A) Set Prime UAX (B) Set Internal States

6.6.1.6.2 Internal I/O: Example 2 – AND Outputs

An output is required that is energized when all gates are down (all 4 GDs are energized) or the island is occupied in a 2 track bidirectional (Template 1A, see below).

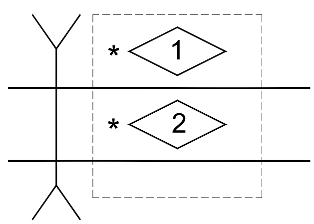


Figure 6-102:
Template 1A (Shown for Reference Only)

(Note that this logic is similar to the Gate Down Indication, but gate down indication is only available when Advance Preempt is used).

- Turn on **AND 2** and **AND 3**
- Set **AND 2 Enable** and **AND 2 Wrap** to **Yes** (Figure 6-103A).
- Set **AND 3** to AND both islands (Figure 6-103B)
- Set Internal state 1 (**Int.1 Set by**) with **NOT AND 3** (so internal state 1 is energized when any island is occupied, and deenergized when both islands are unoccupied) (Figure 6-103C).

- Use Internal State 1 (**Int.1 Sets**) to set the **AND 2 Wrap** input (thus AND 2 is energized when any island is occupied) (Figure 6-103C).
- Set Internal States 2 (**Int.2 Set by**) and 3 (**Int.3 Set by**) with **Passthru State 1** and **2** respectively (Figure 6-103C).
- Use Internal States 2 (**Int.2 Sets**) and 3 (**Int.3 Sets**) to set **AND 2 Enable** – if any of these states are deenergized, **AND 2 Enable** will be deenergized. (Figure 6-103C).
- Set Internal States 5 through 8 as follows (Figure 6-103D):
- Int.5 Set by to Passthru State 1
- Int.6 Set by to Passthru State 1
- Int.7 Set by to Passthru State 2
- Int.7 Set by to Passthru State 2).
- Use Internal States 5 through 8 to set the GDs as follows (Figure 6-103D):
- Int.5 Sets – GD 1.1
- Int.6 Sets – GD 1.1
- Int.7 Sets – GD 2.1
- Int.7 Sets – GD 2.1.
- Assign **Passthru State 1** and **2** to where the GDs are wired on the SSCC modules (see Figure 6-103E).

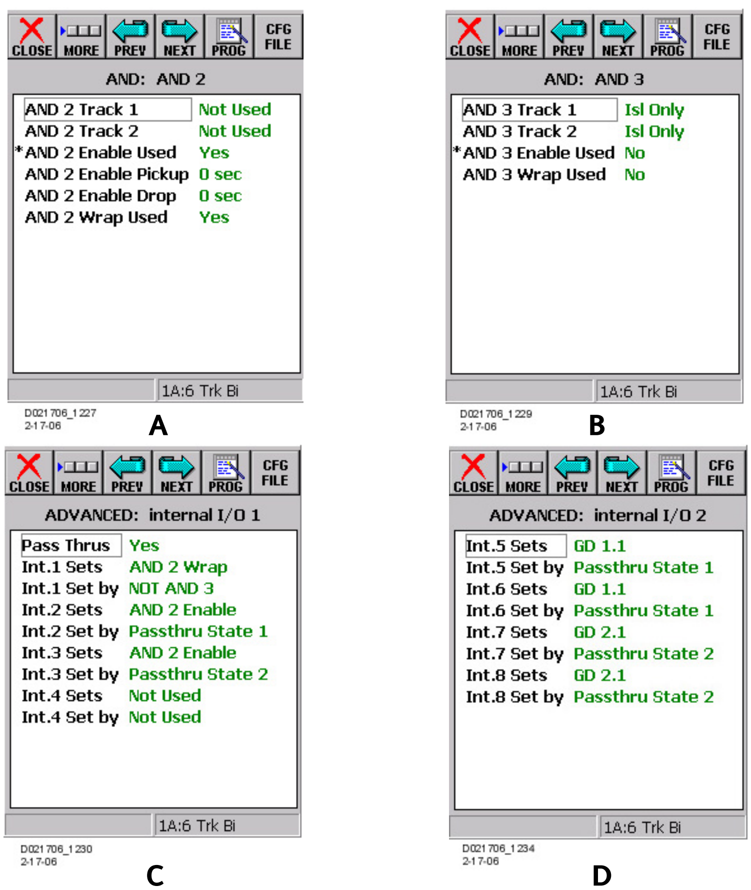
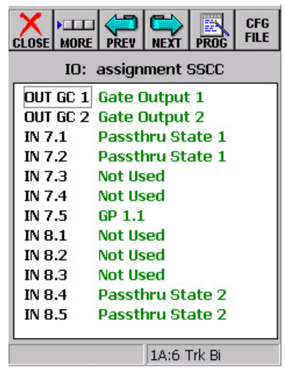


Figure 6-103:
Internal I/O Example 2: AND Outputs

(Continued next page)



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2-17-06

E

Figure 6-103E:
Internal I/O Example 2: AND Outputs concluded

6.6.1.6.3 Internal I/O Example 3 – Vital Comms used for DAXing

An example of using internal states and the Vital Comms links is provided in Section 8.2, Vital Comms.

6.6.1.6.4 OR Example 2

An output is required that deenergizes if all gate position inputs are deenergized. In this case, assume separate GP inputs are coming into both SSCC modules (GP 1.1 and GP 1.2). The OR inputs have to be system outputs. Since the GP is a system input, it has to be assigned via a Passthru state.

- Set **Pass Thrus** to **Yes** – to make the Passthru states available (Figure 6-104A)
- Set the internal I/O 1 (**Int.1 Set by**) state using **Passthru State 1** (Figure 6-104A)
- Set the internal I/O 2 (**Int.2 Set by**) state using **Passthru State 2** (Figure 6-104A)
- Use internal I/O 1 (**Int.1 Sets**) to set **GP 1.1** (Figure 6-104A)
- Use internal I/O 2 (**Int.2 Sets**) to set **GP 2.1** (Figure 6-104A)
- Assign input 7.5 to **Passthru State 1** (**IN 7.5** now sets GP 1.1 via internal I/O state 1) (Figure 6-104B)
- Assign input 8.5 to P**assthru State 2** (**IN 8.5** now sets GP 2.1 via internal I/O state 2) (Figure 6-104B)
- Set the OR inputs using **Passthru States 1** and **2**. (Figure 6-104C)

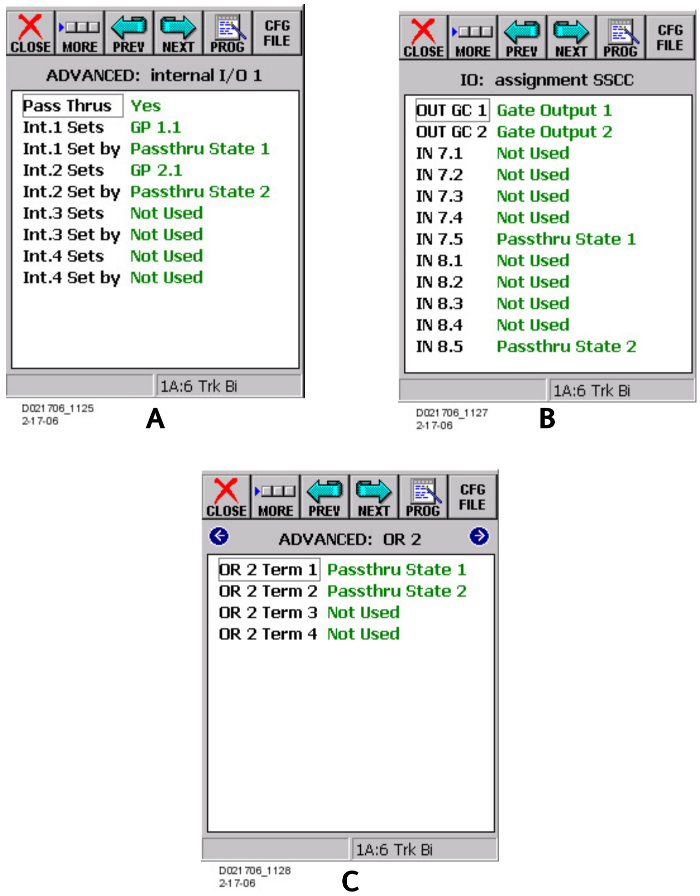


Figure 6-104:
OR Example: Gate Position Inputs ORed

6.6.1.7 Passthru States

Passthru states allow a system input state to be used to set an internal state. Internal states are usually only set by system outputs.

The Model 4000 GCP provides 4 Passthru states

Paragraphs 6.6.1.6.4 and 6.6.1.6.2 provide examples of using Passthru states.

6.7 SPREAD SPECTRUM RADIO

Spread spectrum radio may be used to send vital ATCS messages between locations without the use of physical cables. The ATCS messages sent from the DAXing unit contain the states of all the DAX predictors on all the tracks at that unit. The crossing unit evaluates the ATCS messages to determine the real-time state of the DAX predictors at the sending unit. Based on this evaluation, the crossing unit determines when the crossing should be activated.

Model 4000 GCP units communicate using the Echelon LONTALK® communication protocol. The Model 4000 GCP has onboard circuitry similar to an HD/LINK, so when communicating using Ethernet Spread Spectrum Radios (eSSR), the use of an HD/LINK is not required; the GCP is connected via twisted wire pair to the WAG connecting to the eSSR. An example of the generic connections between the Model 4000 GCP, the WAG, and the eSSR is provided in Figure 6-105. For further information see Section 6.9. For further information regarding Echelon® Lontalk, see Siemens' Echelon® Configuration Handbook, COM-00-07-09.

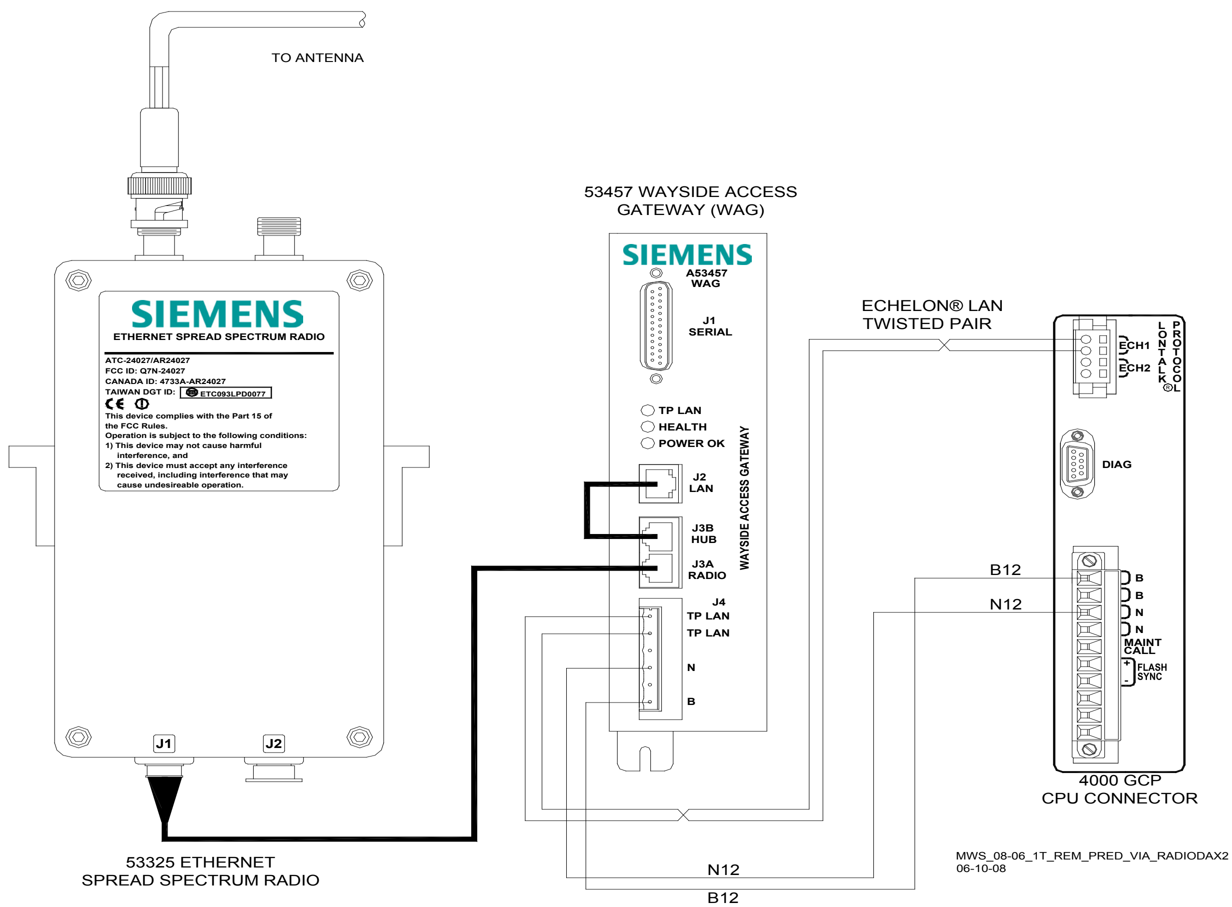


Figure 6-105:
Generic Model 4000 GCP Connection to Ethernet Spread Spectrum Radio Via WAG

Sections 6.11.1 and 6.11.2 provide two examples of using radio DAXing (RDAX) and vital communication links (VLINK) to assist in passing information up and down stream to other crossing equipment. These examples are presented to provide a modified real world application illustrating how various GCPs were programmed to handle RDAX and VLINK programming. The example includes drawings and Program Reports.

6.8 RADIO DAX LINKS

Two radio DAX (RDAX) links may be used with the Model 4000 GCP: RDAX Link A (RDAXA) and RDAX Link B (RDAXB). Each RDAX link transmits the real-time states of all predictors for each track at the sending location. The receiving location must be manually configured to connect each RDAX Link to the appropriate tracks. Once a RDAX link is connected to a track, the predictors from the DAXing unit are connected automatically and do not require manual selection.

6.8.1 ATCS Addressing and ATCS Offsets

Because the Model 4000 GCP uses ATCS messages for communication, each site must be programmed with a unique ATCS address (known as the Site Identification Number, or SIN). The railroad design office usually assigns the ATCS address.

ATCS addresses consist of twelve digits in the format: **7.RRR.LLL.GGG.SS** where:

- **7** is the wayside equipment type
- **RRR** is the railroad number (this number is assigned by the ATCS committee for each Railroad)
- **LLL** is the line number
- **GGG** is the group number (all equipment at one location has the same group number)
- **SS** is the subnode number

Each unit at a location has a different subnode number. By default:

- 16 is assigned to the Model 4000 GCP CPU
- 99 is assigned to the SEAR2i
- 02 and higher (02, 03, 04, etc.) is assigned to each HD/Link Module found within the group

Typically, Model 4000 GCP's that DAX to each other have the same railroad (**RRR**), line (**LLL**), and subnode (**SS**) numbers, but have different group (**GGG**) numbers. When communicating with HD/Link Modules connected to Model 3000 GCPs, such as in Crossing 6 in Figure 6-106, both the group (**GGG**) and subnode (**SS**) numbers will differ.

Figure 6-106 provides examples of various crossing and remote sites. The crossing or remote is identified along with the GCP number, the MTF being utilized by that Model 4000 GCP, as well as the ATCS address (SIN) associated with that GCP

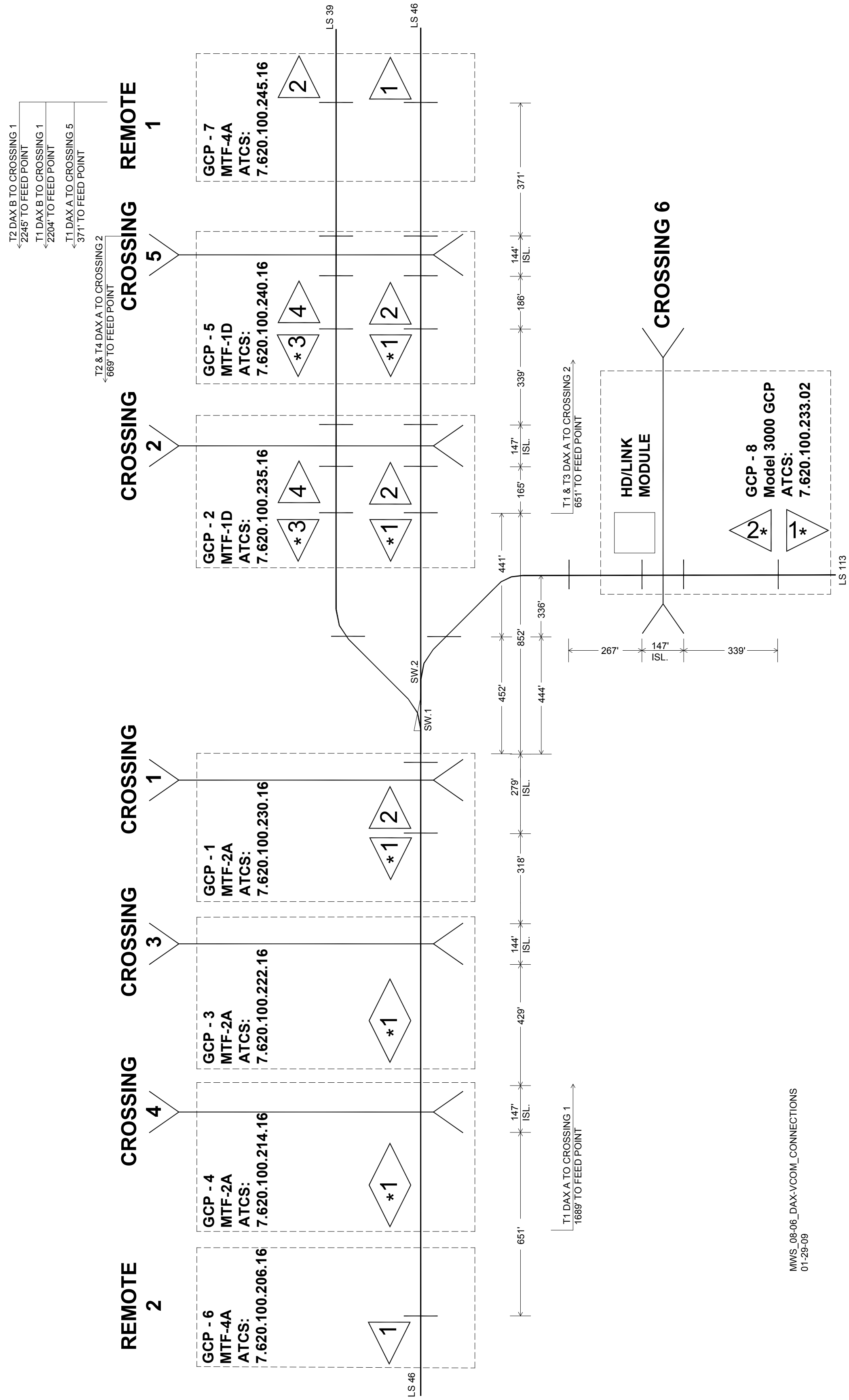


Figure 6-106:
Example Crossing and Remote Site Data

6.8.1.1 Setting the Crossing Site ID

Prior to beginning the remote site setup, its ATCS address must be programmed. The Site Identification Number Dialog Window is accessed by selecting the **ATCS Site Id** entry of either the **TEMPLATE: Site Info** (Figure 6-107A) or the **SITE: Programming** (Figure 6-107B) window.

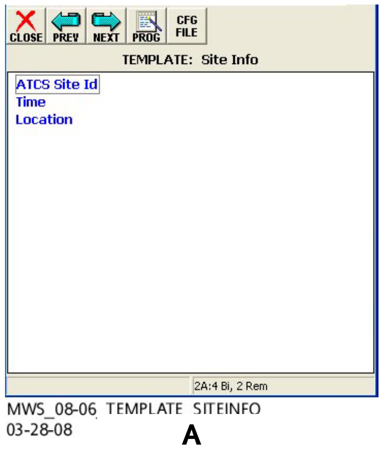


Figure 6-107:
Site Programming Windows

NOTE

When working with ATCS addressing, there are now two methods available for setting the remote Site Identification Number (SIN) in the Display Panel and Display Terminal (DT). The first method, (discussed in paragraph 6.8.1.2, Setting the Address of Neighboring Locations (Using DT 4.7.5 or newer); depicted in Figure 6-108 titled Setting the Remote Site ID, is only available with units that have the Display Panels loaded with software version 4.7.5 and newer. The second application design, (discussed in paragraph 6.8.2.1, Setting the Address of Neighboring Locations (Using DT 4.6.0 or older); depicted in Figure 6-110 titled Entering DAX Link Offset Values, is used with Display Panels having software version 4.6.0 and older. Both the previous and new application guidelines are provided.

6.8.1.2 <u>Setting the Address of Neighboring Locations (Using DT 4.7.5 or Newer)</u>

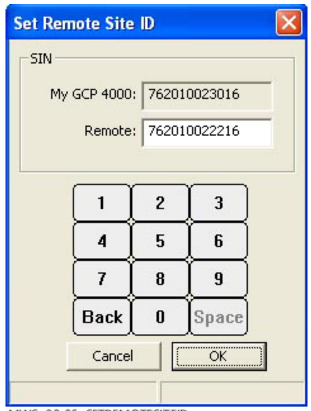


Figure 6-108:
The Set Remote Site ID Window

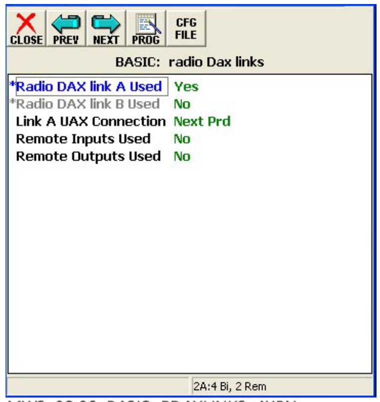
To set the Remote Site ID directly, select the Remote SIN numerical value shown on the screen. The **Set Remote Site ID** Window opens (see Figure 6-108). Enter the new Remote value and select **OK**. The new SIN will reflect in the **BASIC: RDax Link #** Window.

6.8.2 DAX Link Programming Parameters

On the **BASIC: radio DAX links** window, Figure 6-109, when the **Radio DAX Link A Used** field is set to **Yes**, the **Link A UAX Connection** entry displays. This entry selects which predictor from the remote neighbor is selected as the UAX/Enable for the crossing. Two **DAX Link A Neighbor** input allocation parameters may be selected:

- **Next Prd** (default) designates that: 1) DAX A at the remote is an input into Prime UAX Enable at the crossing and 2) DAX B at the remote is an input to DAX A Enable at the crossing and so on.
- **Same Prd** designates that: 1) the Prime predictor at the remote is an input into Prime UAX Enable at the crossing and 2) DAX A at the remote is an input to DAX A Enable at the crossing, and so on.

The crossing UAX/DAX Enable input allocations for the **Link A UAX Connection Next Prd** and **Same Prd** settings are shown in Table 6-1.



MWS_08-06_BASIC_RDAXLINKS_AYBN
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Figure 6-109:
Radio DAX Link Window Neighbor Selection

Table 6-1:
UAX/DAX Enable Input Allocations

UAX/Enable Input	Input Allocation With Next Prd Setting	Input Allocation With Same Prd Setting
Prime UAX	DAX A information	Prime information
DAX A Enable	DAX B information	DAX A information
DAX B Enable	DAX C information	DAX B information
DAX C Enable	DAX D information	DAX C information
Preempt Enable	Preempt information	Preempt information

6.8.2.1 Setting the Address of Neighboring Locations (Using DT 4.6.0 or Older)

To set the remote SIN using DAX link offset values, the address of each GCP neighbor must be set into the receiving Model 4000 GCP. The address of each neighbor is specified by an offset value that corresponds to the difference between the group (GGG) number of the receiving site and that of the neighbor site. Using the example provided in Figure 6-106:

- Crossing 1 (GCP-1) has an ATCS address of 7.602.100.**230**.16
- Crossing 2 (GCP-2) has an ATCS address of 7.602.100.**235**.16
- Crossing 3 (GCP-3) has an ATCS address of 7.602.100.**222**.16.

For DAX Link A (RDAXA), the GGG offset value is:

- 235 (Crossing 2, GCP 2) – 230 (Crossing 1, GCP-1) = **5**

For DAX Link B (RDAXB), the GGG offset value is:

- 222 (Crossing 3, GCP-3) – 230 (Crossing 1, GCP-1) = **-8**.

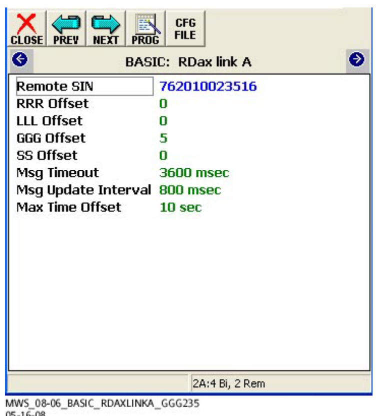
When using DT 4.6.0 or older, a negative offset number cannot be entered directly. A negative offset number must be converted to a usable entry number as follows:

- Change the negative offset number to its absolute value; e.g., -8 has an absolute value of 8
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 8 + 32768 = **32776**.

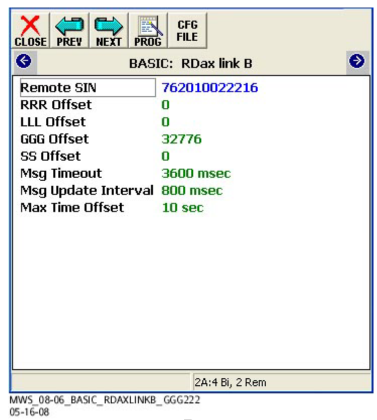
The two offset values obtained are entered as shown in Figure 6-110A and Figure 6-110B

NOTE

As a rule, the DAX Link A neighbor has a higher ATCS address, and the DAX Link B neighbor has a lower ATCS address.



A



B

Figure 6-110:
Entering DAX Link Offset Values for A: RDAXA; and B: RDAXB

6.8.3 Setting Up the DAXing Site

The DAXing site is set up in the following sequence:

- Select the Radio DAX Link to be used to send the DAX information and site address (see Figure 6-109). The **Link UAX Connection** field setting is not used by the DAXing unit.
- Enter the appropriate ATCS offsets and addresses as described in paragraph 6.8.1.
- Set the parameters of the DAX to be used as described in paragraph 6.8.4.

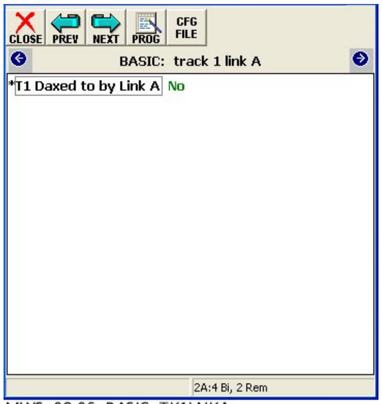
6.8.4 Connecting Radio DAX to UAX at the Crossing

When setting up the crossing or a remote site cascading DAX predictors, the link information must: correspond to the remote site performing the DAXing and specify which tracks are receiving the DAX information.

These sites are set up in the following sequence:

- Enable the required **Radio DAX Link Used** field(s), as described in paragraph 6.8.1.2.

- Select the required setting for the **Link UAX Connection** field(s), as described in paragraph 6.8.2.
- For each DAX link, specify which track receives data on this link. The receiving location must be manually configured to connect each Radio DAX Link to the appropriate tracks.
  - When track 1 is not set to receive UAX/DAX information via DAX link A, the **track 1 link A** window displays as shown in Figure 6-111A.
  - When track 1 is set to receive UAX/DAX information on DAX link B, the **track 1 link B** window appears as shown in Figure 6-111B.



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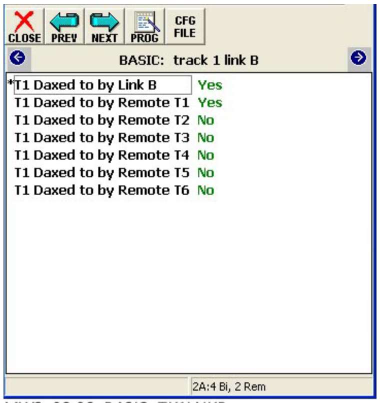
A



MWS_08-06_BASIC_TK1LNKB
03-28-08
B

Figure 6-111:
Track Link Configuration

6.8.5 Message Update and Timeouts

The transmission parameters for each radio DAX link are set using the **BASIC: DAX link** window, Figure 6-110. In this window, the interval between message transmissions is set by the **Msg Update Interval** field, which specifies how often a repeat ATCS message is sent across the radio link. The message is sent immediately when a state change occurs (energized to de-energized or vice versa). The interval that the receiving unit must wait for a good message from the neighbor unit is set by the **Msg Timeout** field. If a message is not received by the end of this interval the unit reverts to a safe state. For example, when the **Msg Timeout** field is set to the default setting of 3600ms, and a new message is not received within 3.6 seconds of the last message, the Model 4000 GCP:

- Designates the link as failed
- Defaults to a restrictive set of states for the message data on the failed link
- Assumes that all predictors on all tracks of the crossing are de-energized, and de-energize the UAXes to tracks accordingly.

The default setting for DAX Link is 800ms. At this default value, approximately 3 messages can be lost on the radio link without the link failing.

6.8.6 Radio DAXing from Remote to Crossing

A remote site transmitting a DAX signal to a crossing via a Radio Link is shown in Figure 6-112.

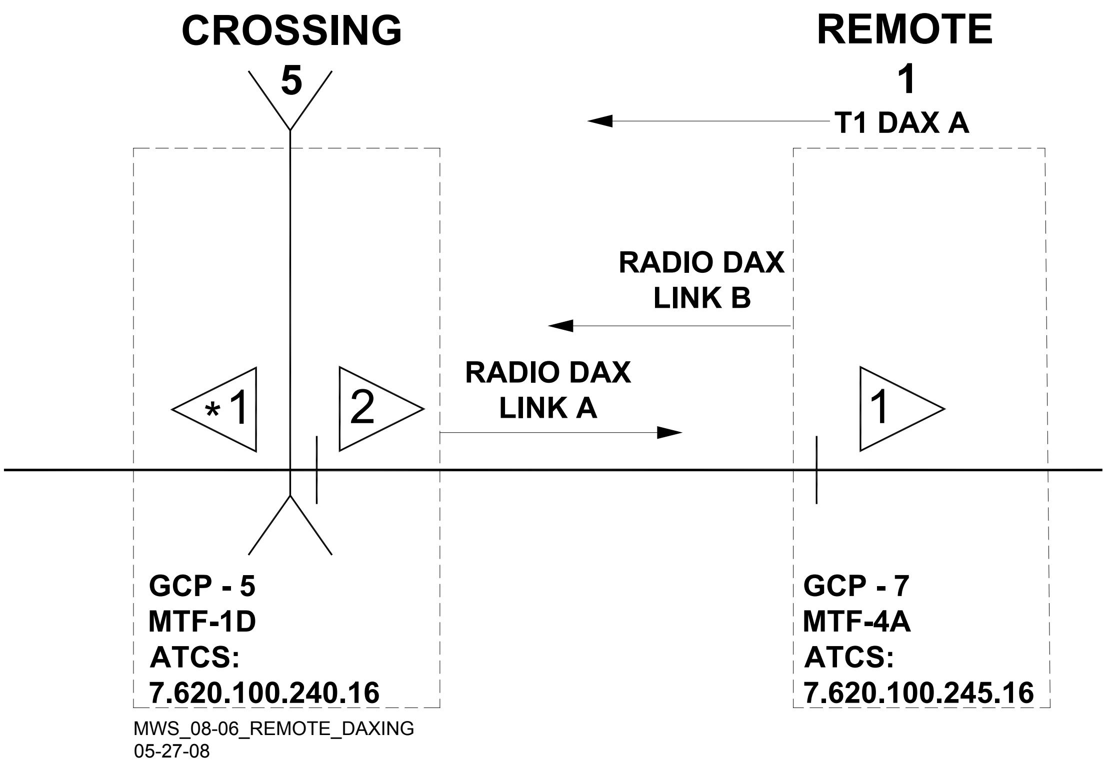


Figure 6-112:
Remote Site Radio DAXing Crossing Data Via Radio DAX Link

6.8.6.1 Remote Site Programming

For the configuration shown in Figure 6-112, the remote site must be programmed as follows:

- **Radio DAX link B Used** is set to **Yes** (enabled) as shown in Figure 6-113.

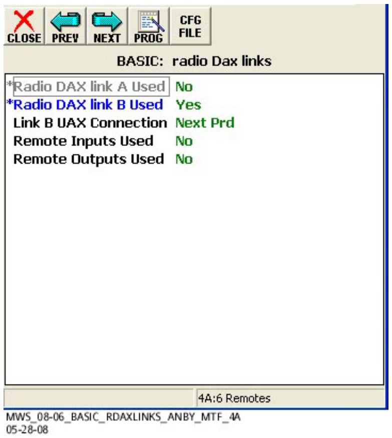
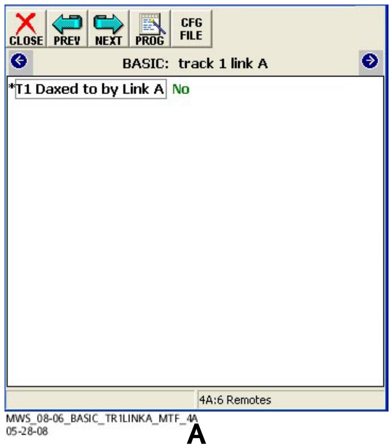
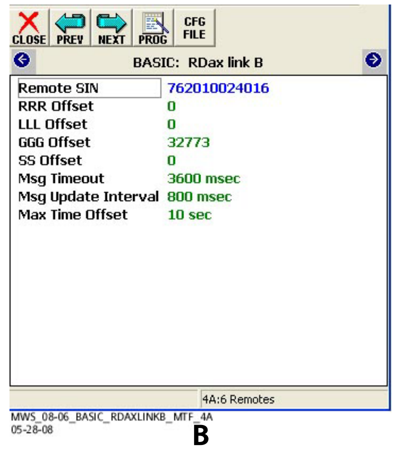


Figure 6-113:
Remote 1 (GCP-7) Radio DAX Link Configuration

- On the **BASIC: track n link A** Window, the **T1 DAXed to by Link A** parameter is set to **No** as shown in Figure 6-114A (the entry is left disabled because remote track 1 does not receive DAX information).



A



B

Figure 6-114:
Remote 1 (GCP-7) A: Track 1 Link A Parameters; B: Radio DAX Link Parameters

6.8.6.1.1 Setting Address of Neighboring Location Using DT Version 4.7.5 and newer

Select the numerical portion of the Remote SIN parameter on the **BASIC: RDax link B** Window as instructed in paragraph 6.8.1.2. When the **Set Remote Site ID** Window (see Figure 6-108) opens, enter the new Remote value and select **OK**. The new SIN will reflect in the **BASIC: RDax Link #** Window.

6.8.6.1.2 Setting Address of Neighboring Location Using DT Version 4.6.0 and older

The address of the neighboring location is set by entering its offsets as shown in Figure 6-114B. The offsets are calculated by subtracting the ATCS address fields of the remote from the address fields of the crossing. Since a difference occurs only between the group numbers, the GGG offset is set to that difference:

240 (GCP-5, Crossing 5) – 245 (GCP-7, Remote 1) = **-5**

Using DT 4.6.0 or older, a negative offset number cannot be entered directly. A negative offset number must be converted to a usable entry number as follows:

- Change the negative offset number to its absolute value; e.g., -5 has an absolute value of 5.
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 5 + 32768 = **32773**.

Refer to Figure 6-106 to obtain the DAX A Offset Distance between Remote 1 and Crossing 5.

On Remote 1 (GCP-7), the **GCP: track 1 DAX A** Window is set to the values shown in Figure 6-115.

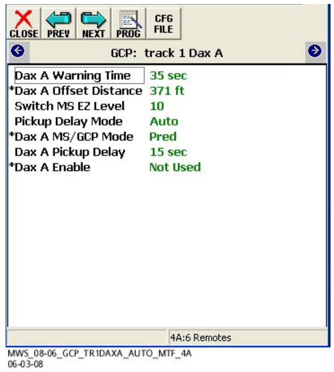


Figure 6-115:
Remote 1 (GCP-7) Track 1 DAX a Parameters

6.8.6.2 <u>Crossing Site Programming</u>

For the configuration shown in Figure 6-112, the crossing site must be programmed as follows:

Radio DAX link A Used is set to **Yes** (enabled) as shown in Figure 6-116.

<u>NOTE</u>

Radio DAX Links of neighbor sites must always be used in complementary pairs; i.e., DAX Link B of a crossing site must be connected to DAX Link A of a remote site.

Conversely, a radio DAX Link of one site must not be connected to the same radio DAX Link of another site:

- DAX Link A cannot be connected to DAX Link A
- DAX Link B cannot be connected to DAX Link B

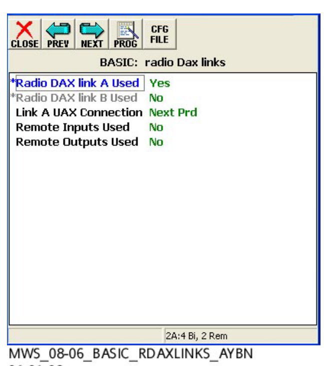


Figure 6-116:
Crossing 5 (GCP-5) Radio DAX Link Configuration

On the **BASIC: radio Dax** Links Window:

- The **Link A UAX Connection** parameter is set to **Next Prd**. This sets the correct DAX input relationship, as defined in Table 6-1.

On the BASIC: track 1 link A Window:

- The **T1 DAXed to by Link A** parameter is set to **No** as shown in Figure 6-117A, since track 1 does not receive DAX information.

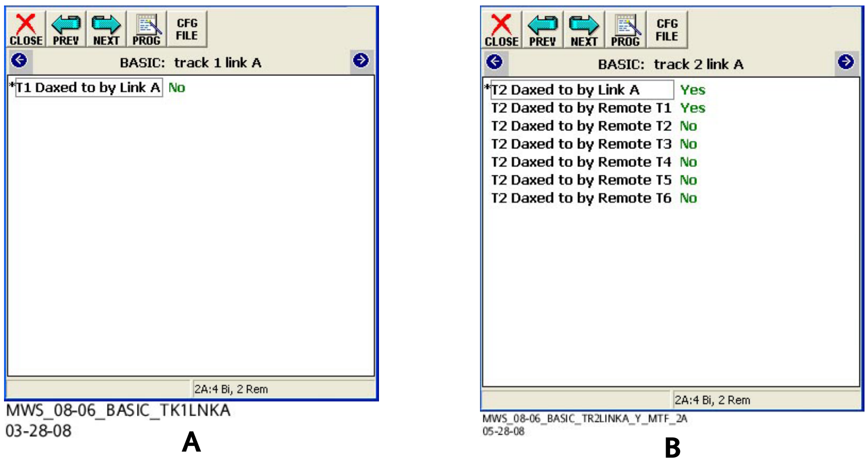


Figure 6-117:
Crossing 5 (GCP-5) A: Track 1 Link A; B: Track 2 Link A Parameters

On the BASIC: track 2 link A Window:

- The **T2 DAXed to by Link A** parameter is set to **Yes**.
- The **T2 DAXed to by Remote T1** parameter is set to **Yes**. (As shown in Figure 6-117B, six tracks appear in this list, because the remote can have up to 6 tracks.)

6.8.6.2.1 Setting Address of Neighboring Location Using DT Version 4.7.5 and newer

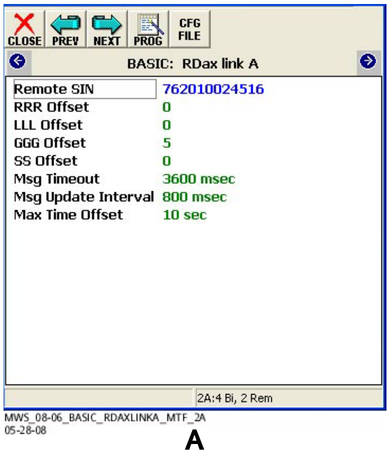
Select the numerical portion of the Remote SIN parameter on the **BASIC: RDax link B** Window as instructed in paragraph 6.8.1.2. When the **Set Remote Site ID** Window (see Figure 6-108) opens, enter the new Remote value and select **OK**. The new SIN will reflect in the **BASIC: RDax Link #** Window.

6.8.6.2.2 Setting Address of Remote Site Using DT Version 4.6.0 and older

The address of the neighboring remote location is set by entering its offsets as shown in Figure 6-118. The offsets are calculated by subtracting the ATCS address fields of the crossing from the address fields of the remote. Since a difference occurs only between the group numbers, the GGG offset is set to that difference.

245 (Remote 1, GCP-7) – 240 (Crossing 5, GCP-5) = **5**

Keep the default **Msg Timeout** and **Msg Update Interval** values shown in Figure 6-118A. Track 2 **Prime UAX** field is set to **RDAX** as shown in Figure 6-118B. Applies the DAX A input received via Radio DAX Link A to the prime predictor of crossing A.



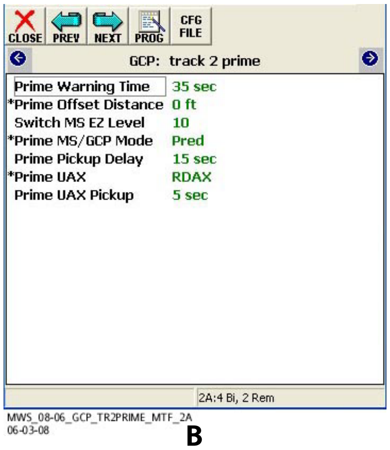


Figure 6-118:
Crossing 5 (GCP-5) Configuration Windows

6.8.7 Radio DAXing between Adjacent Crossings

In Figure 6-119, crossing 2 and 5 are DAXing to each other, using the radio link.

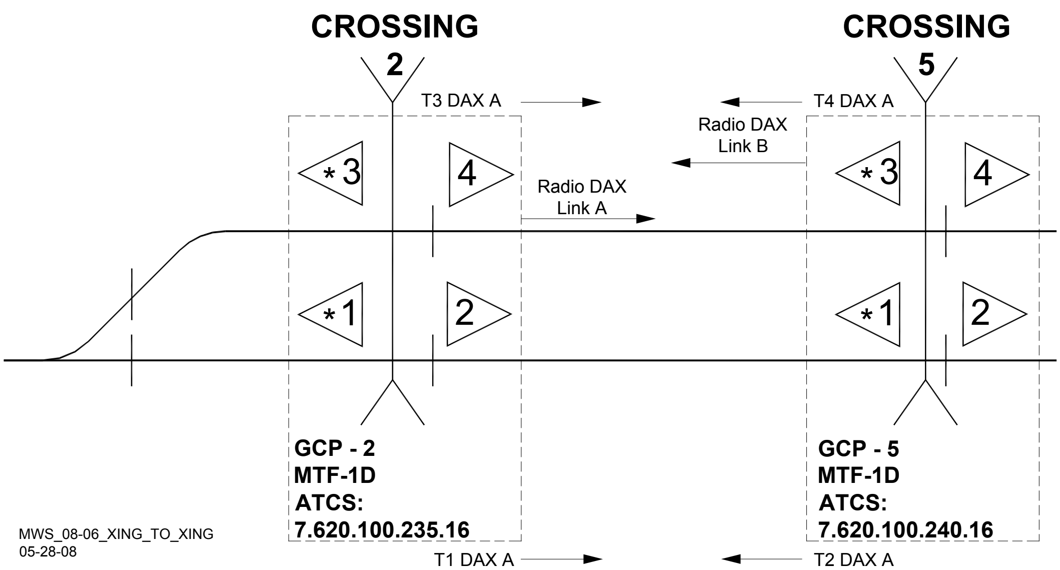


Figure 6-119:
Crossing 2 (GCP-2) to Crossing 5 (GCP-5) DAXing Via Radio Links

6.8.7.1 Crossing 2 (GCP-2) Programming

For the configuration shown in Figure 6-119, the remote site must be programmed as follows:

Radio DAX Link A Used is set to **Yes** (enabled) as shown in Figure 6-121.

NOTE

Generally, DAX Link A sends messages to a higher ATCS address and DAX Link B sends messages to a lower ATCS address

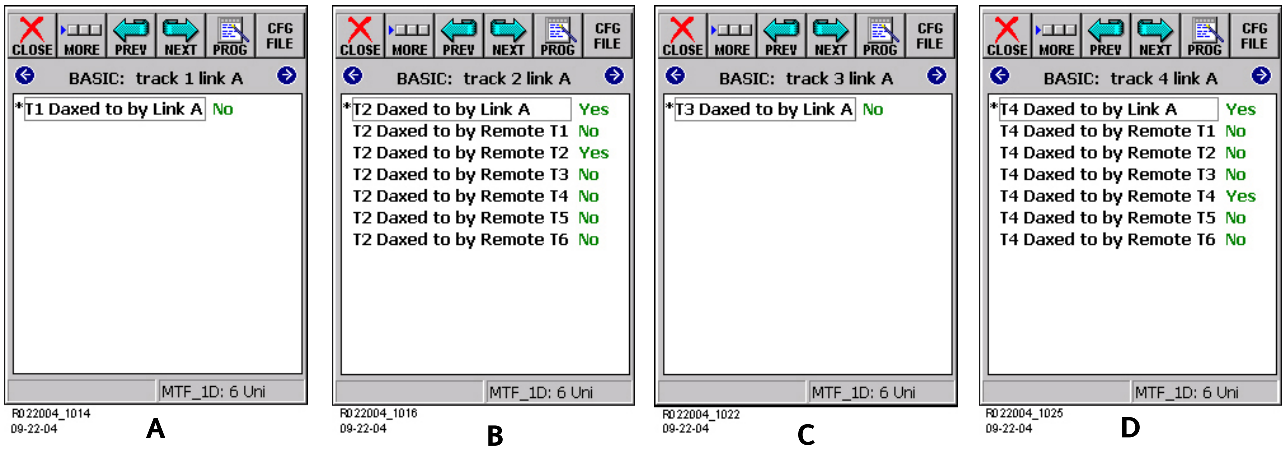


Figure 6-120:
Crossing 2 (GCP-2) Radio DAX Link Configuration

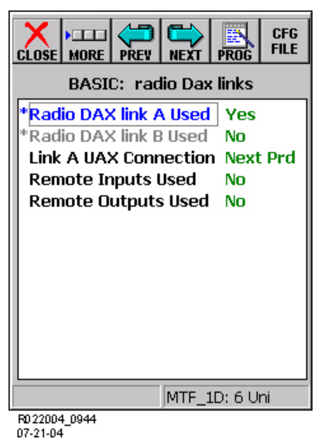


Figure 6-121:
Crossing 2 (GCP-2) Track Link Configuration

On the **BASIC: radio DAX** links Window,

- The **Link A UAX Connection** parameter is set to **Next Prd**. This setting allows DAX A of Crossing 5 to be applied as an input to Prime UAX of Crossing 2.

Tracks are configured to receive DAX information from Crossing 5 as shown in Figure 6-120A through Figure 6-120D. Track 1 and Track 3 are set to not receive DAX information. Track 2 and Track 4 are set to receive DAX information.

NOTE

When configuring track links multiple tracks may be selected as required (see paragraph 6.8.8).

The ATCS address offsets are set as described in paragraph 6.8.2.

Refer to Figure 6-106 to obtain the DAX A Offset Distances between Tracks 1 & 3 at Crossing 2 and Crossing 5.

The **Warning Time** and **Offset Distance** for track 1 and 3 DAX A are set as required (see Figure 6-122).

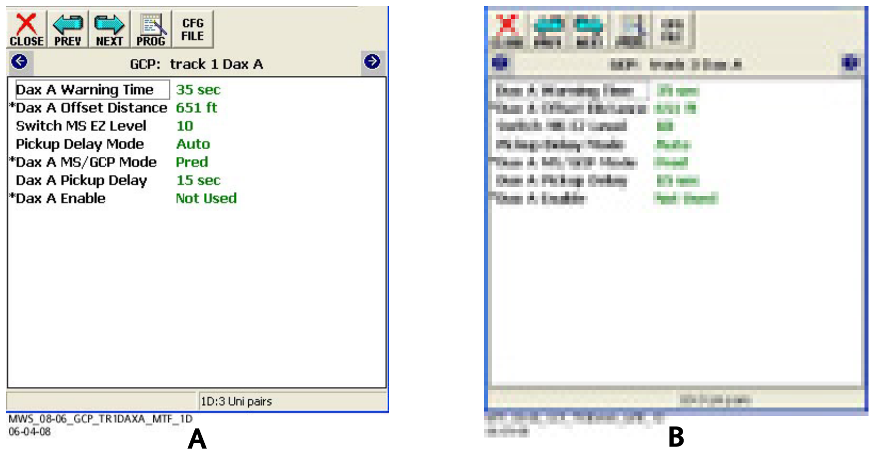


Figure 6-122:
Track 1 and Track 3 DAX Configuration Windows

On the **GCP: track n DAX A** Windows, the **Prime UAX** parameters for track 2 and track 4 are set to **RDAX** as shown in Figure 6-123A and Figure 6-123B. This enables the DAX A inputs received from the remote via Radio DAX Link A to be applied to the track 2 and track 4 prime predictors.

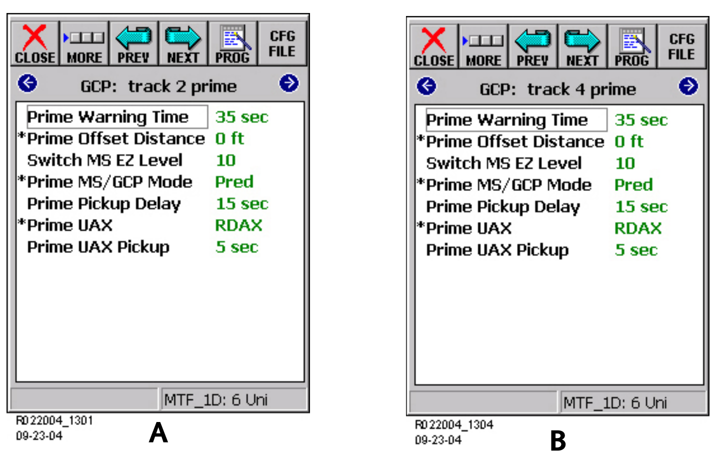


Figure 6-123:
Crossing 2 Configuration Windows

6.8.7.2 Crossing 5 (GCP-5) Programming

For the configuration shown in Figure 6-119, the remote site must be programmed as follows:

Radio DAX link B Used is set to **Yes** (enabled) as shown in Figure 6-124.

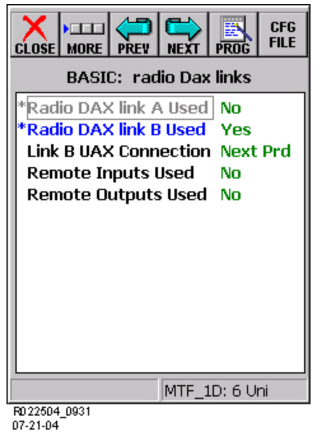


Figure 6-124:
Crossing 5 Radio DAX Link Configuration

On the **BASIC: radio DAX** links Window,

- The **Link B UAX Connection** parameter is set to **Next Prd**. This setting allows DAX A of Crossing 2 to be applied as an input to Prime UAX of Crossing 5.

The tracks are configured to receive DAX information from Crossing 2 as shown in Figure 6-125A through Figure 6-125D. Track 1 and track 3 are set to receive DAX information. Track 2 and track 4 are set to not receive DAX information.

NOTE

When configuring track links multiple tracks may be selected as required (see paragraph 6.8.8).

Refer to Figure 6-106 to obtain the DAX A Offset Distances between Tracks 2 & 4 at Crossing 5 and Crossing 2. The ATCS address offsets are set as described in paragraph 6.8.2. The **Warning Time** and **Offset Distance** for track 2 and 4 DAX A are set as required (see Figure 6-117A and Figure 6-117B.)

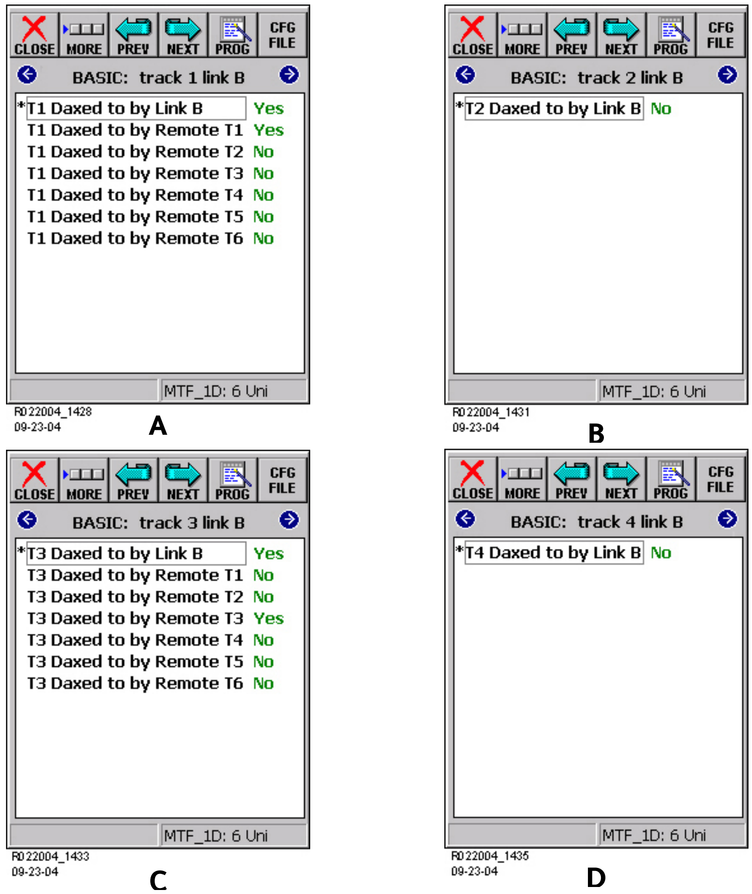


Figure 6-125:
Crossing 5 Track Link Configuration

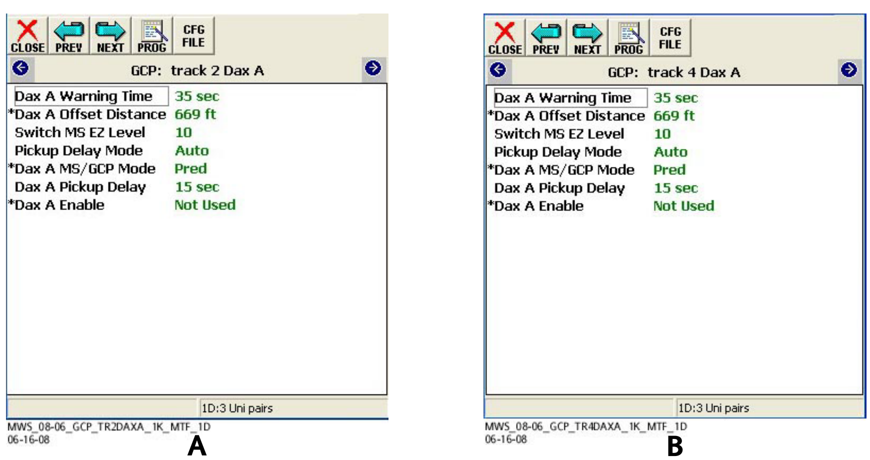


Figure 6-126:
Track 2 and Track 4 DAX Configuration Windows

The track 1 and track 3 **Prime UAX** fields are set to **RDAX** as shown in Figure 6-127A and Figure 6-127B. This enables the DAX A inputs received from the remote via Radio DAX Link B to be applied to the track 1 and track 3 prime predictors.

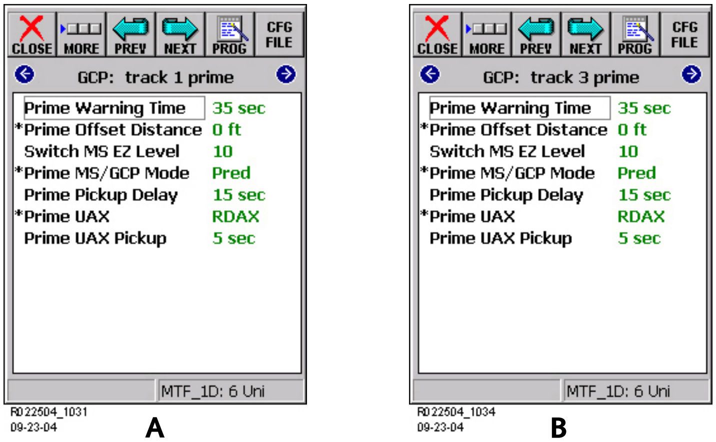


Figure 6-127:
Crossing 5 Configuration Windows

6.8.8 Radio DAX and Line Wire DAX Combination

Multiple remote tracks using a radio DAX Link may be combined with a single remote line wire DAX to control a bidirectional crossing as shown in Figure 6-128:

- Remote 1 (GCP-7) predictors T1 DAX A and T2 DAX A control the crossing via Radio DAX Links B and A.
- Remote 2 (GCP-6) predictor T1 DAX A controls the crossing via line wire.

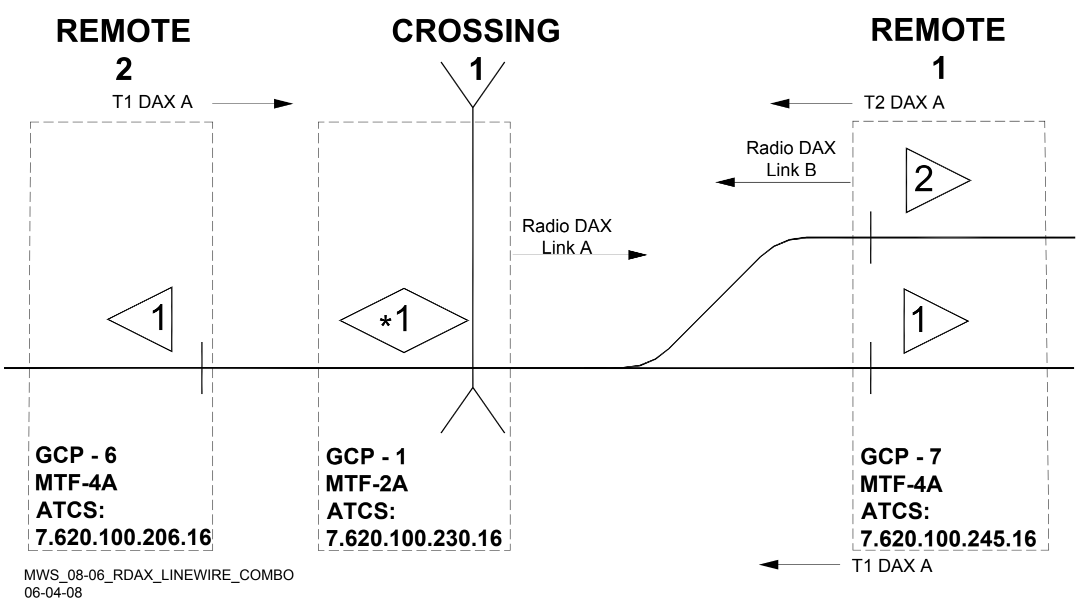


Figure 6-128:
Radio DAX and Line Wire Combination

6.8.8.1 Crossing 1 (GCP-1) Programming

For the configuration shown in Figure 6-128, Crossing 1 (GCP-1) must be programmed as follows:

On the BASIC: radio DAX links Window:

- The **Radio DAX link A Used** parameter is set to **Yes** as shown in Figure 6-129A.

Track 1 is configured to receive DAX information from Remote 1 as shown in Figure 6-129B. On the **BASIC: track 1 link A** Window:

- The **Track 1 DAXed to by Link A** parameter is set to **Yes**
- The **Track 1 DAXed to by Remote T1** parameter is set to **Yes**
- The **Track 1 DAXed to by Remote T2** parameter is set to **Yes**

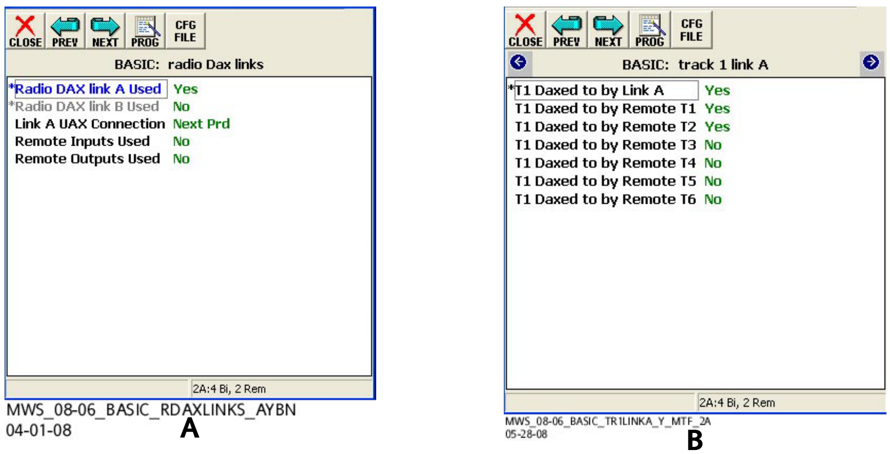


Figure 6-129:
Crossing 1 (GCP-1): A: Radio DAX Links; B: Track 1 Link A Configuration Windows

On the **GCP: track 1** prime Window:

- The **Prime UAX** parameter is set to **RDAX+IP** as shown in Figure 6-130. (This enables DAX information to be received from both the radio link from Remote 1 and the line wire from Remote 2.)

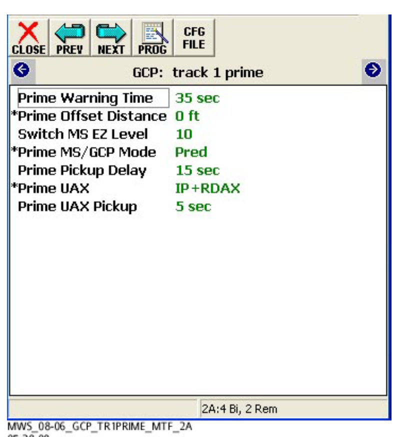


Figure 6-130:
Crossing 1 (GCP-1) GCP: track 1 Window

6.8.8.2 Remote 1 (GCP-7) Programming

For the configuration shown in Figure 6-128, on the Remote 1 (GCP-7) **BASIC: radio DAX links** Window:

- The **Radio DAX link B Used** parameter is set to **Yes** as shown in Figure 6-131.

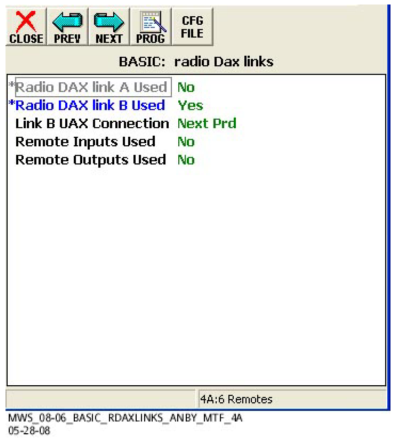


Figure 6-131:
Remote 1 (GCP-7) Radio DAX Link Configuration

Refer to Figure 6-106 to obtain the DAX A Offset Distances between Tracks 1 & 2 at Remote 1 and Crossing 1. The ATCS address offsets are set as described in paragraph 6.8.2. On the **GCP: track n DAX B** Windows:

- The **Warning Time** parameters are set to **35 sec** and the **Offset Distance** parameters are set to **1000** feet are set for track 1 and 2, respectively (see Figure 6-132A and Figure 6-132B)

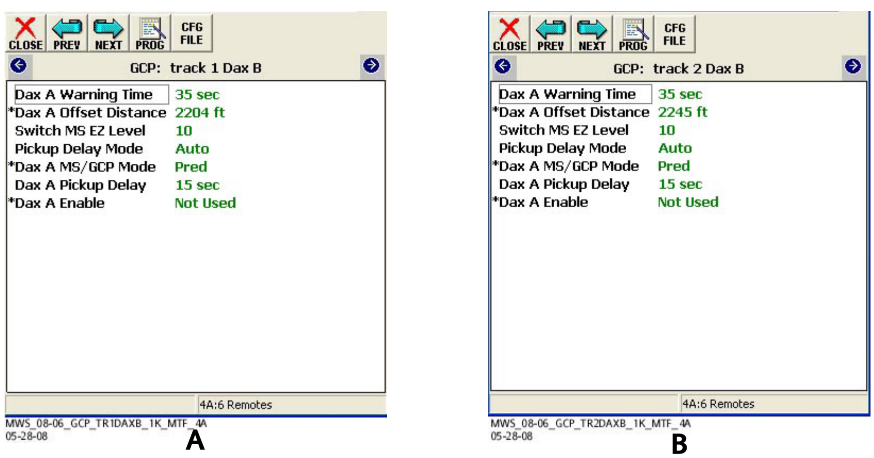


Figure 6-132:
Remote 1 (GCP-7) A: Track 1 and B: Track 2 DAX B Configuration Windows

6.8.8.3 Remote 2 (GCP-6) Programming

Refer to Figure 6-106 to obtain the DAX A Offset Distances between Track 1 at Remote 2 and Crossing 1. For the configuration shown in Figure 6-128, on the Remote 2 (GCP-6) **GCP: track 1 DAX A** Window is programmed as follows:

- The **Warning Time** parameter is set to **35 sec**
- The **Offset Distance** parameter is set to **1689 feet.**

On the OUTPUT: assignment page 1 Window:

- The **OUT 1.**1 parameter is set to **T1 DAX A** as shown in Figure 6-133. (This allows DAX A to be connected to Crossing 1 (GCP-1) via a line circuit.)

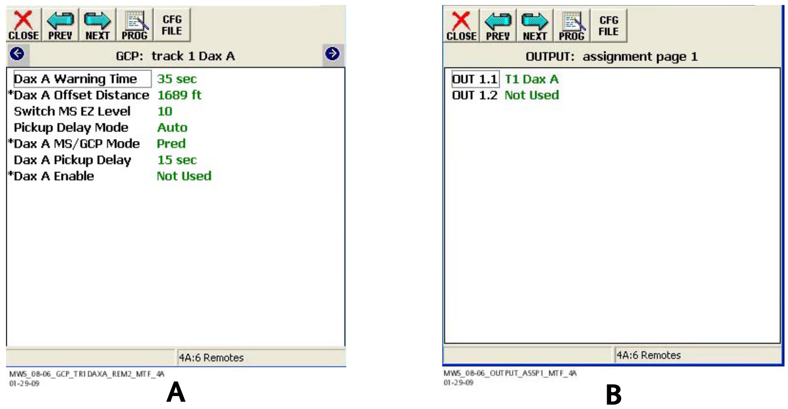


Figure 6-133:
Remote 2 (GCP-6) A: GCP: track 1 DAX A; B: OUTPUT assignment page 1

6.8.9 Remote Inputs and Outputs

The radio DAX links may also be used to send vital input data between Model 4000 GCPs. This allows a vital input from one location, such as a hand-throw-switch indication, to drive a vital output at a second location.

6.8.9.1 Using Vital Inputs

The Model 4000 GCP provides eight general purpose vital inputs. Each input may be sent to the connected remote location via Radio DAX links A and/or B. To use these inputs: set the status field of Radio DAX link A Used and/or Radio DAX link B Used to Yes; set the status field of **Remote Inputs Used** to **Yes** as shown in Figure 6-134A; and assign each remote input to a physical input as shown in Figure 6-134B.

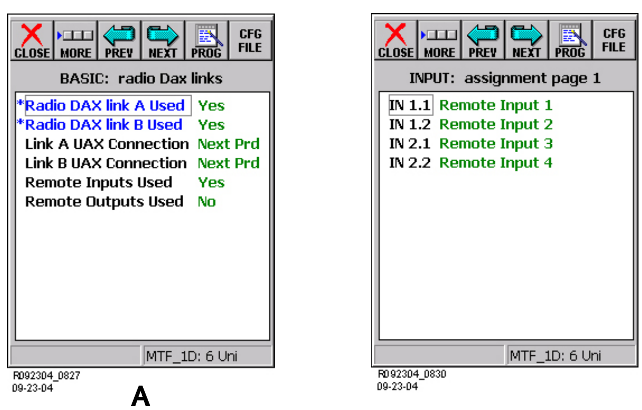


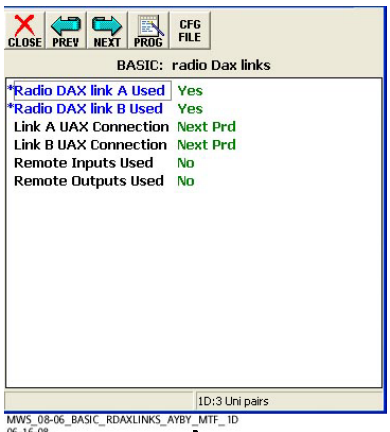
Figure 6-134:
Remote Input Windows

At the receiving unit the vital indications sent via the Radio DAX Links are allocated as follows:

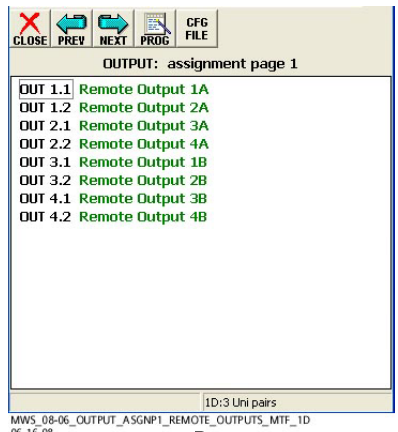
- Indications received via Link A are allocated to remote outputs 1A through 8A
- Indications received via Link B are allocated to remote outputs 1B through 8B

To use these inputs:

- On the **BASIC: radio DAX** links Window,
  - Set the **Radio DAX link A Used** and/or **Radio DAX link B Used** parameter to Yes. as shown in Figure 6-135A
  - Set the **Remote Outputs Used** parameter to **Yes** as shown in Figure 6-135A
- On the **OUTPUT: assignment page** 1 Window, assign each remote output to a physical output as shown in Figure 6-135B



A



B

Figure 6-135:
Remote Output Windows

A typical configuration for a single remote input/output may be programmed as follows:

Remote Sending Unit

- Set **Radio DAX link A Used** to **Yes**
- Set **Remote Inputs Used** to **Yes**
- Assign **Remote Input 1** to required physical input

Remote Receiving Unit

- Set **Radio DAX link B Used** to **Yes**
- Set **Remote Outputs Used** to **Yes**
- Assign **Remote Output 1B** to required physical output

Configuration enables **Remote Input** 1 indication to drive **Remote Output 1B**.

6.8.10 Bidirectional Dax Passthru

The Bidirectional DAX Passthru option allows the two Radio DAX sessions to be used more effectively when there are bidirectional locations in the radio DAX chain.

The **Bidirectional DAX Passthru** parameter is found on the **GCP: track n MS Control** Window (See Figure 6-136).

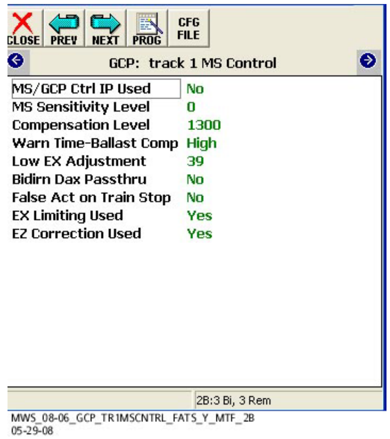


Figure 6-136:
The Bidirectional DAX Passthru parameter

The track predictor output is an AND gate made up of the predictor output from the track card and the optional Enable input, as shown in Figure 6-137A. When the **Bidirn Dax Passthru** option is turned on, the AND gate is reduced to that shown in Figure 6-137B.

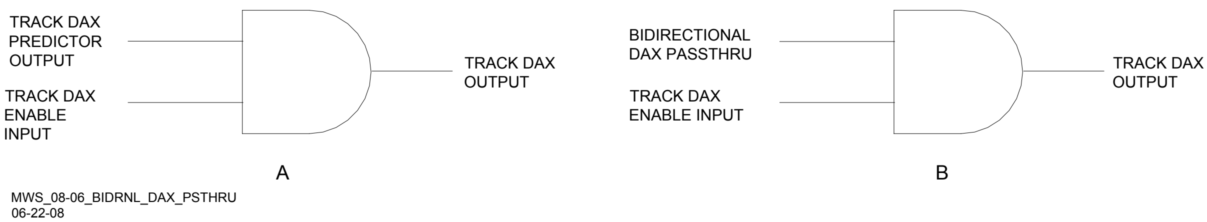


Figure 6-137:
Input Configurations for Track Predictor Output AND Gate

The DAX output now just repeats the Enable input. **The DAX predictor on the track card will no longer drop the Track DAX output.** This can be used to cascade DAXes through bidirectional units when radio DAXing.

WARNING

INCORRECT USE OF BIDIRN DAX PASSTHRU MAY RESULT IN NO ACTIVATION OF THE CROSSING WARNING DEVICES. WHEN BIDIRN DAX PASSTHRU'S ARE PLACED IN SERVICE OR MODIFIED, THE CROSSING SYSTEM SHOULD BE THOROUGHLY TESTED.

6.8.10.1 Example: Radio DAXing through Bidirectional Tracks

A box can only radio DAX to two neighboring boxes. The **Bidirn Dax Passthru** option is used to allow DAXes to be cascaded through bidirectional locations (Figure 6-138).

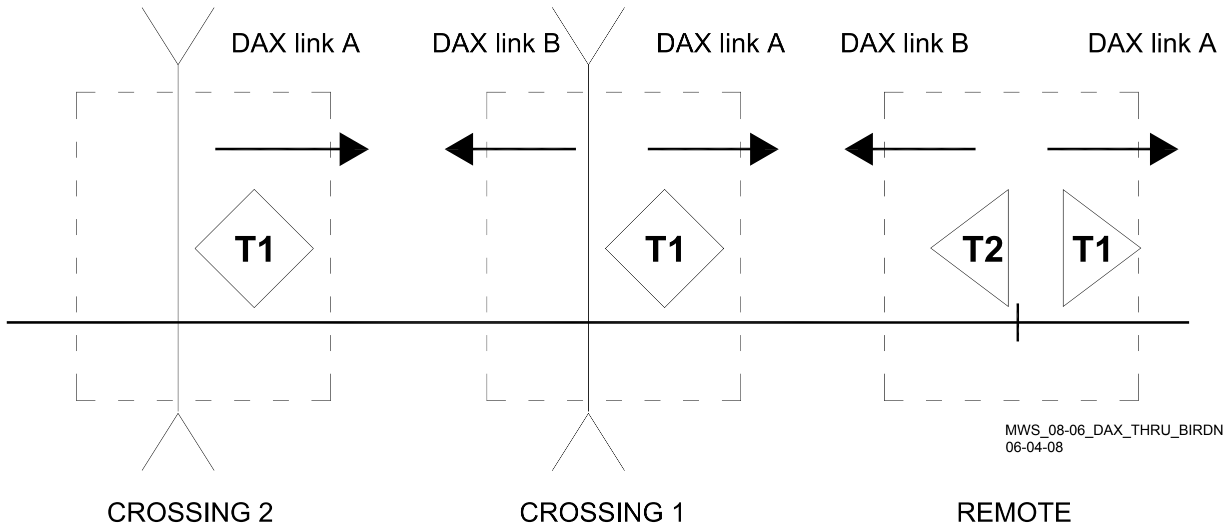


Figure 6-138:
DAXing Through Bidirectionals

Remote location uses both its radio DAX links for DAXing to:

- The crossing to the right.
- Crossing 1 on the left
- Crossing 2 on the left

Remote T1 DAX A is used to DAX to crossing 1 and remote T1 DAX B is used to DAX to crossing 2. The T1 DAX B state has to be cascaded through crossing 1. Crossing 1 is a bidirectional unit, and so cannot DAX; therefore, the Bidirectional DAX Passthru option is used to repeat the DAX enable from the remote through to crossing 2.

6.8.10.2 Crossing 1 Programming

The crossing is programmed as follows:

- On the **PREDICTORS: track 1** Window:
  - Set **DAX A Used** to **Yes** (See Figure 6-139A);
- On the **BASIC: radio DAX links** Window:
  - Set the **Radio DAX link A Used** parameter to **Yes** (Figure 6-139B);
  - Set the **Radio DAX link B Used** parameter to **Yes** (Figure 6-139B)
  - leave the default programming for **BASIC: track 1 link A** (Figure 6-139C);
- On the BASIC: track 1 link A Window:
  - The Track 1 DAXed to by Link A parameter is set to Yes
  - The Track 1 DAXed to by Remote T1 parameter is set to Yes
- On the **BASIC: track 1 link B** Window:

    - Set the **T1 DAXed to by link B** parameter to **No** (the crossing is not being DAXed by crossing 2 (Figure 6-139D));
    - Set the **DAX A Enable** to **RDAX**, so it is affected by the radio DAX ATCS messages (Figure 6-139E);
- On the **GCP: track 1 DAX** A Window, leave the following options at their default values, they will have no effect as the DAX predictor on the track module is not being used (Figure 6-139E):
    - Dax A Warning time
    - Dax A Offset Distance
    - Pick Delay Mode
    - Dax A Pickup Delay)
- On the **GCP: track 1 MS Control** Window:
    - Set the **Dax A Enable Pickup** parameter to **0 sec** (all the Pickup delay can be built in at the crossing location 2, 9Figure 6-139E)).
    - Set the **Bidirn Dax Passthru** parameter to **Yes** (so that only the DAX Enable and not the track predictor deenergizes the DAX (Figure 6-139F)).

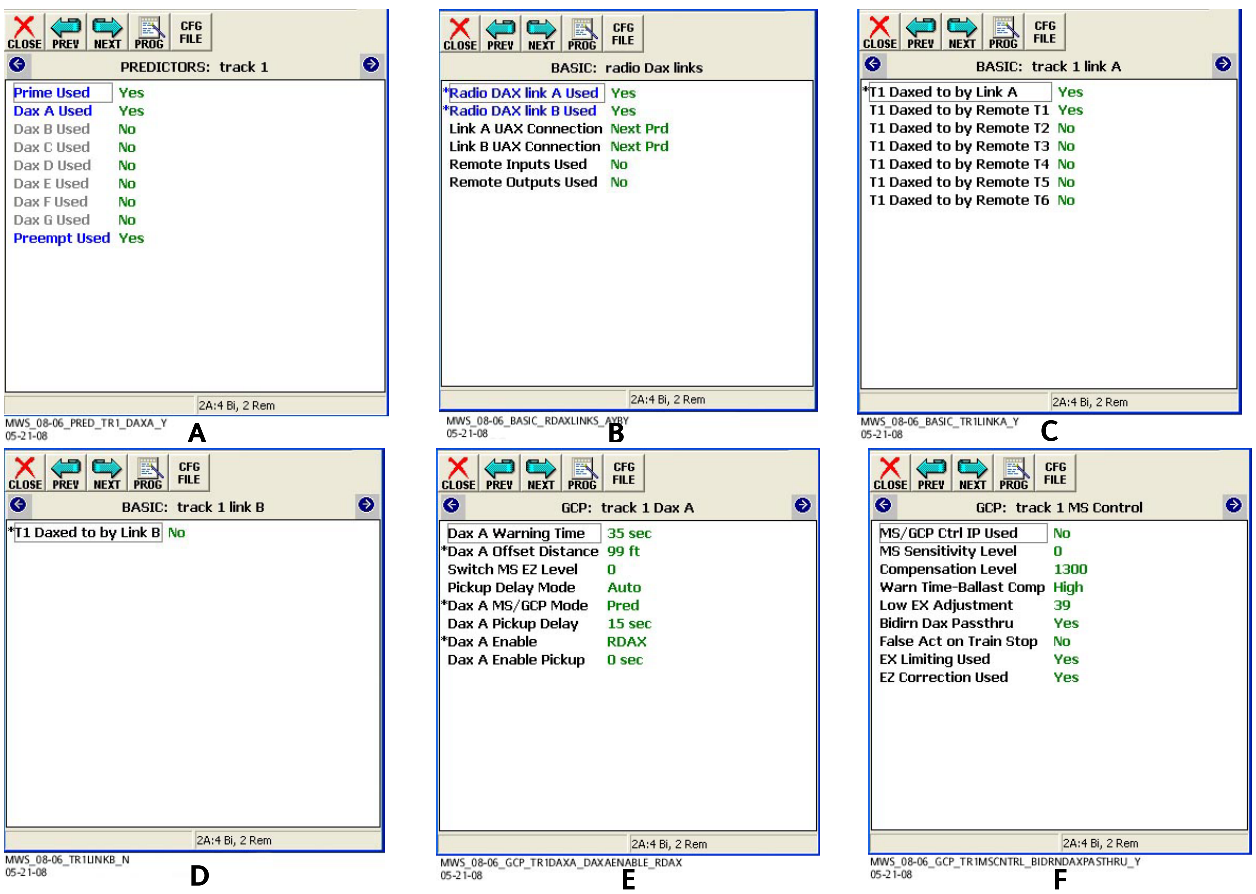


Figure 6-139:
Crossing 1 Programming

6.8.10.3 Crossing 2 Programming

Crossing 2 requires the normal Radio Dax programming; **Bidirn Dax Passthru** is not used here (See Figure 6-140A, B and C).

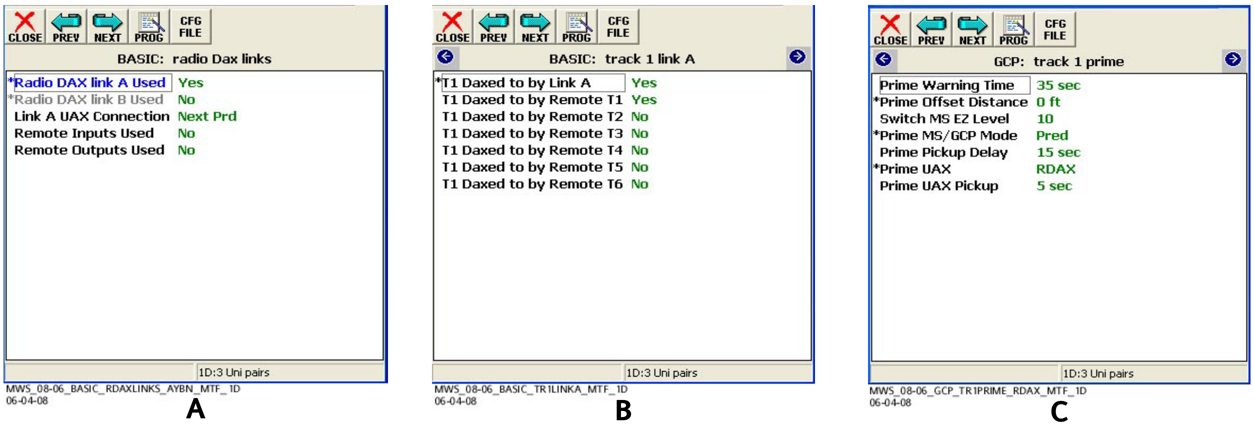


Figure 6-140:
Crossing 2 Programming

6.9 VITAL COMMS LINKS

An Echelon connection via a WAG to a spread spectrum radio may be used to send vital ATCS messages between Model 4000 GCPs or from a Model 4000 GCP to an HD/Link Module without the use of line wires. The ATCS messages sent from the Model 4000 GCP unit contain the states of eight general purpose vital inputs on the Model 4000 GCP unit. When the ATCS message from the Model 4000 GCP is received by a Model 4000 GCP, if the message is valid it can be used to set the states of up to eight vital outputs on the Model 4000 GCP. When the ATCS message is received by an HD/Link module, if the message is valid it is used to set the states of the eight vital outputs on the HD/Link Module. The ATCS messages sent from the HD/Link module contain the states of the eight general purpose vital inputs (VPIs) on the HD/Link. When the ATCS message from the HD/Link Module is received by a Model 4000 GCP, if the message is valid it can be used to set the states of up to eight vital outputs on the Model 4000 GCP. The Vital Comms links can be used to:

- Communicate DAX information between two Model 4000 GCP units
- Communicate other vital states between two Model 4000 GCP units
- Communicate DAX information from a Model 4000 GCP unit to a Model 3000 GCP via an HD/Link Module
- Communicate DAX information from a Model 3000 GCP unit to a Model 4000 GCP via an HD/Link Module

6.9.1 Vital Comms Links

Two Vital Comms links may be used with the Model 4000 GCP: Vital Comms Link 1 (VLINK1) and Vital Comms Link 2 (VLINK2). Each Vital Comms Link transmits the states of up to 8 vital inputs assigned to modules at the sending location. A Model 4000 GCP receiving location can be configured to use the state of the vital inputs in the received ATCS message to set vital outputs or set internal states. An HD/Link receiving location will set its vital outputs based upon the state of the bits in the vital message.

6.9.2 ATCS Addressing and ATCS Offsets

Because the Model 4000 GCP uses ATCS messages for communication, each site must be programmed with a unique ATCS address (known as the Site Identification Number, or SIN). The railroad design office usually assigns the ATCS address.

ATCS addresses consist of twelve digits in the format: **7.RRR.LLL.GGG.SS** where:

- **7** is the wayside equipment type
- **RRR** is the railroad number (this number is assigned by the ATCS committee for each Railroad)
- **LLL** is the line number
- **GGG** is the group number (all equipment at one location has the same group number)
- **SS** is the subnode number

Each unit at a location has a different subnode number. By default:

- 16 is assigned to the Model 4000 GCP CPU
- 99 is assigned to the SEAR2i
- 02 and higher (02, 03, 04, etc.) is assigned to each HD/Link Module found within the group

Typically, Model 4000 GCP's that DAX to each other have the same railroad (**RRR**), line (**LLL**), and subnode (**SS**) numbers, but have different group (**GGG**) numbers. When communicating with HD/Link Modules connected to Model 3000 GCPs, such as in Crossing 6 in Figure 6-106, both the group (**GGG**) and subnode (**SS**) numbers will differ.

Figure 6-106 provides examples of various crossing and remote sites. The crossing or remote is identified along with the GCP number, the MTF being utilized by that Model 4000 GCP, as well as the ATCS address (SIN) associated with that GCP.

NOTE

When working with ATCS addressing, there are now two methods available for setting the remote Site Identification Number (SIN) in the Display Panel and Display Terminal (DT). The first method, (discussed in paragraph 6.8.1.2, Setting the Address of Neighboring Locations (Using DT 4.7.5 or newer); depicted in Figure 6-108 titled Setting the Remote Site ID, is only available with units that have the Display Panels loaded with software version 4.7.5 and newer. The second application design, (discussed in paragraph 6.8.2.1, Setting the Address of Neighboring Locations (Using DT 4.6.0 or older);

depicted in Figure 6-110 titled Entering DAX Link Offset Values, is used with Display Panels having software version 4.6.0 and older. Both the previous and new application guidelines are provided.

6.9.2.1 Setting the Address of Remote Site Directly (Using DT Version 4.7.5 and newer)

Select the numerical portion of the Remote SIN parameter on the **BASIC: Vital Comms link #** Window as instructed in paragraph 6.8.1.2. When the **Set Remote Site ID** Window (see Figure 6-108) opens, enter the new Remote value and select **OK**. The new SIN will reflect in the **BASIC: Vital Comms Link #** Window.

6.9.2.2 Setting the Address of Remote Site (Using DT Version 4.6.0 and older)

Typically, Model 4000 GCPs that DAX to each other have the same railroad (**RRR**) and line (**LLL**) numbers, but have different group (**GGG**) numbers. To implement each Vital Comms link, the address of each GCP or HD/Link neighbor must be set into the Model 4000 GCP. The address of each neighbor is specified by an offset value that corresponds to the difference between the group (GGG) number of the receiving site and that of the neighbor site.

Using the example provided in Figure 6-106:

- At Crossing 1 (GCP-1), the receiving GCP has an ATCS address of 7.602.100.**230**.16
- At Crossing 6 (GCP-8), the Vital Comms Link 1 neighbor has an ATCS address of 7.602.100.**233**.**02**
- At Remote 2 (GCP-6), the Vital Comms Link 2neighbor has an ATCS address of 7.602.100.**206**.16.

For Vital Comms Link 1, the GGG offset value is:

- 233 (Crossing 6, GCP-8) – 230 (Crossing 1, GCP-1) = **3**.

For Vital Comms Link 1, the SS offset value is:

- 02 (Crossing 6, GCP-8) – 16 (Crossing 1, GCP-1) = **-14**.
- Change the negative offset number to its absolute value; e.g., -14 has an absolute value of 14
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 14 + 32768 = **32782**. (See Figure 6-141A)

For Vital Comms Link 2, the GGG offset value is:

- 206 (Remote 2, GCP-6) – 230 (Crossing 1, GCP-1) = **-24**.

Using DT 4.6.0 or older, a negative offset number cannot be entered directly.

A negative offset number must be converted to a usable entry number as follows:

- Change the negative offset number to its absolute value; e.g., -24 has an absolute value of 24
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 24 + 32768 = **32792**. (See Figure 6-141B)

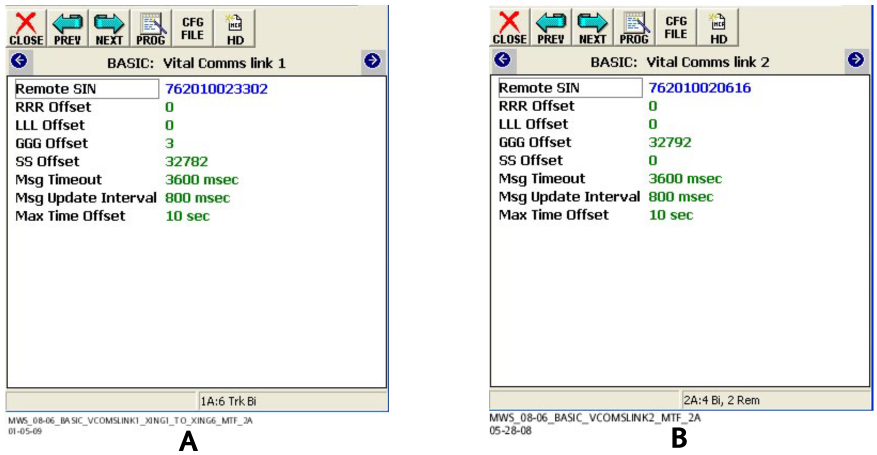


Figure 6-141:
Entering Vital Comms Link Offset Values

6.9.3 Vital Comms Link Programming Parameters

On the **BASIC: Vital Comms links** window, Figure 6-142A, when the **Vital Comms Link 1 Used** field is set to **Yes**:

- **Vital Link 1 OP 1** through **Vital Link 1 OP 8** are available to be assigned to outputs, or internal channels (Figure 6-142B and Figure 6-142D).
- **Vital Link 1 IP 1** through **Vital Link 1 IP 8** are available to be assigned to inputs, or internal channels (Figure 6-142C).

When the **Vital Comms Link 2 Used** field is set to **Yes**:

- **Vital Link 2 OP 1** through **Vital Link 2 OP 8** are available to be assigned to outputs, or internal channels (Figure 6-142B and Figure 6-142D).
- **Vital Link 2 IP 1** through **Vital Link 2 OP 8** are available to be assigned to inputs, or internal channels (Figure 6-142C).

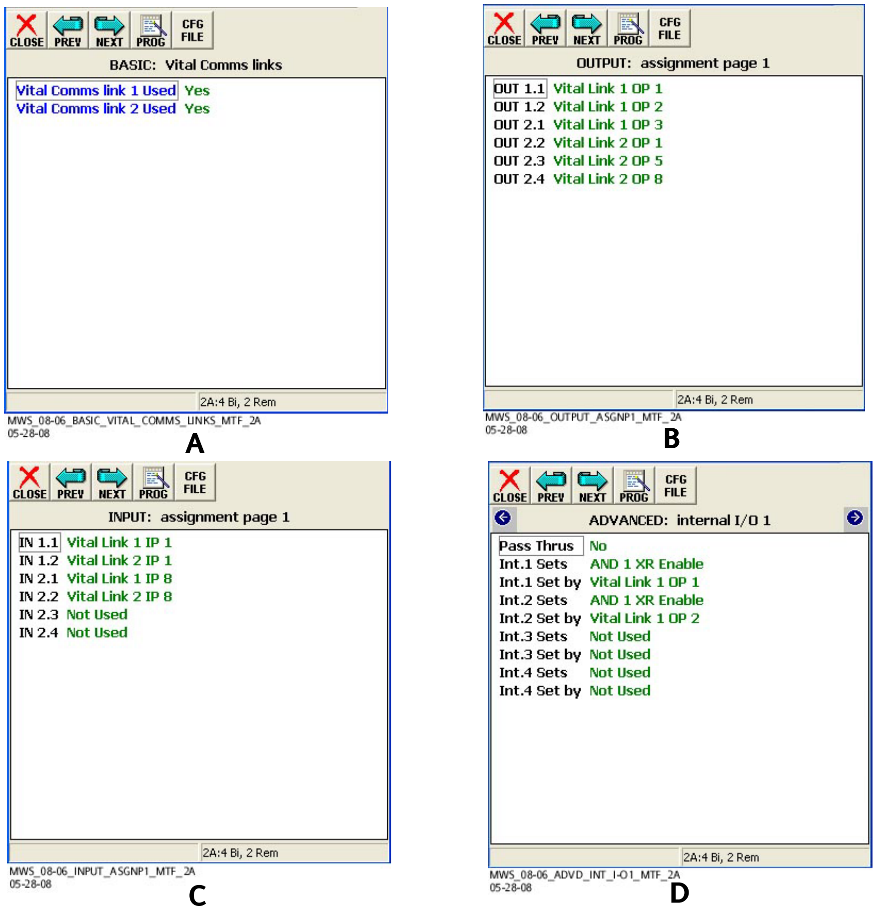


Figure 6-142:
A: Vital Comms Link Window; B: Output Assignment Page 1 Window
C: Input Assignment Page 1 Window; D: Advanced Internal I/O Assignments Window

6.9.4 Message Update and Timeouts

The transmission parameters for each Vital Comms link are set using the **BASIC: Vital Comms link** window (Figure 6-141). In this window,

- The interval between message transmissions is set by the **Msg Update Interval** field.
- Specifies how often a repeat ATCS message is sent across the radio link.
- The message is sent immediately when a state change occurs (energized to de-energized or vice versa)
- The interval that the receiving unit waits for a good message from the neighbor unit before declaring it out of session is set by the **Msg Timeout** field.
- If a message is not received by the end of this interval the unit reverts to a safe state.

For example, when the **Msg Timeout** field is set to the default setting of 3600ms, and a new message is not received within 3.6 seconds of the last message, the Model 4000 GCP:

- designates the link as failed

- defaults to a restrictive set of states for the message data on the failed link
- deenergizes the Vital Comms Outputs

The default setting for the **Message Update** parameter is 800ms. At this default value, approximately 4 messages can be lost on the radio link without the link failing.

6.9.5 Using the Vital Comms to DAX From Remote to Crossing

A remote site can be used to send a DAX signal to a crossing via a Radio Link as shown in Figure 6-143.

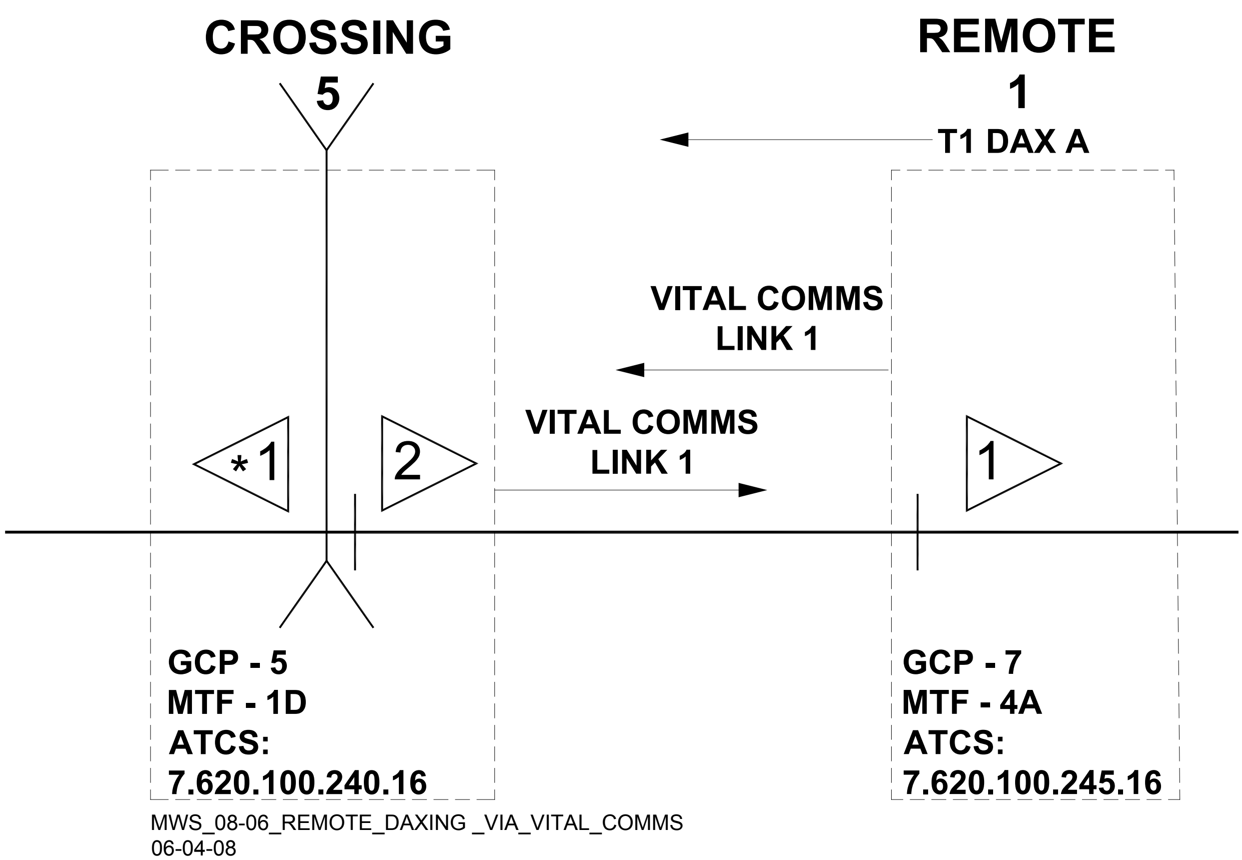


Figure 6-143:
Remote Site Radio DAXing A Crossing Via Vital Comms Link

6.9.5.1 Remote Site Programming

For the configuration shown in Figure 6-143, on the Remote 1 **BASIC: Vital Comms links** Window:

- Set the **Vital Comms Link 1 Used** parameter is to **Yes**.

6.9.5.1.1 Setting Address of Neighboring Location Using DT Version 4.7.5 and newer

Use the same procedure as outlined in Section 6.8.1.2 using the **BASIC: Vital Comms link n** Window rather than the **Basic: RDax Link n** Window.

6.9.5.1.2 Setting Address of Neighboring Location Using DT Version 4.6.0 and older

Using the example provided in Figure 6-143:

- Crossing 5 (GCP-5) has an ATCS address of 7.602.100.**240**.16
- Remote 1 (GCP-7) has an ATCS address of 7.602.100.**245**.16.

The offsets are calculated by subtracting the ATCS address fields of the remote from the address fields of the crossing. Since a difference occurs only between the group numbers, the GGG offset is set to that difference:

240 (Crossing 5, GCP-5) – 245 (Remote 1, GCP-7) = **-5**

Using DT 4.6.0 or older, a negative offset number cannot be entered directly. A negative offset number must be converted to a usable entry number as follows:

- Change the negative offset number to its absolute value; e.g., -5 has an absolute value of 5.
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 5 + 32768 = **32773**.

The DAX output from track 1 must be connected to the Vital Comms Link. This can be done using the internal channels (Figure 6-144). **T1 Dax A** output is connected to **Vital Link 1 IP 1** by setting internal state 1 with **T1 Dax A and** using internal state 1 to set **Vital Link 1 IP 1.**

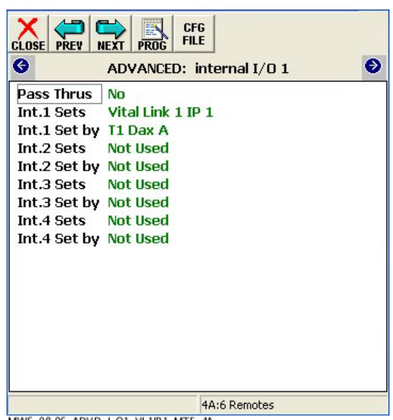


Figure 6-144:
Connecting Dax Output to Vital Comms Link Input

6.9.5.2 <u>Crossing Site Programming</u>

For the configuration shown in Figure 6-143, the crossing site must be programmed as follows:

- On the **BASIC: Vital Comms links** Window, set the **Vital Comms Link 1 Used** parameter to **Yes** (enabled) as shown in Figure 6-145.

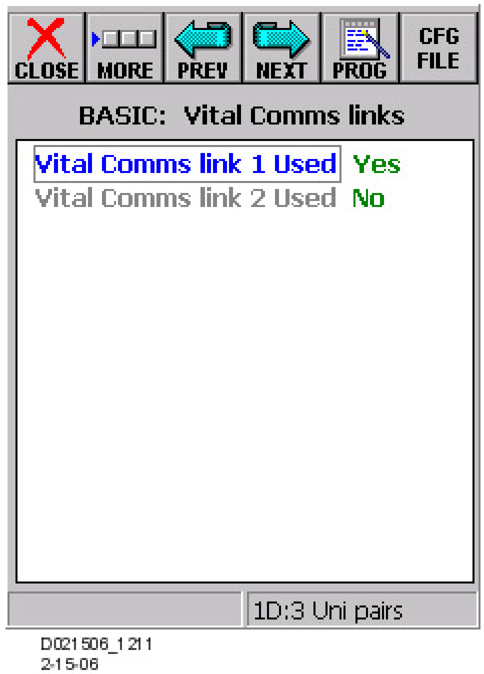


Figure 6-145:
Crossing Site Programming

NOTE

Vital Comms Links of neighbor sites must always be used in pairs; i.e., Vital Link 1 of one Model 4000 GCP must be connected to Vital Link 1 of the other Model 4000 GCP.

The Vital Comms output state must be connected to the UAX for track 1. This can be done using the internal channels.

On the GCP: track 1 prime Window:

- Set the **Prime UAX** parameter to **IP** (not **RDAX** – the remote input state is treated as a physical input brought in from a remote site (Figure 6-146A)).

On the **ADVANCED: internal I/O #** Window **Vital Link 1 OP 1** is connected to **T1 Prime UAX** (Figure 6-146B) by:

- Set the **Int.1 Sets** parameter to **T1 Prime UAX**
- Set the **Int.1 Set by** parameter to **Vital Link 1 OP 1**

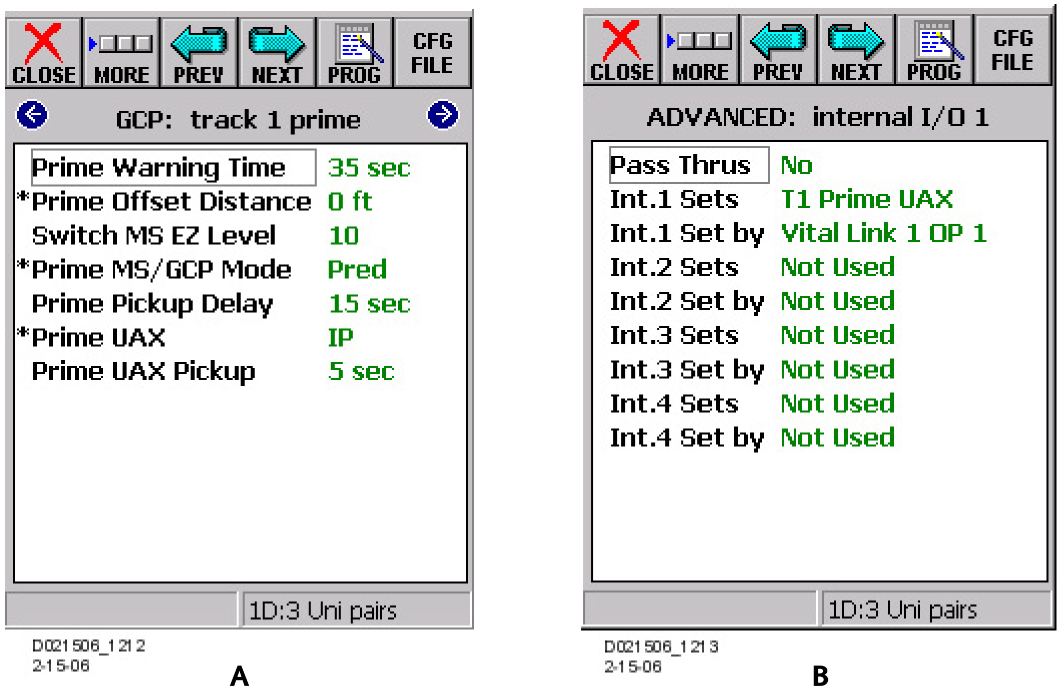


Figure 6-146:
Crossing Programming

6.9.5.2.1 Setting Address of Neighboring Location Using DT Version 4.7.5 and newer

Use the same procedure as outlined in Section 6.8.1.2 using the **BASIC: Vital Comms link n** Window rather than the **Basic: RDax Link n** Window.

6.9.5.2.2 Setting Address of Neighboring Location Using DT Version 4.6.0 and older

Using the example provided in Figure 6-143:

- Crossing 5 (GCP-5) has an ATCS address of 7.602.100.**240**.16
- Remote 1 (GCP-7) has an ATCS address of 7.602.100.**245**.16.

The offsets are calculated by subtracting the ATCS address fields of the remote from the address fields of the crossing. Since a difference occurs only between the group numbers, the GGG offset is set to that difference:

245 (Remote 1, GCP-7) – 240 (Crossing 5, GCP-5) = **5**

Keep the default **Msg Timeout** and **Msg Update Interval** values shown in Figure 6-147.

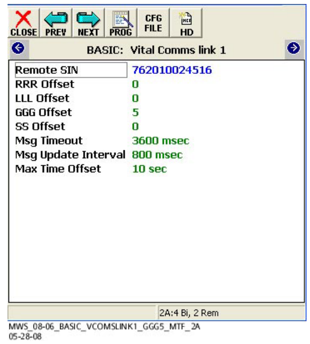


Figure 6-147:
Crossing ATCS Setup

6.9.6 Radio DAXing between Model 3000 GCP and Model 4000 GCP

In Figure 6-148, a remote Model 3000 GCP site is DAXing to two bidirectional crossings equipped with Model 4000 GCPs using an HD/Link Module and radio link.

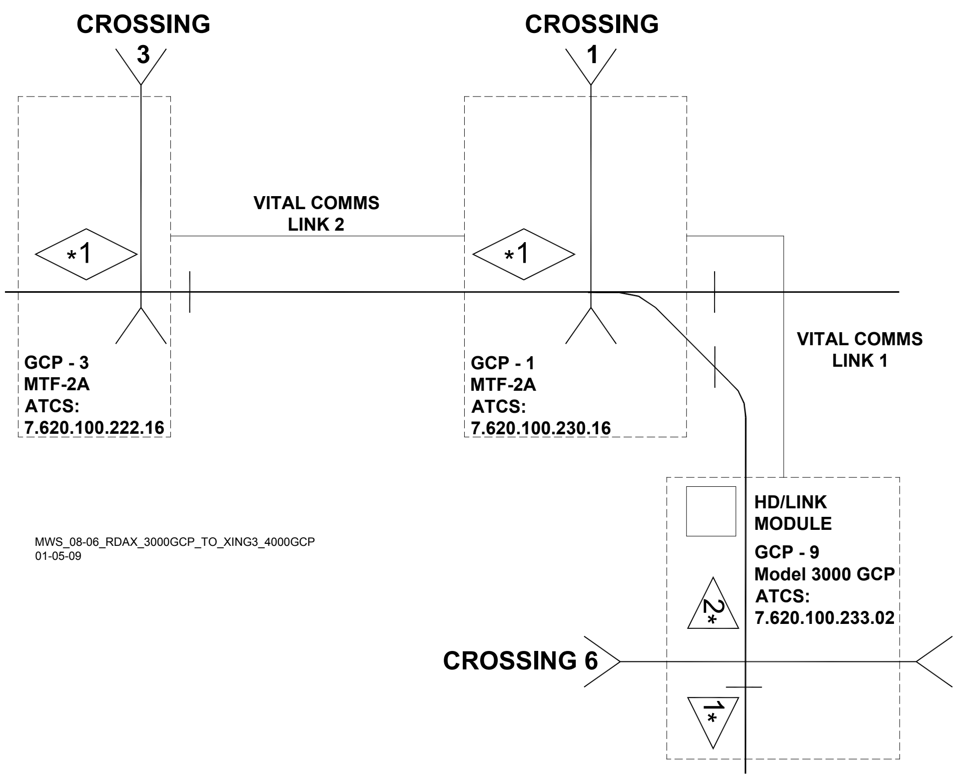


Figure 6-148:
Model 3000 GCP DAXing to Model 4000 GCPs

6.9.6.1 <u>Crossing 6 (Model 3000 GCP – HD/Link Module) Programming</u>

The Model 3000 GCP is programmed as per Microprocessor Based Grade Crossing Predictor Model 3000 Instruction & Installation Manual, SIG-00-00-02. The Model 3000 GCP Prime Output (GCP RLY, TB1-9 & TB1-10) is connected to Vital Input 1 (VPI1, pins 1 and 21) on the HD/Link

Module. The 3000's DAX A Output (TB1-13 & TB1-14) is connected to Vital Input 2 (VPI2, pins 2 and 22) on the HD/Link Module. The HD/Link is configured with the SIN 7.602.100.233.02. The HD/Link is programmed with a suitably amended MCF (see Section 6.10 for information on programming and amending the HD/Link MCF using the DT).

WARNING

THE HD/LINKER ALONE MUST NOT BE USED TO CREATE MCF'S FOR THE HD/LINK MODULES WHEN USED TO INTERFACE TO MODEL 4000 GCP'S. PLEASE FOLLOW THE PROCEDURES OUTLINED IN SECTION 6.10.

6.9.6.2 Crossing 1 (GCP-1) Programming

For the configuration shown in Figure 6-148, the Crossing 1 GCP **BASIC: Vital Comms links** Window is programmed as follows:

- Set the **Vital Comms Link 1 Used** parameter to **Yes** (enabled) as shown in Figure 6-149.
- Set the **Vital Comms Link 2 Used** parameter to **Yes** (enabled) as shown in Figure 6-149.

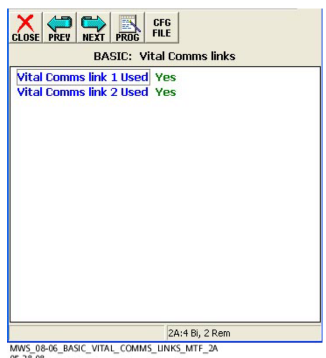


Figure 6-149:
Crossing 1 Setup

6.9.6.2.1 Setting Address of Neighboring Location Using DT Version 4.7.5 and newer

Select the numerical portion of the Remote SIN parameter on the **BASIC: Vital Comms link #** Window as instructed in paragraph 6.8.1.2. When the **Set Remote Site ID** Window (see Figure 6-108) opens, enter the new Remote value and select **OK**. The new SIN will reflect in the **BASIC: Vital Comms link #** Window (see Figure 6-150A and Figure 6-150B).

6.9.6.2.2 Setting Address of Remote Site Using DT Version 4.6.0 and older

To implement each Vital Comms link, the address of each GCP or HD/Link neighbor must be set into the Model 4000 GCP. The address of each neighbor is specified by an offset value that corresponds to the difference between the group (GGG) number of the receiving site and that of the neighbor site.

Using the example provided in Figure 6-148:

- At Crossing 1 (GCP-1), the receiving GCP has an ATCS address of 7.602.100.**230**.**16**
- At Crossing 6 (GCP-8), the Vital Comms Link 1 neighbor has an ATCS address of 7.602.100.**233**.**02**
- At Crossing 3 (GCP-3), the Vital Comms Link 2 neighbor has an ATCS address of 7.602.100.**222**.16.

For Vital Comms Link 1, the GGG offset value is:

- 233 (Crossing 6, GCP-8) – 230 (Crossing 1, GCP-1) = **3**.

For Vital Comms Link 1, the SS offset value is: **-14**

- 02 (Crossing 6, GCP-8) – 16 (Crossing 1, GCP-1) = **-14**.
- Change the negative offset number to its absolute value; e.g., -14 has an absolute value of 14
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 14 + 32768 = **32782**.

For Vital Comms Link 2, the GGG offset value is:

- 222 (Crossing 3, GCP-3) – 230 (Crossing 1, GCP-1) = **-8**.

Using DT 4.6.0 or older, a negative offset number cannot be entered directly.

A negative offset number must be converted to a usable entry number as follows:

- Change the negative offset number to its absolute value; e.g., -8 has an absolute value of 8
- The absolute value of the offset number is then added to 32768 to obtain the value to be entered; e.g., 8 + 32768 = **32776**.

The two offset values obtained are entered as shown in Figure 6-150A and Figure 6-150B.

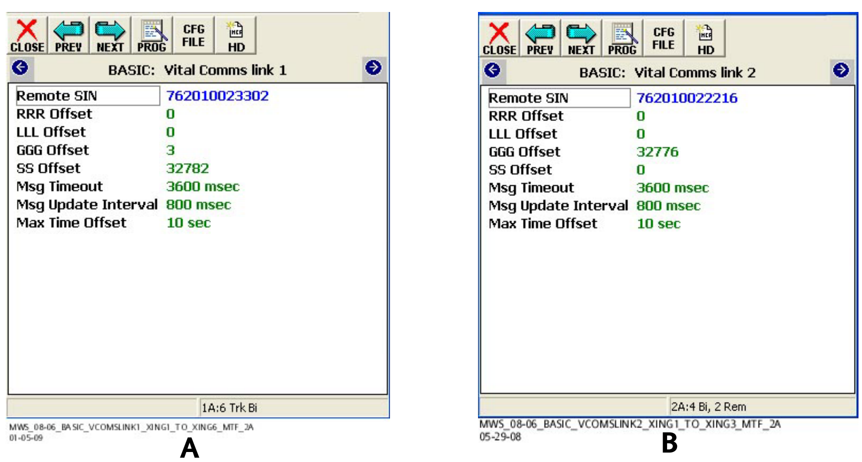
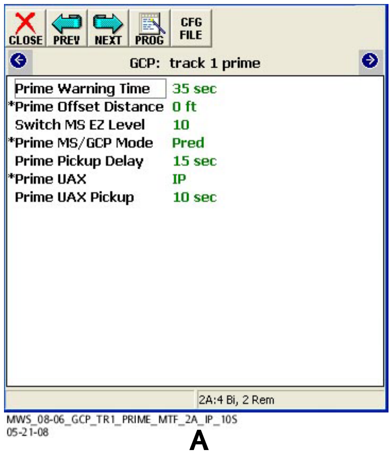
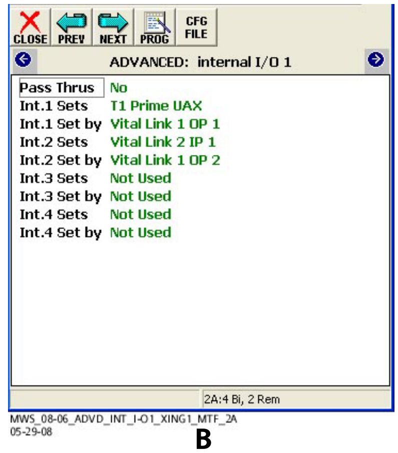


Figure 6-150:
A: Vital Comms Link 1 Setup; B: Vital Comms Link 2 Setup



A



B

Figure 6-151:
A: Crossing 1UAX Setup; B: Crossing 1 Internal Connections

Crossing 1 is receiving two vital inputs from Crossing 6 and internally sends the **Vital Link 2 OP 2** data to Crossing 3. **Vital Link 1 OP 1** is used to activate Crossing 1.

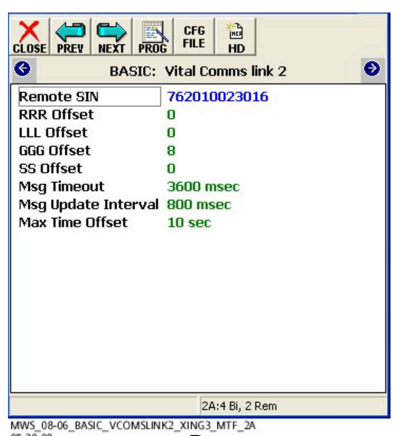
- On the **GCP: track 1 prime Window**:
  - Set the **Prime UAX** parameter to **IP** (Figure 6-151A).
- On the **ADVANCED: internal I/O # Window**,
  - The **Int. 1 Sets** parameter is set to **Track 1 Prime UAX**
  - The **Int. 1 Sets by** parameter is set to **Vital Link 1 OP 1** (Figure 6-151B).

Vital Link 1 OP 2 is used to activate Crossing 3.

- On the **ADVANCED: internal I/O #** Window,
  - The **Int. 2 Sets** parameter is set to **Vital Link 2 IP 1**
  - The **Int. 2 Sets by** parameter is set to **Vital Link 1 OP 2** (Figure 6-151B).

6.9.6.3 Crossing 3 (GCP-3) Programming

A



B

Figure 6-152:
A: Crossing 3 Vital Comms Links Setup; B: Crossing 3 VComs Link 2 Setup

For the configuration shown in Figure 6-148, the Crossing 3 site must be programmed as follows:

- **Vital Comms Link 2 Used** is set to **Yes** (enabled) as shown in Figure 6-152A.
- For Vital Comms Link 2, the GGG offset value is:
    - 230 (Crossing 1, GCP-1) – 222 (Crossing 3, GCP-3) = **8** as shown in Figure 6-152A.

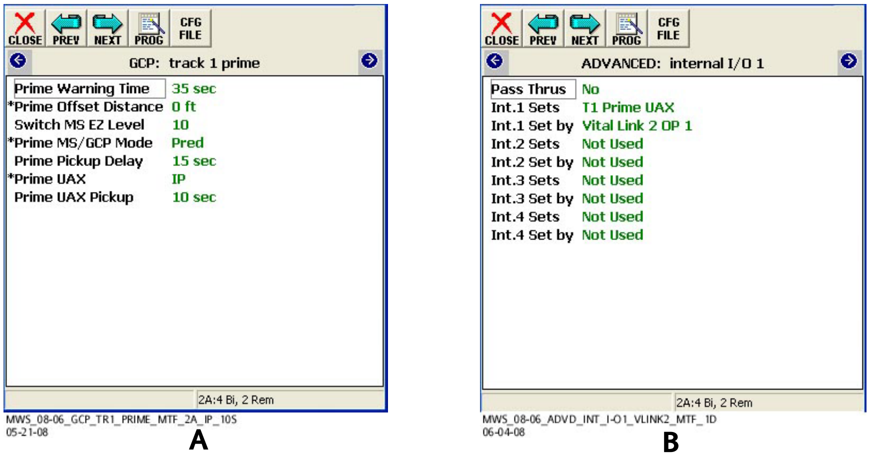


Figure 6-153:
(A) UAX Setup for Crossing 2, (B) Internal Connections for Crossing 2

Crossing 3 is receiving a vital input from Crossing 1. **Vital Link 2 OP 1** is used to activate the crossing.

- On the **GCP: track 1 prime Window**:
    - Set the **Prime UAX** parameter to **IP** (Figure 6-153A).
- On the **ADVANCED: internal I/O # Window**,
    - The **Int. 1 Sets** parameter is set to **Track 1 Prime UAX**
    - The **Int. 1 Sets by** parameter is set to **Vital Link 2 OP 1** (Figure 6-153B).

6.10 HD/LINK MODULE PROGRAMMING SUPPORT

With the release of the latest Siemens Display Terminal (DT) (version 4.7.5 or later), the DT is now able to amend the programming and read the HD/Link Module logs. With this version of the DT, the Model 4000 GCP DT can be used to modify a currently loaded MCF on the DT. All programming of the HD/Link, to include initially creating MCFs and establishing VPI linkages, is still performed using the HD/Linker.

The DT version 4.7.5 can perform the following actions regarding the HD/Link Module:

- Install MEF
- Install MCF
- Set SIN.
- Set UCN.
- Set time.
- View the state of VPI, VRO, and internal variables.
- View module status.

- View SAT status.
- View timing parameter settings.
- View and save the status log.
- View the diagnostic dump.
- View statistics.
- Set the verbosity.
- Reset the HD/Link module.
- Unconfigure the HD/Link module.

If using DT 4.6.0 or earlier, continue to program and monitor the HD/Link using the HD/Linker. For further information on programming the HD/Link, see the following documents:

- SIG-00-97-07, HD/Link Vital I/O Module Installation Handbook
- SIG-00-97-05, HD/Link Vital I/O Module Application Guidelines
- SIG 00-97-08, HD/LINKer User's Handbook

For further information regarding Echelon® Lontalk, see Siemens' Echelon® Configuration Handbook, COM-00-07-09.

WARNING

AFTER INSTALLATION OF A MODULE, OR WHENEVER A CHANGE IS MADE TO THE SOFTWARE OR THE CONFIGURATION, THE INSTALLATION SHOULD BE FULLY OPERATIONAL TESTED TO ENSURE SAFETY.

Vital operations (inputs read and outputs set) can only be done when the HD/Link Module has passed through the initialization state, the health and configuration checks have been passed, and the module can read the ECD data. Before vital operations can begin, the module must have the correct MCF, MEF, and UCN

Because of possible failure in equipment or tools used to configure an application, steps must be taken to ensure that the application and the configuration do not contain incorrect data

Changes can only be made to the system configuration when the vital processing has been shut down. During normal operation of the system, when any vital operations are being done, it is not possible to change the configuration of the system.

Configuration of the HD/LINK module utilizing the DT consists of loading the MCF, the SIN, and the UCN. If the MEF is not the desired version, loading the MEF may also be required. The MEF version may be checked by clicking the View Report button on the Create HD/Link MCF Window.

6.10.1 Start the Diagnostic Terminal (DT)

To prepare the DT for use with the HD/LINK:

- Open the DT

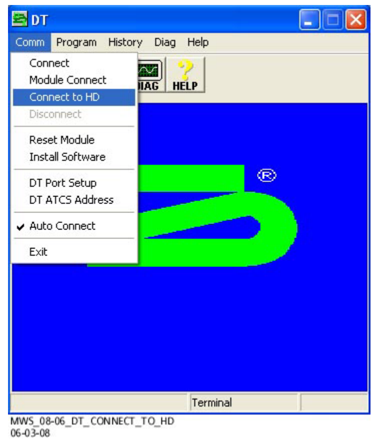


Figure 6-154:
Connecting to HD

- Select COMM > Connect to HD (see Figure 6-154). The HD DT opens (see Figure 6-155).

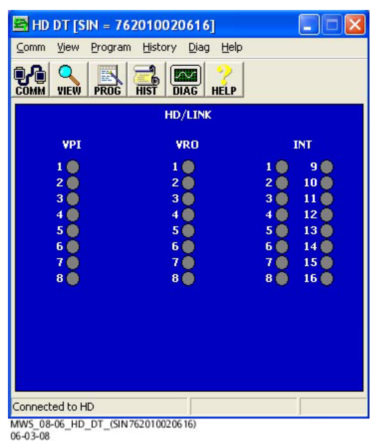


Figure 6-155:
The HD/LINK DT Window

6.10.2 Install MEF

<u>WARNING</u>

LOAD HDL01_20 OR LATER VERSION OF MEF ONLY. DO NOT LOAD SOFTWARE VERSIONS HDL01_OO OR HDL01_10. REFER TO CUSTOMER SERVICE BULLETIN CSB4-98 FOR INFORMATION.

NOTE

Siemens provides HD/LINK modules already loaded with the latest HD/LINK software. Loading the MEF should not normally be required.

Changing the Module Executable File (MEF) for the HD/LINK module does not require changing any EEPROMs. The software is stored in flash memory and can be updated using a laptop computer running the Diagnostic Terminal.

- On the DT, select COMM > Install Software (see Figure 6-156). The Text Terminal Window opens (see Figure 6-157) which allows the user to Change SIN (F1), Change UCN (F2), Change MCF (F3), Change MEF (F4) or Exit Setup (F5).

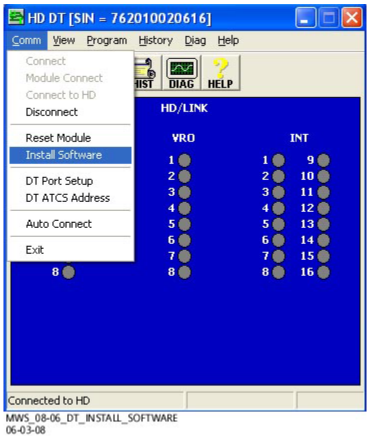


Figure 6-156:
The Install Software Option Window

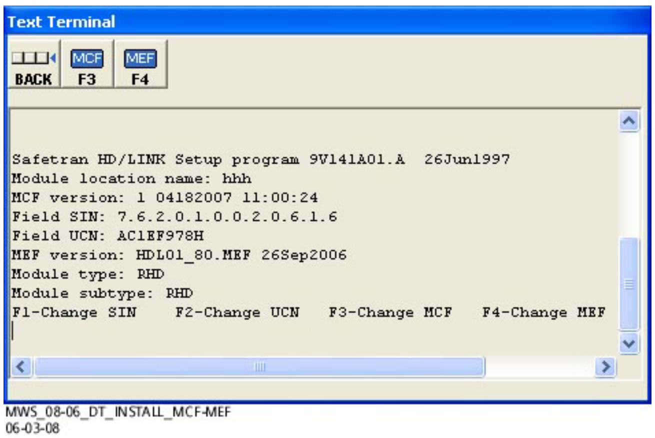
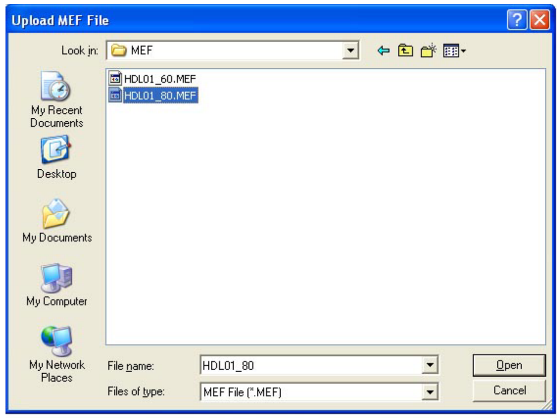


Figure 6-157:
The Text Terminal Window – Install MEF

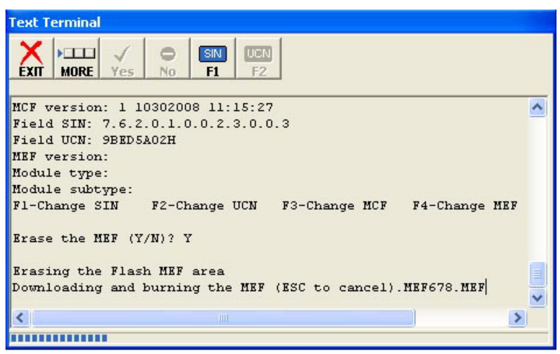
- Select F4 - Change MEF. “Erase the MEF?” appears on the Text Terminal Window. Enter Y and press ENTER.



MWS_08-06_DT_UPLOAD_MEF_FILE
01-08-09

Figure 6-158:
The Upload MEF File Window

- The Upload MEF File Window opens. Select the correct MEF file and select OPEN.



MWS_08-06_DT_DOWNLOAD_MEF
01-08-09

Figure 6-159:
The Download MEF Text Terminal Window

- The MEF is downloaded and burned into the Flash EEPROM. Once the MEF is installed, begin installing the updated MCF.

