SIEMENS

APPLICATION GUIDELINES

MICROPROCESSOR BASED GRADE CROSSING PREDICTOR 5000 FAMILY

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

DOCUMENT HISTORY

Version	Release Date	Sections Changed	Details of Change
A	AUG 2014		Initial Release per NG5-F96
A.1	OCT 2014		Replaced references to A80485-2 with A80485-1
A.2	JUL 2017	Section 1 Section 8	Page 1-5, Changed Note text., Modified Figure 1-3 Page 8-14, Changed Note text, Modified Figure 8-9 Page 8-15, Modified Figure 8-10 Page 8-17, Modified Table 8-7, add second note to table Page 8-18, Modified Figure 8-12, modified Table 8-8
A.3	AUG 2022	All	Figures and content updated to reflect Diagnostic terminal and CPUIII updates. New sections for the A80485 display Content and figures added to include additional information for ‘Out of Service’ Display Option. Formatting throughout. Addition of SEAR IIi details.

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NOTES, CAUTIONS, AND WARNINGS

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

⚠ WARNING	**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 Mobility, Inc. 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 Mobility, Inc. 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.

SECTION 1 – GCP 5000 OVERVIEW

SECTION 1 GCP 5000 OVERVIEW

1.1 SYSTEM CONFIGURATIONS

The Grade Crossing Predictor (GCP) 5000 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 GCP 5000 is available in several case configurations.

1.2 STANDARD FEATURES

The GCP 5000 can have up to six 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 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 is available with redundant Main/Standby operation for CPU, Track, and RIO modules.

The GCP can perform independent event recording, using the SEAR IIi. The SEAR IIi 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 can utilize Echelon or Ethernet 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 of the system.

1.2.1 GCP Case Configurations

The Grade Crossing Predictor (GCP) 5000 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 provided 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 SSCC IIIi Crossing Control[1]	0, 1 or 2	0, 1 or 2	No	0, 1 or 2
Internal SEAR IIi Recorder	Yes	Yes	Yes	Yes
I/O Expansion[2]	0, 1 or 2	0 or 1	0 or 1	0, 1, 2 or 3
Echelon LAN Functions	Yes	Yes	Yes	Yes

[1] SSCC IIIi module controls Gates, Flashing Light Signals and Bells.

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

For detailed descriptions of the various cases and modules, refer to Section 8.

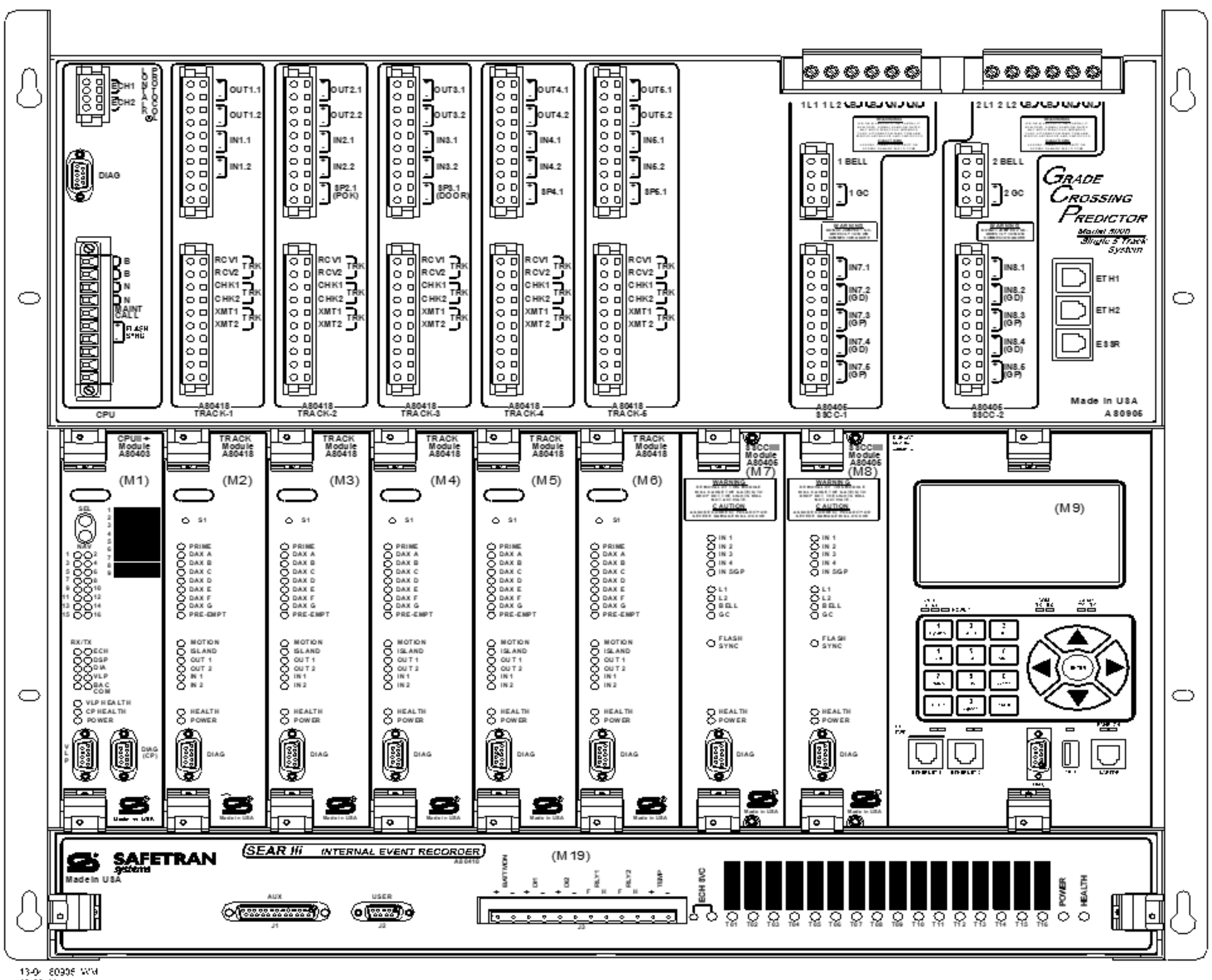


Figure 1-1: A80905 Single Five-Track Configuration

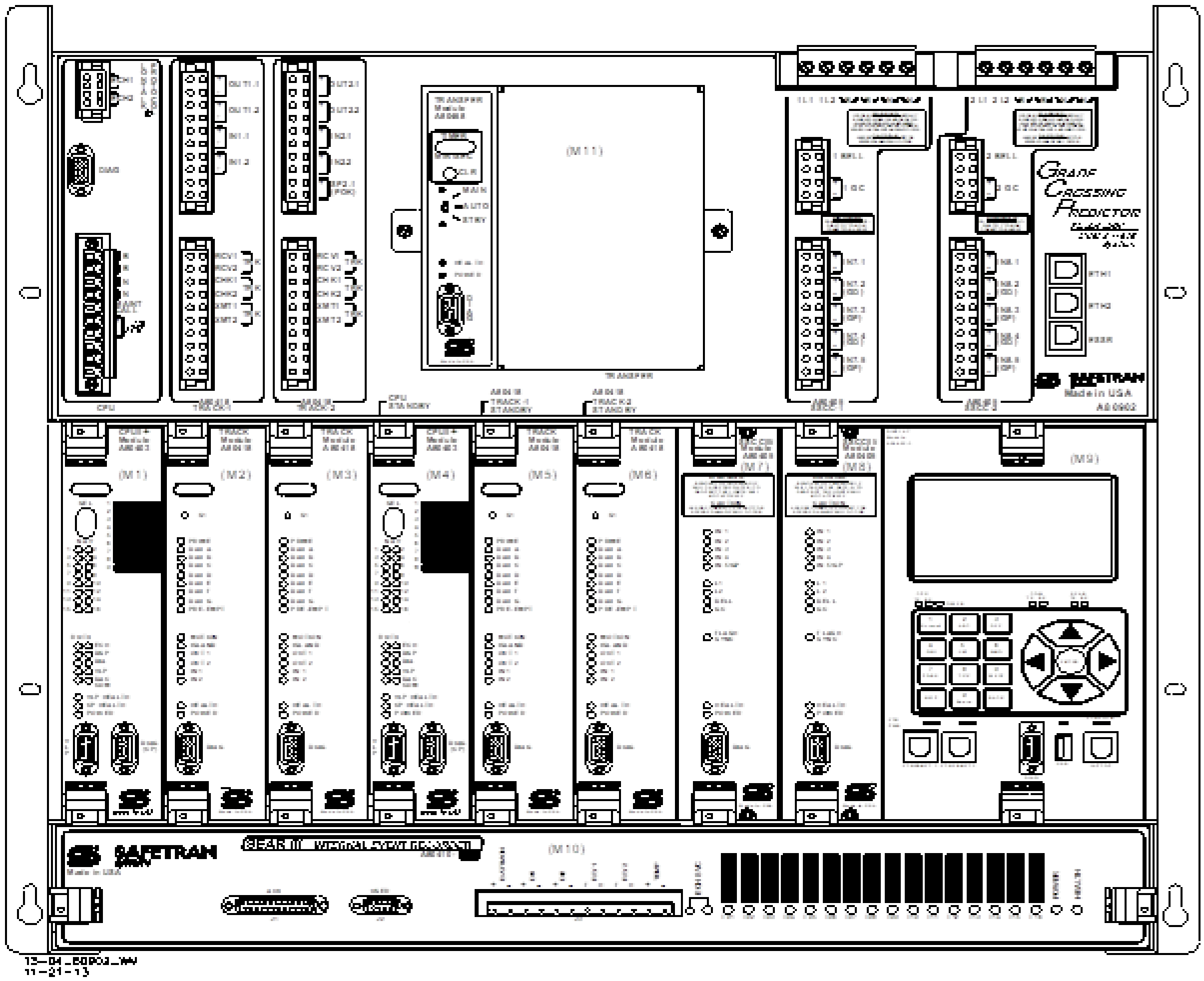


Figure 1-2: A80902 Dual Two-Track Configuration

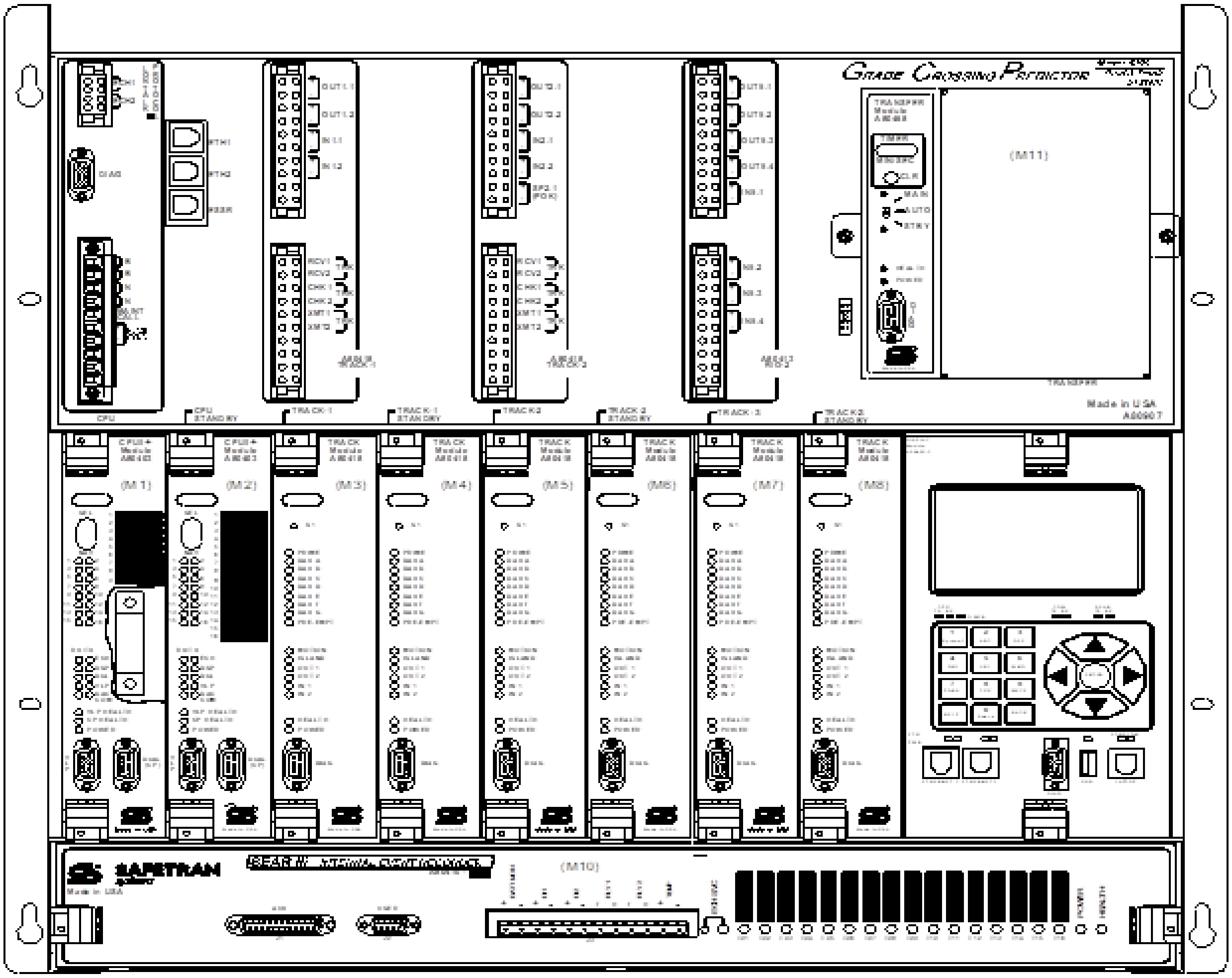


Figure 1-3: A80907 Dual Three-Track Configuration

NOTE

NOTE

On the A80907chassis only, software versions gcp5K-3trk-0-1-0.mcf and later, the third track is referred to as Track-3, older versions refer to the third track as Track-5.

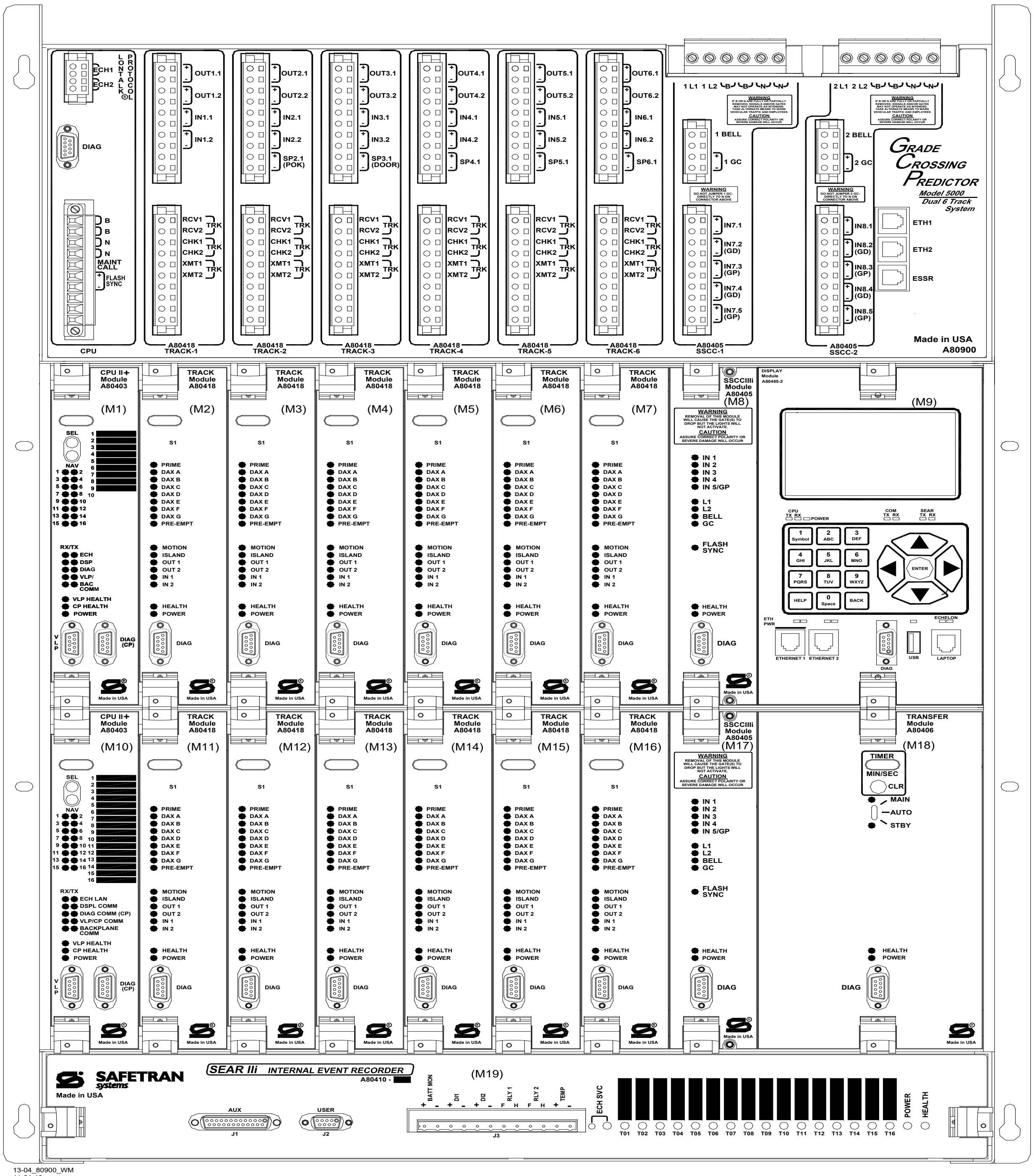


Figure 1-4: A80900 Dual Six-Track Configuration

1.3 GCP OPERATIONAL PARAMETERS

The GCP 5000 supports Unidirectional track circuits, Bidirectional track circuits, and Simulated Bidirectional track circuits. The number of tracks that may be monitored is determined by the GCP 5000 case configuration, the number of Track Modules installed, track configurations, and available I/O.

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

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

The GCP 5000 includes circuitry that eliminates the need for a Wayside Access Gateway (WAG). Additionally, the GCP 5000 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: SEAR IIi, HD/Link, VHF Comms, iLod, SSCCIV, GCP 4000, and GCP 5000
- The GCP can communicate with these other local devices in the bungalow via the Ethernet: ESSR, WAG, GCP 5000, Wayside Inspector
- The GCP can communicate to remote ATCS device by connection to an extended Ethernet LAN using ESSR
- The integrated Siemens SEAR IIi 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 GCP 5000 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 GCP 5000 and used to determine relative train speed and to predict when to activate the crossing warning devices.

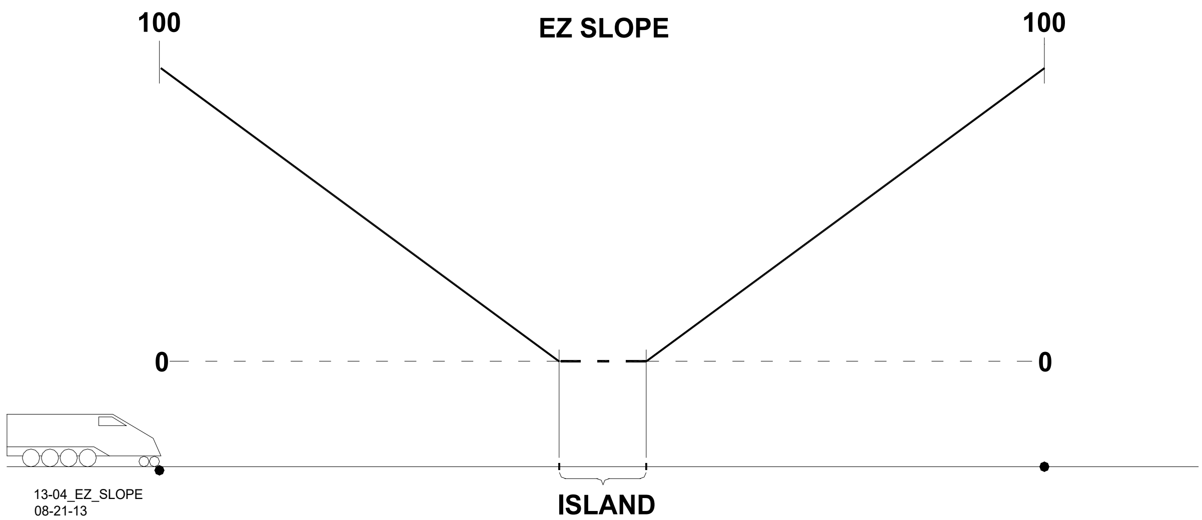


Figure 1-5: Diagram of EZ Level Compared to Train Shunt Location

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 GCP 5000 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). GCP 5000 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, 27 offset frequencies, or 23 other frequencies.

Table 1-2: GCP 5000 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, 141, 149, 151, 237, 239, 249, 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 SSCC IIIi Connector	9.0-16.5 VDC
Maximum Ripple	1.0V p-p

Table 1-4: GCP 5000 Input Current Requirements

Component	CPU Battery Connector @10V	CPU Battery Connector @13.2 V	CPU Battery Connector @16.5V
CPU II+:	0.4 A	0.5 A	0.6 A
CPU III	0.7 A	0.6 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
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
SSCC IIIi current draw from CPU battery connector:	0.020A	0.015 A	0.015 A
SSCC IIIi current draw from SSCC IIIi 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
SEAR IIi:	1.15A	0.8 A	0.65 A
Six Track, Dual Bay Chassis with all Modules Present: CPU II+; Track (6 each); SSCC IIIi (2 each); Display; Transfer; and SEAR IIi	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: GCP 5000 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 section 2.18 for battery and external cable surge protection.	
Typical Monitoring and Storage:	DISPLAY	SEAR IIi
Total Events (Including Train Move Data):	250,000 minimum	100,000 minimum
Mounting:	All GCP 5000 chassis can be wall, rack, or shelf mounted	
Temperature Range:	-40 °F to +158 °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:		
CPU II+ (A80403)	1.25 lbs. (0.56 kg)	
CPU III (A80903)	1.15 lbs. (0.51 kg)	
Track (A80418)	1.00 lbs. (0.45 kg)	
RIO (A80413)	1.13 lbs. (0.51 kg)	
SSCC IIIi (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)	
SEAR IIi (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 Isolated DC Output Drive Voltage:	12 VDC nominal
Gate Isolated 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

SECTION 2 – GENERAL GCP APPLICATION INFORMATION

SECTION 2 GENERAL GCP APPLICATION INFORMATION

2.1 GCP 5000 TRACK SIGNALS

The GCP 5000 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 GCP 5000 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 GCP 5000 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 VERSUS 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

GCP 5000 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

GCP 5000 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, GCP 5000 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 Section 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 high 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 high 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 high 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 high 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 high 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 THE GCP 5000 TRACK FREQUENCY, ACCOUNT FOR ANY EXISTING AUDIO FREQUENCY TRACK CIRCUIT SIGNALS.**

2.5.1 Frequency Selection Restrictions

Before selecting the GCP 5000 frequency, determine if any high-level audio frequency (AF) is present on the track. Avoid using any GCP 5000 frequency that is within fifteen percent of any AF signal present. For additional restrictions on the use of overlapping GCP frequencies, see section 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 GCP 5000 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 GCP 5000, 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
Total Warning Time in Seconds	Distance Traveled in Feet														
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 GCP 5000 response time in seconds.

2.6.2 Approach Distance Calculation Example

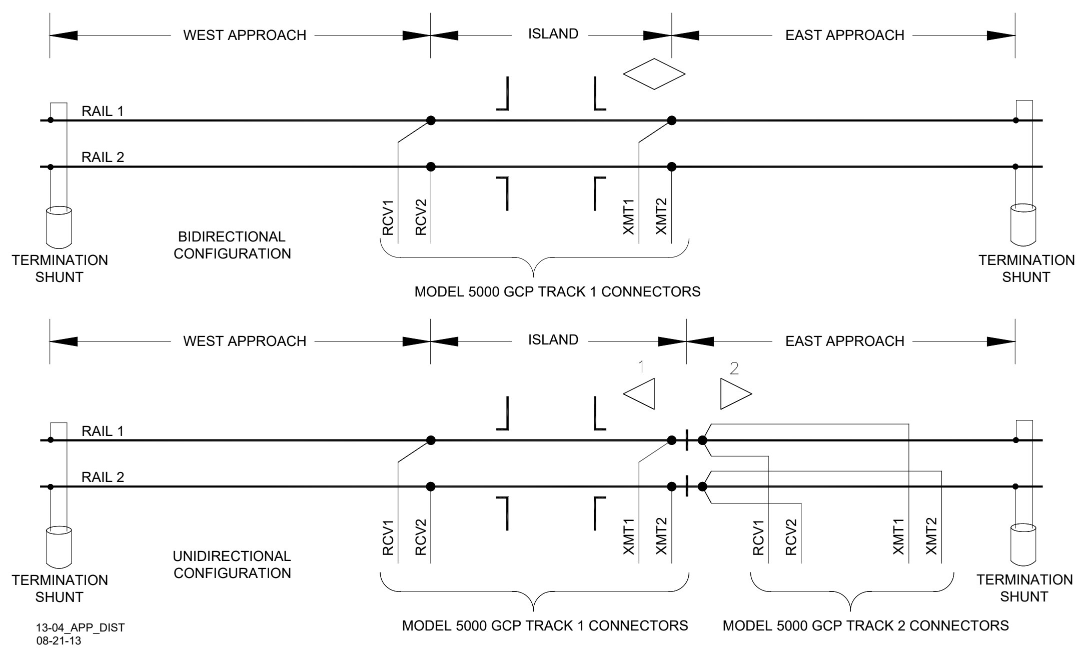


Figure 2-1: Approach Distance

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 sections.

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.

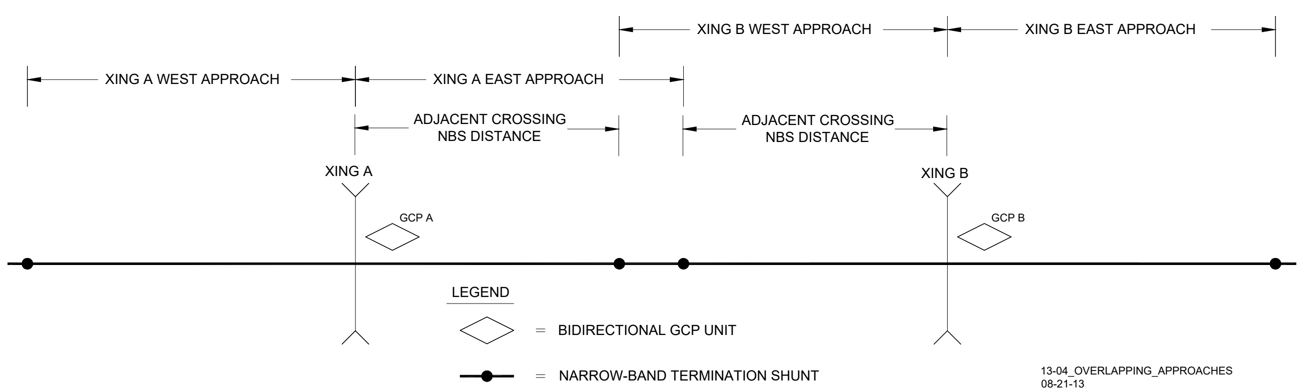


Figure 2-2: Overlapping Approaches

2.7.2 Types of Narrow-Band Shunts

The following sections detail the types of narrow-band shunts that can be used with the GCP 5000.

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	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**.

⚠ WARNING

WARNING

THE 62775 NARROW-BAND SHUNT CANNOT BE USED IF A GCP 5000 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

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

2.7.2.3 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 the 62775-f narrow-band shunt but does not terminate as well as the 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. The 62780 narrow band shunt is also available in a multifrequency version, see section 7.6.

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 GCP 5000 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 GCP 5000 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).

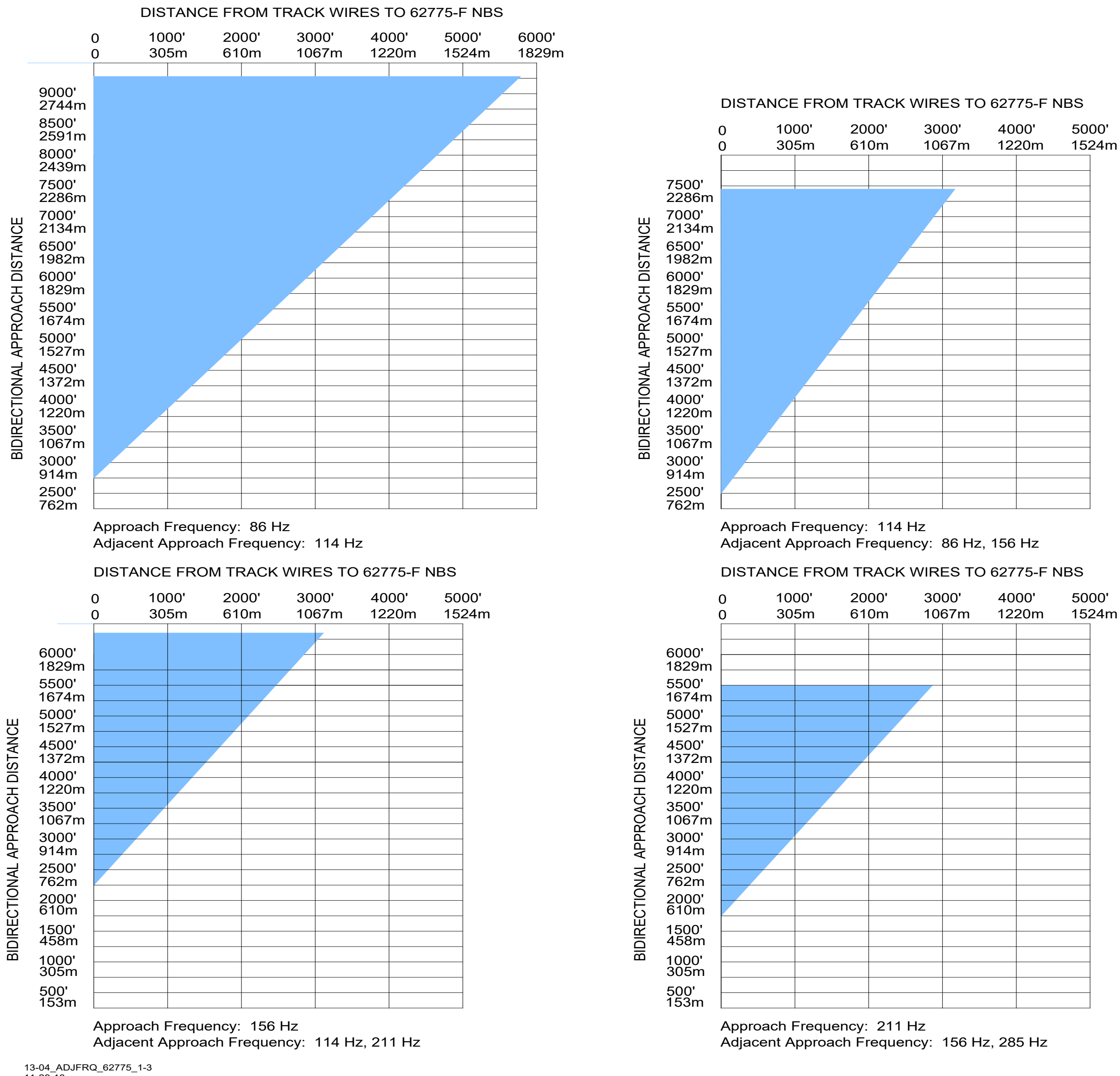
The 114 Hz chart shows that 62775-f Narrow-band Shunts for 86 Hz should be located no closer than 1,000 feet (304.8 m) to the 114 Hz GCP track wires.

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 GCP 5000 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)

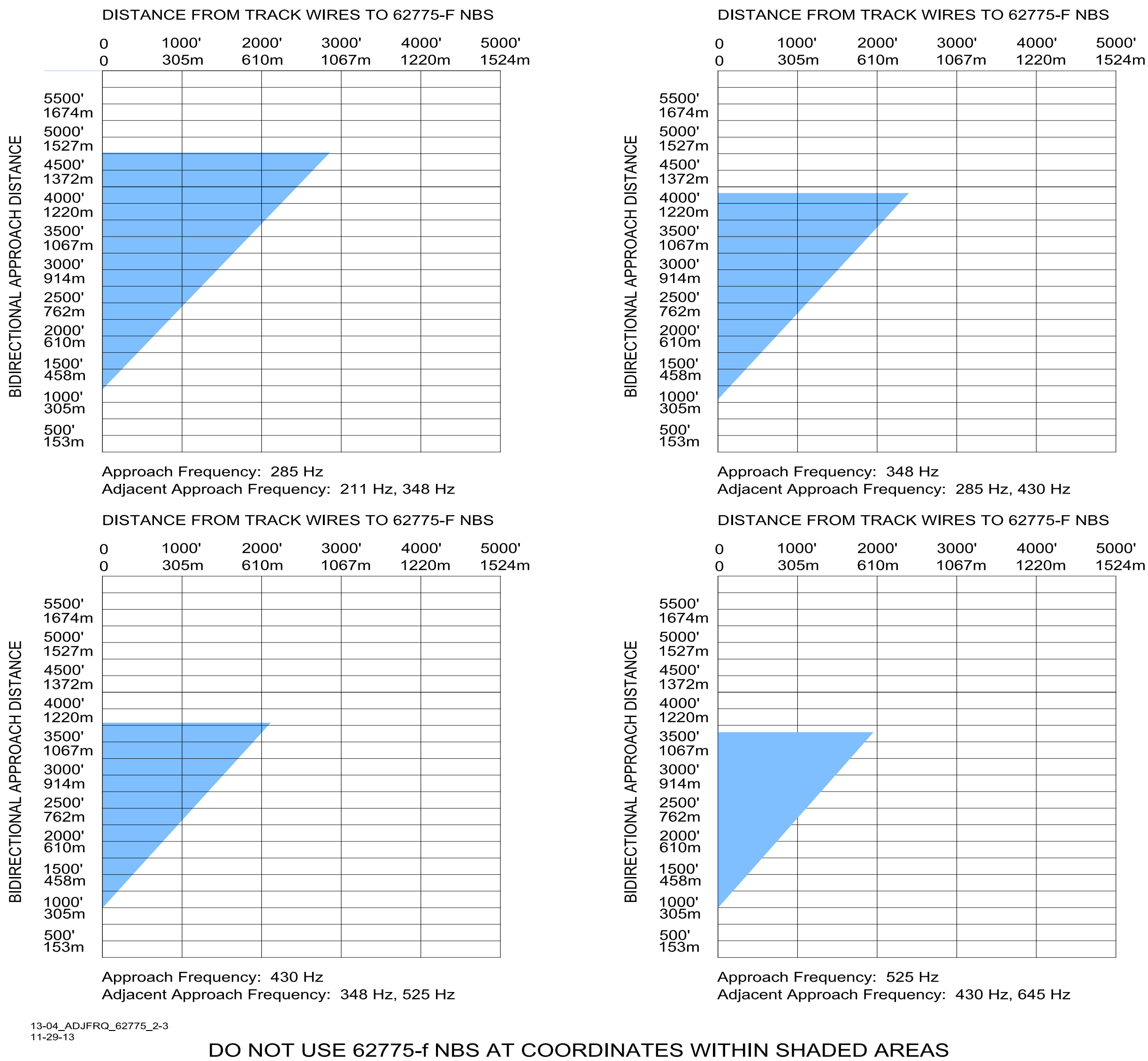
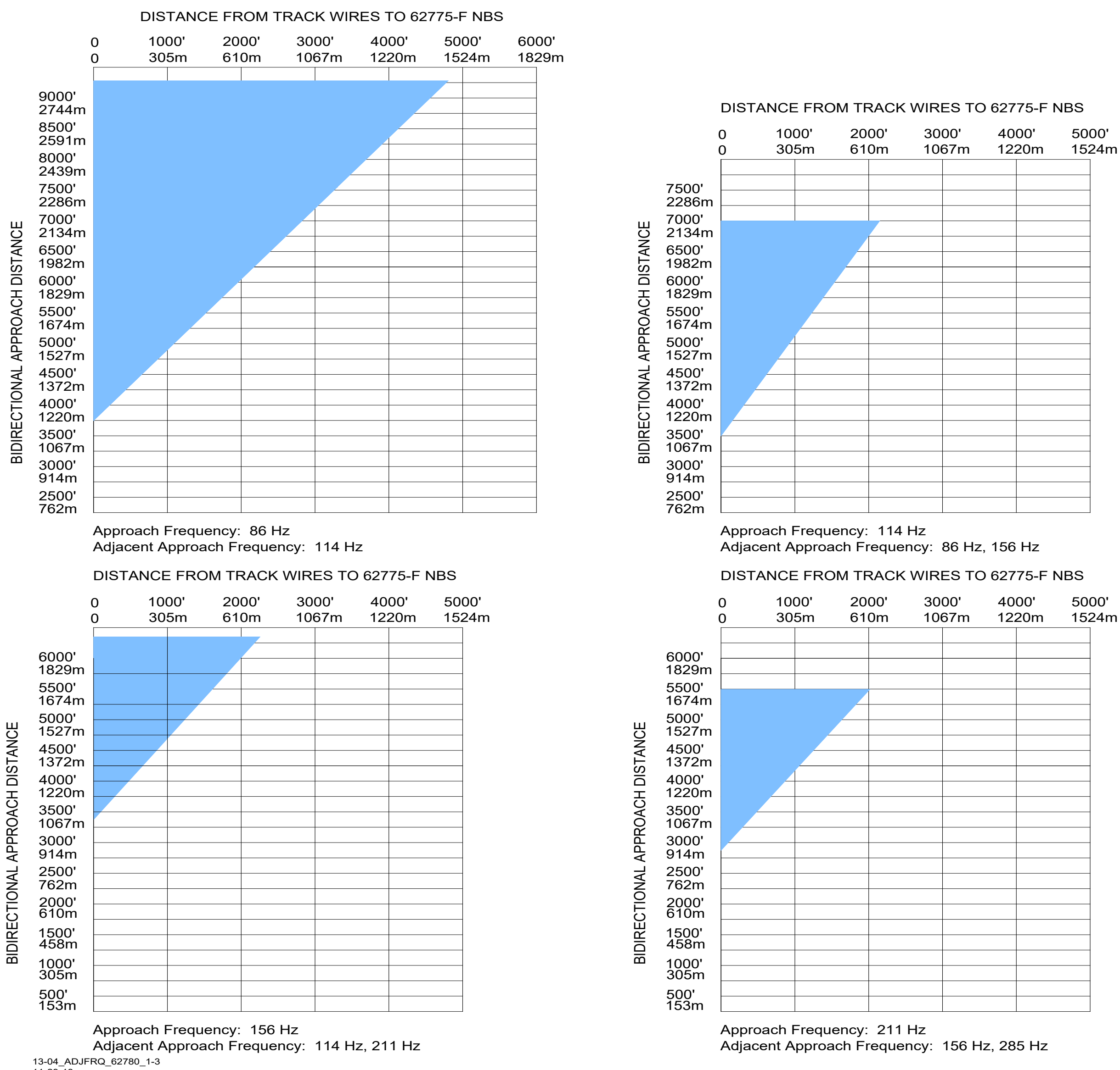


Figure 2-4: Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 2 of 3)

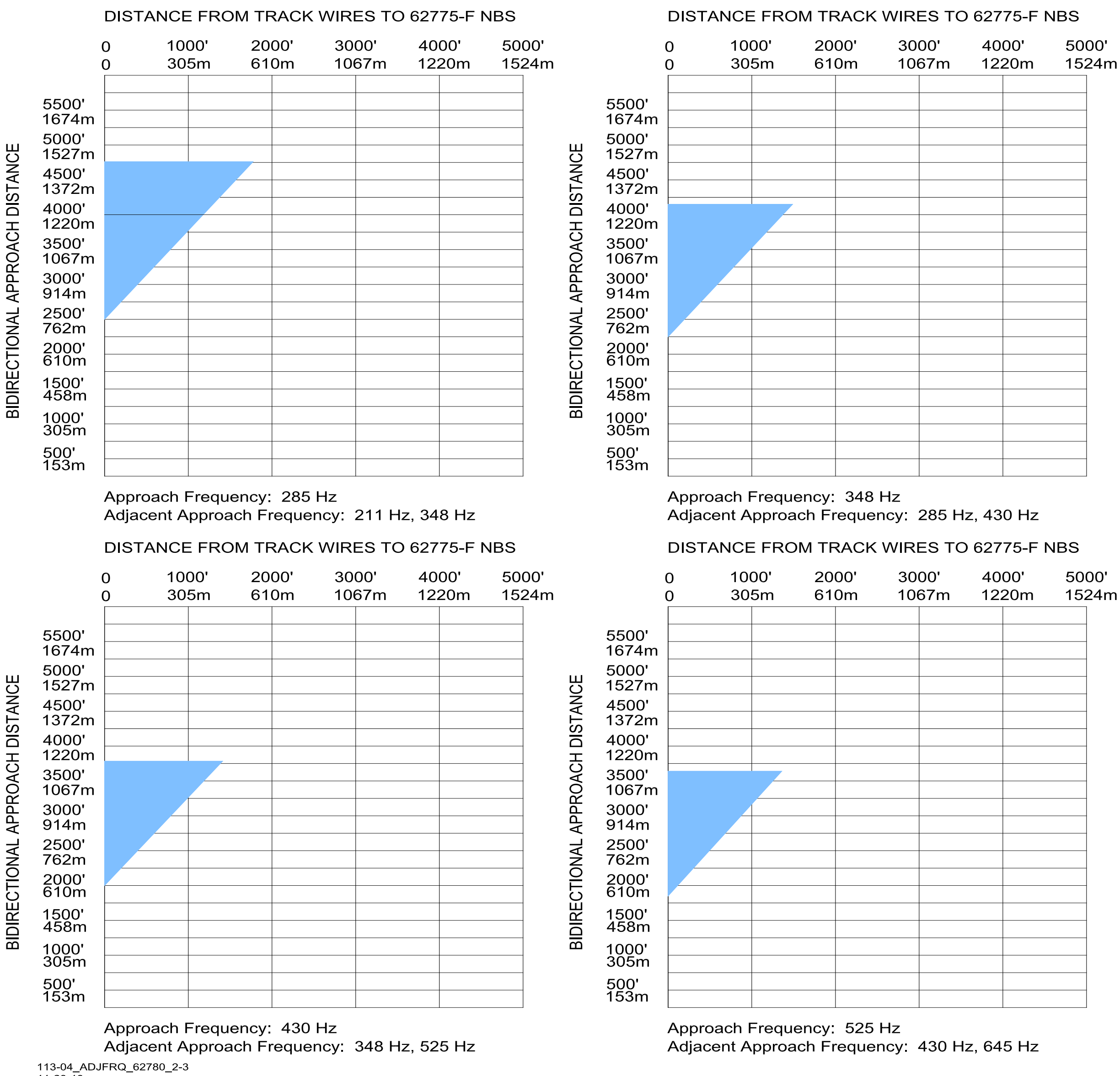
DO NOT USE 62775-f NBS AT COORDINATES WITHIN SHADED AREAS

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



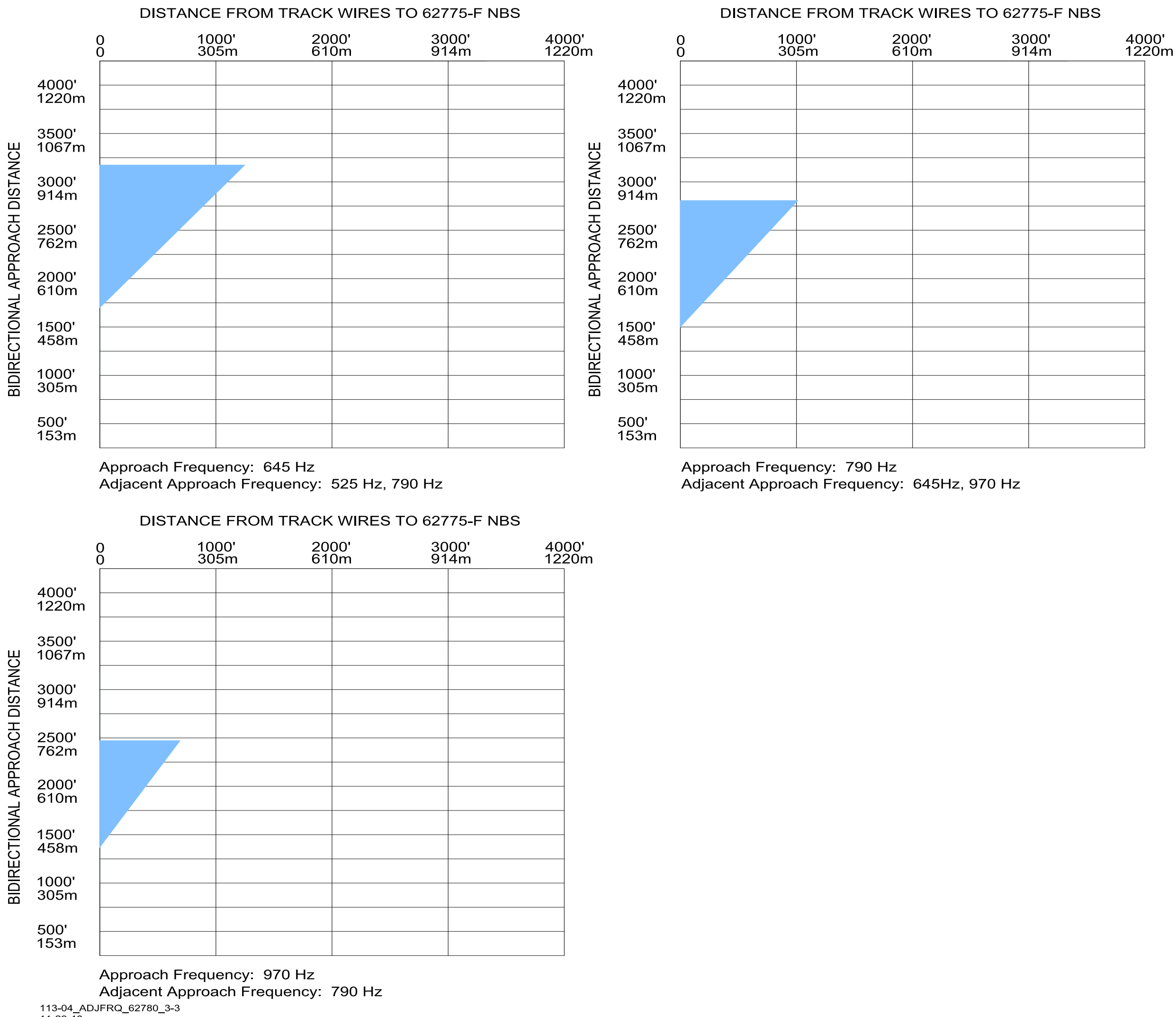
DO NOT USE 62780-f NBS AT COORDINATES WITHIN SHADED AREAS

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



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

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



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 GCP 5000 OPERATING FREQUENCIES

2.8.1 Insulated Joints Requirements

In general, do not operate two GCP 5000s 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 GCP 5000 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 GCP 5000 track frequency as normal and the other to the lower offset frequency.

Example: When a frequency of 285 Hz is selected, set one GCP 5000 to 285 Hz and the other to 284 Hz.

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

Standard 5000 GCP Frequency (HZ)	Separation Distance in ft. (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 GCP 5000 offset frequencies is provided in Table 2-9.

Table 2-9: GCP 5000 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 GCP 5000 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 section 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

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

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

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 sections.

⚠ 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 GCP 5000.

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 sets of 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 GCP 5000 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.

⚠ WARNING

WARNING

THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN Table 2-14 APPLY ONLY TO SIEMENS GCP 5000s.

WHEN THE GCP 5000 IS PROGRAMMED AS A PREDICTOR APPLICATION, RULES FOR THE 62785-F ARE SPECIFIED IN 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 GCP 5000.

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

- 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 GCP 5000 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.

Table 2-14: Minimum Distance to Insulated Joints Bypassed with 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.

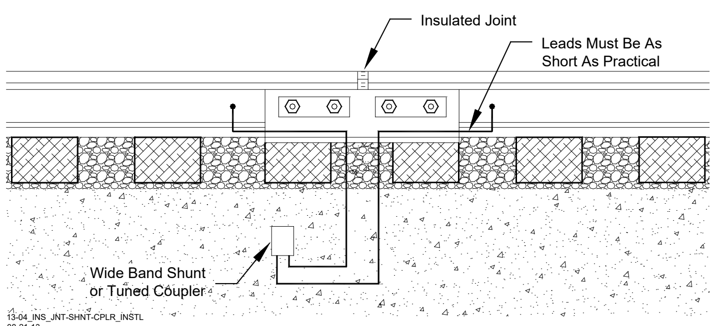


Figure 2-9: Insulated Joint, Shunt, or Coupler Installation

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 GCP 5000 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.

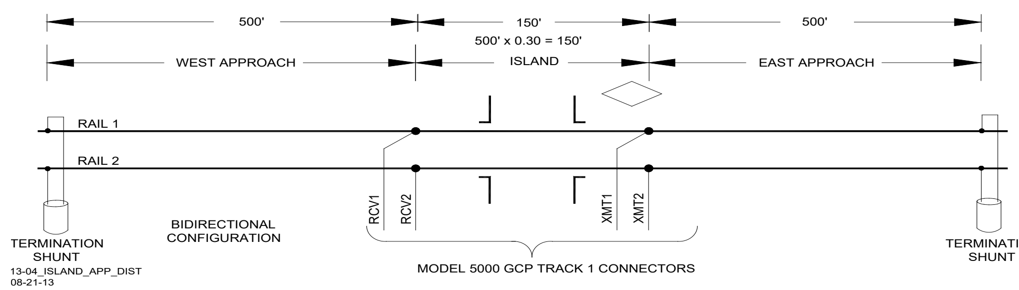


Figure 2-10: Determining Island Approach Length

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

2.12.3 Island Frequencies

Table 2-15: GCP 5000 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 GCP 5000 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.

⚠ WARNING

WARNING

IF THE GCP 5000 IS USED WITH AN MCF THAT DOES NOT HAVE 'TRC' IN THE FILE NAME, THE GCP 5000 CHASSIS MUST HAVE FERRITE BEADS INSTALLED ON THE TRACK XMT AND RCV WIRES, AS DESCRIBED IN APPENDIX D.

THIS IS DONE TO AVOID POSSIBLE SHUNTING ISSUES, IF A REV D OR EARLER A80418 MODULE IS INSTALLED IN THE CHASSIS.

2.13 TRACK CONNECTIONS

Track wire (lead) connection requirements are based on the track circuit configuration and the distance between the GCP 5000 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 SECTION 2.13.7.

2.13.1 Four-Wire Connections for Bidirectional Applications

In most installations where a GCP 5000 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 the following table.

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.

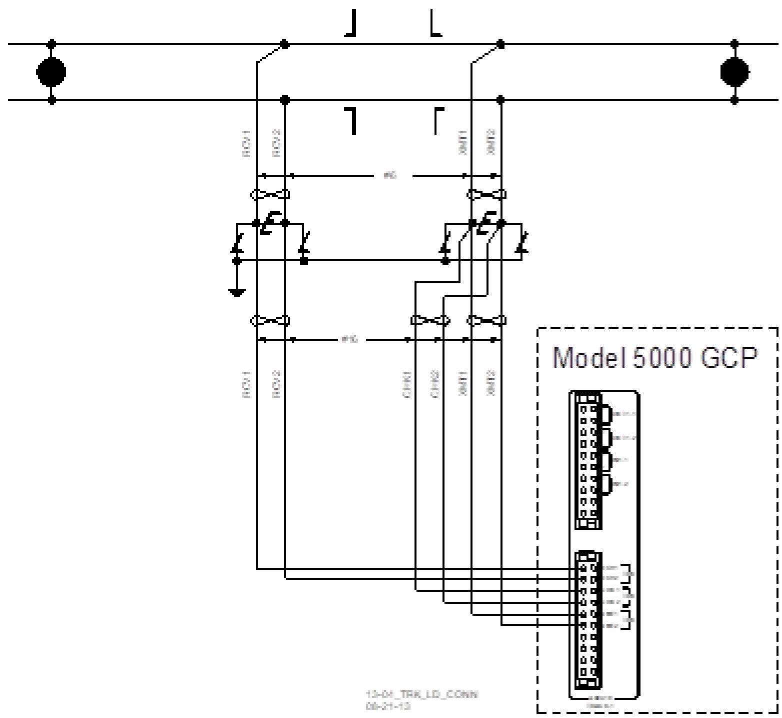


Figure 2-11: Track Lead Connections

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.

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 & 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 GCP 5000 and the Surge Panel use twisted 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 GCP 5000 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 SECTION 2.13.7.

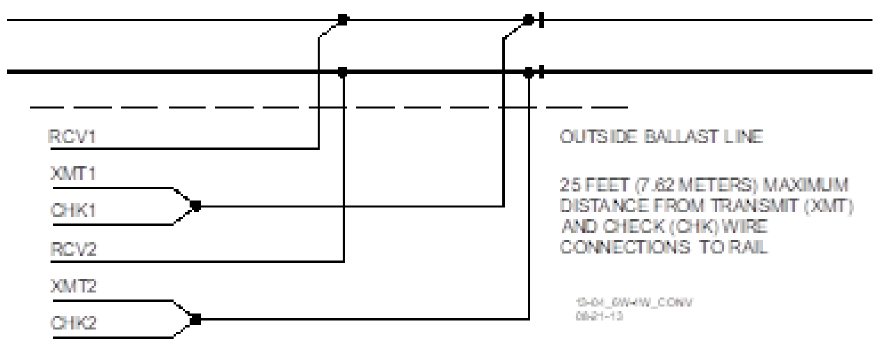


Figure 2-12: Six-Wire To Four Wire Conversion

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 sections 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 SIX 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 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 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.

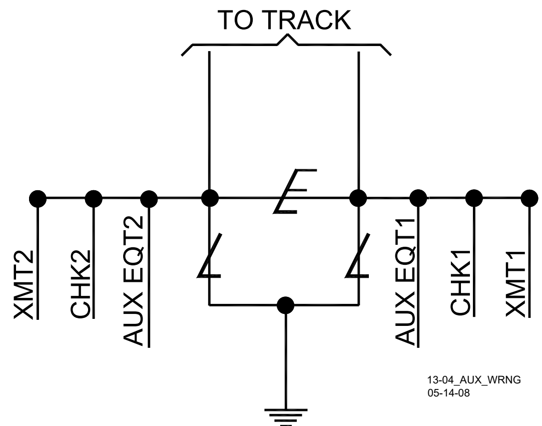


Figure 2-13: Proper Connections of Track Wires

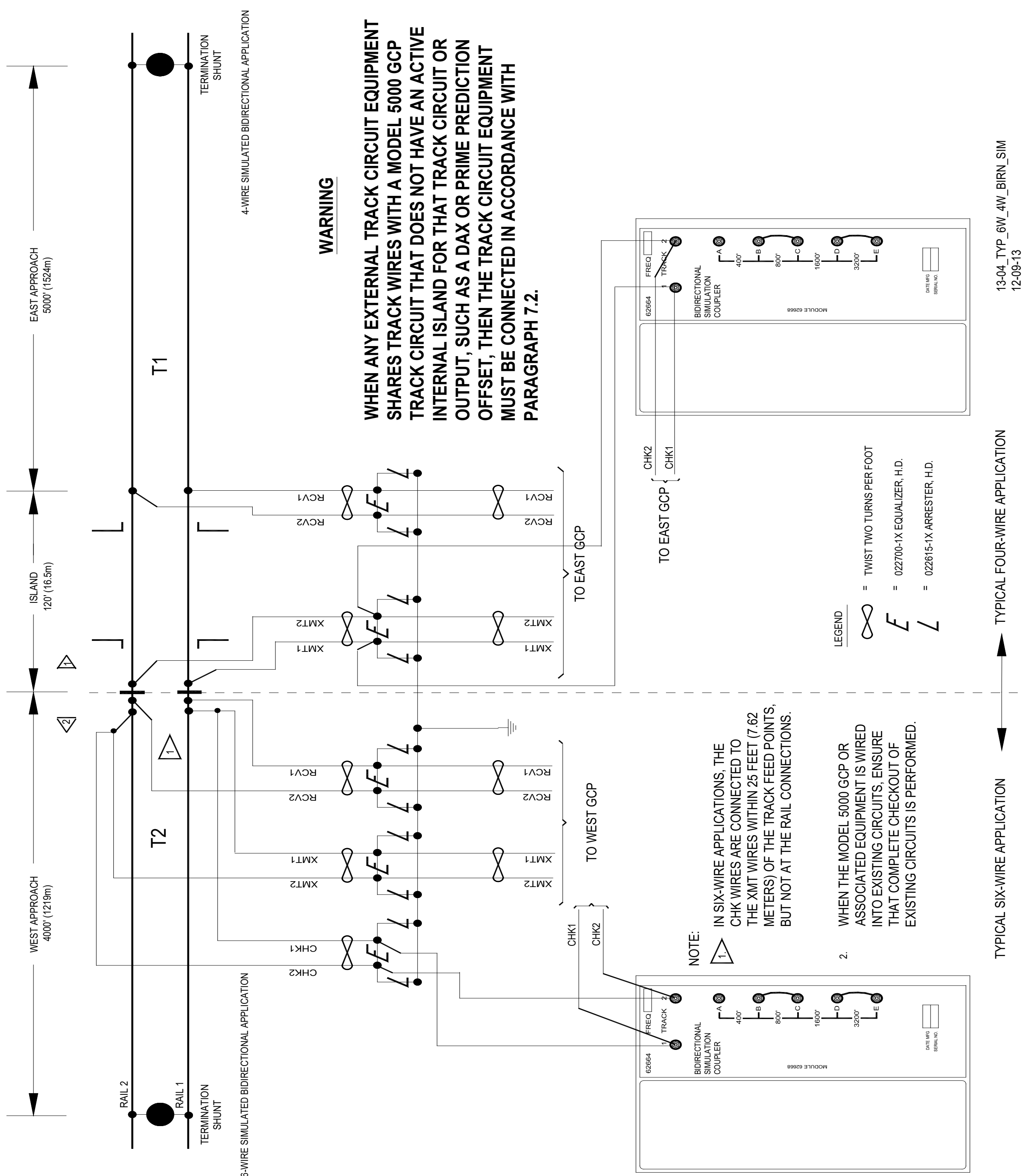


Figure 2-14: Proper 4-Wire & 6-Wire Connections when using Auxiliary Track Circuit Equipment

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 sections 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 Application Engineering 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 GCP 5000 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

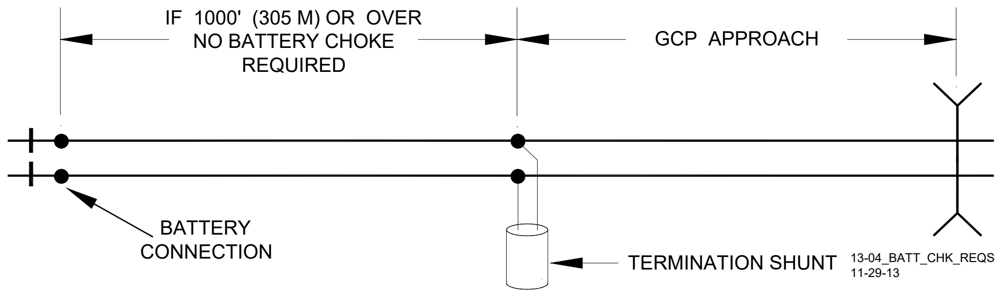


Figure 2-15: Battery Choke Requirements

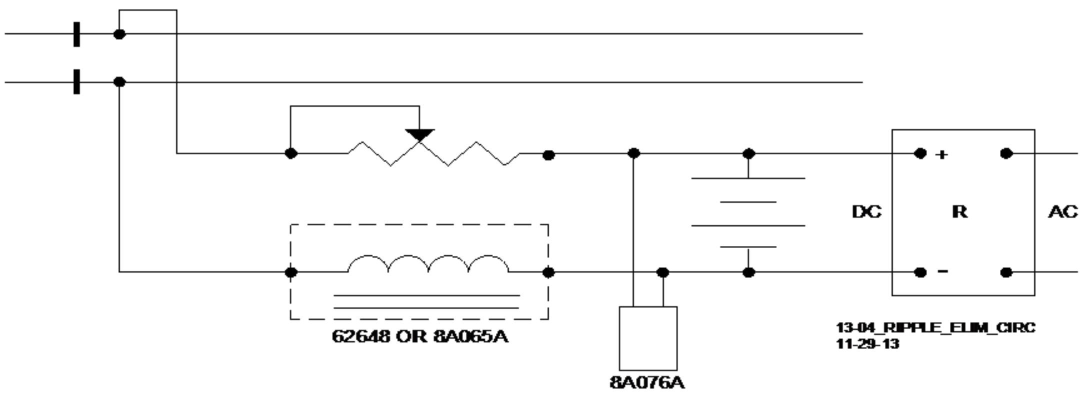


Figure 2-16: Ripple Elimination Circuit

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 high 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 high GCP track drive.

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

NOTE

NOTE

Under some circumstances, an external track filter may be required when electronic coded track is located within the GCP 5000 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 WITH THE 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 GCP 5000. 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.

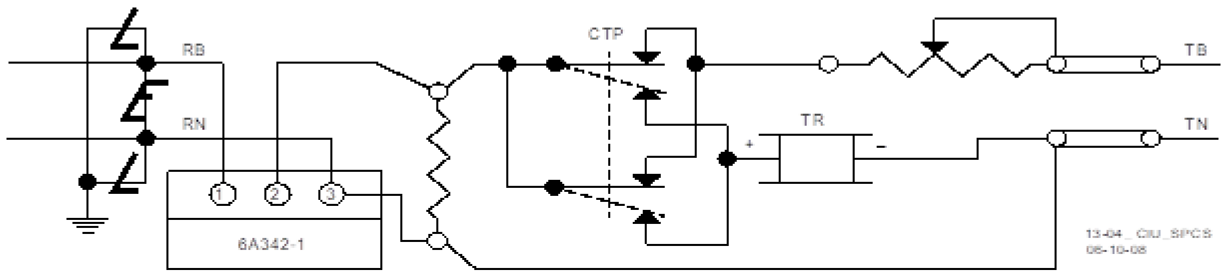


Figure 2-17: Code Isolation Unit in a Single Polarity Code System

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.

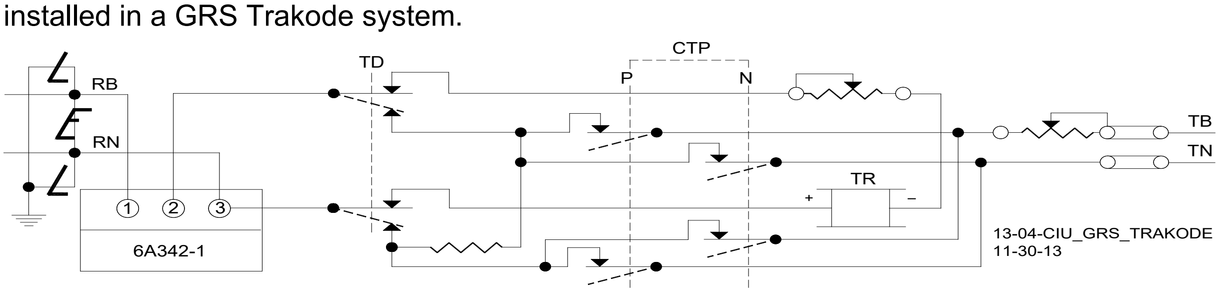


Figure 2-18: Code Isolation Unit Installation In GRS Trakode System

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 GCP 5000 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.

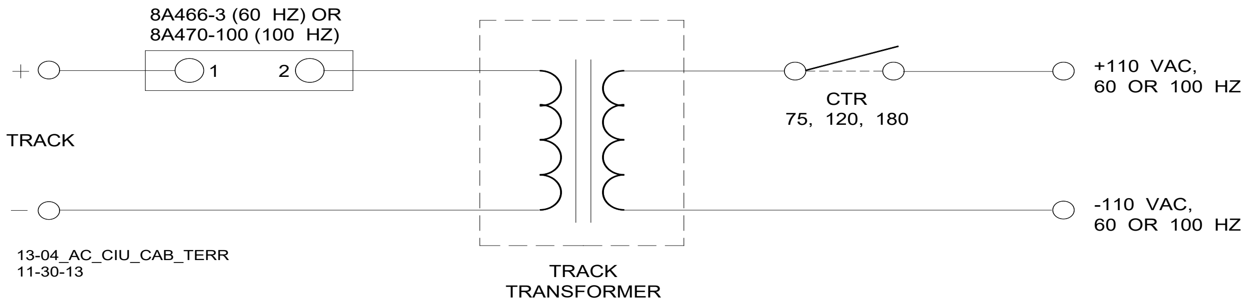


Figure 2-19: AC Code Isolation Unit used in CAB Territory

2.15 APPROACH CONFIGURATIONS

2.15.1 Bidirectional Configuration

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

- a single GCP 5000 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

<u>DO NOT</u> 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.

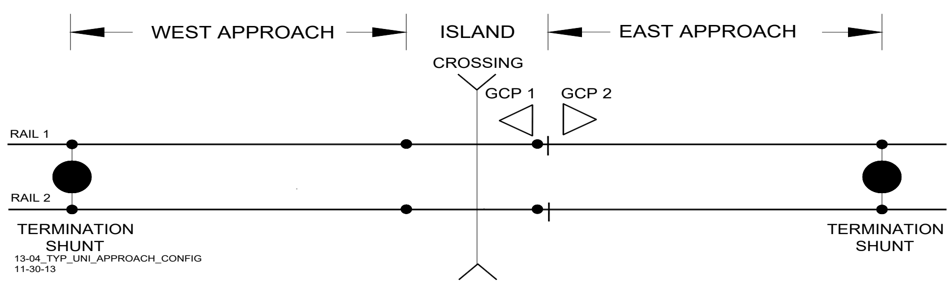


Figure 2-20: Typical Unidirectional Approach Configuration

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 GCP 5000 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.

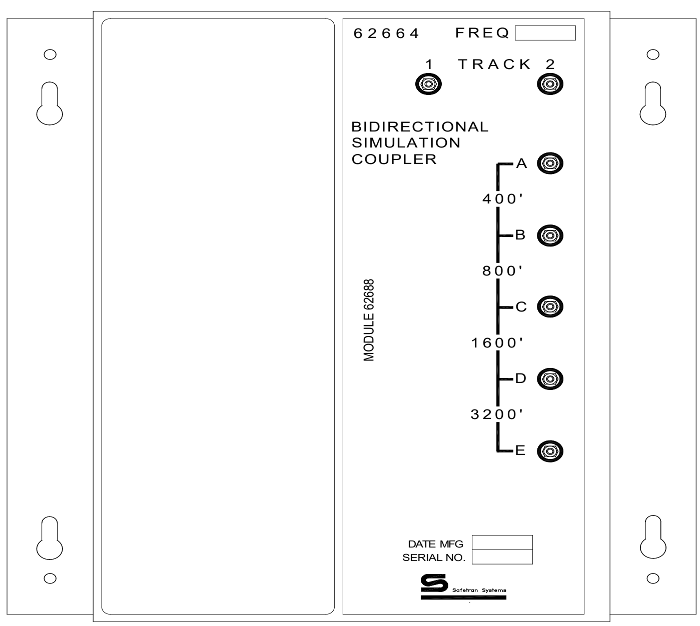
The simulated bidirectional configuration is applied to a unidirectional installation to obtain the low ballast and adjacent frequency overlap operating benefits of a bidirectional application. Bidirectional applications are less affected by low ballast (EX) than unidirectional applications. In the simulated 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 GCP 5000.

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 GCP 5000 is connected in a six-wire simulated bidirectional configuration (see section 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.

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 Remote Prediction Via ESSR

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.

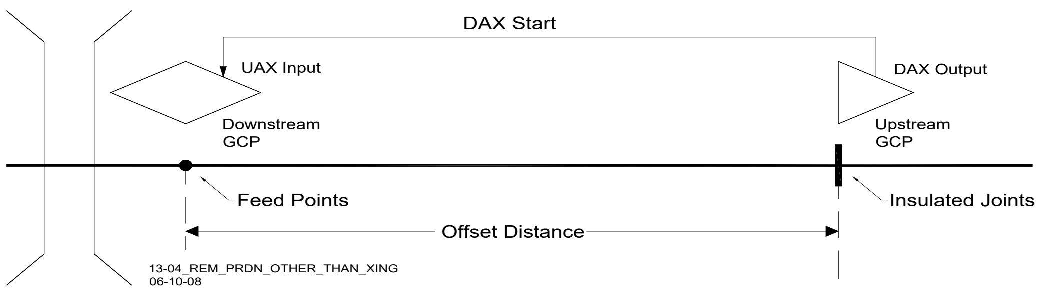


Figure 2-22: Remote Prediction From A Remote Location Other Than A Crossing

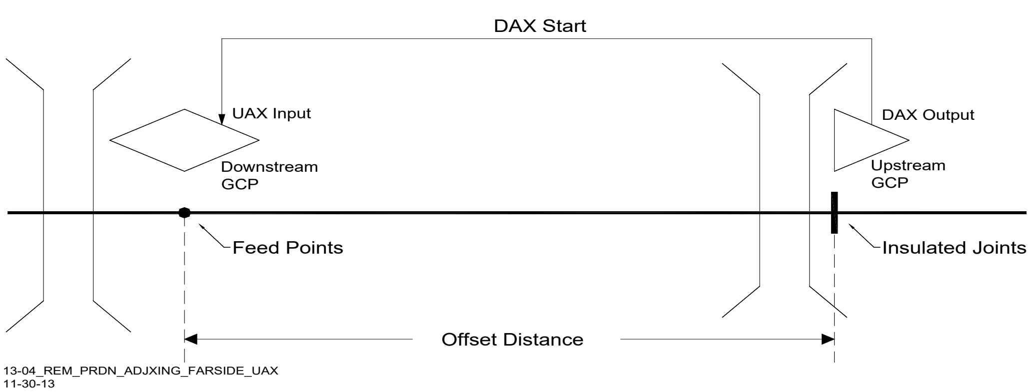


Figure 2-23: Remote Prediction From An Upstream Crossing - Joints On Far Side

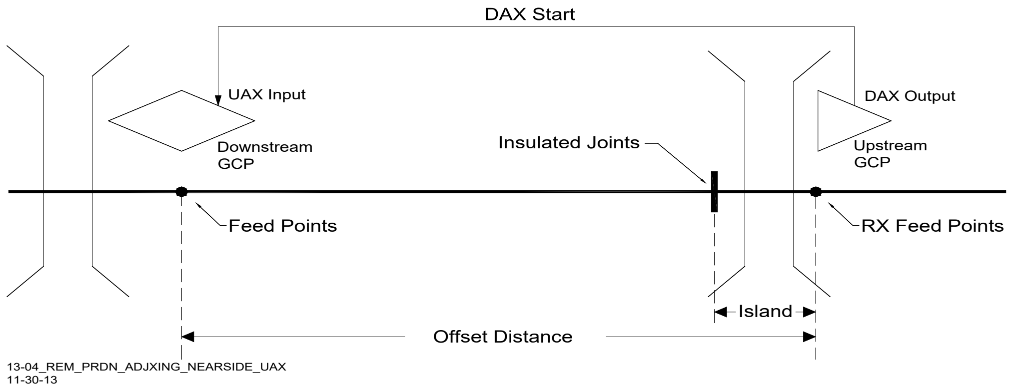


Figure 2-24: Remote Prediction From An Upstream Crossing – Joints On Near Side

2.16.5 DAX Offset Distance

The distance between the crossing feed points and the remote GCP 5000 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 SECTION 5.3, MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS.

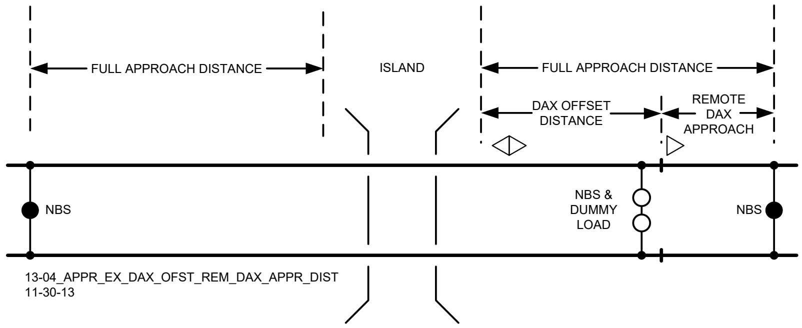


Figure 2-25: Approach Example with DAX Offset and Remote DAX Approach Distances

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 2-42. Primary surge protection for all I/O wiring between bungalows is shown in Figure 2-43.

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 2-44. SSCC surge protection is discussed in Appendix C.3.

2.18 TYPICAL APPLICATION DRAWINGS

This section provides drawings to show each of the following GCP 5000 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 Track Wire Surge Protection for 4 and 6 Wire Track Connections (Figure 2-42)
- Typical Surge Protection Requirements When Cabling Between Remote DAX Unit and Crossing Unit (Figure 2-43)
- Recommended Battery Surge Protection Wiring for GCP 5000s (Figure 2-44)

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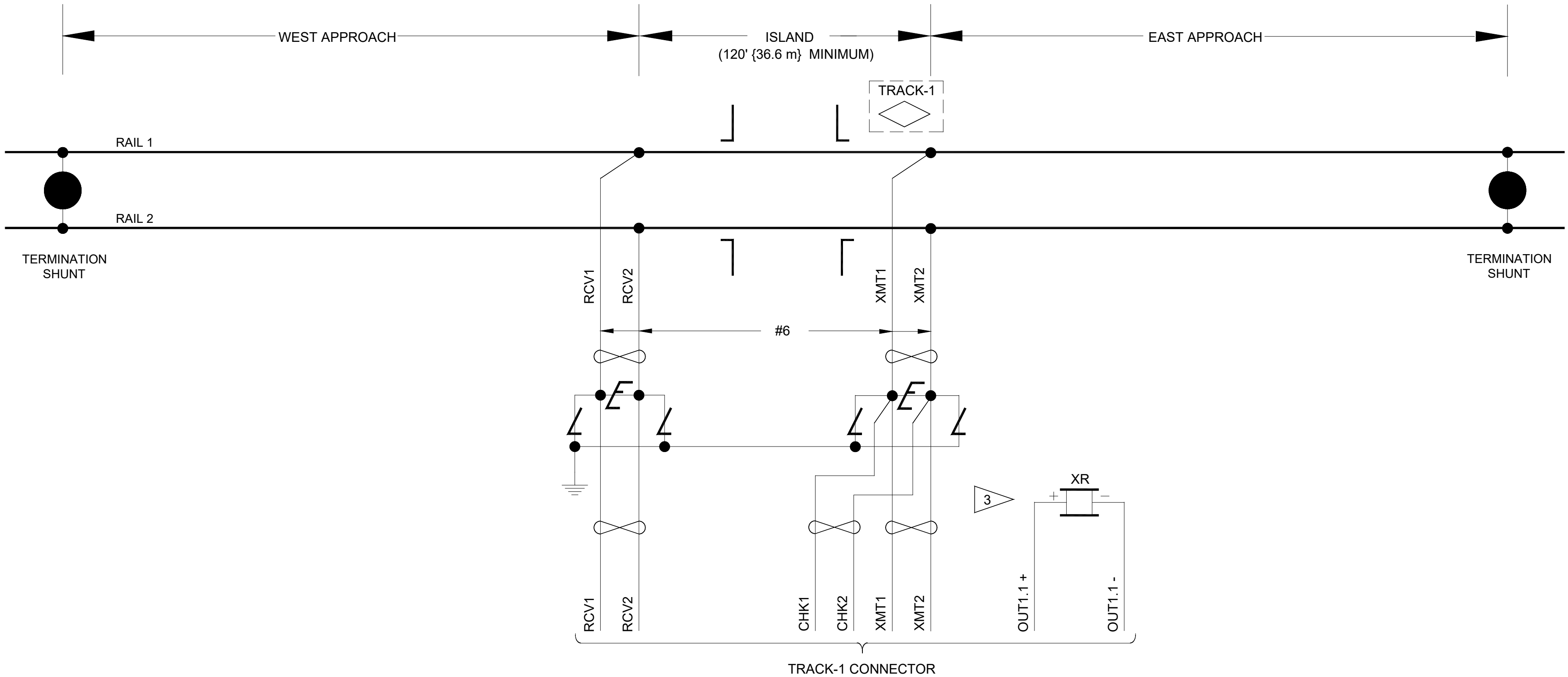


NOTES

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.

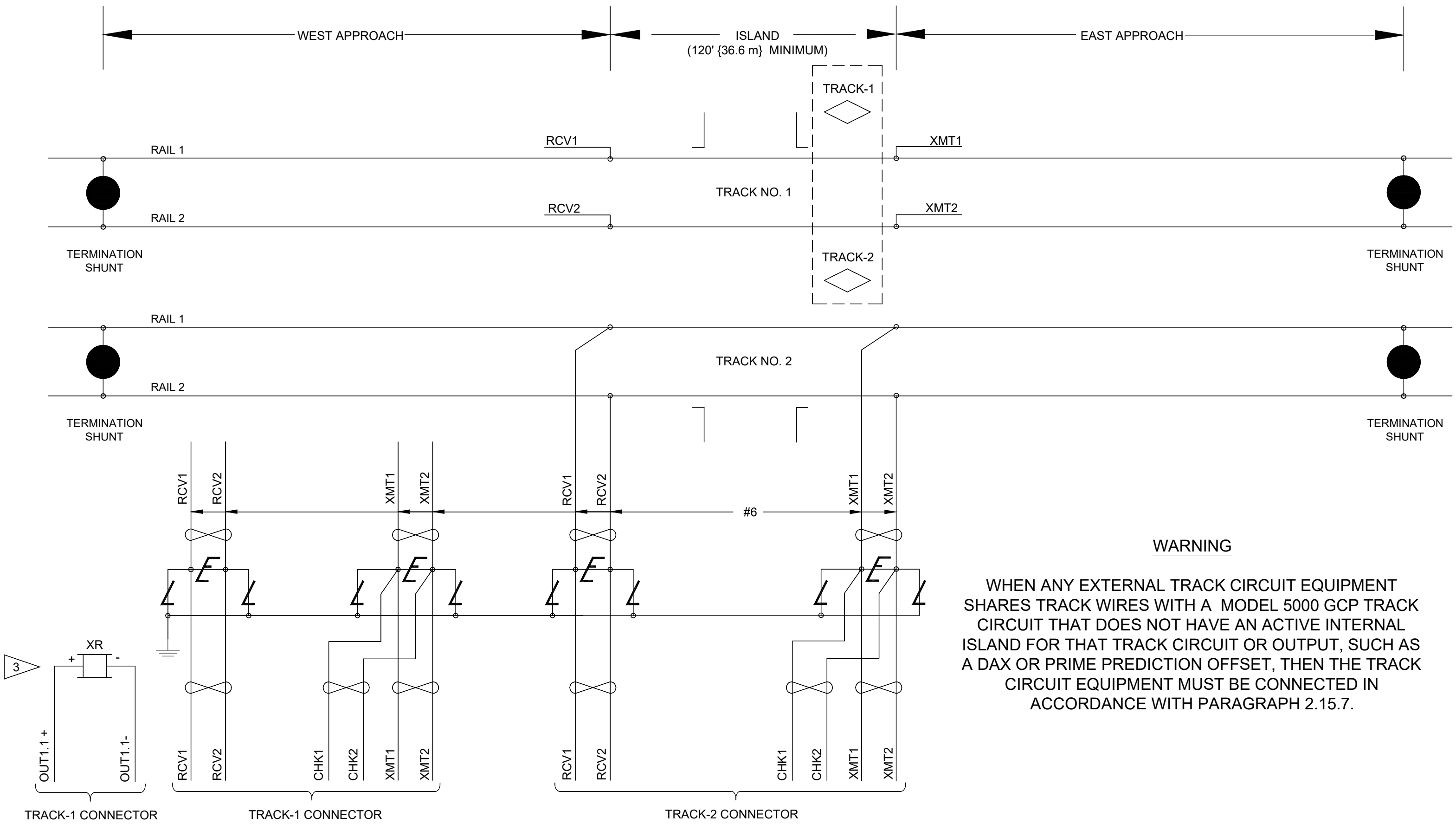
= BIDIRECTIONAL GCP

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



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.

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

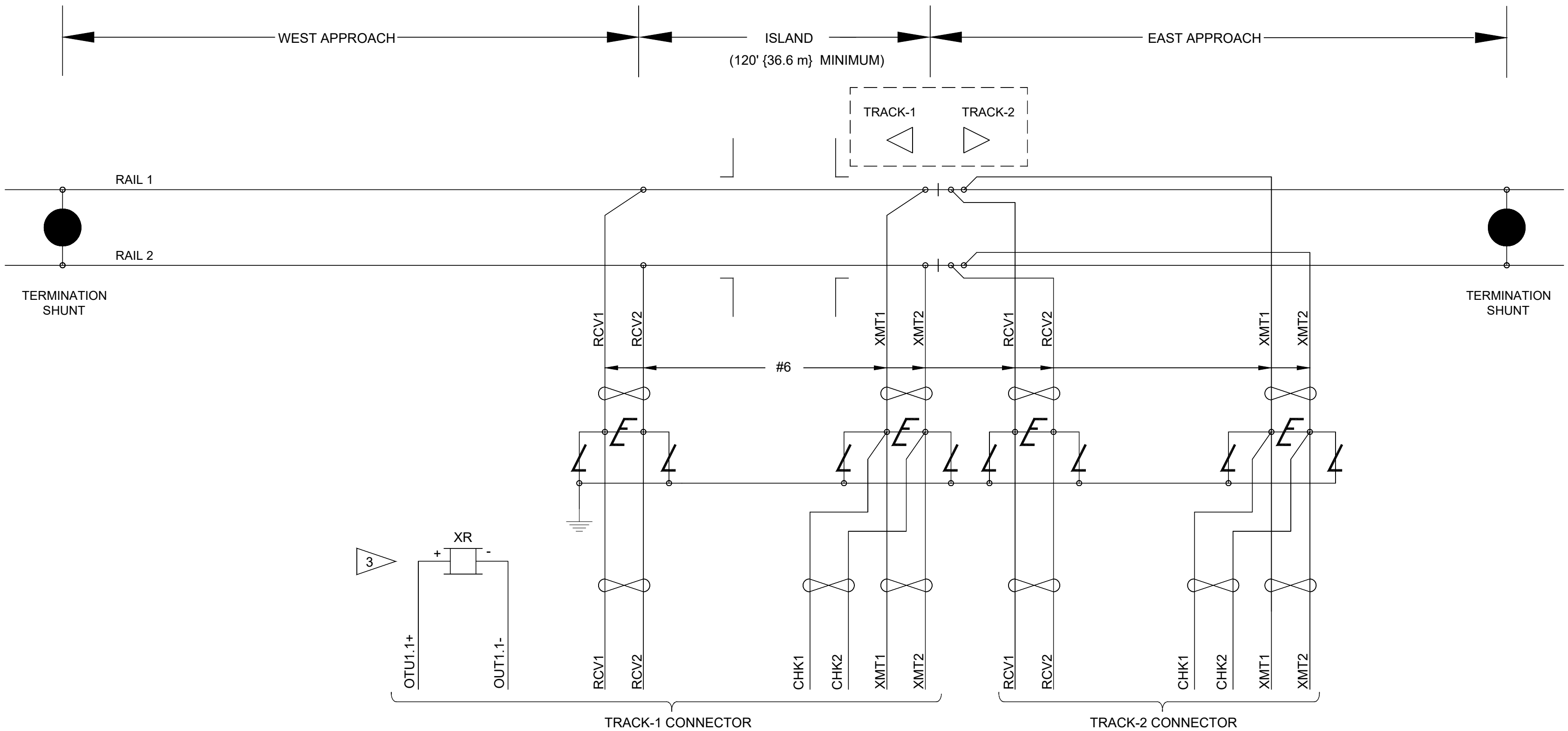
= 02270-1X EQUALIZER, H.D.

= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

13-04_TYP_2T_BIDRN_APP
09-10-13

Figure 2-27: Typical 2 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.

13-04_TYP_1T_B2B_UNI_APPL
09-10-13

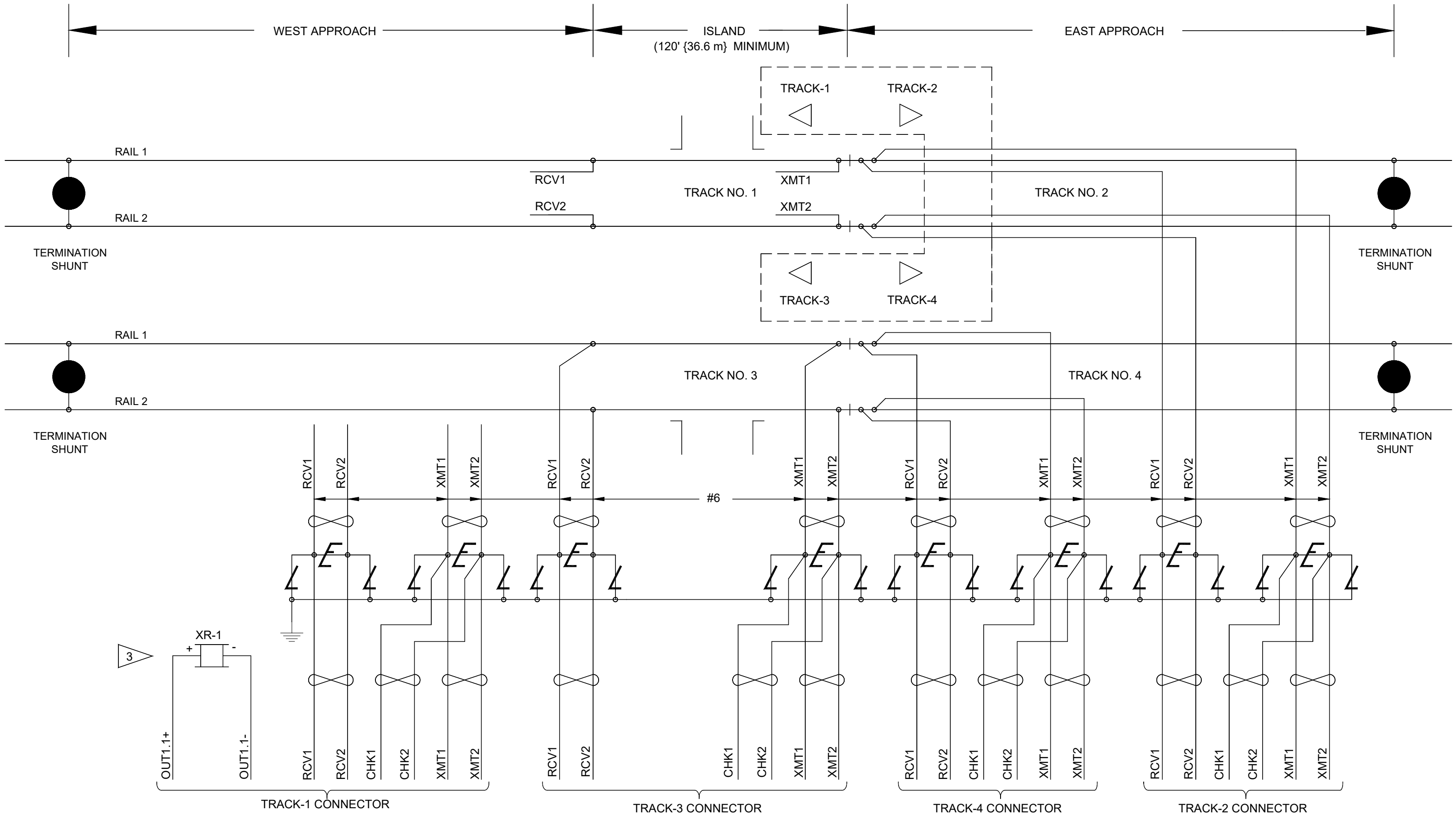
LEGEND

- = 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 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.

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.

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10-21-13

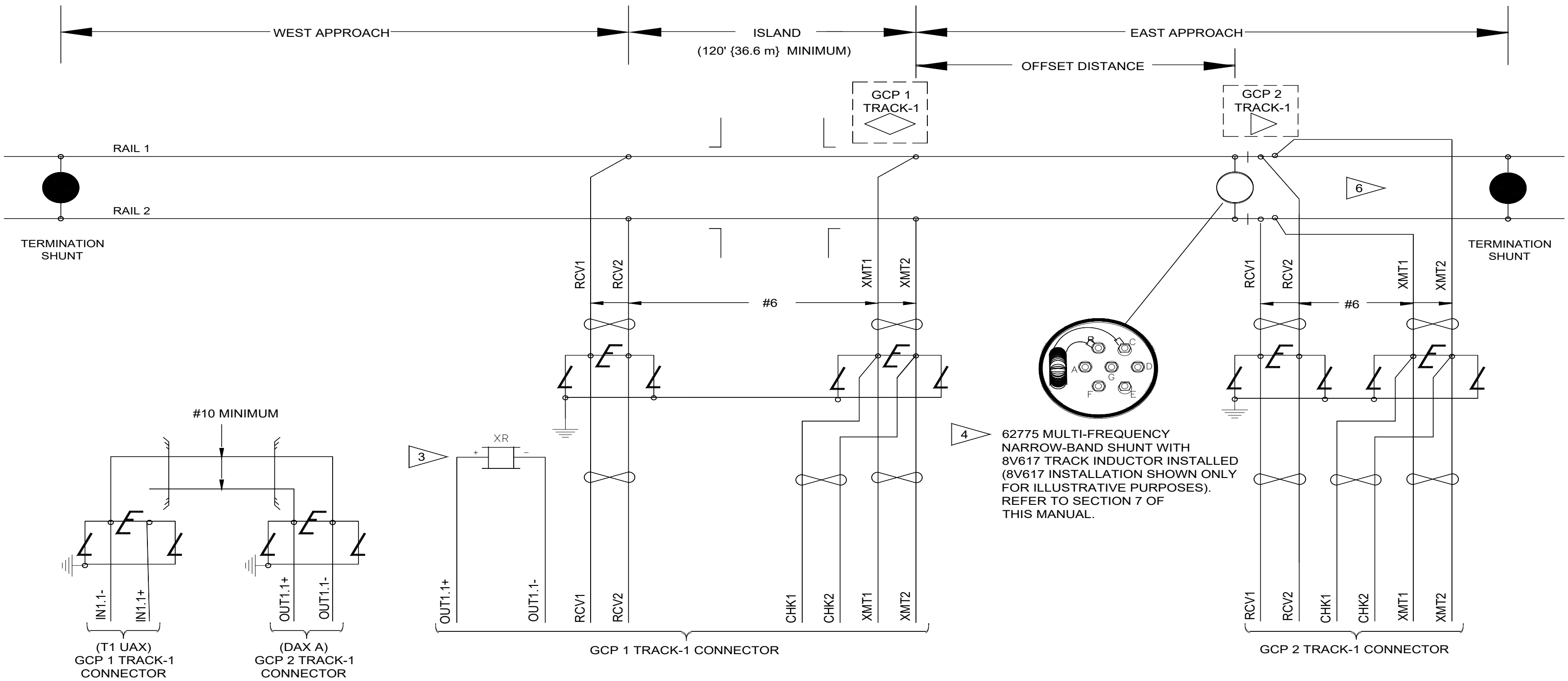
LEGEND

= 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 2 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

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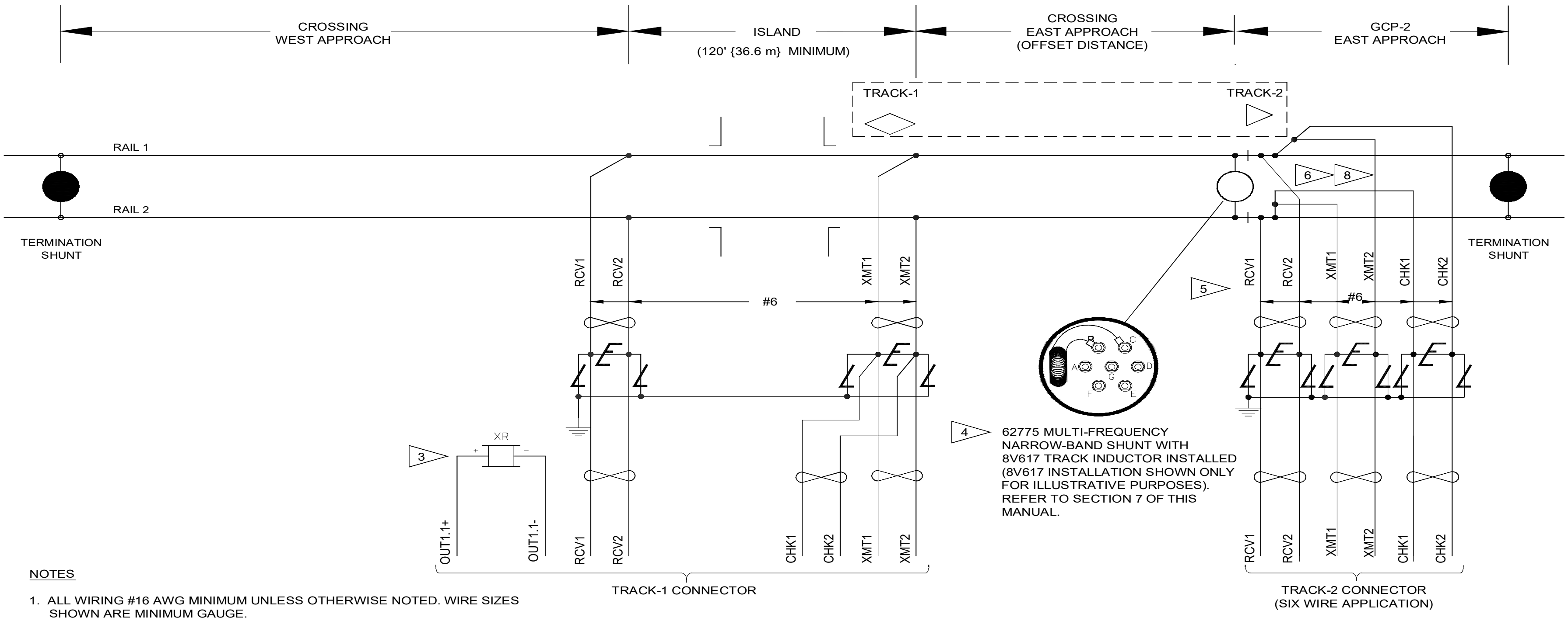
11-22-13

Figure 2-30: Typical Single Track, Bidirectional, & 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

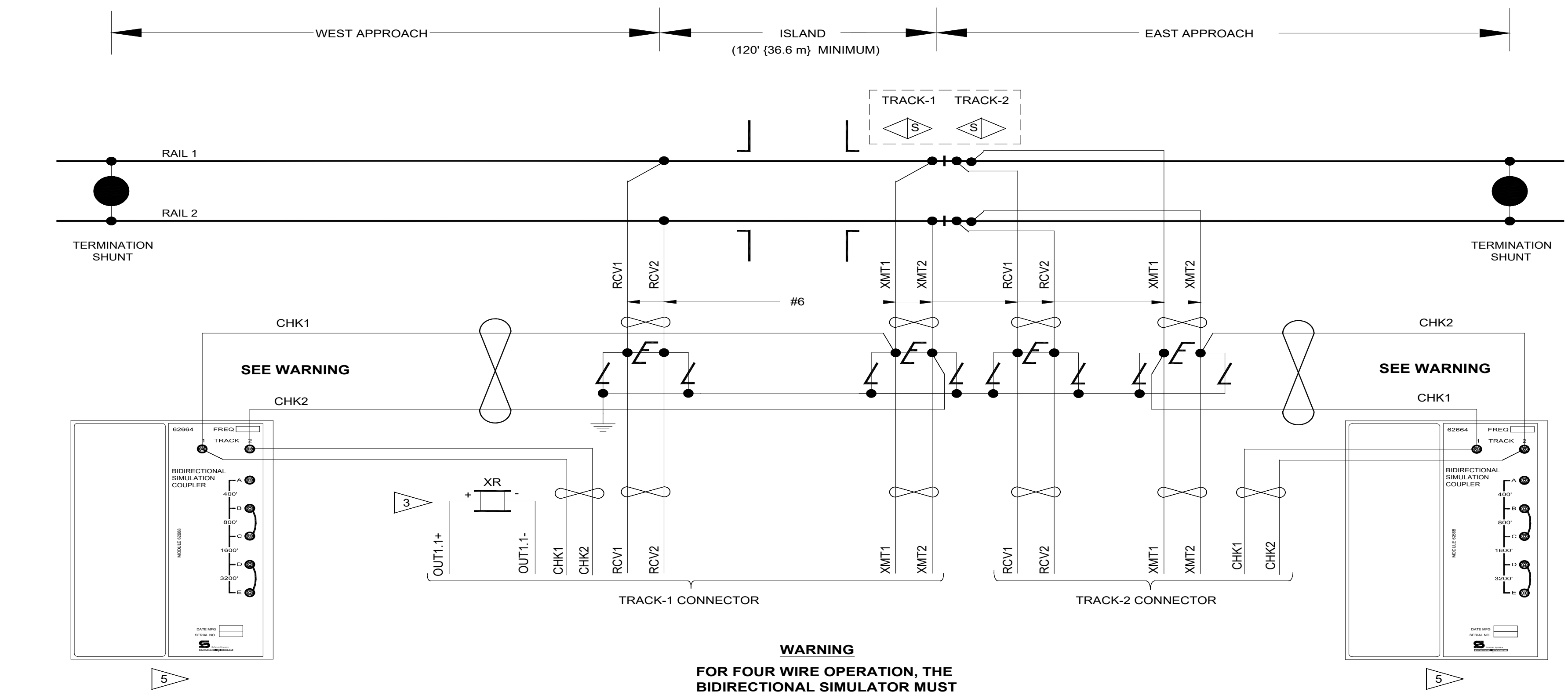
WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 5000 GCP TRACK CIRCUIT THAT DOES NOT HAVE AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH 2.15.7.

LEGEND

- (twist symbol) = TWIST TWO TURNS PER FOOT
- (E symbol) = 02270-1X EQUALIZER, H.D.
- (arrester symbol) = 02585-1X ARRESTER, H.D.
- (diamond) = BIDIRECTIONAL GCP
- (triangle) = UNIDIRECTIONAL GCP

13-04_1T_BIDRN_RST6W_UNI_APPL_1CASE
11-22-13

Figure 2-31: Typical Single Track, Bidirectional, & Remote Single Track (6 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

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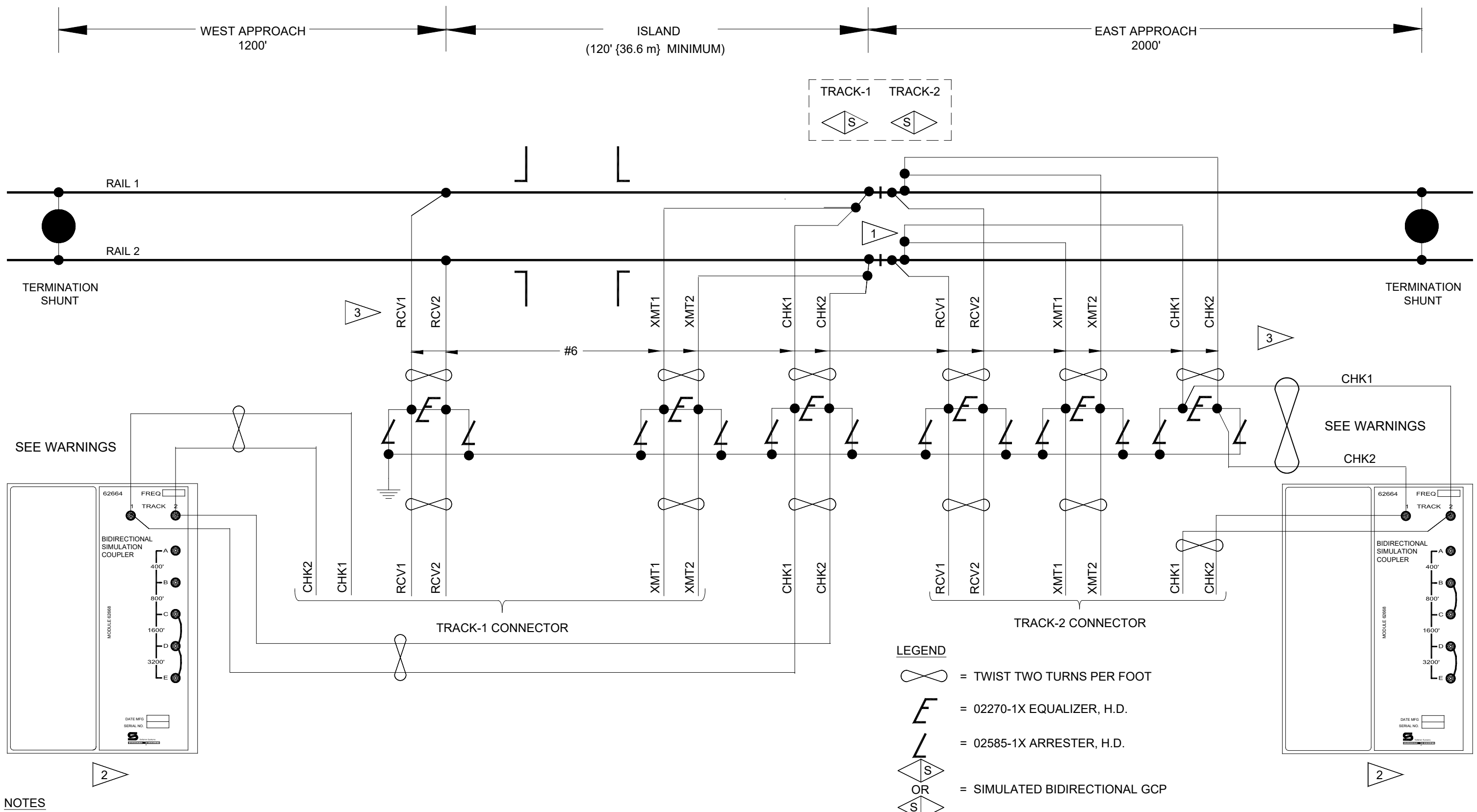
Figure 2-32: Typical Single Track, Back-to-Back, Unidirectional, in Simulated Bidirectional Operation Application



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

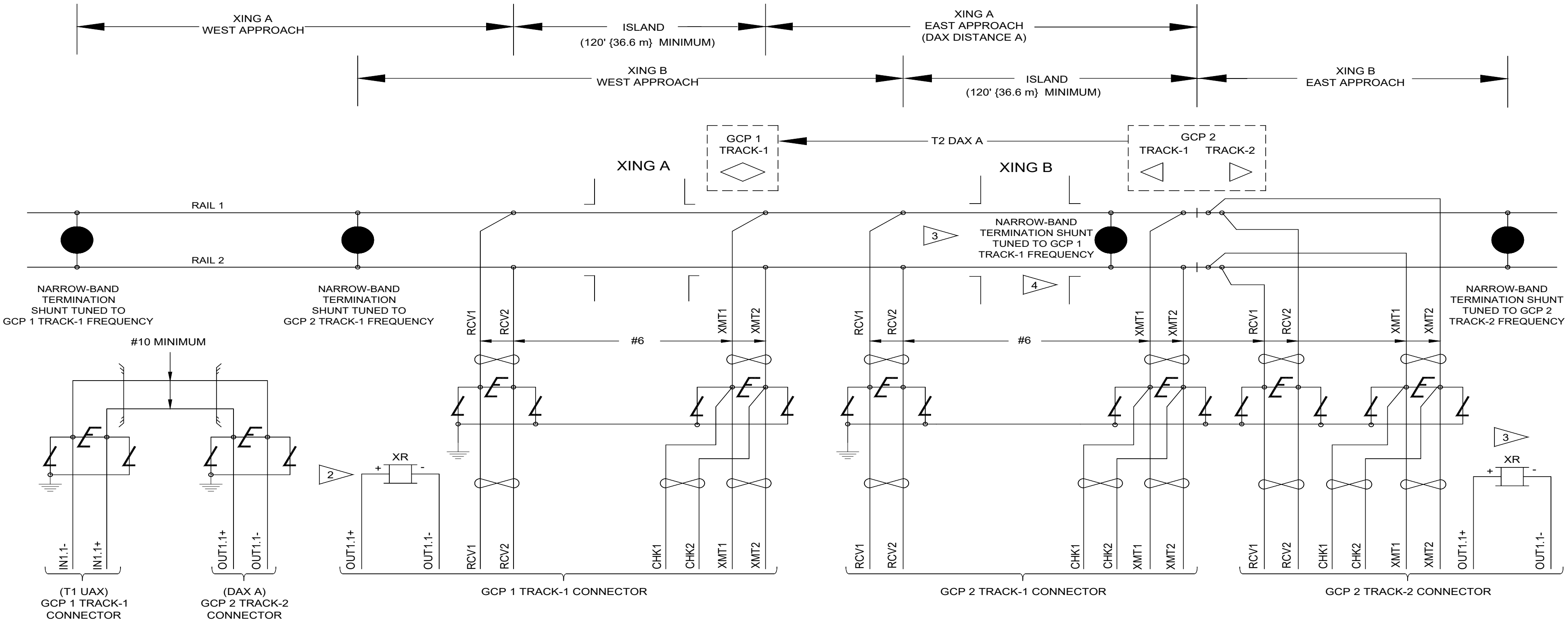
WARNING

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, 6 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.

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

13-04_TYP_1T_2OVERLAPPING_XINGS_REMPDR_APPL
11-30-13

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

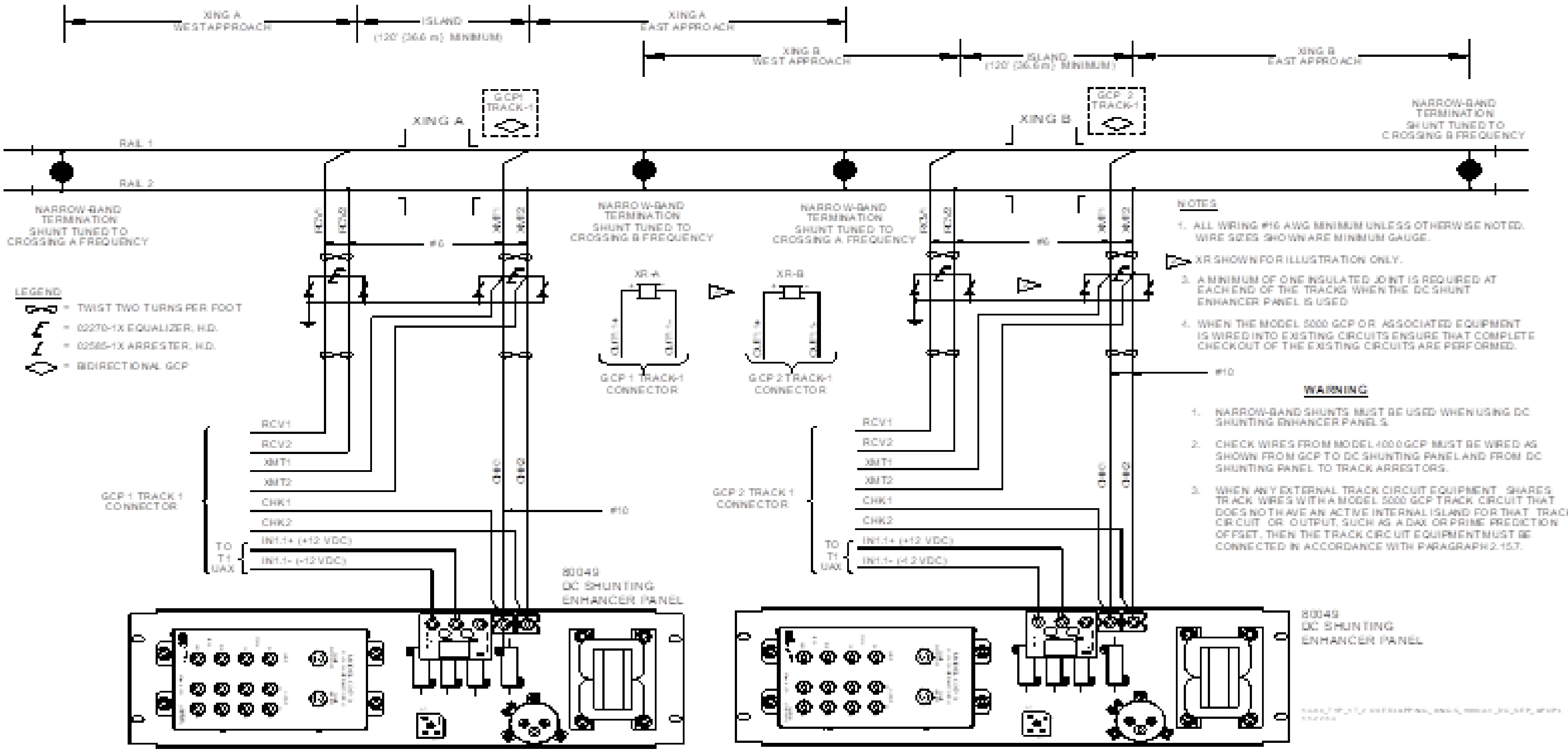
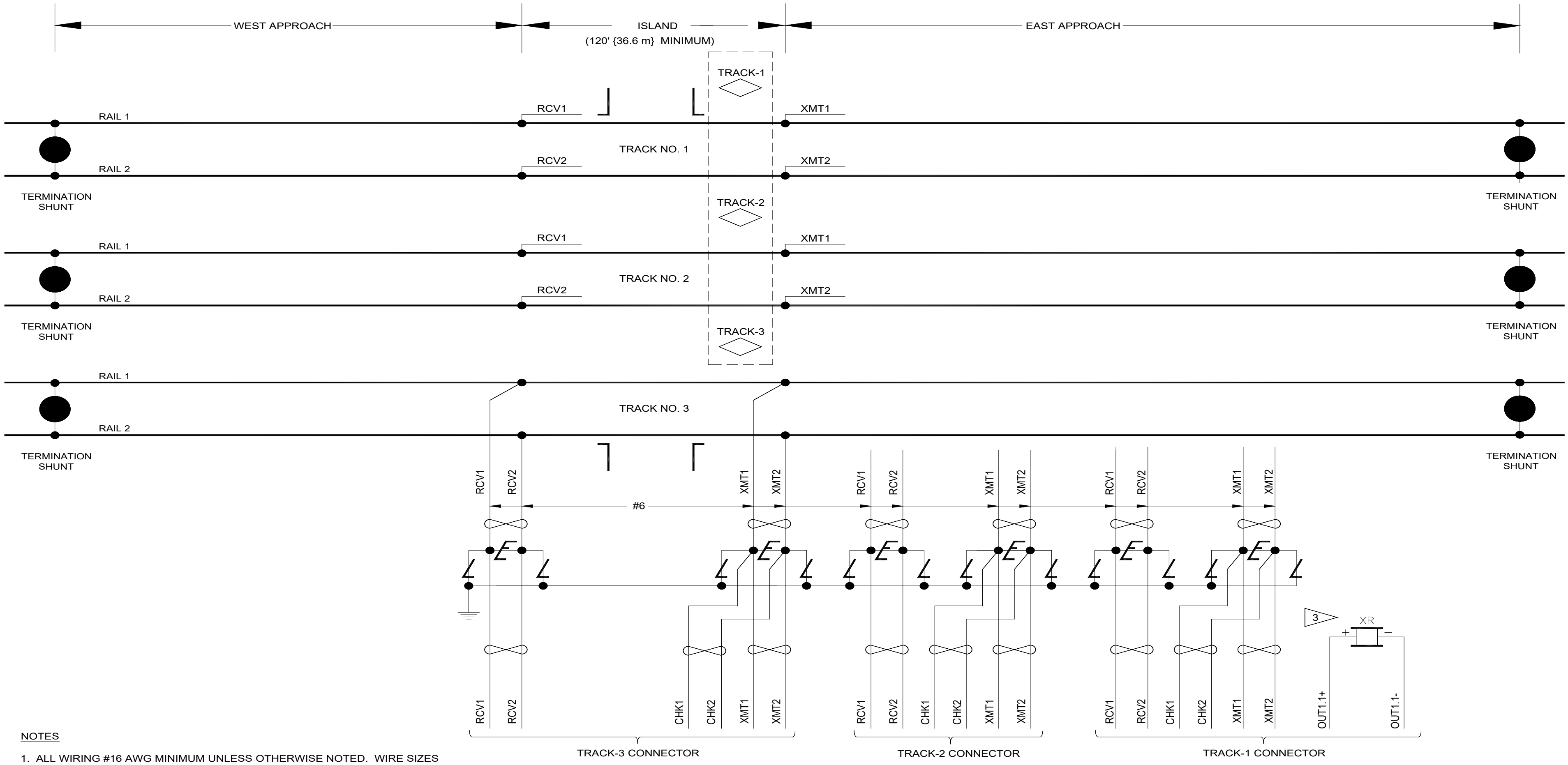


Figure 2-35: Typical Single Track, 2 Overlapping Crossings, using 80049-1 DC Shunting Enhancer Panels Application



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.

LEGEND

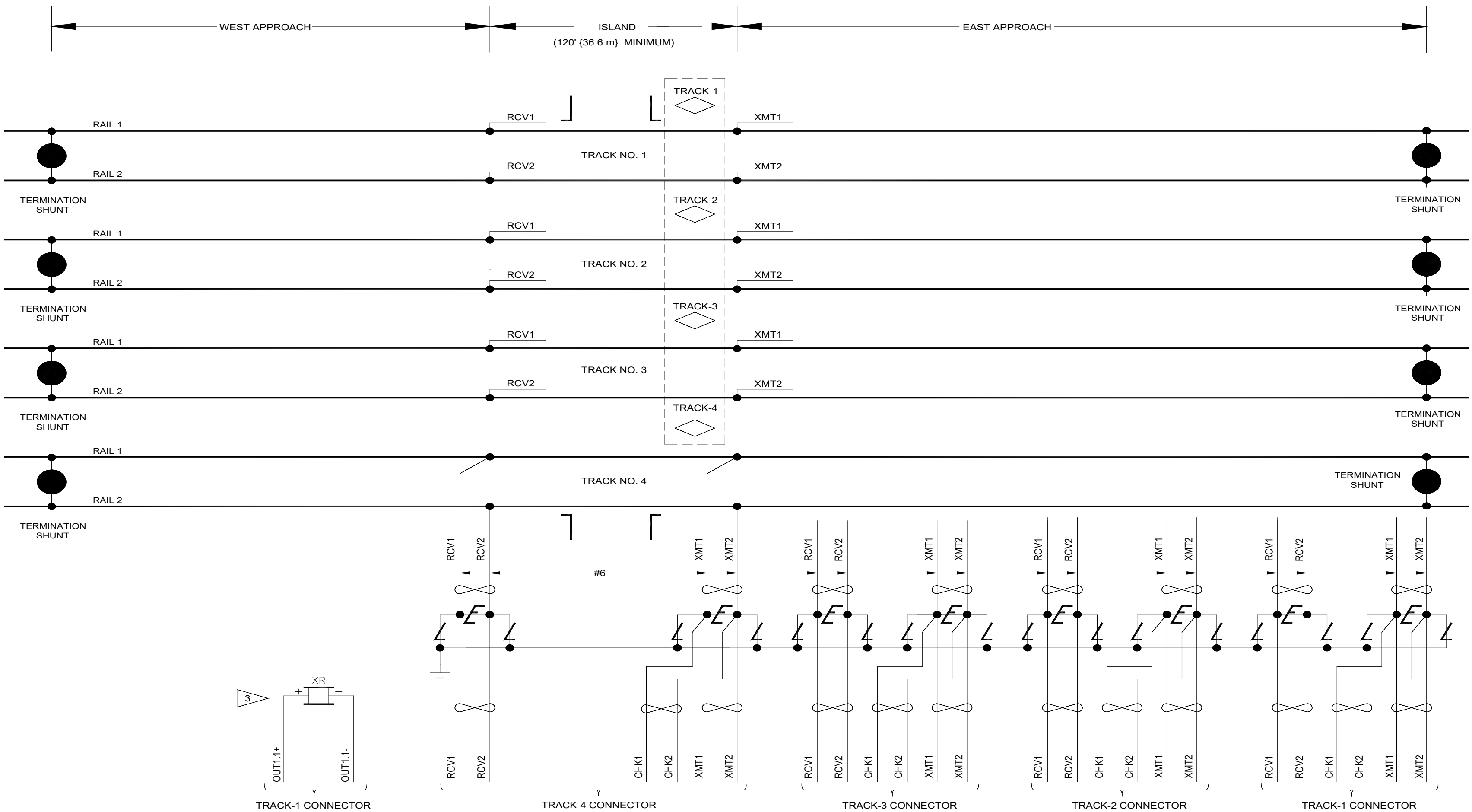
= TWIST TWO TURNS PER FOOT
= 02270-1X EQUALIZER, H.D.
= 02585-1X ARRESTER, H.D.
= BIDIRECTIONAL GCP

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_3T_BIRDN_APPL
11-22-13

Figure 2-36: Typical 3 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

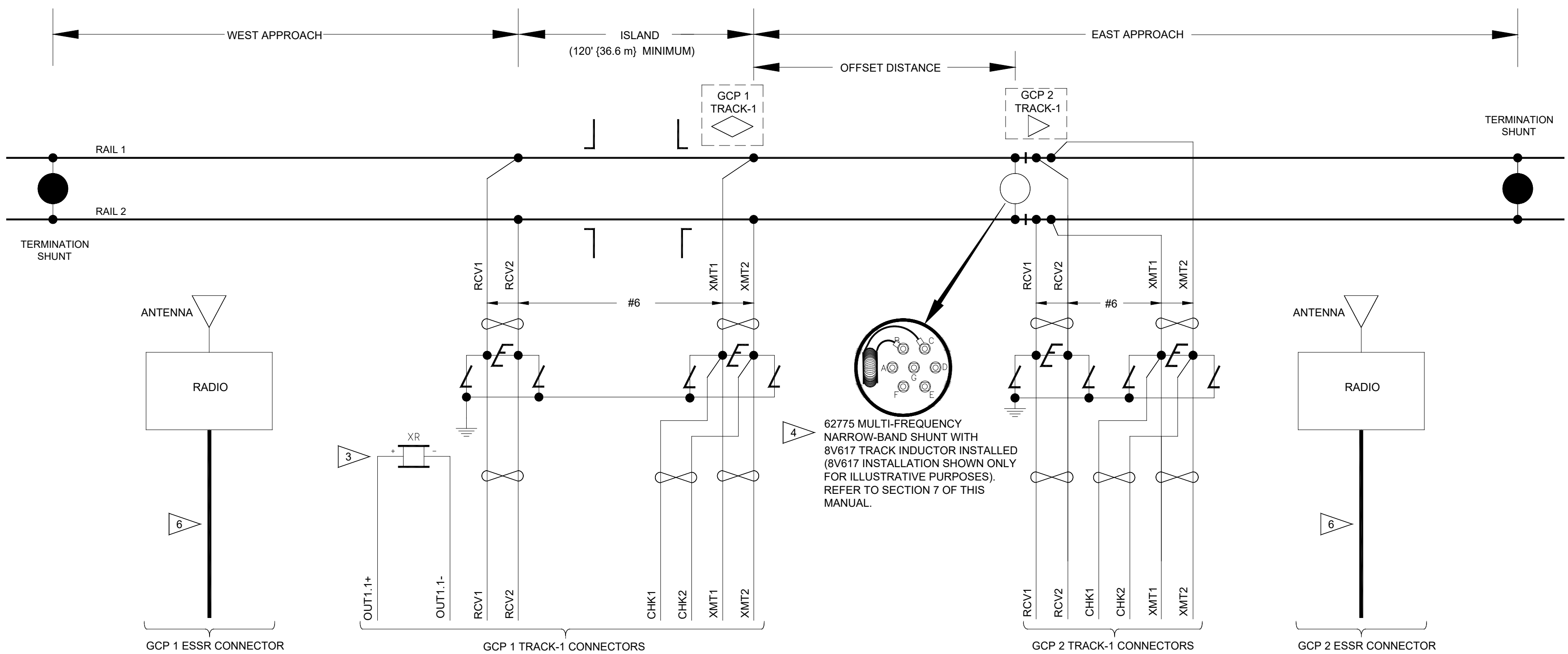
= TWIST TWO TURNS PER FOOT
= 02270-1X EQUALIZER, H.D.
= 02585-1X ARRESTER, H.D.
= BIDIRECTIONAL GCP

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 4 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)

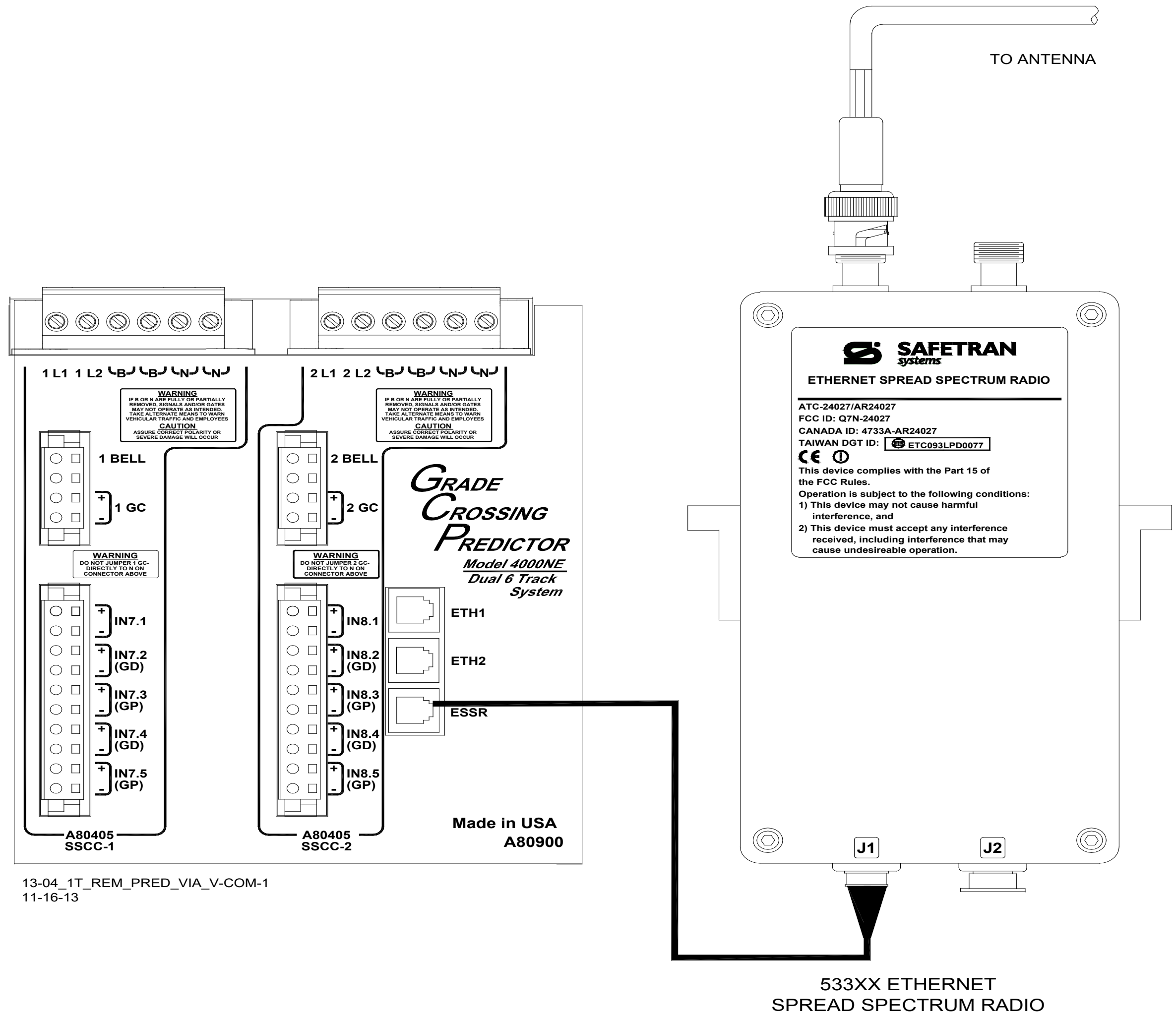
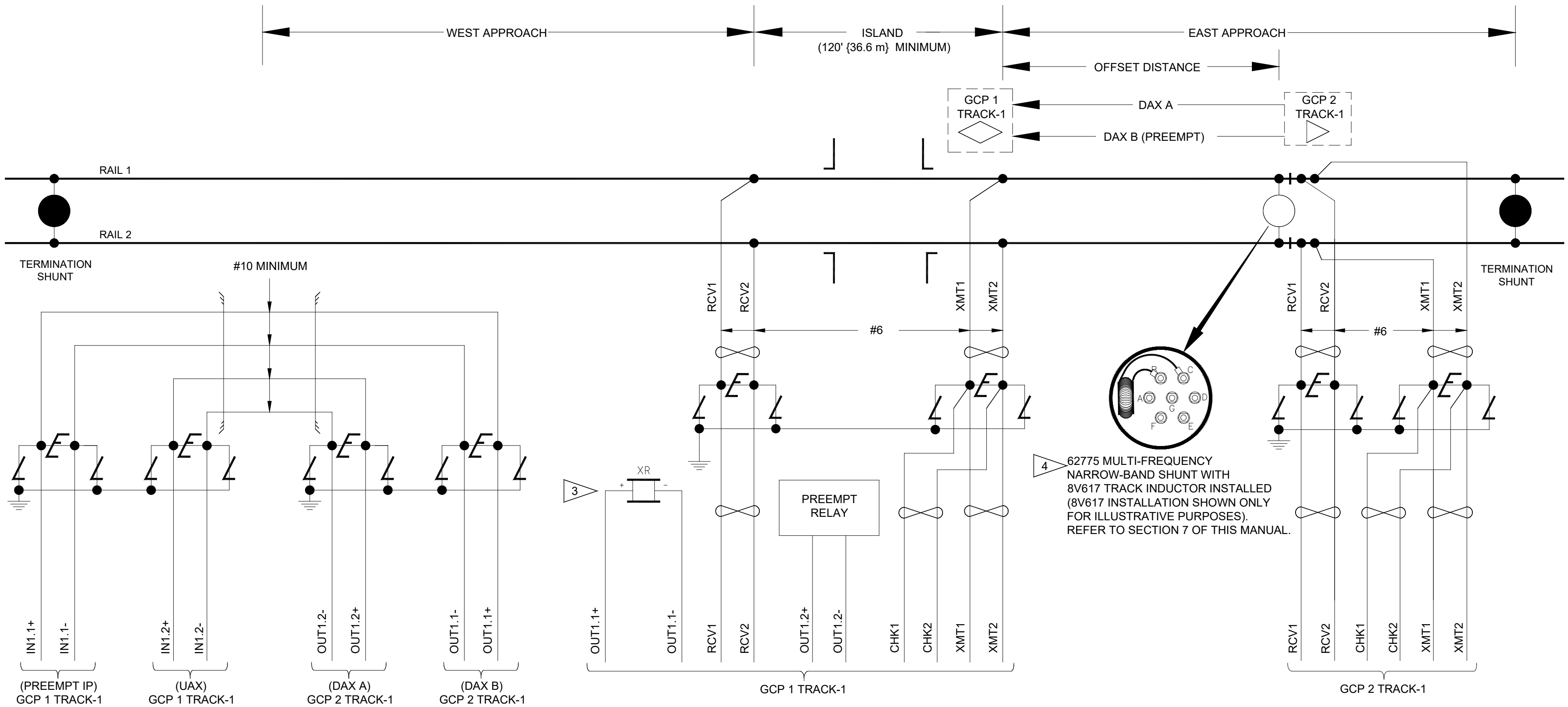


Figure 2-39: Single Track, Remote Prediction via ESSR (Sheet 2 of 2)



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.

