SIEMENS

APPLICATION GUIDELINES

GRADE CROSSING PREDICTOR MODEL 3000+

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DOCUMENT HISTORY

Version	Release Date	Sections Changed	Details of Change
A	12/19/2017	N/A	Initial Release

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NOTES, CAUTIONS, AND WARNINGS

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

WARNING

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

CAUTION

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

NOTE

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

If there are any questions, contact Siemens 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.

GLOSSARY

TERM	DESCRIPTION
AAR:	Association of American Railroads – An organization that establishes uniformity and standardization among different railroad systems.
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
AREMA:	American Railroad Equipment Manufacturing Association – An organization that supersedes AAR.
ATCS:	Advanced Train Control System – A set of standards compiled by the AAR for controlling all aspects of train operation.
CCN:	Configuration Check Number
CHK:	CHECK receiver on a track module connected to transmit wires that perform track wire integrity checks.
CHK EZ:	Check EZ is a signal value compared to main receiver EZ that is useful in troubleshooting.
CIC:	Chassis Identification Chip – A non-volatile memory chip that is installed adjacent to the ECD on the GCP backplane. Stores site specific information for both Main and Standby operations.
Computed Approach Distance:	The track approach length calculated by the GCP. The calculated distance between the wire connections on the rail and the termination shunt connections.
CP:	Communications Processor – One of two microprocessors on the CPUII+ module, processes external communications for the Model 3000+ GCP.
CRC:	Cyclical Redundancy Check – Used to determine that data has not been corrupted.
CRTU:	Cellular Remote Telemetry Unit
DAX:	Downstream Adjacent Crossing (Xing) – DAX outputs are used to send prediction information from an upstream GCP to a downstream GCP when insulated joints are in the approach circuit.
dB	Decibels

TERM	DESCRIPTION
DIAG:	Diagnostic
DOT Number:	Department Of Transportation crossing inventory number assigned to every highway-railroad crossing that consists of six numbers with an alpha suffix.
ECD:	External Configuration Device – A serial EEPROM (Flash Memory) device mounted inside the chassis of the GCP unit. The ECD is used to store site-specific configuration data (MCF, SIN, and configuration parameters) for the CPU.
Echelon:	A Local Area Network, LAN, used by the Model 3000+ GCP.
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.
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.
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.
EX Value	Is the phase of the received signal, which is the measure of the impedance of the track ballast. This measurement identifies how much current is leaking from one rail to another.
EZ Value	Is the measure of the received signal level.
FCN	Field Check Number – The FCN changes whenever a track is calibrated. 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.
GCP:	Grade Crossing Predictor – A train detection device used as part of a highway-railroad grade crossing warning system to provide a relatively uniform warning time.
GCP APP	GCP Approach length calibration into a hardwire shunt located at the termination shunt.
GCP CAL:	GCP Calibration into a termination shunt.
GCP LIN	GCP Approach Linearization calibration into a hardwire shunt located at the 50% point on the approach.

TERM	DESCRIPTION
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.
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.
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.
MCF:	Module Configuration File – The GCP application logic file.
MEF:	Module Executable File – The executive software running in the CPU or I/O Modules. The user can download the MEF through the Diag port to update the software.

TERM	DESCRIPTION
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.
NVRAM	Non-Volatile Random Access Memory
OCCN:	Office Configuration Check Number – 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 – A Web based PC tool that can be used to create configuration package files (PAC files) for the Model 3000+ GCP system.
Offset Distance:	The distance between the track circuit connections of the remote GCP (sending DAX information) to the island track connections of the UAX GCP (receiving the information).
Out Of Service:	The process for taking one or more GCP approach circuits and / or approach and island circuits out of service.
PAC File:	A model 3000+ GCP configuration Package File that can either be created in the office using the OCE, or downloaded from a MODEL 3000+ GCP system via the Display or Web UI.
PCB	Printed Circuit Board
Pick Up Delay:	An internal delay time between when an input receives the signal to pickup and when it actually responds.
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.
RJ-45	Industry standard Ethernet port
RIO:	Relay Input Output Module
RS232:	Industry standard serial port.
RTU:	Remote Telemetry Unit
RX:	Receive
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.

TERM	DESCRIPTION
SIN:	Site Identification Number – The 12-digit ATCS address for the site. The SIN has the form 7.RRR.LLL.GGG.SS stored in binary coded decimal, with each digit in one nibble. The digit 0 is represented by “A” and 0 is used as a null byte.
Site Location:	The location where GCP unit is installed.
Standby:	The GCP Backup Modules (e.g., CPU, Track, and RIO modules) that are in a dual GCP chassis.
TCN	Track Check Number – 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.
Track Speed Train	A train that proceeds through the approach at the maximum authorized speed.
TX:	Transmit
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.
VLP:	Vital Logic Processor – One of two microprocessors on the CPUII+ module, processes GCP vital system logic.
VPI:	Vital Parallel Input – A module input circuit the function of which affects the safety of the crossing operation.
VRO:	Vital Relay Output – A module output circuit the function of which affects the safety of the crossing operation.
Z Level:	An Island calibration value. A calibrated island will have a nominal Z Level of approximately 250. The Z Level approaches 0 when shunted.

SECTION 1 INTRODUCTION

1.0 GENERAL INFORMATION

The Model 3000+ Grade Crossing Predictor (GCP) is a modular, microprocessor-controlled predictor system that is deployed to continually monitor the approach(es) to railroad grade crossings and to control the lamps, gates, and bells associated with these crossings.

This manual provides application guidelines and detailed application instructions for the Model 3000+ Grade Crossing Predictor.

1.1 ORGANIZATION

This manual is divided as follows:

1.1.1 Section 1 – Introduction

The introduction contains a brief overview of operations, standard features, the Model 3000+ GCP case configurations, operational parameters, and system specifications.

1.1.2 Section 2 – General GCP Application Information

This section details the various parameters and equipment that will need to be selected for GCP application.

1.1.3 Section 3 – Display Menu Screens and Office Configuration Editor

This section gives an overview of the menu screens and their applications, as well as an intro to the Office Configuration Editor (OCE).

1.1.4 Section 4 – Programming Using the Main Program Menus

This section details the methods used to program the Model 3000+ GCP using the Main Program Menus.

1.1.5 Section 5 – Advanced Application Programming

This section contains detailed instructions on programming to suit various crossing scenarios.

1.1.6 Section 6 – Auxiliary Equipment

This section provides a brief description of the auxiliary equipment available for use in conjunction with the Model 3000+ GCP system. Also provided are installation and adjustment procedures for the equipment, where applicable.

1.1.7 Section 7 – Detailed Case and Module Description

This section details the Model 3000+ GCP case and all available modules.

1.1.8 Appendix A – Interference

This appendix contains information for troubleshooting interferences issues.

1.1.9 Appendix B – Installation of Ferrite Beads

This appendix contains information for installation of Ferrite Beads on the Transmit and Receive wires of a Model 3000+ GCP installation.

1.2 OPERATIONAL OVERVIEW

The 3000+ Grade Crossing Predictor (GCP) is a microprocessor-controlled system that is deployed to continually monitor the approaches to railroad grade crossings. In operation, the Model 3000+ GCP may function either in the Predictor or Motion Sensor (MS) modes.

In the Predictor mode, the Model 3000+ GCP:

- detects approaching trains
- computes train speed and distance
- predicts train arrival time at the crossing
- activates crossing-warning equipment at a set (programmed) time prior to the predicted arrival of the train at the crossing

In the MS mode, the Model 3000+ GCP:

- detects the motion of an approaching train when its speed exceeds the motion detection threshold of approximately 2 mph at the crossing
- activates crossing-warning equipment at time of train detection

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, and 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.

1.3 STANDARD FEATURES

The Model 3000+ GCP can have up to 2 Track Modules for train detection. The Track Module Prime Predictor is generally used for control of local crossings. The Track Module DAX A through DAX D Predictors are generally used for control of remote crossings. Each track module has two vital inputs and two vital outputs. In addition to predictors, each track module is capable of providing a multi-frequency island circuit.

The GCP can utilize RIO modules to extend I/O capability via the RIO’s four vital inputs and four vital outputs. The GCP has redundant Main/Standby operation for CPU, Track, and RIO modules.

1.4 MODEL 3000+ GCP CASE CONFIGURATIONS

The Model 3000+ GCP operates from battery power to ensure continued operation in the event of AC power failure. There is one single Model 3000+ GCP chassis with optional plug-in modules, this allows options for:

- Non-redundant Single-track systems (control single-track circuits)
- Non-redundant Double-track systems (control two-track circuits)
- Redundant Single-track systems (control single-track circuits)
- Redundant Double-track systems (control two-track circuits)

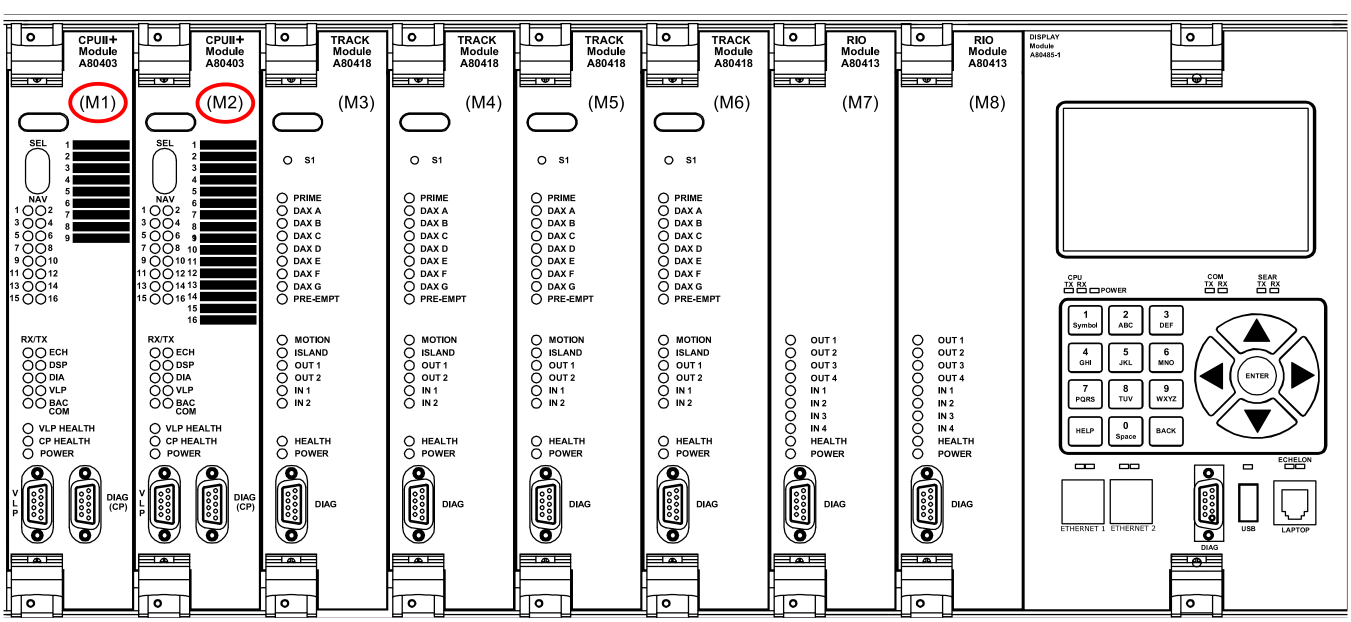
Redundant Systems have transfer modules and two identical sets of modules.

- One module set serves as the primary system and the other as the backup.
- In the event of a system failure, control automatically switches to the backup system.

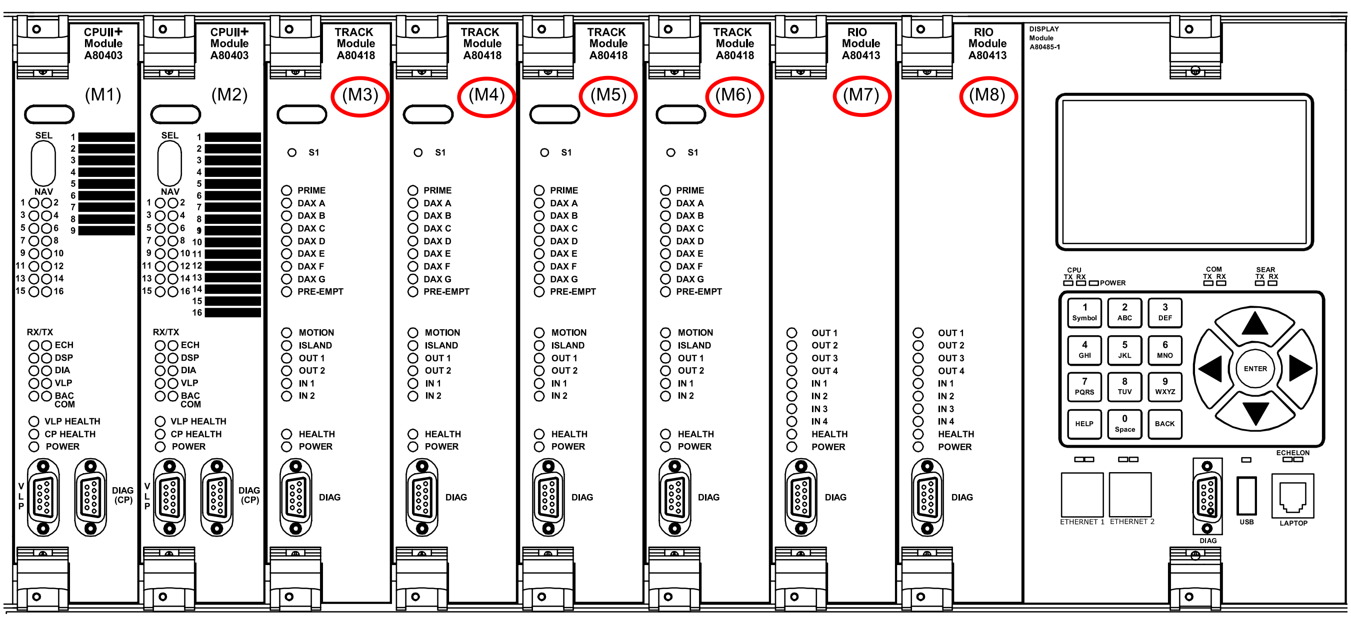
Table 1-1 shows some of the ordering options and the equivalent Model 3000+ GCP part number.

Table 1-1 Part Number Configuration Charts

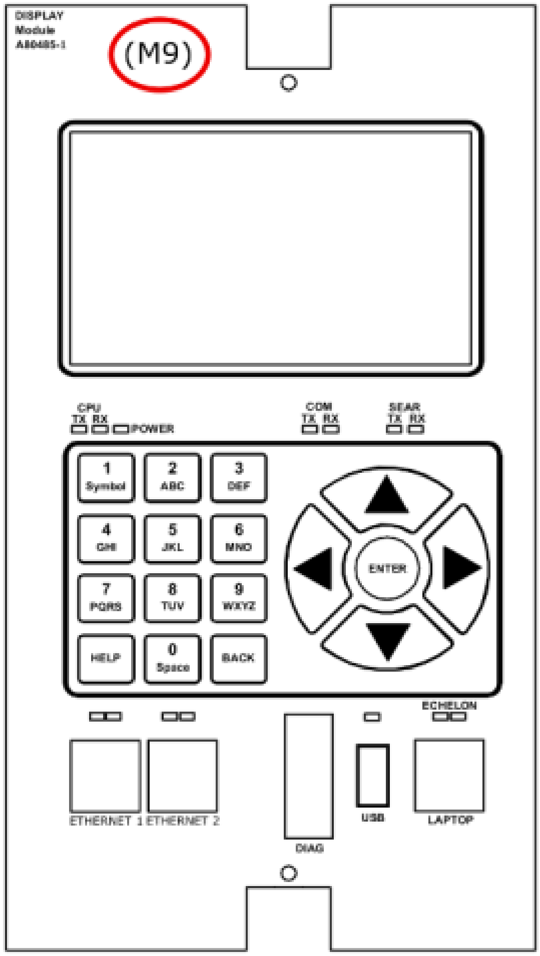
Dash No.	Combination of CPU Cards, B=D39325-01, Filler Slots for CPU Card 8**X**XX-81040-XXXX	
	M1	**M2**
0	A80403-06	B
1	A80403-06	A80403-06



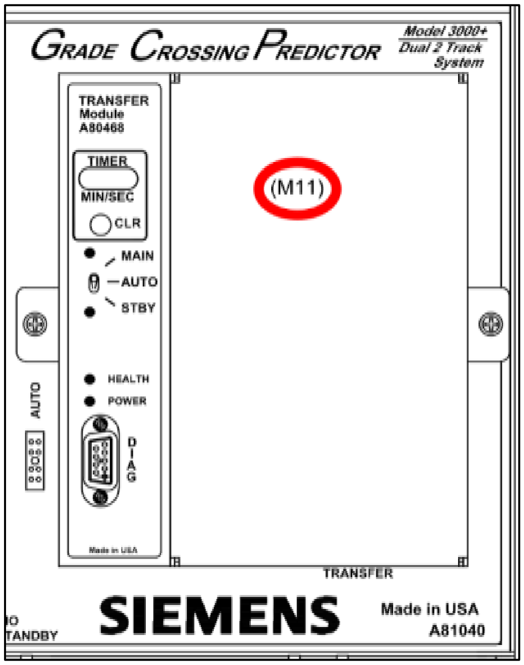
	Combination of Track Cards, RIO Cards, Mylars and Filler Panels T= For Main (M2-M3) A80418 and A8K004 T= For Standby (M5-M6) A80418 R= A80413-01 RIO Card Installed B= D39325-01 Blank Filler Installed					
	Slots for Track Cards and Filler Panels 8X**XX**-81040-XXXX					
	Main			**Standby**		
Dash No.	**M3**	**M5**	**M7**	**M4**	**M6**	**M8**
00	B	B	B	B	B	B
01	T	B	B	T	B	B
02	T	T	B	T	T	B
03	T	T	R	T	T	R
04	T	B	B	B	B	B
05	T	T	B	B	B	B
06	T	T	R	B	B	B



Dash No.	M9 Display A80485-01 - WITH 8XXX-81040-X**X**XX
0	WITH
1	W/O



Dash No.	M11 Transfer Module 8XXX-81040-XX**X**X
0	WITH
1	W/O



Dash No.	USB Flash Drive 8XXX-81040-XXX**X**
0	WITH
1	W/O

1.5 GCP OPERATIONAL PARAMETERS

The Model 3000+ GCP supports unidirectional track circuits, bidirectional track circuits, and simulated bidirectional track circuits.

1.5.1 3000+ Track Signal Sensing

During operation, the Model 3000+ GCP applies a constant current AC signal to the track and measures the level of the resulting voltage.

- The voltage level (EZ) varies with approach track impedance, which, in turn, 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 low-resistance shunt created by the train's wheels causes the track circuit impedance to decrease, thereby decreasing the EZ level.
    - When a train reaches the crossing, the approach circuit is reduced to minimum impedance.
- The EZ value and its rate of change are sensed by the Model 3000+ GCP and are used to:
    - estimate train speed
    - estimate train arrival time at the crossing
    - activate the crossing-warning equipment at that time

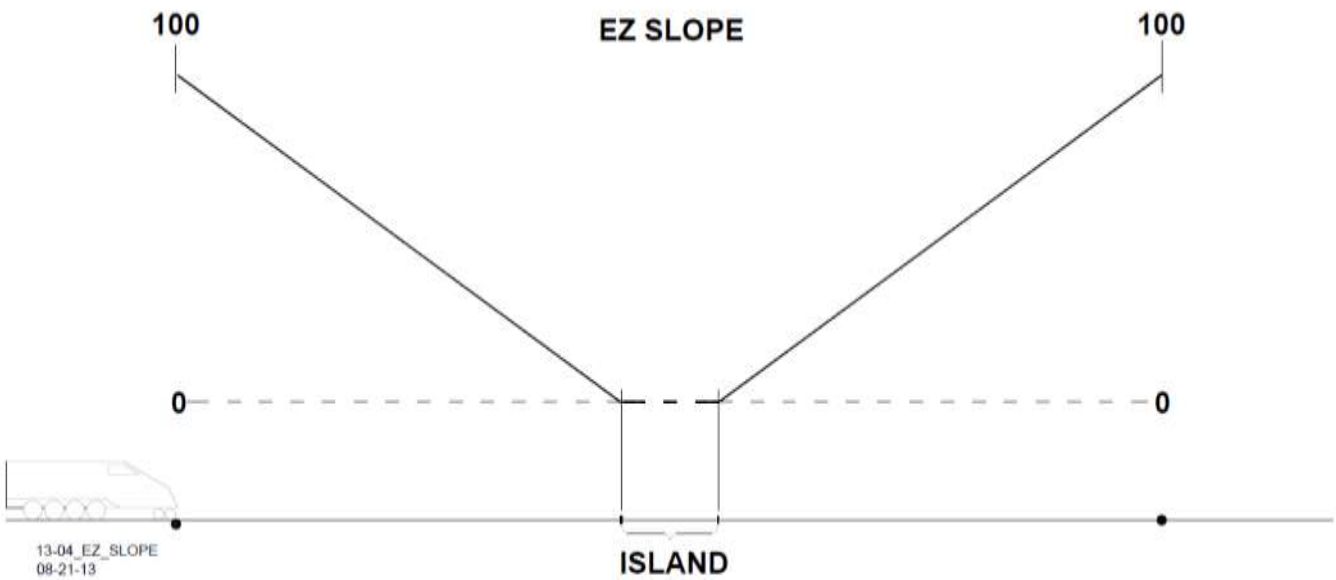


Figure 1-1 Diagram of EZ Level Compared to Train Shunt Location

- Once the train exits the Island Circuit, the impedance level will begin to increase, raising the EZ level back up to its highest resting value. The figure above illustrates this process.

1.5.2 Track Ballast Condition

The EX value is a numerical indication of track ballast conditions. The EX corresponds to electrical leakage through track ballast. An EX value of 100 represents optimum track ballast conditions. The standard low EX operating threshold for the Model 3000+ GCP is 39. EX is normally between 70 and 100.

1.5.3 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). The Model 3000+ GCP provides automatic compensation of EZ for a wide range of lump loading conditions.

1.5.4 GCP Signal Frequencies

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

Table 1-2 GCP Frequencies Available

Siemens Standard Frequencies:	86, 114, 156, 211, 285, 348, 430, 545, 645, 790, and 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, 250, 267, 326, 392, 452, 522, 560, 630, 686, 753, 816, 881, 979, and 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)

1.5.5 Termination Shunts

A shunt is connected across the rails to terminate the Model 3000+ GCP approach circuit. This device presents a low impedance at the Model 3000+ GCP operating frequency, and may consist of any of the following:

- Hardwire shunt - used when no other signals (AC or DC) are present on the rails.
- Wideband shunt - used when only non-coded DC track circuits are present.
- Narrow band shunt - used when other AC signals are present or on DC coded track circuits.

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.

NOTE

NOTE

The use of dual wideband shunts, part number 8A077, is not recommended for Model 3000+ GCP applications.

1.5.6 Insulated Joint Bypass Couplers

Insulated joints are placed in the rails to electrically isolate adjacent crossing circuits.

In non-coded DC track circuits, the insulated joints within an approach may be bypassed by wideband shunts as required for signaling purposes.

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 2-2 are observed.

WARNING

WARNING

WHEN A MODEL 3000+ GCP IS INSTALLED IN A UNIDIRECTIONAL OR A SIMULATED BIDIRECTIONAL CONFIGURATION, THE INSULATED JOINTS OF THE APPROACH MUST NOT BE BYPASSED WITH FREQUENCY COUPLING DEVICES IN ANY WAY.

CAUTION

CAUTION

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

NOTE

NOTE

The use of dual wideband shunts, part number 8A077, is not recommended for Model 3000+ GCP applications.

For a discussion of the 62785-F Tunable Insulated Joint Bypass Coupler, refer to Section 6.11

For a discussion of simulated bidirectional configuration, refer to Section 6.11.1.

1.5.7 Extending Approach Length with a Remote 3000+ DAX

When insulated joints limit GCP approach distances and these joints may not be bypassed using frequency-coupling devices, the approach length may in effect be extended by electrically transferring prediction information from a remote Model 3000+ GCP located upstream beyond the insulated joints. This may be accomplished through use of either of the following functions:

- Prime Prediction Offset
- Downstream Adjacent Crossing (DAX)

1.5.7.1 Prime Prediction Offset

The prime prediction offset function, as illustrated below, allows the prime relay (GCP RLY) output of a Model 3000+ GCP to control a crossing from an upstream remote location other than a crossing. This is accomplished by:

- Electrically transferring the GCP RLY output of the upstream unit to the Upstream Adjacent Crossing (UAX) input of the downstream unit.
- Programming the upstream unit to delay prime prediction to compensate for the offset distance between the insulated joints and the downstream crossing feed points.

⚠ WARNING

WARNING

ENTERING AN INCORRECT DAX AND/OR PRIME PREDICTION OFFSET DISTANCE MAY RESULT IN SHORT OR NO WARNING TIME. WHEN A GCP TRACK CIRCUIT INCLUDES AN ISLAND, DO NOT USE PRIME PREDICTION OFFSET (PPO) WHEN A PPO DISTANCE (OTHER THAN 0) IS ENTERED, THE ISLAND CIRCUIT DOES NOT DE-ENERGIZE THE PRIME OUTPUT. THE WARNING SYSTEM WILL RECOVER WITH A TRAIN OCCUPYING THE ISLAND CIRCUIT AFTER THE PRIME PICKUP TIMER RUNS.

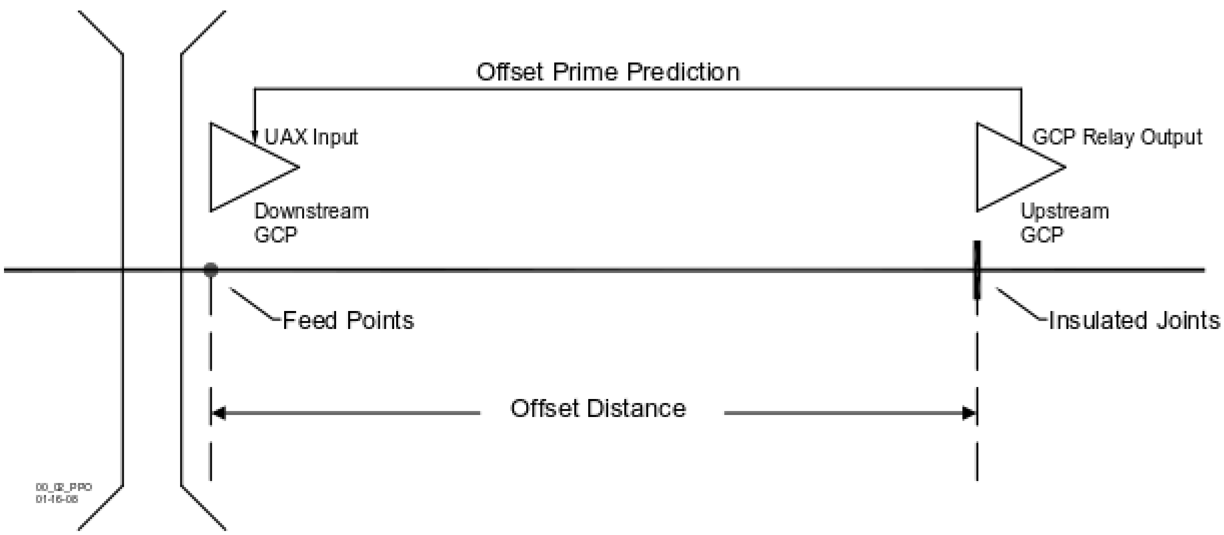


Figure 1-2 Prime Prediction Offset

1.5.7.2 DAX Functions

> **WARNING**
>
> **ENTERING A NON-ZERO VALUE FOR THE DAX OFFSET DISTANCE DISABLES THE PREEMPT FUNCTION SO THAT THE ISLAND AND UAX DO NOT AFFECT THE DAX RELAY DRIVE.**

Where a crossing is protected by a unidirectional Model 3000+ GCP, and the approach distance between that crossing and the adjacent upstream crossing is insufficient to provide the required warning time, the approach may, in effect, be extended by means of the DAX function illustrated below. This function allows the GCP at the downstream crossing to operate in response to a DAX-start input received from the upstream crossing. This is accomplished by:

- Electrically transferring the DAX RLY output of the upstream unit to the Upstream Adjacent Crossing (UAX) input of the downstream unit.
- Programming the upstream unit to delay the DAX start to compensate for the offset distance between the insulated joints and the downstream crossing feed points.

> **NOTE**
>
> For DAX applications, refer to Section 5.3. To implement the DAX function, the RIO module (Part# A80413) must be installed in the upstream GCP.

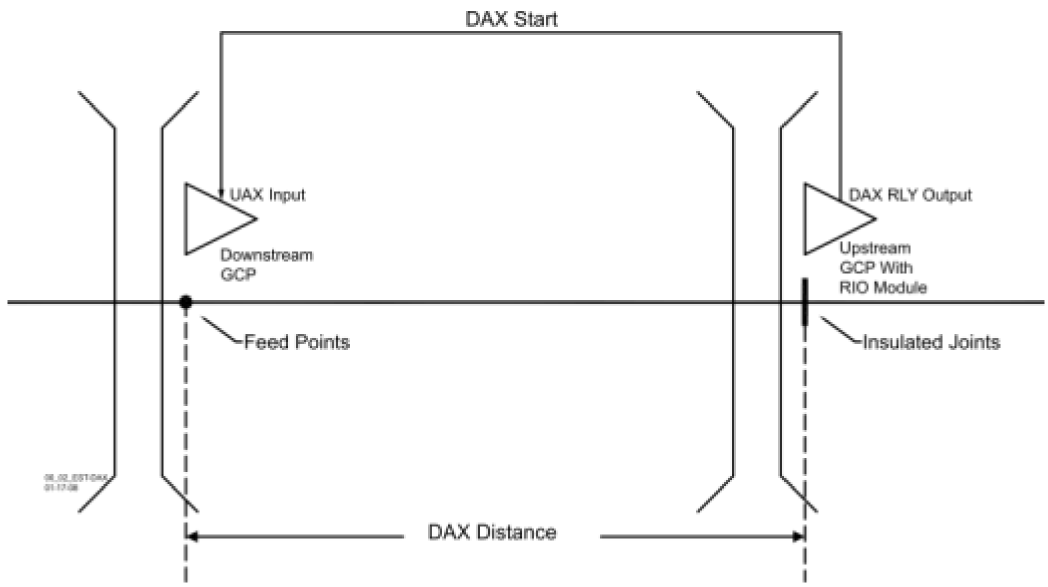


Figure 1-3 Establishing Downstream Adjacent Crossing (DAX)

1.5.8 Traffic Signal Preemption

A Model 3000+ DAX Preempt output may be interconnected to traffic signal equipment. This interconnection 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 signal activation using Advance Preemption, or, at the same time as crossing signal activation using Simultaneous Preemption.

Traffic signal preemption can be performed using an output from the RIO module. The front contacts of a DAX Relay are routed to the local traffic signal control equipment where they are used to control operation of the traffic signal lights at the crossing.

Where only the DAX 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:

- DAX preempt predictor warning time
- Prime predictor warning time
- Train speed variation following preempt prediction

For example, with the DAX preempt predictor warning time set to 40 seconds, the prime warning time set to 30 seconds, and the 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 IS USED, A TRAIN THAT SLOWS AFTER THE PREEMPT PREDICTION COULD RESULT IN AN ADVANCE TRAFFIC PREEMPTION INTERVAL THAT IS GREATER THAN THAT OF THE CONSTANT SPEED TRAIN. THIS LONGER-THAN-DESIRED TIME INTERVAL COULD ALLOW THE TRAFFIC SIGNAL TO CHANGE BACK TO RED BEFORE THE CROSSING SIGNALS ACTIVATE. IF THIS HAPPENED, VEHICLES COULD PROCEED ON THE TRACKS AND BE STOPPED BY THE RED TRAFFIC SIGNAL. THE ADVANCE PREEMPTION TIMER SHOULD BE USED TO PREVENT THIS POSSIBILITY.

If the Advance Preempt timer was not used and a train decelerated after the preempt prediction, this would result in an advance traffic preemption interval 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. When a train slows after the preempt prediction, the expired advance preempt timer will activate the crossing prior to the prime predicting.

When 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, an advance preemption timer set at 10 seconds might run for only 8 seconds before the prime predictor predicts, overriding the preempt timer and activating the crossing.

When the advance preemption timer is used and the preempt controlling the traffic signals drops, it will start the advance preemption timer. When the advance preemption timer expires, this will drop the GCP RLY and any other DAX PREEMPT outputs.

The Model 3000+ GCP may also incorporate an Advanced Preempt Timer feature as described in Section 4.2.2; paragraph 4.

NOTE

The 3000+ GCP assumes that the 1st DAX assigned for each track and set with a zero offset distance will be used to control the traffic signals.

The following table provides examples of the Traffic Signal Preemption. The Traffic Preempt column shows which DAX needs to be wired to the traffic preemption relay.

Table 1-3 Traffic Signal Preemption

Example	Number DAXes	DAX	Offset	Track	Traffic Preempt	Notes
1	1	A	0	1	Yes	1st used preempt on T1
2	2	A	0	1	Yes	1st used preempt on T1
		B	0	1	No	
3	2	A	0	1	Yes	1st used preempt on T1
		B	500	1	No	
4	4	A	0	1	Yes	1st used preempt on T1
		B	500	1	No	
		C	0	2	Yes	1st used preempt on T2
		D	500	2	No	
5	4	A	1000	1	No	
		B	500	2	No	
		C	0	1	Yes	1st used preempt on T1
		D	0	2	Yes	1st used preempt on T2

This scheme allows the 3000+ GCP to be configured with preempts containing different warning times.

When two tracks are used, either track may need to be able to start the traffic signals, so the preempt outputs for each track will need ANDing externally.

Advance preemption can be initiated from a GCP at a remote location by using the MS/GCP CTL input. When the Advance Preempt Timer is set to a non-zero value, the MS/GCP CTL, will be used as an advance preemption start input rather than its normal use of the switching between predictor and motion sensor.

When the Advance Preempt input de-energizes it will:

- De-energize the DAX Preempts associated with traffic system (1st used Preempt for each track as explained in preceding section)
- Start the advance preemption timer for each track

When the advance preemption timer expires it will de-energize the GCP RLY and any other DAX Preempt in a similar manner as if it was started by the DAX preempt de-energizing.

> **NOTE**
>
> If the Advance Preemption Input (MS/GCP_CTL) is de-energized then immediately energized, it will start the Advance Preemption time. When the timer starts it has to run to completion, so when the timer expires it will de-energize the GCP RLY, then the GCP RLY will re-energize after 10 seconds.

1.5.9 Island Circuit

An island circuit is a short track circuit that enables the Model 3000+ GCP to provide train detection for limited distances on both sides of a highway crossing.

- The Model 3000+ GCP Track Module (A81040) supports a built-in island transmitter and receiver.
- The length of the island circuit is established by the location of the track connections on either side of the crossing
- A transmitter is placed on one side of the crossing and a receiver is placed on the other
- A train located at any point within the island circuit will activate the Model 3000+ GCP, which, in turn, activates the Crossing Warning system.
- The island circuit does not de-energize DAX outputs or Prime outputs with non-zero offset distances.

1.5.10 Intermittent or Poor Track Shunting

The low-resistance shunt created by the wheels of a train is dependent on solid physical contact with the track. Because of this, certain track conditions can result in intermittent or poor track shunting. Although poor track shunting can occur just about anywhere due to numerous causes, it generally is due to:

- infrequent track usage
- lightly weighted cars
- passenger and transit operation
- spillage from railcars
- rail contamination

In addition, little or no track shunting may occur in dark territory where no DC or AC track circuits exist and few trains run per week.

NOTE

NOTE

The Siemens 80049 DC Shunting Enhancer Panel provides a very simple and cost effective solution for improving shunting in dark territory, thus enabling the 3000+ Enhanced Detection software to function properly. The panel applies a nominal 6 volts DC to the track at the crossing to break down the film on the rails. For a discussion of the 80049 DC Shunting Enhancer Panel, refer to Section 6.2.

The Model 3000+ GCP incorporates an Enhanced Detection feature as described in Section 4.2.6.

When poor shunting conditions are anticipated at a remote unidirectional DAX or prime prediction offset application, an island circuit is used to ensure correct reverse train move logic.

- When there is a remote Model 3000+ GCP installed back-to-back and there is DAX control from both sides of a set of insulated joints, only one island circuit is required.
- Track wire spacing for the remote island must be a minimum of 80 feet (transmit to receive wires).
- When de-energized, the remote island does not affect DAX or Prime Prediction offset relay drive outputs.

1.5.11 Display Module

Application parameters, including warning time, are programmable via either the A80485 Display Module Local User Interface (see Section 7.3.4) or the Web User Interface and a computer running a compatible web browser (see Section 3.4).

1.5.12 Self-Checking and Troubleshooting

The self-checking processes in the Model 3000+ GCP continually test the unit to ensure continued safe and reliable operation. Module status LED indicators combined with microprocessor-controlled diagnostic messages presented on the display permit rapid trouble-shooting.

1.6 SYSTEM SPECIFICATIONS

1.6.1 Input Power

Battery Voltage
On CPU Connector: 9.0-16.5 VDC
Maximum Ripple: 1.0 V p-p

Module Current

	CPU Battery Connector @10 V	CPU Battery Connector @13.2 V	CPU Battery Connector @ 16.5 V
CPU II+	0.32 A	0.26 A	0.23 A
Track	1140 mA @ medium transmit power 1190 mA @ high transmit power *Current increases by 90 mA when one 250 ohm relay output is energized	830 mA @ medium transmit power 870 mA @ high transmit power *Current increases by 50 mA when one 250 ohm relay output is energized	660 mA @ medium transmit power 720 A @ high transmit output *Current increases by 40 mA when one 250 ohm relay output is energized
Minimum Output Current @ medium transmit power:	180 mA	180 mA	180 mA
Minimum Output Current @ high transmit power:	260 mA	260 mA	260 mA
RIO	740 mA with no relay output *Current increases by 50 mA when one 500 ohm relay output is energized	530 mA with no relay output *Current increases by 40 mA when one 500 ohm relay output is energized	490 mA with no relay output *Current increases by 40 mA when one 500 ohm relay output is energized
Display:	770 mA 740 mA	660 mA 640 mA hibernating	600 mA 590 mA hibernating
Transfer:	190 mA on Main 430 mA on Standby	200 mA on Main 500 mA on Standby	210 mA on Main 510 mA on Standby
3000+ GCP with Full Complement of Modules: **CPU II+** **Track (2 each)** **RIO** **Display** **Transfer**	4.3 A (Main) 4.5 A (Standby)	3.3 A (Main) 3.6 A (Standby)	2.8 A (Main) 3.1 A (Standby)

GCP Frequencies Available:	Siemens Standard Frequencies: 86, 114, 156, 211, 285, 348, 430, 545, 645, 790, and 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, 250, 267, 326, 392, 452, 522, 560, 630, 686, 753, 816, 881, 979, and 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)

NOTE

NOTE

The Siemens 80049 DC Shunting Enhancer Panel provides a very simple and cost effective solution for improving shunting in dark territory, thus enabling the 3000+ Enhanced Detection software to function properly. The panel applies a nominal 6 volts DC to the track at the crossing to break down the film on the rails. For a discussion of the 80049 DC Shunting Enhancer Panel, refer to Section 6.2.

The Model 3000+ GCP incorporates an Enhanced Detection feature as described in Section 4.2.6.

MS/GCP Response Time	5 seconds
Relay Drive Outputs (VO)	100 to 1000-ohm load
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.
Typical Monitoring and Storage	CPU II+
I/O State Changes	3000 minimum

Train Moves Up to 20

Mounting All 3000+ GCP chassis can be wall, rack, or shelf mounted.

Chassis Dimensions

A81040		
Width:	23.25 Inches	(59.06 centimeters)
Depth:	11.20 Inches	(28.44 centimeters)
Height:	22.12 Inches	(56.20 centimeters)

Chassis Weight

	Empty	Full Module Complement
A81040	24.6 pounds (11.2 kilograms)	38.3 pounds (17.8 kilograms)

Module Weight

CPU II+ (A80403)	1.25 pounds (0.56 kilograms)
Track (A80418)	1.00 pounds (0.45 kilograms)
RIO (A80413)	1.13 pounds (0.51 kilograms)
Display (A80407)	3.88 pounds (1.75 kilograms)
Transfer (A80468)	1.50 pounds (0.68 kilograms)

Temperature Range -40 °F to +160 °F (-40 °C to 70 °C)

LonTalk™ Protocol (Echelon®) LAN Interface

Data Transfer Rate 1.25 Mbps

Transmission Medium

- For normal installations within the same signal case or bungalow, use stranded twisted pair, conductor size #22 AWG (0.3 mm²) to #16 AWG (1.3 mm²).
- Communication grade twisted pair cable NEMA Level 4 is recommended.

Topology Bus (direct daisy-chain)

Number of Nodes Maximum of:

- 8 nodes in any 16-meter (53 feet) length of transmission cable
- 16 nodes per network segment

Termination	One Network Echelon Termination Unit, p/n 8000-80078-001, is recommended per network segment
Network Length	53 feet (16 meters) • 426 feet (130 meters) maximum per network segment

CAUTION

CAUTION

ALL DEVICES CONNECTED TO THE LAN SHOULD BE CONTAINED ENTIRELY WITHIN THE SAME SIGNAL CASE OR BUNGALOW.

1.7 MINIMUM APPROACH LENGTH

The shortest approach distance at which a Model 3000+ GCP will provide reliable operation is determined by:

- the GCP operating frequency
- the gauge and length of the transmit wires connected to the rails
- the length of the Island
- ballast conditions in street and approach

NOTE

NOTE

In certain applications, shorter approach distances can be achieved by the use of a six-wire connection.

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SECTION 2 GENERAL GCP APPLICATION INFORMATION

2.0 MODEL 3000+ GCP TRACK SIGNALS

The Model 3000+ GCP applies a constant current audio frequency (AF) signal to the track.

2.1 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.

2.1.1 GCP Frequency Range

The Model 3000+ GCP application program shows a list of selectable frequencies between 44 and 999 Hz.

2.1.2 GCP Signal Attenuation

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

2.2 SIEMENS MODEL 3000+ GCP STANDARD FREQUENCIES

Siemens recommends the eleven standard frequencies listed in the first row of Table 2-1. Using these frequencies is dependent on approach distance requirements and track ballast conditions.

If the same GCP frequency is to be used on two different 3000+ GCP units, interference may occur due to coupling between them. In the older 3000 GCP, this is avoided by slaving the two units so that their transmit signals are synchronized. Slaving is not supported in the 3000+ GCP, instead, offset frequencies should be used. For example, rather than both units using 86Hz, one can be programmed to 85.5Hz and the other to 86.5Hz. The list of offset frequencies supported by the 3000+ GCP is listed in Table 2-1.

The “Other frequencies” listed in Table 2-1 are useful when there are specific types of noise on the track. Contact Siemens if further information is required.

Table 2-1 GCP Frequencies Available

Siemens Standard Frequencies:	86, 114, 156, 211, 285, 348, 430, 545, 645, 790, and 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, 250, 267, 326, 392, 452, 522, 560, 630, 686, 753, 816, 881, 979, and 999 Hz

2.3 GCP FREQUENCY VS 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 Table 2-3 (Unidirectional). The minimum distances provided are based on use of hardwire or wideband shunts. Lumped loads in the GCP approach can affect the linearity (slope) of EZ over the length of the approach

Table 2-2 Ballast Resistance vs. Approach Length by Frequency, Bidirectional Applications

MODEL 3000+ GCP OPERATING FREQUENCY (HZ)	BIDIRECTIONAL APPROACH DISTANCE IN FEET (METERS)					
	2 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		4 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		6 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST	
	MIN	MAX	MIN	MAX	MIN	MAX
86	1,000 (304.8)	5,350 (1,630.7)	1,000 (304.8)	7,950 (2,423.2)	1,000 (304.8)	9,280 (2,362.2)
114	750 (228.6)	4,525 (1,379.2)	750 (228.6)	6,450 (1,966.0)	750 (228.6)	7,448 (2,270.2)
156	600 (182.9)	3,925 (1,196.3)	600 (182.9)	5,550 (1,691.6)	600 (182.9)	6,349 (1,935.2)
211	475 (144.8)	3,350 (1,021.1)	475 (144.8)	4,800 (1,463.0)	475 (144.8)	5,494 (1,674.6)
285	400 (121.9)	2,950 (899.2)	400 (121.9)	4,225 (1,287.8)	400 (121.9)	4,762 (1,451.5)
348	400 (121.9)	2,625 (800.1)	400 (121.9)	3,675 (1,120.1)	400 (121.9)	4,151 (1,265.2)
430	400 (121.9)	2,300 (701.0)	400 (121.9)	3,350 (1,021.1)	400 (121.9)	3,785 (1,153.7)
525	400 (121.9)	2,150 (655.3)	400 (121.9)	3,150 (960.1)	400 (121.9)	3,541 (1,179.3)
645	400 (121.9)	1,950 (594.4)	400 (121.9)	2,800 (853.4)	400 (121.9)	3,175 (967.7)
790	400 (121.9)	1,725 (525.8))	400 (121.9)	2,475 (753.4)	400 (121.9)	2,807 (855.9)
970	400 (121.9)	1,550 (472.4)	400 (121.9)	2,175 (662.9)	400 (121.9)	2,472 (753.5)

Both tables based upon use of hardwire or wideband shunts.

Table 2-3 Ballast Resistance vs. Approach Length by Frequency, Unidirectional Applications

MODEL 3000+ GCP OPERATING FREQUENCY (HZ)	UNIDIRECTIONAL APPROACH DISTANCE IN FEET (METERS)					
	2 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		4 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST		6 OHMS/1,000' (304.8M) DISTRIBUTED BALLAST	
	MIN	MAX	MIN	MAX	MIN	MAX
86	700 (213.4)	4,375 (1,333.5)	700 (213.4)	6,175 (1,882.1)	700 (213.4)	7,080 (2,158.0)
114	525 (160.0)	3,850 (1,173.5)	525 (160.0)	5,550 (1,691.6)	525 (160.0)	6,360 (1,938.5)
156	420 (128.0)	3,325 (1,013.5)	420 (128.0)	4,875 (1,485.9)	420 (128.0)	5,520 (1,682.5)
211	400 (121.9)	2,750 (838.2)	400 (121.9)	4,100 (1,249.7)	400 (121.9)	4,680 (1,426.5)
285	400 (121.9)	2,250 (686.8)	400 (121.9)	3,500 (1,066.8)	400 (121.9)	3,960 (1,207.0)
348	400 (121.9)	1,925 (586.7)	400 (121.9)	3,025 (922.0)	400 (121.9)	3,420 (1,042.4)
430	400 (121.9)	1,725 (525.8)	400 (121.9)	2,650 (807.7)	400 (121.9)	3,000 (914.4)
525	400 (121.9)	1,500 (457.2)	400 (121.9)	2,275 (693.4)	400 (121.9)	2,580 (786.4)
645	400 (121.9)	1,300 (396.2)	400 (121.9)	1,950 (594.4)	400 (121.9)	2,220 (676.7)
790	400 (121.9)	1,125 (342.9)	400 (121.9)	1,650 (502.9)	400 (121.9)	1,860 (566.9)
970	400 (121.9)	1,050 (320.0)	400 (121.9)	1,550 (472.4)	400 (121.9)	1,710 (521.2)

2.4 TRACK CIRCUIT OPERATING FREQUENCY RESTRICTIONS

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

NOTE

Refer to paragraph 6.10 Track Circuit Isolation Devices, for applicable battery isolation and AC filter requirements. Contact Siemens Technical Support for assistance as required at (800)-793-7233.

2.4.1 Relay Coded DC Track Circuits

WARNING

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

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 the 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 the 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 the 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 the 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 the 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 MODEL 3000+ GCP TRACK FREQUENCY, ACCOUNT FOR ANY EXISTING AUDIO FREQUENCY TRACK CIRCUIT SIGNALS.

2.5.1 Frequency Selection Restrictions

Before selecting the Model 3000+ GCP frequency, determine if any high-level audio frequency (AF) is present on the track. Avoid using any Model 3000+ GCP frequency that is within fifteen percent of any AF signal present. For additional restrictions on the use of overlapping GCP frequencies, see paragraph 4.2.4.

2.6 GCP APPROACH DISTANCE CALCULATIONS

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

2.6.1 Approach Distance Calculations

⚠ WARNING

WARNING

THE MODEL 3000+ GCP APPROACH DISTANCE CALCULATIONS ARE BASED ON MINIMUM WARNING TIME REQUIREMENTS. ADDITIONAL TIME CAN BE ADDED AS NEEDED TO ACCOUNT FOR ANGLED CROSSINGS, MULTIPLE TRACK, ADVANCE TRAFFIC SIGNAL PREEMPTION, AND SO ON. WHEN PREEMPTING TRAFFIC SIGNALS FOR THE SAME CROSSING AS THE MODEL 3000+ GCP, THE APPROACH DISTANCE MUST BE BASED ON THE ADVANCE PREEMPTION TIME PLUS THE SYSTEM RESPONSE TIME. IN AREAS WHERE POOR SHUNTING IS EXPECTED, ADD FIVE SECONDS OF ADDITIONAL APPROACH DISTANCE.

IN APPLICATIONS WITH SHORT APPROACHES, VERIFY THAT THE ISLAND LENGTH (MINIMUM 120 FT / 36.6 M) DOES NOT EXCEED 30 PERCENT (30%) OF THE LONGEST GCP APPROACH. IF GREATER THAN 30%, INCREASE THE LENGTH. WHERE NOT POSSIBLE (E.G. INSULATED JOINTS) INCREASE THE APPROACH LENGTH WITH A DUMMY LOAD IN SERIES WITH THE TERMINATION SHUNT. ENSURE THAT THE RESULTING TOTAL LENGTH MEETS THE LENGTH-VS.-FREQUENCY REQUIREMENTS.

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

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

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

Table 2-5 Warning Time vs. Maximum Speed Distance Table (Metric [km/h-M/S])

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

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

NOTE

NOTE

System response time is 5 seconds.

The approach distance for a GCP installation with or without an island circuit is the distance from the GCP track wire connections on the rail to the termination shunt connections.

Figure 2-1 provides a depiction of approach distances. The required approach distance is calculated using the following factors:

- Maximum speed of trains through the approach in feet per second or meters per second
- Highest crossing warning time requirement in seconds. This is based on crossing operation time or traffic signal preemption time as well as the Model 3000+ GCP response time in seconds.

