SIEMENS

APPLICATION GUIDELINES

MICROPROCESSOR BASED MODEL 5000 GRADE CROSSING PREDICTOR FAMILY

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DOCUMENT HISTORY

Version	Release Date	Details of Change
A	08-06-14	Initial Release per NG5-F96
A.1	10-29-14	Replaced references to A80485-2 with A80485-1

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

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

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

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 5000 GCP OVERVIEW

1.1 SYSTEM CONFIGURATIONS

The Model 5000 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 5000 GCP is available in several case configurations.

1.2 STANDARD FEATURES

The Model 5000 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 train 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 vital communications to other locations via Ethernet spread spectrum radio (ESSR) and single person calibration and monitoring using VHF communicator. The GCP has a color display module for configuration, monitoring and troubleshooting the system.

1.2.1 GCP Case Configurations

The Model 5000 Grade Crossing Predictor (GCP) System is available in the following case configurations:

- Single Five Track, A80905, Figure 1-1
- Dual Two Track, A80902, Figure 1-2
- Dual Three Track, A80907, Figure 1-3
- Dual Six Track, A80900, Figure 1-4

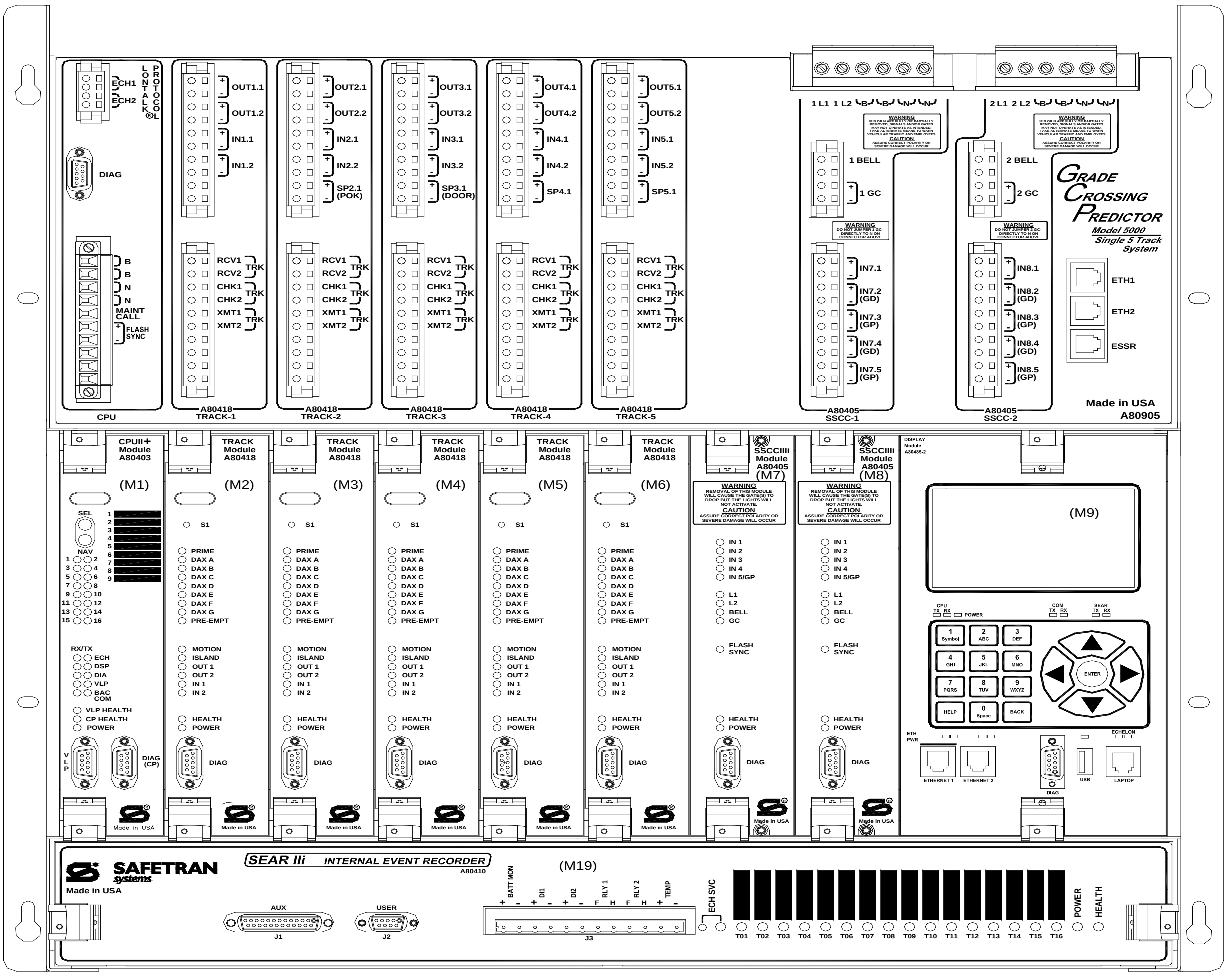
The features of each configuration are given in Table 1-1.

**Table 1-1:
Case Configurations**

FEATURE	CASE CONFIGURATION			
	80905	80902	80907	80900
Track Modules	1 to 5 tracks	1 or 2 tracks	1 to 3 tracks	1 to 6 tracks
Main/ Standby Transfer System	No	Yes	Yes	Yes
Internal SSCC3i Crossing Control[1]	0, 1 or 2	0, 1 or 2	No	0, 1 or 2
Internal SEAR2i Recorder	Yes	Yes	Yes	Yes
Internal PSO Module[2]	0, 1, 2 or 3	0 or 1	0 or 1	0, 1, 2 or 3
I/O Expansion[3]	0, 1 or 2	0 or 1	0, 1, or 2	0, 1, 2 or 3
Echelon LAN Functions	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

For detailed Description of the various cases and modules, refer to Section 8, Case and Module Descriptions.



13-04_80905_WM
10-28-14

Figure 1-1:
A80905 Single Five-Track Configuration

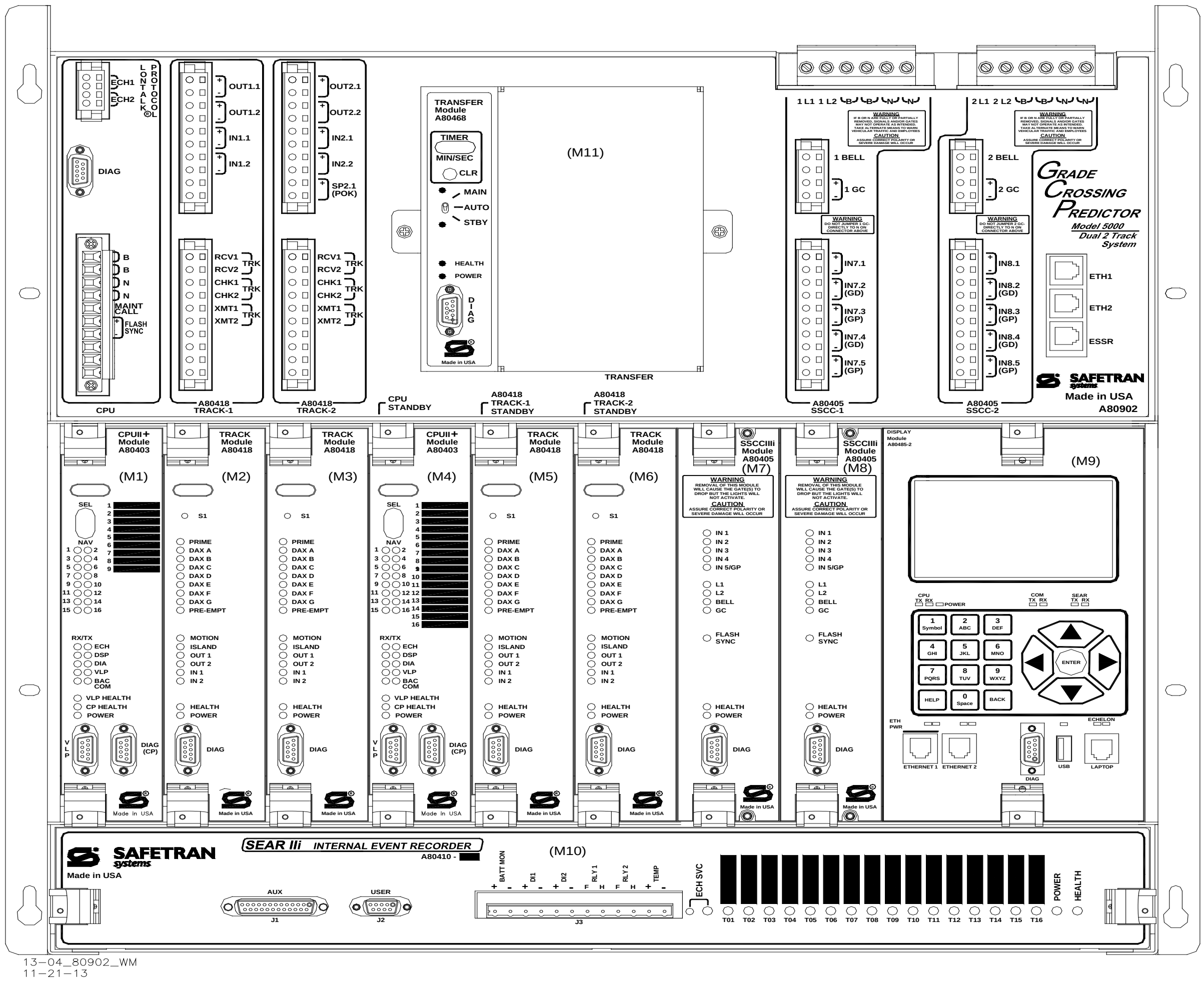


Figure 1-2:
A80902 Dual Two-Track Configuration

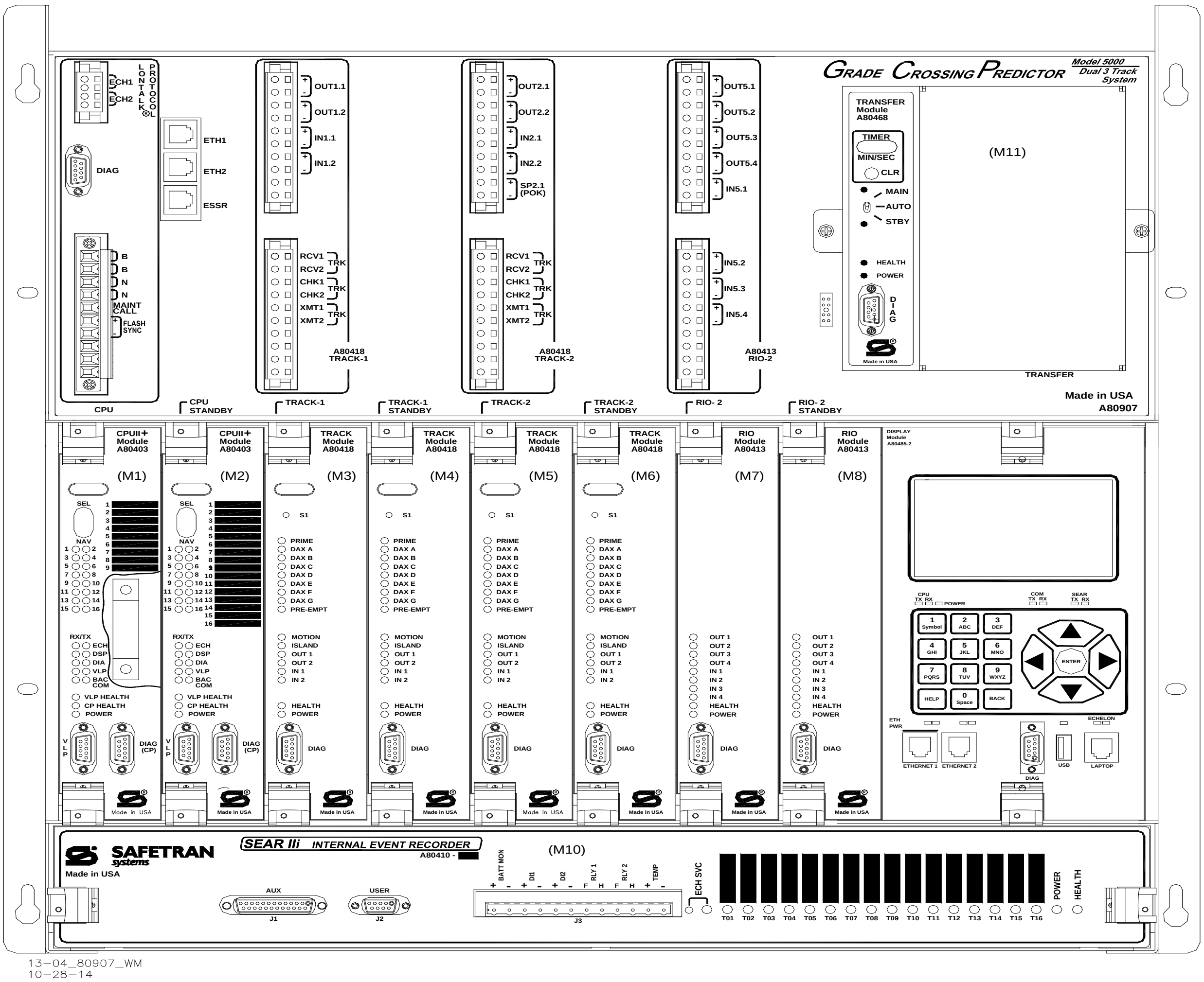


Figure 1-3:
A80907 Dual Three-Track Configuration

NOTE

NOTE
On the A80907chassis only, the third track is referred to as Track-5.

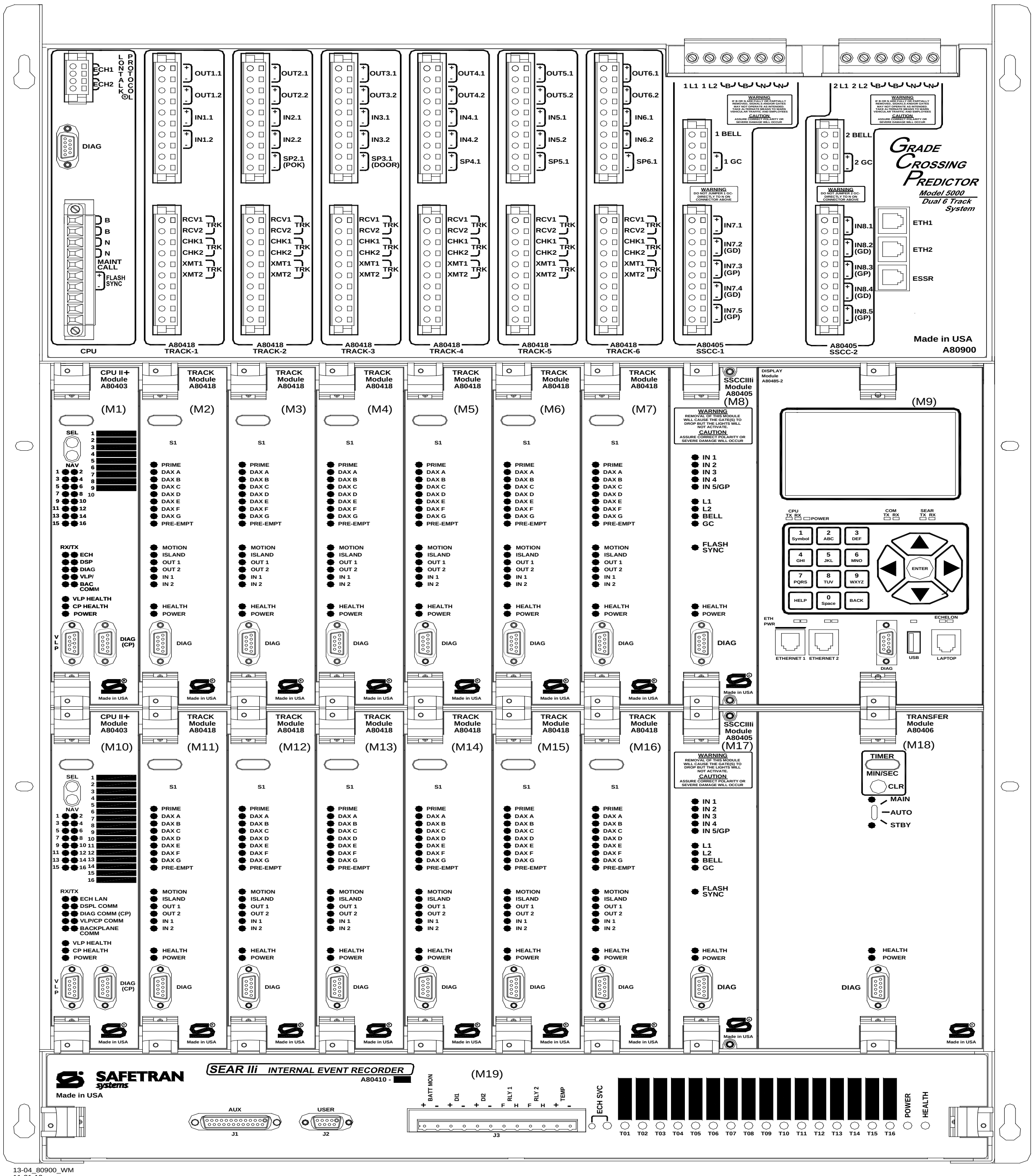


Figure 1-4:
A80900 Dual Six-Track Configuration

1.3 GCP OPERATIONAL PARAMETERS

The Model 5000 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 5000 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 Model 5000 GCP includes circuitry that eliminates the need for a Wayside Access Gateway (WAG). Additionally, the Model 5000 GCP now includes Ethernet compatibility. This allows greater communication options:

- The GCP can communicate with other ATCS devices via Ethernet or Echelon.
- The GCP can communicate with these other local devices in the bungalow via the Echelon LAN: SEAR2, HD/Link, VHF Comms, iLod, SSCCIV, Model 4000 GCP, and Model 5000 GCP
- The GCP can communicate with these other local devices in the bungalow via the Ethernet: ESSR, WAG, Model 5000 GCP
- The GCP can communicate to remote ATCS device by connection to an extended Ethernet LAN using ESSR

The integrated Siemens SEARIIi Internal Event Recorder records 100,000 events and is expandable to 390,000, controls non-vital I/O, and can optionally issue alarms.

NOTE

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 5000 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 1-5). The EZ value rate of change is proportional to the speed of the train. The rate of change is sensed by the Model 5000 GCP and used to determine relative train speed and to predict when to activate the crossing warning devices

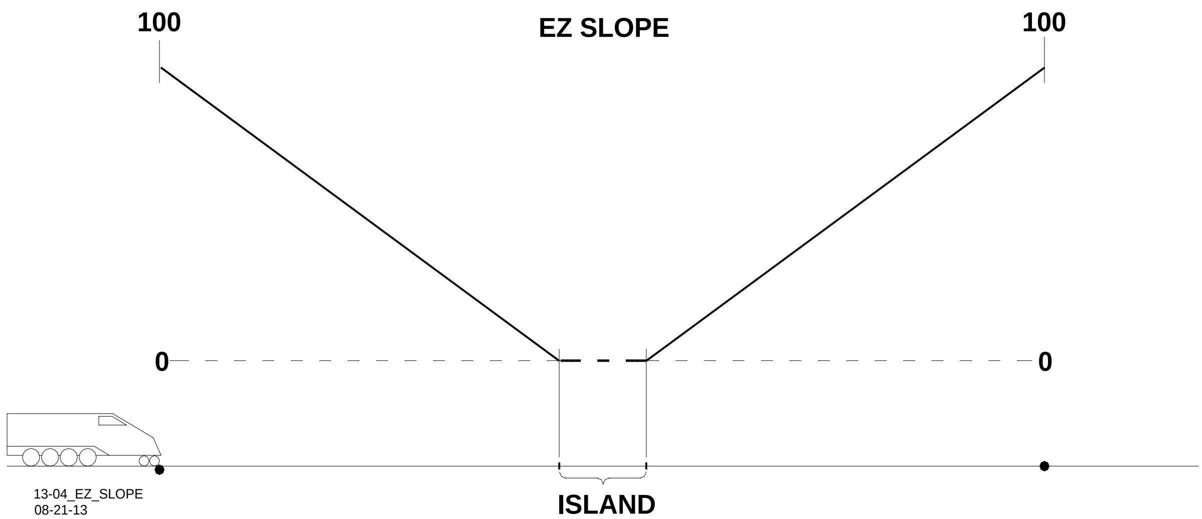


Figure 1-5:
Diagram of EZ Level Compared to Train Shunt Location

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 5000 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 5000 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 5000 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 5000 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.
Display:	2.70 A with Backlight on and heater on	2.97 A with Backlight on and heater on	2.67 A with Backlight on and heater on
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

COMPONENT	CPU BATTERY CONNECTOR @10V	CPU BATTERY CONNECTOR @13.2 V	CPU BATTERY CONNECTOR @16.5V
Six Track, Dual Bay Chassis With All Modules Present: 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 5000 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:	DISPLAY	SEAR2i
Total Events (Including Train Move Data):	250,000 minimum	100,000 minimum
Mounting:	All Model 5000 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		
PARAMETER	VALUES	
Chassis Dimensions:		
Five Track (A80905), Dual Two Track (A80902), & Dual Three Track (A80907)		
Width:	23.25 In.	(59.06 cm)
Depth:	12.38 In.	(31.45 cm)
Height:	22.15 In.	(56.26 cm)
Dual Six Track (A80900)		
Width:	23.25 In.	(59.06 cm)
Depth:	12.38 In.	(31.45 cm)
Height:	31.47 In.	(79.93 cm)
Chassis Weight:		
	Empty	Full Module Complement
Five Track (A80905)	26.01 lbs (11.7 kg)	48.6 lbs (21.87 kg)
Dual Two Track (A80902)	25.73 lbs (11.58 kg)	50.1 lbs (22.55 kg)
Dual Three Track (A80907)	25.73 lbs (11.58 kg)	44.86 lbs (20.35 kg)
Dual Six Track (A80900)	35.59 lbs (16.02 kg)	66.84 lbs (30.08 kg)
Module Weight:		
CPU2+ (A80403)	1.25 lbs (0.56 kg)	
Track (A80418)	1.00 lbs (0.45 kg)	
RIO (A80413)	1.13 lbs (0.51 kg)	
PSO (A80428-03)	1.13 lbs (0.51 kg)	
SSCC3i (A80405)	3.63 lbs (1.63 kg)	
Display (A80485-1)	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 5000 GCP TRACK SIGNALS

The Model 5000 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 5000 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 SIEMENS MODEL 5000 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 5000 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 5000 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 5000 GCP Field Manual, SIG-00-13-03.

2.4 TRACK CIRCUIT OPERATING FREQUENCY RESTRICTIONS

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

NOTE

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

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

WARNING
WHEN SELECTING MODEL 5000 GCP TRACK FREQUENCY, ACCOUNT FOR ANY EXISTING AUDIO FREQUENCY TRACK CIRCUIT SIGNALS.

2.5.1 Frequency Selection Restrictions

Before selecting the Model 5000 GCP frequency, determine if any high-level audio frequency (AF) is present on the track. Avoid using any Model 5000 GCP Frequency that is within fifteen percent of any AF signal present. For additional restrictions on the use of overlapping GCP frequencies, see paragraph 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

WARNING

THE MODEL 5000 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 5000 GCP, THE APPROACH DISTANCE MUST BE BASED ON THE ADVANCE PREEMPTION 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-VS-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
DISTANCE TRAVELED IN METERS																
TOTAL WARNING TIME IN SECONDS	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

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 or meters per second
- Highest crossing warning time requirement in seconds. This is based on crossing operation time or traffic signal preemption time as well as the Model 5000 GCP response time in seconds.

2.6.2 Approach Distance Calculation Example

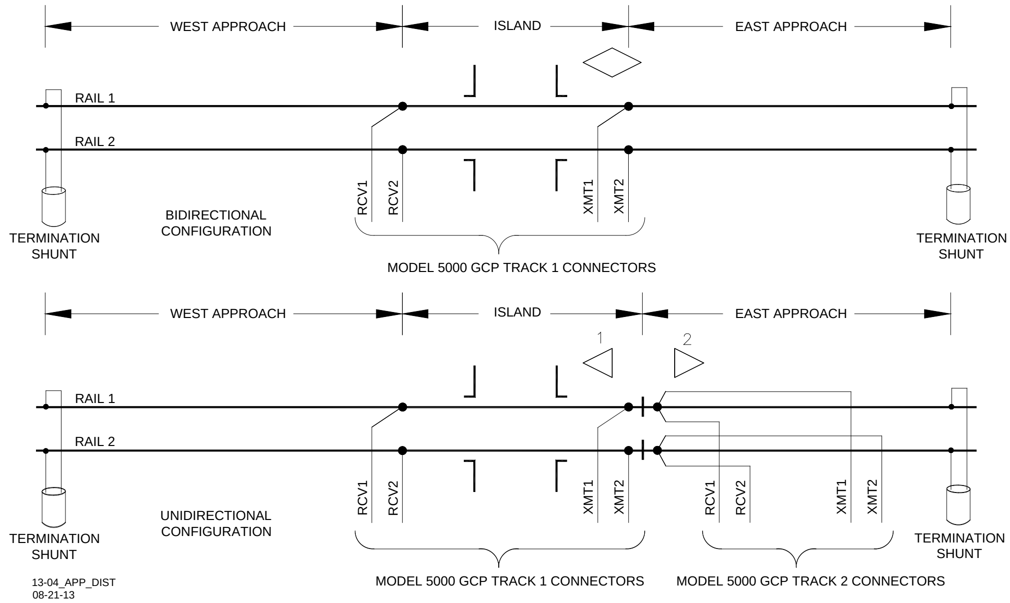


Figure 2-1:
Approach Distance

Given:

- Speed Conversion Factor:
  - 1 mile per hour (MPH) = 1.47 feet per second (ft/s)
  - 1 kilometer per hour (KPH) = 0.28 meters per second (m/s)
- Maximum train speed = 50 MPH or 80 KPH
- Typical GCP 5000 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 GCP 5000 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

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.

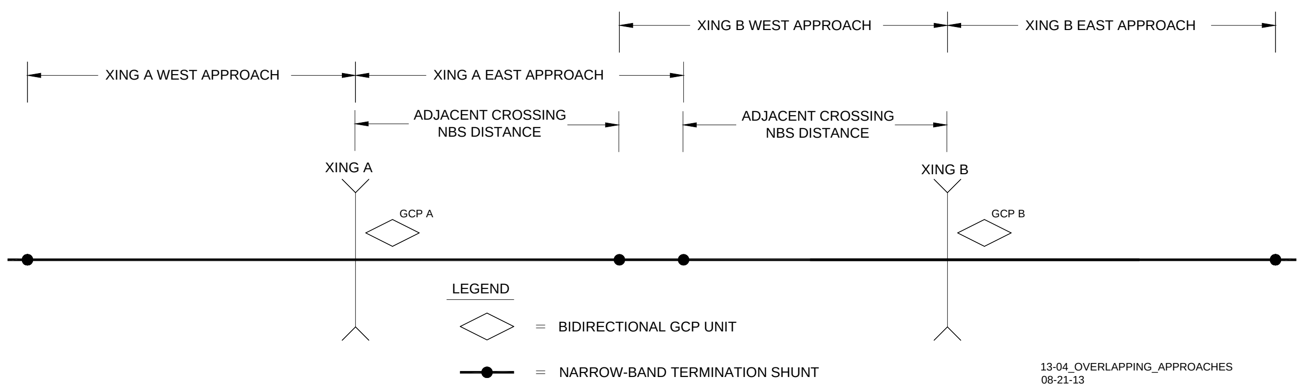


Figure 2-2:
Overlapping Approaches

2.7.2 Types of Narrow-Band Shunts

The following sections detail the types of narrow-band shunts can be used with the Model 5000 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 5000 GCP frequencies are shown in **bold**.						

⚠ WARNING

WARNING

THE 62775 NARROW-BAND SHUNT CANNOT BE USED IF A MODEL 5000 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 5000 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 5000 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).

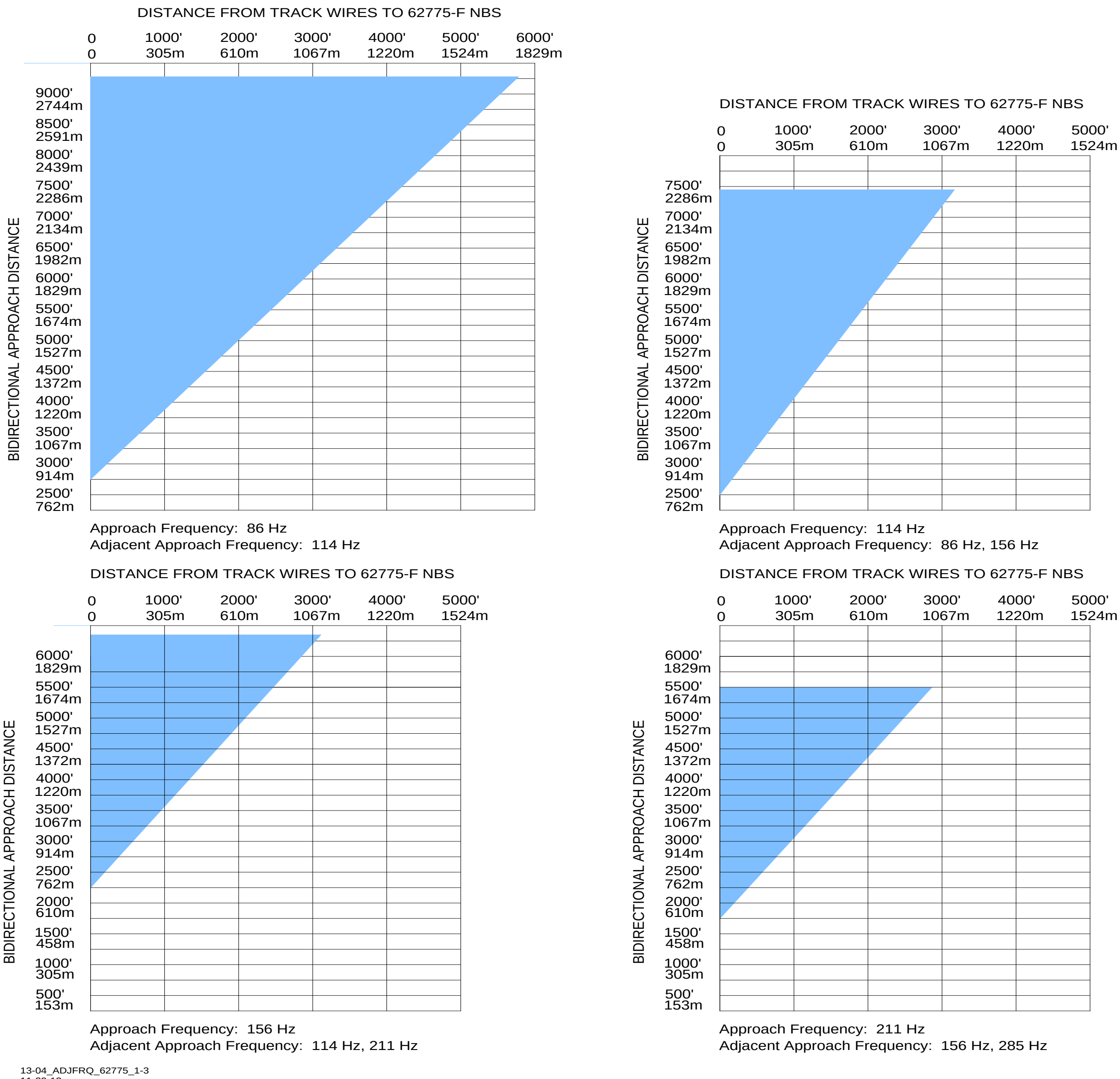
The 114 Hz chart shows that 62775-f Narrow-band Shunts for 86 Hz should be located no closer than 1,000 feet (304.8 m) to the 114 Hz GCP track wires.

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

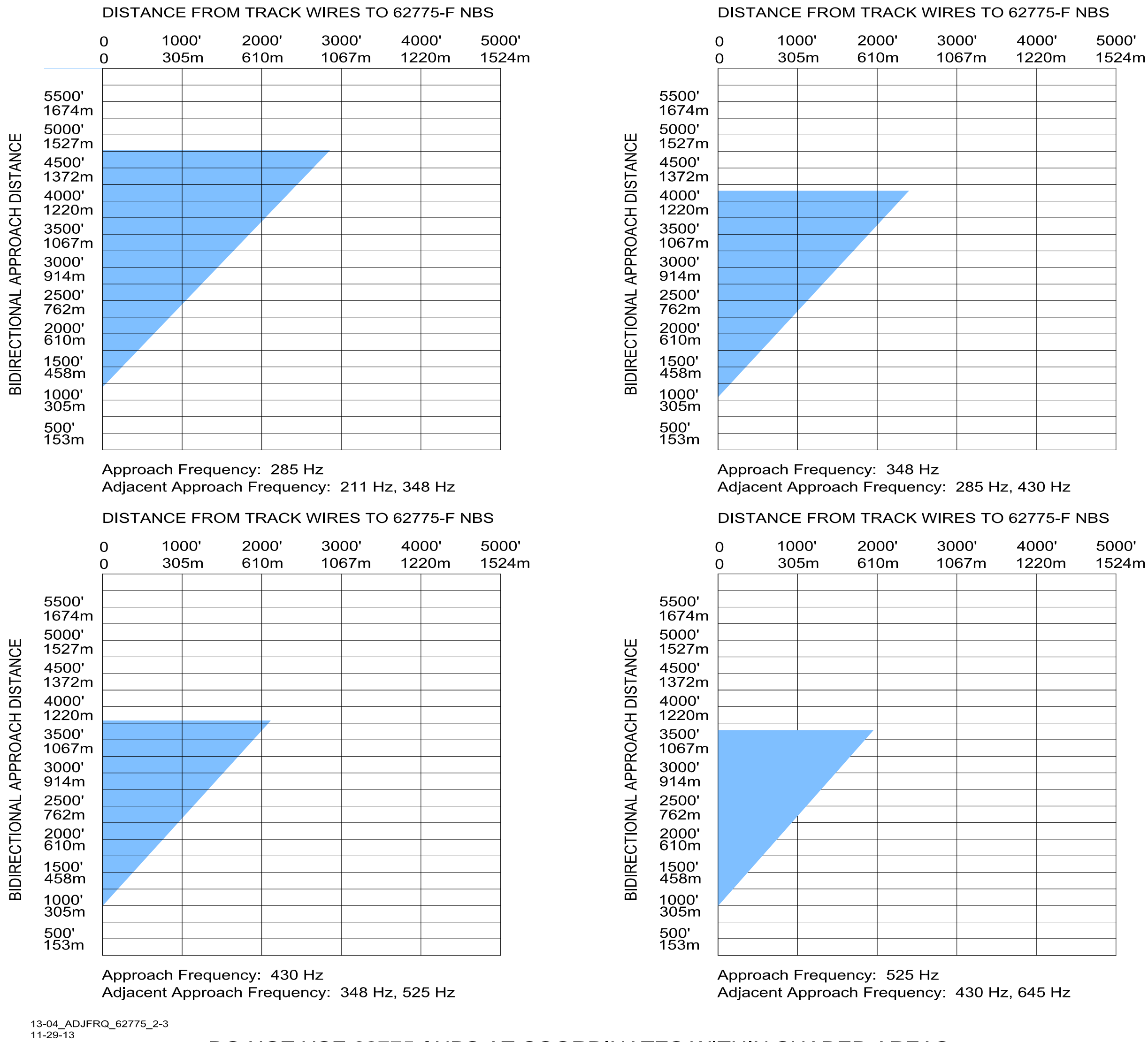
When adjacent Model 5000 GCP operating frequencies are used for overlapping unidirectional approaches, narrow-band shunts can be used in accordance with the following:

- 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.



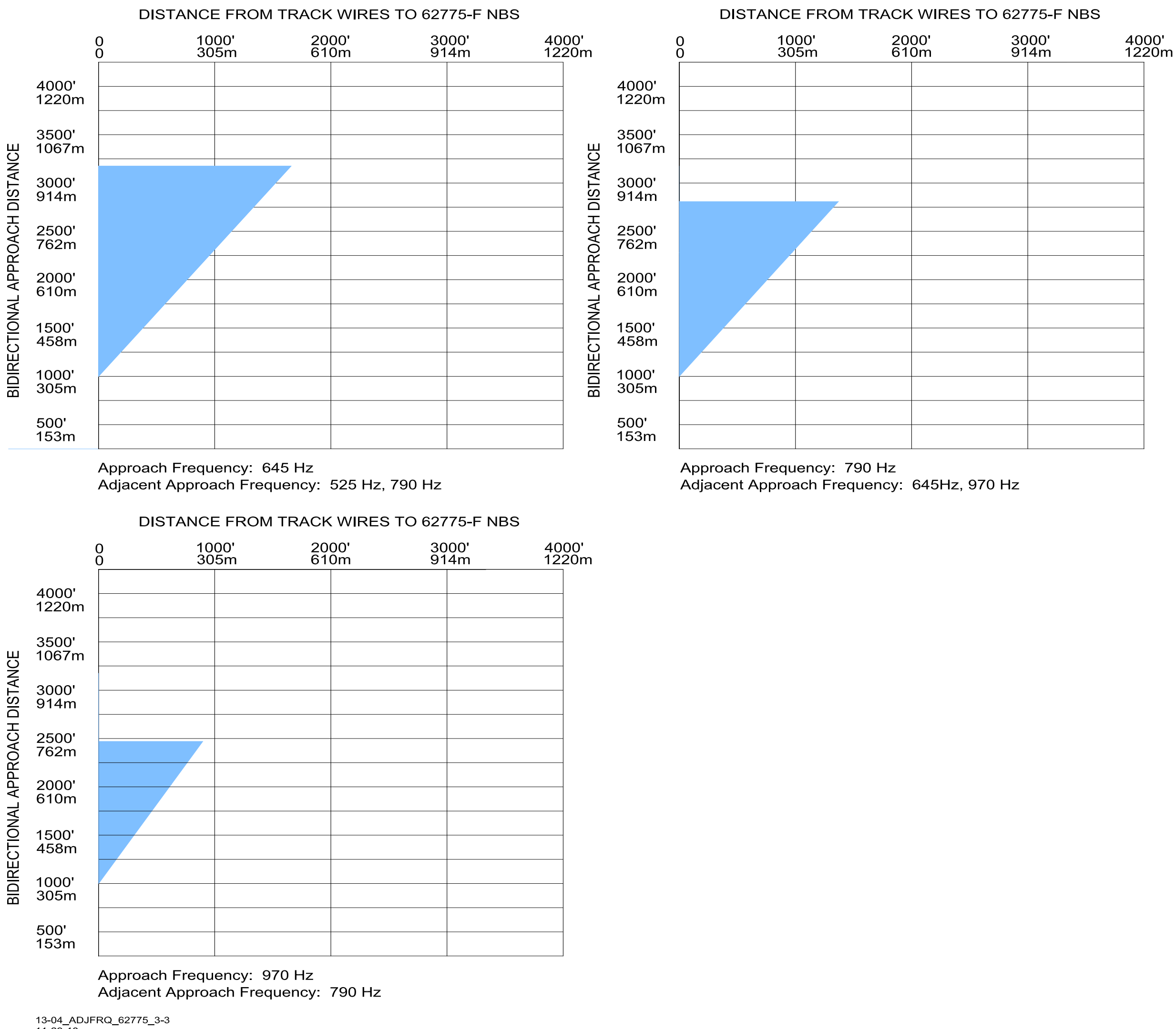
DO NOT USE 62775-f NBS AT COORDINATES WITHIN SHADED AREAS

Figure 2-3:
Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 1 of 3)



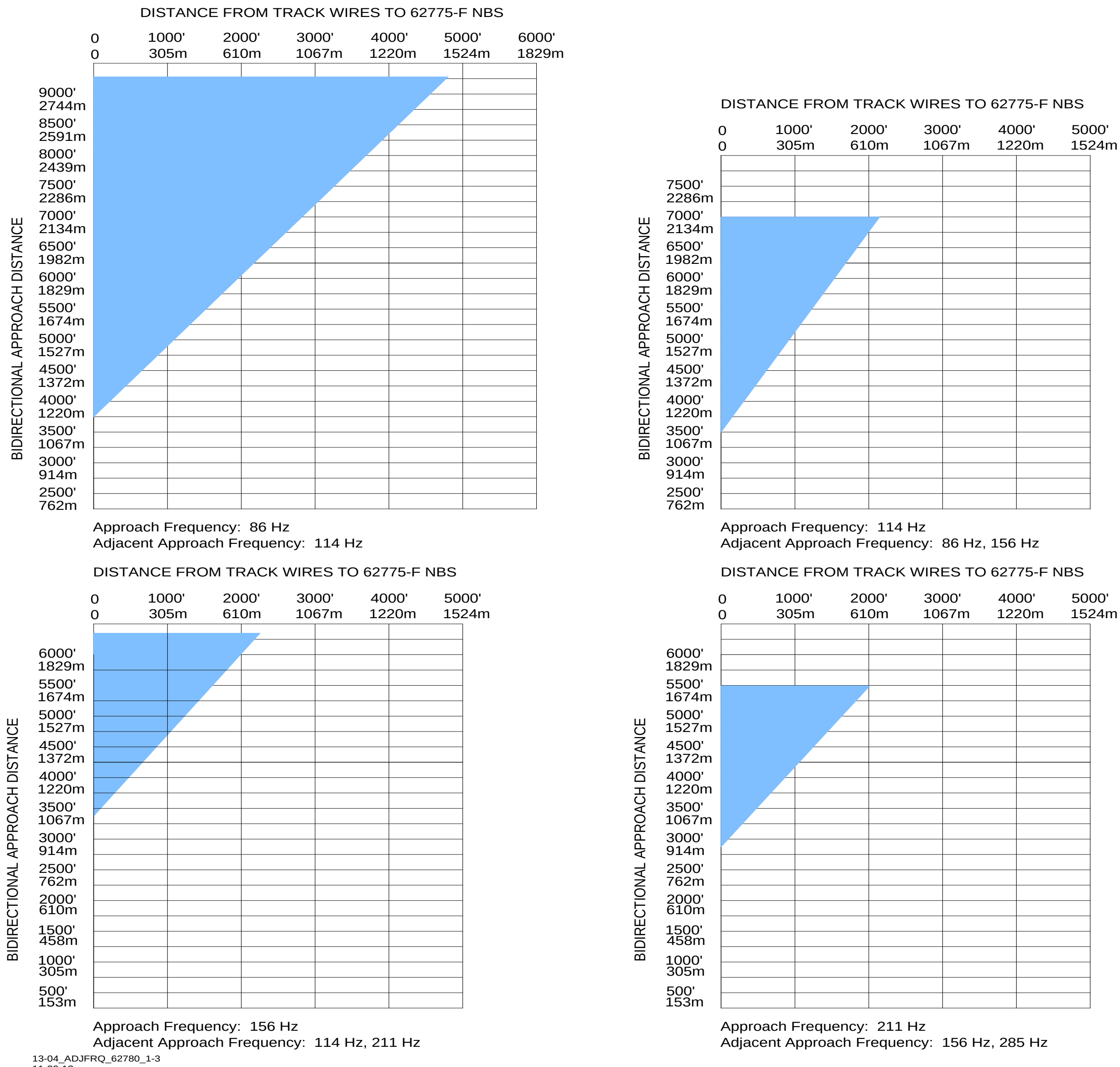
DO NOT USE 62775-f NBS AT COORDINATES WITHIN SHADED AREAS

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



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)



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

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

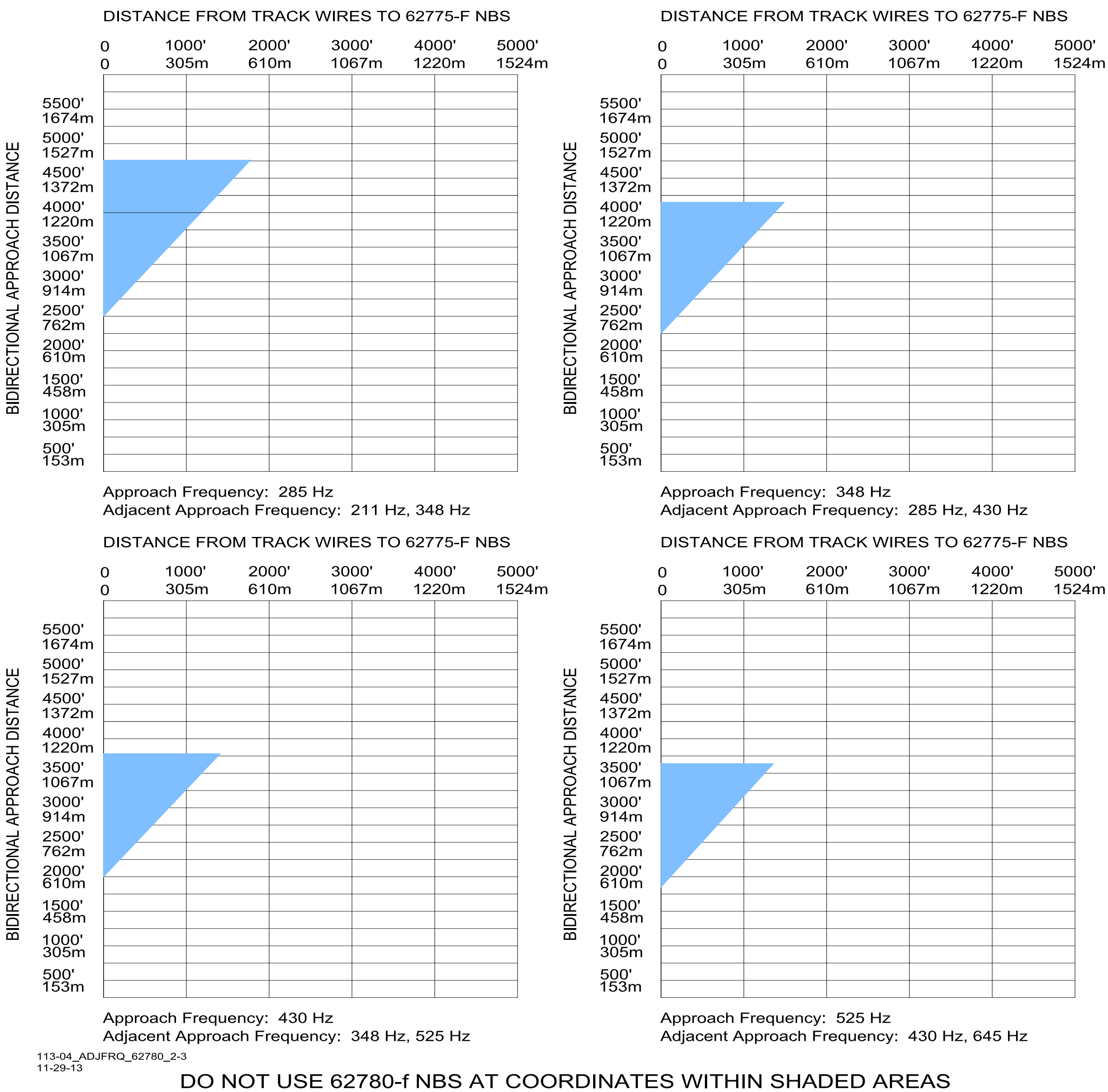
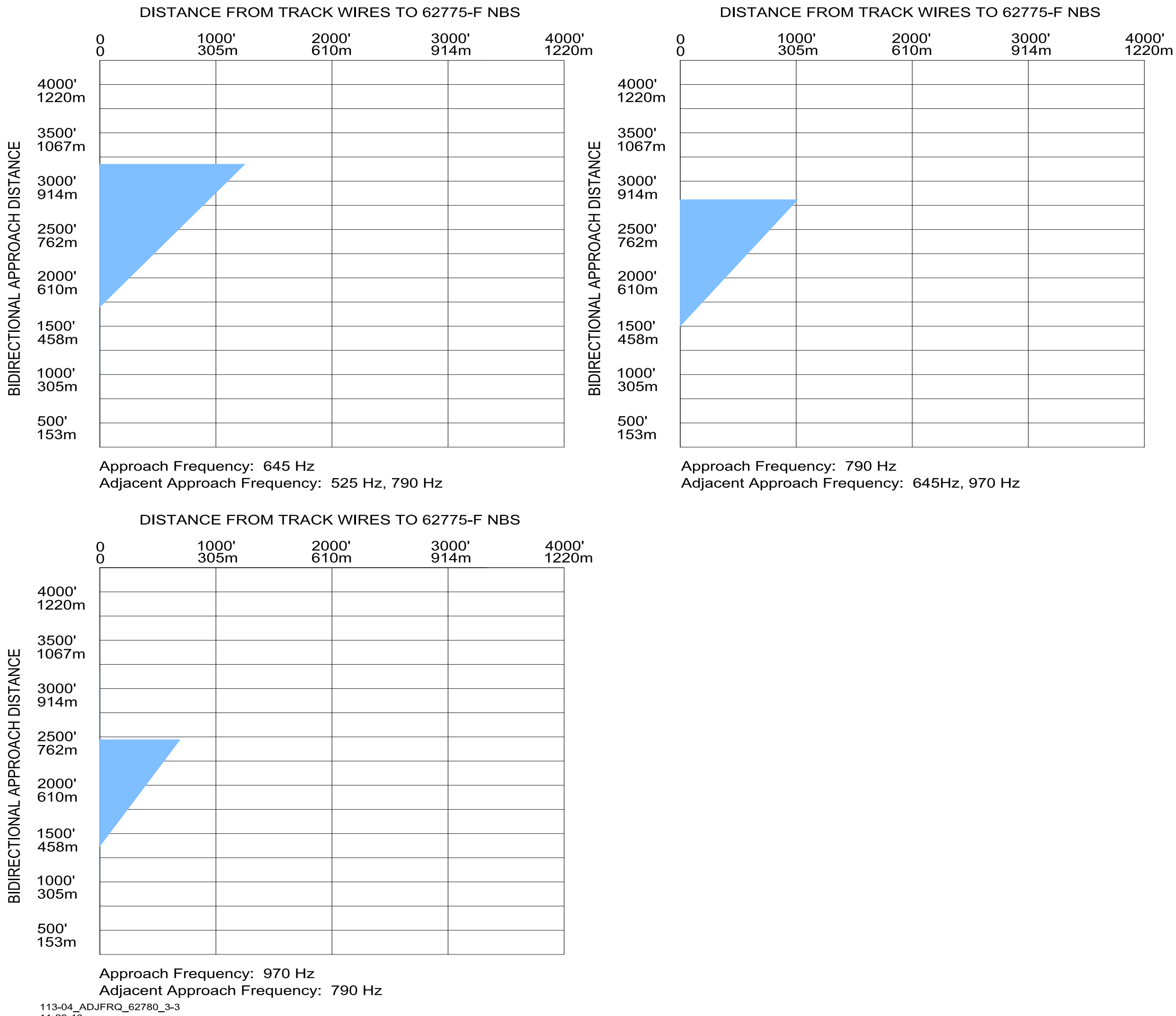


Figure 2-7:
Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 2 of 3)



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 5000 GCP OPERATING FREQUENCIES

2.8.1 Insulated Joints Requirements

In general, do not operate two Model 5000 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 5000 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

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 5000 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 5000 GCP to 285 Hz and the other to 284 Hz.

Table 2-8:
Minimum Distance Between Termination Shunts When Repeating Model 5000 GCP Operating Frequencies

STANDARD 5000 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 5000 GCP offset frequencies is provided in Table 2-9.

Table 2-9:
Model 5000 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 5000 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

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 5000 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

SHUNT PART NUMBER	FREQUENCY (HZ)	SHUNT PART NUMBER	FREQUENCY (HZ)
62775-8621	86	62775-2152	211
	114		285
	156		348
	211		430
			525
62775-1543	156	62775-3497	348
	211		430
	285		525
	348		645
	430		790
			970

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

WARNING

THE FEED POINT 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 5000 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

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

NOTE

The use of dual wideband couplers, part number 8A077, is not required for GCP 5000 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 5000 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 5000 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

WARNING

THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN TABLE 2-14 APPLY ONLY TO SIEMENS MODEL 5000 GCP'S.
WHEN THE MODEL 5000 GCP IS PROGRAMMED AS A PREDICTOR, APPLICATION RULES FOR THE 62785-F ARE SPECIFIED IN THE TABLE 2-14. WHEN APPROACH LENGTHS 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 5000 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.

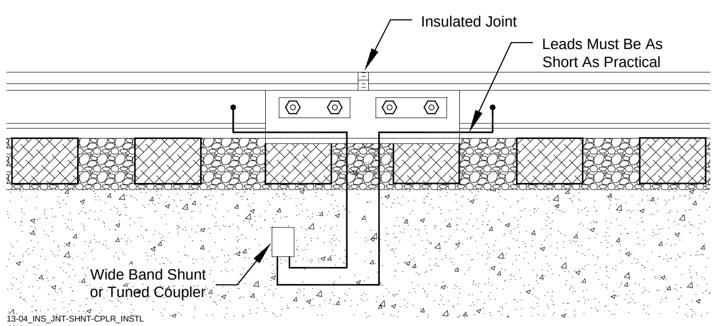


Figure 2-9:
Insulated Joint, Shunt, or Coupler Installation

NOTE

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 5000 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.

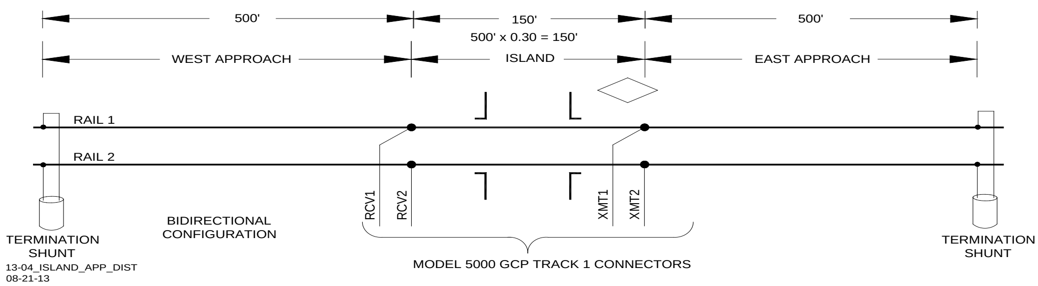


Figure 2-10:
Determining Island Approach Length

For Model 5000 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 5000 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 5000 GCP Island is compatible with most track circuits, including DC and AC coded track.

2.12.3 Island Frequencies

Table 2-15:
Model 5000 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

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

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

NOTE

The island circuit shunting sensitivity adjustment procedure is in the Model 5000 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

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 5000 GCP bungalow and the transmitter lead connections at the track.

⚠ WARNING

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 5000 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

. 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.

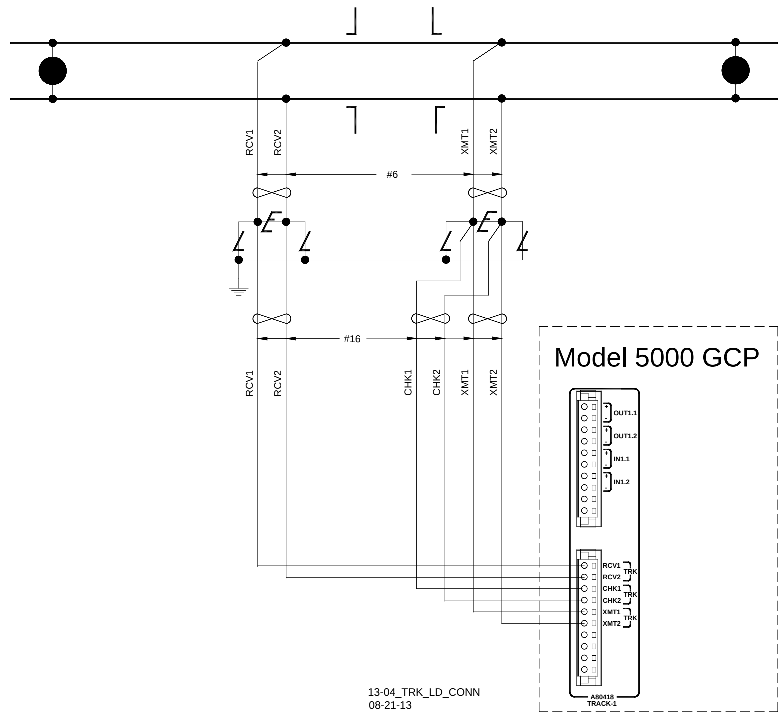


Figure 2-11:
Track Lead Connections

CAUTION

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 FOLLOW THESE GUIDELINES MAY RESULT IN CHECK RECEIVER ERRORS AND FALSE ACTIVATION.

NOTE

NOTE

For information pertaining to PSO Module track connection options including four-wire and six-wire track wire track connections, see Section 6.10, Bidirectional DAXing Operations.

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 5000 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 5000 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

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. Use a crimped or welded splice when splicing track wire connections.

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 5000 GCP six-wire to four-wire conversion operating in unidirectional mode is shown in Figure 2-12.

WARNING

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.

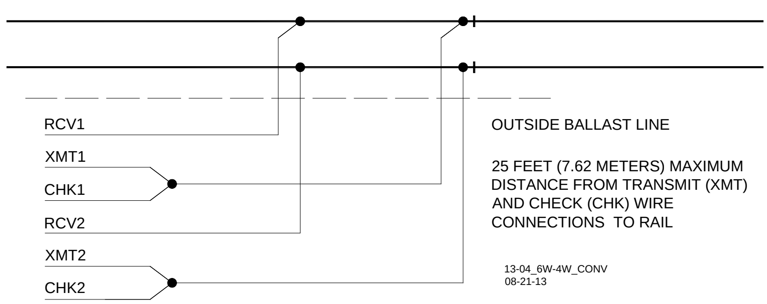


Figure 2-12:
Six-Wire To Four Wire Conversion

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

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

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

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.

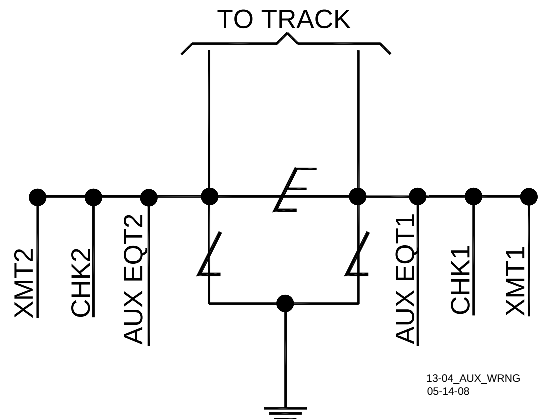


**Figure 2-13:
Proper Connections of Track Wires**

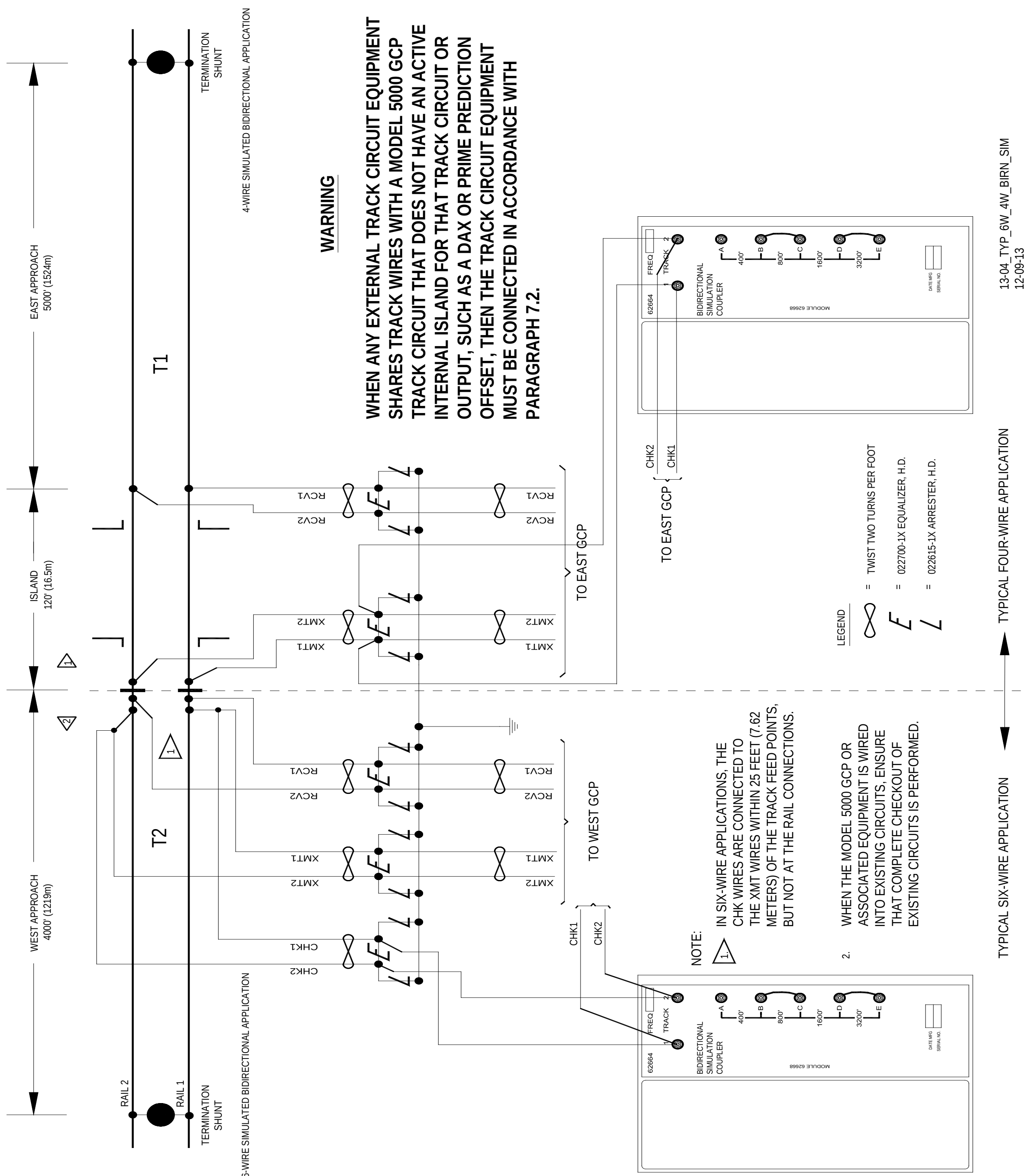


Figure 2-14:
Proper 4-Wire & 6-Wire Connections When Using Auxiliary Track Circuit Equipment

NOTE

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

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 5000 GCP approach and it is less than 1,000 feet (304.80 meters) beyond the approach termination.

NOTE

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

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

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

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

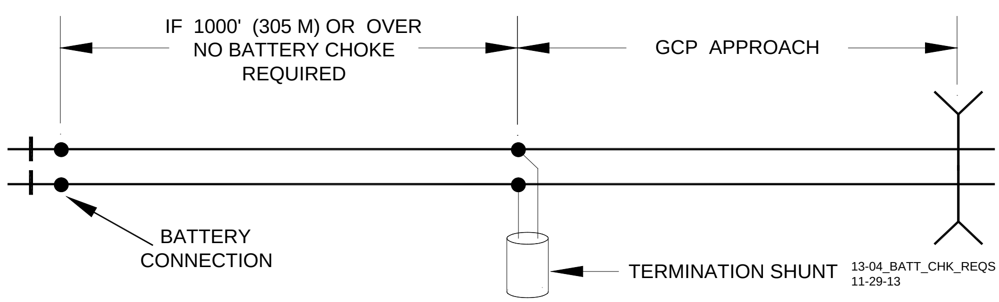


Figure 2-15:
Battery Choke Requirements

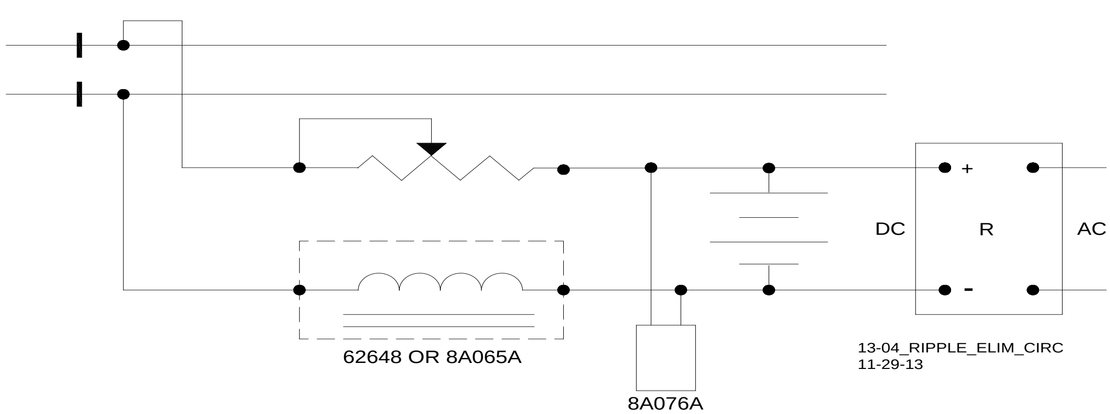


Figure 2-16:
Ripple Elimination Circuit

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

> **NOTE**
>
> Under some circumstances, an external track filter may be required when electronic coded track is located within the Model 5000 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

> **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 5000 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

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

NOTE

> **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.

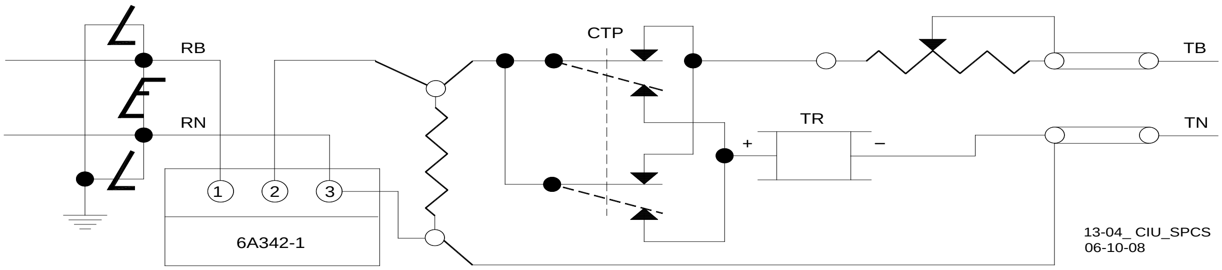


Figure 2-17:
Code Isolation Unit in a Single Polarity Code System

2.14.4.2 GRS Trakode (Dual Polarity) Systems:

⚠ WARNING

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

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.

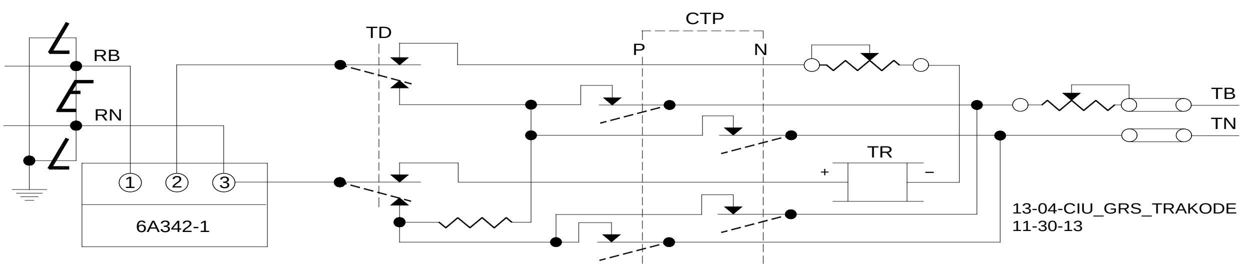


Figure 2-18:
Code Isolation Unit Installation In GRS Trakode System

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

⚠ WARNING

WARNING

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

NOTE

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

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

Application of Model 5000 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.

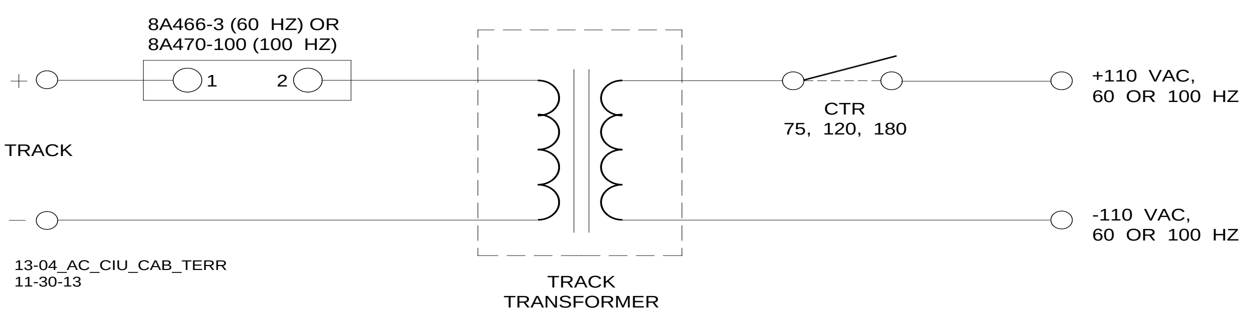


Figure 2-19:
AC Code Isolation Unit Used in CAB Territory

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 5000 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

WARNING

DO NOT BYPASS THE FEED POINT 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.

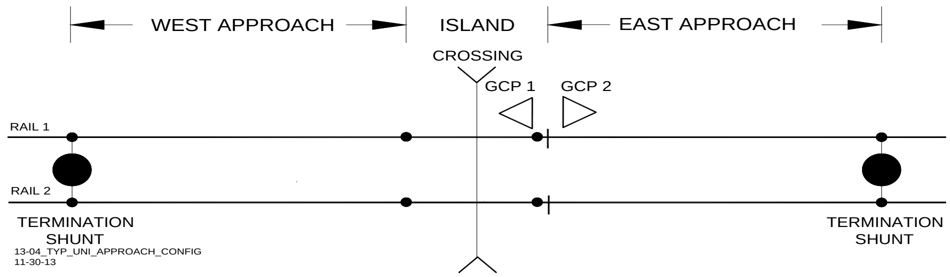


Figure 2-20:
Typical Unidirectional Approach Configuration

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

WARNING

FOR SIMULATED BIDIRECTIONAL OPERATION, THE MODEL 5000 GCP MUST BE PROGRAMMED FOR SIMULATED BIDIRECTIONAL OPERATION.

NOTE

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 5000 GCP.

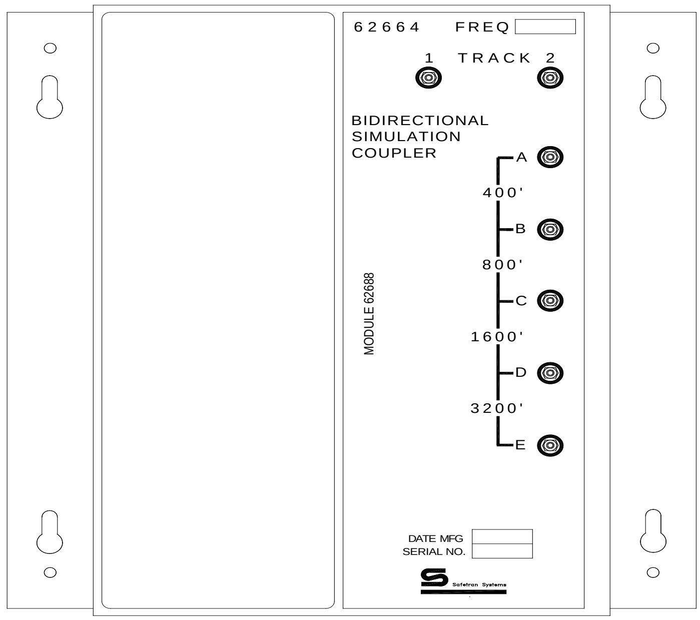
2.15.6 Simulated Approach

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.



13-04_BIRDN_SIM_CPLR
11-30-13

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

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 2-14. DO NOT USE THIS COUPLER AS A STANDARD TERMINATION SHUNT ON THE TRACK.

NOTE

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 5000 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 2-14.

⚠ WARNING

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 2-14 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.

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 Ethernet spread spectrum radio (ESSR).

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 5000 GCP may be programmed to provide up to nine prediction output signals:

- Prime
- Preempt
- DAX A through DAX G

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 5000 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

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 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 <u>Remote Prediction Via ESSR</u>

Data transfer between 5000 GCP and ESSR is via Ethernet. There are four communication channels: Vital Communication Link 1 through Vital Communication Link 4. All active vital signals are transmitted via wire or ESSR over one of the four 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 crossing as shown in Figure 2-22.

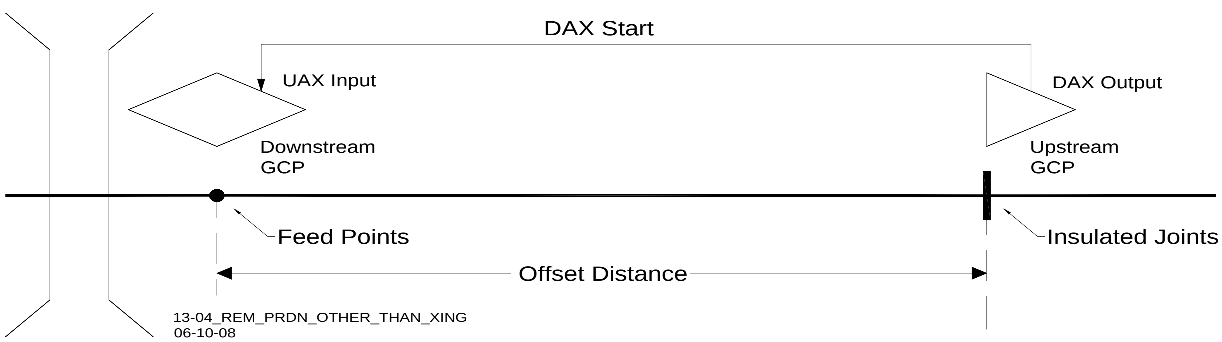


Figure 2-22:
Remote Prediction From A Remote Location Other Than A Crossing

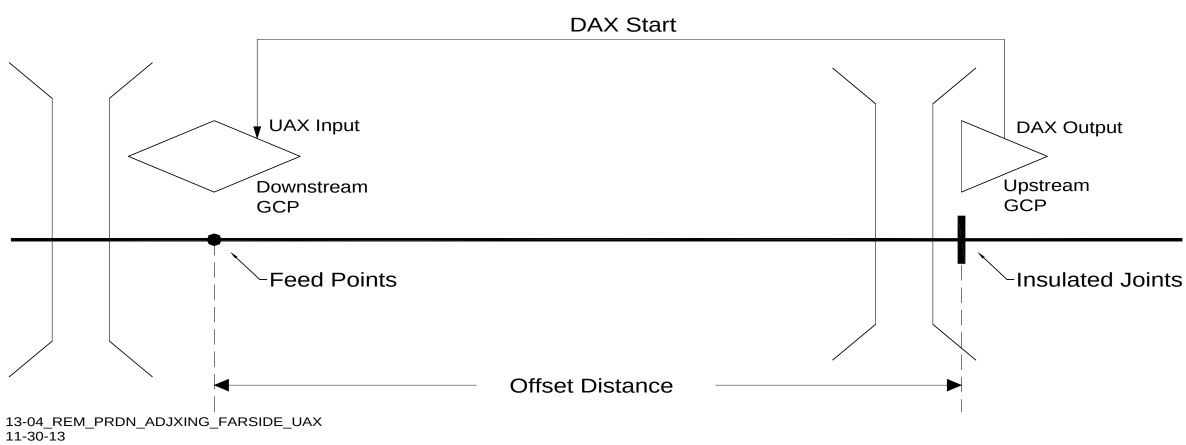


Figure 2-23:
Remote Prediction From An Upstream Crossing - Joints On Far Side

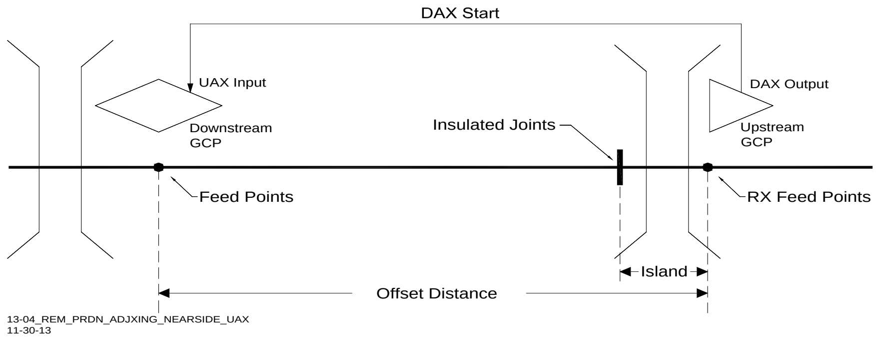


Figure 2-24:
Remote Prediction From An Upstream Crossing – Joints On Near Side

2.16.5 DAX Offset Distance

The distance between the crossing feed points and the remote Model 5000 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 2-24 or to the DAX receiver feed wires as shown in Figure 2-24.

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

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.

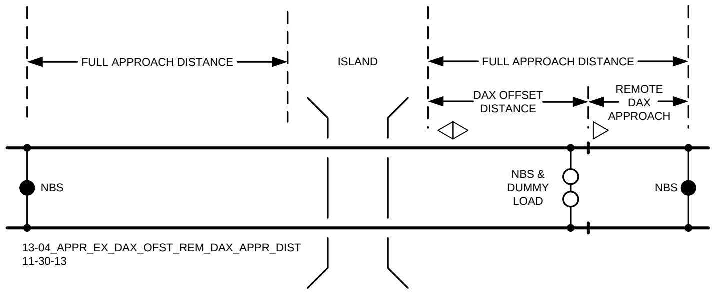


Figure 2-25:
Approach Example with DAX Offset and Remote DAX Approach Distances

2.17 SURGE PROTECTION

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

All GCP 5000 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 2-45. Primary surge protection for all I/O wiring between bungalows is shown in Figure 2-46.

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 5000 equipment. Primary arrestors, equalizers and power wiring are shown in Figure 2-47.

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 5000 GCP applications:

- Single Track, Bidirectional (Figure 2-26)
- Two Track, Bidirectional (Figure 2-27)
- Single Track, Back-to-Back, Unidirectional (Figure 2-28)
- Two Track, Back-to-Back, Unidirectional (Figure 2-29)
- Single Track, Bidirectional, And Remote Single Track, Unidirectional (Figure 2-30)
- Single Track, Bidirectional, And Remote Single Track (Six Wire), Unidirectional, In Single GCP Case (Figure 2-31)
- Single Track, Back-to-Back, Unidirectional, In Simulated Bidirectional Operation (Figure 2-32)
- Single Track, Back-to-Back, Unidirectional, In Simulated Bidirectional Six Track Wire Operation (Figure 2-33)
- Single Track, Two Overlapping Crossings, Using Remote Prediction (Figure 2-34)
- Single Track, Two Overlapping Crossings, Using 80049-1 DC Shunting Enhancer Panels (Figure 2-35)
- Three Track, Bidirectional (Figure 2-36)
- Four Track Bidirectional (Figure 2-37)
- Single Track, Remote Prediction via Radio DAX link (Sheet 1 of 2) (Figure 2-38)
- Single Track, Remote Prediction via Radio DAX link (Sheet 2 of 2) (Figure 2-39)
- Single Track, Remote Prediction with Advanced Preemption (Figure 2-40)
- Single Track, Remote Prediction for Two Overlapping Bidirectional Crossings (Figure 2-41)
- Typical Single Track, Vital IO Bidirectional DAX Application (Figure 2-42)
- Typical Single Track, Internal PSO Bidirectional DAX Four-Wire Application (Figure 2-43)
- Typical Single Track, Center Fed Bidirectional DAX Six-Wire Application (Figure 2-44)
- Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections Figure 2-45)
- Typical Surge Protection Requirements When Cabling Between Remote DAX Unit and Crossing Unit (Figure 2-46)
- Recommended Battery Surge Protection Wiring for Model 5000 GCPs (Figure 2-47)

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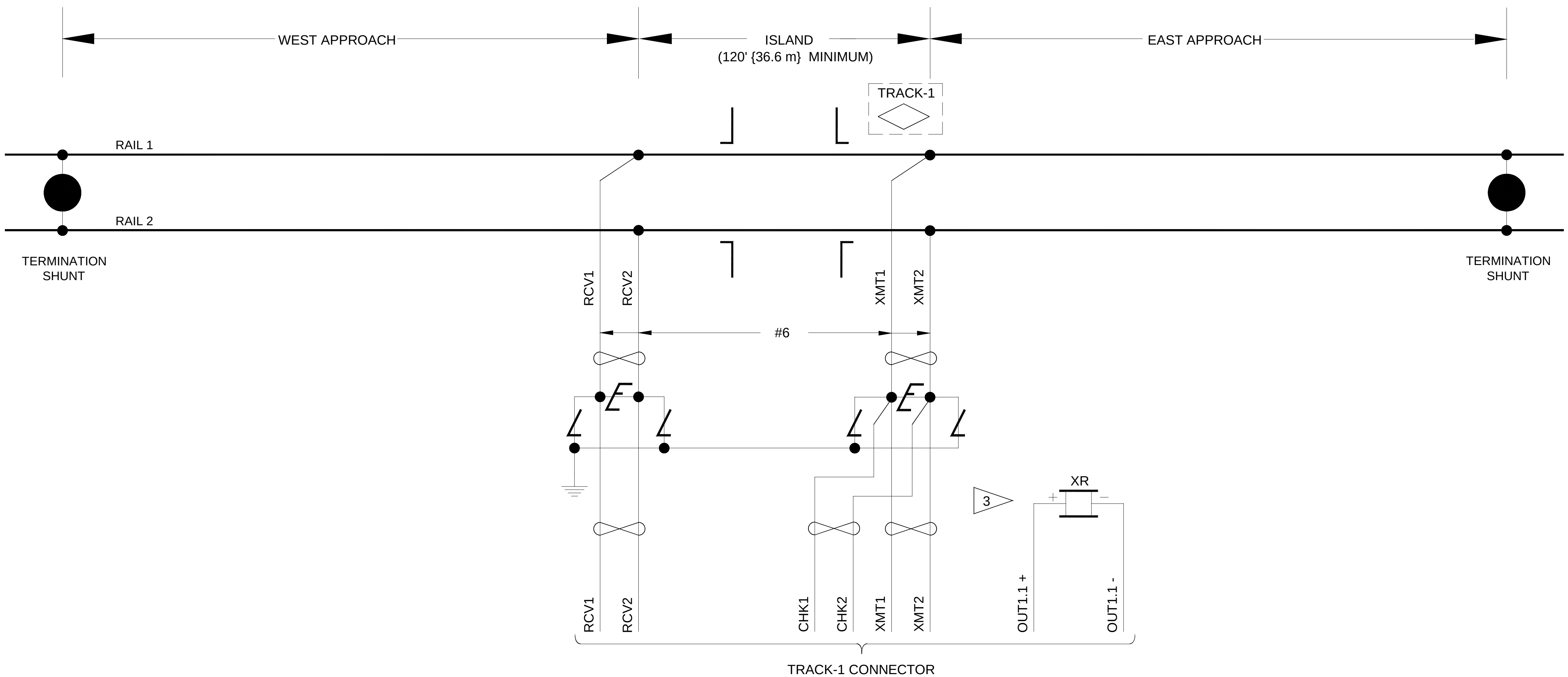


NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

LEGEND

= TWIST TWO TURNS PER FOOT

= 02270-1X EQUALIZER, H.D.

= 02585-1X ARRESTER, H.D.

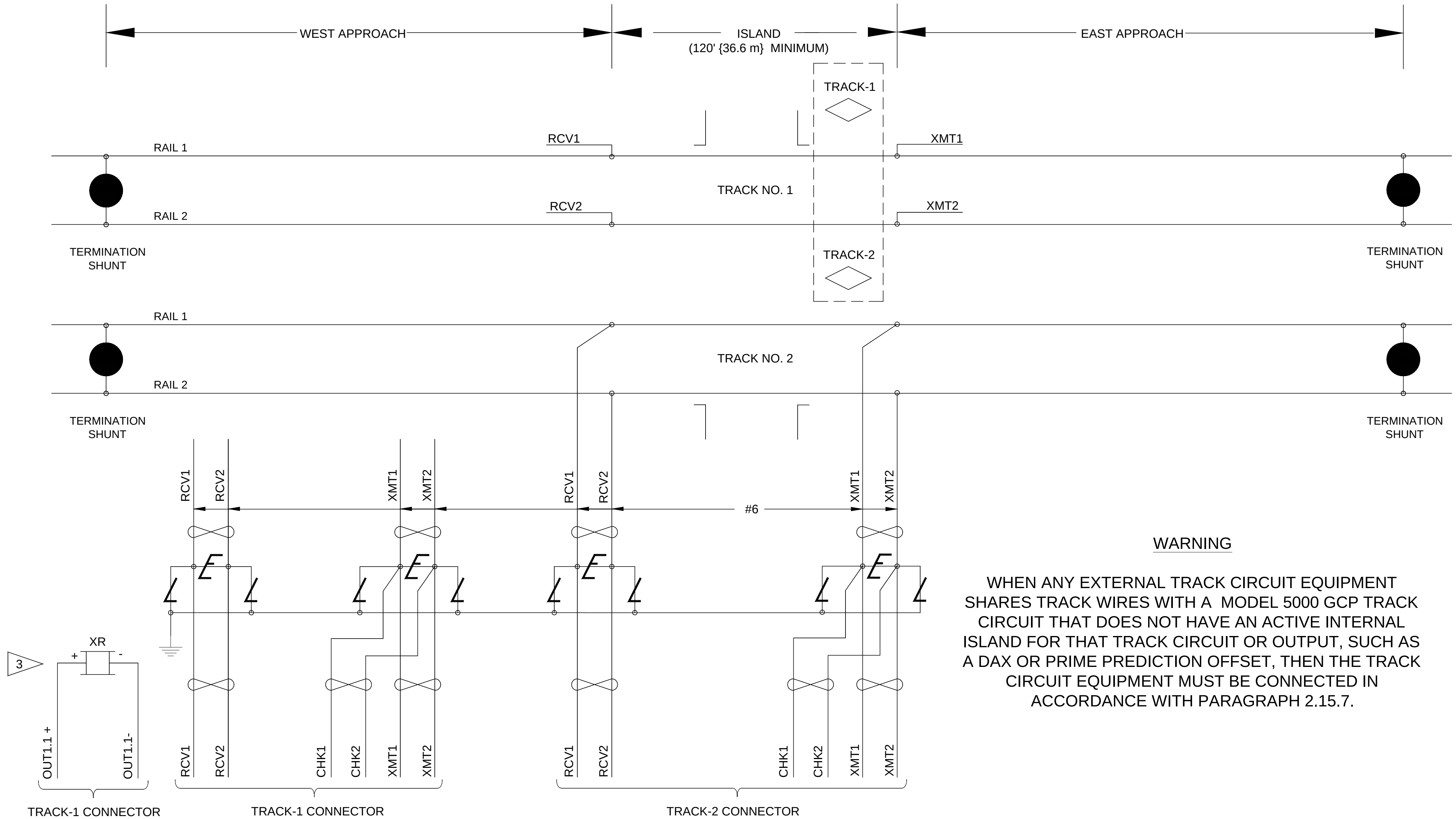
= BIDIRECTIONAL GCP

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP 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 2.15.7.

13-04_TYP_1T_BIRDN_APPL
09-10-13

Figure 2-26:
Typical Single Track Bidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

LEGEND

= TWIST TWO TURNS PER FOOT

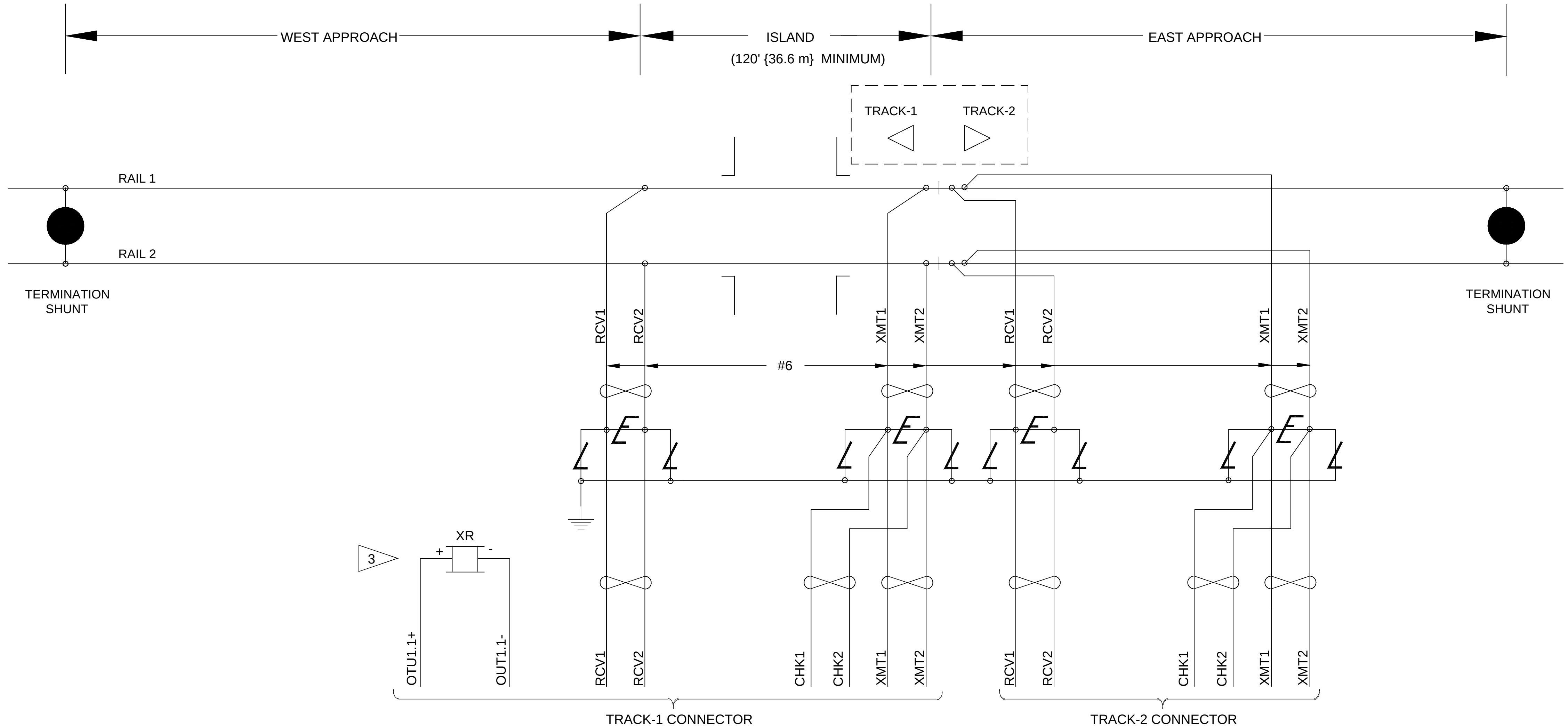
= 02270-1X EQUALIZER, H.D.

= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

13-04_TYP_2T_BIDRN_APP
09-10-13

Figure 2-27:
Typical Two Track Bidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

LEGEND

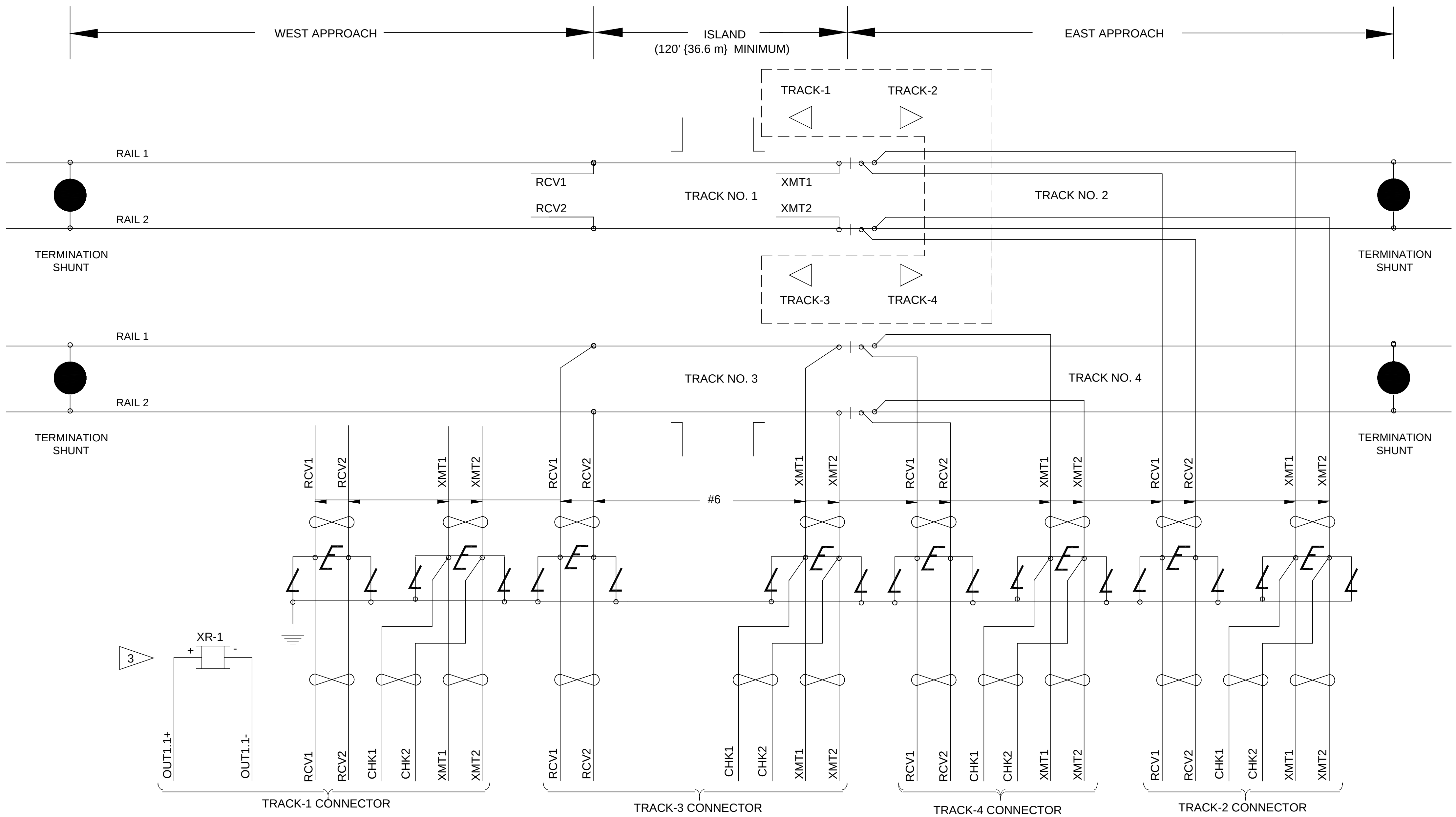
- = TWIST TWO TURNS PER FOOT
- = 02270-1X EQUALIZER, H.D.
- = 02585-1X ARRESTER, H.D.
- OR = UNIDIRECTIONAL GCP

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP TRACK CRCUIT 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 2.15.7.

13-04_TYP_1T_B2B_UNI_APPL
09-10-13

Figure 2-28:
Typical Single Track, Back-to-Back, Unidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS, ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

13-04_TYP_2T_B2B_UNI_APPL
10-21-13

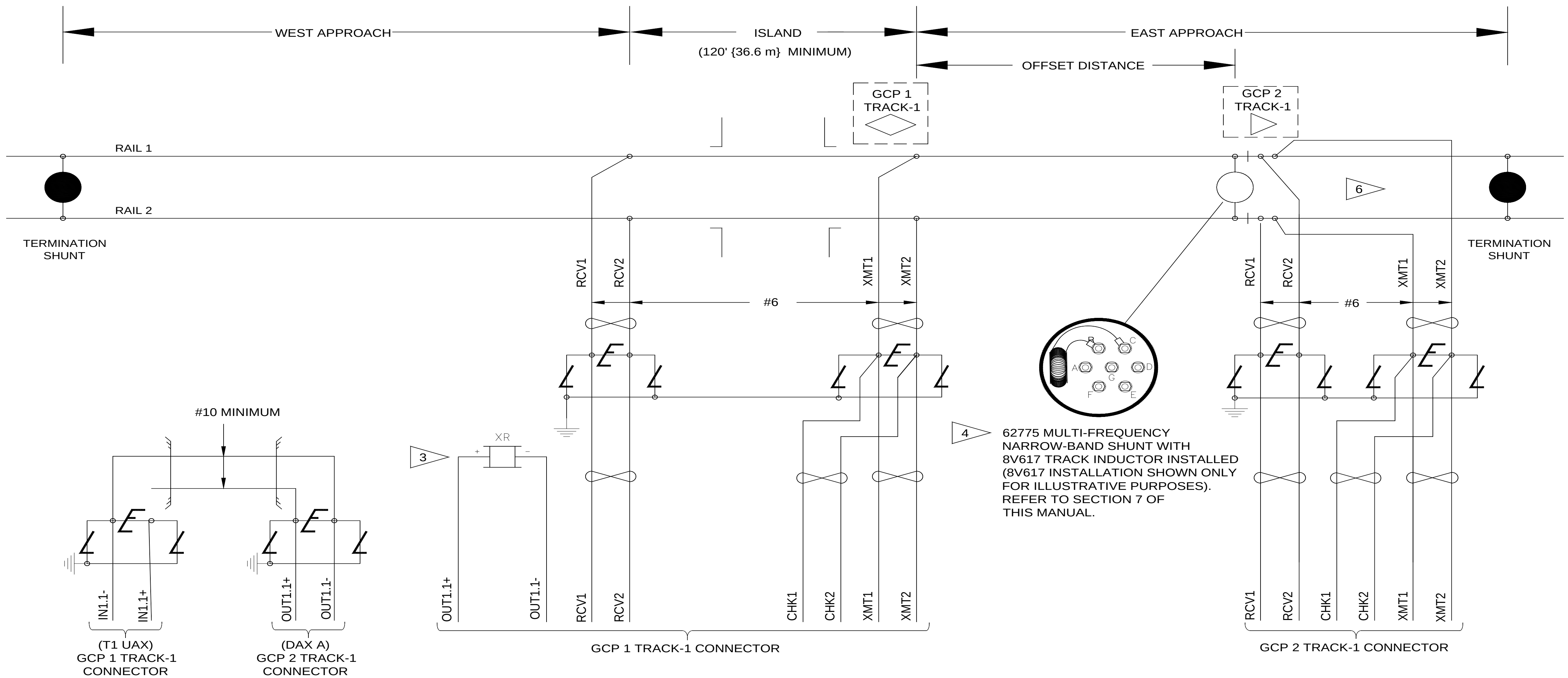
LEGEND

- = TWIST TWO TURNS PER FOOT
- = 02270-1X EQUALIZER, H.D.
- = 02585-1X ARRESTER, H.D.
- OR = UNIDIRECTIONAL GCP

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 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 2.15.7

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



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.

2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.

3 XR SHOWN FOR ILLUSTRATION ONLY.

4 8V617 SIMULATED TRACK INDUCTOR IS REQUIRED ONLY IF DISTANCE TO THE INSULATED JOINTS (OFFSET DISTANCE) IS 90 PERCENT OR LESS OF WEST APPROACH DISTANCE.

5. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT ARE WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

6 MINIMUM APPROACH DISTANCE FOR REMOTE DAX IS 1000 FEET (304.8 METERS).

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 5000 GCP 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 2.15.7

LEGEND

= TWIST TWO TURNS PER FOOT

= 02270-1X EQUALIZER, H.D.

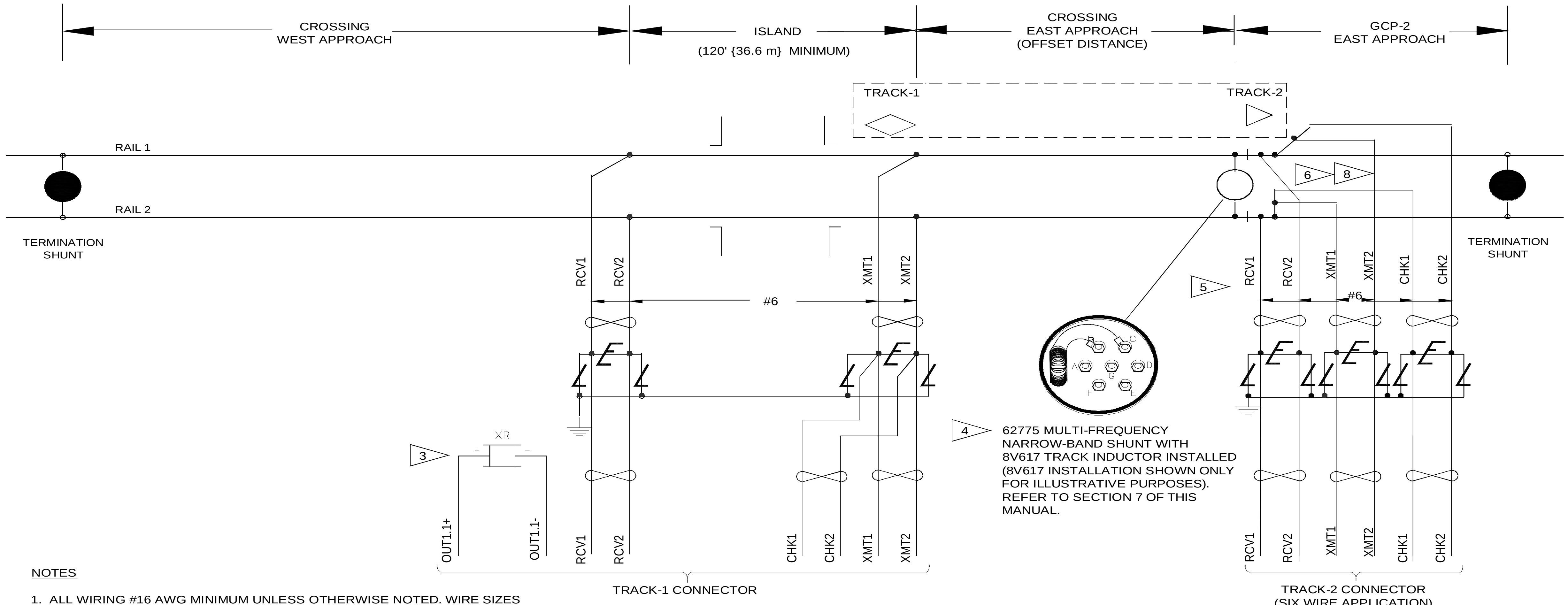
= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

= UNIDIRECTIONAL GCP

13-04_1T_BIDRN_RST_UNI_APPL
11-22-13

Figure 2-30:
Typical Single Track, Bidirectional, and Remote Single Track, Unidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.

2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.

3 XR SHOWN FOR ILLUSTRATION ONLY.

4 8V617 SIMULATED TRACK INDUCTOR IS REQUIRED ONLY IF DISTANCE TO THE INSULATED JOINTS (OFFSET DISTANCE) IS 90 PERCENT OR LESS OF THE WEST APPROACH DISTANCE.

5. THE MAXIMUM LENGTH OF EACH CONDUCTOR IN SIX-WIRE WIRE APPLICATIONS IS 3500 FEET.

6 FOR 6 WIRE TO 4 WIRE CONVERSION, THE CHK WIRES ARE CONNECTED TO THE XMT WIRES UNDERGROUND WITHIN 25 FEET (7.62 METERS) OF THE TRACK FEET POINTS, BUT NOT AT THE RAIL CONNECTIONS.

7. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS, ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

8 MINIMUM APPROACH DISTANCE FOR REMOTE DAX IS 1000 FEET (304.8 METERS).

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 5000 GCP 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 2.15.7.

LEGEND

= TWIST TWO TURNS PER FOOT

= 02270-1X EQUALIZER, H.D.

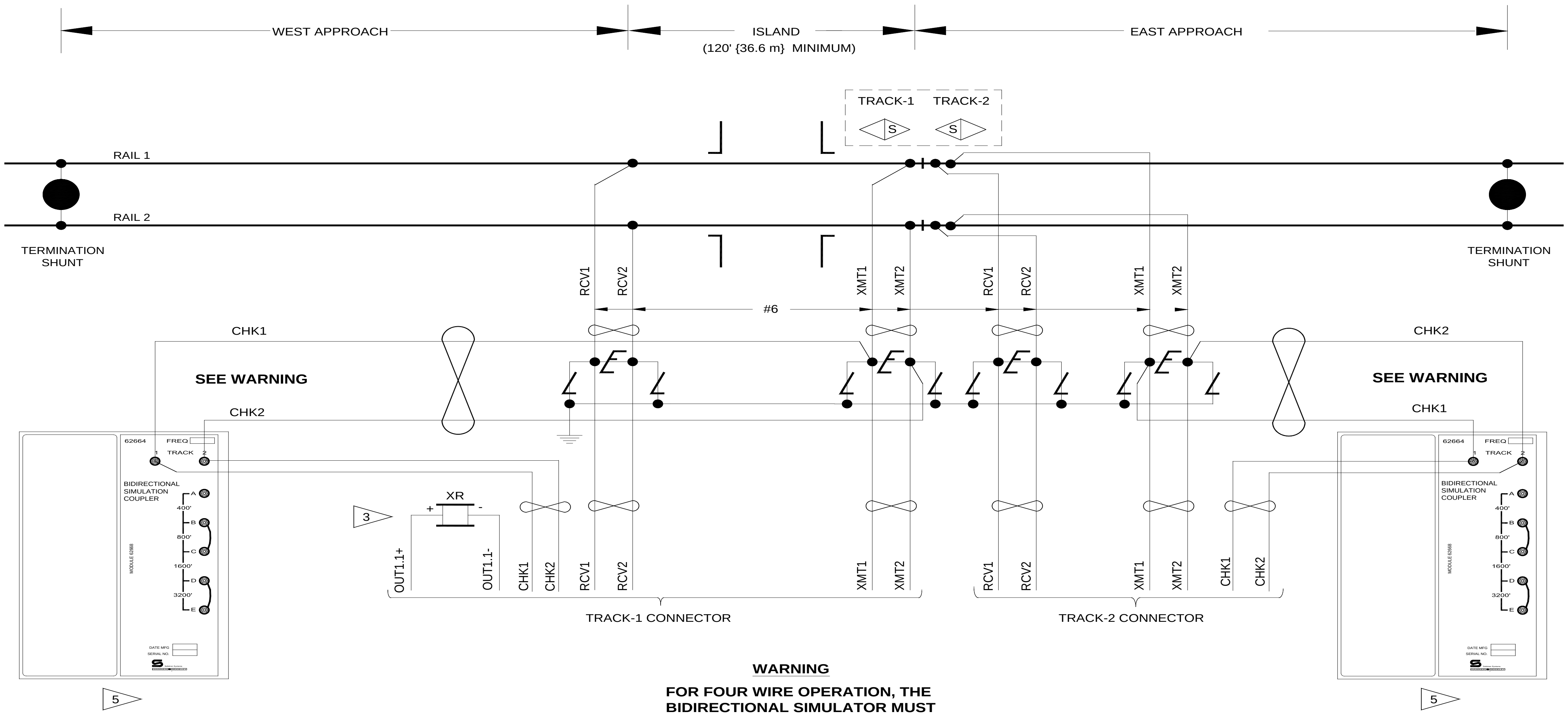
= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

= UNIDIRECTIONAL GCP

13-04_1T_BIDRN_RST6W_UNI_APPL_1CASE
11-22-13

Figure 2-31:
Typical Single Track, Bidirectional, and Remote Single Track (Six Wire), Unidirectional Application, In Single GCP Case.



WARNING

FOR FOUR WIRE OPERATION, THE BIDIRECTIONAL SIMULATOR MUST BE WIRED PER PARAGRAPH 2.15.6.

NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT ARE WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.
5. BIDIRECTIONAL COUPLERS MUST BE THE SAME FREQUENCY AS THE GCP AND ARE FIELD ADJUSTED TO APPROXIMATE THE GCP APPROACH DISTANCE.

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 5000 GCP 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 2.15.7

LEGEND

= TWIST TWO TURNS PER FOOT

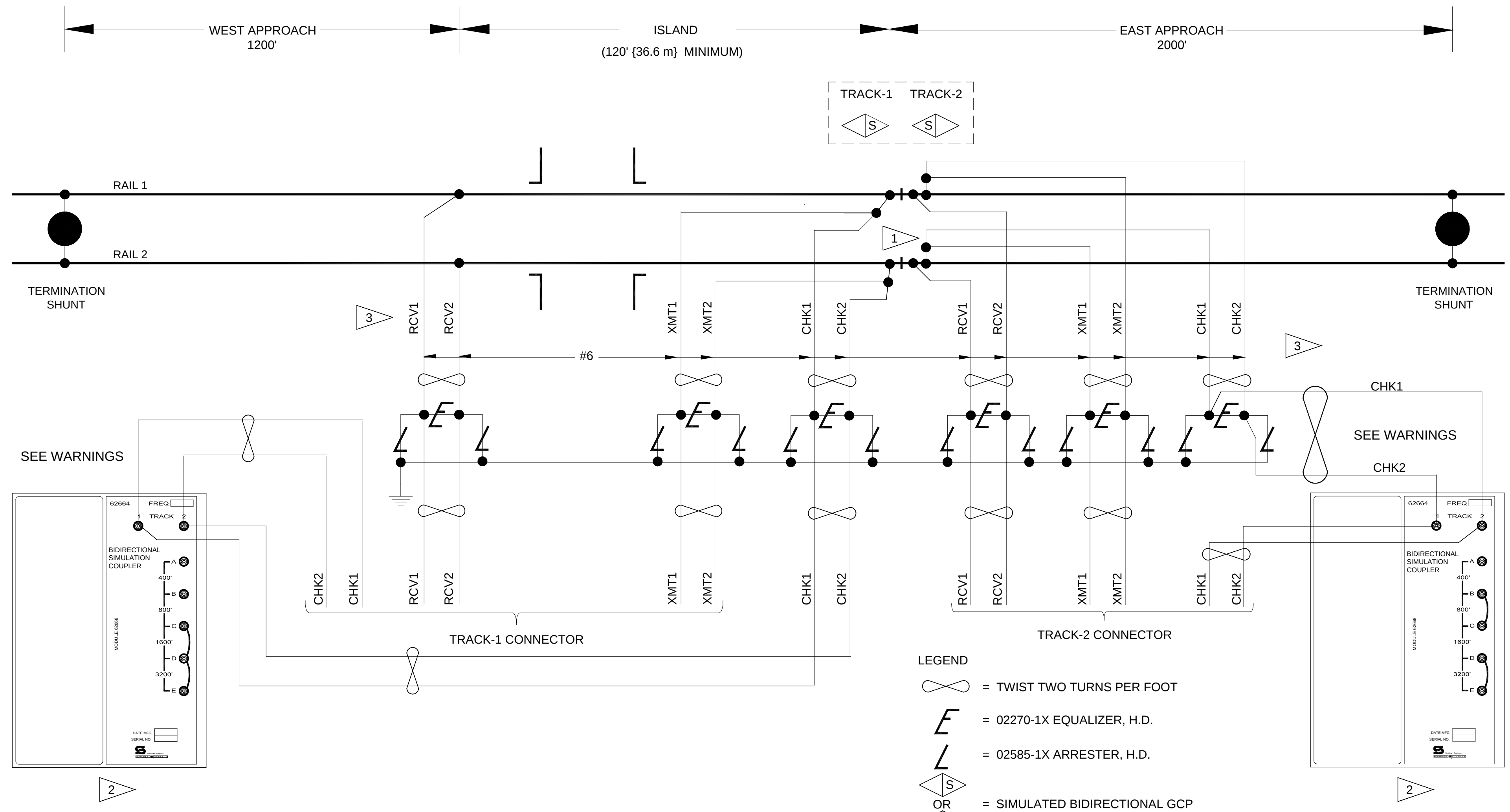
= 02270-1X EQUALIZER, H.D.

= 02585-1X ARRESTER, H.D.

S OR S = SIMULATED BIDIRECTIONAL GCP

13-04_TYP_1T_B2B_UNI_SIMBIRDN_OPS_APPL
11-22-13

Figure 2-32:
Typical Single Track, Back-to-Back,
Unidirectional, In Simulated Bidirectional Operation Application



NOTES

1. IN SIX-WIRE APPLICATIONS, 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.
2. BIDIRECTIONAL COUPLERS MUST BE THE SAME FREQUENCY AS THE APPROACH FREQUENCY AND ARE FIELD ADJUSTED TO APPROXIMATE THE APPROACH DISTANCE.
3. ALL WIRING #16 AW MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
4. TERMINATION SHUNTS MAY BE HARDWIRE, WIDE-BAND, OR NARROW-BAND DEPENDING UPON THE TRACK CIRCUIT IN USE.
5. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT ARE WIRED INTO EXISTING CIRCUITS, ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

13-04_TYP_1T_B2B_UNI_SIMBI_6T_WIRE
11-22-13

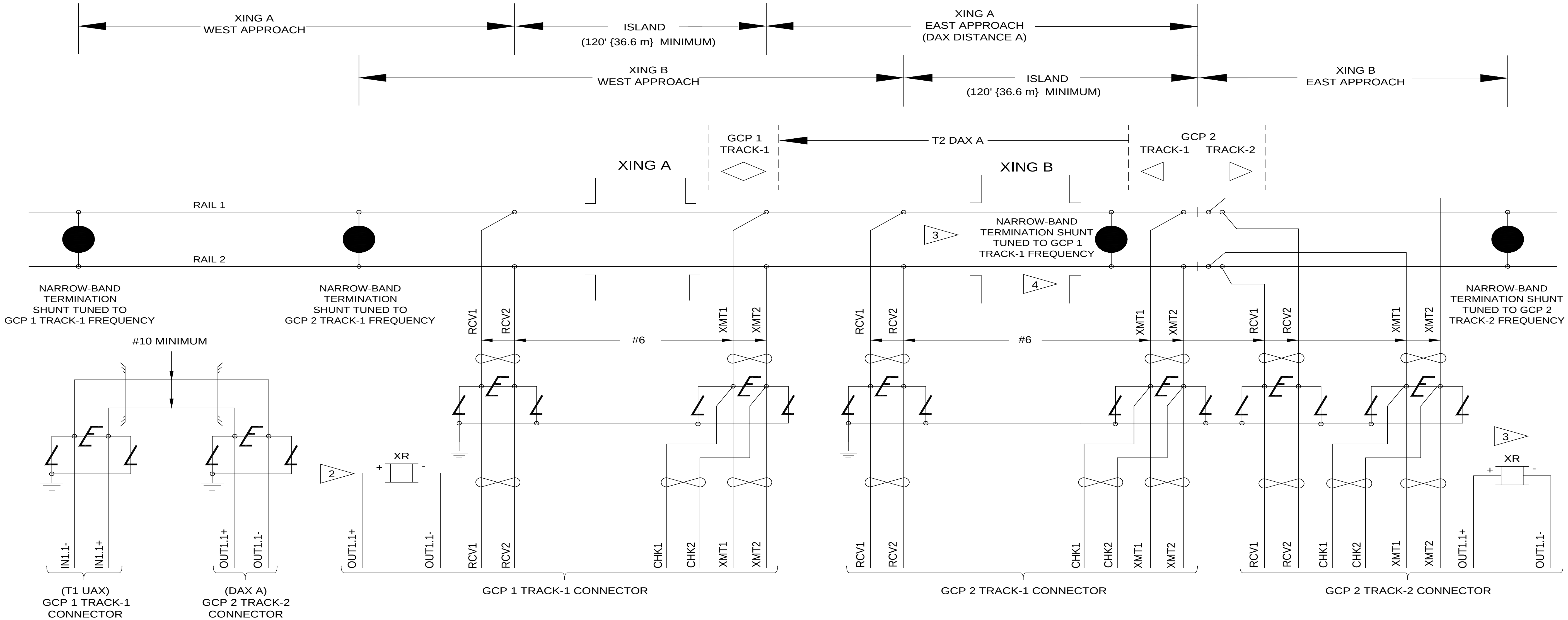
WARNING

FOR 6-WIRE OPERATION, THE BIDIRECTIONAL COUPLERS MUST BE CONNECTED TO CHECK WIRES.

THE MODEL 5000 GCP MUST BE PROGRAMMED FOR BIDIRECTIONAL OR SIMULATED BIDIRECTIONAL APPROACH.

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A GCP 4000 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 2.15.7.

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



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.

2 XR SHOWN FOR ILLUSTRATION ONLY.

3 WHEN THE 5000 GCP OR ASSOCIATED EQUIPMENT ARE WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

4 NARROW BAND SHUNT HAS SIMULATED TRACK INDUCTOR INSTALLED WHICH SERVES TO BALANCE THE GCP1 APPROACHES.

13-04_TYP_1T_2OVERLAPPING_XINGS_REMPDR_APPL
11-30-13

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 5000 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 2.15.7

LEGEND

= TWIST TWO TURNS PER FOOT
= 02270-1X EQUALIZER, H.D.
= 02585-1X ARRESTER, H.D.
= BIDIRECTIONAL GCP
OR = UNIDIRECTIONAL GCP

Figure 2-34: Typical Single Track, Two Overlapping Crossings, Using Remote Prediction Application

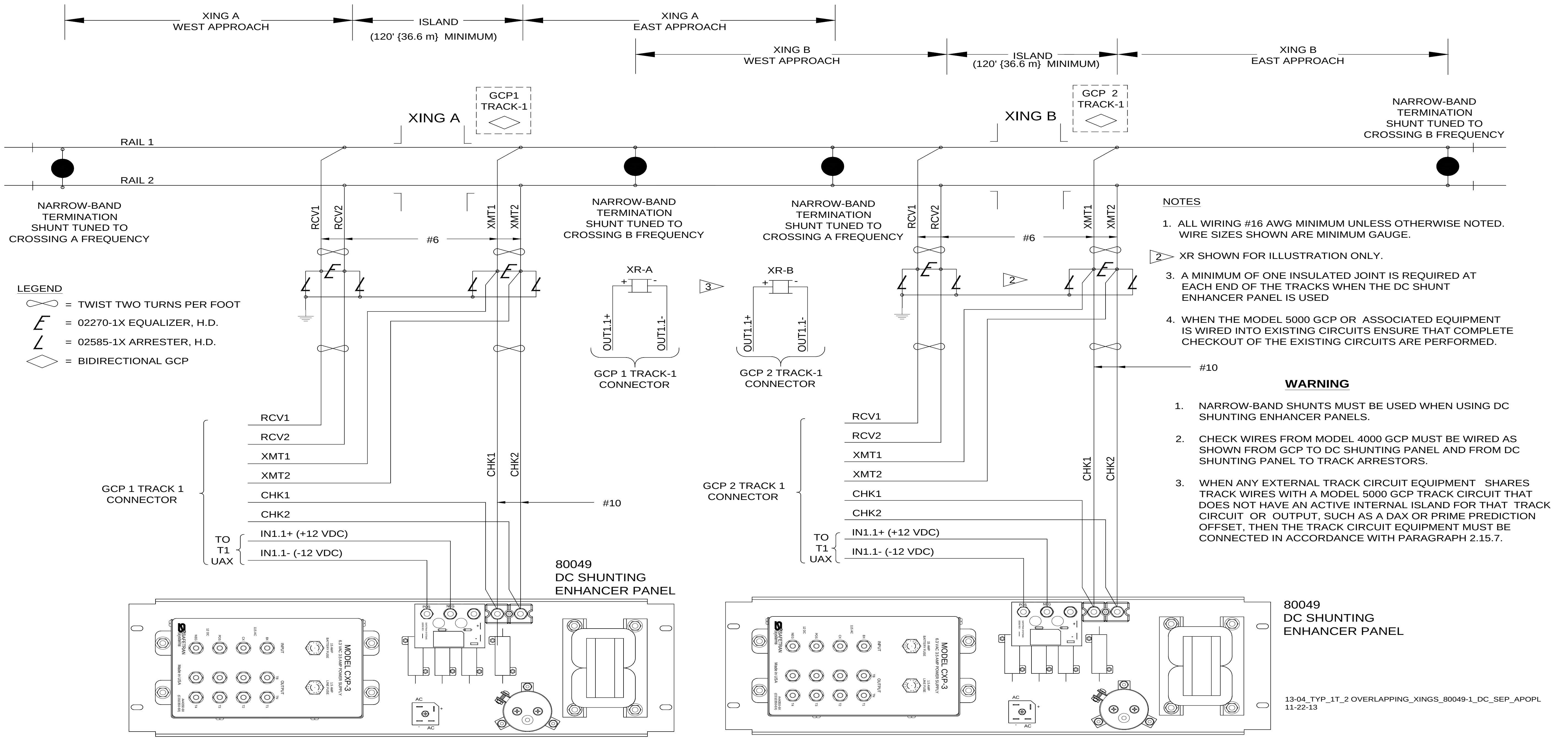
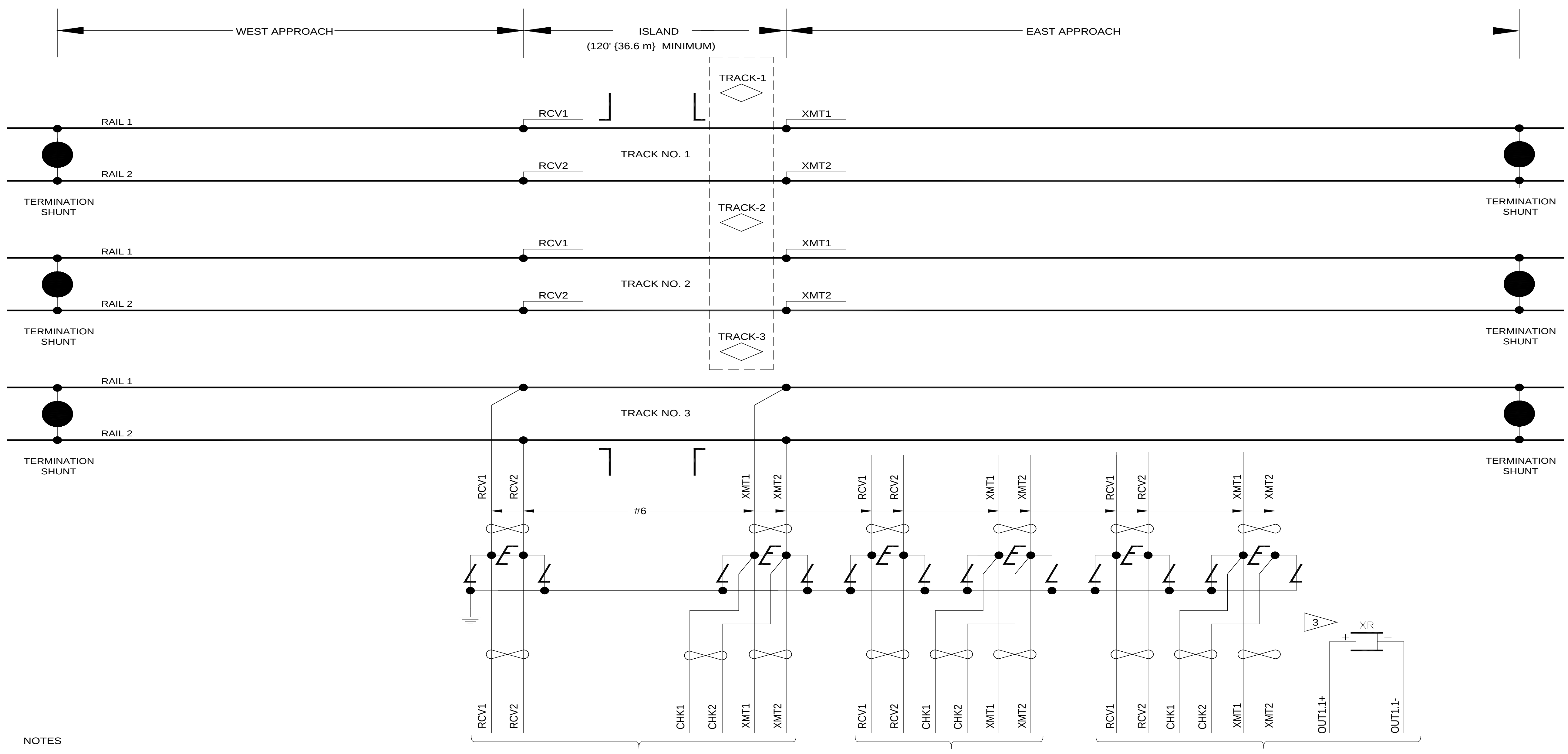


Figure 2-35:
Typical Single Track, Two Overlapping Crossings,
Using 80049-1 DC Shunting Enhancer Panels, Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT ARE WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS ARE PERFORMED.

13-04_TYP_3T_BIRDN_APPL
11-22-13

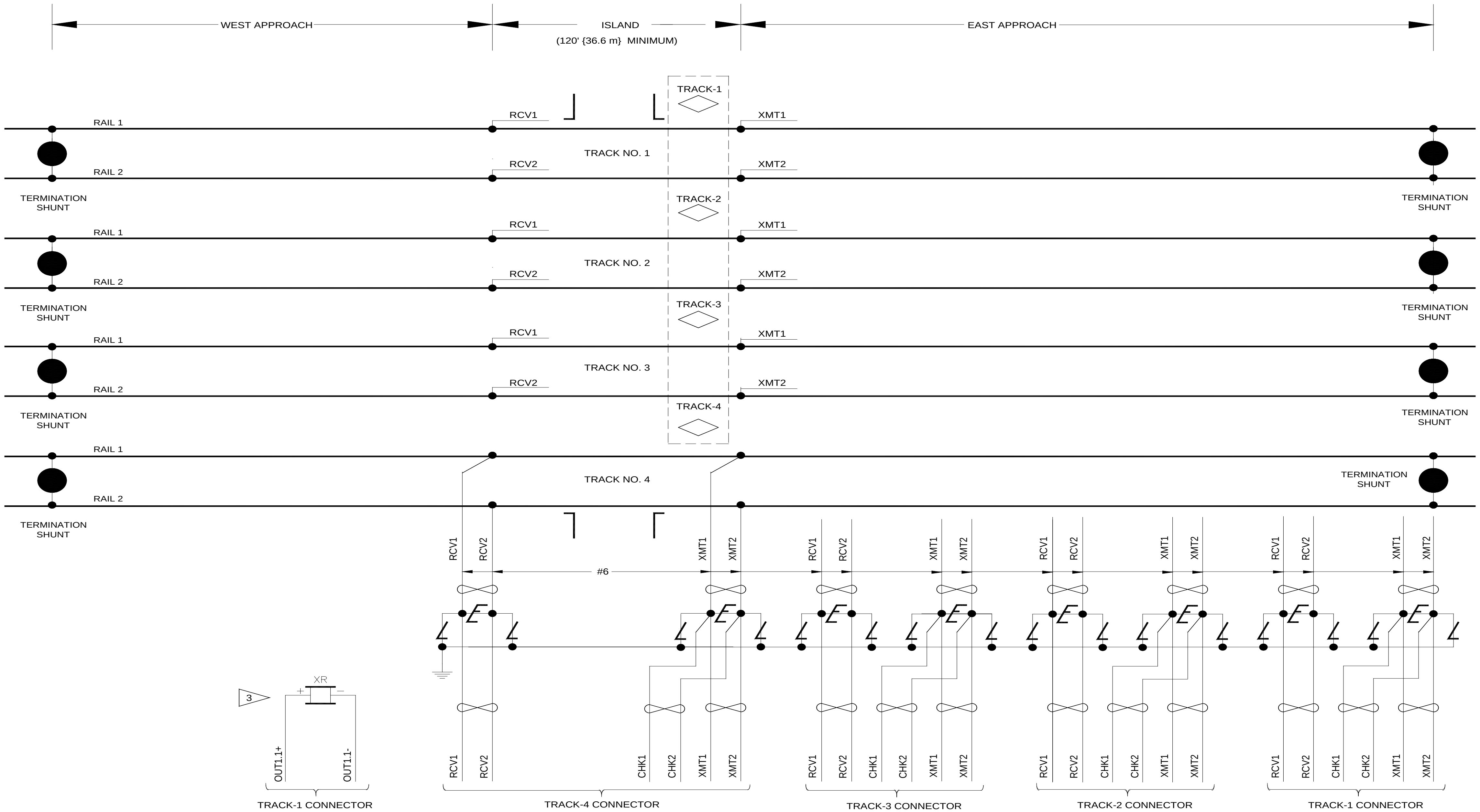
LEGEND

= TWIST TWO TURNS PER FOOT
= 02270-1X EQUALIZER, H.D.
= 02585-1X ARRESTER, H.D.
= BIDIRECTIONAL GCP

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP 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 2.15.7.

Figure 2-36:
Typical Three Track, Bidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS ARE PERFORMED.

LEGEND

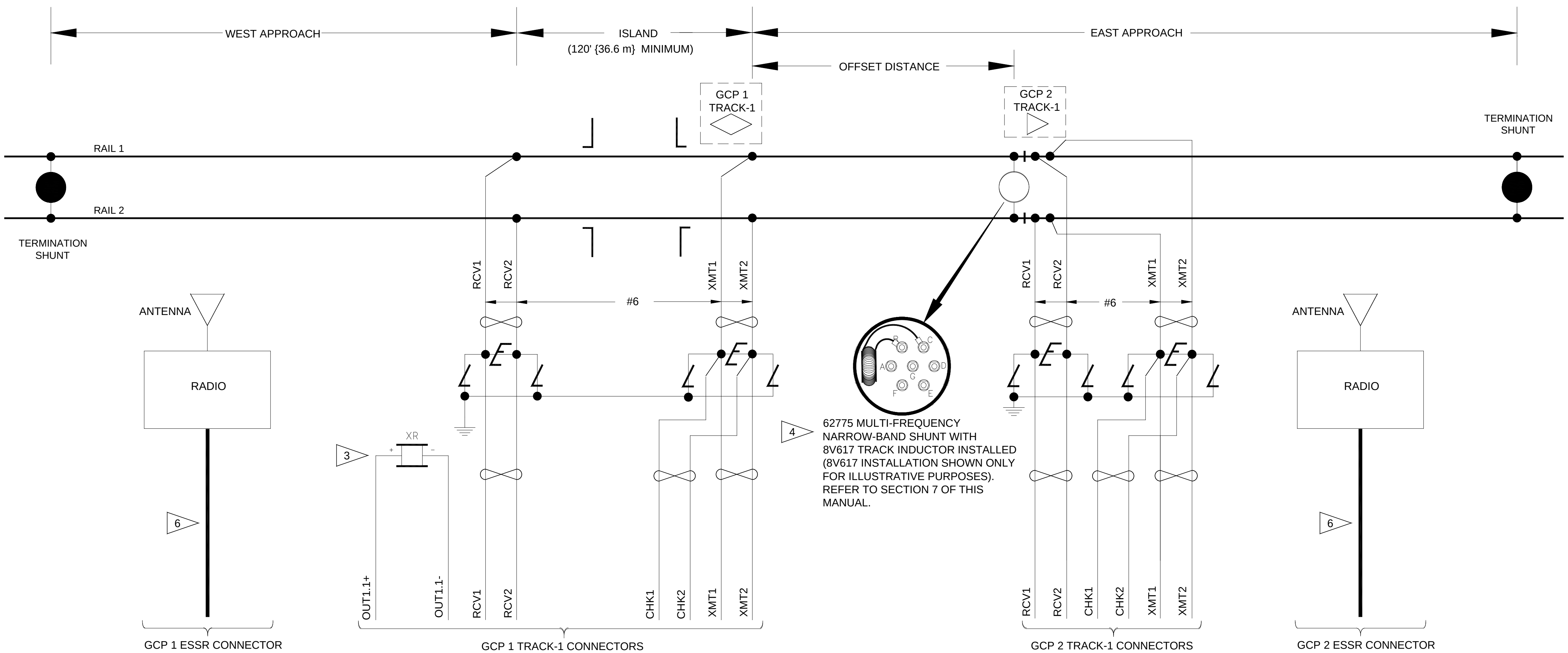
- = TWIST TWO TURNS PER FOOT
- = 02270-1X EQUALIZER, H.D.
- = 02585-1X ARRESTER, H.D.
- = BIDIRECTIONAL GCP

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP 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 2.15.7.

13-04_TYP_4T_BIRDN_APPL
11-22-13

**Figure 2-37:
Typical Four Track, Bidirectional Application**



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.

2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.

3. XR SHOWN FOR ILLUSTRATION ONLY.

4. 8V617 SIMULATED TRACK INDUCTOR IS REQUIRED ONLY IF DISTANCE TO THE INSULATED JOINTS (OFFSET DISTANCE) IS 90 PERCENT OR LESS OF WEST APPROACH DISTANCE.

5. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

6. INSERT THE RJ-45 CONNECTOR OF THE 53325 ETHERNET SPREAD SPECTRUM RADIO (ESSR) INTO ESSR SLOT ON THE FACE OF THE MODEL 5000 GCP CASE. THE THE 53457 WAYSIDE ACCESS GATEWAY (WAG) IS NOT REQUIRED ON THE MODEL 5000 GCP.

LEGEND

= TWIST TWO TURNS PER FOOT

= 02270-1X EQUALIZER, H.D.

= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

= UNIDIRECTIONAL GCP

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 5000 GCP 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 2.15.7.

13-04_1T_REM_PRED_ESSR
11-22-13

Figure 2-38:
Single Track, Remote Prediction via ESSR (Sheet 1 of 2)

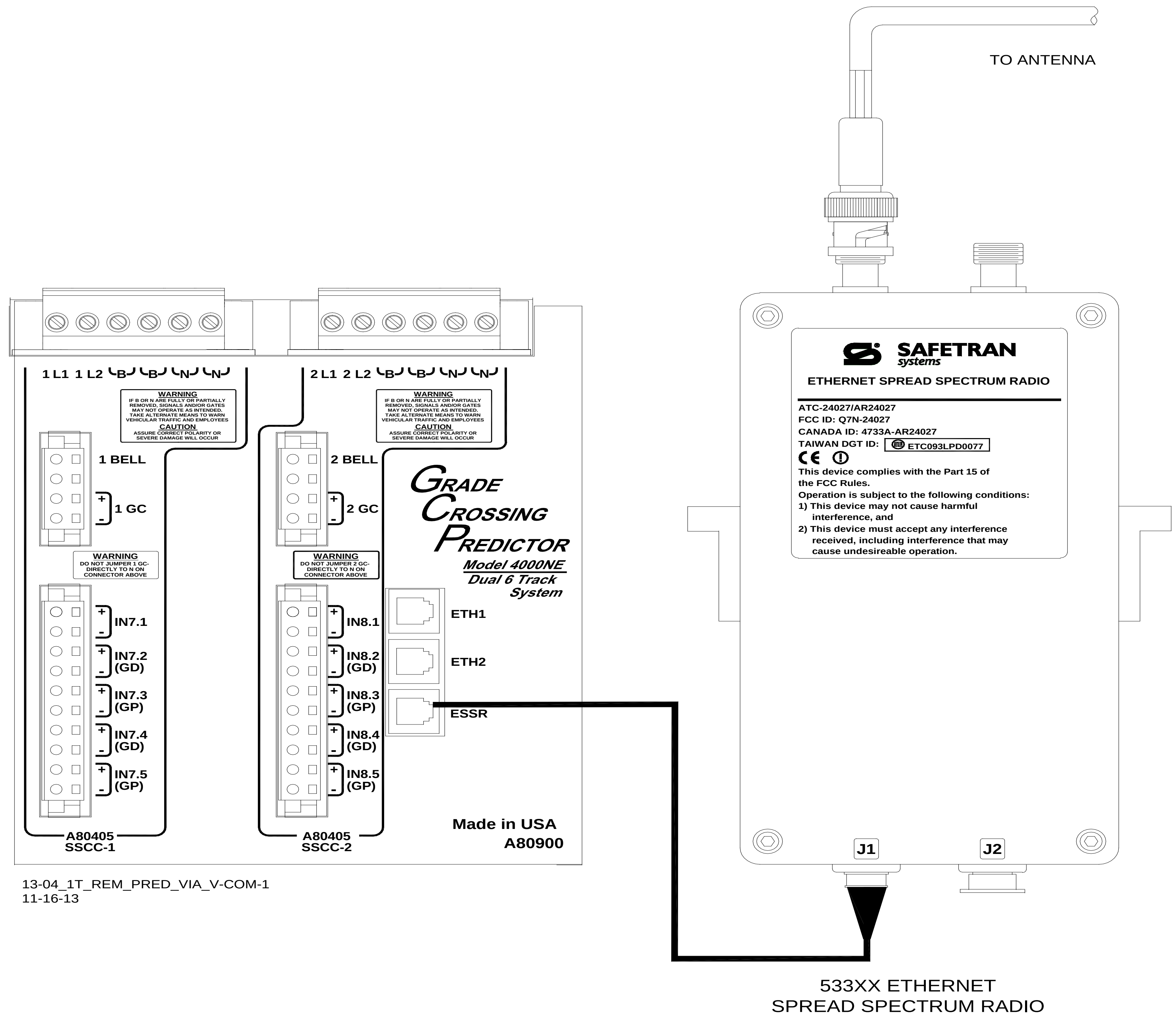
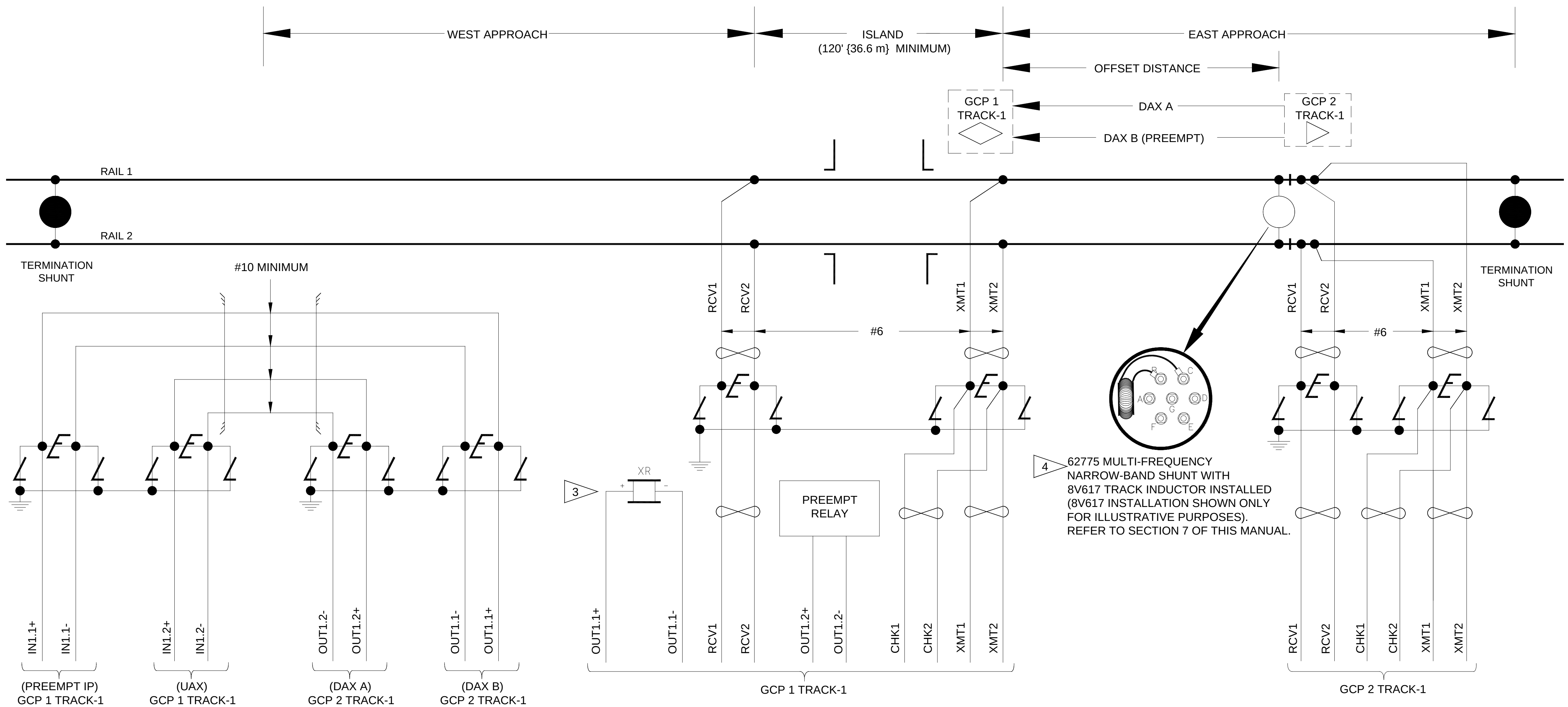


Figure 2-39:
Single Track, Remote Prediction via ESSR (Sheet 2 of 2)



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.

2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.

3. XR SHOWN FOR ILLUSTRATION ONLY.

4. 8V617 SIMULATED TRACK INDUCTOR IS REQUIRED ONLY IF DISTANCE TO THE INSULATED JOINTS (OFFSET DISTANCE) IS 90 PERCENT OR LESS OF EAST APPROACH DISTANCE.

5. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP 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 2.15.7

LEGEND

= TWIST TWO TURNS PER FOOT

= 02270-1X EQUALIZER, H.D.

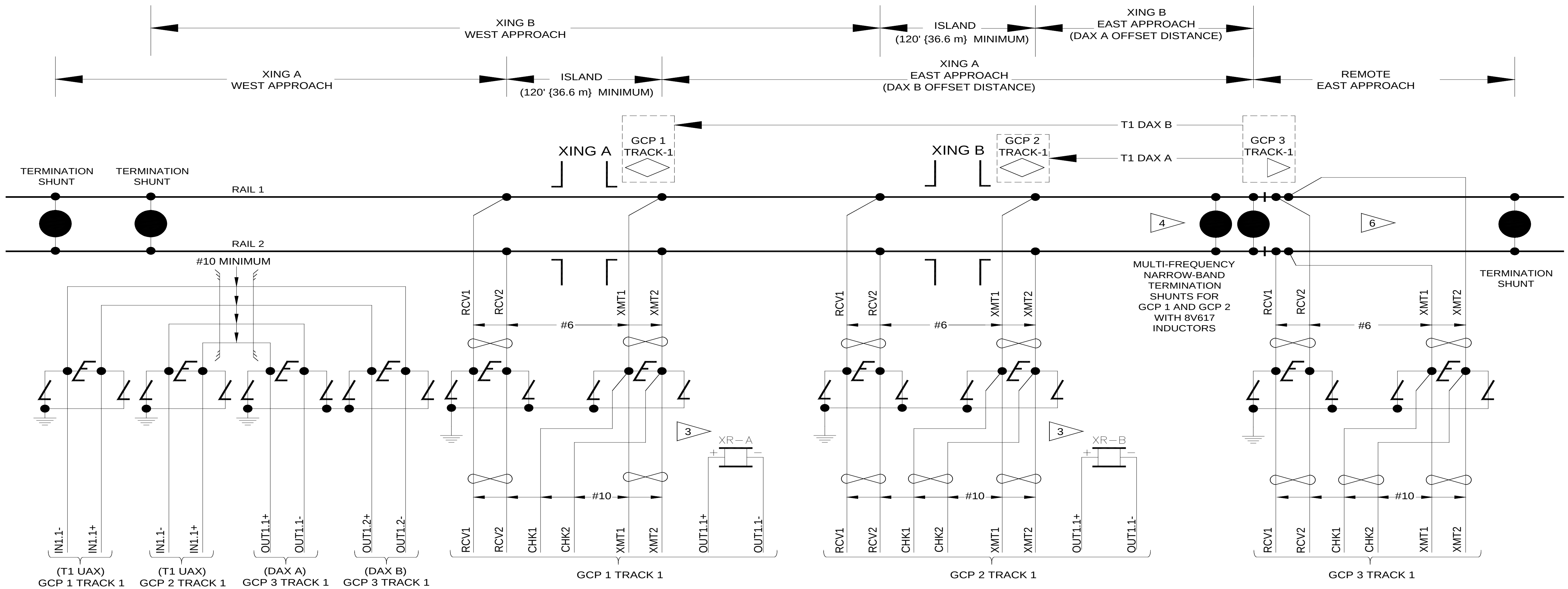
= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

= UNIDIRECTIONAL GCP

13-04_1TR_REM_PRDN_W_ADV_PREEPMTION
11-22-13

**Figure 2-40:
Single Track, Remote Prediction
with Advanced Preemption**

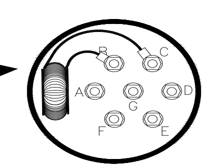


NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWARE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. A SEPARATE 62775 MULTI-FREQUENCY NARROW-BAND SHUNT MUST BE INSTALLED FOR EACH CROSSING FREQUENCY. AN 8V617 SIMULATED TRACK INDUCTOR MUST BE INSTALLED WITHIN THE NARROW-BAND SHUNT WHEN THE THE EAST APPROACH DISTANCE FOR THE CROSSING IS 90 PERCENT OR LESS OF CROSSING A WEST APPROACH DISTANCE.
5. WHEN THE MODEL 5000 GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.
6. MINIMUM APPROACH DISTANCE FOR REMOTE DAX IS 1000 FEET (304.8 METERS).

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP 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 2.15.7.



62775 MULTI-FREQUENCY NARROW-BAND SHUNT WITH 8V617 TRACK INDUCTOR INSTALLED (8V617 INSTALLATION SHOWN ONLY FOR ILLUSTRATIVE PURPOSES). REFER TO SECTION 7 OF THIS MANUAL.

LEGEND

- = TWIST TWO TURNS PER FOOT
- = 02270-1X EQUALIZER, H.D.
- = 02585-1X ARRESTER, H.D.
- = BIDIRECTIONAL GCP
- = UNIDIRECTIONAL GCP

13-04_1T_REM_PRDN_2OVERLAPPING_BIRDN_XINGS_APPL
11-22-13

Figure 2-41:
Typical Single Track, Remote Prediction for Two Overlapping Bidirectional Crossings Application

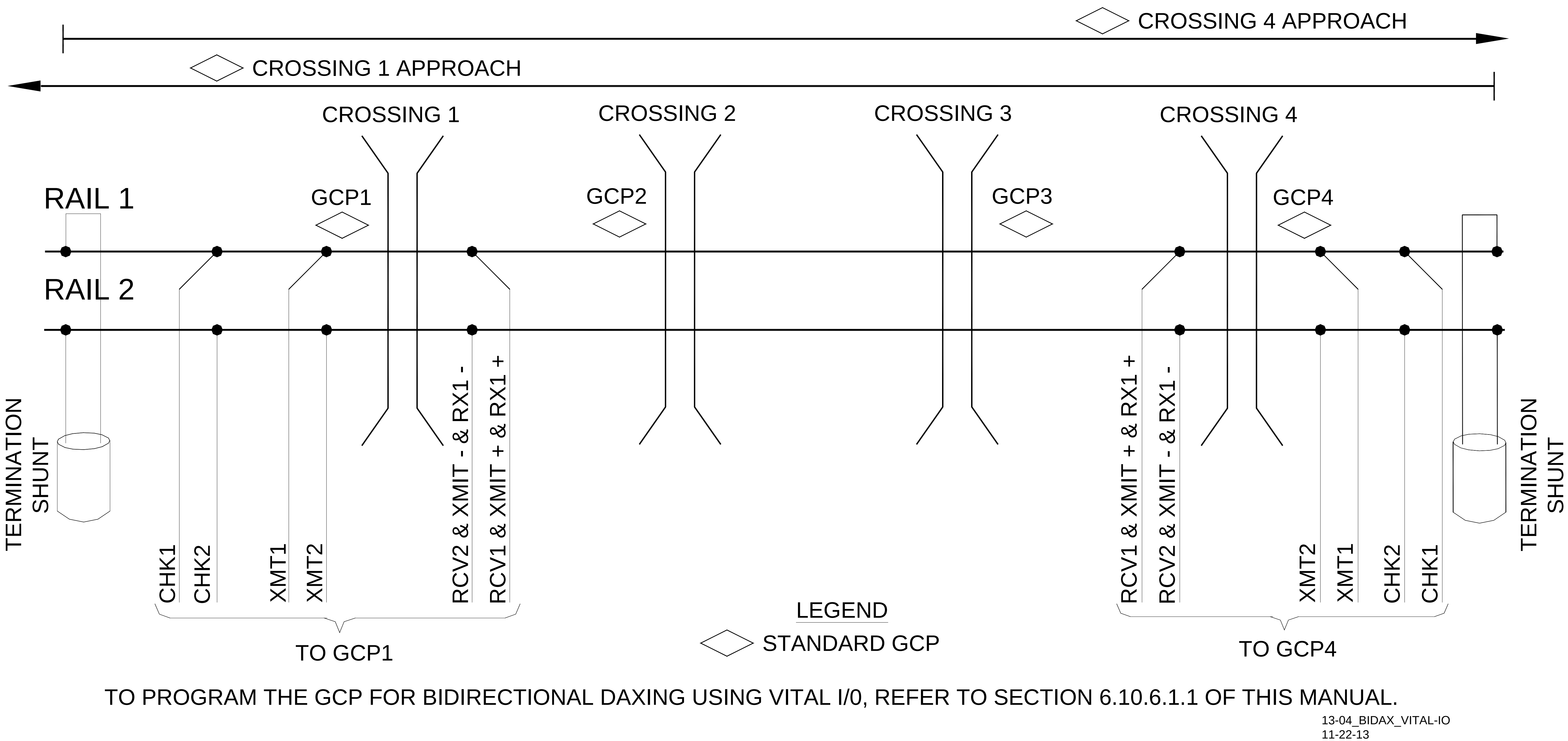
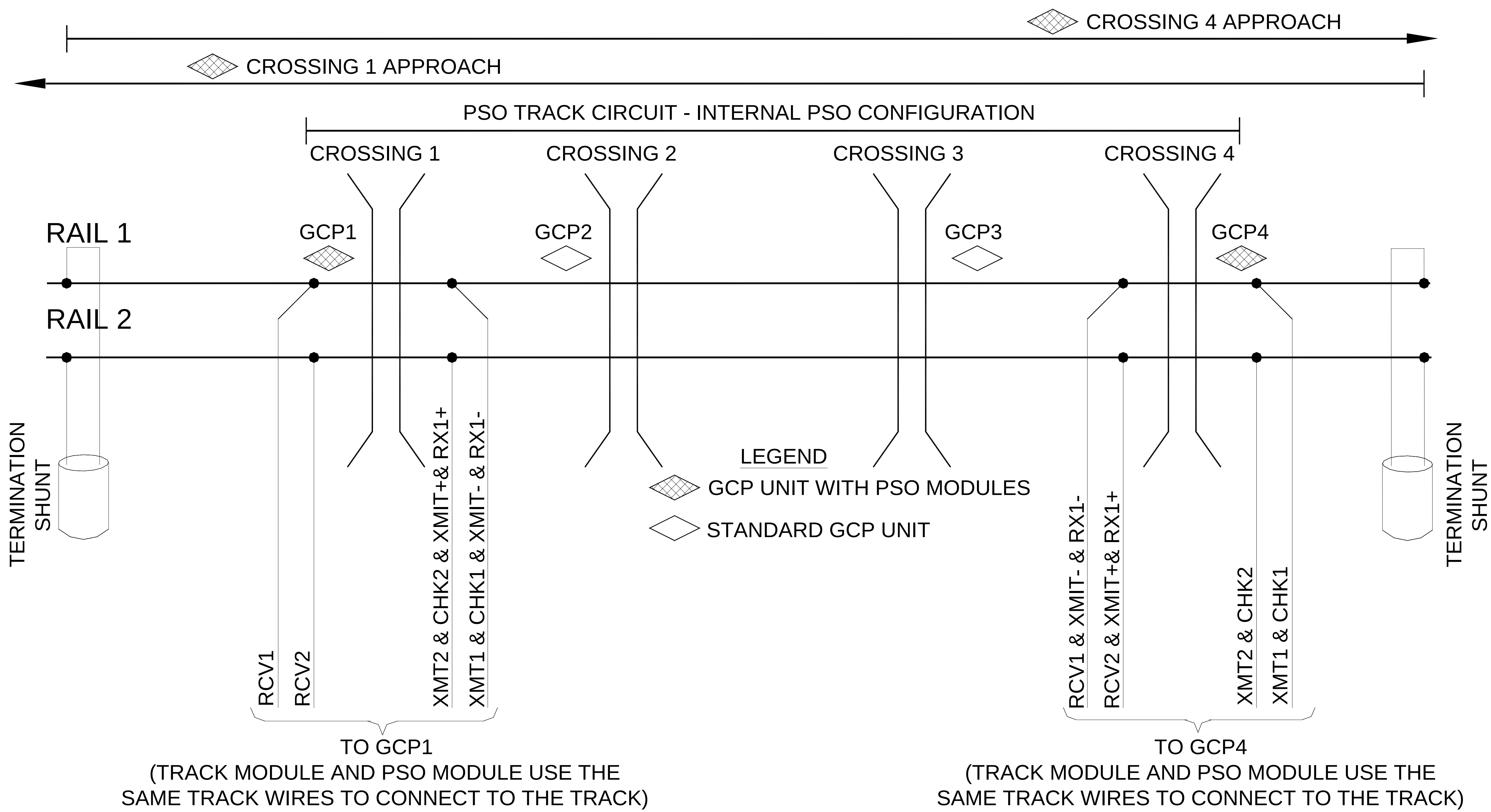


Figure 2-42:
Typical Single Track Vital IO Bidirectional DAX Application



TO PROGRAM THE GCP FOR BIDIRECTIONAL DAXING USING INTERNAL PSO, REFER TO SECTION 6.10.6.1.2 OF THIS MANUAL.

113-04_BIDAX_INTERNAL_PSO
11-22-13

Figure 2-43:
Typical Single Track, Internal PSO
BIDAX TX – BIDAX RX Four-Wire Application

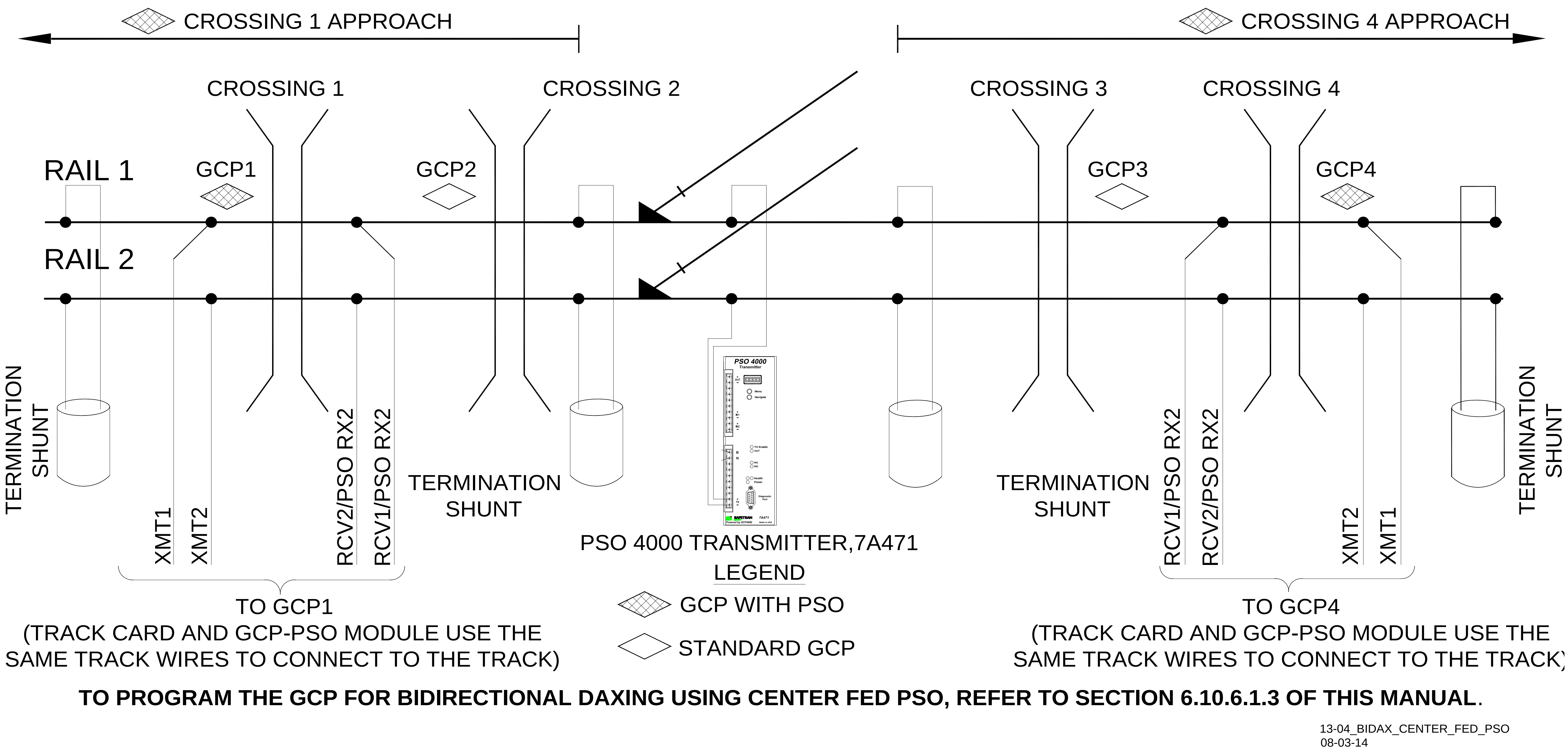


Figure 2-44:
Typical Single Track Center Fed
PSO Bidirectional DAX Application

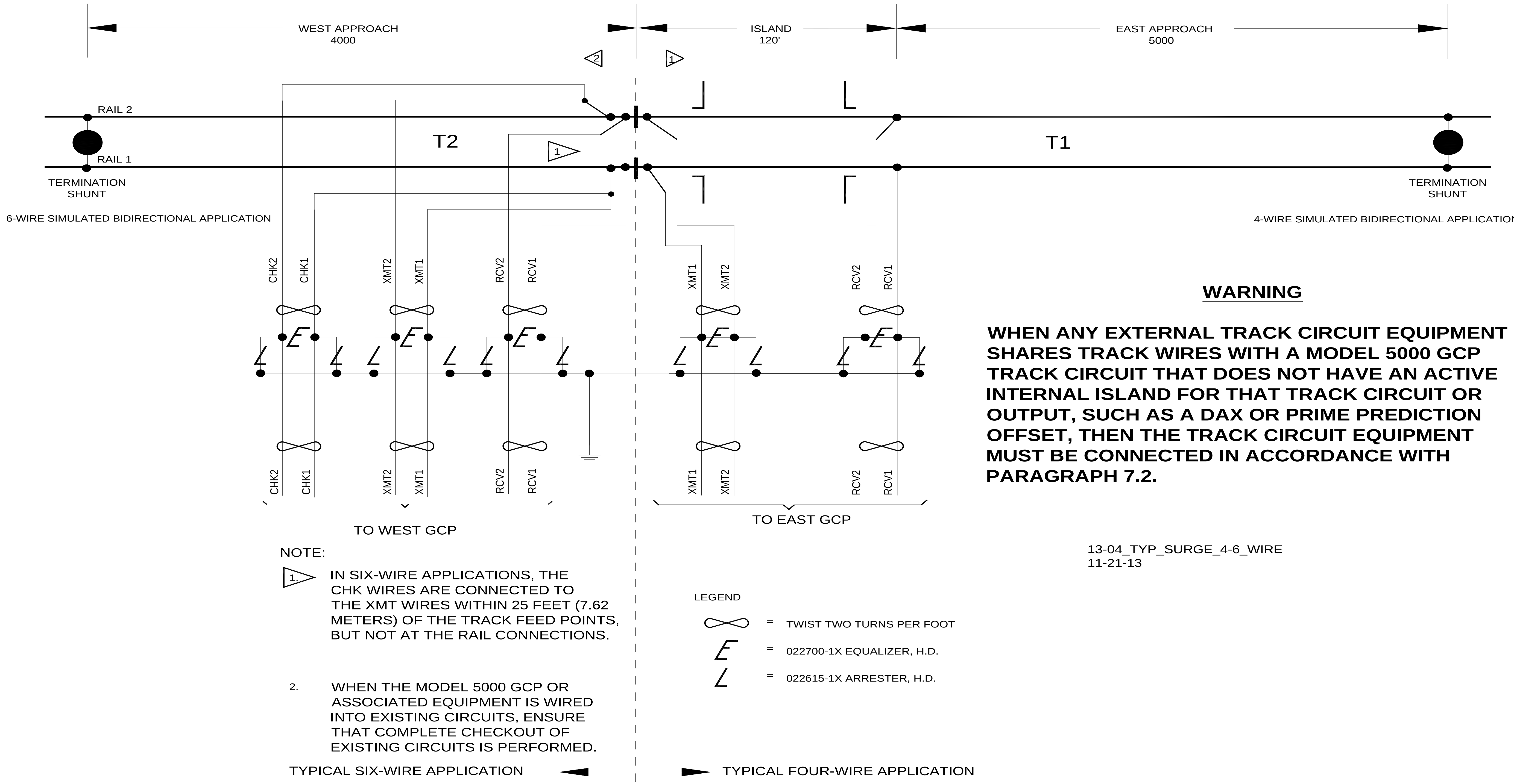


Figure 2-45:
Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections

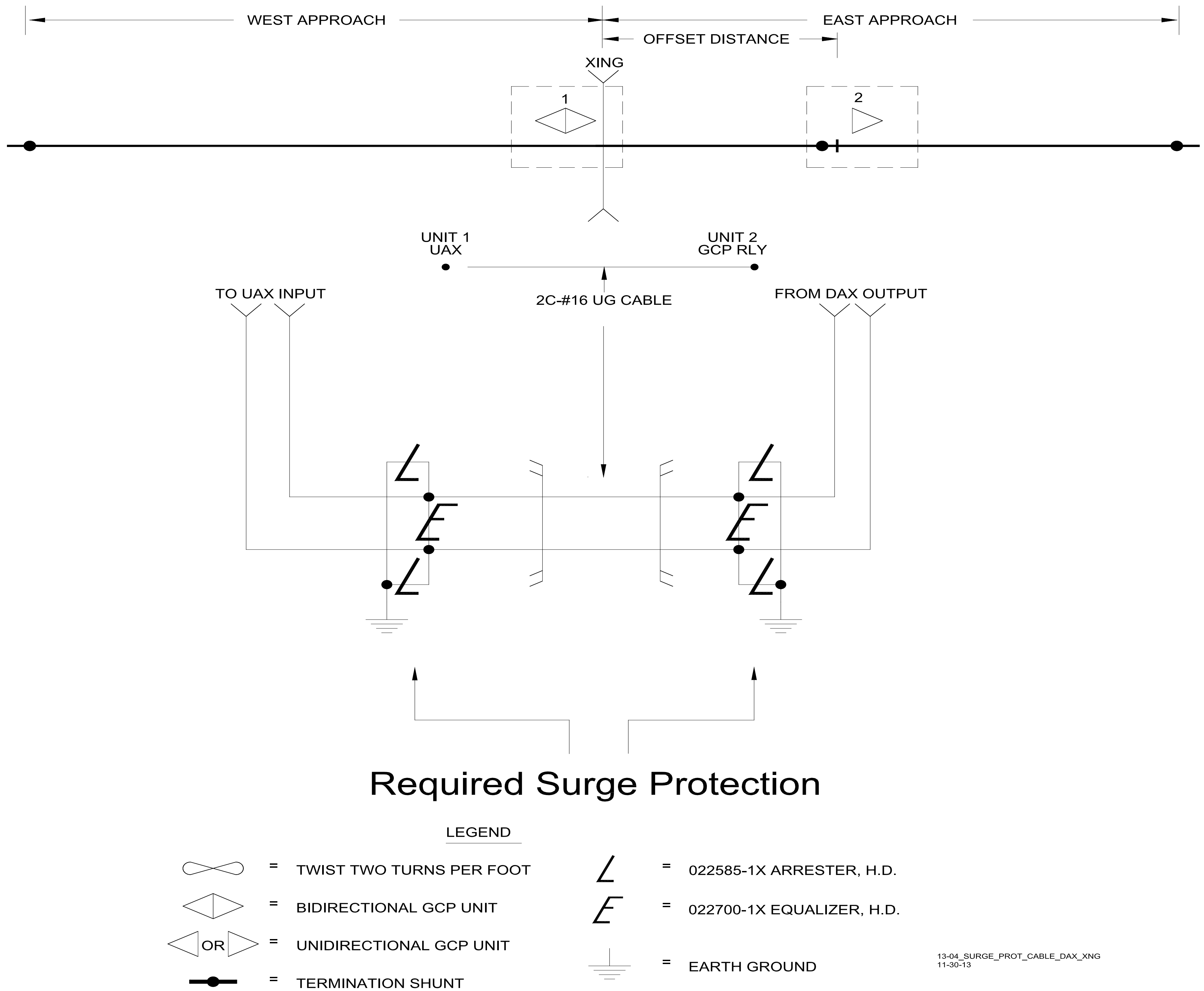


**Figure 2-46:
Typical Surge Protection Requirements When
Cabling Between Remote DAX Unit and Crossing Unit**

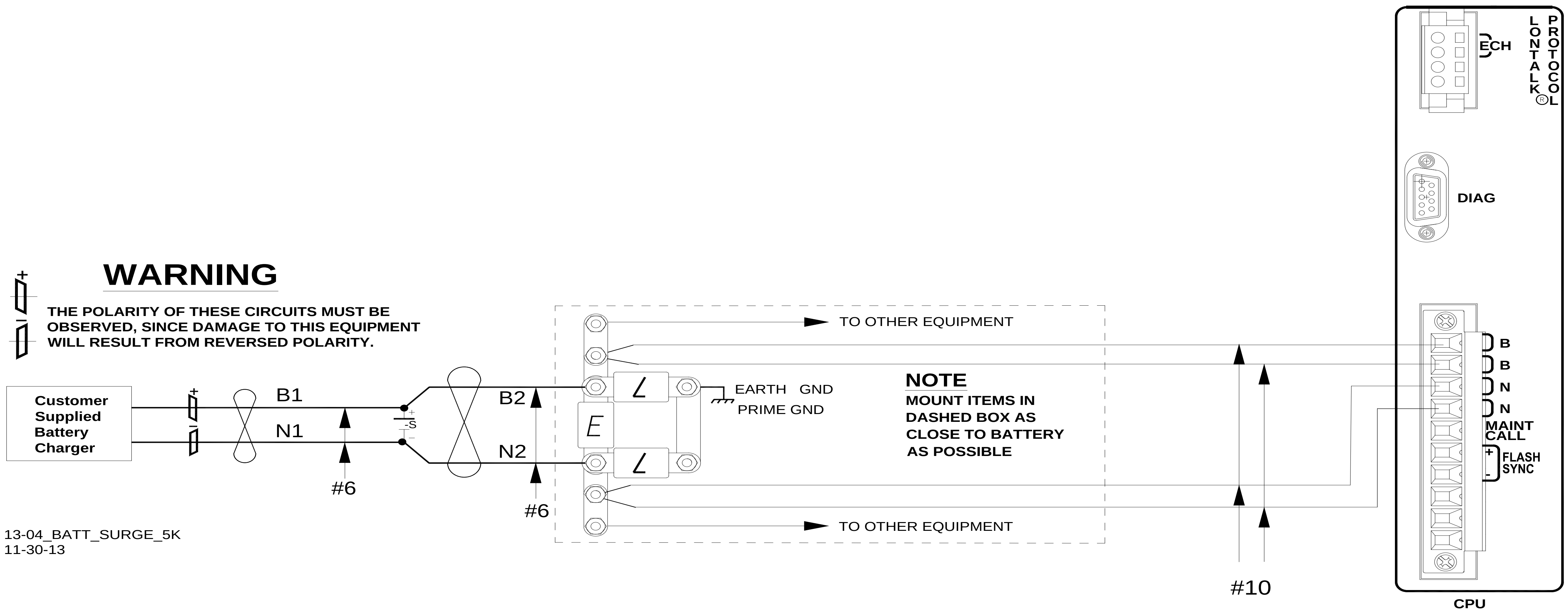


Figure 2-47:
Recommended Battery Surge
Protection Wiring for Model 5000 GCPs

SECTION 3 – DISPLAY MENU SCREENS AND OFFICE CONFIGURATION EDITOR

3.1 DISPLAY MODULE

The Display Module's programming interface (Display) is a Siemens developed Linux based software that is available on CD from Siemens Customer Service. The Display provides the user interface that allows:

- Model 5000 GCP configuration
  - Upload a configuration package (Pac) file to the CPU2+ from the Display's USB drive, or from the Web User Interface (Web U/I),
  - Download the configuration package (Pac) file from the CPU2+ and save it on the Display's USB drive or to the user's PC via the Web User Interface (Web U/I),.
- Software Installation, to include the following types of software:
  - Master Configuration File (MCF) to the CPU2+ card
  - Master Executive Files (MEF) to the various cards
  - Non-Vital Executive Files to the Display
  - SEAR software:
  - Executive Application – CDL (Control Description Language) files specific to individual railroads and agencies
- Generate, present, and copy the following reports:
  - Configuration (Config) Report
  - Version Report
  - Program Report
  - Minimum Program Report
  - Templates Report
  - SEAR Incident Reports
- Generate, present, and copy the following logs
  - Event Log
  - Display Log
  - Diagnostic Log
  - CPU-Card IO Logs
  - Maintenance Log
  - Train Log
  - SEAR Event Log
  - SEAR Application Log
  - SEAR CDL Log

3.2 MENU SCREENS PORTRAYED ON THE DISPLAY

The Display portrays five top level menu screens. They are navigated by using the left (◄) and right (►) arrows found on the front of the display:

- System View
- IO & Logic View
- Diags & Reports
- USB Menu (When USB Stick is inserted in slot on Display Module)
- Program View

3.2.1 System View Screen

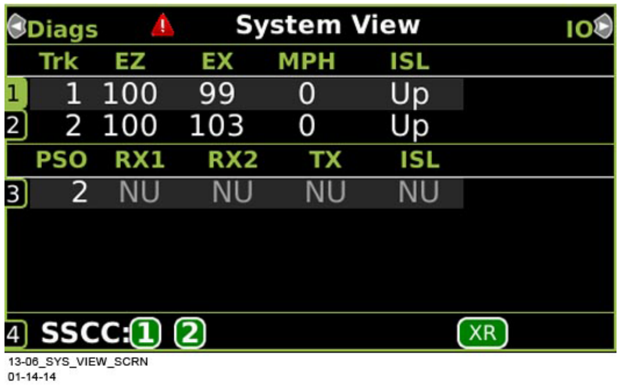


Figure 3-1:
The System View Screen

The System View screen provides information regarding the status of:

- Each active track in the Track Data section
- Each active PSO in the PSO Data section
- Each active SSCC module as well as the status of the XR Relay on the bottommost line of the screen (SSCC Data section)

3.2.1.1 <u>The Track Data Section</u>

The Track Data section provides the following indicators and information:

- Item number e.g., 1 – 6
- Occupancy status, depicted by a warning triangle with a locomotive in it
- Track status, as signified by the text appearing in the following colors:
  - Gray: The Track Module is healthy, and no train is in the approach
  - White: The Track Module is healthy, and a Train is in the approach
  - Red: The Track Module is unhealthy
  - Flashing blue: The GCP or the GCP/Island is out of service.
- EZ Value
- EX Value
- Train speed measure in MPH
- Island Status
- Additional Information
  - “W”= Wrap
  - “ed”= Enhanced Detection energized
  - “m”= Motion Sensor Restart energized
  - “OOS”= Out of Service

3.2.1.2 <u>The PSO Data Section</u>

The PSO Data section provides the following indicators and information:

- The line number e.g., 2-6
- The code received on RX1
- The code received on RX2
- The signal strength being transmitted
- The island data

3.2.1.3 The SSCC Data Section

The SSCC Data section provides the following indicators and information:

- The status of SSCC1
- The status of SSCC2
- The status of the XR Relay

3.2.2 IO & Logic View Screen

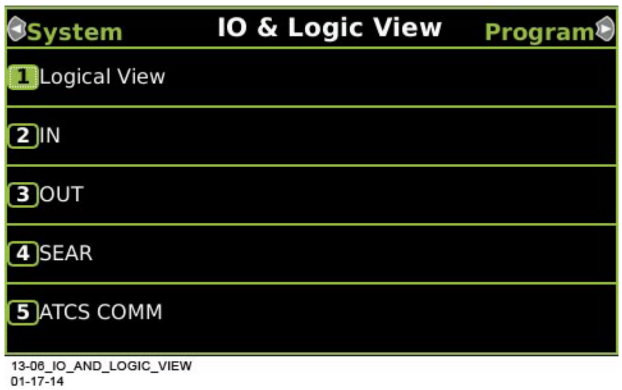


Figure 3-2:
The IO & Logic View Screen

The IO & Logic View screen provides users with the status of all IO and logic conditions set in the system. The IO & Logic View screen has the following submenus:

- Logical View
- IN
- OUT
- SEAR
- ATCS COMM

3.2.2.1 Logical View

The Logical View screen provides the status of all logic currently set in the system. There are four submenus

- AND:
- OR:
- Internal States
- System States

3.2.2.1.1 The Logic Details – AND Screen

The Logic Details – AND screen depicts the status of all ANDs and their Enables. Scrolling to the individual AND and selecting ENTER will open a screen depicting the ladder logic of that AND.

3.2.2.1.2 The Logic Details – OR Screen

The Logic Details – OR screen depicts the status of the four ORs (OR 1 – OR 4). Scrolling to the individual OR and selecting ENTER will open a screen depicting the ladder logic of that OR.

3.2.2.1.3 The Internal States Screen

The Internal States screen depicts the status of all internal logic currently set in the system. It provides a list by Internal Logic number (1 – 16) stating Int.X:(Set by Parameter) Sets (Parameter set by logic action) e.g., Int1:T3 Prime Sets T2 AND Enable.

3.2.2.1.4 The System States Screen

The System States Screen depicts the status of all system level states. Generally, this is Maintenance Call (MC) and/or Out of Service (OOS). Scrolling to the individual entry and selecting ENTER will open a screen depicting the ladder logic of that entry.

3.2.2.2 The IN Details Screen

The IN Details screen depicts all inputs with their assigned parameter.

3.2.2.3 The OUT Details Screen

The OUT Details screen depicts all outputs with their assigned parameter.

3.2.2.4 The SEAR I/O Screen

The SEAR I/O screen details the status of the SEAR I/O. The Inputs and Outputs are listed by Channel, Name, and State/Value, and are divided as follows:

- SEAR I/O Digital Input 1 – 16
- SEAR I/O Digital Input 17 – 32
- SEAR I/O Digital Input 33 – 48
- SEAR I/O Digital Input 49 – 63
- SEAR I/O Analog Input monitors the following analog inputs
    - Case Battery Monitor
    - SSCC 1 Battery Monitor
    - SSCC 2 Battery Monitor
    - Internal Temperature
    - External Temperature
    - External Battery Monitor
- SEAR I/O Digital Output monitors the following digital outputs
    - Aux. Outputs 1 – 6
    - Relay Outputs 1 & 2
- SEAR I/O LEDs, Channels 1 – 16
- SEAR I/O MTSS
- SEAR I/O GFT
- SEAR I/O SEAR Module Status

For further information concerning the SEAR and SEAR I/O, see page 9 of Siemens' GCP 5000 GCP Field Manual, SIG-00-13-03.

3.2.2.5 The GCP ATCS COMM Screen

The GCP ATCS COMM screen shows the ATCS Communication status of all items set for monitoring by the GCP and SEAR.

3.2.3 The Program View Screen

Figure 3-3:
The Program View Screen

The Program View screen is where all parameters required for GCP operation per the approved site diagram are set. The OCCN, CCN, and FCN numbers are displayed on Line 1, SITE Setup. The screen has the following submenus:

- SITE Setup
- SEAR Programming
- GCP Programming

3.2.3.1 <u>The SITE Programming Screen</u>

The SITE Programming screen sets all the parameters required for the GCP to communicate with other locations, the Display hibernation/buzzer settings, and enables the system to be Set to Default. The screen depicts the following submenus:

- Site Configuration
- Serial Port
- Ethernet Ports
- Router Settings
- Log Setup
- Security
- Display Options
- Set to Defaults
- Site Configuration

3.2.3.1.1 The Site Configuration Screen

The Site Configuration screen is used to set the values of the following parameters:

- Site Name
- DOT Number
- Mile Post
- Time Zone
- ATCS – Railroad
- ATCS – Line
- ATCS – Group
- ATCS – Display Subnode
- ATCS – CPU2+ Subnode

- ATCS – SEAR Subnode
- SEAR Temp. Format
- SEAR Date Format
- Units of Measure
- Date
- Time

3.2.3.1.2 The Serial Port Screen

The Serial Port screen is used to set the values of the following parameters for Serial Port 1:

- Baud Rate
- Data Bits
- Parity
- Stop Bits
- Flow Ctrl
- Path Type
- Protocol

3.2.3.1.3 The Ethernet Ports Screen

The Ethernet Ports screen is used to set the values of the following submenus:

- DNS Configuration, which sets the IP address of Servers 1 – 3
- Laptop Eth Port, which has two screens, Configure and Status
    - Configure determines whether the system is configured as Disabled, as a Client, or as a DNS Server.
    - Status provides Ethernet Connection data regarding IP address, Subnet Mask, BCast Address, and MAC Address for the Laptop Port, Ethernet 1 and Ethernet 2
- Ethernet Port 1, which sets values for the Ethernet Port 1 parameters DHCP Configuration (either Disabled or Client), IP Address, Network Mask, Default Gateway, Path Type and Protocol
- Ethernet Port 2, which sets values for the Ethernet Port 1 parameters DHCP Configuration (either Disabled or Client), IP Address, Network Mask, Default Gateway, Path Type and Protocol

3.2.3.1.4 The Router Settings Screen

The Router Settings screen enables the user to set the parameter Route Table Entry Timeout, measured in milliseconds

3.2.3.1.5 The Log Setup Screen

The Log Setup screen has the following submenus

- Consolidated Logging, which sets the Event and Diagnostic Log IP Addresses
- Diagnostic Options, which opens setting the following parameters of the Diagnostic Log:
    - Message Processing (Layer 7)
    - Routing (Layer 3)
    - Serial Port 1 TX/RX (Layer 2)
    - EZ/EX Logging
    - EZ/EX Point Change
    - EZ/EX Logging Internal

  - EZ/EX Recording
- Logging Verbosity, which sets the following parameters for Log Verbosity:
  - Display Diagnostic Log Verbosity
  - CP Log Verbosity
  - VLP Log Verbosity
  - Slot 2 Log Verbosity
  - Slot 3 Log Verbosity
  - Slot 4 Log Verbosity
  - Slot 5 Log Verbosity
  - Slot 6 Log Verbosity
  - Slot 7 Log Verbosity
  - SSCC3i-1 Log Verbosity
  - SSCC3i-2 Log Verbosity
- Track Monitor Options, which sets the following parameters for Track Monitoring:
  - Track 1
  - Track 2
  - Track 3
  - Track 4
  - Track 5
  - Track 6
  - Pre-Trigger Samples
  - Post-Trigger Samples
  - Max Storage (Mbytes)

3.2.3.1.6 The Security Screen

The Security Screen enables the use of the Maintainer Only, Supervisor Only, or Maintenance or Supervisor passwords. The Session Inactivity Timeout parameter may also be set here.

3.2.3.1.7 The Display Options Screen

The Display Options screen enables the user set the Display Hibernation Time and Display Buzzer Enable parameters

3.2.3.1.8 The Set to Defaults Screen

When the Set to Defaults screen is selected the user sees the following message: **GCP DISPLAY Site Setup Restore Defaults? Press Enter to Confirm and Continue OR Press Back to Cancel Request**. Selecting ENTER will initiate the Set to Defaults process, selecting BACK will exit the option.

3.2.3.2 The SEAR Programming S

Refer to page 9 of Siemens' Model 5000 Grade Crossing Predictor Field Manual, SIG 00-13-03 for information regarding programming the SEAR IIi Module.

3.2.3.3 The GCP Programming Screen

Refer to Section 3.3 GCP Programming for information regarding Model 5000 GCP programming and to Section 0 for the GCP programming menu default settings.

3.2.4 Diags & Reports Screen

Figure 3-4:
The Diags & Reports Screen

The Diags and Reports screen depicts the following submenus:

- DIAG
- SEAR
- Reports & Logs
- Statistics

3.2.4.1 The DIAG Screen

The DIAG Screen depicts all current Diagnostic Messages one after another or reports “No Diag Msgs present!”

3.2.4.2 The SEAR Screen

The SEAR Maint screen depicts the following parameters:

- The Maint On Site screen, which has the following parameters:
    - CDL Engine
    - MOS Mode Currently:
    - Time Remaining
    - Time Duration
    - Reset Time
    - Enable MOS
- The CDL Messages screen, which depicts all current CDL Messages one after another or reports “No CDL Messages found!”
- The WAMS Test Message Screen depicts the status of the WAMS Test Message. The function executes automatically when the screen is opened.
- The Clear Alarms screen enables the user to clear alarms from the system. The function executes automatically when the screen is opened.
- The SEAR Reset screen enables the user to reset the SEAR. The function executes automatically when the screen is opened.

3.2.4.3 The Reports & Logs Screen

Refer to page 116 of Siemens’ Model 5000 Grade Crossing Predictor Field Manual, SIG-00-13-03 for further information on Reports and Logs.

3.2.4.4 The Statistics Screen

The GCP Statistics screen tracks statistics on the following items:

- Card Statistics
- Vital ATCS Statistics
- Non-Vital ATCS Statistics
- Time_Statistics
- SIO Statistics
- Console Statistics
- LAN Statistics
- VLP Statistics

3.2.4.4.1 The Card Statistics Screen

The Card Statistics screen provides statistics regarding the following:

- Card Number
- Bad CRC's
- Lost Sessions
- Reboots

3.2.4.4.2 The Vital ATCS Statistics Screen

The Vital ATCS Statistics screen provides statistics regarding the following:

- Out of order ATCS messages
- Stale messages
- Lost sessions
- Vital messages TX
- Vital messages RX

3.2.4.4.3 The Non-Vital ATCS Statistics Screen

The Non-Vital ATCS Statistics screen provides statistics regarding the following:

- Out of order ATCS messages
- Lost sessions
- Indication messages transmitted
- Recall messages received
- Control messages received

3.2.4.4.4 The Time_Statistics Screen

The Time_Statistics screen provides the following information for seven (7) time periods:

- Time
- Min
- Max
- Mean

3.2.4.4.5 The SIO Statistics Screen

The SIO Statistics screen provides statistics regarding the following:

- Bad SIO packet count

- SIO TX packet count
- SIO RX packet count
- SPI TX Q full count
- SPI RX Q full count

3.2.4.4.6 The Console Statistics Screen

The Console Statistics screen provides statistics regarding the following:

- Invalid packets received
- Valid packets received
- Packets transmitted

3.2.4.4.7 The LAN Statistics Screen

The LAN Statistics screen provides statistics regarding the following:

- Invalid LAN packets
- Valid LAN RX packets
- Valid LAN TX packets

3.2.4.4.8 The VLP Statistics Screen

The VLP Statistics screen provides information regarding the number of reboots.

3.2.5 USB Menu Screen

Refer to page 103 of Siemens' Model 5000 Grade Crossing Predictor Field Manual, SIG-00-13-03 for further information on the USB Menu Screen.

3.3 GCP PROGRAMMING USING THE MAIN PROGRAM MENUS

NOTE

> **NOTE**
>
> This section lists the various screens that make up the **Main Program Menu** (this menu selection appears under the path "**Program View > 3) GCP Programming**" on the top row of the Display.

The **Main Program Menu** screen provides access to the following configuration menu windows:

- 1) Basic Configuration
- 2) GCP and Island Programming
- 3) Logic Programming
- 4) Advanced Programming
- 5) SSCC Programming
- 6) Input/Output Assignments

NOTE

> **NOTE**
>
> Whenever an plus sign (+) precedes a parameter name (such as the +Preempt Logic), this signifies that by changing the default value to one of the other choices, additional values open on the screen or other screens become activated further down the menu tree.

3.3.1 1) BASIC Configuration Menus

Selecting **1) Basic Configuration** provides access to the following configuration menu windows:

- 1) Set Template
- 2) Module Selection
- 3) Preemption
- 4) MS/Restart
- 5) Vital Comms Links
- 6) Out of Service
- Set to Default

3.3.1.1 1) Set Template

The **Set Template** screen allows the user to select the appropriate programming template for the planned application. See Section 4 for a discussion regarding the available templates. The parameters set on the **Set Template** screen are as follows:

- Template
- Chassis Type*

* The Chassis Type is not selectable by Field Service personnel. This parameter may only be set by the application planner.

3.3.1.2 2) Module Selection

The **Module Selection** screen displays which modules are used in each slot in the case. The options are as follows:

- Track 1/PSO 1 Slot
- Track 2/RIO 1 Slot
- Track 3/PSO 2 Slot
- Track 4/PSO 3 Slot
- Track 5/RIO 2 Slot
- Track 6/RIO 3 Slot
- SSCC-1 Slot
- SSCC-2 Slot
- SEAR Used

3.3.1.3 3) Preemption

The **Preemption** screen controls whether or not Advanced or Simultaneous Preemption is enabled.

- When +Preempt Logic is set to **No**:
  - No additional parameters are revealed.
- When +Preempt Logic is set to **Advnce**, the following parameters are revealed:
  - +Preempt Logic
  - Adv Preempt Delay
  - Preempt Hlth IP Used
  - Adv Preempt IP Used
  - Traffic Sys Hlth IP Used
  - Gate Down Logic Used

  - Second Trn Logic Used+
- When +Preempt Logic is set to **Simult**, the following parameters are revealed:
  - +Preempt Logic
  - Preempt Hlth IP Used

3.3.1.4 4) MS/Restart

The **MS/Restart** screen 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.

- When +MS/GCP Restart Used is set to **No**:
  - No additional parameters are revealed.
- When +MS/GCP Restart Used is set to **Yes**, the following parameters are revealed:
  - MS/GCP Restart all Trks
  - +MS/GCP Timer Used
  - MS/GCP Restart Time

3.3.1.5 5) Vital Comms Links

The **Vital Comms Link** screen controls whether or not Vital Communication Links is/are enabled.

- When Vital Comms Link 1-4 Used are all set to **No**:
  - No additional screens are enabled.
- When any of the Vital Comms Links (1-4) Used is set to **Yes**, a **Vital Comms Link “N”** (abbreviated as **VCom “N”**)screen is enabled for each link set to **Yes.** The following parameters appear on each screen:
  - RRR Offset
  - LLL Offset
  - GGG Offset
  - SS Offset
  - Msg Timeout
  - Msg Update Interval
  - Max Time Offset
  - Remote SIN

For additional information regarding Vital Comms Links, refer to Sections 5 & 6 of this manual.

3.3.1.6 6) Out of Service

The **Out of Service** screen 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 screen displays the following parameters:

- **+OOS Control** – The default setting is **Display**. The following options enable the listed features:
  - When set to **Display+OOS IPs**, **1) Out of Service Ctrl 1** is enabled.

  - When set to **OOS IPs**, **+OOS Timeout** and **OOS Timeout** are hidden, and **1) Out of Service Ctrl 1** and **1) Out of Service Ctrl 2** are enabled
  - When set to **4000 Case OOS IP**, **+OOS Timeout** and **OOS Timeout** are hidden and **1) Out of Service Ctrl 1** and **1) Out of Service Ctrl 2** remain disabled
- +OOS Timeout
- OOS Timeout
- 1) Out of Service Ctrl 1 (Default setting is disabled)
- 2) Out of Service Ctrl 2 (Default setting is disabled)

When either **Display+OOS IPs** or **OOS IPs** values are selected, the **Out of Service Ctrl "N"** screen is enabled

- The **Out of Service Ctrl "N"** screen displays the following parameters for each enabled track:
  - T"N" OOS Control

For more information regarding OOS, see Section 5 of this manual.

3.3.1.7 <u>7) Set to Default</u>

The **Set to Default** screen enables users to return the system to the system default settings.

- The **Set to Default** screen displays the following parameter:
  - 1) Set to Defaults

For more information regarding Set to Default, see Section 5.

3.3.2 2) GCP and Island Programming

The **2) GCP and Island Programming** menus control all track related parameters. The first sub-menu is a listing of each enabled track. Under each individual track's menu are the following sub-menus:

- 1) GCP Frequency
- 2) Island Frequency
- 3) Predictors
- 4) Enhanced Detection
- 5) Positive Start
- 6) MS Control
- 7) Wraps and Override
- 8) GCP Miscellaneous

3.3.2.1 <u>1) GCP Frequency</u>

The **Trk "N": GCP Frequency** screen sets the corresponding track circuit configuration parameters. A **Trk "N": GCP Frequency** screen appears for each assigned Track Module. Use the left and right arrow buttons to move between the screens for each track.

- The **Trk "N": GCP Frequency** screen displays the following parameters:
  - +MS/GCP Operation - When set to **No**, the parameters below are hidden
  - GCP Freq Category
  - GCP Frequency
  - GCP Transmit Level
  - Uni/Bi/Sim-Bidirnl
  - Approach Distance

- Directionally Wired
- Island Connection
- Island Distance

For further information regarding island frequencies, refer to Sections 2, 5, and 6 of this manual.

3.3.2.2 2) Island Frequency

The **Trk "N": Island Frequency** screen sets the corresponding island configuration parameters. A **Trk "N": Island Frequency** screen appears for each assigned Track Module. Use the left and right arrow buttons to move between the screens for each Island.

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).

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**.

- The **Trk "N": Island Frequency** screen displays the following parameters
  - +Island Used – The screen displays according to the value selected

If set to **No**, all parameters listed below are hidden
If set to **External**, all parameters are hidden and **Isl "N" Enable Pickup Delay** is enabled
If set to **Internal**, the default parameters below are enabled

  - Isl Frequency
  - Pickup Delay (2s +)
  - +Isl Enable IP Used – If set to **Yes**, the parameter **Isl "N" Enable Pickup Delay** is enabled

For further information regarding island frequencies, refer to Sections 2, 5, and 6 of this manual.

3.3.2.3 3) Predictors

The **Trk "N": Predictors** screen sets which predictors are used. A **Trk "N": Predictors** screen appears for each assigned Track Module. The **Preempt Used** parameter is present only when the **+Preempt Logic** selection field is set to **Advnce**. Use the left and right arrow buttons at top of the window to move between the **Trk "N": Predictors** screens.

- The **Trk "N": Predictors** screen displays the following parameters:
  - 1) Prime Used
  - 2) Preempt Used – If Advanced Preemption (value=**Advanced**) was selected on the **Trk "N": Predictors** parameter +Preempt Logic [1) BASIC CONFIGURATION > 3) PREEMPTION > +PREEMPT LOGIC]
  - 3) Dax A Used
  - 4) Dax B Used
  - 5) Dax C Used
  - 6) Dax D Used
  - 7) Dax E Used
  - 8) Dax F Used
  - 9) Dax G Used

3.3.2.3.1 Trk "N" Predictor: Prime

When Prime Prediction is enabled (Prime Used=**Yes**) on the **Trk "N" Predictors** screen, the **Trk "N" Predictors: Prime** screen is enabled.

The window display is determined by the **Prime MS/GCP Mode** selection parameter. **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 parameter set to **Pred.**

- The **Trk "N" Predictors: Prime** screen displays the following parameters
  - Prime Warning Time
  - +Prime Offset Distance – When set to a non-zero number (>0), the parameter **Pickup Delay Mode** appears below the parameter **Switch MS EZ Level**
  - Switch MS EZ Level
  - +Prime MS/GCP Mode – When set to **MS**, the following parameters are displayed
  - +Prime Offset Distance – When set to a non-zero number (>0), the parameter **Pickup Delay Mode** appears below the parameter **Switch MS EZ Level**
  - +Prime MS/GCP Mode
  - Prime Pickup Delay
  - +Prime UAX – When set to **Yes**, the parameter **Prime UAX Pickup** is enabled
  - Prime Pickup Delay
  - +Prime UAX – When set to **Yes**, the following parameter appears:
  - Prime UAX Pickup
  - Prime Track Side – enabled only when parameter Directionally Wired is set to **Yes** on the **GCP Frequency** screen, and both the +BIDAX to RX Appr and the +BIDAX to TX Appr parameters are set to **Internal PSO** on the **Bidirectional Daxing** screens.

3.3.2.3.2 Trk "N" Predictor: Preempt

When Preemption is enabled (Preempt Used=**Yes**) on the **Trk "N" Predictors** screen, the **Trk "N" Predictors: Preempt** screen is enabled.

- The **Trk "N" Predictors: Prmpt** screen displays the following parameters
  - Prmpt Warning Time
  - +Prmpt Offset Distance – When set to a non-zero number (>0), the parameter **Pickup Delay Mode** appears below the parameter **Switch MS EZ Level**
  - Switch MS EZ Level
  - +Prmpt MS/GCP Mode – When set to **MS**, the following parameters are displayed
  - +Prmpt Offset Distance – When set to a non-zero number (>0), the parameter **Pickup Delay Mode** appears below the parameter **Switch MS EZ Level**
  - +Prmpt MS/GCP Mode
  - Prmpt Pickup Delay
  - +Prmpt Enable – When set to **Yes**, the parameter **Prmpt Enable Pickup** is enabled
  - Prmpt Pickup Delay
  - +Prmpt Enable – When set to **Yes**, the following parameter appears:
  - Prmpt Enable Pickup
  - Prmpt Track Side – enabled only when parameter Directionally Wired is set to **Yes** on the **GCP Frequency** screen, and both the +BIDAX to RX Appr and the +BIDAX to TX Appr parameters are set to **Internal PSO** on the **Bidirectional Daxing** screens.

3.3.2.3.3 Trk “N” Predictor: Dax A – G

When Dax A – G is enabled (Dax A – G Used=**Yes**) on the **Trk “N” Predictors** screen, the **Trk “N” Predictors: Dax A – G** screen is/are enabled.

Prime/Dax A...G/Preempt Pickup Delay Mode 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.

- The **Trk “N” Predictors: Dax A - G** screen displays the following parameters
  - Dax A – G Warning Time
  - +Dax A – G Offset Distance – When set to a non-zero number (>0), the parameter **Pickup Delay Mode** appears below the parameter **Switch MS EZ Level**
  - Switch MS EZ Level
  - +Dax A – G MS/GCP Mode – When set to **MS**, the following parameters are displayed
  - +Dax A – G Offset Distance – When set to a non-zero number (>0), the parameter **Pickup Delay Mode** appears below the parameter **Switch MS EZ Level**
  - +Dax A – G MS/GCP Mode
  - Dax A – G Pickup Delay
  - +Dax A – G Enable – When set to **Yes**, the parameter **Dax A - G Enable Pickup** is enabled
  - Dax A – G Pickup Delay
  - +Dax A – G Enable – When set to **Yes**, the following parameter appears:
  - Dax A – G Enable Pickup
  - Dax A – G Track Side – enabled only when parameter Directionally Wired is set to **Yes** on the **GCP Frequency** screen, and both the +BIDAX to RX Appr and the +BIDAX to TX Appr parameters are set to **Internal PSO** on the respective **Bidirectional Daxing** screens.

For further information regarding prediction, refer to Sections 5 & 6 of this manual.

3.3.2.4 4) Enhanced Detection

The **Trk “N”: Enhanced Detection** screen sets the corresponding track circuit enhanced detection parameters. A **Trk “N”: Enhanced Detection** screen appears for each assigned Track Module. Use the left and right arrow buttons at top of the window to move between the **Trk “N”: Enhanced Detection** screens.

Post Joint Detn Time: In Model 4000 and Model 3000 GCPs, 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 **1) +Adv Appr Predictn** selection parameter. The default configuration displays with this parameter set to **No.** The alternate configuration displays when this parameter is set to **Yes**.

- The **Trk 1: Enhanced Detection** screen displays the following parameters:
  - Inbound PS Sensitivity
  - Speed Limiting Used
  - Outbound False Act Lvl
  - Outbound PS Timer
  - Trailing Switch Logic

- Post Joint Detn Time
- Cancel Pickup Delay
- 1) +Adv Appr Predictn – The link is disabled (text in grey letters) when set to **No**. When set to **Yes**, the screen's appearance changes, as noted above. Speed Limiting Used is hidden when +Adv Appr Predictn is set to **Yes**, and the. Additionally, the link is enabled (text in green letters) when set to **Yes**.

3.3.2.4.1 Trk 1: Adv Appr Prediction

The **Trk 1: Adv Appr Prediction** screen controls the parameters that control Advanced Approach Prediction when **Adv Appr Predn** is set to **Yes.** This feature improves the GCP's 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 affected by inbound train movement. Options are **This Isl** or **Any Isl**. Default is **This Isl**.

- The **Trk 1: Adv Appr Prediction** screen displays the following parameters:
  - Adv Appr Predn Time
  - Adv Appr Predn Strt EZ
  - Adv Appr Predn Stop EZ

For further information regarding Enhanced Detection, refer to Section 6 of this manual.

3.3.2.5 5) Positive Start

The **Trk "N"" Positive Start, Low EZ** screen sets the corresponding track circuit positive start and low EZ parameters.

- The **Trk "N"" Positive Start, Low EZ** screen has the following parameters:
  - 1) Positive Start
  - 2) Sudden Shnt Det Used
  - 3) Low EZ Detection Used

3.3.2.5.1 Trk"N": Positive Start

When Positive Start is set to On, the **Trk "N": Positive** Start screen is enabled. The key parameter is **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 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.

- The **Trk "N": Positive Start** screen shows the following parameters:
  - Positive Start Level
  - Positive Start Offset
  - Sudden Shnt Det Level
  - Sudden Shnt Det Offset

3.3.2.5.2 Trk “N”: Low EZ Detection

When 3) Low EZ Detection Used is set to **Yes**, the **Trk 1: Low EZ Detection** screen is enabled. It shows more track configuration options.

- The **Trk “N”: Low EZ Detection** screen displays the following parameters:
  - Low EZ Detection Level
  - Low EZ Detection Time
  - Low EZ Detection Effect (Activate, MS, Act+MS, Default **Activate**)
  - Low EZ Detection Override IP (when used inputs called T”N” Low EZ Override can be assigned to inputs).

For further information regarding Positive Start, Sudden Shunt Detection, and Low EZ, please refer to Section 6 of this manual.

3.3.2.6 6) Trk “N”: MS Control

The **Trk “N”: MS Control** screen 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.

- The **Trk “N”: MS Control** screen displays the following parameters:
  - MS/GCP Ctrl IP Used
  - MS Sensitivity Level
  - MS/GCP Restart EZ Level
  - 1) Dax C...G Switch to MS

3.3.2.7 7) Wraps and Overrides

The **Trk “N”: Wraps and Overrides** screen sets which track wrap inputs are used and sets the predictor override status of each predictor or all predictors as a group.

- The **Trk “N”: Wraps and Overrides** screen displays the following parameters
  - +Wrap Used – When set to **No**, no additional parameters are enabled. When set to **Yes**, the following parameter is visible:
  - Wrap LOS Timer
  - +All Predictors Override Used –Setting this parameter to **Yes** hides the remaining parameters. When set to **No**, any enabled predictor’s override is displayed.
  - Dax A – G Override Used

For further information regarding Wraps and Overrides, please refer to Section 6 of this manual.

3.3.2.8 8) GCP Miscellaneous

The **Trk “N”: GCP Miscellaneous** screen places a variety of parameters in one location.

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.

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.

- The **Trk "N": GCP Miscellaneous** screen displays the following parameters:
  - Low EX Adjustment
  - False Act on Train Stop
  - EX Limiting Used
  - EZ Correction Used
  - Compensation Level
  - Warn Time-Ballast Comp

For further information regarding these parameters, please refer to Section 6 of this manual.

3.3.3 3) Logic Programming

The **3) Logic Programming** screen displays the different logic types used in the Model 5000 GCP.

- The **3) Logic Programming** screen displays the following parameters:
  - 1) Logic: Track ANDing
  - 2) Logic: AND Gates
  - 3) Logic: OR Gates
  - 4) Logic: Controls
  - 5) Logic: Internal I/O

3.3.3.1 1) Logic: Track ANDing

The **1) Logic: Track ANDing** screen sets the AND functions that are used.

- The **1) Logic: Track ANDing** screen displays the following parameters:
  - 1) AND 1 XR Used
  - 2) AND 2 Used
  - 3) AND 3 Used
  - 4) AND 4 Used

3.3.3.1.1 1) Logic: AND 1 XR

The **Logic: AND 1 XR** screen 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.

- The **1) Logic: AND 1 XR** screen displays the following parameters:
  - AND 1 XR Track "N" (all enabled tracks)
  - AND 1 Wrap Used
  - +AND 1 Enable Used – When set to default (**No**) no additional screens are enabled. When set to **Yes**, the **Logic: AND 1 XR Enable** screen is enabled.
- The **1) +AND 1 Enable Used**
  - And 1 Enable Pickup
  - And 1 Enable Drop

3.3.3.1.2 2) Logic: AND 2 (through AND 4)

The **Logic: AND 2** screen 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.

- The **1) Logic: AND 2** screen displays the following parameters:
  - AND 2 Track "N" (all enabled tracks)
  - AND 2 Wrap Used
  - +AND 2 Enable Used – When set to default (**No**) no additional screens are enabled. When set to **Yes**, the **Logic: AND 1 XR Enable** screen is enabled.
- The **1) +AND 2 Enable Used**
  - And 2 Enable Pickup
  - And 2 Enable Drop

3.3.3.2 <u>2) Logic: AND Gates</u>

The **Logic: AND Gates** screen enables/disables ANDs 5 through 12.

- The following parameters are displayed:
  - 1) AND 5 Used
  - 2) AND 6 Used
  - 3) AND 7 Used
  - 4) AND 8 Used
  - 5) AND 9 Used
  - 6) AND 10 Used
  - 7) AND 11 Used
  - 8) AND 12 Used

3.3.3.2.1 "N") Logic: AND "N (5 – 12)"

When an AND "5 – 12" Used parameter is set to **Yes**, a screen is enabled

- The following parameters are displayed:
  - AND "N" Term 1
  - AND "N" Term 2
  - AND "N" Term 3
  - AND "N" Term 4
  - AND "N" Wrap Used
  - 1) +AND "N" Enable Used

3.3.3.3 <u>3) Logic: OR Gates</u>

The **Logic: OR Gates** screen displays a list of which user configurable ORs are available. Corresponding OR function is enabled when set to **Yes**.

- The Logic: OR Gates screen displays the following parameters:
  - 1) OR 1 Used
  - 2) OR 2 Used
  - 3) OR 3 Used
  - 4) OR 4 Used

3.3.3.3.1 Logic: OR 1 – 4

When an OR gate is selected, e.g., **1 OR 1 Used** set to **Yes**, a screen display appears for each OR that is enabled. Allows selection of the system outputs to be used as inputs to the OR

- The following parameters are available for each OR term:
  - OR 1 Term 1
  - OR 1 Term 2
  - OR 1 Term 3
  - OR 1 Term 4

3.3.3.4 <u>4) Logic: Controls</u>

The **Logic: Controls** screen enables Emergency Activation function, the Maintenance Call operation, and Pass Thrus.

- The **Logic: Controls** screen displays the following parameters:
  - Emergency Activate IP
  - Maint Call Rpt IP Used
  - Pass Thrus.

3.3.3.5 <u>5) Logic: Internal I/O</u>

The **Logic: Internal I/O** screen is used to navigate to one of the 16 Internal Logic I/Os.

- The **Logic: Internal I/O** screen displays the following parameter links:
  - 1) Internal I/O 1 – 4
  - 2) Internal I/O 5 – 8
  - 3) Internal I/O 9 – 12
  - 4) Internal I/O 13 – 16

3.3.3.5.1 1) Logic: Internal I/O 1-4

The **Logic: Internal I/O 1-4** screen 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.

- The **Logic: Internal I/O 1-4** screen displays the following parameters:
  - 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

3.3.3.5.2 2) Logic: Internal I/O 5-8

The **Logic: Internal I/O 5-8** screen 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.

- The **Logic: Internal I/O 5-8** screen displays the following parameters:
  - Int.5 Sets
  - Int.5 Set by
  - Int.6 Sets
  - Int.6 Set by
  - Int.7 Sets
  - Int.7 Set by
  - Int.8 Sets

- Int.8 Set by

3.3.3.5.3 3) Logic: Internal I/O 9-12

The **Logic: Internal I/O 9-12** screen 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.

- The **Logic: Internal I/O 9-12** screen displays the following parameters:
  - Int.9 Sets
  - Int.9 Set by
  - Int.10 Sets
  - Int.10 Set by
  - Int.11 Sets
  - Int.11 Set by
  - Int.12 Sets
  - Int.12 Set by

3.3.3.5.4 4) Logic: Internal I/O 13-16

The **Logic: Internal I/O 13-16** screen 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.

- The **Logic: Internal I/O 13-16** screen displays the following parameters:
  - Int.13 Sets
  - Int.13 Set by
  - Int.14 Sets
  - Int.14 Set by
  - Int.15 Sets
  - Int.15 Set by
  - Int.16 Sets
  - Int.16 Set by

For further information regarding Internal Logic, please refer to Section 6 of this manual.

3.3.4 4) Advanced Programming

The **4) Advanced Programming** screen provides access for Bidirectional Dax programming.

The **Advanced Programming** screen displays the following parameters:

- Trk 1: Bidirectional Daxing
- Trk 2: Bidirectional Daxing
- Trk 3: Bidirectional Daxing
- Trk 4: Bidirectional Daxing
- Trk 5: Bidirectional Daxing
- Trk 6: Bidirectional Daxing

3.3.4.1 <u>“N”) Trk “N”: Bidirectional Daxing</u>

The **Trk “N”: Bidirectional Daxing** screen enables the corresponding track circuit BiDax parameters. A **Trk “N”: Bidirectional Daxing** screen appears for each assigned Track Module. Use the left and right arrow buttons at top of the window to move between the **Trk “N”: Bidirectional Daxing** screens.