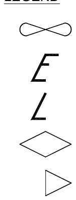
4 8V617 SIMULATED TRACK INDUCTOR IS REQUIRED ONLY IF DISTANCE TO THE INSULATED JOINTS (OFFSET DISTANCE) IS 90 PERCENT OR LESS OF EAST APPROACH DISTANCE.

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

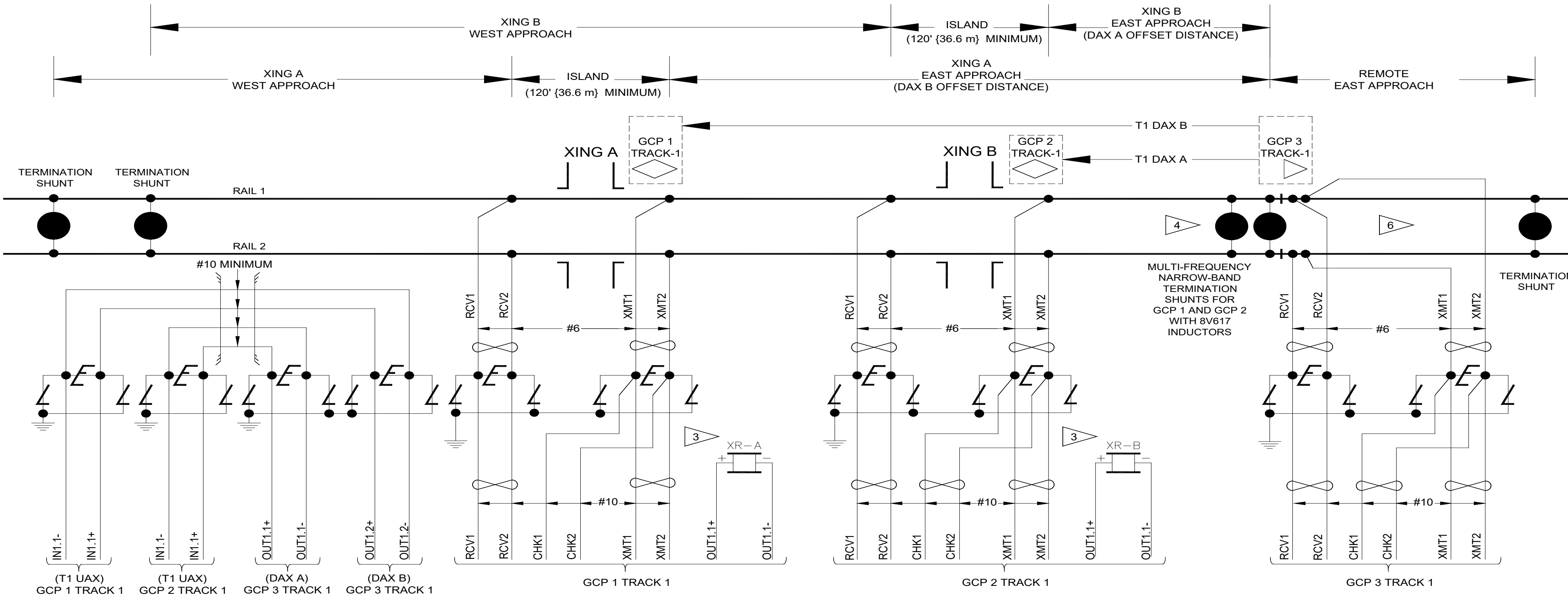
WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 5000 GCP TRACK CIRCUIT THAT DOES NOT HAVE AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH 2.15.7

LEGEND



13-04_1TR_REM_PRDN_W_ADV_PREEPMTION
11-22-13

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

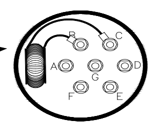


NOTES

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 2 Overlapping Bidirectional Crossings Application

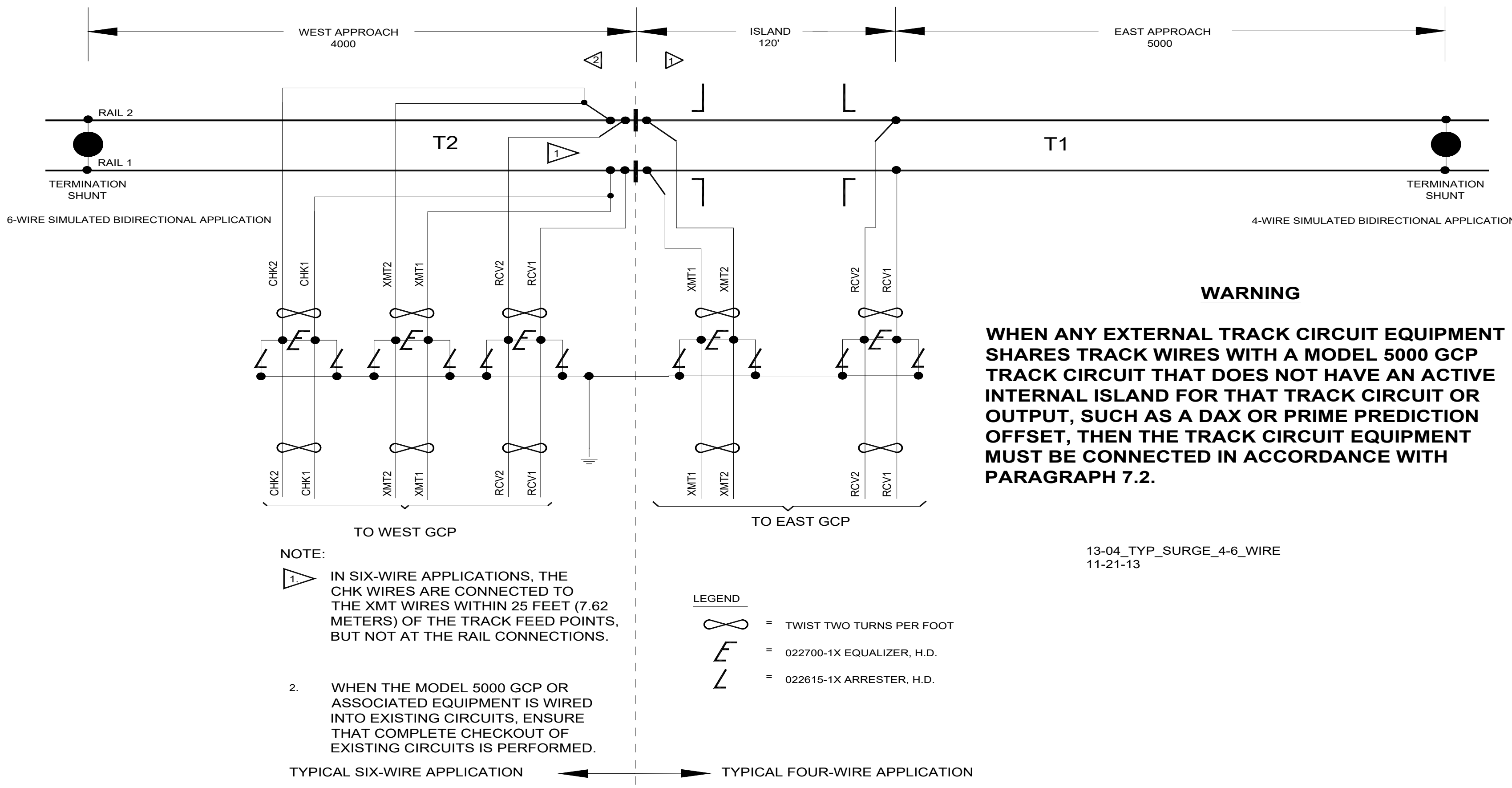


Figure 2-42: Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections

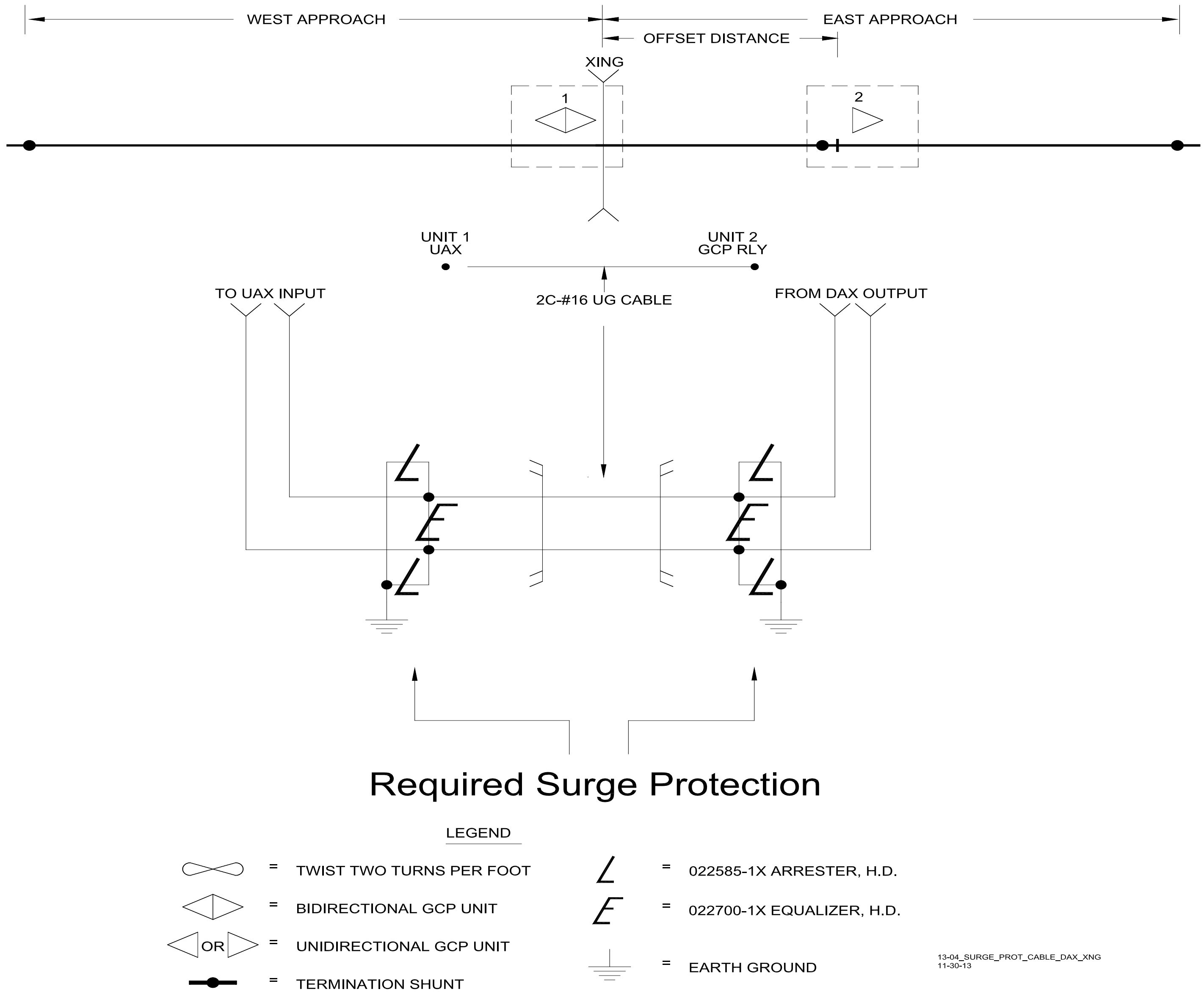


Figure 2-43: Typical Surge Protection Requirements When Cabling between Remote DAX Unit and Crossing Unit

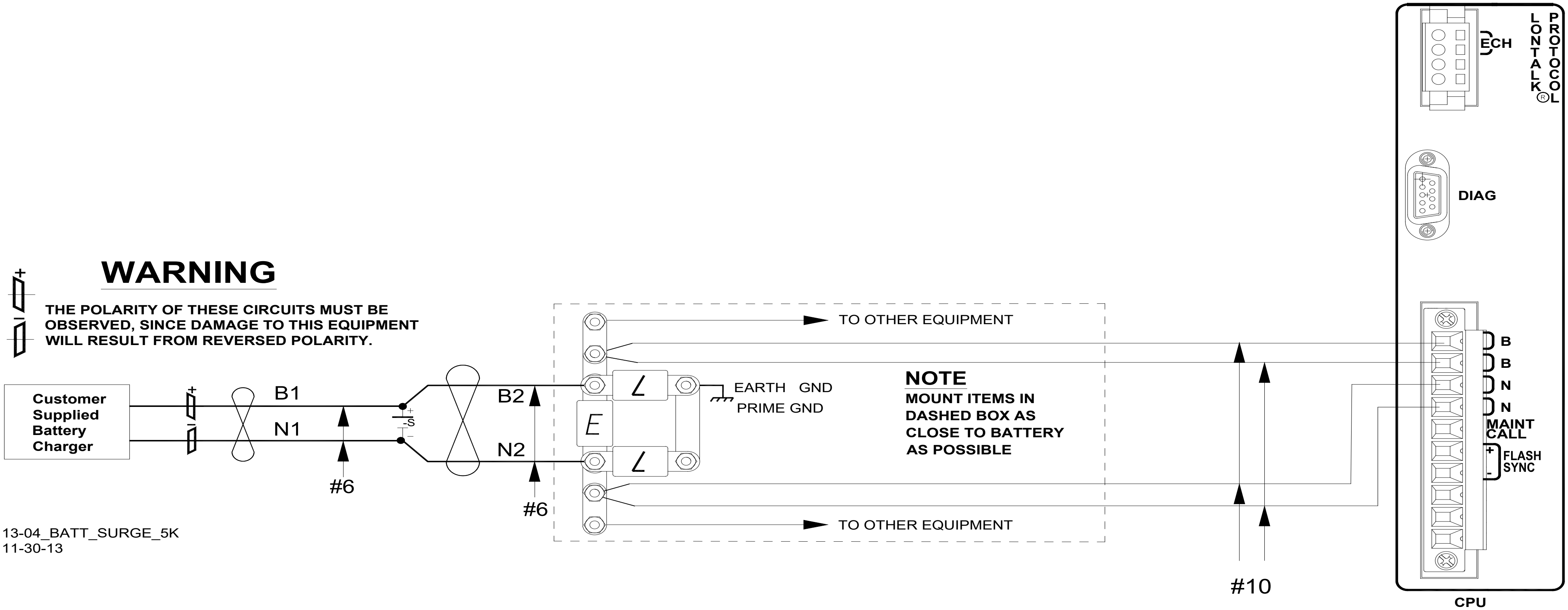


Figure 2-44: Recommended Battery Surge Protection Wiring for GCP 5000s

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SECTION 3 – DISPLAY MENU SCREENS AND OFFICE CONFIGURATION EDITOR

SECTION 3 DISPLAY MENU SCREENS AND OFFICE CONFIGURATION EDITOR

3.1 DISPLAY MODULE (80485)

The display provides the user interface that allows:

- GCP 5000 configuration:
  - Upload a configuration package (PAC) file to the CPU II+/CPU III from the Display's USB drive, or from the Web User Interface (Web UI).
  - Download the configuration package (PAC) file from the CPU II+/CPU III and save it on the Display's USB drive or to the user's PC via the Web User Interface (Web UI).
- Software Installation, to include the following types of software:
  - Master Configuration File (MCF) to the CPU II+/CPU III 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

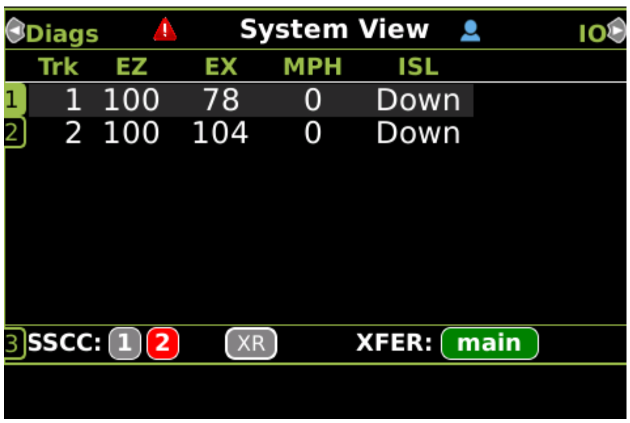

Figure 3-1: System View Screen

The System View screen provides information regarding the status of:

- Each active track in the Track Data section.
- Each active SSCC module, as well as the status of the XR Logic, on the bottom line of the screen (SSCC Data section).

3.2.1.1 Track Data Section

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 inside 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 (or KPH if the unit is set for metric units)
- Island Status
- Additional Information
  - "W"= Wrap
  - "ed"= Enhanced Detection activated
  - "m"= Motion Sensor Restart activated
  - "OOS"= Out of Service

3.2.1.2 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 Logic.

3.2.2 IO & Logic View Screen

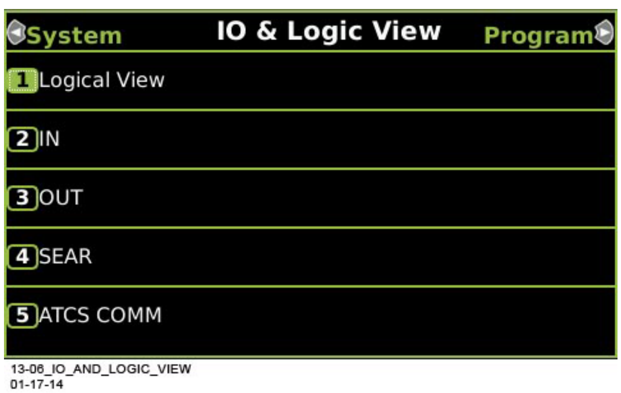

Figure 3-2: IO & Logic View Screen

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

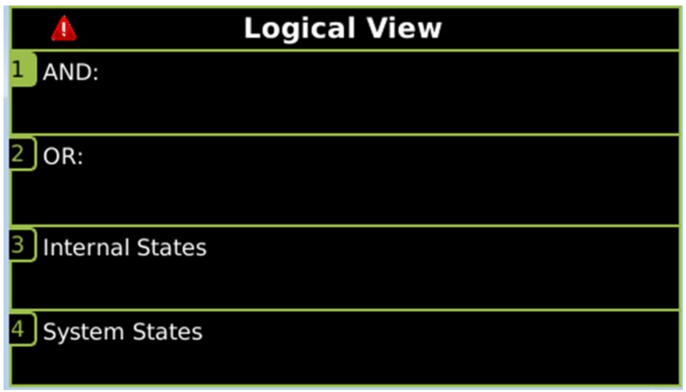

Figure 3-3: I/O & Logic View Menu

3.2.2.2 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. The Logic Detail – AND screen shows the state of the AND outputs, as shown in the following figure. The possible colors of the indicators are defined as follows:

- white - not used
- grey - off
- green - on
- red - unhealthy

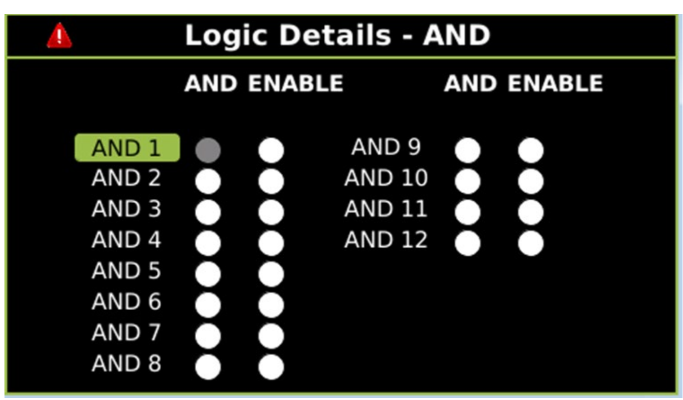

Figure 3-4: Logic Details - AND

Use the arrow keys on the Display module to select the AND and press **Enter**. This will bring up the logic diagram showing what terms contribute to the selected AND output. For example, the following figure shows that AND 1 is an "AND" of the T1PrimeA, T2PrimeA, and the XngTest. Red indicates that the coil or contact is de-energized, green indicates that it is energized. So, in this example AND1 is de-energized because T2PrimeA is de-energized.

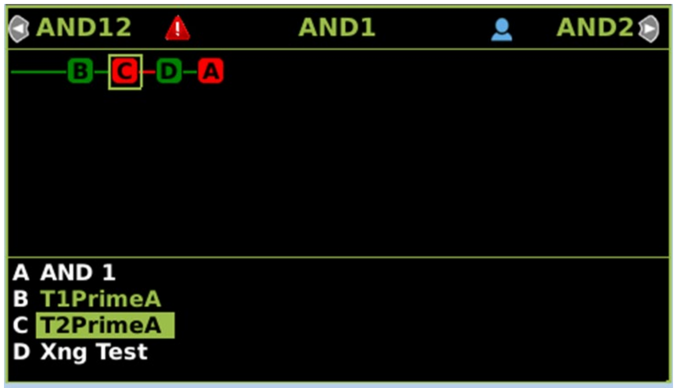

Figure 3-5: AND Logic Example

If the name of the output in the bottom panel is shown in green, it is a selectable term. To select, press the **Enter** button and the relay diagram for this item will appear.

Troubleshooting with Logic Detail View

The Web User interface also shows the relay logic view

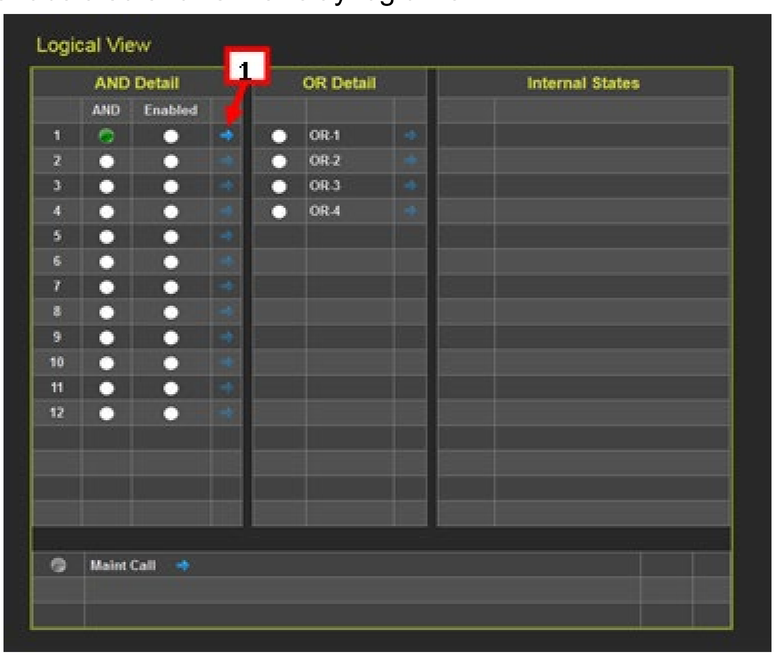

Figure 3-6: CPU III Web UI – Status Monitor Menu – Logical View

This screen shows the relay view and can be used in troubleshooting to see what is causing a particular output to be deenergized.

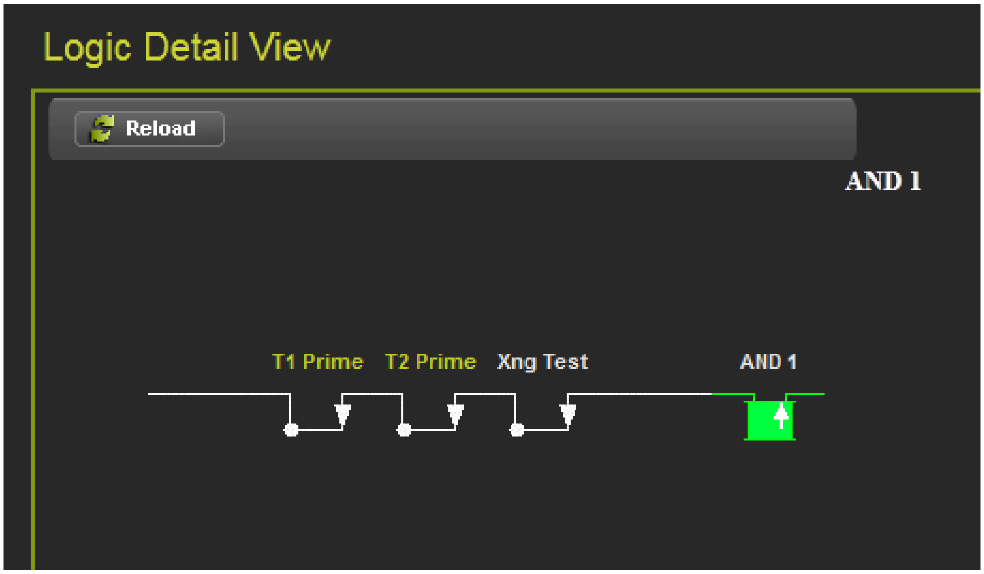

Figure 3-7: CPU III Web UI – Status Monitor Menu – Logical View – Logical View Detail

Using the Logic Detail View the user can locate the problem area when system problems occur. In the example in Figure 3-8, the first screen shows that the AND 1 is de-energized, as indicated with the icon being red. Review of the logic indicates T1PrimeA on Track 1 is de-energized. Highlighted text on the logic switch indicates that the user can click on that text and move deeper in the logic and see the detailed circuit for that switch which is shown in the second screen.

The second screen shows Track 1 Prime UAX is de-energized (note that the text is not highlighted so another level is not available). The Island 1 text is highlighted so another level can be accessed as shown in the third screen. The Island 1 logic is energized, and the Island 1 icon is green.

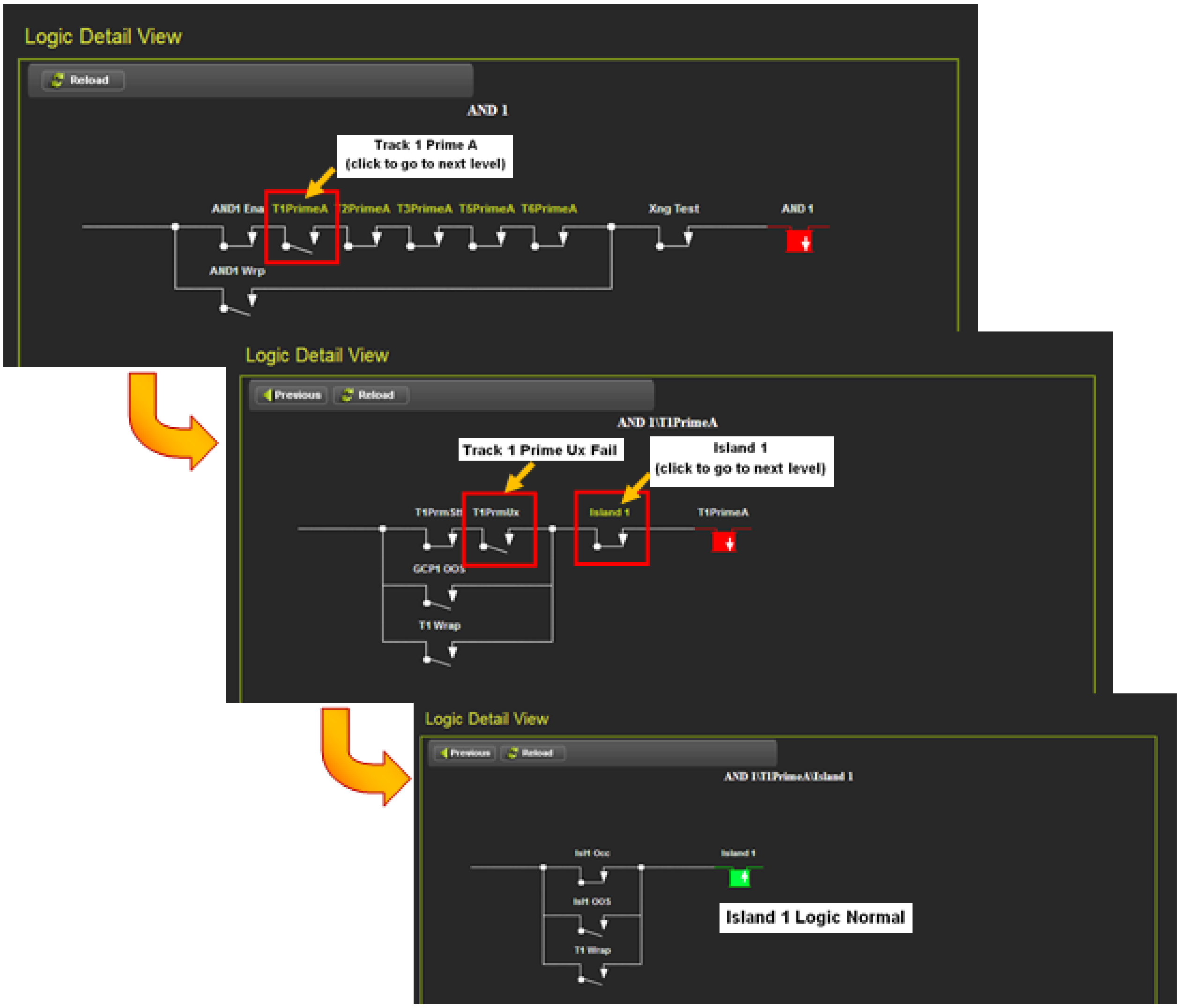

Figure 3-8: Logic View Troubleshooting Example

Logic View Example with a Timer

Logic switches with an hourglass indicate a timed switch controlled by a user defined timer. Figure 3-9 shows a timed logic switch. The top screen shows the drop delay relay, and the bottom screen shows the pick-up relay. The user can view the switch state change when the logic switch times out.

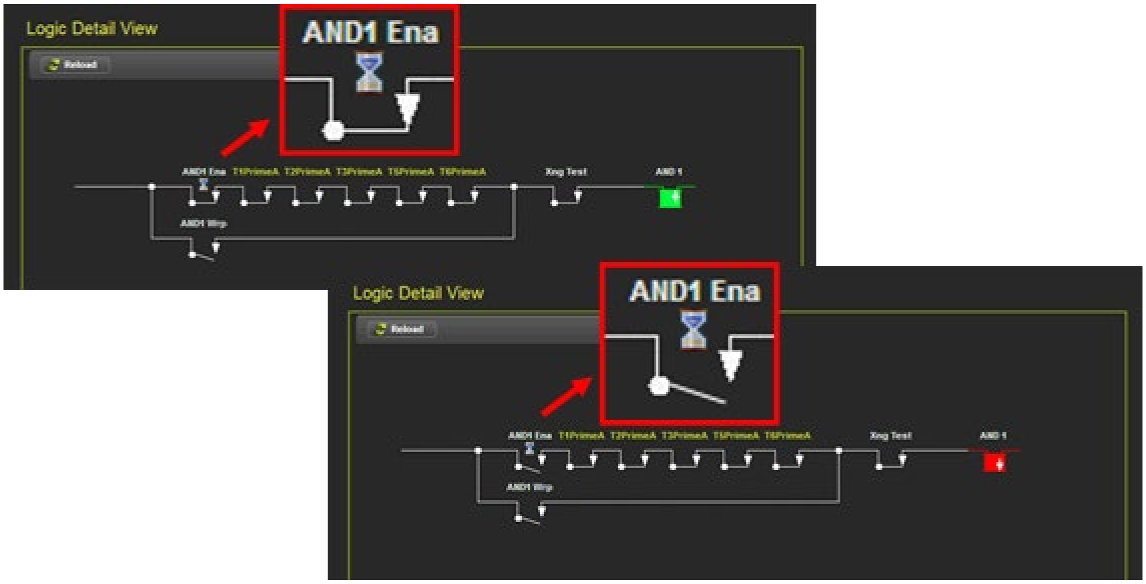

Figure 3-9: Logic View Example with a Timed Logic Switch

Logic View – Maintenance Call

The user can view the System States on the Logical View screen. In the example shown in Figure 3-10 the Maintenance Call is shown in the System States, clicking on the arrow will bring up the Logic Detail View screen. In this example the SEAR unit indicates a problem.

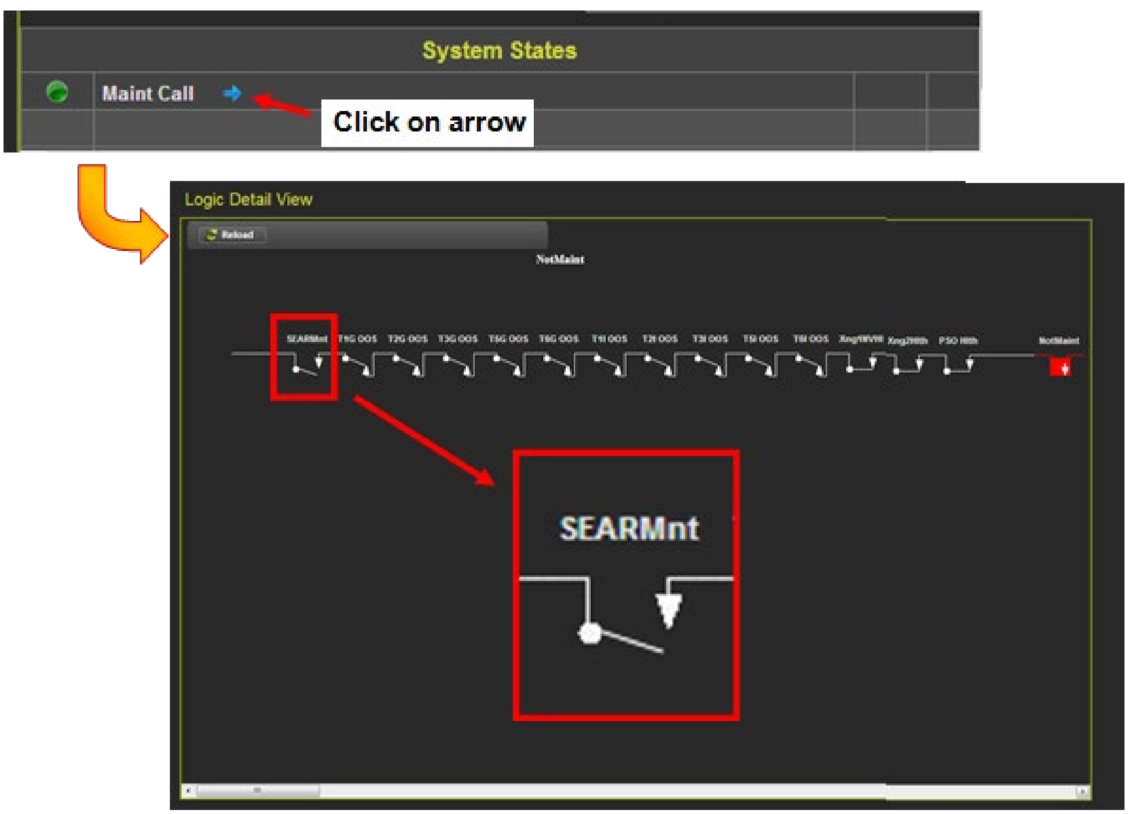

Figure 3-10: System States Logic Detail View

3.2.2.3 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. The Logic Details - OR screen shows the state of the OR outputs.

Figure 3-11: Logic Details - OR

Use the arrow keys to select a used OR, then press **Enter** to show the logic equation for the OR.

Figure 3-12: OR Logic Example

Similar to the AND logic equation, if the terms in the window at the bottom are green, they can be selected to show their specific equations.

3.2.2.4 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.

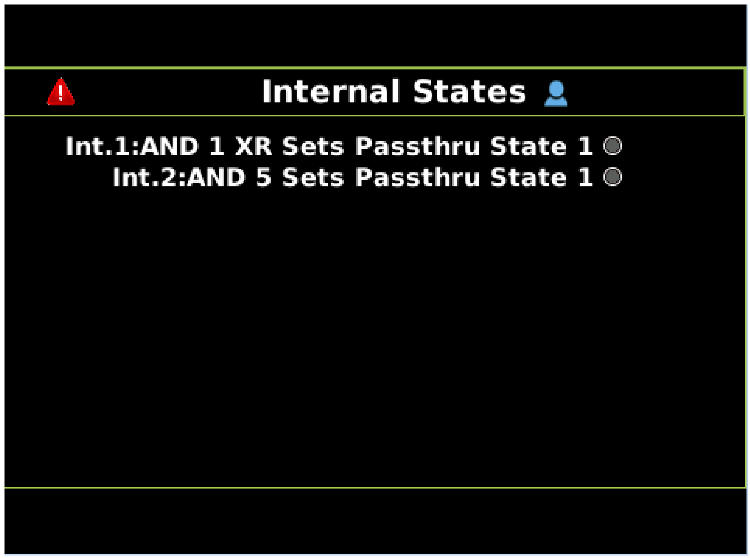

Figure 3-13: Internal States Screen

3.2.2.5 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.

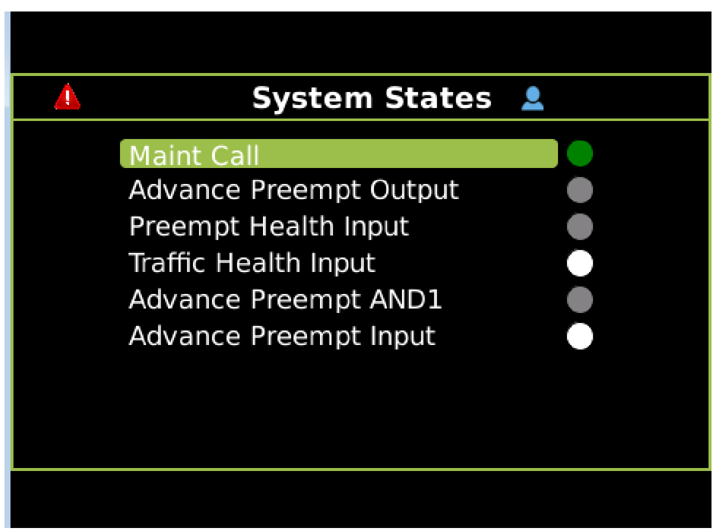

Figure 3-14: System States Screen

Logic View – Maintenance Call

The user can view the Maintenance call from the System States View screen. In the example shown in Figure 3-15 the Maintenance Call is shown on the Web UI in the System States, clicking on the arrow will bring up the Logic Detail View screen. In this example the SEAR unit indicates a problem.

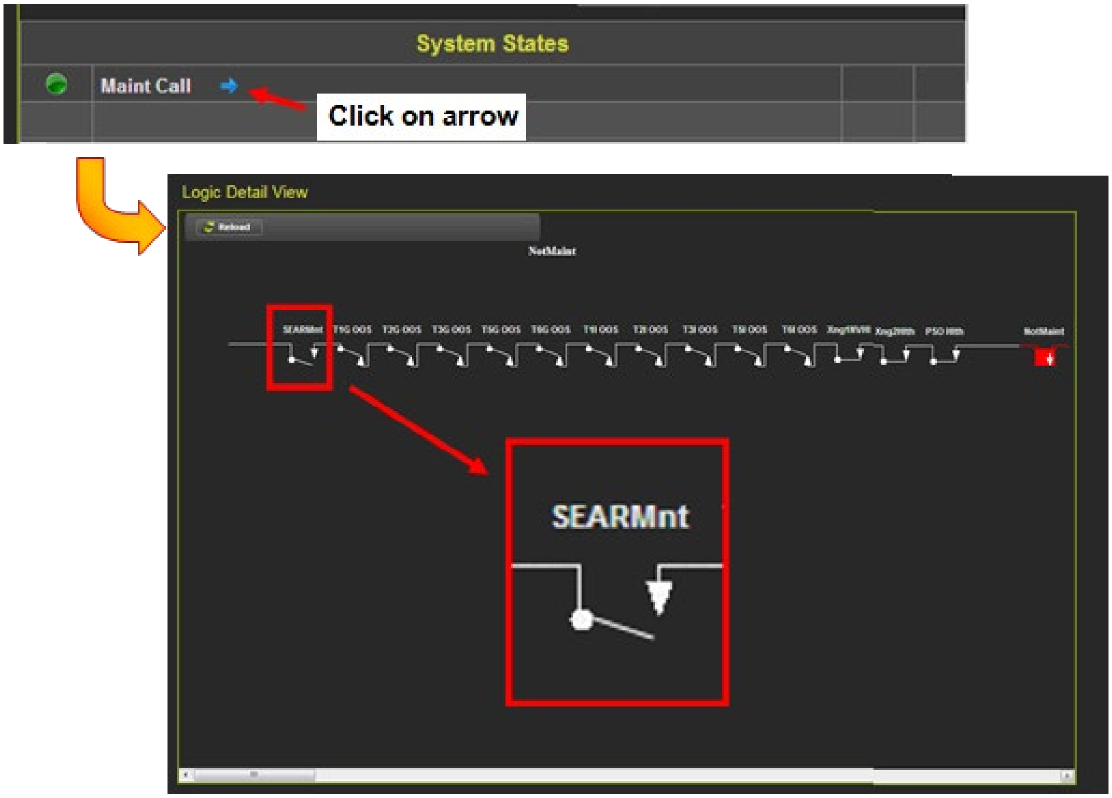

Figure 3-15: Maint Call from System States View of Web UI

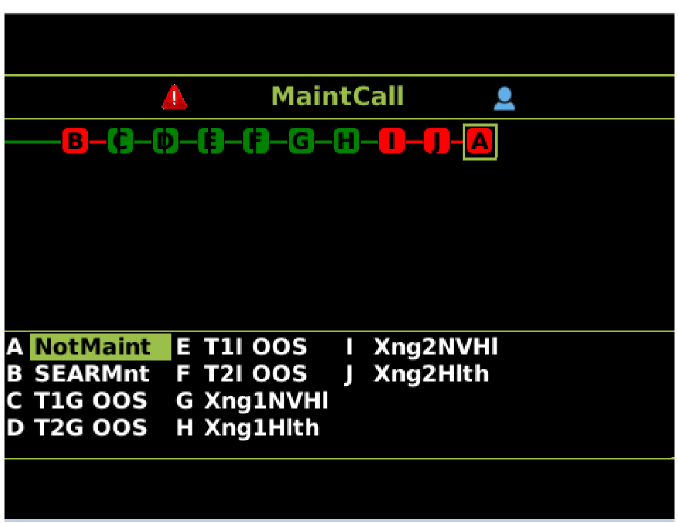

Figure 3-16: Maint Call from System States View of Local UI

3.2.2.6 IN Details Screen

The IN Details screen depicts the states of all inputs with their assigned parameter names.

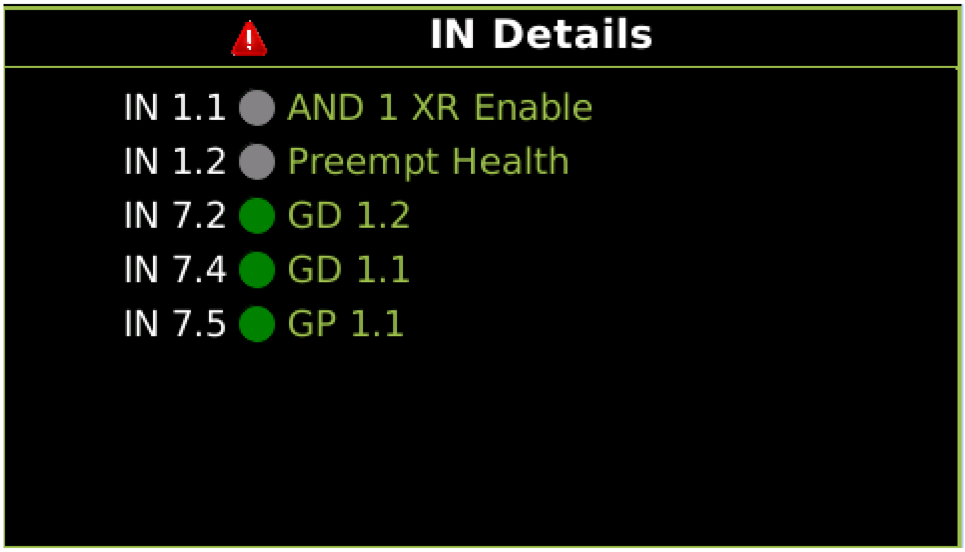

Figure 3-17: IN Details Screen

3.2.2.7 OUT Details Screen

The OUT Details screen depicts the states of all outputs with their assigned parameter names.

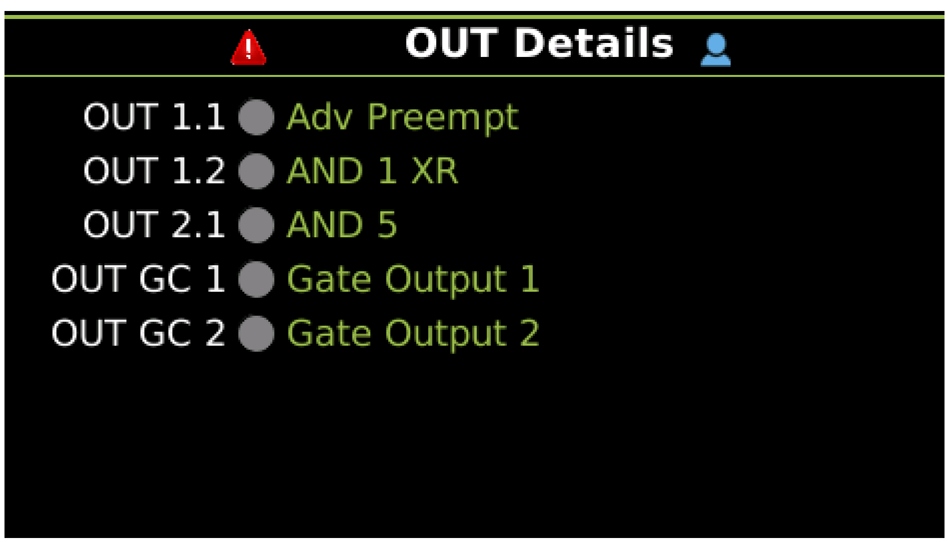

Figure 3-18: OUT Details Screen

3.2.2.8 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, refer to the *SEAR Accessory Group* section of the Siemens GCP 5000 Field Manual, SIG-00-13-03.

3.2.2.9 GCP ATCS COMM Screen

The GCP ATCS COMM screen shows the ATCS Communication status of ATCS Vital communications links, and also the status of bit sent from the SEAR.

The bar at the top indicated red for link out of session, or green for in session. The msg bits are red for 0 and green for 1.

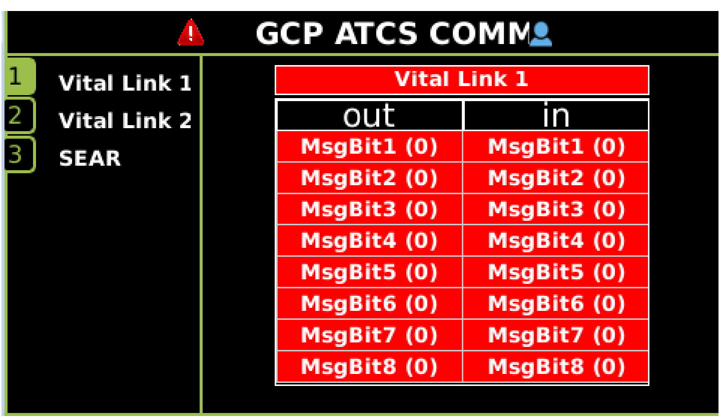

Figure 3-19: ATCS Comms Vital Link Screen

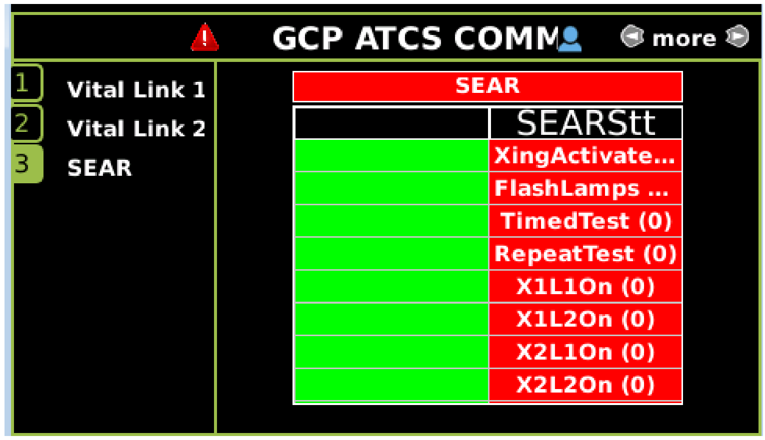

Figure 3-20: ATCS Comms SEAR Screen

3.2.3 Program View Screen

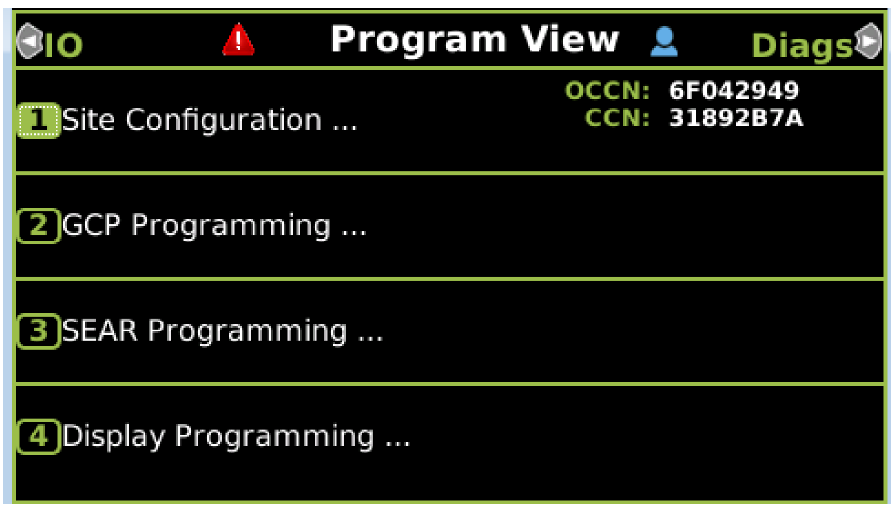

Figure 3-21: Program View Screen

The Program View screen is where all parameters required for GCP operation per the approved site diagram are set. The OCCN and CCN are displayed top right. The screen has the following submenus:

- Site Configuration
- GCP Programming
- SEAR Programming
- Display Programming

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

3.2.3.2 GCP Programming Screen

Refer to Section 3.3 GCP Programming for information regarding GCP 5000 programming and to Section 3.4.3 for the GCP programming menu default settings.

3.2.3.3 SEAR Programming Screen

Refer to the *SEAR Accessory Group* section of the Siemens GCP 5000 Field Manual, SIG 00-13-03, for information regarding programming of the SEAR IIi Module.

3.2.3.4 Display Programming Screen

The Display Programming screen show in Figure 3-22 is used to set parameters on the display or web access, security and communication to other sites.

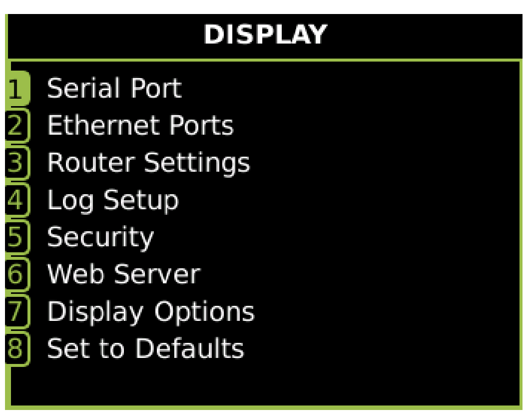

Figure 3-22: Display Programming Options Screen

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

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 2 parameters DHCP Configuration (either Disabled or Client), IP Address, Network Mask, Default Gateway, Path Type and Protocol.

Router Settings Screen

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

Log Setup Screen

The Log Setup screen has the following submenus. These are used to set various levels of diagnostic level message tracing and debugging and are generally for Siemens personnel use:

- Consolidated Logging, which sets the Event and Diagnostic Log IP Addresses of the target system to send log events to.
- Diagnostic Options, which opens setting the following parameters of the Diagnostic Log:
  - EZ/EX Logging:
    - This controls the granularity of logging ez/ex values in the event log on a train move. Default is Change.
    - **None** – logging of EZ/EX values in Event log turned off.
    - **Change** –EZ/EX values logged when it changes by X points, where X is set by value of EZ/EX Point Change.
    - **Periodic** – EZ/EX are logged periodically every Y seconds or on change of X points, where Y is set by EZ/EX Logging Internal.

- EZ/EX Point Change – number of points change in EZ or EX to log new value in log when EZ/EX Logging set to **Change**.
- EZ/EX Logging Internal – interval between logging EZ/EX entries when EZ/EX Logging set to **Periodic.**
- EZ/EX Recording- Enabled/Disabled. This allows a continuous log of ez/ex and predictors values to be saved.

The following parameters are for Siemens use, for message tracing. These should be set to disabled unless specifically advised by Siemens. Setting them to enabled can slow down the performance of the system:

- Message Processing (Layer 7)
- Routing (Layer 3)
- Serial Port 1 TX/RX (Layer 2)
- Ethernet Laptop Port RX/TX (layer2)
- Ethernet Laptop Port 1 RX/TX (layer2)
- Ethernet Laptop Port 2 RX/TX (layer2)
- Echelon RX/TX
- CPU2+ RX/TX

Logging Verbosity

Display Diagnostic Log Verbosity:

- Basic
- Error
- Warning
- Info
- Debug

The following parameters are available for changing the granularity of logging messages. Value 1 is the lowest level of logging and should be used unless advised otherwise by Siemens for a specific diagnostic purpose:

- CP Log Verbosity : 1-2
- VLP Log Verbosity : 1-5
- Slot 2 Log Verbosity: 1-5
- Slot 3 Log Verbosity: 1-5
- Slot 4 Log Verbosity: 1-5
- Slot 5 Log Verbosity: 1-5
- Slot 6 Log Verbosity: 1-5
- Slot 7 Log Verbosity: 1-5
- SSCC IIIi-1 Log Verbosity: 1-5
- SSCC IIIi-2 Log Verbosity: 1-5

Security Screen

The Security Screen enables the user to enable the password using the Security Enabled setting which has the values None, Maintainer Only, Supervisor Only, or Maintenance or Supervisor.

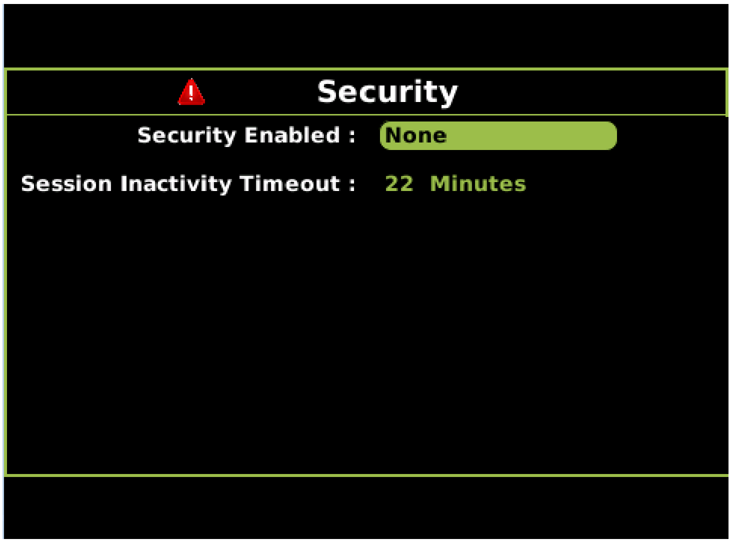

Figure 3-23: Security Screen

When a value is selected the user can enter the appropriate password.

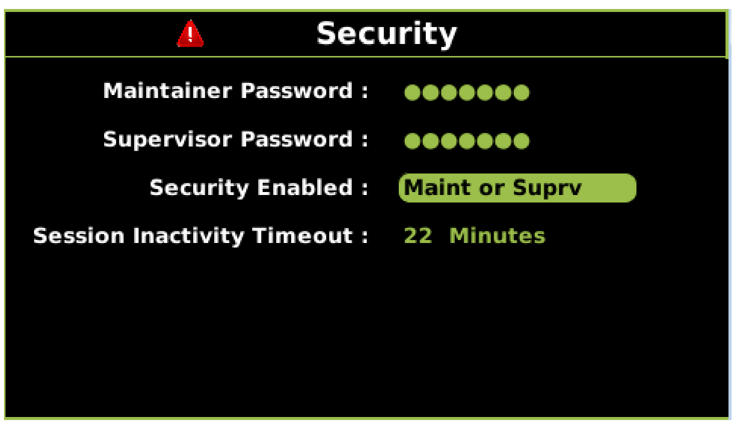

Figure 3-24: Security Screen with Passwords Enabled

The Session Inactivity Timeout parameter may also be set here. This controls how long the configuration is unlocked for after the password has been set.

Web Server Screen

The Web Server screen allows the user to select between using http or the more secure https mode of option for the web browser.

NOTE

> **NOTE**
>
> The CPU III Web UI is not compatible with most recent web browser's updates (since Feb 2022) when used in https mode. It is recommended to use http at this time.
>
> To change to http, connect using Internet Explorer, and change to http. Then reconnect using the browser of choice. Refer to the CPU III User Guide, SIG-00-15-05, Section 3.1.2.9 (Web Server paragraph) or Section 3.1.3.13 for further information.

Display Options Screen

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

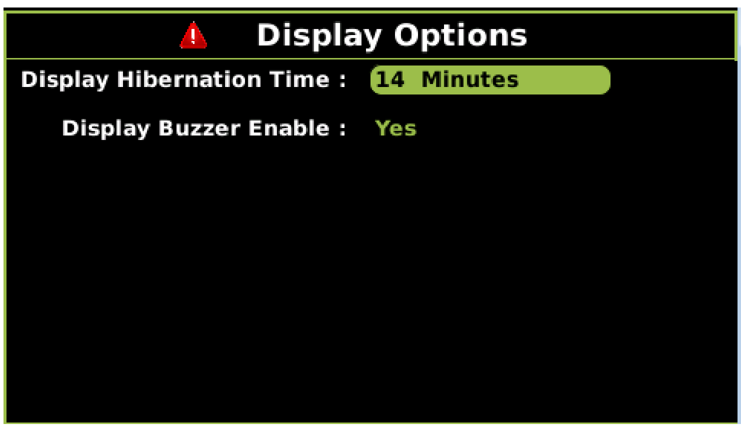

Figure 3-25: Display Options Screen

Set to Default Screen

The Set to default setting under the Display Menu is used to set the display options back to default settings. The Site Configuration, GCP programming, and SEAR programming are unaffected.

When the Set to Default 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.

3.2.4 Diags & Reports Screen

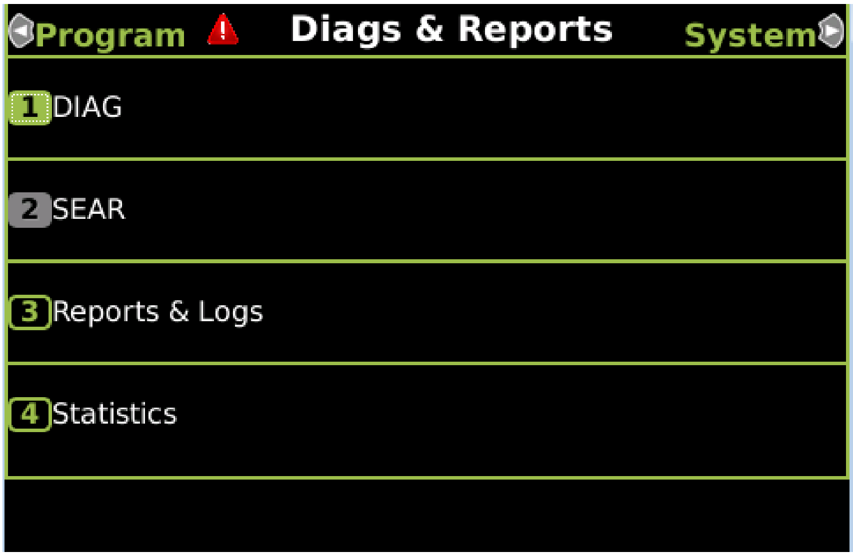

Figure 3-26: The Diags & Reports Screen

The Diags and Reports screen allows the user to view various reports.

3.2.4.1 DIAG Screen

The DIAG Screen depicts all the Diagnostic Messages currently present in the system. If the system is healthy and there are no messages the screen will show “No Diag Msgs present!”.

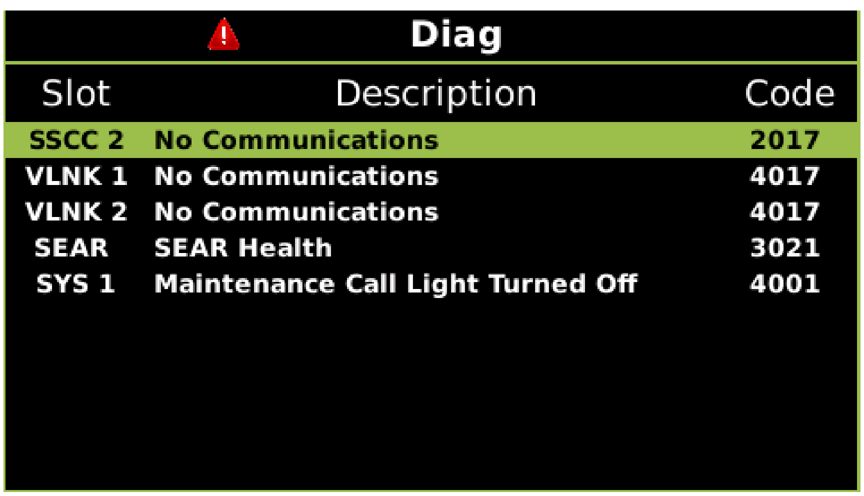

Figure 3-27: Diag Screen

The user can select a diagnostic message using the keypad and press ‘Enter’ to see details about the diagnostic message, as shown in the following figure.

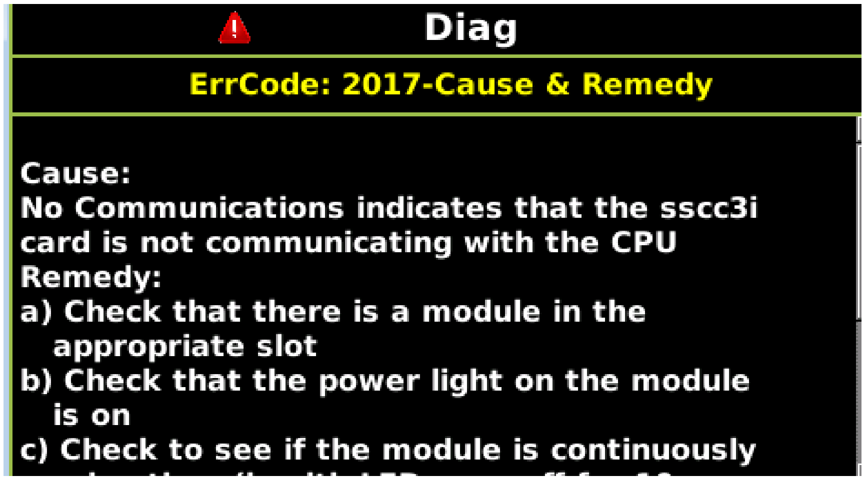

Figure 3-28: Details of Diag Message

3.2.4.2 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 Reports & Logs Screen

Refer to the *Downloading Reports and Logs* section of Siemens GCP 5000 Field Manual, SIG-00-13-03 for further information on Reports and Logs.

3.2.4.4 Statistics Screen

The GCP Statistics screen shows statistics for the item, as shown in the following figure. These statistics are primarily for the use of Siemens Personnel.

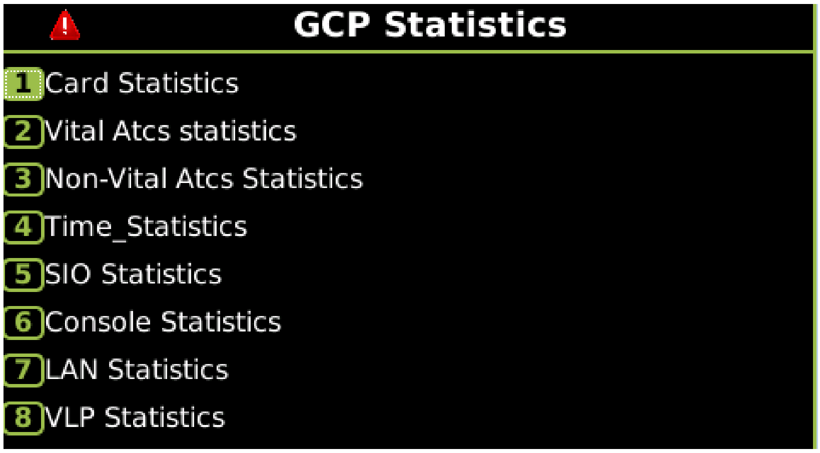

Figure 3-29: GCP Statistics Screen

3.2.5 USB Menu Screen

Refer to the *Transfer Sear Data Via USB Device* section of Siemens GCP 5000 Field Manual , SIG-00-13-03 for further information on the USB Menu Screen.

3.3 WEB USER INTERFACE SCREENS

The Display Module provides a Web Interface which enables the user to configure the GCP 5000 model locally as well as remotely through the Laptop/Ethernet Port (RJ-45) on the front of the Display Module. The Display Laptop Port default protocol is set as DHCP Server (https) protocol.

NOTE

NOTE

From April 2022, the Web UI uses non-secure (http) as the default unless the user has changed the setting to HTTP Secure (https). Units shipped prior to this date may be set to https.

The Display DHCP Server protocol will assign the laptop an IP address and connect the user to the GCP. The Display supports the following web browsers:

- IE 10 and 11
- Firefox (version 46.x)
- Chrome (version 55.x)

Open the correct web browser and type in the IP address of the display. The default IP is: http://192.168.255.81. The browser may display the screens shown in the following figure, regarding the connection.

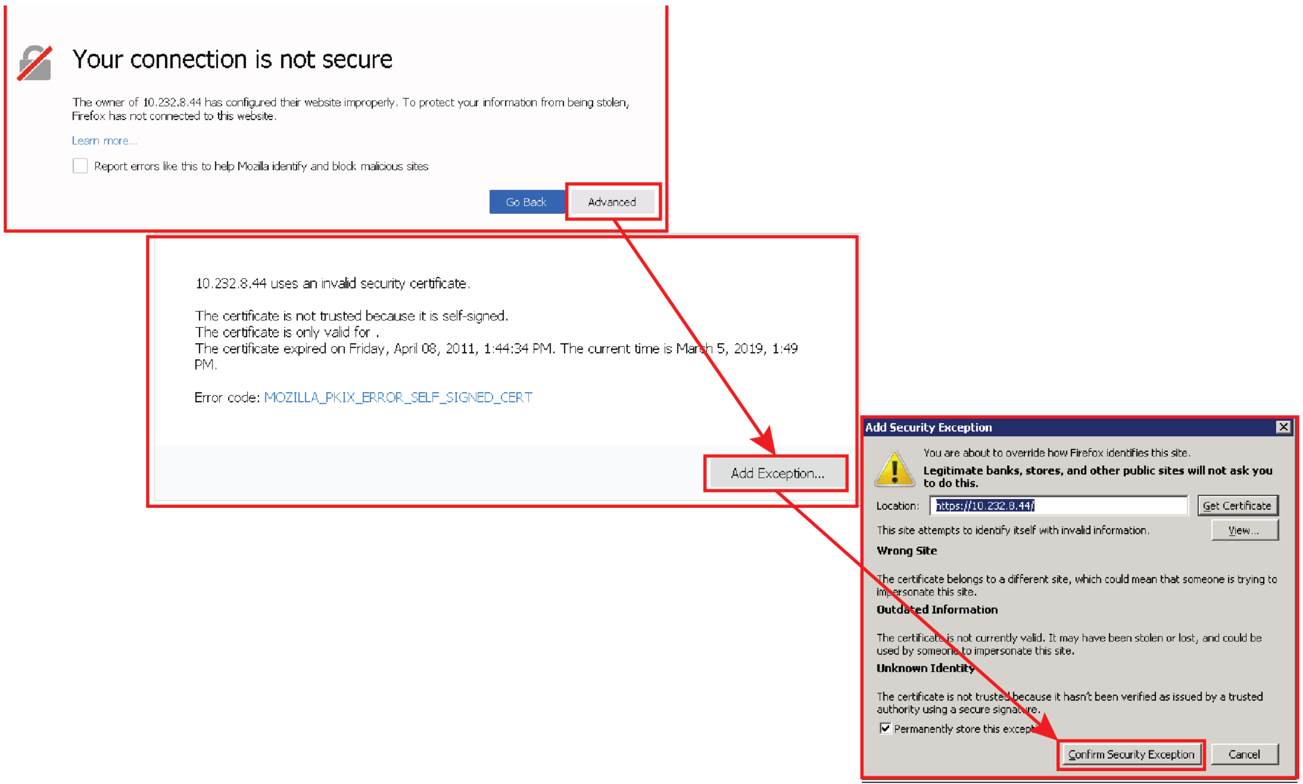

Figure 3-30: Unsecure Connection Warning

The display WebUI will then appear. Select the username “Maintainer” (default). The Admin user is for Siemens personnel use only.

The default password is GCP5000 (case sensitive) to open the session. If security has not been set to enable a maintainer password, the default will allow all regular user functions of the WebUI to be accessed. If a specific maintainer password has been set, enter this. The default password ‘GCP5000’ may still be used to access the WebUI, but the user will be unable to change GCP Programming parameters.

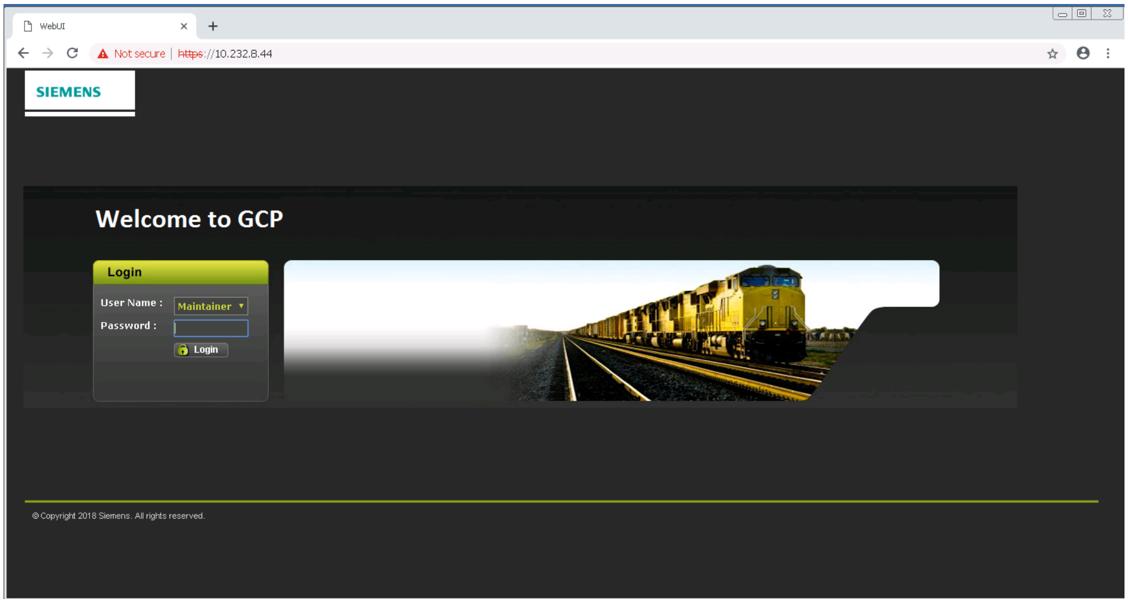

Figure 3-31: WebUI Login Screen

CAUTION

CAUTION

IF THE EQUIPMENT IS TO BE CONNECTED TO A NETWORK, IT WILL BE NECESSARY FOR THE USER TO SET THE ETHERNET PORT AS A DHCP CLIENT.

FAILURE TO DO SO WILL CAUSE AN INTERRUPTION OF THE NETWORK SINCE TWO DHCP SERVERS WILL BE INTRODUCED ONTO THE NETWORK.

NOTE

NOTE

The WebUI has a 1-minute session timeout. If the web browser is closed without selecting **Logout** the user will not be able to log back in for 1 minute.

The WebUI has buttons at the top of the window allowing the user to select various functions.

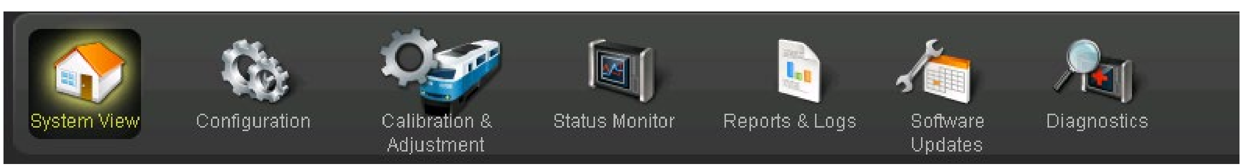

Figure 3-32: WebUI Tool Bar

3.3.1 System View

The System View is the main screen, showing an overview of the GCP status. If there are diagnostic messages present, the System View will show a red exclamation mark at the top right.

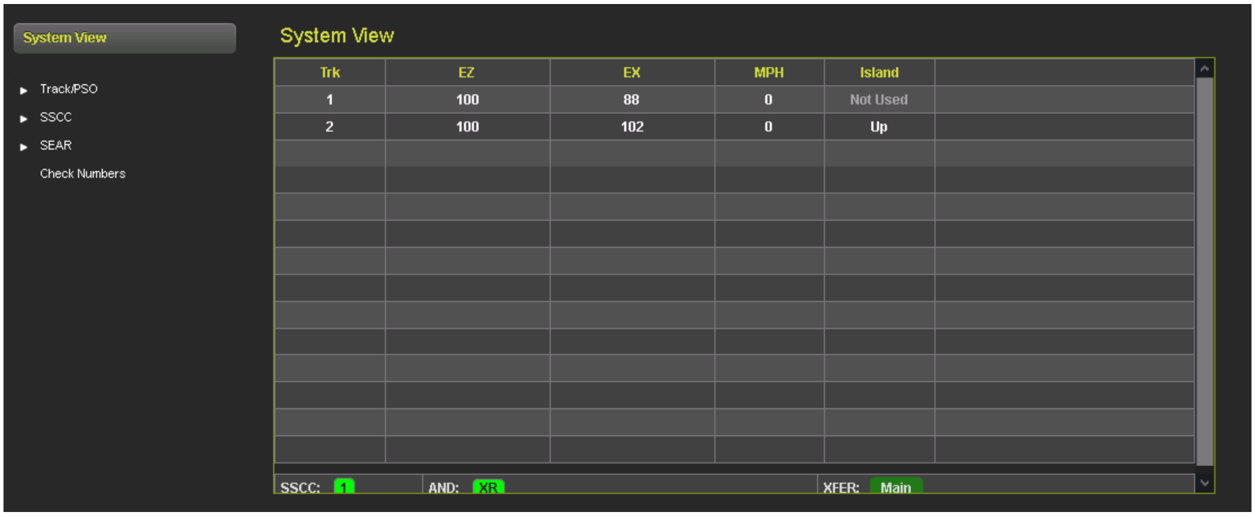

Figure 3-33: Web UI System View

3.3.1.1 System View - Track / PSO

The Track/PSO tab can be expanded to show the following options for the Track modules.

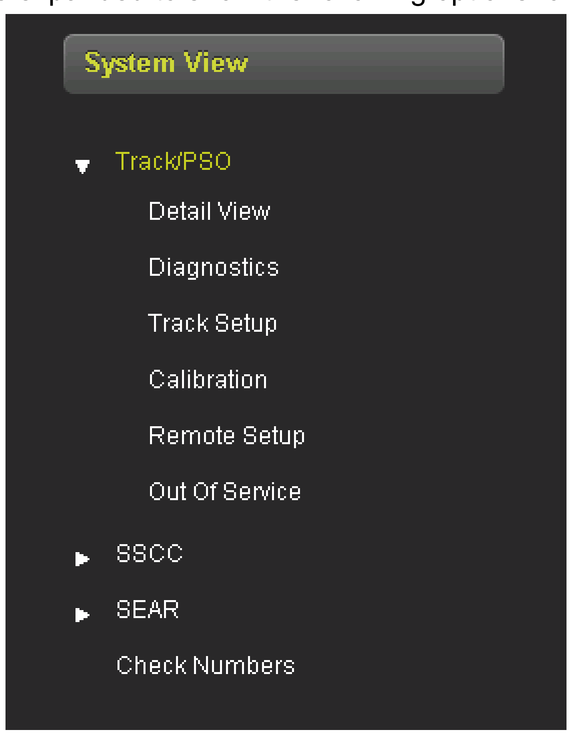

Figure 3-34: Web UI Track Options

When Detail View is selected the Web UI shows more detailed information about the 1st track, click on the yellow tabs at the top to select a different track module. The tab will be red if the track card is not in session.

Figure 3-35: Web UI Track Detail View

When Diagnostics is selected the Web UI shows any diagnostic messages currently present in the system.

Figure 3-36: Web UI Diagnostics View

When a specific diagnostic message selected, the Web UI will show the cause and remedy of this.

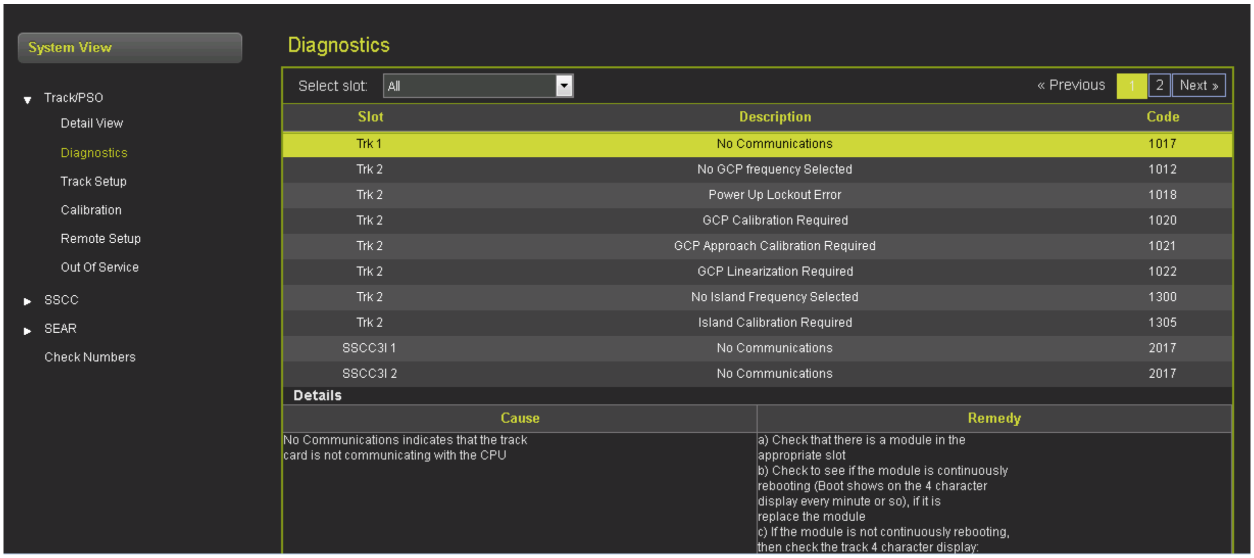

Figure 3-37: Web UI Detailed Diagnostics View

To show diagnostic messages for just a specific module in the system select the drop down menu labeled 'select slot'.

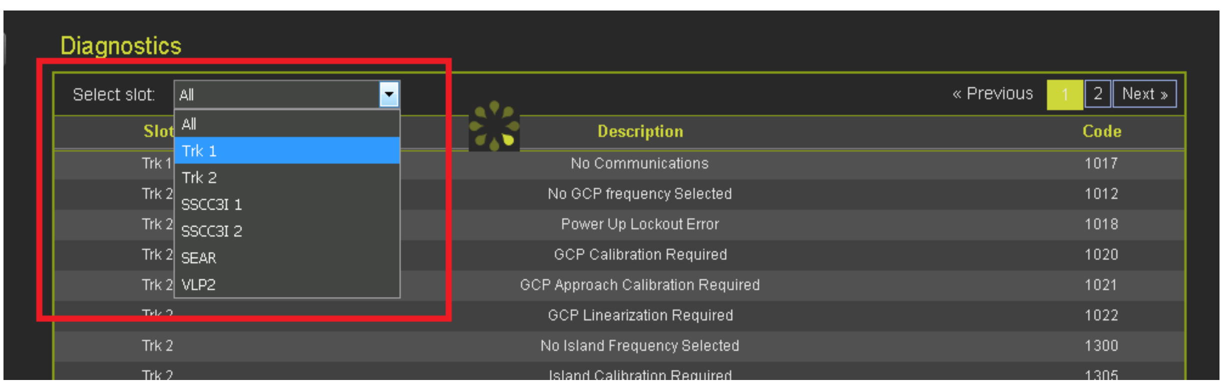

Figure 3-38: Web UI Diagnostics View – Module Selection

Then the Web UI only shows diagnostic messages for that slot as shown below.

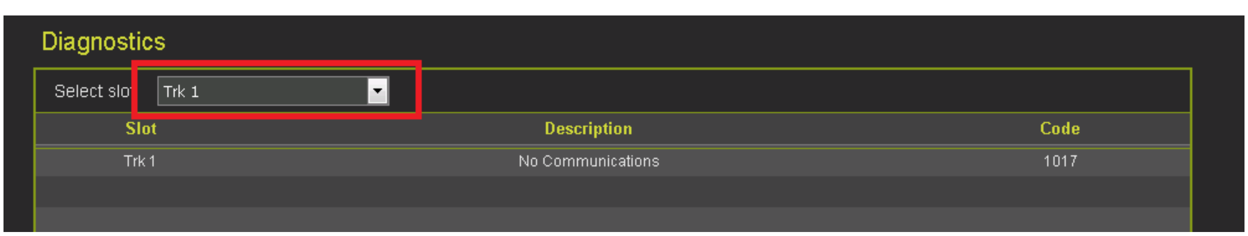

Figure 3-39: Web UI Diagnostics View Track

When Track Setup is selected the Web UI will show the following screen that allows the user to see and change configuration settings that are commonly modified during maintenance operations. This provides a more convenient way to access these maintenance related parameters than searching for them in the main program menus. Before options can be selected on the screen, it has to be unlocked and local user presence confirmed. Refer to Appendix B of Siemens GCP 5000 Field Manual , SIG-00-13-03 for further information

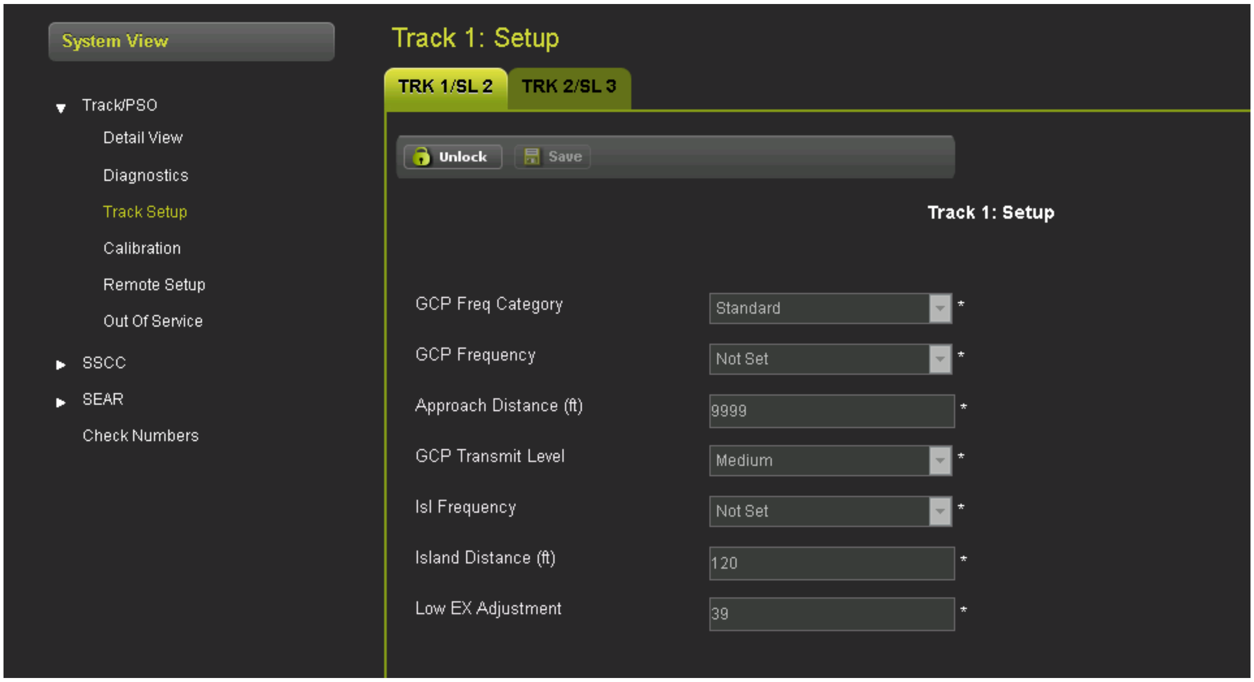

Figure 3-40: Web UI Track Setup

When Calibration is selected the Web UI will show the following screen that allows the user to calibrate the GCP, approach, linearity or island. Before options can be selected on the screen, it has to be unlocked and local user presence confirmed.

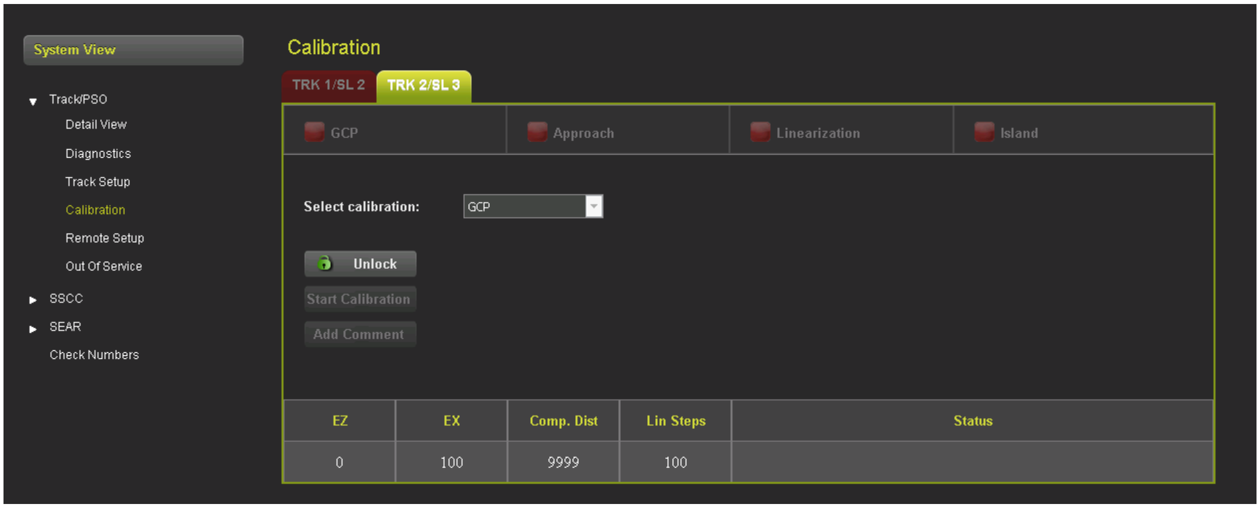

Figure 3-41: Web UI Track Calibration View

When Remote Setup is selected the Web UI shows the following screen that allows the user to obtain the remote setup password and select which tracks are going to be calibrated when the system is used with a VHF communicator and DTMF radio that allow remote setup operations to be performed. Before options can be selected on the screen, it has to be unlocked and local user presence confirmed.

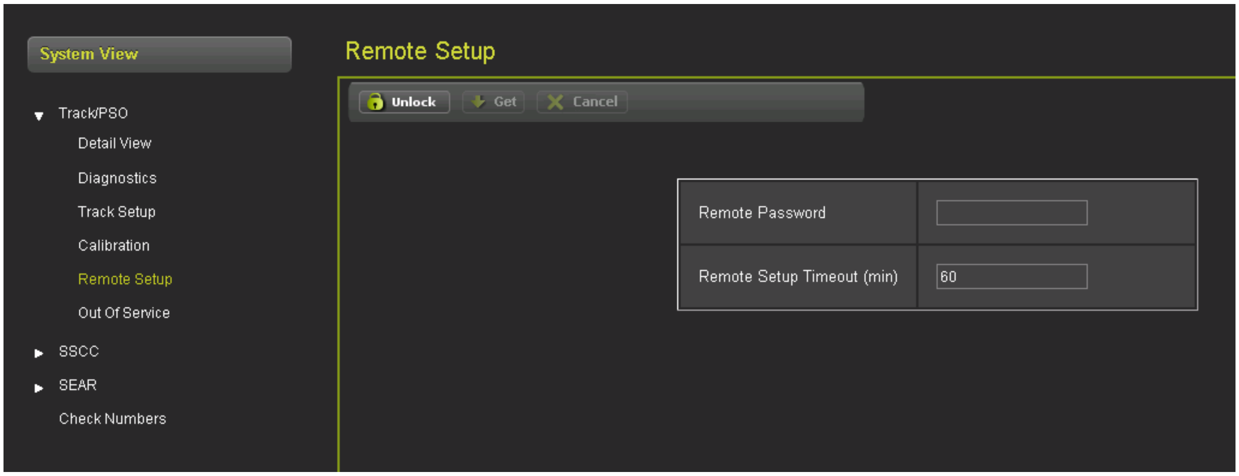

Figure 3-42: Web UI Remote Setup

When Out of Service is selected the Web UI shows the following screen that allows the user to take the GCP approach or island out of service. Before options can be selected on the screen, it has to be unlocked and local user presence confirmed.

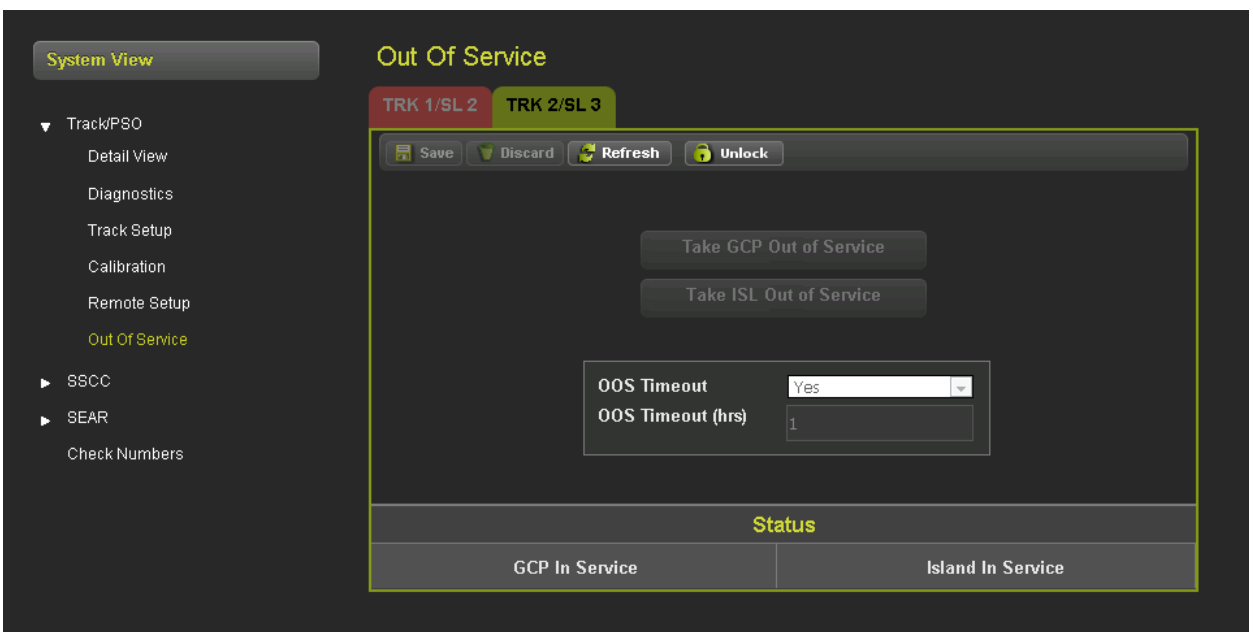

Figure 3-43: Web UI Out of Service

3.3.1.2 System View – SSCC

The SSCC menu under the System View provides the options shown in Figure 3-44.

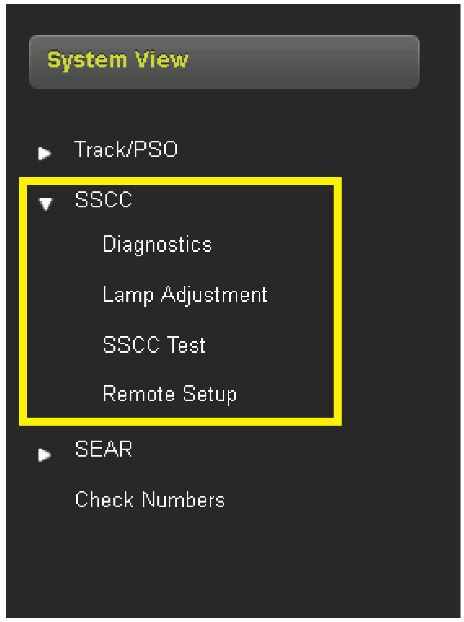

Figure 3-44: Web UI System View SSCC Menu Options

The Diagnostics menu shows the same Diagnostic screen as Track Diagnostics, see Figure 3-37.

The Lamp Adjustment menu allows the user to turn the lamps on and adjust their voltages. If a train approaches, the lamp on command will be overridden and the lamps will flash.

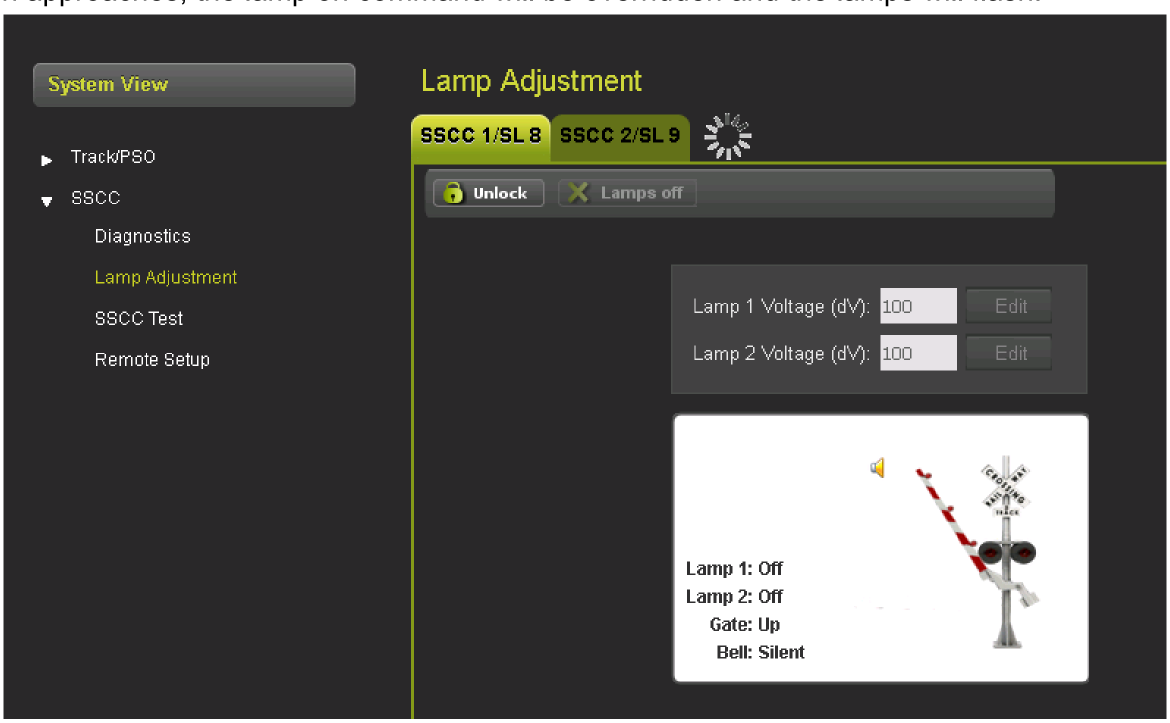

Figure 3-45: Web UI SSCC Lamp Adjustment

The SSCC Test menu allows the user to perform various tests on the crossing, provided it is not already activated. These include:

- Flash the lamps.
- Timed test (delay, flash lamps, turn lamps off).
- Repeat test (delay, flash lamps, delay, flash lamps again, turn lamps off).
- Ring bell.
- Activate crossing.

⚠ CAUTION	**CAUTION** THE ACTIVATE CROSSING OPTION WILL NOT TRIGGER THE PRE-EMPT. ENSURE THAT THE CROSSING IS CLEAR BEFORE PERFORMING THIS ACTION.

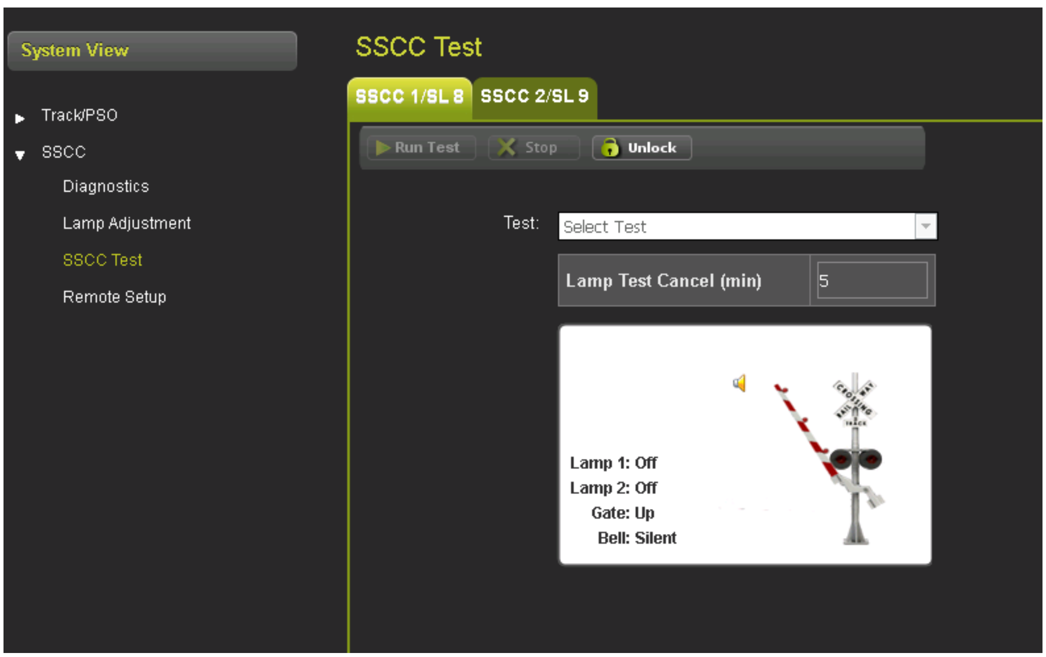

Figure 3-46: Web UI SSCC Test

The Remote Setup menu will show the same screen as shown under the track menus, see Figure 3-42.

3.3.1.3 System View – SEAR

The SEAR menu under the System View provides the menus options shown in the following figure.

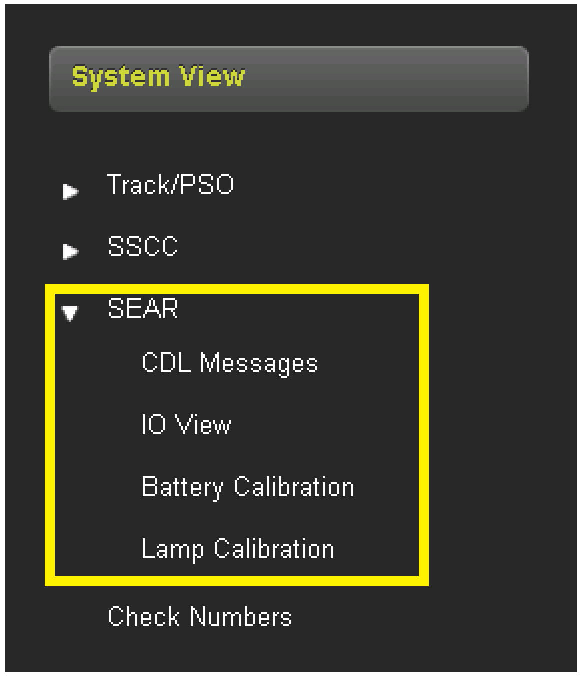

Figure 3-47: Web UI SEAR Menu

The CDL Message Screen will show any messages that are generated when the CDL is executing.

The IO View allows the user to see the states of the SEAR IIi inputs.

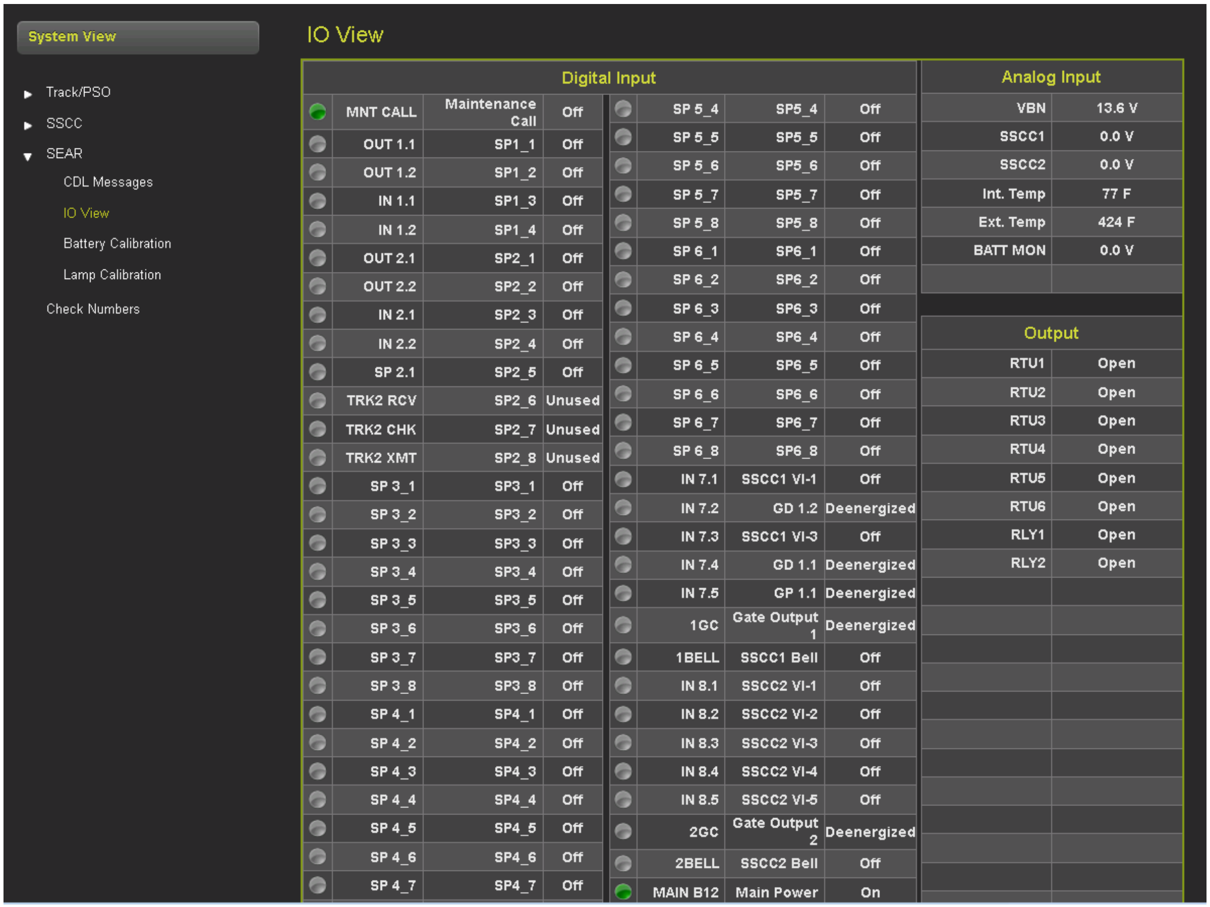

Figure 3-48: Web UI SEAR IO View

Battery Calibration

If battery monitoring is included in the installation, the battery calibration function will be active. Select the Battery Calibration option from the SEAR menu, a window will appear as shown in the following figure. Click the Start icon to begin the internal calibration process.

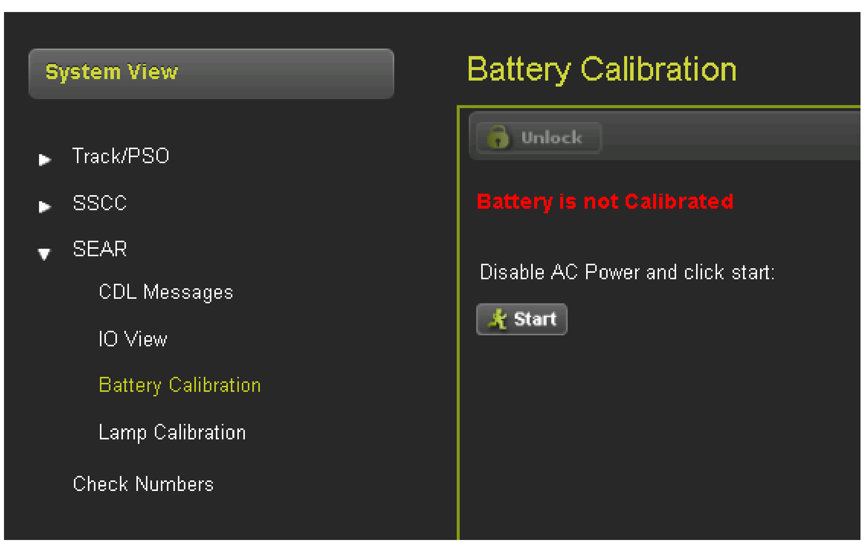

Figure 3-49: Battery Calibration Screen

After pressing the Start button, the battery calibration screen will appear, as shown in the following figure. A countdown tally displays the calibration progress. The battery voltage and calibrated value are displayed. The Status column displays the current voltage state of each component.

Figure 3-50: Battery Calibration Screen after Pressing Start

Lamp Calibration

The lamp calibration process for an iLOD sets the internal threshold levels used by the iLOD software to detect flashing lamp current. These levels are site specific. It is also used by the application program to determine the number of lamps and the current draw that is present for a properly operating crossing. This process is not the same as factory calibration. Factory calibration is performed on the iLOD units before shipment.

The Web UI is used to illustrate the calibration, it can also be done form the Local UI on the Display Module.

If there is an application program loaded into the SEAR, enter the number of flashing lamps for each iLOD sensor when requested.

If the site has Gate Tip Sensors installed, when asked to flash the lamps, make sure the gates are level before pressing Enter.

The current reading is allowed to “settle” for 15 seconds.

Depending on the configuration of the crossing, it may be necessary to repeat this process with AC power to the crossing turned off. At some installations, the process may be repeated more times depending on configuration (split tracks, etc.).

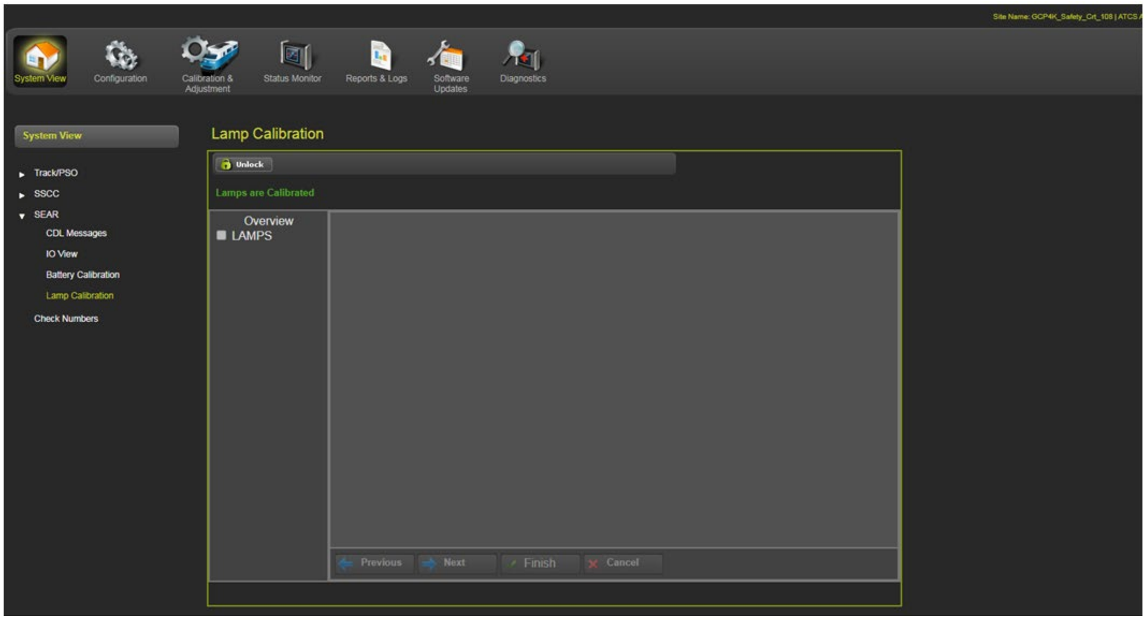

Figure 3-51: Lamp Calibration Opening Screen

To continue, the parameters need to be unlocked. To unlock the parameters click on the Unlock button. A warning screen displays, click OK to continue.

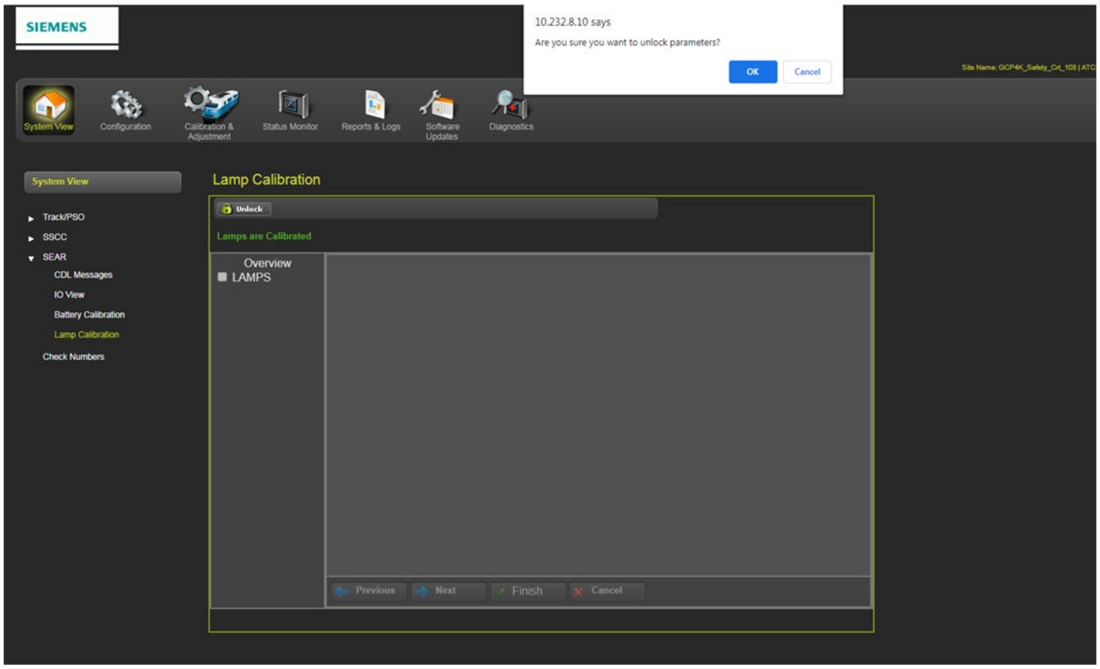

Figure 3-52: Lamp Calibration – Unlocking Parameters

Select the calibration type. Figure 3-53 shows 'Manual' selected, click Next to continue.

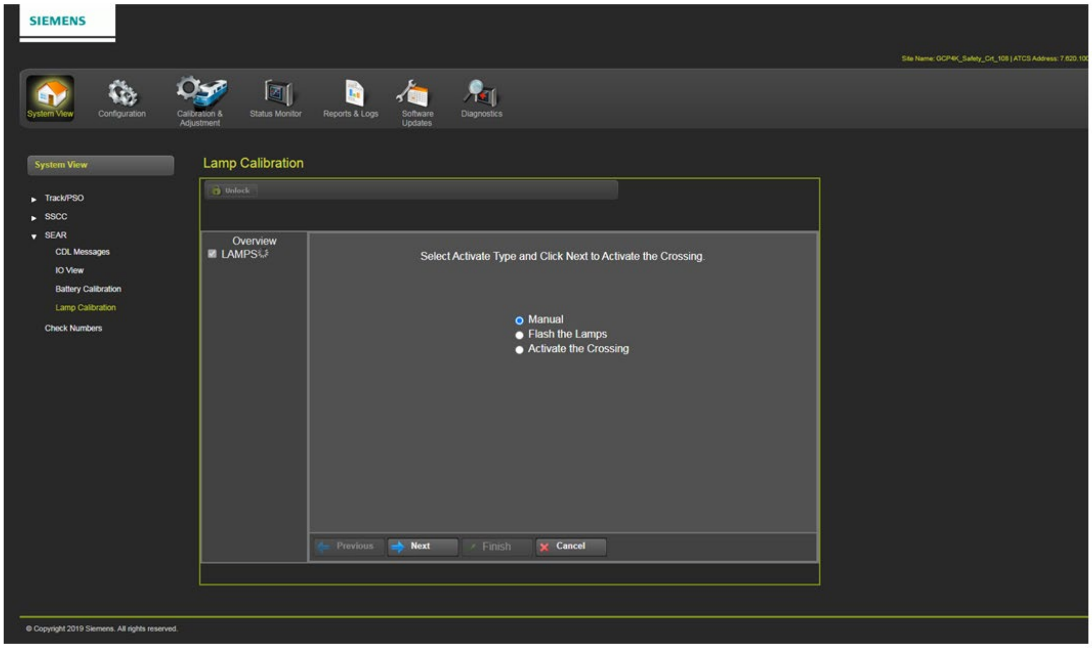

Figure 3-53: Lamp Calibration – Manual

A progress bar will display with a countdown number indicating the progress of the calibration.

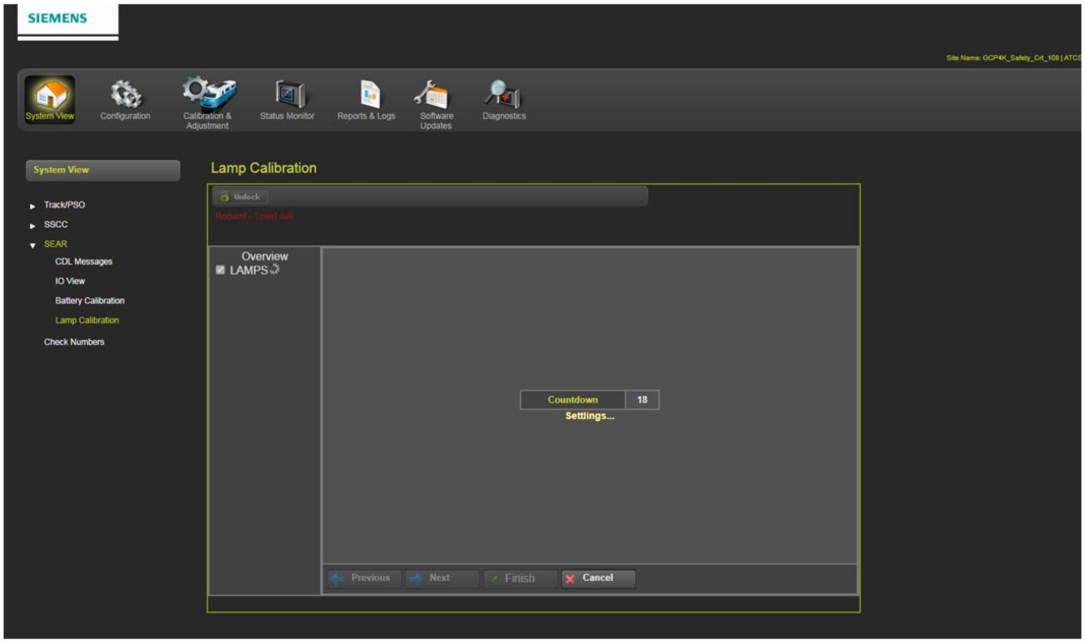

Figure 3-54: Lamp Calibration – Calibration Progress

In the event the iLOD(s) is inoperative or not installed, a message will display advising the user to install the iLOD(s) and restart the lamp calibration.

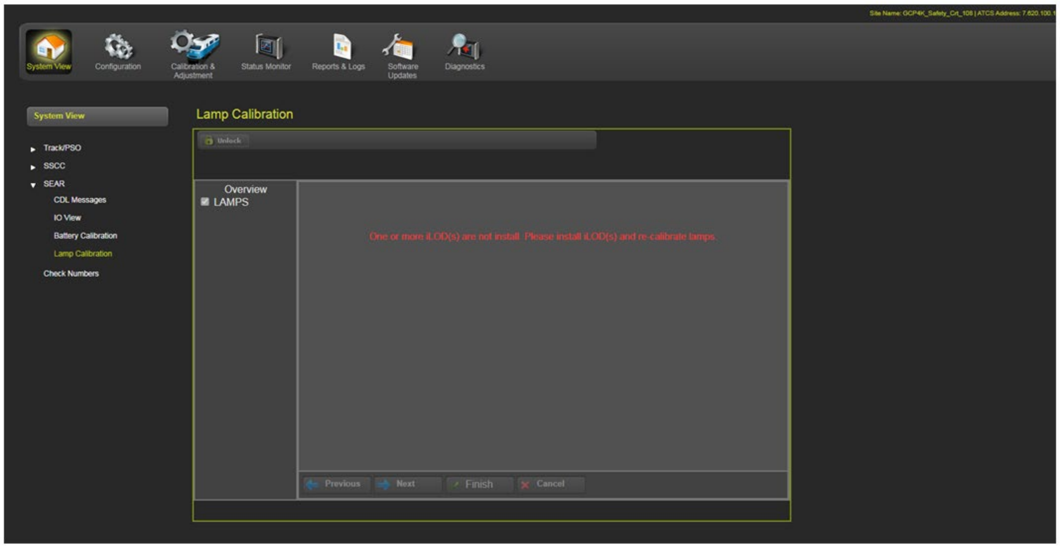

Figure 3-55: Lamp Calibration – iLOD Not Installed Warning

The next screen in the calibration process requires entering the number of bulbs being used. After entering the bulb count, click on the Next button to continue as shown in Figure 3-56.

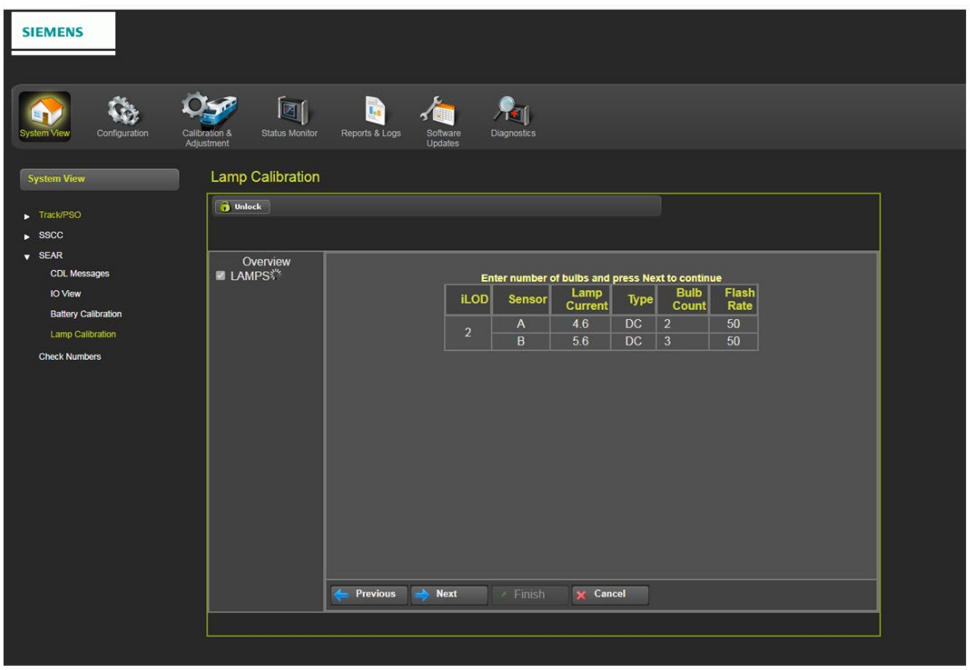

Figure 3-56: Lamp Calibration – Number of Bulbs

The next step is to deactivate the crossing and click on the Finish button to complete the calibration.

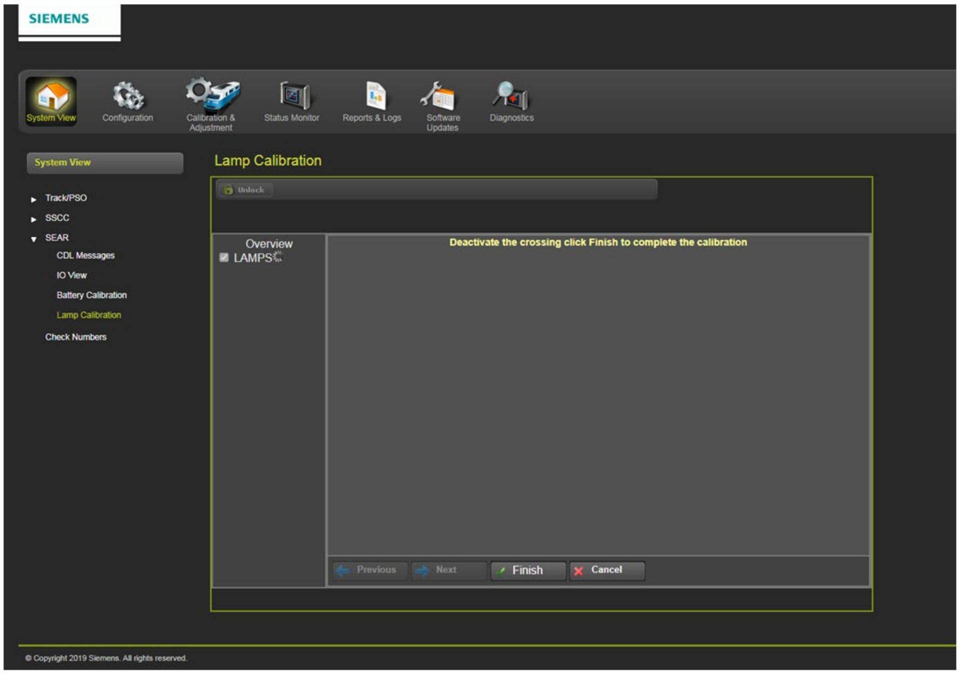

Figure 3-57: Lamp Calibration – Deactivate Crossing Finish Calibration

When the process is finished, the screen will display Calibration complete.