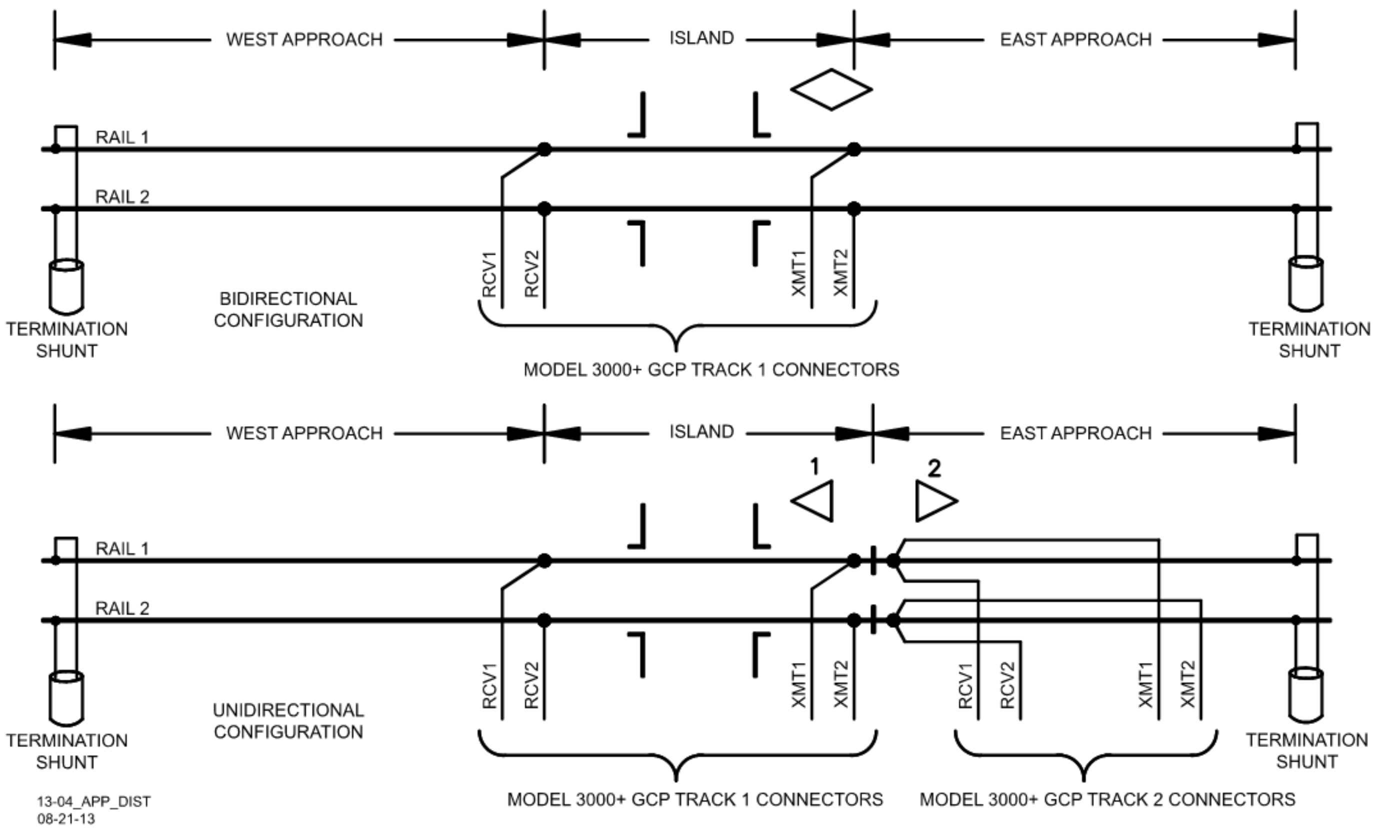


Figure 2-1 Approach Distance Calculation Example

Given:

- Speed Conversion Factor:
- 1 mile per hour (MPH) = 1.47 feet per second (ft/s)
- 1 kilometer per hour (km/h) = 0.28 meters per second (m/s)
- Maximum train speed = 50 mph or 80 km/h
- Typical 3000+ GCP 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 km/h multiplied by 0.28
- Total approach time = Typical 3000+ GCP 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 km/h X 0.28 = 22.2 m/s
- Total approach time = 5 seconds + 30 seconds = 35 seconds
- Required approach distance:
- 73.3 ft/sec X 35 seconds = 2567 feet
- 22.2 m/s X 35 seconds = 777.62 meters

NOTE

The required approach distance is the distance from the island track wires to the shunt termination. Refer to Figure 2-1 for further information.

2.7 USING NARROW-BAND SHUNTS AND OVERLAPPING APPROACHES

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

2.7.1 Using Narrow-Band Termination Shunts

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

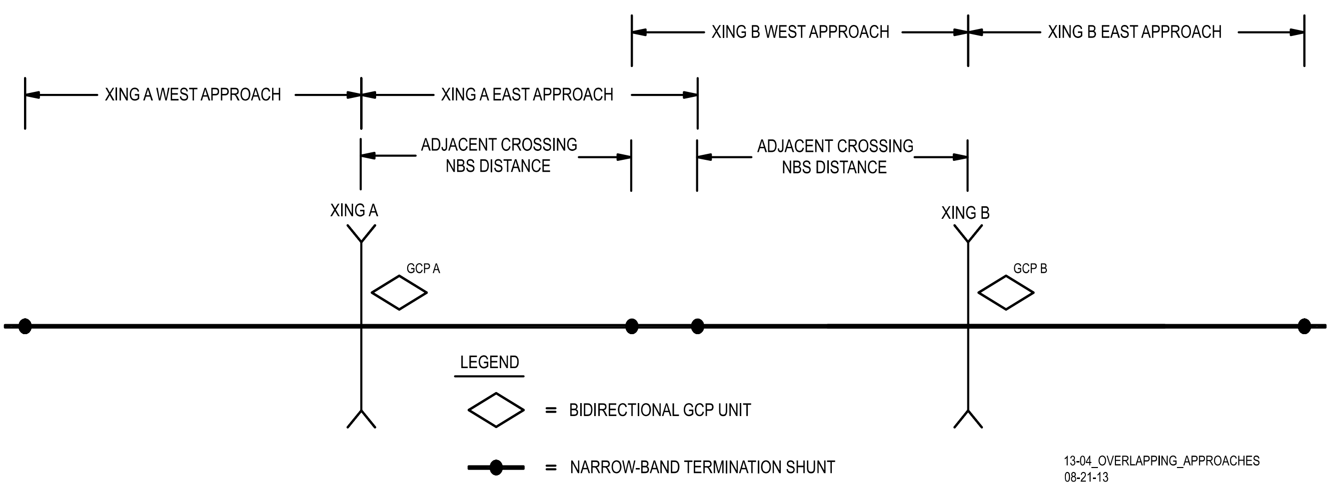


Figure 2-2 Overlapping Approaches

2.7.2 Types of Narrow-Band Shunts

There are several types of narrow-band shunts that can be used with the Model 3000+ GCP:

- 62775-f Single-Frequency Narrow-Band Shunt
- 62775-f Multi-Frequency Narrow-Band Shunt
- 62780-f Single Frequency Narrow-Band Shunt
- 62780-f Multi-Frequency Narrow-Band Shunt

Details regarding each of these can be found in SECTION 6 Auxiliary Equipment.

2.7.3 Adjacent Frequency Use in Overlapping Bidirectional or Simulated Bidirectional Approaches

When overlapping two or more adjacent GCP frequencies in bidirectional and simulated-bidirectional applications, the frequency of the overlapping narrow-band termination shunt must be selected to ensure optimum Model 3000+ GCP operation. The acceptable adjacent narrow-band shunt frequency is determined by the length of the approach, the track frequency of the approach, and the location of the overlapping termination shunts in their respective approaches.

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

- Charts for 62775-f narrow-band shunt are shown in Figure 2-3, Figure 2-4, and Figure 2-5.
- Charts for 62780-f narrow-band shunt are shown in Figure 2-6, Figure 2-7, and Figure 2-8.
- A chart is provided for each Model 3000+ GCP crossing frequency with its adjacent frequency acceptance information.
- Each chart relates approach distance with the distance from the track wires to the adjacent approach narrow-band shunt.
- Shading indicates the distance area near the GCP track wires that adjacent frequency narrow-band shunt distances should not be used.

2.7.4 Adjacent Frequency Narrow-Band Shunt Distance Example

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

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

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

2.7.5 Adjacent Frequency Use with Unidirectional Applications

When adjacent Model 3000+ GCP operating frequencies are used for overlapping unidirectional approaches, narrow-band shunts can be used in accordance with the following:

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

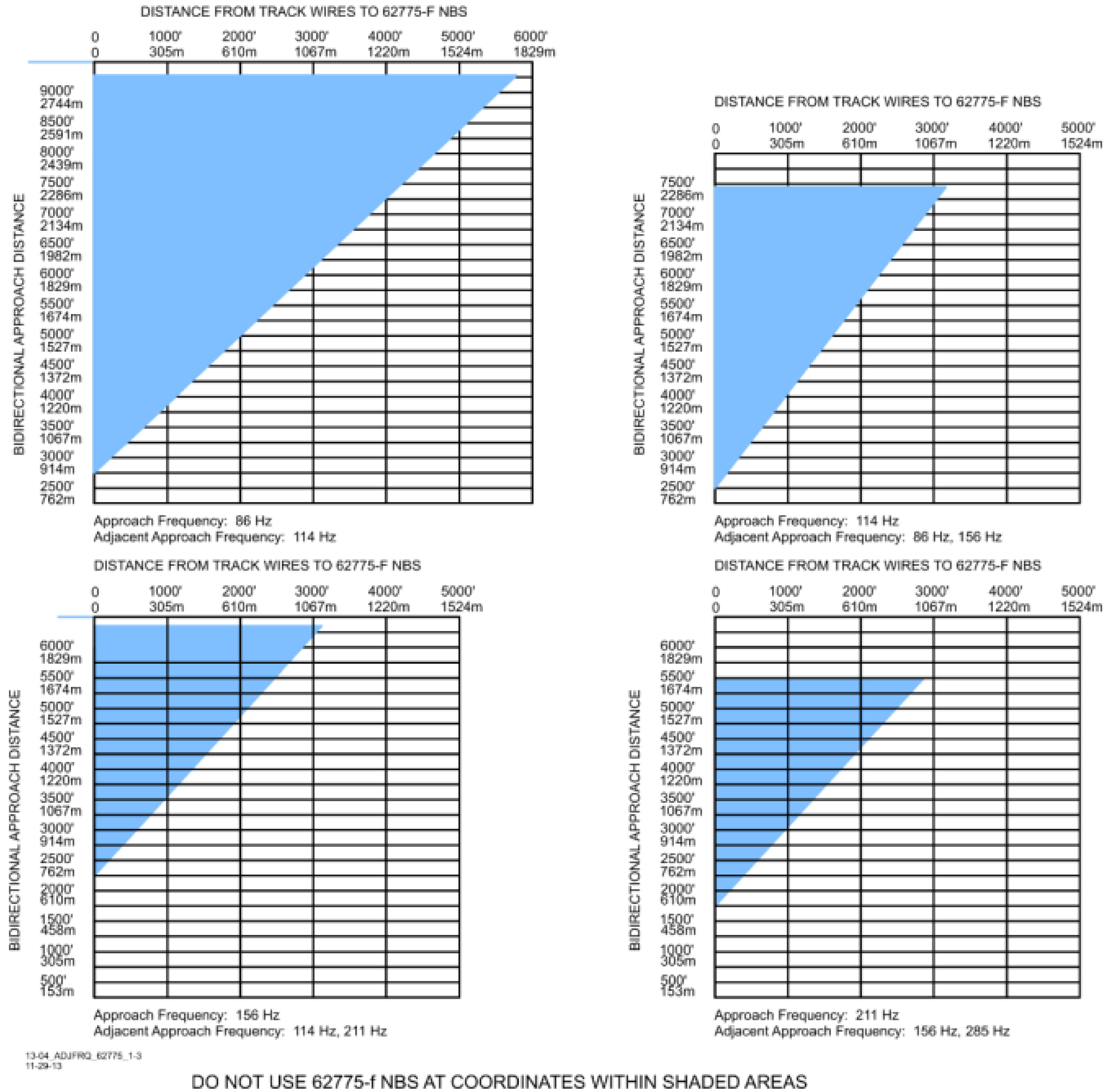


Figure 2-3 Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 1 of 3)

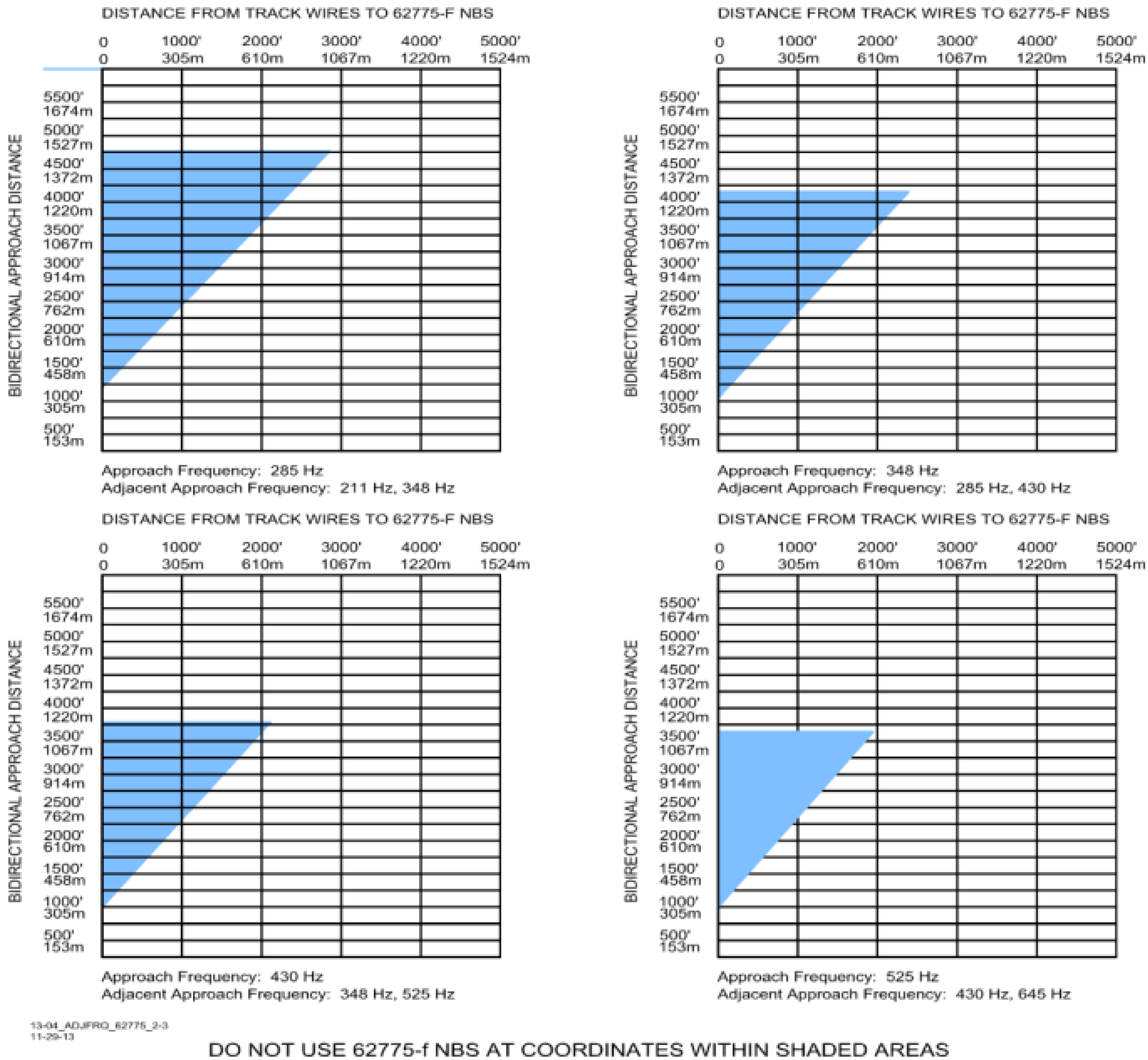
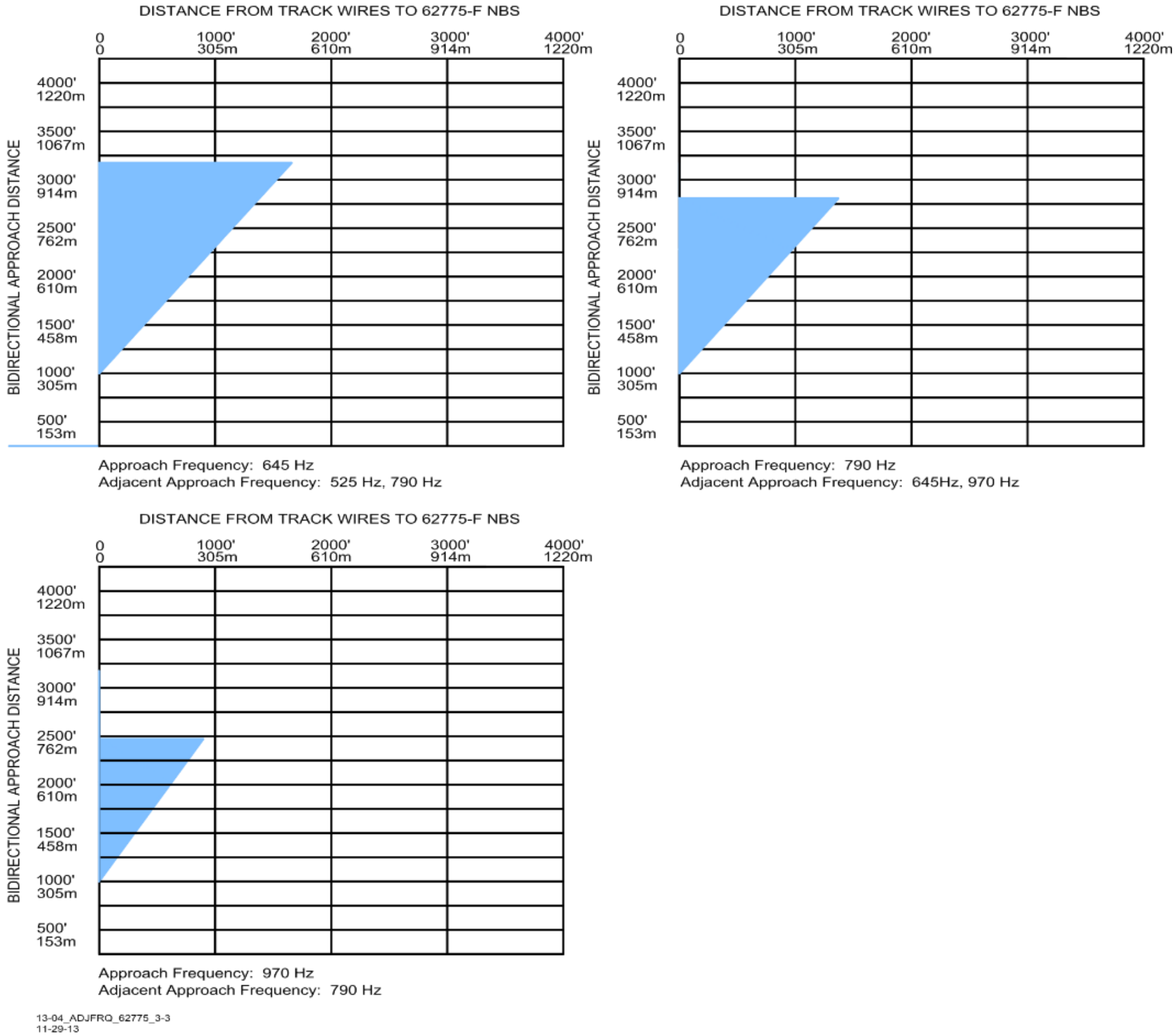


Figure 2-4 Adjacent Frequency 62775-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 2 of 3)



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)

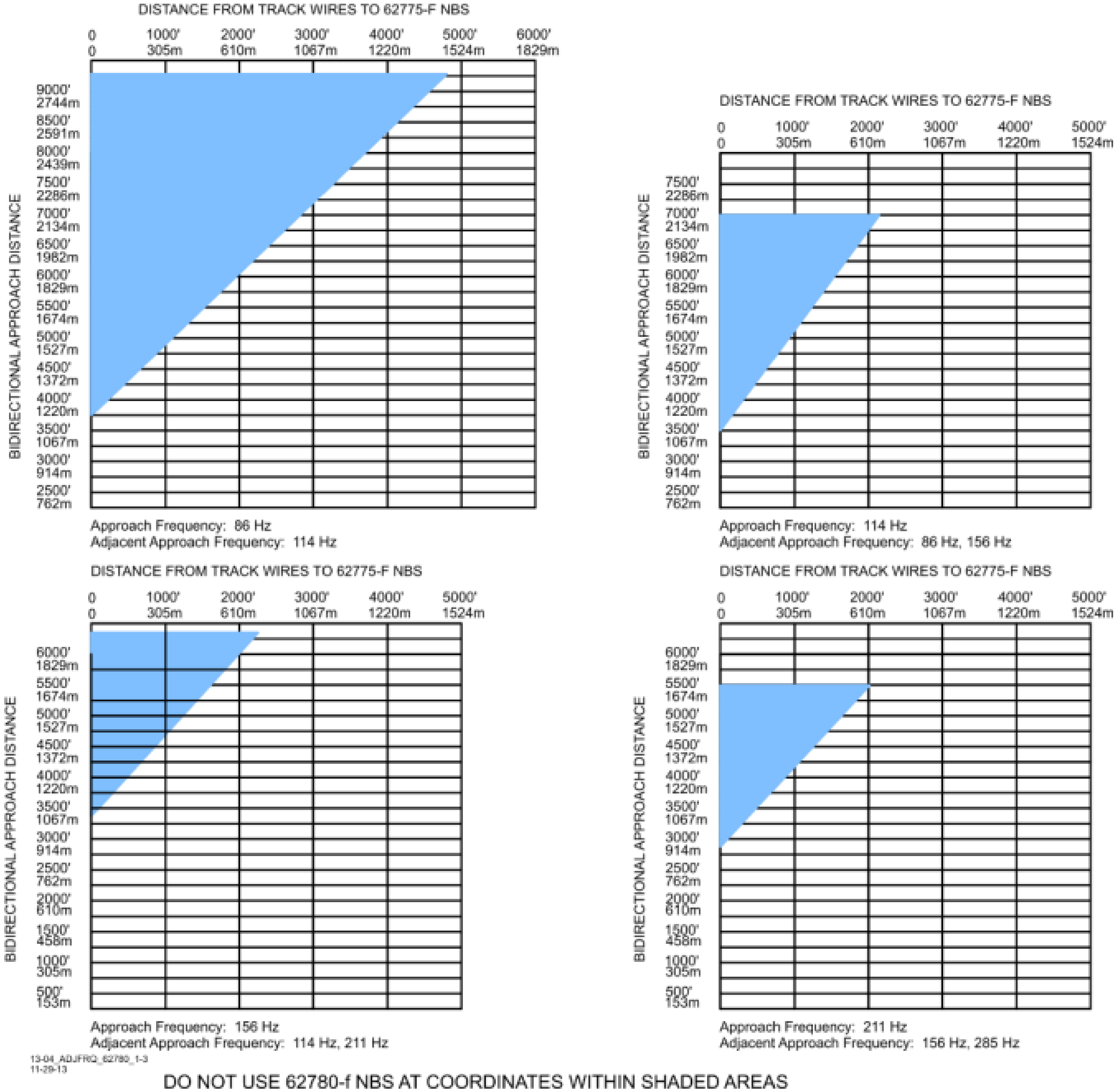


Figure 2-6 Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 1 of 3)

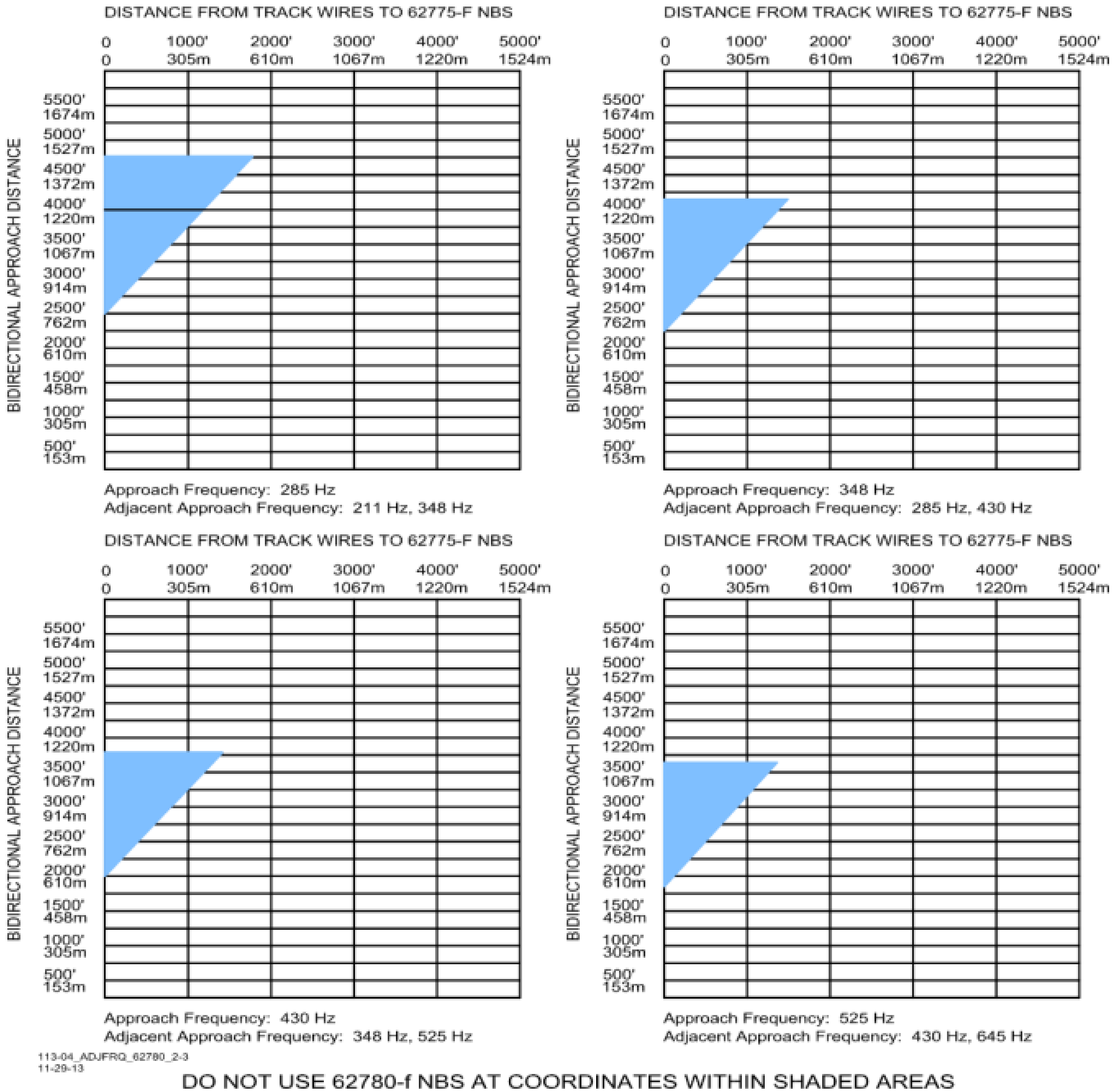


Figure 2-7 Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 2 of 3)

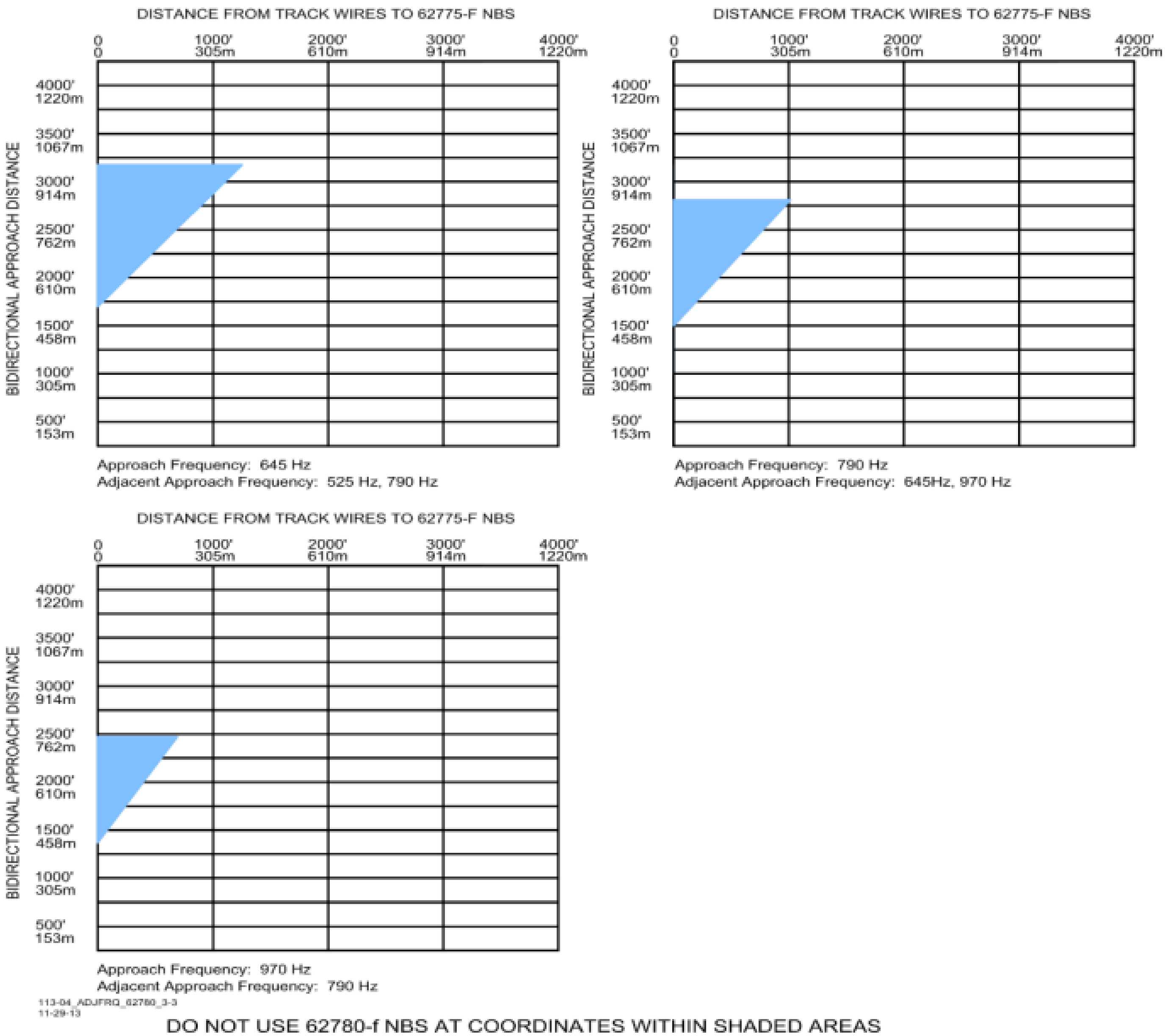


Figure 2-8 Adjacent Frequency 62780-f Narrow-band Shunt Placement Charts, Bidirectional and Simulated Bidirectional Application (Sheet 3 of 3)

2.8 REPEATING MODEL 3000+ GCP OPERATING FREQUENCIES

2.8.1 Insulated Joint Requirements

In general, do not operate two Model 3000+ GCPs at the same frequency on a common track unless the units are separated by insulated joints. If necessary, frequencies can be repeated without insulated joints, provided the Model 3000+ GCP approaches do not overlap and the minimum separation distances specified in Table 2-6 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 2-6 vary according to frequency and type of terminating shunt. Use greater distances between shunts where possible. When repeating frequencies in the same block section where the approaches do not overlap, set one Model 3000+ GCP track frequency as normal and the other to the lower offset frequency.

Example: When a frequency of 285 Hz is selected, set one Model 3000+ GCP to 285 Hz and the other to 284 Hz.

Table 2-6 Minimum Distance between Termination Shunts When Repeating Model 3000+ GCP Operating Frequencies

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

2.8.2 Offset Frequencies

A list of the available Model 3000+GCP offset frequencies is provided in Table 2-7.

Table 2-7 Model 3000+ GCP Offset Frequencies (Hz)

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

2.9 TERMINATION SHUNTS

Termination shunts are required for all Model 3000+ GCP installations. They must be connected across the rails at sufficient distances from the GCP track wire connection points to provide full crossing signal operating time (see Section 2.6).

WARNING

WARNING

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.

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 3000+ applications.

2.9.3 Narrow-Band Shunt

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

2.9.4 Termination Shunt Installation

On open track, locate termination shunts near the rail with leads as short as practical. When termination shunts are not located 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 SECTION 6, Auxiliary Equipment.

2.10 COUPLING AROUND INSULATED JOINTS

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

⚠ WARNING

WARNING

THE FEED POINT INSULATED JOINTS OF A UNIDIRECTIONAL OR A SIMULATED BIDIRECTIONAL APPROACH MUST NOT BE BYPASSED WITH ANY COUPLING DEVICE.USE ONLY INSULATED JOINT BYPASS COUPLER, 62785 F WITH THE MODEL 3000+ GCP.

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

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

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

2.10.1 Bypassing Insulated Joints Using Wideband Shunts

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 Model 3000+ GCP 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 circuits.

2.10.2 Tunable Insulated Joint Bypass Coupler

The 62785-f Tunable Insulated Joint Bypass Coupler is available in the standard Siemens operating frequencies of 156 Hz through 970 Hz. The coupler must be located within 10 feet (3.05 meters) of the insulated joints that it is coupling. It can be used in Model 3000+ GCP applications that require using an insulated joint bypass coupler as long as:

- No CAB signals, AC, or coded AC track circuits are present.
- In DC coded track circuits, the insulated joints within an approach can be bypassed using the 62785-f coupler, provided the minimum distances specified in Table 2-8 are observed.
- As a general rule, a maximum of two sets of insulated joints in each approach can be bypassed using the 62785-f.
- The 62785-f coupler must be field adjusted to pass the Model 3000+ GCP operating frequency around the insulated joints, as field tuning enables precise frequency adjustment for proper GCP operation.
- The 62785-f couplers must be adjusted in conjunction with GCP calibration.
- In motion sensor applications only, you can use the 62785-f coupler when insulated joints are located, in general, anywhere within the approach. When used in a motion sensor application, the 62785-f couplers must be adjusted in conjunction with GCP calibration

WARNING

THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN Table 2-8 APPLY ONLY TO SIEMENS MODEL 3000+ GCPS. WHEN THE MODEL 3000+ GCP IS PROGRAMMED AS A PREDICTOR. APPLICATION RULES FOR THE 62785-F ARE SPECIFIED IN THE Table 2-8. WHEN APPROACH LENGTHS ARE SHORTER THAN THOSE SPECIFIED IN Table 2-4, THE 62785-F COUPLER MUST NOT BE LOCATED WITHIN THE INNER TWO-THIRDS OF THAT APPROACH. USE ONLY THE INSULATED JOINT BYPASS COUPLER, 62785-F WITH THE MODEL 3000+ GCP. TUNED COUPLERS CANNOT BE USED TO BYPASS INSULATED JOINTS IN CAB SIGNAL OR AC TRACK CIRCUITS.

Table 2-8 Minimum Distance to Insulated Joints Bypassed with the 62785-f Coupler

Frequency (Hz)	Minimum Distance to 1st Set of Insulated Joints in Feet (Meters)	Minimum Distance to 2nd Set of Insulated Joints in Feet (Meters)
151 to 211	1500 (457.2)	2200 (670.6)
212 to 348	1000 (304.8)	1400 (426.7)
349 to 560	700 (213.4)	1000 (304.8)
561 to 790	500 (152.4)	800 (243.8)
791 to 979	400 (121.9)	700 (213.4)

* Distance applies to insulated joints located on the same side of the crossing.

NOTE: Frequencies of 86 and 114 Hz are not normally used with the 62785-f coupler. Contact Siemens Technical Support at 1-800-793-7233 for these applications.

2.11 INSTALLING BYPASS SHUNTS AND COUPLERS

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

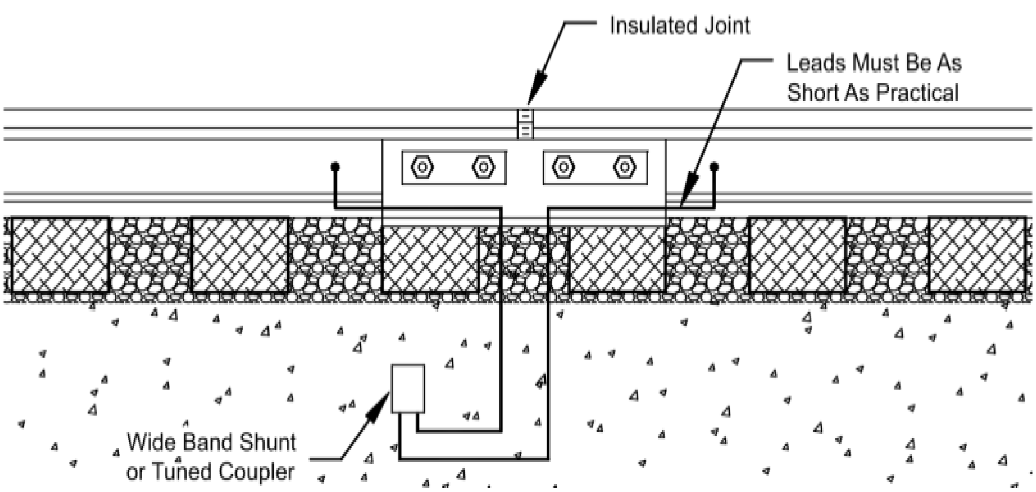


Figure 2-9 Insulated Joint, Shunt, or Coupler Installation

NOTE

NOTE

The A62776 MS/GCP Termination Shunt Burial Kit is designed to protect shunts while they are buried. For additional information, refer to SECTION 6, Auxiliary Equipment

2.12 ISLAND CIRCUITS

The Model 3000+ GCP provides a high frequency island track circuit with excellent cutoff and shunting characteristics under varying ballast conditions.

2.12.1 Island Circuit Approach Length

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

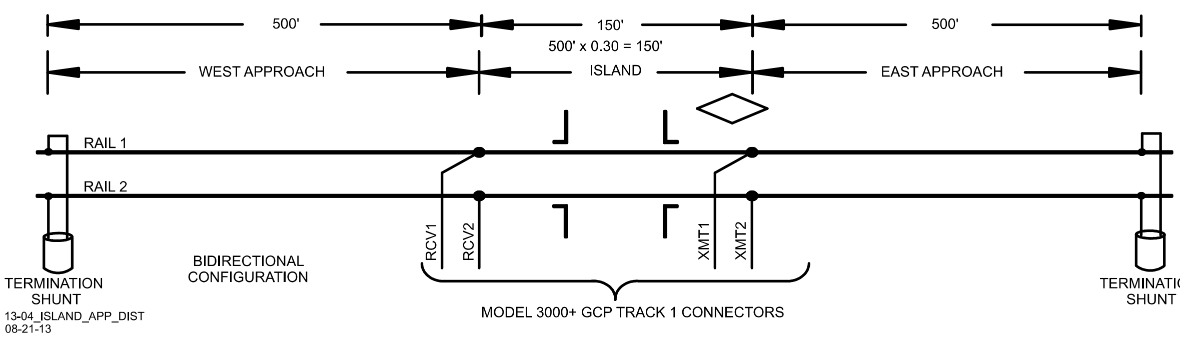


Figure 2-10 Determining Island Approach Length

For Model 3000+ GCP track approaches utilizing an internal island and with track approaches that are less than 800 feet (243.8m), it is permissible to connect the RX and CHK wires to the same pair of track wires from the crossing house. This activity will provide a similar benefit to making a six-wire connection for remote applications.

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

- use a standard six-wire connection where the Model 3000+ GCP CHK wires are connected to the TX wires adjacent to the track side connections, or
- extend or lengthen the approach(es) to a length that meets the 30% rule. This may be accomplished either by extending the approaches or adding dummy loads in series with the termination shunts.

2.12.2 Track Circuit Compatibility

The Model 3000+ GCP Island is compatible with most track circuits, including DC and AC coded track.

2.12.3 Island Frequencies

Table 2-9 Model 3000+ GCP Island Frequencies (kHz)

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

WARNING

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

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

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

NOTE

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

2.12.4 Island Shunting Sensitivity

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

NOTE

The island circuit shunting sensitivity adjustment procedure is in the Model 3000+ GCP Instruction and Installation Manual (SIG-00-17-03).

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

2.12.5 Island Circuit Wiring

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

CAUTION

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

2.13 TRACK CONNECTIONS

Track wire (lead) connection requirements are based on the track circuit configuration and the distance between the Model 3000+ GCP bungalow and the transmitter lead connections at the track.

WARNING

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

2.13.1 Four-Wire Connections for Bidirectional Applications

In most installations where a Model 3000+ GCP is operating at a crossing, four track leads (wires) connect the GCP to the track.

- Two transmit leads are connected on the side of the crossing nearest the instrument bungalow. The transmitter leads must be as short as possible and not exceed the maximum lengths specified in Table 2-10.
- 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.

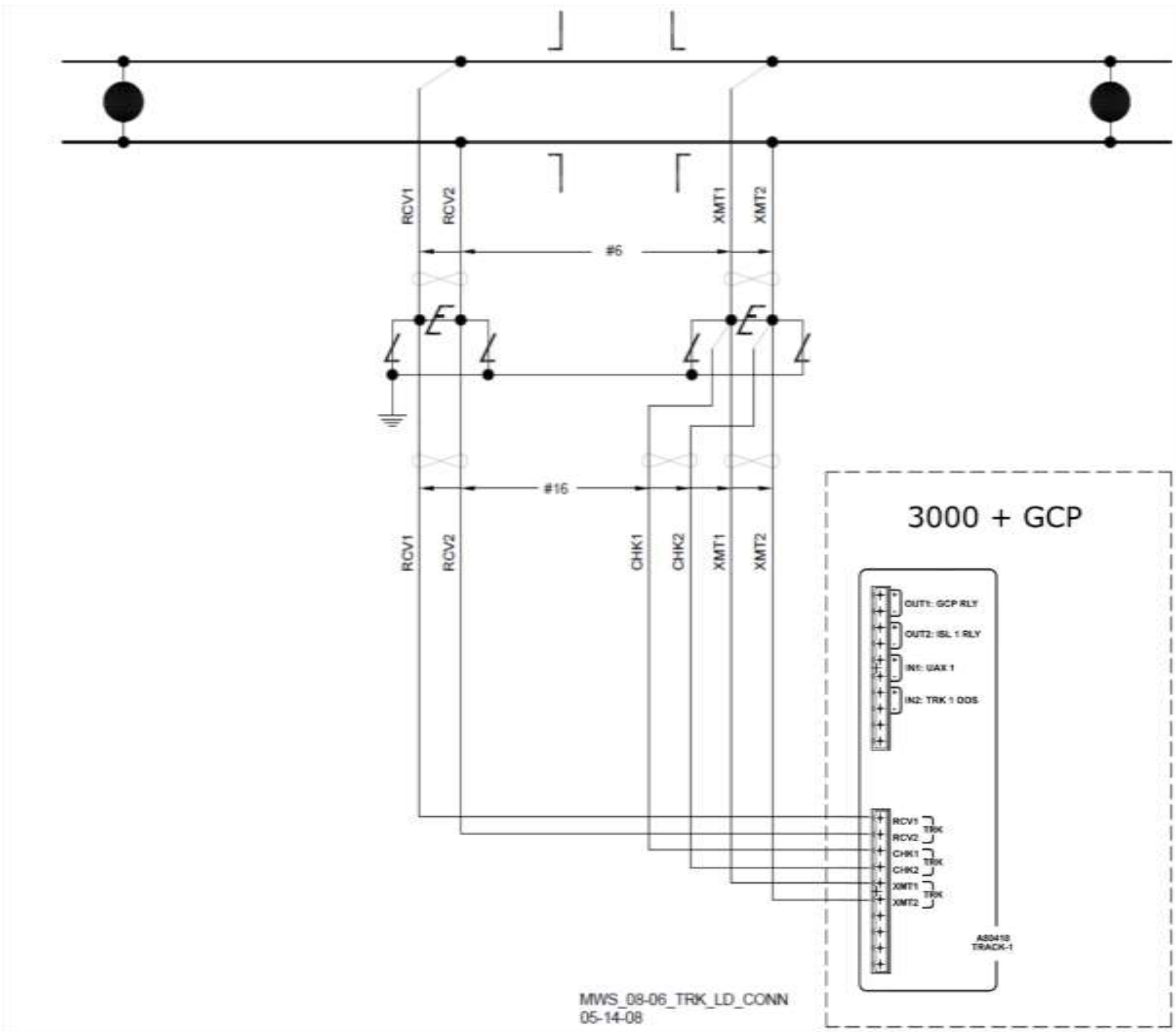


Figure 2-11   Track Lead Connections

CAUTION

CAUTION

THE MAXIMUM TRANSMITTER LEAD LENGTHS SPECIFIED IN Table 2-10 ARE FOR THE TRANSMITTER PAIR OF WIRES MEASURED BETWEEN THE BUNGALOW AND THE RAIL CONNECTIONS. FAILURE TO DO SO MAY RESULT IN CHECK RECEIVER ERRORS AND FALSE ACTIVATION.

Table 2-10 Maximum Transmit Wire Lengths (Four-wire Applications)

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

2.13.2 Four Track Wire Unidirectional and Simulated Bidirectional Application 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 3000+ front panel and the Surge Panel and between the Surge Panel and the rails as shown in Figure 2-11. The leads between the Model 3000+ GCP and the Surge Panel must use number 16 AWG to 12 AWG wire twisted. 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 of a 4-wire circuit 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 transmit wires must exceed the maximum length specified in the Table 2-10, a six-wire track hookup must be used. In a six-wire hookup, the maximum wire length allowed is 3,500 feet (1,067 meters).

2.13.6 Six-Wire Transmitter and Check Receiver Track Connection Requirements

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

- Within 25 feet (7.62 meters) of the rail connections
- Outside the ballast line or area damaged by track machinery
- Both transmitter/check pairs are connected to the rail by single wires
- A typical Model 3000+ GCP six-wire to four-wire conversion operating in unidirectional mode is shown in Figure 2-12

In a six-wire application, two check wires are connected to the corresponding transmitter track wires in the underground (within 10 feet [7.62 meters] of the transmit feed point, but not at the rail connection and not where the connection can be damaged by track machinery or dragging equipment) to provide remote sensing of the transmit signal.

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 situated away from the track and in a manner that minimizes the risk of the check and receive wires being damaged simultaneously by track machinery or dragging equipment.

When any external track circuit equipment or auxiliary track circuit equipment shares track wires with a GCP/MS track circuit that does not have an active internal island for that track circuit or output, such as a DAX or prime prediction offset, then the track circuit equipment must be connected in accordance with paragraph 2.13.7.

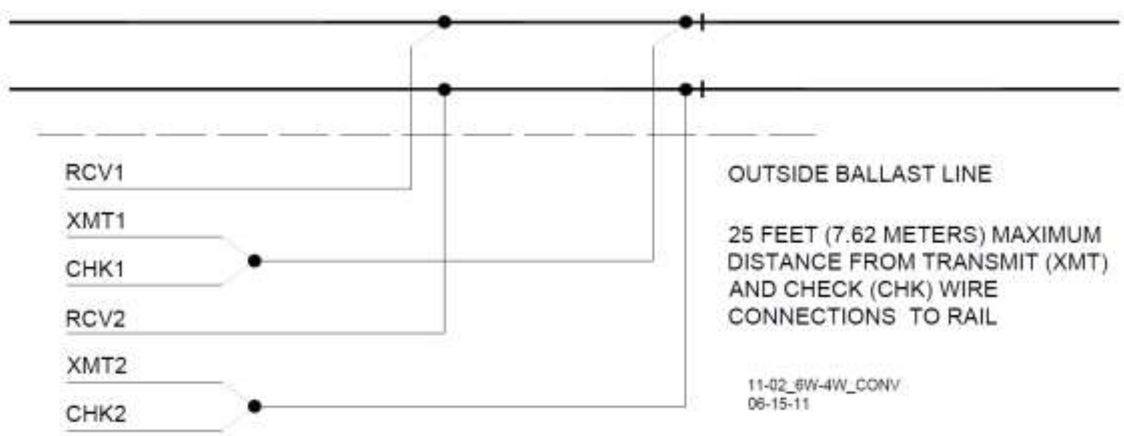


Figure 2-12 Six-Wire to Four Wire Conversion

2.13.7 Sharing Track Wires with External Track Circuit Equipment

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

- The external track circuit equipment or auxiliary track circuit equipment may be connected across the receiver wires directly, or
- When connected to the Transmitter/Check Receiver wires, the external track circuit equipment or auxiliary track circuit equipment must be connected as identified in paragraphs 2.13.7.1 and 2.13.7.2.

2.13.7.1 Six-Wire Connections

The external equipment must be connected to the Check Receiver wires only.

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 either to the Transmitter wires at the same point or prior to connecting to the other track circuit equipment (refer to Figure 2-13), or the Check Channel Receiver wires may connect to the external track circuit equipment prior to connecting to the transmitter track wires (refer to Figure 2-14).