The **Trk "N": Bidirectional Daxing** screen displays the following parameters:

- 1) Trk "N": BiDax to RX Approach
- 2) Trk "N": BiDax to TX Approach

3.3.4.1.1 Trk "N": BIDAX To RX Appr

The **Trk "N": BIDAX To RX Appr** screen sets the parameters used in Bidirectional Daxing to the Receiver side of the track circuit. There are four variations of screens, depending upon the value set to the +BIDAX To RX Appr parameter

- The Trk "N": BIDAX To RX Appr screen displays the following parameters when +BIDAX To RX Appr is set to **Not Used**:
  - +BIDAX To RX Appr
  - 1) PSO Used – inactive (grayed out) in this application
- The Trk "N": BIDAX To RX Appr screen displays the following parameters when +BIDAX To RX Appr is set to **Vital I/O**:
  - +BIDAX To RX Appr
  - Stick Release Time
  - Appr Clear Time
  - Stick EZ Value
  - Appr Clear EZ value
  - 1) PSO Used – inactive (grayed out) in this application
- The Trk "N": BIDAX To RX Appr screen displays the following parameters when +BIDAX To RX Appr is set to **Internal PSO**:
  - +BIDAX To RX Appr
  - Stick Release Time
  - Appr Clear Time
  - Stick EZ Value
  - Appr Clear EZ value
  - 1) PSO Used – inactive (grayed out) when set to **Not Used**. Text turns green when set to a programmed PSO, and the following menu appears on the **Trk "N": BiDax RX PSO** screen:
  - RX1 Freq Category
  - RX1 Frequency
  - TX Freq Category
  - TX Frequency
  - TX Transmit Level
- The Trk "N": BIDAX To RX Appr screen displays the following parameters when +BIDAX To RX Appr is set to **Center Fed PSO**:
  - +BIDAX To RX Appr
  - Stick Release Time
  - Appr Clear Time
  - Stick EZ Value
  - Appr Clear EZ value
  - 1) PSO Used – inactive (grayed out) when set to **Not Used**. Text turns green when set to a programmed PSO, and the following menu appears on the **Trk "N": BiDax RX PSO** screen:
  - RX2 Freq Category
  - RX2 Frequency

3.3.4.1.2 Trk "N": BIDAX To TX Appr

The **Trk "N": BIDAX To TX Appr** screen sets the parameters used in Bidirectional Daxing to the Receiver side of the track circuit. There are four variations of screens, depending upon the value set to the +BIDAX To TX Appr parameter

- The Trk "N": BIDAX To TX Appr screen displays the following parameters when +BIDAX To TX Appr is set to **Not Used**:
  - +BIDAX To TX Appr
  - 1) PSO Used – inactive (grayed out) in this application
- The Trk "N": BIDAX To TX Appr screen displays the following parameters when +BIDAX To TX Appr is set to **Vital I/O**:
  - +BIDAX To TX Appr
  - Stick Release Time
  - Appr Clear Time
  - Stick EZ Value
  - Appr Clear EZ value
  - 1) PSO Used – inactive (grayed out) in this application
- The Trk "N": BIDAX To TX Appr screen displays the following parameters when +BIDAX To TX Appr is set to **Internal PSO**:
  - +BIDAX To TX Appr
  - Stick Release Time
  - Appr Clear Time
  - Stick EZ Value
  - Appr Clear EZ value
  - 1) PSO Used – inactive (grayed out) when set to **Not Used**. Text turns green when set to a programmed PSO, and the following menu appears on the **Trk "N": BiDax TX PSO** screen:
  - RX1 Freq Category
  - RX1 Frequency
  - TX Freq Category
  - TX Frequency
  - TX Transmit Level
- The Trk "N": BIDAX To TX Appr screen displays the following parameters when +BIDAX To TX Appr is set to **Center Fed PSO**:
  - +BIDAX To TX Appr
  - Stick Release Time
  - Appr Clear Time
  - Stick EZ Value
  - Appr Clear EZ value
  - 1) PSO Used – inactive (grayed out) when set to **Not Used**. Text turns green when set to a programmed PSO, and the following menu appears on the **Trk "N": BiDax TX PSO** screen:
  - RX2 Freq Category
  - RX2 Frequency

3.3.5 5) SSCC Programming

The **SSCC** Window sets the options / levels of the SSCC functions. Use the Arrow buttons at top of the screen to move between the SSCC windows. The options displayed in the window depend on how the SSCCs are being used.

- The **5) SSCC Programming** entry provides access to the following SSCC configuration screens:
  - 1) SSCC Configuration
  - 2) SSCCIV Control and Setup – hidden (grayed out) unless +SSCCIV Controller Used is set to is set **Yes** on the **SSCC Configuration** screen
  - 3) SSCC 1 Configuration
  - 4) SSCC 2 Configuration

3.3.5.1 <u>1) SSCC Configuration</u>

The **SSCC Configuration** screen controls SSCC operation. There are two sets of menus, depending upon the value assigned to the +SSCCIV Controller Used parameter. When SSCCIV Controller Used is set to **Yes**, some parameters on this screen are hidden and additional screens are enabled.

- When the +SSCCIV Controller Used parameter is set to **No**, the following parameters are visible:
  - +Gates Used – If +Gates Used is set to **No**, the SSCC1+2 GPs Coupled parameter is hidden
  - SSCC1+2 GPs Coupled
  - Min Activation
  - Rmt Activation Cancel
  - Bell on Gate Rising
  - Mute Bell on Gate Down
  - +SSCCIV Controller Used
- When the +SSCCIV Controller Used parameter is set to **Yes**, the following parameters are visible:
  - +Gates Used – If +Gates Used is set to **No**, the SSCC1+2 GPs Coupled parameter is hidden
  - Min Activation
  - Rmt Activation Cancel
  - +SSCCIV Controller Used
  - 4000 Control Type – if set to **Entrnce**, the disabled parameters are enabled

3.3.5.2 <u>2) SSCCIV Control and Setup</u>

- When the +SSCCIV Controller Used parameter is set to **Yes**, the following screens are enabled:
  - SSCCIV Control and ATCS Setup
  - SSCCIV ATCS Connection

3.3.5.2.1 SSCCIV Control and ATCS Setup

The **SSCCIV: Control and ATCS Setup** screen 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.

- The **SSCCIV: Control and ATCS Setup** screen displays the following parameters:
  - SSCCIV Activation
  - SSCCIV GPs Coupled – Hidden when the 4000 Control Type parameter is set to **Exit**, enabled when 4000 Control Type parameter is set to **Entrnce.**
  - 1) ATCS Connection Parameters

3.3.5.2.2 ATCS Connection Parameters

- The **SSCCIV ATCS Connection** screen displays the following parameters:
- RRR Offset
- LLL Offset
- GGG Offset
- SS Offset
- Msg Timeout
- Msg Update Interval
- Max Time Offset

3.3.5.3 <u>3) SSCC 1 Configuration</u>

The **SSCC 1 Configuration** screen sets configuration options for SSCC 1 module.

- The **SSCC 1 Configuration** screen displays the following parameters:
  - SSCC-1 Activation
  - SSCC-1 Gate Delay
  - SSCC-1 Number of GPs
  - SSCC-1 Number of GDs
  - 1) SSCC 1 Extended Parameters – when this parameter is selected, the following extended parameters appear:
  - Flash Rate
  - Flash Sync
  - Invert Gate Output
  - Lamp Neutral Test
  - Lamp 1 Voltage
  - Lamp 2 Voltage
  - +Aux-1 Xng Ctrl Used
  - Aux-1 Xng Ctrl Hlth IP – hidden unless +Aux 1 Xng Ctrl Used is set to **Yes**

3.3.5.4 <u>4) SSCC 2 Configuration</u>

The **SSCC 2 Configuration** screen sets configuration options for SSCC 2 module.

- The **SSCC 2 Configuration** screen displays the following parameters:
  - SSCC-2 Activation
  - SSCC-2 Gate Delay
  - SSCC-2 Number of GPs
  - SSCC-2 Number of GDs
  - 1) SSCC 2 Extended Parameters – when this parameter is selected, the following extended parameters appear:
  - Flash Rate
  - Flash Sync
  - Invert Gate Output
  - Lamp Neutral Test
  - Lamp 1 Voltage
  - Lamp 2 Voltage
  - +Aux-1 Xng Ctrl Used
  - Aux-1 Xng Ctrl Hlth IP – hidden unless +Aux 1 Xng Ctrl Used is set to **Yes**

3.3.6 6) Input/Output Assignments

- The **Input/Output Assignments** screen displays the following links:

- 1) Output Assignments
- 2) Input Assignments

3.3.6.1 <u>1) Output Assignments</u>

The **Output Assignments** screen sets output function for the modules**.** Only outputs for assigned modules appear.

- The **Output Assignments** screen displays the following parameters:
  - 1) I/O: Output Slot 1-2
  - 2) I/O: Output Slot 3-4
  - 3) I/O: Output Slot 5-6
  - 4) I/O: Output Slot SSCC

3.3.6.1.1 1) I/O: Output Slot 1-2

- The **I/O: Output Slot 1-2** screen displays the following parameters:
  - OUT 1.1
  - OUT 1.2
  - OUT 2.1
  - OUT 2.2

3.3.6.1.2 2) I/O: Output Slot 3-4

- The **I/O: Output Slot 3-4** screen displays the following parameters:
  - OUT 3.1
  - OUT 3.2
  - OUT 4.1
  - OUT 4.2

3.3.6.1.3 3) I/O: Output Slot 5-6

- The **I/O: Output Slot 5-6** screen displays the following parameters:
  - OUT 1.1
  - OUT 1.2
  - OUT 2.1
  - OUT 2.2

3.3.6.1.4 4) I/O: Output Slot SSCC

- The **I/O: Output Slot SSCC** screen displays the following parameters:
  - OUT GC 1
  - OUT GC 2

3.3.6.2 <u>2) Input Assignments</u>

The **Input Assignments** screen sets Input function for the modules**.** Only Inputs for assigned modules appear.

- The **Input Assignments** screen displays the following parameters:
  - 1) I/O: Input Slot 1-2
  - 2) I/O: Input Slot 3-4
  - 3) I/O: Input Slot 5-6
  - 4) I/O: Input Slot SSCC 1
  - 5) I/O: Input Slot SSCC 2

3.3.6.2.1 1) I/O: Input Slot 1-2

- The **I/O: Input Slot 1-2** screen displays the following parameters:
  - IN 1.1
  - IN 1.2
  - IN 2.1
  - IN 2.2

3.3.6.2.2 2) I/O: Input Slot 3-4

- The **I/O: Input Slot 3-4** screen displays the following parameters:
  - IN 3.1
  - IN 3.2
  - IN 4.1
  - IN 4.2

3.3.6.2.3 3) I/O: Input Slot 5-6

- The **I/O: Input Slot 5-6** screen displays the following parameters:
  - IN 1.1
  - IN 1.2
  - IN 2.1
  - IN 2.2

3.3.6.2.4 4) I/O: Input Slot SSCC 1

- The **I/O: Input Slot SSCC** screen displays the following parameters:
  - IN 7.1
  - IN 7.2
  - IN 7.3
  - IN 7.4
  - IN 7.5

3.3.6.2.5 5) I/O: Input Slot SSCC 2

- The **I/O: Input Slot SSCC** screen displays the following parameters:
  - IN 8.1
  - IN 8.2
  - IN 8.3
  - IN 8.4
  - IN 8.5

3.4 GCP PROGRAMMING MENU DEFAULT SETTINGS

NOTE

NOTE

This section lists the various screens that make up the **Main Program Menu** (this menu selection appears under the path "**Program View > 3) GCP Programming**" on the top row of the Display. For Discussion of the **1 Site Setup** and **2) SEAR Programming** menus, as well as explanations of the various parameters, see Sections 3, 5, & 6 of this manual and also Siemens Model 5000 GCP Field Manual, SIG-00-13-03.

The **Main Program Menu** screen provides access to the following configuration menu windows:

- 1) Basic Configuration
- 2) GCP and Island Programming
- 3) Logic Programming
- 4) Advanced Programming
- 5) SSCC Programming
- 6) Input/Output Assignments

3.4.1 1) Basic Configuration

Selecting **1) Basic Configuration** provides access to the following configuration menu windows:

- 1) Set Template
- 2) Module Selection
- 3) Preemption
- 4) MS/Restart
- 5) Vital Comms Links
- 6) Out of Service
- Set to Default

The **Basic Configuration** menus are shown in Table 3-1.

Table 3-1: Basic Configuration Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Set Template	Template	1D:3 Uni Pairs
	Chassis Type	Dual Six Track
Module Selection	Track 1 Slot	Track
	Track 2 Slot	Track
	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

Table 3-1: Basic Configuration Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
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
BASIC: Vital Comms Links	Vital Comms link 1 Used	No
	Vital Comms link 2 Used	No
	Vital Comms link 3 Used	No
	Vital Comms link 4 Used	No
Vital Comms Link 1	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
	Remote SIN	762020020116
Vital Comms Link 2	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
	Remote SIN	762020020116
Vital Comms Link 3	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
	Remote SIN	762020020116

Table 3-1: Basic Configuration Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Vital Comms Link 4	RRR Offset LLL Offset GGG Offset SS Offset Msg Timeout Msg Update Interval Max Time Offset Remote SIN	0 0 1 0 3600 msec 800 msec 10 sec 762020019916
Out of Service	+OOS Control +OOS Timeout OOS Timeout 1) Out of Service Ctrl 1 2) Out of Service Ctrl 2	Display Yes 1 hr
Out of Service Ctrl 1	T1 OOS Control T2 OOS Control	OOS Input 1 OOS Input 2
Out of Service	T1 OOS Control T2 OOS Control	GCP And Island GCP Only
Set to Default	Set to Default	N/A
1 Assignment depends on the template selected. [2] Not Used in MTF_4A, MTF_5a.		

3.4.2 2) GCP and Island Programming

The **2) GCP and Island Programming** menus control all track related parameters. The first sub-menu is a listing of each enabled track. Under each individual track's menu are the following sub-menus:

- 1) GCP Frequency
- 2) Island Frequency
- 3) Predictors
- 4) Enhanced Detection
- 5) Positive Start
- 6) MS Control
- 7) Wraps and Override
- 8) GCP Miscellaneous

The **GCP and Island Programming** menus are shown in Table 3-2.

Table 3-2: GCP and Island Programming

MENU	MENU ENTRIES	DEFAULT SETTINGS
GCP and Island Programming	1) Trk1: GCP and Island 2) Trk2: GCP and Island 3) Trk3: GCP and Island 4) Trk4: GCP and Island 5) Trk5: GCP and Island 6) Trk6: GCP and Island	N/A
Trk 1: GCP Frequency	+MS/GCP Operation GCP Freq Category GCP Frequency GCP Transmit Level Uni/Bi/Sim-Bidirnl Approach Distance Directionally Wired Island Connection Island Distance	Yes Standard Not Set Medium Unidirnl 9999 ft No Isl 1 199 ft
Trk 1: Island Frequency	+Island Used Isl Frequency Pickup Delay (2s +) +Isl Enable IP Used Isl 1 Enable Pickup Delay	Internal Not Set 0 sec Yes 1 sec
Trk 1: Predictors	Prime Used Preempt Used Dax A Used Dax B Used Dax C Used Dax D Used Dax E Used Dax F Used Dax G Used	Yes[1] Yes[2] No No No No No No No
Trk 1 Predictor: Prime	Prime Warning Time +Prime Offset Distance Switch MS EZ Level Pickup Delay Mode +Prime MS/GCP Mode Prime Pickup Delay +Prime UAX Prime UAX Pickup	35 0 ft 10 Fixed Pred 15 Sec No 5 sec

Table 3-2: GCP and Island Programming

MENU	MENU ENTRIES	DEFAULT SETTINGS
Trk 1 Predictor: Preempt	Preempt Warning Time +Preempt Offset Distance Switch MS EZ Level Pickup Delay Mode +Preempt MS/GCP Mode Preempt Pickup Delay +Preempt UAX Preempt UAX Pickup	45 0 ft 10 Fixed Pred 15 Sec No 5 sec
Trk 1 Predictor: Dax A	Dax A Warning Time +Dax A Offset Distance Switch MS EZ Level Pickup Delay Mode +Dax A MS/GCP Mode Dax A Pickup Delay +Dax A UAX Dax A UAX Pickup	45 99 ft 0 Auto Pred 15 Sec No 5 sec
Trk 1 Enhanced Detection	Inbound PS Sensitivity Speed Limiting Used Outbound False Act Lvl Outbound PS Timer Trailing Switch Logic Post Joint Detn Time Adv Appr Predn	High Yes Normal 20 sec On 15 sec No
Trk 1: Adv Appr Predn	Adv Appr Predn Time Adv Appr Predn Strt EZ Adv Appr Predn Stop EZ	20 sec 85 0
Trk1: Positive Start, Low EZ	1) Positive Start 2) Sudden Shnt Det Used 3) Low EZ Detection Used	Off No No
Trk 1: Positive Start	Positive Start Level Positive Start Offset Positive Start Timer Sudden Shnt Det Level Sudden Shnt Det Offset	10 0 ft 10 min 70 0 ft
Trk1: Low EZ Detection	Low EZ Detection Level Low EZ Detection Time Low EZ Det Effect Low EZ Det Override IP	70 10 min Activate No

Table 3-2: GCP and Island Programming

MENU	MENU ENTRIES	DEFAULT SETTINGS
Trk 1: MS Control	MS/GCP Ctrl IP Used	No
	MS Sensitivity Level	0
	MS/GCP Restart EZ Level	80
	Prime Switch to MS	Yes
	Preempt switch to MS	Yes
	Dax A switch to MS	No
	Dax B switch to MS	No
Trk 1: MS Control Cont.	Dax B switch to MS	No
	Dax B switch to MS	No
	Dax B switch to MS	No
	Dax B switch to MS	No
	Dax B switch to MS	No
Trk 1: Wraps and Overrides	+Wrap Used	No
	Wrap LOS Timer	5 sec
	+All Predictors Override Used	No
	Dax A Override Used	No
	Dax B Override Used	No
	Dax C Override Used	No
	Dax D Override Used	No
	Dax E Override Used	No
	Dax F Override Used	No
	Dax G Override Used	No
Trk 1: GCP Miscellaneous	Low EX Adjustment	39
	False Act on Train Stop	No
	EX Limiting Used	Yes
	EZ Correction Used	Yes
	Compensation Level	1300
	Warn Time-Ballast Comp	High
Track 2 Parameters	Same as track 1 except for template differences	
Track 3 Parameters		
Track 4 Parameters		
Track 5 Parameters		
Track 6 Parameters		

3.4.3 3) Logic Programming Menus

The **3) Logic Programming** screen displays the different logic types used in the Model 5000 GCP.

- The **3) Logic Programming** screen displays the following parameters:
  - 1) Logic: Track ANDing
  - 2) Logic: AND Gates
  - 3) Logic: OR Gates

- 4) Logic: Controls
- 5) Logic: Internal I/O

The **Logic Programming** menus are shown in Table 3-3.

Table 3-3: Logic Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Logic: Track ANDing	AND 1 XR Used AND 2 Used AND 3 Used AND 4 Used	Yes No No No
Logic: AND 1 XR	AND 1 XR Track 1 AND 1 XR Track 2 AND 1 XR Wrap Used AND 1 XR Enable Used	Prime Prime No No
Logic: AND 1 XR Enable	AND 1 Enable Pickup AND 1 Enable Drop	5 sec 0 sec
Logic: AND 2	AND 2 Track 1 AND 2 Track 2 And 2 Wrap Used +AND 2 Enable Used	Not Used Not Used No No
Logic: AND 3	AND 3 Track 1 AND 3 Track 2 And 3 Wrap Used +AND 3 Enable Used	Not Used Not Used No No
Logic: AND 4	AND 4 Track 1 AND 4 Track 2 And 4 Wrap Used +AND 4 Enable Used	Not Used Not Used No No
Logic: AND Gates	AND 5 Used AND 6 Used AND 7 Used AND 8 Used AND 9 Used AND 10 Used AND 11 Used AND 12 Used	No No No No No No No No
Logic: AND 5	AND 5 Term 1 AND 5 Track 2 AND 5 Term 3 AND 5 Term 4 And 5 Wrap Used +AND 5 Enable Used	Not Used Not Used Not Used Not Used No No

Table 3-3: Logic Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Logic: AND 6	AND 6 Term 1	Not Used
	AND 6 Track 2	Not Used
	AND 6 Term 3	Not Used
	AND 6 Term 4	Not Used
	AND 6 Wrap Used	No
	+AND 6 Enable Used	No
Logic: AND 7	AND 7 Term 1	Not Used
	AND 7 Track 2	Not Used
	AND 7 Term 3	Not Used
	AND 7 Term 4	Not Used
	AND 7 Wrap Used	No
	+AND 7 Enable Used	No
Logic: AND 8	AND 8 Term 1	Not Used
	AND 8 Track 2	Not Used
	AND 8 Term 3	Not Used
	AND 8 Term 4	Not Used
	AND 8 Wrap Used	No
	+AND 8 Enable Used	No
Logic: AND 9	AND 9 Term 1	Not Used
	AND 9 Track 2	Not Used
	AND 9 Term 3	Not Used
	AND 9 Term 4	Not Used
	AND 9 Wrap Used	No
	+AND 9 Enable Used	No
Logic: AND 10	AND 10 Term 1	Not Used
	AND 10 Track 2	Not Used
	AND 10 Term 3	Not Used
	AND 10 Term 4	Not Used
	AND 10 Wrap Used	No
	+AND 10 Enable Used	No
Logic: AND 11	AND 11 Term 1	Not Used
	AND 11 Track 2	Not Used
	AND 11 Term 3	Not Used
	AND 11 Term 4	Not Used
	AND 11 Wrap Used	No
	+AND 11 Enable Used	No
Logic: AND 12	AND 12 Term 1	Not Used
	AND 12 Track 2	Not Used
	AND 12 Term 3	Not Used
	AND 12 Term 4	Not Used
	AND 12 Wrap Used	No
	+AND 12 Enable Used	No

Table 3-3: Logic Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Logic: OR Gates	OR 1 Used	No
	OR 2 Used	No
	OR 3 Used	No
	OR 4 Used	No
Logic: OR 1	OR 1 Term 1	Not Used
	OR 1 Term 2	Not Used
	OR 1 Term 3	Not Used
	OR 1 Term 4	Not Used
Logic: OR 2	OR 2 Term 1	Not Used
	OR 2 Term 2	Not Used
	OR 2 Term 3	Not Used
	OR 2 Term 4	Not Used
Logic: OR 3	OR 3 Term 1	Not Used
	OR 3 Term 2	Not Used
	OR 3 Term 3	Not Used
	OR 3 Term 4	Not Used
Logic: OR 4	OR 4 Term 1	Not Used
	OR 41 Term 2	Not Used
	OR 4 Term 3	Not Used
	OR 4 Term 4	Not Used
Logic: Controls	Emergency Activate IP	No
	Maint Call Rpt IP Used	No
	Pass Thrus	No
Logic: Internal I/O	Internal I/0 1-4	None
	Internal I/O 5-8	
	Internal I/O 9-12	
	Internal I/O 13-16	
Internal I/0 1-4	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 3-3: Logic Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Internal I/O 5-8	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
Internal I/O 9-12	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
Internal I/O 13-16	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

3.4.4 4) Advanced Programming Menus

The **4) Advanced Programming** screen provides access for Bidirectional Dax programming.

The **Advanced Programming** screen displays the following parameters:

- Trk 1: Bidirectional Daxing
- Trk 2: Bidirectional Daxing
- Trk 3: Bidirectional Daxing
- Trk 4: Bidirectional Daxing
- Trk 5: Bidirectional Daxing
- Trk 6: Bidirectional Daxing

The **Advanced Programming** menus are shown in Table 3-4.

Table 3-4: Advanced Programming

MENU	MENU ENTRIES	DEFAULT SETTINGS
Advanced Programming	Trk 1: Bidirectional Daxing Trk 2: Bidirectional Daxing Trk 3: Bidirectional Daxing Trk 4: Bidirectional Daxing Trk 5: Bidirectional Daxing Trk 6: Bidirectional Daxing	None
Trk 1: Bidirectional Daxing	Trk 1: BiDax to RX Approach Trk 1: BiDax to TX Approach	None
Trk 1: BiDax to RX Approach	+BIDAX To RX Appr Stick Release Time Appr Clear Time Stick EZ Value Appr Clear EZ Value +PSO Used	Not Used 10 Min 60 sec 20 80 Not Set
Trk1: BiDax RX PSO	RX 1 Freq Category RX1 Frequency RX 2 Freq Category RX2 Frequency TX Freq Category TX Frequency TX Transmit Level	Standard Not Set Standard Not Set Standard Not Set Low
Trk 1: BiDax to TX Approach	*BIDAX To RX Appr Stick Release Time Appr Clear Time Stick EZ Value Appr Clear EZ Value *PSO Used	Not Set 10 Min 60 sec 20 80 Not Set
Trk 1: BiDax TX PSO: track 1	RX 1 Freq Category RX1 Frequency RX 2 Freq Category RX2 Frequency TX Freq Category TX Frequency TX Transmit Level	Standard Not Set Standard Not Set Standard Not Set Low
Trk 2: Bidirectional Daxing	Same as track 1 except for template differences	
Trk 3: Bidirectional Daxing		
Trk 4: Bidirectional Daxing 4		
Trk 5: Bidirectional Daxing		
Trk 6: Bidirectional Daxing		

3.4.5 5) SSCC Programming Menus

The **SSCC Programming** menus are shown in Table 3-5.

Table 3-5: SSCC Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
SSCC Programming	1) SSCC Configuration	None
	2) SSCCIV Control and Setup	
	3) SSCC 1 Configuration	
	4) SSCC 2 Configuration	
SSCC Configuration	+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 Controller Type	Exit
SSCCIV Control and ATCS Setup	SSCCIV Activation	AND 1 XR
	ATCS Connection Parameters	None
SSCCIV ATCS Connection	RRR Offset	0
	LLL Offset	0
	GGG Offset	0
	SS Offset	1
	Msg Timeout	3600 msec
	Msg Update Interval	800 msec
	Max Time Offset	10 sec
SSCC 1 Configuration	SSCC-1 Activation	AND 1 XR
	SSCC-1 Gate Delay	4 sec
	SSCC-1 Number of GPs	1
	SSCC-1 Number of GDs	2
	1) SSCC 1 Extended Parameters	None
SSCC 1 Extended Parameters	Flash Rate	50
	Flash Sync	Master
	Invert Gate Output	No
	Lamp Neutral Test	Off
	Lamp 1 Voltage	100 dV
	Lamp 2 Voltage	100 dV
	Aux-1 Xng Ctrl Used	No
	Aux-1 Xng Ctrl Hlth IP	Yes

Table 3-5: SSCC Programming Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
SSCC 2 Configuration	SSCC-2 Activation	AND 1 XR
	SSCC-2 Gate Delay	4 sec
	SSCC-2 Number of GPs	0
	SSCC-1 Number of GDs	0
	1) SSCC 2 Extended Parameters	None
SSCC 2 Extended Parameters	Flash Rate	50
	Flash Sync	slave
	Invert Gate Output	No
	Lamp Neutral Test	Off
	Lamp 1 Voltage	100 dV
	Lamp 2 Voltage	100 dV
	Aux-1 Xng Ctrl Used	No
	Aux-1 Xng Ctrl Hlth IP	Yes

3.4.6 6) Input/Output Assignments

- The **Input/Output Assignments** screen displays the following links:
  - 1) Output Assignments
  - 2) Input Assignments

The **6) IO assignment** menus are shown in Table 3-6.

Table 3-6: IO Assignment Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
Input/Output Assignments	1) Output Assignments	None
	2) Input Assignments	
Output Assignments	1) I/O: Output Slot 1-2	None
	2) I/O: Output Slot 3-4	
	3) I/O: Output Slot 5-6	
	4) I/O: Output Slot SSCC	
I/O: Output Slot 1-2	OUT 1.1	Not Used
	OUT 1.2	Not Used
	OUT 2.1	Not Used
	OUT 2.2	Not Used
I/O: Output Slot 3-4	OUT 3.1	Not Used
	OUT 3.2	Not Used
	OUT 4.1	Not Used
	OUT 4.2	Not Used

Table 3-6: IO Assignment Menus

MENU	MENU ENTRIES	DEFAULT SETTINGS
I/O: Output Slot 5-6	OUT 5.1 OUT 5.2 OUT 6.1 OUT 6.2	Not Used Not Used Not Used Not Used
I/O: Output Slot SSCC	OUT GC 1 OUT GC 2	Gate Output 1 Gate Output 2
Input Assignments	1) I/O: Input Slot 1-2 2) I/O: Input Slot 3-4 3) I/O: Input Slot 5-6 4) I/O: Input Slot SSCC 1 5) I/O: Input Slot SSCC 2	None
I/O: Input Slot 1-2	IN 1.1 IN 1.2 IN 2.1 IN 2.2	Not Used Not Used Not Used Not Used
I/O: Input Slot 3-4	IN 3.1 IN 3.2 IN 4.1 IN 4.2	Not Used Not Used Not Used Not Used
I/O: Input Slot 5-6	IN 5.1 IN 5.2 IN 6.1 IN 6.2	Not Used Not Used Not Used Not Used
I/O: Input Slot SSCC 1	IN 7.1 IN 7.2 IN 7.3 IN 7.4 IN 7.5	Not Used GD 1.2 Not Used GD 1.1 GP 1.1
I/O: Input Slot SSCC 2	IN 8.1 IN 8.2 IN 8.3 IN 8.4 IN 8.5	Not Used Not Used Not Used Not Used Not Used

3.5 OFFICE CONFIGURATION EDITOR (OCE)

The Office Configuration Editor is solely a function of the PC based Display Terminal (DT) and is not supported by the A80485-1 Display Module. This function extends the operation of the by enabling:

- Configuration parameters and their current values to be captured from an MCF while disconnected from the 5000 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 5000 using a USB drive connected to the display. Loading the Pac file is an efficient method of programming office design into a field 5000 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.

3.5.1 Check Numbers

The Office Configuration Editor (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 Display computes the Track Check Number (TCN) for each configured Track Module in a Model 5000 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 5000 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 Display Module 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 allows the user to select to turn-on or turn-off the saving of the EZ/EX data for selected Track modules. The Display saves the EZ/EX data to the USB drive. The (PC) saves the EZ/EX data to a selected permanent or removable computer drive.

The Main 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.

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

The software used in the Model 5000 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 5000 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.

3.6.1 Parameters Now Excluded From OCCN

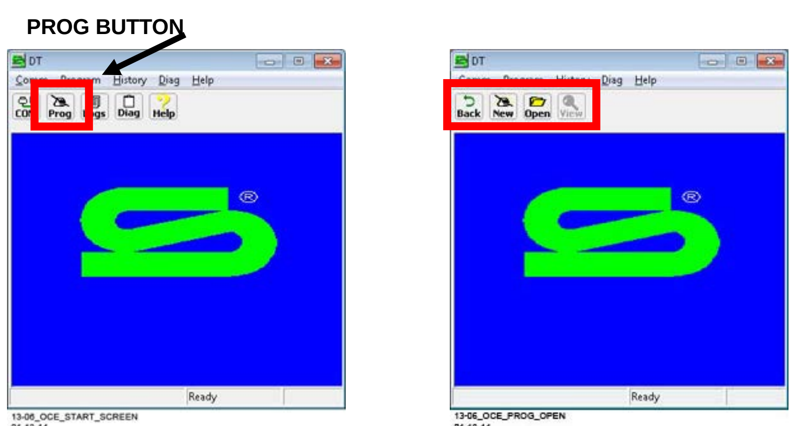
The following values have been excluded from OCCN and are covered by the Field Password:

Table 3-7:
Field Password Values

GCP Freq Category	Positive Start Level	EX/EX login
GCP Frequency	Positive Start Offset	EZ/EX Log Interval
GCP Transmit Level	Sudden Shunt Det Level	EZ/EX Point Change
SSCC 1 / 2 Low Battery Detection	Sudden Shunt Det Offset	Approach Distance
SSCC 1 / 2 Low Battery Level	Low EZ Detection Level	Outbound PS Time
SSCC 1 / 2 Lamp Neutral Test	MS Sensitivity Level	Speed Limiting
Inbound PS Sensitivity	Compensation Level	SEAR Subnode
Outbound False Activation Level	Warn Time Ballast Comp	Radio Subnode
Island Distance (in all templates)	Low EX Adjustment	Field Password Access
False Activation on Train Stop	Trailing Switch Logic	Field Password
Adv Appr Predn Start EZ	EX Limiting Used	Low Battery Enabled (for CPU)
Adv Appr Predn Stop EZ	EZ Correction Used	Low Battery Level (for CPU)
Track 1..6 MS Restart EZ Level	Island Frequency	
Predictors (Prime…Preempt) Offset Distances		

3.7 OFFICE CONFIGURATION EDITOR OPERATION

The functions of the 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 buttons are replaced by a group of four buttons (see Figure 3-5B).



A B

Figure 3-5:
Opening the Office Configuration Editor

- The **BACK** button returns the display to the initial 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.

- When a new MCF or a configuration pack file is selected, the **Office Configuration Editor** screen opens.

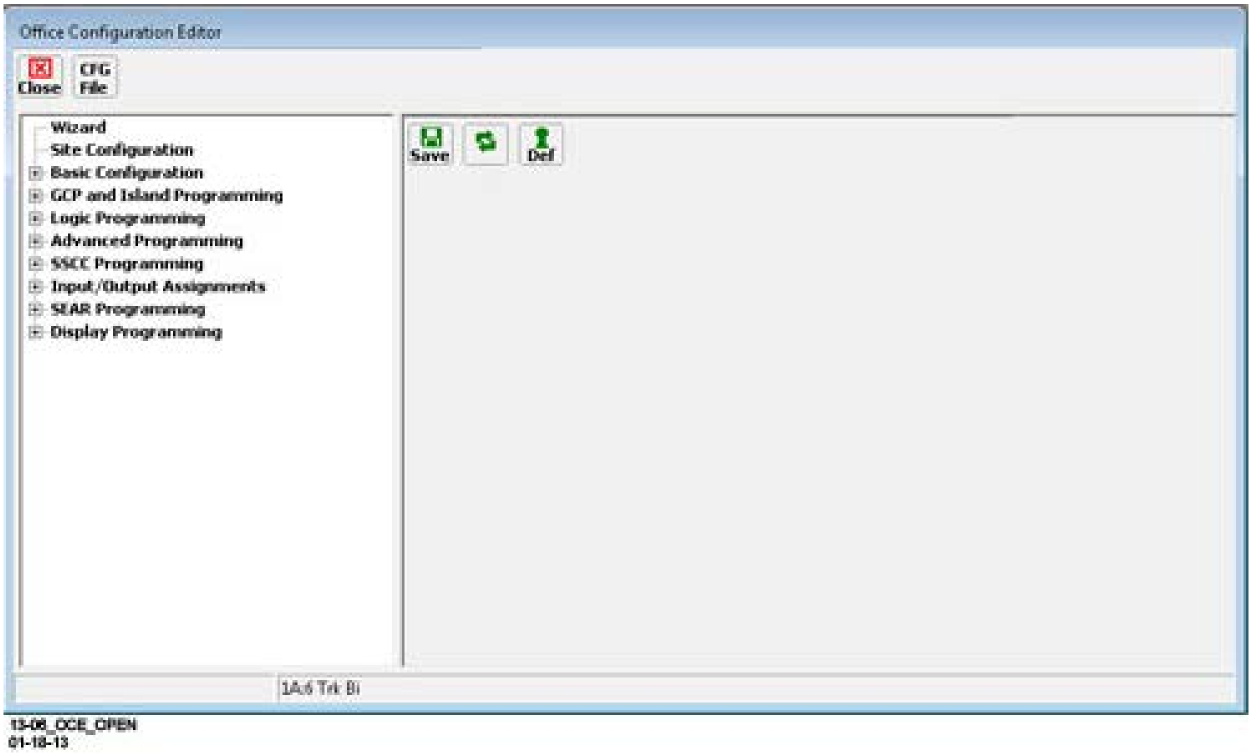


Figure 3-6:
The Office Configuration Editor

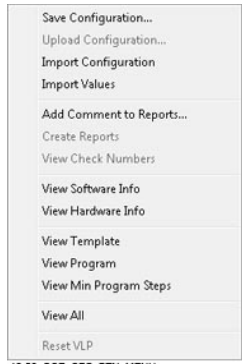
This screen provides access to the programming functions described in Sections 5 & 6.

Selecting **CFG FILE** button opens the Configuration File drop-down menu described below.

3.7.1 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
- Specified values to be imported
- 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)



13-06_OCE_CFG_BTN_MENU
01-18-14

Figure 3-7:
OCE Configuration Drop-down Menu

3.8 OFFICE CONFIGURATION EDITOR REPORTS

3.8.1 Menu Button Functions

When 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

3.8.2 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 program.
	• The Startup Screen displays (see Figure 3-5A).
Step 2	Select the **PROG** button at the top the Start-up Screen.
	• The buttons change to the configuration shown in Figure 3-5B.
Step 3	Select the **NEW** button.
	• The **Select MCF file** window opens.
Step 4	Select an *.mcf from the displayed files or from another location as required.
	• The **Select MCF file** window closes and the **Office Configuration Editor Menu** of the selected MCF displays (Figure 3-6).
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

3.8.3 Importing Parameters Into Open Pac File

NOTE

NOTE

When importing PAC files, care must be taken to ensure compatibility between the software levels of the MCFs. Only MCFs gcp_t6x_05_0.mcf and later may be installed into GCP 5000s.

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 **Office Configuration Editor Menu** (Figure 3-6) 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 **Office Configuration Editor 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 **Office Configuration Editor Menu**. A text file for each active Configuration drop-down menu report item is saved for the Pac file.

3.8.4 Adding Comments To An 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 An 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 Office Configuration Editor Menu.

SECTION 4 – TEMPLATE OVERVIEW AND GUIDELINES

4.1 TEMPLATE OVERVIEW

The Model 5000 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 5000 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

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 5000 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

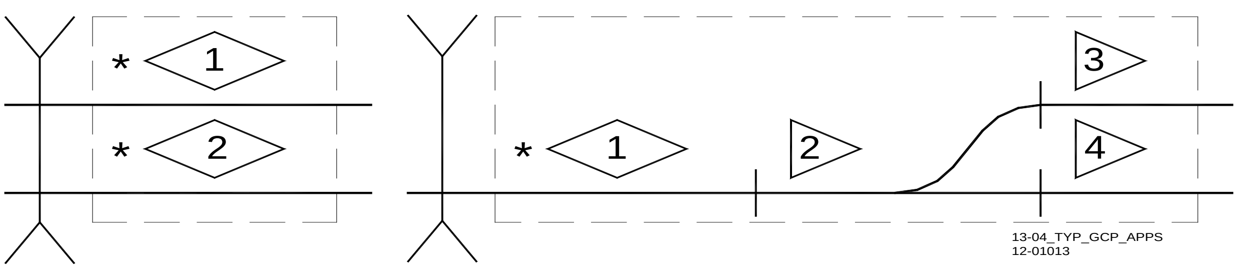


Figure 4-1:
Typical GCP Applications

4.1.1.1 Template Selection

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 5000 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.

NOTE

NOTE

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

4.1.1.2 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 the Main Program Menu

4.1.1.3 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 5000 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 5000 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

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 4-2 through Figure 4-5.

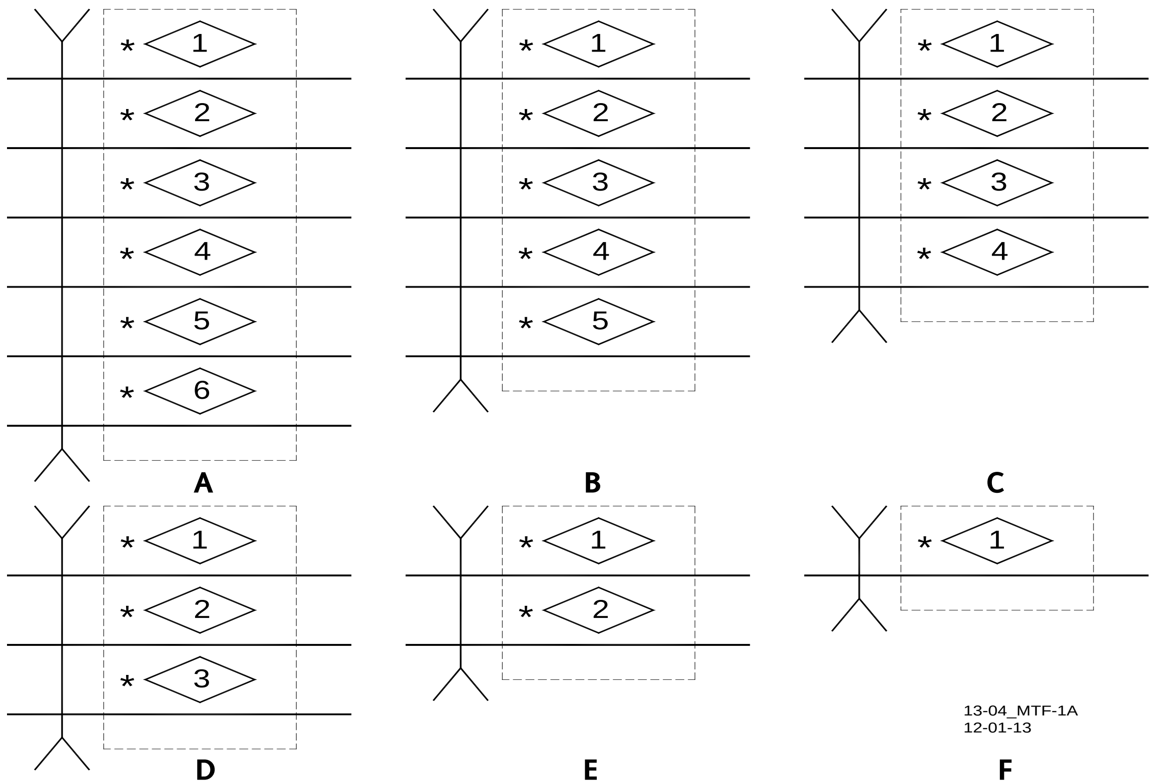


Figure 4-2:
Template 1A (MTF_1A) Configurations

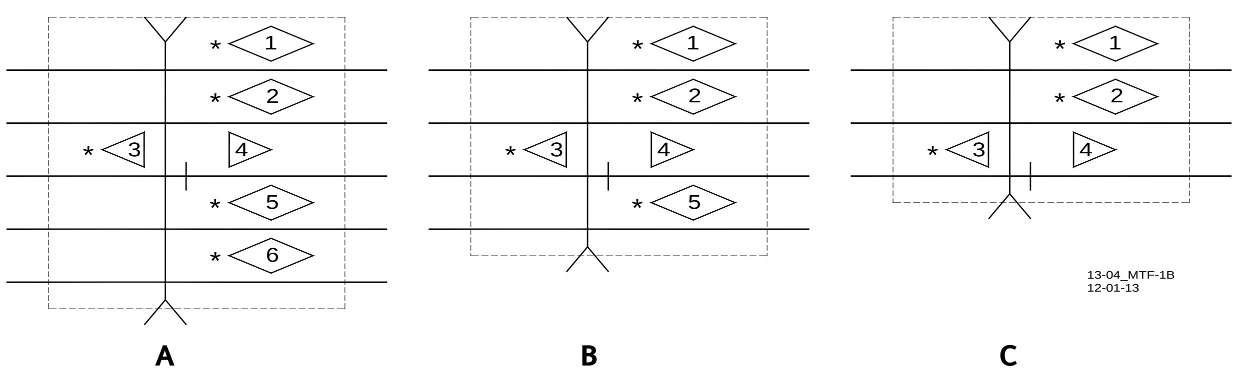


Figure 4-3:
Template 1B (MTF_1B) Configurations

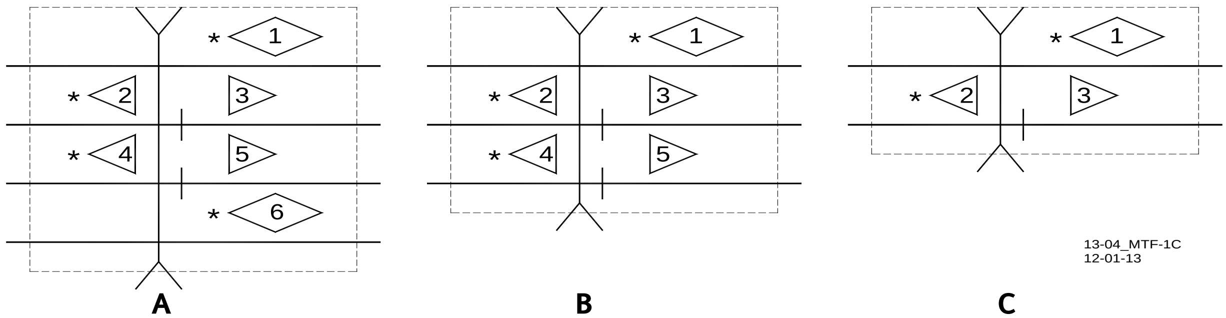


Figure 4-4:
Template 1C (MTF_1C) Configurations

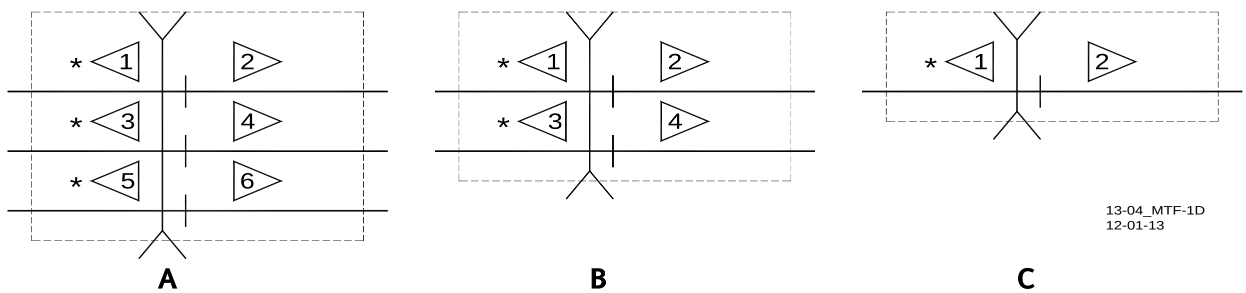


Figure 4-5:
Template 1D (MTF_1D) Configurations

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 4-6 through Figure 4-13.

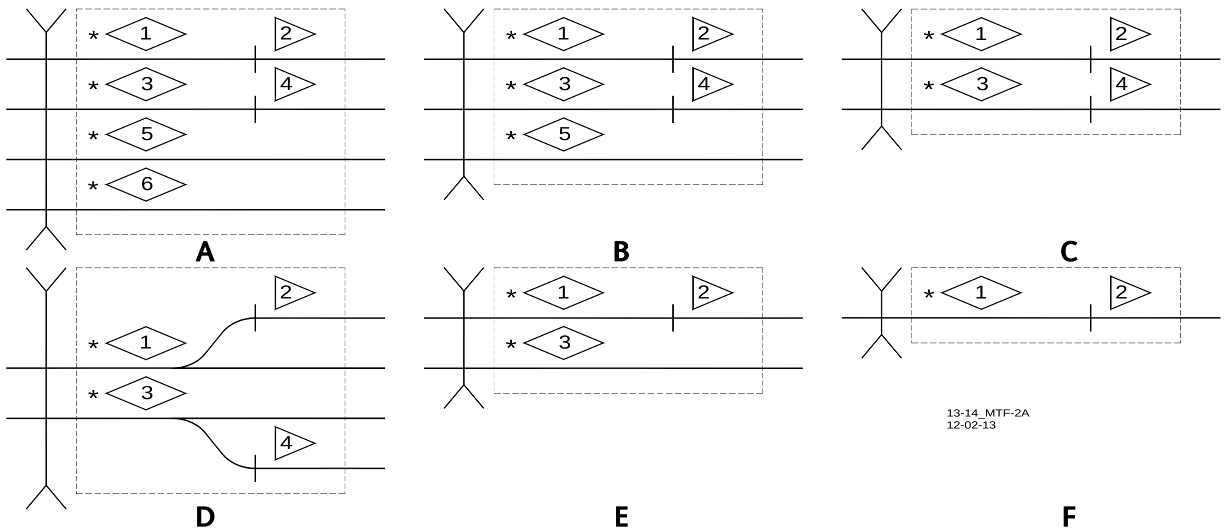


Figure 4-6:
Template 2A (MTF_2A) Configurations

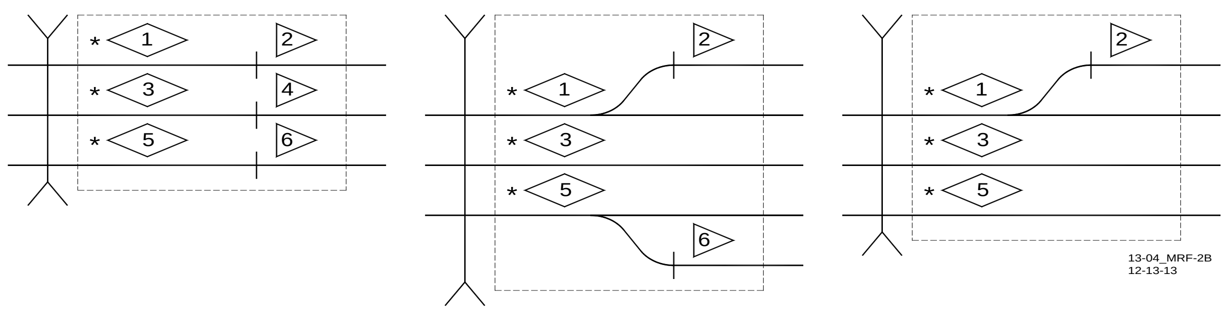


Figure 4-7:
Template 2B (MTF_2B) Configurations

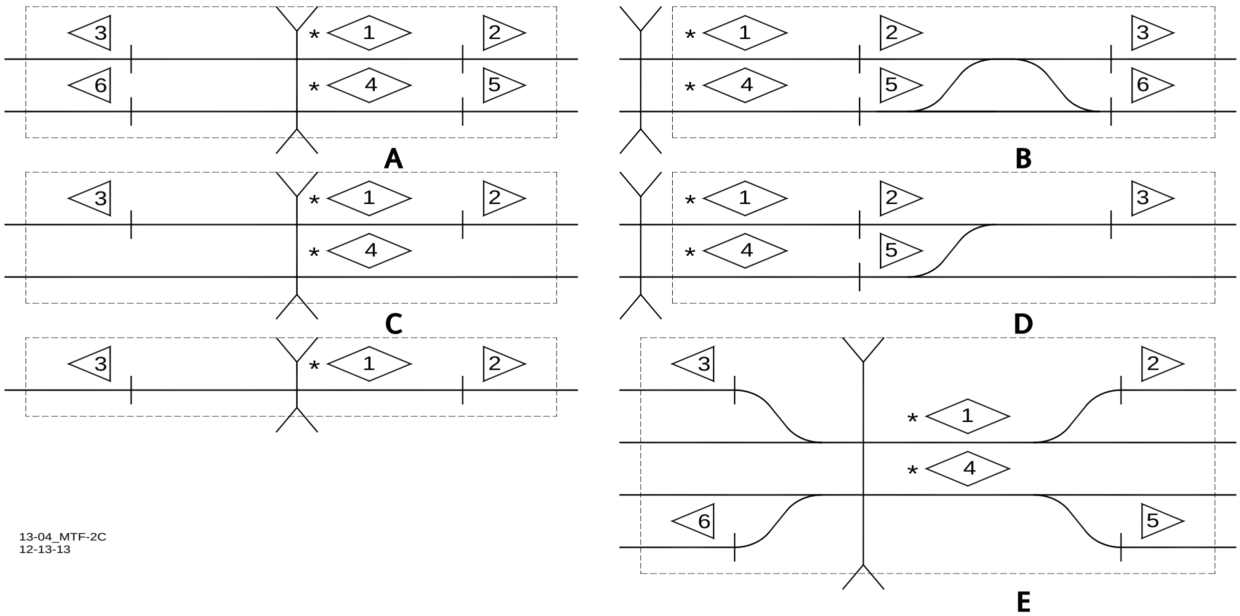


Figure 4-8:
Template 2C (MTF_2C) Configurations

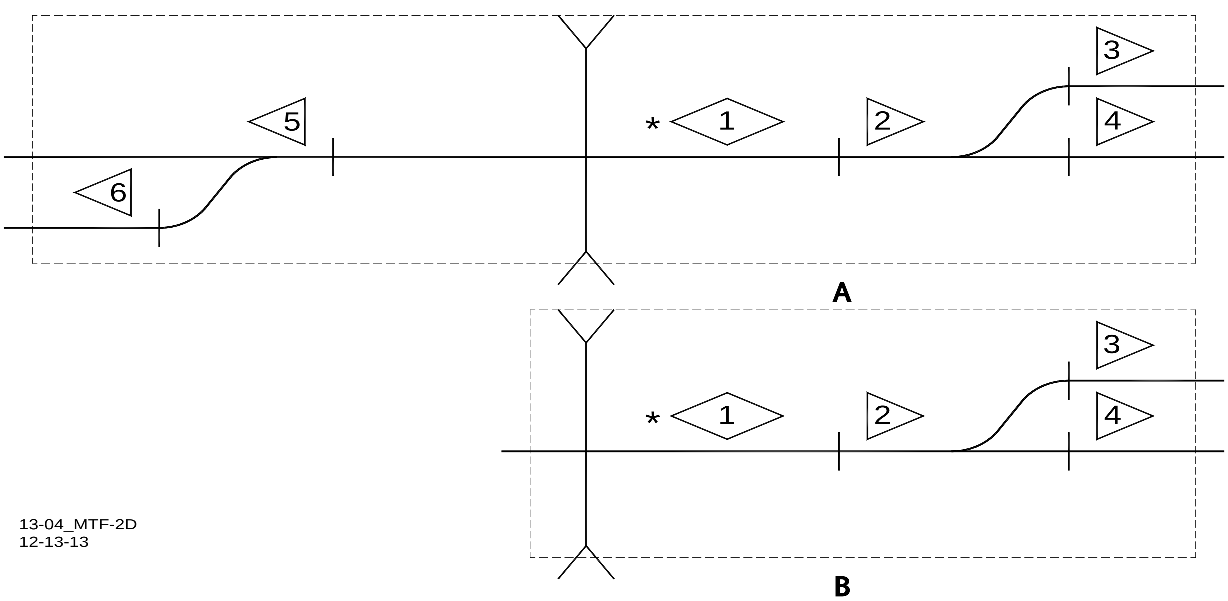


Figure 4-9:
Template 2D (MTF_2D) Configurations

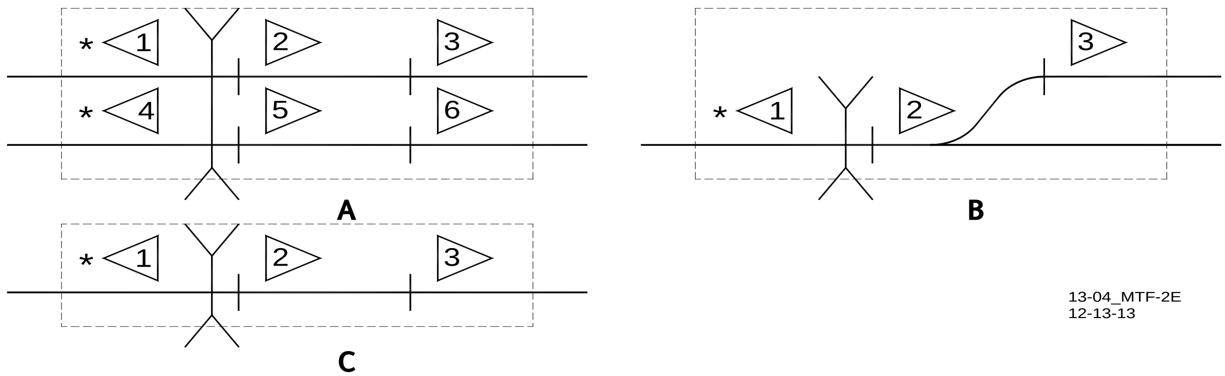


Figure 4-10:
Template 2E (MTF_2E) Configurations

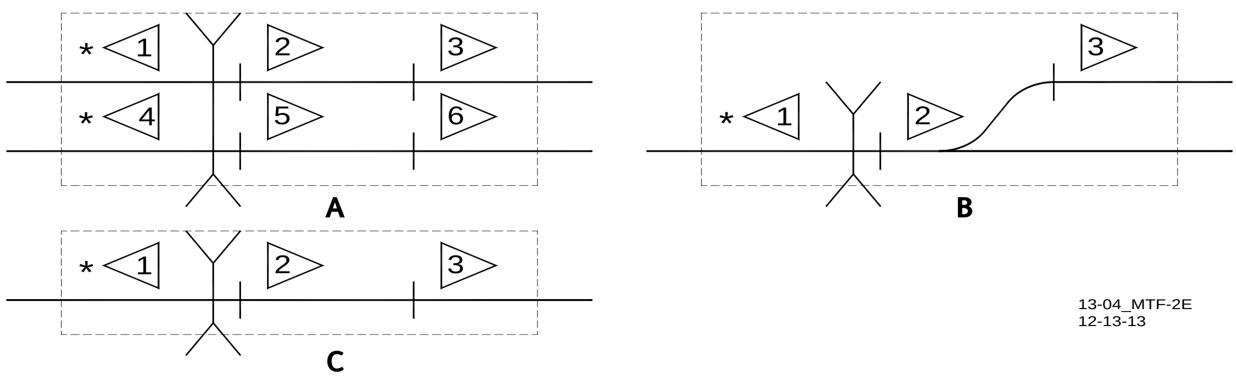


Figure 4-11:
Template 2F (MTF_2F) Configurations

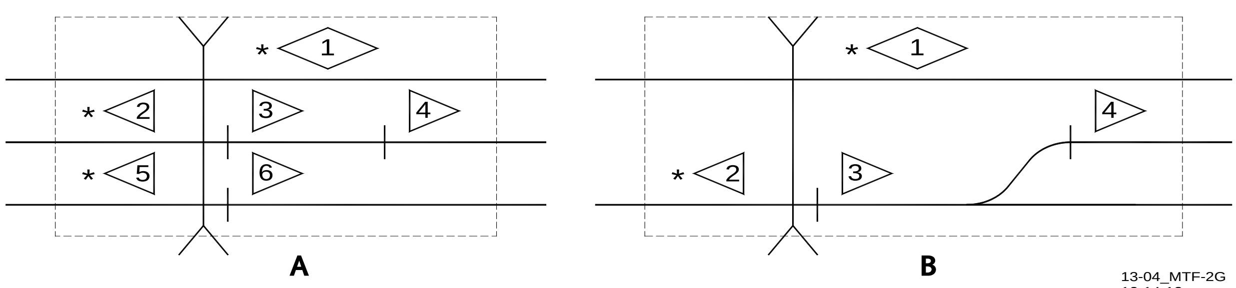


Figure 4-12:
Template 2G (MTF_2G) Configurations

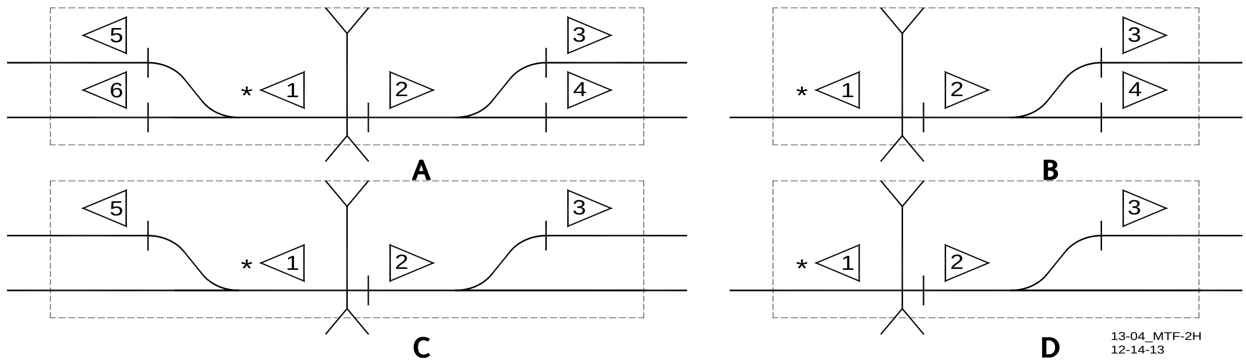


Figure 4-13:
Template 2H (MTF_2H) Configurations

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 4-14through Figure 4-20.

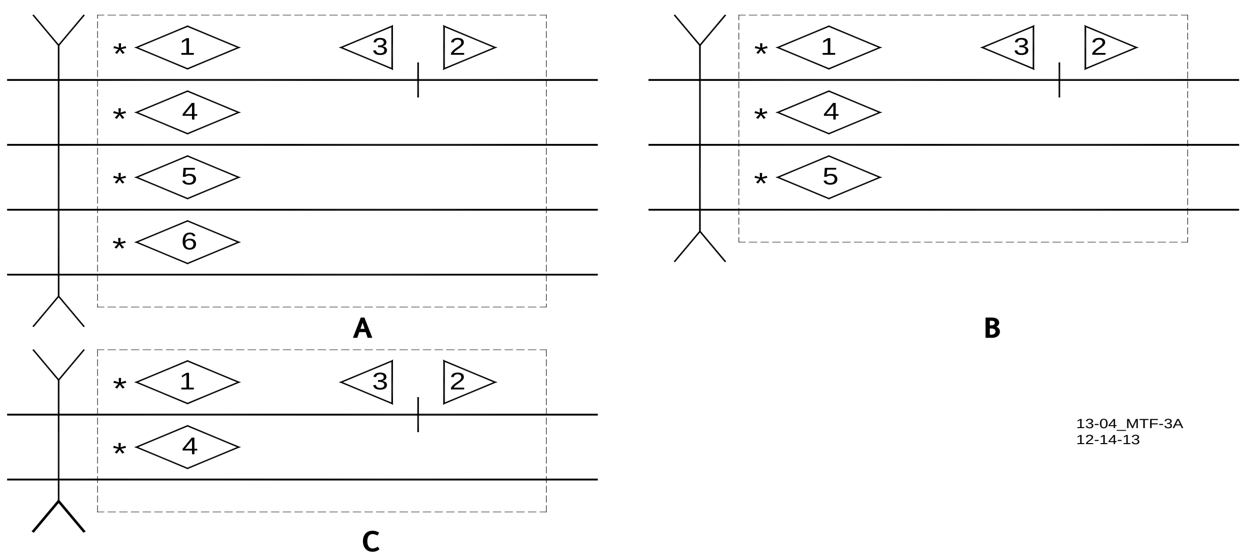


Figure 4-14:
Template 3A (MTF_3A) Configurations

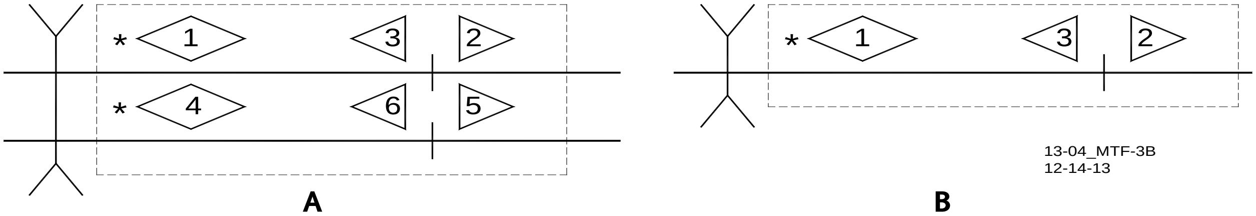


Figure 4-15:
Template 3B (MTF_3B) Configurations

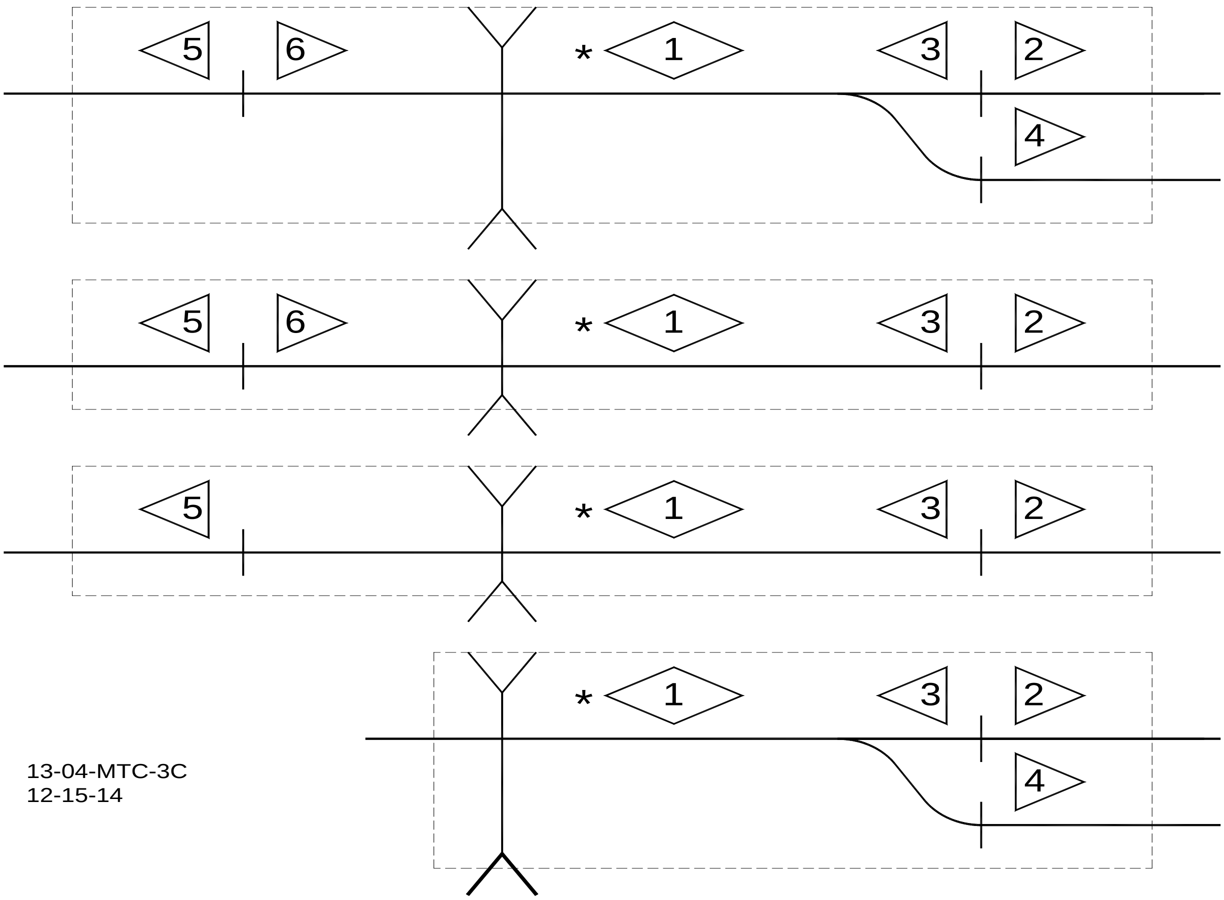


Figure 4-16:
Template 3C (MTF_3C) Configurations

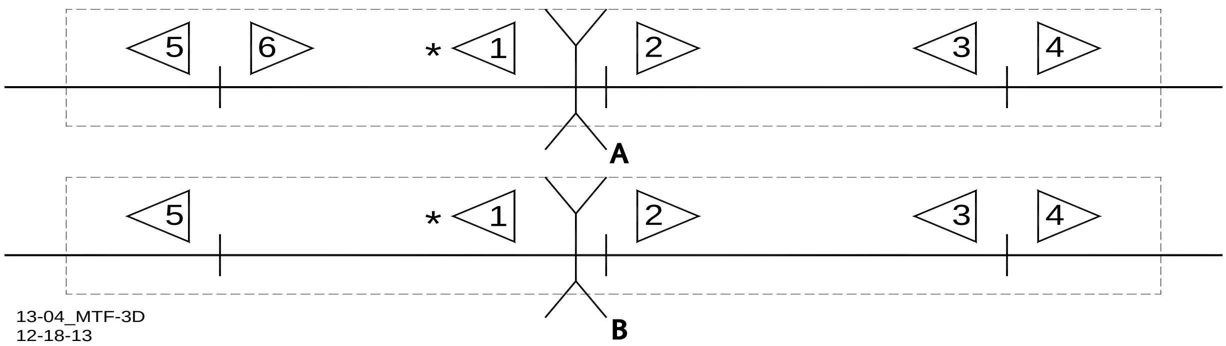


Figure 4-17:
Template 3D (MTF_3D) Configurations

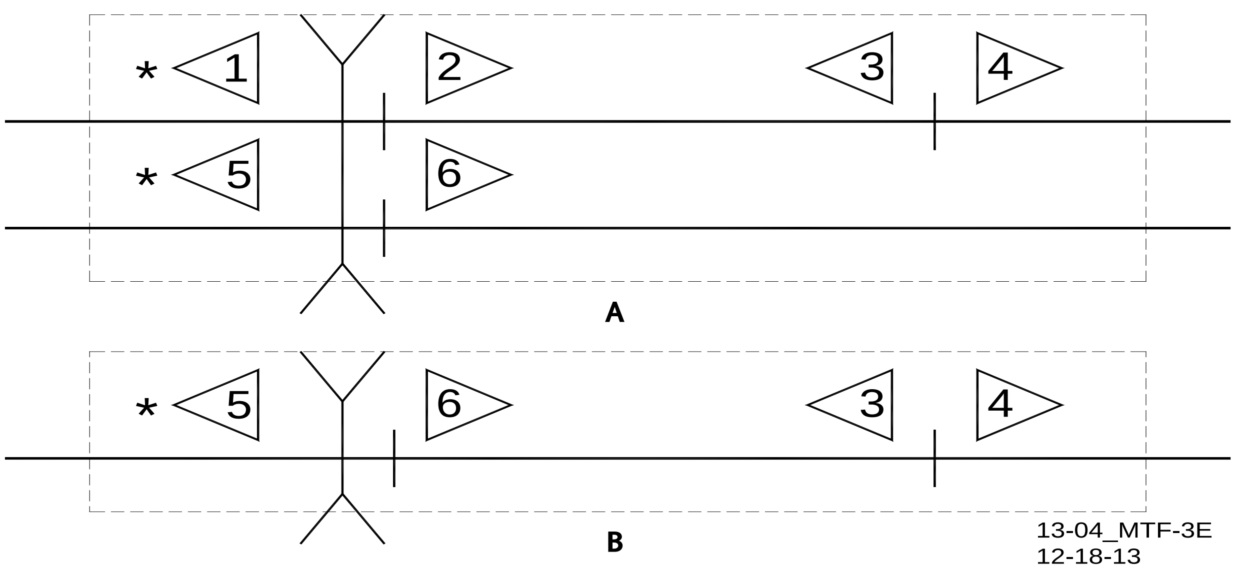


Figure 4-18:
Template 3E (MTF_3E) Configurations

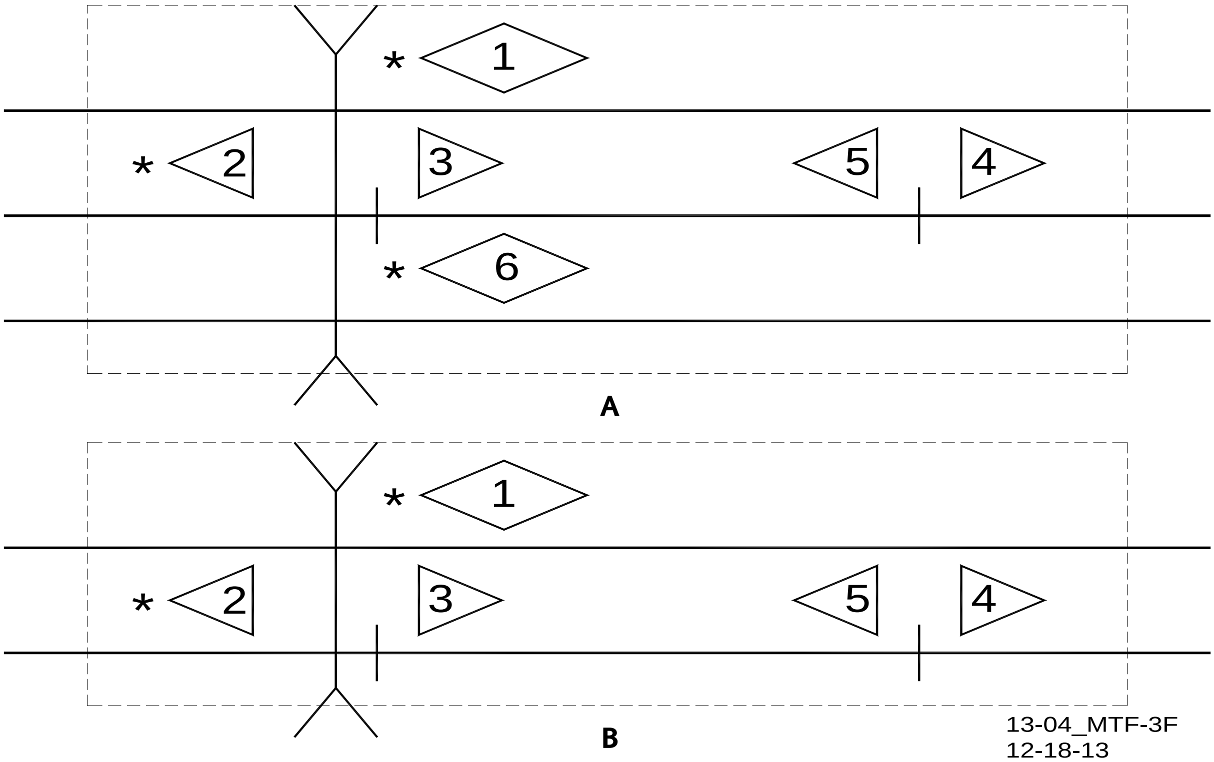


Figure 4-19:
Template 3F (MTF_3F) Configurations

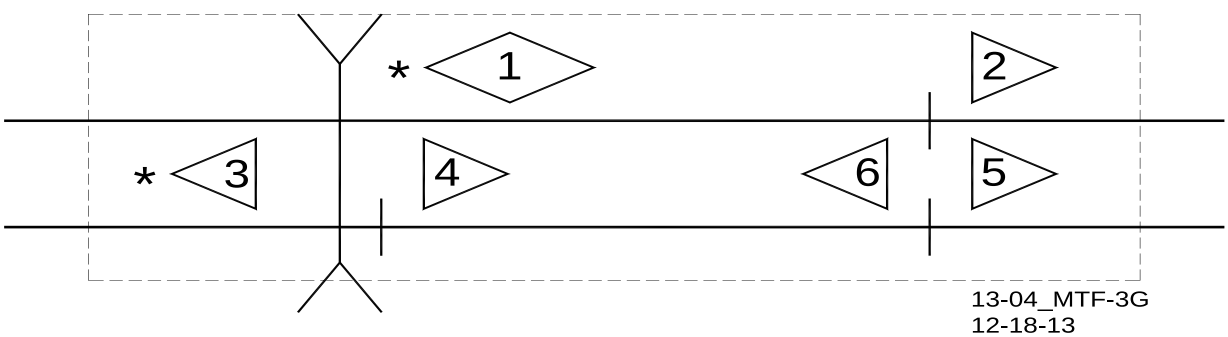


Figure 4-20:
Template 3G (MTF_3G) Configurations

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 4-21.

NOTE

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.

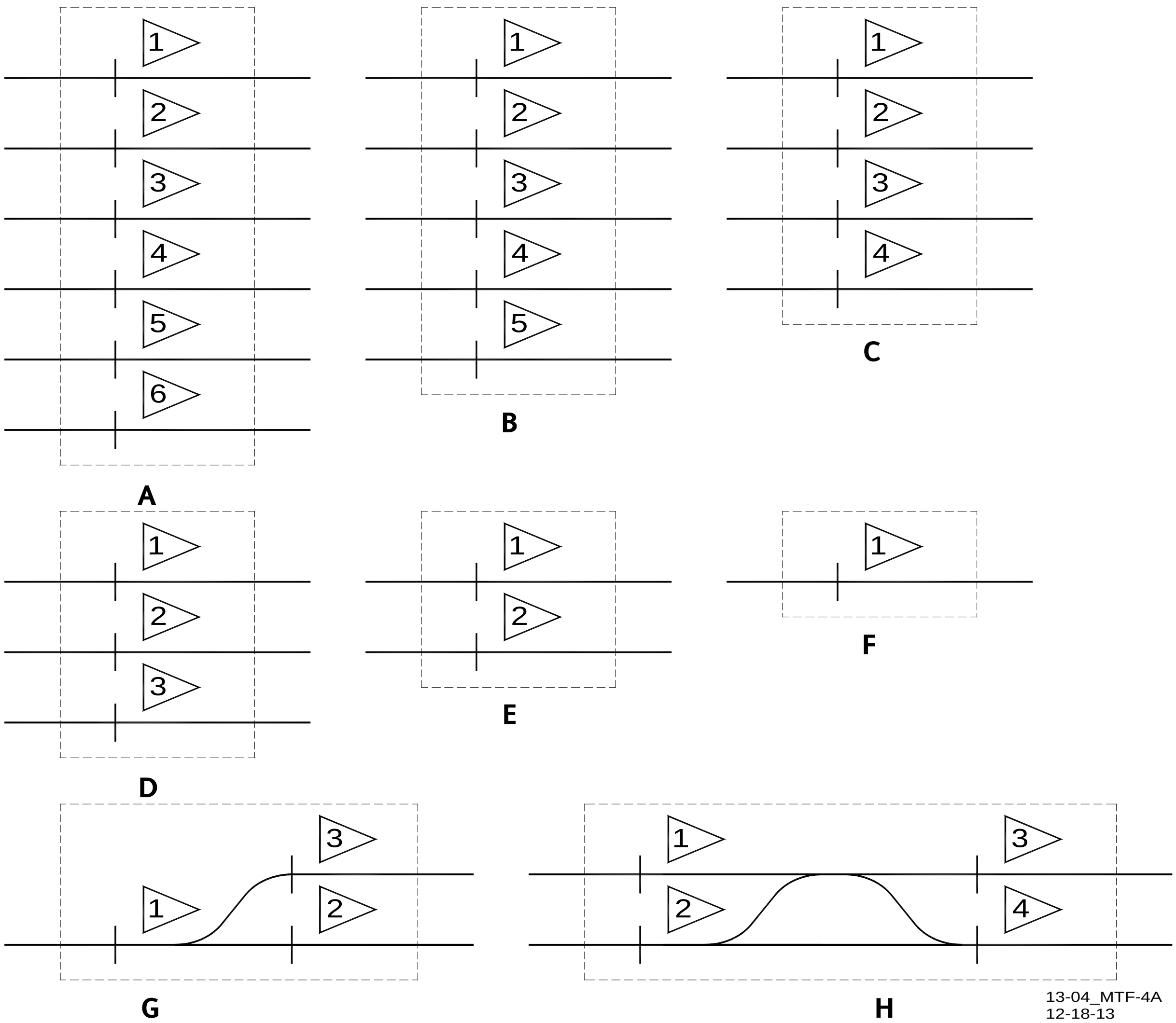


Figure 4-21:
Template 4A (MTF_4A) Configurations

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 4-22.

⚠ WARNING

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.

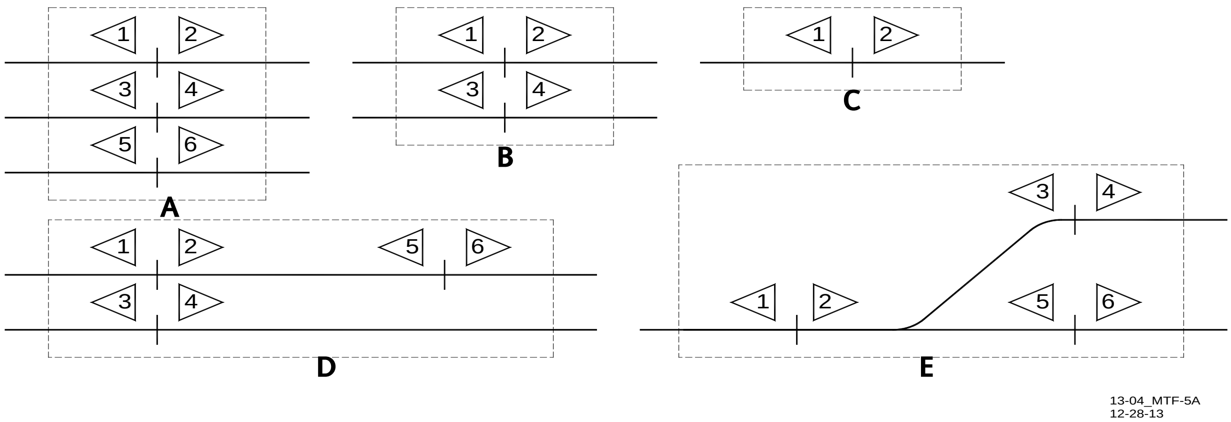


Figure 4-22:
Template 5A (MTF_5A) Configurations

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 5000 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 4-24 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 4-23A and Figure 4-23B).
- The GCPs assigned to adjacent (non-connected) tracks may be shifted to accommodate the requirements of the tracks (refer to Figure 4-24A and Figure 4-24B).

WARNING

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

NOTE

Always perform Set to Default prior to beginning Template Programming.

4.6 CONFIGURING TEMPLATE OPTIONS

From the **Program View** screen, select 3) GCP PROGRAMMING > 1) BASIC CONFIGURATION > 1) SET 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 PSO 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 5000 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 5000 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 4-23A. 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 4-23.

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.

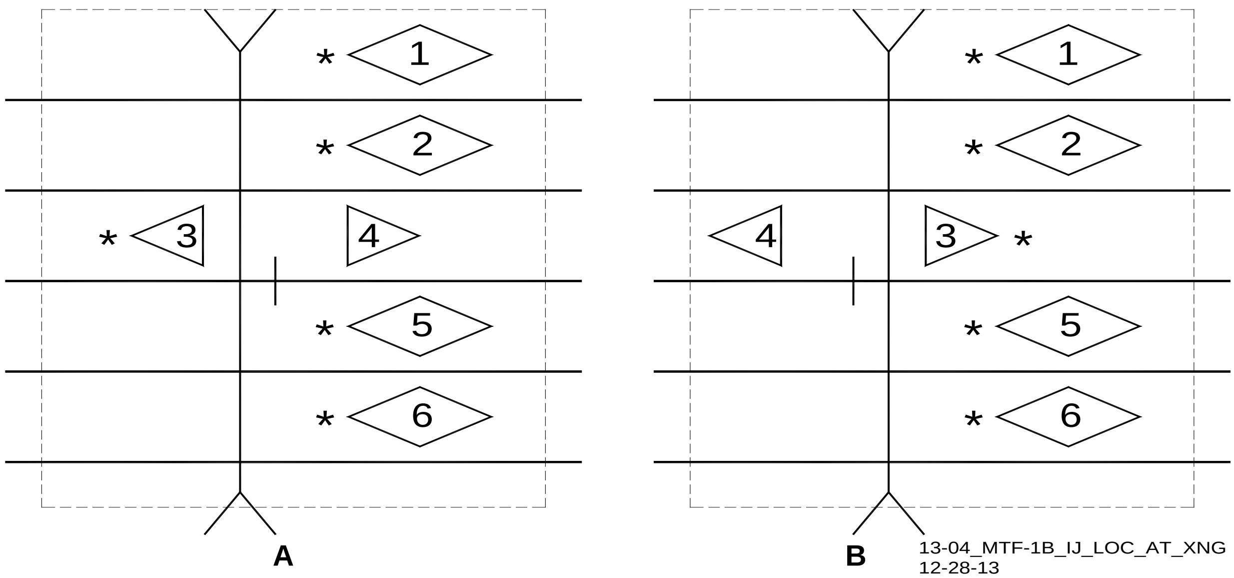


Figure 4-23:
Template 1B Showing Insulated Joints At The Crossing

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 4-24. 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 4-24B.

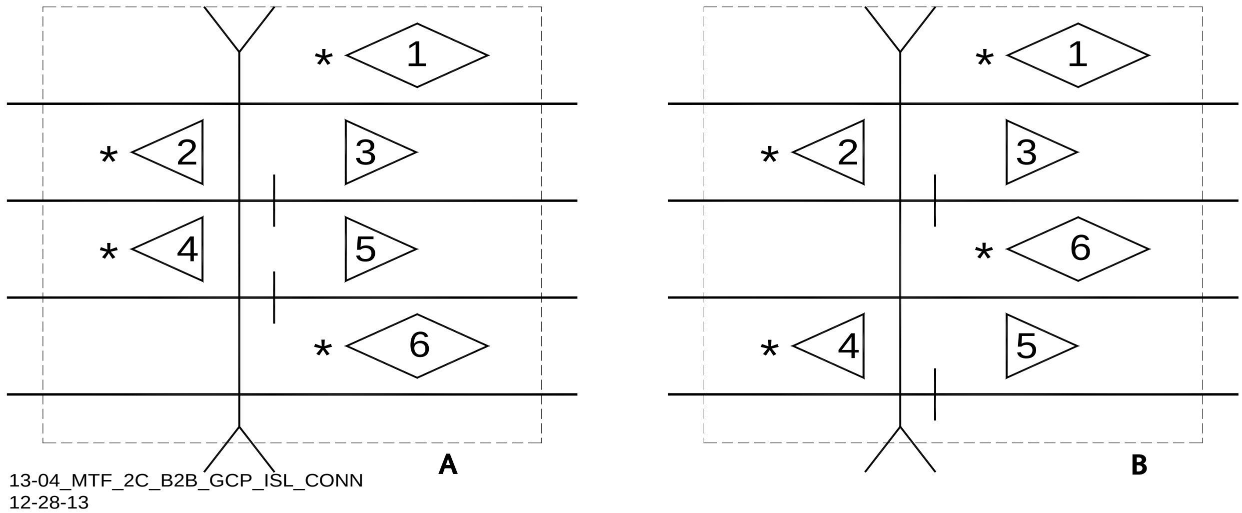


Figure 4-24:
Template 1C

4.7.3 Working with Remotes

A template can have a crossing GCP with a remote GCP on its approach, as shown in Figure 4-25A. The remote can be located on either side of the crossing as shown in Figure 4-25B. Each remote can be used to DAX to any of the crossing GCP's as shown in Figure 4-25C.

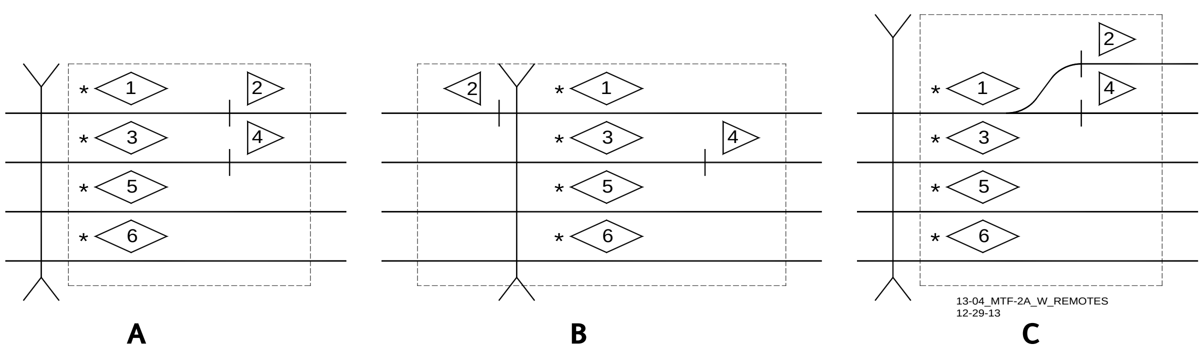


Figure 4-25:
Template 2A Using Remote GCPs

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 4-26A, the T3 remote is DAXing to the T1/T2 pair located at the crossing. In Figure 4-26B, 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 4-26C. 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 4-26D.

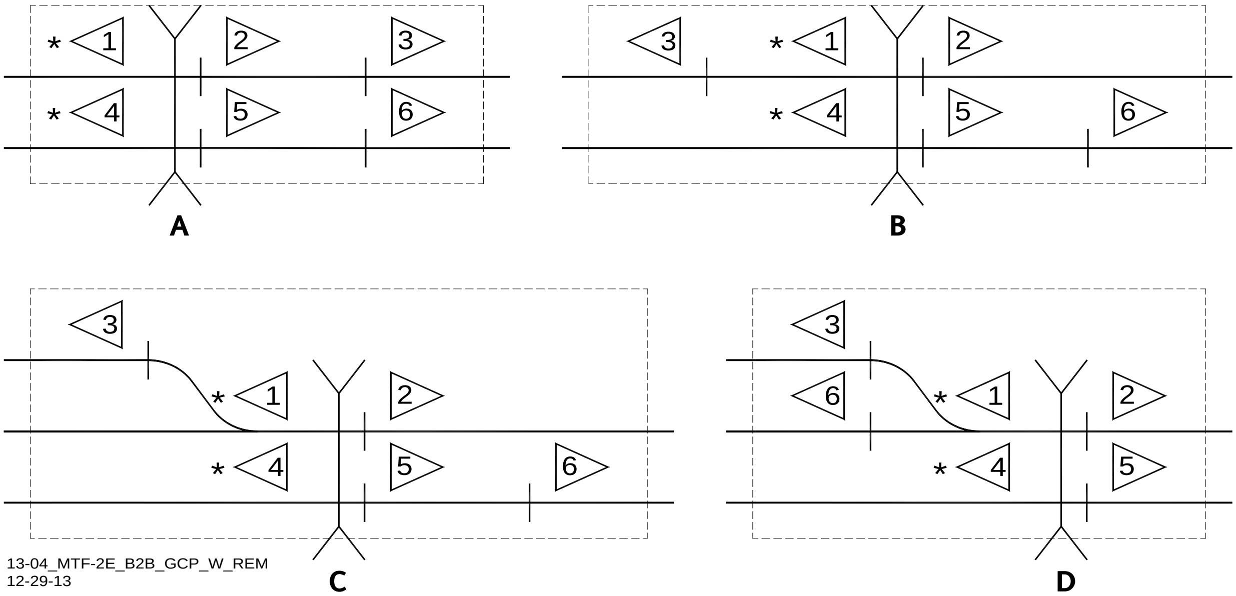


Figure 4-26:
Template 2E With Back to Back GCPs Using Remote GCPs

4.7.5 Double Crossover Layouts

Some templates offer additional layout flexibility in design such as shown in Figure 4-27A. The 2C layout can be reconfigured as a double crossover with all remotes on the right side of the crossing as shown in Figure 4-27B. Remotes T2 and T3 DAX to T1 while remotes T5 and T6 DAX to T4.

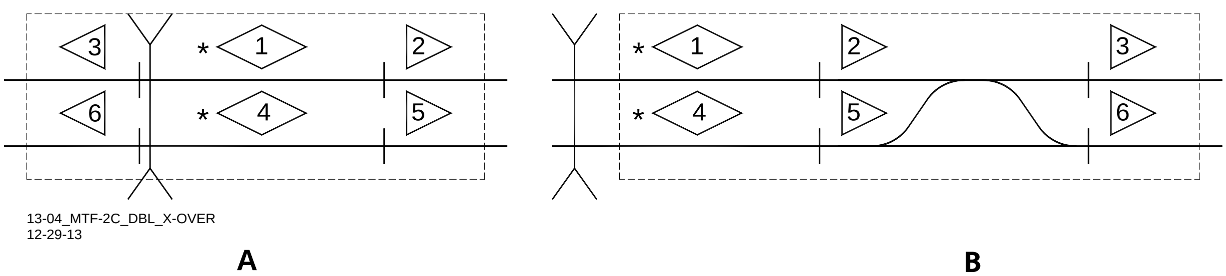


Figure 4-27:
Template 2C With Double Crossover Layouts

4.7.6 All Remotes DAXing

When only remote GCP circuits are in a 5000 case as shown in Figure 4-28A, 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 4-28B
- double crossover as shown in Figure 4-28C.

When the 5000 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.

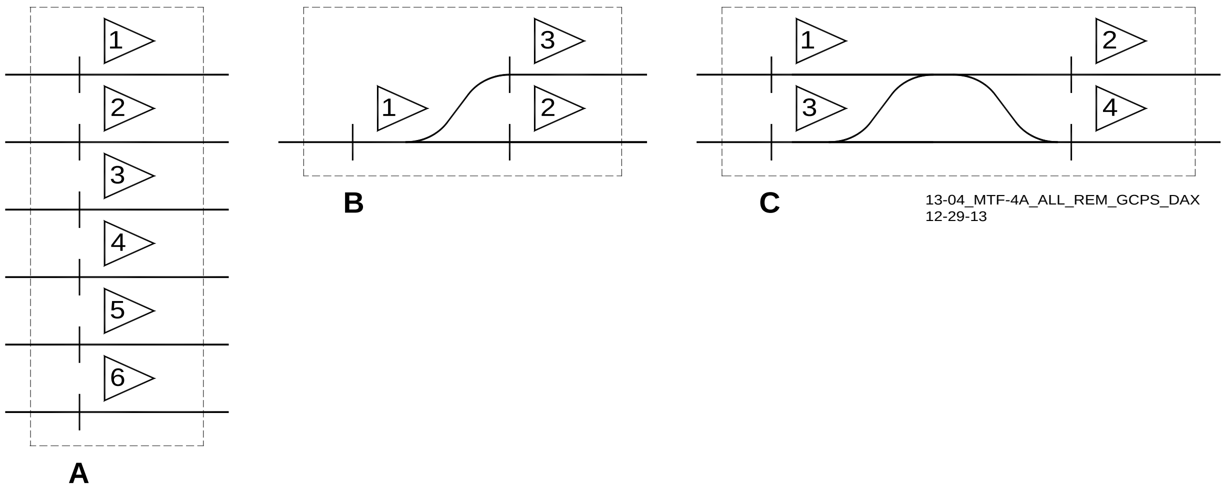


Figure 4-28:
Template 4A With All Remote GCPs DAXing

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 4-29A. In Figure 4-29B, 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.

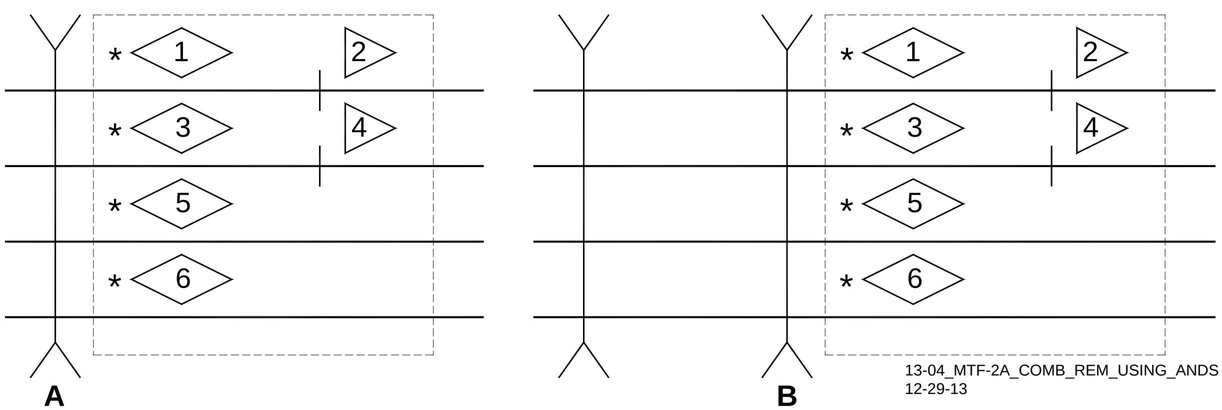


Figure 4-29:
Template 2A Combining Remotes Using ANDs

SECTION 5 – BASIC APPLICATION PROGRAMMING

5.1 INTRODUCTION AND OVERVIEW

NOTE

NOTE

Throughout this section, examples are given of programming parameters required for given applications. Except as otherwise noted in specific instances, all screens begin at the Display's Main Program Menu screen (PROGRAM VIEW > 3) GCP PROGRAMMING). All navigation will be given starting from this screen, and is shown as follows: [1 GCP AND ISLAND PROGRAMMING > "N") TRK"N": GCP AND ISLAND > 1) GCP FREQUENCY]. The lines below this path will discuss individual parameter programming steps.

The Model 5000 Grade Crossing Predictor (GCP) allows many application functions to be configured in software, 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 software routines. The software 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 5000 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 parameters to specific default values that best fit the particular template application layout, programs the Model 5000 GCP for the required functionality, and utilizes all applicable items of the Main Program Menu.

5.2 BASIC PREDICTION APPLICATIONS USING THE MODEL 5000 GCP

⚠ WARNING

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 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

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 5000 Grade Crossing Predictor is train detection and prediction. A general understanding of prediction is required to fully exercise Model 5000 GCP functionality. This section provides the required information for basic planning and programming of the Model 5000 GCP. Advanced planning and programming of Model 5000 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 Ethernet Spread Spectrum Radio (ESSR).

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 5000 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 5000 GCP functionality is also available that enables remote prediction from bidirectional GCP locations, providing that all hardware and software configuration criteria are met.

5.2.2 Remote Prediction Capability

Each Track Module of the 5000 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, as well as Bidirectional DAXing, if required. See Section 6, Advanced Application Programming for information on Bidirectional DAXing.

5.2.3.1 <u>Warning Time</u>

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

5.2.3.2 Predictor Input

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.

NOTE

> **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

5.2.3.3 Remote Prediction Via Ethernet Spread Spectrum Radio (ESSR) {533XX}

Data transfer between 5000 GCP and ESSR is hardwired via a powered Ethernet connection. There are four vital communication channels: Vital Comms Link 1 through Vital Comms Link 4. All active vital signals are transmitted via ESSR over one of these four 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.

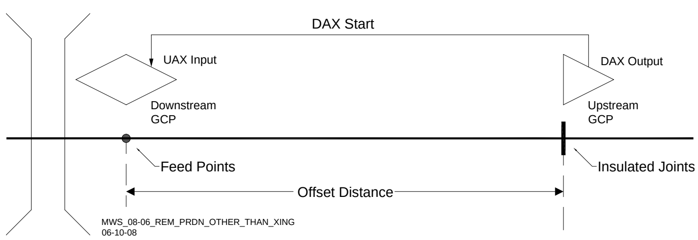


Figure 5-1:
Remote Prediction From A Remote Location Other Than A Crossing

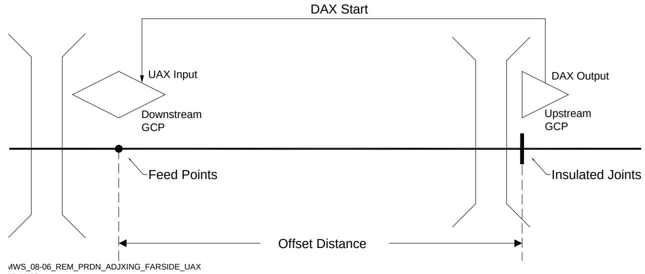


Figure 5-2:
Remote Prediction From An Upstream Crossing - Joints On Far Side

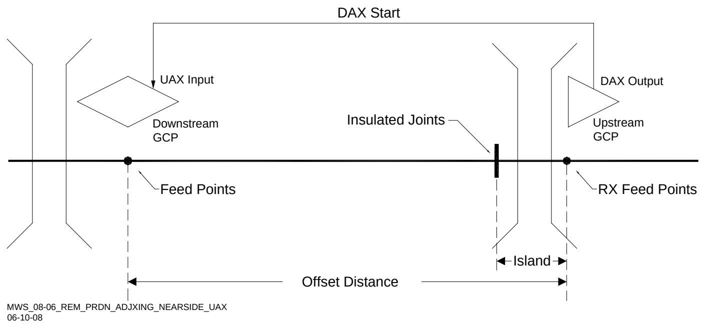


Figure 5-3:
Remote Prediction From An Upstream Crossing – Joints On Near Side

5.2.5 DAX Offset Distance

The distance between the crossing feed points and the remote 5000 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 to 3600 ft.(1097.3 m)
- DAX offset distance to 2200 ft. (670.6 m)
- DAX Approach distance to 3600 – 2200 to 1400 ft. (1097.3 – 670.6 to 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

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.

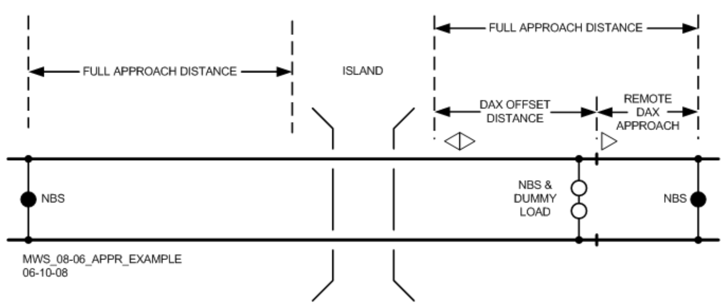


Figure 5-4:
Approach Example with DAX Offset and Remote DAX Approach Distances

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.

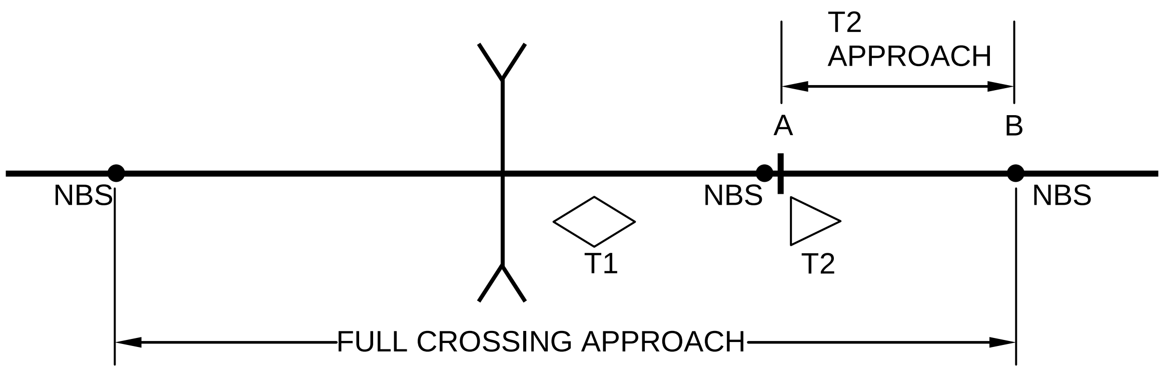


Figure 5-5:
Scenario 1, T2 Approach as Short as 500 Ft.

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.

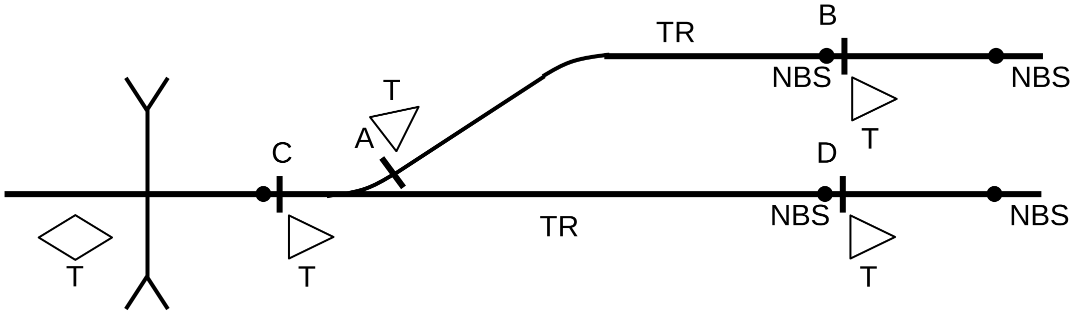


Figure 5-6:
Scenario B, T2 & T4 Special OS Application

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:

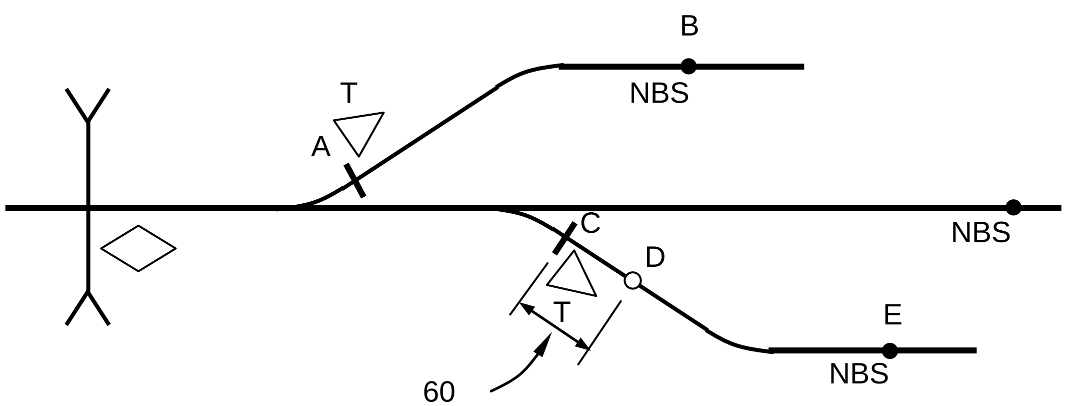


Figure 5-7:
T2 or T3 Less Than 1000 Ft.