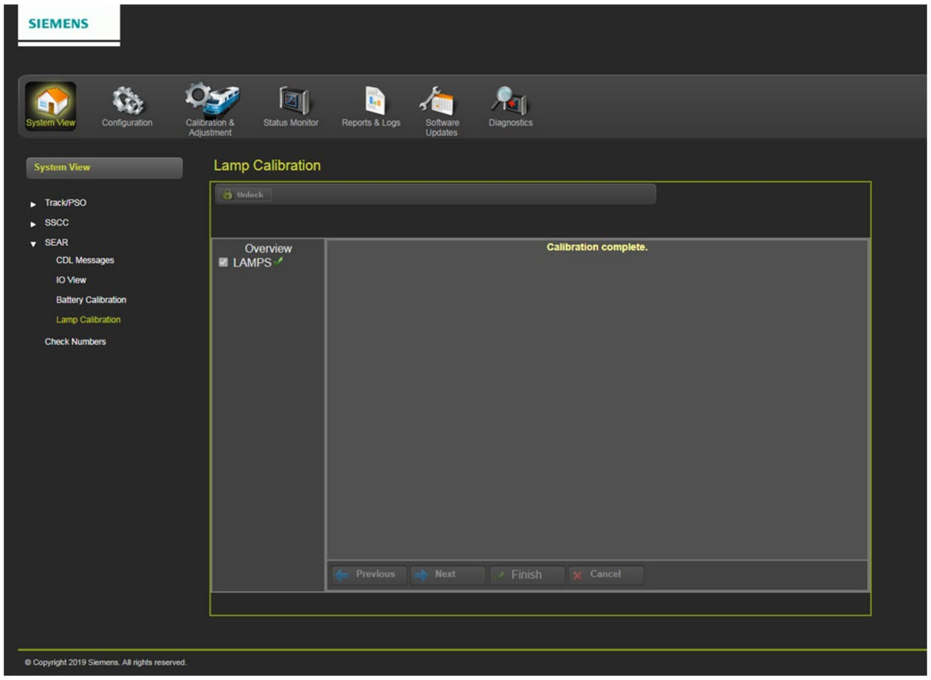

Figure 3-58: Lamp Calibration – Calibration Complete

The second type of activation is Flash the Lamps. Click on the Flash the Lamps button and click on the Next button as shown in Figure 3-59.

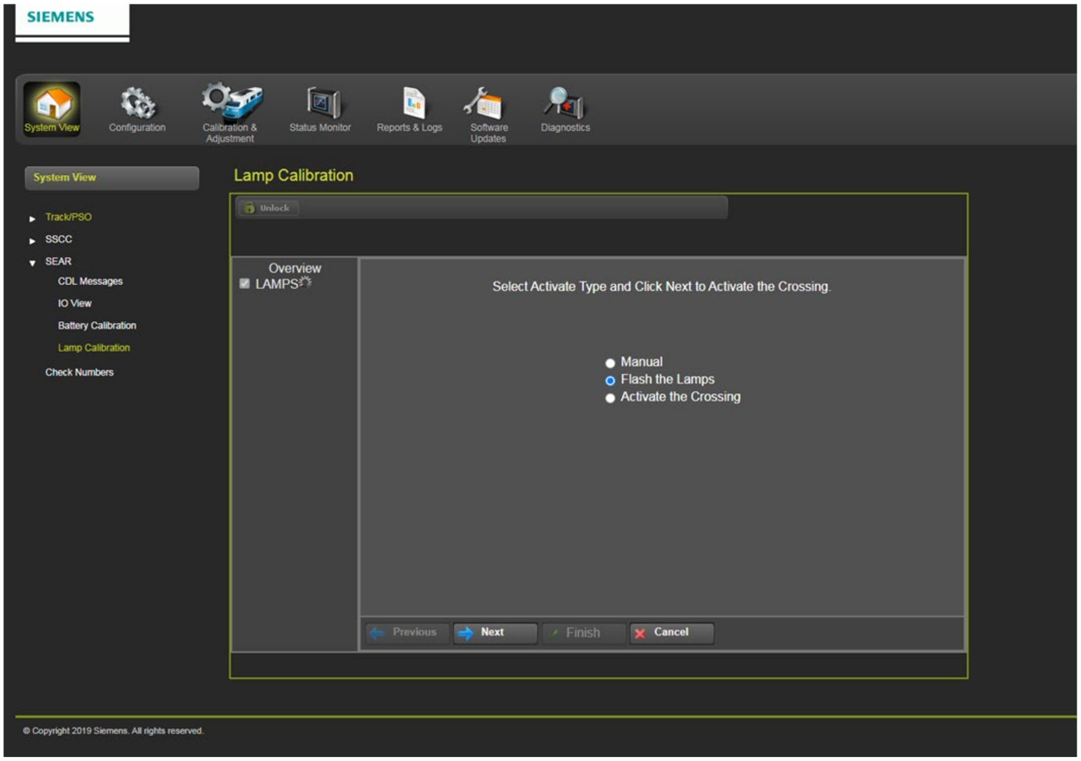

Figure 3-59: Lamp Calibration - Flash the Lamps

The next screen shows the activation of SSCC 1.

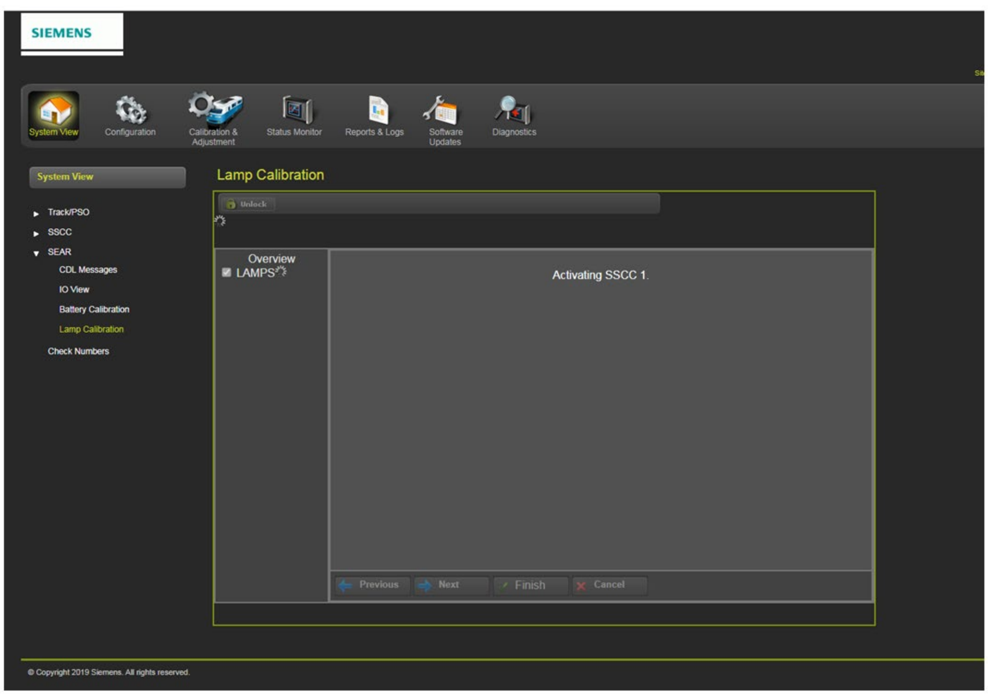

Figure 3-60: Lamp Calibration – Activating SSCC 1

The next screen in the calibration process requires entering the number of bulbs being used. After entering the bulb count, click on the Next button to continue as shown in Figure 3-61.

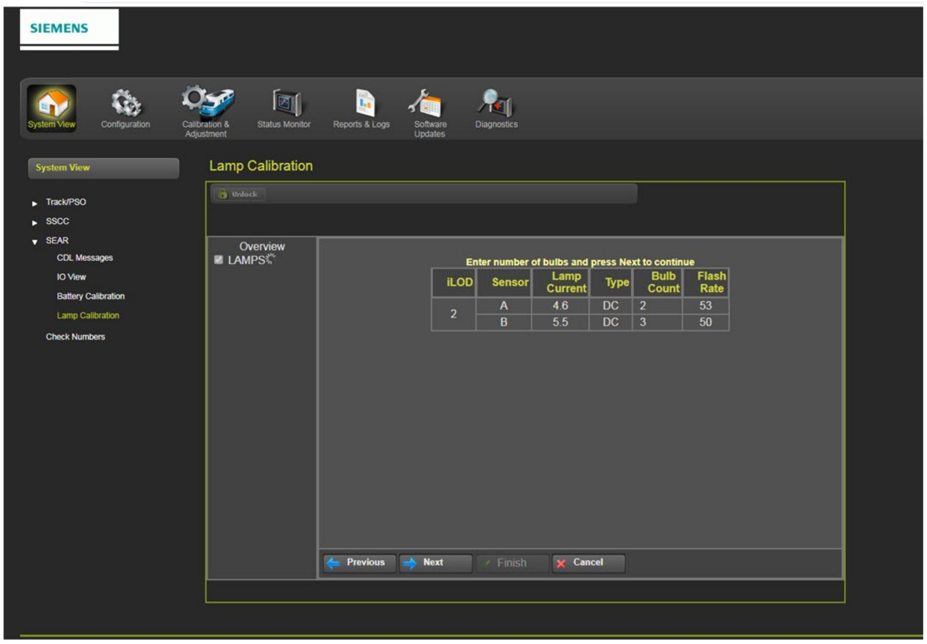

Figure 3-61: Lamp Calibration – Number of Bulbs

The next screen shows the deactivation of SSCC 1 and the completion of the calibration.

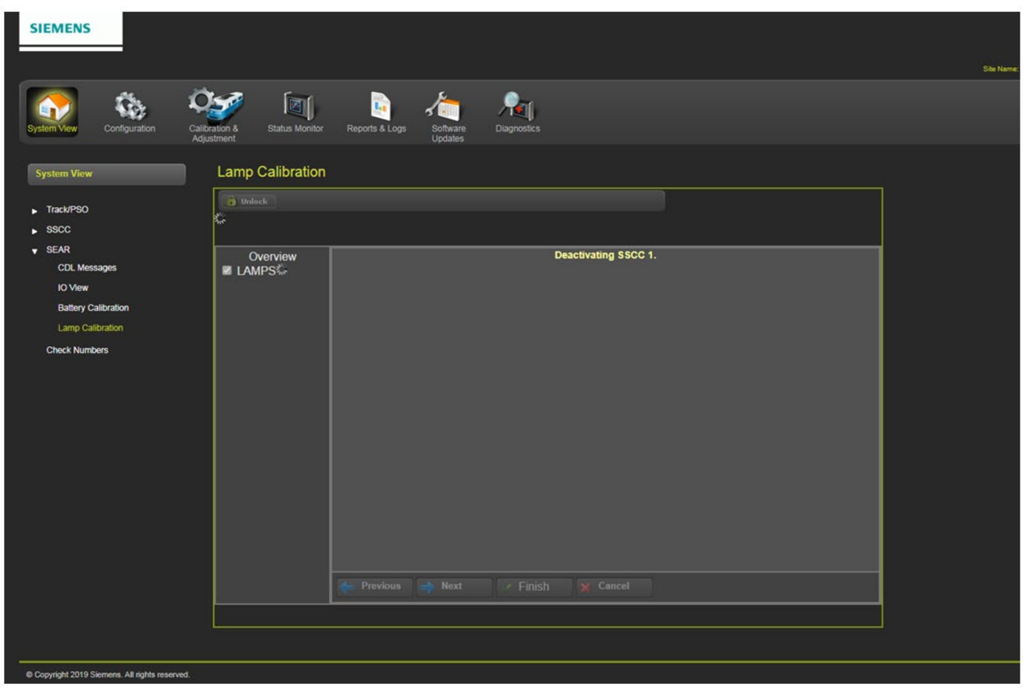

Figure 3-62: Lamp Calibration – Deactivating SSCC 1

The third activation type is Activate the Crossing. Select the Activate the Crossing button and click on the Next button to continue.

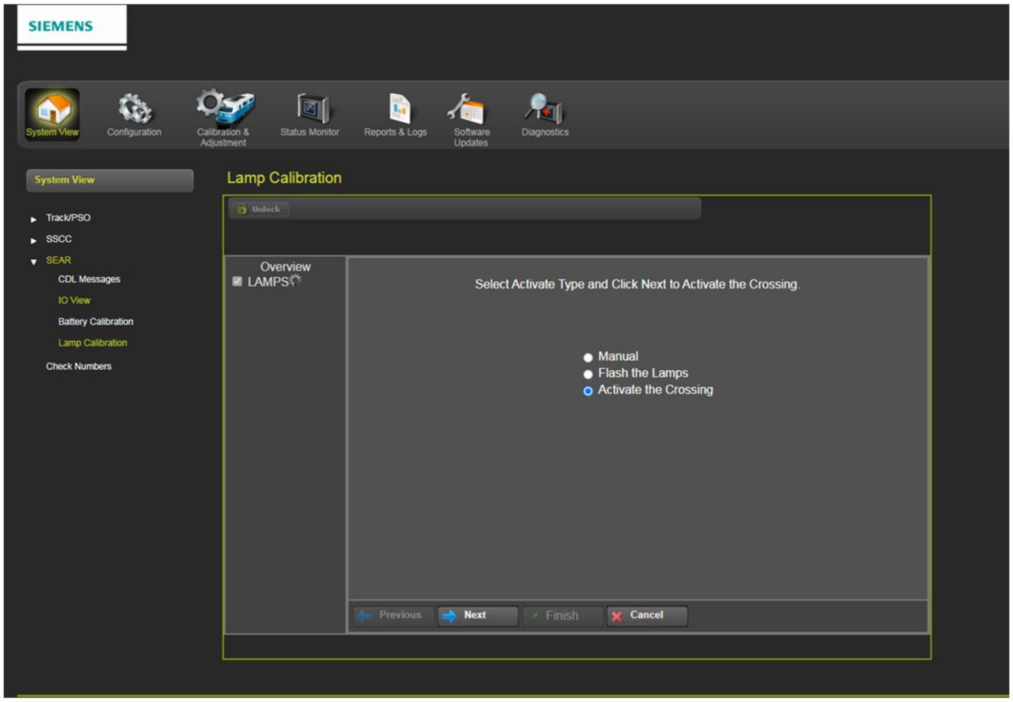

Figure 3-63: Lamp Calibration – Activating the Crossing

The next screen shows the activation of SSCC 1.

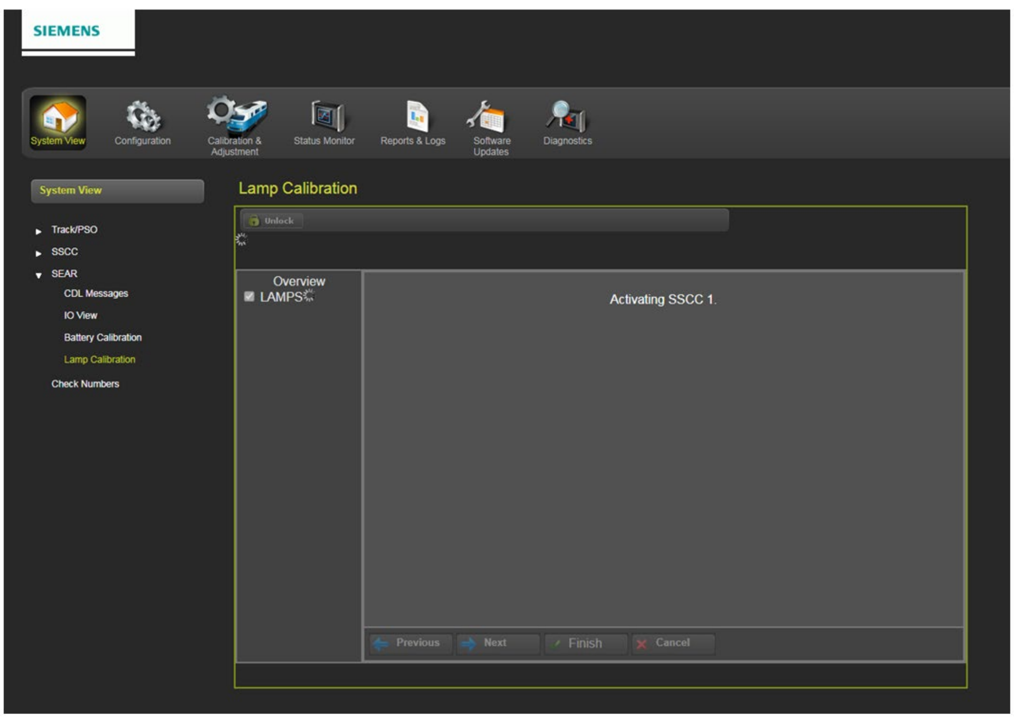

Figure 3-64: Lamp Calibration – Activating SSCC 1

A progress bar will display with a countdown number indicating the progress of the calibration.

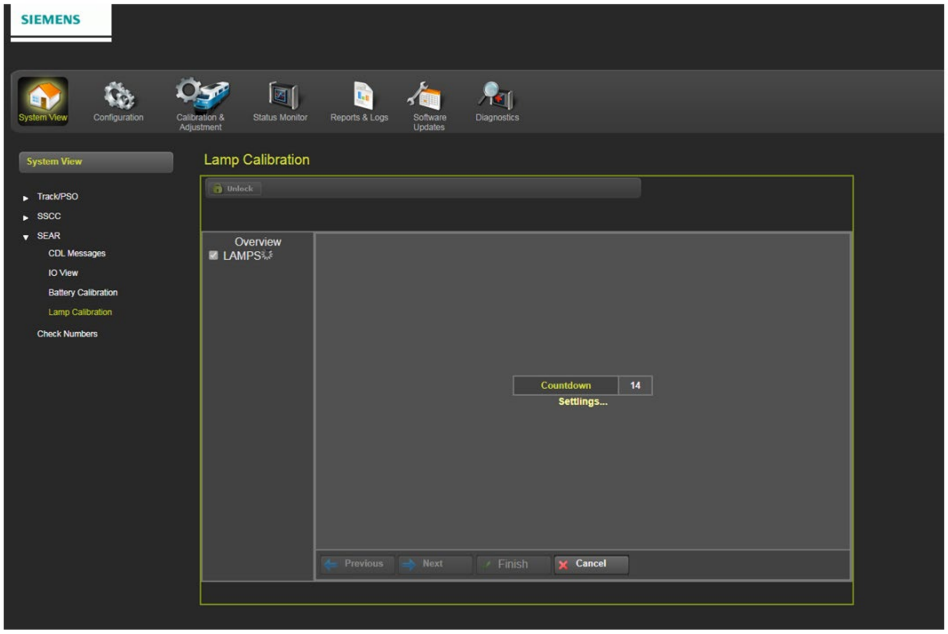

Figure 3-65: Lamp Calibration – Calibration in Progress

The next screen in the calibration process requires entering the number of bulbs being used. After entering the bulb count, click on the Next button to continue as shown in Figure 3-65.

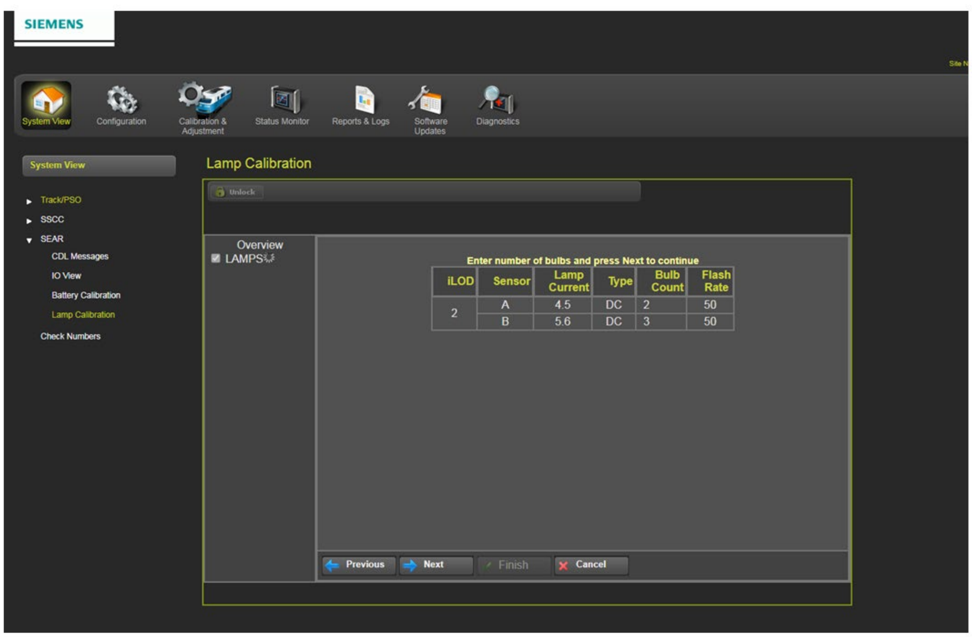

Figure 3-66: Lamp Calibration – Number of Bulbs

The next screen shows the deactivation of SSCC 1 and the completion of the calibration.

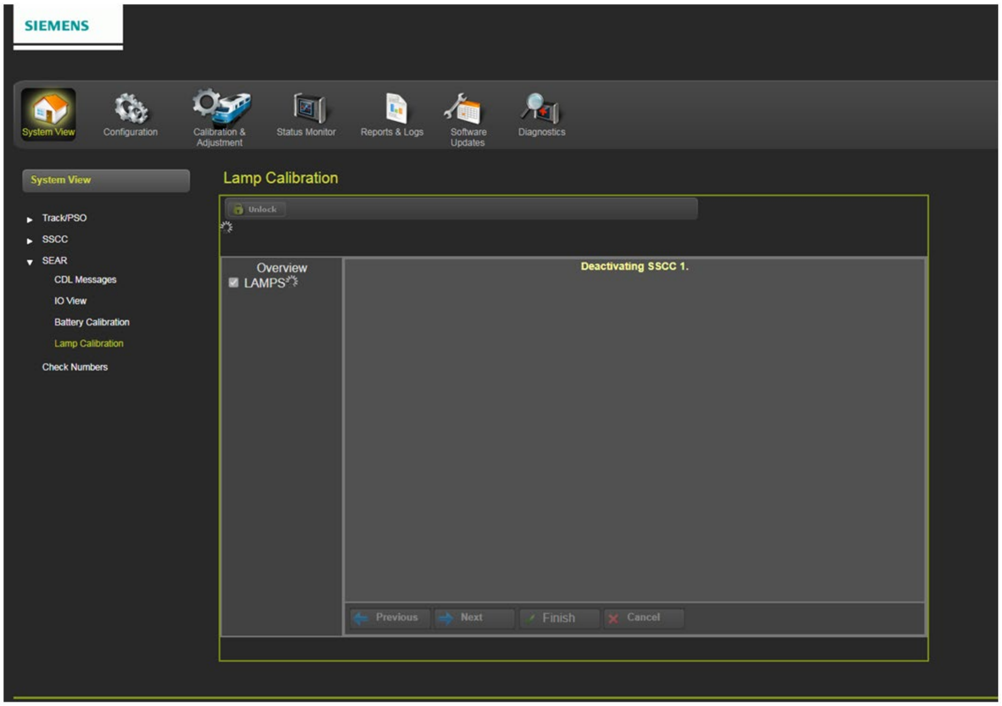

Figure 3-67: Lamp Calibration – Deactivating SSCC1

The final screen shows the calibration process is complete.

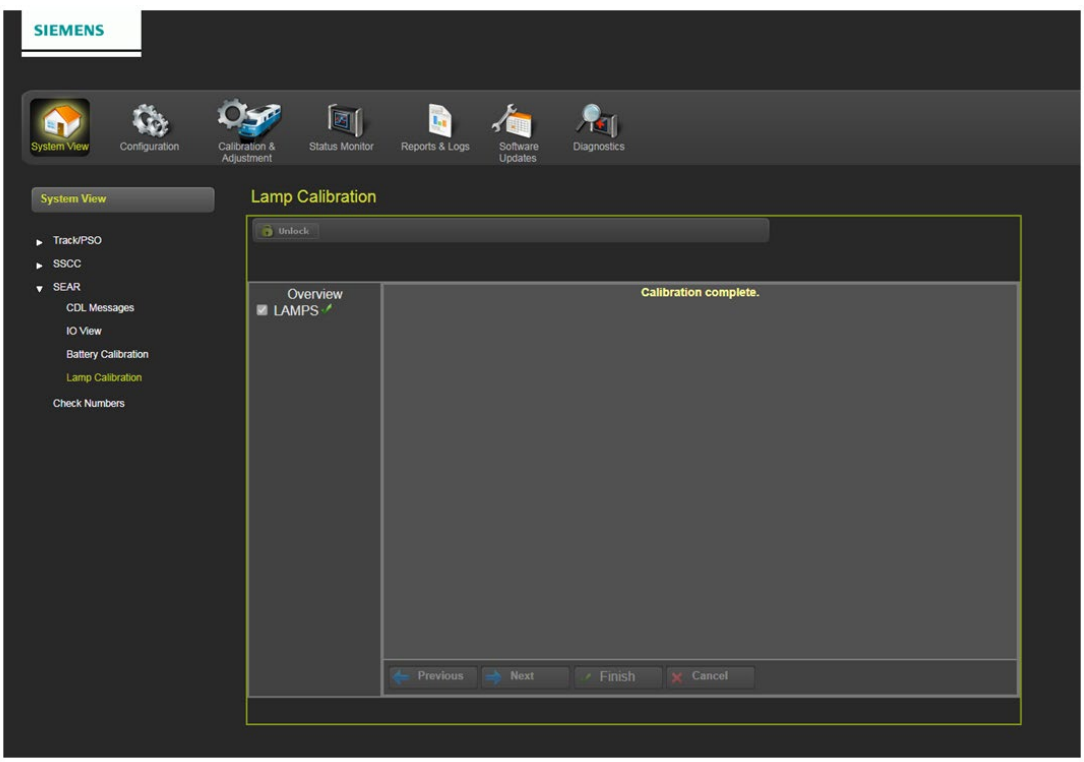

Figure 3-68: Lamp Calibration – Calibration Complete

3.3.1.4 System View - Check Numbers

The check numbers screen has been updated to show the Track Check Numbers (TCNs) and Field Check Numbers (FCNs) for both the main and the standby track cards. Previously, the user would have to power up the other side to see its numbers.

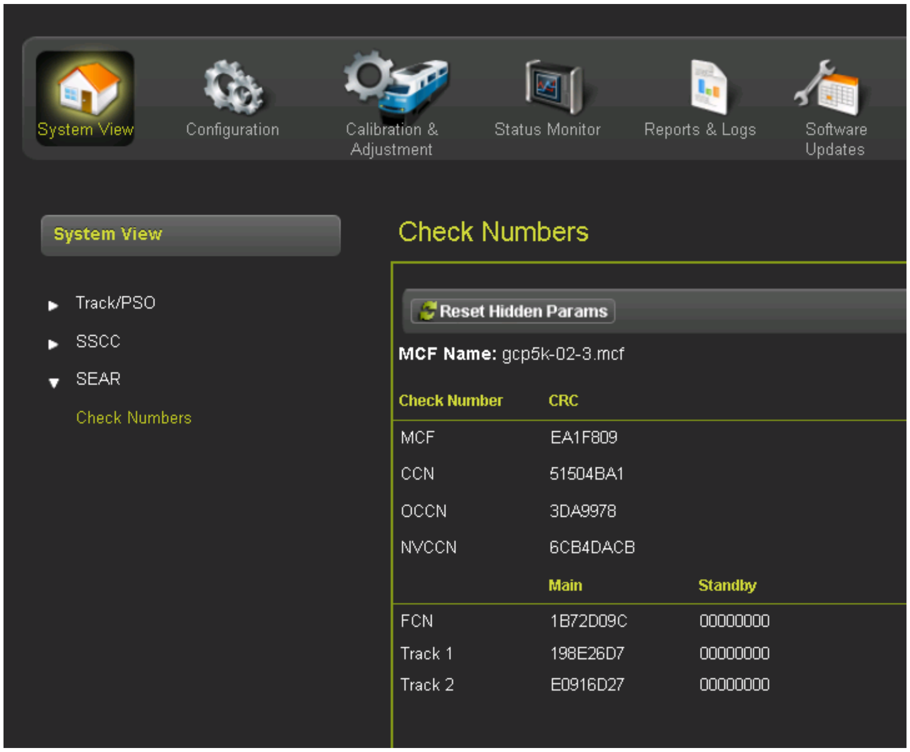

Figure 3-69: Web UI Check Numbers Screen

The TCN and FCN will show a value of 0 if the track card is not fully configured and calibrated and in session with the CPU (for the powered side).

The TCN will change whenever a track card is recalibrated (GCP calibration, approach, linearization or island), or the computed approach distance or linearization steps altered.

If both main and standby systems are calibrated, and the computed approach distance or linearization steps altered, then both the main and standby TCNs are updated.

If a parameter is changed which causes the GCP to require calibration, then the TCNs for both main and standby will show zero. When the main is then fully calibrated, its values will be non-zero, and the standby TCNs will still be at zero, thus providing an indication that the unpowered standby side has not yet been calibrated.

NOTE

NOTE

If a parameter that affects the TCN is changed, so calibration is required, but then it is changed back to its original value, the GCP will no longer require calibration, but the TCN is updated to a new value, as the TCN is recalculated when the GCP goes from an uncalibrated to a calibrated state.

The FCN is an overall check number covering the TCNs for all used tracks and the crossing controller lamp voltage settings. It will also show 0 if any track is not calibrated.

The configuration report lists the main and standby TCNs and FCNs.

NOTE

NOTE

The main/standby TCNs and FCN, and OCCN out of date indication are only available for CPU III versions after 1.1.61r and 9VC72-V3H01_00.mef.

3.4 CONFIGURATION

The Display Web User interface shows the following options under the Configuration tab, these same options are also shown in the Program View on the Local user interface of the Display:

- Site Configuration
- GCP Programming
- SEAR Programming
- Display Programming

3.4.1 Site Configuration

This page allows the user to set the following:

- Site Name
- DOT Number
- Mile Post
- Time Zone
- ATCS address of the system which includes
- ATCS railroad, default 620,
- ATCS line, default 100
- ATCS group, default 100
- ATCS Subnode for Display, default 1
- ATCS Subnode for CPU II+(or CPU III), default 16
- ATCS Subnode for SEAR, default 99
- SEAR temperature format, Celsius or Fahrenheit, default Fahrenheit
- SEAR Date format, European (dd-mm-yyyy) or American (mm-dd-yyyy), default American
- Units of Measure, standard or metric, default standard
- Date
- Time

When Units of Measure is set to Standard, speeds shown on the display and in logs are in mph, and distances in feet. Configuration parameters such as the GCP approach distance is entered and shown in feet.

When Units of Measure is set to Metric, speeds shown on the display and in logs are in kph, and distances in meters. Configuration parameters such as the GCP approach distance is entered and shown in meters.

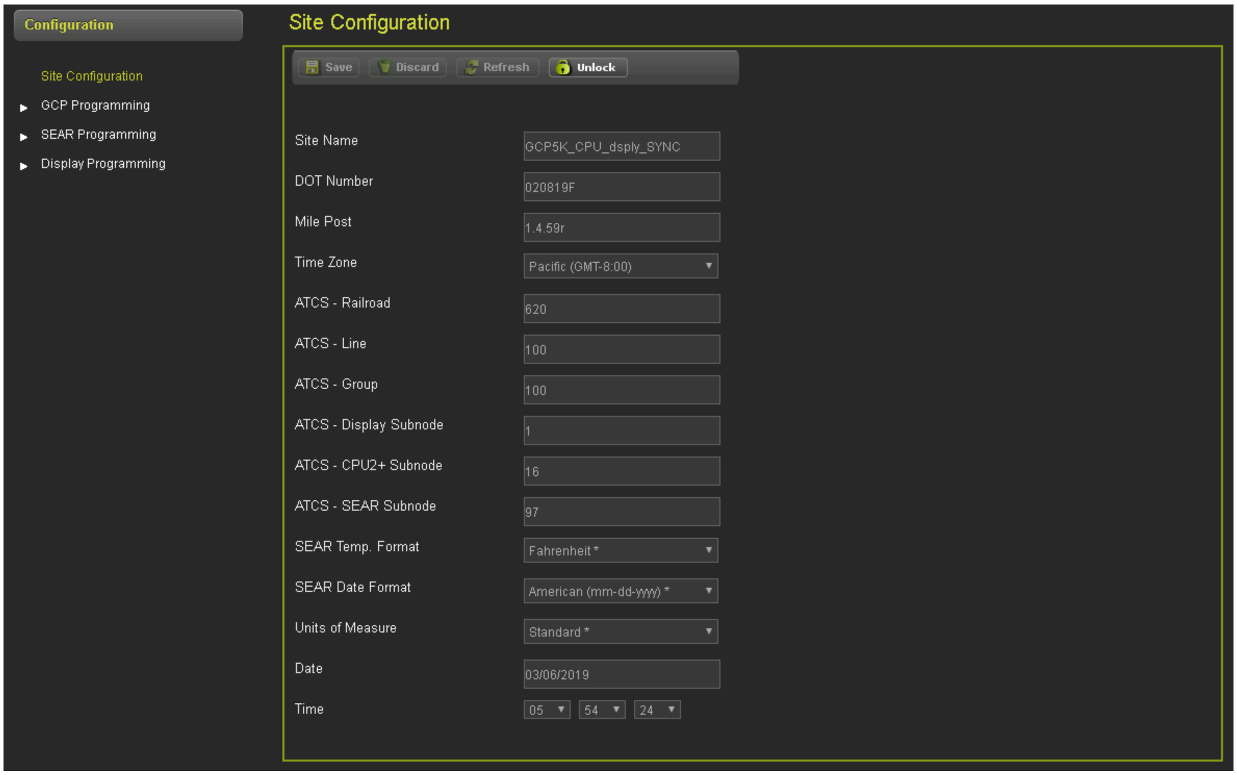

Figure 3-70: Site Configuration

3.4.2 GCP Programming

This section lists the submenu and parameters found under the GCP Programming menu under the Configuration Tab on the Web UI or Program View > 2) GCP Programming menu on the local UI. The local UI is restricted to only showing 10 parameters per menu page, so in some instances menus are split over multiple pages in the local UI and are visible all on one page in the web UI, the descriptions below will describe where this occurs.

On the Web UI the choices under the GCP Programming are:

- Setup Wizard
- Basic Configuration
- GCP and Island Programming
- Logic Programming
- SSCC Programming
- Input/Output Assignments

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

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

Figure 3-71: Web UI Configuration

The GCP 5000 provides a quick way of navigating the Main Program Menu on the local user interface to find a specific configuration parameter listed in the configuration report. The configuration reports shows a number in parenthesis in front of each menu name. This is the number of the menu in the local user interface.

```
 Minimum Program Steps
=================
(1.2) Module Selection
  Track 5/RIO 2 Slot = Track    (OCCN) *
  SSCC-2 Slot = Not Used   (OCCN) *
  Chassis Type = Five Track  (Set in Field)

(2.1.1) Trk 1: GCP Frequency
 Track 1 :  GCP Frequency = 285 Hz   (OCCN,TCN) *
 Track 1 :  GCP Transmit Level = High  (Set in Field ,TCN)
 Track 1 :  Approach Distance = 1600 m   (OCCN,TCN) *
 Track 1 :  Island Connection = Isl 5   (OCCN) *

(2.1.2) Trk 1: Island Frequency
 Track 1 :  Island Used = No   (OCCN) *

(2.1.3.1) Trk 1 Predictor: Prime
 Track 1 :  Prime Warning Time = 34 sec   (OCCN) *
 Track 1 :  Switch MS EZ Level = 16     (OCCN) *
 Track 1 :  Prime Pickup Delay = 20 sec   (OCCN) *
```

To quickly navigate to the specific menu, first go to the Main Program menu. If a submenu of this is currently visible pressing 0 will return to the Main Program menu. Then press the numbers listed in the report in turn on the keypad, for example if the user wants to change track 1 prime warning time, which is in the (2.1.3.1) Trk 1 Predictor: Prime menu.

Press 0 then 2 then 1 then 3 then 1 as shown below:

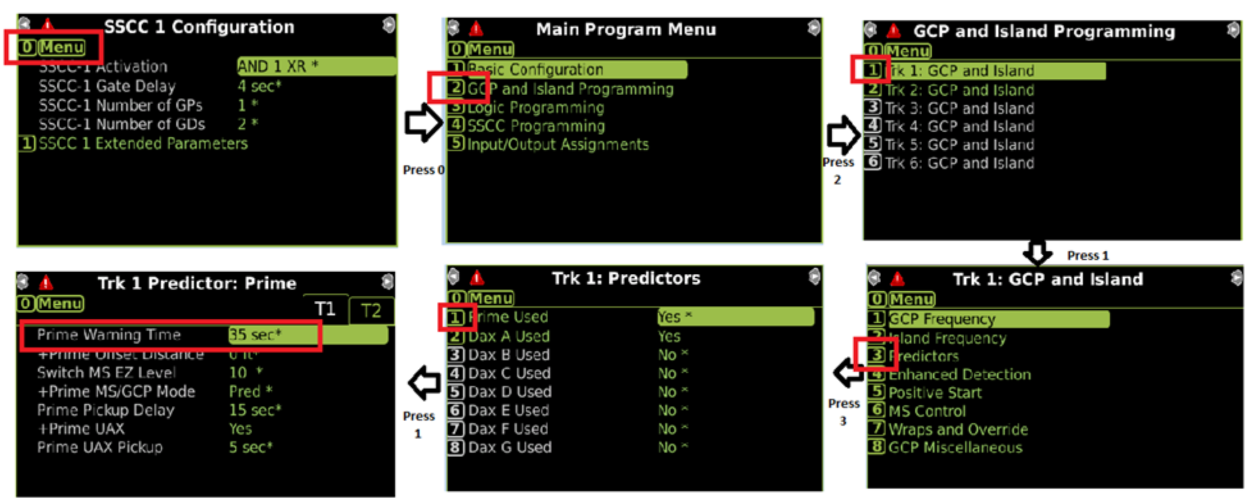

Figure 3-72: Screen navigation

NOTE

NOTE
Whenever a 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.

3.4.2.1 Setup Wizard (Web UI only)

The Setup wizard is what was formally known as the template menus on GCP 4000. If the user wants to program the system based upon the parameters in the template menus they can use this page. The templates menus are more useful the office designer for configuring the basic settings that are common to most crossings.

The ability to view and edit the template menus is not present in the display as it is easier for the user to program the system either by:

- Loading the PAC file, or
- Using the minimum program report and keypad to navigate the menus as shown above.

3.4.2.2 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
7) Set to Default

Set Template

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

- Template

If the template is changed the CPU will reboot in order to load the new default values contained in the template. The display will disconnect from the CPU and reconnect.

If programming a new system for the first time, the template must be set before any other GCP Programming parameters are changed, since changing the template will set everything back to default.

Module Selection

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

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

- SEAR Used
- Chassis Type*

  * When the chassis is shipped from Siemens, the chassis type is set in the CIC. If the chassis type has been set in this manner, the Chassis Type will not be editable. If the contents of the CIC are erased, this information will be lost, and the user is able to change the chassis type.

Preemption

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

When +Preempt Logic is set to **No**:

- Second Trn Logic Used is visible

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
- the ‘Adv Preempt’ option is visible in the Output Assignments menu.

When +Preempt Logic is set to **Advnce** or Second Trn Logic Used is set to **Yes**, the track Preempt predictors are available and the ‘Tn Preempt’ option is visible in the Output Assignments menu.

- When Preempt Health IP Used is set to **Yes** , the ‘Preempt Health’ option is visible in the Input Assignments menu.

When Adv Preempt IP Used is set to **Yes** , the ‘Adv Preempt IP’ option is visible in the Input Assignments menu.

- When Traffic Sys Hlth IP Used is set to **Yes** , the ‘Trf Sys Hlth’ option is visible in the Input Assignments menu.
- When +Gate Down Logic Used is set to **Yes** the Adv Preempt Delay is hidden, and the user is allowed to select which gates down inputs are used in the gate down logic. Note that only the gate downs shown are based upon the Number of GDs parameter value in the SSCC menus (4.3) SSCC 1 Configuration and (4.4) SSCC 2 Configuration, so these may have to be set correctly first before information on this menu can be completed.

When +Gate Down Logic Used is set to **yes**, the ‘Gate Dwn Indication’ option is visible in the Output Assignments menu.

When +Preempt Logic is set to **Simult**, the following parameters are revealed:

- +Preempt Logic
- Preempt Hlth IP Used
- Second Trn Logic Used
- When +Preempt Logic is set to **Simult**, the ‘Sim Preempt’ option is visible in the Output Assignments menu.

For additional information regarding Preemption Logic, refer to Sections 6.3 of this manual.

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

When +MS/GCP Timer Used is set to No the MS/GCP Restart Time is hidden.

When +MS/GCP Timer Used is set to Yes, the ‘Tn MS Ctrl OP’ option is visible in the Output Assignments menu.

For additional information on using MS/Restart, refer to Section 5.8 of this manual.

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

The remote SIN is calculated from the ATCS address of the GCP set in the Site Information screen and the RRR, LLL, GGG and SS Offsets set in these screens.

When +Vital Comms Link 1 Used is set to **YES:**

- Eight outputs labelled **Vital Link 1 OP 1** .. . **Vital Link 1 OP 8** are visible in the Output Assignments menu and Internal States menus.
- Eight inputs labelled **Vital Link 1 IP 1** .. . **Vital Link 1 IP 8** are visible in the Input Assignments menu and Internal States menus.

Vital Comms Link 2 has 8 inputs and outputs.

Vital Comms Link 3 and 4 have 16 inputs and outputs.

The IP states should be set using internal I/O to the values to be transmitted to the remote unit. The OP states reflect the state of the remote bits received from the remote inputs and can be used to set GCP states using Internal I/O available in the Logic Programming / Logic: Internal I/O menus.

For additional information on Vital Comms Links, refer to Section 6.8 of this manual.

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 local user interface screen displays the following:

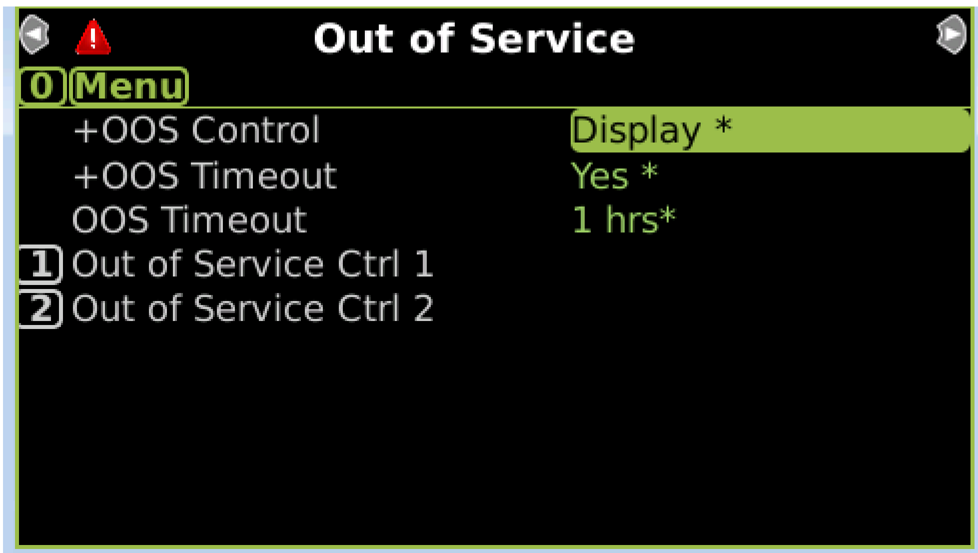

Figure 3-73: Out of Service Options

+OOS Control has 4 options:

- Display (default),
- Display+OOS IPs,
- OOS IPs
- 5000 Case OOS IP

When OOS Control is set to Display, the OOS Timeout options are visible, and both the Out of Service Ctrl submenus are disabled.

When OOS Control is set to Display+OOS IPs, the OOS Timeout options are visible, and the Out of Service Ctrl 1 submenus are enabled.

When OOS Control is set to OOS IPs, the OOS Timeout options are not visible, and Out of Service Ctrl 1 and 2 submenus are enabled.

When OOS Control is set to 5000 Case OOS IP, the OOS Timeout options are not visible, and both Out of Service Ctrl 1 and 2 submenus are disabled.

The Out of Service Ctrl 1 menu allows the user to select which inputs are required to take a specific track out of service. The user can choose to have one input for each track, one input for groups of tracks.

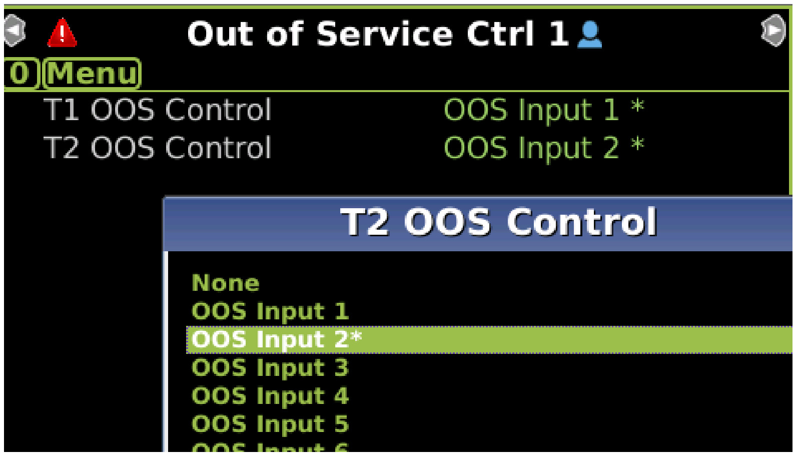

Figure 3-74: Out if Service Input selection

The Out of Service Ctrl 2 menu is used when OOS Inputs are used without the Display and allows the user to select whether when an OOS input is energized it takes just the GCP approach out of service, or both the GCP approach and island out of service.

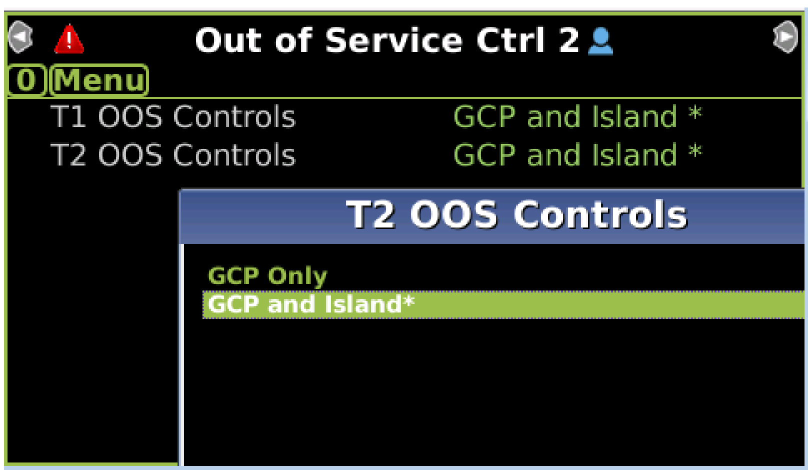

Figure 3-75: Out if Service Control selection

As more space is available on the Web UI, the submenus are not necessary, and all the options are available on 1 page as shown below.

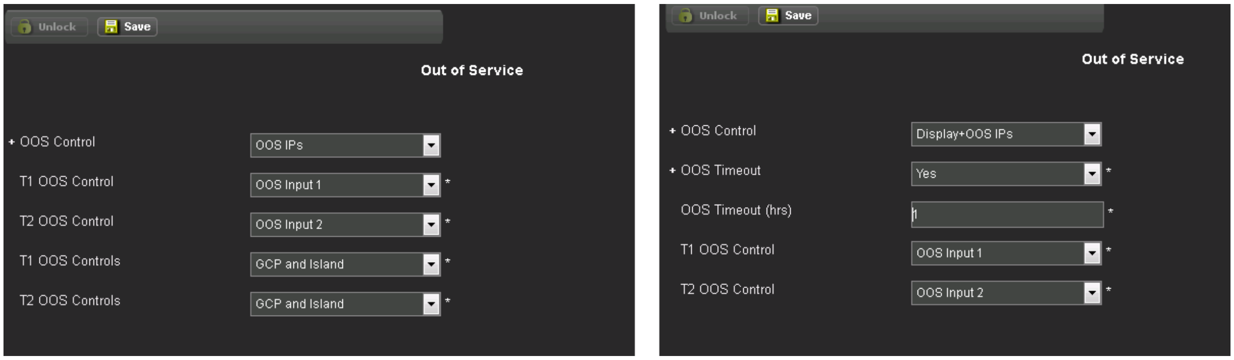

Figure 3-76: Out if Service Web UI

For more information regarding OOS, see Section 5.12 of this manual.

Set to Default

The **Set to Default** screen enables users to return the GCP Programming parameters to their default settings. The Site Information, SEAR Programming, and Display programming are unaffected. The **Set to Default** screen displays the following parameter:

- Set to Defaults

⚠ CAUTION

CAUTION

ONCE 'SET TO DEFAULT' IS PERFORMED, IT CANNOT BE UNDONE. ALL GCP PROGRAMMING WILL NEED TO BE RE-ENTERED.

3.4.2.3 GCP and Island Programming

The **GCP and Island Programming** menus control all track related parameters.

The first sub-menu allows the user to select the track.

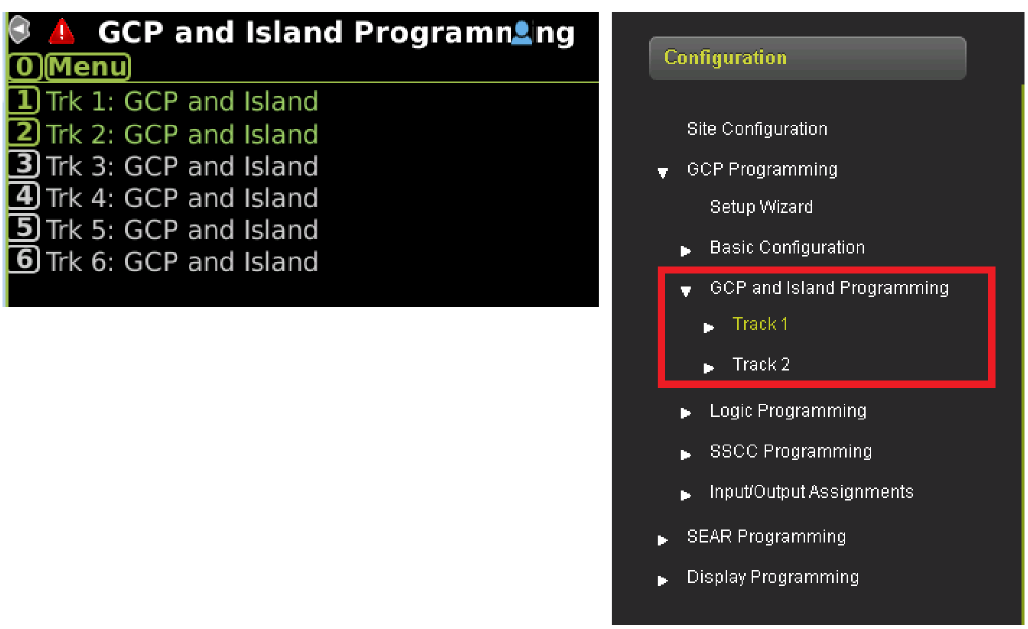

Figure 3-77: GCP and Island Programming Selection

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

GCP Frequency

The **Trk "N": GCP Frequency** screen allows the user to set the corresponding track circuit configuration parameters. On the local User interface use the left and right arrow buttons to move between the screens for each track. To move between tracks use the up arrow button to highlight the Track tab, then press the right or left arrow button to change tracks. On the Web UI select the tab for the desired track

Figure 3-78: Tab to next Track

The **Trk "N": GCP Frequency** screen displays the following parameters:

- +MS/GCP Operation
- GCP Freq Category
- GCP Frequency
- GCP Transmit Level
- Uni/Bi/Sim-Bidirnl
- Approach Distance
- Directionally Wired
- Island Connection
- Computed Distance (not editable, Web UI only)
- Linearization Steps (not editable Web UI only)

If the MS/GCP operation is not required as only the island is being used on the module, set **MS/GCP Operation** to **No**, this will hide all the parameters above.

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

Island Frequency

The **Trk "N": Island Frequency** screen sets the corresponding island configuration parameters. The following parameters are available on the screen

- Island Used
- Isl Frequency
- Pickup Delay (2s+)
- Isl Enable IP Used
- Island Distance
- Island Used has the options of **Internal** (default), **External** or **No**.
- When Island Used is set to Internal the user is able to set the parameters listed above.

When Island Used is set to External the parameters shown are:

- Island Used
- Isl 1 Enable Pickup Delay
- Island Distance

In this case 'Isl n Enable' inputs are enabled as options in the Input Assignment menus. The user has to assign an input to Isl 'n' Enable and wire the external inland to the chosen input.

When Island Used is set to **No** the Island Distance is still visible, as the island distance is used by the GCP for post joint prediction calculations.

In some cases, the user may use the MS/GCP function on one track module but use the island on a separate track module. This may be done so that external filters can be added that just affect the GCP or Island but not both. In order to get correct post joint detection on a track the island distance associated with that track needs to be settable.

When the Island is set to Internal, the user can set its frequency and an additional pickup delay. The internal island has a built in 2s pickup delay and the value added here is an addition to that 2s. Note that an external island has no additional pickup delay, 0s is the default value. This is because the external device providing the island track circuit may have its own built in pickup delay.

If Isl Enable IP Used is set to Yes, the **"Isl n Enable"** is available is an input. 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.

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

Predictors

The **Trk "N": Predictors** screen sets which predictors are used on the specified track. The **Preempt Used** parameter is present only when the **+Preempt Logic** selection field is set to **Advnce** or **Second Trn Logic Used** is set to **Yes**.

The **Trk "N": Predictors** screen displays the following parameters:

- 1) Prime Used
- 2) Preempt Used (only visible when adv preemption or second train logic used)
- 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

Trk “N” Predictor: Prime

When Prime Used is set to **Yes** for track “N”, the **Trk “N” Predictors: Prime** screen is enabled. The default items visible when offset distance is 0 are:

- Prime Warning Time
- +Prime Offset Distance
- Switch MS EZ Level
- +Prime MS/GCP Mode
- Prime Pickup delay
- +Prime UAX

When the Prime Offset Distance is set to a non-zero value, the **Pickup Delay Mode** parameter is shown which is used to control the manner in which the pickup delay is calculated, see section 6.2 for details. The **Switch MS EZ Level** should usually be set to 0 when an offset is used, but in some special application may be set to a non-zero value.

To change to prime predictor to a motion sensor change **Prime MS/GCP Mode** to MS. When this is done the **Prime Warning Time** and **Switch MS EZ Level** parameters are hidden as they are no longer applicable.

When the **Prime UAX** is set to **Yes** the **Prime UAX Pickup** parameter is shown allowing the user to set a pickup delay between 0 and 500s for the Prime UAX.

Trk “N” Predictor: Preempt

When Advance Preemption or Second Train Logic is used the Preempt predictor is made visible.

The **Trk “N” Predictors: Prmpt** screen displays the following parameters

- Prmpt Warning Time
- +Prmpt Offset Distance
- Switch MS EZ Level
- +Prmpt MS/GCP Mode
- Prmpt Pickup Delay
- +Prmpt Enable

The Preempt follows similar rules as the Prime regarding visibility of options when Prmpt Offset Distance and Prmpt MS/GCP Mode values are changed.

Trk “N” Predictor: Dax A – G

When Dax A – G Used is set to **Yes**, the **Trk “N” Predictors: Dax A – G** menus are enabled. The **Trk “N” Predictors: Dax A - G** screen displays the following parameters:

- Dax A – G Warning Time
- +Dax A – G Offset Distance
- Switch MS EZ Level
- Pickup Delay Mode

- +Dax A – G MS/GCP Mode
- Dax A – G Pickup Delay
- +Dax A – G Enable

The Offset Distance is non-zero by default on a DAX which causes the **Pickup Delay Mode** parameter to be shown which is used to control the manner in which the pickup delay is calculated, see section 6.2 for details. If the offset is set to 0, this is hidden, and the configured Pickup Delay is used.

The **Switch MS EZ Level** should usually be set to 0 when an offset is used, but in some special applications may be set to a non-zero value.

To change to Dax to a motion sensor change the **Dax MS/GCP Mode** to MS. When this is done the **Dax Warning Time** and **Switch MS EZ Level** parameters are hidden as they are no longer applicable.

When the **Dax Enable** is set to **Yes** the **Dax Enable Pickup** parameter is shown, allowing the user to set a pickup delay between 0 and 500s for the Dax Enable.

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

Enhanced Detection

The **Trk "N": Enhanced Detection** screen allows the user to set enhanced detection parameters for the specified track.

Post Joint Detn Time: In Model 4000 and GCP 3000s, the post joint detection time for DAXes was adjusted by modifying the Island Distance. With the GCP 5000, the **Post Joint Detn Time** allows the user to directly enter the required time.

The **Enhanced Detection** screen shows 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 Prediction

The **Adv Appr Prediction** link is disabled when the parameter is set to **No**.
When **Adv Appr Prediction** is set to **Yes**, the **Speed Limiting Used** is hidden, as it is always treated as on in this mode, and the link to Adv Appr Prediction screen is enabled (text in green letters).

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.

- The **Adv Appr Predn Time** sets the time for which the prediction process continues, default is 20s.
- **Adv Appr Predn Strt EZ**, default 85, used to select the EZ value at which the advanced approach prediction algorithm starts.
- **Adv Appr Predn Stop EZ**, default 0, , used to select the EZ value at which the advanced approach prediction algorithm stops
- **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.

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

Trk “N”: Positive Start

When **Positive Start** is set to **On** or **Timed** or **Sudden Shnt Det Used** is set to **Yes**, the **Trk “N”: Positive** Start screen is enabled.

The **Positive Start Offset:** (default **0**ft) parameters allows the positive start to be used with DAXes. When EZ is less than configured Positive Start EZ level, predictors with non-zero offsets, offsets less than the configured Positive start offset will be de-energized on inbound moves. Positive start does not affect DAXes on reverse moves.

When **Sudden Sht Detection Used is set to Yes the** “Sudden Shunt Detection Level” and “Sudden Shunt Detection Offset” are visible on this screen. 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
- Positive Start Timer
- Sudden Shnt Det Level
- Sudden Shnt Det Offset

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.

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). A train stopping between EZ 0.5 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

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, refer to Section 6 of this manual.

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, refer to Section 6 of this manual.

3.4.2.4 Logic Programming

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

The **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

Logic: Track ANDing

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

The **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

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 **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

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 **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

Logic: AND Gates

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

When an AND "5 – 12" Used parameter is set to **Yes** the options associated with the AND are shown as in Figure 3-79. The user can select any available system output for the AND Terms**.**

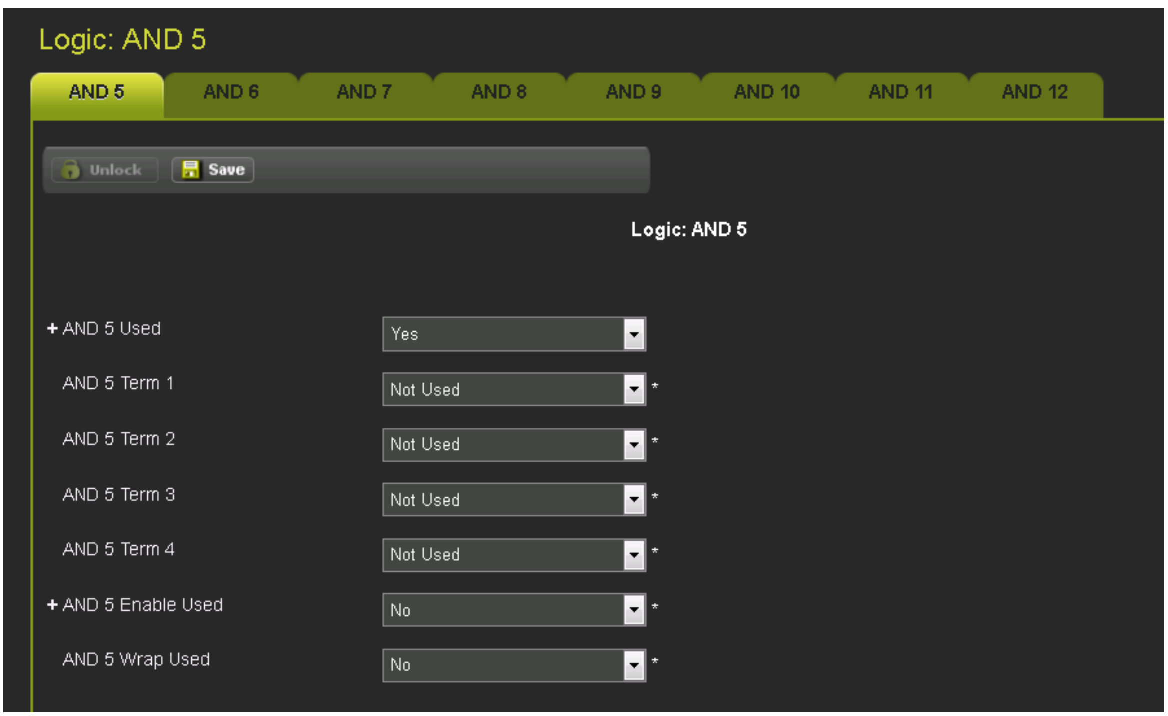

Figure 3-79: AND 5 Logic Example

Logic: OR Gates

The **Logic: OR Gates** screen displays the user configurable ORs are available. When an OR"1 -4" Used parameter is set to **Yes** the options associated with the OR are shown as in Figure 3-80. The user can select any available system output for the OR Terms

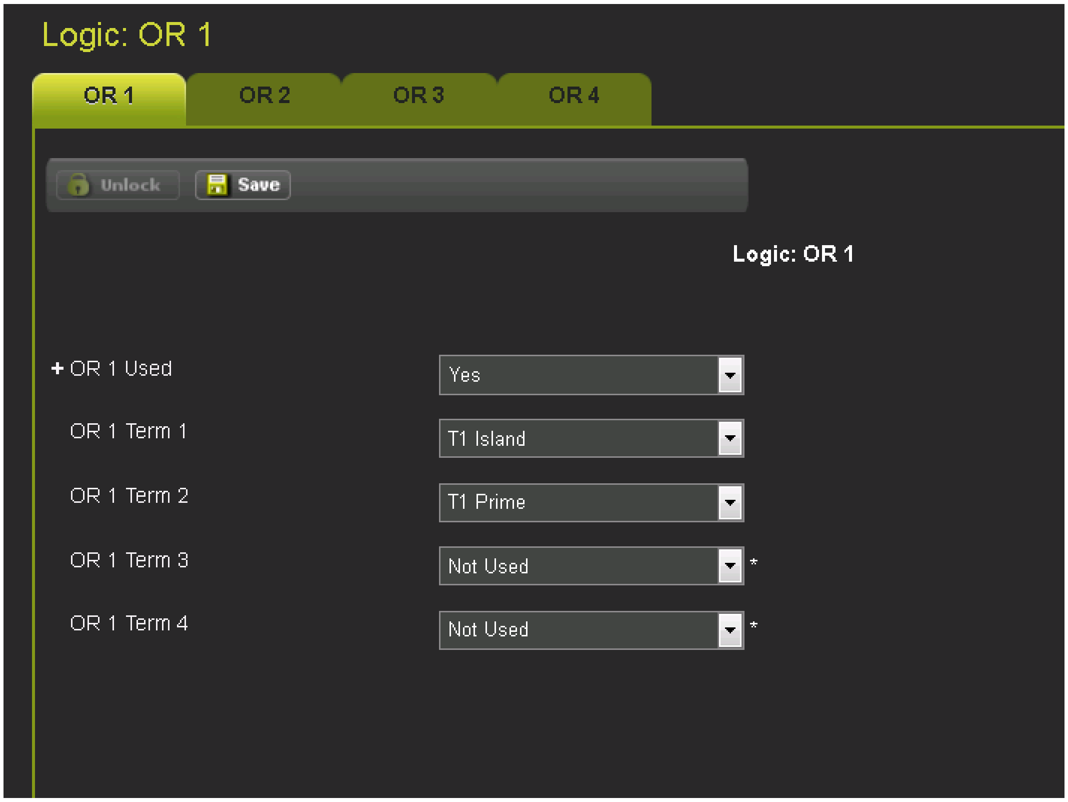

Figure 3-80: OR 1 Logic Example

Logic: Controls

The **Logic: Controls** screen enables Emergency Activation function, the Maintenance Call operation, and Pass Thru States. Pass Thru states allow a system input state to be used to set an internal state. Internal states are usually only set by system outputs.

The **Logic: Controls** screen displays the following parameters:

- Emergency Activate IP
- Maint Call Rpt IP Used
- Pass Thrus.

When Emergency Activate IP is set to **Yes** the user can assign the **Emergency Activate** input to a vital input on a module. This input should be wired to a switch that can be used to activate the crossing. When the emergency activation is de-energized all GCP predictors and vital outputs are de-energized, all vital inputs are treated a de-energized. The SSCC IIIi modules will de-energize the gate output and flash the lamps.

If the Maint Call Rpt IP is set to yes the user can assign the **Maint Call Rpt IP** to a vital input on a module. This input will be ANDed in with the internal logic controlling the maintenance call output.

When Pass Thrus is set to yes, four pass thru state options (Pass Thru State 1 .. Pass Thru State 4) become available which can be assigned to vital inputs. These allows an external input to be used in the logic to set another input term function via the internal channels.

Logic: Internal I/O

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

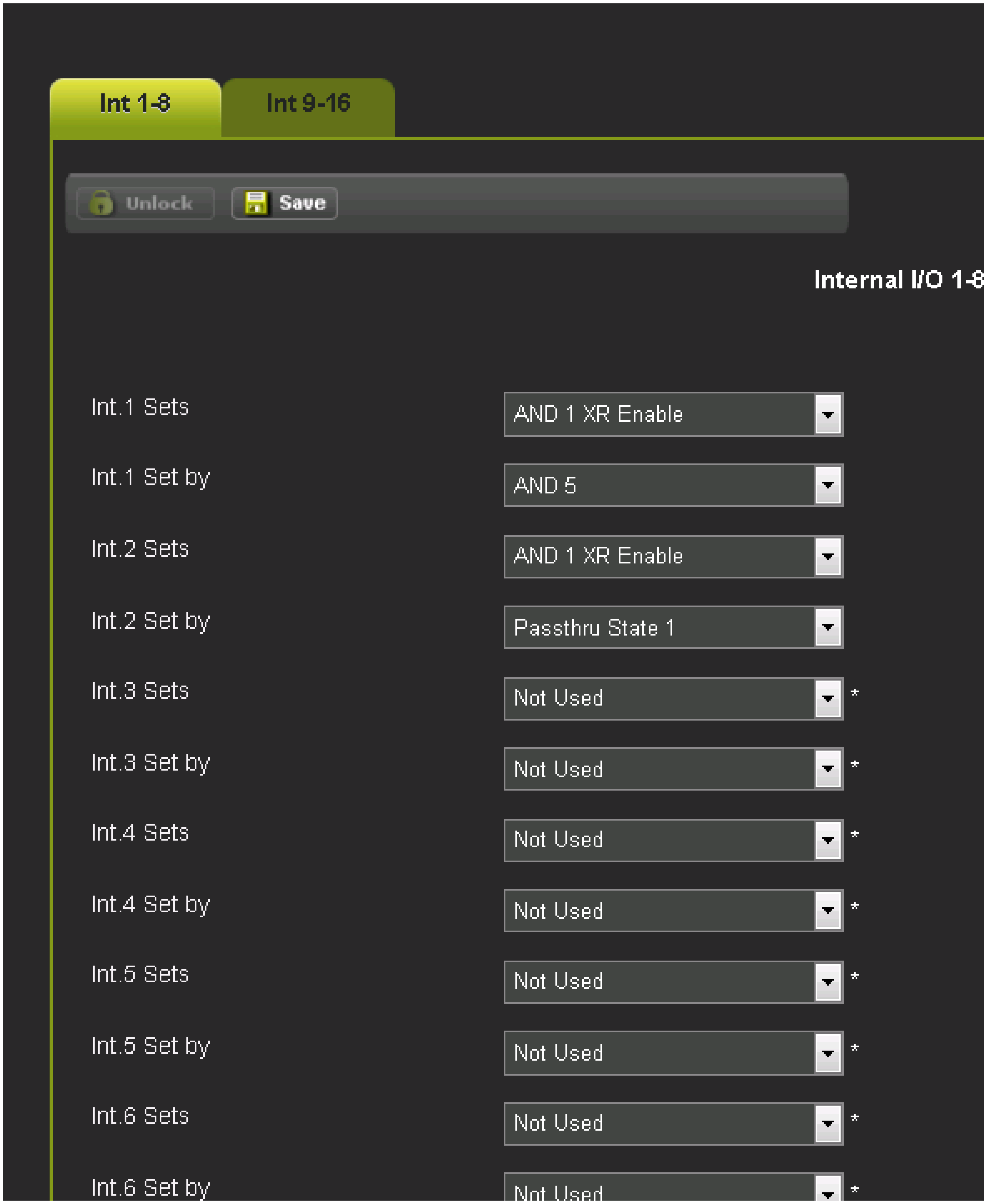

Figure 3-81: Internal Channels Screen

For further information regarding Internal Logic, please refer to Section 6.6.1.6 of this manual.

3.4.2.5 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 **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

SSCC Configuration

The **SSCC Configuration** screen is used to set functions regarding the crossing controllers that is common to both SSCCi modules

When the +SSCCIV Controller Used parameter is set to **No**, the following parameters are visible.

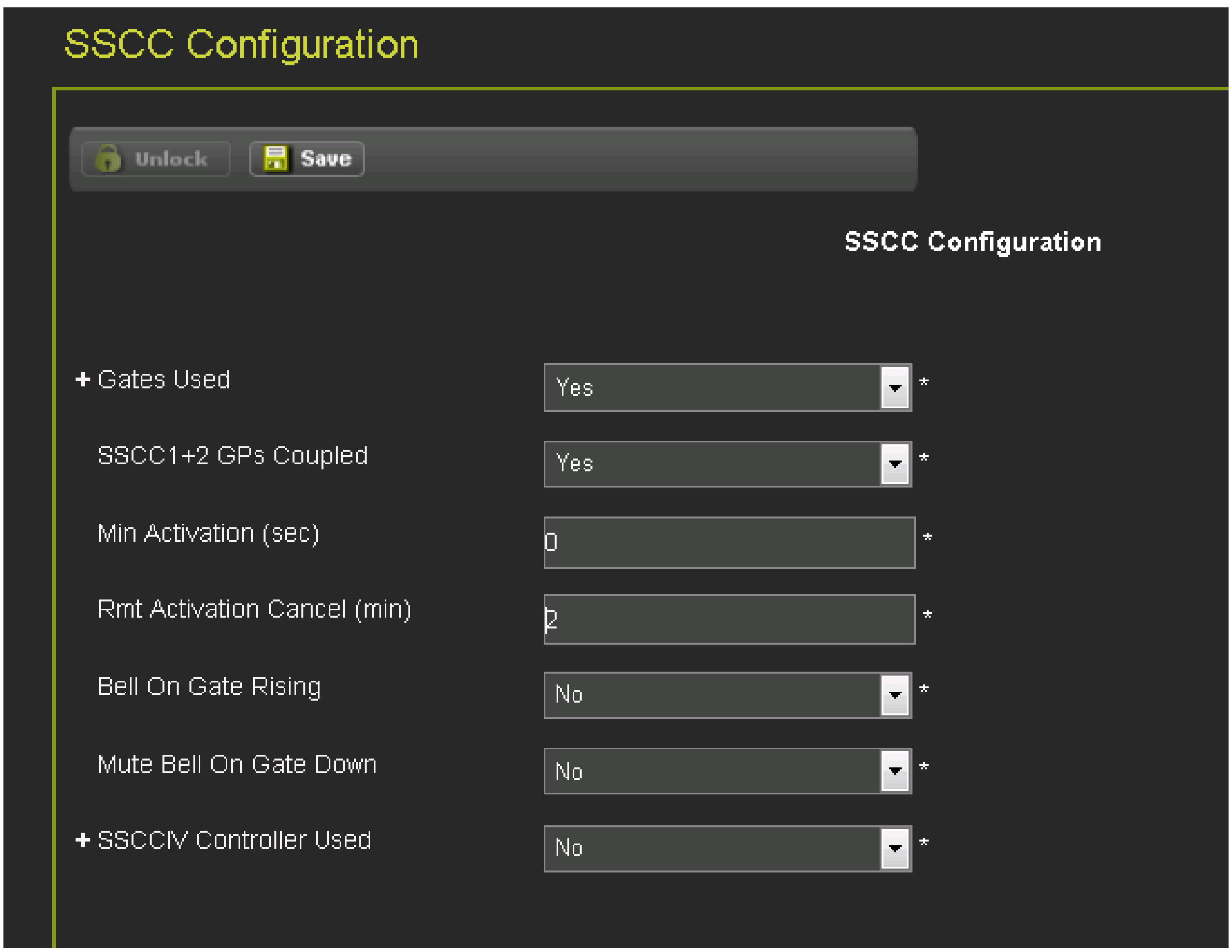

Figure 3-82: SSCC Configuration Screen

If an auxiliary external SSCC is needed to provide more gate or lamp outputs, or 4 quadrant gate functionality set SSCCIV controller used to yes. The 4000 Control Type can then be used to select whether the SSCCIV is an entrance gate controller or an exit gate controller.

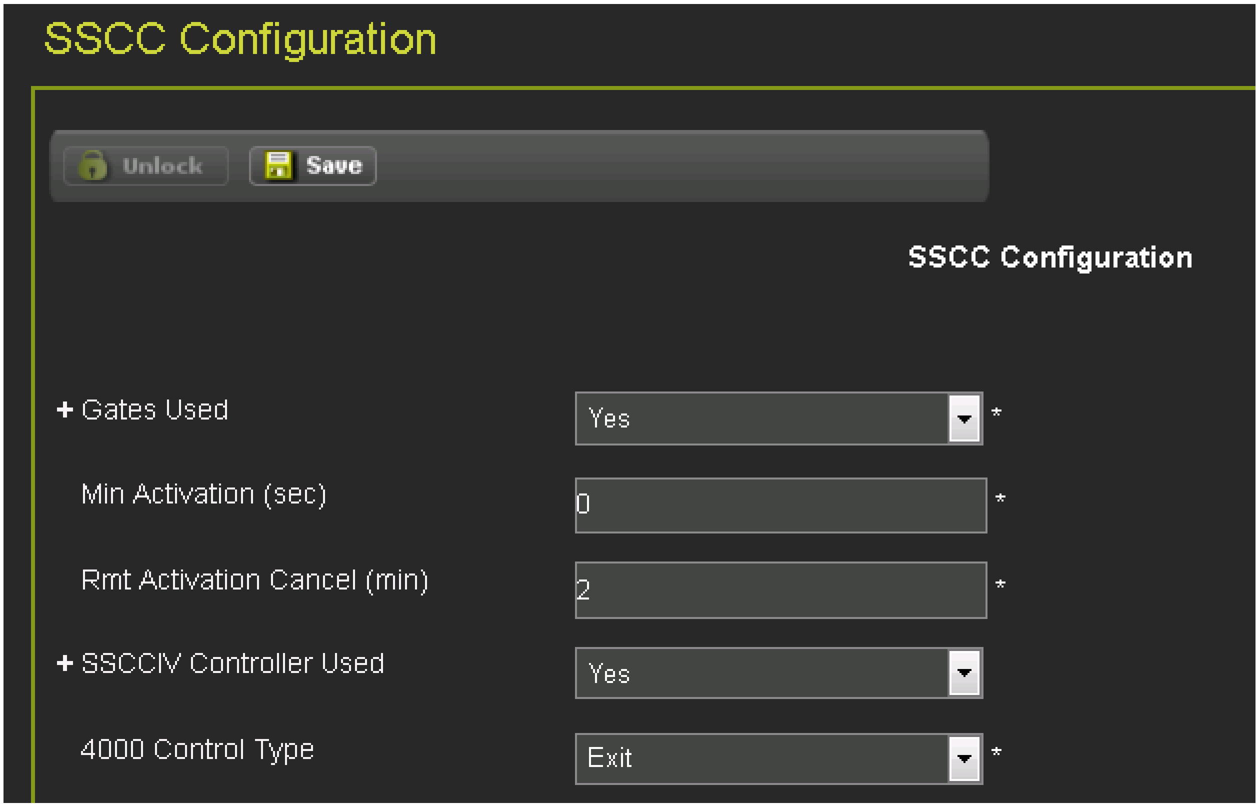

Figure 3-83: SSCC Configuration Screen with SSCCIV Selected

SSCCIV Control and Setup

When the +SSCCIV Controller Used parameter is set to **Yes**, the following screens is enabled in the web UI which allows the user to set the ATCS address parameters of the SSCCIV. The GCP communicates to the SSCCIV via the Echelon communication link and thus requires the user to set the GCPs ATCS address and that of the SSCCIV module.

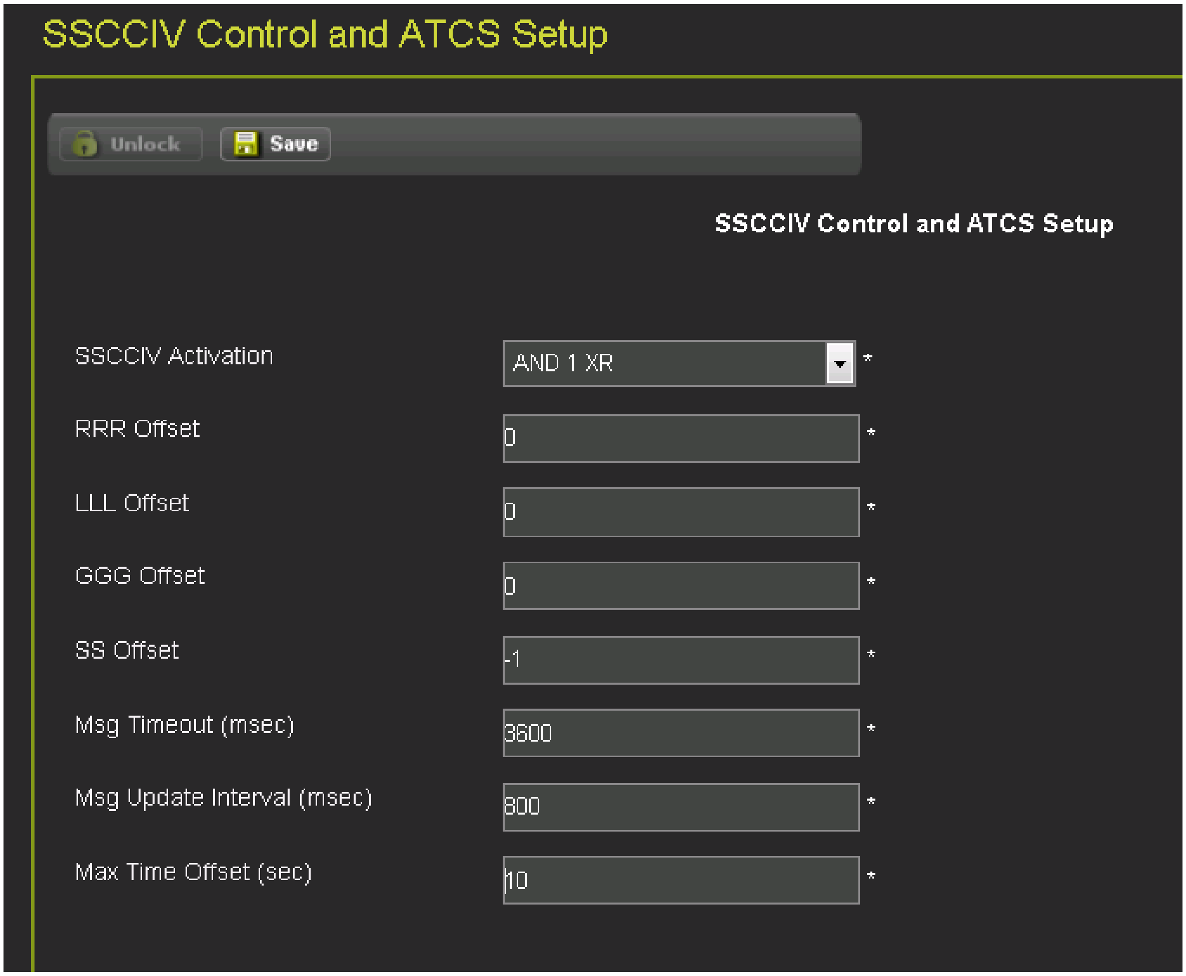

Figure 3-84: SSCC Configuration Screen with SSCCIV Selected

SSCC 1 and 2 Configuration

The **SSCC 1 Configuration** and the similar SSCC **2 Configuration** screen are used to set configuration options for SSCC 1 and 2 modules.

Figure 3-85: SSCC 1 Configuration Screen

Aux-1 Xng Ctrl Used is set to yes when the GCP is used in interconnected railroad crossings, where lamp controls from one crossing may need to be sent to the other crossing.

3.4.2.6 Input/Output Assignments

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

- 1) Output Assignments
- 2) Input Assignments

Output Assignments

The **Output Assignments** screen is used to sets the output function for the module output. The outputs that appear depend on which types of module are selected.

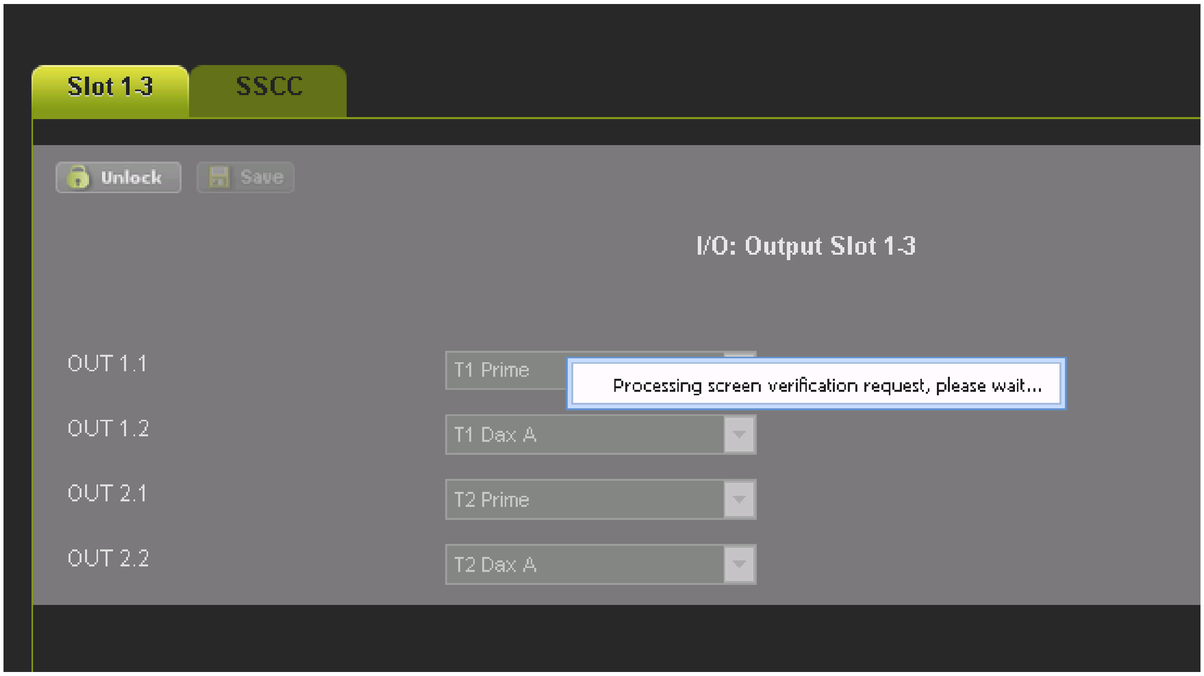

Figure 3-86: Output Assignments

Input Assignments

The **Input Assignments** screen is used to set Input function for the modules**.** The inputs that appear depend on which types of module are selected.

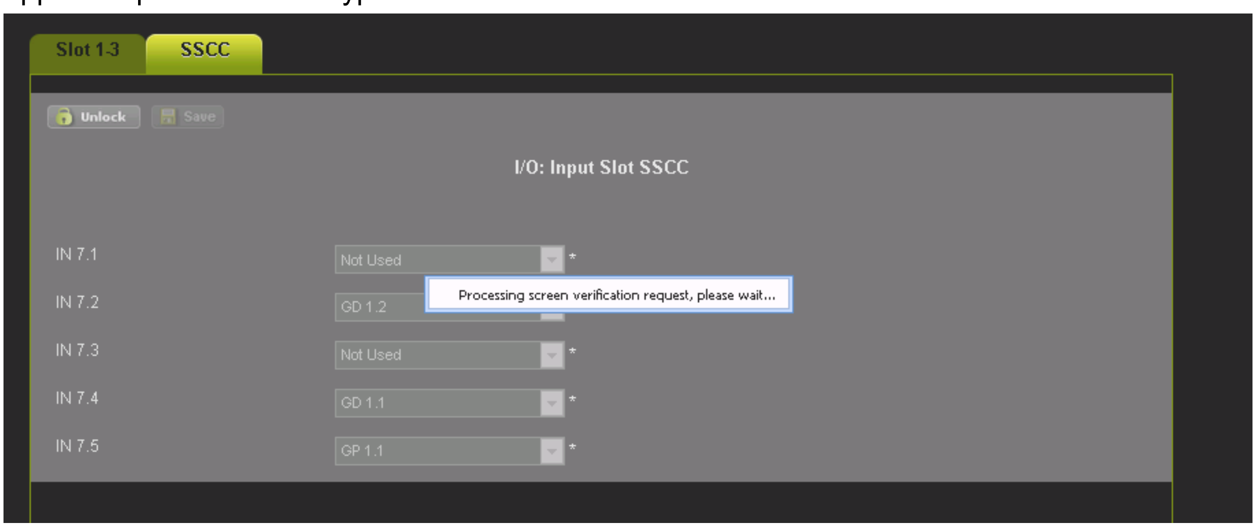

Figure 3-87: Input Assignments

3.4.3 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 GCP 5000 Field Manual, SIG-00-13-03.

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

- Basic Configuration
- GCP and Island Programming
- Logic Programming
- Advanced Programming
- SSCC Programming
- Input/Output Assignments

3.4.3.1 Basic Configuration

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

- Set Template
- Module Selection
- Preemption
- MS/Restart
- Vital Comms Links
- 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/RIO 1 Slot	Track
	Track 3 Slot	Not Used[1]
	Track 4 Slot	Not Used[1]
	Track 5/RIO 2 Slot	Not Used[1]
	Track 6/RIO 3 Slot	Not Used[1]
	SSCC-1 Slot	SSCC IIIi[2]
	SSCC-2 Slot	SSCC IIIi[2]
	SEAR Used	Yes
	Chassis Type	Dual Six Track
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
	GDown Lgc Uses GD 1.1	Yes
	GDown Lgc Uses GD 1.2	Yes
	Second Trn Logic Used	No
MS/Restart	+MS/GCP Restart Used	No
	MS/GCP Restart all Trks	No
	+MS/GCP Timer Used	Yes
	MS/GCP Restart Time	10mins
Vital Comms Link 1	+Vital Comms link 1 Used	No
	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 2	+Vital Comms link 2 Used RRR Offset LLL Offset GGG Offset SS Offset Msg Timeout Msg Update Interval Max Time Offset Remote SIN	No 0 0 1 0 3600 msec 800 msec 10 sec 762020020116
Vital Comms Link 3	+Vital Comms link 3 Used RRR Offset LLL Offset GGG Offset SS Offset Msg Timeout Msg Update Interval Max Time Offset Remote SIN	No 0 0 1 0 3600 msec 800 msec 10 sec 762020020116
Vital Comms Link 4	+Vital Comms link 4 Used RRR Offset LLL Offset GGG Offset SS Offset Msg Timeout Msg Update Interval Max Time Offset Remote SIN	No 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.

3.4.3.2 GCP and Island Programming

The **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	Yes Standard Not Set Medium Unidirnl 9999 ft No Isl 1
Trk 1: Island Frequency	+Island Used Isl Frequency Pickup Delay (2s +) +Isl Enable IP Used Isl 1 Enable Pickup Delay Island Distance	Internal Not Set 0 sec Yes 1 sec 199 ft

Table 3-2: GCP and Island Programming

Menu	Menu Entries	Default Settings
Trk 1: Predictors	Prime Used	Yes[1]
	Preempt Used	Yes[2]
	Dax A Used	No
	Dax B Used	No
	Dax C Used	No
	Dax D Used	No
	Dax E Used	No
	Dax F Used	No
	Dax G Used	No
Trk 1 Predictor: Prime	Prime Warning Time	35
	+Prime Offset Distance	0 ft
	Switch MS EZ Level	10
	Pickup Delay Mode	Fixed
	+Prime MS/GCP Mode	Pred
	Prime Pickup Delay	15 Sec
	+Prime UAX	No
	Prime UAX Pickup	5 sec
Trk 1 Predictor: Preempt	Preempt Warning Time	45
	+Preempt Offset Distance	0 ft
	Switch MS EZ Level	10
	Pickup Delay Mode	Fixed
	+Preempt MS/GCP Mode	Pred
	Preempt Pickup Delay	15 Sec
	+Preempt UAX	No
	Preempt UAX Pickup	5 sec
Trk 1 Predictor: Dax A	Dax A Warning Time	45
	+Dax A Offset Distance	99 ft
	Switch MS EZ Level	0
	Pickup Delay Mode	Auto
	+Dax A MS/GCP Mode	Pred
	Dax A Pickup Delay	15 Sec
	+Dax A UAX	No
	Dax A UAX Pickup	5 sec
Trk 1 Enhanced Detection	Inbound PS Sensitivity	High
	Speed Limiting Used	Yes
	Outbound False Act Lvl	Normal
	Outbound PS Timer	20 sec
	Trailing Switch Logic	On
	Post Joint Detn Time	15 sec
	Adv Appr Predn	No

Table 3-2: GCP and Island Programming

Menu	Menu Entries	Default Settings
Trk 1: Adv Appr Predn	Adv Appr Predn Time	20 sec
	Adv Appr Predn Strt EZ	85
	Adv Appr Predn Stop EZ	0
Trk1: Positive Start, Low EZ	1) Positive Start	Off
	2) Sudden Shnt Det Used	No
	3) Low EZ Detection Used	No
Trk 1: Positive Start	Positive Start Level	10
	Positive Start Offset	0 ft
	Positive Start Timer	10 min
	Sudden Shnt Det Level	70
	Sudden Shnt Det Offset	0 ft
Trk1: Low EZ Detection	Low EZ Detection Level	70
	Low EZ Detection Time	10 min
	Low EZ Det Effect	Activate
	Low EZ Det Override IP	No
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 C switch to MS	No
	Dax D switch to MS	No
	Dax E switch to MS	No
	Dax F switch to MS	No
	Dax G 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

Table 3-2: GCP and Island Programming

Menu	Menu Entries	Default Settings
Trk 1: GCP Miscellaneous	Low EX Adjustment False Act on Train Stop EX Limiting Used EZ Correction Used Compensation Level Warn Time-Ballast Comp	39 No Yes Yes 1300 High
Track 2 Parameters	Same as Track 1 except for track differences.	
Track 3 Parameters		
Track 4 Parameters		
Track 5 Parameters		
Track 6 Parameters		

3.4.3.3 Logic Programming Menus

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

Table 3-3: Logic Programming Menus

Menu	Menu Entries	Default Settings
Logic: AND 3	AND 3 Track 1	Not Used
	AND 3 Track 2	Not Used
	And 3 Wrap Used	No
	+AND 3 Enable Used	No
Logic: AND 4	AND 4 Track 1	Not Used
	AND 4 Track 2	Not Used
	And 4 Wrap Used	No
	+AND 4 Enable Used	No
Logic: AND Gates	AND 5 Used	No
	AND 6 Used	No
	AND 7 Used	No
	AND 8 Used	No
	AND 9 Used	No
	AND 10 Used	No
	AND 11 Used	No
	AND 12 Used	No
Logic: AND 5	AND 5 Term 1	Not Used
	AND 5 Term 2	Not Used
	AND 5 Term 3	Not Used
	AND 5 Term 4	Not Used
	And 5 Wrap Used	No
	+AND 5 Enable Used	No
Logic: AND 6	AND 6 Term 1	Not Used
	AND 6 Term 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 Term 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 Term 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

Table 3-3: Logic Programming Menus

Menu	Menu Entries	Default Settings
Logic: AND 9	AND 9 Term 1 AND 9 Term 2 AND 9 Term 3 AND 9 Term 4 AND 9 Wrap Used +AND 9 Enable Used	Not Used Not Used Not Used Not Used No No
Logic: AND 10	AND 10 Term 1 AND 10 Term 2 AND 10 Term 3 AND 10 Term 4 AND 10 Wrap Used +AND 10 Enable Used	Not Used Not Used Not Used Not Used No No
Logic: AND 11	AND 11 Term 1 AND 11 Term 2 AND 11 Term 3 AND 11 Term 4 AND 11 Wrap Used +AND 11 Enable Used	Not Used Not Used Not Used Not Used No No
Logic: AND 12	AND 12 Term 1 AND 12 Term 2 AND 12 Term 3 AND 12 Term 4 AND 12 Wrap Used +AND 12 Enable Used	Not Used Not Used Not Used Not Used No No
Logic: OR Gates	OR 1 Used OR 2 Used OR 3 Used OR 4 Used	No No No No
Logic: OR 1	OR 1 Term 1 OR 1 Term 2 OR 1 Term 3 OR 1 Term 4	Not Used Not Used Not Used Not Used
Logic: OR 2	OR 2 Term 1 OR 2 Term 2 OR 2 Term 3 OR 2 Term 4	Not Used Not Used Not Used Not Used
Logic: OR 3	OR 3 Term 1 OR 3 Term 2 OR 3 Term 3 OR 3 Term 4	Not Used Not Used Not Used Not Used

Table 3-3: Logic Programming Menus

Menu	Menu Entries	Default Settings
Logic: OR 4	OR 4 Term 1	Not Used
	OR 4 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/O 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
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

Table 3-3: Logic Programming Menus

Menu	Menu Entries	Default Settings
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

3.4.3.4 SSCC Programming Menus

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

Table 3-4: 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

Table 3-4: SSCC Programming Menus

Menu	Menu Entries	Default Settings
SSCC 1 Extended Parameters	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	50 Master No Off 100 dV 100 dV No Yes
SSCC 2 Configuration	SSCC-2 Activation SSCC-2 Gate Delay SSCC-2 Number of GPs SSCC-1 Number of GDs 1) SSCC 2 Extended Parameters	AND 1 XR 4 sec 0 0 None
SSCC 2 Extended Parameters	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	50 slave No Off 100 dV 100 dV No Yes

3.4.3.5 Input/Output Assignments

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

1) Output Assignments
2) Input Assignments

The **IO assignment** menus are shown in Table 3-5.

Table 3-5: IO Assignment Menus

Menu	Menu Entries	Default Settings
Input/Output Assignments	1) Output Assignments 2) Input Assignments	None
Output Assignments	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	None

Table 3-5: IO Assignment Menus

Menu	Menu Entries	Default Settings
I/O: Output Slot 1-2	OUT 1.1 OUT 1.2 OUT 2.1 OUT 2.2	Not Used Not Used Not Used Not Used
I/O: Output Slot 3-4	OUT 3.1 OUT 3.2 OUT 4.1 OUT 4.2	Not Used Not Used Not Used Not Used
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

3.4.4 SEAR Programming

In the GCP 5000 the SEAR IIi is programmed via the A80485 Display Web UI or Local UI menus, unlike the GCP 4000 where it is programmed via either the terminal interface accessed via the front of the SEAR or a terminal emulation on display module. In the GCP 5000 the configuration data for the SEAR is stored in the USB ECD by the Display, this means that if the SEAR IIi is replaced it will not require reprogramming.

The GCP 5000 also allows the SEAR IIi programming to be done offline using the OCE. The PAC file created by the OCE contains the SEAR IIi configuration settings.

When the OCE has been used to completely program the SEAR IIi and the CDL questions have been answered, the following steps should be done to complete the setup on the GCP 5000:

1. Load CDL,
2. Load PAC file,
3. Install SEAR IIi Echelon modules,
4. Perform the Lamp Calibration procedure,
5. Perform the Battery Calibration procedure.

If the PAC file already had CDL questions answered, it is not necessary to reperform the CDL Q&A on the GCP 5000 provided that no other configuration is changed.

In some cases, the SEAR IIi programming may not be complete when the PAC file was created, if so, the following steps should be done to complete the setup on the GCP 5000:

1. Load CDL,
2. Load PAC file,
3. Configure any remaining SEAR IIi settings (that were not specified in PAC file),
4. Run through the CDL Q&A,
5. Install SEAR IIi Echelon modules,
6. Perform the Lamp Calibration procedure,
7. Perform the Battery Calibration procedure.

Figure 3-88 shows the SEAR IIi programming available or the Web UI of the A80485 Display Module. Similar menus are available on the local user interface of the Display Module.

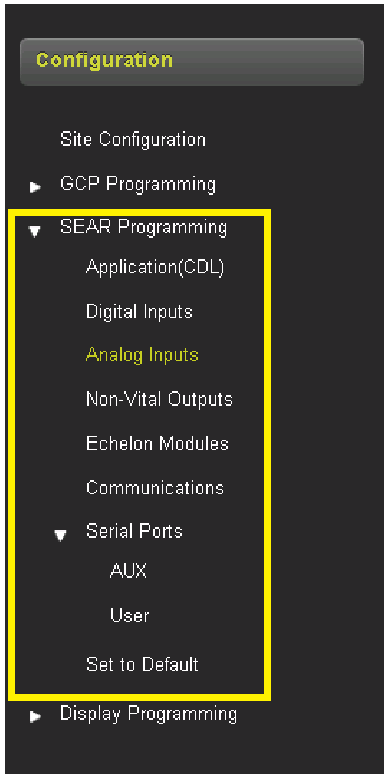

Figure 3-88: SEAR Program Menus

3.4.4.1 Application (CDL)

As part of the SEAR programming, the user can select a CDL file.

Figure 3-89: SEAR CDL Selection

Once the CDL has been loaded, the user can answer the CDL questions by pressing the Start button, press Next to move to the next question as shown in Figure 3-90.

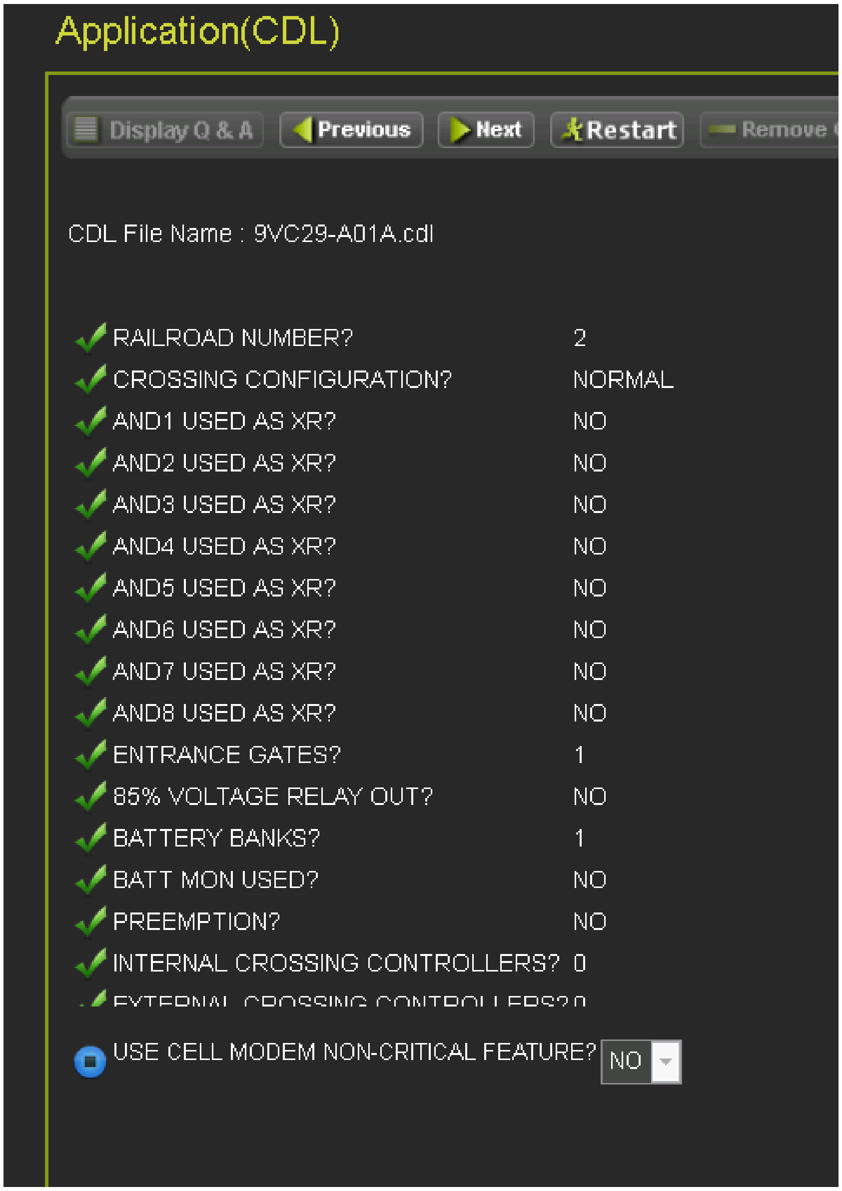

Figure 3-90: SEAR CDL Questions

Once all the questions have been answered, the user can compile, the CDL, shown in Figure 3-91 and Figure 3-92.

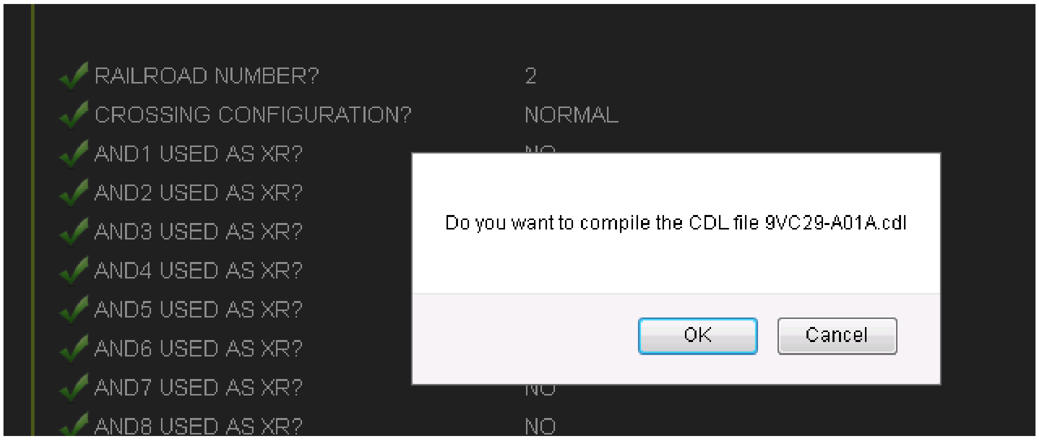

Figure 3-91: SEAR CDL Compile Message

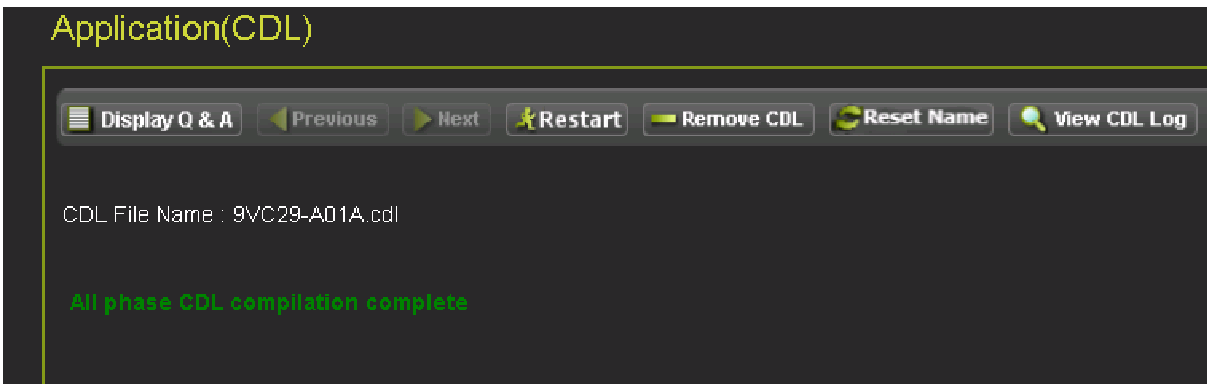

Figure 3-92: SEAR CDL Compile Complete

NOTE

NOTE
The SEAR application will not run unless CDL Setup is completed.

CDLs are specific to the crossing applications.

3.4.4.2 Digital Inputs

On the GCP 5000, the OCE allows the user to set the values for digital inputs on the SEAR.

The SEAR IIi has 63 digital inputs, two of these are accessible on the front of the SEAR IIi. The remaining 61 are connected to traces on the back plane of the chassis that allow the SEAR IIi to monitor the GCP I/O without requiring any external wiring.

The Channels column indicates the name on the GCP chassis terminals. The names shown in the Channels column will depend on what type of module is defined in the GCP programming module configuration. Thus it is important to program the vital parameters and I/O assignments in the GCP before doing the SEAR programming, see SECTION 5 regarding the order of programming.

If a track module is defined, the Web UI will show the channel names relating to what is seen on the Mylar for each I/O point on the chassis, for example for track 1 four channels are potentially available: OUT 1.1, OUT 1.2 and IN 1.1, IN 1.2 are listed as shown in Figure 3-93 (the SEAR IIi does not connect to the track connections for track 1). For tracks 2 to 6, eight channels are potentially available corresponding to OUT x.1, OUT x.2 IN x.1 IN x.2, the Spare input SP x.1 and the 3 track connections: TRX x RCV, CHK and XMT.

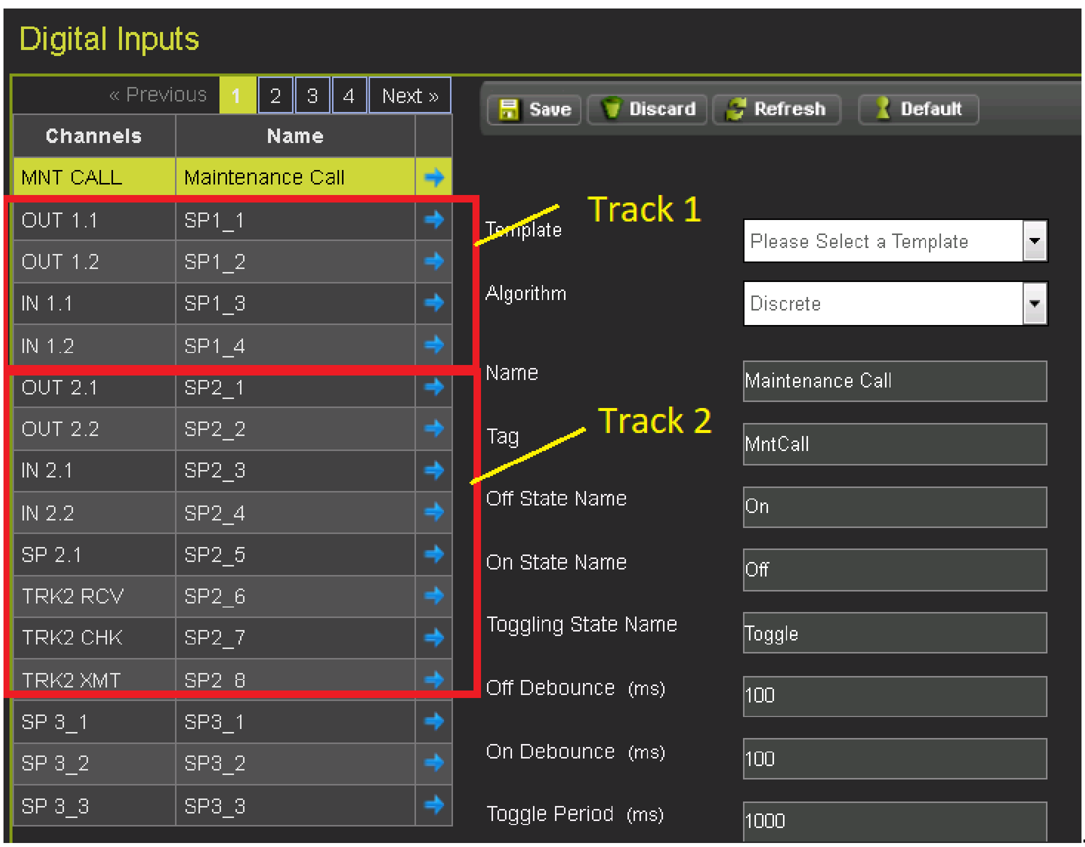

Figure 3-93: SEAR Digital Inputs – Track 1 and 2

If no module is allocated to the slot in the module configuration, the Channels are labeled as spares (SP_x_y), where x indicates the slot number and y indicates the I/O point starting from the top connector and working down as shown in Figure 3-94. Similarly if the SEAR digital input has not been allocated a function it will have the Name: SPx_y.

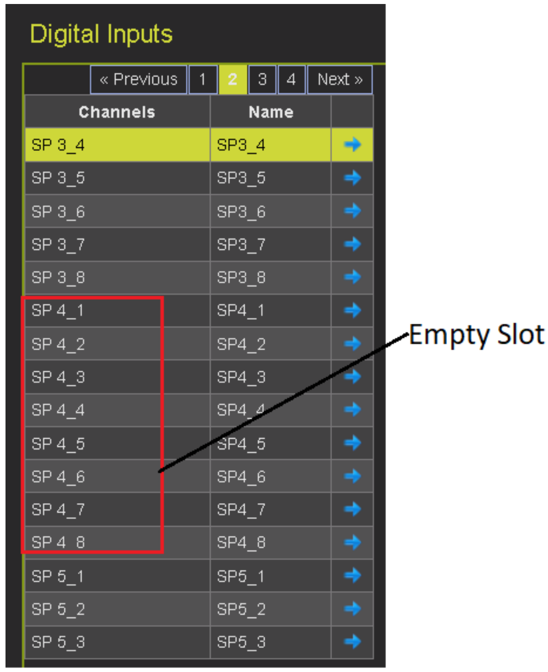

Figure 3-94: SEAR Digital Inputs Channel for empty slot

The SEAR digital inputs corresponding to SSCC IIIi modules are labelled as shown in Figure 3-95 which illustrates the second SSCC module.

Figure 3-95: SEAR Digital Inputs Channel for SSCC IIIi

The SEAR digital inputs corresponding to a RIO module are labelled as shown in Figure 3-96 which illustrates a RIO in slot 6.

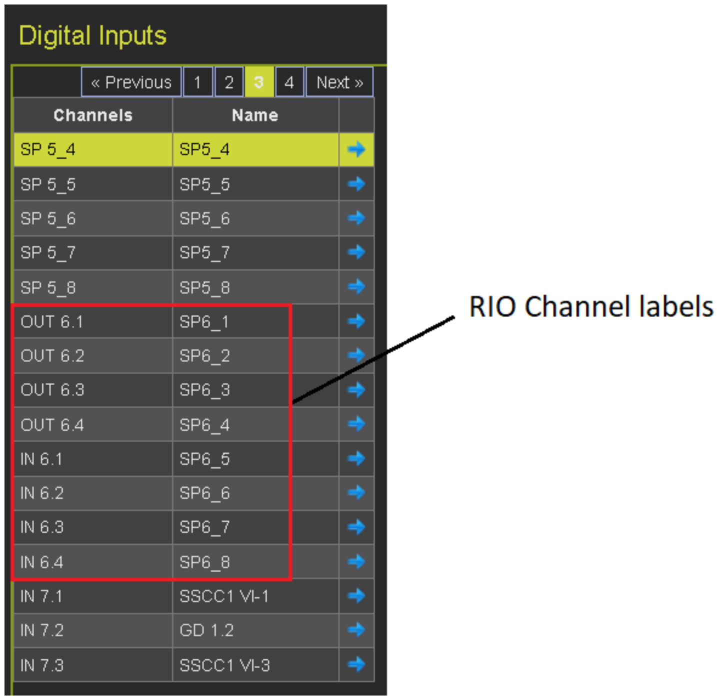

Figure 3-96: SEAR Digital Inputs Channel for RIO

The Name column indicates the function the digital input is being used for and is the name used in SEAR IIi event log entries when the digital input changes state. If the GCP programming has already assigned an input or output function for this channel, the Web UI will show this channel as pre-assigned and show the function assigned in the GCP programming in the Name column, as shown in Figure 3-97. When the GCP programming has assigned the input or output, the corresponding SEAR digital input algorithm is automatically selected as a Discrete input and most properties associated with the preassigned input are locked, as shown. The debounce times are still editable.

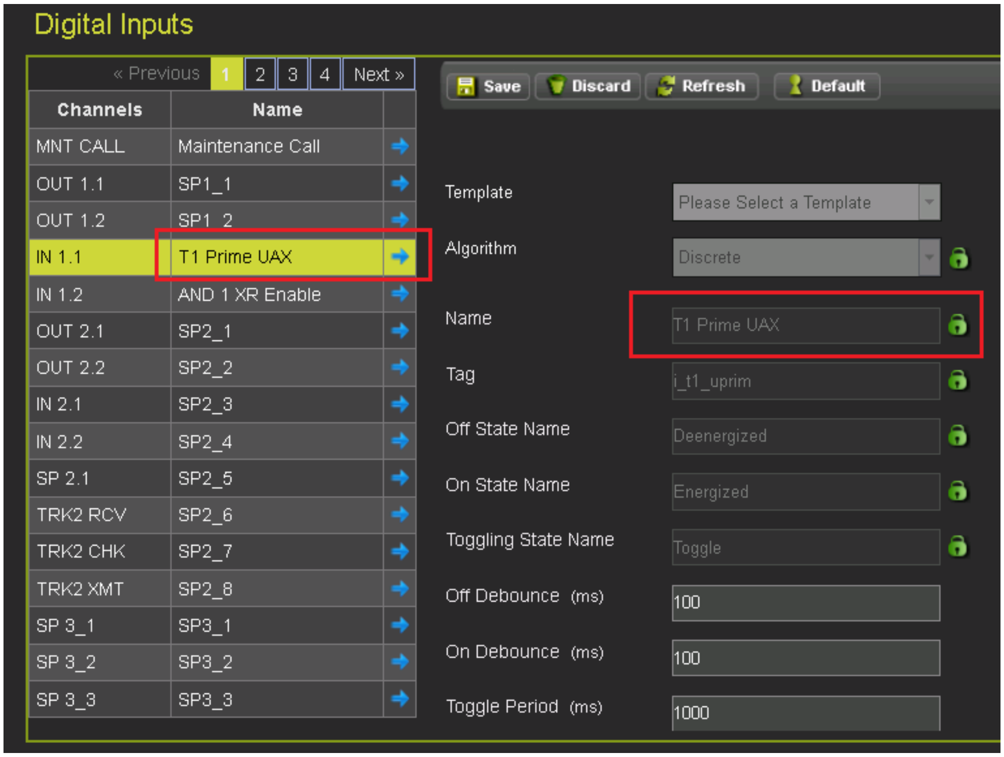

Figure 3-97: SEAR Digital Inputs GCP Assigned Vital I/O

The CDL program may also have already assigned an input, in which case it will be shown as locked here.

When the slot is used for a track module, the SEAR digital inputs corresponding to track connections are automatically set to unused and are not available to be used for other purposes, for example Figure 3-98.

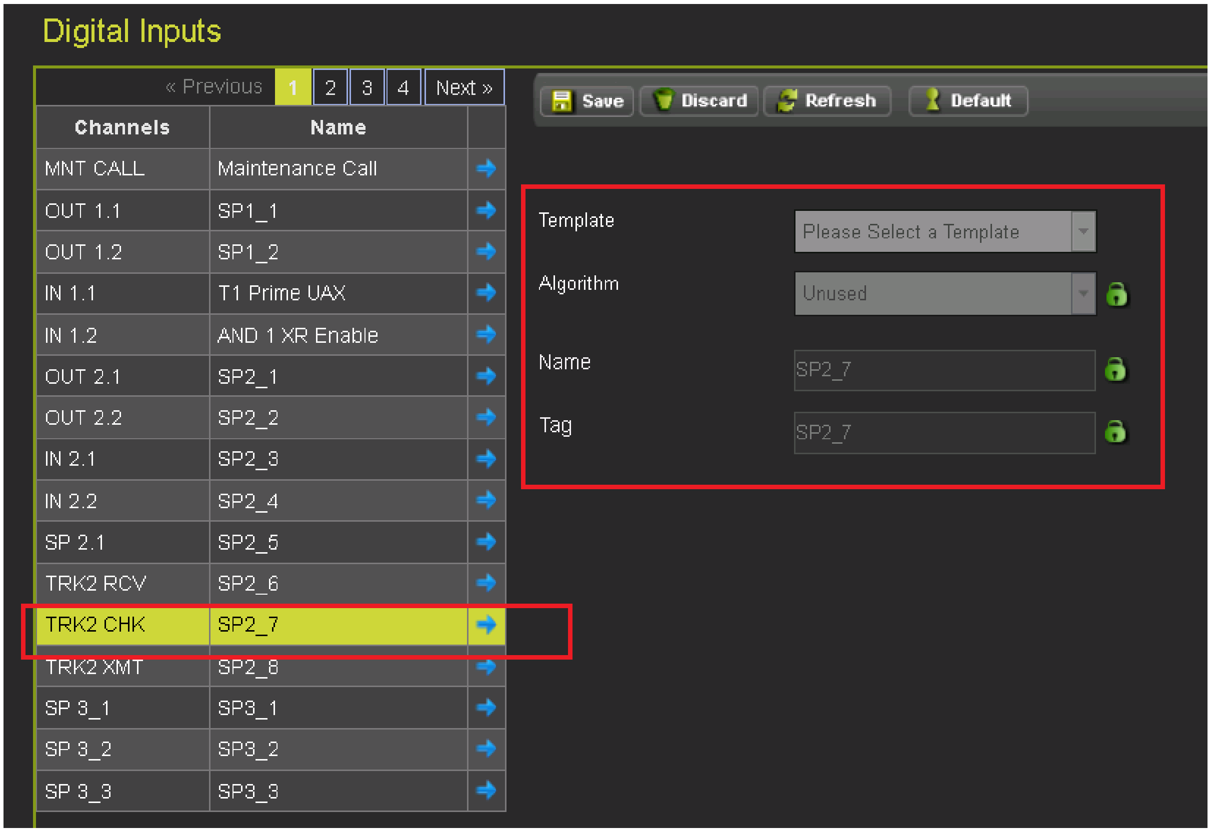

Figure 3-98: SEAR Digital Inputs GCP Track Connections

SEAR digital inputs that are not being used by the GCP programming and are not track connections inputs can be used to monitor outputs from other sources that can be wired into the GCP I/O connectors. It is not necessary to have a module in a slot, an empty slot can be used to monitor digital inputs by wiring to the GCP I/O connectors for that slot.

To configure a digital input use the Template parameter to choose one of the predefined input types as show in Figure 3-99.

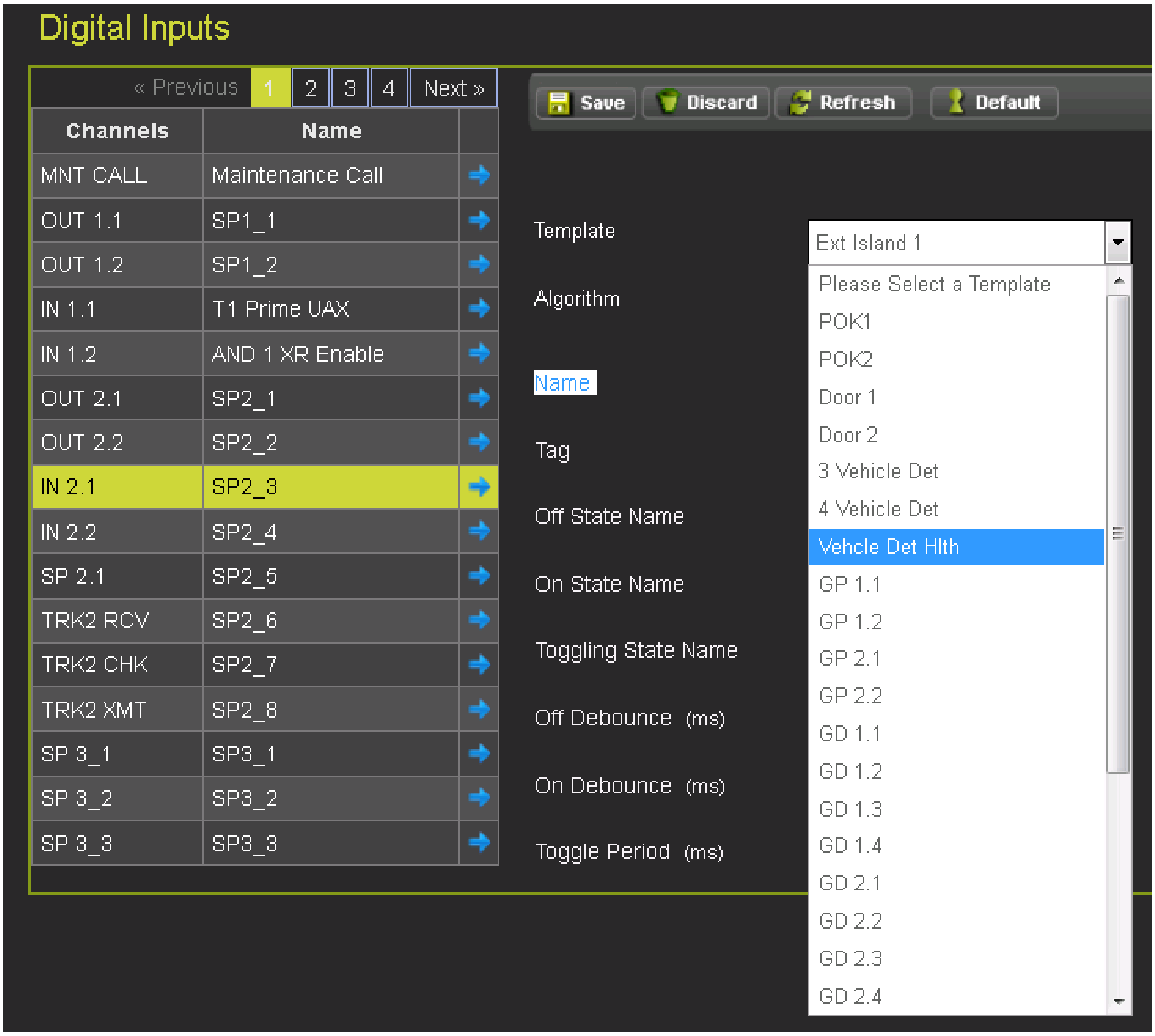

Figure 3-99: SEAR Digital Input Template

The available templates that set up the input as a discrete input are shown in Table 3-6, the table also shows the default tag names for the template type.

When one of these templates is selected the Channel Name is set automatically to that of the template, a tag (used by the CDL) is automatically generated. The on and off and toggle states names default to de-energized, energized and toggle and the debounces to 100ms, and toggle period 1000ms as shown in Figure 3-100.