WARNING

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

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

NOTE

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

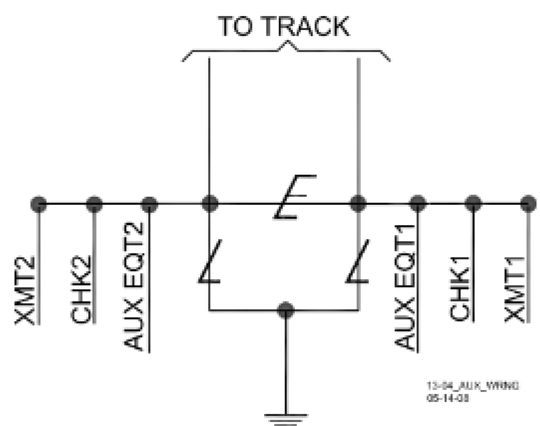


Figure 2-13   Proper Connection of Track Leads

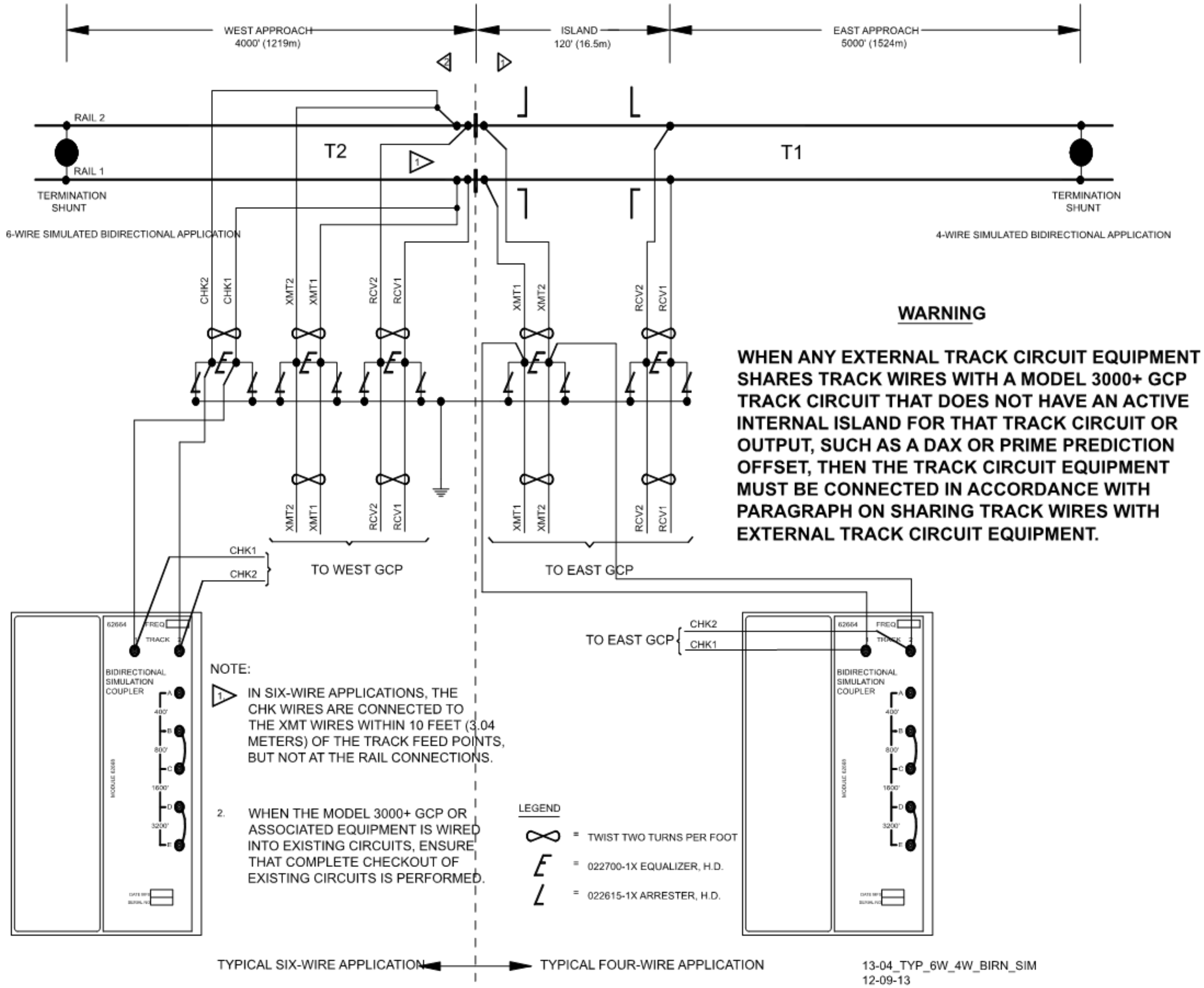


Figure 2-14   Proper 4-Wire and 6-Wire Connections when Using Auxiliary Track Circuit Equipment

2.14 TRACK CIRCUIT ISOLATION DEVICES

Several types of track circuit isolation devices are available for both DC and AC coded track applications.

- Part Number 8A065A
- Part Number 62648
- DC Code Isolation Unit 6A342-1
- DC Code Isolation Unit 6A342-3
- AC Code Isolation Unit 8A466-3
- AC Code Isolation Unit 8A470-100
- AC Code Isolation Unit 8A471-180

These parts are discussed in detail in SECTION 6 Auxiliary Equipment.

2.15 APPROACH CONFIGURATIONS

2.15.1 Bidirectional Configuration

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

- a single Model 3000+ GCP track module to monitor train movement in both approaches to a crossing
- longest approach distance for each operating frequency
- bidirectional approach distances are less affected by low ballast resistance than unidirectional applications

A typical bidirectional application consists of an island and two approaches (see Figure 2-15). 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.

2.15.1.1 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.

2.15.1.2 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 Multi-frequency Narrow-band Shunt
- 8A398-6 Adjustable Inductor

2.15.2 Unidirectional Installations

WARNING

WARNING

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

When configured for unidirectional operation:

- A Track module monitors train movements in a single approach due to insulated joints being present
- When insulated joints are at a crossing, two Track modules are required to monitor both approaches
- Insulated joints are sometimes used to separate crossing approaches (see Figure 2-15).
- Using insulated joints permits GCP frequencies to be repeated in adjacent approaches.
- Locate insulated joints opposite each other, as close as practical.

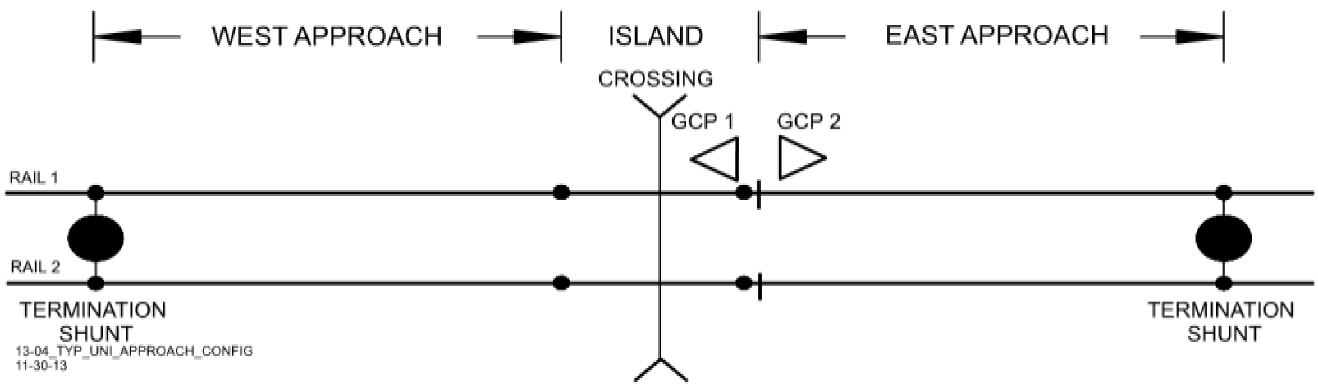


Figure 2-15 Typical Unidirectional Approach Configuration

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.

2.15.3 Simulated Bidirectional Installations

WARNING

FOR SIMULATED BIDIRECTIONAL OPERATION, THE MODEL 3000+ GCP MUST BE PROGRAMMED FOR BIDIRECTIONAL OPERATION.

NOTE

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

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

This combination is generally connected in parallel across the track connections in the bungalow and is adjusted to be electrically equal in distance to that of the actual track approach circuit. Both approach circuits appear equal in length to the Model 3000+ GCP.

2.15.3.1 Simulated Approach

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

- 62664-f Bidirectional Simulation Coupler adjusted to the proper distance. See SECTION 6 for details.
- 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. See SECTION 6 for details.
- 8A398-6 Simulated Track Inductor in series with a Narrow-band Shunt. See SECTION 6 for details.

2.15.4 Six-Wire Simulated Bidirectional Applications Connections

When a unidirectional Model 3000+ GCP is connected in a six-wire simulated bidirectional configuration (see paragraph 2.13.6) 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 6-2 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 Predication (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 using a cable.

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 3000+ GCP may be programmed to provide up to five prediction output signals:

- Prime
- DAX A through DAX D

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.

2.16.4 Warning Time

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

2.16.4.1 Predictor Input

NOTE

NOTE

When a UAX or is de-energized, the associated prime, or DAX Preempt, will switch to motion sensor operation.
When the UAX energizes, 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 using the UAX input.

The UAX input must be configured for the required pickup delay.

2.16.5 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 2-16.

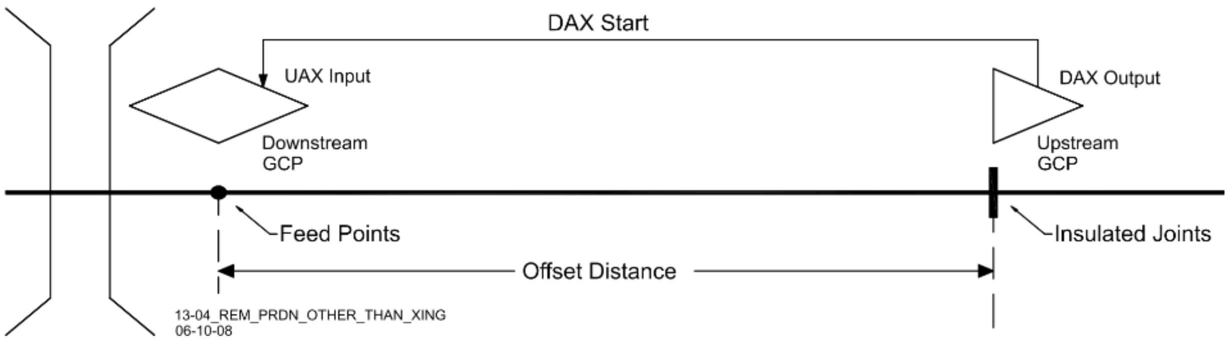


Figure 2-16 Remote Prediction from a Remote Location Other than a Crossing

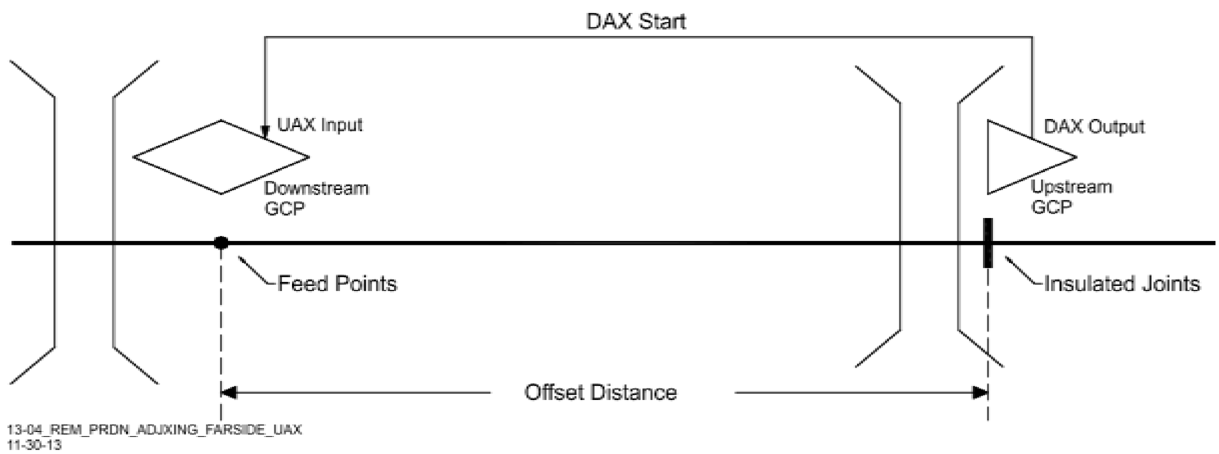


Figure 2-17 Remote Prediction from an Upstream Crossing – Joints on Far Side

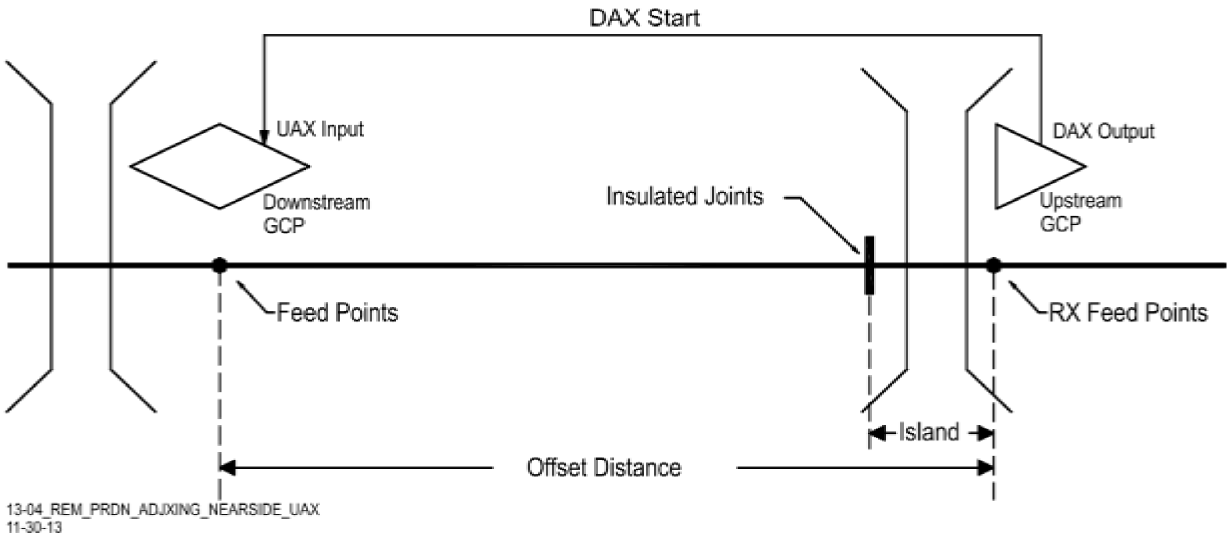


Figure 2-18 Remote Prediction from an Upstream Crossing - Joints on Near Side

2.16.6 DAX Offset Distance

The distance between the crossing feed points and the remote Model 3000+ GCP location is the remote offset distance. This value is programmed in the remote prediction unit. The offset distance is field measured from the crossing feed points to either the DAX insulated joints as illustrated in Figure 2-18 or to the DAX receiver feed wires as shown in Figure 2-19.

2.16.7 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 = 3,600 ft. / 1,098 m
- DAX offset distance = 2,200 ft / 671 m
- DAX Approach distance = 3,600 – 2,200 = 1,400 ft. / 427 m

DAX approach distance (in this case 1,400 ft. / 427 m) can be designed longer if desired but not shorter or warning time for fastest trains will become shorter.

WARNING

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

FOR EXCEPTIONS, SEE PARAGRAPH 5.2, MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS.

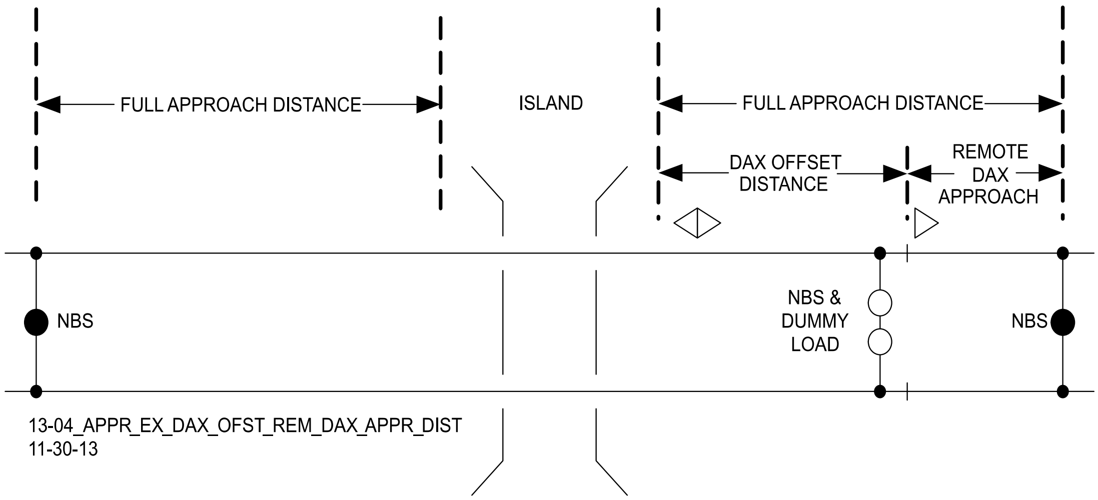


Figure 2-19 Approach Example with DAX Offset and Remote DAX Approach Distances

2.17 SURGE PROTECTION

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

All GCP 3000+ 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 2-31. Primary surge protection for all I/O wiring between bungalows is shown in Figure 2-32.

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 3000+ equipment. Primary arrestors, equalizers and power wiring are shown in Figure 2-33.

2.18 TYPICAL APPLICATION DRAWINGS

The following figures illustrate a variety of typical Model 3000+ GCP applications.

Table 2-11 Table of Typical Application Drawings

FIGURE	TITLE
Figure 2-20	Single Track, Bidirectional
Figure 2-21	Two Track, Bidirectional
Figure 2-22	Single Track, Back-to-Back, Unidirectional
Figure 2-23	Single Track, Bidirectional, and Remote Single Track, Unidirectional
Figure 2-24	Single Track, Bidirectional, and Remote Single Track (Six Wire), Unidirectional, In Single GCP Case
Figure 2-25	Single Track, Back-to-Back, Unidirectional, In Simulated Bidirectional Operation
Figure 2-26	Single Track, Back-to-Back, Unidirectional, in Simulated Bidirectional Six Track Wire Operation
Figure 2-27	Single Track, Two Overlapping Crossings, Using Remote Prediction
Figure 2-28	Single Track, Two Overlapping Crossings, Using Shunting Enhancer Panels
Figure 2-29	Single Track, Remote Prediction with Advanced Preemption
Figure 2-30	Single Track, Remote Prediction for Two Overlapping Bidirectional Crossings
Figure 2-31	Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections
Figure 2-32	Typical Surge Protection Requirements When Cabling Between Remote DAX Unit and Crossing Unit
Figure 2-33	Recommended Battery Surge Protection Wiring for Model 3000+ GCP

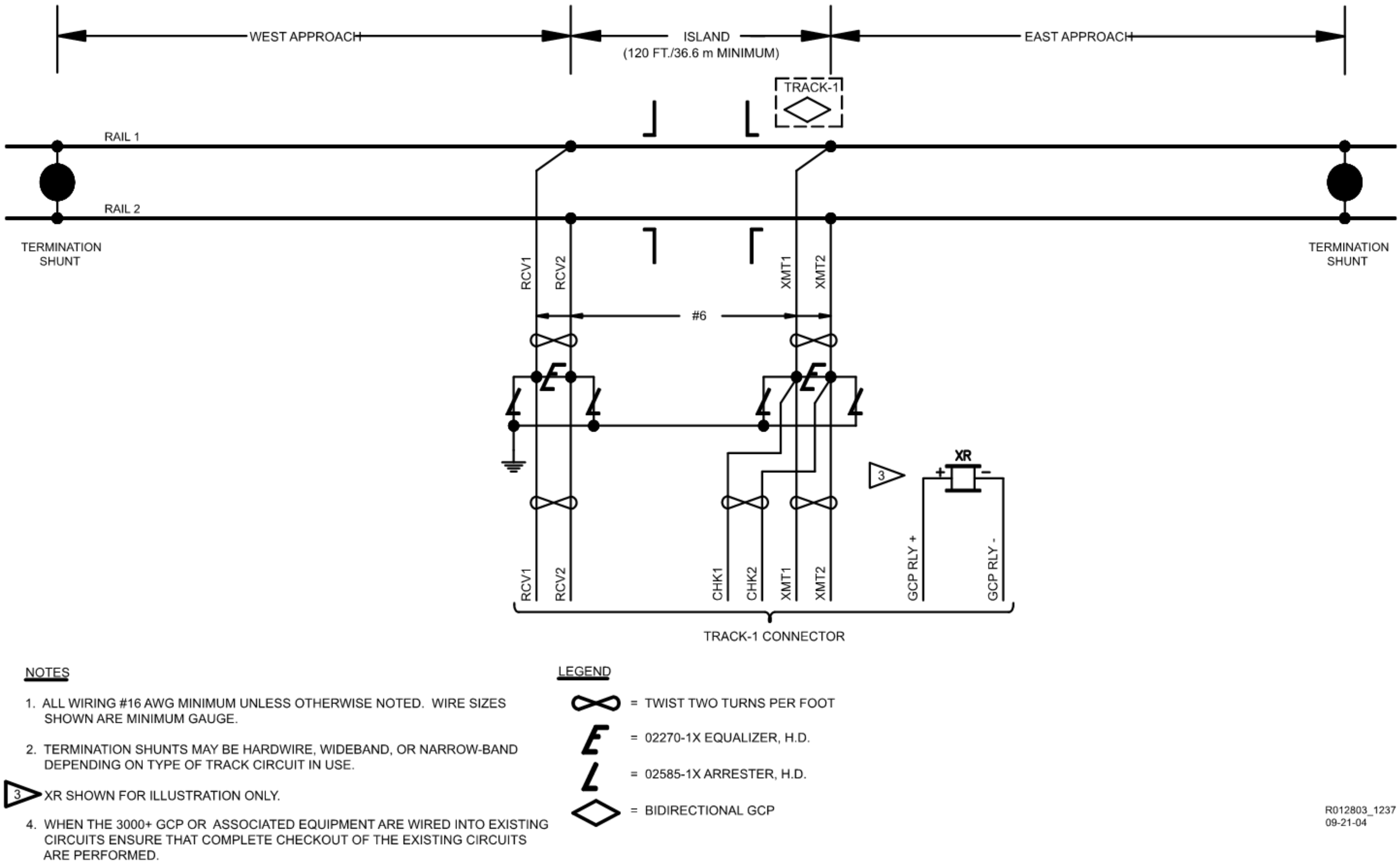
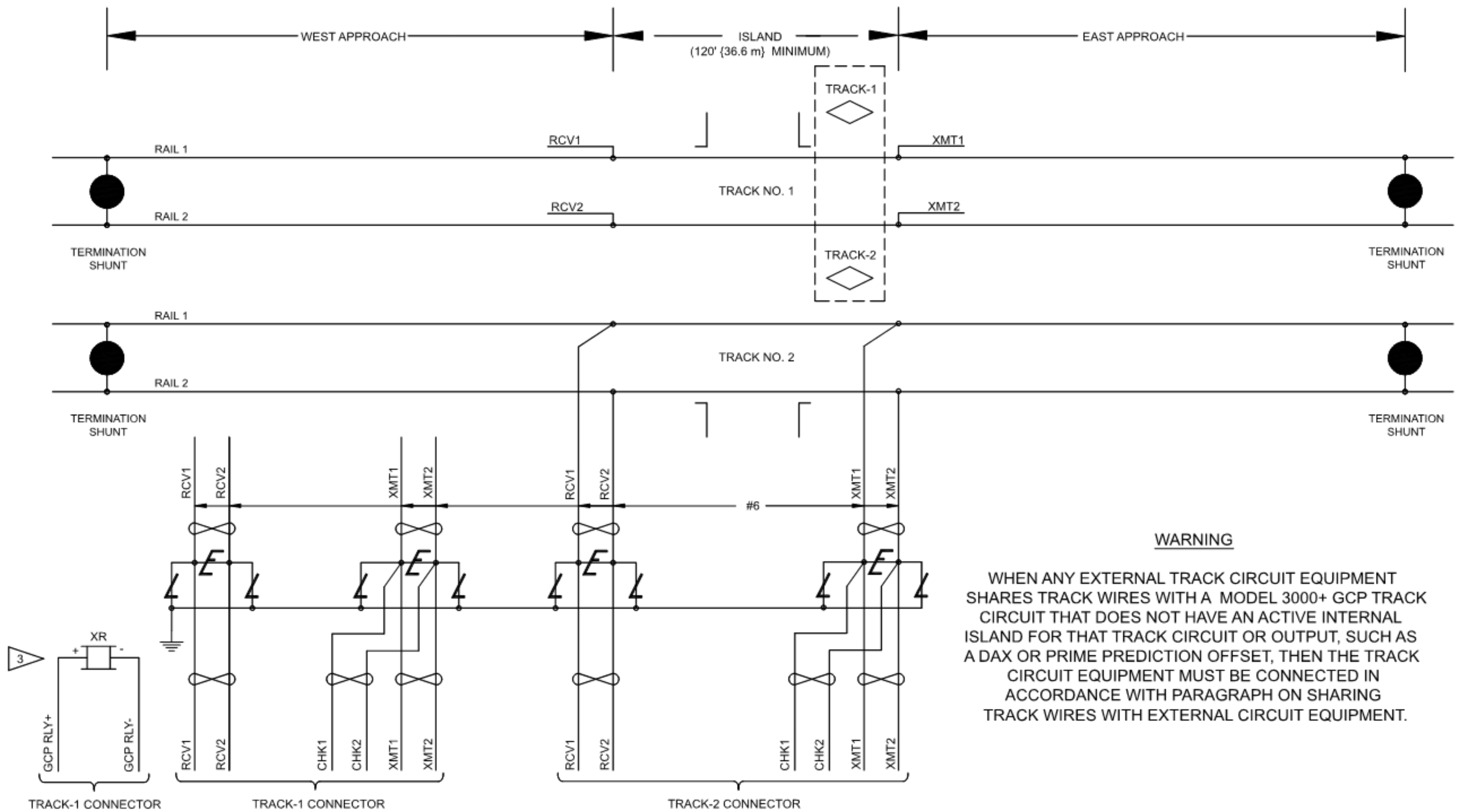


Figure 2-20 Typical Single Track Bidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWIRE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 3000+ 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

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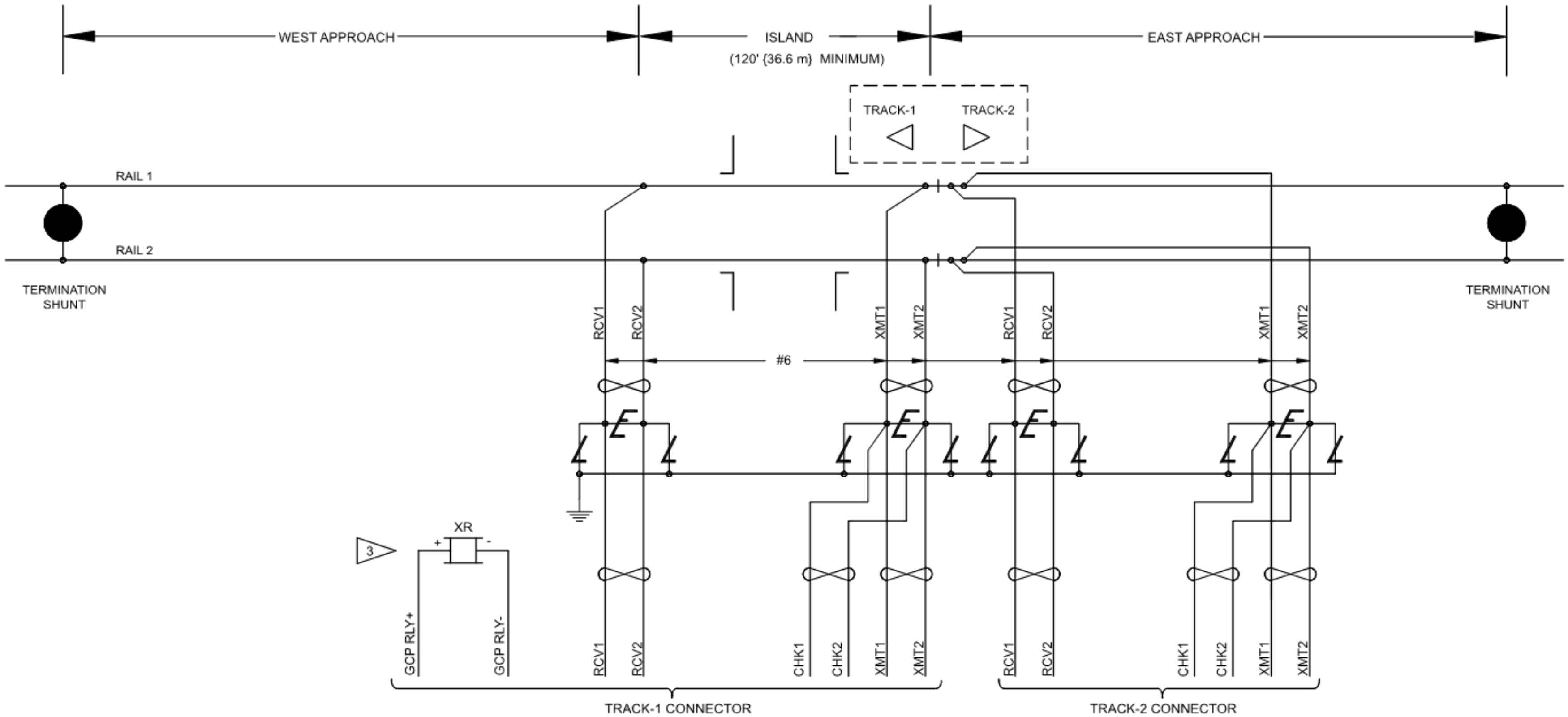
Figure 2-21 Typical Two Track Bidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWIRE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 3000+ GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

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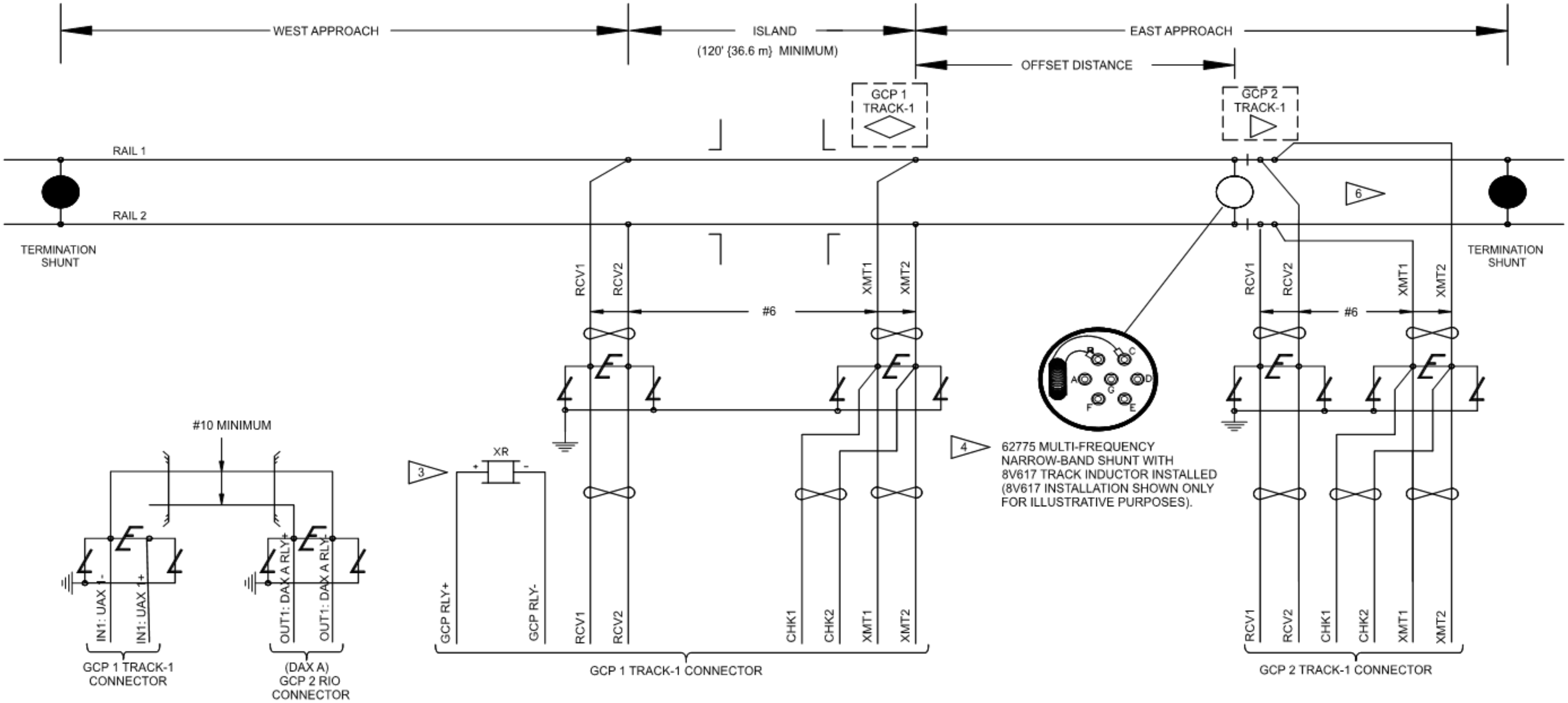
LEGEND

= 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 3000+ 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

Figure 2-22 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 HARDWIRE, 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 3000+ 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 3000 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

LEGEND

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

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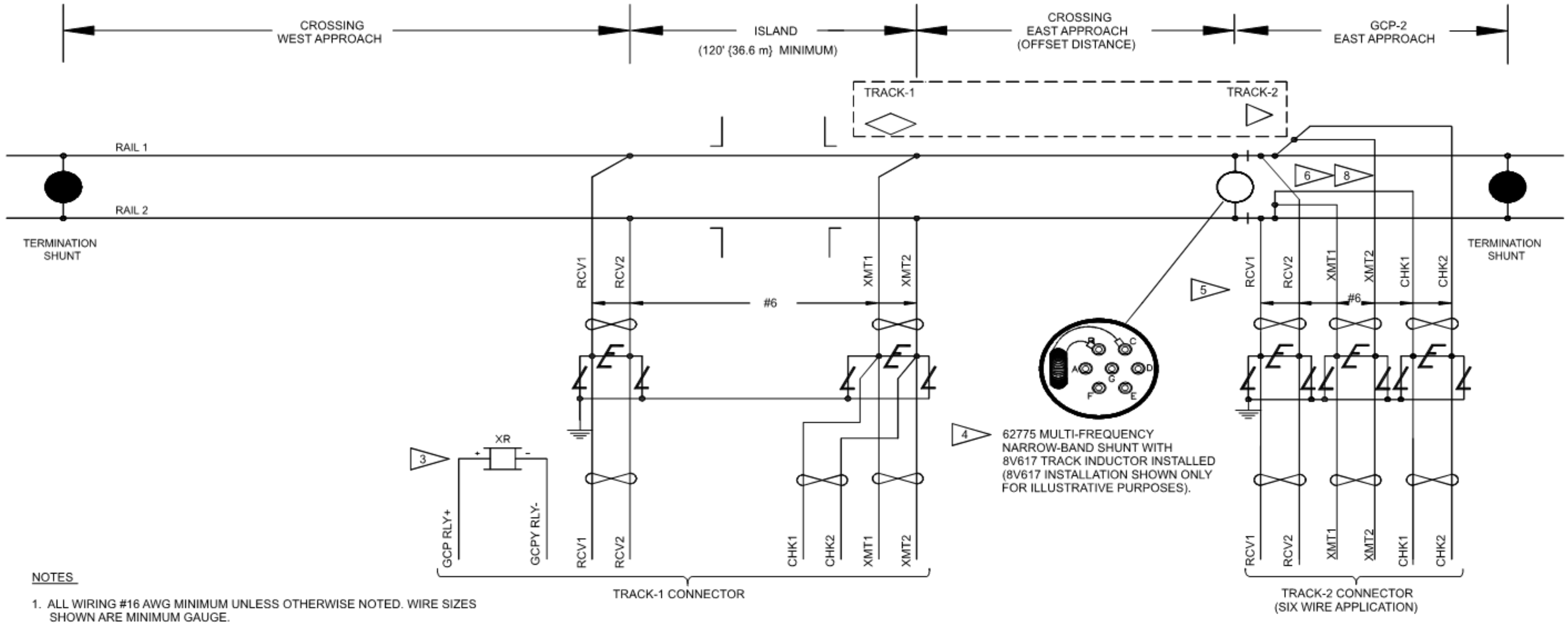
Figure 2-23 Typical Single Track, Bidirectional, and Remote Single Track, Unidirectional Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWIRE, 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 3000+ 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 3000+ 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

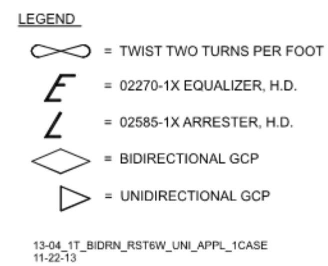
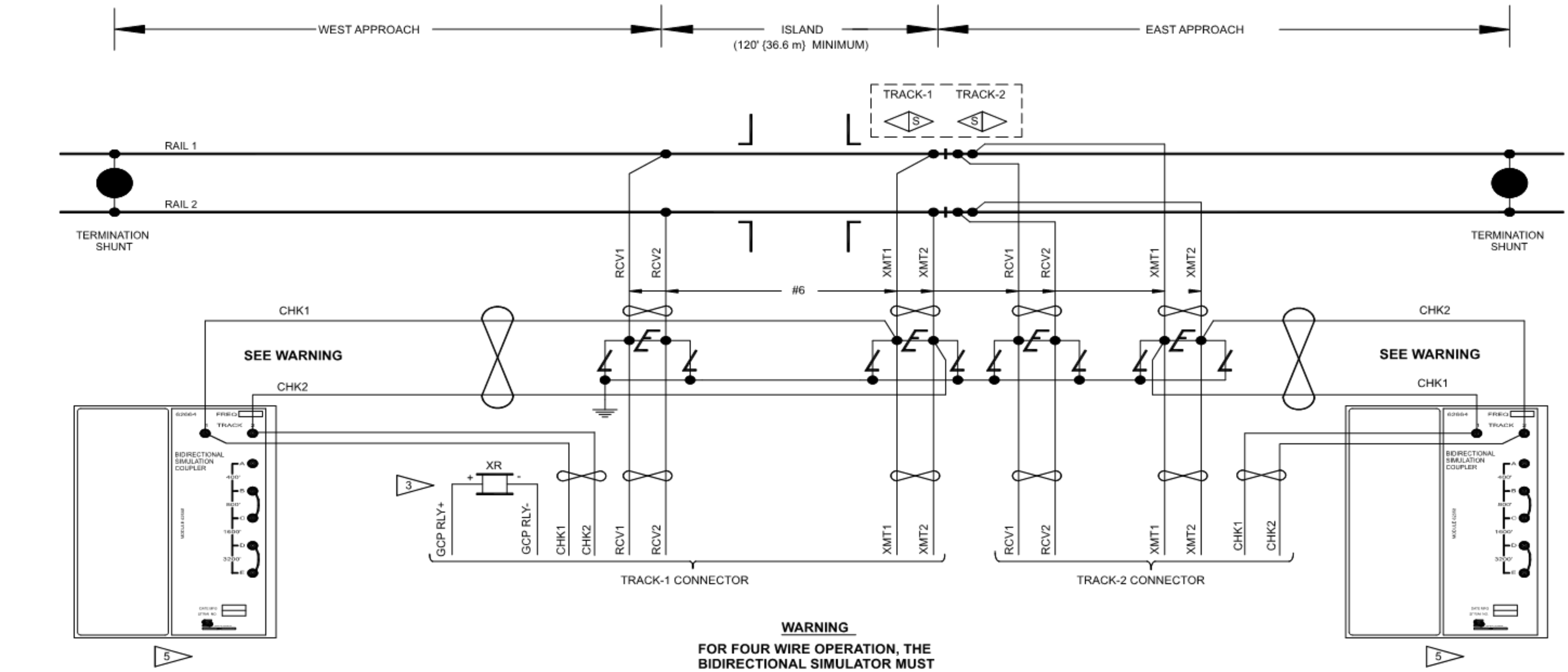


Figure 2-24 Typical Single Track, Bidirectional, and Remote Single Track (Six Wire), Unidirectional Application, In Single GCP Case



WARNING

FOR FOUR WIRE OPERATION, THE BIDIRECTIONAL SIMULATOR MUST BE WIRED PER PARAGRAPH ON FOUR-WIRE CONNECTIONS

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 3000+ 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWIRE, WIDEBAND, OR NARROW-BAND DEPENDING ON TYPE OF TRACK CIRCUIT IN USE.
3. XR SHOWN FOR ILLUSTRATION ONLY.
4. WHEN THE MODEL 3000+ 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.

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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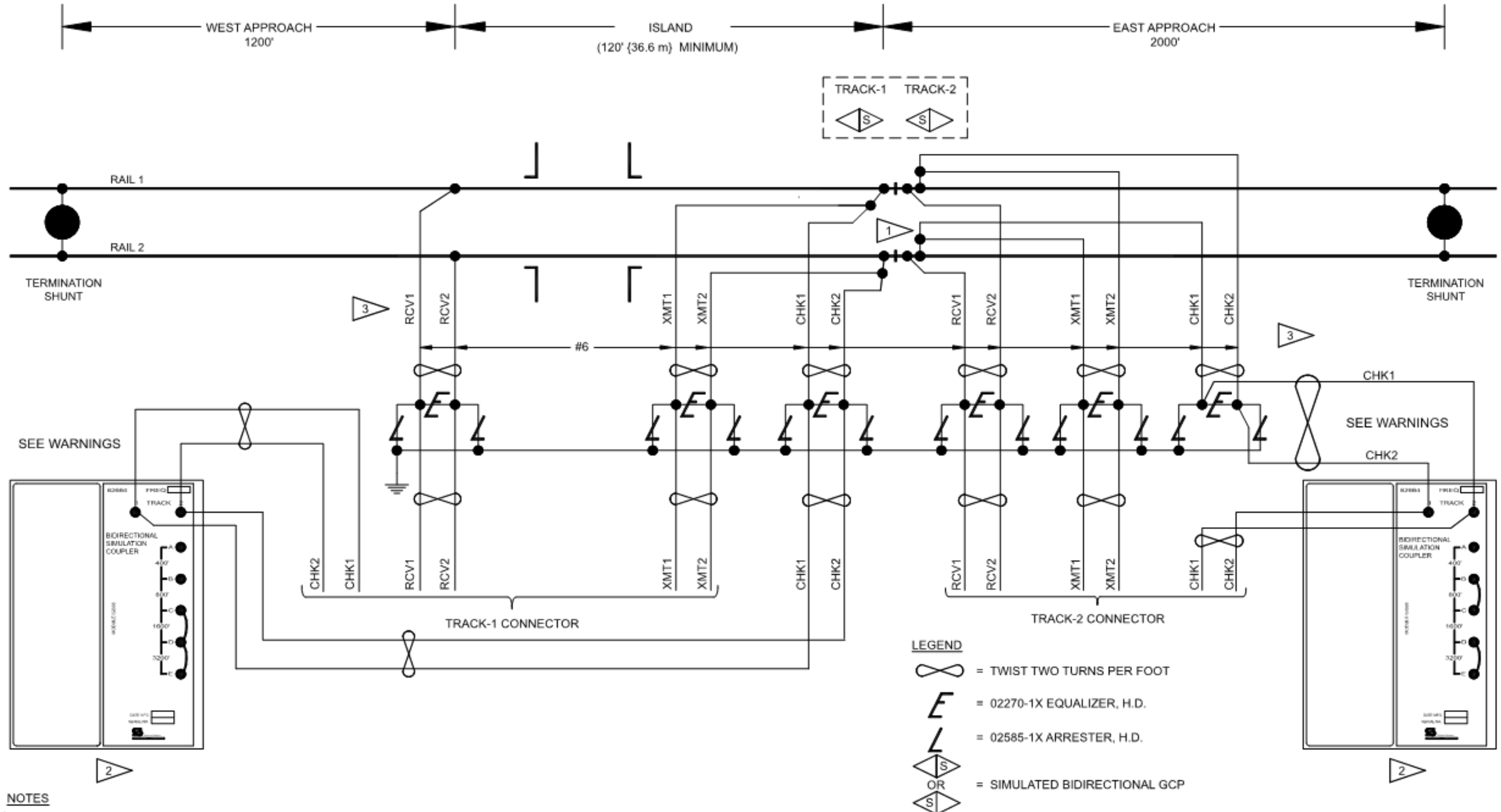
Figure 2-25 Typical Single Track, Back-to-Back, Unidirectional, In Simulated Bidirectional Operation Application



NOTES

1. IN SIX-WIRE APPLICATIONS, THE CHK WIRES ARE CONNECTED TO THE XMT WIRES WITHIN 10 FEET (3.04 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 3000+ 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

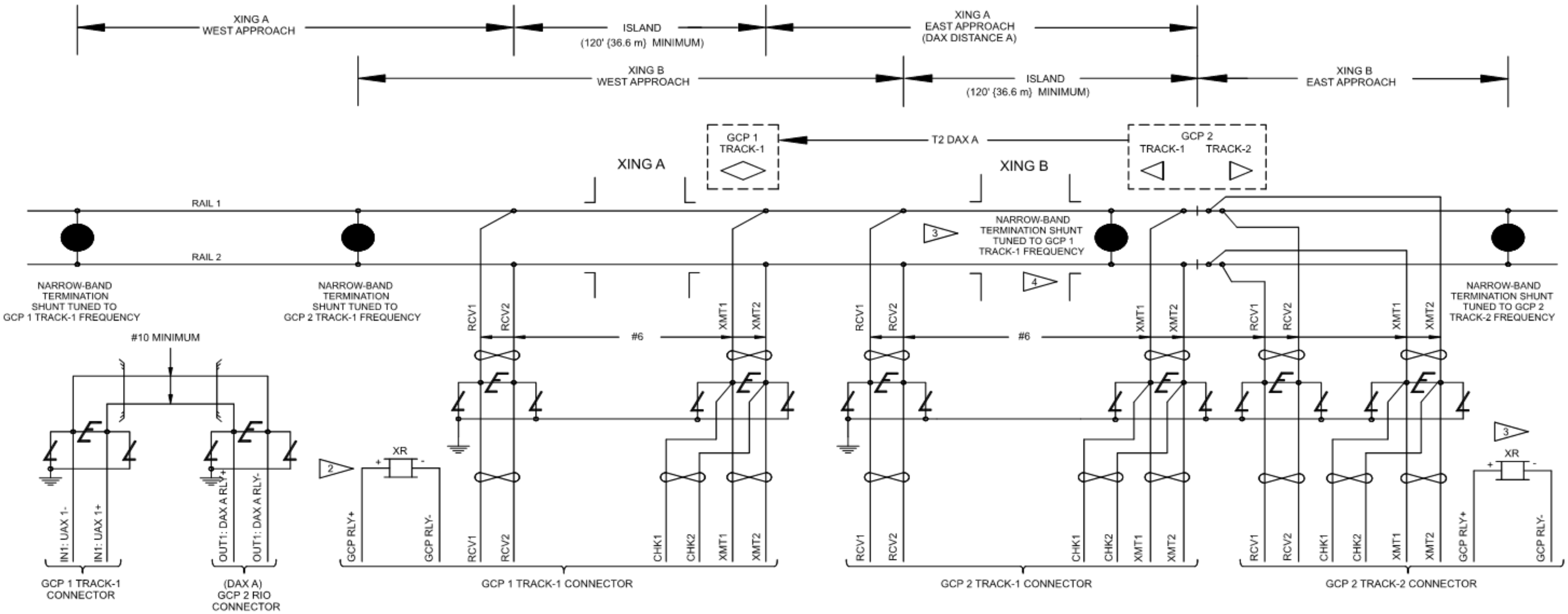
WARNING

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

THE MODEL 3000+ GCP MUST BE PROGRAMMED FOR BIDIRECTIONAL OR SIMULATED BIDIRECTIONAL APPROACH.

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A GCP 3000+ 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

Figure 2-26 Typical Single Track, Back-to-Back, Unidirectional, in Simulated Bidirectional, Six Track Wire Operation



NOTES

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

2. XR SHOWN FOR ILLUSTRATION ONLY.

3. WHEN THE 3000+ GCP OR ASSOCIATED EQUIPMENT ARE WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

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

13-04_TYP_1T_2OVERLAPPING_XINGS_REMPDR_APPL
11-30-13

WARNING

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WIHT A MODEL 3000+ 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

LEGEND

= TWIST TWO TURNS PER FOOT

= 02270-1X EQUALIZER, H.D.

= 02585-1X ARRESTER, H.D.