6.10.3 Operations Regarding the MCF

6.10.3.1 Create a Remote SIN using Model 4000 GCP

One of the features of DT 4.7.5 allows the Model 4000 GCP to be connected directly to the HD/LINK using Vital Comms Links 1 & 2. With this option, the pre-programmed MCF for an HD/LINK Module can be amended to change the SIN and the UCN for direct use with the GCP.

To create a MCF using the GCP:

- Connect the cable from the laptop or desktop running the DT program to the GCP case.
- Open the BASIC: Vital Comms Link 1 Window (see Figure 6-160), enter the Remote SIN. Select the HD MCF button.

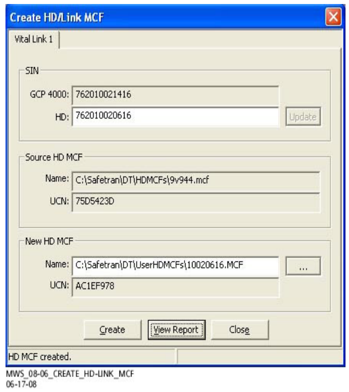


Figure 6-160:
The BASIC: Vital Comms Link 1 Window – HD Link Button and SIN Setting

- The Create HD/LINK MCF Window opens (see Figure 6-162).

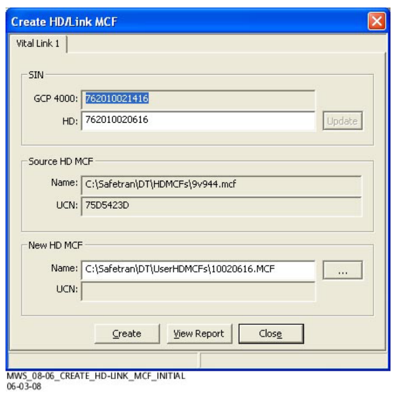


Figure 6-161:
The Create HD/LINK MCF Window

- Select Create. The UCN line of the screen is populated (see Figure 6-162). The modified MCF is created and placed as shown in the Name: line of the New HD MCF section of the Window. You may view the MCF Report generated by this activity by selecting View Report (see Figure 6-163, Figure 6-164, and Figure 6-165)

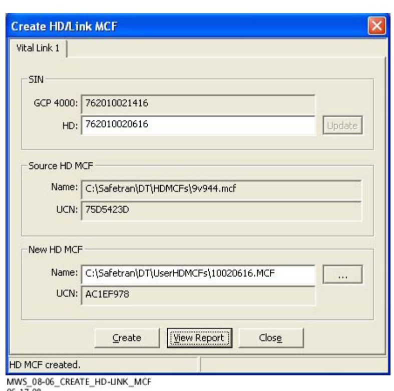


Figure 6-162:
Create an HD/Link MCF Window

HD/LINK MODULE CONFIGURATION FILE LISTING

ATCS Site ID (SIN): 7.620.100.206.16
Neighbor Link - 4000 GCP: Vital Comms Link 1
MCF: C:\Safetran\DT\UserHDMCFs\10020616.MCF
Date/Time: 06/02/2008 12:33:16
UCN: AC1EF978
Part Number: 9000-53201-0018

Program Summary:
Neighbor ATCS Site ID (SIN): 7.620.100.214.16
Max Time Offset: 10 seconds
Message Timeout: 3.60 seconds
Message Update Interval: 0.80 seconds

VSAT Program Detail:
Device No.: 6
Client Data Used: Yes
Max Time Stamp Offset: 10 seconds
Non Restrictive Timeout: 3.60 seconds
Number Of Channels: 8
Refresh Time Stamp: 3600.00 seconds
Restrictive Timeout: 3.60 seconds
Retry Client Session: 2.00 seconds
Session Attempt Timeout: 14400.00 seconds
Client Data
Server Data Used: Yes
Non Restrictive Update: 0.80 seconds
Number Of Channels: 8
Refresh Time Stamp Timeout: 7202.00 seconds
Restrictive Update: 0.80 seconds
Retry Server Session: 2.00 seconds
Server Data
Neighbor ATCS Site ID (SIN): 7.620.100.214.16
Neighbor Device: 6

MWS_08-06_DT_HD-LINK_MOD_CONFIG_LISTING_P1
06-03-08

Figure 6-163:
HD/LINK Module Configuration File Listing, Part 1

INPUTS

Input	+Pin	+Pin Label	-Pin	-Pin Label	Direction
1	21	VPI1 POS	1	VPI1 NEG	Unidirectional
2	2	VPI2 POS	22	VPI2 NEG	Unidirectional
3	23	VPI3 POS	3	VPI3 NEG	Unidirectional
4	4	VPI4 POS	24	VPI4 NEG	Unidirectional
5	25	VPI5 POS	5	VPI5 NEG	Unidirectional
6	6	VPI6 POS	26	VPI6 NEG	Unidirectional
7	27	VPI7 POS	7	VPI7 NEG	Unidirectional
8	8	VPI8 POS	28	VPI8 NEG	Unidirectional

OUTPUTS

Output	+Pin	+Pin Label	-Pin	-Pin Label	Direction	Pkup/Drp Delay
1	29	VRO1 POS	9	VRO1 NEG	Unidirectional	0/0
2	10	VRO2 POS	30	VRO2 NEG	Unidirectional	0/0
3	31	VRO3 POS	11	VRO3 NEG	Unidirectional	0/0
4	12	VRO4 POS	32	VRO4 NEG	Unidirectional	0/0
5	33	VRO5 POS	13	VRO5 NEG	Unidirectional	0/0
6	14	VRO6 POS	34	VRO6 NEG	Unidirectional	0/0
7	35	VRO7 POS	15	VRO7 NEG	Unidirectional	0/0
8	16	VRO8 POS	36	VRO8 NEG	Unidirectional	0/0

MWS_08-06_DT_HD-LINK_MOD_CONFIG_LISTING_P2
06-03-08

Figure 6-164:
HD/LINK Module Configuration File Listing, Part 2

HD MCF VALIDATION

Source MCF: 9V944.MCF
Source MCF Version: 1
New MCF: 10020616.MCF

Differences:

Byte Number	Source	New	Explanation
243	00	01	OK part of HD SIN
246	00	02	OK part of HD SIN
248	01	06	OK part of HD SIN
249	00	01	OK part of HD SIN
250	00	06	OK part of HD SIN
1021	00	01	OK part of the neighbor SIN
1024	00	02	OK part of the neighbor SIN
1025	00	01	OK part of the neighbor SIN
1026	00	04	OK part of the neighbor SIN
1027	00	01	OK part of the neighbor SIN
1028	00	06	OK part of the neighbor SIN
1176	AC	8E	OK part of the check sum
4189	35	27	OK part of the file CRC
4190	60	C9	OK part of the file CRC
4191	07	CA	OK part of the file CRC
4192	87	82	OK part of the file CRC

Validation of the HD MCF 'C:\Safetran\DT\UserHDMCFs\10020616.MCF' passed.

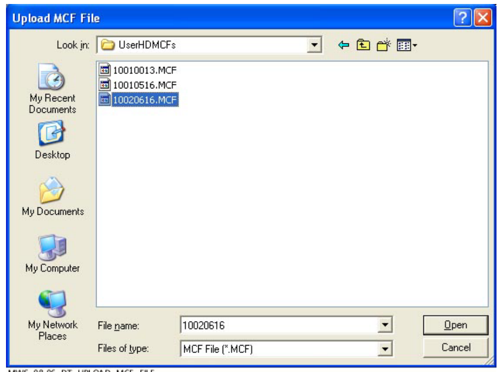
MWS_08-06_DT_HD-LINK_MOD_CONFIG_LISTING_P3
06-03-08

Figure 6-165:
HD/LINK Module Configuration File Listing, Part 3

6.10.3.2 Install MCF.

To install a new MCF:

- Connect the cable from the laptop to the HD/LINK Module.
- On the DT, select COMM > Install Software (see Figure 6-156). The Text Terminal Window opens (see Figure 6-157).
- Select F3-Change MCF. The Upload MCF File Window opens (see Figure 6-166). Use the location provided on the Name: line of the New HD MCF section of the Window(see Figure 6-162) or on the MCF: line of the HD/LINK Module Configuration File Listing (see Figure 6-163)

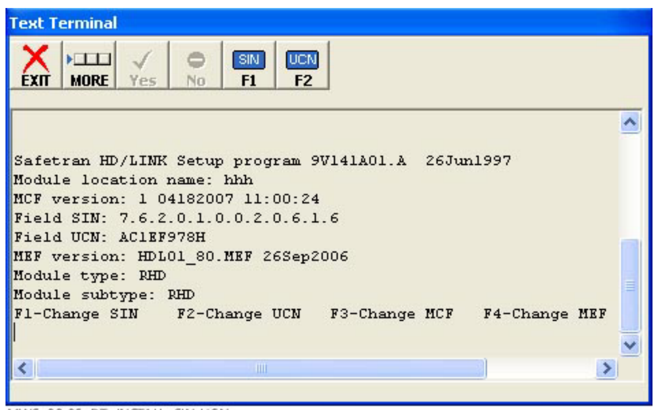


MWS_08-06_DT_UPLOAD_MCF_FILE
06-03-08

Figure 6-166:
The Upload MCF Window

6.10.4 Set SIN.

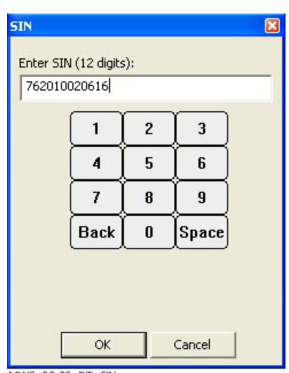
- Once the file has uploaded, select F1 – Change SIN on the Text Terminal Window (see



MWS_08-06_DT_INSTALL_SIN-UCN
06-03-08

Figure 6-167:
The Text Terminal Window – Change SIN – UCN

- Select F1- Change SIN. The Change SIN Window opens (see Figure 6-168). Enter the new SIN and select OK.



MWS_08-06_DT_SIN
06-03-08

Figure 6-168:
The Change SIN Window

6.10.5 Set UCN.

- On the Text Terminal Window (see Figure 6-167), select F2 – Change UCN. The MCFCRC Window opens (see Figure 6-169).

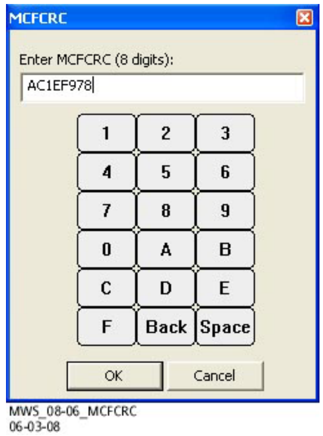


Figure 6-169:
The MCFCRC Window

- Enter the new UCN. After the Text Message Window updates and the Change module setup? Message appears, enter N. Then select the Exit button.

6.10.6 Set time.

The HD/LINK module contains a real time clock. The time and date of the module can be set using the DT or over the LAN. The time and date is used to timestamp Events in the Event Log.

To set the time on the HD/LINK Module:

- Select Program > Time. The Time Window opens (see Figure 6-170). The date and time used is that which is currently set on the PC running the DT.
- There are three options to setting the time:
  - Select the Renew button. This will set the time up to the module real time clock value.
  - Select the Set button. Physically enter the date and the time in the fields in the Date and Time Windows.
  - Select the Get button. This obtains the time from the PC running the DT.

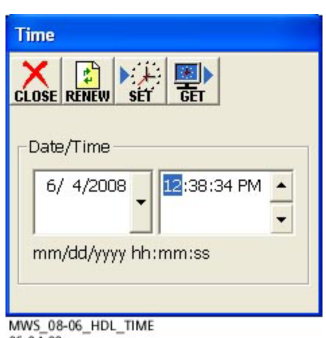


Figure 6-170:
The Time Window

6.10.7 View the state of VPI, VRO, and internal variables.

When you open the HD/LINK DT, the screen provides you the status of the VPIs, VROs, and Internal Variables.

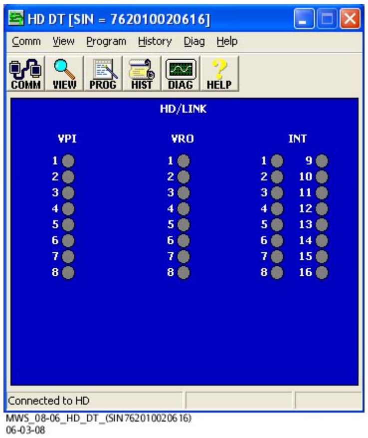


Figure 6-171:
The HD/LINK DT Window

6.10.8 View module status.

To view module status:

- Select View > Module Status. The HD Status Window opens (see Figure 6-172).

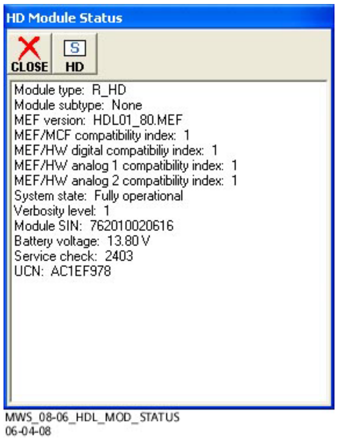


Figure 6-172:
The HD/LINK Module Status Window

6.10.9 View SAT status.

To view the SAT status:

- Select View>SAT Status the SAT Window opens (see Figure 6-173A). Select the VSAT to be observed. Select OK. The HD SAT Status Window opens (see Figure 6-173B)

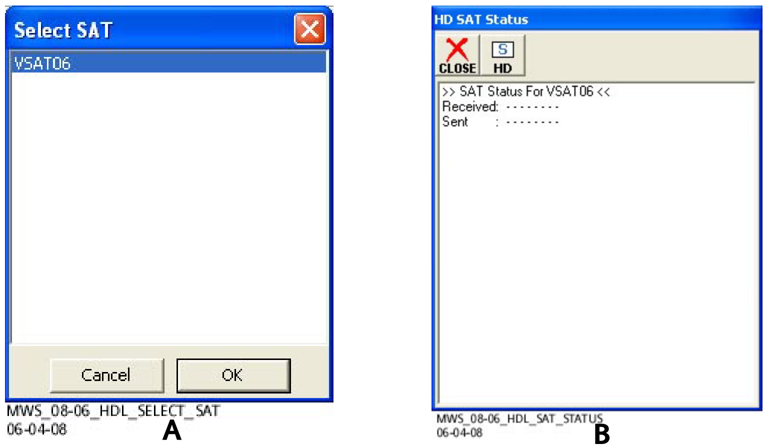


Figure 6-173:
A: The Select SAT Window; B: The HD SAT Status Window

6.10.10 View timing parameter settings.

To view the timing parameter settings:

- Select View>Timing Parameters. The Select SAT (Figure 6-173) Window opens. Select the SAT, select OK. The HD Timing Parameters Window opens (see Figure 6-174).

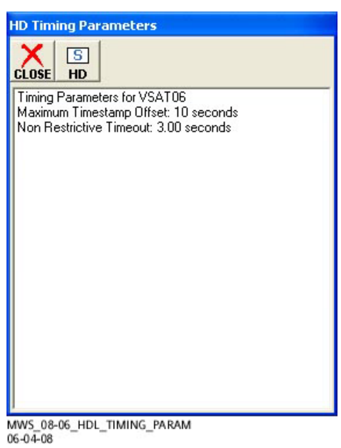


Figure 6-174:
The HD Timing Parameters Window

6.10.11 View and save the status log.

To view the Status Log:

- Select History> Status Log. The Status Log Window opens.

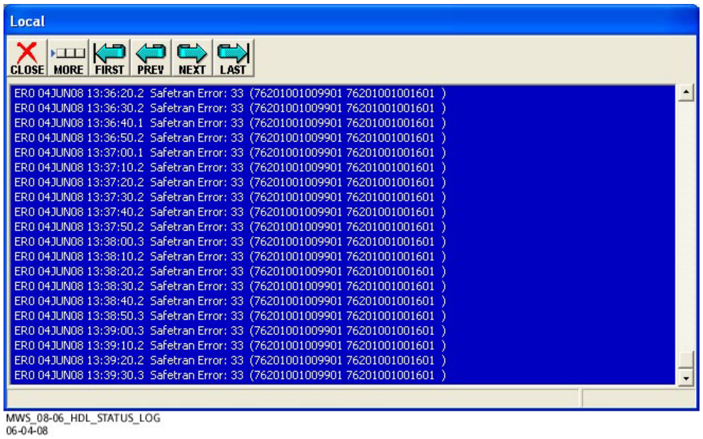


Figure 6-175:
The Status Log Window

6.10.12 View the diagnostic dump.

To view the Diagnostic Dump:

- Select Diag> Diagnostic Dump

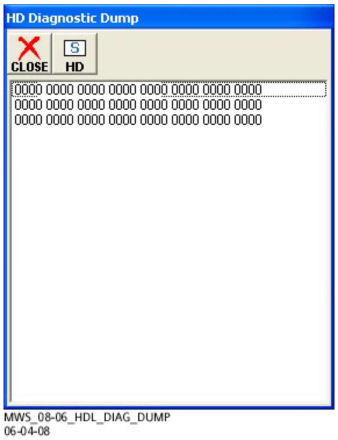


Figure 6-176:
The Diagnostic Dump Window

6.10.13 View statistics.

To view the DT Statistics:

- Select Diag > Statistics

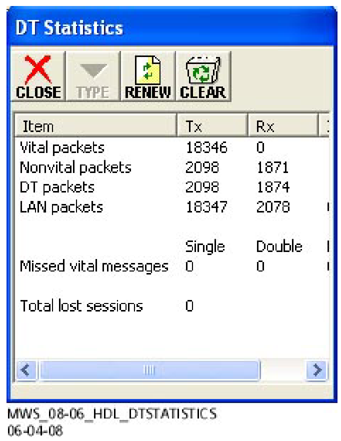


Figure 6-177:
The DT Statistics Window

6.10.14 Set the verbosity.

To view the verbosity level:

- Select View> Status Log. The Status Log Window (Figure 6-175) appears. Select the More button until the Set Verb Button appears at the end of the buttons, then select the Set Verb Button

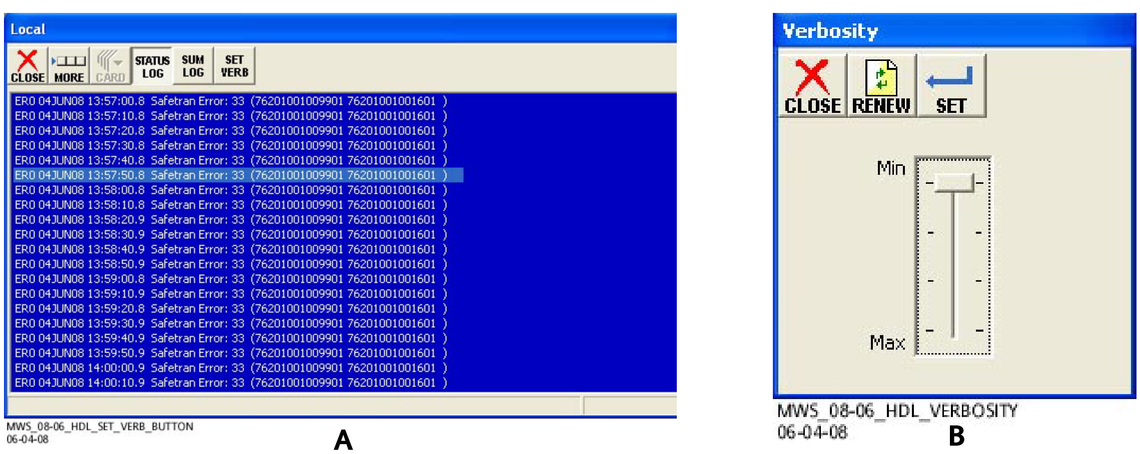


Figure 6-178:
A: The Set Verb Button; B: The Verbosity Window

6.10.15 Reset the HD/LINK module.

To Reset the HD/LINKJ Module:

- Select Comm > Reset Module. Select Yes on the confirmation window. The Text Message Window opens (see

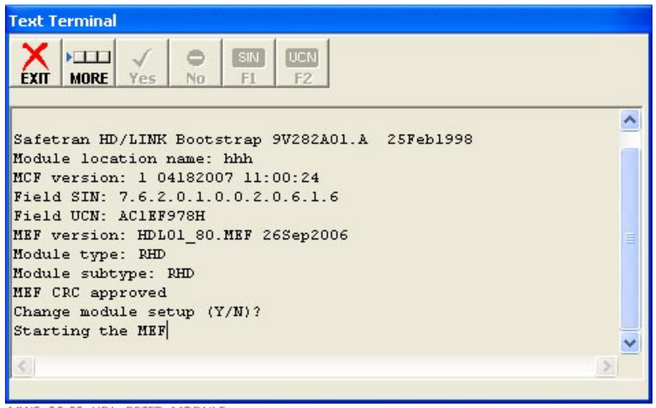


Figure 6-179:
The Reset the HD/Link Module Window

6.10.16 Unconfigure the HD/LINK module.

To Unconfigure the HD/LINK Module:

- Select Program > Unconfigure Module. Select Yes on the Destroy module MCF Window.

The HD/LINK Module then unconfigures the module. A new MCF must then be loaded for operation.

6.11 RADIO DAX AND VITAL COMMUNICATION LINK PROGRAMMING EXAMPLES

6.11.1 Example 1 Radio DAXing to GCP 4000 and Vital Communications Link to GCP 3000

Presented below is the fictional Palmer Quiet Zone project. LS-26, a two track section, is shown with the primary emphasis in this example is the interaction between the crossing at 1st Street (M.P. 9.21) and the RDAX links to the crossings at 4th Street (M.P. 9.42) and 4th Avenue (M.P. 8.91). Also provided is VLINK2 to the GCP 3000 and HD/LINK on Broadmoor Street (M.P. 9.57).

6.11.1.1 Spread Spectrum Radio/Relay Equivalence Drawing for LS 26

Presented below is a portion of the spread spectrum radio/relay equivalence drawing for a portion of LS-26. The downstream connections of the 4th Avenue crossing are not depicted; however the Program Report for 4th Avenue is complete. The SIN as well as the Group (GGG) and Subnode (SS) offsets are provided, to provide examples of how DTs using software version 4.7.5 and newer and software version 4.6.0 and older, respectively, are programmed in this circumstance.

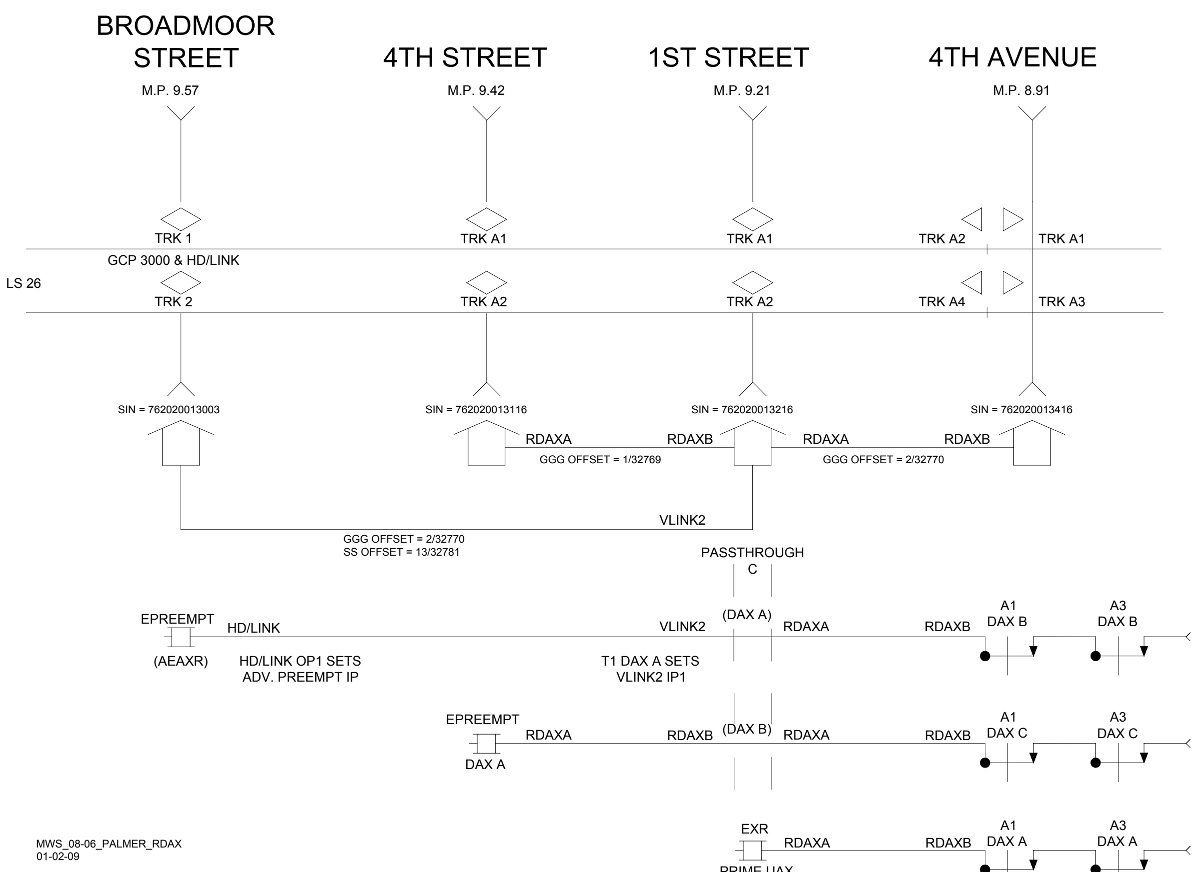


Figure 6-180:
Example 1: Radio DAX (RDAX) and Model 3000 GCP HD/Link (VLINK)

6.11.1.2 Configuration Package (PAC) files for LS-26

Table 6-2:
4th Avenue Crossing, M.P. 8.91, Page 1

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 080792K
Milepost Number: MP 8.91
Site Name: 4th Ave

SIN: 762020013416

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 1D:3 Uni pairs

Check Numbers
-------------
Office Check No. (DT 4.6.0): 739CAF15
Office Check Number: 739CAF15
Config. Check Number: 66C8C139
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Track
Track 4 Slot = Track
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = SSCC3i
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes
Track 3 : MS/GCP Operation = Yes
Track 4 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal
Track 2 : Island Used = No
Track 3 : Island Used = Internal
Track 4 : Island Used = No

BASIC:  preemption
Preempt Logic = Advnce
Adv Preempt Delay = 41 sec
Preempt Hlth IP Used = Yes
Adv Preempt IP Used = Yes
Traffic Sys Hlth IP Used = No
Gate Down Logic Used = No
Second Trn Logic Used = Yes
```

```
BASIC:  radio Dax links
Radio DAX link A Used = Yes
Radio DAX link B Used = Yes
Link A UAX Connection = Next Prd
Link B UAX Connection = Next Prd
Remote Inputs Used = No
Remote Outputs Used = No

BASIC:  track 1 link A
T1 Daxed to by Link A = No

BASIC:  track 1 link B
T1 Daxed to by Link B = No

BASIC:  track 2 link A
T2 Daxed to by Link A = No

BASIC:  track 2 link B
T2 Daxed to by Link B = No

BASIC:  track 3 link A
T3 Daxed to by Link A = No

BASIC:  track 3 link B
T3 Daxed to by Link B = No

BASIC:  track 4 link A
T4 Daxed to by Link A = No

BASIC:  track 4 link B
T4 Daxed to by Link B = No

BASIC:  RDax link A
Radio DAX A : RRR Offset = 0
Radio DAX A : LLL Offset = 0
Radio DAX A : GGG Offset = 2
Radio DAX A : SS Offset = 0
Radio DAX A : Msg Timeout = 3600 msec
Radio DAX A : Msg Update Interval = 800 msec
Radio DAX A : Max Time Offset = 10 sec

BASIC:  RDax link B
Radio DAX B : RRR Offset = 0
Radio DAX B : LLL Offset = 0
Radio DAX B : GGG Offset = 32770
Radio DAX B : SS Offset = 0
Radio DAX B : Msg Timeout = 3600 msec
Radio DAX B : Msg Update Interval = 800 msec
Radio DAX B : Max Time Offset = 10 sec

BASIC:  Vital Comms links
Vital Comms link 1 Used = Yes
Vital Comms link 2 Used = Yes

BASIC:  Vital Comms link 1
HDLink 1 : RRR Offset = 0
HDLink 1 : LLL Offset = 0
HDLink 1 : GGG Offset = 1
HDLink 1 : SS Offset = 0
HDLink 1 : Msg Timeout = 3600 msec
HDLink 1 : Msg Update Interval = 800 msec
HDLink 1 : Max Time Offset = 10 sec
```

Table 6-3:
4th Avenue Crossing, M.P. 8.91, Page 2

```
BASIC:  Vital Comms link 2
HDLink 2 : RRR Offset = 0
HDLink 2 : LLL Offset = 0
HDLink 2 : GGG Offset = 4
HDLink 2 : SS Offset = 0
HDLink 2 : Msg Timeout = 3600 msec
HDLink 2 : Msg Update Interval = 800 msec
HDLink 2 : Max Time Offset = 10 sec

PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = Yes
Track 1 : Dax B Used = Yes
Track 1 : Dax C Used = Yes
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No
Track 1 : Prmpt Used = Yes

PREDICTORS:  track 2
Track 2 : Prime Used = Yes
Track 2 : Dax A Used = Yes
Track 2 : Dax B Used = Yes
Track 2 : Dax C Used = Yes
Track 2 : Dax D Used = Yes
Track 2 : Dax E Used = Yes
Track 2 : Dax F Used = Yes
Track 2 : Dax G Used = No
Track 2 : Prmpt Used = Yes

PREDICTORS:  track 3
Track 3 : Prime Used = Yes
Track 3 : Dax A Used = Yes
Track 3 : Dax B Used = Yes
Track 3 : Dax C Used = Yes
Track 3 : Dax D Used = No
Track 3 : Dax E Used = No
Track 3 : Dax F Used = No
Track 3 : Dax G Used = No
Track 3 : Prmpt Used = Yes

PREDICTORS:  track 4
Track 4 : Prime Used = Yes
Track 4 : Dax A Used = Yes
Track 4 : Dax B Used = Yes
Track 4 : Dax C Used = Yes
Track 4 : Dax D Used = Yes
Track 4 : Dax E Used = Yes
Track 4 : Dax F Used = Yes
Track 4 : Dax G Used = No
Track 4 : Prmpt Used = Yes

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 4206 ft
Track 1: Uni/Bi/Sim-Bidirnl = Sim. Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 163 ft
Track 1 : Computed Distance = 4445 ft
Track 1 : Linearization Steps = 99
```

```
GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = Max
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 prime
Track 1 : Prime Warning Time = 38 sec
Track 1 : Prime Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prime MS/GCP Mode = Pred
Track 1 : Prime Pickup Delay = 15 sec
Track 1 : Prime UAX = Not Used

GCP:  track 1 Dax A
Track 1 : Dax A Warning Time = 44 sec
Track 1 : Dax A Offset Distance = 1468 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax A MS/GCP Mode = Pred
Track 1 : Dax A Pickup Delay = 15 sec
Track 1 : Dax A Enable = Not Used

GCP:  track 1 Dax B
Track 1 : Dax B Warning Time = 66 sec
Track 1 : Dax B Offset Distance = 3449 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax B MS/GCP Mode = Pred
Track 1 : Dax B Pickup Delay = 15 sec
Track 1 : Dax B Enable = Not Used

GCP:  track 1 Dax C
Track 1 : Dax C Warning Time = 68 sec
Track 1 : Dax C Offset Distance = 2719 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax C MS/GCP Mode = Pred
Track 1 : Dax C Pickup Delay = 15 sec
Track 1 : Dax C Enable = Not Used

GCP:  track 1 preempt
Track 1 : Prmpt Warning Time = 84 sec
Track 1 : Prmpt Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prmpt MS/GCP Mode = Pred
Track 1 : Prmpt Pickup Delay = 15 sec
Track 1 : Prmpt Enable = Not Used

GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No
```

Table 6-4:
4th Avenue Crossing, M.P. 8.91, Page 3

GCP: track 1 MS Control Track 1 : MS/GCP Ctrl IP Used = No Track 1 : MS Sensitivity Level = 0 Track 1 : Compensation Level = 1300 Track 1 : Warn Time-Ballast Comp = High Track 1 : Low EX Adjustment = 39 Track 1 : Bidirn Dax Passthru = No Track 1 : False Act on Train Stop = No Track 1 : EX Limiting Used = Yes Track 1 : EZ Correction Used = No GCP: track 2 Track 2 : GCP Freq Category = Standard Track 2 : GCP Frequency = 86 Hz Track 2 : Approach Distance = 4928 ft Track 2 : Uni/Bi/Sim-Bidirnl = Sim. Bidirnl Track 2 : GCP Transmit Level = Medium Track 2 : Island Connection = Isl 1 Track 2 : Island Distance = 0 ft Track 2 : Computed Distance = 5431 ft Track 2 : Linearization Steps = 95 GCP: track 2 enhanced det Track 2 : Inbound PS Sensitivity = Max Track 2 : Speed Limiting Used = Yes Track 2 : Outbound False Act Lvl = Normal Track 2 : Outbound PS Timer = 20 sec Track 2 : Trailing Switch Logic = On Track 2 : Post Joint Detn Time = 15 sec Track 2 : Adv Appr Predn = No Track 2 : Cancel Pickup Delay = This Isl GCP: track 2 prime Track 2 : Prime Warning Time = 38 sec Track 2 : Prime Offset Distance = 0 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Prime MS/GCP Mode = Pred Track 2 : Prime Pickup Delay = 15 sec Track 2 : Prime UAX = Not Used GCP: track 2 Dax A Track 2 : Dax A Warning Time = 38 sec Track 2 : Dax A Offset Distance = 1502 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax A MS/GCP Mode = Pred Track 2 : Dax A Pickup Delay = 15 sec Track 2 : Dax A Enable = Not Used GCP: track 2 Dax B Track 2 : Dax B Warning Time = 81 sec Track 2 : Dax B Offset Distance = 1502 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax B MS/GCP Mode = Pred Track 2 : Dax B Pickup Delay = 15 sec Track 2 : Dax B Enable = Not Used	GCP: track 2 Dax C Track 2 : Dax C Warning Time = 75 sec Track 2 : Dax C Offset Distance = 4116 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax C MS/GCP Mode = Pred Track 2 : Dax C Pickup Delay = 15 sec Track 2 : Dax C Enable = Not Used GCP: track 2 Dax D Track 2 : Dax D Warning Time = 98 sec Track 2 : Dax D Offset Distance = 2799 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax D MS/GCP Mode = Pred Track 2 : Dax D Pickup Delay = 15 sec Track 2 : Dax D Enable = Not Used GCP: track 2 Dax E Track 2 : Dax E Warning Time = 38 sec Track 2 : Dax E Offset Distance = 374 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax E MS/GCP Mode = Pred Track 2 : Dax E Pickup Delay = 15 sec Track 2 : Dax E Enable = Not Used GCP: track 2 Dax F Track 2 : Dax F Warning Time = 79 sec Track 2 : Dax F Offset Distance = 374 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax F MS/GCP Mode = Pred Track 2 : Dax F Pickup Delay = 15 sec Track 2 : Dax F Enable = Not Used GCP: track 2 preempt Track 2 : Prmpt Warning Time = 84 sec Track 2 : Prmpt Offset Distance = 0 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Prmpt MS/GCP Mode = Pred Track 2 : Prmpt Pickup Delay = 15 sec Track 2 : Prmpt Enable = Not Used GCP: track 2 pos start Track 2 : Positive Start = Off Track 2 : Sudden Shnt Det Used = No Track 2 : Low EZ Detection Used = No GCP: track 2 MS Control Track 2 : MS/GCP Ctrl IP Used = No Track 2 : MS Sensitivity Level = 0 Track 2 : Compensation Level = 1300 Track 2 : Warn Time-Ballast Comp = High Track 2 : Low EX Adjustment = 39 Track 2 : Bidirn Dax Passthru = No Track 2 : False Act on Train Stop = No Track 2 : EX Limiting Used = Yes Track 2 : EZ Correction Used = No

Table 6-5:
4th Avenue Crossing, M.P. 8.91, Page 4

```
GCP:  track 3
Track 3 : GCP Freq Category = Standard
Track 3 : GCP Frequency = 156 Hz
Track 3 : Approach Distance = 4308 ft
Track 3 : Uni/Bi/Sim-Bidirnl = Sim. Bidirnl
Track 3 : GCP Transmit Level = Medium
Track 3 : Island Connection = Isl 3
Track 3 : Island Distance = 178 ft
Track 3 : Computed Distance = 4488 ft
Track 3 : Linearization Steps = 99

GCP:  track 3 enhanced det
Track 3 : Inbound PS Sensitivity = Max
Track 3 : Speed Limiting Used = Yes
Track 3 : Outbound False Act Lvl = Normal
Track 3 : Outbound PS Timer = 20 sec
Track 3 : Trailing Switch Logic = On
Track 3 : Post Joint Detn Time = 15 sec
Track 3 : Adv Appr Predn = No
Track 3 : Cancel Pickup Delay = This Isl

GCP:  track 3 prime
Track 3 : Prime Warning Time = 38 sec
Track 3 : Prime Offset Distance = 0 ft
Track 3 : Switch MS EZ Level = 10
Track 3 : Prime MS/GCP Mode = Pred
Track 3 : Prime Pickup Delay = 15 sec
Track 3 : Prime UAX = Not Used

GCP:  track 3 Dax A
Track 3 : Dax A Warning Time = 44 sec
Track 3 : Dax A Offset Distance = 1621 ft
Track 3 : Switch MS EZ Level = 0
Track 3 : Pickup Delay Mode = Auto
Track 3 : Dax A MS/GCP Mode = Pred
Track 3 : Dax A Pickup Delay = 15 sec
Track 3 : Dax A Enable = Not Used

GCP:  track 3 Dax B
Track 3 : Dax B Warning Time = 66 sec
Track 3 : Dax B Offset Distance = 3449 ft
Track 3 : Switch MS EZ Level = 0
Track 3 : Pickup Delay Mode = Auto
Track 3 : Dax B MS/GCP Mode = Pred
Track 3 : Dax B Pickup Delay = 15 sec
Track 3 : Dax B Enable = Not Used

GCP:  track 3 Dax C
Track 3 : Dax C Warning Time = 68 sec
Track 3 : Dax C Offset Distance = 2719 ft
Track 3 : Switch MS EZ Level = 0
Track 3 : Pickup Delay Mode = Auto
Track 3 : Dax C MS/GCP Mode = Pred
Track 3 : Dax C Pickup Delay = 15 sec
Track 3 : Dax C Enable = Not Used

GCP:  track 3 preempt
Track 3 : Prmpt Warning Time = 84 sec
Track 3 : Prmpt Offset Distance = 0 ft
Track 3 : Switch MS EZ Level = 10
Track 3 : Prmpt MS/GCP Mode = Pred
Track 3 : Prmpt Pickup Delay = 15 sec
Track 3 : Prmpt Enable = Not Used
```

```
GCP:  track 3 pos start
Track 3 : Positive Start = Off
Track 3 : Sudden Shnt Det Used = No
Track 3 : Low EZ Detection Used = No

GCP:  track 3 MS Control
Track 3 : MS/GCP Ctrl IP Used = No
Track 3 : MS Sensitivity Level = 0
Track 3 : Compensation Level = 1300
Track 3 : Warn Time-Ballast Comp = High
Track 3 : Low EX Adjustment = 39
Track 3 : Bidirn Dax Passthru = No
Track 3 : False Act on Train Stop = No
Track 3 : EX Limiting Used = Yes
Track 3 : EZ Correction Used = No

GCP:  track 4
Track 4 : GCP Freq Category = Standard
Track 4 : GCP Frequency = 86 Hz
Track 4 : Approach Distance = 4928 ft
Track 4 : Uni/Bi/Sim-Bidirnl = Sim. Bidirnl
Track 4 : GCP Transmit Level = Medium
Track 4 : Island Connection = Isl 3
Track 4 : Island Distance = 0 ft
Track 4 : Computed Distance = 5484 ft
Track 4 : Linearization Steps = 100

GCP:  track 4 enhanced det
Track 4 : Inbound PS Sensitivity = Max
Track 4 : Speed Limiting Used = Yes
Track 4 : Outbound False Act Lvl = Normal
Track 4 : Outbound PS Timer = 20 sec
Track 4 : Trailing Switch Logic = On
Track 4 : Post Joint Detn Time = 15 sec
Track 4 : Adv Appr Predn = No
Track 4 : Cancel Pickup Delay = This Isl

GCP:  track 4 prime
Track 4 : Prime Warning Time = 38 sec
Track 4 : Prime Offset Distance = 0 ft
Track 4 : Switch MS EZ Level = 10
Track 4 : Prime MS/GCP Mode = Pred
Track 4 : Prime Pickup Delay = 15 sec
Track 4 : Prime UAX = Not Used

GCP:  track 4 Dax A
Track 4 : Dax A Warning Time = 38 sec
Track 4 : Dax A Offset Distance = 1502 ft
Track 4 : Switch MS EZ Level = 0
Track 4 : Pickup Delay Mode = Auto
Track 4 : Dax A MS/GCP Mode = Pred
Track 4 : Dax A Pickup Delay = 15 sec
Track 4 : Dax A Enable = Not Used

GCP:  track 4 Dax B
Track 4 : Dax B Warning Time = 81 sec
Track 4 : Dax B Offset Distance = 1502 ft
Track 4 : Switch MS EZ Level = 0
Track 4 : Pickup Delay Mode = Auto
Track 4 : Dax B MS/GCP Mode = Pred
Track 4 : Dax B Pickup Delay = 15 sec
Track 4 : Dax B Enable = Not Used
```

Table 6-6:
4th Avenue Crossing, M.P. 8.91, Page 5

```
GCP:  track 4 Dax C
Track 4 : Dax C Warning Time = 75 sec
Track 4 : Dax C Offset Distance = 4116 ft
Track 4 : Switch MS EZ Level = 0
Track 4 : Pickup Delay Mode = Auto
Track 4 : Dax C MS/GCP Mode = Pred
Track 4 : Dax C Pickup Delay = 15 sec
Track 4 : Dax C Enable = Not Used

GCP:  track 4 Dax D
Track 4 : Dax D Warning Time = 98 sec
Track 4 : Dax D Offset Distance = 2799 ft
Track 4 : Switch MS EZ Level = 0
Track 4 : Pickup Delay Mode = Auto
Track 4 : Dax D MS/GCP Mode = Pred
Track 4 : Dax D Pickup Delay = 15 sec
Track 4 : Dax D Enable = Not Used

GCP:  track 4 Dax E
Track 4 : Dax E Warning Time = 38 sec
Track 4 : Dax E Offset Distance = 374 ft
Track 4 : Switch MS EZ Level = 0
Track 4 : Pickup Delay Mode = Auto
Track 4 : Dax E MS/GCP Mode = Pred
Track 4 : Dax E Pickup Delay = 15 sec
Track 4 : Dax E Enable = Not Used

GCP:  track 4 Dax F
Track 4 : Dax F Warning Time = 79 sec
Track 4 : Dax F Offset Distance = 374 ft
Track 4 : Switch MS EZ Level = 0
Track 4 : Pickup Delay Mode = Auto
Track 4 : Dax F MS/GCP Mode = Pred
Track 4 : Dax F Pickup Delay = 15 sec
Track 4 : Dax F Enable = Not Used

GCP:  track 4 preempt
Track 4 : Prmpt Warning Time = 84 sec
Track 4 : Prmpt Offset Distance = 0 ft
Track 4 : Switch MS EZ Level = 10
Track 4 : Prmpt MS/GCP Mode = Pred
Track 4 : Prmpt Pickup Delay = 15 sec
Track 4 : Prmpt Enable = Not Used

GCP:  track 4 pos start
Track 4 : Positive Start = Off
Track 4 : Sudden Shnt Det Used = No
Track 4 : Low EZ Detection Used = No

GCP:  track 4 MS Control
Track 4 : MS/GCP Ctrl IP Used = No
Track 4 : MS Sensitivity Level = 0
Track 4 : Compensation Level = 1300
Track 4 : Warn Time-Ballast Comp = High
Track 4 : Low EX Adjustment = 39
Track 4 : Bidirn Dax Passthru = No
Track 4 : False Act on Train Stop = No
Track 4 : EX Limiting Used = Yes
Track 4 : EZ Correction Used = No

ISLAND:  track 1
Track 1 : Isl Frequency = 7.1 kHz
Track 1 : Pickup Delay (2s +) = 0 sec
Track 1 : Isl Enable IP Used = No
```

```
ISLAND:  track 3
Track 3 : Isl Frequency = 8.3 kHz
Track 3 : Pickup Delay (2s +) = 0 sec
Track 3 : Isl Enable IP Used = No

AND:  track Anding
AND 1 XR Used = Yes
AND 2 Used = Yes
AND 3 Used = Yes
AND 4 Used = Yes
AND 5 Used = Yes
AND 6 Used = Yes
AND 7 Used = Yes
AND 8 Used = No

AND:  AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 XR Track 2 = Prime
AND 1 XR Track 3 = Prime
AND 1 XR Track 4 = Prime
AND 1 Enable Used = Yes
And 1 Enable Pickup = 5 sec
AND 1 Enable Drop = 0 sec
AND 1 Wrap Used = No

AND:  AND 2
AND 2 Track 1 = Not Used
AND 2 Track 2 = Dax E
AND 2 Track 3 = Not Used
AND 2 Track 4 = Dax E
AND 2 Enable Used = No
AND 2 Wrap Used = No

AND:  AND 3
AND 3 Track 1 = Not Used
AND 3 Track 2 = Dax F
AND 3 Track 3 = Not Used
AND 3 Track 4 = Dax F
AND 3 Enable Used = Yes
AND 3 Enable Pickup = 0 sec
AND 3 Enable Drop = 0 sec
AND 3 Wrap Used = No

AND:  AND 4
AND 4 Track 1 = Not Used
AND 4 Track 2 = Dax C
AND 4 Track 3 = Not Used
AND 4 Track 4 = Dax C
AND 4 Enable Used = No
AND 4 Wrap Used = No

AND:  AND 5
AND 5 Track 1 = Not Used
AND 5 Track 2 = Dax D
AND 5 Track 3 = Not Used
AND 5 Track 4 = Dax D
AND 5 Enable Used = No
AND 5 Wrap Used = No
```

Table 6-7:
4th Avenue Crossing, M.P. 8.91, Page 6

AND: AND 6 AND 6 Track 1 = Not Used AND 6 Track 2 = Not Used AND 6 Track 3 = Not Used AND 6 Track 4 = Not Used AND 6 Enable Used = Yes AND 6 Enable Pickup = 2 sec AND 6 Enable Drop = 0 sec AND 6 Wrap Used = No AND: AND 7 AND 7 Track 1 = Isl Only AND 7 Track 2 = Not Used AND 7 Track 3 = Isl Only AND 7 Track 4 = Not Used AND 7 Enable Used = No AND 7 Wrap Used = No ADVANCED: MS restart MS/GCP Restart Used = No ADVANCED: out of service OOS Control = Display+OOS IPs OOS Timeout = Yes OOS Timeout = 1 hrs ADVANCED: out of service 2 T1 OOS Control = OOS Input 1 T2 OOS Control = OOS Input 1 T3 OOS Control = OOS Input 1 T4 OOS Control = OOS Input 1 ADVANCED: track wrap circuits Wrap LOS Timer = 5 sec Track 1 Wrap Used = No Track 2 Wrap Used = No Track 3 Wrap Used = No Track 4 Wrap Used = No ADVANCED: trk 1 overrides Track 1 : All Predictors Override Used = No Track 1 : Dax A Override Used = No Track 1 : Dax B Override Used = No Track 1 : Dax C Override Used = No ADVANCED: trk 2 overrides Track 2 : All Predictors Override Used = No Track 2 : Dax A Override Used = No Track 2 : Dax B Override Used = No Track 2 : Dax C Override Used = No ADVANCED: trk 3 overrides Track 3 : All Predictors Override Used = No Track 3 : Dax A Override Used = No Track 3 : Dax B Override Used = No Track 2 : Dax C Override Used = No ADVANCED: trk 4 overrides Track 4 : All Predictors Override Used = No Track 4 : Dax A Override Used = No Track 4 : Dax B Override Used = No Track 4 : Dax C Override Used = No	ADVANCED: OR logic OR 1 Used = Yes OR 2 Used = No OR 3 Used = No OR 4 Used = No ADVANCED: OR 1 OR 1 Term 1 = AND 6 OR 1 Term 2 = NOT AND 7 OR 1 Term 3 = Not Used OR 1 Term 4 = Not Used ADVANCED: internal I/O 1 Pass Thrus = No Int.1 Sets = AND 3 Enable Int.1 Set by = Vital Link 2 OP 3 Int.2 Sets = Vital Link 1 IP 2 Int.2 Set by = AND 2 Int.3 Sets = Vital Link 1 IP 3 Int.3 Set by = AND 3 Int.4 Sets = Vital Link 2 IP 4 Int.4 Set by = AND 4 ADVANCED: internal I/O 2 Int.5 Sets = Vital Link 2 IP 5 Int.5 Set by = AND 5 Int.6 Sets = Adv Preempt IP Int.6 Set by = Vital Link 2 OP 2 Int.7 Sets = AND 6 Enable Int.7 Set by = Rmt SSCCIV OP 1 Int.8 Sets = Not Used Int.8 Set by = Not Used ADVANCED: internal I/O 3 Int.9 Sets = Not Used Int.9 Set by = Not Used Int.10 Sets = Not Used Int.10 Set by = Not Used Int.11 Sets = Not Used Int.11 Set by = Not Used Int.12 Sets = Not Used Int.12 Set by = Not Used ADVANCED: internal I/O 4 Int.13 Sets = Not Used Int.13 Set by = Not Used Int.14 Sets = Not Used Int.14 Set by = Not Used Int.15 Sets = Not Used Int.15 Set by = Not Used Int.16 Sets = Not Used Int.16 Set by = Not Used ADVANCED: site options Daylight Savings = Off Units = Standard Maint Call Rpt IP Used = No Emergency Activate IP = No EZ/EX Logging = Change EZ/EX Point Change = 3

Table 6-8:
4th Avenue Crossing, M.P. 8.91, Page 7

```
SSCC
Gates Used = Yes
Min Activation = 0 sec
Rmt Activation Cancel = 2 min
SSCCIV Controller Used = Yes
4000 Control Type = Exit

SSCCIV:  Control and ATCS Setup
SSCCIV Activation = AND 1 XR
Exit Gate : RRR Offset = 0
Exit Gate : LLL Offset = 0
Exit Gate : GGG Offset = 0
Exit Gate : SS Offset = 32769
Exit Gate : Msg Timeout = 3600 msec
Exit Gate : Msg Update Interval = 800 msec
Exit Gate : Max Time Offset = 10 sec

SSCC:  1
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 1
SSCC 1 : Flash Rate = 55
SSCC 1 : Low Battery Detection = No
SSCC 1 : Flash Sync = master
SSCC 1 : Lamp Neutral Test = Off
Aux-1 Xng Ctrl Used = No

SSCC:  2
SSCC-2 Number of GPs = 1
SSCC-2 Number of GDs = 1
SSCC 2 : Flash Rate = 55
SSCC 2 : Low Battery Detection = No
SSCC 2 : Flash Sync = slave
SSCC 2 : Lamp Neutral Test = Off
Aux-2 Xng Ctrl Used = No

OUTPUT:  assignment page 1
OUT 1.1 = OR 1
OUT 1.2 = AND 7
OUT 2.1 = Adv Preempt
OUT 2.2 = Not Used
OUT 3.1 = Not Used
OUT 3.2 = Not Used
OUT 4.1 = Not Used
OUT 4.2 = Not Used

INPUT:  assignment page 1
IN 1.1 = Preempt Health
IN 1.2 = Adv Preempt IP
IN 2.1 = Not Used
IN 2.2 = Not Used
IN 3.1 = Out Of Service IP 1
IN 3.2 = AND 1 XR Enable
IN 4.1 = AND 6 Enable
IN 4.2 = Not Used
```

```
IO:  assignment SSCC
OUT GC 1 = Gate Output 1
OUT GC 2 = Gate Output 2
IN 7.1 = Not Used
IN 7.2 = Vehicle Detect Hlth
IN 7.3 = 3 Vehicle Detect
IN 7.4 = GD 1.1
IN 7.5 = GP 1.1
IN 8.1 = Not Used
IN 8.2 = Not Used
IN 8.3 = 4 Vehicle Detect
IN 8.4 = GD 2.1
IN 8.5 = GP 2.1

SEAR
SEAR Subnode = 99
DI 1 = TSS 1
DI 2 = TSS 2
Rly 1 = Not Used
Rly 2 = Not Used

SEAR:  inputs
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

SEAR:  slot 1-4 inputs
IN 2.1 = General 1
IN 2.2 = General 2
IN 4.2 = Not Used

SEAR:  inputs slot 5
IN 5.1 = Not Used
IN 5.2 = Not Used

SEAR:  inputs slot 6
IN 6.1 = Not Used
IN 6.2 = Not Used

SEAR:  slot 7-8 inputs
IN 7.1 = TSS 5
IN 8.1 = TSS 6
IN 8.2 = Not Used

SITE:  programming
Radio Subnode = 1
Field Password = On
Low Battery Enabled = Off

Configuration Package File
--------------------------
Filename: CONFIG-080792G-2009Jan13.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 1/13/2009 10:06:48
DT Version: 4.8.5
```

Table 6-9:
1st Street Crossing, M.P. 9.21, Page 1

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 080901J
Milepost Number: 9.21
Site Name: 1st Street

SIN: 762020013216

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 1A:6 Trk Bi

Check Numbers
-------------
Office Check No. (DT 4.6.0): 60714AC5
Office Check Number: 60714AC5
Config. Check Number: 4C5F64C0
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = SSCC3i
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal
Track 2 : Island Used = Internal

BASIC:  preemption
Preempt Logic = No

BASIC:  radio Dax links
Radio DAX link A Used = Yes
Radio DAX link B Used = Yes
Link A UAX Connection = Next Prd
Link B UAX Connection = Next Prd
Remote Inputs Used = No
Remote Outputs Used = No
```

```
BASIC:  track 1 link A
T1 Daxed to by Link A = Yes
T1 Daxed to by Remote T1 = Yes
T1 Daxed to by Remote T2 = No
T1 Daxed to by Remote T3 = No
T1 Daxed to by Remote T4 = No
T1 Daxed to by Remote T5 = No
T1 Daxed to by Remote T6 = No

BASIC:  track 1 link B
T1 Daxed to by Link B = No

BASIC:  track 2 link A
T2 Daxed to by Link A = Yes
T2 Daxed to by Remote T1 = No
T2 Daxed to by Remote T2 = No
T2 Daxed to by Remote T3 = Yes
T2 Daxed to by Remote T4 = No
T2 Daxed to by Remote T5 = No
T2 Daxed to by Remote T6 = No

BASIC:  track 2 link B
T2 Daxed to by Link B = No

BASIC:  RDax link A
Radio DAX A : RRR Offset = 0
Radio DAX A : LLL Offset = 0
Radio DAX A : GGG Offset = 2
Radio DAX A : SS Offset = 0
Radio DAX A : Msg Timeout = 3600 msec
Radio DAX A : Msg Update Interval = 800 msec
Radio DAX A : Max Time Offset = 10 sec

BASIC:  RDax link B
Radio DAX B : RRR Offset = 0
Radio DAX B : LLL Offset = 0
Radio DAX B : GGG Offset = 32769
Radio DAX B : SS Offset = 0
Radio DAX B : Msg Timeout = 3600 msec
Radio DAX B : Msg Update Interval = 800 msec
Radio DAX B : Max Time Offset = 10 sec

BASIC:  Vital Comms links
Vital Comms link 1 Used = No
Vital Comms link 2 Used = Yes

BASIC:  Vital Comms link 2
HDLink 2 : RRR Offset = 0
HDLink 2 : LLL Offset = 0
HDLink 2 : GGG Offset = 32770
HDLink 2 : SS Offset = 32781
HDLink 2 : Msg Timeout = 3600 msec
HDLink 2 : Msg Update Interval = 800 msec
HDLink 2 : Max Time Offset = 10 sec
```

Table 6-10:
1st Street Crossing, M.P. 9.21, Page 2

```
PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = Yes
Track 1 : Dax B Used = Yes
Track 1 : Dax C Used = No
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No

PREDICTORS:  track 2
Track 2 : Prime Used = Yes
Track 2 : Dax A Used = Yes
Track 2 : Dax B Used = Yes
Track 2 : Dax C Used = No
Track 2 : Dax D Used = No
Track 2 : Dax E Used = No
Track 2 : Dax F Used = No
Track 2 : Dax G Used = No

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 430 Hz
Track 1 : Approach Distance = 2785 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 140 ft
Track 1 : Computed Distance = 2765 ft
Track 1 : Linearization Steps = 100

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 prime
Track 1 : Prime Warning Time = 44 sec
Track 1 : Prime Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prime MS/GCP Mode = Pred
Track 1 : Prime Pickup Delay = 15 sec
Track 1 : Prime UAX = RDAX
Track 1 : Prime UAX Pickup = 5 sec

GCP:  track 1 Dax A
Track 1 : Dax A Warning Time = 66 sec
Track 1 : Dax A Offset Distance = 1828 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax A MS/GCP Mode = Pred
Track 1 : Dax A Pickup Delay = 15 sec
Track 1 : Dax A Enable = RDAX
Track 1 : Dax A Enable Pickup = 2 sec
```

```
GCP:  track 1 Dax B
Track 1 : Dax B Warning Time = 68 sec
Track 1 : Dax B Offset Distance = 1098 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax B MS/GCP Mode = Pred
Track 1 : Dax B Pickup Delay = 15 sec
Track 1 : Dax B Enable = RDAX
Track 1 : Dax B Enable Pickup = 2 sec

GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No

GCP:  track 1 MS Control
Track 1 : MS/GCP Ctrl IP Used = No
Track 1 : MS Sensitivity Level = 0
Track 1 : Compensation Level = 1300
Track 1 : Warn Time-Ballast Comp = High
Track 1 : Low EX Adjustment = 39
Track 1 : Bidirn Dax Passthru = Yes
Track 1 : False Act on Train Stop = No
Track 1 : EX Limiting Used = Yes
Track 1 : EZ Correction Used = Yes

GCP:  track 2
Track 2 : GCP Freq Category = Standard
Track 2 : GCP Frequency = 430 Hz
Track 2 : Approach Distance = 2875 ft
Track 2 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 2 : GCP Transmit Level = Medium
Track 2 : Island Connection = Isl 2
Track 2 : Island Distance = 140 ft
Track 2 : Computed Distance = 2856 ft
Track 2 : Linearization Steps = 100

GCP:  track 2 enhanced det
Track 2 : Inbound PS Sensitivity = High
Track 2 : Speed Limiting Used = Yes
Track 2 : Outbound False Act Lvl = Normal
Track 2 : Outbound PS Timer = 20 sec
Track 2 : Trailing Switch Logic = On
Track 2 : Post Joint Detn Time = 15 sec
Track 2 : Adv Appr Predn = No
Track 2 : Cancel Pickup Delay = This Isl

GCP:  track 2 prime
Track 2 : Prime Warning Time = 44 sec
Track 2 : Prime Offset Distance = 0 ft
Track 2 : Switch MS EZ Level = 10
Track 2 : Prime MS/GCP Mode = Pred
Track 2 : Prime Pickup Delay = 15 sec
Track 2 : Prime UAX = RDAX
Track 2 : Prime UAX Pickup = 5 sec
```

Table 6-11:
1st Street Crossing, M.P. 9.21, Page 3

GCP: track 2 Dax A Track 2 : Dax A Warning Time = 66 sec Track 2 : Dax A Offset Distance = 1828 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax A MS/GCP Mode = Pred Track 2 : Dax A Pickup Delay = 15 sec Track 2 : Dax A Enable = RDAX Track 2 : Dax A Enable Pickup = 2 sec GCP: track 2 Dax B Track 2 : Dax B Warning Time = 68 sec Track 2 : Dax B Offset Distance = 1098 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax B MS/GCP Mode = Pred Track 2 : Dax B Pickup Delay = 15 sec Track 2 : Dax B Enable = RDAX Track 2 : Dax B Enable Pickup = 2 sec GCP: track 2 pos start Track 2 : Positive Start = Off Track 2 : Sudden Shnt Det Used = No Track 2 : Low EZ Detection Used = No GCP: track 2 MS Control Track 2 : MS/GCP Ctrl IP Used = No Track 2 : MS Sensitivity Level = 0 Track 2 : Compensation Level = 1300 Track 2 : Warn Time-Ballast Comp = High Track 2 : Low EX Adjustment = 39 Track 2 : Bidirn Dax Passthru = Yes Track 2 : False Act on Train Stop = No Track 2 : EX Limiting Used = Yes Track 2 : EZ Correction Used = Yes ISLAND: track 1 Track 1 : Isl Frequency = 5.9 kHz Track 1 : Pickup Delay (2s +) = 0 sec Track 1 : Isl Enable IP Used = No ISLAND: track 2 Track 2 : Isl Frequency = 4.9 kHz Track 2 : Pickup Delay (2s +) = 0 sec Track 2 : Isl Enable IP Used = No AND: track Anding AND 1 XR Used = Yes AND 2 Used = No AND 3 Used = No AND 4 Used = No AND 5 Used = No AND 6 Used = No AND 7 Used = No AND 8 Used = No AND: AND 1 XR AND 1 XR Track 1 = Prime AND 1 XR Track 2 = Prime AND 1 Enable Used = Yes And 1 Enable Pickup = 5 sec AND 1 Enable Drop = 0 sec AND 1 Wrap Used = No	ADVANCED: MS restart MS/GCP Restart Used = No ADVANCED: out of service OOS Control = Display+OOS IPs OOS Timeout = Yes OOS Timeout = 1 hrs ADVANCED: out of service 2 T1 OOS Control = OOS Input 1 T2 OOS Control = OOS Input 1 ADVANCED: track wrap circuits Wrap LOS Timer = 5 sec Track 1 Wrap Used = No Track 2 Wrap Used = No ADVANCED: trk 1 overrides Track 1 : All Predictors Override Used = No Track 1 : Dax A Override Used = No Track 1 : Dax B Override Used = No ADVANCED: trk 2 overrides Track 2 : All Predictors Override Used = No Track 2 : Dax A Override Used = No Track 2 : Dax B Override Used = No ADVANCED: OR logic OR 1 Used = No OR 2 Used = No OR 3 Used = No OR 4 Used = No ADVANCED: internal I/O 1 Pass Thrus = No Int.1 Sets = Vital Link 2 IP 1 Int.1 Set by = T1 Dax A Int.2 Sets = Vital Link 2 IP 1 Int.2 Set by = T2 Dax A Int.3 Sets = Vital Link 2 IP 8 Int.3 Set by = Vital Link 2 OP 8 Int.4 Sets = Out Of Service IP 1 Int.4 Set by = Rmt SSCCIV OP 4 ADVANCED: internal I/O 2 Int.5 Sets = Not Used Int.5 Set by = Not Used Int.6 Sets = Not Used Int.6 Set by = Not Used Int.7 Sets = Not Used Int.7 Set by = Not Used Int.8 Sets = Not Used Int.8 Set by = Not Used ADVANCED: internal I/O 3 Int.9 Sets = Not Used Int.9 Set by = Not Used Int.10 Sets = Not Used Int.10 Set by = Not Used Int.11 Sets = Not Used Int.11 Set by = Not Used Int.12 Sets = Not Used Int.12 Set by = Not Used

Table 6-12:
1st Street Crossing, M.P. 9.21, Page 4

```
ADVANCED:  internal I/O 4
Int.13 Sets = Not Used
Int.13 Set by = Not Used
Int.14 Sets = Not Used
Int.14 Set by = Not Used
Int.15 Sets = Not Used
Int.15 Set by = Not Used
Int.16 Sets = Not Used
Int.16 Set by = Not Used

ADVANCED:  site options
Daylight Savings = Off
Units = Standard
Maint Call Rpt IP Used = No
Emergency Activate IP = No
EZ/EX Logging = Change
EZ/EX Point Change = 3

SSCC
Gates Used = Yes
Min Activation = 0 sec
Rmt Activation Cancel = 2 min
SSCCIV Controller Used = Yes
4000 Control Type = Exit

SSCCIV:  Control and ATCS Setup
SSCCIV Activation = AND 1 XR
Exit Gate : RRR Offset = 0
Exit Gate : LLL Offset = 0
Exit Gate : GGG Offset = 0
Exit Gate : SS Offset = 32769
Exit Gate : Msg Timeout = 3600 msec
Exit Gate : Msg Update Interval = 800 msec
Exit Gate : Max Time Offset = 10 sec

SSCC:  1
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 1
SSCC 1 : Flash Rate = 55
SSCC 1 : Low Battery Detection = No
SSCC 1 : Flash Sync = master
SSCC 1 : Lamp Neutral Test = Off
Aux-1 Xng Ctrl Used = No

SSCC:  2
SSCC-2 Number of GPs = 1
SSCC-2 Number of GDs = 1
SSCC 2 : Flash Rate = 55
SSCC 2 : Low Battery Detection = No
SSCC 2 : Flash Sync = slave
SSCC 2 : Lamp Neutral Test = Off
Aux-2 Xng Ctrl Used = No

OUTPUT:  assignment page 1
OUT 1.1 = Not Used
OUT 1.2 = Not Used
OUT 2.1 = AND 1 XR
OUT 2.2 = Not Used

INPUT:  assignment page 1
IN 1.1 = Not Used
IN 1.2 = AND 1 XR Enable
IN 2.1 = Not Used
IN 2.2 = Not Used
```

```
IO:  assignment SSCC
OUT GC 1 = Gate Output 1
OUT GC 2 = Gate Output 2
IN 7.1 = Not Used
IN 7.2 = Vehicle Detect Hlth
IN 7.3 = 3 Vehicle Detect
IN 7.4 = GD 1.1
IN 7.5 = GP 1.1
IN 8.1 = Not Used
IN 8.2 = Not Used
IN 8.3 = 4 Vehicle Detect
IN 8.4 = GD 2.1
IN 8.5 = GP 2.1

SEAR
SEAR Subnode = 99
DI 1 = TSS 1
DI 2 = TSS 2
Rly 1 = Not Used
Rly 2 = Not Used

SEAR:  inputs
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

SEAR:  slot 1-4 inputs
IN 1.1 = Not Used
IN 2.1 = Not Used
IN 2.2 = Not Used
IN 3.1 = Not Used
IN 3.2 = Not Used
IN 4.1 = Not Used
IN 4.2 = Not Used

SEAR:  inputs slot 5
IN 5.1 = Not Used
IN 5.2 = Not Used

SEAR:  inputs slot 6
IN 6.1 = Not Used
IN 6.2 = Not Used

SEAR:  slot 7-8 inputs
IN 7.1 = TSS 5
IN 8.1 = TSS 6
IN 8.2 = General 1

SITE:  programming
Radio Subnode = 1
Field Password = On
Low Battery Enabled = Off

Configuration Package File
--------------------------Filename: CONFIG-
080901J-2009Jan13.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 1/13/2009 9:16:58
DT Version: 4.8.5
```

Table 6-13:
4th Street Crossing, M.P. 9.41, Page 1

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 080907A
Milepost Number: 9.42
Site Name: 4th St - Palmer

SIN: 762020013116

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 1A:6 Trk Bi

Check Numbers
-------------
Office Check No. (DT 4.6.0): 6B45E6AB
Office Check Number: 6B45E6AB
Config. Check Number: 0475F3BA
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = Not Used
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal
Track 2 : Island Used = Internal

BASIC:  preemption
Preempt Logic = Advnce
Adv Preempt Delay = 30 sec
Preempt Hlth IP Used = Yes
Adv Preempt IP Used = Yes
Traffic Sys Hlth IP Used = No
Gate Down Logic Used = No
Second Trn Logic Used = Yes

BASIC:  radio Dax links
Radio DAX link A Used = Yes
Radio DAX link B Used = No
Link A UAX Connection = Next Prd
Remote Inputs Used = No
Remote Outputs Used = No
```

```
BASIC:  track 1 link A
T1 Daxed to by Link A = Yes
T1 Daxed to by Remote T1 = Yes
T1 Daxed to by Remote T2 = No
T1 Daxed to by Remote T3 = No
T1 Daxed to by Remote T4 = No
T1 Daxed to by Remote T5 = No
T1 Daxed to by Remote T6 = No

BASIC:  track 2 link A
T2 Daxed to by Link A = Yes
T2 Daxed to by Remote T1 = No
T2 Daxed to by Remote T2 = Yes
T2 Daxed to by Remote T3 = No
T2 Daxed to by Remote T4 = No
T2 Daxed to by Remote T5 = No
T2 Daxed to by Remote T6 = No

BASIC:  RDax link A
Radio DAX A : RRR Offset = 0
Radio DAX A : LLL Offset = 0
Radio DAX A : GGG Offset = 1
Radio DAX A : SS Offset = 0
Radio DAX A : Msg Timeout = 3600 msec
Radio DAX A : Msg Update Interval = 800 msec
Radio DAX A : Max Time Offset = 10 sec

BASIC:  Vital Comms links
Vital Comms link 1 Used = No
Vital Comms link 2 Used = No

PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = Yes
Track 1 : Dax B Used = No
Track 1 : Dax C Used = No
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No
Track 1 : Prmpt Used = Yes

PREDICTORS:  track 2
Track 2 : Prime Used = Yes
Track 2 : Dax A Used = Yes
Track 2 : Dax B Used = No
Track 2 : Dax C Used = No
Track 2 : Dax D Used = No
Track 2 : Dax E Used = No
Track 2 : Dax F Used = No
Track 2 : Dax G Used = No
Track 2 : Prmpt Used = Yes

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 4283 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 181 ft
Track 1 : Computed Distance = 4441 ft
Track 1 : Linearization Steps = 98
```

Table 6-14:
4th Street Crossing, M.P. 9.41, Page 2

GCP: track 1 enhanced det Track 1 : Inbound PS Sensitivity = High Track 1 : Speed Limiting Used = Yes Track 1 : Outbound False Act Lvl = Normal Track 1 : Outbound PS Timer = 20 sec Track 1 : Trailing Switch Logic = On Track 1 : Post Joint Detn Time = 15 sec Track 1 : Adv Appr Predn = No Track 1 : Cancel Pickup Delay = This Isl GCP: track 1 prime Track 1 : Prime Warning Time = 38 sec Track 1 : Prime Offset Distance = 0 ft Track 1 : Switch MS EZ Level = 10 Track 1 : Prime MS/GCP Mode = Pred Track 1 : Prime Pickup Delay = 15 sec Track 1 : Prime UAX = Not Used GCP: track 1 Dax A Track 1 : Dax A Warning Time = 68 sec Track 1 : Dax A Offset Distance = 99 ft Track 1 : Switch MS EZ Level = 10 Track 1 : Pickup Delay Mode = Auto Track 1 : Dax A MS/GCP Mode = Pred Track 1 : Dax A Pickup Delay = 15 sec Track 1 : Dax A Enable = RDAX Track 1 : Dax A Enable Pickup = 2 sec GCP: track 1 preempt Track 1 : Prmpt Warning Time = 68 sec Track 1 : Prmpt Offset Distance = 0 ft Track 1 : Switch MS EZ Level = 10 Track 1 : Prmpt MS/GCP Mode = Pred Track 1 : Prmpt Pickup Delay = 8 sec Track 1 : Prmpt Enable = Not Used GCP: track 1 pos start Track 1 : Positive Start = Off Track 1 : Sudden Shnt Det Used = No Track 1 : Low EZ Detection Used = No GCP: track 1 MS Control Track 1 : MS/GCP Ctrl IP Used = No Track 1 : MS Sensitivity Level = 0 Track 1 : Compensation Level = 1300 Track 1 : Warn Time-Ballast Comp = High Track 1 : Low EX Adjustment = 39 Track 1 : Bidirn Dax Passthru = Yes Track 1 : False Act on Train Stop = No Track 1 : EX Limiting Used = Yes Track 1 : EZ Correction Used = Yes GCP: track 2 Track 2 : GCP Freq Category = Standard Track 2 : GCP Frequency = 156 Hz Track 2 : Approach Distance = 4283 ft Track 2 : Uni/Bi/Sim-Bidirnl = Bidirnl Track 2 : GCP Transmit Level = Medium Track 2 : Island Connection = Isl 2 Track 2 : Island Distance = 181 ft Track 2 : Computed Distance = 4576 ft Track 2 : Linearization Steps = 99	GCP: track 2 enhanced det Track 2 : Inbound PS Sensitivity = High Track 2 : Speed Limiting Used = Yes Track 2 : Outbound False Act Lvl = Normal Track 2 : Outbound PS Timer = 20 sec Track 2 : Trailing Switch Logic = On Track 2 : Post Joint Detn Time = 15 sec Track 2 : Adv Appr Predn = No Track 2 : Cancel Pickup Delay = This Isl GCP: track 2 prime Track 2 : Prime Warning Time = 38 sec Track 2 : Prime Offset Distance = 0 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Prime MS/GCP Mode = Pred Track 2 : Prime Pickup Delay = 15 sec Track 2 : Prime UAX = Not Used GCP: track 2 Dax A Track 2 : Dax A Warning Time = 68 sec Track 2 : Dax A Offset Distance = 99 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax A MS/GCP Mode = Pred Track 2 : Dax A Pickup Delay = 15 sec Track 2 : Dax A Enable = RDAX Track 2 : Dax A Enable Pickup = 2 sec GCP: track 2 preempt Track 2 : Prmpt Warning Time = 68 sec Track 2 : Prmpt Offset Distance = 0 ft Track 2 : Switch MS EZ Level = 10 Track 2 : Prmpt MS/GCP Mode = Pred Track 2 : Prmpt Pickup Delay = 15 sec Track 2 : Prmpt Enable = Not Used GCP: track 2 pos start Track 2 : Positive Start = Off Track 2 : Sudden Shnt Det Used = No Track 2 : Low EZ Detection Used = No GCP: track 2 MS Control Track 2 : MS/GCP Ctrl IP Used = No Track 2 : MS Sensitivity Level = 0 Track 2 : Compensation Level = 1300 Track 2 : Warn Time-Ballast Comp = High Track 2 : Low EX Adjustment = 39 Track 2 : Bidirn Dax Passthru = Yes Track 2 : False Act on Train Stop = Yes Track 2 : EX Limiting Used = Yes Track 2 : EZ Correction Used = Yes ISLAND: track 1 Track 1 : Isl Frequency = 7.1 kHz Track 1 : Pickup Delay (2s +) = 0 sec Track 1 : Isl Enable IP Used = No ISLAND: track 2 Track 2 : Isl Frequency = 7.1 kHz Track 2 : Pickup Delay (2s +) = 0 sec Track 2 : Isl Enable IP Used = No

Table 6-15:
4th Street Crossing, M.P. 9.41, Page 3

AND: track Anding AND 1 XR Used = Yes AND 2 Used = Yes AND 3 Used = Yes AND 4 Used = No AND 5 Used = No AND 6 Used = No AND 7 Used = No AND 8 Used = No AND: AND 1 XR AND 1 XR Track 1 = Prime AND 1 XR Track 2 = Prime AND 1 Enable Used = Yes And 1 Enable Pickup = 5 sec AND 1 Enable Drop = 0 sec AND 1 Wrap Used = No AND: AND 2 AND 2 Track 1 = Not Used AND 2 Track 2 = Not Used AND 2 Enable Used = Yes AND 2 Enable Pickup = 2 sec AND 2 Enable Drop = 0 sec AND 2 Wrap Used = No AND: AND 3 AND 3 Track 1 = Isl Only AND 3 Track 2 = Isl Only AND 3 Enable Used = No AND 3 Wrap Used = No ADVANCED: MS restart MS/GCP Restart Used = No ADVANCED: out of service OOS Control = Display+OOS IPs OOS Timeout = Yes OOS Timeout = 1 hrs ADVANCED: out of service 2 T1 OOS Control = OOS Input 1 T2 OOS Control = OOS Input 1 ADVANCED: track wrap circuits Wrap LOS Timer = 5 sec Track 1 Wrap Used = No Track 2 Wrap Used = No ADVANCED: trk 1 overrides Track 1 : All Predictors Override Used = No Track 1 : Dax A Override Used = No ADVANCED: trk 2 overrides Track 2 : All Predictors Override Used = No Track 2 : Dax A Override Used = No ADVANCED: OR logic OR 1 Used = Yes OR 2 Used = No OR 3 Used = No OR 4 Used = No	ADVANCED: OR 1 OR 1 Term 1 = AND 2 OR 1 Term 2 = NOT AND 3 OR 1 Term 3 = Not Used OR 1 Term 4 = Not Used ADVANCED: internal I/O 1 Pass Thrus = Yes Int.1 Sets = Adv Preempt IP Int.1 Set by = T1 Dax A Int.2 Sets = Adv Preempt IP Int.2 Set by = T2 Dax A Int.3 Sets = AND 2 Enable Int.3 Set by = Rmt SSCCIV OP 1 Int.4 Sets = AND 2 Enable Int.4 Set by = Passthru State 1 ADVANCED: internal I/O 2 Int.5 Sets = AND 1 XR Enable Int.5 Set by = Rmt SSCCIV OP 3 Int.6 Sets = Out Of Service IP 1 Int.6 Set by = Rmt SSCCIV OP 4 Int.7 Sets = GD 1.1 Int.7 Set by = Passthru State 1 Int.8 Sets = Not Used Int.8 Set by = Not Used ADVANCED: internal I/O 3 Int.9 Sets = Not Used Int.9 Set by = Not Used Int.10 Sets = Not Used Int.10 Set by = Not Used Int.11 Sets = Not Used Int.11 Set by = Not Used Int.12 Sets = Not Used Int.12 Set by = Not Used ADVANCED: internal I/O 4 Int.13 Sets = Not Used Int.13 Set by = Not Used Int.14 Sets = Not Used Int.14 Set by = Not Used Int.15 Sets = Not Used Int.15 Set by = Not Used Int.16 Sets = Not Used Int.16 Set by = Not Used ADVANCED: site options Daylight Savings = Off Units = Standard Maint Call Rpt IP Used = No Emergency Activate IP = No EZ/EX Logging = Change EZ/EX Point Change = 3 SSCC Gates Used = Yes Min Activation = 0 sec Rmt Activation Cancel = 2 min SSCCIV Controller Used = Yes 4000 Control Type = Exit

Table 6-16:
4th Street Crossing, M.P. 9.41, Page 4

```
SSCCIV:  Control and ATCS Setup
SSCCIV Activation = AND 1 XR
Exit Gate : RRR Offset = 0
Exit Gate : LLL Offset = 0
Exit Gate : GGG Offset = 0
Exit Gate : SS Offset = 32769
Exit Gate : Msg Timeout = 3600 msec
Exit Gate : Msg Update Interval = 800 msec
Exit Gate : Max Time Offset = 10 sec

SSCC:  1
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 1
SSCC 1 : Flash Rate = 55
SSCC 1 : Low Battery Detection = No
SSCC 1 : Flash Sync = master
SSCC 1 : Lamp Neutral Test = Off
Aux-1 Xng Ctrl Used = No

OUTPUT:  assignment page 1
OUT 1.1 = OR 1
OUT 1.2 = Not Used
OUT 2.1 = Adv Preempt
OUT 2.2 = Not Used

INPUT:  assignment page 1
IN 1.1 = Preempt Health
IN 1.2 = Adv Preempt IP
IN 2.1 = Not Used
IN 2.2 = Not Used

IO:  assignment SSCC
OUT GC 1 = Gate Output 1
IN 7.1 = Not Used
IN 7.2 = Vehicle Detect Hlth
IN 7.3 = 3 Vehicle Detect
IN 7.4 = Passthru State 1
IN 7.5 = GP 1.1

SEAR
SEAR Subnode = 99
DI 1 = TSS 1
DI 2 = TSS 2
Rly 1 = Not Used
Rly 2 = Not Used
```

```
SEAR:  inputs
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

SEAR:  slot 1-4 inputs
IN 2.1 = General 1
IN 2.2 = General 2
IN 3.1 = Not Used
IN 3.2 = Not Used
IN 4.1 = Not Used
IN 4.2 = Not Used
SEAR:  inputs slot 5
IN 5.1 = Not Used
IN 5.2 = Not Used

SEAR:  inputs slot 6
IN 6.1 = Not Used
IN 6.2 = Not Used

SEAR:  slot 7-8 inputs
IN 7.1 = TSS 5
IN 8.1 = Not Used
IN 8.2 = General 3
IN 8.3 = Not Used
IN 8.4 = Not Used
IN 8.5 = Not Used

SITE:  programming
Radio Subnode = 1
Field Password = On
Low Battery Enabled = Off

Configuration Package File
--------------------------
Filename: Config-080907A.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 1/02/2009 12:49:21
```

6.11.1.3 <u>Using Model 4000 GCP DT to Modify MCF for Broadmoor Street, MP 9.57</u>

Because the Broadmoor Street crossing is controlled by a Model 3000 GCP connected to an HD/LINK module, a Program Report such as is used with a Model 4000 GCP is not provided. Provided below are the steps necessary to make the connection to the Model 3000 GCP. Refer to the 1st Street Crossing in Figure 6-180 for additional information.

Step 1: Program the Model 3000 GCP per the Railroad's written instructions.

Step 2: Program the HD/Link as outlined in SIG-00-97-08, HD/LINKer User's Handbook per the Railroad's written instructions. Install the MCF as outlined in Sections 6.10.3.2, 6.10.4, & 6.10.5.

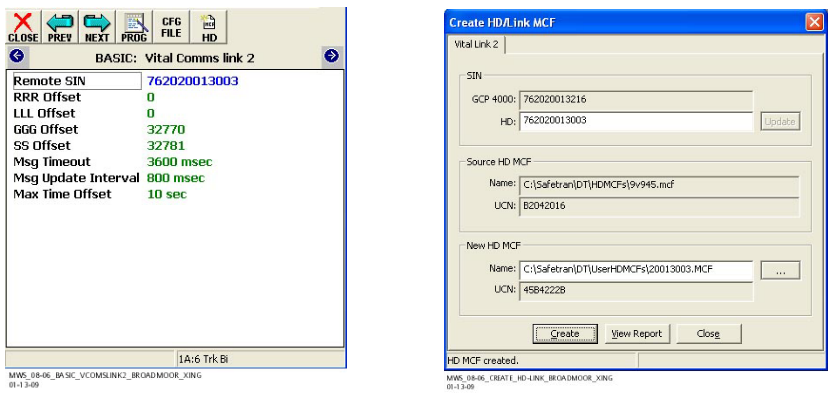


Figure 6-181:
Broadmoor Crossing Modify MCF Screens

Step 3: Follow the steps in Section 6.10.3 and Figure 6-181 to create the modified MCF.

Step 4: Install the modified MCF as outlined in Sections 6.10.3.2, 6.10.4, & 6.10.5.

6.11.2 Example 2 – Programming Vital Communications Links Between Model 4000 GCPs

Continuing the examples using the Palmer Quiet Zone project, LS-26 continues to be shown, but the primary emphasis in this example is the interaction between the Remote GCPs at M.P. 5.69 and M.P. 21.49 on LS-220, and how the Crossing GCPs at 11th Street and 14th Street on LS-26 are connected via VLINK.

6.11.2.1 Spread Spectrum Radio/Relay Equivalence Drawing for LS 220

Presented below is a portion of the spread spectrum radio/relay equivalence drawing for a portion of LS-220. Both the SIN and GGG offsets are provided, to provide examples of how DTs using software version 4.7.5 and newer and software version 4.6.0 and older, respectively, are programmed in this circumstance.

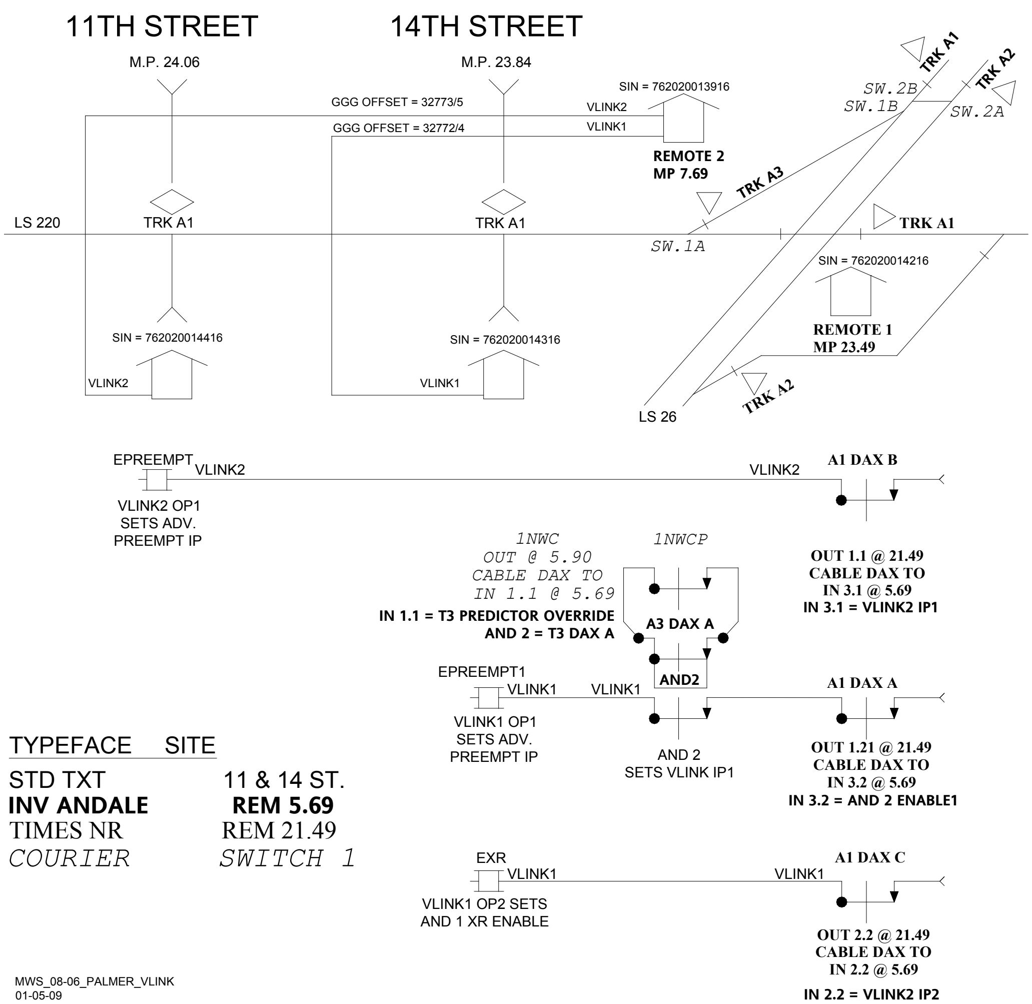


Figure 6-182:
Example 2: Radio DAX (RDAX) & Vital Communications Link (VLINK)

6.11.2.2 Configuration Package (PAC) Files for LS 220

Table 6-17:
Remote Crossing 1, M.P. 23.49, Page 1

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 0000002
Milepost Number: 23.49
Site Name: Remote Crossing 1

SIN: 762020014216

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 5A:3 Remote pairs

Check Numbers
-------------
Office Check No. (DT 4.6.0): 3327AA35
Office Check Number: 3327AA35
Config. Check Number: 209C73B2
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = Not Used
SSCC-2 Slot = Not Used
SEAR Used = No

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = No
Track 2 : Island Used = No

BASIC:  radio Dax links
Radio DAX link A Used = No
Radio DAX link B Used = No

BASIC:  Vital Comms links
Vital Comms link 1 Used = No
Vital Comms link 2 Used = No
```

```
PREDICTORS:  track 1
Track 1 : Prime Used = No
Track 1 : Dax A Used = Yes
Track 1 : Dax B Used = Yes
Track 1 : Dax C Used = Yes
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No

PREDICTORS:  track 2
Track 2 : Prime Used = No
Track 2 : Dax A Used = Yes
Track 2 : Dax B Used = No
Track 2 : Dax C Used = No
Track 2 : Dax D Used = No
Track 2 : Dax E Used = No
Track 2 : Dax F Used = No
Track 2 : Dax G Used = No

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 790 Hz
Track 1 : Approach Distance = 1997 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Unidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = No Islands
Track 1 : Island Distance = 0 ft
Track 1 : Computed Distance = 2007 ft
Track 1 : Linearization Steps = 100

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 Dax A
Track 1 : Dax A Warning Time = 94 sec
Track 1 : Dax A Offset Distance = 1269 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax A MS/GCP Mode = Pred
Track 1 : Dax A Pickup Delay = 15 sec
Track 1 : Dax A Enable = Not Used

GCP:  track 1 Dax B
Track 1 : Dax B Warning Time = 98 sec
Track 1 : Dax B Offset Distance = 2453 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax B MS/GCP Mode = Pred
Track 1 : Dax B Pickup Delay = 15 sec
Track 1 : Dax B Enable = Not Used
```

Table 6-18: Remote Crossing 1, M.P. 23.49, Page 2	
GCP: track 1 Dax C Track 1 : Dax C Warning Time = 38 sec Track 1 : Dax C Offset Distance = 1269 ft Track 1 : Switch MS EZ Level = 0 Track 1 : Pickup Delay Mode = Auto Track 1 : Dax C MS/GCP Mode = Pred Track 1 : Dax C Pickup Delay = 15 sec Track 1 : Dax C Enable = Not Used GCP: track 1 pos start Track 1 : Positive Start = Off Track 1 : Sudden Shnt Det Used = No Track 1 : Low EZ Detection Used = No GCP: track 1 MS Control Track 1 : MS/GCP Ctrl IP Used = No Track 1 : MS Sensitivity Level = 0 Track 1 : Compensation Level = 1300 Track 1 : Warn Time-Ballast Comp = Low Track 1 : Low EX Adjustment = 39 Track 1 : Bidirn Dax Passthru = No Track 1 : False Act on Train Stop = No Track 1 : EX Limiting Used = Yes Track 1 : EZ Correction Used = Yes GCP: track 2 Track 2 : GCP Freq Category = Standard Track 2 : GCP Frequency = 970 Hz Track 2 : Approach Distance = 506 ft Track 2 : Uni/Bi/Sim-Bidirnl = Unidirnl Track 2 : GCP Transmit Level = Medium Track 2 : Island Connection = No Islands Track 2 : Island Distance = 0 ft Track 2 : Computed Distance = 2004 ft Track 2 : Linearization Steps = 100 GCP: track 2 enhanced det Track 2 : Inbound PS Sensitivity = High Track 2 : Speed Limiting Used = Yes Track 2 : Outbound False Act Lvl = Normal Track 2 : Outbound PS Timer = 20 sec Track 2 : Trailing Switch Logic = On Track 2 : Post Joint Detn Time = 15 sec Track 2 : Adv Appr Predn = No Track 2 : Cancel Pickup Delay = This Isl GCP: track 2 Dax A Track 2 : Dax A Warning Time = 80 sec Track 2 : Dax A Offset Distance = 600 ft Track 2 : Switch MS EZ Level = 0 Track 2 : Pickup Delay Mode = Auto Track 2 : Dax A MS/GCP Mode = Pred Track 2 : Dax A Pickup Delay = 15 sec Track 2 : Dax A Enable = Not Used GCP: track 2 pos start Track 2 : Positive Start = Off Track 2 : Sudden Shnt Det Used = No Track 2 : Low EZ Detection Used = No	GCP: track 2 MS Control Track 2 : MS/GCP Ctrl IP Used = No Track 2 : MS Sensitivity Level = 0 Track 2 : Compensation Level = 1300 Track 2 : Warn Time-Ballast Comp = Low Track 2 : Low EX Adjustment = 39 Track 2 : Bidirn Dax Passthru = No Track 2 : False Act on Train Stop = No Track 2 : EX Limiting Used = Yes Track 2 : EZ Correction Used = Yes AND: track Anding AND 1 XR Used = No AND 2 Used = No AND 3 Used = No AND 4 Used = No AND 5 Used = No AND 6 Used = No AND 7 Used = No AND 8 Used = No ADVANCED: MS restart MS/GCP Restart Used = No ADVANCED: out of service OOS Control = Display OOS Timeout = Yes OOS Timeout = 1 hrs ADVANCED: track wrap circuits Wrap LOS Timer = 5 sec Track 1 Wrap Used = No Track 2 Wrap Used = No ADVANCED: trk 1 overrides Track 1 : All Predictors Override Used = No Track 1 : Dax A Override Used = No Track 1 : Dax B Override Used = No Track 1 : Dax C Override Used = No ADVANCED: trk 2 overrides Track 2 : All Predictors Override Used = No Track 2 : Dax A Override Used = No ADVANCED: OR logic OR 1 Used = No OR 2 Used = No OR 3 Used = No OR 4 Used = No ADVANCED: internal I/O 1 Pass Thrus = No Int.1 Sets = Not Used Int.1 Set by = Not Used Int.2 Sets = Not Used Int.2 Set by = Not Used Int.3 Sets = Not Used Int.3 Set by = Not Used Int.4 Sets = Not Used Int.4 Set by = Not Used

Table 6-19:
Remote Crossing 1, M.P. 23.49, Page 3

ADVANCED: internal I/O 2 Int.5 Sets = Not Used Int.5 Set by = Not Used Int.6 Sets = Not Used Int.6 Set by = Not Used Int.7 Sets = Not Used Int.7 Set by = Not Used Int.8 Sets = Not Used Int.8 Set by = Not Used ADVANCED: internal I/O 3 Int.9 Sets = Not Used Int.9 Set by = Not Used Int.10 Sets = Not Used Int.10 Set by = Not Used Int.11 Sets = Not Used Int.11 Set by = Not Used Int.12 Sets = Not Used Int.12 Set by = Not Used ADVANCED: internal I/O 4 Int.13 Sets = Not Used Int.13 Set by = Not Used Int.14 Sets = Not Used Int.14 Set by = Not Used Int.15 Sets = Not Used Int.15 Set by = Not Used Int.16 Sets = Not Used Int.16 Set by = Not Used	ADVANCED: site options Daylight Savings = Off Units = Standard Maint Call Rpt IP Used = No Emergency Activate IP = No EZ/EX Logging = Change EZ/EX Point Change = 3 OUTPUT: assignment page 1 OUT 1.1 = T1 Dax B OUT 1.2 = T1 Dax A OUT 2.1 = T2 Dax A OUT 2.2 = T1 Dax C INPUT: assignment page 1 IN 1.1 = Not Used IN 1.2 = Not Used IN 2.1 = Not Used IN 2.2 = Not Used SITE: programming Radio Subnode = 1 Field Password = Off Low Battery Enabled = Off Configuration Package File -------------------------- Filename: CONFIG-0000002-2009Jan05.pac Path: C:\Safetran\DT\Config Files\ Date/Time: 1/05/2009 10:43:49 DT Version: 4.8.5

**Table 6-20:
Remote Crossing 2, M.P. 7.69, Page 1**

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 0000004
Milepost Number: 7.69
Site Name: Remote Crossing 2

SIN: 762020013916

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 4A:6 Remotes

Check Numbers
-------------
Office Check No. (DT 4.6.0): 5F68992E
Office Check Number: 5F68992E
Config. Check Number: 6C7BDF35
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Track
Track 3 Slot = Track
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = RIO
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = Not Used
SSCC-2 Slot = Not Used
SEAR Used = No

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes
Track 2 : MS/GCP Operation = Yes
Track 3 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = No
Track 2 : Island Used = No
Track 3 : Island Used = No

BASIC:  radio Dax links
Radio DAX link A Used = Yes
Radio DAX link B Used = No
Link A UAX Connection = Next Prd
Remote Inputs Used = Yes
Remote Outputs Used = No

BASIC:  track 1 link A
T1 Daxed to by Link A = No

BASIC:  track 2 link A
T2 Daxed to by Link A = No
```

```
BASIC:  track 3 link A
T3 Daxed to by Link A = No

BASIC:  RDax link A
Radio DAX A : RRR Offset = 0
Radio DAX A : LLL Offset = 0
Radio DAX A : GGG Offset = 32769
Radio DAX A : SS Offset = 0
Radio DAX A : Msg Timeout = 3600 msec
Radio DAX A : Msg Update Interval = 800 msec
Radio DAX A : Max Time Offset = 10 sec

BASIC:  Vital Comms links
Vital Comms link 1 Used = Yes
Vital Comms link 2 Used = Yes

BASIC:  Vital Comms link 1
HDLink 1 : RRR Offset = 0
HDLink 1 : LLL Offset = 0
HDLink 1 : GGG Offset = 4
HDLink 1 : SS Offset = 0
HDLink 1 : Msg Timeout = 3600 msec
HDLink 1 : Msg Update Interval = 800 msec
HDLink 1 : Max Time Offset = 10 sec

BASIC:  Vital Comms link 2
HDLink 2 : RRR Offset = 0
HDLink 2 : LLL Offset = 0
HDLink 2 : GGG Offset = 5
HDLink 2 : SS Offset = 0
HDLink 2 : Msg Timeout = 3600 msec
HDLink 2 : Msg Update Interval = 800 msec
HDLink 2 : Max Time Offset = 10 sec

PREDICTORS:  track 1
Track 1 : Prime Used = No
Track 1 : Dax A Used = Yes
Track 1 : Dax B Used = Yes
Track 1 : Dax C Used = Yes
Track 1 : Dax D Used = Yes
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No

PREDICTORS:  track 2
Track 2 : Prime Used = No
Track 2 : Dax A Used = Yes
Track 2 : Dax B Used = Yes
Track 2 : Dax C Used = Yes
Track 2 : Dax D Used = Yes
Track 2 : Dax E Used = No
Track 2 : Dax F Used = No
Track 2 : Dax G Used = No
```

Table 6-21:
Remote Crossing 2, M.P. 7.69, Page 2

```
PREDICTORS:  track 3
Track 3 : Prime Used = No
Track 3 : Dax A Used = Yes
Track 3 : Dax B Used = No
Track 3 : Dax C Used = No
Track 3 : Dax D Used = No
Track 3 : Dax E Used = No
Track 3 : Dax F Used = No
Track 3 : Dax G Used = No

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 211 Hz
Track 1 : Approach Distance = 3320 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Unidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = No Islands
Track 1 : Island Distance = 0 ft
Track 1 : Computed Distance = 9999 ft
Track 1 : Linearization Steps = 100

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 Dax A
Track 1 : Dax A Warning Time = 31 sec
Track 1 : Dax A Offset Distance = 1667 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax A MS/GCP Mode = Pred
Track 1 : Dax A Pickup Delay = 15 sec
Track 1 : Dax A Enable = Not Used

GCP:  track 1 Dax B
Track 1 : Dax B Warning Time = 80 sec
Track 1 : Dax B Offset Distance = 1667 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax B MS/GCP Mode = Pred
Track 1 : Dax B Pickup Delay = 15 sec
Track 1 : Dax B Enable = Not Used

GCP:  track 1 Dax C
Track 1 : Dax C Warning Time = 98 sec
Track 1 : Dax C Offset Distance = 3025 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax C MS/GCP Mode = Pred
Track 1 : Dax C Pickup Delay = 15 sec
Track 1 : Dax C Enable = Not Used
```

```
GCP:  track 1 Dax D
Track 1 : Dax D Warning Time = 81 sec
Track 1 : Dax D Offset Distance = 4302 ft
Track 1 : Switch MS EZ Level = 0
Track 1 : Pickup Delay Mode = Auto
Track 1 : Dax D MS/GCP Mode = Pred
Track 1 : Dax D Pickup Delay = 15 sec
Track 1 : Dax D Enable = Not Used

GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No

GCP:  track 1 MS Control
Track 1 : MS/GCP Ctrl IP Used = No
Track 1 : MS Sensitivity Level = 0
Track 1 : Compensation Level = 1300
Track 1 : Warn Time-Ballast Comp = Low
Track 1 : Low EX Adjustment = 39
Track 1 : Bidirn Dax Passthru = No
Track 1 : False Act on Train Stop = No
Track 1 : EX Limiting Used = Yes
Track 1 : EZ Correction Used = Yes

GCP:  track 2
Track 2 : GCP Freq Category = Standard
Track 2 : GCP Frequency = 211 Hz
Track 2 : Approach Distance = 3320 ft
Track 2 : Uni/Bi/Sim-Bidirnl = Unidirnl
Track 2 : GCP Transmit Level = Medium
Track 2 : Island Connection = No Islands
Track 2 : Island Distance = 0 ft
Track 2 : Computed Distance = 9999 ft
Track 2 : Linearization Steps = 100

GCP:  track 2 enhanced det
Track 2 : Inbound PS Sensitivity = High
Track 2 : Speed Limiting Used = Yes
Track 2 : Outbound False Act Lvl = Normal
Track 2 : Outbound PS Timer = 20 sec
Track 2 : Trailing Switch Logic = On
Track 2 : Post Joint Detn Time = 15 sec
Track 2 : Adv Appr Predn = No
Track 2 : Cancel Pickup Delay = This Isl

GCP:  track 2 Dax A
Track 2 : Dax A Warning Time = 31 sec
Track 2 : Dax A Offset Distance = 1667 ft
Track 2 : Switch MS EZ Level = 0
Track 2 : Pickup Delay Mode = Auto
Track 2 : Dax A MS/GCP Mode = Pred
Track 2 : Dax A Pickup Delay = 15 sec
Track 2 : Dax A Enable = Not Used
```

Table 6-22:
Remote Crossing 2, M.P. 7.69, Page 3

```
GCP:  track 2 Dax B
Track 2 : Dax B Warning Time = 80 sec
Track 2 : Dax B Offset Distance = 1667 ft
Track 2 : Switch MS EZ Level = 0
Track 2 : Pickup Delay Mode = Auto
Track 2 : Dax B MS/GCP Mode = Pred
Track 2 : Dax B Pickup Delay = 15 sec
Track 2 : Dax B Enable = IP
Track 2 : Dax B Enable Pickup = 2 sec

GCP:  track 2 Dax C
Track 2 : Dax C Warning Time = 98 sec
Track 2 : Dax C Offset Distance = 3025 ft
Track 2 : Switch MS EZ Level = 0
Track 2 : Pickup Delay Mode = Auto
Track 2 : Dax C MS/GCP Mode = Pred
Track 2 : Dax C Pickup Delay = 15 sec
Track 2 : Dax C Enable = Not Used

GCP:  track 2 Dax D
Track 2 : Dax D Warning Time = 81 sec
Track 2 : Dax D Offset Distance = 4302 ft
Track 2 : Switch MS EZ Level = 0
Track 2 : Pickup Delay Mode = Auto
Track 2 : Dax D MS/GCP Mode = Pred
Track 2 : Dax D Pickup Delay = 15 sec
Track 2 : Dax D Enable = Not Used

GCP:  track 2 pos start
Track 2 : Positive Start = Off
Track 2 : Sudden Shnt Det Used = No
Track 2 : Low EZ Detection Used = No

GCP:  track 2 MS Control
Track 2 : MS/GCP Ctrl IP Used = No
Track 2 : MS Sensitivity Level = 0
Track 2 : Compensation Level = 1300
Track 2 : Warn Time-Ballast Comp = Low
Track 2 : Low EX Adjustment = 39
Track 2 : Bidirn Dax Passthru = No
Track 2 : False Act on Train Stop = No
Track 2 : EX Limiting Used = Yes
Track 2 : EZ Correction Used = Yes

GCP:  track 3
Track 3 : GCP Freq Category = Other
Track 3 : GCP Frequency = 392 Hz
Track 3 : Approach Distance = 719 ft
Track 3 : Uni/Bi/Sim-Bidirnl = Unidirnl
Track 3 : GCP Transmit Level = Medium
Track 3 : Island Connection = No Islands
Track 3 : Island Distance = 0 ft
Track 3 : Computed Distance = 9999 ft
Track 3 : Linearization Steps = 100

GCP:  track 3 enhanced det
Track 3 : Inbound PS Sensitivity = High
Track 3 : Speed Limiting Used = Yes
Track 3 : Outbound False Act Lvl = Normal
Track 3 : Outbound PS Timer = 20 sec
Track 3 : Trailing Switch Logic = On
Track 3 : Post Joint Detn Time = 15 sec
Track 3 : Adv Appr Predn = No
Track 3 : Cancel Pickup Delay = This Isl

GCP:  track 3 Dax A
Track 3 : Dax A Warning Time = 94 sec
Track 3 : Dax A Offset Distance = 1022 ft
Track 3 : Switch MS EZ Level = 0
Track 3 : Pickup Delay Mode = Auto
Track 3 : Dax A MS/GCP Mode = Pred
Track 3 : Dax A Pickup Delay = 15 sec
Track 3 : Dax A Enable = Not Used

GCP:  track 3 pos start
Track 3 : Positive Start = Off
Track 3 : Sudden Shnt Det Used = No
Track 3 : Low EZ Detection Used = No

GCP:  track 3 MS Control
Track 3 : MS/GCP Ctrl IP Used = No
Track 3 : MS Sensitivity Level = 0
Track 3 : Compensation Level = 1300
Track 3 : Warn Time-Ballast Comp = Low
Track 3 : Low EX Adjustment = 39
Track 3 : Bidirn Dax Passthru = No
Track 3 : False Act on Train Stop = No
Track 3 : EX Limiting Used = Yes
Track 3 : EZ Correction Used = Yes

AND:  track Anding
AND 1 XR Used = No
AND 2 Used = Yes
AND 3 Used = No
AND 4 Used = No
AND 5 Used = No
AND 6 Used = No
AND 7 Used = No
AND 8 Used = No

AND:  AND 2
AND 2 Track 1 = Not Used
AND 2 Track 2 = Not Used
AND 2 Track 3 = Dax A
AND 2 Enable Used = Yes
AND 2 Enable Pickup = 2 sec
AND 2 Enable Drop = 0 sec
AND 2 Wrap Used = No

ADVANCED:  MS restart
MS/GCP Restart Used = No

ADVANCED:  out of service
OOS Control = Display+OOS IPs
OOS Timeout = Yes
OOS Timeout = 1 hrs
```

Table 6-23:
Remote Crossing 2, M.P. 7.69, Page 4

```
ADVANCED:  out of service 2
T1 OOS Control = OOS Input 1
T2 OOS Control = OOS Input 1
T3 OOS Control = OOS Input 1

ADVANCED:  track wrap circuits
Wrap LOS Timer = 5 sec
Track 1 Wrap Used = No
Track 2 Wrap Used = No
Track 3 Wrap Used = No

ADVANCED:  trk 1 overrides
Track 1 : All Predictors Override Used = Yes

ADVANCED:  trk 2 overrides
Track 2 : All Predictors Override Used = Yes

ADVANCED:  trk 3 overrides
Track 3 : All Predictors Override Used = Yes

ADVANCED:  OR logic
OR 1 Used = No
OR 2 Used = No
OR 3 Used = No
OR 4 Used = No

ADVANCED:  internal I/O 1
Pass Thrus = No
Int.1 Sets = Vital Link 1 IP 1
Int.1 Set by = AND 2
Int.2 Sets = Not Used
Int.2 Set by = Not Used
Int.3 Sets = Not Used
Int.3 Set by = Not Used
Int.4 Sets = Not Used
Int.4 Set by = Not Used

ADVANCED:  internal I/O 2
Int.5 Sets = Not Used
Int.5 Set by = Not Used
Int.6 Sets = Not Used
Int.6 Set by = Not Used
Int.7 Sets = Not Used
Int.7 Set by = Not Used
Int.8 Sets = Not Used
Int.8 Set by = Not Used

ADVANCED:  internal I/O 3
Int.9 Sets = Not Used
Int.9 Set by = Not Used
Int.10 Sets = Not Used
Int.10 Set by = Not Used
Int.11 Sets = Not Used
Int.11 Set by = Not Used
Int.12 Sets = Not Used
Int.12 Set by = Not Used

ADVANCED:  internal I/O 4
Int.13 Sets = Not Used
Int.13 Set by = Not Used
Int.14 Sets = Not Used
Int.14 Set by = Not Used
Int.15 Sets = Not Used
Int.15 Set by = Not Used
Int.16 Sets = Not Used
Int.16 Set by = Not Used

ADVANCED:  site options
Daylight Savings = Off
Units = Standard
Maint Call Rpt IP Used = No
Emergency Activate IP = No
EZ/EX Logging = Change
EZ/EX Point Change = 3

OUTPUT:  assignment page 1
OUT 1.1 = Not Used
OUT 1.2 = Not Used
OUT 2.1 = Not Used
OUT 2.2 = Not Used
OUT 3.1 = Not Used
OUT 3.2 = Not Used

OUTPUT:  assignment page 2
OUT 5.1 = Not Used
OUT 5.2 = Not Used
OUT 5.3 = Not Used
OUT 5.4 = Not Used

INPUT:  assignment page 1
IN 1.1 = T3 Pred Override
IN 1.2 = Not Used
IN 2.1 = T2 Dax B Enable
IN 2.2 = Vital Link 1 IP 2
IN 3.1 = Vital Link 2 IP 1
IN 3.2 = AND 2 Enable

INPUT:  assignment page 2
IN 5.1 = T1 Pred Override
IN 5.2 = T2 Pred Override
IN 5.3 = Remote Input 1
IN 5.4 = Out Of Service IP 1

SITE:  programming
Radio Subnode = 1
Field Password = On
Low Battery Enabled = Off

Configuration Package File
--------------------------
Filename: CONFIG-0000004-2009Jan05.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 1/05/2009 12:24:52
DT Version: 4.8.5
```

Table 6-24:
14th Street Crossing, M.P. 23.84, Page 1

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 083128V
Milepost Number: 23.84
Site Name: 14th St-Palmer

SIN: 762020014316

MCF and Template Selection
-------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 1A:6 Trk Bi

Check Numbers
-------------
Office Check No. (DT 4.6.0): 258EFB8F
Office Check Number: 258EFB8F
Config. Check Number: 21021933
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Not Used
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = Not Used
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal

BASIC:  preemption
Preempt Logic = Advnce
Adv Preempt Delay = 56 sec
Preempt Hlth IP Used = Yes
Adv Preempt IP Used = Yes
Traffic Sys Hlth IP Used = No
Gate Down Logic Used = No
Second Trn Logic Used = No

BASIC:  radio Dax links
Radio DAX link A Used = No
Radio DAX link B Used = No

BASIC:  Vital Comms links
Vital Comms link 1 Used = Yes
Vital Comms link 2 Used = No
```

```
BASIC:  Vital Comms link 1
HDLink 1 : RRR Offset = 0
HDLink 1 : LLL Offset = 0
HDLink 1 : GGG Offset = 32772
HDLink 1 : SS Offset = 0
HDLink 1 : Msg Timeout = 3600 msec
HDLink 1 : Msg Update Interval = 800 msec
HDLink 1 : Max Time Offset = 10 sec

PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = No
Track 1 : Dax B Used = No
Track 1 : Dax C Used = No
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No
Track 1 : Prmpt Used = Yes

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 285 Hz
Track 1 : Approach Distance = 3630 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 165 ft
Track 1 : Computed Distance = 9999 ft
Track 1 : Linearization Steps = 100

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 prime
Track 1 : Prime Warning Time = 38 sec
Track 1 : Prime Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prime MS/GCP Mode = Pred
Track 1 : Prime Pickup Delay = 15 sec
Track 1 : Prime UAX = Not Used

GCP:  track 1 preempt
Track 1 : Prmpt Warning Time = 94 sec
Track 1 : Prmpt Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prmpt MS/GCP Mode = Pred
Track 1 : Prmpt Pickup Delay = 15 sec
Track 1 : Prmpt Enable = Not Used

GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No
```

Table 6-25:
14th Street Crossing 2, M.P. 23.84, Page 2

```
GCP:  track 1 MS Control
Track 1 : MS/GCP Ctrl IP Used = No
Track 1 : MS Sensitivity Level = 0
Track 1 : Compensation Level = 1300
Track 1 : Warn Time-Ballast Comp = High
Track 1 : Low EX Adjustment = 39
Track 1 : Bidirn Dax Passthru = No
Track 1 : False Act on Train Stop = No
Track 1 : EX Limiting Used = Yes
Track 1 : EZ Correction Used = Yes

ISLAND:  track 1
Track 1 : Isl Frequency = 11.5 kHz
Track 1 : Pickup Delay (2s +) = 2 sec
Track 1 : Isl Enable IP Used = No

AND:  track Anding
AND 1 XR Used = Yes
AND 2 Used = Yes
AND 3 Used = Yes
AND 4 Used = No
AND 5 Used = No
AND 6 Used = No
AND 7 Used = No
AND 8 Used = No

AND:  AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 Enable Used = Yes
And 1 Enable Pickup = 5 sec
AND 1 Enable Drop = 0 sec
AND 1 Wrap Used = No

AND:  AND 2
AND 2 Track 1 = Not Used
AND 2 Enable Used = Yes
AND 2 Enable Pickup = 2 sec
AND 2 Enable Drop = 0 sec
AND 2 Wrap Used = No

AND:  AND 3
AND 3 Track 1 = Isl Only
AND 3 Enable Used = No
AND 3 Wrap Used = No

ADVANCED:  MS restart
MS/GCP Restart Used = No

ADVANCED:  out of service
OOS Control = Display+OOS IPs
OOS Timeout = Yes
OOS Timeout = 1 hrs

ADVANCED:  out of service 2
T1 OOS Control = OOS Input 1

ADVANCED:  track wrap circuits
Wrap LOS Timer = 5 sec
Track 1 Wrap Used = No

ADVANCED:  trk 1 overrides
Track 1 : All Predictors Override Used = No
```

```
ADVANCED:  OR logic
OR 1 Used = Yes
OR 2 Used = No
OR 3 Used = No
OR 4 Used = No

ADVANCED:  OR 1
OR 1 Term 1 = AND 2
OR 1 Term 2 = NOT AND 3
OR 1 Term 3 = Not Used
OR 1 Term 4 = Not Used

ADVANCED:  internal I/O 1
Pass Thrus = Yes
Int.1 Sets = Adv Preempt IP
Int.1 Set by = Vital Link 1 OP 1
Int.2 Sets = AND 1 XR Enable
Int.2 Set by = Vital Link 1 OP 2
Int.3 Sets = AND 2 Enable
Int.3 Set by = Rmt SSCCIV OP 1
Int.4 Sets = AND 2 Enable
Int.4 Set by = Passthru State 1

ADVANCED:  internal I/O 2
Int.5 Sets = AND 1 XR Enable
Int.5 Set by = Rmt SSCCIV OP 3
Int.6 Sets = Out Of Service IP 1
Int.6 Set by = Rmt SSCCIV OP 4
Int.7 Sets = GD 1.1
Int.7 Set by = Passthru State 1
Int.8 Sets = Not Used
Int.8 Set by = Not Used

ADVANCED:  internal I/O 3
Int.9 Sets = Not Used
Int.9 Set by = Not Used
Int.10 Sets = Not Used
Int.10 Set by = Not Used
Int.11 Sets = Not Used
Int.11 Set by = Not Used
Int.12 Sets = Not Used
Int.12 Set by = Not Used

ADVANCED:  internal I/O 4
Int.13 Sets = Not Used
Int.13 Set by = Not Used
Int.14 Sets = Not Used
Int.14 Set by = Not Used
Int.15 Sets = Not Used
Int.15 Set by = Not Used
Int.16 Sets = Not Used
Int.16 Set by = Not Used

ADVANCED:  site options
Daylight Savings = Off
Units = Standard
Maint Call Rpt IP Used = No
Emergency Activate IP = No
EZ/EX Logging = Change
EZ/EX Point Change = 3
```

Table 6-26:
14th Street Crossing 2, M.P. 23.84, Page 3

```
SSCC
Gates Used = Yes
Min Activation = 0 sec
Rmt Activation Cancel = 2 min
SSCCIV Controller Used = Yes
4000 Control Type = Exit

SSCCIV:  Control and ATCS Setup
SSCCIV Activation = AND 1 XR
Exit Gate : RRR Offset = 0
Exit Gate : LLL Offset = 0
Exit Gate : GGG Offset = 0
Exit Gate : SS Offset = 32769
Exit Gate : Msg Timeout = 3600 msec
Exit Gate : Msg Update Interval = 800 msec
Exit Gate : Max Time Offset = 10 sec

SSCC:  1
SSCC-1 Number of GPs = 1
SSCC-1 Number of GDs = 1
SSCC 1 : Flash Rate = 55
SSCC 1 : Low Battery Detection = No
SSCC 1 : Flash Sync = master
SSCC 1 : Lamp Neutral Test = Off
Aux-1 Xng Ctrl Used = No

OUTPUT:  assignment page 1
OUT 1.1 = OR 1
OUT 1.2 = Adv Preempt

INPUT:  assignment page 1
IN 1.1 = Preempt Health
IN 1.2 = Adv Preempt IP

IO:  assignment SSCC
OUT GC 1 = Gate Output 1
IN 7.1 = Not Used
IN 7.2 = Vehicle Detect Hlth
IN 7.3 = 3 Vehicle Detect
IN 7.4 = Passthru State 1
IN 7.5 = GP 1.1

SEAR
SEAR Subnode = 99
DI 1 = TSS 1
DI 2 = TSS 2
Rly 1 = Not Used
Rly 2 = Not Used
```

```
SEAR:  inputs
SP 2.1 = POK 1
SP 3.1 = Not Used
SP 4.1 = Not Used
SP 5.1 = Not Used
SP 6.1 = Not Used

SEAR:  slot 1-4 inputs
IN 2.1 = General 1
IN 2.2 = General 2
IN 3.1 = Not Used
IN 3.2 = Not Used
IN 4.1 = Not Used
IN 4.2 = Not Used

SEAR:  inputs slot 5
IN 5.1 = Not Used
IN 5.2 = Not Used

SEAR:  inputs slot 6
IN 6.1 = Not Used
IN 6.2 = Not Used

SEAR:  slot 7-8 inputs
IN 7.1 = TSS 5
IN 8.1 = Not Used
IN 8.2 = Not Used
IN 8.3 = Not Used
IN 8.4 = Not Used
IN 8.5 = Not Used

SITE:  programming
Radio Subnode = 1
Field Password = Off
Low Battery Enabled = Off

Configuration Package File
--------------------------
Filename: CONFIG-083128V-2009Jan05.pac
Path: C:\Safetran\DT\Config Files\
Date/Time: 1/05/2009 14:03:29
DT Version: 4.8.5
```

Table 6-27:
11th Street Crossing, M.P. 24.96, Page 1

```
Program Report
--------------

Location and SIN
----------------
DOT Number: 083131X
Milepost Number: 24.06
Site Name: 11th St-Palmer

SIN: 762020014416

MCF and Template Selection
--------------------------
MCF Name: GCP-T6X-02-1.mcf
MCF Revision: 021
MCFCRC: 6076E435

Template = 1A:6 Trk Bi

Check Numbers
-------------
Office Check No. (DT 4.6.0): 28E278B5
Office Check Number: 28E278B5
Config. Check Number: 47B17652
(Based on MCF Revision 021)


Program
-------
BASIC:  module configuration
Track 1 Slot = Track
Track 2/RIO 1 Slot = Not Used
Track 3 Slot = Not Used
Track 4 Slot = Not Used
Track 5/RIO 2 Slot = Not Used
Track 6/RIO 3 Slot = Not Used
SSCC-1 Slot = SSCC3i
SSCC-2 Slot = Not Used
SEAR Used = Yes

BASIC:  MS/GCP operation
Track 1 : MS/GCP Operation = Yes

BASIC:  island operation
Track 1 : Island Used = Internal

BASIC:  preemption
Preempt Logic = Advnce
Adv Preempt Delay = 60 sec
Preempt Hlth IP Used = Yes
Adv Preempt IP Used = Yes
Traffic Sys Hlth IP Used = No
Gate Down Logic Used = No
Second Trn Logic Used = No

BASIC:  radio Dax links
Radio DAX link A Used = No
Radio DAX link B Used = No

BASIC:  Vital Comms links
Vital Comms link 1 Used = No
Vital Comms link 2 Used = Yes
```

```
BASIC:  Vital Comms link 2
HDLink 2 : RRR Offset = 0
HDLink 2 : LLL Offset = 0
HDLink 2 : GGG Offset = 32773
HDLink 2 : SS Offset = 0
HDLink 2 : Msg Timeout = 3600 msec
HDLink 2 : Msg Update Interval = 800 msec
HDLink 2 : Max Time Offset = 10 sec

PREDICTORS:  track 1
Track 1 : Prime Used = Yes
Track 1 : Dax A Used = No
Track 1 : Dax B Used = No
Track 1 : Dax C Used = No
Track 1 : Dax D Used = No
Track 1 : Dax E Used = No
Track 1 : Dax F Used = No
Track 1 : Dax G Used = No
Track 1 : Prmpt Used = Yes

GCP:  track 1
Track 1 : GCP Freq Category = Standard
Track 1 : GCP Frequency = 156 Hz
Track 1 : Approach Distance = 4344 ft
Track 1 : Uni/Bi/Sim-Bidirnl = Bidirnl
Track 1 : GCP Transmit Level = Medium
Track 1 : Island Connection = Isl 1
Track 1 : Island Distance = 175 ft
Track 1 : Computed Distance = 4552 ft
Track 1 : Linearization Steps = 99

GCP:  track 1 enhanced det
Track 1 : Inbound PS Sensitivity = High
Track 1 : Speed Limiting Used = Yes
Track 1 : Outbound False Act Lvl = Normal
Track 1 : Outbound PS Timer = 20 sec
Track 1 : Trailing Switch Logic = On
Track 1 : Post Joint Detn Time = 15 sec
Track 1 : Adv Appr Predn = No
Track 1 : Cancel Pickup Delay = This Isl

GCP:  track 1 prime
Track 1 : Prime Warning Time = 38 sec
Track 1 : Prime Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prime MS/GCP Mode = Pred
Track 1 : Prime Pickup Delay = 15 sec
Track 1 : Prime UAX = Not Used

GCP:  track 1 preempt
Track 1 : Prmpt Warning Time = 98 sec
Track 1 : Prmpt Offset Distance = 0 ft
Track 1 : Switch MS EZ Level = 10
Track 1 : Prmpt MS/GCP Mode = Pred
Track 1 : Prmpt Pickup Delay = 15 sec
Track 1 : Prmpt Enable = Not Used

GCP:  track 1 pos start
Track 1 : Positive Start = Off
Track 1 : Sudden Shnt Det Used = No
Track 1 : Low EZ Detection Used = No
```

Table 6-28:
11th Street Crossing 2, M.P. 24.96, Page 2

```
GCP:  track 1 MS Control
Track 1 : MS/GCP Ctrl IP Used = No
Track 1 : MS Sensitivity Level = 0
Track 1 : Compensation Level = 1300
Track 1 : Warn Time-Ballast Comp = High
Track 1 : Low EX Adjustment = 39
Track 1 : Bidirn Dax Passthru = No
Track 1 : False Act on Train Stop = No
Track 1 : EX Limiting Used = Yes
Track 1 : EZ Correction Used = Yes

ISLAND:  track 1
Track 1 : Isl Frequency = 5.9 kHz
Track 1 : Pickup Delay (2s +) = 0 sec
Track 1 : Isl Enable IP Used = No

AND:  track Anding
AND 1 XR Used = Yes
AND 2 Used = Yes
AND 3 Used = Yes
AND 4 Used = No
AND 5 Used = No
AND 6 Used = No
AND 7 Used = No
AND 8 Used = No

AND:  AND 1 XR
AND 1 XR Track 1 = Prime
AND 1 Enable Used = Yes
And 1 Enable Pickup = 5 sec
AND 1 Enable Drop = 0 sec
AND 1 Wrap Used = No

AND:  AND 2
AND 2 Track 1 = Not Used
AND 2 Enable Used = Yes
AND 2 Enable Pickup = 2 sec
AND 2 Enable Drop = 0 sec
AND 2 Wrap Used = No

AND:  AND 3
AND 3 Track 1 = Isl Only
AND 3 Enable Used = No
AND 3 Wrap Used = No

ADVANCED:  MS restart
MS/GCP Restart Used = No

ADVANCED:  out of service
OOS Control = Display+OOS IPs
OOS Timeout = Yes
OOS Timeout = 1 hrs

ADVANCED:  out of service 2
T1 OOS Control = OOS Input 1

ADVANCED:  track wrap circuits
Wrap LOS Timer = 5 sec
Track 1 Wrap Used = No

ADVANCED:  trk 1 overrides
Track 1 : All Predictors Override Used = No
```

```
ADVANCED:  OR logic
OR 1 Used = Yes
OR 2 Used = No
OR 3 Used = No
OR 4 Used = No

ADVANCED:  OR 1
OR 1 Term 1 = AND 2
OR 1 Term 2 = NOT AND 3
OR 1 Term 3 = Not Used
OR 1 Term 4 = Not Used

ADVANCED:  internal I/O 1
Pass Thrus = Yes
Int.1 Sets = Adv Preempt IP
Int.1 Set by = Vital Link 2 OP 1
Int.2 Sets = AND 1 XR Enable
Int.2 Set by = Rmt SSCCIV OP 3
Int.3 Sets = Out Of Service IP 1
Int.3 Set by = Rmt SSCCIV OP 4
Int.4 Sets = AND 2 Enable
Int.4 Set by = Rmt SSCCIV OP 1

ADVANCED:  internal I/O 2
Int.5 Sets = AND 2 Enable
Int.5 Set by = Rmt SSCCIV OP 2
Int.6 Sets = GD 1.1
Int.6 Set by = Passthru State 1
Int.7 Sets = AND 2 Enable
Int.7 Set by = Passthru State 1
Int.8 Sets = Not Used
Int.8 Set by = Not Used

ADVANCED:  internal I/O 3
Int.9 Sets = Not Used
Int.9 Set by = Not Used
Int.10 Sets = Not Used
Int.10 Set by = Not Used
Int.11 Sets = Not Used
Int.11 Set by = Not Used
Int.12 Sets = Not Used
Int.12 Set by = Not Used

ADVANCED:  internal I/O 4
Int.13 Sets = Not Used
Int.13 Set by = Not Used
Int.14 Sets = Not Used
Int.14 Set by = Not Used
Int.15 Sets = Not Used
Int.15 Set by = Not Used
Int.16 Sets = Not Used
Int.16 Set by = Not Used

ADVANCED:  site options
Daylight Savings = Off
Units = Standard
Maint Call Rpt IP Used = No
Emergency Activate IP = No
EZ/EX Logging = Change
EZ/EX Point Change = 3
```

Table 6-29:
11th Street Crossing 2, M.P. 24.96, Page 3

```
SSCC                                         SEAR
Gates Used = Yes                             SEAR Subnode = 99
Min Activation = 0 sec                       DI 1 = TSS 1
Rmt Activation Cancel = 2 min                DI 2 = TSS 2
SSCCIV Controller Used = Yes                 Rly 1 = Not Used
4000 Control Type = Exit                     Rly 2 = Not Used

SSCCIV:  Control and ATCS Setup              SEAR:  inputs
SSCCIV Activation = AND 1 XR                 SP 2.1 = POK 1
Exit Gate : RRR Offset = 0                   SP 3.1 = Not Used
Exit Gate : LLL Offset = 0                   SP 4.1 = Not Used
Exit Gate : GGG Offset = 0                   SP 5.1 = Not Used
Exit Gate : SS Offset = 32769                SP 6.1 = Not Used
Exit Gate : Msg Timeout = 3600 msec
Exit Gate : Msg Update Interval = 800 msec   SEAR:  slot 1-4 inputs
Exit Gate : Max Time Offset = 10 sec         IN 2.1 = General 1
                                             IN 2.2 = General 2
SSCC:  1                                     IN 3.1 = Not Used
SSCC-1 Number of GPs = 1                     IN 3.2 = Not Used
SSCC-1 Number of GDs = 1                     IN 4.1 = Not Used
SSCC 1 : Flash Rate = 55                     IN 4.2 = Not Used
SSCC 1 : Low Battery Detection = No          SEAR:  inputs slot 5
SSCC 1 : Flash Sync = master                 IN 5.1 = Not Used
SSCC 1 : Lamp Neutral Test = Off             IN 5.2 = Not Used
Aux-1 Xng Ctrl Used = No
                                             SEAR:  inputs slot 6
OUTPUT:  assignment page 1                   IN 6.1 = Not Used
OUT 1.1 = OR 1                               IN 6.2 = Not Used
OUT 1.2 = Adv Preempt
                                             SEAR:  slot 7-8 inputs
INPUT:  assignment page 1                    IN 7.1 = TSS 5
IN 1.1 = Preempt Health                      IN 8.1 = Not Used
IN 1.2 = Adv Preempt IP                      IN 8.2 = Not Used
                                             IN 8.3 = Not Used
IO:  assignment SSCC                         IN 8.4 = Not Used
OUT GC 1 = Gate Output 1                     IN 8.5 = Not Used
IN 7.1 = Not Used
IN 7.2 = Vehicle Detect Hlth                 SITE:  programming
IN 7.3 = 3 Vehicle Detect                    Radio Subnode = 1
IN 7.4 = Passthru State 1                    Field Password = On
IN 7.5 = GP 1.1                              Low Battery Enabled = Off

                                             Configuration Package File
                                             --------------------------
                                             Filename: CONFIG-083131X-2009Jan06.pac
                                             Path: C:\Safetran\DT\Config Files\
                                             Date/Time: 1/06/2009 7:31:00
                                             DT Version: 4.8.5
```

6.12 BIDIRECTIONAL DAXING OPERATIONS

There are constraints on allocation of GCP frequencies on the same track for closely spaced adjacent crossings. When there is a high density of crossings in an area, all of the lower frequencies may be allocated requiring the use of higher frequencies or insulated joints to isolate sections of track. Use of the higher frequencies is frequently avoided due to the limitations in approach distance capabilities impacting the system's ability to achieve the desired approach length for the crossing.