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.

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.

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.

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 5000 GCP is programmed for DAX operation via the Display I. 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 parameters 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) When there is no island, set the Track X Island Connection parameter to No Islands.

Given the example in Figure 5-7, T2 is a remote unit and T2 DAX A is assigned. The following parameters 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 is generally selected to be 10 to 15 seconds longer than the 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

WARNING

THE FEED POINT 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

5.5.1 Examples of DAX operation include:

- DAX start from a remote location using two GCP cases (see Figure 5-8).
- DAX start from an adjacent crossing that has insulated joints (Figure 5-10)

5.5.1.1 DAX Start from a Remote Location, Two GCP Cases

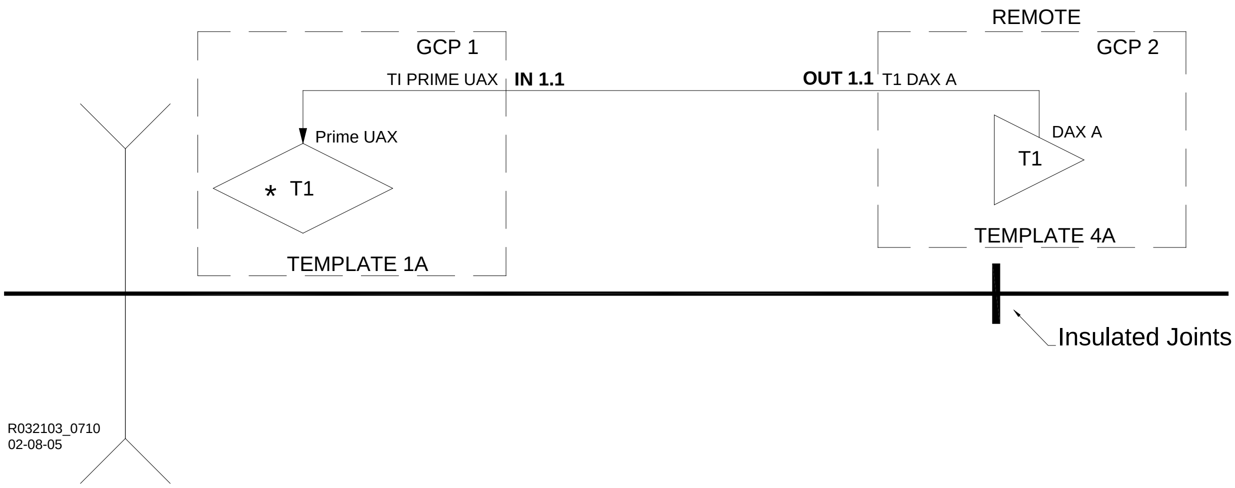


Figure 5-8:
DAX Start From Remote Location, Two GCP Cases

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 5-8 requires the following entries:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to 5 sec (or whatever the specified pickup delay value)
- On the **I/O: INPUT SLOT 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX**

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

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set DAX A Used to Yes
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set DAX A Warning Time to **35 sec** (or whatever the required warning time is)
  - Set DAX A Offset Distance to **349 ft**. (or whatever the measured distance is)
  - Set DAX A MS/GCP Mode to **Pred**
  - Set DAX A Pickup Delay to **15** (or whatever the required pickup delay is)
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T1 DAX A**

5.5.1.2 DAX Start from a Remote Location, Single GCP Case

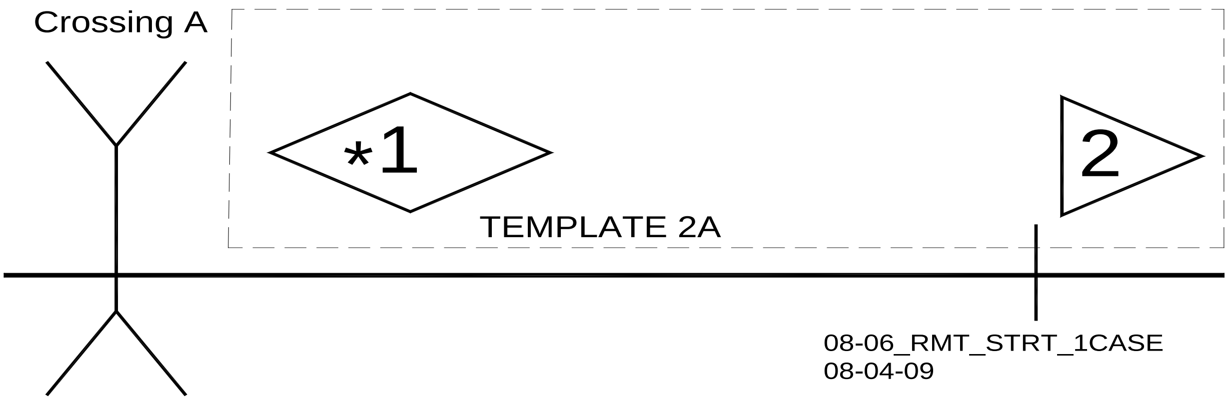


Figure 5-9:
DAX Start From Remote Location, Single GCP Case

- On the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PRIME]:
  - Set T2 Prime Offset Distance to **1350 ft** (Distance between T1 track wires and insulated joint at T2).

5.5.1.3 DAX Start from an Adjacent Crossing with Insulated Joints

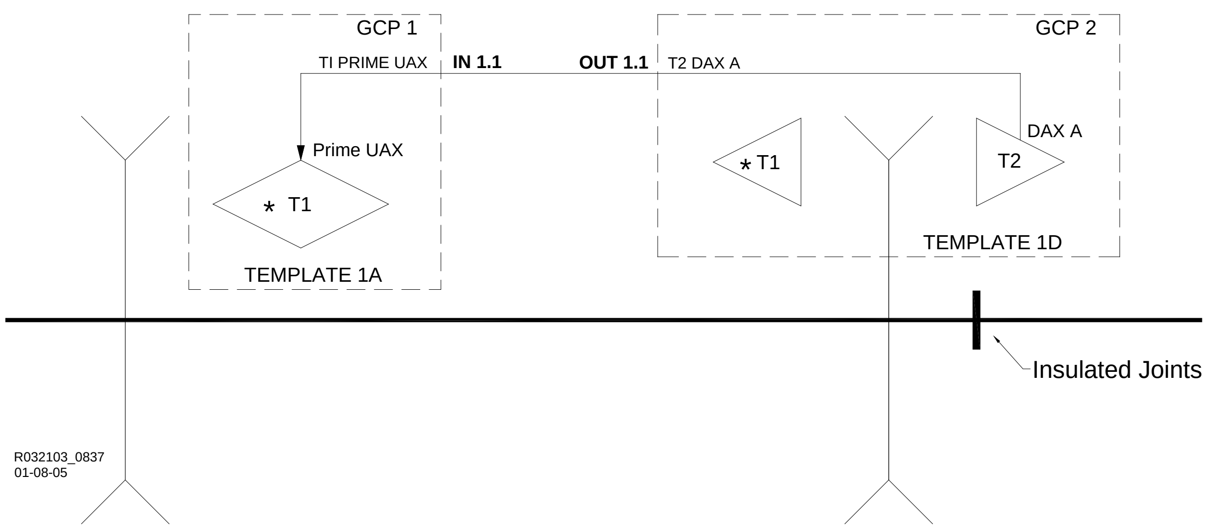


Figure 5-10:
DAX Start From Adjacent Crossing

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

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to **5 sec** (or whatever the required pickup delay is)

- On the **I/O: INPUT SLOT 1-2 screen** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX**

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

- On the PREDICTORS: track 2 screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to **Yes**
- Right arrow to the **Trk 2 Predictor: DAX A** screen
  - Set DAX A Warning Time to **35 sec** (or whatever the required warning time is)
  - Set DAX A Offset Distance to **99 ft.** (or whatever the required distance is)
  - Set DAX A MS/GCP Mode to **Pred**
  - Set DAX A Pickup Delay to **15** (or whatever the required pickup delay is)
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T2 DAX A**

5.5.2 Remote DAXing to Multiple Bidirectional Crossings

Remote prediction for two bidirectional crossings is shown in Figure 5-11. 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 parameters are individually programmed for each DAX start. Each Model 5000 GCP is individually programmed to provide the appropriate interface connections: physical inputs and outputs.

5.5.3 DAXing Between Crossings Separated by Insulated Joints

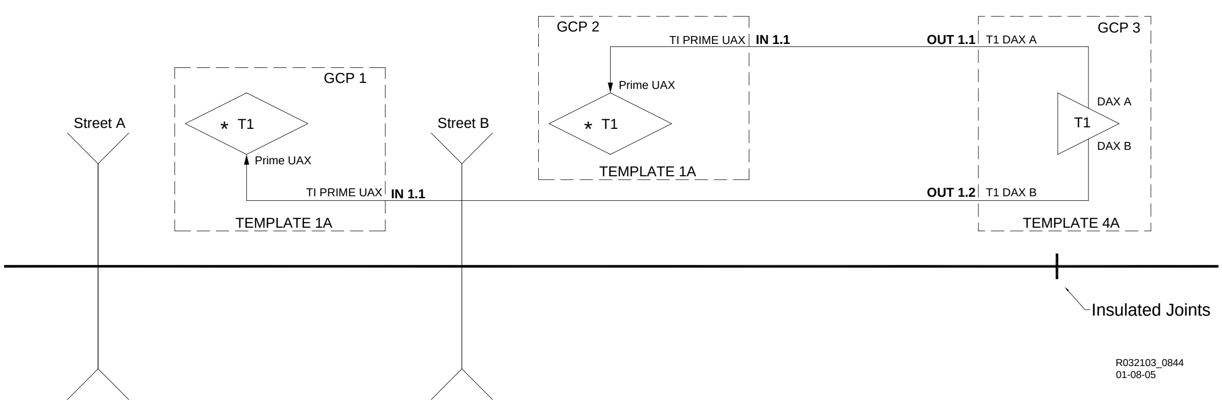


Figure 5-11:
Remote Prediction For Multiple Bidirectional Crossings

Remote prediction for two adjacent crossings where the crossings are separated by insulated joints is shown in Figure 5-12. A two-track Model 5000 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.

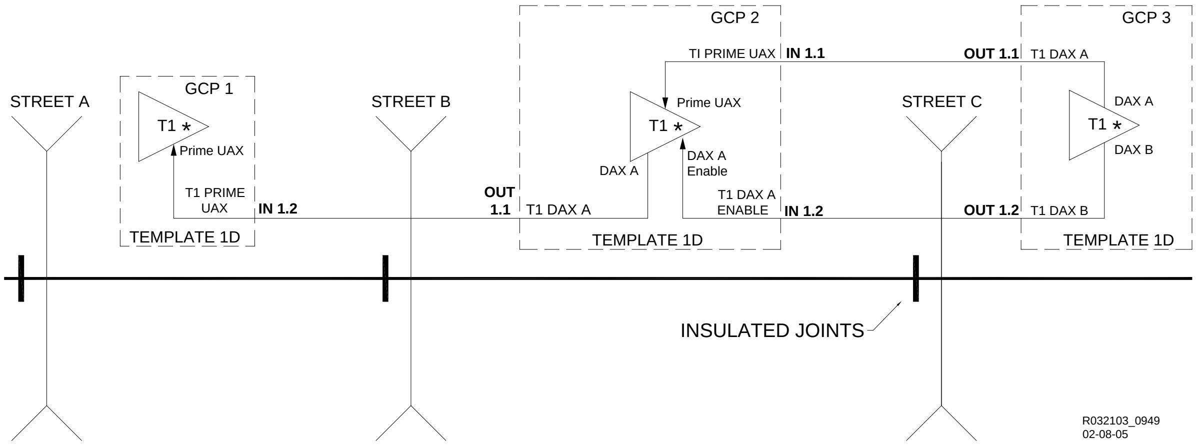


Figure 5-12:
Remote Prediction between Multiple Crossings Separated by Insulated Joints

Each Model 5000 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.

5.5.4 Remote GCP Operation in an OS Track

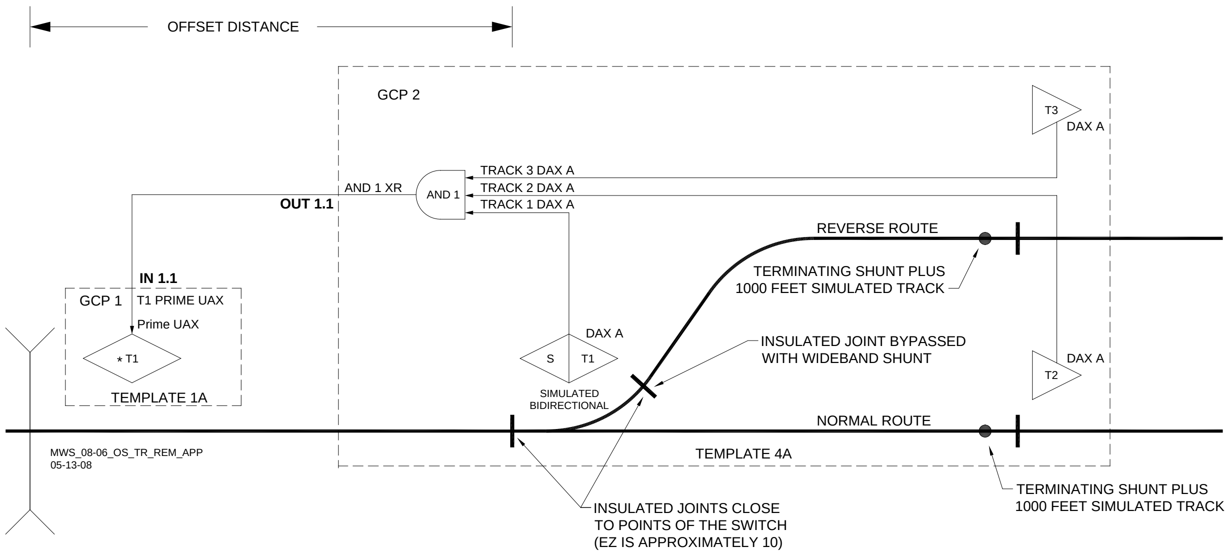


Figure 5-13:
OS Track Remote Prediction Application

WARNING

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

A track circuit contained within interlocking limits is commonly referred to as OS (on-station) track (see Figure 5-13).

5.5.4.1 Approach Configuration Requirements

WARNING

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

NOTE
Take the following factors into consideration when designing Model 5000 GCPs, inside and around an OS: • the proximity of the OS track to the crossing • the maximum train speeds through the OS track

In this example, all remote tracks are in one Model 5000 GCP unit. 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.

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 5-13).

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 re-peater 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 5-13 for a typical GCP and OS installation diagram.

5.6 ASSOCIATING ISLANDS WITH GCP TRACKS

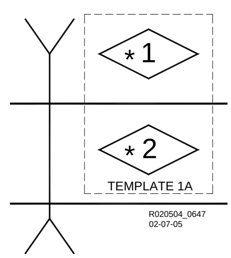


Figure 5-14:
Bidirectional Mode at Two-Track Crossing

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 5-14.

5.6.1 Island Association

Associating an Island to a GCP is always made using the program menus. To make a track association:

- On the **Trk "N": GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > "N") TRK "N": GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Island Connection to **Isl "N"**

If the 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 5-15 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.

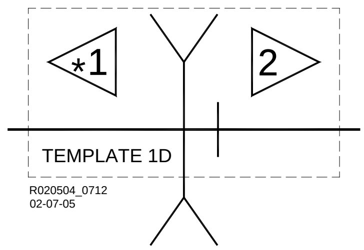


Figure 5-15:
Back-to-Back Unidirectional GCP Pair at A Crossing

When island 1 is occupied, it de-energizes both T1 and T2 prime predictors, which de-energizes the AND 1 XR function.

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 5-16. The island is located in the track module that looks through the street (Track 1 in Figure 5-16). Island 1 of track 1 is turned on and the Island for track 2 is turned off which is the default setting for unidirectional template applications.

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:

- On the **Trk 1: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Island Connection to **Isl 1**
- On the **Trk 2: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Island Connection to **Isl 1**

NOTE

NOTE

An island may be turned off by changing the corresponding **Island Used** field on the **Trk "N": Island Frequency** window from **Internal** to **No**.
Unless otherwise indicated as shown in Figure 5-15, all track modules shown are in the same Model 5000 GCP case as indicated by dashed line.

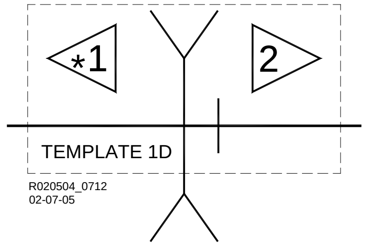


Figure 5-16:
Back-to-Back Unidirectional Configuration

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 5000 GCP, it can be assigned to any of the track, PSO, or RIO outputs.

5.6.2.3 Island Parameter Selection

Use the **Trk"N": Island Frequency** menus to select the following parameters 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.

5.6.2.3.1 Island Frequencies

The Island Frequencies depicted in Table 5-1 are available with the Model 5000 GCP.

Table 5-1:
Model 5000 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 5000 GCP, such as a DC island, designate the corresponding **Island Used** as **External**. Assign the input as **Isl 1 Enable**. The LOS pickup delay for an external island is set using the **Isl 1 Enable Pickup Delay** entry of the corresponding **Trk "N": Island Frequency** window. Configuration range: 0 to 6 seconds.

- On the **Trk 1: Island Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 ISLAND FREQUENCY]:
  - Set +Island Used to **External**
  - Set Isl 1 Enable Pickup Delay to value specified in approved drawing or plan.
- On the **I/O: INPUT SLOT 1-2 screen** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Isl 1 Enable**

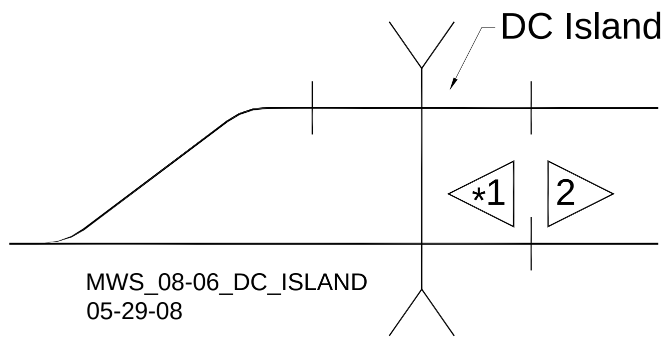


Figure 5-17:
External Island Example

NOTE

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 runs and expires.

NOTE

NOTE

If bidirectional approaches are used, Positive Start is active for both directions of train traffic.

For uni-directional applications, on the the Positive Start option “**Positive Start Offset”** is available:

- On the **Trk 1: Positive Start, Low EZ** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 5) POSITIVE START]:
  - Set Positive Start to **On** or **Timed**

When Positive Start is set to ON, two parameters are available: Positive Start Level and Positive Start Offset. When Positive Start is set to TIMED, one additional value, Positive Start Timer is enabled.

Positive Start Offset 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 runs and expires.

NOTE

NOTE

If the crossing is very 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.

NOTE

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 on the **Trk “N” Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING> “N”) TRK “N”: GCP AND ISLAND3) PREDICTORS]. This function with new software is now 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). The Switch MS EZ level does not affect the DAX on a reverse train move.

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 after 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

To enable MS Restart:

- On the **MS Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart Used to **Yes**.

When the MS restart function is enabled three additional fields display within the window:

5.8.3.1 MS/GCP Restart all Trks

- 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 MS/GCP Timer Used

- 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 after 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.

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.

5.8.4.1 MS/GCP Restart EZ level

- 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, set the Restart EZ level to between 5 and 10.

5.8.4.2 Prime Switch to MS

- This field allows selection of the predictor to be switched to motion sensor operation when a train stop is detected.

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.

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 5000 cases.
- Option 3C has a station stop in the remote approach and the crossing and remote units are in the same 5000 case.

5.8.5.1 Option 3A: Station stop is in the crossing approach

To program MS restart operation: Select the MS restart function parameter. Select track predictors to be affected by the restart timer parameter. See Figure 5-18 for the corresponding track configuration.

NOTE

NOTE

The Restart EZ level for the station stop 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.

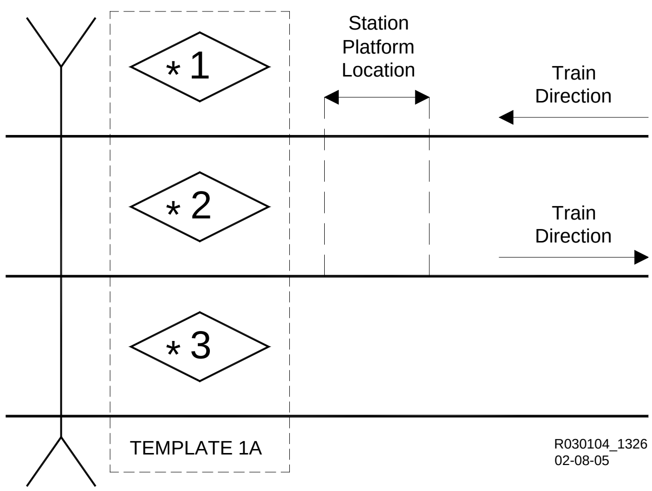


Figure 5-18:
MS Restart Track Configuration

For the track configuration shown in Figure 5-18, 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**. MS restart timer affects only tracks 1 and 2 so the **Prime Switch to MS** for track 3 is set to **No**.

- On the **MS/Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart All Trks to **No**.
- On the **Trk 3: MS Control** screen [2) GCP AND ISLAND PROGRAMMING > 3) TRK 3: GCP AND ISLAND > TRK 3: MS CONTROL]:
  - Set Prime switch to MS to **No**
- On the **MS Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart Used to **Yes**.

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.

5.8.5.2 Option 3B MS Restart for a Station Stop in Remote Approach (Separate 5000 cases)

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 5000 Unit

For the track configuration shown in Figure 5-19, the switch to motion sensor restart option should be selected for both the GCP at the Remote and at the crossing.

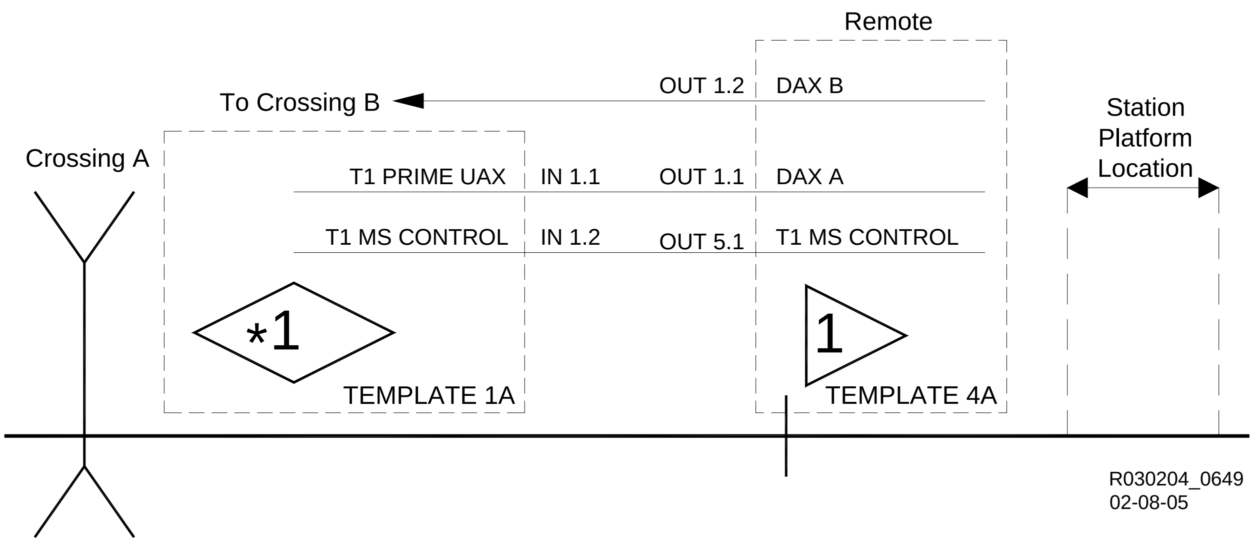


Figure 5-19:
Remote MS Restart for Crossing A

In this example, Crossing B is considered far enough away that it does not require the switch to MS operation.

Remote GCP Programming Screens

To select the switch to MS option, program the remote for Restart operation.

Three remote output signals are required to implement the track configuration shown in Figure 5-19. To obtain the third output, install a RIO module in the Track 5/RIO 2 Slot of the remote Model 5000 GCP. After installing the RIO module, assign **RIO** to Track 5/RIO 2 Slot.

Predictors and MS Controls are assigned to the three remote outputs

- On the **Module Selection** screen [1) BASIC CONFIGURATION > 2) MODULE SELECTION]:
  - Set Track 1/PSO 1 Slot to **Track**
  - Set Track 5/RIO 2 Slot to **RIO**
- On the **MS/Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart to **Yes**.
  - Set MS/GCP Restart All Trks to **No**
  - Set MS/GCP Timer Used to **Yes**
  - Set MS/GCP Restart Time to **3 min**
- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to Yes
  - Set DAX B Used to Yes
- Right arrow to the **Trk 1 Predictor: DAX A** screen
  - Set DAX A Predictor Mode to **Fixed**
  - Set DAX A Pickup Delay to **10 sec**
- On the **Trk 1: MS Control** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > TRK 1: MS CONTROL]:
  - Set Dax A switch to MS to **Yes**
  - Set Dax B switch to MS to **No**
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T1 DAX A**
  - Set OUT 1.2 to **T1 DAX B**
- On the **I/O: Output Slot 5-6** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 3) I/O: OUTPUT SLOT 5-6]:
  - Set OUT 5.1 to **T1 MS Ctrl OP**

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 DAX A pickup delay to 10 sec.

The DAX B may remain in AUTO mode with a 15 second pickup delay since it does not switch to motion sensing

5.8.5.2.2 Programming MS Restart for the Crossing 5000 Unit

Set the following parameters for the track configuration shown in Figure 5-19.

Crossing GCP Programming Screens

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set Prime UAX to **Yes**.
- Right arrow to the **Trk 1: MS Control** screen
  - Set MS/GCP Ctrl IP Used to **Yes**.
- On the **I/O: INPUT SLOT 1-2 screen** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX**
  - Set IN 1.2 to **T1 MS Control**

Program the crossing A motion restart function as follows:

- On the **MS/Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart to **Yes**.
  - Set MS/GCP Restart All Trks to **No**
  - Set MS/GCP Timer Used to **Yes**
  - Set MS/GCP Restart Time to **3 min**
- On the **Trk 1: MS Control** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > TRK 1: MS CONTROL]:
  - Set MS/GCP Restart EZ Level to **80**
  - Set MS Sensitivity Level to **50**
  - Set Prime switch to MS to **Yes**

The crossing Restart Timer is generally set for the same time as the remote Restart Timer (in this case 3 minutes).

NOTE

NOTE

If there are switching moves in the crossing approach, the Restart EZ level for the crossing in the example above 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 Trk 1: MS Control 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 5-19, 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. 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.

5.8.5.2.3 Continuous Activation Option for Station Stop in the Remote (crossing and remote in separate 5000 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:

- On the **MS/Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart to **No**.
- On the **I/O: INPUT SLOT 1-2 screen** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX**
  - Set IN 1.2 to **T1 Prime UAX**
- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set Prime UAX Pickup to **30** seconds

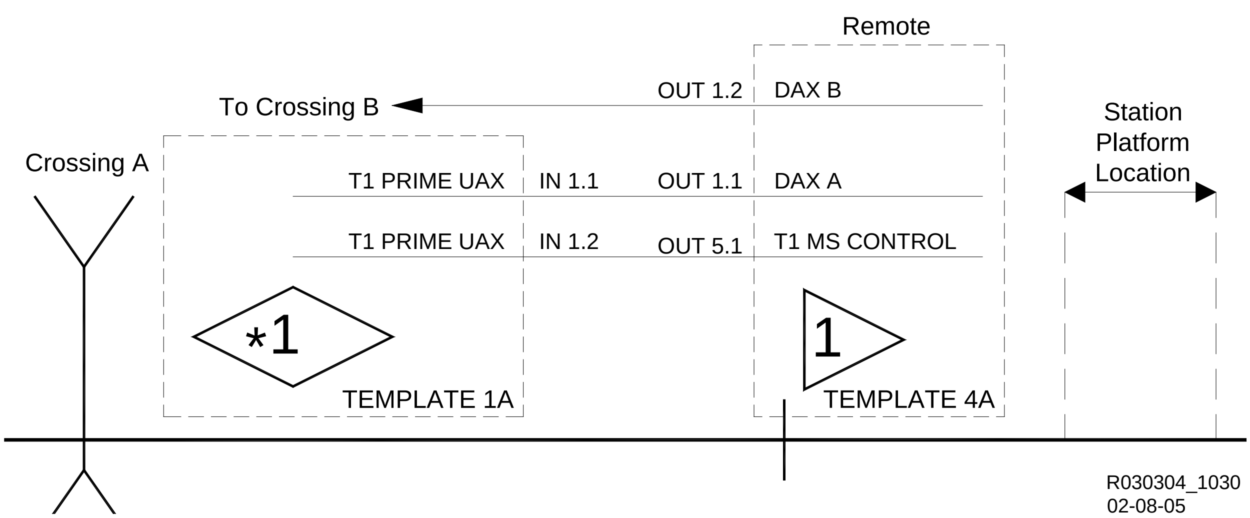


Figure 5-20:
Continuous Crossing Activation

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 after 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.
- After 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 Option 3C: MS Restart for a Station Stop in Remote Approach (crossing and remote are in same 5000 case)

When remote predictors are in the same Model 5000 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 5-21 the switch to motion sensor restart option when selected will operate in both the Remote T2 and the crossing T1 modules.

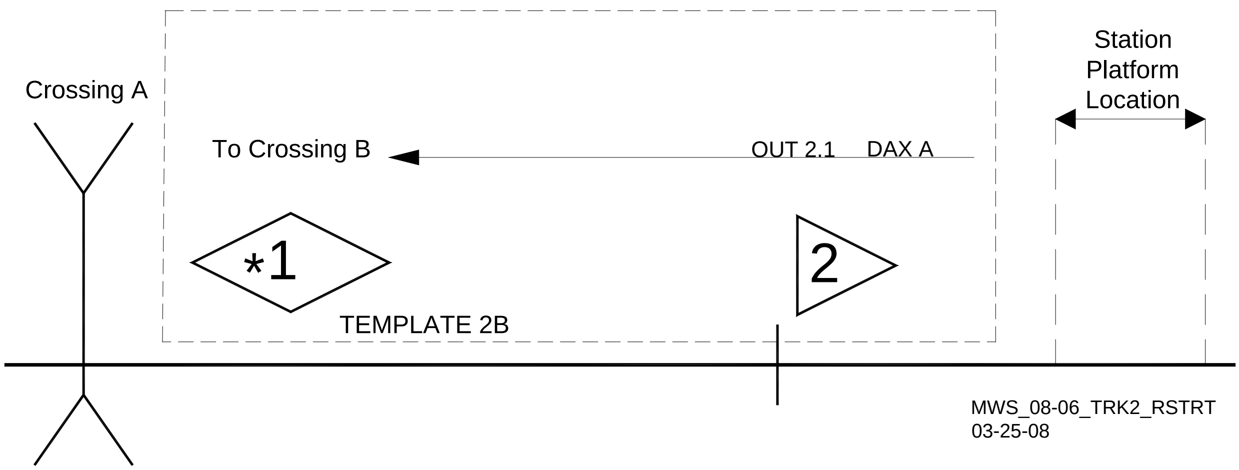


Figure 5-21:
Remote MS Restart (Crossing and Remote in the Same 5000 Case)

Figure 5-21 is the same application as shown in Figure 5-19 of option 3B, except the crossing and remote modules are in the same 5000 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 described:

NOTE

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.

- On the **MS/Restart** screen [1) BASIC CONFIGURATION > 4) MS/RESTART]
  - Set MS/GCP Restart to **Yes**.
  - Set MS/GCP Restart All Trks to **No**
  - Set MS/GCP Timer Used to **Yes**
  - Set MS/GCP Restart Time to **3 min**

The configuration in the above situation that only one output signal is required.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T2 DAX A** (connected to input at Crossing B)
- the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PRIME]:
- Set Prime Pickup Delay to **10 sec**
  - 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.

5.8.6 Restart Switch to Motion Sensor programming for crossing T1 Unit

To program crossing A track 1 to respond to the remote **T2 MS/GCP Ctrl** output

- On the **Trk 1: MS Control** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > TRK 1: MS CONTROL]:
- Set MS/GCP Ctrl IP Used to **Yes**.

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 the T1 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 below

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set Prime UAX to **IP**
  - Set Prime UAX Pickup to **30 sec**
- On the **Trk 1: MS Control** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > TRK 1: MS CONTROL]:
  - Set the MS Sensitivity Level to **50**.

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.

Program the Internal I/O between T2 and T1 as shown below

- On the **Logic: Internal I/O** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:

- Set Int.1 Sets to **T1 MS control**
- Set Int.1 Set by to **T2 MS Ctrl OP**
- Set Int.2 Sets to **T1 Prime UAX**
- Set Int.2 Set by to **T2 Prime**

NOTE

NOTE

The I/O connection status may be viewed in the field by doing the following:

- Select the BACK Button until PROGRAM VIEW is visible, then left arrow to IO & LOGIC VIEW > 1 LOGICAL VIEW > 3) INTERNAL STATES
- The **Internal States** screen reports the status of each programmed internal logic state.

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:

- On the **Logic: Internal I/O** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.3 Sets to **T2 Prime UAX**
  - Set Int.3 Set by to **T2 MS Ctrl OP**

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 after 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.
  - After 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 after 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. 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.

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

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 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
- 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 Sudden Shunt Detection can both be used to provide the quickest crossing activation possible.

5.8.9 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.

When Low EZ Detection Used is set to **Yes**, the **Trk 1: Low EZ Detection** screen is enabled. The screen controls four parameters

- 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.

5.8.9.1 <u>Low EZ Detection Level</u>

- This sets the threshold level for low EZ detection. It is generally set at the default level of 70 for most applications.

5.8.9.2 <u>Low EZ Detection Time</u>

- 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.

5.8.9.3 <u>Low EZ Detection Effect</u>

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.

5.8.9.4 <u>Low EZ Detection Override IP</u>

The valid range of entries in the Low EZ Detection Override IP are No and Yes. The default setting is **No**.

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 after 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.

To utilize the Low EZ Detection Override IP

- On the **Trk1: Positive Start, Low EZ** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 5) POSITIVE START]:
  - Set the Low EZ Det Override IP field to **Yes.**
- On the **I/O: INPUT SLOT 1-2 screen** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Low EZ Override**

5.8.10 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 5-22. 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.

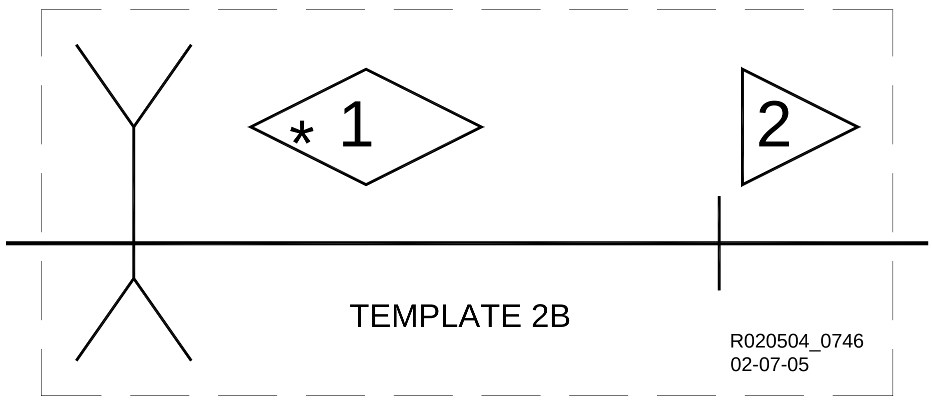


Figure 5-22:
Track application

The sudden shunt option allows the user to configure the crossing unit so that the prime predictor (zero offset) and optionally DAXes will 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 after 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.

Set the Sudden Shunt function as follows:

- On the **Trk1: Positive Start, Low EZ** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 5) POSITIVE START]:
  - Set the Sudden Shunt Det Used field to **Yes.**

When the Sudden Shunt function is enabled, two additional fields display within the window

- Sudden Shnt Det Level (EZ level)
- Sudden Shnt Det Offset (in ft.)

5.8.10.1 Track 1, Sudden Shunt Det Level

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 points 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 detection EZ level configuration setting is from an EZ of 5 to 75

5.8.10.2 Track 1, Sudden Shunt Detector Offset:

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

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.

5.8.11 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:

- On the **Trk 1: GCP Miscellaneous** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 8) GCP MISCELLANEOUS]:
  - Set False Act on Train Stop to **Yes**.

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.

5.9 PROGRAMMING FOR POOR SHUNTING OPERATION (ENHANCED DETECTION)

The Model 5000 GCP provides for advanced poor shunting logic. These parameters are found on the **Trk 1: Enhanced Detection** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 4) ENHANCED DETECTION]:

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 Predictn (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 5000 GCP in areas where poor track shunting conditions may occur. Inbound PS Sensitivity is template defaulted to **High**.

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.

When Inbound PS detects a poor shunting event, the associated Track Module:

- Immediately causes all predictors de-energize 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

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 OR AT LOCATIONS WHERE POOR SHUNTING HAS BEEN OBSERVED IN THE PAST.

5.9.4 Speed Limiting Used

This is a feature that is very useful when poor shunting or track related discontinuities occur in EZ.

On the Model 5000 GCP, an additional highly sensitive motion detection operation is 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 Adv Appr Predictn is set to Yes, a new screen, **Trk 1: Adv Appr Prediction**, is activated. It displays the following parameters:

- 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

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.

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 Outbound PS Timer

It is template defaulted to 20 seconds. The range is 10 to 120 seconds. It requires reprogramming only if tail rings occur after an outbound train stops in the GCP approach and then continues outbound.

5.9.6.3 Trailing Switch Logic

Trailing Switch Logic 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.

5.9.7 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.

5.9.7.1 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. 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.

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 controls discussed above, there are four additional new submenus. They are:

- False Act on Train Stop
- EX Limiting Used
- EZ Correction Used.
- Warn Time-Ballast Comp

5.9.7.2 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.

5.9.7.3 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**.

5.9.7.4 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 **System View** screen, selecting the desired track by entering the track number or scrolling to the desired track and pressing **Enter** and selecting **1) Detail View**. Observe the parameter **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.

5.9.7.5 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.

5.10 EXTERNAL CROSSING CONTROLLERS

An external crossing controller may be used with the Model 5000 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 5000 GCP must be assigned to an external output.

- 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.

5.10.2 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 SSCCIIIA, SSCCIII+, or an SSCCIV 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:

- On the **SSCC 1 Extended Parameters** screen [5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION > SSCC 1 CONFIGURATION > 1) SSCC 1 EXTENDED PARAMETERS]:
  - Set Aux-(1) Xng Ctrl Used to **Yes**
  - Set Aux-(1) Xng Ctrl Hlth IP to **Yes**

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.** To assign these I/O:

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **Aux-1 Lmp Control**. Connect this output to the appropriate gate position input of the external crossing controller.
- On the **I/O: INPUT SLOT 1-2 screen** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Aux-1 Xng Ctrl Hlth**. 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 5000 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

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.

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

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 5000 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 5000 GCP if:

- An unhealthy state is detected within any module in the case
- The battery on the crossing controllers is low
- The CPU detects a low battery condition

User specific SEAR application program can have special provisions and can also customize the operation of the Maintenance Call output

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:

- On the **Logic Controls** screen [3) LOGIC PROGRAMMING > 4) LOGIC CONTROLS]:
  - Set Maint Call Rpt IP Used to **Yes**
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **Aux-1 Lmp Control**. Connect this output to the appropriate gate position input of the external crossing controller.

- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Aux-1 Xng Ctrl Hlth**. Connect this input to the gate output of the external Connect this output to the **CROSSING CONTROL INPUT** of the external crossing controller as shown in Figure 5-23.
- On the **I/O: Input Slot SSCC 1** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT SSCC 1]:
  - Set IN 7.1 to **Maint Call Rpt IP**. Connect this input to the **MAINT CALL** output of the external crossing controller as shown in Figure 5-23.
  - Set IN 7.3 to **AUX-1 Xng Ctrl Hlth**. Connect this input to the **1 GC** output of the external crossing controller as shown in Figure 5-23.
- Connect the **FLASH SYNC** output of the GCP to the **FLASH SYNC I/O** of the external crossing controller as shown in Figure 5-23.
- With this configuration the state of the external equipment is reflected in the maintenance call output of the Model 5000 GCP.

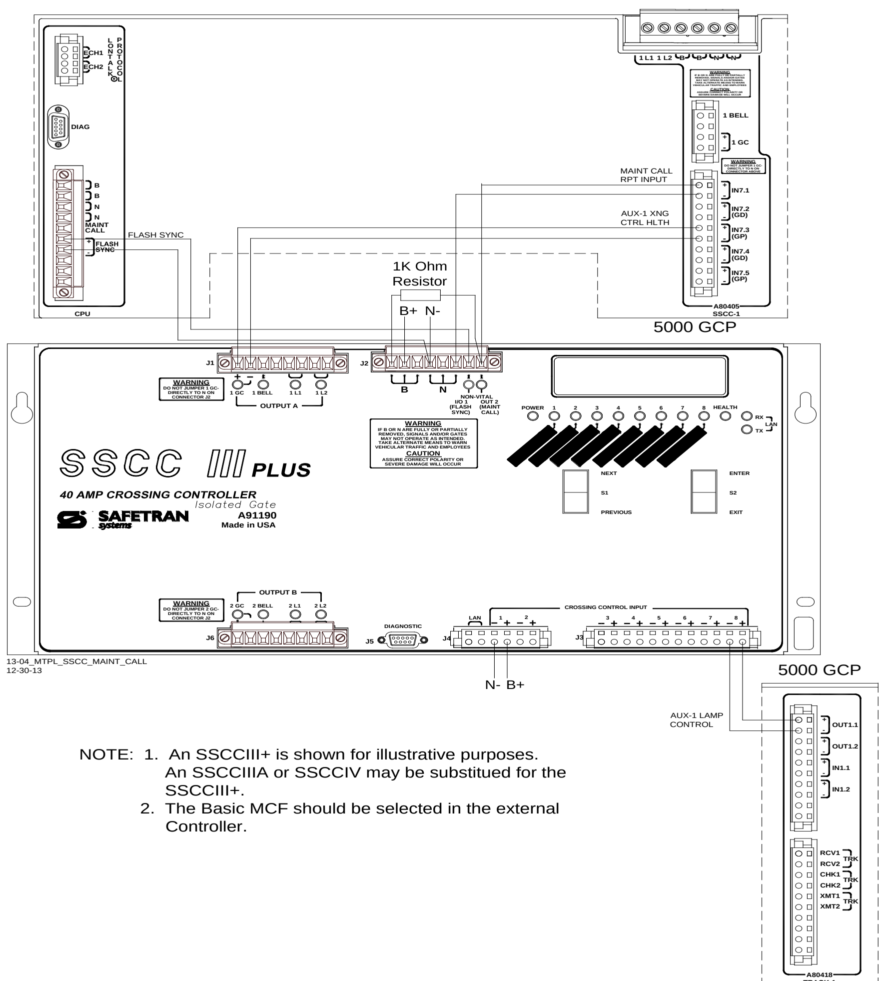


Figure 5-23:
Connection Between Model 5000 GCP and External SSCC For Additional Lamp Load

5.12 TAKING TRACKS "OUT OF SERVICE"

WARNING

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

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)
- 5000 Case OOS IP (5000 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:

- On the **Out of Service** screen [1) BASIC CONFIGURATION > 6) OUT OF SERVICE].
  - The green text field to the right of **OOS Control**.

NOTE

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 after a user configurable timer runs out.

5.12.1.1 <u>The "Display" Option</u>

To take a track Out of Service when using the "Display" option:

- Scroll to the **System View** screen,
  - Select the desired track by scrolling up or down and selecting ENTER or simply enter the number on the left of the screen
  - On the Track 1 Options screen, Select **6)Out of Service**
  - On the Track 1 Options screen, select **1) GCP**
  - On the Track 1 GCP Out of Service screen, select **1) Take Track "N" GCP Out of Service**
  - On the Information screen, press **ENTER** to Confirm and Continue or Press **Back** to Cancel Request.
  - On the Track 1 Options screen, select **2) Island**
  - On the Track 1 GCP Out of Service screen, select **1) Take I "N" ISL Out of Service**
  - On the Information screen, press **ENTER** to Confirm and Continue or Press **Back** to Cancel Request.

The OOS display that appears provides buttons that enable the track and the island to be taken out of service separately. The user is prompted to be sure that the track/island is to be taken out of service.

5.12.1.2 <u>The "Display" Timeout Option</u>

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 or the **OOS Timeout** timer runs out.

To be used, the **OOS Timeout** feature must be set to **Yes** and time set prior to taking a track OOS. If the **OOS Timeout** feature is not to be used, it must be set to **No** and the timer function disabled.

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 System View screen, the end of the track status area continuously a flashes dark gray and blue field with **OOS** (Out **Of Service)** beings indicated.

5.12.1.2.2 Display Out Of Service Operation Explained

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 System View screen as a red triangle with a white exclamation point visible. OOS tracks do not turn red when in failure. Failure types and causes can be reviewed by selecting the DIAG function. 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 the Model 5000 GCP 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

WARNING

AT CROSSINGS USING SSCC MEF XNG02_0.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

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. No change to XR wiring on the 5000 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

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 <u>“Display+OOS IP” (Display Plus Out Of Service Input)</u>

This OOS programming option operates identical to the **Display** programming option described above with the additional requirements and features described in the following paragraphs.

⚠ WARNING

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. Maintenance call light is turned off when:

- any track is out of service
- OOS input is energized, even if no tracks are OOS.

5.12.1.3.2 Additional Programming Option

With the **Display+OOS IP** programming option selected, 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 or to assign one physical input for OOS control of grouped (multiple) tracks.

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.

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.

5.12.1.4 “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

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, 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,
- Assign one physical input for OOS control of multiple tracks (groups) 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.

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 5000 GCP switches over between MAIN and STANDBY, any OOS track will continue OOS once the 5000 has completed switchover and modules have booted.

NOTE

> **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

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 System View Screen continuously flash dark gray to blue while displaying either **OOS** or **GCP-ISL Out Of Service.** All track module predictor outputs remain energized. Predictor inputs are ignored (such as UAX, DAX Enables).

OOS track module failures and corresponding rail failures are ignored. Any failures are indicated on the System View 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 scrolling to the **DIAG** 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 5000 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

> **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).
- Assign inputs to only the OOS Inputs that are allowed to be taken out of service
- 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.

5.12.1.5 "5000 CASE OOS IP" Option

This option takes all track modules and the 5000 case OOS when the **5000 CASE OOS IP** input is energized.

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 5000 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 a Model 5000 GCP is switched over between MAIN and STANDBY, all OOS tracks will continue OOS once the Model 5000 GCP has completed switch-over and modules have booted. No timeout option is available

NOTE

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

NOTE

NOTE

Due to a known software issue, the parameter "4000 Case OOS IP" lists a Model 4000 GCP case rather than a Model 5000 GCP case. This will be corrected in a later software release.

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. Do NOT assign inputs to the **4000 Case OOS IP**. Ensure that **Not Used** is selected rather than **4000 Case OOS IP.**

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 5000 track circuits.

- In the **Module Select** screen [1) BASIC: CONFIGURATION > 2) MODULE SELECT]:
  - Set the Track modules to Not Used
- On the **Logic: Track ANDing** screen [3) LOGIC PROGRAMMING > 1) LOGIC: TRACK ANDING]:
  - 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
- On the **I/O: INPUT SLOT SSCC 1** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT SSCC 1]:
  - Set IN 7.1 to **AND 1 XR Enable** Connect a contact of the existing XR relay to that input

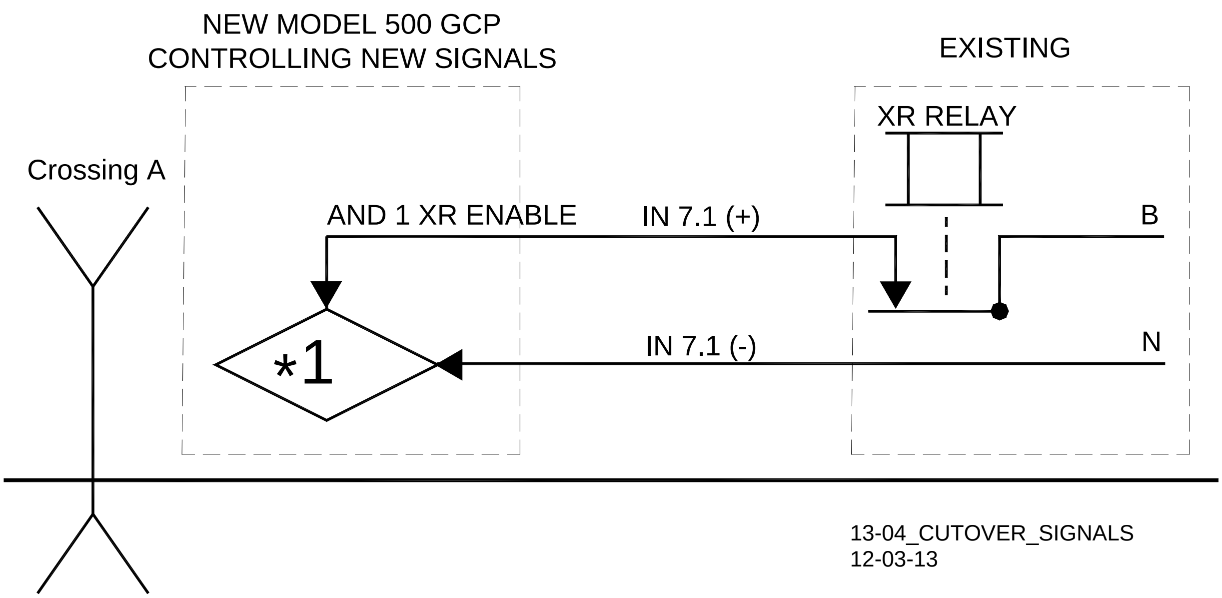


Figure 5-24:
New Warning Devices and SSCCIIi
Controlled by Existing Train Detection

5.13.2 Cutting over the new GCP track circuits controlling the existing warning devices

In this situation, an output from the new 5000 GCP is needed to control the existing XR circuit.

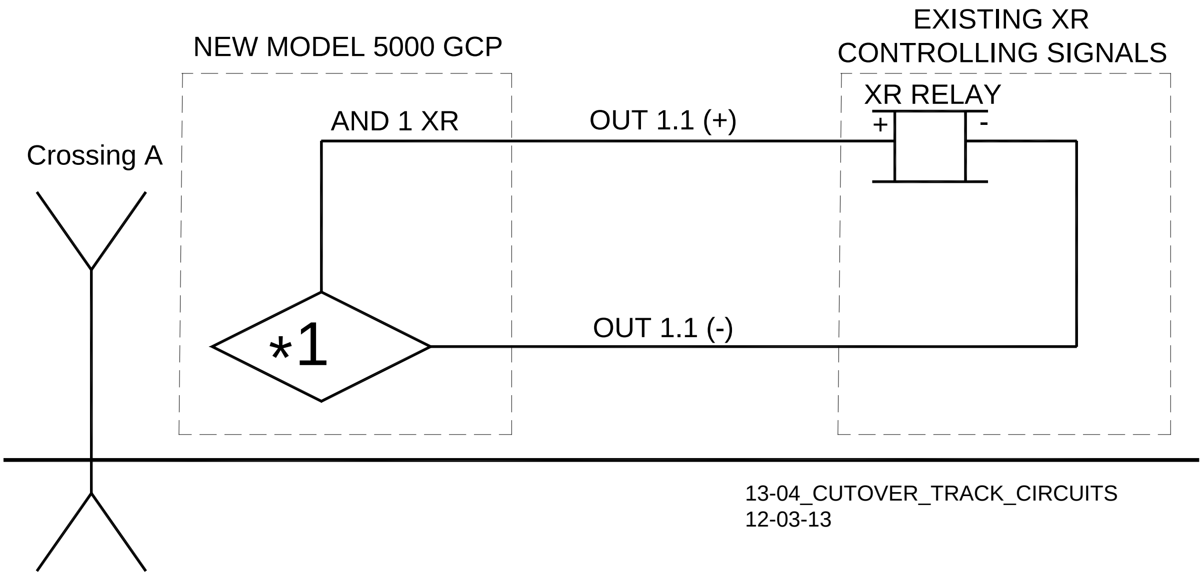


Figure 5-25:
New Model 5000 GCP Track Circuits
Controlling Existing Warning Devices

- In the **Module Select** screen [1) BASIC: CONFIGURATION > 2) MODULE SELECT]:screen
    - Set the Track modules to Not Used
- On the **I/O: OUTPUT SLOT 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT SSCC 1]:
    - Set OUT 1.1 to **AND 1 XR.** Connect a contact of the existing XR relay to that input

In the Basic: Module Configuration screen set the SSCC-‘n’ modules to Not Used.

In the I/O: Output Slot 1-2 screen, set an output to AND 1 XR. Connect the existing XR relay to that output.

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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 5000 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 5000 GCP can be configured to AND different track predictors internally to a physical output, instead of using external AND gates or relays. The Model 5000 GCP provides twelve configurable AND functions:

- AND 1 XR
- AND 2 through AND 4

The AND 1 XR function controls the local crossing. It is equivalent to the XR relay. If the Model 5000 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 Model 5000 GCP system. Additionally, AND 1 XR along with ANDs 2 through 4, allow specific ANDing of track predictors. (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

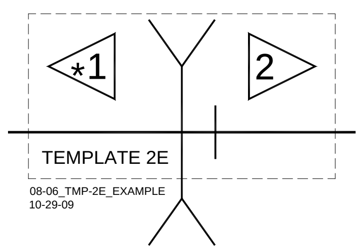


Figure 6-1:
Back-to-Back Unidirectional GCP Pair at a Crossing

The follow examples show how to program 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 and the corresponding track configuration is shown in Figure 6-2.

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
  - Set AND 1 XR Track 3 to **Prime**
  - Set AND 1 XR Track 4 to **Prime**
  - Set AND 1 XR Track 5 to **Prime**

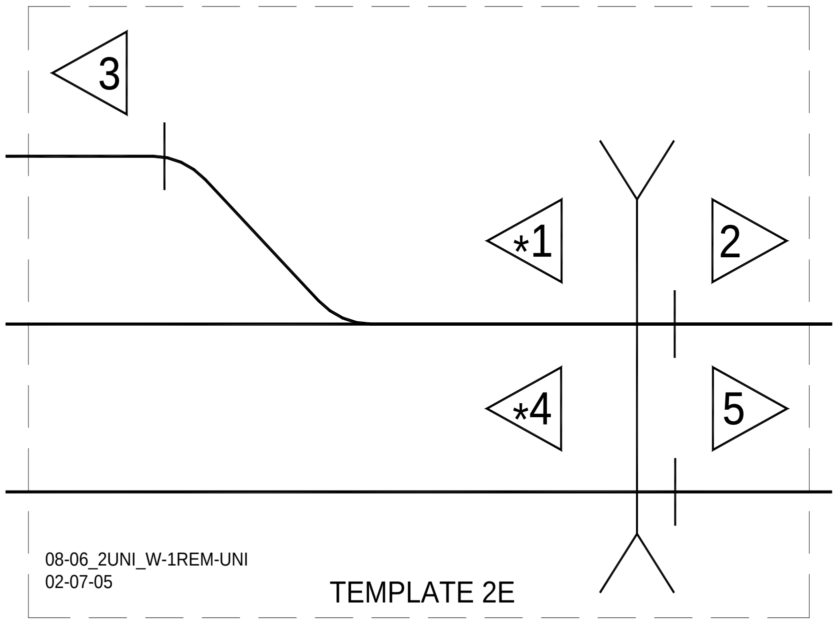


Figure 6-2:
Two Unidirectional Pairs at Crossing with Single Remote Unidirectional

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 6-3, 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.

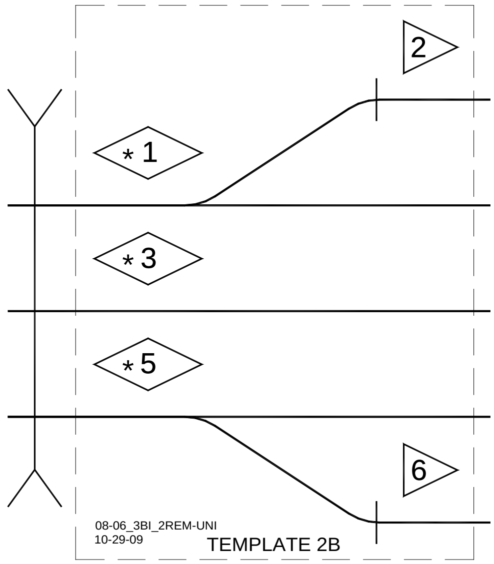


Figure 6-3:
Three Bidirectional at Crossing with Two Remote Unidirectional

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 below).

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
  - Set AND 1 XR Track 3 to **Prime**
  - Set AND 1 XR Track 4 to **Prime**
  - Set AND 1 XR Track 5 to **Prime**
  - Set AND 1 XR Track 6 to **Prime**

NOTE

NOTE

When remote tracks are combined with tracks at the crossing out of the same Model 5000 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 5000 case.

6.1.2.3 Example 3: Local and Remote Track Modules Predicting For Local and Adjacent Crossings

In Figure 6-4, **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.

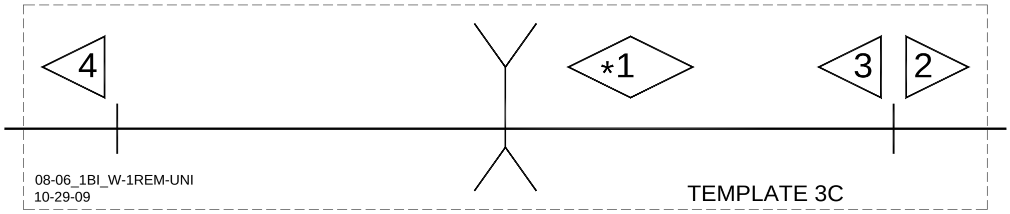


Figure 6-4:
Single Bidirectional at Crossing with Remote Unidirectional

This configuration is implemented by changing **AND 1 XR Track 3** to **Not Used** as below

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
  - Set AND 1 XR Track 3 to **Not Used**
  - Set AND 1 XR Track 4 to **Prime**

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

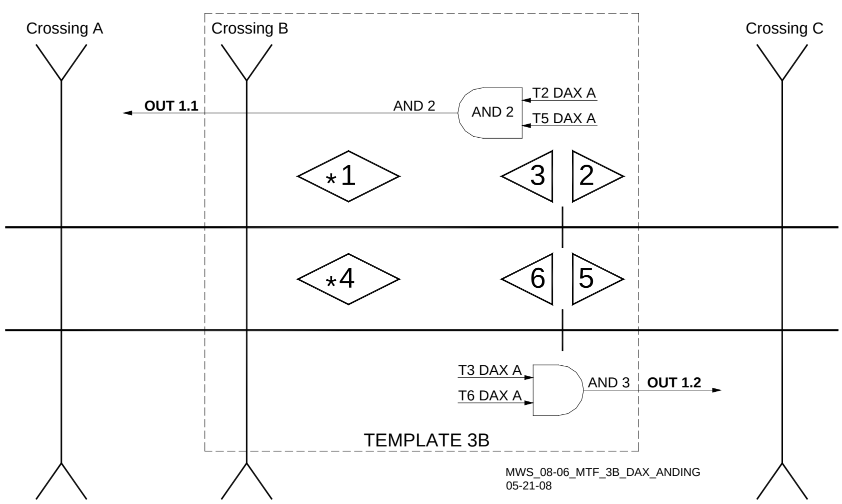


Figure 6-5:
ANDing DAX Predictors For Three Adjacent Crossings

- On the **Logic: AND 1 XR Used** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING]:
  - Set AND 1 Used to **Yes**
  - Set AND 2 Used to **Yes**
  - Set AND 3 Used to **Yes**
  - Set AND 4 Used to **No**

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
  - Set AND 1 XR Track 3 to **Not Used**
  - Set AND 1 XR Track 4 to **Prime**
  - Set AND 1 XR Track 5 to **Prime**
  - Set AND 1 XR Track 6 to **Not Used**
- On the **Logic: AND 2** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 2]:
  - Set AND 2 Track 1 to **Not Used**
  - Set AND 2 Track 2 to **Dax A**
  - Set AND 2 Track 3 to **Not Used**
  - Set AND 2 Track 4 to **Not Used**
  - Set AND 2 Track 5 to **Dax A**
  - Set AND 2 Track 6 to **Not Used**
- On the **Logic: AND 3** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 3]:
  - Set AND 3 Track 1 to **Not Used**
  - Set AND 3 Track 2 to **Not Used**
  - Set AND 3 Track 3 to **Dax A**
  - Set AND 3 Track 4 to **Not Used**
  - Set AND 3 Track 5 to **Not Used**
  - Set AND 3 Track 6 to **Dax A**

In Figure 6-5, 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:

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

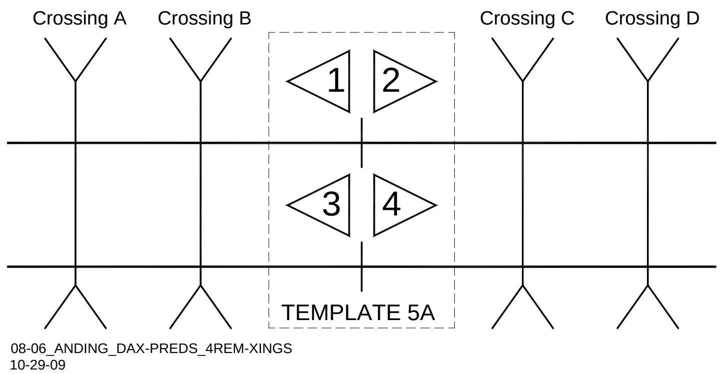


Figure 6-6:
ANDing DAX Predictors For Four Remote Crossings

In the previous example, AND 1 XR controls the local crossing.

In this configuration, by utilizing a remote Model 5000 GCP case with all remote tracks as shown in Figure 6-6, 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 5000 cases. They are generally used with DAXes.

- On the **Logic: AND 1 XR** screen [<u>3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR</u>]:
  - Set AND 1 XR Track 1 to **Dax A**
  - Set AND 1 XR Track 2 to **Not Used**
  - Set AND 1 XR Track 3 to **Dax A**
  - Set AND 1 XR Track 4 to **Not Used**
- On the **Logic: AND 2** screen [<u>3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 2</u>]:
  - Set AND 2 Track 1 to **Not Used**
  - Set AND 2 Track 2 to **Dax A**
  - Set AND 2 Track 3 to **Not Used**
  - Set AND 2 Track 4 to **Dax A**
- On the **Logic: AND 3** screen [<u>3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 3</u>]:
  - Set AND 3 Track 1 to **Dax B**
  - Set AND 3 Track 2 to **Not Used**
  - Set AND 3 Track 3 to **Dax B**
  - Set AND 3 Track 4 to **Not Used**
- On the **Logic: AND 4** screen [<u>3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 4</u>:
  - Set AND 4 Track 1 to **Not Used**
  - Set AND 4 Track 2 to **Dax B**
  - Set AND 4 Track 3 to **Not Used**
  - Set AND 4 Track 4 to **Dax B**

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 listed above.

To implement this configuration the AND functions are assigned to physical outputs as follows:

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **AND 1 XR** (controls crossing C)
  - Set OUT 2.1 to **AND 2** (controls crossing B)
- On the **I/O: Output Slot 3-4** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 2) I/O: OUTPUT SLOT 3-4]:
  - Set OUT 3.1 to **AND 3** (controls crossing D)
  - Set OUT 4.1 to **AND 4** (controls crossing A)

6.2 ISLAND OPERATION WITHOUT MS/GCP FUNCTION

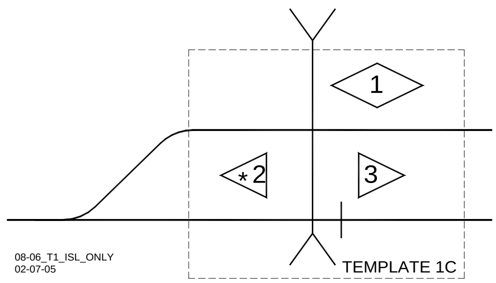


Figure 6-7:
Track Configuration to Support Island Only Operation on Track 1

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 6-7 requires only island operation.

Island only operation may be implemented as depicted below.

- On the **Trk 1: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set +MS/GCP Operation to **No**
- On the **Trk 1: Island Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 ISLAND FREQUENCY]:
  - Set +Island Used to **Island**

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 depicted below.

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Isl 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 5000 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 5000 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 5000 GCP as a single UAX input.

6.2.1.2 AND Enable Inputs

NOTE

NOTE

When ANDing Tracks, as in Figure 6-8, 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.

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
  - Set +AND 1 Enable Used to **Yes**
- On the **Logic: AND 1 XR Enable** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR > 1) +AND 1 Enable Used]:
  - Set AND 1 Enable Pickup to **5 sec**
  - Set AND 1 Enable Drop to **0 sec**

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 Model 5000 GCP DAXing to a crossing and cascading DAX is shown in Figure 6-8. 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 below. 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 6-8. Crossing B is controlled via AND 2 (Enable).

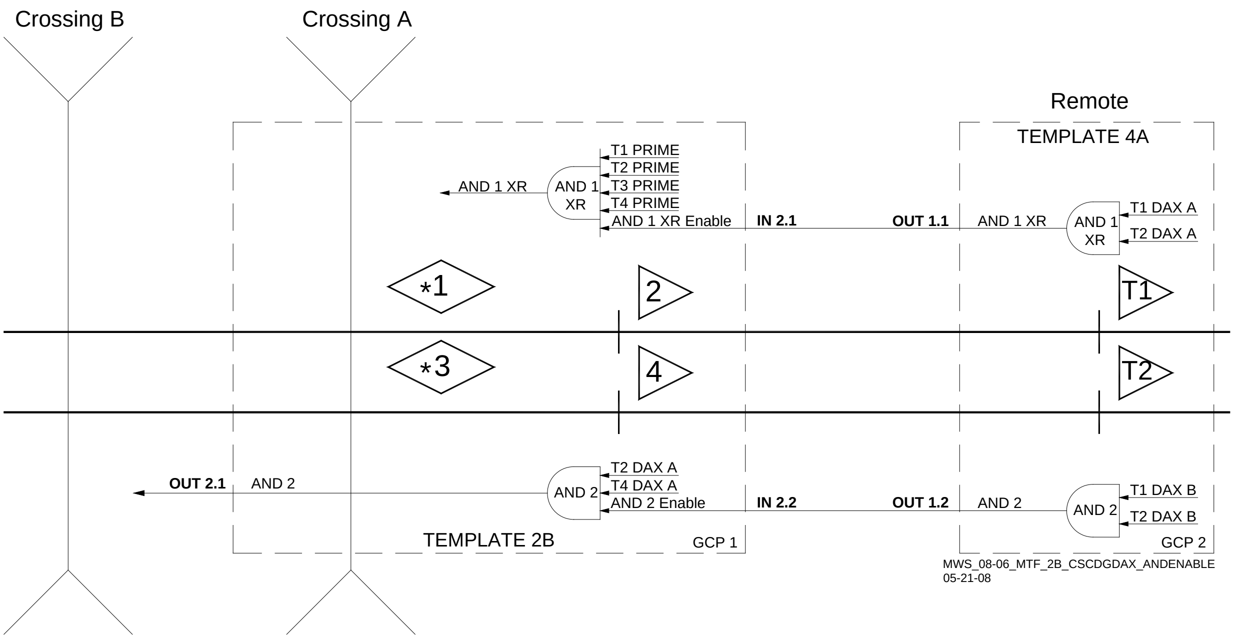


Figure 6-8:
Cascading DAX using AND Enable Inputs

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
  - Set AND 1 XR Track 3 to **Prime**
  - Set AND 1 XR Track 4 to **Prime**
  - Set +AND 1 Enable Used to **Yes**
- On the **Logic: AND 1 XR Enable** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR > 1) +AND 1 Enable Used]:
  - Set AND 1 Enable Pickup to **5 sec**
  - Set AND 1 Enable Drop to **0 sec**
- On the **Logic: AND 2** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 2]:
  - Set AND 2 Track 1 to **Not Used**
  - Set AND 2 Track 2 to **Dax A**
  - Set AND 2 Track 3 to **Not Used**
  - Set AND 2 Track 4 to **Dax A**
  - Set +AND 2 Enable Used to **Yes**
- On the **Logic: AND 2 Enable** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 2 > 1) +AND 2 Enable Used]:
  - Set AND 1 Enable Pickup to **2 sec**
  - Set AND 1 Enable Drop to **0 sec**

The inputs and outputs at the crossing may be assigned as follows:

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 2.1 to **AND 2** (controls crossing B)
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 2.1 to **AND 1 XR Enable** (receives DAX output from remote GCP DAX A predictors)
  - Set IN 2.2 to **AND 2 Enable** (receives input from remote GCP DAX B predictors)

6.2.2 Out of Service ANDing of Predictors

⚠ WARNING

WARNING
OUT OF SERVICE TRACKS WILL NOT RESPOND TO TRAIN OPERATION. TAKE ALTERNATE MEANS TO WARN VEHICULAR TRAFFIC, PEDESTRIANS, AND EMPLOYEES.

Tracks are taken out of service using the Model 5000 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

⚠ WARNING

WARNING
WHEN DAX CIRCUITS ARE CASCADED, ONE SECOND IS ADDED TO THE CROSSING WARNING TIME FOR EACH CASCADED DAX. **ADDITIONAL APPROACH DISTANCE MAY ALSO BE REQUIRED FOR BOTH THE CROSSING AND REMOTE GCPS.**

Each DAX predictor output at a remote GCP unit may be sent to a crossing using individual line pairs as shown in Figure 6-9.

This configuration is a variation of the DAX line ANDing configuration shown in Figure 6-8.

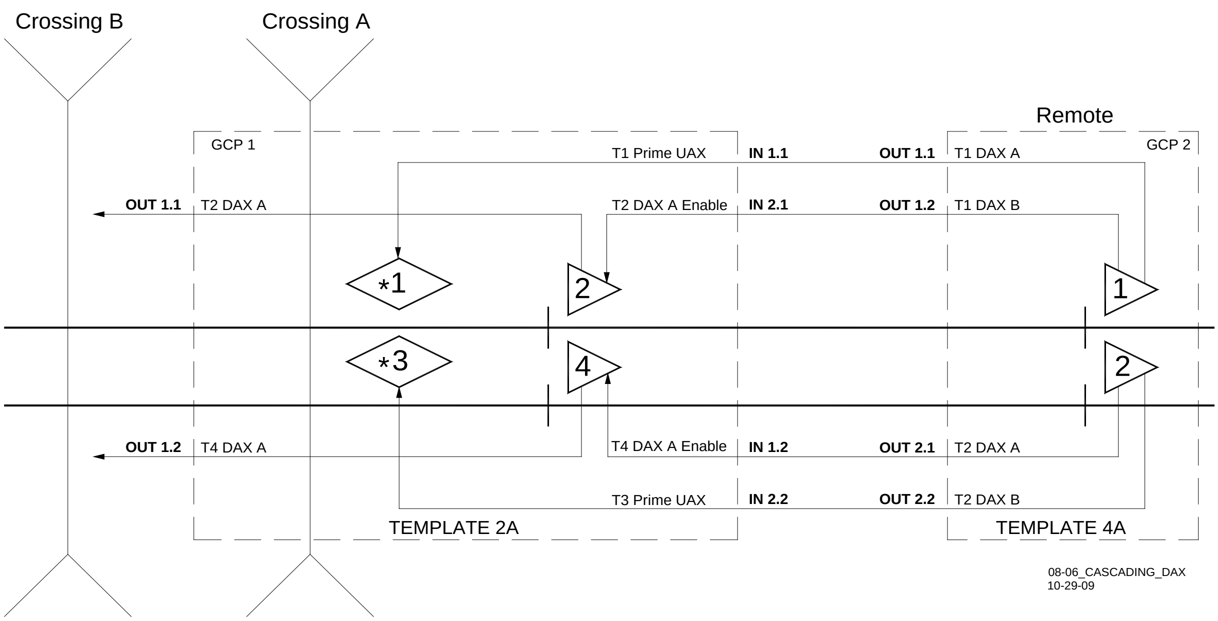


Figure 6-9:
Cascading DAX with Individual Controls

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 below.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T1 Dax A**
  - Set OUT 1.2 to **T1 Dax B**
  - Set OUT 2.1 to **T2 Dax A**
  - Set OUT 2.2 to **T2 Dax B**

At crossing A, track 1 and track 3 Prime UAXes are enabled as inputs as shown below.

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to **5 sec**
- On the **Trk 3 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 3 PREDICTOR: PRIME]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to **5 sec**

At crossing A, track 2 and track 4 DAX A Enables are set to Yes. The DAX Enable Pickup delay time for T2 and T4 is set to 2 seconds.

- On the PREDICTORS: track 2 screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to **Yes**
- Right arrow to the **Trk 2 Predictor: DAX A** screen
  - Set DAX A Enable to **Yes**
  - Set DAX A Pickup Delay to **2 sec**

- On the PREDICTORS: track 4 screen [2) GCP AND ISLAND PROGRAMMING > 4) TRK 4: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to **Yes**
- Right arrow to the **Trk 4 Predictor: DAX A** screen
  - Set DAX A Enable to **Yes**
  - Set DAX A Pickup Delay to **2 sec**

6.2.3.1 Connection Assignment for Cascading DAX Signals

Assigning the inputs as shown above makes the connections between the remote GCP and the crossing GCP.

- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX**
  - Set IN 1.2 to **T3 Prime UAX**
  - Set IN 2.1 to T2 DAX A Enable
  - Set IN 2.2 to T4 DAX A Enable

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.

- The DAX A predictors from crossing A are assigned to outputs as below. This allows the outputs to be connected to crossing B via a line circuit.
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T2 Dax A**
  - Set OUT 1.2 to **T4 Dax A**

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 5000 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 6-10 is an example of a back-to-back remote application where all Model 5000 GCP track modules are configured as remotes (MTF 5A).

The remote Model 5000 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 below.

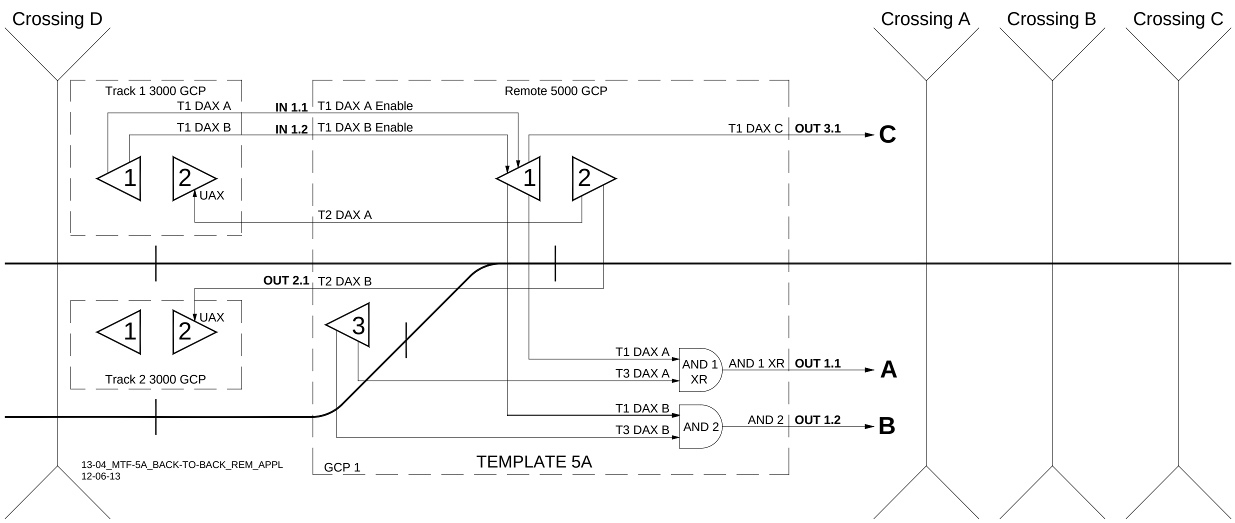


Figure 6-10:
Cascading DAX

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Dax A**
  - Set AND 1 XR Track 3 to **Dax A**
- On the **Logic: AND 2** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 2]:
  - Set AND 2 Track 1 to **Dax B**
  - Set AND 2 Track 3 to **Dax B**

The remote Model 5000 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.

Program the unit as depicted below:

- On the PREDICTORS: track 1 screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to **Yes**
  - Set DAX B Used to **Yes**
  - Set DAX C to **Yes**
- Right arrow to the **Trk 1Predictor: DAX A** screen
  - Set DAX A Enable to **Yes**
  - Set DAX A Pickup Delay to **2 sec**
- Right arrow to the **Trk 1Predictor: DAX B** screen
  - Set DAX B Enable to **Yes**
  - Set DAX B Pickup Delay to **2 sec**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to T1 Dax A Enable
  - Set IN 1.2 to T1 Dax B Enable

The cascaded DAX outputs of the remote are assigned as shown below.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **AND 1 XR**
  - Set OUT 1.2 to **AND 2**
  - Set OUT 2.1 to **T2 Dax A**
  - Set OUT 2.2 to **T2 Dax B**
- On the **I/O: Output Slot 3-4** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 2) I/O: OUTPUT SLOT 3-4]:
  - Set OUT 3.1 to **T1 Dax C**

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

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 TRACK CIRCUIT EXPIRING PRIOR TO THE CROSSING GCP PREDICTING FOR THE TRAIN. REFER TO SECTION 6.2.5 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 **Trk 1 Predictor: Prime** default settings are depicted below:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Prime Warning Time is set to **35 sec***
  - +Prime Offset Distance is set to **0 ft***
  - Switch MS EZ Level is set to **0**
  - Pickup Delay Mode is set to Fixed*
  - +MS/GCP Mode is set to Pred*
  - Prime Pickup Delay is set to **15 sec***
  - +Prime UAX is set to **No***

6.2.4.2 Predictors with non-zero Offset distances (unidirectional and Simulated Bidirectional applications)

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 DAX Pickup Delay Determination

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.

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

> **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:

On the remote unit:

- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: DAX A**]**:
- Set Pickup Delay Mode to **Fixed**
- Set Prime Dax A Pickup Delay to **8 sec**

On the crossing unit:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
- Set Prime UAX to **Yes**
- Set Prime UAX Pickup to **5 sec**

NOTE

NOTE

In software version gcp-t6x-02-5.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.

6.2.5 Special Provisions for Short DAX Offset Distance (UAX Not Used)

WARNING

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

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).

In certain cases where a DAX has a very short offset distance and a train decelerates, the crossing warning system may briefly timeout. For this 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

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 5000 GCP chassis
  - May not be used with Advanced Preemption

NOTE

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 5000 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 5000 GCP chassis
  - With or without Advanced Preemption

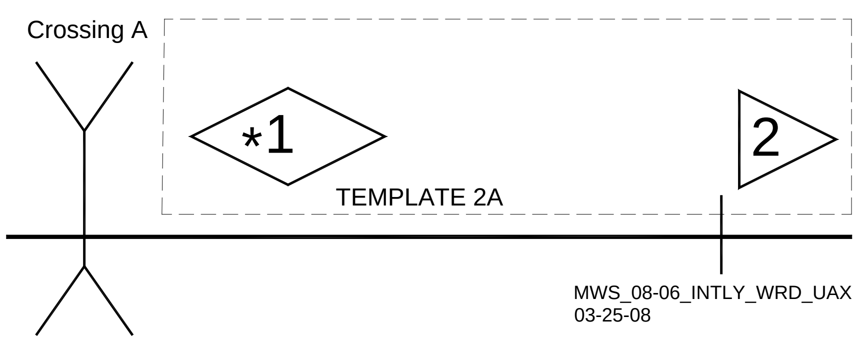


Figure 6-11:
Crossing with Model 5000 GCP and DAX in Same Chassis

NOTE

> **NOTE**
>
> The following subsections assume that T1 is at the crossing and T2 is a remote DAX (prime with offset) in the same 5000 chassis (see Figure 6-11). When crossing and remote DAX are in separate 5000 chassis, use the standard DAX to crossing UAX applications (discussed in Section 6.2.5.3).

6.2.5.1 Option 1: Use of Positive Start

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:

- On the **Trk 1: Positive Start, Low EZ** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 5) POSITIVE START]:
  - Set Positive Start to **On** or **Timed** (If Positive Start=Timed, then set the Positive Start Timer to the desired interval)
- Right arrow to the **Trk 1: Positive Start** screen
  - Set Positive Start Offset=**0 ft**
  - Set the Positive Start Value to be equal to or slightly higher than the EZ value at the insulated joints.
- On the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > Trk 2 Predictor: Prime]:
  - Set Prime Offset Distance to **250 ft**
  - Set Pickup Delay Mode to **Fixed**
  - Set Prime Pickup Delay to **8 sec**

6.2.5.2 Option 2: Use of Internally Connected UAX

When Model 5000 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:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Set T1 Prime UAX to **Yes**
  - Set Prime UAX Pickup to **20 sec**
- On the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 2 Predictor: Prime]:
  - Set T2 Prime Offset Distance = Distance between T1 track wires and insulated joint at T2. For this example, that distance is **265 ft**
  - Leave Pickup Delay Mode=Auto
- On the **Logic: Internal I/O** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.1 Sets to **T1 Prime UAX**
  - Set Int.1 Set by to **T2 Prime**

If there is a second DAX to the crossing in the same 5000 crossing chassis then add the following parameter settings:

- On the **Logic: Internal I/O** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.1 Set by to **T2 Prime**
  - Set Int.2 Sets to **T1 Prime UAX**
  - Set Int.2 Set by to **T3 Prime**

If the second Dax is in a separate chassis then skip programming of Internal I/O 2. Instead, program a crossing input as follows:

- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX** (all inputs set to T1 prime UAX are internally ANDed together)

Program the remote DAX (in the separate Model 5000 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 5000 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

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.

When the remote is in the same chassis as the crossing GCP, program the GCP parameters as stated below:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Set T1 Prime UAX to **Yes**
  - Set Prime UAX Pickup to **20 sec**
- On the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PRIME]:
  - Set T2 Prime Offset Distance= Distance between T1 track wires and insulated joint at T2. For this example, that distance is **265 ft**
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T2 Prime**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime UAX**
- Add external wires on the crossing Model 5000 GCP chassis from:
  - OUT1.1 (+) to IN1.1 (+)
  - OUT1.1 (-) to IN1.1 (-)

If there is a second DAX to the crossing in the same 5000 crossing chassis then add the following parameter settings:

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.2 to **T3 Prime**

- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.2 to **T1 Prime UAX**
- Add external wires on the crossing Model 5000 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 above Instead, program a second crossing input as follows:

- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.2 to **T1 Prime UAX**

Program the remote DAX (in the separate Model 5000 GCP chassis) to standard DAX programming and wire that remote DAX output to the crossing chassis IN 1.2 Prime UAX.

6.2.6 DAX Utilizing Post Joint Prediction (PJP)

The Model 5000 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 5000 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

NOTE

In a double crossover application, there are two application designs available for the crossover closest to the crossing. The first application design, which is discussed in paragraph 0 and is depicted in Figure 6-13 as Crossover1, is titled Double Crossover using DAX Post Joint Prediction {PJP}. The second application design, which is discussed in paragraph 6.2.7.4.1 and depicted in Figure 6-15 as Crossover1; is titled Double Crossover Using DAX Advanced Approach Prediction {Adv Appr Predn}. 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 6-12 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 determine the amount of time to be programmed into "Post Joint Detection Time" (Post Joint Detn. Time) parameter found on the Enhanced Detection screen.

⚠ WARNING

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.

6.2.6.2.1 Single Crossover Using DAX Post Joint Prediction (PJP)

NOTE

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.

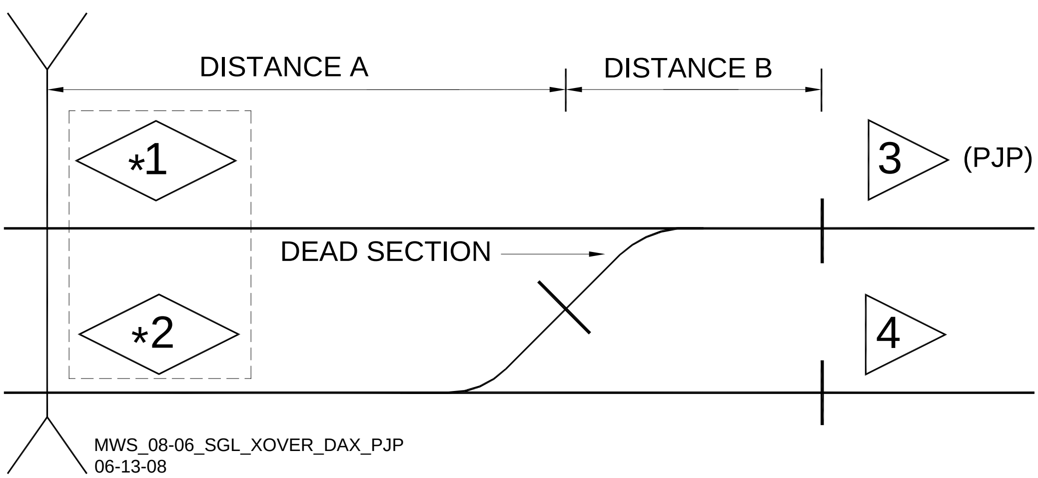
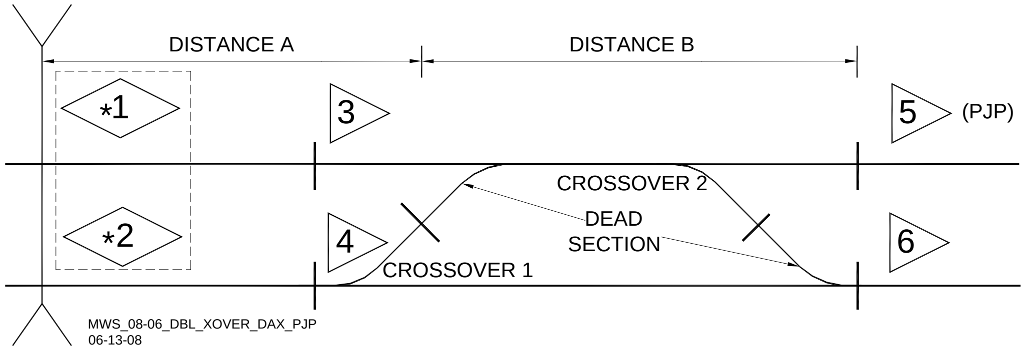


Figure 6-12:
Single Crossover Using DAX Post Joint Prediction (PJP)

Procedure 6-1: Single Crossover Using DAX Post Joint Prediction (PJP)	
	The predictor dead zone in Crossover1 in Figure 6-12 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 4.
Step 4	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 6-13:



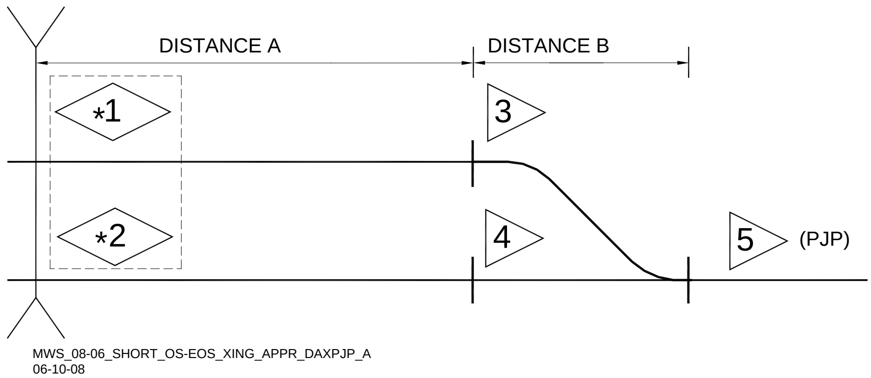
Double Crossover Using DAX Post Joint Prediction (PJP)

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 4.
Step 4	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.

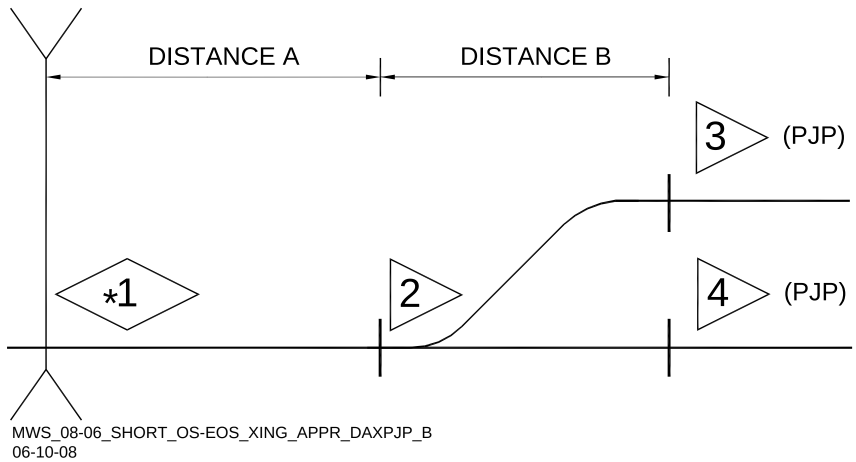
NOTE

> **NOTE**
>
> Advanced Approach Prediction can also be used for Double Crossover applications (see paragraph 6.2.7).

6.2.6.2.3 Short OS (End of Siding) in Crossing Approach Using DAX Post Joint Prediction (PJP)



Layout A



Layout B

Figure 6-14:
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 6-14 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 6-14 A and GCPs 3 and 4 in Figure 6-14 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 6.
Step 6	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

NOTE

In a double crossover application, there are two application designs available for the crossover closest to the crossing. The first application design, which is discussed in paragraph 0 and is depicted in Figure 6-13 as Crossover1, is titled Double Crossover using DAX Post Joint Prediction (PJP). The second application design, which is discussed in paragraph 6.2.7.4.1 and is depicted in Figure 6-15 as Crossover1; is titled Double Crossover Using DAX Advanced Approach Prediction (Adv Appr Predn. Both the previous and new application guidelines are provided.

The **Trk “N”: Adv Appr Prediction** (Advanced Approach Prediction) 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.

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)

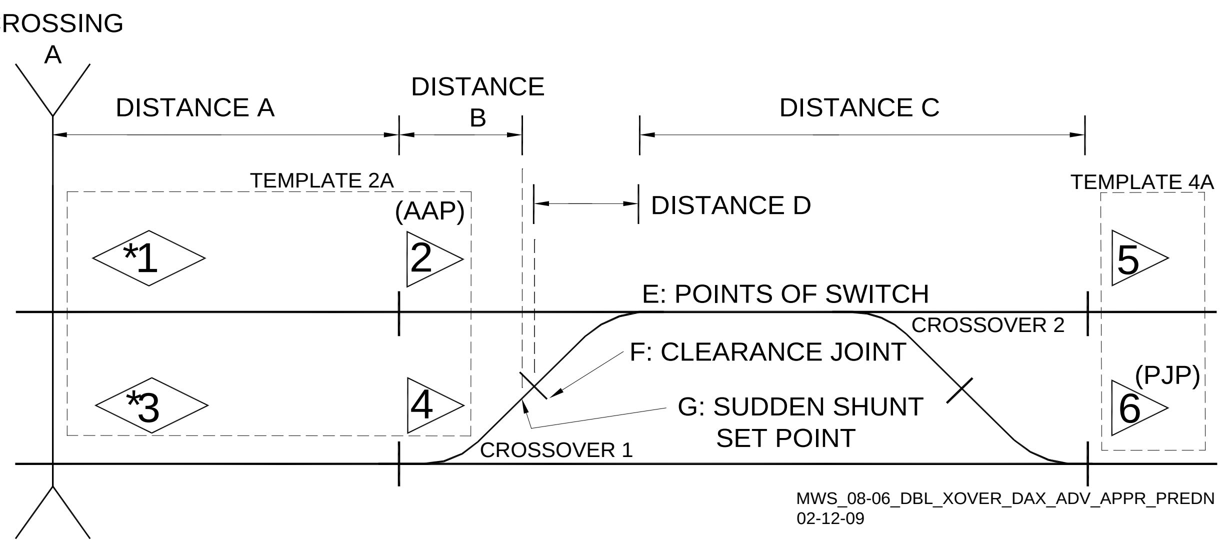


Figure 6-15:
Remote Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)

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 6-15 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 6-17.

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.

WARNING

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**

Procedure 6-4: Remote Double Crossover Using Advanced Approach Prediction (Adv Appr Predn)	
	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.
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.
⚠ WARNING	**WARNING** **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 6-16 provide example for calculating AAP timer values.

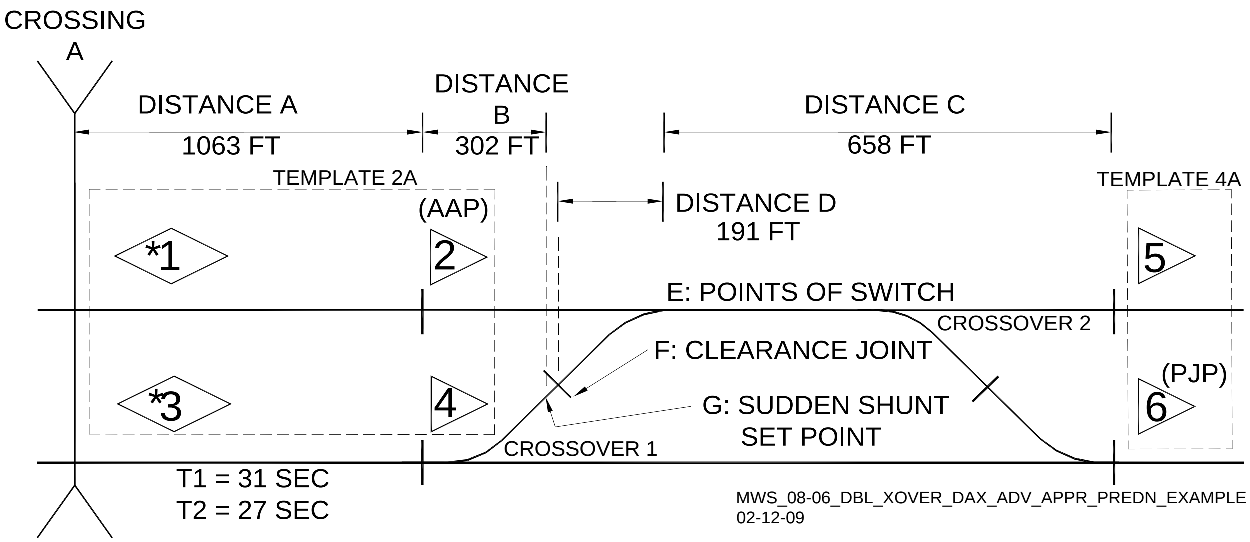


Figure 6-16:
Example Remote Double Crossover Using Advanced Approach Prediction (AAP)

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.

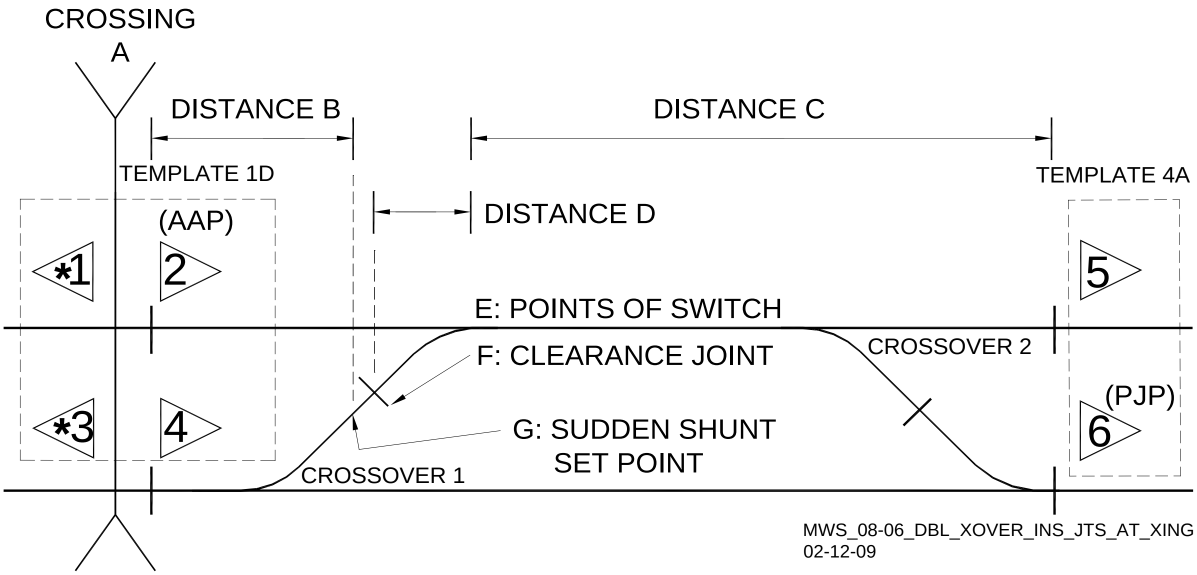


Figure 6-17:
Double Crossover Where Insulated Joints are Located at the Crossing

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 6-17.

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 6-17, 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 6-17, 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

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 5000 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 as follows:

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set Preempt Logic to **Advnce**.

With the Advance preemption function selected the **Preemption** window displays six additional menus. 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**.

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.

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

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

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.

NOTE

NOTE

When the Advance Preempt Timer is used, the interval between prime and preempt predictions will never exceed the timer value.

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.

6.3.1.2 Configuring Advance Preemption

To minimize the delay interval reduction caused by accelerating trains, the following process should be used: set **+Preempt Logic** to **Advnce** and **Adv Preempt Delay** to **10 sec** (the preempt automatically appears in the Track Predictor menu windows), set the warning time for each track Prime predictor for 2 to 3 seconds below their normal value, set the preempt warning times to 40 seconds as shown below.

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **Advnce**
  - Set Adv Preempt Delay to **10 sec**
- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set Prime Warning Time to **28 sec** (somewhere 2 – 3 seconds below normal warning time)

- On the **Trk 1 Predictor: Preempt** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PREEMPT]:
  - Set Prmpt Warning Time to **40 sec**

On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:

To control the Advance preemption relay, assign the advance preempt output to a physical output a shown below.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **Adv Preempt**

6.3.1.3 False Traffic Signal Preemption

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 5000 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 5000 GCP to perform a continuous correspondence check:

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set Preempt Hlth IP Used to **Yes**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Preempt Health**
- Apply Battery B through a front contact of the preemption relay and back to the assigned input.

6.3.1.4 Traffic System Health

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 5000 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 5000 GCP switches to simultaneous preemption and activates the warning devices as soon as a track module preempt predictor predicts.

To activate this monitor function

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set Traffic Sys Hlth IP Used to **Yes**

- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Preempt Health**
  - Set IN 1.2 to **Trf Sys Health**

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 5000 GCP case is shown in Figure 6-18.

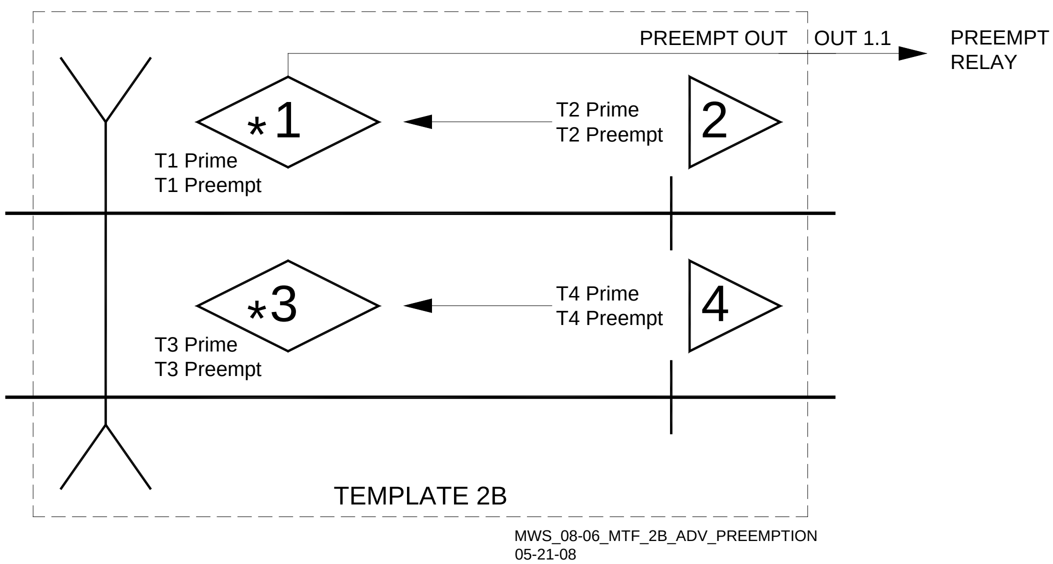


Figure 6-18:
Remote Advance Preemption Between Modules of the Same Case

The advance preempt setup for this configuration is described below.

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **Advnce**
  - Set Adv Preempt Delay to **10 sec**
  - Set Preempt Hlth IP Used to **Yes**
  - Set Second Trn Logic Used to **Yes**

The Prime and Preempt predictors of each Track Module are enabled.

The setup for Track 1 is as follows:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set Prime Warning Time to **33 sec**
- On the **Trk 1 Predictor: Preempt** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PREEMPT]:
  - Set Prmpt Warning Time to **45 sec**

The setup for Track 2 is as follows:

- On the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PRIME]:
  - Set Prime Warning Time to **33 sec**
  - Set Prime Offset Distance to **500 ft**
  - Set Pickup Delay Mode to **Auto**
- On the **Trk 2 Predictor: Preempt** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PREEMPT]:
  - Set Prmpt Warning Time to **45 sec**
  - Set +Prmpt Offset Distance to **500 ft**
  - Set Pickup Delay Mode to **Auto**

Set the module output and input assignments as shown below.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **Adv Preempt**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Preempt Health**

The setup for tracks 3 and 4 are identical to the setup for tracks 1 and 2.