= BIDIRECTIONAL GCP

OR = UNIDIRECTIONAL GCP

Figure 2-27 Typical Single Track, Two Overlapping Crossings, Using Remote Prediction Application

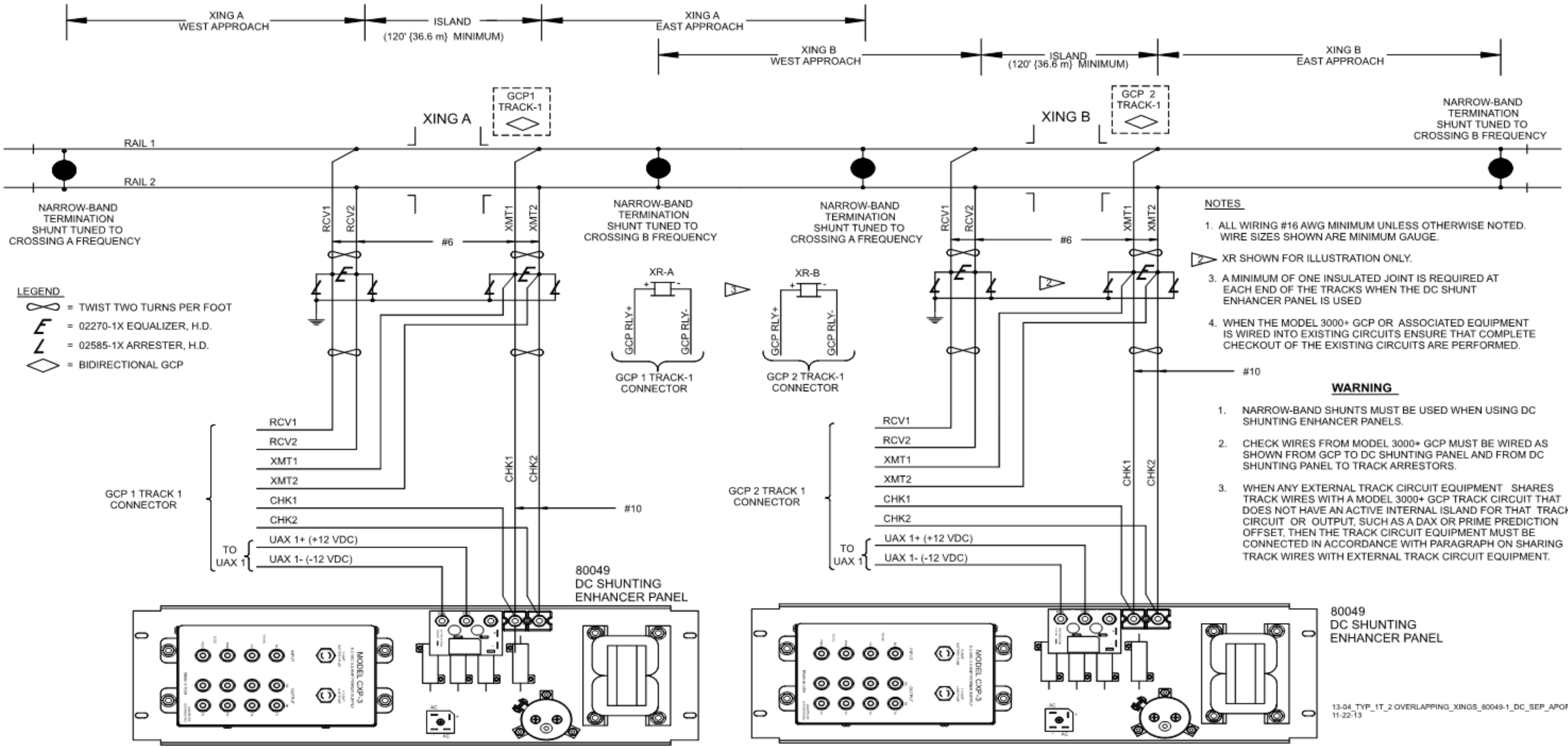
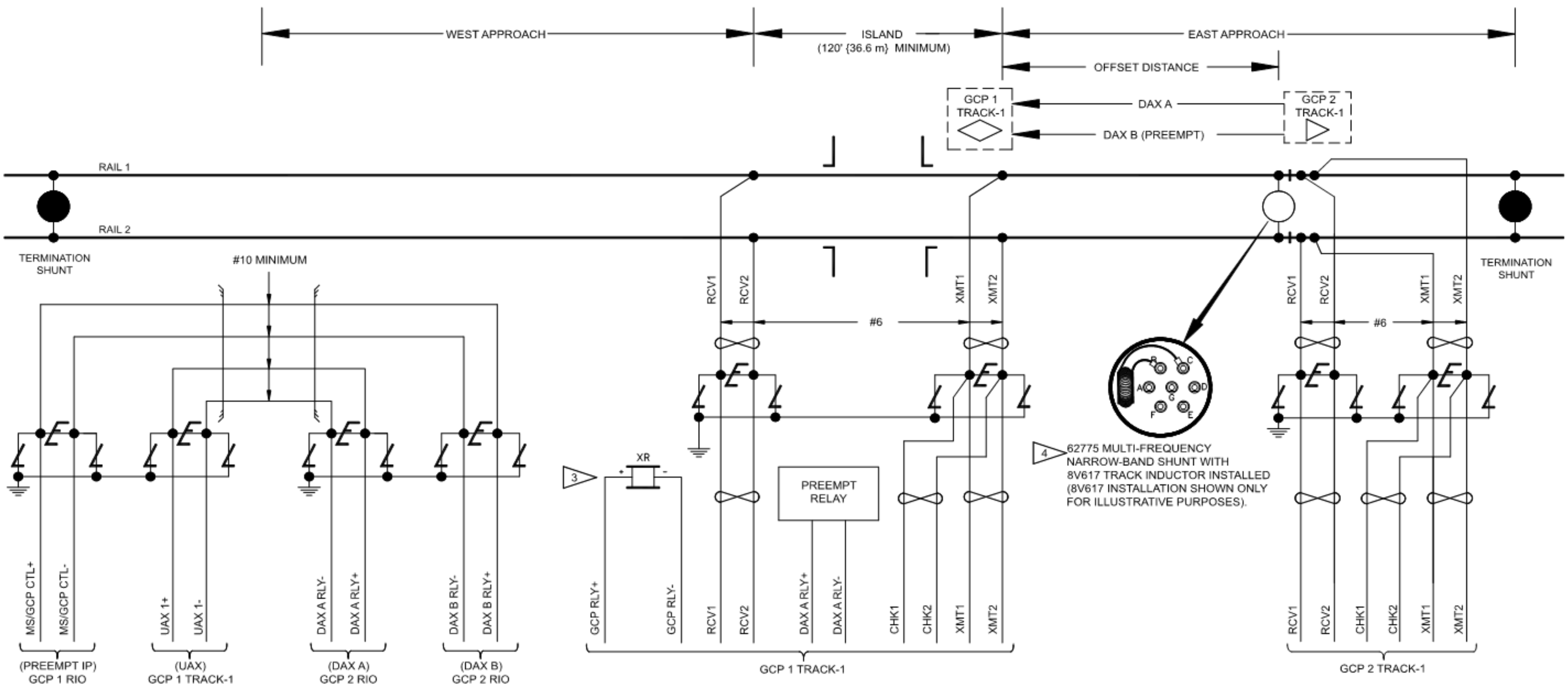


Figure 2-28 Typical Single Track, Two Overlapping Crossings, Using Shunting Enhancer Panels, Application



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWIRE, 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 3000+ GCP OR ASSOCIATED EQUIPMENT IS WIRED INTO EXISTING CIRCUITS ENSURE THAT COMPLETE CHECKOUT OF THE EXISTING CIRCUITS IS PERFORMED.

WARNING

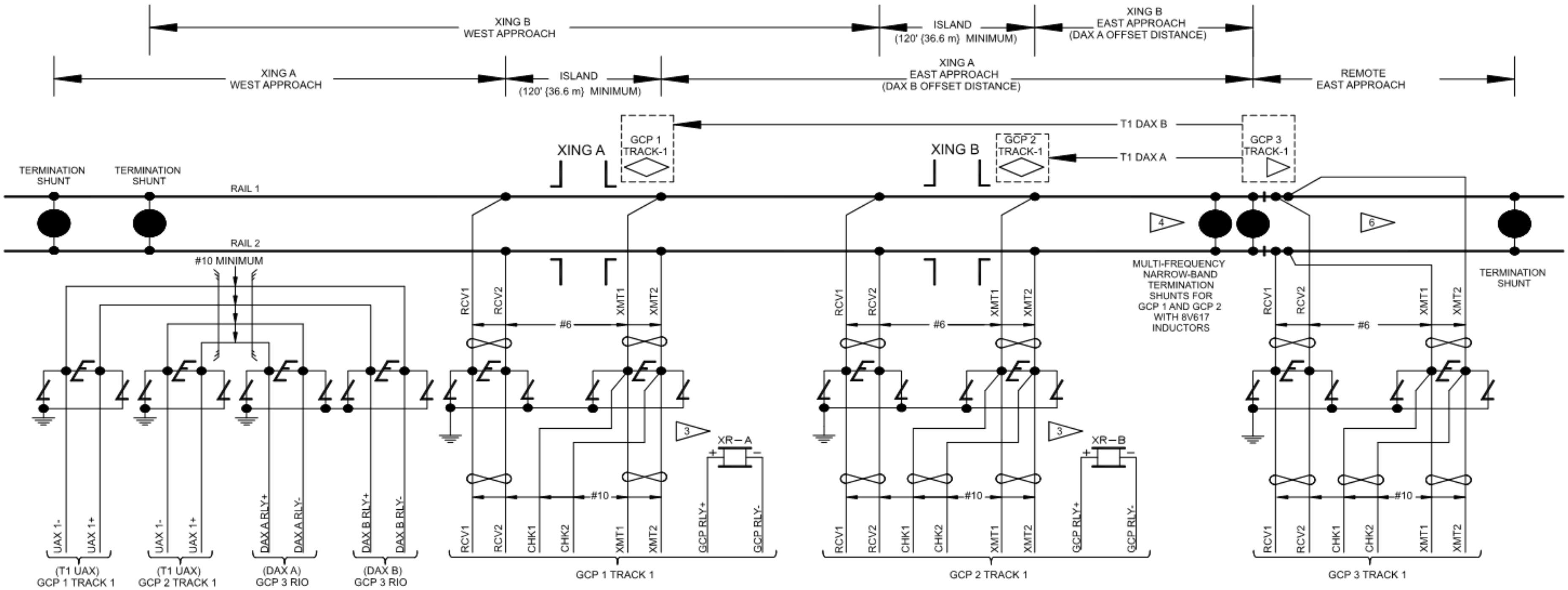
WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A MODEL 3000+ GCP TRACK CIRCUIT THAT DOES NOT HAVE AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.

LEGEND

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

13-04_1TR_REM_PRDN_W_ADV_PREEPMTION
11-22-13

Figure 2-29 Single Track, Remote Prediction with Advanced Preemption

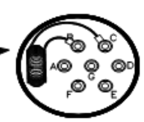


NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED. WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. TERMINATION SHUNTS MAY BE HARDWIRE, 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 3000+ 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 3000+ 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 ON SHARING TRACK WIRES WITH EXTERNAL TRACK CIRCUIT EQUIPMENT.



62775 MULTI-FREQUENCY NARROW-BAND SHUNT WITH 8V617 TRACK INDUCTOR INSTALLED (8V617 INSTALLATION SHOWN ONLY FOR ILLUSTRATIVE PURPOSES).

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 2-30 Typical Single Track, Remote Prediction for Two Overlapping Bidirectional Crossing Application

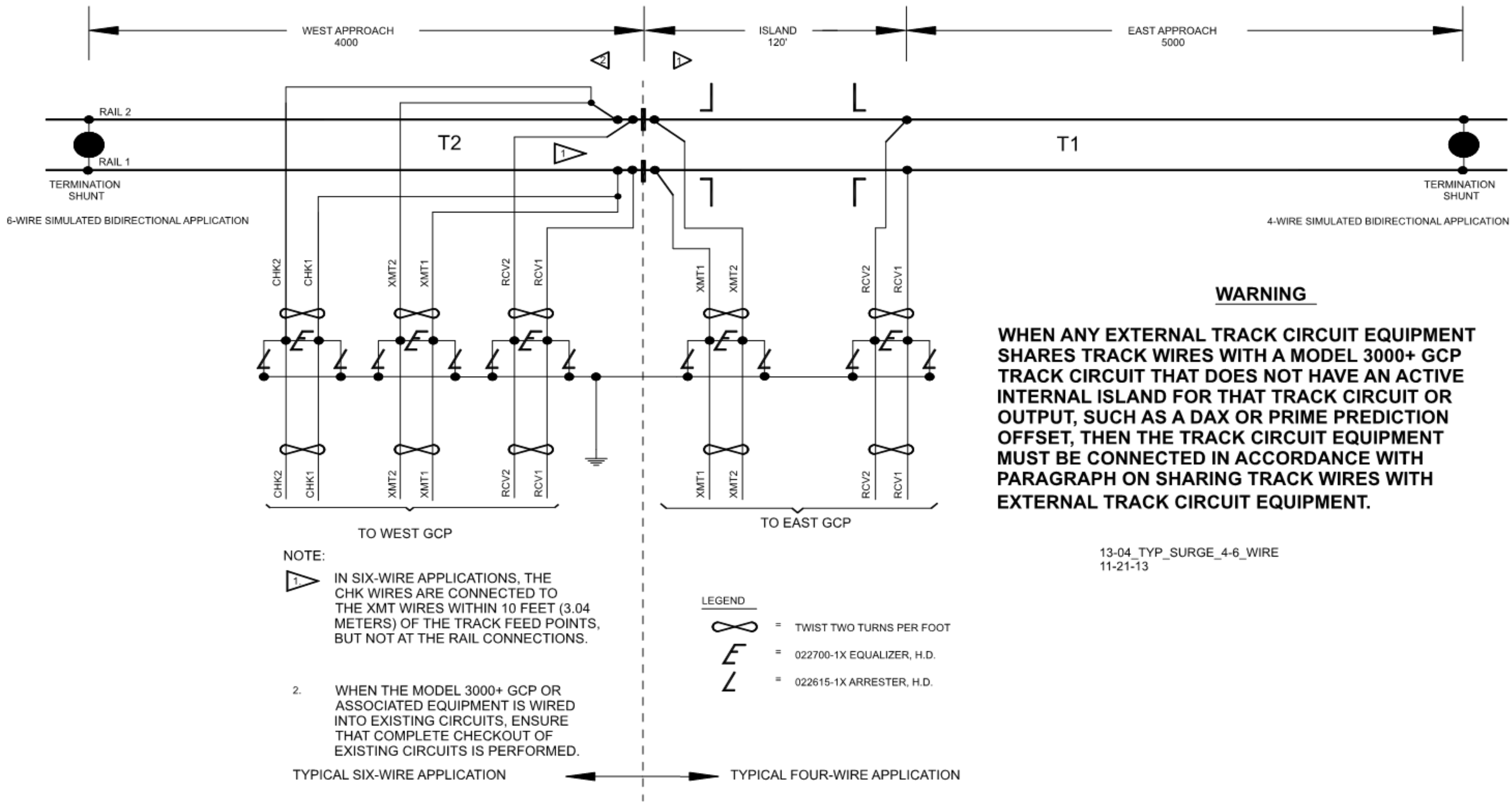


Figure 2-31 Typical Track Wire Surge Protection for 4 and 6 Wire Track Connections

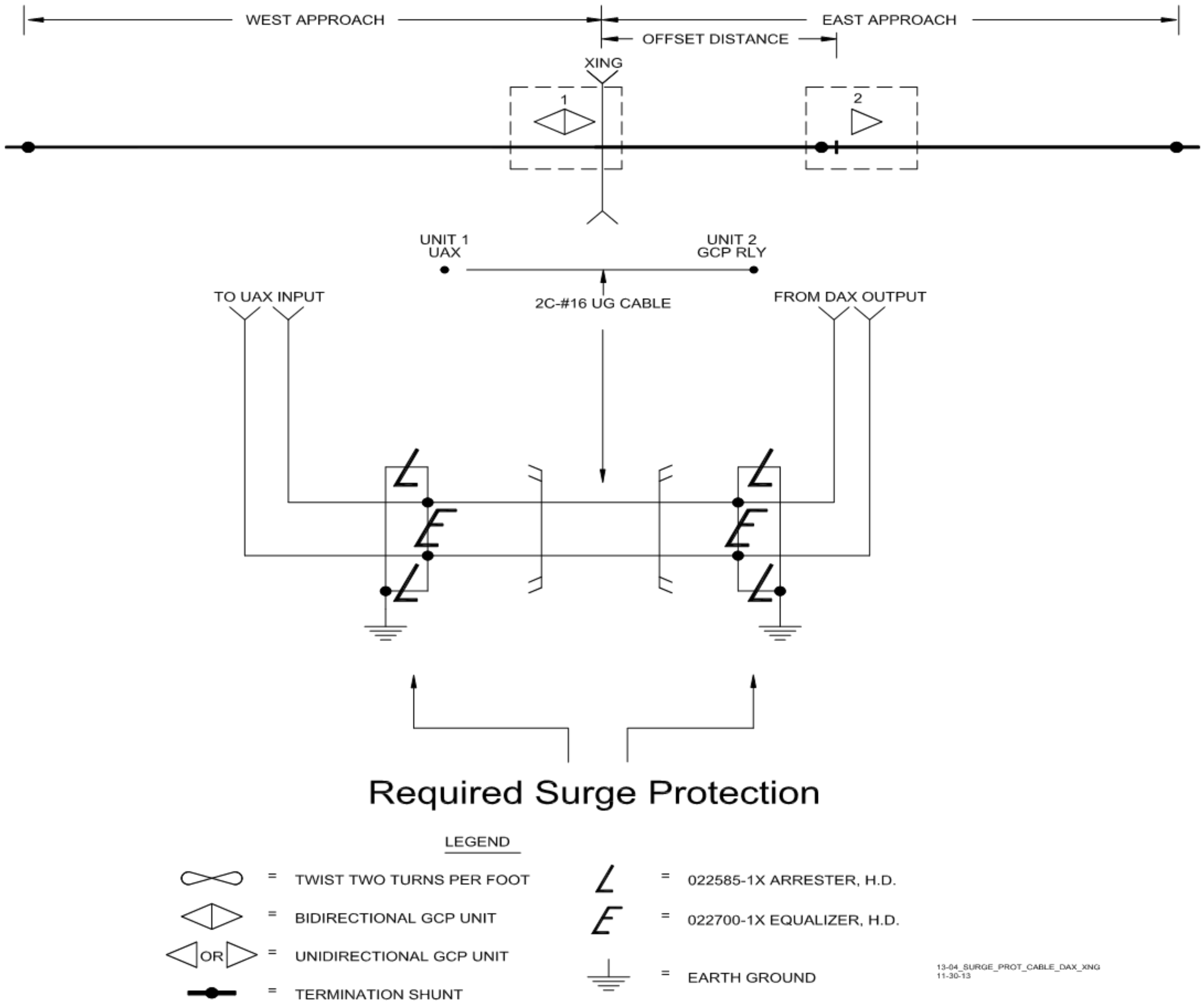


Figure 2-32 Typical Surge Protection Requirements When Cabling Between Remote DAX Unit and Crossing Unit

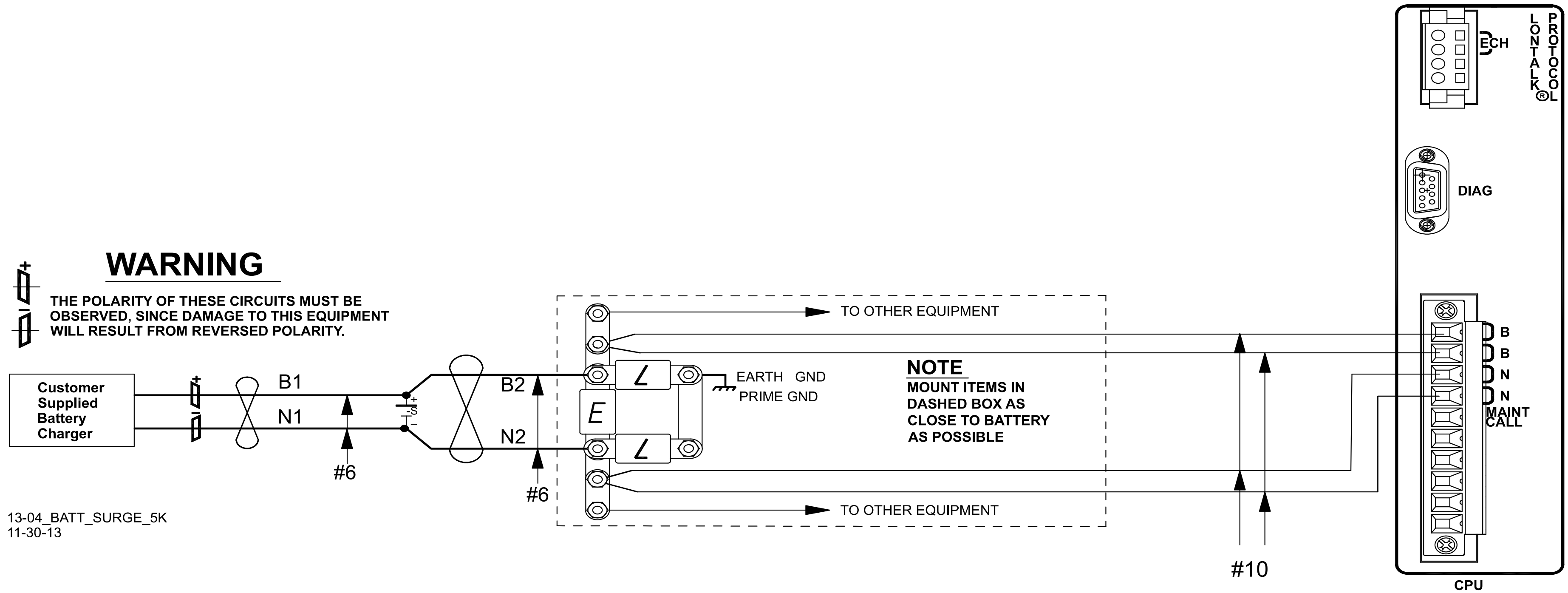


Figure 2-33 Recommended Battery Surge Protection Wiring for Model 3000+ GCPs

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SECTION 3 DISPLAY MENU SCREENS AND OFFICE CONFIGURATION EDITOR

3.0 DISPLAY MENU SCREENS

3.1 DISPLAY MODULE

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

Status and Diagnostic Monitoring:

- Viewing track status (EZ, EX, speed)
- Island status
- Input and output status

Model 3000+ GCP configuration:

- Uploading of a configuration package (PAC) file to the CPU II+ from the Display's USB drive, or from the Web User Interface (Web U/I),
- Download the configuration package (PAC) file from the CPU II+ and save it on the Display's USB drive or to the user's PC via the Web User Interface (Web U/I).

Software installation to include the following types of software:

- Master Configuration File (MCF) to the CPU II+ module
- Master Executive Files (MEF) to the CPU II+, track and RIO modules
- Non-Vital Executive Files to the Display

Generate, and copy the following reports:

- Configuration (Config) Report

Generate, and copy the following logs

- Event Log
- Diagnostic Log
- Train Log

3.2 DISPLAY SCREENS

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

To navigate these menu screens:

- Press a number to go to the indicated submenu
- Use the up and down keys to change the highlighted menu, then press **Enter**
- Use the right and left arrows to move from one screen to the next in a cyclical order

Use the **Back** key to go back up to a higher menu. Use the 0 key to move back to the top level Main program menu. Holding the Back key for 3s in any screen will navigate back to the top of the menu tree, then the left and right arrows can be used to get back to the system view.

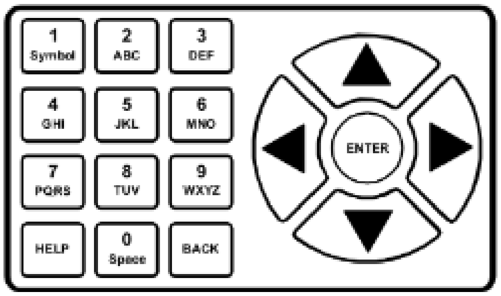


Figure 3-1 Display Keypad

3.2.1 System View Screen

The System View screen provides information regarding the status of:

- Track Data section which shows the status of the used tracks
- Comms Status section which communication status of track, RIO and event recorder
- Relay Output Status section which shows the status of GCP and DAX relay outputs

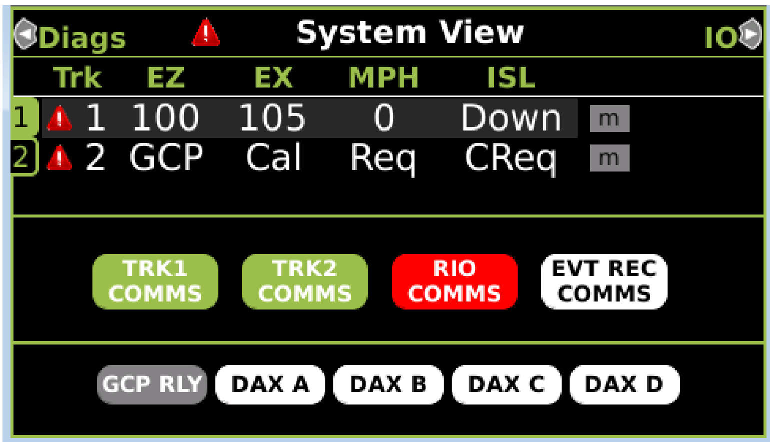


Figure 3-2 Display System View Screen

3.2.1.1 The Track Data Section

The Track Data section provides the following indicators and information:

- Track number e.g. 1 – 2
- Calibration Status of GCP and Island:
    - When GCP calibration is required, the display shows **GCP Cal Req** under EZ/EX/MPH as shown for track 1 above.
    - When Island calibration is required, the display shows **CReq** under ISL as show for track 2 above.
- A train on approach is depicted by a warning triangle with a locomotive in it.

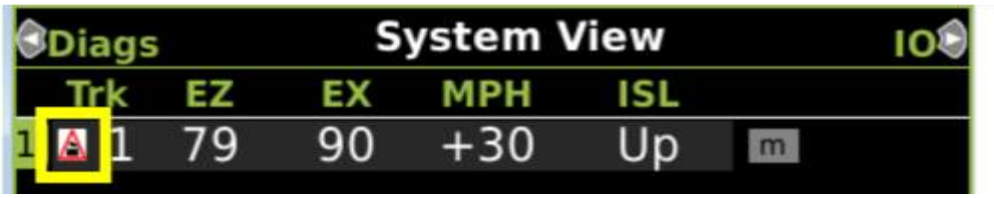


Figure 3-3 Train on Approach Icon

EZ Value – see Trk 1 in Figure 3-3

EX Value– see Trk 1 in Figure 3-3

Train speed measured in MPH – see Trk 1 in Figure 3-3

Island Status shown as:

- Up (unoccupied)
- Down (occupied)
- NA (not applicable) if island not used

NOTE

NOTE
If the 3000+ GCP can be configured for metric units, speeds will be shown in km/h and distance in meters.

Additional Information:

Out of Service:

GCP OOS flashes between blue and white to indicate that the GCP approach circuit is out of service. If the island is used, it will be shown in service.

OOS flashes between blue and white to indicates that both the GCP approach circuit and island circuit are out of service

Figure 3-4 System View Out Service Indication

Enhanced Detection

When a track module has detected unstable EZ/EX readings that are characteristic of poor shunting, and the module has switched into enhanced detection mode, the display will indicate this with "ed" in the Track Data section.

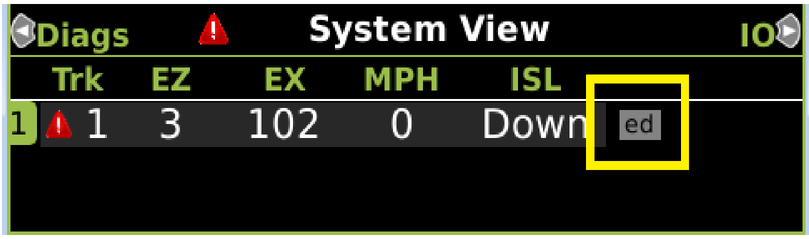


Figure 3-5 Enhanced Detection Icon

Motion Control Active

When the 3000+ has been transferred from a predictor to a motion sensor because either the GCP/MS Control input is de-energized, or the Xfer Delay MS to GCP timer is running, the display will show the "m" symbol in the track data section for the affected track.

Figure 3-6 System View Motion Control Indication

Diagnostic Indication

When there is a diagnostic message available related to the track module, the system view will indicate this with a red triangle to the left of the track number as show in the figure above.

Comms Status Section

The Comms Data section shows the communication status of track, RIO, and event recorder.

If a module is not configured as used, the Comms status will show as white.

When the module is communicating properly, the status will show green.

When the module is configured for use but is not communicating with the CPU, the status will show red.

For example, the following figure shows a 3000+ configured for one track, so track 2 is shown in white as it is not used. The RIO card is configured for use but the card has not been plugged in, so the RIO Comms shows in red. The event recorder is not configured as used so it shows in white.

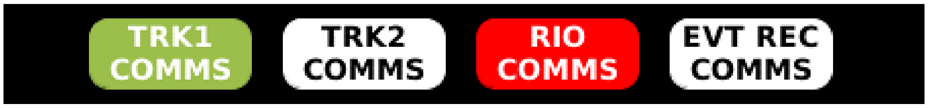


Figure 3-7 Display Comms Status

Relay Output Status Section

The RLY Status section shows the state of the GCP and DAX RLY outputs. If DAXes are not used, these are shown in white. Energized outputs are shown in green and de-energized in grey. If an output on a module has failed, i.e. it is in a de-energized state, when it is commanded to be energized, the RLY status will show it in red.

For example, the following shows the GCP RLY output as de-energized, DAX A and DAX B RLY outputs as energized, and DAX C and DAX D RLY outputs as not used.

Figure 3-8 Display System RLY Status

The Track Data section has submenus indicated by the green circles and number next to each track shown in the yellow box below.

Figure 3-9 System Track Submenus Buttons

Press the 1 on the display keypad to show the track 1 submenu, or press 2 for the track 2 submenu (see Figure 3-10).

3.2.1.2 Detail View

The detail view provides more details about each module. The detail view screens are useful as they show the check EZ level and the island Z level.

Use the left and right arrow to navigate to the next detail screen for this particular module.

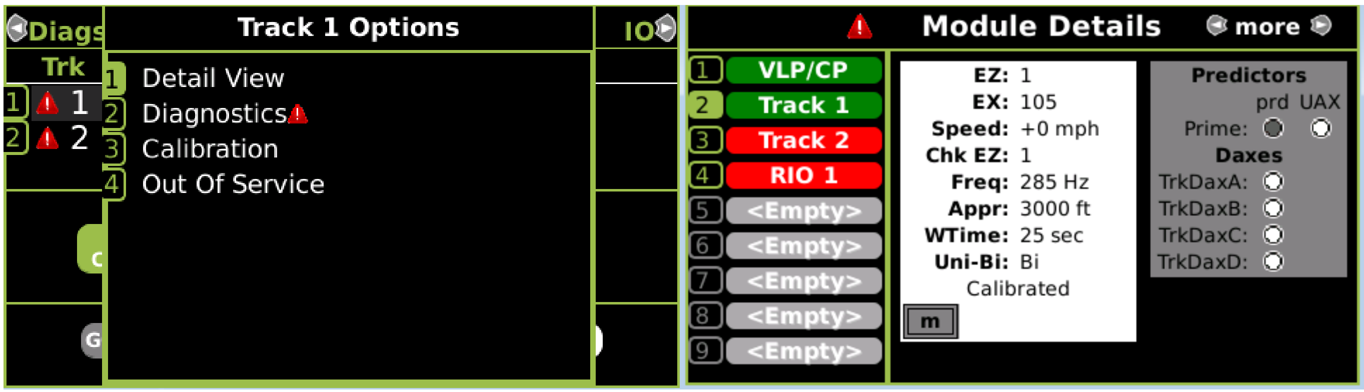


Figure 3-10 System Track Submenus

3.2.1.3 Diagnostics

Selecting the Diagnostics from the Track Options menu will bring up the Diag screen that shows diagnostic messages specific to this module. More information about a specific diagnostic message can be found by first selecting the message and then pressing the **Enter** button. See section 3.2.4.1 for more details.

Figure 3-11 Track Diagnostic Screen

3.2.1.4 Calibration

Selecting the Calibration menu from the Track Option will bring up the Calibration screen for the specified module.

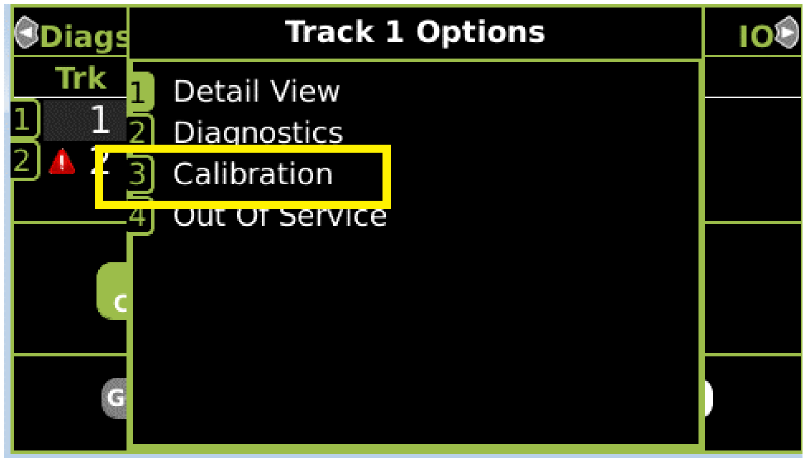


Figure 3-12 Track Options - Calibration

The calibration screen will show the status of the calibration steps. If calibration is required, the screen shows a red cross and **Calib Req** as shown on the left, if the calibration has been performed, the screen shows a green check and **Calibrated** as shown on the right.

Figure 3-13 Track Calibration

See Manual SIG-00-17-03 for details on how to perform the GCP calibration, approach calibration, linearization, and island calibration procedures.

3.2.1.5 Out Of Service

NOTE

NOTE

See SIG-00-17-03 3000+ GCP Instruction & Installation Guide for full details, precautions, and warnings for taking tracks out of service.

Access the **Out Of Service** Menu on the display by selecting the desired track in the System View window on the display. The Track "N" Options window opens. To open the menus for taking the GCP and Island out of service, select **4) Out Of Service** from the drop down display.

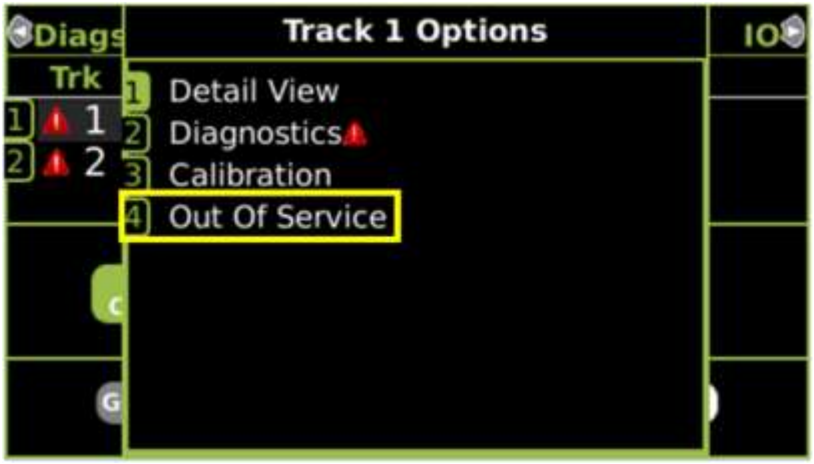


Figure 3-14 Track Options

The Track OOS screen will open and from here either the GCP or Island can be taken out of service and the Out of Service timer can be adjusted.

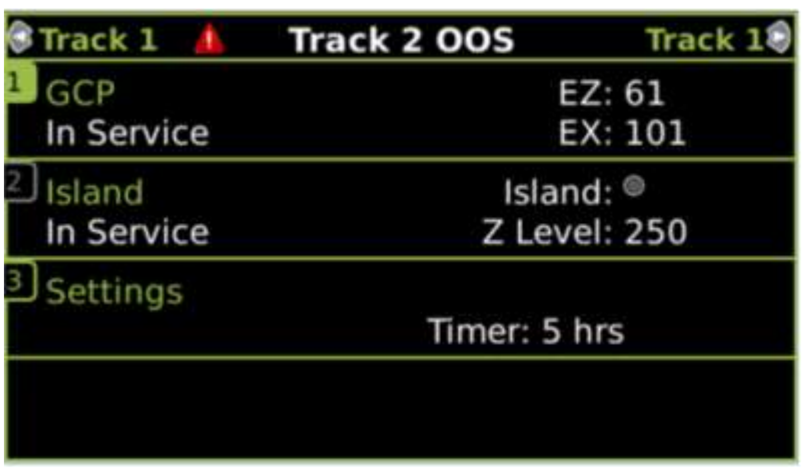


Figure 3-15 Track Out Of Service Menu

Once either the Island or GCP is taken out of service, the Track "N" OOS window shows **Out of Service**.

When the Track "N" OOS screen is closed by selecting the **BACK** button, the display returns to the System View window. An Out of Service (OOS) icon will be shown at the end of the track row.

Figure 3-16 GCP Out of Service Icon

3.2.1.6 Returning a Track to Service

To return the track(s) and island(s) to service, select the desired track by selecting that track number. From the Track "N" Options window, select **4) Out of Service**. Select either the GCP or Island to display the options: **1) Put Track "N" GCP (ISL) Back in Service**, and **2) Cancel**. Selecting 1 will put the GCP back in service with no further confirmations.

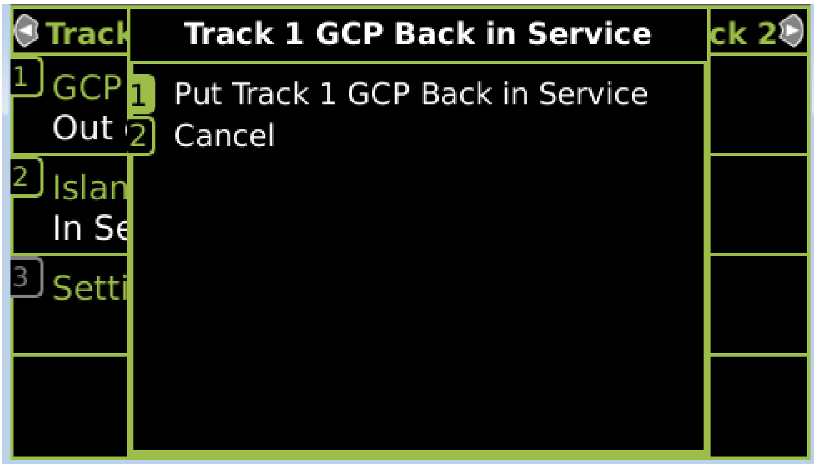


Figure 3-17 Placing a Track Back in Service

On the Track "N" OOS screen, **1) GCP** now reads: **In Service**. Exit the Track "N" OOS window by selecting **BACK**. The System View screen appears, with the track previously Out of Service no longer displaying OOS at the end of the track row.

WARNING

REQUIRED OPERATIONAL TESTS SHALL BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES WHEN RESTORING TRACKS TO SERVICE.

3.2.1.7 Out of Service Inputs

The Model 3000+ allows a track to be taken out of service using the Out of Service inputs in one of two ways: either the Out of Service input is energized to take the track out of service, or the system can be set up in such a way that the display must be used in conjunction with the Out of Service input to take a track out of service.

⚠ WARNING	**WARNING** **THE RAILROAD PROCEDURES FOR APPLYING TEMPORARY JUMPERS MUST BE FOLLOWED WHEN ENERGIZING THE “OUT OF SERVICE” INPUT(S).**

To enable an OOS Input:

- Scroll to **Program View > 2) GCP Programming > 1) General Configuration**.
- Select OOS Control by pressing **Enter**. The OOS Control window opens with the following parameters:
    - Display*
    - Display+OOS IPs
    - OOS IPs
- Select the type input desired then select **Enter**.
- If out of service inputs are set to **Yes**, the proper input must be energized (TRK 1 OOS, TRK 2 OOS).

⚠ WARNING	**WARNING** **IF OOS IPS IS SELECTED, ENERGIZING THE TRK OOS INPUT WILL TAKE BOTH THE GCP APPROACH AND ISLAND OUT OF SERVICE.**

3.2.2 I/O Screen

The I/O View screen provides users with the status of all I/Os on the Model 3000+ GCP as well as some other general indications for other high level states.

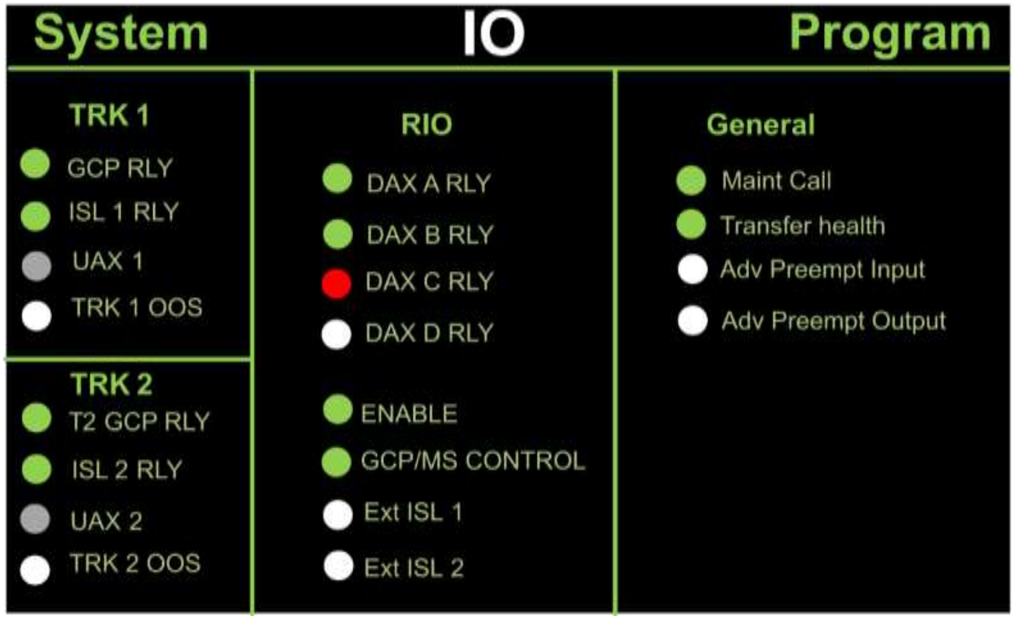


Figure 3-18 I/O Screen

The following colors are used to represent the states:

- Green – input or output is energized
- Grey– input or output is de-energized
- Red – input or output is failed or unhealthy
- White– input or output is not configured for use by the system

The I/O View screen shows the following:

- Track 1 outputs (GCP RLY, ISL 1 RLY) and inputs (UAX 1, TRK 1 OOS)
- Track 2 outputs (T2 GCP RLY, ISL 2 RLY) and inputs (UAX 2, TRK 2 OOS)
- RIO outputs (DAX A thru D RLY) and inputs (Enable, GCP/MS Control, Ext ISL 1,2)
- Maintenance Call output state
    - Green indicates system healthy: maintenance call output will be on and the maintenance call light on bungalow will be off
    - Red indicates system unhealthy: maintenance call output will be off and the maintenance call light on bungalow will be on
- Transfer health – this indicates whether the CPU is driving the transfer output which prevents the transfer module timer from starting its count down
- Advance Preempt Input state – when advance preemption is used, this shows the state of the advance preemption input. This input is shared with the GCP/MS Control input (IO input 2)
- Advance Preempt Output state – when advance preemption is used, this shows the state of the advance preemption output. One of the DAXes will be configured as a Preempt, so physically, the output will be connected to a DAX RLY output

When a track or RIO module is not used, the I/O view will indicate **NOT USED** as shown in the figure below.

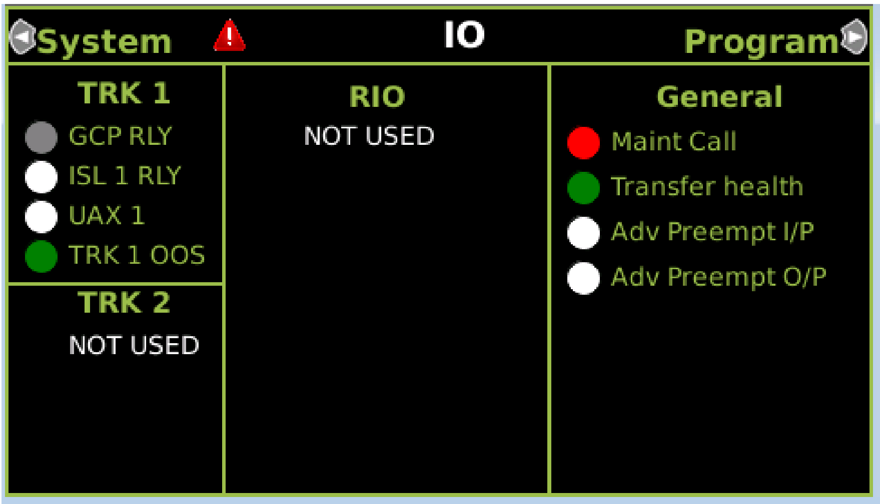


Figure 3-19 I/O View with TRK2 and RIO Not Used

3.2.3 Program View Screen

The Program View screen is where all parameters required for GCP operation are set. There are three main submenus:

Site Configuration is used to set up the non-vital site information, for example, site name, milepost, DOT number

GCP Programming is used to set the vital parameters that control the operation of the 3000+ GCP

Display Programming is used to set non-vital settings related to the operation of the display.

The numbers in the top right indicate the values of various check numbers used to verify the programming:

OCCN – Office Configuration Check number, used to verify that the configuration settings prescribed by the design office are correct

CCN - Configuration Check number, a check number that covers every configuration parameter that is part of the GCP programming. This number can be used to check whether anything in the vital programming has been changed.

FCN – Field Check number: a check number that changes when changes are made to the calibration of the GCP. The check number will change whenever a GCP, approach, linearization, or island calibration is performed.

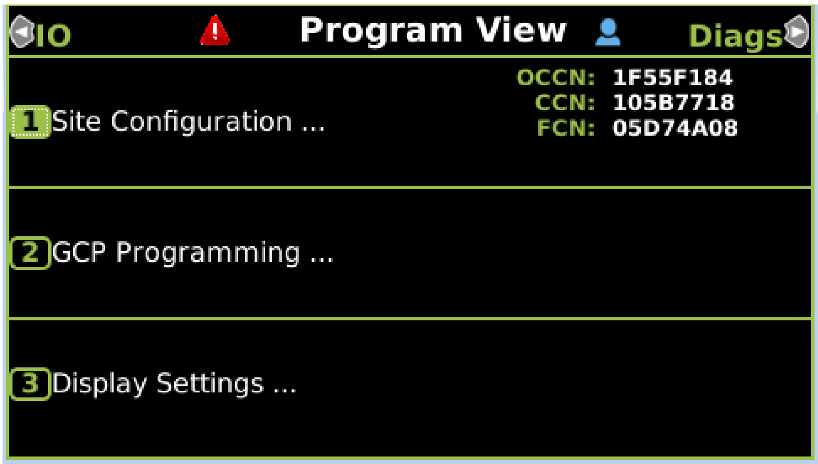


Figure 3-20 Program View Screen

The GCP Programming menu has the submenus illustrated in the following figure.

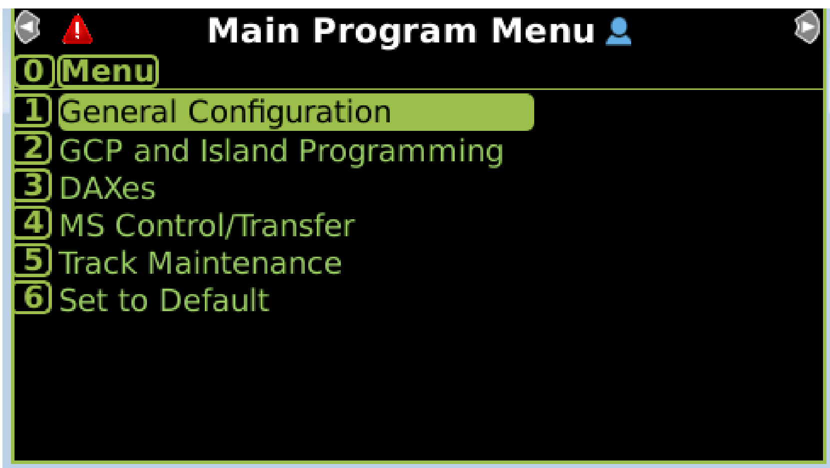


Figure 3-21 GCP Programming Main Program Menu

When the Maintainer password has been enabled from the Security menu, the user will not be able to change any GCP Programming parameters unless the correct maintainer password has been entered. When the user enters the GCP Programming menu (left), they will be prompted to enter the Maintainer password (right).

Figure 3-22 Enter Maintainer Password

To enable the parameters for editing, enter the correct maintainer password, and the program will open as normal. If an incorrect password is entered, or no password is entered, the program menu will open with all parameters set to Read Only with the values shown in white, rather than the usual green.

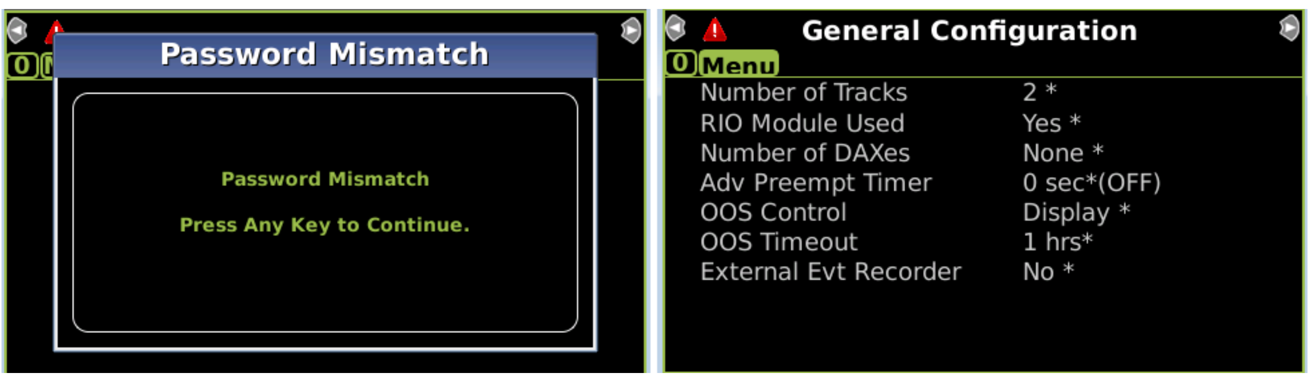


Figure 3-23 Incorrect Maintainer Password

The display will request the password each time the GCP Programming screen is entered.

NOTE

NOTE

If the maintainer password is enabled and the password has been forgotten, contact Siemens for a temporary password.

3.2.4 Diags and Reports Screen

The **Diags and Reports** screen is used to see diagnostic information about the system or view logs.

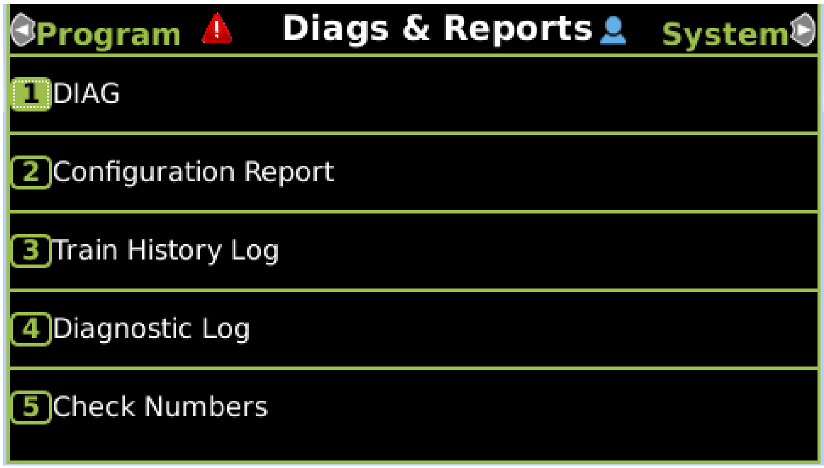


Figure 3-24 Diag & Reports Screen

3.2.4.1 The Diag Screen

The Diag Screen shows all the Diagnostic Messages that are currently being generated by the system; for example, see Figure 3-25.

If the system is healthy the Diag screen should say “No Diag Msgs present!”

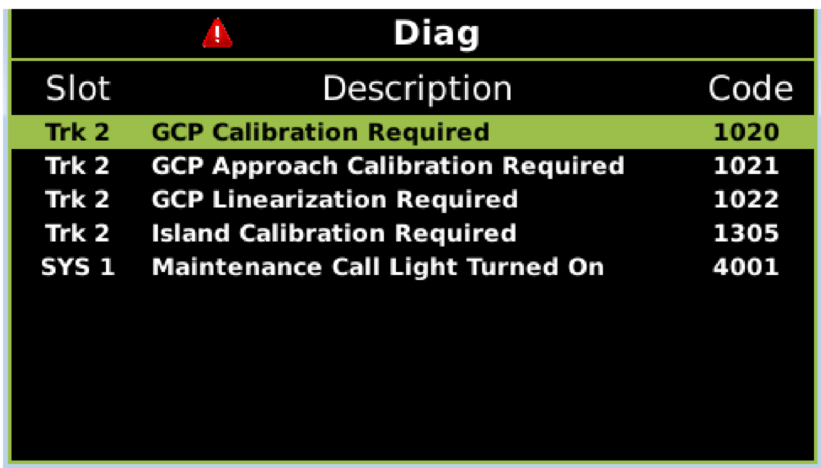


Figure 3-25 Diag Message Screen

To see further information regarding a specific diagnostic message, use the up and down arrow keys to select the desired message, then press the **Enter** key. The display will show the potential cause of the problem and suggest remedies to help fix it. Use the up / down keys to scroll up and down and the back key to go back to the previous menu.