The traditional solution is to install a unidirectional GCP at insulated joints which can provide the advanced start (DAX) for the bidirectional crossings. However, where insulated joints do not exist at the desired location, this may be a significant incremental cost and often necessitates changes to the installed signaling system as well as the additional maintenance costs associated with maintaining the additional equipment and material

Bidirectional DAXing provides a method whereby bidirectional Model 4000 GCP units can DAX to each other. This allows railroads and agencies to utilize a greater range of the available GCP channels where the railroad or agency would otherwise be limited due to train speed and or seasonal ballast problems caused by salt contamination within the crossing islands, other crossing islands within a crossing's approach, and or around commuter station platforms. These three conditions are mitigated by utilizing bidirectional DAXing to allow for the permanent shortening of the GCP approaches, with the full approach provided by remote GCPs located at bidirectional DAX locations.

Utilization of bidirectional DAXing GCP units saves the railroad or agency the expense of having to install a coded track repeater along with the insulated joints to isolate between track circuits. Bidirectional DAXing is accomplished either by the use of GCP vital inputs and outputs or through the use of the Model 4000 GCP Phased Shift Overlay (PSO) Module.

6.12.1 Model 4000 GCP Phased Shift Overlay (PSO) Module, A80423-03

NOTE

For further general information regarding the Model 4000 GCP Phase Shift Overlay (PSO) Module, P/N 80428-03 not found in this manual, please refer to Siemens' Phase Shift Overlay 4000 (PSO 4000) Installation and Instruction Manual, SIG-00-07-06.

The Model 4000 GCP Phased Shift Overlay (PSO) Module, A80428-03, is a track occupancy overlay system that is used in conjunction with other GCP modules to determine direction of train travel, act as an occupancy detector, or perform other functions within a bidirectional DAXing environment. Depending upon the application, the PSO module utilizes a transmitter, a receiver or both.

The Transmitter generates a modulated audio-frequency track signal. It sends a coded, 8-bit address code through the rails using an audio frequency signal as a carrier. The rail connections for the coupling unit delimit the other end of the track circuit. The modulated signal is detected by the receiver where it is decoded and processed. The Receiver responds only to signals of the proper frequency, address, and amplitude. The ability of the PSO module to differentiate between its operating signal and all other signals present on the track is due to the nonsymmetrical coded modulation and receiver decoding techniques which ensure that the system is immune to random or foreign AM, FM, and beat signals. The receiver decodes the signal and, if it qualifies the signal as valid, the receiver produces an output to energize a vital relay, if so programmed.

No insulated joints are needed to confine the signal because the coupling units have low impedance at the operating frequency of the track circuit, and high impedance at all other frequencies.

The PSO module is available with a wide variety of carrier frequencies. Sixteen PSO carrier frequencies, ranging from 156 Hz to 4000 Hz, are available for use in non-electrified territory and an additional 31 common frequencies, ranging from 500 Hz to 10200 Hz, typically used by non-Siemens equipment, are also available for use. For installations where multiple circuits are required on the same track, the PSO module has two sets of eight frequencies each that can be connected as required with negligible interference.

6.12.2 PSO Module Specifications

6.12.2.1 Frequencies Available for Use with PSO Module

WARNING

NEVER USE AN APPROACH FREQUENCY THAT IS THE SAME AS THE ISLAND FREQUENCY.

The standard Siemens PSO module frequencies depicted in Table 6-30 are available for use with PSO module when utilized as a PSO transmitter or receiver. The alternate frequencies depicted in Table 6-30 are those typically used by other equipment and are available for use with PSO module. However, the alternate frequencies use Siemens modulation patterns and are not directly compatible with non-Siemens transmitters or receivers. When PSO module Receiver-Transmitter pairs are deployed, they can be substituted for other non-PSO II/III legacy overlay equipment operating on the same channel.

Table 6-30:
Frequencies Available for Use with PSO Module

APPLICATION TYPE	FREQUENCIES UTILIZED
Standard PSO frequencies (Hz)	156, 211, 285, 348, 430, 525, 645, 790, 970, 1180, 1450, 1770, 2140, 2630, 3240, 4000
Alternate PSO frequencies (Hz)	500, 700, 900, 1000, 1100, 1125, 1250, 1300, 1375, 1500, 1600, 1640, 1750, 1875, 2175, 2300, 2675, 2800, 3100, 3500, 4000, 4900, 5400, 5900, 6400, 7100, 7700, 8300, 8900, 9500, 10200

Table 6-31:
PSO Module Track Frequency Groups

GROUP NUMBER	FREQUENCIES UTILIZED
1	156, 285, 430, 645, 970, 1450, 2140, 3240,
2	211, 348, 525, 790, 1180, 1770, 2630, 4000

NOTE

In some site specific applications, the use of Transmitter Line-to-Rail Coupler, 7A399-f and Tuned Receiver Coupler, 7A355-f may be required to resolve EX loading issues.

All frequencies within a group are compatible and may be intermixed without restriction on the same rails without insulated joint separation.

6.12.2.2 Maximum Operating Distances and Frequency Interoperability

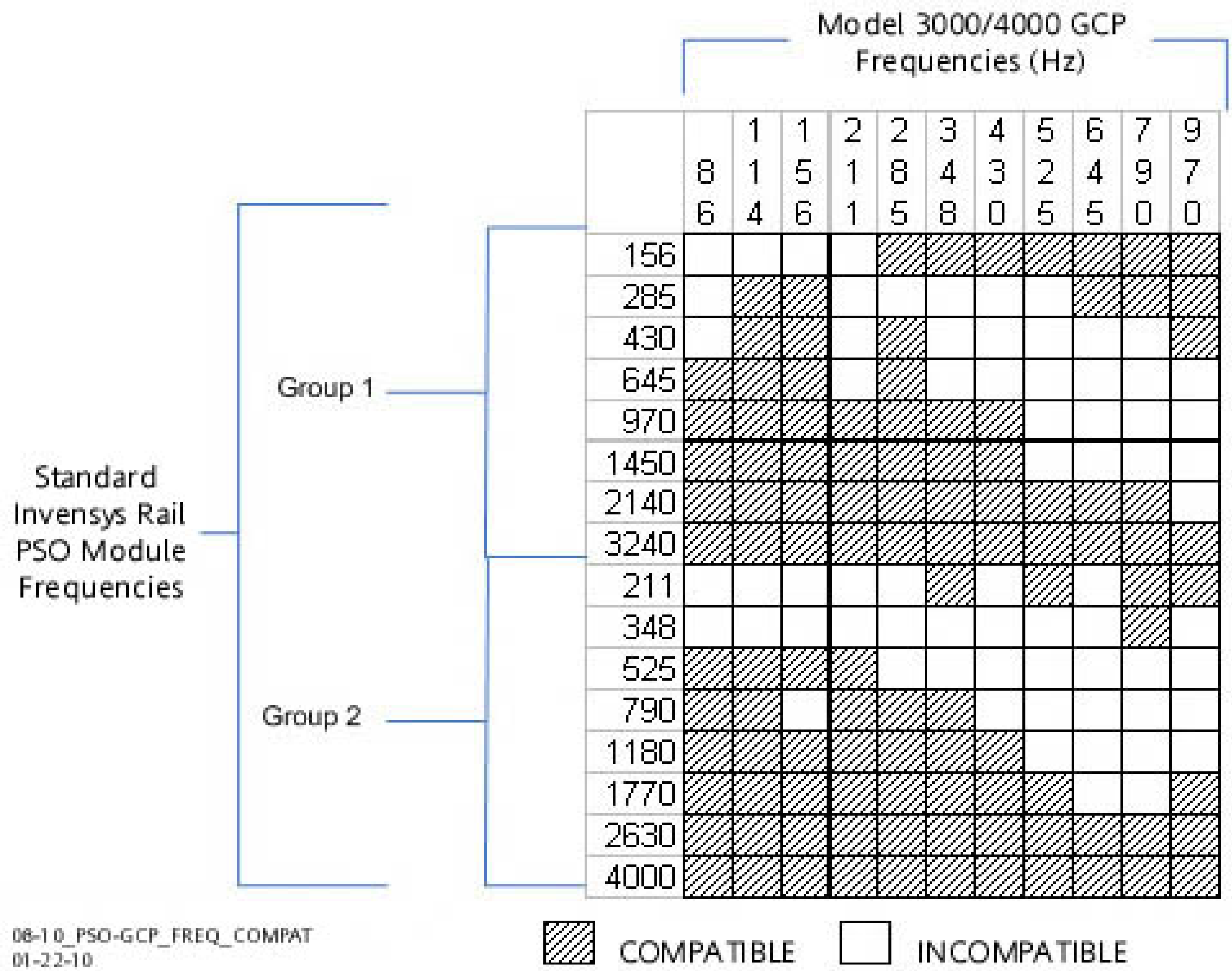
Table 6-32:
Maximum Operating Distances at 0.06-Ohm Shunting Sensitivity

APPLICATION	GROUP	FREQUENCY (HZ)	BALLAST	
			2 Ω/1,000 FT. OPERATING DISTANCE (FT./M)	4 Ω/1,000 FT. OPERATING DISTANCE (FT./M)
PSO MODULE FREQUENCIES	1	156	9,000/2,895.6	12,500/3,810.0
		285	6,900/2,103.1	9,800/2,987.0
		430	5,800/1,767.8	8,000/2,438.4
		645	4,700/1,432.6	6,600/2,011.7
		970	3,900/1,188.7	5,500/1,676.4
		1,450	3,300/1,005.8	4,600/1,402.1
		2,140	2,600/792.5	3,800/1,158.2
		3,240	2,100/640.1	3,000/914.4
	2	211	7,900/2,407.9	11,100/1,183.3
		348	6,300/1,920.2	9,000/2,743.2
		525	5,300/1,615.4	6,100/1,859.3
		790	4,300/1,310.6	5,500/1,676.4
		1,180	3,700/1,127.8	5,200/1,585.
		1,770	3,000/914.4	4,200/1,280.2
		2,630	2,400/731.5	3,300/1,005.8
		4,000	2,000/670.6	2,800/853.4

The maximum operating distances shown in are between transmitter and receiver track wire connections for end-fed track circuits. For center-fed track circuits, double the distances given to obtain the maximum receiver-to-receiver distance.

Table X-XX depicts the frequency compatibility between the PSO Module frequencies and the Track Card frequencies found on the Model 4000 GCP and Model 3000 GCP.

Table 6-33:
PSO Module and GCP Track Card Frequency Compatibility



6.12.3 PSO Module Utilization

The PSO module can be placed in slots 1, 3, or 4 of the GCP chassis. The PSO module can operate in all three locations simultaneously. The PSO module may operate in any configuration in track module locations 1, 3, and 4 with any combination of functional track modules or RIO modules.

The PSO module may operate without insulated joints at either end or both ends of the track circuit.

The PSO operates on both the main and standby sides of the GCP, and transfers all PSO calibration parameters between the two sides of the GCP. If an unhealthy PSO module is detected, the GCP will perform a transfer operation, depending upon the time programmed on the transfer module.

6.12.4 PSO Module User Interface

The Model 4000 GCP Display Terminal (DT) controls all of the PSO module's functionality and input/output assignments. Generally, the DT sequences programming of track modules first, then PSO modules, and finishes with programming of RIO modules.

The user interface for the PSO Module is comprised of various DT screens and one display mounted on the PSO module:

- Model 4000 GCP DT Window with PSO Summary Data
- PSO Detail Status View Window
- PSO Calibration Window
- PSO 4-Character Display (on PSO module)
- Bidirectional DAX Configuration Programming Windows (e.g., GCP: track 'n' BIDAX RX and/or GCP: track 'n' BIDAX TX).

Each type of window or display is discussed below.

6.12.4.1 <u>Model 4000 GCP DT Window with PSO Summary Data</u>

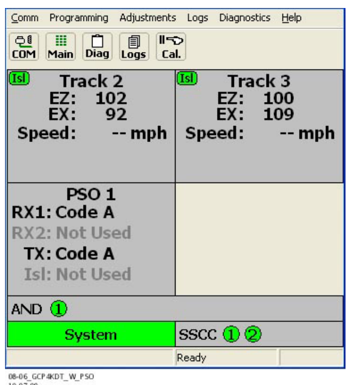


Figure 6-183:
Model 4000 GCP DT Window with PSO Summary Data

The DT interface for the PSO Summary Window displays the following information when so configured:

- Displays the status of the two PSO receivers as follows:
  - Displays "RXn" in black when configured as a PSO receiver
  - Displays "RXn" as shadowed/grayed when not configured as a PSO receiver
  - Displays the code being received when configured as a PSO receiver.
  - Displays "RXn Cal Req" when configured as an receiver and not calibrated
- Displays the status of the PSO Transmitter as follows:
  - Displays "TX" in black when configured as a PSO transmitter
  - Displays "TX" as shadowed/grayed when not configured as a PSO transmitter
  - Displays the code being transmitted when configured as a PSO transmitter

6.12.4.2 PSO Detail Status View Window

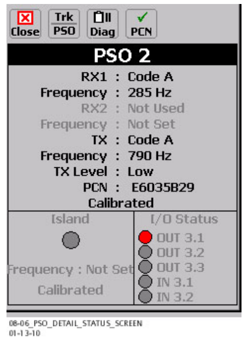


Figure 6-184:
PSO Detail Status View Window

The DT interface for the PSO Detail View Window displays the following information when so configured:

- Displays the status of the two PSO receivers as follows:
  - Displays "RXn" in black when configured as a PSO receiver
  - Displays "RXn" as shadowed/grayed when not configured as a PSO receiver
  - Displays the code being received when configured as a PSO receiver.
  - Displays "RXn Cal Req" when configured as an receiver and not calibrated
  - Displays the programmed receiver frequency
- Displays the status of the PSO Transmitter as follows:
  - Displays "TX" in black when configured as a PSO transmitter
  - Displays "TX" as shadowed/grayed when not configured as a PSO transmitter
  - Displays the code being transmitted when configured as a PSO transmitter
  - Displays the programmed transmitter frequency
  - Displays the transmitter level when the PSO transmitter is enabled
- Displays the "PSO Track Check Number (PCN) when configured as a Transmitter or a Receiver
- Displays the Calibration status for the enabled receiver(s)
- Displays the I/O status for the PSO module depicted

6.12.4.3 PSO Calibration Window

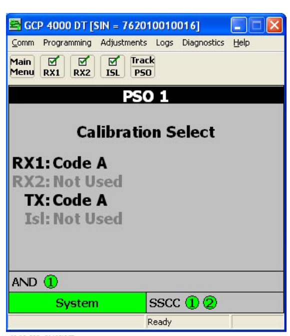


Figure 6-185:
The PSO Calibration Select Window

The DT PSO Calibration screen allows the PSO receivers to be calibrated

6.12.4.4 PSO 4-Character Display

The PSO module's 4-Character display provides information on the following items of information:

- The 4-Character Display displays "PSO" and "*PSO" alternating at a one second interval.
- The 4-Character Display displays "ERR:" followed by the 4 character mnemonic error code(s) when the PSO module detects an error condition.
- The 4-Character Display displays "CAL" and *CAL" alternating at a one second interval when any enabled receiver or island is being calibrated

The 4-Character Display's priority of operation will display the calibration message over the errors message and the errors message over the idle PSO message.

6.12.5 PSO Output Indications

There are three types of indications provided by the GCP regarding the PSO to users. They are:

- Received Code Indications
- Health Indications
- Occupation Indications

6.12.5.1 Received PSO Code Indications

The GCP unit allows users to configure outputs based on codes received, e.g., Energize output "n" when code A is received on Receiver 1 (RX1).

6.12.5.2 Health Indications

The GCP unit allows users to configure individual outputs as individual PSO module health indications, e.g., one output is configured for each PSO module. Multiple PSO module health indications may be configured such that their status is reported by one output, e.g., one output is configured to cover all PSO modules. The health indication is tied to the Model GCP 4000 unit Maintenance Call output.

The GCP unit allows users to configure the following health indication outputs:

- RX1
- RX2
- TX

6.12.5.3 Occupation Outputs

The GCP unit allows users to configure an output to provide occupancy indications for the following items:

- PSO RX1
- PSO RX2

6.12.6 Bidirectional DAXing

Bidirectional DAXing is programmed on the **GCP: track "N" BIDAX RX** or **GCP: track "N" BIDAX TX** windows. The DT supports programming the following BIDAX setup configuration parameters:

- Disabled (No parameters are displayed. In this case, the window is a placeholder only)
- Vital I/O (driven by external inputs and outputs)
- Internal PSO (GCP PSO at each outer unit)
- Center Fed PSO (PSO 4000 unit emplaced centrally with GCP PSO unit for each outer limit)

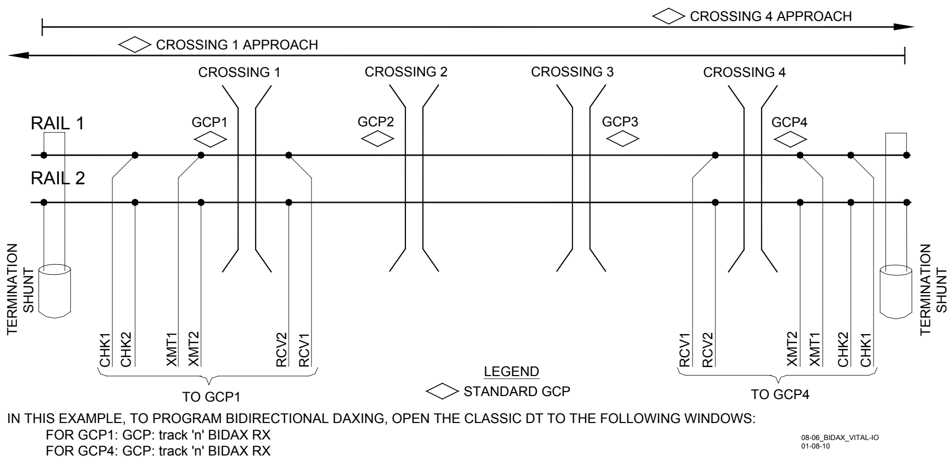


Figure 6-186:
Typical BIDAX Vital IO Application

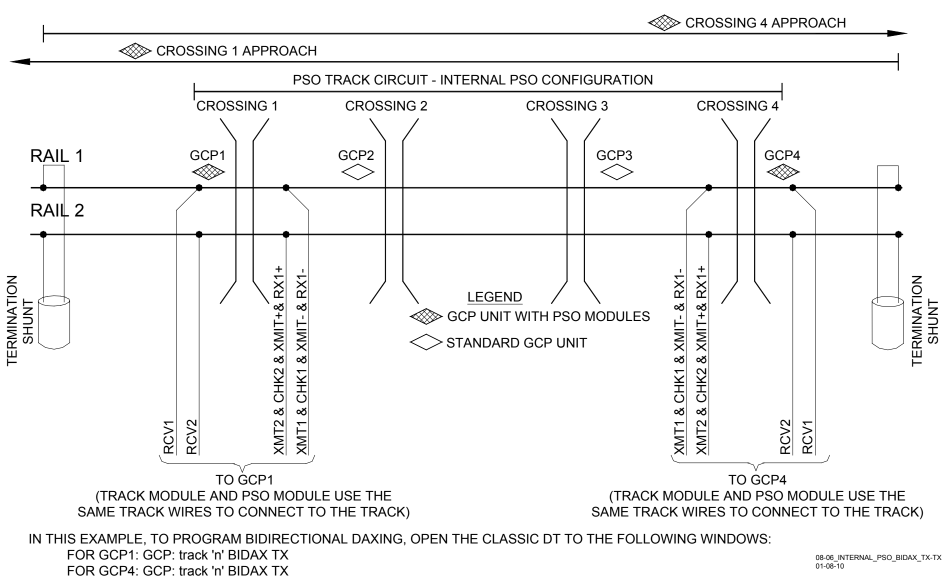


Figure 6-187:
Typical BIDAX Internal PSO Application

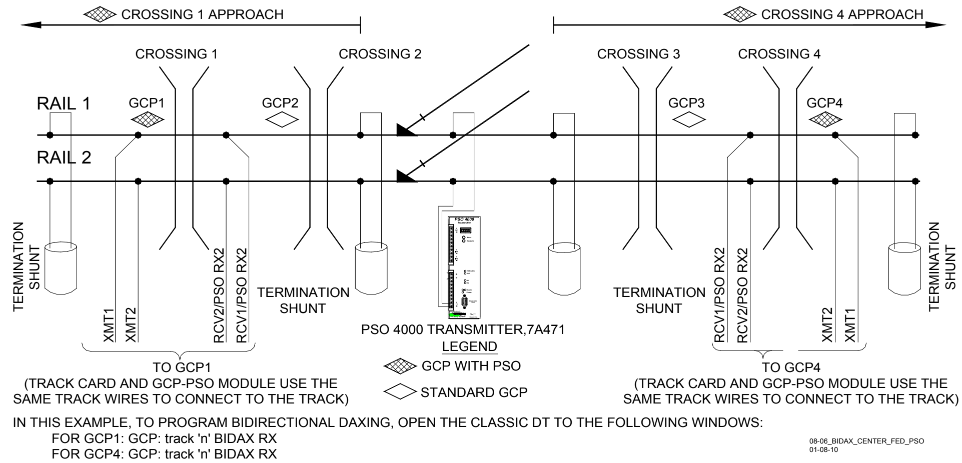


Figure 6-188:
Typical BIDAX Center Fed PSO Application

When configured for bidirectional DAXing, the parameters and ranges of values depicted in Table 6-34 are available.

Table 6-34:
Bidirectional DAXing Parameters

PARAMETER	RANGE OF VALUES
BIDAX to Rx/Tx Appr[2]	**Not Used**, Internal PSO, Center Fed PSO, Vital I/O
Stick Release Time[2]	1 – 30 minutes in 1 minute increments (Default = **10 minutes)**
Approach Clear Time[2]	1 – 600 seconds in 1 second increments (Default = **60 seconds**)
Stick EZ Value[3]	**20** – 100 in 1 EZ increments
Approach Clear EZ Value[3]	0 – **80**[1]
PSO module selected	**Not Set,** PSO-1, PSO-2, PSO-3

(Default values are displayed in **Bold** text)

1 The Approach Clear EZ is set when the bidirectional DAX systems approach terminates in the outer approach of the adjacent bidirectional DAX system. A shunt is placed at the track connection point of the adjacent Bidax unit's inner approach and the EZ value entered for the Approach Clear EZ value, otherwise the default setting is used.

2 The parameter is OCCN protected

3 The parameter is Field Programmable and not part of the OCCN

These settings are configurable in either online or offline DT modes.

The Stick Release Time parameter sets the length of time for the stick to be held while the train is in the approach. The Stick Release Time parameter should be programmed to the amount of time that the stick should remain set if a train were to stop between the bidirectional DAX systems.

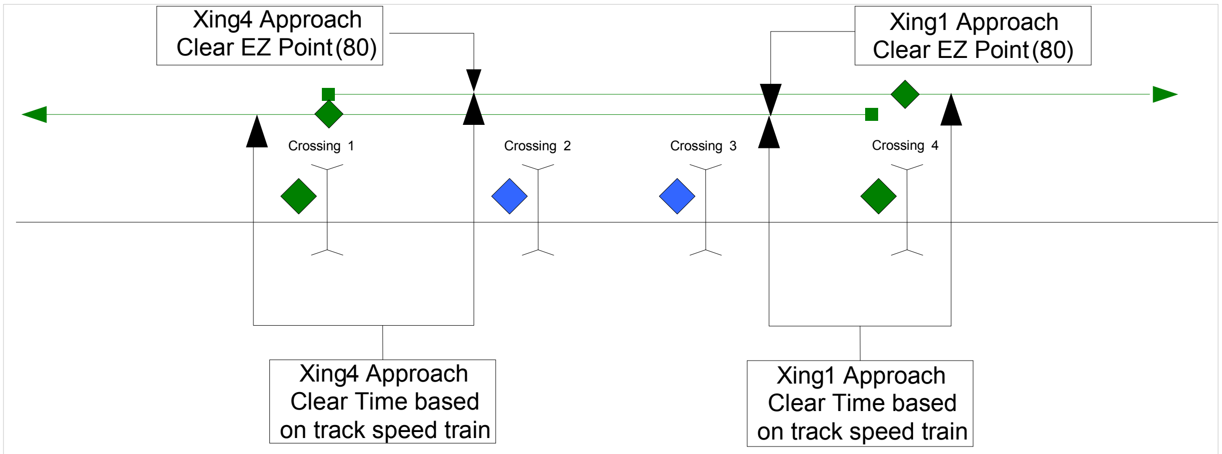


Figure 6-189: Approach Clear Time

The Approach Clear Time parameter should be programmed to the time it takes the train to travel from Approach Clear EZ point on this systems approach to the far side of the island of the adjacent bidirectional DAX system for the track speed train.

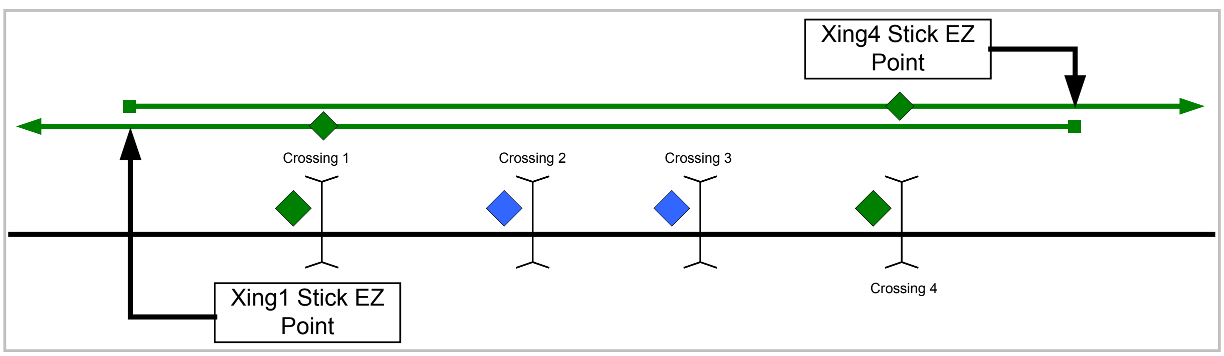


Figure 6-190: Stick EZ Value

The Stick EZ Value is determined by placing a shunt at the location of the termination shunt for the adjacent crossing within the crossing approach being setup and adding 5 EZ. If the adjacent crossing does not terminate in the outer approach of this crossing then the Stick EZ should be set to minimum.

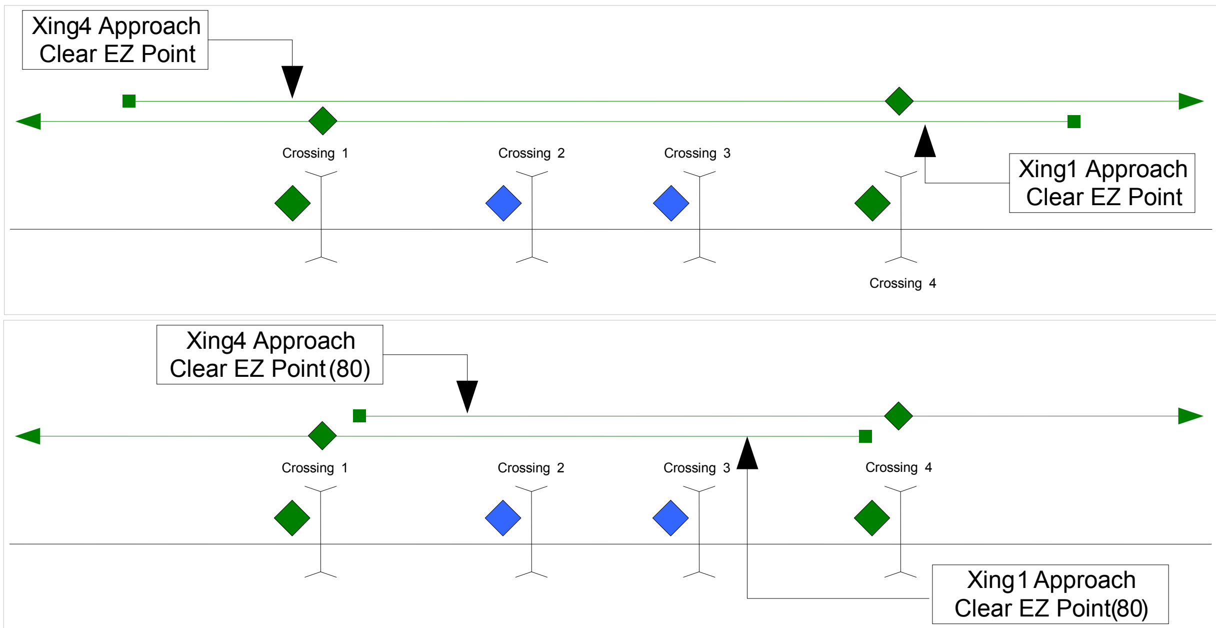


Figure 6-191:
Approach Clear EZ

The Approach Clear EZ Value is used to set the EZ value representing a clear approach. Once EZ is greater than the Approach Clear EZ value the system will start running the Approach Clear Timer if no train motion is present. The Approach Clear EZ value will normally be set to 80 (as depicted in the lower portion of Figure 6-191) except when this crossing's approach extends through the adjacent bidirectional DAX system crossing island (as depicted in the upper portion of Figure 6-191). When this crossing approach overlaps the adjacent bidirectional DAX system crossing island the Approach Clear EZ is determined by placing a shunt on the far side of the adjacent bidirectional DAX system crossing island (at the farthest track leads) and recording the EZ value of this bidirectional DAX system. The Approach Clear EZ value will be set to the EZ value plus 5. If there is no overlap, the Approach Clear EZ value should be left at the default value.

Additionally, the following Bidirectional DAX functionality selections are configurable:

- Bidirectional DAX functionality is configurable per track
- Bidirectional DAX functionality is configurable per each track's approach, e.g., transmit wire connection or receive wire connection. (This allows for a bidirectional DAX unit to be an outer unit for two adjacent bidirectional DAX circuits.)
- Each bidirectional DAX track approach configuration operates independently of another within the same GCP unit

When configured with an Internal PSO, the Model 4000 GCP unit:

- Allows the user to select which internal PSO module will be dedicated to the Internal PSO bidirectional DAX functionality from the PSO modules configured.
- Uses Receiver 1 (RX1) from the internal PSO module selected for the bidirectional DAX functionality
- Uses the Transmitter from the internal PSO module selected for the bidirectional DAX functionality

When configured with a Center Fed PSO, the Model 4000 GCP unit uses Receiver 2 (RX2) from the internal PSO module selected for the bidirectional DAX functionality.:

In any enabled bidirectional DAX configuration, the GCP Bidirectional DAX system:

- Sets the Approach Clear Timer to the programmed Approach Clear Time when EZ is less than the Approach Clear EZ and the Stick Release Timer is set.
- Starts the Approach Clear Timer when the EZ is greater than the Approach Clear EZ and no inbound or outbound motion is seen on the unit’s approach.
- Freezes the Approach Clear Timer at its current value when the EZ is greater than 80 and inbound or outbound motion is seen on the unit’s approach.
- Clears all bidirectional DAX sticks and timers when a system fault occurs. A system fault is one that is not associated with a train move (e.g., the track module health is bad). Any fault associated with a train move (e.g., enhanced detection) is not considered a system fault in this context.
- Clears all bidirectional DAX sticks and timers if the Emergency Activate Input de-energizes.
- Keeps all bidirectional DAX sticks and timers clear while the Emergency Activate Input is de-energized.

6.12.6.1 Programming Bidirectional DAX Configuration Parameters

In applications where the Model 4000 GCP is positioned to DAX bidirectionally, e.g., between two or more Model 4000 GCPs all of which are programmed for bidirectional DAXing, the system must identify which direction of travel is associated with each DAX. This is accomplished using the GCP: track “n” ‘DAX A-G window’s DAX A-G Track Side parameter. The values of this parameter are either TX Wires Side or RX Wire Side.

Figure 6-192:
Bidirectional DAX Track Side Connections

Generally, BIDAX outputs and inputs are used to indicate the presence of a train and to set the stick of the downstream crossing. The BIDAX Input is used to set the stick and prevent DAXes from predicting for the inbound train. The BIDAX Output is used to report the presence of an inbound train to the upstream crossing.

6.12.6.1.1 BIDAX Setup Configuration for Vital I/O

NOTE

To properly operate, the Vital IO application must have a six-wire track connection and the Directionally Wired parameter must be set to Yes.

When Vital I/O is selected as the BIDAX to RX/TX Appr parameter, the following parameters are displayed.

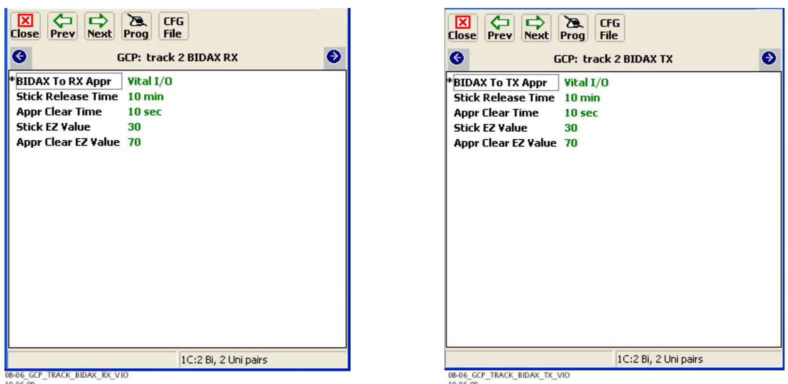


Figure 6-193:
GCP: Track "N" BIDAX RX Windows, Typical Vital I/O Application

The Vital IO application (see Figure 6-186) must have a six-wire track connection and the Directionally Wired parameter must be enabled in order to properly operate (see Figure 6-194). The Directionally Wired parameter is found on the GCP: track 'n' window.

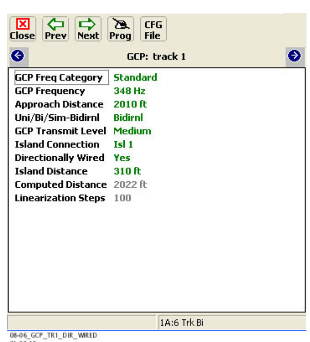


Figure 6-194:
Setting the Directionally Wired Parameter

Table 6-35:
GCP: track "N" BIDAX Rx/Tx Parameters – Vital I/O Selected

PARAMETER	RANGE OF VALUES
• BIDAX to Rx/Tx Appr	Vital I/O
• Stick Release Time	**1** – 30 min.
• Approach Clear Time	**1** – 600 sec.
• Stick EZ Value	**20** – 100
• Approach Clear EZ Value	0 – **80**.

(Default values are displayed in **Bold** text)

6.12.6.1.2 BIDAX Setup for Internal PSO

NOTE

When programming Internal PSO parameters, the frequency selected for the transmit frequency of the East Crossing PSO is the receive frequency of the West Crossing PSO, and the receive frequency of the East Crossing PSO is the transmit frequency of the West Crossing PSO.

When Internal PSO is selected as the BIDAX to RX/TX Appr parameter, the following parameters are displayed.

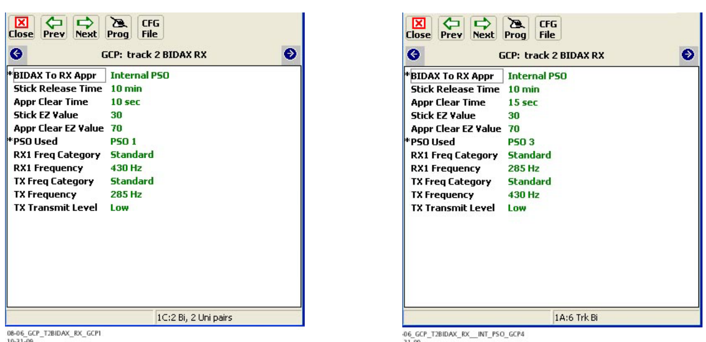


Figure 6-195:
GCP: Track "N" BIDAX RX Windows,
Internal PSO Selected, Outermost Crossing GCPs Depicted

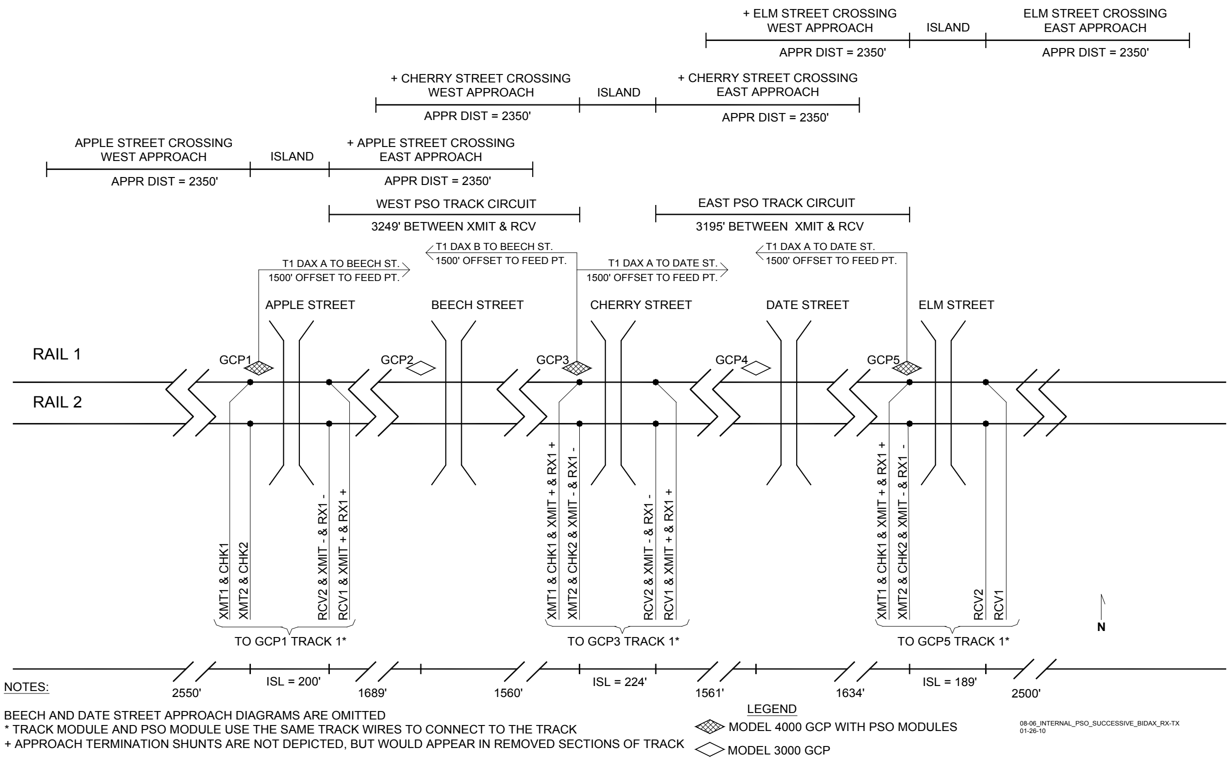


Figure 6-196:
Typical Successive BIDAX Application

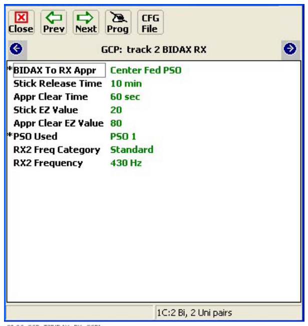
Table 6-36:
GCP: track “N” BIDAX Rx Parameters – Internal PSO Selected

PARAMETER	RANGE OF VALUES
• BIDAX to RX/TX Appr	Internal PSO
• Stick Release Time	**1** – 30 min.
• Approach Clear Time	**1** – 600 sec.
• Stick EZ Value	**20** – 100
• Approach Clear EZ Value	0 – **80**.
• PSO Used	**Not Set**, PSO 1, PSO 2, PSO 3
• RX1 Frequency Category	**Standard**, Alternate
• RX1 Frequency	See Table 6-30’s Std. PSO Freq. row. Default = **Not Selected.**
• TX Frequency Category	**Standard**, Alternate
• TX Frequency	See Table 6-30’s Std. PSO Freq. row. Default = **Not Selected.**
• TX Level	**Low**, High

(Default values are displayed in **Bold** text)

6.12.6.1.3 BIDAX Setup for Center Fed PSO

When Center Fed PSO (see Figure 6-188) is selected as the BIDAX to RX/TX Appr parameter, the following parameters are displayed.



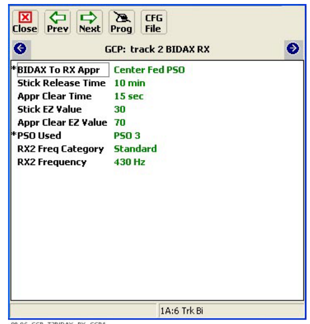


Figure 6-197:
GCP: Track "N" BIDAX Rx/Tx Windows,
Center Fed PSO, Outermost Crossing GCPs Depicted

Table 6-37:
GCP: track "N" BIDAX Rx Parameters – Center Fed PSO Selected

PARAMETER	RANGE OF VALUES
• BIDAX to RX/TX Appr	Center Fed PSO
• Stick Release Time	**1** – 30 min.
• Approach Clear Time	**1** – 600 sec.
• Stick EZ Value	**20** – 100
• Approach Clear EZ Value	0 – **80**.
• PSO Used	**Not Set**, PSO 1, PSO 2, PSO 3
• RX2 Frequency Category	**Standard**, Alternate
• RX2 Frequency	See Table 6-30's Std. PSO Freq. row. Default = **Not Selected.**

(Default values are displayed in **Bold** text)

6.12.7 Bidirectional DAX Application Guidelines

6.12.7.1 Vital I/O Configuration

No PSO Modules are used in this configuration; in this configuration direction determination at the island as well as Vital I/O actions are determined using the GCP's track wire connections. The GCP Bidirectional DAX system's BIDAX to RX/TX Appr parameter is set to Vital I/O where the GCP's internal logic handles all BIDAX issues.

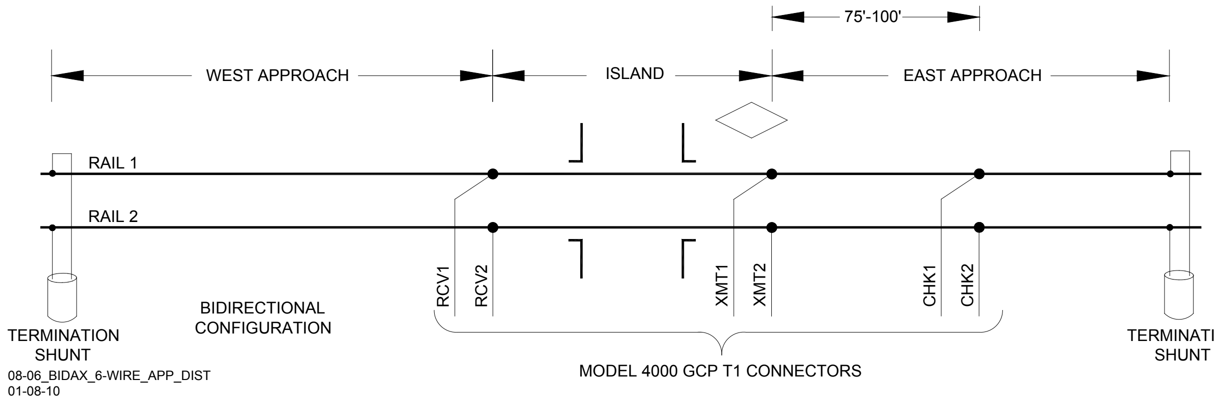


Figure 6-198:
Typical Six-Wire Track Connections Used in Vital IO Applications

In this configuration, a six wire connection, one where the Check wires are physically separated from the Transmit wires, is required in order to allow the system to determine train direction. The wires are separated by between 75 – 100 feet (see Figure 6-186).

The parameter "Directionally Wired" that appears on the GCP: track 'n' window (see Figure 6-194) enables the system to determine train direction. As an example, as the train passes through the crossing, it crosses the Receive wire, then the Transmit wire followed by the Check wire. The system notes this as the train direction.

The GCP unit allows the user to configure the following parameters when the Vital I/O configuration is selected:

- BIDAX To RX/TX Appr
- Stick Release Time
- Approach Clear Time
- Stick EZ Value
- Approach Clear EZ

When configured as a Vital I/O Bidirectional DAX, the GCP unit allows users:

- To configure any GCP input as a BIDAX input.
- To configure any GCP output as a BIDAX output.

When configured as a Vital I/O Bidirectional DAX, the GCP unit's Bidirectional DAX system:

- Keeps the BIDAX output normally de-energized
- Keeps the BIDAX output de-energized when any of the zero offset predictors are de-energized due to a system fault that is not associated with a train movement (e.g., an EX process error would result in the BIDAX output energizing since this is a result of train movement).

When configured as a Vital I/O Bidirectional DAX, the GCP unit's Bidirectional DAX system energizes its BIDAX output when the following condition, and all of the sub-conditions for a given condition, are true:

- EZ is less than or equal to programmed Stick EZ value and all of the following sub-conditions are true:
  - Any zero offset predictor associated with this track is de-energized due to train movement and not a system fault
  - The BIDAX Input is de-energized

6.12.7.2 Internal PSO Configuration

The Internal PSO Configuration is used when there is a PSO at each outer unit of the track circuit. Using either a four-wire or a six-wire track wire connection, the direction of travel is determined by the initial GCP; in the examples this is GCP1. The GCP utilizes directional stick logic in setting the stick to prevent tail rings and to provide proper DAX functionality during the progression of the train through the PSO track circuit.

The default receiver used in Internal PSO DAXing is Receiver 1 (RX1). When configured as an Internal PSO, the GCP unit's Bidirectional DAX System transmits a code "C" when all of the following are true:

- Any zero offset predictor associated with this track is de-energized due to train movement and not a system fault
- The PSO RX1 is energized and receiving a code "A"
- EZ is less than or equal to the programmed Stick EZ value.

When configured as an internal PSO, the GCP Bidirectional DAX system transmits a code "A" until the conditions to transmit a code "C" are met.

The GCP unit allows the user to configure the following parameters when the Center Fed PSO configuration is selected:

- BIDAX From RX Appr
- Stick Release Time
- Approach Clear Time
- Stick Release EZ Value
- Approach Clear EZ
- PSO Used
- RX1 Freq Category
- RX1 Frequency
- TX Freq Category
- TX Frequency
- TX Transmit Level

In any enabled bidirectional DAX configuration, the GCP Bidirectional DAX system starts the Stick Release Timer when:

- The Stick Release Timer has been set
- There is no inbound or outbound motion on the unit's approach
- And the PSO circuit (if used) is not receiving a code "C".

A generic Internal PSO track wiring diagram is presented in Figure 6-199. The generic programming windows for the Internal PSO application are presented in Figure 6-200.

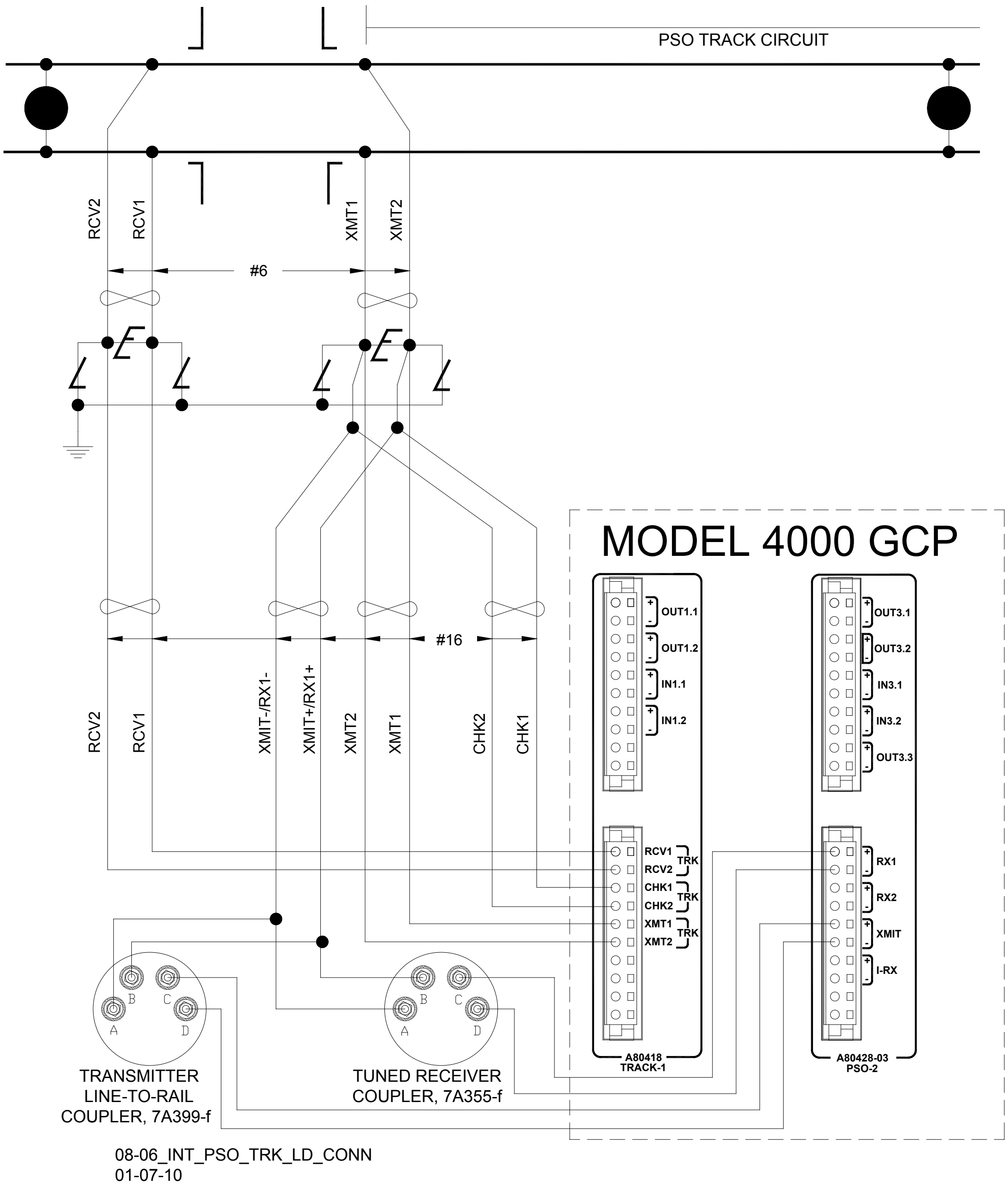


Figure 6-199:
Typical Internal PSO Configuration Track Wire Connections, BIDAX TX Application

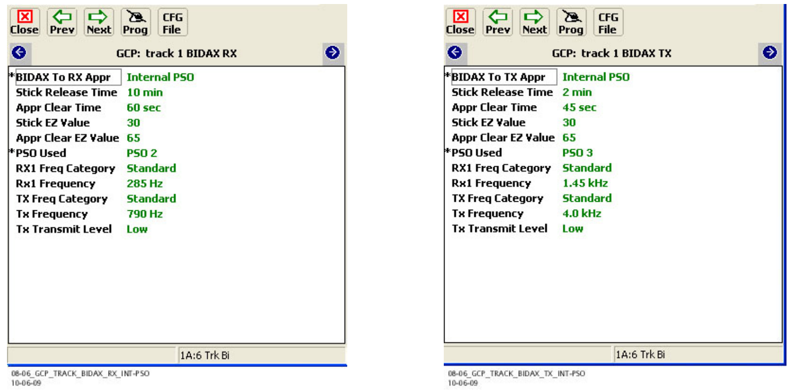


Figure 6-200:
Typical Programming Windows for Internal PSO Configuration

When utilizing the Internal PSO Configuration in Bidirectional DAXing, there are four typical applications used. They are based upon the layout of the track wires at the specific crossing covered by the GCP:

- If the transmit wires are positioned the on the inside of the PSO track circuit (in relation to the receiving GCP), the PSO track wires are connected to each other, then the PSO track wires are connected to the check wires, which are then joined to the transmit wires at the surge panel (see Figure 6-199)
- If the receive wires are positioned the on the inside of the PSO track circuit (in relation to the receiving GCP), the PSO track wires are connected to each other, then the PSO track wires are connected to the receive wires at the surge panel.

The Bidirectional DAX parameters are set using the following programming windows:

- GCP: track ‘n’ BIDAX TX
- GCP: track ‘n’ BIDAX RX

Typical track diagrams and programming windows for each configuration are presented in the following sections.

Model 4000 GCPs are typically connected to the track using a four-wire connection. Some site specific applications may require a six-wire connection. In such a case, connect the PSO leads as described in the Vital IO section.

6.12.7.2.1 Transmit Wire Connection (BIDAX TX) to Transmit Wire Connection (BIDAX TX)

A generic transmit wire connection (BIDAX TX) to transmit wire connection (BIDAX TX) is presented in Figure 6-201.

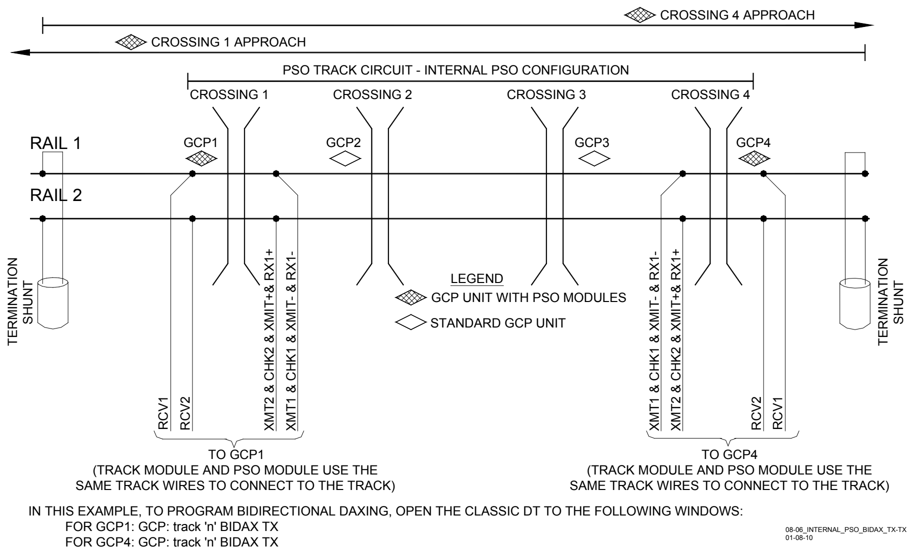


Figure 6-201:
Bidirectional DAXing using Internal PSO Configuration, BIDAX TX (GCP1) to BIDAX TX Application (GCP4)

6.12.7.2.2 Transmit Wire Connection (BIDAX TX) to Receive Wire Connection (BIDAX RX)

A generic transmit wire connection (BIDAX TX) to receive wire connection (BIDAX RX) is presented in Figure 6-202.

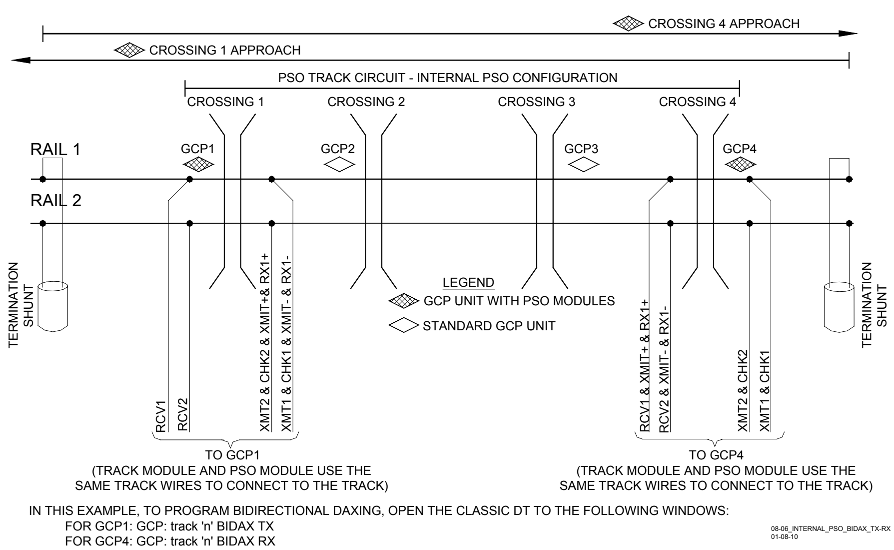


Figure 6-202:
Bidirectional DAXing using Internal PSO Configuration, BIDAX TX (GCP1) to BIDAX RX Application (GCP4)

6.12.7.2.3 Receive Wire Connection (BIDAX RX) to Transmit Wire Connection (BIDAX TX)

A generic receive wire connection (BIDAX RX) to transmit wire connection (BIDAX TX) is presented in Figure 6-203.

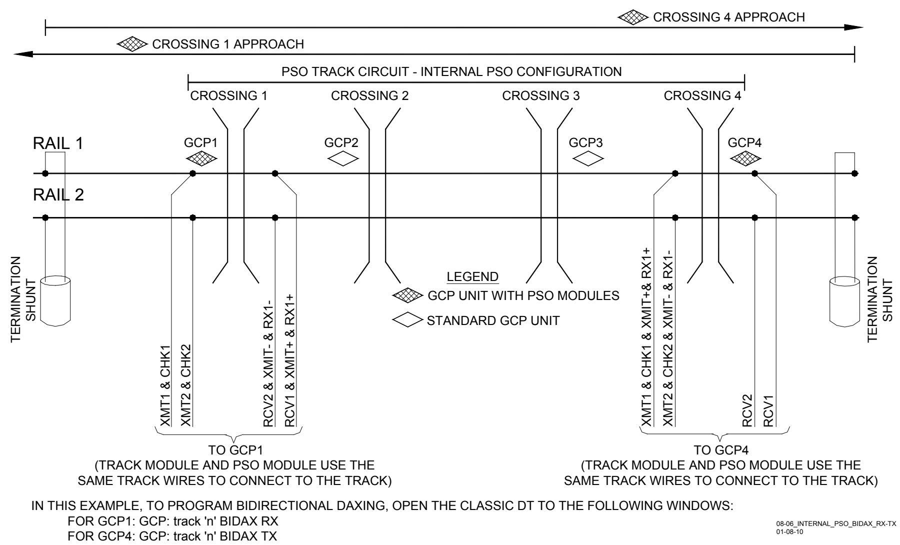


Figure 6-203:
Bidirectional DAXing using Internal PSO Configuration,
BIDAX RX (GCP1) to BIDAX TX Application (GCP4)

6.12.7.2.4 Receive Wire Connection (BIDAX RX) to Receive Wire Connection (BIDAX RX)

A generic receive wire connection (BIDAX RX) to receive wire connection (BIDAX RX) is presented in Figure 6-204.

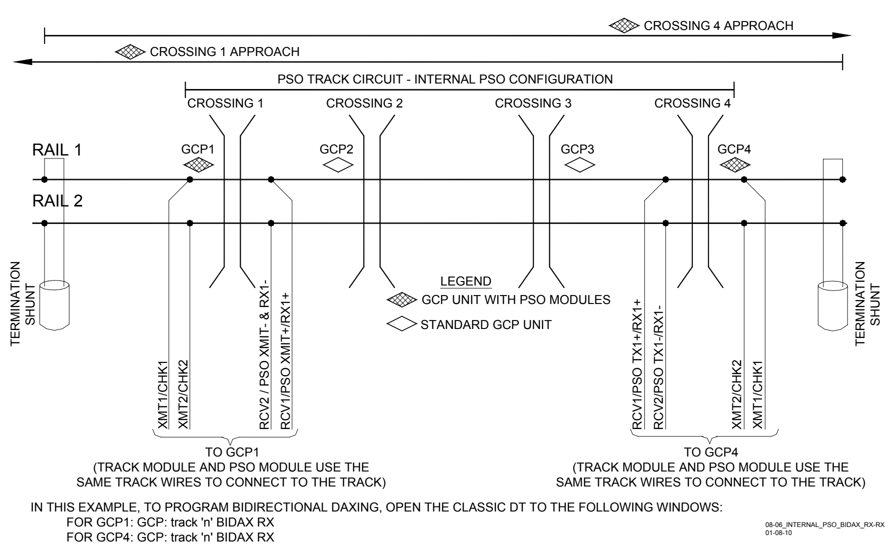


Figure 6-204:
Bidirectional DAXing using Internal PSO Configuration,
BIDAX RX (GCP1) to BIDAX RX Application (GCP4)

6.12.7.3 Center Fed PSO Configuration

The Center Fed PSO is a version of the Vital I/O application with a PSO 4000 unit located somewhere in between the two GCPs for a switch. When RX2 receives a Code C, the stick is set. If RX2 receives a Code A, then the system acts as a pure Vital I/O application, If RX2 receives a Code C and an inbound train starts crossing the approaches, then the Code C is ignored and the system acts as a pure Vital I/O application.

The default receiver used in Center Fed PSO DAXing is Receiver 2 (RX2). When configured as a Center Fed PSO, the GCP unit's Bidirectional DAX System transmits a code "C" when all of the following are true:

The GCP unit allows the user to configure the following parameters when the Center Fed PSO configuration is selected:

- BIDAX From RX Appr
- Stick Release Time
- Approach Clear Time
- Stick Release EZ Value
- Approach Clear EZ
- PSO Used
- RX2 Frequency Category
- RX2 Frequency

When configured as a Center Fed PSO bidirectional DAX, the GCP unit allows users:

- To configure an input as a BIDAX input (T1 RX BIDAX IP, T2 RX BIDAX IP, etc.)
- To configure an output as a BIDAX output.

When configured as a Center Fed PSO, the GCP unit's Bidirectional DAX system:

- Keeps the BIDAX output normally de-energized
- Keeps the BIDAX output de-energized when any of the zero offset predictors are de-energized due to a system fault that is not associated with a train movement (e.g., an EX process error would result in the BIDAX output energizing since this is a result of train movement).
- Freezes the Stick Release Timer at its current value when the Stick Release Timer has been set, inbound or outbound motion is seen on the unit's approach or, if PSO is used, the PSO circuit energizes and a code "C" is received.

6.12.7.3.1 Center Fed PSO Track Wire Connection (BIDAX RX)

NOTE

To properly operate, the Center Fed application must have a six-wire track connection and the Directionally Wired parameter must be set to Yes.

The programming windows for GCP1 and GCP4, respectively, for this type application are presented in Figure 6-205. A generic Center Fed PSO application using an external PSO 4000 unit is presented in Figure 6-206.

Like Vital IO, the Center Fed application must have a six-wire track connection and the Directionally Wired parameter must be enabled in order to properly operate (see Figure 6-194). The Directionally Wired parameter is found on the GCP: track 'n' window.

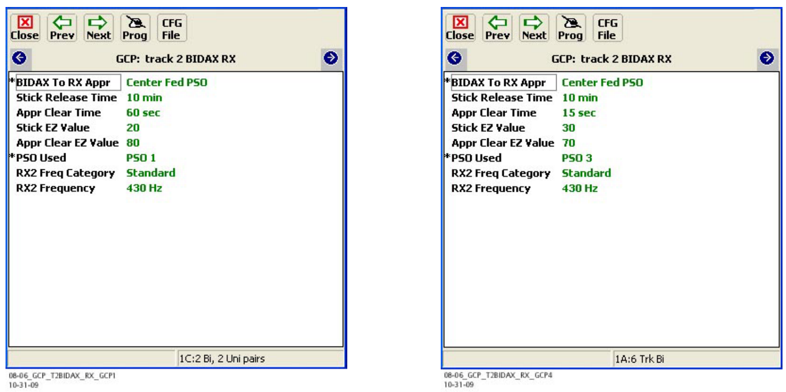


Figure 6-205:
Typical Programming Windows for Center Fed PSO Configuration

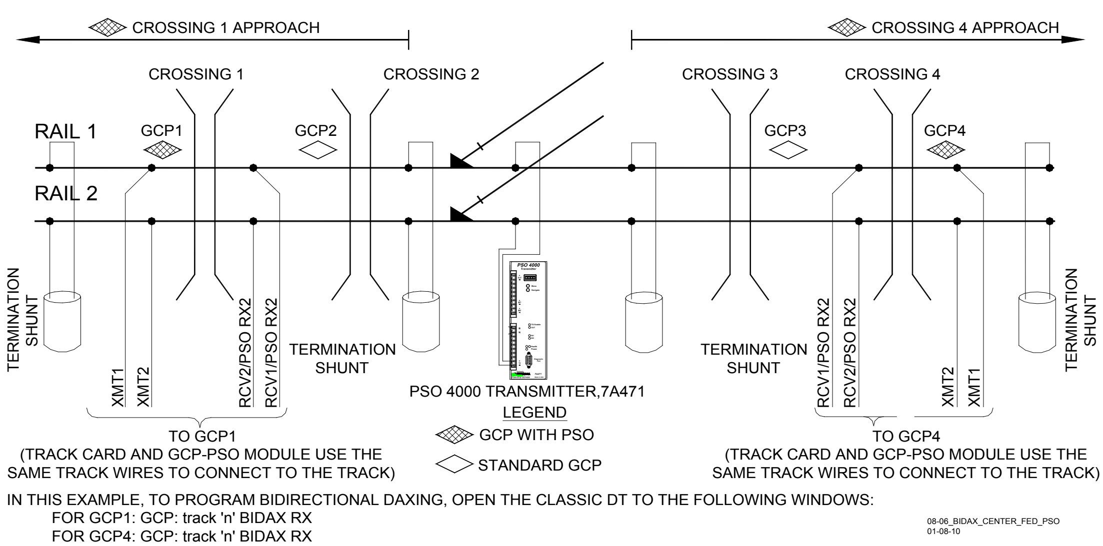


Figure 6-206:
Center Fed PSO Configuration

6.12.8 Successive Internal PSO Bidirectional DAXing (BIDAX) Application Example

This is an example of a Successive Internal PSO BIDAX application with the site specific drawing and the various programming parameters required for optimal performance of the example site. All tracks are default set as Track 1. The track frequencies selected for use in this area are from Group 1and all frequency selections were determined after referring to Table 6-33. Basic data is as follows:

- The crossings on Apple, Cherry, and Elm streets are equipped with Model 4000 GCPs that
- The crossings on Beech and Date streets are equipped with Model 3000 GCPs.
- Ballast conditions in the area are 4 Ohms per 1000 feet.
- Track Frequency assignments are as follows:
    - GCP1 – Track 1 is set to 156 Hz
    - GCP2 – Track 1 is set to 114 Hz
    - GCP3 – Track 1 is set to 285 Hz
    - GCP4 – Track 1 is set to 348 Hz
    - GCP5 – Track 1 is set to 211 Hz
    - All DAXes are connected via cable/wire

When programming the system for Bidirectional DAXing, there are four new parameters that must be determined for proper BIDAX operations:

- The **Stick Release Time** is the length of time, measured in minutes, that is set in Bidirectional DAX (BIDAX) operations that allows the directional stick to be held while the train is on the approach.
- The **Approach Clear Time** is the length of time, measured in seconds, that is set in Bidirectional DAX (BIDAX) operations that allows the directional stick to be held until the maximum speed train clears the bidirectional approach.
- The **Stick EZ Value** is the value below which a BIDAX output or Occupation Code (Code C) is transmitted after prediction has begun.
- The **Approach Clear EZ Value** is the setting that is programmed to keep a directional stick set during Bidirectional DAX (BIDAX) operations; the directional stick is held while the train exits the approach. The Approach Clear EZ is set where the BIDAX system's approach terminates in the outer approach of the adjacent bi-directional DAX system.

In this example, all crossings are programmed for 10 minute Stick Release Time.

The key element in successfully programming BIDAX parameters is to correctly determine the Approach Clear EZ Value.

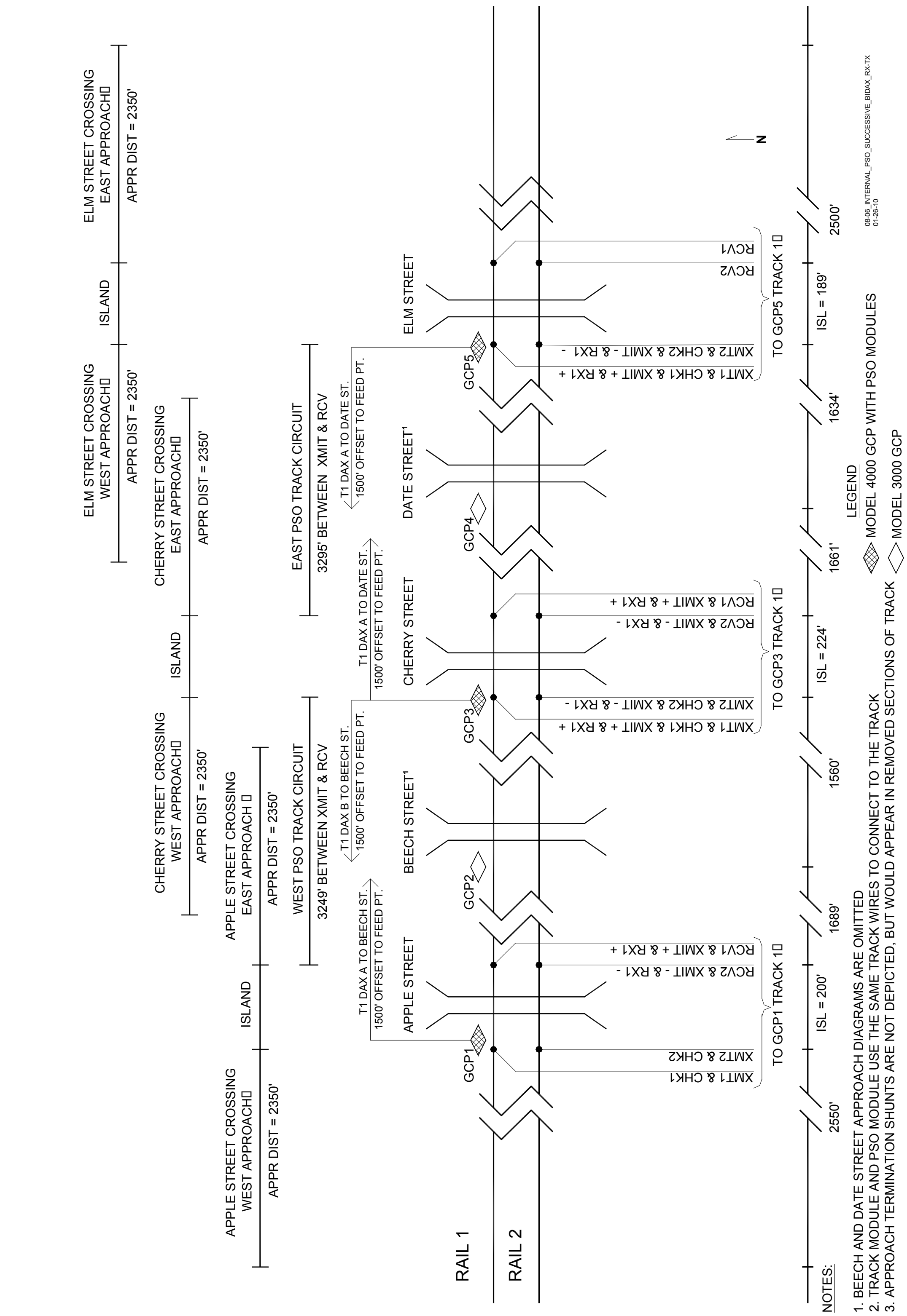


Figure 6-207:
Successive Internal PSO BIDAX Application Example

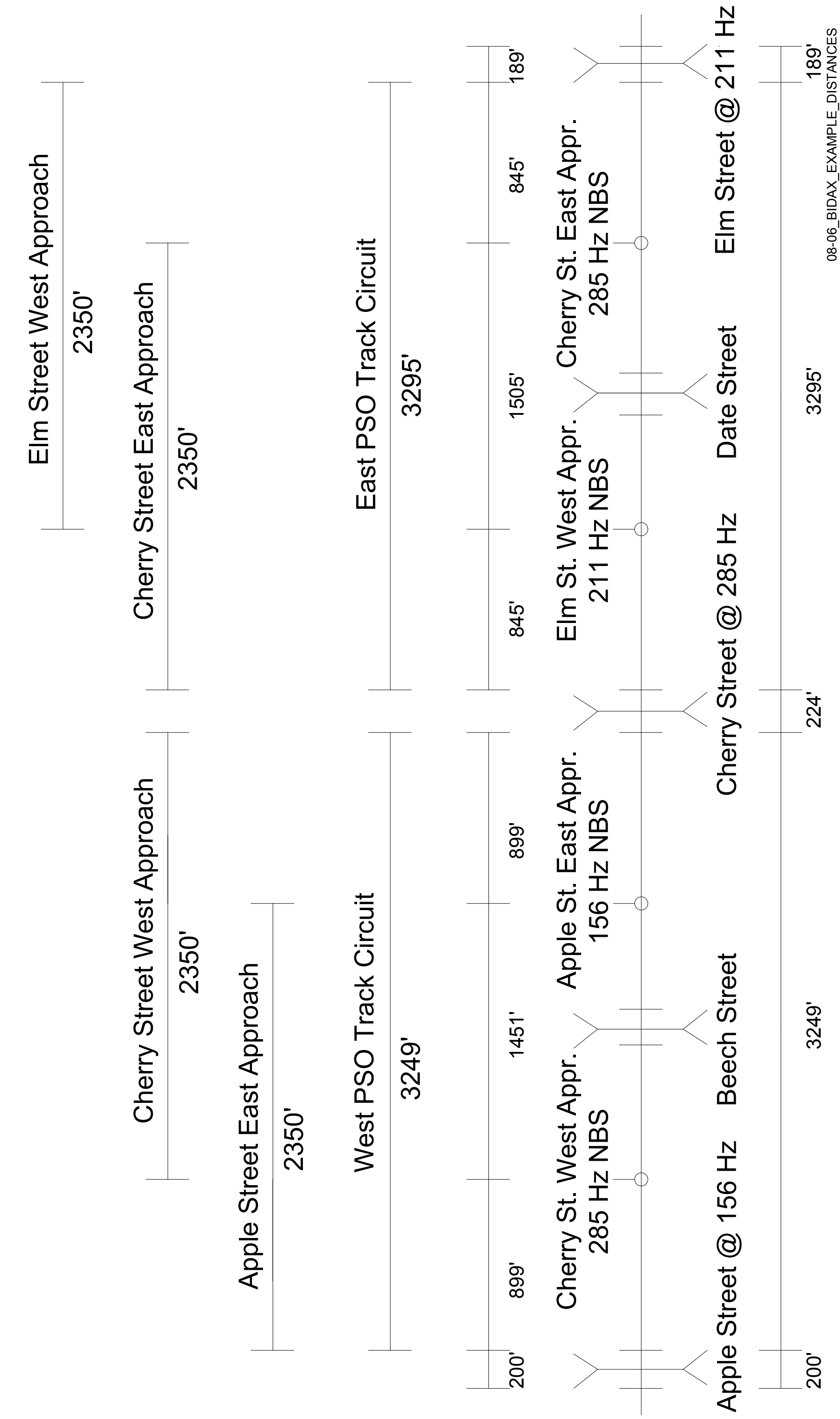


Figure 6-208:
Successive Internal PSO BIDAX Application Example
Offset Distances and Shunt Locations

6.12.8.1 Site Layout and Drawing

The site used as an example (see Figure 6-207) is a set of five crossings with three successive GCPs with BIDAX Internal PSO track circuits. To the west is Apple Street (GCP1); in the center is Cherry Street (GCP3) and to the east is Elm Street (GCP5), all of which are Model 4000 GCPs. There are four PSO track circuits: the West PSO's track circuit consists of the two Internal PSO circuits between the Apple Street Crossing's East Approach and the Cherry Street Crossing's West Approach; the East PSO's track circuit consists of the two Internal PSO circuits between the Cherry Street Crossing's East Approach and the Elm Street Crossing's West Approach. Minimum warning time is 35 seconds, plus 5 seconds system reaction time provides 40 seconds total time. At 40 mph track speed, minimum approach length is 2350 feet for all Model 4000 GCP approaches.

6.12.8.2 GCP Programming – Apple Street Crossing (East Approach Only)

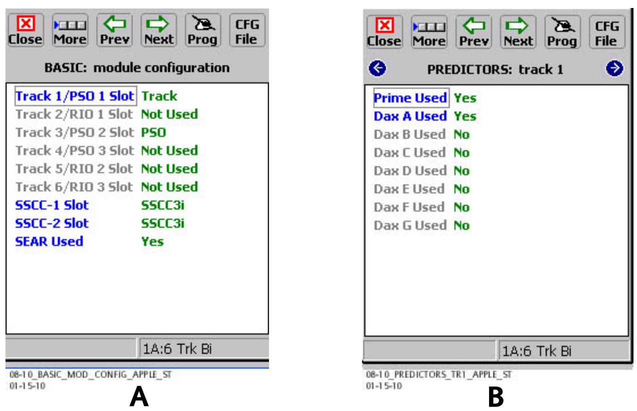


Figure 6-209:
Apple Street (East Approach) Programming Windows:
A: BASIC: module configuration Window; B: PREDICTORS: track 1 Window

In Figure 6-209A, the system is programmed to operate one track and one PSO. Track 1 and PSO 2 are selected. In Figure 6-209B, Track 1 DAX A Used is set to Yes.

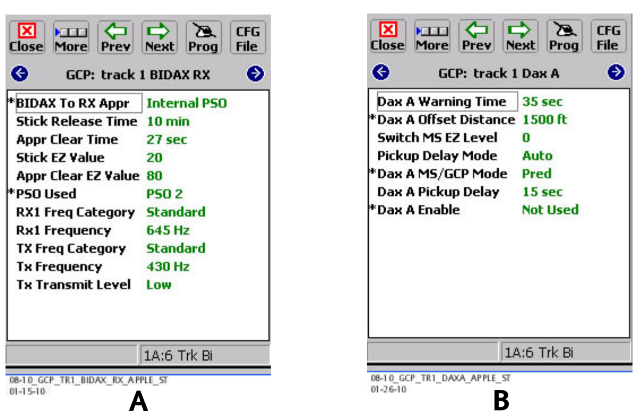


Figure 6-210:
Apple Street (East Approach) Programming Windows:
A: GCP: track 1 BIDAX RX Window; B: GCP: track 1 DAX A Window

A review of Figure 6-208 reveals that the Apple Street East Approach does not fully overlap other approaches; therefore, determination of the Approach Clear EZ Value is not required and the default of 80 is used. Subtracting 80 from the overall EZ of 100 provided a remainder of 20. To determine the Approach Clear Distance, deduct 20 percent from 2350 feet, which is 470 feet. The total distance between the receive wires at Apple Street and the transmit wires at Cherry Street is 3249 feet. The 156 Hz narrow-band shunt is placed 2350 feet from Apple Street's receive wires. This leaves the remaining distance of 899 feet that the train must transit during approach clearance. The Island distance is 224 feet. Adding the 470 feet, 899 feet, and 224 feet brings the total to 1593 feet. Track speed trains travel at 40 mph, or 59 feet per second. This leaves:

- 1493 feet / 59 feet per second = 27.00 seconds (Approach Clear Time = 27 sec)

Apple Street's BIDAX RX Stick EZ Value remains at the minimum value since the approach to Cherry Street terminates at the receive wires and not the termination shunt.

- To program the Apple Street **GCP: track 1 BIDAX RX** window (see Figure 6-210A):
    - Set the **BIDAX To RX Appr** parameter to **Internal PSO**
    - Set the **Stick Release Time** parameter to **10 min**
    - Set the **Appr Clear Time** parameter to **27 sec**
    - Set the **Stick EZ Value** parameter to **20**
    - Set the **Appr Clear EZ Value** parameter to **80**
    - Set the **PSO Used** parameter to **PSO 2**
    - Set the **RX1 Freq Category** parameter to **Standard**
    - Set the **RX1 Frequency** parameter to **645 Hz**
    - Set the **TX Freq Category** parameter to **Standard**
    - Set the **TX Frequency** parameter to **430 Hz**
    - Set the **TX Transmit Level** parameter to **Low**

From the site drawing (see Figure 6-207), the offset distance for the eastbound approach is 1500'.

- To program the **GCP: track 1 Dax A** window (see Figure 6-210B):
    - Set the **Dax B Warning Time** parameter to **35 sec**
    - Set the **Dax B Offset Distance** parameter to **1500 ft**

Any required outputs (**T1 Dax A**, **PSO2 RX1 Code A**, **PSO2 RX1 Code C**, **PSO2 RX1 Health**, **PSO2 TX Health**, **PSO Health**, **PSO2 RX1 Occupancy**, and/or **T1 RX BIDAX Stick**) for the Apple Street Crossing (GCP1) are programmed on the **OUTPUT: assignment page 1** window per the railroad's or agency's approved site plan.

6.12.8.3 <u>GCP Programming – Cherry Street Crossing (East & West Approaches)</u>

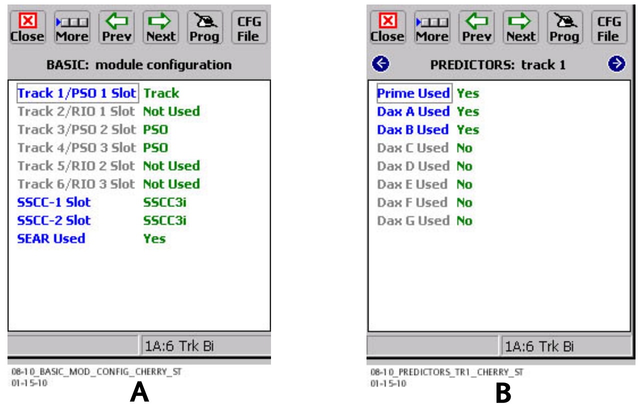


Figure 6-211:
Cherry Street Programming Windows:
A: BASIC: module configuration; B: PREDICTORS: track 1

In Figure 6-211A, the system is programmed to operate one track and two PSO's. Track 1 with PSO 2 and PSO 3 are selected. In Figure 6-211B, Track 1 DAX A Used is set to Yes and Track 1 DAX B Used is set to Yes.

6.12.8.3.1 East Approach Programming

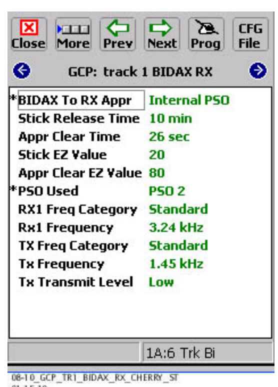


Figure 6-212:
Cherry Street (East Approach) Programming:
GCP: track 1 BIDAX RX Window

A review of Figure 6-208 reveals that the Cherry Street East Approach does not fully overlap other approaches; therefore, determination of the Approach Clear EZ Value is not required and the default of 80 is used. Subtracting 80 from the overall EZ of 100 provided a remainder of 20. To determine the Approach Clear Distance, deduct 20 percent from 2350 feet, which is 470 feet. The total distance between the receive wires at Cherry Street and the transmit wires at Elm Street is 3295 feet. The 285 Hz narrow-band shunt is placed 2350 feet from Cherry Street's receive wires. This leaves the remaining distance of 845 feet that the train must transit during approach clearance. The Island distance is 189 feet. Adding the 470 feet, 845 feet, and 189 feet brings the total to 1504 feet. Track speed trains travel at 40 mph, or 59 feet per second. This leaves:

- 1504 feet / 59 feet per second = 25.49 seconds (Approach Clear Time = 26 sec)

Cherry Street's BIDAX RX Stick EZ Value remains at the minimum value since the approach to Elm Street terminates at the receive wires and not the termination shunt.

To program Cherry Street's **GCP: track 1 BIDAX RX** window:

- Set the **BIDAX To TX Appr** parameter to **Internal PSO**
- Set the **Stick Release Time** parameter to **10 min**
- Set the **Appr Clear Time** parameter to **26 sec**
- Set the **Stick EZ Value** parameter to **20**
- Set the **Appr Clear EZ Value** parameter to **80**
- Set the **PSO Used** parameter to **PSO 2**
- Set the **RX1 Freq Category** parameter to **Standard**
- Set the **RX1 Frequency** parameter to **3.24 kHz**
- Set the **TX Freq Category** parameter to **Standard**
- Set the **TX Frequency** parameter to **1.45 kHz**
- Set the **TX Transmit Level** parameter to **Low**

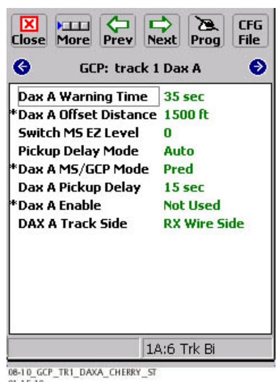


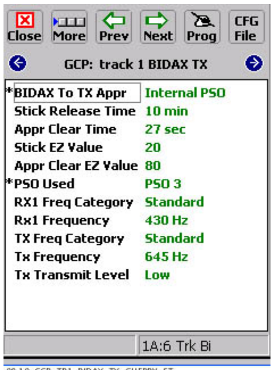
Figure 6-213:
Cherry Street (East Approach) Programming:
GCP: track 1 DAX A Window

Track 1 Dax A is assigned to the East Approach. From the site drawing (see Figure 6-207), the offset distance for the DAX A is 1500 feet. The signal is transmitted on the RX wire side of the crossing.

To program the **GCP: track 1 Dax A** window:

- Set the **Dax A Warning Time** parameter to **35 sec**
- Set the **Dax A Offset Distance** parameter to **1500 ft**
- Set the **Dax A Track Side** parameter to **RX Wire Side**

6.12.8.3.2 West Approach Programming



08-10_GCP_TR1_BIDAX_TX_CHERRY_ST
01-15-10

Figure 6-214:
Cherry Street (West Approach) Programming:
GCP: track 1 BIDAX TX Window

A review of Figure 6-208 reveals that the Cherry Street West Approach does not fully overlap other approaches; therefore, determination of the Approach Clear EZ Value is not required and the default of 80 is used. Subtracting 80 from the overall EZ of 100 provided a remainder of 20. To determine the Approach Clear Distance, deduct 20 percent from 2350 feet, which is 470 feet. The total distance between the transmit wires of Cherry Street and the receive wires of Apple Street is 3249 feet. The 285 Hz narrow-band shunt is placed 2350 feet from Cherry Street's receive wires. This leaves the remaining distance of 899 feet that the train must transit during approach clearance. The Island distance is 200 feet. Adding the 470 feet, 899 feet, and 200 feet brings the total to 1569 feet. Track speed trains travel at 40 mph, or 59 feet per second. This leaves:

- 1569 feet / 59 feet per second = 26.59 seconds (Approach Clear Time = 27 sec)

Cherry Street's BIDAX TX Stick EZ Value remains at the minimum value since the approach to Cherry Street terminates at the receive wires and not the termination shunt.

To program Cherry Street's **GCP: track 1 BIDAX TX** window (see Figure 6-212B):

- Set the **BIDAX To TX Appr** parameter to **Internal PSO**
- Set the **Stick Release Time** parameter to **10 min**
- Set the **Appr Clear Time** parameter to **27 sec**
- Set the **Stick EZ Value** parameter to **20**
- Set the **Appr Clear EZ Value** parameter to **80**
- Set the **PSO Used** parameter to **PSO 3**
- Set the **RX1 Freq Category** parameter to **Standard**
- Set the **RX1 Frequency** parameter to **430 Hz**
- Set the **TX Freq Category** parameter to **Standard**
- Set the **TX Frequency** parameter to **645 Hz**
- Set the **TX Transmit Level** parameter to **Low**

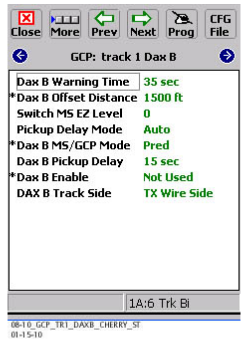


Figure 6-215:
Cherry Street (West Approach) Programming:
GCP: track 1 DAX B Window

Track 1 Dax B is assigned to the West Approach. From the site drawing (see Figure 6-207), the offset distance for the DAX B is 1500 feet. The signal is transmitted on the TX wire side of the crossing.

To program the **GCP: track 1 Dax B** window:

- Set the **Dax B Warning Time** parameter to **35 sec**
- Set the **Dax B Offset Distance** parameter to **1500 ft**
- Set the **Dax B Track Side** parameter to **TX Wire Side**

Any required outputs (**T1 Dax A**, **T1 Dax B**, **PSO2 RX1 Code A**, **PSO2 RX1 Code C**, **PSO3 RX1 Code A**, **PSO3 RX1 Code C**, **PSO2 RX1 Health**, **PSO2 TX Health**, **PSO3 Health**, **PSO3 RX1 Health**, **PSO3 TX Health**, **PSO3 Health**, **PSO Health**, **PSO2 RX1 Occupancy**, **PSO3 RX1 Occupancy**, **T1 RX BIDAX Stick** and/or **T1 TX BIDAX Stick**) for the Cherry Street Crossing (GCP3) are programmed on the **OUTPUT: assignment page 1** window per the railroad's or agency's approved site plan.

6.12.8.4 GCP5 Programming – Elm Street Crossing (West Approach Only)

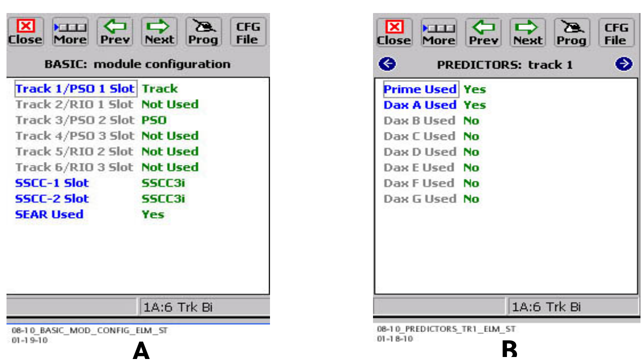


Figure 6-216:
Elm Street (West Approach) Programming Windows:
A: Module Config; B: Predictors

In Figure 6-216A, the system is programmed to operate one track and one PSO. Track 1 and PSO 2 are selected. In Figure 6-216B, Track 1 DAX A Used is set to Yes.

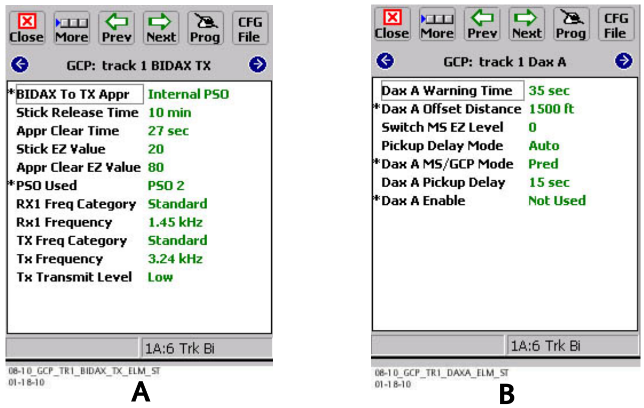


Figure 6-217:
Elm Street (West approach) Programming Windows:
A: BIDAX TX Window; B: Track 1 DAX A Window

A review of Figure 6-208 reveals that the Elm Street West Approach does not fully overlap other approaches; therefore, determination of the Approach Clear EZ Value is not required and the default of 80 is used. Subtracting 80 from the overall EZ of 100 provided a remainder of 20. To determine the Approach Clear Distance, deduct 20 percent from 2350 feet, which is 470 feet. The total distance between the transmit wires of Elm Street and the receive wires of Cherry Street is 3295 feet. The 211 Hz narrow-band shunt is placed 2350 feet from Elm Street's receive wires. This leaves the remaining distance of 845 feet that the train must transit during approach clearance. The Island distance is 224 feet. Adding the 470 feet, 845 feet, and 224 feet brings the total to 1539 feet. Track speed trains travel at 40 mph, or 59 feet per second. This leaves:

- 1539 feet / 59 feet per second = 26.08 seconds (Approach Clear Time = 27 sec)

Elm Street's BIDAX TX Stick EZ Value remains at the minimum value since the approach to Cherry Street terminates at the receive wires and not the termination shunt.

To program Elm Street's **GCP: track 1 BIDAX TX** window (see Figure 6-217A):

- Set the **BIDAX To TX Appr** parameter to **Internal PSO**
- Set the **Stick Release Time** parameter to **10 min**
- Set the **Appr Clear Time** parameter to **27 sec**
- Set the **Stick EZ Value** parameter to **20**
- Set the **Appr Clear EZ Value** parameter to **80**
- Set the **PSO Used** parameter to **PSO 2**
- Set the **RX1 Freq Category** parameter to **Standard**
- Set the **RX1 Frequency** parameter to **1.45 kHz**
- Set the **TX Freq Category** parameter to **Standard**
- Set the **TX Frequency** parameter to **3.24 kHz**
- Set the **TX Transmit Level** parameter to **Low**

From the site drawing (see Figure 6-207), the offset distance for the westbound approach is 1500 feet. The signal is transmitted on the TX wire side of the crossing.

To program the **GCP: track 1 Dax A** window (see Figure 6-217B):

- Set the **Dax A Warning Time** parameter to **35 sec**
- Set the **Dax A Offset Distance** parameter to **1500 ft**

Any required outputs (**T1 Dax A**, **PSO2 RX1 Code A**, **PSO2 RX1 Code C**, **PSO2 RX1 Health**, **PSO2 TX Health**, **PSO Health**, **PSO2 RX1 Occupancy**, and/or **T1 RX BIDAX Stick**) are programmed on the **OUTPUT: assignment page 1** window per the railroad's or agency's approved site plan.

SECTION 7 – AUXILIARY EQUIPMENT

7.1 GENERAL

The equipment described in this section can be used with the 4000 GCP. Where applicable, installation and adjustment information is provided. The following equipment is covered:

NOTE

See Siemens Phase Shift Overlay 4000 (PSO 4000) Installation and Instruction Manual, SIG-00-07-06, for all Auxiliary Equipment used with the PSO Module.

7.2 BIDIRECTIONAL SIMULATION COUPLER, 62664-MF

WARNING

WHEN A GCP 4000 IS CONNECTED IN A SIX-WIRE CONFIGURATION (TWO RECEIVER WIRES, TWO TRANSMIT WIRES, AND TWO CHECK WIRES) AS SHOWN IN FIGURE 7-2, THE BIDIRECTIONAL SIMULATION COUPLER MUST BE CONNECTED TO THE CHECK (CHK) WIRES, NOT TO THE TRANSMIT (XMT) WIRES. IF THE COUPLER IS CONNECTED TO THE TRANSMIT WIRES, AN OPEN TRANSMITTER TRACK WIRE CANNOT BE DETECTED AND CAN, THEREFORE, ADVERSELY AFFECT GCP OPERATION. HOWEVER, IN STANDARD FOUR-WIRE SIMULATED BIDIRECTIONAL INSTALLATIONS; IT IS PERMISSIBLE TO CONNECT THE COUPLER TO THE TWO TRANSMITTER TRACK LEADS AS SHOWN.

THIS CONDITION EXISTS FOR SIX-WIRE APPLICATIONS USING BIDIRECTIONAL SIMULATION EQUIPMENT WHICH IS LOCATED IN THE CASE/BUNGALOW (NOT AT THE TRACKS) REGARDLESS OF WHICH OF THE FOLLOWING TYPES OF SIMULATED TRACK LOAD IS USED:

(1) BIDIRECTIONAL SIMULATION COUPLER (62664-MF),

(2) SINGLE-FREQUENCY NARROW-BAND SHUNT (62775-MF) USED IN CONJUNCTION WITH ADJUSTABLE INDUCTOR (8A398-6), OR

(3) MULTIFREQUENCY NARROW-BAND SHUNT (62775 OR 62780) EQUIPPED WITH SIMULATED TRACK INDUCTOR (8V617-DISTANCE).

IN STANDARD FOUR TRACK WIRE SIMULATED BIDIRECTIONAL INSTALLATIONS, IT IS PERMISSIBLE TO CONNECT THE SIMULATED BIDIRECTIONAL LOAD TO THE TWO TRANSMITTER TRACK LEADS IN THE BUNGALOW AS SHOWN IN FIGURE 7-2.

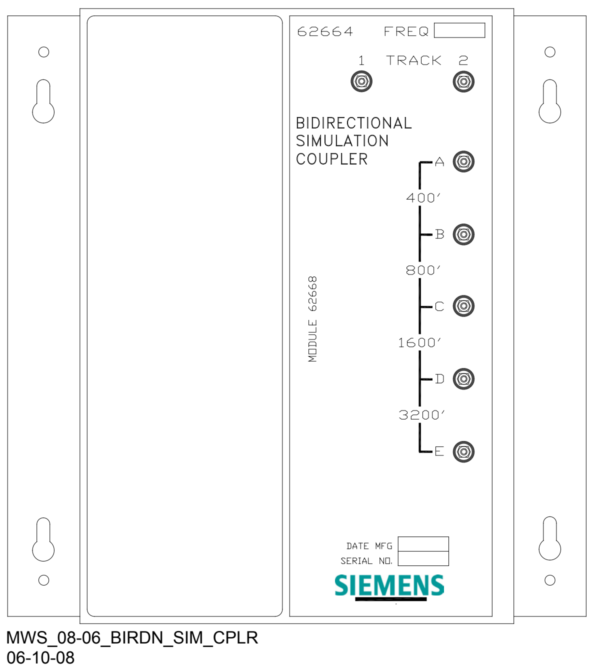


Figure 7-1:
Bidirectional Simulation Coupler, 62664-Mf

Low ballast resistance effectively reduces approach distances to a greater degree in unidirectional 4000 GCP installations than in bidirectional installations.

- Although the 4000 GCP is operated unidirectionally while DAXing, a technique referred to as bidirectional simulation can be applied to a unidirectional installation to obtain the operating benefits of a bidirectional application.
- A unidirectional 4000 GCP can provide a DAX start for an adjacent street, as well as other unidirectional functions, while operating as a simulated bidirectional GCP (GCP must be programmed for bidirectional operation).

WARNING

THE 62664 BIDIRECTIONAL SIMULATION COUPLER MUST NOT BE USED AS A TERMINATION SHUNT.

THE MODEL 3000 AND THE MODEL 4000 GCP ARE THE ONLY UNITS THAT ARE CAPABLE OF PERFORMING REMOTE PREDICTION FUNCTIONS WHILE OPERATING UNIDIRECTIONALLY IN A SIMULATED BIDIRECTIONAL MODE. EARLIER GCP MODELS ARE NOT CAPABLE OF OPERATING UNIDIRECTIONALLY IN A SIMULATED BIDIRECTIONAL MODE.

THE 62664 PLUG-IN MODULE FREQUENCY MUST BE THE SAME AS THE GCP FREQUENCY.

WHEN THE COUPLER IS UESD, THE CORRESPONDING GCP TRACK MUST BE PROGRAMMED FOR “SIM BIDIRNL”.THE 4000 GCP AND 3000 GCP ARE CAPABLE OF OPERATING UNIDIRECTIONALLY IN A SIMULATED BIDIRECTIONAL MODE WHILE DAXING.

In a simulated bidirectional configuration, a narrow-band shunt is connected in series with an adjustable inductor. This combination is:

- Connected in parallel across the track connections.
- Electrically equal to that of the actual track approach circuit.

Both approach circuits appear equal in length to the 4000 GCP, even though one of the circuits consists of the shunt and inductor located in the instrument housing/bungalow.

The 62664 Bidirectional Simulation Coupler (Figure 7-1) is a convenient, compact, shelf- or backboard-mounted unit containing:

- A narrow-band Shunt of the same frequency as the GCP
- An adjustable inductor (simulated track).

The Bidirectional Simulation Coupler is housed in a brushed aluminum case and consists of:

- A single plug-in-type printed circuit board that is available in 12 fixed frequencies (Hz)
- Four series-connected, toroid-wound inductors. Each inductor simulates a specific track length and is tapped and connected to the front panel terminals.

The front panel terminals allow simulated approach distances to be selected that closely match the actual track approach:

- Approach distances ranging from 400 to 6,000 feet (122 – 1829 meters) may be selected using terminal shorting straps.
- The available simulated approach distances and the corresponding shorting strap terminal positions for the 62664 are shown in Table 7-1.

Table 7-1:
Approach Distance Selection Strapping For Bidirectional Simulation Coupler, 62664-Mf

DISTANCE (FEET)	STRAP TERMINALS	DISTANCE (FEET)	STRAP TERMINALS
400/122	B-C, C-D, D-E	3,600/1098	B-C, C-D
800/244	A-B, C-D, D-E	4,000/1220	A-B, C-D
1,200/366	C-D, D-E	4,400/1342	C-D
1,600/488	A-B, B-C, D-E	4,800/1464	A-B, B-C
2,000/610	B-C, D-E	5,200/1585	B-C
2,400/732	A-B, D-E	5,600/1707	A-B
2,800/854	D-E	6,000/1829	No Straps
3,200/976	A-B, B-C, C-D		

When a 4000 GCP is connected in a six-wire configuration the bidirectional simulation coupler must be connected to the check (CHK) wires as shown in Figure 7-2.

When a 4000 GCP is connected in a standard four-wire configuration, the bidirectional simulation coupler is connected to the two transmit leads as shown in Figure 7-2.

Mounting dimensions for the bidirectional simulation coupler are provided in Figure 7-3. Specifications for the bidirectional simulation coupler are as depicted in Table 7-2:

Table 7-2:
Bidirectional Simulation Coupler, 62664-Mf

PARAMETER	VALUE
Environmental	-40°F to +160°F (-40°C to +71°C)
Dimensions	8.75 inches (22.225 centimeters) high 8.50 inches (21.590 centimeters) wide 9.25 inches (23.495 centimeters) deep
Weight	5 pounds (2.27 kilograms) (approximate)
Adjustment Range	400 to 6,000 feet (122 – 1829 meters)
Loading Effect	Loading effects of the internal narrow-band Shunt are equivalent to that of the 62775 narrow-band Shunt.

NOTE

The adjustment range must be within ±10% of actual approach distance.

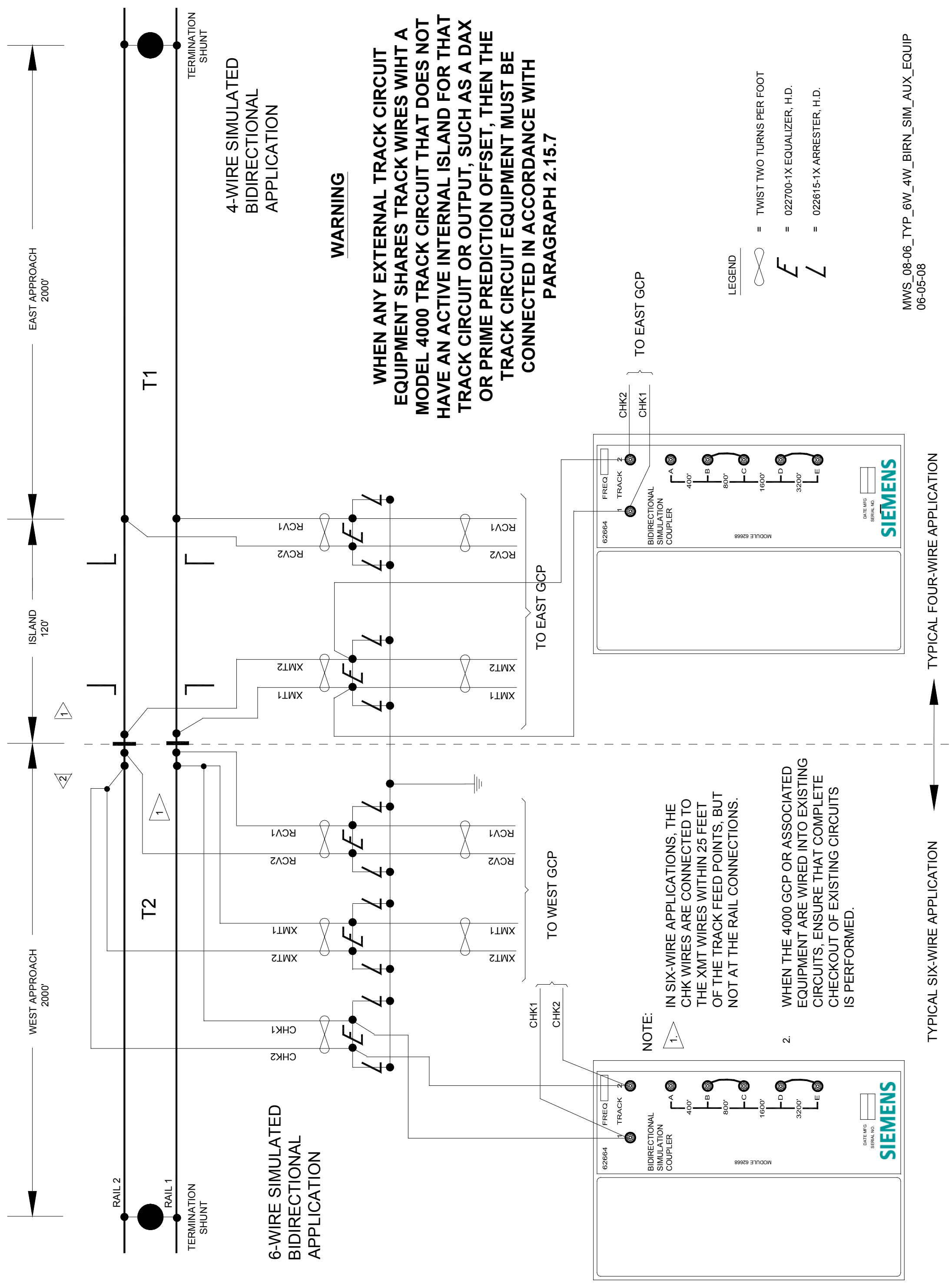


Figure 7-2:
Proper 4000 GCP Four-wire and Six-wire Connections Using Bidirectional Simulation Coupler on 4000 GCP Operating in the Bidirectional Simulation Mode

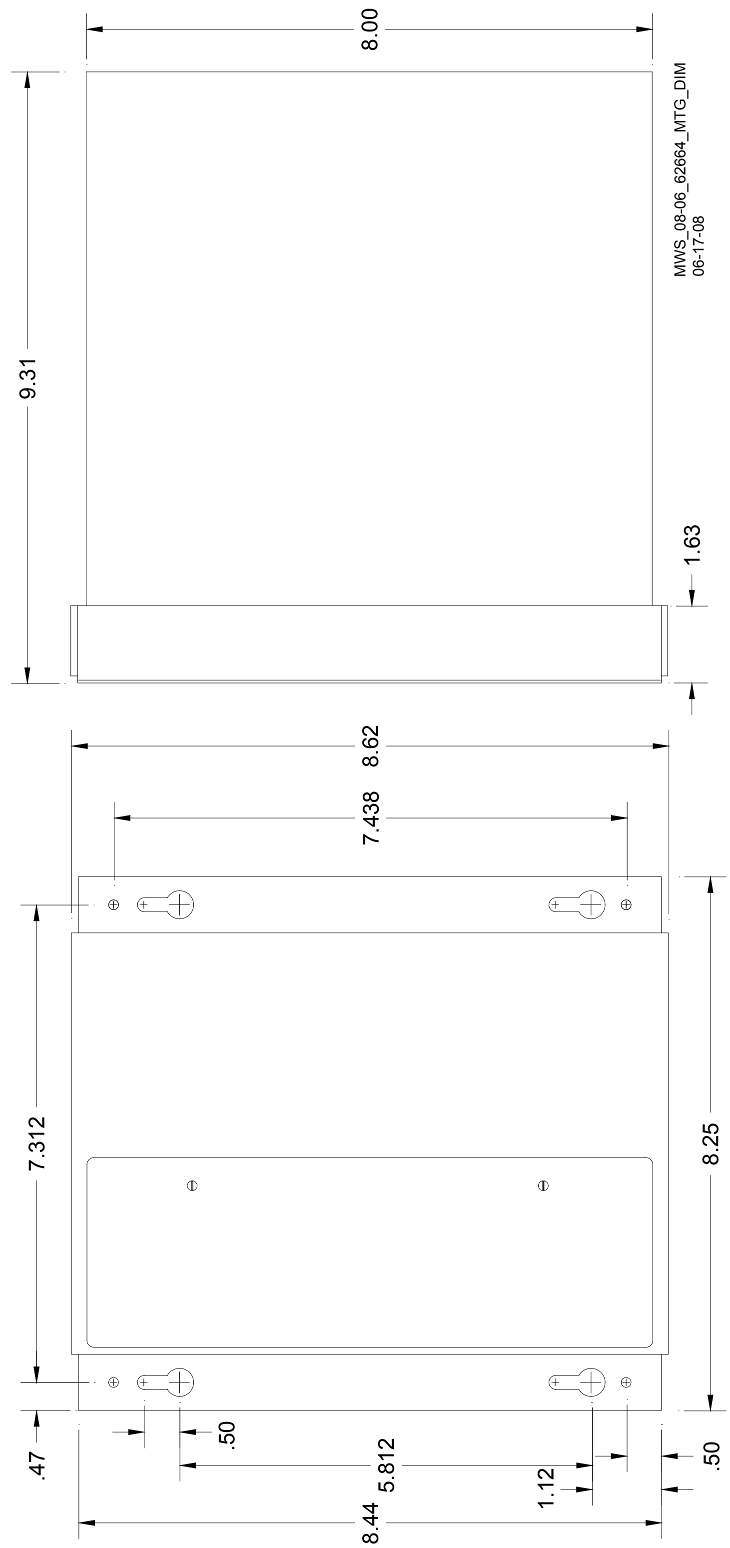


Figure 7-3:
Bidirectional Simulation Coupler Assembly Mounting Dimensions

7.3 DC SHUNTING ENHANCER PANEL, 80049

Intermittent poor shunting can result just about anywhere due to numerous causes, but generally occurs due to:

- infrequent track usage
- lightly weighted cars
- passenger and transit operation
- spillage from rail cars
- rail contamination

Lack of any shunting generally occurs in dark territory where no DC or AC track circuits exist and few trains run. Track shunting in dark territory can be easily improved using methods similar to those employed in style-C track circuits (but without the need for so many insulated joints). This involves the use of one insulated joint at the far end of each approach and the application of a DC voltage to the track at the crossing.

These measures improve shunting, thus allowing the Model 4000 GCP Enhanced Detection software to function optimally.

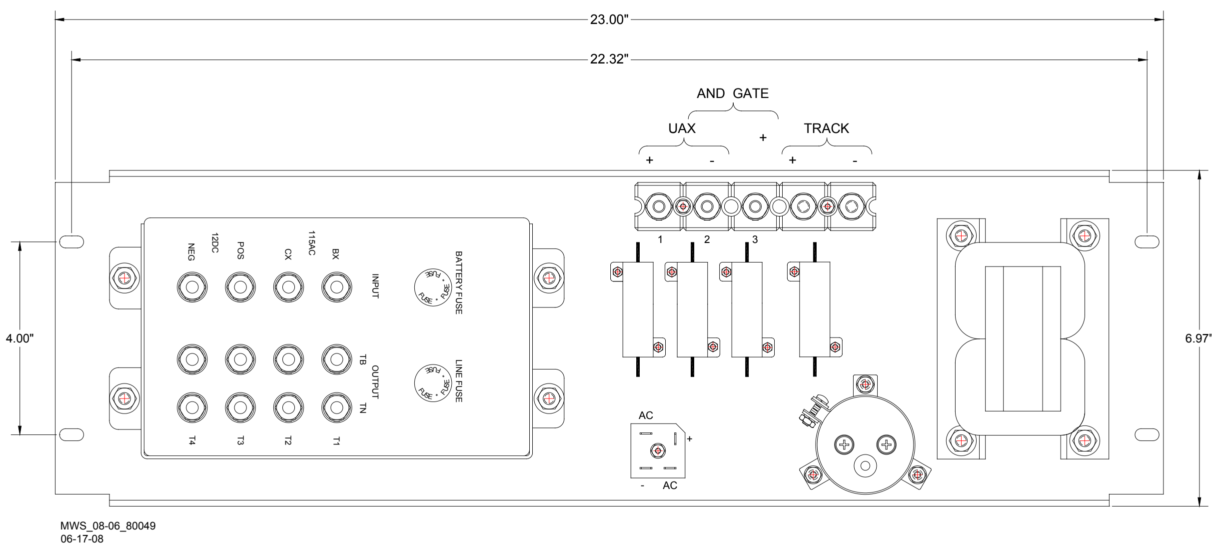


Figure 7-4:
DC Shunting Enhancer Panel, 80049

7.3.1 Track Output Voltage

The Siemens 80049 DC Shunting Enhancer Panel, Figure 7-4, applies a nominal 6 volts DC to the track at the crossing to break down any insulating film that may develop on the rails. This DC voltage is isolated from battery and is generated from a 110 volt AC step-down transformer when AC is present or utilizes battery powered DC-to-DC converter when AC is off. The panel switches automatically to the DC-to-DC converter output if AC fails.

7.3.2 Monitor Output Voltage

The Monitor Output voltage is applied to a 4000 GCP vital input programmed as AND 1 XR Enable. Loss of the Monitor Output voltage will activate the crossing. The AND 1 XR enable must be programmed with a minimum of 5 second pickup delay.

7.3.3 Track Requirements

Installation of the Siemens 80049 DC Shunting Enhancer Panel requires the placement of at least one joint at the far end of each approach. The insulated joints are required to confine the DC track voltage to the crossing. The insulated joints can be located beyond the approach narrow-band shunt termination as desired.

The 80049 panel can be rack, wall, or shelf mounted. See Figure 7-4 for mounting dimensions.

WARNING

THE TERMINATION SHUNTS MUST BE 62775-F OR 62780-F NARROW-BAND SHUNTS. SOME FAILURE MODES CANNOT BE DETECTED IF HARDWIRE OR WIDEBAND SHUNTS ARE USED.

GCP TRANSMIT WIRES MUST FIRST BE ROUTED TO THE ENHANCER PANEL TRACK CONNECTIONS AND THEN ON TO THE TRACK; IF NOT, SOME FAILURES CANNOT BE DETECTED BY THE SYSTEM. (SEE FIGURE 7-7)

CAUTION

WHEN TWO OR MORE DARK TERRITORY CROSSINGS OVERLAP, ENSURE THAT EACH MODEL 4000 GCP CROSSING HAS AN 80049 PANEL IN OPERATION AND THAT THE POLARITY OF THE TRACK VOLTAGE TO THE RAIL FROM ALL 80049 PANELS IS THE SAME AT EACH CROSSING.

NOTE

The DC Shunting Enhancer Panel can be used with applications involving overlapping approaches from two or more crossings without the use of additional insulated joints.

A typical DC Shunting Enhancer Panel application drawing for a two track application is provided in Figure 7-7 and for two overlapping crossings is provided in Figure 7-8.

7.3.4 Interface Terminal Connections

The DC Shunting Enhancer Panel is equipped with eight user interface terminals. These terminals are connected as shown in Figure 7-5.

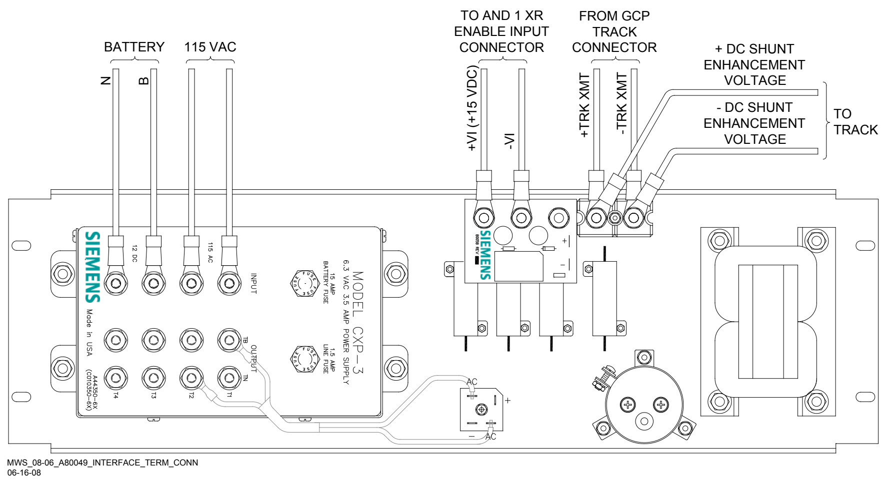


Figure 7-5:
DC Shunting Enhancer Panel, 80049, Interface Terminal Connections

7.3.5 DC Shunting Enhancer Panel Specifications

Table 7-3:
DC Shunting Enhancer Panel Specifications

PARAMETER	VALUES
CXP Input Power:	
AC Voltage:	95 to 130 VAC
DC Voltage:	11 to 16 VDC
DC Current (AC present):	0 amps
DC Current (AC not present):	0.25 amps with no train and high ballast resistance 2.5 amps with train shunting track
Environmental Temperature Range:	-40 °F to +160 °F (-40 °C to +71 °C)
UAX Output:	+15.0 ± 0.2 VDC
Surge Protection:	Primary protection required for AC input and battery Secondary protection provided internally
Humidity:	95%, non-condensing

Concluded on next page

Table 7-3: Concluded

PARAMETER	VALUES
Dimensions:	
-1 unit:	6.97 inches (17.704 centimeters) high 23.0 inches (58.420 centimeters) wide 10.75 inches (27.305 centimeters) deep
-5 unit:	6.97 inches (17.704 centimeters) high 23.0 inches (58.420 centimeters) wide 5.75 inches (14.605 centimeters) deep
Weight:	-1 unit: 32 pounds (14.4 kilograms) (approximate) -5 unit: 17 pounds (7.65 kilograms) (approximately)
Mounting Dimensions	The DC Shunting Enhancer Panel can be rack, wall, or shelf mounted. The Panel mounting dimensions are provided in figure 3-5.

Figure 7-6:
DC Shunting Enhancer Panel Mounting Dimensions

7.3.6 DC Shunting Enhancer Panel Configuration Options

Two DC Shunting Enhancer Panel configuration options are available. These configurations are described in Table 7-4.

Table 7-4:
DC Shunting Enhancer Panel Configuration Options

PART NUMBER	OPTION DESCRIPTION
8000-80049-0001	Panel with CXP-3 DC-to-AC Inverter
8000-80049-0005	Panel without CXP-3 DC-to-AC Inverter Used in two track applications

7.3.7 Two Track and Overlapping Crossing Applications

When two 80049 Panels are required with applications involving two tracks at a crossing, the first panel is an 80049-0001and the second panel may be an 80049-0001 or 80049-0005.

NOTE

When the –5 panel is used, it must be connected to the isolated 6.3 VAC inverter output of the first panel as shown in Figure 7-7.

When there are two crossings that have overlapping approaches, this application may be implemented as shown in Figure 7-8.

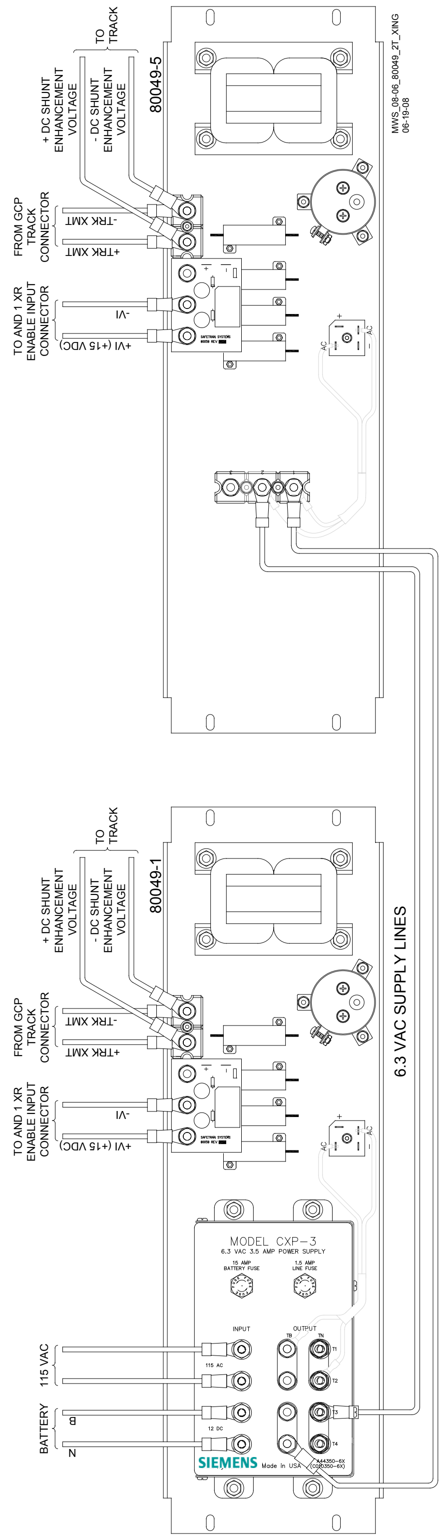


Figure 7-7:
DC Shunting Enhancer Panels for Two Track Crossing

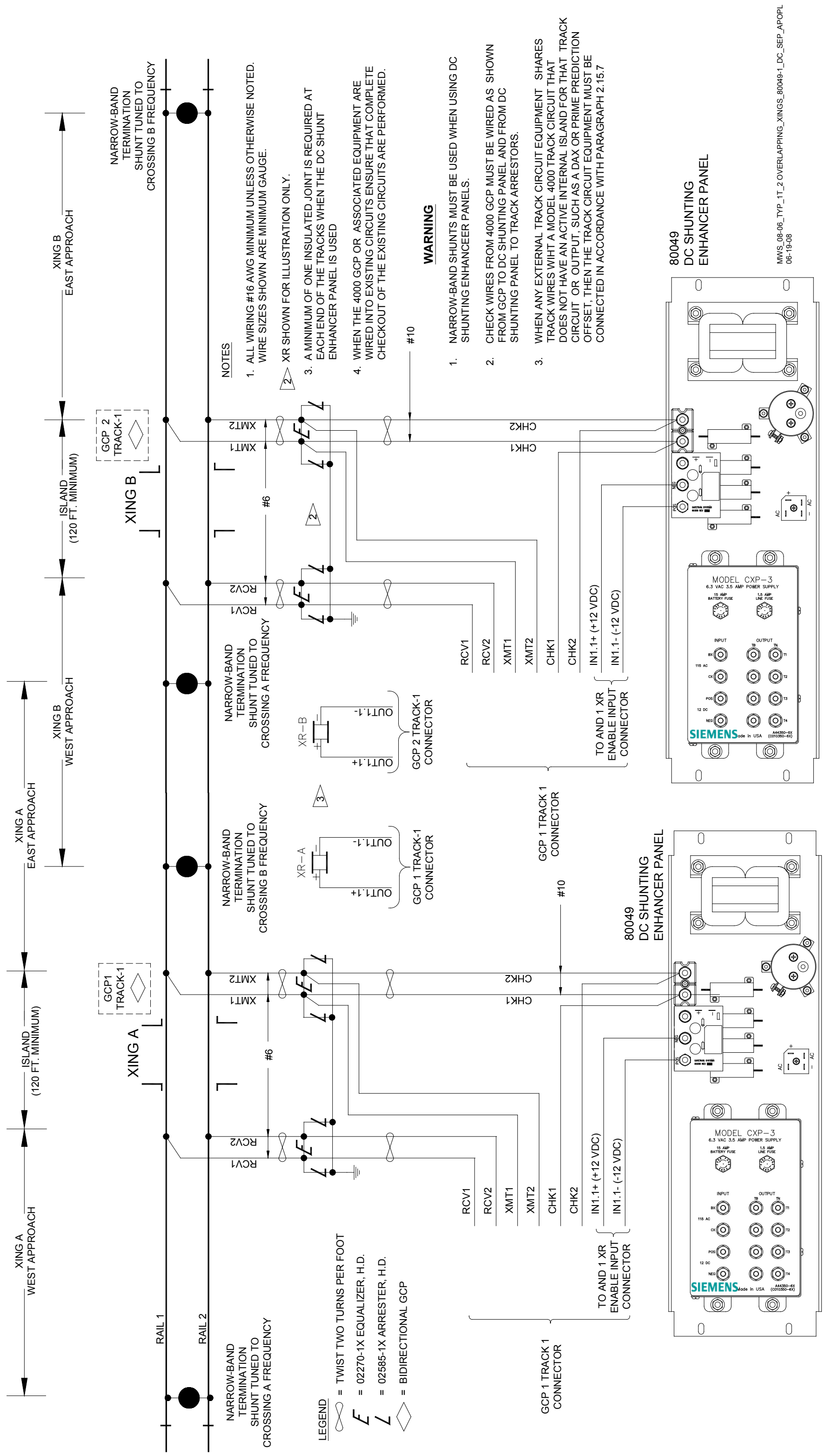


Figure 7-8:
DC Shunting Enhancer Panels for Overlapping Crossings

7.4 NARROW-BAND SHUNT, 62775-F

WARNING

THE 62775-F SHUNT MUST NOT BE USED ANYWHERE WITHIN A MODEL 300 OR 400 GCP APPROACH; NARROW-BAND SHUNT 62780-F IS RECOMMENDED FOR THESE APPLICATIONS.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS.

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 25 FT. (7.62 M)) AND, TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH (SEE PARAGRAPH 7.15.1). IT IS NOT NECESSARY TO BURY THE SHUNT BELOW THE FROST LINE.

The 62775-f Narrow-band Shunt (Figure 7-9) is intended for use in areas where other AC frequencies or DC coded track circuits are present, but where only the 4000 GCP frequency should be terminated.

The Shunt requires no special tuning and is generally preferred for most applications.

The 62775-f Narrow-band Shunt is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end.

The Shunt is available in any fixed frequency (Hz) listed in the chart below (Siemens frequencies are shown in **boldface** type).

Table 7-5:
Frequencies Available with
Narrow Band Shunt, 62775-f

86	151	285	522	753
100	156	326	525	790
114	172	348	560	816
134	210	392	630	881
141	211	430	645	970
149	267	452	686	979

7.4.1 Narrow-band Shunt, 62775-F Specifications

Dimensions	16 inches (40.640 centimeters) long 5 inches (12.700 centimeters) in diameter
Weight	10 pounds (4.54 kilograms) (approximate)
Frequencies	See Table 5-5 above.
Leads	10 feet (3.047.62 METERS); number 6 AWG, stranded, black PVC

7.5 NARROW-BAND SHUNT, 62780-F

<u>CAUTION</u>

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS.