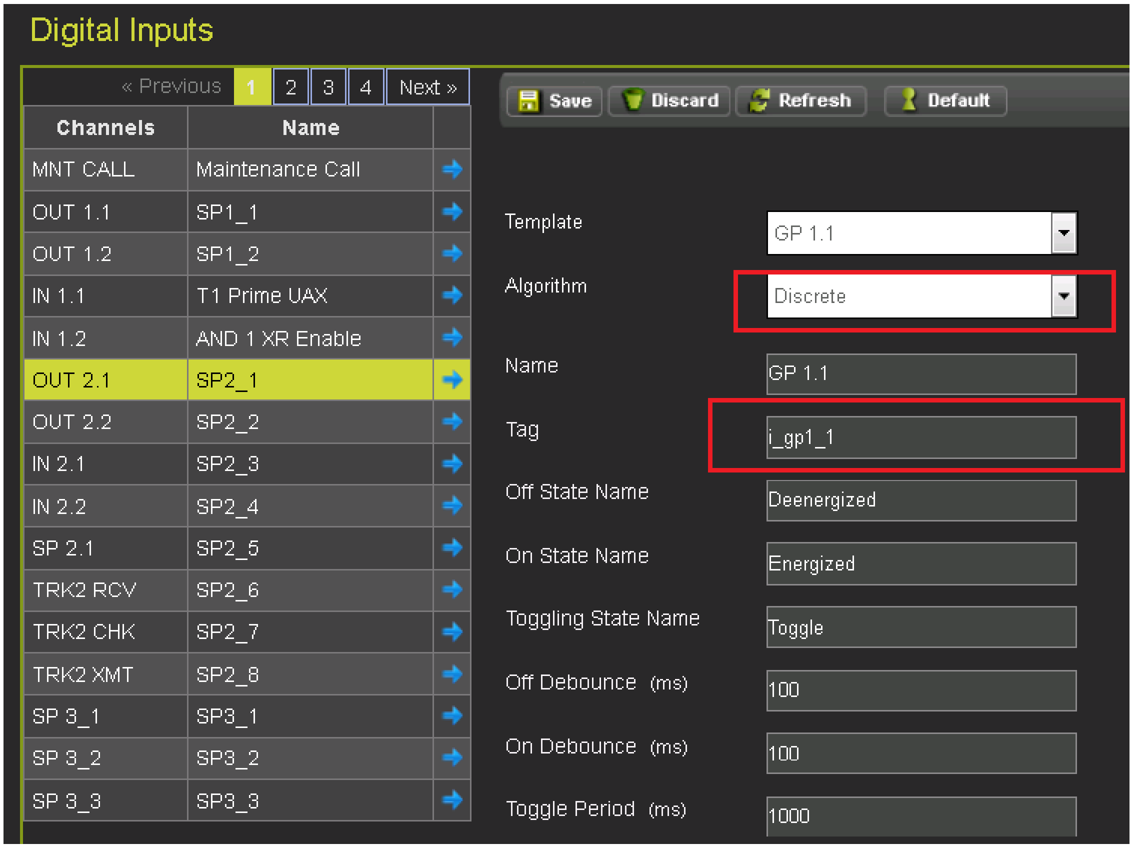

Figure 3-100: SEAR Digital Inputs Discrete

Table 3-6: Discrete Template Options

Template/Name	Default Tag
POK1	POK1
POK2	POK2
Door1	DOOR1
Door 2	DOOR2
3 Vehicle Det	i_3_vdet
4 Vehicle Det	i_4_vdet
Vehicle Det Hlth	i_vdet_h
GP 1.1	i_gp1_1
GP 1.2	i_gp1_2
GP 2.1	i_gp2_1
GP 2.2	i_gp2_2
GD 1.1	i_gd1_1
GD 1.2	i_gd1_2
GD 1.3	i_gd1_3
GD 1.4	i_gd1_4
GD 2.1	i_gd2_1
GD 2.2	i_gd2_2
GD 2.3	i_gd2_3
GD 2.4	i_gd2_4
General 1	GEN1
General 2	GEN2
General 3	GEN3
General 4	GEN4
Ext Island 1	ExtIsl1
Ext Island 2	ExtIsl2
Ext Island 3	ExtIsl3
TXGI	TX

The user may edit the tag names, state names, or debounce times as needed.

Only certain inputs are available which can be configured as Ground fault test inputs or MTSS inputs. These correspond with the top input of the lower GCP I/O connector for the track and RIO slots, the 5 inputs for each SSCC module and the two inputs on the front of the SEAR. The labelling of these will depend on whether a module is present in the slot and what type it is, as shown in Table 3-7.

Table 3-7: Connections allowing TSS and Gnd Fault Tester

Table 3-7: Connections allowing TSS and Gnd Fault Tester

Track Card Present	RIO Present	Empty Slot
SP 2.1	IN 2.1	SP 2_5
SP 3.1	IN 3.1	SP 3_5
SP 4.1	IN 4.1	SP 4_5
SP 5.1	IN 5.1	SP 5_5
SP 6.1	IN 6.1	SP 6_5

The SSCC inputs on SSCC Module 1 (SSCC1 VI-1 thru SSCC1 VI-5) and SSCC Module 2 (SSCC2 VI-1 thru SSCC2 VI-5) are also available to be used for Ground fault tester and MTSS inputs provided that they are not being used by the GCP Programming.

The two inputs on the front of the SEAR (EXT DI1 and EXT DI2) are also available to be used for Ground fault tester and MTSS.

When an input is selected with algorithm MTSS, the options shown in Figure 3-101 are available.

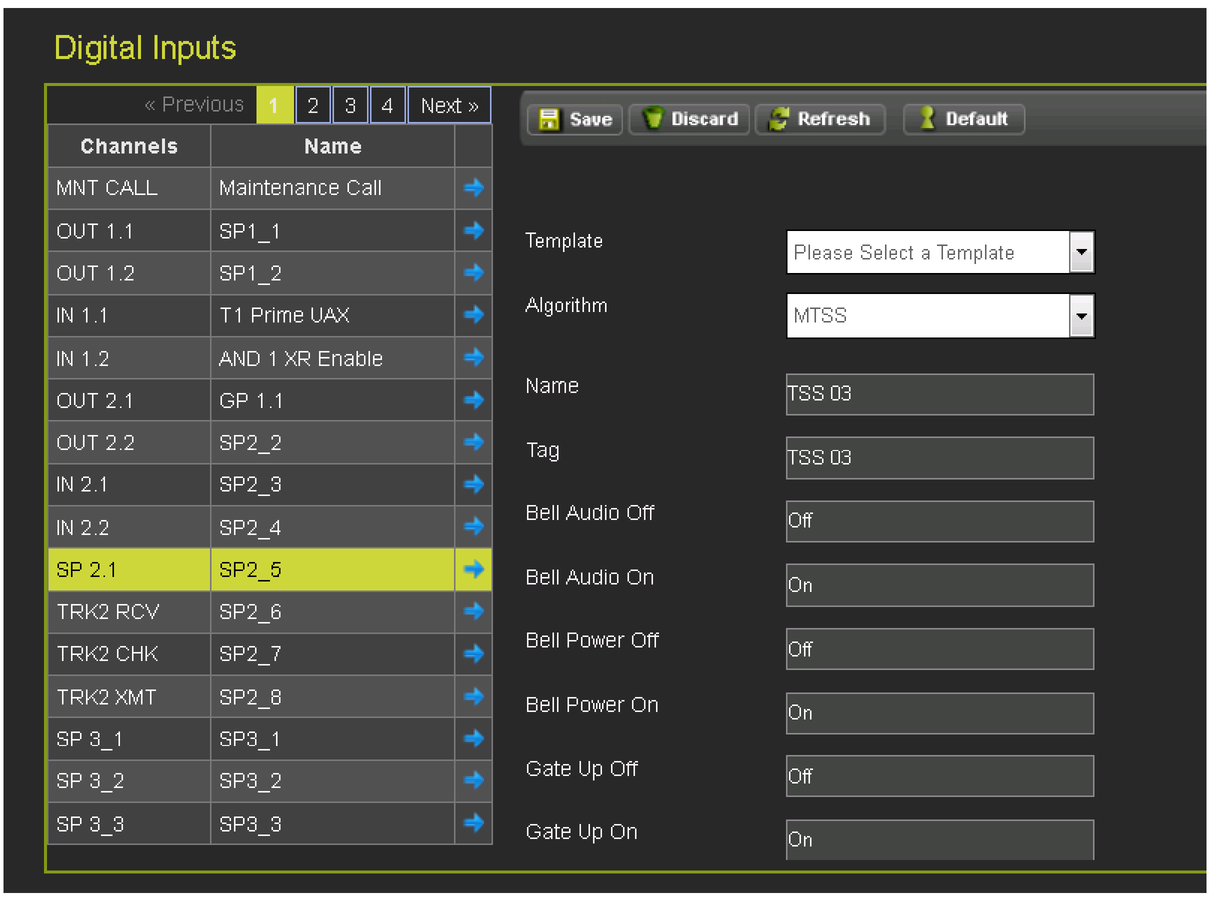

Figure 3-101: SEAR Digital Inputs TSS Options

When an input is selected with algorithm GFT (Ground fault tester) the options shown in Figure 3-102 are available.

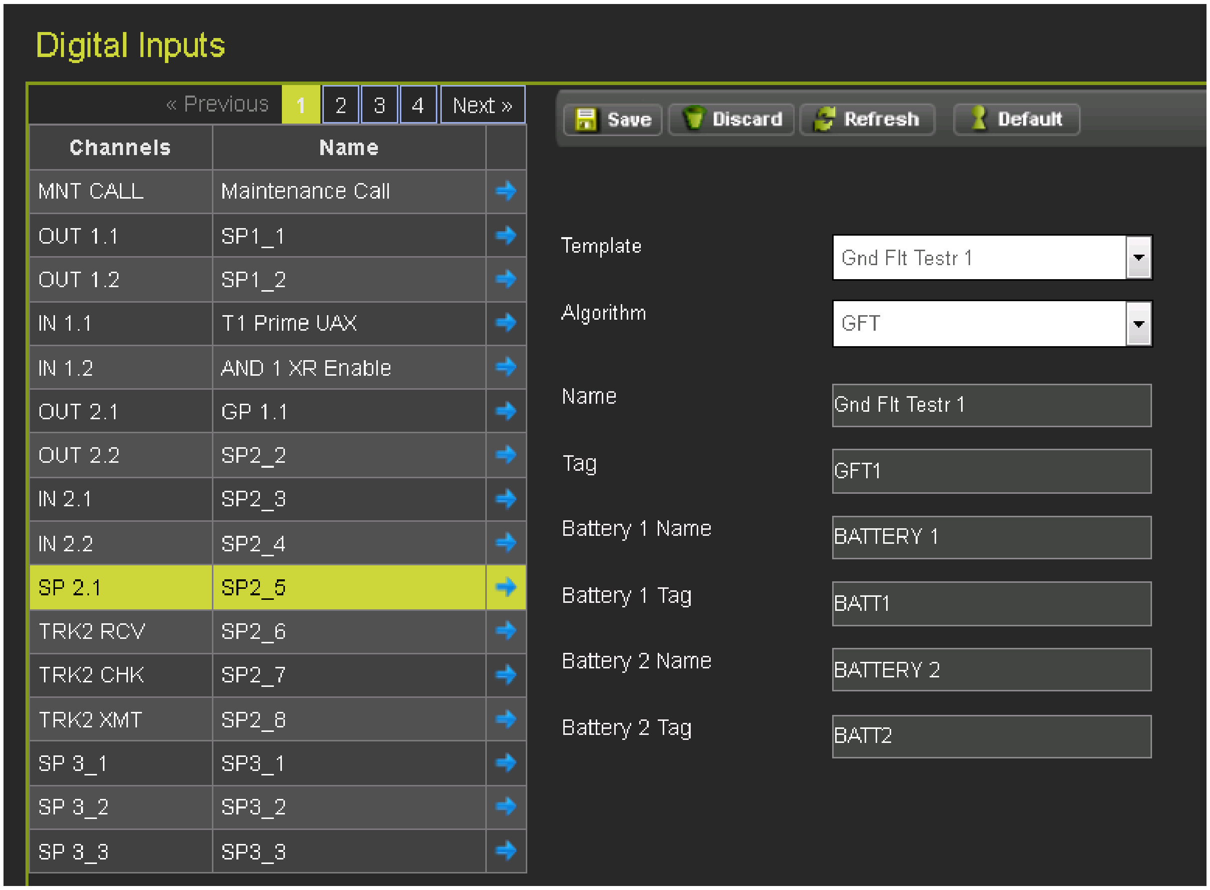

Figure 3-102: SEAR Digital Inputs GFT Options

The SEAR digital inputs are presented in the same order as channel number the user would see if using the terminal interface to access the SEAR, shown in Figure 3-103. Appendix E shows the channel number associated with each input, as this may be required for the CDL program.

NOTE

NOTE

The terminal interface is still available on the SEAR in the GCP 5000, but the user should use the Display Module as the primary way of configuring the SEAR.

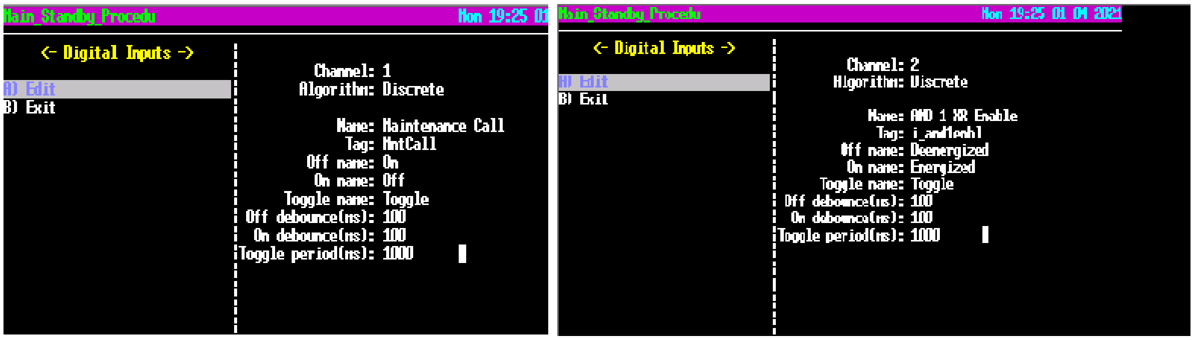

Figure 3-103: SEAR Terminal interface

3.4.4.3 Analog Inputs

The analog inputs can be used to monitor the voltage on standard 12 VDC and 24 VDC batteries. They may also be used to monitor any DC voltage from 0 VDC to 36 VDC. There are six battery monitor channels which are used as follows:

- General purpose one on the front of the SEAR (BATT MON).
- Monitoring the GCP CPU and I/O module power (VBN).
- Monitoring each SSCC IIIi module power (SSCC1 and SSCC2).
- Monitoring the internal system temperature (Int. Temp).
- Monitoring the external system temperature (Ext. Temp).

Table 3-8: Battery Input Settings

Setting	Description
Name	Up to 20 characters long and used to describe the input but not used in event reports.
Tag	Up to 10 characters long and used to identify the input in event reports and local menus.
Sample Period	Number of milliseconds between processing of the input. Events for the input can be logged on this interval only. Internally, the SEAR IIi samples the inputs every 10 milliseconds regardless of this setting.
Resolution	Specifies the change in volts (or degrees Fahrenheit) required before an event will be logged into the SEAR IIi event buffer.
Samples to Average	Specifies the number of consecutive 10 millisecond samples to average together to determine the voltage present on the input. This value can be set to no averaging, 2 samples, 4 samples, 8 samples, 16 samples, or 32 samples.

The SEAR IIi samples the input every 10 milliseconds, regardless of the 'Sample Period' setting. The 'Sample Period' setting determines how often the SEAR IIi will average the samples to determine if an event is logged. The number of 10 millisecond samples that are averaged is determined by the 'Samples to Average' setting.

If this calculated average results in a quantity that differs by more than the amount defined in 'Resolution' from the previously logged value, then a new event is logged.

For example, the battery inputs can be configured:

Resolution = 0.5 V

Sample Period =100 ms

Samples to Average = 32 samples

In this case, every 100 milliseconds the SEAR IIi averages the last 32 samples of 10 milliseconds each (a period of 320 millisecond) and compares it to the last logged value of battery voltage on the input. If the new average value is different by 0.5 V or more from the last logged value, an event is logged. If the input's voltage changes rapidly, an event could be logged every 100 milliseconds.

The Analog inputs on the SEAR can be configured from the Analog Input tab show in Figure 3-104.

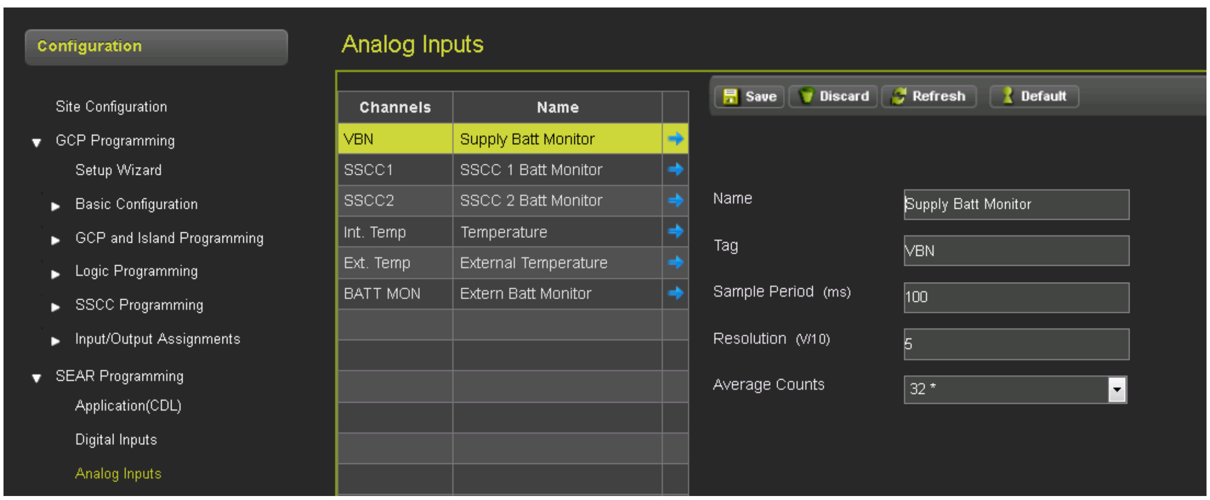

Figure 3-104: Analog Inputs

3.4.4.4 Non Vital Outputs

Non-Vital outputs can be controlled to the OFF state, ON state, TOGGLING state, or PULSED state. In the OFF state, the relay contacts are open. in the ON state the relay contacts are closed. In the TOGGLING state, the relay contact is opening and closing at the user specified duty cycle and period.

The settings for each relay output are described in Table 3-9.

Table 3-9: Relay Output Settings

Setting	Description
Name	Up to 20 characters long and used to describe the relay but not used in event reports.
Tag	Up to 10 characters long and used to identify the relay in event reports and local menus.
State names	Up to 12 characters in length and displayed in event reports and local menus.
Toggle period	Specifies the time between cycles of toggling the relay output from off to on, and back to off in seconds.
Duty cycle	Specifies the percentage of time the relay is in the ON state when toggling.

The Non-Vital outputs on the SEAR can be configured from the Non-Vital Output tab shown in Figure 3-105.

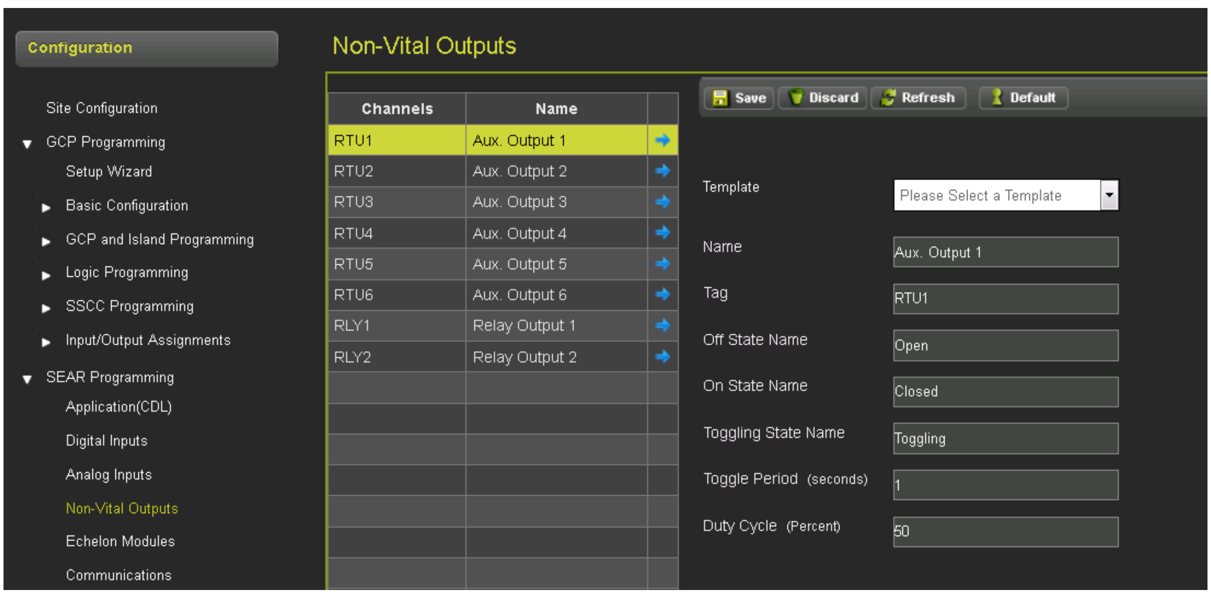

Figure 3-105: Non Vital Outputs

To choose one of the predefined outputs, select a template from the list as shown in Figure 3-106.

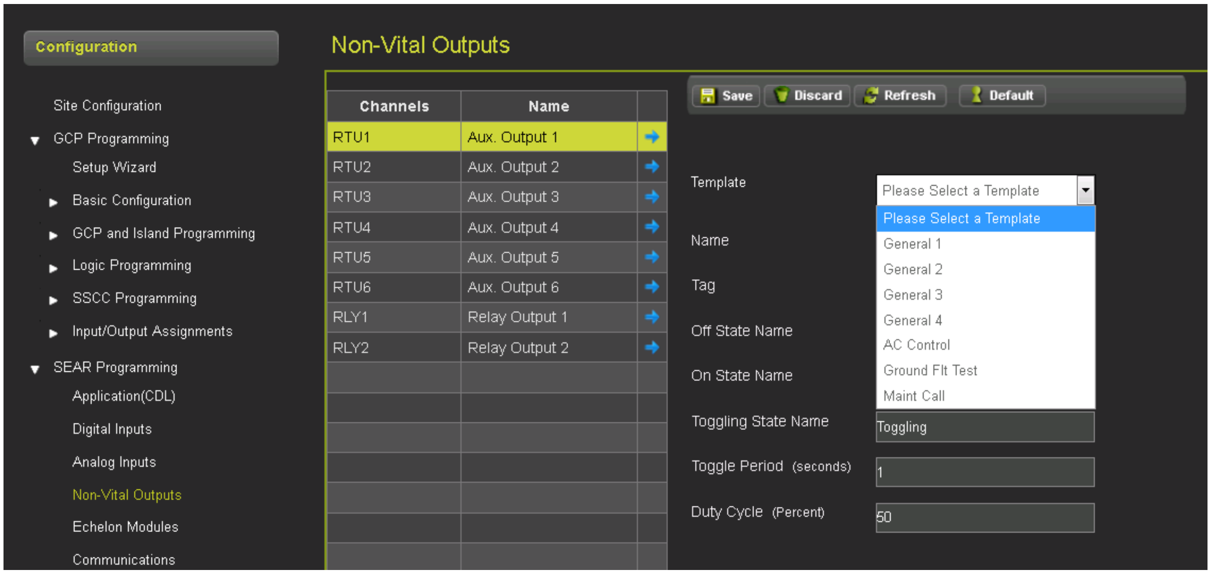

Figure 3-106: Non Vital Output Templates

Selecting the template will automatically fill in the Name and Tag. The defaults for all outputs are shown in Figure 3-107.

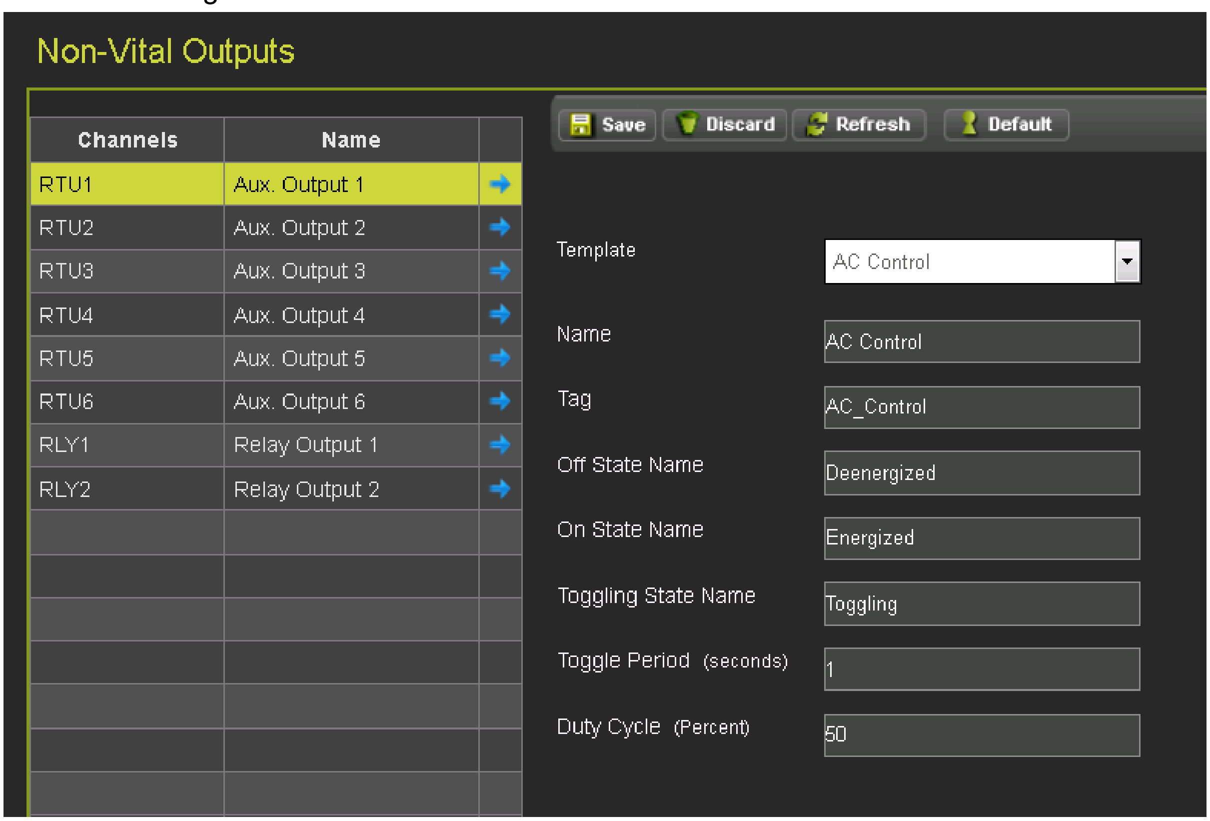

Figure 3-107: Non Vital Output Defaults

Even when a template has been used, the user can still edit the properties for the output to their own values.

If there is no suitable template, the user can fill in their own values.

3.4.4.5 Echelon Modules

The user can add Echelon based modules such as the iLOD or SSCC from the Echelon Modules Tab.

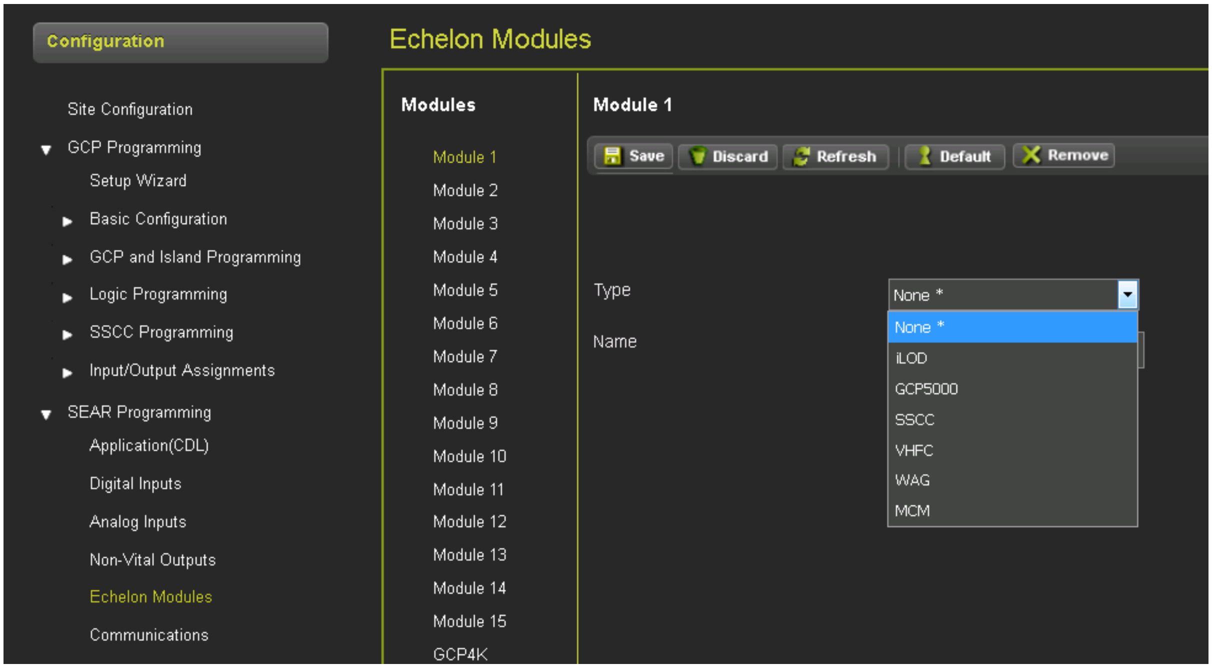

Figure 3-108: Echelon Modules

iLOD Module

When an iLOD module is selected the following parameters are available.

Figure 3-109: Echelon Modules: iLOD

The flash rate in Flashes per Minute sets the message resolution for the lamps being monitored. This means that if the flash rate varies by as much as this number per minute, then an event message will go from the iLOD to the SEAR IIi.

The current resolution determines how much of a shift in current will generate a message to the SEAR IIi

See iLOD, A80271 user guide, SIG-00-03-05 for more details.

SSCC

The SEAR IIi can be used to monitor an external SSCC module. When SSCC is selected the parameters shown in Figure 3-110 are available. The user needs to configure the ATCS address of the SSCC module and the Echelon node (which should correspond to the Subnode fields in the ATCS Address).

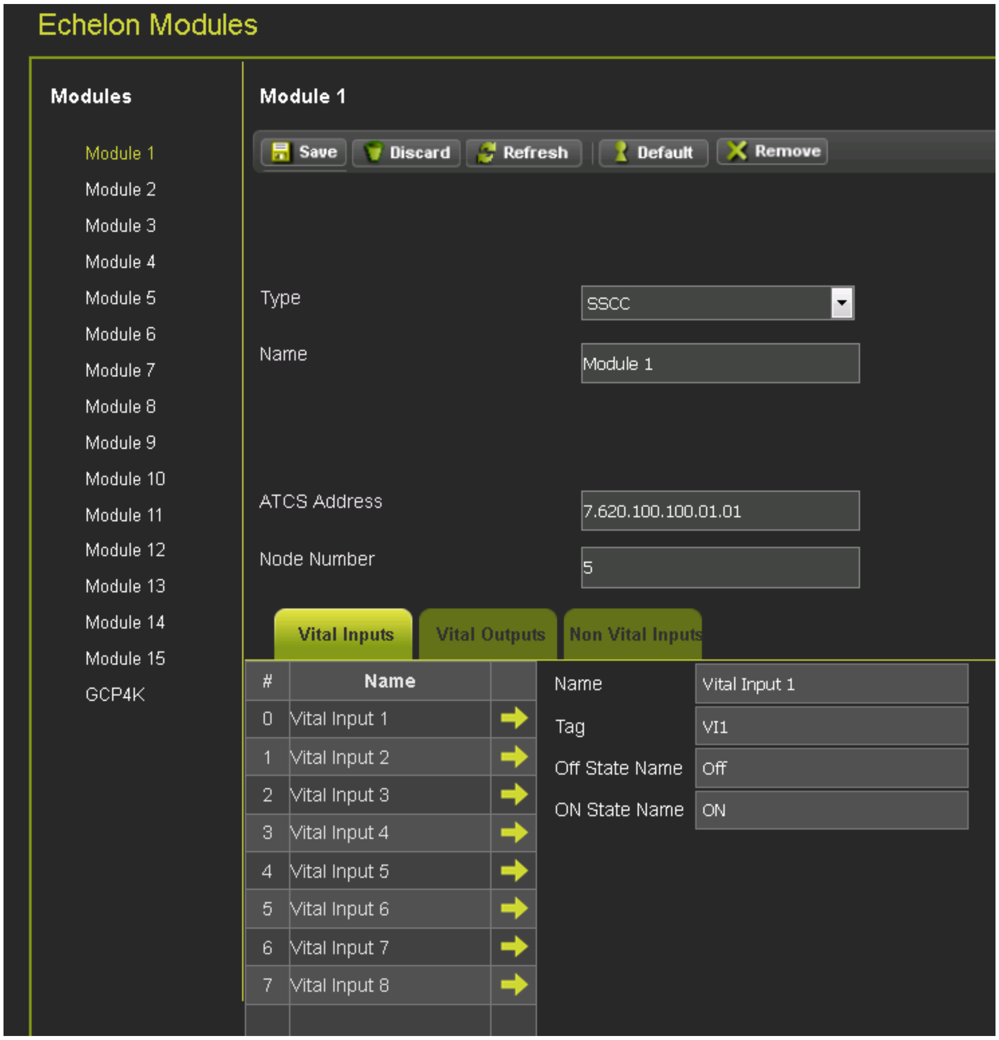

Figure 3-110: Echelon Modules: SSCC

The user can specify the following:

- Vital Inputs 1 – 8:
    - Name, default Vital Input x (where = 1..8),
    - Tag, default VIx (where = 1..8)
    - Off State Name, default Off
    - On State Name, default On
- Vital Outputs Bank A
    - Lamp 1 Name, default 1 Lamp Output 1
    - Lamp 1 Tag, default 1 L1
    - Lamp 1 Burned Out Name, default Burned Out
    - Lamp 1 Flashing Name, default Flashing
    - Lamp 1 Off State Name, default Off
    - Lamp 1 On State Name, default On
    - Lamp 2 Name, default 1 Lamp Output 2

    - Lamp 2 Tag, default 1 L2
    - Lamp 2 Burned Out Name, default Burned Out
    - Lamp 2 Flashing Name, default Flashing
    - Lamp 2 Off State Name, default Off
    - Lamp 2 On State Name, default On
    - Bell Name, default 1 Bell Output
    - Bell Tag, default 1 Bell
    - Bell Off State Name, default Off
    - Bell On State Name, default ON
    - Gate Ctrl Name, default 1 Gate Control
    - Gate Ctrl Tag, default 1 GC
    - Gate Ctrl Off State Name, default De-energized
    - Gate Ctrl On State Name, default Energized
- Vital Outputs Bank B
    - Lamp 1 Name, default 2 Lamp Output 1
    - Lamp 1 Tag, default 2 L1
    - Lamp 1 Burned Out Name, default Burned Out
    - Lamp 1 Flashing Name, default Flashing
    - Lamp 1 Off State Name, default Off
    - Lamp 1 On State Name, default On
    - Lamp 2 Name, default 2 Lamp Output 2
    - Lamp 2 Tag, default 2 L2
    - Lamp 2 Burned Out Name, default Burned Out
    - Lamp 2 Flashing Name, default Flashing
    - Lamp 2 Off State Name, default Off
    - Lamp 2 On State Name, default On
    - Bell Name, default 2 Bell Output
    - Bell Tag, default 2 Bell
    - Bell Off State Name, default Off
    - Bell On State Name, default ON
    - Gate Ctrl Name, default 2 Gate Control
    - Gate Ctrl Tag, default 2 GC
    - Gate Ctrl Off State Name, default De-energized
    - Gate Ctrl On State Name, default Energized
- Non-Vital Inputs:
    - Flash Sync
        - Name, default Flash Sync
        - Tag, default Flash Sync
        - Off State Name, default De-energized
        - On State Name, default Energized

- Maint Call Sync
    - Name, default Maint Call
    - Tag, default Maint Call
    - Off State Name, default De-energized
    - On State Name, default Energized

VHFC

When a VHF Communicator is selected, the parameters shown in the following figure are available.

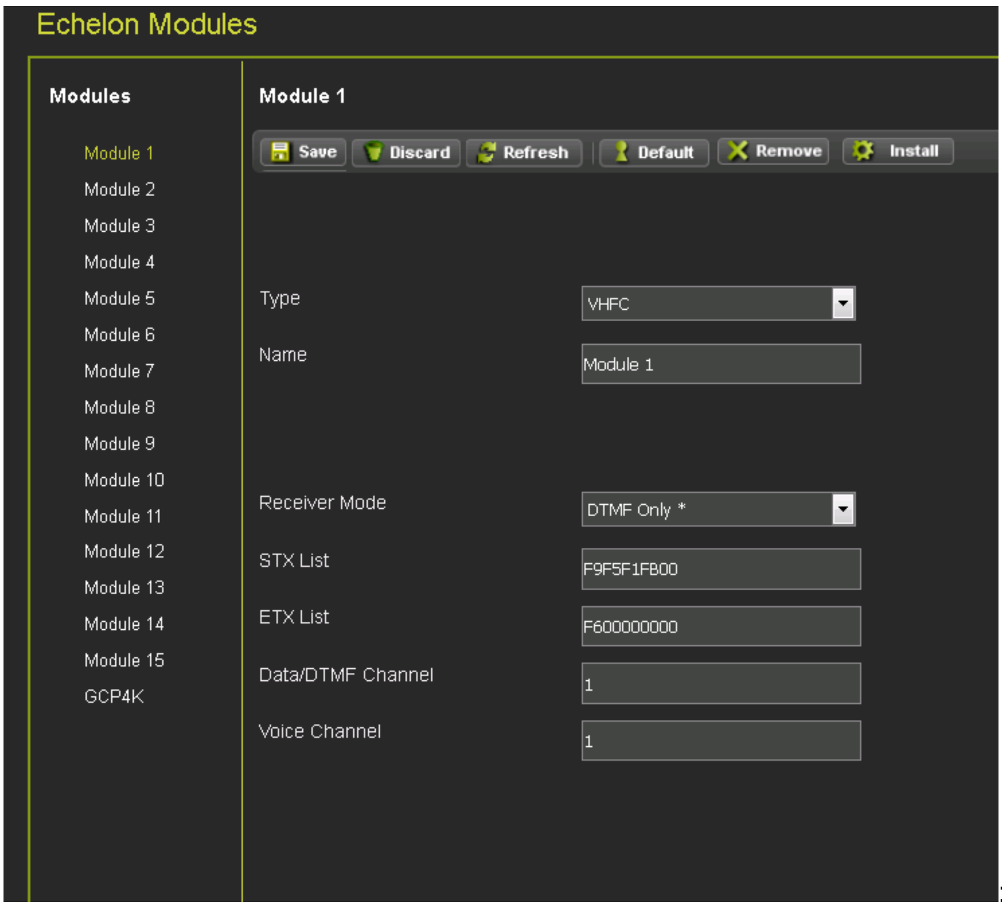

Figure 3-111: Echelon Modules: VHFC

Table 3-10: VHF Communicator/SEAR II Configurable Settings

Setting	Possible Values	Default Value	Description
Receiver Mode	DTMF Only Framed Stream	DTMF Only	Determines method the VHF Communicator will use to packetize the incoming data. See descriptions of types below. In DTMF only mode, no data will be received.
STX List	0 – FF (hex) for each of 5 values	F5 F9 FB F1 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the start of a valid frame of data. An entry with a value of zero is not used.
ETX List	0 – FF (hex) for each of 5 values	F6 00 00 00 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the end of a valid frame of data. An entry with a value of zero is not used.
Date/DTMF Channel	1 – 8	1	Specifies the channel of the radio that will be used to send and receive data packets and DTMF tones.
Voice Channel	1-8	1	Specifies the channel of the radio that will be used to transmit digitized speech.

For more details regarding the VHFC see SIG-00-03-002, VHF Communicator, A80276 User Guide.

WAG

When a WAG is selected the Node number is available, range 1-99, this is the Subnode on the Echelon of the WAG. By default, this is 1.

The user may give the WAG a name, which the SEAR will use when logging entries related to this module.

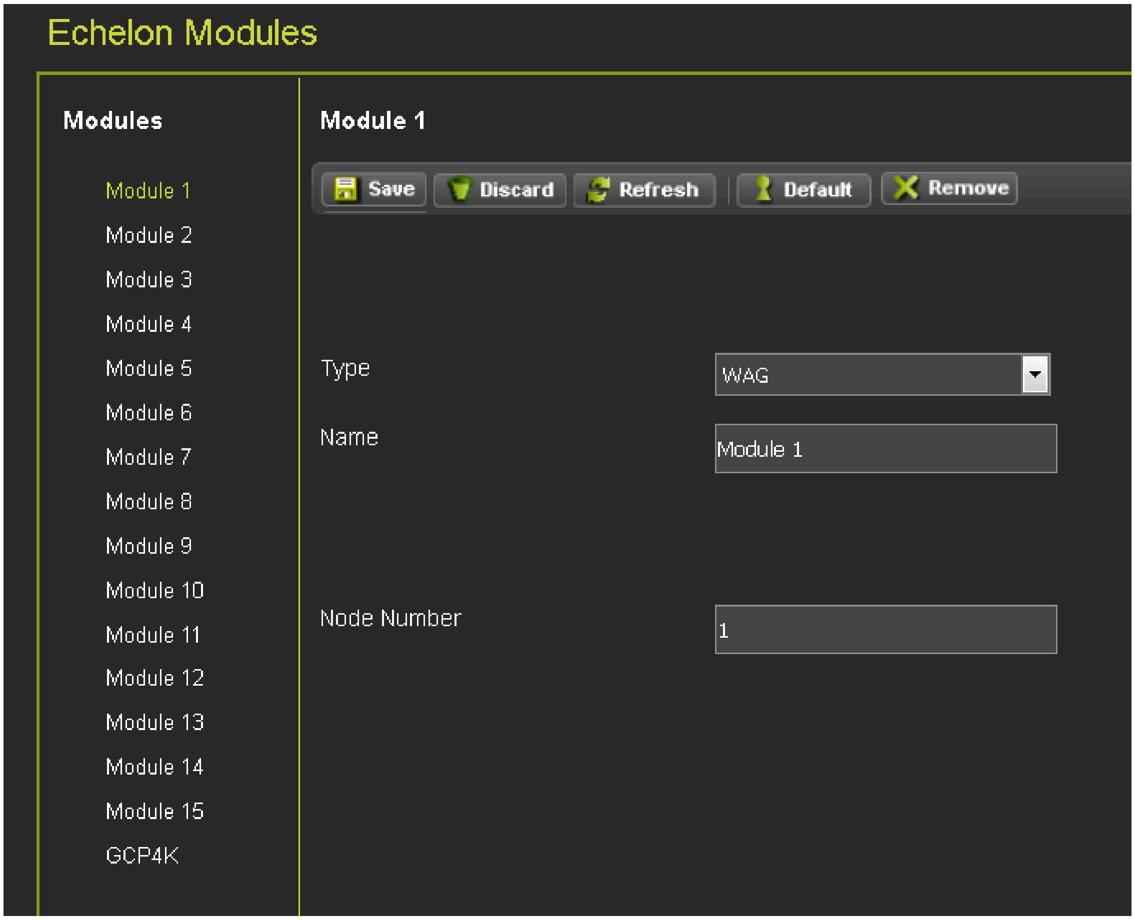

Figure 3-112: Echelon Modules: WAG

MCM

When an MCM is selected the Node number is available, range 1-99, this is the Subnode on the Echelon of the MCM. By default, this is 1.

The user may enter a name for the MCM, which the SEAR will use when logging entries related to this module.

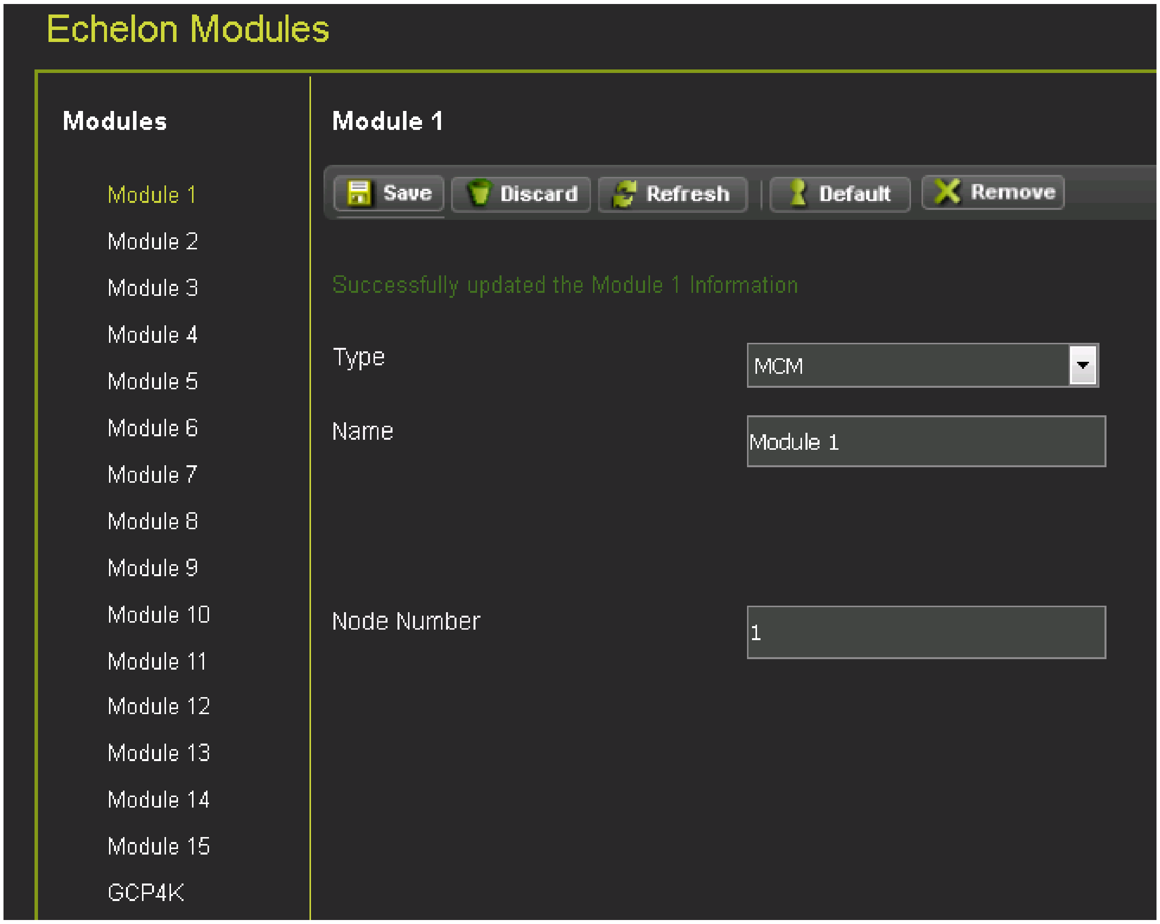

Figure 3-113: Echelon Modules: MCM

GCP 5000

When a GCP 5000 is selected, the Node number is available. This is the Subnode on the Echelon of the GCP CPU. By default, this should be set to 16. This corresponds to the ATCS – CPU Subnode number of the GCPs ATCS address set in the Site Configuration page. If the node number is changed here, the ATCS – CPU Subnode must also be changed to match. This setting applies when a CPU III or CPU II+ is used.

Module 16 is assigned by default to be a GCP 5000 and will have Node number 16.

NOTE

NOTE

The default name for module 16 is GCP4K not GCP5K. The reason for this is to be backward compatible with CDL programs written for the GCP 4000. If the name is changed here the CDL must be changed to match.

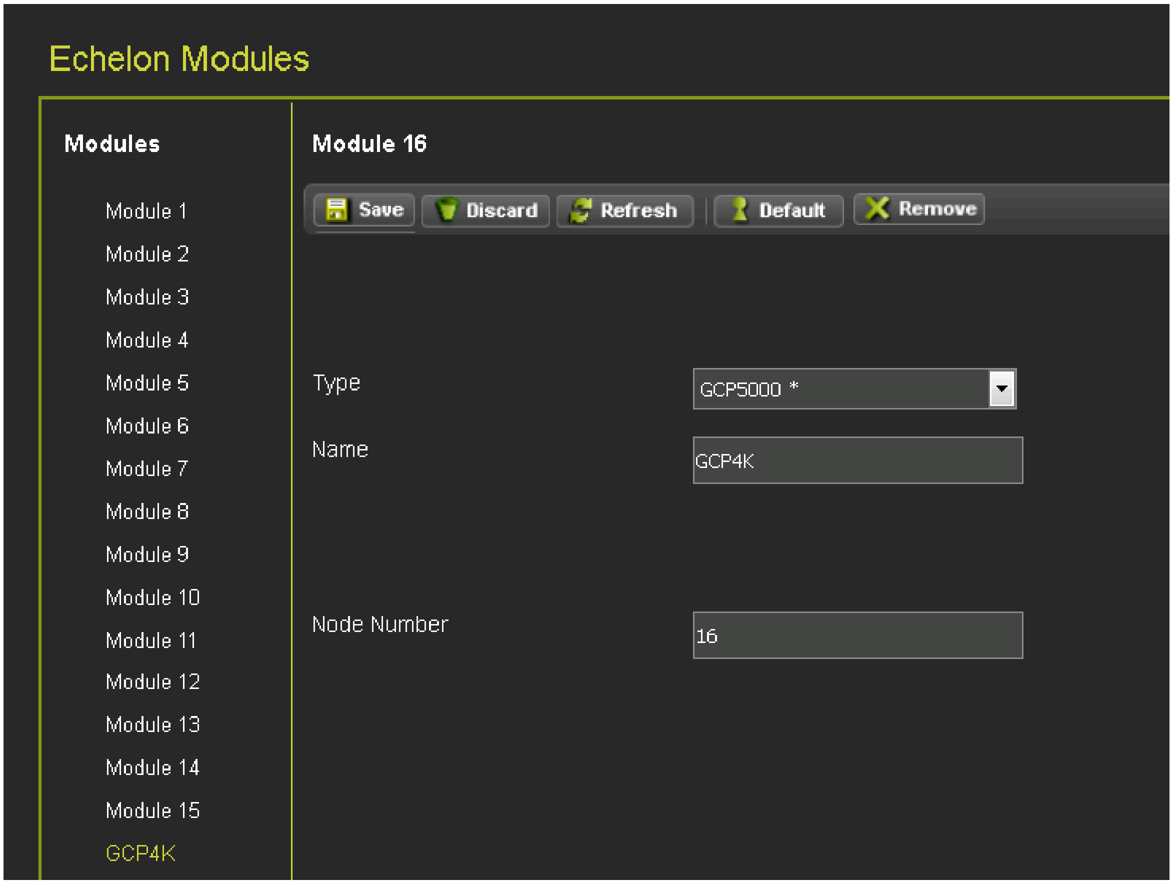

Figure 3-114: Echelon Modules: GCP 5000

3.4.4.6 Communications

The SEAR IIi may be configured to operate with external communication devices. For more details on communication networks see the Event Analyzer Recorder (SEAR II) A80273, SIG-00-02-07 manual.

The communications parameters are configured on the Communication tab shown in Figure 3-115.

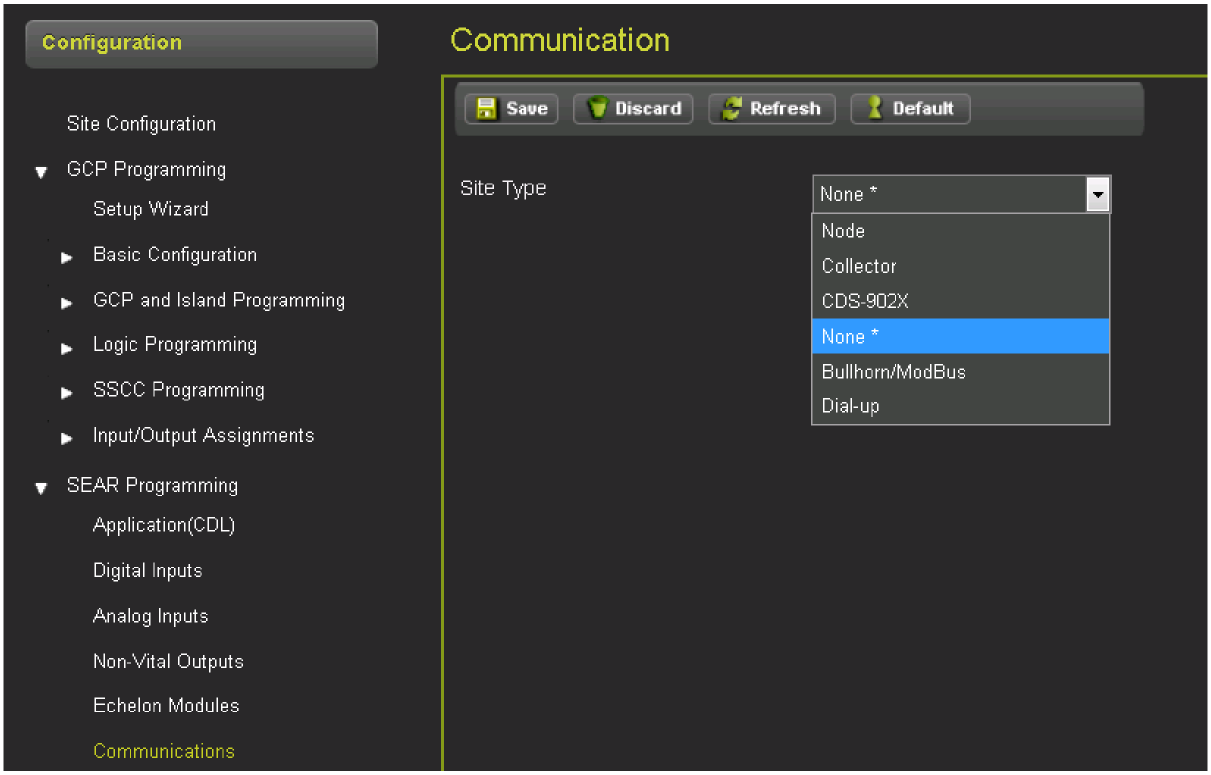

Figure 3-115: SEAR Communications

The user defined settings for each device are described in Table 3-11.

Table 3-11: Communications Settings

Site Type	Settings
No Communication	N/A
Bullhorn/MODBUS	POLL ID
NODE	Site address, office address, office site, backup site 1, backup site 2, field device
Collector	Site address, office address, poll ID, office device, office port, field device
CDS-902X (Cellular Modem)	none
Dial-up	Modem init string

Node

A SEAR IIi module with the site type set to Node is a slave unit in the ATCS enhanced routing protocol used to “hop” alarms to a Collector. Messages may hop from one Node to the next until they reach a collector where they will be forwarded to the office system. A Node has the following settings.

Table 3-12: Node Settings

Setting	Description
Site Address	ATCS address of this site. The address is a type 7 field address with the following format: 7.RRR.LLL.GGG.SS.DD.
Office (WAMS) ATCS Addr	ATCS address of the Wayside Alarm Management System software. The address is a type 2 office address with the following format: 2.RRR.NN.DDDD.
Primary Hop ATCS Addr	ATCS address of the primary site to send message bound for the office system. This site may be the Collector or another Node that is closer to the Collector. The address is a type 7 field address with the following format: 7.RRR.LLL.GGG.SS.DD.
Backup1 Hop ATCS Addr	ATCS address of the first site to route messages through if communication is lost with the Office Site. The address is a type 7 field address with the following format: 7.RRR.LLL.GGG.SS.DD.
Backup2 Hop ATCS Addr	ATCS address of the second site to route message through if communication is lost with both the Office Site and Backup Site 1. The address is a type 7 field address with the following format: 7.RRR.LLL.GGG.SS.DD.
Field Device	The device used to communicate with other SEAR II sites in the network. This setting can be any of the following: • VHFC Comm (Echelon) • SSR (Spread Spectrum Radio) (RS232) • WAG (Echelon) • VHF Comm (RS232) • None

Figure 3-116: SEAR Communications: Node

When configuring communications, if the user picks an Echelon device such as the VHF communicator for the communications medium, the user must also add that module in the Echelon configuration.

No Communication

A SEAR IIi with the site type set to No Communication has no link to an office system and no alarms or messages are handled by the unit.

Collector (master)

A SEAR IIi with the site type set to Collector is the master unit in the ATCS enhanced routing protocol that has a direct link to the office system. SEAR IIi modules configured as Nodes report their alarms and status to this site. The unit then forwards the messages to the office system.

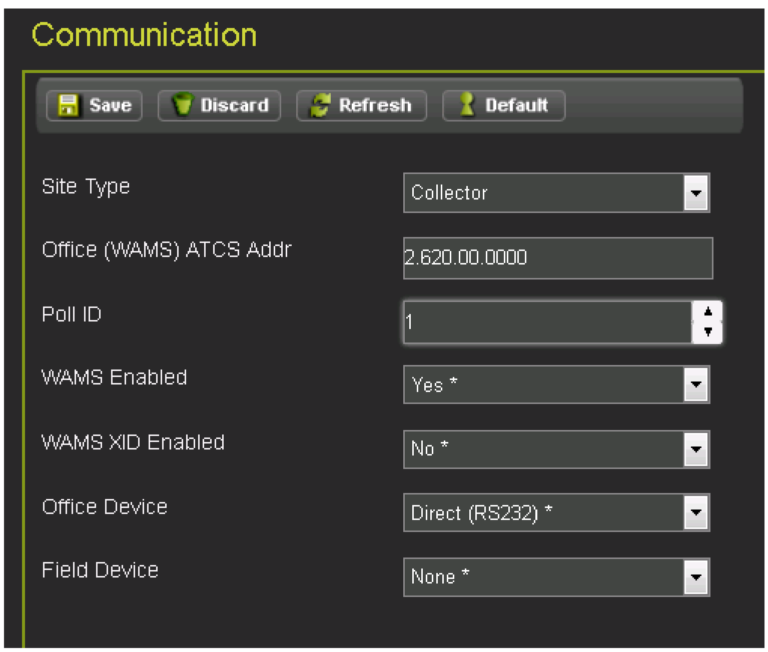

Figure 3-117: SEAR Communications: Collector

A Collector site has the following settings.

Table 3-13: Collector Settings

Setting	Description
Office (WAMS) ATCS Address	ATCS address of the Wayside Alarm Management System software. The address is a type 2 office address with the following format: 2.RRR.NN.DDDD.
Poll ID	The Genisys protocol poll ID of this site.
WAMS Enabled	Enables or disables communication with the back-office Wayside Alarm Management System
WAMS XID Enabled	Enables or disables the WAMS XID messages. Typically, this can be left to No and is not used.
Office Device	The device used to communicate with the office. This setting can be any of the following: • Direct (RS232) • MCM (RS232) • WAG (Echelon) • MCM (Echelon) • Dial Modem (RS232)
Modem Phone Number	If the selected office device is Dial Modem (RS232), the phone number for the office system must be specified.
Modem Init String	If the selected office device is Dial Modem (RS232), an initialization string for the modem may be specified. NOTE: Auto answer for the modem must be disabled. The SEAR IIi handles phone answering.
Field Device	The device used to communicate with Node SEAR IIi sites in the network. This setting can be any of the following: • VHFC Comm (Echelon) • SSR (Spread Spectrum Radio) (RS232) • WAG (Echelon) • VHF Comm(RS232) • None

CDS-902X

A SEAR IIi configured with a site type of CDS-902X sends alarm messages to the office system using the Data remote CDS-902X cellular modem. The messages are sent to the office using the Short Message Service (SMS) or the phone system. There are no additional settings.

Bullhorn/Modbus

A SEAR IIi configured with a site type of Bullhorn/Modbus communicates with the office using a Bullhorn cellular unit and the Modbus protocol. A Bullhorn/Modbus site has the following settings.

Table 3-14: Bullhorn/Modbus Settings

Setting	Description
Poll ID	Modbus protocol poll identifier. 1-255

3.4.4.7 Serial Port

The SEAR IIi has two serial ports, the USER port and the AUX port, these are configured from the Serial Port tab.

Table 3-15: Serial Port Settings

Setting	Description
Baud Rate	300, 600,1200,2400,4800,9600 (default),19200,38400, 57600
Data Bits	7,8 (default)
Parity	None (default), odd, even
Stop Bits	1 (default), 2
Flow Ctrl	None, Hardware, Radio

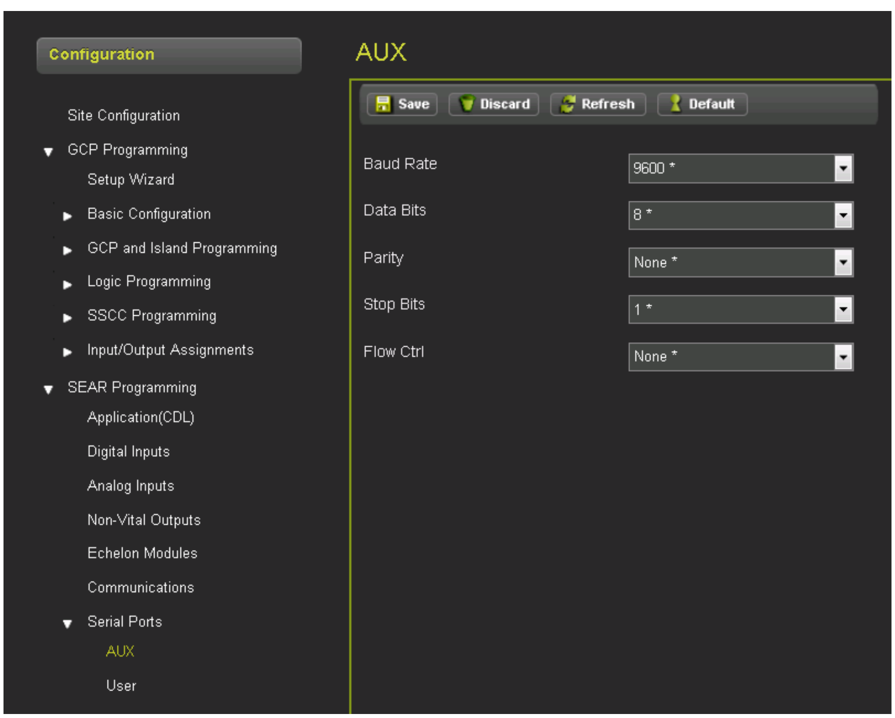

Figure 3-118: SEAR Serial Ports: AUX Port

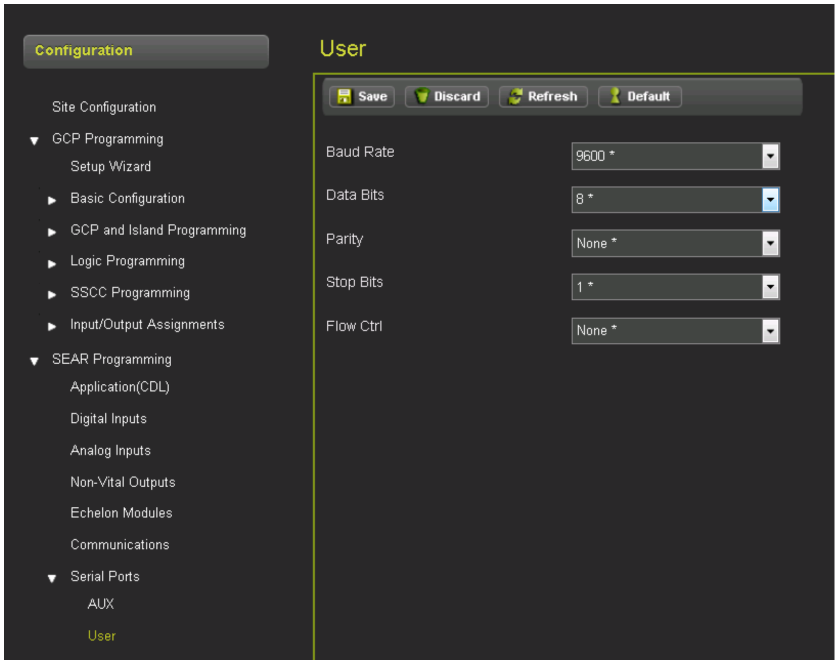

Figure 3-119: SEAR Serial Ports: User Port

3.4.4.8 Set to Default

This setting is used to set the SEAR configuration back to the default settings.

NOTE

NOTE

GCP and Display programming are not affected when 'Set to Default' is performed.

CAUTION

CAUTION

ONCE 'SET TO DEFAULT' IS PERFORMED, IT CANNOT BE UNDONE. ALL SEAR PROGRAMMING WILL NEED TO BE RE-ENTERED.

3.4.5 Display Programming

The Display Programming menu is used to set non-vital parameters used by the display.

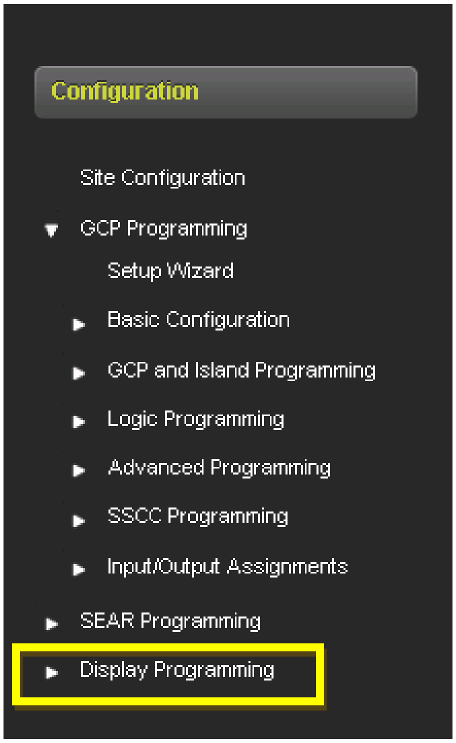

Figure 3-120: Display Programming Menu

3.4.5.1 Serial Port

The serial port menu allows the user to configure the serial port connected to the DIAG connector on the chassis. The DIAG port on the front of the Display module is not user-configurable.

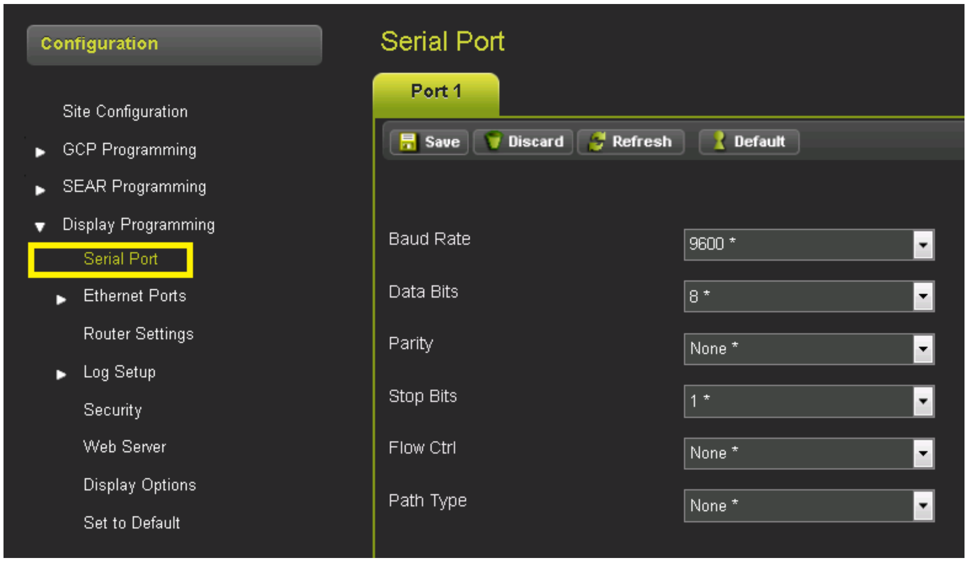

Figure 3-121: Display Programming Serial Port

3.4.5.2 Ethernet Ports

The Display Module has three serial ports. The laptop port should be accessed from the front of the Display Module. Ethernet port 1 and 2 should be accessed from the RJ45 connectors on the GCP Chassis.

NOTE

NOTE

For Ethernet Ports 1 and 2 use the appropriate RJ45 connections on the GCP 5000 chassis. Do not use the RJ45 connections on the front of the display module, these are only used in a GCP 4000.

Laptop Ethernet Port:

This menu allows the user to select between Disabled, DHCP Server or DHCP Client mode. The default setting is as a DHCP Server with IP Address 192.168.255.81.

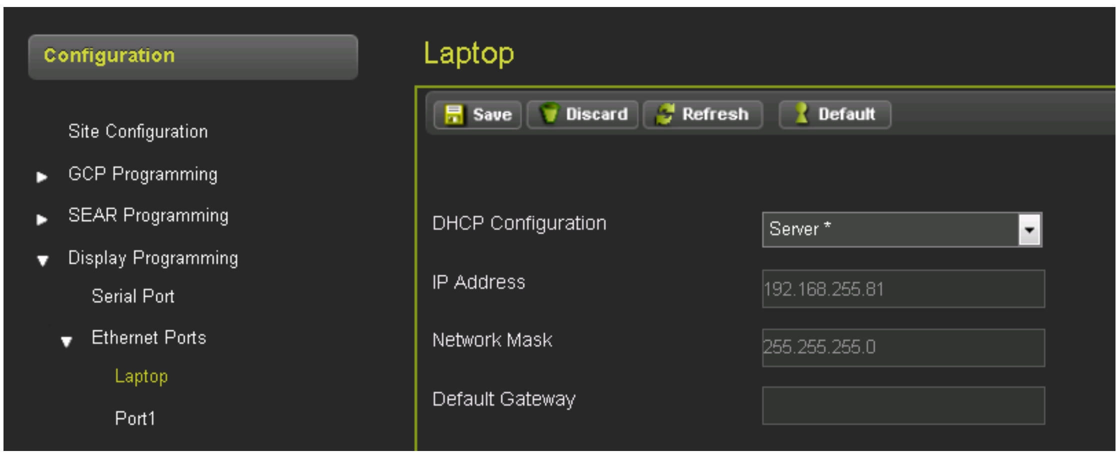

Figure 3-122: Display Programming Laptop Ethernet Port

Ethernet Port 1

This menu allows the user to select options for Ethernet port 1. The user can choose between Disabled and DHCP Client mode. When Disabled, the port has the fixed IP address as default as shown below. The screen also allows the user to check the status of the connection.

This port would typically be used when connecting the GCP 5000 to a cell modem for remote monitoring.

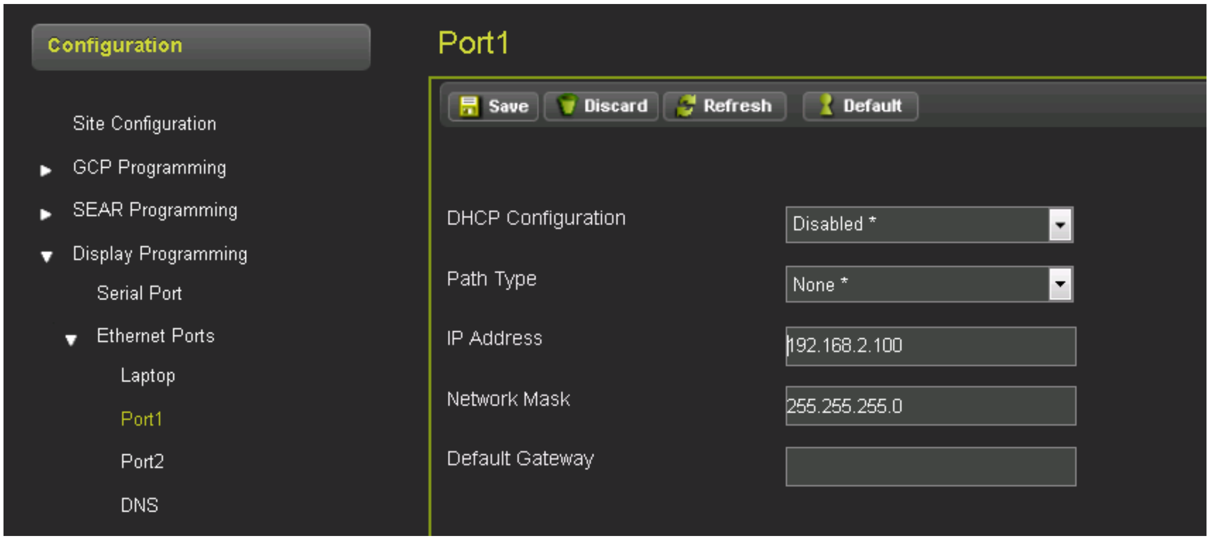

Figure 3-123: Display Programming Port 1 Ethernet Port

Ethernet Port 2

This menu allows the user to select options for Ethernet port 2. The user can choose between Disabled and DHCP Client mode. When Disabled, the port has the fixed IP address as default, as shown below.

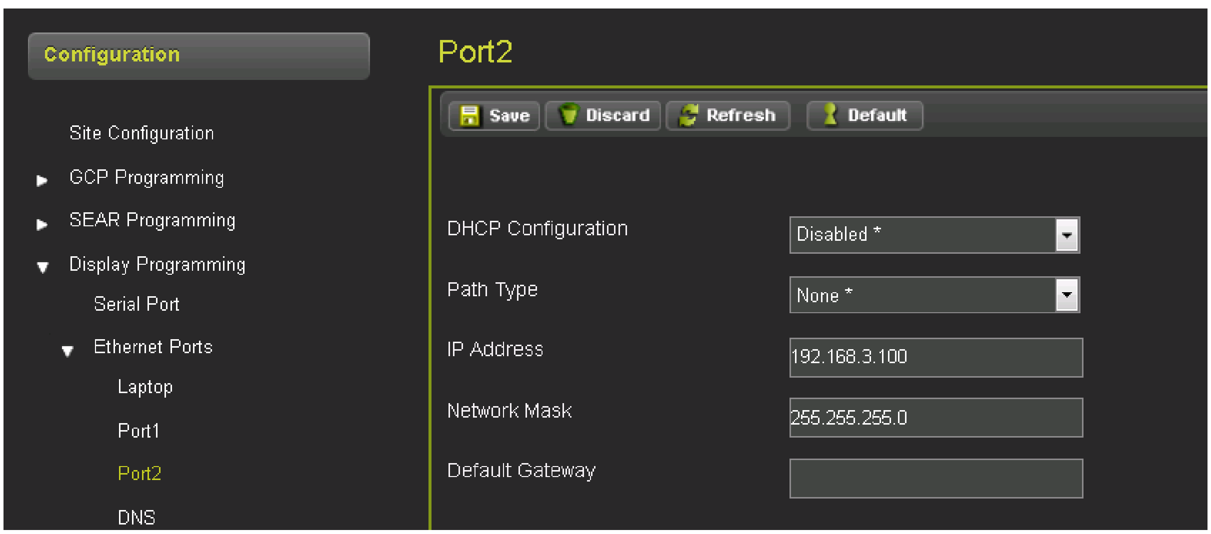

Figure 3-124: Display Programming Port 2 Ethernet Port

DNS

The DNS menu allows the user to set the IP address of name servers used for the domain name system.

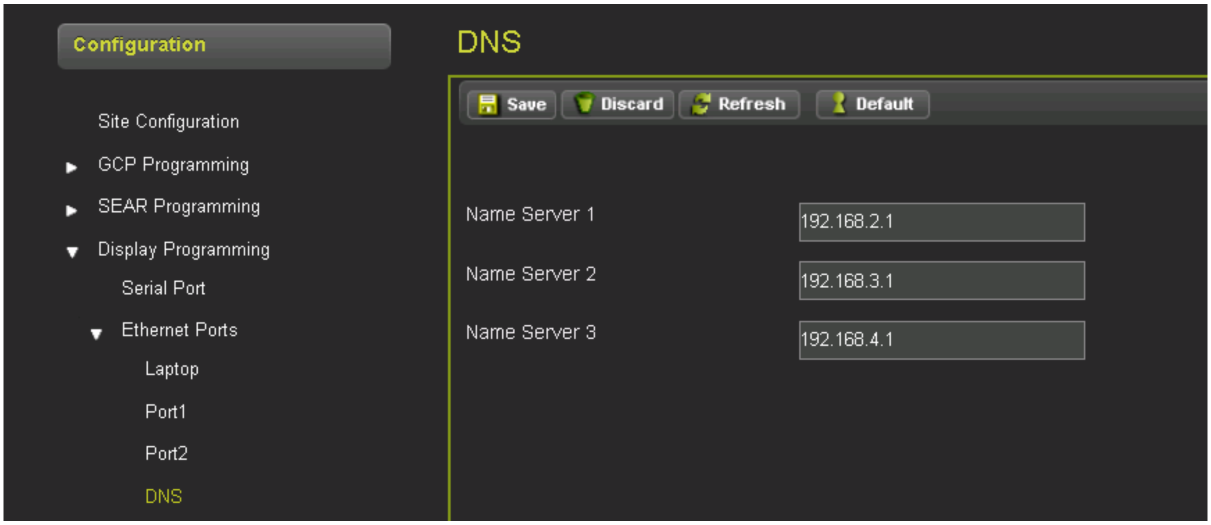

Figure 3-125: Display Programming DNS

3.4.5.3 Router Settings

The Router Settings page is used when there is a CPU III in the system. This controls the routing of vital ATCS messages from the CPU IIII when vital communication links are used. When the parameter is set here, it is sent to the CPU III and then stored in the CIC, so that the CPU III can read it on boot up, regardless of whether the Display module is present.

ATCS IP Field Interface has options of None, Echelon and Ethernet, default Echelon. This controls the routing of the vital ATCS messages. If it is set to Echelon the CPU III will send vital messages out of the Echelon port. If it is set to Ethernet, the CPU III will send vital messages out of the CPU III laptop port.

ATCS IP Field UDP Port Number is the Ethernet port number used when the Field interface is set to Ethernet. Default 13000.

The **Route Table Entry timeout** is used by the display module to delete ATCS route entries in the route table if they are no longer used, range 0 -172800s, default 400s

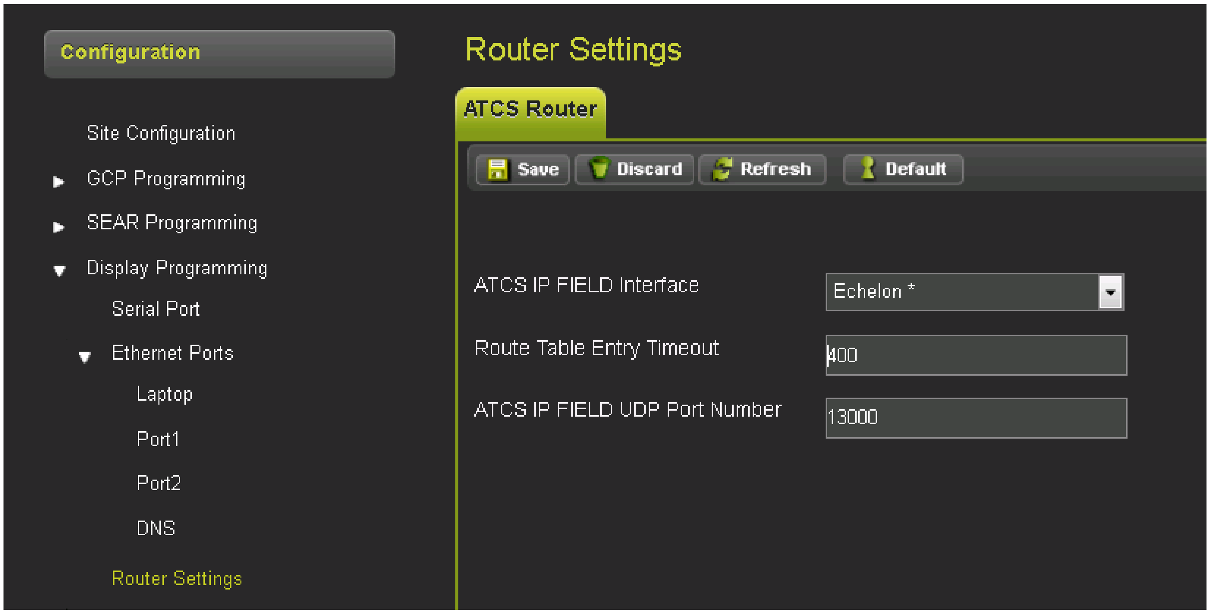

Figure 3-126: Display Programming Router Settings

3.4.5.4 Log Setup

Consolidated Logging

If multiple GCPs are present at a site, the Display is able to consolidate the logs for all these into one. On the screen shown in Figure 3-127 enter the IP address of the Display that the when the Event log and Diagnostic log are to be stored. These may be stored on separate Display Modules.

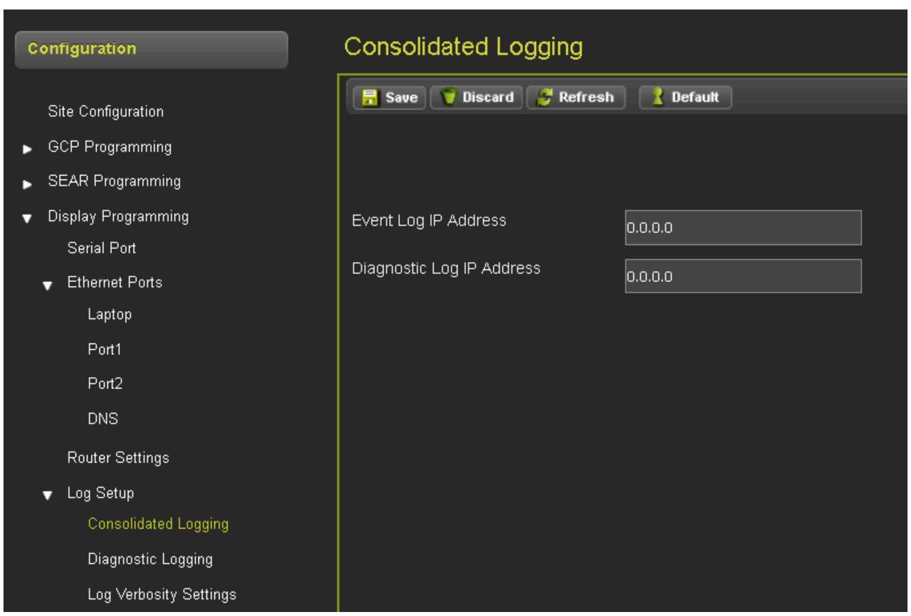

Figure 3-127: Display Programming Consolidated Logging

Diagnostic Logging

Most of the options on this page, as shown in Figure 3-128, are for Siemens use for diagnostics.

The options that may be used by the customer are:

EZ/EX Logging: this uses the values: Change, None, and Periodic. The default is Change. This is used to control the logging on the CPU that occurs when a train move is in process.

If the value is set to Change: a new entry will be added to the log when EZ or EX change by more than the value set by EZ/EX change.

If the value is set to Periodic: a new entry will be added to the log when EZ or EX change by more than the value set by EZ/EX change or periodically with an interval set by the EZ/EX Logging Interval (only visible when value is Periodic).

If the value is set to None: the EZ/EX entry is not logged.

EZ/EX Point Change: the range 1-5. The default is 3. This is used to set the change needed to log an EZ/EX entry when EZ/EX Logging is set to Change or Periodic.

EZ/EX Logging Interval: the range is 1-5 seconds. The default is 4 seconds. This is used to set the interval between logging EZ/EX entries when EZ/EX Logging is set to Periodic.

EZ/EX Recording: the range is Enabled/Disabled. The default is Enabled. This is used to turn on the feature where the display continuously stores a record of the EZ/EX, island, and predictor states for each track in a file that can be downloaded as a csv.

Figure 3-128: Display Programming Diagnostic Logging

Log Verbosity Settings

This page is used to set the verbosity (the detail of the logging) of the Diagnostics, CPU and I/O module logs.

For the CP and I/O modules, the default verbosity is 1, the value should be kept at this unless Siemens requires more detailed log information to diagnose a specific problem.

CP Verbosity: range 1-2, default 1

VLP, Slot 1-6, SSCC IIIi Verbosity: range 1-5, default 1

The Display Diagnostic Log Verbosity control the detail of logging to the Display module's display log. Range Basic, Error, Warning, Info, Debug, default: Info

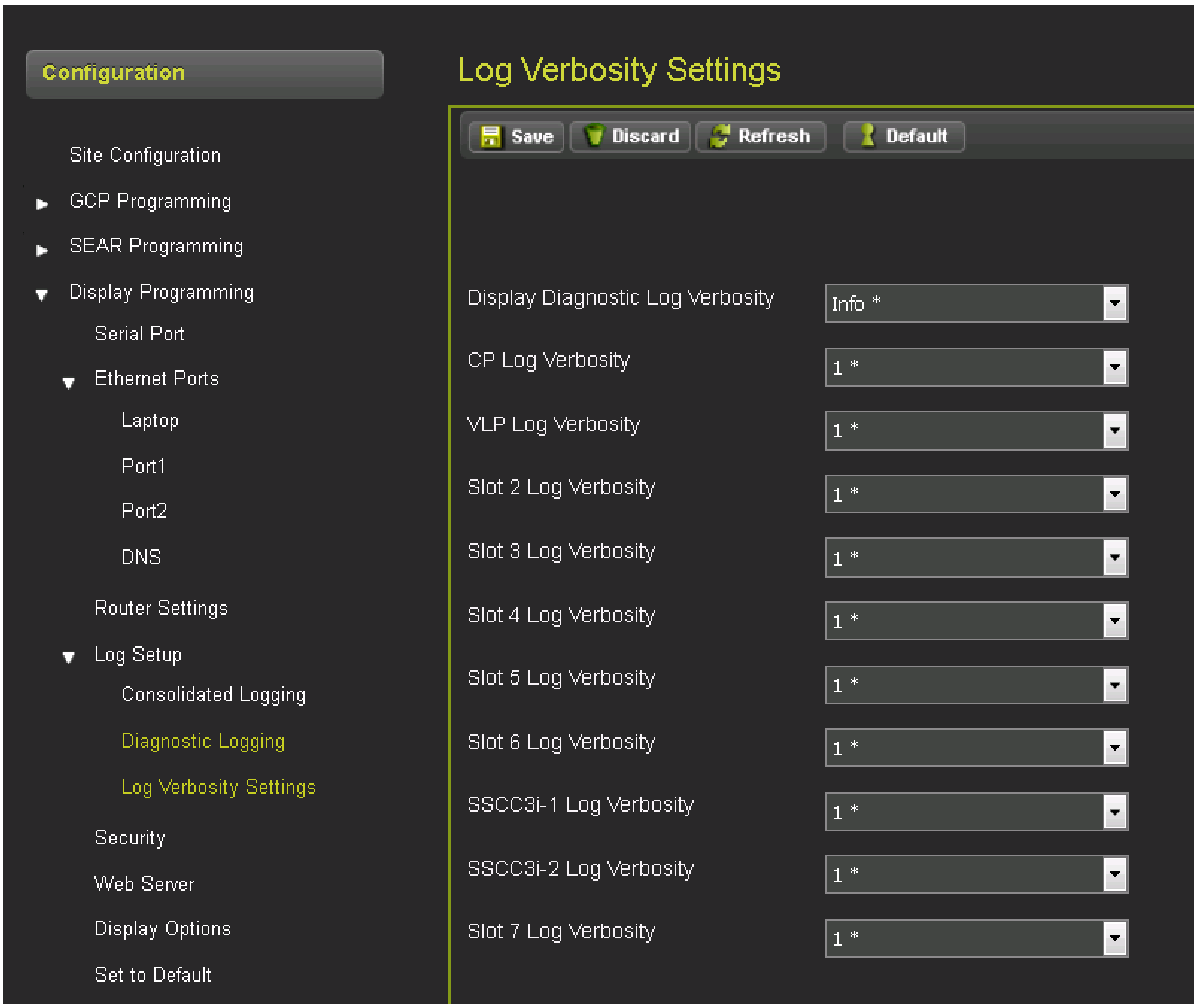

Figure 3-129: Display Programming Log Verbosity Settings

3.4.5.5 Security

The security page allows the user to enable or disable the Maintainer password protection using the **Security Enabled** field. This defaults to **None**. When the **Security Enabled** is set to Maintainer the Maintainer Password field appears and the user can type in the required password.

On returning to this screen, the password cannot be edited unless the correct password is entered. See Section 3.3 for details.

If security has been enabled, the user will need to enter this password on the local user interface in order to be able to edit GCP MCF parameters. Also the user will need to log into the Web UI with this password in order to be able to edit GCP MCF parameters. The user can still log into the Web UI using the default GCP 5000 password, but the configuration will be read only.

Session Inactivity Timeout: 5 to 60 mins, the default is 20min. This is used to timeout the WebUI if there is no activity on the GCP for the configured time.

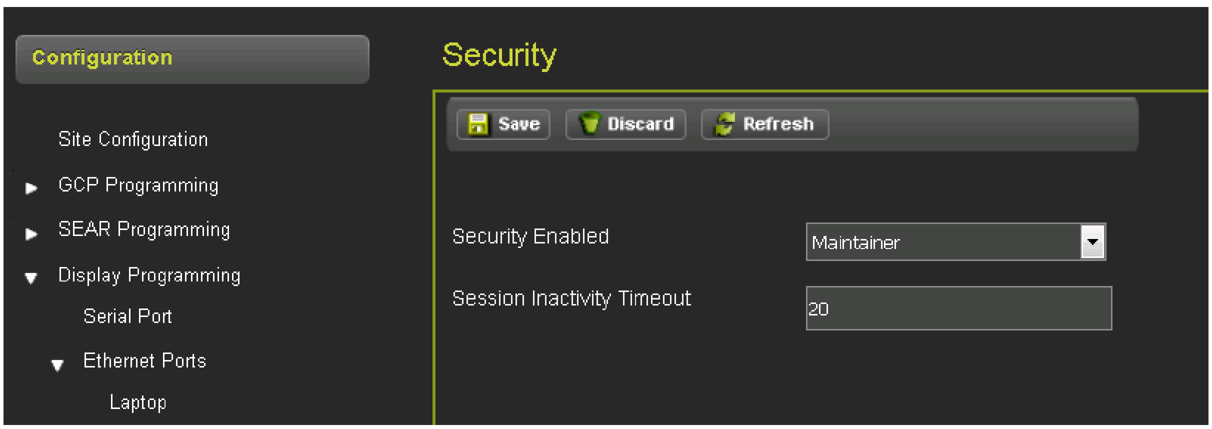

Figure 3-130: Display Programming Security

3.4.5.6 Web Server

This is used to control whether the Web UI uses secure (https) or non-secure (http) access. The default is non-secure access.

NOTE

NOTE

From April 2022, the Web UI uses non-secure (http) as the default unless the user has changed the setting to HTTP Secure (https). Units shipped prior to this date may be set to https.

NOTE

NOTE

The CPU III Web UI is not compatible with most recent web browser's updates (since Feb 2022) when used in https mode. It is recommended to use http at this time.

To change to http, connect using Internet Explorer, and change to http. Then reconnect using the browser of choice. Refer to the CPU III User Guide, SIG-00-15-05, Section 3.1.2.9 (Web Server paragraph) or Section 3.1.3.13 for further information.

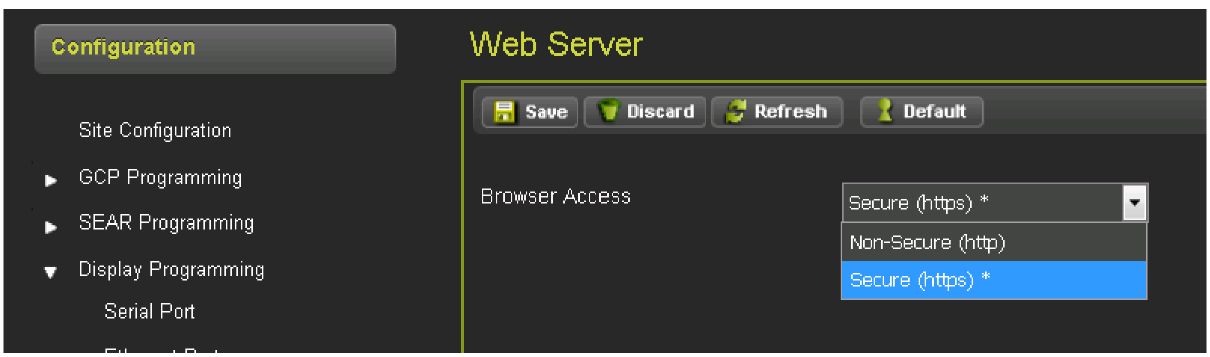

Figure 3-131: Display Programming Web Server

3.4.5.7 Display Options

Display Buzzer Enable: the range for this setting is Yes or No, and the default is Yes. This is used to enable or disable the buzzer on the Display

Display Hibernation Time (minutes): the range for this setting is 5-60, and the default is 15. This is used to darken the display when there has been no activity.

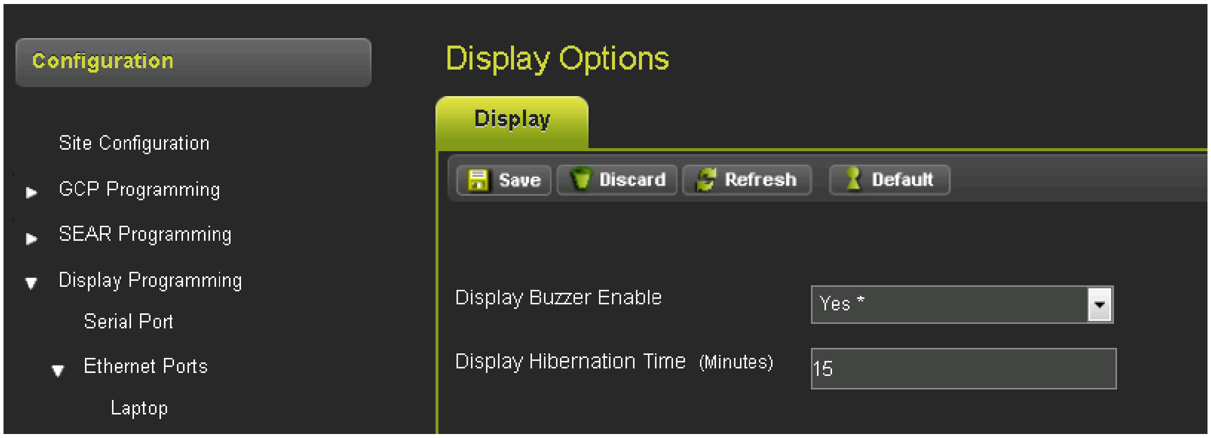

Figure 3-132: Display Programming Display Options

3.4.5.8 Set to Default

This is used to set the Display parameters back to the default settings. The parameters under GCP Programing are unaffected.

CAUTION

ONCE 'SET TO DEFAULT' IS PERFORMED, IT CANNOT BE UNDONE. ALL DISPLAY PROGRAMMING WILL NEED TO BE RE-ENTERED.

3.5 OFFICE CONFIGURATION EDITOR (OCE)

The Office Configuration Editor allows the user to capture the configuration for the GCP 5000 offline and save this to a file known as the PAC file. The OCE allows the user to set the GCP programming options, the SEAR programming including answering the CDL site setup questions and also the display programming options.

The PAC file can then be loaded into the GCP 5000 via the Display module.

NOTE

NOTE

When uploading files to a GCP 5000, the MCF must be loaded prior to loading the PAC file.

NOTE

NOTE

When uploading files to a GCP 5000, the CDL must be loaded prior to loading a PAC file containing the CDL settings. If this order is not observed, site setup will have to be restarted and completed a second time in the correct order.

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 the office designer to designate most configuration parameters. Only site-specific parameters must be determined and entered in the field. Refer to the Office Configuration Editor manual, SIG-00-11-15 for more details.

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 excluded. Specifically excluded are those values intended to be changed by the maintainer in the field. The purpose of the OCCN is to create a configuration check over the properties that the office sets and exclude the properties that the user sets in the field.

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

The software used in the GCP 5000 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 GCP 5000 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 Excluded From OCCN

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

Table 3-16: Field Password Values

GCP Freq Category	Positive Start Level
GCP Transmit Level	Positive Start Offset
SSCC 1 / 2 Low Battery Detection	Sudden Shunt Det Level
SSCC 1 / 2 Low Battery Level	Sudden Shunt Det Offset
SSCC 1 / 2 Lamp Neutral Test	Low EZ Detection Level
SSCC 1 / 2 Lamp Voltage	MS Sensitivity Level
Inbound PS Sensitivity	Compensation Level
Outbound False Activation Level	Warn Time Ballast Comp
Island Distance (in all templates)	Low EX Adjustment
False Activation on Train Stop	Trailing Switch Logic
Adv Appr Predn Start EZ	Outbound PS Time
Adv Appr Predn Stop EZ	Speed Limiting
Track 1..6 MS Restart EZ Level	

SECTION 4 – TEMPLATE OVERVIEW & GUIDELINES

SECTION 4 TEMPLATE OVERVIEW & GUIDELINES

4.1 TEMPLATE OVERVIEW

The GCP 5000 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 GCP 5000 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 GCP 5000 applications.

For each application:

- The crossing designer selects the appropriate template using the diagrams provided in section 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.

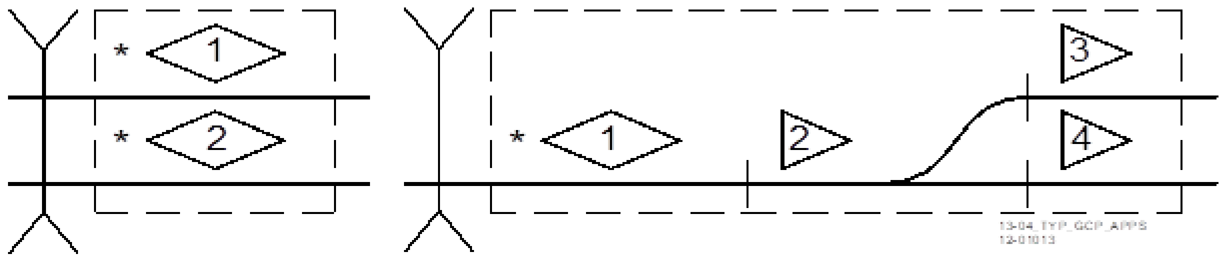

Figure 4-1: Typical GCP Applications

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 GCP 5000 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 GCP 5000 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 section 4.7.

The following sections 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.

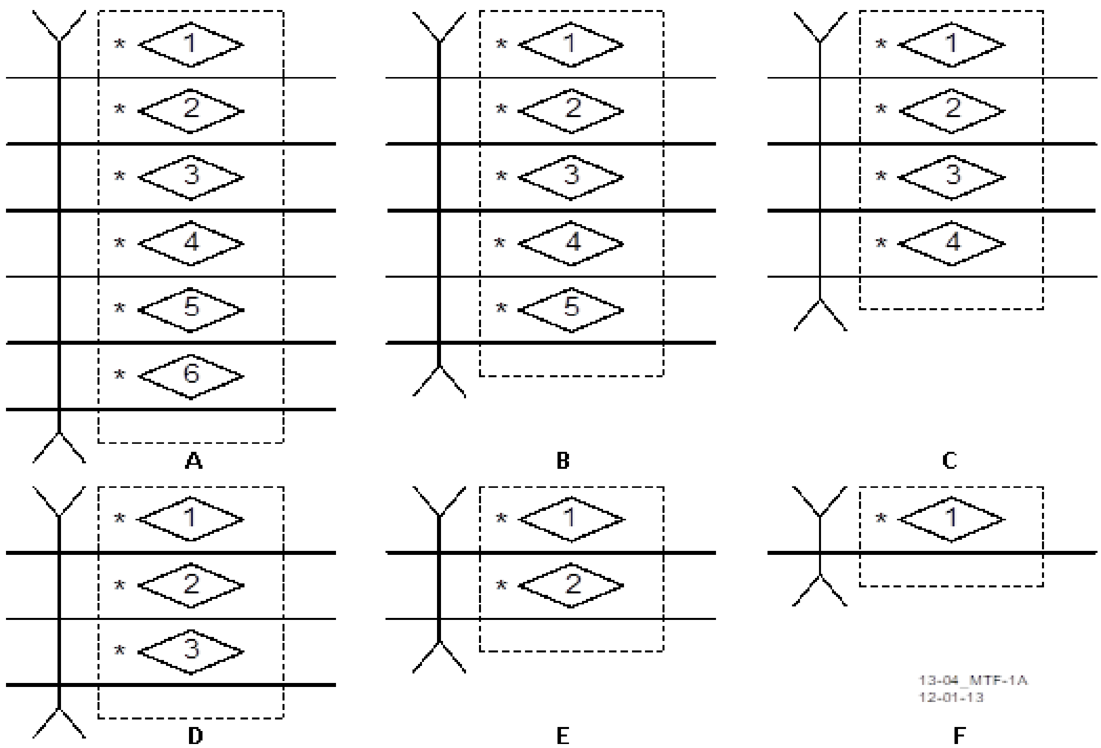

Figure 4-2: Template 1A (MTF_1A) Configurations

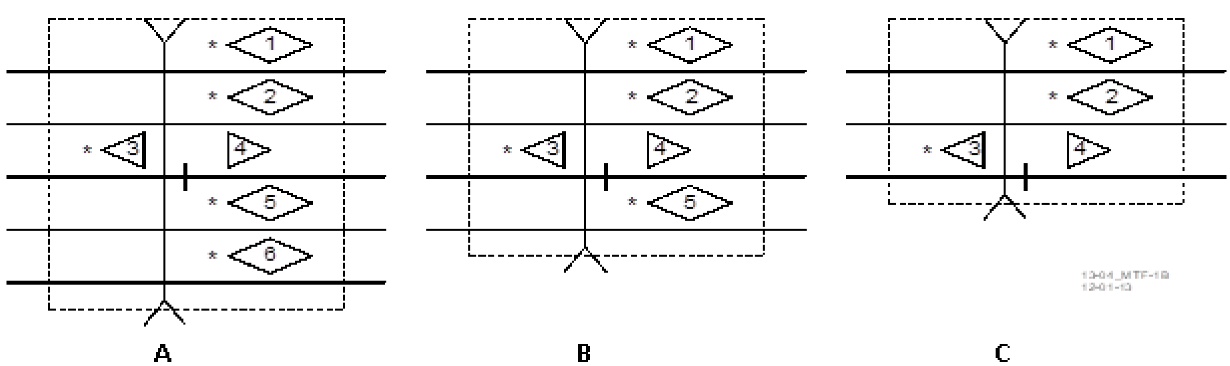

Figure 4-3: Template 1B (MTF_1B) Configurations

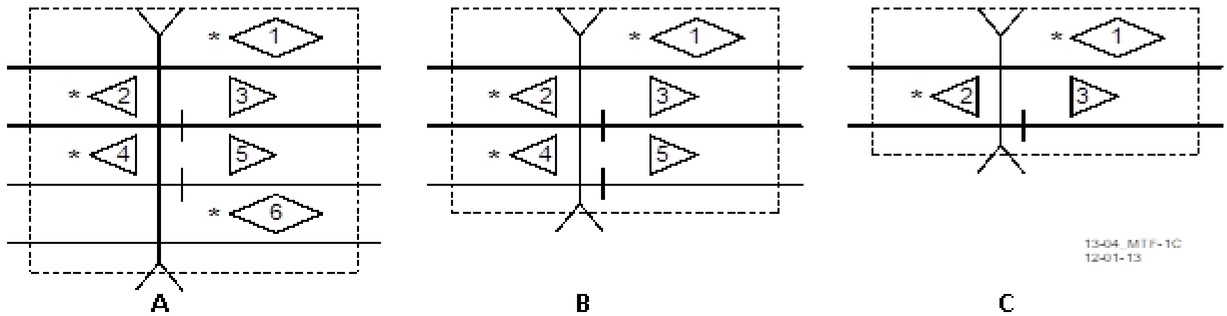

Figure 4-4: Template 1C (MTF_1C) Configurations

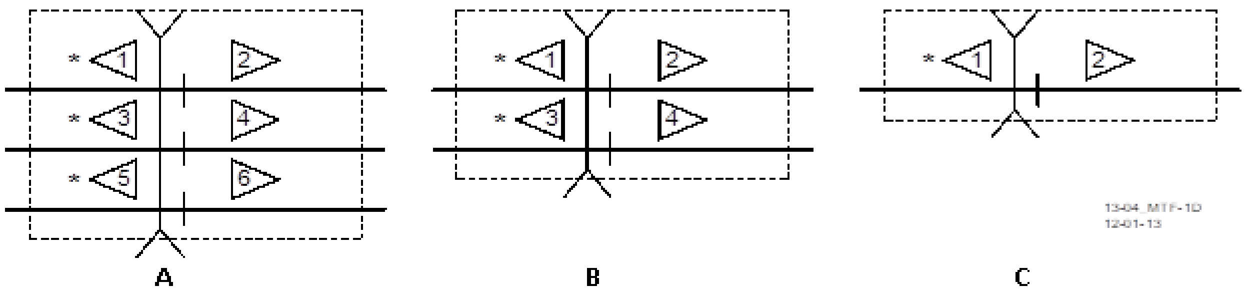

Figure 4-5: Template 1D (MTF_1D) Configurations

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.

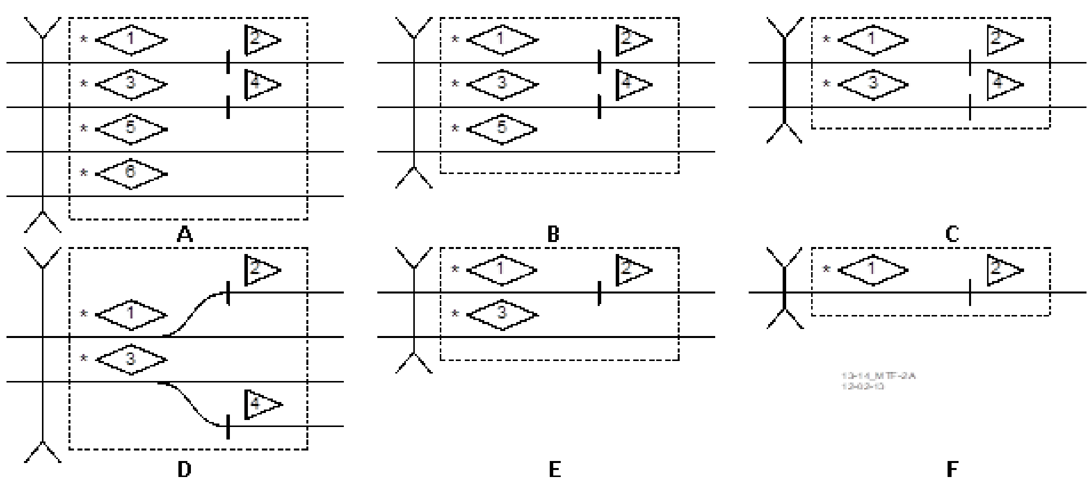

Figure 4-6: Template 2A (MTF_2A) Configurations

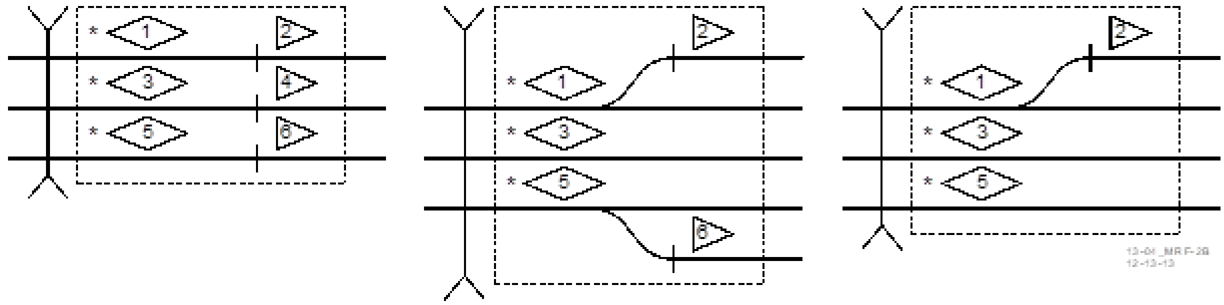

Figure 4-7: Template 2B (MTF_2B) Configurations

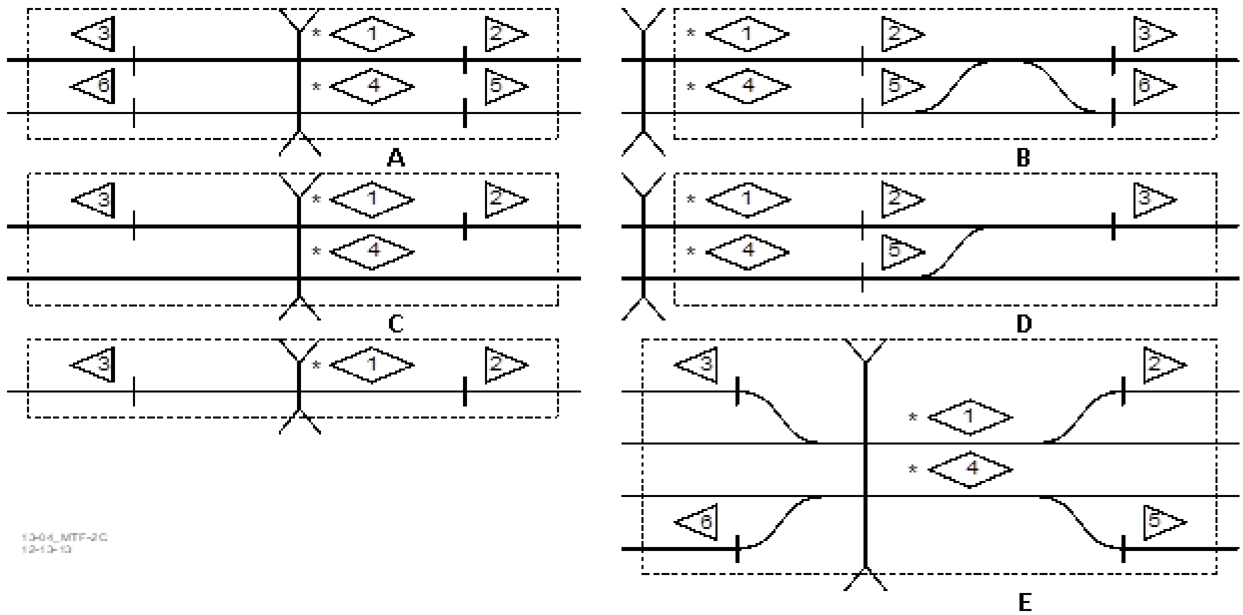

Figure 4-8: Template 2C (MTF_2C) Configurations

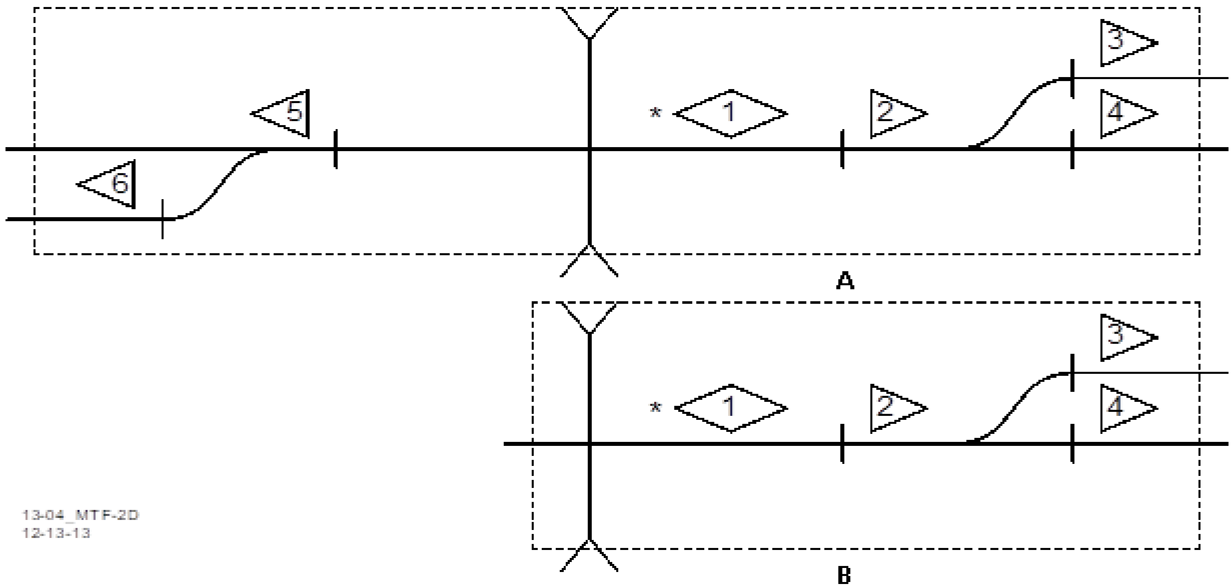

Figure 4-9: Template 2D (MTF_2D) Configurations

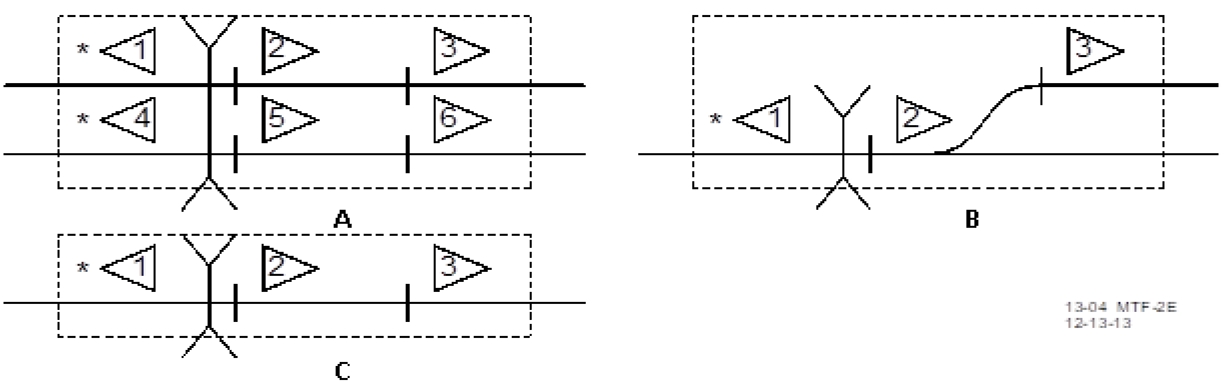

Figure 4-10: Template 2E (MTF_2E) Configurations

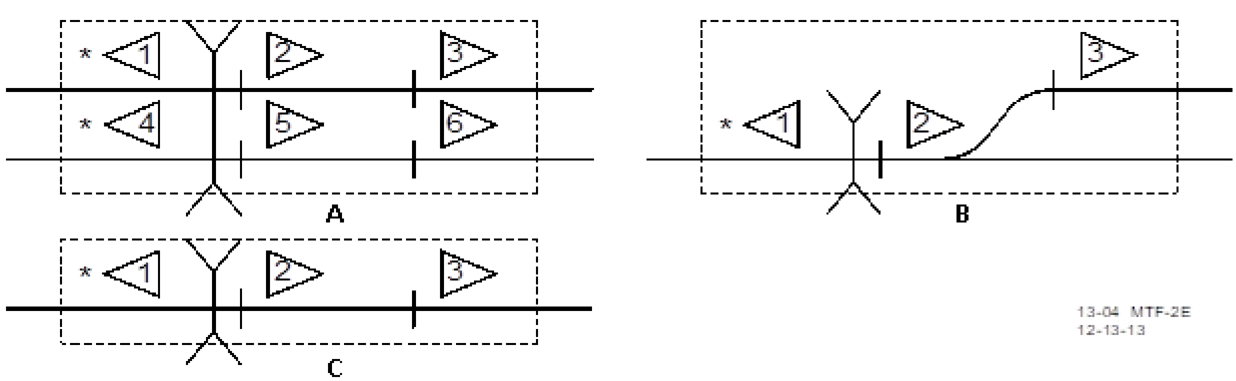

Figure 4-11: Template 2F (MTF_2F) Configurations

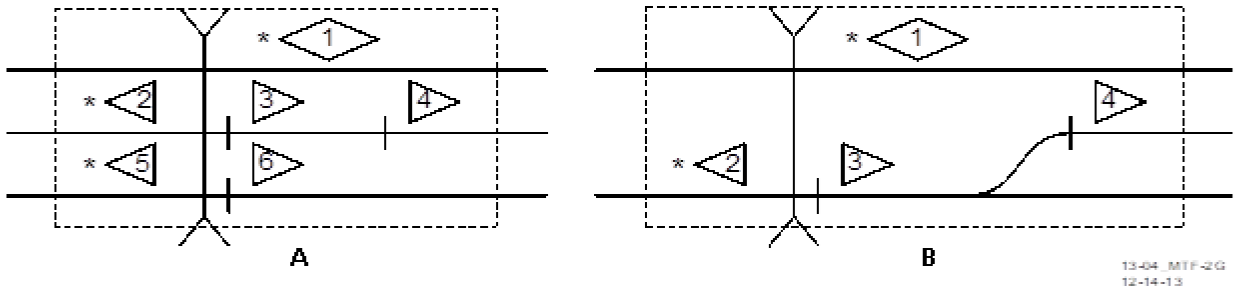

Figure 4-12: Template 2G (MTF_2G) Configurations

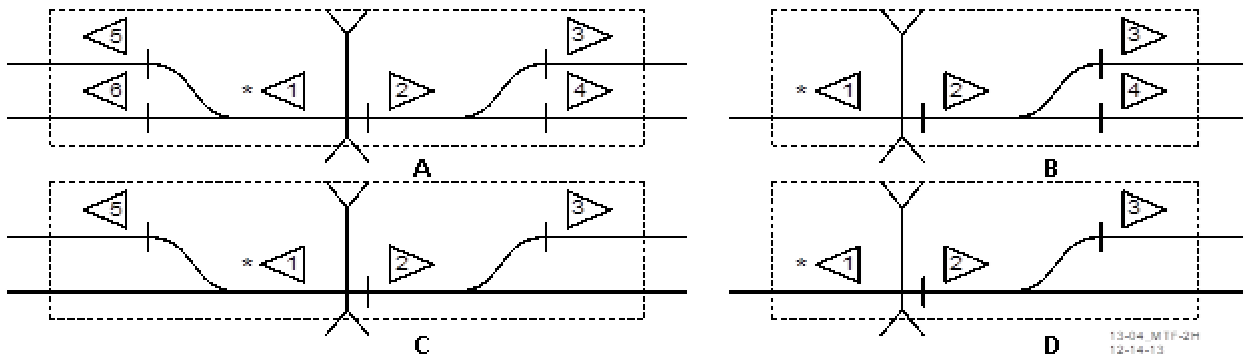

Figure 4-13: Template 2H (MTF_2H) Configurations

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 4-14 through Figure 4-20.