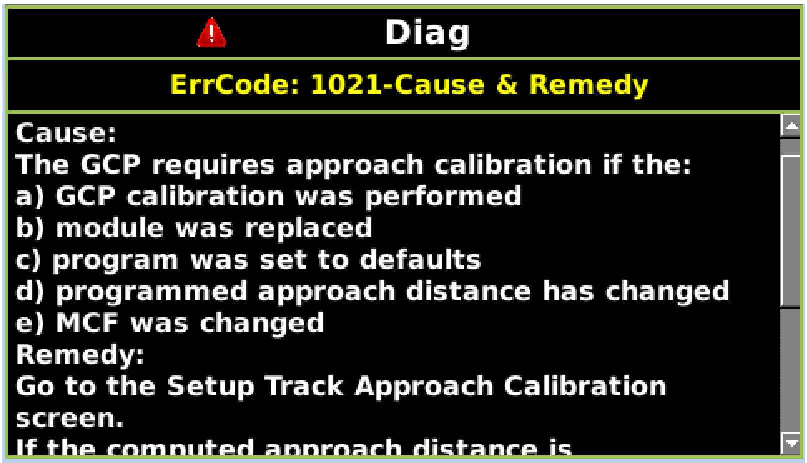


Figure 3-26 Diag Message Detail Screen

3.2.4.2 Configuration Report

When the configuration screen is entered, the display will first generate the report (see figure below on the left). When the report is complete, the display will show a list of options that can be used to browse the various sections of the report (below right).

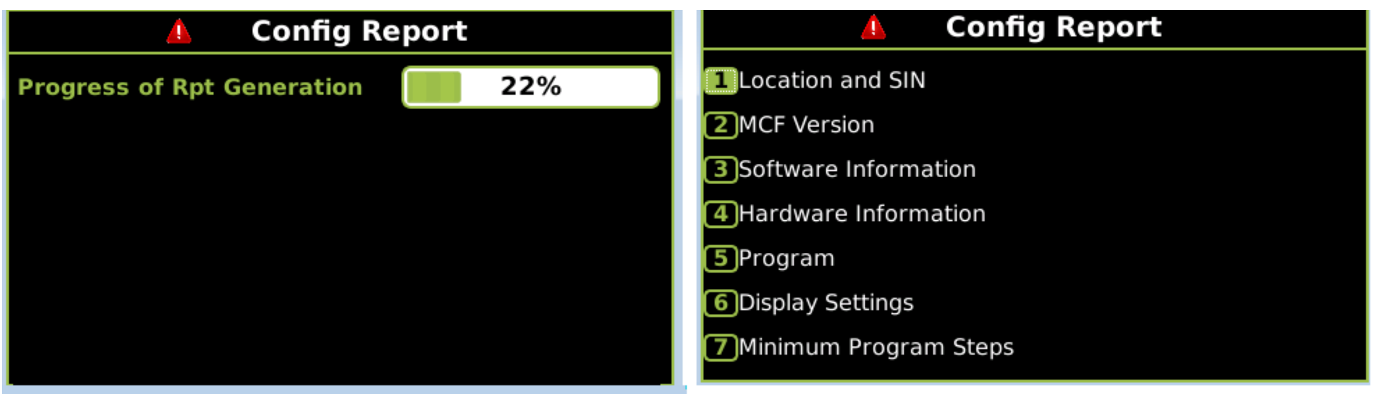


Figure 3-27 Configuration Report

3.2.4.3 Train History Log

If the Train History Log is selected, the display will show a time and date stamped log containing the last 20 train moves.

The log shows the following:

- Trk – which track the train was detected on.
- WT – the recorded warning time in seconds.
- Det – the detected train speed.
- Isl – the train speed at the island.
- Avg – the average train speed.

If the Units are set to **Standard** in the Site Configuration, the speeds are shown in mph. If the Units are set to **Metric**, the speeds are shown in km/h.

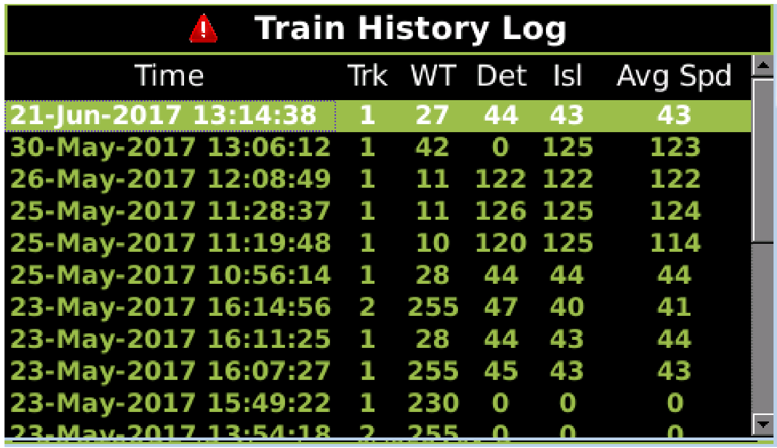


Figure 3-28 Train History Log

3.2.4.4 Diagnostic Log

The Diagnostic log shows a timestamped log of the when the diagnostic messages shown in the DIAG menu occur and when the diagnostic message is cleared. For example, at 16:19:14 track 1 showed GCP Stabilizing, then at 16:19:29 this message was cleared.

Figure 3-29 Diagnostic Log Screen

3.2.4.5 Check Numbers

The check numbers screen will show the following check numbers:

- OCCN – Office Configuration Check number, used to verify configuration that the settings prescribed by the design office are correct
- CCN - Configuration Check number, a check number that covers every configuration parameter that is part of the GCP programming. This number can be used to check whether anything in the vital programming has been changed.
- FCN – Field Check number: a check number that changes when changes are made to the calibration of the GCP. The check number will change whenever a GCP, approach, linearization, or island calibration is performed.

The screen also allows hidden parameters to be reset. In the GCP programming menus, changing one parameter may cause other parameters to be hidden, for example if the **RIO Used** is set to **No**, all the DAX configuration parameters are hidden and cannot be edited.

The OCCN is calculated over all configuration parameters marked as having been included in the OCCN calculation defined by the MCF, regardless of whether they are hidden or not. This may result in the OCCN shown on this screen not matching the one listed on the configuration provided for the office. This discrepancy is due to some parameter that is not currently visible to the user not having the same value as the one used in the office. To avoid this potential issue, select the **Reset Hidden Parameters** button; this will cause the display to set all hidden parameters back to their defaults values. If the OCCN does not match now, check each parameter in turn against the office supplied configuration.

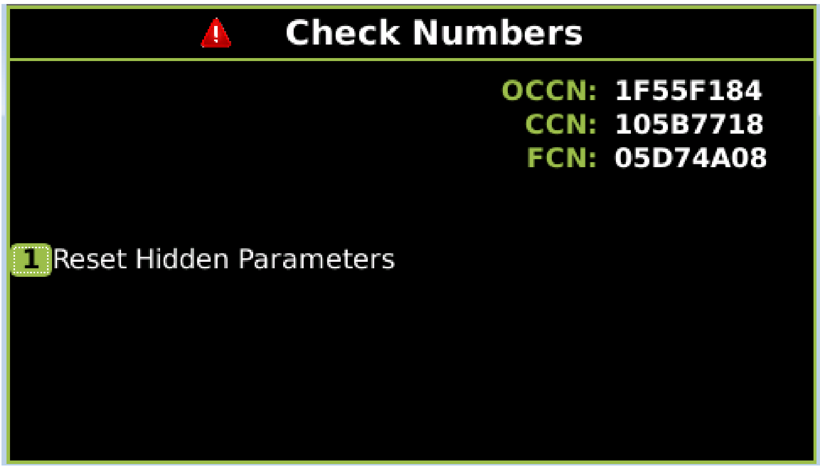


Figure 3-30 Check Numbers Screen

3.2.5 USB Menus Screen

When a USB stick is inserted in to the Display, the menu shown in the following figure will appear. This menu can also be accessed by using left arrows from the System View screen, or right arrows from the **Diags and Report** screen.

The menu allows various reports to be downloaded on to the USB stick, or software uploaded from the USB stick to the Model 3000+ GCP system.

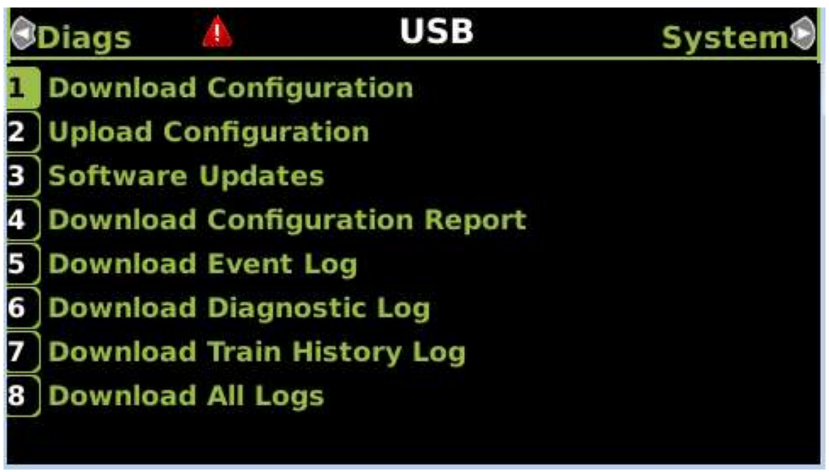


Figure 3-31 USB Menu

3.2.5.1 Download Configuration

This is used to download the configuration file from the 3000+ GCP. The configuration file is known as the PAC file. The PAC file can be opened offline using the OCE tool (See manual SIG-00-11-15). The PAC file can be used as a back up to the 3000+ GCP configuration and it can be loaded back into the system using the Upload Configuration step described below.

See the 3000+ Instruction and Installation Guide SIG-00-17-03 for the detailed procedure for uploading a configuration file.

3.2.5.2 Upload Configuration

The Upload Configuration option is used to upload a new configuration file (PAC file) to the Model 3000+ GCP. The PAC file may have been a previously saved file or may have been created by the OCE tool (See manual SIG-00-11-15).

See the 3000+ Instruction and Installation Guide SIG-00-17-03 for the detailed procedure for uploading configuration file.

3.2.5.3 Software Updates

The Model 3000+ GCP allows new software to be uploaded to modules from the USB, See the 3000+ Instruction and Installation Guide (SIG-00-17-03) for a detailed procedure on uploading new software from a USB.

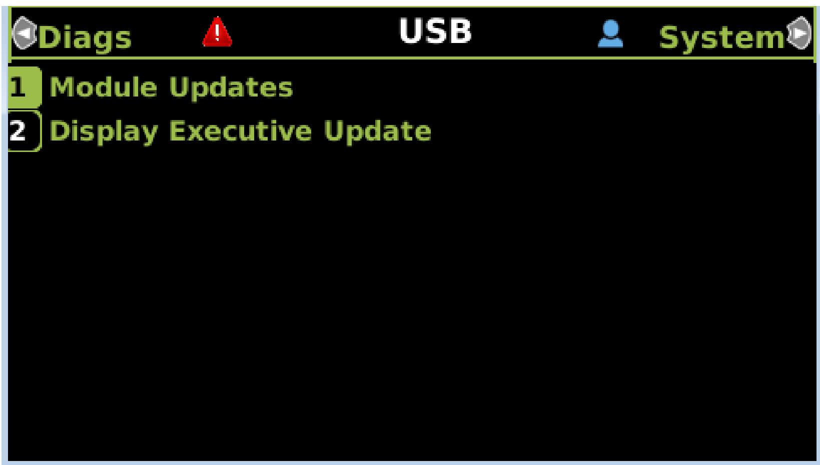


Figure 3-32 Software Update Options

3.2.5.4 Download Configuration Report

Use this option to download a copy of the configuration report for the system.

The file will be stored on the USB stick in a folder called:

Siemens\<DOT#>-<Site NAME>\gcp4000\Reports\yyyymmdd

With a file name given by: system_report_dd-mm-yyyy.txt

NOTE

> **NOTE**
>
> Due to software commonality issues, the USB Display device utilizes folders titled GCP4000 rather than GCP 3000+.

3.2.5.5 Download Event Log

When this is selected, the display will show the options illustrated in the following figure. Select the desired option.

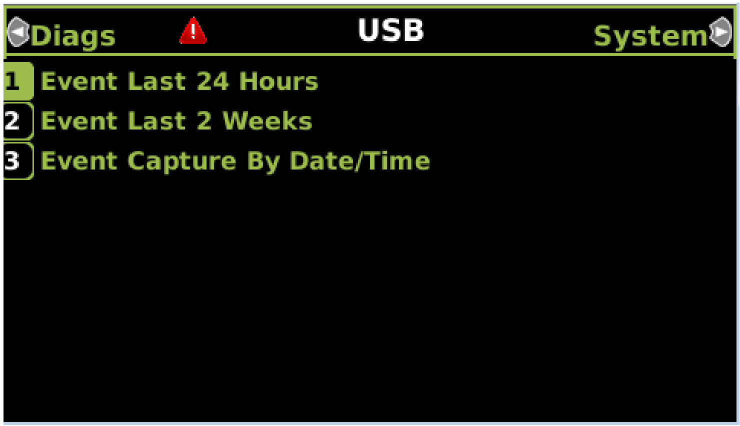


Figure 3-33 Download Log Options

The logs are downloaded into a folder on the USB called:
Siemens\<DOT#>-<Site NAME>\gcp4000\Reports\yyyymmdd
With a file name given by: EvtLog <DOT#>-yyyymmdd to yyyymmdd.txt

3.2.5.6 Download Diagnostic Log

The log will be stored in a folder on the USB called:
Siemens\<DOT#>-<Site NAME>\gcp4000\Reports\yyyymmdd
With a file name given by: DiagLog-<DOT#>-yyyymmdd to yyyymmdd.txt

3.2.5.7 Download Train History Log

The train log will be stored in a folder on the USB called:
Siemens\ <DOT#>-<Site NAME>\ gcp4000\Reports\yyyymmdd
With a file name given by: TrainLogAll-<DOT#>-<Site NAME>-yyyymmdd.txt

3.2.5.8 Download All Logs

This option is used to download all the logs available in the system.
The event and display logs are downloaded and will be stored in a folder on the USB called:
Siemens\<DOT#>-<Site NAME>\gcp4000\Reports\yyyymmdd
With a file name given by:
EvtLog-<DOT#>-yyyymmdd to yyyymmdd.txt
DispLog-<DOT#>-yyyymmdd to yyyymmdd.txt

NOTE

NOTE

The Display log is primarily for Siemens use.

3.3 USB FILE STRUCTURE

3.3.1 Setting up a USB Device for Use

New software issued by Siemens Rail Automation for the Model 3000+ GCP is installed via the A80485-1 Display using a USB device.

WARNING

WARNING

UPLOADING A NEW CONFIGURATION, MEF, OR MCF WILL PLACE THE GCP IN A RESTRICTIVE STATE AND ACTIVATE THE CROSSING WARNING SYSTEM.

BEFORE UPLOADING BEGINS, TAKE ADEQUATE PRECAUTIONS TO WARN ANY PEDESTRIANS, PERSONNEL, TRAINS, AND VEHICLES IN THE AREA UNTIL PROPER SYSTEM OPERATION IS VERIFIED.

DURING MODULE CHANGE OUT, SOFTWARE REVISION, REBOOT AND CALIBRATION PROCEDURES, WARNING DEVICES MAY NOT OPERATE AS INTENDED. TAKE ALTERNATE MEANS TO WARN VEHICULAR TRAFFIC, PEDESTRIANS, AND EMPLOYEES.

TESTS MUST BE PERFORMED TO VERIFY PROPER OPERATION OF GCP PRIOR TO PLACING THE SYSTEM BACK IN SERVICE.

CAUTION

CAUTION

TO MINIMIZE THE TIME THAT THE CROSSING IS ACTIVE, IF THE EXISTING CONFIGURATION NEEDS TO BE SAVED, SAVE IT PRIOR TO SELECTING **UPLOAD CONFIGURATION** FROM THE USB WIZARD MENU.

NOTE

NOTE

Due to software commonality issues, the USB Display device utilizes folders titled GCP4000 rather than GCP3000+.

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

Current software configuration requires installing a serial cable with a null modem adapter between the A80485-1 Display's DIAG connector and the DIAG connector on the individual modules.

When working with transferring files, the following definitions apply:

- Download – The transfer of data from GCP to USB
- Upload – The transfer of data from USB to GCP

Future software revisions will be issued with instructions that describe which module the software is to be loaded into. Such software instructions may supersede portions of this manual.

The following Model 3000+ GCP file types can be uploaded from a USB drive connected to the Display Module:

- Module Configuration Files (MCF)
- Module Executable Files (MEF)
- Configuration Files (PAC)

3.3.1.1 Creating the USB Device File Structure

Uploading or downloading files between the GCP and the USB Device requires that a specific file structure be created on the USB Device. The system looks for specific file folders to find or place Application, Executive, Configuration or Report files.

The file structure is as follows:

- SIEMENS
  - <DOT#>-<SITE NAME>
    - GCP4000
      - CONFIGURATIONS
        - .PAC FILES
      - REPORTS
        - <YYYY><MON>
- GCP4000
  - APPLICATIONS
    - .MCF
    - .PAC
  - EXECUTIVES
    - .MEF
    - .TGZ
    - .BIN

PAC files or MCFs to be uploaded should be placed under the GCP4000\Applications.

Executive software to be uploaded should be placed under the GCP4000\Executives.

Downloaded files are placed under the Siemens\<DOT#>-<Sitename>\GCP4000 folder.

3.3.2 Checking CCN and OCCN

After uploading a new configuration (PAC file) or manually programming the system via the Program Menu, verify that the OCCN matches what is on the prints by scrolling to the Program menu and checking the OCCN in the top right.

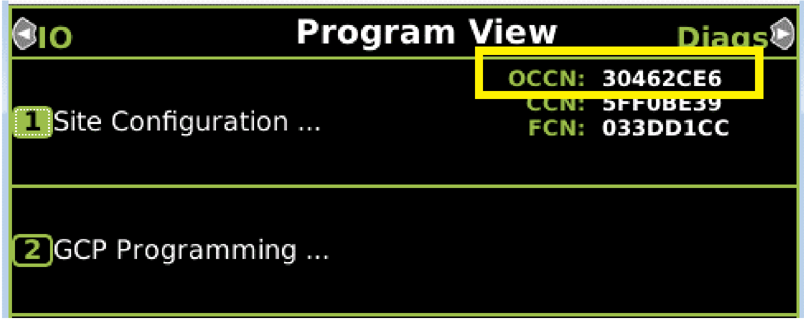


Figure 3-34 Checking the OCCN

3.4 WEB USER INTERFACE SCREENS

The Display Module provides a Web Interface which enables the user to configure the 3000+ GCP 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. The default address from the factory is https://192.168.255.81. The Web UI uses the HTTP Secure (https) protocol. 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 a web browser and type in the IP address of the display. The browser may give the following screens regarding the connection.

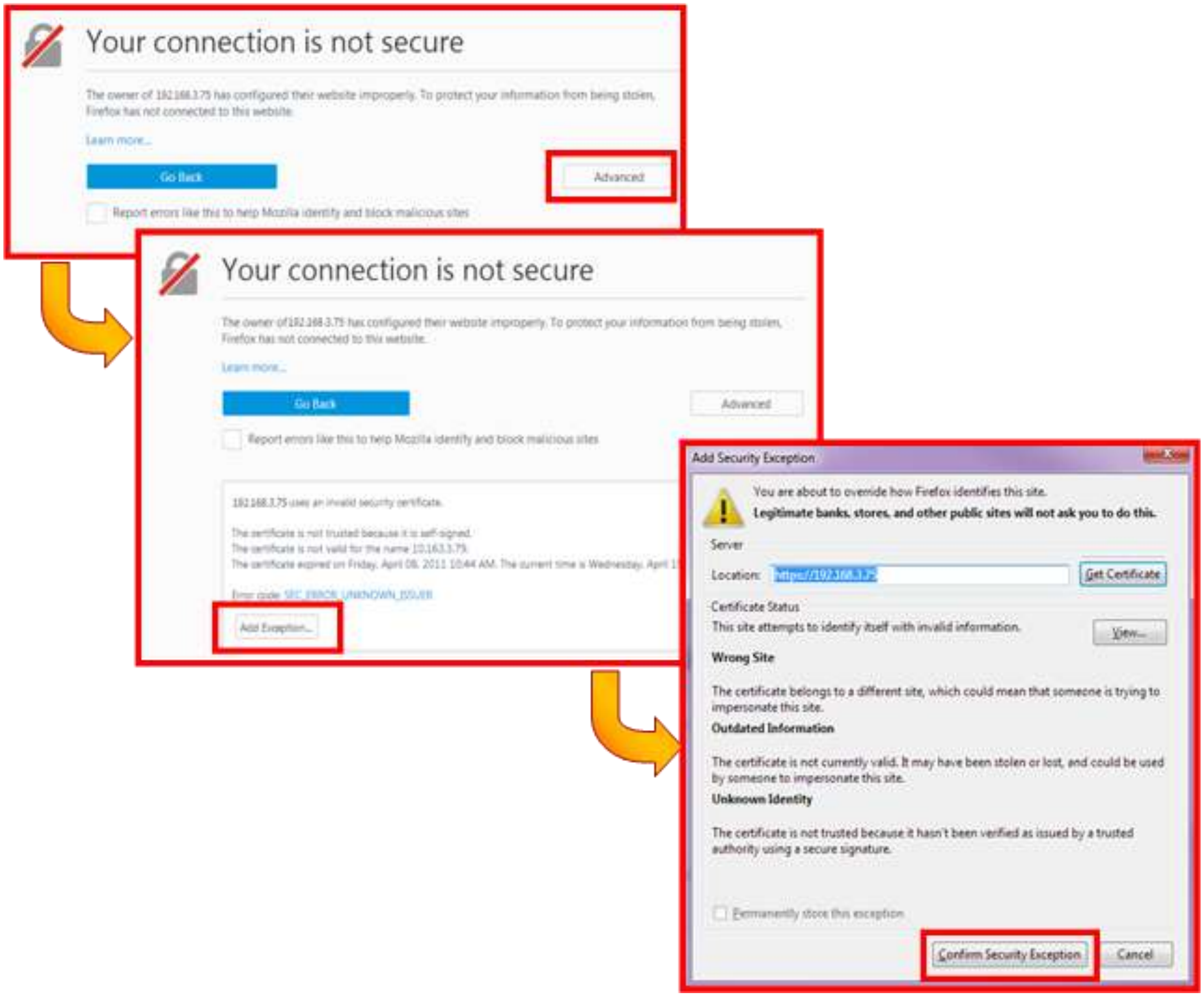


Figure 3-35 Unsecure Connection Warning

The display Web UI will then appear. Select the user name as Maintainer (default). The Admin is for Siemens personnel use only.

The default password is GCP3000+ (case sensitive) to open the session. If the security has not been set to enable a maintainer password, this default will allow all regular user functions of the Web UI to be accessed. If a specific maintainer password has been set, enter this. The default GCP3000+ may still be used to access the Web UI, but the user will be unable to change GCP Programming parameters.

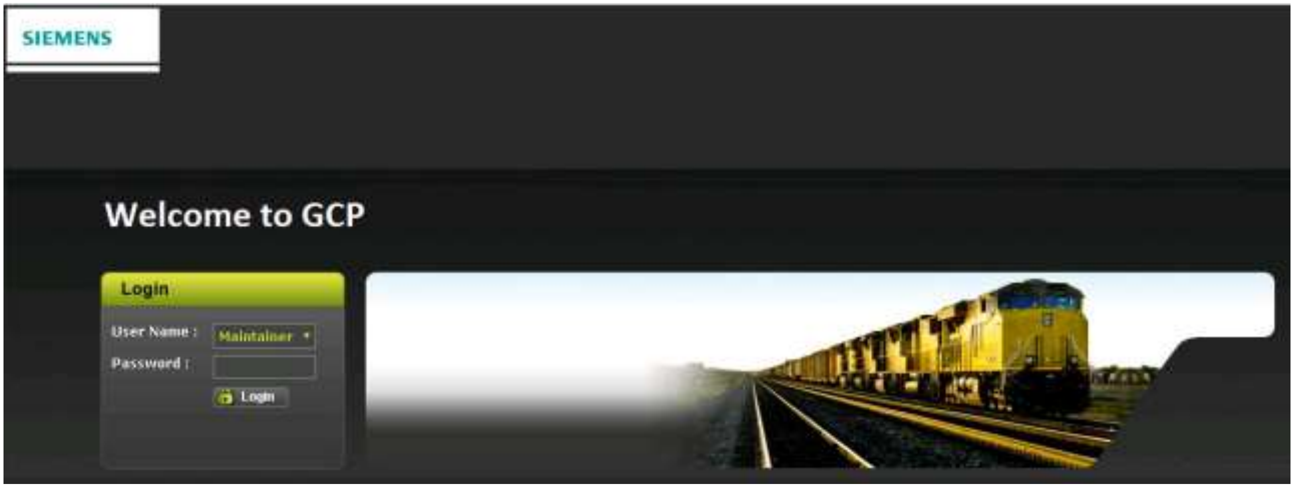


Figure 3-36 Web UI Login Screen

NOTE

NOTE

The passwords **GCP4000** and **GCP5000** are also valid Maintainer login passwords; this is because the Display Module is a common module with the 4000 and 5000 GCP products.

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 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 3000+ GCP web server 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.

See Manual SIG-00-17-03 for instructions on using the 3000+ GCP Display on a network.

The Web UI has buttons at the top which allow the user to select the various functions.

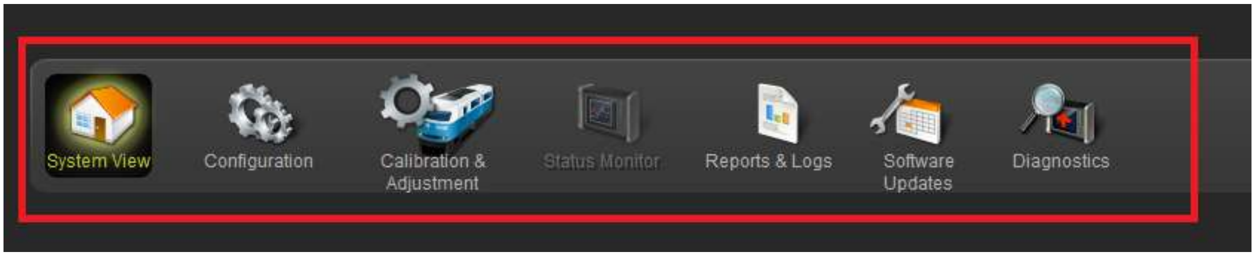


Figure 3-37 Web UI Tool Bar

3.4.1 System View

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

Figure 3-38 System View

The System View shows the status of each track module. The same convention as the Display screens is used for the LED icons.

- Green – energized
- Grey – de-energized
- White – function not configured as used in 3000+
- Red – unhealthy / failed

If a GCP is not fully calibrated, the required calibrations are indicated, as shown below for Track 2. The Island status is indicated as

- Up – unoccupied
- Down – occupied
- Not Used – not used
- Cal Req – calibration required

If diagnostic messages are present related to a track module, the system view will show the red diagnostic indictor on that track.

The track panel shows the configured GCP and island frequencies.

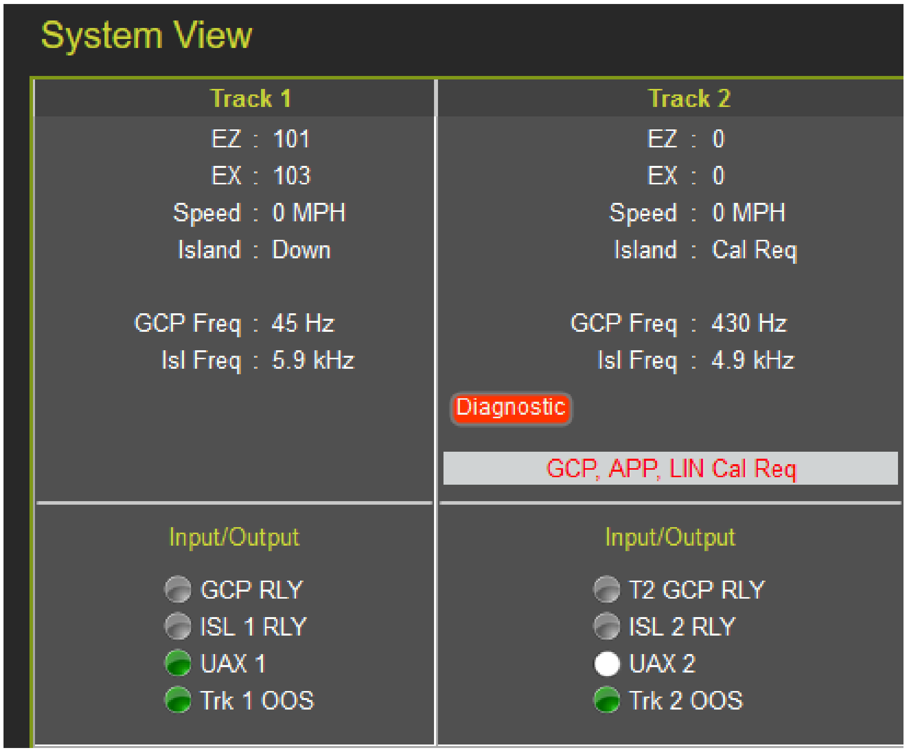


Figure 3-39 System View Track Information

If an external island is used, this is indicated as shown below for track 1. The island status still shows Up/Down, but the display shows **Isl External**.

Or, if track 2 is using track 1's island, this is indicated as shown for track 2 below. The island is marked as **Not Used** and the track as **Uses Trk 1 Island** – in this case, look at the island state for track 1 to see what is being used by track 2.

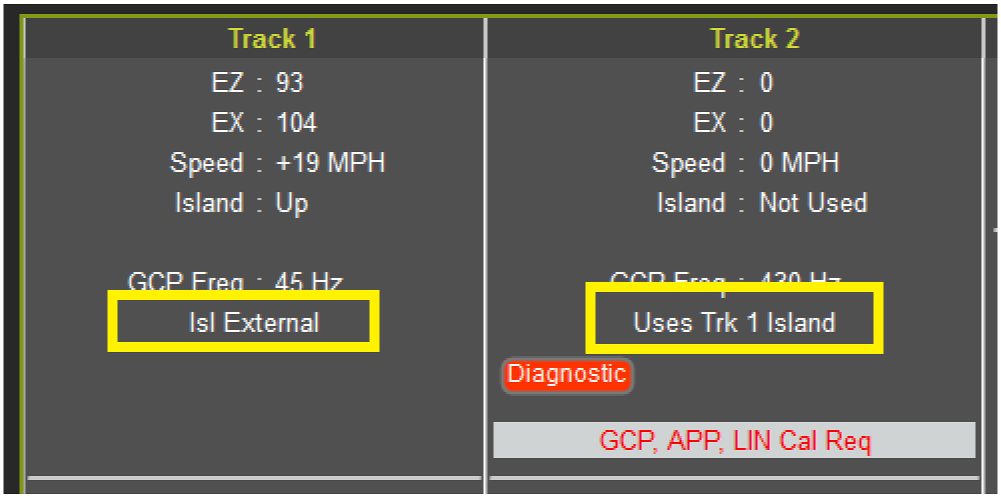


Figure 3-40 System View Island Indications

The System View shows the RIO status as follows:

- Communications from CPU to RIO module: green if healthy, red if unhealthy.
- The states of the outputs (DAX A.. D RLY) and input (ENABLE.. EXT ISL 2)

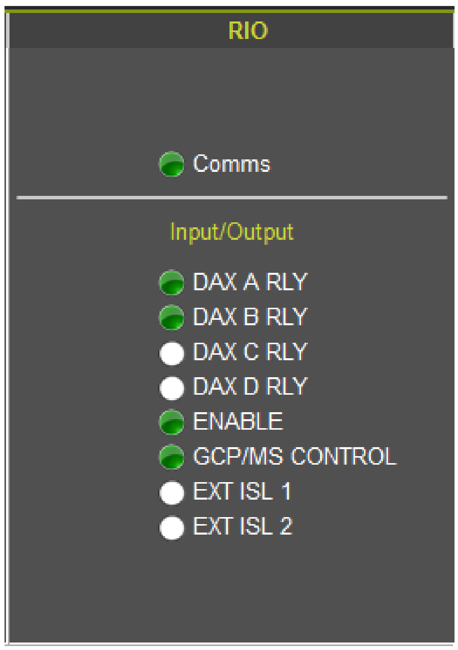


Figure 3-41 RIO Status Indications

If System View also shows some other general status indications:

- Maintenance Call output state:
  - Green indicates system healthy: maintenance call output will be on and the maintenance call light on bungalow will be off.
  - Red indicates system unhealthy: maintenance call output will be off and the maintenance call light on bungalow will be on.
- Transfer health – this indicates whether the CPU is driving the transfer output which prevents the transfer module timer from starting its count down.
- Advance Preempt Input state – when advance preemption is used, this shows the state of the advance preemption input. This input is shared with the GCP/MS Control input (IO input 2).
- Advance Preempt Output state – when advance preemption is used, this shows the state of the advance preemption output. One of the DAXes will be configured as a Preempt, so physically, the output will be connected to a DAX RLY output.
- Evt Rec Comms – this indicates whether the CPU is in session with an external event recorder via the Echelon.

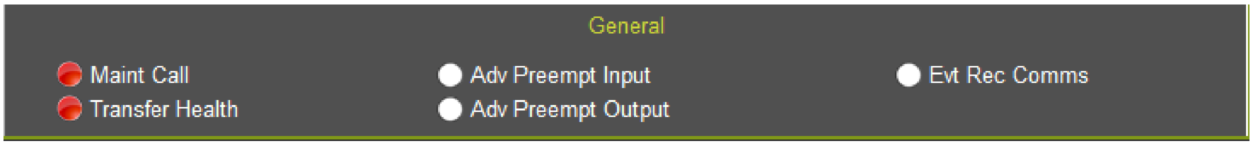


Figure 3-42 General Status Indications

The System View has menus on the left that allow other Web UI screens to be accessed.

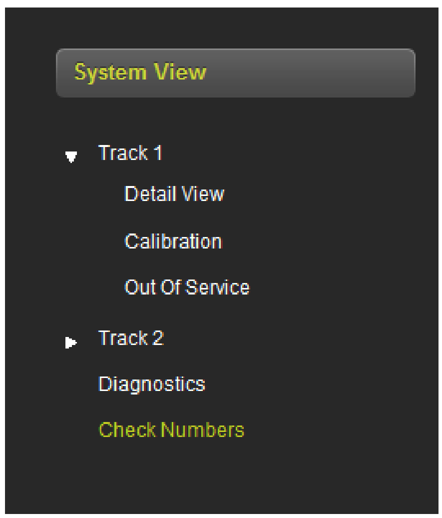


Figure 3-43 System View Menus

If track 2 or the RIO module are not used, the System View will show the following:

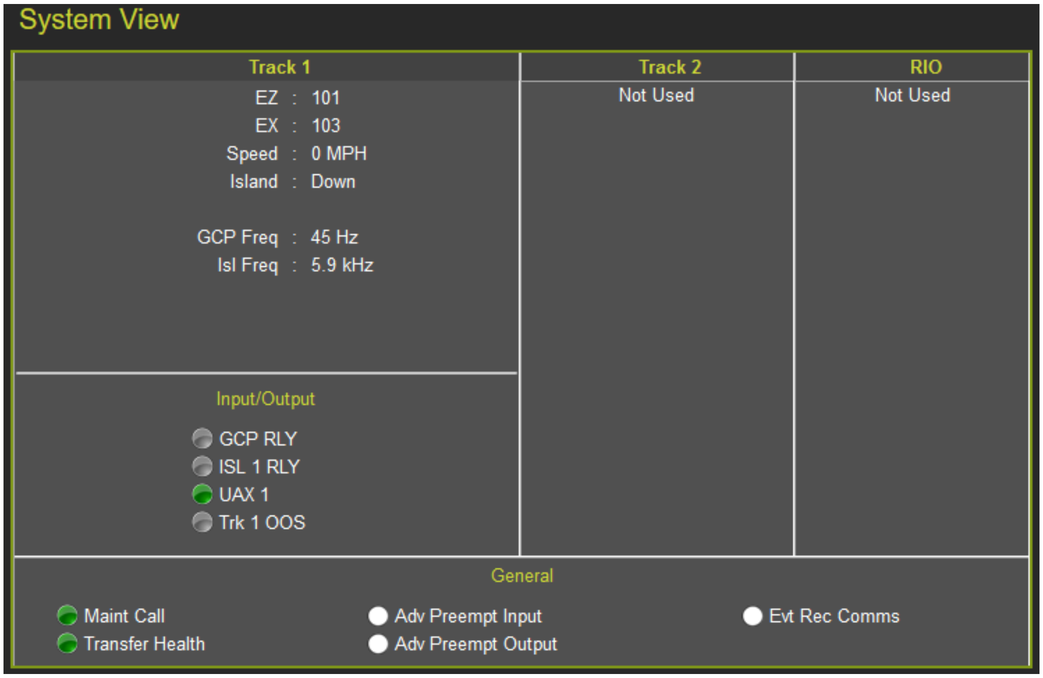


Figure 3-44 Track and RIO Not Used

3.4.1.1 Track – Detail View

The track detail view shows more detailed information about the track module. This screen is primarily used to see the information shown in the following Figure 3-45 (highlighted with yellow boxes) as this is not available elsewhere on the Web UI:

- Check EZ – value of EZ on the check wires,
- Island Z Level – the island signal level, where 100,
- Track Check Number (TCN) and date and time it was last changed.

The Island Z level represents the normalized signal level on the island. When the value is below 100 the island becomes occupied, the island will start its pickup delay timer running when the Z level goes back over 110. The display does not show values over 250, even though the island level will generally be much higher.

The track detail track screen also shows the user the EZ/EX limits information consisting of:

- The highest EZ value the track has recorded since this screen was last reset and the EX value at that time. The time/date this occurred is shown.
- The lowest EX value the track has recorded since this screen was last reset and the EZ value at that time. The time/date this occurred is shown.

The values can be reset by pressing the **Reset** button.

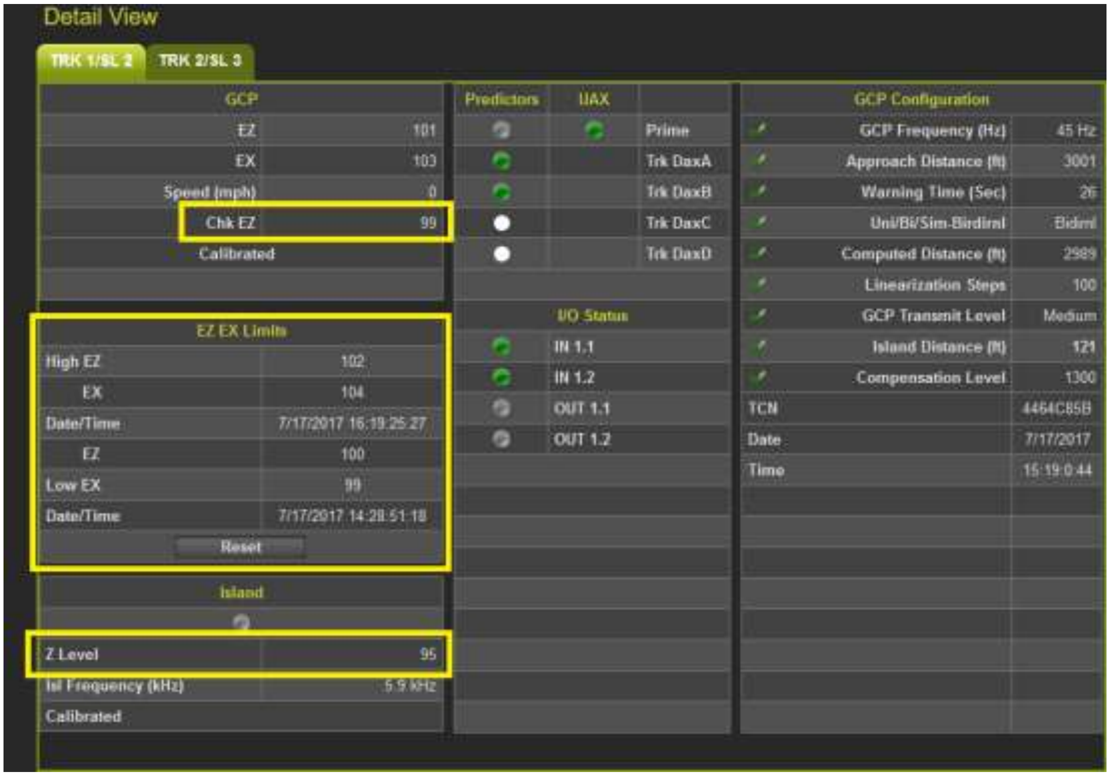


Figure 3-45 Track Detail View

3.4.1.2 Track - Calibration

The calibration screen can be accessed from the **System View Track Calibration** menu or from the **Calibration & Adjustment** icon on the tool bar.

Figure 3-46 Selecting Calibration

The Calibration screen shows the state of the calibration for the specified track. If the calibrations are complete, these are marked with a green check mark as shown in Figure 3-47.

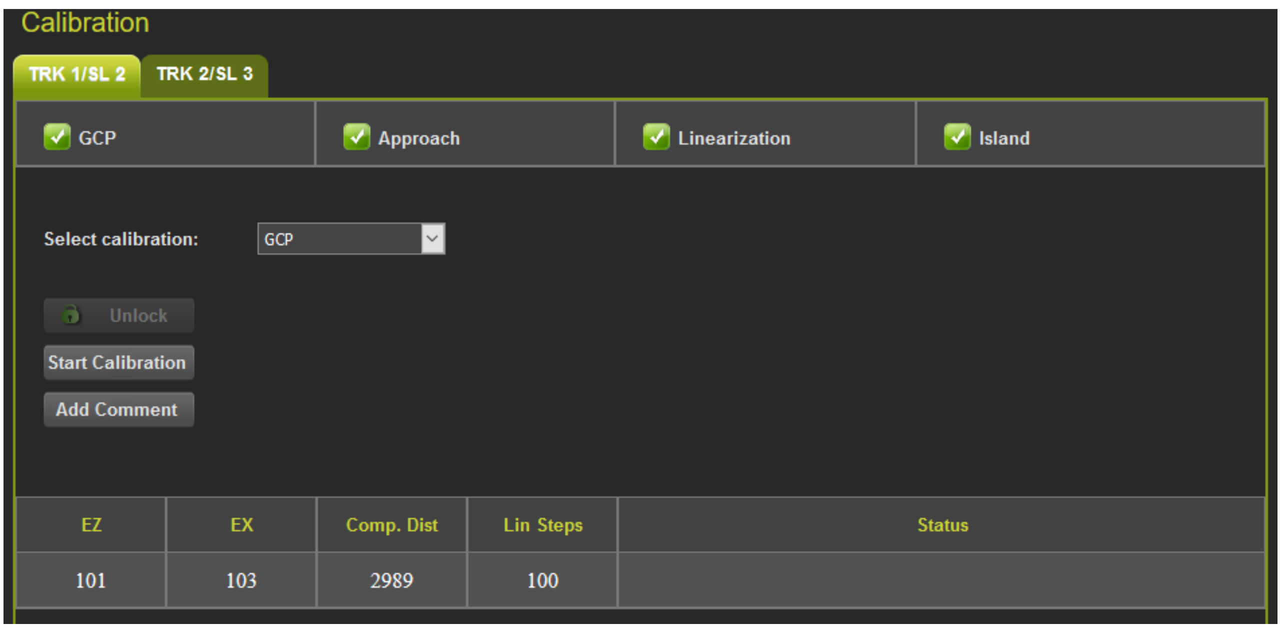


Figure 3-47 Calibration Not Required

If the calibrations are required, these are marked with a red check box as shown in Figure 3-48.

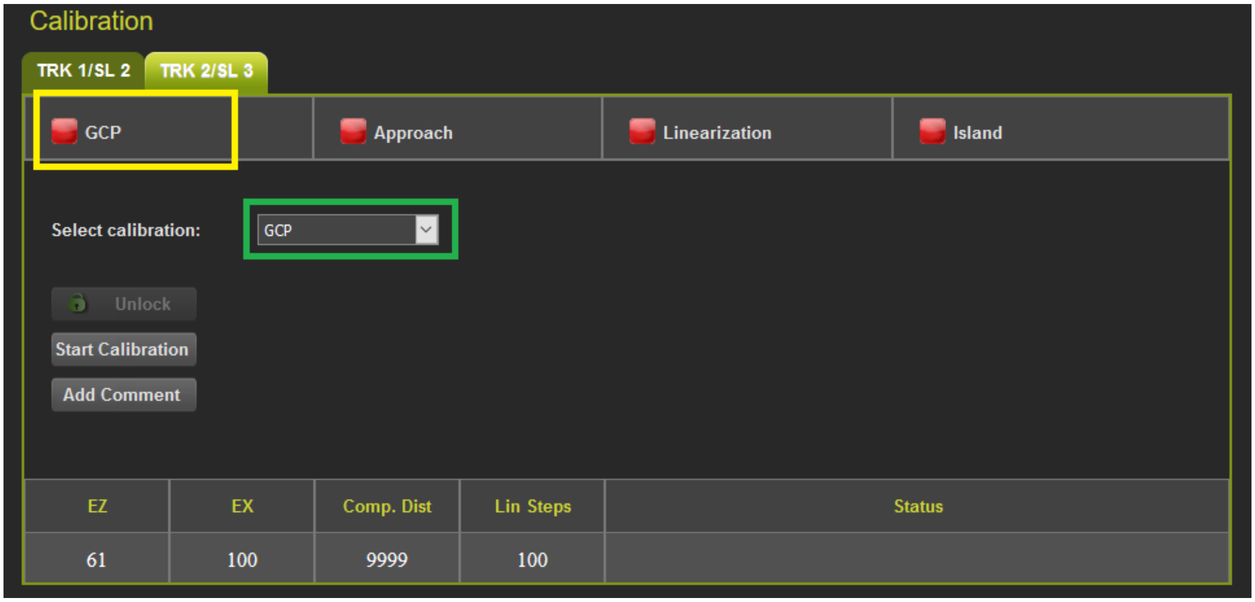


Figure 3-48 Calibration Required

To select which calibration to perform, either click on a specific calibration in the menu bar, for example, GCP shown in the yellow box above, or select the calibration from the drop down menu shown in green box (Figure 3-48).

When the island calibration is selected, the Web UI will show the distance at which the shunt should be placed. The distances shown are automatically calculated for the island frequency that has been configured.

Figure 3-49 Island Calibration

See Manual SIG-00-17-03 for the detailed instructions on performing calibrations.

3.4.1.3 Track – Out-of-Service

WARNING

WARNING

THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A TRACK CIRCUIT OUT OF SERVICE SHALL BE FOLLOWED. THE INSTRUCTIONS IN THIS SECTION MAY BE FOLLOWED ONLY IF ALLOWED BY THE RAILROAD.

REQUIRED OPERATIONAL TESTS SHALL BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES WHEN RESTORING TRACKS TO SERVICE.

THE RAILROAD PROCEDURES FOR APPLYING TEMPORARY JUMPERS MUST BE FOLLOWED WHEN ENERGIZING THE "OUT OF SERVICE" INPUT(S).

The Web UI can be used to take the 3000+ GCP approach circuit and the island circuit out of service. There are three methods of using the Out of Service feature on the 3000+. The method used is selected in the GCP Programming by using OOS Control parameter. The options are:

- Display
- Display + OOS IPs
- OOS IPs

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.

When **OOS Control** is set to **Display**, the Web or Local UI by itself can be used to take a GCP approach or island out of service.

When **OOS Control** is set to **Display+OOS IPs**, the Web UI is used in conjunction with the Trk Out of Service inputs (IN 2 on the each track module) to take a GCP approach or island out of service.

When **OOS Control** is set to **OOS IPs,** the Web UI is not used in taking the GCP approach and island out of service, only the Trk Out of service inputs are used.

Selecting the **Track Out of Service** screen will show the **Out of Service** screen as shown below.

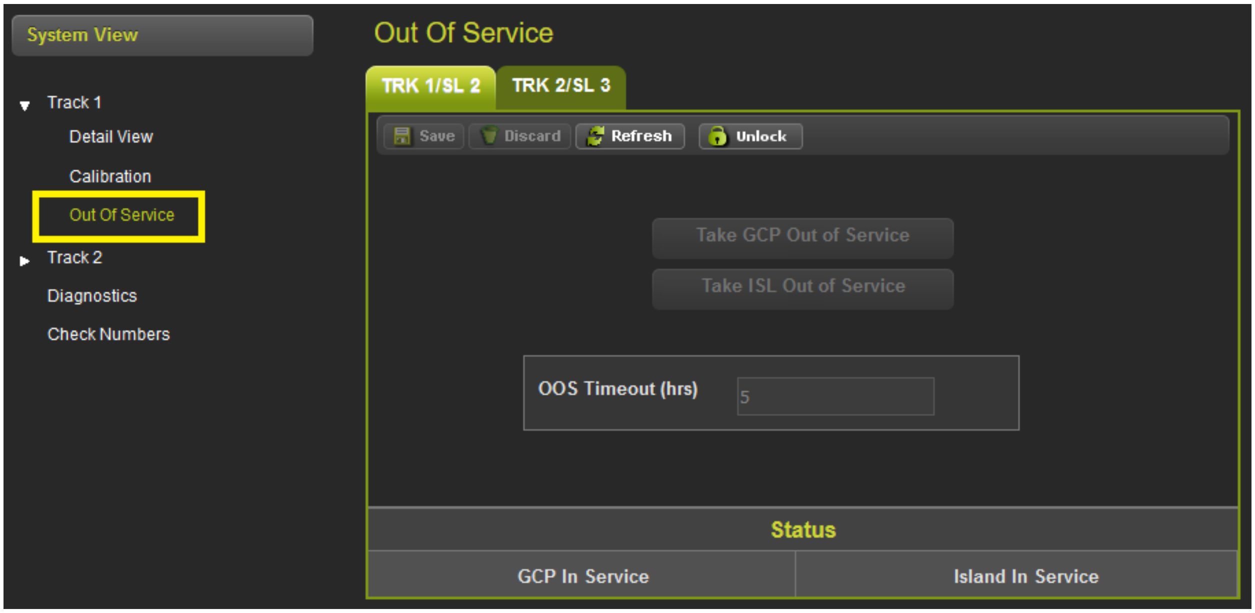


Figure 3-50 Web UI Out of Service

Since the Web UI may be used remotely, before anything can be changed on this page, the screen has to be unlocked by demonstrating that there is a person at the actual GCP in the field. Select the **Unlock** button and then have the person in the field use the keypad to acknowledge the message shown on the display, see Section 3.4.7 for more information.

Once local user presence has been confirmed, other buttons will be enabled as shown below.