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 25 FT. (7.62 M)) AND, TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH (SEE PARAGRAPH 7.15.1). IT IS NOT NECESSARY TO BURY THE SHUNT BELOW THE FROST LINE.

The Narrow-band Shunt, 62780-f (Figure 7-9) is intended for use in areas where other AC frequencies or DC coded track circuits are present, but where only the 4000 GCP frequency should be terminated.

- Similar to the Narrow-band Termination Shunt, 62775 (paragraph 7.4).

- The 62780 Shunt produces less loading effect on adjacent frequencies (10 ohms reactance) than the 62775 Shunt:
- This shunt can be used in territories with overlapping Model 300 and Model 400 GCP approaches.
- The 62780 Narrow-band Shunt is compatible with all Siemens Motion Sensors and GCP's.

This shunt is available in any one of 26 frequencies ranging from 86 Hz to 979 Hz as shown in the following chart (Siemens frequencies are shown in **boldface** type).

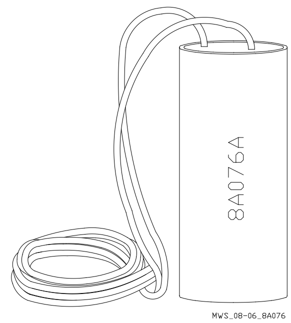
Table 7-6: Frequencies Available with Narrow Band Shunt, 62780-f

86	151	**211**	326	**430**	**525**	**645**	**790**	**970**
100	**156**	267	**348**	452	560	686	816	979
114	210	**285**	392	522	630	753	881	

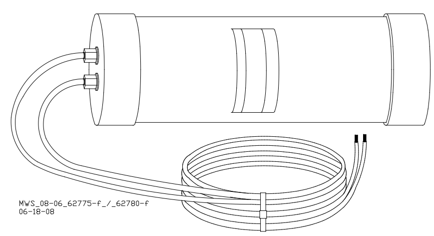
The Narrow-band Shunt, 62780 is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end.

7.5.1 Narrow-band Shunt, 62780-f Specifications

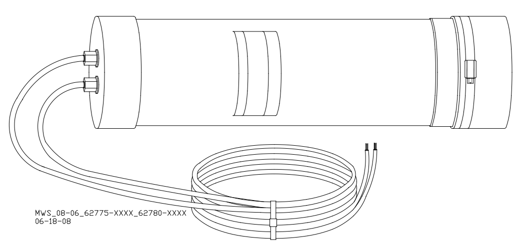
Dimensions	14.125 inches (35.9 centimeters) long 4.125 inches (10.5 centimeters) in diameter
Weight	7 pounds (3.18 kilograms) (approximate)
Frequencies	See Table 7-6 above.
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC



Wideband Shunt, 8A076A



Narrow-band Shunt, 62775-f/62780-f



Multifrequency, Narrow-band Shunt, 62775-XXXX/62780-XXXX

Figure 7-9:
Siemens Narrow-band and Wide-band Termination Shunts

7.6 MULTIFREQUENCY NARROW-BAND SHUNT, 62775-XXXX

WARNING

THE 62775-XXXX MULTIFREQUENCY NARROW-BAND SHUNT MUST NOT BE USED ANYWHERE WITHIN A MODEL 300 OR 400 GCP APPROACH; NARROW-BAND SHUNT 62780-XXXX IS RECOMMENDED FOR THESE APPLICATIONS.

CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS.

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 25 FT. (7.62 M,) AND, TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH (SEE PARAGRAPH 7.15.1). IT IS NOT NECESSARY TO BURY THE SHUNT BELOW THE FROST LINE.

NOTE

The Shunt is shipped with no factory jumpers installed and is, therefore, electrically open and does not load any frequency on the track. Install jumpers for the desired frequency before placing the unit in service.

The Multifrequency Narrow-band Shunt, 62775-XXXX, like its single single-frequency counterpart (paragraph 7.4), is designed to terminate specific track frequencies in areas where other audio frequencies or DC coded track circuits are present.

7.6.1 Physical Description

The Multifrequency Narrow-band Shunt, 62775-XXXX, (Figure 7-9) is slightly longer than its single-frequency counterpart (Section 7.4), but exhibits the same electrical characteristics as the basic single-frequency unit.

7.6.2 Frequency Selection

The Multifrequency Narrow-band Shunt is available in eight frequency ranges.

- The Shunt is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end and seven standard AREMA terminals extending from the other.
- The terminals are labeled A through G and are jumpered to select the desired shunting frequency (Table 7-7).

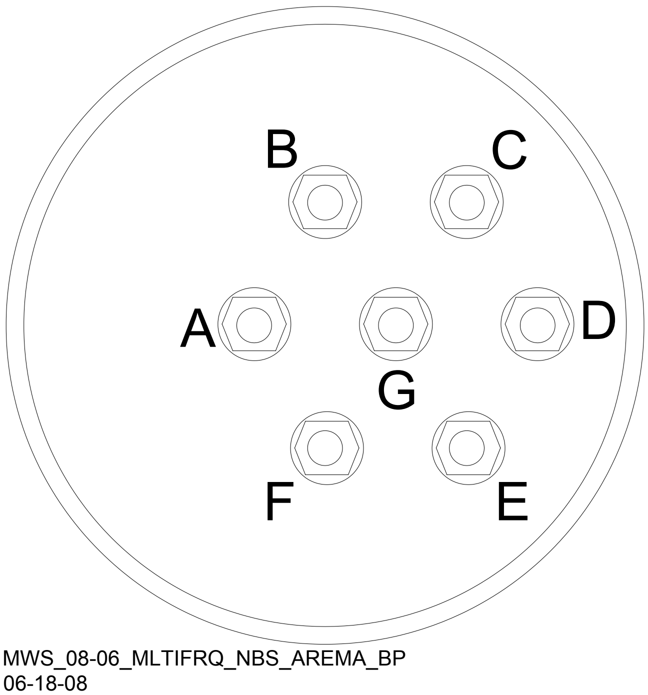


Figure 7-10:
Multifrequency Narrow-band Shunt, 62775-XXXX/62780-XXXX AREMA Binding Posts

NOTE

Terminal jumper hardware is supplied with each Shunt. The Shunt is shipped with no factory jumpers installed and is therefore electrically open and does not load any frequency on the track. Install jumpers for the desired frequency before placing the unit into service. A label located inside the removable end cap identifies the terminal jumpering for each frequency.

The pliable end cap covering the terminal end of the Shunt is secured in place by a sturdy stainless steel clamp for protection against moisture.

7.6.3 Multifrequency Narrow-band Shunt, 62775-XXXX Specifications

Dimensions	22 inches (55.880 centimeters) long 5 inches (12.700 centimeters) in diameter
Weight	10 pounds (4.54 kilograms) (approximate)
Frequencies	See Table 5-7
Leads	10 feet (3.048 meters); number 6 AWG, stranded, black PVC

**Table 7-7:
Multifrequency Narrow-band Shunt,
62775-XXXX Frequency Selection Jumpers**

SHUNT PART NUMBER	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
62775-8621	86	A-F, G-D, D-E, E-F
	114	B-G, G-D, D-E
	156	C-D, D-G
	211	C-D
62775-1543	156	A-F, G-C, C-D, D-E, E-F
	211	A-G, G-C, C-D, D-E
	285	B-C, C-D, D-G,
	348	B-C, C-D
	430	B-C
62775-2132*	211	A-F, G-C, C-D, D-E, E-F
	267	B-G, G-C, C-D, D-E
	285	B-C, C-D, D-G
	313	B-C, C-D
	326	B-C
62775-2152	211	A-F, G-C, C-D, D-E, E-F
	285	B-C, C-D, D-E, E-G
	348	B-C, C-D, D-G
	430	B-C, C-D
	525	B-C
62775-3448*	348	A-B, B-C, C-D, D-E, E-F, F-G
	389	A-B, B-C, C-D, D-E, E-F
	392	A-B, B-C, C-D, D-E
	430	A-B, B-C, C-D
	452	A-B, B-C
	483.5	A-B

Continued on next page

Table 7-7 Concluded

SHUNT PART NUMBER	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
62775-3497	348	A-B, B-C, C-D, D-E, E-F, F-G
	430	A-B, B-C, C-D, D-E, E-F
	525	A-B, B-C, C-D, D-E
	645	A-B, B-C, C-D
	790	A-B, B-C
	970	A-B
62775-5274*	522	A-B, B-C, C-D, D-E, E-F, F-G
	525	A-B, B-C, C-D, D-E, E-F
	560	A-B, B-C, C-D, D-E
	645	A-B, B-C, C-D
	669.9	A-B, B-C
	746.8	A-B
62775-7910*	790	A-B, B-C, C-D, D-E, E-F, F-G
	816	A-B, B-C, C-D, D-E, E-F
	832.5	A-B, B-C, C-D, D-E
	970	A-B, B-C, C-D
	979	A-B, B-C
	1034	A-B

*Available for special applications only

7.7 MULTIFREQUENCY NARROW-BAND SHUNT, 62780-XXXX

WARNING

CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS.

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 25 FT. (7.62 M)) AND, TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH (SEE PARAGRAPH 7.15.1). IT IS NOT NECESSARY TO BURY THE SHUNT BELOW THE FROST LINE.

NOTE

The Multifrequency Narrow-band Shunt is shipped with no factory jumpers installed and is, therefore, electrically open and does not load any frequency on the track. Install jumpers for the desired frequency before placing the unit in service.

The Multifrequency Narrow-band Shunt, 62780-XXXX Figure 7-9, can be used in territories with overlapping Model 300 and Model 400 GCP approaches.

This shunt:

- Produces less loading effect on adjacent frequencies (10 ohms reactance) than the 62775-xxxx Shunt (paragraph 7.6)
- Is compatible with all Siemens GCP’s and Motion Sensors.
- Is available in four multifrequency versions (see Table 7-8).
- Is housed in a hermetically-sealed, cylindrical case:

A pair of 10-foot leads extends from one end of the case. Seven standard AREMA terminals extend from the opposite end of the case.

- AREMA terminals are jumpered to select the desired shunt frequency.
- AREMA terminals are labeled A through G
- Terminal jumper hardware is supplied with each Multifrequency Shunt:
- A label located inside the removable end cap identifies the terminal jumpers required for each frequency.

The pliable end cap covers the terminal end of the Shunt is secured in place by a sturdy stainless steel clamp for protection against moisture.

Table 7-8:
Multifrequency Narrow-band Shunt,
62780 Frequency Selection Jumpers

SHUNT PART NUMBER	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
62780-8621	86	A-F, G-D, D-E, E-F
	114	B-G, G-D, D-E
	156	C-D, D-G
	211	C-D
62780-1543	156	A-F, G-C, C-D, D-E, E-F
	211	A-G, G-C, C-D, D-E
	285	B-C, D-G, C-D
	348	B-C, C-D
	430	B-C
62780-2152*	211	A-F, G-C, C-D, D-E, E-F
	285	B-C, C-D, D-E, C-G
	348	B-C, C-D, D-G
	430	B-C, C-D
	525	B-C
62780-5297	525	A-B, B-C, C-D, D-E
	645	A-B, B-C, C-D
	790	A-B, B-C
	970	A-B

*Available for special applications only

7.7.1 Multifrequency Narrow-band Shunt, 62780-XXXX Specifications

Dimensions	22 inches (55.880 centimeters) long 5 inches (12.700 centimeters) in diameter
Weight	10 pounds (4.54 kilograms) (approximate)
Frequencies	See Table 5-8 above
Leads	10 feet (3.048 meters); number 6 AWG, stranded, black PVC

7.8 WIDEBAND SHUNT, 8A076A

WARNING

THE 8A076A OR 8A077 WIDEBAND SHUNTS MUST NOT BE USED TO BYPASS INSULATED JOINTS IN DC CODED TRACK CIRCUITS OR WHERE AC OR CODED AC CIRCUITS EXIST.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUSTS BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEM OR WAYSIDE SIGNAL SYSTEM TRACK CIRCUITS.

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 25 FT. (7.62 M)) AND, TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH (SEE PARAGRAPH 7.15.1). IT IS NOT NECESSARY TO BURY THE SHUNT BELOW THE FROST LINE.

NOTE

The use of dual wideband couplers, part number 8A077, is not recommended for 4000 GCP applications.

The Wideband Shunt, 8A076A (Figure 7-9) provides an effective short circuit to AC but presents an open circuit to DC. This shunt may be used as a termination shunt where no other frequencies (other than the GCP) are present or to bypass existing insulated joints required for DC signaling purposes within the track circuit.

The Wideband Shunt is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end.

7.8.1 Wideband Shunt Specifications

Dimensions	7.5 inches (19.050centimeters) long
	3.35 inches (8.509 centimeters) in diameter
Weight	7 pounds (3.18 kilograms) (approximate)
Leads	10 feet (3.048 meters); number 6 AWG, stranded, black PVC

7.9 SIMULATED TRACK INDUCTOR, 8V617 (USED WITH MULTIFREQUENCY SHUNTS)

The Simulated Track Inductor, 8V617 (Figure 7-11) is intended for use with Safetran’s Multifrequency Narrow-band Shunts (62775/62780).

In bidirectional motion sensor and grade crossing predictor installations, insulated joints located in one approach frequently prevent both termination shunts from being installed at equal distances from the MS/GCP feed point as required.

The 8V617 Simulated Track Inductor is used with the Shunt in the shorter approach to compensate for the reduced distance (Figure 7-12).

Each Inductor:

- Consists of an insulated, toroid-wound coil with a pair of 4-inch number 18 AWG stranded wire leads with 1/4-inch ring terminals attached.
- Is supplied in 21 configurations to simulate track lengths ranging from 200 to 4,000 feet in 200-foot increments plus 4,400 feet.
- Is identified with the basic part number followed by a dash number indicating the simulated distance in feet as listed in Table 7-9.

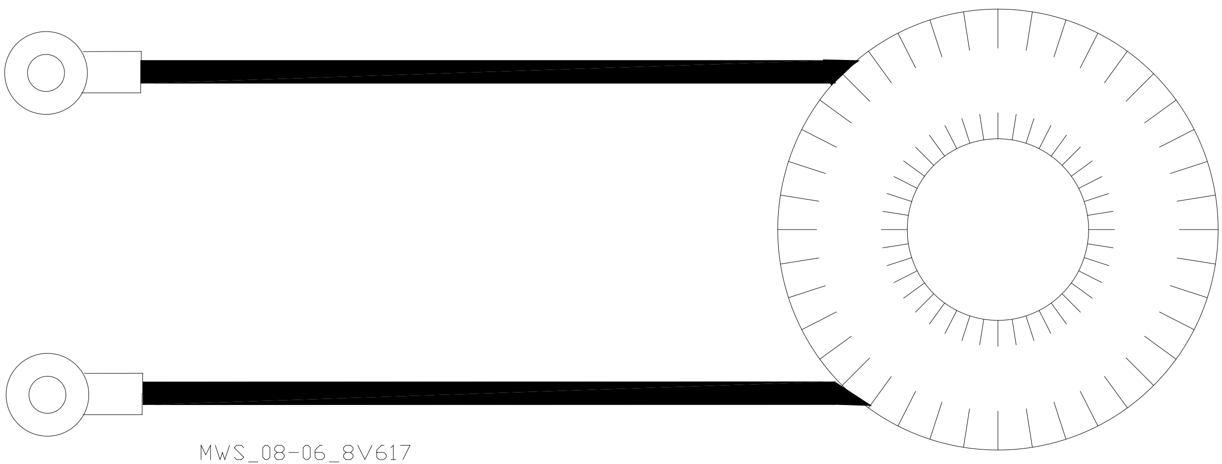


Figure 7-11:
Simulated Track Inductor, 8V617

Table 7-9:
Simulated Track Inductor Part Number Listing

BASIC PART NO.	DASH NUMBER = DISTANCE (FEET)		
8V617	-0200 (61)	-1600 (488)	-3000 (450)
	-0400 (122)	-1800 (549)	-3200 (976)
	-0600 (183)	-2000 (610)	-3400 (1037)
	-0800 (244)	-2200 (671)	-3600 (1098)
	-1000 ((309)	-2400 (732)	-3800 (1159)
	-1200 (366)	-2600 (793)	-4000 (1220)
	-1400 (427)	-2800 (854)	-4400 (1342)

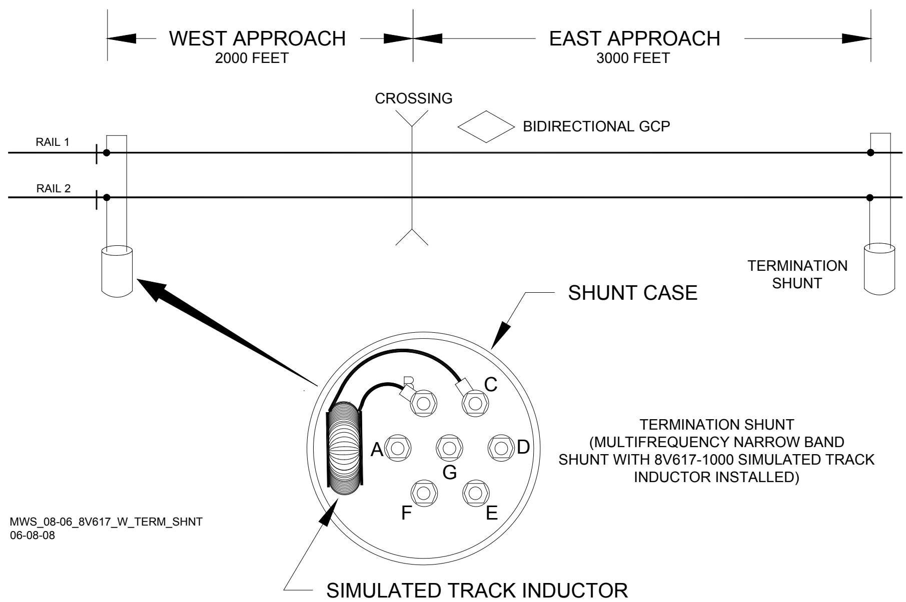


Figure 7-12:
Simulated Track Inductor Used With Termination Shunt

7.9.1 Simulated Track Inductor Installation

WARNING

BEFORE INSTALLING, VERIFY THAT THE 8V617 INDUCTOR IS THE CORRECT DISTANCE VALUE FOR THE APPLICATION.

ALWAYS WRAP THE INDUCTOR IN THE FOAM INSULATION (INCLUDED WITH THE INDUCTOR) THAT PROVIDES INSULATION FROM THE TERMINAL POSTS (AS SHOWN IN FIGURE 7-13).

NOTE

Refer to the small chart inside the end cap for terminal strapping information. If the chart is missing or illegible, refer to Table 7-7 (62775) or Table 7-8 (62780) in this manual.

Position the inductor with the leads extending horizontally toward the side (not upward) to prevent interference with the Shunt end cap.

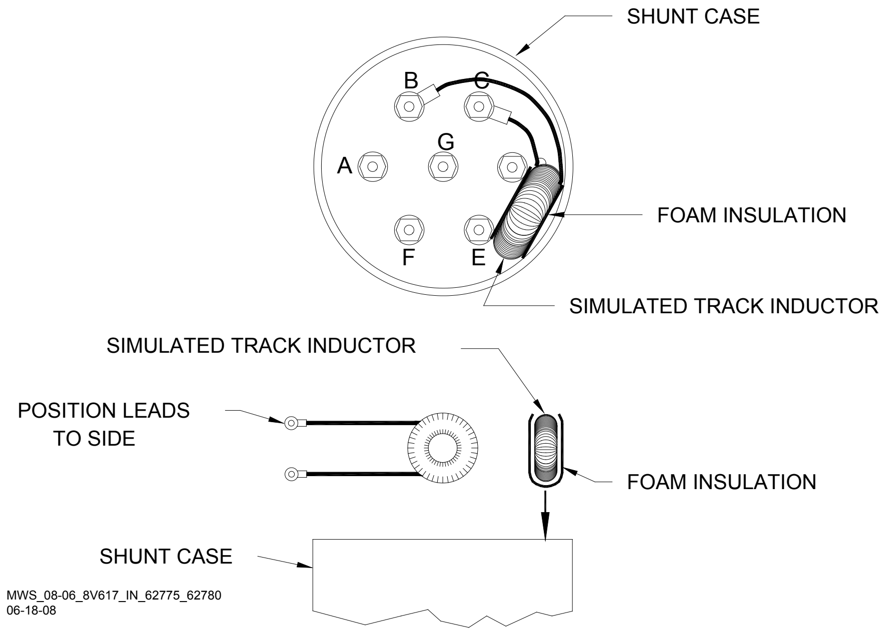


Figure 7-13:
Typical Installation of 8V617 in 62775/62780 Shunt

Step 1: Determine the Shunt frequency and compensating distance required.

Step 2: Loosen the clamp and remove the end cap from the Shunt to gain access to the frequency-selection terminals.

Step 3: Refer to Table 7-10 and note the inductor mounting terminals for the applicable shunt and frequency.

Step 4: Remove the nuts, washers, and shorting link from the shunt terminals indicated. Discard the shorting link.

Step 5: Install the inductor in its place by connecting the inductor leads to the two terminals. Install the washers and nuts and tighten securely.

Step 6: Wrap the inductor in the foam insulation (included with the inductor) as shown in Figure 7-13 and carefully insert into the Shunt housing between the terminals and case at the approximate location shown.

Step 7: Return the end cap to its original position on the Shunt and tighten the clamp securely.

7.9.2 8V617 Simulated Track Inductor Specifications

Diameter	1.875 inches (4.763 centimeters)
Thickness	0.875 inches (2.223 centimeters)
Weight	5 ounces (141.75 grams)

Table 7-10:
Simulated Track Inductor, 8V617, Mounting Terminals

NARROW-BAND SHUNT PART NO.	FREQUENCY (HZ)	REMOVE SHORTING LINK AND CONNECT INDUCTOR LEADS BETWEEN SHUNT TERMINALS
62775/62780-8621	86	A and F
	114	B and G
	156	C and D
	211	C and D
62775/62780-1543	156	A and F
	211	A and G
	285	B and C
	348	B and C
	430	B and C
62775-2132*	211	A and F
	267	B and G
	285	B and C
	313	B and C
	326	B and C
62775/62780-2152*	211	A and F
	285	B and C
	348	B and C
	430	B and C
	525	B and C
62775-3448*	348	A and B
	389	A and B
	392	A and B
	430	A and B
	452	A and B
	483.5	A and B
62775-2132*	211	A and F
	267	B and G
	285	B and C
	313	B and C
	326	B and C

Continued on next page

Table 7-10: Concluded

NARROW-BAND SHUNT PART NO.	FREQUENCY (HZ)	REMOVE SHORTING LINK AND CONNECT INDUCTOR LEADS BETWEEN SHUNT TERMINALS
62775/62780-2152*	211	A and F
	285	B and C
	348	B and C
	430	B and C
	525	B and C
62775-3448*	348	A and B
	389	A and B
	392	A and B
	430	A and B
	452	A and B
	483.5	A and B
62775-3497	348	A and B
	430	A and B
	525	A and B
	645	A and B
	790	A and B
	970	A and B
62775-7910*	790	A and B
	816	A and B
	832.5	A and B
	970	A and B
	979	A and B
	1034	A and B
62775-5274*	522	A and B
	525	A and B
	560	A and B
	645	A and B
	669.9	A and B
	746.8	A and B
62780-5297	525	A and B
	645	A and B
	790	A and B
	970	A and B

*Available for special applications only

7.10 ADJUSTABLE INDUCTOR ASSEMBLY, 8A398-6

The Adjustable Inductor Assembly, 8A398 is intended for use with Safetran's Single-frequency Narrow-band Shunts (62775-f/62780-f) to balance the approaches of a bidirectional application when the approaches differ by more than 10%. Insulated joints located in one approach frequently prevent both termination shunts from being installed at approximately equal distances from the 4000 GCP feed point as required.

- Adjustable Inductor Assembly, 8A398-6 (Figure 7-14), may be used along with the Shunt in the shorter approach to compensate for the reduced distance as shown in Figure 7-15.
- The Adjustable Inductor Assembly consists of a 3-inch diameter ABS plastic enclosure with mounting brackets at the base.
- Seven AREMA terminals extend from the top of the assembly
- Terminals accommodate connections to six inductors that are connected in series and housed within the sealed unit

NOTE

When configuring the 8A398-6 Adjustable Inductor, simulated track length is selectable in 50 foot (15.2 meter) increments ranging from 50 to 3150 feet (15.2 – 960.1 meters).

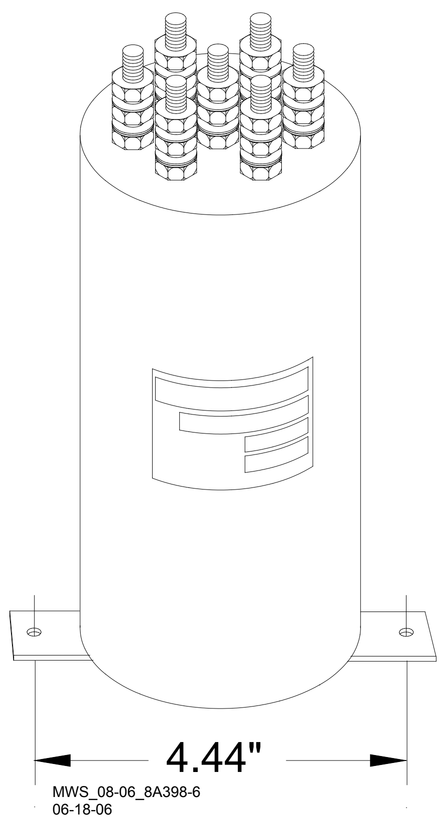


Figure 7-14:
Adjustable Inductor Assembly, 8A398-6

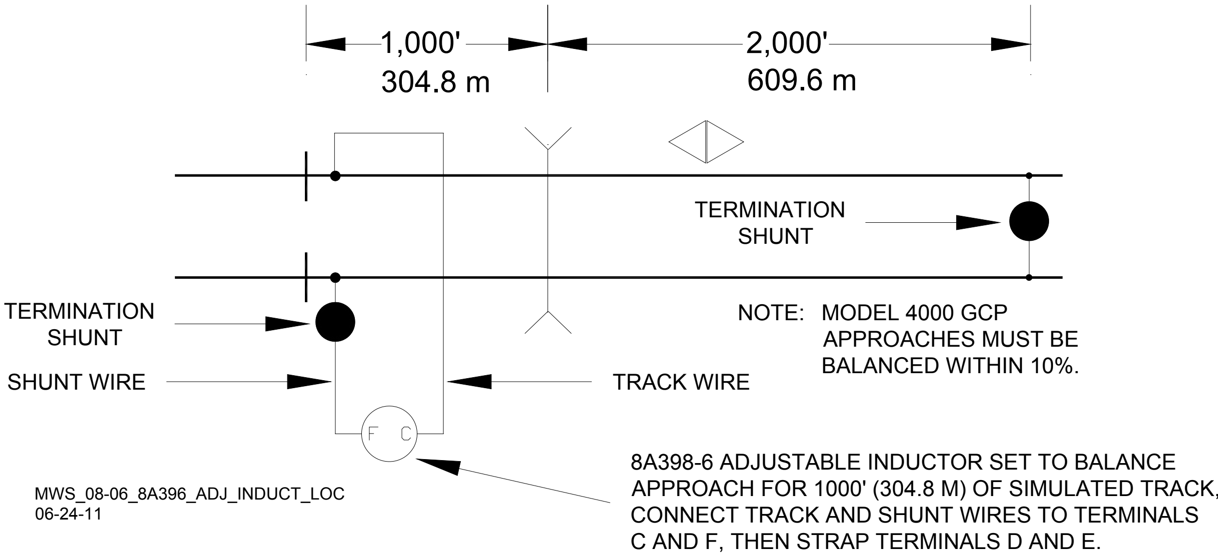


Figure 7-15:
Adjustable Inductor Used With Termination Shunt

7.10.1 Adjustable Inductor Configuration

Step 1: Refer to Table 7-11 and locate the desired simulated track length (column 1).

Step 2: Read across the table to determine which inductors (indicated by terminal pairs in column 2) are required to simulate that length (i.e., for a simulated track length of 1,000 feet, terminals C and F are indicated).

Step 3: Connect the track wire and the shunt wire (see Figure 7-15) to the two terminals indicated in column 2.

Step 4: Install a strap between the terminal pairs indicated in column 3. [This shorts the inductor(s) located between the track and shunt wire connecting terminals (Figure 7-16) which are not required for the desired length. To continue the example given in Step 2, when the track and shunt wires are connected to terminals C and F, a simulated track length of 1400 feet (800 + 400 + 200) is selected. Placing a strap between terminals D and E shorts the 400-foot inductor, removing it from the series circuit].

Table 7-11:
Adjustable Inductor Assembly, 8A398-6, Terminal Connections

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 1	COLUMN 2	COLUMN 3
SIMULATED TRACK LENGTH FEET/METERS	**SET TRACK & SHUNT WIRES TO TERMINALS**	**CONNECT SHORTING STRAP(S) TO THESE TERMINALS**	**SIMULATED TRACK LENGTH FEET/METERS**	**CONNECT TRACK AND SHUNT WIRES TO TERMINALS**	**CONNECT SHORTING STRAP(S) BETWEEN THESE TERMINALS**
50/16	A-B		1650/503	A-G	B-C, C-D, D-E, E-F
100/31	B-C				
150/46	A-C		1700/519	B-G	C-D, D-E, E-F
200/61	C-D		1750/134	A-G	C-D, D-E, E-F
250/77	A-D	B-C	1800/549	C-G	D-E, E-F
300/92	B-D		1850/564	A-G	B-C, D-E, E-F
350/107	A-D		1900/580	B-G	D-E, E-F
400/122	D-E		1950/595	A-G	D-E, E-F
450/137	A-E	B-C, C-D	2000/610	D-G	E-F
500/153	B-E	C-D	2050/625	A-G	B-C, C-D, E-F
550/168	A-E	C-D	2100/640	B-G	C-D, E-F
600/183	C-E		2150/656	A-G	C-D, E-F
650/199	A-E	B-C	2200/671	C-G	E-F
700/214	B-E		2250/686	A-G	B-C, E-F
750/229	A-E		2300/701	B-G	E-F
800/244	E-F		2350/717	A-G	E-F
850/259	A-F	B-C, C-D, D-E	2400/732	E-G	
900/275	B-F	C-D, D-E	2450/747	A-G	B-C, C-D, D-E
950/282	A-F	C-D, D-E	2500/762	B-G	C-D, D-E
1000/305	C-F	D-E	2550/778	A-G	C-D, D-E
1050/320	A-F	B-C, D-E	2600/793	C-G	D-E
1100/336	B-F	D-E	2650/808	A-G	B-C, D-E
1150/351	A-F	D-E	2700/823	B-G	D-E
1200/366	D-F		2750/839	A-G	D-E
1250/381	A-F	B-C, C-D	2800/854	D-G	
1300/397	B-F	C-D	2850/869	A-G	B-C, C-D, D-E
1350/412	A-F	C-D	2900/884	B-G	C-D
1400/427	C-F		2950/899	A-G	C-D
1450/442	A-F	B-C	3000/914	C-G	
1500/458	B-F		3050/930	A-G	B-C
1550/473	A-F		3100/945	B-G	
1600/488	F-G		3150/961	A-G	

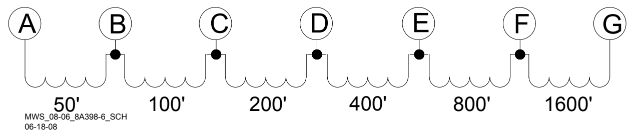


Figure 7-16:
Adjustable Inductor, 8A398-6 Schematic

7.10.2 8A398-6 Adjustable Inductor Assembly Specifications

Diameter	3.375 inches (8.573 centimeters)
Height	9 inches (22.860 centimeters) (to top of AREMA terminals)
Weight	5 pounds, 12 ounces (2.59 kilograms)

7.11 TRACK CIRCUIT ISOLATION DEVICES

Several types of track circuit isolation devices are available for both DC and AC coded track applications. The following discussions are grouped by coded track circuit type.

NOTE

The recommendations presented in the following paragraphs are general in nature and no attempt has been made to cover all applications.

Battery chokes and code isolation devices described here are designed for mounting inside a weatherproof enclosure.

If there are any questions concerning these recommendations or applications, contact Siemens Technical Support for assistance.

7.11.1 Steady Energy DC Track Circuits

NOTE

If the track connections for the DC track circuit are 2,000 (609.8 m)feet or more beyond the GCP approach termination shunt, a battery choke is not required (see Figure 7-17).

A DC track circuit should be equipped with a battery choke when its battery is located:

- Within the 3000/4000 GCP approach
- Less than 2,000 ft. (609.8 m) beyond the approach termination.

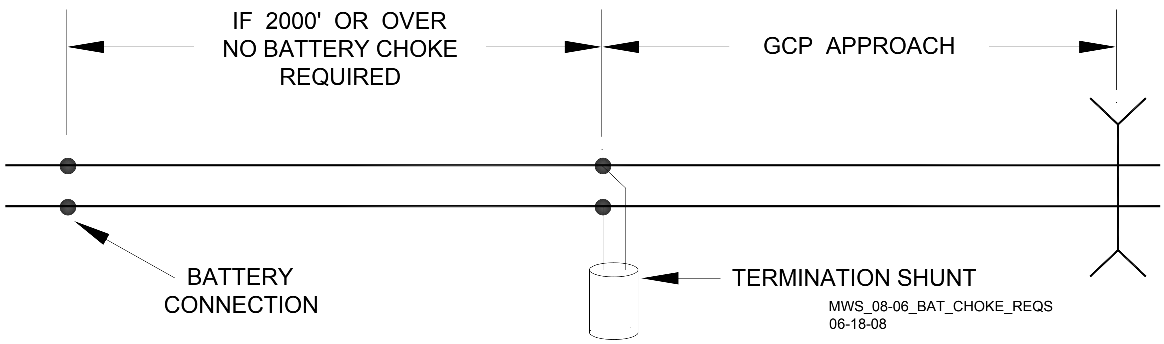


Figure 7-17:
Battery Choke Requirements

Either of the following Battery Chokes may be used: (see limitations in the following paragraphs):

- Part number 8A065A
- Part number 62648.

The use of battery chokes is subject to the following limitations:

- Operation of long DC track circuits with very low ballast conditions may be affected by the DC resistance (DCR) of the 8A065A Battery Choke (DCR of 8A065A is 0.40 ohm). Such track circuits should use the 62648 Battery Choke, which has a DCR of 0.10 ohm.
- In applications where the Choke is located within a Model 300 or Model 400 GCP approach, the 8A065A Battery Choke must be used.
- When a rectified track circuit is used and the GCP is operating at 114 Hz, an 8A076A Wideband Shunt (paragraph 7.8) should be used together with the Battery Choke to eliminate 120 Hz ripple. This application is illustrated in Figure 7-18.

The 62648 and 8A065A Battery Chokes each consist of a large inductance coil with two top-mounted AREMA terminals and a mounting base (see Figure 7-19).

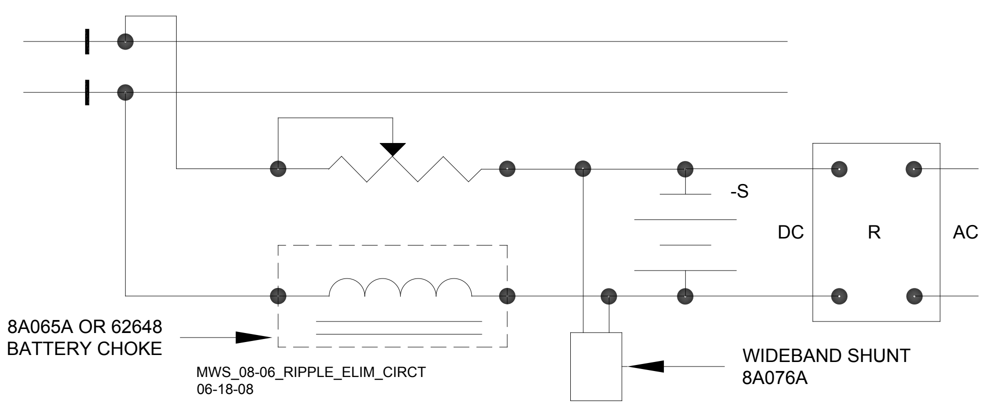


Figure 7-18:
Ripple Elimination Circuit

7.11.1.1 62648 and 8A065A Battery Chokes Specifications

Dimensions	4.5 inches (11.430 centimeters) wide 5.0 inches (12.700 centimeters) deep 8.5 inches (21.590 centimeters) high (to top of terminal studs)
Weight	17 pounds (7.72 kilograms) (approximate)

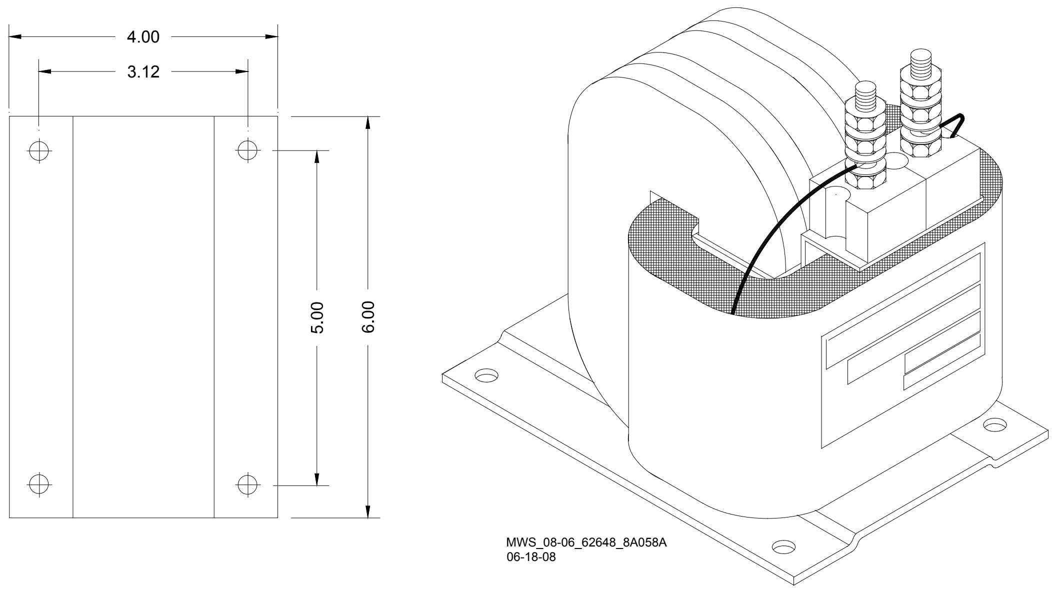


Figure 7-19:
62648/8A065A Battery Choke With Mounting Dimensions

7.11.2 Siemens GEO Electronic DC Coded System

The standard Siemens 4000 GCP frequencies of 86 Hz and above are compatible with GEO. Isolation circuits are generally not required in the GEO transmitter rail connections. GCP Frequencies of 86, 114, 156, and 211 Hz require use of maximum current, track devices, and the GEO Track Noise Suppression Filter, A53252. The GEO Filter must be installed at the signal location for the above mentioned frequencies.

7.11.3 ElectroCode Electronic Coded System

Model 4000 GCP frequencies of 86 Hz and above can normally be used with Electro Code.

- All frequencies of 211 Hz and lower require use of maximum current track drive.
- In certain instances, 285 Hz may also require maximum current.
- For frequencies of 211 Hz and lower, an Electro Code track filter (TF-freq) may be required when the Electro Code transmitter is located within the 4000 GCP approach.

NOTE

Under some circumstances,+++++++ an external track filter may be required when electronic coded track is located within the Model 4000 GCP approach. As with any coded track system, the lower the transmit level, the less interference to GCP units.

7.11.4 Relay Coded DC Track

Most relay coded DC track installations require use of DC Code Isolation units. A code isolation unit is a special battery choke that aids in preventing coded track battery and track relays from causing high interference with the 4000 GCP. There are two Siemens DC Code Isolation units: the 6A342-1 DC Code Isolation Unit, used in single polarity systems and the 6A342-3 DC Code Isolation Unit, which is used in dual polarity systems.

7.11.4.1 DC Code Isolation Unit, 6A342-1

The 6A342-1 DC Code Isolation Unit, Figure 7-20, is used in most single polarity code systems. It consists of filter components (L1, C1, R1, and CR1) and three AREMA binding posts on a mounting base. The 6A342-3 DC Code Isolation Unit is used in GRS Trakode (dual polarity) relay systems.

WARNING

THE SINGLE POLARITY CODED TRACK CIRCUIT MUST BE CAREFULLY REVIEWED TO ENSURE THAT ALL TRANSMIT AND RECEIVE CODES ARE OF THE SAME POLARITY PRIOR TO INSTALLING ANY 6A341-1 UNIT. IF THE POLARITY IS IN DOUBT, INSTALL TWO 6A342-3 ISOLATION UNITS AT EACH END OF THE TRACK CIRCUIT. SAME INSTALLATION AS THE DUAL POLARITY CODED TRACK CIRCUIT.

CONTACT SIEMENS TECHNICAL SUPPORT AT 800-793-7233 FOR DETAILS.

NOTE

All wiring to terminals 1 and 2 on the Isolation units should be number 6 AWG. This significantly reduces current losses to the track relay during low track ballast conditions. Frequencies below 211 Hz require maximum GCP track drive current.

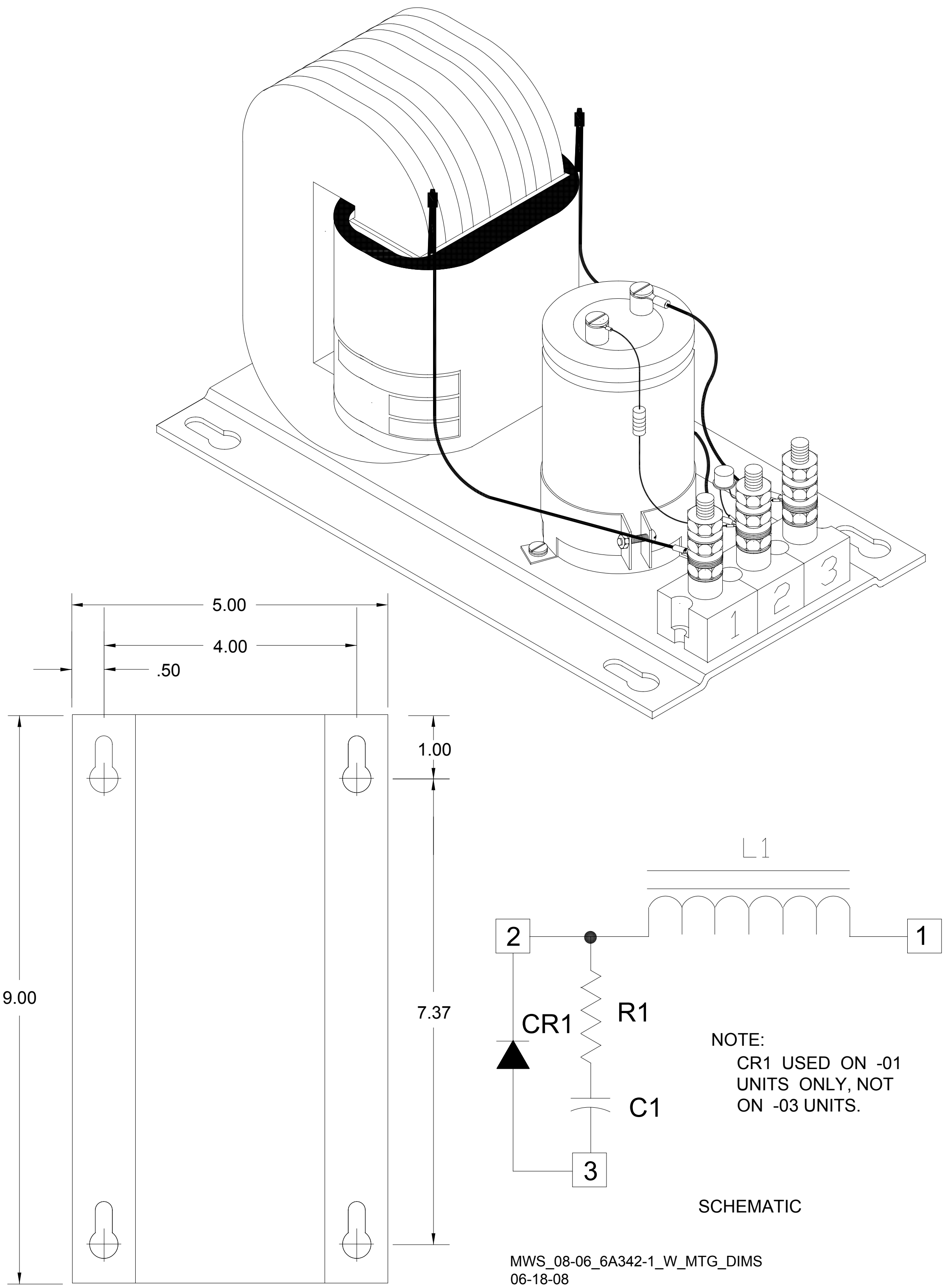


Figure 7-20:
DC Code Isolation Unit, 6A342-1, With Mounting Dimensions

WARNING

ALWAYS VERIFY PROPER COD+E SYSTEM OPERATION FOLLOWING INSTALLATION OF THE ISOLATION UNIT.

7.11.4.2 DC Code Isolation Unit, 6A342-1 Specifications

Dimensions	5.0 inches (12.700 centimeters) wide
	9.0 inches (22.860 centimeters) deep
	5.75 inches (14.605 centimeters) high
Weight	15 pounds (6.81 kilograms) (approximate)

7.11.4.3 DC Code Isolation Unit, 6A342-1 Applications

Three applications for the 6A342-1 DC Code Isolation Units are discussed in the following paragraphs.

7.11.4.4 Single Polarity Systems (Fixed Polarity)

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

NOTE

To limit current losses to the track relay during low track ballast conditions, use number 6 AWG wires to terminals 1 and 2 on the isolation units.

The 6A342-1 Code Isolation unit can be used in most single (fixed) polarity code systems. A single polarity code system must have the same received and transmitted polarities to use this Code Isolation unit. Most rate code systems (75, 120, 180 ppm) are of this type. Figure 7-21 illustrates a typical 6A342-1 Code Isolation unit installation in a single polarity code system.

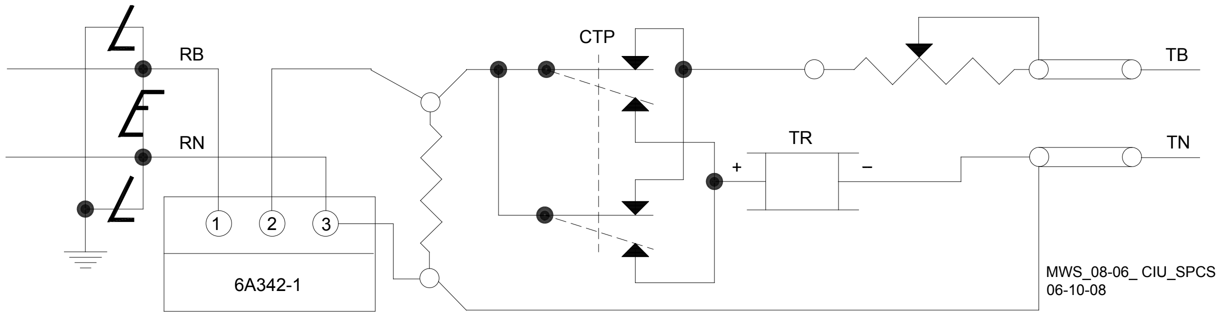


Figure 7-21:
Code Isolation Unit In a Single Polarity Code System

7.11.4.5 GRS Trakode (Dual Polarity) Systems

WARNING

TO INSTALL THE UNIT AS SHOWN, A TRANSFER DELAY (TD) RELAY MUST BE USED. DO NOT INSTALL ANY CODE ISOLATION CIRCUIT IN GRS TRAKODE WITHOUT USE OF THE TD RELAY.

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

NOTE

To limit current losses to the track relay during low track ballast conditions, use number 6 AWG wires to terminals 1 and 2 on the isolation units.

Figure 7-22 illustrates the 6A342-1 Code Isolation unit installed in a GRS Trakode system.

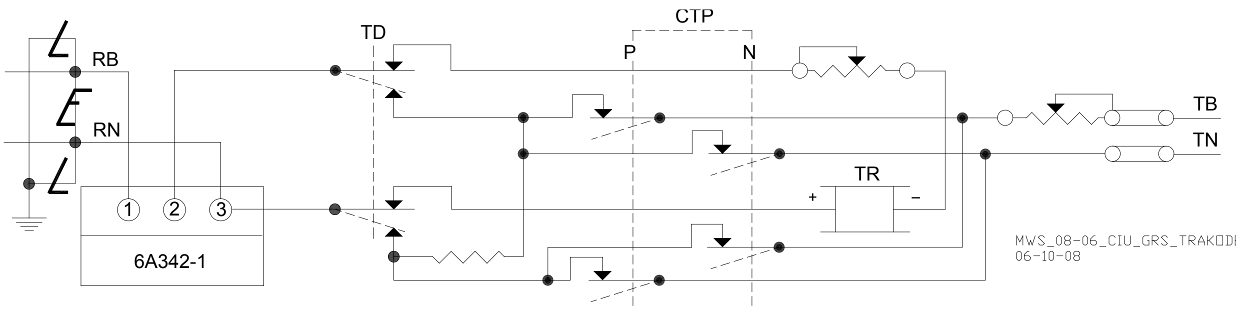


Figure 7-22:
Code Isolation Unit Installation In a GRS Trackode System

7.11.4.6 Dual Polarity (Polar) Coded Track Systems Other Than GRS Trakode

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

A dual polarity system is one in which the received code polarity is opposite to that of the transmitted code.

7.11.4.7 DC Code Isolation Unit, 6A642-3

The 6A342-3 Code Isolation unit can be used in a dual polarity system; however, two 6A342-3 units must be specifically placed at each end of the circuit for proper filtering. The application will depend upon the track circuit configuration. Contact Siemens Technical Support for assistance in dual polarity code systems.

7.11.5 AC Code Isolation Units

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF AN ISOLATION UNIT.

CAB signal and style C track circuit installations require the use of an AC Code Isolation unit such as the 8A466-3 (Figure 7-23) or the 8A470-100 (Figure 7-24). Both of these units should be used only with GCP frequencies of 790 Hz and higher in style C track circuit installations. Contact Siemens Technical Support for specific information.

7.11.5.1 AC Code Isolation Unit, 8A466-3

The 8A466-3 AC Code isolation unit is used in 60 Hz CAB signal track circuit installations to reduce 60 Hz harmonics from being applied to the track. It is used with GCP frequencies 156 Hz and higher. It is housed in a steel case with top mounted AREMA binding posts provided for track connections.

7.11.5.2 AC Code Isolation Unit, 8A466-3 Specifications

Dimensions	10.15 inches (25.781 centimeters) wide
	11.78 inches (29.921 centimeters) deep
	7.62 inches (19.355 centimeters) high
Weight	26 pounds (11.8 kilograms) (approximate)

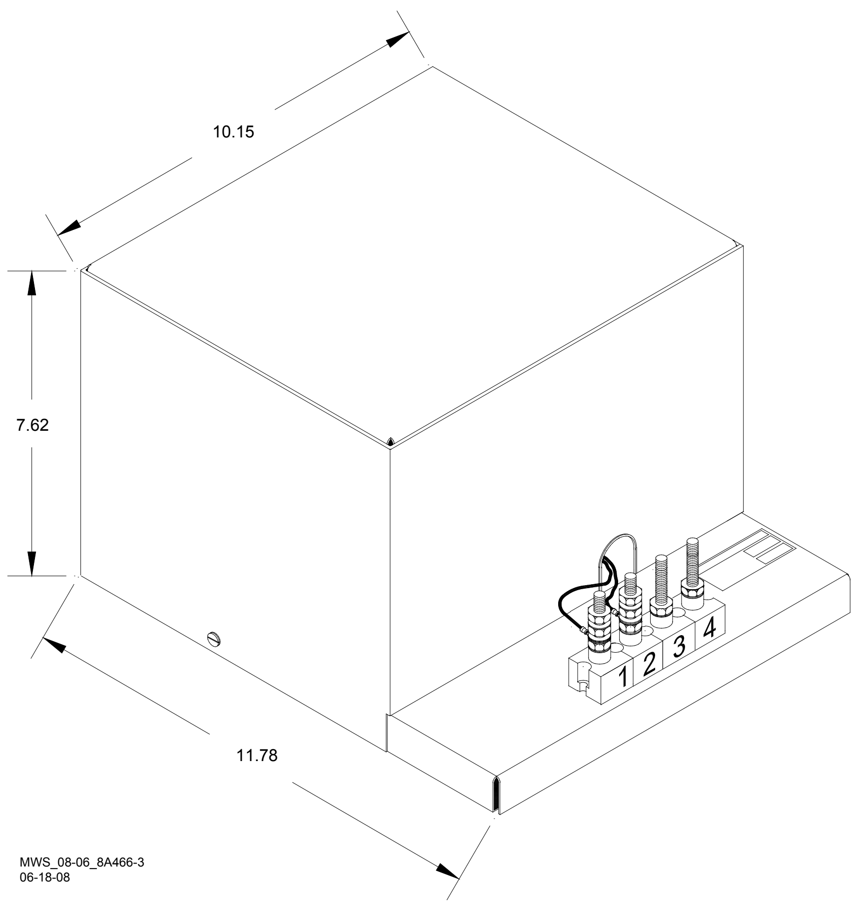


Figure 7-23:
AC Code Isolation Unit, 8A466-3

7.11.5.3 AC Code Isolation Unit, 8A470-100

The 8A470-100 AC Code isolation unit is used in 100 Hz CAB signal track circuit installations to reduce 100 Hz harmonics from being applied to the track. It is used on with GCP frequencies 211

Hz and higher. It is mounted on an aluminum case with two top mounted AREMA binding posts provided for track connections.

7.11.5.4 Code Isolation Unit, 8A470-100 AC Specifications

Dimensions	5.0 inches (12.700 centimeters) wide
	9.4 inches (23.876 centimeters) deep
	9.0 inches (22.860 centimeters) high
Weight	5 pounds (2.27 kilograms) (approximate)

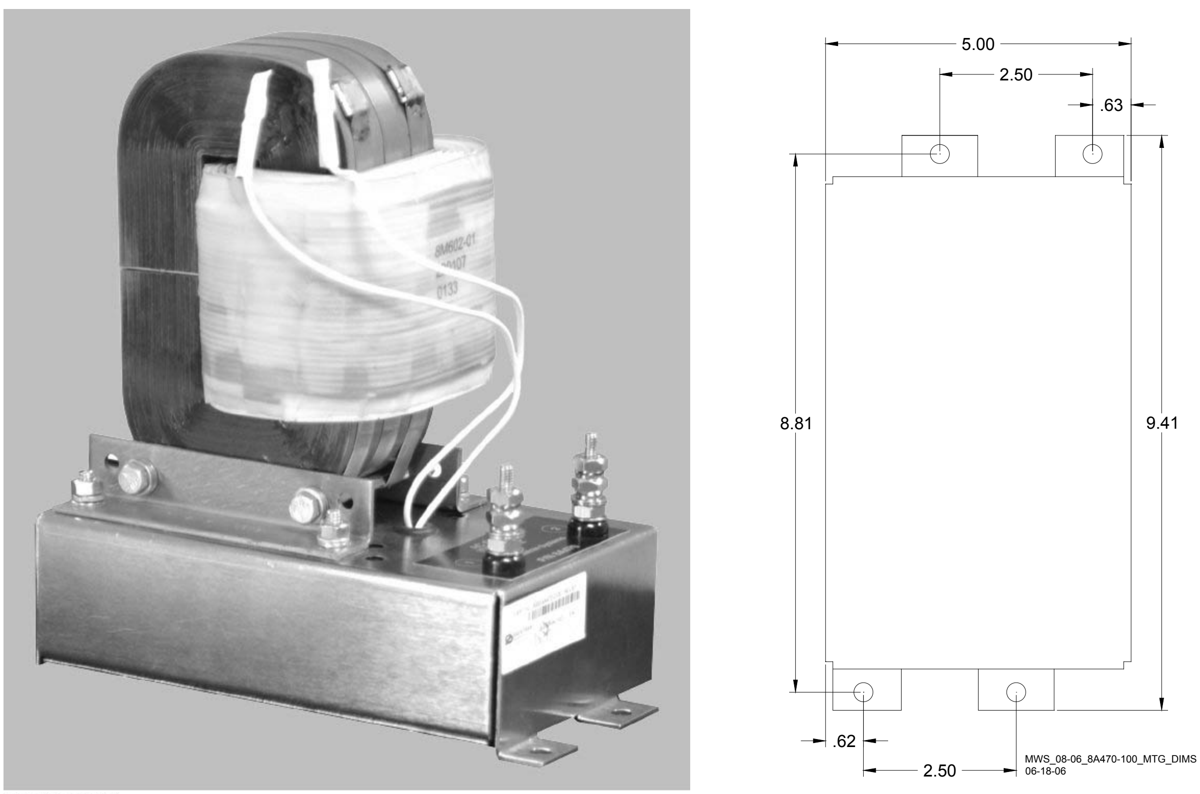
7.11.5.5 Cab Signal AC

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF A CAB SIGNAL UNIT.

Application of 4000 GCP systems in cab territory using the 8A466-3, 60 Hz AC Code Isolation Unit or the 8A470-100, 100 Hz Isolation Unit is shown in Figure 7-25.

For other installations, contact Siemens Technical Support for assistance.



MWS_08-06_8A470-100
06-18-08

Figure 7-24:
AC Code Unit, 8A470-100, With Mounting Dimensions

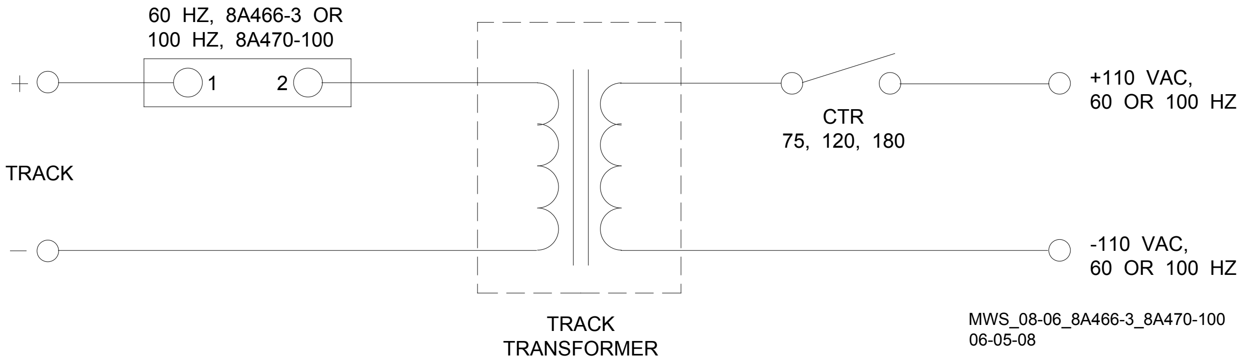


Figure 7-25:
AC Code Isolation Unit Used In CAB Territory

7.11.5.6 Style C Track Circuits

The 60 Hz AC Code Isolation unit (8A466-3) is used with style C track circuits as shown in Figure 7-26.

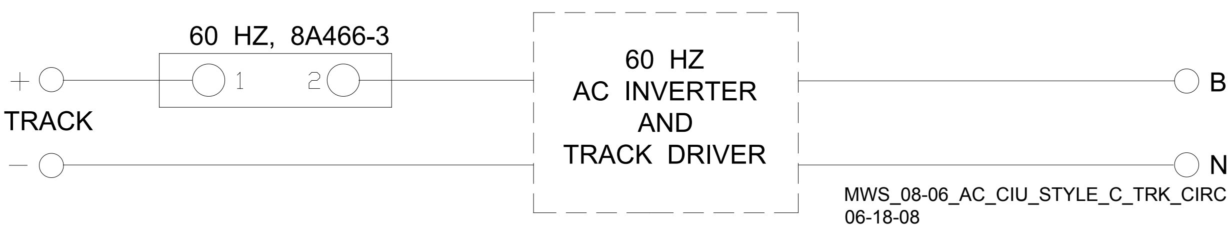


Figure 7-26:
AC Code Isolation Unit Used in Style C Track Circuits

7.11.5.7 AC Code Isolation Unit, 8A471-180

For special applications, 180 Hz AC Code Isolation Unit (8A471-180) is also available. Contact Siemens Technical Support for specific information.

7.12 TUNABLE INSULATED JOINT BYPASS COUPLER, 62785-F

The Tunable Insulated Joint Bypass Coupler, 62785-f is the only tuned bypass coupler to be used with the Model 4000 GCP for bypassing insulated joints in DC coded track.

- The 62785-f Bypass Coupler is used in all 4000 GCP applications requiring the use of an insulated joint bypass coupler.
- The 62785-f Coupler is available in standard Siemens frequencies of 114 Hz through 970 Hz.

WARNING

INSULATED JOINT BYPASS COUPLERS, 62531-F AND 62631-F, MUST NOT BE USED WITH THE 4000 GCP.

THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN TABLE 7-12 APPLY TO THE 3000/4000 GCP ONLY; NOT TO ANY EARLIER SIEMENS GCP'S (MODELS 660, 600, 400, AND 300).

WHEN THE 4000 GCP IS PROGRAMMED AS A PREDICTOR, THE 62785-F COUPLER CANNOT BE USED TO BYPASS INSULATED JOINTS WITHIN THE INNER TWO-THIRDS OF AN APPROACH, EXCEPT AS SPECIFIED IN TABLE 7-12.

THE TUNED JOINT COUPLER MUST BE TUNED PRIOR TO PERFORMING SETUP FOR APPROACH LENGTH AND LINEARIZATION PROCEDURES DURING THE TRACK CALIBRATION PROCESS.

62785-F TUNED BYPASS COUPLERS MUST ONLY BE USED TO BYPASS INSULATED JOINTS IN CODED DC TRACK CIRCUITS

The application guidelines for Tunable Insulated Joint Bypass Coupler, 62785-f when used only with the 4000 GCP have been expanded as follows:

- In DC coded track circuits, the insulated joints within an approach may be bypassed using the Siemens 62785-f Tunable Insulated Joint Bypass Coupler, provided the minimum distances specified in Table 7-12 are observed.
- The 62785-f Coupler must be field tuned to pass the 4000 GCP operating frequency (f) around insulated joints in DC or coded DC track circuits.
- Field tuning of the Coupler enables precise frequency adjustment for track and joint parameters.
- The Coupler must be located within 10 feet of the insulated joints that it is coupling.
- The minimum distance to the insulated joints is generally a function of the 4000 GCP operating frequency; i.e., the lower the operating frequency, the longer the minimum distance.

Two sets of insulated joints may be coupled in any single approach, provided the minimum operating distances specified in Table 7-12 are observed.

- Table 7-12 indicates the minimum operating distances (in feet) to the first and second set of insulated joints that are coupled with 62785-f couplers for 4000 GCP operation.

Table 7-12:
Minimum Distance to Insulated Joints When Coupled With Tunable Insulated Joint Bypass Coupler, 62785-f

FREQUENCY (HZ)	MINIMUM DISTANCE TO FIRST SET OF INSULATED JOINTS (FEET)*	MINIMUM DISTANCE TO SECOND SET OF INSULATED JOINTS (FEET)*
86	N/A	N/A
114	2000/610	3000/914
151 – 211	1500/458	2200/671
212 – 348	1000/305	1400/427
349 – 560	700/214	1000/305
561 – 790	500/153	800/244
791 – 979	400/122	700/214

*Distance applies to insulated joints located on the same side of the crossing.

The Coupler is housed in a hermetically sealed, 6- inch (15.240 cm) diameter case

- A pair of 10-foot, number 6 AWG leads extend from one end
- Nine AREMA terminals extend from the other end (see Figure 7-27).
- Five of the terminals (labeled A through E) are equipped with special gold test nuts that are used to tune the Coupler.

WARNING

AT THE COMPLETION OF FIELD TUNING THE 62785-F BYPASS COUPLERS ENSURE THAT A STANDARD AREMA NUT IS TIGHTENED SECURELY AGAINST EACH GOLD NUT ON TERMINALS A THROUGH E, INCLUDING THE TERMINALS THAT ARE NOT TIGHTENED DOWN.

NOTE

While field tuning the 62785-f Bypass Coupler, tightening the nut on terminal E produces maximum change in EZ value. Tightening the nut on terminal A produces minimum change.

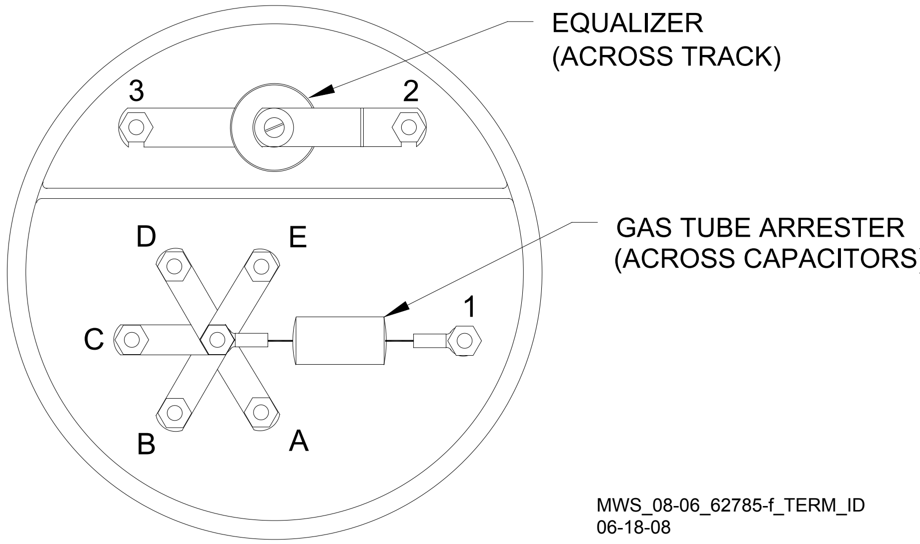


Figure 7-27:
Terminal Identification, 62785-f
Tunable Insulated Joint Coupler

The Coupler is tuned in the following sequence:

- The gold nut on terminal E is tightened first.
- Calibrate the Model 4000 GCP so that the EZ value is 100.
- Next, a hardwire shunt is placed across the tracks, first on one side of the coupler and then on the other, tightening one or more of the remaining nuts in sequence to obtain the minimum change in EZ value across the joint.

NOTE

Tightening the nut on terminal E produces maximum change in EZ value and tightening the nut on terminal A produces minimum change.

- When the adjustment is complete, a second (standard) AREMA nut is tightened on each of the terminals to lock the gold adjusting nuts firmly in position.
- Next an equalizer and a gas tube for capacitor protection are connected to the remaining AREMA terminals to provide complete surge protection.
- Finally, a pliable end cap is secured in place over the terminal end of the coupler by a sturdy stainless steel clamp to provide protection against moisture and dust.

There are two different tuning procedures to tune the Tunable Insulated Joint Bypass Coupler depending on where the coupler(s) is/are located in the approach. Use the procedure outlined in paragraph 7.12.1 primarily. Use the procedure outlined in paragraph 7.12.2 as an alternate. Refer to Figure 7-28 when performing either of the following tuning procedures.

CAUTION

THE COUPLER SHOULD BE CONNECTED WITHIN 10 FEET (3.048 METERS) OF THE RAILS. TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, IT SHOULD BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH (SEEPARAGRAPH 5.13). IT IS NOT NECESSARY TO BURY THE COUPLER BELOW THE FROST LINE.

NOTE

Multiple couplers often require the procedures in paragraph 7.12.2 for proper setup.

7.12.1 Field Tuning Procedure #1

Refer to the appropriate installation diagram in Figure 7-28 for the following tuning procedure.

Step 1: Tighten the gold nut securely on terminal E of each coupler.

Step 2: Calibrate the 4000 GCP so that the EZ value is 100.

Step 3: Place a hardwire test shunt across the track at location A (refer to Figure 7-28).

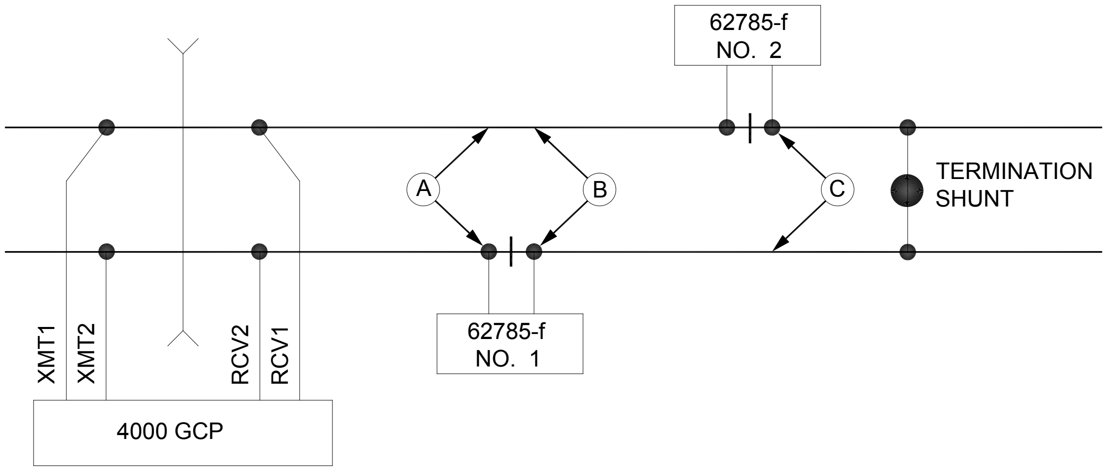
Step 4: **Make note of the EZ value** appearing on the 4000 GCP display.

Step 5: Move the test shunt to location B.

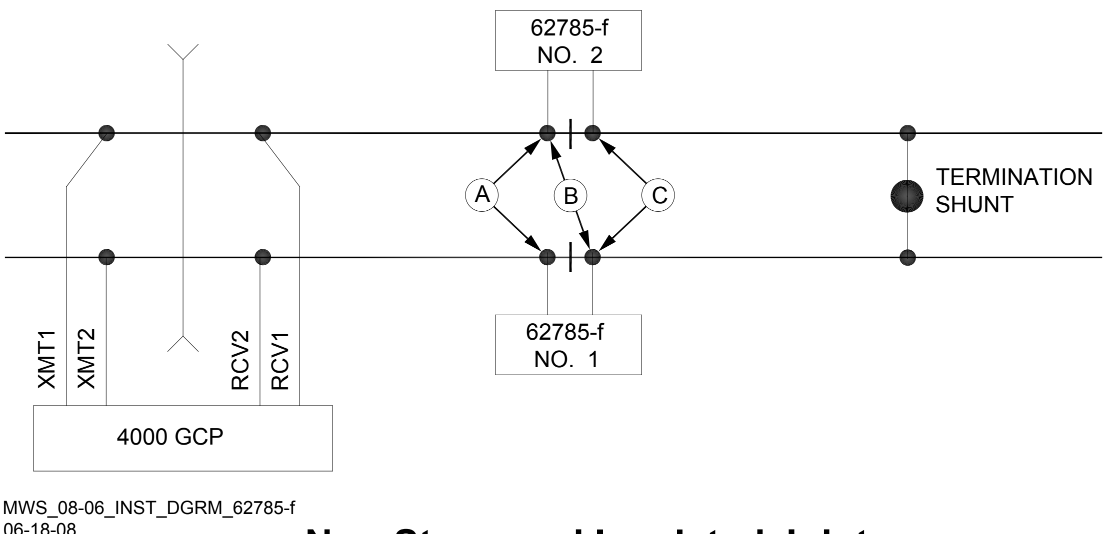
Step 6: Tune the Tunable Insulated Joint Bypass Coupler #1 to the same EZ value noted in Step 4.

- Tighten the gold nut on the Coupler **#1** terminals labeled D, C, B, and A, in sequence beginning with terminal D.
- If tightening a nut results in an EZ value that is lower than the value recorded in step 4, loosen the nut and tighten the next nut in sequence.
- If, after tightening a nut, the EZ value remains higher than the value recorded in step 4, leave the nut tightened and tighten the next nut in sequence.
- Continue to tighten nuts D through A as necessary to obtain an EZ value that is approximately the same as that recorded in step 4.

Step 7: Move the test shunt to location C.



Staggered Insulated Joints



Non-Staggered Insulated Joints

Figure 7-28:
Typical Installation Diagrams Using the 62785-f Coupler

Step 8: Tune the No. 2 Tunable Insulated Joint Bypass Coupler to the EZ value noted in step 4.

- Tighten the gold nut on the Coupler #1 terminals labeled D, C, B, and A, in sequence beginning with terminal D.
- If tightening a nut results in an EZ value that is lower than the value recorded in step 4, loosen the nut and tighten the next nut in sequence.
- If, after tightening a nut, the EZ value remains higher than the value recorded in step 4, leave the nut tightened and tighten the next nut in sequence. Continue to tighten nuts D through A as necessary to obtain an EZ value that is approximately the same as that recorded in step 4.

Step 9: Remove the test shunt and tighten a standard AREMA nut against each gold nut to ensure all nuts are securely locked in position.

WARNING

ENSURE THAT A STANDARD AREMA NUT IS TIGHTENED SECURELY AGAINST EACH GOLD NUT ON TERMINALS A THROUGH E, INCLUDING THE TERMINALS THAT ARE NOT TIGHTENED DOWN.

Step 10: Completely recalibrate the 4000 GCP and perform all operational checks while observing the smooth change in the EZ value across the couplers during a train move.

Field Tuning Procedure #2 for Couplers

Step 1: Tighten the gold nut securely on terminal E of each coupler.

Step 2: Calibrate the Model 4000 GCP EZ value to 100.

Step 3: Place a hardwire test shunt across the track at location A (refer to Figure 7-28).

Step 4: Make a note of the EZ and EX values on the Model 4000 GCP display.

Step 5: Move the test shunt to location B.

Step 6: Tune the Tunable Insulated Joint Bypass Coupler **#1 EX** value to above 75. The **EZ** value may be as much as 8 points above the value noted in Step 4.

Step 7: Move the test shunt to location C.

Step 8: Tune the Tunable Insulated Joint Bypass Coupler **#2** so the **EX** value stays above 75. The **EZ** value may be as much as 16 points above the value note in Step 4.

Step 9: Remove the test shunt and tighten a standard AREMA nut against each gold nut to ensure all nuts are securely locked in position.

WARNING

ENSURE THAT A STANDARD AREMA NUT IS TIGHTENED SECURELY AGAINST EACH GOLD NUT ON TERMINALS A THROUGH E. TERMINALS THAT ARE NOT USED FOR TUNING THE COUPLER MUST HAVE THEIR GOLD NUTS REMOVED.

Step 10: Completely recalibrate the Model 4000 GCP and perform all the operational checks while observing the relatively smooth change in the EZ value across the couplers during a train move.

7.12.2 Tunable Insulated Joint Bypass Coupler, 62785-f Specifications

Dimensions	18 inches (45.720 centimeters) long
	6 inches (15.240 centimeters) in diameter
Weight	12 pounds (5.45 kilograms) (approximate)
Leads	10 feet (3.048 meters); #6 AWG, stranded, black PVC
Surge Suppresser	Equalizer, 022700-21X, Siemens No. Z803-00052-0001
Part Numbers	Gas Tube Arrester, Siemens No. Z803-00053-0001

7.13 SPREAD SPECTRUM RADIOS, 53308 AND 53325

Siemens Spread-Spectrum Radios may be used to provide a vital RF communications link between 4000 GCP installations.

7.13.1 Spread-Spectrum Radio (SSR), 53308

For information pertaining to the 53308 Spread Spectrum Radio (SSR), refer to Instruction & Installation Document, COM-00-97-21 (see Figure 7-29A). There are many in service but the unit is no longer in production

7.13.2 Ethernet Spread-Spectrum Radio (ESSR), 53325

For information pertaining to the 53325 Ethernet Spread Spectrum Radio (ESSR), refer to Installation & Operation Document, COM-00-05-05 (see Figure 7-29B). This unit requires Wayside Access Gateway, 53457 (paragraph 7.14), to interface with the 4000 GCP.

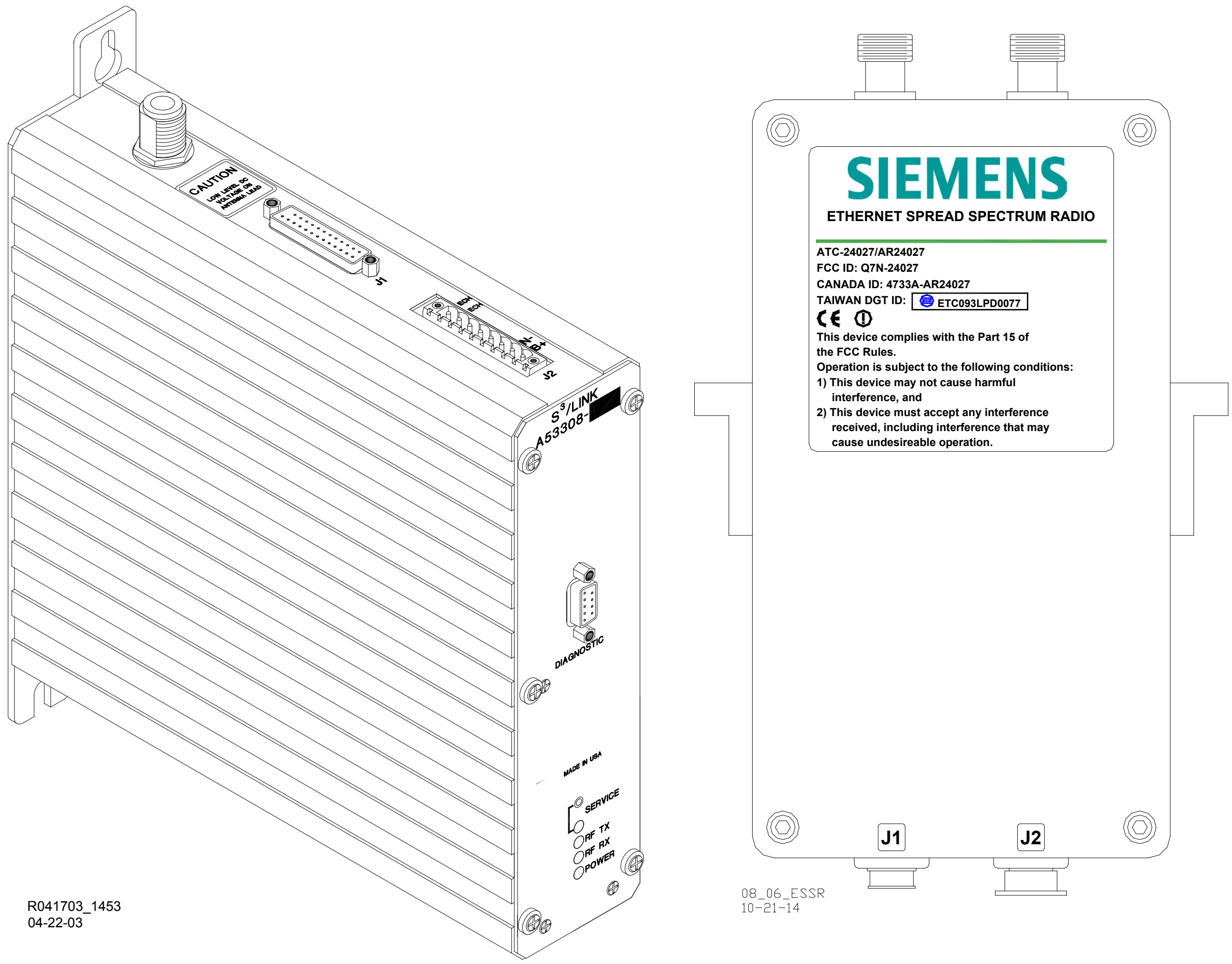


Figure 7-29.
Spread Spectrum Radios, 53308 and 53325

7.14 WAYSIDE ACCESS GATEWAY, 53457

The Wayside Access Gateway (WAG), 53457 Figure 7-30, is used as a part of the vital Ethernet communications link between 4000 GCP installations. It is used in conjunction with the Siemens 53325 Ethernet Spread-Spectrum Radio (paragraph 7.13.2). For further information and detailed instructions regarding the Wayside Access Gateway, 53457, refer to User's Guide Document, COM-00-05-16.

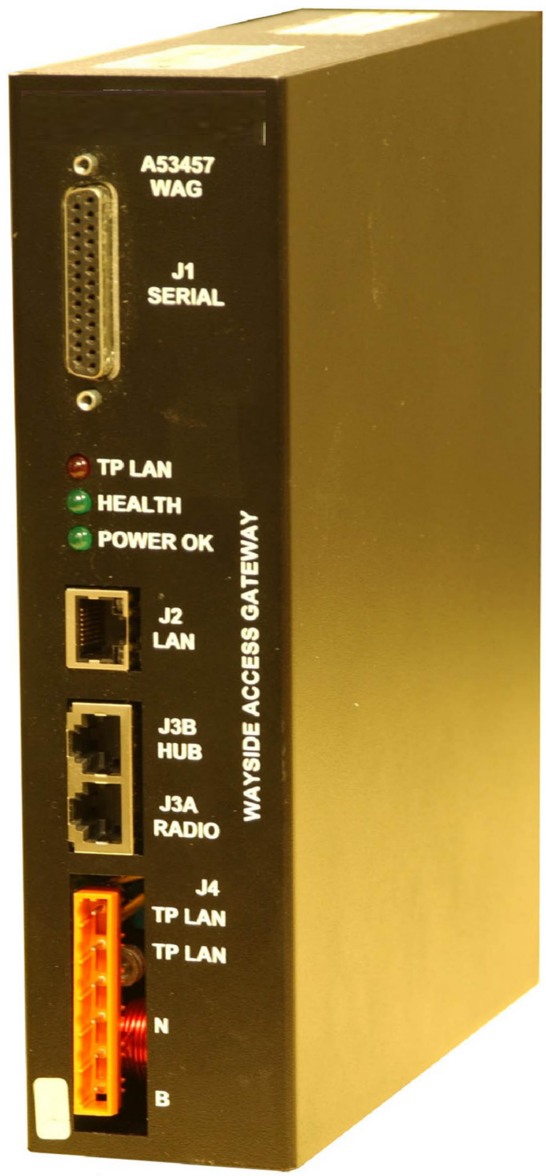


Figure 7-30:
Wayside Access Gateway, 53457

7.15 HD/LINK MODULE, A53201

When used in conjunction with a Wayside Access Gateway (WAG), A53457, an HD/LINK functions in a communications network system as a vital I/O unit. An HD/LINK system provides the capability to read the state of a vital input at one location, typically a relay contact, and use this input state to drive a vital output on the GCP at the same or another location. The HD/LINK is connected to a WAG and this WAG is connected to a WAG co-located with the GCP via a LAN. The input into the HD/LINK is passed through to the WAGs and into the GCP. The GCP can pass a vital output back to the switch by the reverse method.

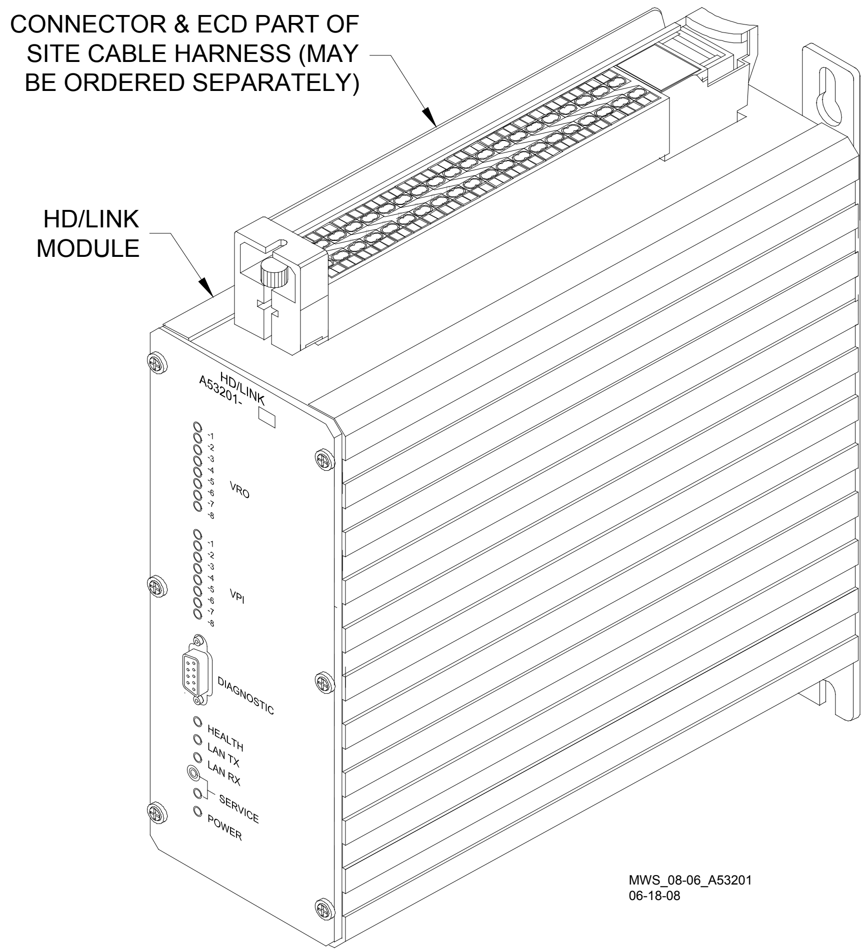


Figure 7-31:
HD/LINK MODULE, A53201

7.15.1 Siemens HD/LINKer Software

The HD/LINKer is a Microsoft® Windows™-based office application that creates Module Configuration Files (MCFs) for the HD/LINK Vital I/O Modules.

Each MCF created by the HD/LINKer represents the configuration of the HD/LINK Modules at a specific railroad location. Module configuration data for the various railroad groups is created by the HD/LINKer and stored in a Master Advanced Train Control System (ATCS) Database

When a MCF is needed for a Line, module specific configuration data is retrieved from the Database by the HD/LINKer and compiled into the MCF. This MCF, along with the other MCFs for the line, is transferred (checked-out) to a portable field computer by means of network drive, CD, or disk.

Within the field PC, the MCF is transferred to the Diagnostic Terminal Utility (DTU) application. At the appropriate railroad group, the MCF is transferred from the DTU into the External Configuration Device (ECD) contained within the WAGO® interface connector of the group's HD/LINK Module.

The MCF data within the ECD then determines the configuration of the connected HD/LINK Module.

7.16 MS/GCP TERMINATION SHUNT BURIAL KIT, 62776

The MS/GCP Termination Shunt Burial Kit, 62776, is designed to protect Narrow-band Termination Shunts while they are buried in the space between adjacent railroad ties.

7.16.1 Kit Contents

The MS/GCP Termination Shunt Burial Kit, 62776, consists of a 26-inch length enclosure of 6-inch diameter black PVC tubing, a 7x24-inch, 1/4-inch thick steel plate, a pliable rubber cap with an adjustable stainless steel clamp, and two ¼ X 3-inch lag bolts (not shown).

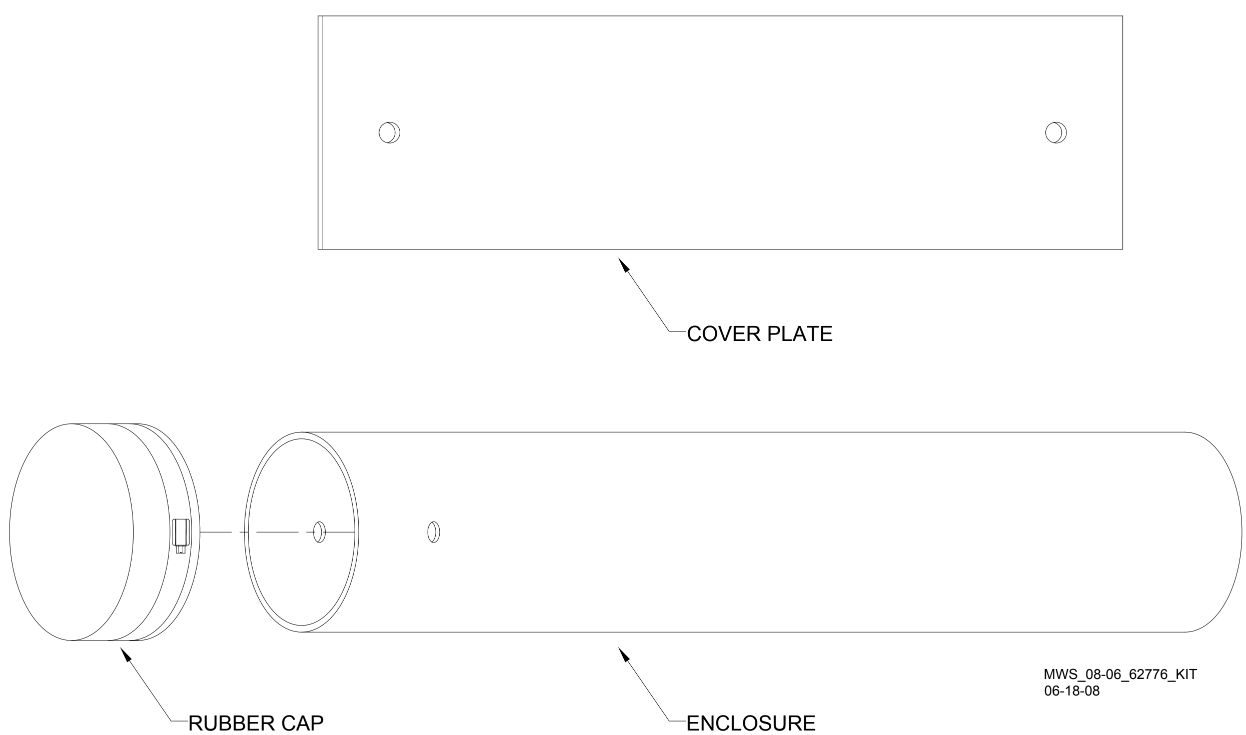


Figure 7-32:
MS/GCP Termination Shunt Burial Kit, 62776

One end of the tubing is fitted with a pliable rubber cap that is secured in place by an adjustable stainless steel clamp. Two 5/8-inch diameter holes located near the capped end of the tube accommodate the shunt leads.

7.16.2 Kit Use

The enclosure is normally buried in a vertical position between the ties.

- The Termination Shunt is lowered into the enclosure and the two leads routed through the holes in the enclosure wall and connected to the rails using standard procedures.
- The cap is then secured over the top of the enclosure using the stainless steel clamp.
- The steel plate is centered over the buried enclosure/shunt and securely fastened to each tie using the two 1/4x3-inch lag bolts provided.

7.16.3 Shunt Kit Assemblies Specifications

Dimensions:		
	Enclosure (PVC)	24 inches (60.960 centimeters) long (w/o end cap)
		6 inches (15.240 centimeters) in diameter (inside)
	Cover Plate (Steel)	24 inches (60.960 centimeters) long
		7 inches (17.780 centimeters) wide
		0.25 inch (0.635 centimeters) thick
Weight:		
	Enclosure	5 pounds (2.27 kilograms)
	Cover Plate	12 pounds (5.44 kilograms)

7.17 VITAL AND-GATE DRIVER PANEL ASSEMBLY, 91044

The Vital AND-Gate Driver Panel Assembly, 91044 provides mounting holes to accommodate from one to three 90975 Vital 2-Input AND-Gate Relay Drivers.

7.17.1 Vital AND-Gate Driver Panel Assembly Mounting Dimensions-91044

Vital AND-Gate Driver Panel Assembly mounting dimensions are provided on the Figure 7-33.

7.17.2 Vital AND-Gate Driver Panel Assembly, 91044 Specifications:-

Table 7-13:
Vital AND-Gate Driver Panel Assembly, 91044 Specifications

PARAMETER	VALUE
Height	6.96 in (17.68 cm)
Width	23.00 in (58.420 cm)
Depth	0.125 in (0.317 cm)
Weight	5.00 lb (17.78 kg)

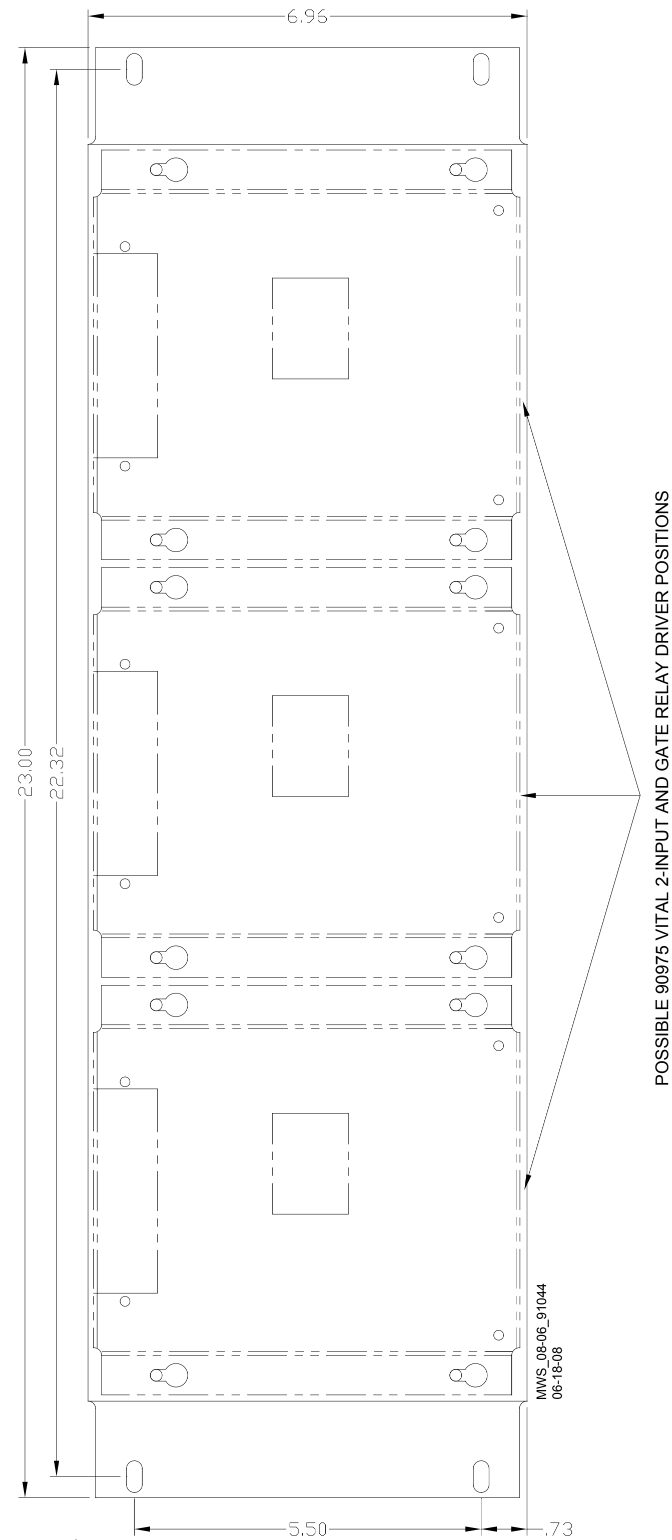


Figure 7-33:
Vital AND Gate Driver Panel Assembly, 91044

7.18 VITAL 2-INPUT AND GATE, 90975

The solid-state Vital 2-input AND Gate, 90975 (Figure 7-34) is a logic device that combines two DC inputs to produce a single DC output.

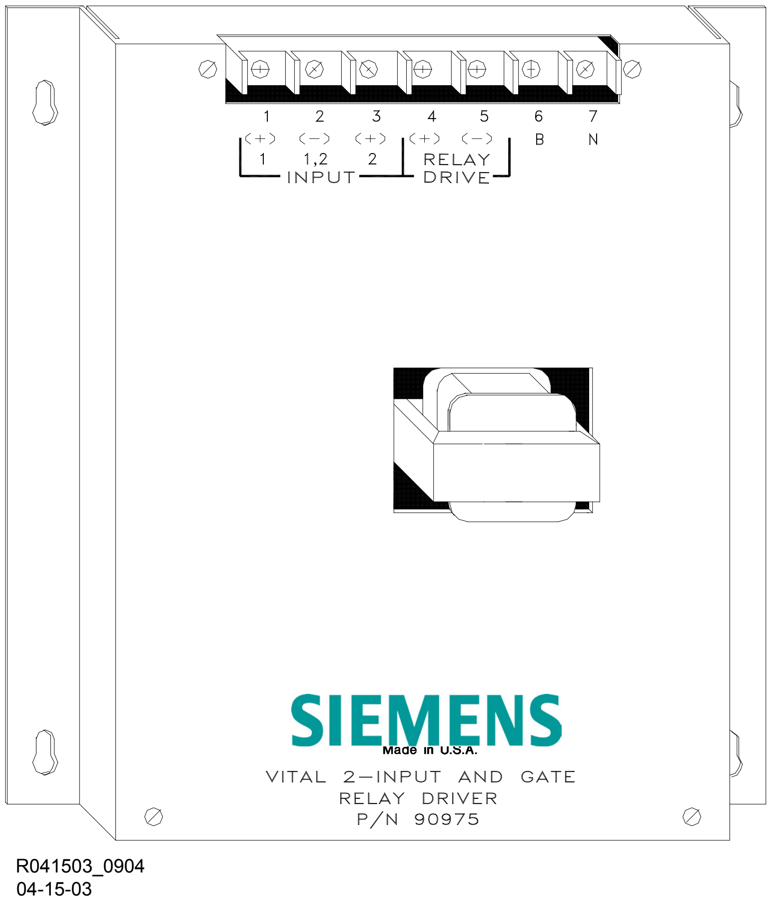


Figure 7-34:
Vital 2-Input AND Gate, 90975

7.18.1 Functional Description

The solid-state Vital 2-input AND Gate, 90975 combines two inputs to produce a single output.

- When a relay drive voltage is applied to both of the AND gate inputs, the drive voltage appears at the output of the gate.
- When the drive voltage is removed from one or both of the AND gate inputs, no voltage is present at the output of the gate.

7.18.2 Vital 2-input AND Gate, 90975 Specifications

Table 7-14:
Vital 2-input AND Gate, 90975 Specifications

PARAMETER	VALUE
Environmental Temperature Range:	-40 °F to +160 °F (-40 °C to +71 °C)
Height:	6.75 in (17.145 cm)
Width	6.25 in (15.875 cm)
Depth	2.50 in (6.350 cm)
Weight:	1 lb (0.5 kg) (approximate)
Power Input:	
Voltage:	9.5 to 16.5 VDC
Current:	200 milliamperes
Output Voltage:	12 VDC (nominal); will drive 200 to 1,000-ohm loads
Control Inputs:	7 to 18 VDC (1,000-ohm input resistance)

7.18.3 Input/Output Protection:

Floating (optically isolated and transformer coupled) surge protected

7.18.4 Mounting Dimensions

The Vital 2-input AND Gate is housed in a brushed aluminum case designed for shelf or backboard mounting. The unit mounting dimensions are provided in Figure 7-35.

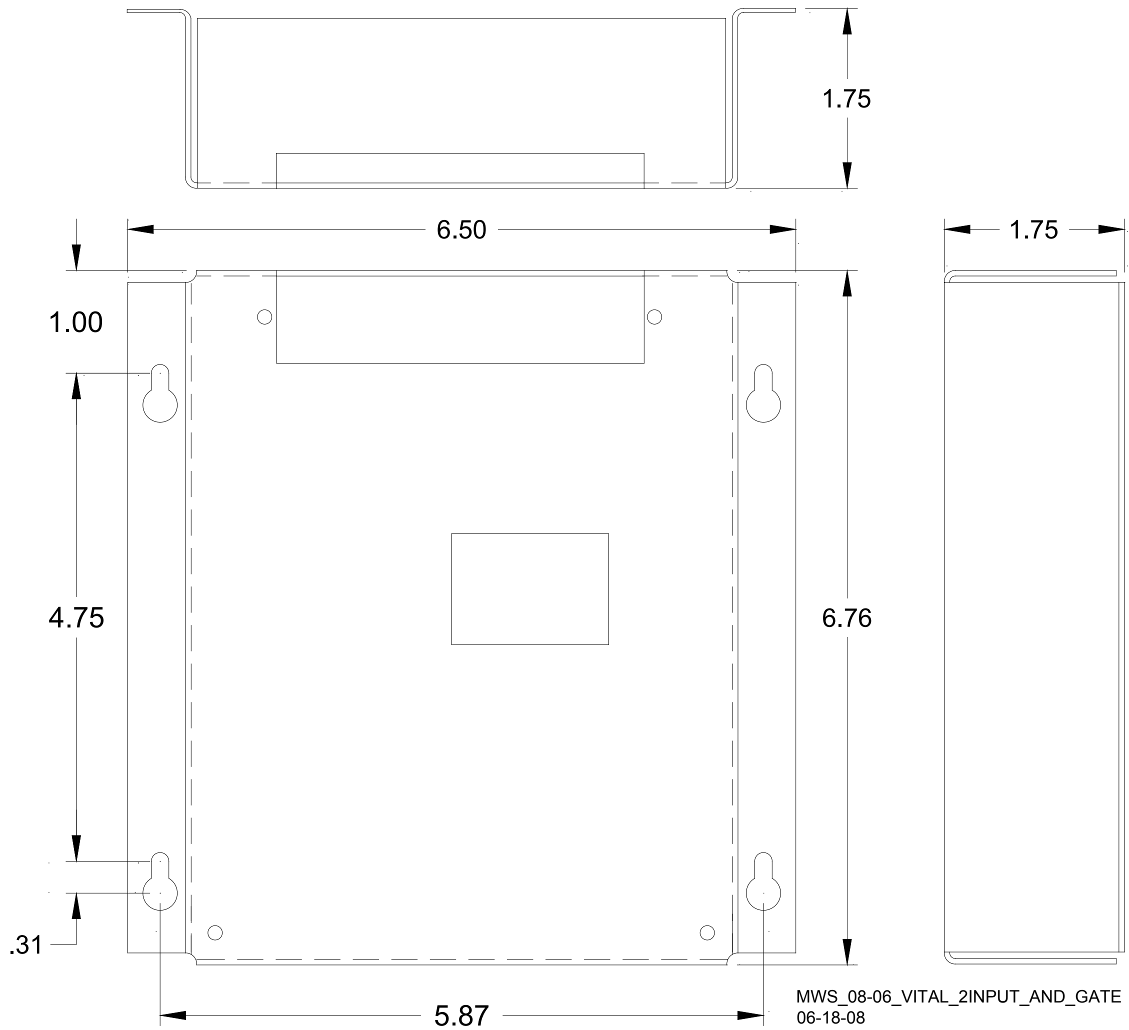


Figure 7-35:
Vital 2-Input AND Gate Assembly Mounting Dimensions

7.19 4-INPUT VITAL AND GATE, 91082

The 91082 solid-state 4-input Vital AND Gate (Figure 7-36) is a logic device that combines four DC inputs to produce a single DC output.

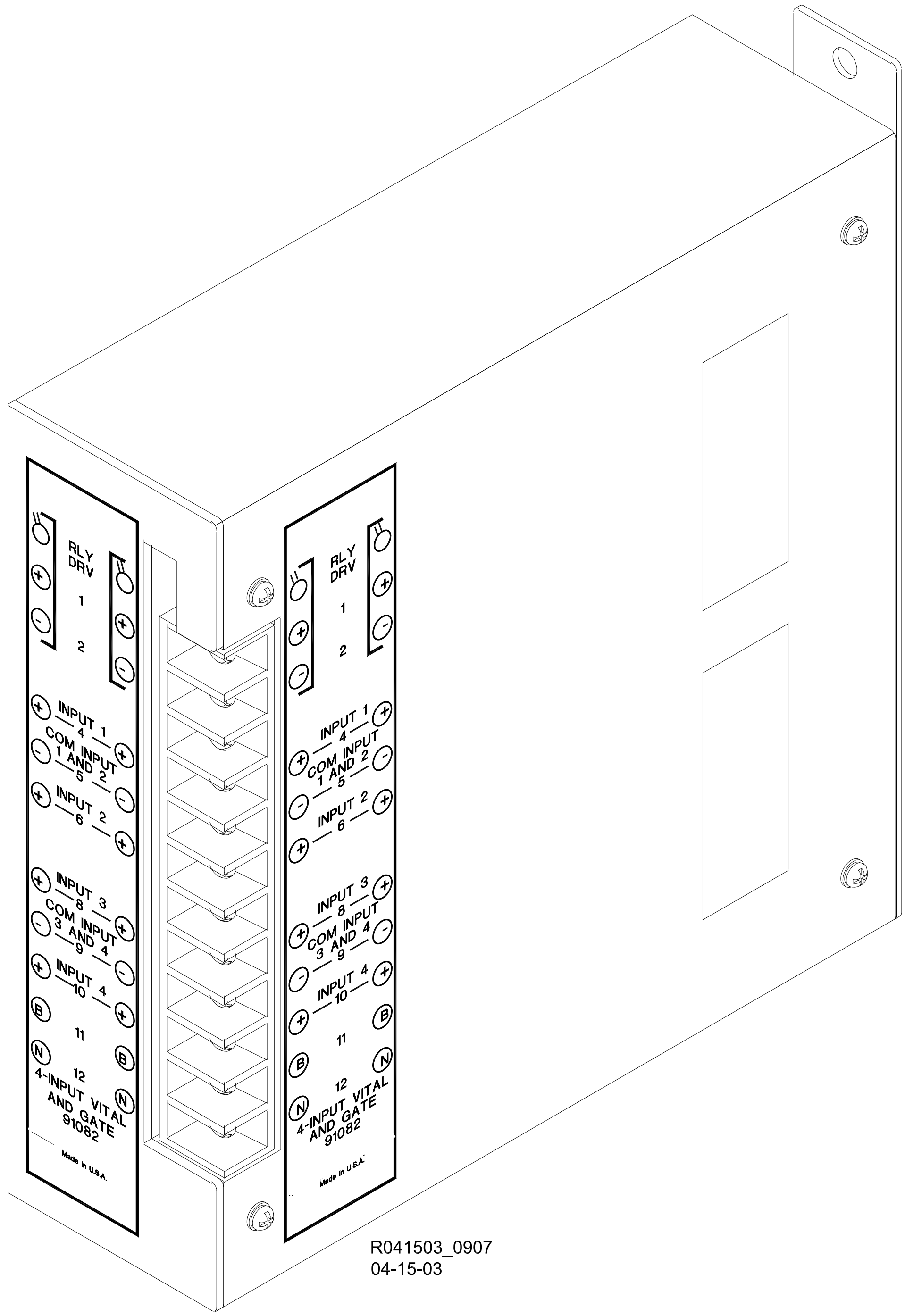


Figure 7-36:
4-Input Vital AND Gate, 91082

7.19.1 Functional Description

The solid-state 4-input Vital AND Gate, 91082 combines four inputs to produce a single output. When a relay drive voltage is applied to all of the AND gate inputs, the drive voltage appears at the **RLY DRV** output of the gate. When the drive voltage is removed from any one of the AND gate inputs, voltage is removed from the **RLY DRV** output.

NOTE

The inputs and outputs are electrically isolated from battery (B and N) within the unit.

7.19.2 4-input Vital AND Gate Specifications

Table 7-15:
4-input Vital AND Gate, 91082

PARAMETER	VALUES
Environmental Temperature Range:	-40 °F to +160 °F (-40 °C to +71 °C)
Dimensions:	9.38 inches (87.89 centimeters) high 2.44 inches (20.37 centimeters) wide 8.02 inches (20.37 centimeters) deep
Weight:	4.06 pound (1.8 kilogram) (approximate)
Power Input: Voltage: Current:	 9.5 to 16.5 VDC 200 milliamperes
Output Voltage:	12 VDC (nominal); will drive 400 to 1,000-ohm loads
Control Inputs:	7 to 18 VDC (1,000-ohm input resistance)
Input/Output Protection:	Floating (optically isolated and transformer coupled); surge protected
Mounting Dimensions	The 4-input Vital AND Gate is housed in a brushed aluminum case designed for shelf or backboard mounting. The unit mounting dimensions are provided in Figure 7-37.

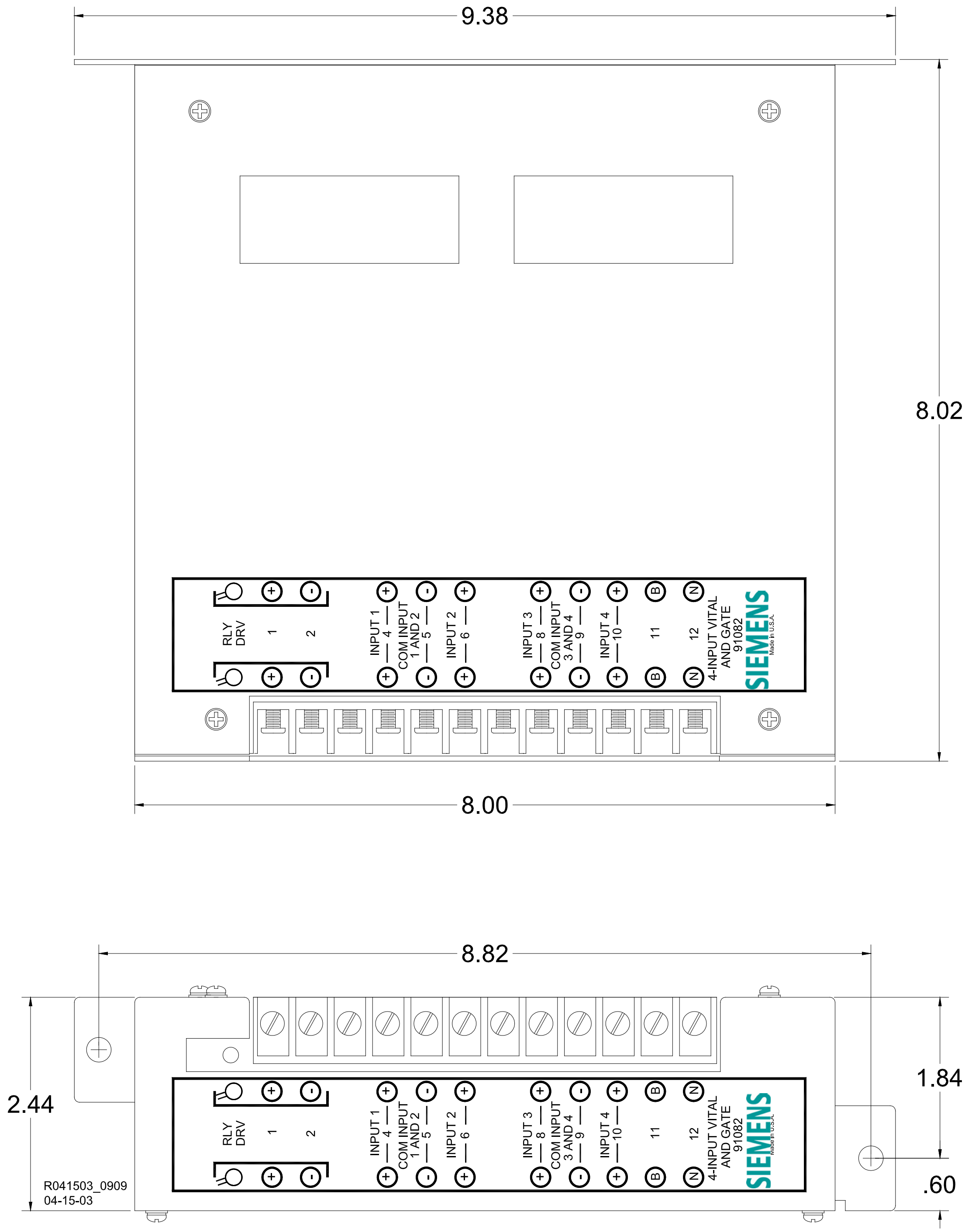


Figure 7-37:
4-input Vital AND Gate Assembly Mounting Dimensions

7.20 SURGE PANELS, 80026-XX

The 80026-XX Surge Panels are available in a combination of equalizers and arresters to provide protection for battery and/or track circuits.

WARNING

ANY ALTERNATIVE SURGE PROTECTION DEVICE MUST BE ANALYZED TO INSURE THAT FAILURE MODES OF DEVICE DO NOT COMPROMISE SAFETY OF 4000 GCP SYSTEM. FOR EXAMPLE, BUT NOT LIMITED TO UNINTENTIONAL EARTH GROUNDS ON CONTROL CIRTCUITS OR SHORTS ON TRACK CIRCUITS.

7.20.1 Surge Panel Configurations

Surge Panel units are provided in a variety of configurations to meet specific customer requirements. Wall mounted Surge Panel applications are listed in Table 7-16. Rack mount Surge Panel applications are listed in Table 7-17.

NOTE

For surge protection requirements not listed or for custom designed Surge Panels, contact Siemens Technical Support.

7.20.2 Surge Panel Nomenclature and Mounting Dimensions

Surge panel nomenclature and mounting dimensions are provided on the figures identified in Table 7-16 and Table 7-17.

7.20.3 Surge Panel Arresters

WARNING

DO NOT MOUNT ARRESTER WITH ELECTRODES POINTED IN THE DOWN POSITION TO MINIMIZE THE POTENTIAL OF SHORT CIRCUIT.

A typical Surge Panel arrester is shown in Figure 7-38.