6.3.1.5.2 Remote Advance Preemption Between Separate GCP Cases

When the remote predictors are in a separate 5000 case, the track configuration is as shown in Figure 6-19.

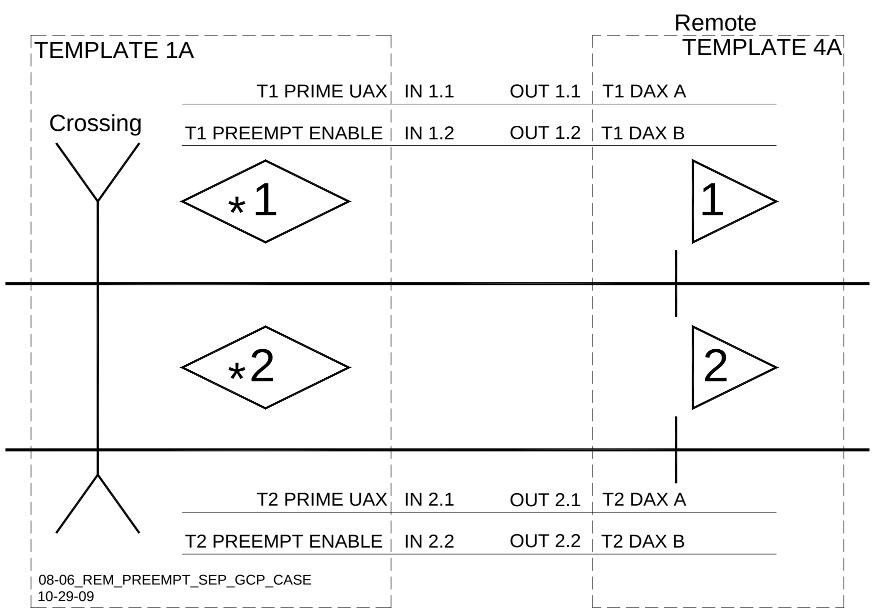


Figure 6-19:
Remote Preemption From Separate Model 5000 GCP Case

To implement this configuration, set the Track Modules at the remote site to provide two DAX predictors as shown below, with DAX A to start the crossing and DAX B to start the Advance Preemption process.

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **No**
- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to **Yes**
  - Set DAX B Used to **Yes**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set DAX A Warning Time to **33 sec**
  - Set DAX A Offset Distance to **500 ft**.
- On the **Trk 1 Predictor: Dax B** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: DAX B]:
  - Set DAX A Warning Time to **45 sec**
  - Set DAX A Offset Distance to **500 ft**.
- On the **Trk 2 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: DAX A]:
  - Set DAX A Warning Time to **33 sec**
  - Set DAX A Offset Distance to **500 ft**.
- On the **Trk 2 Predictor: Dax B** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: DAX B]:
  - Set DAX A Warning Time to **45 sec**
  - Set DAX A Offset Distance to **500 ft**.

Individually assign the DAX predictors to the physical outputs on the GCP front panel as shown below. Preempt logic at remote is set to **No**.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T1 Dax A**
  - Set OUT 1.2 to **T1 Dax B**
  - Set OUT 2.1 to **T2 Dax A**
  - Set OUT 2.2 to **T2 Dax B**

Set the prime and preempt parameters at the crossing as shown below. Assign Prime UAX and Preempt Enable to IP. Assign the physical inputs to the crossing. 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.

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **Advnce**
- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS]:
  - Set DAX A Used to **Yes**
  - Set DAX B Used to **Yes**
- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set Prime Warning Time to **33 sec**
  - Set +Prime UAX to **Yes**
- On the **Trk 1 Predictor: Preempt** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PREEMPT]:
  - Set Preempt Warning Time to **45 sec**
  - Set +Preempt Enable to **Yes**

- On the **Trk 2 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PRIME]:
  - Set Prime Warning Time to **33 sec**
  - Set +Prime UAX to **Yes**
- On the **Trk 2 Predictor: Preempt** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 3) PREDICTORS > TRK 2 PREDICTOR: PREEMPT]:
  - Set Preempt Warning Time to **45 sec**
  - Set +Preempt Enable to **Yes**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **T1 Prime**
  - Set IN 1.2 to T1 Preempt Enable
  - Set IN 2.1 to **T2 Prime**
  - Set IN 2.2 to T2 Preempt Enable

6.3.1.5.3 Preempt Relay Health Check (Alternatives)

In the configuration shown in Figure 6-19, 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 below.

- On the **I/O: Input Slot SSCC 1** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT SSCC 1]:
  - Set IN 7.1 to **Preempt Health**.

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 6-20. 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 and the DAX B signals are combined in AND 2 as shown below.

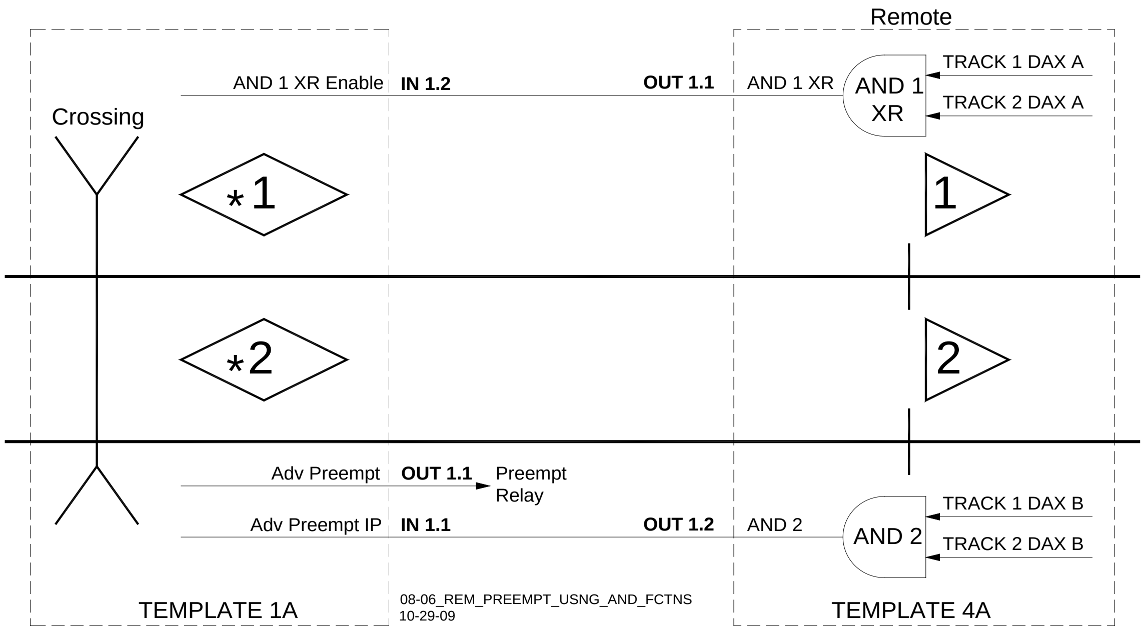


Figure 6-20:
Remote Preemption From Separate Model 5000 GCP Case Using AND Functions

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Dax A**
  - Set AND 1 XR Track 2 to **Dax A**
- On the **Logic: AND 2** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 2]:
  - Set AND 2 Track 1 to **Dax B**
  - Set AND 2 Track 2 to **Dax B**

Assign the AND function outputs to the physical outputs on the track modules connectors, as shown below.

- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **AND 1 XR**
  - Set OUT 1.2 to **AND 2**

At the crossing, set **AND 1 XR Enable** to **Yes**, set **Preempt Logic** to **Advnce, Advance Preempt** to **IP, and Preempt IP Used** to **Yes**, assign **Adv Preempt IP**, **AND 1 XR Enable**, and **Preempt Health** to the physical inputs as shown below. 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.

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set AND 1 XR Track 1 to **Prime**
  - Set AND 1 XR Track 2 to **Prime**
- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **Advnce**
  - Set Adv Preempt IP Used to **Yes**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to **Adv Preempt IP**
  - Set IN 1.2 to AND 1 XR Enable
  - Set IN 2.1 to **Preempt Health**

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**, 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 connected to vital inputs on the crossing controllers as shown below.

When assigned to a physical output **Gate Dwn Indication** may be connected to the traffic system to terminate clear-out-green operation.

WARNING

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.

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **Advnce**
  - Set Adv Preempt IP Used to **Yes**
  - Set Gate Down Logic Used to **Yes**
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **Not Used**
  - Set OUT 1.2 to Gate Down Indication
- On the **I/O: Output Slot 5-6** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 4) I/O: OUTPUT SLOT SSCC]:
  - Set OUT GC 1 to **Gate Output 1**
  - Set OUT GC 2 to **Gate Output 2**

6.3.1.7 Second Train Logic (Default is Yes)

When **Preemption Logic** is set to **Advnce**, the **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

Under the above conditions, when this field 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

NOTE

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**
- Assigning **Sim Preempt** to a physical output

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.

- On the **Preemption** screen [1) BASIC CONFIGURATION > 3) PREEMPTION]:
  - Set +Preempt Logic to **Simult**
  - Set Adv Preempt IP Used to **Yes**
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **Sim Preempt**

6.4 WRAP CIRCUITS

NOTE

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. Setting +Wrap Used to Yes enables the Wrap LOS Timer parameter, when then becomes visible on the Display.

6.4.1 Track Wrap Circuit Programming:

- On the **Trk 1: Wraps and Overrides** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1) WRAPS AND OVERRIDE]:
  - Set +Wrap Used to **Yes**

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. 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 triangle with a white exclamation point (!) at the end of the row for the problematic track. Failure types and causes can be reviewed by scrolling to the **Diag** screen. 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 5000 GCP switches over between MAIN and STANDBY modules and no train is present, any wrapped track will continue wrapped once the 5000 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 Model 5000 GCP Wrap Design Considerations

⚠ WARNING

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 Model 5000 GCP track modules (including DAXes) are located in same 5000 crossing unit (Figure 6-21), the Track circuit repeater used for wrapping the remote track must be available at the crossing GCP location. In Figure 6-21, template 2A is used.

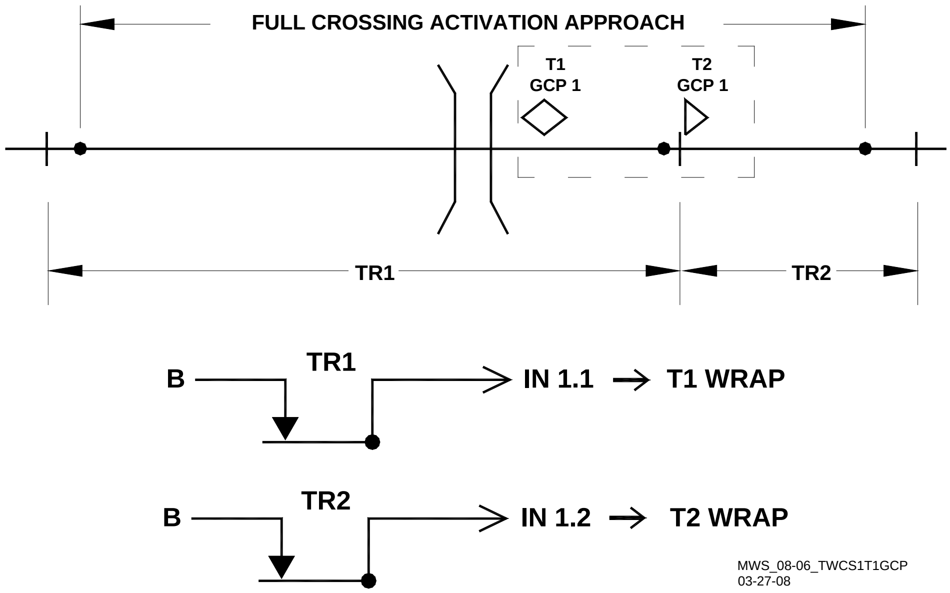


Figure 6-21:
Single Track--When Model 5000 GCP Track Modules Located In Same 5000 Crossing Unit

6.4.3.2 Single Track—Remote GCP

When a DAX module is in a separate remote Model 5000 GCP unit (see Figure 6-22), connect the remote DAX A physical output at GCP 2 to AND 1 XR enable at GCP 1 as shown in Figure 6-22 (with a minimum of 5 seconds of pickup delay).

WARNING

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 as well as “AND Enable” inputs are not wrapped when wrap inputs are energized. In Figure 6-22, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

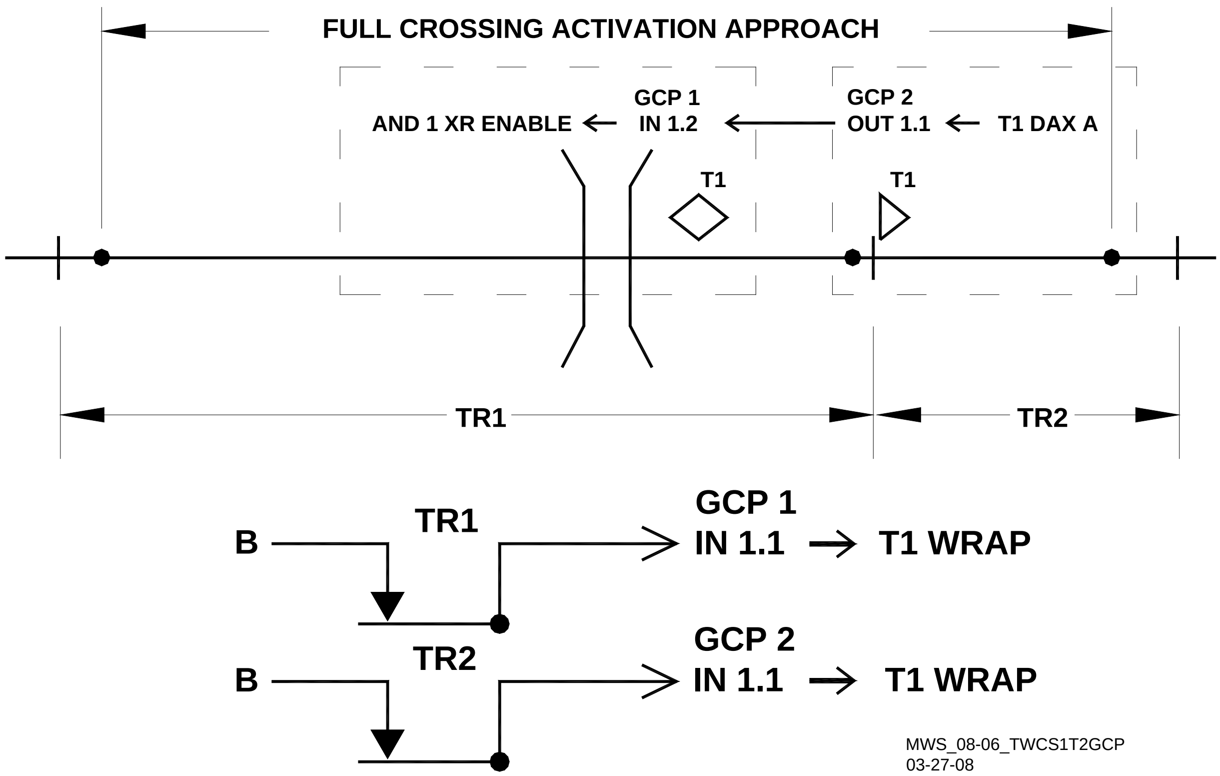


Figure 6-22:
Single Track--When A DAX Module Is In A Separate Remote Model 5000 GCP Unit

6.4.3.3 <u>Double Track—Same GCP</u>

When the Model 5000 GCP track modules including DAXes are located in same 5000 crossing unit (Figure 6-23), the track circuit repeaters used for wrapping the remote GCP must be available at the crossing GCP location. In Figure 6-23, template 2A is used

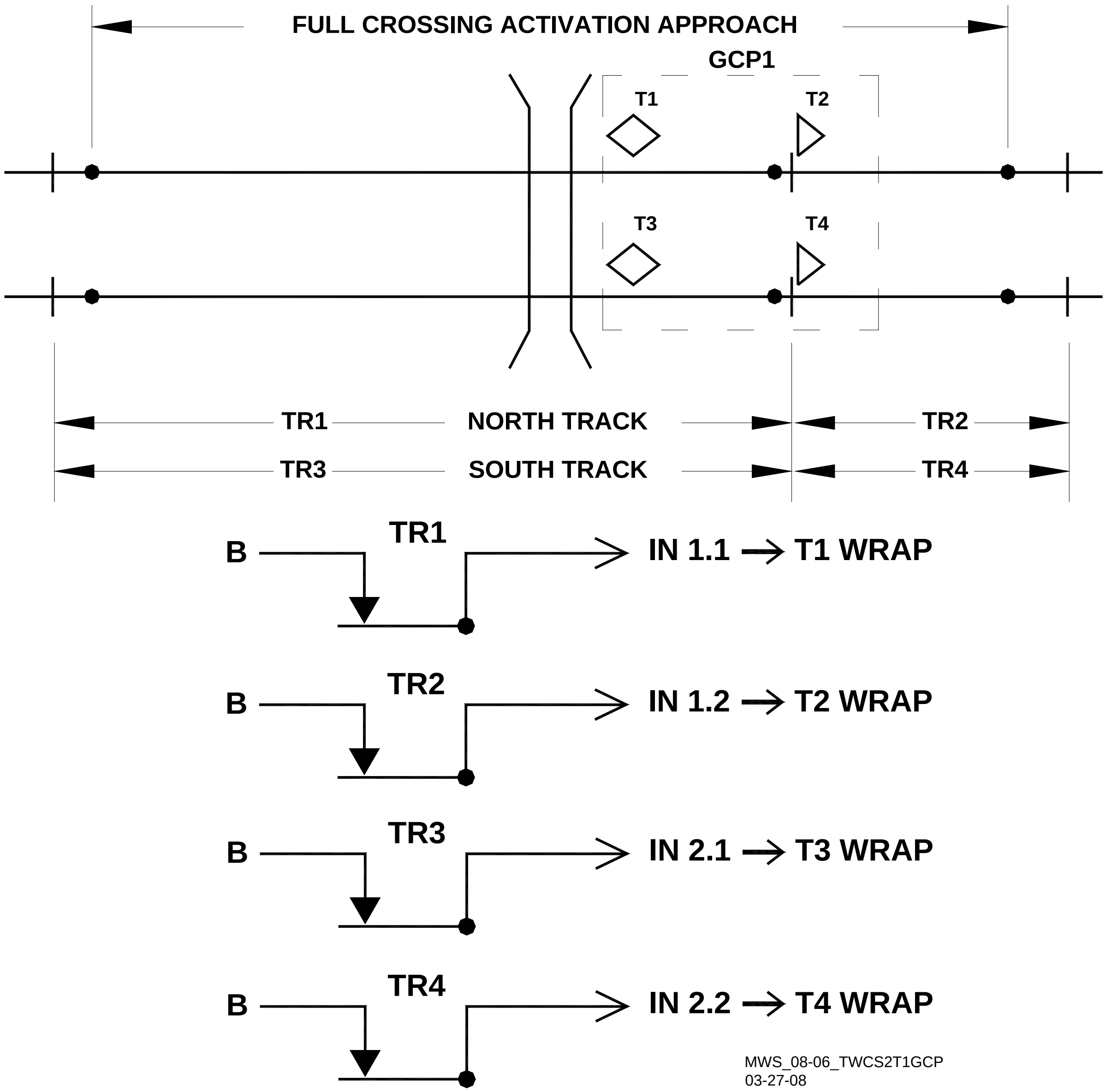
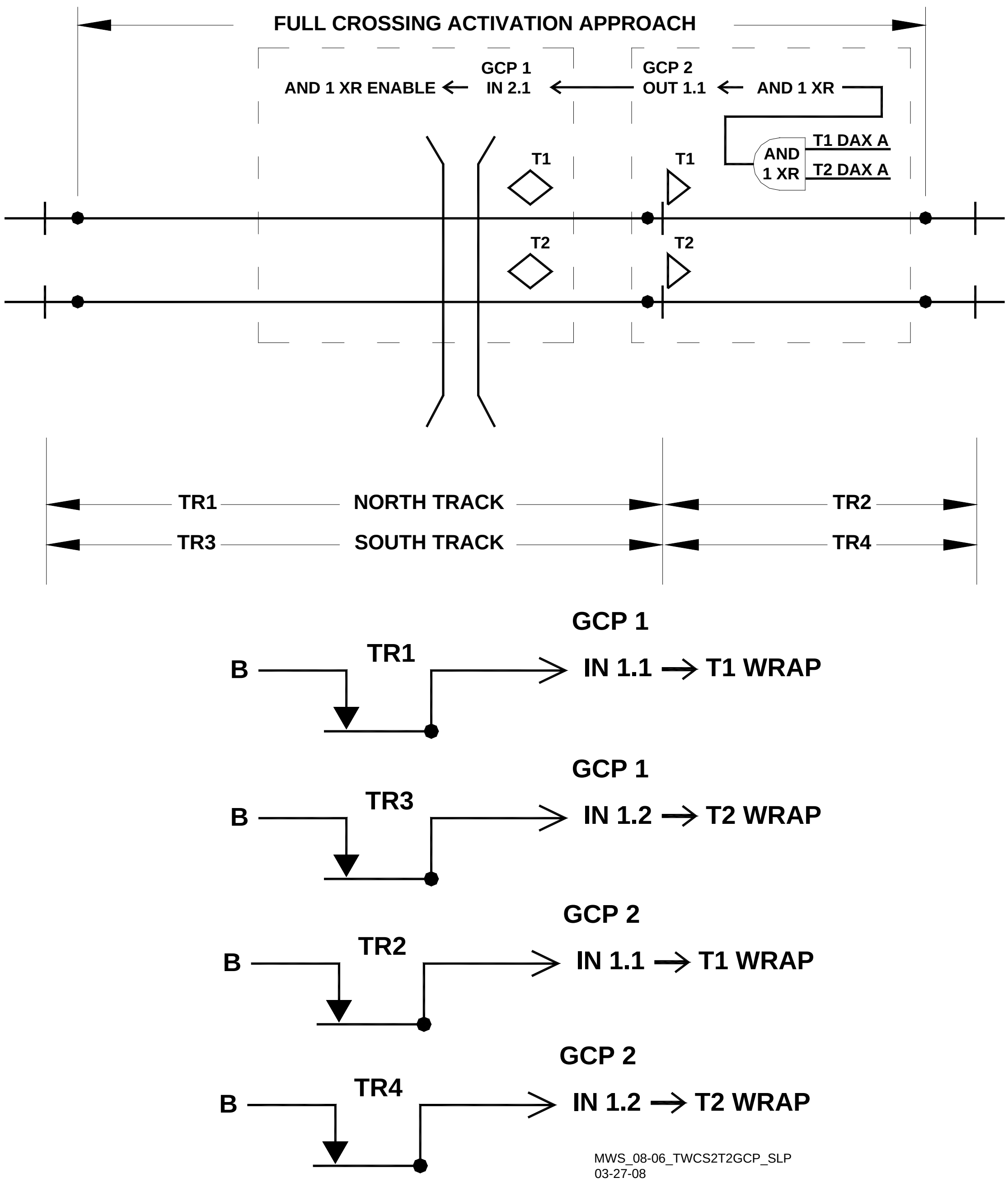


Figure 6-23:
Double Track—All Model 5000 GCP Track Modules Located In Same 5000 Crossing Unit

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 5000 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 6-24). 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 6-24, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

Figure 6-24:



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 6-25). 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 6-25). In Figure 6-25, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

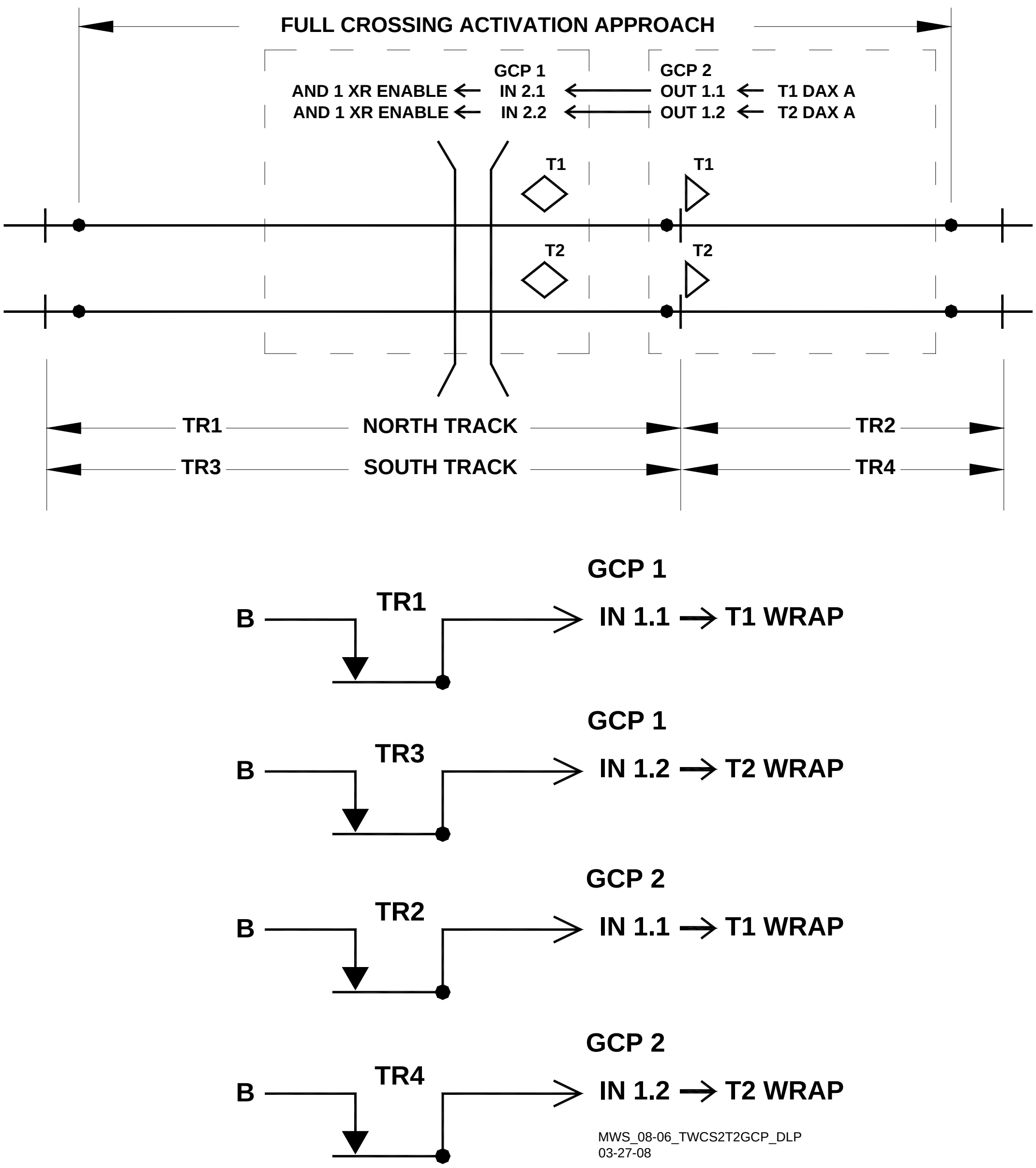


Figure 6-25:
Double Track—With Two Line Pair From Remote GCP 2 to Crossing GCP 1

Once the GCP is correctly programmed, when a train clears the Wrap Circuit, a shaded “W” appears at the end of the appropriate Track description row on the Display.

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 5000 GCP switches over between MAIN and STANDBY modules while override is in effect, the override will continue once the 5000 has completed switch-over and the modules have booted, as long as the override input 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

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 6-26).

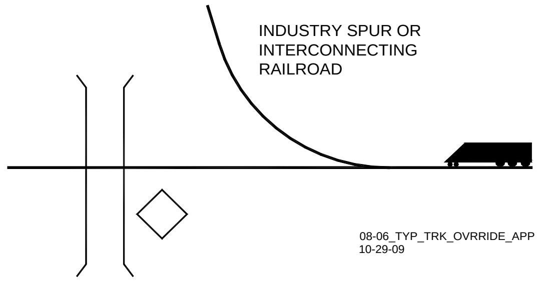


Figure 6-26:
Typical Track Override Application

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

To program an Override, select **Yes** or **No** on the **All Predictors Override Used** parameter. If **No**, select whether or not to use the applicable DAX Overrides

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:

- 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. When DAXes A, B, and C overrides are all enabled, a spare input must be used for the T1 Dax Override; do not program the override to either IN 1.1 or IN 1.2. Generally, spare physical inputs are available in the SSCCs. To program the Dax Overrides:

- On the **Trk 1: Wraps and Overrides** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1) WRAPS AND OVERRIDE]:
  - Set All Predictors Override Used to **No.**
  - Set Dax A Override Used to **Yes**
  - Set Dax B Override Used to **Yes**
  - Set Dax C Override Used to **Yes**
- On the **I/O: Input Slot SSCC 1** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 4) I/O: INPUT SLOT SSCC 1]:
  - Set IN 7.1 to T1 Dax A Override
  - Set IN 7.3 to T1 Dax C Override
- On the **I/O: Input Slot SSCC 2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 5) I/O: INPUT SLOT SSCC 2]:
  - Set IN 8.1 to T1 Dax C Override

6.5.3.3 Model 5000 GCP Override Design Considerations

⚠ WARNING

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 6-27, Figure 6-28 and Figure 6-29 demonstrate examples of Override programming.

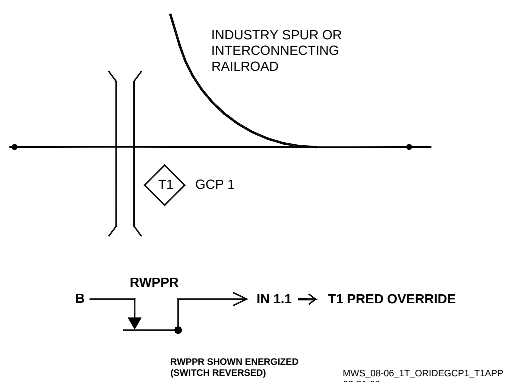


Figure 6-27:
Single Track Application, Override Switch In GCP 1, T1 Approach

Figure 6-27 shows:

- Single track application
- Override switch is in GCP 1
- T1 approach
- Template used is 1A

Program as follows for override:

- On the **Trk 1: Wraps and Overrides** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1) WRAPS AND OVERRIDE]:
  - Set All Predictors Override Used to **Yes**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to T1 Pred Override

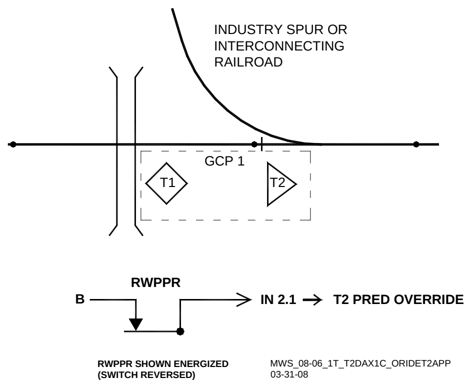


Figure 6-28:
Single Track, T2 DAX In Same Model 5000 GCP Case, Override Switch In T2 Approach

Figure 6-28 shows:

- Single track application
- DAX in same Model 5000 GCP unit
- Override switch is in T2 approach
- Template used is 2A

Program as follows for override of T2:

- On the **Trk 2: Wraps and Overrides** screen [2) GCP AND ISLAND PROGRAMMING > 2) TRK 2: GCP AND ISLAND > 1) WRAPS AND OVERRIDE]:
  - Set All Predictors Override Used to **Yes**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 2.1 to T2 Pred Override

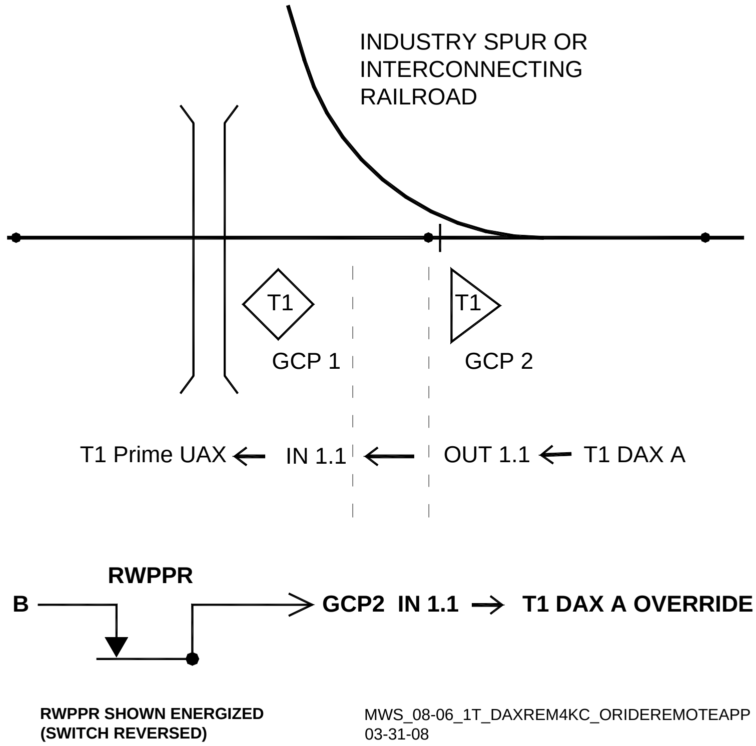


**Figure 6-29:
Single Track, DAX In Remote Model 5000 GCP Case,
Override Switch In Remote Approach**

Figure 6-29 shows:

- Single track remote T1 application
- DAX in remote Model 5000 GCP unit
- Override switch is in remote approach
- Template used is 1A for GCP 1 and 4A in GCP 2

For override of GCP 2, T1 DAX A, program GCP 2 as follows:

- On the **Trk 1: Wraps and Overrides** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1) WRAPS AND OVERRIDE]:
  - Set All Predictors Override Used to **No.**
  - Set Dax A Override Used to **Yes**
- On the **I/O: Input Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 1) I/O: INPUT SLOT 1-2]:
  - Set IN 1.1 to T1 Dax A Override
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **T1 Dax A**

To program GCP 1 to receive the GCP 2 signal:

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set +Prime UAX to **Yes**
  - Program GCP 1 IN 1.1 to T1 Prime UAX

6.6 LOGIC PROGRAMMING

⚠ WARNING

WARNING

ANY INPUT NOT USED OR NOT PROGRAMMED IS CONSIDERED ENERGIZED IN THE "AND" INPUT TO THE MODEL 5000 GCP. PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO ADVANCED LOGIC FEATURES, THE MODEL 5000 GCP OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.

NOTE

NOTE

Due to a known software issue, the parameter "4000 Case OOS IP" lists a Model 4000 GCP case rather than a Model 5000 GCP case. This will be corrected in a later software release.

The Model 5000 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

6.6.1 AND Gates

The Model 5000 GCP provides twelve configurable AND gates:

- AND 1 XR
- AND 2 through AND 12

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 6-30 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 Model 5000 GCP 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.

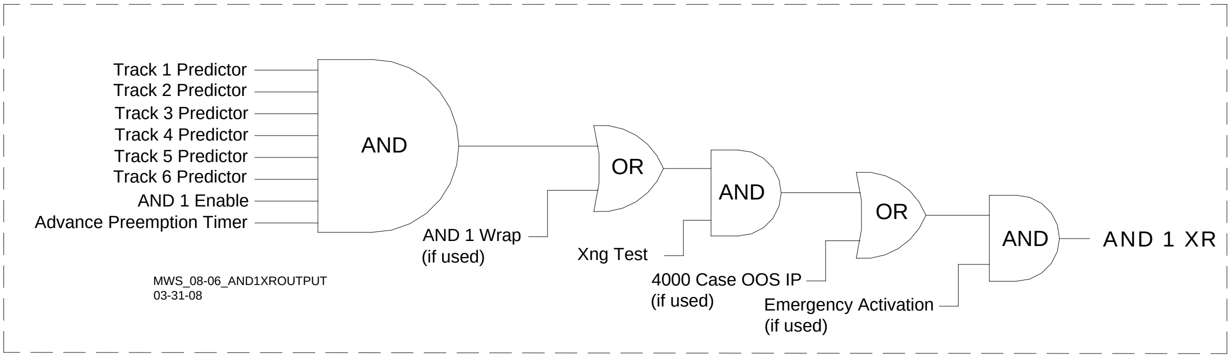


Figure 6-30:
AND 1 XR Output

Figure 6-31 shows the terms that contribute to the **AND 2** output (AND 3 as well as 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.

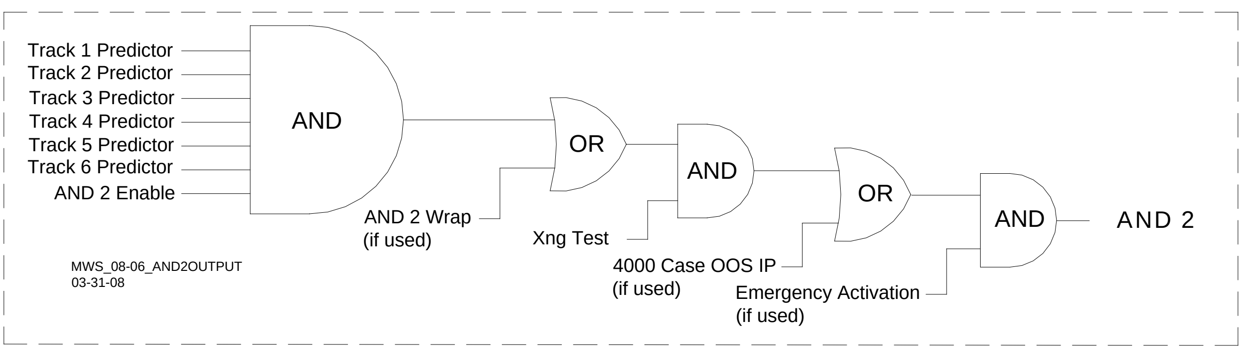


Figure 6-31:
AND 2 Output

Figure 6-32 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, has both Pickup and Drop delays.
- emergency activation input, if used,
- The **AND 5 Wrap** input wraps the track predictors and **AND 5 Enable**, but not the Emergency Activation.

The **5000 Case OOS IP** input wraps the track predictors, and **AND 5 Enable**, but not **Emergency Activation**.

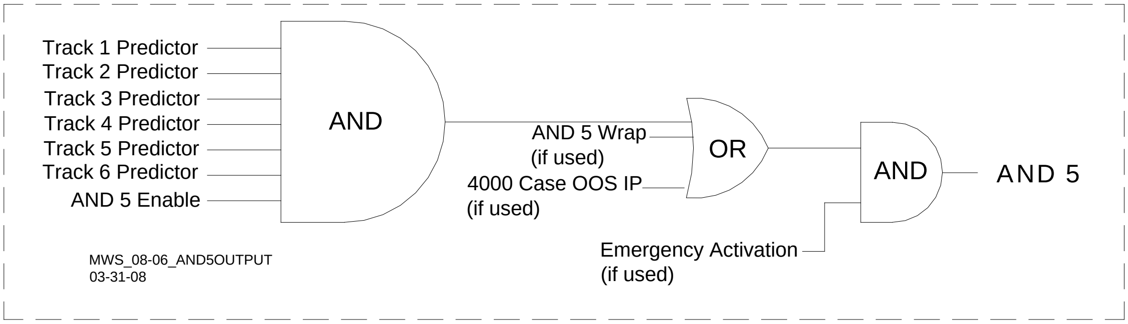


Figure 6-32:
AND 5 Output

6.6.1.1 AND Enable Pickup Delays

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 AND Enable Drop Delays

⚠ WARNING

WARNING

INCORRECT USE OF THE 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 5000 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 NOT AND Outputs

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

The example below 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 as well as the assignment of **AND 1 XR** and **NOT AND 1 XR** to an output.

- On the **Logic: AND 1 XR** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR]:
  - Set +AND 1 Enable Used to **Yes**
- On the **Logic: AND 1 XR Enable** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 1 XR > 1) +AND 1 ENABLE USED]:
  - Set AND 1 Enable Pickup to **10 sec**
  - Set AND 1 Enable Drop to **5 sec**
- On the **I/O: Output Slot 1-2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS > 1) I/O: OUTPUT SLOT 1-2]:
  - Set OUT 1.1 to **AND 1 XR**
  - Set OUT 1.2 to **NOT AND 1 XR**

6.6.1.4 AND Wraps

⚠ WARNING

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 5000 GCP SYSTEM OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.

Each of the twelve 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.

6.6.1.5 OR Gates

⚠ WARNING

WARNING
ANY INPUT NOT USED OR NOT PROGRAMMED IS CONSIDERED DE-ENERGIZED IN THE "OR" INPUT TO THE MODEL 5000 GCP. PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO ADVANCED LOGIC FEATURES, THE MODEL 5000 GCP OPERATION MUST BE TESTED TO INSURE PROPER WARNING SYSTEM OPERATION.

The Model 5000 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.

6.6.1.5.1 OR Example 1

An output is required that is deenergized only when all islands are occupied. The example below shows the screen for programming the inputs to an OR gate. In this case the two island states are ORed together.

- On the **Logic: OR Gates** screen [3) LOGIC PROGRAMMING > 3) LOGIC: OR GATES]:
  - Set OR 1 Used to **Yes**
- On the **Logic: OR 1** screen [3) LOGIC PROGRAMMING > 3) LOGIC: OR GATES > 1) LOGIC: OR 1 USED]:
  - Set OR 1 Term 1 to **T1 Island**
  - Set OR 1 Term 2 to **T2 Island**

6.6.1.6 Internal I/O States

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 5000 GCP provides 16 internal I/O States. Each of these states is:

- Sets a selected system input
- Set by a selected system output

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 5000 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 5000 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
- Set the state on Internal state 1 (**Int.1 Set by**) with **T2 Prime**
- Set the state of **T1 Prime UAX** with Internal State 1 (**Int.1 Sets**)

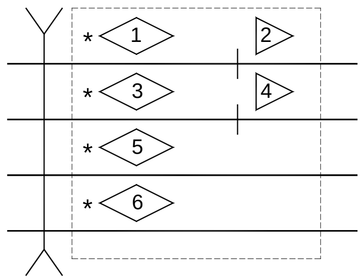


Figure 6-33:
Template 2A (Shown For Reference Only)

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTOR: PRIME]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to **10 sec**
- On the **Logic: Internal I/O** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1]:
  - Set Int.1 Sets to **T1 Prime UAX**
  - Set Int.1 Set by to **T2 Prime**

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).

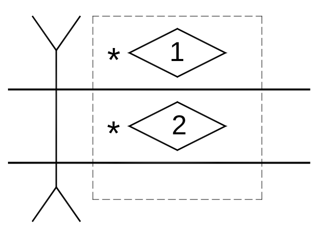


Figure 6-34:
Template 1A (Shown for Reference Only)

(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**.
- Set **AND 3** to AND both islands.

- 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).
- Use Internal State 1 (**Int.1 Sets**) to set the **AND 2 Wrap** input (thus AND 2 is energized when any island is occupied).
- Set Internal States 2 (**Int.2 Set by**) and 3 (**Int.3 Set by**) with **Passthru State 1** and **2** respectively).
- 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.
- Set Internal States 5 through 8 as follows:
- Set **Int.5 Set by** to **Passthru State 1**.
- Set **Int.6 Set by** to **Passthru State 1**.
- Set **Int.7 Set by** to **Passthru State 2**.
- Set **Int.8 Set by** to **Passthru State 2**.
- Use Internal States 5 through 8 to set the GDs as follows:
- Set **Int.5 Sets** to **GD 1.1**.
- Set **Int.6 Sets** to **GD 1.1**.
- Set **Int.7 Sets** to **GD 2.1**.
- Set **Int.8 Sets** to **GD 2.1**.
- Assign **Passthru State 1** and **2** to where the GDs are wired on the SSCC modules.

The programming is as follows:

- On the **Logic: Track ANDing** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING]:
  - Set **AND 2 Used** to **Yes**
  - Set **AND 3 Used** to **Yes**
- On the **Logic: AND 2** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 2) AND 2 USED]:
  - Set **+AND 2 Enable Used** to **Yes**
- On the **Logic: AND 2 Enable** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 2) AND 2 USED > 1) AND 2 ENABLE USED]:
  - Set **AND 2 Enable Pickup** to **0 sec**
  - Set **AND 2 Enable Drop** to **0 sec**
  - Set **AND 2 Wrap Used** to **Yes**
- On the **Logic: AND 3** screen [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 3) AND 3 USED]:
  - Set **AND Track 1** to **Isl Only**
  - Set **AND Track 2** to **Isl Only**
- On the **Logic: Controls** screen [3) LOGIC PROGRAMMING > 4) LOGIC: CONTROLS]:
  - Set **Pass Thrus** to **Yes**
- On the **Logic: Internal I/O 1-4** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set **Int.1 Sets** to **AND 2 Wrap**
  - Set **Int.1 Set by** to **NOT AND 3**
  - Set **Int.2 Sets** to **AND 2 Enable**
  - Set **Int.2 Set by** to **Passthru State 1**
  - Set **Int.3 Sets** to **And 2 Enable**
  - Set **Int.3 Set** by to **Passthru State 2**
  - Set **Int.4 Sets** to **Not Used**
  - Set **Int.4 Set** by to **Not Used**

- On the **Logic: Internal I/O 5-8** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 2) INTERNAL I/O 5-8]:
  - Set **Int.5 Sets** to **GD 1.1**
  - Set **Int.5 Set by** to **Passthru State 1**
  - Set **Int.6 Sets** to **GD 1.1**
  - Set **Int.6 Set by** to **Passthru State 1**
  - Set **Int.7 Sets** to **GS 2.1**
  - Set **Int.7 Set by** to **Passthru State 2**
  - Set **Int.8 Sets** to **GD 2.1**
  - Set **Int.8 Set by** to **Passthru State 2**
- On the **I/O: Input Slot SSCC 1** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 4) I/O: INPUT SLOT SSCC 1]:
  - Set **IN 7.1** to **Passthru State 1**
  - Set **IN 7.2** to **Passthru State 1**
  - Set **IN 7.4** to **Not Used**
- On the **I/O: Input Slot SSCC 2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 4) I/O: INPUT SLOT SSCC 2]:
  - Set **IN 8.4** to **Passthru State 2**
  - Set **IN 8.5** to **Passthru State 2**

6.6.1.6.3 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 2.1). 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
- Set the internal I/O 1 (**Int.1 Set by**) state using **Passthru State 1**
- Set the internal I/O 2 (**Int.2 Set by**) state using **Passthru State 2**
- Use internal I/O 1 (**Int.1 Sets**) to set **GP 1.1**
- Use internal I/O 2 (**Int.2 Sets**) to set **GP 2.1**
- Assign input 7.5 to **Passthru State 1** (**IN 7.5** now sets GP 1.1 via internal I/O state 1)
- Assign input 8.5 to P**assthru State 2** (**IN 8.5** now sets GP 2.1 via internal I/O state 2)
- Set the OR inputs using **Passthru States 1** and **2**.

To set the parameters listed above:

- On the **Logic: Controls** screen [3) LOGIC PROGRAMMING > 4) LOGIC: CONTROLS]:
  - Set Pass Thrus to **Yes**
- On the **Logic: OR 2** screen [3) LOGIC PROGRAMMING > 3) LOGIC: OR GATES > 2) LOGIC: OR 2 USED]:
  - Set **OR 2 Term 1** to **Passthru 1**
  - Set **OR 2 Term 2** to **Passthru 2**
- On the **Logic: Internal I/O 1-4** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set **Int.1 Sets** to **GP 1.1**
  - Set **Int.1 Set by** to **Passthru State 1**
  - Set **Int.2 Sets** to **GP 2.1**
  - Set **Int.2 Set by** to **Passthru State 2**

- On the **I/O: Input Slot SSCC 1** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 4) I/O: INPUT SLOT SSCC 1]:
  - Set **IN 7.5** to **Passthru State 1**
- On the **I/O: Input Slot SSCC 2** screen [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS > 4) I/O: INPUT SLOT SSCC 2]:
  - Set **IN 8.5** to **Passthru State 2**

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 5000 GCP provides four Passthru states

Paragraphs 6.6.1.6.3 and 6.6.1.6.2 provide examples of using Passthru states.

6.7 ETHERNET SPREAD SPECTRUM RADIO AND VITAL COMMUNICATION LINKS

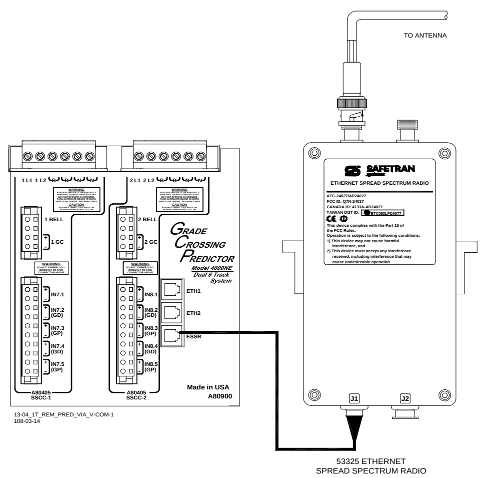


Figure 6-35:
Generic Model 5000 GCP Connection to Ethernet Spread Spectrum Radio

Ethernet spread spectrum radio may be used to send vital ATCS messages between locations without the use of physical cables. Vital status information can be sent from other GCPs and evaluated using system logic. Based on this evaluation, the crossing unit determines when the crossing should be activated.

Model 5000 GCP units communicate using the Echelon LONTALK® communication protocol. The Model 5000 GCP has onboard circuitry that allows communication via Ethernet using Ethernet Spread Spectrum Radios (ESSR). An example of the generic connections between the Model 5000 GCP and the ESSR is provided in Figure 6-35. For further information see Section 6.8. For further information regarding Echelon® Lontalk, see Siemens's Echelon® Configuration Handbook, COM-00-07-09.

6.8 VITAL COMMS LINKS

CAUTION

CAUTION

When using a HD/LINK with GCP 5000, connect the two units using VCom 1 or VCom 2 only. Using VCom 3 or VCom 4 may cause damage to the HD/LINK unit.

An Ethernet connection via an Ethernet ESSR may be used to send vital ATCS messages between Model 5000 GCPs, between a Model 5000 GCP and a Model 4000 GCP, or from a Model 5000 GCP to an HD/Link Module without the use of line wires. A Model 5000 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. Four Vital Comms links may be used with the Model 5000 GCP: Vital Comms Link 1 (VCom 1), Vital Comms Link 2 (VCom 2), Vital Comms Link 3 (VCom 3), and Vital Comms Link 4 (VCom 4). Using either VCom 1 or VCom 2, the ATCS messages sent from the Model 5000 GCP unit contain the states of eight (8) general purpose vital inputs and eight (8) general purpose vital outputs on the Model 5000 GCP unit. Using either VCom 3 or VCom 4, the ATCS messages sent from the Model 5000 GCP unit contain the states of sixteen (16) general purpose vital inputs and sixteen (16) general purpose vital outputs on the Model 5000 GCP unit. When the ATCS message from the Model 5000 GCP is received by a Model 5000 GCP, if the message is valid it can be used to set the states of up to eight (VCom 1 or VCom 2) or sixteen vital outputs (VCom 3 or VCom 4) on the Model 5000 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 5000 GCP, if the message is valid it can be used to set the states of up to eight vital outputs on the Model 5000 GCP. The Vital Comms links can be used to:

- Communicate DAX information between two Model 5000 GCP units
- Communicate other vital states between two Model 5000 GCP units
- Communicate DAX information between a Model 5000 GCP unit and a Model 4000 unit
- Communicate other vital states between a Model 5000 GCP unit and a Model 4000 unit
- Communicate DAX information from a Model 5000 GCP unit to a Model 3000 GCP via an HD/Link Module
- Communicate DAX information from a Model 3000 GCP unit to a Model 5000 GCP via an HD/Link Module

6.8.1 ATCS Addressing and ATCS Offsets

Because the Model 5000 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 5000 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 5000 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 the example below, both the group (**GGG**) and subnode (**SS**) numbers will differ.

The examples below provide 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 5000 GCP, as well as the ATCS address (SIN) associated with that GCP.

6.8.1.1 Setting Model 5000 GCP Site Identification Number (SIN)

Prior to beginning the remote site setup, its ATCS address must be programmed. The Site Identification Number is set as follows:

NOTE	**NOTE** Setting the Site Identification Number (SIN) on the Model 5000 GCP is not done from within the Main Program Menu. Select the Back button and return to Program View.

To set the SIN:

- On **Site Configuration** screen [1) SITE SETUP > 1) SITE CONFIGURATION]:
  - Set **ATCS – Railroad** to the number specified in the approved site drawing.
  - Set **ATCS – Line** to the number specified in the approved site drawing.
  - Set **ATCS – Group** to the number specified in the approved site drawing.
  - Set **ATCS – CPU2+ Subnode** to the number specified in the approved site drawing.

The GCP will reboot after navigating away from the **Site Configuration** screen when the ATCS data has been changed.

6.8.1.2 Setting the Address of Remote Site Directly

Select the numerical portion of the Remote SIN parameter on the **Vital Comms link "N"** screen. When the **Set Remote Site ID** Window opens, enter the new Remote SIN value and select **OK**. The new SIN will reflect in the **Vital Comms Link "N"** Window.

6.8.2 Vital Comms Link Programming Parameters

On the **Vital Comms Links screen**, 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.
- **Vital Link 1 IP 1** through **Vital Link 1 IP 8** are available to be assigned to inputs, or internal channels.

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.
- **Vital Link 2 IP 1** through **Vital Link 2 IP 8** are available to be assigned to inputs, or internal channels.

When the **Vital Comms Link 3 Used** field is set to **Yes**:

- **Vital Link 3 OP 1** through **Vital Link 3 OP 16** are available to be assigned to outputs, or internal channels.
- **Vital Link 3 IP 1** through **Vital Link 3 IP 16** are available to be assigned to inputs, or internal channels.

When the **Vital Comms Link 4 Used** field is set to **Yes**:

- **Vital Link 4 OP 1** through **Vital Link 4 OP 16**are available to be assigned to outputs, or internal channels.
- **Vital Link 4 IP 1** through **Vital Link 4 IP 16** are available to be assigned to inputs, or internal channels.

6.8.3 Message Update and Timeouts

The transmission parameters for each Vital Comms link are set using the **Vital Comms Link "N"** window. 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 5000 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.

6.8.4 Using the Vital Comms to DAX From Remote to Crossing

NOTE

NOTE

Vital Comms Links of neighbor sites must always be used in pairs; i.e., Vital Link 1 of one Model 5000 GCP must be connected to Vital Link 1 of the other Model 5000 GCP.

A remote site can be used to send a DAX signal to a crossing via an ESSR as shown in Figure 6-36.

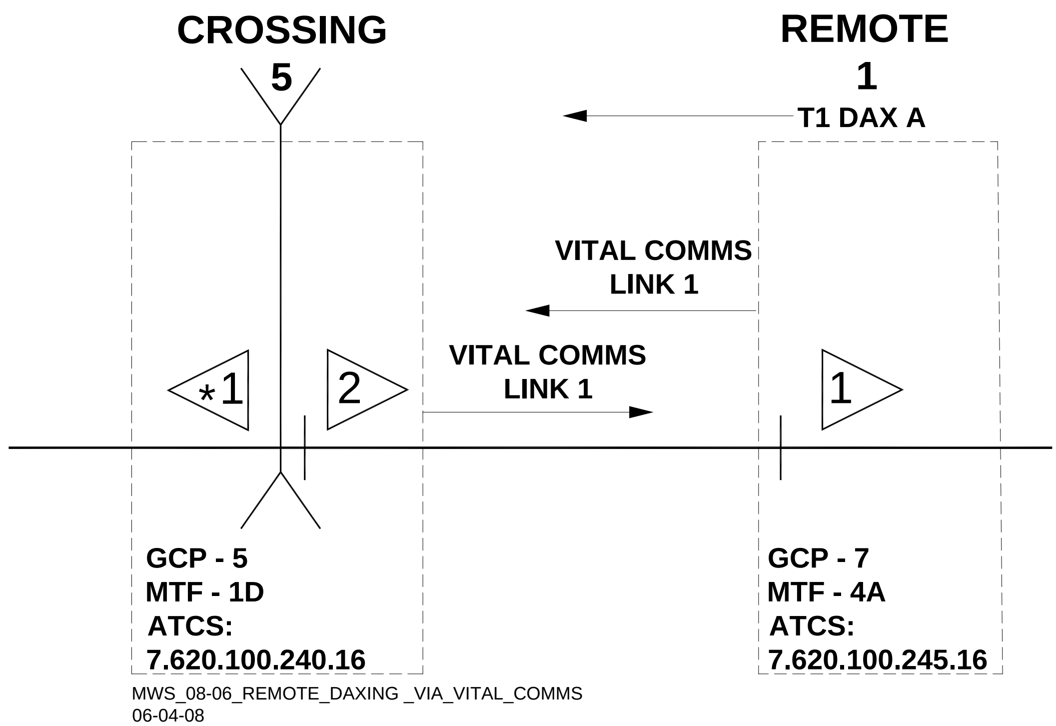


Figure 6-36:
Remote Site DAXing A Crossing Via Vital Comms Link

6.8.4.1 Remote Site Programming

For the configuration shown in Figure 6-36 on the Remote 1 GCP:

- On Vital Comms Links screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS]:
  - Set Vital Comms Link 1 Used to **Yes**.
- On Vital Comms Link 1 screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS > 1) VITAL COMMS LINK 1]:
  - Set Remote SIN to **762010024016**

6.8.4.2 Crossing Site Programming

For the configuration shown in Figure 6-36, the crossing site (Crossing 5, Track 2) is programmed as follows:

- On Vital Comms Links screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS]:
  - Set Vital Comms Link 1 Used to **Yes**.
- On Vital Comms Link 1 screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS > 1) VITAL COMMS LINK 1]:
  - Set Remote SIN to **762010024516**

The Vital Comms output state must be connected to the UAX for track 1. This can be done using the internal channels.

- On the **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Set +Prime UAX to **Yes**

- On the **Logic: Internal I/O 1-4** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.1 Sets to **T1 Prime UAX**
  - Set Int.1 Set by to **Vital Link 1 OP 1**

6.8.4.3 Crossing 6 (Model 3000 GCP – HD/Link Module) Programming

In Figure 6-37, a remote Model 3000 GCP site is DAXing to two bidirectional crossings equipped with Model 5000 GCPs using an HD/Link Module and radio link.

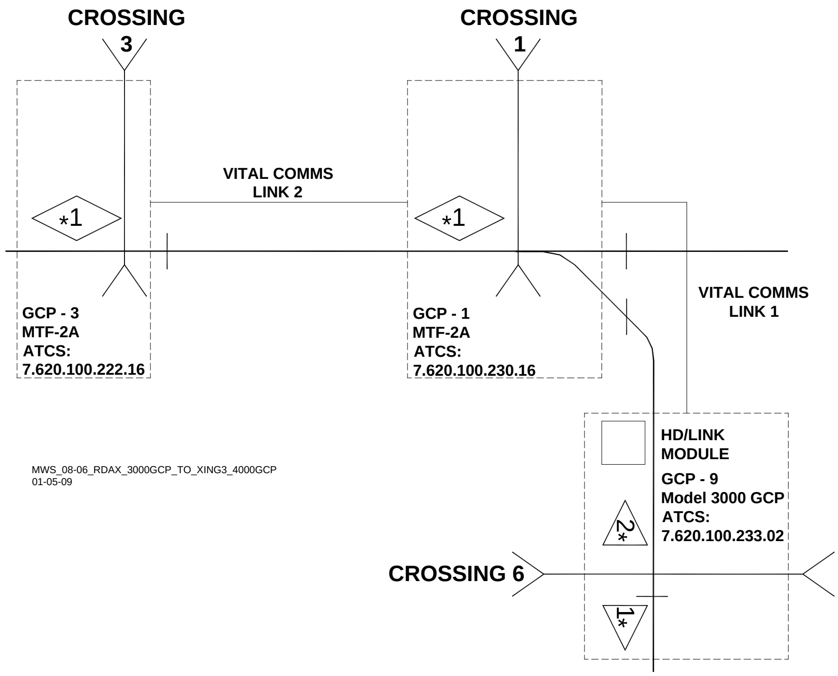


Figure 6-37:
Model 3000 GCP DAXing to Model 5000 GCPs

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 6.9 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 5000 GCP’S. PLEASE FOLLOW THE PROCEDURES OUTLINED IN SECTION 6.9.

6.8.4.4 Crossing 1 (GCP-1) Programming

For the configuration shown in Figure 6-37, the Crossing 1 GCP **Vital Comms links** Window is programmed as follows:

- On Vital Comms Links screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS]:
  - Set Vital Comms Link 1 Used to **Yes**.
  - Set Vital Comms Link 2 Used to **Yes**.

- On Vital Comms Link 1 screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS > 1) VITAL COMMS LINK 1]:
  - Set Remote SIN to **762010023302**

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 **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to **10 sec**
- On the **Logic: Internal I/O 1-4** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.1 Sets to **T1 Prime UAX**
  - Set Int.1 Set by to **Vital Link 1 OP 1**
  - Set Int.2 Sets to **Vital Link 2 IP 1**
  - Set Int.2 Set by to **Vital Link 1 OP 2**

6.8.4.5 Crossing 3 (GCP-3) Programming

- On Vital Comms Links screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS]:
  - Set Vital Comms Link 2 Used to **Yes**.
- On Vital Comms Link 1 screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS > 1) VITAL COMMS LINK 1]:
  - Set Remote SIN to **762010023016**

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 **Trk 1 Predictor: Prime** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > Trk 1 Predictor: Prime]:
  - Set +Prime UAX to **Yes**
  - Set Prime UAX Pickup to **10 sec**
- On the **Logic: Internal I/O 1-4** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.1 Sets to **T1 Prime UAX**
  - Set Int.1 Set by to **Vital Link 1 OP 1**

6.9 HD/LINK MODULE PROGRAMMING SUPPORT

With the release of the latest Siemens Display Terminal (DT) (version 5.7.1 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 5000 GCP DT can be used to modify a currently loaded MCF on the DT.

The DT version 5.7.1 and newer 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.

For further information regarding Echelon® Lontalk, see Siemens's Echelon® Configuration Handbook, COM-00-07-09.

⚠ WARNING

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.

6.9.1 Start the Diagnostic Terminal (DT)

To prepare the DT for use with the HD/LINK:

- Open the DT

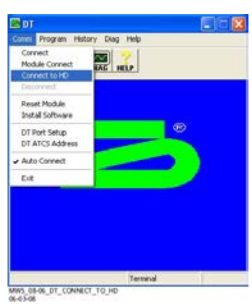


Figure 6-38:
Connecting to HD

- Select COMM > Connect to HD (see Figure 6-38). The HD DT opens (see Figure 6-39).

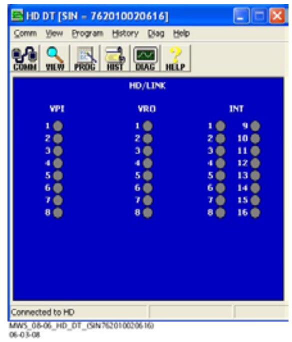


Figure 6-39:
The HD/LINK DT Window

6.9.2 Install MEF

WARNING

WARNING

LOAD HDL01_20 OR LATER VERSION OF MEF ONLY. DO NOT LOAD SOFTWARE VERSIONS HDL01_00 OR HDL01_10. REFER TO CUSTOMER SERVICE BULLETIN CSB4-98 FOR INFORMATION.

NOTE

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 6-40). The Text Terminal Window opens (see Figure 6-41) which allows the user to Change SIN (F1), Change UCN (F2), Change MCF (F3), Change MEF (F4) or Exit Setup (F5).

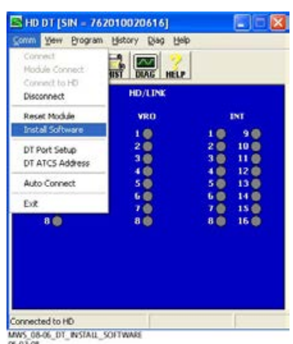


Figure 6-40:
The Install Software Option Window

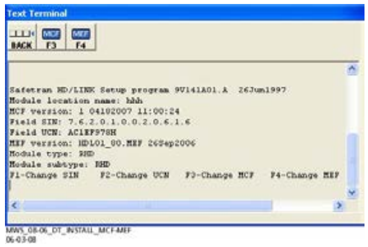


Figure 6-41:
The Text Terminal Window – Install MEF

- Select F4 - Change MEF. “Erase the MEF?” appears on the Text Terminal Window. Enter Y and press ENTER.

Figure 6-42:
The Upload MEF File Window

- The Upload MEF File Window opens. Select the correct MEF file and select OPEN.

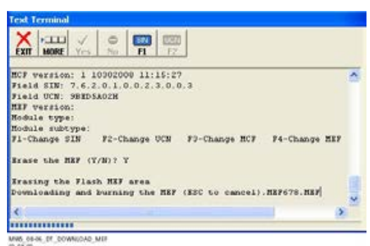


Figure 6-43:
The Download MEF Text Terminal Window

- The MEF is downloaded and burned into the Flash EEPROM. Once the MEF is installed, begin installing the updated MCF.

6.9.3 Operations Regarding the MCF

6.9.3.1 <u>Create a Remote SIN using Model 5000 GCP</u>

One of the features of DT 4.7.5 allows the Model 5000 GCP to be connected directly to the HD/LINK using VCom 1 – VCom 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 Vital Comms Link 1 Window (see Figure 6-44), enter the Remote SIN. Select the HD MCF button.

Figure 6-44:
The Vital Comms Link 1 Window – HD Link Button and SIN Setting

- The Create HD/LINK MCF Window opens (see Figure 6-46).

Figure 6-45:
The Create HD/LINK MCF Window

- Select Create. The UCN line of the screen is populated (see Figure 6-46). 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 6-47, Figure 6-48, and Figure 6-49)

Figure 6-46:
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 6-47:
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 6-48:
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.

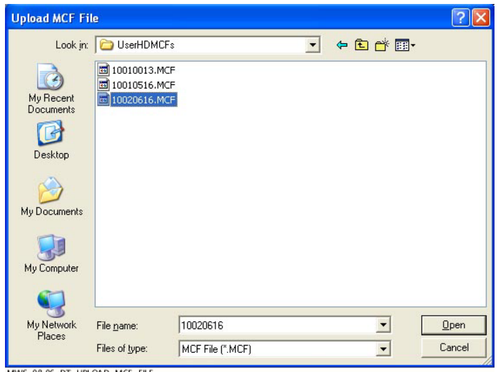
MWS_08-06_DT_HD-LINK_MOD_CONFIG_LISTING_P3
06-03-08

Figure 6-49:
HD/LINK Module Configuration File Listing, Part 3

6.9.3.2 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 6-40). The Text Terminal Window opens (see Figure 6-41).
- Select F3-Change MCF. The Upload MCF File Window opens (see Figure 6-50). Use the location provided on the Name: line of the New HD MCF section of the Window(see Figure 6-46) or on the MCF: line of the HD/LINK Module Configuration File Listing (see Figure 6-47)

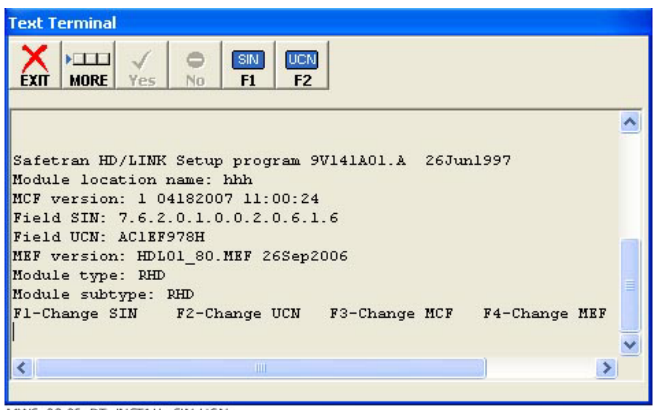


MWS_08-06_DT_UPLOAD_MCF_FILE
06-03-08

Figure 6-50:
The Upload MCF Window

6.9.4 Set SIN.

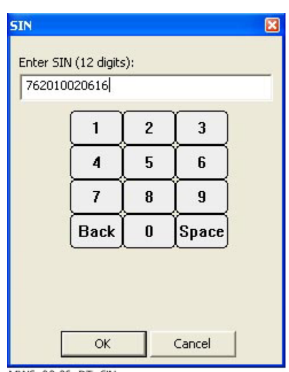
- Once the file has uploaded, select F1 – Change SIN on the Text Terminal Window (see



MWS_08-06_DT_INSTALL_SIN-UCN
06-03-08

Figure 6-51:
The Text Terminal Window – Change SIN – UCN

- Select F1- Change SIN. The Change SIN Window opens (see Figure 6-52). Enter the new SIN and select OK.



MWS_08-06_DT_SIN
06-03-08

Figure 6-52:
The Change SIN Window

6.9.5 Set UCN.

- On the Text Terminal Window (see Figure 6-51), select F2 – Change UCN. The MCFCRC Window opens (see Figure 6-53).

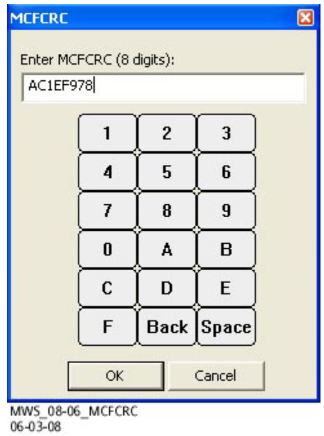


Figure 6-53:
The MCFCRC Window

- Enter the new UCN. After the Text Message Window updates and the Change module setup? Message appears, enter N. Then select the Exit button.

6.9.6 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 6-54). 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.

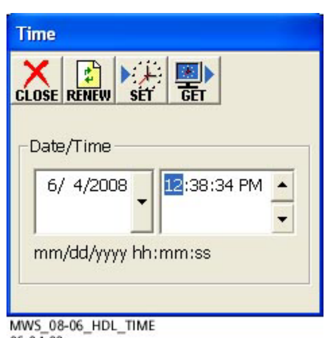


Figure 6-54:
The Time Window

6.9.7 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.

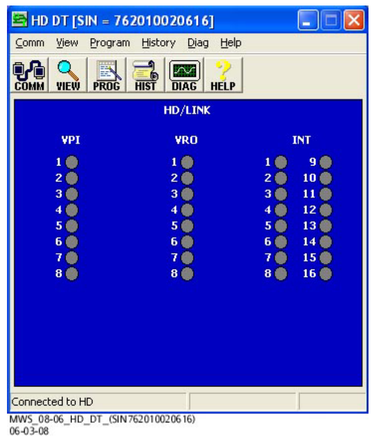


Figure 6-55:
The HD/LINK DT Window

6.9.8 View module status.

To view module status:

- Select View > Module Status. The HD Status Window opens (see Figure 6-56).

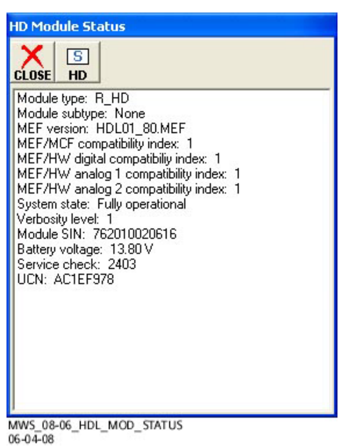


Figure 6-56:
The HD/LINK Module Status Window

6.9.9 View SAT status.

To view the SAT status:

- Select View>SAT Status the SAT Window opens (see Figure 6-57A). Select the VSAT to be observed. Select OK. The HD SAT Status Window opens (see Figure 6-57B)

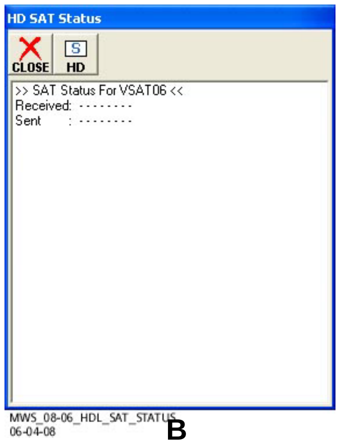


Figure 6-57:
A: The Select SAT Window; B: The HD SAT Status Window

6.9.10 View timing parameter settings.

To view the timing parameter settings:

- Select View>Timing Parameters. The Select SAT (Figure 6-57) Window opens. Select the SAT, select OK. The HD Timing Parameters Window opens (see Figure 6-58).

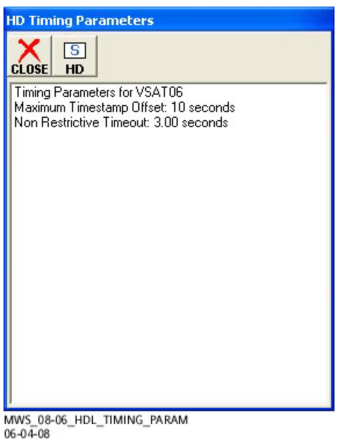


Figure 6-58:
The HD Timing Parameters Window

6.9.11 View and save the status log.

To view the Status Log:

- Select History> Status Log. The Status Log Window opens.

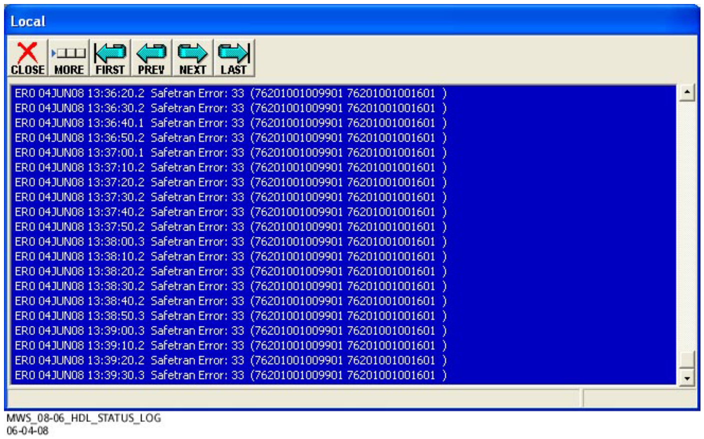


Figure 6-59:
The Status Log Window

6.9.12 View the diagnostic dump.

To view the Diagnostic Dump:

- Select Diag> Diagnostic Dump

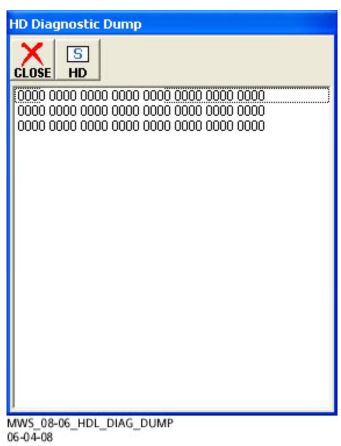


Figure 6-60:
The Diagnostic Dump Window

6.9.13 View statistics.

To view the DT Statistics:

- Select Diag > Statistics

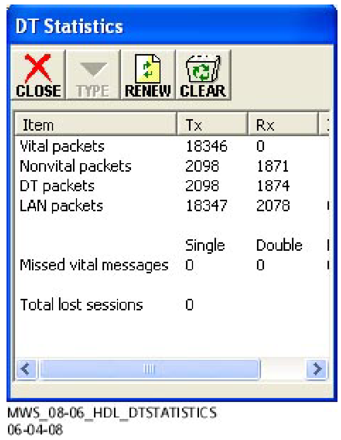


Figure 6-61:
The DT Statistics Window

6.9.14 Set the verbosity.

To view the verbosity level:

- Select View> Status Log. The Status Log Window (Figure 6-59) appears. Select the More button until the Set Verb Button appears at the end of the buttons, then select the Set Verb Button

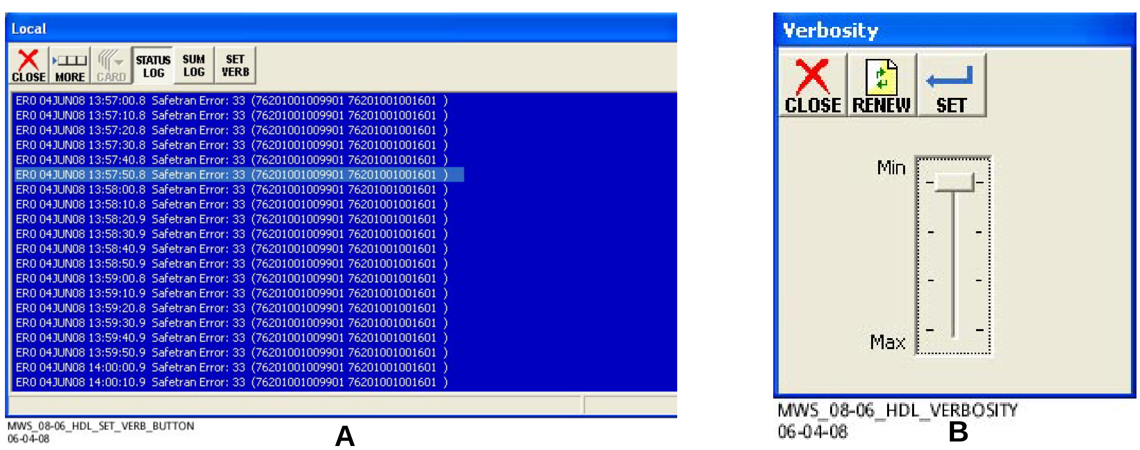


Figure 6-62:
A: The Set Verb Button; B: The Verbosity Window

6.9.15 Reset the HD/LINK module.

To Reset the HD/LINK Module:

- Select Comm > Reset Module. Select Yes on the confirmation window. The Text Terminal Window opens (see Figure 6-63).

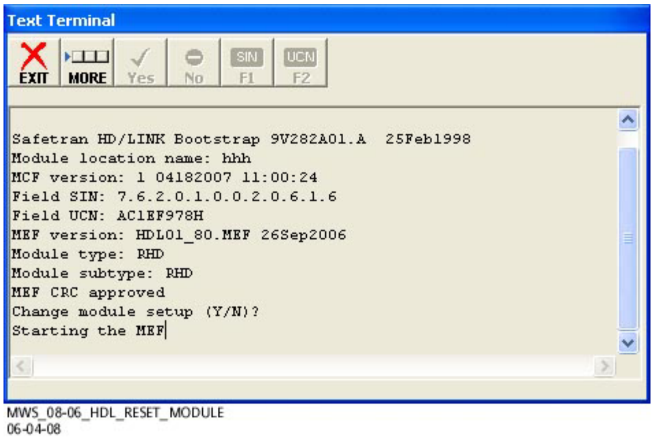


Figure 6-63:
The Reset the HD/Link Module Window

6.9.16 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.

6.10 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 5000 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 5000 GCP Phase Shift Overlay (PSO) Module.

6.10.1 Model 5000 GCP Phase Shift Overlay (PSO) Module, A80423-03

NOTE

NOTE

For further general information regarding the Model 5000 GCP Phase Shift Overlay (PSO) Module, P/N 80428-03 not found in this manual, please refer to Siemens's Phase Shift Overlay 4000 (PSO 4000) Installation and Instruction Manual, SIG-00-07-06.

The Model 5000 GCP Phase 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.

6.10.2 PSO Module Specifications

6.10.2.1 Frequencies Available for Use with PSO Module

WARNING

WARNING

NEVER USE AN APPROACH FREQUENCY THAT IS THE SAME AS THE ISLAND FREQUENCY.

The standard Siemens PSO module frequencies depicted in Table 6-1 are available for use with PSO module when utilized as a PSO transmitter or receiver. The alternate frequencies depicted in Table 6-1 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 6-1:
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 6-2:
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.

6.10.2.2 Maximum Operating Distances and Frequency Interoperability

Table 6-3:
Maximum Operating Distances at 0.06-Ohm Shunting Sensitivity

APPLICATION	GROUP	FREQUENCY (HZ)	BALLAST 2 Ω/1,000 FT. OPERATING DISTANCE (FT./M)	BALLAST 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 6-4 depicts the frequency compatibility between the PSO Module frequencies and the Track Card frequencies found on the Model 5000 GCP, the Model 4000 GCP, and the Model 3000 GCP.

Table 6-4:
PSO Module and GCP Track Card Frequency Compatibility

			Model 3000/4000/5000 GCP Frequencies (Hz)										
			86	114	156	211	285	348	430	525	645	790	970
PSO Module Standard Frequencies	Group 1 Frequencies	156					///	///	///	///	///	///	///
		285		///	///						///	///	///
		430		///	///		///						///
		645	///	///	///		///						
		970	///	///	///	///	///	///	///				
		1450	///	///	///	///	///	///	///				
		2140	///	///	///	///	///	///	///	///	///	///	
		3240	///	///	///	///	///	///	///	///	///	///	///
	Group 2 Frequencies	211						///		///		///	///
		348										///	
		525	///	///	///	///							
		790	///	///		///	///	///					
		1180	///	///	///	///	///	///	///				
		1770	///	///	///	///	///	///	///	///			///
		2630	///	///	///	///	///	///	///	///	///	///	///
		4000	///	///	///	///	///	///	///	///	///	///	///

/// Compatible   (blank) INCOMPATIBLE

6.10.3 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.

6.10.4 PSO Module User Interface

The Model 5000 GCP Display controls all of the PSO module's functionality and input/output assignments. Generally, the Display 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 Display screens and one display mounted on the PSO module:

- Model 5000 GCP Display 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.

6.10.4.1 Model 5000 GCP Display Window with PSO Summary Data

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

6.10.4.2 PSO Detail Status View Window

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 a 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

6.10.4.3 PSO Calibration Window

The PSO Calibration screen allows the PSO receivers to be calibrated.

6.10.4.4 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.

6.10.5 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

6.10.5.1 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).

6.10.5.2 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 5000 GCP unit Maintenance Call output.

The GCP unit allows users to configure the following health indication outputs:

- RX1
- RX2
- TX

6.10.5.3 Occupation Outputs

The GCP unit allows users to configure an output to provide occupancy indications for the following items:

- PSO RX1
- PSO RX2

6.10.6 Bidirectional DAXing

Bidirectional DAXing is programmed on the **Trk "N": BiDax to RX Approach** screen using the **+BIDAX To RX Approach** parameter or the **Trk "N": BiDax to TX Approach** screen, using the **+BIDAX To TX Approach** parameter. The parameter supports programming the following BIDAX setup configuration values:

- 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)

When configured for bidirectional DAXing, the parameters and ranges of values depicted in Table 6-5 are available.

Table 6-5:
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 Display 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.

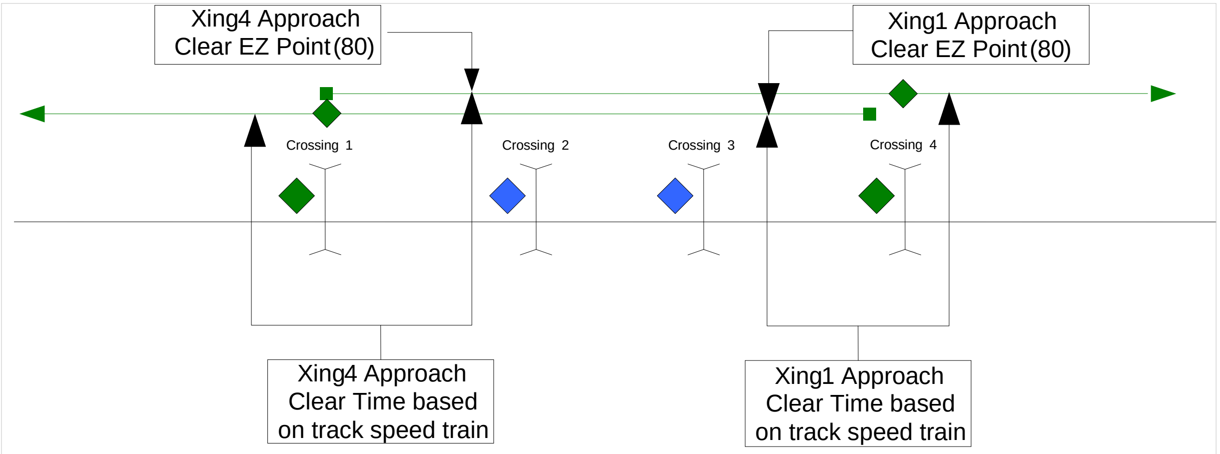
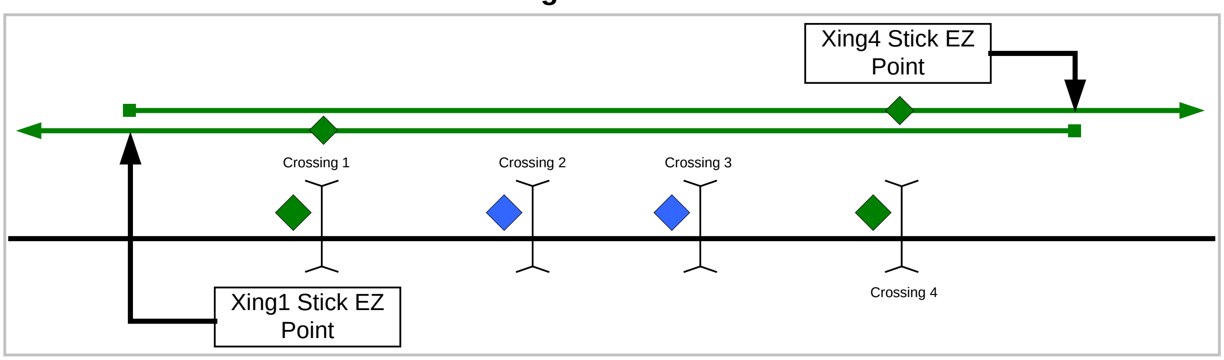


Figure 6-64:
Approach Clear Time

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.

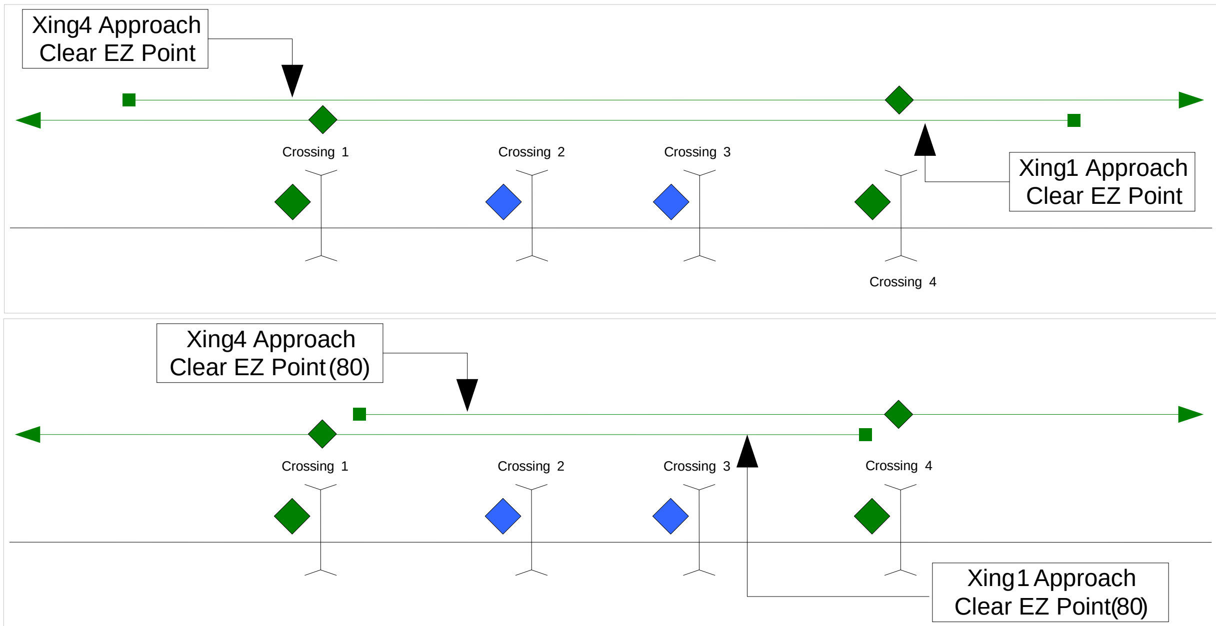
Figure 6-65:



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 6-66:



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 6-66) except when this crossing's approach extends through the adjacent bidirectional DAX system crossing island (as depicted in the upper portion of Figure 6-66). 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 5000 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 5000 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.

6.10.6.1 Configuring Internal PSOs for Bidirectional DAX Operation

In applications where the Model 5000 GCP is positioned to DAX bidirectionally, e.g., between two or more Model 5000 GCPs all of which are programmed for bidirectional DAXing, the system must identify which direction of travel is associated with each DAX. This is enabled using multiple screens:

- On the **Module Selection** screen [1) BASIC CONFIGURATION > 2) MODULE SELECTION]:
  - Set Track 1/PSO 1 Slot to **Track**
  - Set Track 3/PSO 2 Slot to **PSO**
  - Set Track 4/PSO 3 Slot to **PSO**
  - Set all remaining screen parameters per approved site drawing
- On the **Trk 1: BiDax to RX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO RX APPROACH]:
  - Set +BIDAX To RX Approach to **Internal PSO**
  - Set PSO Used to **PSO 2**
  - Set all remaining screen parameters per approved site drawing
- On the **Trk 1: BiDax RX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO RX APPROACH > 1) PSO USED]:
  - Set all screen parameters per approved site drawing
- On the **Trk 1: BiDax to TX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH]:
  - Set +BIDAX To TX Approach to **Internal PSO**
  - Set PSO Used to **PSO 3**
  - Set all remaining screen parameters per approved site drawing
- On the **Trk 1: BiDax TX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH > 1) PSO USED]:
  - Set all screen parameters per approved site drawing,

- On the **Trk 1: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Directionally Wired to **Yes**
  - Set all remaining screen parameters per approved site drawing
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set 2) Dax A used to **Yes**
  - Set any other predictors specified in the approved site drawings to **Yes**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A > 2) DAX A USED]:
  - Set Dax A Track Side used to **RX Wire Side** or **TX Wire Side**, as specified in the approved site drawing
  - Set all other parameters as specified in the approved site drawings to **Yes**

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.

6.10.6.1.1 BIDAX Setup Configuration for Vital I/O

NOTE

> **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.

The Vital IO application (see Figure 6-67)) must have a six-wire track connection and the Directionally Wired parameter must be enabled in order to properly operate. The Directionally Wired parameter is found at the bottom of the list of parameters on the **Trk 1 Predictor: Prime**, **Trk 1 Predictor: Preempt**, and **Trk 1 Predictor: Dax A-G** screens.

When Vital I/O is selected as the BIDAX to RX/TX Appr parameter, the parameters listed in Table 6-6 are displayed (same parameters appear on both screens).

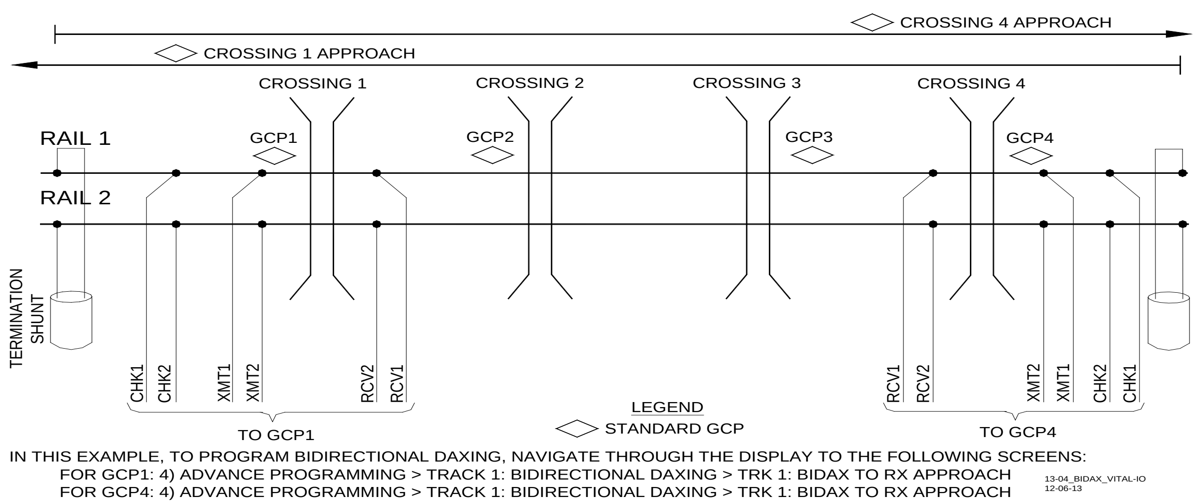


Figure 6-67:
Typical BIDAX Vital IO Application

Table 6-6:
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)

6.10.6.1.2 BIDAX Setup for Internal PSO

NOTE

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.

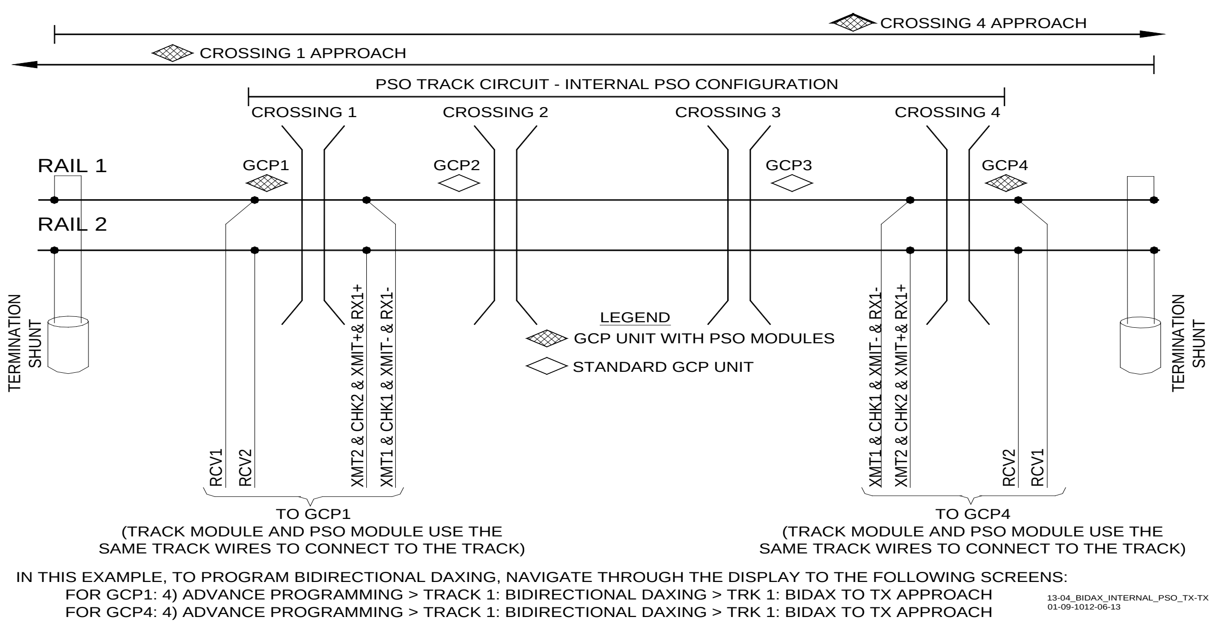


Figure 6-68:
Typical BIDAX Internal PSO Application

When Internal PSO is selected as the BIDAX to RX/TX Appr parameter, the parameters in Table 6-7 are displayed.

Table 6-7:
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 6-1's Std. PSO Freq. row. Default = **Not Selected.**
• TX Frequency Category	**Standard**, Alternate
• TX Frequency	See Table 6-1's Std. PSO Freq. row. Default = **Not Selected.**
• TX Level	**Low**, High

(Default values are displayed in bold text)

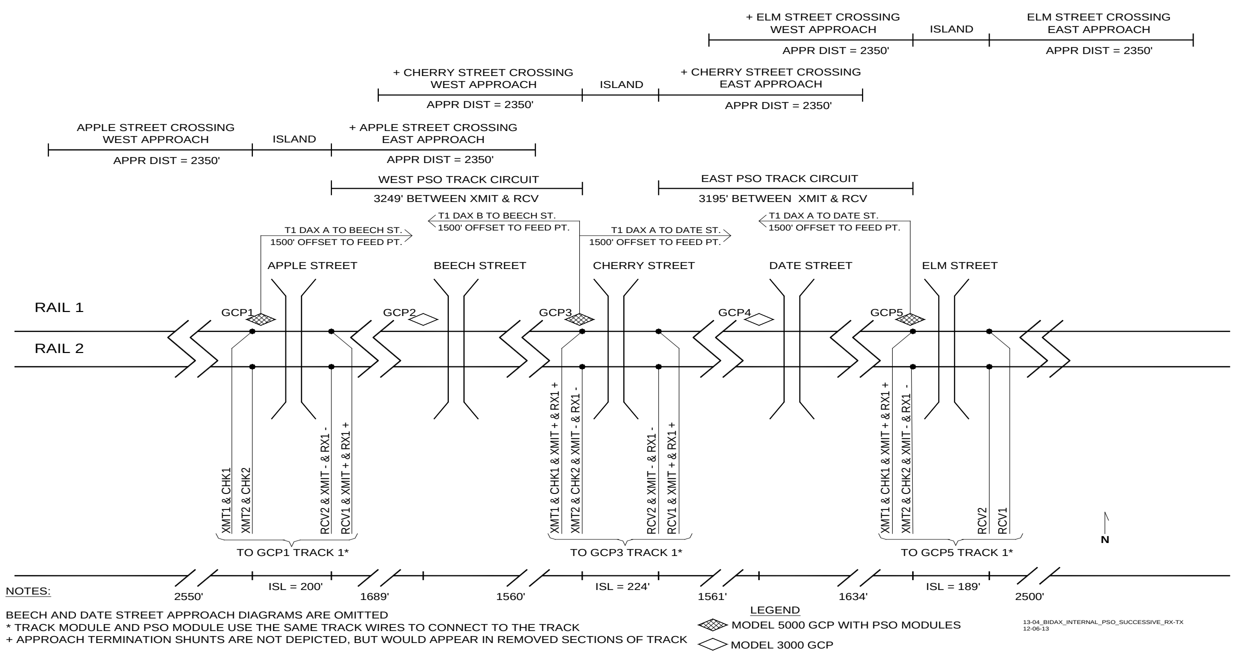


Figure 6-69:
Typical Successive BIDAX Application

6.10.6.1.3 BIDAX Setup for Center Fed PSO

When Center Fed PSO (see Figure 6-70) is selected as the BIDAX to RX/TX Appr parameter, the following parameters in Table 6-8 are displayed.

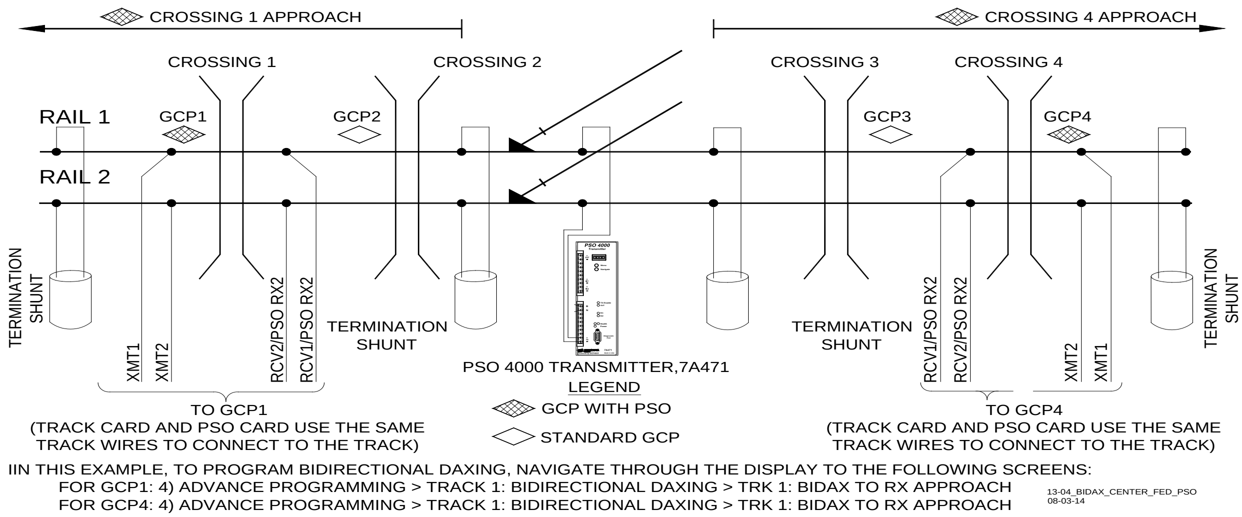


Figure 6-70:
Typical BIDAX Center Fed PSO Application

Table 6-8:
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 6-1's Std. PSO Freq. row. Default = **Not Selected.**

(Default values are displayed in bold text)

6.10.7 Bidirectional DAX Application Guidelines

6.10.7.1 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.

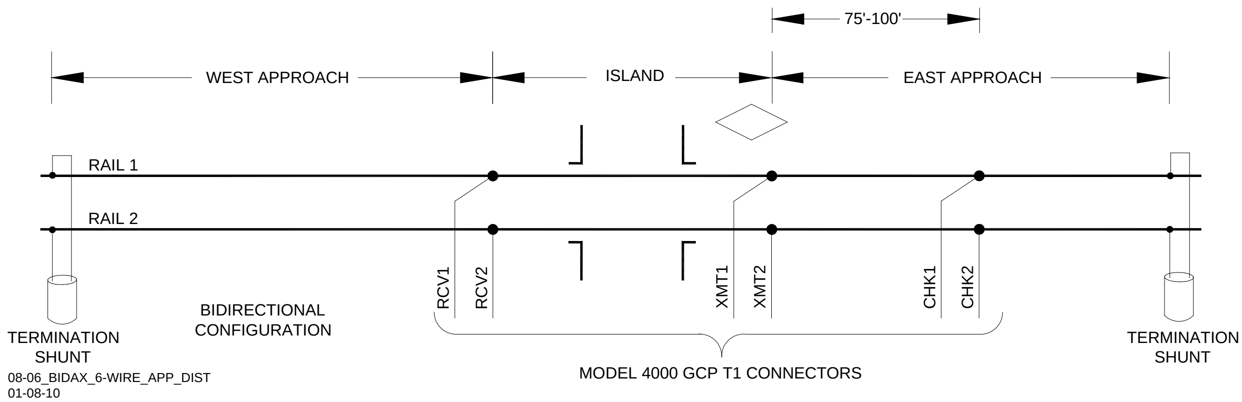


Figure 6-71:
Typical Six-Wire Track Connections Used in Vital IO Applications

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 6-71).

The parameter “Directionally Wired” that appears on the **Trk 1: BiDax to RX/TX Approach** screen 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

6.10.7.2 <u>Internal PSO Configuration</u>

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 6-72.