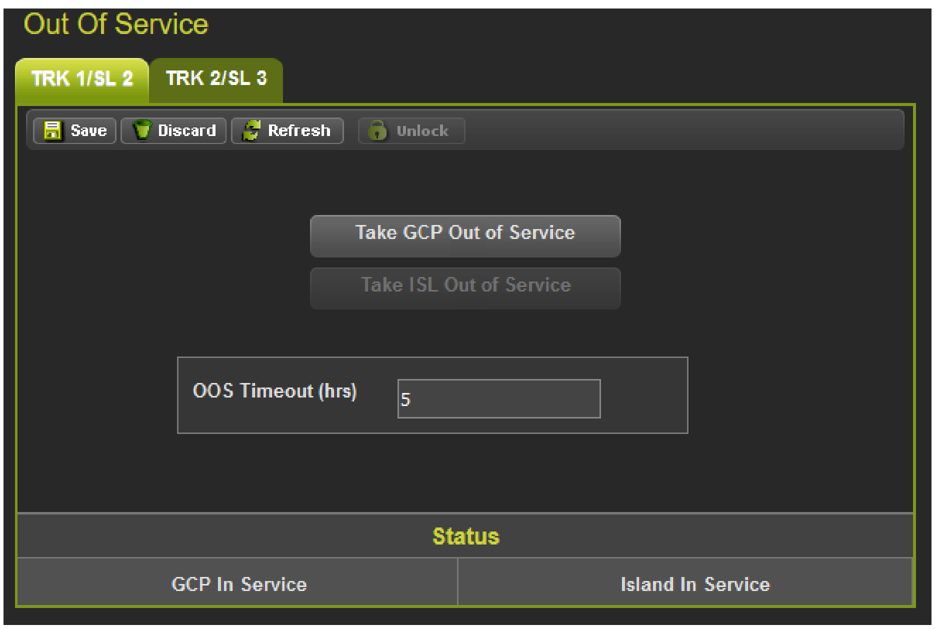


Figure 3-51 Web UI: Out of Service Unlocked

First, enter the **Out of Service Timeout** that is required, and press **Save**. The timer cannot be changed once a track is out of service, so it needs to be set first. The valid values are 0 to 23 hours, where the value 0 means that the timeout is not being used.

NOTE

NOTE

The **Out of Service Timeout** covers all tracks taken out of service with one time interval.

If the timer is running for one track out of service, and it is desired to take the other track out of service for an added amount of time, do the following:

- Return to the first track service
- Edit the **Out of Service Timeout** to the new value
- Take both 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.

If **OOS Control** is set to **Display+OOS IPs**, energize the Trk OOS Input on the track module (IN2) before continuing. Then select the **Take GCP Out of Service** button. The Web UI will ask for confirmation as shown below.

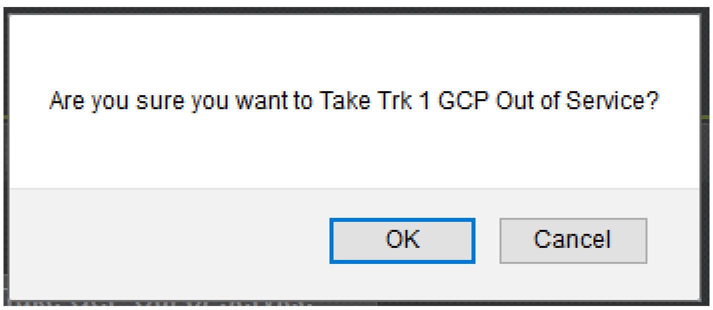


Figure 3-52 Web UI: Out of Service Acknowledge

Select **OK** if required. The Web UI will now show the **GCP Out of Service** as shown in the figure below on the left. The System View will show the GCP OOS icon flashing between blue and white.

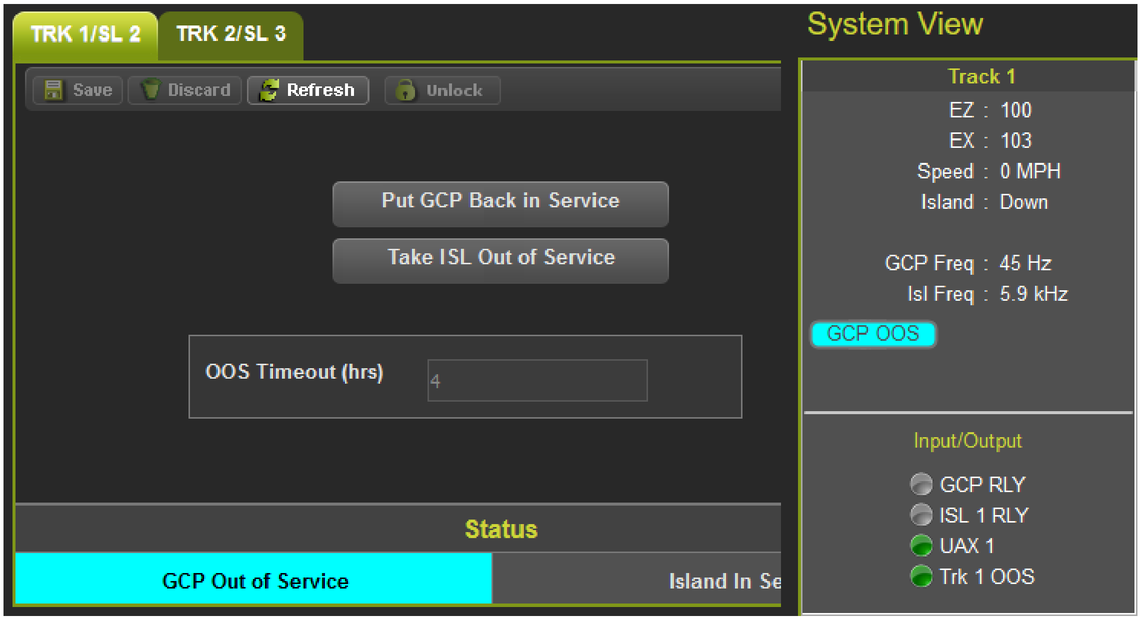


Figure 3-53 Web UI: Out of Service Indications

The track module will also display the message GOFS on its four character display. The maintenance call output on the 3000+ will turn off; this will cause the maintenance call lamp to go on, if it is wired.

To return the GCP to service, if **OOS Control** is set to **Display+OOS IPS**, de-energize the track OOS input on the track module.

If **OOS Control** is set to **Display**, use the Web UI module and select the **Put GCP Back in Service** button shown in Figure 3-53 above. (This requires local user presence - Section 3.4.7).

NOTE

NOTE

When a GCP is OOS but the island remains in service, the crossing will activate when the island is occupied.

NOTE

NOTE

Putting the GCP back in service will also put the island back in service if it was out of service.

If the **OOS Control** is set to **Display+OOS IPs** and the Trk OOS Input is still energized, performing the above step will put the track back in service; however, the maintenance lamp call will remain on while the Trk OOS Input is still energized. Similarly, if the out of service timer expires and the Trk OOS Input is still energized, the maintenance call lamp will remain on.

⚠ WARNING

WARNING

ENSURE THAT TRACK-OUT-OF-SERVICE IS RETURNED TO DE-ENERGIZED WHEN THE TRACK IS PUT BACK IN SERVICE.

NOTE

NOTE

The island cannot be taken out of service by itself, the GCP has to be first taken out of service.

If **OOS Control** is set to **OOS IPs** the options to take the GCP out of service will not be enabled on this screen.

To take the island out of service, first take the GCP out of service, then select the **Take ISL Out of Service** button shown in Figure 3-53.

This will bring up the following confirmation screen.

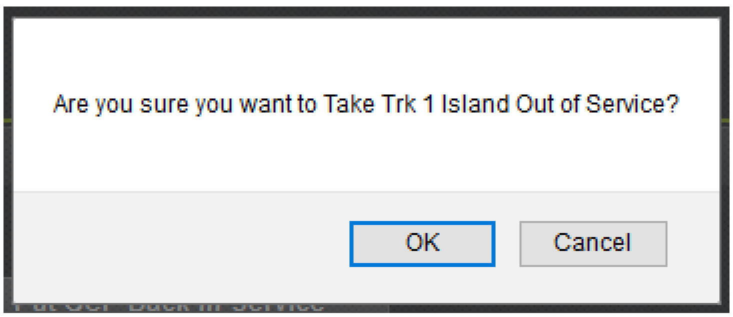


Figure 3-54 Island Out of Service Confirmation

If required, select **OK** to continue.

The **Out of Service** screen will now show the Island as **Out of Service**, and the top system level screen will show the message **GCP-ISL OOS** that will alternate between blue and white. The track module will display the messages **GOFS** and **IOFS** on its four character display. As before, the maintenance call output on the 3000+ will turn off; this will cause the maintenance call lamp to go on, if it is wired.

Figure 3-55 Island Out of Service Indications on Web UI

If **OOS Control** is set to **Display+ OOS IPs**, to return the GCP and island to service, de-energize the track OOS input on the track module. If only the island needs to be put back in service, use the Web UI and select the **Put ISL Back in Service**.

NOTE

NOTE
Either the Web UI or Display Keypad can be used to put the GCP and Island in or out of service.

3.4.1.4 Diagnostics

Selecting the Diagnostics menu from the System view will show the Diagnostics screen. This shows diagnostic messages present in the system. The slot column shows which component this is related to:

- Trk 1 or Trk 2 indicates a diagnostic message related to a track module.
- RIO 1 indicates a diagnostic message related to RIO module
- SYS 1 indicates a system diagnostic message not specific to a track or RIO module

If a specific message is selected, the display will show possible causes of this diagnostic messages and remedies to help fix it.

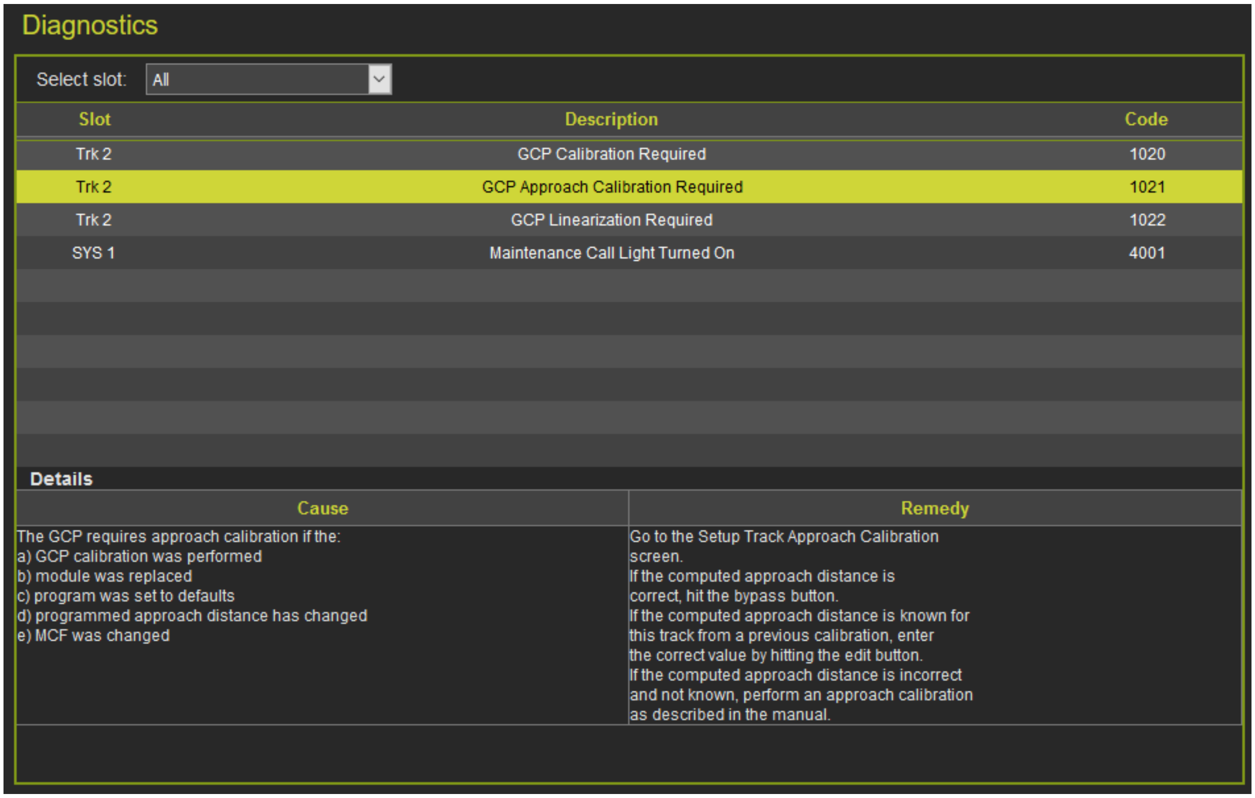


Figure 3-56 Diagnostic Message

3.4.1.5 Check Numbers

The check numbers screen will show the following check numbers:

- MCF Name – the name/version of the MCF
- MCF CRC – the CRC of the MCF that is running
- CCN - Configuration Check number, a check number that covers every configuration parameter that is part of the GCP programming and can be used to check whether anything in the vital programming has been changed.
- OCCN – Office Configuration Check number, used to verify configuration settings prescribed by design office are correct
- FCN – Field Check number: a check number that changes when changes are made to the calibration of the GCP. The check number will change whenever a GCP, approach, linearization or island calibration is performed.

The screen also allows hidden parameters to be reset. See description in Section 3.2.4.5 for use of this.

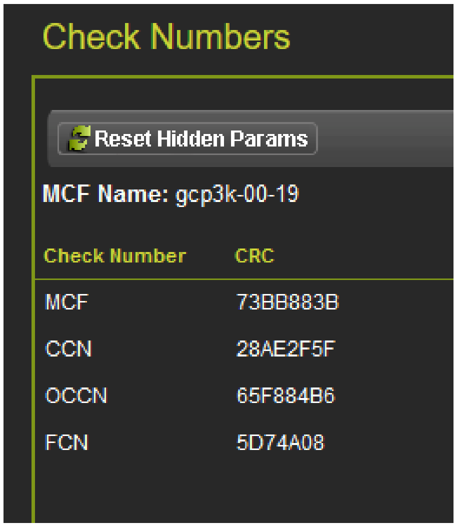


Figure 3-57 Web UI: Check Number

3.4.2 Configuration

When the configuration icon on the tool bar is selected, the Web UI will show the menu illustrated in the figure below.

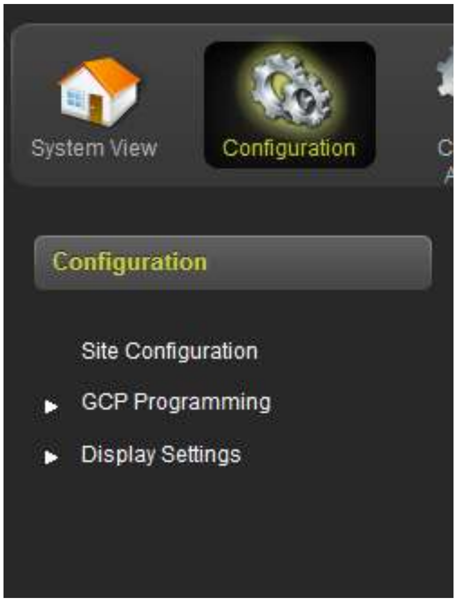


Figure 3-58 Web UI: Configuration Menus

- **Site Configuration** is used to set up the non-vital site information, for example, site name, milepost, DOT number
- **GCP Programming** is used to set the vital parameters that control the operation and the 3000+ GCP
- **Display Programming** is used to set non-vital settings related to the operation of the display.

Section 4.0 discusses the programming options in detail.

3.4.2.1 Site Configuration

This screen is used to set the non-vital site information, for example, site name, milepost, DOT number. To edit, first unlock and confirm local user presence (see Section 3.4.7). The fields will now be editable. To edit a field, type in the new value and then press the **Save** button. Multiple fields on this page can be changed, then **Save** pressed. If there are unsaved changes and a new screen is selected, the Web UI will prompt the user to save or discard the changes.

To discard changes without saving, press the **Discard** button.

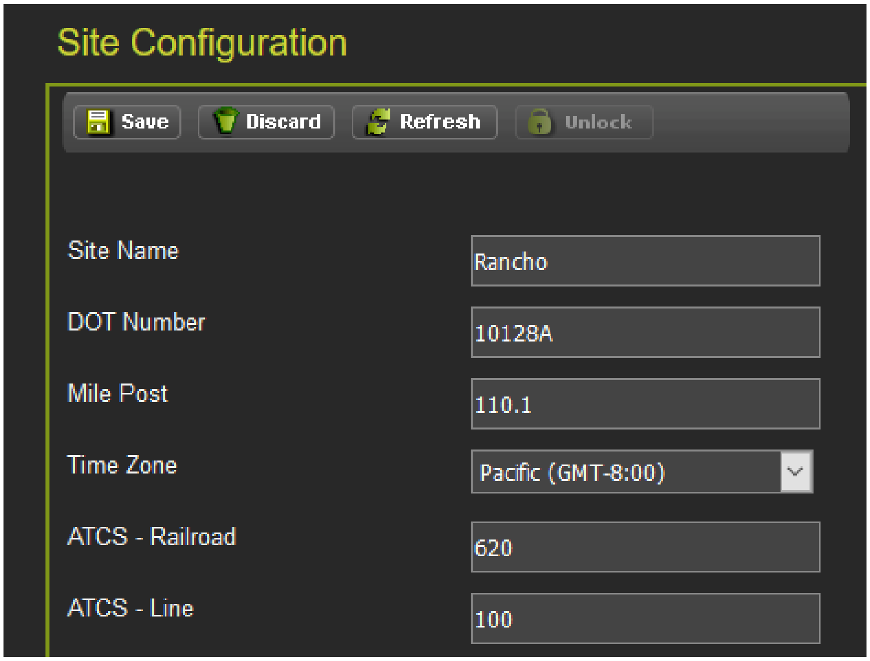


Figure 3-59 Web UI: Site Configuration

The Web UI will not accept invalid characters in text fields. If the data entered is out of range, the Web UI will flag this with an error.

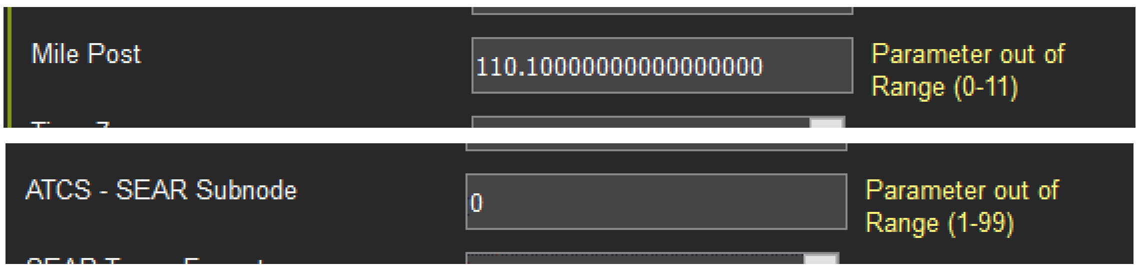


Figure 3-60 Web UI: Error Checking

NOTE

NOTE

The Site and DOT number are to create file paths or file names when files are downloaded to a USB memory device.

NOTE

NOTE

Changing the ATCS Railroad, Line, Group, Display or Subnode or CPU II+ subnode will cause the Display to disconnect from the CPU and then reconnect.

3.4.2.2 GCP Programming

This screen is used to set parameters that affect the operation of the GCP and its ability to detect trains and provide a constant warning time. The design on the circuit plans for the crossing warning system determines the programming of the 3000+ GCP.

WARNING

WARNING

PROGRAM CHANGES MUST BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES. SYSTEM OPERATION MUST BE VERIFIED PRIOR TO PLACING SYSTEM IN SERVICE OR FOLLOWING PROGRAMMING, HARDWARE OR WIRING CHANGES.

To edit the parameters, first unlock and confirm local user presence (see Section 3.4.7). The fields will now be editable.

NOTE

NOTE

If the Security Enabled is set to Maintainer, the correct Maintainer password has to be entered in the Web UI in order to edit parameters. If the default password is used, the GCP programming parameter will remain locked.

To edit a field, either select from the drop down list, or enter a numerical value as appropriate.

Multiple fields on this page can be changed before saving. After the required fields are changed, press **Save** to implement the changes. If there are unsaved changes and a new screen is selected, the Web UI will prompt the user to save or discard the changes.

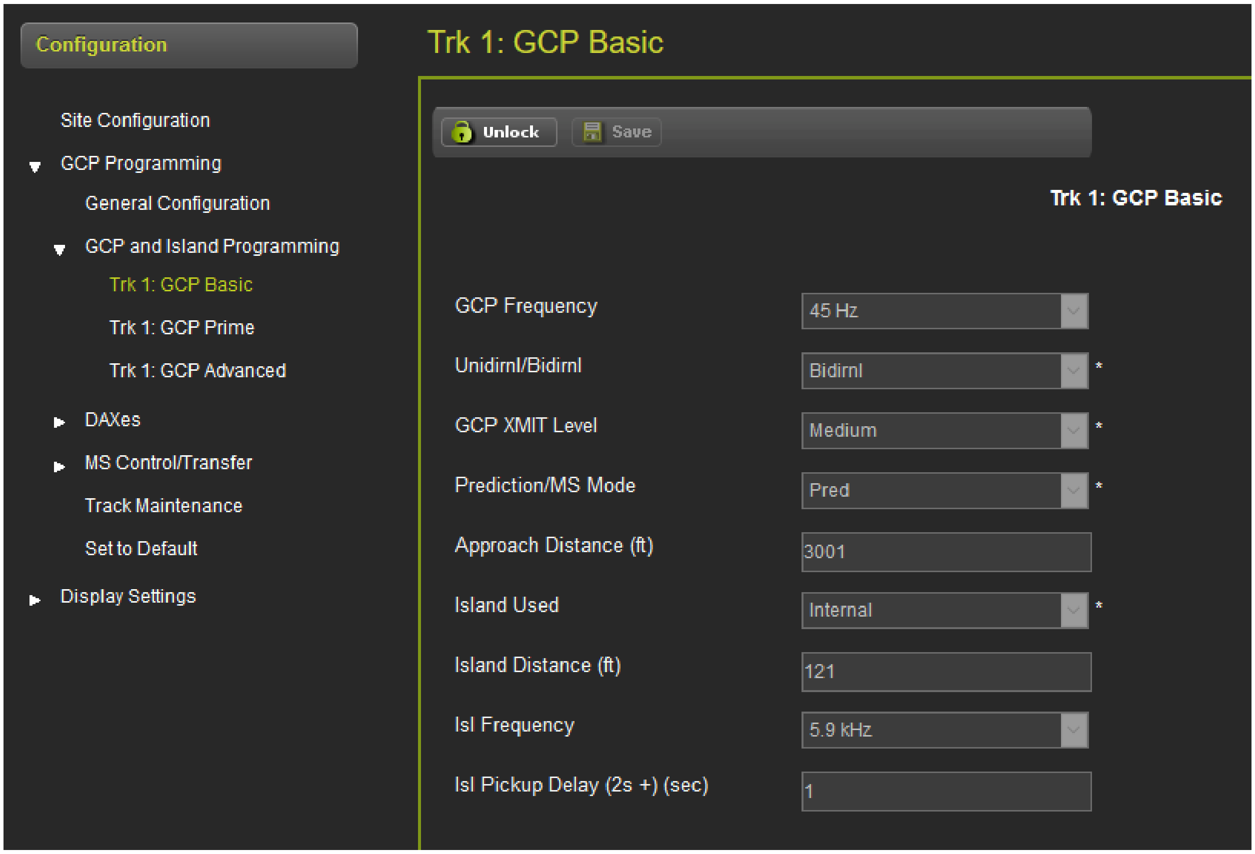


Figure 3-61   Web UI: GCP Programming

Some parameters get hidden based upon the value or other parameters. The hidden parameter is not visible until the parameter that causes it to be hidden is saved.

For example, the Prime Pickup Delay Mode is only visible when the Prime Prediction Offset is not 0. So, if the plans indicate to change the Pickup Delay Mode, the Prime Prediction Offset first has to be changed to a non-zero value and then the changes saved before the Pickup Delay Mode is visible.

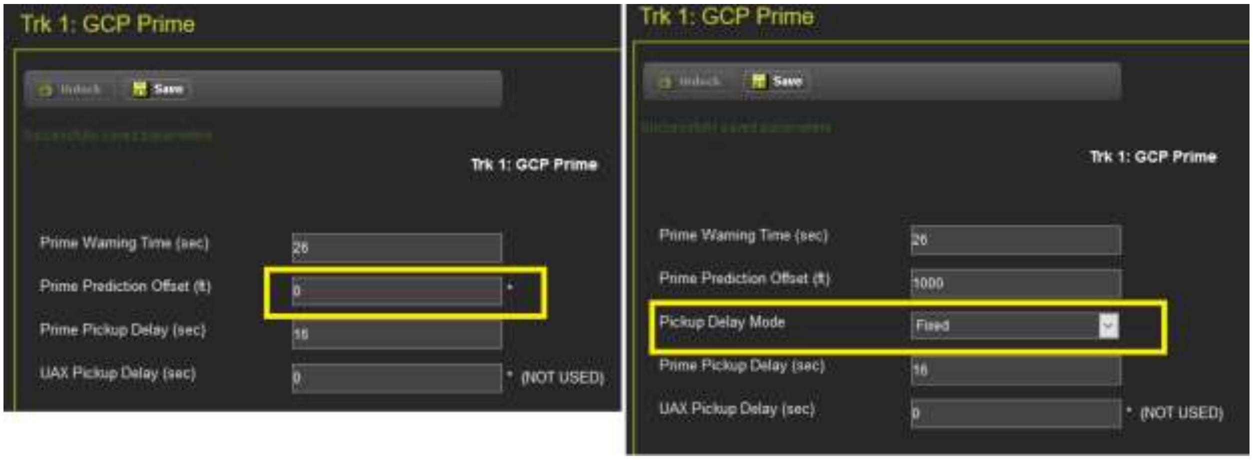


Figure 3-62 Web UI: Hidden Parameters

The * to the right of the value indicates that the parameter is set to its default value.

The 3000 GCP had some numerical parameters where 0 represented a **Not Used** or **Off** condition. In order to emulate this on the 3000+ GCP, these specific parameters that use an **Off** value will show this in text to the right of the value, as shown in the following examples:

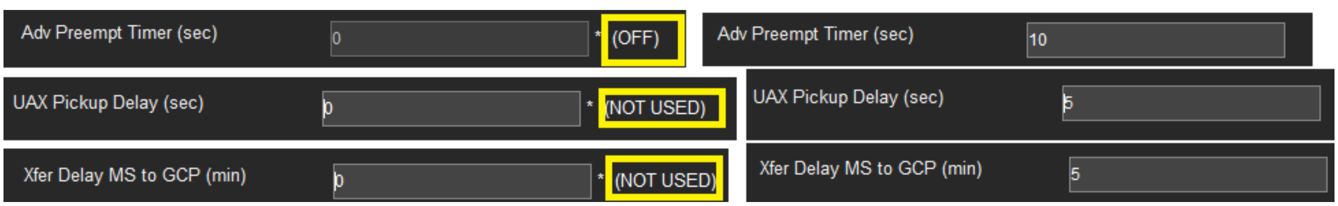


Figure 3-63 Web UI: Off Values

Changes to some parameters cause the options in the left hand menu to change. For example, the DAXes menu is empty unless the **Number of DAXes** is greater than 0 in the **General Configuration** menu.

3.4.3 Calibration and Adjustment

This icon will bring up the same calibration page as the **Track Calibration** menu described in Section 3.4.1.2, see that section for details.

3.4.4 Status Monitor

The Status monitor icon is shown on the tool bar, but is disabled. This function is only available when logged into the Web UI in as the Admin user.

3.4.5 Reports and Logs

Selecting the **Reports and Logs** icon will result in the Web UI showing the following menu selections.

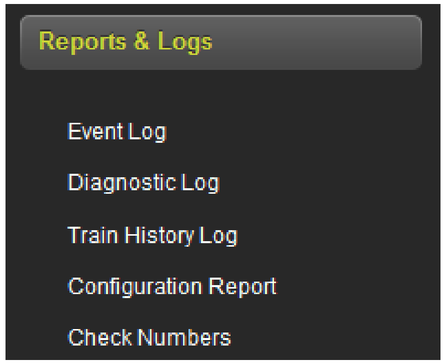


Figure 3-64 Web UI: Reports and Logs Menus

The Web UI will also display the last events in the event log when the Reports and Logs are first entered.

3.4.5.1 Event Log

The display contains an event log. The events in here are generated by the CPU and sent to the display where they are time stamped and added to the log. In a redundant 3000+ system, the Display log will contain events from both the main and standby systems.

The Web UI Event Log page allows the user to page through the event, download all or part of the log, or turn on a real time trace so new events get displayed as they are logged.

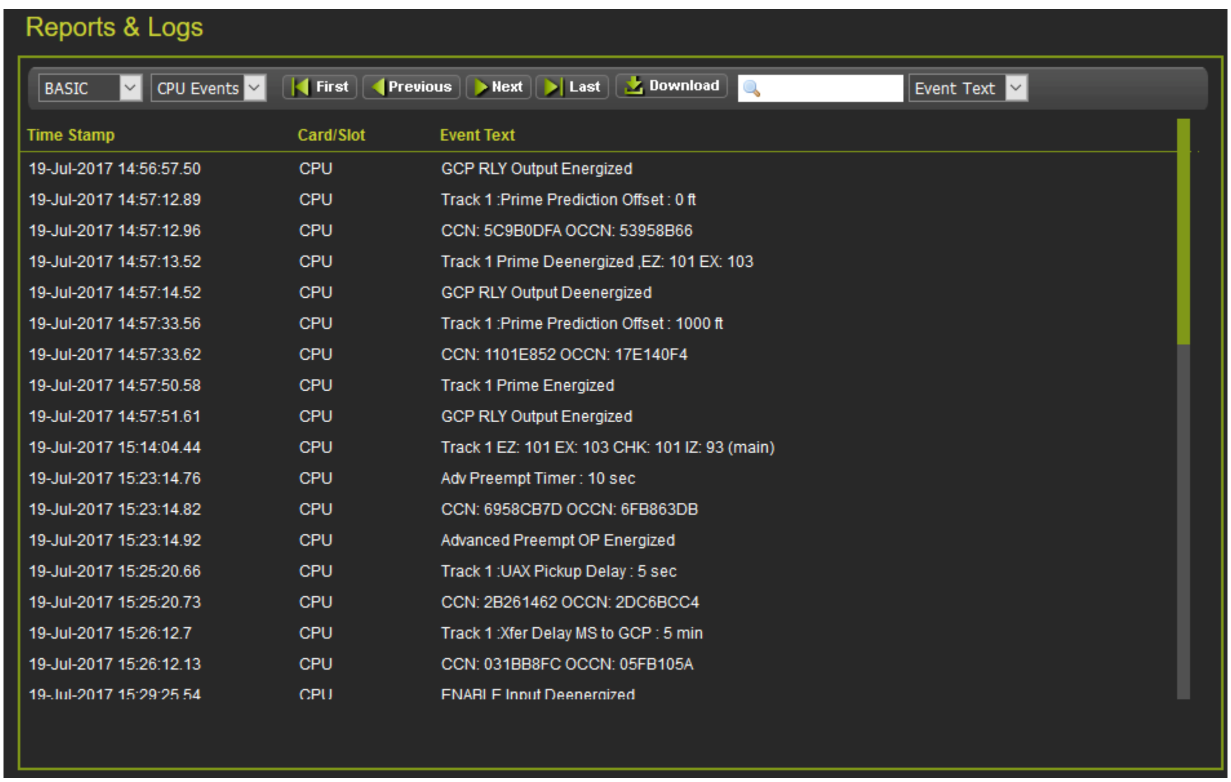


Figure 3-65 Web UI: Event Log

3.4.5.2 Diagnostic Log

The Diagnostic log contains entries for whenever a diagnostic message is generated or cleared. The events in here are generated by the CPU and sent to the display where they are time stamped and added to the log. In a redundant 3000+ system, the Display log will contain events from both the main and standby systems.

The Web UI diagnostic log page allows the user to page through the events, download all or part of the log, or turn on a real time trace so new events get display as they are logged.

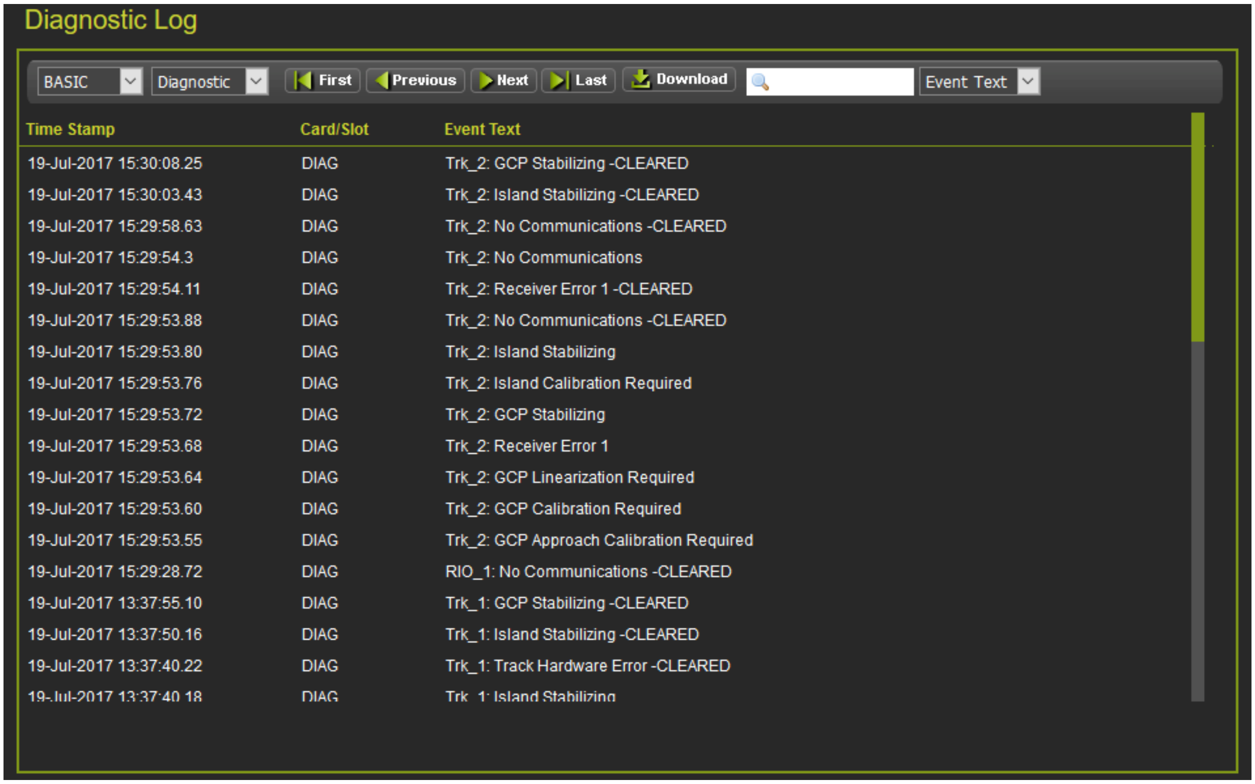


Figure 3-66 Web UI: Diagnostic Log

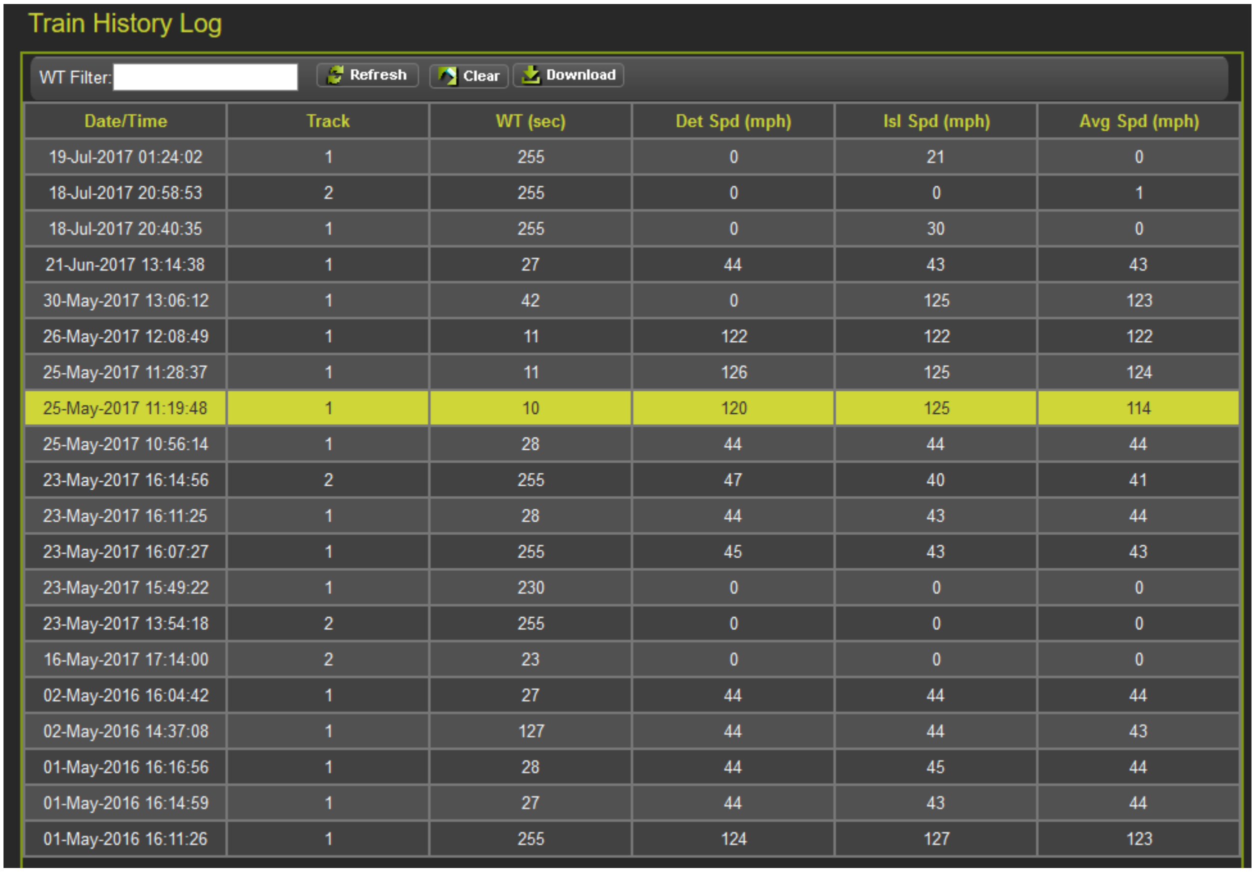
The menu bar allows navigation of the log and downloading is the same as for the Event Log. See the Event Log Section 3.2.5.5 for details.

3.4.5.3 Train History Log

The train history log contains a log of the last 20 train moves. The log shows the following:

- Trk - which track the train was detected on.
- WT – the recorded warning time in seconds.
- Det – the detected train speed.
- Isl – the train speed at the island.
- Avg – the average train speed.

If the units are set to standard in the Site Configuration, the speeds are shown in mph. If the units are set to metric, the speeds are shown in km/h.



Date/Time	Track	WT (sec)	Det Spd (mph)	Isl Spd (mph)	Avg Spd (mph)
19-Jul-2017 01:24:02	1	255	0	21	0
18-Jul-2017 20:58:53	2	255	0	0	1
18-Jul-2017 20:40:35	1	255	0	30	0
21-Jun-2017 13:14:38	1	27	44	43	43
30-May-2017 13:06:12	1	42	0	125	123
26-May-2017 12:08:49	1	11	122	122	122
25-May-2017 11:28:37	1	11	126	125	124
25-May-2017 11:19:48	1	10	120	125	114
25-May-2017 10:56:14	1	28	44	44	44
23-May-2017 16:14:56	2	255	47	40	41
23-May-2017 16:11:25	1	28	44	43	44
23-May-2017 16:07:27	1	255	45	43	43
23-May-2017 15:49:22	1	230	0	0	0
23-May-2017 13:54:18	2	255	0	0	0
16-May-2017 17:14:00	2	23	0	0	0
02-May-2016 16:04:42	1	27	44	44	44
02-May-2016 14:37:08	1	127	44	44	43
01-May-2016 16:16:56	1	28	44	45	44
01-May-2016 16:14:59	1	27	44	43	44
01-May-2016 16:11:26	1	255	124	127	123

Figure 3-67 Web UI: Train History Log

Select the **Clear** button to clear the event in the train history.

The WT filter is used to filter the train moves with warning times below or equal to this value. The value entered has to be between 23 and 99s. Enter the value and press equal, or refresh, and the Web UI will show the train moves that meet this criteria. To cancel the filter, delete the value then press enter.

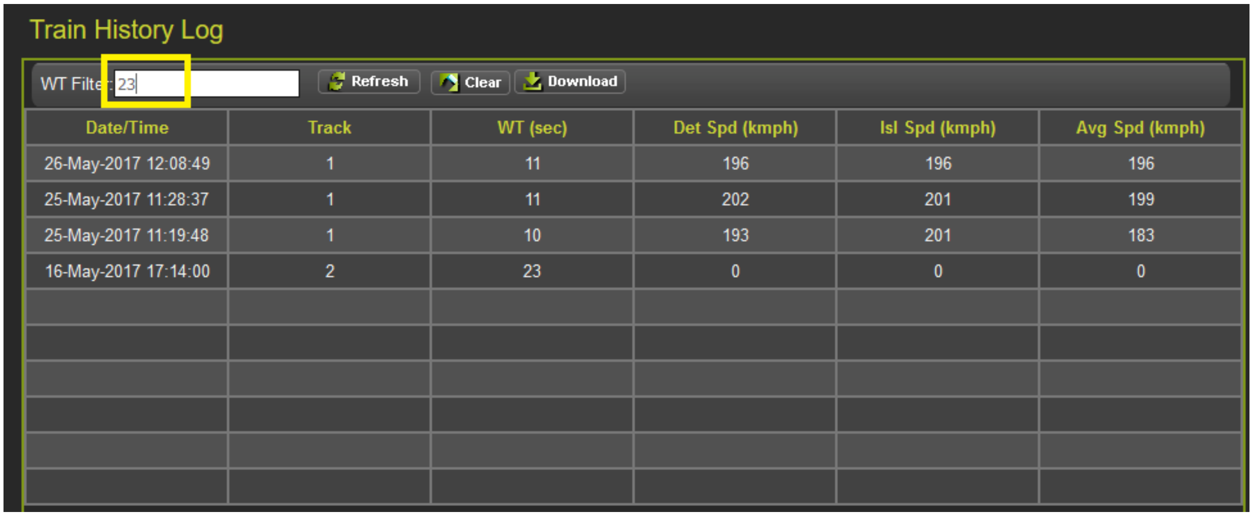


Figure 3-68   Web UI: Train History Log WT Filter

To download the train history log, press the **Download** button.

NOTE

NOTE
The download button will download the events shown on the screen. Clear the warning time filter first to download all events.

3.4.5.4   Configuration Report

Selecting the Configuration Menu will bring up the screen shown in the following figure. Press the **Create** button to create the report.

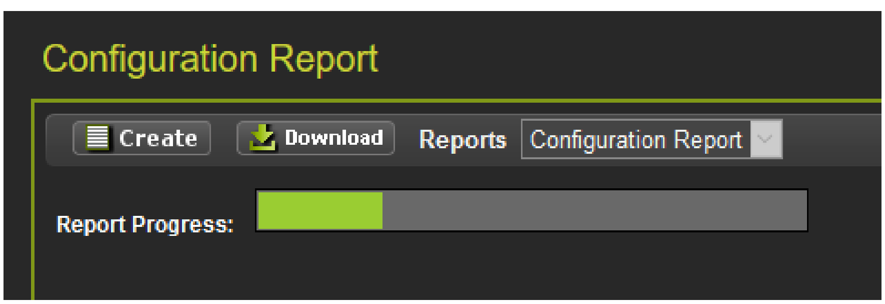


Figure 3-69   Web UI: Configuration Report Progress

After the report has been created, it will show up as illustrated in the figure below. Use the scroll bars to navigate it. Select the download button to save the report to the PC or open it in a separate file.

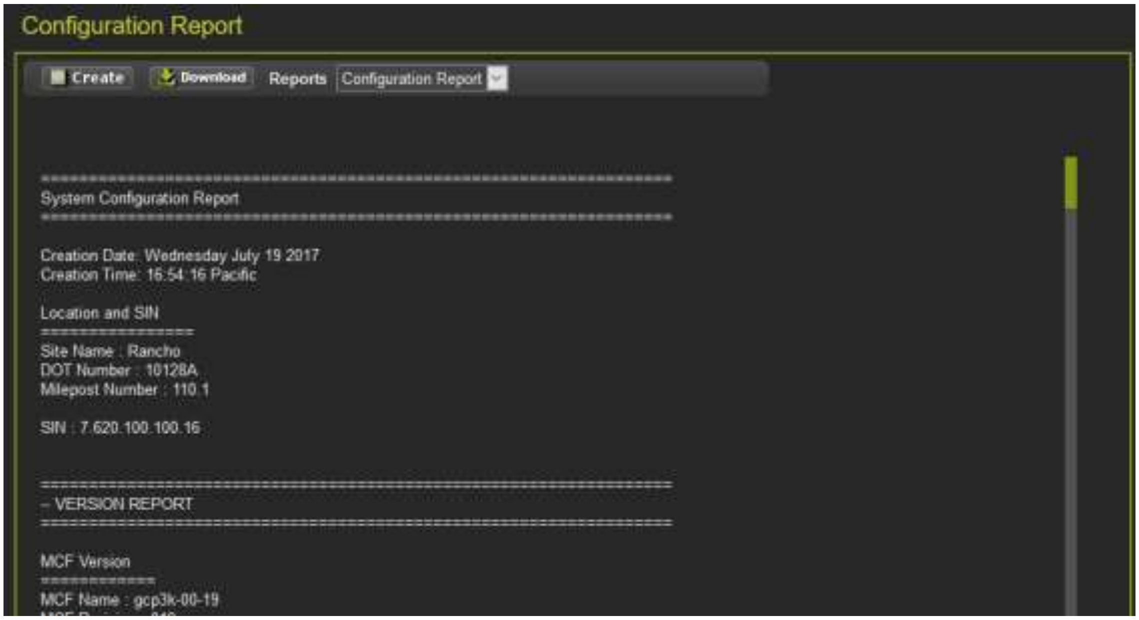


Figure 3-70   Web UI: Configuration Report

3.4.5.5   Check Numbers

This menu provides an alternative way to see the check number from the System View menu. The check numbers shown here are the same as described in Section 3.4.1.5.

3.4.6   Software Updates

When the software updates icon is selected, the Web UI will show the menu options illustrated in the following figure. The screen will open with the **Configuration** options.

Figure 3-71   Web UI: Software Updates

3.4.6.1 Configuration

This menu is used to download the configuration file (PAC file) from the 3000+ GCP or to upload a new one. The configuration file is known as the PAC file. The PAC file can be opened offline using the OCE tool (See manual SIG-00-11-15). The PAC file can be used as a back up to the 3000+ GCP configuration and loaded back into the system using the Upload Configuration step described in the Instruction and Installation Guide (SIG-00-17-03).

WARNING

UPLOADING A NEW CONFIGURATION WILL PUT THE GCP INTO A RESTRICTIVE STATE AND ACTIVATE THE CROSSING.

WARNING

IF A NEW CONFIGURATION FILE IS LOADED INTO THE GCP, THE GCP WILL HAVE TO BE RETESTED ACCORDING TO RAILROAD STANDARDS.

NOTE

The GCP must be running the same MCF that the PAC file was created for. If the PAC file is created for a different MCF, the Web UI will reject the upload.

3.4.6.2 Vital CPU / Module

NOTE

In order to load new software into a CPU II+ (A80903), track module (A80418) or RIO module (A80413), a serial cable with null modem needs to be connected between the serial port on the front of the display and the DIAG port on the module whose software is to be updated.

The Web UI can be used to update the software on the CPU II+, track or RIO module, select the Vital CPU / Module option.

3.4.6.3 Reset VLP Module

This menu is used to reset the VLP module.

3.4.6.4 Display

To update the software on the display, select the Display / Executive option; use the **Browse** button to select the correct tgz file for the display, then press **Upload**.

CAUTION

CAUTION	**CAUTION** ENSURE THAT THE FILE SELECTED IS ACTUALLY FOR THE DISPLAY (NAME HAS FORMAT ng5k_mef_x.y.zzr.tgz). LOADING THE TGZ FILE FOR A DIFFERENT PRODUCT MAY CAUSE THE DISPLAY TO GET LOCKED UP.

3.4.7 Local User Presence

Since the Web UI may be used to connect to the 3000+ GCP remotely, it is necessary to confirm that someone is present at the location before certain operations, such as changing GCP programming or re-calibration, can be performed.

To enable the GCP programming or calibration, first unlock the screen from the Web UI by pressing the **Unlock** button.

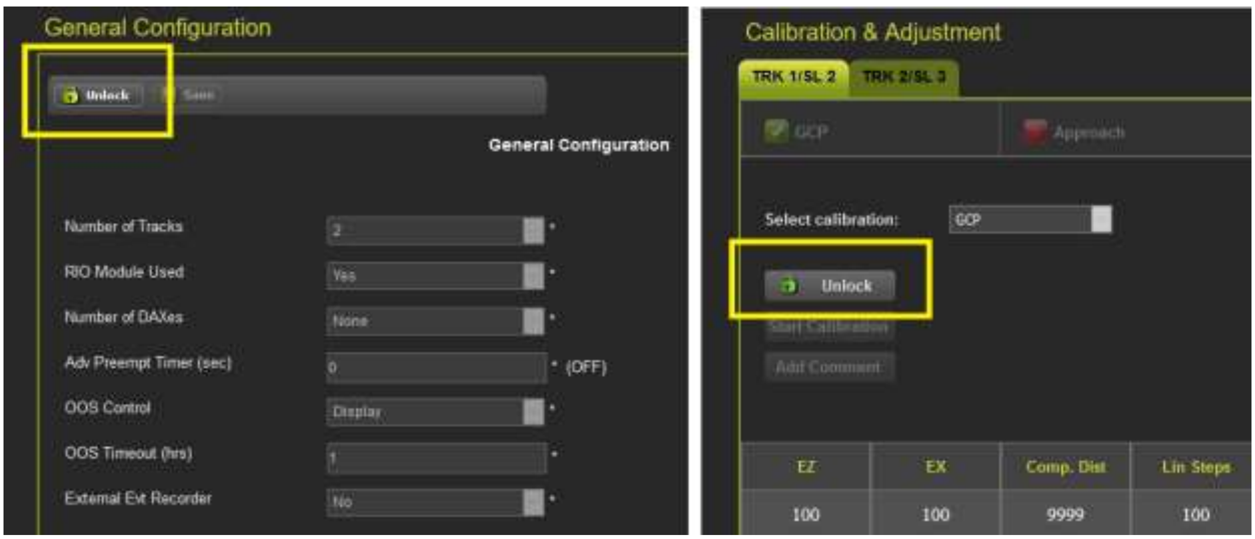


Figure 3-72 Web UI: Unlock

The Web UI will show the message below on the left, asking for confirmation to continue. Select **OK** and the Web UI will show the message below on the right.