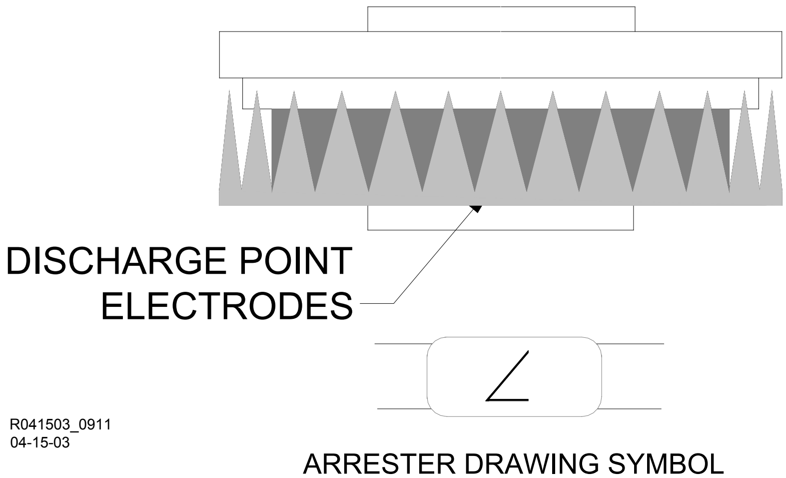


Figure 7-38:
Typical 80026 Surge Panel Arrester Mounting Position

Table 7-16:
Wall Mount Surge Panels

PART NO.	FIG.	DESCRIPTION	DIMENSIONS	WEIGHT
80026-01	3-35	Protects 1 battery and 1 track circuit.	Height: 13.5 in (34.290 cm) Width: 5.69 in (14.453 cm) Depth: 3.625 in (9.208 cm)	6.00 lb. (2.72 kg) (approximate)
80026-02	3-35	Protects 1 track circuit. • Use with –1 panel for subsequent track protection.	Height: 8.75 in (22.23 cm) Width: 5.69 in (14.453 cm) Depth: 3.625 in (9.208 cm)	4.00 lb. (1.82 kg) (approximate)
80026-22	3-35	• Protects 1 track circuit. Use for six-wire applications.	Height: 5.44 in (13.82 cm) Width: 5.69 in (14.453 cm) Depth: 3.625 in (9.208 cm)	3.00 lb. (1.36 kg) (approximate)

Table 7-17: Rack Mount Surge Panels

PART NO.	FIG.	DESCRIPTION	DIMENSIONS	WEIGHT
80026-31	3-36	Protects 1 track and 1 battery circuit.	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	5.00 lb. (2.26 kg) (approximate)
80026-32	3-36	Protects 1 track and 1 battery circuit. • Use with –31 panel for subsequent track and battery circuit protection.	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	6.00 lb. (2.72 kg) (approximate)
80026-33	3-37	Protects 1 battery circuit. • Use with –31 panel for subsequent battery circuit protection.	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	7.00 lb. (3.18 kg) (approximate)
80026-34	3-37	Protects 1 track circuit. • Use with –31 panel for subsequent track circuit protection.	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	6.00 lb. (2.72 kg) (approximate)
80026-35	3-38	Protects 2 track circuits.	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	7.00 lb. (3.18 kg) (approximate)
80026-36	3-38	Protects 1 track circuit. • Use with –31 panel for subsequent track circuit protection. • Used with six-wire applications for transmit, receive, and check receive lead protection	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	6.00 lb. (2.72 kg) (approximate)
80026-37	3-39	Protects 1 battery circuit.	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	6.00 lb. (2.72 kg) (approximate)
80026-38	3-39	Protects 2 track circuits. • Used in applications with six wires on one track and four on the other	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	8.00 lb. (3.64 kg) (approximate)
80026-39	3-40	Protects 4 battery circuits. • Battery input/output line protection for two DAX start or two UAX circuits. • Normally used with second battery when line circuit protection is required	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	6.00 lb. (2.72 kg) (approximate)

Concluded on next page

Table 7-17: Concluded

PART NO.	FIG.	DESCRIPTION	DIMENSIONS	WEIGHT
80026-41	3-40	Protects 110 VAC circuits. • Used when 20-ampere solid-state crossing controller (91070A) is used in conjunction with MS4000 • Includes four 15-ampere resettable circuit breakers and one 15-ampere GFCI duplex outlet	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	9.00 lb. (4.09 kg) (approximate)
80026-41A	3-40	Protects 110 VAC circuits. • Used when 40-ampere solid-state crossing controller (91075A) is used in conjunction with MS4000 • Includes three 15-ampere and one 25-ampere resettable circuit breakers and one 15-ampere GFCI duplex outlet	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	9.00 lb. (4.09 kg) (approximate)
80026-47	3-41	Protects 2 battery circuits and 1 track circuit. • Used with motion sensor battery and second battery	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	7.00 lb. (3.18 kg) (approximate)
80026-50	3-41	Protects 4 vital Input/output circuits • Generally used for UAX inputs or DAX start outputs	Height: 4.96 in (12.598 cm) Width: 23.00 in (58.420 cm) Depth: 4.535 in (11.519 cm)	7.00 lb. (3.18 kg) (approximate)

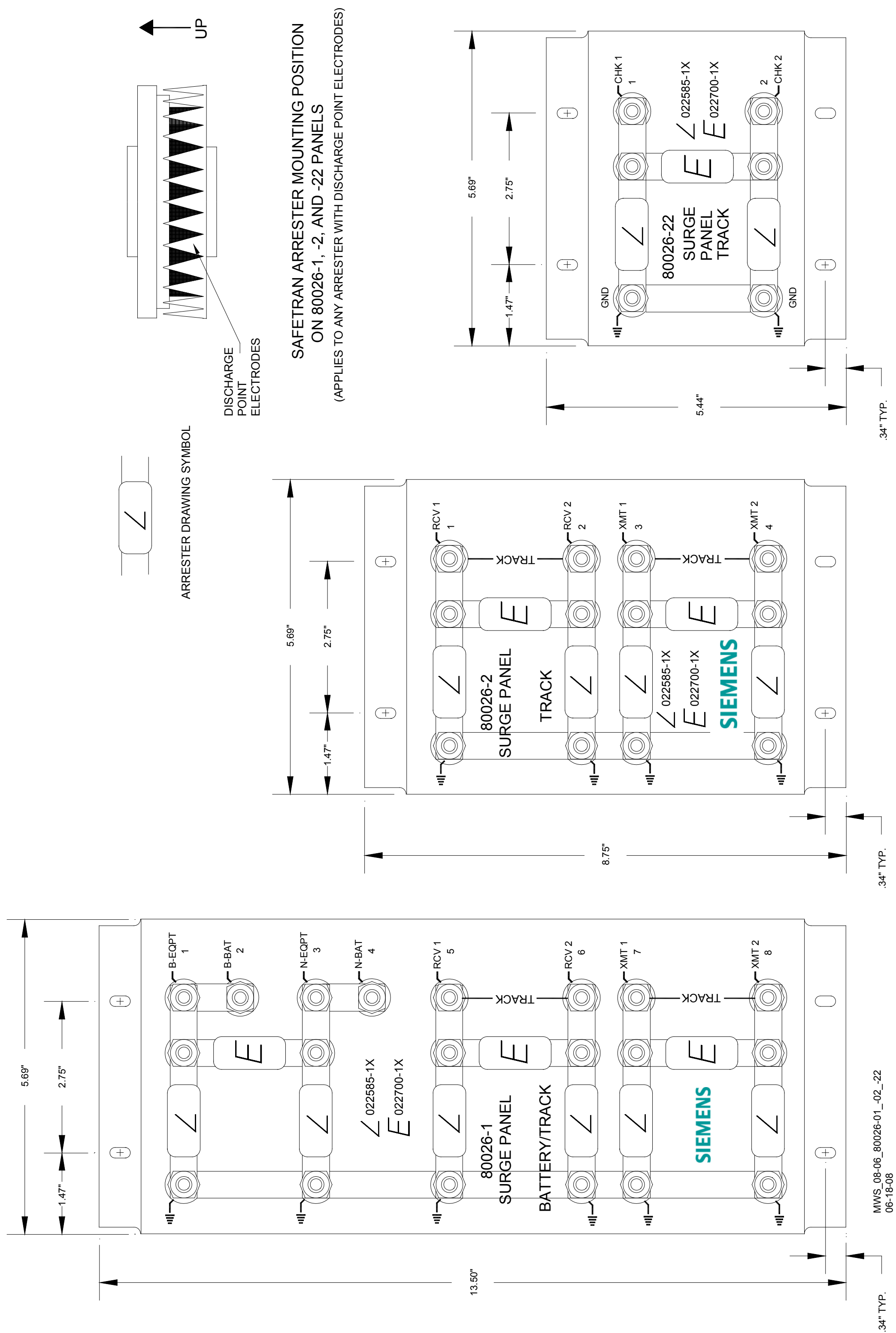


Figure 7-39:
Wall Mount Surge panels, 80026-01, -02, and -22

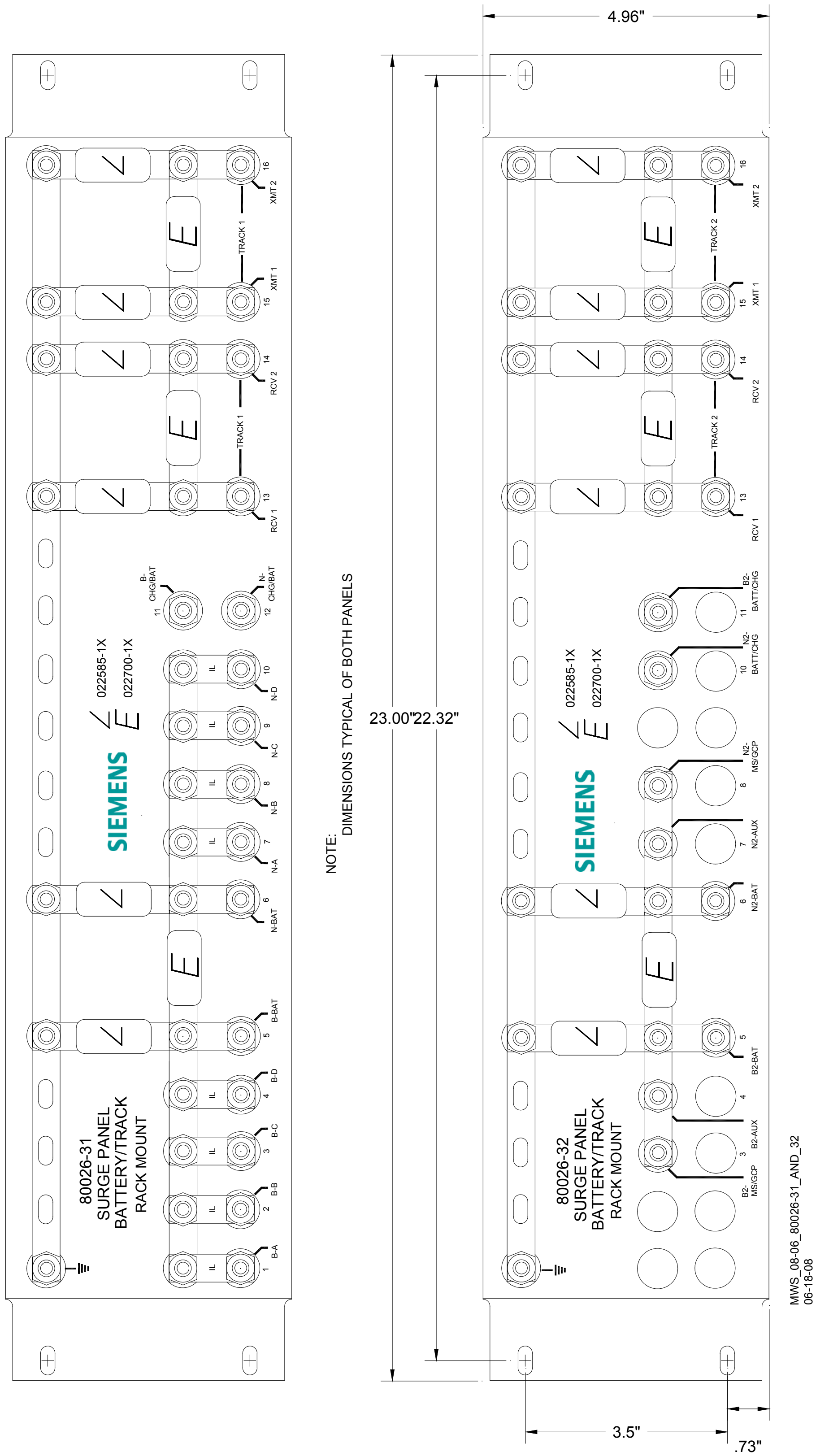


Figure 7-40:
Rack Mounted Surge Panels, 80026-31 and -32

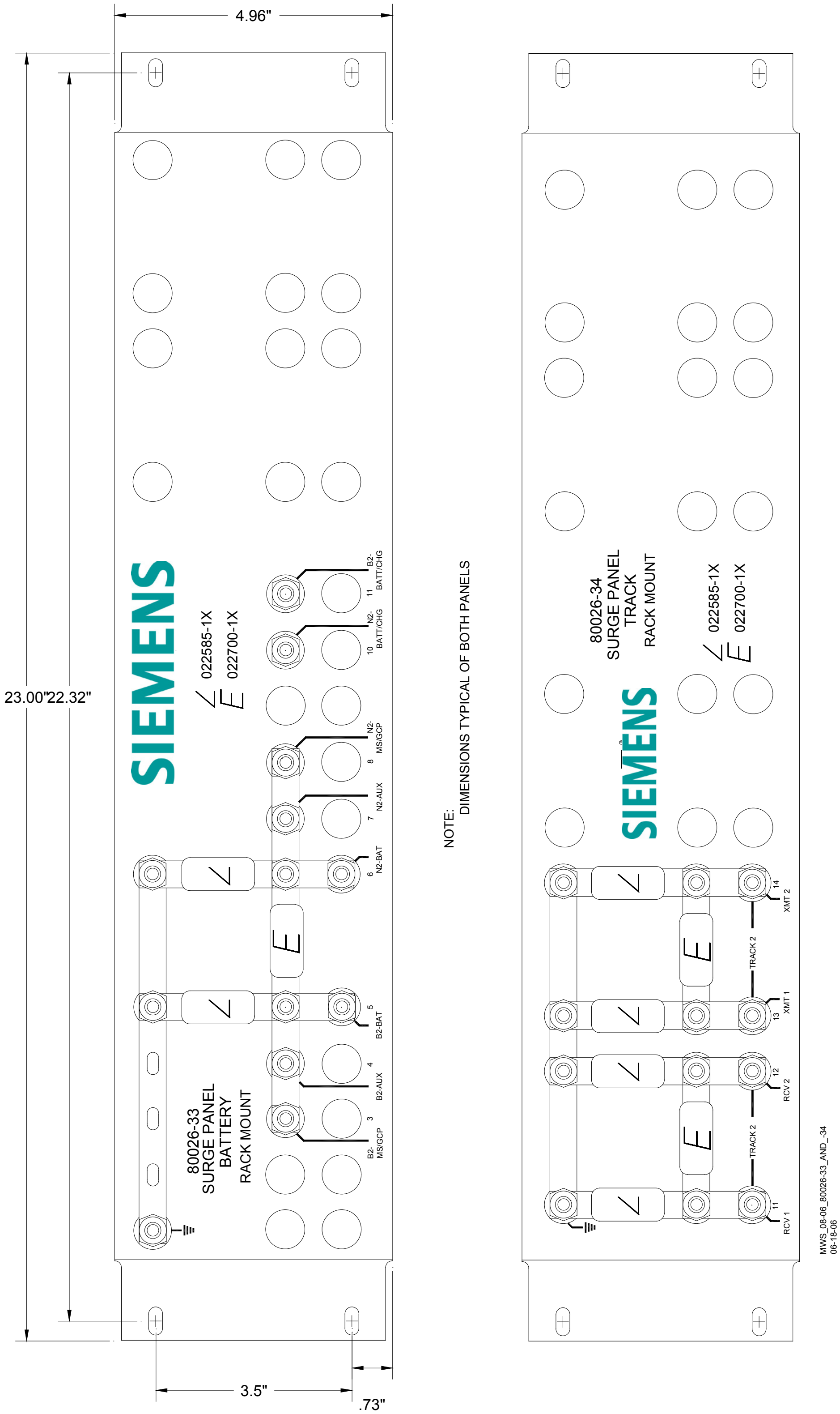


Figure 7-41:
Rack Mounted Surge Panels, 80026-33 And -34

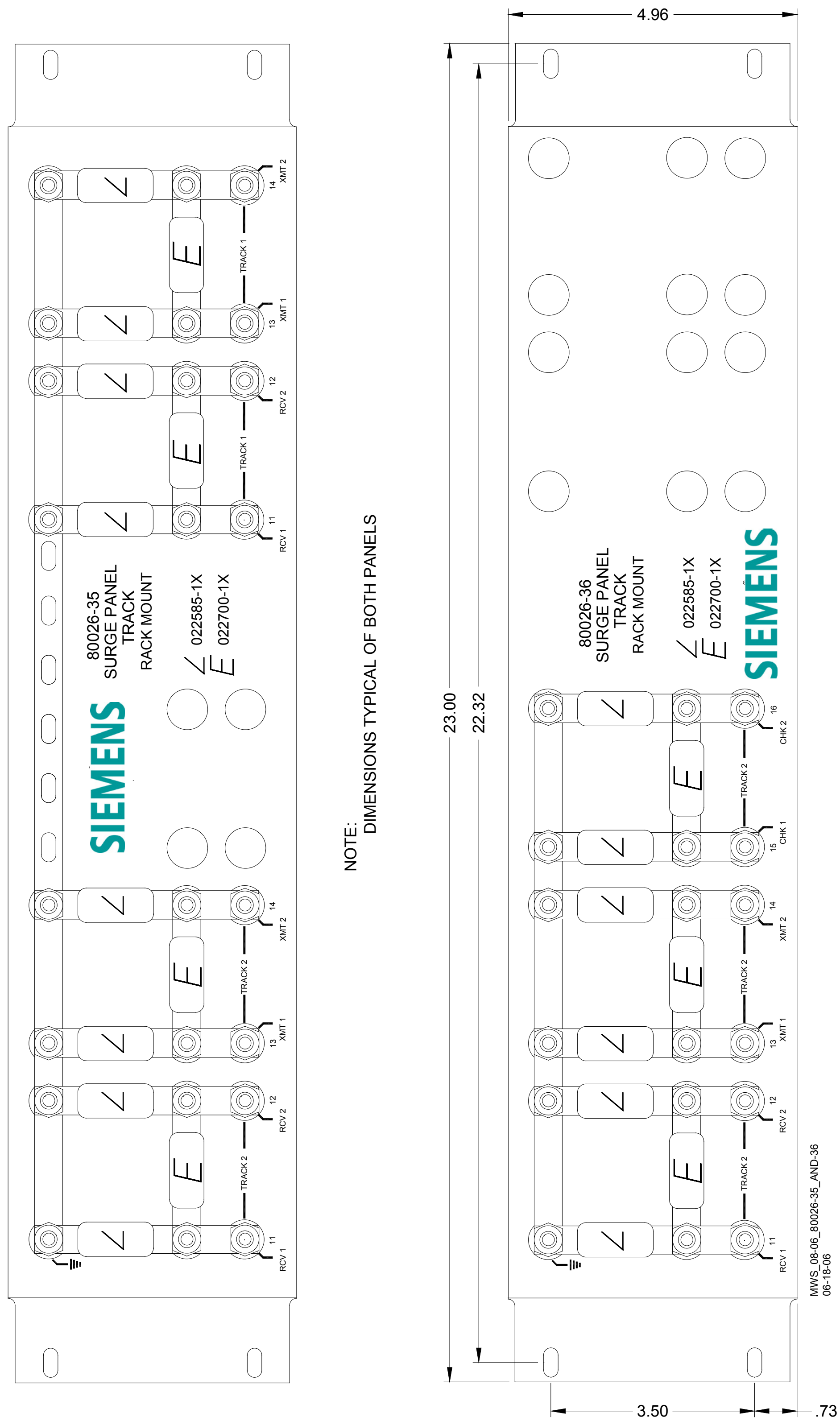


Figure 7-42:
Rack Mounted Surge Panels, 80026-35 and -36

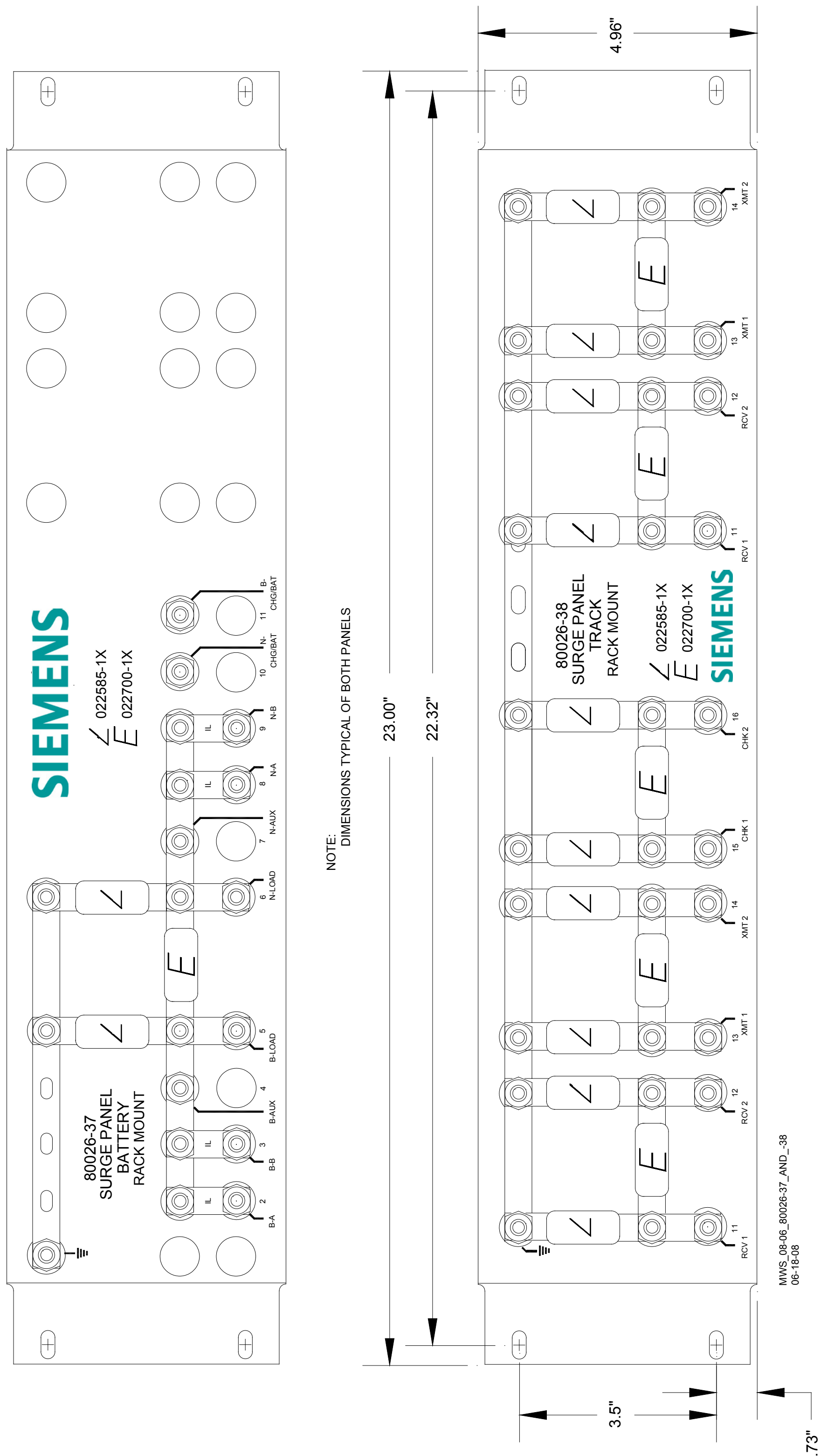


Figure 7-43:
Rack Mounted Surge Panels, 80026-37 And -38

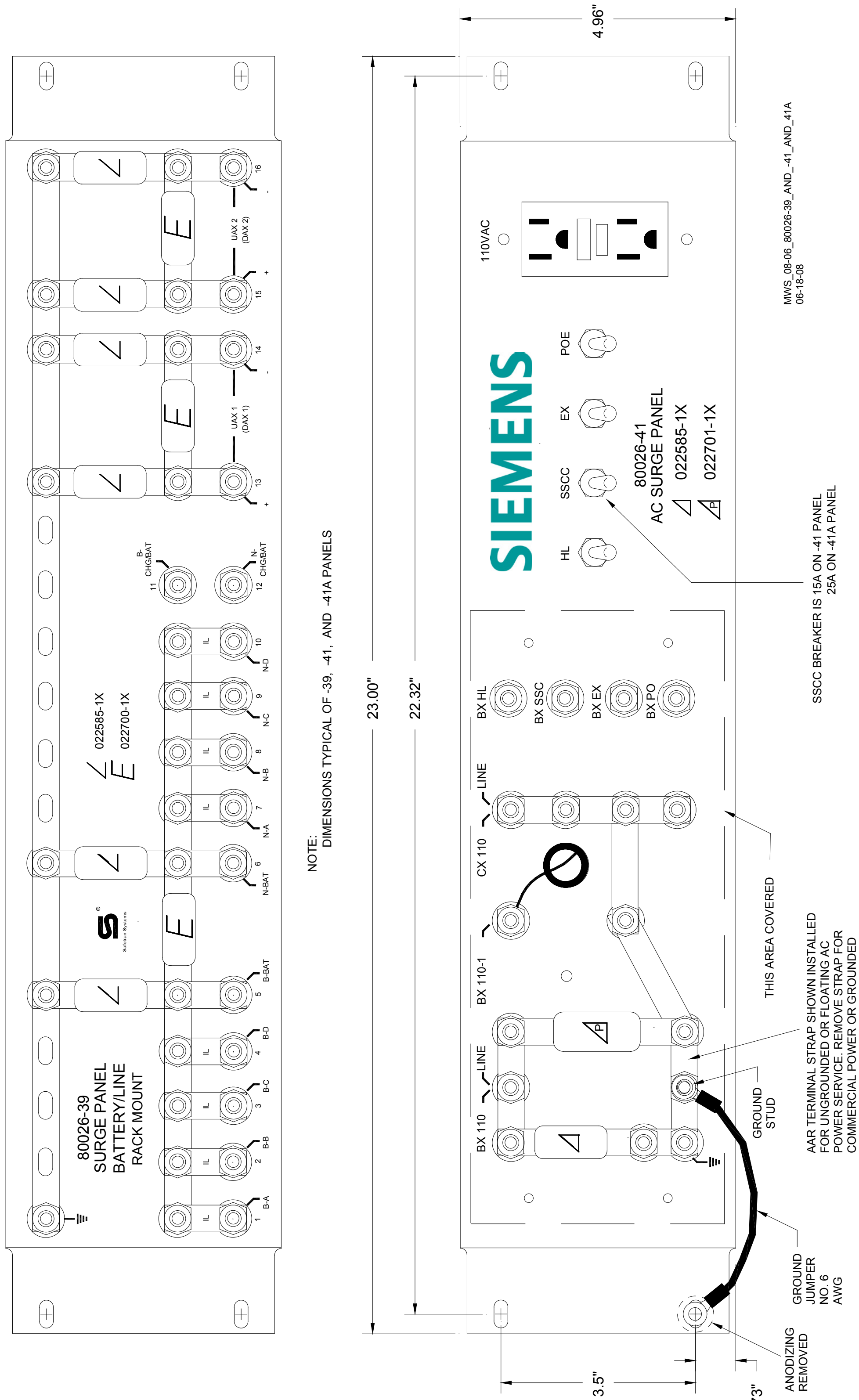


Figure 7-44:
Rack Mounted Surge Panels. 80026-39, -41 and -41A

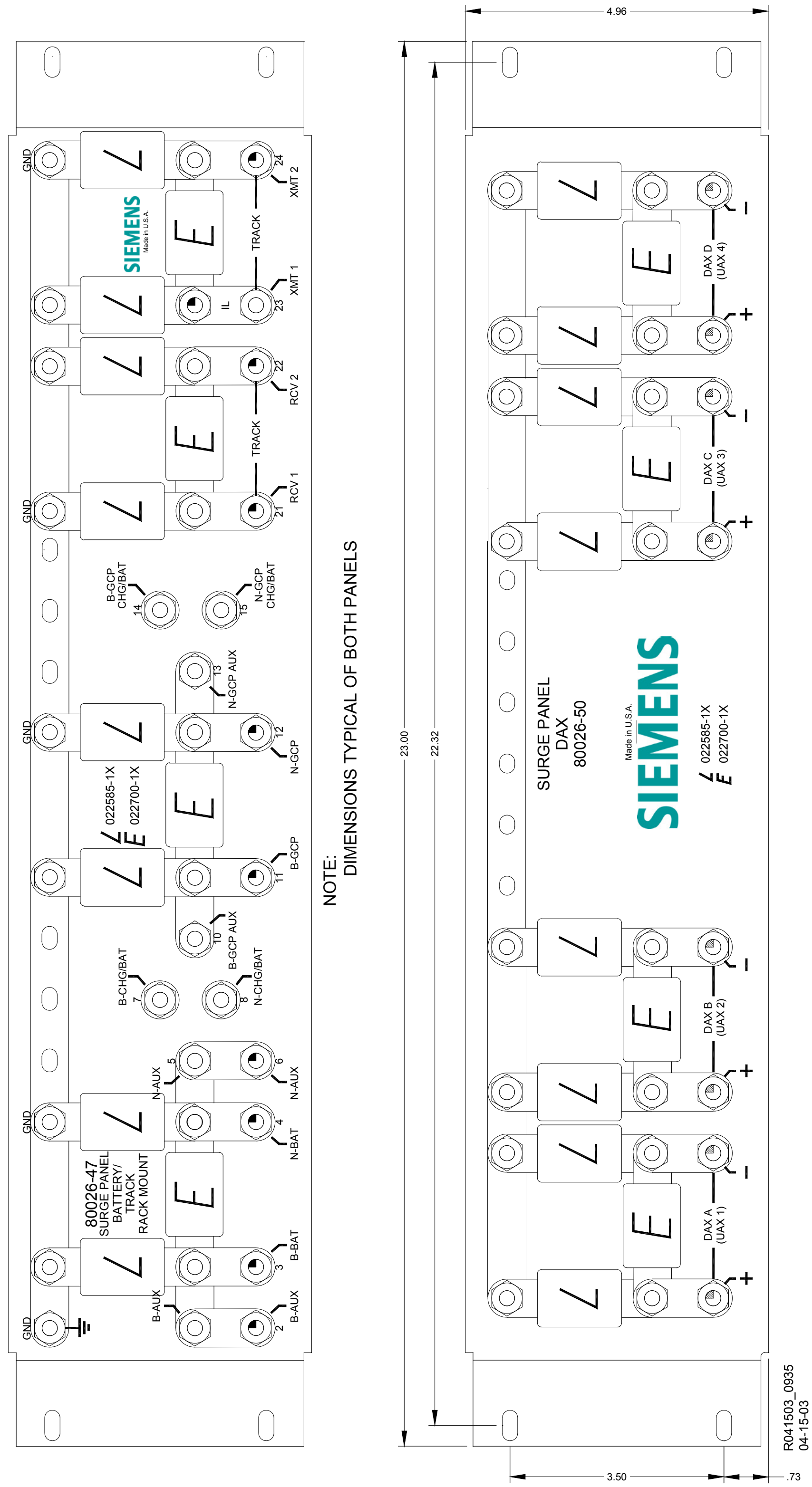


Figure 7-45:
Rack Mounted Surge Panels 80026-47 and 80026-50

7.21 RECTIFIER PANEL ASSEMBLY, 80033

The 80033 Rectifier Panel Assembly is equipped with equalizers and arresters to provide surge protection on the B (+) and N (-) connections to the battery and the GCP. Mounting holes are provided for a battery charger, as required.

7.21.1 Rectifier Panel Assembly Nomenclature and Mounting Dimensions-

Rectifier Panel Assembly, 80033 nomenclature and mounting dimensions are provided on Figure 7-46.

Table 7-18:
Rectifier Panel Assembly, 80033 Specifications

PARAMETER	VALUE
Height	10.46 in. (26.568 cm)
Width	23.00 in. (58.420 cm)
Depth	2.75 in. (6.985cm)
Weight	7 pounds (3.18 kg) (approximate)

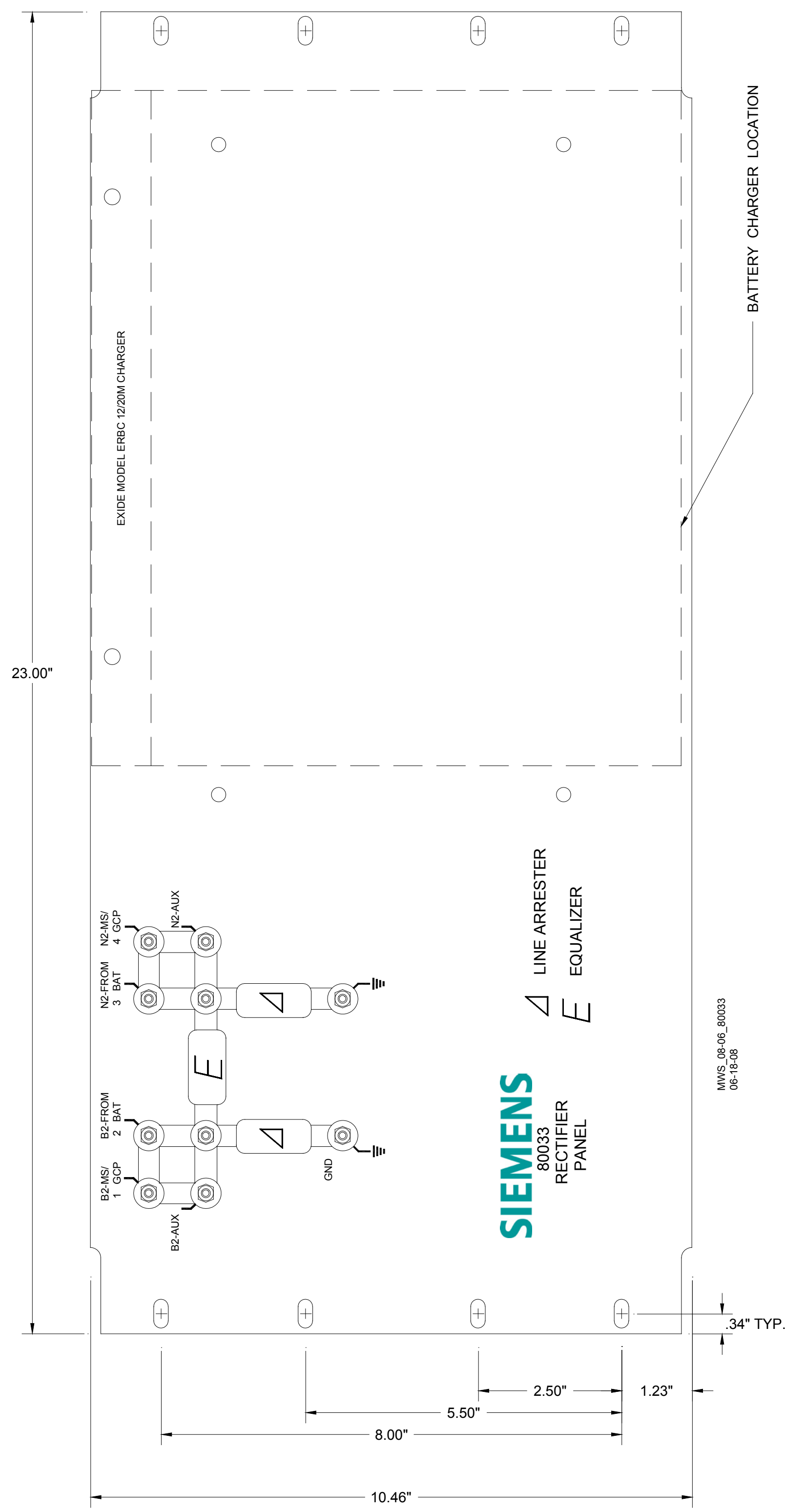


Figure 7-46:
Rectifier Panel assembly, 80033

7.22 CABLE TERMINATION PANEL ASSEMBLY, 91042

The Cable Termination Panel Assembly, 91042 is a universal-mounting panel that can be ordered with from 1 to 19 pairs of strapped AREMA binding posts.

Cable Termination Panel Assembly Mounting Dimensions-91042 Cable Termination Panel Assembly mounting dimensions are provided on Figure 7-47.

Table 7-19:
Cable Termination Panel Assembly, 91042 Specifications

PARAMETER	VALUE
Height	3.96 in. (10.058 cm)
Width	23.00 in. (58.420 cm)
Depth	2.25 in. (5.715cm)
Weight	7 pounds (3.18 kg) (approximate)

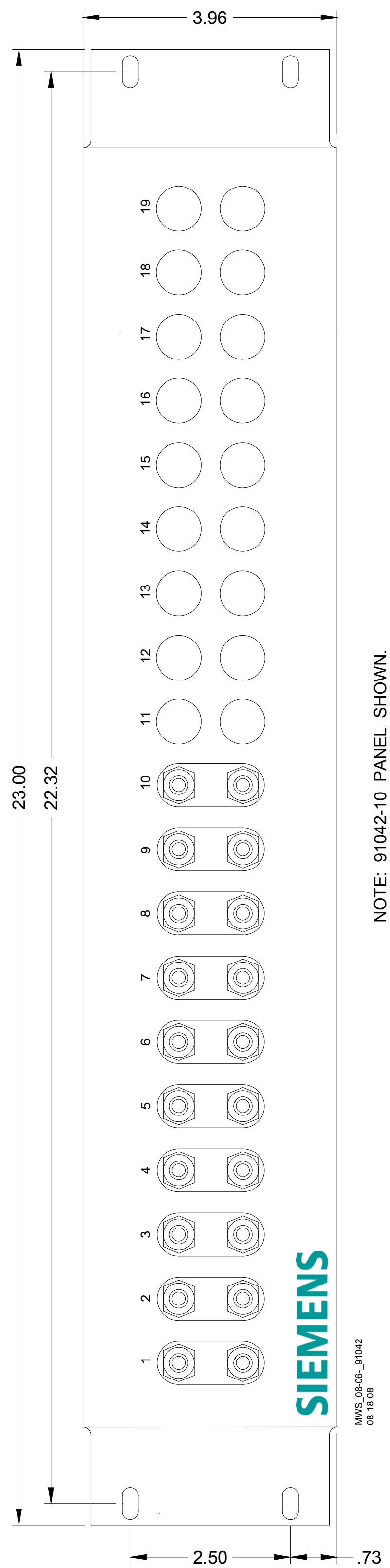


Figure 7-47:
Cable Termination Panel Assembly, 91042

7.23 SSCC III LIGHTING SURGE PANELS, 91170-1 AND 91181-1

WARNING

ANY ALTERNATIVE SURGE PROTECTION DEVICE MUST BE ANALYZED TO ENSURE THAT FAILURE MODES OF DEVICE DO NOT COMPROMISE SAFETY OF 4000 GCP SYSTEM. FOR EXAMPLE, BUT NOT LIMITED TO, CROSSES & GROUNDS.

The SSCC3i Lighting Surge Panels provide external I/O primary surge protection for the 80405 Solid State Crossing Controller IIIi (SSCC3i) module and grade crossing gate controller circuitry.

The 91170-1, Figure 7-48, provides common return gate control. The 91181-1, Figure 7-49, provides isolated gate control Both Surge Panels have built-in secondary surge protection for all external I/O

7.23.1 Lighting Surge Panel Description

The SSCC III Lighting Surge Panels provides:

- arresters and equalizers for surge protection
- standard AREMA binding posts for cable connections to the flashing lights, gates, and bells
- gate battery circuit protection
- insulated links in the underground cable connections. These allow quick circuit isolation for testing and measurements without disarranging cable circuits
- adjustable resistors in the **NEAR GATE** Lamp 1 (**L1**) and Lamp 2 (**L2**) circuits. These provide compensation for different wire lengths (cabling) to the crossing flashing lamps as well as compensate for unequal voltage drops between the two lamp cables
- steering diodes for the Crossing Controller Gate Control output to provide gate control circuit isolation.

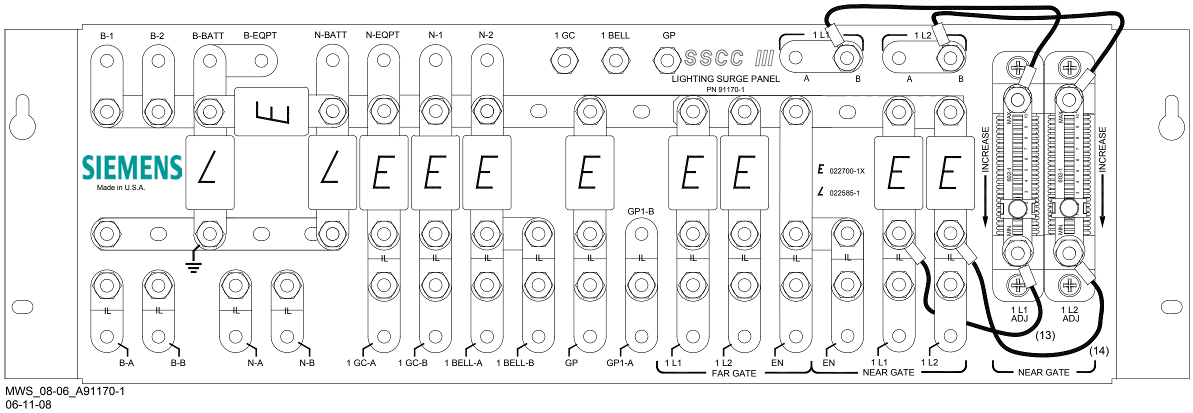


Figure 7-48:
SSCC III Lighting Surge Panel, 91170-1

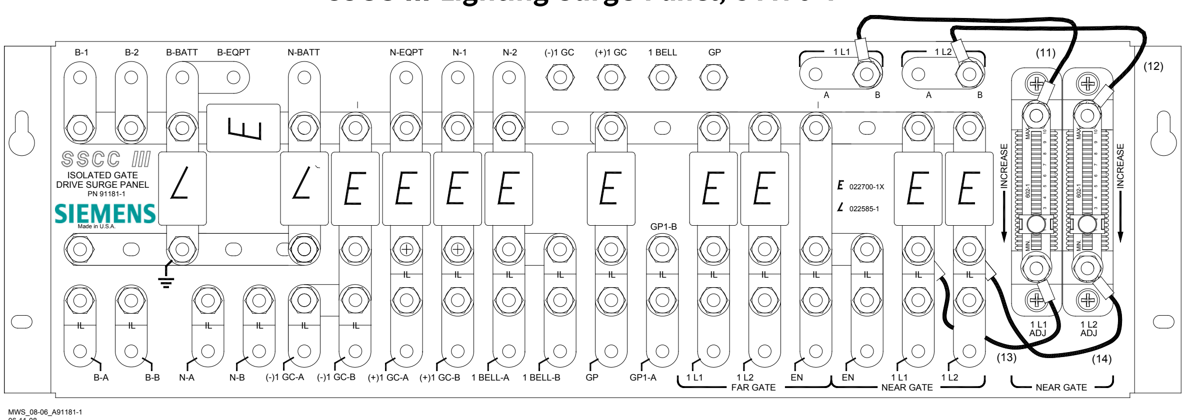
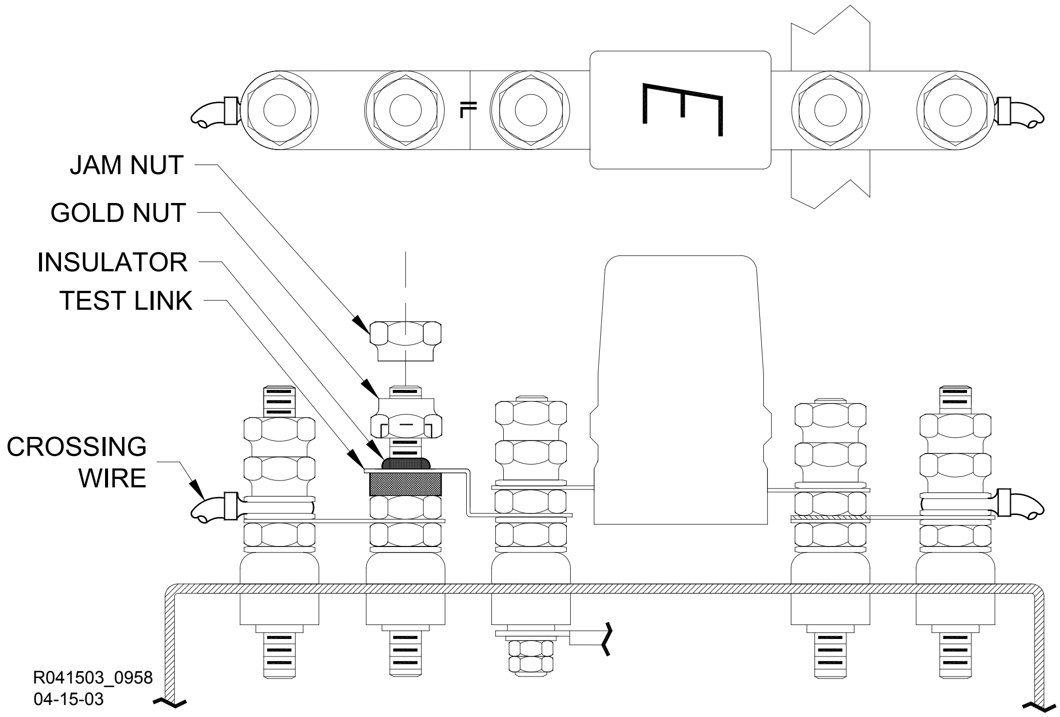


Figure 7-49:
SSCC III Lighting Surge Panel, 91181-1

7.23.2 Insulated Testing Links

Insulated testing links, Figure 7-50, are provided to allow crossing wires to be isolated for test purposes.

- The insulated testing link contains an integral insulating washer.
- Contact between insulated testing link and AREMA binding post is accomplished using a gold plated nut.
  - The gold plated nut is secured on the binding post using a standard jam nut.
  - The gold plated nut has a recess for the insulator.
  - Loosening the gold nut until contact between it and the test link is lost opens the link.
  - When the gold plated nut is tightened the link is closed.



SHOWN IN OPEN POSITION

Figure 7-50:
Insulated Testing Link

7.23.3 Surge Panel I/O Interface

Figure 7-51:
SSCC III Lighting Surge Panels, 91170-1& 91181-1 Interfaces

PARAMETER	VALUE
I /O Interface Type:	Standard AREMA binding posts
Lamp Cable Compensation:	Adjustable resistors for Near Gate Lamp 1 and Lamp 2
Test/Measurement:	Special insulated links on all connections to the crossing for quick circuit isolation.
Surge Protection:	Surge protection is provided on the following gate interface terminals: • L1 (lamp 1 output for Near and Far Gates) • L2 (lamp 2 output for Near and Far Gates) • En (lamp common for Near and Far Gates) • GP (gate position input) • 1 BELL (bell outputs for Near and Far Gates) • 1 GC (gate controls for Near and Far Gates) • B (battery + input) • N (battery return)

7.23.4 SSCC III Lighting Surge Panels, 91170-1& 91181-1 Specifications

Table 7-20:
SSCC III Lighting Surge Panels, 91170-1& 91181-1 Specifications

PARAMETER	VALUE
Height	6.97 in. (17.704 cm)
Width	23.00 in. (58.420 cm)
Depth	3.56 in. (9.042 cm)
Weight	10 pounds (4.41 kg) (approximate)

7.23.5 SSCC III Lighting Surge Panels, 91170-1& 91181-1Mounting Dimensions

The 91170-1 SSCC III Lighting Surge Panel is housed in a Black powder-coat metal panel designed for wall, backboard, or rack mount. The unit mounting dimensions are provided in Figure 7-52.

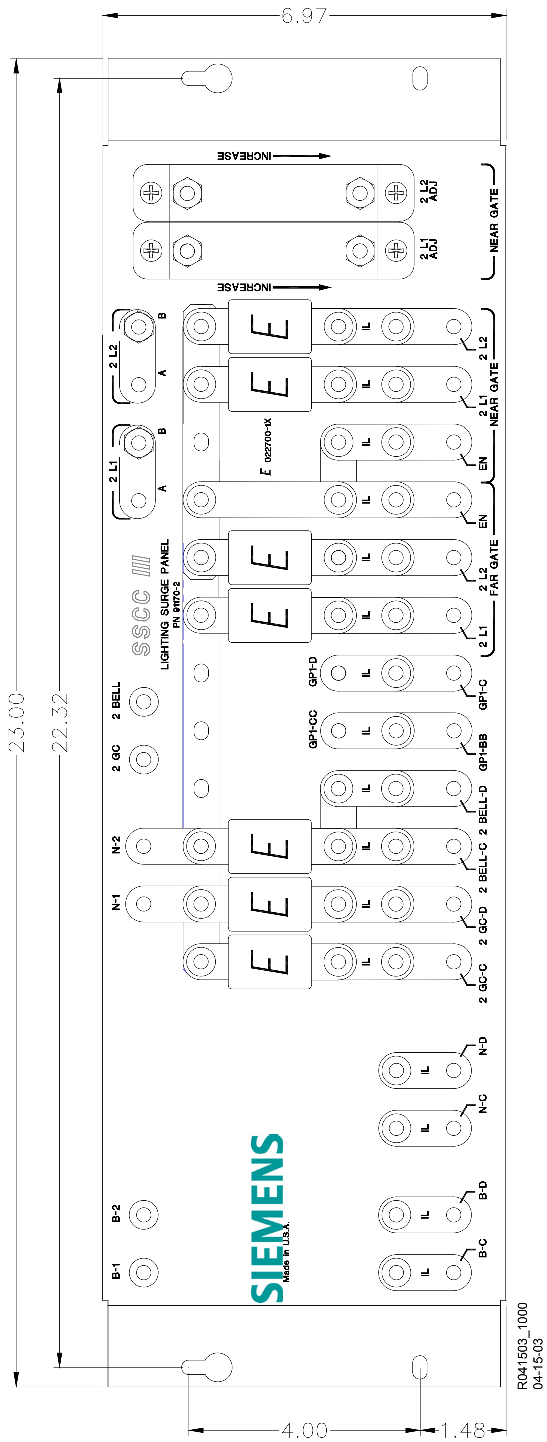


Figure 7-52:
SSCC III Lighting Surge Panel Mounting Dimensions

SECTION 8 – DETAILED CASE AND MODULE DESCRIPTION

8.1 GENERAL PHYSICAL DESCRIPTION

Each 4000 GCP consists of a case assembly, a motherboard, and plug-in circuit modules that come equipped with plug-in external wiring connectors.

8.1.1 Case Assemblies

Each 4000 GCP case assembly consists of a powder-coated steel case with a backplane-mounted motherboard. Refer to Table 8-1 for key features of each case configuration.

Table 8-1: 4000 GCP Case Feature Overview

CASE PART NUMBER	FEATURE							REFERENCE PARAGRAPH
	NUMBER OF TRACK MODULES	MAIN/ STANDBY TRANSFER SYSTEM	INTERNAL SSCC3i CROSSING CONTROL MODULE [1]	INTERNAL SEAR2i RECORDER	PHASE SHIFT OVERLAY (PSO) MODULE [2]	I/O EXPANSION (RIO MODULE) [3]	ECHELON LAN FUNCTIONS	
80445 [4]	1 track	No	No	No	0 or 1	No	Yes	8.2
80455 [4]	1 track	No	0, 1 or 2	No	No	No	Yes	8.3
80440 [4]	1 to 5 tracks	No	0, 1 or 2	Yes	0, 1, 2 or 3	0, 1 or 2	Yes	8.4
80465 [4]	1 or 2 tracks	Yes	0, 1 or 2	Yes	0 or 1	0 or 1	Yes	8.5
80475 [4]	1 to 3 tracks	Yes	No	Yes	0 or 1	0, 1 or 2	Yes	8.6
80400 [4]	1 to 4 tracks	Yes	0, 1 or 2	Yes	0, 1, 2 or 3	0, 1, 2 or 3	Yes	8.7
80460 [4]	1 to 6 tracks	Yes	0, 1 or 2	Yes	0, 1, 2 or 3	0, 1, 2 or 3	Yes	8.8

[1] - SSCC3i module controls Gates, Flashing Light Signals and Bells

[2] – Phase Shift Overlay (PSO) Module can be used in lieu of Track Module in the 1st, 3rd and/or 4th track slot

[3]- Relay Input Output (RIO) Module can be used in lieu of Track Module in the 2nd, 5th and/or 6th track slot

[4] – The A80500 DiagView Display Unit may be used with this unit.

8.1.2 Motherboard

The Motherboard for each assembly provides:

- GCP unit wiring
- Circuit module connectors

- External Configuration Device Connector(s)
- Chassis Identification Chip socket(s)
- DIAG (diagnostic) port connector
- Interface connectors for external wiring connectors
- Echelon LONTALK® PROTOCOL LAN connector (See Siemens' Echelon Configuration Handbook, COM-00-07-09).

8.1.3 Plug-In Circuit Modules

Each 4000 GCP plug-in circuit module is equipped with:

- A dual 43-pin connector on one edge which plugs into a corresponding edge connector on the motherboard.
- Locking ejector levers at the top and bottom of each module to facilitate removal from the case.
- SSCC3i Modules include screw locking mechanism for securing modules.

WARNING

SSCC3i MODULES MUST BE SECURED IN PLACE BY SCREW LOCKING MECHANISM. ACCIDENTAL REMOVAL OF SSCC3i MODULE WILL CAUSE THE GATES TO DROP WITHOUT GATE DELAY AND FLASHING LIGHTS WILL NOT ACTIVATE.

8.1.4 External Wiring Connectors & Wire Size

All external wiring to a 4000 GCP Assembly is by means of plug-in connectors. The orange cage-clamp connectors for the signal circuits should use 16 to 12 AWG wire. The orange cage-clamp connector for the Echelon Lon Talk should use communication grade twisted wires of at least 20 AWG. The green Screw-Lock connectors for the CPU and the SSCC should use 10 AWG wire.

NOTE

Generic spare connectors that are not keyed for specific modules may be ordered. Refer to the catalog for ordering information.

8.1.5 Wire Preparation

Strip insulation from the end of the wire as follows:

Table 8-2:
Wire Preparation Standards

CONNECTOR TYPE	STRIP LENGTH
Screw terminal	0.28” (7 mm)
Cage clamp	0.32” – 0.35” (8 – 9 mm)

NOTE

Use a stripping tool to accurately set the strip length.

The addition of ferrules is not required.

8.1.6 Screw-terminal Connector Wire Insertion

Wires are secured to the screw-terminal connector as follows:

- Insert the stripped end of a wire into the wire receptor of the connector until it stops
- Tighten the screw to a torque of 4.5 inch pounds (0.508 Newton meters)

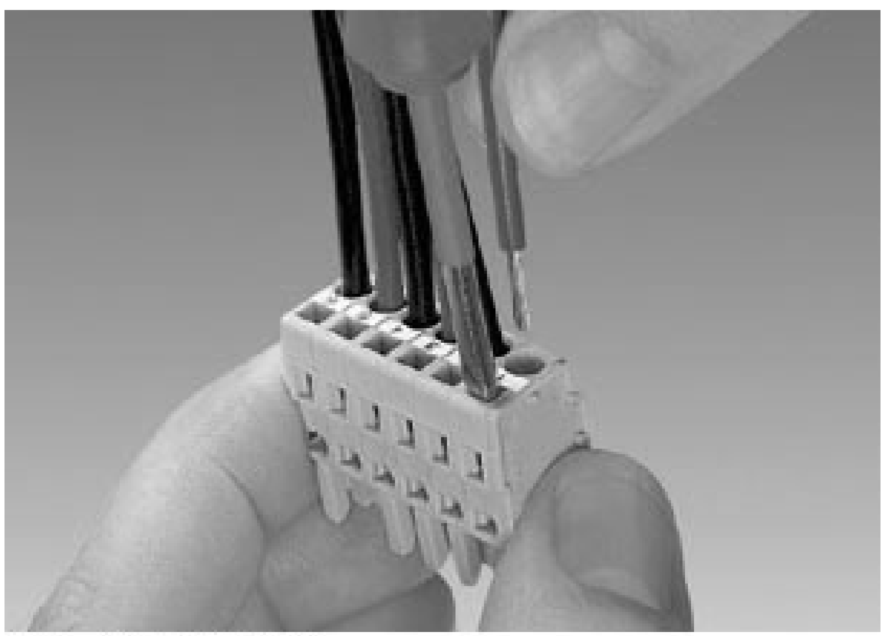


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Figure 8-1:
Insertion of Wire into Cage-clamp Connector

8.1.7 Cage-clamp Connector Wire Insertion

Wires are secured to the cage-clamp connector as follows:

- Place a flat bladed screwdriver in the rectangular slot in the connector next to the wire receptor (see Figure 8-1).
- Use a screwdriver blade 0.10 in. wide and 0.020 in. thick (2.5mm x 0.5mm)
- Lever the wire cage clamp open by pressing straight down on the screwdriver
- Insert the stripped end of a wire into the fully-open wire receptor until it stops
- Hold the wire in place and release the screwdriver blade pressure
- The wire receptor closes on the stripped end of the wire

8.2 SINGLE TRACK CASE, A80445

8.2.1 Single Track Case Interface Connectors

The A80445 Single Track case is shown in Figure 8-2. The relationships between the Single Case modules and the interface connectors are described in Table 8-3.

NOTE

The module slot allocations shown below the module connectors are assigned for discussion purposes only and do not appear on the actual case assembly.

Table 8-3:
Single Track Case, A80445 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80418	M2	TRACK-1

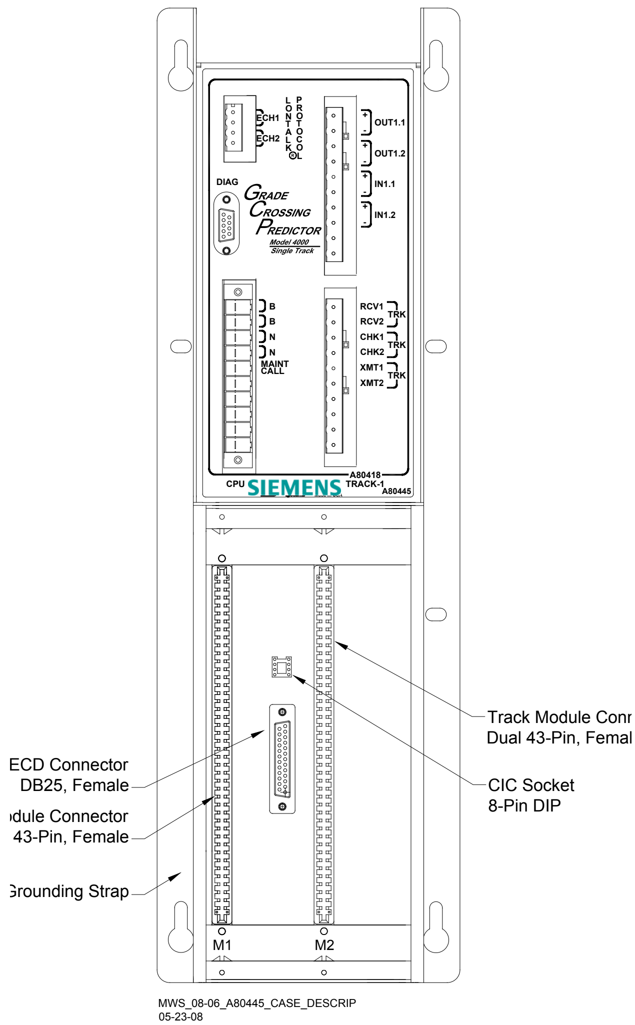

Figure 8-2:
Single Track Case, A80445

8.2.2 Single Track Case Modules and External Wiring Connectors

The Single Track Case, A80445 with modules and external wiring connectors installed is shown in Figure 8-3. The case contains two modules:

- Central Processor Unit, A80403 (CPU2+) module in slot position M1.
- Track Module, A80418 in slot position M2

The Single Track Case, A80445 has four external wiring connectors (see Table 8-4).

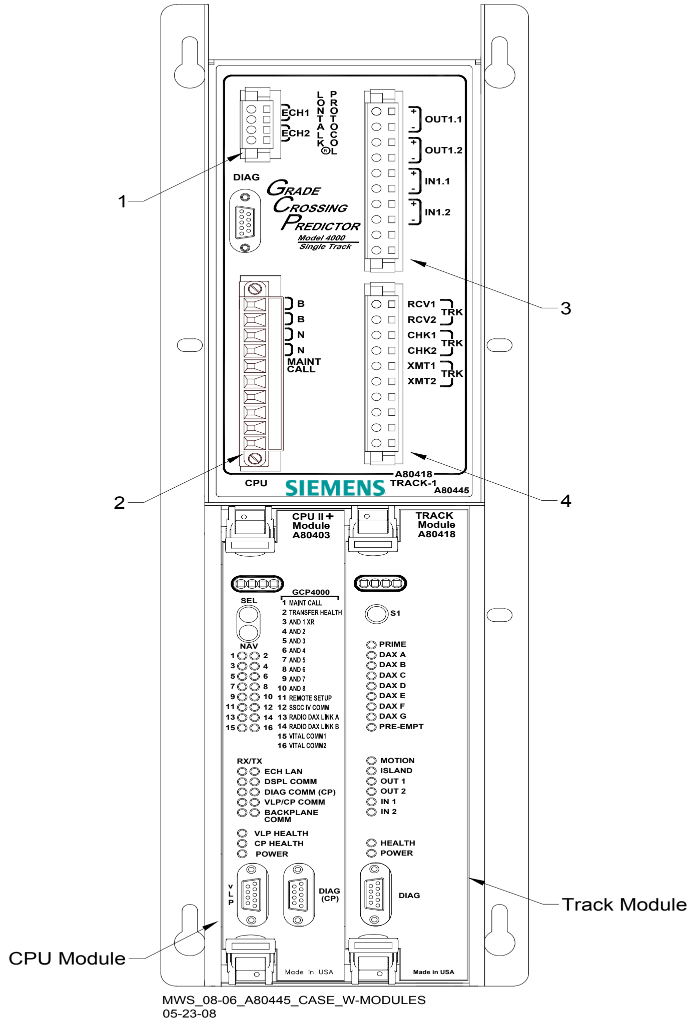

Figure 8-3:
Single Track Case, A80445 With Modules and External Wiring Connectors Installed

Table 8-4:
Single Case External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin cage clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	10-pin screw lock, female	CPU	Z715-02101-0007
3	Keyed 10-pin cage clamp, female	Upper TRACK	Z715-02101-0001
4		Lower TRACK	Z715-02101-0008

8.3 BASIC CROSSING CASE, A80455

The Basic Crossing Case, A80455 is shown in Figure 8-4.

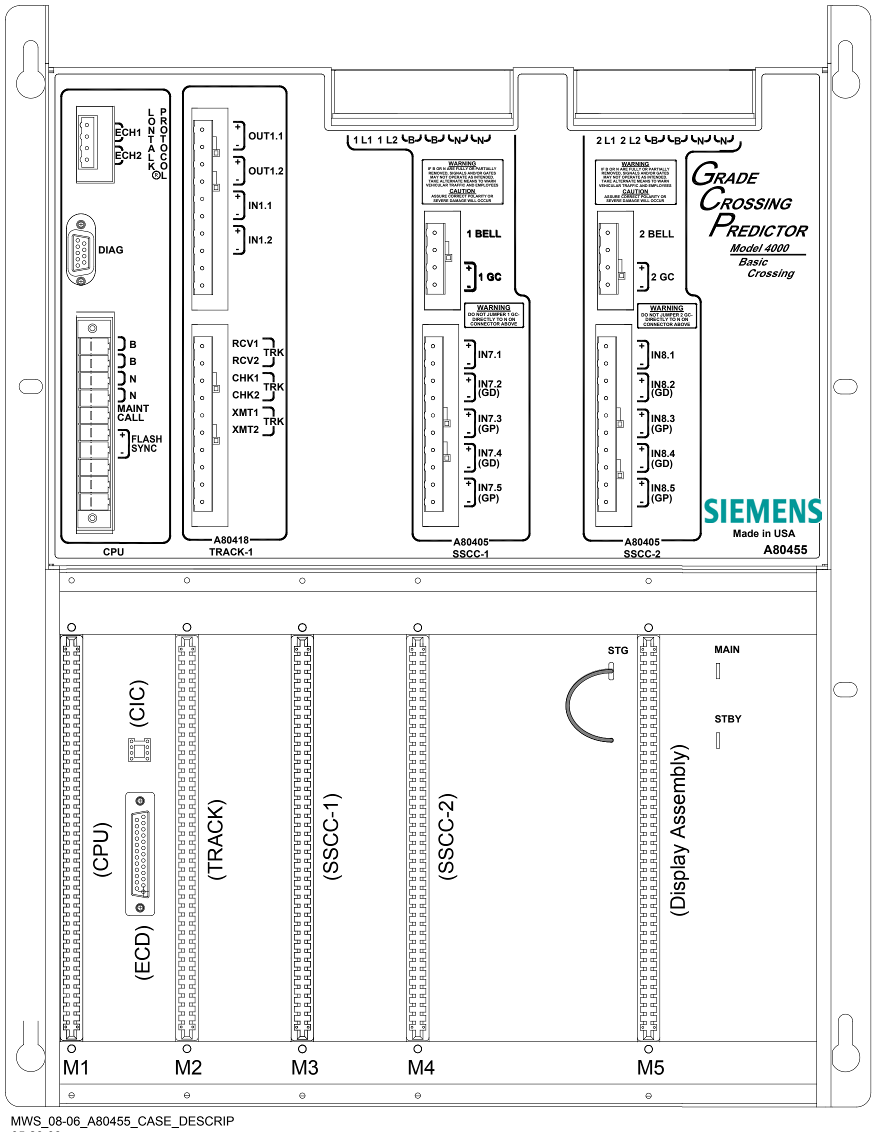

Figure 8-4:
Basic Crossing Case, A80455

NOTE

The module slot allocations shown below the module connectors are assigned for discussion purposes only and do not appear on the actual case assembly.

8.3.1 Basic Crossing Case Modules

The Basic Crossing Case, A80455 with modules installed is shown in Figure 8-5.

- A80403 Central Processor Unit (CPU2+) module in slot position M1:
- A80418 Track module in slot position M2
- A80405 Solid State Crossing controller Module in slot position M3
- A80405 Solid State Crossing controller Module in slot position M4
- A80407 Display Module in slot position M5

8.3.2 Basic Crossing Case Interface Connector to Module Relationship

The relationship between the interface connectors and the Basic Crossing Case modules is shown in Table 8-5.

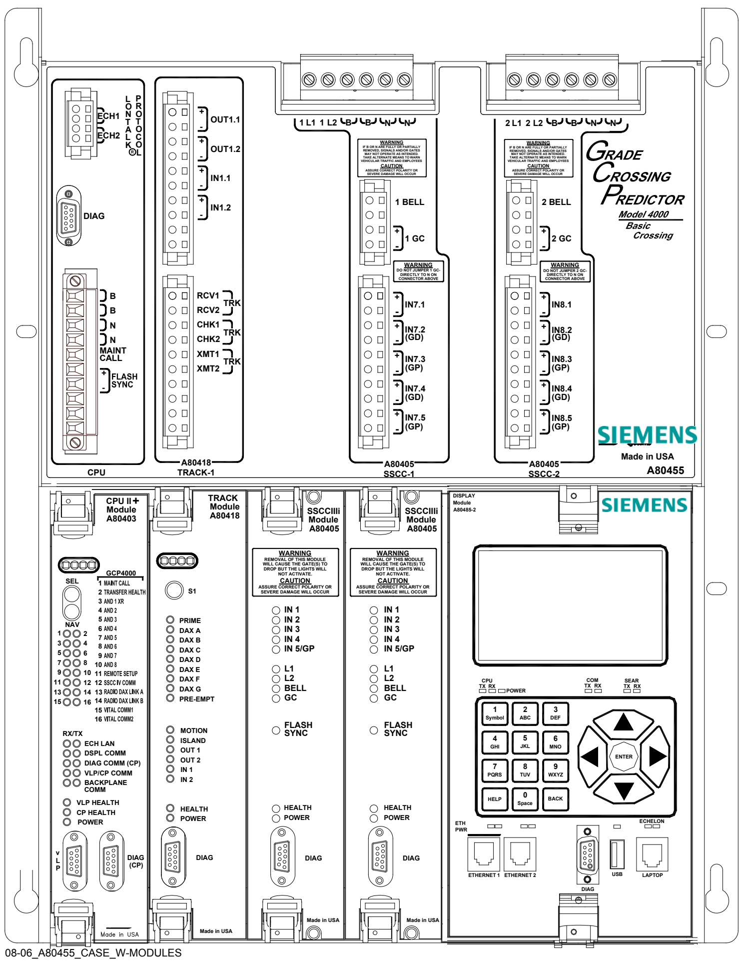

Figure 8-5:
Basic Crossing Case, A80455 With Connectors and Modules Installed

Table 8-5:
Basic Crossing Case A80455 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80418	M2	TRACK-1
A80405	M3	SSCC-1
A80405	M4	SSCC-2
A80407	M5	Display

8.3.3 Basic Crossing External Wiring Connectors

The external wiring connectors of the Basic Crossing Case are shown in Figure 8-6 and described in Table 8-5.

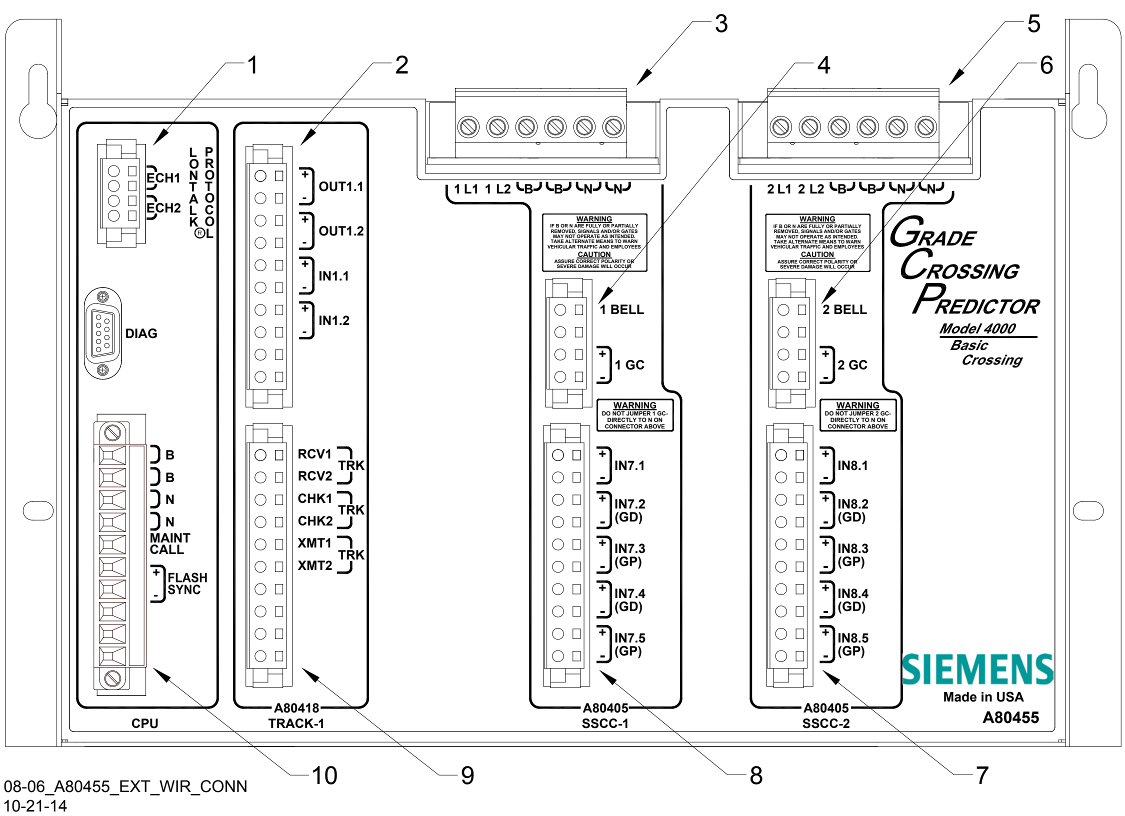

Figure 8-6:
Basic Crossing Case, A80455 External Wiring Connectors

Table 8-6:
Basic Crossing Case, A80455 External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin cage clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	Keyed 10-pin cage clamp, female	Upper TRACK	Z715-02101-0001
3	6-pin screw terminal, female	SSCC-1 power and lamp	Z715-02118-0001
4	Keyed 4-pin cage clamp, female	Upper SSCC-1	Z715-02106-0001
5	6-pin screw terminal, female	SSCC-2 power and lamp	Z715-02118-0002
6	Keyed 4-pin cage clamp, female	Upper SSCC-2	Z715-02106-0002
7	Keyed 10-pin cage clamp, female	Lower SSCC-2	Z715-02101-0015
8		Lower SSCC-1	Z715-02101-0014
9		lower TRACK	Z715-02101-0008
10	10-pin cage clamp, female	CPU	Z715-02101-0007

8.4 SINGLE FIVE TRACK CASE, A80440

The Single Five Track Case, A80440 is shown in Figure 8-7.

NOTE

The module slot allocations shown below the module connectors are assigned for discussion purposes only and do not appear on the actual case assembly.

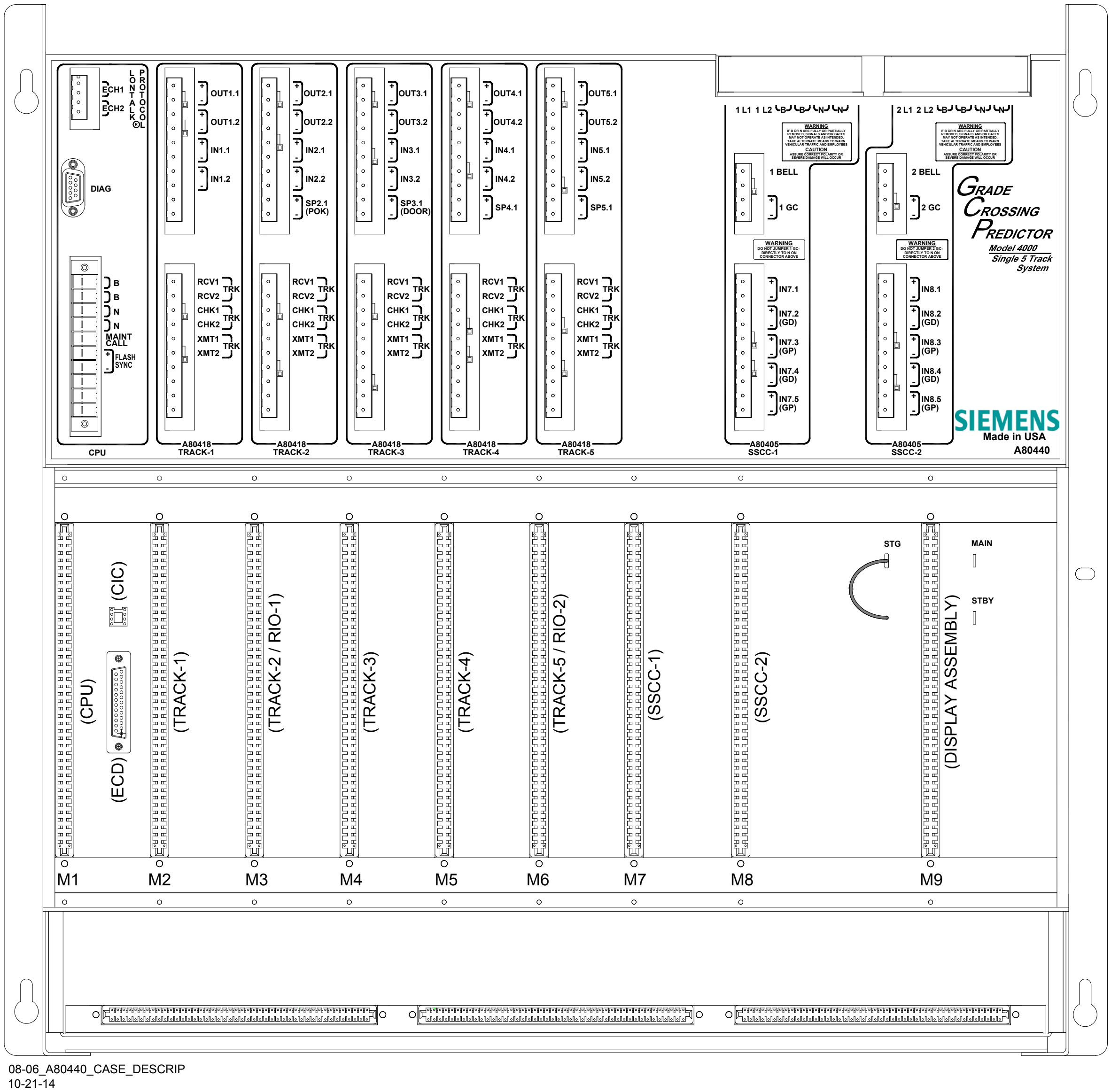

Figure 8-7:
Single Five Track Case, A80440

8.4.1 Single Five Track Case, A80440 Modules and Subassembly

The A80440 Single Five Track case with the following modules installed is shown in Figure 8-8.

- A80403 Central Processor Unit Plus (CPU2+) module in slot position M1.
- Five A80418 Track modules in slot positions M2 through M6.
- Two A80405 Solid State Crossing controller Modules in slot positions M7 and M8
- A80407 Display Module in slot position M9
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) subassembly in bay below modules

NOTE

- The A80413 RIO module may be used in place of the Track module in slot positions M3 and M6.

8.4.2 Single Five Track Case, A80440 Interface Connector to Module Relationship

The relationship between the interface connectors and the Single Five Track Case, A80440 modules is shown in Table 8-7.

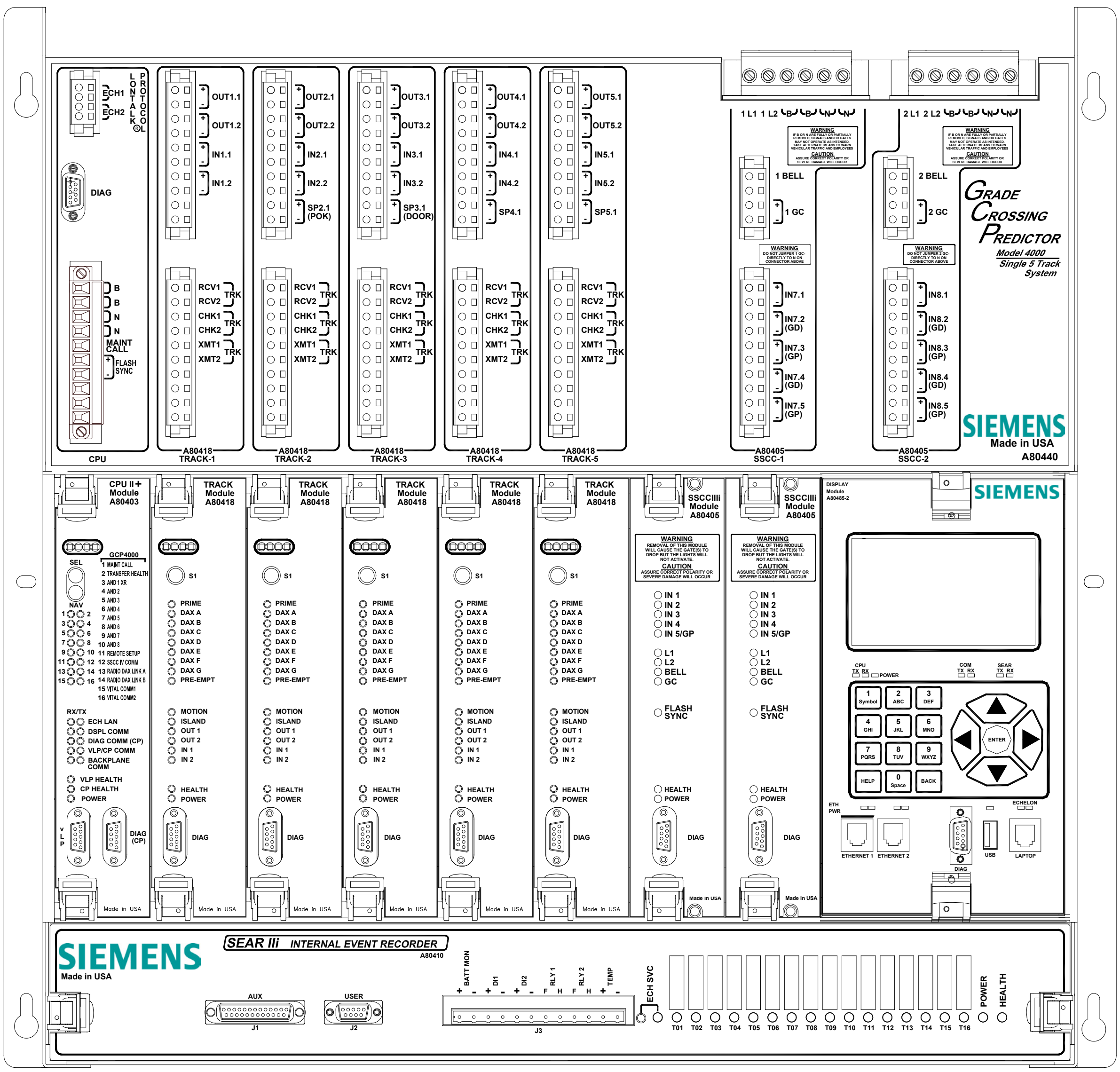

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Figure 8-8:
Single Five Track Case, A80440 With Modules and SEAR2i Installed

Table 8-7:
Single Five Track Case, A80440 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80418	M2	Track-1
A80418	M3*	Track-2 / RIO-1
A80418	M4	Track-3
A80418	M5	Track-4
A80418	M6*	Track-5 / RIO-2
A80405	M7	SSCC-1
A80405	M8	SSCC-2
A80407	M9	Display

*Note: A80413 RIO may be used in slots M3 and M6.

8.4.3 Single Five Track Case, A80440 External Wiring Connectors

The external wiring connectors of the Single Five Track Case, A80440 are shown in Figure 8-9 and described in Table 8-8.

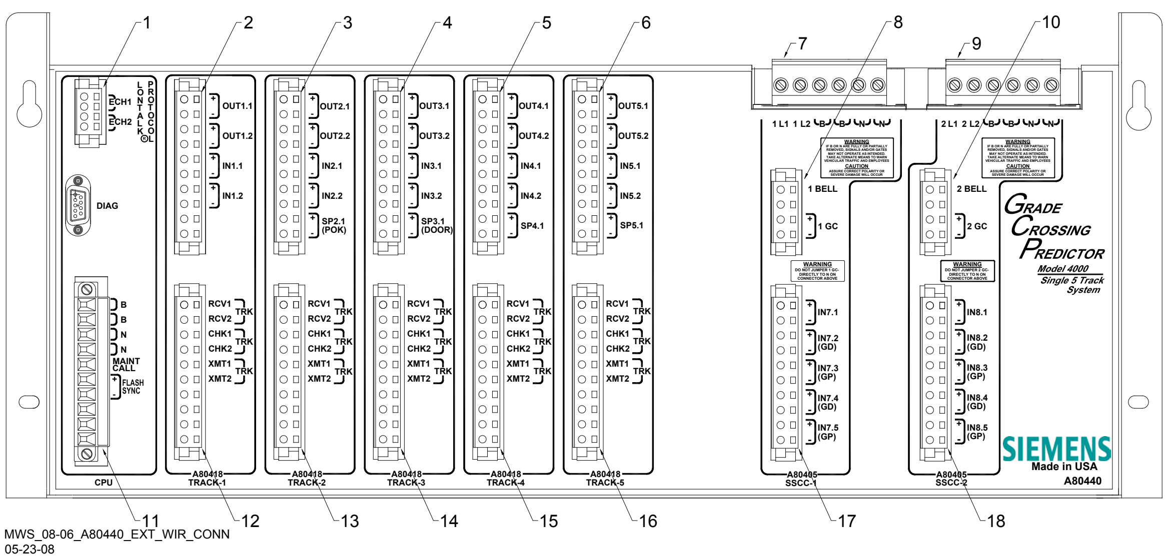


Figure 8-9:
Single Five Track Case, A80440 External Wiring Connectors

Table 8-8:
Single Five Track Case, A80440 External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin cage clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	Keyed 10-pin cage clamp, female	Upper TRACK-1	Z715-02101-0001
3		Upper TRACK-2	Z715-02101-0002
4		Upper TRACK-3	Z715-02101-0003
5		Upper TRACK-4	Z715-02101-0004
6		Upper TRACK-5	Z715-02101-0005
7	6-pin screw terminal, male	SSCC-1 power and lamp	Z715-02118-0001
8	Keyed 4-pin cage clamp, female	Upper SSCC-1	Z715-02106-0001
9	6-pin screw terminal, male	SSCC-2 power and lamp	Z715-02118-0002
10	Keyed 4-pin cage clamp, female	Upper SSCC-2	Z715-02106-0002
11	10-pin cage clamp, female	CPU	Z715-02101-0007
12	Keyed 10-pin cage clamp, female	lower TRACK-1	Z715-02101-0008
13		lower TRACK-2	Z715-02101-0009
14		lower TRACK-3	Z715-02101-0010
15		lower TRACK-4	Z715-02101-0011
16		lower TRACK-5	Z715-02101-0012
17		Lower SSCC-1	Z715-02101-0014
18		Lower SSCC-2	Z715-02101-0015

8.5 DUAL TWO TRACK CASE, A80465

The Dual Two Track Case, A80465 is shown in Figure 8-10.

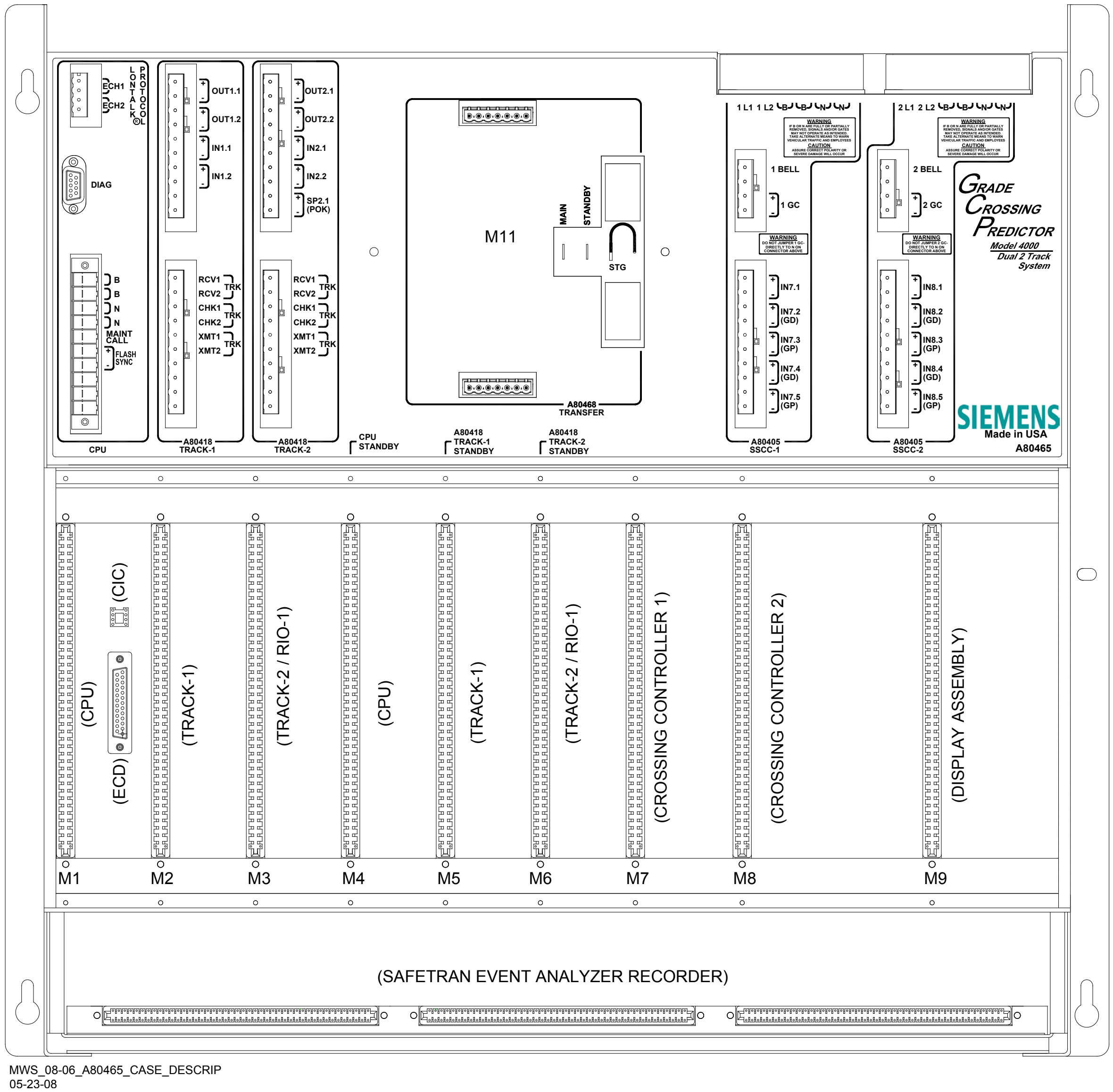


Figure 8-10:
Dual Two Track Case, A80465

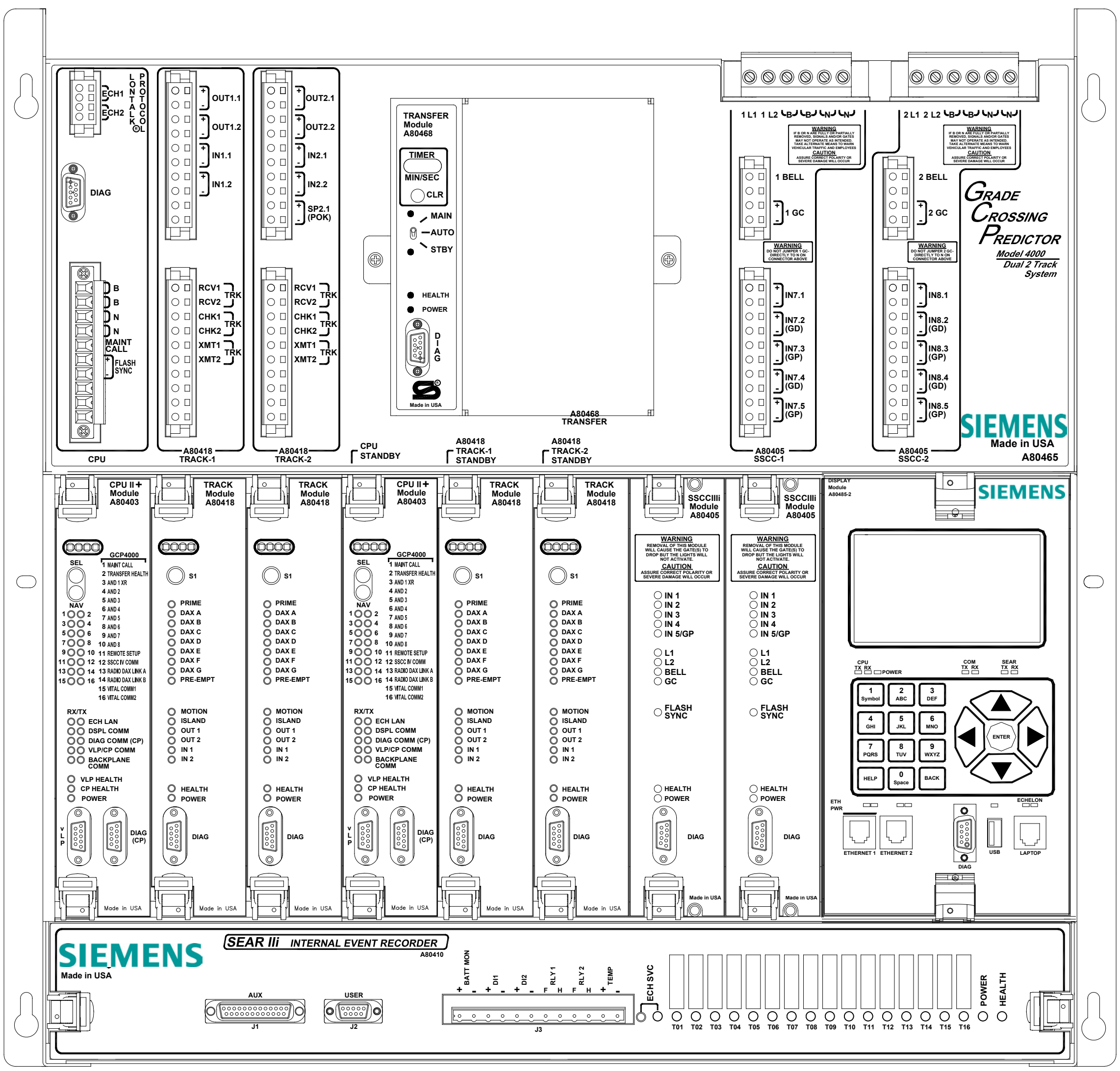
NOTE

The module slot allocations shown below the module connectors are assigned for discussion purposes only and do not appear on the actual case assembly.

8.5.1 Dual Two Track Case Modules and Subassembly

The A80465 Dual Two Track case with the following modules installed is shown in Figure 8-11.

- A80403 Central Processor Unit Plus (CPU2+) modules in slot positions M1 and M4
- Four A80418 Track modules in slot positions M2, M3, M5 and M6
- Two A80405 Solid State Crossing controller Modules in slot positions M7 and M8
- A80407 Display Module in slot position M9
- A80468 Transfer module located in the center of the top connector interface panel (slot position M11)
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) subassembly in bay below modules
- Slots M2 and M3 are utilized by the system as Main Modules and slots M5 and M6 are utilized by the system as Standby Modules.



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05-23-08

Figure 8-11:
Dual Two Track Case, A80465 With Modules and SEAR2i Installed

WARNING

GATES WILL BEGIN TO LOWER IMMEDIATELY (WITHOUT GATE DELAY TIME) WHEN THE TRANSFER SWITCH IS USED TO SWAP BETWEEN HEALTHY UNITS. USE CAUTION WHEN TRANSFERRING CONTROL TO AVOID GATES HITTING VEHICLES OR PEDESTRIANS.

NOTE

The A80413 RIO module may be used in place of the Track module in slot positions M3 and M6.

During normal operation power is applied to the module set selected from the A80468 Transfer assembly (see paragraph 8.12.2).

- Power is applied to the main module set when the A80468 is set to MAIN.
- Power is applied to the standby module set when the A80468 is set to STBY.
- Power is initially applied to the main modules when the A80468 is set to AUTO and is automatically transferred to the standby modules when a main module failure is detected.

The transfer jumper (see Figure 8-12) is connected to the STG (storage) terminal when the Transfer module is used.

Under limited maintenance circumstances, when the Transfer assembly is not operational and has been removed, power application is controlled by the position of the transfer jumper.

- Power is applied to the main module set when the jumper is connected to the MAIN terminal.
- Power is applied to the standby module set when jumper is connected to the STBY terminal.

Backup (standby) modules are not provided for the:

- A80405 State Crossing Controller (SSCC3i) modules
- A80407 Display module assembly

- A80468 Transfer assembly
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to Model 4000 GCP Field Manual, SIG-00-08-10 for selecting Transfer Interval Time.

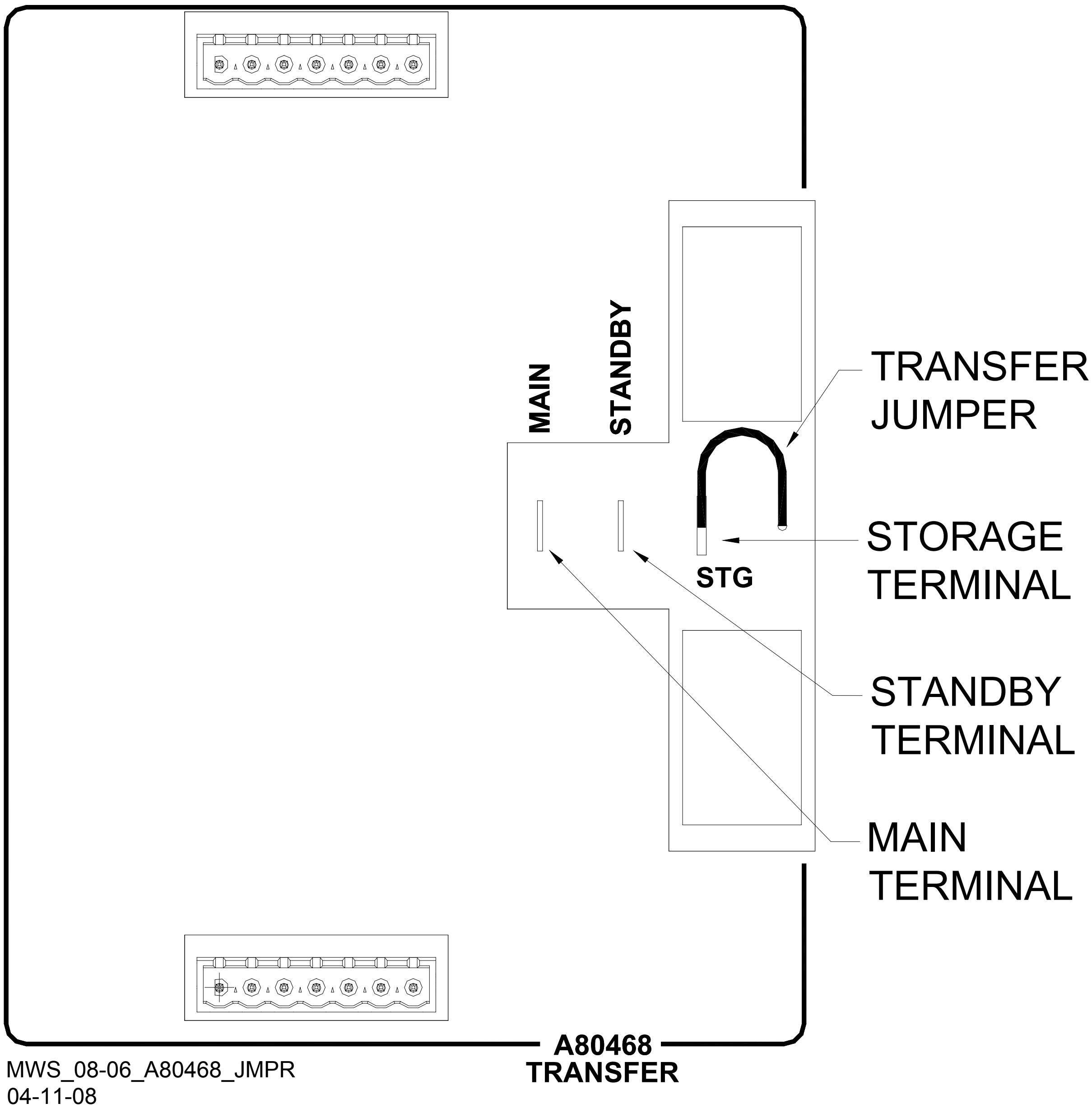


Figure 8-12:
Dual Two Track Case Transfer Jumper Terminals

8.5.2 Dual Two Track Case Interface Connector to Module Relationship

The relationship between the interface connectors and the Dual Two Track Case modules is shown in Table 8-9.

Table 8-9:
Dual Two Track Case, A80465 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80418	M2	Track-1
A80418	M3*	Track-2 / RIO-1
A80403	M4	CPU Standby
A80418	M5	Track-1 Standby
A80418	M6*	Track-2 / RIO-1 Standby
A80405	M7	SSCC-1
A80405	M8	SSCC-2
A80407	M9	Display
A80468	Top Center	Transfer

*Note: MAIN and STANDBY may use RIO in Track-2 slots (M3 and M6).

8.5.3 Dual Two Track Case External Wiring Connectors

The external wiring connectors of the Dual Two Track Case, A80465 are shown in Figure 8-13 and described in Table 8-10.

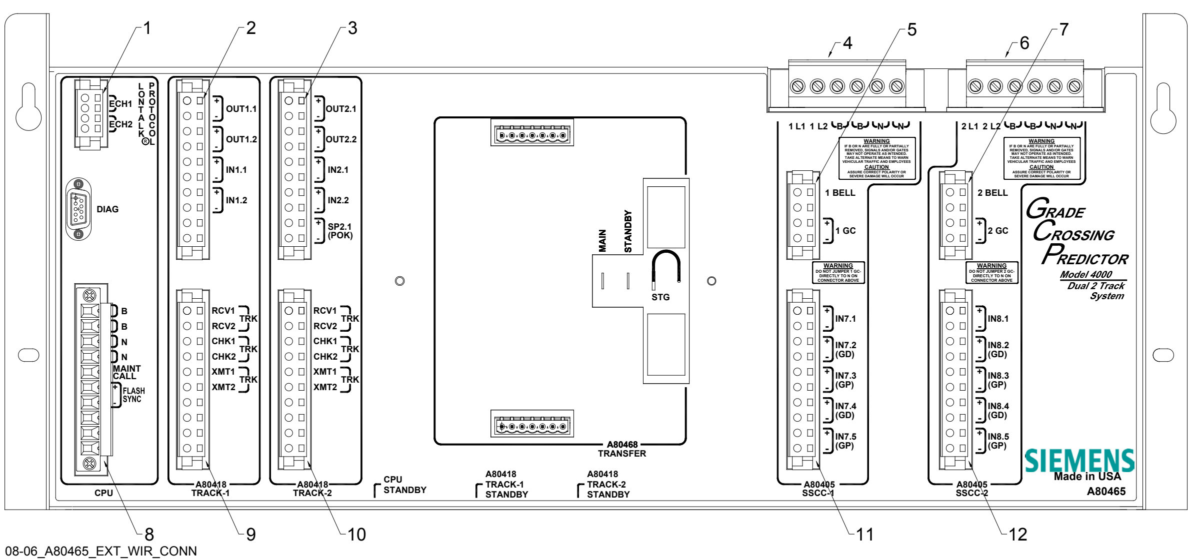


Figure 8-13:
Dual Two Track Case, A80465 External Wiring Connectors

Table 8-10:
Dual Two Track Case, A80465 External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin cage clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	Keyed 10-pin cage clamp, female	Upper TRACK-1	Z715-02101-0001
3		Upper TRACK-2	Z715-02101-0002
4	6-pin screw terminal, male	SSCC-1 power and lamp	Z715-02118-0001
5	Keyed 4-pin cage clamp, female	Upper SSCC-1	Z715-02106-0001
6	6-pin screw terminal, male	SSCC-2 power and lamp	Z715-02118-0002
7	Keyed 4-pin cage clamp, female	Upper SSCC-2	Z715-02106-0002
8	10-pin cage clamp, female	CPU	Z715-02101-0007
9	Keyed 10-pin cage clamp, female	lower TRACK-1	Z715-02101-0008
10		lower TRACK-2	Z715-02101-0009
11		Lower SSCC-1	Z715-02101-0014
12		Lower SSCC-2	Z715-02101-0015

8.6 DUAL THREE TRACK CASE, A80475

The Dual Three Track Case, A80475 is shown in Figure 8-14.

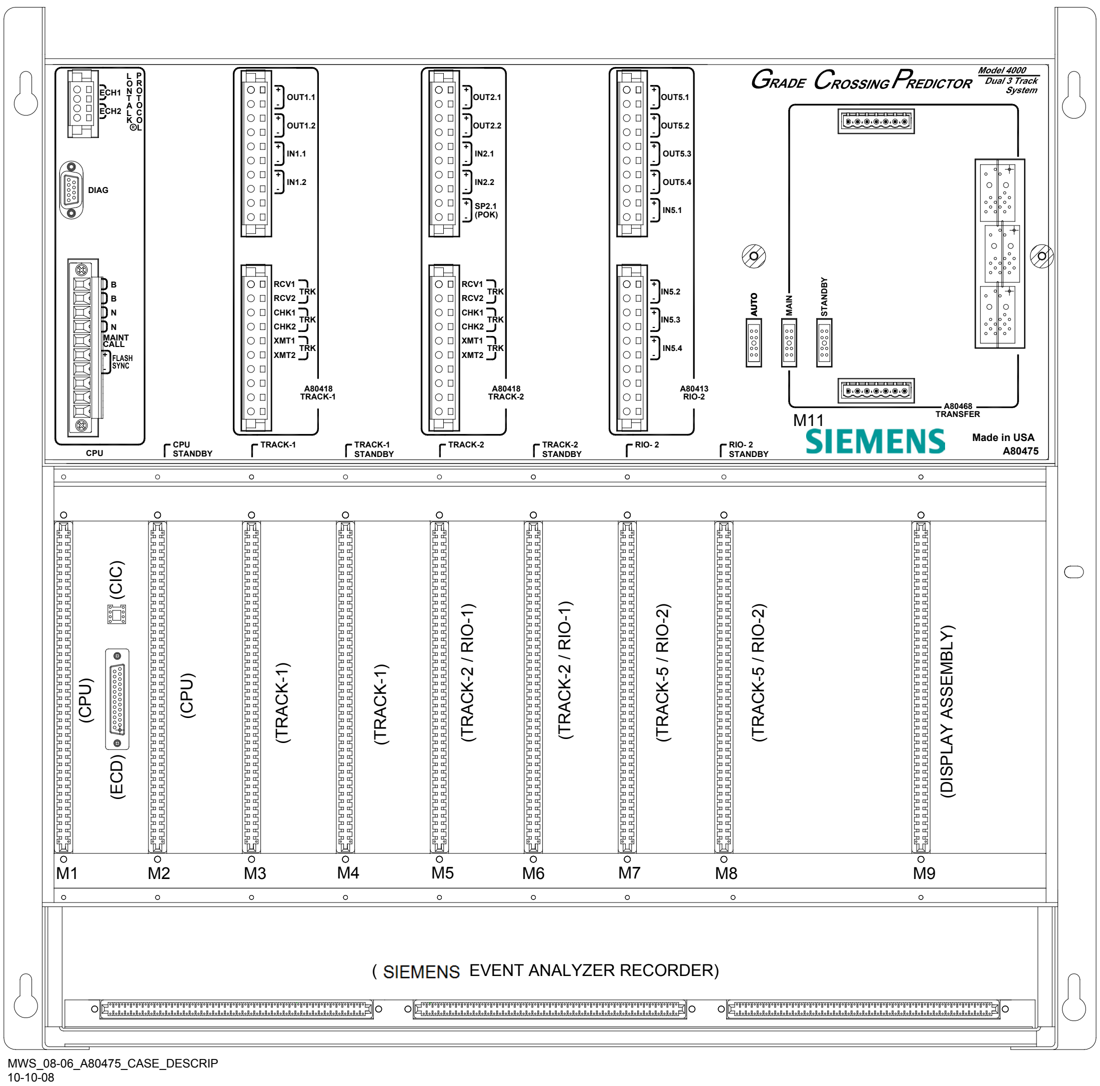


Figure 8-14:
Dual Three Track Case, A80475

NOTE

The module slot allocations shown below the module connectors are assigned for discussion purposes only and do not appear on the actual case assembly.

On the A80475 chassis only, the third track is referred to as Track-5.

8.6.1 Dual Three Track Case Modules and Subassembly

The A80475 Dual Three Track case with the following modules installed is shown in Figure 8-15.

- Two A80403 Central Processor Unit Plus (CPU2+) modules in slot positions M1 and M2
- Six A80418 Track modules in slot positions M3, M4, M5, M6, M7 and M8
- Two A80413 Relay Input/Output (RIO) modules may be located in slot positions M5, M6, M7, and M8 when required
- One A80407 Display Module in slot position M9
- One A80468 Transfer module located on the far right of the top connector interface panel (slot position M11)
- One A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) subassembly in bay below modules
- Slots M1, M3, M5, and M7 are utilized by the system as Main Modules and slots M2, M4, M6, and M8 are utilized by the system as Standby Modules.

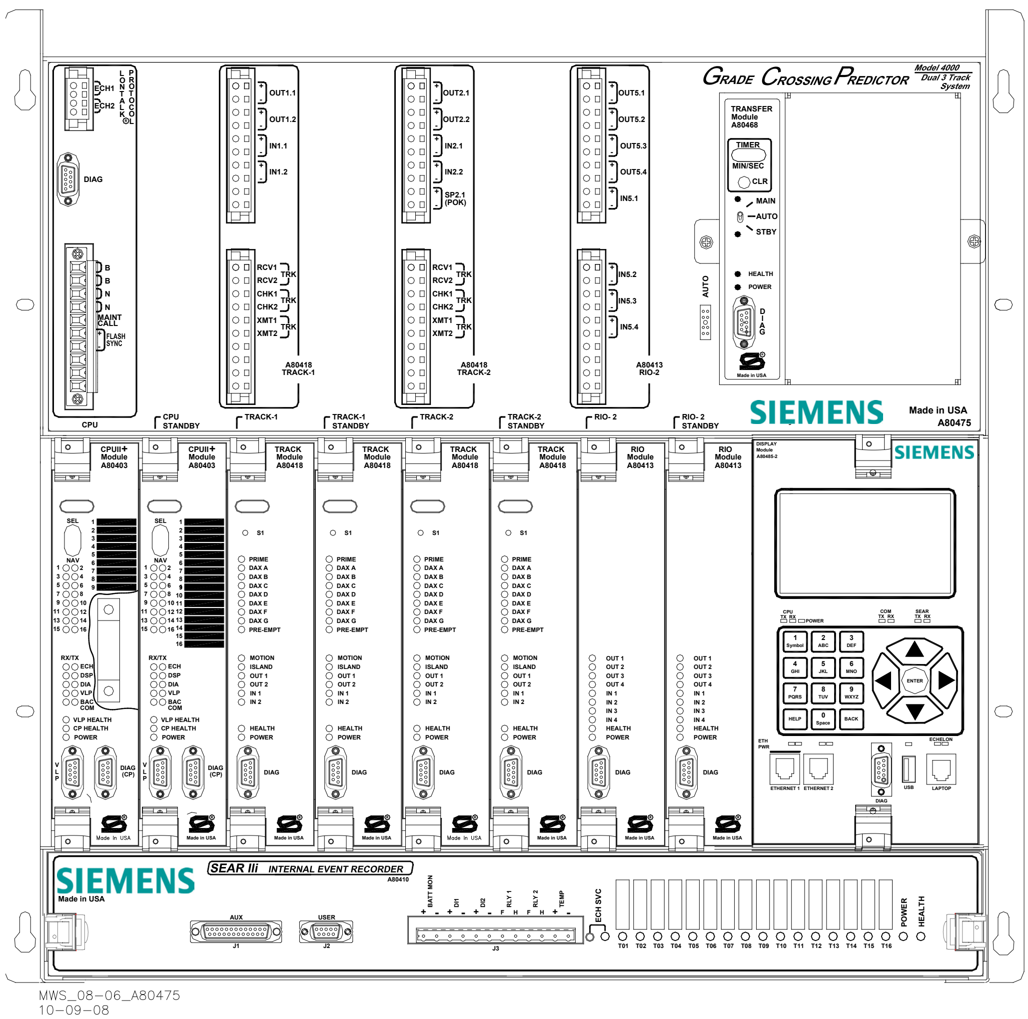


Figure 8-15:
Dual Three Track Case, A80475 With Modules and SEAR2i Installed

NOTE

The A80413 RIO module may be used in place of the Track module in slot positions M5 and M6, and the A80418 Track module may be used in place of the RIO module in slot positions M7 and M8.

During normal operation power is applied to the module set selected from the A80468 Transfer assembly (see paragraph 8.12.2).

- Power is applied to the main module set when the A80468 is set to MAIN.
- Power is applied to the standby module set when the A80468 is set to STBY.
- Power is initially applied to the main modules when the A80468 is set to AUTO and is automatically transferred to the standby modules when a main module failure is detected.

The Dual Three Track Chassis uses a different transfer jumper than that used on the other Model 4000 GCPs. Although the transfer jumper used on the A80475 Chassis resembles an automotive fuse, it is simply solid metal. The jumper is stored in to the Auto terminal slot when the Transfer module is used (see Figure 8-16).

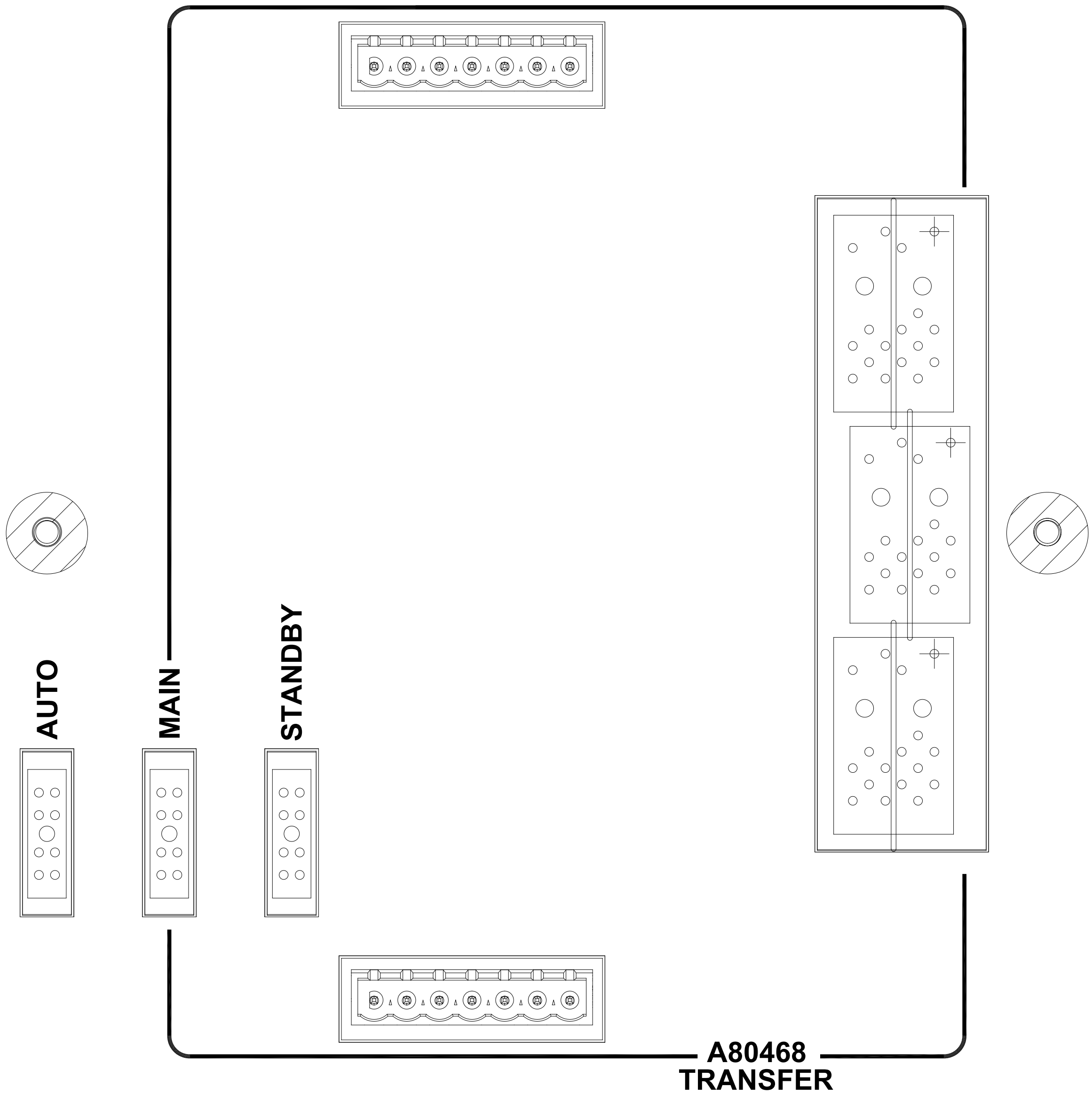
Under limited maintenance circumstances, when the Transfer assembly is not operational and has been removed, power application is controlled by the position of the transfer jumper.

- Power is applied to the main module set when the jumper is connected to the MAIN terminal.
- Power is applied to the standby module set when jumper is connected to the STANDBY terminal.

Backup (standby) modules are not provided for the:

- A80407 Display module assembly
- A80468 Transfer assembly
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to Model 4000 GCP Field Manual, SIG-00-08-10 for selecting Transfer Interval Time.



MWS_08-06_A80468_DTT_Chassis
10-17-08

Figure 8-16:
Dual Three Track Case Transfer Jumper Terminals

8.6.2 Dual Three Track Case Interface Connector to Module Relationship

The relationship between the interface connectors and the Dual Three Track Case modules is shown in Table 8-11.

Table 8-11:
Dual Three Track Case, A80475 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80403	M2	CPU Standby
A80418	M3	Track-1
A80418	M4	Track-1 Standby
A80418	M5*	Track-2 / RIO-1
A80418	M6*	Track-2 / RIO-1 Standby
A80413	M7*	Track-5 / RIO-2
A80413	M8*	Track-5 / RIO-2 Standby
A80407-03	M9	Display II
A80468	Top Right	Transfer

*Note: MAIN may use RIO in Track-2 slot (M5) and Track-5 slot (M7) and STANDBY may use RIO in Track-2 slot (M6) and Track-5 slot (M8).

8.6.3 Dual Three Track Case External Wiring Connectors

The external wiring connectors of the Dual Three Track Case, A80475 are shown in Figure 8-17 and described in Table 8-12.

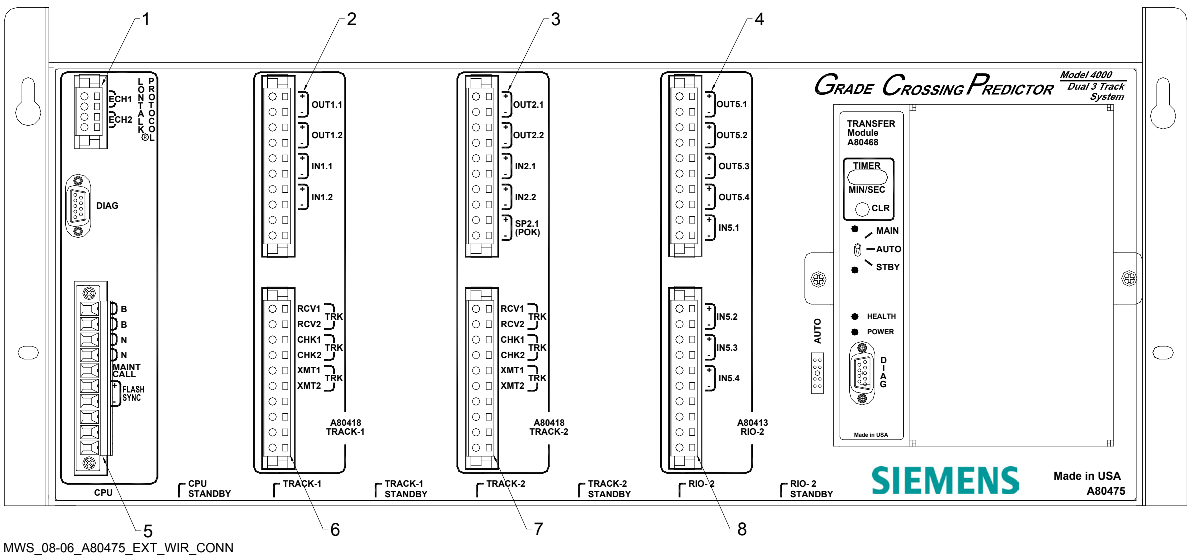


Figure 8-17:
Dual Three Track Case, A80475 External Wiring Connectors

Table 8-12:
Dual Three Track Case, A80475 External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin cage clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	Keyed 10-pin cage clamp, female	Upper TRACK-1	Z715-02101-0001
3		Upper TRACK-2	Z715-02101-0002
4		Upper RIO-2	Z715-02101-0003
5	10-pin cage clamp, female	CPU	Z715-02101-0007
6	Keyed 10-pin cage clamp, female	Lower TRACK-1	Z715-02101-0008
7		Lower TRACK-2	Z715-02101-0009
8		Lower RIO-2	Z715-02101-0010

8.7 DUAL FOUR TRACK CASE, A80400

The Dual Four Track Case, A80400 is shown in Figure 8-18 and it includes the nomenclature for three RIO cards.

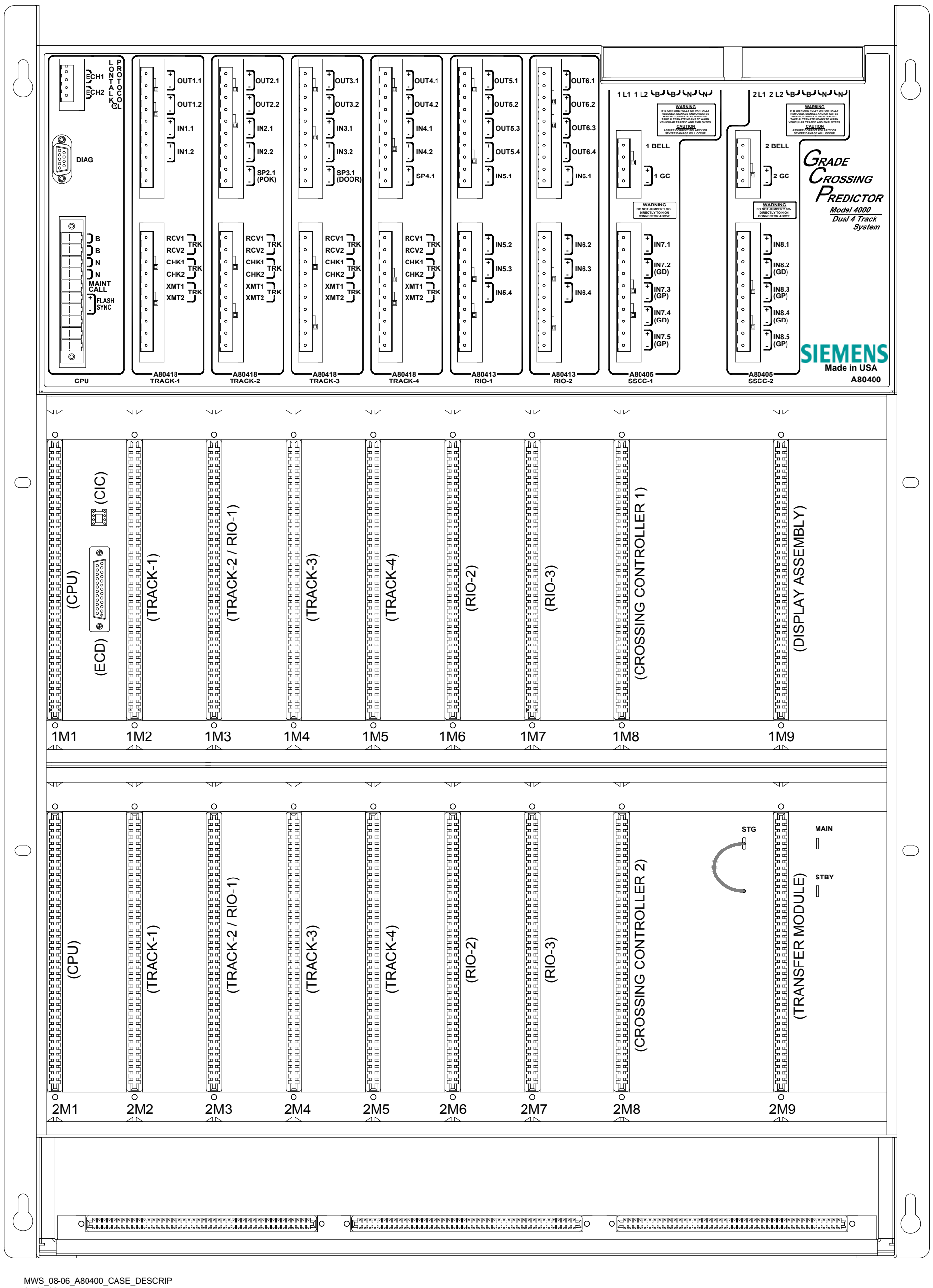


Figure 8-18:
Dual Four Track Case, A80400

NOTE

Module slot position numbers shown in Figure 8-18 are assigned for discussion purposes only and do not appear on the actual case assembly.

The module slots are numbered from left to right as viewed from the front of the case:

- Upper module slots designated 1M1 through 1M9
- Lower module slots designated 2M1 through 2M9

8.7.1 Dual Four Track Case, A80400 Modules

The Dual Four Track Case, A80400 with a full complement of modules installed is shown in Figure 8-19.

The upper module set is designated as the main module set. A main module set consists of:

- A80403 Central Processor Unit Plus (CPU2+) module in slot 1M1
- Four A80418 Track modules, slots 1M2 through 1M5
- Two A80413 Relay Input/Output (RIO) modules in slots 1M6 and 1M7
- Two A80405 Solid State Crossing Controller IIIi (SSCC3i) in slots 1M8 and 2M8
- A80407 Display module assembly in slot 1M9
- A80406 Transfer module in slot 2M9
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) module assembly

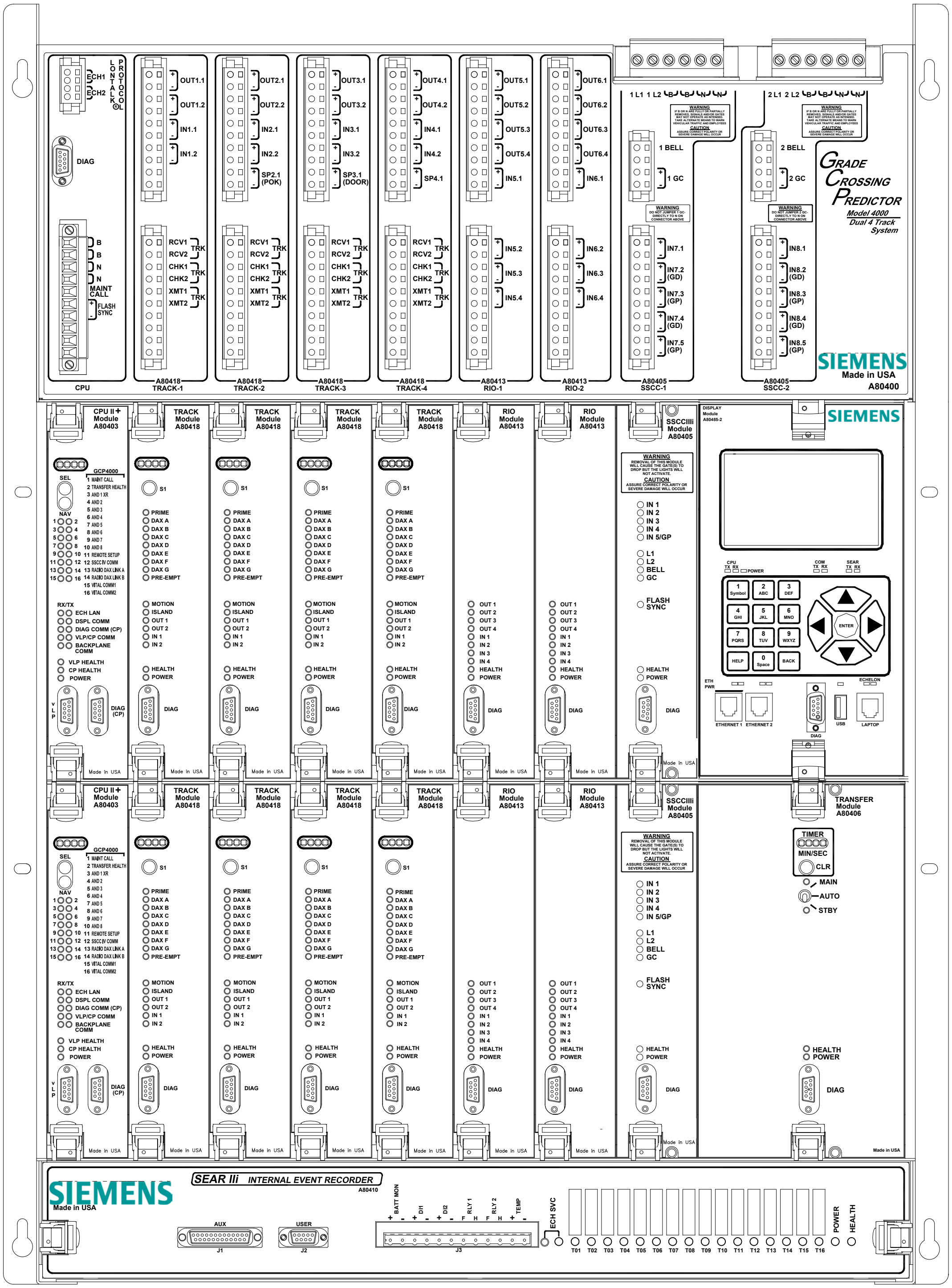
The lower module set is designated as the standby module set. A standby module set consists of:

- A80403 Dual Central Processor Unit II Plus (CPU2+) module in slot 2M1
- Four A80418 Track modules, slots 2M2 through 2M5
- Two A80413 Relay Input/Output (RIO) modules in slots 2M6 and 2M7

NOTE

The A80413 RIO module may be used in place of the Track module in slot positions 1M3 and 2M3.

Faceplates reflecting the nomenclature of slots used for RIO cards are available through Siemens Customer Support



MWS_08-06_A80400_W-MODULES
05-23-08

Figure 8-19: Dual Four Track Case, A80400 With Modules Installed

WARNING

GATES WILL BEGIN TO LOWER IMMEDIATELY (WITHOUT GATE DELAY TIME) WHEN THE TRANSFER SWITCH IS USED TO SWAP BETWEEN HEALTHY UNITS. USE CAUTION WHEN TRANSFERRING CONTROL TO AVOID GATES HITTING VEHICLES OR PEDESTRIANS.

NOTE

During normal operation power is applied to the module set selected from the A80406 Transfer assembly (see paragraph 8.11).

- Power is applied to the main module set when the A80406 is set to MAIN.
- Power is applied to the standby module set when the A80406 is set to STBY.
- Power is initially applied to the main modules when the A80406 is set to AUTO and is automatically transferred to the standby modules when a main module failure is detected.

The transfer jumper (see Figure 8-20) on the next page is connected to the STG (storage) terminal when the Transfer module is used.

Under limited maintenance circumstances, when the Transfer assembly is not operational and has been removed, power application is controlled by the position of the transfer jumper.

- Power is applied to the main module set when the jumper is connected to the MAIN terminal.
- Power is applied to the standby module set when jumper is connected to the STBY terminal.

Backup (standby) modules are not provided for the:

- A80405 State Crossing Controller (SSCC3i) modules
- A80407 Display module assembly
- A80468 Transfer assembly

- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to Model 4000 GCP Field Manual, SIG-00-08-10 for selecting Transfer Interval Time.

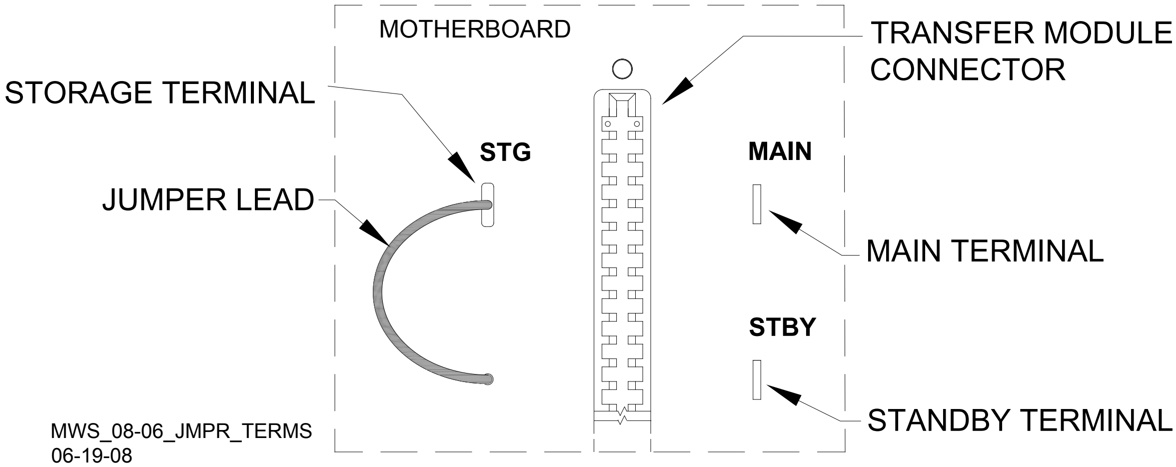


Figure 8-20:
Dual Four & Six Track Case Transfer Jumper Terminals on Motherboard

8.7.2 Dual Four Track Case Interface Connectors to Module Relationship

The interface connector to module relationships in the A80400 Dual Four Track Case is shown in Table 8-13. The external wiring connectors of the Dual Four Track Case, A80400 are shown Figure 8-21 is described in Table 8-14.

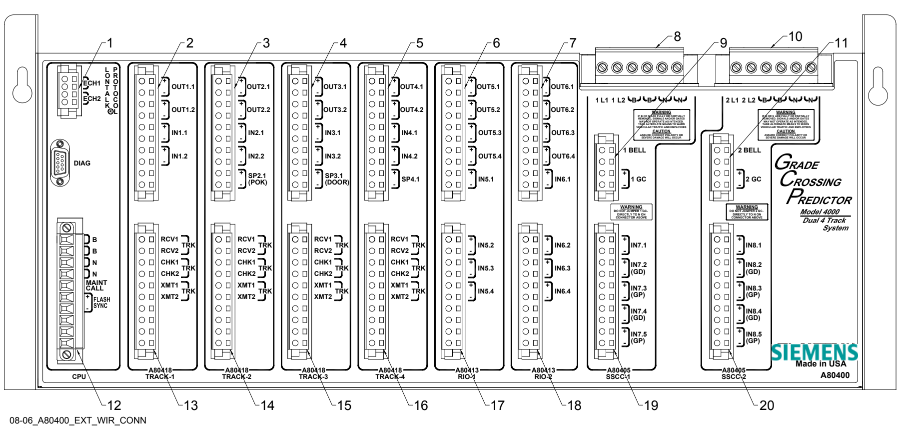


Figure 8-21:
Dual Four Track Case, A80400 External Wiring connections

Table 8-13:
Dual Four Track Case, A80400 Interface Connector to Module Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	1M1	CPU
A80418	1M2	TRACK-1
A80418	1M3*	TRACK-2 / RIO-1
A80418	1M4	TRACK-3
A80418	1M5	TRACK-4
A80413	1M6	RIO-2
A80413	1M7	RIO-3
A80405	1M8	SSCC-1
A80407	1M9	Display
A80403	2M1	CPU
A80418	2M2	TRACK-1
A80418	2M3*	TRACK-2 / RIO-1
A80418	2M4	TRACK-3
A80418	2M5	TRACK-4
A80413	2M6	RIO-2
A80413	2M7	RIO-3
A80405	2M8	SSCC- 2
A80406	2M9	Transfer

*Note: MAIN and STANDBY may contain additional RIO in Track-2 slot (M3).

Table 8-14:
Dual Four Track Case, A80400 External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin cage clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	Keyed 10-pin cage clamp, female	Upper TRACK-1	Z715-02101-0001
3		Upper TRACK-2	Z715-02101-0002
4		Upper TRACK-3	Z715-02101-0003
5		Upper TRACK-4	Z715-02101-0004
6		Upper RIO-1	Z715-02101-0005
7		Upper RIO-2	Z715-02101-0006
8	6-pin screw terminal, male	SSCC-1 power and lamp	Z715-02118-0001
9	Keyed 4-pin cage clamp, female	Upper SSCC-1	Z715-02106-0001
10	6-pin screw terminal, male	SSCC-2 power and lamp	Z715-02118-0001
11	Keyed 4-pin cage clamp, female	Upper SSCC-2	Z715-02106-0002
12	10-pin screw clamp, female	CPU	Z715-02101-0007
13	Keyed 10-pin cage clamp, female	Lower TRACK-1	Z715-02101-0008
14		Lower TRACK-2	Z715-02101-0009
15		Lower TRACK-3	Z715-02101-0010
16		Lower TRACK-4	Z715-02101-0011
17		Lower RIO-1	Z715-02101-0012
18		Lower RIO-2	Z715-02101-0013
19		Lower SSCC-1	Z715-02101-0014
20		Lower SSCC-2	Z715-02101-0015

8.8 DUAL SIX TRACK CASE, A80460

The Dual Six Track Case, A80460 is shown in Figure 8-22.

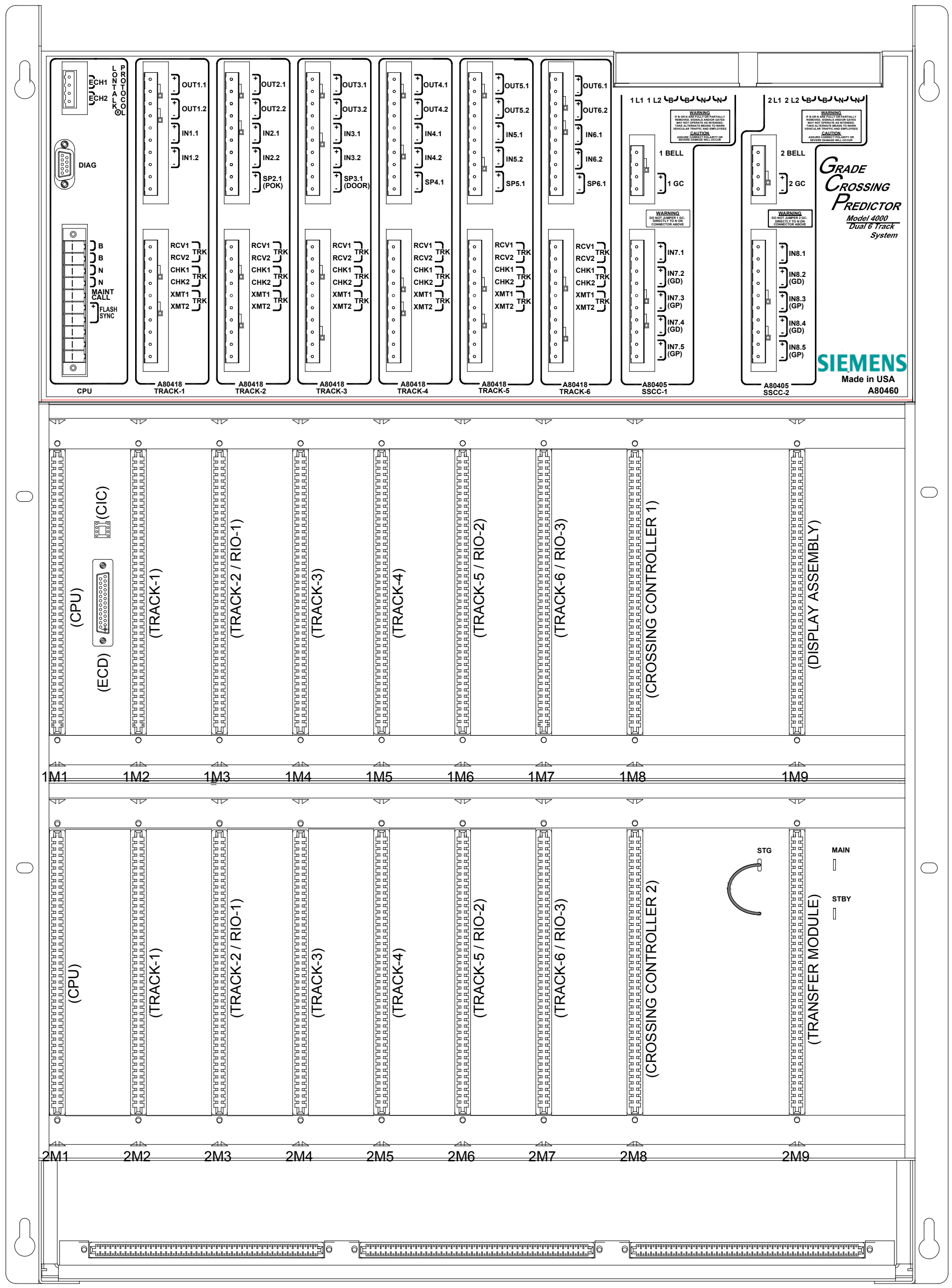


Figure 8-22:
Dual Six Track Case, A80460

NOTE

Module slot position numbers shown in Figure 8-22 are assigned for discussion purposes only and do not appear on the actual case assembly.

The module slots are numbered from left to right as viewed from the front of the case.

- Upper module slots designated 1M1 through 1M9
- Lower module slots designated 2M1 through 2M9

8.8.1 Dual Six Track Case, A80460 Modules

The Dual Six Track Case with a full complement of modules installed is shown in Figure 8-23.