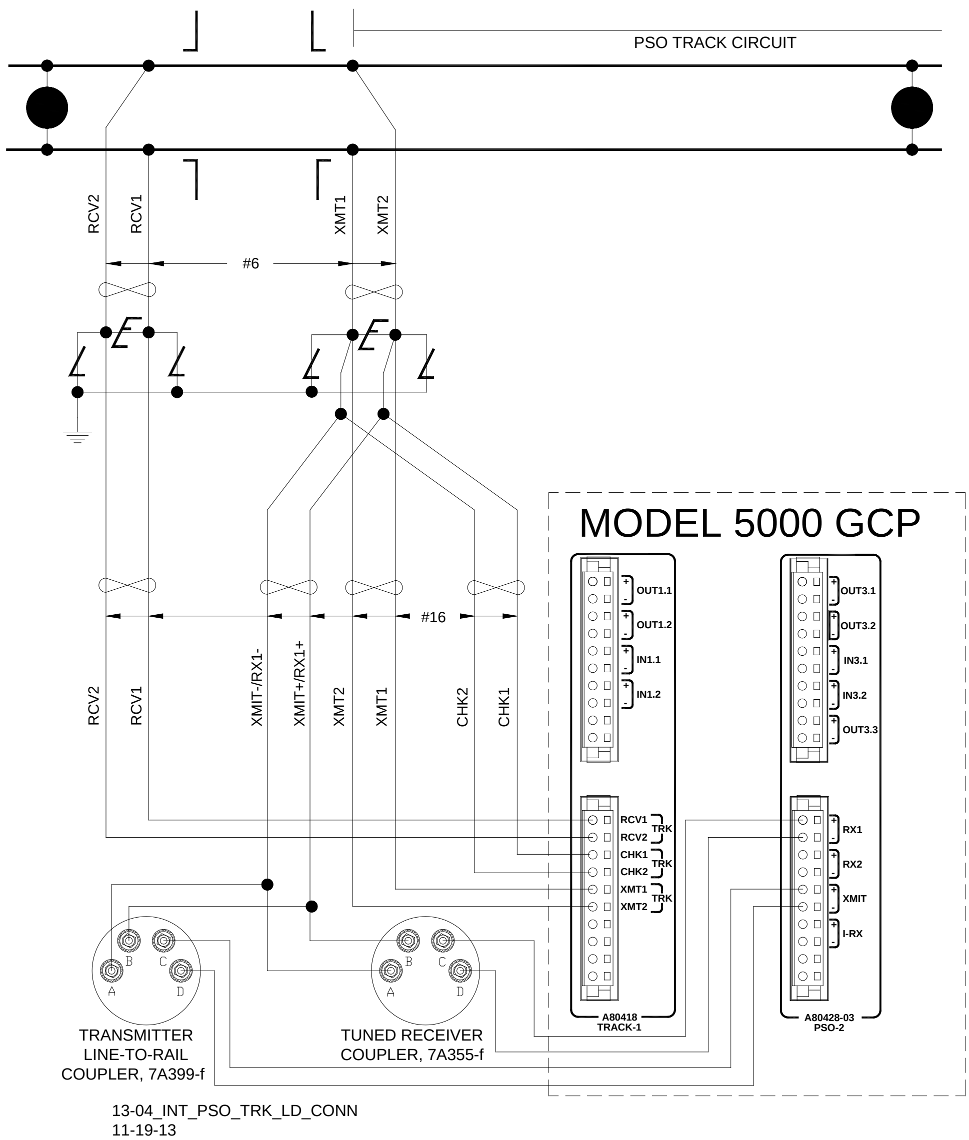


Figure 6-72:
Typical Internal PSO Configuration Track Wire Connections, BIDAX TX Application

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 6-72)
- 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 5000 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.

6.10.7.2.1 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 6-73.

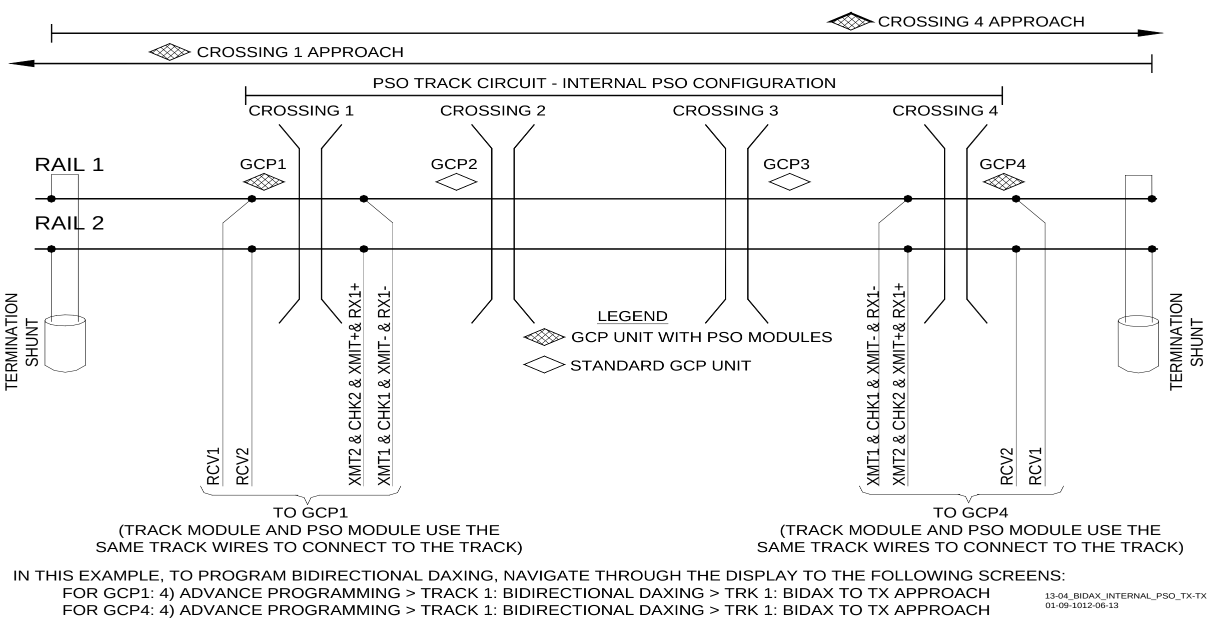


Figure 6-73:
Bidirectional DAXing using Internal PSO Configuration,
BIDAX TX (GCP1) to BIDAX TX Application (GCP4)

6.10.7.2.2 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 6-74.

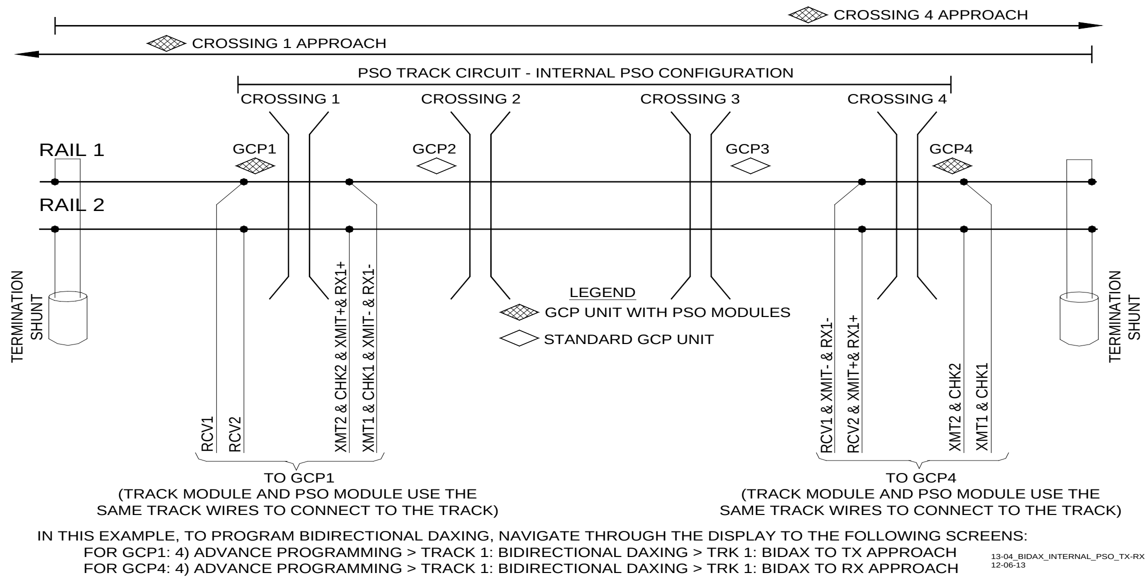


Figure 6-74:
Bidirectional DAXing using Internal PSO Configuration,
BIDAX TX (GCP1) to BIDAX RX Application (GCP4)

6.10.7.2.3 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 6-75.

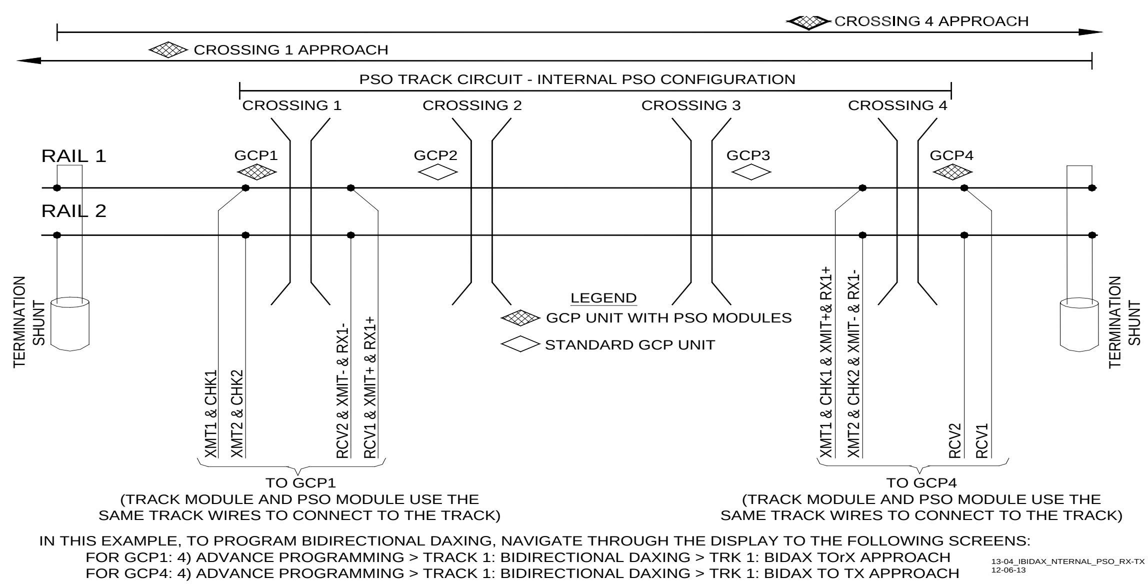


Figure 6-75:
Bidirectional DAXing using Internal PSO Configuration,
BIDAX RX (GCP1) to BIDAX TX Application (GCP4)

6.10.7.2.4 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 6-76.

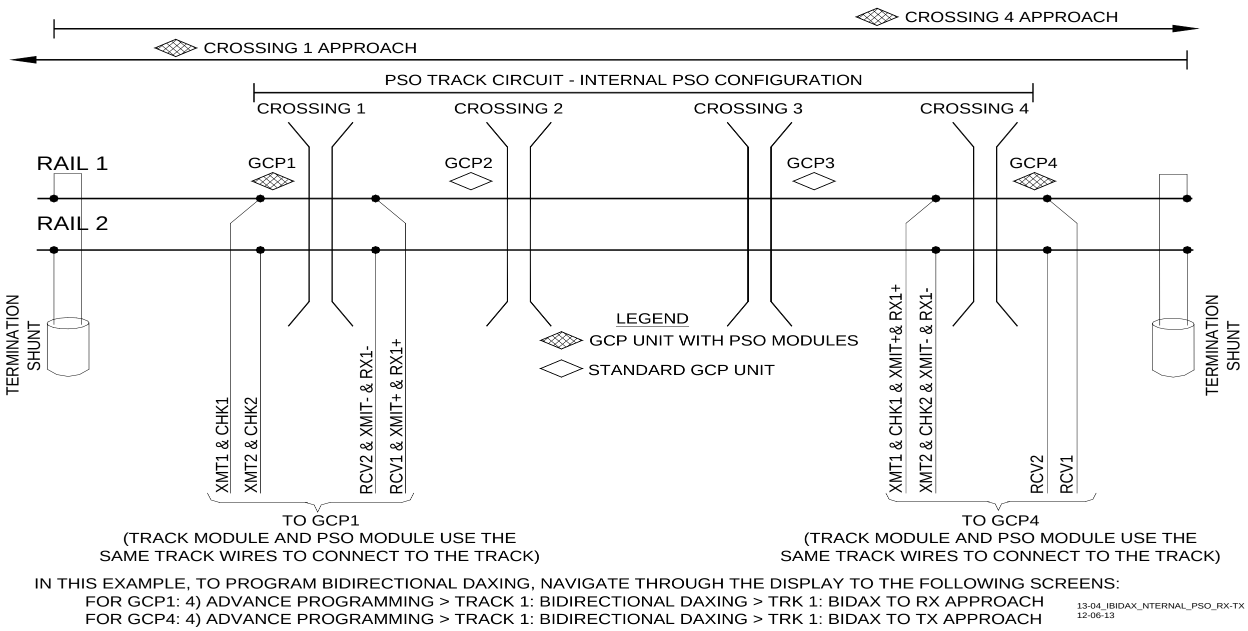


Figure 6-76:
Bidirectional DAXing using Internal PSO Configuration,
BIDAX RX (GCP1) to BIDAX RX Application (GCP4)

6.10.7.3 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).

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.

6.10.7.3.1 Center Fed PSO Track Wire Connection (BIDAX RX)

NOTE

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 for GCP1 and GCP4, respectively, for this type application are presented in. A generic Center Fed PSO application using an external PSO 4000 unit is presented in Figure 6-77.

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. The Directionally Wired parameter is found on the GCP: track 'n' window.

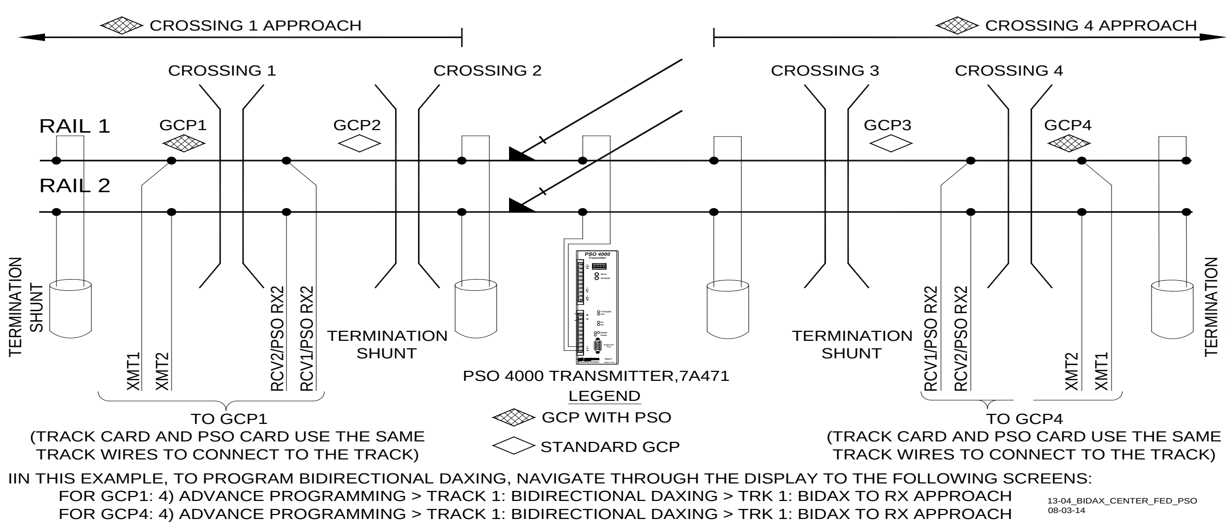


Figure 6-77:
Center Fed PSO Configuration

6.10.8 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 6-4. Basic data is as follows:

- The crossings on Apple, Cherry, and Elm streets are equipped with Model 5000 GCPs
- 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.

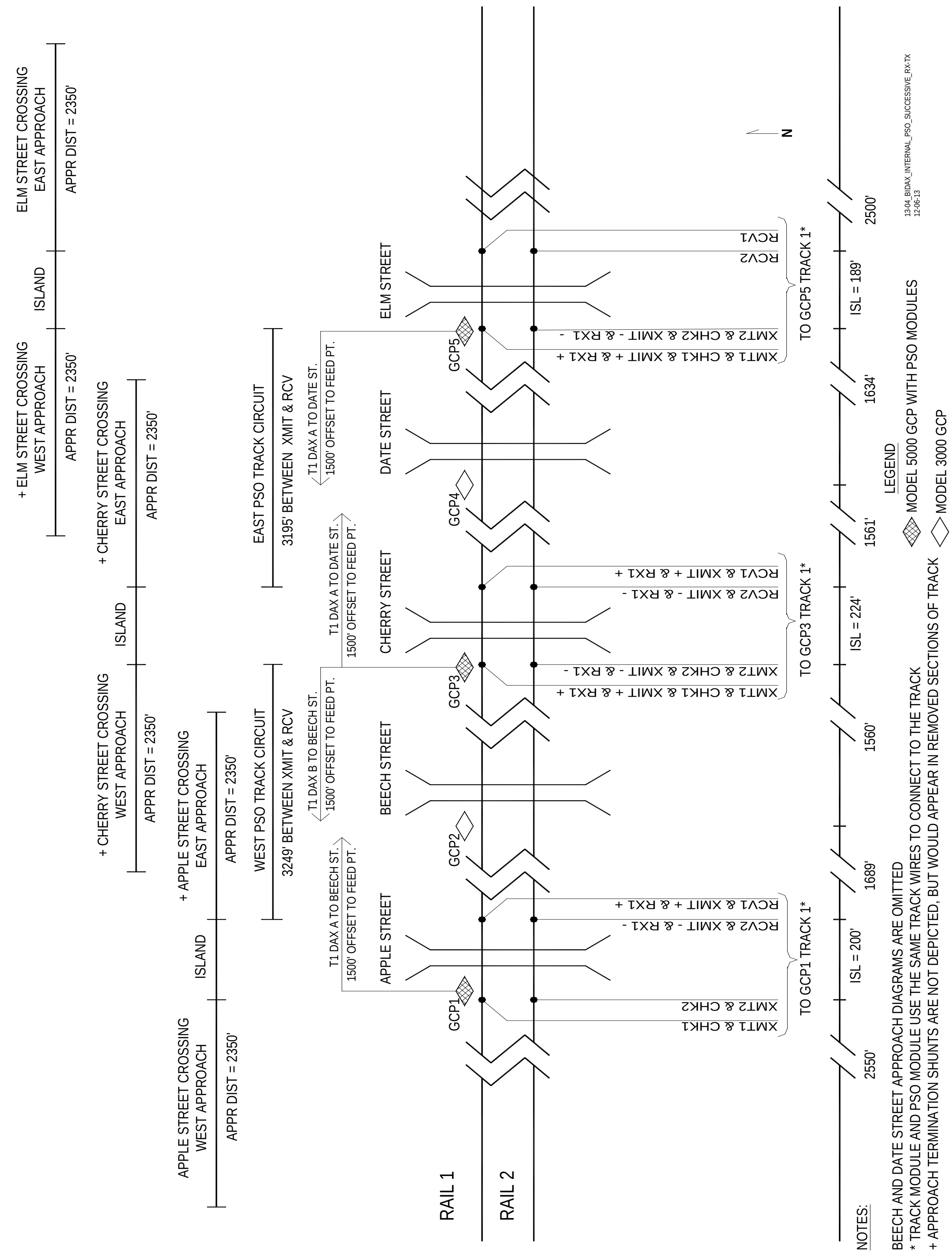


Figure 6-78:
Successive Internal PSO BIDAX Application Example

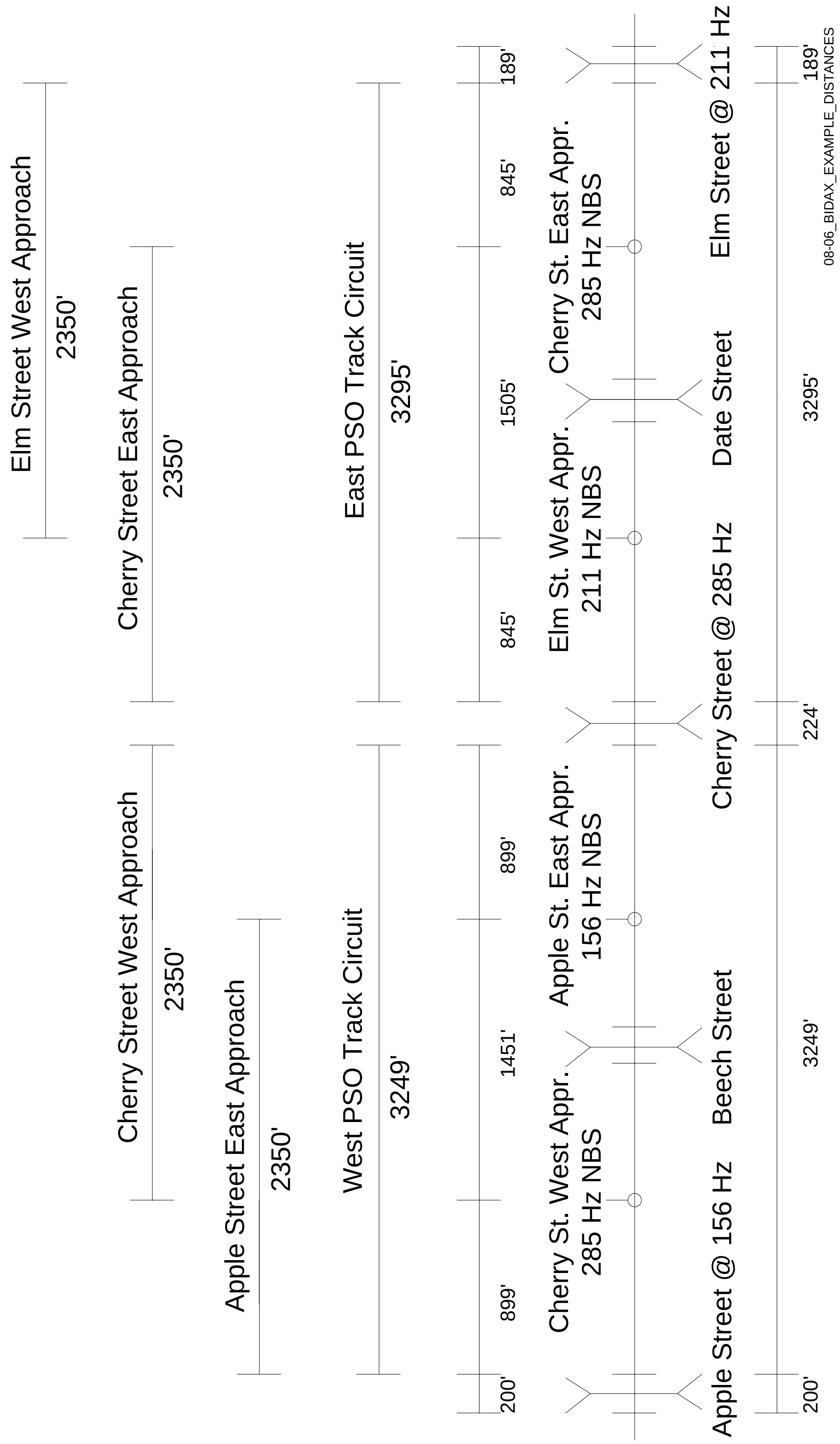


Figure 6-79:
Successive Internal PSO BIDAX Application Example
Offset Distances and Shunt Locations

6.10.8.1 Site Layout and Drawing

The site used as an example (see Figure 6-78) 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 5000 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 5000 GCP approaches.

6.10.8.2 GCP Programming – Apple Street Crossing (East Approach Only)

A review of Figure 6-79 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 Apple Street's parameters:

- On the **Module Selection** screen [1) BASIC CONFIGURATION > 2) MODULE SELECTION]:
  - Set Track 1/PSO 1 Slot to **Track**
  - Set Track 3/PSO 2 Slot to **PSO 2**
- On the **Trk 1: BiDax to RX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO RX APPROACH]:
  - Set +BIDAX To RX Approach to **Internal PSO**
  - Set Stick Release Time to **10 min**
  - Set Appr Clear Time to **27 sec**
  - Set Stick EZ Value to **20**
  - Set Appr Clear EZ Value to **80**
  - Set PSO Used to **PSO 2**
- On the **Trk 1: BiDax RX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO RX APPROACH > 1) PSO USED]:
  - Set RX1 Freq Category to Standard
  - Set RX1 Frequency to **645 Hz**
  - Set TX Freq Category to Standard
  - Set TX Frequency to **430 Hz**
  - Set TX Transmit Level to **Low**

- On the **Trk 1: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Directionally Wired to **Yes**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set 2) Dax A used to **Yes**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A > 1) DAX A USED]:
  - Set Dax A Warning Time to **35 se**c
  - Set +Dax A Offset Distance 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 **I/O: Output Slot "N – N+"** screens per the railroad's or agency's approved site plan.

6.10.8.3 GCP Programming – Cherry Street Crossing (East & West Approaches)

A review of Figure 6-79 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 **Trk 1: BiDax to RX Approach** parameters:

- On the **Module Selection** screen [1) BASIC CONFIGURATION > 2) MODULE SELECTION]:
  - Set Track 1/PSO 1 Slot to **Track**
  - Set Track 3/PSO 2 Slot to **PSO 2**
  - Set Track 4/PSO 3 Slot to **PSO 3**
- On the **Trk 1: BiDax to RX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO RX APPROACH]:
  - Set +BIDAX To RX Approach to **Internal PSO**
  - Set Appr Clear Time to 26 sec
  - Set PSO Used to **PSO 2**
- On the **Trk 1: BiDax RX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO RX APPROACH > 1) PSO USED]:
  - Set RX1 Freq Category to **Standard**
  - Set RX1 Frequency to **3.24 kHz**
  - Set TX Freq Category to **Standard**

- Set TX Frequency to **1.45 kHz**
- Set TX Transmit Level to **Low**
- On the **Trk 1: BiDax to TX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH]:
  - Set +BIDAX To TX Approach to **Internal PSO**
  - Set PSO Used to **PSO 3**
  - Set all remaining screen parameters per approved site drawing
- On the **Trk 1: BiDax TX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH > 1) PSO USED]:
  - Set all screen parameters per approved site drawing,
- On the **Trk 1: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Directionally Wired to **Yes**
  - Set all remaining screen parameters per approved site drawing

Track 1 Dax A is assigned to the East Approach. From the site drawing (see Figure 6-78), the offset distance for the DAX A is 1500 feet. The signal is transmitted on the RX wire side of the crossing.

- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set 2) Dax A used to **Yes**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A > 2) DAX A USED]:
  - 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**

6.10.8.3.1 West Approach Programming

A review of Figure 6-79 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 **Trk 1: BiDax to TX Approach** parameters:

- On the **Trk 1: BiDax to TX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH]:
  - Set +BIDAX To TX Approach to **Internal PSO**
  - Set Appr Clear Time to **27 sec**

  - Set PSO Used to **PSO 3**
- On the **Trk 1: BiDax TX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH > 1) PSO USED]:
  - 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**
- On the **Trk 1: GCP Frequency** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 1 GCP FREQUENCY]:
  - Set Directionally Wired to **Yes**
  - Set all remaining screen parameters per approved site drawing

Track 1 Dax B is assigned to the West Approach. From the site drawing (see Figure 6-78), the offset distance for the DAX B is 1500 feet. The signal is transmitted on the TX wire side of the crossing.

- On the **Trk 1 Predictor: Dax B** screen [2) GCP AND ISLAND PROGRAMMING > 1 > TRK 1 PREDICTOR: DAX B:
  - Set 2) Dax B used to **Yes**
  - Set any other predictors specified in the approved site drawings to **Yes**
- On the **Trk 1 Predictor: Dax B** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A > 3) DAX B USED]:
  - Set the Dax A Warning Time parameter to **35 sec**
  - Set the Dax A Offset Distance parameter to **1500 ft**
  - Set Dax A Track Side used 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 **I/O: Output Slot "N – N+"** screens per the railroad's or agency's approved site plan.

6.10.8.4 GCP5 Programming – Elm Street Crossing (West Approach Only)

A review of Figure 6-79 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 **Trk 1: BiDax to TX Approach** parameters:

- On the **Module Selection** screen [1) BASIC CONFIGURATION > 2) MODULE SELECTION]:
  - Set Track 1/PSO 1 Slot to **Track**
  - Set Track 3/PSO 2 Slot to **PSO 2**
- On the **Trk 1: BiDax to TX Approach** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH]:
  - Set +BIDAX To TX Approach to **Internal PSO**
  - Set Appr Clear Time to **27 sec**
  - Set PSO Used to **PSO 2**
- On the **Trk 1: BiDax TX PSO** screen [4) ADVANCED PROGRAMMING > 1) TRK 1: BIDIRECTIONAL DAXING > TRK 1: BIDAX TO TX APPROACH > 1) PSO USED]:
  - Set RX1 Freq Category to **Standard**
  - Set RX1 Frequency to **1.45 kHz**
  - Set TX Freq Category to **Standard**
  - Set TX Frequency to **3.24 kHz**
  - Set TX Transmit Level to **Low**

From the site drawing (see Figure 6-78), the offset distance for the westbound approach is 1500 feet. The signal is transmitted on the TX wire side of the crossing.

- Set the **Dax A Warning Time** parameter to **35 sec**
- Set the **Dax A Offset Distance** parameter to **1500 ft**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A]:
  - Set 2) Dax A used to **Yes**
- On the **Trk 1 Predictor: Dax A** screen [2) GCP AND ISLAND PROGRAMMING > 1) TRK 1: GCP AND ISLAND > 3) PREDICTORS > TRK 1 PREDICTORS > TRK 1 PREDICTOR: DAX A > 2) DAX A USED]:
  - Set the Dax A Warning Time parameter to **35 sec**
  - Set the Dax A Offset Distance parameter to **1500 ft**
  - Set Dax A Track Side used to **TX Wire Side**

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 **I/O: Output Slot "N – N+"** screens per the railroad's or agency's approved site plan.

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SECTION 7 –
AUXILIARY EQUIPMENT

7.1 GENERAL

The equipment described in this section can be used with the Model 5000 GCP. Where applicable, installation and adjustment information is provided. The following equipment is covered:

CAUTION

CAUTION

THE DEVICES DESCRIBED HERE MUST BE MOUNTED IN WEATHERPROOF ENCLOSURES UNLESS STATED OTHERWISE.

Paragraph	Equipment Covered	Page
7.2	Bidirectional Simulation Coupler, 62664-Mf	7-2
7.3	DC Shunting Enhancer Panel, 80049	7-8
7.4	Narrow-band Shunt, 62775-f	7-15
7.5	Narrow-band Shunt, 62780-f	7-16
7.6	Multifrequency Narrow-band Shunt, 62775-XXXX	7-18
7.7	Multifrequency Narrow-band Shunt, 62780-XXXX	7-22
7.8	Wideband Shunt, 8A076A	7-24
7.9	Simulated Track Inductor, 8V617	7-25
7.10	Adjustable Inductor Assembly, 8A398-6	7-31
7.11	Track Circuit Isolation Devices	7-34
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7.12	Tunable Insulated Joint Bypass Coupler, 62785-f	7-44
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7.15	Surge Panels, 80026-XX	7-46
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7.17	Cable Termination Panel Assembly, 91042	7-59
7.18	SSCC III Lighting Surge Panels, 91170-1 & 91181-1	7-60

NOTE

NOTE

See Siemens's 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

WARNING

WHEN A MODEL 5000 GCP 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.

Low ballast resistance effectively reduces approach distances to a greater degree in unidirectional Model 5000 GCP installations than in bidirectional installations.

- Although the Model 5000 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 Model 5000 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

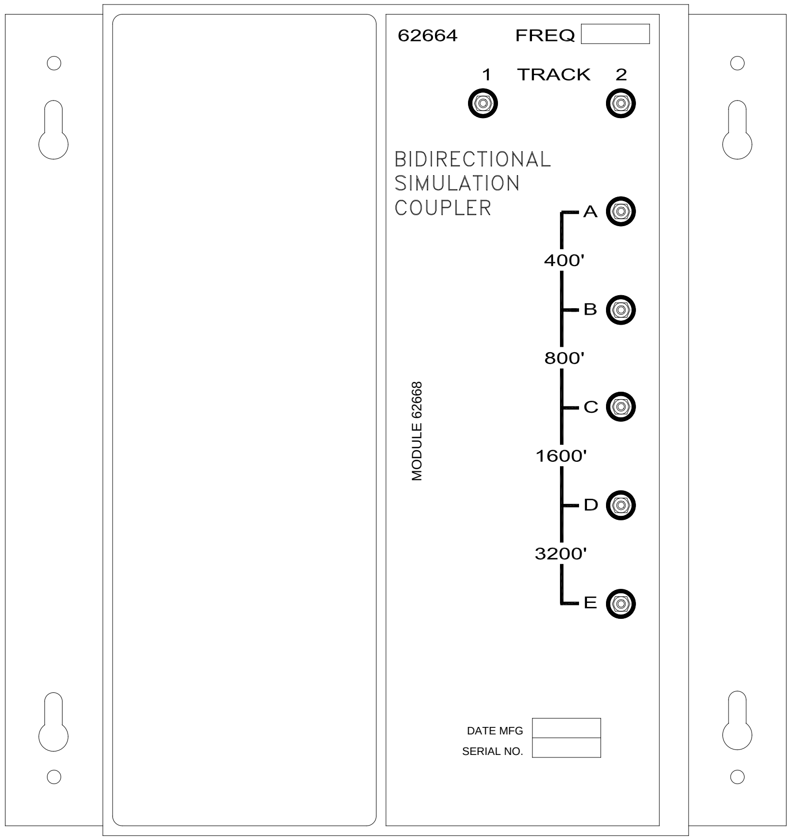
WARNING

THE 62664 BIDIRECTIONAL SIMULATION COUPLER MUST NOT BE USED AS A TERMINATION SHUNT.

THE MODEL 3000, 4000, AND 5000 GCPS 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 USED, THE CORRESPONDING GCP TRACK MUST BE PROGRAMMED FOR “SIM BIDIRNL”.



13-04_BIRDN_SIM_CPLR
12-09-13

Figure 7-1:
Bidirectional Simulation Coupler, 62664-Mf

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 Model 5000 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 (FT/M)	STRAP TERMINALS	DISTANCE(FT/M)	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 Model 5000 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 Model 5000 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

> **NOTE**
>
> The adjustment range must be within ±10% of actual approach distance.

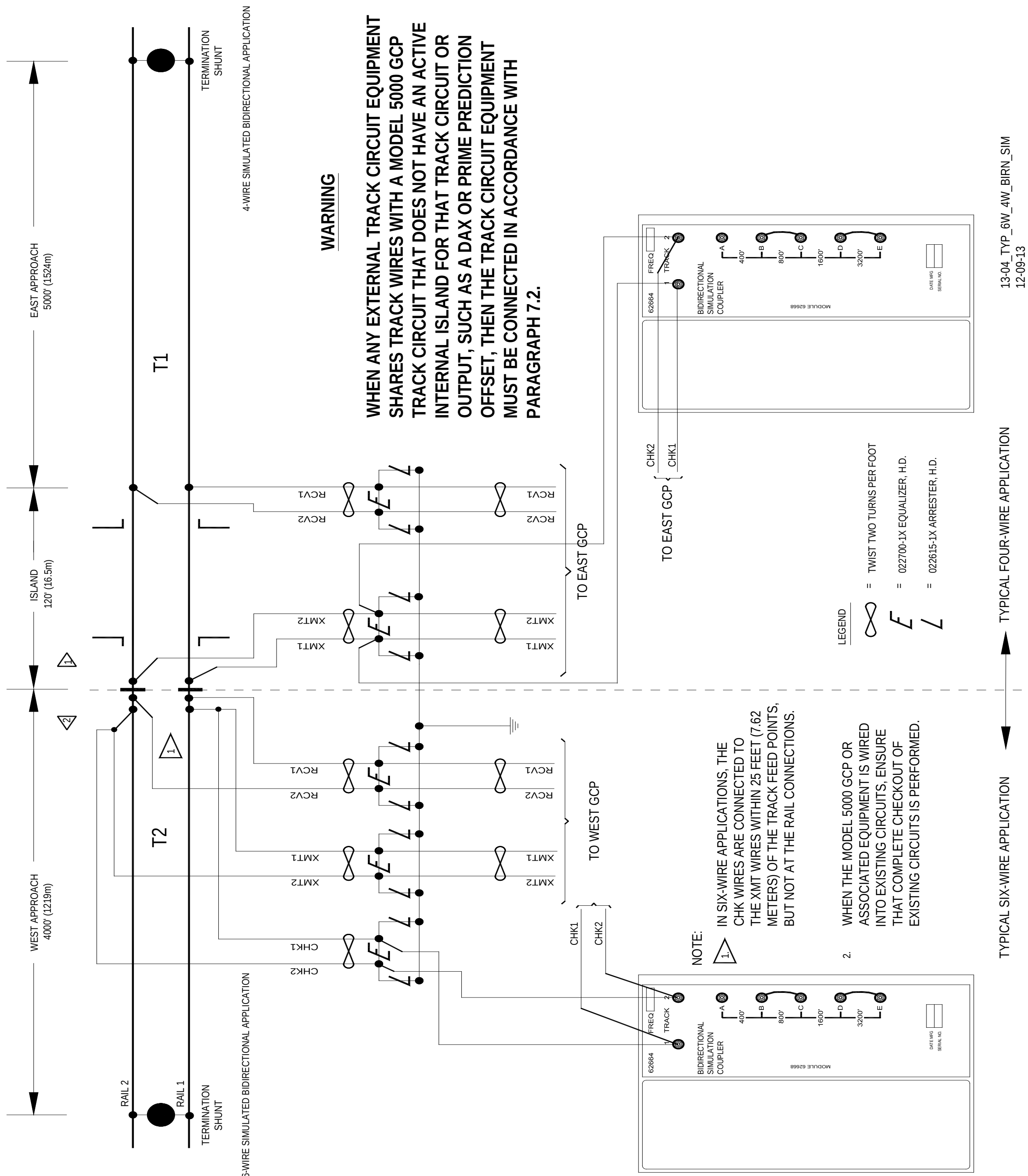


Figure 7-2:
Proper Model 5000 GCP Four-wire and Six-wire Connections Using Bidirectional Simulation Coupler on Model 5000 GCP Operating in the Bidirectional Simulation Mode

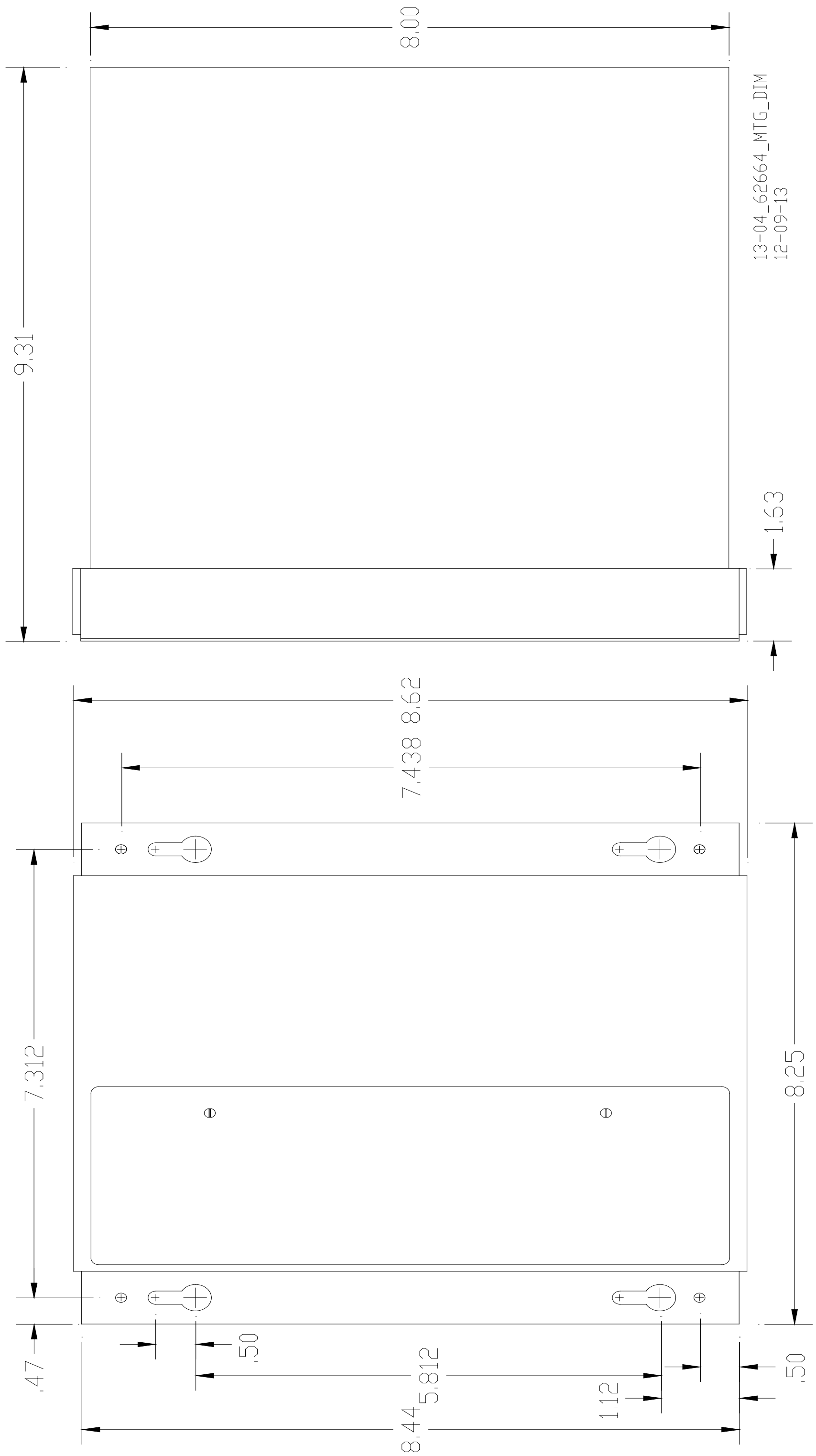


Figure 7-3:
Bidirectional Simulation Coupler Assembly Mounting Dimensions

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 5000 GCP Enhanced Detection software to function optimally.

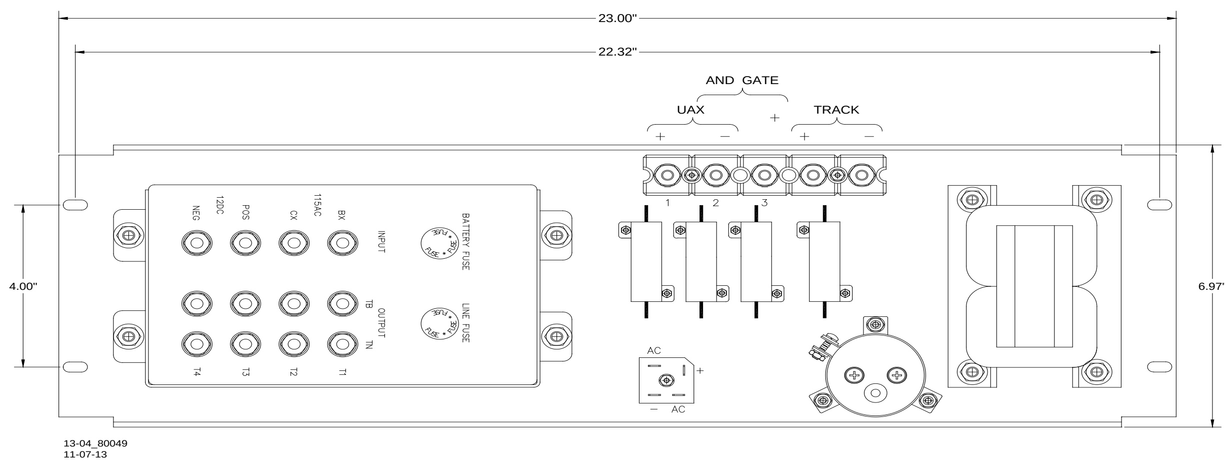


Figure 7-4:
DC Shunting Enhancer Panel, 80049

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 Model 5000 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

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

CAUTION

WHEN TWO OR MORE DARK TERRITORY CROSSINGS OVERLAP, ENSURE THAT EACH MODEL 5000 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

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.

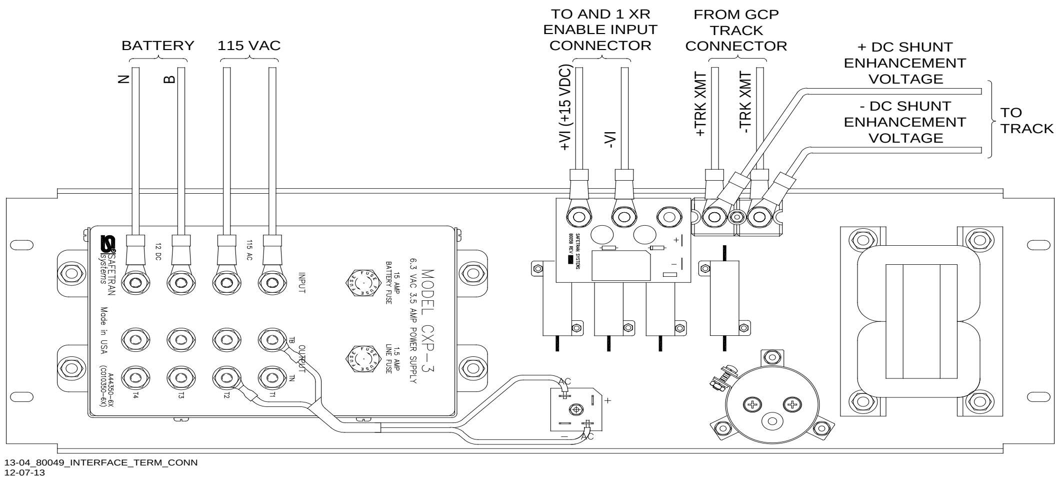


Figure 7-5:
DC Shunting Enhancer Panel, 80049, Interface Terminal Connections

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
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

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.

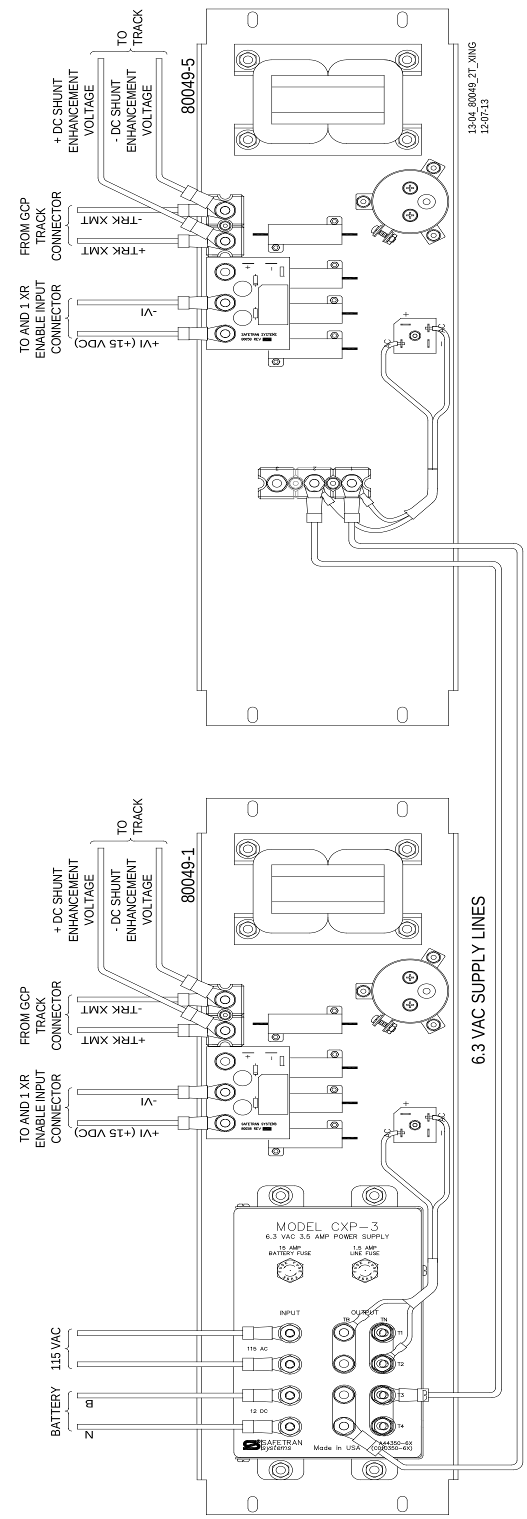


Figure 7-7:
DC Shunting Enhancer Panels for Two Track Crossing

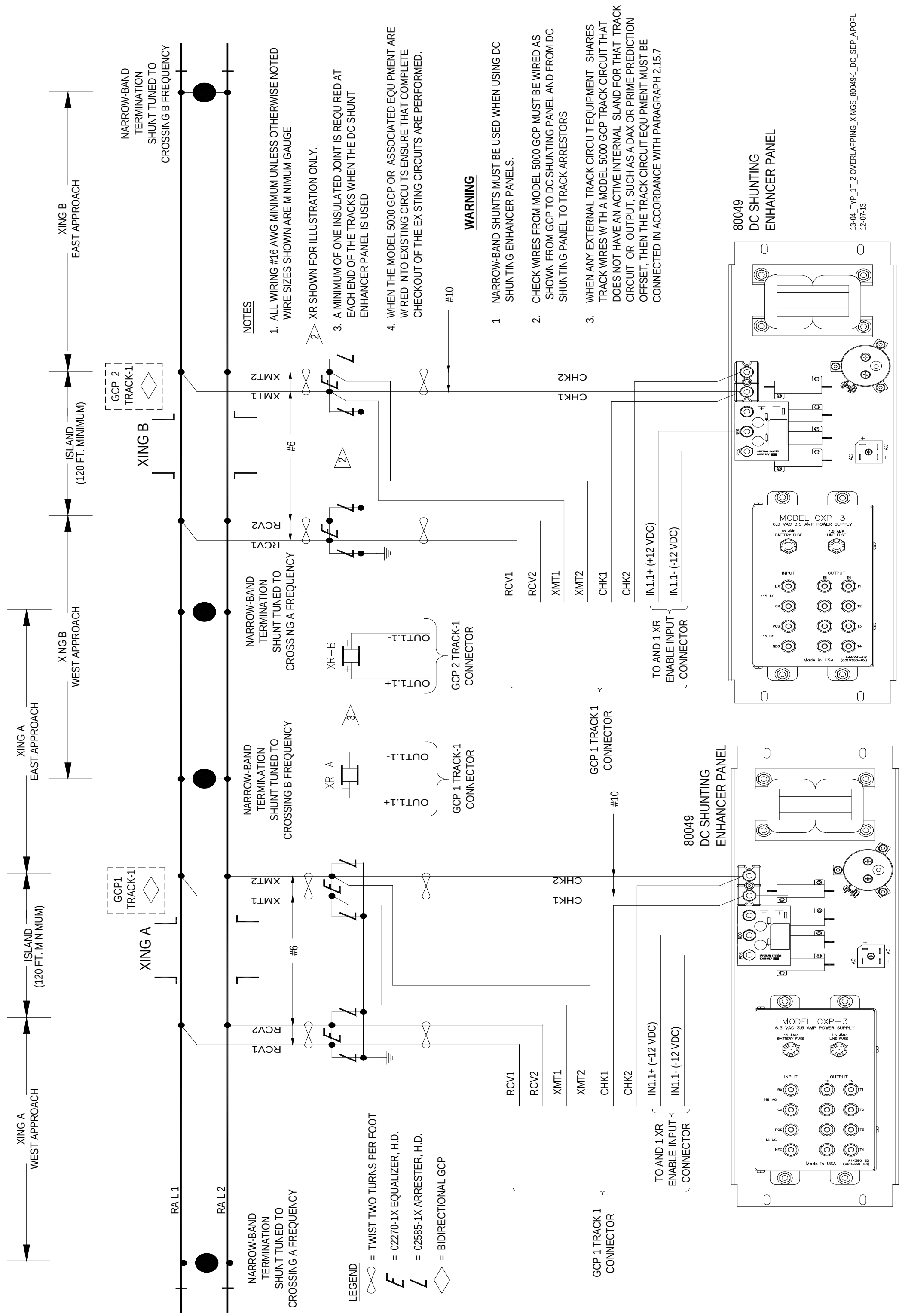


Figure 7-8:
DC Shunting Enhancer Panels for Overlapping Crossings

7.4 NARROW-BAND SHUNT, 62775-F

⚠ WARNING

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

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 Model 5000 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

⚠ CAUTION

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 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 Model 5000 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 GCPs.

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).

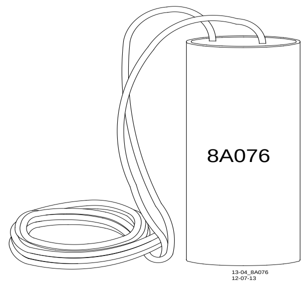
Table 7-6:
Frequencies Available with
Narrow Band Shunt, 62780-f

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	

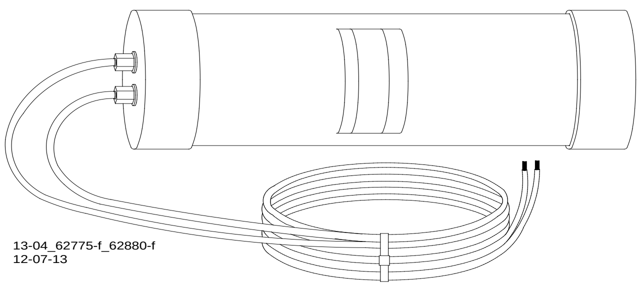
The Narrow-band Shunt, 62780 is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end.

7.5.1 Narrow-band Shunt, 62780-f Specifications

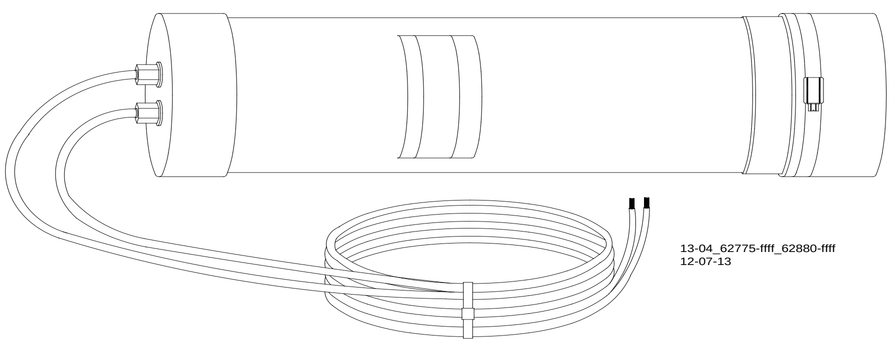
Dimensions	14.125 inches (35.9 centimeters) long 4.125 inches (10.5 centimeters) in diameter
Weight	7 pounds (3.18 kilograms) (approximate)
Frequencies	See Table 7-6 above.
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC



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

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

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

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.

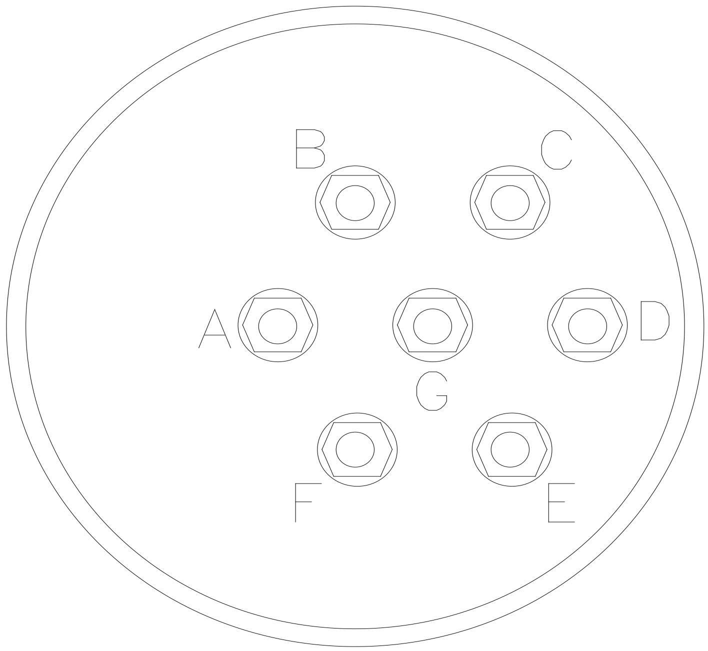
7.6.1 Physical Description

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).



13-04_MLTIFRQ_NBS_AREMA_BP
12-07-13

Figure 7-10:
Multifrequency Narrow-band Shunt, 62775-XXXX/62780-XXXX AREMA Binding Posts

NOTE

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
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

Continued on next page

Table 7-7 Concluded

SHUNT PART NUMBER	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
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

WARNING

CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

CAUTION

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

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

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

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 Model 5000 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 Siemens' 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.

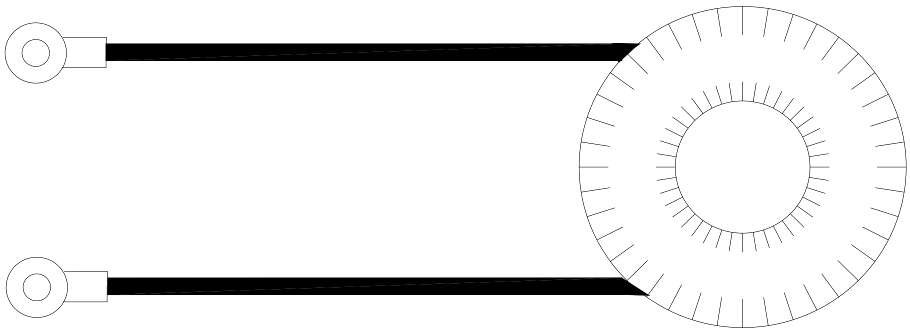


**Figure 7-11:
Simulated Track Inductor, 8V617**

**Table 7-9:
Simulated Track Inductor Part Number Listing**

BASIC PART NO.	DASH NUMBER = DISTANCE (FT/M)		
8V617	-0200 (61) -0400 (122) -0600 (183) -0800 (244) -1000 ((309) -1200 (366) -1400 (427)	-1600 (488) -1800 (549) -2000 (610) -2200 (671) -2400 (732) -2600 (793) -2800 (854)	-3000 (450) -3200 (976) -3400 (1037) -3600 (1098) -3800 (1159) -4000 (1220) -4400 (1342)

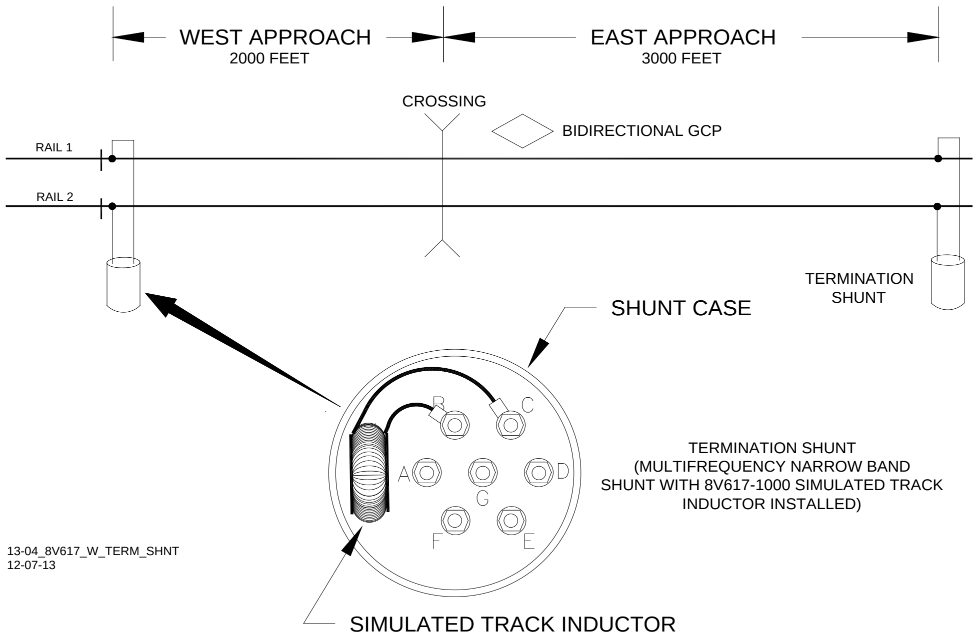


Figure 7-12:
Simulated Track Inductor Used With Termination Shunt

7.9.1 Simulated Track Inductor Installation

⚠ WARNING

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

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.

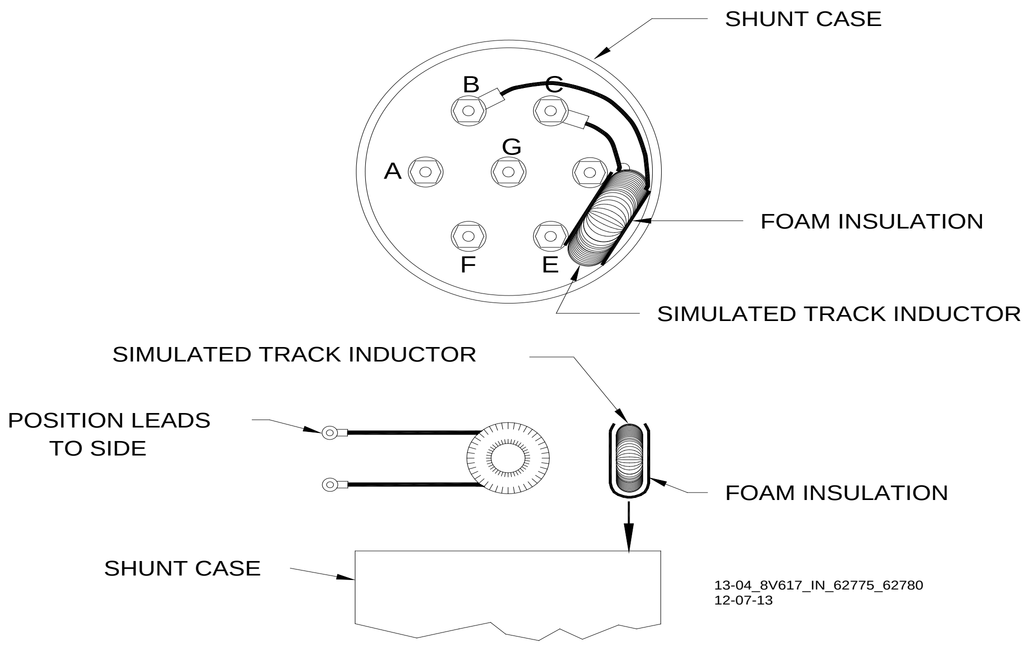


Figure 7-13:
Typical Installation of 8V617 in 62775/62780 Shunt

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
62775/62780-2152*	211	A and F
	285	B and C
	348	B and C
	430	B and C
	525	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
62775-3448*	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 BADJUSTABLE INDUCTOR ASSEMBLY, 8A398-6

The Adjustable Inductor Assembly, 8A398 is intended for use with Siemens'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 Model 5000 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

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).

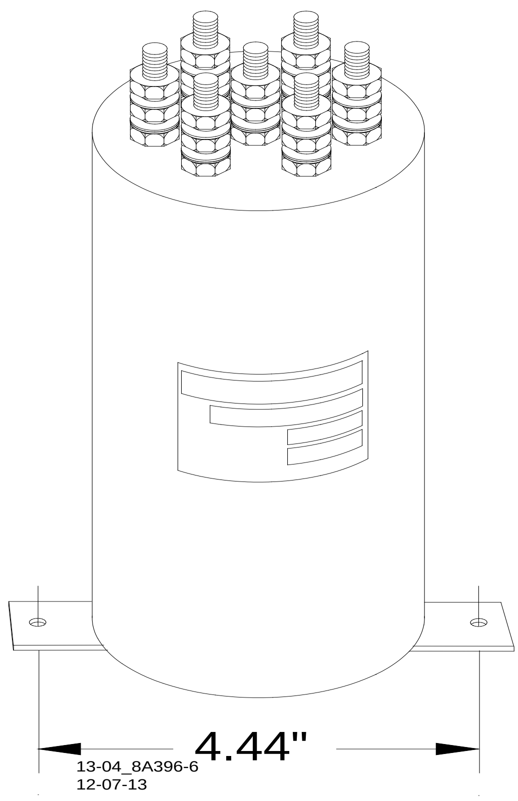


Figure 7-14:
Adjustable Inductor Assembly, 8A398-6

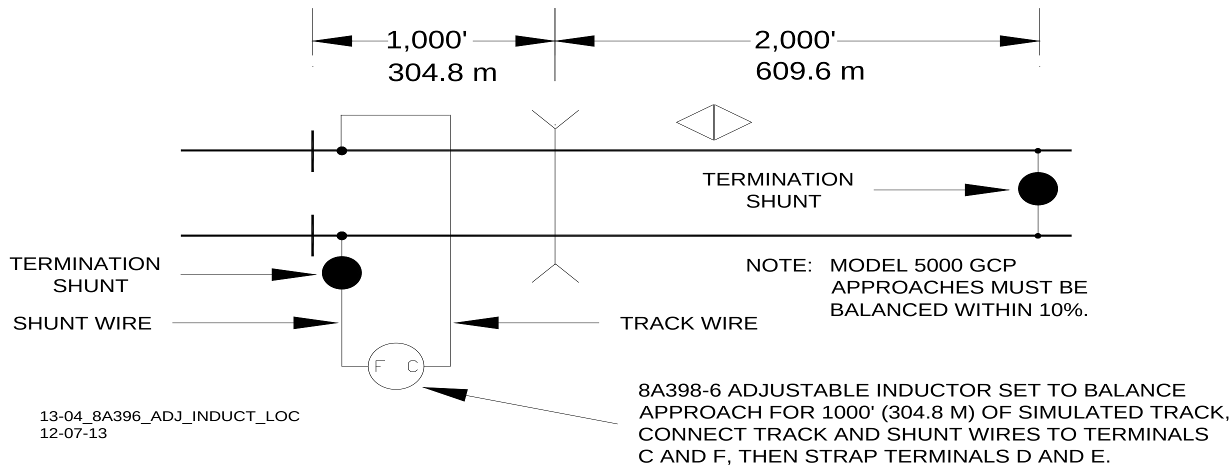


Figure 7-15:
Adjustable Inductor Used With Termination Shunt

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	

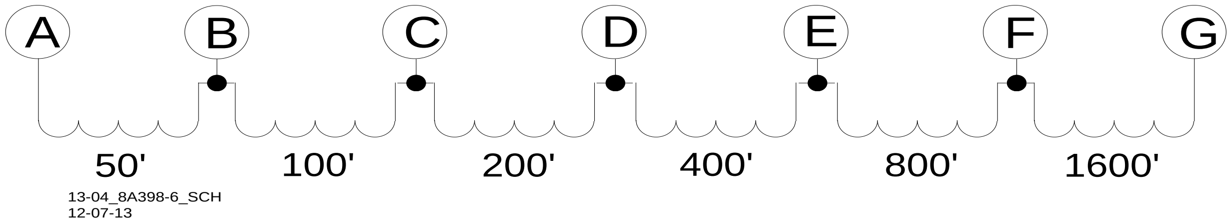


Figure 7-16:
Adjustable Inductor, 8A398-6 Schematic

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

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

NOTE

If the track connections for the DC track circuit are 2,000 ft (609.8 m) 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 Model 3000/4000/5000 GCP approach
- Less than 2,000 ft. (609.8 m) beyond the approach termination.

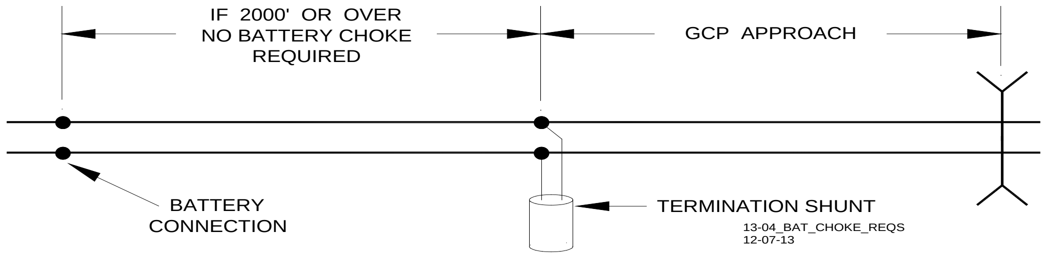


Figure 7-17:
Battery Choke Requirements

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).

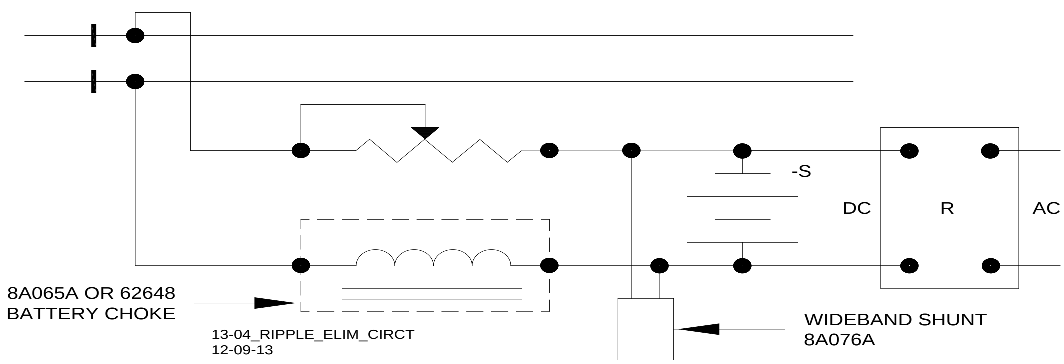


Figure 7-18:
Ripple Elimination Circuit

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)

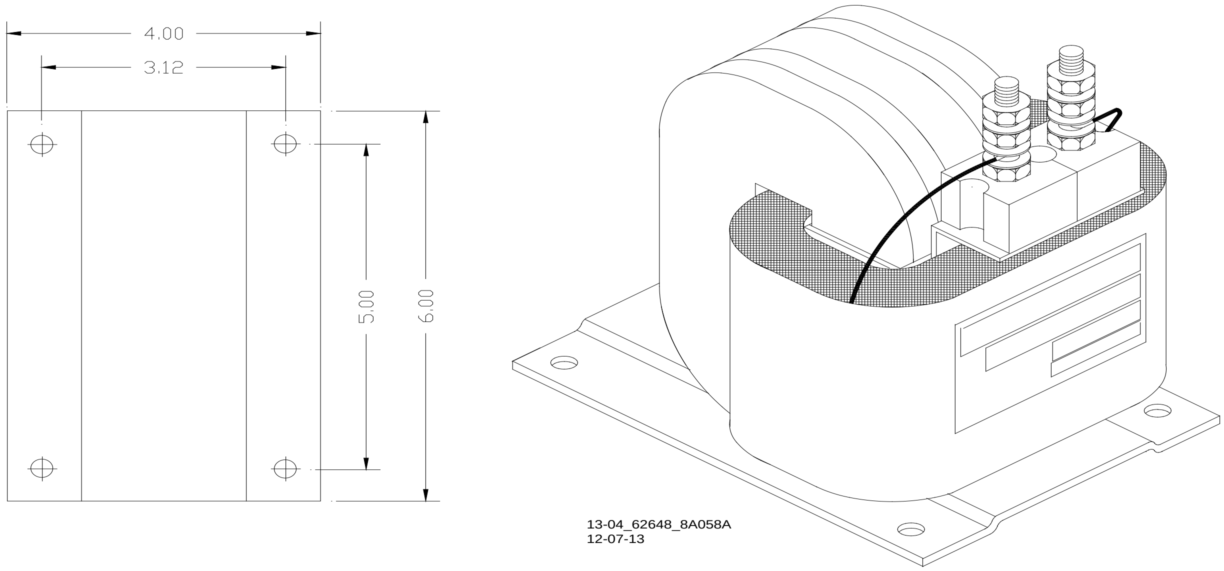


Figure 7-19:
62648/8A065A Battery Choke With Mounting Dimensions

7.11.2 Siemens GEO Electronic DC Coded System

The standard Siemens Model 5000 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 5000 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 Model 5000 GCP approach.

NOTE

NOTE

Under some circumstances, an external track filter may be required when electronic coded track is located within the Model 5000 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 Model 5000 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

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

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.

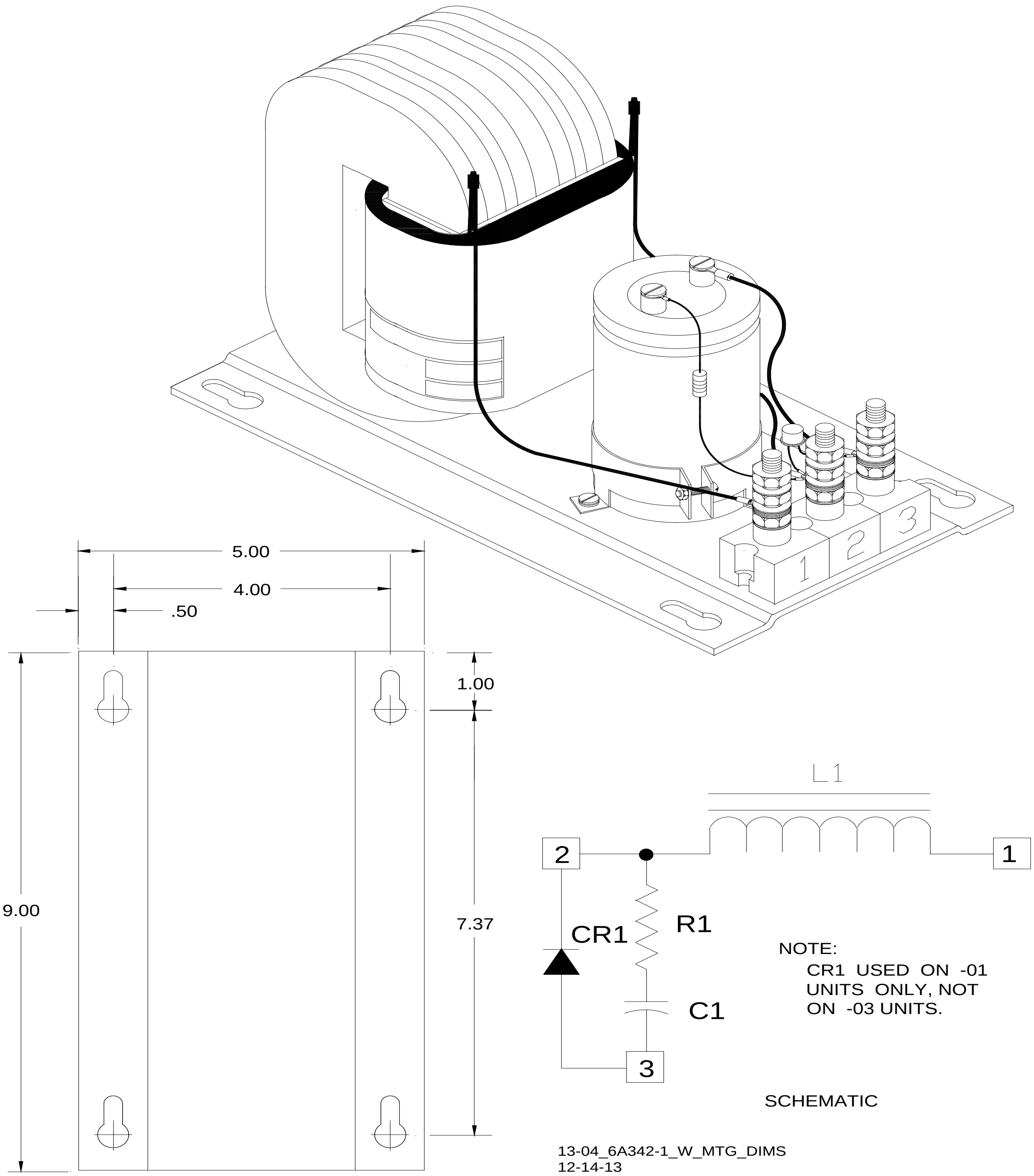


Figure 7-20:
DC Code Isolation Unit, 6A342-1, With Mounting Dimensions

⚠ WARNING

WARNING
ALWAYS VERIFY PROPER CODE 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

WARNING

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

NOTE

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.

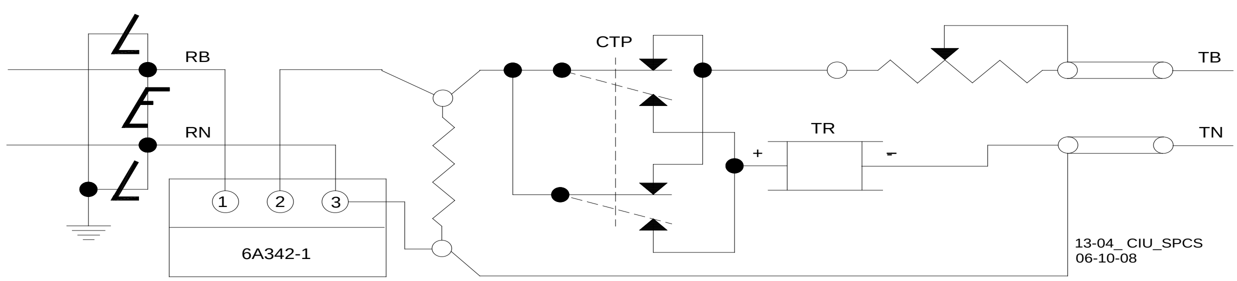


Figure 7-21:
Code Isolation Unit In a Single Polarity Code System

7.11.4.5 GRS Trakode (Dual Polarity) Systems

⚠ WARNING

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

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.

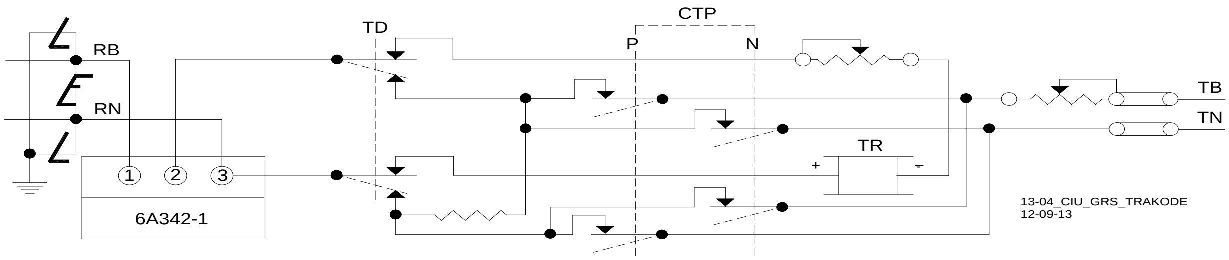


Figure 7-22:
Code Isolation Unit Installation In a GRS Trackode System

7.11.4.6 <u>Dual Polarity (Polar) Coded Track Systems Other Than GRS Trakode</u>

⚠ WARNING

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 <u>DC Code Isolation Unit, 6A642-3</u>

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

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 <u>UAC Code Isolation Unit, 8A466-3</u>

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 <u>BUAC Code Isolation Unit, 8A466-3 Specifications</u>

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)

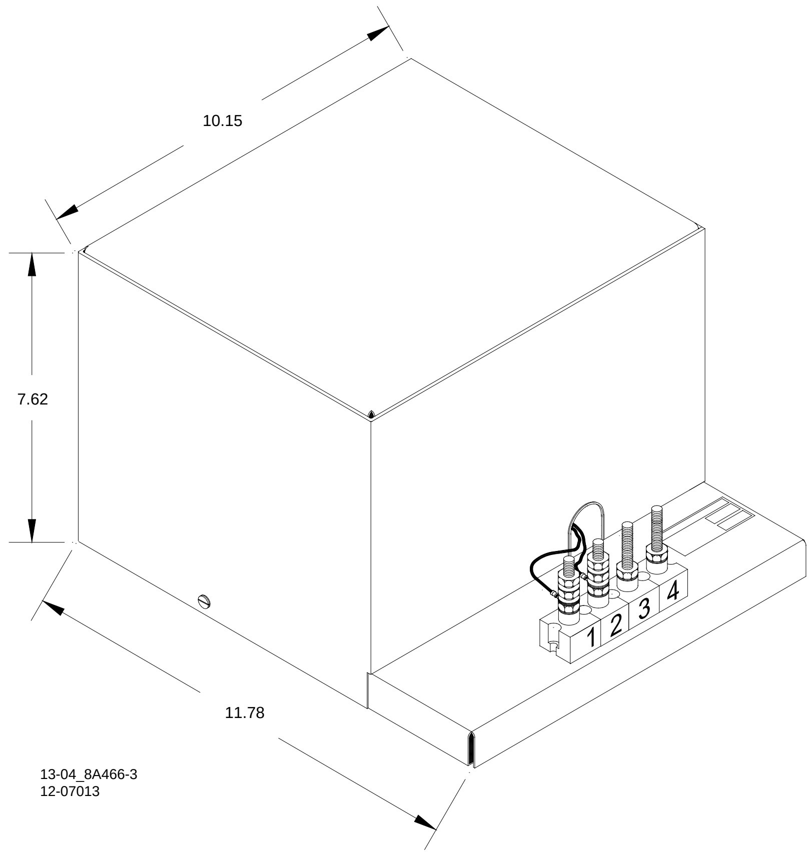


Figure 7-23:
AC Code Isolation Unit, 8A466-3

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 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)

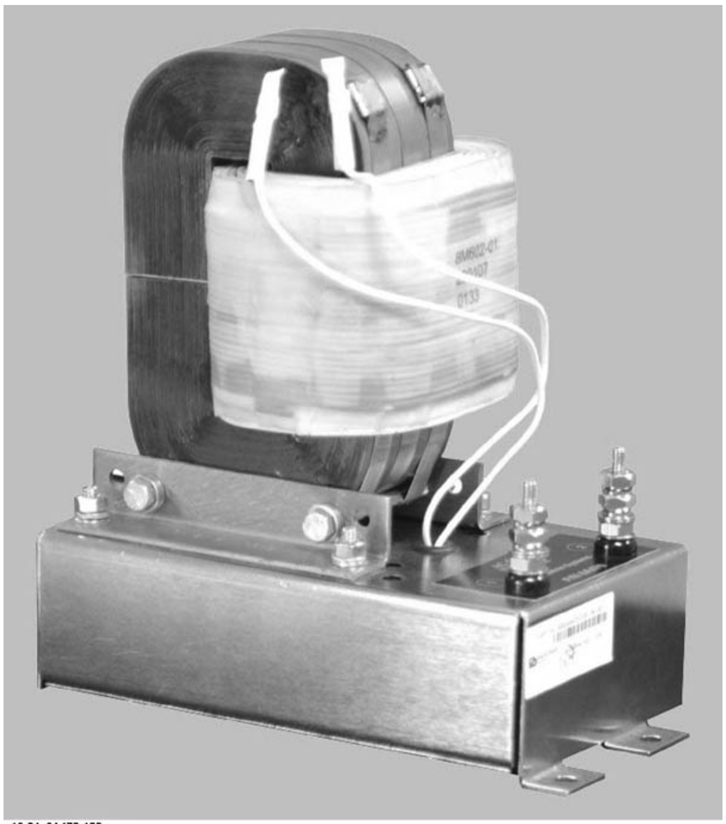
7.11.5.5 Cab Signal AC

WARNING

WARNING
ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF A CAB SIGNAL UNIT.

Application of Model 5000 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.



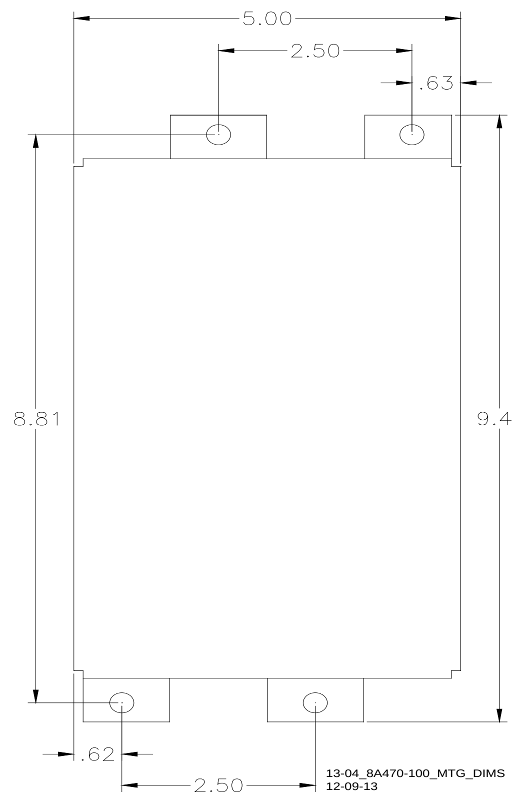


Figure 7-24:
AC Code Unit, 8A470-100, With Mounting Dimensions

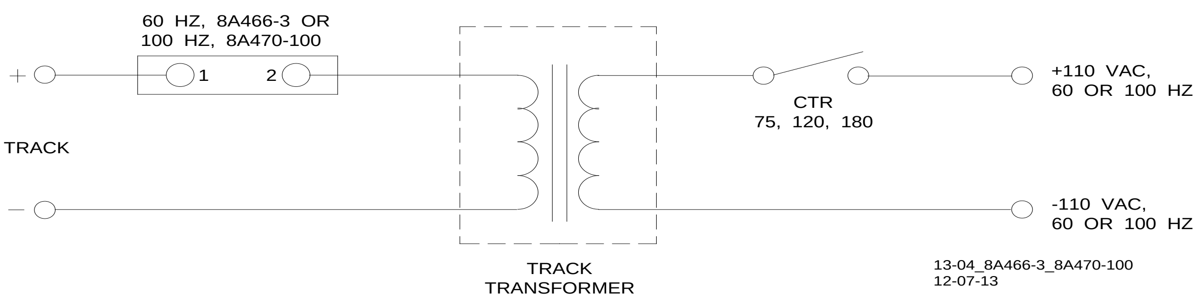


Figure 7-25:
AC Code Isolation Unit Used In CAB Territory

7.11.5.6 <u>Style C Track Circuits</u>

The 60 Hz AC Code Isolation unit (8A466-3) is used with style C track circuits as shown in Figure 7-26.

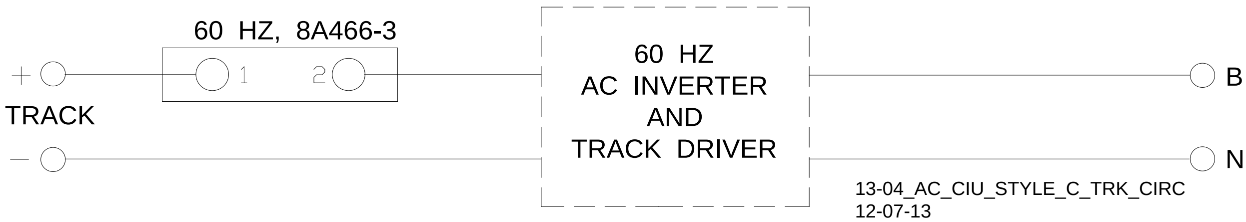


Figure 7-26:
AC Code Isolation Unit Used in Style C Track Circuits

7.11.5.7 <u>AC Code Isolation Unit, 8A471-180</u>

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 5000 GCP for bypassing insulated joints in DC coded track.

- The 62785-f Bypass Coupler is used in all Model 5000 GCP applications requiring the use of an insulated joint bypass coupler.
- The 62785-f Coupler is available in standard Siemens frequencies of 156 Hz through 970 Hz.

⚠ WARNING

WARNING

INSULATED JOINT BYPASS COUPLERS, 62531-F AND 62631-F, MUST NOT BE USED WITH THE MODEL 5000 GCP.
THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN TABLE 7-12 APPLY TO THE MODEL 3000/4000/5000 GCP ONLY; NOT TO ANY EARLIER SIEMENS GCP'S (MODELS 660, 600, 400, AND 300).
WHEN THE MODEL 5000 GCP IS PROGRAMMED AS A PREDICTOR, THE 62785-F COUPLER CANNOT BE USED TO BYPASS INSULATED JOINTS WITHIN THE <u>INNER TWO-THIRDS</u> 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.
ONLY 62785-F TUNED BYPASS COUPLERS MAY 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 Model 5000 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 Model 5000 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 Model 5000 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 Model 5000 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

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

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.

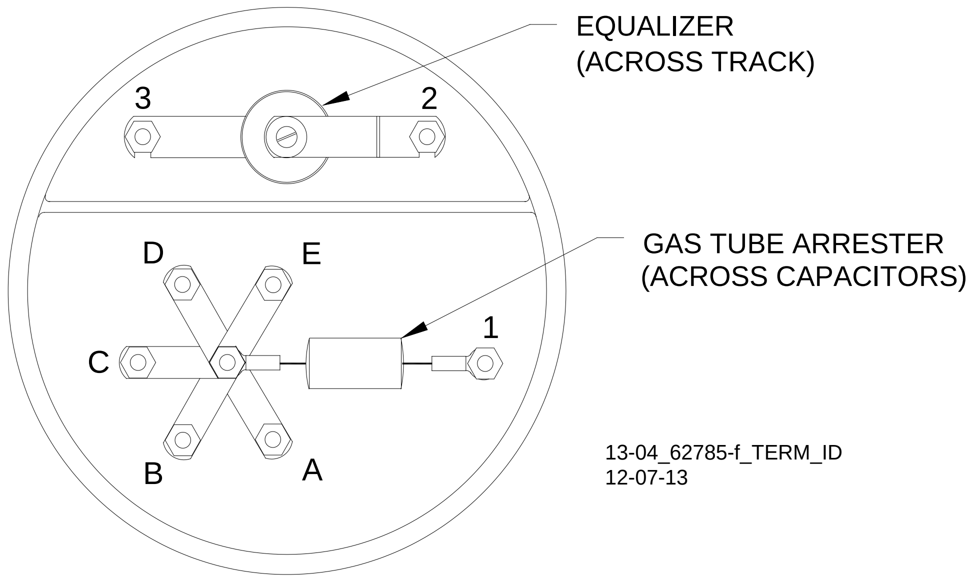


Figure 7-27:
Terminal Identification, 62785-f
Tunable Insulated Joint Coupler

The Coupler is tuned in the following sequence:

- The gold nut on terminal E is tightened first.
- Calibrate the Model 5000 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

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

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 (SEE PARAGRAPH 5.13). IT IS NOT NECESSARY TO BURY THE COUPLER BELOW THE FROST LINE.

NOTE

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 Model 5000 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).

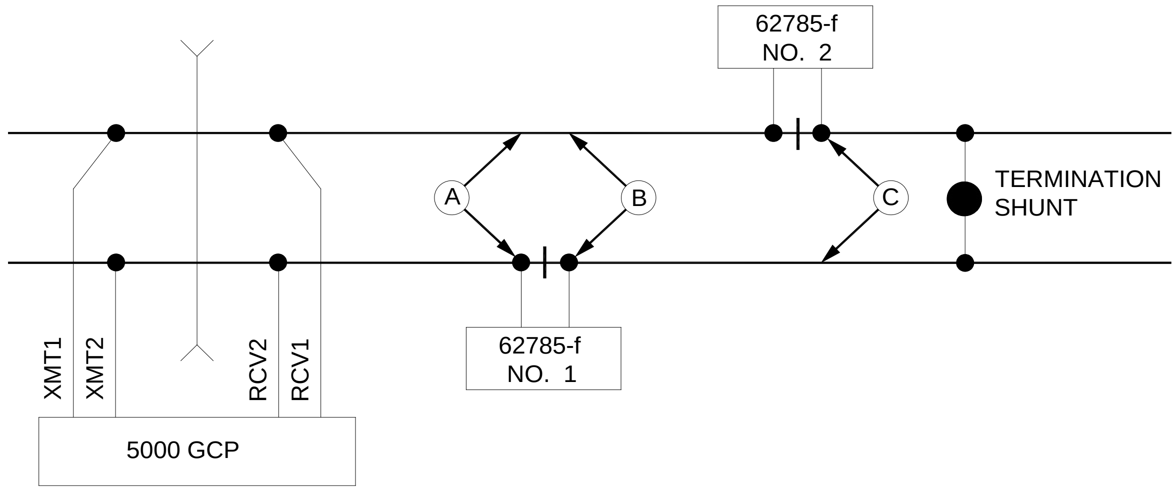
Step 4: **Make note of the EZ value** appearing on the Model 5000 GCP display.

Step 5: Move the test shunt to location B.

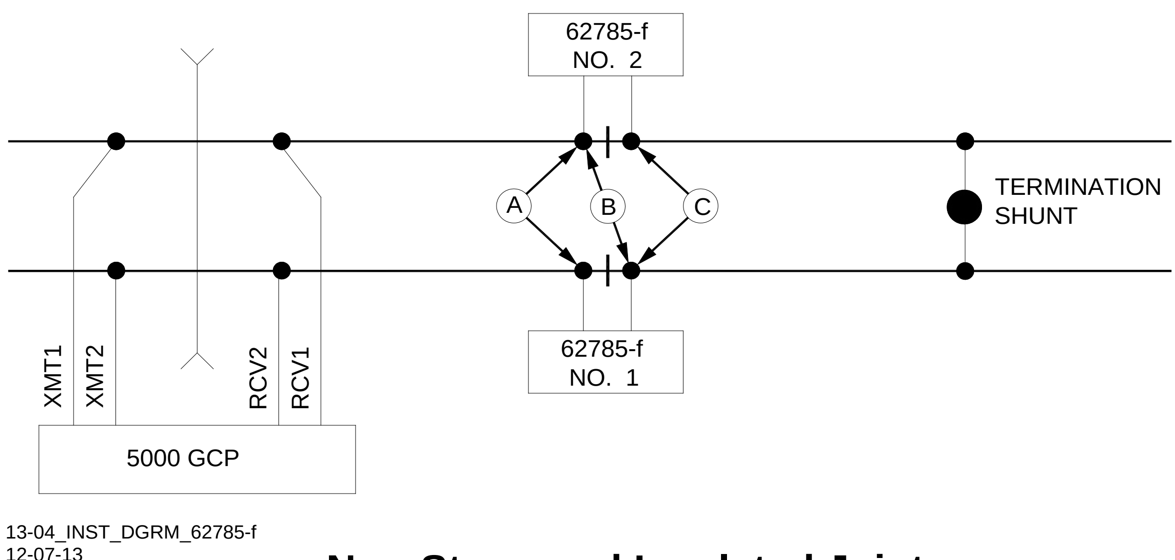
Step 6: Tune the Tunable Insulated Joint Bypass Coupler #1 to the same EZ value noted in Step 4.

- 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	**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 Model 5000 GCP and perform all operational checks while observing the smooth change in the EZ value across the couplers during a train move.

7.12.2 Field Tuning Procedure #2 for Couplers

Step 1: Tighten the gold nut securely on terminal E of each coupler.

Step 2: Calibrate the Model 5000 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 5000 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	**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 5000 GCP and perform all the operational checks while observing the relatively smooth change in the EZ value across the couplers during a train move.

7.12.3 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 Part Numbers	Equalizer, 022700-21X, Siemens No. Z803-00052-0001 Gas Tube Arrester, Siemens No. Z803-00053-0001

7.13 ETHERNET SPREAD-SPECTRUM RADIO (ESSR), 533XX

Siemens Ethernet Spread-Spectrum Radios may be used to provide a vital RF communications link between Model 5000 GCP installations.

For information pertaining to the 533XX Ethernet Spread Spectrum Radio (ESSR), refer to Installation & Operation Document, COM-00-05-05 (see Figure 7-29).

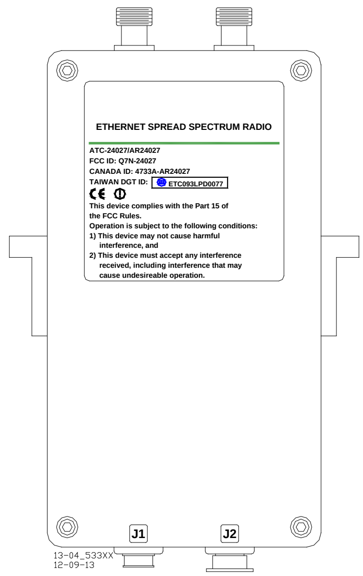


Figure 7-29.
Ethernet Spread Spectrum Radio, 533XX

7.14 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.

7.14.1 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).

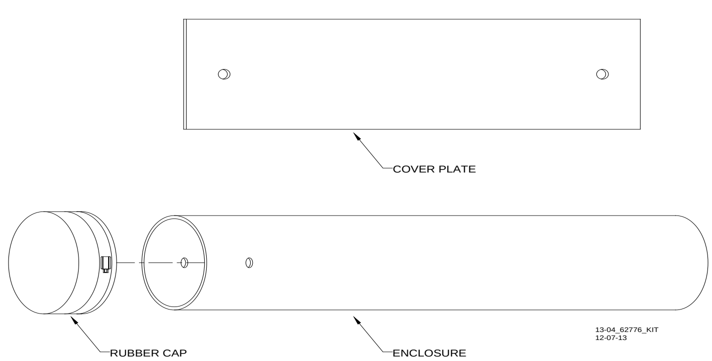


Figure 7-30:
MS/GCP Termination Shunt Burial Kit, 62776

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.

7.14.2 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.

7.14.3 55BShunt 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)

7.15 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

WARNING

ANY ALTERNATIVE SURGE PROTECTION DEVICE MUST BE ANALYZED TO INSURE THAT FAILURE MODES OF DEVICE DO NOT COMPROMISE SAFETY OF MODEL 5000 GCP SYSTEM. FOR EXAMPLE, BUT NOT LIMITED TO UNINTENTIONAL EARTH GROUNDS ON CONTROL CIRCUITS OR SHORTS ON TRACK CIRCUITS.

7.15.1 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

NOTE

For surge protection requirements not listed or for custom designed Surge Panels, contact Siemens Technical Support.

7.15.2 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.

7.15.3 Surge Panel Arresters

WARNING

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.