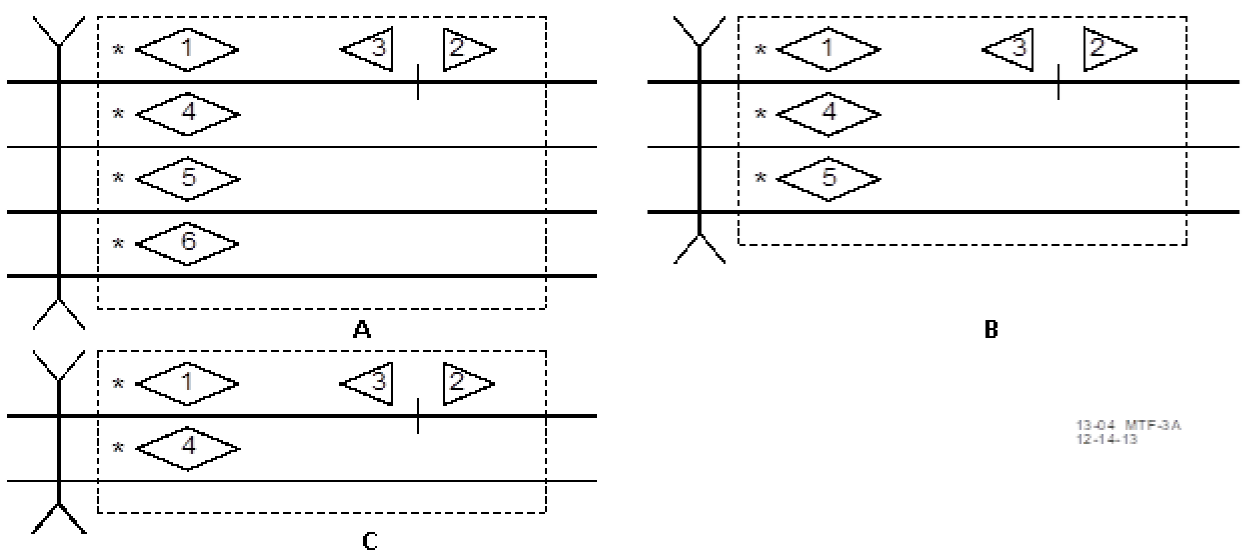

Figure 4-14: Template 3A (MTF_3A) Configurations

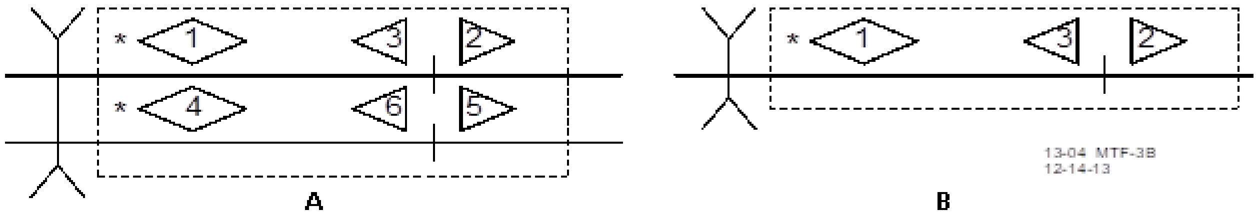

Figure 4-15: Template 3B (MTF_3B) Configurations

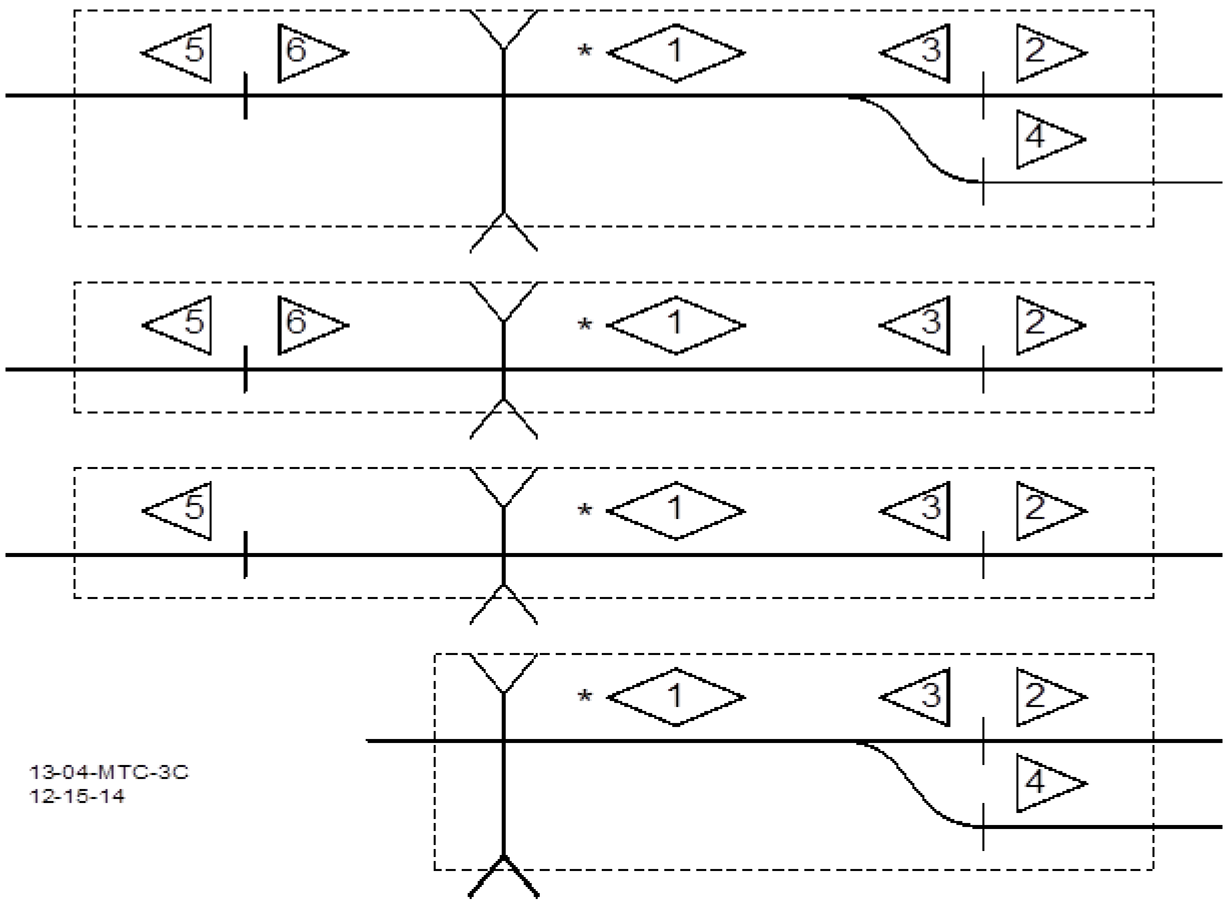

Figure 4-16: Template 3C (MTF_3C) Configurations

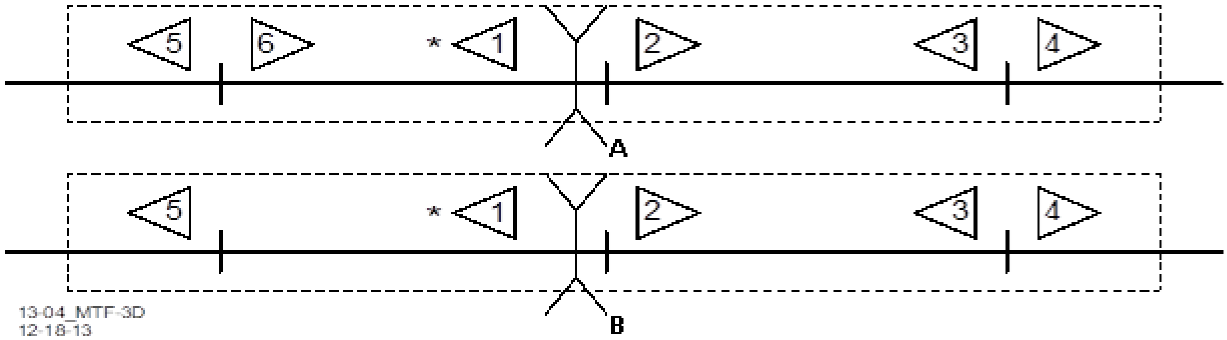

Figure 4-17: Template 3D (MTF_3D) Configurations

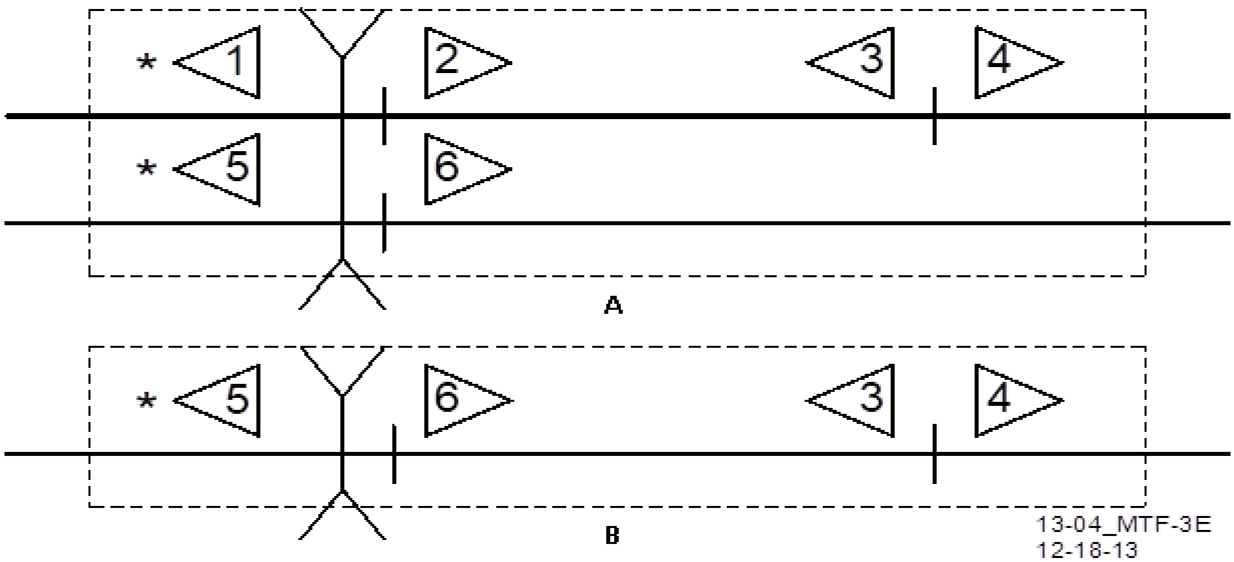

Figure 4-18: Template 3E (MTF_3E) Configurations

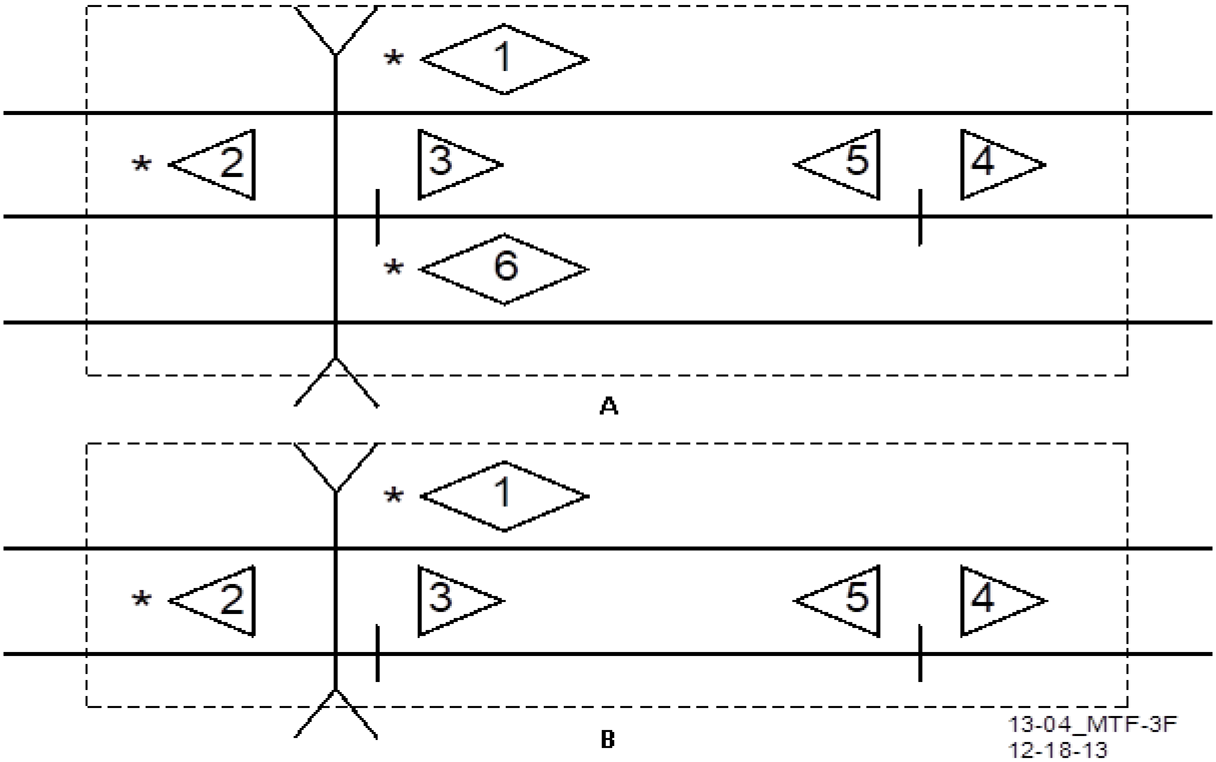

Figure 4-19: Template 3F (MTF_3F) Configurations

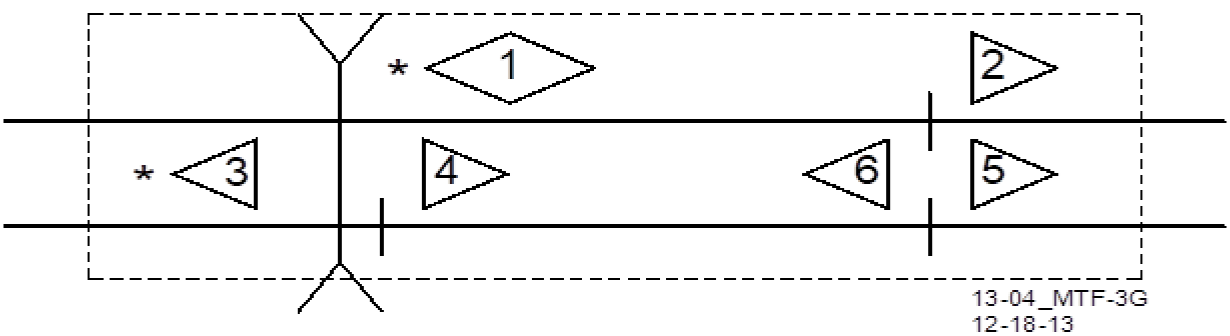

Figure 4-20: Template 3G (MTF_3G) Configurations

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.

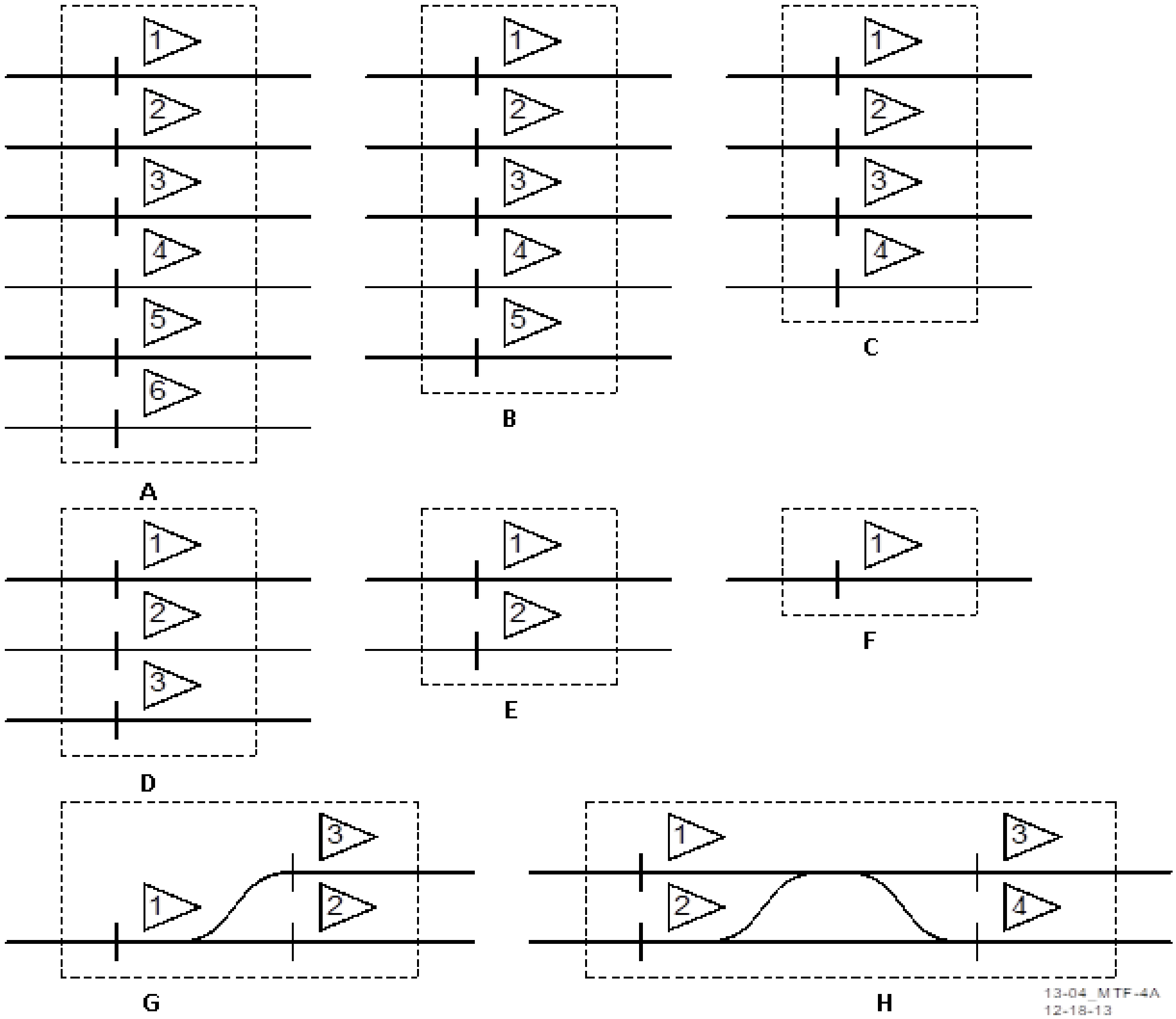

Figure 4-21: Template 4A (MTF_4A) Configurations

4.2.5 Template Program MTF_5A

This template program is used in track configurations where:

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

Examples of configurations for this template are shown in Figure 4-22.

WARNING

WHEN USING THE DEFAULT SETTINGS IN TEMPLATE 5A, THE AND 1 XR FUNCTION 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.

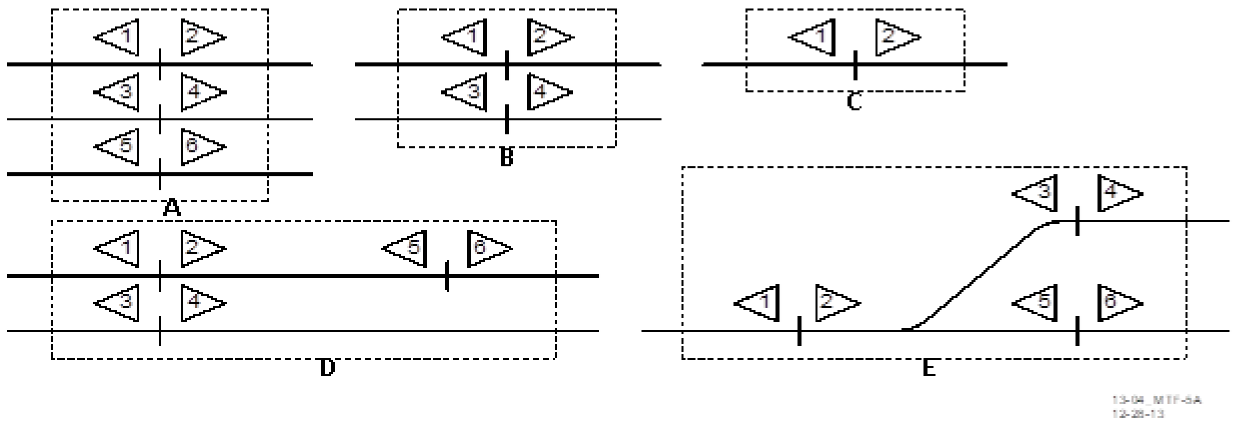

Figure 4-22: Template 5A (MTF_5A) Configurations

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 sections 4.2 and 4.7.

4.5 TEMPLATE GUIDELINE OVERVIEW

When a template is programmed, the number of modules installed in the GCP 5000 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 GCP 5000 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 will become available. When a DAX is enabled, it must also be assigned to a physical output for it to control other remote crossings. Additional DAXes 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 GCP 5000 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 sections 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.

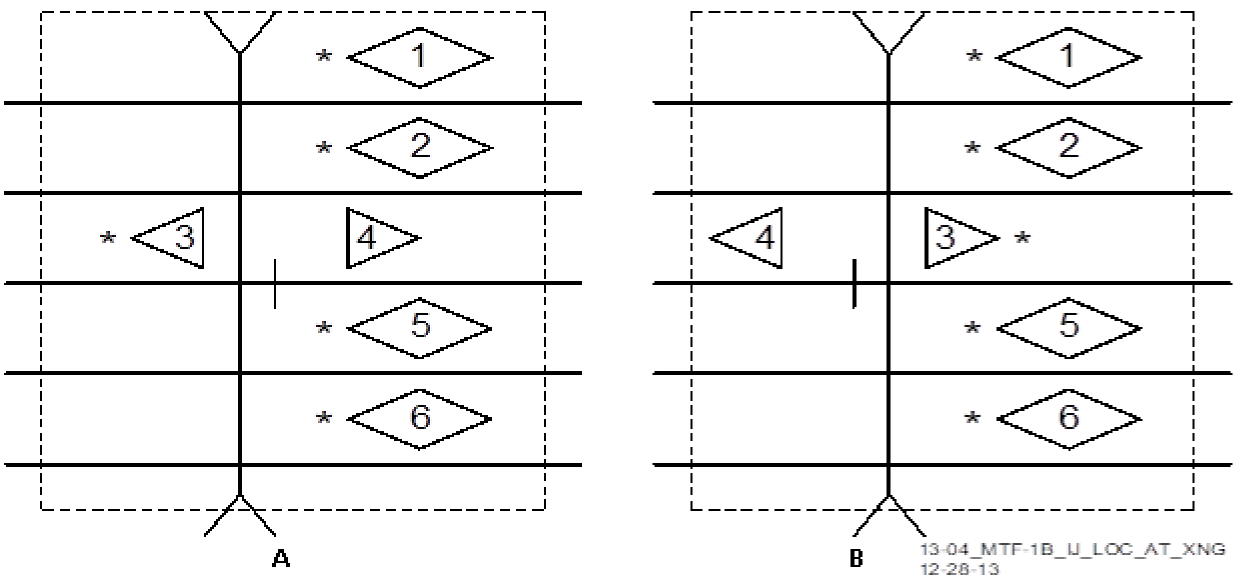

Figure 4-23: Template 1B Showing Insulated Joints at Crossing

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.

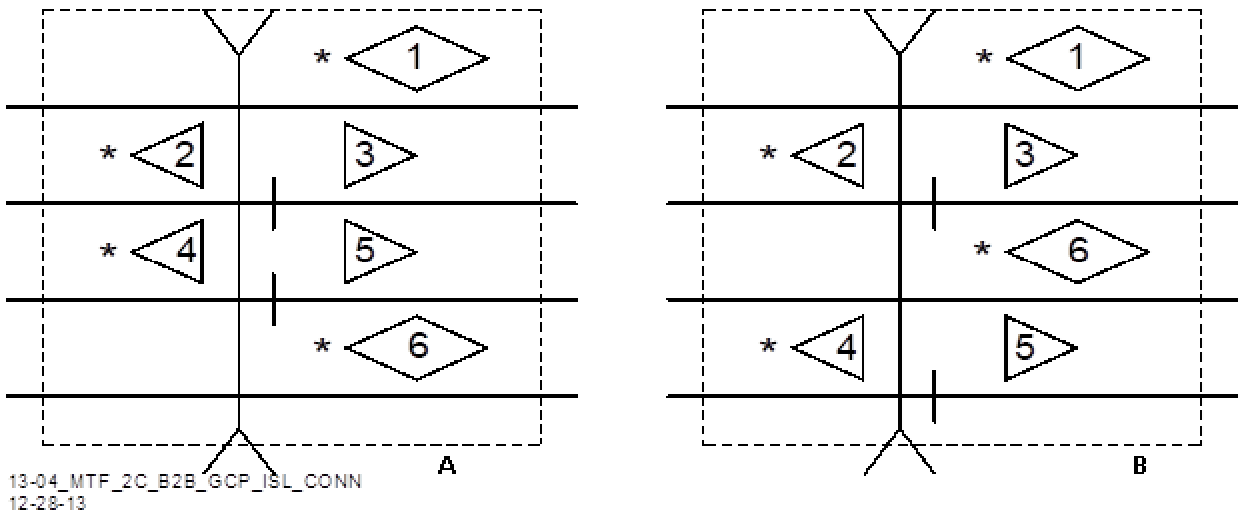

Figure 4-24: Template 1C

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.

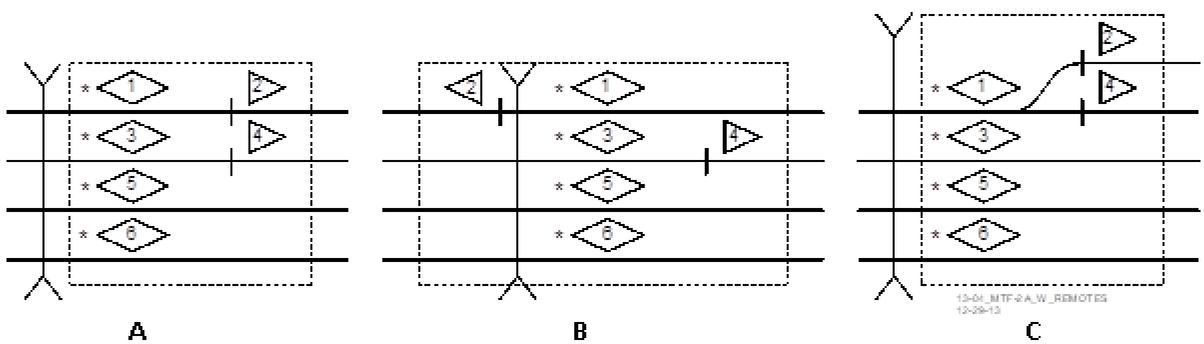

Figure 4-25: Template 2A using Remote GCPs

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 sidetrack 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.

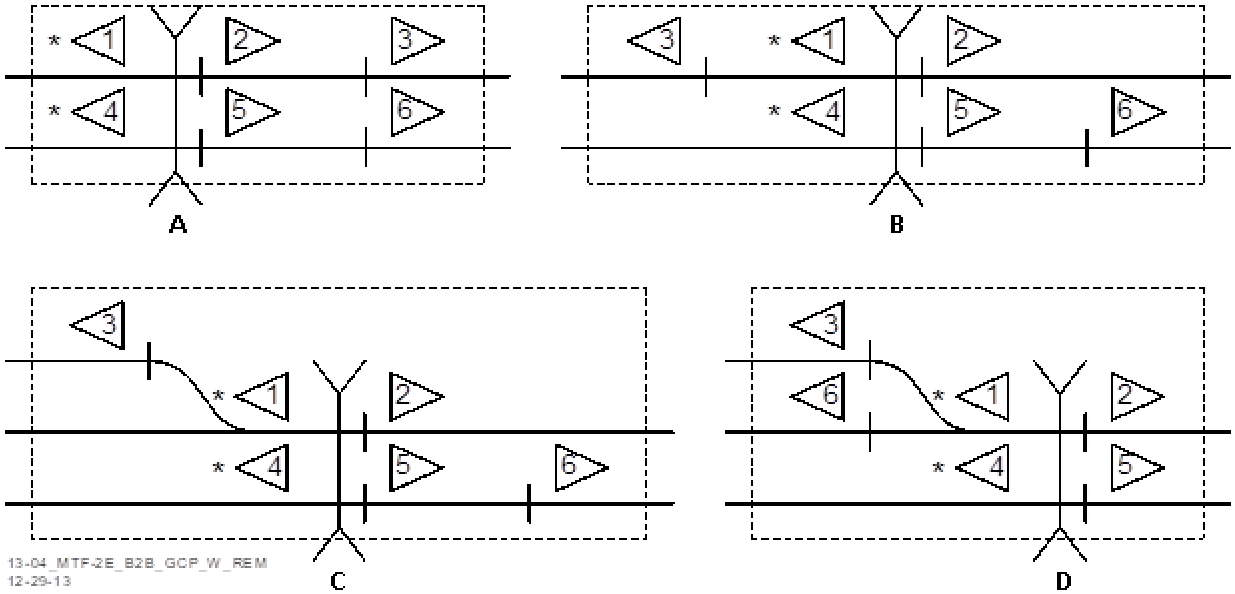

Figure 4-26: Template 2E With Back to Back GCPs Using Remote GCPs

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.

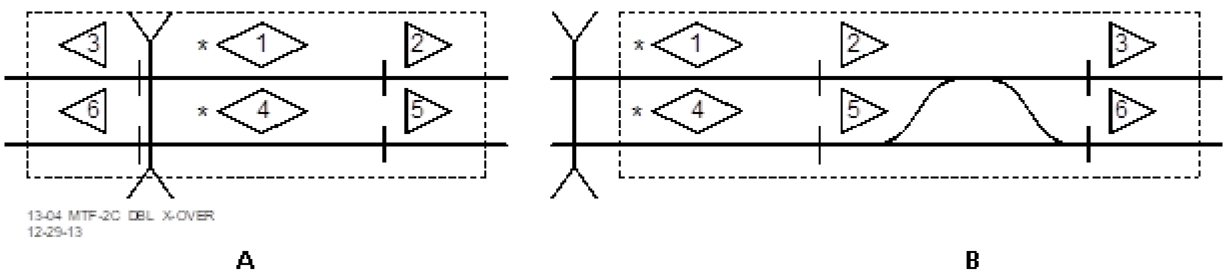

Figure 4-27: Template 2C With Double Crossover Layouts

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.

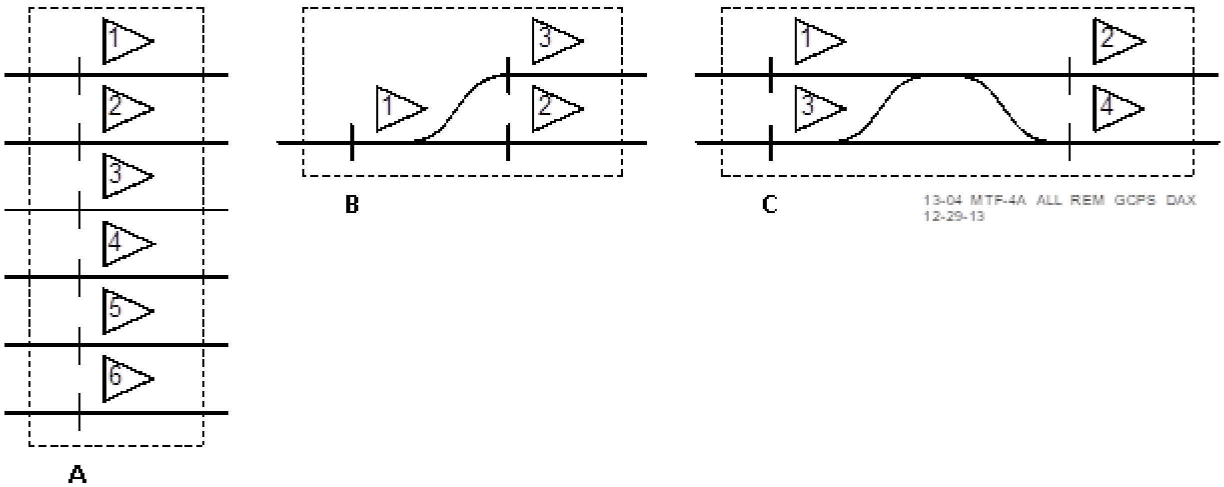

Figure 4-28: Template 4A With All Remote GCPs DAXing

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.

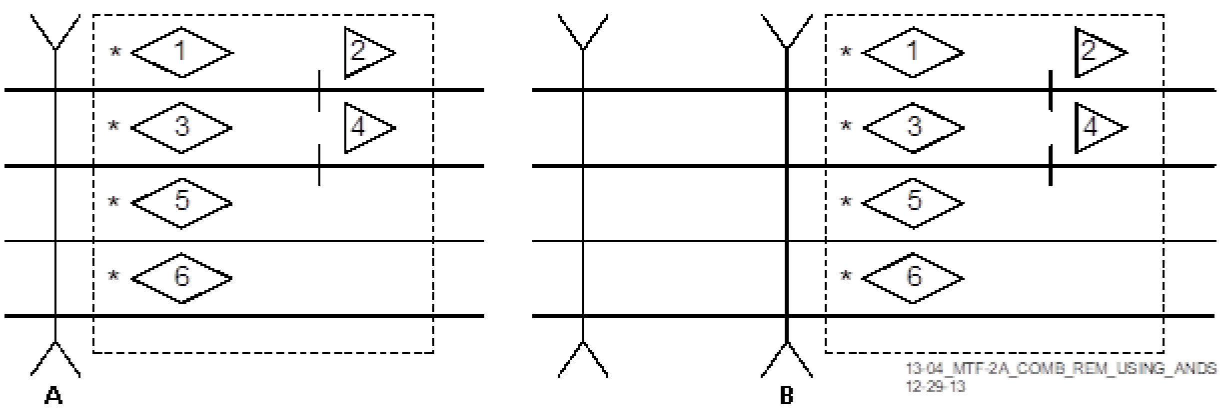

Figure 4-29: Template 2A Combining Remotes Using ANDs

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SECTION 5 – BASIC APPLICATION PROGRAMMING

SECTION 5 BASIC APPLICATION PROGRAMMING

5.1 INTRODUCTION & 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 in this section demonstrate the flexibility of GCP 5000 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 GCP 5000 for the required functionality and utilizes all applicable items of the Main Program Menu.

5.2 BASIC PREDICTION APPLICATIONS USING THE GCP 5000

⚠ 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 GCP 5000 functionality. This section provides the required information for basic planning and programming of the GCP 5000.

Remote Prediction (also known as DAXing) effectively extends approaches beyond the limits imposed by insulated joints. 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 GCP 5000 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 GCP 5000 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 Warning Time

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

5.2.3.2 Predictor Input

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.

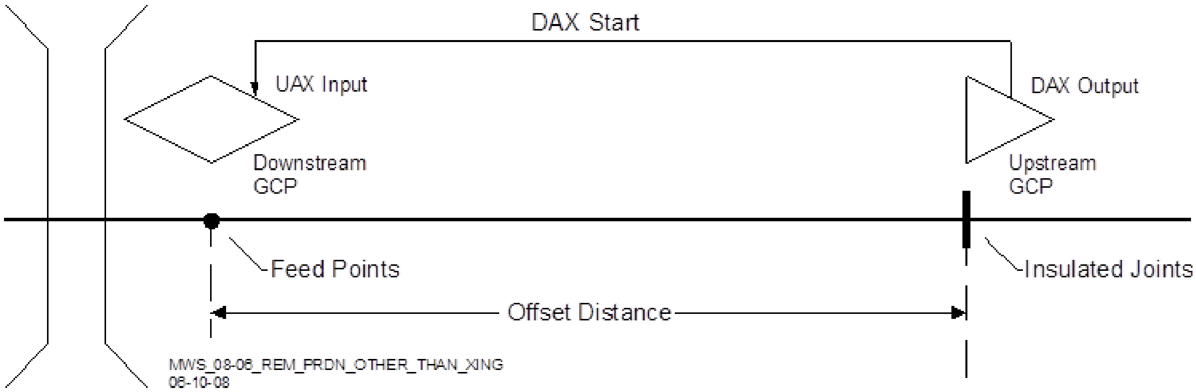


Figure 5-1: Remote Prediction from Remote Location other than Crossing

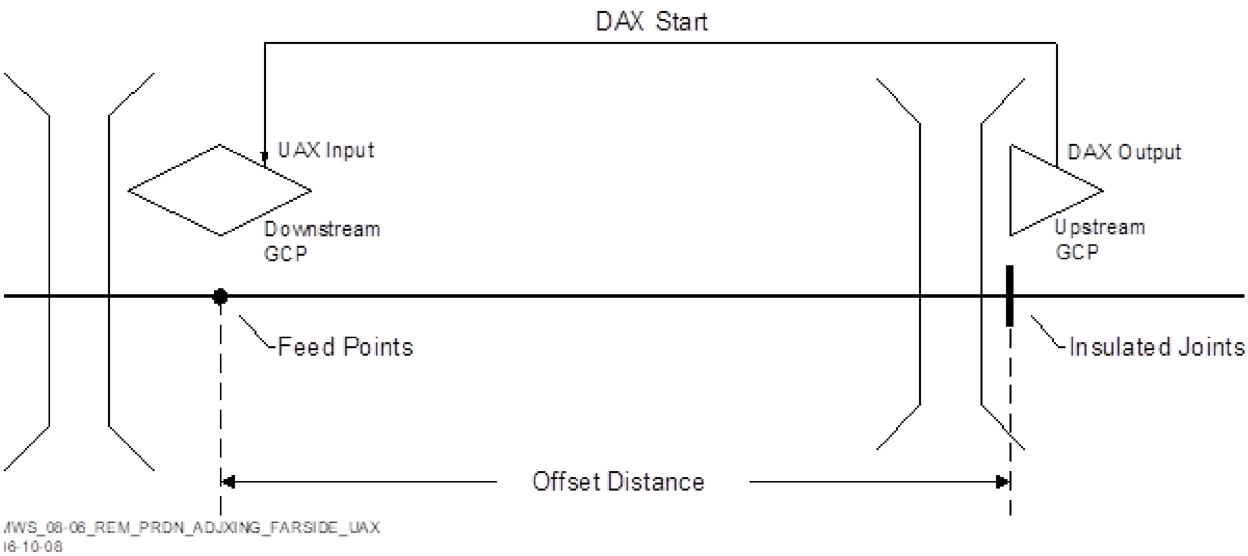


Figure 5-2: Remote Prediction from Upstream Crossing - Joints on Far Side

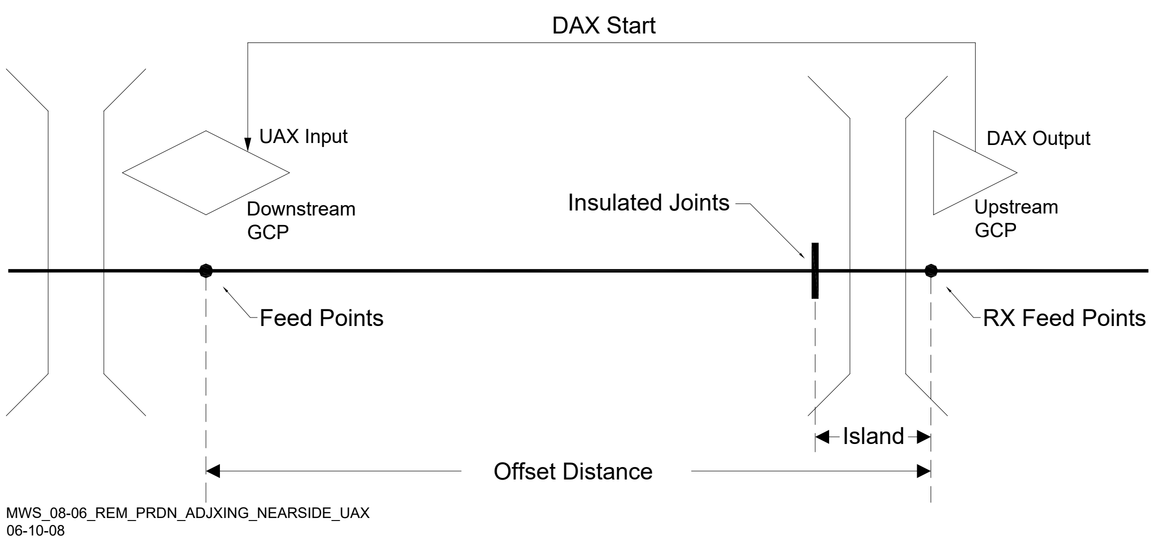


Figure 5-3: Remote Prediction from Upstream Crossing – Joints on Near Side

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

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 SECTION 5.3, MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS.

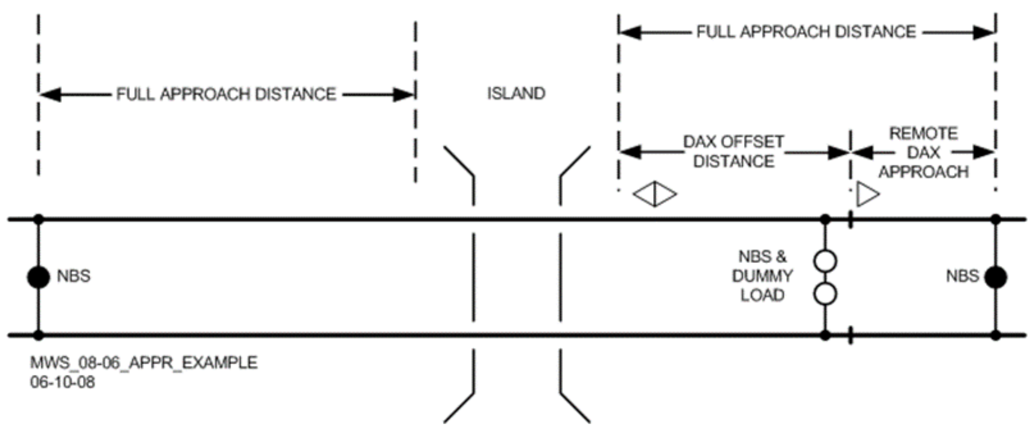


Figure 5-4: Approach Example with DAX Offset and Remote DAX Approach Distances

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.

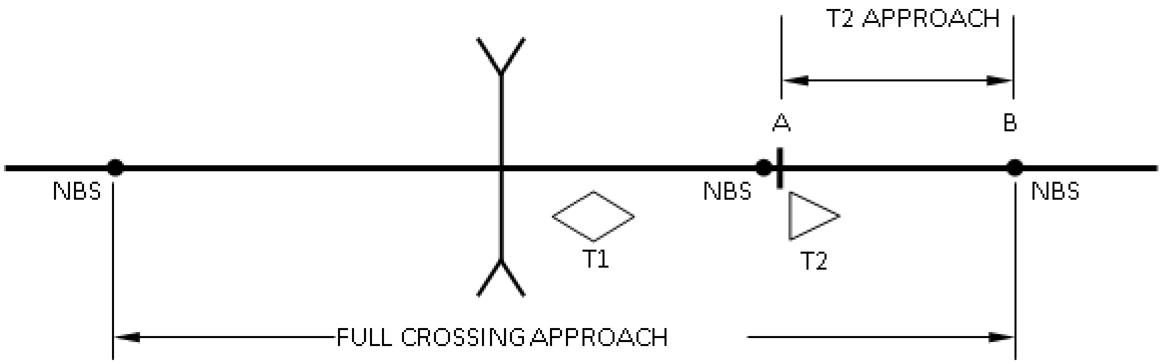


Figure 5-5: Scenario 1, T2 Approach as Short as 500 Ft.

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 section 5.3.

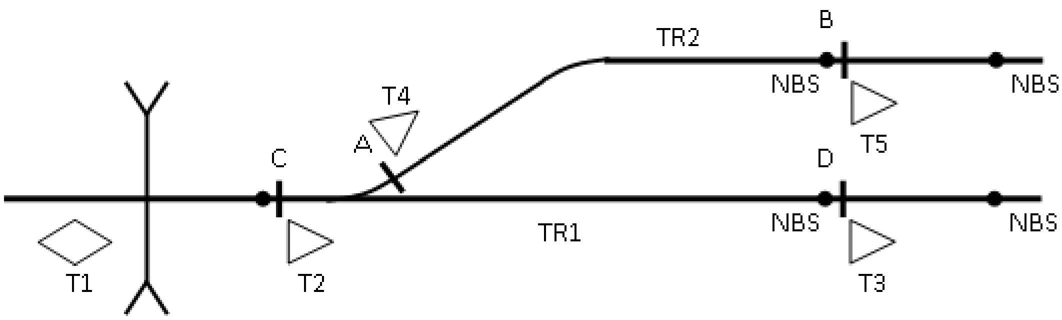


Figure 5-6: Scenario B, T2 & T4 Special OS Application

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:

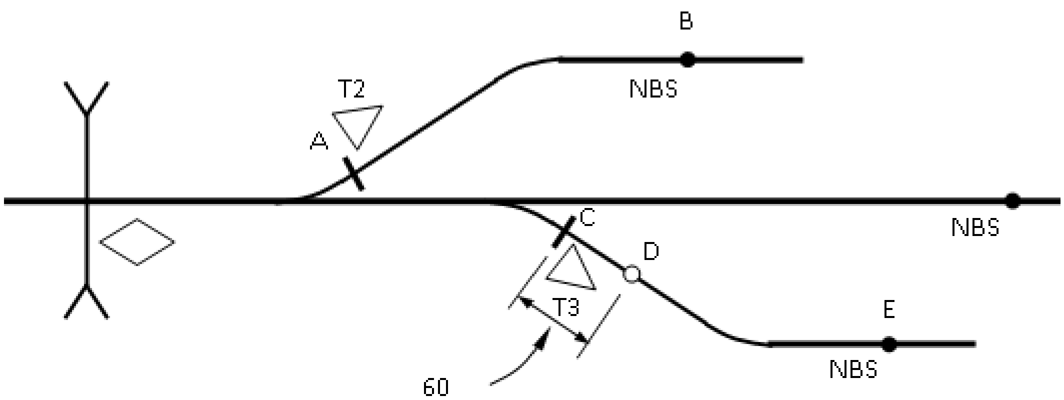


Figure 5-7: T2 or T3 Less Than 1000 Ft.

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 section 5.3 differ in certain aspects; however, the following guidelines apply to both.

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

5.4.2 Programming for Dax Operation

The GCP 5000 is programmed for DAX operation via the display. The 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 sections.

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 <u>not</u> 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 between crossings, or between the remote location and the crossing to be DAXed. The approach distance is shown in feet., unless the units are set to metric, then it will be shown in meters.

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

Examples of DAX operation include:

- DAX start from a remote location using two GCP cases (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

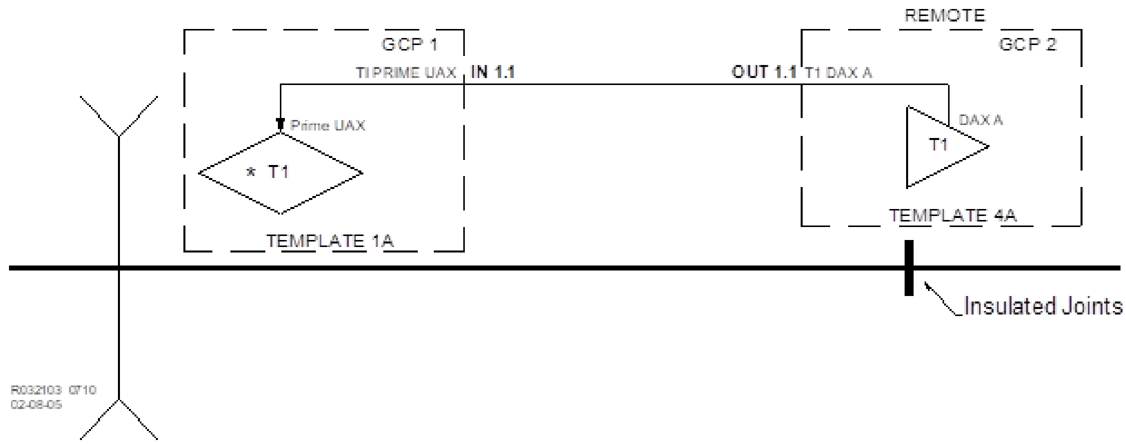


Figure 5-8: DAX Start from Remote Location, 2 GCP Cases

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 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

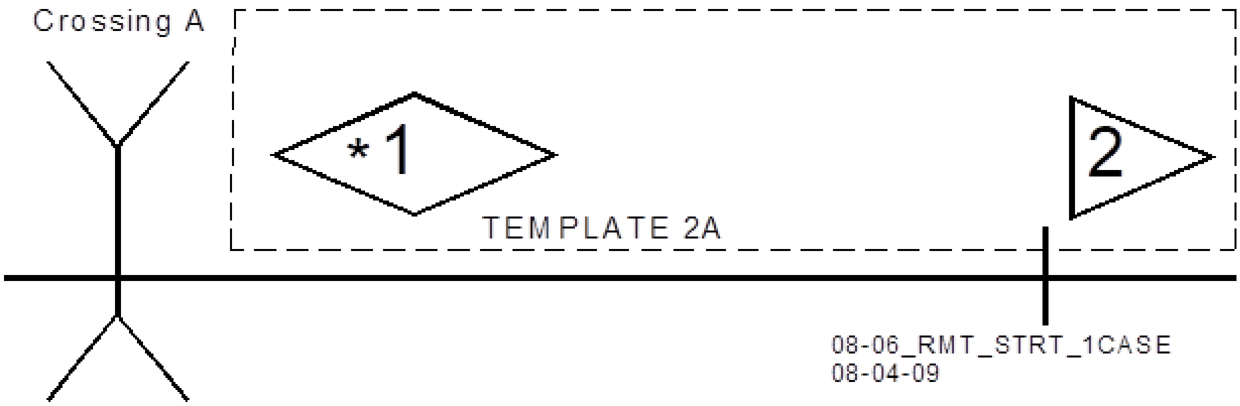


Figure 5-9: DAX Start From Remote Location, Single GCP Case

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

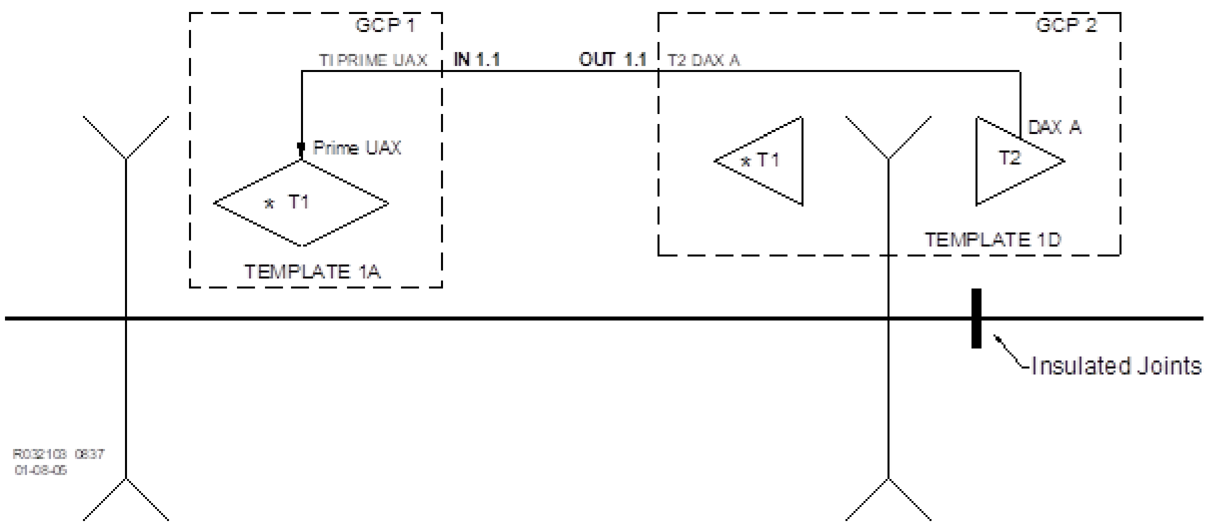


Figure 5-10: DAX Start from Adjacent Crossing

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 GCP 5000 is individually programmed to provide the appropriate interface connections: physical inputs and outputs.

5.5.3 DAXing Between Crossings Separated by Insulated Joints

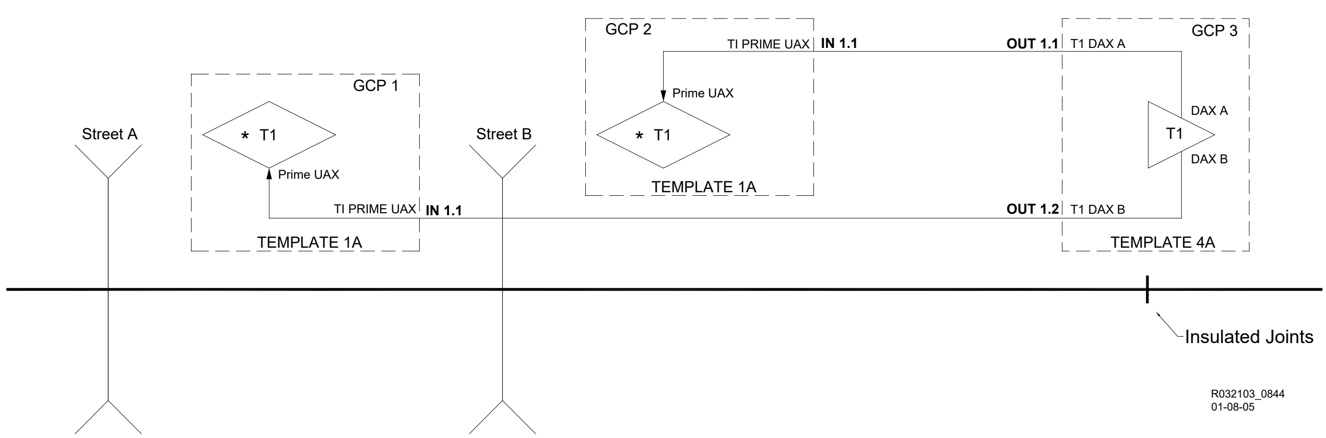


Figure 5-11: Remote Prediction For Multiple Bidirectional Crossings

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

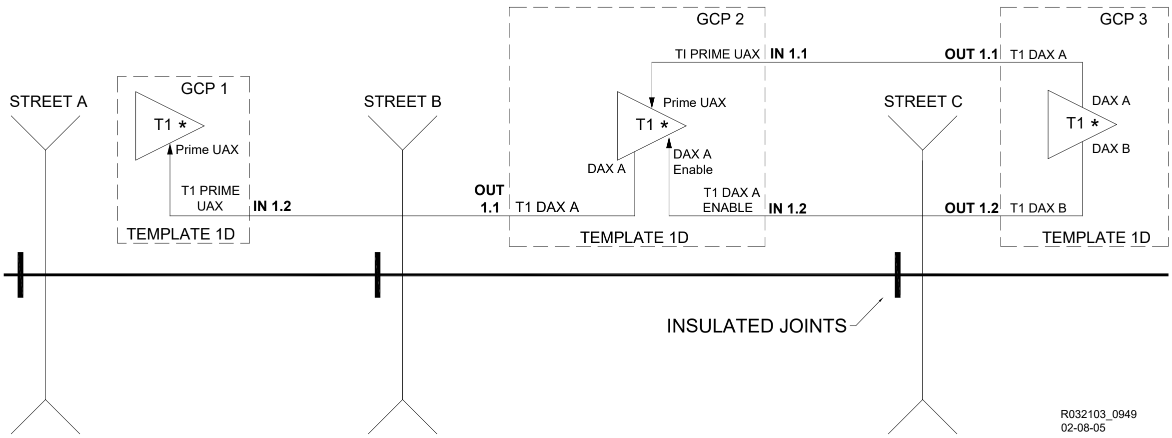


Figure 5-12: Remote Prediction between Multiple Crossings Separated by Insulated Joints

Each GCP 5000 is individually programmed to provide the appropriate interface connections to physical inputs and outputs. Crossings are controlled by internal SSCC IIIi 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 OS Track

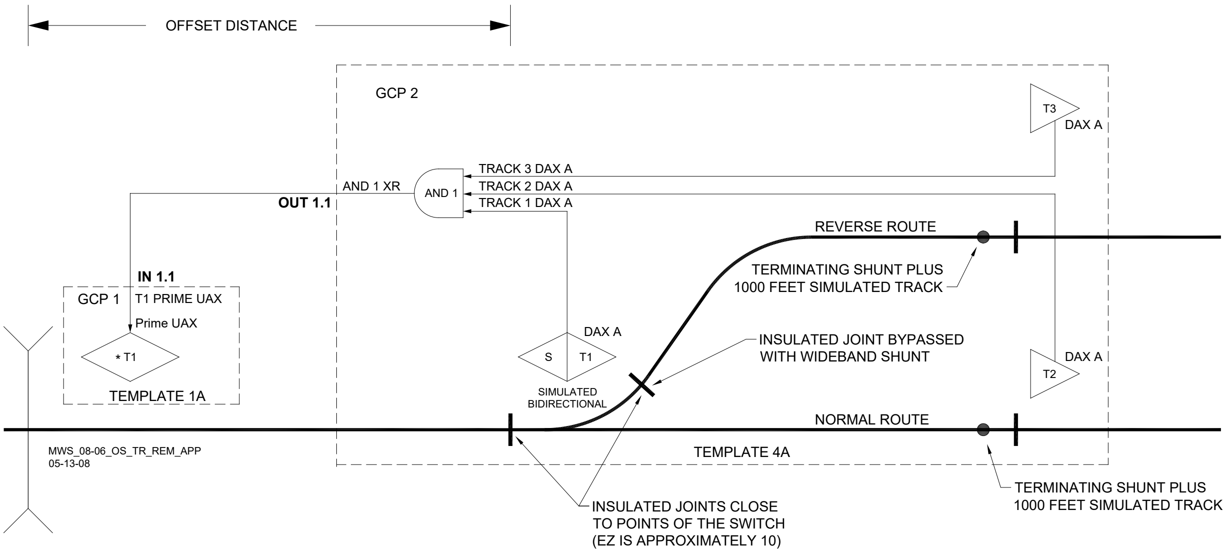


Figure 5-13: OS Track Remote Prediction Application

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, AS 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 GCP 5000s, 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 GCP 5000 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 (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 repeater relay circuit is then formed to interface with the signal control circuits.

Independent track batteries may also be used to power the individual track circuits, in which case it may be necessary to use wideband shunts to couple the GCP operating frequency around insulated joints in the turnout.

When a GCP is installed within the limits of an existing series OS circuit, the OS circuit should be converted to a parallel or two relay circuit since installation of inductors in series OS track circuits has frequently resulted in marginal operation. Siemens recommends the use of the two relay or parallel relay circuit. See Figure 5-13 for a typical GCP and OS installation diagram.

5.6 ASSOCIATING ISLANDS WITH GCP TRACKS

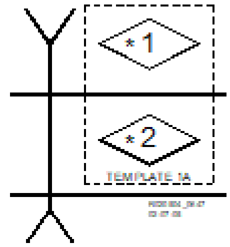


Figure 5-14: Bidirectional Mode at Two-Track Crossing

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.

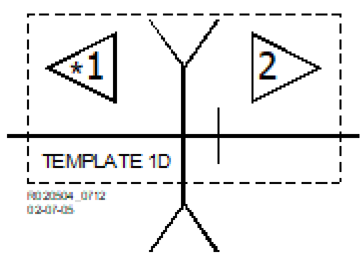


Figure 5-15: Back-to-Back Unidirectional GCP Pair at A Crossing

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 ensure 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 GCP 5000 case as indicated by dashed line.

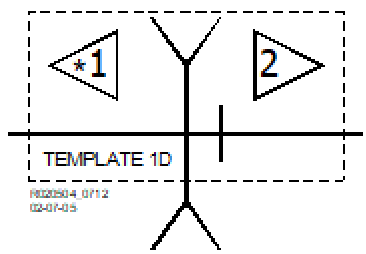


Figure 5-16: Back-to-Back Unidirectional Configuration

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 GCP 5000, it can be assigned to any of the track 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 GCP 5000.

Table 5-1: GCP 5000 Island Frequencies

Not Set	4.9 kHz	11.5 kHz
2.14 kHz	5.9 kHz	13.2 kHz
2.63 kHz	7.1 kHz	15.2 kHz
3.24 kHz	8.3 kHz	17.5 kHz
4.0 kHz	10.0 kHz	20.2 kHz

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 GCP 5000, 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**

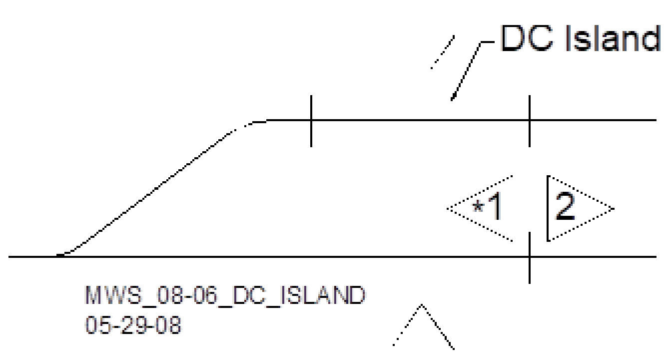


Figure 5-17: External Island Example

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 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 it’s 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 ensure 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.

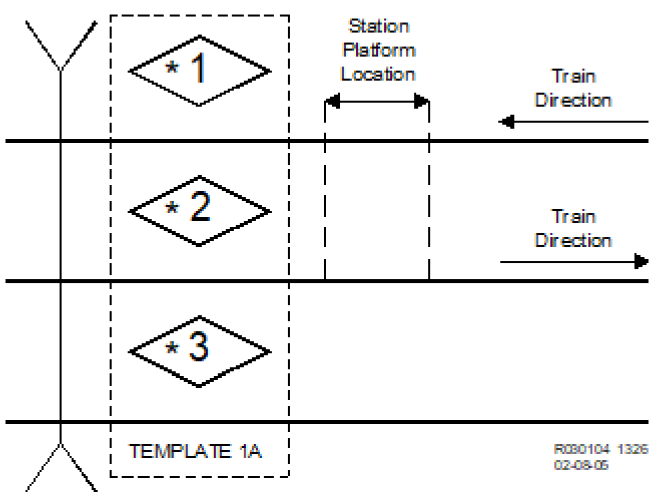


Figure 5-18: MS Restart Track Configuration

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 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.

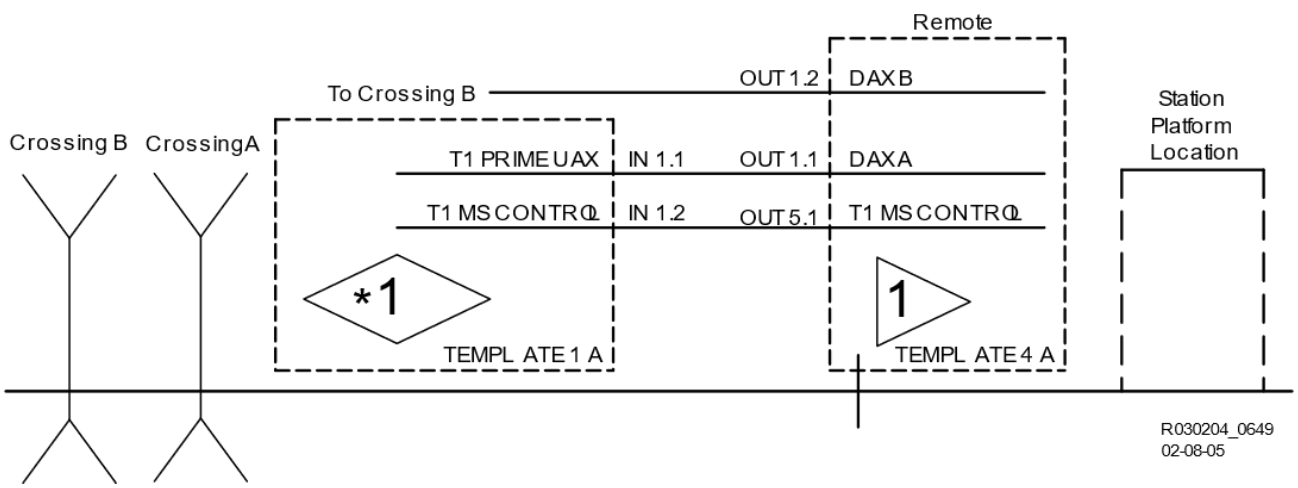


Figure 5-19: Remote MS Restart for Crossing A

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 GCP 5000. 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 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 Remote Crossing & 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

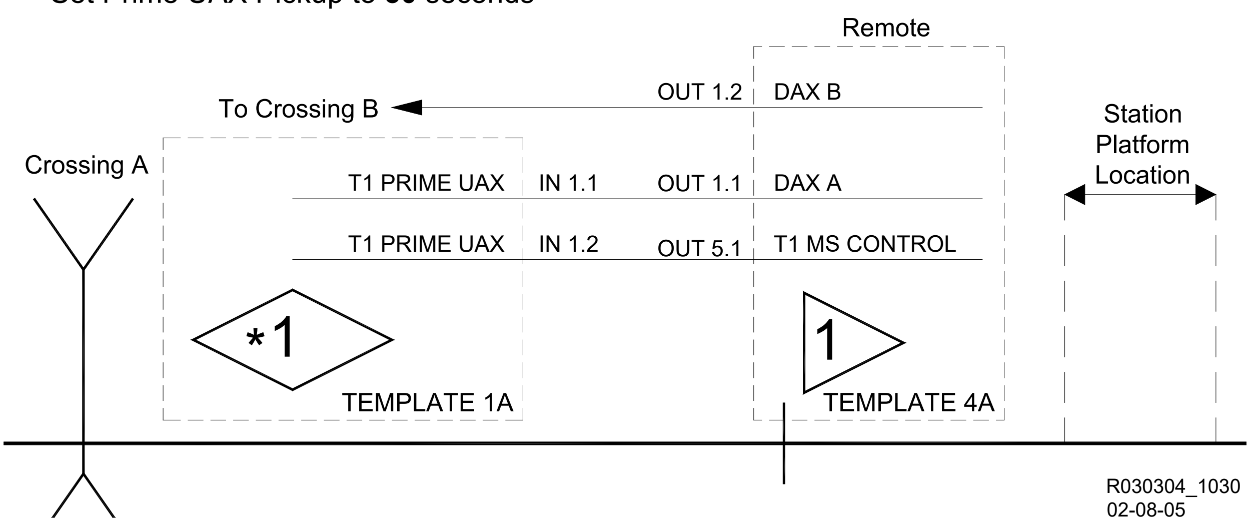


Figure 5-20: Continuous Crossing Activation

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.

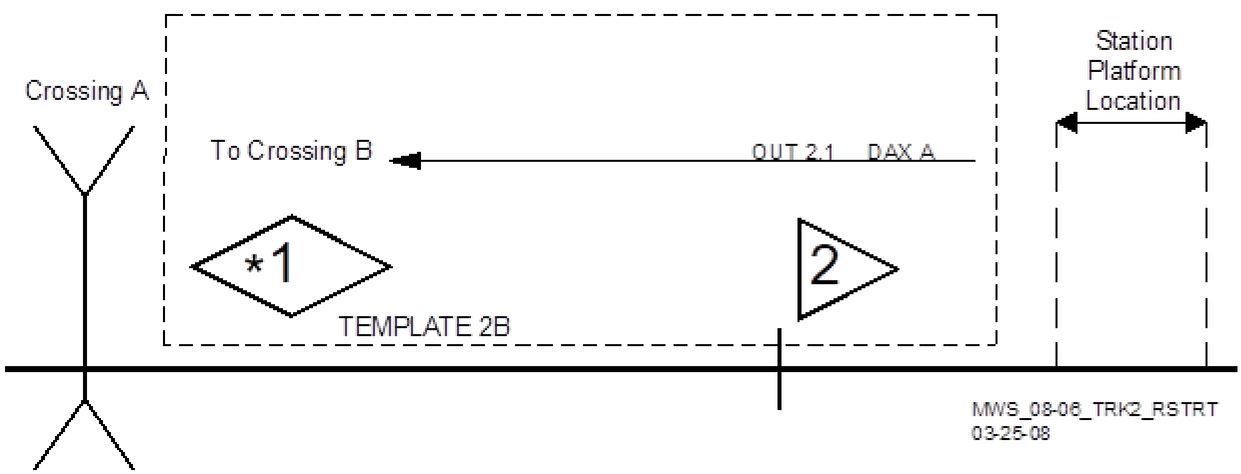


Figure 5-21: Remote MS Restart (Crossing and Remote in the Same 5000 Case)

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 a motion sensor 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 Ft 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 whether 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 ensure 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 Low EZ Detection Level

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

5.8.9.2 Low EZ Detection Time

The valid range of entry is between 2 and 99 minutes. The default is 10 minutes.

The low EZ detection timer is generally programmed for a time interval longer than trains would normally remain in the GCP approach.

5.8.9.3 Low EZ Detection Effect

The valid range of entries in the Low EZ Detection Effect menu is: **Activate**, **MS**, and **Act+MS**. The default setting is **Activate**.

When a low EZ condition is detected (low EZ Error occurs), the designer can choose one of the following effect options:

- When Activate is selected it activates the crossing(s) by de-energizing all predictors on the associated track.
- When MS is selected, predictors do not deenergize but the operating mode changes from predictor to motion sensor on the associated track.
- When Act + MS is selected it changes the operating mode from predictor to motion sensors but only if motion is being detected when the low EZ error occurs otherwise it activates the crossing(s) on the associated track.

5.8.9.4 Low EZ Detection Override IP

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

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.

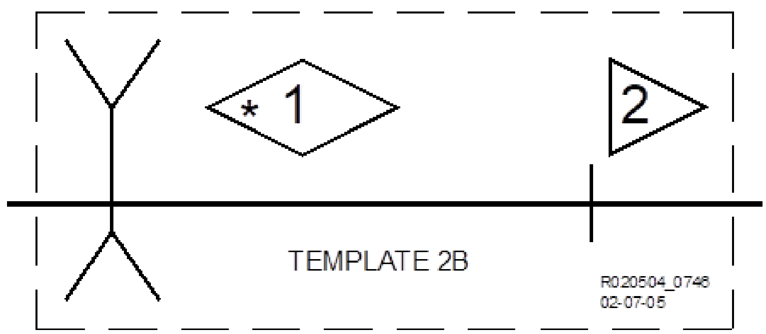


Figure 5-22: Track Application

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 ensure 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 GCP 5000 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, as follows.

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 GCP 5000, 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 ensure 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 Ft 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 submenus:

- 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 GCP 5000 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 SSCC IIIA, SSCC III Plus, or SSCC IV 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 GCP 5000 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 Appendix C, SSCC Applications & 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 GCP 5000 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 section 5.11.

NOTE

> **NOTE**
>
> SSCC IIIi Modules Rev D and later have an isolated flash sync output.
>
> Where battery isolation must be maintained and SSCC IIIi 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 GCP 5000, 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 GCP 5000 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 GCP 5000.

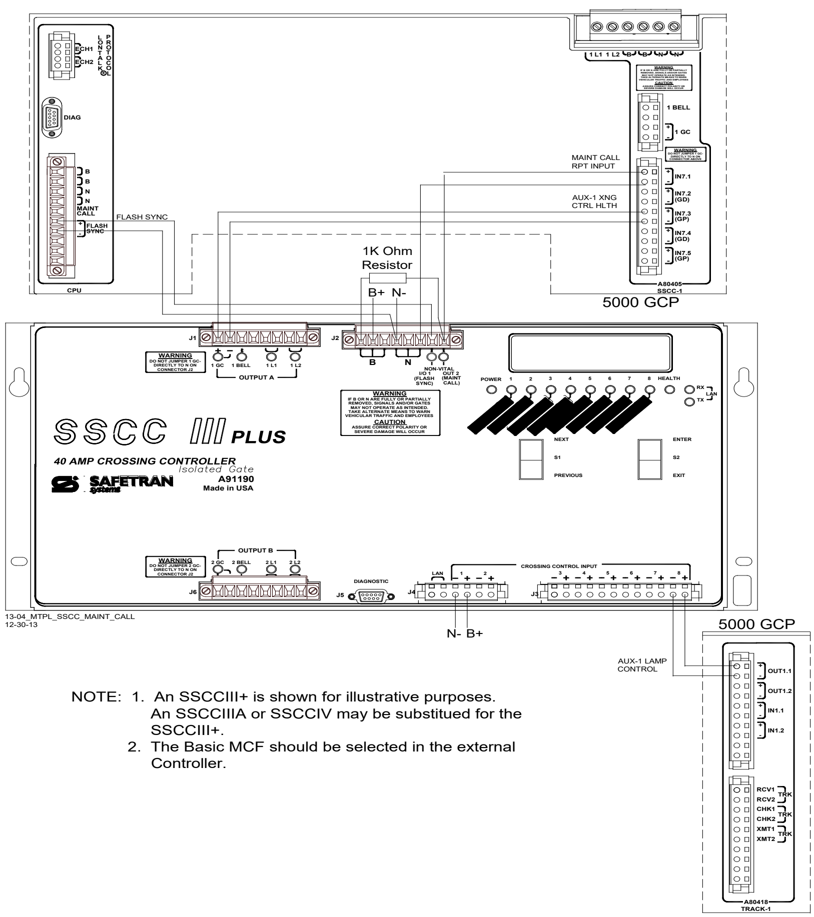


Figure 5-23: Connection Between GCP 5000 & External SSCC for Additional Lamp Load

5.12 TAKING TRACKS “OUT OF SERVICE”

⚠ WARNING

WARNING

THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A TRACK CIRCUIT OUT OF SERVICE MUST 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.

The GCP 5000 also provides a way to put a track automatically back into service if a train is detected, see the Out of Service Override described in section 5.12.1.6.

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 "Display" Option

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 "Display" Timeout Option

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.

NOTE

NOTE
When a track is out of service, the display will remain ON and will not go into sleep mode.

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 GCP 5000 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.

The 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 "Display+OOS IP" (Display Plus Out Of Service Input)

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

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 GCP 5000 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 must 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 the Out of Service option is not required for specific tracks, then do not assign an OOS input to them. For example, if 6 tracks are present, T1, T2, T3, and T4 will be allowed to be taken OOS. T5 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 out of service 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 GCP 5000 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 GCP 5000 is switched over between MAIN and STANDBY, all OOS tracks will continue OOS once the GCP 5000 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.

5.12.1.6 Out of Service Override

The GCP 5000 has a feature which helps protect against a track left out of service, resulting in no crossing activation if a train approaches on the out of service track.

The program parameter ‘Train Line Speed’ is used to control this feature.

⚠ WARNING

WARNING

IF THE ‘TRAIN LINE SPEED’ IS SET TO 0, THE OUT OF SERVICE OVERRIDE FEATURE DISABLED.

If ‘Train Line Speed’ is not 0, the out of service override is enabled. If a train is detected that is going faster than 80% of the programmed train line speed for more than 5 seconds then all out of service tracks and islands controlled by that GCP will be put back into service.

The Train Line Speed should be set accordingly, so if there are various speed trains on the crossing, for example, a mixture of freight and passenger, then freight trains could also put the track back in service, if desired. In other words, the programmed Train Line Speed needs to be applicable to both train types and account for the difference in their speed.

⚠ WARNING

WARNING

THE OUT OF SERVICE OVERRIDE IS NOT FAIL SAFE, IT SHOULD NOT BE RELIED ON TO PUT A CROSSING BACK INTO SERVICE, ITS PURPOSE IS TO PROVIDE AN EXTRA LAYER OF PROTECTION IN SOME CASES.

The GCP requires 5 seconds to initially determine the correct train speed when the train enters the approach, especially in cases where the train comes over a joint. The GCP will then need to see the train speed above the threshold for a further 5 seconds before the out of service disable feature will operate. In general, if the train is not on the approach for at least 10 seconds, the GCP may not override the out of service condition.

Note that if the GCP has a track at the crossing and remote track DAXing to the crossing, if both the remote track and the crossing track are taken out of service, then a train approaches on the remote track, the override out of service feature will put all the tracks in the crossing back into service.

WARNING

WARNING

IF THE TRAIN IS NOT ON THE GCP TRACK FOR AT LEAST 10 SECONDS, THE GCP MAY NOT BE PUT BACK INTO SERVICE.

The GCP does a check to make sure that the computed approach length is consistent with the largest warning time of any predictor on that track and train line speed as follows:

- Computed Approach length >= (Largest Predictor Warning time + 5) x (train line speed)

Where the train line speed is in ft/sec in the above calculation.

If this check fails, the GCP will display the following warning on the Display Module:

Approach Length Error (Diag1204)

Cause: The GCP Computed Approach Length is too short. It needs to be at least the train line speed x (predictor warning time + 5)

Remedy:

a) Check the train line speed has been set correctly.

b) Check the approach length has been set correctly.

This warning may be seen in cases where there is a shortened track approach due to an insulated joint and the crossing is being DAXed to, as the computed approach distance of the short track is less than required to give the requisite warning time for a full speed train.

NOTE

NOTE

The above warning (Diag1204) will not cause the GCP and the crossing to activate.

If this is the case, either the feature can be turned off by setting ‘Train Line Speed’ to 0, or a lower value of ‘Train Line Speed’ used. See the associated warning above that the train needs to be on the track for at least 10 seconds for the feature to be useful.

Overriding the out of service condition also has limitations when out of service inputs are used with no additional input from the user via the Display module as described below.

WARNING

WARNING

IF THE ‘OOS CONTROL’ IS SET TO ‘OOS IPS’ OR ‘5000 CASE OOS IP’, AND THE OOS INPUT IS ENERGIZED WHEN A TRAIN IS DETECTED, THE OUT OF SERVICE IS OVERRIDDEN.

HOWEVER, IF THE CPU IS REPOWERED (OR SWITCHED TO THE OTHER SIDE IN A REDUNDANT SYSTEM) AND THE OOS INPUTS ARE STILL ENERGIZED, THEY WILL TAKE THE GCP OUT OF SERVICE AGAIN.

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 SSCC IIIi 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.

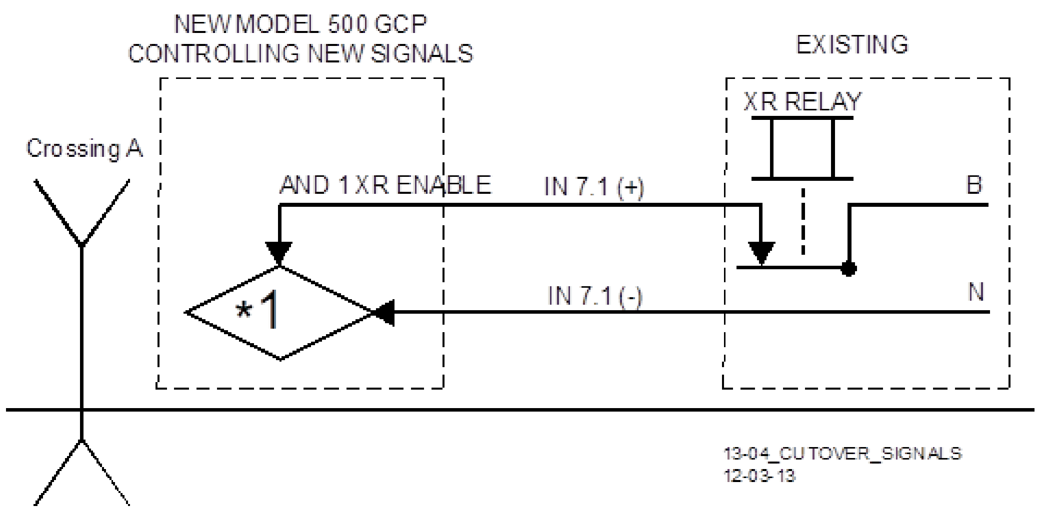


Figure 5-24: New Warning Devices and SSCC IIIi Controlled by Existing Train Detection

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.

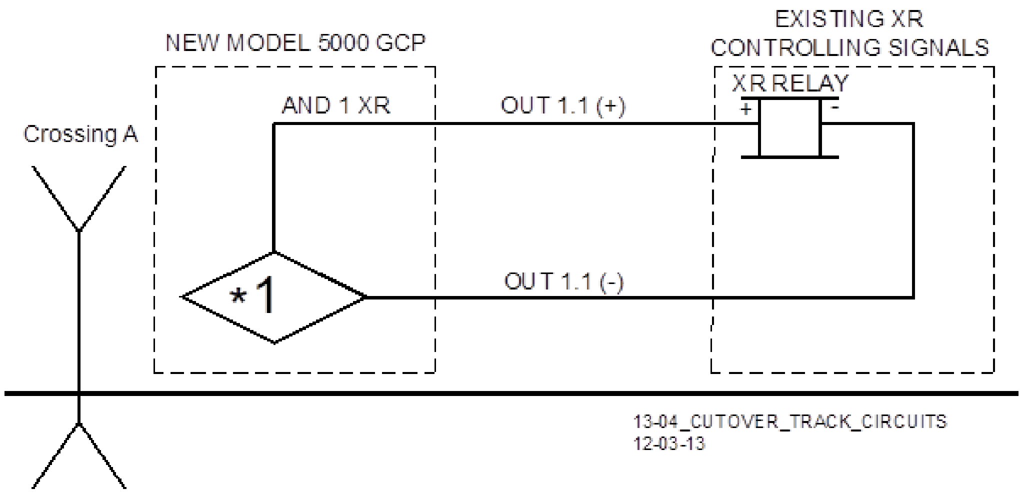


Figure 5-25: New GCP 5000 Track Circuits Controlling Existing Warning Devices

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.

SECTION 6 – ADVANCED APPLICATION PROGRAMMING

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 GCP 5000 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 GCP 5000 can be configured to AND different track predictors internally to a physical output, instead of using external AND gates or relays.

The GCP 5000 provides twelve configurable AND functions:

- AND 1 XR
- AND 2 through AND 4
- AND 5 through AND 12 (these are general purpose AND gates that can AND any output term).

The AND 1 XR function controls the local crossing. It is equivalent to the XR relay. If the GCP 5000 contains SSCC IIIi 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 GCP 5000 system.

Additionally, AND 1 XR along with ANDs 2 through 4, allow specific ANDing of track predictors. For more information, see Appendix C, SSCC Application & Programming Guidelines.

The SSCC IIIi 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

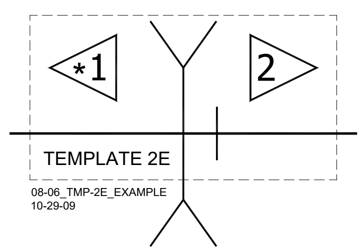


Figure 6-1: Back-to-Back Unidirectional GCP Pair at Crossing

The follow examples show how to program AND Prime predictors to control the crossing.

6.1.2.1 Example 1: Crossing Activated By All Track Modules

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**

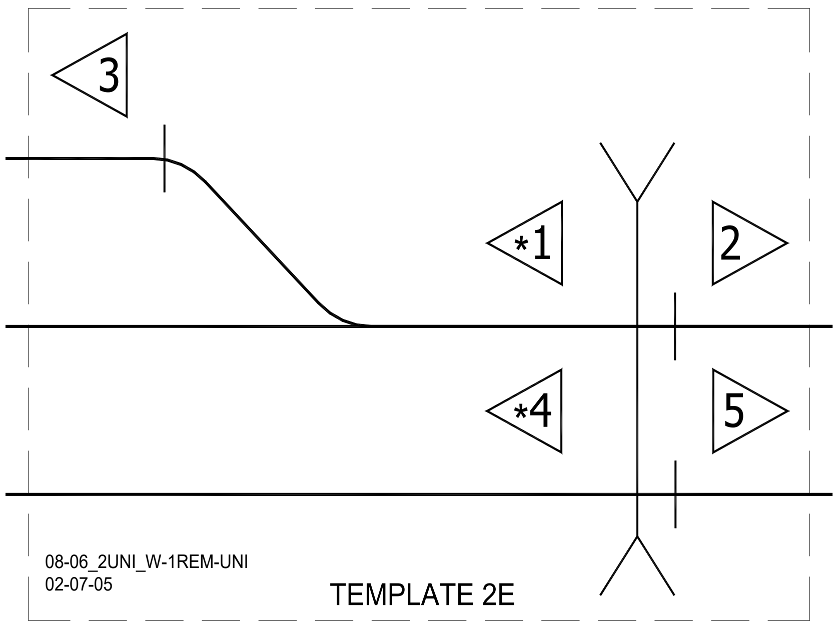


Figure 6-2: Two Unidirectional Pairs at Crossing with Single Remote Unidirectional

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 & Remote Track Module 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.

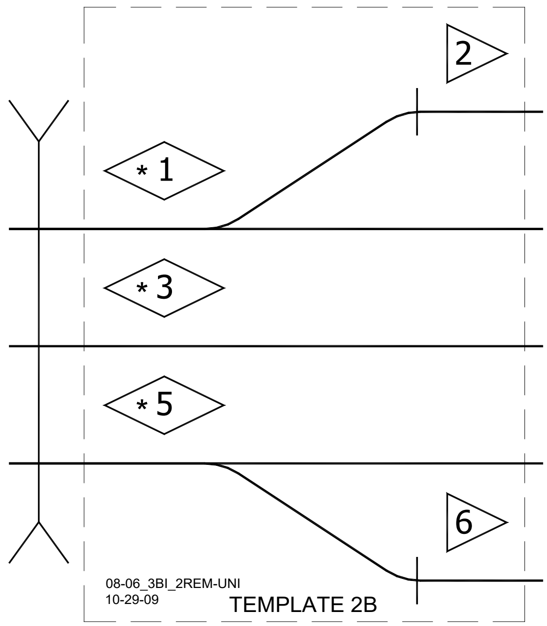


Figure 6-3: Three Bidirectional at Crossing with Two Remote Unidirectional

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 **Not Used**
- 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 GCP 5000 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 & Remote Track Modules Predicting for Local & 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.

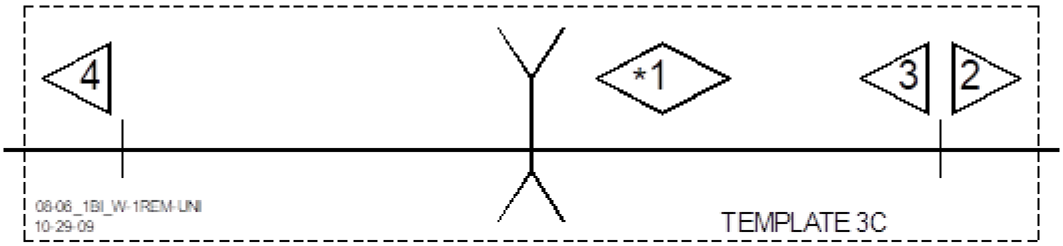


Figure 6-4: Single Bidirectional at Crossing with Remote Unidirectional

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

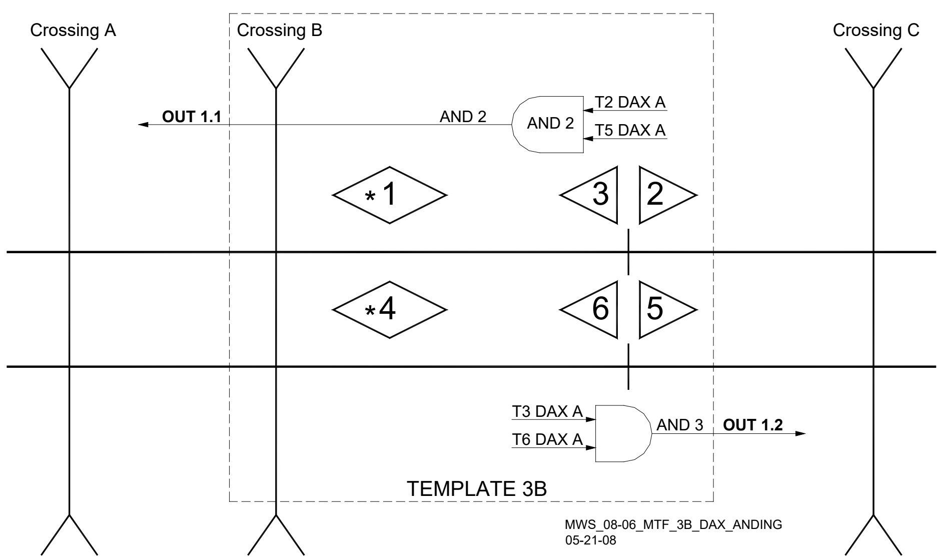


Figure 6-5: ANDing DAX Predictors For Three Adjacent Crossings

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 2, and AND 3, may be assigned (connected) to physical outputs to control crossings A and C. The assignments may be completed 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

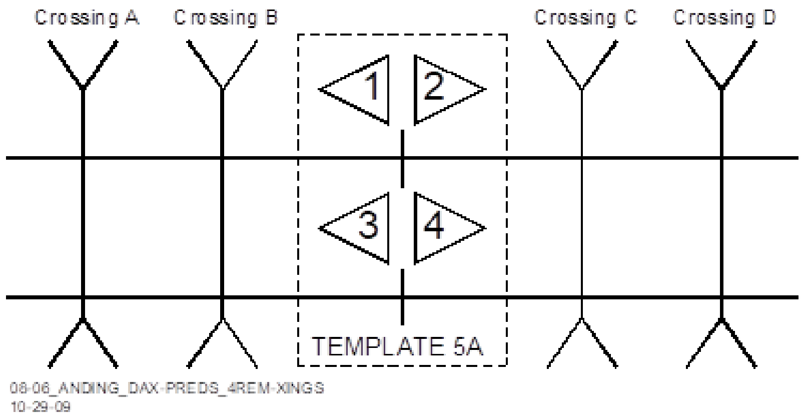


Figure 6-6: ANDing DAX Predictors For Four Remote Crossings

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

In this configuration, by utilizing a remote GCP 5000 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 [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 **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 [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**

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 **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 [3) LOGIC PROGRAMMING > 2) LOGIC: TRACK ANDING > 1) AND 1 XR USED > LOGIC: AND 4]:

- 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

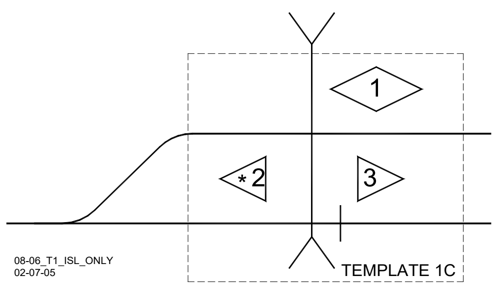


Figure 6-7: Track Configuration to Support Island Only Operation on Track 1

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 GCP 5000 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 (GCP 5000 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 GCP 5000 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 GCP 5000 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).

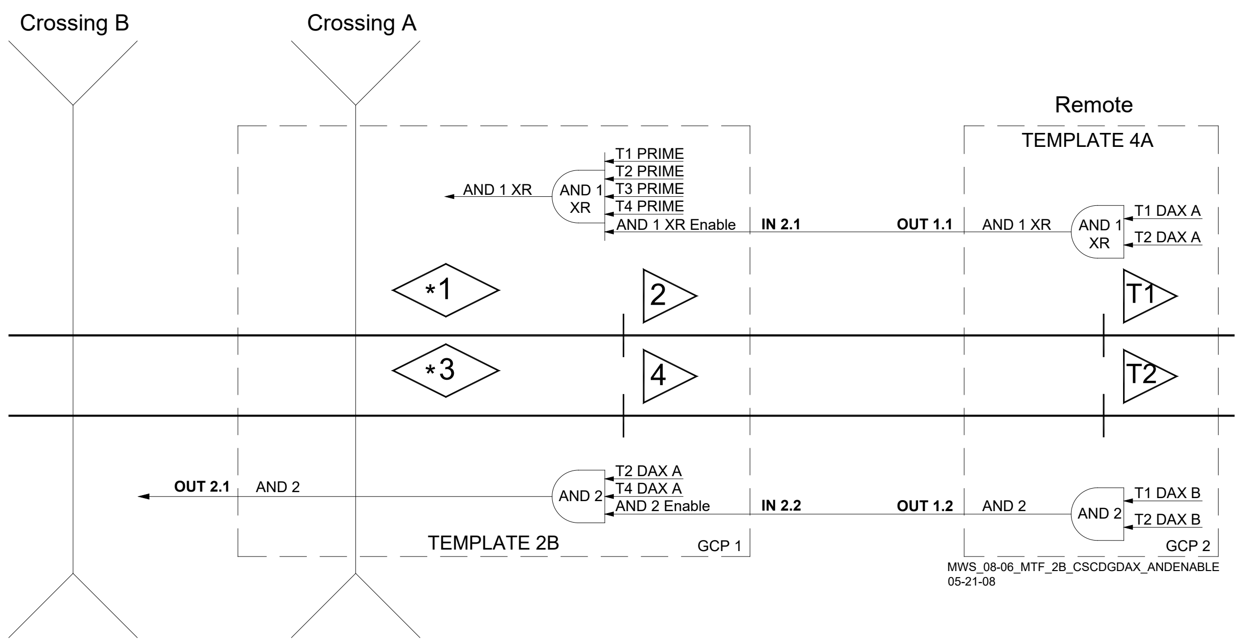


Figure 6-8: Cascading DAX using AND Enable Inputs

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 GCP 5000. 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

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 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.

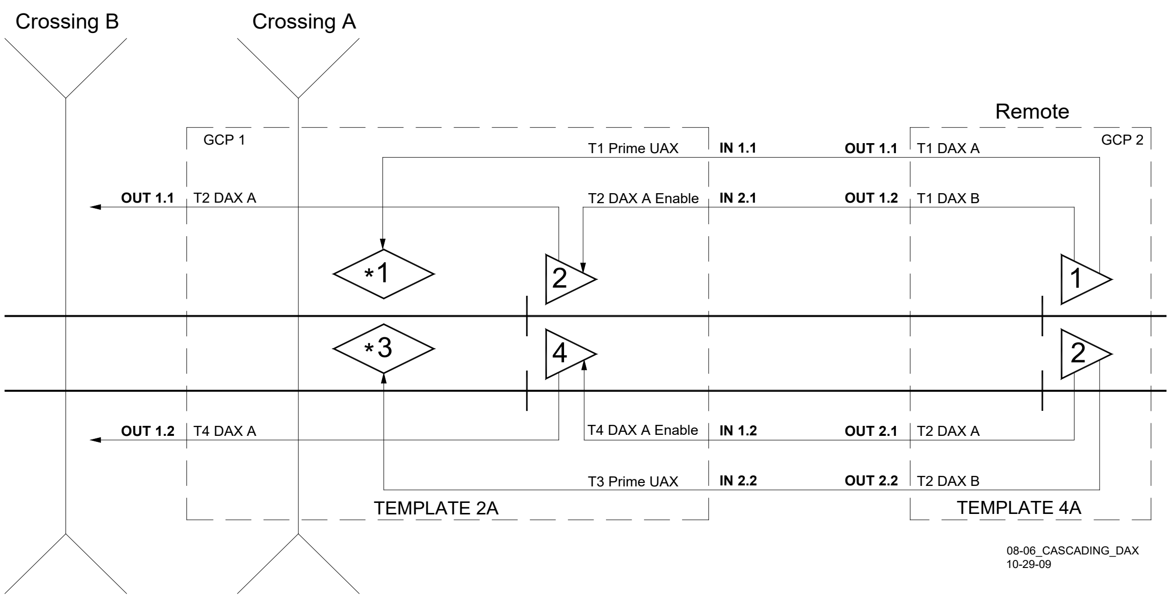


Figure 6-9: Cascading DAX with Individual Controls

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 the remote DAXing GCP 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 GCP 5000 track modules are configured as remotes (MTF 5A).

The remote GCP 5000 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 GCP 3000 cases with back-to-back GCPs on 2 tracks. The track 1 DAX C output to crossing C may be allocated to a physical output without ANDing. Track 1 and track 3 DAX A predictors must be ANDed to control crossings A and B as shown in the following figure.

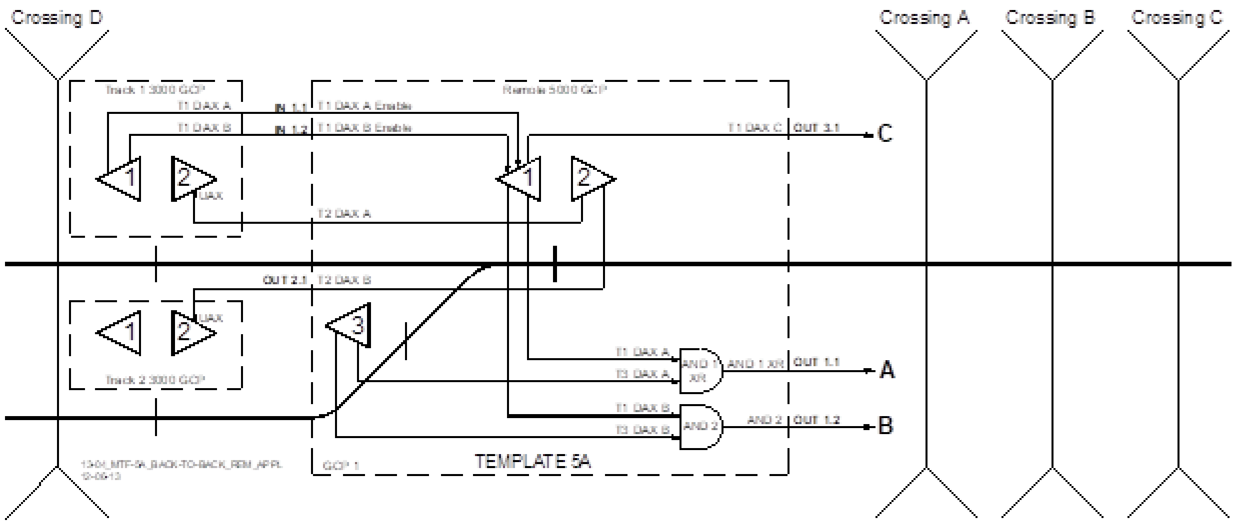


Figure 6-10: Cascading DAX

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 GCP 5000 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 & 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.

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.

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

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 GCP 5000 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 GCP 5000 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 GCP 5000 chassis.
  - With or without Advanced Preemption.

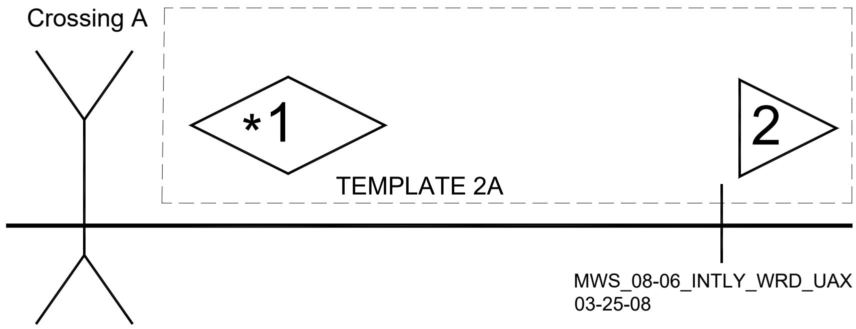


Figure 6-11: Crossing with GCP 5000 and DAX in Same Chassis

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 GCP 5000 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 GCP 5000 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 GCP 5000 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 GCP 5000 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 GCP 5000 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 GCP 5000 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 GCP 5000 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 GCP 5000. 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 section 6.2.6.2 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 section 6.2.7.5 and depicted in Figure 6-15 as Crossover1; is titled Double Crossover Using DAX 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.

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.

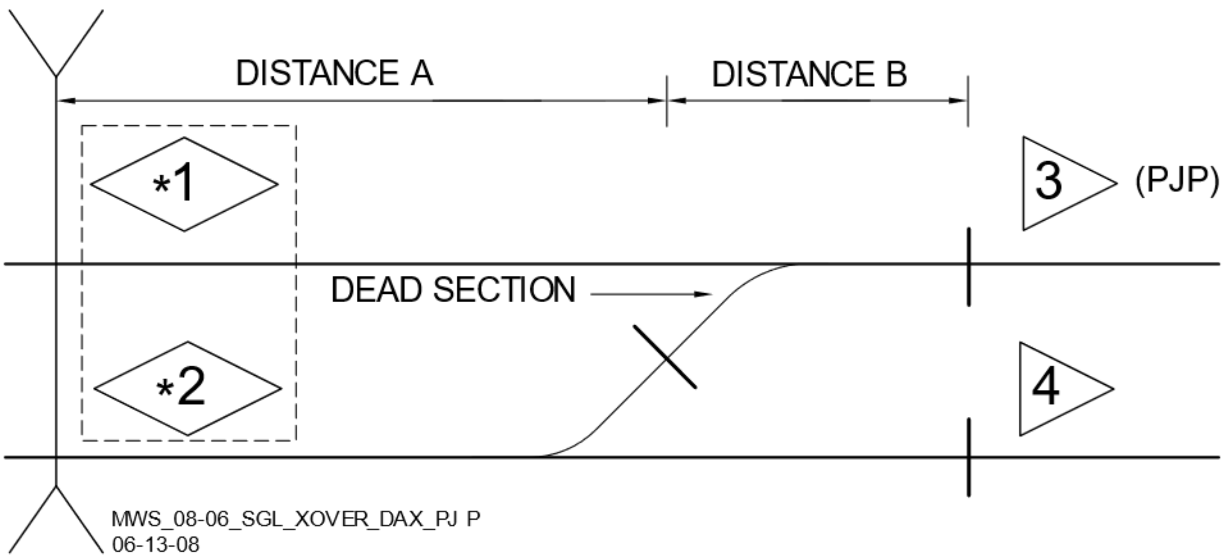


Figure 6-12: Single Crossover Using DAX Post Joint Prediction (PJP)

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.

Double Crossover Using DAX Post Joint Prediction (PJP)

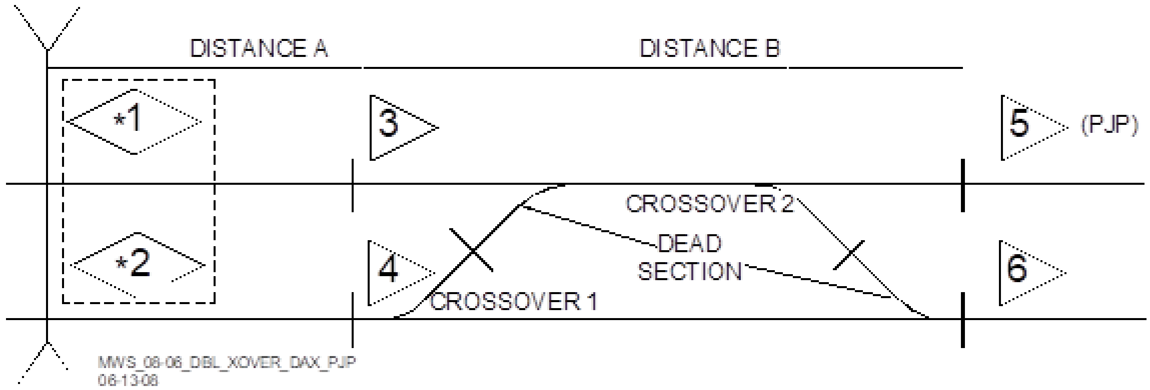


Figure 6-13: Double Crossover Using DAX Post Joint Prediction (PJP)

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.

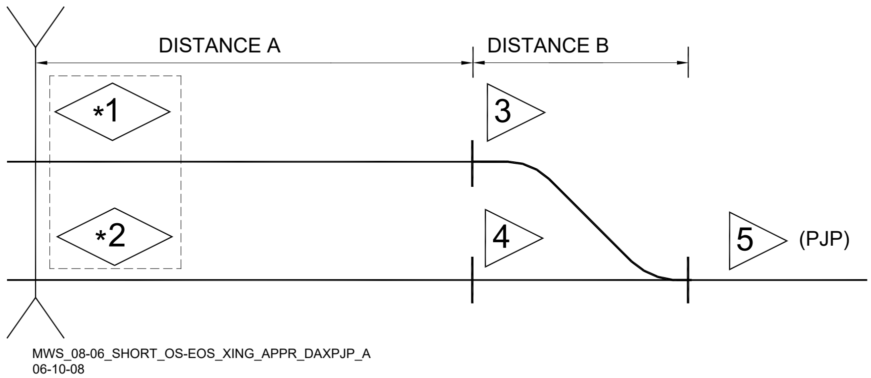
NOTE

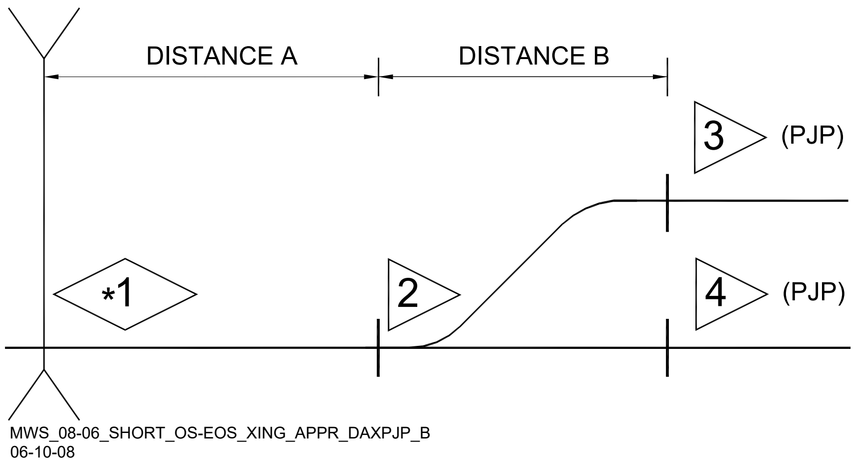
NOTE

Advanced Approach Prediction can also be used for Double Crossover applications (see section 6.2.7).

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 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 section 6.2.6.2 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 section 6.2.7.5 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** 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 Advanced 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.

6.2.7.5 Double Crossover using Adv Appr Predn

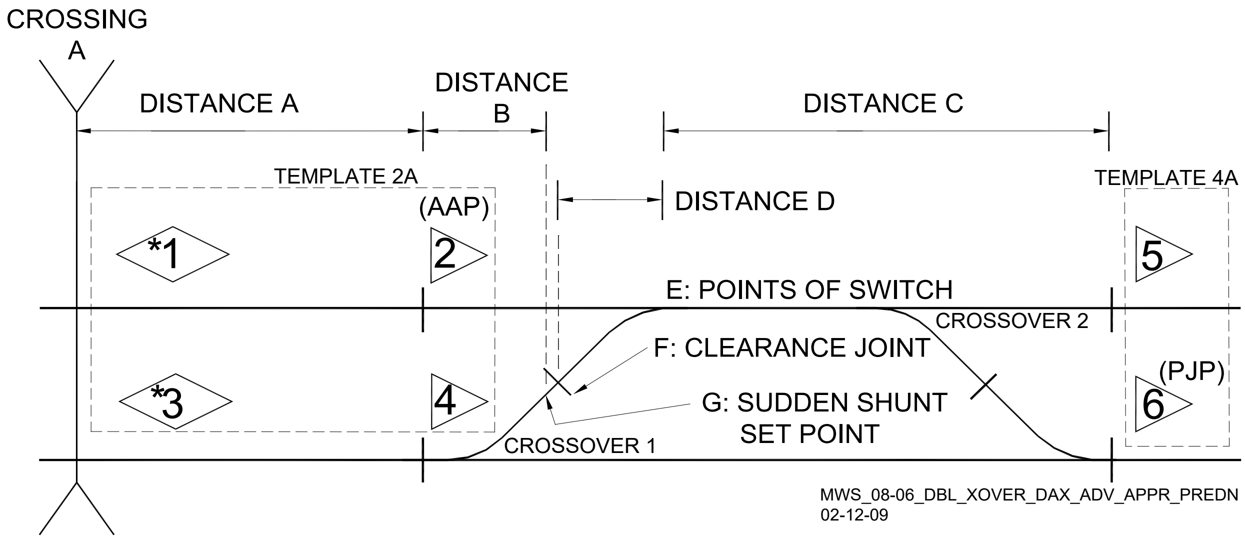


Figure 6-15: Remote Double Crossover Using Adv Appr Predn

Procedure 6-4: Remote Double Crossover Using 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 SECTION 1 **<u>note</u>** 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 ADVANCED 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

Procedure 6-4: Remote Double Crossover Using Adv Appr Predn	
Step 7	Calculate Total Occupancy Time (Dist D) / (ft/s from Step 6). Time = ________ sec. Calculate Total Occupancy Time (Dist D) / (m/s from Step 6). Time = ________ sec.
Step 8	If time from Step 5 is greater than 100 and time from Step 7 is less than 100 then use Sudden Shunt Detection in GCP 4 at Shunt detect point G and AAP Time from Step 7 in GCP 2. The field instructions are shown in the following steps.
Step 9	The following are field programming steps of **Adv Appr Predn Start EZ, Stop EZ and timer** value for **GCP 2**. 1. Program GCP 2 Adv Appr Predn Used to YES 2. Place Hard wire shunt at points of switch (E) and **note** the EZ value. •EZ = _________. Remove the shunt. 3. Program Adv Appr Predn **Start** EZ value to be 15 EZ points higher than the noted EZ value. 4. Program Adv Appr Predn **Stop** EZ value to be 15 EZ points lower than the noted EZ value. 5. Program Adv Appr Predn **Time** to value of step 5 if steps 6, 7, and 8 were skipped or step 7 if not skipped.
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 section 6.2.6.2.)

Example Remote Double Crossover Using Adv Appr Predn

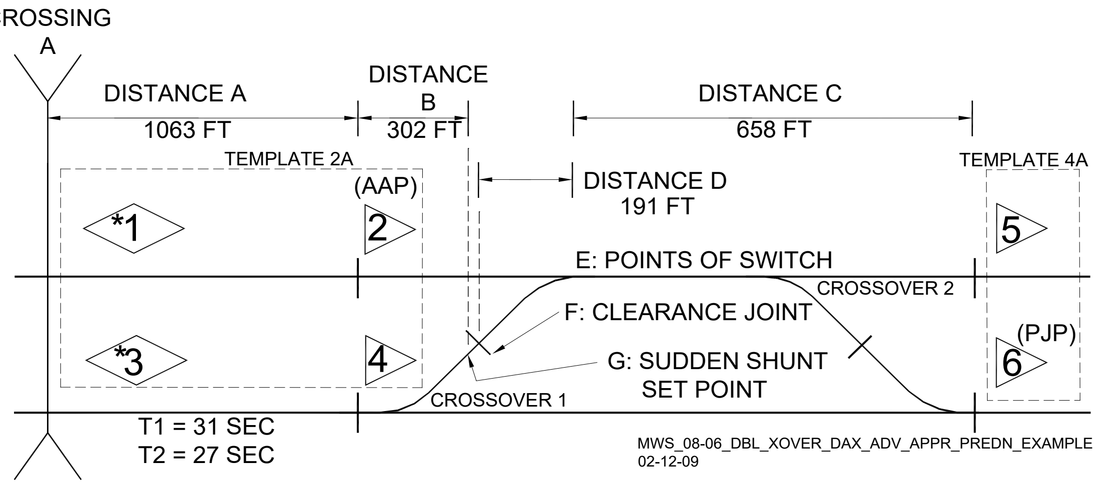


Figure 6-16: Example Remote Double Crossover Using Adv Appr Predn

The layout distances shown in Figure 6-16 provide example for calculating AAP timer values.

Procedure 6-5: Example Remote Double Crossover Using Adv Appr Predn	
	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.

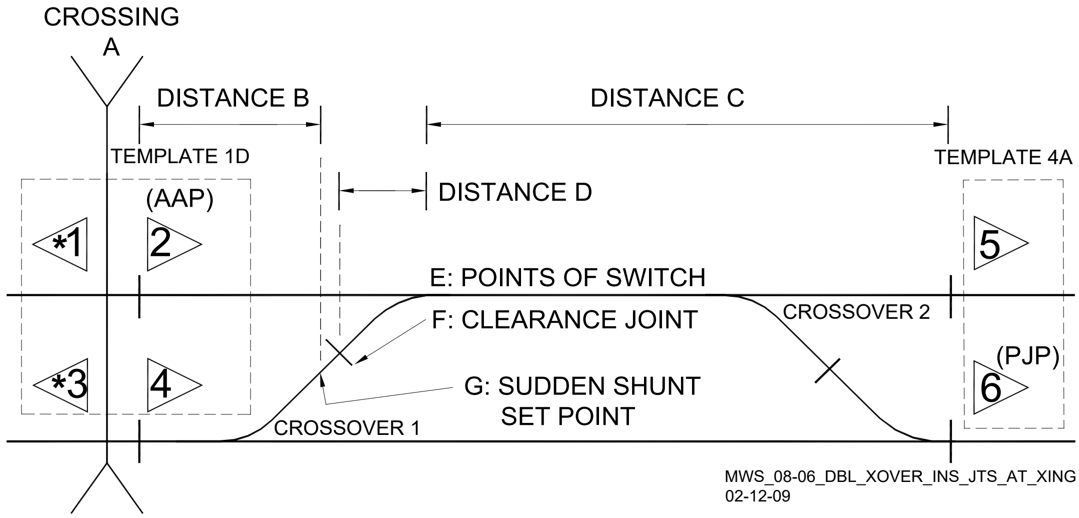


Figure 6-17: Double Crossover Where Insulated Joints are Located at the Crossing

For further information regarding Adv Appr Predn, see section 5.9.5.

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 GCP 5000 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

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

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.

Preemption Relay Health Detection (Default is Yes)

To detect a false traffic signal preemption, the GCP 5000 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.

Preemption Relay Health Check Configuration

To configure the GCP 5000 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 GCP 5000 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 GCP 5000 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.

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 GCP 5000 case is shown in Figure 6-18.

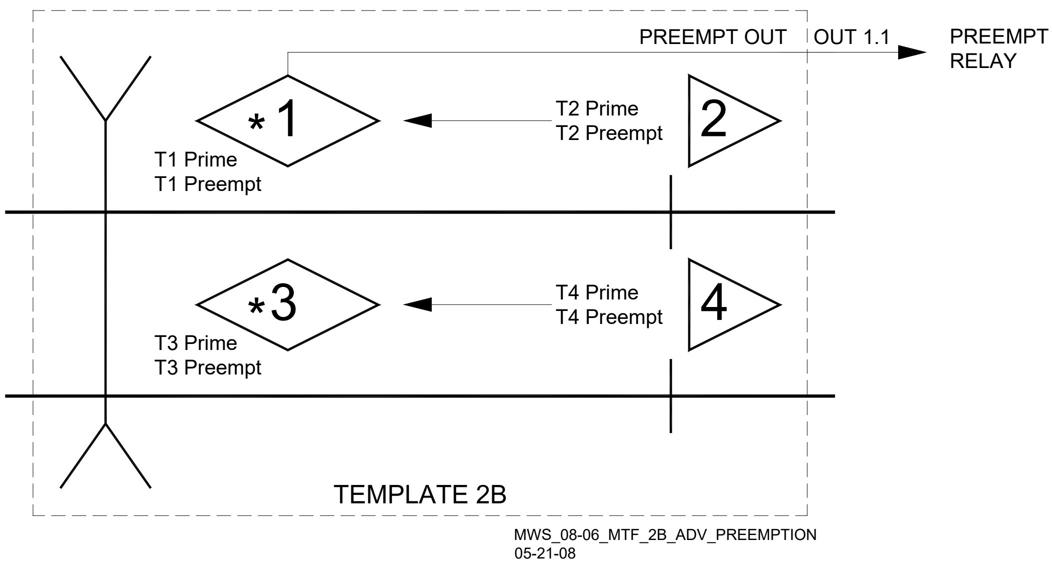


Figure 6-18: Remote Advance Preemption Between Modules of the Same Case

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 is identical to the setup for tracks 1 and 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.

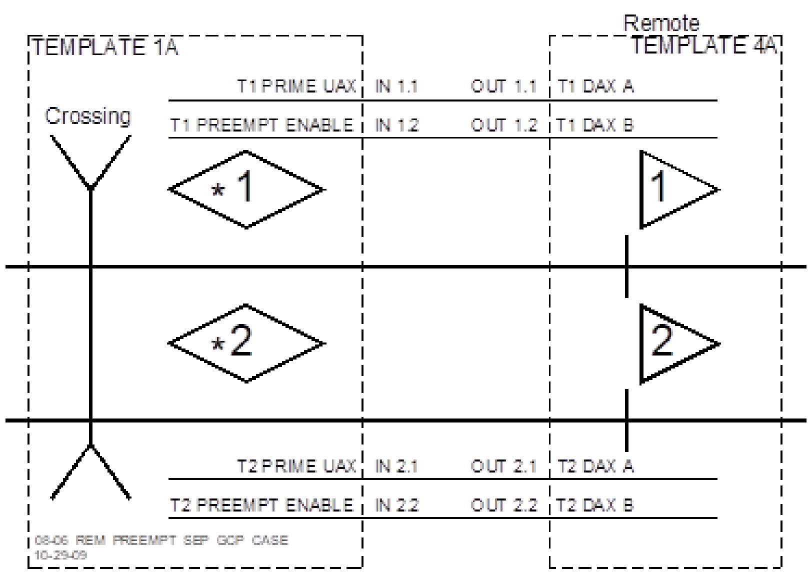


Figure 6-19: Remote Preemption From Separate GCP 5000 Case

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 **Advance**

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

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 SSCC IIIi 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.

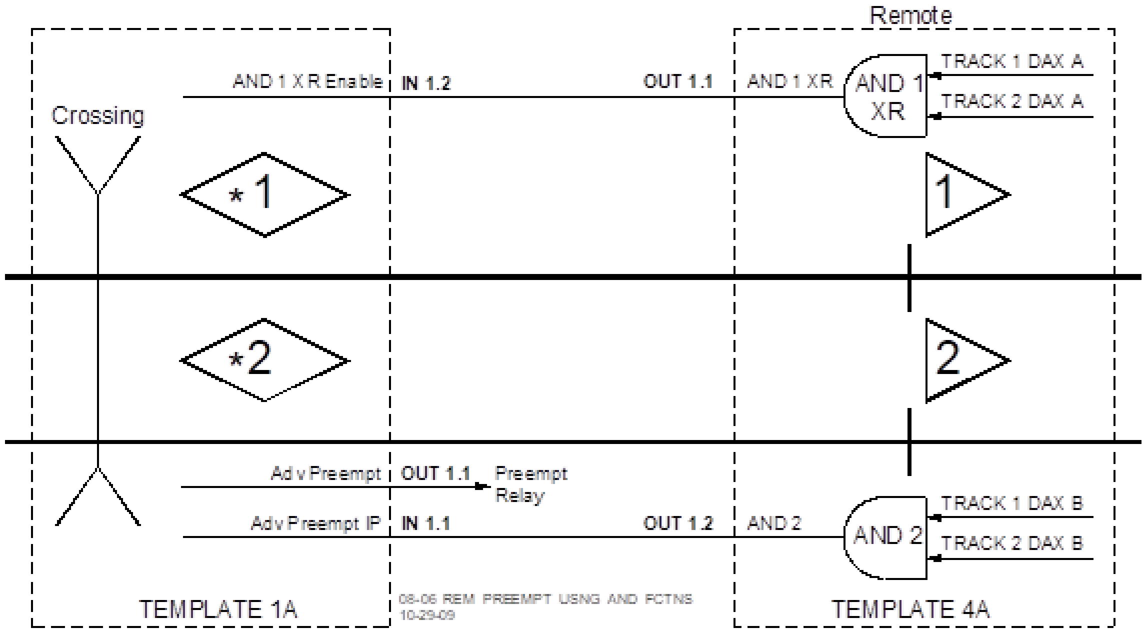


Figure 6-20: Remote Preemption from Separate GCP 5000 Case using AND Functions

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 **Advance, 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 section 6.3.1.3.

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 selected **GD** (gate down) inputs are energized.
  - Only GD inputs from gates controlling movement toward the preempted intersection must be selected. The user can assign all Gate Downs to inputs as normal, but then select which Gate Down inputs are to be used in the Gate Down Logic as shown in Figure 6-22. This screen will only show the GDs that have been enabled on the SSCC:1 and SSCC:2 programming screens.
  - The advance preemption timer is not shown when gate down logic is used, as this function is not necessary when gate down logic is used.

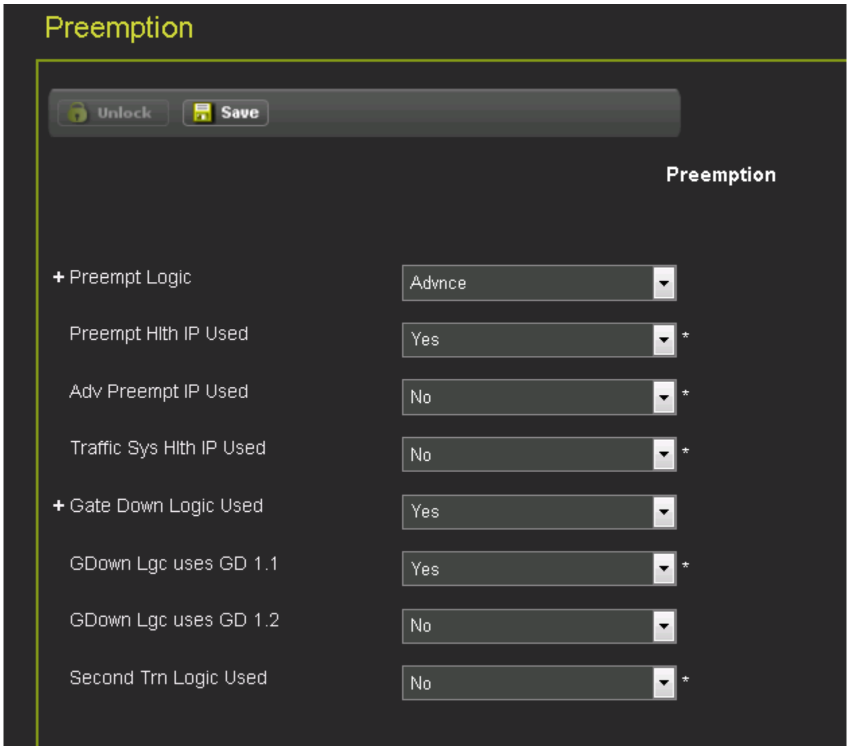


Figure 6-21: Assigning Gate Downs to Gate Down Logic

When assigned to a physical output **Gate Dwn Indication** may be connected to the traffic system to terminate clear-out-green operation. 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**
  - Set GDown Lgc uses GD x.y to **Yes** for all gates controlling movement to the preempted intersection and set **No** for other gates.

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

The **Preemption** window provides the option of enabling second train logic, this is selectable whether **Preempt Logic** is set to **Advnce** or not. If **Preempt Logic** is not set to **Advnce** and **Second Trn Logic Used** is set to **Yes**, the Preempt predictors are available to be configured.

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.

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 section 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 GCP 5000 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 GCP 5000 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 GCP 5000 track modules (including DAXes) are located in same 5000 crossing unit (Figure 6-22), the Track circuit repeater used for wrapping the remote track must be available at the crossing GCP location. In Figure 6-22, template 2A is used.

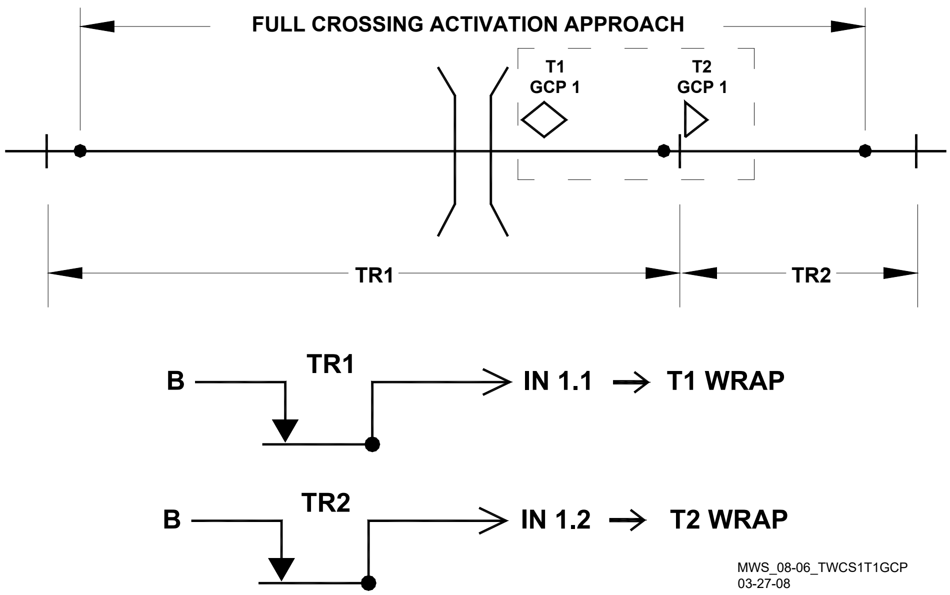


Figure 6-22: Single Track-When GCP 5000 Track Modules Located in Same 5000 Crossing Unit

6.4.3.2 Single Track—Remote GCP

When a DAX module is in a separate remote GCP 5000 unit (see Figure 6-23), connect the remote DAX A physical output at GCP 2 to AND 1 XR enable at GCP 1 as shown in Figure 6-23 (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 6-23, the template in GCP 1 is 1A and the template in GCP 2 is 4A.

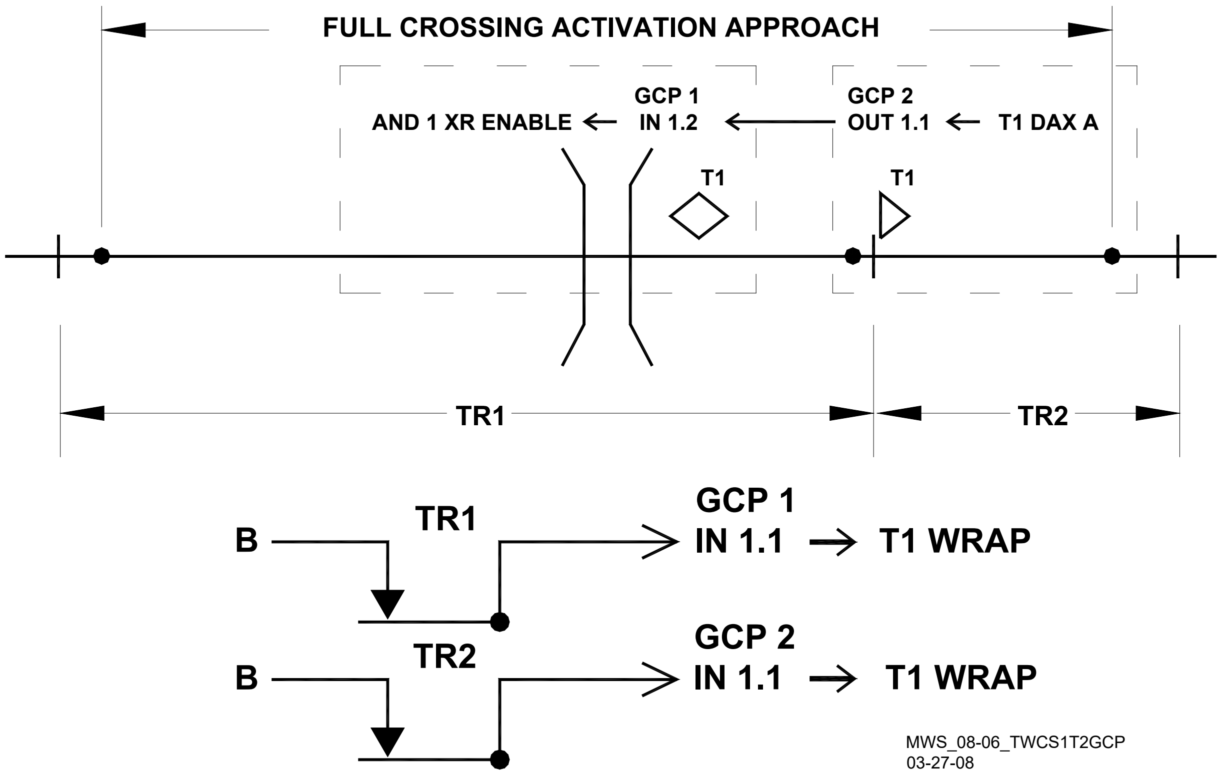


Figure 6-23: Single Track--When A DAX Module is in Separate Remote GCP 5000 Unit

6.4.3.3 Double Track—Same GCP

When the GCP 5000 track modules including DAXes are located in same 5000 crossing unit (Figure 6-24), the track circuit repeaters used for wrapping the remote GCP must be available at the crossing GCP location. In Figure 6-24, template 2A is used.

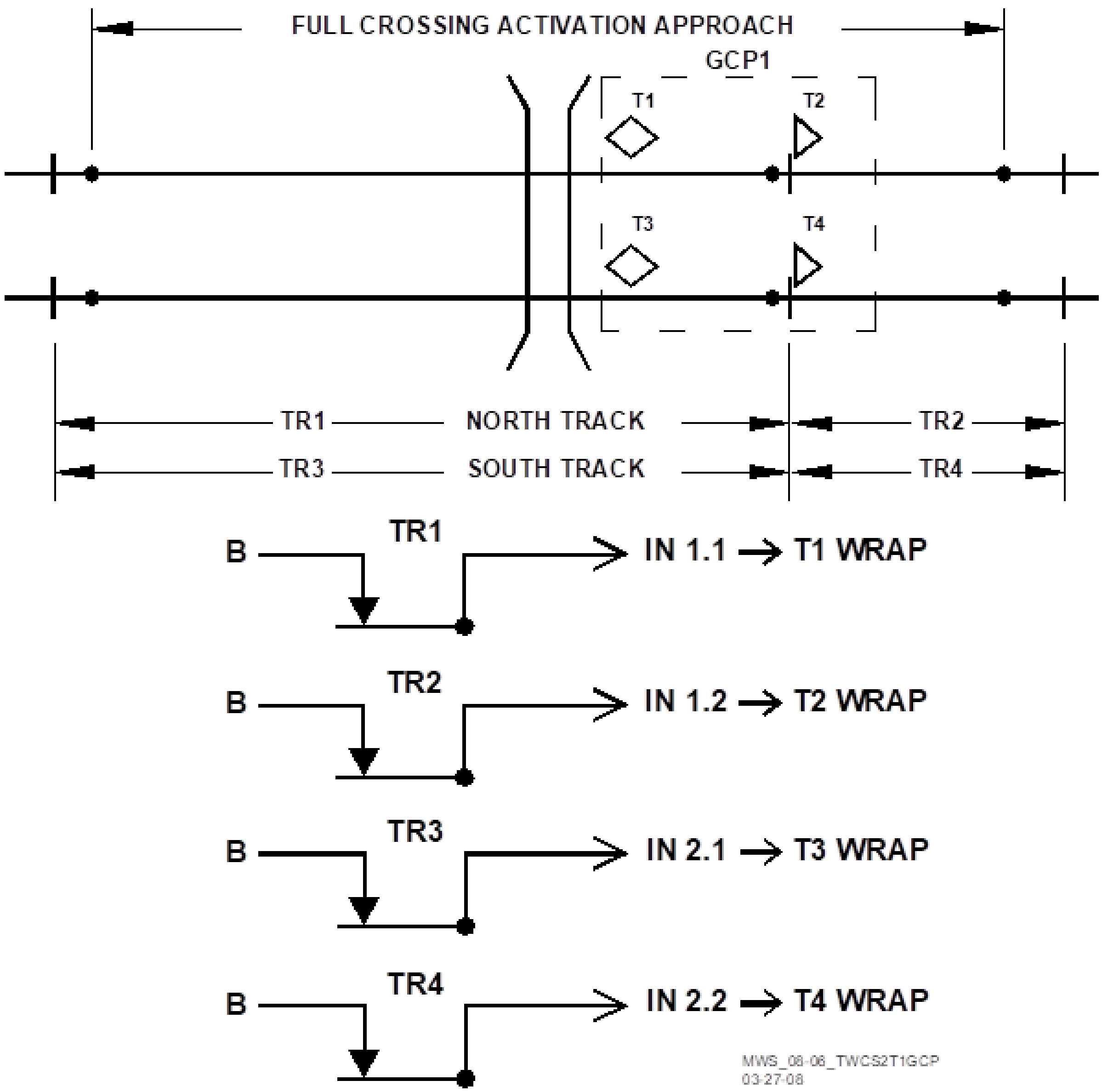


Figure 6-24: Double Track—All GCP 5000 Track Modules Located in Same 5000 Crossing Unit

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 GCP 5000 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.