The upper module set is designated as the main module set. A main module set consists of:

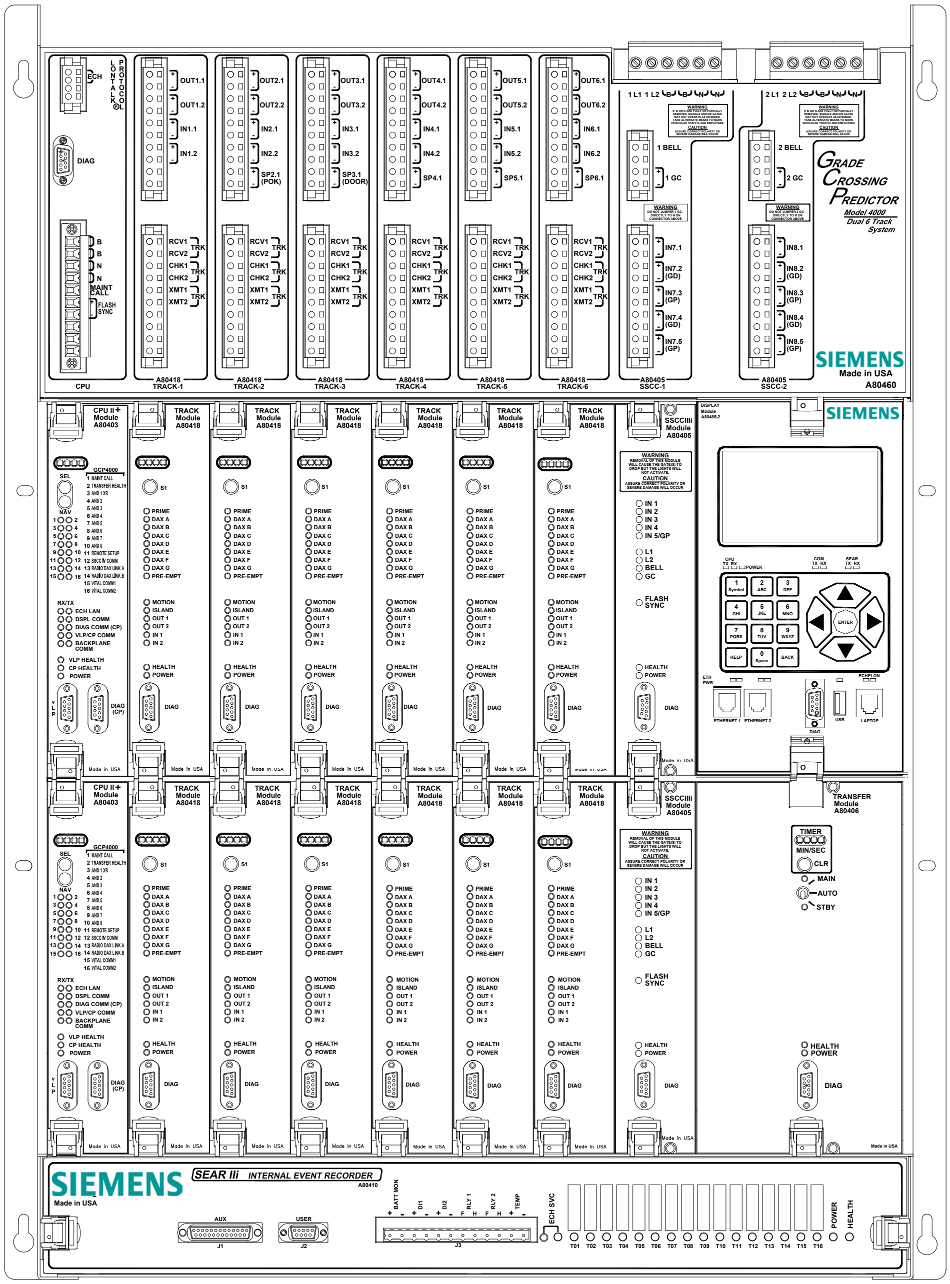
- A80403 Central Processor Unit Plus (CPU2+) module in slot position 1M1
- Six A80418 Track modules in slot positions 1M2 through 1M7
- Two A80405 Solid State Crossing Controller IIIi (SSCC3i) in slot positions 1M8 and 2M8
- A80407 Display module assembly in slot position 1M9
- A80406 Transfer module in slot position 2M9
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) module assembly

The lower module set is designated as the standby module set. A standby module set consists of:

- A80403 Dual Central Processor Unit II Plus (CPU2+) module in slot position 2M1
- Six A80418 Track modules in slot positions 2M2 through 2M7

NOTE

The A80413 RIO module may be used in place of the Track module in slot positions 1M3, 1M6, 1M7, 2M3, 2M6 and 2M7.



08-06_A80460_CASE_W-MODULES
10-22-14

Figure 8-23:
Dual Six Track Case, A80460 With Modules Installed

WARNING

GATES WILL BEGIN TO LOWER IMMEDIATELY (WITHOUT GATE DELAY TIME) WHEN THE TRANSFER SWITCH IS USED TO SWAP BETWEEN HEALTHY UNITS. USE CAUTION WHEN TRANSFERRING CONTROL TO AVOID GATES HITTING VEHICLES OR PEDESTRIANS.

NOTE

During normal operation power is applied to the module set selected from the A80406 Transfer module (see paragraph 8.11).

- Power is applied to the main module set when the A80406 is set to MAIN.
- Power is applied to the standby module set when the A80406 is set to STBY.
- Power is initially applied to the main modules when the A80406 is set to AUTO and is automatically transferred to the standby modules when a main module failure is detected.

The transfer jumper, see Figure 8-20, is connected to the STG (storage) terminal when the Transfer module is used.

Under limited maintenance circumstances, when the Transfer assembly is not operational and has been removed, power application is controlled by the position of the transfer jumper.

- Power is applied to the main module set when the jumper is connected to the MAIN terminal.
- Power is applied to the standby module set when jumper is connected to the STBY terminal.

Backup (standby) modules are not provided for the:

- A80405 State Crossing Controller (SSCC3i) modules
- A80407 Display module assembly
- A80406 Transfer module

- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to the Model 4000 GCP Field Manual, SIG-00-08-10 for selecting Transfer Interval Time.

8.8.2 Dual Six Track Case, A80460 Interface Connectors to Module Relationship

The relationship between the interface connectors and the Dual Six Track Case, A80460 modules are described in Table 8-15.

Table 8-15:
Dual Six Track Case, A80460 Interface Connector to Module Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	1M1	CPU
A80418	1M2	TRACK-1
A80418	1M3*	TRACK-2 / RIO-1
A80418	1M4	TRACK-3
A80418	1M5	TRACK-4
A80418	1M6*	TRACK-5 / RIO-2
A80418	1M7*	TRACK-6 / RIO-3
A80405	1M8	SSCC-1
A80407	1M9	Display
A80403	2M1	CPU
A80418	2M2	TRACK-1
A80418	2M3*	TRACK-2 / RIO-1
A80418	2M4	TRACK-3
A80418	2M5	TRACK-4
A80418	2M6*	TRACK-5 / RIO-2
A80418	2M7*	TRACK-6 / RIO-3
A80405	2M8	SSCC- 2
A80406	2M9	Transfer

*Note: MAIN and STANDBY may use RIO in slots M3, M6 and M7

8.8.3 Dual Six Track Case, A80460 External Wiring Connectors

The external wiring connectors of the Dual Six Track Case are shown in Figure 8-24 and described in Table 8-16.

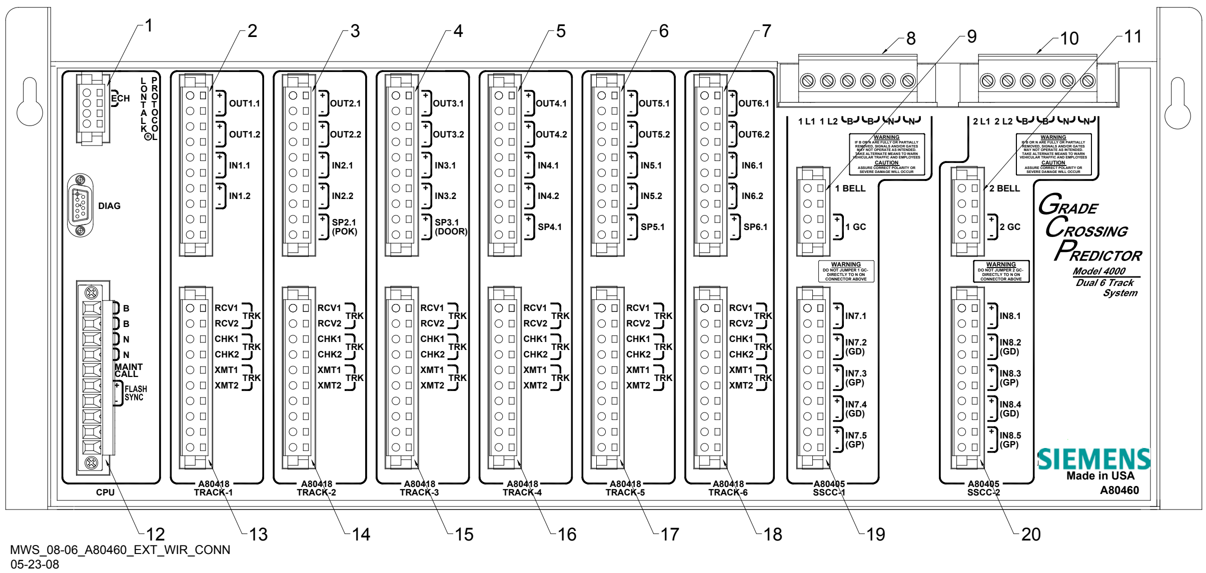


Figure 8-24:
Dual Six Track Case, A80460 External Wiring connections

Table 8-16:
Dual Six Track Case, A80460 External Wiring Connectors

REF. NO.	CONNECTOR DESCRIPTION	CONNECTOR DESIGNATION	SIEMENS PART NUMBER
1	4-pin non- locking screw clamp, female	LONTALK® PROTOCOL	Z715-09099-0000
2	Keyed 10-pin cage clamp, female	Upper TRACK-1	Z715-02101-0001
3		Upper TRACK-2	Z715-02101-0002
4		Upper TRACK-3	Z715-02101-0003
5		Upper TRACK-4	Z715-02101-0004
6		Upper TRACK-5	Z715-02101-0005
7		Upper TRACK-6	Z715-02101-0006
8	6-pin screw terminal, male	SSCC-1 power and lamp	Z715-02118-0001
9	Keyed 4-pin cage clamp, female	Upper SSCC-1	Z715-02106-0001
10	6-pin screw terminal, male	SSCC-2 power and lamp	Z715-02118-0001
11	Keyed 4-pin cage clamp, female	Upper SSCC-2	Z715-02106-0002
12	10-pin cage clamp, female	CPU	Z715-02101-0007
13	Keyed 10-pin cage clamp, female	Lower TRACK-1	Z715-02101-0008
14		Lower TRACK-2	Z715-02101-0009
15		Lower TRACK-3	Z715-02101-0010
16		Lower TRACK-4	Z715-02101-0011
17		Lower TRACK-5	Z715-02101-0012
18		Lower TRACK-6	Z715-02101-0013
19		Lower SSCC-1	Z715-02101-0014
20		Lower SSCC-2	Z715-02101-0015

8.9 DIAGVIEW DISPLAY UNIT, A80500

The DiagView Display Unit Case, A80500 is shown in Figure 8-25.

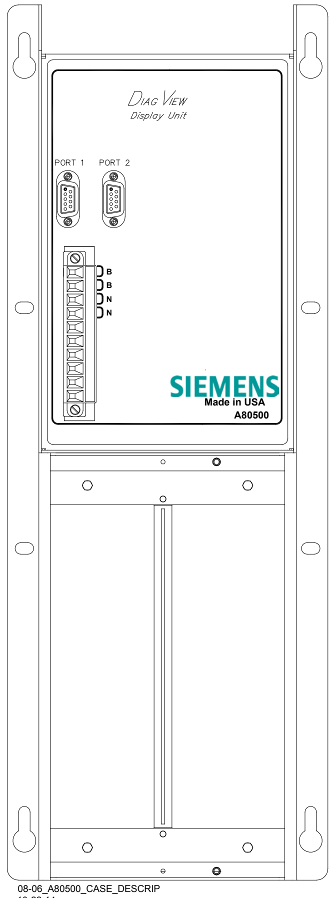


Figure 8-25:
DiagView Display Unit Case, A80500

8.9.1 DiagView Display Unit Case, A80500 Modules

The DiagView Display Unit Case along with the Display II Panel, A80407-03, installed is shown in Figure 8-26.

Table 8-17:
DiagView Display Unit Case External Wiring Connectors

REF. NO.	DESCRIPTION	DESIGNATION	SIEMENS PART NUMBER
1	DB9 connector	Port 1	Z715-09099-0000
2	DB9 connector	Port 2	Z715-02101-0007
3	10-pin screw clamp connector, female	Power	Z715-02101-0007

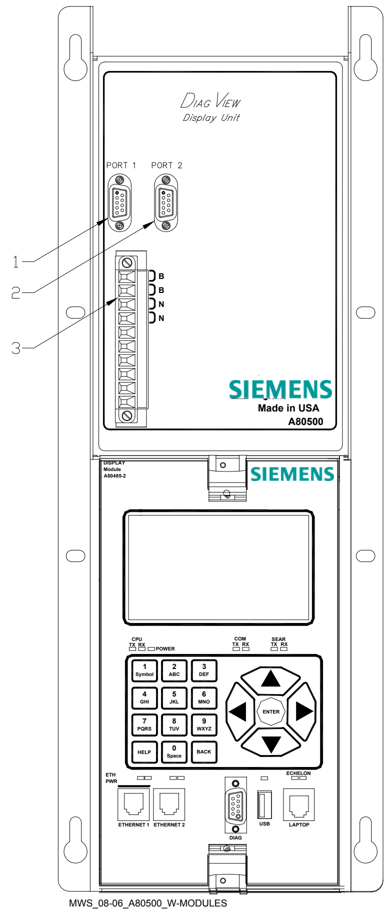


Figure 8-26:
DiagView Display Unit, A80500

The DiagView Display Unit is used with the Single Track Case, A80455, to provide the user with a visual cue of track status as well as a Display Terminal.

The DiagView Display Unit is connected to the Single Track Case through the use of Serial Cable, P/N Z706-00280-0000. This cable has a male DB9 connector on each end of the cable. The cable is connected between the Diag Port located on the upper portion of the Single Track Case between the Echelon LAN connector and the power connector and Port 1 on the DiagView Display Unit case.

8.10 PLUG-IN MODULES AND SUBASSEMBLIES

8.10.1 CPU2+ Module, A80403

The A80403 CPU2+ Module is a central processing unit that provides all vital logic processing functions for all 4000 GCP chassis controls GCP LAN and vital and non-vital serial communications interfaces with front panel CPU connectors.

8.10.1.1 CPU2+ Module, A80403 User Interface

The CPU2+ front panel is shown in Figure 8-27. The CPU2+ user interface is described in Table 8-18. (Refer to Model 4000 GCP Field Manual, SIG-00-08-10, for diagnostics and troubleshooting)

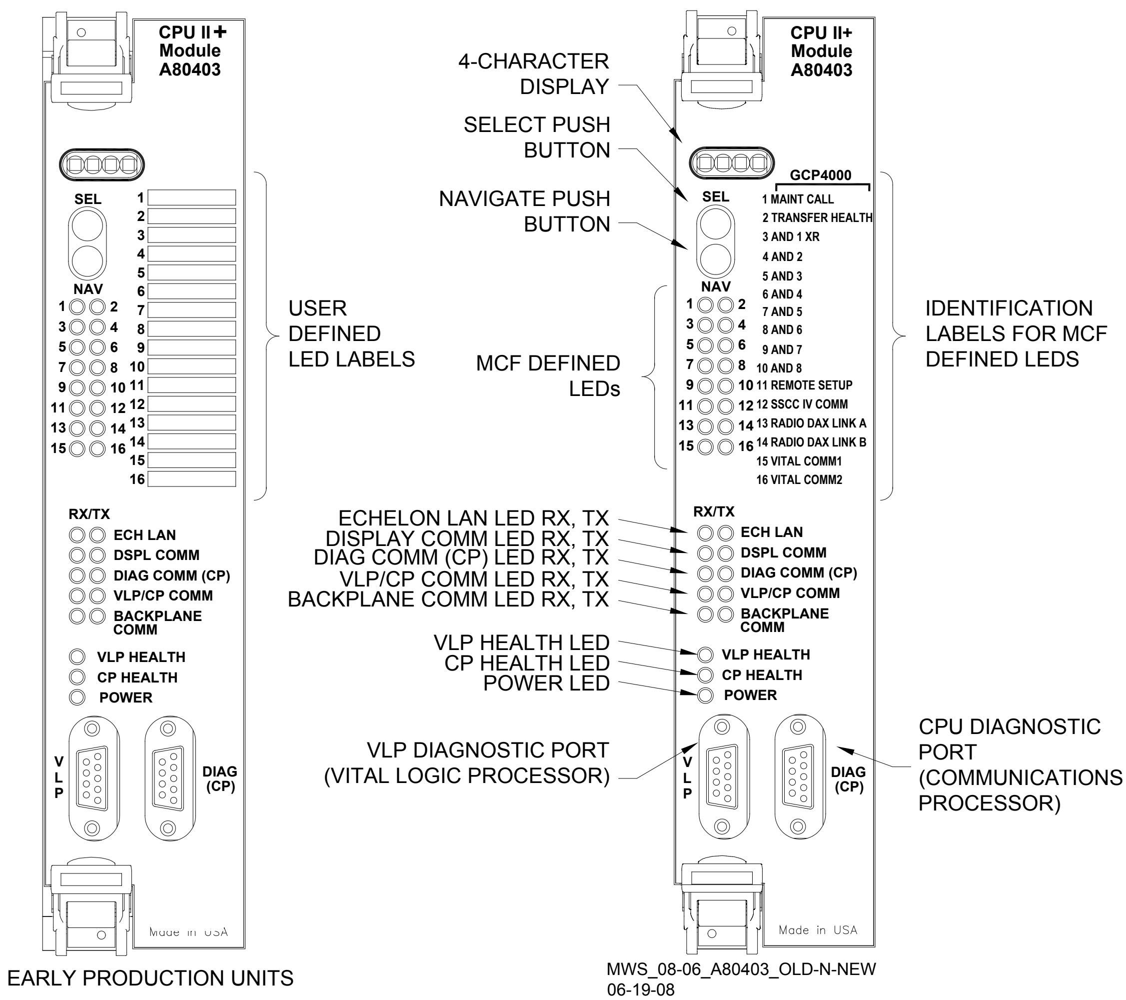


Figure 8-27:
CPU2+ Module, A80403 Front Panel

Table 8-18:
CPU2+ Module, A80403 User Interface

COMPONENT	FUNCTION		
4-Character Display	Displays alphanumeric representation of currently selected function menu item. (Refer to Model 4000 GCP Field Manual for diagnostic messages.)		
Select Push Button (SEL)	Used to select menu item displayed on 4-Character Display.		
Navigate Push Button (NAV)	Used to select an available function menu.		
16 MCF Defined LEDs	Color	Function	Indication
1 (MAINT CALL)	Red	Maintenance Call see maintenance call logic section	On – maintenance call output on Off – maintenance call output off
2 (TRANSFER HEALTH)	Red	Transfer Output see transfer output section	On – transfer signal is being generated transfer card should not be counting down Off – transfer signal is not being generated If transfer card is in AUTO it should be counting down
3 (AND 1 XR)	Red	AND 1 XR	On – AND 1 XR is energized Off – AND 1 XR is Deenergized
4 (AND 2)	Red	AND 2	On – AND 2 is Energized Off – AND 2 is Deenergized or Not Used
5 (AND 3)	Red	AND 3	On – AND 3 is Energized Off – AND 3 is Deenergized or Not Used
6 (AND 4)	Red	AND 4	On – AND 4 is Energized Off – AND 4 is Deenergized or Not Used
7 (AND 5)	Red	AND 5	On – AND 5 is Energized Off – AND 5 is Deenergized or Not Used
8 (AND 6)	Red	AND 6	On – AND 6 is Energized Off – AND 6 is Deenergized or Not Used
9 (AND 7)	Red	AND 7	On – AND 7 is Energized Off – AND 7 is Deenergized or Not Used
10 (AND 8)	Red	AND 8	On – AND 8 is Energized Off – AND 8 is Deenergized or Not Used

Continued on next page

Table 8-18 Continued

<table>
<tr><th>COMPONENT</th><th colspan="3">FUNCTION</th></tr>
<tr><td>11 (REMOTE SETUP)</td><td>Red</td><td>Remote Setup Session</td><td>On – the GCP has been primed for a remote one person setup
see section 6-10.
Off – No remote setup is in progress</td></tr>
<tr><td>12 (SSCC IV COMM)</td><td>Red</td><td>Remote Setup Active</td><td>On – a remote setup action (GCP Approach calibration etc) is in progress
Off – no remote setup action is in progress</td></tr>
<tr><td>13 (RADIO DAX LINK A)</td><td>Red</td><td>Radio DAX Link A</td><td>On – Radio DAX Link A is in session
Off – Radio DAX Link A is not used or not in session</td></tr>
<tr><td>14 (RADIO DAX LINK B)</td><td>Red</td><td>Radio DAX Link B</td><td>On – Radio DAX Link B is in session
Off – Radio DAX Link B is not used or not in session</td></tr>
<tr><td>15 (VITAL COMM1)</td><td>Red</td><td>Vital Comm 1</td><td>On – Vital Comm1 is in session
Off – Vital Comm1 is not used or not in session</td></tr>
<tr><td>16 (VITAL COMM2)</td><td>Red</td><td>Vital Comm 2</td><td>On – Vital Comm2 is in session
Off – Vital Comm2 is not used or not in session</td></tr>
<tr><td rowspan="2">ECH LAN LEDs</td><td colspan="3">TX flashes red when the CPU2+ is transmitting an ATCS message via the LONTALK® LAN.</td></tr>
<tr><td colspan="3">RX flashes green when the CPU2+ is receiving an ATCS message via the LONTALK® LAN.</td></tr>
<tr><td rowspan="2">DSPL COMM LEDs</td><td colspan="3">TX flashes red when the CPU2+ is transmitting data to the Display Panel.</td></tr>
<tr><td colspan="3">RX flashes green when the CPU2+ is receiving data from the Display Panel.</td></tr>
<tr><td rowspan="2">DIAG COMM (CP) LEDs</td><td colspan="3">TX flashes red when the CPU2+ is transmitting data on the communications processor diagnostic (DIAG CP) serial port.</td></tr>
<tr><td colspan="3">RX flashes green when the CPU2+ is receiving data from the communications processor diagnostic (DIAG CP) serial port.</td></tr>
<tr><td rowspan="2">VLP/CP COMM LEDs</td><td colspan="3">TX flashes red when the Vital Logic Processor (VLP) is transmitting data to the Communications Processor (CP).</td></tr>
<tr><td colspan="3">RX flashes green when the Vital Logic Processor (VLP) is receiving data from the Communications Processor (CP).</td></tr>
<tr><td rowspan="2">BACKPLANE COMM LEDs</td><td colspan="3">TX flashes red when the Vital Logic Processor (VLP) is sending data onto the serial bus.</td></tr>
<tr><td colspan="3">RX flashes green when the Vital Logic Processor (VLP) is receiving data from the serial bus.</td></tr>
</table>

Concluded on next page

Table 8-18 Concluded

COMPONENT	FUNCTION
BACKPLANE COMM LEDs	TX flashes red when the Vital Logic Processor (VLP) is sending data onto the serial bus.
	RX flashes green when the Vital Logic Processor (VLP) is receiving data from the serial bus.
VLP HEALTH LED	Flashes yellow to indicate that the Vital Logic Processor is functioning normally.
CP HEALTH LED	Flashes yellow to indicate that the Communications Processor is functioning normally.
POWER LED	Lights green to indicate that power is applied to the CPU2+ module.
VLP Serial Port	9-pin diagnostic serial port for Vital Logic Processor.
DIAG (CP) Serial Port	9-pin diagnostic serial port for Communications Processor.

8.10.2 Track Module, A80418

The Track Module, A80418 performs the predictor and island train detection functions. The Vital I/O functions found on the Track Module, A80418 are:

- 2 isolated vital inputs
- 2 isolated vital outputs

8.10.2.1 Track Module, A80418 Front Panel

The Track module front panel is shown in Figure 8-28. The user interface is described in Table 8-19.

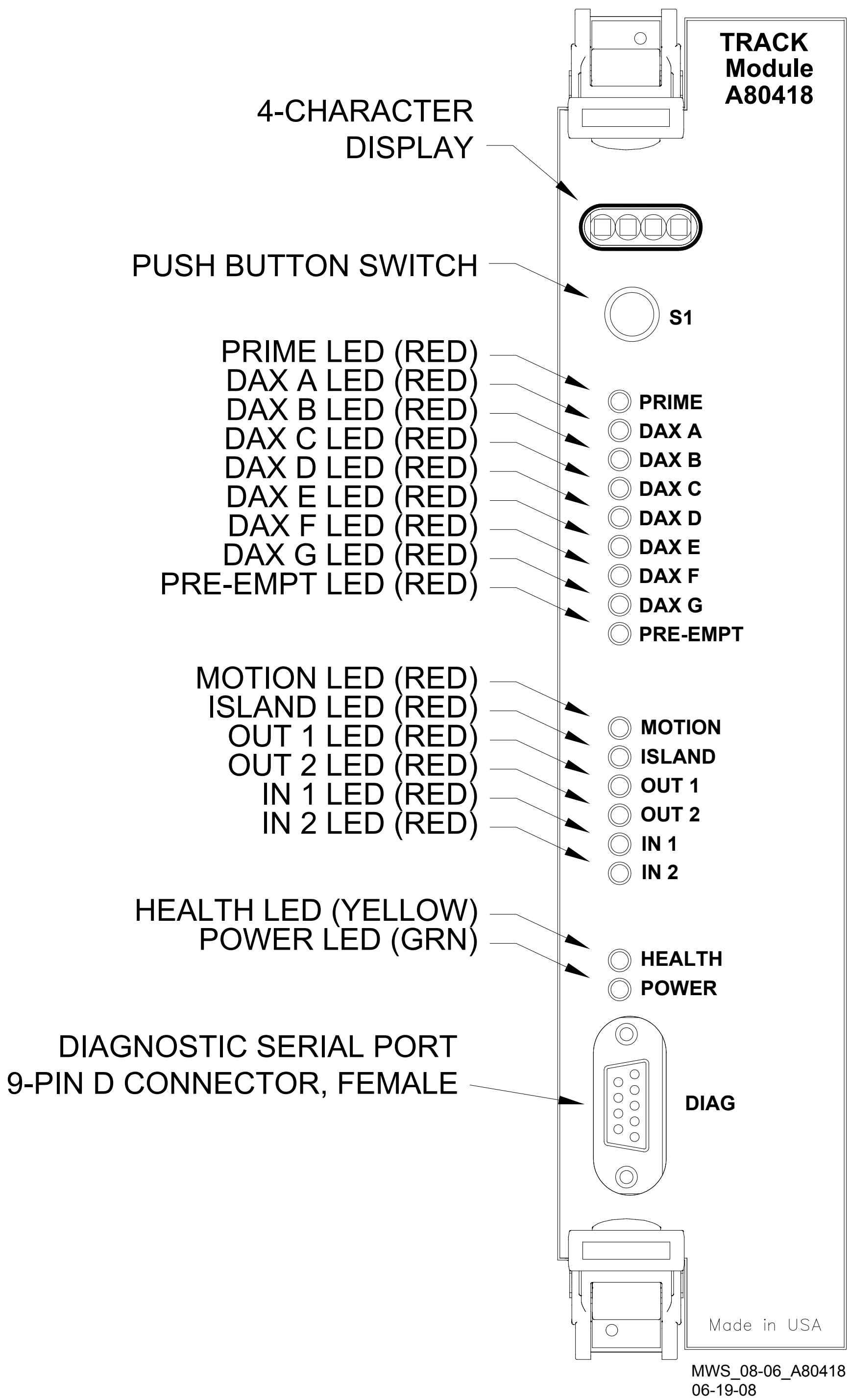


Figure 8-28:
Track Module, A80418 Front Panel

Table 8-19:
Track Module, A80418 User Interface

COMPONENT	FUNCTION
4-Character Display	Displays module and track status and diagnostic messages. Refer to the following tables in the Model 4000 GCP Field Manual, SIG-00-08-10: Tables 7, 9, 12 & 14, Calibration Messages Tables 22 & 23, Diagnostic Messages Table 34, Normal Messages
S1 Push Button Switch	For future applications.
PRIME LED (red)	On – Prime predictor is energized Off – Prime predictor is de-energized or not used Flashing – Prime predictor is running the programmed pickup delay
DAX A – DAX G LEDS (red)	On – DAX A predictor is energized Off – DAX A predictor is de-energized or not used Flashing – DAX A predictor is running its pickup delay
PRE-EMPT LED (red)	On – Preempt predictor is energized Off – Preempt predictor is de-energized or not used Flashing – Preempt predictor is running its pickup delay
MOTION LED (red)	On – GCP has not detected motion Off – GCP has detected motion
ISLAND LED (red)	On – Island is unoccupied Off – Island is occupied Flashing – Island is running its pickup delay
OUT 1 LED (red)	On – output energized Off – output de-energized or not used
OUT 2 LED (red)	On – output energized Off – output de-energized or not used
IN 1 LED (red)	On – input energized Off – input de-energized or not used
IN 2 LED (red)	On – input energized Off – input de-energized or not used
HEALTH LED (yellow)	Slow (1Hz) – module is healthy and communicating with CPU Fast (2Hz) – module is healthy but not communicating with CPU Very Fast (4Hz) – module is unhealthy and communicating with CPU
POWER LED (green)	LED is on steady when power is applied to the module
DIAG Serial Port	9-pin diagnostic serial port for Track module.

8.10.3 Phase Shift Overlay (PSO) Module, A80428-03

The Model 4000 GCP Phased Shift Overlay (PSO) Module, A80428-03, is a track occupancy overlay system that is used in conjunction with other GCP modules to determine direction of train travel, act as an occupancy detector, or perform other functions within a bidirectional DAXing environment. The PSO module can be utilized as a transmitter or a receiver. The Vital I/O functions found on the PSO Module, A80428-03 are:

- 2 isolated vital inputs
- 3 isolated vital outputs

8.10.3.1 PSO Module, A80428-03 Front Panel

The Track module front panel is shown in Figure 8-28. The user interface is described in Figure 8-20.

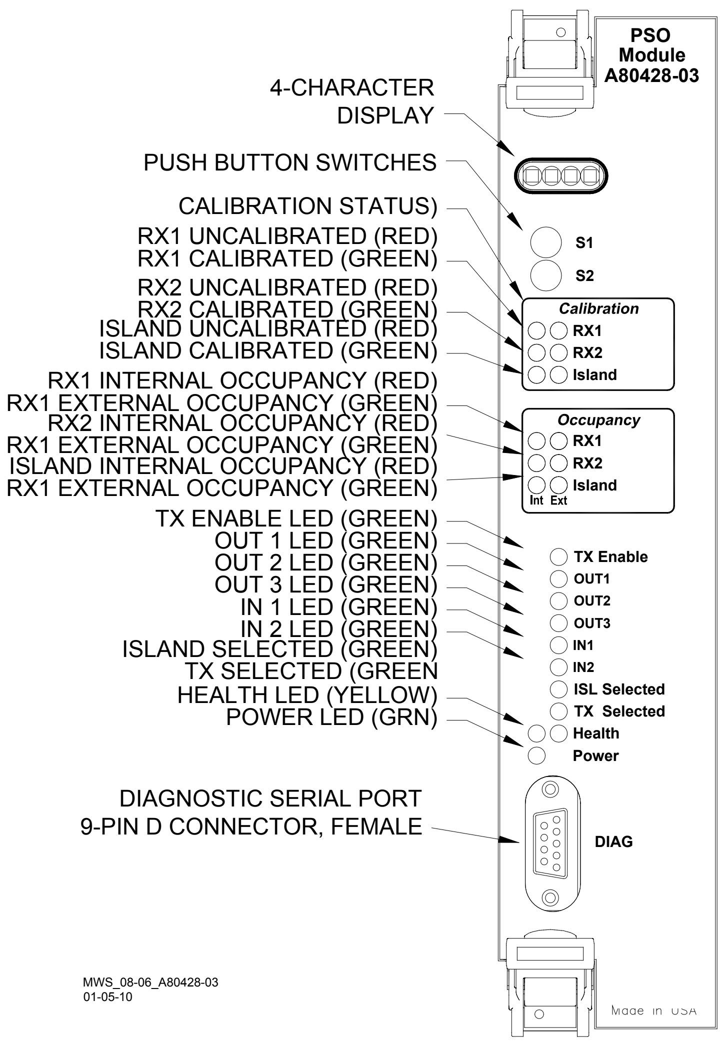


Figure 8-29:
PSO Module, A80428-03 Front Panel

Table 8-20:
PSO Module, A80428-03 User Interface

LEDS		DESCRIPTION
NAME	COLOR	
RX1	Red	RX1 not calibrated
RX1	Green	RX1 is calibrated
RX2	Red	RX2 not calibrated
RX2	Green	RX2 is calibrated
Island	Red	Island not calibrated
Island	Green	Island is calibrated
RX1 (Int)	Red	On – RX1 Internal track circuit is unoccupied Off – RX1 Internal track circuit is occupied Flashing – RX1 Internal track circuit is running its pickup delay
RX1 (Ext)	Green	On – RX1 External track circuit is unoccupied Off – RX1 External track circuit is occupied Flashing – RX1 External track circuit is running its pickup delay
RX2 (Int)	Red	On – RX2 Internal track circuit is unoccupied Off – RX2 Internal track circuit is occupied Flashing – RX2 Internal track circuit is running its pickup delay
RX2 (Ext)	Green	On – RX2 External track circuit is unoccupied Off – RX2 External track circuit is occupied Flashing – RX2 External track circuit is running its pickup delay
Island (Int)	Red	On – Island Internal track circuit is unoccupied Off – Island Internal track circuit is occupied Flashing – Island1 Internal track circuit is running its pickup delay
Island (Ext)	Green	On – Island External track circuit is unoccupied Off – Island External track circuit is occupied Flashing – Island External track circuit is running its pickup delay
TX Enable	Green	On – TX is enabled Off – TX is disabled
OUT 1	Red	On – output energized Off – output de-energized or failed
OUT 2	Red	On – output energized Off – output de-energized or failed
OUT 3	Red	On – output energized Off – output de-energized or failed
IN 1	Red	On – input energized Off – input de-energized or failed
IN 2	Red	On – input energized Off – input de-energized or failed

Table 8-20:
PSO Module, A80428-03 User Interface

LEDS		
NAME	**COLOR**	**DESCRIPTION**
HEALTH	Yellow	Slow (1Hz) – module is healthy and communicating with CPU. Fast (2Hz) – module is healthy but not communicating with CPU. Very Fast (4Hz) – module is unhealthy and communicating with CPU.
POWER	Green	On steadily when power is applied to the module
*PSO	*blinks on and off, PSO steady	Module is healthy No trains are detected on the approach
*CAL	Switches between *CAL and 1CAL or 2CAL	PSO Calibration in progress

8.10.4 RIO Module, A80413

- RIO Module, A80413

The RIO Module, A80413 provides four vital inputs and four vital outputs. The I/O functions are selected by the user. There are four isolated vital inputs and four isolated vital outputs.

8.10.4.1 RIO Module User Interface

The RIO module front panel is shown in Figure 8-30. The user interface is described in Table 8-21.

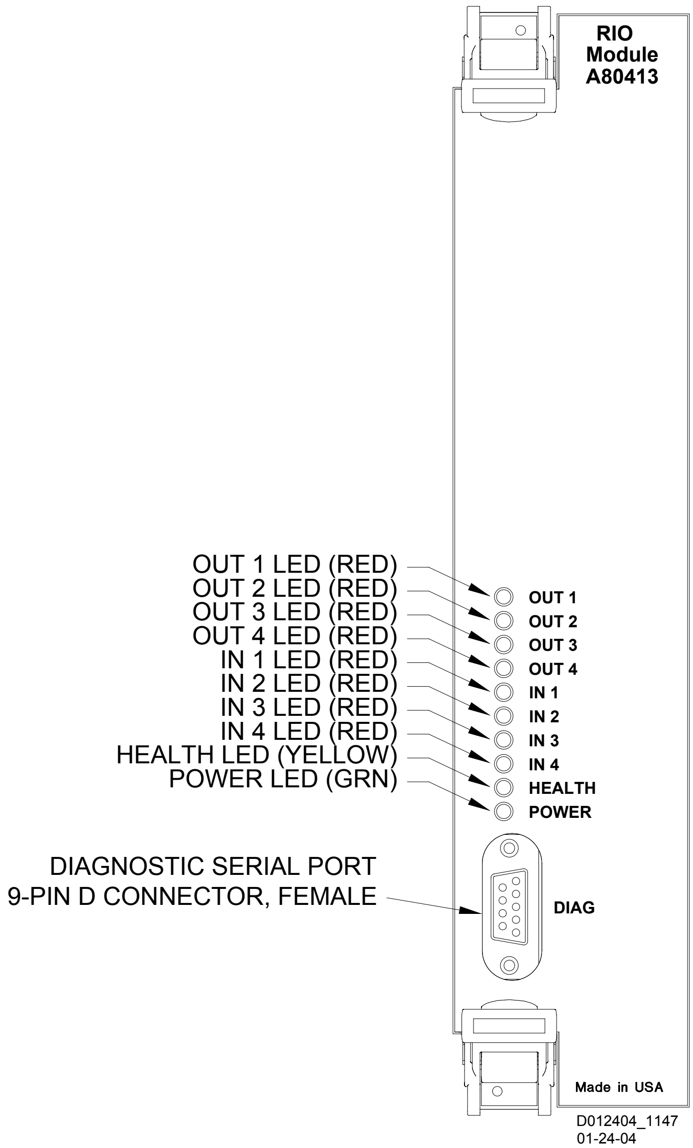


Figure 8-30:
RIO Module, A80413 Front Panel

Table 8-21:
RIO Module, A80413 User Interface

COMPONENT	FUNCTION
OUT 1 LED	Lights red when vital Output 1 is energized.
OUT 2 LED	Lights red when vital Output 2 is energized.
OUT 3 LED	Lights red when vital Output 3 is energized.
OUT 4 LED	Lights red when vital Output 4 is energized.
IN 1 LED	Lights red when vital Input 1 is energized.
IN 2 LED	Lights red when vital Input 2 is energized.
IN 3 LED	Lights red when vital Input 3 is energized.
IN 4 LED	Lights red when vital Input 4 is energized.
HEALTH LED	Lights yellow. Flashes approximately 1 pulse per second when module is fully operational, 2 pulses per second when module is not communicating with the CPU, and approximately 8 pulses per second when fault is detected within the module.
POWER LED	Lights green to indicate that power is applied to the RIO module.
DIAG Diagnostic Serial Port	9-pin diagnostic serial port for RIO module.

8.10.4.2 Solid State Crossing Controller IIIi, A80405 (SSCC3i)

The Solid State Crossing Controller IIIi, A80405 (SSCC3i), is activated by crossing activation logic from the GCP CPU module and provides operational control for the following grade crossing equipment:

- gates, including gate delay
- lamps
- bells

WARNING

TAKE ALTERNATE MEANS TO WARN VEHICULAR TRAFFIC, PEDESTRIANS AND EMPLOYEES IF:

- **THE SSCC3i MODULE OR B OR N ARE FULLY REMOVED. THE SIGNALS WILL BE DARK AND GATES WILL LOWER IMMEDIATELY WITHOUT GATE DELAY TIME.**

- **B OR N ARE FULLY OR PARTIALLY REMOVED. SIGNALS AND/OR GATES MAY NOT OPERATE AS INTENDED.**

CAUTION

ENSURE CORRECT POLARITY OF B AND N OR SEVERE DAMAGE WILL OCCUR TO THE MODULE.

REFER TO SECTION 3 FOR DETAILED INSTRUCTIONS ON THE SSCC BEFORE APPLYING POWER TO THE SSCC3i POWER CONNECTOR(S).

8.10.5 SSCC3i User Interface

The SSCC3i module front panel is shown in Figure 8-31.

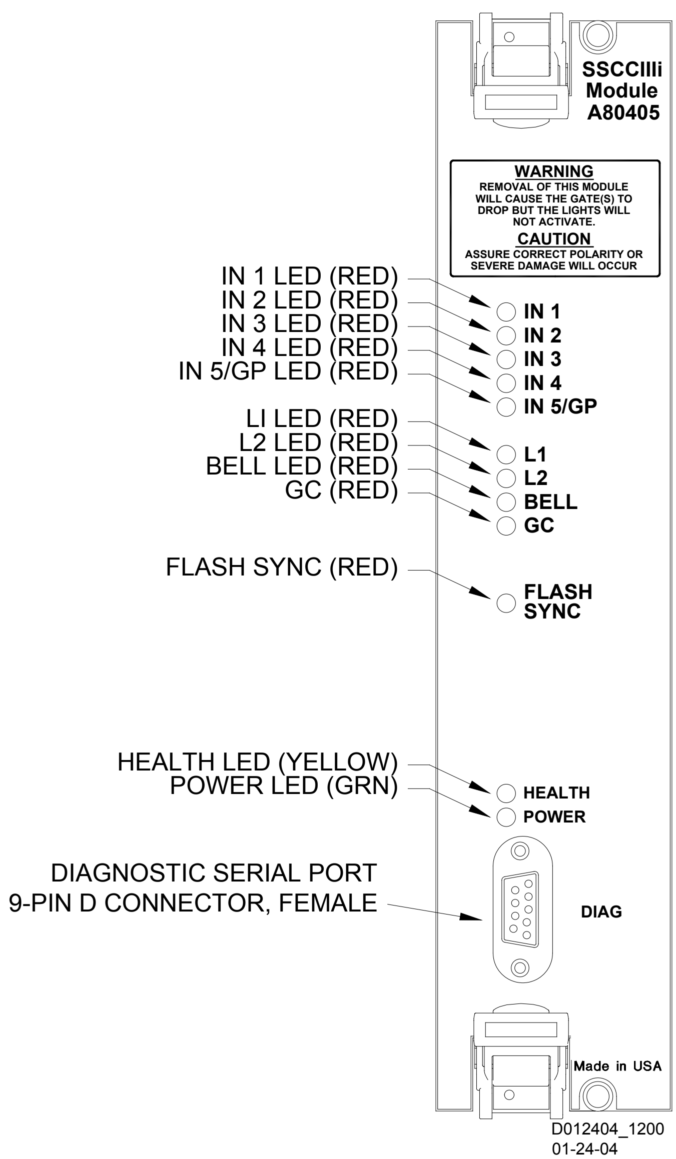


Figure 8-31:
SSCC3i Front Panel

Table 8-22 describes the SSCC3i user interface.

Table 8-22:
SSCC3i Module User Interface

COMPONENT	FUNCTION
IN 1 LED	Lights red when crossing input to 1 is energized.
IN 2 LED	Lights red when crossing input to 2 is energized.
IN 3 LED	Lights red when crossing input to 3 is energized.
IN 4 LED	Lights red when crossing input to 4 is energized.
IN 5/GP LED	Lights red when crossing input to 5 is energized.
L1 LED	Lights red when Lamp Output L1 is on.
L2 LED	Lights red when Lamp Output L2 is on.
BELL LED	Lights red when bell output is on.
GC LED	Lights red when gate control (GC) output is energized.
FLASH SYNC LED	Flashes red when sync pulse is present at FLASH SYNC input/output.
HEALTH LED	Lights yellow. Flashes approximately 1 pulse per second when module is fully operational, 2 pulses per second when module is not communicating with the CPU, and approximately 8 pulses per second when fault is detected within the module.
POWER LED	Lights green to indicate that power is applied to the SSCC3i module.
DIAG Diagnostic Serial Port	9-pin diagnostic serial port for the SSCC3i module.

8.10.6 Display Module, A80485

The Siemens A80485-1 Display Module is the next generation display module replacing the A80407 Display Module, offering enhanced features and improved speed and responsiveness. A restructured menu reduces programming and maintenance time in the field. The addition of two Ethernet ports offers connectivity to a network or Ethernet devices. A powered Ethernet port is available for devices deriving their power from an Ethernet connection. The Laptop port enables the user to connect a laptop computer to the display to configure parameters, update software, and download logs. The display screen and keypad provide a local user interface, allowing operation without the need of a computer.

Figure 8-32 Display Module, A80485

8.10.6.1 GCP Display Module Controls, Indicators, Connectors, and Display

The GCP Display module controls, indicators, connectors, and display are shown in Figure 1 2 and described in Table 1 1.

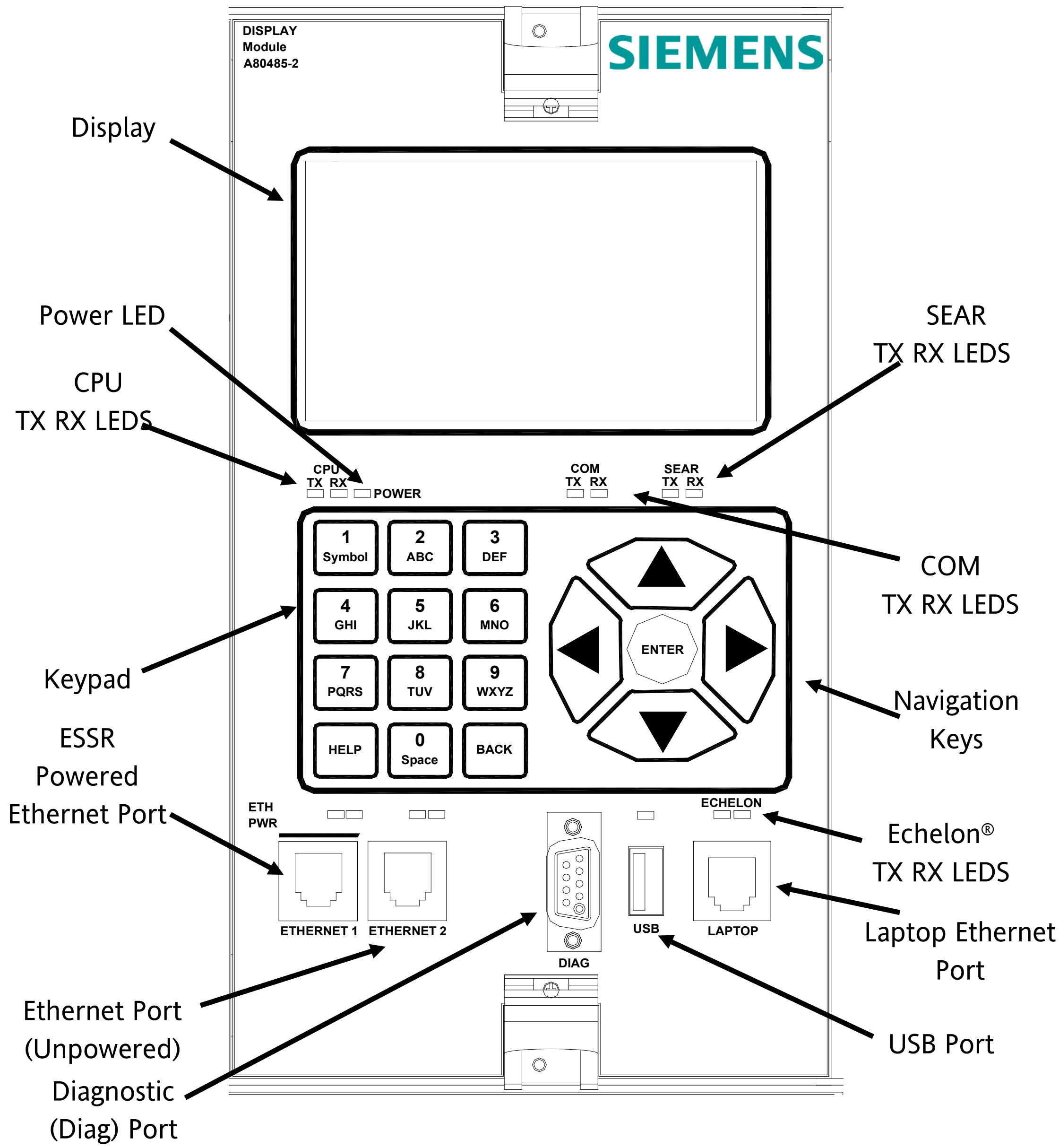


Figure 8-33 A80485 GCP Display Module Controls, Indicators, and Display

Table 8-23 Display Module Controls, Indicators, Connectors, and Display Descriptions

ITEM	DESCRIPTION
DISPLAY	2 ½ x 4 inch OLED Color Display
CONTROLS	
Keypad	12-key membrane keypad
Navigation	5-key membrane navigational cluster
INDICATORS	
Power	LED (Green)
CPU TX/RX	CPU data stream indicators TX LED (Green) RX LED (Yellow)
COM TX/RX	Communications data stream indicators TX LED (Green) RX LED (Yellow)
SEAR TX/RX	SEAR data stream indicators TX LED (Green) RX LED (Yellow)
Echelon® LAN	Echelon® LAN data indicators TX LED (Green) RX LED (Yellow)
Ethernet 1 (powered)[1]	Ethernet Power indicator LED (Green) Ethernet 1 data indicators (embedded in connector) Data:TX LED (Green) RX LED (Yellow)
Ethernet 2[1]	Ethernet 2 data indicators (embedded in connector) TX LED (Green) RX LED (Yellow)
CONNECTORS	
Ethernet 1[1]	RJ-45 powered connector (See note)
Ethernet 2[1]	RJ-45 connector
Diag (Diagnostics)	DB-9, Female Serial connector, RS-232
USB	USB 2.0 Type A connector
Laptop	RJ-45 connector

[1] Ethernet 1 and Ethernet 2 ports are not available on the GCP4000, therefore these ports on the Display module are not useable.

NOTE

The Ethernet 1 powered connector is designed specifically for Siemens Ethernet Spread Spectrum Radios and may not power other Power-Over-Ethernet (POE) devices.

8.10.7 Display Module, A80407 (Obsolete)

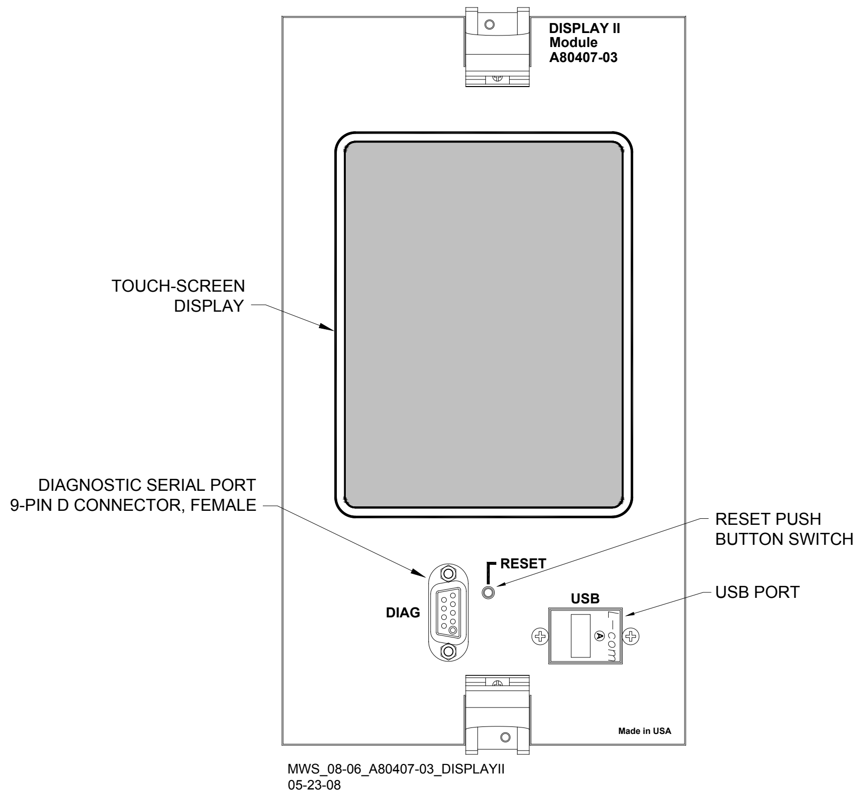
The Display Module, A80407, Figure 8-34:, provides a touch-screen display to allow:

- configuration programming
- application programming
- calibration programming
- system diagnostics
- system parameter display
- track status display

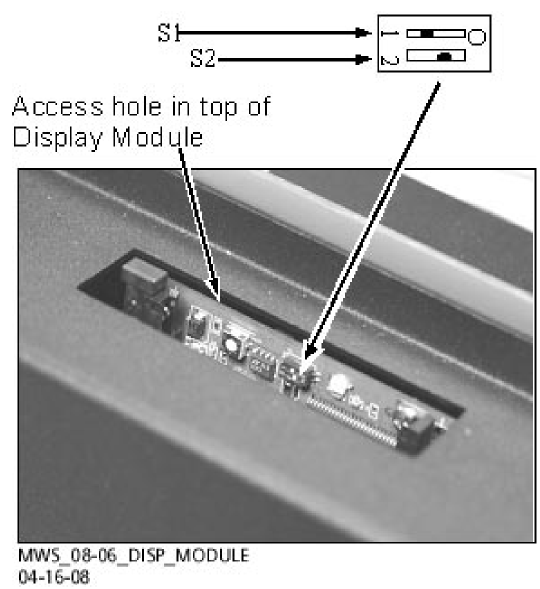
The display module is reset by actuation of the RESET push button switch.

NOTE

Refer to Model 4000 GCP Field Manual, SIG-00-08-10, for detailed instructions on the Display Module.



A



B

Figure 8-34:
Display Module, A: A80407 Front Panel and B: S1 & S2 Switch Locations

8.11 TRANSFER MODULE, A80406

The Transfer Module, A80406 provides operational switchover from the main modules to the standby GCP modules when main module failure is detected. Switchover occurs after a set transfer delay interval.

NOTE

The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

8.11.1 Transfer Module, A80406 User Interface

The Transfer Module, A80406 front panel is shown in Figure 8-35. The user interface is described in Table 8-24.

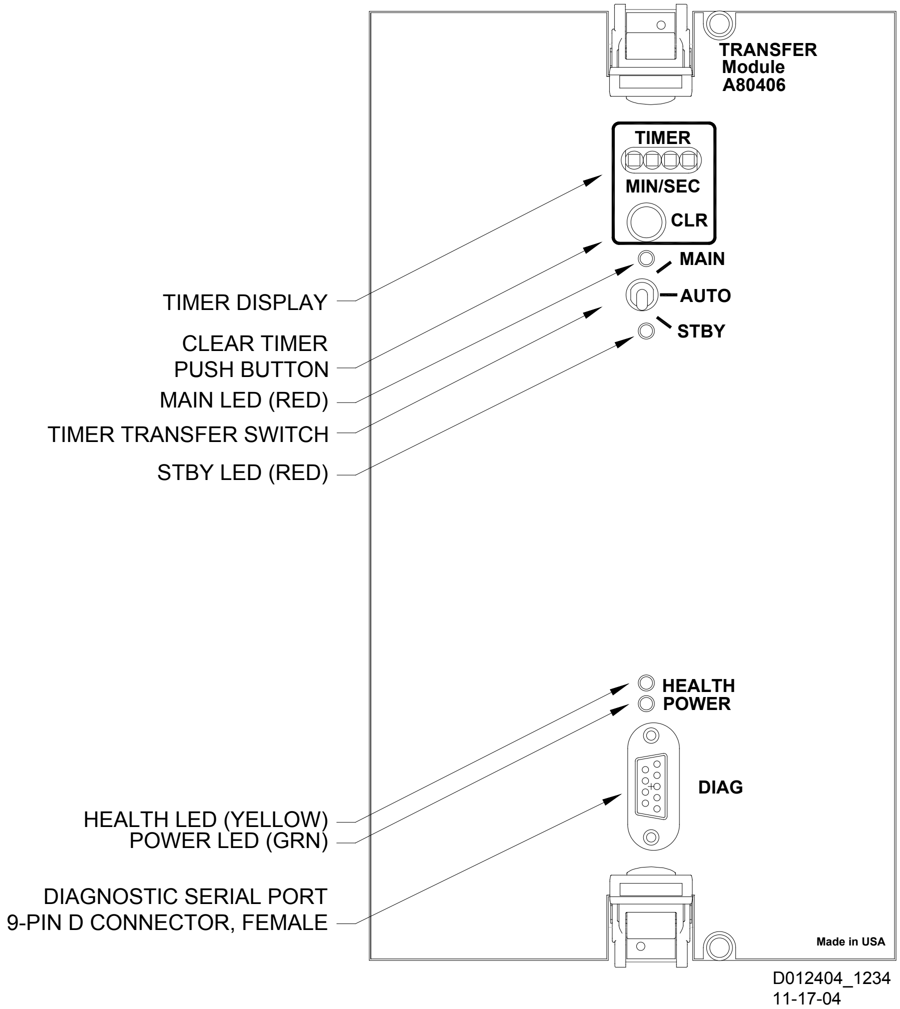


Figure 8-35:
Transfer Module, A80406 Front Panel

Table 8-24:
Transfer Module, A80406 User Interface

COMPONENT	FUNCTION
Timer Display	When transfer delay is set using the DIP switch (S3), the **TIMER** Display: shows the set transfer delay in minutes and seconds shows transfer timer delay count down in 1 sec. increments
CLR (Clear Timer) push button	Clears transfer delay time from counter. When pressed during timer countdown: sets the timer to the selected Transfer Delay Interval, and initiates immediate transfer of GCP operation to opposite modules.
MAIN LED	Lights red when: main modules are enabled while Transfer Timer Switch is set to **AUTO**. Timer Transfer Switch is set to **MAIN** position.
Timer Transfer Switch	Three-position toggle switch: **MAIN** position enables only main module operation and will not automatically transfer. **AUTO** position enables automatic switch over to opposite set of modules: transfers from main modules to standby modules when main module failure is detected, or transfers from standby modules to main modules when standby module failure is detected. **STBY** position enables only standby module operation and will not automatically transfer. To switch from one set of modules (**MAIN** or **STBY**) to the other set of modules when the transfer time is not counting down, move the switch from **AUTO** to the desired position (**MAIN** or **STBY**). Then return switch to **AUTO.**
STANDBY LED	Lights red when: Standby modules are enabled while Transfer Timer Switch is set to AUTO. Timer Transfer Switch is set to STBY position.
HEALTH LED	Flashes yellow to indicate that the Transfer module is functioning normally.
POWER LED	Lights green to indicate that power is applied to the Transfer module.
DIAG Diagnostic Port	9-pin diagnostic serial port for Transfer module.

WARNING

GATES WILL BEGIN TO LOWER IMMEDIATELY (WITHOUT GATE DELAY TIME) WHEN THE TRANSFER SWITCH IS USED TO SWAP BETWEEN HEALTHY UNITS. USE CAUTION WHEN TRANSFERRING CONTROL TO AVOID GATES HITTING VEHICLES OR PEDESTRIANS.

NOTE

Under normal conditions in the AUTO Transfer mode, gate delay time will run when the gates initially operate. If the trouble continues, the gates will already be lowered when the Transfer Module later swaps units.

A switchover interval ranging from 1 to 31 minutes is selectable from the Transfer module. The module is set at the factory for a switchover delay of 3 minutes.

During the switchover period, the crossing gates, lights, and bells are activated.

8.12 TRANSFER ASSEMBLY, A80468

The Transfer Assembly, A80468 provides operational switchover from the main modules to the standby GCP modules when main module failure is detected. Switchover occurs after a set transfer delay interval.

NOTE

The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

8.12.1.1 Transfer Assembly User Interface

WARNING

GATES WILL BEGIN TO LOWER IMMEDIATELY (WITHOUT GATE DELAY TIME) WHEN THE TRANSFER SWITCH IS USED TO SWAP BETWEEN HEALTHY UNITS. USE CAUTION WHEN TRANSFERRING CONTROL TO AVOID GATES HITTING VEHICLES OR PEDESTRIANS.

The Transfer assembly front panel is shown in Figure 8-36. The user interface is described in Table 8-25.

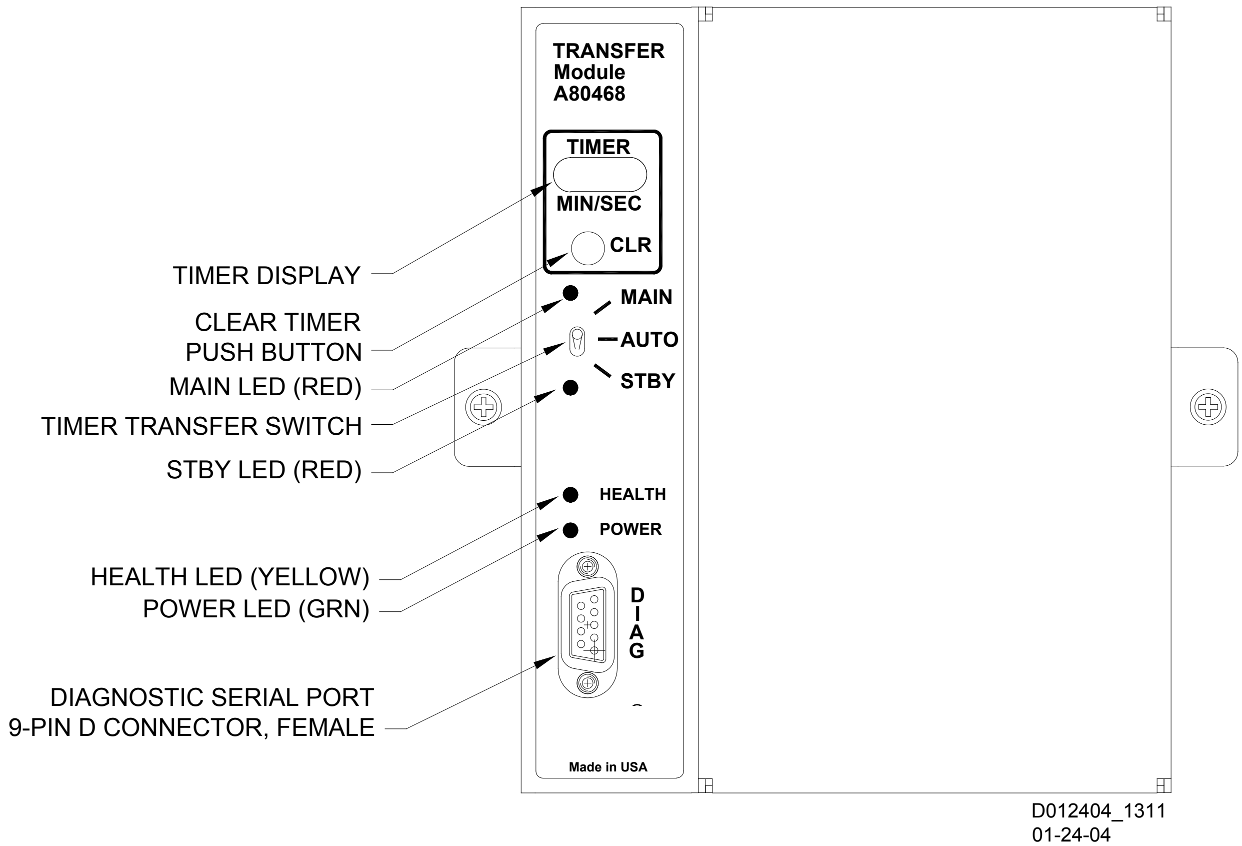


Figure 8-36:
Transfer Assembly, A80468 Front Panel

NOTE

Under normal conditions in the AUTO Transfer mode, gate delay time will run when the gates initially operate. If the trouble continues, the gates will already be lowered when the Transfer Module later swaps units.

Table 8-25:
Transfer Module, A80468 User Interface

COMPONENT	FUNCTION
Timer Display	When transfer delay is set using the DIP switch (S3), the TIMER Display: shows the set transfer delay in minutes and seconds shows transfer timer delay count down in 1 sec. increments
CLR (Clear Timer) push button	Clears transfer delay time from counter. When pressed during timer countdown: sets the timer to the selected Transfer Delay Interval, and initiates immediate transfer of GCP operation to opposite modules.
MAIN LED	Lights red when: main modules are enabled while Transfer Timer Switch is set to AUTO. Timer Transfer Switch is set to MAIN position.
Timer Transfer Switch	Three-position toggle switch: **MAIN** position enables only main module operation and will not automatically transfer. **AUTO** position enables automatic switch over to opposite set of modules: transfers from main modules to standby modules when main module failure is detected, or transfers from standby modules to main modules when standby module failure is detected. **STBY** position enables only standby module operation and will not automatically transfer. To switch from one set of modules (**MAIN** or **STBY**) to the other set of modules when the transfer time is not counting down, move the witch from **AUTO** to the desired position **MAIN** or **STBY**). Then return switch to **AUTO.**
STANDBY LED	Lights red when: standby modules are enabled while Transfer Timer Switch is set to AUTO. Timer Transfer Switch is set to STBY position.
HEALTH LED	Flashes yellow to indicate that the Transfer module is functioning normally.
POWER LED	Lights green to indicate that power is applied to the Transfer module.
DIAG Diagnostic Port	9-pin diagnostic serial port for Transfer module.

NOTE

A switchover interval ranging from 1 to 31 minutes is selectable from the Transfer module. The module is set at the factory for a switchover delay of 3 minutes.

During the switchover period, the crossing gates, lights, and bells are activated.

8.12.2 TRANSFER INTERVAL SELECTION

The transfer timer interval is preset in the factory for 3 minutes and normally does not require any change. A shorter time than 3 minutes is not recommended. If a longer time is desired, the interval time is selected by means of DIP switch S3 located on the Transfer Module.

8.12.3 Transfer Module A80406

The switch levers of S3 on the A80406 module are set to the positions designated in the Delay Interval Table to obtain the required delay time (see Figure 8-37 and Table 8-26).

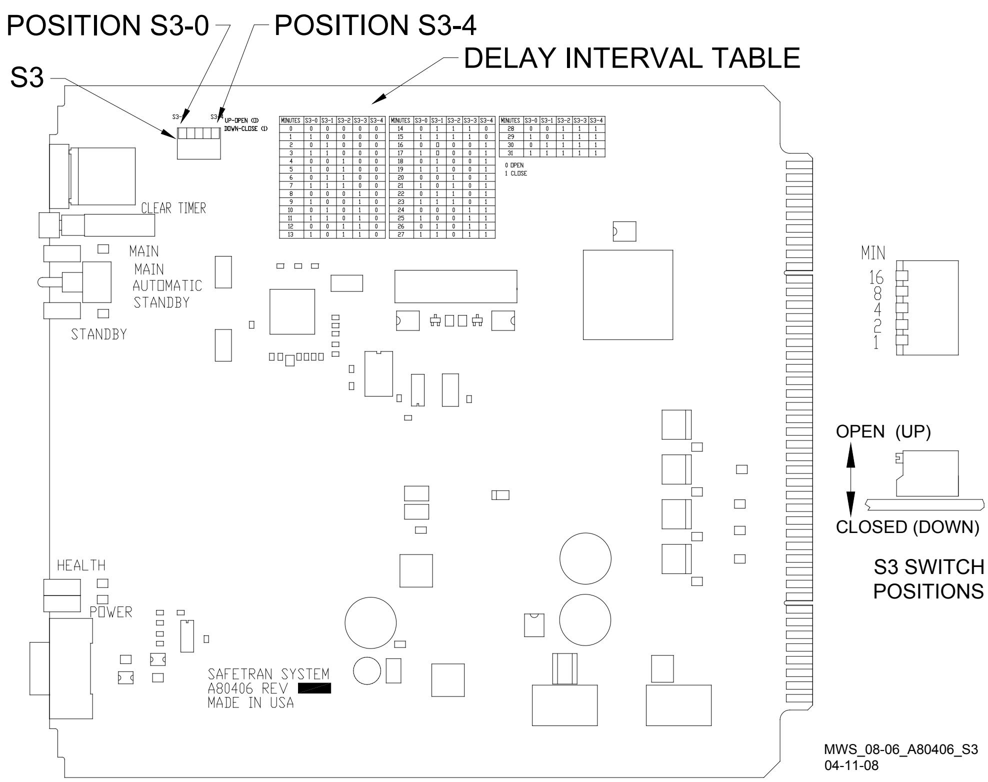
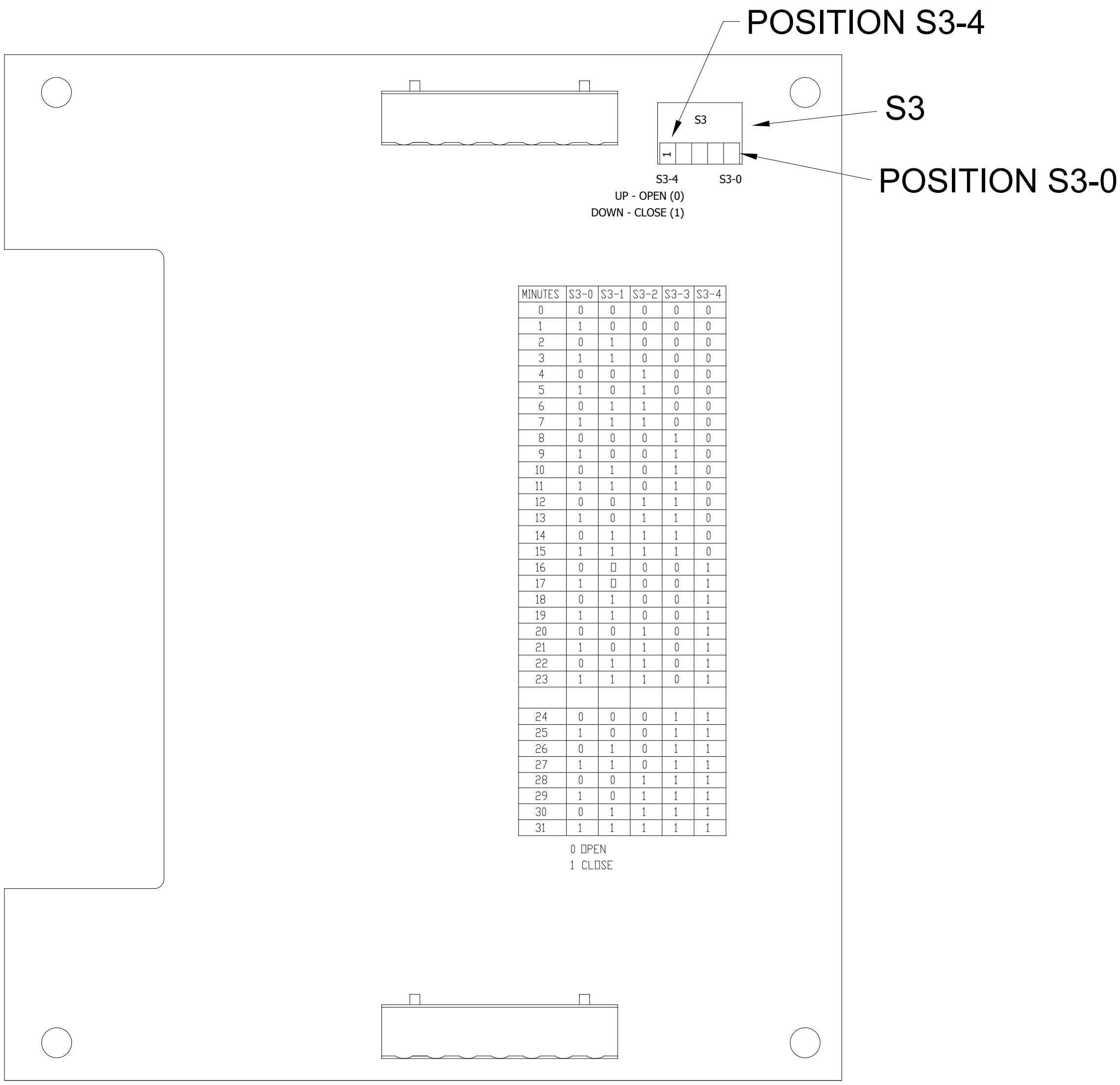


Figure 8-37:
Transfer Module, A80406, S3 Switch Positions

8.12.4 Transfer Module A80469 on Transfer Assembly A80468

The transfer timer interval is selected by means of DIP switch S3 located on the back of the A80469 Transfer Module as shown in Figure 8-38.

- The module is accessible by removing the mounting screws on either side of the A80468 assembly and unplugging the unit from the front of the 4000 GCP case.
- The switch levers of S3 are set to the positions designated in Table 8-26 to obtain the required delay time (see Figure 8-38).



MINUTES	S3-0	S3-1	S3-2	S3-3	S3-4
0	0	0	0	0	0
1	1	0	0	0	0
2	0	1	0	0	0
3	1	1	0	0	0
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0
11	1	1	0	1	0
12	0	0	1	1	0
13	1	0	1	1	0
14	0	1	1	1	0
15	1	1	1	1	0
16	0	0	0	0	1
17	1	0	0	0	1
18	0	1	0	0	1
19	1	1	0	0	1
20	0	0	1	0	1
21	1	0	1	0	1
22	0	1	1	0	1
23	1	1	1	0	1
24	0	0	0	1	1
25	1	0	0	1	1
26	0	1	0	1	1
27	1	1	0	1	1
28	0	0	1	1	1
29	1	0	1	1	1
30	0	1	1	1	1
31	1	1	1	1	1

MWS_08-06_A80468_S3
04-11-08

Figure 8-38:
Transfer Module Assembly, A80468, S3 Switch Position

Table 8-26:
Transfer Delay Interval Table (for S3 on A80406/A80468 Module Assembly)

MINUTES	S3-0	S3-1	S3-2	S3-3	S3-4
0	0	0	0	0	0
1	1	0	0	0	0
2	0	1	0	0	0
3	**1**	**1**	**0**	**0**	**0**
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0
11	1	1	0	1	0
12	0	0	1	1	0
13	1	0	1	1	0
14	0	1	1	1	0
15	1	1	1	1	0
16	0	0	0	0	1
17	1	0	0	0	1
18	0	1	0	0	1
19	1	1	0	0	1
20	0	0	1	0	1
21	1	0	1	0	1
22	0	1	1	0	1
23	1	1	1	0	1
24	0	0	0	1	1
25	1	0	0	1	1
26	0	1	0	1	1
27	1	1	0	1	1
28	0	0	1	1	1
29	1	0	1	1	1
30	0	1	1	1	1
31	1	1	1	1	1

0 = OPEN   1 = CLOSED   **Bold** = Default

8.12.5 Operation Without Transfer Module A80406

To disable the A80406 Transfer Module, remove the module from the chassis and move the jumper from the storage position, STG, to the MAIN or standby (STBY) position (see Figure 8-39).

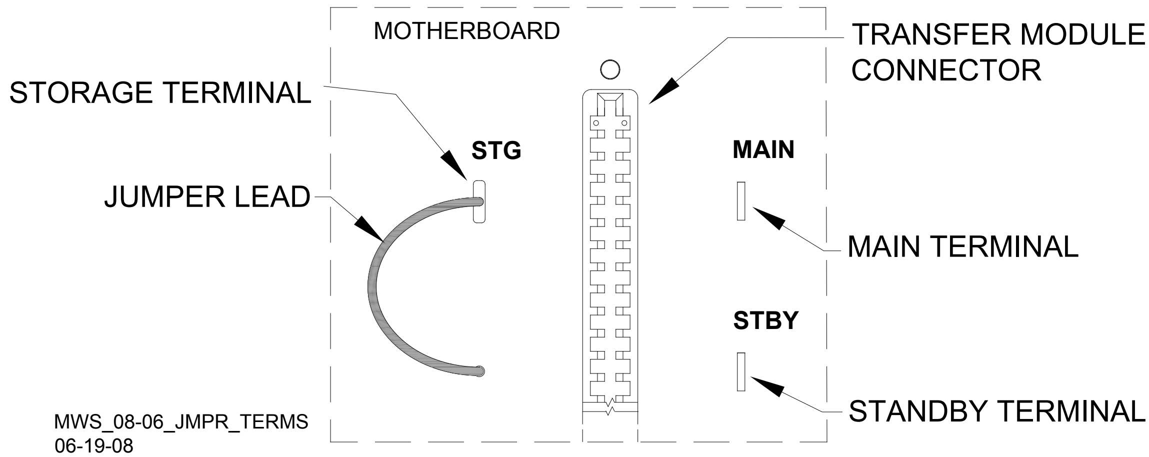


Figure 8-39:
Transfer Module (A80406) Jumper Positions

8.12.6 Operation Without Transfer Module Assembly A80468

To disable the A80468 Transfer Module Assembly, remove the module from the chassis and move the jumper from the storage position, STG, to the MAIN or standby (STBY) position (see Figure 8-40).

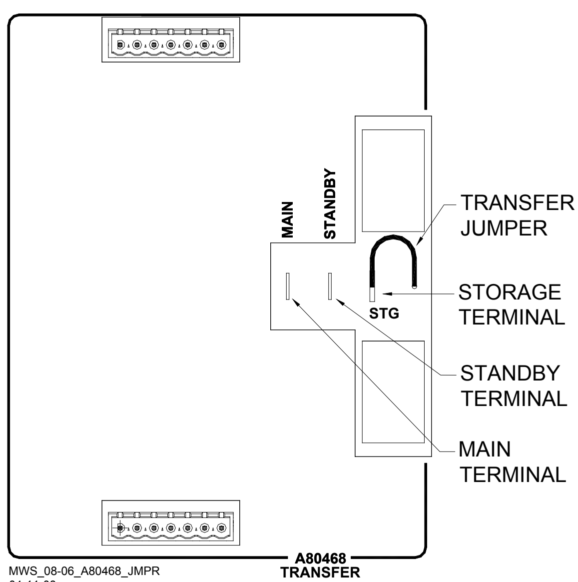


Figure 8-40:
Transfer Module (A80468) Jumper Positions

8.12.7 Siemens Event Analyzer Recorder IIi (SEAR2i), A80410

The Siemens Event Analyzer Recorder IIi (SEAR2i), A80410 provides continuous real-time status monitoring and event recording of the 4000 GCP and the grade crossing devices controlled by the GCP (see Model 4000 GCP Field Manual, SIG-00-08-10).

8.12.8 SEAR2i User Interface

The SEAR2i module front panel is shown in Figure 8-41. The user interface is described in Table 8-27.

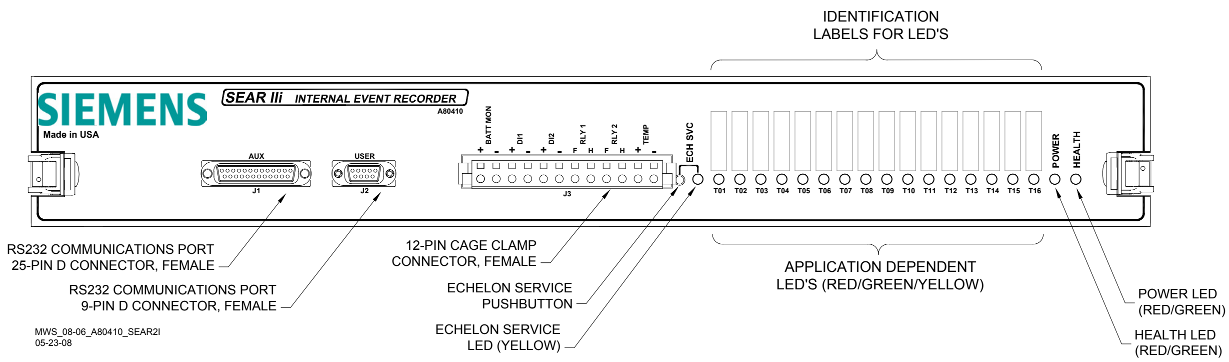


Figure 8-41:
SEAR2i Front Panel

Table 8-27:
SEAR2i Module User Interface

COMPONENT	FUNCTION
Identification Labels For User Programmable LEDs T01 through T16	Each label corresponds to a User Programmable LED and may be inscribed to identify a user-defined event.
ECH SVC LED	Flashes red until SEAR2i is initialized.
ECH SVC Push button	Not used
POWER LED	Lights green when power is applied to SEAR2i
HEALTH LED	Flashes green if backup battery output is within acceptable voltage range. Flashes yellow if backup battery is below minimum acceptable voltage. Remains off when SEAR2i is inoperative.
User Programmable LEDs T01 through T16	Each LED lights to Identify the occurrence of a user-defined event. LED color (red, green, or yellow) determined by programming.
AUX J1	Female DB-25 connector for RS232/RS422 serial interface to radio or telephone modem
USER J2	Female DB-9 connector for RS232 serial interface to printer or PC
J3	12-pin male I/O connector, providing the following functions: Two isolated digital inputs (DI1, DI2) Each input may be used to monitor up to 120V AC/DC Two isolated contact relay outputs (RLY 1, RLY 2) Temperature monitor input (TEMP) Battery monitor input (BATT MON)

8.12.9 A80435 External Configuration Device (ECD)

The ECD is a factory installed plug-in device on the 4000 GCP backplane (see Figure 8-42). The ECD stores the module configuration file (MCF) and the application program for the 4000 GCP. Both the Main and the Standby CPU Modules copy the MCF from the ECD, as it is used for vital system operation.

WARNING

IF AN ECD IS REPLACED WITH AN ECD CONTAINING A DIFFERENT MCF, THE GCP WILL COPY THE NEW MCF INTO THE FLASH ON THE CPU MODULES AND SET THE SYSTEM BACK TO DEFAULT VALUES.

8.12.10 Chassis Identification Chip (CIC)

The CIC is a non-volatile memory chip that is installed adjacent to the ECD on the GCP backplane (see Figure 8-42). Each CIC stores site specific information for both Main and Standby vital operations.

WARNING

IF THE CIC IS REPLACED, THE USER MUST SET THE SYSTEM BACK TO DEFAULTS AND REPROGRAM THE SYSTEM. FAILURE TO DO THIS COULD RESULT IN THE SYSTEM RUNNING WITH THE WRONG CONFIGURATION FOR THE SITE.

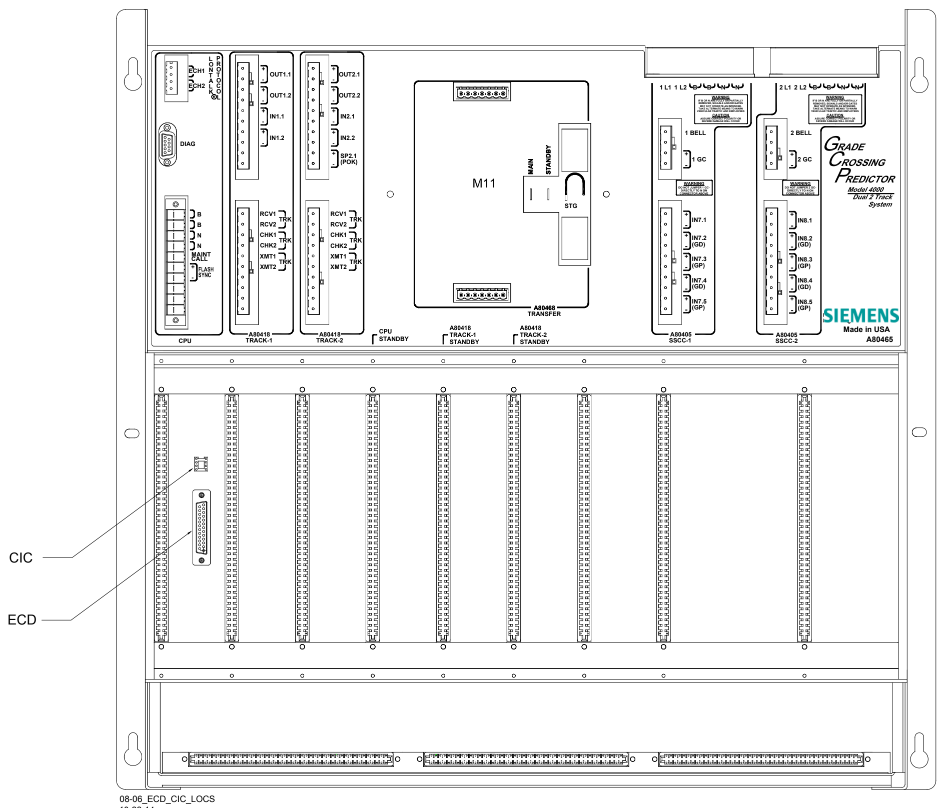


Figure 8-42:
Typical ECD & CIC Locations On Backplane

8.12.11 Interface Connector Functions

The 4000 GCP interface connector functions are described in tables 2-23 through 2-26.

8.12.11.1 CPU Connectors

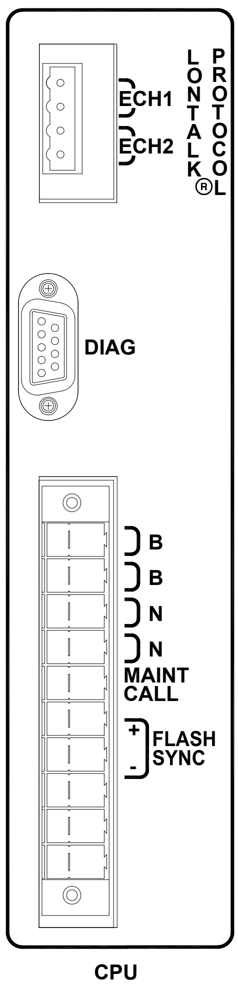


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Table 8-28:
CPU Connectors

CONNECTOR	PINOUT	FUNCTION
LONTALK® PROTOCOL	ECH1	LAN Twisted pair
	ECH2	LAN Twisted pair
DIAG	2	DT_TX
	3	DT_RX
	4	GROUND
CPU	B	Battery B input to GCP
	N	Battery N input to GCP
	MAINT CALL	Output to Maintenance Call lamp in crossing bungalow. When no problem is detected within the system, the maintenance call output is held at the Battery N voltage level, causing the lamp to light. When a problem is detected within the system, the voltage is removed and the lamp is extinguished.
	FLASH SYNC	Crossing Controller lamp flash rate synchronizing signal. Used to synchronize the flash sequence and rate of multiple external controllers.

NOTE

Effective with Revision D of the SSCC3i, FLASH SYNC is an isolated two-wire output.

- If two Revision D or later SSCC3i units in the same chassis are operated by separate batteries, the FLASH SYNC returns are connected internally and no additional connection is required.
- Revision D SSCC3i Modules can be identified by either a "D" located at end of Part Number / Bar Code tag or by the large metal bracket located on component side of module.

When using Revision C SSCC3i or earlier, or when external SSCC units are connected to a master SSCC3i and operated from a different battery, the following wiring must be provided for FLASH SYNC Return:

- If two Revision C SSCC3i units in the same chassis are operated by separate batteries, the N pins of the SSCC3i power and lamp connectors must be wired together.
- If an external SSCC IIIA, SSCC III PLUS, or SSCC IV is connected to a master SSCC3i:
    - If the SSCC3i is Revision C or earlier, the negative terminals of the master SSCC3i and external SSCC must be wired together.
    - If the SSCC3i is Revision D or later, the SSCC3i **FLASH SYNC** return (**-**) must be connected to **N** on the external SSCC.

The terminology for flash sync control differs between a GCP 4000 and an external SSCC device. The GCP 4000 terms Master and Slave SSCC, are called "Flash Sync Out" and "Flash Sync In" respectively in an external SSCC (Slave = Flash Sync In).

8.12.11.2 Track Connectors

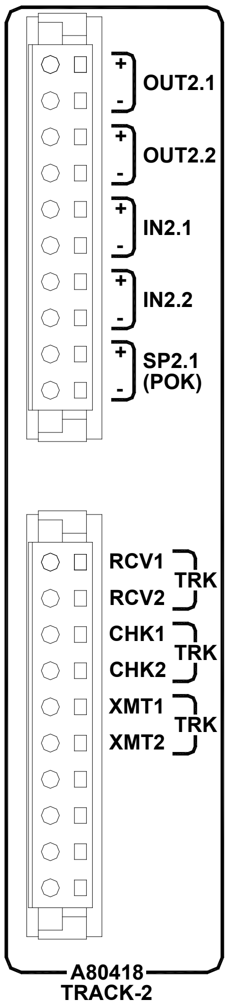

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Table 8-29:
Track Connectors

CONNECTOR	PINOUT*		FUNCTION
TRACK-1 TRACK-2 TRACK-3 TRACK-4 TRACK-5 TRACK-6	+	OUT2.1	Vital output 1
	-		
	+	OUT2.2	Vital output 2
	-		
	+	IN2.1	Vital input 1
	-		
	+	IN2.2	Vital input 2
	-		
	+	SP2.1	Spare input connection mapped to SEAR2i for all Track Modules except Track 1
	-		
	TRK RCV1		Receiver input from track
	TRK RVC2		
	TRK CHK1		Check input from track
	TRK CHK2		
	TRK XMT1		Transmit output to track
	TRK XMT2		

* See following Note

NOTE

The digit preceding the decimal point in input and output connector labels indicates the track number; e.g., OUT2.1 designates vital output 1 of TRACK-2 connector.

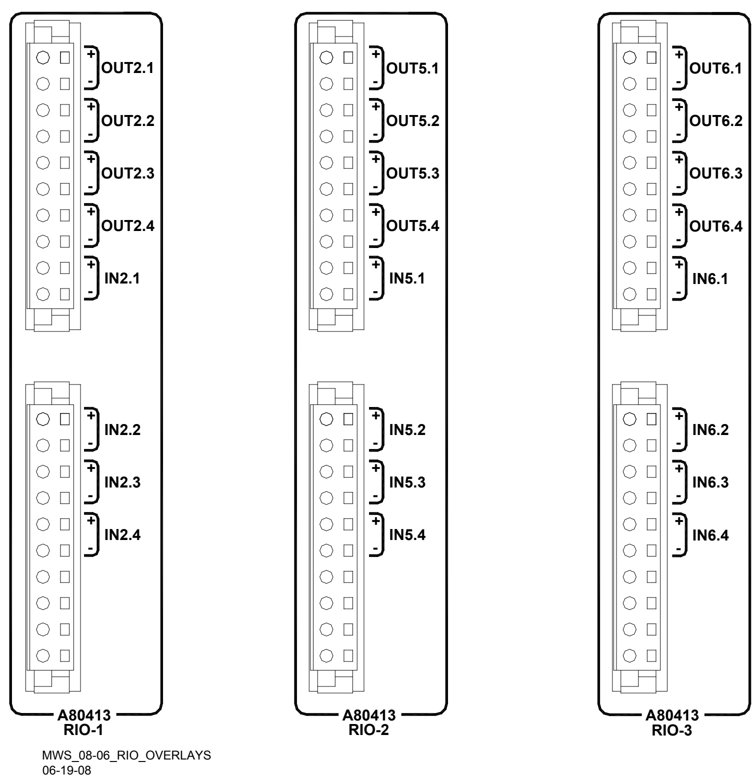
On all multi-track chassis, a spare connection is provided on the top track connector for TRACK 2 and higher that is mapped to the SEAR2i; e.g., SP2.1 (POK) of TRACK-2 connector.

8.12.11.3 RIO Connectors

RIO Modules and their associated front panel connector groups provide additional Vital I/O. The dual 4-track chassis (A80400) comes standard with two RIO connector groups. RIO Modules may also be substituted for Track 2, Track 5 and Track 6 Modules in single 5-track, dual 2-track, dual 4-track and dual 6-track chassis when needed. The track module slots must then be configured as RIO modules in the system programming.

The 4000 GCP software will automatically designate the RIO in the track 2 slot as RIO 1, the RIO in the track 5 slot as RIO 2 and the RIO in the track 6 slot as RIO 3. The RIO modules may be installed in any order. See Table 8-30 for connector pinouts.

If a RIO Module is installed in place of a Track Module, the corresponding RIO Mylar overlay should be affixed over the existing Track Module connector position to reflect proper connector nomenclature. Siemens has three molars available for RIO connectors, as shown below with their Siemens part numbers.



Case Location:	**Slot M3/RIO1**	**Slot M6/RIO2**	**Slot M7/RIO3**
Nomenclature:	**Overlay, RIO 1**	**Overlay, RIO 2**	**Overlay, RIO 3**
Part Numbers:	**Z610-39589-0001**	**Z610-39589-0002**	**Z610-39589-0003**

Figure 8-43:
RIO Mylar Overlay Ordering Information

Table 8-30:
RIO Connectors

CONNECTOR	PINOUTS*	01	-02	-03	FUNCTION
RIO-1 RIO-2 RIO-3	+ / -	OUT2.1	OUT5.1	OUT6.1	Vital output 1
	+ / -	OUT2.2	OUT5.2	OUT6.2	Vital output 2
	+ / -	OUT2.3	OUT5.3	OUT6.3	Vital output 3
	+ / -	OUT2.4	OUT5.4	OUT6.4	Vital output 4
	+ / -	IN2.1	IN5.1	IN6.1	Vital input 1
	+ / -	IN2.2	IN5.2	IN6.2	Vital input 2
	+ / -	IN2.3	IN5.3	IN6.3	Vital input 3
	+ / -	IN2.4	IN5.4	IN6.4	Vital input 4

*** See following Note**

NOTE

The digit preceding the decimal point in input and output connector labels indicates module slot number in chassis; e.g., OUT6.1 is associated with TRACK 6/RIO 3 in slot position M7.

8.12.11.4 Crossing Controller Connectors

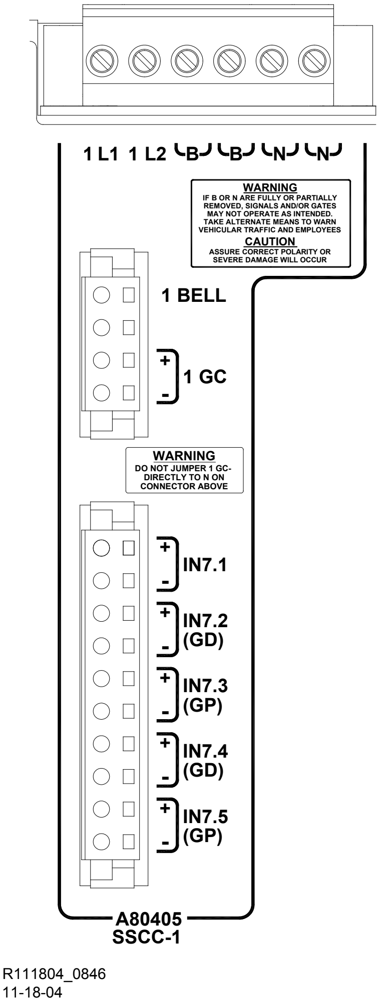


Table 8-31:
Crossing Controller Connectors

CONNECTOR	PINOUT*		FUNCTION
SSCC-1 SSCC-2	1L1		Lamp output 1
	1L2		Lamp output 2
	B		Battery positive input
	B		Battery positive input
	N		Battery negative input
	N		Battery negative input
	1 BELL		Bell output
	+	1 GC	Gate output
	-		
	+	IN7.1	Vital crossing input 1
	-		
	+	IN7.2	Vital crossing input 2
	-	(GD)	(gate down input)
	+	IN7.3	Vital crossing input 3
	-	(GP)	(gate position input)
	+	IN7.4	Vital crossing input 4
	-	(GD)	(gate down input)
	+	IN7.5(	Vital crossing input 5
	-	GP)	(gate position input)

* See following Note

NOTE

The number preceding the lamp output connector labels indicates the SSCC associated with the connector; e.g., 1L1 is associated with SSCC-1.

The digit preceding the decimal point in input connector labels indicates the chassis SSCC slot; e.g., IN8.1 is associated with SSCC-2.

8.13 LAN COMMUNICATIONS

Each 4000 GCP may communicate with other Siemens equipment via LONTALK® LAN (Echelon®) For further information, see Safetran's Echelon Configuration Handbook, COM-00-07-09.

8.13.1 ATCS Vital Protocol

Vital ATCS serial protocol data may be incorporated with the LONTALK® protocol to facilitate:

- crossing control functions
- remote prediction operations via Spread Spectrum Radio (SSR)
- vital communications with other Siemens vital controllers

CAUTION

BECAUSE THE ECHELON® INTERFACE IS NOT SURGE PROTECTED, NETWORK CONNECTIONS MUST BE RESTRICTED TO THE EQUIPMENT CONTAINED INSIDE A SIGNAL CASE OR BUNGALOW.

NOTE

For additional information concerning the Echelon® LAN, contact Siemens Technical Support.

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SECTION 9 –
I/O FUNCTIONS AND ASSIGNMENTS

9.1 OUTPUT FUNCTIONS AND PHYSICAL OUTPUT ASSIGNMENTS

Model 4000 GCP Track and RIO module physical outputs are user programmable, but not dedicated to specific output terminals on the Model 4000 GCP chassis

9.1.1 Output Requirements Due To Module Integration

Because the Track, Crossing Controller and SEAR Modules are integrated into the Model 4000 GCP case some of the outputs previously used in the 3000 GCP are not required by the Model 4000 GCP. For example, XR or Island physical outputs are not required when using the integrated Solid State Crossing Controller Module, since the XR control is an internal software connection. One benefit is that the amount of wiring required to install and to maintain a crossing is reduced.

9.1.2 Turning On Outputs

If a physical output is required to perform a specific application function, the function must first be enabled using the appropriate configuration menu.

For example, when DAX A for track 1 is to be used in a DAXing application, **DAX A Used** must be enabled (set to **Yes**) using the **PREDICTORS: track 1** menu. The physical output must then be assigned (mapped) to the function using the **OUTPUT: assignment** menu, e.g. **T1 DAX A** mapped to **Out 1.2**.

9.1.3 General Guidelines for Using Output Functions

Any output function can be assigned to any of the available Model 4000 GCP physical outputs. For an output function to be included in the output selection list for a particular physical output, the output function must be enabled. For example, for **T1 DAX A** to appear in the list, the **DAX A Used** status field of the **PREDICTORS: track 1** window must be set to **Yes**.

When an output function is enabled; i.e., track 1 **Prime Used** set to **Yes**: it does not have to be assigned to a physical output; it can be used solely as an internal function to the system. When a function is assigned to a physical output, and the enabling condition is turned off, the output is de-energized but the function remains assigned to the output. For example, when **T1 DAX A** is mapped to **OUT 1.2** and the **T1 DAX A Used** status field is returned to **No**. the **OUT 1.2** assignment field is still set to **T1 DAX A**.

Returning the output assignment field to **Not Used** removes the assignment and makes troubleshooting easier. The same function may be mapped (allocated) to multiple physical outputs. For example, **T1 DAX A** can be assigned to both **OUT 1.1** and **OUT 1.2**.

9.1.4 Tables Overview

Table 9-1 and Table 9-2 show the output functions available for assignment to the physical outputs.

Table 9-1 shows output functions that are not specific to a particular track module.

Table 9-2 shows output functions that are specific to a track module.

Tracks 2 through 6 have the same set of output functions as the Track 1 functions shown in Table 9-2.

- Table 9-3 shows the maintenance call and the items affecting it
- Table 9-4 shows the available physical outputs and the conditions necessary to use them.

NOTE

In some versions of the software, come items are not available in the Template menus; these items are accessible from the main Program menu.

Table 9-1:
System Outputs

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Not Used			When an output is set to **Not Used**, it is always de-energized
AND 1 XR	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: track Anding)	The AND 1XR function controls the crossing. The SSCC activation input defaults to the AND 1 XR output. The AND 1 XR function is set up automatically when a template is selected in a 4000 case at the crossing. An enabled AND 1XR function can be used to combine (AND) remote predictors outputs at a remote location. The following de-energizes the AND 1 XR function output: One of the predictors included in the AND 1 XR function is de-energized One of the predictor UAX/Enables included in the AND 1 XR function is de-energized A connected island is de-energized if predictor has zero offset The AND 1 Enable input is de-energized if configured The Advance Preempt timer has elapsed if programmed On AND if Preempt Health input is low and the Preempt output is high. A test activation of the crossing is performed and either of the SSCCs have AND 1 XR as an activation control The emergency activation input is used and de-energized

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
AND 2	And 2 Used **Yes**	AND: track Anding	AND 2 through AND 4 provide a means of ANDing remote predictor outputs from multiple tracks to provide a single output. The following de-energizes AND 2 through AND 8: One of the predictors included in the AND function is de-energized Connected island is de-energized if predictor has zero offset One of the predictor UAX/Enables included in the AND function is de-energized The AND Enable, if programmed On, is de-energized The emergency activation input is used and de-energized
AND 3	And 3 Used **Yes**		
AND 4	And 4 Used **Yes**		
AND 5	And 5 Used **Yes**		
AND 6	And 6 Used **Yes**		
AND 7	And 7 Used **Yes**		
AND 8	And 8 Used **Yes**		

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Adv Preempt	Preempt Logic **Advnce**	BASIC: preemption (TEMPLATE: preemption)	The adv (advanced) preempt output is connected to the preempt relay and controls preemption in the traffic system. The following de-energizes the Adv Preempt output: AND 1 XR is de-energized One of the Preempt predictors is de-energized if the corresponding Prime predictor is enabled for the AND 1 XR function Connected island is de-energized, if predictor has zero offset One of the Preempt predictor Enables is de-energized if the corresponding Prime predictor is part of AND 1 XR The Advance Preempt input is de-energized SSCC is unhealthy The emergency activation input is used and de-energized
	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: track Anding)	
Sim Preempt	Preempt Logic **Simult**	BASIC: preemption (TEMPLATE: preemption)	The sim (simultaneous) preempt output is connected to the preempt relay and controls preemption in the traffic system. The following de-energizes the Sim Preempt output: AND 1 XR is de-energized Connected island is de-energized, if predictor has zero offset The emergency activation input is used and de-energized
	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: track Anding)	
Aux-1 Lmp Control	SSCC 1 Slot **SSCC3i**	BASIC: module configuration	The Aux-1 Lmp Control output is used to control the lamps on an external crossing controller shadowing the internal SSCC-1. The following de-energizes the Aux-1 Lmp Control function: The AND function that is used in SSCC-1 activation is de-energized GP 1.1 or GP 1.2 is de-energized on SSCC1 if used Either SSCC 1 or SSCC 2 is unhealthy if used The emergency activation input is used and de-energized
	Aux-1 Xng Ctrl Used **Yes**	SSCC: 1	

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Aux-2 Lmp Control	SSCC 2 Slot **SSCC3i**	BASIC: module configuration	The Aux-2 Lmp Control output is used to control the lamps on an external crossing controller shadowing the internal SSCC-2. The following de-energizes the Aux-2 Lmp Control: The AND function that is used in SSCC-2 activation is de-energized GP 2.1 or GP 2.2 is de-energized on SSCC1 if used Either SSCC 1 or SSCC 2 is unhealthy if used The emergency activation input is used and deenergized
	Aux-2 Xng Ctrl Used **Yes**	SSCC: 2	
Aux-1 Xng Control	SSCC 1 Slot **SSCC3i**	BASIC: module configuration	The Aux-1 Xng Control output is used to control the lamps on an external crossing controller shadowing the internal SSCC-2. The following de-energizes the Aux-1 Xng Control function: AND 1 XR function is de-energized Either SSCC 1 or SSCC 2 is unhealthy if used The emergency activation input is used and deenergized
	Aux-1 Xng Ctrl Used **Yes**	SSCC: 1	
Aux-2 Xng Control	SSCC 2 Slot **SSCC3i**	BASIC: module configuration	The Aux-2 Xng Control output is used to activate an external crossing controller or Model 4000 GCP shadowing the internal SSCC-1. The following de-energizes the Aux-2 Xng Control: AND 2 XR is de-energized Either SSCC 1 or SSCC 2 is unhealthy if used The emergency activation input is used and deenergized
	Aux-2 Xng Ctrl Used **Yes**	SSCC: 2	

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Gate Dwn Indication	Preempt Logic **Advnce**	BASIC: preemption (TEMPLATE: preemption)	The Gate Dwn Indication output is used to Interface to a traffic control system The Gate Dwn Indication output is energized when: The advanced preemption output is deenergized and either all the gate down inputs are energized or an island is occupied The Gate Dwn Indication output is deenergized when: The advanced preemption output is energized or Any gate down inputs is deenergized or All island are unoccupied
Remote Output 1A	Radio DAX link A Used **Yes** Remote Outputs Used **Yes**	BASIC: radio DAX links (not available in template menu)	Remote Output 1A is used as a general-purpose vital output driven by a vital input from a remote GCP. Remote Output 1A is energized if Remote Input 1 is energized on the GCP connected via radio DAX link A and the link is in session. Remote Output 1A is deenergized if: Remote Input 1 is deenergized on the GCP connected via radio DAX link A the link is in out of session the emergency activation input is used and is deenergized on the box with remote output 1A and/or is deenergized on the box with remote input 1

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Remote Output 1B	Radio DAX link B Used **Yes** Remote Outputs Used **Yes**	BASIC: radio DAX links (not available in template menu)	Remote Output 1B is used as a general-purpose vital output driven by a vital input from a remote GCP. Remote Output 1B is energized if Remote Input 1 is energized on the GCP connected via radio DAX link B and the link is in session. Remote Output 1B is deenergized if: Remote Input 1 is deenergized on the GCP connected via radio DAX link B the link is in out of session the emergency activation input is used and is deenergized on the box with remote output 1B and/or is deenergized on the box with remote input 1
Remote Output 2A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above
Remote Output 2B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Remote Output 3A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above
Remote Output 3B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Remote Output 4A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above
Remote Output 4B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Remote Output 5A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Remote Output 5B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Remote Output 6A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above
Remote Output 6B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Remote Output 7A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above
Remote Output 7B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Remote Output 8A	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above	As depicted in Remote Output 1 A above
Remote Output 8B	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above	As depicted in Remote Output 1 B above
Vital Link 1 Output 1	Vital Comms link 1 Used **Yes**	BASIC: Vital Comms Link (not available in template menu)	Vital Link 1 Output 1 is used as a general-purpose vital output driven by a vital input from a remote GCP or HD/Link module. Vital Link 1 Output 1 is energized if Vital Link 1 Input 1 is energized on the GCP connected via Vital Comms link 1 and the link is in session. Vital Link 1 Output 1 is energized if Vital Link 1 Input 1 is energized on the HD/Link module connected via Vital Comms link 1 and the link is in session. Vital Link 1 Output 1 is deenergized if: Vital Link 1 Input 1 is deenergized on the GCP or HD/Link connected via Vital Comms 1 Link the link is in out of session the emergency activation input is used and deenergized on the box with vital link 1 output 1 deenergized on the GCP4000 box with vital link 1 input 1

Table 9-1:
System Outputs (Continued)

Output Function Name	Condition For Output To Be Available	Found In Main Program Menu (Template Menu)	Description
Vital Link 2 Output 1	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 2	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 2 Output 2	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 3	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 2 Output 3	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 4	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 2 Output 4	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 5	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 2 Output 5	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 6	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 2 Output 6	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 7	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Vital Link 2 Output 7	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 1 Output 8	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Vital Link 2 Output 8	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above	As depicted in Vital Link 1 Output above
Rmt SSCCIV OP 1	SSCCIV Controller Used **Yes**	BASIC: SSCC (not available in template menu)	Rmt SSCCIV OP 1 is used as a general-purpose vital output driven by a vital input from a remote SSCCIV module. Rmt SSCC IV OP 1 is energized if input 5 is energized on the SSCCIV connected via echelon and the link is in session. Rmt SSCC IV OP 1 is deenergized if: input 5 is deenergized on the SSCCIV connected via the echelon the link is in out of session the emergency activation input is used and deenergized
Rmt SSCCIV OP 2	As depicted in Rmt SSCCIV OP 1 above	As depicted in Rmt SSCCIV OP 1 above	As depicted in Rmt SSCCIV OP 1 above, but controlled by SSCCIV input 6
Rmt SSCCIV OP 3	As depicted in Rmt SSCCIV OP 1 above	As depicted in Rmt SSCCIV OP 1 above	As depicted in Rmt SSCCIV OP 1 above, but controlled by SSCCIV input 7
Rmt SSCCIV OP 4	As depicted in Rmt SSCCIV OP 1 above	As depicted in Rmt SSCCIV OP 1 above	As depicted in Rmt SSCCIV OP 1 above, but controlled by SSCCIV input 8
Gate Output 1	SSCC 1 Slot SSCC3i Gates Used Yes	BASIC: module configuration	Gate Output 1 repeats the state of the GC output on SSCC1
Gate Output 2	SSCC 2 Slot SSCC3i Gates Used Yes	BASIC: module configuration	Gate Output 2 repeats the state of the GC output on SSCC2

Table 9-1:
System Outputs (Continued)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Bell 1	SSCC 1 Slot SSCC3i	BASIC: module configuration	Bell 1 output repeats the state of the bell output on SSCC1
Bell 2	SSCC 2 Slot SSCC3i	BASIC: module configuration	Bell 2 output repeats the state of the bell output on SSCC2
OR 1	OR 1 Used **Yes**	ADVANCED: OR Logic	The OR 1 output is a general purpose output configured to OR together up to 4 system outputs. The OR 1 output is energized when any of the 4 inputs into the OR gate are energized.
OR 2	As depicted in OR 1 above	As depicted in OR 1 above	As depicted in OR 1 above
OR 3	As depicted in OR 1 above	As depicted in OR 1 above	As depicted in OR 1 above
OR 4	As depicted in OR 1 above	As depicted in OR 1 above	As depicted in OR 1 above
NOT AND 1 XR	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: track Anding)	The NOT AND 1 XR output provides an output that is the inverse of the AND 1 XR output The NOT AND 1 XR output is energized when the AND 1 XR is deenergized and AND 1 XR is used The NOT AND 1 XR output is deenergized when the AND 1 XR is energized
NOT AND 2.	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above
NOT AND 3	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above

Table 9-1:
System Outputs (Concluded)

OUTPUT FUNCTION NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
NOT AND 4.	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above
NOT AND 5.	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above
NOT AND 6.	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above
NOT AND 7.	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above
NOT AND 8.	As depicted in NOT AND 1 XR above	As depicted in AND 1 XR above	As depicted in AND 1 XR above
Passthru State 1	Pass Thrus **Yes**	ADVANCED: internal I/O 1	The Passthru State 1 Output repeats the state of the Passthru State 1 input. It is used to convert an input state to an output state so it can be used to set internal states.
Passthru State 2	As depicted in Passthru State 1	As depicted in Passthru State 1	As depicted in Passthru State 1
Passthru State 3	As depicted in Passthru State 1	As depicted in Passthru State 1	As depicted in Passthru State 1
Passthru State 4	As depicted in Passthru State 1	As depicted in Passthru State 1	As depicted in Passthru State 1

**Table 9-2:
Track Specific Output Functions**

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 Island	Track 1 Slot **Track**	BASIC: module configuration (not available in template menu)	This output reflects the state of the island on track 1 and is used if the track 1 island state is required in some equipment outside of the GCP4000 system. The following deenergizes the island output: A train occupies the island circuit The island frequency is not programmed The island is not calibrated The island is unhealthy The emergency activation input is used and deenergized
	Island 1 Used **Internal**	BASIC: island operation (not available in template menu)	
T1 Prime	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	The prime predictor output reflects the state of the prime prediction on the track module. The following de-energizes the Prime: Prime prediction on the track module Prime UAX is de-energized (input or radio DAX state is de-energized) Prime UAX is running its pickup delay timer Advance preemption is used and advance preempt timer has elapsed Advance preemption is used and preempt health input is falsely deenergized Connected island is de-energized (if Prime has zero offset) Track health error The emergency activation input is used and deenergized
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	Prime Used Yes	PREDICTORS: track 1 (not available in template menu)	

Table 9–2:
Track Specific Output Functions (Continued)

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 DAX A	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	The DAX A predictor output reflects the state of the DAX A prediction on the track module. The following de-energizes DAX A: DAX A prediction on the track module DAX A Enable is de-energized (input or radio DAX state is de-energized) DAX A Enable is running its pickup delay timer Connected island is de-energized (if DAX A has zero offset) Track health error The emergency activation input is used and deenergized
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	DAX A Used **Yes**	PREDICTORS: track 1 (TEMPLATE: track 1 DAXes)	
T1 DAX B	As depicted in T1 DAX A above	As depicted in T1 DAX A above	As depicted in T1 DAX A above
T1 DAX C	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	The DAX C predictor output reflects state of DAX C prediction on track module. The following de-energizes DAX C: DAX C prediction on the track module DAX C Enable is de-energized (input or radio DAX state is de-energized) Connected island is de-energized (if DAX C has zero offset) Track health error The emergency activation input is used and deenergized
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	DAX C Used **Yes**	PREDICTORS: track 1 (TEMPLATE: track 1 DAXes)	
T1 DAX D	As depicted in T1 DAX C above	As depicted in T1 DAX C above	As depicted in T1 DAX C above
T1 DAX E			
T1 DAX F			
T1 DAX G			

Table 9–2:
Track Specific Output Functions (Concluded)

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 Preempt	Track 1 Slot Track	BASIC: module configuration (TEMPLATE: module configuration)	The Preempt predictor output reflects the state of the preemption prediction on the track module. The Preempt is generally used in conjunction with advanced preemption. The following de-energizes the Preempt: Preempt prediction on the track module Preempt Enable is de-energized (input or radio DAX state is de-energized) Preempt Enable is running its pickup delay timer Connected island is de-energized (if Preempt has zero offset) Track health error The emergency activation input is used and deenergized
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	Preempt Logic **Advnce** or Second Trn Logic Used = **Yes**	BASIC: preemption (TEMPLATE: preemption)	
T1 MS Ctrl OP	Track 1 Slot **Track**	BASIC: module configuration	The MS Ctrl OP output is used to control whether the selected predictors at a down stream adjacent crossing are switched to motions sensors. When the MS/GCP restart is on, the MS Control is normally energized. The MS Control is de-energized when a train stop is detected on the track, and remains de-energized until programmed MS/GCP Restart Time elapses. The MS Control output can also be de-energized if another input is configured as a MS Control input and it is de-energized
	MS/GCP Restart Used **Yes**	ADVANCED: MS restart (not available in template menu)	

Table 9-3:
Maintenance Call (MC) Output

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Maint Call	Always	n/a	The Maint call output is used to drive a Maintenance Call lamp on the crossing bungalow. When no problem is detected within the GCP, the maintenance call output is held at the Battery N voltage level, causing the lamp to light. When a problem is detected within the GCP, the voltage is removed and the lamp is extinguished. The problems which cause the Maint Call to remove the voltage are: An SSCC module is unhealthy An SSCC module has low battery detection turned on and is reporting a low battery condition The CPU2+ module has low battery detection turned on and is reporting a low battery condition The Aux n Xng Ctrl Hlth input is used and is deenergized A GCP Approach or Island is out of service OOS Control is set to Display+OOS IPs and any out of service input is energized A Maint Call Repeater input is used and is deenergized The SSCCIV Controller Used is Yes and the SSCCIV Maint Call output is deenergized The SEAR2i is used, and the SEAR2i is not communicating with the CPU or the SEAR2i application program is commanding the Maint Call off

Table 9-4:
Model 4000 GCP Physical Outputs

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
OUT 1.1 OUT 1.2	Track 1/PSO 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 1
OUT 2.1 OUT 2.2	Track 2 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 2
OUT 3.1 OUT 3.2	Track 3 Slot/PSO 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 3
OUT 4.1 OUT 4.2	Track 4 Slot/PSO 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 4
OUT 5.1 OUT 5.2	Track 5/RIO 2 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 5
OUT 6.1 OUT 6.2	Track 6/RIO 3 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 6
OUT 1.1 OUT 1.2 OUT 1.3	Track 1/PSO 1 Slot **PSO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 1
OUT 3.1 OUT 3.2 OUT 3.3	Track 3/PSO 3 Slot **PSO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 3
OUT 4.1 OUT 4.2 OUT 4.3	Track 4/PSO 4 Slot **PSO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from track slot 4

Table 9–4:
Model 4000 GCP Physical Outputs (Concluded)

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE		FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
OUT 2.1	Track 2/RIO 1 Slot	**RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from RIO 1
OUT 2.2				
OUT 2.3				
OUT 2.4				
OUT 5.1	Track 5/RIO 2 Slot	**RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from RIO 2
OUT 5.2				
OUT 5.3				
OUT 5.4				
OUT 6.1	Track 6/RIO 3 Slot	**RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from RIO 3
OUT 6.2				
OUT 6.3				
OUT 6.4				
Out GC 1	SSCC 1 Slot	SSCC3i	IO: assignment SSCC	The Out GC 1 is located on the SSCC3i module in SSCC slot 1. The default is Gate Output 1. Other selections are the same as a track output.
	Gates Used	Yes		
Out GC 2	SSCC 2 Slot	SSCC3i	IO: assignment SSCC	The Out GC 2 is located on the SSCC3i module in SSCC slot 1. The default is Gate Output 2. Other selections are the same as a track output.
	Gates Used	Yes		

9.2 INPUT FUNCTIONS AND PHYSICAL INPUT ASSIGNMENTS

Model 4000 GCP Track, RIO module, and Crossing Controller physical inputs are user programmable and are not dedicated to specific input terminals on the Model 4000 GCP chassis.

9.2.1 Input Requirements Due To Module Integration

Because the Track, Crossing Controller and SEAR Modules are integrated into the Model 4000 GCP case some inputs previously used by the 3000 GCP are not required by the Model 4000 GCP System.

9.2.2 Turning on Inputs

When a physical input is required to perform a specific application function the function must first be enabled using the appropriate configuration menu. For example, when prime UAX for track 1 is to be used, Prime UAX must be enabled using the GCP track 1 prime menu. The physical input must then be assigned (mapped) to the function using the INPUT: assignment menu. For example, T1 Prime UAX mapped to In 1.1

9.2.2.1 General Guidelines for Using Input Functions

In general, any input function can be assigned to any of the available Model 4000 GCP physical inputs. The same input function can be allocated to multiple physical inputs. As a result, the allocated input function will de-energize when either input is de-energized. For example, with T1 Prime UAX allocated to both IN 1.1 and IN 1.2, T1 Prime UAX will de-energize if either IN 1.1 or IN 1.2 is de-energized.

For an input function to appear in the selection list for a particular physical input, the input function must be enabled. For example, for **AND 2 Enable** to appear in the list:

- **AND 2 Used** of the **AND: track Anding** window must first be set to **Yes**
- **AND 2 Enable Used** of the **AND: AND 2** window is then set to **Yes**

If an input function is enabled, but is not assigned to a physical input, it is treated as de-energized. For example, when the **AND 2 Enable** function is enabled but not assigned to a physical input.

If an input function is assigned to a physical input and the enabling condition is turned off, the input is ignored but the function remains assigned to the output. For example, when **AND 1 XR Enable** is mapped to **IN 1.1** and the **AND 2 Enable Used** status field is returned to **No**. the **IN 1.1** assignment field is still set to **AND 1 XR Enable**. The input is no longer turned on

The physical input does not have to be wired high, as returning the input assignment field to **Not Used** removes the assignment and makes troubleshooting easier.

9.2.3 Tables Overview

Table 9-5, Table 9-6 and Table 9-7 show the input functions available to be assigned to a physical input: e.g., IN 1.1.

Table 9-5 shows input functions that are not specific to a particular track module.

Table 9-6 shows Input functions specific to a track module. Tracks 2 through 6 have a similar set of input functions as the Track 1 functions.

Table 9-7 shows inputs that are specific to the crossing controller.

Table 9-8 shows the available physical inputs and the conditions necessary to use them.

WARNING

IN TRACK MODULE MEFS GCP02_00.MEF AND EARLIER, IF A PREDICTOR TRACK CIRCUITS HAS AN ISLAND, THEN THERE SHOULD NOT BE ANY PRIME PREDICTION OFFSET DISTANCE PROGRAMMED GREATER THAN ZERO. IF IT OCCURS, IT MAY RESULT IN A SHORTENED WARNING TIME OR CROSSING ACTIVATION FAILURE.

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, THEN IN VERY LIMITED CIRCUMSTANCES WITH TRAIN DECELERATION THE CROSSING WARNING SYSTEM MAY BRIEFLY TIMEOUT IF THE DAX DOES NOT UTILIZE THE PRIME UAX INPUT (THE UAX PARAMETER IS SET TO "NOT USED"). THIS SITUATION RESULTS FROM THE "AUTOMATED PICKUP DELAY" IN THE REMOTE TRACK CIRCUIT EXPIRING PRIOR TO THE CROSSING GCP PREDICTING FOR THE TRAIN. REFER TO SECTION 6.7.8 FOR CORRECTIVE ACTIONS.

NOTE

In some versions of the software, some items are not available in the Template menus; these items are accessible from the main Program menu.

When an input is set to **Not Used** it is treated as de-energized.

When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, DAX, or pre-empt will switch to motion sensor operation.