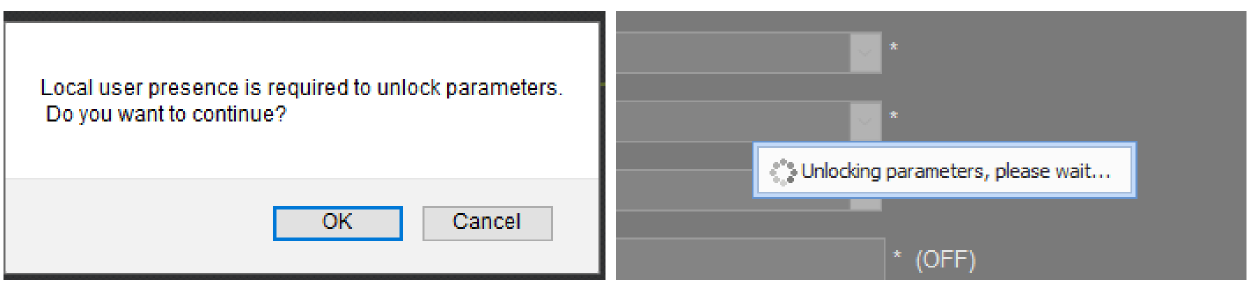


Figure 3-73 Web UI: Confirm Local User Presence

At this point, the display module will show the message in the following figure to the user in the field. The user in the field will press **Enter** to confirm that the remote user may continue, or the local user may deny the remote user editing access by pressing the back key.

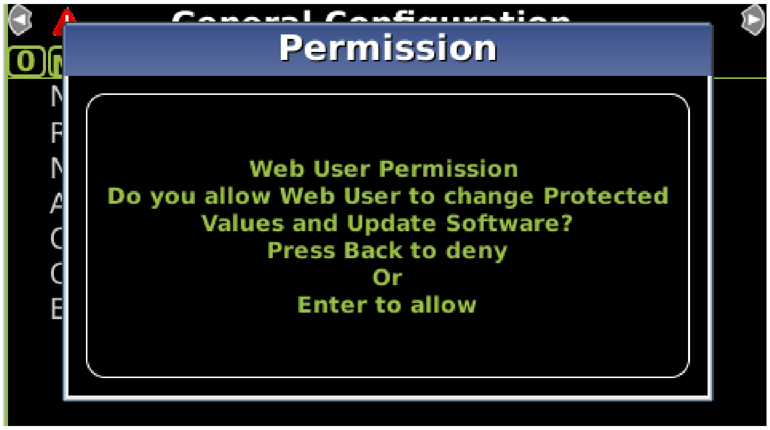


Figure 3-74 Display: Confirm Local User Presence

The local user can tell when a remote user still has **Editing** permission as the program and calibration screens will show the little blue man indication shown in the yellow box below.

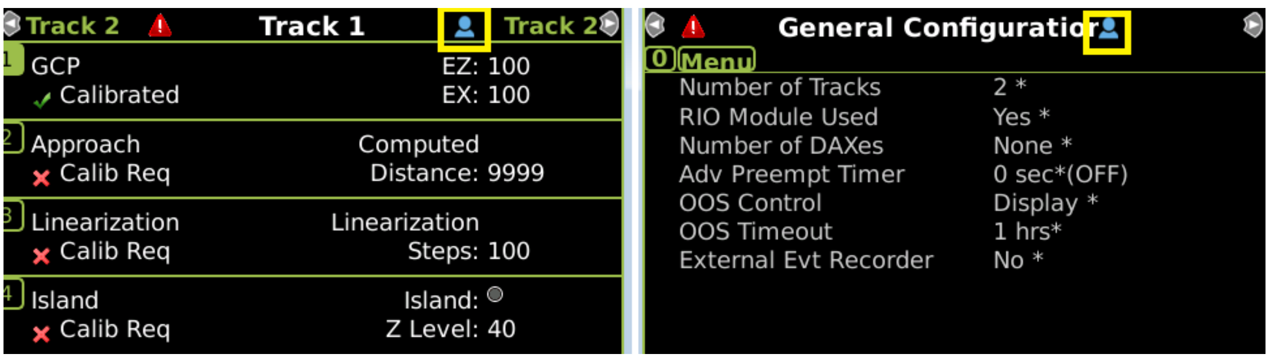


Figure 3-75 Display Local User Presence Indicator

3.4.8 Web UI Display / CPU Connecting

If the Display module is not in session with the CPU, it will be indicated with just a red exclamation point as illustrated in the top pane in Figure 3-76. During the connection process, the display will show the icon in the second pane below (boxed in yellow). The last pane indicates Creating Real Time Database.

Figure 3-76 Display Module Not in Session

When this is complete, the display will show the Diagnostics screen (if Diagnostic messages are present) or it will show the System View.

SECTION 4 PROGRAMMING USING THE MAIN PROGRAM MENUS

4.0 PROGRAMMING

The programming parameters in the Model 3000+ GCP are designed to match very closely with those of the old Model 3000 GCP so that users familiar with the 3000 GCP can easily understand the 3000+. Because of the difference in display modules used, the actual layout and means by which these parameters are entered is different.

The figures used to illustrate the GCP programming in this section will be taken from the local user interface of the display, and Web UI will show equivalent screens. This section will focus on the programming parameters themselves, rather than how to use the keypad and display or Web UI, see Section 3.0 for instructions on using these.

WARNING

WARNING

THE 3000+ GCP MUST BE PROGRAMMED CORRECTLY FOR THE LOCATION AND APPLICATION. FAILURE TO DO SO MAY RESULT IN SHORT OR NO WARNING TIME.

WARNING

WARNING

WHEN INSTALLING, TESTING, OR PERFORMING MAINTENANCE ON OR NEAR A 3000+ GCP SYSTEM, ENSURE ADEQUATE SAFETY PRECAUTIONS ARE TAKEN FOR PERSONNEL, VEHICULAR AND TRAIN TRAFFIC.

NOTE

NOTE

Please refer to the Railroad Installation Drawing or the Installation Plans for the exact parameters to be entered when programming the Model 3000+ GCP.

The 3000+ GCP programming is divided into three sections:

- Site Configuration
- GCP Programming
- Display Programming

4.1 SITE CONFIGURATION

This section is used to set non-vital information, such as the location, DOT number, ATCS address.

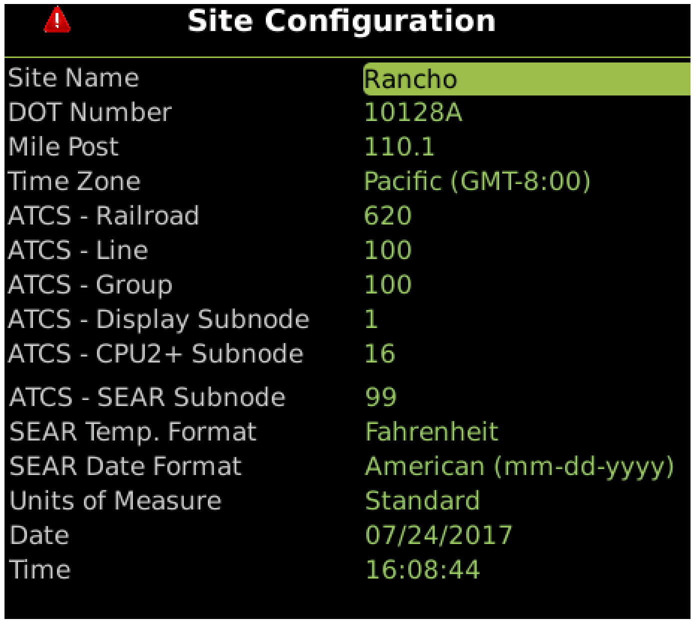


Figure 4-1 Site Configuration Menu

Site Name: Enter the site name, 0-20 characters

DOT Number: Enter the Department of Transportation (DOT) Number, if required, 0-7 characters

Milepost: Enter the milepost, if required, 0-11 characters

Time Zone: Select the appropriate Time Zone for the location

ATCS Address: The ATCS Address of the GCP CPU has the format 7.RRR.LLL.GGG.SS,

The ATCS Address is used if the 3000+ GCP is used to communicate with an external event recorder such as the Argus. The Argus and 3000+ GCP will need to have the same values for the RRR, LLL and GGG parts of the ATCS address. In order to get the two to communicate, the GCP needs to be configured with the SS part of the Argus' address.

Set the RRR using the ATCS – Railroad parameter, range 0-999, default 620

Set the LLL using the ATCS – Line parameter, range 0-999, default 100

Set the GGG using the ATCS – Group parameter, range 0-999, default 100

Set the SS using the ATCS – CPU II+ Subnode parameter, range 3-98, default 16

The ATCS Subnode of the display module using the ATCS – Display Subnode parameter, range 1-99, default 1.

If an external event recorder such as the Argus is used, set the ATCS Subnode of this using the ATCS – Argus Subnode parameter, range 1-99, the default is 99.

Units of Measure: Standard, Metric, the default is **Standard**. If the 3000+ GCP is configured for metric units:

- Distances will be shown on the display and Web UI screens and in logs in meters.
- Approach distances and offset distances can be programmed in meters.
- Speeds will be shown on the display, Web UI screens, and in logs as km/h.

Date: Use this to set the date. This is used for time stamping the log entries.

Time: Use this to set the time. This is used for time stamping the log entries.

4.2 GCP PROGRAMMING

The following table shows a list of the available GCP programming parameters. The Track column indicates whether a separate parameter is available for each track.

Table 4-1 GCP Programming Parameters

GCP Programming Parameter	Range	Default Value	Track	Reference	Included in OCCN
Number of Tracks	1-2	2	N/A	4.2.2	Yes
RIO Module Used	Yes, No	Yes	N/A	4.2.2	Yes
Number of DAXs	None,1-4	None	N/A	4.2.2	Yes
Adv Preempt Timer (sec)	0s (off), 1-500	0 (off)	N/A	4.2.2	Yes
OOS Control	Display, Display+OOS IPs, OOS IPs	Display	N/A	4.2.2	Yes
OOS Timeout (hrs)	0-23	1	N/A	4.2.2	No
External Evt Recorder	Yes, No	No	N/A	4.2.2	No
GCP Frequency	Not Set,86-999Hz (see later for specific values)	Not Set	T1 / T2	4.2.3	Yes
Unidirnl/Bidirnl	Bidirnl, UniDirnl	Bidirnl	T1 / T2	4.2.3	Yes
GCP XMIT level	Medium, High	Medium	T1 / T2	4.2.3	No
Prediction/MS Mode	Pred, MS	Pred	T1 / T2	4.2.3	Yes
Approach Distance (ft)	0-9999	9999	T1 / T2	4.2.3	Yes
Island Used	Internal, External Not Used	Internal	T1	4.2.3	Yes
Island Used	Internal, External Not Used T1Isl	Internal	T2	4.2.3	Yes

GCP Programming Parameter	Range	Default Value	Track	Reference	Included in OCCN
Island Distance (ft)	0-999	120	T1 / T2	4.2.3	No
Isl Frequency	Not Set, 2.14kHz - 20.2kHz (see later for specific values)	Not Set	T1 / T2	4.2.3	Yes
Isl Pickup Delay (2s+) (sec)	0-6s	0s	T1 / T2	4.2.3	Yes
Prime Warning Time (sec)	23-99s	25s	T1 / T2	4.2.3	Yes
Prime Prediction Offset (ft)	0-9909ft	0 ft	T1 / T2	4.2.3	Yes
Pickup Delay Mode	Auto, Fixed	Fixed	T1/T2	4.2.3	Yes
Prime Pickup Delay (sec)	8-500s	15s	T1 / T2	4.2.3	Yes
UAX Pickup Delay (sec)	0 (Not Used), 1-500	0 (Not Used)	T1 / T2	4.2.3	Yes
Enhanced Detection	On(Max), On(High), On(Med), On(Low), Off	On (High)	T1 / T2	4.2.3	Special (see section 4.5.2)
Speed Limiting Used	Yes, No	Yes	T1 / T2	4.2.3	No
Station Stop Timer (sec)	10-120	20	T1 / T2	4.2.3	No
Trailing Switch Logic	On, Off	On	T1 / T2	4.2.3	No
Low EZ Detection Used (EZ=70)	Off, On	Off	T1 / T2	4.2.3	Yes
Low EZ Detection Time (mins)	2-99	20	T1 / T2	4.2.3	Yes
Positive Start EZ Level	0 (OFF), 1-80	0 (OFF)	T1 / T2	4.2.3	Special (see section 4.5.2)
Positive Start Timeout			T1 / T2	4.2.3	Yes
Sudden Shunt Detn Level	0 (OFF), 0-75	0 (OFF)	T1 / T2	4.2.3	Special (see section 4.5.2)
Sudden Shunt Detn Offset	0-9999	0	T1 / T2	4.2.3	Yes
DAX A Track Assignment	Track 1, Track 2	Track 1		4.2.4	Yes

GCP Programming Parameter	Range	Default Value	Track	Reference	Included in OCCN
DAX A Warning Time (sec)	0-99	25	N/A	4.2.4	Yes
DAX A Offset Distance (ft)	0-9999	99	N/A	4.2.4	Yes
DAX A Pickup Delay Mode	Fixed, Auto	Auto	N/A	4.2.4	Yes
DAX A Pickup Delay (sec)	8-500	15	N/A	4.2.4	Yes
DAX B .. DAX D as per DAX A				4.2.4	
Same parameters as above for DAX B, C, D					
MS Sensitivity Level	Normal, 20,40,60,80,100	Normal	T1 / T2	4.2.5	No
Switch MS EZ level	0-100	10	T1 / T2	4.2.5	Yes
Xfer Delay MS to GCP (min)	0 (Not used), 1-60mins	0 (Not used(	T1 / T2	4.2.5	Yes
Prime Xfer MS to GCP	Off, On	Off		4.2.5	Yes
DAX A Xfer MS to GCP	Off, On	Off		4.2.5	Yes
DAX B Xfer MS to GCP	Off, On	Off		4.2.5	Yes
DAX C Xfer MS to GCP	Off, On	Off		4.2.5	Yes
DAX D Xfer MS to GCP	Off, On	Off		4.2.5	Yes
Low EX Adjustment	0-5	0	T1 / T2	4.2.6	No
Compensation Value	1000-2000	1300	T1 / T2	4.2.6	No

The following figures show each menu under GCP Programming in the order in which they appear. The values shown are all defaults, with the exception of “Number of DAXes,” this is set to 4 so that the DAX programming screens can be seen.

4.2.1 Main Program Menu

The Main Program Menu provides menus that allow the user to navigate the top level of different sections of the program.

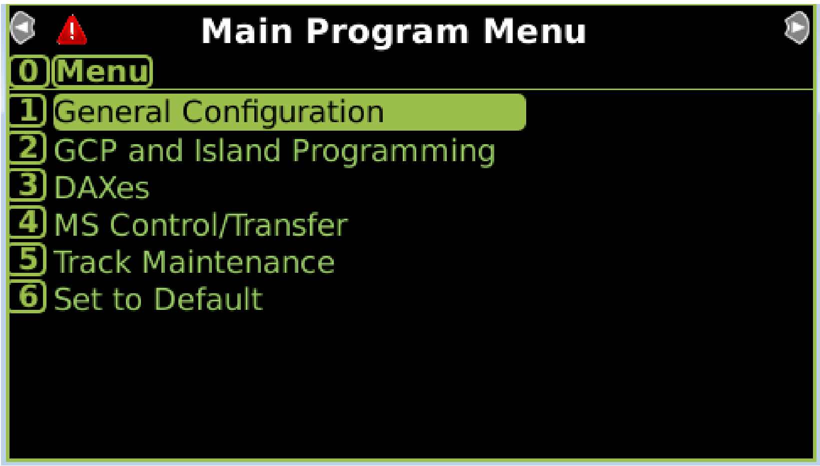


Figure 4-2 Main Program Menu

4.2.2 General Configuration

The General Configuration menu allows the user to configure top level system parameters.

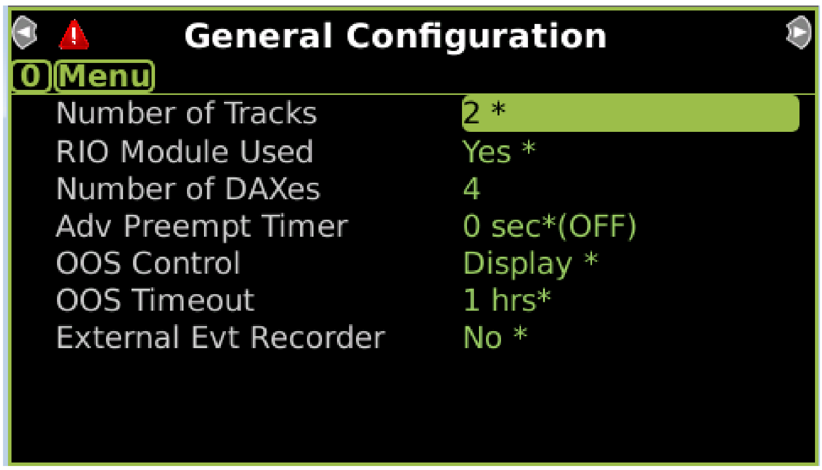


Figure 4-3 General Configuration

Number of Tracks: 1 or 2, the default is 2. Use this to set the number of track modules used.

RIO Module Used: Yes, No, the default is Yes. Use this to set whether the RIO module is used or not.

The RIO module will only be needed when the application requires:

- DAX Relay outputs
- DAX Preempt Outputs, for example, use with Advance Preemption
- Inputs from external island circuits, e.g. DC islands
- An Enable input
- Logic to switch GCP to MS mode

If the RIO module is used for normal operation, the Enable input (RIO input 1) and the GCP/MS Control input (RIO input 2) will normally need to be energized. The use of RIO inputs 3 and 4 is optional. These are used when an external DC island is used in place of the internal island on the track module.

If the RIO module is not used, the Enable and GCP/MS Control inputs do not need to be wired.

Number of DAXes: None or 1-4, the default is None. Set this to indicate how many DAXes are used. This option is not visible on the menu when **RIO Module Used** is set to **No**. The DAXes programming is described in Section 4.2.7.

Adv Preempt Timer: 0-99 seconds. If Advance Preemption is not used, set this to 0 (display will indicate **OFF**). If Advance Preemption is used, set the value of the timer to indicate the delay required between the preempt output de-energizing and the GCP RLY de-energizing. A DAX will be required to be configured as a Preempt, i.e. with an offset distance of 0. See Section 1.5.8 for description of setting up an application for Advance Preemption.

OOS Control: Display, Display+OOS IPs, OOS IPs, default Display. The 3000+ GCP provides a feature that was not available on the 3000 GCP. This is the ability to take a track out of service without having to jumper the XR relay externally. The Out of Service feature provides 3 modes of operation:

- Display – in this mode, the user can take either the GCP approach, or the Island out of service just using display module, no external wiring is required.
- Display+OOS IPs – in this mode, the out of service input for the specific track module (IN2) first has to be energized and then the user can take either the GCP approach, or the Island out of service using display module.
- OOS IPs – in this mode only the Out of Service input for the specific track module (IN2) is required to be energized to take the GCP and the island out of service, there is no user input needed on the display. Both the GCP and Island are taken out of service when this mode is used; the user cannot choose to just take the GCP approach out of service as in the other modes.

OOS Timeout: 0-23 hrs, default 1hr. The Out of Service feature provides a time-out feature to protect against the GCP being accidently left out of service. When any track is taken out service, the timer is started with its configured value. When the timer expires, all out of service GCPs and Islands are put back into service. When this is set to 0, this means that the Out of Service timeout is not used.

NOTE

NOTE

The Out of Service timer is started when any GCP or island is first put out of service. The timer is not restarted when the second track is taken out of service.

WARNING

WARNING

THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A TRACK CIRCUIT OUT OF SERVICE SHALL BE FOLLOWED. THE INSTRUCTIONS IN THIS SECTION MAY BE FOLLOWED ONLY IF ALLOWED BY THE RAILROAD. REQUIRED OPERATIONAL TESTS SHALL BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES WHEN RESTORING TRACKS TO SERVICE. THE RAILROAD PROCEDURES FOR APPLYING TEMPORARY JUMPERS MUST BE FOLLOWED WHEN ENERGIZING THE “OUT OF SERVICE” INPUT(S).

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.

If the OOS Control is set to **OOS IPs**, and a track is taken out of service by energizing an input, this will start the OOS Timeout timer. When the timer expires, the track will be put back in service, even though the Track OOS input is still energized; however, if the CPU were to reboot, for example by switching from the main to the standby side in a redundant configuration, the track will go out of service again and the Out of Service timer will be restarted.

If the OOS Control is set to **Display** or **Display+OOS IPs**, a track is taken out of service, and the CPU was then to reboot, (for example, by switching from the main to the standby side in a redundant configuration) the tracks will remain in service unless specifically taken out of service again using the display.

WARNING

IF OOS CONTROL IS SET TO OOS IPS, AND "TRK OOS INPUT" IS ENERGIZED, AND THE CPU IS REBOOTED, THE OOS TIMER WILL RESTART AND THE TRACK WILL GO OUT OF SERVICE.

External Evt Recorder: Yes, No, the default is No. Use this to indicate whether an external event recorder is used with the 3000+ GCP, for example the SEAR II, Wayside Inspector, or Argus.

4.2.3 GCP and Island Programming

The GCP and Island screen provides menus that allow the user to navigate to different GCP sections of the program for track 1 or 2. If the number of tracks is set to 1, the track 2 menus are not visible.

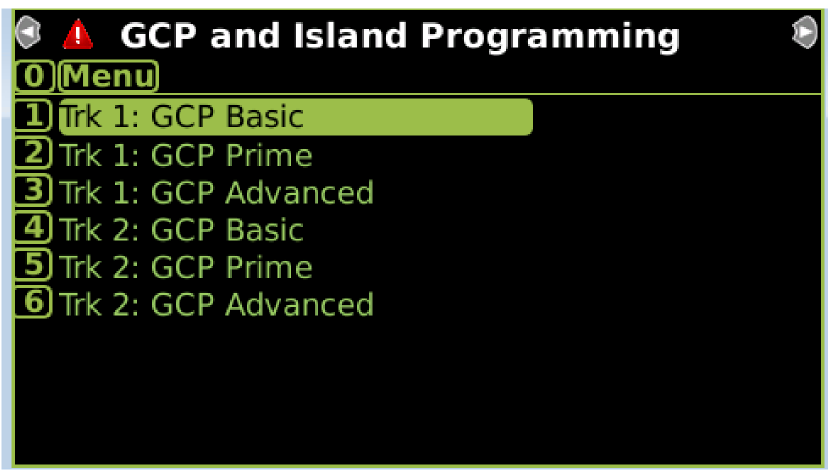


Figure 4-4 GCP and Island Programming

4.2.4 Trk 1 / 2 GCP Basic

The Trk 1: GCP Basic screen allows the user to configure essential parameters for track 1. Track 2 has an identical screen.

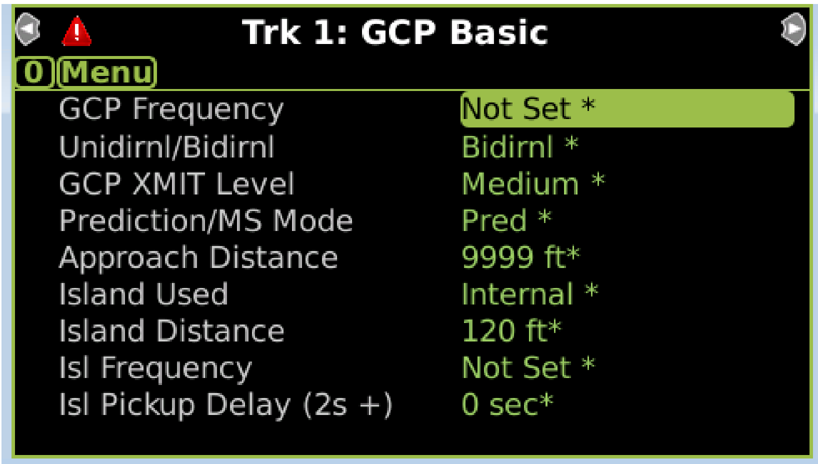


Figure 4-5 Track 1 GCP Basic

GCP Frequency: The GCP frequency provides a set of discrete values that the user can choose from (unlike the 3000 GCP where the frequency is adjustable in 1Hz intervals). The default is **Not Set**.

The frequencies are separated into 3 groups:

Standard Frequencies: 86, 114, 156, 211, 285, 348, 430, 525, 645, 790, 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, 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, 999 Hz

Standard frequencies will be the most commonly used.

See the Section 2.1 for rules regarding selection of GCP frequencies and offset frequencies.

Unidirnl/Bidirnl: Unidirnl, Bidirnl, the default is Bidirnl. Use this to set whether the track module has a unidirectional or bidirectional approach. If a simulated bidirectional circuit is used on a unidirectional approach set this to Bidirectional (see Section 6.11.1).

GCP XMIT Level: Medium, High, the default is Medium. Medium is used in most applications. High is used in applications where there are large amounts of noise on the track.

Prediction/MS Mode: Pred, MS, the default is MS. If this is set to MS, the Prime and DAX Preempts (DAXes with zero offset distance) will be set to motion sensor mode.

Approach Distance: 1-9999 feet. Used to set the approach distance.

Island Used: Internal, External, No, T1 ISL, the default is Internal. This is used to select which type of island circuit is used. To use the internal island on the track module, set the island to **Internal**, then set the island frequency. If no island is used, for example in a remote application, set this to **No**. If some other external equipment provides the island, for example a DC island, set this to **External** and wire the output from the external island to the RIO input 3 Ext Island 1 for track 1, or RIO input 4 Ext Island 2 for track 2.

For a back-to-back location where this is an insulated joint at a crossing, track 1 will always have the island, so select the appropriate value from **Internal** or **External**. Track 2 will share the island information from track 1, so set **Trk 2 Island Used** to the value T1 ISL.

Island Distance: 0 – 999 ft, the default is 120. Set this to define the length of the island. This value is always visible and does not depend upon the **Island Used** selection. This value is used in DAXing applications to determine the Post Joint detection time and in some cases, this value is required even when there is no actual island circuit.

Isl Frequency: Not Used, 2.14, 2.63, 3.24, 4.0, 4.0, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5 20.2 kHz. This is only visible when **Island Used** is set to **Internal**. Use this to set the frequency of the internal island, see Section 2.12.3 for rules regarding selection of island frequencies.

Isl Pickup Delay (2s+): 0-6 seconds, the default is 0. This setting is only visible when **Island Used** is set to **Internal**. Use this to set the pickup delay for the internal island. The island has a built-in pickup delay of 2s, the value selected here adds additional time to the 2s.

Isl Pickup Delay: 0-500 seconds, the default is 1. This setting is only visible when **Island Used** is set to **External**. Use this to set the pickup delay for the external island. The external island may already have a built-in pickup delay; use this value to add additional time to the pickup delay provided by the external equipment.

4.2.5 Trk 1 / 2 GCP Prime

The Trk 1: GCP Prime screen allows the user to configure parameter related to the operation of the Prime predictor on track 1. Track 2 has an identical screen.

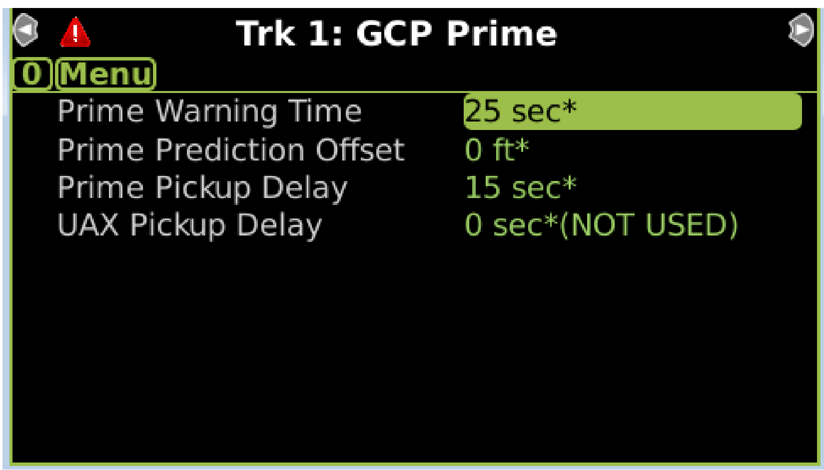


Figure 4-6 Track 1 GCP Prime

Prime Warning Time: 23 – 99 seconds, the default is 25. Set this to set the warning time for the Prime predictor.

Prime Prediction Offset: 0-9999 feet, the default is 0. Use this to set the offset distance for the prime prediction. This is only used when the track module is being used at a remote location where there is no island.

WARNING

WHEN A GCP TRACK CIRCUIT INCLUDES AN ISLAND, DO NOT USE PRIME PREDICTION OFFSET. WHEN THE PRIME PREDICTION OFFSET IS SET TO A VALUE GREATER THAN 0, THE ISLAND CIRCUIT DOES NOT DE-ENERGIZE THE PRIME OUTPUT. THE WARNING SYSTEM WILL RECOVER WITH A TRAIN OCCUPYING THE ISLAND CIRCUIT AFTER THE PRIME PICKUP TIMER RUNS OUT.

Pickup Delay Mode: Auto, Fixed, the default is Fixed. This parameter is only visible if the **Prime Prediction Offset** is set to a non-zero value. This parameter is used to determine how the pickup delay is calculated for post joint detection predictions. If the mode is set to **Auto**, the track module will calculate a pickup delay such that the Prime will pick up when the train is predicted to reach the remote crossing (i.e. a distance down the track equal to the prime prediction offset).

If the mode is set to **Fixed**, the track module will calculate a pickup delay such that the Prime will pick up when the train is 8s past the insulated joint. The Island Distance programmed in Section 4.2.3 is used in the calculations to determine the position of the joints.

Prime Pickup Delay: 8-500 seconds, the default is 15. Used to set the pickup delay for the prime predictor. The pickup delay will start when motion stops, and when the delay has elapsed, the Prime will pick up. The pickup delay may be truncated after the train leaves the island. This pickup delay will not apply in all cases when the Prime Prediction Offset is not 0.

UAX Pickup Delay: 0-500 seconds, the default is 0 (Not Used). Use this to indicate whether the UAX input and its pickup delay is used or not: 0 means that the UAX is not used. When the UAX is used, set the appropriate pickup delay by entering a non-zero value here. The appropriate UAX input, Track 1 IN 1 or Track 2 IN 1 will need to be wired, see Section 7.3.3.

4.2.6 Trk 1 / 2 GCP Advanced

The Trk 1: GCP Prime screen allows the user to configure advanced parameter settings related to the operation of the track 1. Track 2 has an identical screen.

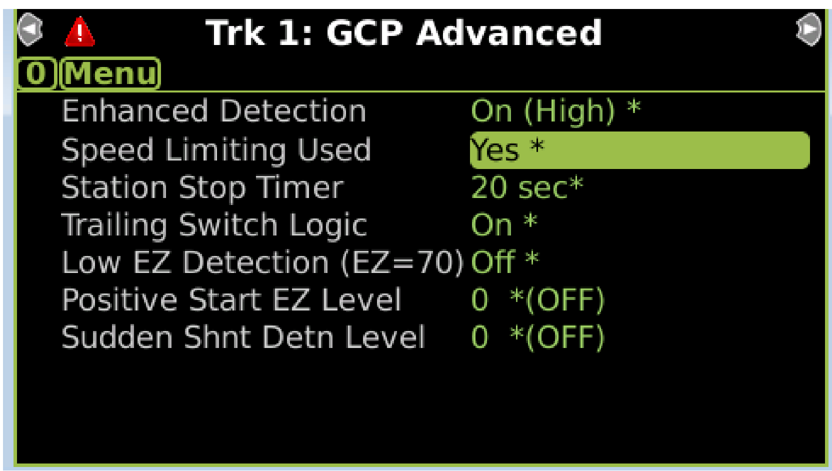


Figure 4-7 Track 1 GCP Advanced

The last three items shown above have additional parameters that are visible when they are enabled as shown in Figure 4-8.

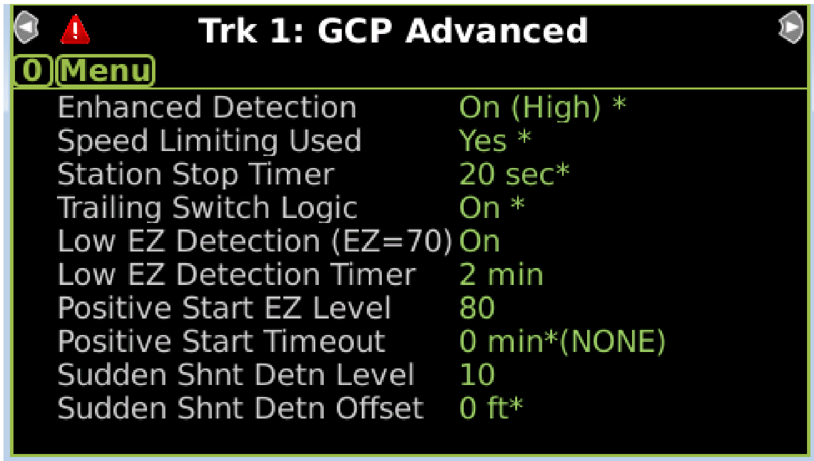


Figure 4-8 Track 1 GCP Advanced Cont.

Enhanced Detection: Off, On (Max), On (High), On (Med), On (Low), default On (High). Allows use of 3000+ GCP in areas where poor track shunting conditions may occur. On (Max) provides the highest sensitivity for detecting poor shunting, while On (Low) provides the least sensitivity and Off turns it off. The default setting of On (High) is generally used for most applications.

When inbound poor-shunting is detected on a specific Track Module, the track module will:

- Immediately cause the Prime and all DAX predictors to de-energize and automatically switch all the 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). The track module will continue to operate as conventional grade crossing predictor as long as poor shunting conditions are not detected.

NOTE

NOTE

Enhanced Detection activation can result in longer than programmed Warning Times at:

- Remote prediction (DAX) locations
- Crossings where slower trains are encountered

Enhanced Detection should be used where passenger trains, commuter, or other light rail vehicles operate.

Speed Limiting Used: Yes, No, the default is Yes. This is a feature that is very useful when poor shunting or track related discontinuities occur in EZ. On the Model 3000+ GCP, an additional highly sensitive motion detection operation is in use to detect inbound motion when trains first enter an approach. When this inbound train motion is detected, the GCP switches from the 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.

Station Stop Timer: 10-120s, the default is 20s. The Station Stop Timer is used to prevent poor shunt detection causing false activations for trains that make a station stop after passing the crossing. Poor shunt detection may:

- occur as the train departs from the station
- result in tail rings

The timer is initiated automatically when a train stops after leaving the island circuit. The timer should be programmed for an interval longer than the time the train normally remains stopped at the station.

Trailing Switch Logic: On, Off, the default is On. This is used to prevent tail rings caused by the wheel noise of a train entering the approach on a trailing switch. It can be left on for most applications.

Low EZ Detection (EZ=70): Off, On, the default is Off. This is used to turn on the Low EZ detection function which is used to detect false shunts left on the track. When Low EZ Detection is turned on, if the EZ drops below 70 for a time exceeding the configured Low EZ Detection Timer value, the GCP RLY output for the configured track will be de-energized and the track is determined to be unhealthy.

Low EZ Detection Timer: 2-99 min, the default is 2. This is only visible when Low EZ Detection (EZ=70) is set to **On**. Use this to set the time after which a track is declared unhealthy if EZ remains under 70.

Positive Start EZ Level: 0-80, the default is 0 (OFF). When this is set to a non-zero value, the positive start function is active. When EZ drops to below the configured EZ level, the GCP RLY will de-energize and remain de-energized until either:

1. The train occupying the island leaves the island,
2. EZ rises by 5 points above this level or
3. EZ is less than the Positive Start EZ Level for more than the configured value of the Positive Start Timeout (when this is not set to 0).

Positive Start Timeout: 0-99 mins, the default is 0 (NONE). This is only visible when Positive Start EZ Level is not zero. When this is set to 0 (NONE), the positive start will not time out, the GCP RLY will remain de-energized while conditions 1 and 2 are not met above. When this is set to a non-zero value, the positive start will time out after this time and GCP RLY will energize even if EZ is still less than the Positive Start EZ Level.

Sudden Shnt Detn Level: 0-75, the default is 0 (OFF). Sudden Shunt Detection is used to 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. Set **Sudden Shnt Detn Level** to 0 when this feature is not used. When Sudden Shunt Detection is to be used, set the **Sudden Shnt Detn Level** to an EZ level value 10 point higher than the EZ level observed when a hardwire shunt is placed at the joints, see Section 5.8.7 for details. When sudden shunt is detected, the GCP RLY and all DAX Preempt assigned to this track will de-energize.

Sudden Shnt Detn Offset: 0-9999 ft, the default is 0. When the value is set to 0, DAXes (with non-zero offset distance) are not affected by the Sudden Shunt. If **Sudden Shnt Detn Offset** is set to a non-zero value, all DAXes with an offset distance less than this value will also be de-energized when Sudden Shunt is detected.

4.2.7 DAXes

The DAXes screen provides menus that allow the user to navigate to the programming screen for DAXes. The menu will only show enabled DAXES; for example, if Number of DAXes is set to 1, only DAX A is visible.

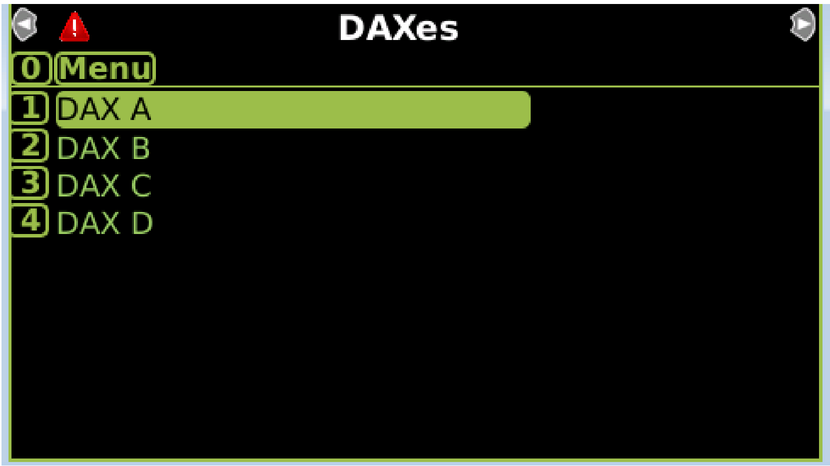


Figure 4-9 DAXes

4.2.8 DAX A to DAX D

The DAX A to DAX D screens allow the user to set the configuration for enabled DAXes. The properties for DAX A are described below, DAX B, C and D have similar properties.

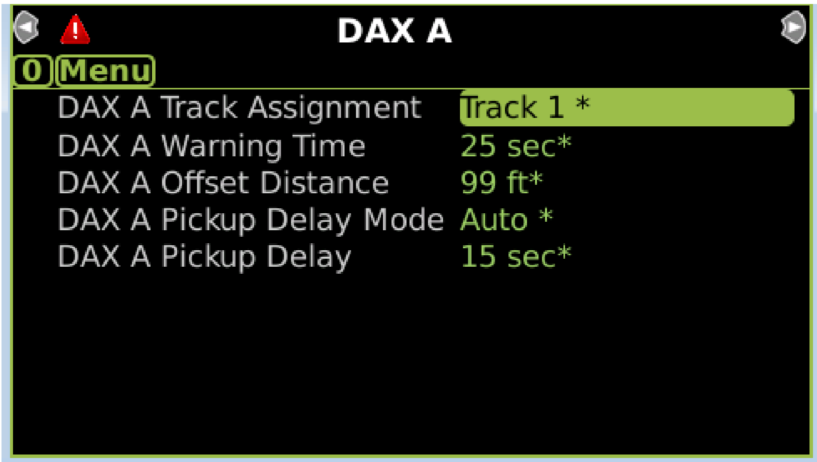


Figure 4-10 DAX A

DAX A Track Assignment: Track 1, Track 2, the default is Track 1. Use this to set which track is being used to control the DAX RLY output.

DAX A Warning Time: 23-99 seconds, the default is 25. This is used to set the warning time for the DAX.

DAX A Offset Distance: 0-9999 feet, the default is 99. This is used to set the offset distance for the DAX. If the offset distance is set to 0, the DAX is used as a Preempt and the display screen will show this as follows.

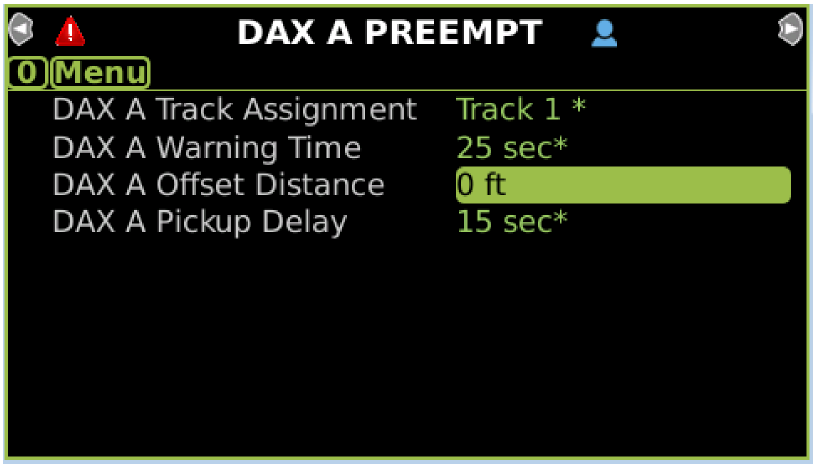


Figure 4-11   DAX A PREEMPT

NOTE

NOTE

When a DAX has an offset, the DAX RLY output will not be de-energized if the island is occupied, or the ENABLE input or UAX input is de-energized.

DAX A Pickup Delay Mode: Auto, Fixed, the default is Auto. This parameter is only visible if the **DAX A Offset** is set to a non-zero value. This parameter is used to determine how the pickup delay is calculated for post-joint detection predictions. If the mode is set to **Auto**, the track module will calculate a pickup delay such that the DAX will pick up when the train is predicted to reach the remote crossing (i.e. a distance down the track equal to the DAX Offset Distance).

If the mode is set to **Fixed**, the track module will calculate a pickup delay such that the DAX will pick up when the train is 8s past the insulated joint. The Island Distance programmed in Section 4.2.3 is used in the calculations to determine the position of the joints.

DAX A Pickup Delay: 8-500 seconds, the default is 15. Used to set the pickup delay for the DAX. The pickup delay will start when motion stops. The DAX RLY will energize when the delay has elapsed. If the DAX has a 0 offset distance (i.e. DAX preempt) the pickup delay may be truncated after the train leaves the island. This pickup delay will not generally be used in through train moves when the DAX Offset Distance is not 0 as the rules governing the Auto and Fixed pickup delays described above will dictate the actual pickup delay.

4.2.9 MS Control / Transfer

The MS Control / Transfer screen provides menus that allow the user to navigate to the programming screen for these functions for each track.

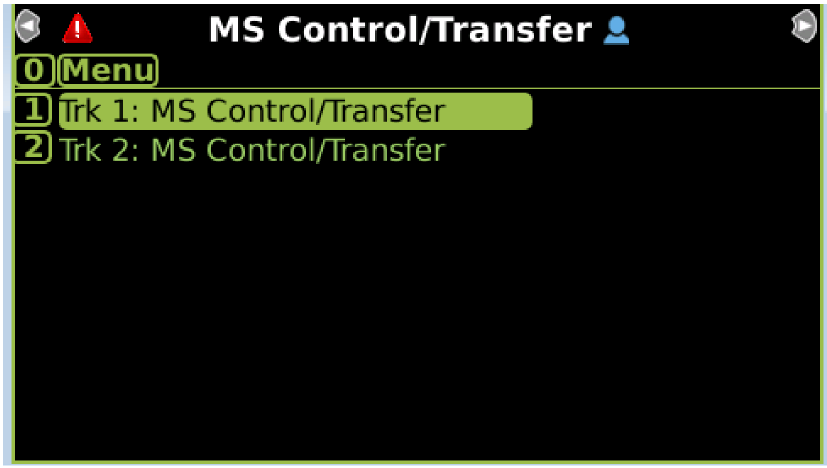


Figure 4-12 MS Control / Transfer

4.2.10 Trk 1 / 2: MS Control / Transfer

This screen allows the user to configure settings related to the use of the 3000+ GCP as a motion sensor.

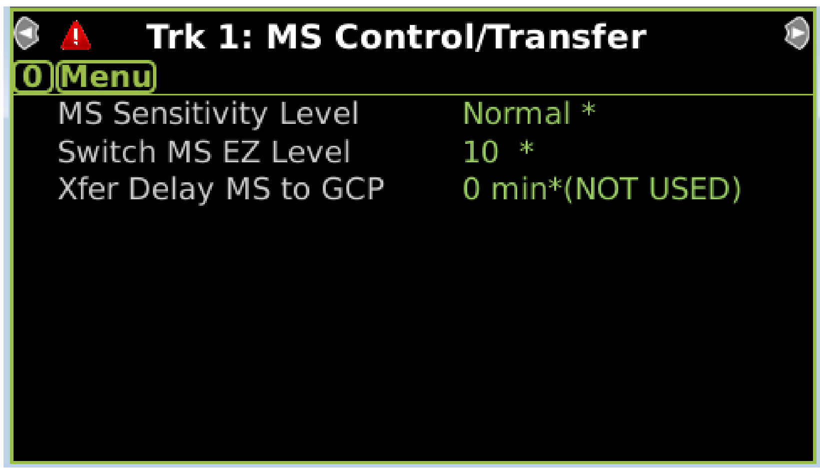


Figure 4-13 Trk 1: MS Control / Transfer

MS Sensitivity Level: Normal, 20, 40, 60, 80, 100, the default is Normal. Motion sensing sensitivity can be adjusted on each track using the **MS Sensitivity Level** field parameter. Table 4-2 shows the variation in motion sensing detection relative to train speed at the far end of the approach. In most general applications, this can be left at **Normal**.

As an example:

- The value of Normal provides motion sensitivity of approximately 30 mph at the end of a 3000-foot approach and approximately 1 mph at the feed points.
- The value of 100 provides motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach.

Table 4-2 MS Detection Threshold Relative to Sensitivity Level Setting for 3000 Foot Approach

MOTION SENSITIVITY LEVEL VALUE	MOTION SENSING DETECTION THRESHOLD IN MPH
Normal	30
20	24
80	6
100	1

Switch MS EZ Level: 0 -100, the default is 10. This is used to control the point near the crossing at which the track module switches from being a predictor to a motion sensor. When the prime or a DAX has an offset, it is not affected by this setting.

Xfer Delay MS to GCP: 0-60 mins, the default is 0 (Not Used). This parameter is primarily used when there is a station stop on the approach close to a crossing. When the train stops at the station and then restarts, it is desirable to detect the train as quickly as possible and activate the crossing. This feature allows the GCP to be held as a motion sensor while the train is stopped at the station so that it can be detected more quickly as it restarts. When the train is detected as having stopped, the transfer delay will start and the Prime and all Preempt predictors assigned to this track will be held as motion sensors, until a time equal to the configured value of **Xfer Delay MS to GCP** has elapsed. When the GCP/MS Control input energizes, it will also start the transfer timer for the track if the **Xfer Delay MS to GCP** is non-zero. See Section 5.8.3.1 for a details of how to use this feature.

The following parameter may also be visible when the Xfer Delay MS to GCP is used.

When the Prime or DAXes have zero offset, they are automatically switched to Motion Sensor when the MS/GCP Control input is de-energized or the transfer delay timer is running. If the Prime or DAXes have a non-zero offset, the user can choose whether to have the predictor be affected by the motion control or not, using the following parameters:

Prime Xfer MS to GCP: On, Off, the default is On. This is only visible if the Prime Prediction Offset is not zero. Set to **On** to have the Prime be held as a motion sensor by the transfer delay timer.

DAX A Xfer MS to GCP DAX D Xfer MS to GCP: On, Off, the default is Off. This is only visible if the DAX Offset Distance is not zero and the DAX is assigned to this track. Set to **On** to have the DAX be held as a motion sensor by the transfer delay timer. For example, the following screen shows a case where the Prime has an offset (Prime Xfer MS to GCP is visible) and 4 DAXes are used, but DAX A is not visible as it either has a 0 offset, or is assigned to track 2.

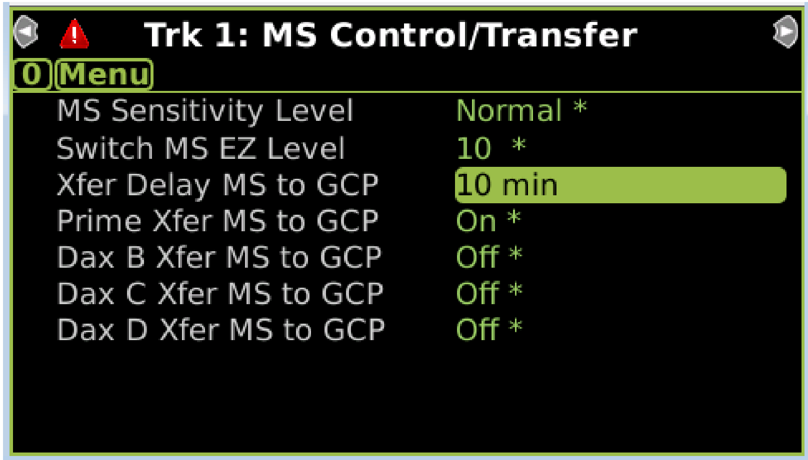


Figure 4-14 Trk 1: MS Control / Transfer Xfer Delay Used

4.2.11 Track Maintenance

The Track Maintenance screen shows values that may need adjusting by the maintainer based upon changes in track ballast.

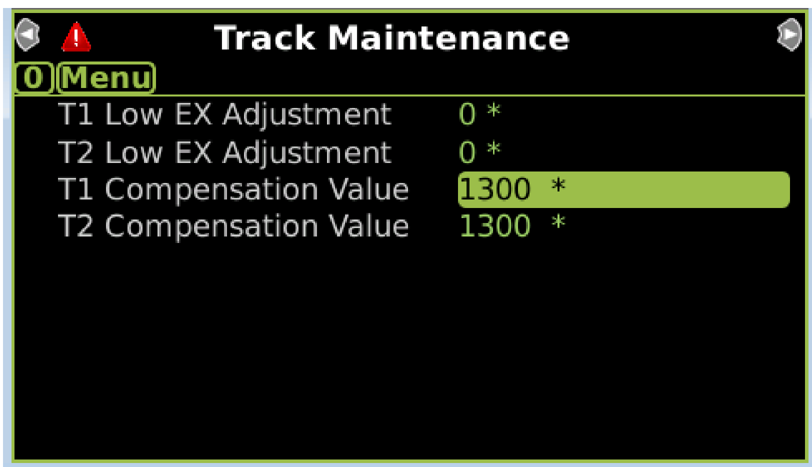


Figure 4-15 Track Maintenance

T1 / T2 Low EX Adjustment: 0-5, the default is 0. This value is used to lower the value of EX that causes the track module to go into Low EX error. When this is set to 0, the track module goes into Low EX error at EX 39, the **Low EX Adjustment** lowers this value by the indicated amount. For example, if **Low EX Adjustment** is set to 5, the track module will go into error at an EX of 39 – 5, i.e. EX 34.