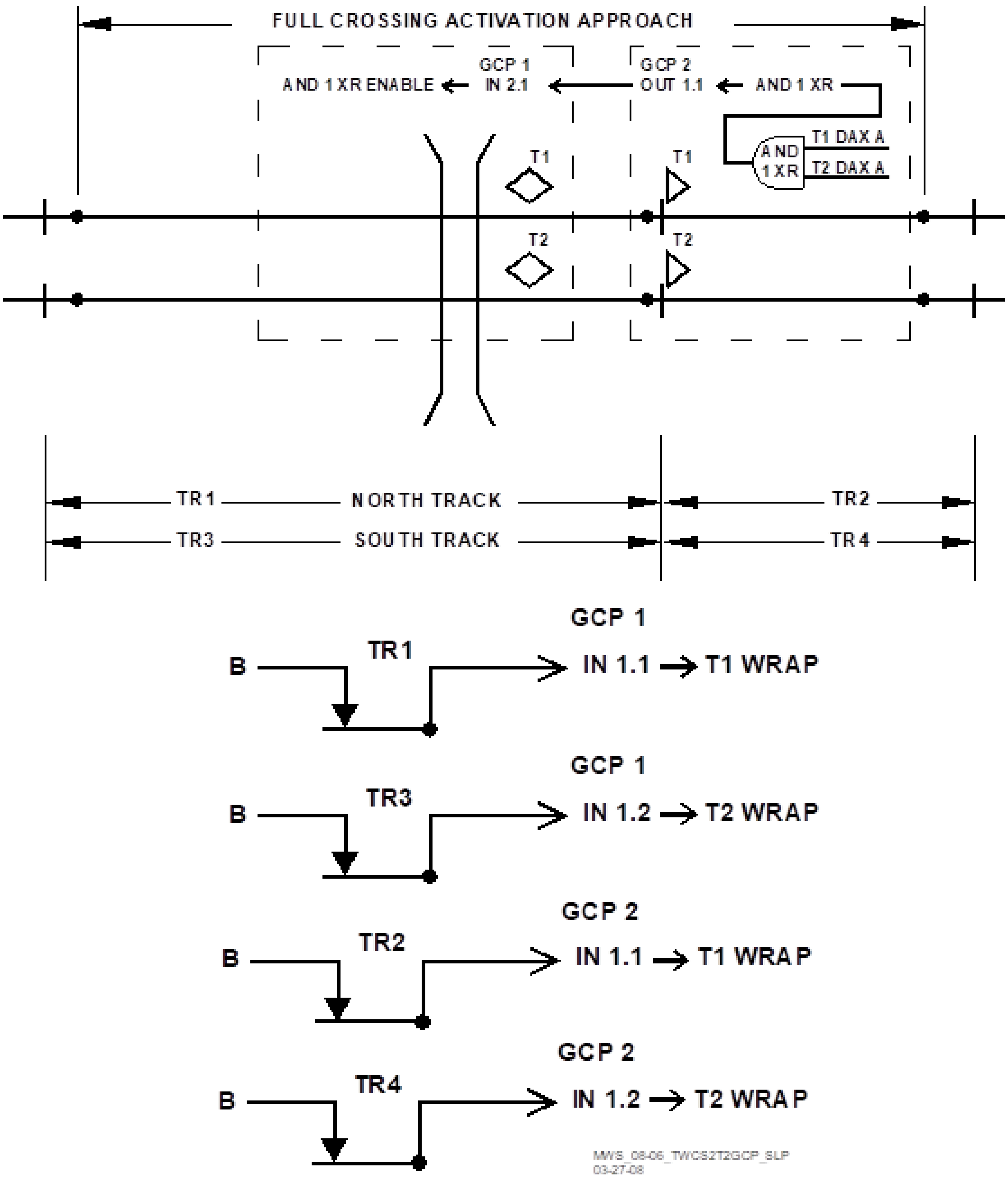


Figure 6-25: Double Track—with Single Line Pair from Remote GCP 2 to Crossing GCP 1

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 6-26). 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 6-26). In Figure 6-26, the template in GCP 1 is 1A and the template in GCP 2 is 4A. 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.

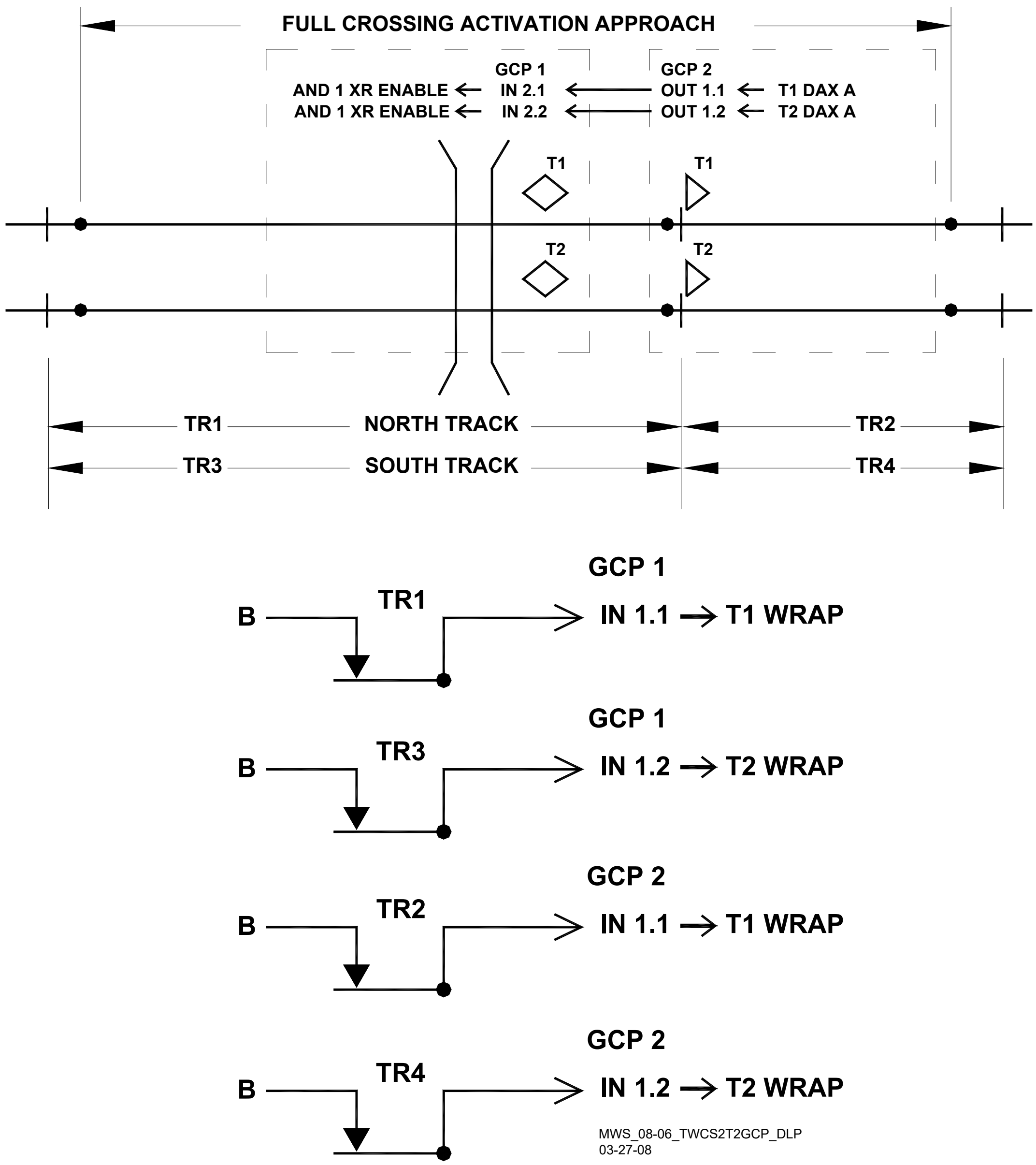


Figure 6-26: Double Track—with Two Line Pair from Remote GCP 2 to Crossing GCP 1

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 GCP 5000 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 6-27).

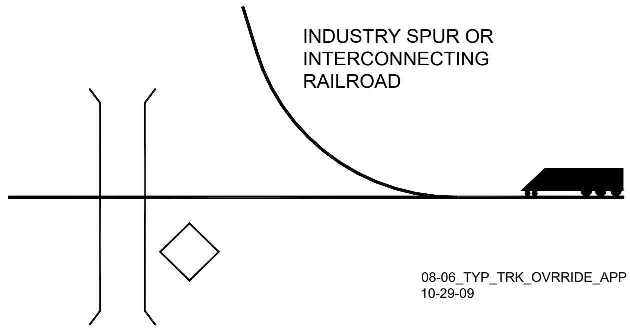


Figure 6-27: Typical Track Override Application

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 GCP 5000 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 6-28, Figure 6-29 and Figure 6-30 demonstrate examples of Override programming.

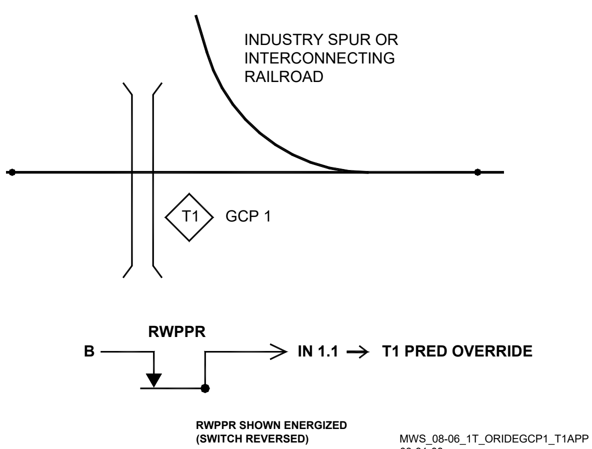


Figure 6-28: Single Track Application, Override Switch in GCP 1, T1 Approach

Figure 6-28 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

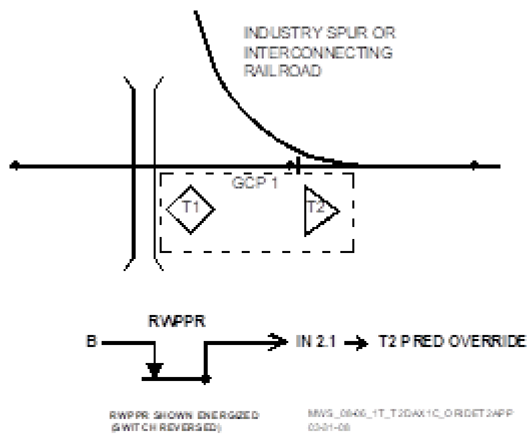


Figure 6-29: Single Track, T2 DAX in Same GCP 5000 Case, Override Switch in T2 Approach

Figure 6-29 shows:

- Single track application
- DAX in same GCP 5000 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

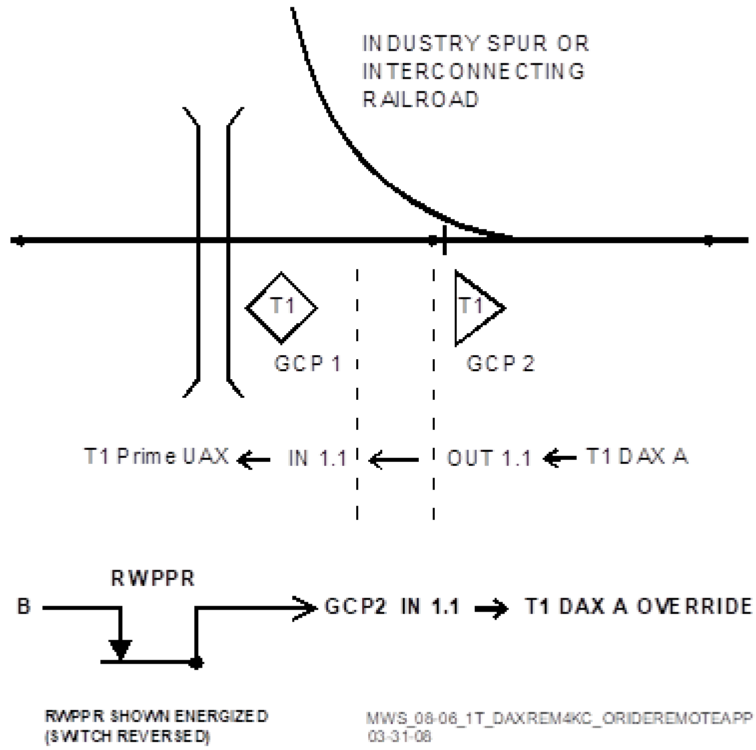


Figure 6-30: Single Track, DAX in Remote GCP 5000 Case, Override Switch in Remote Approach

Figure 6-30 shows:

- Single track remote T1 application
- DAX in remote GCP 5000 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 GCP 5000.

PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO ADVANCED LOGIC FEATURES, THE GCP 5000 OPERATION MUST BE TESTED TO ENSURE PROPER WARNING SYSTEM OPERATION.

The GCP 5000 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
- Pass thru states

6.6.1 AND Gates

The GCP 5000 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 6-31 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 GCP 5000 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 de-energized.

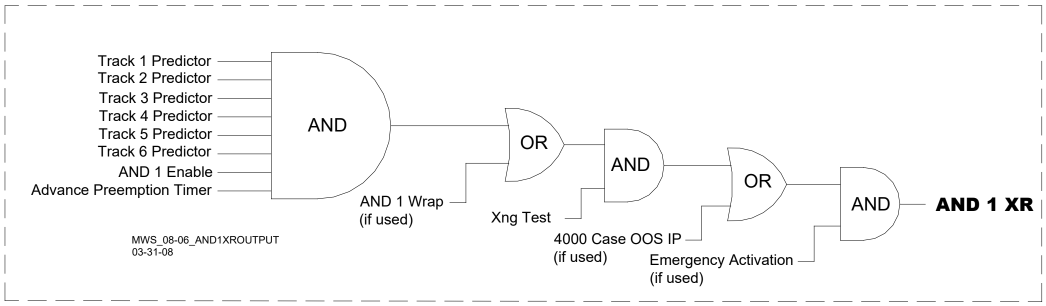


Figure 6-31: AND 1 XR Output

Figure 6-32 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.

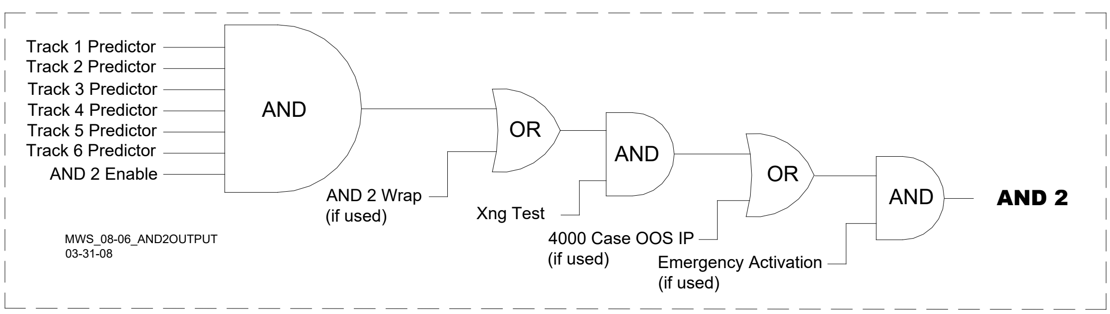


Figure 6-32: AND 2 Output

Figure 6-33 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**.

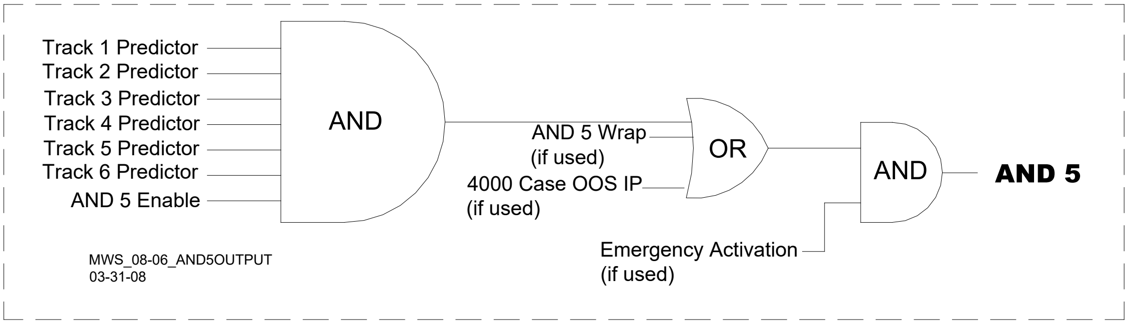


Figure 6-33: AND 5 Output

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

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 GCP 5000 OPERATION MUST BE TESTED TO ENSURE 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", GCP 5000 SYSTEM OPERATION MUST BE TESTED TO ENSURE PROPER WARNING SYSTEM OPERATION.

Each of the twelve AND gates have 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 GCP 5000.

PRIOR TO BEING PLACED IN SERVICE OR IF CHANGES ARE MADE TO ADVANCED LOGIC FEATURES, THE GCP 5000 OPERATION MUST BE TESTED TO ENSURE PROPER WARNING SYSTEM OPERATION.

The GCP 5000 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 pass thru states. When all inputs are low the OR output is low. When any input is high the OR output is high.

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

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

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 GCP 5000 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**)

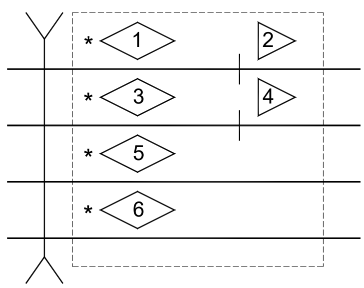


Figure 6-34: Template 2A (Shown for Reference Only)

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**

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).

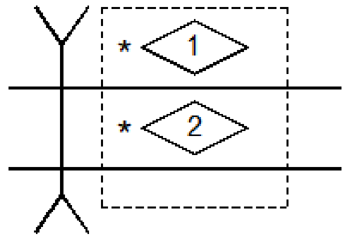


Figure 6-35: Template 1A (Shown for Reference Only)

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 GD 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

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 GCP 5000 provides four Passthru states. Section 6.6.1.6 provides an example of using Passthru states.

6.7 ETHERNET SPREAD SPECTRUM RADIO AND VITAL COMMUNICATION LINKS

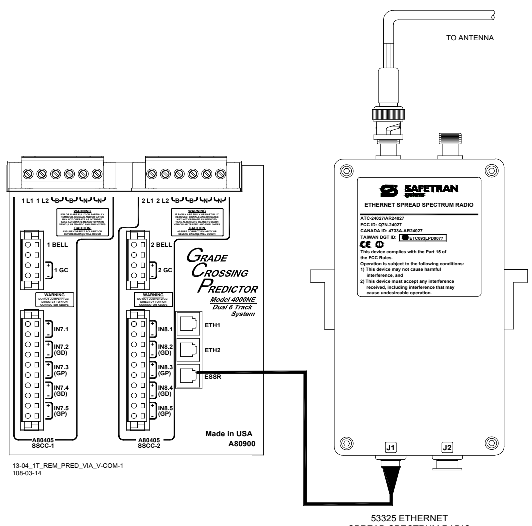


Figure 6-36: Generic GCP 5000 Connection to Ethernet Spread Spectrum Radio

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.

GCP 5000 units communicate using the Echelon LONTALK® communication protocol. The GCP 5000 has onboard circuitry that allows communication via Ethernet using Ethernet Spread Spectrum Radios (ESSR). An example of the generic connections between the GCP 5000 and the ESSR is provided in Figure 6-36. 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 INCORRECT OPERATION.

An Ethernet connection via an Ethernet ESSR may be used to send vital ATCS messages between GCP 5000s, between a GCP 5000 and a GCP 4000, or from a GCP 5000 to an HD/Link Module without the use of line wires.

A GCP 5000 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 GCP 5000: 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 GCP 5000 unit contain the states of eight (8) general purpose vital inputs and eight (8) general purpose vital outputs on the GCP 5000 unit.

Using either VCom 3 or VCom 4, the ATCS messages sent from the GCP 5000 unit contain the states of sixteen (16) general purpose vital inputs and sixteen (16) general purpose vital outputs on the GCP 5000 unit. When the ATCS message from the GCP 5000 is received by a GCP 5000, and 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 GCP 5000.

When the ATCS message is received by an HD/Link module, and 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 GCP 5000, and if the message is valid, it can be used to set the states of up to eight vital outputs on the GCP 5000. The Vital Comms links can be used to:

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

6.8.1 ATCS Addressing and ATCS Offsets

Because the GCP 5000 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 GCP 5000 CPU
- 99 is assigned to the SEAR IIi
- 02 and higher (02, 03, 04, etc.) is assigned to each HD/Link Module found within the group

Typically, GCP 5000'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 GCP 3000s, 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 GCP 5000, as well as the ATCS address (SIN) associated with that GCP.

6.8.1.1 Setting GCP 5000 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 GCP 5000 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 – CPU 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 GCP 5000:

- 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 GCP 5000 must be connected to Vital Link 1 of the other GCP 5000.

A remote site can be used to send a DAX signal to a crossing via an ESSR as shown in Figure 6-37.

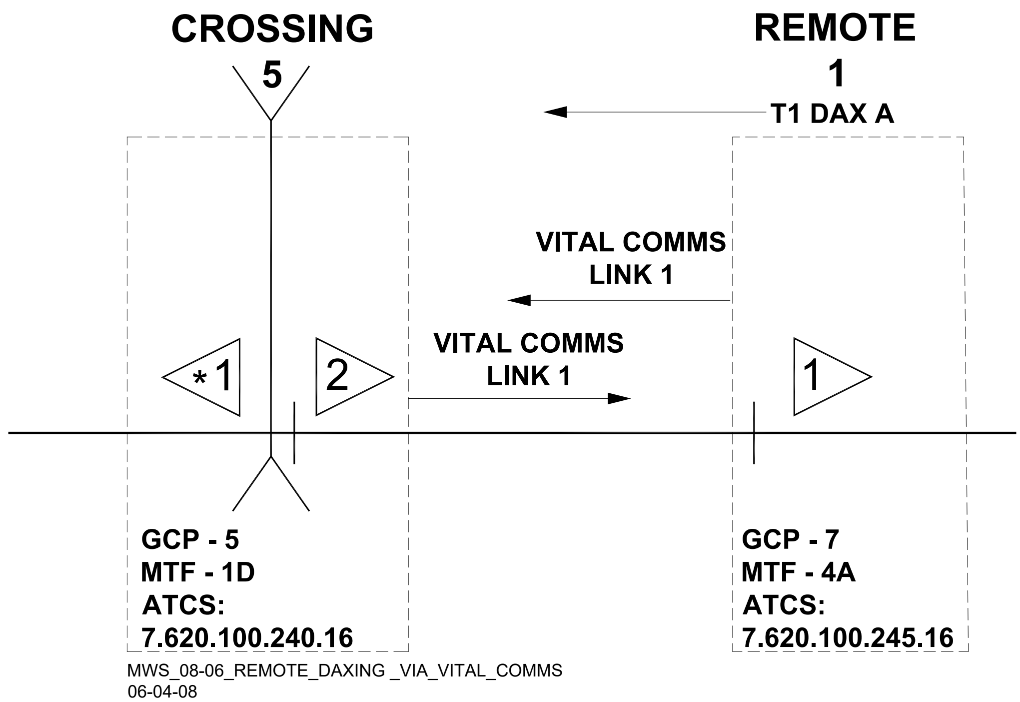


Figure 6-37: Remote Site DAXing A Crossing via Vital Comms Link

6.8.4.1 Remote Site Programming

For the configuration shown in Figure 6-37 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 6-37, 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 (GCP 3000 – HD/Link Module) Programming

In Figure 6-38, a remote GCP 3000 site is DAXing to two bidirectional crossings equipped with GCP 5000s using an HD/Link Module and radio link.

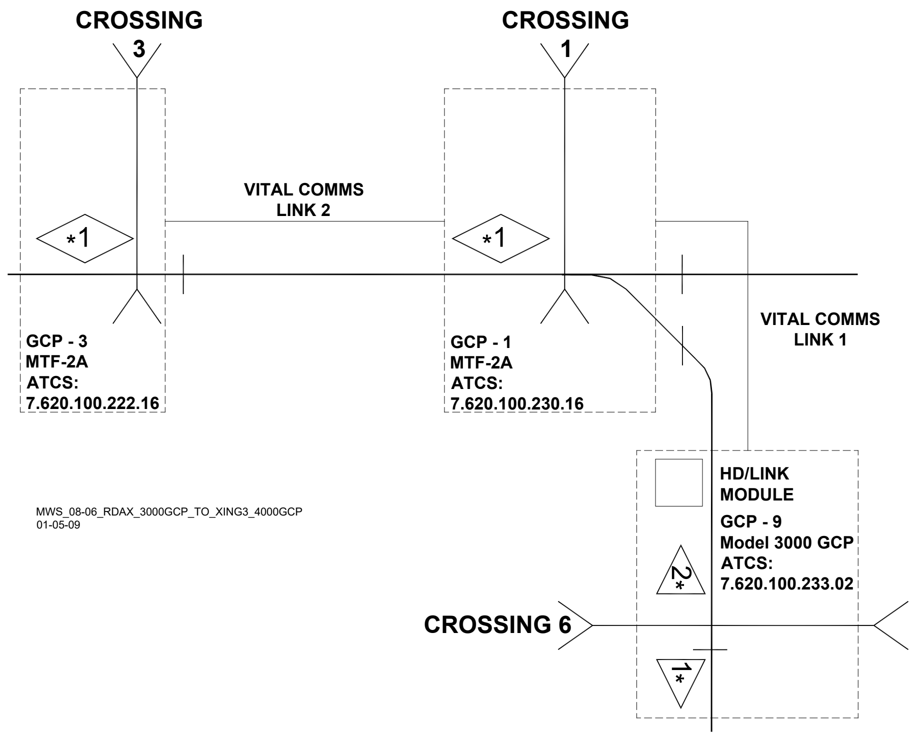


Figure 6-38: GCP 3000 DAXing to GCP 5000s

The GCP 3000 is programmed as per Microprocessor Based Grade Crossing Predictor GCP 3000 Instruction & Installation Manual, SIG-00-00-02. The GCP 3000 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

WARNING

THE HD/LINKER ALONE MUST NOT BE USED TO CREATE MCFs FOR THE HD/LINK MODULES WHEN USED TO INTERFACE TO GCP 5000s. FOLLOW THE PROCEDURES OUTLINED IN SECTION 6.9.

6.8.4.4 Crossing 1 (GCP-1) Programming

For the configuration shown in Figure 6-38, 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 the Vital Comms Links screen [1) BASIC CONFIGURATION > 5 VITAL COMMS LINKS]:

- Set Vital Comms Link 2 Used to **Yes**.

On the 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 Diagnostic 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 GCP 5000 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.

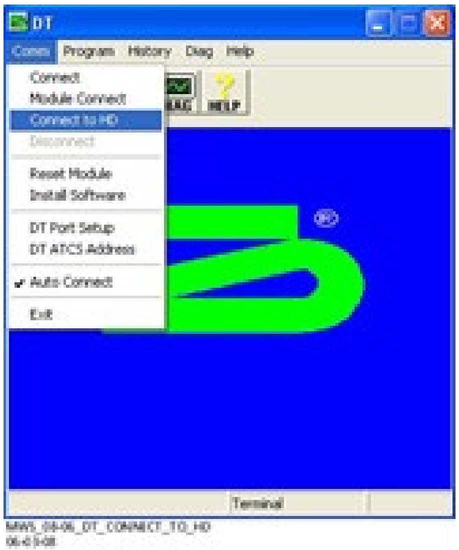
Changes can only be made to the system configuration when the vital processing has been shut down. During normal operation of the system, when any vital operations are being done, it is not possible to change the configuration of the system.

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:

- Connect Serial cable from the serial port of the laptop computer to the HD Diag Port.
- Open the DT
- Select COMM > Connect to HD. The HD DT opens (see Figure 6-39).



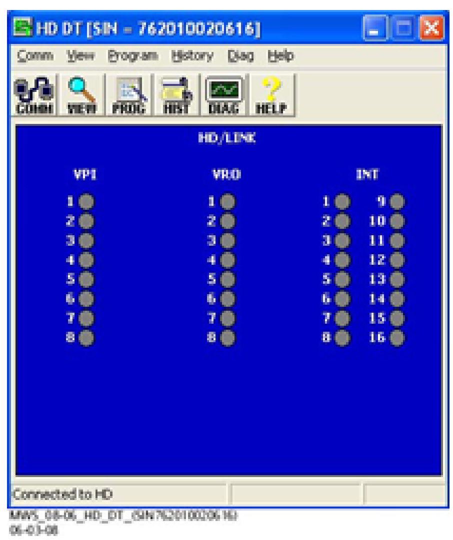


Figure 6-39: HD/LINK DT Window

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 CSB 4-98 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).

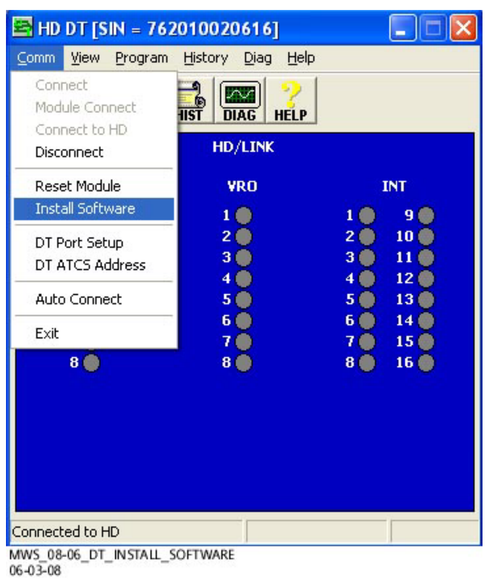
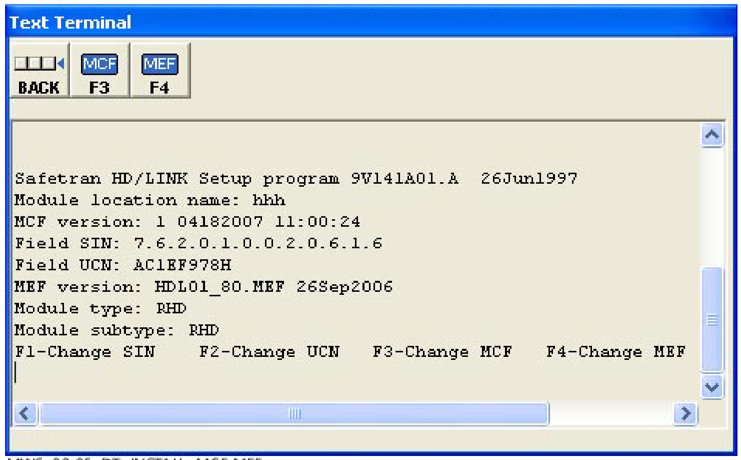


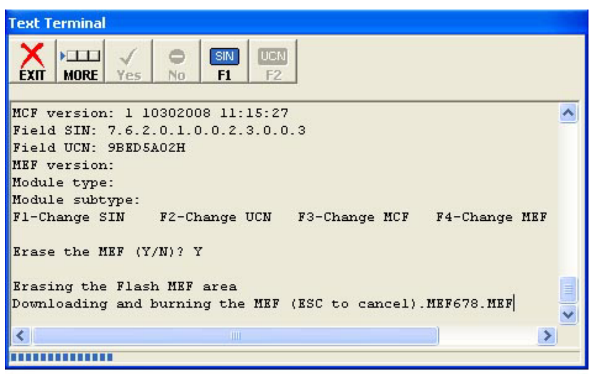
Figure 6-40: Install Software Option Window



MWS_08-06_DT_INSTALL_MCF-MEF
06-03-08

Figure 6-41: Text Terminal Window – Install MEF

- Select F4 - Change MEF. “Erase the MEF?” appears on the Text Terminal Window. Enter Y and press ENTER.
- The Upload MEF File Window opens. Select the correct MEF file and select OPEN.



MWS_08-06_DT_DOWNLOAD_MEF
01-08-09

Figure 6-42: 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 Create a Remote SIN using GCP 5000

One of the features of DT 4.7.5 allows the GCP 5000 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 6-43), enter the Remote SIN. Select the HD MCF button.

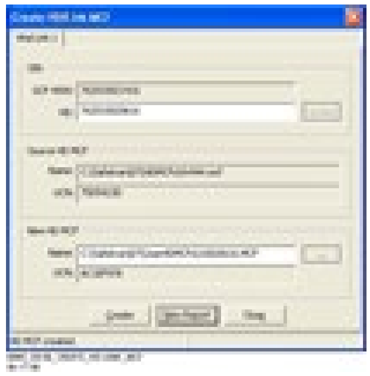


Figure 6-43: Vital Comms Link 1 Window – HD Link Button and SIN Setting

- The Create HD/LINK MCF Window opens (see Figure 6-45).

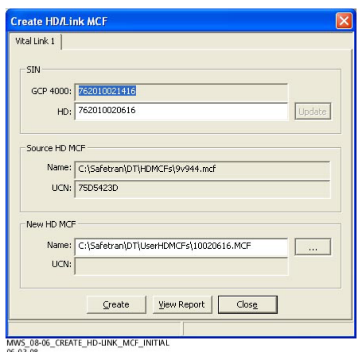


Figure 6-44: Create HD/LINK MCF Window

- Select Create. The UCN line of the screen is populated (see Figure 6-45). 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 6-46, Figure 6-47 and Figure 6-48).

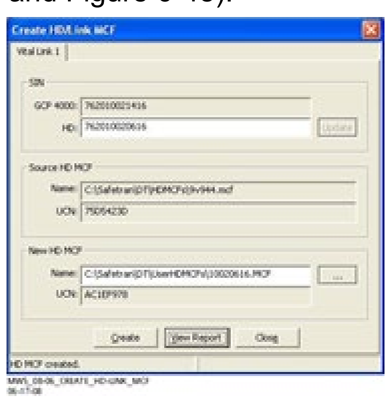


Figure 6-45: Create an HD/Link MCF Window

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 6-46: 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 6-47: 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.

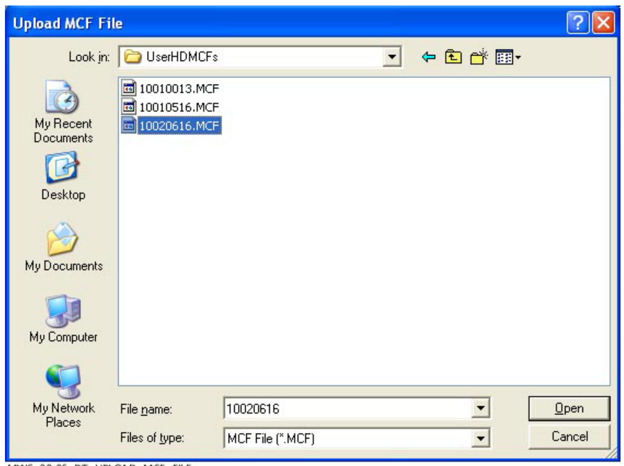
MWS_08-06_DT_HD-LINK_MOD_CONFIG_LISTING_P3
06-03-08

Figure 6-48: 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 6-49). Use the location provided on the Name: line of the New HD MCF section of the Window (see Figure 6-45) or on the MCF: line of the HD/LINK Module Configuration File Listing (Figure 6-49).

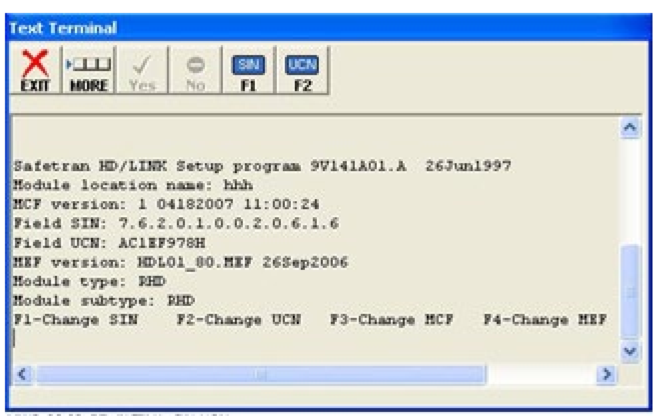


MWS_08-06_DT_UPLOAD_MCF_FILE
06-03-08

Figure 6-49: Upload MCF Window

6.9.4 Set SIN

- Once the file has uploaded, select F1 – Change SIN on the Text Terminal Window (see Figure 6-50



MWS_08-06_DT_INSTALL_SIN-UCN
06-03-08

Figure 6-50: Text Terminal Window – Change SIN – UCN

- Select F1- Change SIN. The Change SIN Window opens (see Figure 6-51). Enter the new SIN and select OK.

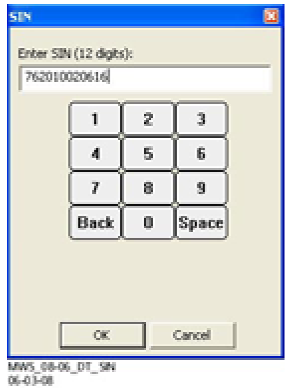


Figure 6-51: Change SIN Window

6.9.5 Set UCN

- On the Text Terminal Window (see Figure 6-50), select F2 – Change UCN. The MCFCRC Window opens (see Figure 6-52).

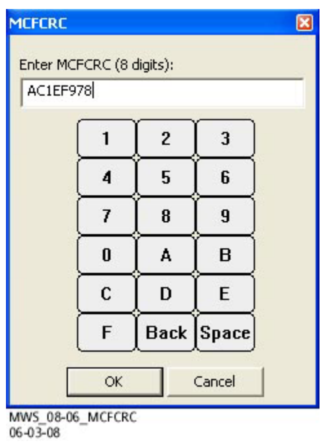


Figure 6-52: MCFCRC Window

- 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 are 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 6-53). 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 6-53: Time Window

6.9.7 View State of VPI, VRO & Internal Variables

When you open the HD/LINK DT, the screen provides you the status of the VPIs, VROs, and Internal Variables.

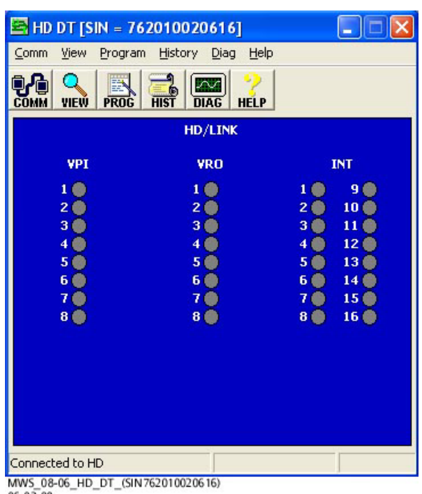


Figure 6-54: HD/LINK DT Window

6.9.8 View Module Status

To view module status:

- Select View > Module Status. The HD Status Window opens (see Figure 6-55).

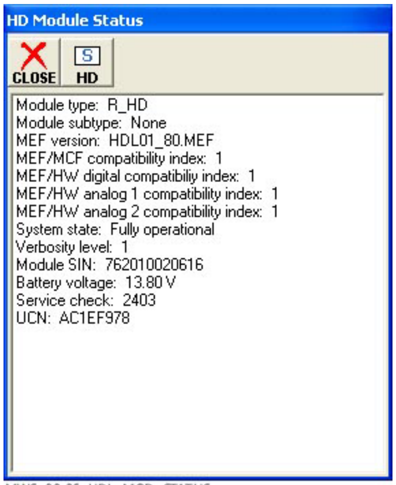


Figure 6-55: HD/LINK Module Status Window

6.9.9 View SAT Status

To view the SAT status:

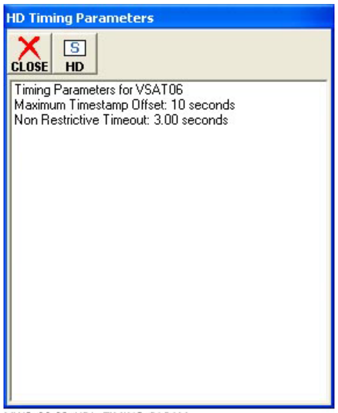
- Select View>SAT Status the SAT Window opens (see Figure 6-56A). Select the VSAT to be observed. Select OK. The HD SAT Status Window opens (see Figure 6-56B)

Figure 6-56: A: Select SAT Window; B: 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 6-56) Window opens. Select the SAT, select OK. The HD Timing Parameters Window opens (see Figure 6-57).



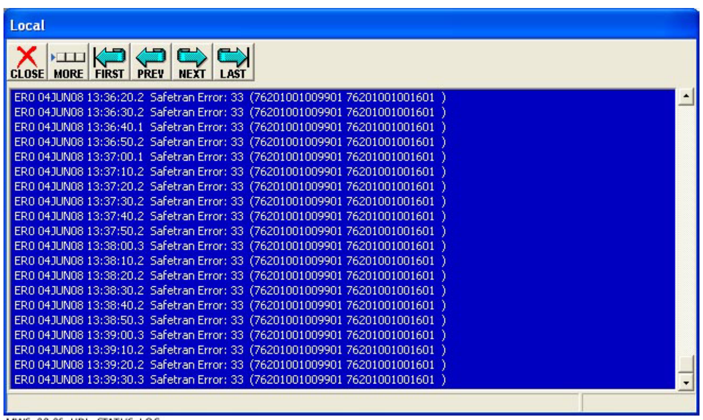
MWS_08-06_HDL_TIMING_PARAM
06-04-08

Figure 6-57: 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.



MWS_08-06_HDL_STATUS_LOG
06-04-08

Figure 6-58: Status Log Window

6.9.12 View the Diagnostic Dump

To view the Diagnostic Dump:

- Select Diag> Diagnostic Dump

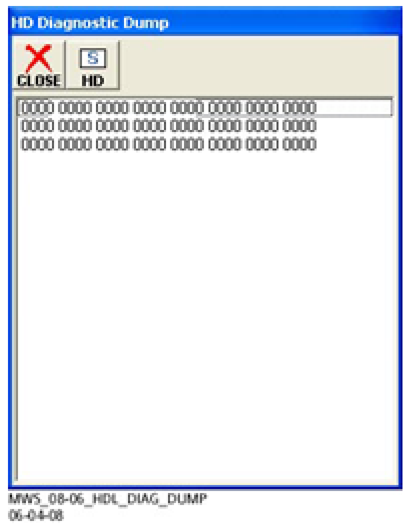


Figure 6-59: Diagnostic Dump Window

6.9.13 View Statistics

To view the DT Statistics:

- Select Diag > Statistics

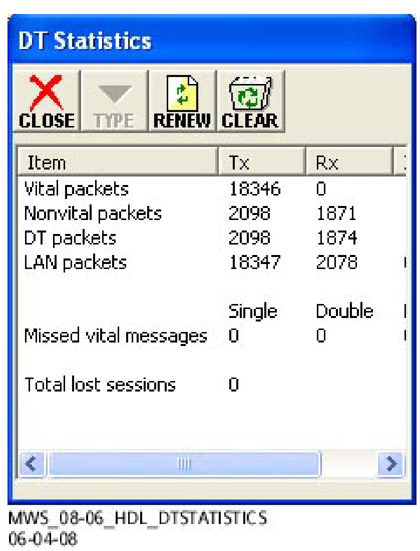


Figure 6-60: DT Statistics Window

6.9.14 Set the Verbosity

To view the verbosity level:

- Select View> Status Log. The Status Log Window (Figure 6-58) appears. Select the More button until the Set Verb Button appears at the end of the buttons, then select the Set Verb Button

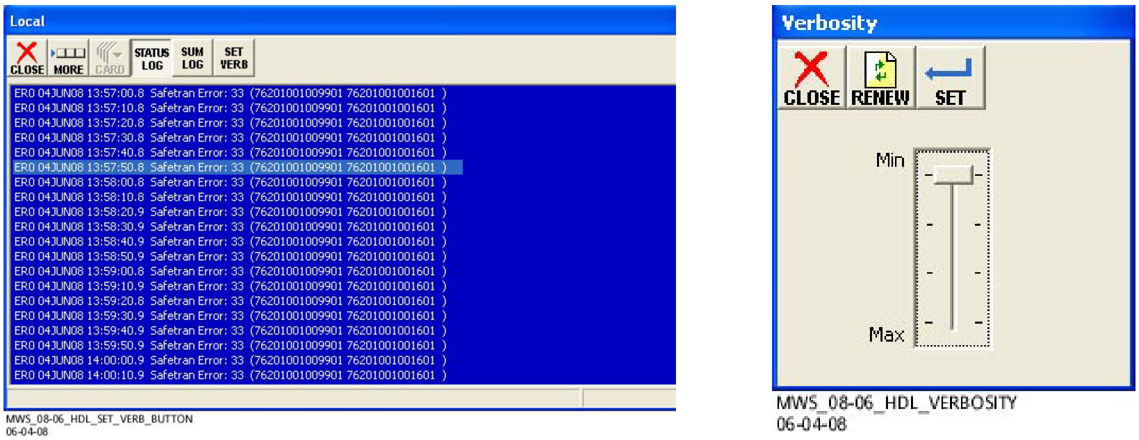


Figure 6-61: A: Set Verb Button; B: The Verbosity Window

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 6-62).

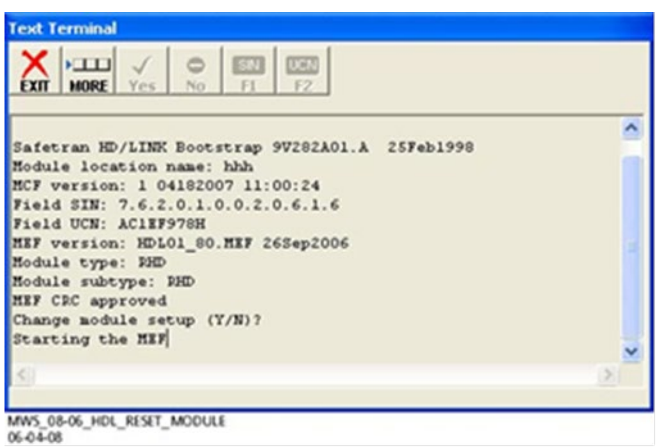


Figure 6-62: Reset the HD/Link Module Window

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.

⚠ CAUTION

CAUTION

ONCE THIS FUNCTION IS PERFORMED, IT CANNOT BE UNDONE. A NEW MCF WILL NEED TO BE LOADED FOR OPERATION.

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SECTION 7 – AUXILIARY EQUIPMENT

SECTION 7 - AUXILIARY EQUIPMENT

7.1 GENERAL

The equipment described in this section can be used with the GCP 5000. 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.

7.2 BIDIRECTIONAL SIMULATION COUPLER, 62664-MF

⚠ WARNING

WARNING

WHEN A GCP 5000 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 GCP 5000 installations than in bidirectional installations.

- Although the GCP 5000 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 GCP 5000 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

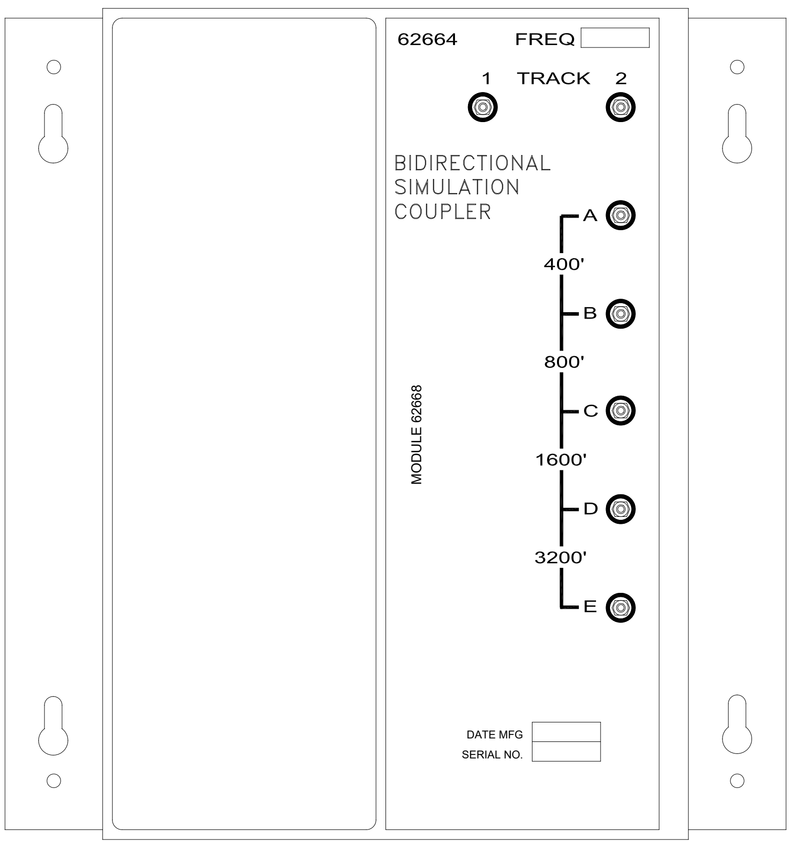
WARNING

THE 62664 BIDIRECTIONAL SIMULATION COUPLER MUST NOT BE USED AS A TERMINATION SHUNT.

THE GCP 3000, 4000, AND 5000 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 GCP 5000, 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 GCP 5000 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 GCP 5000 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	Height: 8.75 inches (22.225 centimeters) Width: 8.50 inches (21.590 centimeters) Depth: 9.25 inches (23.495 centimeters)
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.

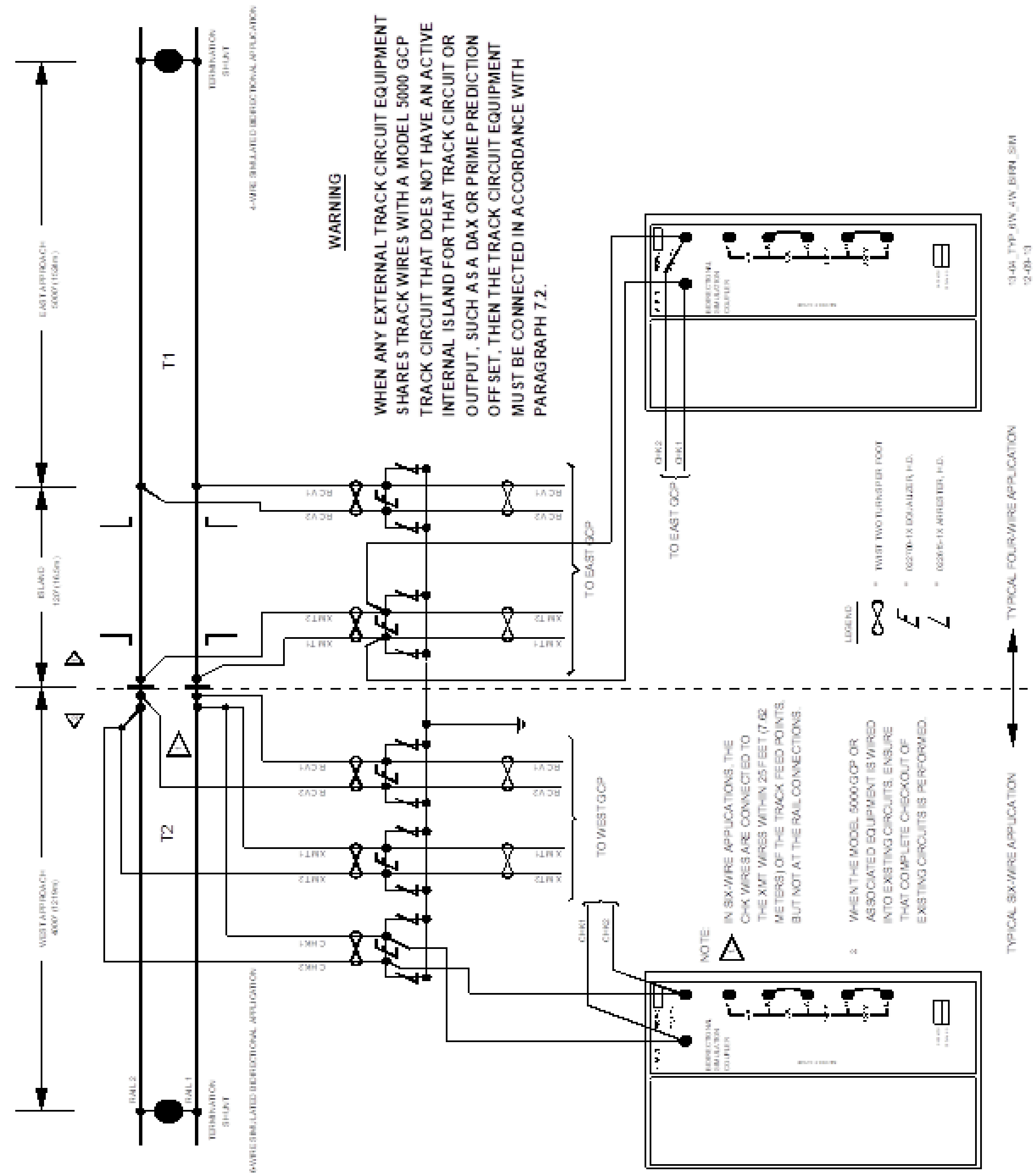


Figure 7-2: Proper GCP 5000 4-wire & 6-wire Connections using Bidirectional Simulation Coupler on GCP 5000 Operating in Bidirectional Simulation Mode

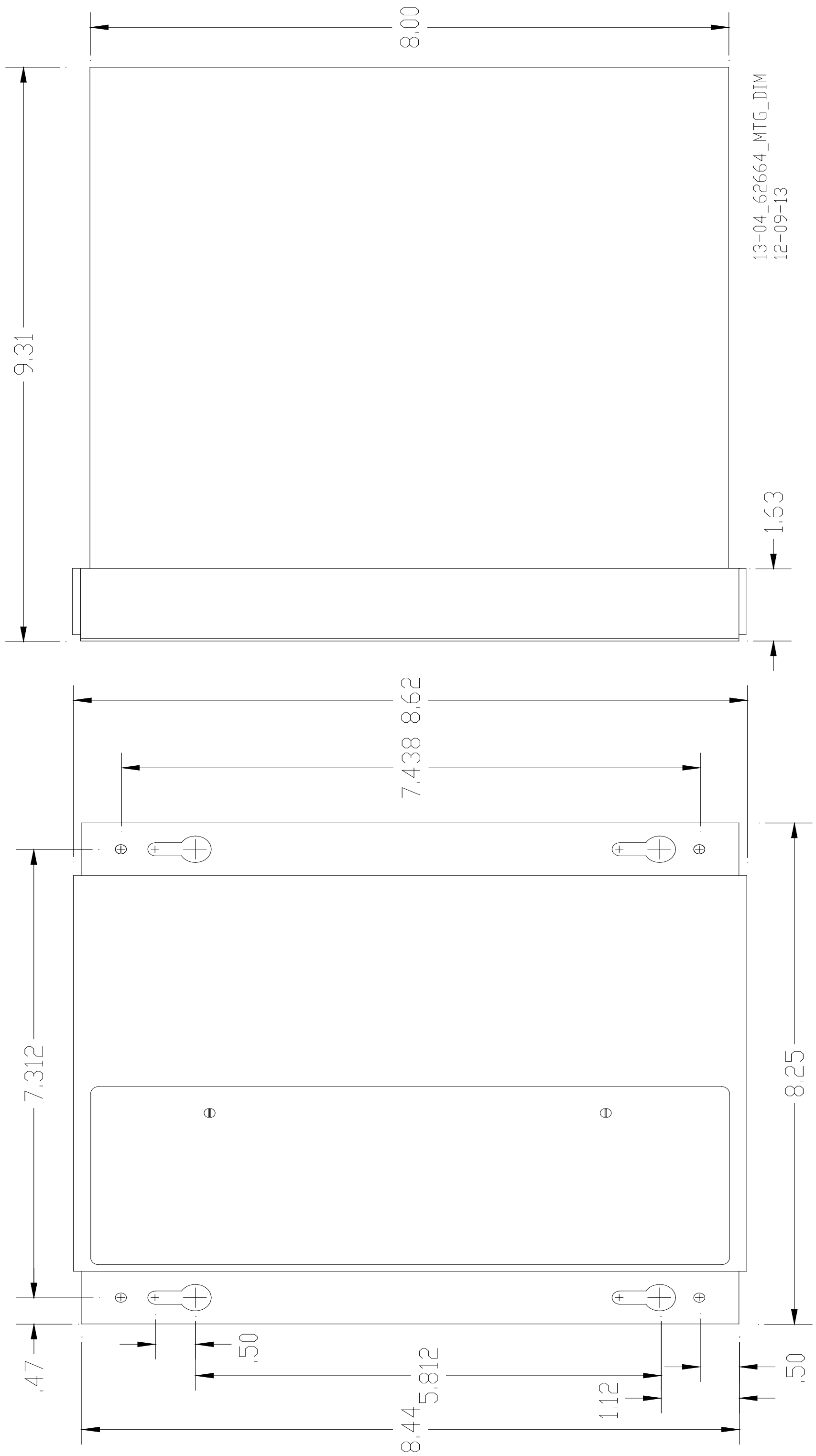


Figure 7-3: Bidirectional Simulation Coupler Assembly Mounting Dimensions

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 GCP 5000 Enhanced Detection software to function optimally.

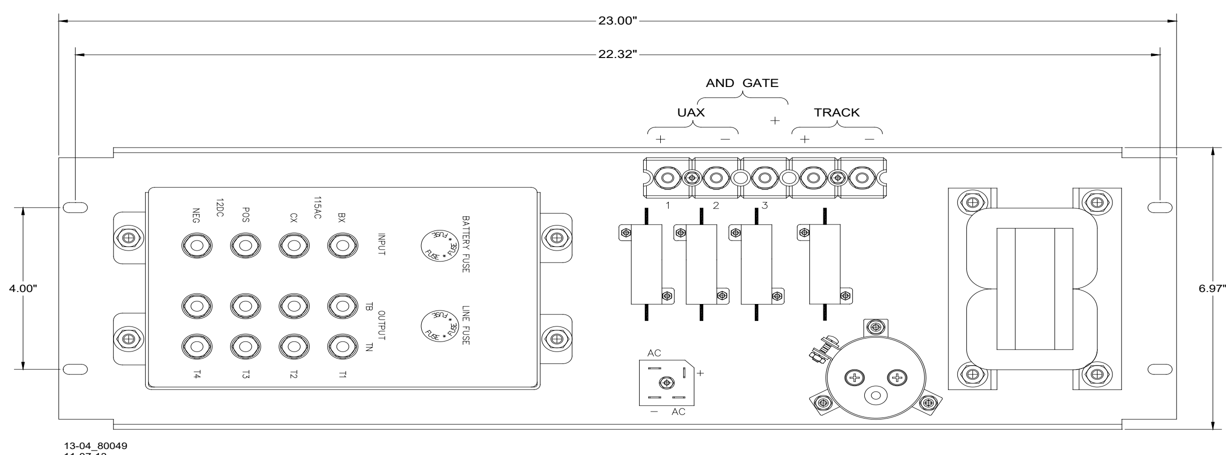


Figure 7-4: DC Shunting Enhancer Panel, 80049

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 GCP 5000 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 CHECK 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 GCP 5000 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.

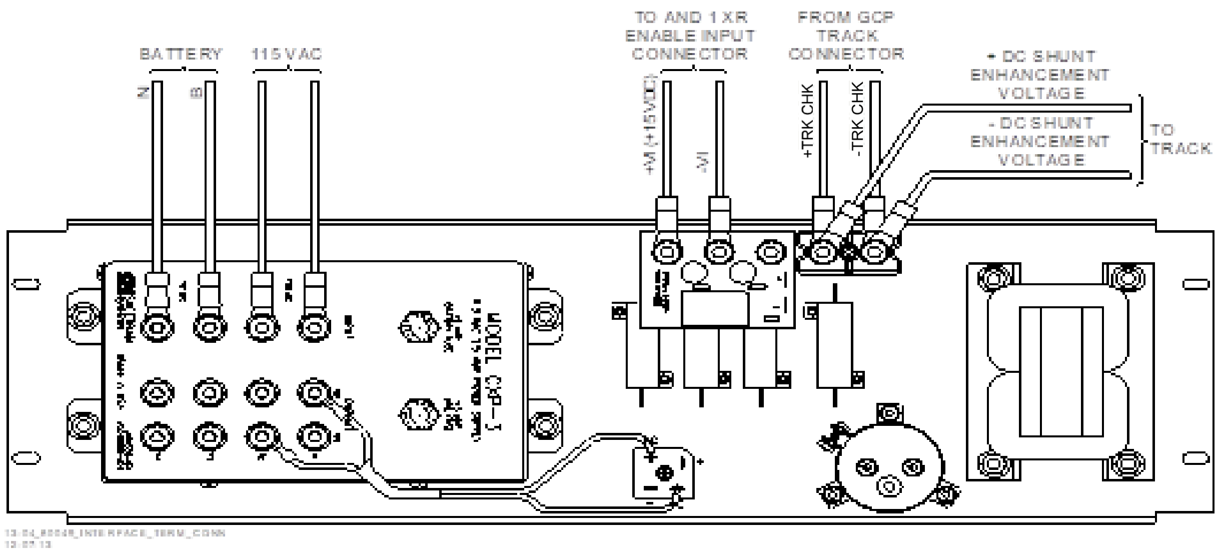


Figure 7-5: DC Shunting Enhancer Panel, 80049, Interface Terminal Connections

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.

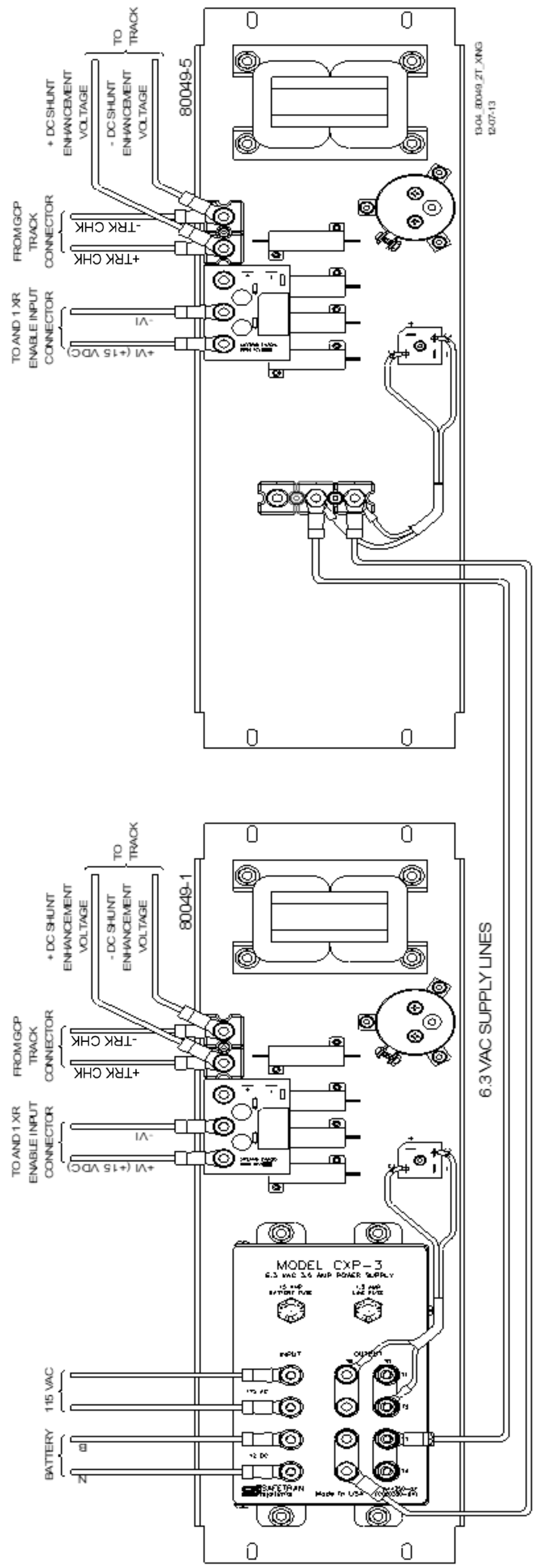


Figure 7-7: DC Shunting Enhancer Panels for Two Track Crossing

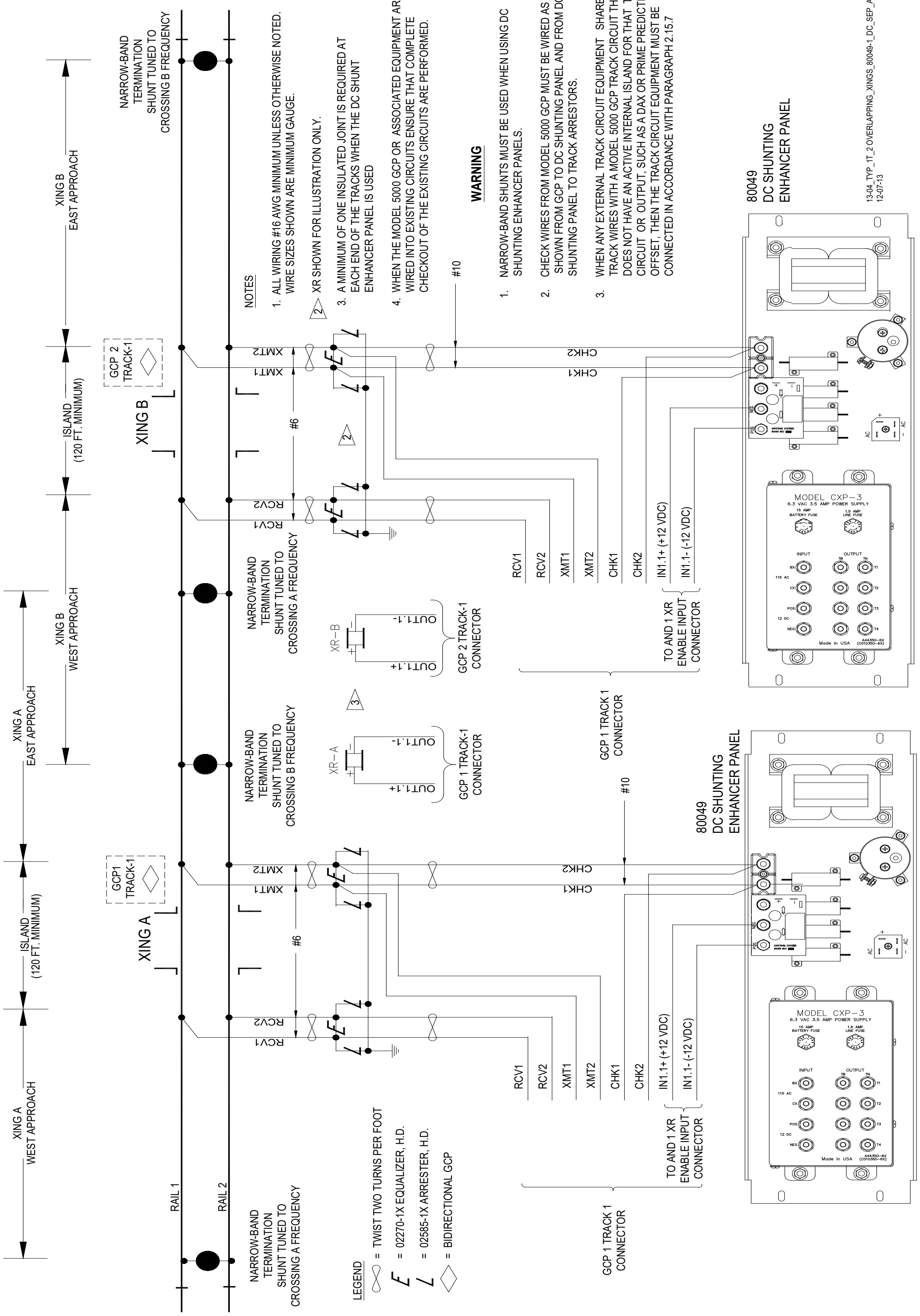


Figure 7-8: DC Shunting Enhancer Panels for Overlapping Crossings

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 MUST 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 SECTION 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 GCP 5000 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 table below.

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

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

7.4.1 Narrow-Band Shunt, 62775-F Specifications

Length: 16 inches (40.640 centimeters)
Diameter: 5 inches (12.700 centimeters)
Weight: 10 pounds (4.54 kilograms) (approximate)
Frequencies: See Table 7-5.
Leads: 10 feet (3.48 meters); number 6 AWG, stranded, black PVC

7.5 NARROW-BAND SHUNT, 62780-F

⚠ CAUTION

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUST 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 SECTION 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 GCP 5000 frequency should be terminated.

- Similar to the Narrow-band Termination Shunt, 62775 (section 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.

Table 7-6: Frequencies Available with Narrow Band Shunt, 62780-f

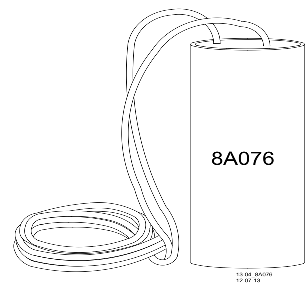
86	151	**211**	326	**430**	**525**	**645**	**790**	**970**
100	**156**	267	**348**	452	560	686	816	979
114	210	**285**	392	522	630	753	881	

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

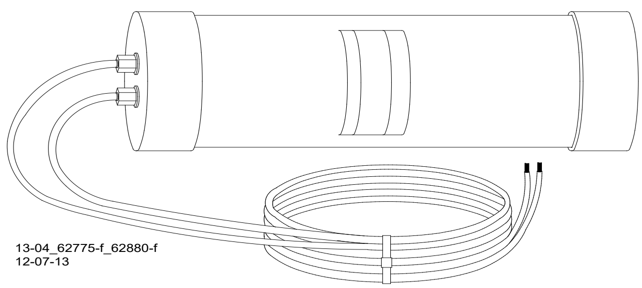
The Narrow-band Shunt, 62780 is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end.

7.5.1 Narrow-band Shunt, 62780-f Specifications

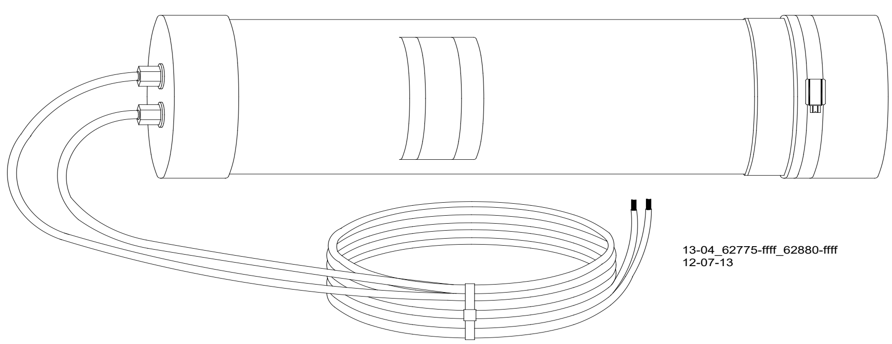
Length: 14.125 inches (35.9 centimeters)
Diameter: 4.125 inches (10.5 centimeters)
Weight: 7 pounds (3.18 kilograms) (approximate)
Frequencies: See Table 7-6
Leads: 10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC



Wideband Shunt, 8A076A



Narrow-band Shunt, 62775-f/62780-f



Multi-frequency Shunt, 62775-ffff/62880-ffff

Figure 7-9: Siemens Narrow-band and Wide-band Termination Shunts

7.5.2 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 MUST 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 SECTION 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 (section 7.4), is designed to terminate specific track frequencies in areas where other audio frequencies or DC coded track circuits are present.

7.5.3 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.

7.5.4 Frequency Selection

The Multifrequency Narrow-band Shunt is available in eight frequency ranges.

The Shunt is housed in a hermetically sealed, cylindrical case with a pair of 10-foot leads extending from one end and seven standard AREMA terminals extending from the other.

The terminals are labeled A through G and are jumpered to select the desired shunting frequency (Table 7-7).

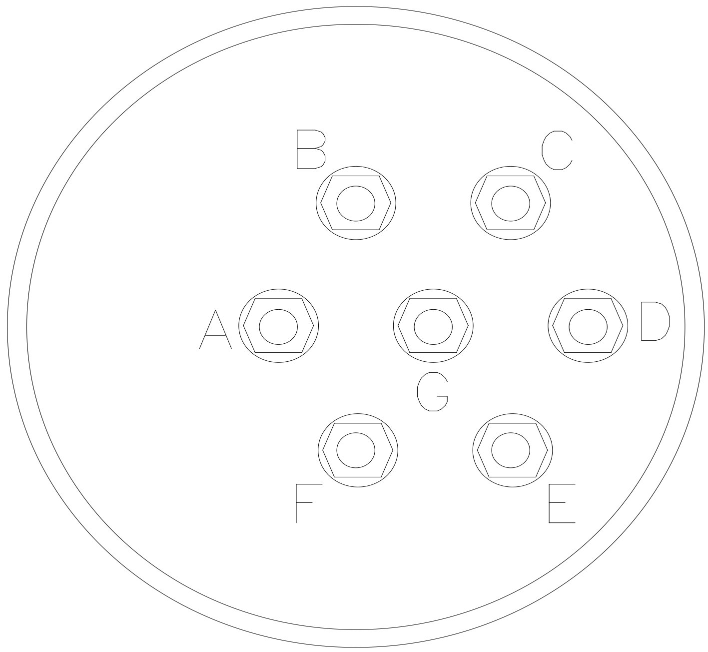


Figure 7-10: Multifrequency Narrow-Band Shunt, 62775-XXXX/62780-XXXX AREMA Binding Posts

NOTE

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.

7.5.5 Multifrequency Narrow-band Shunt, 62775-XXXX Specifications

Length: 22 inches (55.880 centimeters)
Diameter: 5 inches (12.700 centimeters)
Weight: 10 pounds (4.54 kilograms) (approximate)
Frequencies: See Table 7-7
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

Shunt Part Number	Frequency (Hz)	Jumper Shunt Terminals
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
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

7.6 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 MUST 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 SECTION 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 (section 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

7.6.1 Multifrequency Narrow-band Shunt, 62780-XXXX Specifications

Length: 22 inches (55.880 centimeters)
Diameter: 5 inches (12.700 centimeters)
Weight: 10 pounds (4.54 kilograms) (approximate)
Frequencies: See Table 7-8
Leads: 10 feet (3.048 meters); number 6 AWG, stranded, black PVC

7.7 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 MUST 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 SECTION 7.15.1). IT IS NOT NECESSARY TO BURY THE SHUNT BELOW THE FROST LINE.

NOTE

NOTE

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

7.7.1 Wideband Shunt Specifications

Length: 7.5 inches (19.050 centimeters)

Diameter: 3.35 inches (8.509 centimeters)

Weight: 7 pounds (3.18 kilograms) (approximate)

Leads: 10 feet (3.048 meters); number 6 AWG, stranded, black PVC

7.8 SIMULATED TRACK INDUCTOR, 8V617 (Used With Multifrequency Shunts)

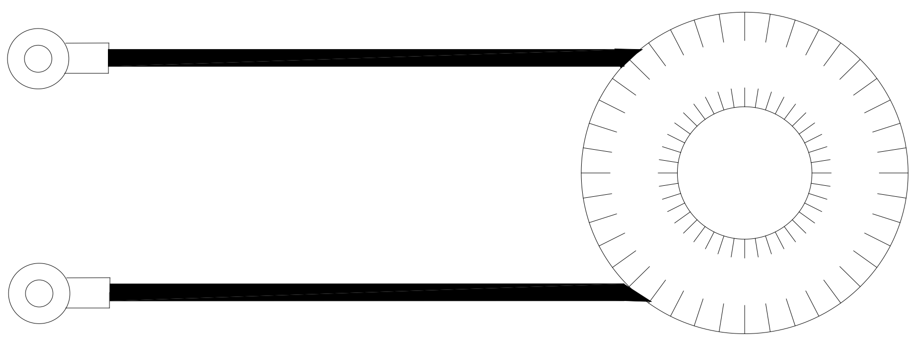
The Simulated Track Inductor, 8V617 (Figure 7-11) is intended for use with Siemens' Multifrequency Narrow-band Shunts (62775/62780).

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.



13-04_8V617
12-07-13

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)	-1600 (488)	-3000 (450)
	-0400 (122)	-1800 (549)	-3200 (976)
	-0600 (183)	-2000 (610)	-3400 (1037)
	-0800 (244)	-2200 (671)	-3600 (1098)
	-1000 ((309)	-2400 (732)	-3800 (1159)
	-1200 (366)	-2600 (793)	-4000 (1220)
	-1400 (427)	-2800 (854)	-4400 (1342)

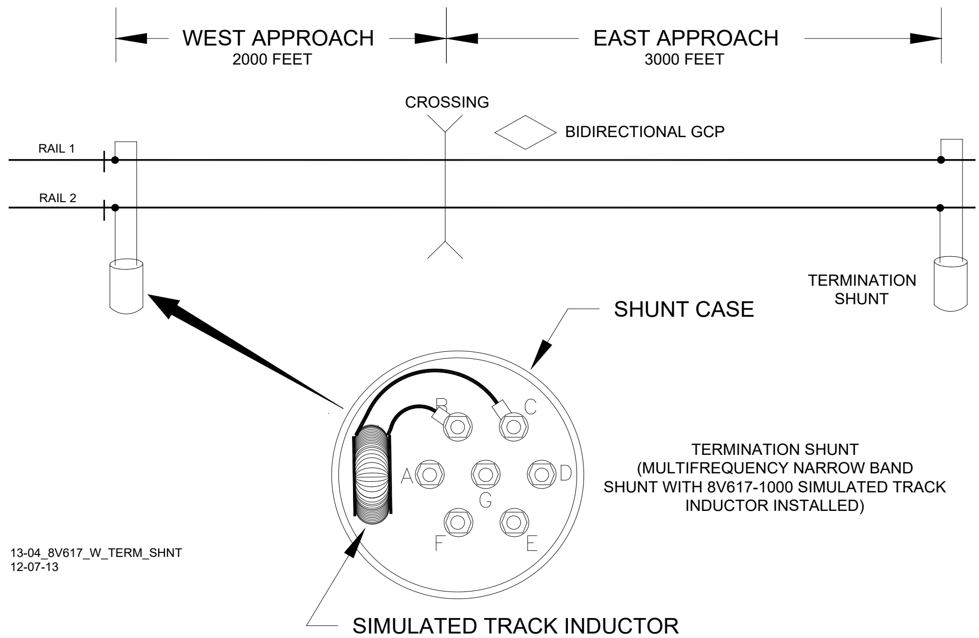


Figure 7-12: Simulated Track Inductor used with Termination Shunt

7.8.1 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.

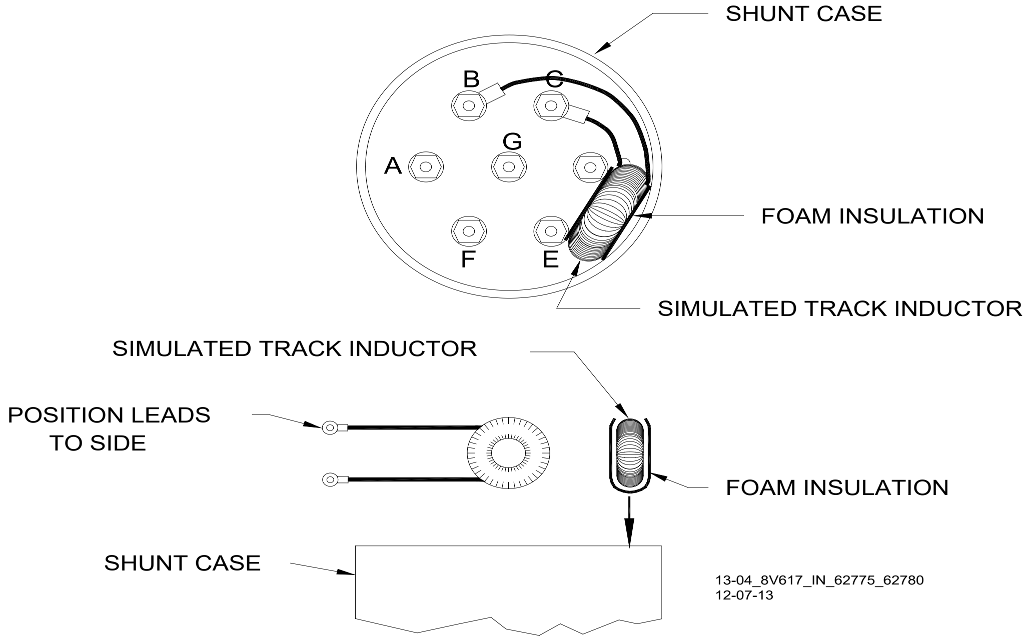


Figure 7-13: Typical Installation of 8V617 in 62775/62780 Shunt

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.

7.8.2 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
62775-3448*	348	A and B

Narrow-band Shunt Part No.	Frequency (Hz)	Remove Shorting Link and Connect Inductor Leads Between Shunt Terminals
	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

7.9 ADJUSTABLE 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 GCP 5000 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).

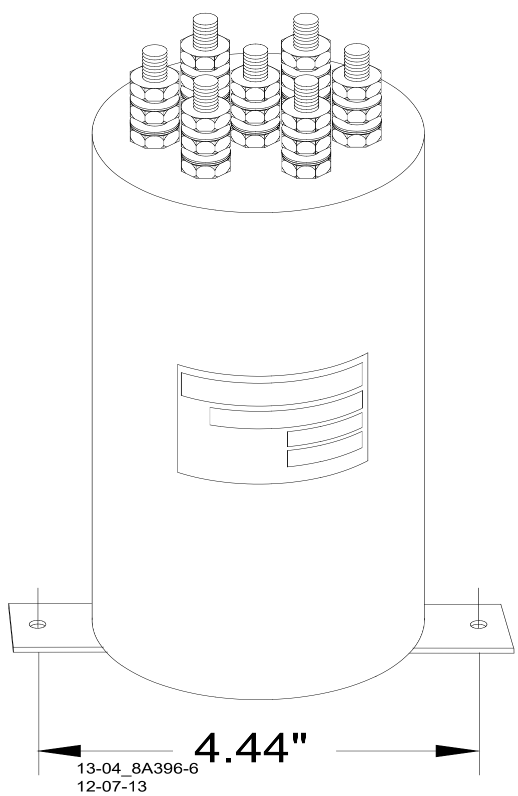


Figure 7-14: Adjustable Inductor Assembly, 8A398-6

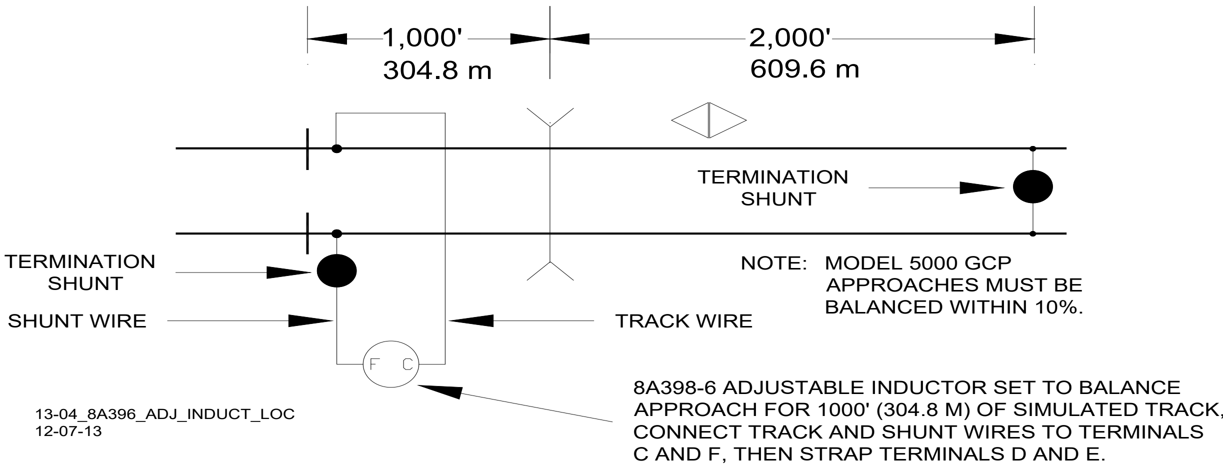


Figure 7-15: Adjustable Inductor used with Termination Shunt

7.9.1 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 & 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	

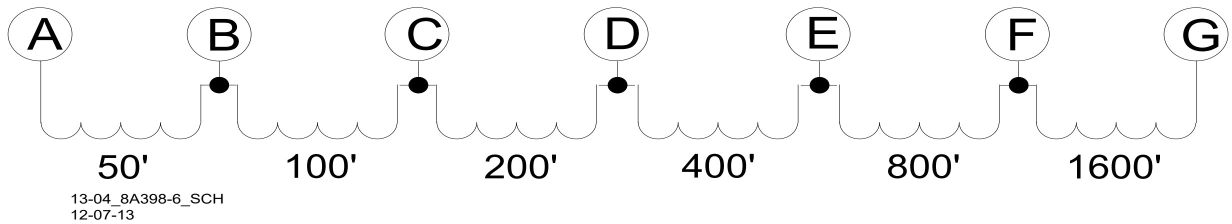


Figure 7-16: Adjustable Inductor, 8A398-6 Schematic

7.9.2 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)

7.10 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 sections 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.

7.10.1 Steady Energy DC Track Circuits

NOTE

NOTE

If the track connections for the DC track circuit are 1,000 ft (304.8 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 GCP 3000/4000/5000 approach.
- Less than 1,000 ft. (304.8 m) beyond the approach termination.

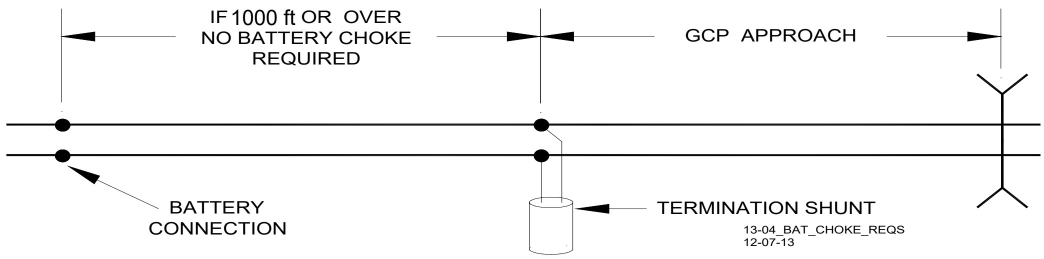


Figure 7-17: Battery Choke Requirements

Either of the following battery chokes may be used: (see limitations in the following sections):

- 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 (section 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).

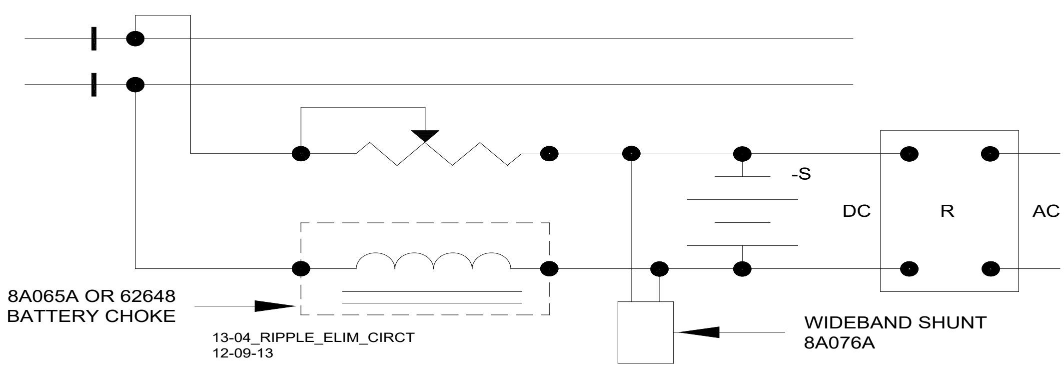


Figure 7-18: Ripple Elimination Circuit

7.10.2 62648 and 8A065A Battery Chokes Specifications

Dimensions –
Width: 4.5 inches (11.430 centimeters)
Depth: 5.0 inches (12.700 centimeters)
Height: 8.5 inches (21.590 centimeters) (to top of terminal studs)
Weight: 17 pounds (7.72 kilograms) (approximate)

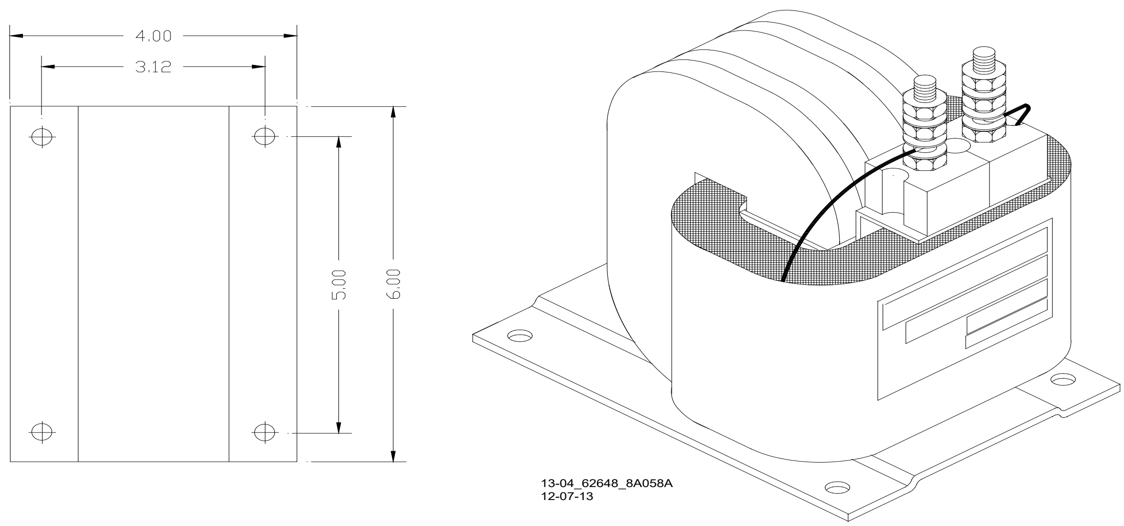


Figure 7-19: 62648/8A065A Battery Choke with Mounting Dimensions

7.10.3 Siemens GEO Electronic DC Coded System

The standard Siemens GCP 5000 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 high 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.

7.10.4 ElectroCode Electronic Coded System

GCP 5000 frequencies of 86 Hz and above can normally be used with Electro Code.

- All frequencies of 211 Hz and lower require use of high current track drive.
- In certain instances, 285 Hz may also require high 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 GCP 5000 approach.

NOTE

NOTE

Under some circumstances, an external track filter may be required when electronic coded track is located within the GCP 5000 approach. As with any coded track system, the lower the transmit level, the less interference to GCP units.

7.10.5 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 GCP 5000. 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.

7.10.6 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, WITH THE 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 high GCP track drive current.

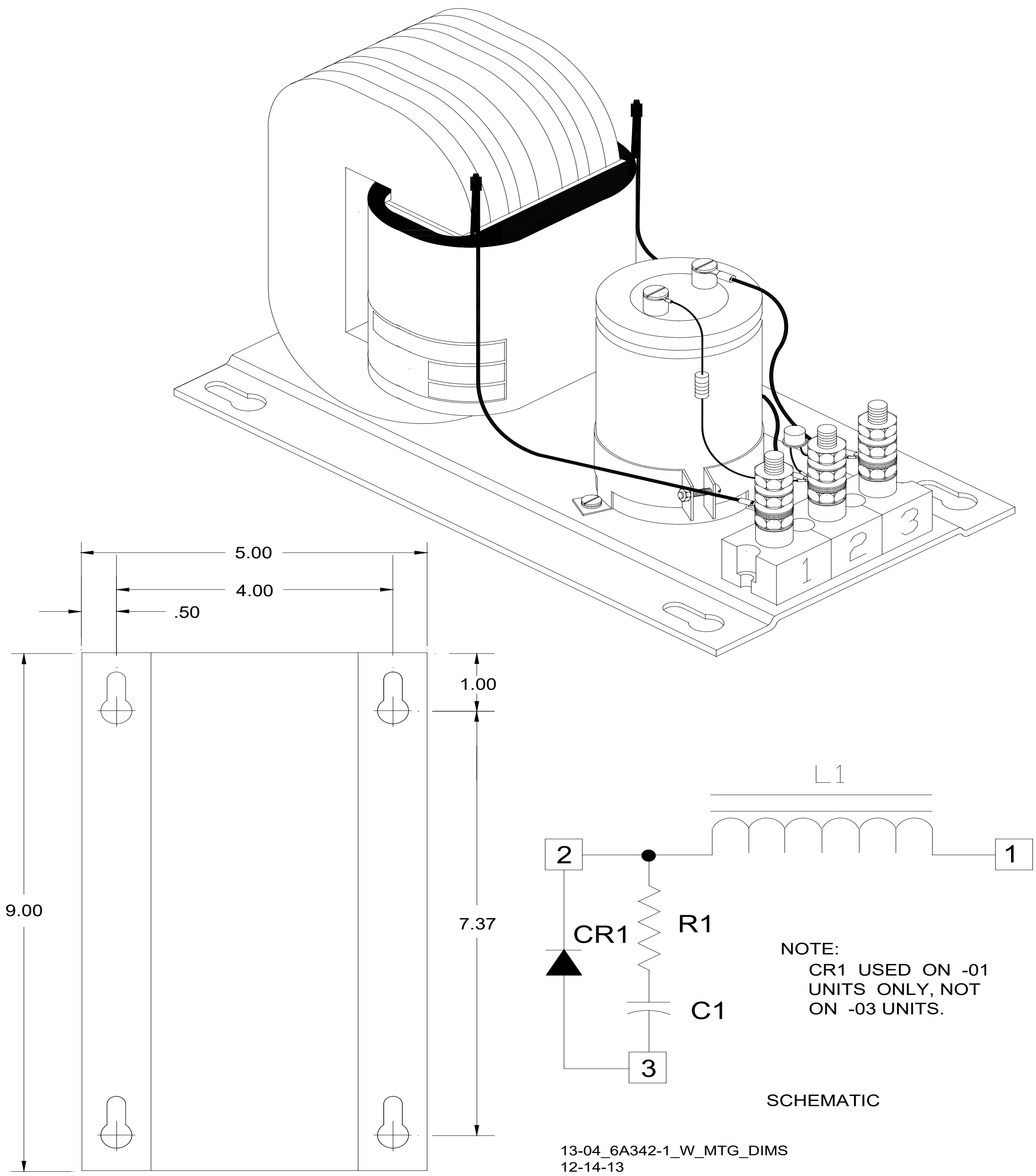


Figure 7-20: DC Code Isolation Unit, 6A342-1, With Mounting Dimensions

⚠ WARNING	**WARNING** **ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF THE ISOLATION UNIT.**

7.10.6.1 DC Code Isolation Unit, 6A342-1 Specifications

Dimensions –
Width: 5.0 inches (12.700 centimeters)
Depth: 9.0 inches (22.860 centimeters)
Height: 5.75 inches (14.605 centimeters)
Weight: 15 pounds (6.81 kilograms) (approximate)

7.10.6.2 DC Code Isolation Unit, 6A342-1 Applications

Three applications for the 6A342-1 DC Code Isolation Units are discussed in the following sections.

7.10.6.3 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.

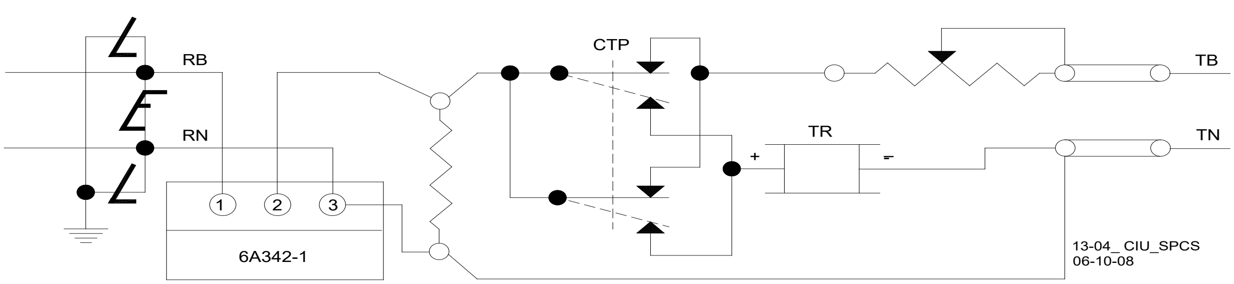


Figure 7-21: Code Isolation Unit In a Single Polarity Code System

7.10.6.4 GRS Trakode (Dual Polarity) Systems

WARNING

TO INSTALL THE UNIT AS SHOWN, A TRANSFER DELAY (TD) RELAY MUST BE USED. DO NOT INSTALL ANY CODE ISOLATION CIRCUIT IN GRS TRAKODE WITHOUT USE OF THE TD RELAY.

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

NOTE

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

The following figure shows the 6A342-1 Code Isolation unit installed in a GRS Trakode system.

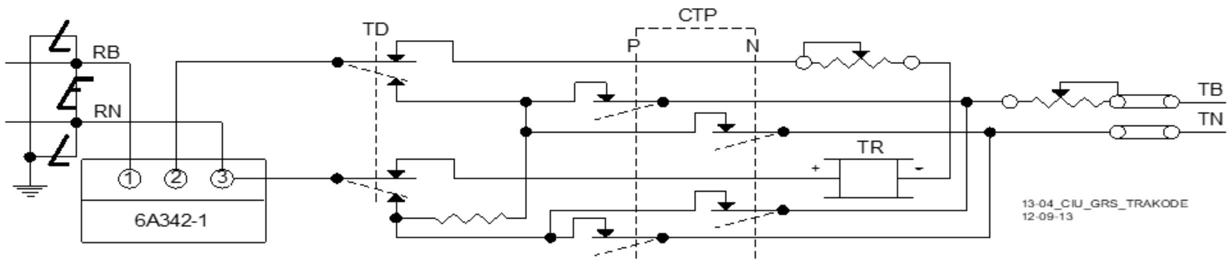


Figure 7-22: Code Isolation Unit Installation In a GRS Trackode System

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

WARNING

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

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

7.10.6.6 DC Code Isolation Unit, 6A642-3

The 6A342-3 Code Isolation unit can be used in a dual polarity system; however, two 6A342-3 units must be specifically placed at each end of the circuit for proper filtering. The application will depend upon the track circuit configuration. Contact Siemens Technical Support for assistance in dual polarity code systems.

7.10.7 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.

7.10.7.1 AC Code Isolation Unit, 8A466-3

The 8A466-3 AC Code isolation unit is used in 60 Hz CAB signal track circuit installations to reduce 60 Hz harmonics from being applied to the track. It is used with GCP frequencies 156 Hz and higher. It is housed in a steel case with top mounted AREMA binding posts provided for track connections.

7.10.7.2 AC Code Isolation Unit, 8A466-3 Specifications

Dimensions –

Width: 10.15 inches (25.781 centimeters)

Depth: 11.78 inches (29.921 centimeters)

Height: 7.62 inches (19.355 centimeters)

Weight: 26 pounds (11.8 kilograms) (approximate)

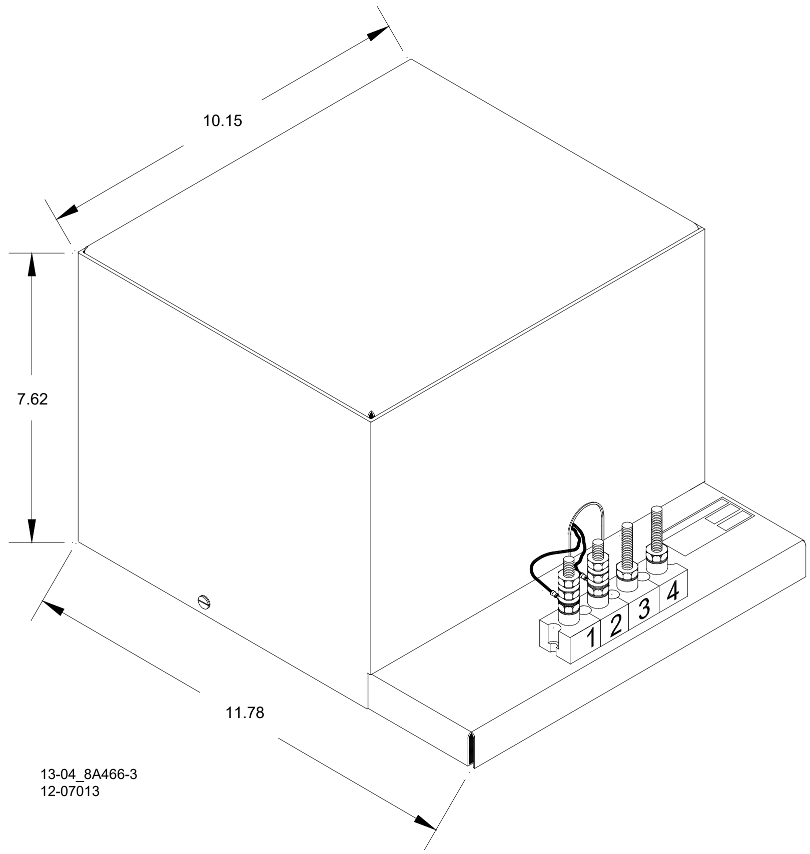


Figure 7-23: AC Code Isolation Unit, 8A466-3

7.10.7.3 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.

7.10.7.4 AC Code Isolation Unit, 8A470-100 Specifications

Dimensions –

Width: 5.0 inches (12.700 centimeters)

Depth: 9.4 inches (23.876 centimeters)

Height: 9.0 inches (22.860 centimeters)

Weight: 5 pounds (2.27 kilograms) (approximate)

7.10.7.5 Cab Signal AC

WARNING

WARNING

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION FOLLOWING INSTALLATION OF A CAB SIGNAL UNIT.

Application of GCP 5000 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.

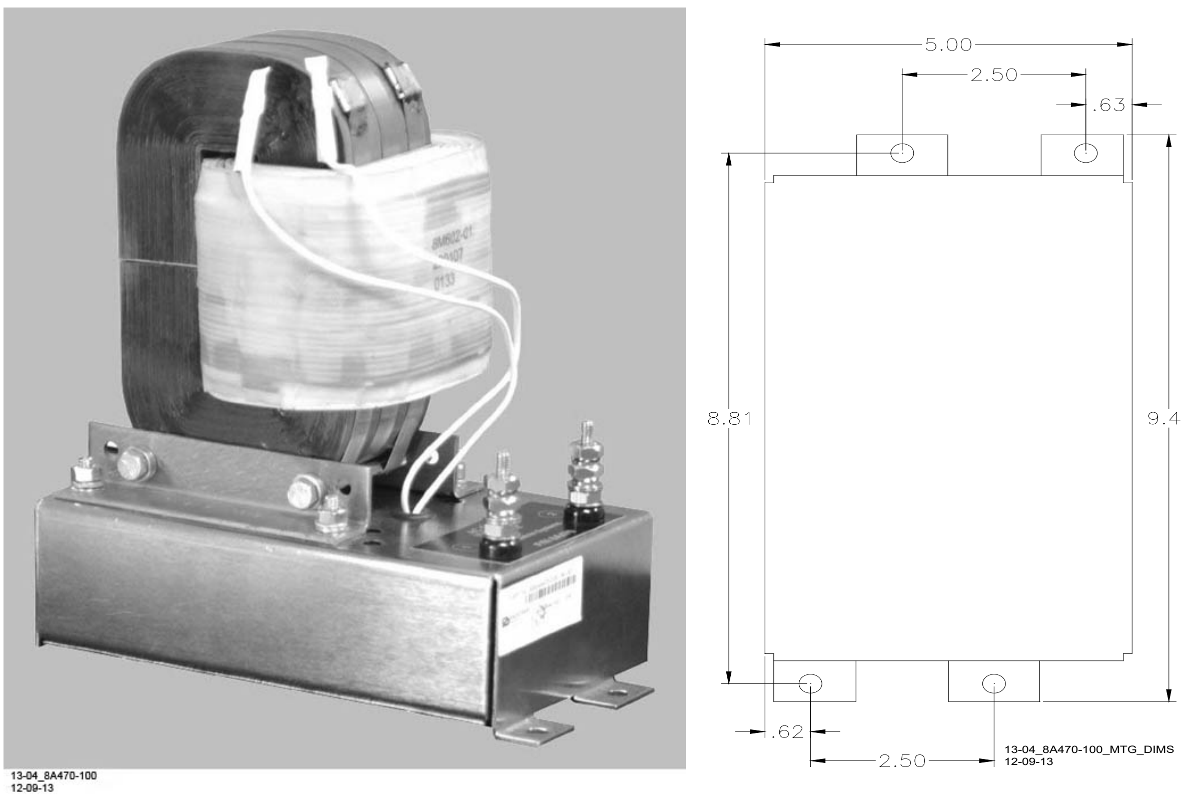


Figure 7-24: AC Code Unit, 8A470-100 with Mounting Dimensions

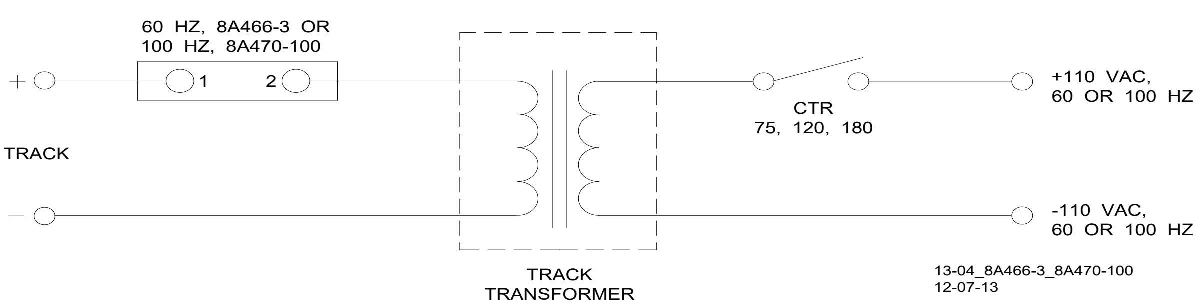


Figure 7-25: AC Code Isolation Unit used in CAB Territory

7.10.7.6 Style C Track Circuits

The 60 Hz AC Code Isolation unit (8A466-3) is used with style C track circuits as shown in Figure 7-26.

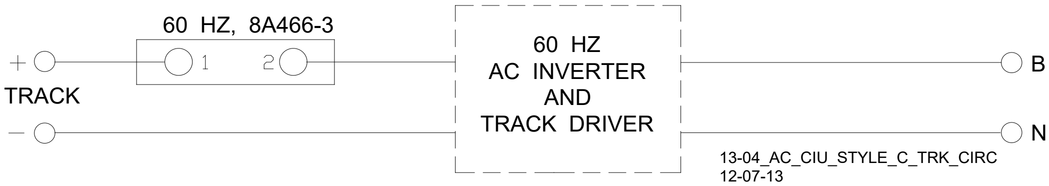


Figure 7-26: AC Code Isolation Unit used in Style C Track Circuits

7.10.7.7 AC Code Isolation Unit, 8A471-180

For special applications, 180 Hz AC Code Isolation Unit (8A471-180) is also available. Contact Siemens Technical Support for specific information.

7.11 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 GCP 5000 for bypassing insulated joints in DC coded track.

- The 62785-f Bypass Coupler is used in all GCP 5000 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 GCP 5000.

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 GCP 5000 IS PROGRAMMED AS A PREDICTOR, THE 62785-F COUPLER CANNOT BE USED TO BYPASS INSULATED JOINTS WITHIN THE INNER TWO-THIRDS OF AN APPROACH, EXCEPT AS SPECIFIED IN TABLE 7-12.

THE TUNED JOINT COUPLER MUST BE TUNED PRIOR TO PERFORMING SETUP FOR APPROACH LENGTH AND LINEARIZATION PROCEDURES DURING THE TRACK CALIBRATION PROCESS.

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 GCP 5000 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 GCP 5000 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 GCP 5000 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 GCP 5000 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	N/A	N/A
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.

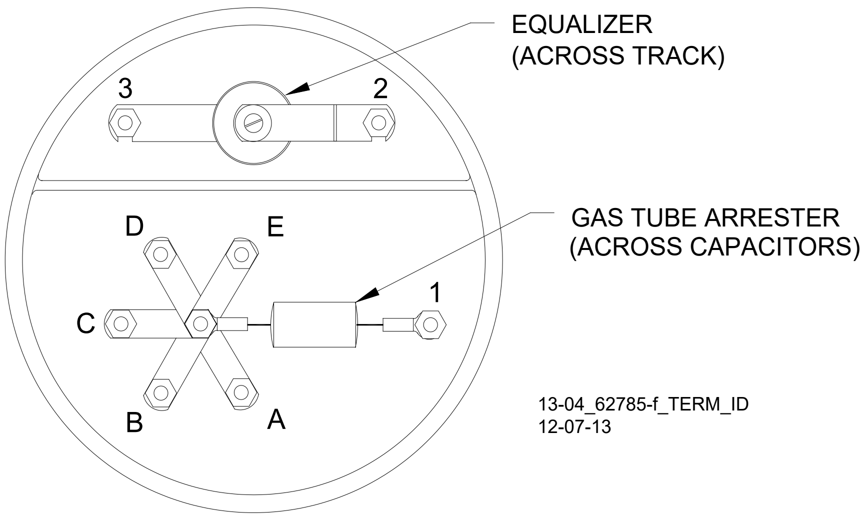


Figure 7-27: Terminal Identification, 62785-f Tunable Insulated Joint Coupler

The Coupler is tuned in the following sequence:

- The gold nut on terminal E is tightened first.
- Calibrate the GCP 5000 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 section 7.12.1 primarily. Use the procedure outlined in section 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 SECTION 5.13). IT IS NOT NECESSARY TO BURY THE COUPLER BELOW THE FROST LINE.

NOTE

NOTE

Multiple couplers often require the procedures in section 7.12.2 for proper setup.

7.11.1 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 GCP 5000 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 GCP 5000 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.

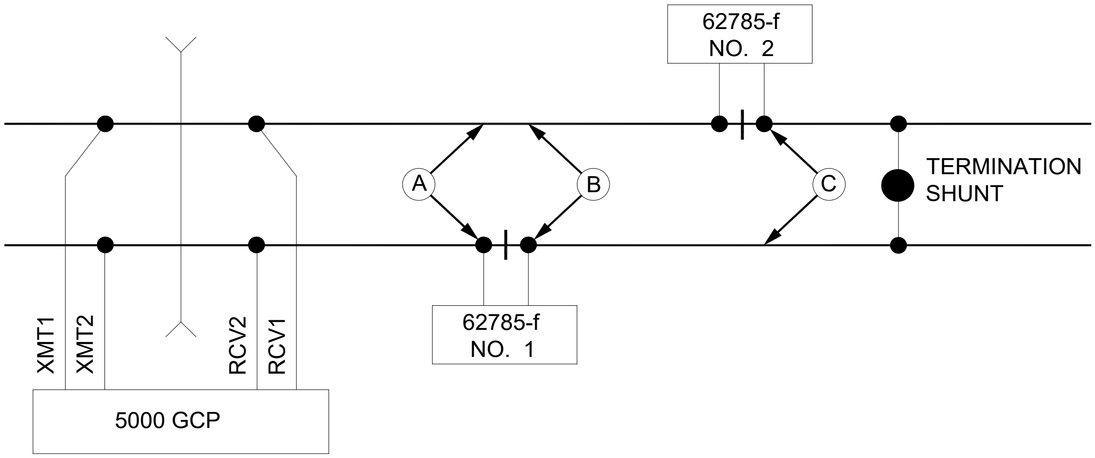
Tighten the gold nut on the Coupler **#1** terminals labeled D, C, B, and A, in sequence beginning with terminal D.

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.

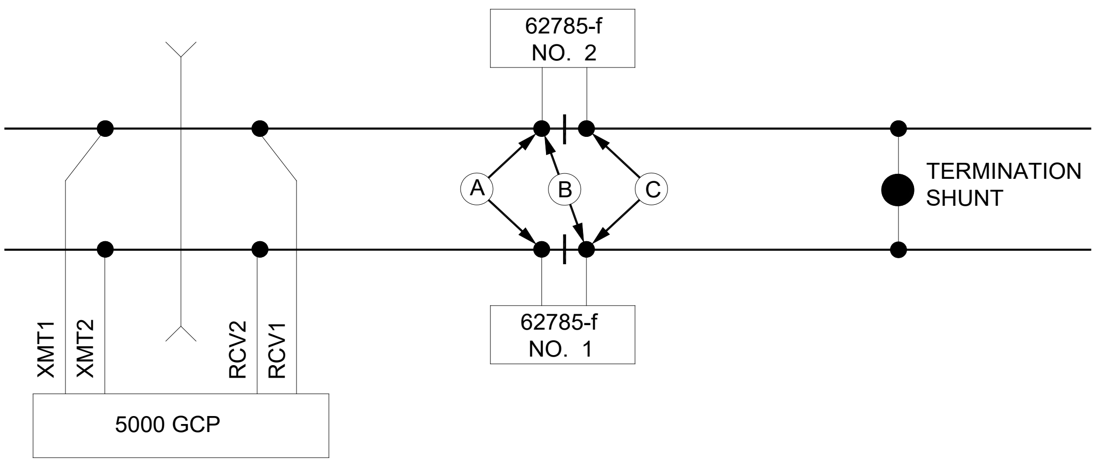
If, after tightening a nut, the EZ value remains higher than the value recorded in Step 4, leave the nut tightened and tighten the next nut in sequence.

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



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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 GCP 5000 and perform all operational checks while observing the smooth change in the EZ value across the couplers during a train move.

7.11.2 Field Tuning Procedure #2 for Couplers

Step 1: Tighten the gold nut securely on terminal E of each coupler.

Step 2: Calibrate the GCP 5000 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 GCP 5000 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 GCP 5000 and perform all the operational checks while observing the relatively smooth change in the EZ value across the couplers during a train move.

7.11.3 Tunable Insulated Joint Bypass Coupler, 62785-f Specifications

Dimensions –

Length: 18 inches (45.720 centimeters)

Diameter: 6 inches (15.240 centimeters)

Weight: 12 pounds (5.45 kilograms) (approximate)

Leads: 10 feet (3.048 meters); #6 AWG, stranded, black PVC

Part Numbers –

Surge Suppresser Equalizer, 022700-21X, Siemens No. Z803-00052-0001

Gas Tube Arrester, Siemens No. Z803-00053-0001

7.12 ETHERNET SPREAD-SPECTRUM RADIO (ESSR), 533XX

Siemens Ethernet Spread-Spectrum Radios may be used to provide a vital RF communications link between GCP 5000 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).

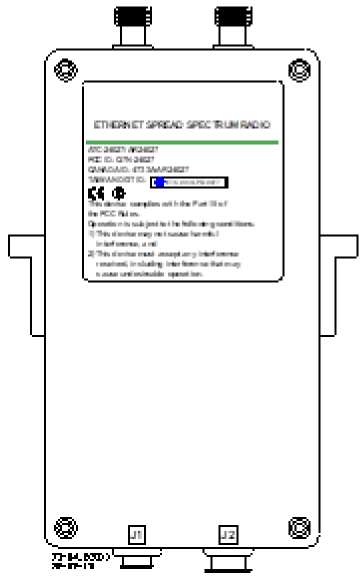


Figure 7-29: Ethernet Spread Spectrum Radio, 533XX

7.13 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.

7.13.1 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).

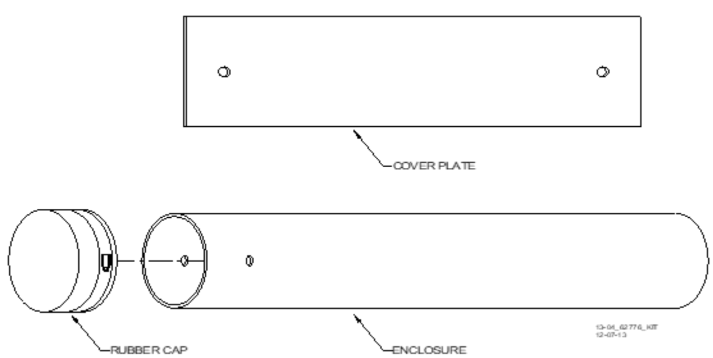


Figure 7-30: MS/GCP Termination Shunt Burial Kit, 62776

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.

7.13.2 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.

7.13.3 55BShunt Kit Assemblies Specifications

Enclosure (PVC) Length (without end cap):	24 inches (60.960 centimeters)
Diameter (inside):	6 inches (15.240 centimeters)
Cover Plate (Steel) Length:	24 inches (60.960 centimeters)
Width:	7 inches (17.780 centimeters)
Thickness:	0.25 inch (0.635 centimeters)
Enclosure Weight:	5 pounds (2.27 kilograms)
Cover Plate Weight:	12 pounds (5.44 kilograms)

7.14 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 ENSURE THAT FAILURE MODES OF DEVICE DO NOT COMPROMISE THE SAFETY OF THE GCP 5000 SYSTEM.

FOR EXAMPLE, BUT NOT LIMITED TO, UNINTENTIONAL EARTH GROUNDS ON CONTROL CIRCUITS OR SHORTS ON TRACK CIRCUITS.

7.14.1 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.

7.14.2 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.

7.14.3 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 the following figure.