When the UAX or DAX ENABLE energize, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation

Table 9-5:
System Input Functions

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Adv Preempt IP	Preempt Logic **Advnce**	BASIC: preemption (TEMPLATE: preemption)	The Adv Preempt Control input starts the advance preempt timer in response to a DAX signal input from a remote unit. The advance preempt timer starts when input goes low. The timer runs to completion even when the input drops for only a short period.
	Adv Preempt IP Used **Yes**	BASIC: preemption (TEMPLATE: preemption)	
	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	
AND 1 XR Enable	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	AND 1 XR Enable de-energizes the AND 1 XR in response to an external input received by the system. AND 1 XR is de-energized when AND 1 XR Enable is de-energized after the optional drop delay timer has expired. AND 1 is energized when AND 1 XR Enable is energized after the optional pickup delay timer has expired.
	And 1 Enable Used **Yes**	AND: AND 1 XR (TEMPLATE: AND 1 XR)	
AND 2 Enable	And 2 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	AND 2 Enable de-energizes the AND 2 in response to an external input received by the system. AND 2 is de-energized when AND 2 Enable is de-energized after the optional drop delay timer has expired. AND 2 is energized when AND 2 Enable is energized after the optional pickup delay timer has expired.
	And 2 Enable Used **Yes**	AND: AND 2 (TEMPLATE: AND 2)	
AND 3 Enable	And 3 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	As depicted in And 2 Enable
	And 3 Enable Used **Yes**	AND: AND 3 (TEMPLATE: AND 3)	
AND 4 Enable	And 4 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	As depicted in And 2 Enable
	And 4 Enable Used **Yes**	AND: AND 4 (TEMPLATE: AND 4)	

Table 9–5:
System Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
AND 5 Enable	And 5 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	As depicted in And 2 Enable
	And 5 Enable Used **Yes**	AND: AND 5 (TEMPLATE: AND 5)	
AND 6 Enable	And 6 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	As depicted in And 2 Enable
	And 6 Enable Used **Yes**	AND: AND 6 (TEMPLATE: AND 6)	
AND 7 Enable	And 7 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	As depicted in And 2 Enable
	And 7 Enable Used **Yes**	AND: AND 7 (TEMPLATE: AND 7)	
AND 8 Enable	And 8 Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	As depicted in And 2 Enable
	And 8 Enable Used **Yes**	AND: AND 8 (TEMPLATE: AND 8)	
Emergency Activate	Emergency Activate IP **Yes**	ADVANCED: site options	The Emergency Activate input is used to set all the GCP outputs to a restrictive state from a single input When the emergency activate input is deenergized all GCP 4000 outputs are deenergized (with the exception of NOT AND outputs and inverted gate outputs) all out of service GCP or Islands are put back in service Wraps and Overrides inputs are deenergized

Table 9–5:
System Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
AND 1 Wrap	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	The Wrap input is used to energize the AND 1 XR output if the AND 1 Wrap input is energized. If the AND 1 Wrap input is energized the AND 1 XR output will be energized unless the emergency activation input is deenergized.
	AND 1 Wrap **Yes**	AND: AND 1 XR	
Input Name	Condition For Input To Be Available	Found in Main Program Menu (Template Menu)	Description
AND 2 Wrap	As depicted in AND 2 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 3 Wrap	As depicted in AND 3 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 4 Wrap	As depicted in AND 4 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 5 Wrap	As depicted in AND 5 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 6 Wrap	As depicted in AND 6 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 7 Wrap	As depicted in AND 7 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 8 Wrap	As depicted in AND 8 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
Trf Control Health	Preempt Logic **Advnce**	BASIC: preemption (TEMPLATE: preemption)	The Trf (traffic) Control Health input from the traffic controller indicates the health of the controller. The input is de-energized when the controller is unhealthy. Sets advance preemption timer to zero Initiates simultaneous preemption
	Traffic Sys Hlth IP Used **Yes**	BASIC: preemption (TEMPLATE: preemption)	
	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	

Table 9–5:
System Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Preempt Health	Preempt Logic **Advnce** or **Simult**	BASIC: preemption (TEMPLATE: preemption)	The Preempt health input checks the correspondence of the traffic relay. Battery over a front contact of the relay is brought back into the preempt health input. The crossing is activated when the Model 4000 GCP detects that the traffic relay drive is present but the preempt health input is low. This condition may occur when the wire to the traffic relay coil opens or falls off.
	Preempt Hlth IP Used **Yes**	BASIC: preemption (TEMPLATE: preemption)	
	And 1 XR Used **Yes**	AND: track Anding (TEMPLATE: Track Anding)	
Input Name	Condition For Input To Be Available	Found in Main Program Menu (Template Menu)	Description
Maint Call Rpt IP	Ext Maint Call Input **Yes**	ADVANCED: site options (not available in template menu)	This input receives the maintenance call from external equipment; e.g., SSCC III Plus or SSCC IV and is included with the Model 4000 GCP maintenance call logic to produce the front panel Maint Call output.
Aux-1 Xng Ctrl Hlth	SSCC-1 Slot **SSCCIIIi**	BASIC: module configuration (TEMPLATE: module configuration)	The Aux-1 Xng Ctrl Hlth input enables the health of an auxiliary lamp (crossing) controller to be brought into the GCP 4000. When Aux-1 Xng Ctrl Hlth de-energizes it activates internal crossing controllers SSCC-1 and SSCC-2.
	Aux-1 Xng Ctrl Used **Yes**	SSCC: 1 (not available in template menu)	
	Aux-1 Xng Ctrl Hlth IP **Yes**	SSCC: 1 (not available in template menu)	

Table 9–5:
System Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Aux-2 Xng Ctrl Hlth	SSCC-1 Slot **SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration)	The Aux-2 Xng Ctrl Hlth input enables the health of an auxiliary lamp (crossing) controller to be brought into the GCP 4000. When Aux-2 Xng Ctrl Hlth de-energizes it activates internal crossing controllers SSCC-1 and SSCC-2.
	Aux-2 Xng Ctrl Used **Yes**	SSCC: 2 (not available in template menu)	
	Aux-2 Xng Ctrl Hlth IP **Yes**	SSCC: 2 (not available in template menu)	
Remote Input 1	Radio DAX link A Used **Yes** Remote Outputs Used **Yes**	BASIC: radio DAX links (not available in template menu)	Remote Input 1 is used to send the state of an input to a remote GCP via the radio network.
Remote Input 2	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above
Input Name	Condition For Input To Be Available	Found in Main Program Menu (Template Menu)	Description
Remote Input 3	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above
Remote Input 4	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above
Remote Input 5	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above
Remote Input 6	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above
Remote Input 7	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above

Table 9–5:
System Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Remote Input 8	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above	As depicted in Remote Input 1 above
Vital Link 1 Input 1	Vital Comm Link 1 Used **Yes**	BASIC: Vital Comms Links	Vital Link 1 Input 1 is used to send the state of an input to a remote GCP or HD/Link via the radio or echelon network.
Vital Link 1 Input 2	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 1 Input 3	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 1 Input 4	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 1 Input 5	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 1 Input 6	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 1 Input 7	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 1 Input 8	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above	As depicted in Vital Link 1 Input 1 above
Vital Link 2 Input 1	Vital Comm Link 2 Used **Yes**	BASIC: Vital Comms Links	Vital Link 2 Input 1 is used to send the state of an input to a remote GCP or HD/Link via the radio or echelon network.
Vital Link 2 Input 2	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above
Vital Link 2 Input 3	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above
Vital Link 2 Input 4	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above

Table 9–5:
System Input Functions (Concluded)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Vital Link 2 Input 5	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above
Vital Link 2 Input 6	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above
Vital Link 2 Input 7	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above
Vital Link 2 Input 8	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above	As depicted in Vital Link 2 Input 1 above
Passthru State 1	Pass Thrus **Yes**	ADVANCED: internal I/O 1	The Passthru State 1 input is used to convert an input state to an output state so it can be used to set internal states.
Passthru State 2	As depicted in Passthru State 1 above	As depicted in Passthru State 1 above	As depicted in Passthru State 1 above
Passthru State 3	As depicted in Passthru State 1 above	As depicted in Passthru State 1 above	As depicted in Passthru State 1 above
Passthru State 4	As depicted in Passthru State 1 above	As depicted in Passthru State 1 above	As depicted in Passthru State 1 above

Table 9-6: Track Specific Input Functions

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Ext Island 1	Track 1 Slot **Track**	BASIC: module configuration (not available in template menu)	The Ext Island 1 input brings in the state of an external island, when the island on the track module is not being used. Predictors and UAX functions are the same with the external island as with the internal island. The state of the external island is received via a physical input
	Island 1 Used **External**	BASIC: island operation (not available in template menu)	
Ext Island 2	As depicted in Ext Island 1	As depicted in Ext Island 1	As depicted in Ext Island 1
Ext Island 3	As depicted in Ext Island 1	As depicted in Ext Island 1	As depicted in Ext Island 1
Ext Island 4	As depicted in Ext Island 1	As depicted in Ext Island 1	As depicted in Ext Island 1
Ext Island 5	As depicted in Ext Island 1	As depicted in Ext Island 1	As depicted in Ext Island 1
Ext Island 6	As depicted in Ext Island 1	As depicted in Ext Island 1	As depicted in Ext Island 1
Out Of Service IP 1	T* OOS Control **OOS Input 1**	ADVANCED: out of service 2	If OOS Control is set to Display+OOS IPs, the Out Of Service input works in conjunction with the Out Of Service Window to take either the GCP Approach or the Island on specified track modules out of service. If T* OOS Control Input is set to none, it does not apply. If OOS Control is set to OOS IPs, the Out Of Service input when energized it takes either the GCP Approach or the Island on the configured track modules out of service. The Out Of Service Window is described in paragraph 4.1.4.1.2. The Out Of Service input 1 must be energized when the out of service is requested.
	OOS Control Display+OOS IPs Or OOS Control **OOS IPs**	ADVANCED: out of service (not available in template menu)	
Out Of Service IP 2	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above
Out Of Service IP 3	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above

Table 9–6:
Track Specific Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Out Of Service IP 4	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above
Out Of Service IP 5	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above
Out Of Service IP 6	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above	As depicted in Out Of Service IP 1 above
4000 Case OOS IP	OOS Control 4000 Case OOS IP	ADVANCED: out of service (not available in template menu)	The 4000 Case OOS IP is used to take the whole GCP case out of service with one input. When the 4000 Case OOS IP is energized, All GCP and Island functions are taken out of service. All used AND are energized (even if there AND Enable inputs are deenergized) Advance Preemption outputs are energized If the Emergency activation input is used and deenergized it will override the 4000 Case OOS IP and deenergize all outputs.
3 Vehicle Detect	SSCCIV Controller Used **Yes**	SSCC (not available in template menu)	The 3 Vehicle Detect input is used to interface to loop detectors to detect road traffic on the crossing, when the Model 4000 GCP is used in a four quadrant gate application. The 3 Vehicle Detect input is associated with the exit gate sector 3 (SSCC 1 on the 4000).
	4000 Control Type **Exit**	SSCC (not available in template menu)	
4 Vehicle Detect	SSCCIV Controller Used **Yes**	SSCC (not available in template menu)	The 4 Vehicle Detect input is used to interface to vehicle detectors to detect road traffic on the crossing, when the Model 4000 GCP is used in a four quadrant gate application. The 4 Vehicle Detect input is associated with the exit gate sector 4 (SSCC 2 on the 4000).
	4000 Control Type **Exit**	SSCC (not available in template menu)	

Table 9–6:
Track Specific Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
Vehicle Detect Hlth	SSCCIV Controller Used **Yes**	SSCC (not available in template menu)	The Vehicle Detect Hlth input is used to monitor the health of the vehicle detectors, when the Model 4000 GCP is used in a four quadrant gate application.
	4000 Control Type **Exit**	SSCC (not available in template menu)	
T1 Prime UAX	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	The Track 1 Prime UAX drops the Track 1 Prime predictor output in response to a DAX signal from a remote GCP. UAX only affects the Track 1 Prime predictor, and no other predictors on this or other tracks. However if Track 1 Prime is used in an AND function, the AND de-energizes when the Prime UAX de-energizes. The Prime UAX can be programmed with a pickup delay of between 0 and 500 seconds. The pickup delay timer starts when the UAX input energizes When the train leaves the island, the pickup delay timer is stopped short of its programmed time (truncated) This allows UAX to recover before its programmed time if the Prime predictor has zero offset. When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, DAX, or pre-empt will switch to motion sensor operation. When the UAX or DAX ENABLE energizes, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	Prime Used **Yes**	PREDICTORS: track 1 (not available in template menu)	
	Prime UAX **IP, RDAX,** or **IP+RDAX**	GCP: track 1 prime (TEMPLATE: track 1)	

Table 9–6:
Track Specific Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 DAX A Enable	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	The Track 1 DAX A Enable de-energizes the Track 1 DAX A output in response to a signal input from a remote GCP. This input is typically used to cascade multiple DAX. This Enable affects only the Track 1 DAX A, and no other predictors on this or other tracks. However if track 1 DAX A is used in an AND function, the AND de-energizes when the DAX A Enable de-energizes. The DAX A Enable can be programmed with a pickup delay of between 0 and 500 seconds. The pickup delay timer starts when the Enable input energizes When the DAX has an offset the DAX pickup delay timer always runs its programmed time. If the DAX has zero offset the DAX pickup delay timer recovers when the train leaves the island. When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, DAX, or pre-empt will switch to motion sensor operation. When the UAX or DAX ENABLE energizes, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation.
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	DAX A Used **Yes**	PREDICTORS: track 1 (TEMPLATE: track 1 DAXes)	
	DAX A Enable **IP, RDAX,** or **IP+RDAX**	GCP: track 1 DAX A (TEMPLATE: track 1 DAXes)	
T1 DAX B Enable T1 DAX C Enable	As depicted in T1 DAX A Enable above	As depicted in T1 DAX A Enable above	As depicted in T1 DAX A Enable above

Table 9–6:
Track Specific Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 DAX D Enable	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module Configuration)	As depicted in T1 DAX A Enable above, except with no programmable pickup delay.
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	DAX D Used **Yes**	PREDICTORS: track 1 (not available in template menu)	
	DAX D Enable **IP**	GCP: track 1 DAX D (not available in template menu)	
T1 DAX E Enable	As depicted in T1 DAX D Enable above	As depicted in T1 DAX D Enable above	As depicted in T1 DAX A Enable above, except with no programmable pickup delay.
T1 DAX F Enable			
T1 DAX G Enable			

Table 9–6:
Track Specific Input Functions (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 Preempt Enable	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module Configuration)	The track 1 Preempt Enable drops the Track 1 Preempt output in response to a signal input from a remote GCP. This Enable affects only the Track 1 Preempt, and no other predictors on this or other tracks. The Preempt predictor is usually used only when Advance Preemption is turned on. When the Preempt Enable de-energizes, it deenergizes the traffic preempt relay and it starts the Advance preempt timer. The Preempt Enable can be programmed with a pickup delay of between 0 and 500 seconds. The pickup delay timer starts when the input energizes. When the train leaves the island, the pickup delay timer is stopped short of its programmed time (is truncated). This allows Preempt Enable to recover before its programmed time if the Prime predictor has zero offset. When a UAX or DAX/PREEMPT ENABLE is de-energized, the associated prime, DAX, or pre-empt will switch to motion sensor operation. When the UAX or DAX ENABLE energize, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP Operation (not available in template menu)	
	Preempt Used **Yes**	PREDICTORS: track 1 (not available in template menu)	
	Preempt Enable **IP, RDAX,** or **IP+RDAX**	GCP: track 1 Preempt (TEMPLATE: track 1 DAXes)	
T1 Wrap	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module Configuration)	The Track 1 Wrap input ties the operation of the Track 1 module GCP and island to that of an external track circuit. When the wrap input is energized all track 1 predictors and the track 1 island are considered to be energized regardless of their actual state. Generally, the LOS timer should be set for a minimum of 5 seconds.
	Track 1 Wrap Used **Yes**	ADVANCED: wrap circuits (N/A in template menu)	

Table 9–6:
Track Specific Input Functions (Concluded)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 Wrap	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module Configuration)	The Track 1 Wrap input ties the operation of the Track 1 module GCP and island to that of an external track circuit. When the wrap input is energized all track 1 predictors and the track 1 island are considered to be energized regardless of their actual state. Generally, the LOS timer should be set for a minimum of 5 seconds.
	Track 1 Wrap Used **Yes**	ADVANCED: wrap circuits (not available in template menu)	
T1 MS Control	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module Configuration)	The Track 1 MS Control input switches certain predictors to motion sensor mode. When this input is de-energized, all predictors (prime and DAX) that are programmed for MS/GCP restart operation start to function as motion sensors. When the Track 1 MS Control input is again energized, the MS/GCP Restart Timer is started. The predictors remain in the motion sensor mode until the MS/GCP Restart Timer countdown is complete.
	Track 1 MS/GCP Operation **Yes**	BASIC: MS/GCP operation (not available in template menu)	
	MS/GCP Ctrl IP Used **Yes**	GCP: track 1 MS Control (not available in template menu)	
T1 Pred Override	All Predictors Override Used **Yes**	ADVANCED: trk 1 overrides (not available in template menu)	The Track 1 Pred Override input disables all track 1 predictors when a predetermined track condition exists. When the T1 Pred Override input is energized all predictors of the track are disabled The override input does override the predictor outputs if: the island is deenergized and the predictor has no offset the track GCP is unhealthy the emergency activation input is used and deenergized
T1 DAX A Override	All Predictors Override Used **No**	ADVANCED: trk 1 overrides (not available in template menu)	The Track 1 DAX A Override input disables the DAX A predictor when a predetermined track condition exists. When the T1 DAX A Override input is energized it will not override the T1 DAX A output if: the island is deenergized and DAX A has no offset. the track GCP is unhealthy the emergency activation input is used and deenergized
	DAX A Used **Yes**		
	DAX A Override Used **Yes**		

Table 9-7:
Crossing Controller Specific Input Functions

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE		FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
T1 DAX A Override	All Predictors Override Used	**No**	ADVANCED: trk 1 overrides (not available in template menu)	The Track 1 DAX A Override input disables the DAX A predictor when a predetermined track condition exists. When the T1 DAX A Override input is energized it will not override the T1 DAX A output if: the island is deenergized and DAX A has no offset. the track GCP is unhealthy the emergency activation input is used and deenergized
	DAX A Used	**Yes**		
	DAX A Override Used	**Yes**		
T1 DAX B Override	As depicted in T1 DAX A Override above		As depicted in T1 DAX A Override above	As depicted in T1 DAX A Override above
T1 DAX C Override				
GP 1.1	SSCC-1 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	GP1.1 input on SSCC-1 receives the gate position signal from the crossing gates.
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC-1 Number GPs	**1** or **2**	SSCC: 1 (TEMPLATE: SSCC)	
GP 1.2	SSCC 1 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	GP1.2 input on SSCC-1 receives a second gate position signal from gates where two GP signals are desired at an installation where GC 1 is driving 2 gates. GP 1.2 is ANDed internally with GP 1.1 De-energizing either GP flashes the lamps
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC-1 Number GPs	**2**	SSCC: 1 (TEMPLATE: SSCC)	
GP 2.1	SSCC-2 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	As depicted in GP1.1 but for SSCC-2
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC-2 Number GPs	**1** or **2**	SSCC: 2 (TEMPLATE: SSCC)	

Table 9–7:
Crossing Controller Specific Input Functions (Continued)

GP 2.2	SSCC 2 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	As depicted in GP1.2 but for SSCC-2
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC-2 Number GPs	**2**	SSCC: 2 (TEMPLATE: SSCC)	
GD 1.1	SSCC 1 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	GD1.1 input receives the gate down signal from a gate connected to gate output 1GC on SSCC-1. Used in Advanced Preemption Gate Down Logic and for monitoring by the SEAR2i.
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC-2 Number GPs	**2**	SSCC: 2 (TEMPLATE: SSCC)	
GD 1.2	SSCC 1 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	GD1.2 input receives the gate down signal from a second gate connected to gate output 1GC on SSCC-1. Used in Advanced Preemption Gate Down Logic and for monitoring by the SEAR2i.
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC 1 Number GDs	**2** thru **4**	SSCC: 1 (TEMPLATE: SSCC)	
GD 1.3	SSCC 1 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	GD1.3 input receives the gate down signal from a third gate connected to gate output 1GC on SSCC-1. Used in Advanced Preemption Gate Down Logic and for monitoring by the SEAR2i.
	Gates Used	**Yes**	SSCC 1 (TEMPLATE: SSCC)	
	SSCC 1 Number GDs	**3** and **4**	SSCC: 1 (TEMPLATE: SSCC)	
GD 1.4	SSCC 1 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	GD1.4 input receives the gate down signal from a fourth gate connected to gate output 1GC on SSCC-1. Used in Advanced Preemption Gate Down Logic and for monitoring by the SEAR2i.
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC 1 Number GDs	**4**	SSCC: 1 (TEMPLATE: SSCC)	

Table 9–7:
Crossing Controller Specific Input Functions (Concluded)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE		FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
GD 2.1	SSCC 2 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	As depicted in GD1.1 but for SSCC-2
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC 2 Number GDs	**1** thru **4**	SSCC: 2 (TEMPLATE: SSCC)	
GD 2.2	SSCC 2 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	As depicted in GD1.2 but for SSCC-2
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC 2 Number GDs	**2** thru **4**	SSCC: 2 (TEMPLATE: SSCC)	
GD 2.3	SSCC 2 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	As depicted in GD1.3 but for SSCC-2
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC 2 Number GDs	**3** and **4**	SSCC: 2 (TEMPLATE: SSCC)	
GD 2.4	SSCC 2 Slot	**SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	As depicted in GD1.but for SSCC-2
	Gates Used	**Yes**	SSCC (TEMPLATE: SSCC)	
	SSCC 2 Number GDs	**4**	SSCC: 2 (TEMPLATE: SSCC)	

Table 9-8:
Model 4000 GCP Physical Inputs

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MENU	DESCRIPTION
IN 1.1 IN 1.2	Track 1 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to track slot 1
IN 2.1 IN 2.2	Track 2 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to track slot 2
IN 2.1 IN 2.2 IN 2.3 IN 2.4	Track 2/ RIO 1 Slot **RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to RIO 1
IN 3.1 IN 3.2	Track 3 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to track slot 3
IN 4.1 IN 4.2	Track 4 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to track slot 4
IN 5.1 IN 5.2	Track 5/ RIO 2 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to track slot 5
IN 5.1 IN 5.2	Track 6/ RIO 3 Slot **Track**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to track slot 6
IN 5.1 IN 5.2 IN 5.3 IN 5.4	Track 5/ RIO 2 Slot **RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to RIO 2

Table 9–8:
Model 4000 GCP Physical Inputs (Continued)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MENU	DESCRIPTION
IN 6.1 IN 6.2 IN 6.3 IN 6.4	Track 6/ RIO 3 Slot **RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital inputs to RIO 3
IN 5.1 IN 5.2 IN 5.3 IN 5.4 IN 5.5 IN 5.6 IN 5.7 IN 5.8	Track 5/ RIO 2 Slot **SEAR input**	BASIC: module configuration (TEMPLATE: module configuration	Vital inputs to SEAR
IN 6.1 IN 6.2 IN 6.3 IN 6.4 IN 6.5 IN 6.6 IN 6.7 IN 6.8	Track 6/ RIO 3 Slot **SEAR input**	BASIC: module configuration (TEMPLATE: module configuration	Vital inputs to SEAR
SSCC1 IN 7.1 SSCC1 IN 7.2 SSCC1 IN 7.3 SSCC1 IN 7.4 SSCC1 IN 7.5	SSCC 1 Slot **SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	Vital inputs to SSCC3i

Table 9–8:
Model 4000 GCP Physical Inputs (Concluded)

INPUT NAME	CONDITION FOR INPUT TO BE AVAILABLE	FOUND IN MENU	DESCRIPTION
SSCC2 IN 8.1	SSCC 2 Slot **SSCC3i**	BASIC: module configuration (TEMPLATE: module configuration	Vital inputs to SSCC3i
SSCC2 IN 8.2			
SSCC2 IN 8.3			
SSCC2 IN 8.4			
SSCC2 IN 8.5			

SECTION 10 –
MENU MAP

10.1 MAIN PROGRAM MENUS

The **MAIN PROGRAM menu** Window provides access to the following configuration menu windows:

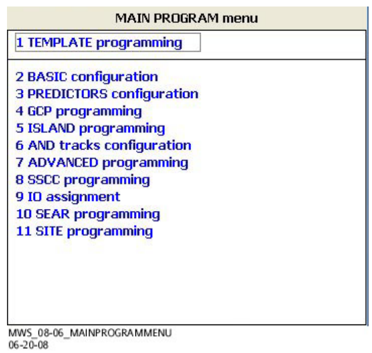


Figure 10-1:
The MAIN PROGRAM menu “1 TEMPLATE programming” Window

Selecting the Template assignment field displays a list of templates. Each selected template item configures the Model 4000 GCP to specific default parameters.

NOTE

Generally, throughout this manual, each screen depicted has its template shown in the lower right half of the screen, e.g. 1A:6 Trk Bi, denoting MTF 1A, with six bidirectional tracks. Throughout this section, however, almost all screenshots are taken solely from MTF 1A, and therefore, that portion of the screen will not be presented. Additionally, the navigation buttons which typically appear above the menu title are not depicted in this section either.

Also, whenever an asterisk (*) precedes a parameter name (such as the *Preempt Logic No parameter on the Template: preemption Window as depicted in Figure 10-4 below), this signifies that by changing the default value to one of the other choices, additional values open on the Window or other Windows become activated further down the menu tree.

10.2 TEMPLATE MENUS

10.2.1 The TEMPLATE: selection Window

Selecting the **Set System to Template Defaults** item returns the system to the default values of the active template.

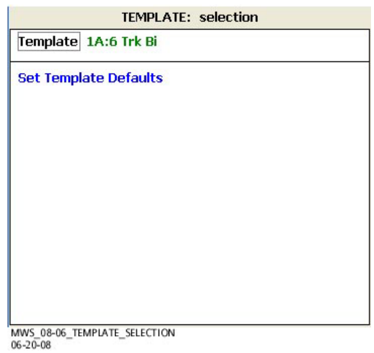


Figure 10-2:
The TEMPLATE: selection Window

10.2.2 The TEMPLATE: module configuration Window

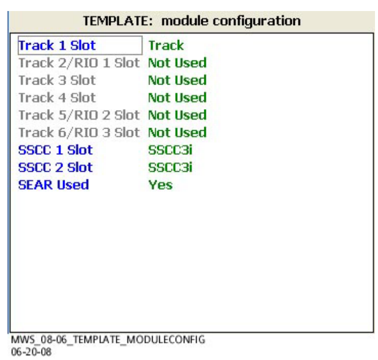


Figure 10-3:
The TEMPLATE: module configuration Window

The **TEMPLATE: module configuration** Window displays which modules are used in the system.

10.2.3 The TEMPLATE: preemption Window

The **TEMPLATE: preemption** window provides three program displays: **No**, **Advnce**, and **Simult**.

The **N**o preemption window displays when the Preempt Logic selection field is set to No. This is the default window.

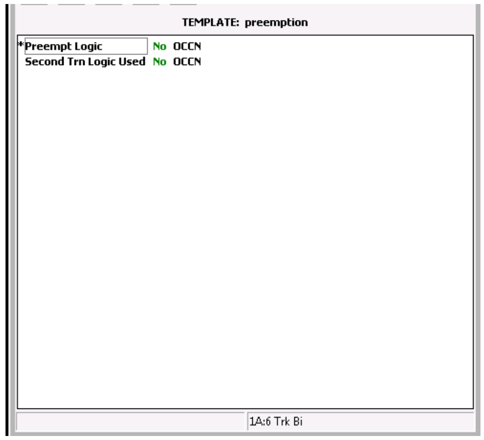


Figure 10-4:
The TEMPLATE: preemption "NO" Second Trn Logic Used "No" Window

10.2.3.1 The TEMPLATE: preemption "Advnce" Window

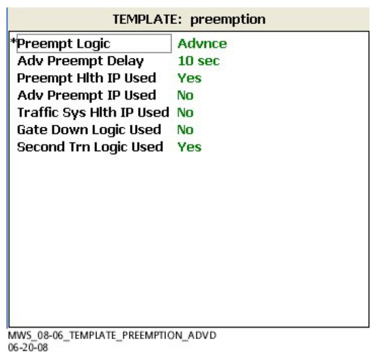


Figure 10-5:
The TEMPLATE: preemption "Advnce" Window

The advanced preemption window displays when the **Preempt Logic** selection field is set to **Advnce.**

10.2.3.2 The TEMPLATE: preemption "Simult" Window

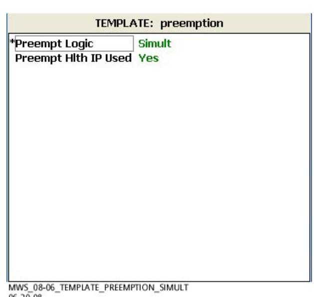


Figure 10-6:
The TEMPLATE: preemption "Simult" Window

The simultaneous preemption window displays when the **Preempt Logic** selection field is set to **Simult.**

10.2.4 The TEMPLATE: tracks "N" –Uni/Bi/Sim-Bidirnl, Island/No Island Windows

The following group of templates sets track configuration, whether or not the Island is active, remote prime status.

10.2.4.1 The TEMPLATE: track "N"-Bi, Island Window

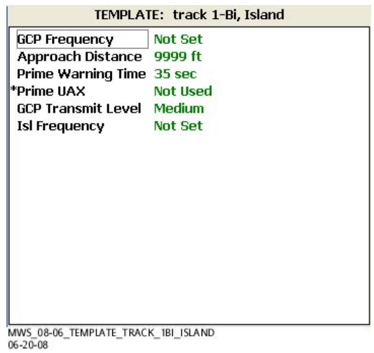


Figure 10-7:
The TEMPLATE: track "N"-Bi, Island Window
with Preemption set to Off and Prime UAX set to Off

The **TEMPLATE: track "N"–Bi, Island** Window (Preemption and Prime UAX Off) (See Figure 10-7) sets track circuit/island configuration parameters. A window appears for each assigned Track Module. The window default settings vary according to track circuit location relative to the crossing.

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Prime UAX when set to Not Used
- GCP Transmit Level
- Island frequency

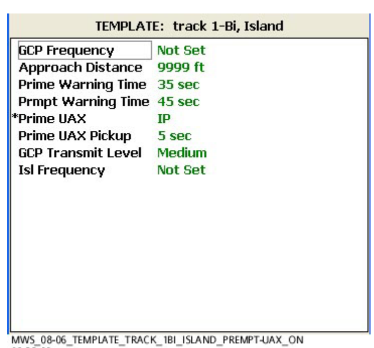


Figure 10-8:
The TEMPLATE: track "N"-Bi, Island Window with
Preemption set to "Advnce" and Prime UAX set to On

The **TEMPLATE: track "N"–Bi, Island** Window (Preemption Advnce and Prime UAX On) (See Figure 10-8) sets track circuit/island configuration parameters. A window appears for each assigned Track Module. The window default settings vary according to track circuit location relative to the crossing.

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Preempt warning time (entry displays only when Preempt Logic parameter is set to Advnce on the TEMPLATE: preemption Window. (See Figure 10-5)
- Prime UAX Value when set to IP, RDAX, or IP+RDAX
- Prime UAX Pickup time in seconds
- GCP Transmit Level
- Island Frequency

10.2.4.2 <u>The TEMPLATE: track "N"-Uni, Island Window</u>

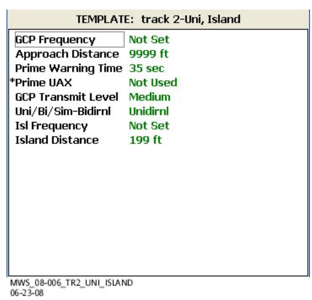


Figure 10-9:
The TEMPLATE: track "N"-Uni, Island Window
with Preemption set to Off and Prime UAX set to Off

The **TEMPLATE: track "N"–Uni, Island** Window (Preemption and Prime UAX Off) (See Figure 10-9) sets track circuit/island configuration parameters. A window appears for each assigned Track Module. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Prime UAX when set to Not Used
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl setting
- Island frequency
- Island Distance

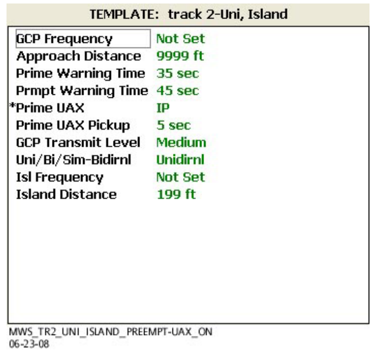


Figure 10-10:
The TEMPLATE: track “N”-Uni, Island Window
with Preemption set to “Advnce” and Prime UAX On

The **TEMPLATE: track “N”–Uni, Island** Window (Preemption Advnce and Prime UAX On) (See Figure 10-10) sets track circuit/island configuration parameters. A window appears for each assigned Track Module. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Preempt warning time (entry displays only when Preempt Logic parameter is set to Advnce on the TEMPLATE: preemption Window. See Figure 10-5)
- Prime UAX Value when set to IP, RDAX, or IP+RDAX
- Prime UAX Pickup time in seconds
- GCP Transmit Level
- Island Frequency

10.2.4.3 The TEMPLATE: track “N”-Uni, No Island Window

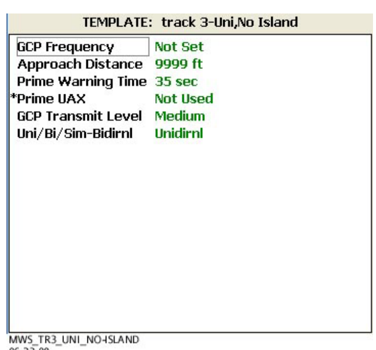


Figure 10-11:
The TEMPLATE: track “N”-Uni, No Island Window
with Preemption and Prime UAX set to Off

The **TEMPLATE: track "N"–Uni, No Island** Window (Preemption and Prime UAX Off) (See Figure 10-11) sets track circuit configuration parameters. A window appears for each assigned Track Module. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Prime UAX when set to Not Used
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl setting

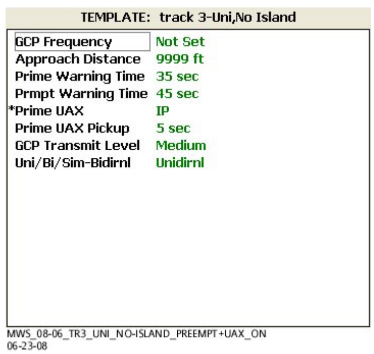


Figure 10-12:
The TEMPLATE: track "N"-Uni, No Island Window with Preemption set to "Advnce" and Prime UAX set to On

The **TEMPLATE: track "N"–Uni, No Island** Window (Preemption Advnce and Prime UAX On) (See Figure 10-12) sets track circuit configuration parameters. A window appears for each assigned Track Module. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Preempt warning time (entry displays only when Preempt Logic parameter is set to Advnce on the TEMPLATE: preemption Window. See Figure 10-5)
- Prime UAX Value when set to IP, RDAX, or IP+RDAX
- Prime UAX Pickup time in seconds
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl setting

10.2.4.4 The TEMPLATE: track N DAXes Window

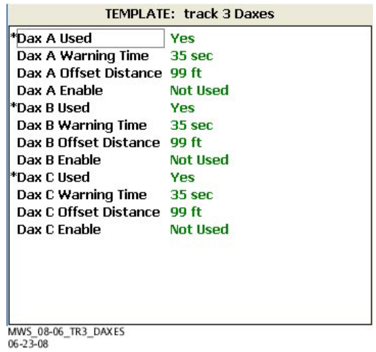


Figure 10-13:
The TEMPLATE: track "N" DAXes Window

The **TEMPLATE: track "N" DAXes** Window (Figure 10-13) sets operating parameters of DAX A, B, and C. A window appears for each enabled track that is configured by the template for unidirectional operation.

It also allows the following parameters to be set:

- DAX "X" used. When set to Yes, the following parameters appear
- DAX "X" warning Time
- DAX "X" offset Distance
- DAX "X" enable

10.2.4.5 The TEMPLATE: track "N"- Remote Prime Window

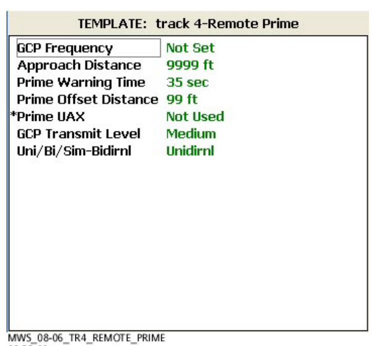
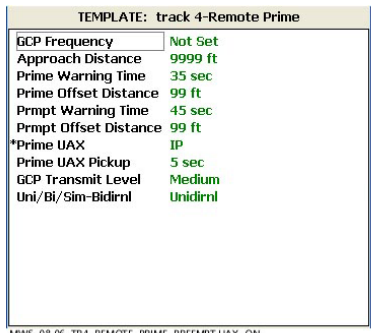


Figure 10-14:
The TEMPLATE: track "N"-Remote Prime Window
with Preemption and Prime UAX set to Off

The **TEMPLATE: track "N"– Remote Prime** Window (Preemption and Prime UAX Off) (See Figure 10-14) sets track circuit remote prime configuration parameters. A window appears for each assigned Track Module so configured. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Prime offset distance
- Prime UAX set to Not Used
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl setting



MWS_08-06_TR4_REMOTE_PRIME_PREEMPT-UAX_ON
06-23-08

Figure 10-15:
The TEMPLATE: track "N"- Remote Prime Window with Preemption set to "Advnce" and Prime UAX set to On

The **TEMPLATE: track "N"– Remote Prime** Window (Preemption Advnce and Prime UAX On) (See Figure 10-15) sets track circuit remote prime configuration parameters. A window appears for each assigned Track Module so configured. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- Prime warning time
- Prime offset distance
- Preempt warning time (entry displays only when Preempt Logic parameter is set to Advnce on the TEMPLATE: preemption Window. See Figure 10-5)
- Preempt offset distance
- Prime UAX Value when set to IP, RDAX, or IP+RDAX
- Prime UAX Pickup time in seconds
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl setting

10.2.4.6 The TEMPLATE: track "N"- Remote DAX Window

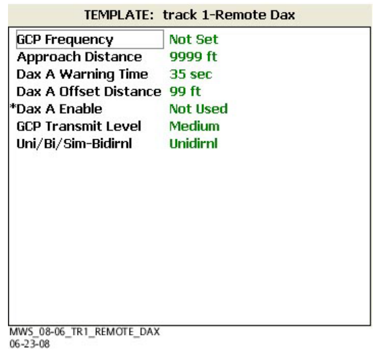


Figure 10-16:
The TEMPLATE: track "N"-Remote DAX Window

The **TEMPLATE: track "N"– Remote DAX** Window (See Figure 10-16) sets track circuit remote DAX configuration parameters. A window appears for each assigned Track Module so configured. The window default settings vary according to track circuit location relative to the crossing

It also allows the following parameters to be set:

- GCP frequency
- Approach distance
- DAX A warning time
- DAX A offset distance
- DAX A enable
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl setting

10.2.4.7 The TEMPLATE: track "N" – Remote DAXes Window

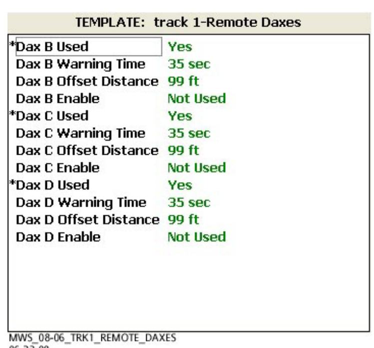


Figure 10-17:
The TEMPLATE: track "N"- Remote DAXes Window

The **TEMPLATE: track "N" Remote DAXes** Window (Figure 10-17) sets operating parameters of DAX A, B, and C. A window appears for each enabled track that is configured by the template for unidirectional operation.

It also allows the following parameters to be set:

- DAX “X” used. When set to Yes, the following parameters appear
- DAX “X” warning Time
- DAX “X” offset Distance
- DAX “X” enable

10.2.5 The TEMPLATE: track ANDing Window

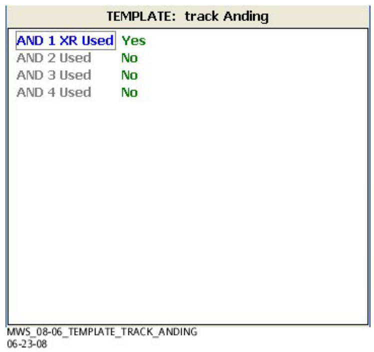


Figure 10-18:
The TEMPLATE: track ANDing Window

The **TEMPLATE: track ANDing** Window enables system AND functions.

10.2.6 The TEMPLATE: AND 1 XR Window

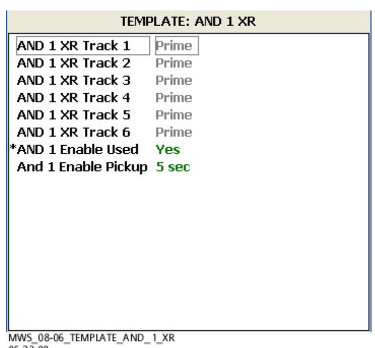


Figure 10-19:
The TEMPLATE: AND 1 XR Window

The **TEMPLATE: AND 1 XR** Window depicts the **AND 1 XR function** input allocation for each track module assigned to a track slot. This window enables and configures the **AND 1 XR Enable Used** input.

10.2.7 The TEMPLATE: SSCC Window

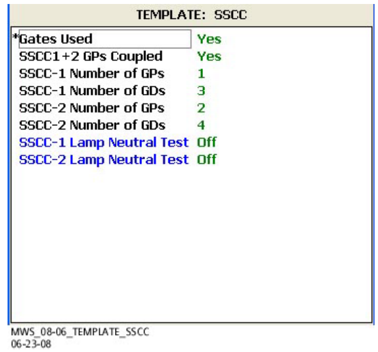


Figure 10-20:
The TEMPLATE: SSCC Window

The **TEMPLATE: SSCC** Window sets SSCC circuit configuration parameters. This window appears when one or both modules are assigned to SSCC slots.

10.2.8 The TEMPLATE: OOS Window

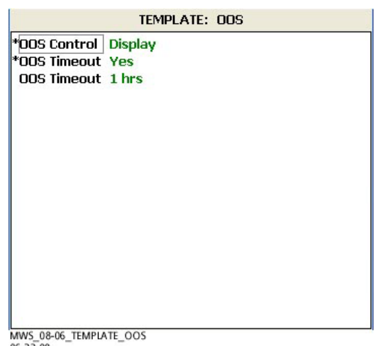


Figure 10-21:
The TEMPLATE: OOS Window

The **TEMPLATE: OOS** Window enables system **Out of Service (OOS)** functions.

10.2.9 The TEMPLATE: OP assignment 1 Window

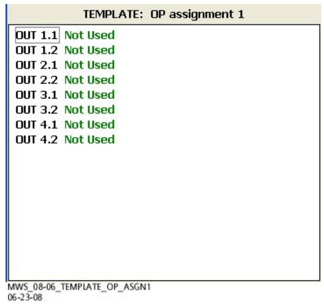


Figure 10-22:
The TEMPLATE: OP assignment 1 Window

The **TEMPLATE: OP assignment 1** sets output functions for modules assigned to **Tracks 1** through **4** and/or **RIO 1.** Only outputs for the assigned modules appear.

10.2.10 The TEMPLATE: OP assignment 2 Window

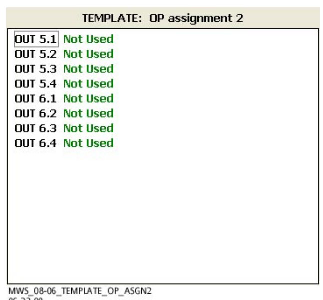


Figure 10-23:
The TEMPLATE: OP assignment 2 Window

The **TEMPLATE: OP assignment 2** Window sets output functions for Track or RIO modules assigned to **Track 5/RIO 2** and **Track 6/RIO 3**. Only outputs for the assigned modules appear.

10.2.11 The TEMPLATE: IP assignment 1 Window

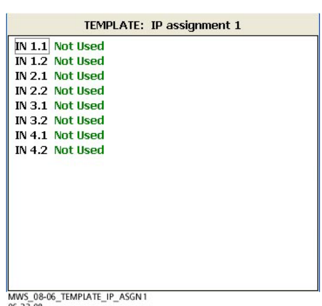


Figure 10-24:
The TEMPLATE: IP assignment 1 Window

The **TEMPLATE: IP assignment 1** Window sets input functions for Track Modules assigned to **Track Slots 1** through **4** and **RIO slot 1**. Only inputs for the assigned modules appear.

10.2.12 The TEMPLATE: IP assignment 2 Window

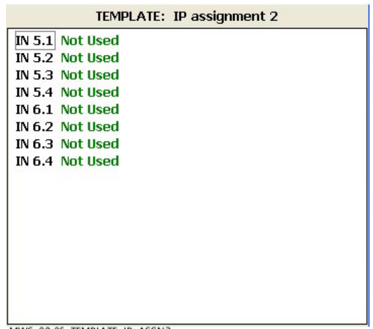


Figure 10-25:
The TEMPLATE: IP assignment 2 Window

The **TEMPLATE: IP assignment 2** Window sets input functions for modules assigned to **Track 5/RIO 2** and **Track 6/RIO 3** slots. Only inputs for the assigned modules appear.

10.2.13 The TEMPLATE: IP assignment SSCC Window

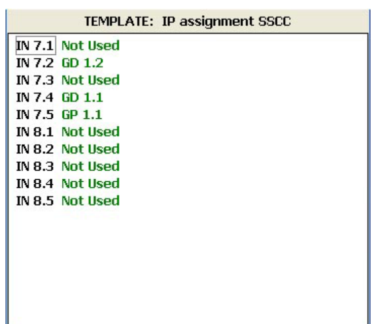


Figure 10-26:
The TEMPLATE: IP assignment SSCC Window

The **TEMPLATE: IP assignment SSCC** Window sets input allocations for modules assigned to **SSCC 1** and **SSCC 2** slots. The window appears only when modules are assigned to **SSCC 1** and/or **SSCC 2** slots. Only the inputs for slots with assigned SSCC module appear.

10.2.14 The TEMPLATE: Site Info Window

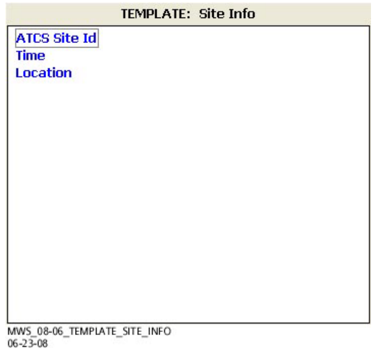


Figure 10-27:
The TEMPLATE: Site Info Window

The **TEMPLATE: Site Info** Window sets the system:

- ATCS site identification number
- Time
- Location Data

10.2.15 The TEMPLATE: SEAR Window

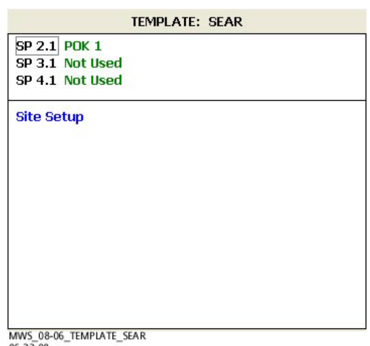


Figure 10-28:
The TEMPLATE: SEAR Window

The **TEMPLATE: SEAR** Window sets SEAR input assignments. The window appears only when **SEAR Used** status field of **TEMPLATE: module configuration** is set to **Yes.** The **Site Setup** window entry provides access to the SEAR interface display.

10.3 BASIC MENUS

The **2 BASIC configuration** entry provides access to the following configuration menu windows:

10.3.1 The BASIC: module configuration Window

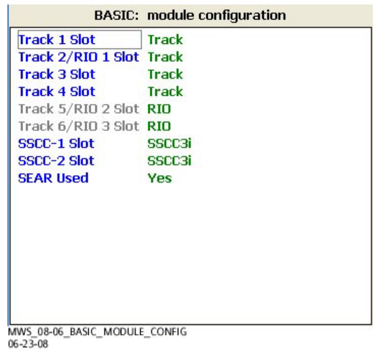


Figure 10-29:
The BASIC: module configuration Window

The **BASIC: module configuration** Window displays which modules are used in the system.

10.3.2 The BASIC: MS/GCP operation Window

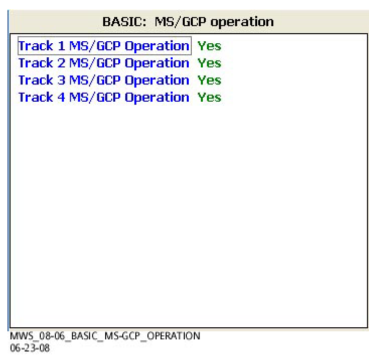


Figure 10-30:
The BASIC: MS/GCP operation Window

The **BASIC: MS/GCP operation** Window specifies MS/GCP operation for each active track

10.3.3 The BASIC: island operation Window

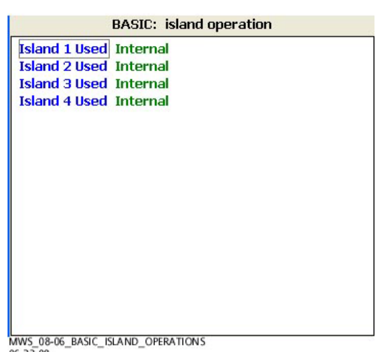


Figure 10-31:
The BASIC: island operation Window

The **BASIC: island operation** Window sets the island function for each active track. When the **Island Used** parameter is set to **External** or **No**, **Island Cal Req** is no longer displayed

10.3.4 The BASIC: preemption Window

10.3.4.1 The BASIC: preemption "No" Window

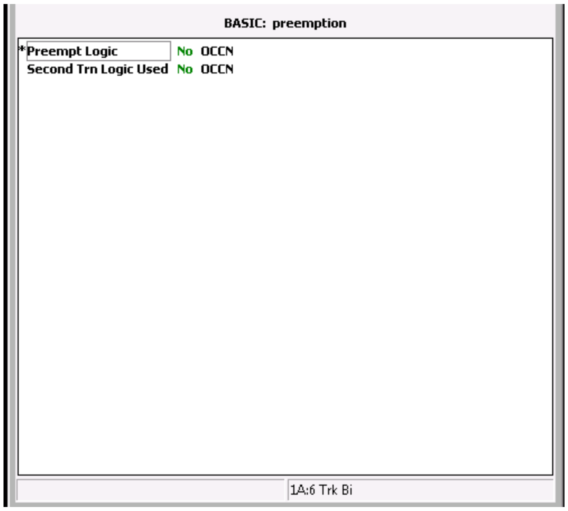


Figure 10-32:
The BASIC: preemption "No" Window

The **BASIC: preemption** Window provides three program displays: **No**, **Advnce**, and **Simult.** The no preemption window displays when the **Preempt Logic** selection field is set to **No**. It is the default window.

10.3.4.2 The BASIC: preemption "Advnce" Window

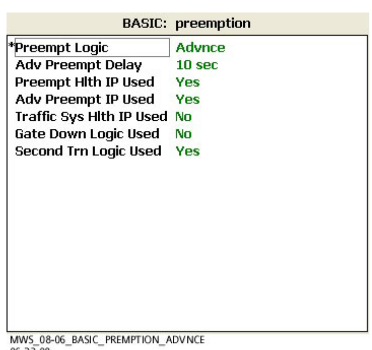


Figure 10-33:
The BASIC: preemption "Advnce" Window

The advance preemption window displays when the **Preempt Logic** selection field is set to **Advnce**.

10.3.4.3 The BASIC: preemption "Simult" Window

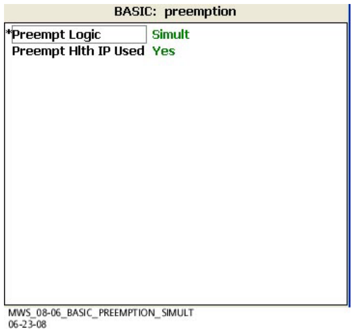


Figure 10-34:
The BASIC: preemption "Simult" Window

The simultaneous preemption window displays when the Preempt **Logic** selection field is set to **Simult**.

10.3.5 The BASIC: radio Dax links Window

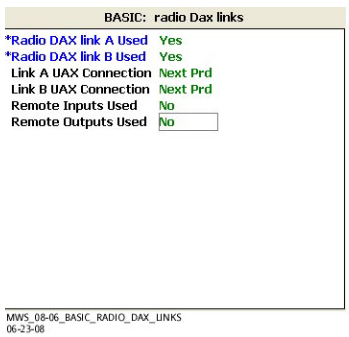


Figure 10-35:
The BASIC: radio Dax links Window

The **BASIC: radio Dax links** Window is used to configure the Radio DAX Communication links that allow a Model 4000 GCP to communicate with another Model 4000 GCP via Echelon.

The BASIC: track "N" link "X" Window

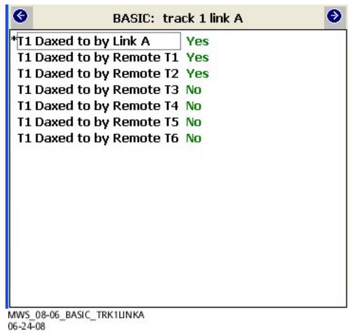


Figure 10-36:
The BASIC: track "N" link "X" Window

The **BASIC: track "N" link "X"** Window sets the Radio DAX link functional status for DAX A or DAX B. It displays only when **Radio DAX link "X" Used** field is set to **Yes**.

10.3.6 The BASIC: Dax link A Window

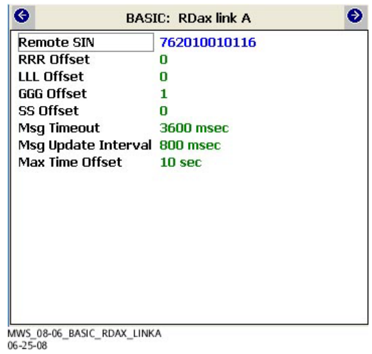


Figure 10-37:
The BASIC: Dax link A Window

The **BASIC: Dax link A** Window sets the Radio DAX link A offset information. It displays only when **Radio DAX link A Used** field is set to **Yes**.

10.3.7 The BASIC: Vital Comms links Window

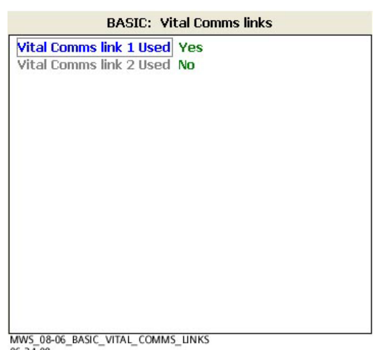


Figure 10-38:
The BASIC: Vital Comms links Window

The **BASIC: Vital Comms links** Window is used to configure the Vital Communication links that allow a Model 4000 GCP to communicate with another Model 4000 GCP or an HD/Link via Echelon.

10.3.8 The BASIC: Vital Comms link "N" Window

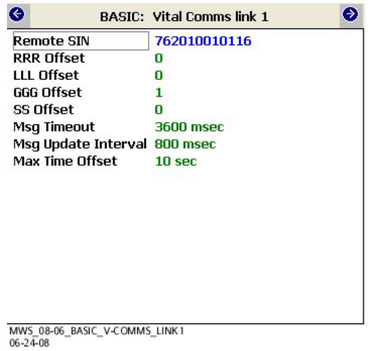


Figure 10-39:
The BASIC: Vital Comms link 1 Window

The **BASIC: Vital Comms link "N"** Window is used to configure the ATCS Address and Session timing parameters for Vital Communications link 1. It displays when Vital Comms link 1 Used or Vital Comms Link 2 Used is set to Yes.

10.4 PREDICTORS MENUS

The **3 PREDICTORS configuration** entry provides access to up to six predictor menu windows:

10.4.1 The PREDICTORS: track "N" Window

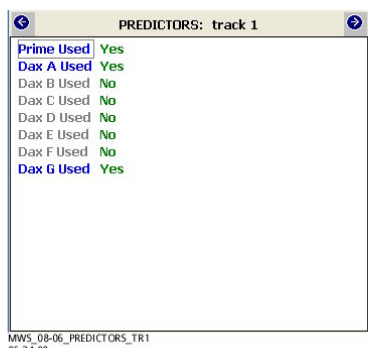


Figure 10-40:
The PREDICTORS: track "N" Window

The **PREDICTORS: track "N"** Window sets which predictors are used. A **PREDICTORS: track N** window appears for each assigned Track Module. The **Preempt Used** field is present only when the Preempt **Logic** selection field is set to **Advnce**. Use the Arrow buttons at top of the window to move between the **PREDICTORS: track** windows.

10.5 GCP MENUS

The **4 GCP programming** entry provides access to the following configuration menu windows:

10.5.1 The GCP: track "N" Window

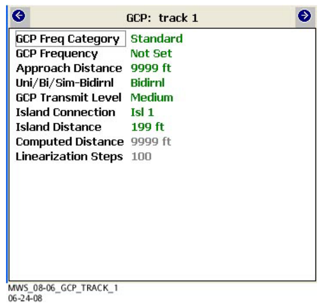


Figure 10-41:
The GCP: track "N" Window

The **GCP: track "N"** Window sets the corresponding track circuit configuration parameters. A **GCP: track** window appears for each assigned Track Module. Use the Arrow buttons at top of window to move between the **GCP: track** windows.

10.5.2 The GCP: track "N" enhanced det Window

Figure 10-42:
The GCP: track "N" enhanced det Window

The **GCP: track "N" enhanced det** Window sets the corresponding track circuit enhanced detection parameters. A **GCP: track prime** window appears for each assigned Track Module. Use the Arrow buttons at top of window to move between the GCP: track enhanced det windows

Post Joint Detn Time: In previous releases and the 3000 GCP, the post joint detection time for DAXes was adjusted by modifying the Island Distance. The "Post Joint Detection Time" allows the user to directly enter the required time.

- The window display is determined by the **Adv Appr Predn** selection field. The default configuration displays with this field set to **No.** The alternate configuration displays when this field is set to **Yes**.

10.5.3 The GCP: track “N” enhanced det “Adv Appr Predn Yes” Window

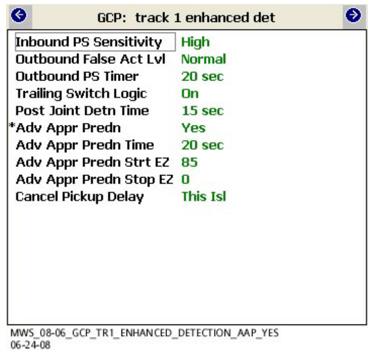


Figure 10-43:
The GCP: track “N” enhanced det “Adv Appr Predn Yes” Window

The **GCP: track “N” enhanced det** “Adv Appr Predn Yes” Window sets the corresponding values when **Adv Appr Predn** is set to **Yes.** This new feature has been added to improve GCP capability regarding prediction within crossovers (or other moves) where a train moves from one track circuit through an unmonitored section of rail and then on to a second track circuit. Adv Appr Prediction allows the GCP to predict within an unmonitored section of rail. Adv Appr Predn Time sets the time for which the prediction process continues. Default is 20s. Adv Appr Predn Strt EZ and Stop EZ selects the start and stop values of Adv Appr Predn. Default EZ value for Adv Appr Predn Strt EZ is 85. Default EZ value for Adv Appr Predn St09 EZ is 0. Cancel Pickup Delay: This option is used in conjunction with crossover applications to allow GCP approaches to truncate pick-up delay time if they are not otherwise effected by in bound train movement. Options are **This Isl** or **Any Isl**. Default is **This Isl**.

10.5.4 The GCP: track “N” RX BIDAX Window

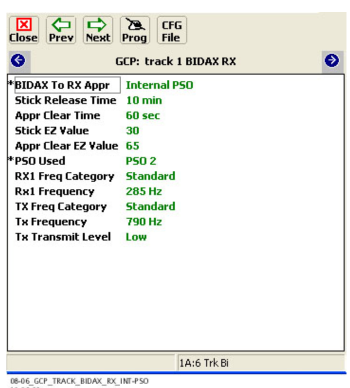


Figure 10-44:
The GCP: track “n” BIDAX RX Window

Refer to Section 6.12.6 for information regarding the GCP: track “n” BIDAX RX Window

10.5.5 The GCP: track "N" TX BIDAX Window

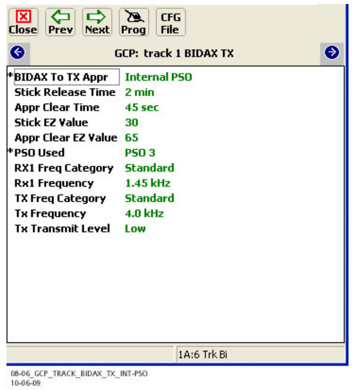


Figure 10-45:
The GCP: track "n" BIDAX TX Window

Refer to Section 6.12.6 for information regarding the GCP: track "n" BIDAX TX Window

10.5.6 The GCP: track "N" prime Window

There are two screen versions activated in the **GCP: track "N" prime** window: **Prime Warning Time** and **Prime MS/GCP mode.**

10.5.6.1 The GCP: track "N" prime "Prime Warning Time - Predictor" Window

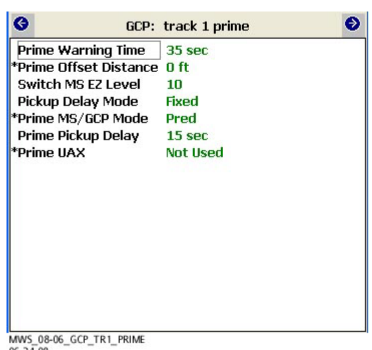


Figure 10-46:
The GCP: track "N" prime "Prime Warning Time - Predictor" Window

The **GCP: track "N" prime** Window sets the corresponding track circuit prime predictor parameters. A **GCP: track prime** window appears for each assigned Track Module. Use the Arrow buttons at top of window to move between the GCP: track prime windows. The window display is determined by the **Prime MS/GCP Mode** selection field. **Switch MS EZ Level:** Value may be used with non-zero offset predictors (prime or DAXes). **Switch MS EZ Level** will not affect DAXes on reverse moves. The default configuration displays with this field set to **Pred.**

10.5.6.2 The GCP: track “N” prime “Prime MS/GCP Mode - MS” Window

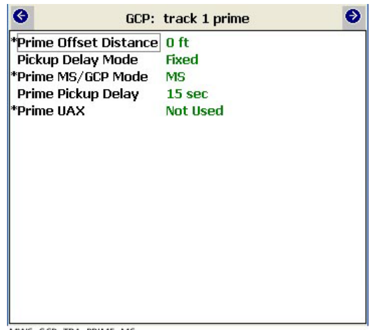


Figure 10-47:
The GCP: track “N” prime “Prime MS/GCP Mode - MS” Window

The alternate configuration displays when this field is set to **MS**.

10.5.7 The GCP: track “N” Dax A Window

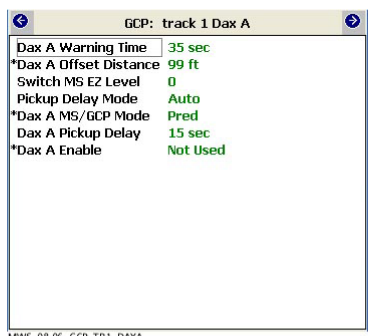


Figure 10-48:
The GCP: track “N” Dax A Window

The **GCP: track “N” Dax A** Window sets the **DAX A** parameters for the active track. The **GCP: track Dax** window display only when the corresponding **Dax Used** function of the **PREDICTORS: track** window is set to **Yes.** Use the Arrow buttons at top of window to move between corresponding DAX windows on other track modules. **Prime/Dax A...G/Preempt Pickup Delay Mod**e can be set to Auto when Adv Appr prediction used. **Prime/Dax A...G/Preempt MS/GCP Mode** remains editable when a non-zero offset distance is entered, allowing DAXes to be set to motion sensors without first setting their offsets to zero. Setting to MS mode will not affect DAXes on reverse moves.

10.5.8 The GCP: track “N” preempt Window

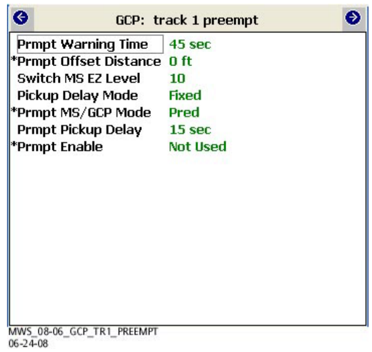


Figure 10-49:
The GCP: track “N” preempt Window

The **GCP: track “N” preempt** Window sets the preemption parameters for the active track. A **GCP: track preempt** window displays only when the advanced preemption function or second train logic used is selected. A **GCP: track preempt** window appears for each assigned Track Module. Use the Arrow buttons at top of window to move between the **GCP: track preempt** windows on other track modules.

10.5.9 The GCP: track “N” pos start Window

The **GCP: track “N” pos start** window has three parameters that may be turned on or off: **Positive Start**, **Sudden Shunt Det Used**, and **Low EZ Detection Used.**

10.5.9.1 <u>The GCP: track “N” pos start “Positive Start and Sudden Shunt Det On” Window</u>

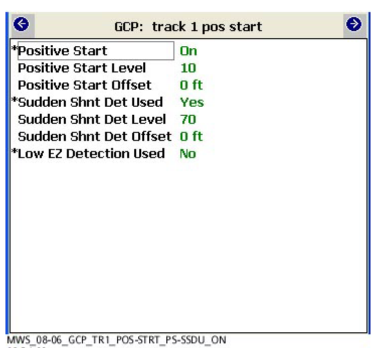


Figure 10-50:
The GCP: track “N” pos start “Positive Start and Sudden Shunt Det On” Window

The **GCP: track “N” pos start** Window has been changed significantly in this revision. **Positive Start Offset:** (default **0**ft). This allows positive start to be used with DAXes. When EZ is less than positive start level, DAXes (non-zero offset predictors) with offsets less than the configured Positive start offset will be de-energized on inbound moves. Positive start does not affect DAXes on reverse moves. **Sudden Shunt Detection Used:** has options “Sudden Shunt Detection Level” and “Sudden Shunt Detection Offset”. This new option is useful for applications where an insulated joint is close to the GCP island and it is desired to detect the train immediately as it enters the GCP approach.

10.5.9.2 The GCP: track "N" pos start "Low EZ Detection On" Window

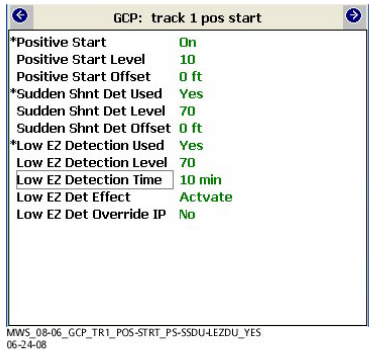


Figure 10-51:
The GCP: track "N" pos start "Low EZ Detection On" Window

The GCP: track "N" pos start "Low EZ Detection On" Window shows more track configuration options. Window with **Low EZ Detection Used** set to **Yes**. **Low EZ Detection Used:** Low EZ Detection Effect (Activate, MS, Act+MS, Default **Activate**) and Low EZ Detection Override IP (when used inputs called T* Low EZ Override can be assigned to inputs).

10.5.10 The GCP: track "N" MS Control Window

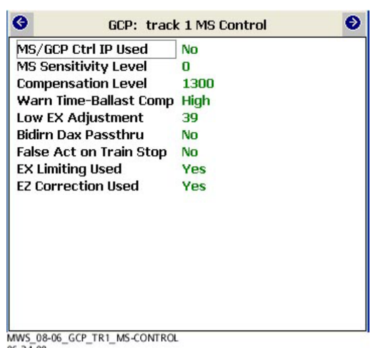


Figure 10-52:
The GCP: track "N" MS Control Window.

Warn Time-Ballast Comp: Values None, Low, Med, High (default **High** for tracks with island, **Low** for tracks with no island). This option is used to add warning time when EX is low, the amount of warning time depends on the option setting.

False Activation On Train Stop: added. This can be used in areas of high noise and is used to help prevent a false activation of the crossing due to noise when a train is stopped close to the crossing.

EX Limiting Used: Yes, No (default **Yes**). This option is used to reduce effect of bad bonds, couplers etc, (track conditions that cause EX to decrease on inbound train) on warning time.

EZ Correction Used: (Yes, no, default **Yes**). Used to stabilize the EZ at 100 over the full range of ballast conditions that may occur during normal seasonal cycles. This will allow for more consistency in the EZ value viewed when no train is present on a monitored track.

10.6 ISLAND PROGRAMMING MENUS

The **5 ISLAND programming** entry provides access to the island menu windows:

10.6.1 The ISLAND: track "N" Window

There are three separate versions of the **ISLAND: track "N"** window: **Basic**, **Isl Enable IP Used**, and **Pickup Delay.**

10.6.1.1 The basic ISLAND: track "N" Window

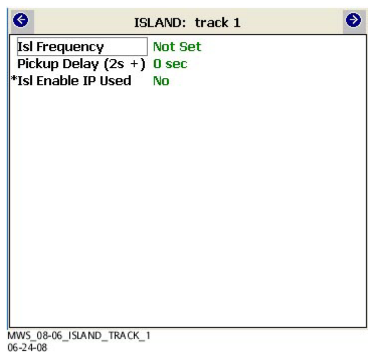


Figure 10-53:
The ISLAND: track "N" Window

The **ISLAND: track "N"** Window sets the active island parameters. An **Island: track** window appears for bidirectional or unidirectional pair crossing applications: Window appears when the **BASIC: island operation** window entries are set to **Internal**. Use the Arrow buttons at top of the window to move between the **ISLAND: track** windows. Use the **Isl Enable IP Used** to have an external island enable used in conjunction with an existing internal island. With the latest software revision, if Not Set is selected, a spurious 20 kHz signal is no longer transmitted. Default setting is **No**.

10.6.1.2 The Isl Enable IP Used Window

Figure 10-54:
The ISLAND: track "N" "Isl Enable IP Used" Window

Isl Enable IP Used sets the active internal island IP to add an external island. This allows an Island Enable input to be used in conjunction with an internal island. This can be used to cause an island event to truncate pickup delays. This window appears when the **Isl Enable IP Used** is set to **Yes**, The input previously known as "Ext Island n", has been renamed **"Isl n Enable"** (same input as used with Isl Enable IP above).

10.6.1.3 The Pickup Delay 1 sec Window

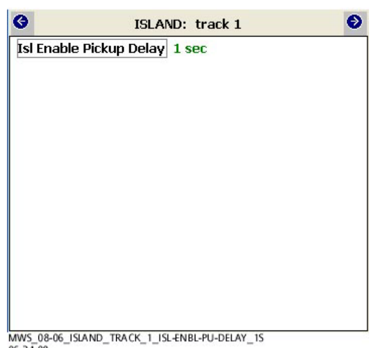


Figure 10-55:
The ISLAND: track "N" "Pickup Delay 1 sec" Window

The Pickup Delay 1 sec Window sets the active external island pickup delay parameter. An **Island: track** window appears for bidirectional or unidirectional pair crossing applications. This window appears when the **BASIC: island operation** window entries are set to **External**.

10.7 AND TRACK CONFIGURATION MENUS

The **6 AND track configuration** entry provides access to the following AND configuration menu windows:

10.7.1 The AND: track ANDing Window

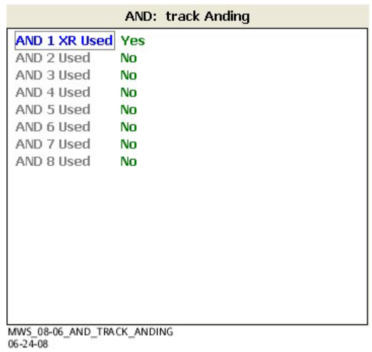


Figure 10-56:
The AND: track ANDing Window

The **AND: track ANDing** Window sets the AND functions that are used.

10.7.2 The AND: AND 1 XR Window

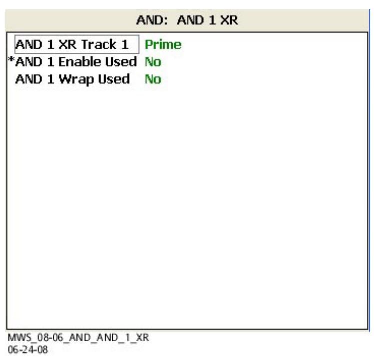


Figure 10-57:
The AND: AND 1 XR Window

The **AND: AND 1 XR** Window sets the inputs for each AND function. An input entry appears for each enabled track circuit. An **AND** window appears for each enabled internal AND function.

10.8 ADVANCED PROGRAMMING MENUS

The **7 ADVANCED programming** entry provides access to the **ADVANCED: programming** menu window:

10.8.1 The MS restart Window

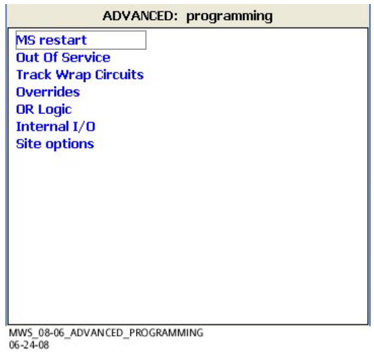


Figure 10-58:
The MS restart Window

The **MS restart** Window provides links to Advanced function windows.

10.8.1.1 The ADVANCED: MS restart Window

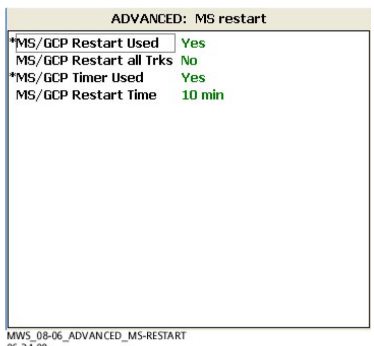


Figure 10-59:
The ADVANCED: MS restart Window

The **ADVANCED: MS restart** Window activates and controls the **MS/GCP Restart Used** function. When set to **Yes**, it keeps the MS restart timer running for the selected period of time while the train is stopped. When set to **No**, the change to motion sensor will remain in effect until the train has left the approach and has crossed the MS Restart EZ Level. Maximum value of MS Restart time is 60 minutes (3600 seconds). **MS/GCP Timer Used:** added to the MS/GCP restart function. When the timer is not used, the system will remain a motion sensor until the train leaves the approach, or passes through the island.

10.8.1.2 The ADVANCED: restart track "N" Window

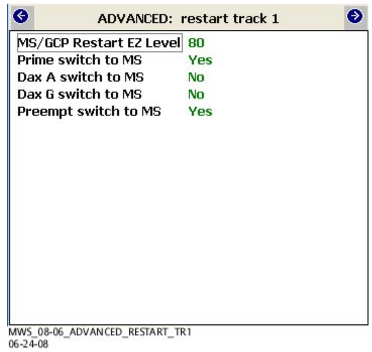


Figure 10-60:
The ADVANCED: restart track "N" Window

The **ADVANCED: restart track "N"** Window activates and controls **MS Restart EZ Level** function for individual tracks. The **MS/GCP Restart EZ Level** has been added for each track (range 5 to 80, default 80). In the previous system a train stopping between EZ 5 and 80 will cause the MS restart timer to start. In the new software, a train stopping between 1 and the configured MS/GCP Restart EZ Level will cause the MS restart timer to start

10.8.2 The ADVANCED: out of service Window

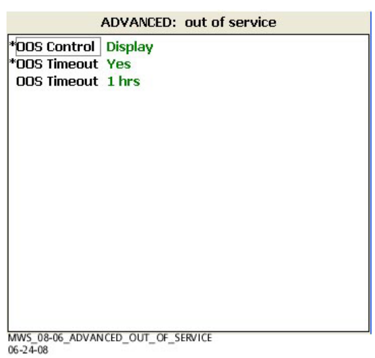


Figure 10-61:
The ADVANCED: out of service Window

The **ADVANCED: out of service** Window selects which method is used to take the GCP and Island functions out of service. For the **Display** mode, it allows selection of an out of service time. The **OOS Control None** was added to allow the user to elect to not specify an OOS input from some tracks, and specify ones for other tracks when OOS inputs are used.

10.8.2.1 The ADVANCED: out of service "Display + OOS IPs" Window

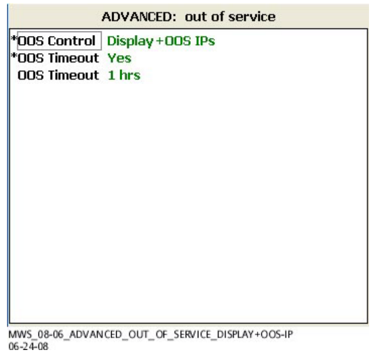


Figure 10-62:
The ADVANCED: out of service "Display + OOS IPs" Window

The **ADVANCED: out of service "Display + OOS IPs"** Window selects which method is used to take the GCP and Island functions out of service. For the **Display+OOS IP** mode, it allows selection of an out of service time.

10.8.2.2 The ADVANCED: out of service 2 Window

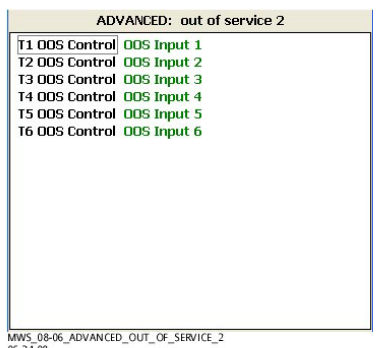


Figure 10-63:
The ADVANCED: out of service 2 Window

The **ADVANCED: out of service 2** Window is activated when **OOS Control** is set to **Display+OOS IPs**, the **ADVANCED: out of service 2** display allows selection of which out of service input will be used to take the indicated track out of service.

10.8.2.3 The ADVANCED: out of service 2 "OOS IP" Window

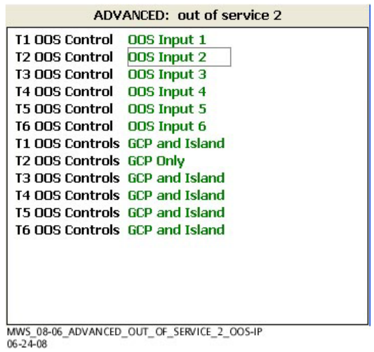


Figure 10-64:
The ADVANCED: out of service 2 "OOS IPs" Window

The **ADVANCED: out of service 2 "OOS IP**" Window when **OOS Control** is set to **OOS IPs**, the **ADVANCED: out of service 2** display allows selection of which out of service input will be used to take the indicated track out of service and whether the input affects the GCP and/or the Island

10.8.3 The ADVANCED: track wrap circuits Window

Figure 10-65:
The ADVANCED: track wrap circuits Window

The **ADVANCED: track wrap circuit**s Window sets which track wrap inputs are used.

10.8.4 The ADVANCED: trk 1 overrides Window

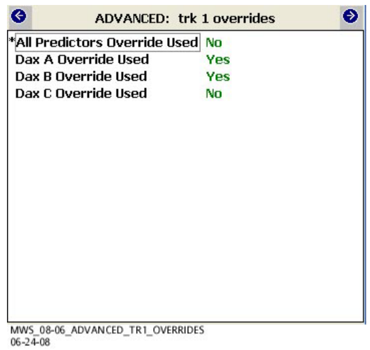


Figure 10-66:
The ADVANCED: trk 1 overrides Window

The **ADVANCED: trk 1 overrides** Window Sets the predictor override status. An **ADVANCED: trk 1 overrides** window appears for each assigned Track Module. Use the Arrow buttons at top of the window to move between the **ADVANCED: track overrides** windows of other track modules.

10.8.5 The ADVANCED: OR logic Window

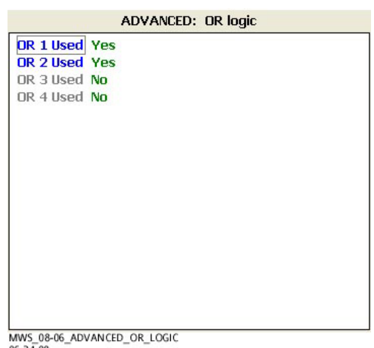


Figure 10-67:
The ADVANCED: OR logic Window

The **ADVANCED: OR logic** Window displays a list of which user configurable ORs are available. Corresponding OR function is enabled when set to **Yes**.

10.8.6 The ADVANCED: OR 1 Window

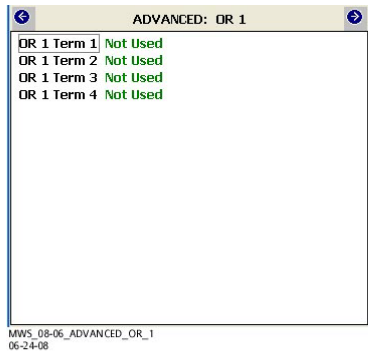


Figure 10-68:
The ADVANCED: OR 1 Window

The **ADVANCED: OR 1** Window display appears for each OR that is enabled. Allows selection of the system outputs to be used as inputs to the OR.

10.8.7 The ADVANCED: internal I/O 1 Window

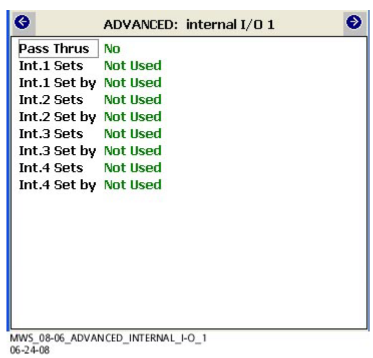


Figure 10-69:
The ADVANCED: internal I/O 1 Window

The **ADVANCED: internal I/O 1** Window specifies which output function is used to set the state of each internal state, and which input function the internal state is used to set

10.8.8 The ADVANCED: internal I/O 2 Window

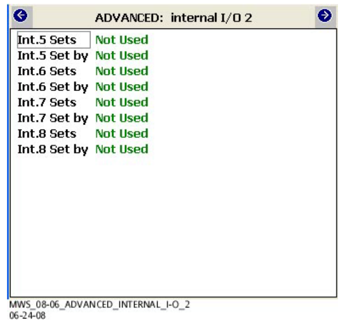


Figure 10-70:
The ADVANCED: internal I/O 2 Window

The **ADVANCED: internal I/O 2** Window specifies which output function is used to set the state of each internal state, and which input function the internal state is used to set.

10.8.9 The ADVANCED: internal I/O 3 Window

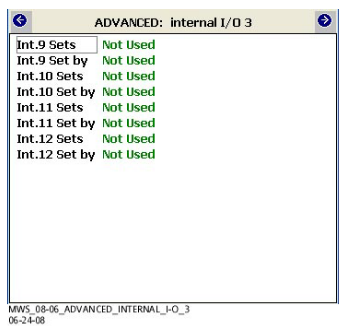


Figure 10-71:
The ADVANCED: internal I/O 3 Window

The **ADVANCED: internal I/O 3** Window specifies which output function is used to set the state of each internal state, and which input function the internal state is used to set.

10.8.10 The ADVANCED: internal I/O 4 Window

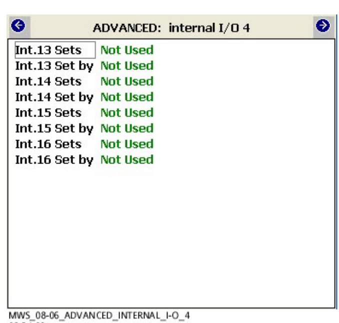


Figure 10-72:
The ADVANCED: internal I/O 4 Window

The **ADVANCED: internal I/O 4** Window specifies which output function is used to set the state of each internal state, and which input function the internal state is used to set.

10.8.11 The ADVANCED: site options Window

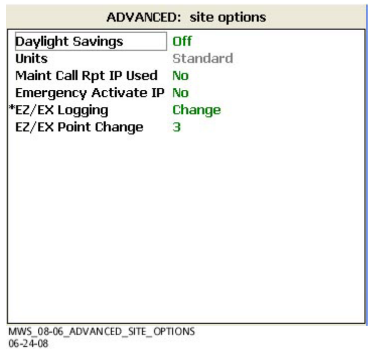


Figure 10-73:
The ADVANCED: site options Window

The **ADVANCED: site options** Window selects the Daylight savings option, the Maintenance call operation, the EZ/EX log functions, and the Emergency Activation function.

10.9 SSCC PROGRAMMING

The **8 SSCC programming** entry provides access to the following SSCC configuration windows:

10.9.1 The SSCC Window

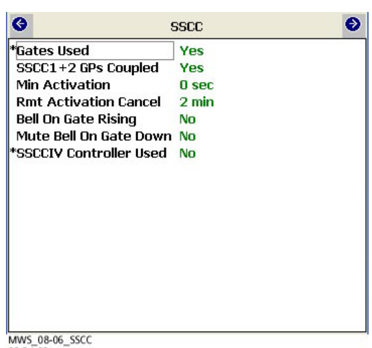


Figure 10-74:
The SSCC Window

The **SSCC** Window sets the options / levels of the SSCC functions. Use the Arrow buttons at top of the window to move between the SSCC windows. The options displayed in the window depend on how the SSCCs are being used.

10.9.1.1 The SSCC "SSCCIV Controller Used 4000 Exit" Window

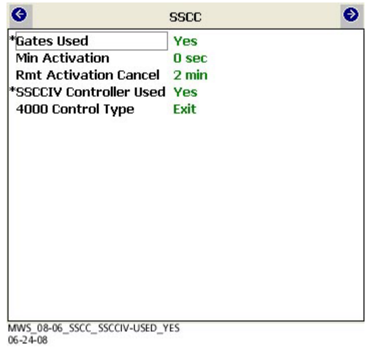


Figure 10-75:
The SSCC "SSCCIV Controller Used 4000 Exit" Window

The **SSCC "SSCCIV Controller Used 4000 Exit"** Window is displayed when the Model 4000 GCP is used as an exit gate controller and the SSCCIV as an entrance gate controller.

10.9.1.2 The SSCC "SSCCIV Controller Used 4000 Entrance Repeater" Window

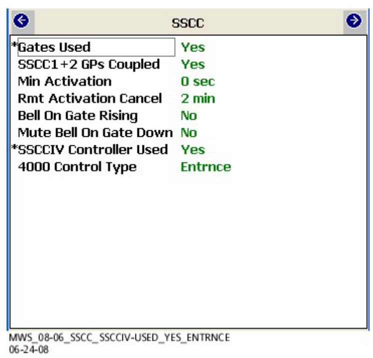


Figure 10-76:
The SSCC "SSCCIV Controller Used 4000 Entrance Repeater" Window

The **SSCC "SSCCIV Controller Used 4000 Entrance Repeater**" Window displays when the Model 4000 GCP is being used as an entrance gate controller and the SSCCIV as an entrance gate repeater.

10.9.2 The SSCCIV: Control and ATCS Setup Window

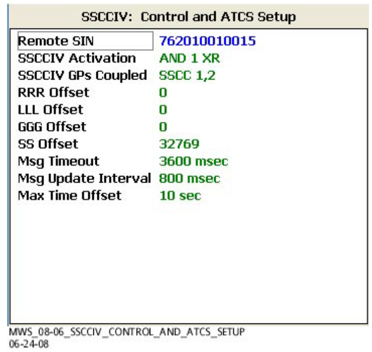


Figure 10-77:
The SSCCIV: Control and ATCS Setup Window

The **SSCCIV: Control and ATCS Setup** Window displays when SSCCIV Controller Used is set to Yes. The **SSCCIV: Control and ATCS Setup** Window is used to set the activation condition for the SSCCIV and to configure the SSCCIV ATCS address

10.9.3 The SSCC: 1 Window

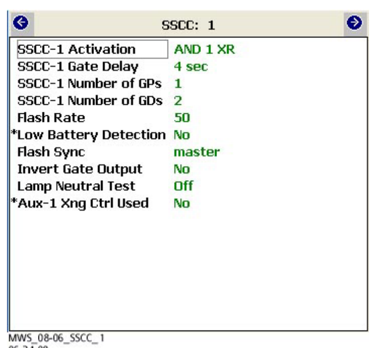


Figure 10-78:
The SSCC: 1 Window

The **SSCC: 1 Window** sets configuration options for SSCC-1 module. Use the Arrow buttons at top of the window to move between the SSCC windows.

10.9.4 The SSCC: 2 Window

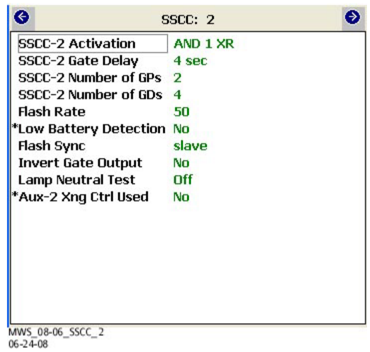


Figure 10-79:
The SSCC: 2 Window

The **SSCC: 2 Window** sets configuration options for SSCC-2 module. Use the Arrow buttons at top of the window to move between the SSCC windows

10.10 IO ASSIGNMENT MENUS

The **9 IO assignment** entry provides access to the following I/O assignment windows:

10.10.1 The OUTPUT: assignment page 1 Window

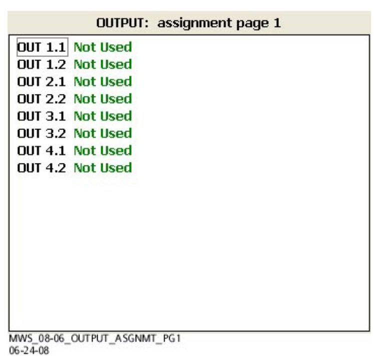


Figure 10-80:
The OUTPUT: assignment page 1 Window

The **OUTPUT: assignment page 1** Window sets output function for modules assigned to **Tracks 1** through **4** and **RIO 1.** Only outputs for assigned modules appear.

10.10.2 The OUTPUT: assignment page 2 Window

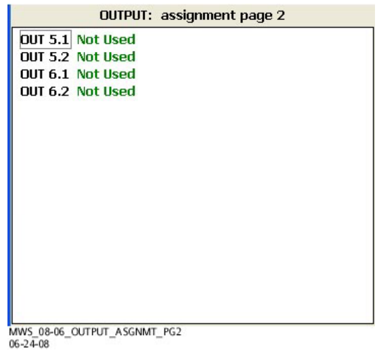


Figure 10-81:
The OUTPUT: assignment page 2 Window

The **OUTPUT: assignment page 1** Window sets output functions for modules assigned to **Track 5/RIO 2** and **Track 6/RIO 3**. Only outputs for assigned modules appear.

10.10.3 The INPUT: assignment page 1 Window

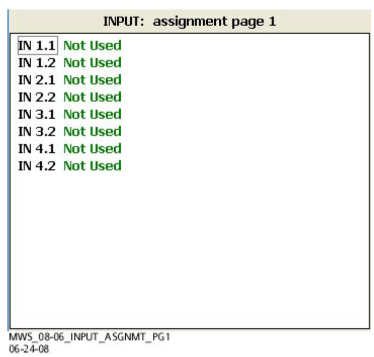


Figure 10-82:
The INPUT: assignment page 1 Window

The **INPUT: assignment page 1** Window sets input allocations for Track Modules assigned to **Track Slots 1** through **4** and **RIO Slot 1**. Only inputs for slots with assigned modules appear.

10.10.4 The INPUT: assignment page 2 Window

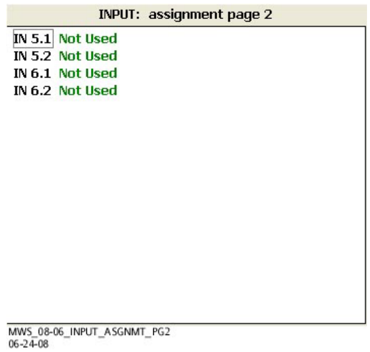


Figure 10-83:
The INPUT: assignment page 2 Window

The **INPUT: assignment page 2** Window sets input functions for modules assigned to **Track 5/RIO 2** and **Track 6/RIO 3** slots. Four inputs display for each assigned RIO Module.

10.10.5 The IO: assignment SSCC Window

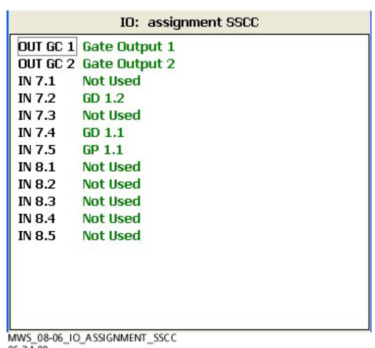


Figure 10-84:
The IO: assignment SSCC Window

The **IO: assignment SSCC Window** selects the GC and input function assignments for SSCC-1 and SSCC-2 module slots.

10.11 SEAR PROGRAMMING MENUS

The **10 SEAR programming** entry provides access to the following SEAR configuration windows:

10.11.1 The SEAR Window

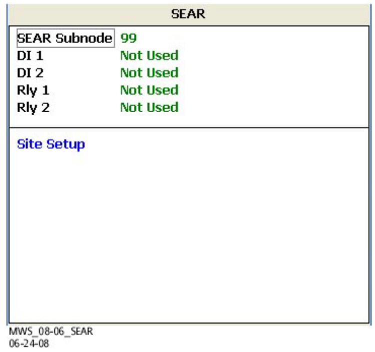


Figure 10-85:
The SEAR Window

The **SEAR** Window sets the SEAR subnode value and monitor input functions. It provides the link to the SEAR interface.

10.11.2 The SEAR: inputs Window

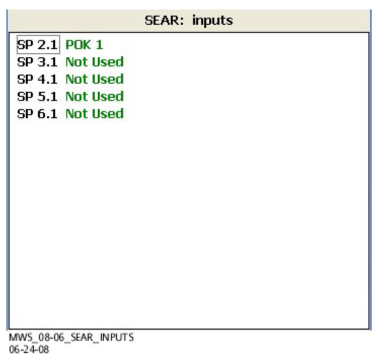


Figure 10-86:
The SEAR: inputs Window

The **SEAR: inputs** Window sets the SEAR spare function assignments for GCP connector inputs. Spare I/O on track and RIO module connectors are connected to the SEAR2i on the chassis backplane and may be used as a SEAR2i input when the module slot is empty.

NOTE

SEAR inputs are not available when they are used by the GCP application; i.e., when assigned by either of the **INPUT: assignment** windows.

10.11.3 The SEAR: slot 1 – 4 inputs Window

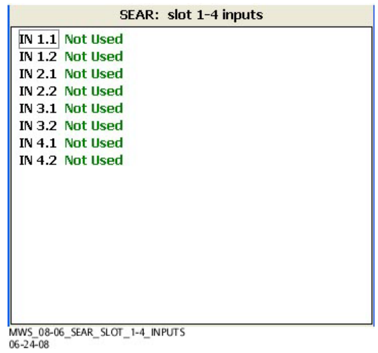


Figure 10-87:
The SEAR: slot 1 – 4 inputs Window

The **SEAR: slot 1 – 4 inputs** Window Set the SEAR input assignments for slot positions 1 through 4.

10.11.4 The SEAR: inputs slot 5 Window

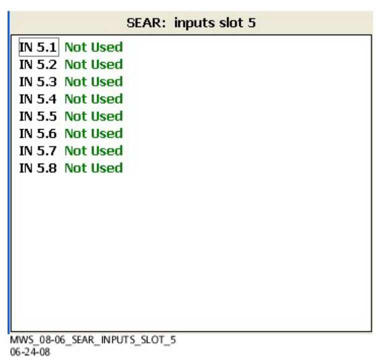


Figure 10-88:
The SEAR: inputs slot 5 Window

The SEAR: inputs slot 5 Window sets the SEAR input assignments for slot position 5. When Track 5/RIO 2 Slot is set to Track, the **SEAR: inputs slot 5** displays two inputs (IN 5.1 and IN 5.2). When Track 5/RIO 2 Slot is set to RIO, the **SEAR: inputs slot 5** displays four inputs (IN 5.1, IN 5.2, IN 5.3, and IN 5.4). When Track 5/RIO 2 Slot is set to SEAR input, the **SEAR: inputs slot 5** displays eight inputs (see Figure 10-88).

10.11.5 The SEAR: inputs slot 6 Window

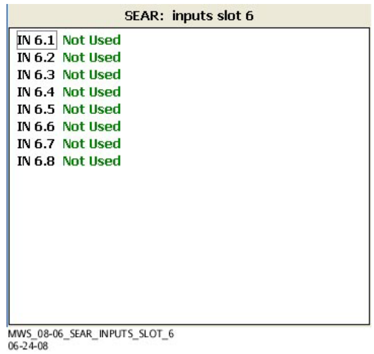


Figure 10-89:
The SEAR: inputs slot 6 Window

The SEAR: inputs slot 6 Window sets the SEAR input assignments for slot position 6. The Window displays only when SEAR is assigned to Track 6 slot position.

10.11.6 The SEAR: slot 7 – 8 inputs Window

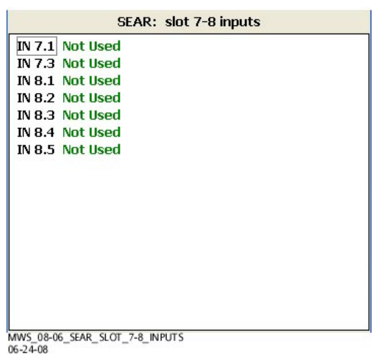


Figure 10-90:
The SEAR: slot 7 – 8 inputs Window

The SEAR: slot 7 – 8 inputs Window sets the SEAR input assignments for slot positions 7 and 8.

10.12 SITE PROGRAMMING MENU

The **11 SITE programming** entry provides access to the **SITE: programming** window:

10.12.1 The SITE: programming Window

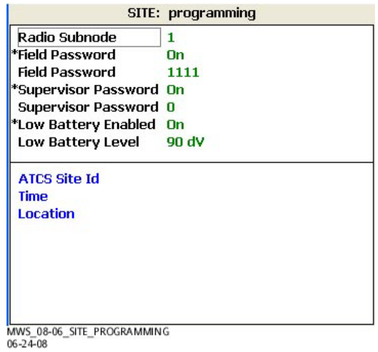


Figure 10-91:
The SITE: programming Window

The SITE: programming Window sets radio subnode value, sets the Field Password status and value, and sets the Supervisor Password status and value (The Supervisor Password is not available on DT versions 4.6.0 and earlier.), Sets Low Battery function and level, and provides links to:

- ATCS ID setup
- time set window
- location set window

APPENDIX A – MENU DEFAULT SETTINGS

A.1 OVERVIEW

This Appendix shows the default values for all GCP menu entries. Menu entries with template dependent default values are noted. Refer to Section 4 for the configuration variations for each template. In general, only track 1 defaults are listed. For track specific options, tracks 2 through 6 have the same defaults as track 1. All menu entry options are listed. Entries that are normally hidden are shown so that their default values may be listed. The default values of Six-Track Bidirectional Template MTF_1A are used as the configuration reference.

A.1.1 BASIC Configuration Menus

The **BASIC configuration** menus are shown in Table A-1.

Table A-1: BASIC configuration Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
BASIC: module configuration	Track 1 Slot	Track
	Track 2 Slot	Not Used[1]
	Track 3 Slot	Not Used[1]
	Track 4 Slot	Not Used[1]
	Track 5/RIO 1 Slot	Not Used[1]
	Track 6/RIO 2 Slot	Not Used[1]
	SSCC-1 Slot	SSCC3i[2]
	SSCC-2 Slot	SSCC3i[2]
	SEAR Used	Yes

MENU	MENU ENTRIES	DEFAULT SETTINGS
BASIC: MS/GCP operation	Track 1 MS/GCP Operation	Yes
	Track 2 MS/GCP Operation	No
	Track 3 MS/GCP Operation	No
	Track 4 MS/GCP Operation	No
	Track 5 MS/GCP Operation	No
	Track 6 MS/GCP Operation	No
BASIC: island operation	Island 1 Used	Internal
	Island 2 Used	No[1]
	Island 3 Used	No[1]
	Island 4 Used	No[1]
	Island 5 Used	No[1]
	Island 6 Used	No[1]
BASIC: preemption	Preempt Logic	No
	Adv Preempt Delay	10 sec
	Preempt Hlth IP Used	Yes
	Adv Preempt IP Used	No
	Traffic Sys Hlth IP Used	No
	Gate Down Logic Used	No
	Second Trn Logic Used	Yes (No for 2-9 MCF)
BASIC: radio Dax links	Radio DAX link A Used	No
	Radio DAX link B Used	No
	Link A UAX Connection	Next Prd
	Link B UAX Connection	Next Prd
	Remote Inputs Used	No
	Remote Outputs Used	No
BASIC: track 1 link A	T1 Daxed to by Link A	Yes
	T1 Daxed to by Remote T1	Yes
	T1 Daxed to by Remote T2	No
	T1 Daxed to by Remote T3	No
	T1 Daxed to by Remote T4	No
	T1 Daxed to by Remote T5	No
	T1 Daxed to by Remote T6	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
BASIC: track 1 link B	T1 Daxed to by Link B	Yes
	T1 Daxed to by Remote T1	Yes
	T1 Daxed to by Remote T2	No
	T1 Daxed to by Remote T3	No
	T1 Daxed to by Remote T4	No
	T1 Daxed to by Remote T5	No
	T1 Daxed to by Remote T6	No
BASIC: track 2 link A	T2 Daxed to by Link A	Yes
	T2 Daxed to by Remote T1	No
	T2 Daxed to by Remote T2	Yes
	T2 Daxed to by Remote T3	No
	T2 Daxed to by Remote T4	No
	T2 Daxed to by Remote T5	No
	T2 Daxed to by Remote T6	No
BASIC: track 2 link B	T2 Daxed to by Link B	Yes
	T2 Daxed to by Remote T1	No
	T2 Daxed to by Remote T2	Yes
	T2 Daxed to by Remote T3	No
	T2 Daxed to by Remote T4	No
	T2 Daxed to by Remote T5	No
	T2 Daxed to by Remote T6	No
BASIC: track 3 link A	T3 Daxed to by Link A	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	Yes
	T3 Daxed to by Remote T4	No
	T3 Daxed to by Remote T5	No
	T3 Daxed to by Remote T6	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
BASIC: track 3 link B	T3 Daxed to by Link B	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	Yes
	T3 Daxed to by Remote T4	No
	T3 Daxed to by Remote T5	No
	T3 Daxed to by Remote T6	No
BASIC: track 4 link A	T3 Daxed to by Link A	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	No
	T3 Daxed to by Remote T4	Yes
	T3 Daxed to by Remote T5	No
	T3 Daxed to by Remote T6	No
BASIC: track 4 link B	T3 Daxed to by Link B	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	No
	T3 Daxed to by Remote T4	Yes
	T3 Daxed to by Remote T5	No
	T3 Daxed to by Remote T6	No
BASIC: track 5 link A	T3 Daxed to by Link A	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	No
	T3 Daxed to by Remote T4	No
	T3 Daxed to by Remote T5	Yes
	T3 Daxed to by Remote T6	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
BASIC: track 5 link B	T3 Daxed to by Link B	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	No
	T3 Daxed to by Remote T4	No
	T3 Daxed to by Remote T5	Yes
	T3 Daxed to by Remote T6	No
BASIC: track 6 link A	T3 Daxed to by Link A	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	No
	T3 Daxed to by Remote T4	No
	T3 Daxed to by Remote T5	No
	T3 Daxed to by Remote T6	Yes
BASIC: track 6 link B	T3 Daxed to by Link B	Yes
	T3 Daxed to by Remote T1	No
	T3 Daxed to by Remote T2	No
	T3 Daxed to by Remote T3	No
	T3 Daxed to by Remote T4	No
	T3 Daxed to by Remote T5	No
	T3 Daxed to by Remote T6	Yes
BASIC: Dax link A	Remote SIN	7 620 100 101 16
	RRR Offset	0
	LLL Offset	0
	GGG Offset	1
	SS Offset	0
	Msg Timeout	3600 msec
	Msg Update Interval	800 msec
	Max Time Offset	10 sec

MENU	MENU ENTRIES	DEFAULT SETTINGS
BASIC: Dax link B	Remote SIN	7 620 100 099 16
	RRR Offset	0
	LLL Offset	0
	GGG Offset	32769
	SS Offset	0
	Msg Timeout	3600 msec
	Msg Update Interval	800 msec
	Max Time Offset	10 sec
BASIC: Vital Comms Links	Vital Comms link 1 Used	No
	Vital Comms link 2 Used	No
BASIC: Vital Comms Link 1	Remote SIN	7 620 100 101 16
	RRR Offset	0
	LLL Offset	0
	GGG Offset	1
	SS Offset	0
	Msg Timeout	3600 msec
	Msg Update Interval	800 msec
	Max Time Offset	10 sec
BASIC: Vital Comms Link 2	Remote SIN	7 620 100 101 16
	RRR Offset	0
	LLL Offset	0
	GGG Offset	1
	SS Offset	0
	Msg Timeout	3600 msec
	Msg Update Interval	800 msec
	Max Time Offset	10 sec
1 Assignment depends on the template selected. [2] Not Used in MTF_4A, MTF_5a.		

A.1.2 PREDICTORS Configuration Menus

The **PREDICTORS configuration** menus are shown in Table A-2.

Table A-2: PREDICTORS Configuration Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
PREDICTORS: track 1	Prime Used	Yes[1]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
	Preempt Used	Yes[2]
PREDICTORS: track 2	Prime Used	Yes[1]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
	Preempt Used	Yes[2]
PREDICTORS: track 3	Prime Used	Yes[1]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
	Preempt Used	Yes[2]

MENU	MENU ENTRIES	DEFAULT SETTINGS
PREDICTORS: track 4	Prime Used	Yes[1]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
	Preempt Used	Yes[2]
PREDICTORS: track 5	Prime Used	Yes[1]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
	Preempt Used	Yes[2]
PREDICTORS: track 6	Prime Used	Yes[1]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
	Preempt Used	Yes[2]

[1] Predictors used depends on template.

[2] Only visible when advanced preemption or second train logic is used is turned on.

A.1.3 GCP Programming Menus

The **GCP programming** menus are shown in Table A-3.

Table A-3: GCP Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
GCP: track 1	GCP Freq Category	Standard
	GCP Frequency	Not Set
	Approach Distance	9999 ft
	Uni/Bi/Sim-Bidirnl	Bidirnl
	GCP Transmit Level	Medium
	Island Connection	Isl 1
	Directionally Wired	No
	Island Distance	199 ft
	Computed Distance	9999 ft
	Linearization Steps	100
GCP: track 1 enhanced det	Inbound PS Sensitivity	High
	Speed Limiting Used	Yes
	Outbound False Act Lvl	Normal
	Outbound PS Timer	20 sec
	Trailing Switch Logic	On
	Post Joint Detn Time	15 sec
	Adv Appr Predn	No
	Adv Appr Predn Time	20 sec
	Adv Appr Predn Strt EZ	85
	Adv Appr Predn Stop EZ	0
	Cancel Pickup Delay	This Isl

MENU	MENU ENTRIES	DEFAULT SETTINGS
GCP: track 1 RX BIDAX	*BIDAX To RX Appr	Not Set
	Stick Release Time	10 Min
	Appr Clear Time	60 sec
	Stick EZ Value	20
	Appr Clear EZ Value	80
	*PSO Used	Not Set
	RX 1 Freq Category	Standard
	RX1 Frequency	Not Set
	RX 2 Freq Category	Standard
	RX2 Frequency	Not Set
	TX Freq Category	Standard
	TX Frequency	Not Set
	TX Transmit Level	Low
GCP: track 1 TX BIDAX	*BIDAX To RX Appr	Not Set
	Stick Release Time	10 Min
	Appr Clear Time	60 sec
	Stick EZ Value	20
	Appr Clear EZ Value	80
	*PSO Used	Not Set
	RX 1 Freq Category	Standard
	RX1 Frequency	Not Set
	RX 2 Freq Category	Standard
	RX2 Frequency	Not Set
	TX Freq Category	Standard
	TX Frequency	Not Set
	TX Transmit Level	Low
GCP: track 1 prime	Prime Warning Time	35 sec
	Prime Offset Distance	0 ft
	Switch MS EZ Level	10
	Pickup Delay Mode	Fixed
	Prime MS/GCP Mode	Pred
	Prime Pickup Delay	15 sec
	Prime UAX	Not Used
	Prime UAX Pickup	5 sec

MENU	MENU ENTRIES	DEFAULT SETTINGS
GCP: track 1 Dax A	Dax A Warning Time	35 sec
	Prmpt Offset Distance	99 ft
	Switch MS EZ Level	0
	Pickup Delay Mode	Auto
	Prmpt MS/GCP Mode	Pred
	Prmpt Pickup Delay	15 sec
	Prmpt Enable	Not Used
	Prmpt Enable Pickup	2 sec
	DAX A Track Side	Not Set
GCP: track 1 preempt	Prmpt Warning Time	45 sec
	Prmpt Offset Distance	0 ft
	Switch MS EZ Level	10
	Pickup Delay Mode	Fixed
	Prmpt MS/GCP Mode	Pred
	Prmpt Pickup Delay	15 sec
	Prmpt Enable	Not Used
	Prmpt Enable Pickup	5 sec
GCP: track 1 pos start	Positive Start	Off
	Positive Start Level	10
	Positive Start Offset	0 ft
	Positive Start Timer	10 min
	Sudden Shnt Det Used	No
	Sudden Shnt Det Level	70
	Sudden Shnt Det Offset	0 ft
	Low EZ Detection Used	No
	Low EZ Detection Level	70
	Low EZ Detection Time	10 min
	Low EZ Det Effect	Activate
	Low EZ Det Override IP	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
GCP: track 1 MS Control	MS/GCP Ctrl IP Used MS Sensitivity Level Compensation Level Warn Time-Ballast Comp Low EX Adjustment Bidirn Dax Passthru False Act on Train Stop EX Limiting Used EZ Correction Used	No 0 1300 High 39 No No Yes Yes
GCP: track 2 MS Control	Same as track 1 except for template differences	
GCP: track 3 MS Control		
GCP: track 4 MS Control		
GCP: track 5 MS Control		
GCP: track 6 MS Control		

A.1.4 ISLAND Programming Menus

The **ISLAND programming** menus are shown in Table A-4.

Table A-4: ISLAND Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
ISLAND: track 1	Isl Frequency Pickup Delay (2s +) [1] Isl Enable IP Used Ext Isl Pickup Delay 2	Not Set 0 sec No 1 sec
ISLAND: track 2	Same as track 1 except for template differences	
ISLAND: track 3		
ISLAND: track 4		
ISLAND: track 5		
ISLAND: track 6		
[1] Only shown if Island Used Internal [2] Only shown if Island Used External		

A.1.5 AND Tracks Configuration Menus

The **AND tracks configuration** menus are shown in Table A-5.

Table A-5: AND Tracks Configuration Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
AND: track Anding	AND 1 XR Used	Yes
	AND 2 Used	No
	AND 3 Used	No
	AND 4 Used	No
	AND 5 Used	No
	AND 6 Used	No
	AND 7 Used	No
	AND 8 Used	No
AND: AND 1 XR	AND 1 XR Track 1	Prime
	AND 1 XR Track 2	Prime
	AND 1 XR Track 3	Prime
	AND 1 XR Track 4	Prime
	AND 1 XR Track 5	Prime
	AND 1 XR Track 6	Prime
	AND 1 Enable Used	No
	AND 1 Enable Pickup	5 sec
	AND 1 Enable Drop	0 sec
	AND 1 Wrap Used	No
AND: AND 2	AND 2 Track 1	Not Used
	AND 2 Track 2	Not Used
	AND 2 Track 3	Not Used
	AND 2 Track 4	Not Used
	AND 2 Track 5	Not Used
	AND 2 Track 6	Not Used
	AND 2 Enable Used	No
	AND 2 Enable Pickup	2 sec
	AND 2 Enable Drop	0 sec
	AND 2 Wrap Used	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
AND: AND 3	AND 3 Track 1	Not Used
	AND 3 Track 2	Not Used
	AND 3 Track 3	Not Used
	AND 3 Track 4	Not Used
	AND 3 Track 5	Not Used
	AND 3 Track 6	Not Used
	AND 3 Enable Used	No
	AND 3 Enable Pickup	2 sec
	AND 3 Enable Drop	0 sec
	AND 3 Wrap Used	No
AND: AND 4	AND 4 Track 1	Not Used
	AND 4 Track 2	Not Used
	AND 4 Track 3	Not Used
	AND 4 Track 4	Not Used
	AND 4 Track 5	Not Used
	AND 4 Track 6	Not Used
	AND 4 Enable Used	No
	AND 4 Enable Pickup	2 sec
	AND 4 Enable Drop	0 sec
	AND 4 Wrap Used	No
AND: AND 5	AND 5 Track 1	Not Used
	AND 5 Track 2	Not Used
	AND 5 Track 3	Not Used
	AND 5 Track 4	Not Used
	AND 5 Track 5	Not Used
	AND 5 Track 6	Not Used
	AND 5 Enable Used	No
	AND 5 Enable Pickup	2 sec
	AND 5 Enable Drop	0 sec
	AND 5 Wrap Used	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
AND: AND 6	AND 6 Track 1	Not Used
	AND 6 Track 2	Not Used
	AND 6 Track 3	Not Used
	AND 6 Track 4	Not Used
	AND 6 Track 5	Not Used
	AND 6 Track 6	Not Used
	AND 6 Enable Used	No
	AND 6 Enable Pickup	2 sec
	AND 6 Enable Drop	0 sec
	AND 6 Wrap Used	No
AND: AND 7	AND 7 Track 1	Not Used
	AND 7 Track 2	Not Used
	AND 7 Track 3	Not Used
	AND 7 Track 4	Not Used
	AND 7 Track 5	Not Used
	AND 7 Track 6	Not Used
	AND 7 Enable Used	No
	AND 7 Wrap Used	No
AND: AND 8	AND 8 Track 1	Not Used
	AND 8 Track 2	Not Used
	AND 8 Track 3	Not Used
	AND 8 Track 4	Not Used
	AND 8 Track 5	Not Used
	AND 8 Track 6	Not Used
	AND 8 Enable Used	No
	AND 8 Wrap Used	No

A.1.6 ADVANCED Programming Menus

The **ADVANCED Programming** menus are shown in Table A-6.

Table A-6: ADVANCED Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
ADVANCED: MS restart	MS/GCP Restart Used MS/GCP Restart all Trks MS/GCP Timer Used MS/GCP Restart Time	No No Yes 10 sec
ADVANCED: restart track 1	MS/GCP Restart EZ Level Prime switch to MS Preempt switch to MS	80 Yes Yes
ADVANCED: restart track 2	Same as track 1	
ADVANCED: restart track 3		
ADVANCED: restart track 4		
ADVANCED: restart track 5		
ADVANCED: restart track 6		
ADVANCED: out of service	OOS Control OOS Timeout OOS Timeout	Display Yes 1 hrs
ADVANCED: out of service 2	T1 OOS Control T2 OOS Control T3 OOS Control T4 OOS Control T5 OOS Control T6 OOS Control	OOS Input 1 OOS Input 2 OOS Input 3 OOS Input 4 OOS Input 5 OOS Input 6
ADVANCED: track wrap circuits	Wrap LOS Timer Track 1 Wrap Used Track 2 Wrap Used Track 3 Wrap Used Track 4 Wrap Used Track 5 Wrap Used Track 6 Wrap Used	5 sec No No No No No No

MENU	MENU ENTRIES	DEFAULT SETTINGS
ADVANCED: trk 1 overrides	All Predictors Override Used	No
ADVANCED: trk 2 overrides	Same as track 1	
ADVANCED: trk 3 overrides		
ADVANCED: trk 4 overrides		
ADVANCED: trk 5 overrides		
ADVANCED: trk 6 overrides		
ADVANCED: OR logic	OR 1 Used OR 2 Used OR 3 Used OR 4 Used	No No No No
ADVANCED: OR 1	OR 1 Term 1 OR 1 Term 2 OR 1 Term 3 OR 1 Term 4	Not Used Not Used Not Used Not Used
ADVANCED: internal I/O 1	Pass Thrus Int.1 Sets Int.1 Set By Int.2 Sets Int.2 Set By Int.3 Sets Int.3 Set By Int.4 Sets Int.4 Set By	No Not Used Not Used Not Used Not Used Not Used Not Used Not Used Not Used

MENU	MENU ENTRIES	DEFAULT SETTINGS
ADVANCED: internal I/O 2	Int.5 Sets	Not Used
	Int.5 Set By	Not Used
	Int.6 Sets	Not Used
	Int.6 Set By	Not Used
	Int.7 Sets	Not Used
	Int.7 Set By	Not Used
	Int.8 Sets	Not Used
	Int.8 Set By	Not Used
ADVANCED: internal I/O 3	Int.9 Sets	Not Used
	Int9 Set By	Not Used
	Int.10 Sets	Not Used
	Int.10 Set By	Not Used
	Int.11 Sets	Not Used
	Int.11 Set By	Not Used
	Int.12 Sets	Not Used
	Int.12 Set By	Not Used
ADVANCED: internal I/O 4	Int.13 Sets	Not Used
	Int.13 Set By	Not Used
	Int.14 Sets	Not Used
	Int.14 Set By	Not Used
	Int.15 Sets	Not Used
	Int.15 Set By	Not Used
	Int.16 Sets	Not Used
	Int16 Set By	Not Used
ADVANCED: site options	Daylight Savings	Off
	Units	Standard
	Ext Maint Call Input	No
	Emergency Activate IP	No
	EZ/EX Logging	Change
	EZ/EX Log Interval	4 sec
	EZ/EX Point Change	3

A.1.7 SSCC Programming Menus

The **SSCC programming** menus are shown in Table A-7.

Table A-7: SSCC Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
SSCC	Gates Used	Yes
	SSCC1+2 GPs Coupled	Yes
	Min Activation	0 sec
	Rmt Activation Cancel	2 min
	Bell On Gate Rising	No
	Mute Bell On Gate Down	No
	SSCCIV Controller Used	No
	4000 Control Type	Exit
SSCCIV: Control and ATCS Setup	Remote SIN	7 620 100 100 15
	SSCCIV Activation	AND 1 XR
	RRR Offset	0
	LLL Offset	0
	GGG Offset	0
	SS Offset	32769
	Msg Timeout	3600 msec
	Msg Update Interval	800 msec
	Max Time Offset	10 sec
SSCC: 1	SSCC-1 Activation	AND 1 XR
	SSCC-1 Gate Delay	4 sec
	SSCC-1 Number of GPs	1
	SSCC-1 Number of GDs	2
	Flash Rate	50
	Low Battery Detection	No
	Flash Sync	Master
	Invert Gate Output	No
	Lamp Neutral Test	Off
	Aux-1 Xng Ctrl Used	No

MENU	MENU ENTRIES	DEFAULT SETTINGS
SSCC: 2	SSCC-2 Activation	AND 1 XR
	SSCC-2 Gate Delay	4 sec
	SSCC-2 Number of GPs	0
	SSCC-2 Number of GDs	0
	Flash Rate	50
	Low Battery Detection	No
	Flash Sync	Slave
	Invert Gate Output	No
	Lamp Neutral Test	Off
	Aux-2 Xng Ctrl Used	No

A.1.8 IO Assignment Menus

The **IO assignment** menus are shown in Table A-8.

Table A-8: IO Assignment Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
OUTPUT: assignment page 1	OUT 1.1	Not Used
	OUT 1.2	Not Used
	OUT 2.1	Not Used
	OUT 2.2	Not Used
	OUT 3.1	Not Used
	OUT 3.2	Not Used
	OUT 4.1	Not Used
	OUT 4.2	Not Used
OUTPUT: assignment page 2	OUT 5.1	Not Used
	OUT 5.2	Not Used
	OUT 6.1	Not Used
	OUT 6.2	Not Used

MENU	MENU ENTRIES	DEFAULT SETTINGS
INPUT: assignment page 1	IN 1.1	Not Used
	IN 1.2	Not Used
	IN 2.1	Not Used
	IN 2.2	Not Used
	IN 3.1	Not Used
	IN 3.2	Not Used
	IN 4.1	Not Used
	IN 4.2	Not Used
INPUT: assignment page 2	IN 5.1	Not Used
	IN 5.2	Not Used
	IN 6.1	Not Used
	IN 6.2	Not Used
IO: assignment SSCC	OUT GC 1	Gate Output 1
	OUT GC 2	Gate Output 2
	IN 7.1	Not Used
	IN 7.2	GD 1.2
	IN 7.3	Not Used
	IN 7.4	GD 1.1
	IN 7.5	GP 1.1
	IN 8.1	Not Used
	IN 8.2	Not Used
	IN 8.3	Not Used
	IN 8.4	Not Used
	IN 8.5	Not Used

A.1.9 SEAR Input/Output Menus

The **SEAR I/O** menus are shown in Table A-9.

Table A-9: SEAR I/O Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
SEAR	SEAR Subnode	99
	DI 1	Not Used
	DI 2	Not Used
	Rly 1	Not Used
	Rly 2	Not Used
SEAR: inputs	SP 2.1	POK 1
	SP 3.1	Not Used
	SP 4.1	Not Used
	SP 5.1[1]	Not Used
	SP 6.1[1]	Not Used
SEAR: slot 1-4 inputs	IN 1.1	Not Used
	IN 1.2	Not Used
	IN 2.1	Not Used
	IN 2.2	Not Used
	IN 3.1	Not Used
	IN 3.2	Not Used
	IN 4.1	Not Used
	IN 4.2	Not Used
SEAR: slot 5 inputs[2]	IN 5.1	Not Used
	IN 5.2	Not Used
	IN 5.3[2]	Not Used
	IN 5.4[2]	Not Used
	IN 5.5[2 & 3]	Not Used
	IN 5.6[2 & 3]	Not Used
	IN 5.7[2 & 3]	Not Used
	IN 5.8[2 & 3]	Not Used

MENU	MENU ENTRIES	DEFAULT SETTINGS
SEAR: slot 6 inputs[4]	IN 6.1	Not Used
	IN 6.2	Not Used
	IN 6.3[4]	Not Used
	IN 6.4[4]	Not Used
	IN 6.5[4 & 5]	Not Used
	IN 6.6[4 & 5]	Not Used
	IN 6.7[4 & 5]	Not Used
	IN 6.8[4 & 5]	Not Used
SEAR: slot 7-8 inputs	IN 7.1	Not Used
	IN 7.2	Not Used
	IN 7.3	Not Used
	IN 7.4	Not Used
	IN 8.1	Not Used
	IN 8.2	Not Used
	IN 8.3	Not Used
	IN 8.4	Not Used
	IN 8.5	Not Used

1 Not visible when Track 5/RIO 2 or Track 6/RIO 3 Slot is set to RIO.

[2] Not visible when Track 5/RIO 2 Slot is set to Track.

[3] Not visible when Track 5/RIO 2 Slot is set to RIO.

[4] Not visible when Track 6/RIO 3 Slot is set to Track.

[5] Not visible when Track 6/RIO 3 Slot is set to Track.

A.1.10 SITE Programming Menu

The **SITE programming** menu is shown in Table A-10.

Table A-10: SITE Programming Menu

MENU	MENU ENTRIES	DEFAULT SETTINGS
SITE: programming	Radio Subnode	1
	Field Password	Off
	Password	1111
	Supervisor Password	Off
	Supervisor Password	0
	Low Battery Enabled	Off
	Low Battery Level	90 dV

APPENDIX B – INTERFERENCE

B.1 CHARACTERISTICS

In general terms there are two basic types of interference, which are characterized by voltage amplitude. The first and usually the most common is ‘Low Voltage’ amplitude and the second is ‘High Voltage’ amplitude.

Symptoms for the first case include a moving EZ and EX. Typically this is only a few points at a time (less than 10). This movement can happen in either jumps (step changes) or a slow drift over time (30 secs to several minutes). In many situations the changes in EZ and EX can result in occasional false activations or nuisance operations.

The High Voltage symptoms include both EZ and EX changing great amounts over time. This change may include frequent errors such as Hi EZ, Frequency, and Self Check.

Many times the system will not operate normally for any extended time; having almost constant false activations.

B.2 MEASUREMENTS AND IDENTIFICATION

In order to address the interference issue the actual problem needs to be identified. Use of a Spectrum Analyzer (Velleman or Equivalent) can often be an extremely valuable tool in this effort of identifying interfering fundamental and harmonic frequencies.

B.2.1 Measure The Track Voltage

This is a rail to rail measurement for AC voltage with the GCP and island turned off. If the problem is present and the AC value is 2.5 VRMS or smaller the interference falls into the low voltage category. If the value is greater than 5VRMS with the problem present it falls into the High Voltage category.

If the spectrum analyzer is available take a sample of frequencies within 100 HZ of the GCP frequency being analyzed. If any frequencies are found to be within 1 channel of the GCP in question or within 20 dBm, they could be a potential concern.

NOTE

In High Voltage situations frequencies may be much higher in value than the frequency set by the GCP.

When looking for low voltage problems check other AC track circuits. Especially look for other GCP’s of the same frequency. Overlay Track circuits can also be a source.

The investigation should also include adjacent tracks, particularly when switches are in the area. When conducting these checks think in terms of Signal Blocks not just Approaches. Sources are often found outside of the in question approach limits.

The Power Company can also be a source. Check the area for load balancing capacitors mounted on poles. These can be a source of problems for higher frequencies (generally 348Hz and above).

Other problems can result from improper or failed equipment, such as Isolation/filter units, Surge protection, battery chokes, or other track appliances.

High Voltage problems are typically some what easier to identify since any mitigation results in large observable changes. Sources typically include cab signal/ AC track circuits and power company related sources.

WARNING

BE VERY CAREFUL WHEN INVESTIGATING POWER COMPANY ISSUES. IN SOME AREAS VOLTAGES CAN BE OVER 50VRMS WITH SIGNIFICANT CURRENT. THIS CAN BE A HAZARD TO BOTH PERSONNEL AND EQUIPMENT.

The power company issues usually will involve transmission line situations. Typically a power line or large industry is in or near the crossing. There may also be substations and/or power plants as well. The history of the location can be important. The local personnel probably know an area which has always had a power related issue.

Another major cause can be related to bad insulated joints. A shorted joint can cause a major electrical imbalance which can result in conduction of power company signals and their harmonics on to the track.

As stated above, other items can come into play, such as Isolation/filter units, Surge protection, battery chokes, or other track appliances. In this situation be especially watchful for damage due to surge protection issues.

B.3 MITIGATION

Generally two basic approaches are followed to mitigate interference problems. One is to minimize the interference effects by changing the GCP frequency. The other, which is typically more difficult, is to identify the source of the interference and reduce or eliminate it.

The simple approach is most often used in ‘Low voltage’ situations. Looking at the simple approach a rule of thumb applies: find a frequency for the GCP that is 15% or more from that of the interference. The Spectrum Analyzer is a real aide in identifying the new frequency. Conversely one could change the frequency of the interfering unit.

NOTE

If two GCP systems are operating at the same frequency and a slow drift of EZ is observed, a shift of one of the two GCP frequencies (using a GCP offset frequency) could be accomplished rather than changing to a new frequency.

For 'High Voltage' situations where elimination or reduction of the voltage is attempted try the following. Repair or replace insulated joints, surge protection as necessary. Look for bad grounds and also note the phasing of local power lines.

If these initial steps do not reduce the interference to workable levels (less than 5 volts RMS), then working on identifying and minimizing the voltage must be attempted. There are two categories- Cab Signal Environment and Power related environment.

B.3.1 Cab Signal Environment

In the Cab Signal Environment of course there is little flexibility to reduce amplitudes. One needs to consider the following options:

A. Change the GCP Frequency.
B. For Frequencies 211 Hz and lower use 62770 Shunts with Max GCP transmit current.
C. For Frequencies above 211Hz use 62780 Shunts.
D. Insure that the appropriate cab signal filters are being used (if required) in the cab signal feeds to the track.

B.3.2 Power Related Environment

In the Power related environment:

- When the option exists to reduce amplitudes of 60 and 180 Hz harmonics typically a shunt is used. In addition to reducing amplitude this often balances the track circuit which can also improve conditions.
- Use a 62780-60 or 62780-180 Hz shunts for filtering of lower track current interference situations.
- For those where more than 2 amps are suspected use a 62765 for 60 or 180 Hz.
- For severe situations use a 62760 for 60 hertz applications.

Start with using these shunts rail to rail within the approach of interest as close to the crossing as possible. If this does not help, check rail to rail at the next set of joints. At times two or more of these shunts may be required. Some situations may require these shunts to be applied across the joints. There is no magic combination here- use whatever combination works out best for your situation.

After determining the amplitude remaining after using one of the above shunts and the problem still persists, options A through C from above will still need to be accomplished. Again the spectrum analyzer can be a good tool to use.

Again remember flexibility is key. It may take a combination of actions to arrive at a solution. Due to the variability of these issues solutions for one location may not work at a different location.

Table B-1:
Devices Specially Designed for Interference Mitigation:

PART NUMBER	RATING	APPLICATION
62780	Low Current	60 Hz and 180 Hz Shunt
62770	Medium and High Currents	86Hz – 211Hz Termination shunts
62765	Medium and Higher Currents- 3 amps	60Hz and 180 Hz Shunts
62760	High Currents- 10 amps	60 Hz Shunt
8A470-100	High Cab 100 Hz filter	100 Hz Cab Signal
8A466-3	Low Cab 60 Hz filter	60 Hz cab signal

APPENDIX C – SSCC APPLICATIONS & PROGRAMMING GUIDELINES

C.1 SSCC3i APPLICATION GUIDELINES

The A80405 Solid-State Crossing Controller IIIi (SSCC3i), Figure C-1, is a plug-in module for the 4000 Grade Crossing Predictor (GCP). All multi-track 4000 GCP cases accommodate two A80405 modules. Each module provides:

- up to 20-amperes of lamp drive
- gate and bell control

A80405 module Interface is through GCP front-panel connectors. The A80405 module generally operates from a separate battery than the GCP portion of the system.

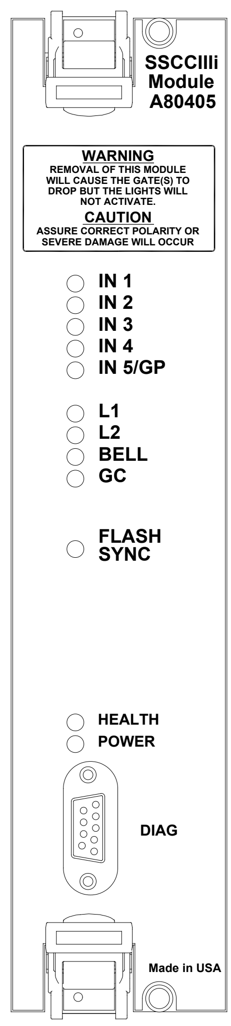


Figure C-1:
A80405 Solid-State Crossing Controller IIIi

The SSCCIIIi modules are integrated into the 4000 GCP system (wiring between the GCP, the SSCC3i, and the SEAR2i is eliminated) and are not redundant.

C.2 UNIT OVERVIEW

The A80405 module is programmed, calibrated, and tested from the Display module of the 4000 GCP. It is activated by internal logic from the 4000 GCP, and monitors gate position inputs from the crossing gate mechanism as well as provides activation for the bell, lamps, and gates of a crossing warning system

C.2.1 Module Function Control

The following A80405 module functions may be programmed:

- lamp flash rate
- gate control delay
- low battery threshold indication
- control maintenance call output
- test timer intervals
- crossing and lamp tests
- lamp flashing synchronization between the A80405 modules of multiple 4000 GCPs
- disabling of crossing bells while the gates are rising
- disabling of crossing bells while the gates are down
- requires gate down inputs to be energized

C.2.2 Crossing Controller Features

The circuits of the A80405 incorporate heavy-duty solid-state switches and have regulated lamp voltage. It is user-programmable. It minimizes lamp voltage dropping below acceptable limits when the AC power is interrupted for short periods and eliminates seasonal adjustment of lamp voltages when using temperature compensated battery chargers. The Crossing Controller Lamp Voltage uses pulse width modulation regulation, with the pulsed output frequency is approximately 500 Hz. The peak voltage of the pulse is approximately 1 volt below the battery input voltage. Depending on the voltage in, the pulse width is automatically varied to give a regulated output. The following examples assume the desired output is 10 volts:

Example 1: 16 volts in, the pulse is 15 volts and on 66% of the cycle.

Example 2: 13 volts in, the pulse is 12 volts and on 83% of the cycle.

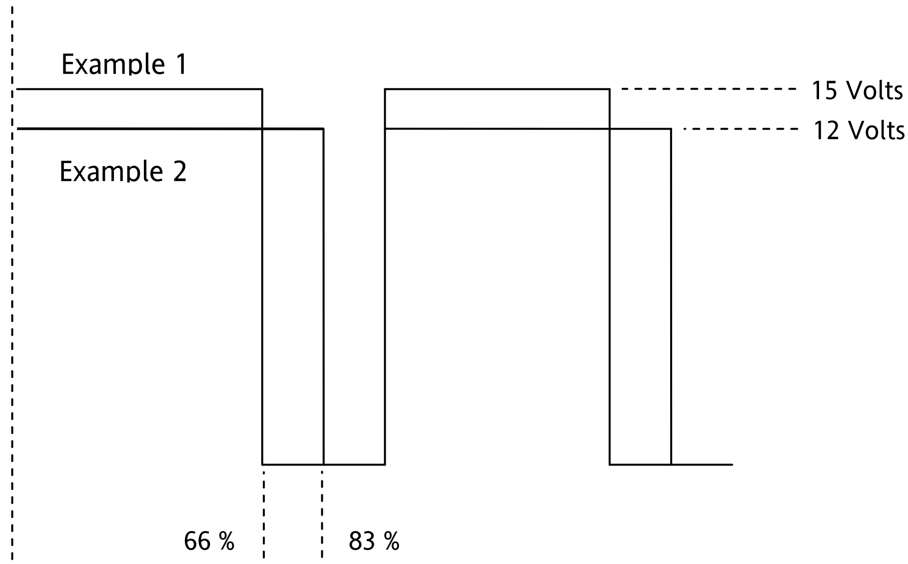


Figure C-2:
Pulse Width Modulation - Examples

NOTE

The regulated lamp drive is a pulse-width modulated voltage with an AC component and a DC component.

A True RMS AC+DC meter is required to accurately read the pulse-modulated lamp voltage, e.g., Agilent U1252A

Conventional multimeters may be used; however, the voltage reading will vary from the true rms value.

The variance is not a set percentage and is dependent on battery voltage.

A conversion chart cross-referencing several conventional meters is provided in paragraph C.9

C.2.3 Module Health

The CPU of the A80405 module provides an output that controls the HEALTH LED on the module front panel

- Yellow HEALTH LED reflects the health of the module:
- Flashes at 1 Hz rate when module fully operational.
- Flashes at 2 Hz rate when module not communicating with CPU module.
- Flashes at 8 Hz rate when fault is detected within the module.

C.3 BATTERY SURGE PROTECTION AND POWER WIRING

Battery surge protection for the SSCC is shown in Figure C-2. The Primary surge protection for SSCC modules is provided on the SSCC battery (see inside dotted line). The Primary surge protection for I/O interconnect is provided on lighting surge panels (see paragraph C.3.1). Provide power wiring to A80405 SSCC3i modules:

- via **B** and **N** contacts of the respective crossing controller connectors on 4000 GCP front panel.
- using poly-jacketed #10 AWG wire (recommended) for DC power and return between battery surge protection and the 4000 GCP crossing controller connectors.

Provide power wiring to the lighting surge panels:

- using poly-jacketed #6 AWG wire (recommended) for DC power and return between the –1 lighting surge panel (A91170-1 or A91181-1) and the crossing gate battery posts.
- using poly-jacketed #10 AWG wire (recommended) for DC power and return between the –1 lighting surge panel (A91170-1 or A91181-1) and the –2 lighting surge panel (A91170-2 or A91181-2).