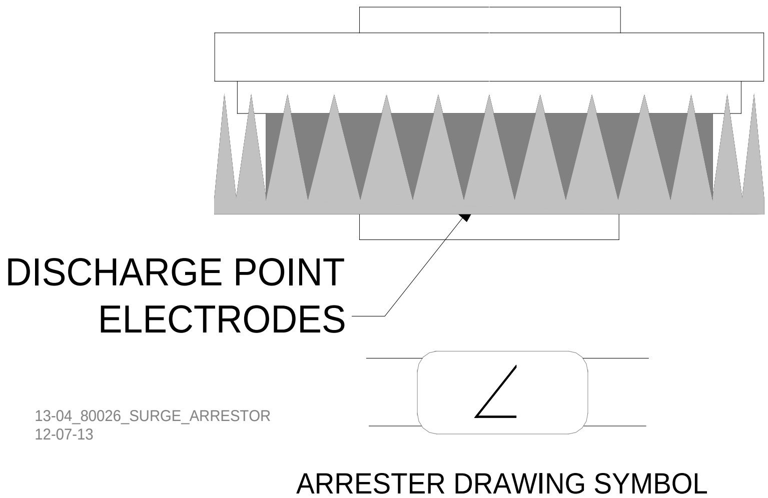


Figure 7-31:
Typical 80026 Surge Panel Arrester Mounting Position

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 7-32:
Wall Mount Surge panels, 80026-01, -02, and -22

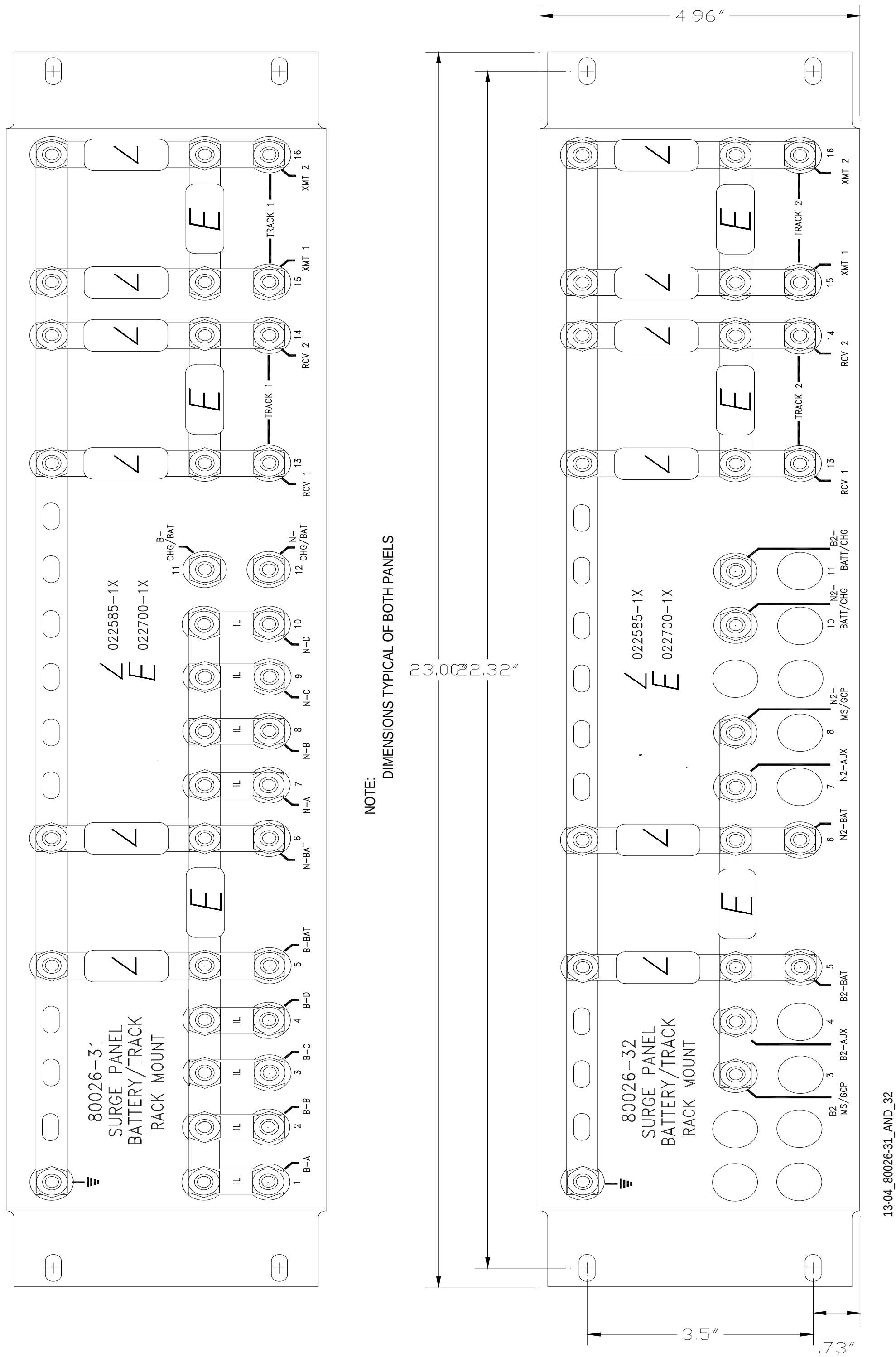


Figure 7-33:
Rack Mounted Surge Panels, 80026-31 and -32

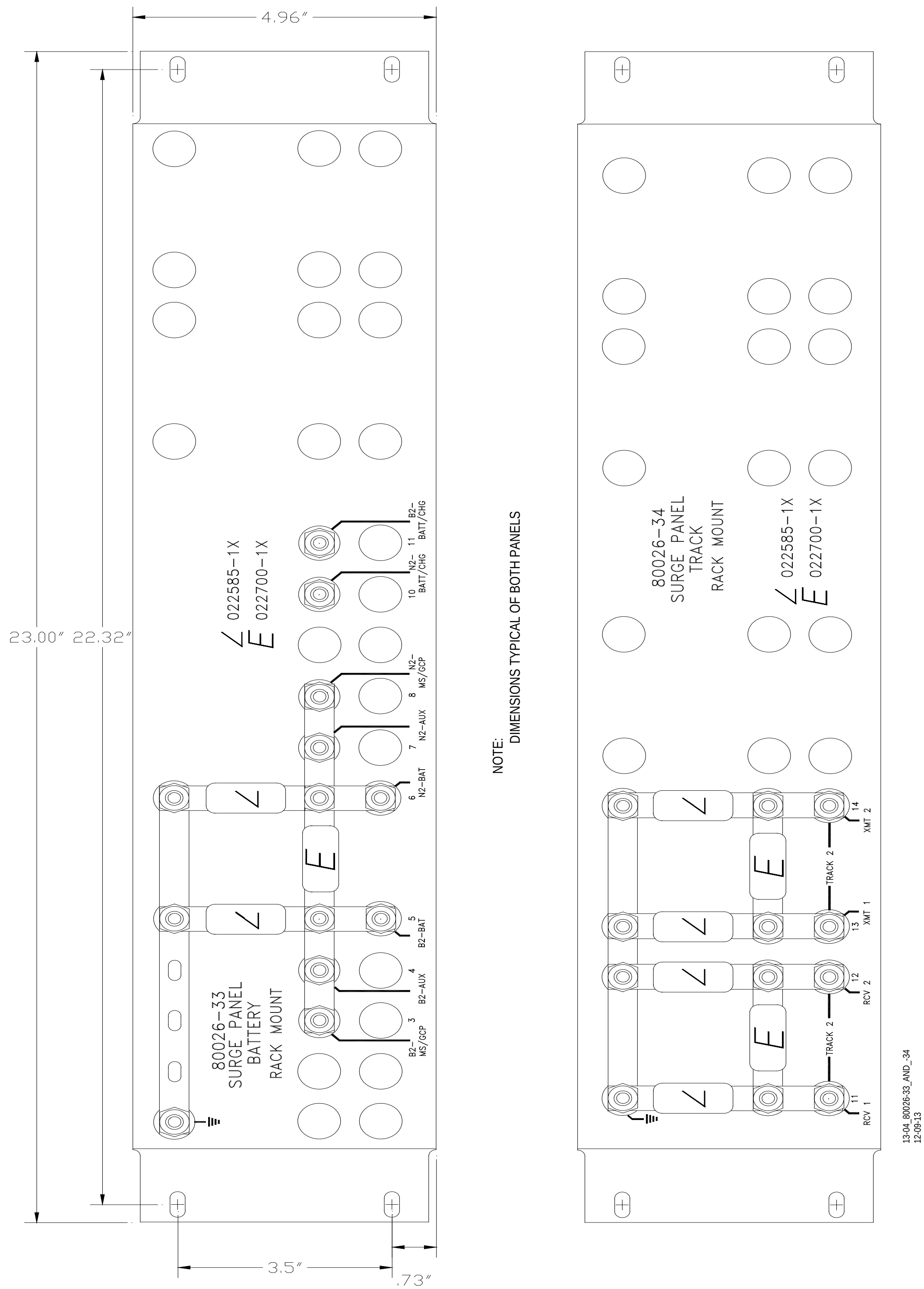


Figure 7-34:
Rack Mounted Surge Panels, 80026-33 And -34

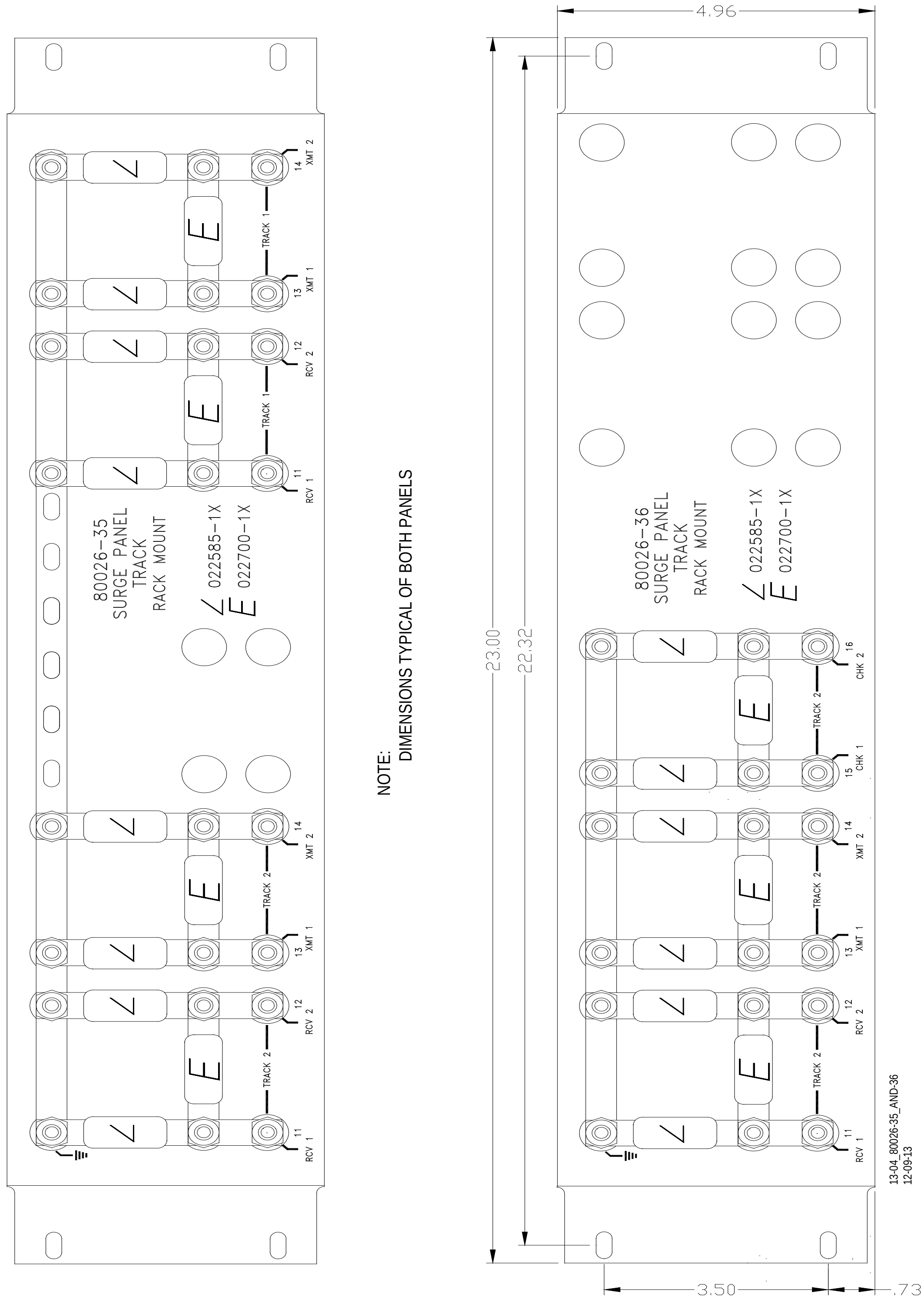


Figure 7-35:
Rack Mounted Surge Panels, 80026-35 and -36

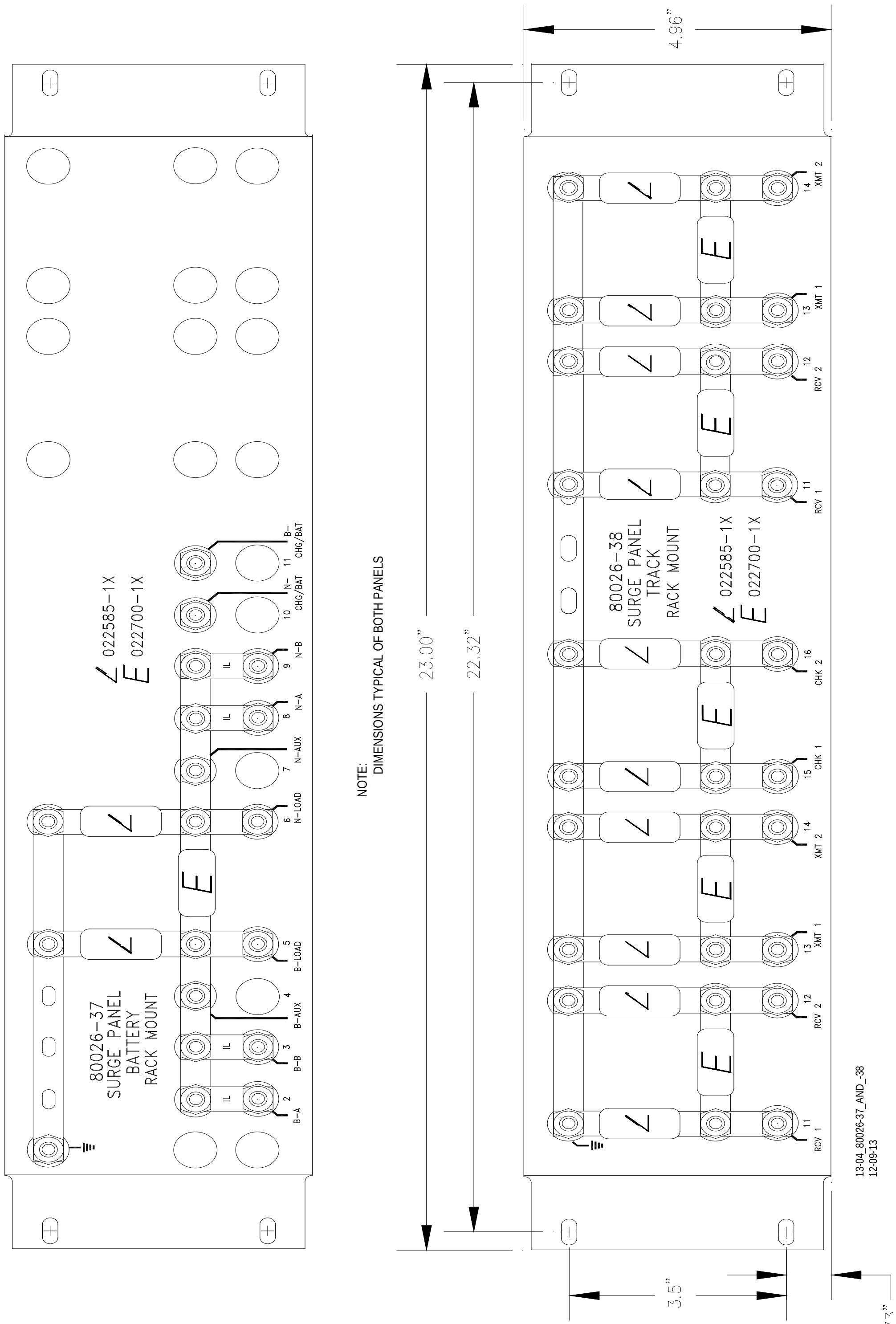


Figure 7-36:
Rack Mounted Surge Panels, 80026-37 And -38

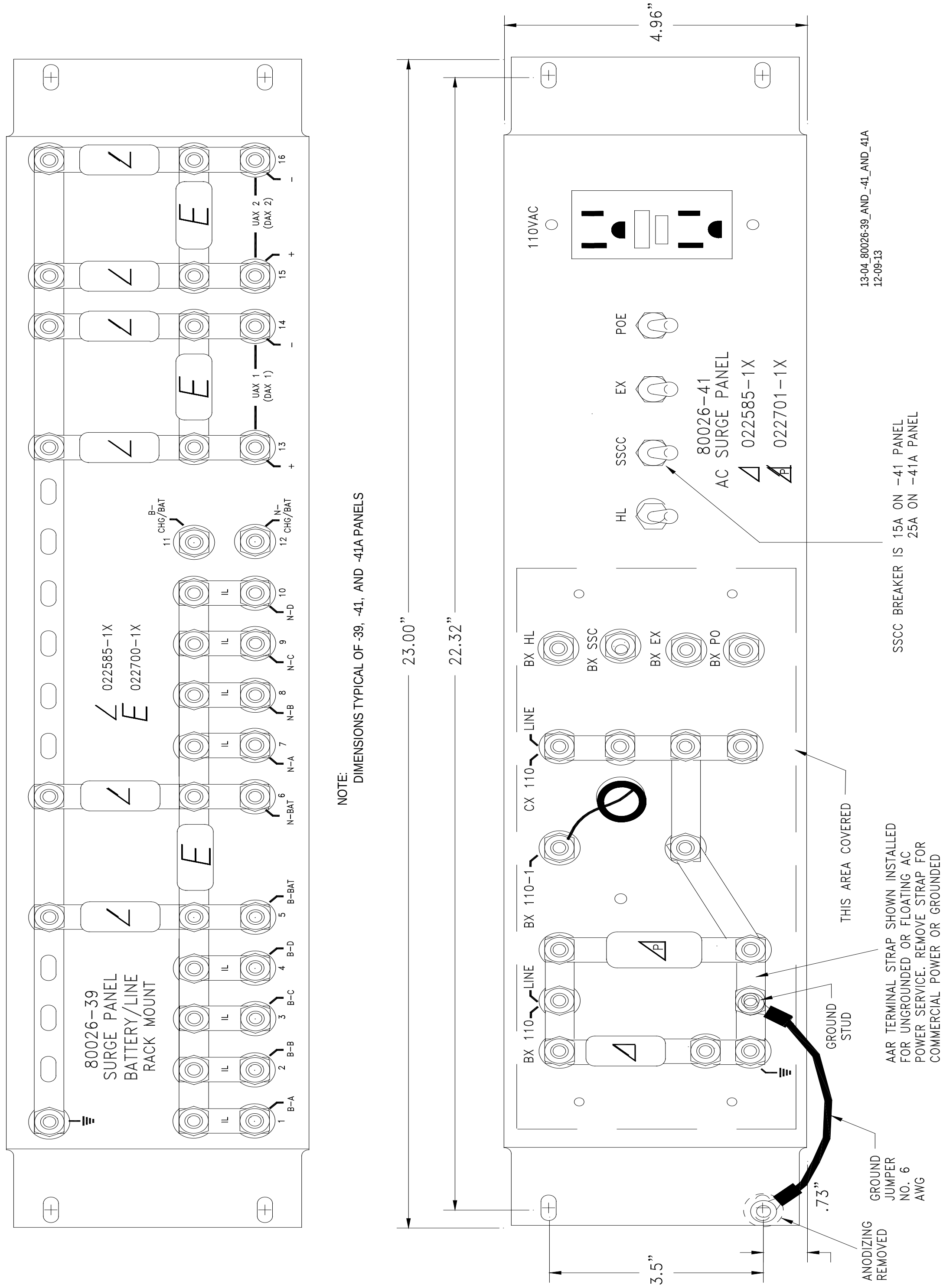


Figure 7-37:
Rack Mounted Surge Panels. 80026-39, -41 and -41A

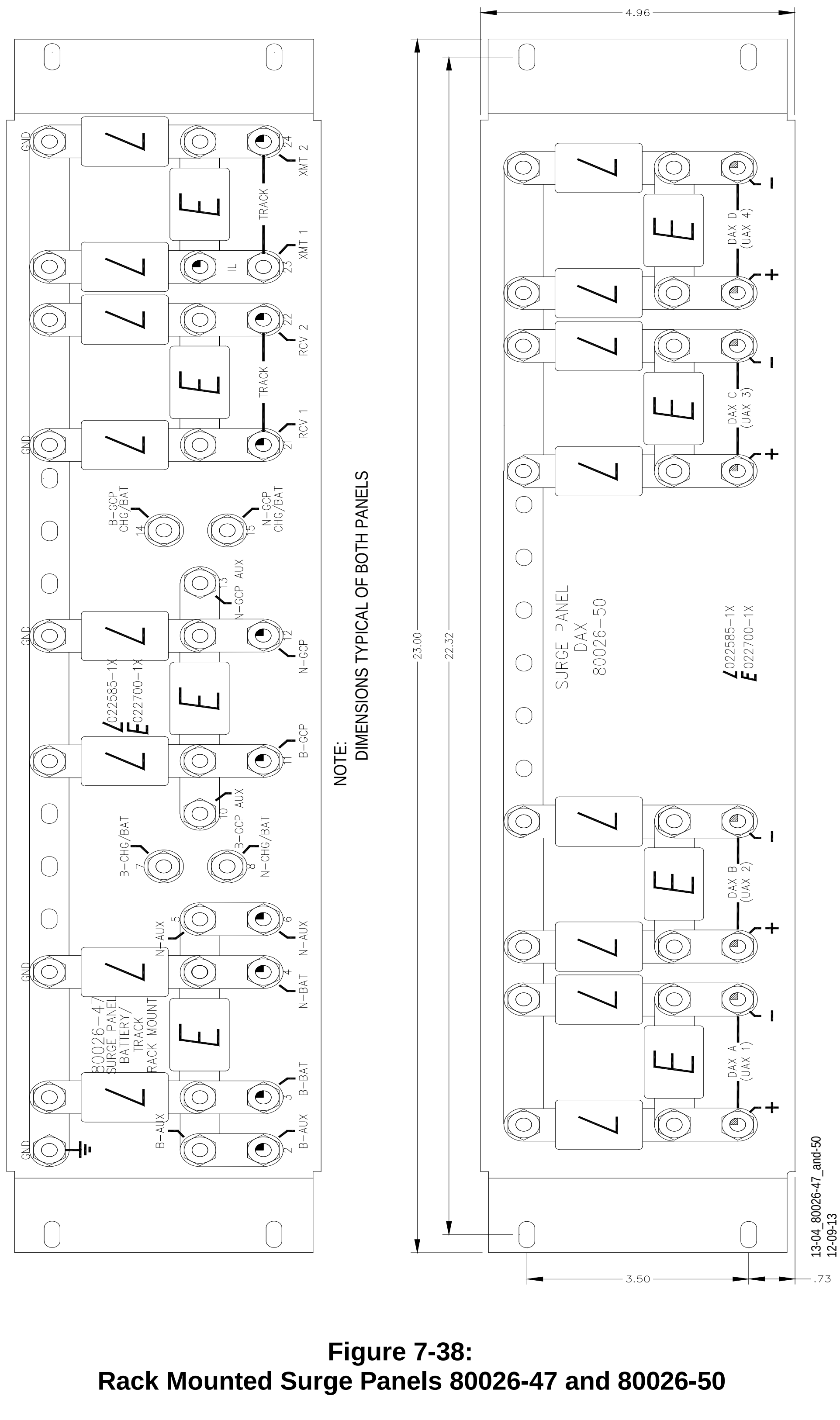


Figure 7-38:
Rack Mounted Surge Panels 80026-47 and 80026-50

7.16 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.

7.16.1 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)

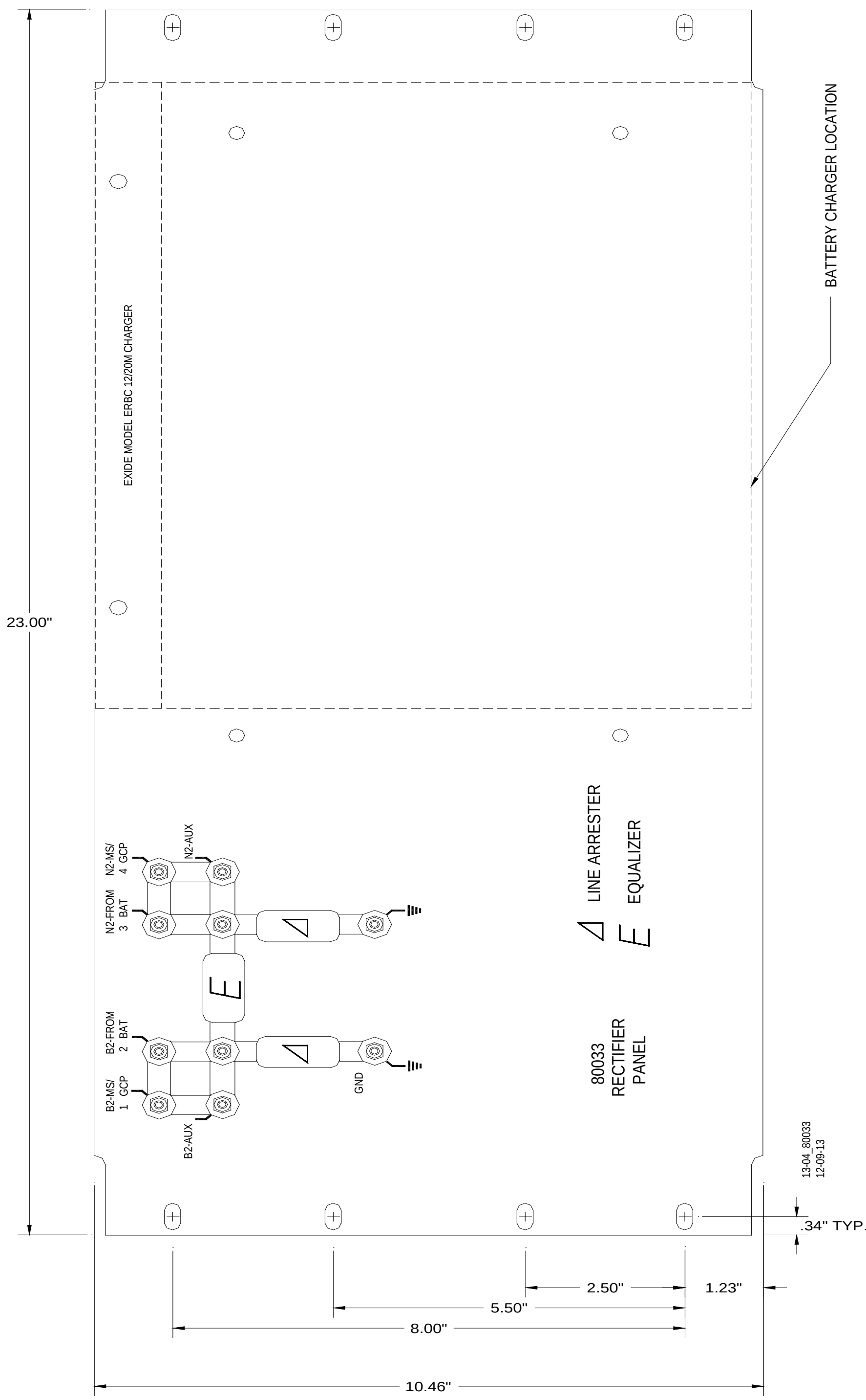


Figure 7-39:
Rectifier Panel Assembly, 80033

7.17 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)

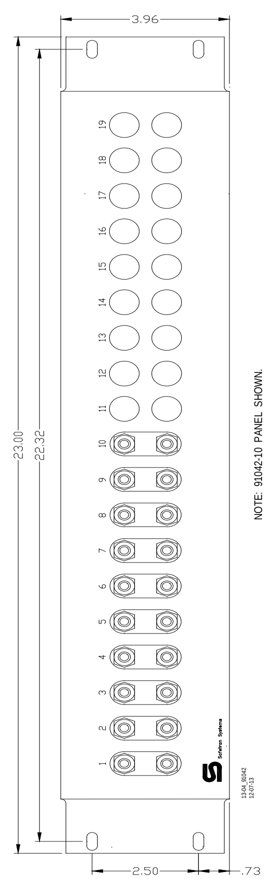


Figure 7-40:
Cable Termination Panel Assembly, 91042

7.18 SSCC III LIGHTING SURGE PANELS, 91170-1 AND 91181-1

⚠ WARNING

WARNING
ANY ALTERNATIVE SURGE PROTECTION DEVICE MUST BE ANALYZED TO ENSURE THAT FAILURE MODES OF DEVICE DO NOT COMPROMISE SAFETY OF MODEL 5000 GCP SYSTEM. FOR EXAMPLE, BUT NOT LIMITED TO, CROSSES & GROUNDS.

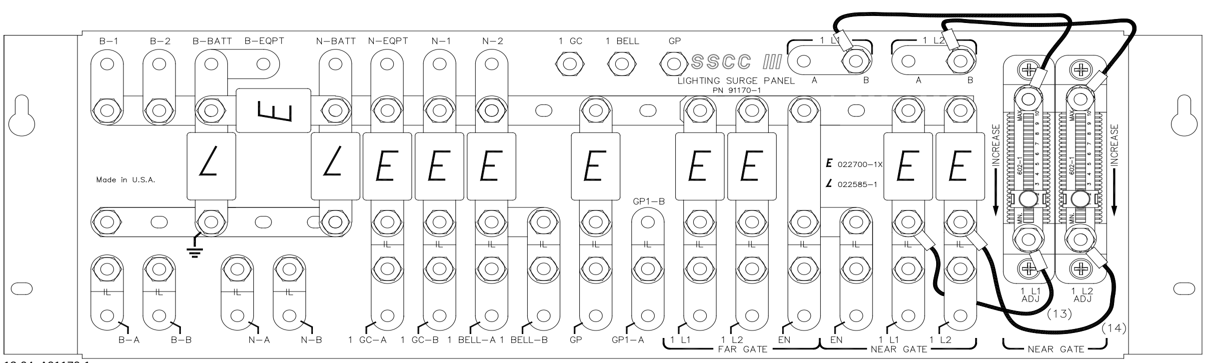
The SSCC3i Lighting Surge Panels provide external I/O primary surge protection for the 80405 Solid State Crossing Controller IIIi (SSCC3i) module and grade crossing gate controller circuitry.

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

7.18.1 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.



13-04_A91170-1
12-09-13

Figure 7-41:
SSCC III Lighting Surge Panel, 91170-1

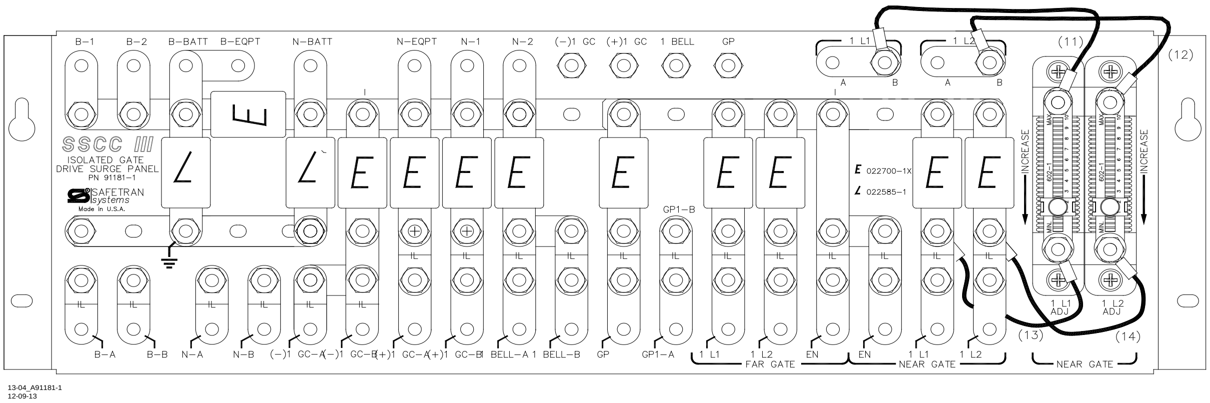
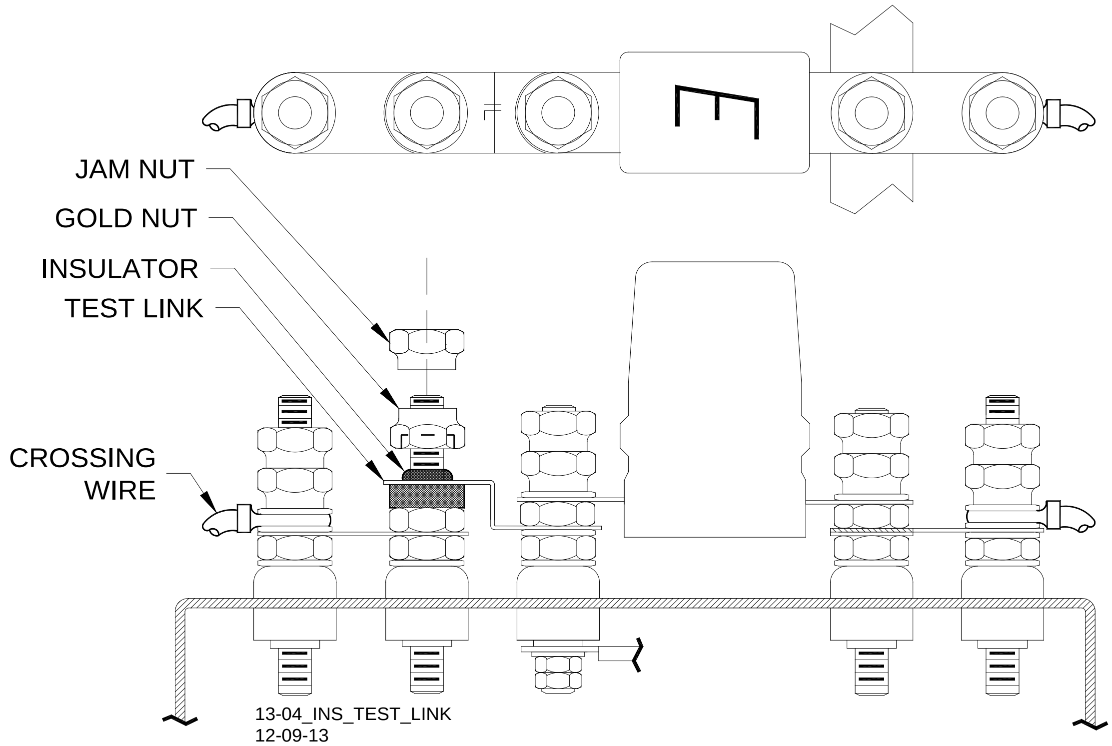


Figure 7-42:
SSCC III Lighting Surge Panel, 91181-1

7.18.2 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 7-43:
Insulated Testing Link

7.18.3 Surge Panel I/O Interface

Figure 7-44:
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)

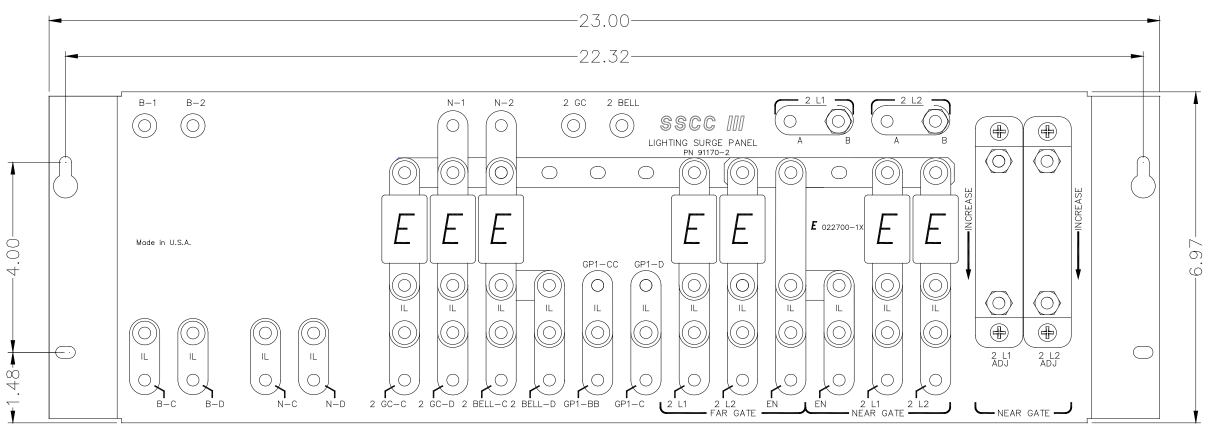
7.18.4 SSCC III Lighting Surge Panels, 91170-1& 91181-1 Specifications

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)

7.18.5 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



13-04_91170_MTG_DIM
12-09-13

Figure 7-52.

Figure 7-45:
SSCC III Lighting Surge Panel Mounting Dimensions

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SECTION 8 – DETAILED CASE AND MODULE DESCRIPTION

8.1 GENERAL PHYSICAL DESCRIPTION

Each Model 5000 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 Model 5000 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: Model 5000 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	
80905	1 to 5 tracks	No	0, 1 or 2	Yes	0, 1, 2 or 3	0, 1 or 2	Yes	8.2
80902	1 or 2 tracks	Yes	0, 1 or 2	Yes	0 or 1	0 or 1	Yes	8.3
80907	1 to 3 tracks	Yes	No	Yes	0 or 1	0, 1 or 2	Yes	8.4
80900	1 to 6 tracks	Yes	0, 1 or 2	Yes	0, 1, 2 or 3	0, 1, 2 or 3	Yes	8.5

[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

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's Echelon Configuration Handbook, COM-00-07-09).
- Two Ethernet connectors
- One powered Ethernet connector

8.1.3 Plug-In Circuit Modules

Each Model 5000 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

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 Model 5000 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

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

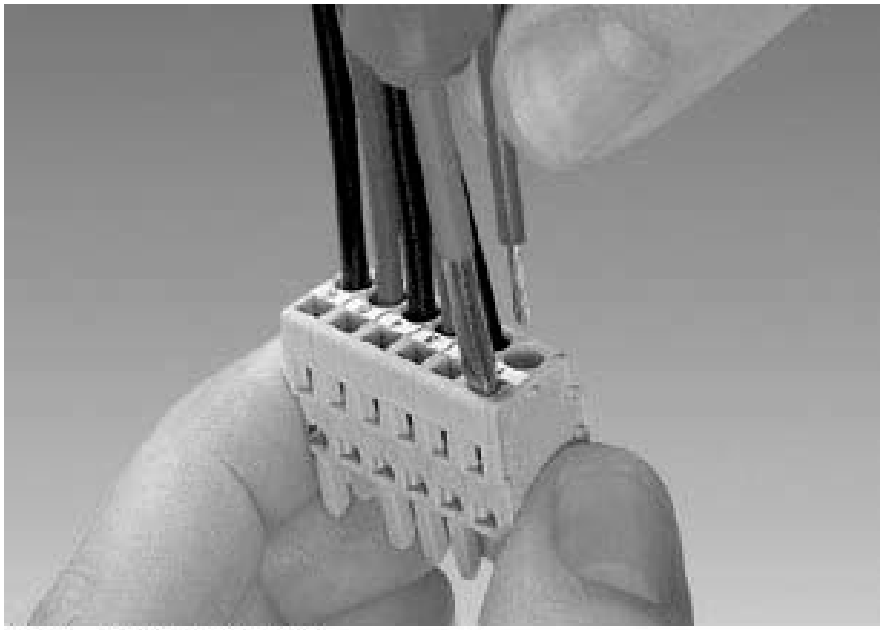
NOTE

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)



MWS_08-06_WIRE_INS
06-19-08

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 FIVE TRACK CASE, A80905

The Single Five Track Case, A80905 is shown in Figure 8-2.

NOTE

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.

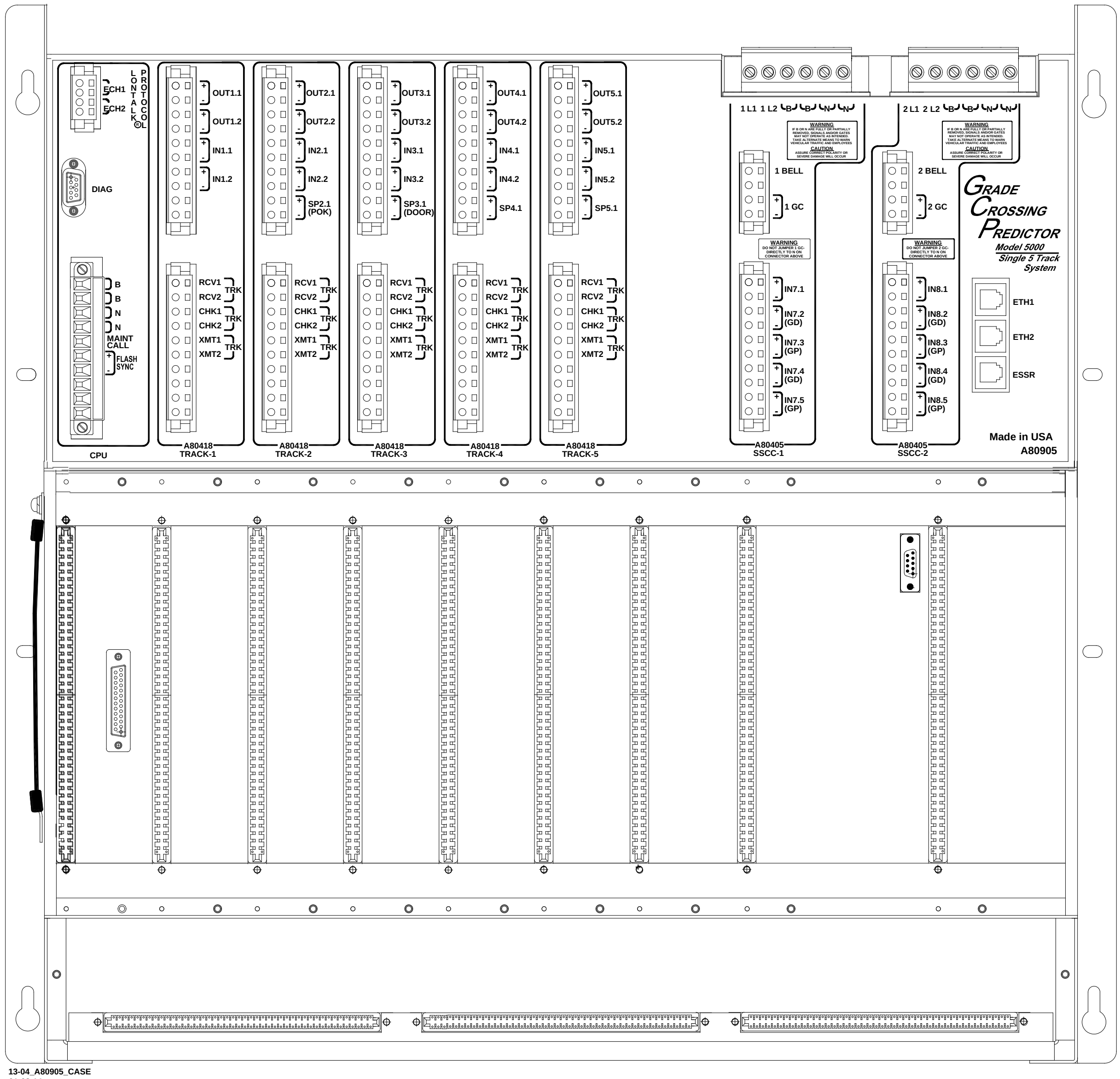


Figure 8-2:
Single Five Track Case, A80905

8.2.1 Single Five Track Case, A80905 Modules and Subassembly

The A80905 Single Five Track case with the following modules installed is shown in Figure 8-3.

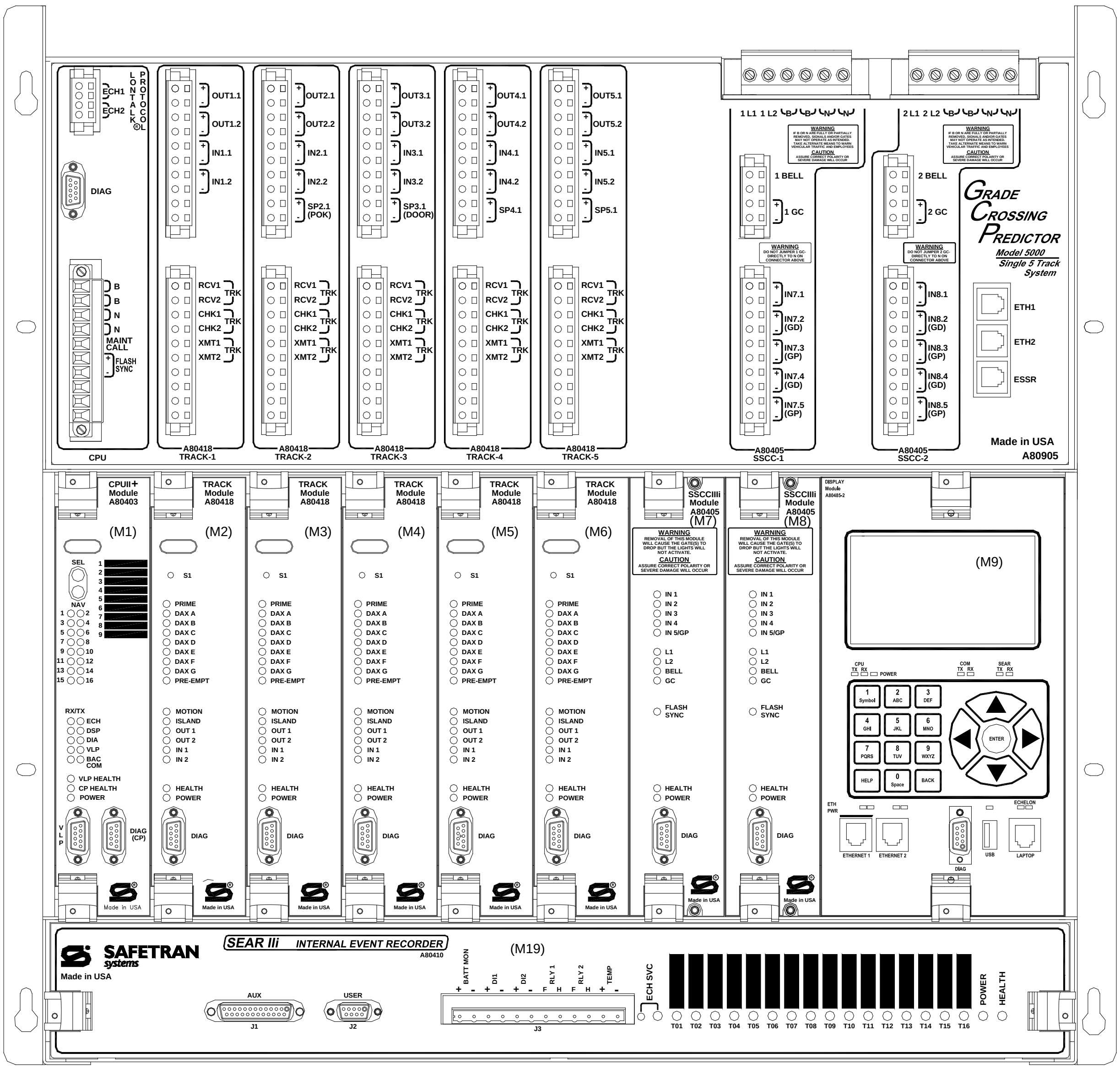
- A80403 Central Processor Unit Plus (CPU2+) module in slot position M1.
- Five A80418 Track modules in slot positions M2 through M6.
- Two A80405 Solid State Crossing controller Modules in slot positions M7 and M8
- A80485-1 Display Module in slot position M9
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) subassembly in bay below modules

NOTE

> **NOTE**
>
> The A80413 RIO module may be used in place of the Track module in slot positions M3 and M6.

8.2.2 Connector to Module Relationship

The relationship between the interface connectors and the Single Five Track Case, A80905 modules is shown in Table 8-3.



13-04_80905_WM
10-28-14

Figure 8-3:
Single Five Track Case, A80905 With Modules and SEAR2i Installed

Table 8-3:
Single Five Track Case, A80905 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80418+	M2	Track-1 / PSO-1
A80418	M3*	Track-2 / RIO-1
A80418+	M4	Track-3 / PSO-2
A80418+	M5	Track-4 / PSO-3
A80418	M6*	Track-5 / RIO-2
A80405	M7	SSCC-1
A80405	M8	SSCC-2
A80485-1	M9	Display

+Note: A80428 PSO may be used in slots M1, M4, and M5
*Note: A80413 RIO may be used in slots M3 and M6.

8.2.3 Single Five Track Case, A80905 External Wiring Connectors

The external wiring connectors of the Single Five Track Case, A80905 are shown in Figure 8-4 and described in Table 8-4.

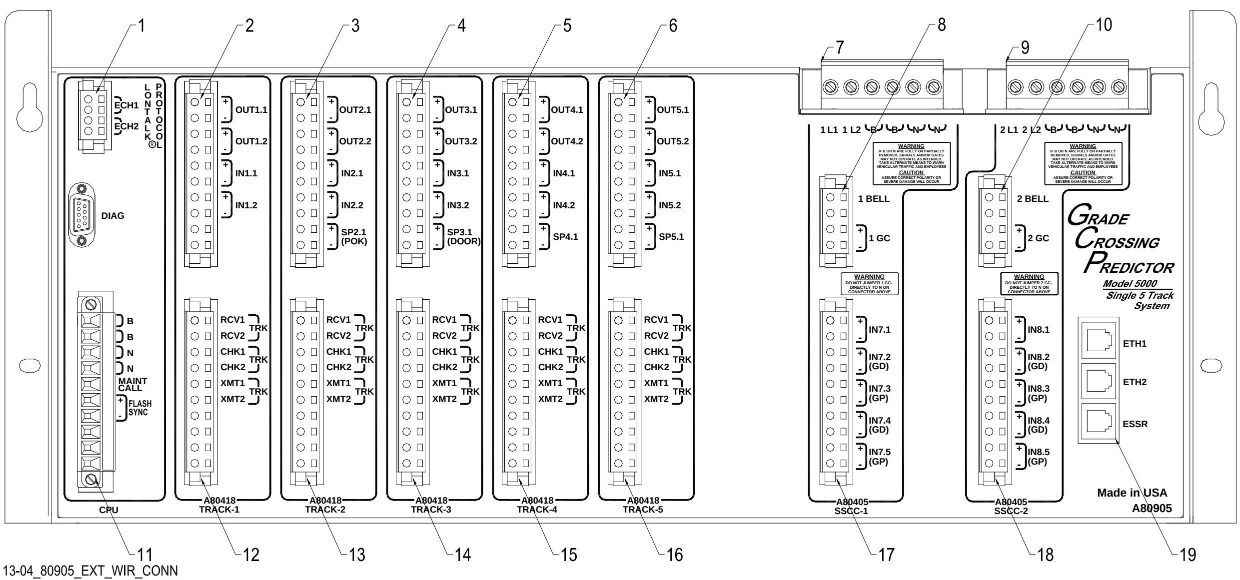


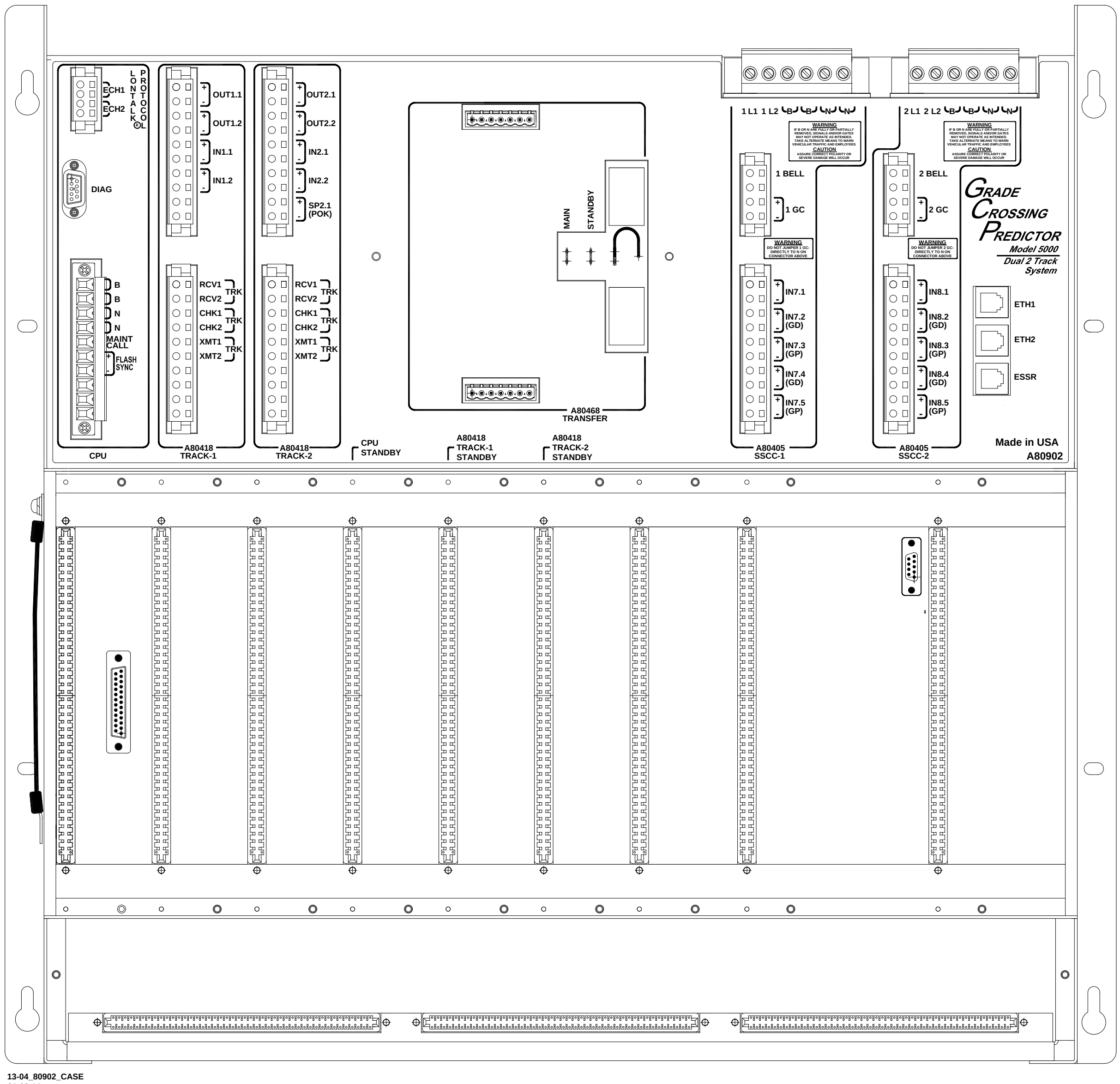
Figure 8-4:
Single Five Track Case, A80905 External Wiring Connectors

Table 8-4:
Single Five Track Case, A80905 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
19	Modular Connector	Ethernet Connectors	Z715-03682-0008

8.3 DUAL TWO TRACK CASE, A80902

The Dual Two Track Case, A80902 is shown in Figure 8-5.



13-04_80902_CASE
01-02-14

Figure 8-5:
Dual Two Track Case, A80902

NOTE

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 Dual Two Track Case Modules and Subassembly

The A80902 Dual Two Track case with the following modules installed is shown in Figure 8-6.

- 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
- A80485-1 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.

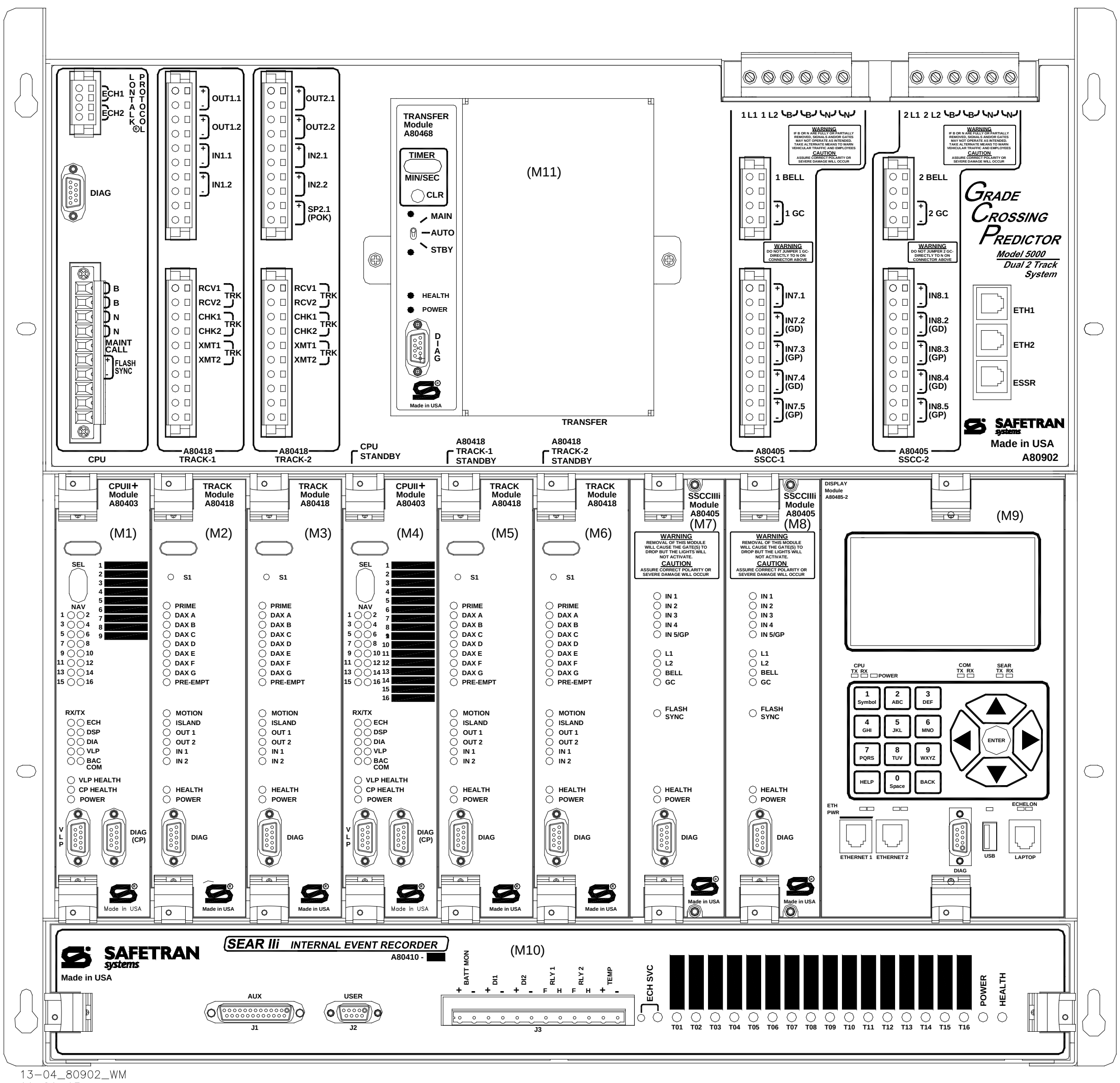


Figure 8-6:
Dual Two Track Case, A80902 With Modules and SEAR2i Installed

NOTE

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 8.8.2).

- 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 8-7) 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
- A80485-1 Display module assembly
- A80468 Transfer assembly
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to Model 5000 GCP Field Manual, SIG-00-13-03 for selecting Transfer Interval Time.

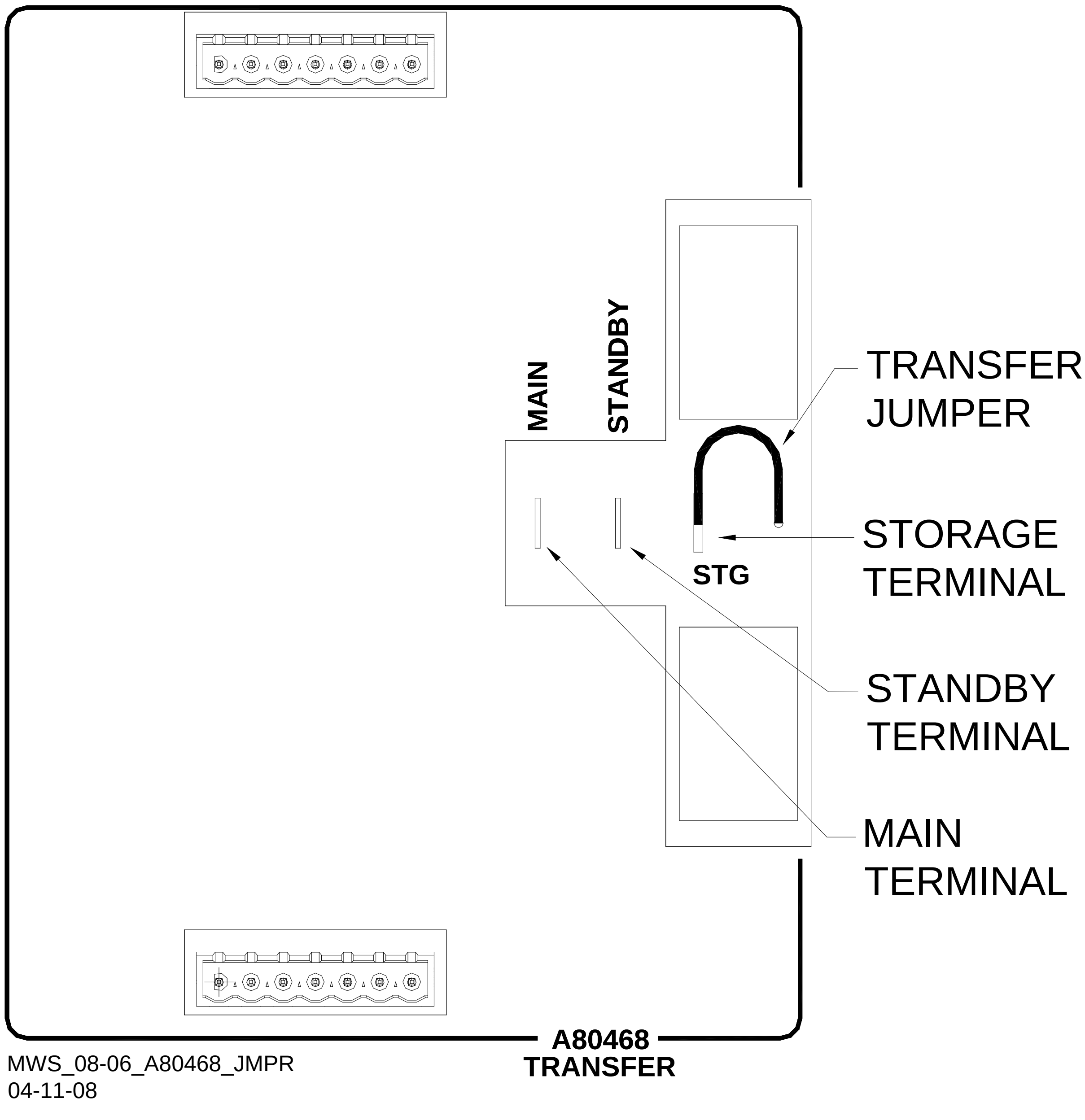


Figure 8-7:
Dual Two Track Case Transfer Jumper Terminals

8.3.2 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 8-5.

Table 8-5:
Dual Two Track Case, A80902 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
A80485-1	M9	Display
A80468	Top Center	Transfer

*Note: MAIN and STANDBY may use RIO in Track-2 slots (M3 and M6).

8.3.3 Dual Two Track Case External Wiring Connectors

The external wiring connectors of the Dual Two Track Case, A80902 are shown in Figure 8-8 and described in Table 8-6.

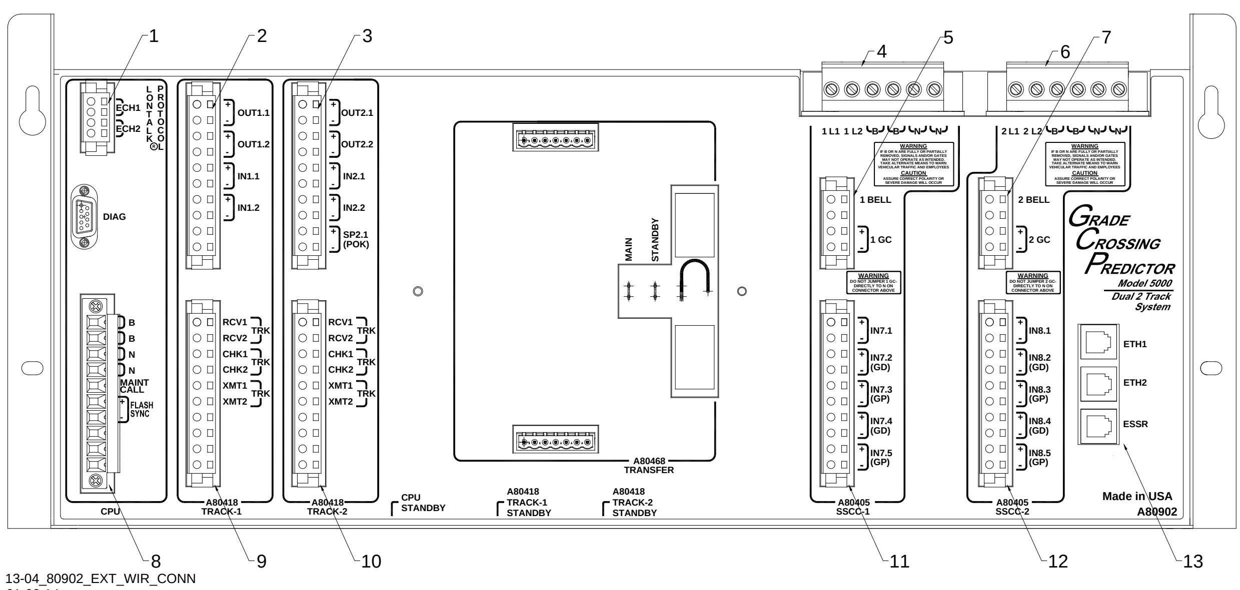


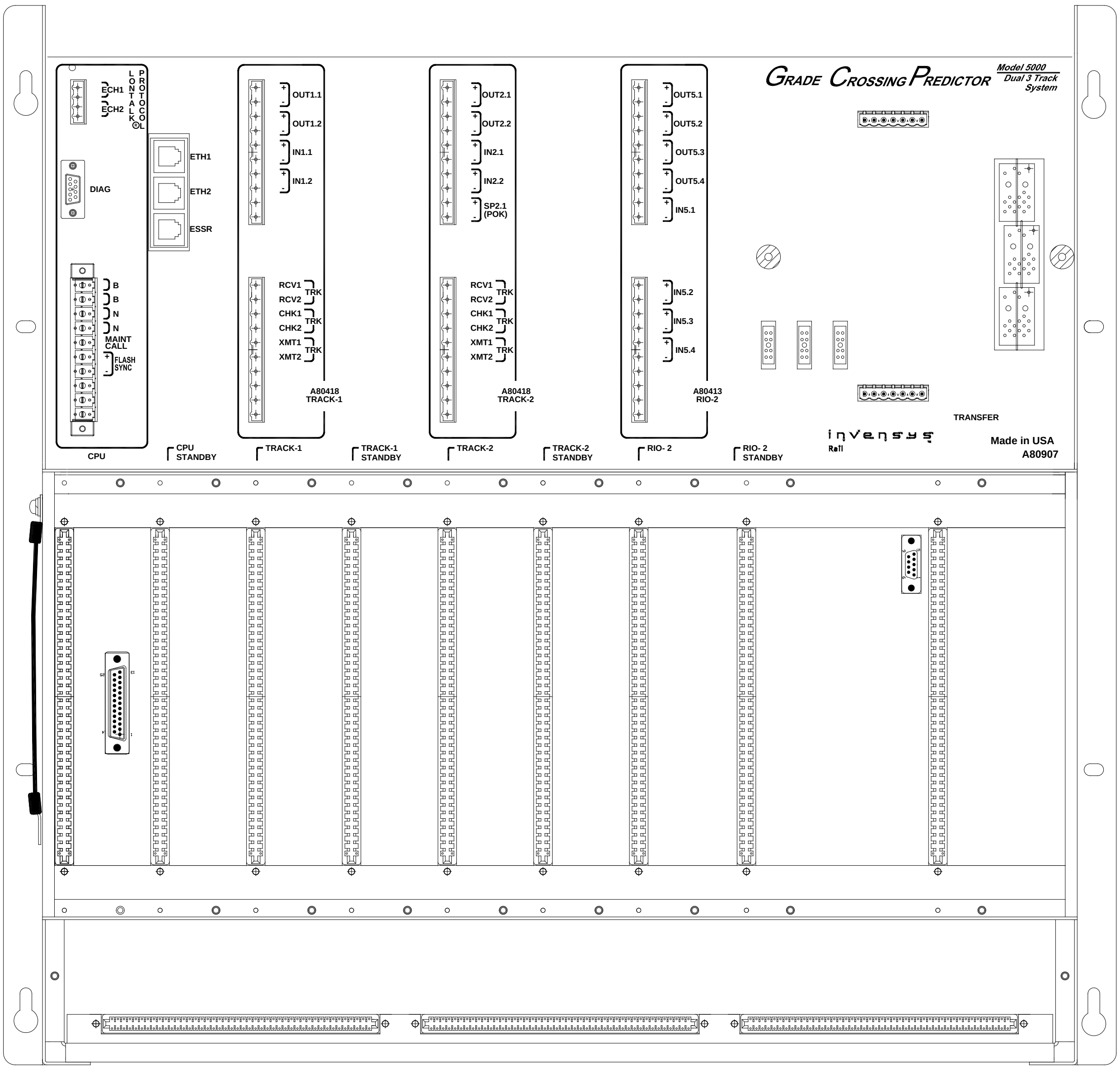
Figure 8-8:
Dual Two Track Case, A80902 External Wiring Connectors

Table 8-6:
Dual Two Track Case, A80902 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
13	Modular Connector	Ethernet Connectors	Z715-03682-0008

8.4 DUAL THREE TRACK CASE, A80907

The Dual Three Track Case, A80907 is shown in Figure 8-9.



13-04_80907_CASE
01-02-14

Figure 8-9:
Dual Three Track Case, A80907

NOTE

> **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 A80907 chassis only, the third track is referred to as Track-5.

8.4.1 Dual Three Track Case Modules and Subassembly

The A80907 Dual Three Track case with the following modules installed is shown in Figure 8-10.

- 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 A80485-1 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.

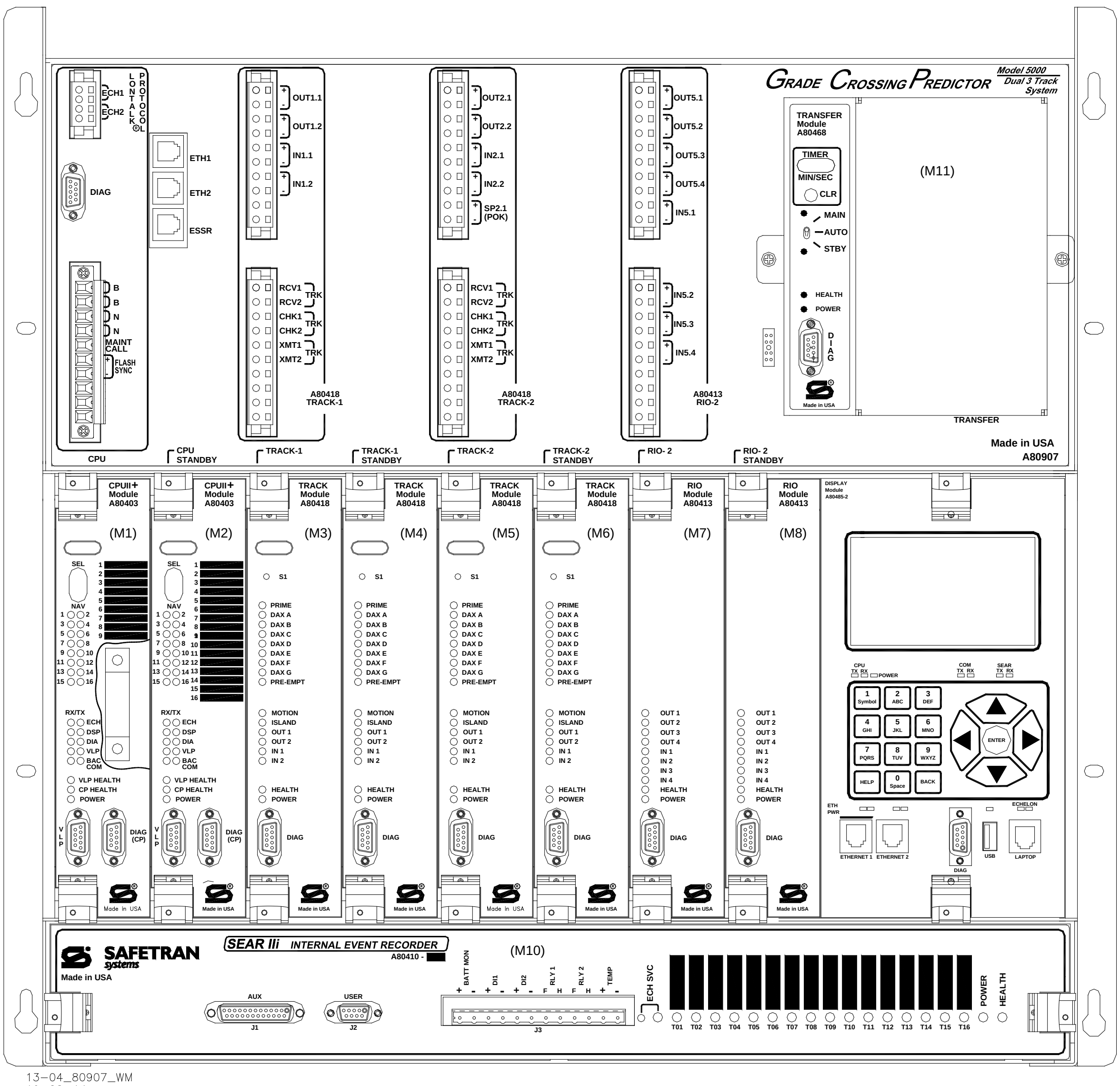


Figure 8-10:
Dual Three Track Case, A80907 With Modules and SEAR2i Installed

NOTE

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 8.8.2).

- 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 5000 GCPs. Although the transfer jumper used on the A80907 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 8-11).

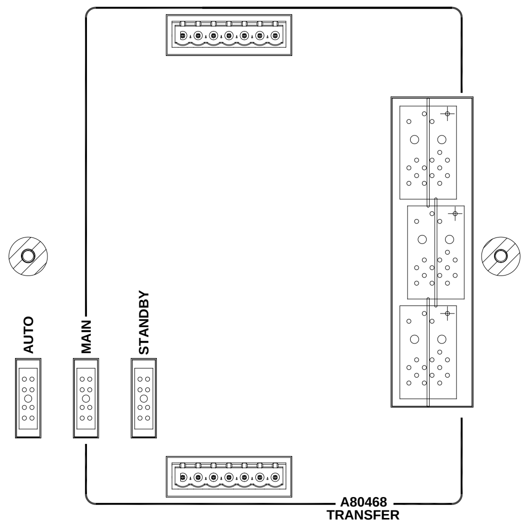
Under limited maintenance circumstances, when the Transfer assembly is not operational and has been removed, power application is controlled by the position of the transfer jumper.

- 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:

- A80485-1 Display module assembly
- A80468 Transfer assembly
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to Model 5000 GCP Field Manual, SIG-00-13-03 for selecting Transfer Interval Time.



MWS_08-06_A80468_DTT_Chassis
10-17-08

Figure 8-11:
Dual Three Track Case Transfer Jumper Terminals

8.4.2 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 8-7.

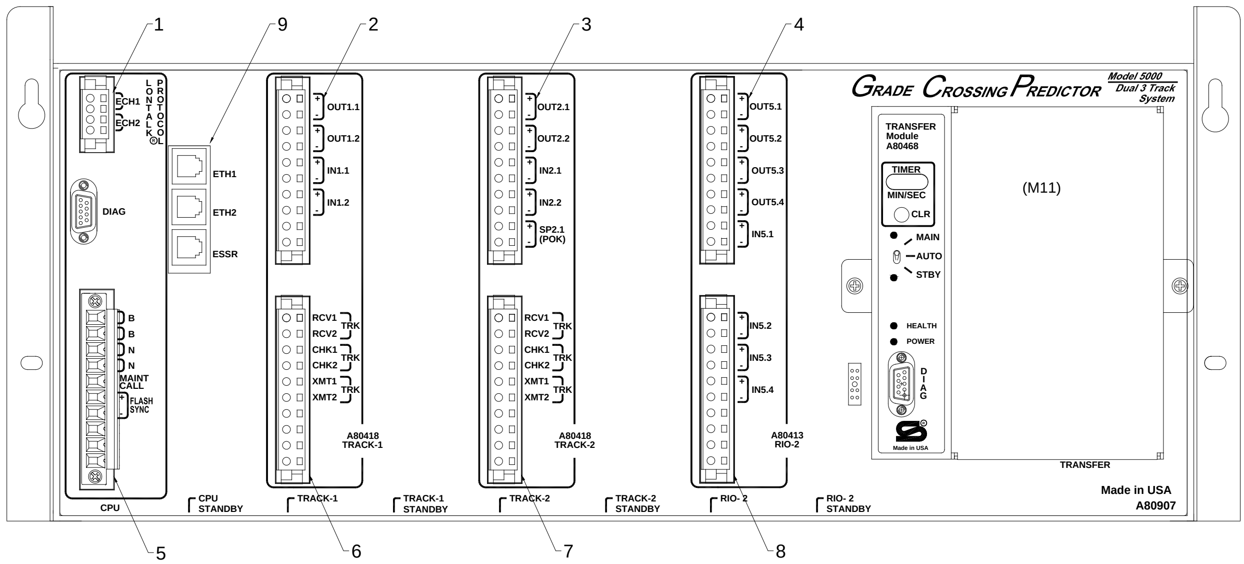
Table 8-7:
Dual Three Track Case, A80907 Module to Interface Connector Relationship

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
A80485-1	M9	Display
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).

8.4.3 Dual Three Track Case External Wiring Connectors

The external wiring connectors of the Dual Three Track Case, A80907 are shown in Figure 8-12 and described in Table 8-8.



13-04_80907_EXT_WIR_CONN
01-02-14

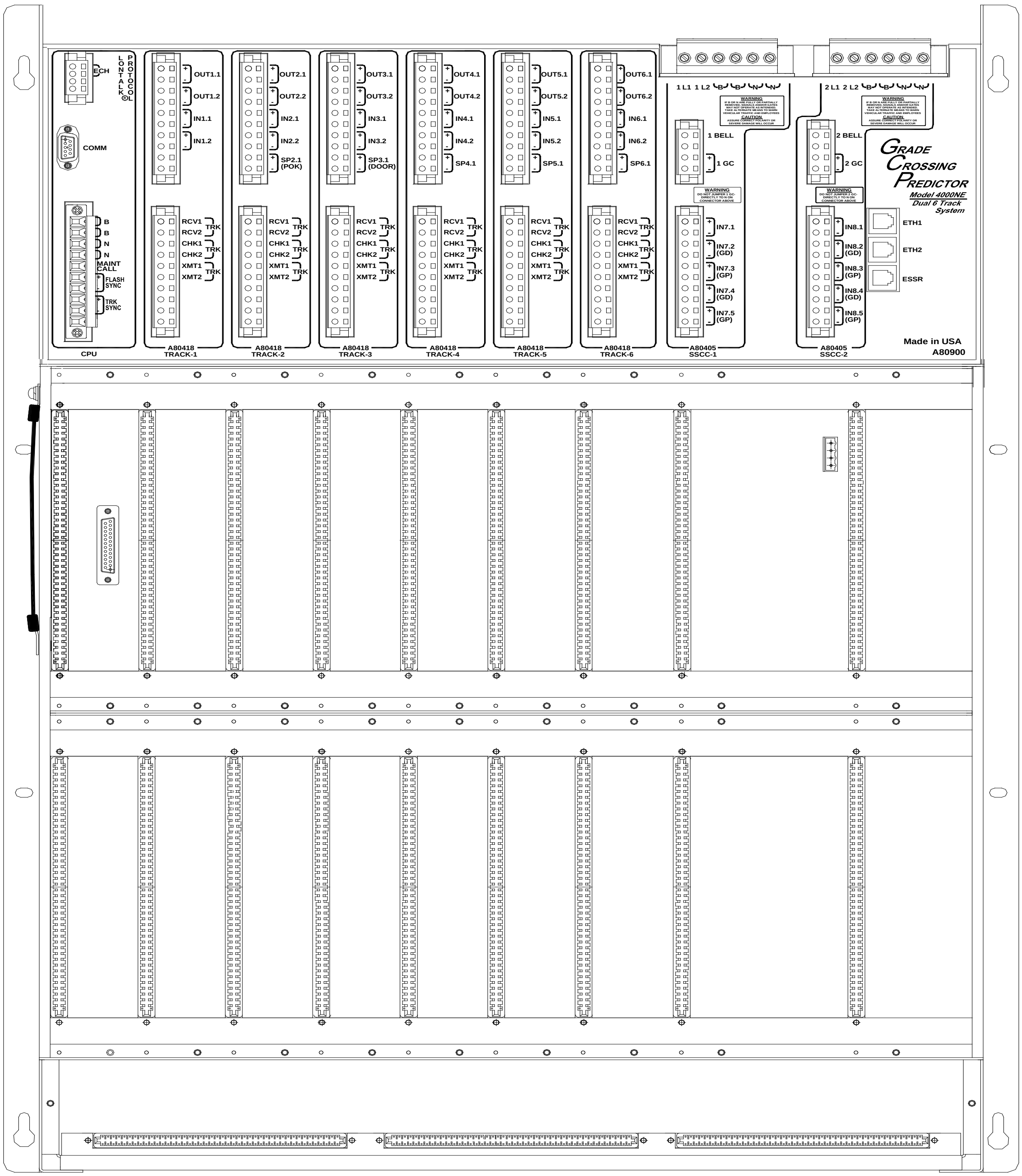
Figure 8-12:
Dual Three Track Case, A80907 External Wiring Connectors

Table 8-8:
Dual Three Track Case, A80907 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
9	Modular Connector	Ethernet Connectors	Z715-03682-0008

8.5 DUAL SIX TRACK CASE, A80900

The Dual Six Track Case, A80900 is shown in Figure 8-13.



13–04_80900_CASE

Figure 8-13:
Dual Six Track Case, A80900

NOTE

NOTE

Module slot position numbers shown in Figure 8-13 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

8.5.1 Dual Six Track Case, A80900 Modules

The Dual Six Track Case with a full complement of modules installed is shown in Figure 8-14.

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
- A80485-1 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

NOTE

The A80413 RIO module may be used in place of the Track module in slot positions 1M3, 1M6, 1M7, 2M3, 2M6 and 2M7.

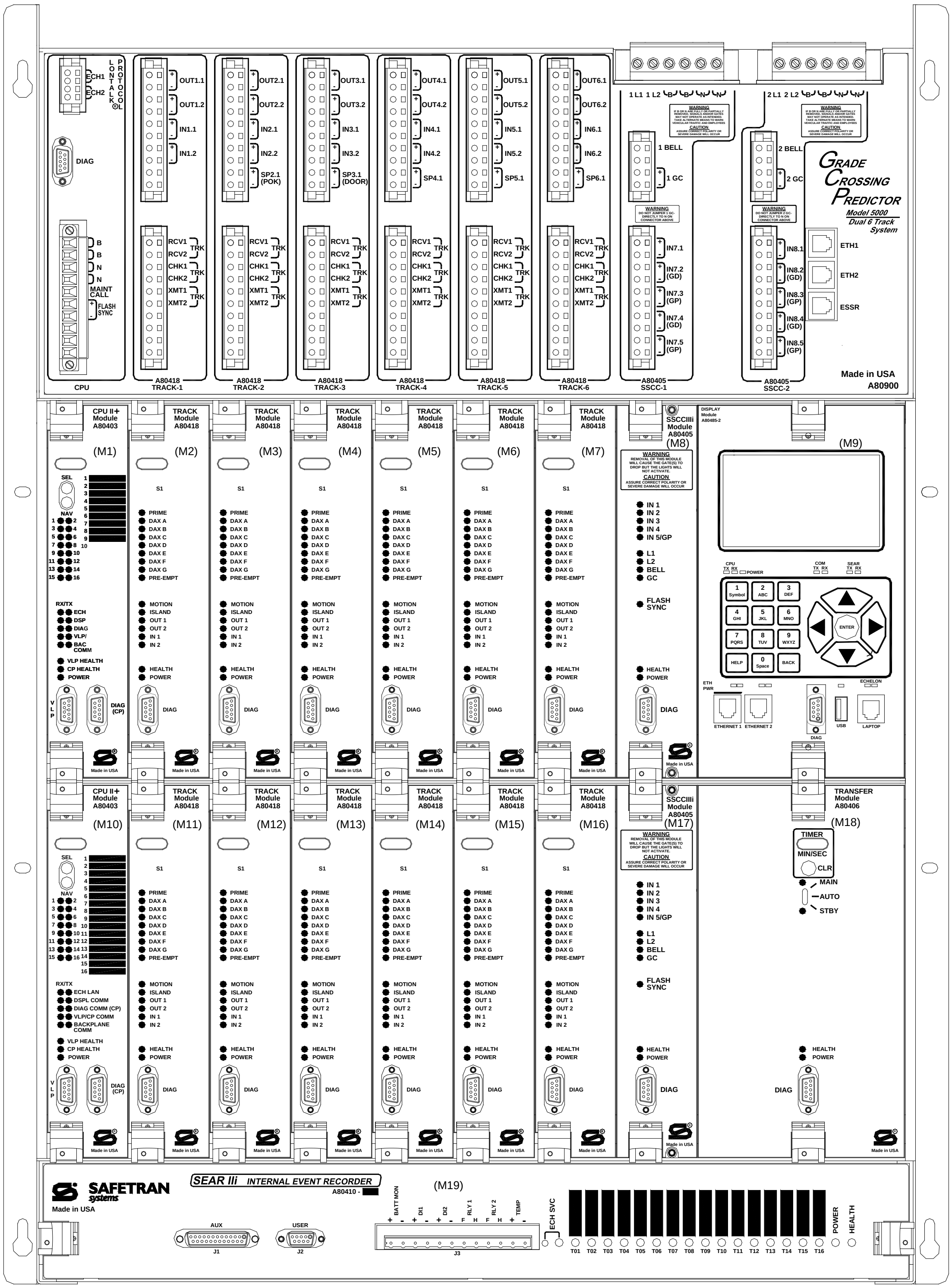


Figure 8-14:
Dual Six Track Case, A80900 With Modules Installed

NOTE

NOTE

During normal operation power is applied to the module set selected from the A80406 Transfer module (see paragraph 8.7).

- 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.

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
- A80485-1 Display module assembly
- A80406 Transfer module
- A80410 Siemens Event Analyzer Recorder IIi (SEAR2i) assembly

Refer to the Model 5000 GCP Field Manual, SIG-00-13-03 for selecting Transfer Interval Time.

8.5.2 Dual Six Track Case, A80900 Interface Connectors to Module Relationship

The relationship between the interface connectors and the Dual Six Track Case, A80900 modules are described in Table 8-9.

Table 8-9:
Dual Six Track Case, A80900 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
A80485-1	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

8.5.3 Dual Six Track Case, A80900 External Wiring Connectors

The external wiring connectors of the Dual Six Track Case are shown in Figure 8-15 and described in Table 8-10.

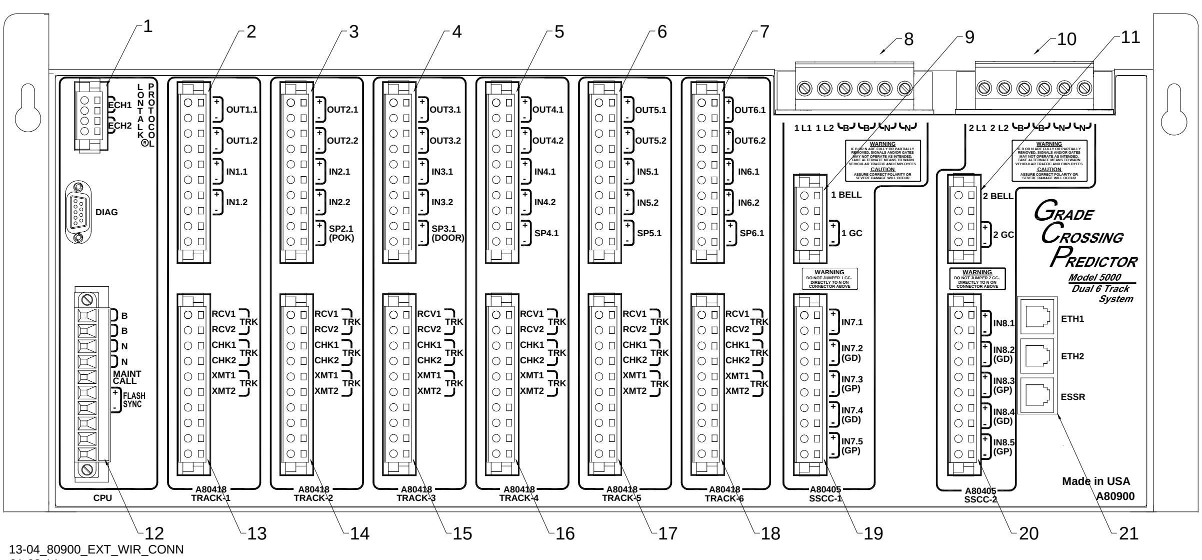


Figure 8-15:
Dual Six Track Case, A80900 External Wiring connections

Table 8-10:
Dual Six Track Case, A80900 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
21	Modular Connector	Ethernet Connectors	Z715-03682-0008

8.6 PLUG-IN MODULES AND SUBASSEMBLIES

8.6.1 CPU2+ Module, A80403

The A80403 CPU2+ Module is a central processing unit that provides all vital logic processing functions for all Model 5000 GCP chassis controls GCP LAN and vital and non-vital serial communications interfaces with front panel CPU connectors.

8.6.1.1 CPU2+ Module, A80403 User Interface

The CPU2+ front panel is shown in Figure 8-16. The CPU2+ user interface is described in Table 8-11. (Refer to Model 5000 GCP Field Manual, SIG-00-13-03, for diagnostics and troubleshooting)

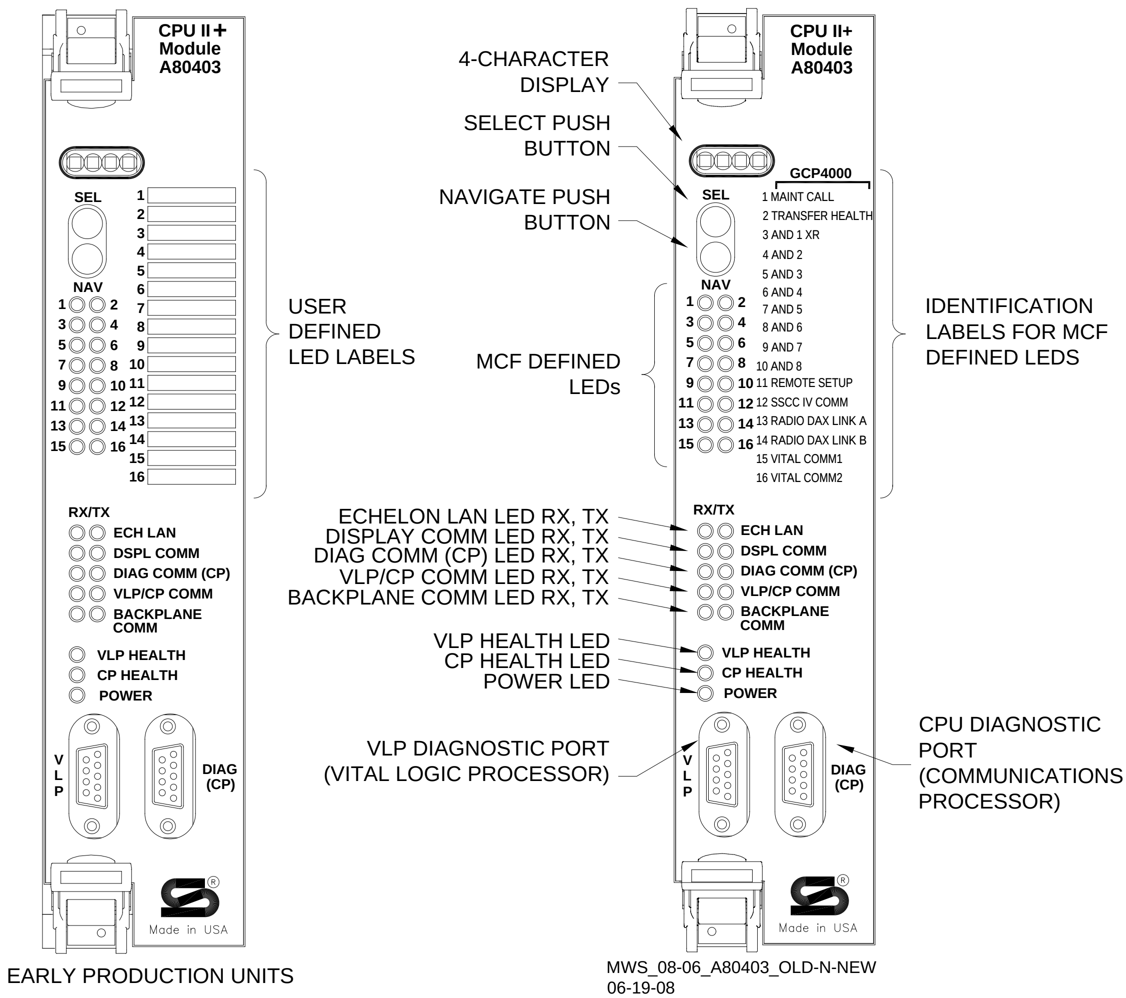


Figure 8-16:
CPU2+ Module, A80403 Front Panel

Table 8-11:
CPU2+ Module, A80403 User Interface

COMPONENT	FUNCTION		
4-Character Display	Displays alphanumeric representation of currently selected function menu item. (Refer to Model 5000 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
11 (REMOTE SETUP)	Red	Remote Setup Session	On – the GCP has been primed for a remote one person setup see section 6-10. Off – No remote setup is in progress
12 (SSCC IV COMM)	Red	External SSCCIV Communications	On – an external SSCCIV is in session Off – no external SSCCIV is used or in session

Continued on next page

Table 8-18 Concluded

COMPONENT	FUNCTION		
13 (VITAL COMM LINK 1)	Red	Vital Comm 1	On – Vital Comm Link 1 is in session Off – Vital Comm Link 1 is not used or not in session
14 (VITAL COMM LINK 2)	Red	Vital Comm 2	On – Vital Comm Link 2 is in session Off – Vital Comm Link 2 is not used or not in session
15 (VITAL COMM LINK 3)	Red	Vital Comm 3	On – Vital Comm Link 3is in session Off – Vital Comm Link 3 is not used or not in session
16 (VITAL COMM LINK 4)	Red	Vital Comm 4	On – Vital Comm Link 4 is in session Off – Vital Comm Link 4 is not used or not in session
ECH LAN LEDs	TX flashes red when the CPU2+ is transmitting an ATCS message via the LONTALK® LAN.		
	RX flashes green when the CPU2+ is receiving an ATCS message via the LONTALK® LAN.		
DSPL COMM LEDs	TX flashes red when the CPU2+ is transmitting data to the Display Panel.		
	RX flashes green when the CPU2+ is receiving data from the Display Panel.		
DIAG COMM (CP) LEDs	TX flashes red when the CPU2+ is transmitting data on the communications processor diagnostic (DIAG CP) serial port.		
	RX flashes green when the CPU2+ is receiving data from the communications processor diagnostic (DIAG CP) serial port.		
VLP/CP COMM LEDs	TX flashes red when the Vital Logic Processor (VLP) is transmitting data to the Communications Processor (CP).		
	RX flashes green when the Vital Logic Processor (VLP) is receiving data from the Communications Processor (CP).		
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.		

8.6.2 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

8.6.2.1 Track Module, A80418 Front Panel

The Track module front panel is shown in Figure 8-17. The user interface is described in Table 8-12.

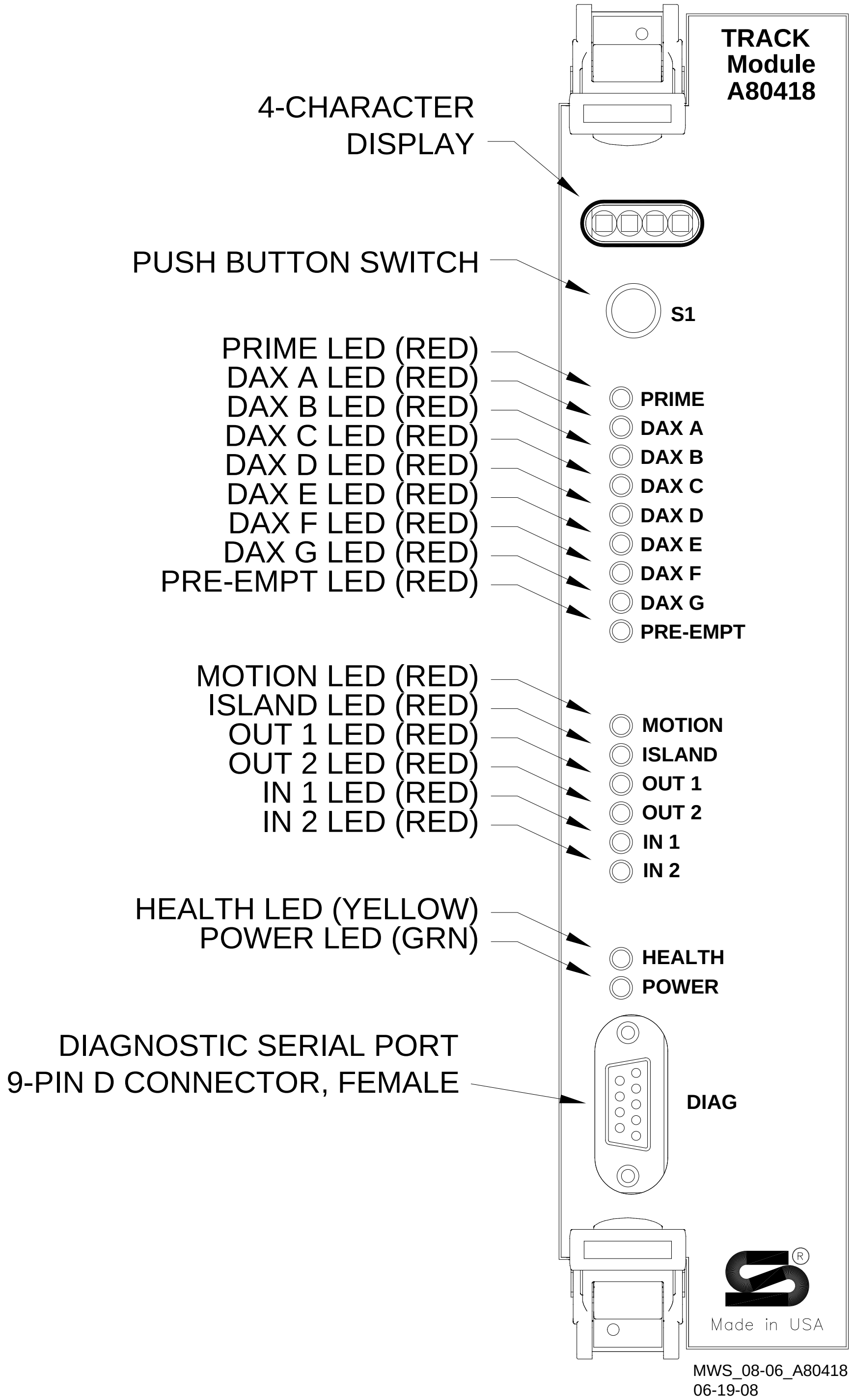


Figure 8-17:
Track Module, A80418 Front Panel

Table 8-12:
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 5000 GCP Field Manual, SIG-00-13-03: • 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.

8.6.3 Phase Shift Overlay (PSO) Module, A80428-03

The Model 5000 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

8.6.3.1 PSO Module, A80428-03 Front Panel

The PSO module front panel is shown in Figure 8-18. The user interface is described in Table 8-13.

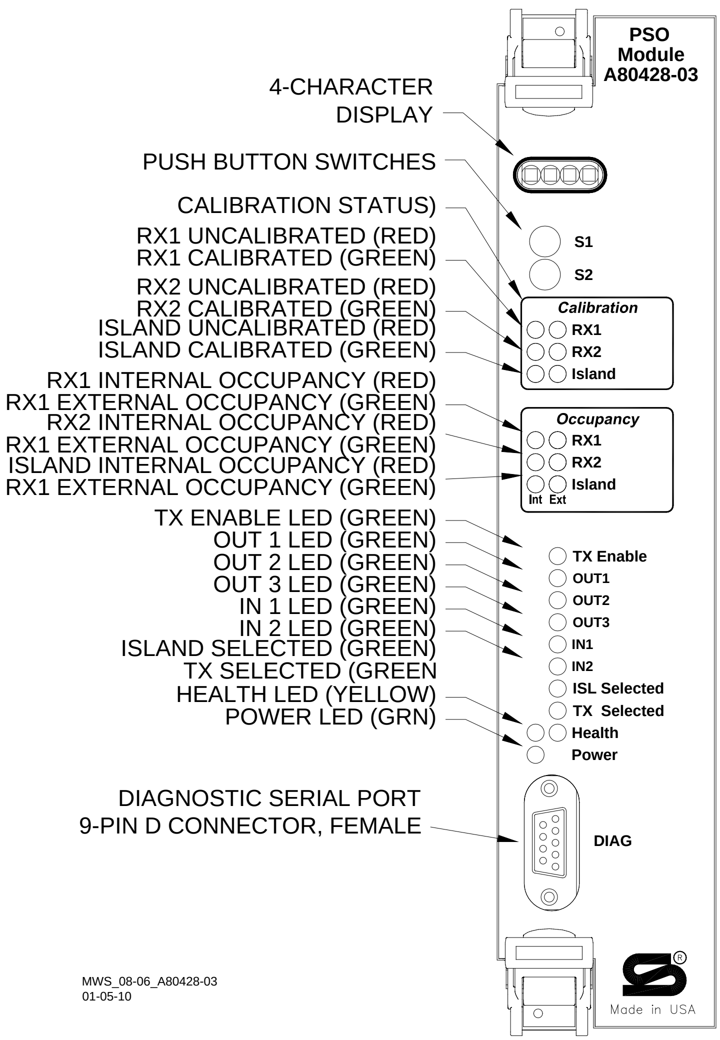


Figure 8-18:
PSO Module, A80428-03 Front Panel

Table 8-13:
PSO Module, A80428-03 User Interface

LEDS		
NAME	**COLOR**	**DESCRIPTION**
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
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

**Table 8-13:
PSO Module, A80428-03 User Interface**

LEDS		
NAME	**COLOR**	**DESCRIPTION**
*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

8.6.4 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.

8.6.4.1 RIO Module User Interface

The RIO module front panel is shown in Figure 8-19. The user interface is described in Table 8-14.

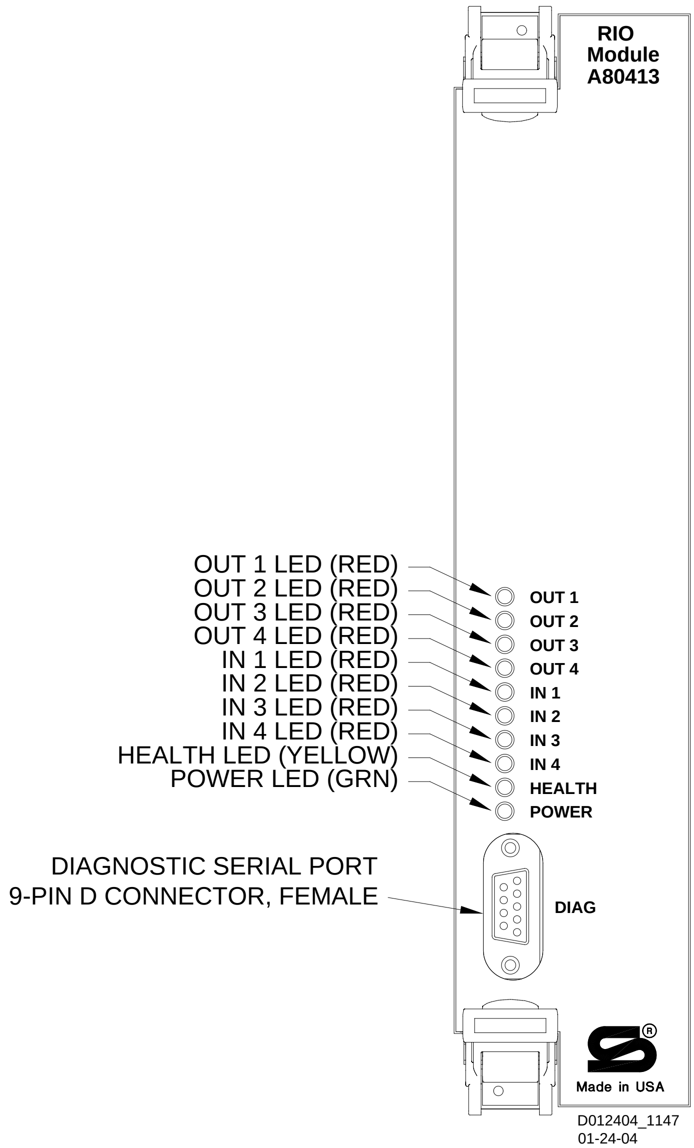


Figure 8-19:
RIO Module, A80413 Front Panel

Table 8-14:
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.

8.6.4.2 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

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

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).

8.6.5 SSCC3i User Interface

The SSCC3i module front panel is shown in Figure 8-20.

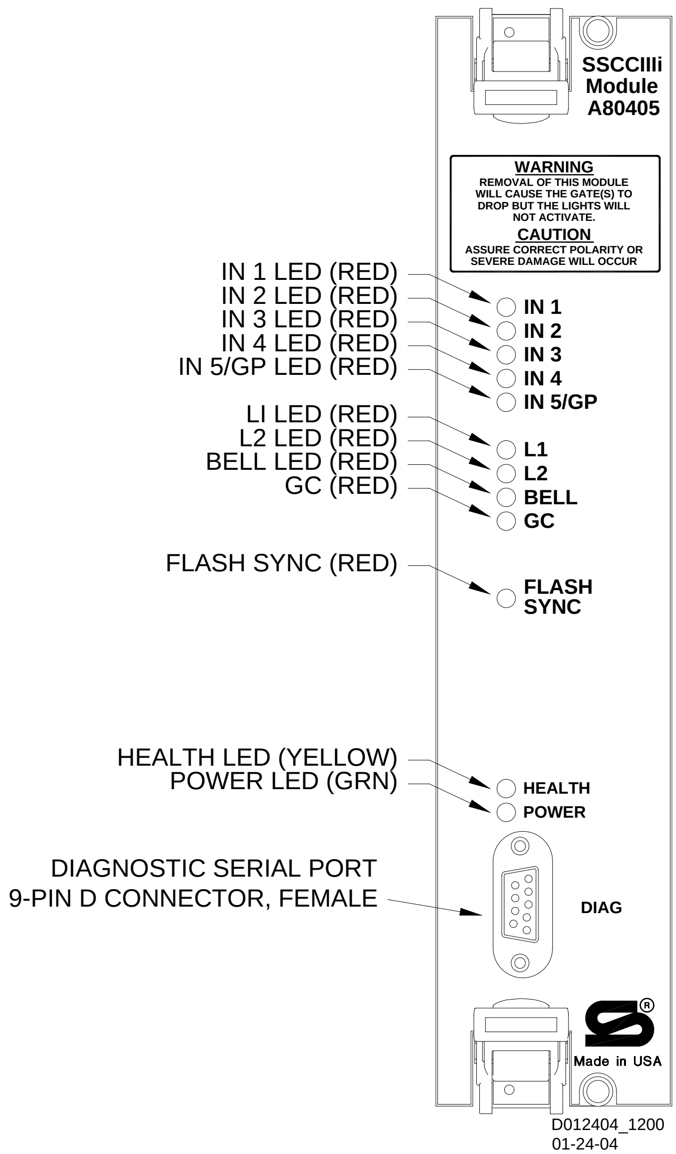


Figure 8-20:
SSCC3i Front Panel

Table 8-15 describes the SSCC3i user interface.

Table 8-15:
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.