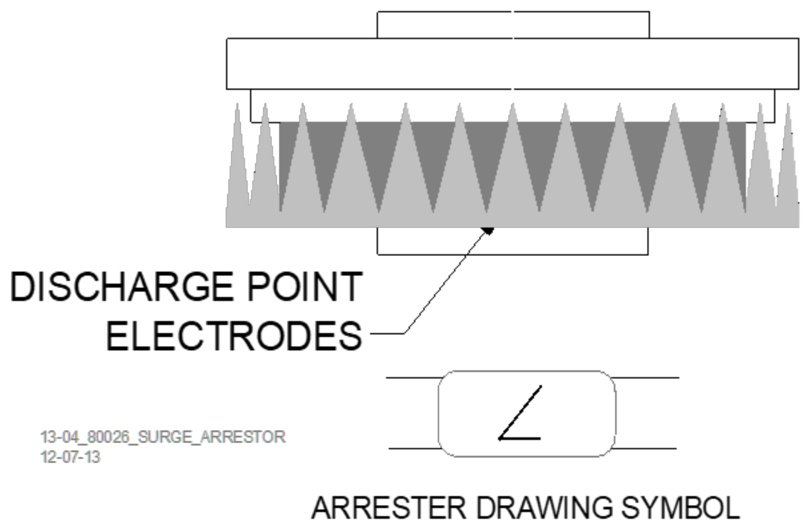


Figure 7-31: Typical 80026 Surge Panel Arrester Mounting Position

Table 7-13: Wall Mount Surge Panels

Part No.	Fig.	Description	Dimensions	Weight
80026-01	Figure 7-32	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	Figure 7-32	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	Figure 7-32	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 7-14: Rack Mount Surge Panels

Part No.	Fig.	Description	Dimensions	Weight
80026-31	Figure 7-33	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	Figure 7-33	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	Figure 7-34	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	Figure 7-34	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	Figure 7-35	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	Figure 7-35	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	Figure 7-36	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	Figure 7-36	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	Figure 7-37	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)
80026-41	Figure 7-37	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)

Part No.	Fig.	Description	Dimensions	Weight
80026-41A	Figure 7-37	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	Figure 7-38	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	Figure 7-38	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)

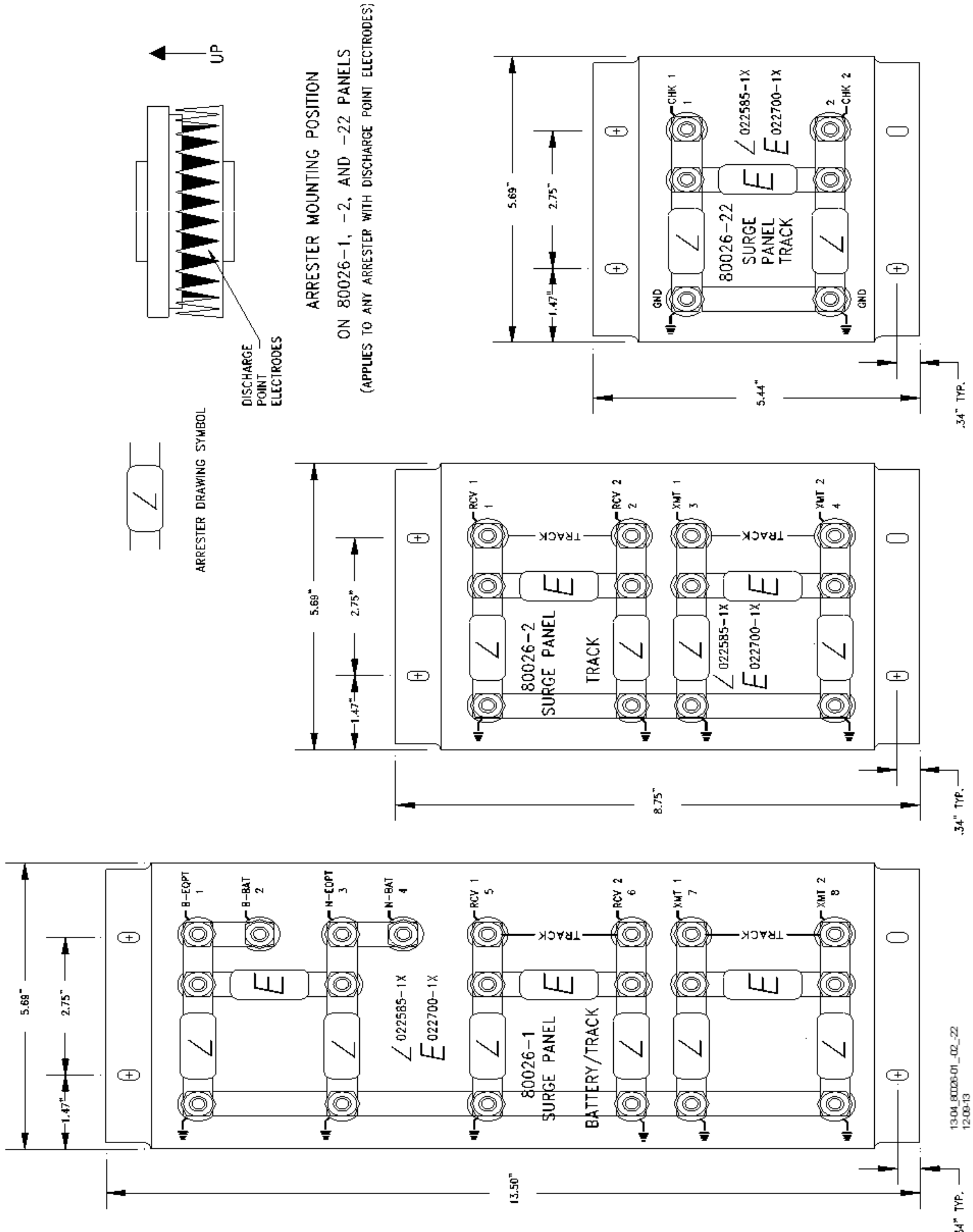


Figure 7-32: Wall Mount Surge panels, 80026-01, -02, and -22

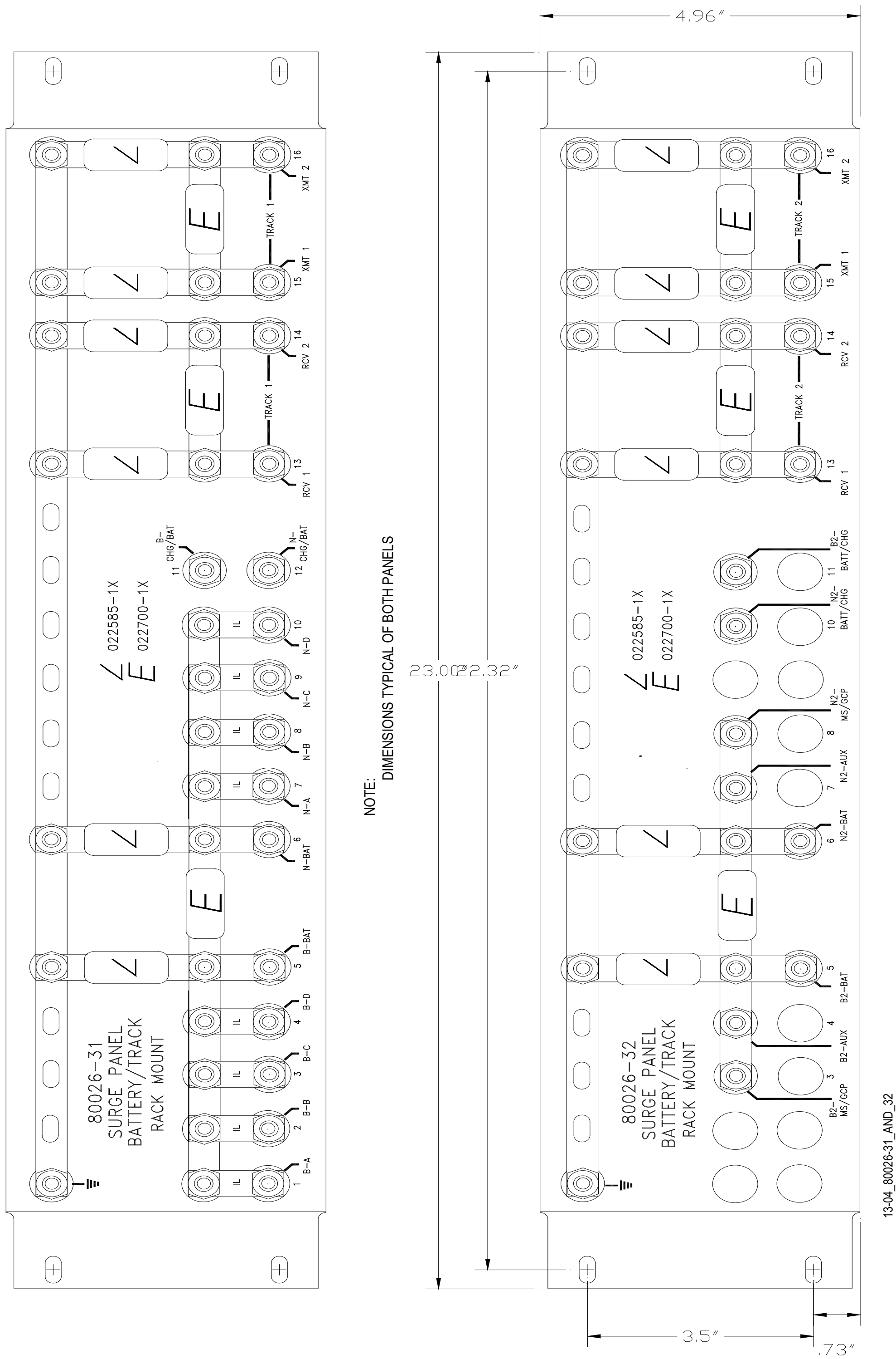


Figure 7-33: Rack Mounted Surge Panels, 80026-31 and -32

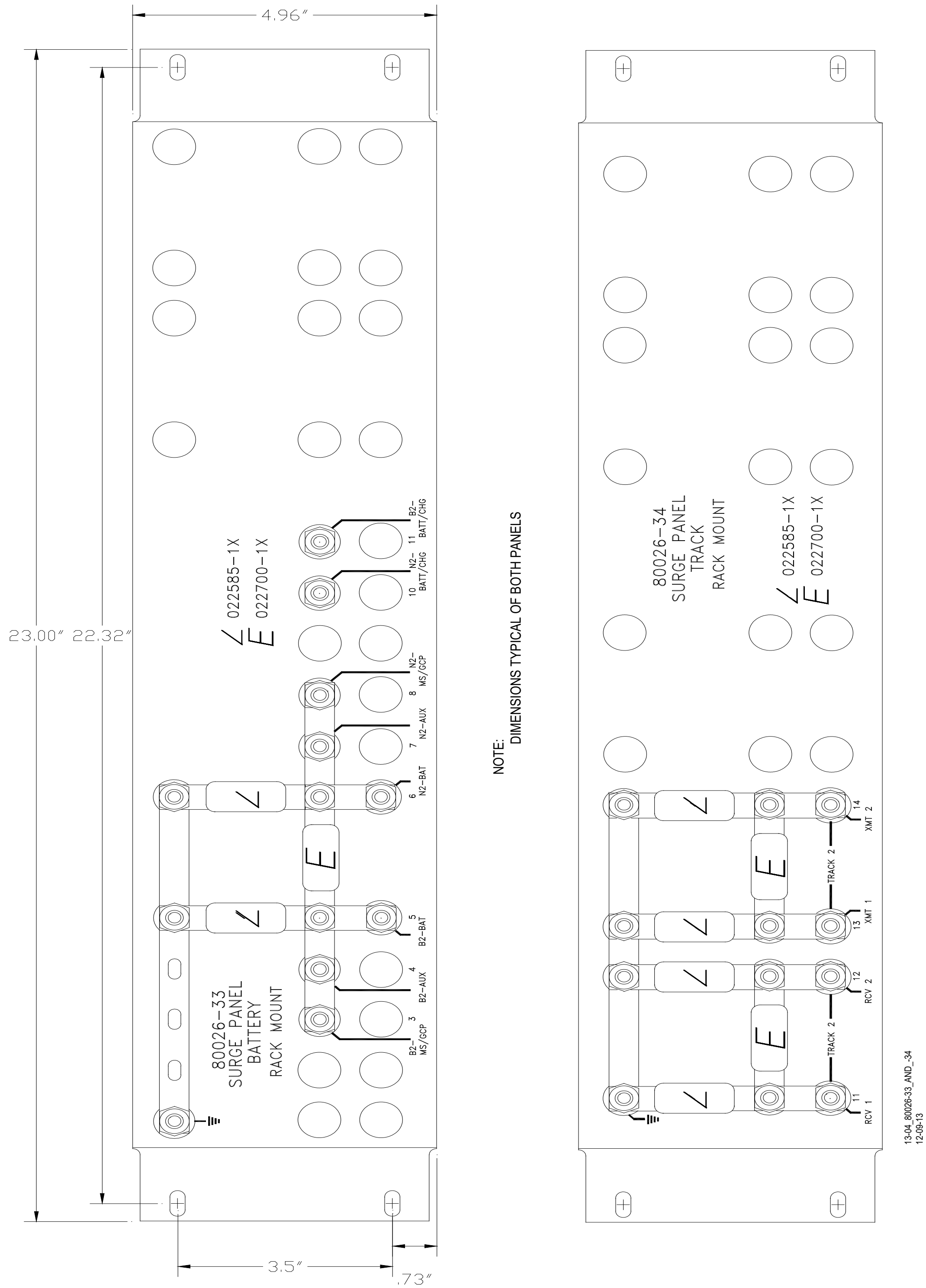


Figure 7-34: Rack Mounted Surge Panels, 80026-33 And -34

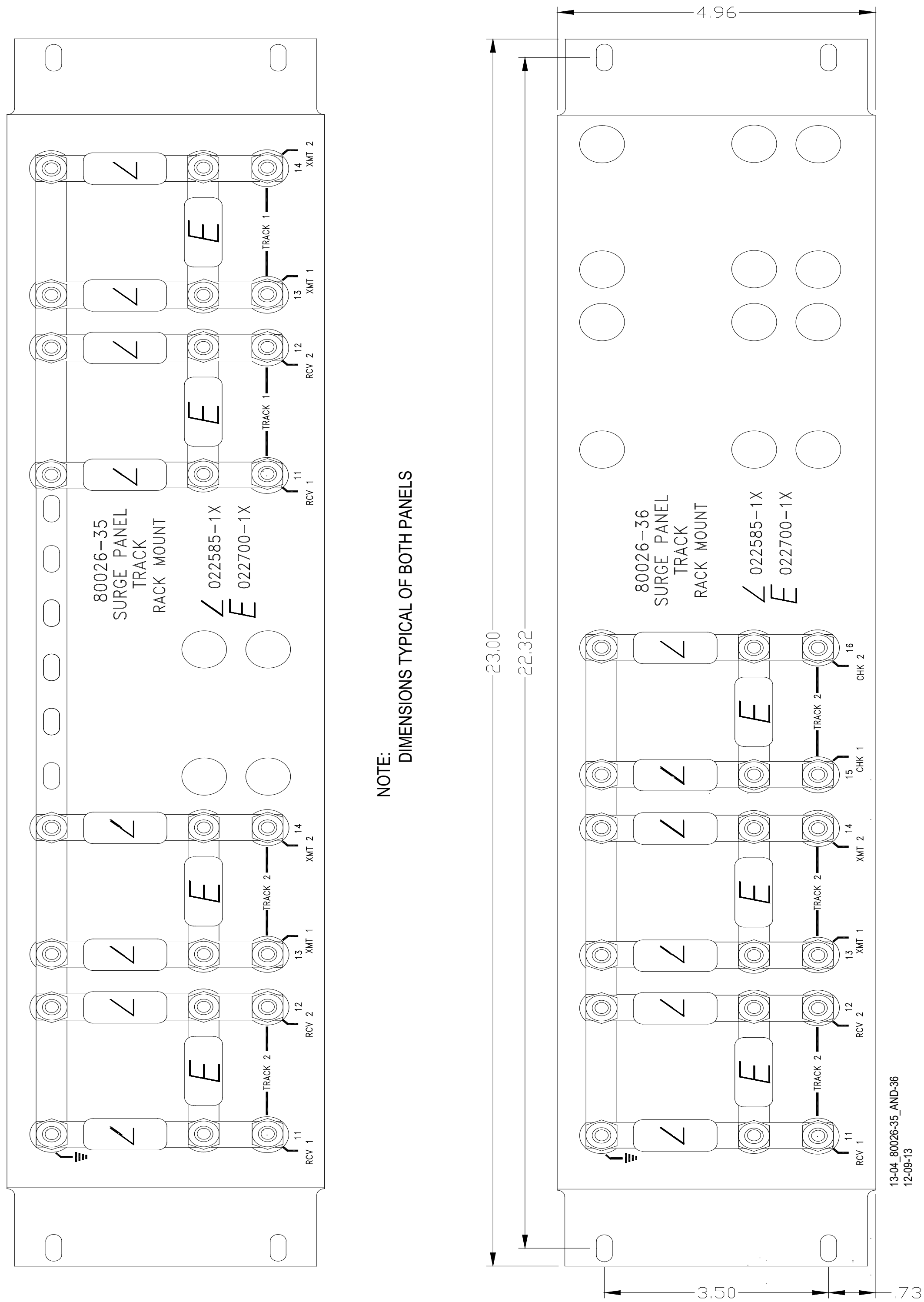


Figure 7-35: Rack Mounted Surge Panels, 80026-35 and -36

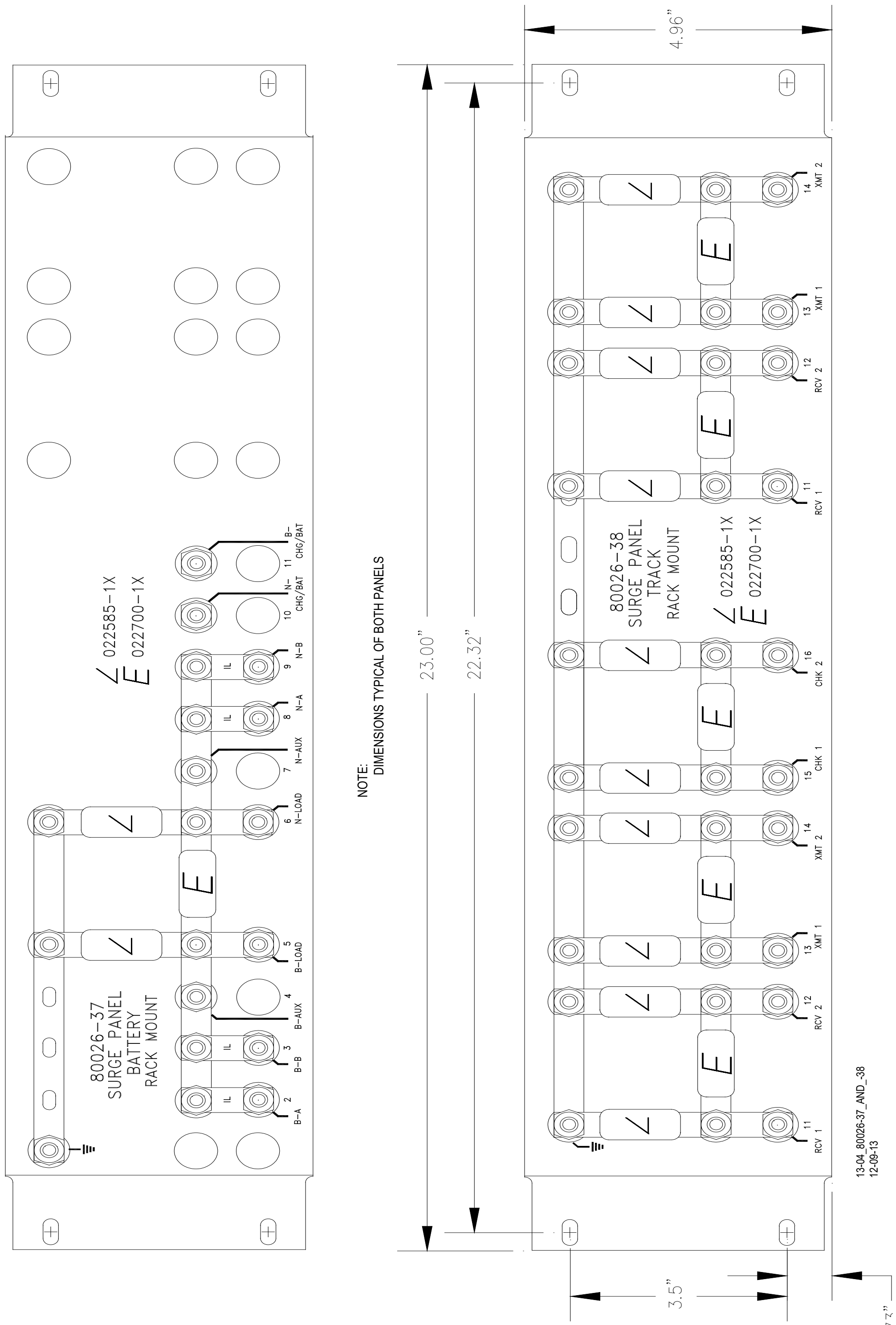


Figure 7-36: Rack Mounted Surge Panels, 80026-37 And -38

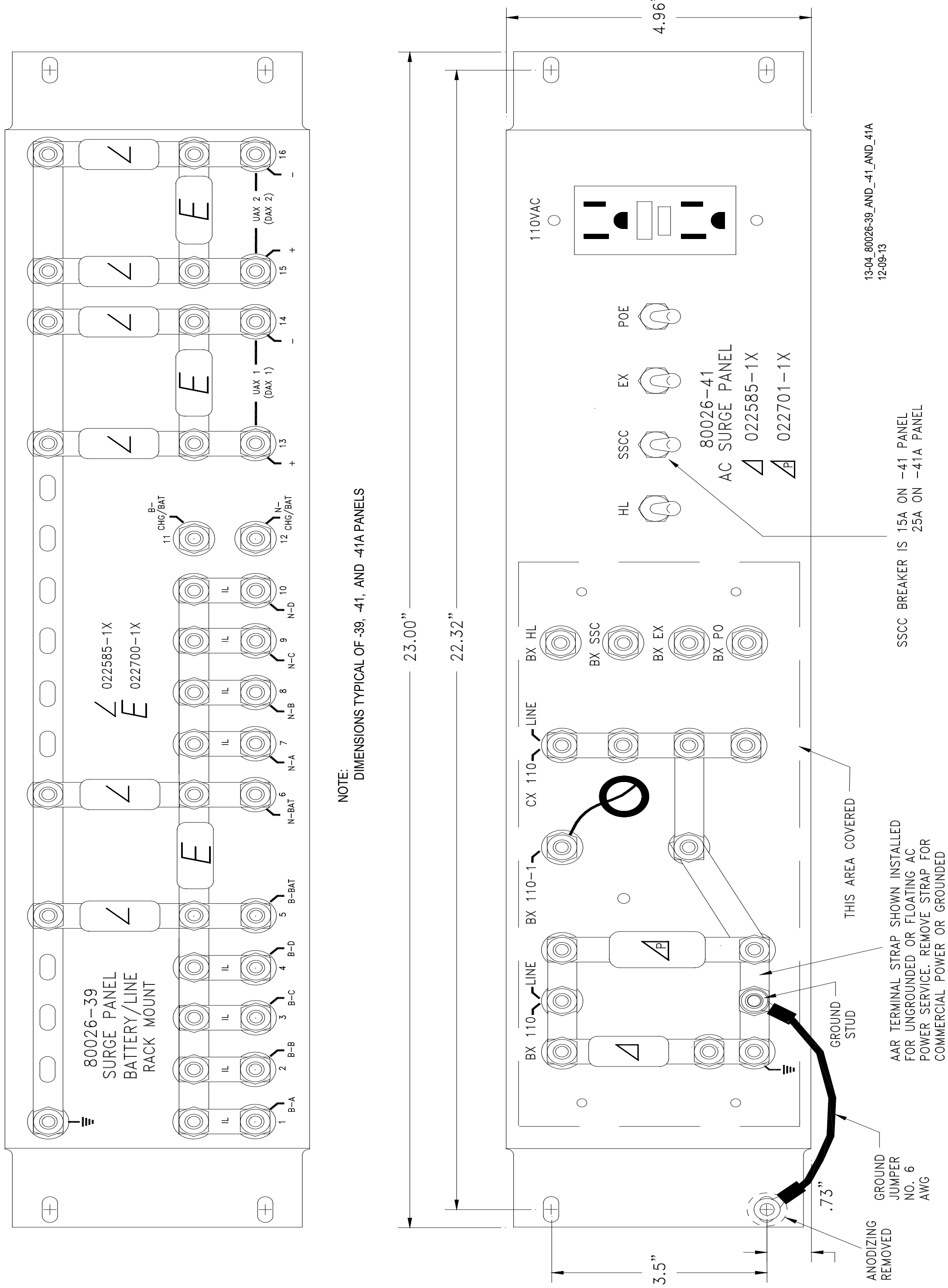


Figure 7-37: Rack Mounted Surge Panels. 80026-39, -41 and -41A

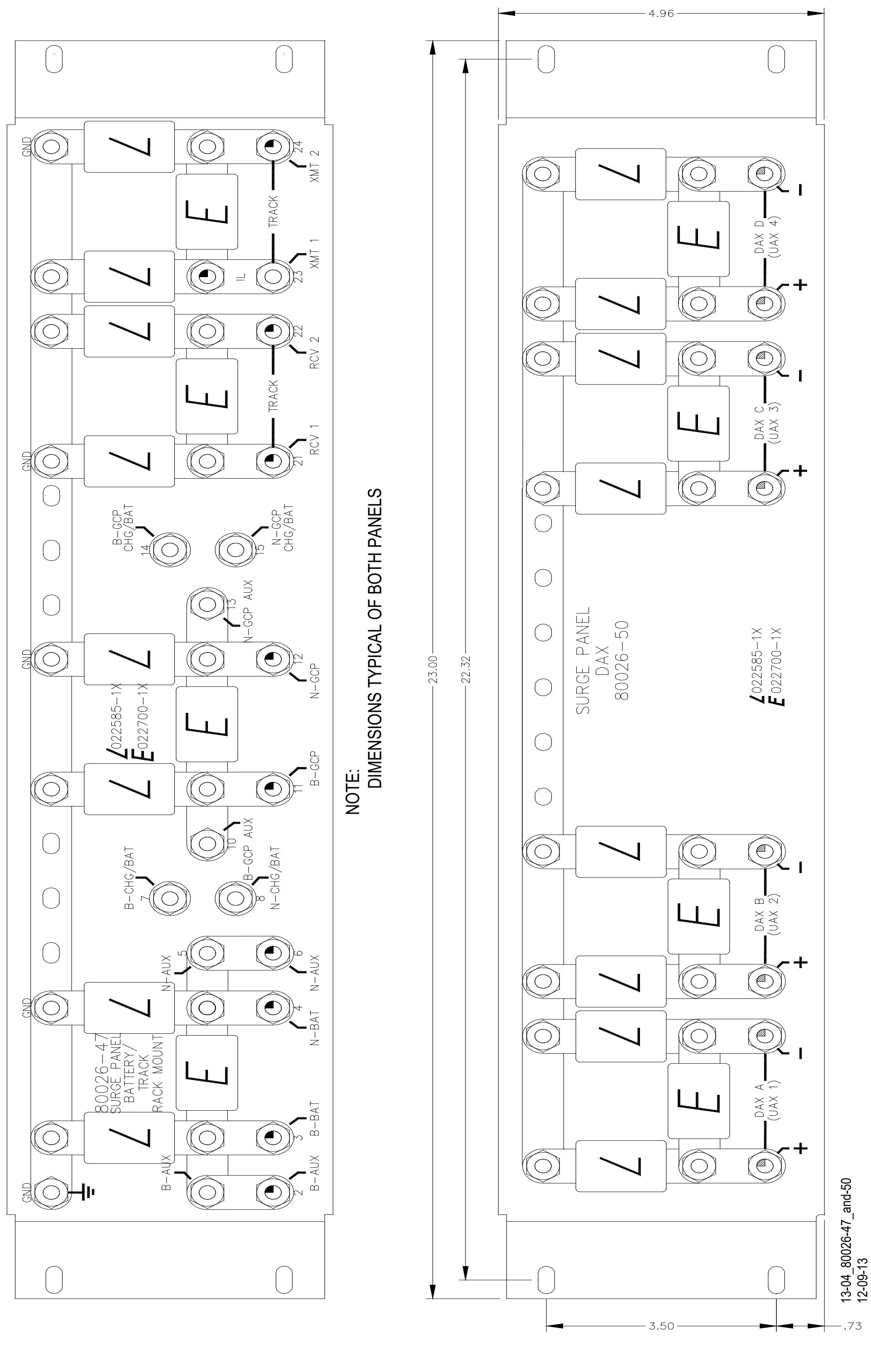


Figure 7-38: Rack Mounted Surge Panels 80026-47 and 80026-50

7.15 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.

7.15.1 Rectifier Panel Assembly Nomenclature and Mounting Dimensions-

Rectifier Panel Assembly, 80033 nomenclature and mounting dimensions are provided on Figure 7-46.

Table 7-15: 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)

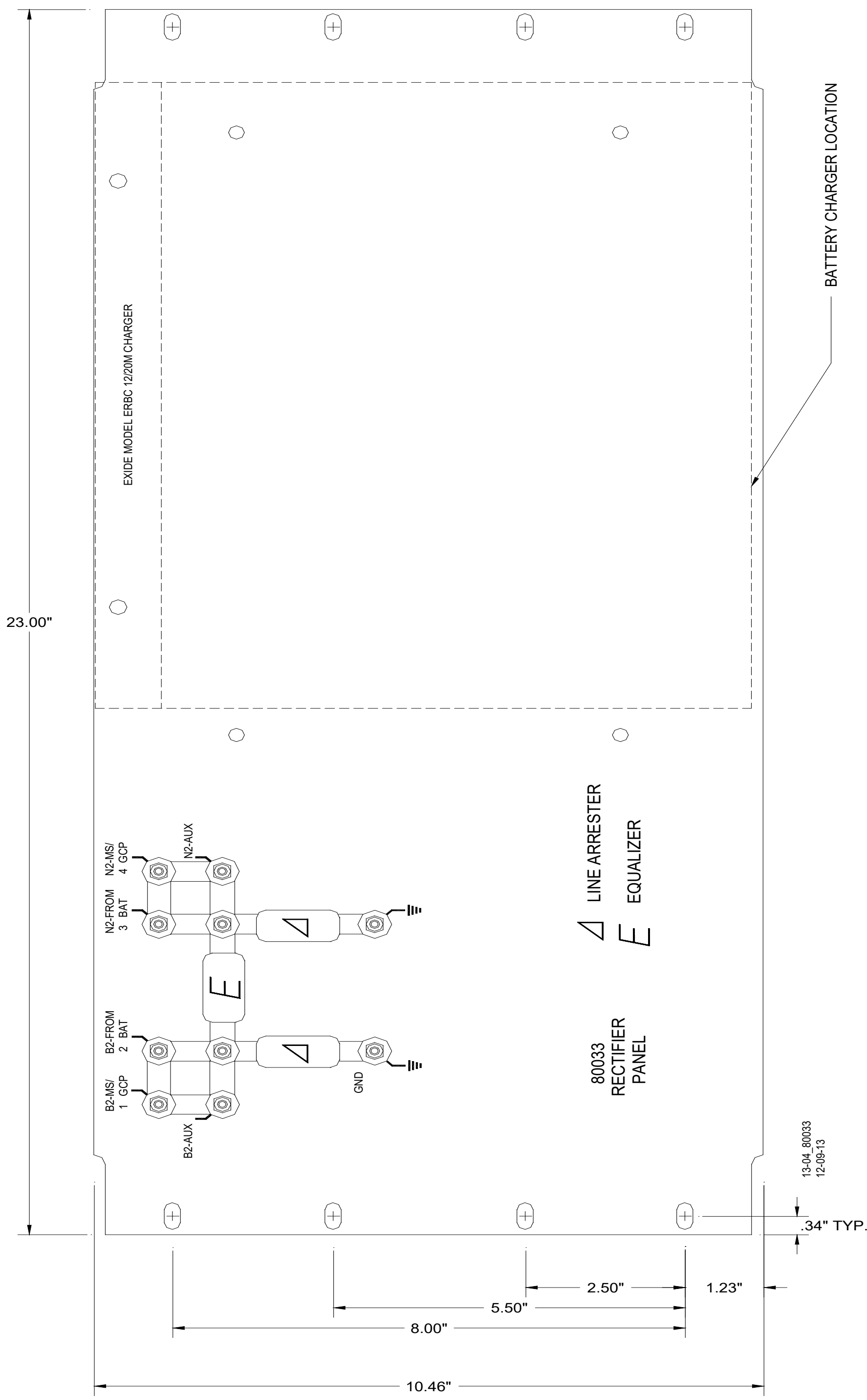


Figure 7-39: Rectifier Panel Assembly, 80033

7.16 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 7-16: 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)

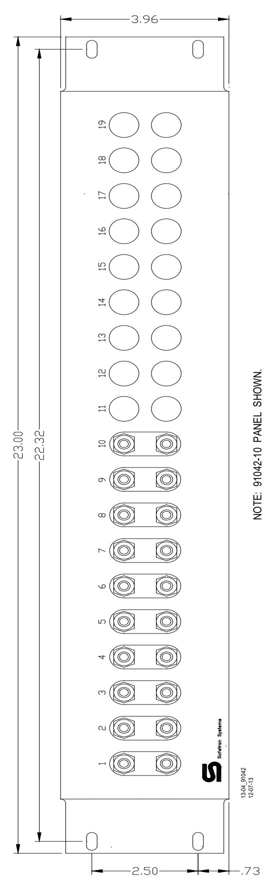


Figure 7-40: Cable Termination Panel Assembly, 91042

7.17 SSCC III LIGHTING SURGE PANELS, 91170-1 & 91181-1

WARNING

WARNING

ANY ALTERNATIVE SURGE PROTECTION DEVICE MUST BE ANALYZED TO ENSURE THAT FAILURE MODES OF DEVICE DO NOT COMPROMISE THE SAFETY OF THE GCP 5000 SYSTEM.

FOR EXAMPLE, BUT NOT LIMITED TO, CROSSES AND GROUNDS.

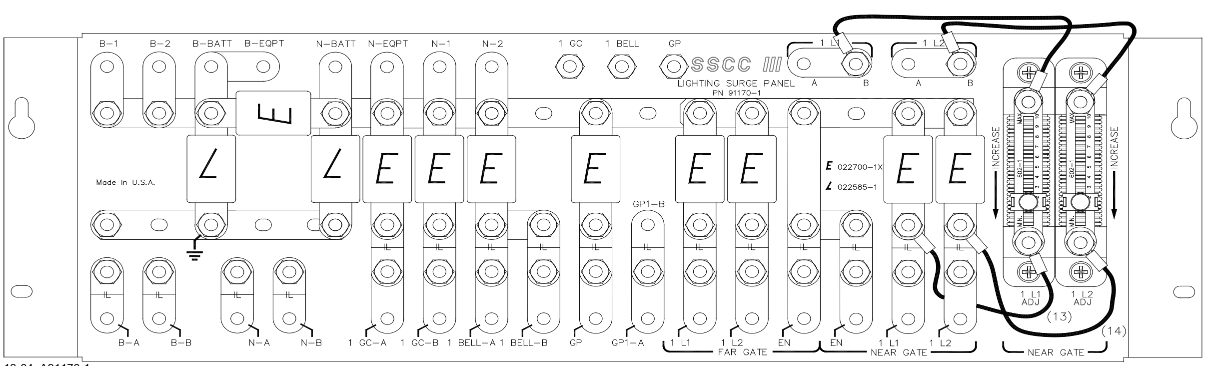
The SSCC IIIi Lighting Surge Panels provide external I/O primary surge protection for the 80405 Solid State Crossing Controller IIIi (SSCC IIIi) module and grade crossing gate controller circuitry.

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.

7.17.1 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

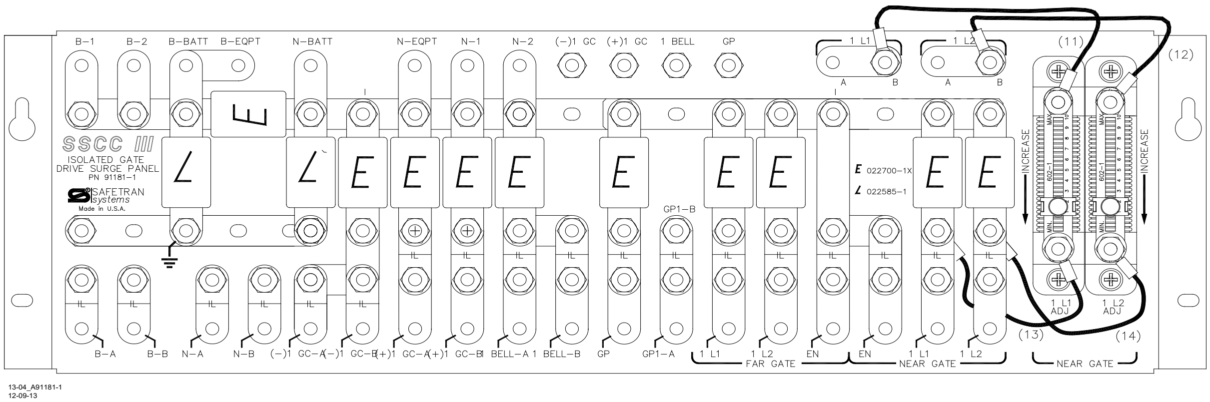
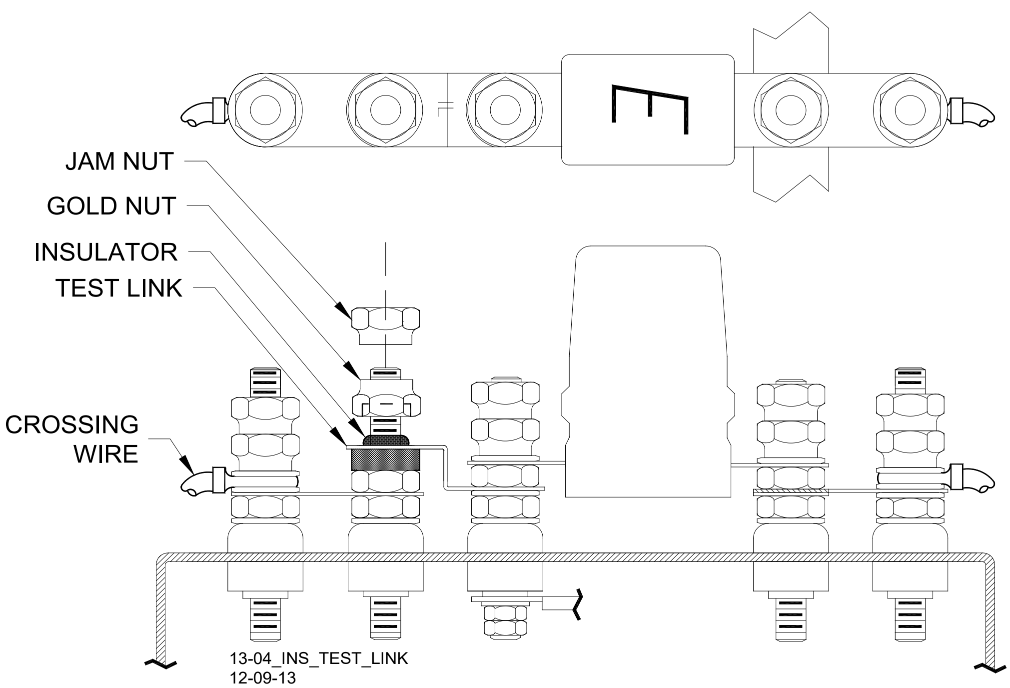


Figure 7-42: SSCC III Lighting Surge Panel, 91181-1

7.17.2 Insulated Testing Links

Insulated testing links, shown in the following figure, 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

7.17.3 Surge Panel I/O Interface

Table 7-17: 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)

7.17.4 SSCC III Lighting Surge Panels, 91170-1& 91181-1 Specifications

Table 7-18: 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)

7.17.5 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 below.

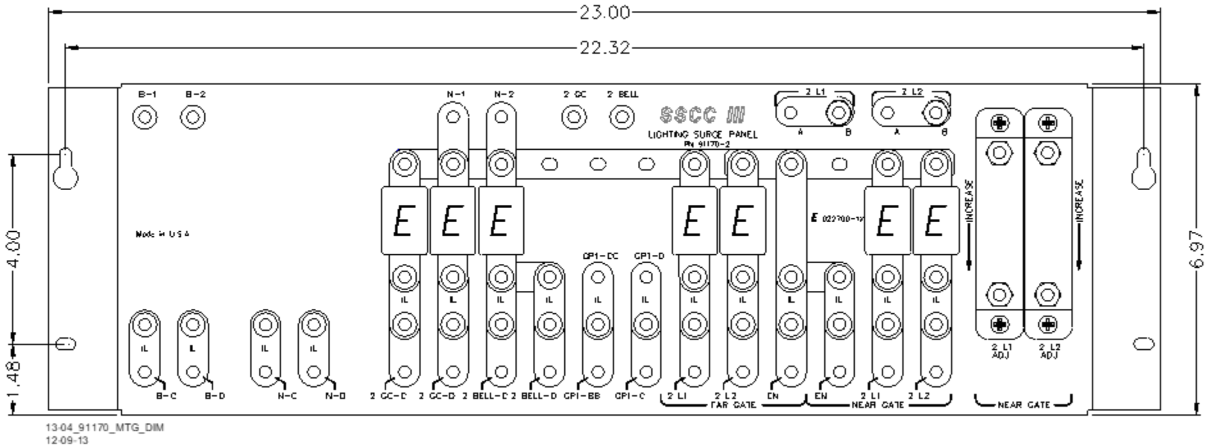


Figure 7-44: SSCC III Lighting Surge Panel Mounting Dimensions

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SECTION 8 – DETAILED CASE & MODULE DESCRIPTION

SECTION 8 - DETAILED CASE & MODULE DESCRIPTION

8.1 GENERAL PHYSICAL DESCRIPTION

Each GCP 5000 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 GCP 5000 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: GCP 5000 Case Feature Overview

Case Part Number	Feature						Reference Section
	No. of Track Modules	Main/ Standby Transfer System	Internal SSCC IIIi Crossing Control Module [1]	Internal SEAR IIi Recorder	I/O Expansion (RIO Module)[2]	Echelon LAN Functions[3]	
80905	1 to 5 tracks	No	0, 1 or 2	Yes	0, 1 or 2	Yes	8.2
80902	1 or 2 tracks	Yes	0, 1 or 2	Yes	0 or 1	Yes	8.3
80907	1 to 3 tracks	Yes	No	Yes	0, 1 or 2	Yes	8.4
80900	1 to 6 tracks	Yes	0, 1 or 2	Yes	0, 1, 2 or 3	Yes	8.5

[1] - SSCC IIIi module controls Gates, Flashing Light Signals, and Bells.

[2]- Relay Input Output (RIO) Module can be used in lieu of Track Module in the 2nd, 5th and/or 6th track slot. For a 3 track chassis, two RIOs can be used in the 2nd and 3rd slots, trk in 1st slot.

[3] - If CPU III is used, it must have Echelon capability, part number: 8000-80903-2021.

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 GCP 5000 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.
- SSCC IIIi and CPU III Modules include screw locking mechanism for securing modules.

WARNING

WARNING

SSCC IIIi MODULES MUST BE SECURED IN PLACE BY A SCREW LOCKING MECHANISM.

ACCIDENTAL REMOVAL OF THE SSCC IIIi MODULE WILL CAUSE THE GATES TO DROP WITHOUT GATE DELAY AND THE FLASHING LIGHTS WILL NOT ACTIVATE.

8.1.4 External Wiring Connectors & Wire Size

All external wiring to a GCP 5000 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

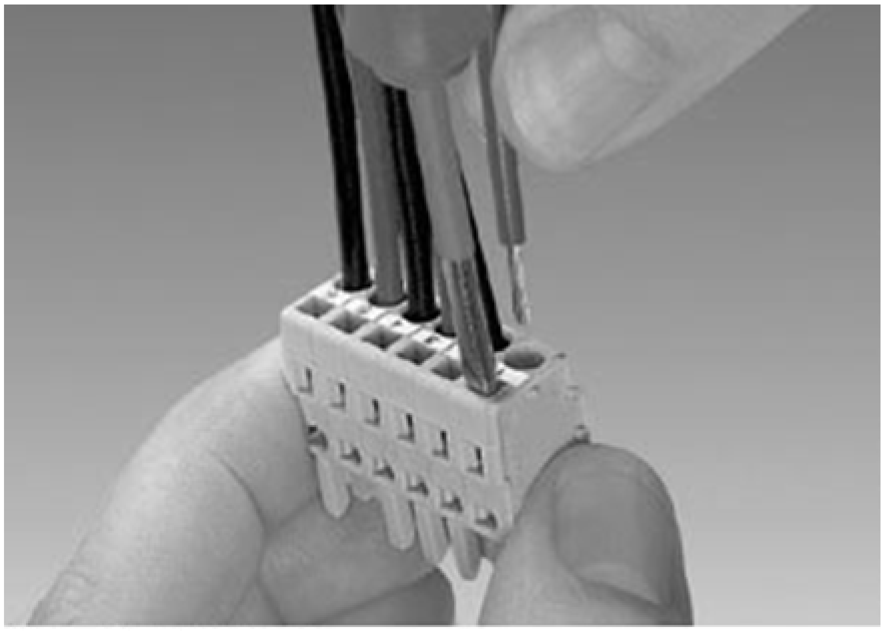
NOTE

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.

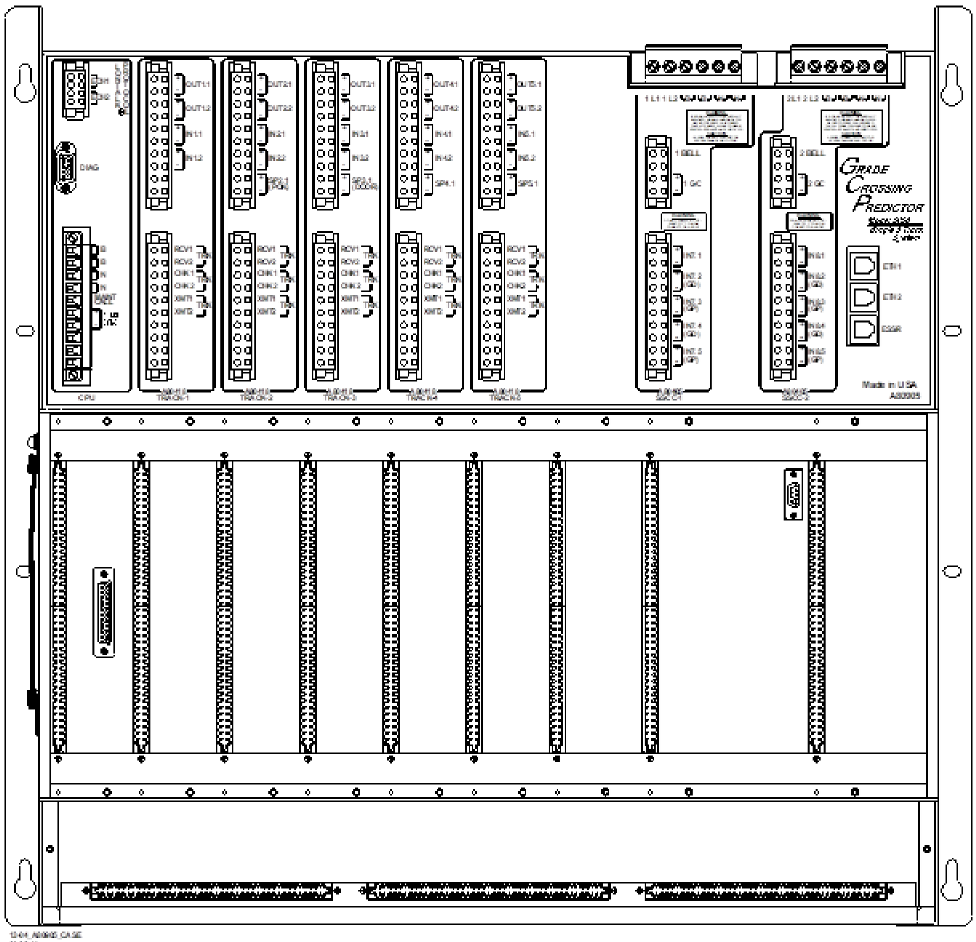


Figure 8-2: Single Five Track Case, A80905

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 (CPU II+) or A80903 (CPU III) 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 (SEAR IIi) 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.

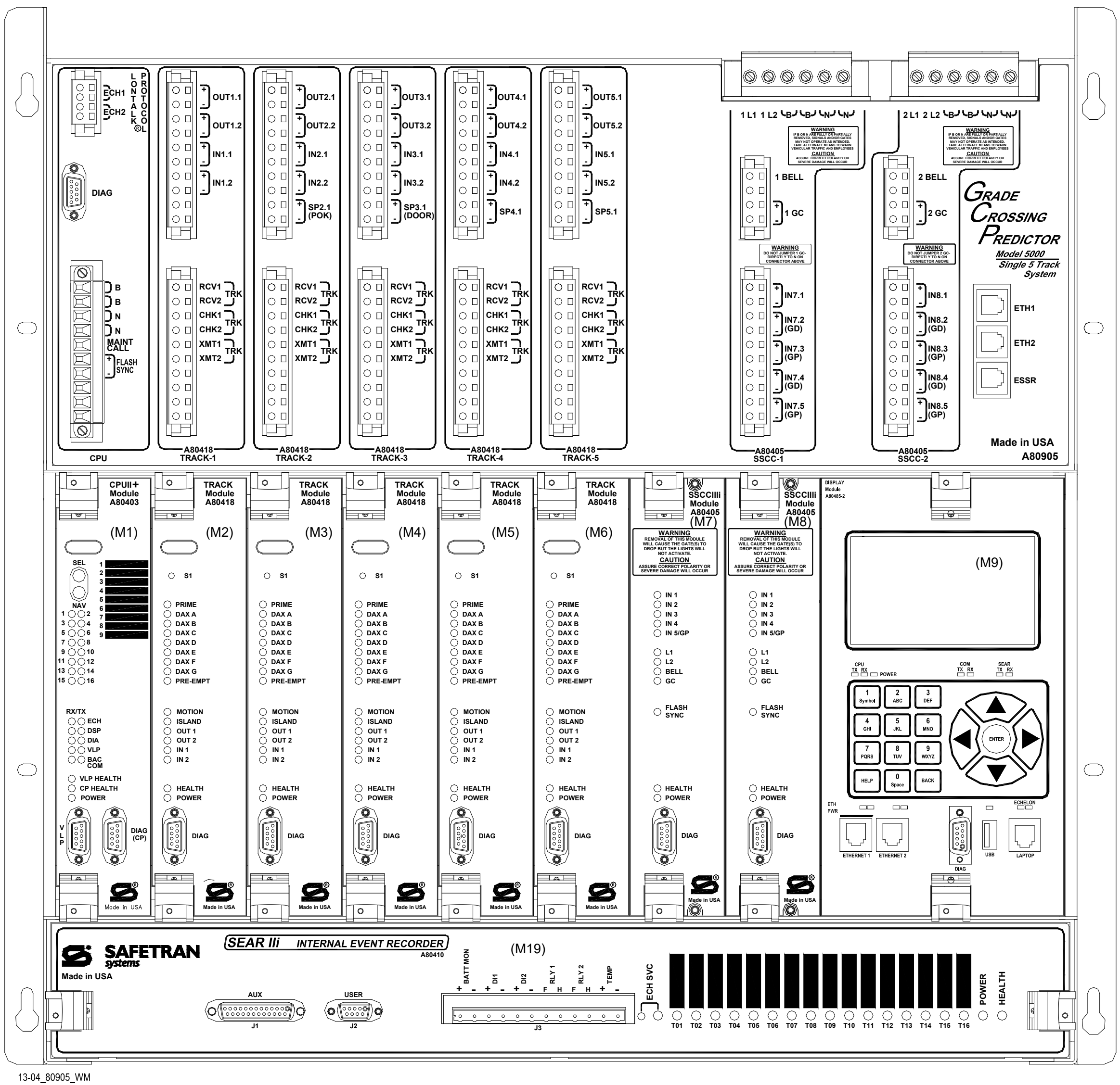


Figure 8-3: Single Five Track Case, A80905 With Modules and SEAR IIi Installed

Table 8-3: Single Five Track Case, A80905 Module to Interface Connector Relationship

Module	Slot Position	Interface Connector
A80403 / A80903	M1	CPU
A80418	M2	Track-1
A80418	M3*	Track-2 / RIO-1
A80418	M4	Track-3
A80418	M5	Track-4
A80418	M6*	Track-5 / RIO-2
A80405	M7	SSCC-1
A80405	M8	SSCC-2
A80485-1	M9	Display

***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.

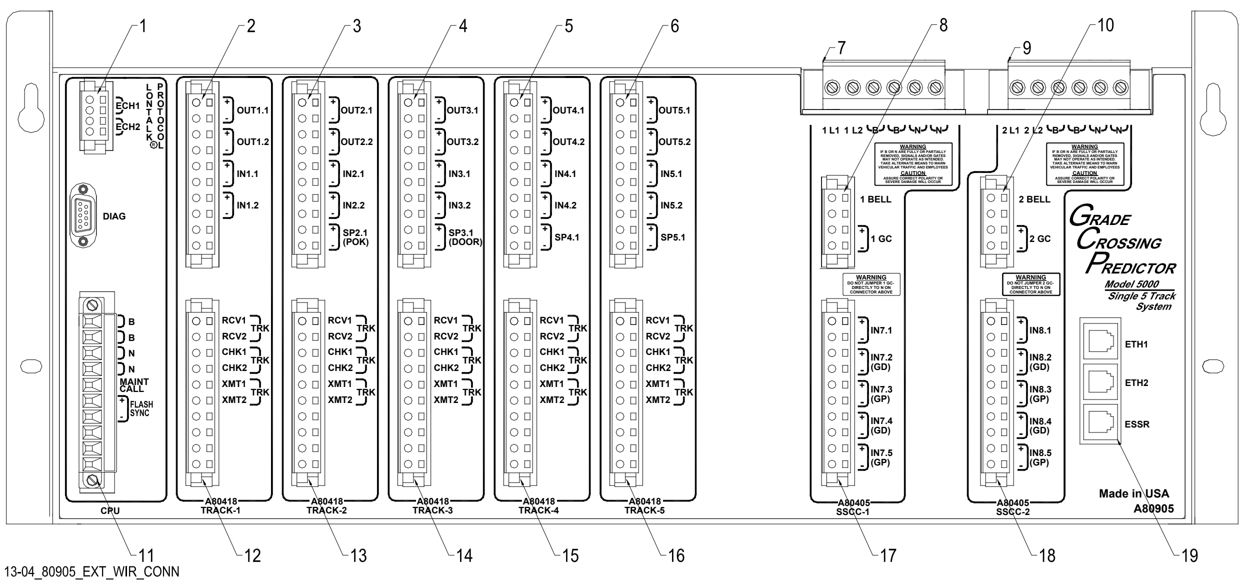


Figure 8-4: Single Five Track Case, A80905 External Wiring Connectors

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	Screw terminal connector	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.

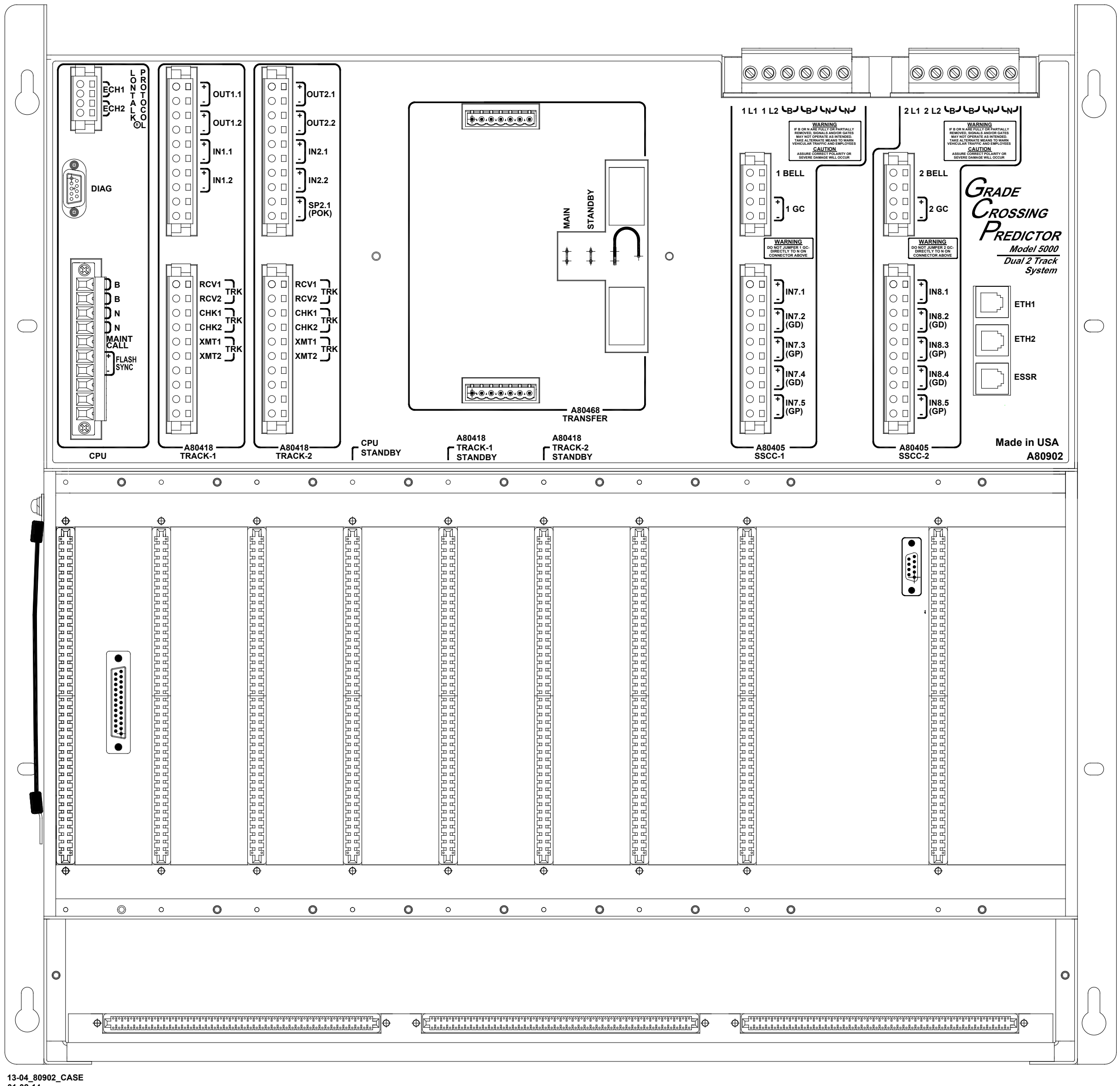


Figure 8-5: Dual Two Track Case, A80902

> **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 (CPU II+) or A80903 (CPU III) 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 (SEAR IIi) 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.

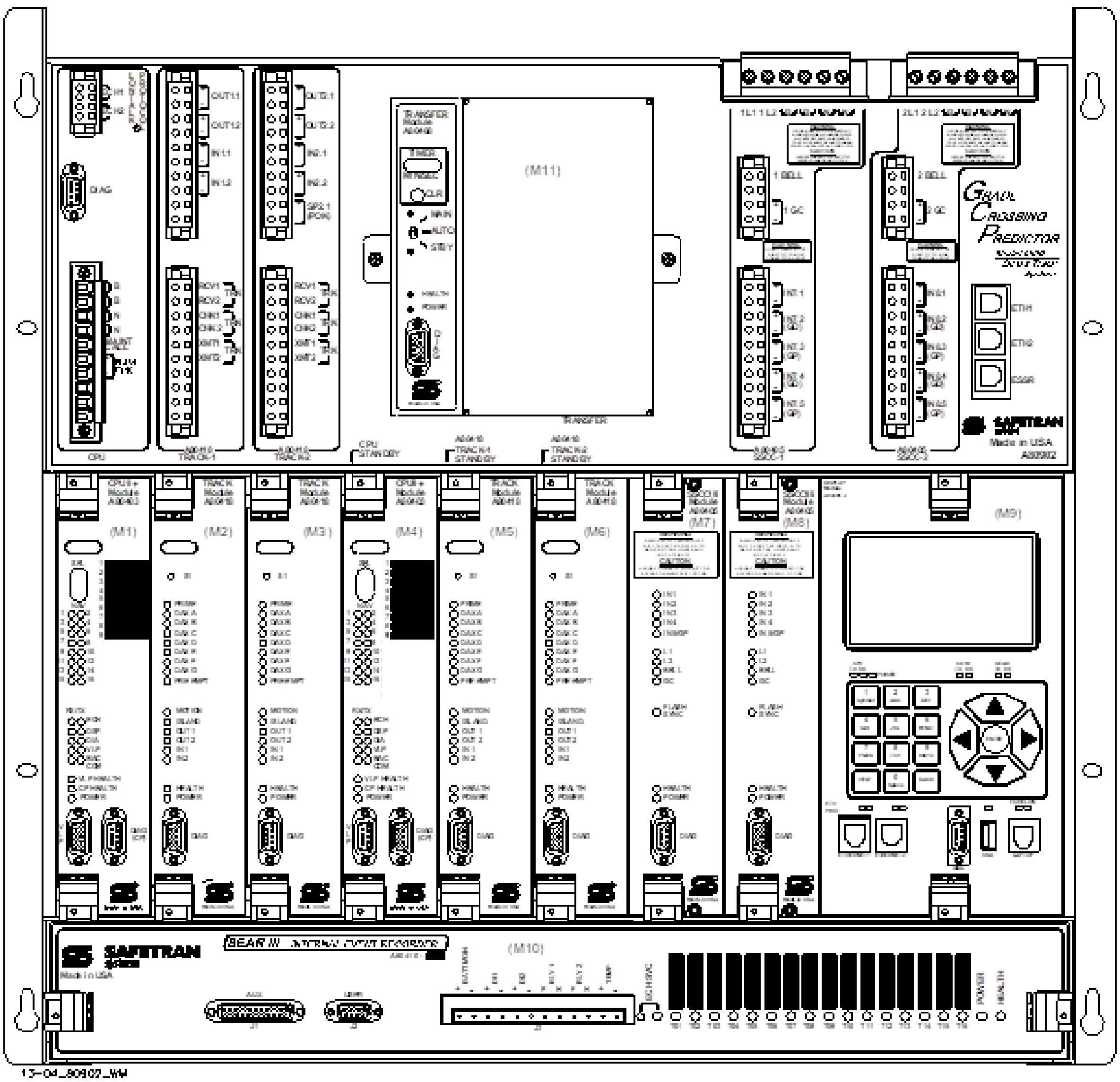


Figure 8-6: Dual Two Track Case, A80902 with Modules and SEAR IIi Installed

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 section 8.6.7.2).

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 Solid State Crossing Controller (SSCC IIIi) modules
- A80485-1 Display module assembly
- A80468 Transfer assembly
- A80410 Siemens Event Analyzer Recorder IIi (SEAR IIi) assembly

Refer to GCP 5000 Field Manual, SIG-00-13-03 for selecting Transfer Interval Time.

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.

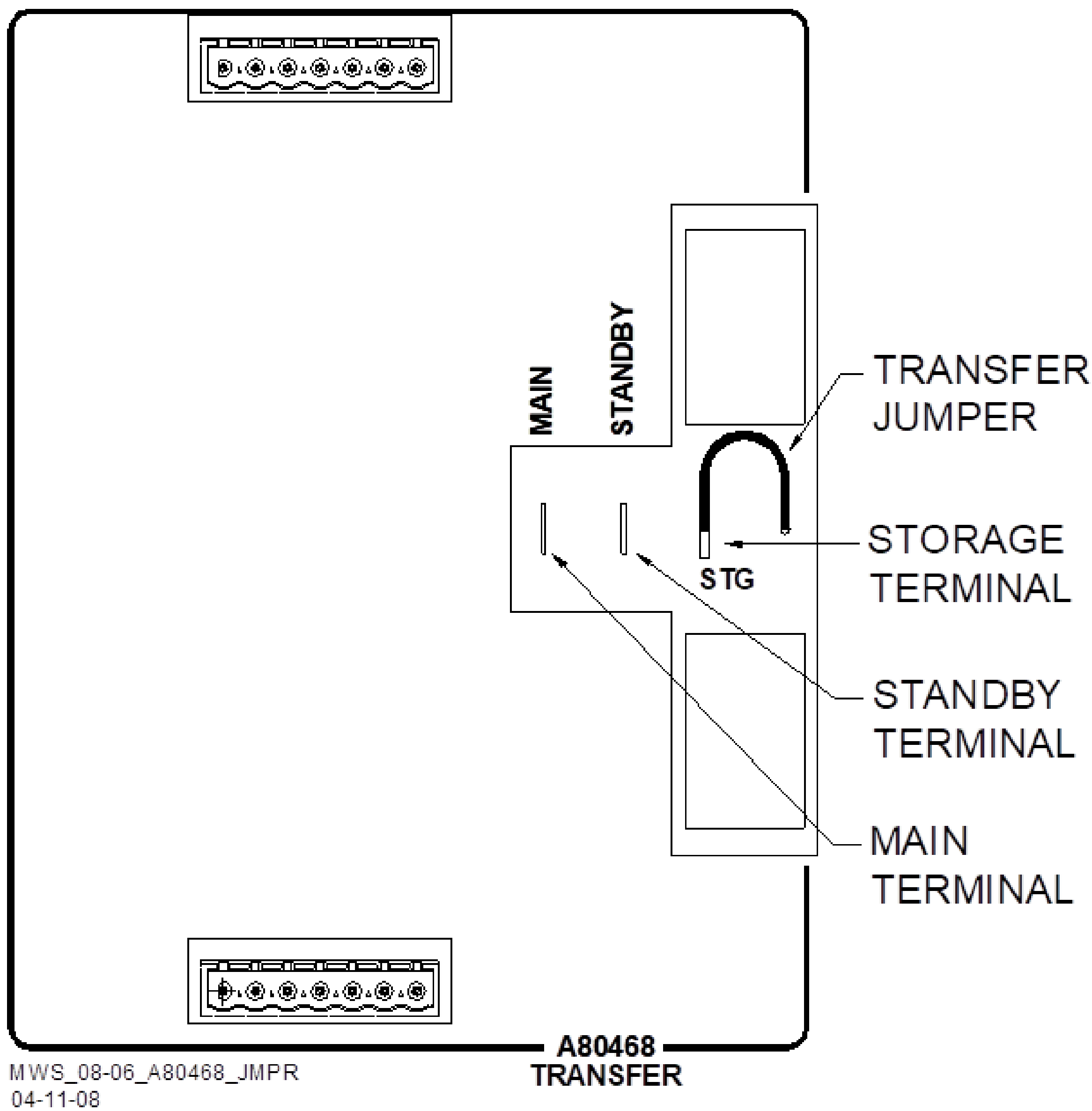


Figure 8-7: Dual Two Track Case Transfer Jumper Terminals

Table 8-5: Dual Two Track Case, A80902 Module to Interface Connector Relationship

Module	Slot Position	Interface Connector
A80403 / A80903	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.

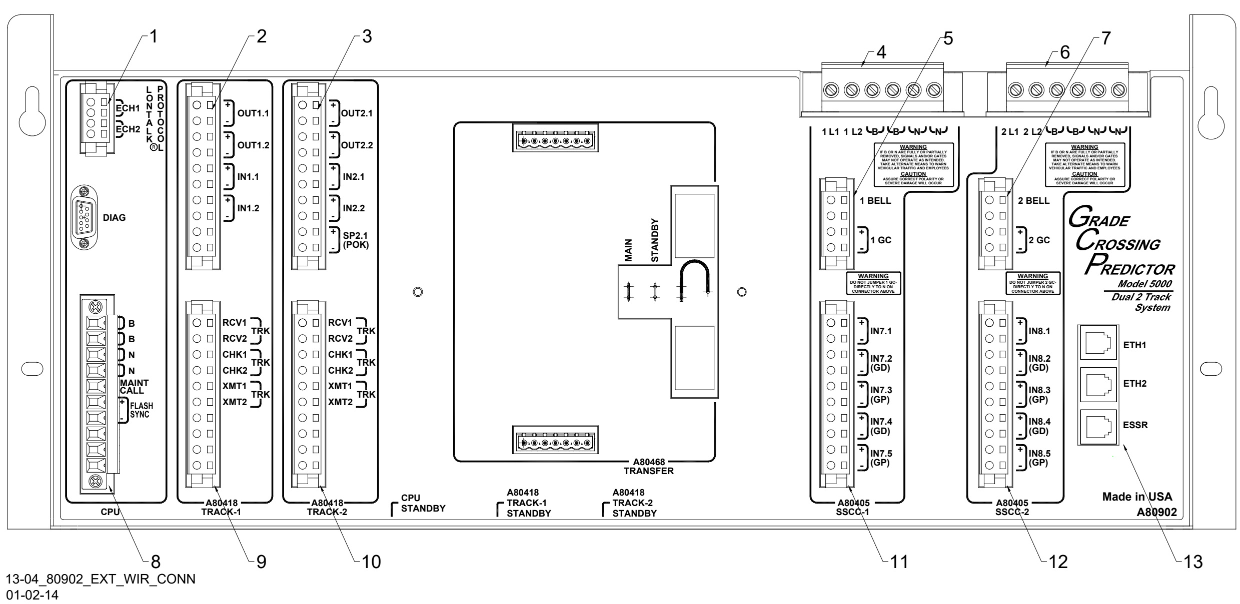


Figure 8-8: Dual Two Track Case, A80902 External Wiring Connectors

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	Screw terminal connector	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.

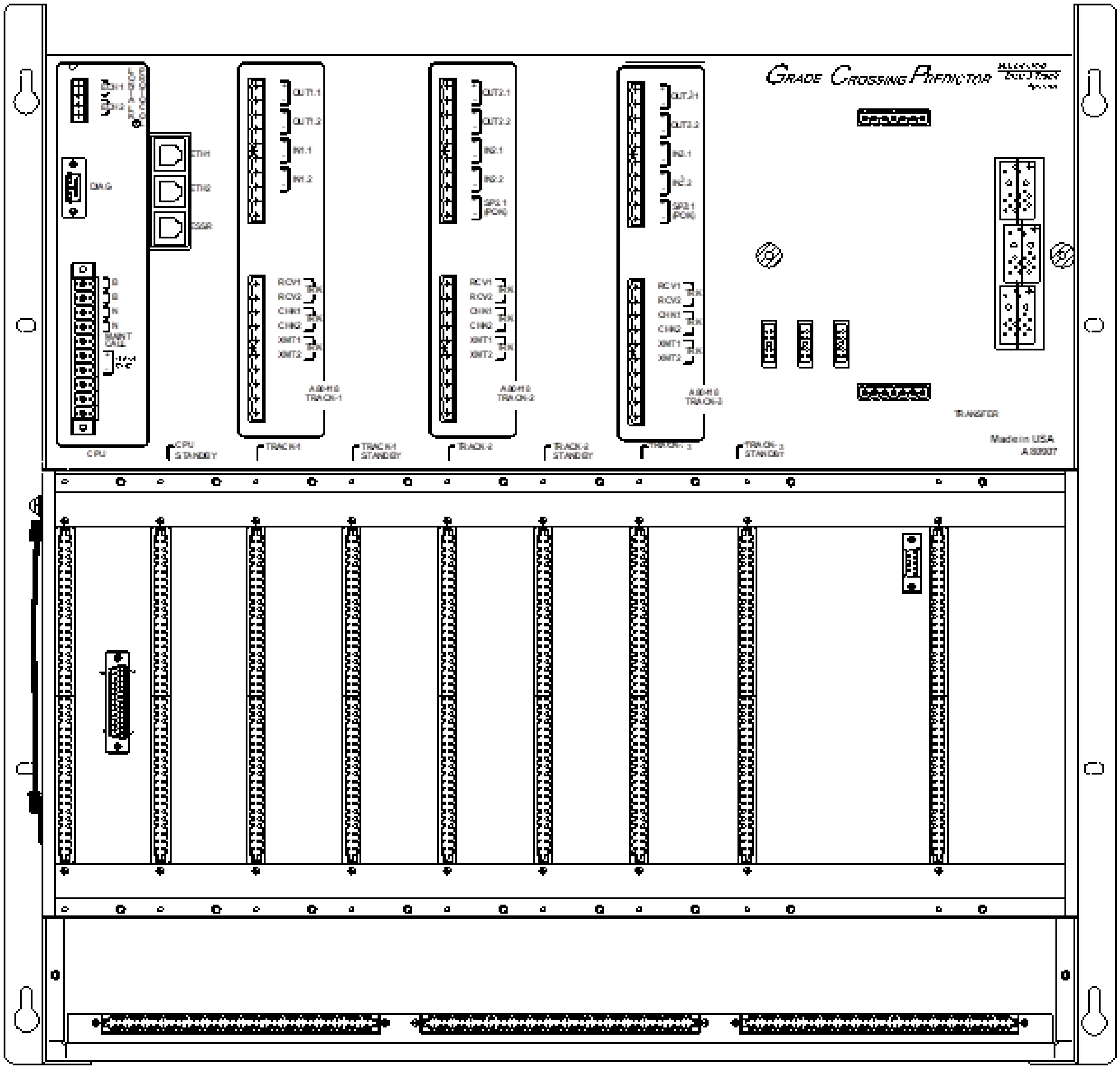


Figure 8-9: Dual Three Track Case, A80907

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, software versions gcp5K-3trk-0-1-0.mcf and later, the third track is referred to as Track-3, older versions refer to the third track 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.

- A80403 (CPU II+) or A80903 (CPU III) 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 (SEAR IIi) 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.

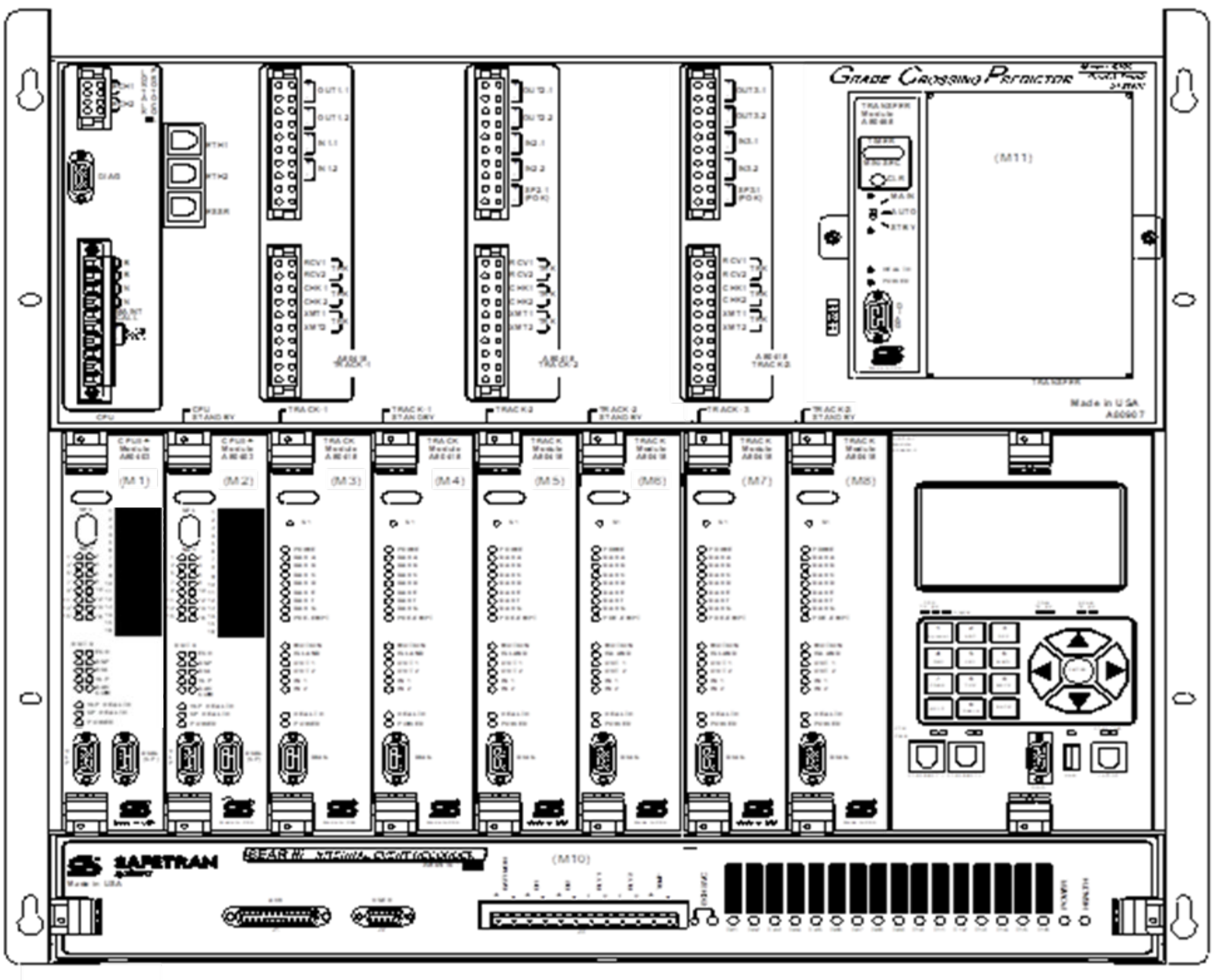


Figure 8-10: Dual Three Track Case, A80907 with Modules and SEAR IIi Installed

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 section 8.6.7.2).

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 GCP 5000s. Although the transfer jumper used on the A80907 Chassis resembles an automotive fuse, it is simply solid metal. The jumper is stored into 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 (SEAR IIi) assembly

Refer to GCP 5000 Field Manual, SIG-00-13-03 for selecting Transfer Interval Time.

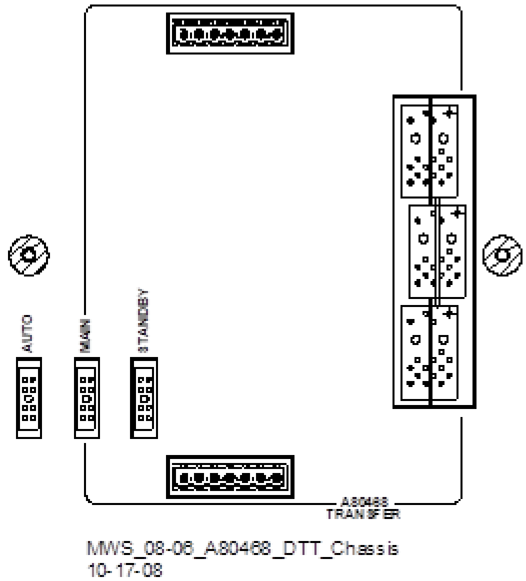


Figure 8-11: Dual Three Track Case Transfer Jumper Terminals

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 / A80903	M1	CPU
A80403 / A80903	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
A80418	M7*	Track-3** / RIO-2
A80418	M8*	Track-3** / 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-3 slot (M8).

****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, software versions gcp5K-3trk-0-1-0.mcf and later, the third track is referred to as Track-3, older versions refer to the third track as Track-5.

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.

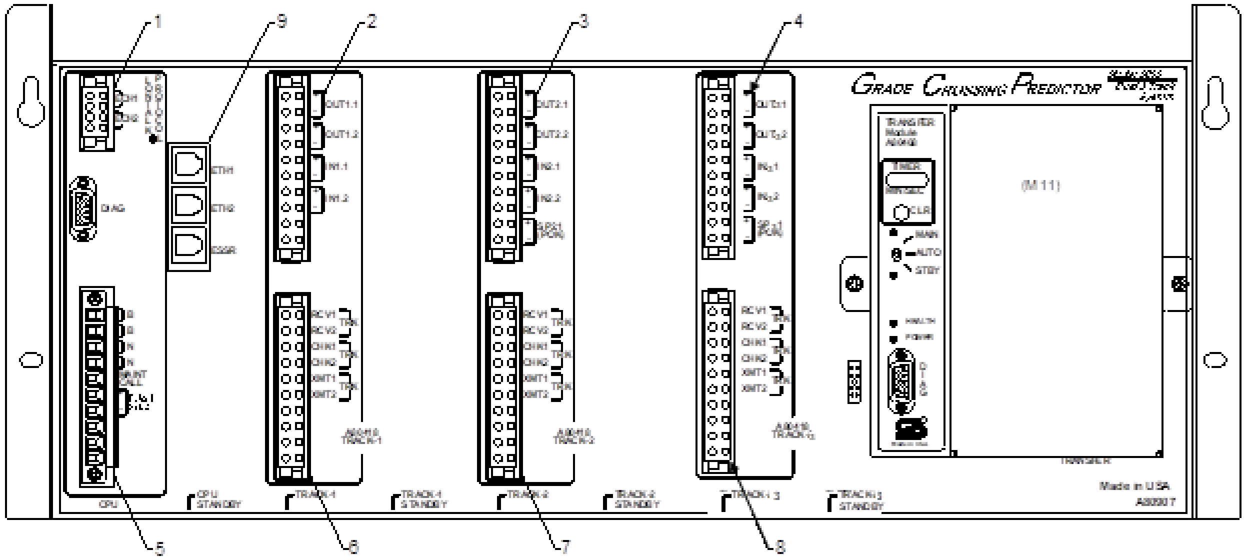


Figure 8-12: Dual Three Track Case, A80907 External Wiring Connectors

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 TRACK-3	Z715-02101-0003
5	Screw terminal connector	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 TRACK-3	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.

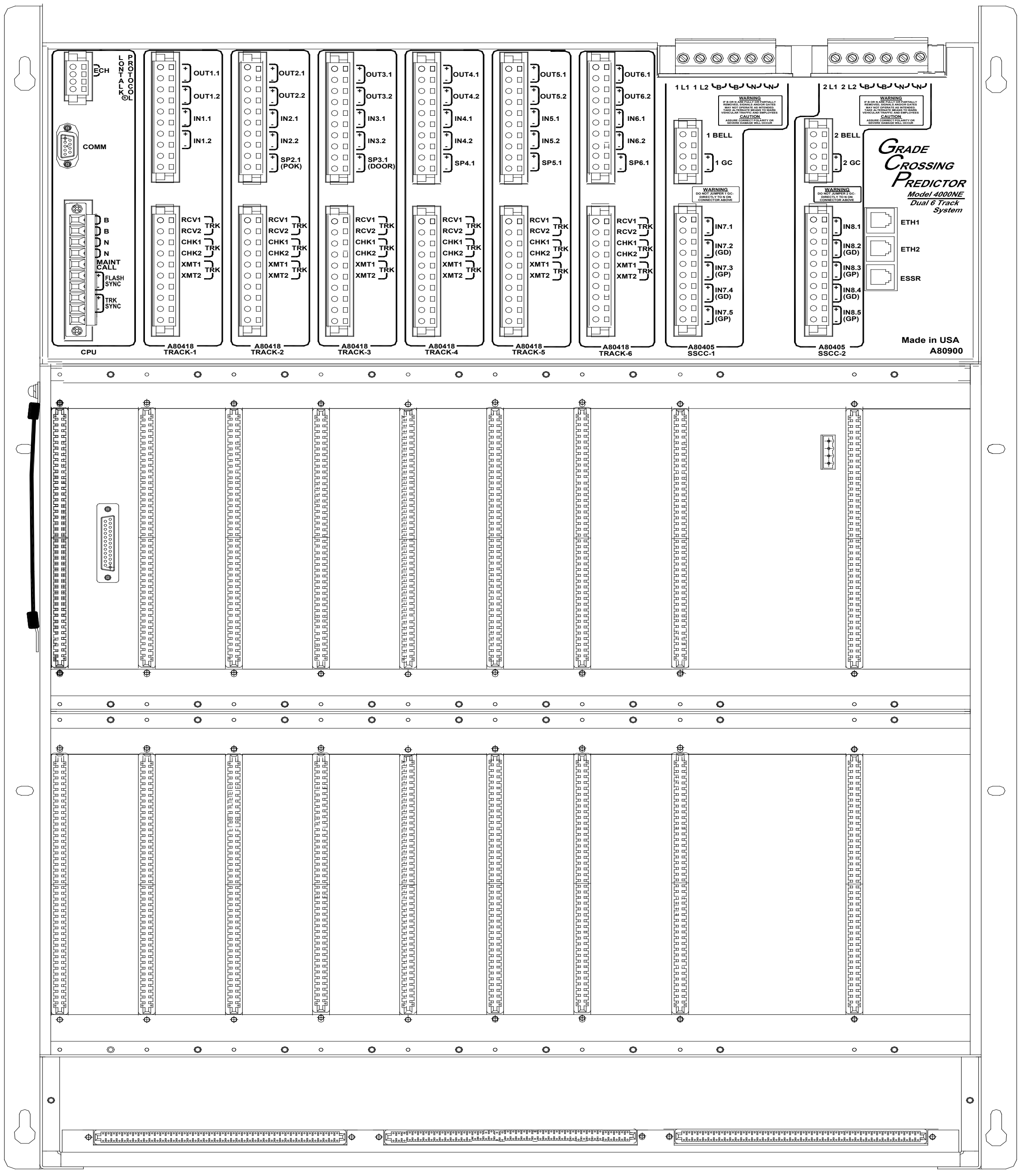


Figure 8-13: Dual Six Track Case, A80900

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 are designated 1M1 through 1M9.
- Lower module slots are 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 (CPU II+) or A80903 (CPU III) module in slot position 1M1
- Six A80418 Track modules in slot positions 1M2 through 1M7

The lower module set (2M1-2M7) is designated as the standby module set. A standby module set consists of:

- A80403 (CPU II+) or A80903 (CPU III) Dual Central Processor Unit module in slot position 2M1
- Six A80418 Track modules in slot positions 2M2 through 2M7

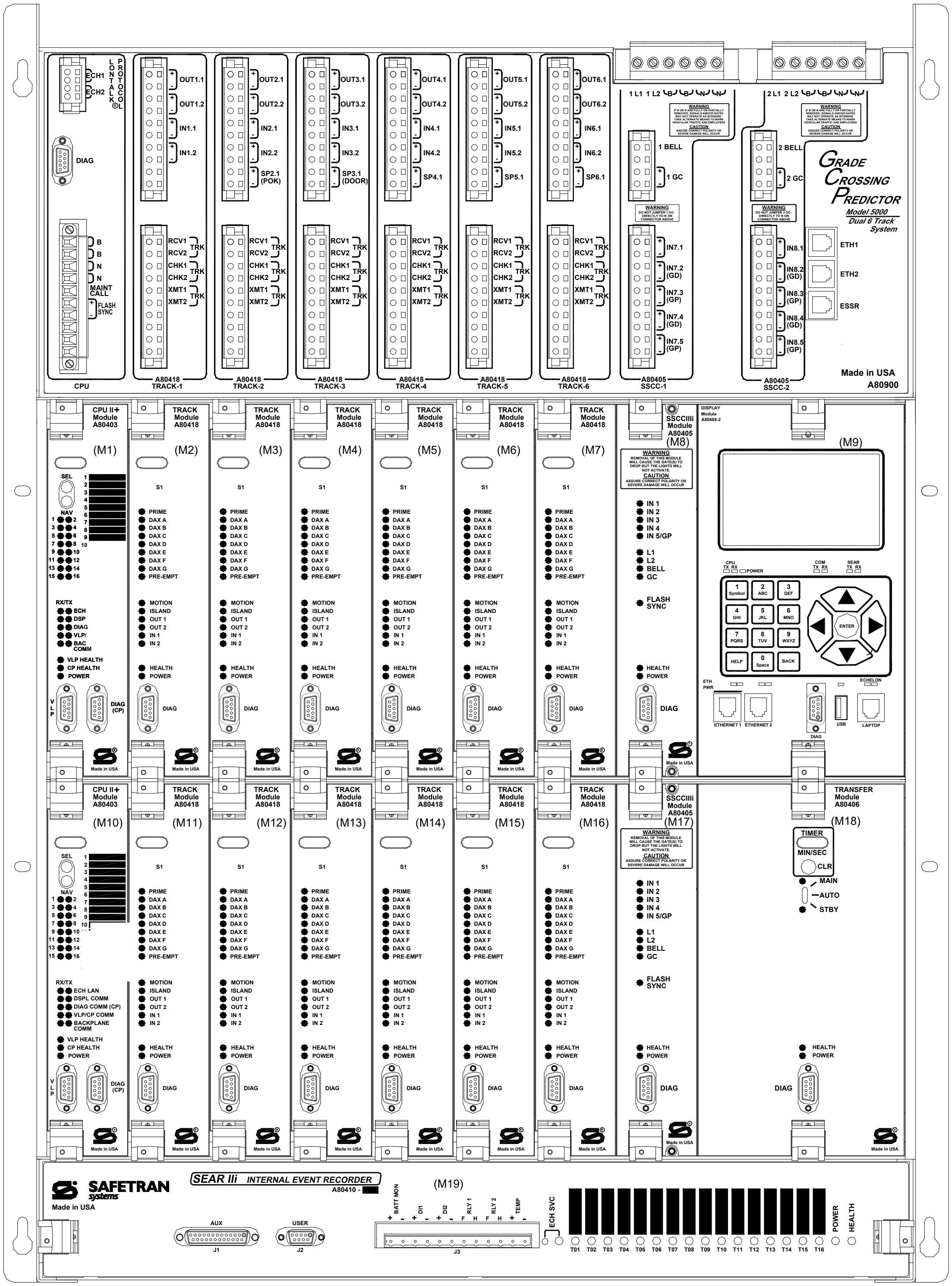
In both the main module set and the standby module set, the following modules are active:

- Two A80405 Solid State Crossing Controller IIIi (SSCC IIIi) 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 (SEAR IIi) module assembly

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.



13-04_80900_WM
11-21-13

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 section 8.6.6).

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 (SSCC IIIi) modules
- A80485-1 Display module assembly
- A80406 Transfer module
- A80410 Siemens Event Analyzer Recorder IIi (SEAR IIi) assembly

Refer to the GCP 5000 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 / A80903	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 / A80903	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.

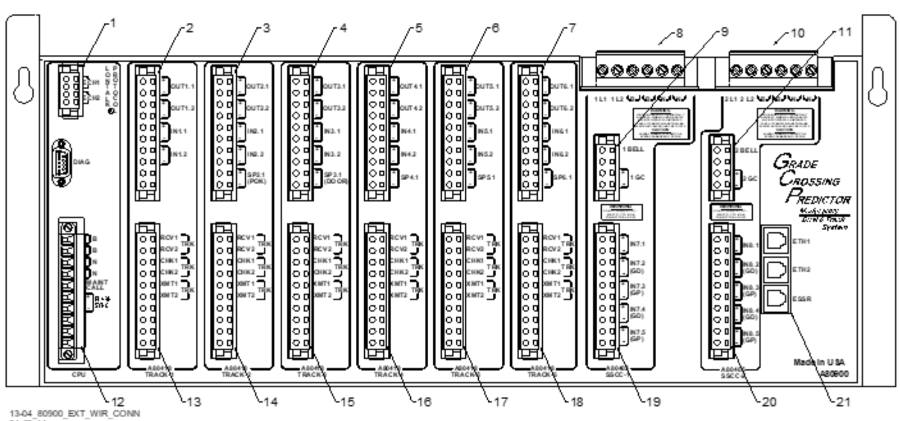


Figure 8-15: Dual Six Track Case, A80900 External Wiring connections

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	Screw terminal connector	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 CPU II+ (A80403) and CPU III (A80903) Modules

The CPU Module is a central processing unit that provides all vital logic processing functions for all GCP 5000 chassis controls, GCP LAN, and vital and non-vital serial communications interfaces with front panel CPU connectors. The CPU III replaces the obsolete CPU II+ module.

8.6.1.1 CPU II+ Module, A80403 User Interface

The CPU II+ front panel is shown in Figure 8-16. The CPU II+ user interface is described in Table 8-11. (Refer to the GCP 5000 Field Manual, SIG-00-13-03, for diagnostics and troubleshooting).

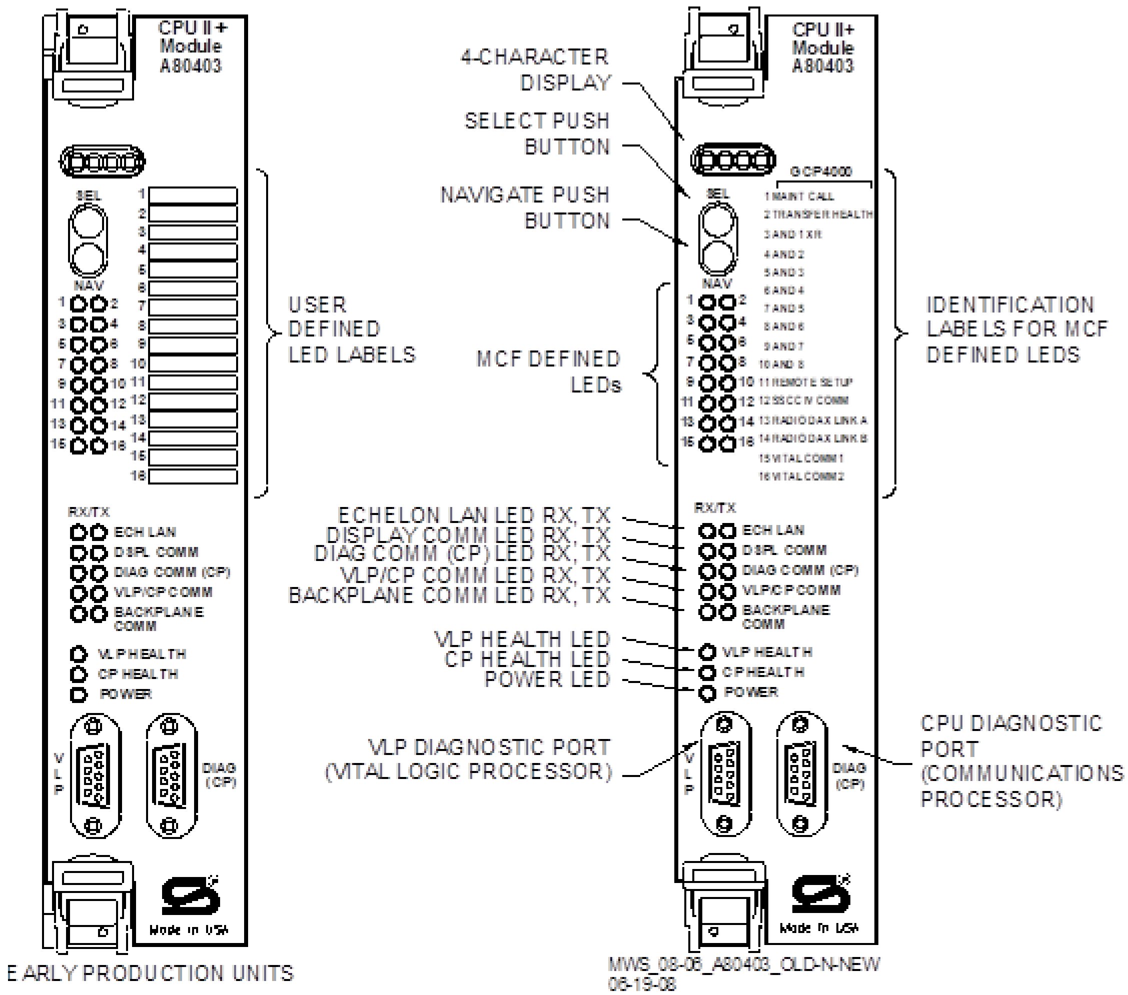


Figure 8-16: CPU II+ Module, A80403 Front Panel

8.6.1.2 CPU III Module, A80903 User Interface

The CPU III front panel is shown in Figure 8-17. The CPU III user interface is described in Table 8-11. (Refer to the GCP 5000 Field Manual, SIG-00-13-03, for diagnostics and troubleshooting).

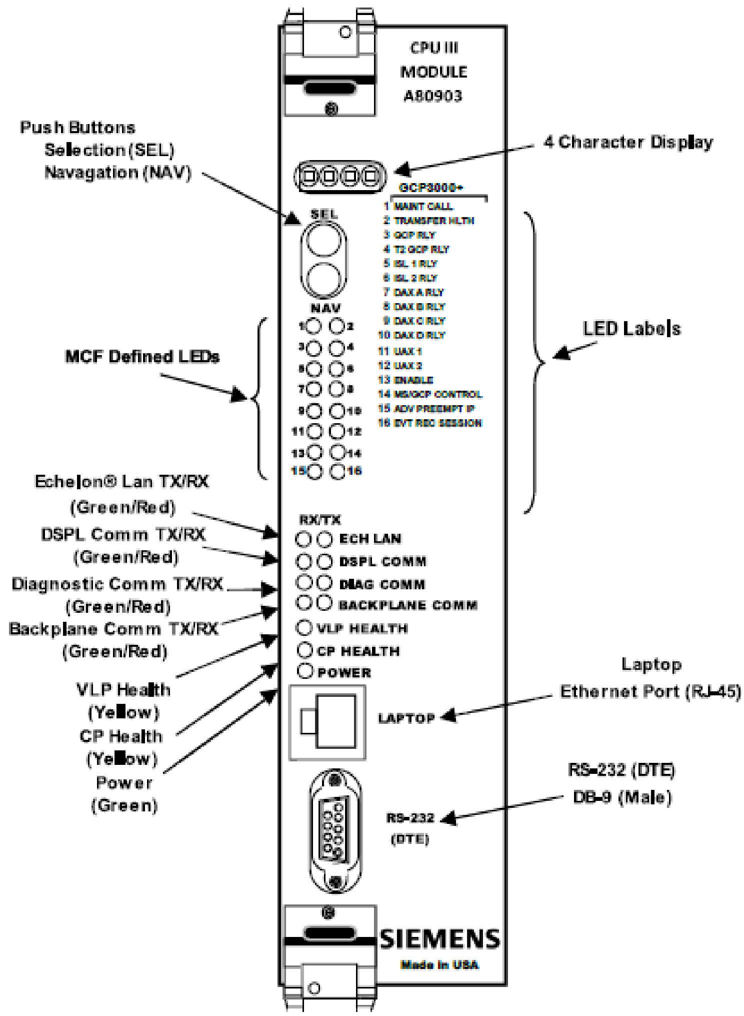


Figure 8-17 : CPU III Module, A80903 Front Panel

Table 8-11: CPU Module, User Interface

Component	Function		
4-Character Display	Displays alphanumeric representation of currently selected function menu item. (Refer to GCP 5000 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 (Refer to maintenance call logic section.)	On – maintenance call output on Off – maintenance call output off
2 (TRANSFER HEALTH)	Red	Transfer Output (Refer to 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 Flashing – indicates transfer timer has been extended transfer card should not 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

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 CPU is transmitting an ATCS message via the LONTALK® LAN.		
	RX flashes green when the CPU is receiving an ATCS message via the LONTALK® LAN.		
DSPL COMM LEDs	TX flashes red when the CPU is transmitting data to the Display Panel.		
	RX flashes green when the CPU is receiving data from the Display Panel.		
DIAG COMM (CP) LEDs	TX flashes red when the CPU is transmitting data on the communications processor diagnostic (DIAG CP) serial port.		
	RX flashes green when the CPU is receiving data from the communications processor diagnostic (DIAG CP) serial port.		
VLP/CP COMM LEDs (CPU II+ Only)	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 CPU module.		
VLP Serial Port (CPUII+ only)	9-pin diagnostic serial port for Vital Logic Processor.		
DIAG (CP) Serial Port (CPUII+ only)	9-pin diagnostic serial port for Communications Processor.		
RS-232(DTE) (CPU III only)	9-pin diagnostic serial port for Communications Processor used to load software onto I/O modules		
Laptop Port (CPU III only)	RJ45 Ethernet port for connection to web browser		

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 8-18. The user interface is described in Table 8-12.

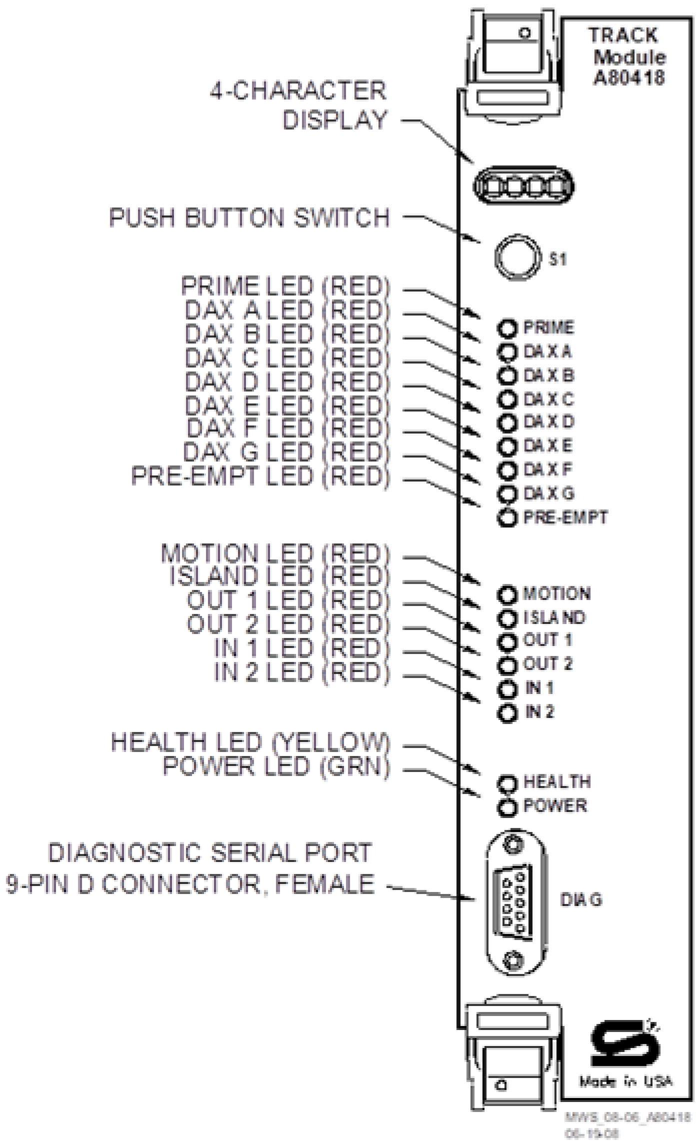


Figure 8-18: Track Module, A80418 Front Panel

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 GCP 5000 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	Used to scroll between EZ, EX, and Island Z Values on the 4-character display of the track module.
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 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.

8.6.3.1 RIO Module User Interface

The RIO module front panel is shown in Figure 8-19. The user interface is described in Table 8-13.

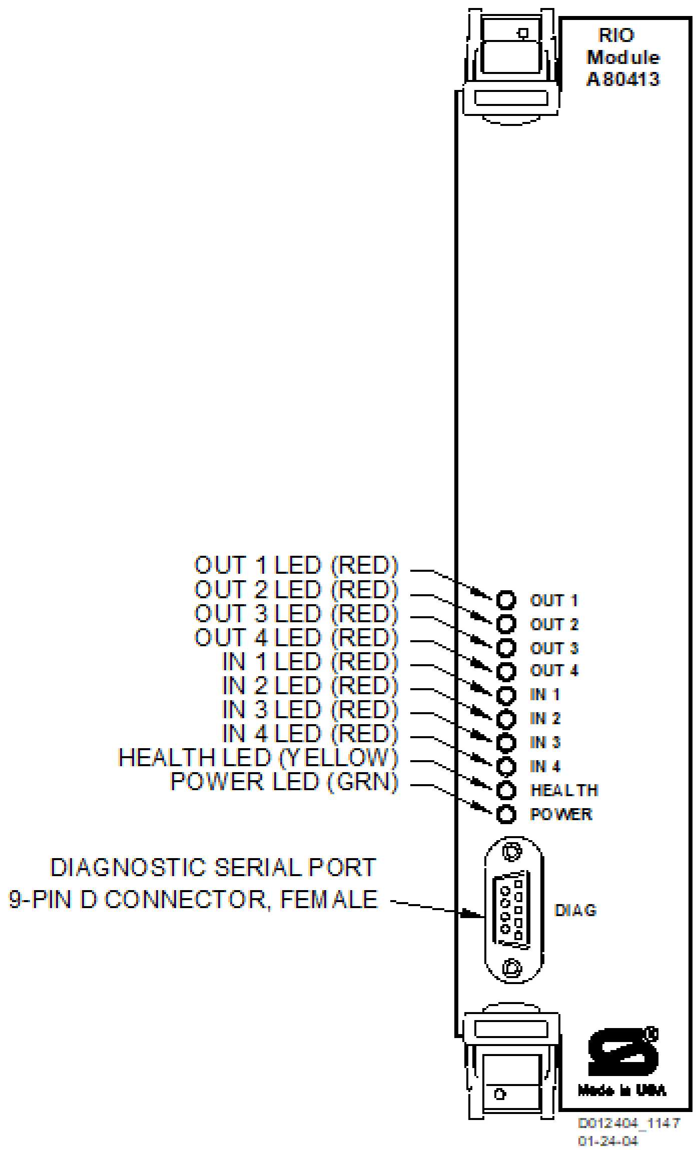


Figure 8-19: RIO Module, A80413 Front Panel

Table 8-13: 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.

8.6.3.2 Solid State Crossing Controller IIIi, A80405 (SSCC IIIi)

The Solid State Crossing Controller IIIi, A80405 (SSCC IIIi), 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 SSCC IIIi 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 SSCC IIIi POWER CONNECTOR(S).

8.6.4 SSCC IIIi User Interface

The SSCC IIIi module front panel is shown in Figure 8-20.

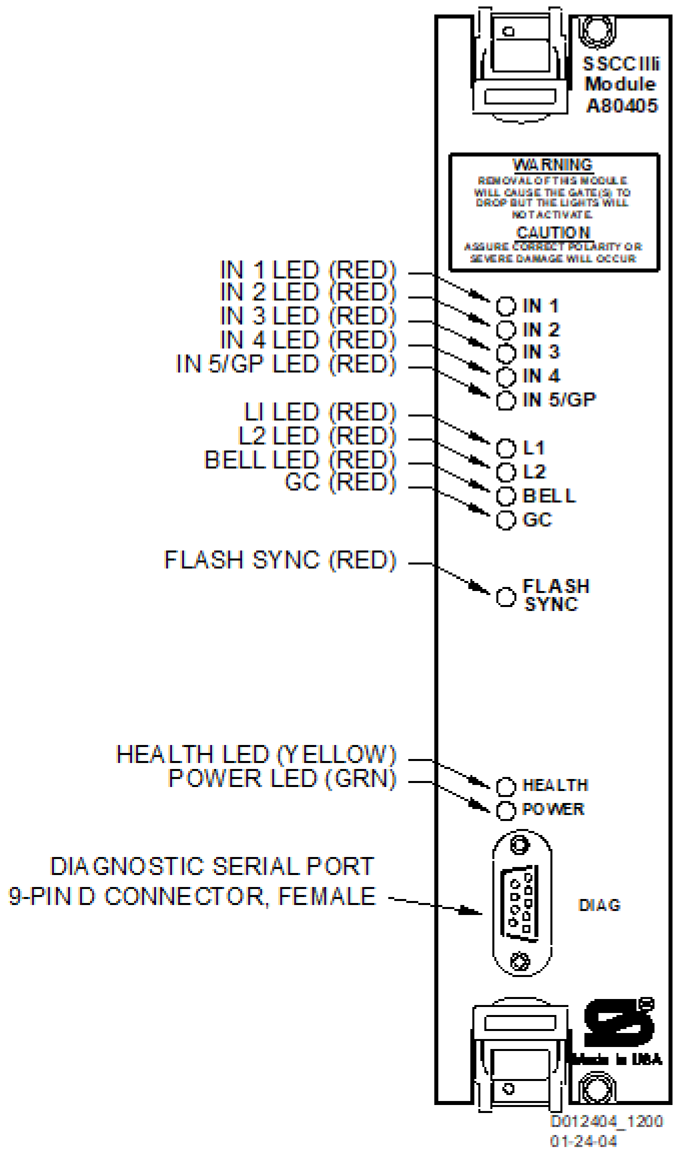


Figure 8-20: SSCC IIIi Front Panel

Table 8-14 describes the SSCC IIIi user interface.

Table 8-14: SSCC IIIi 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 SSCC IIIi module.
DIAG Diagnostic Serial Port	9-pin diagnostic serial port for the SSCC IIIi module.

8.6.5 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 the GCP 5000 Field Manual, SIG-00-13-03, for detailed instructions on the Display Module.

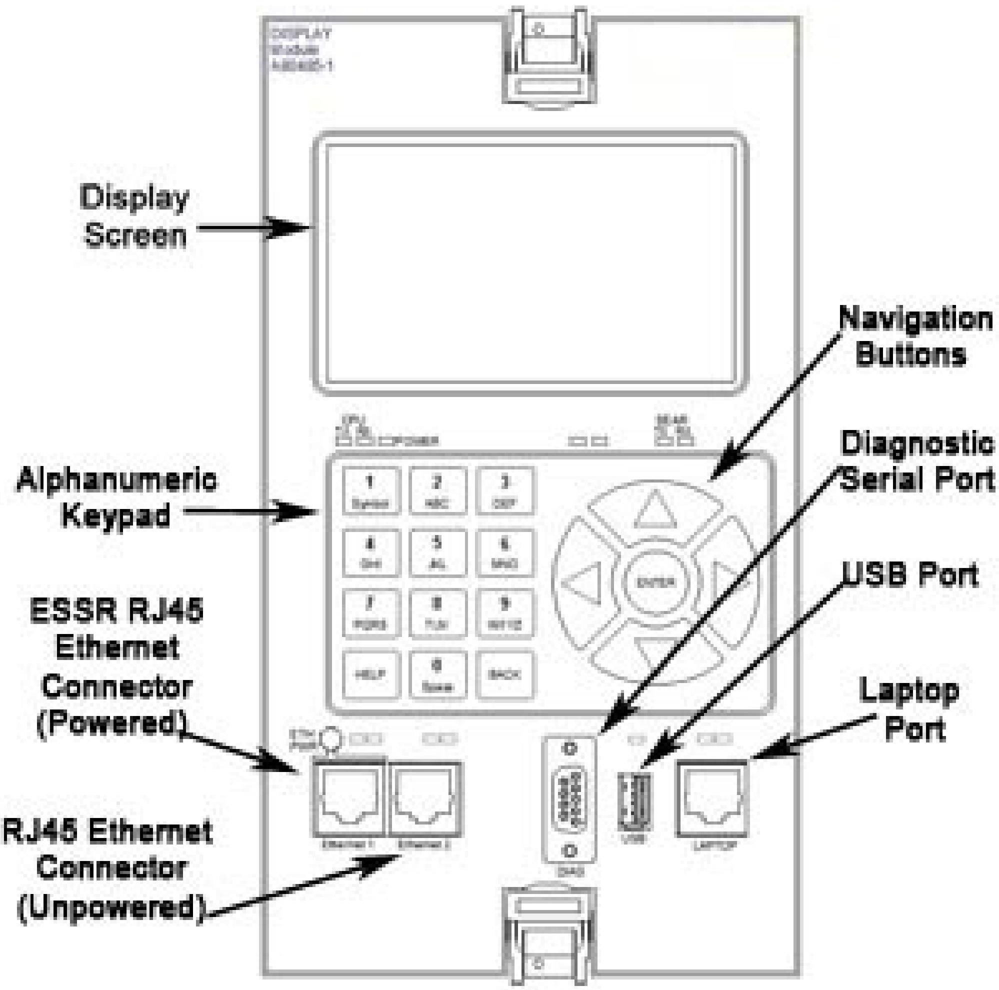


Figure 8-21: Display Module, A80485-1

8.6.6 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. This module is used on the A80900 chassis.

NOTE

NOTE

The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

8.6.6.1 Transfer Module, A80406 User Interface

The Transfer Module, A80406 front panel is shown in Figure 8-22. The user interface is described in Table 8-15.

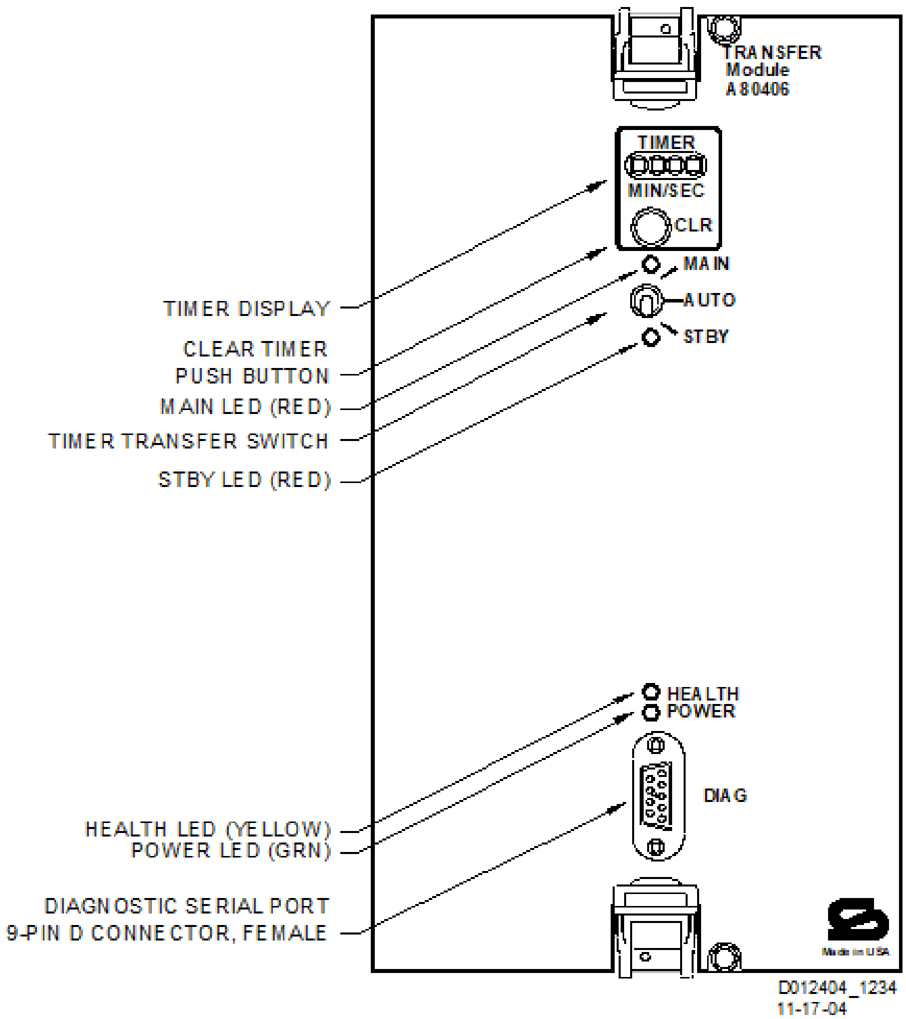


Figure 8-22: Transfer Module, A80406 Front Panel

Table 8-15 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.

8.6.6.2 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.

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 8-23 and Table 8-16).

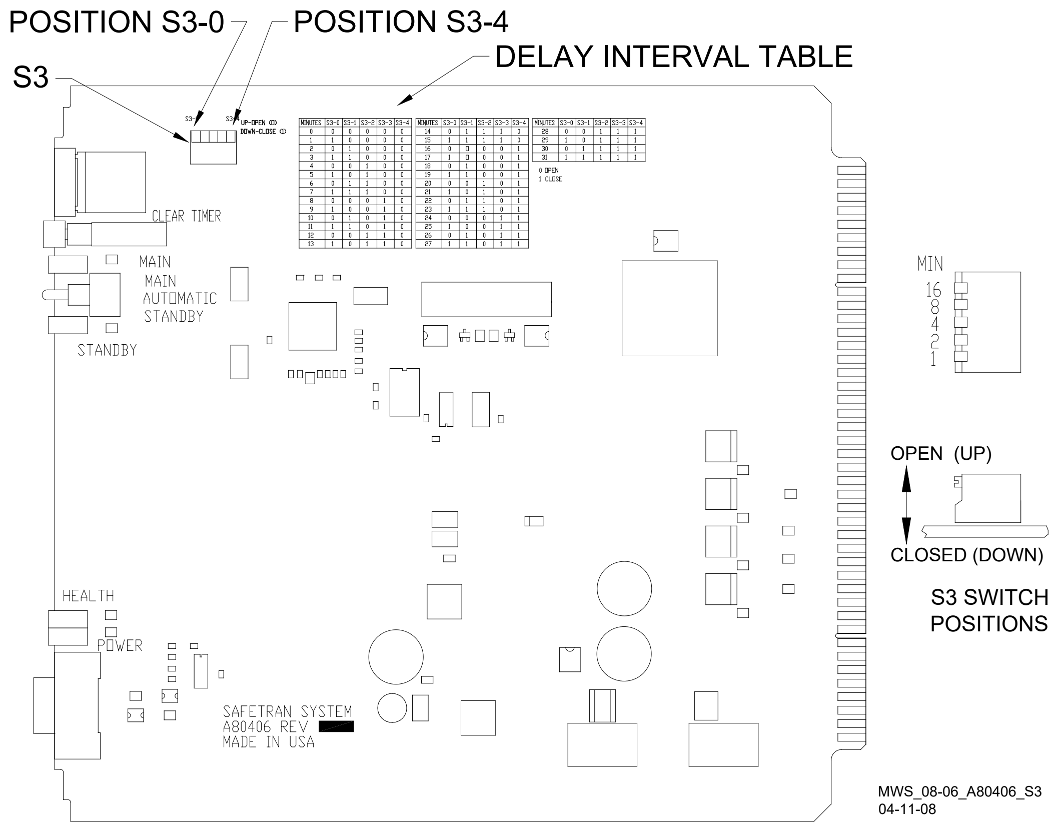


Figure 8-23: Transfer Module, A80406, S3 Switch Positions

Table 8-16: 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

8.6.6.3 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 8-24).

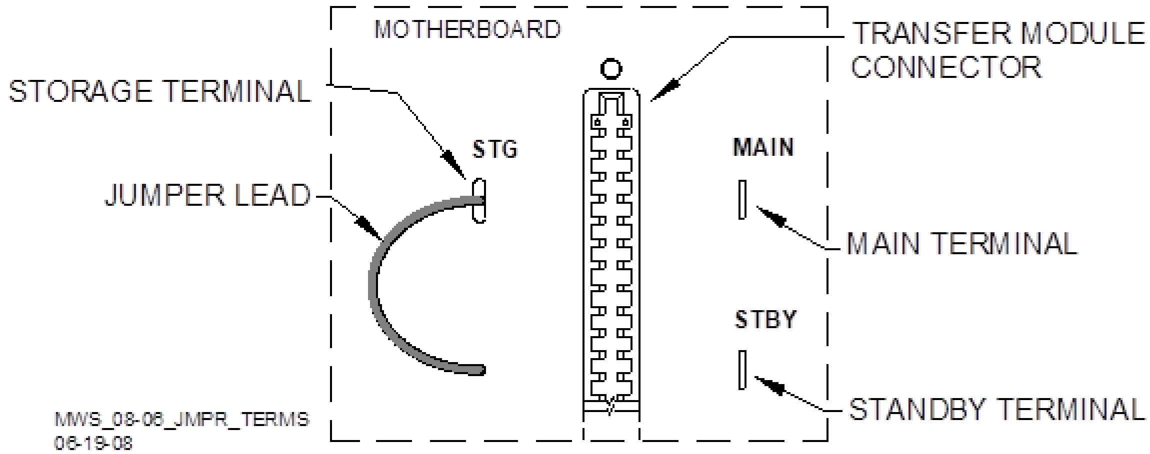


Figure 8-24: Transfer Module (A80406) Jumper Positions

8.6.7 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. The transfer assembly is used on the A80902 and A80907 chassis.

NOTE

> **NOTE**
>
> The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

8.6.7.1 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 8-25. The user interface is described in Table 8-17.

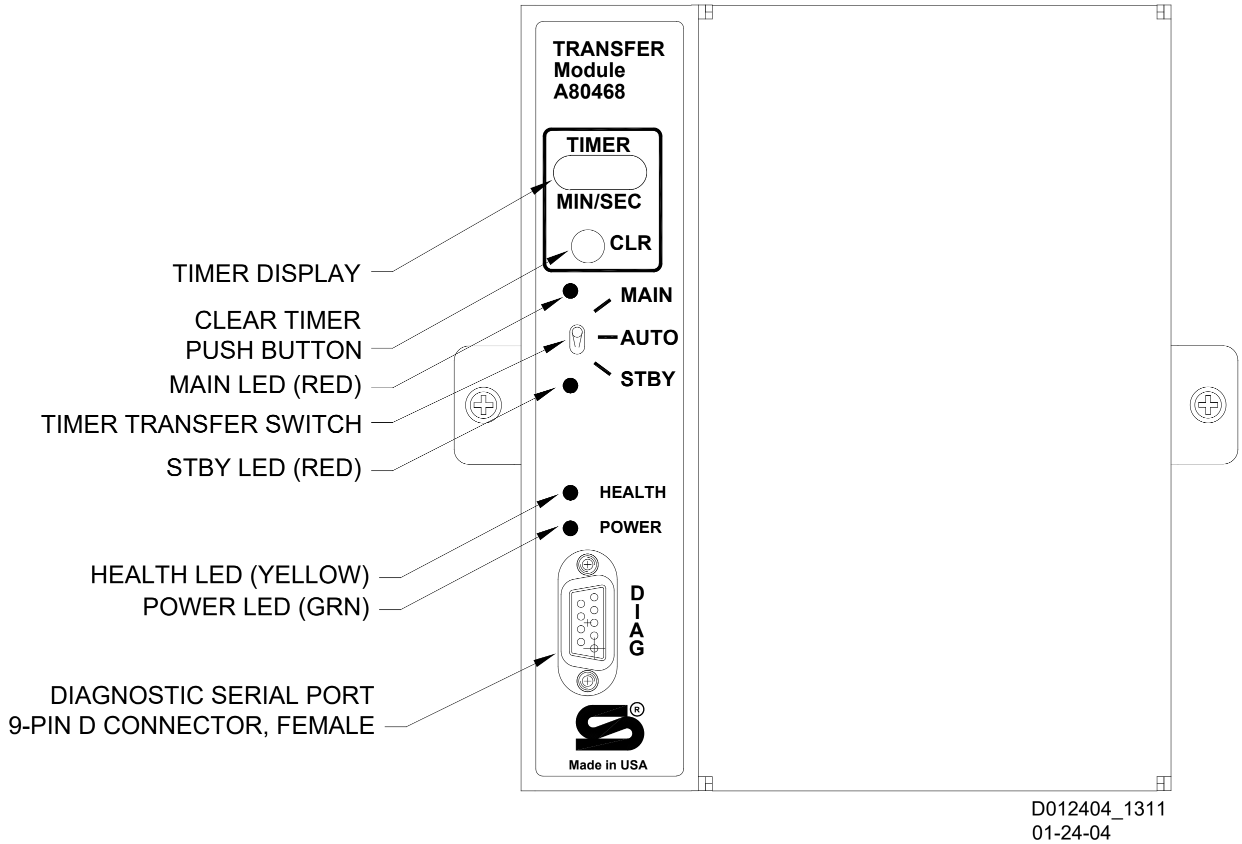


Figure 8-25: Transfer Assembly, A80468 Front Panel

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.

8.6.7.2 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.

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 8-26.

- 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 GCP 5000 case.
- The switch levers of S3 are set to the positions designated in Table 8-16 to obtain the required delay time (see Figure 8-26).

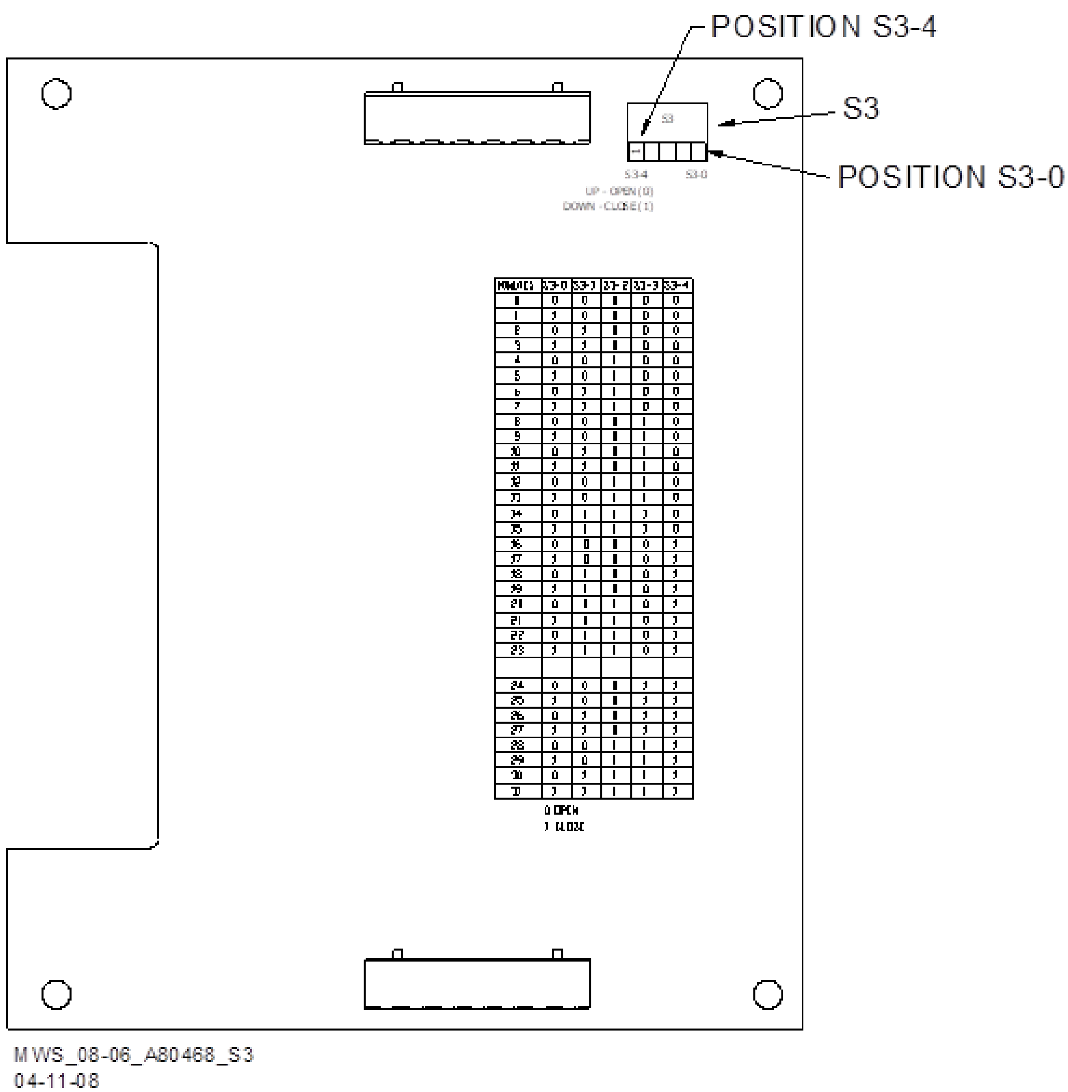


Figure 8-26: Transfer Module Assembly, A80468, S3 Switch Position

8.6.7.3 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).

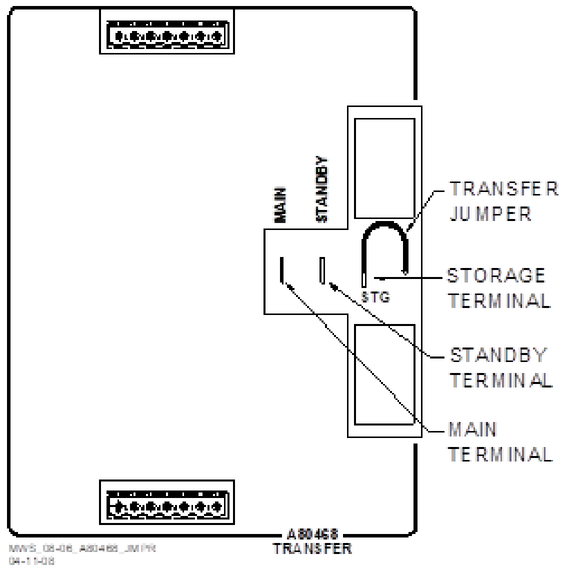


Figure 8-27: Transfer Module (A80468) Jumper Positions

8.6.8 Siemens Event Analyzer Recorder IIi (SEAR IIi), A80410

The Siemens Event Analyzer Recorder IIi (SEAR IIi), A80410 provides continuous real-time status monitoring and event recording of the GCP 5000, and the grade crossing devices controlled by the GCP (see GCP 5000 Field Manual, SIG-00-13-03).

The SEAR IIi is described in more detail in the GCP 5000 SEAR IIi Internal Event Recorder Field Manual, SIG-00-19-02.

8.6.8.1 SEAR IIi User Interface

The SEAR IIi module front panel is shown in Figure 8-28. The user interface is described in Table 8-18.

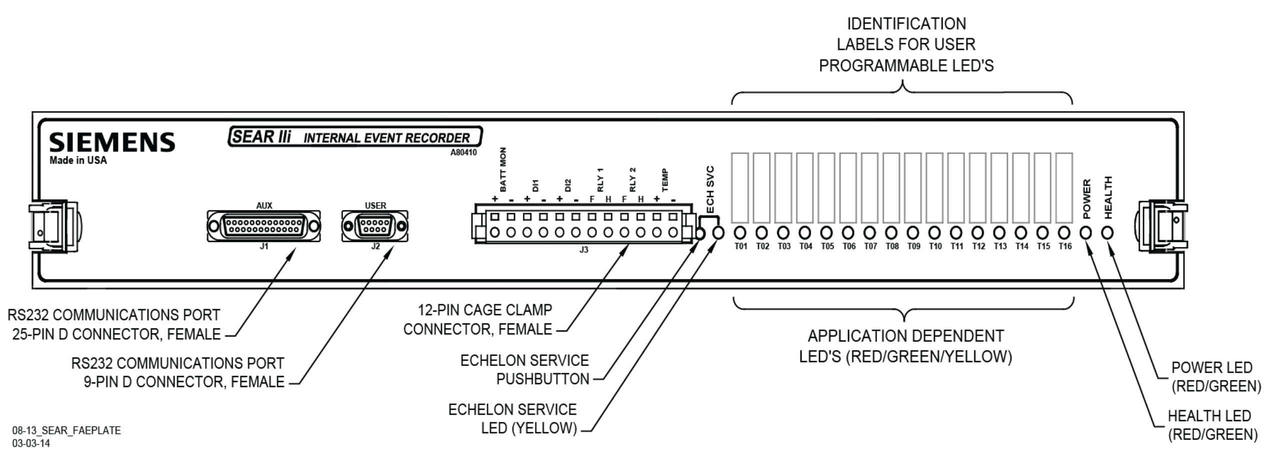


Figure 8-28: SEAR IIi Front Panel

Table 8-18: SEAR IIi 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 SEAR IIi is initialized.
ECH SVC Push button	Not used
POWER LED	Lights green when power is applied to SEAR IIi
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 SEAR IIi 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)

8.6.9 A80435 External Configuration Device (ECD)

The ECD is a factory installed plug-in device on the GCP 5000 backplane (see Figure 8-29). The ECD stores the module configuration file (MCF) and the application program for the GCP 5000. 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.

8.6.10 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.

8.6.11 A53555 USB External Configuration Device (ECD)

The USB ECD is a factory installed plug-in device on the GCP 5000 backplane (see Figure 8-29). The USB ECD stores the Display and SEAR IIi configuration data and the CDL for the GCP 5000. This allows the Display Module or SEAR IIi to be replaced without having to reprogram them.