CAUTION

PROPER BATTERY SURGE PROTECTION REQUIRES THAT THE BATTERY CHARGER OUTPUT BE WIRED DIRECTLY TO THE OPERATING BATTERY POSTS WHILE A SEPARATE PAIR OF WIRES RUN FROM THE BATTERY POSTS TO THE SSCC SURGE PROTECTION (ACROSS THE EQUALIZER) AS SHOWN IN FIGURE C-3.

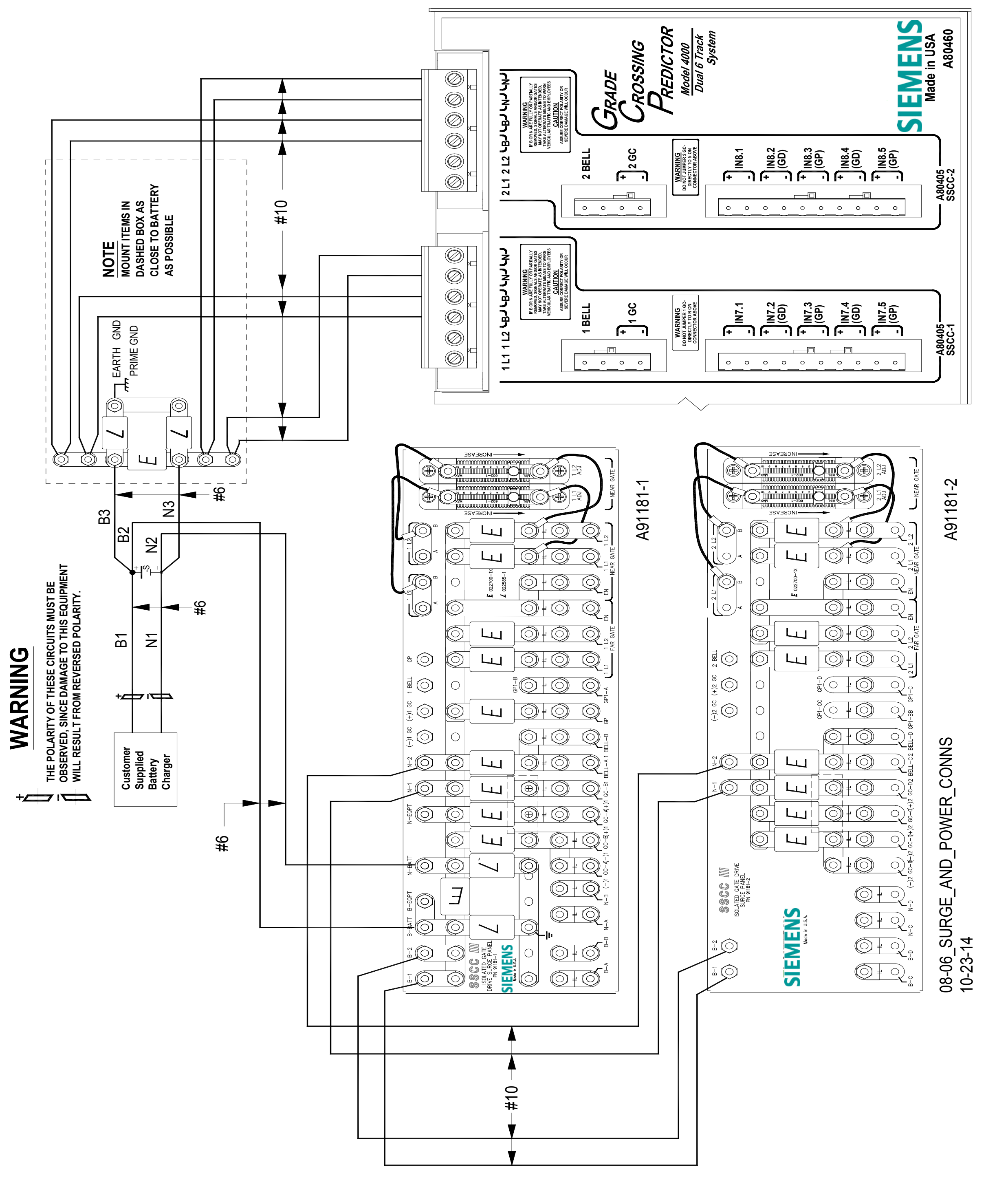


Figure C-3:
Surge & Power Connections to
SSCC Modules & Lighting Surge Panels

C.3.1 Lighting Surge Panels

The A80405 modules use either of two SSCC III Lighting Surge Panel configurations to provide external I/O primary surge protection.

- A91170-1, -2 common return gate control, Figure C-3A and Figure C-3B
- A91181-1, -2 isolated gate control, Figure C-4A and Figure C-4B

Both Surge Panel configurations provide surge protection on all external I/O interconnects. The SSCC III Lighting Surge Panels provide:

- arresters and equalizer for surge protection from transients on underground-cable battery voltage
- protection on all other I/O underground cable connections
- standard AREMA binding posts for connections to the flashing lights, gates, and bells
- insulated links in the underground cable connections allows quick circuit isolation for testing and measurements without site cabling removal
- adjustable resistors in the **NEAR GATE** Lamp 1 (**1 L1**) and Lamp 2 (**1 L2**) circuits provide compensation for different lengths of cabling to the crossing flashing lamps allows the system to compensate for unequal voltage drops between the two cables
- steering diodes for the Crossing Controller Gate Control output to provide isolation between the two crossing gate controls (see Figure C-6)

For common return gate control, a single A91170-1 panel (Figure C-4A) is used for up to 20-ampere operation and both an A91170-1 and an A91170-2 panel (Figure C-4B) are generally used for 21 to 40-ampere operation. Refer to Figure C-5A for typical common return gate control wiring.

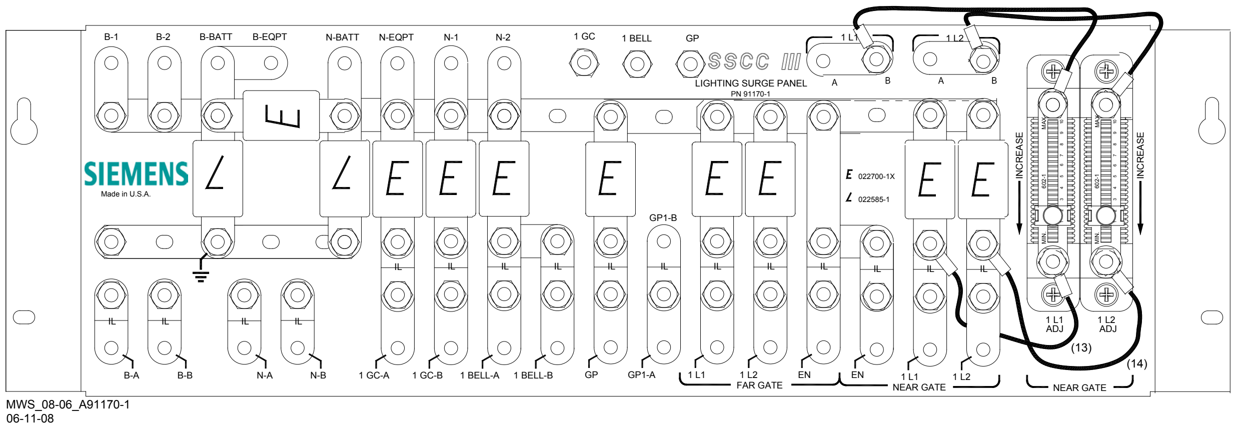
For isolated gate control, a single A91181-1 panel (Figure C-5A) is used for 20-ampere operation and both an A91181-1 and an A91181-2 panel (Figure C-6B) are generally used for 21 to 40-ampere operation. Refer to figure 8-5B for typical isolated gate control wiring.

WARNING

WHEN 91170 OR 91180 PANELS ARE NOT USED WITH THE SSCC, EQUIVALENT SURGE PROTECTION MUST BE PROVIDED WITH THE ADDITION OF STEERING DIODES IN THE GATE CONTROL (GC) OUTPUTS AS SHOWN IN FIGURE C-6A AND FIGURE C-6B.

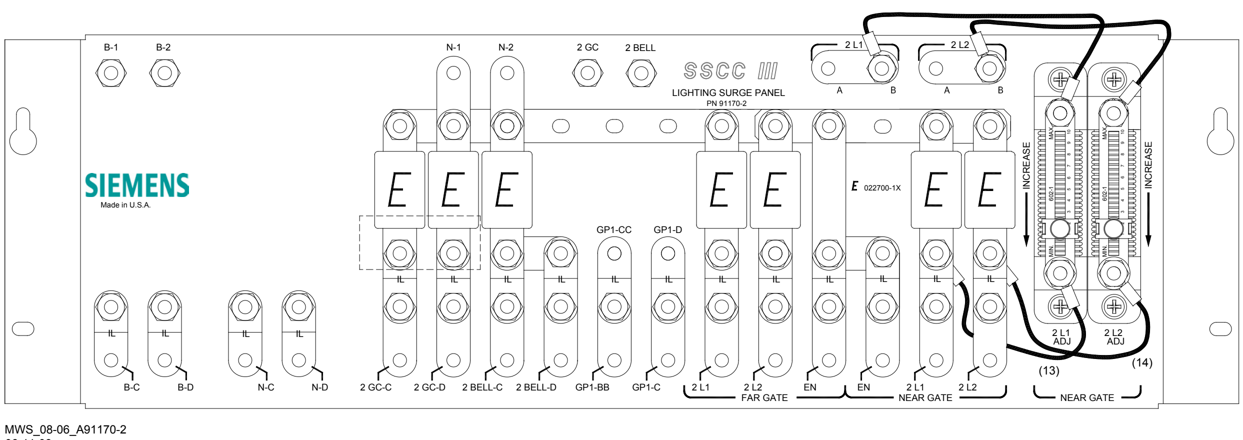
NOTE

For information on the selection and installation of the 91170-1 and 91181-1 SSCC III Lighting Surge Panels, refer to Section 9, Auxiliary Equipment.



A

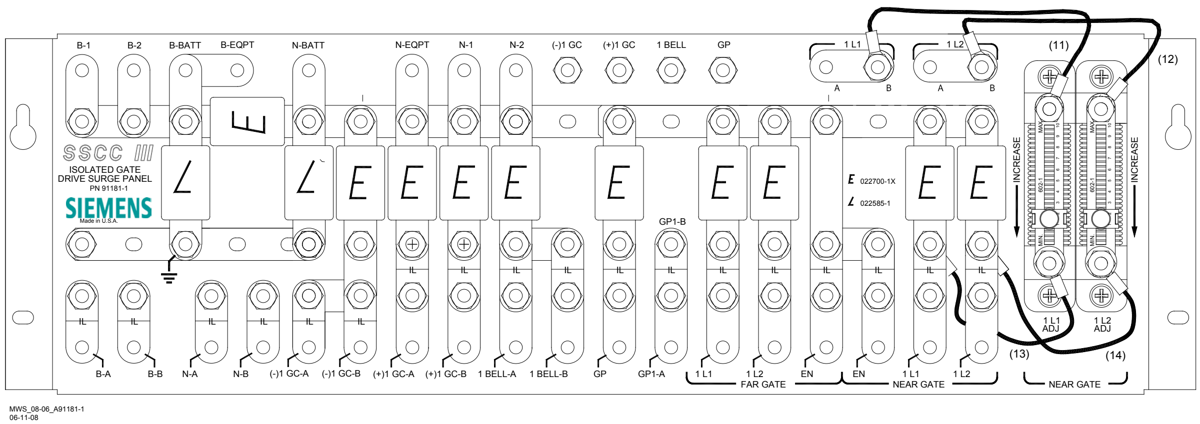
A91170-1



B

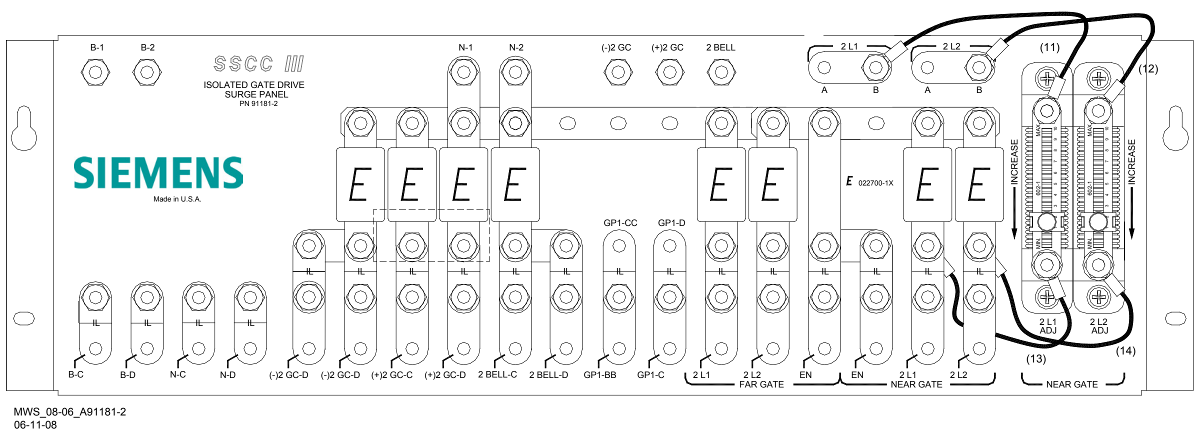
A91170-2

Figure C-4:
Common Return Lighting Surge Panels, A91170-1 & A91170-2



A

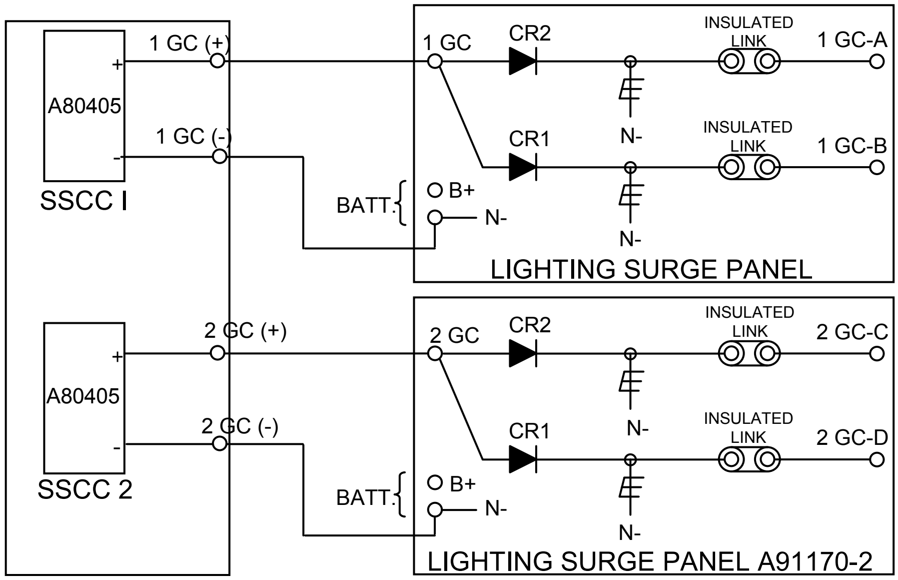
A91181-1



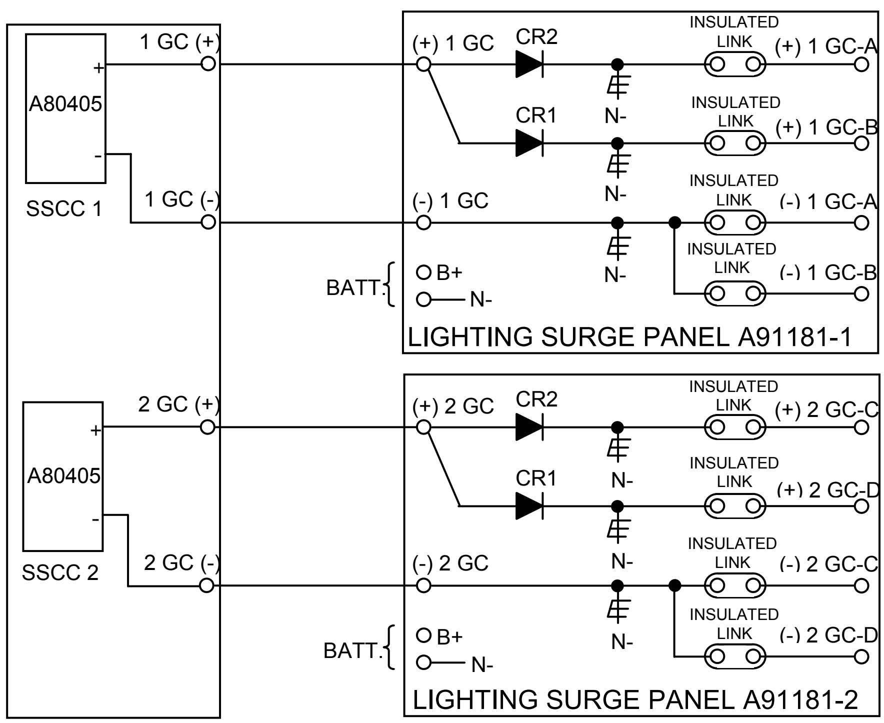
B

A91181-2

Figure C-5:
Isolated Return Lighting Surge Panels, A91181-1 & A91181-2



A: Typical Common Return Gate Control



B: Typical Isolated Gate Control

Figure C-6:
Typical Gate Control Options

C.4 CROSSING CONTROLLER OPERATION

The A80405 module provides drive for up to 20 amps of lamp current. The A80405 module continually performs self-diagnostic tests that result in complete on-line testing of module operation. If a critical failure is detected, the appropriate signal states are generated to immediately flash the crossing lamps and bring down the gates.

WARNING

REMOVING INPUT POWER FROM THE A80405 MODULE CAUSES THE GATES TO DROP BUT THE LAMPS ARE NOT ACTIVATED.

IF B OR N ARE FULLY OR PARTIALLY REMOVED, SIGNALS AND/OR GATES MAY NOT OPERATE AS INTENDED. TAKE ALTERNATE MEANS TO WARN VEHICULAR TRAFFIC, PEDESTRIANS AND EMPLOYEES.

Table C-1:
A80405 Module Operating Parameters

PARAMETER	VALUE
System Reaction Time:	Nominal 700 ms
Power-Up Time:	40 seconds maximum
Lamp Flash Rate:	Can be programmed for 30 to 70 flashes per minute in 5 flashes-per-minute increments. 50 flashes per minute default
Lamp Duty Cycle:	50% each flashed lamp
Lamp Voltage Adjustment:	Gate lamps are programmable, with regulated set points from 9.0 to 15.0 volts in 0.1 increments The lamp output voltage at the SSCC connector is limited to 1.5 volts under the battery voltage. Variable resistors on the Near Gate output of the Lighting Surge panel are provided for voltage drop compensation as required (see Figure C-9 and Figure C-10).
Test Modes:	
Static Lamp & Bell Tests:	Selected lamps lit steady. All lamps flashing Bell ON Steady
Activate Crossing:	Crossing activates according to normal operation
Timed Lamp Test:	Automatically delayed & timed.
Repeated Lamp Test:	Timed lamp test repeated after twice the initial delay.

C.5 INSTALLATION

C.5.1 Crossing Controller Module Installation

Two non-redundant A80405 Solid-State Crossing Controller IIIi (SSCC3i) modules can be installed in the 4000 GCP as shown in Figure C-7. Crossing Controller lamp and bell circuit wiring includes:

- Installation of wiring between the 4000 GCP Crossing Controller connectors and the SSCC III Lighting Surge Panels
- Installation of underground wiring between the SSCC III Lighting Surge Panels and the crossing Mast Junction Boxes
- Use of SSCC III Lighting Surge Panel(s)

Where one signal is controlled by each Controller Module, one surge panel may be used for both modules as shown in Figure C-8.

WARNING

WHEN ONE FLASHING LIGHT SIGNAL IS CONTROLLED BY EACH SSCC MODULE, A SINGLE SURGE PANEL MAY BE USED AS SHOWN IN FIGURE C-8. JUMPER LINKS FROM A TO B MUST BE REMOVED IN TWO PLACES.

WHERE TWO SIGNALS ARE CONTROLLED BY A SINGLE CROSSING CONTROLLER MODULE, ONE SURGE PANEL MAY BE USED AS SHOWN IN FIGURE C-9

NOTE

Where multiple signals are controlled by each Crossing Controller Module, an additional –2 surge panel is required and is wired and jumper links installed similar to Figure C-9, but connected to the second SSCC module connector.

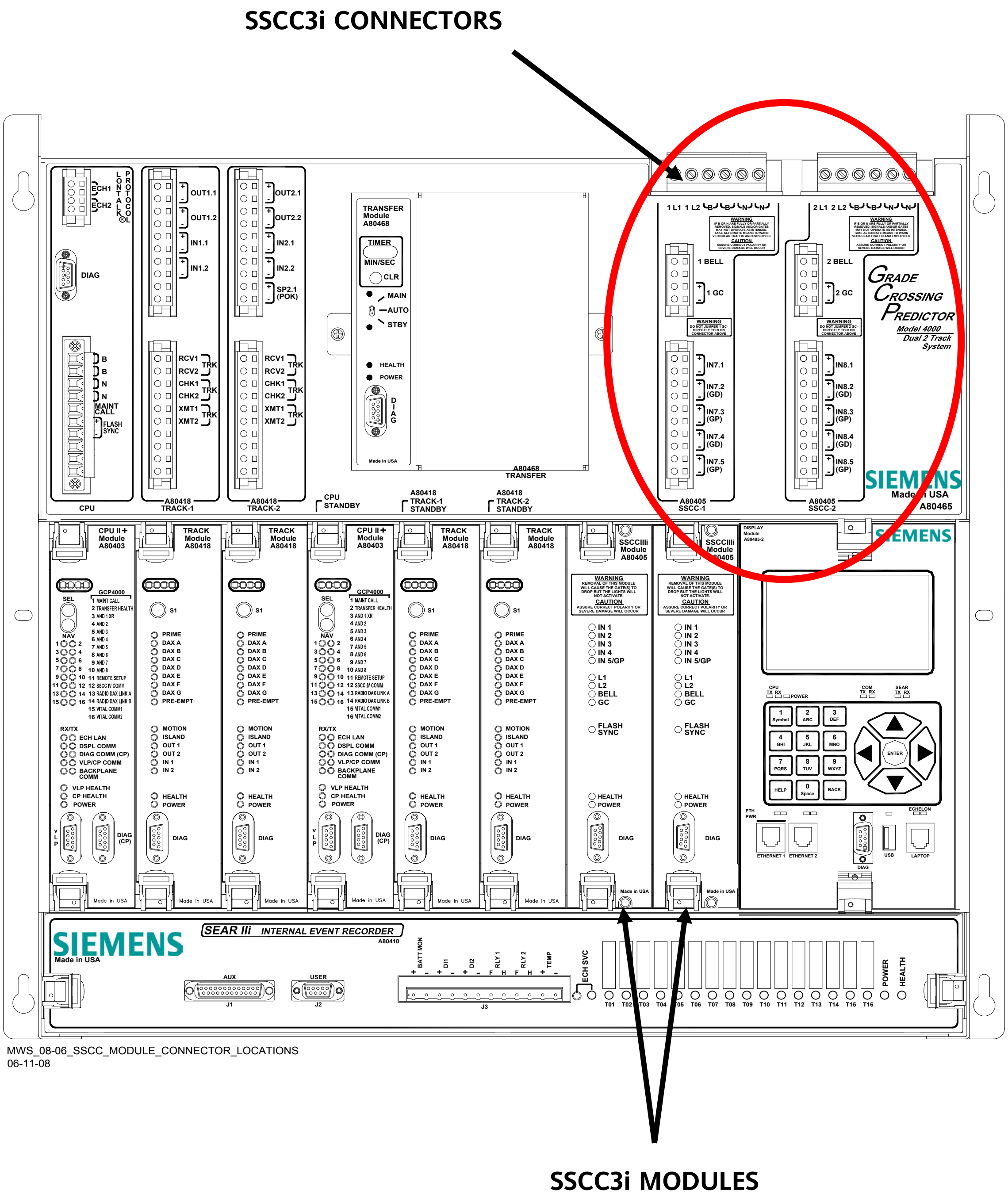


Figure C-7:
4000 GCP Crossing Controller Module and Connector Locations

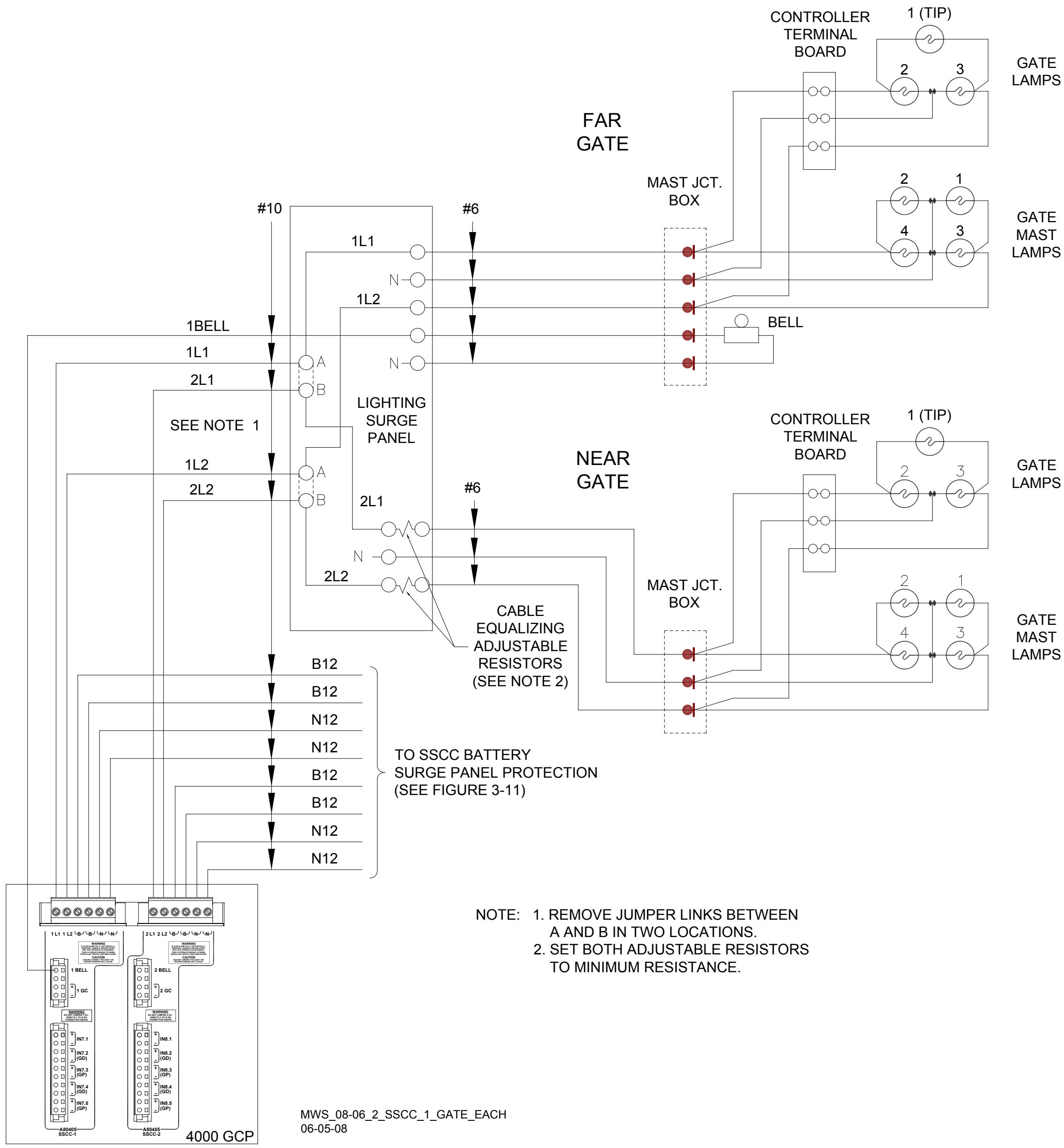


Figure C-8:
Two Crossing Controller Modules Controlling One Gate Each

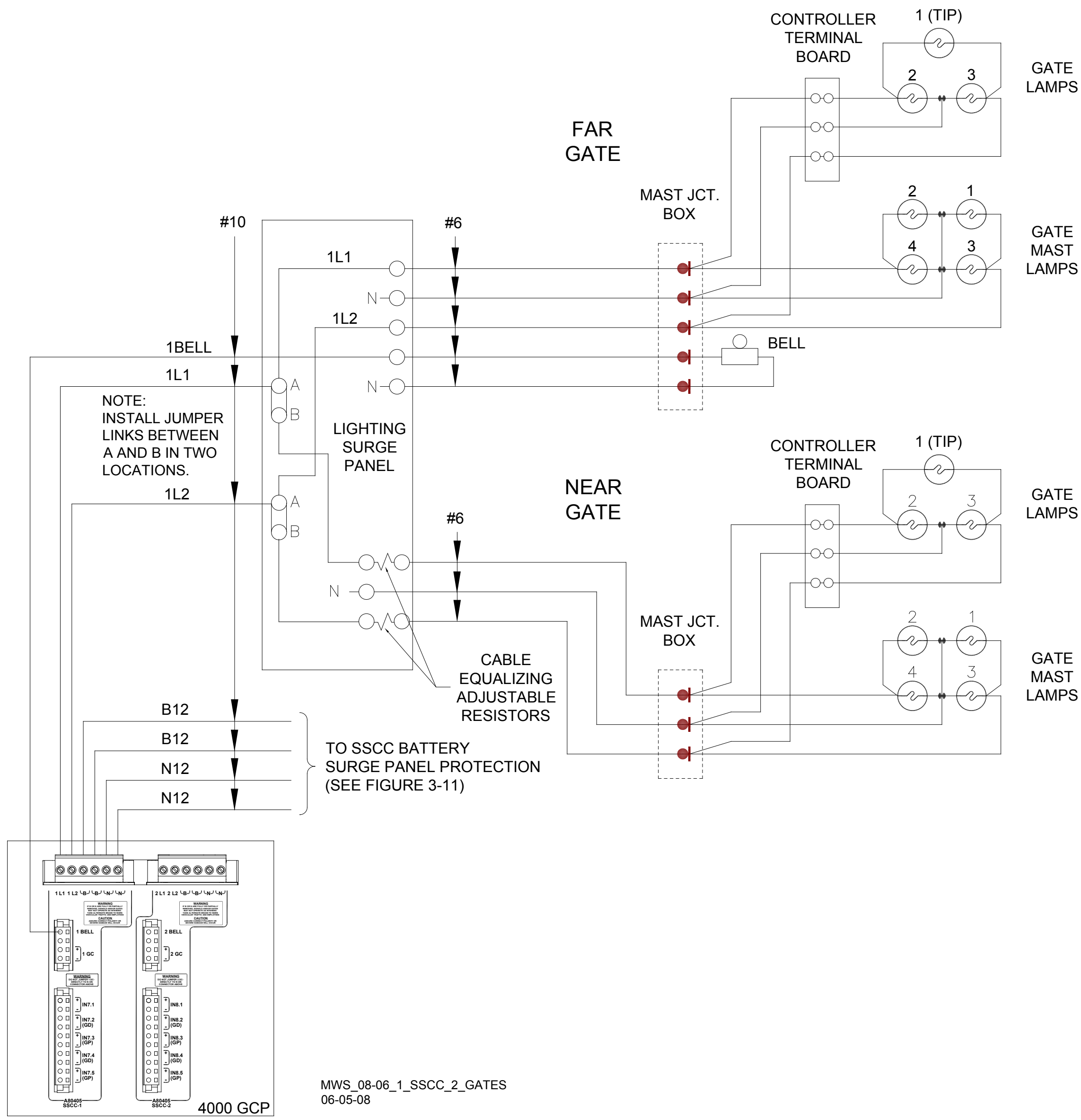


Figure C-9:
One Crossing Controller Module Controlling Two Gates

C.5.2 Crossing Controller Connectors

The 4000 GCP Crossing Controller connectors accommodate all wiring between the A80405 module(s) and the 91170 or 91181 SSCC III Lighting Surge Panel(s). Recommended crossing controller connector wire sizes are listed in Table C-2. The use of stranded wire is recommended

Table C-2: Minimum Recommended Crossing Controller Wire Sizes

EXTERNAL WIRING CONNECTOR	PIN	CONNECTOR TYPE	WIRE SIZE
SSCC-1	1L1	6-pin screw terminal	10AWG
	1L2	6-pin screw terminal	10AWG
	B	6-pin screw terminal	10AWG
	N	6-pin screw terminal	10AWG
	1BELL	4-pin cage clamp	16AWG
	+1GC	4-pin cage clamp	16AWG
	-1GC	4-pin cage clamp	16AWG
	+1IN7.1	10-pin cage clamp	16AWG
	-1IN7.1	10-pin cage clamp	16AWG
	+IN7.2 (GD)	10-pin cage clamp	16AWG
	-IN7.2 (GD)	10-pin cage clamp	16AWG
	+IN7.3 (GP)	10-pin cage clamp	16AWG
	-IN7.3 (GP)	10-pin cage clamp	16AWG
	+IN7.4 (GD)	10-pin cage clamp	16AWG
	-IN7.4 (GD)	10-pin cage clamp	16AWG
	+IN7.5 (GP)	10-pin cage clamp	16AWG
	-IN7.5 (GP)	10-pin cage clamp	16AWG
SSCC-2	2L1	6-pin screw terminal	10AWG
	2L2	6-pin screw terminal	10AWG
	B	6-pin screw terminal	10AWG
	N	6-pin screw terminal	10AWG
	2BELL	4-pin cage clamp	16AWG
	+2GC	4-pin cage clamp	16AWG
	-2GC	4-pin cage clamp	16AWG
	+IN8.1	10-pin cage clamp	16AWG
	-IN8.1	10-pin cage clamp	16AWG
	+IN8.2 (GD)	10-pin cage clamp	16AWG
	-IN8.2 (GD)	10-pin cage clamp	16AWG
	+IN8.3 (GP)	10-pin cage clamp	16AWG
	-IN8.3 (GP)	10-pin cage clamp	16AWG
	+IN8.4 (GD)	10-pin cage clamp	16AWG
	-IN8.4 (GD)	10-pin cage clamp	16AWG
	+IN8.5 (GP)	10-pin cage clamp	16AWG
	-IN8.5 (GP)	10-pin cage clamp	16AWG

CAUTION

CROSSING WIRING MUST CONFORM TO APPROVED RAILROAD SCHEMATICS.

WHEN INSTALLING B AND N PIN WIRES, OBSERVE CORRECT POLARITY OR SEVERE DAMAGE TO THE A80405 MODULE WILL OCCUR.

USE THE CORRECT SCREWDRIVER BLADE SIZE TO AVOID CONNECTOR DAMAGE. FOR WIRE PREPARATION AND INSERTION INSTRUCTIONS, REFER TO PARAGRAPH 10.1 OR THE MODEL 4000 GCP FIELD MANUAL, SIG-00-08-10.

C.5.3 Lamp and Bell Wiring to the Lighting Surge Panel

AREMA binding posts connect wiring to the Lighting Surge panel. Simplified Lighting Surge Panel Lamp and Bell wiring diagrams for typical crossings are shown in Figure C-8 and Figure C-9. A typical crossing lamp configuration is shown in Figure C-10. Recommended wire size for L1 and L2 between the Lighting Surge Panel and the 4000 SSCC power connector is number 10 AWG. Recommended wire size between the Lighting Surge Panel and the Mast Junction Box is number 6 AWG. The Lighting Surge Panel should be mounted as close as practical to the 4000 GCP.

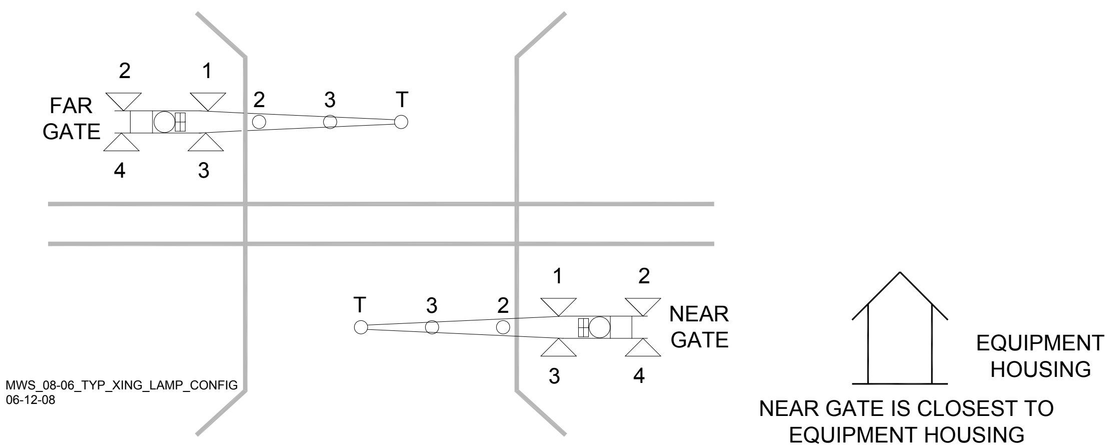


Figure C-10:
Typical Crossing Lamp Configuration

NOTE

For a crossing without gates, disable the GP input to the A80405 module by programming the Gates Used to NO.

C.5.4 Lamp Wire Length Limitations

The maximum single wire length between the Lighting Surge Panel and the Mast Junction Box is determined by the:

- Gauge of the wire
- Total lamp current
- Type of battery used

C.5.5 Maximum Lamp Wire Length

The maximum recommended lamp wire length for a crossing is listed in Table C-3.

Designated load current is based on 9.5 volts supplied to lamps.

Generally, 18-watt bulbs draw 1.8 amps per each bulb lit at the same time and 25-watt bulbs draw 2.5 amps per each bulb lit at the same time.

NOTE

If a lamp wire between the surge Panel and the Mast Junction Box is too long, its resistance can prevent the full required voltage from being applied to the lamps.

The effective resistance of a wire can be reduced and/or its maximum length increased by using two wires of the same gauge in parallel as indicated in Table C-3.

The A80405 module maintains a constant lamp output voltage provided:

- The battery voltage to the SSCC remains 1.5 volts higher than the lamp voltage measured at the SSCC L1 and L2 outputs.
- The maximum lamp wire length is not exceeded.

When the battery voltage supply cannot supply the requested lamp voltage, a lamp voltage limited message will be displayed.

Table C-3:
Maximum Recommended Crossing Lamp Wire Length

BATTERY			WIRE LENGTH (FT.M)			
LOAD CURRENT	TYPE	CELLS	#9AWG	DUAL #9AWG	#6AWG	DUAL #6AWG
5.0 Amp	Pb	6	225/68.6	450/137.2	450/137.2	900/274.3
	NiCd	9	175/53.3	350/106.7	350/106.7	700/213.4
7.5 Amp	Pb	6	117/35.7	234/71.3	234/71.3	469/143.0
	Pb	7[1]	260/79.2	520/158.5	500/152.4	1000/304.8
	NiCd	10	200/61.0	400/121.9	400/121.9	800/243.8
	NiCd	11[1]	260/79.2	520/158.5	500/152.4	1000/304.8
10.0 Amp	Pb	6	88/26.8	176/53.6	175/53.3	350/106.7
	Pb	7[1]	213/64.9	426/129.8	375/114.3	750/228.6
	NiCd	10	150/45.7	300/91.4	300/91.4	600/182.9
	NiCd	11[1]	213/64.9	426/129.8	375/114.3	750/228.6

Pb = Lead acid
NiCd = Nickel-cadmium
Note 1: Do not exceed 16.5 volts on power terminals of controller.

C.5.6 Crossing Controller DC Power Connections

The A80405 modules receive power via the Lighting Surge panel and the **CROSSING CONTROLLER** connectors as shown in Figure C-11:

Surge panel provides primary battery surge protection.

Secondary surge protection provided by each A80405 module

Make power connections to each A80405 module via the **B** and **N** contacts of the respective **CROSSING CONTROLLER** connectors:

Poly-jacketed 10AWG wire is recommended for DC power and return between the lighting surge panel and the 4000 GCP.

Poly-jacketed 6AWG wire is recommended for DC power and return between the lighting surge panel and the crossing battery.

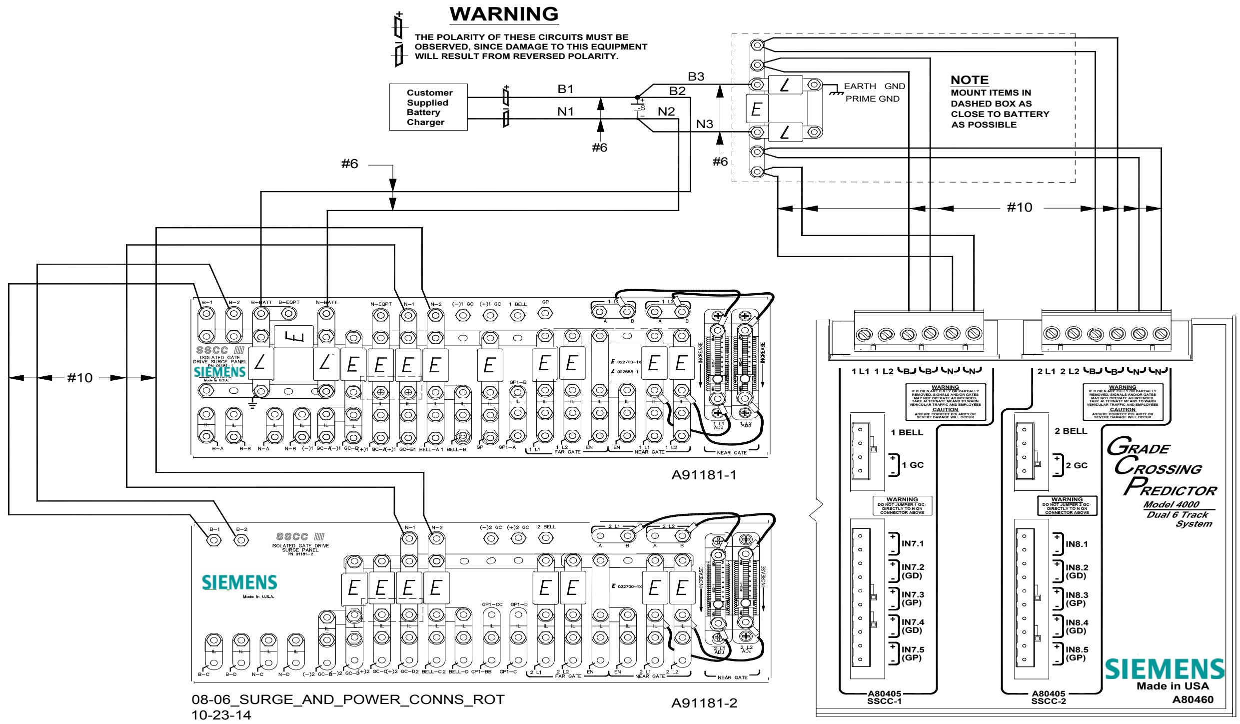


Figure C-11:
Typical Crossing Controller Module Battery Connections

CAUTION

WHEN USING TEMPERATURE COMPENSATED BATTERY CHARGERS:

EXCEEDING 16.5 VDC ON CROSSING CONTROLLER POWER TERMINALS MAY RESULT IN INTERMITTENT FALSE ACTIVATIONS.

EXCEEDING 18 VDC WILL RESULT IN CONTROLLER DAMAGE.

OBSERVE CORRECT POLARITY WHEN CONNECTING BATTERY POWER TO THE B AND N CONTACTS ON THE CROSSING CONTROLLER CONNECTOR(S).

INCORRECT POLARITY WILL RESULT IN SEVERE DAMAGE TO THE A80405 MODULE(S).

C.5.7 Flash Sync Connections to External Controllers

NOTE

Effective with Revision D of the SSCC3i, FLASH SYNC is an isolated two-wire output. If two Revision D or later SSCC3i units in the same chassis are operated by separate batteries, the FLASH SYNC returns are connected internally and no additional connection is required.

Revision D SSCC3i Modules can be identified by:

- "D" located at end of Part Number / Bar Code tag.
- Large metal bracket located on component side of module.

When using Revision C SSCC3i or earlier, or when external SSCC units are connected to a master SSCC3i and operated from a different battery, the following wiring must be provided for FLASH SYNC Return:

If two Revision C SSCC3i units in the same chassis are operated by separate batteries, the **N** pins of the SSCC3i power and lamp connectors must be wired together.

If an external SSCC IIIA, SSCC III PLUS, or SSCC IV is connected to a master SSCC3i:

- If the SSCC3i is Revision C or earlier, the negative terminals of the master SSCC3i and external SSCC must be wired together.
- If the SSCC3i is Revision D or later, the SSCC3i **FLASH SYNC** return (-) must be connected to **N** on the external SSCC.

The terminology for flash sync control differs between a GCP 4000 and an external SSCC device. The GCP 4000 terms Master and Slave SSCC, are called "Flash Sync Out" and "Flash Sync In" respectively in an external SSCC (Slave = Flash Sync In).

The SSCC3i flash sync connection to an external SSCC is located on the CPU connector.

C.6 EXTERNAL CROSSING CONTROLLERS

An external crossing controller may be used with the Model 4000 GCP to replace the internal crossing controllers or to supplement the lamp current provided by the internal crossing controllers. An appropriate crossing controller such as the SSCCIII, SSCCIII Plus, or SSCCIV may be used.

C.7 CONFIGURATION SOFTWARE

NOTE

Where only LED lamps are used, a false lamp-neutral-wire-open condition may be detected when **Lamp Neutral Test** is set to **On** (see paragraph 7.1.4.9).

To avoid a false error indication, set **Lamp Neutral Test** status entry for each active crossing controller to **Off**.

C.8 CONNECTING POWER AT INITIAL CUTOVER

Once the system has booted up, the SSCC3i module has internal short circuit protection for lamp, bell and gate control outputs. Therefore, at the initial cutover it is important to boot up the system prior to connecting external loads.

After external wiring is complete, the connectors must be applied as instructed in the following CAUTION before applying power to the 4000 GCP SSCC3i module(s).

WARNING

DURING THE SSCC BOOT-UP PROCESS AND AFTER ALL WIRING IS CONNECTED:

- **THE CROSSING GATES WILL BE DOWN WITH CROSSING LAMPS FLASHING AND BELLS RINGING.**
- **A80405 MODULE(S) WILL NOT BE RESPONSIVE TO CROSSING CONTROL INPUT FROM THE 4000 GCP.**

TAKE ADEQUATE PRECAUTIONS TO WARN ANY PEDESTRIANS, PERSONNEL, TRAINS, AND VEHICLES IN THE AREA UNTIL PROPER SYSTEM OPERATION IS VERIFIED.

CAUTION

THE WIRING AND CONNECTORS MUST BE APPLIED IN THE FOLLOWING SEQUENCE TO AVOID DAMAGE:

1. OPEN THE LAMP, GATE GC CONTROL, GP INPUTS, GD INPUTS AND BELL CIRCUITS AT THE SURGE PANEL(S).

2. VERIFY POLARITY ON POWER CONNECTOR(S).

3. CONNECT THE SCREW-LOCK POWER CONNECTOR FOR EACH SSCC3i MODULE AND LOCK BY TIGHTENING SCREWS.

4. WAIT APPROXIMATELY 40 SECONDS FOR SSCC3i MODULE(S) TO BOOT UP.

5. CONNECT THE GC/BELL AND GP/GD CAGE–CLAMP CONNECTORS FOR THE APPROPRIATE SSCC3I.

6. CLOSE THE LAMP, GATE CONTROL, GP/GD INPUTS AND BELL CIRCUITS ON THE SURGE PANEL(S).

C.9 MEASURING CROSSING LAMP VOLTAGE USING A CONVENTIONAL MULTIMETER

WARNING

TO PREVENT AN OVERVOLTAGE CONDITION AT THE LAMPS, USE A VOLTMETER WITH A "TRUE RMS AC + DC" SCALE AND MAKE ALL MEASUREMENTS USING THAT SCALE.

To accurately read the crossing lamp voltages, a "true rms AC + DC" multimeter (e.g., Agilent U1252A digital multimeter) must be used. Conventional multimeters may be used, however the voltage read on the meter will vary from "true rms AC + DC". The variance is not a set percentage and is dependent on battery voltage. A conversion table cross-referencing several conventional meters is provided in paragraph C.10.

C.10 METER READING CONVERSION EXAMPLES

Following are two examples of how to measure the lamp voltages using a conventional meter. In both examples:

- Battery bank voltage is 14.7 volts
- Multimeters are set to read DC

Table C-4:
Multimeter Reading Variance from Actual Lamp Voltages

Battery Voltage	Regulated Lamp Drive Voltage Range	Measurement Below Actual Drive Voltage: Using Digital Multimeter (Agilent U1252 or Equivalent)	Measurement Below Actual Drive Voltage: Using Analog Multimeter (TS111)
13.3	9.0 to 12.0	1.3 volts	0.6 volt
	>12.0	0.91 volt	0.42 volt
14.7	9.0 to 12.0	2.2 volts	1.1 volts
	>12.0	1.54 volts	0.77 volts
15.8	9.0 to 12.0	2.6 volts	2.0 volts
	>12.0	1.82 volts	1.4 volts

Lamp voltage measurement examples are provided on next page

C.10.1 Lamp Voltage Measurement Example 1

When setting crossing lamp voltages to 9.5 volts, the conventional meter reading is determined by subtracting the meter variance given in Table C-4 from the desired lamp voltage.

When using a **digital multimeter** (e.g. Agilent U1252A):

- Desired lamp voltage = 9.5
- Meter variance for 14.7 volt battery = -2.2
- Meter reading = **7.3**

When using an **analog multimeter** (e.g. TS111):

- Desired lamp voltage = 9.5
- Meter variance for 14.7 volt battery = -1.1
- Meter reading = **8.4**

C.10.2 Lamp Voltage Measurement Example 2

In this example, it is desired to check that lamp voltage is greater than 8.5 volts and the battery voltage is 13.3 volts.

When verifying that the lamp voltages are greater than 8.5 VDC, the conventional meter reading is determined by subtracting the meter variance given in Table C-4 from the minimum lamp voltage threshold.

When using a **digital multimeter** (e.g. Agilent U1252A):

- Minimum lamp voltage threshold = 8.5
- Meter variance for 13.3 volt battery = -1.3
- Minimum meter reading = **7.2**

When using an **analog multimeter** (e.g. TS111):

- Minimum lamp voltage threshold = 8.5
- Meter variance for 13.3 volt battery = -0.6
- Minimum meter reading = **7.9**

C.11 SSCC3i PROGRAMMING GUIDELINES

The Model 4000 GCP can be configured to use up to two Solid State Crossing Controller IIIi (SSCC3i) modules. Crossing controller modules directly control the gates, lights, and bells for a crossing. Each crossing controller module includes:

- a gate drive output
- a bell output
- 2 lamp outputs that can drive up to 20A of lamp current
- 5 vital inputs

The Model 4000 GCP programming for the SSCC3i modules allows flexibility in the use of the SSCC3i modules. Generally, the SSCC3i modules use a separate set of batteries from the Model 4000 GCP battery to provide lamp, gate, and bell drive.

CAUTION

EXCEEDING 16.5 VDC ON CROSSING CONTROLLER POWER TERMINALS MAY RESULT IN INTERMITTENT FALSE ACTIVATIONS.

EXCEEDING 18 VDC WILL RESULT IN CONTROLLER DAMAGE.

C.11.1 Program Parameters

The program configuration parameters for the SSCC3i modules are shown in Figure C-12A. Seven general options are available for crossing operation.

- Gates Used
  - Specifies whether gates are used at the crossing.
  - Set to **Yes** when gates are used
  - Default: **Yes**
- SSCC1+2 GPs coupled
  - Set to **Yes** to allow a de-energized GP (gate position) input of one crossing controller to flash the lamps of the other crossing controller.
  - Set to **No** to allow the two crossing controllers to function independently. When GP's are not coupled in the main menu, the GP's coupled parameter will not display in the template menu.
  - Default: **Yes**.
- Min Activation
  - Specifies the minimum crossing controller activation period when the crossing is activated and then immediately deactivated.
  - Range: 0 – 100 seconds. Default: **0**

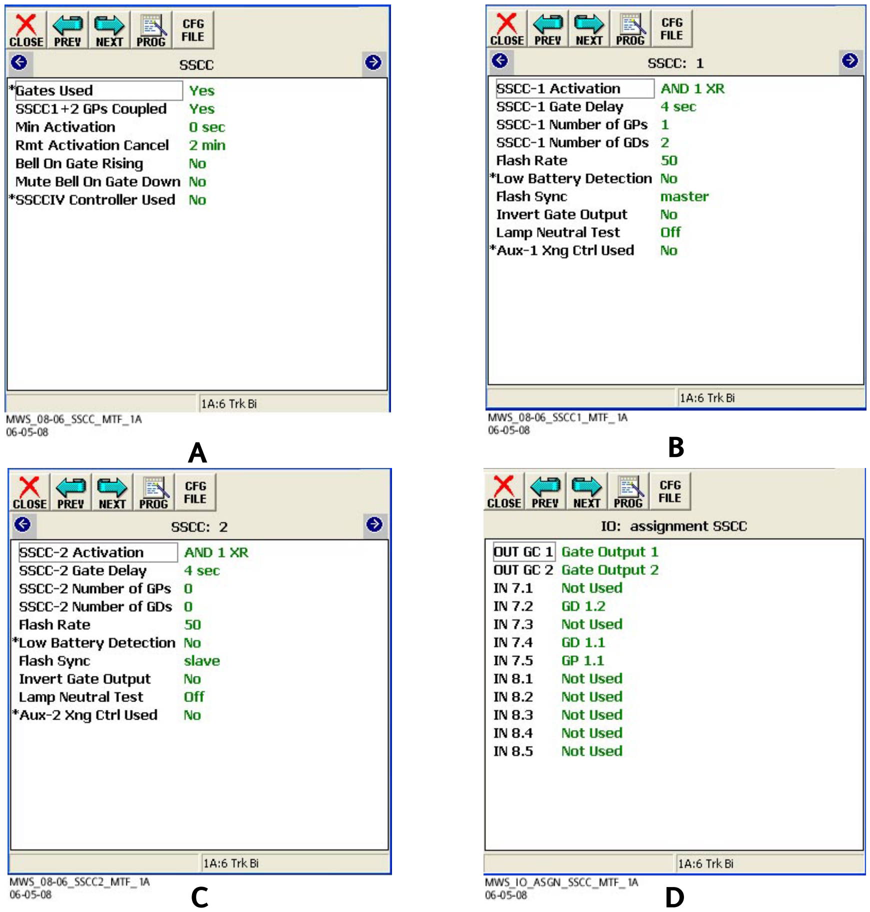


Figure C-12:
Default SSCC Programming Windows

- Rmt (Remote) Activation Cancel
    - Specifies the maximum length of time that the crossing will remain active when activated remotely via a command from the SEAR.
    - Range: 1 – 5 minutes. Default: **2 Min.**
- Bell On Gate Rising
    - When set to **Yes**, the bell rings while the gates are rising.
    - Default: **No**
- Mute Bell On Gate Down
    - Specifies whether the bell outputs are turned off when all the gate down inputs (GDs) are energized.
    - Default:: **No**
- SSCCIV Controller Used
    - Specifies whether the Model 4000 GCP is interfacing for four quadrant applications to an external SSCCIV via the Echelon LAN.
    - Default:: **No**

- 4000 Control Type
  - Displays only when **SSCCIV Controller Used** is set to **Yes**.
  - Specifies whether the Model 4000 GCP is acting as an entrance or an exit gate controller when **SSCCIV Controller Used** is set to **Yes**.
  - Default: **Exit**

C.11.2 Gate Down Inputs

Gate Down inputs (GDs) are used for various applications:

- When the GDs are connected to the SSCC inputs, they are monitored by the SEAR, and can be used to generate alarms conditions and monitor crossing operation.
- Can be used to control Preemption Gate Down Logic.
- Can be used to control Traffic Control Clear Out Interval.
- Four quadrant gate applications.

WARNING

DO NOT USE THE "GATE DWN INDICATION" FOR TRAFFIC SIGNAL PREEMPTION WHEN GD INPUTS ARE ENABLED FOR GATES USED FOR OTHER DIRECTIONS OF TRAFFIC. CONTACT SIEMENS TECHNICAL SUPPORT FOR PROGRAMMING INSTRUCTIONS IF "GATE DWN LOGIC" IS NEEDED WHEN "MUTE BELL ON GATE DOWN" OR FOUR-QUADRANT GATES ARE USED.

C.11.3 Crossing Control Health Reporting

When a crossing controller module detects an internal health problem, it activates the crossing, causing the:

- Lights to flash
- Gates to drop
- Bells to sound
- Maintenance Call (MC) to drop

The internal health problem is also detected by the CPU. This causes the CPU to activate the other Crossing Controller Module, if used.

C.11.4 Crossing Controller Programming

The default programming parameters for the crossing controllers are shown in the SSCC windows, Figure C-12B and Figure C-12C. Each of these windows provides ten function fields:

C.11.4.1 SSCC-1 and SSCC-2 Activation

- All template applications default to **AND 1 XR**.
- The controller can be activated by either AND 1 XR, AND 2, AND 3 or AND 4.
- Use **AND 2** for applications where the controllers are activated independently.

C.11.4.2 SSCC-1 and SSCC-2 Gate Delay

- The gate delay time is measured from the time the signals begin to flash to the time the gate output of the crossing controller de-energizes (the gates start down).
- Range: 3 – 100 seconds. Default: **4 sec.**

C.11.4.3 SSCC-1 and SSCC-2 Number of GPs

Modifies the available SSCC gate position input selections in the **INPUT: assignment SSCC** window.

- Set to **1** when the gate output drives one or more gates, and the gate positions of these gates are daisy-chained together externally with only one gate position brought back into the controller.
- Set to **2** when the gate output drives two gates and each gate position can be brought into separate GP (Gate Position) inputs.

The functions that may be assigned to each SSCC vital input relative to the **number of GPs** selection are shown in Table C-5. The default settings are as follows:

- SSCC 1 Default: **1**
- SSCC 2 Default: **0**

Table C-5: SSCC GP Input Selection

NUMBER SELECTED IN CORRESPONDING GPs FIELD	SSCC-1 VITAL INPUT SELECTION AVAILABLE	SSCC-2 VITAL INPUT SELECTION AVAILABLE
0	Not Used	Not Used
1	Not Used GP 1.1	Not Used GP 2.1
2	Not Used GP 1.1 GP 1.2	Not Used GP 2.1 GP 2.2

C.11.4.4 SSCC-1 and SSCC-2 Number of GDs

Modifies the available SSCC GD (gate down) input selections in the **INPUT: assignment SSCC** window. The functions that may be assigned to each SSCC vital input relative to the **number of GDs** selection are shown in Table C-6.

- SSCC 1 Default: **2** (There is no requirement to change this value or strap the input low if this feature is not used)
- SSCC 2 Default: **0**

Table C-6:
SSCC GD Input Selection

NUMBER SELECTED IN CORRESPONDING GDs FIELD	SSCC-1 VITAL INPUT SELECTION AVAILABLE	SSCC-2 VITAL INPUT SELECTION AVAILABLE
0	Not Used	Not Used
1	Not Used GD 1.1	Not Used GD 2.1
2	Not Used GD 1.1 GD 1.2	Not Used GD 2.1 Gd 2.2
3	Not Used GD 1.1 GD 1.2 GD 1.3	Not Used GD 2.1 GD 2.2 GD 2.3
4	Not Used GD 1.1 GD 1.2 GD 1.3 GD 1.4	Not Used GD 2.1 GD 2.2 GD 2.3 GD 2.4

C.11.4.5 Flash Rate

- The rate in flashes per minute at which the lamps flash.
- The range is 30 to 70 flashes per minute, in steps of 5 flashes.
- Default: **50**

C.11.4.6 Low Battery Detection

- When set to Yes the controller monitors its battery.
- The maintenance call output drops when a low battery condition is detected.
- Default: **No**

C.11.4.6.1 Low Battery Level

- Displays when Low Battery Detection is set to **Yes**
- Sets the low battery detection level.
- If the controller detects a battery voltage lower than this value it will log low battery detected and activate the maintenance call output.
- Range: 90 – 150dV (9.0 – 15.0 volts DC). Default: **90dV** (9.0 volts)

C.11.4.7 Flash Sync

- Used to synchronize all flashing lights.
- External controllers can be synchronized with the flash sync output of the CPU connector.
- A crossing controller can be designated as either master or slave.
    - SSCC1Default: **master**
    - SSCC2 Default: **slave**

C.11.4.8 Invert Gate Output

- Used to invert the on-off state of the GC output for exit gate mechanisms. When set to **Yes:**
    - The output energizes after the Gate Delay timer expires.
    - The output is deenergized when no train movement is detected
- When set to **No**:
    - The output deenergizes after the Gate Delay timer expires.
    - The output is energized when no train movement is detected
- Default: **No**

C.11.4.9 Lamp Neutral Test

NOTE

The power supplies in many LED signals adversely affect the Open Lamp Neutral circuitry. Disable DETECT LAMP NEUTRAL WIRE when LEDs are used on any lamp output.

Used to enable or disable the testing for the open lamp neutral wire on the SSCC. If set to **Off** the SSCC Module will not perform the test for open lamp neutral wires.

If set to **On** the SSCC Module will perform the test for open lamp neutral wires. Default: **Off**

C.11.4.10 Aux-(#) Xng Ctrl Used

This function is used to interface the Model 4000 GCP with external crossing controllers such as the SSCCIIIA, the SSCCIII+, and the SSCCIV. It can be used in interconnected railroad applications. When set to **Yes** the two controls become available to be assigned to an external output: In addition, one input becomes available.

- Aux-(#) Xng Control
    - de-energizes when the SSCC-(#) Module activates due to de-energized assigned **SSCC Activation** input (AND 1 XR, AND 2, 3 or 4) or there is an unhealthy SSCC-1 or SSCC-2
    - May be assigned to a physical output to control external crossing controller or to drop the gates and flash the lamps of an interconnected adjacent crossing in concert with those of the local crossing
- Aux-(#) Lmp Control

- De-energizes when the SSCC-(#) Module activates due to: de-energized assigned **SSCC Activation** input (AND 1 XR, AND 2, 3 or 4); unhealthy SSCC-1 or SSCC-2; de-energized SSCC-(#) Module gate position input
- May be assigned to a physical output to: control external crossing controller; synchronize lamps of an interconnected adjacent crossing with the local crossing

- Aux-(#) Xng Ctrl Hlth IP
  - Displays when Aux-(#) Xng Ctrl Used set to Yes. This function is used to select whether an **Aux-(#) Xng Ctrl Hlth** input is used. **Aux-(#) Xng Ctrl Hlth** receives health status signal from an external crossing controller or the corresponding SSCC-(#) of an interconnected adjacent crossing.
  - If the input is low SSCC-1 and SSCC-2 will activate, flash lamps, and drop gates.

NOTE

If no health output is available from the external equipment, **Aux-(1) Xng Ctrl Hlth** still must be assigned to a physical input and strapped high.

C.11.5 Crossing Controller Gate Position Configuration Examples

Five examples are provided to show how to use the GP and GP Coupled status fields:

Example 1 – One Gate position input
Example 2 – Two gate position inputs
Example 3 – Single gate position input to each crossing controller
Example 4 – Single gate position input to each crossing controller with independent gate position
Example 5 – Crossing flashers only

C.11.5.1 Example 1 - Crossing Configured With One GP Input

To configure the crossing to respond to a single gate position (GP) input,

- Set **GP Coupled** of the **SSCC** window to **Yes** as shown in Figure C-12A. This causes the lamps on both crossing controllers to flash if the GP input goes low.
- Set the parameters for each crossing controller to the values shown in Figure C-12B and Figure C-12C.
- Set the inputs to the crossing controllers to the values shown in Figure C-12D

C.11.5.2 Example 2 - Crossing Configured With Two GP Inputs

To configure the crossing to respond to two gate position (GP) inputs to the same crossing controller (this allows both gates to have their GPs wired individually to two SSCC GP inputs):

- Set **GP Coupled** of the **SSCC** window to **Yes** as shown in Figure C-12A. This causes the lamps on both crossing controllers to flash if either GP input goes low.
- Set the parameters for each crossing controller as shown in Figure C-13A and Figure C-13B. The two GP inputs are automatically combined internally, which allows the SEAR to independently monitor each gate position input

- Set the inputs to the crossing controllers as shown in Figure C-13C. The gate position wires are connected to IN 7.3 and IN 7.5 of SSCC-1.

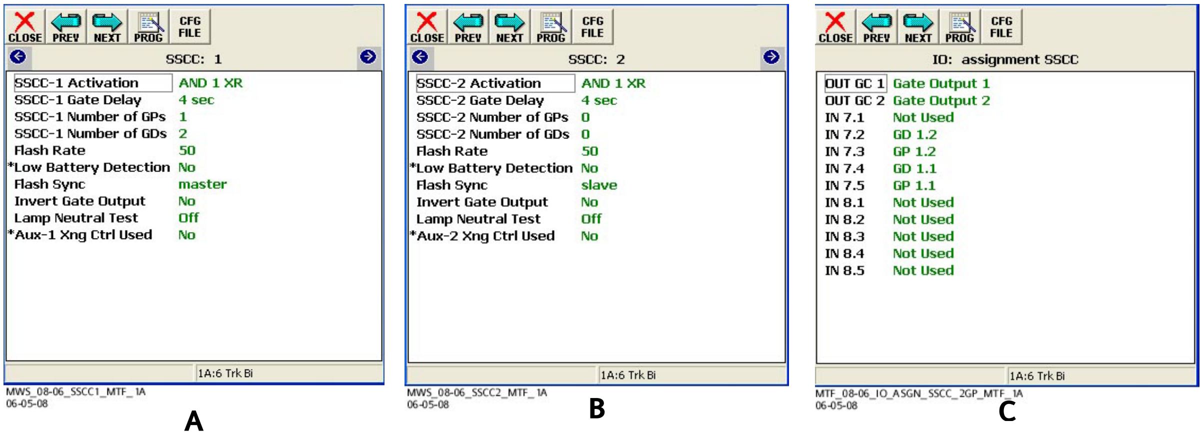


Figure C-13:
SSCC Parameter Settings and Input Assignments for Dual GP Input

C.11.5.3 <u>Example 3 - Crossing Configured for Two GP Inputs (One GP Input To Each SSCC Module)</u>

This example is basically the same as example 2 except that one GP input is assigned to each SSCC Module. To configure the crossing to respond to a gate position (GP) input to each crossing controller:

- Set **SSCC1+2 GPs Coupled** of the **SSCC** window to **Yes** as shown in Figure C-12A. This causes the lamps on both crossing controllers to flash if either GP input goes low. The two GP inputs are automatically combined internally, which allows the SEAR to separately monitor the two gate position inputs.
- Set the parameters for each crossing controller as shown in Figure C-14A and Figure C-14B
- Set the GP inputs to the crossing controllers as shown in Figure C-14C. The gate position wires are connected to IN 7.5 for SSCC 1 and IN 8.5 for SSCC 2.

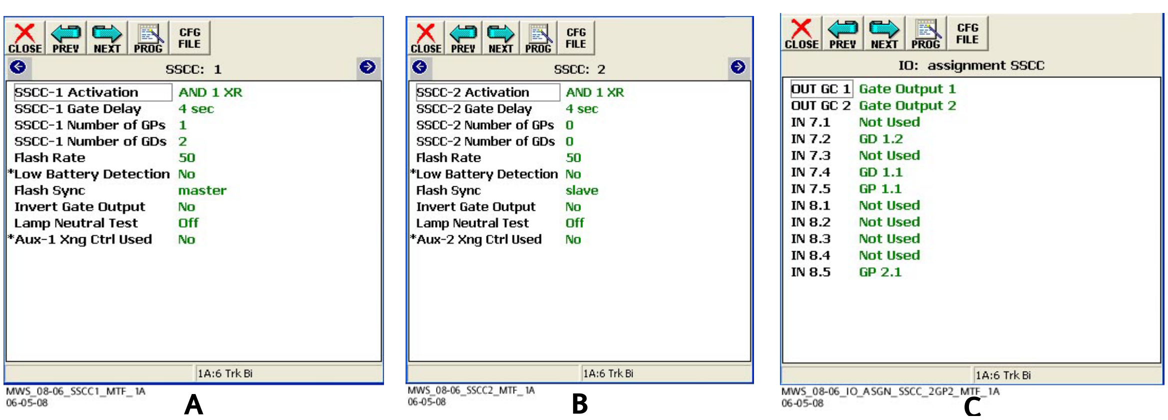


Figure C-14:
A & B: SSCC Parameter Settings For GP Inputs To Two Crossing Controllers;
C: SSCC Input Assignments For Two Crossing Controllers

C.11.5.4 Example 4 - Crossing Configured With GP Inputs To Independent SSCCs

The crossing controllers may be configured to function with minimum interaction, thus allowing each SSCC module to independently control lamp activation. This typically may be used on divided highways where a single gate malfunction does not affect opposing traffic. To configure the crossing controllers for minimum interaction:

- Set **SSCC1+2 GPs Coupled** to **No** as shown in Figure C-15
  - when the GP input to SSCC 1 de-energizes, only the lamps controlled by SSCC-1 flash
  - when the GP input to SSCC 2 de-energizes, only the lamps controlled by SSCC-2 flash
- Set the parameters for each crossing controller as shown in Figure C-16A and Figure C-16B
- Set SSCC 1 for activation by AND 1 XR
- Set the inputs to the crossing controllers as shown in Figure C-17. The gate position wires are connected to IN 7.5 for SSCC 1 and IN 8.5 for SSCC 2.

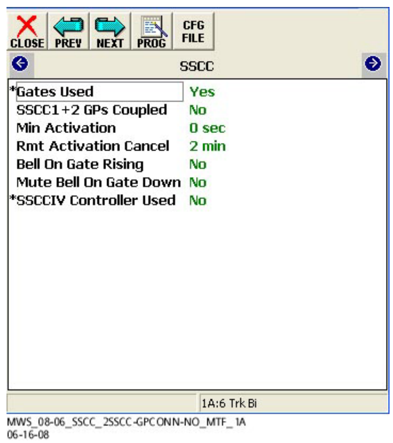
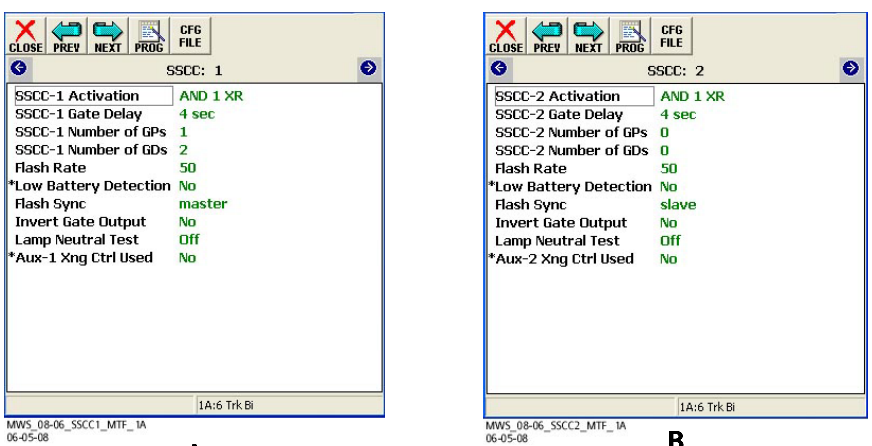


Figure C-15:
SSCC Parameter Settings for GP Inputs to Independent Crossing Controllers



A

Figure C-16:
A: SSCC 1 & B: SSCC-2 Settings for Independent Crossing Controllers

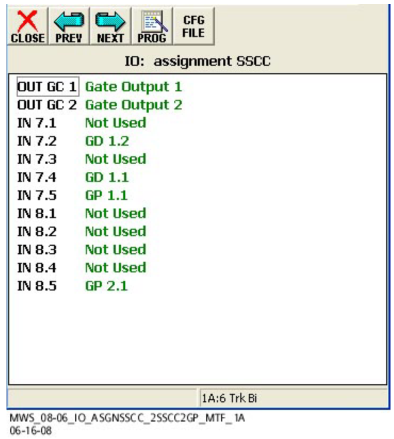


Figure C-17:
SSCC Input Settings for Independent Crossing Controllers

C.11.5.5 <u>Example 5 - Crossing Configured for Flashers Only Using One SSCC Module</u>

The crossing controllers may be configured to only operate the crossing flashers. To configure the crossing controllers for this function:

- Set the **Gates Used** entry to **No** as shown in Figure C-18A
- Set the parameters for SSCC-1 as shown in Figure C-18B
- Set SSCC-2 Slot to Not Used in the Basic: module configuration menu window
- Set all inputs of SSCC-1 to **Not Used** as shown in Figure C-18C.

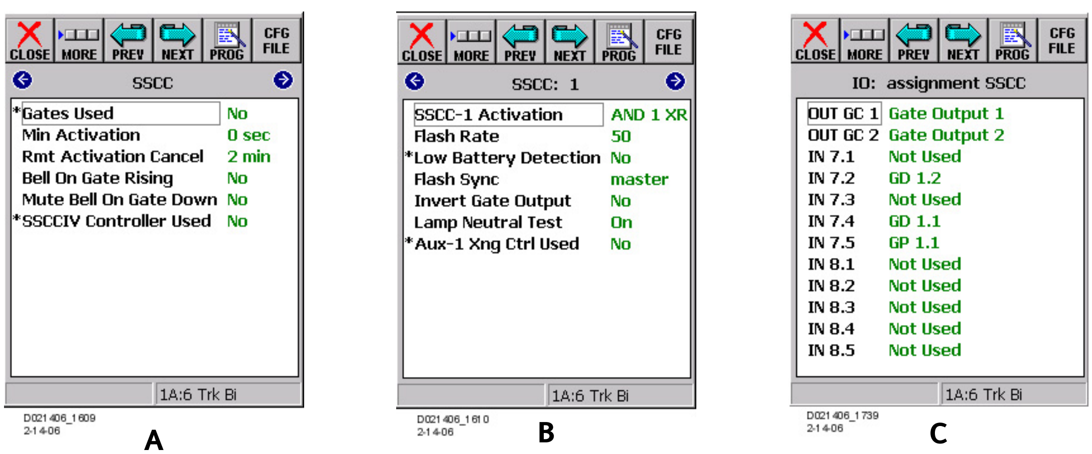


Figure C-18:
SSCC Settings For Flasher Use Only

C.12 EXTERNAL CROSSING CONTROLLERS

An external crossing controller may be used with the Model 4000 GCP to replace the internal crossing controllers or to supplement the lamp current provided by the internal crossing controllers. An appropriate crossing controller such as the SSCCIII, SSCCIII Plus, or SSCCIV may be used.

C.12.1 External Crossing Controller Or Relay Based Control

To accommodate an external crossing controller or relay based crossing control the AND 1 XR signal of the Model 4000 GCP must be mapped to an external output as shown in Figure C-19.

- The external output can be connected to an XR relay.
- The external output can be connected to the appropriate activation input of the crossing controller.

For additional information, see paragraph 3.6, External Crossing Controllers, of this manual.

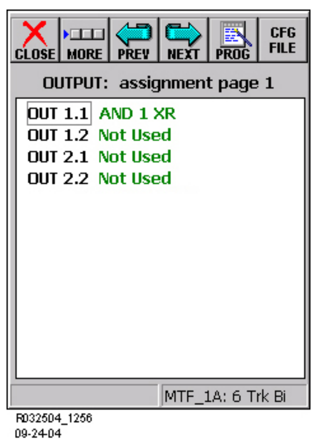
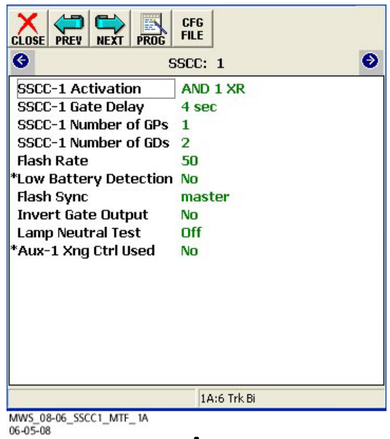


Figure C-19:
Assigning Inputs For External Crossing Controller

C.12.2 External Crossing Controller For Additional Lamp Current

Where the lamp current requirements of the crossing exceed the 40 amp combined capacity of the two internal crossing controller modules, an external controller may be used to provide supplemental lamp current. Either SSCC-1 or SSCC-2 may be used to activate the external controller. The setup to enable activation by SSCC-1 is as follows:

- Set the **Aux-(1) Xng Ctrl Used** entry of the SSCC to **Yes** and the **Aux-(1) Xng Ctrl Hlth IP** to **Yes** as shown in Figure C-20.
- When the **Aux-(1) Xng Ctrl Used** entry is set to **Yes,** this enables two additional outputs, **AUX-1 Xing Control** and **AUX-1 LMP Control.**



A

Figure C-20:
SSCC Crossing Controller Configuration

- Map **Aux-1 Lmp Control** to an output as shown in Figure C-21A. Connect this output to the appropriate gate position input of the external crossing controller.
- Set an input as **Aux-1 Xng Ctrl Hlth** as shown in Figure C-21B. Connect this input to the gate output of the external SSCC.

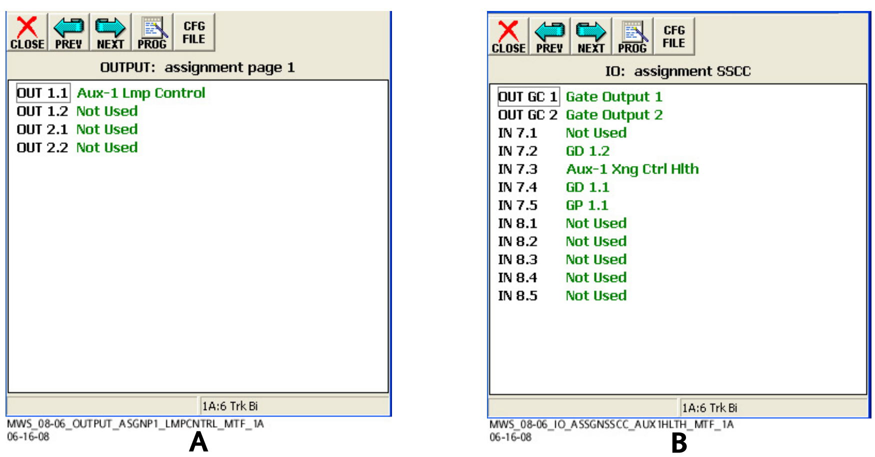


Figure C-21:
External Crossing Controller IO Assignment

To sync the lamps on the external controller:

- Connect the flash sync output of the GCP to the flash sync I/O of the external crossing controller as follows:
- Connect the **FLASH SYNC +** output of the GCP chassis to the **FLASH SYNC I/O** on the external crossing controller.
- Connect the **FLASH SYNC -** output of the GCP to **N** of the external crossing controller. (The power returns for the GCP and the external crossing controller do not have to be connected.)

- When used, connect **MAINT CALL** of the GCP with **MAINT CALL** of the external crossing controller as described in paragraph 6.12.

NOTE

SSCC3i Modules Rev D and later have an isolated flash sync output.

Where battery isolation must be maintained and SSCC3i Modules of Rev C or earlier are used, contact Siemens Technical Support for application information.

The **Aux-1 Lmp Control** output de-energizes whenever the lamps on SSCC-1 flash, either due to activation, gate position or SSCC health.

If the external controller fails, its gate output will de-energize, causing the Aux-1 Xng Ctrl Hlth to de-energize and the internal crossing controllers to activate.

C.13 FOUR-QUADRANT GATE CONTROL WITH DYNAMIC EXIT GATE OPERATING MODE

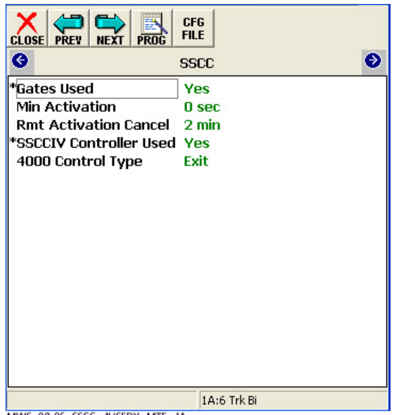
The Model 4000 GCP system, in conjunction with one SSCC IV 40 Amp controller, is designed to operate a four-quadrant gate crossing with an external vehicle detection system. In four quadrant gate applications, additional inputs are provided for vehicle detection, vehicle detection health, and gate position, both up and down, of all gates used.

C.13.1 System Requirements

C.13.1.1 Model 4000 GCP

The Model 4000 GCP must be using gcp-t6x-01-2.mcf or newer, to function in this application. The GCP **SSCC** menu is programmed with **SSCC IV Controller Used** set to **Yes** (Figure C-22). When SSCC IV Controller Used is set to Yes,

- the **4000 Control Type** option is displayed
- the choices are **Entrnce** and **Exit**
- the **Mute Bell on Gate Down** option is not displayed.



MWS_08-06_SSCC_4USEDY_MTF_1A
06-16-08

Figure C-22:
Selecting SSCC IV and 4000 Controller Type

Two SSCC3i controller modules are generally needed to control the exit gates. One SSCC3i is required for controlling exit gates in each direction of vehicular traffic. In hybrid locations, where a median replaces one set of exit gates, one controller may be required. Template programming of the system is dependent on the track circuit arrangement. The Model 4000 GCP running gcp-t6x-01-2.MCF or later provides additional I/O for this application on its internal SSCC3i controllers.

C.13.1.2 SSCC IV

40 amp units are required. The SSCC IV controller operates the GCP4ENT.MCF (MCF ID 808).

- The GCP4ENT MCF contains all the logic required to operate a 4-quadrant gate crossing.
- The GCP4ENT.MCF controls the entrance gate controller and acts as the master of other controllers.
- Setup and configuration for the crossing is done, for the most part, on the master SSCC IV using this MCF.

The exceptions to this are the configuration options that must be done to all crossing controllers. These exceptions include: Flash Rate; Date/Time; ATCS Address; Setup Lamp Voltages; and setting Output Enable to **A and B**.

Two external SSCC IV units (40-Amp) can be connected together for additional lamp load and gate control. The SSCC IV MCFs are as follows:

- AUE4QUAD.MCF (optional) (40-Amp Unit Only)
  - Is used on a crossing controller that is slaved to the master crossing controller as an optional auxiliary entrance gate controller.
  - Is used when additional entrance lamp, bell, and/or gate drives are required.
  - It duplicates the outputs provided by the GCP4ENT.MCF.

- AUX4QUAD.MCF (optional) (40-Amp Unit Only)
  - Is used on a crossing controller that is slaved to the master crossing controller as an optional auxiliary exit gate controller.
  - Is used when additional exit lamp, bell, and/or gate drives are required.
  - It duplicates the outputs of the SSCC3i exit gate controllers in the Model 4000 GCP.

For SSCC IV programming and configuration refer to the Solid-State Crossing Controller IV Instruction & Installation Manual, Document number SIG-00-03-02, Version E and later.

C.13.1.3 Vehicle Detection System

A Vehicle Detection System is required for the Dynamic Exit Gate Operating Mode. The external vehicle detection system should meet applicable industry standards. The system should provide a 12 volt DC nominal output when no vehicle is detected between the entrance gates and exit gates in each direction of traffic. When a vehicle is detected the output shall be less than 1 volt. The system should provide a vehicle detection health (VDH) output (12 volt DC nominal when on, less than 1 volt when off). When vehicle detection health is de-energized the system operates in the Timed Exit Gate Operating Mode.

C.13.2 Four-Quadrant Gate Operation

There are two exit gate operating modes (EGOM) defined for Four Quadrant Gate: Dynamic Exit Gate Operating Mode and Timed Exit Gate Operating Mode.

- In the dynamic mode the exit gate operation is based on the presence and detection of vehicles between the stop bar or entrance gate and the exit gate.
- In the timed mode, the exit gate descent is based on a predetermined time interval.

The GCP4ENT MCF is based on exit gate mechanisms being designed to fail-safe in the up position in accordance with the MUTCD. Exit gate outputs are inverted from entrance gate outputs; therefore, exit gate outputs (GC) are energized when exit gates are down. Any interruption of the GC or motor power to the gate will result in the exit gate rising to avoid vehicle entrapment. The arrangement of gates and vehicle detectors (VD) is shown in Figure C-23:

- Gates 1 and 2 are entrance gates.
- Gates 3 and 4 are exit gates.
- The odd numbered gates are for the lanes in one direction of traffic.
- The even numbered gates are for the vehicular traffic in the other direction.
- The vehicle detector number is the same as the number of the exit gate traffic is approaching in the exit gate’s “own lane”.

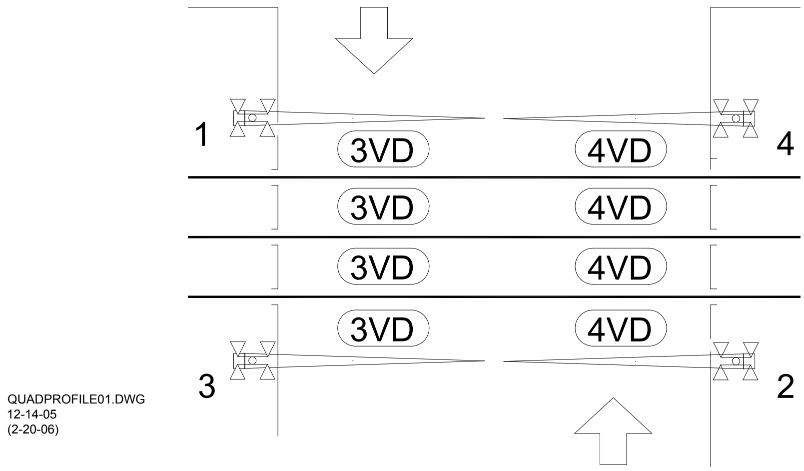


Figure C-23:
Typical 4-Quadrant Gate Crossing

When the Vehicle Detector Health (VDH) is energized, the SSCC IV system operates in the Dynamic EGOM; when it is deenergized, the SSCC IV system operates in the Timed EGOM.

WARNING

EXIT GATE DELAY TIMES SHOULD BE PROGRAMMED IN ACCORDANCE WITH CIRCUIT PLANS. EXIT GATE DELAY TIMES ARE DETERMINED BY ENGINEERING STUDY AND ARE GENERALLY LONGER THAN ENTRANCE GATE DELAY TIMES TO PROVIDE VEHICLES TIME TO PASS THE EXIT GATES. DO NOT SET EXIT GATE DELAY TIMES LESS THAN ENTRANCE GATE DELAY TIMES.

In the Dynamic EGOM when no vehicles are detected, the exit gate delays are determined by the 3DET and 4DET timers respectively. If a vehicle is detected the exit gates will remain up until the island circuit is occupied. The island bypassing the detector is required because vehicle detection systems generally detect a train on the crossing. To prevent the exit gate from rising when a train is on the crossing, the vehicle detection system input is bypassed when a train is on the island. The 3DET and 4DET timers are found in the CONFIGURATION menu of the master SSCC IV controller. The default timer values and range are:

- **3DET** – 7 seconds (range 0 to 60 seconds)
- **4DET** – 7 seconds (range 0 to 60 seconds)

C.13.2.1 Timed Exit Gate Operating Mode

In the Timed EGOM (when vehicle detection health is deenergized), the exit gate delays are determined by the 3TET and 4TET timers respectively. These timers are found in the CONFIGURATION menu of the master controller. The default timer values and range are:

- **3TET** – 15 seconds (range 0 to 60 seconds)
- **4TET** – 15 seconds (range 0 to 60 seconds)

In the timed EGOM there is failed gate timer (**FGTMR**) logic that raises the exit gate if the corresponding entrance gate is not detected down after the time interval expires. The FGTMR timer is found in the CONFIGURATION menu of the master controller.

- **FGTMR** default value is 20 seconds (range 0 to 60 seconds)

C.13.2.2 Traffic Signal Preemption Timer

In this four quadrant gate application, the traffic signal preemption relay is controlled by the Model 4000 GCP which is the train detection device and the I/O interface to the traffic signal controller.

WARNING

THE PREEMPTION RELAY HEALTH CHECK SHOULD BE USED TO INSURE THAT THE WARNING DEVICES ARE ACTIVATED IF THE TRAFFIC SIGNALS ARE FALSELY PREEMPTED.

C.13.2.3 Broken Exit Gate Detection

This logic assumes that an exit gate is broken and may not rise if it is not detected in the down position just prior to the XR recovering. Logic includes a fixed 4 second timer used to determine that both exit gates are in the down position the 4 seconds prior to the XR recovering. If the exit gates are not in the down position during that time, the entrance gates will remain down until both exit gates have indicated the up position. Otherwise, if the exit gates are down when the XR recovers, the entrance gate GC will be energized once the exit gates are no longer down. When 3GD and 4GD inputs become deenergized, it indicates that the exit gate mechanism brake is not engaged and the mechanism is capable of moving.

NOTE

When the crossing devices are activated for a short time and the exit gates do not completely lower, the entrance gates will not raise until both exit gates are completely up.

C.13.2.4 Four-Quadrant Gate Operation Example

The following example uses the default values described above (refer to Figure C-23):

- 3DET - 7 seconds
- 4DET – 7 seconds
- 3TET – 15 seconds
- 4TET – 15 seconds
- FGTMR – 20 seconds

The pre-emption input drops the XR after the Pre-empt time (default = 0). An entrance gate not up will cause the entrance lights to flash. An exit gate not up will cause all lights to flash and the entrance gates to lower. Exit gates are powered down and fail safe to the up position.

- Energizing the exit gate control relay (XGCR) output on the Model 4000 GCP SSCC3i will lower the exit gate.
- De-energizing the XGCR will cause the exit gate to rise.
- This design is based on vehicle detectors for each direction of traffic. Each exit gate is controlled independently of the other exit gate.

If VDH (Vehicle Detector Health) is up,

- the exit gate will start decent after a 7-second exit gate delay if all the islands are up and the corresponding vehicle detection (3VD or 4VD) is up.
- If a 3VD or 4VD de-energizes before all gates are down, the corresponding exit gate will rise.
- All gates down or an island down after the XR has been down for at least 7 seconds will keep the exit gate down.

If VDH is up and an island drops before the DET timer runs out,

- This logic anticipates that train switching moves near the crossing can occupy the island, but not occupy the crossing until vehicles clear.
- The exit gate will start decent after the TET timer runs out regardless of the status of the vehicle detection (3VD or 4VD).
- Normally, exit gates are lowered when the island de-energizes.

If VDH is down the system reverts to Timed EGOM and there is a 15-second delay before the exit gate will start decent.

- If the corresponding entrance gate is down or if an island is down, the exit gate continues decent and remains down.
- If the corresponding entrance gate is not down within 20 seconds, and if an island is not occupied, the exit gate will raise until an island is occupied or the corresponding entrance gate is down.

Second Train Logic – If an island is down and the XGCR is energized (exit gate down), the XGCR will remain energized after the island has recovered if there is another train in the approach. If both exit gates are in the down position when the XR recovers, the entrance gates will start up after both exit gates have started up (rise above 5 degrees).If both exit gates are not in the down position the 4 seconds prior to the XR recovering, the entrance gates will remain down until both exit gates have indicated the up position. This logic assumes that an exit gate is broken and may not completely rise when the XR recovers.

Example A: The XR is down and both exit gates are indicating their down positions. If an exit gate down indication is lost and 3 seconds later the XR recovers, the entrance gates will start up as soon as the other exit gate down indication is lost.
Example B: The XR is down and both exit gates are indicating their down positions. If an exit gate down indication is lost and 5 seconds later the XR recovers, the entrance gates will not start up until both exit gates are indicating their up positions.

C.13.3 Physical Inputs & Outputs

The typical wiring diagram for a 4 quadrant gate system using the Model 4000 GCP and SSCC IV is shown in Figure C-27A and Figure C-27B, which are located at the end of this section.

C.13.3.1 Model 4000 GCP I/O

The inputs to the Model 4000 GCP system are programmed using the I/O Assignment menu. The inputs that are unique to the 4 quadrant gate application are:

- Exit Gate Up, GP (All GP inputs on a SSCC3i module are ANDed internally)
- Exit Gate Down, GD (All GD inputs on a SSCC3i module are ANDed internally)

WARNING

DO NOT USE THE "GATE DOWN INDICATION" FOR TRAFFIC SIGNAL PREEMPTION WHEN GD INPUTS ARE ENABLED FOR GATES USED FOR OTHER DIRECTIONS OF TRAFFIC. CONTACT SIEMENS TECHNICAL SUPPORT AT 800-793-7233 FOR PROGRAMMING INSTRUCTIONS IF "GATE DOWN LOGIC" IS NEEDED WHEN "MUTE BELL ON GATE DOWN" OR FOUR-QUADRANT GATES ARE USED.

- Vehicle Detection,
  - 3 Vehicle Detection, 3VD, for the direction of traffic towards Exit Gate(s) 3
  - 4 Vehicle Detection, 4VD, for the direction of traffic towards Exit Gate(s) 4
  - Vehicle Detection Health, VDH,
  - Multiple inputs are allowed and are ANDed together.

C.13.3.2 SSCC IV I/O

The inputs available on the SSCC IV units using 4-quadrant MCFs are listed in Table C-7 and input definitions are listed in Table C-8.

Table C-7:
GCP4ENT, AUE4QUAD & AUX4QUAD MCF Physical Inputs

INPUT #	INPUT FUNCTION BY MCF		
	ENT4QUAD	AUE4QUAD	AUX4QUAD
1	Entrance GP	Reserved	Reserved
2	Optional Ent. GP	Reserved	Reserved
3	1GD	Reserved	Reserved
4	2GD	Reserved	Reserved
5	Remote Inp 1/ Optional 1GD	Reserved	Reserved
6	Remote Inp 2/ Optional 2 GD	Reserved	Reserved
7	Remote Inp 3	Reserved	Reserved
8	Remote Inp 4	Reserved	Reserved

Table C-8:
SSCC IV Input Definitions

INPUT	DEFINITION
Entrance GP	Gate Position. Energized when Entrance Gate(s) are in the vertical position
Optional Ent. GP	Optional Gate position may be used when additional entrance gates are installed. Energized when additional Entrance Gate(s) are in the vertical position. Input 2, when used, is ANDed with Input 1.
1GD	Gate 1 Down. Energized when Entrance Gate 1, or additional gates at entrance 1, are in the fully lowered position.
2GD	Gate 2 Down. Energized when Entrance Gate 2, or additional gates at entrance 2, are in the fully lowered position.
Remote Inp 1/ Optional 1GD	Remote Input 1 on SSCC IV that can be assigned as an remote input to the Model 4000 GCP, or can be used as an Optional 1 GD.
Remote Inp 2/ Optional 2GD	Remote Input 2 on SSCC IV that can be assigned as an remote input to the Model 4000 GCP, or can be used as an Optional 1 GD.
Remote Inp 3	Remote Input 3 on SSCC IV that can be assigned as an remote input to the Model 4000 GCP.
Remote Inp 4	Remote Input 4 on SSCC IV that can be assigned as an remote input to the Model 4000 GCP.

SSCC IV inputs are not shown on the Model 4000 GCP Display module unless these inputs are assigned to functions displayed on the AND Detail View display, as shown in Figure C-24.

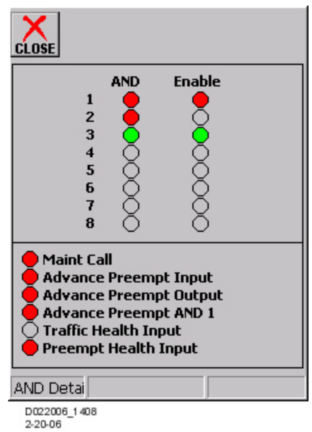


Figure C-24:
Inputs shown on AND Detail View

Examples of using Advanced programming Internal I/O to assign remote SSCC IV inputs to functions within the Model 4000 GCP are shown in Figure C-25.

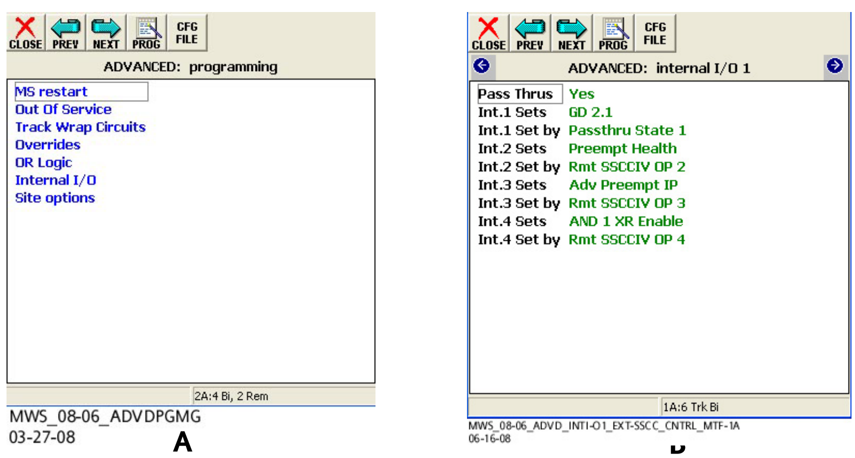


Figure C-25:
Assigning Remote SSCC IV Inputs to 4000 GCP Functions

C.13.3.3 ATCS Addressing

In order for the crossing controller units to communicate with each other, each unit must have a unique ATCS subnode address, and the subnode address must be incremented as defined in Table C-9.

For example, if ent4quad.mcf (master MCF) is assigned the address 762010010015, then the Model 4000 GCP must be assigned 762010010016. If aue4quad.mcf is used, it is assigned 762010010017, and if aux4quad.mcf is used, it is assigned 762010010018 (see Table C-9).

Table C-9:
ATCS Subnode Address Increment Requirements

MCF NAME	ATCS SUBNODE (SS)	DESCRIPTION
GCP4ENT.mcf	SS	4-quadrant entrance gate controller
4000 GCP mcf	SS + 1	4000 GCP 4-quadrant exit gate controller
aue4quad.mcf	SS + 2	Auxiliary entrance gate controller
aux4quad.mcf	SS + 3	Auxiliary exit gate controller

The ATCS address is formatted as follows: **7.RRR.LLL.GGG.SS**

Where:

- **7** is the designation for ATCS wayside type addressing,
- **RRR** is the Railroad number,
- **LLL** is the Line number,
- **GGG** is the Group number,
- **SS** is the subnode number (must be 03 or greater).

C.13.3.4 FLASH SYNC

To keep lamp outputs in synchronization with each other, all units must use "flash sync". In this application (GCP4ENT.MCF), one of the SSCC3i modules in the Model 4000 GCP unit will be configured as a flash sync MASTER and all subsequent SSCC3i and SSCC IV units will be configured as flash sync inputs.

NOTE

All units must be configured with the same flash rate in order for flash sync to work. Also, if any of the units are to be powered from different battery banks, battery negatives must be connected since the flash sync output uses a common return.

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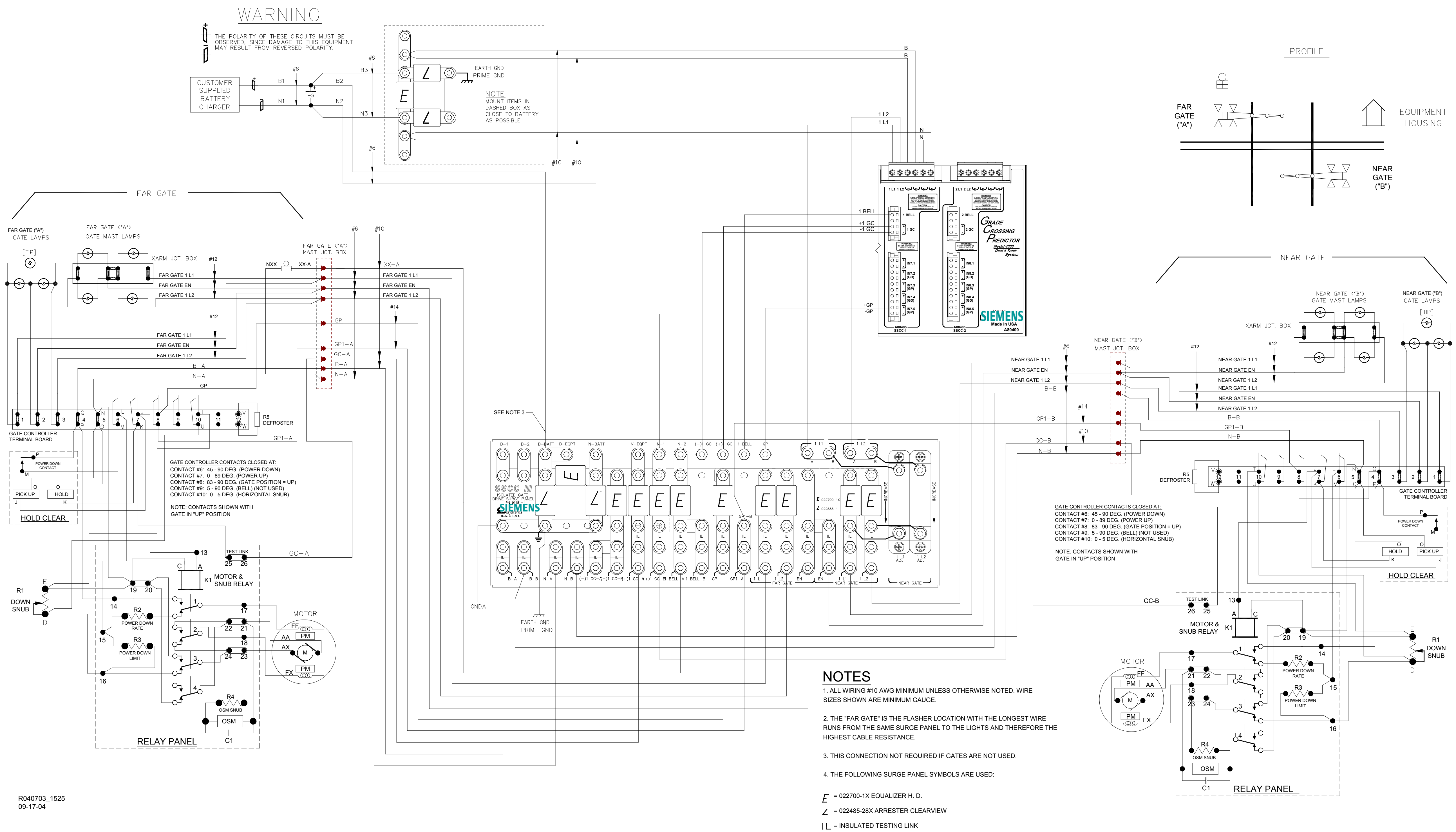


Figure C-26: Typical Two-Gate Application Using the Solid-State Crossing Controller IIIi with the 91181-01 Lighting Surge Panel

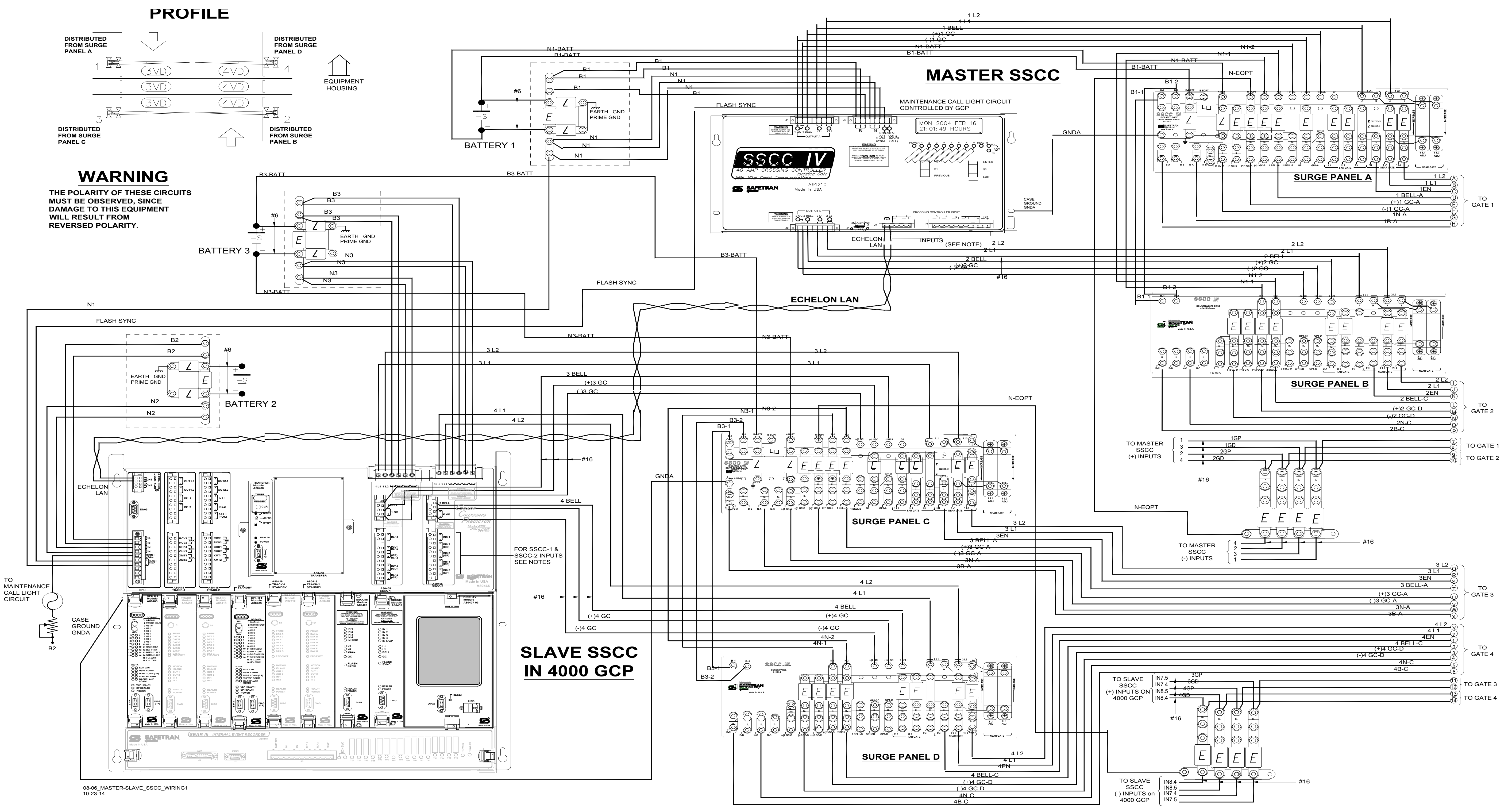
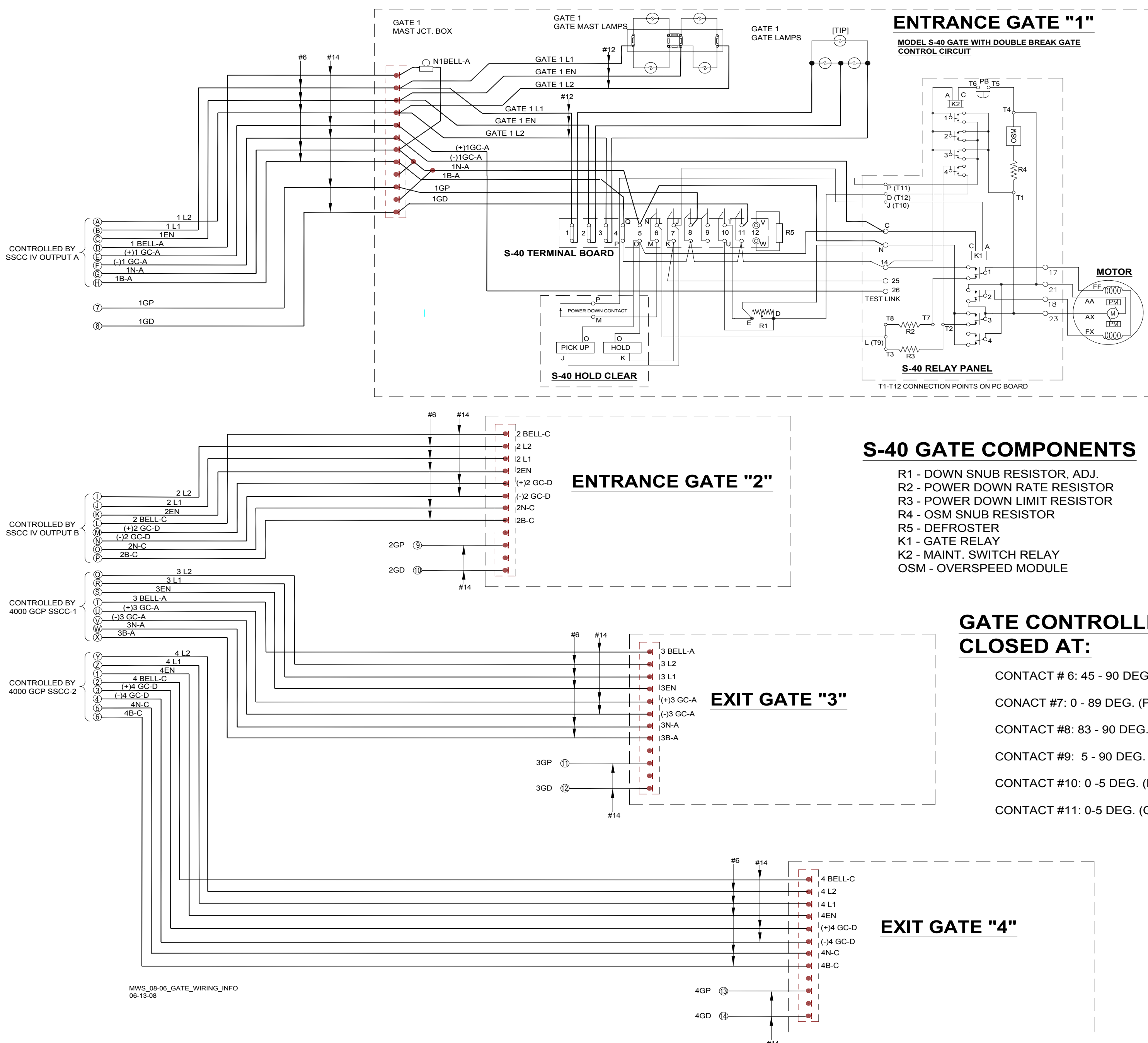


Figure C-27: Typical Four-Quadrant Gate Application (Isolated Gate Return) using Model 4000 GCP and SSCC IV, 40-Ampere Unit, With Lightning/Surge Panels A91181-1 and A91181-2



S-40 GATE COMPONENTS

R1 - DOWN SNUB RESISTOR, ADJ.
R2 - POWER DOWN RATE RESISTOR
R3 - POWER DOWN LIMIT RESISTOR
R4 - OSM SNUB RESISTOR
R5 - DEFROSTER
K1 - GATE RELAY
K2 - MAINT. SWITCH RELAY
OSM - OVERSPEED MODULE

GATE CONTROLLER CONTACTS CLOSED AT:

CONTACT # 6: 45 - 90 DEG. (POWER DOWN)

CONACT #7: 0 - 89 DEG. (POWER UP)

CONTACT #8: 83 - 90 DEG. (GATE POSITION UP)

CONTACT #9: 5 - 90 DEG. (BELL) (NOT USED)

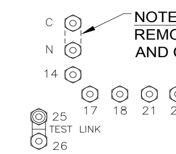
CONTACT #10: 0 -5 DEG. (HORIZONTAL SNUB)

CONTACT #11: 0-5 DEG. (GD-SEE NOTE 5)

NOTES

1. ALL WIRING #10 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. THE FOLLOWING SURGE PANEL SYMBOLS ARE USED:
   - E = 022700-1X EQUALIZER
   - ∠ = 022585-1 ARRESTER CLEARVIEW H. D.
   - IL = INSULATED TESTING LINK
3. THIS APPLICATION REQUIRES AN EXTRA SET OF GATE CONTACTS IN ADDITION TO THE STANDARD GATE MECHANISM CONFIGURATION. EITHER CONTACT #9 (UNUSED) CAN BE SET TO BE CLOSED BETWEEN 0 AND 5 DEGREES, OR ANOTHER CONTACT SET TO BE CLOSED BETWEEN 0 AND 5 DEGREES CAN BE INSTALLED IN CONTACT POSITION #11 (SPARE).
4. MODEL 4000 GCP INPUTS FOR VEHICLE DETECTOR (VD) AND VEHICLE DETECTOR HEALTH (VDH) SHOULD BE NORMALLY-ENERGIZED 12 VOLT RELAY CONTACTS OR SOLID-STATE EQUIVALENT CIRCUITS. IF THE VD OR VDH INPUTS ORIGINATE OUTSIDE OF THE CROSSING EQUIPMENT HOUSE, THESE CIRCUITS MUST BE PROTECTED BY EQUALIZER AND ARRESTER SURGE PROTECTION.

RELAY PANEL TERMINAL LAYOUT



NOTE: FOR DOUBLE BREAK GATE UP CONTROL REMOVE STRAP BETWEEN TERMINALS N & C AND CONNECT (-) UP CONTROL TO TERMINAL C

INPUT ASSIGNMENTS (#16 AWG WIRE MAY BE USED)

NOTE: SSCC IV MCF = GCP4ENT

Master SSCC IV Inputs		Slave SSCC Inputs (4000 GCP)	
1+ 1-	1GP (Entrance GP)	IN7.1+ IN7.1-	VDH
2+ 2-	2GP (Optional Entrance GP)	IN7.2+ IN7.2-	3VD
3+ 3-	1GD	IN7.3+ IN7.3-	Optional 3VD
4+ 4-	2GD	IN7.4+ IN7.4-	3GD
5+ 5-	Remote Input 1	IN7.5+ IN7.5-	3GP
6+ 6-	Remote Input 2	IN8.1+ IN8.1-	Optional VDH
7+ 7-	Remote Input 3	IN8.2+ IN8.2-	4VD
8+ 8-	Remote Input 4	IN8.3+ IN8.3-	Optional 4VD
		IN8.4+ IN8.4-	4GD
		IN8.5+ IN8.5-	4GP

Figure C-28: Typical Four-Quadrant Gate Application (Isolated Gate Return) using Model 4000 GCP and SSCC IV, 40-Ampere Unit, With Lightning/Surge Panels A91181-1 and A91181-2

APPENDIX D – GLOSSARY

Advance Preemption:	Notification of an approaching train is forwarded to the highway traffic signal controller by railroad equipment in advance of activating the railroad active warning devices.
Advance Preemption Time:	This period of time is the difference in the Maximum Preemption Time required for highway traffic signal operation and the Minimum Warning Time needed for railroad operation.
AF	Audio Frequency
AFO	Audio Frequency Overlay
AND:	AND circuits require all inputs to be energized for the output to be energized.
AND ENABLE:	An internal function that can be used to 'connect' an input to an AND circuit.
AND 1 XR:	The AND function that controls the local crossing. Is equivalent to the XR relay.
AND 2 thru 8:	Internal functions that are used to combine inputs.
Approach Clear EZ Value	The EZ value setting that is programmed to keep a directional stick set during Bidirectional DAX (BIDAX) operations; the directional stick is held while the train exits the approach. The Approach Clear EZ is set where the BIDAX system's approach terminates in the outer approach of the adjacent bi-directional DAX system.
Approach Clear Time	The length of time, measured in seconds, that is set in Bidirectional DAX (BIDAX) operations that allows the directional stick to be held until the maximum speed train clears the bidirectional approach.
AREMA	American Railway Engineering and Maintenance-of-way Association
ATCS:	Advanced Train Control System – An industry standard used in the 4000 GCP for communications.
BIDAX	Bidirectional Downstream Adjacent Crossing
BIDAX TO RX	Programming window used when the PSO track connections are located on the Receive side of the crossing.
BIDAX TO TX	Programming window used when the PSO track connections are located on the Transmit side of the crossing.
CCN:	Configuration Check Number – The 32 bit CRC of the configuration data.
CDL:	Control Descriptor Language – The programming language used by application engineers to customize the operation, settings, and behavior of a SEAR II/IIi.
CHK:	CHECK receiver on a track module connected to transmit wires that perform track wire integrity checks.

CHK EZ:	Check EZ is a signal value compared to main receiver EZ that is useful in troubleshooting.
CIC:	Chassis Identification Chip – A non-volatile memory chip that is installed adjacent to the ECD on the GCP backplane. Stores site specific information for both Main and Standby operations.
Computed Approach Distance:	The track approach length calculated by the GCP. The calculated distance between the wire connections on the rail and the termination shunt connections.
CP:	Communications Processor – One of two microprocessors on the CPUII+ module, processes external communications for the GCP 4000.
CRC:	Cyclical Redundancy Check - Used to determine that data has not been corrupted.
CRTU:	Cellular Remote Telemetry Unit
DAX Direction	The software parameter that tells the system which direction to transmit the DAX signal in BIDAX applications, i.e., to the TX side or to the RX side of the crossing.
DAX:	Acronym for Downstream Adjacent Crossing (Xing). DAX outputs are used to send prediction information from an upstream GCP to a downstream GCP when insulated joints are in the approach circuit.
dB	Decibels
DIAG:	Diagnostic
Directionally Wired	Setting used to enable a bidirectional GCP to determine train direction.
Directional Stick Logic	The logic function used to determine direction of train movement. The output of this function is used to activate/deactivate associated signal systems.
DOT Number:	Department Of Transportation crossing inventory number assigned to every highway-railroad crossing that consists of six numbers with an alpha suffix.
DT:	Diagnostic Terminal – The Diagnostic Terminal (DT) is an Invensys Rail developed Windows® based software that can run on the Display Module or on a PC, which allows the user to perform programming, calibration, and troubleshooting.
DTMF:	Dual Tone Multi-Frequency - The tones on a telephone or radio keypad.
ECD:	External Configuration Device – The non-volatile memory device on the GCP backplane used for storing the module configuration file.
Echelon:	A Local Area Network, LAN, used by the 4000 GCP.
EGOM	Exit Gate Operating Mode – A dynamic mode in which the exit gate operation is based on the presence and detection of vehicles between the stop bar or entrance gate and the exit gate.
Enhanced Detection:	User selectable process that detects nonlinear fluctuations in track signal due to poor shunting and temporarily switches the track module from predictor to motion sensor.

Entrance Gate:	A gate used at the entrance to a highway-railroad grade crossing, which is designed to release and lower by gravity from the full vertical position to the horizontal position under a loss of power condition or when the control energy (GC) is removed.
EX:	The EX value is a numerical indication of track ballast conditions relative to the leakage resistance between the rails. A value of 100 represents nominal good ballast. A value of 39 represents very poor ballast.
Exit Gate:	A gate used at the exit from a highway-railroad grade crossing with Four Quadrant Gates to restrict wrong direction vehicular movements, which is designed to raise by gravity from the horizontal position to a vertical position great enough to allow vehicle clearing under a loss of power condition or when the control energy (GC) is removed.
EZ:	The track signal value that varies with approach track impedance that indicates the relative train position within an approach. 100 represents nominal value with no train in the approach, 0 represents nominal value for a train occupying the island.
FAR GATE:	On the same surge panel, the 'far gate' is the flashing light signal or gate with the largest voltage drop in the cable circuit. In general, if both signals have the same number and type of lamps and the same size cable conductors, the 'far gate' is the location with the longest cable run. The 'far gate' circuit on the surge panel does not have an adjustable resistor in series with L1 and L2 that provides voltage adjustment.
Field Password	The password set that allows field maintenance personnel access to field editable parameters.
Flash Memory	A type of non-volatile memory that can be reprogrammed in-circuit via software.
FLASH SYNC:	The two wire circuit that synchronizes the alternating flash of an external crossing controller with the internal crossing controller, SSCC3i or the external crossing controller, SSCCIV.
Gate Delay Period	The programmable time period from when the lights begin to flash until the gates begin to descend.
GC:	Gate Control
GCP:	Grade Crossing Predictor – A train detection device used as part of a highway-railroad grade crossing warning system to provide a relatively uniform warning time.
GCP APP:	GCP Approach length calibration into a hardwire shunt located at the termination shunt.
GCP CAL:	GCP Calibration into a termination shunt.
GCP LIN:	Approach Linearization calibration into a hardwire shunt located at the 50% point on the approach.
GD:	Gate Down, input energized when gate arm is horizontal.

GFT:	Ground Fault Tester – An optional external device connected to the Echelon LAN that constantly monitors up to two batteries for ground faults and indicates battery status to the SEAR2i.
GP:	Gate Position – Input energized when gate is vertical.
GU:	Gate Up – Used in a user defined SEAR2i application program, (the same as GP).
Highway-Railroad Grade Crossing Advance Warning Sign:	A traffic control sign (round yellow sign with RR and a black X) placed by the highway agency in advance of many highway-railroad grade crossings
Healthy:	The GCP system, modules and track circuit are operating as intended. Health is generally indicated by a yellow LED flashing at 1 Hz (approximately the same flash rate as the FLASH SYNC on a controller or a flashing light signal). Unhealthy conditions are indicated by faster flash rates (2 Hz and 4 Hz) or a dark Health LED.
Hz:	Hertz – Common reference for cycles per second or flashes per second.
iLOD:	Intelligent Light Out Detector – used for measuring lamp current.
Interconnection:	The electrical connection between the railroad active warning system and the traffic signal controller for the purpose of preemption.
IO or I/O:	Input/Output
ISL:	Island
ISL CAL:	Island calibration
kHz:	Kilohertz – 1000 Hz or 1000 cycles per second.
LAMP 1 VOLTAGE:	Voltage on 1L1 or 2L1 lamp output of the crossing controller module, SSCC3i.
LAMP 2 VOLTAGE:	Voltage on the lamp 1L2 or 2L2 lamp output of the crossing controller module, SSCC3i.
LAN:	Local Area Network – A limited network where the data transfer medium is generally wires or cable.
Linearization:	The linearization procedure compensates for lumped loads in the GCP approach that affects the linearity (slope) of EZ over the length of the approach.
Linearization Steps:	A calibration value that allows the GCP to compensate for non-linear EZ values within the approach circuit.
LOS:	Loss of Shunt – Commonly due to rust and / or rail contamination. LOS timers provide a pick up delay function.
Lumped Load:	A section of track that has a lower ballast resistance than the rest of the approach because of switches, crossings, contamination, etc.
MAIN:	The primary GCP Modules (CPU, Track, and RIO Modules) that are in a dual GCP chassis.
MBT	Abbreviation for Master Boot file.

MCF:	Module Configuration File – The GCP application logic file.
MEF:	Module Executable File – The GCP executive software program.
Module	Physical package including PCBs and input/output terminals for connecting to external devices and equipment.
MS:	Motion Sensor – A train detection device used as part of a highway-railroad grade crossing warning system to provide a detection of a train approach.
MTSS:	Mini Trackside Sensor – A device located in the gate mechanism that combines input information from gate contacts, bell, and gate tip sensor and sends the information to the SEAR2i.
NEAR GATE:	On the same surge panel, the 'near gate' is the flashing light signal or gate with the lowest voltage drop in the cable circuit. In general, if both signals have the same number and type of lamps and the same size cable conductors, the 'near gate' is the location with the shortest cable run. The 'near gate' circuit on the surge panel has an adjustable resistor in series with L1 and L2 that provides additional voltage adjustment.
NVRAM	Non-Volatile Random Access Memory
OCCN:	Office Configuration Check Number – The 32 bit CRC of the configuration data, excluding items that are protected by the Field Password.
OCE:	Office Configuration Editor – The PC version of the DT that can be used to create configuration package files (Pac files) for the GCP 4000 system.
Offset Distance:	The distance between the track circuit connections of the remote GCP (sending DAX information) to the island track connections of the UAX GCP (receiving the information).
Out Of Service:	The process for taking one or more GCP approach circuits and / or approach and island circuits out of service.
Pac File:	A GCP 4000 configuration Package File that can either be created in the office using the OCE, or downloaded from a GCP 4000 system via the CP.
PCB	Printed Circuit Board
PCN	PSO Check Number (PCN) is used to track changes due to re-calibration and adjustments made to key PSO setup variables.
Pick Up Delay:	An internal delay time between when an input receives the signal to pickup and when it actually responds.
POK:	Power Off Indication
Positive Start:	Activate crossing devices when EZ level is less than a programmed value.
Preemption:	The transfer of normal operation of traffic signals to a special control mode.
PRIME:	PRIME may be de-energized by a Track's prime predictor, UAX, advance preempt, and/or island, if zero offset is selected.

PSO	Phased Shift Overlay Module
PSO II, PSO III, PSO 4000	Different models of Invensys Rail's Phase Shift Overlay – a track circuit (transmitter at one location and receiver at another location) that supplies track occupancy information for crossing warning devices and other train or vehicle detection systems.
RADIO DAX:	DAX information transmitted via Spread Spectrum Radio or other communications devices.
RIO:	Relay Input Output Module
RS232:	Industry standard serial port.
RTU:	Remote Telemetry Unit
RX:	Receive
RX Wire Side Connection	Used in multiple BIDAX operation. This setting enables the system to transmit DAX signals to the Receive Wire side of the crossing.
SEAR2i Application Program:	Programming for SEAR2i that controls alarms.
Simultaneous Preemption:	Notification of an approaching train is forwarded to the highway traffic signal controller unit or assembly and railroad active warning devices at the same time.
SIN:	Site (Subnode) Identification Number - A twelve-digit ATCS address representing the module as a subnode on the network.
Spread Spectrum:	A method of radio transmission in which the transmitted energy is evenly spread over the complete bandwidth of the radio, resulting in a low RF profile.
SSCC:	Solid State Crossing Controller
SSR:	Spread Spectrum Radio – A radio that utilizes spread spectrum transmission.
Standby:	The GCP Backup Modules (e.g., CPU, Track, and RIO modules) that are in a dual GCP chassis.
Stick EZ	The value below which a BIDAX output or Occupation Code (Code C) is transmitted after prediction has begun.
Stick Release Time	The length of time, measured in minutes, that is set in Bidirectional DAX (BIDAX) operations that allows the directional stick to be held while the train is on the approach.
Supervisor Password	The password set that allows application design personnel access to office editable parameters.
TCN	Track Check Number (TCN) is used to track changes due to re-calibration and adjustments made to key Track Modules specific setup variables.
Track Speed Train	A train that proceeds through the approach at the maximum authorized speed.

True RMS AC+DC:	A scale on a multimeter that measures the effective combined AC and DC portions of the total voltage. Used to measure the pulsed output of a crossing controller. Measured as VRMS.
TX:	Transmit
TX Wire Side Connection	Used in multiple BIDAX operation. This setting enables the system to transmit DAX signals to the Transmit Wire side of the crossing.
UAX:	Acronym for Upstream Adjacent Crossing (Xing). UAX inputs are used to receive prediction information from an upstream GCP as inputs to a downstream GCP when insulated joints are in the approach circuit.
USB Port:	Universal Serial Bus Port
USB Drive:	Types of memory devices that plug into a USB port. These devices are commonly called flash drives or memory sticks.
VHF Communicator:	Communications device used for remote operations and calibration as well as data communications.
VLP:	Vital Logic Processor – One of two microprocessors on the CPUII+ module, processes GCP vital system logic.
VRMS	Volt Root Mean Square – See True RMS AC + DC above.
WAG	Wayside Access Gateway – The Invensys Rail A53457 assembly converts Echelon® messages to Ethernet messages allowing Invensys Rail equipment to use Ethernet Spread Spectrum radios A53325 for communications. WAG assembly A53457 also converts Echelon received messages to RS232 messages allowing the system to use modems for communication between Invensys Rail equipment.
WAMS:	Wayside Alarm Management System – An office based application that communicates with and receives data from specially equipped crossings.
WCM:	Wayside Control Module – The Invensys Rail A53105 assembly that centrally controls the functions of a Wayside Communications Package (WCP).
Wrap:	Common reference for a track circuit, or combination of track circuits that extend to or beyond the limits of a GCP approach, which provides train detection. Used to signify that a certain system function is being overridden based upon the state of a vital input.
Z Level:	An Island calibration value. A calibrated island will have a nominal Z Level of approximately 250. The Z Level approaches 0 when shunted.

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