8.6.6 Display Module, A80485-1

The Display Module, A80485-1, Figure 8-21, provides a display to allow:

- configuration programming
- application programming
- calibration programming
- system diagnostics
- system parameter display
- track status display

NOTE

NOTE
Refer to Model 5000 GCP Field Manual, SIG-00-13-03, for detailed instructions on the Display Module.

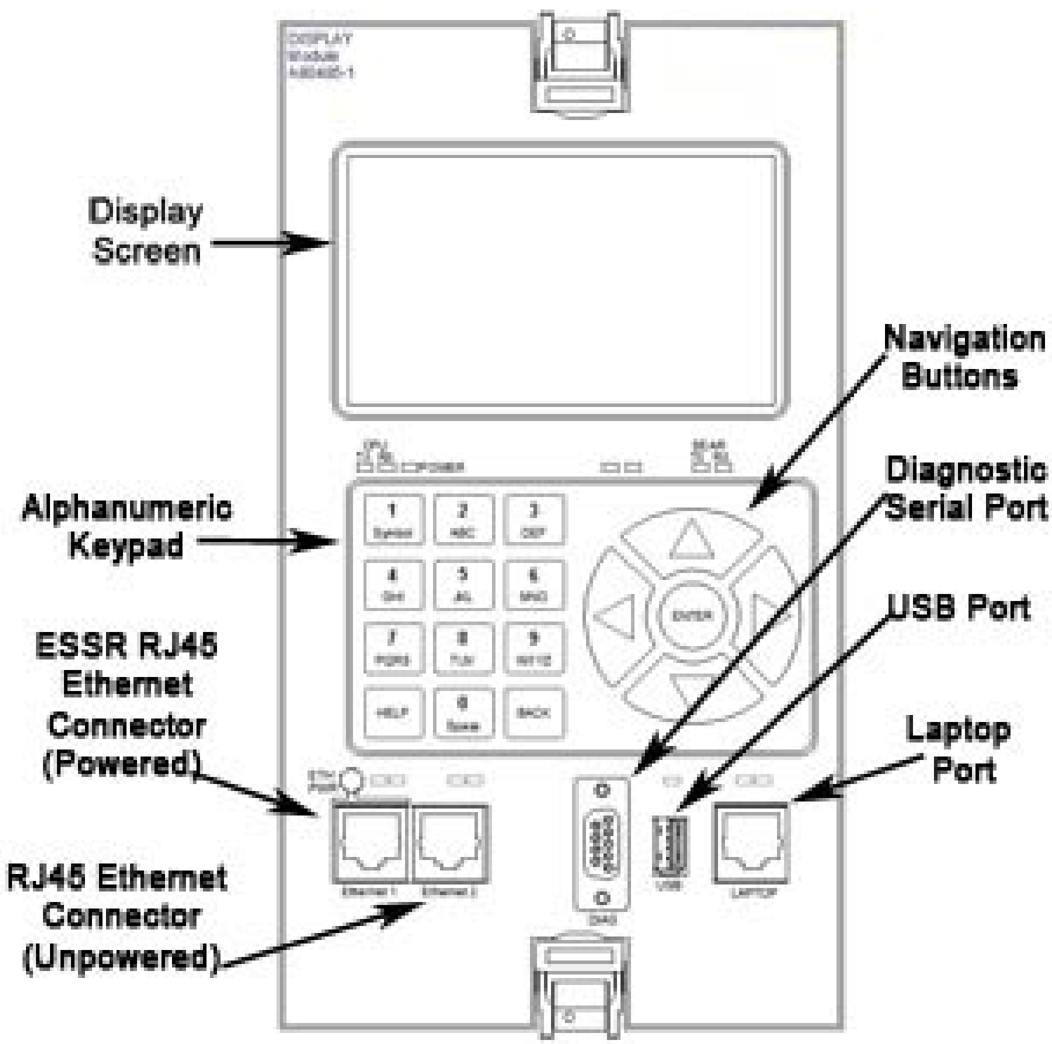


**Figure 8-21:
Display Module, A80485-1**

8.7 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

NOTE

The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

8.7.1.1 Transfer Module, A80406 User Interface

The Transfer Module, A80406 front panel is shown in Figure 8-22. The user interface is described in Table 8-16.

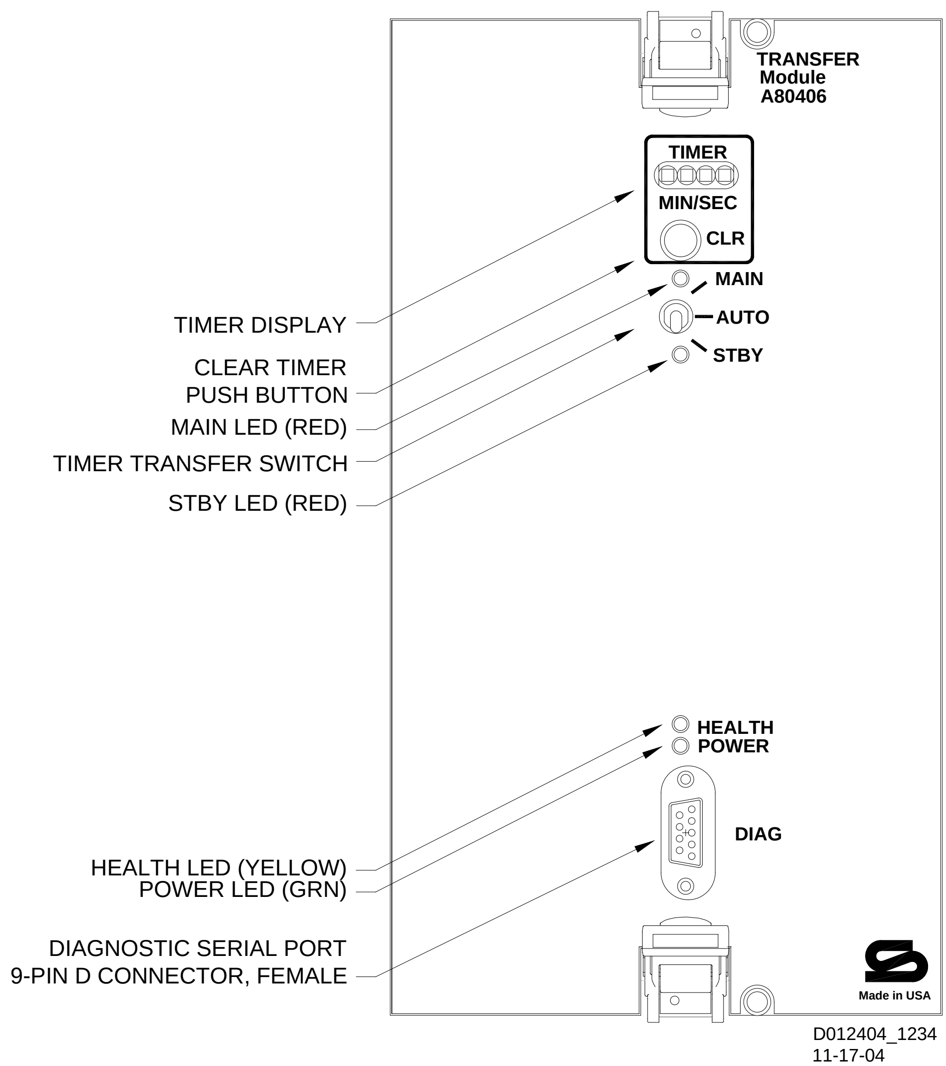


Figure 8-22:
Transfer Module, A80406 Front Panel

Table 8-16:
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.

NOTE

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.

8.8 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

NOTE

The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

8.8.1 Transfer Assembly User Interface

WARNING

WARNING

IF SSCC IIII MODULES HAVE MEF XNG02_00.MEF OR OLDER, (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 8-23. The user interface is described in Table 8-17.

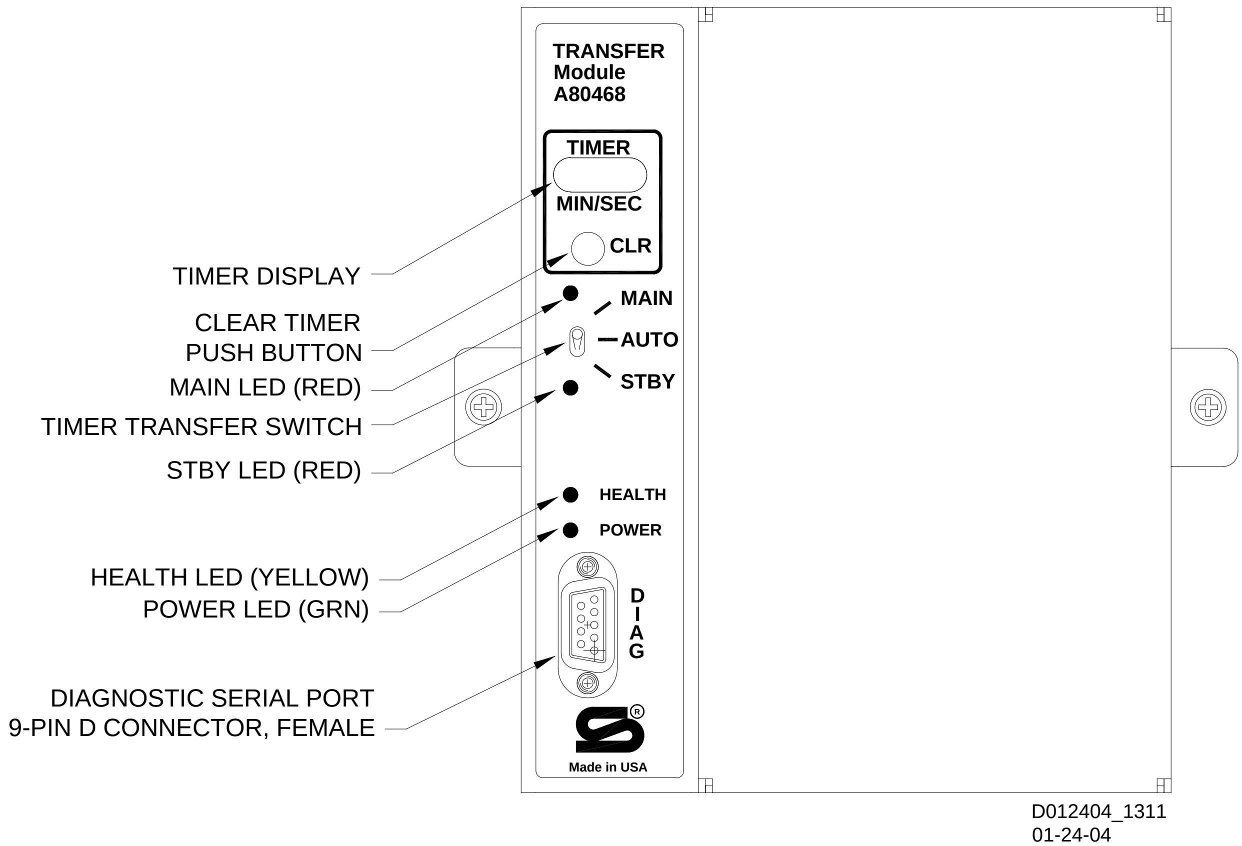


Figure 8-23:
Transfer Assembly, A80468 Front Panel

NOTE

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 8-17:
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

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.

8.8.2 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.

8.8.3 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 8-24 and Table 8-18).

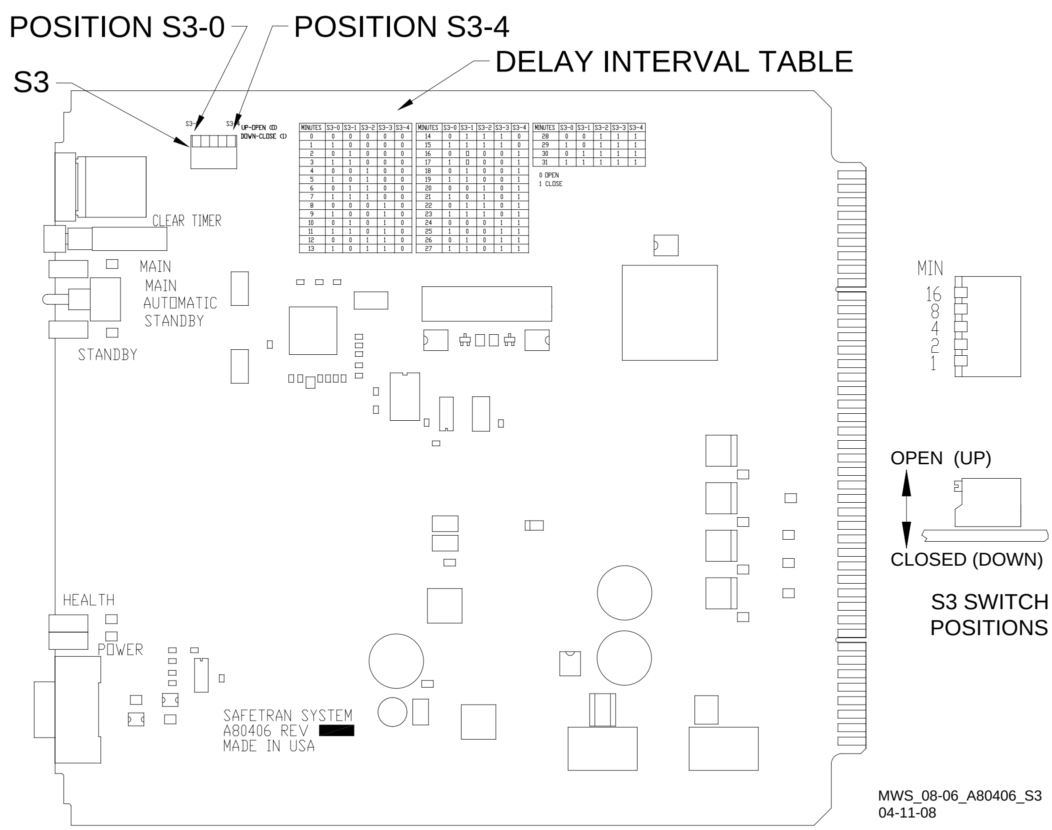
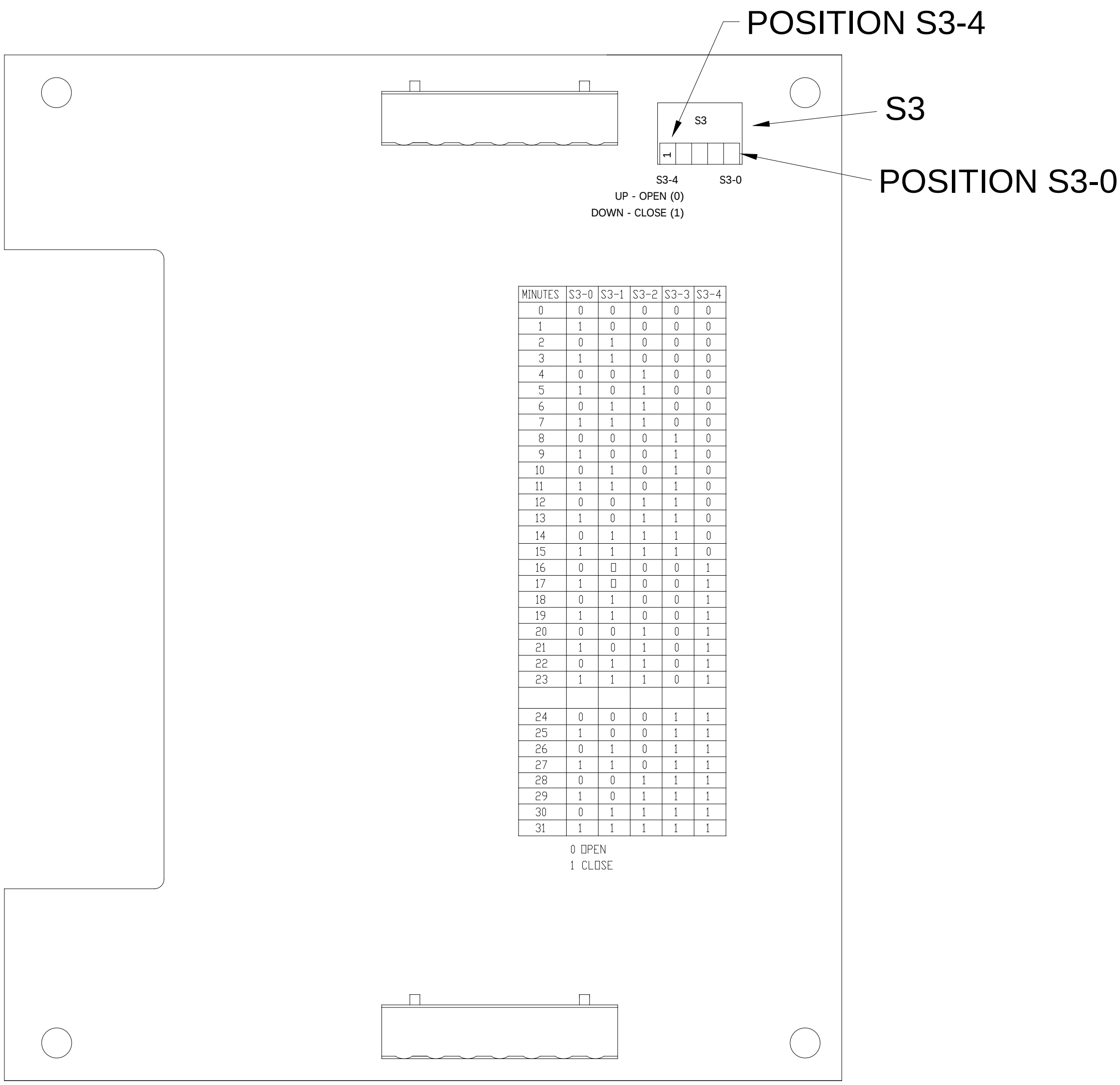


Figure 8-24:
Transfer Module, A80406, S3 Switch Positions

8.8.4 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 8-25.

- 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 Model 5000 GCP case.
- The switch levers of S3 are set to the positions designated in Table 8-18 to obtain the required delay time (see Figure 8-25).



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 CLOSE

MWS_08-06_A80468_S3
04-11-08

Figure 8-25:
Transfer Module Assembly, A80468, S3 Switch Position

**Table 8-18:
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

8.8.5 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 8-26).

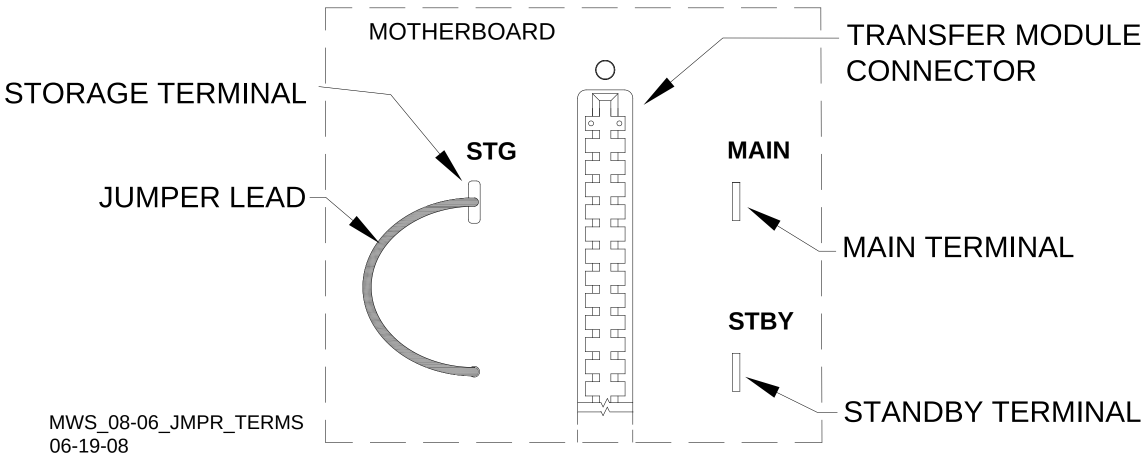
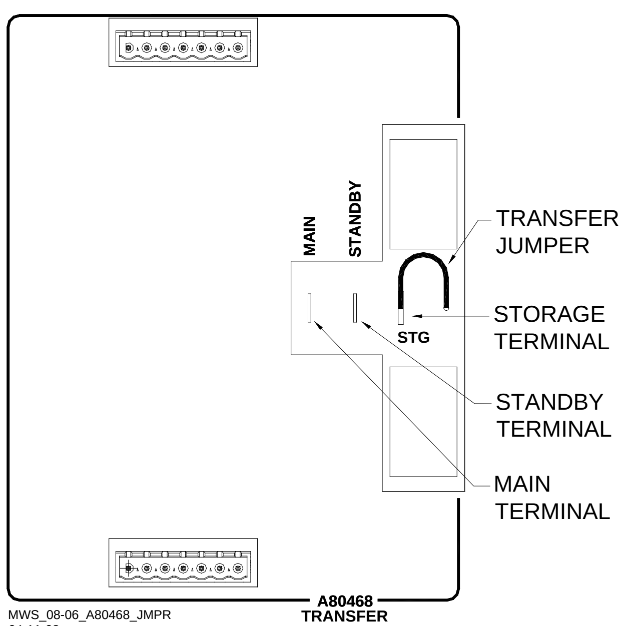


Figure 8-26:
Transfer Module (A80406) Jumper Positions

8.8.6 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 8-27).

Figure 8-27:



Transfer Module (A80468) Jumper Positions

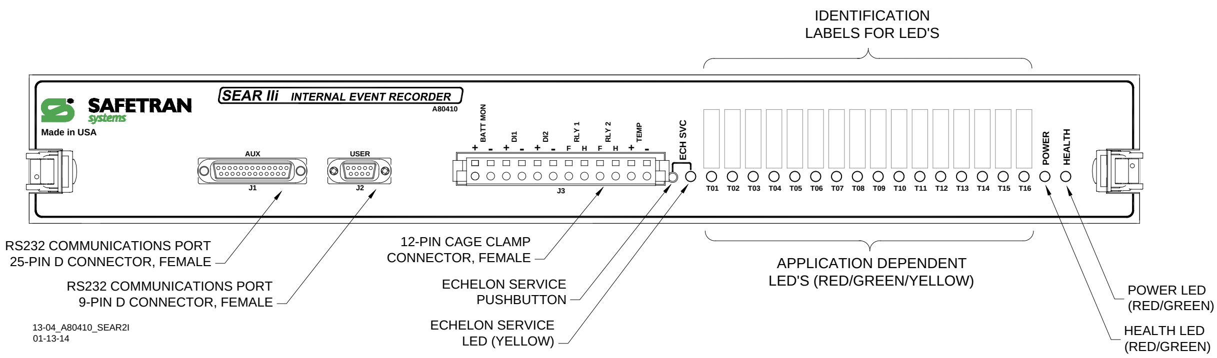
8.8.7 Siemens Event Analyzer Recorder IIi (SEAR2i), A80410

The Siemens Event Analyzer Recorder IIi (SEAR2i), A80410 provides continuous real-time status monitoring and event recording of the Model 5000 GCP and the grade crossing devices controlled by the GCP (see Model 5000 GCP Field Manual, SIG-00-13-03).

8.8.8 SEAR2i User Interface

The SEAR2i module front panel is shown in Figure 8-28. The user interface is described in Table 8-19.

Figure 8-28:



SEAR2i Front Panel

Table 8-19:
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)

8.8.9 A80435 External Configuration Device (ECD)

The ECD is a factory installed plug-in device on the Model 5000 GCP backplane (see Figure 8-29). The ECD stores the module configuration file (MCF) and the application program for the Model 5000 GCP. Both the Main and the Standby CPU Modules copy the MCF from the ECD, as it is used for vital system operation.

⚠ WARNING

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.

8.8.10 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 8-29). Each CIC stores site specific information for both Main and Standby vital operations.

⚠ WARNING

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.

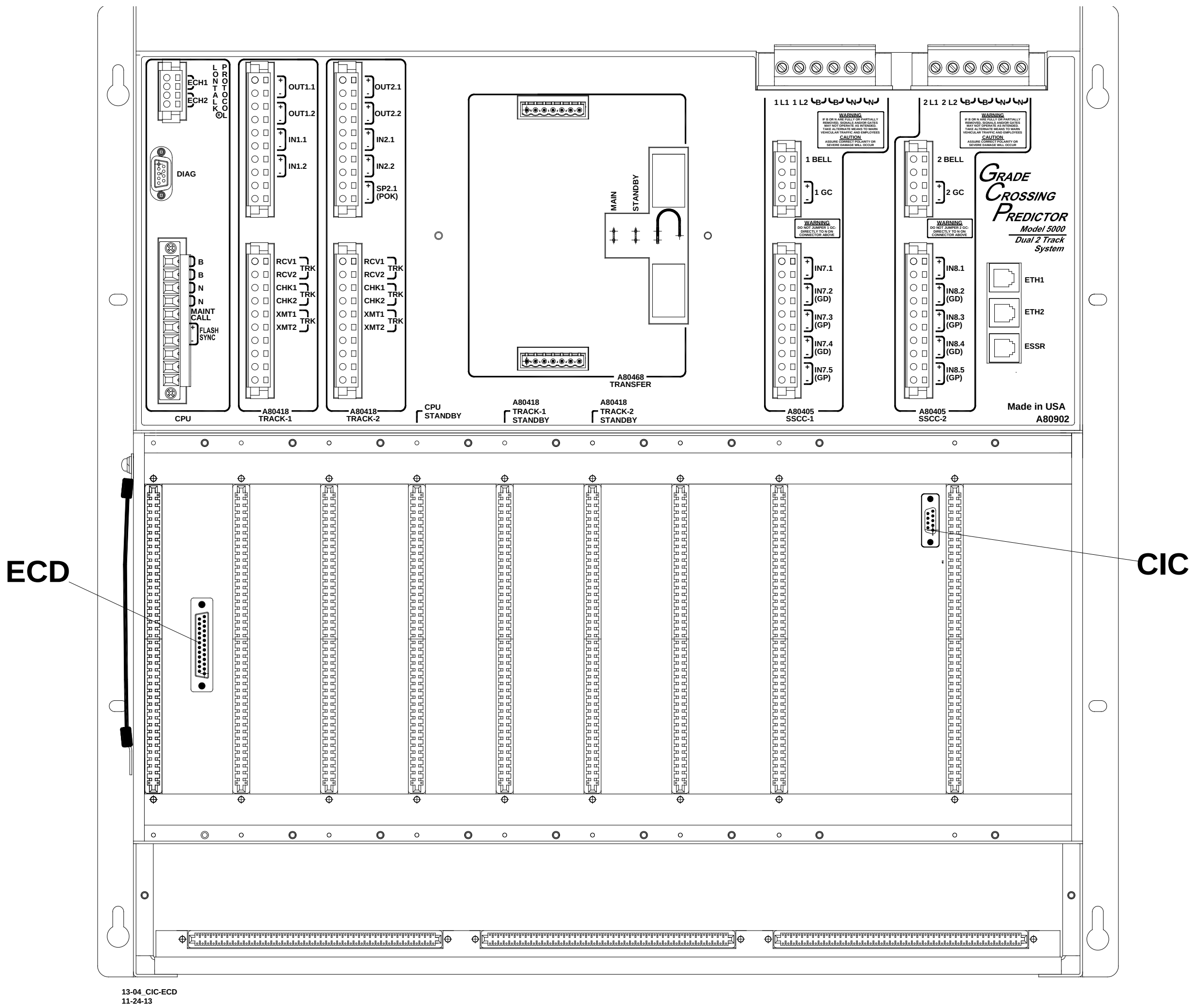
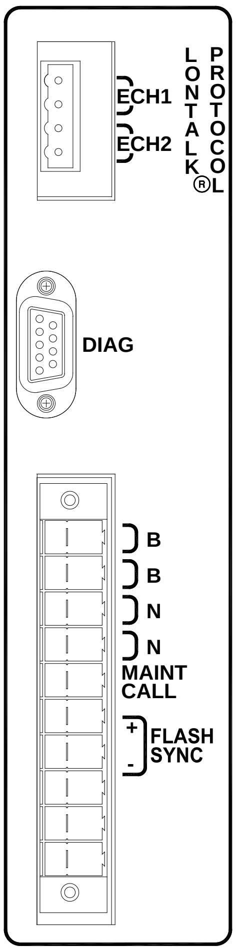


Figure 8-29:
Typical ECD & CIC Locations On Backplane

8.8.11 Interface Connector Functions

The Model 5000 GCP interface connector functions are described in tables 2-23 through 2-26.

8.8.11.1 CPU Connectors



CPU

R111804_0822
01-24-04

Table 8-20: 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

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 5000 and an external SSCC device. The GCP 5000 terms Master and Slave SSCC, are called "Flash Sync Out" and "Flash Sync In" respectively in an external SSCC (Slave = Flash Sync In).

8.8.11.2 Track Connectors

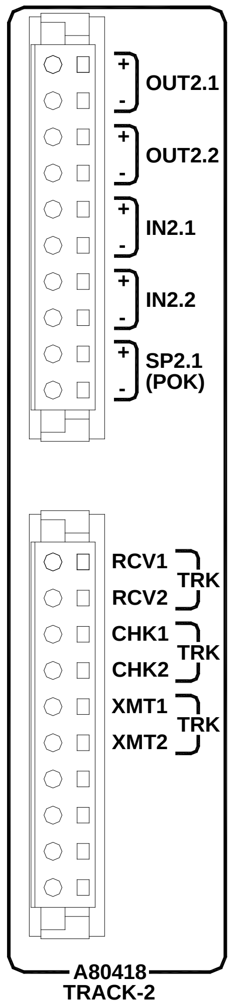


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Table 8-21:
Track Connectors

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 TRK RVC2		Receiver input from track
	TRK CHK1 TRK CHK2		Check input from track
	TRK XMT1 TRK XMT2		Transmit output to track

* See following Note

NOTE

NOTE

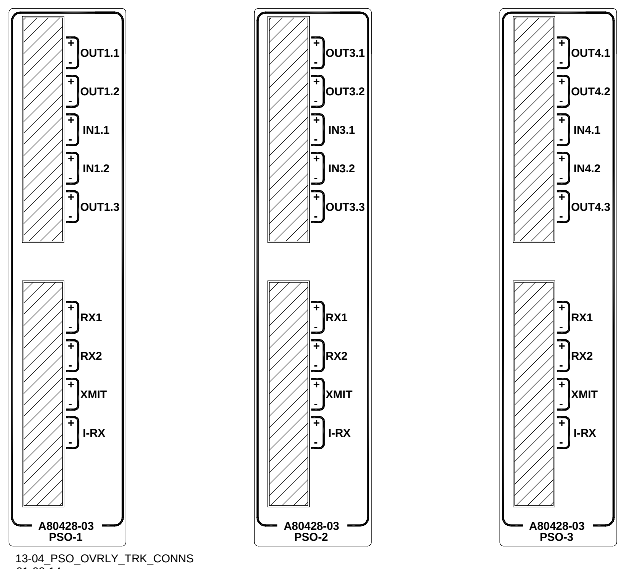
The digit preceding the decimal point in input and output connector labels indicates the track number; e.g., OUT2.1 designates vital output 1 of TRACK-2 connector.
On all multi-track chassis, a spare connection is provided on the top track connector for TRACK 2 and higher that is mapped to the SEAR2i; e.g., SP2.1 (POK) of TRACK-2 connector.

8.8.11.3 PSO Connectors

PSO Modules and their associated front panel connector groups provide an additional Vital I/O, OUT T.3. PSO Modules may also be substituted for Track 1, Track 3 and Track 4 Modules in single 5-track, dual 2-track, dual 3-track and dual 6-track chassis when needed. The track module slots must then be configured as PSO modules in the system programming.

The Model 5000 GCP software will automatically designate the PSO in the track 1 slot as PSO 1, the PSO in the track 3 slot as PSO 2 and the PSO in the track 4 slot as PSO 3. The PSO modules may be installed in any order. See Table 8-23 for connector pinouts.

If a PSO Module is installed in place of a Track Module, the corresponding PSO Mylar overlay should be affixed over the existing Track Module connector position to reflect proper connector nomenclature. Siemens has three Mylar overlays available for PSO connectors, as shown below with their Siemens part numbers.



Case Location:	Slot M1/PSO1	Slot M4/PSO2	Slot 5/PSO3
Nomenclature:	Overlay, PSO 1	Overlay, PSO 2	Overlay, PSO 3
Part Numbers:	Z610-39659-0001	Z610-39659-0002	Z610-39659-0003

Figure 8-30:
PSO Mylar Overlay Ordering Information

**Table 8-22:
PSO Connectors**

CONNECTOR		PINOUTS*			FUNCTION
		-01	-02	-03	
PSO1 PSO2 PSO3	+ -	OUT1.1	OUT3.1	OUT4.1	Vital output 1
	+ -	OUT1.2	OUT3.2	OUT4.2	Vital output 2
	+ -	IN1.1	IN3.1	IN4.1	Vital input 1
	+ -	IN1.2	IN3.2	IN4.2	Vital input 2
	+ -	OUT1.3	OUT3.3	OUT4.3	Vital output 3
	+ -	T1 RX1	T3 RX1	T4 RX1	Receiver 1 input from track
	+ -	T1 RX2	T3 RX2	T4 RX2	Receiver 2 input from track
	+ -	T1 XMIT	T3 XMIT	T4 XMIT	Transmit output to track
	+ -	T1 I-RX	T3 I-RX	T4 I-RX	Island receiver input from track

*** See following Note**

NOTE

NOTE

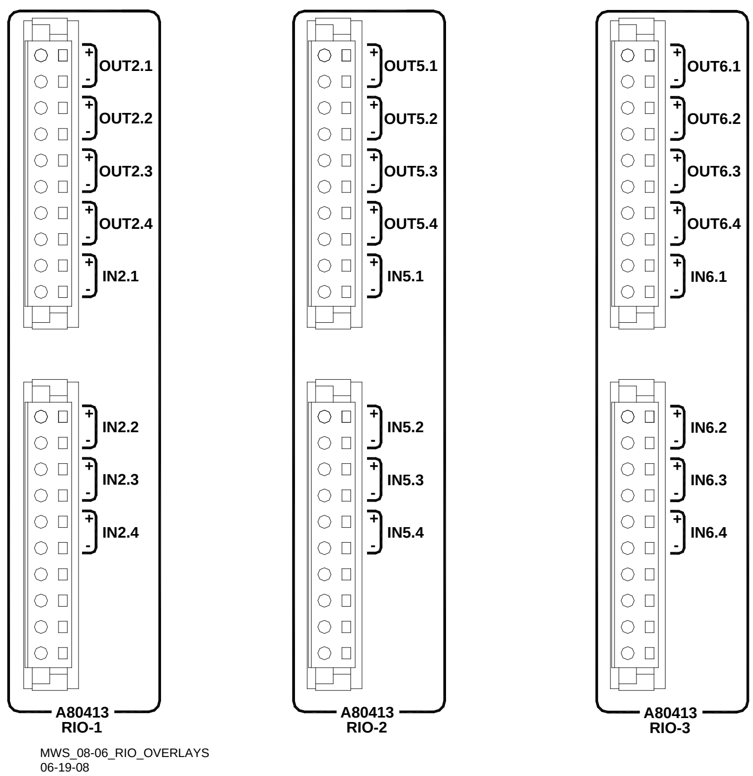
The digit preceding the decimal point in input and output connector labels indicates module slot number in chassis; e.g., OUT4.1 is associated with TRACK 4/PSO 3 in slot position M5.

8.8.11.4 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 Model 5000 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 8-23 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 Mylar overlays 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 8-31:
RIO Mylar Overlay Ordering Information

Table 8-23:
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**

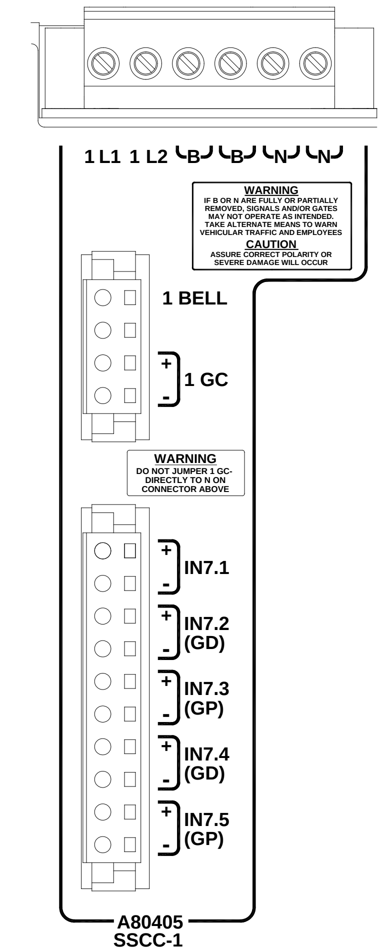
NOTE

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.

8.8.11.5 Crossing Controller Connectors

Table 8-24:
Crossing Controller Connectors



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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

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.

8.9 LAN COMMUNICATIONS

Each Model 5000 GCP may communicate with other Siemens equipment via LONTALK® LAN (Echelon®) For further information, see Siemens's Echelon Configuration Handbook, COM-00-07-09.

8.9.1 ATCS Vital Protocol

Vital ATCS serial protocol data may be incorporated with the Ethernet or the LONTALK® protocol to facilitate:

- Crossing control functions
- Remote prediction operations via Ethernet Spread Spectrum Radio (ESSR)
- Vital communications with other Siemens vital controllers

⚠ CAUTION

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

NOTE

For additional information concerning the Echelon® LAN, contact Siemens Technical Support.

SECTION 9 – I/O FUNCTIONS AND ASSIGNMENTS

9.1 OUTPUT FUNCTIONS AND PHYSICAL OUTPUT ASSIGNMENTS

Model 5000 GCP Track and RIO module physical outputs are user programmable, but not dedicated to specific output terminals on the Model 5000 GCP chassis

9.1.1 Output Requirements Due To Module Integration

Because the Track, Crossing Controller and SEAR Modules are integrated into the Model 5000 GCP case like those of the Model 4000 GCP case, some of the outputs previously used in the 3000 GCP are not required by the Model 5000 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 Enabling 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, **2) DAX A Used** must be enabled (set to **Yes**) using **Program View > 3) GCP Programming > 2) GCP and Island Programming >1) Trk1: GCP and Island > 3) Predictors 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 5000 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

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
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)

<table>
<tr><th>OUTPUT FUNCTION NAME</th><th>CONDITION FOR OUTPUT TO BE AVAILABLE</th><th>FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)</th><th>DESCRIPTION</th></tr>
<tr><td rowspan="2">Aux-2 Lmp Control</td><td>SSCC 2 Slot SSCC3i</td><td>BASIC: module configuration</td><td rowspan="2">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</td></tr>
<tr><td>Aux-2 Xng Ctrl Used Yes</td><td>SSCC: 2</td></tr>
<tr><td rowspan="2">Aux-1 Xng Control</td><td>SSCC 1 Slot SSCC3i</td><td>BASIC: module configuration</td><td rowspan="2">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</td></tr>
<tr><td>Aux-1 Xng Ctrl Used Yes</td><td>SSCC: 1</td></tr>
<tr><td rowspan="2">Aux-2 Xng Control</td><td>SSCC 2 Slot SSCC3i</td><td>BASIC: module configuration</td><td rowspan="2">The Aux-2 Xng Control output is used to activate an external crossing controller or Model 5000 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</td></tr>
<tr><td>Aux-2 Xng Ctrl Used Yes</td><td>SSCC: 2</td></tr>
</table>

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 T1 DAX E T1 DAX F T1 DAX G	As depicted in T1 DAX C above	As depicted in T1 DAX C above	As depicted in T1 DAX C above

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**	BASIC: preemption (TEMPLATE: preemption)	
	Adv Preempt IP 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 5000 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 5000 GCP Physical Outputs (Concluded)

OUTPUT NAME	CONDITION FOR OUTPUT TO BE AVAILABLE	FOUND IN MAIN PROGRAM MENU (TEMPLATE MENU)	DESCRIPTION
OUT 2.1 OUT 2.2 OUT 2.3 OUT 2.4	Track 2/RIO 1 Slot **RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from RIO 1
OUT 5.1 OUT 5.2 OUT 5.3 OUT 5.4	Track 5/RIO 2 Slot **RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from RIO 2
OUT 6.1 OUT 6.2 OUT 6.3 OUT 6.4	Track 6/RIO 3 Slot **RIO**	BASIC: module configuration (TEMPLATE: module configuration)	Vital outputs from RIO 3
Out GC 1	SSCC 1 Slot SSCC3i Gates Used Yes	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.
Out GC 2	SSCC 2 Slot SSCC3i Gates Used Yes	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.

9.2 INPUT FUNCTIONS AND PHYSICAL INPUT ASSIGNMENTS

Model 5000 GCP Track, RIO module, and Crossing Controller physical inputs are user programmable and are not dedicated to specific input terminals on the Model 5000 GCP chassis.

9.2.1 Input Requirements Due To Module Integration

Because the Track, Crossing Controller and SEAR Modules are integrated into the Model 5000 GCP case some inputs previously used by the 3000 GCP are not required by the Model 5000 GCP System.

9.2.2 Enabling 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 5000 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

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

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 5000 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 5000 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**	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 Outputs Used **Yes**		
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 5000 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 5000 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 5000 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	As depicted in T1 DAX A Enable above	As depicted in T1 DAX A Enable above	As depicted in T1 DAX A Enable above
T1 DAX C 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 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 5000 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 5000 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 5000 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			

APPENDIX A – 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 16:	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 Model 5000 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 all vital configuration data, less the timer settings regarding Lamp Tests and Out of Service (OOS). These timer parameters are set by Field Service personnel for each individual occurrence where it is desired to test the Lamps or to take the track OOS. Thus they have no bearing on the CCN.
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 Model 5000 GCP.
CRC:	Cyclical Redundancy Check - Used to determine that data has not been corrupted.
CRTU:	Cellular Remote Telemetry Unit
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.
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.
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.
Drop Delay	An internal delay time between when a function is ordered off and when it actually de-energizes.
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 Model 5000 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.
FCN	Field Check Number – The FCN is computed whenever any track's TCN or PCN is changed, as well as when any Lamp Voltage is changed. This allows Field Service personnel to verify no changes have been made to the system since the last recorded changes were made.
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.
Approach (2)	GCP Approach length calibration into a hardwire shunt located at the termination shunt.
GCP CAL:	GCP Calibration into a termination shunt.
Linearization (2)	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
Island:	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.

MTF	Master Template File – The template selected for a specific application
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.
NVCCN	Non-Vital Configuration Check Number – The 32-bit CRC of the Non-Vital configuration data. This number refers to settings on the Display as well as those of the SEAR IIi.
NVRAM	Non-Volatile Random Access Memory
OCCN:	Office Configuration Check Number – The 32 bit CRC of the vital configuration data, excluding Field Check Number, Lamp Voltage Timer and OOS Timeout timer settings This number is established when the planner creates the approved site drawing with all non-field programmable parameters pre-determined. This number is listed on the plan, and is used to verify that the settings have been properly entered into the GCP prior to the field programmable settings being entered.
OCE:	Office Configuration Editor – The PC version of the DT that can be used to create configuration package files (Pac files) for the Model 5000 GCP 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 MODEL 5000 GCP configuration Package File that can either be created in the office using the OCE, or downloaded from a MODEL 5000 GCP system via the CP.
PCB	Printed Circuit Board
PCN	PSO Check Number (PCN) – The PCN is computed each time the PSO is calibrated. To ensure that the computed PCN is unique, the date and time of the most recent calibration as a part of the PCN, allowing Field Service personnel to verify the status of the PSO is unchanged since last calibration.
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 Siemens’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.
RJ-45	Industry standard Ethernet port
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.
SEAR IIi Application Program:	Programming for SEAR IIi 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) – The TCN is computed each time the track is calibrated. To ensure that the computed TCN is unique, the date and time of the most recent calibration as a part of the TCN, allowing Field Service personnel to verify the status of the track is unchanged since last calibration.

Template	A patented Siemens programming application that provides the simplified programming menus and the programming defaults for a typical track arrangement and application. Each Template: • predefines default programming parameters for the train detection feature of the Model 5000 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
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.
WAMS:	Wayside Alarm Management System – An office based application that communicates with and receives data from specially equipped crossings.
WCM:	Wayside Control Module – The Siemens 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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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

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

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

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.

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

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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 5000 Grade Crossing Predictor (GCP). All multi-track Model 5000 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

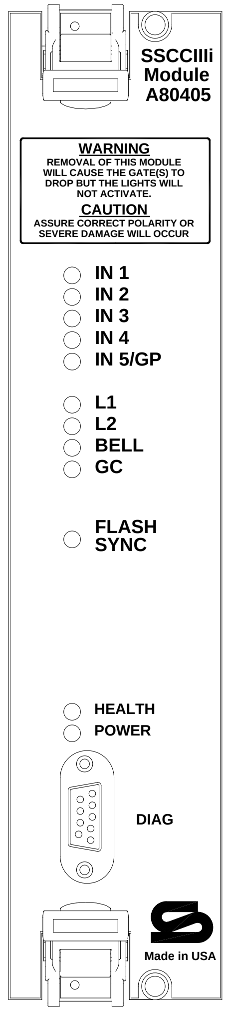

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Figure C-1:
A80405 Solid-State Crossing Controller IIIi

The SSCCIIIi modules are integrated into the Model 5000 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 Model 5000 GCP. It is activated by internal logic from the Model 5000 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 Model 5000 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.

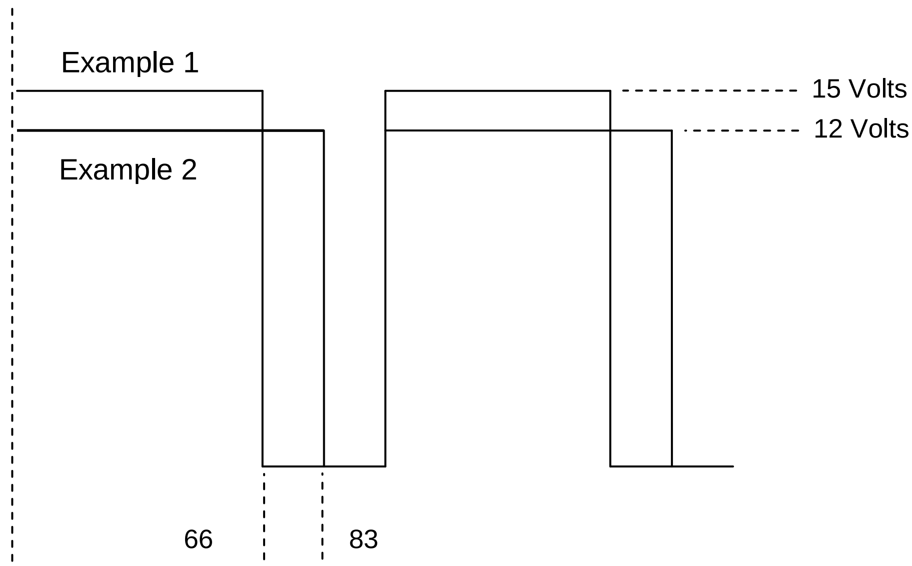


Figure C-2:
Pulse Width Modulation - Examples

NOTE

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 Model 5000 GCP front panel.

- Using poly-jacketed #10 AWG wire (recommended) for DC power and return between battery surge protection and the Model 5000 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

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.

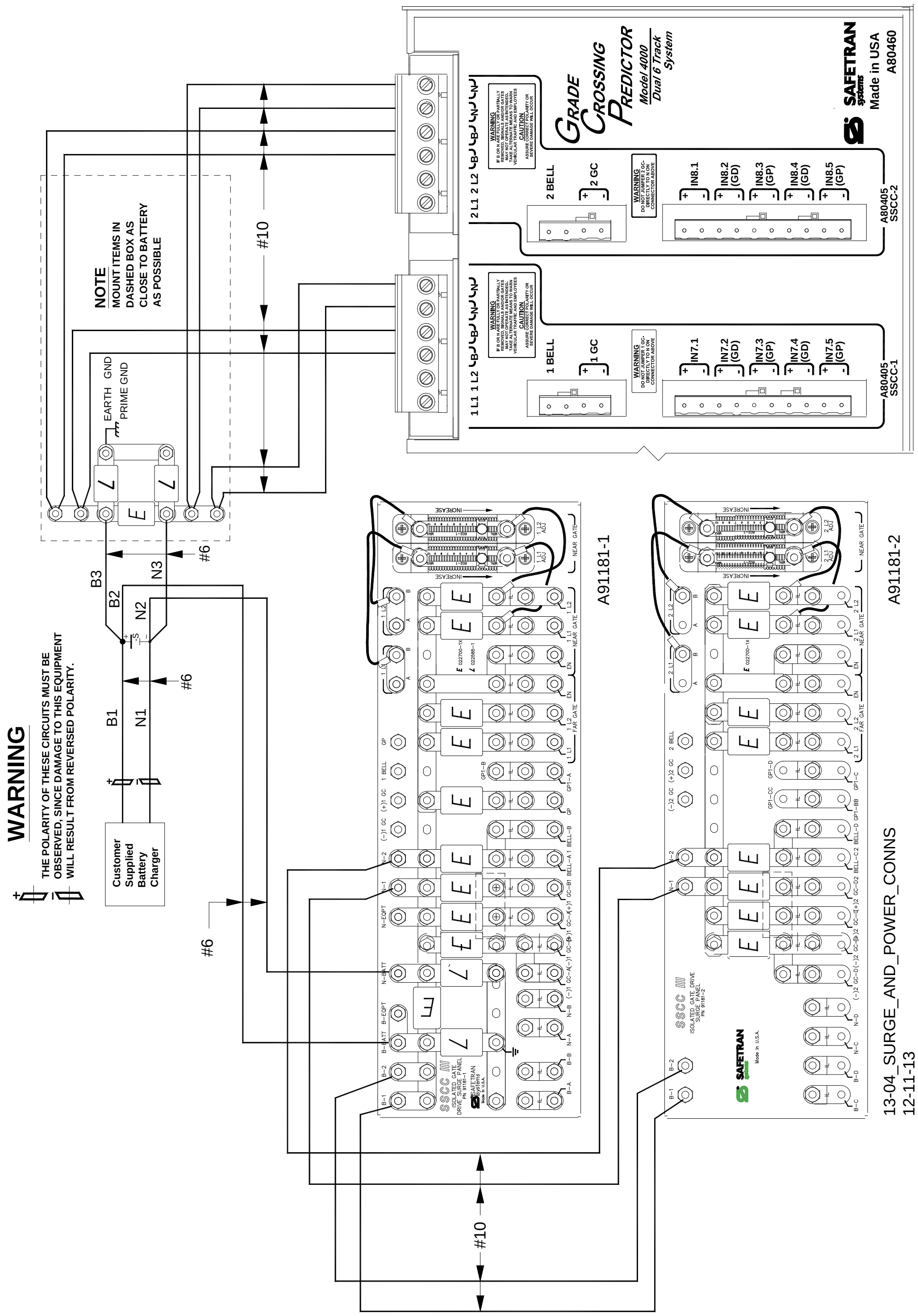


Figure C-3:
Surge & Power Connections to
SSCC Modules & Lighting Surge Panels

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)

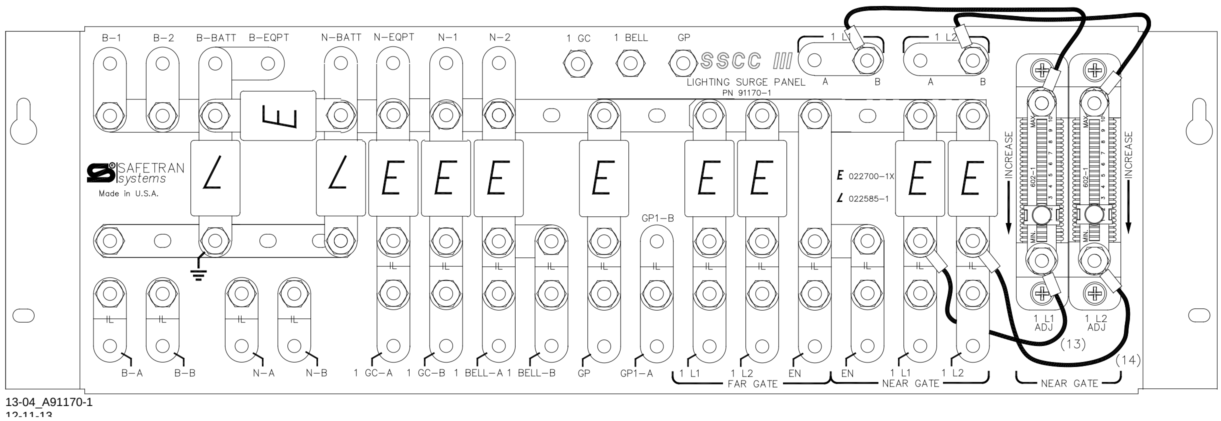
For common return gate control, a single A91170-1 panel (Figure C-4A) is used for up to 20-ampere operation and both an A91170-1 and an A91170-2 panel (Figure C-4B) are generally used for 21 to 40-ampere operation. Refer to Figure C-5A for typical common return gate control wiring.

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	**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.**

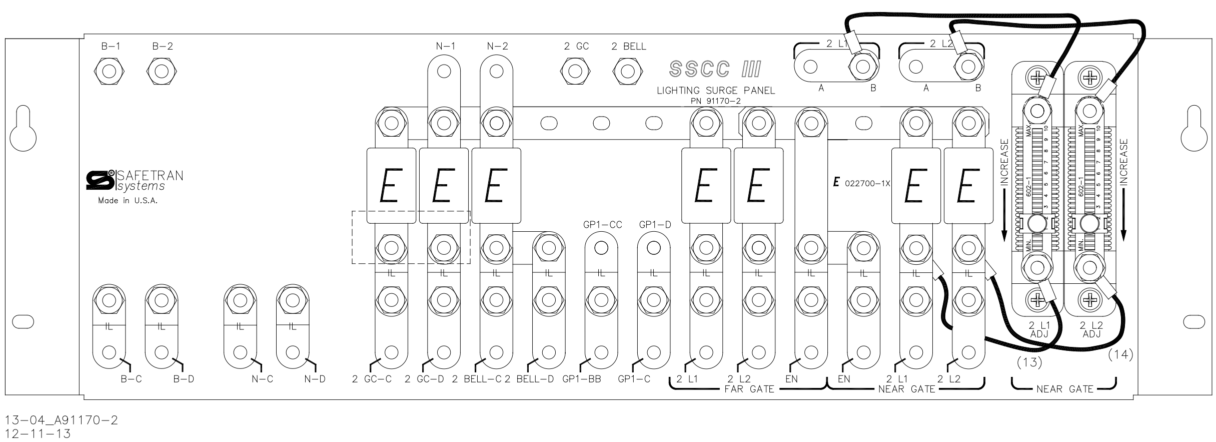
NOTE	**NOTE** For information on the selection and installation of the 91170-1 and 91181-1 SSCC III Lighting Surge Panels, refer to Section 9, Auxiliary Equipment.

A



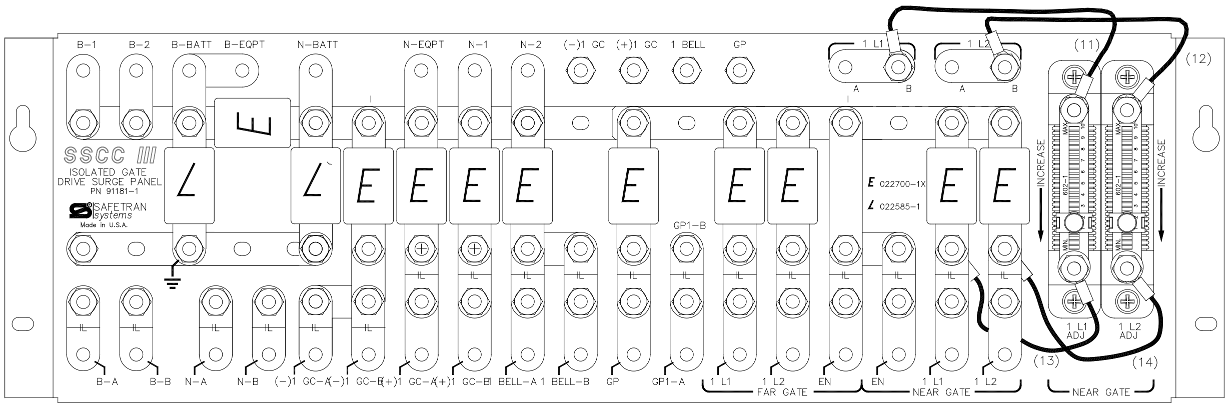
A91170-1

B



A91170-2

Figure C-4:
Common Return Lighting Surge Panels, A91170-1 & A91170-2



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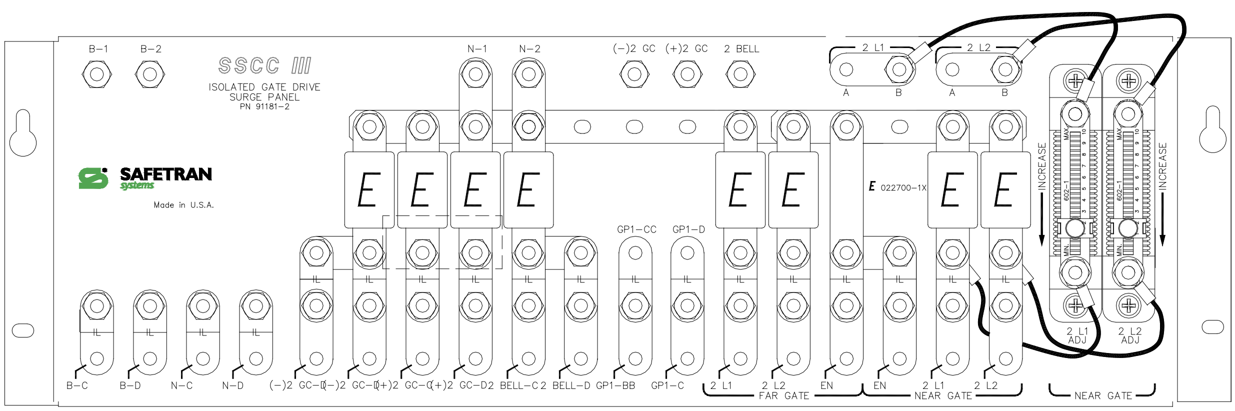
A
A91181-1



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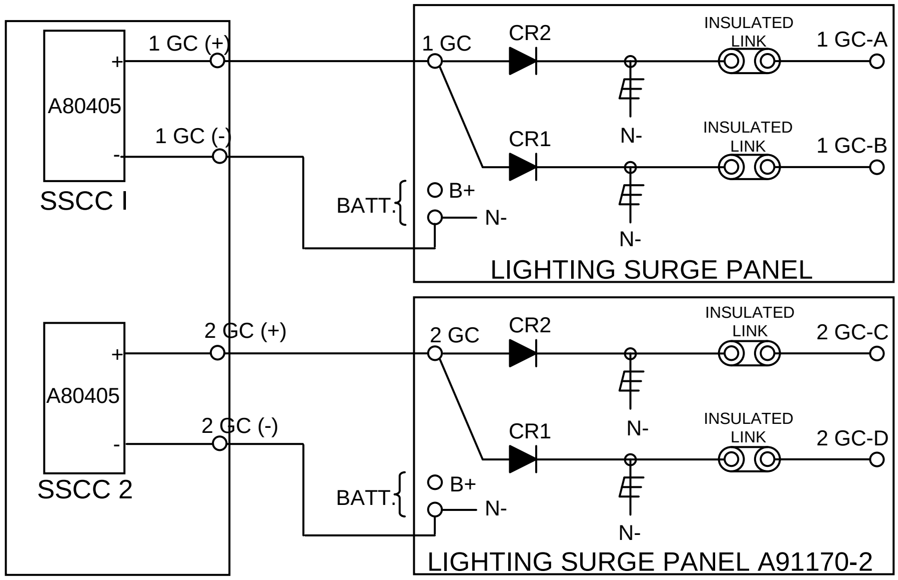
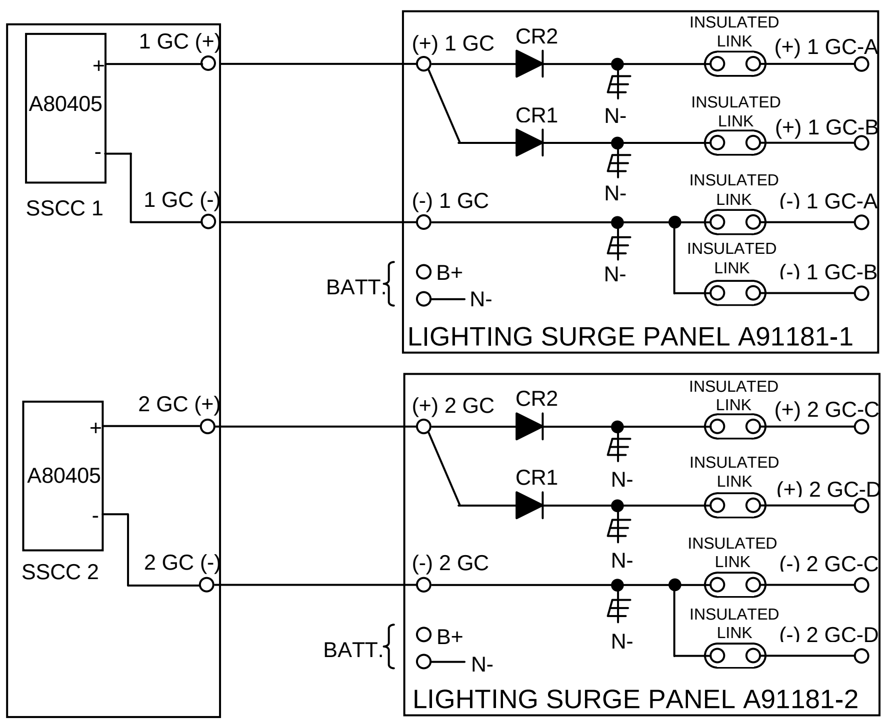
B
A91181-2

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

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.

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 Model 5000 GCP as shown in Figure C-7. Crossing Controller lamp and bell circuit wiring includes:

- Installation of wiring between the Model 5000 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

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

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.

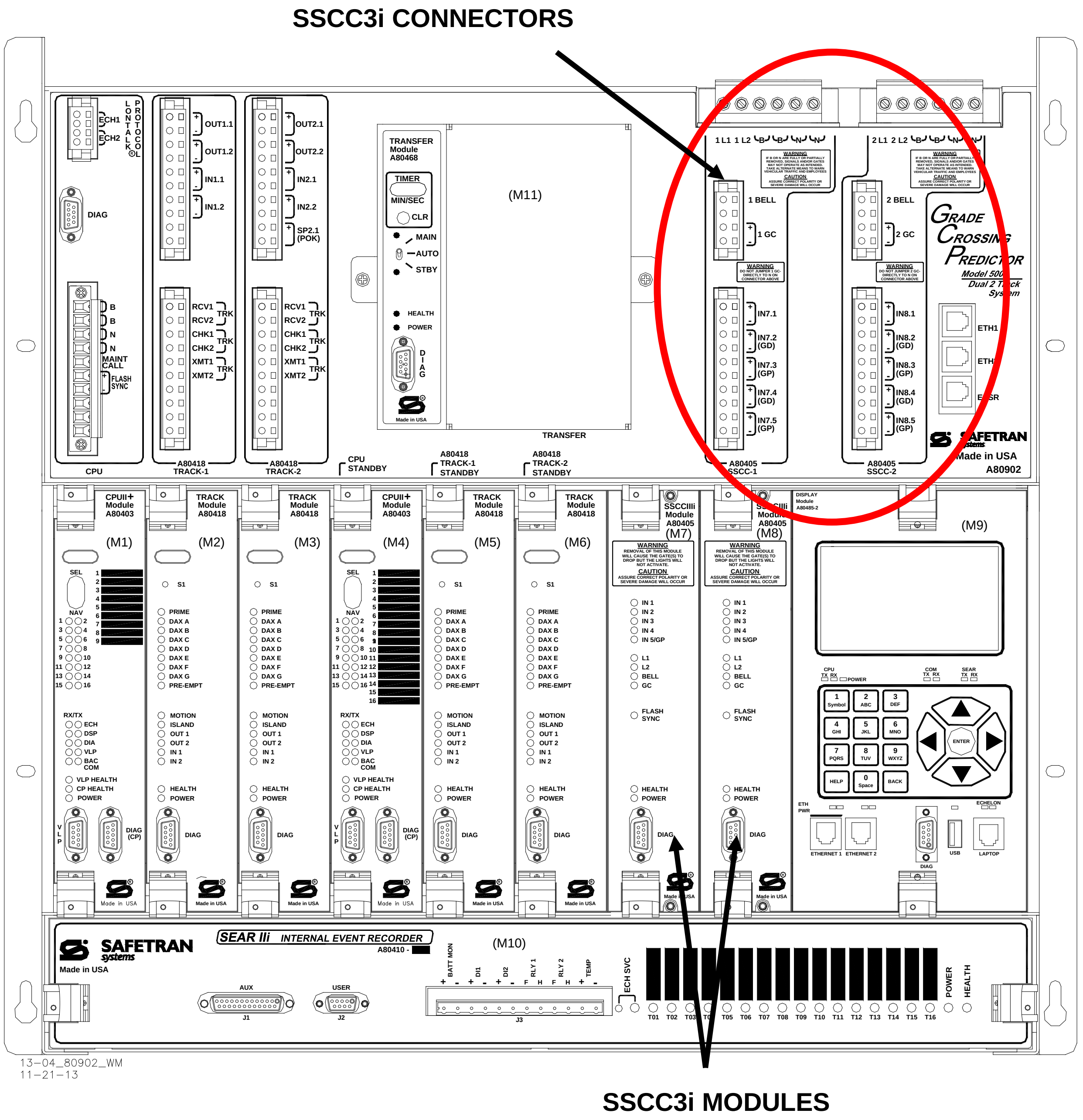


Figure C-7:
Model 5000 GCP Crossing Controller Module and Connector Locations

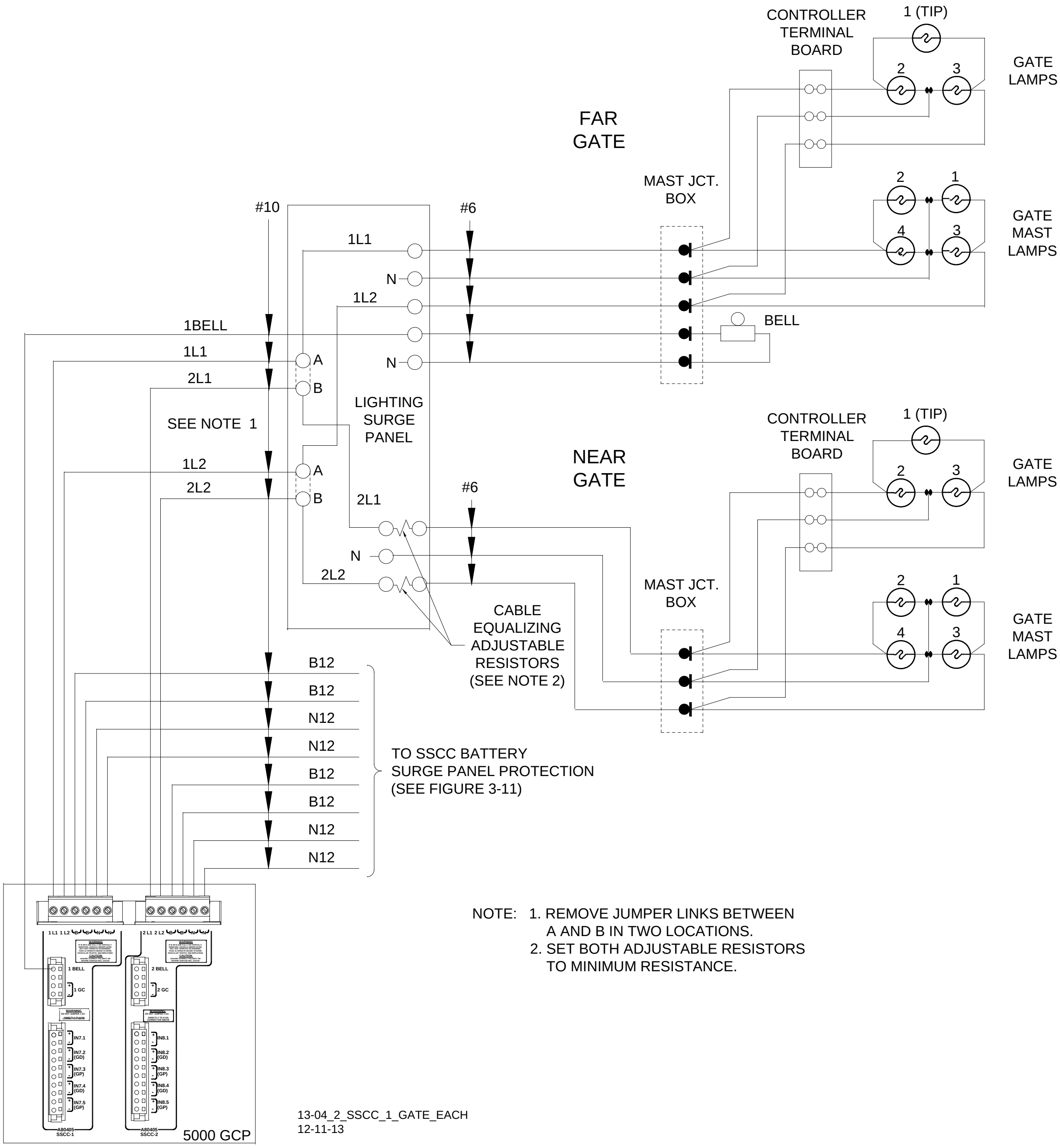


Figure C-8:
Two Crossing Controller Modules Controlling One Gate Each

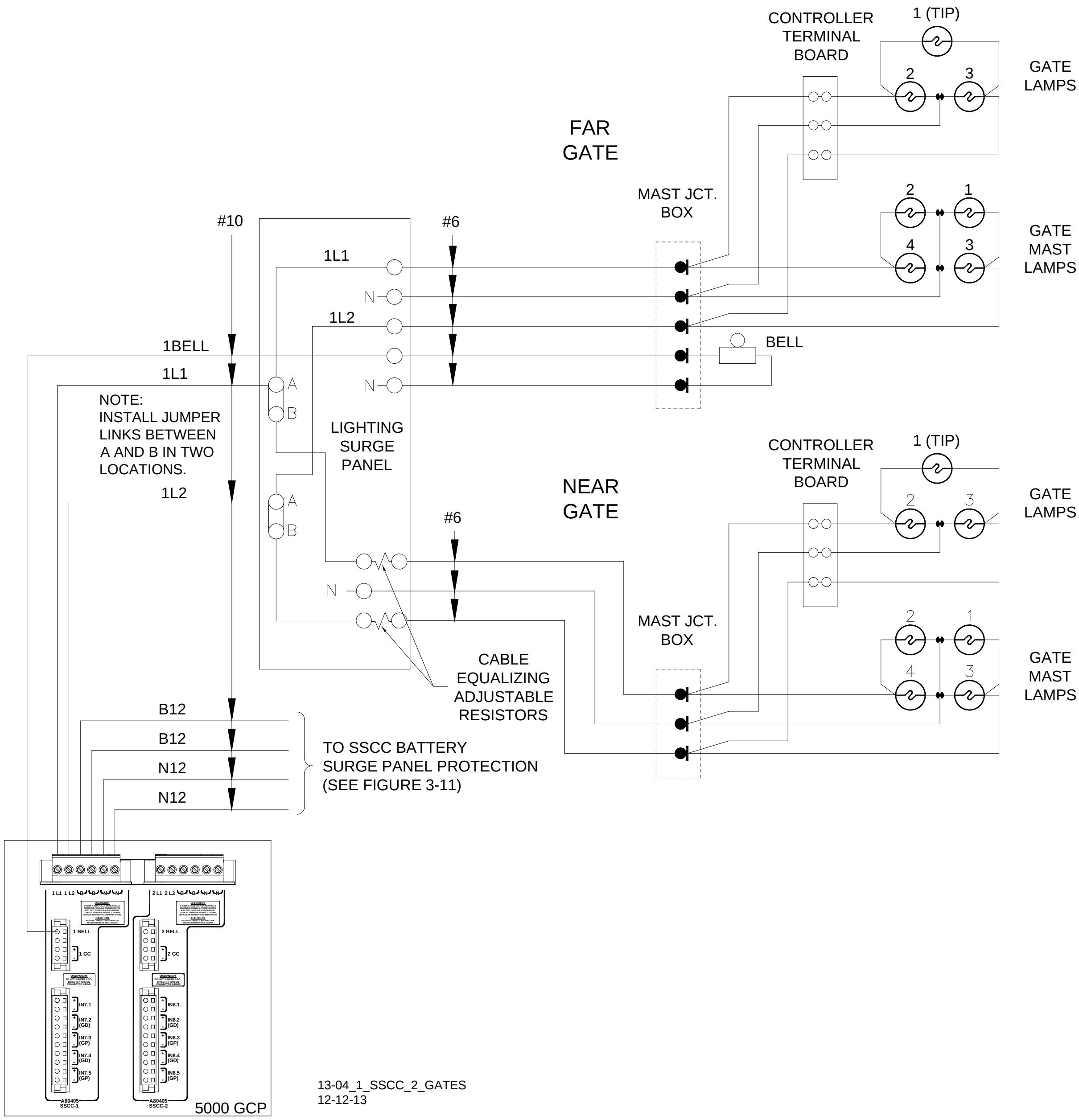


Figure C-9:
One Crossing Controller Module Controlling Two Gates

C.5.2 Crossing Controller Connectors

The Model 5000 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-1. The use of stranded wire is recommended

Table C-1:
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

> **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 5000 GCP FIELD MANUAL, SIG-00-13-03.

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 5000 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 Model 5000 GCP.

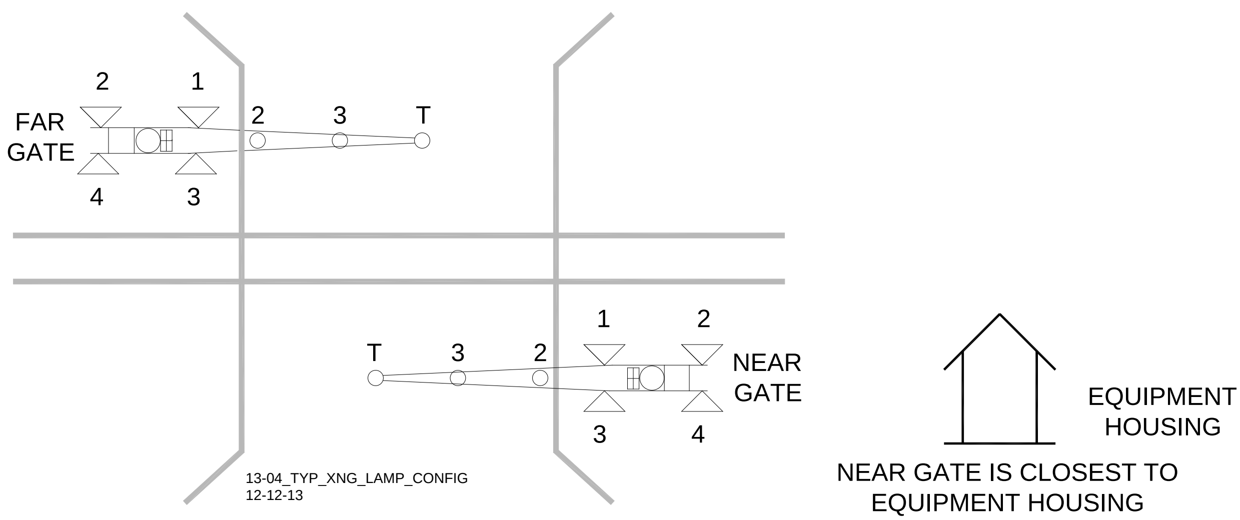


Figure C-10:
Typical Crossing Lamp Configuration

NOTE

> **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-2.

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

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-2.
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-2:
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 Model 5000 GCP.

Poly-jacketed 6AWG wire is recommended for DC power and return between the lighting surge panel and the crossing battery.

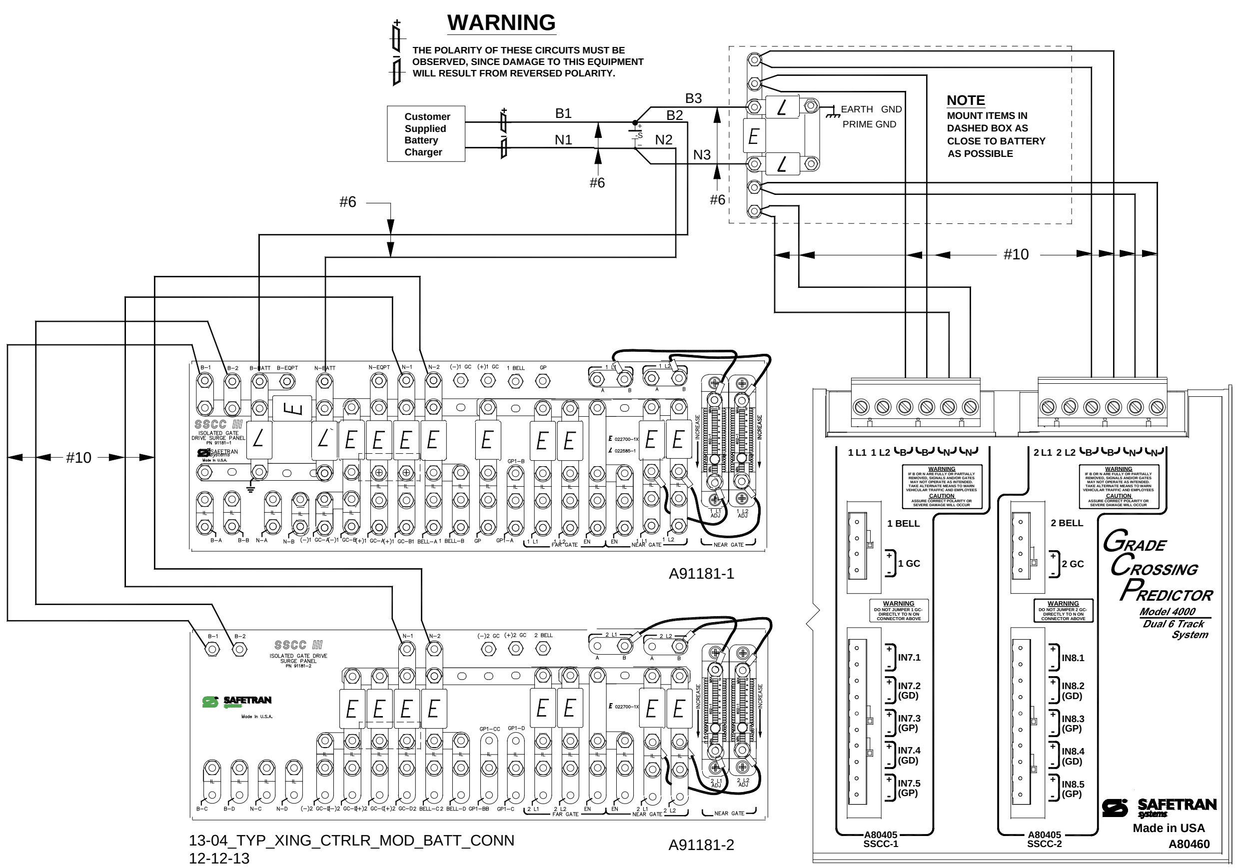


Figure C-11:
Typical Crossing Controller Module Battery Connections

CAUTION

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

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 5000 and an external SSCC device. The GCP 5000 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 5000 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

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 C.11.4.9).
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 Model 5000 GCP SSCC3i module(s).

⚠ WARNING

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 MODEL 5000 GCP.**

TAKE ADEQUATE PRECAUTIONS TO WARN ANY PEDESTRIANS, PERSONNEL, TRAINS, AND VEHICLES IN THE AREA UNTIL PROPER SYSTEM OPERATION IS VERIFIED.

⚠ CAUTION

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

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 or similar) 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-3:
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)	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-3 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-3 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 5000 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 5000 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 5000 GCP battery to provide lamp, gate, and bell drive.

⚠ CAUTION

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

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**

For information regarding SSCC default parameter value, refer to Appendix A.

- 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 5000 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 5000 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

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 Appendix A.:

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 **I/O: Input Slot SSCC 1** and **I/O: Input Slot SSCC 2** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >4) I/O: INPUT SLOT SSCC 1 or 5) I/O: INPUT SLOT SSCC2] screens.

- 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-4. The default settings are as follows:

- SSCC 1 Default: **1**
- SSCC 2 Default: **0**

Table C-4: 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-5.

- 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-5:
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

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 5000 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

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,

- On the **SSCC Configuration [**5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION] screen, set the default values. Ensure **GP Coupled** is set to **Yes**. 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 default values shown for the SSCC 1 Configuration and SSCC 2 Configuration [5) SSCC PROGRAMMING > 3) SSCC 1 CONFIGURATION or 4) SSCC 2 CONFIGURATION] screens.
- Set the inputs to the crossing controllers default values for the **I/O: Input Slot SSCC 1** and **I/O: Input Slot SSCC 2** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >4) I/O: INPUT SLOT SSCC 1 or 5) I/O: INPUT SLOT SSCC2] screens.

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):

- On the **SSCC Configuration [**5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION] screen, set the default values. Ensure **GP Coupled** is set to **Yes**. This causes the lamps on both crossing controllers to flash if the GP input goes low. The two GP inputs are automatically combined internally, which allows the SEAR to independently monitor each gate position input
- Set the parameters for each crossing controller to the default values shown for the SSCC 1 Configuration and SSCC 2 Configuration [5) SSCC PROGRAMMING > 3) SSCC 1 CONFIGURATION or 4) SSCC 2 CONFIGURATION] screens.
- Set the inputs to the **I/O: Input Slot SSCC 1** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >4) I/O: INPUT SLOT SSCC 1] as follows:
  - Set IN 7.1 to Not Used
  - Set IN 7.2 to GD 1.2
  - Set IN 7.3 to GP 1.2
  - Set IN 7.4 to GD 1.1
  - Set IN 7.5 to GP 1.1

C.11.5.3 Example 3 - Crossing Configured for Two GP Inputs (One GP Input To Each SSCC Module)

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:

- On the **SSCC Configuration [**5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION] screen, set the default values. Ensure **GP Coupled** is set to **Yes**. This causes the lamps on both crossing controllers to flash if the 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 to the default values shown for the SSCC 1 Configuration and SSCC 2 Configuration [5) SSCC PROGRAMMING > 3) SSCC 1 CONFIGURATION or 4) SSCC 2 CONFIGURATION] screens.
- Set the inputs to the **I/O: Input Slot SSCC 1** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >4) I/O: INPUT SLOT SSCC 1] as follows:
- Set IN 7.1 to Not Used
- Set IN 7.2 to GD 1.2
- Set IN 7.3 to Not Used
- Set IN 7.4 to GD 1.1
- Set IN 7.5 to GP 1.1
- Set the inputs to the **I/O: Input Slot SSCC 2** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >5) I/O: INPUT SLOT SSCC 2] as follows:
- Set IN 8.1 to Not Used
- Set IN 8.2 to Not Used
- Set IN 8.3 to Not Used
- Set IN 8.4 to Not Used
- Set IN 8.5 to GP 2.1

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:

- On the **SSCC Configuration [**5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION] screen, Set **SSCC1+2 GPs Coupled** to **No**
  - 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 to the default values shown for the SSCC 1 Configuration and SSCC 2 Configuration [5) SSCC PROGRAMMING > 3) SSCC 1 CONFIGURATION or 4) SSCC 2 CONFIGURATION] screens.
- Set the inputs to the **I/O: Input Slot SSCC 1** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >4) I/O: INPUT SLOT SSCC 1] as follows:
  - Set IN 7.1 to Not Used
  - Set IN 7.2 to GD 1.2
  - Set IN 7.3 Not Used
  - Set IN 7.4 to GD 1.1
  - Set IN 7.5 to GP 1.1
- Set the inputs to the **I/O: Input Slot SSCC 2** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >5) I/O: INPUT SLOT SSCC 2] as follows:
  - Set IN 8.1 to Not Used
  - Set IN 8.2 to Not Used
  - Set IN 8.3 to Not Used
  - Set IN 8.4 to Not Used

- Set IN 8.5 to GP 2.1

C.11.5.5 Example 5 - Crossing Configured for Flashers Only Using One SSCC Module

The crossing controllers may be configured to only operate the crossing flashers. To configure the crossing controllers for this function:

- On the **Module Selection** screen [1) BASIC CONFIGURATION > 2) MODULE SELECTION]:
  - Set SSCC-2 Slot to **Not Used**
- On the **SSCC Configuration [**5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION] screen:
  - Set +Gates Used to No
- On the **SSCC 1 Configuration** [5) SSCC PROGRAMMING > 3) SSCC 1 CONFIGURATION] screens:
  - Set all IN 7.X to **Not Used**

C.12 EXTERNAL CROSSING CONTROLLERS

An external crossing controller may be used with the Model 5000 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 5000 GCP must be mapped to an external output e.g., **OUT 1.1**..

- 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 C.6, EXTERNAL CROSSING CONTROLLERS, of this manual.

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:

- On the **SSCC 1 Extended Parameters** screen [5) SSCC PROGRAMMING > 3) SSCC 1 CONFIGURATION > 1) SSCC 1 EXTENDED PARAMETERS]:
  - Set Aux-(1) Xng Ctrl Used to **Yes**
  - Set Aux-(1) Xng Ctrl Hlth IP to **Yes**

Map **Aux-1 Lmp Control** to an output as detailed below. Connect this output to the appropriate gate position input of the external crossing controller.

- Set the inputs to the **I/O: Output Slot SSCC 1** [6) INPUT/OUTPUT ASSIGNMENTS > 1) OUTPUT ASSIGNMENTS >1) I/O: OUTPUT SLOT 1-2] as follows:
  - Set OUT 1.1 to **Aux-1 Lmp Control**

Set an input as **Aux-1 Xng Ctrl Hlth** as detailed below. Connect this input to the gate output of the external SSCC.

- Set the inputs to the **I/O: Input Slot SSCC 1** [6) INPUT/OUTPUT ASSIGNMENTS > 2) INPUT ASSIGNMENTS >4) I/O: INPUT SLOT SSCC 1] as follows:
  - Set IN 7.1 to **Not Used**
  - Set IN 7.2 to **GD 1.2**
  - Set IN 7.3 **Aux-1 Xng Ctrl Hlth**
  - Set IN 7.4 to **GD 1.1**
  - Set IN 7.5 to **GP 1.1**

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 5.11 of this manual.

NOTE

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 5000 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 5000 GCP

The Model 5000 GCP is programmed as follows:

- On the **SSCC Configuration [**5) SSCC PROGRAMMING > 1) SSCC CONFIGURATION] screen:
  - Set +SSCCIV Controller Used to **Yes**

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.

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 5000 GCP 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 5000 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-12:

- 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".

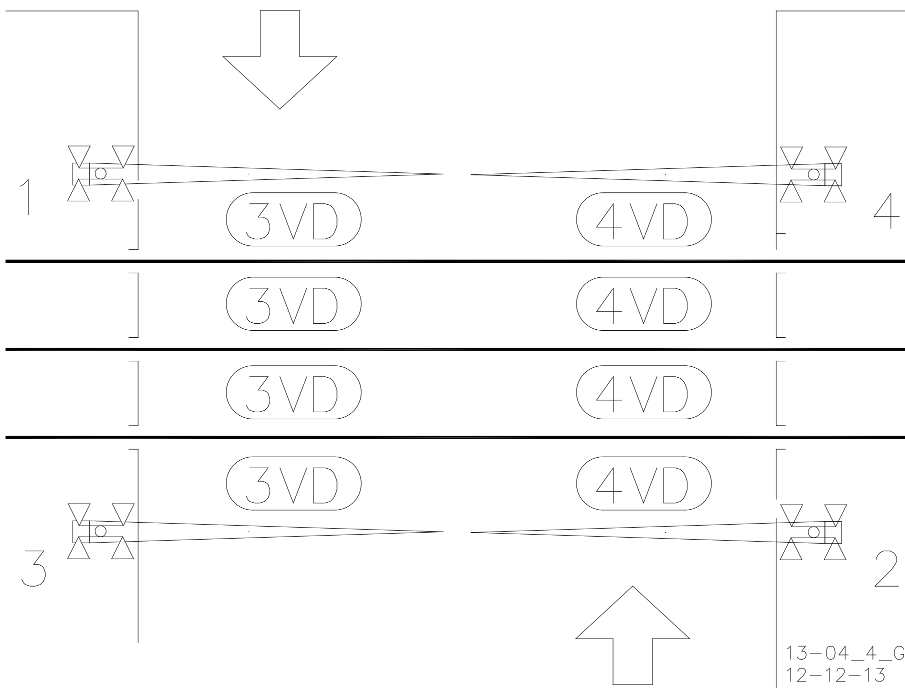


Figure C-12:
Typical 4-Quadrant Gate Crossing

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

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 5000 GCP which is the train detection device and the I/O interface to the traffic signal controller.

WARNING

WARNING

THE PREEMPTION RELAY HEALTH CHECK SHOULD BE USED TO ENSURE 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

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-12):

- 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 5000 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, <u>and</u> 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 5000 GCP and SSCC IV is shown in Figure C-14A and Figure C-14B, which are located at the end of this section.

C.13.3.1 Model 5000 GCP I/O

The inputs to the Model 5000 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

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-6 and input definitions are listed in Table C-7.

Table C-6:
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-7:
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 5000 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 5000 GCP, or can be used as an Optional 1 GD.
Remote Inp 3	Remote Input 3 on SSCC IV that can be assigned as a remote input to the Model 5000 GCP.
Remote Inp 4	Remote Input 4 on SSCC IV that can be assigned as a remote input to the Model 5000 GCP.

SSCC IV inputs are not shown on the Model 5000 GCP Display module unless these inputs are assigned to functions displayed on the **AND:** [IO & LOGIC VIEW > 1) LOGICAL VIEW > 1) AND:] and **System States** [IO & LOGIC VIEW > 1) LOGICAL VIEW > 4) SYSTEM STATES] screens.

Examples of using the **Logic: Controls** and **Logic: Internal I/O** to assign remote SSCC IV inputs to functions within the Model 5000 GCP are shown below:

- On the **Logic: Controls** screen [3) LOGIC PROGRAMMING > 4) LOGIC: CONTROLS]:
  - Set Pass Thrus to **Yes**
- On the **Logic: Internal I/O 1-4** screen [3) LOGIC PROGRAMMING > 5) INTERNAL I/O > 1) INTERNAL I/O 1-4]:
  - Set Int.1 Sets to **GD 2.1**
  - Set Int.1 Set by to **Passthru State 1**
  - Set Int.2 Sets to **Preempt Hlth**
  - Set Int.2 Set by to **Rmt SSCCIV OP 2**
  - Set Int.3 Sets to **Adv Preempt IP**
  - Set Int.3 Set by to **Rmt SSCCIV Op 3**
  - Set Int.4 Sets to **AND 1XR Enable**
  - Set Int.4 Set by to **Rmt SSCCIV OP 4**

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-8.

For example, if ent4quad.mcf (master MCF) is assigned the address 762010010015, then the Model 5000 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-8).

Table C-8:
ATCS Subnode Address Increment Requirements

MCF NAME	ATCS SUBNODE (SS)	DESCRIPTION
GCP4ENT.mcf	SS	4-quadrant entrance gate controller
4000 GCP mcf	SS + 1	Model 5000 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 5000 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

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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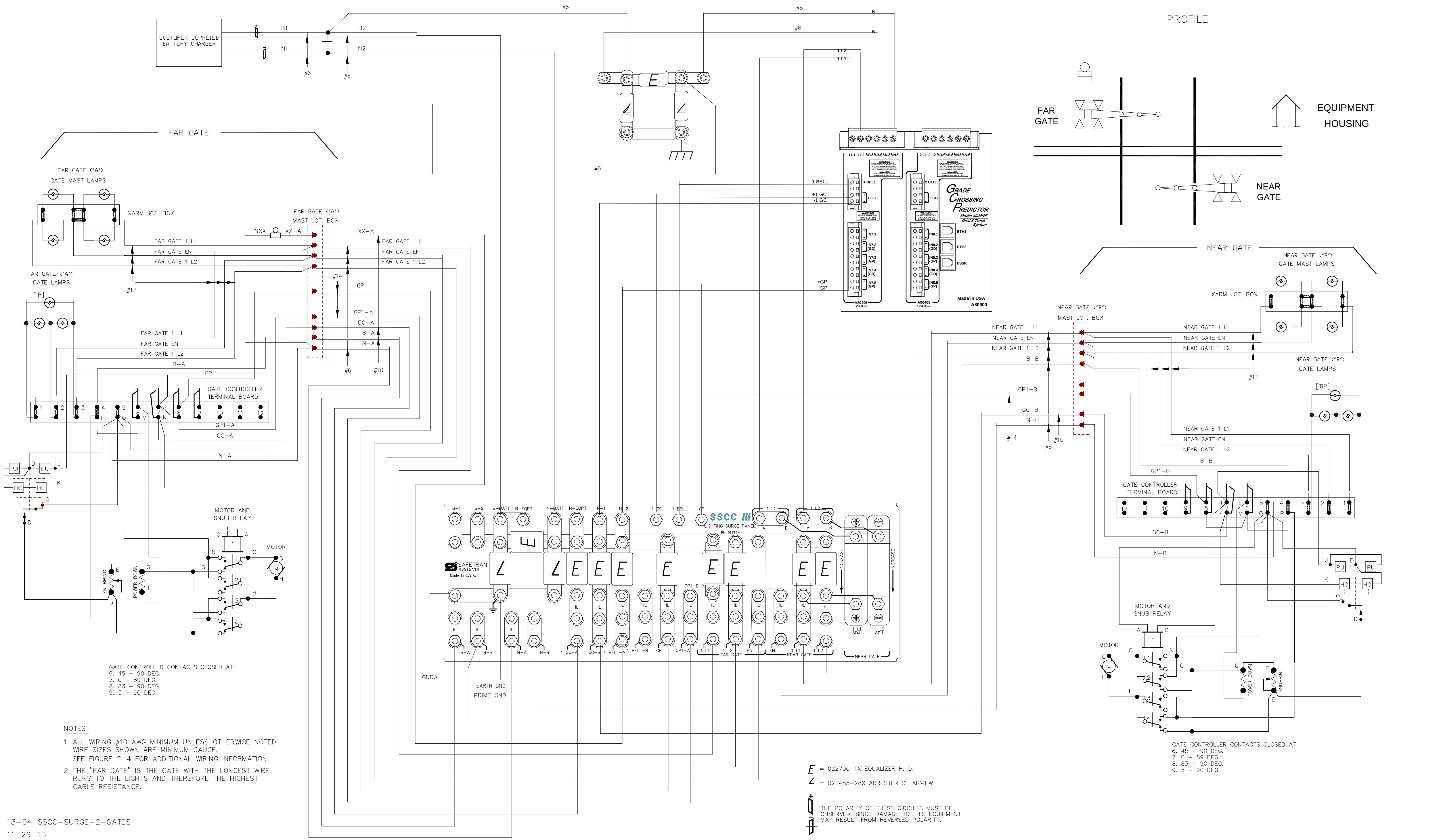


Figure C-13: Typical Two-Gate Application Using the Solid-State Crossing Controller IIIi with the 91181-01 Lighting Surge Panel

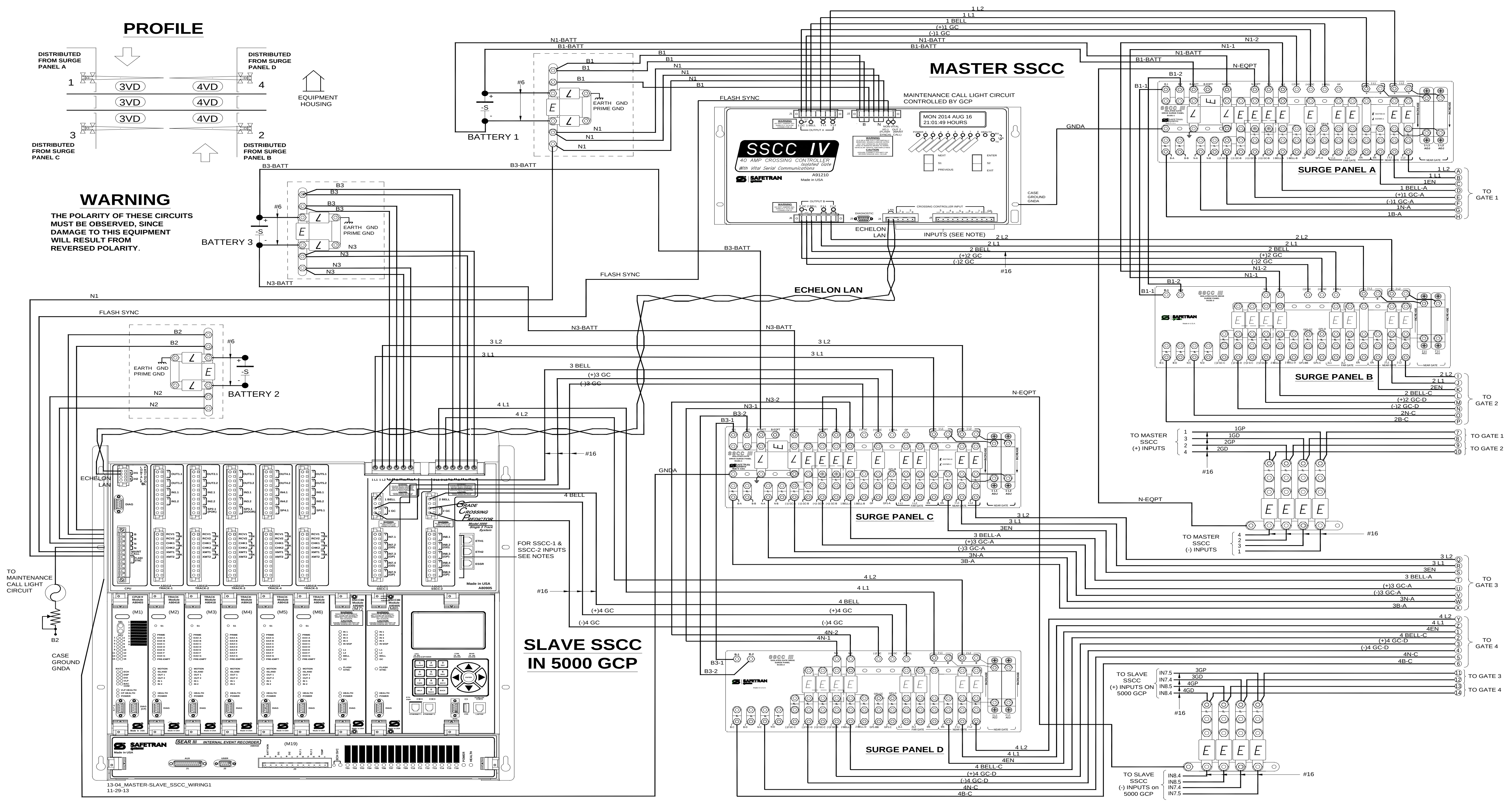
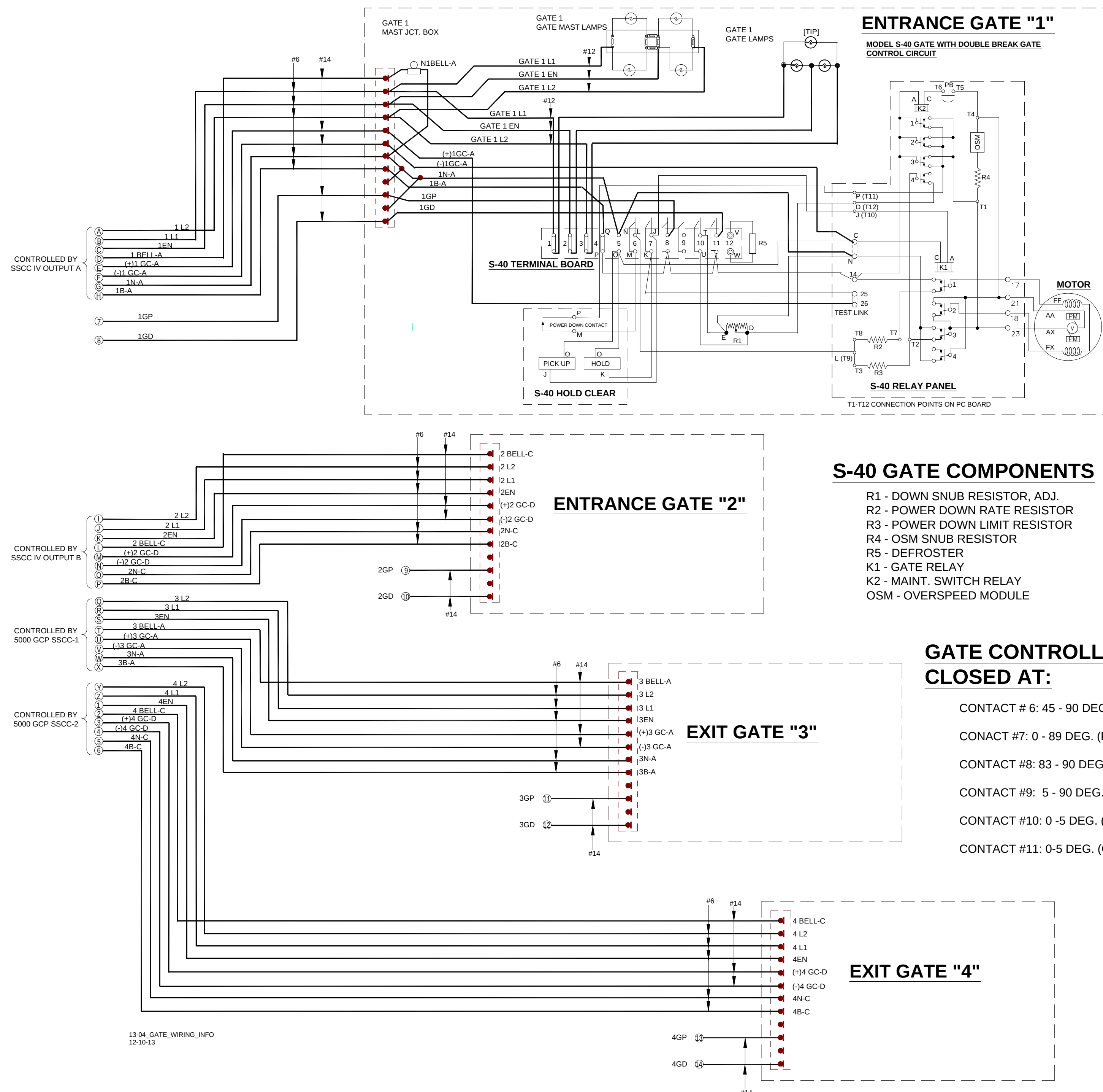


Figure C-14: Typical Four-Quadrant Gate Application (Isolated Gate Return) using Model 5000 GCP and SSCC IV, 40-Ampere Unit, With Lightning/Surge Panels A91181-1 and A91181-2



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

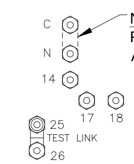
GATE CONTROLLER CONTACTS CLOSED AT:

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 5000 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 (5000 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-15: Typical Four-Quadrant Gate Application (Isolated Gate Return) using Model 5000 GCP and SSCC IV, 40-Ampere Unit, With Lightning/Surge Panels A91181-1 and A91181-2