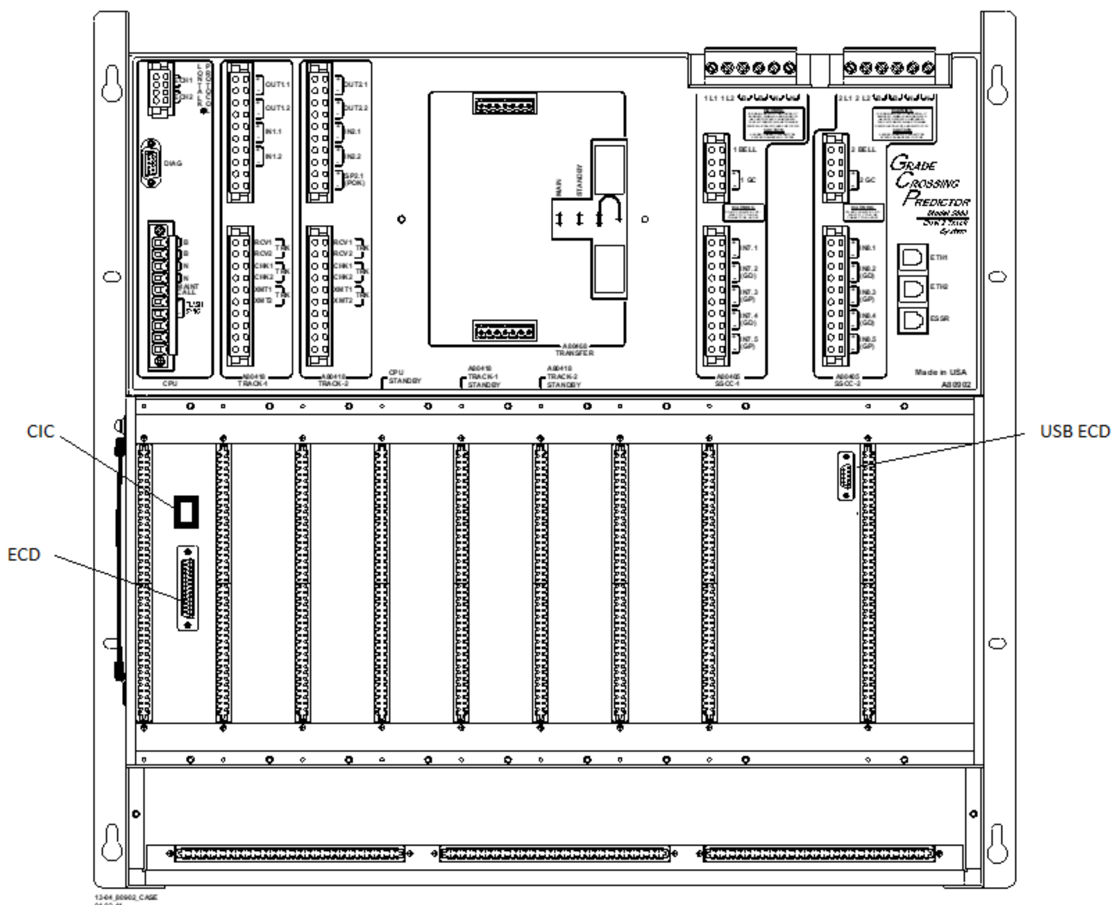


Figure 8-29: Typical ECD, USB ECD & CIC Locations on Backplane

8.6.12 Interface Connector Functions

The GCP 5000 interface connector functions are described in Table 8-19 thru Table 8-22 and Figure 8-30 thru Figure 8-33.

8.6.12.1 CPU Connectors

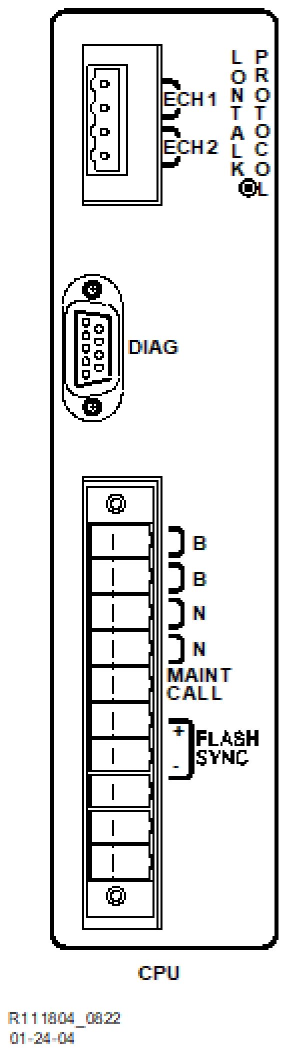


Figure 8-30: CPU Connectors

Table 8-19: 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.

*These functions are not normally used for the GCP 5000 application.

NOTE

NOTE

Effective with Revision D of the SSCC IIIi, FLASH SYNC is an isolated two-wire output.

If two Revision D or later SSCC IIIi 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 SSCC IIIi 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 SSCC IIIi or earlier, or when external SSCC units are connected to a master SSCC IIIi and operated from a different battery, the following wiring must be provided for FLASH SYNC Return:

If two Revision C SSCC IIIi units in the same chassis are operated by separate batteries, the N pins of the SSCC IIIi power and lamp connectors must be wired together.

If an external SSCC IIIA, SSCC III PLUS, or SSCC IV is connected to a master SSCC IIIi:

- If the SSCC IIIi is Revision C or earlier, the negative terminals of the master SSCC IIIi and external SSCC must be wired together.
- If the SSCC IIIi is Revision D or later, the SSCC IIIi **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).

8.6.12.2 Track Connectors

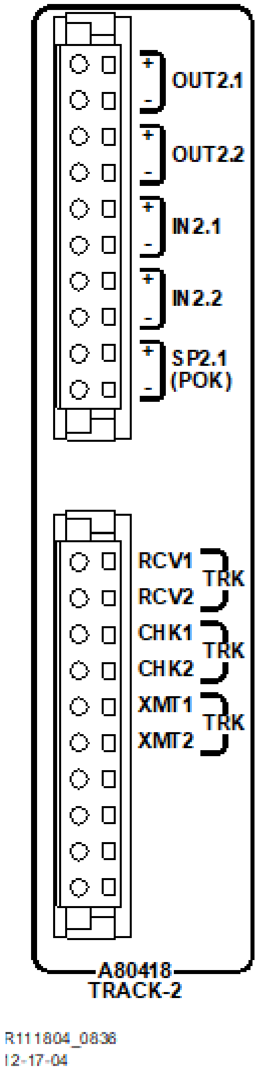


Figure 8-31: Track Connectors

Table 8-20: 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 SEAR IIi for all Track Modules except Track 1
	-		
	TRK RCV1		Receiver input from track
	TRK RVC2		
	TRK CHK1		Check input from track
	TRK CHK2		
	TRK XMT1		Transmit output to track
	TRK XMT2		

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.

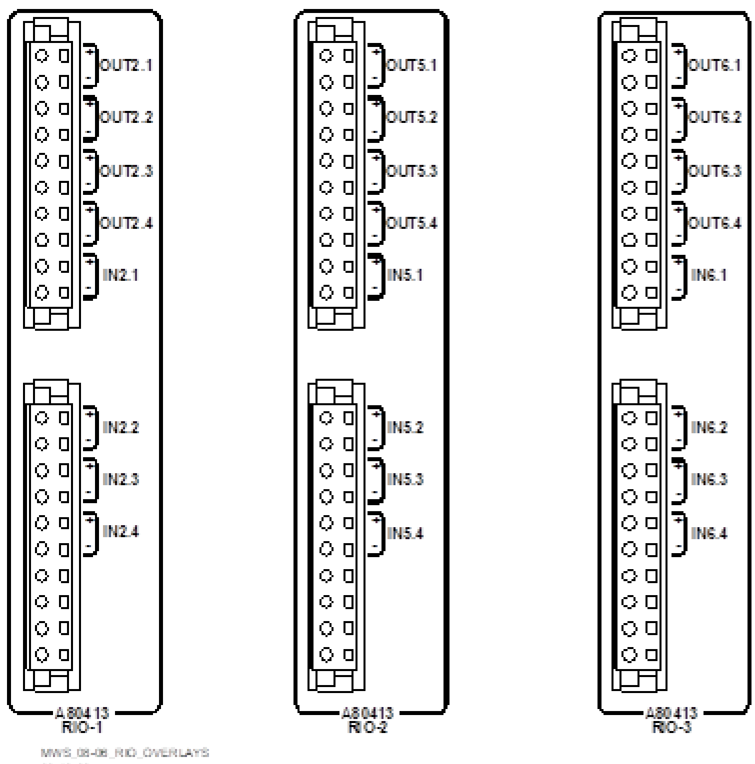
On all multi-track chassis, a spare connection is provided on the top track connector for TRACK 2 and higher that is mapped to the SEAR IIi, e.g., SP2.1 (POK) of TRACK-2 connector.

8.6.12.3 RIO Connectors

RIO Modules and their associated front panel connector groups provide additional Vital I/O. RIO Modules may also be substituted for Track 2, Track 5 and Track 6 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 RIO modules in the system programming.

The GCP 5000 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 8-21 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 8-32: RIO Mylar Overlay Ordering Information

Table 8-21: 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.

8.6.12.4 Crossing Controller Connectors

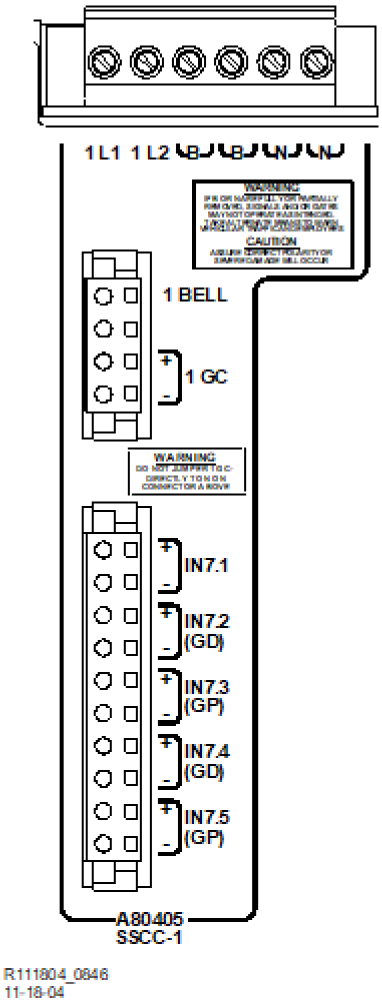


Figure 8-33: Crossing Controller Connectors

Table 8-22: Crossing Controller Connectors

Connector	Pinout*		Function
SSCC-1 SSCC-2	1L1		Lamp output 1
	1L2		Lamp output 2
	B		Battery positive input
	B		Battery positive input
	N		Battery negative input
	N		Battery negative input
	1 BELL		Bell output
	+	1 GC	Gate output
	-		
	+	IN7.1	Vital crossing input 1
	-		
	+	IN7.2	Vital crossing input 2
	-	(GD)	(gate down input)
	+	IN7.3	Vital crossing input 3
	-	(GP)	(gate position input)
	+	IN7.4	Vital crossing input 4
	-	(GD)	(gate down input)
	+	IN7.5(GP)	Vital crossing input 5
	-		(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.

8.7 LAN COMMUNICATIONS

Each GCP 5000 may communicate with other Siemens equipment via LONTALK® LAN (Echelon®) For further information, see Siemens's Echelon Configuration Handbook, COM-00-07-09.

8.7.1 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

THE ECHELON® INTERFACE IS NOT SURGE PROTECTED, THEREFORE 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.

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SECTION 9 – I/O FUNCTIONS & ASSIGNMENTS

SECTION 9 - I/O FUNCTIONS & ASSIGNMENTS

9.1 OUTPUT FUNCTIONS AND PHYSICAL OUTPUT ASSIGNMENTS

GCP 5000 Track, and RIO module physical outputs are user programmable, but not dedicated to specific output terminals on the GCP 5000 chassis

9.1.1 Output Requirements Due To Module Integration

Because the Track, Crossing Controller and SEAR Modules are integrated into the GCP 5000 case like those of the GCP 4000 case, some of the outputs previously used in the 3000 GCP are not required by the GCP 5000. 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 GCP 5000 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 certain versions of the software, some 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**	Logic Programming: Logic: Track ANDing Logic: AND 1 XR (TEMPLATE: AND 1 XR)	The AND 1 XR 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 5000 case at the crossing. An enabled AND 1 XR 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.

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
AND 2	And 2 Used **Yes**	Logic Programming: Logic: Track ANDing Logic: AND 2 .. 4	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 4: • 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**	Logic Programming: Logic: AND Gates Logic: AND 5 .. AND 8	AND 5 through AND 8 provide a means of ANDing up to 4 general purpose outputs. AND 5 to 8 also have an associated Enable input with a configurable pickup and drop delay and an associated Wrap input. The following de-energizes AND 5 through AND 8: • The AND wrap is not used, or used and de-energized and • One of the 4 general purpose outputs is de-energized • The AND Enable, if programmed On, is de-energized or running its pickup delay time Or The emergency activation input is used and de-energized. The emergency activation input drops AND 5 through 12 into the logic.
AND 6	And 6 Used **Yes**		
AND 7	And 7 Used **Yes**		
AND 8	And 8 Used **Yes**		

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
AND 9	And 9 Used **Yes**	Logic Programming: Logic: AND Gates Logic: AND 9 .. AND 12	AND 9 through AND 12 provide a means of ANDing up to 4 general purpose outputs. AND 9 to 12 also have an associated Enable input (no configurable pickup and drop delay are available with these) and an associated Wrap input. The following de-energizes AND 9 through AND 12: • The AND wrap is not used, or used and de-energized and • One of the 4 general purpose outputs is de-energized The AND Enable, if programmed On, is de-energized or running its pickup delay time or The emergency activation input is used and de-energized. The emergency activation input drops AND 5 through 12 into the logic.
AND 10	And 10 Used **Yes**		
AND 11	And 11 Used **Yes**		
AND 12	And 12 Used **Yes**		
Adv Preempt	Preempt Logic **Advnce**	Basic Configuration: 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**	Logic Programming: Logic: Track ANDing Logic: AND 1 XR (TEMPLATE: AND 1 XR)AND: track Anding (TEMPLATE: track Anding)	

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Sim Preempt	Preempt Logic **Simult**	Basic Configuration: PreemptionBASIC: 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**	Logic Programming: Logic: Track ANDing Logic: AND 1 XR (TEMPLATE: AND 1 XR)AND: track Anding (TEMPLATE: track Anding)	
Aux-1 Lmp Control	SSCC 1 Slot **SSCC IIIi**	Basic Configuration: BASIC: Module configurationSelection	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 Programming: SSCC: 1 Configuration	
Aux-2 Lmp Control	SSCC 2 Slot **SSCC IIIi**	Basic Configuration: Module SelectionBASIC: module configuration	The Aux-2 Lmp Control output is used to control the lamps on an external crossing controller shadowing the internal SSCC-2. The following de-energizes the Aux-2 Lmp Control: • The AND function that is used in SSCC-2 activation is de-energized • GP 2.1 or GP 2.2 is de-energized on SSCC1 if used • Either SSCC 1 or SSCC 2 is unhealthy if used. • The emergency activation input is used and de-energized.
	Aux-2 Xng Ctrl Used **Yes**	SSCC Programming: SSCC 2 ConfigurationSSCC: 2	

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Aux-1 Xng Control	SSCC 1 Slot **SSCC IIIi**	Basic Configuration: Module SelectionBASIC: module configuration	The Aux-1 Xng Control output is used to control the lamps on an external crossing controller shadowing the internal SSCC-2. The following de-energizes the Aux-1 Xng Control function: • AND 1 XR function is de-energized • Either SSCC 1 or SSCC 2 is unhealthy if used. • The emergency activation input is used and de-energized.
	Aux-1 Xng Ctrl Used **Yes**	SSCC Programming: SSCC 1 ConfigurationSSCC: 1	
Aux-2 Xng Control	SSCC 2 Slot **SSCC IIIi**	Basic Configuration: Module SelectionBASIC: module configuration	The Aux-2 Xng Control output is used to activate an external crossing controller or GCP 5000 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 de-energized.
	Aux-2 Xng Ctrl Used **Yes**	SSCC Programming: SSCC 2 ConfigurationSSCC: 2	
Gate Dwn Indication	Preempt Logic **Advnce** and Gate Down Logic Used **Yes**	Basic Configuration: Preemption (TEMPLATE: preemption) 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 de-energized and either all the selected gate down inputs are energized or an island is occupied The Gate Dwn Indication output is de-energized when: • The advanced preemption output is energized or • Any gate down inputs is de-energized or all islands are unoccupied

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Vital Link 1 OP 1	Vital Comms link 1 Used **Yes** Remote Outputs Used **Yes**	Basic Configuration: Vital Comms Link1 (not available in template menu)	Vital Link 1 OP 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 OP 1 is energized if Vital Link 1 IP 1 is energized on the GCP connected via Vital Comms link 1 and the link is in session. Vital Link 1 OP 1 is energized if vital input 1 is energized on the HD/Link module connected via Vital Comms link 1 and the link is in session. Vital Link 1 OP 1 is deenergized if: • Vital Link 1 IP 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 OP 1 deenergized on the GCP box with Vital Link 1 IP 1
Vital Link 1 OP 2 thru 8	As depicted in Vital Link 1 OP 1 above.	As depicted in Vital Link 1 OP 1 above.	As depicted in Vital Link 1 OP 1 above.
Vital Link 2 OP 1	Vital Comms Link 2 Used **Yes**	Basic Configuration: Vital Comms Link 2 (not available in template menu)	Vital Link 2 OP 1 is used as a general-purpose vital output driven by a vital input from a remote GCP or HD/Link module. Vital Link 2 OP 1 is energized if Vital Link 2 IP 1 is energized on the GCP connected via Vital Comms link 2 and the link is in session. Vital Link 2 OP 1 is energized if vital input 1 is energized on the HD/Link module connected via Vital Comms link 2 and the link is in session. Vital Link 2 OP 1 is deenergized if: • Vital Link 2 IP 1 is deenergized on the GCP or HD/Link connected via Vital Comms 2 Link • the link is in out of session • the emergency activation input is used and deenergized on the box with Vital Link 2 OP 1 deenergized on the GCP box with Vital Link 2 IP 1.
Vital Link 2 OP 2 thru 8	As depicted in Vital Link 1 OP above	As depicted in Vital Link 2 OP above	As depicted in Vital Link 2 OP above

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Vital Link 3 OP 1	Vital Comms Link 3 Used **Yes**	Basic Configuration: Vital Comms Link 3 (not available in template menu)	Vital Link 3 OP 1 is used as a general-purpose vital output driven by a vital input from a remote GCP or HD/Link module. Vital Link 3 OP 1 is energized if Vital Link 3 IP 1 is energized on the GCP connected via Vital Comms link 3 and the link is in session. Vital Link 3 OP 1 is energized if vital input 1 is energized on the HD/Link module connected via Vital Comms link 3 and the link is in session. Vital Link 3 OP 1 is deenergized if: • Vital Link 3 IP 1 is deenergized on the GCP or HD/Link connected via Vital Comms 3 Link • the link is in out of session • the emergency activation input is used and deenergized on the box with Vital Link 3 OP 1 deenergized on the GCP box with Vital Link 3 IP 1.
Vital Link 3 OP 2 thru 16	As depicted in Vital Link 3 OP 1 above.	As depicted in Vital Link 3 OP 1 above.	As depicted in Vital Link 3 OP 1 above.
Vital Link 4 OP 1	Vital Comms Link 4 Used **Yes**	Basic Configuration: Vital Comms Link 4 (not available in template menu)	Vital Link 4 OP 1 is used as a general-purpose vital output driven by a vital input from a remote GCP or HD/Link module. Vital Link 4 OP 1 is energized if Vital Link 4 IP 1 is energized on the GCP connected via Vital Comms link 4 and the link is in session. Vital Link 4 OP 1 is energized if vital input 1 is energized on the HD/Link module connected via Vital Comms link 4 and the link is in session. Vital Link 4 OP 1 is deenergized if: • Vital Link 4 IP 1 is deenergized on the GCP or HD/Link connected via Vital Comms 4 Link • the link is in out of session • the emergency activation input is used and deenergized on the box with Vital Link 4 OP 1 deenergized on the GCP box with Vital Link 4 IP 1As depicted in Vital Link 1 Output above.

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Vital Link 4 OP 2 thru 16	As depicted in Vital Link 4 OP 1 above.	As depicted in Vital Link 4 OP 1 above.	As depicted in Vital Link 4 OP 1 above.
Rmt SSCCIV OP 1	SSCCIV Controller Used **Yes**	SSCC Programming SSCC Configuration (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 SSCC IIIi Gates Used **Yes**	Basic Configuration: Module Selection	Gate Output 1 repeats the state of the GC output on SSCC1
Gate Output 2	SSCC 2 Slot SSCC IIIi Gates Used **Yes**	Basic Configuration: Module Selection	Gate Output 2 repeats the state of the GC output on SSCC2
Bell 1	SSCC 1 Slot SSCC IIIi	Basic Configuration: Module SelectionBASIC: module configuration	Bell 1 output repeats the state of the bell output on SSCC1

Output Function Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Bell 2	SSCC 2 Slot SSCC IIIi	Basic Configuration: Module SelectionBASIC: module configuration	Bell 2 output repeats the state of the bell output on SSCC2
OR 1	OR 1 Used **Yes**	ADVANCED:Logic Programming Logic: OR LogicGates OR 1	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**	Logic Programming: Logic: Track ANDing Logic: AND 1 XR (TEMPLATE: AND 1 XR)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 de-energized and AND 1 XR is used The NOT AND 1 XR output is de-energized when the AND 1 XR is energized
NOT AND 2 thru NOT AND 12.	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	Logic Programming Logic: Controls	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 (Track 'n' where n = 1..6)

Output Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Tn Island	Track n Slot **Track**	Basic Configuration Module Selection (TEMPLATE: module configuration)	This output reflects the state of the island on track n and is used if the track n island state is required in some equipment outside of the GCP system. The following de-energizes 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 de-energized.
	Island 1 Used **Internal**	GCP and Island Programming Track n Island Frequency (not available in template menu)	
Tn Prime	Track n Slot **Track**	Basic Configuration Module Selection (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 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 de-energized • Connected island is de-energized (if Prime has zero offset) • Track health error • The emergency activation input is used and de-energized.
	Track n MS/GCP Operation **Yes**	GCP and Island Programming Track n GCP Frequency (not available in template menu)	
	Prime Used **Yes**	GCP and Island Programming Track n Predictors Prime (not available in template menu)	

Output Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Tn DAX A	Track n Slot **Track**	Basic Configuration Module Selection (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 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 de-energized
	Track n MS/GCP Operation **Yes**	GCP and Island Programming Track n GCP Frequency (not available in template menu)	
	DAX A Used **Yes**	GCP and Island Programming Track n Predictors Dax A	
Tn DAX B	As depicted in Tn DAX A above	As depicted in Tn DAX A above	As depicted in Tn DAX A above
Tn DAX C	Track n Slot **Track**	Basic Configuration Module Selection (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 is de-energized) • Connected island is de-energized (if DAX C has zero offset) • Track health error • The emergency activation input is used and de-energized
	Track n MS/GCP Operation **Yes**	GCP and Island Programming Track n GCP Frequency (not available in template menu)	
	DAX C Used **Yes**	GCP and Island Programming Track n Predictors Dax C	
Tn DAX D	As depicted in Tn DAX C above	As depicted in Tn DAX C above	As depicted in Tn DAX C above
Tn DAX E			
Tn DAX F			
Tn DAX G			

Output Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
Tn Preempt	Track n Slot **Track**	Basic Configuration Module Selection (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 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 de-energized
	Track n MS/GCP Operation **Yes**	GCP and Island Programming Track n GCP Frequency (not available in template menu)	
	Preempt Logic **Advnce**	Basic Configuration Preemption (TEMPLATE: preemption)	
	Adv Preempt IP Used **Yes**	Basic Configuration Preemption (TEMPLATE: preemption)	
Tn MS Ctrl OP	Track n Slot **Track**	Basic Configuration Module Selection (TEMPLATE: module configuration)	• The MS Ctrl OP output is used to control whether the selected predictors at a downstream 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**	Basic Configuration 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 CPU II+ 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 SEAR IIi is used, and the SEAR IIi is not communicating with the CPU, or the SEAR IIi application program is commanding the Maint Call off

Table 9-4: GCP 5000 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 **Track**	Input/Output Assignments Output Assignments Slot 1-3 (TEMPLATE: OP assignment 1)	Vital outputs from track slot 1
OUT 2.1 OUT 2.2	Track 2 Slot **Track**	Input/Output Assignments Output Assignments Slot 1-3 (TEMPLATE: OP assignment 1)	Vital outputs from track slot 2
OUT 3.1 OUT 3.2	Track 3 Slot **Track**	Input/Output Assignments Output Assignments Slot 1-3 (TEMPLATE: OP assignment 1)	Vital outputs from track slot 3
OUT 4.1 OUT 4.2	Track 4 Slot **Track**	Input/Output Assignments Output Assignments Slot 4-6 (TEMPLATE: OP assignment 2)	Vital outputs from track slot 4
OUT 5.1 OUT 5.2	Track 5/RIO 2 Slot **Track**	Input/Output Assignments Output Assignments Slot 4-6 (TEMPLATE: OP assignment 2)	Vital outputs from track slot 5
OUT 6.1 OUT 6.2	Track 6/RIO 3 Slot **Track**	Input/Output Assignments Output Assignments Slot 4-6 (TEMPLATE: OP assignment 2)	Vital outputs from track slot 6
OUT 2.1 OUT 2.2 OUT 2.3	Track 2/RIO 1 Slot **RIO**	Input/Output Assignments Output Assignments Slot 1-3	Vital outputs from RIO 1

Output Name	Condition for Output to be Available	Found in Main Program Menu (Template Menu)	Description
OUT 2.4			
OUT 5.1 OUT 5.2 OUT 5.3 OUT 5.4	Track 5/RIO 2 Slot **RIO**	Input/Output Assignments Output Assignments Slot 4-6	Vital outputs from RIO 2
OUT 6.1 OUT 6.2 OUT 6.3 OUT 6.4	Track 6/RIO 3 Slot **RIO**	Input/Output Assignments Output Assignments Slot 4-6	Vital outputs from RIO 3
Out GC 1	SSCC 1 Slot **SSCC IIIi** Gates Used **Yes**	Input/Output Assignments Output Assignments SSCC	The Out GC 1 is located on the SSCC IIIi 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 **SSCC IIIi** Gates Used **Yes**	Input/Output Assignments Output Assignments SSCC	The Out GC 2 is located on the SSCC IIIi module in SSCC slot 2. The default is Gate Output 2. Other selections are the same as a track output.

9.2 INPUT FUNCTIONS AND PHYSICAL INPUT ASSIGNMENTS

GCP 5000 Track, RIO module, and Crossing Controller physical inputs are user programmable and are not dedicated to specific input terminals on the GCP 5000 chassis.

9.2.1 Input Requirements Due To Module Integration

Because the Track, Crossing Controller and SEAR Modules are integrated into the GCP 5000 case some inputs previously used by the 3000 GCP are not required by the GCP 5000 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 GCP 5000 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 input. For example, when **AND 1 XR Enable** is mapped to **IN 1.1** and the **AND 1 XR 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 CIRCUIT HAS AN ISLAND, THEN THERE SHOULD NOT BE ANY PRIME PREDICTION OFFSET DISTANCE PROGRAMMED GREATER THAN ZERO. IF IT OCCURS, IT MAY RESULT IN A SHORTENED WARNING TIME OR CROSSING ACTIVATION FAILURE.

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, THEN IN VERY LIMITED CIRCUMSTANCES WITH TRAIN DECELERATION, THE CROSSING WARNING SYSTEM MAY BRIEFLY TIMEOUT IF THE DAX DOES NOT UTILIZE THE PRIME UAX INPUT (THE UAX PARAMETER IS SET TO “NOT USED”).

THIS SITUATION RESULTS FROM THE “AUTOMATED PICKUP DELAY” IN THE REMOTE TRACK CIRCUIT EXPIRING PRIOR TO THE CROSSING GCP PREDICTING FOR THE TRAIN. REFER TO SECTION 6.7.8 FOR CORRECTIVE ACTIONS.

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 Configuration 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	Adv Preempt IP Used **Yes**	Basic Configuration 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	And 1 XR Used **Yes**	Logic Programming Logic: Track ANDing AND 1 XR (TEMPLATE: Track Anding)	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.
AND 1 XR Enable	And 1 XR Used **Yes**	Logic Programming Logic: Track ANDing AND 1 XR (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 XR Enable	And 1 Enable Used **Yes**	Logic Programming Logic: Track ANDing AND 1 XR (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 2 Enable	And 2 Used **Yes**	Logic Programming Logic: Track ANDing AND 2 (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	And 2 Enable Used **Yes**	Logic Programming Logic: Track ANDing AND 2 (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.

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
AND 3 Enable	And 3 Used **Yes**	Logic Programming Logic: Track ANDing AND 3 (TEMPLATE: Track Anding)	As depicted in AND 2 Enable
	And 3 Enable Used **Yes**	Logic Programming Logic: Track ANDing AND 3 (TEMPLATE: Track Anding)	
AND 4 Enable	And 4 Used **Yes**	Logic Programming Logic: Track ANDing AND 4 (TEMPLATE: Track Anding)	As depicted in AND 2 Enable
	And 4 Enable Used **Yes**	Logic Programming Logic: Track ANDing AND 4 (TEMPLATE: Track Anding)	
AND 5 Enable	And 5 Used **Yes**	Logic Programming Logic: AND Gates AND 5 (not available in templates)	As depicted in AND 2 Enable
	And 5 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 5 (not available in templates)	
AND 6 Enable	And 6 Used **Yes**	Logic Programming Logic: AND Gates AND 6 (not available in templates)	As depicted in AND 2 Enable

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
	And 6 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 6 (not available in templates)	
AND 7 Enable	And 7 Used **Yes**	Logic Programming Logic: AND Gates AND 7 (not available in templates)	As depicted in AND 2 Enable
	And 7 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 7 (not available in templates)	
AND 8 Enable	And 8 Used **Yes**	Logic Programming Logic: AND Gates AND 8 (not available in templates)	As depicted in AND 2 Enable
	And 8 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 8 (not available in templates)	
AND 9 Enable	And 9 Used **Yes**	Logic Programming Logic: AND Gates AND 9 (not available in templates)	As depicted in AND 2 Enable
	And 9 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 9 (not available in templates)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
AND 10 Enable	And 10 Used **Yes**	Logic Programming Logic: AND Gates AND 10 (not available in templates)	As depicted in AND 2 Enable
	And 10 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 10 (not available in templates)	
AND 11 Enable	And 11 Used **Yes**	Logic Programming Logic: AND Gates AND 11 (not available in templates)	As depicted in AND 2 Enable
	And 11 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 11 (not available in templates)	
AND 12 Enable	And 12 Used **Yes**	Logic Programming Logic: AND Gates AND 12 (not available in templates)	As depicted in AND 2 Enable
	And 12 Enable Used **Yes**	Logic Programming Logic: AND Gates AND 12 (not available in templates)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
Emergency Activate	Emergency Activate IP**Yes**	Logic Programming Logic: Controls (not available in templates)	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 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. • Wrap and Override inputs are deenergized.
AND 1 Wrap	And 1 XR Used **Yes**	Logic Programming Logic: Track ANDing AND 1 XR (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**	Logic Programming Logic: Track ANDing AND 1 XR (TEMPLATE: Track Anding)	
AND 2 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 3 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 4 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 5 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 6 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 7 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 8 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 9 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 10 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 11 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above
AND 12 Wrap	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above	As depicted in AND 1 Wrap above

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
Trf Control Health	Preempt Logic **Advnce**	Basic Configuration: 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 Configuration: preemption (TEMPLATE: preemption)	
	And 1 XR Used **Yes**	Logic Programming Logic: Track ANDing AND 1 XR (TEMPLATE: Track Anding)	
Preempt Health	Preempt Logic **Advnce** or **Simult**	Basic Configuration: 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 GCP 5000 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 Configuration: preemption (TEMPLATE: preemption)	
	And 1 XR Used **Yes**	Logic Programming Logic: Track ANDing AND 1 XR (TEMPLATE: Track Anding)	
Maint Call Rpt IP	Ext Maint Call Input **Yes**	Logic Programming Logic: Controls	This input receives the maintenance call from external equipment; e.g., SSCC III Plus or SSCC IV and is included with the GCP 5000 maintenance call logic to produce the front panel Maint Call output.
Aux-1 Xng Ctrl Hlth	SSCC-1 Slot **SSCCIIIi**	Basic Configuration Module Selection (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 5000. 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 Programming SSCC 1 Configuration (not available in template menu)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
	Aux-1 Xng Ctrl Hlth IP **Yes**	SSCC Programming SSCC 1 Configuration (not available in template menu)	
Aux-2 Xng Ctrl Hlth	SSCC-2 Slot **SSCC IIIi**	Basic Configuration Module Selection (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 5000. 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 Programming SSCC 2 Configuration	
	Aux-2 Xng Ctrl Hlth IP **Yes**	SSCC Programming SSCC 2 Configuration	
Vital Link 1 IP 1	Vital Comm Link 1 Used **Yes**	Basic Configuration Vital Comms Links Vital Comms Link 1	Vital Link 1 IP 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 IP 2 thru Vital Link 1 IP 8	As depicted in Vital Link 1 IP 1 above	As depicted in Vital Link 1 IP 1 above	As depicted in Vital Link 1 IP 1 above
Vital Link 2 IP 1	Vital Comm Link 2 Used **Yes**	Basic Configuration Vital Comms Links Vital Comms Link 2	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 IP 2 thru Vital Link 2 IP 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
Vital Link 3 IP 1	Vital Comm Link 3 Used **Yes**	Basic Configuration Vital Comms Links Vital Comms Link 3	Vital Link 3 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 3 IP 2 thru Vital Link 3 IP 16	As depicted in Vital Link 3 Input 1 above	As depicted in Vital Link 3 Input 1 above	As depicted in Vital Link 3 Input 1 above
Vital Link 4 IP 1	Vital Comm Link 4 Used **Yes**	Basic Configuration Vital Comms Links Vital Comms Link 4	Vital Link 4 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 4 IP 2 thru Vital Link 4 IP 16	As depicted in Vital Link 4 Input 1 above	As depicted in Vital Link 4 Input 1 above	As depicted in Vital Link 4 Input 1 above

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
Passthru State 1	Pass Thrus **Yes**	Logic Programming Logic: Controls	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 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 Configuration Module Selection (TEMPLATE: module configuration)	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**	GCP and Island Programming Track 1 Island Frequency	
Ext Island 2 thru 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**	Basic Configuration Out of Service	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.

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
	OOS Control Display+OOS IPs Or OOS Control **OOS IPs**	Basic Configuration Out of Service (TEMPLATE : OOS)	If OOS Control is set to OOS IPs, the Out Of Service input when energized takes either the GCP Approach or the Island on the configured track modules out of service. The Out Of Service Window is described in section 4.1.4.1.2. The Out Of Service input 1 must be energized when the out of service is requested.
Out Of Service IP 2 thru 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
5000 Case OOS IP	OOS Control 5000 Case OOS IP	Basic Configuration Out of Service (TEMPLATE : OOS)	The 5000 Case OOS IP is used to take the whole GCP case out of service with one input. When the 5000 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 5000 Case OOS IP and deenergize all outputs.
3 Vehicle Detect	SSCCIV Controller Used **Yes**	SSCC Programming SSCC Configuration (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 GCP 5000 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 GCP).
	4000 Control Type **Exit**	SSCC Programming SSCC Configuration (not available in template menu)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
4 Vehicle Detect	SSCCIV Controller Used Yes	SSCC Programming SSCC Configuration (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 GCP 5000 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 GCP).
	4000 Control Type **Exit**	SSCC Programming SSCC Configuration (not available in template menu)	
Vehicle Detect Hlth	SSCCIV Controller Used **Yes**	SSCC Programming SSCC Configuration (not available in template menu)	The Vehicle Detect Hlth input is used to monitor the health of the vehicle detectors, when the GCP 5000 is used in a four quadrant gate application.
	4000 Control Type **Exit**	SSCC Programming SSCC Configuration (not available in template menu)	
T1 Prime UAX	Track 1 Slot **Track**	Basic Configuration Module Selection (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
	Track 1 MS/GCP Operation **Yes**	GCP and Island Programming Track 1 GCP Frequency (not available in template menu)	
	Prime Used **Yes**	GCP and Island Programming Track 1 Predictors Prime (not available in template menu)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
	Prime UAX **Yes**	GCP and Island Programming Track 1 Predictors Prime (TEMPLATE: track 1)	(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
T1 DAX A Enable	Track 1 Slot **Track**	Basic Configuration Module Selection (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**	GCP and Island Programming Track 1 GCP Frequency (not available in template menu)	
	DAX A Used **Yes**	GCP and Island Programming Track 1 Predictors Dax A (TEMPLATE: track 1 DAXes)	
	DAX A Enable **Yes**	GCP and Island Programming Track 1 Predictors Dax A (TEMPLATE: track 1 DAXes)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
T1 DAX B Enable T1 DAX C Enable	As depicted in T1 DAX A Enable above	As depicted in T1 DAX A Enable above	As depicted in T1 DAX A Enable above
T1 DAX D Enable	Track 1 Slot **Track**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in T1 DAX A Enable above, except with no programmable pickup delay.
	Track 1 MS/GCP Operation **Yes**	GCP and Island Programming Track 1 GCP Frequency (not available in template menu)	
	DAX D Used **Yes**	GCP and Island Programming Track 1 Predictors Dax D (TEMPLATE: track 1 DAXes)	
	DAX D Enable **Yes**	GCP and Island Programming Track 1 Predictors Dax D (TEMPLATE: track 1 DAXes)	
T1 DAX E Enable T1 DAX F Enable T1 DAX G Enable	As depicted in T1 DAX D Enable above	As depicted in T1 DAX D Enable above.	As depicted in T1 DAX D Enable above
T1 Preempt Enable	Track 1 Slot **Track**	Basic Configuration Module Selection (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

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
	Track 1 MS/GCP Operation **Yes**	GCP and Island Programming Track 1 GCP Frequency (not available in template menu)	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.
	Preempt Used **Yes**	GCP and Island Programming Track 1 Predictors Preempt (TEMPLATE: track 1 DAXes)	
	Preempt Enable **Yes**	GCP and Island Programming Track 1 Predictors Preempt	
T1 Wrap	Track 1 Slot **Track**	Basic Configuration Module Selection (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**	GCP and Island Programming Track 1 Wraps and Override (not available in template menu)	
T1 MS Control	Track 1 Slot **Track**	Basic Configuration Module Selection (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

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
	Track 1 MS/GCP Operation **Yes**	GCP and Island Programming Track 1 GCP Frequency (not available in template menu)	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.
	MS/GCP Ctrl IP Used **Yes**	GCP: track 1 MS Control (not available in template menu)	
T1 Pred Override	All Predictors Override Used **Yes**	GCP and Island Programming Track 1 Wraps and Override (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	DAX A Used **Yes**	GCP and Island Programming Track 1 Predictors Dax A (TEMPLATE: Track 1 Daxes)	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
	All Predictors Override Used **No**	GCP and Island Programming Track 1 Wraps and Override (not available in template menu)	
	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 B Override T1 DAX C 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.
GP 1.1	SSCC-1 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	GP1.1 input on SSCC-1 receives the gate position signal from the crossing gates.
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC-1 Number GPs **1** or **2**	SSCC Programming SSCC: 1 Configuration (TEMPLATE: SSCC)	
GP 1.2	SSCC 1 Slot **SSCC IIIi**	Basic Configuration Module Selection (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 Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC-1 Number GPs **2**	SSCC Programming SSCC: 1 Configuration (TEMPLATE: SSCC)	
GP 2.1	SSCC-2 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in GP1.1 but for SSCC-2
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC-2 Number GPs **1** or **2**	SSCC Programming SSCC: 2 Configuration (TEMPLATE: SSCC)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
GP 2.2	SSCC 2 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in GP1.2 but for SSCC-2
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC-2 Number GPs **2**	SSCC Programming SSCC: 2 Configuration (TEMPLATE: SSCC)	
GD 1.1	SSCC 1 Slot **SSCC IIIi**	Basic Configuration Module Selection (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 SEAR IIi.
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC-1 Number GDs **1** thru **4**	SSCC Programming SSCC: 1 Configuration (TEMPLATE: SSCC)	
GD 1.2	SSCC 1 Slot **SSCC IIIi**	Basic Configuration Module Selection (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 SEAR IIi.
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 1 Number GDs **2** thru **4**	SSCC Programming SSCC: 1 Configuration (TEMPLATE: SSCC)	
GD 1.3	SSCC 1 Slot **SSCC IIIi**	Basic Configuration Module Selection (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 SEAR IIi.
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 1 Number GDs **3** or **4**	SSCC Programming SSCC: 1 Configuration (TEMPLATE: SSCC)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
GD 1.4	SSCC 1 Slot **SSCC IIIi**	Basic Configuration Module Selection (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 SEAR IIi.
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 1 Number GDs **4**	SSCC Programming SSCC: 1 Configuration (TEMPLATE: SSCC)	
GD 2.1	SSCC 2 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in GD1.1 but for SSCC-2
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 2 Number GDs **1** thru **4**	SSCC Programming SSCC: 2 Configuration (TEMPLATE: SSCC)	
GD 2.2	SSCC 2 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in GD1.2 but for SSCC-2
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 2 Number GDs **2** thru **4**	SSCC Programming SSCC: 2 Configuration (TEMPLATE: SSCC)	
GD 2.3	SSCC 2 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in GD1.3 but for SSCC-2
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 2 Number GDs **3** or **4**	SSCC Programming SSCC: 2 Configuration (TEMPLATE: SSCC)	

Input Name	Condition for Input to be Available	Found in Main Program Menu (Template Menu)	Description
GD 2.4	SSCC 2 Slot **SSCC IIIi**	Basic Configuration Module Selection (TEMPLATE: module configuration)	As depicted in GD1.4 but for SSCC-2
	Gates Used **Yes**	SSCC Programming SSCC Configuration (TEMPLATE: SSCC)	
	SSCC 2 Number GDs **4**	SSCC Programming SSCC: 2 Configuration (TEMPLATE: SSCC)	

Table 9-8: GCP 5000 Physical Inputs

Input Name	Condition for Input to be Available	Found in Menu	Description
IN 1.1 IN 1.2	Track 1 Slot **Track**	Input/Output Assignments Input Assignments Slot 1-3	Vital inputs to track slot 1
IN 2.1 IN 2.2	Track 2 Slot **Track**	Input/Output Assignments Input Assignments Slot 1-3	Vital inputs to track slot 2
IN 2.1 IN 2.2 IN 2.3 IN 2.4	Track 2/RIO 1 Slot **RIO**	Input/Output Assignments Input Assignments Slot 1-3	Vital inputs to RIO 1
IN 3.1 IN 3.2	Track 3 Slot **Track**	Input/Output Assignments Input Assignments Slot 1-3	Vital inputs to track slot 3
IN 4.1 IN 4.2	Track 4 Slot **Track**	Input/Output Assignments Input Assignments Slot 4-6	Vital inputs to track slot 4

Input Name	Condition for Input to be Available	Found in Menu	Description
IN 5.1 IN 5.2	Track 5/RIO 2 Slot **Track**	Input/Output Assignments Input Assignments Slot 4-6	Vital inputs to track slot 5
IN 5.1 IN 5.2	Track 6/ RIO 3 Slot **Track**	Input/Output Assignments Input Assignments Slot 4-6	Vital inputs to track slot 6
IN 5.1 IN 5.2 IN 5.3 IN 5.4	Track 5/ RIO 2 Slot **RIO**	Input/Output Assignments Input Assignments Slot 4-6	Vital inputs to RIO 2
IN 6.1 IN 6.2 IN 6.3 IN 6.4	Track 6/ RIO 3 Slot **RIO**	Input/Output Assignments Input Assignments Slot 4-6	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**	Input/Output Assignments Input Assignments Slot 4-6	Vital inputs to SEAR
IN 6.1 IN 6.2 IN 6.3 IN 6.4 IN 6.5	Track 6/ RIO 3 Slot **SEAR input**	Input/Output Assignments Input Assignments Slot 4-6	Vital inputs to SEAR

Input Name	Condition for Input to be Available	Found in Menu	Description
IN 6.6			
IN 6.7			
IN 6.8			
SSCC1 IN 7.1	SSCC 1 Slot **SSCC IIIi**	Input/Output Assignments Input Assignments SSCC	Vital inputs to SSCC IIIi
SSCC1 IN 7.2			
SSCC1 IN 7.3			
SSCC1 IN 7.4			
SSCC1 IN 7.5			
SSCC2 IN 8.1	SSCC 2 Slot **SSCC IIIi**	Input/Output Assignments Input Assignments SSCC	Vital inputs to SSCC IIIi
SSCC2 IN 8.2			
SSCC2 IN 8.3			
SSCC2 IN 8.4			
SSCC2 IN 8.5			

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APPENDIX A - GLOSSARY

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 GCP 5000 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 GCP 5000.
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 United States 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 GCP 5000.
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. Also referred to as Inbound / Outbound Poor Shunting.
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, SSCC IIIi 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 (GCP APP)	GCP Approach length calibration into a hardwire shunt located at the termination shunt.
GCP CAL	GCP Calibration into a termination shunt.
Linearization (GCP LIN)	Approach Linearization calibration into a hardwire shunt located at the 50% point on the approach.
GD	Gate Down, input energized when gate arm is horizontal.
GFT	Ground Fault Tester – An optional external device connected to the Echelon LAN that constantly monitors up to two batteries for ground faults and indicates battery status to the SEAR IIi.
GP	Gate Position – Input energized when gate is vertical.
GU	Gate Up – Used in a user defined SEAR IIi 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, SSCC IIIi.

LAMP 2 VOLTAGE Voltage on the lamp 1L2 or 2L2 lamp output of the crossing controller module, SSCC IIIi.

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 SEAR IIi.

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 GCP 5000 system.
Offset Distance	The distance between the track circuit connections of the remote GCP (sending DAX information) to the island track connections of the UAX GCP (receiving the information).
Out Of Service	The process for taking one or more GCP approach circuits and / or approach and island circuits out of service.
PAC File	A GCP 5000 configuration Package File that can either be created in the office using the OCE, or downloaded from a GCP 5000 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 pick up 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	Phase 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.
RailFusion	An office based application that communicates with and receives data from specially equipped crossings.

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 GCP 5000 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 – refer to RailFusion.
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 with the Island unoccupied. The Z Level approaches 0 when shunted.

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APPENDIX B – INTERFERENCE

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.3 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 2.5 VRMS, 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 amplitude than the frequency of 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 somewhat 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 often 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.4 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.4.1 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 high GCP transmit current.

C. For Frequencies above 211Hz use 62780 Shunts.

D. Ensure that the appropriate cab signal filters are being used (if required) in the cab signal feeds to the track.

B.4.2 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

APPENDIX C. SSCC APPLICATIONS & PROGRAMMING GUIDELINES

C.1 SSCC IIIi APPLICATION GUIDELINES

The A80405 Solid-State Crossing Controller IIIi (SSCC IIIi), Figure C-1, is a plug-in module for the 5000 Grade Crossing Predictor (GCP). All multi-track GCP 5000 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.

The SSCCIIIi modules are integrated into the GCP 5000 system (wiring between the GCP, the SSCC IIIi, and the SEAR IIi is eliminated) and are not redundant.

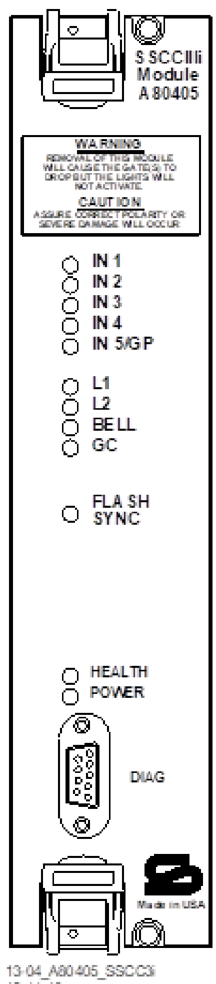


Figure C-1: A80405 Solid-State Crossing Controller IIIi

C.2 UNIT OVERVIEW

The A80405 module is programmed, calibrated, and tested from the Display module of the GCP 5000. It is activated by internal logic from the GCP 5000, 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 GCP 5000s
- 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.

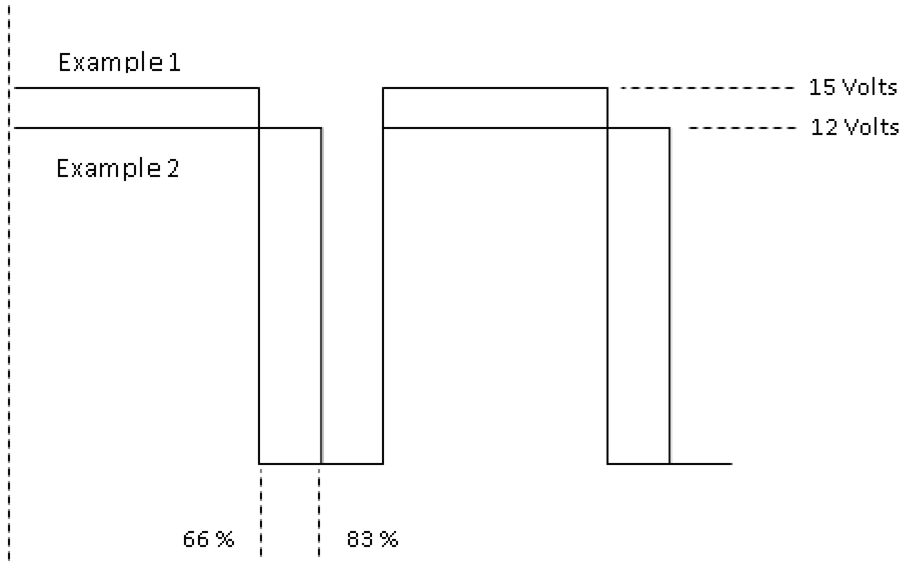


Figure C-2: Pulse Width Modulation - Examples

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 section C.9

C.2.3 Module Health

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-3. 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 section C.3.1).

Provide power wiring to A80405 SSCC IIIi modules:

- Via **B** and **N** contacts of the respective crossing controller connectors on GCP 5000 front panel.
- Using poly-jacketed #10 AWG wire (recommended) for DC power and return between battery surge protection and the GCP 5000 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.

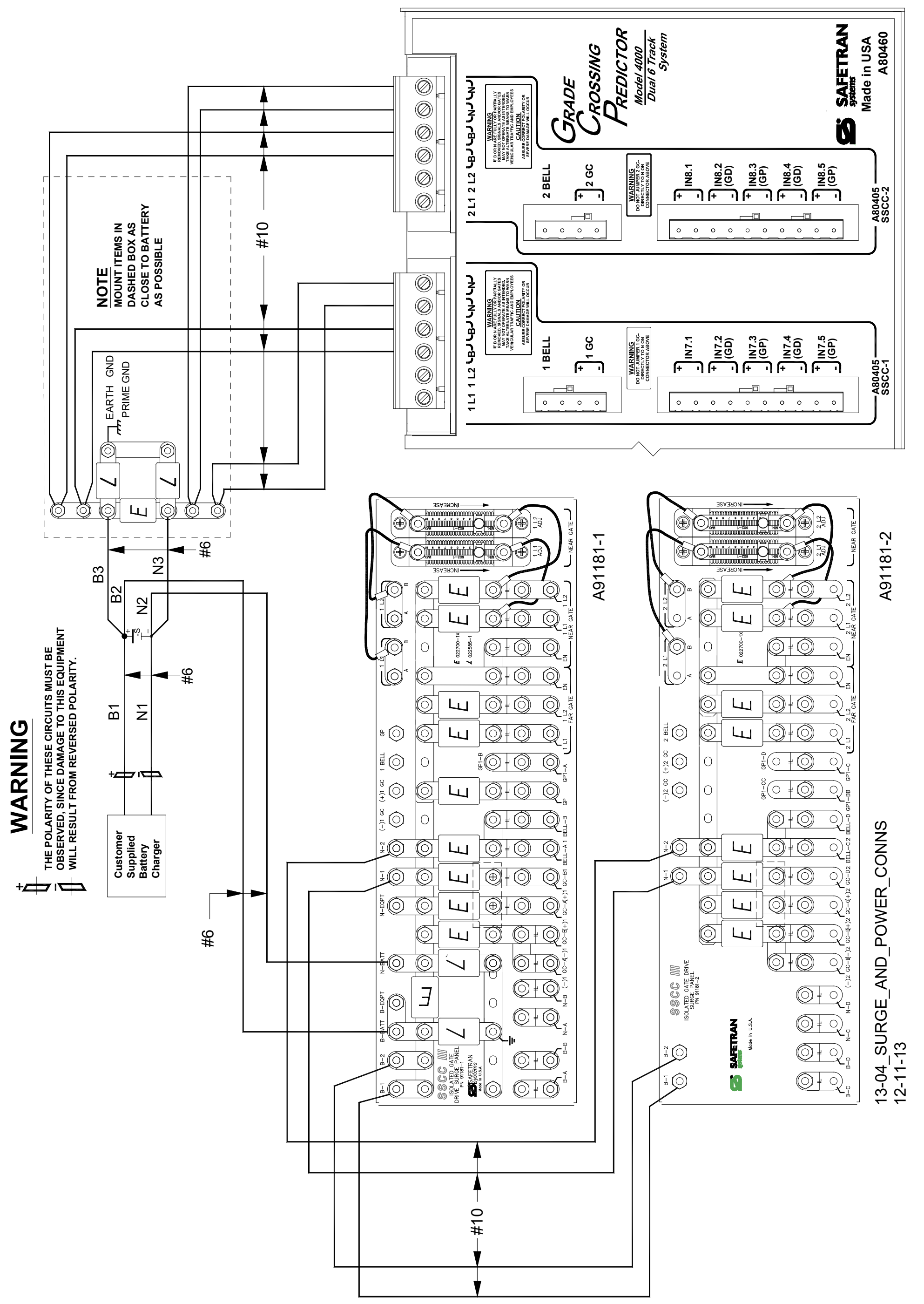


Figure C-3: Surge Protection & Power Connections to SSCC Modules & Lighting Surge Panels

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-4A and Figure C-4B.

A91181-1, -2 isolated gate control, Figure C-5A and Figure C-5B.

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-4B) are generally used for 21 to 40-ampere operation. Refer to Figure C-5B for typical isolated gate control wiring.

⚠ WARNING

WARNING

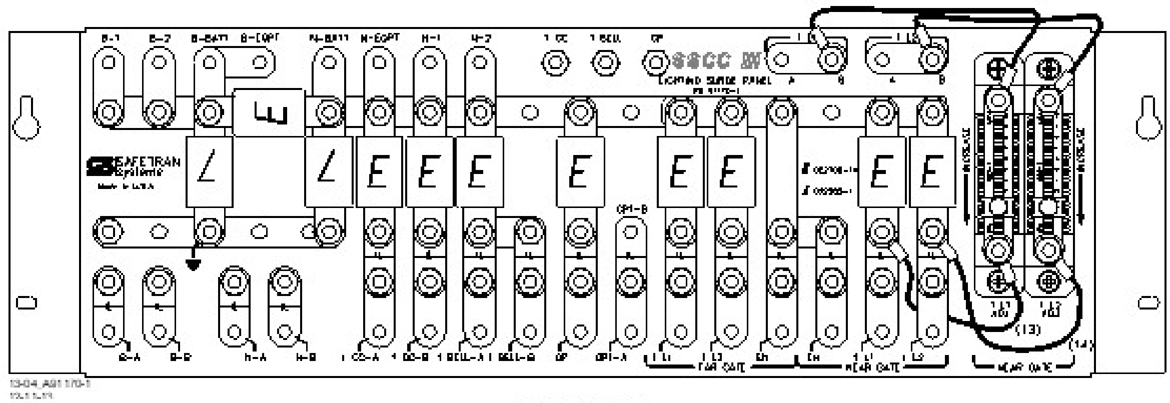
WHEN 91170 OR 91180 PANELS ARE NOT USED WITH THE SSCC, EQUIVALENT SURGE PROTECTION MUST BE PROVIDED WITH THE ADDITION OF STEERING DIODES IN THE GATE CONTROL (GC) OUTPUTS AS SHOWN IN FIGURE C-6A AND FIGURE C-6B.

NOTE

NOTE

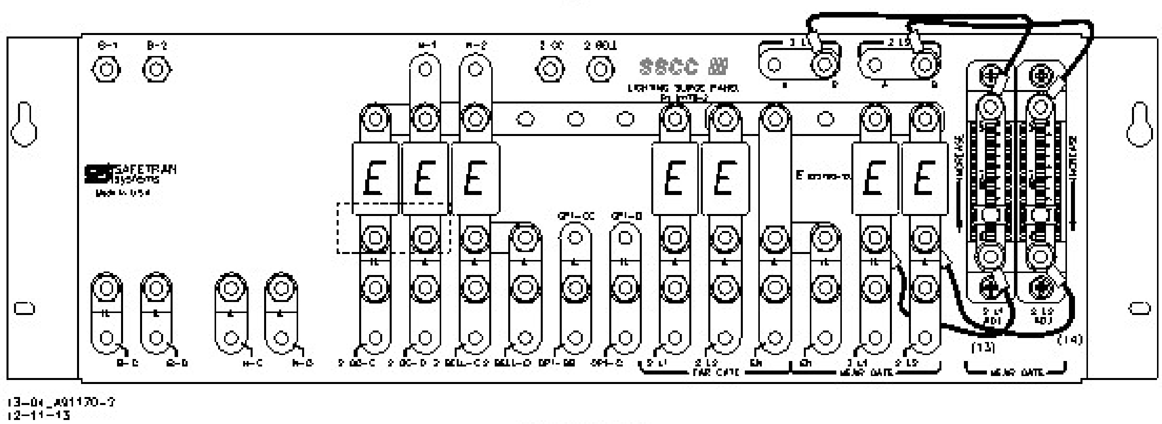
For information on the selection and installation of the 91170-1 and 91181-1 SSCC III Lighting Surge Panels, refer to section 7, Auxiliary Equipment.

A



A91170-1

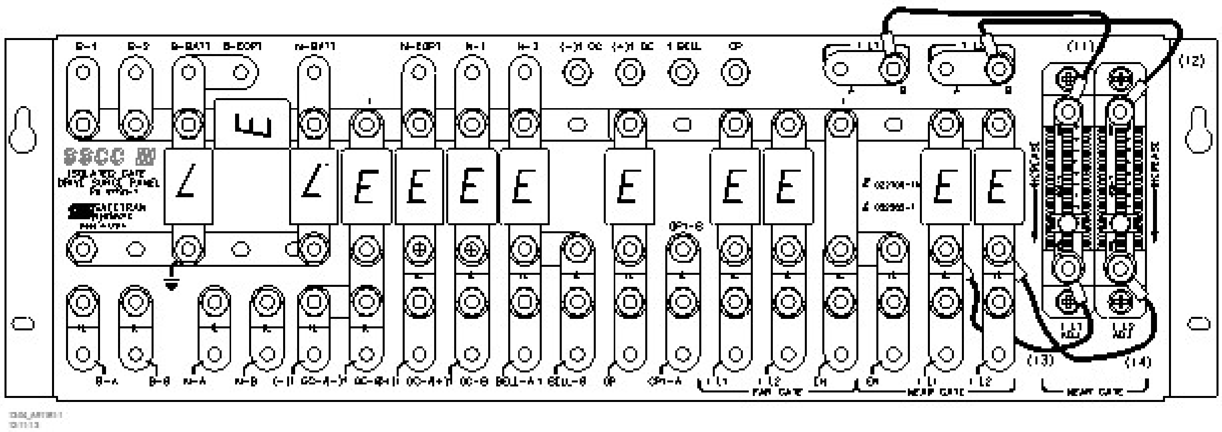
B



A91170-2

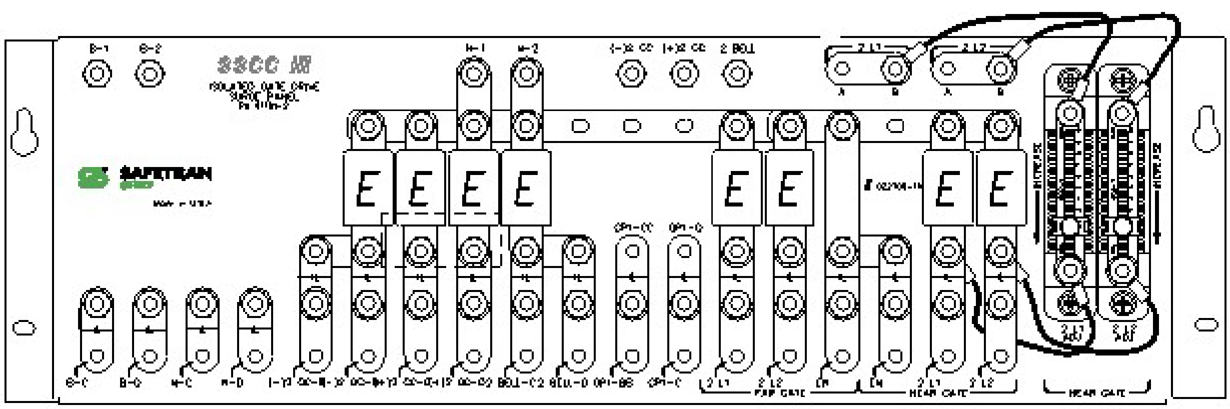
Figure C-4: Common Return Lighting Surge Panels, A91170-1 & A91170-2

A



A91181-1

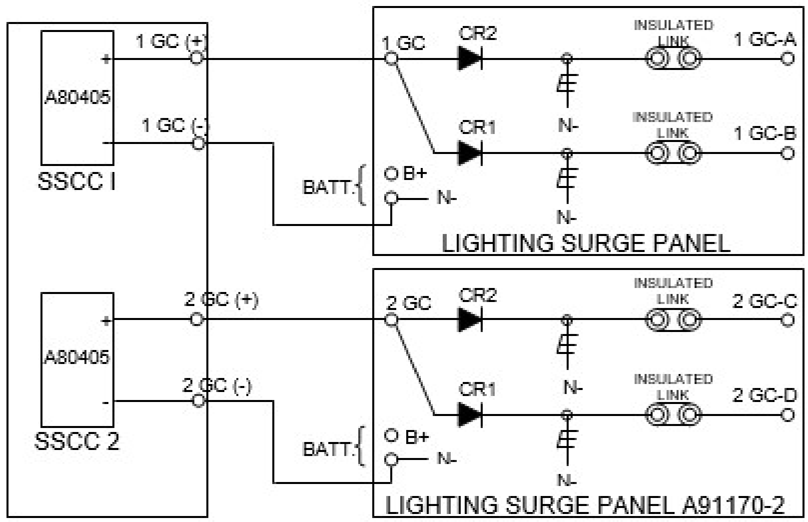
B



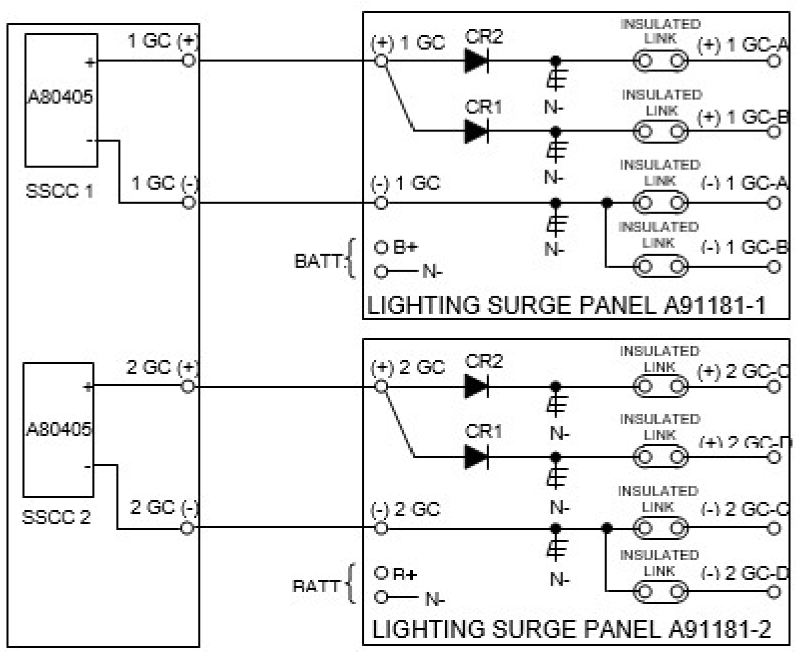
13-04_A91181-2
12-11-13

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.

Table C-1: A80405 Module Operating Parameters

Parameter	Value
System Reaction Time:	Nominal 700 ms
Power-Up Time:	40 seconds maximum
Lamp Flash Rate:	Can be programmed for 30 to 70 flashes per minute in 5 flashes-per-minute increments. 50 flashes per minute default
Lamp Duty Cycle:	50% each flashed lamp
Lamp Voltage Adjustment:	Gate lamps are programmable, with regulated set points from 9.0 to 15.0 volts in 0.1 increments The lamp output voltage at the SSCC connector is limited to 1.5 volts under the battery voltage. Variable resistors on the Near Gate output of the Lighting Surge panel are provided for voltage drop compensation as required (see Figure C-9 and Figure C-10)
Test Modes:	
Static Lamp & Bell Tests:	Selected lamps lit steady. All lamps flashing Bell ON Steady
Activate Crossing:	Crossing activates according to normal operation
Timed Lamp Test:	Automatically delayed & timed.
Repeated Lamp Test:	Timed lamp test repeated after twice the initial delay.

C.5 INSTALLATION

C.5.1 Crossing Controller Module Installation

Two non-redundant A80405 Solid-State Crossing Controller IIIi (SSCC IIIi) modules can be installed in the GCP 5000 as shown in Figure C-7. Crossing Controller lamp and bell circuit wiring includes:

- Installation of wiring between the GCP 5000 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.

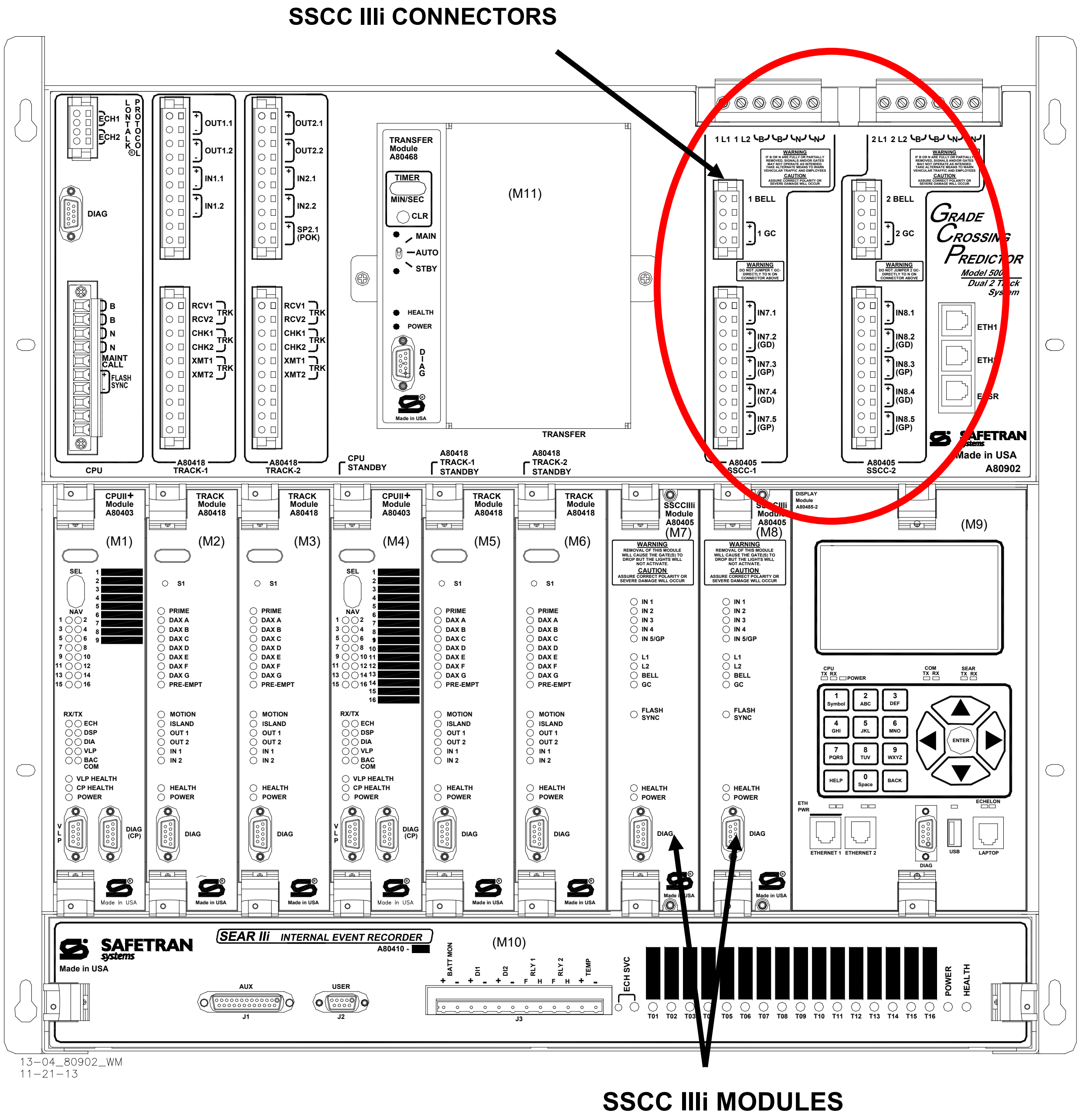


Figure C-7: GCP 5000 Crossing Controller Module & Connector Locations

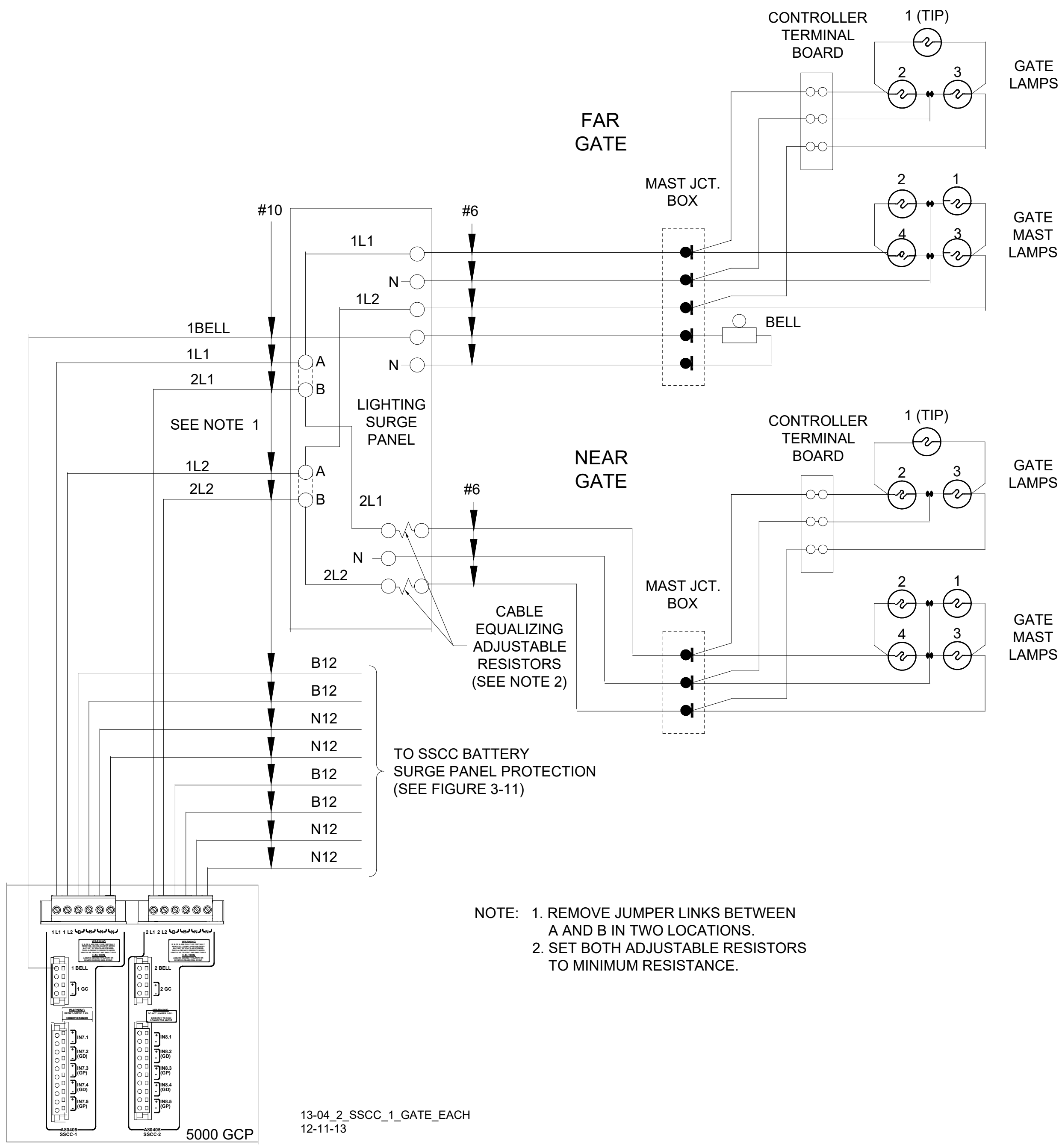


Figure C-8: Two Crossing Controller Modules Controlling One Gate Each

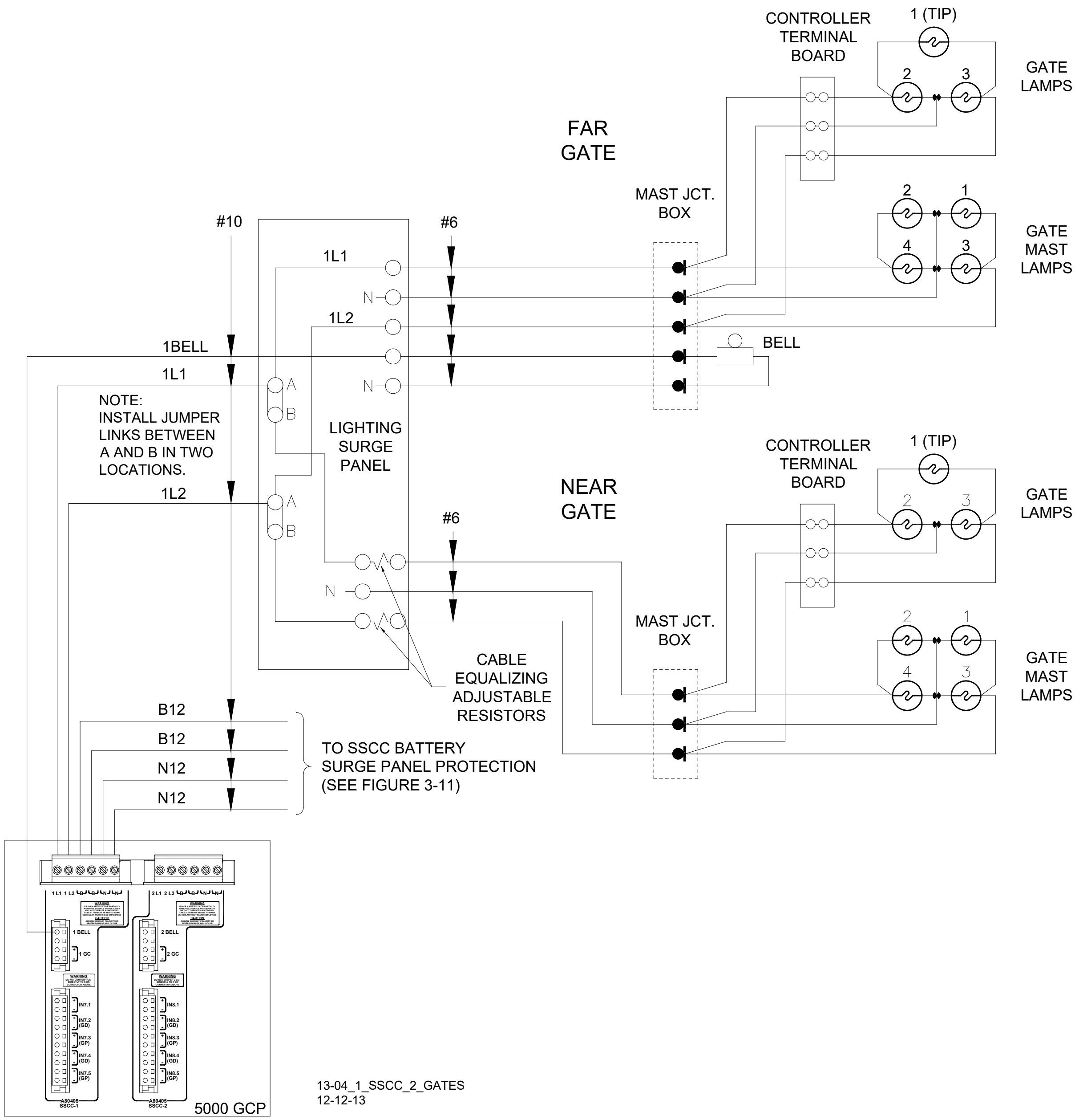


Figure C-9: One Crossing Controller Module Controlling Two Gates

C.5.2 Crossing Controller Connectors

The GCP 5000 Crossing Controller connectors accommodate all wiring between the A80405 module(s) and the 91170 or 91181 SSCC III Lighting Surge Panel(s). Recommended crossing controller connector wire sizes are listed in Table C-2. The use of stranded wire is recommended.

Table C-2 Minimum Recommended Crossing Controller Wire Sizes

External Wiring Connector	Pin	Connector Type	Wire Size
SSCC-1	1L1	6-pin screw terminal	10AWG
	1L2	6-pin screw terminal	10AWG
	B	6-pin screw terminal	10AWG
	N	6-pin screw terminal	10AWG
	1BELL	4-pin cage clamp	16AWG
	+1GC	4-pin cage clamp	16AWG
	-1GC	4-pin cage clamp	16AWG
	+1IN7.1	10-pin cage clamp	16AWG
	-1IN7.1	10-pin cage clamp	16AWG
	+IN7.2 (GD)	10-pin cage clamp	16AWG
	-IN7.2 (GD)	10-pin cage clamp	16AWG
	+IN7.3 (GP)	10-pin cage clamp	16AWG
	-IN7.3 (GP)	10-pin cage clamp	16AWG
	+IN7.4 (GD)	10-pin cage clamp	16AWG
	-IN7.4 (GD)	10-pin cage clamp	16AWG
	+IN7.5 (GP)	10-pin cage clamp	16AWG
	-IN7.5 (GP)	10-pin cage clamp	16AWG
SSCC-2	2L1	6-pin screw terminal	10AWG
	2L2	6-pin screw terminal	10AWG
	B	6-pin screw terminal	10AWG
	N	6-pin screw terminal	10AWG
	2BELL	4-pin cage clamp	16AWG
	+2GC	4-pin cage clamp	16AWG
	-2GC	4-pin cage clamp	16AWG
	+IN8.1	10-pin cage clamp	16AWG
	-IN8.1	10-pin cage clamp	16AWG
	+IN8.2 (GD)	10-pin cage clamp	16AWG
	-IN8.2 (GD)	10-pin cage clamp	16AWG
	+IN8.3 (GP)	10-pin cage clamp	16AWG
	-IN8.3 (GP)	10-pin cage clamp	16AWG
	+IN8.4 (GD)	10-pin cage clamp	16AWG
	-IN8.4 (GD)	10-pin cage clamp	16AWG
	+IN8.5 (GP)	10-pin cage clamp	16AWG
	-IN8.5 (GP)	10-pin cage clamp	16AWG

CAUTION

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 SECTION 10.1 OR THE GCP 5000 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 GCP 5000.

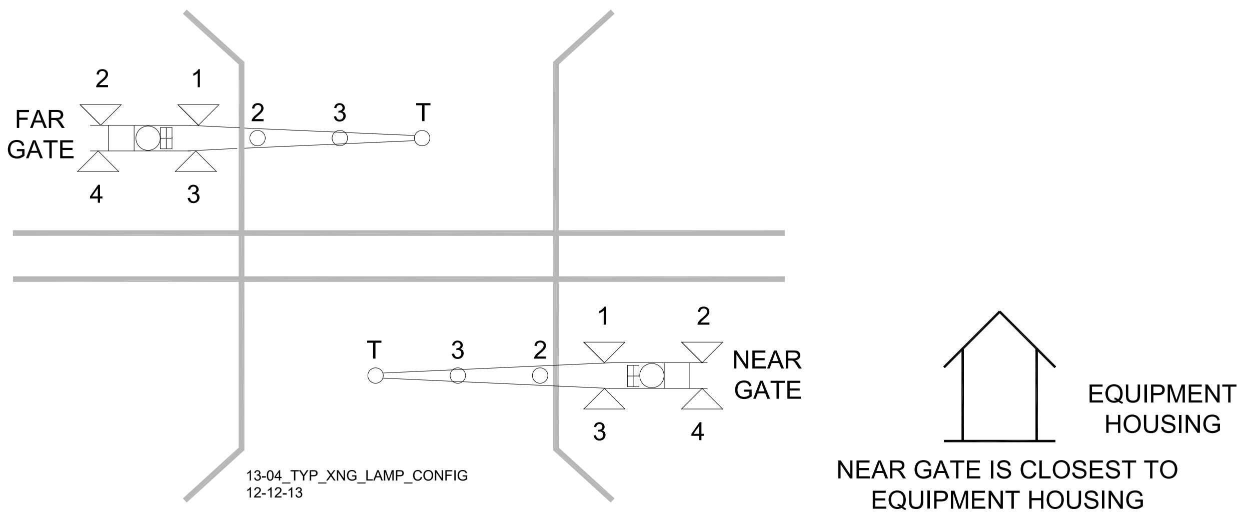


Figure C-10: Typical Crossing Lamp Configuration

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-3.

Designated load current is based on 9.5 volts supplied to lamps.

Generally, 18-watt bulbs draw 1.8 amps per each bulb lit at the same time and 25-watt bulbs draw 2.5 amps per each bulb lit at the same time.

NOTE

NOTE

If a lamp wire between the Surge Panel and the Mast Junction Box is too long, its resistance can prevent the full required voltage from being applied to the lamps.

The effective resistance of a wire can be reduced and/or its maximum length increased by using two wires of the same gauge in parallel as indicated in Table C-3.

The A80405 module maintains a constant lamp output voltage provided:

- The battery voltage to the SSCC remains 1.5 volts higher than the lamp voltage measured at the SSCC L1 and L2 outputs.
- The maximum lamp wire length is not exceeded.

When the battery voltage supply cannot supply the requested lamp voltage, a lamp voltage limited message will be displayed.

Table C-3: Maximum Recommended Crossing Lamp Wire Length

BATTERY			WIRE LENGTH (FT/M)			
LOAD CURRENT	**TYPE**	**CELLS**	**#9AWG**	**DUAL #9AWG**	**#6AWG**	**DUAL #6AWG**
5.0 Amp	Pb	6	225/68.6	450/137.2	450/137.2	900/274.3
	NiCd	9	175/53.3	350/106.7	350/106.7	700/213.4
7.5 Amp	Pb	6	117/35.7	234/71.3	234/71.3	469/143.0
	Pb	7[1]	260/79.2	520/158.5	500/152.4	1000/304.8
	NiCd	10	200/61.0	400/121.9	400/121.9	800/243.8
	NiCd	11[1]	260/79.2	520/158.5	500/152.4	1000/304.8
10.0 Amp	Pb	6	88/26.8	176/53.6	175/53.3	350/106.7
	Pb	7[1]	213/64.9	426/129.8	375/114.3	750/228.6
	NiCd	10	150/45.7	300/91.4	300/91.4	600/182.9
	NiCd	11[1]	213/64.9	426/129.8	375/114.3	750/228.6
Pb = Lead acid NiCd = Nickel-cadmium Note 1: Do not exceed 16.5 volts on power terminals of controller.						

C.5.6 Crossing Controller DC Power Connections

The A80405 modules receive power via the Lighting Surge panel and the **CROSSING CONTROLLER** connectors as shown in Figure C-11.

Surge panel provides primary battery surge protection.

Secondary surge protection provided by each A80405 module

Make power connections to each A80405 module via the **B** and **N** contacts of the respective **CROSSING CONTROLLER** connectors:

Poly-jacketed 10AWG wire is recommended for DC power and return between the lighting surge panel and the GCP 5000.

Poly-jacketed 6AWG wire is recommended for DC power and return between the lighting surge panel and the crossing battery.

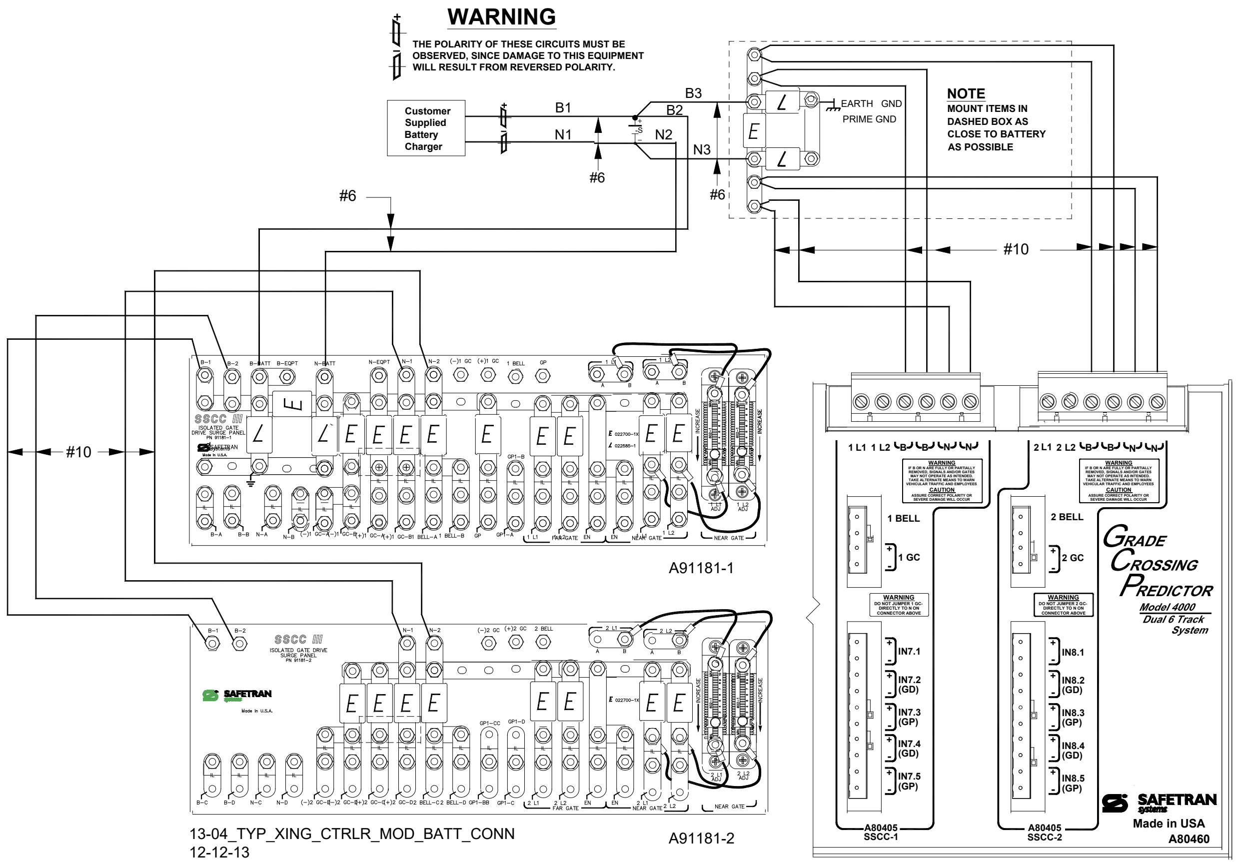


Figure C-11: Typical Crossing Controller Module Battery Connections

⚠ 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 SSCC IIIi, FLASH SYNC is an isolated two-wire output. If two Revision D or later SSCC IIIi 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 SSCC IIIi 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 SSCC IIIi or earlier, or when external SSCC units are connected to a master SSCC IIIi and operated from a different battery, the following wiring must be provided for FLASH SYNC Return:

If two Revision C SSCC IIIi units in the same chassis are operated by separate batteries, the **N** pins of the SSCC IIIi power and lamp connectors must be wired together.

If an external SSCC IIIA, SSCC III PLUS, or SSCC IV is connected to a master SSCC IIIi:

- Where the SSCC IIIi is Revision C or earlier, the negative terminals of the master SSCC IIIi and external SSCC must be wired together.
- Where the SSCC IIIi is Revision D or later, the SSCC IIIi **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 SSCC IIIi flash sync connection to an external SSCC is located on the CPU connector.

C.6 LAMP NEUTRAL TEST WHEN LED LAMPS ARE USED

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 section C.11.4.9).

To avoid a false error indication, set **Lamp Neutral Test** status entry for each active crossing controller to **Off**.

C.7 CONNECTING POWER AT INITIAL CUTOVER

Once the system has booted up, the SSCC IIIi 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 GCP 5000 SSCC IIIi 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 GCP 5000.**

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 SSCC IIII MODULE AND LOCK BY TIGHTENING SCREWS.
4. WAIT APPROXIMATELY 40 SECONDS FOR SSCC IIII MODULE(S) TO BOOT UP.
5. CONNECT THE GC/BELL AND GP/GD CAGE–CLAMP CONNECTORS FOR THE APPROPRIATE SSCC IIII.
6. CLOSE THE LAMP, GATE CONTROL, GP/GD INPUTS AND BELL CIRCUITS ON THE SURGE PANEL(S).

C.8 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 Table C-4.

C.9 METER READING CONVERSION EXAMPLES

Following are two examples of how to measure the lamp voltages using a conventional meter. In both examples:

- Battery bank voltage is 14.7 volts
- Multimeters are set to read DC

Table C-4: Multimeter Reading Variance from Actual Lamp Voltages

Battery Voltage	Regulated Lamp Drive Voltage Range	Measurement Below Actual Drive Voltage	
		Using Digital Multimeter (Agilent U1252 or Equivalent)	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 in the following section.

C.9.1 Lamp Voltage Measurement Example 1

When setting crossing lamp voltages to 9.5 volts, the conventional meter reading is determined by subtracting the meter variance given in Table C-4 from the desired lamp voltage.

When using a **digital multimeter** (e.g. Agilent U1252A):

- Desired lamp voltage = 9.5
- Meter variance for 14.7 volt battery = -2.2
- Meter reading = **7.3**

When using an **analog multimeter** (e.g. TS111):

- Desired lamp voltage = 9.5
- Meter variance for 14.7 volt battery = -1.1
- Meter reading = **8.4**

C.9.2 Lamp Voltage Measurement Example 2

In this example, it is desired to check that lamp voltage is greater than 8.5 volts and the battery voltage is 13.3 volts.

When verifying that the lamp voltages are greater than 8.5 VDC, the conventional meter reading is determined by subtracting the meter variance given in Table C-4 from the minimum lamp voltage threshold.

When using a **digital multimeter** (e.g. Agilent U1252A):

- Minimum lamp voltage threshold = 8.5
- Meter variance for 13.3 volt battery = -1.3
- Minimum meter reading = **7.2**

When using an **analog multimeter** (e.g. TS111):

- Minimum lamp voltage threshold = 8.5
- Meter variance for 13.3 volt battery = -0.6
- Minimum meter reading = **7.9**

C.10 SSCC IIIi PROGRAMMING GUIDELINES

The GCP 5000 can be configured to use up to two Solid State Crossing Controller IIIi (SSCC IIIi) 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 GCP 5000 programming for the SSCC IIIi modules allows flexibility in the use of the SSCC IIIi modules. Generally, the SSCC IIIi modules use a separate set of batteries from the GCP 5000 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.10.1 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 GCP 5000 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 GCP 5000 is acting as an entrance or an exit gate controller when **SSCCIV Controller Used** is set to **Yes**.
- Default: **Exit**

C.10.2 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.

C.10.3 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.10.4 Crossing Controller Programming

The default programming parameters for the crossing controllers are shown in Appendix A.

C.10.4.1 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.10.4.2 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 – 20 seconds. Default: **4 sec.**

C.10.4.3 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-5. The default settings are as follows:

- SSCC 1 Default: **1**
- SSCC 2 Default: **0**

Table C-5: SSCC GP Input Selection

Number Selected in Corresponding GPS Field	SSCC-1 Vital Input Selection Available	SSCC-2 Vital Input Selection Available
0	Not Used	Not Used
1	Not Used GP 1.1	Not Used GP 2.1
2	Not Used GP 1.1 GP 1.2	Not Used GP 2.1 GP 2.2

C.10.4.4 SSCC-1 and SSCC-2 Number of GDs

Modifies the available SSCC GD (gate down) input selections in the **INPUT: assignment SSCC** window. The functions that may be assigned to each SSCC vital input relative to the **number of GDs** selection are shown in Table C-6.

- SSCC 1 Default: **2** (There is no requirement to change this value or strap the input low if this feature is not used).
- SSCC 2 Default: **0**

Table C-6: SSCC GD Input Selection

Number Selected in Corresponding GDS Field	SSCC-1 Vital Input Selection Available	SSCC-2 Vital Input Selection Available
0	Not Used	Not Used
1	Not Used GD 1.1	Not Used GD 2.1
2	Not Used GD 1.1 GD 1.2	Not Used GD 2.1 GD 2.2
3	Not Used GD 1.1 GD 1.2 GD 1.3	Not Used GD 2.1 GD 2.2 GD 2.3
4	Not Used GD 1.1 GD 1.2 GD 1.3 GD 1.4	Not Used GD 2.1 GD 2.2 GD 2.3 GD 2.4

C.10.4.5 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.10.4.6 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.10.4.7 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.10.4.8 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.10.4.9 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.10.4.10 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.10.4.11 Aux-(#) Xng Ctrl Used

This function is used to interface the GCP 5000 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.10.5 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.10.5.1 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.10.5.2 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.10.5.3 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.10.5.4 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.10.5.5 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.11 EXTERNAL CROSSING CONTROLLERS

An external crossing controller may be used with the GCP 5000 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.11.1 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 GCP 5000 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 section 5.10 of this manual.

C.11.2 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 section 5.11 of this manual.

NOTE

NOTE

SSCC IIIi Modules Rev D and later have an isolated flash sync output.

Where battery isolation must be maintained and SSCC IIIi 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.12 FOUR-QUADRANT GATE CONTROL WITH DYNAMIC EXIT GATE OPERATING MODE

The GCP 5000 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.12.1 System Requirements

C.12.1.1 GCP 5000

The GCP 5000 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 SSCC IIIi controller modules are generally needed to control the exit gates. One SSCC IIIi 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 GCP 5000 provides additional I/O for this application on its internal SSCC IIIi controllers.

C.12.1.2 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 SSCC IIIi exit gate controllers in the GCP 5000.

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.12.1.3 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.12.2 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".

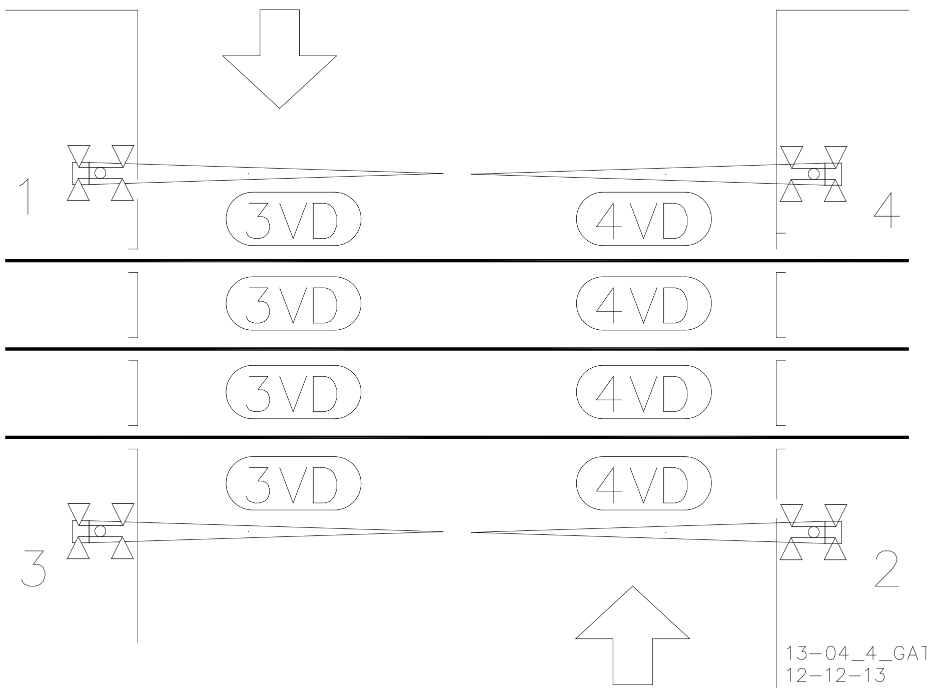


Figure C-12: Typical 4-Quadrant Gate Crossing

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.12.2.1 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.12.2.2 Traffic Signal Preemption Timer

In this four quadrant gate application, the traffic signal preemption relay is controlled by the GCP 5000 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.12.2.3 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.12.2.4 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 GCP 5000 SSCC IIIi will lower the exit gate.
- De-energizing the XGCR will cause the exit gate to rise.

This design is based on vehicle detectors for each direction of traffic. Each exit gate is controlled independently of the other exit gate.

If VDH (Vehicle Detector Health) is up:

- The exit gate will start decent after a 7-second exit gate delay if all the islands are up, and the corresponding vehicle detection (3VD or 4VD) is up.

If a 3VD or 4VD de-energizes before all gates are down, the corresponding exit gate will rise.

All gates down or an island down after the XR has been down for at least 7 seconds will keep the exit gate down.

If VDH is up and an island drops before the DET timer runs out:

- This logic anticipates that train switching moves near the crossing can occupy the island, but not occupy the crossing until vehicles clear.
- The exit gate will start decent after the TET timer runs out regardless of the status of the vehicle detection (3VD or 4VD).

Normally, exit gates are lowered when the island de-energizes.

If VDH is down the system reverts to Timed EGOM and there is a 15-second delay before the exit gate will start decent.

If the corresponding entrance gate is down or if an island is down, the exit gate continues decent and remains down.

If the corresponding entrance gate is not down within 20 seconds, and if an island is not occupied, the exit gate will raise until an island is occupied or the corresponding entrance gate is down.

Second Train Logic – If an island is down and the XGCR is energized (exit gate down), the XGCR will remain energized after the island has recovered if there is another train in the approach. If both exit gates are in the down position when the XR recovers, the entrance gates will start up after both exit gates have started up (rise above 5 degrees).If both exit gates are not in the down position the 4 seconds prior to the XR recovering, the entrance gates will remain down until both exit gates have indicated the up position. This logic assumes that an exit gate is broken and may not completely rise when the XR recovers.

Example A: The XR is down, and both exit gates are indicating their down positions. If an exit gate down indication is lost and 3 seconds later the XR recovers, the entrance gates will start up as soon as the other exit gate down indication is lost.

Example B: The XR is down, and both exit gates are indicating their down positions. If an exit gate down indication is lost and 5 seconds later the XR recovers, the entrance gates will not start up until both exit gates are indicating their up positions.

C.12.3 Physical Inputs & Outputs

The typical wiring diagram for a 4-quadrant gate system using the GCP 5000 and SSCC IV is shown in Figure C-13 and Figure C-14, which are located at the end of this section.

C.12.3.1 GCP 5000 I/O

The inputs to the GCP 5000 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 SSCC IIIi module are ANDed internally)
- Exit Gate Down, GD (All GD inputs on a SSCC IIIi module are ANDed internally)

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.12.3.2 SSCC IV I/O

The inputs available on the SSCC IV units using 4-quadrant MCFs are listed in Table C-7 and input definitions are listed in Table C-8.

Table C-7: GCP4ENT, AUE4QUAD & AUX4QUAD MCF Physical Inputs

Input #	Input Function By MCF		
	ENT4QUAD	AUE4QUAD	AUX4QUAD
1	Entrance GP	Reserved	Reserved
2	Optional Ent. GP	Reserved	Reserved
3	1GD	Reserved	Reserved
4	2GD	Reserved	Reserved
5	Remote Inp 1/ Optional 1GD	Reserved	Reserved
6	Remote Inp 2/ Optional 2 GD	Reserved	Reserved
7	Remote Inp 3	Reserved	Reserved
8	Remote Inp 4	Reserved	Reserved

Table C-8: SSCC IV Input Definitions

Input	Definition
Entrance GP	Gate Position. Energized when Entrance Gate(s) are in the vertical position
Optional Ent. GP	Optional Gate position may be used when additional entrance gates are installed. Energized when additional Entrance Gate(s) are in the vertical position. Input 2, when used, is ANDed with Input 1.
1GD	Gate 1 Down. Energized when Entrance Gate 1, or additional gates at entrance 1, are in the fully lowered position.
2GD	Gate 2 Down. Energized when Entrance Gate 2, or additional gates at entrance 2, are in the fully lowered position.
Remote Inp 1/ Optional 1GD	Remote Input 1 on SSCC IV that can be assigned as an remote input to the GCP 5000, 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 GCP 5000, or can be used as an Optional 2 GD.
Remote Inp 3	Remote Input 3 on SSCC IV that can be assigned as a remote input to the GCP 5000.
Remote Inp 4	Remote Input 4 on SSCC IV that can be assigned as a remote input to the GCP 5000.

SSCC IV inputs are not shown on the GCP 5000 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 GCP 5000 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.12.3.3 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 GCP 5000 must be assigned 762010010016. If aue4quad.mcf is used, it is assigned 762010010017, and if aux4quad.mcf is used, it is assigned 762010010018 (Table C-9).

Table C-9 ATCS Subnode Address Increment Requirements

MCF Name	ATCS Subnode (SS)	Description
GCP4ENT.mcf	SS	4-quadrant entrance gate controller
5000 GCP mcf	SS + 1	GCP 5000 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.12.3.4 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 SSCC IIIi modules in the GCP 5000 unit will be configured as a flash sync MASTER and all subsequent SSCC IIIi 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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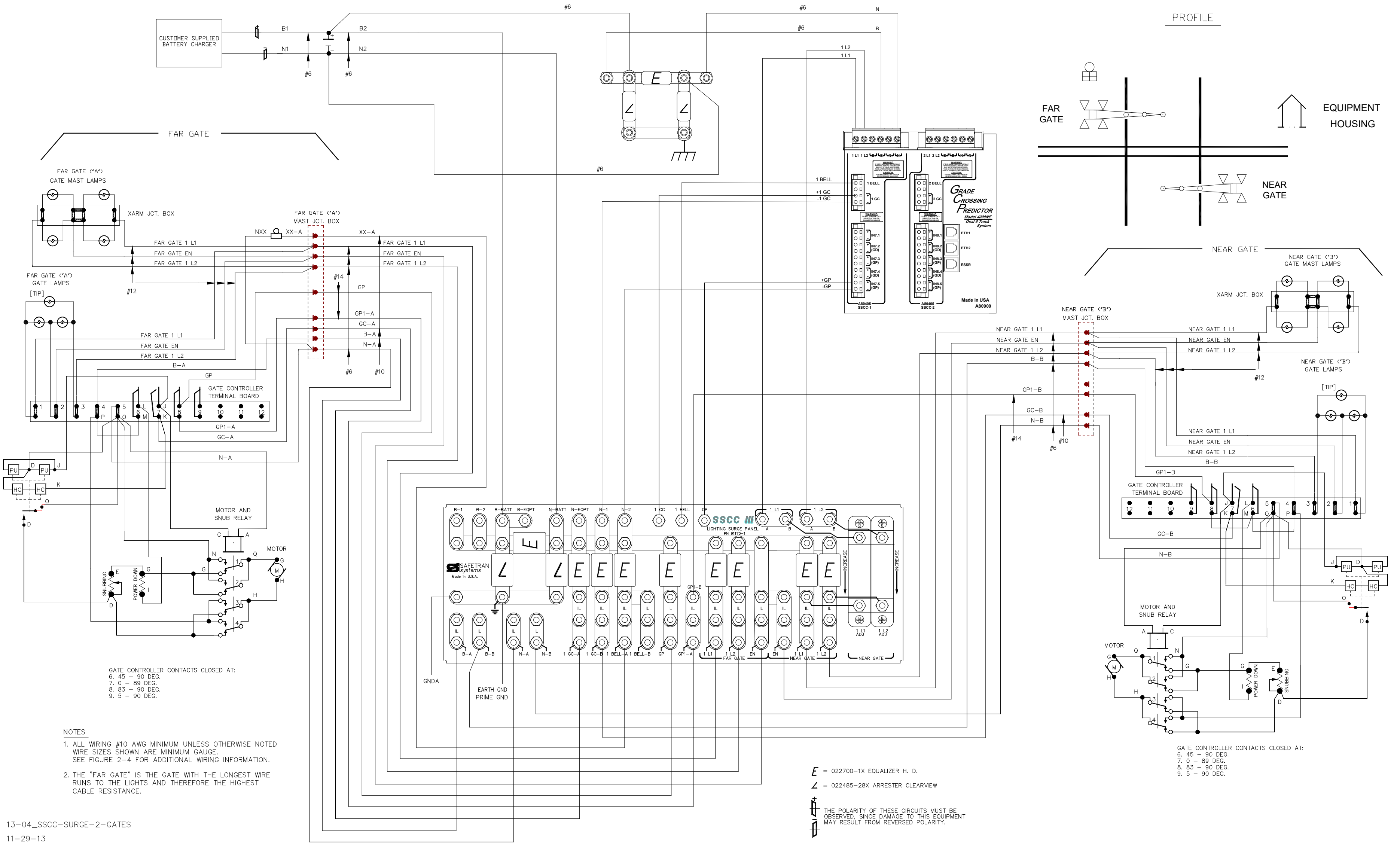
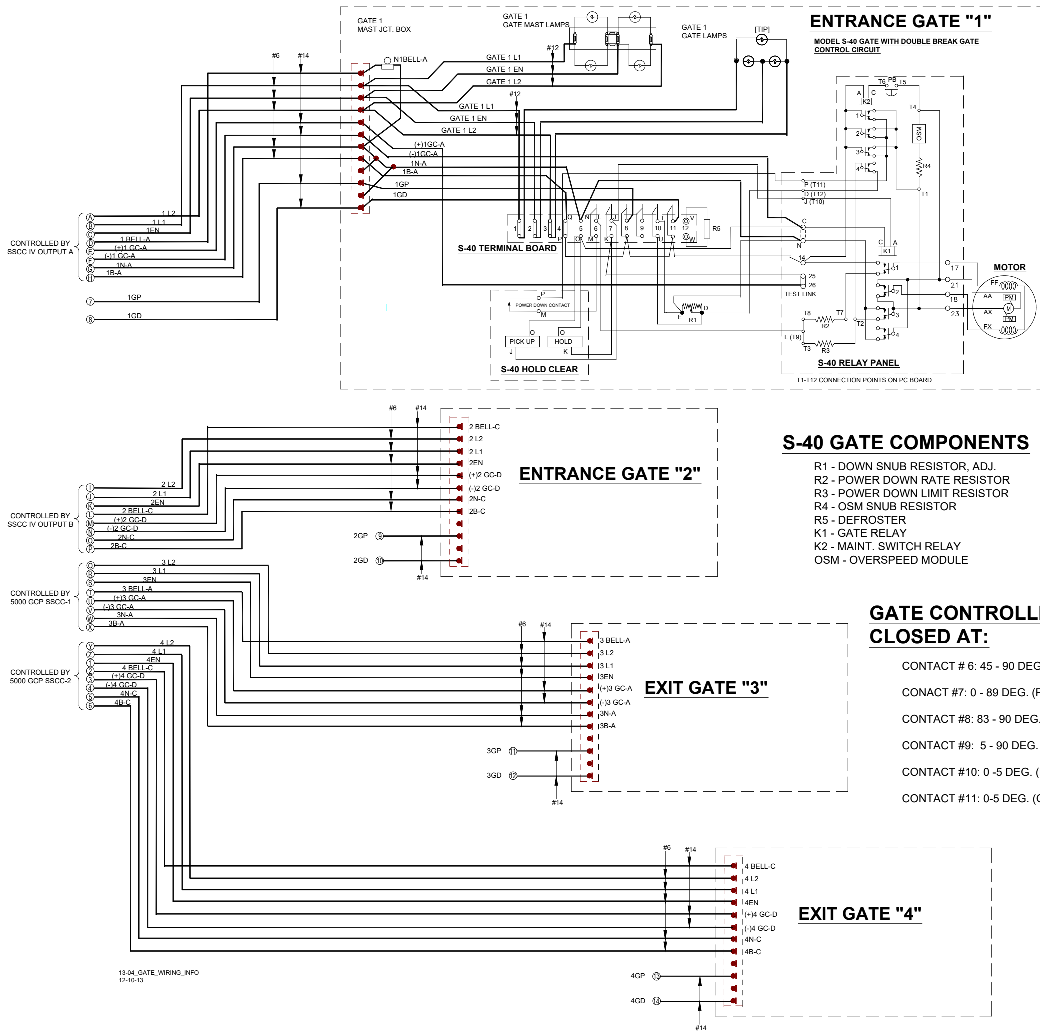


Figure C-13: Typical 2-Gate Application using Solid-State Crossing Controller IIIi with 91181-01 Lighting Surge Panel



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)

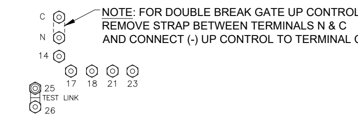
CONTACT #10: 0 -5 DEG. (HORIZONTAL SNUB)

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



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-14: Typical 4-Quadrant Gate Application (Isolated Gate Return) using GCP 5000 & SSCC IV, 40-Ampere Unit, with Lightning/Surge Panels A91181-1 & A91181-2

APPENDIX D – INSTALLATION OF FERRITE BEADS

APPENDIX D. INSTALLATION OF FERRITE BEADS

WARNING

WARNING

IF THE GCP 5000 IS USED WITH AN MCF THAT DOES NOT HAVE 'TRC' IN THE FILE NAME, THE GCP 5000 CHASSIS MUST HAVE FERRITE BEADS INSTALLED ON THE TRACK XMT AND RCV WIRES AS DESCRIBED IN HERE IN ORDER TO AVOID POSSIBLE SHUNTING ISSUES IF A REV D OR EARLIER A80418 TRACK MODULE IS INSTALLED IN CHASSIS.

CAUTION

CAUTION

PRIOR TO INSTALLATION OF THE FERRITE BEADS, RECORD EZ/EX AND ISLAND Z VALUES FOR THE ACTIVE TRACK MODULES WHERE FERRITE BEADS ARE TO BE INSTALLED.

THESE VALUES SHOULD BE RECORDED WITH THE GCP APPROACH CLEAR.

The following guidelines are for the application of Ferrite Beads to the transmitter (XMT1/XMT2) and receiver (RCV1/RCV2) wires [not the check wires] of an affected GCP that incorporates an internal island circuit. The ferrite beads shall be installed on all track slots at the termination point of the XMT1/XMT2 and RCV1/RCV2 wires on the GCP chassis as shown in Figure D-1. There are two different sizes of ferrite beads. The smaller of the two is to be installed on the transmitter [XMT1/XMT2] wires. The larger of the two is to be installed on the receiver [RCV1/RCV2] wires.

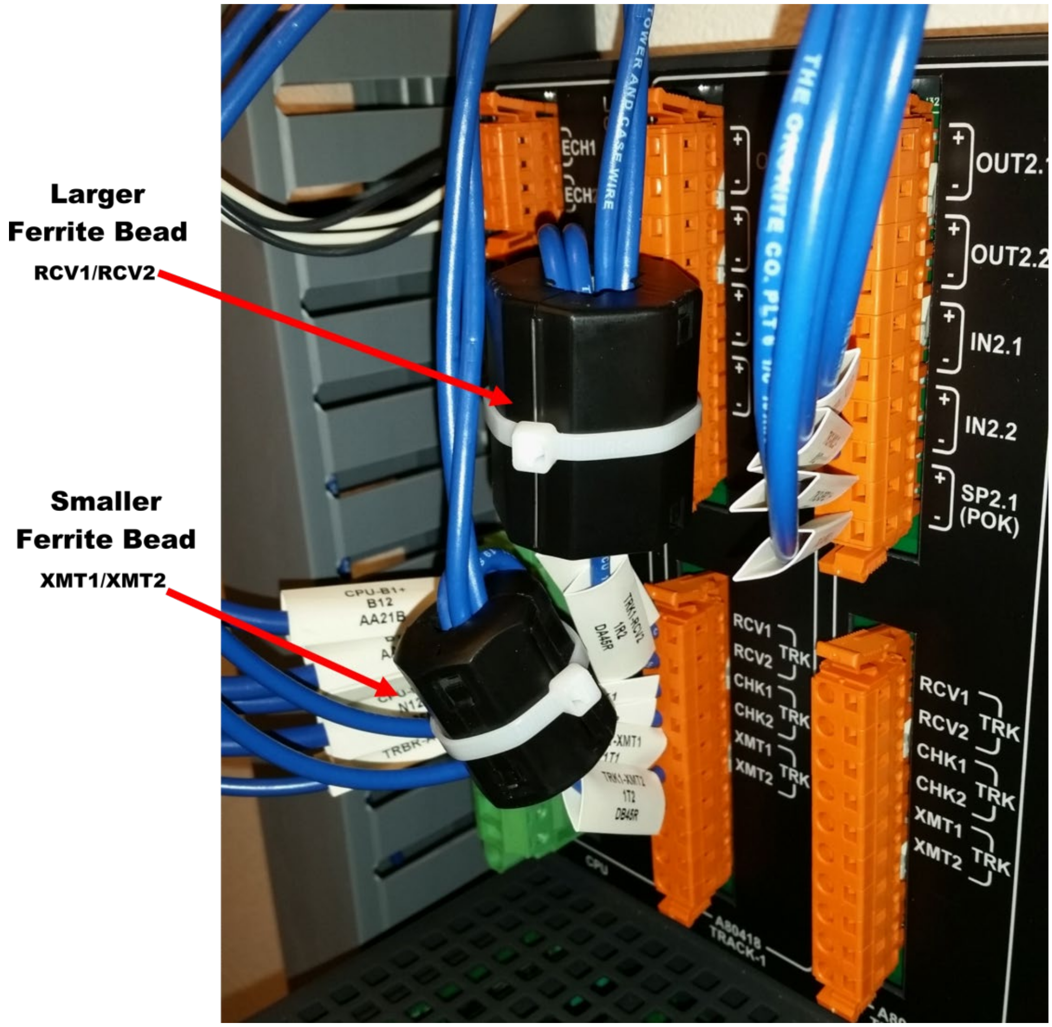


Figure D-1: Ferrite Bead Sizes

The ferrite beads require a single wrap of the wires **[XMT1/XMT2] [RCV1/RCV2]** around the ferrite bead before securing the transmitter or receiver wires to the Wago connector as shown in Figure D-1. The ferrite beads should be installed within two to three inches of the Wago connector. The sleeve tag can be used as a reference to determine this distance as shown in Figure D-2. Close the ferrite bead, ensuring the securing tabs have properly seated and have snapped into the locked position. Once ferrite bead is installed, a zip tie can be used to secure the ferrite bead and wires in place, preventing movement and the unintentional opening of the ferrite bead.

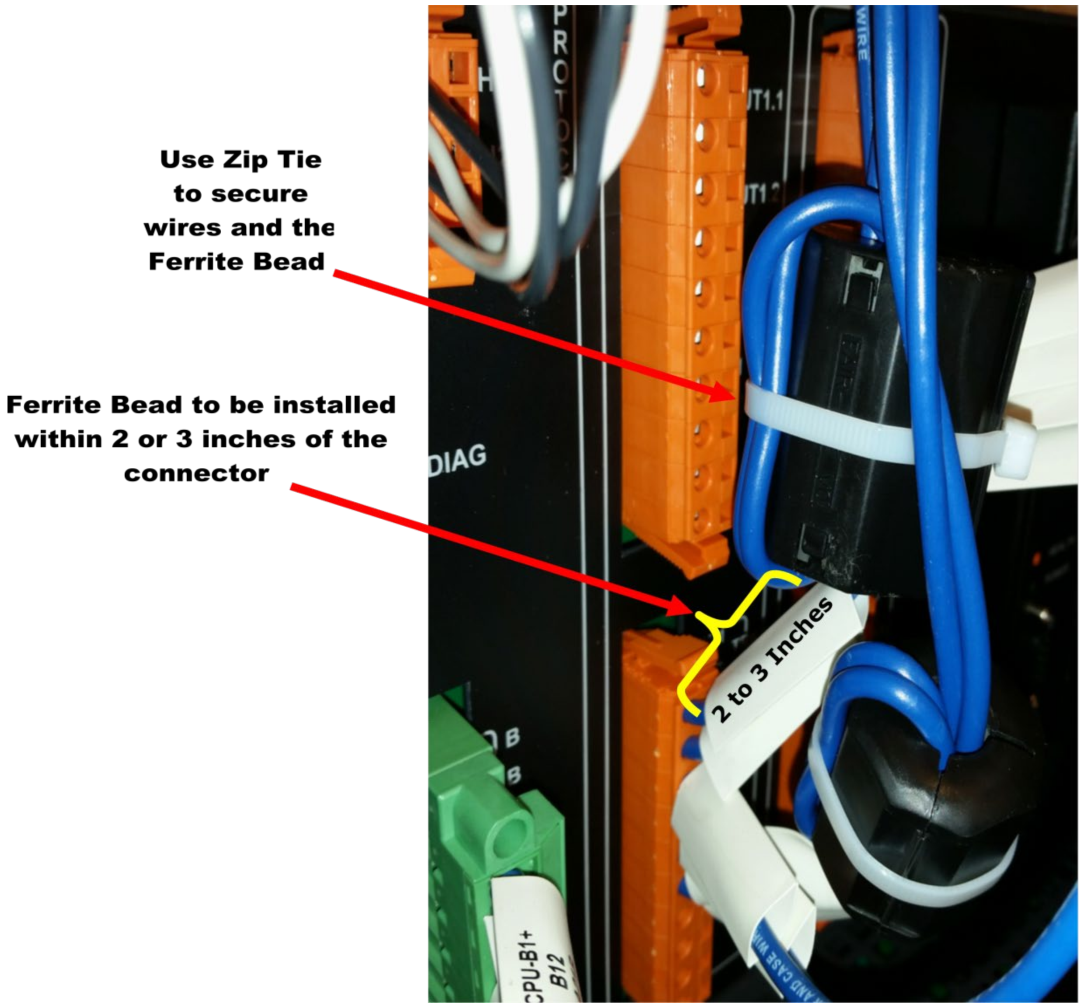


Figure D-2: Ferrite Bead Installation Guide

CAUTION

CAUTION

WITH FERRITE BEADS INSTALLED, AGAIN RECORD EZ/EX AND ISLAND Z VALUES OF ACTIVE TRACK MODULES [WITH APPROACH CLEAR] AND COMPARE TO READINGS RECORDED PREVIOUSLY. VALUES SHOULD DIFFER NO GREATER THAN 3 POINTS BETWEEN THE TWO RECORDED VALUES.

The installation of ferrite beads on the GCP does not require any re-calibration of the track circuits and has no effect in the GCP's ability to detect trains.

The installation of ferrite beads is compatible with all hardware revisions of the 80418 Track Module.

A Ferrite Bead Kit for the 80418 Track Card will be provided by Siemens.

Table D-1: Ferrite Bead Kit Ordering Information

Part Number	Revision	Description
K80418-1	A	Kit, CSB 3-15E, 80418 Track Card

For additional kits contact Siemens Customer Service at (800) 626-2710

For technical assistance please contact Siemens Mobility Technical Support at (800) 793-7233 Option 1.

APPENDIX E – SEAR DIGITAL INPUT NUMBERING

APPENDIX E. SEAR DIGITAL INPUT NUMBERING

CDL Channel	Slot	6-Track Chassis	2-Track Redundant	MTSS/GFT	Default Name	Default Tag	Default Off Name	Default On Name
1	N/A	Maint Call	Maint Call	No	Spare (MAINT)	SP_MC	On	Off
2	1	IN 1.2	IN 1.2	No	SP1_4	SP1_4	Off	On
3	1	IN 1.1	IN 1.1	No	SP1_3	SP1_3	Off	On
4	1	OUT 1.2	OUT 1.2	No	SP1_2	SP1_2	Off	On
5	1	OUT 1.1	OUT 1.1	No	SP1_1	SP1_1	Off	On
6	2	XMT	XMT	No	SP2_8	SP2_8	Off	On
7	2	CHK	CHK	No	SP2_7	SP2_7	Off	On
8	2	RCV	RCV	No	SP2_6	SP2_6	Off	On
9	2	SP 2.1	SP 2.1	Yes	SP2_5	SP2_5	Off	On
10	2	IN 2.2	IN 2.2	No	SP2_4	SP2_4	Off	On
11	2	IN 2.1	IN 2.1	No	SP2_3	SP2_3	Off	On
12	2	OUT 2.2	OUT 2.2	No	SP2_2	SP2_2	Off	On
13	2	OUT 2.1	OUT 2.1	No	SP2_1	SP2_1	Off	On
14	3	XMT	Not used	No	SP3_8	SP3_8	Off	On
15	3	CHK	Not used	No	SP3_7	SP3_7	Off	On
16	3	RCV	Not used	No	SP3_6	SP3_6	Off	On
17	3	SP3.1	Not used	Yes	SP3_5	SP3_5	Off	On
18	3	IN 3.2	Not used	No	SP3_4	SP3_4	Off	On
19	3	IN 3.1	Not used	No	SP3_3	SP3_3	Off	On
20	3	OUT 3.2	Not used	No	SP3_2	SP3_2	Off	On
21	3	OUT 3.1	Not used	No	SP3_1	SP3_1	Off	On
22	4	XMT	Not used	No	SP4_8	SP4_8	Off	On
23	4	CHK	Not used	No	SP4_7	SP4_7	Off	On
24	4	RCV	Not used	No	SP4_6	SP4_6	Off	On
25	4	SP 4.1	Not used	Yes	SP4_5	SP4_5	Off	On
26	4	IN 4.2	Not used	No	SP4_4	SP4_4	Off	On
27	4	IN 4.1	Not used	No	SP4_3	SP4_3	Off	On
28	4	OUT 4.2	Not used	No	SP4_2	SP4_2	Off	On
29	4	OUT 4.1	Not used	No	SP4_1	SP4_1	Off	On
30	5	XMT	Not used	No	SP5_8	SP5_8	Off	On
31	5	CHK	Not used	No	SP5_7	SP5_7	Off	On
32	5	RCV	Not used	No	SP5_6	SP5_6	Off	On
33	5	SP 5.1	Not used	Yes	SP5_5	SP5_5	Off	On
34	5	IN 5.2	Not used	No	SP5_4	SP5_4	Off	On

35	5	IN 5.1	Not used	No	SP5_3	SP5_3	Off	On
36	5	OUT 5.2	Not used	No	SP5_2	SP5_2	Off	On
37	5	OUT 5.1	Not used	No	SP5_1	SP5_1	Off	On
38	6	XMT	Not used	No	SP6_8	SP6_8	Off	On
39	6	CHK	Not used	No	SP6_7	SP6_7	Off	On
40	6	RCV	Not used	No	SP6_6	SP6_6	Off	On
41	6	SP 6.1	Not used	Yes	SP6_5	SP6_5	Off	On
42	6	IN 6.2	Not used	No	SP6_4	SP6_4	Off	On
43	6	IN 6.1	Not used	No	SP6_3	SP6_3	Off	On
44	6	OUT 6.2	Not used	No	SP6_2	SP6_2	Off	On
45	6	OUT 6.1	Not used	No	SP6_1	SP6_1	Off	On
46	8	IN 8.5	IN 8.5	Yes	SSCC2 VI-5	CC2_5	Off	On
47	8	IN 8.4	IN 8.4	Yes	SSCC2 VI-4	CC2_4	Off	On
48	8	IN 8.3	IN 8.3	Yes	SSCC2 VI-3	CC2_3	Off	On
49	8	IN 8.2	IN 8.2	Yes	SSCC2 VI-2	CC2_2	Off	On
50	8	IN 8.1	IN 8.1	Yes	SSCC2 VI-1	CC2_1	Off	On
51	8	2 GC	2 GC	No	SSCC2 Gate	CC2_G	Off	On
52	7	IN 7.5	IN 7.5	Yes	SSCC1 VI-5	CC1_5	Off	On
53	7	IN 7.4	IN 7.4	Yes	SSCC1 VI-4	CC1_4	Off	On
54	7	IN 7.3	IN 7.3	Yes	SSCC1 VI-3	CC1_3	Off	On
55	7	IN 7.2	IN 7.2	Yes	SSCC1 VI-2	CC1_2	Off	On
56	7	IN 7.1	IN 7.1	Yes	SSCC1 VI-1	CC1_1	Off	On
57	7	1 GC	1 GC	No	SSCC1 Gate	CC1_G	Off	On
58	8	2 Bell	2 Bell	No	SSCC2 Bell	CC2_B	Off	On
59	7	1 Bell	1 Bell	No	SSCC1 Bell	CC1_B	Off	On
60	N/A	Main	Main	No	Main Power	B12_M	Off	On
61	N/A	Standby	Standby	No	Stby Power	B12_S	Off	On
62	N/A	SEAR DI1	SEAR DI1	Yes	Extern DI1	DIO1	Off	On
63	N/A	SEAR DI2	SEAR DI2	Yes	Extern DI2	DIO2	Off	On