This value should only be adjusted by properly following the procedure described in the Instruction and Installation Guide (SIG-00-17-03).

⚠ WARNING	**WARNING** **DO NOT ARBITRARILY REDUCE THE EX OPERATING THRESHOLD. IMPROPER ADJUSTMENT MAY CAUSE SHORT OR NO WARNING TIME.**

T1 / T2 Compensation Value: 1000-2000, default 1300. This value is used by the 3000+ GCP track module to determine how EZ changes with changes in EX (ballast).

⚠ WARNING	**WARNING** **DO NOT CHANGE THE COMPENSATION VALUE WITHOUT PROPER INSTRUCTIONS FROM SIEMENS TECHNICAL SUPPORT.**

4.2.12 Set to Default

Use the **Set to Defaults** menu to set all the 3000+ GCP programming parameters back to their default values.

⚠ WARNING	**WARNING** **ONCE VALUES ARE RESET TO DEFAULT, THERE IS NO RECOVERY OF PREVIOUS VALUES.**

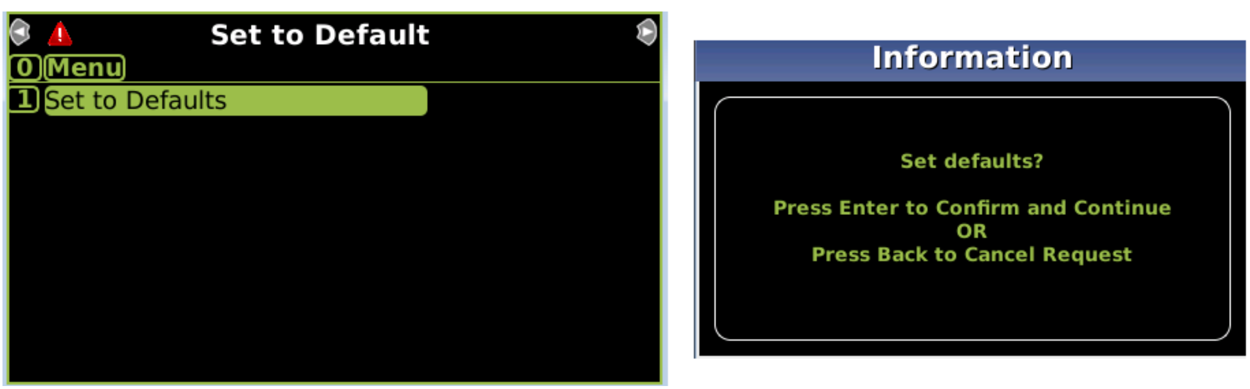


Figure 4-16 Set to Defaults

4.3 DISPLAY CONFIGURATION

This section is used to set non-vital parameter used by the display.

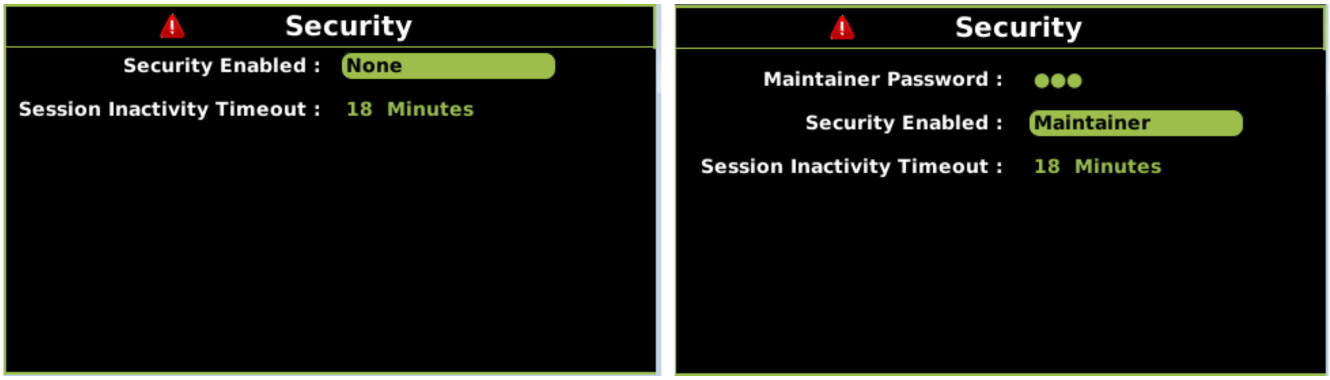


Figure 4-17 Display Security Menu

Security: None, Maintainer, the default is None. When this is set to **Maintainer** the maintainer level password is enabled and a new maintainer password can be entered.

When Security is set to **Maintainer**, the GCP Programming parameters cannot be changed using the display keypad or Web UI unless the correct Maintainer password is entered. See Section 3.4 for details.

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

Laptop Ethernet Port: This is hardcoded to being a DHCP Server with IP Address 192.168.255.81.

4.4 OFFICE CONFIGURATION EDITOR

The Office Configuration Editor (see manual SIG-00-11-15) can be used to create the configuration for the GCP offline in a format that can be loaded into the GCP. The OCE can either be used to:

- Create the configuration file (known as the PAC file) which can be loaded using a USB stick plugged into the display, or using the Web UI (See Section 3.2.5.2 for details on how to load the file)
- Create the Minimum Program Report. This report will only show the parameters which have been changed from their default values. The Configuration report can then be downloaded from the box and the Minimum Program Report compared to the one from the office, or the display used to look at the Minimum Program Report, as shown below.

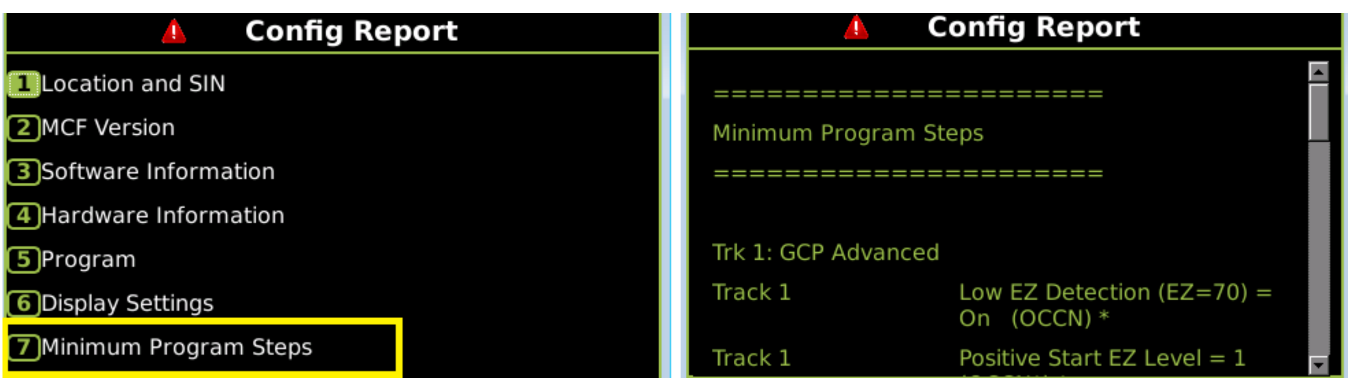


Figure 4-18 Min Program Report

==
Minimum Program Steps
==

Trk 1: GCP Advanced
Track 1 : Low EZ Detection (EZ=70) = On (OCCN) *
Track 1 : Positive Start EZ Level = 1 (OCCN*) *
Track 1 : Positive Start Timeout = 1 min (OCCN) *
Track 1 : Sudden Shnt Detn Level = 1 (OCCN*) *

Trk 1: MS Control/Transfer
Track 1 : Xfer Delay MS to GCP = 1 min (OCCN) *
* Parameter is part of office configuration check number calculation

Check Numbers:
Office Configuration Check Number: 57084C6E
Config. Check Number: 2486B792

NOTE

NOTE

OCE Versions 2.4.5 and earlier do not support the 3000+ GCP. Use an OCE version later than 2.4.5 with the 3000+.

4.5 CONFIGURATION CHECK NUMBERS

The software used in the Model 3000+ GCP generates various 32-bit Cyclical Redundancy Check (CRC) numbers which can be used to determine whether the configuration matches the office plans or whether the configuration has changed since the previous value was recorded.

The four check numbers are:

- CCN – Configuration Check Number
- OCCN – Office Configuration Check Number
- TCN – Track Configuration Check Number
- FCN – Field Configuration Check Number

4.5.1 Configuration Check Number (CCN)

This value is the check number that covers:

a) The MCF CRC
b) The ATCS Address of the CPU
c) The GCP Programming parameters, with the exception of the Out of Service Timeout

If this check number is recorded after the system is installed and commissioned, it can be used to check that there have been no changes in the GCP Programming.

4.5.2 Office Configuration Check Number (OCCN)

This value is the check number that covers:

a) The MCF CRC
b) The ATCS Address of the CPU
c) Selected GCP Programming parameters designated as being included in the OCCN

This check number is generally used to check that the configuration supplied by the design office matches that programmed into the GCP. The parameters that are included in the OCCN are ones that typically can be specified by the office, ones which may need adjustment in the field are not included, for example, parameters which specify an EZ level.

Table 4-3 shows which parameters are included in the OCCN.

Some parameters have special rules regarding the OCCN. For the parameters listed in the table below, the OCCN changes when the parameter is changed from an **Off** value (0) to an **On** (non-zero) value, but the OCCN does not change when different **On** values are chosen. The rationale behind this is the design office wants to control whether the feature is enabled, but does not want the OCCN changing if adjustments to the actual value are needed in the field.

Table 4-3 Parameters Included in the OCCN

Parameter	OCCN Changes When:
Enhanced Detection	Value changed to Off Value changed to be not Off
Positive Start EZ Level	Value changed to 0 (Off) Value changed to be non-zero
Sudden Shnt Detn Level	Value changed to 0 (Off) Value changed to be non-zero

4.5.3 Track and Field Configuration Check Numbers (TCN and FCN)

This Track Check Number is a value that will change every time the track module is calibrated (GCP, Approach, Linearization or Island). Each Track module has its own TCN.

The Field Configuration Check Number (FCN) is a value composed of the TCNs for both track modules.

This field check number can be used by the maintainer to check whether any calibrations have been performed since they last visited the site. If the maintainer finds the FCN is different from the value they last recorded, they can look at the track detail screen at the track check numbers and find the date and time they were last changed.

SECTION 5 APPLICATION PROGRAMMING

5.0 INTRODUCTION AND OVERVIEW

NOTE

Throughout this section, examples are given of programming parameters required for given applications. All screens in these examples (except as otherwise noted) begin at the Display's Main Program Menu screen.

5.1 BASIC PREDICTION APPLICATIONS USING THE MODEL 3000+ GCP

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 5.12.2, SPECIAL PROVISIONS FOR SHORT DAX OFFSET DISTANCE (UAX NOT USED), FOR CORRECTIVE ACTIONS.

NOTE

When a UAX is de-energized, the associated prime or DAX PREEMPT will switch to motion sensor operation to ensure the fastest prediction possible. When the UAX energizes, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation.

The purpose of the Model 3000+ GCP is train detection and prediction. A general understanding of prediction is required to fully exercise the Model 3000+ GCP's functionality. This section provides the required information for basic planning and programming of the Model 3000+ GCP.

Remote Prediction (also known as DAXing) effectively extends approaches beyond the limits imposed by the insulated joints. Remote Prediction transfers prediction information from a GCP at a remote location to a GCP at a crossing. Transfer is via cable.

When the design of the warning system uses two unidirectional track modules, a set of insulated joints is located on one side of the street. These insulated joints cannot be bypassed with couplers of any type. Therefore, when the approach distance between adjacent, unidirectionally-equipped crossings is not sufficient to provide the required warning time, the Model 3000+ GCP provides a means of extending the controls through the use of three types of remote predictors: DAX, prime prediction offset, or preemption.

5.1.1 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.

5.1.2 Remote Prediction Capability

Each Track Module of the 3000+ GCP may be programmed to provide up to five prediction output signals:

- DAX A through DAX D
- Prime

The Prime UAX inputs are track specific.

5.1.3 Remote Prediction Configuration

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

5.1.3.1 Warning Time

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

5.1.3.2 Predictor Input

The GCP receiving the remote prediction must have its track specific UAX input enabled by changing its pickup delay from 0 to the desired value, to receive the individual predictor outputs from the remote unit. The available local inputs must be configured for the required pickup delay.

NOTE

> **NOTE**
>
> When a UAX is de-energized, the associated prime or DAX Preempt will switch to motion sensor operation. When the UAX energizes, motion sensing will continue if inbound motion is being sensed, otherwise they will switch back to predictor operation.

5.1.4 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 5.12, Advanced Application Programming, for a description of Bidirectional DAXing.

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

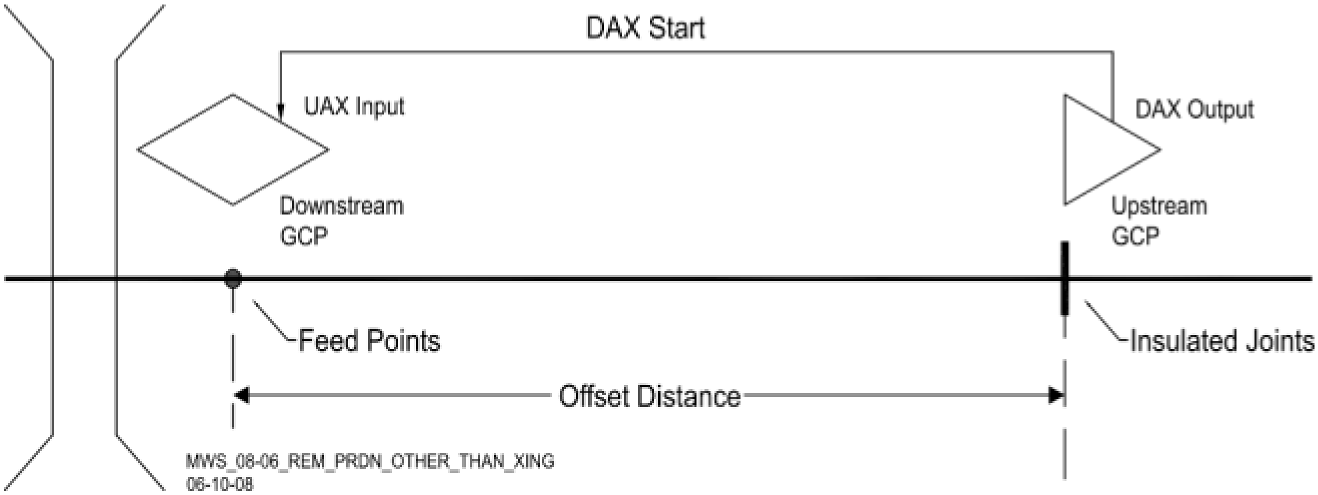


Figure 5-1 Remote Prediction from a Remote Location Other than a Crossing

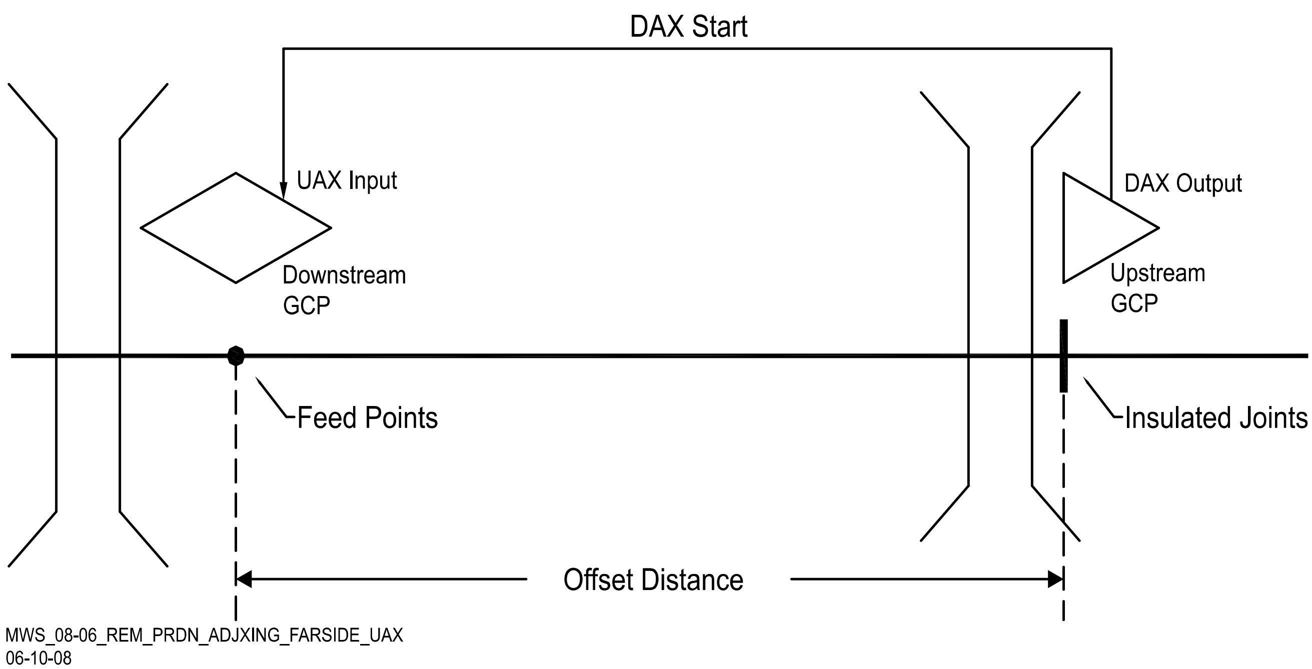


Figure 5-2 Remote Prediction from an Upstream Crossing - Joints on Far

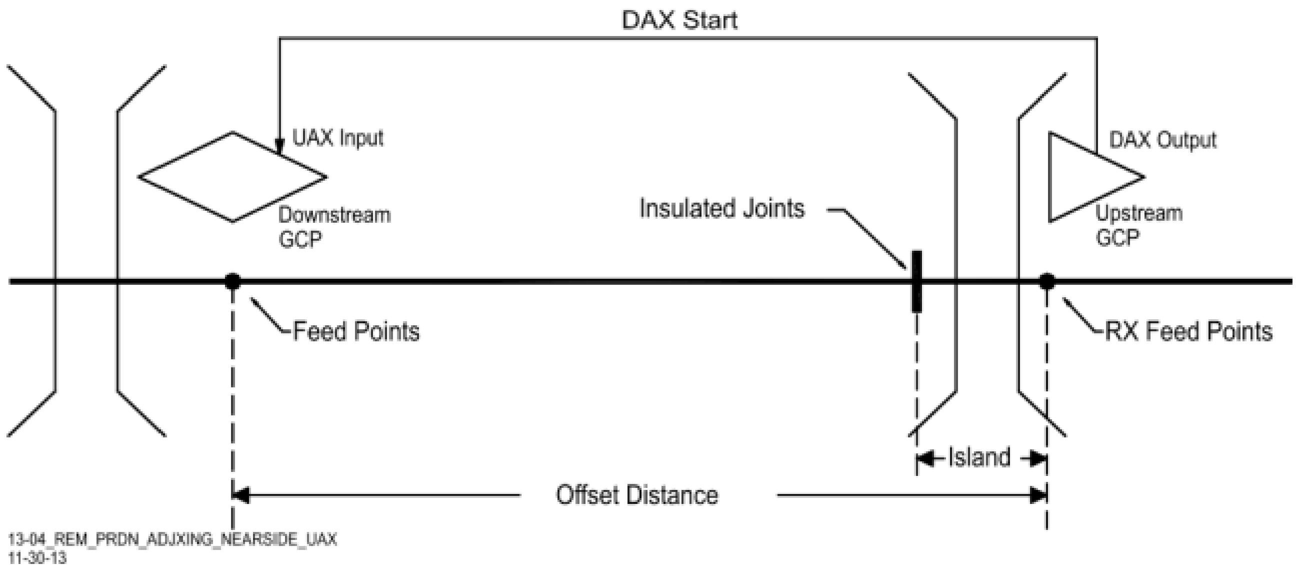


Figure 5-3 Remote Prediction from an Upstream Crossing - Joints on Near Side

5.1.5 DAX Offset Distance

The distance between the crossing feed point and the remote 3000+ 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.

5.1.6 Remote Approach Distance Calculations

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

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

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

⚠ WARNING

WARNING

DAX MINIMUM APPROACH DISTANCE IS A CRITICAL DISTANCE FOR ADEQUATE WARNING TIMES. MINIMUM DAX APPROACH DISTANCE IS GENERALLY 1000 FT (304.8 M), BUT THERE ARE EXCEPTIONS. FOR EXCEPTIONS, SEE PARAGRAPH 5.2. MINIMUM APPROACH DISTANCE GUIDELINES FOR DAX TRACK CIRCUITS.

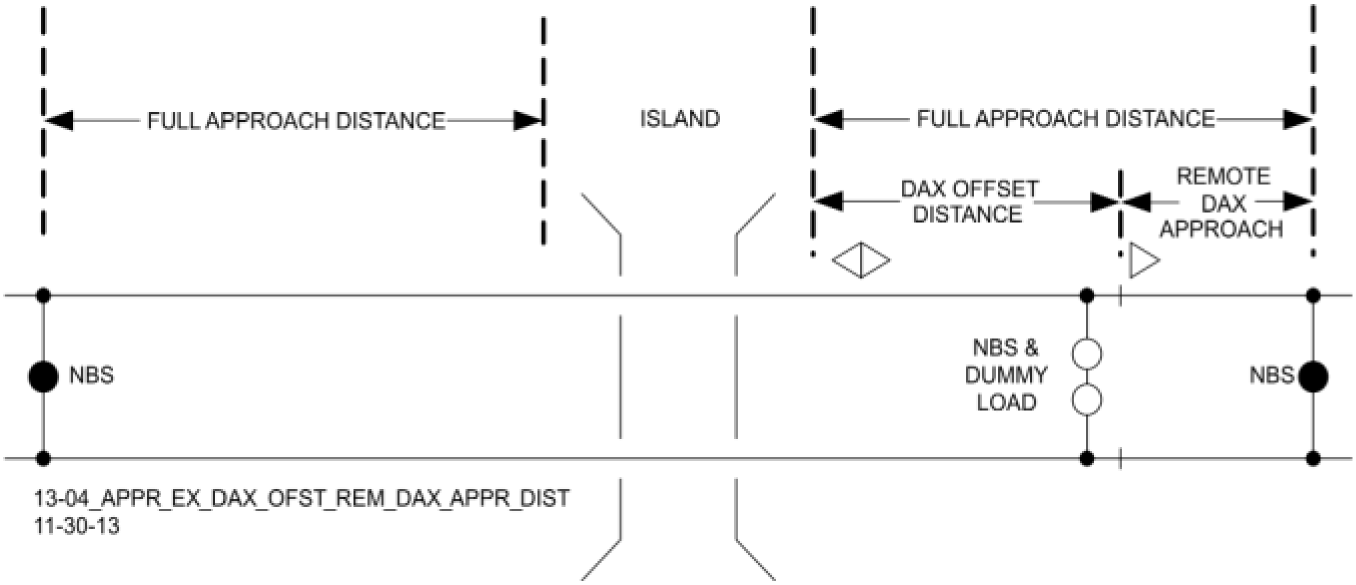


Figure 5-4 Approach Example with DAX Offset and Remote DAX Approach Distances

5.2 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 conditions detailed in the following sections.

5.2.1 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.

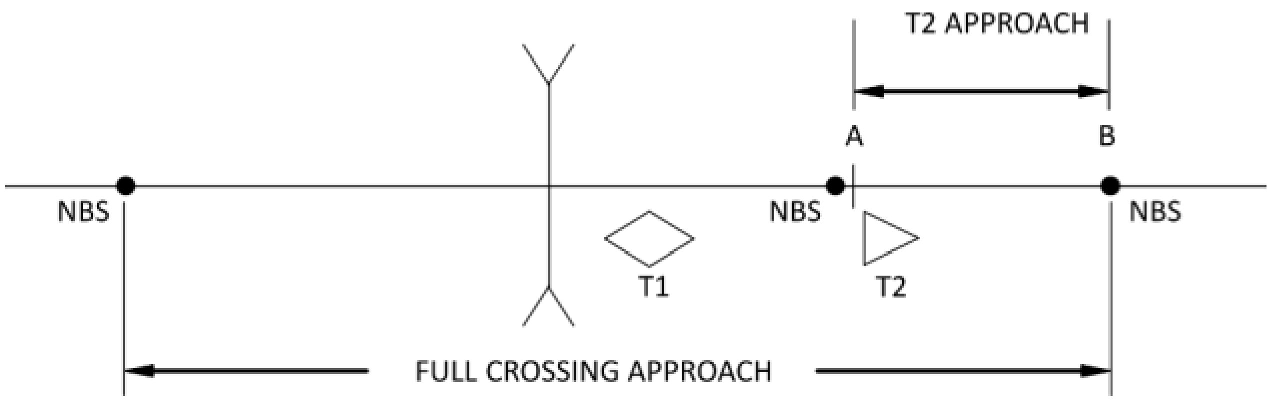


Figure 5-5 Scenario 1, T2 Approach as Short as 500 ft.

5.2.2 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 – 1,200 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, install a second set of predictors (T3 and T5) beyond the insulated joints.
- The minimum approach distances for T3 and T5 follow the rules in paragraph 5.2.

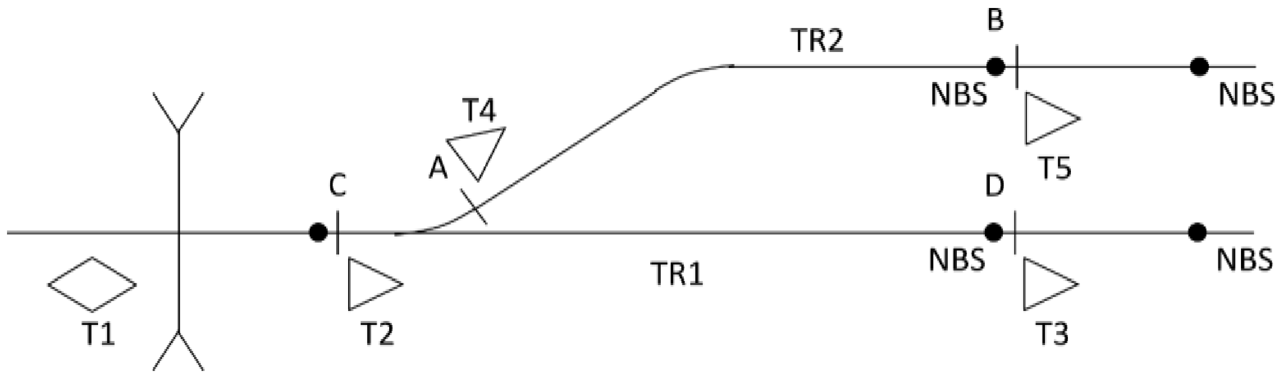


Figure 5-6 Scenario B, T2 & T4 Special OS Application

5.2.3 Scenario #3

In Figure 5-7, when the designed approach distance for T2 or T3 is less than 1,000 ft or 304.8 m (similar to Figure 5-5 in Scenario #1), there are two alternatives:

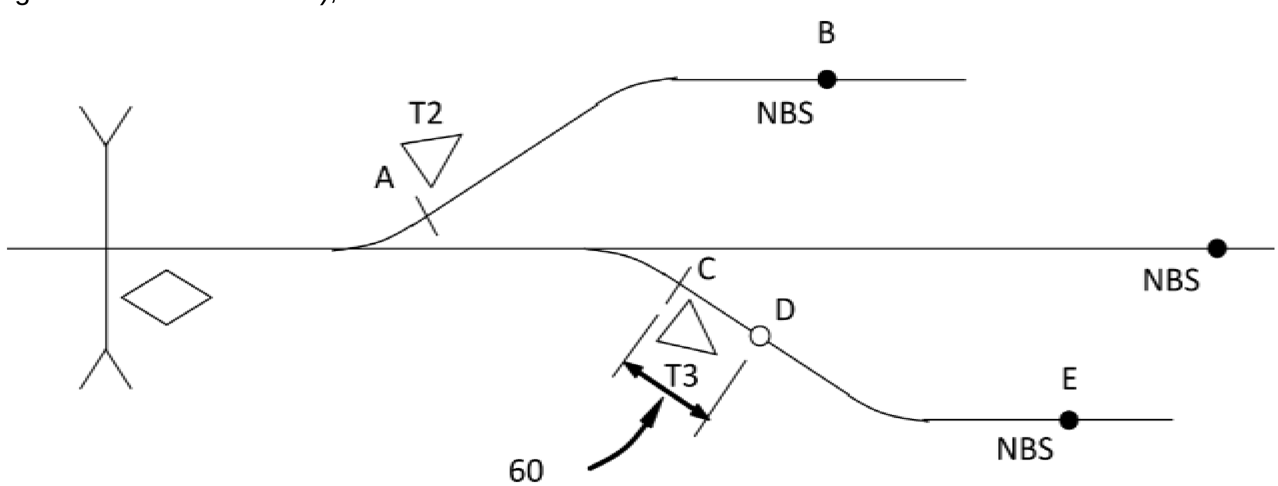


Figure 5-7 T2 or T3 Less than 1000 Ft

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).

5.3 DAX OPERATIONS

5.3.1 Common DAX Application Guidelines from an Insulated Joint Location

The two application areas discussed in Paragraph 5.2 differ in certain aspects; however, the following guidelines apply to both:

The GCP equipped for DAXing must be installed as a unidirectional or simulated bidirectional system at a set of insulated joints. No coupler of any kind (i.e., wideband, narrow-band, or audio overlay bypass couplers) may be installed around these insulated joints.

The DAX relay drive output is connected to the controlled crossing by a two wire line/cable circuit and is normally connected to the UAX input terminals, or the DAX relay drive output must have sufficient pickup delay time programmed if the UAX input is not available.

Bidirectional simulation should be used to take advantage of the bidirectional operating characteristics when wide changing ballast conditions are encountered, or other conditions warrant its use.

5.3.2 Programming for DAX Operation

The Model 3000+ GCP is programmed for DAX operation via the Display Module. Required DAX information includes: island length, DAXes used (and their associated track), UAX used, UAX pickup, DAX warning time, DAX offset distance, and DAX pickup delay time. The DAX operating parameters are programmed as described in the following paragraphs.

5.3.2.1 Island Distance

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

Given the example in Figure 5-8, T2 is a remote unit and T2 DAX A is assigned. The following parameters are found on the DAX screens discussed in 5.4.

5.3.2.2 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.

5.3.2.3 DAX Offset Distance

This entry indicates the approach distance (in feet or meters depending on which units are selected.) between crossings, or between the remote location and the crossing to be DAXed.

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

5.3.2.4 DAX Pickup Delay Time

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

5.3.3 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

5.4 DAX PROGRAMMING EXAMPLES

5.4.1 Examples of DAX operation include:

- DAX start from a remote location using two GCP cases (see Figure 5-8)
- DAX start from a remote location, single GCP case (see Figure 5-9)
- DAX start from an adjacent crossing that has insulated joints (Figure 5-10)

5.4.1.1 DAX Start from a Remote Location, Two GCP Cases

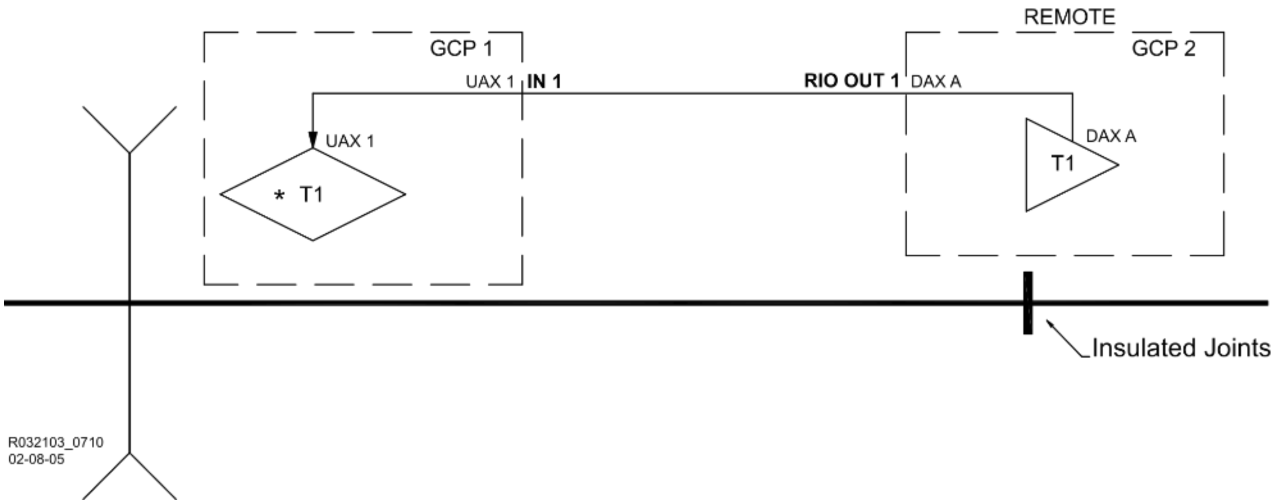


Figure 5-8 DAX Start from Remote Location, Two GCP Cases

Figure 5-8 depicts a DAX that is started from a remote location, e.g. a remote GCP.

Programming GCP 1 to receive the DAX information from GCP 2 in Figure 5-8 requires the following entries:

- On the **Trk 1 GCP Prime** screen:
  - Set UAX Pickup Delay to 5 sec (or whatever the specified pickup delay value)

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

- On the **General Configuration** screen, set:
  - RIO Module used to Yes
  - Number of DAXes used to 1
- On the **Trk 1: GCP Basic** screen, set:
  - Island Used to None
  - Island Distance to 0
- On the **DAX A** screen set:
  - DAX A Track Assignment to Track 1
  - DAX A Warning time to 35 seconds (or required warning time)
  - DAX A Offset Distance to 349 ft.
  - DAX A Pickup Delay to 15 seconds (or required pickup delay time)

An alternative to wiring the DAX to the UAX is to wire it to the Enable input on GCP 1. The Enable input has no pickup delay, so if this was done, all the pickup delay has to be provided at the DAX end.

5.4.1.2 DAX Start from a Remote Location, Single GCP Case

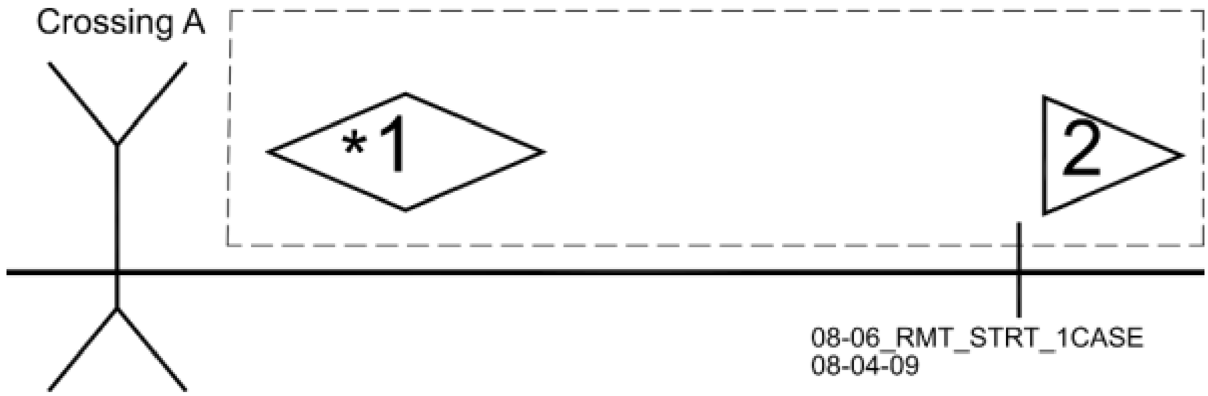


Figure 5-9 DAX Start from a Remote Location, Single GCP Case

In this case we will use the Prime output from track 2 with an offset. The UAX is not used in this application.

On the **General Configuration** screen:

- Set Number of Tracks to 2
- Set RIO Module Used to No
- Set Number of DAXes to 0

On the **Trk 2: GCP Basic** screen:

- Set Island Used to None
- Set Island Distance to 0

On the **Trk 2: Prime** screen:

- Set Prime Prediction Offset to 1350 ft. (Distance between T1 track wires and insulated joint at T2)
- Set Pickup Delay Mode to Auto
- Set UAX Pickup Delay to 0 (NOT USED)

5.4.1.3 DAX Start from an Adjacent Crossing with Insulated Joints

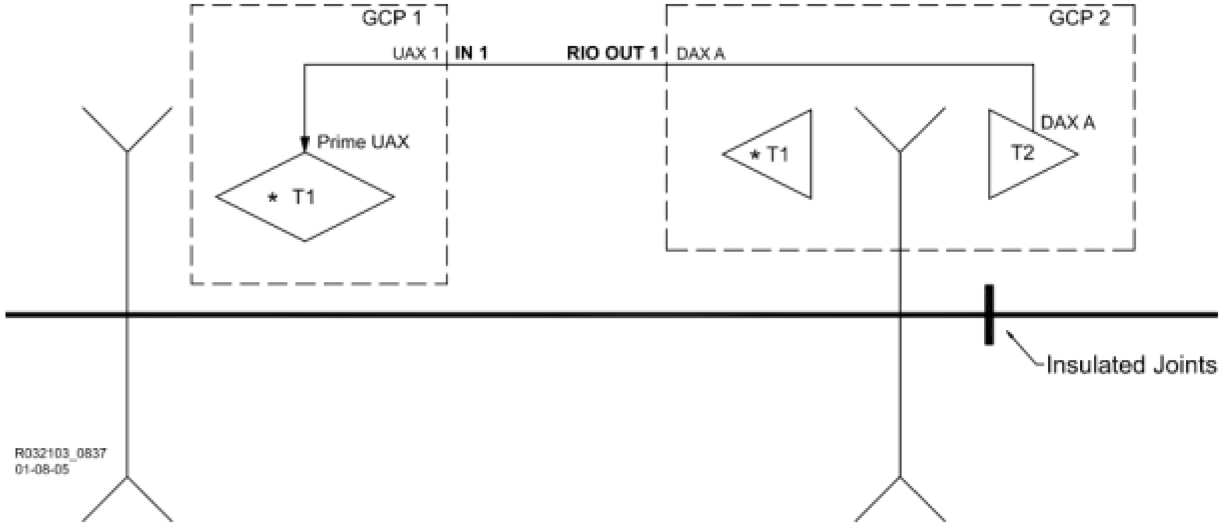


Figure 5-10 DAX Start from Adjacent Crossing

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

- On the **Trk 1: Prime** screen:
  - Set UAX Pickup Delay to 5 seconds (or required pickup delay time)
- Programming GCP 2 T2 to send the DAX A output to GCP 1 requires the following entries:
  - On the **General Configuration** screen:
    - Set Number of Tracks to 2
    - Set RIO Module Used to Yes
    - Set Number of DAXes to 1
  - On the **DAX A** screen
    - Set DAX A Track Assignment to Track 2
    - 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 Pickup Delay to 15 (or whatever the required pickup delay is)

5.4.2 Double Track Installation with UAX from a Remote DAX Location Using Single Cable

A remote location in a double track installation can be used to DAX to a crossing using a single cable. In this case, if DAXes are used at the remote, as shown in Figure 5-11, they will need to be ANDed. At the crossing end, the output from the AND has to be connected to both the UAX 1 and UAX 2 inputs. Program Track 1 UAX Pickup delay and 1 and Track 2 UAX Pickup delay for 1 sec.

The UAX pickup delay timer is normally truncated by a train move through the island, so a longer UAX pickup delay can be used; however, in this case, a train move on track 1 will result in both track 1 and track 2 UAXs being de-energized. When the train leaves track 1's island, the pickup delay for UAX 1 will be truncated, but UAX 2 will have to run its programmed pickup delay, which will result in a delay in energizing the GCP RLY output.

In Figure 5-11, DAX A is assigned to track 1 and DAX B to track 2: the DAX RLY outputs are externally ANDed together.

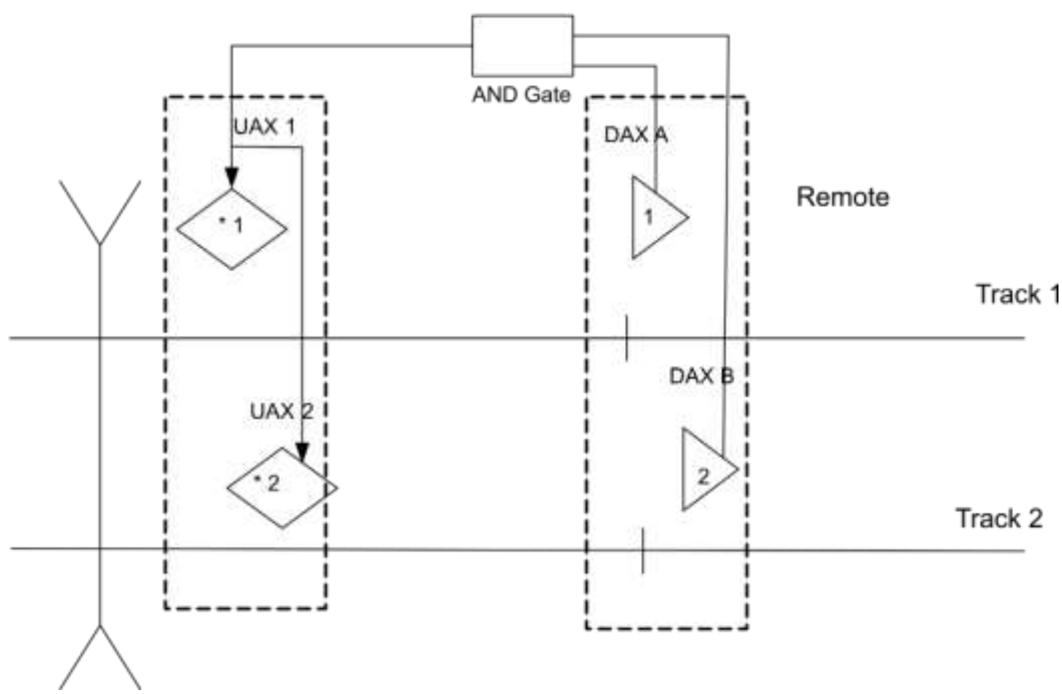


Figure 5-11 Double Track Single Wire Pair DAX / UAX

An alternative to this would be to use the Prime predictors for tracks 1 and 2 with a programmed offset distance. The GCP RLY output can then be used, and the AND gate is not needed as shown in Figure 5-12.

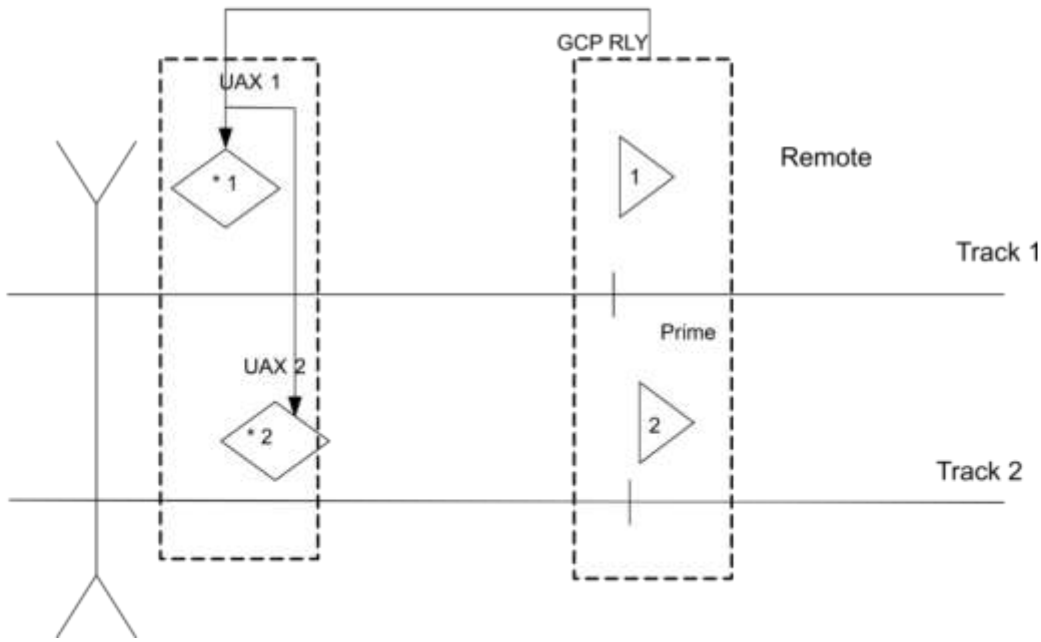


Figure 5-12 Double Track Single Wire Pair Prime Offset / UAX

Another way to program this would be to use the ENABLE input at the crossing rather than UAX 1 and 2 as shown in Figure 5-13. The ENABLE input does not have a pickup delay so all the pickup delays have to be built in at the remote end. Program the remote Prime with a pickup delay mode of AUTO and a 15 sec pickup delay.

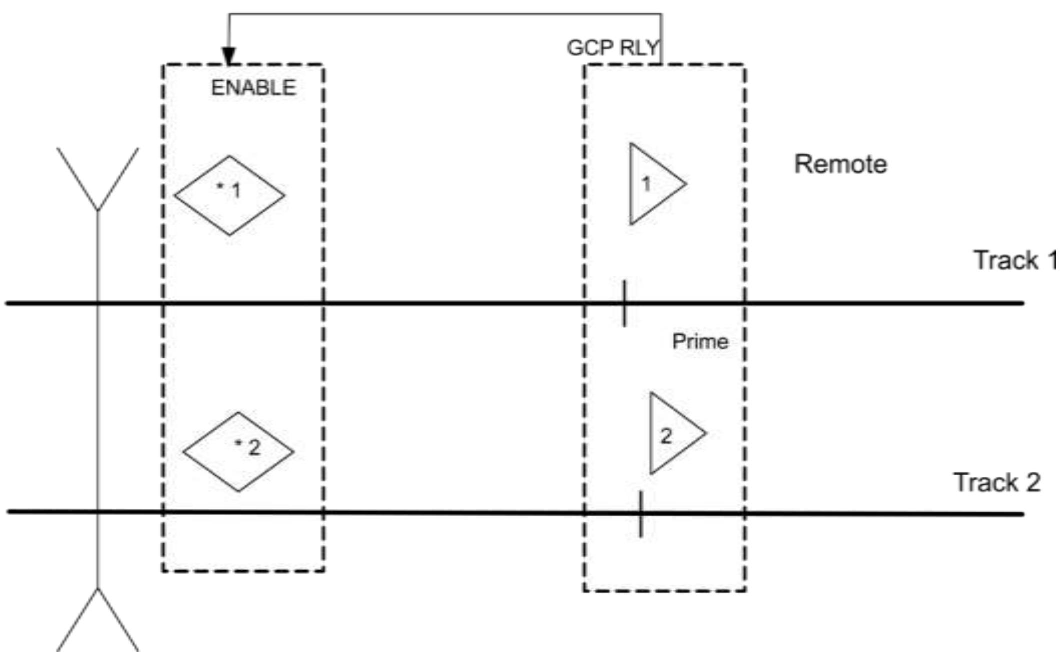


Figure 5-13 Double Track Single Wire Pair Prime Offset / Enable

5.4.3 Double Track Installation with Independent UAX Controls for Each Track

A remote location in a double track installation can be used to DAX to a crossing using two independent DAXes / UAXes. In this case, track 1 must use a DAX as a prediction for track 1 that is independent of track 2. The track 2 prediction could also be from a DAX, as shown below, but the track 2 prime with an offset can also be used or the T2 GCP RLY output used instead of the rack 2 DAX.

At the crossing, the DAX outputs from the crossing are connected to their respective track UAX inputs.

The UAX Pickup Delay can then be set to a value larger than that shown in the previous example. When the train passes through the crossing, then leaves the island, the crossing will recover even if the full UAX pickup delay has not run.

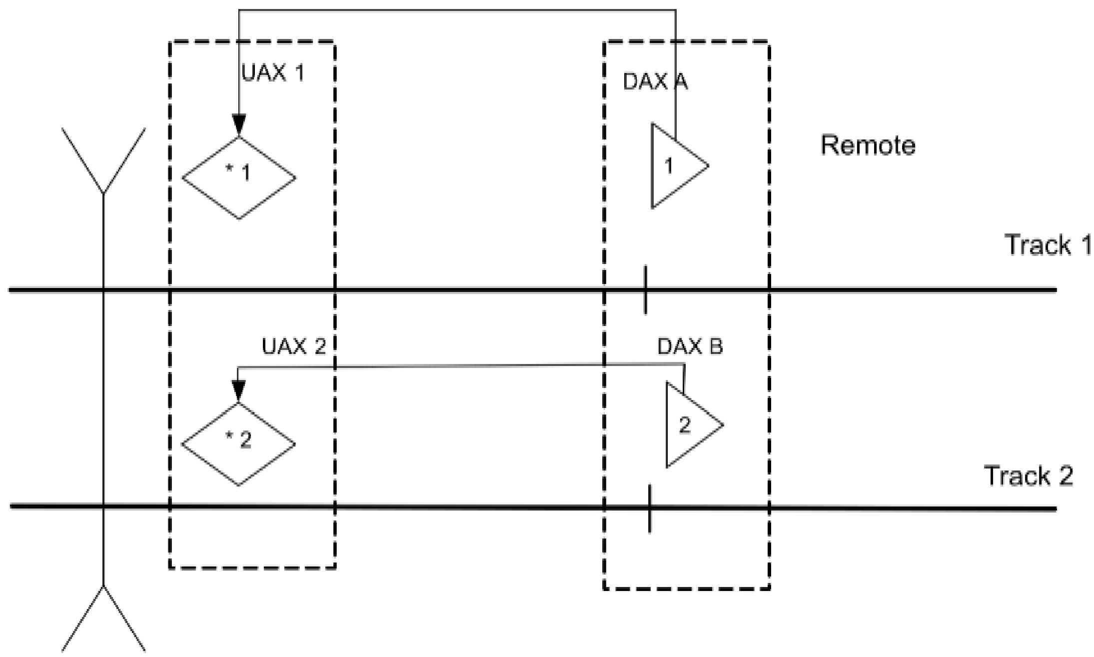


Figure 5-14 Double Track with Independent UAXes

5.4.3.1 Remote DAXing to Multiple Bidirectional Crossings

Remote prediction for two bidirectional crossings is shown in Figure 5-15. T1 DAX A initiates start for T1 (GCP 2) at crossings B. T1 DAX B initiates start for T1 (GCP 1) at Crossing A. Warning time and offset distance parameters are individually programmed for each DAX start. Each Model 3000+ GCP is individually programmed to provide the appropriate interface connections: physical inputs and outputs.

5.4.4 DAXing between Crossings Separated by Insulated Joints

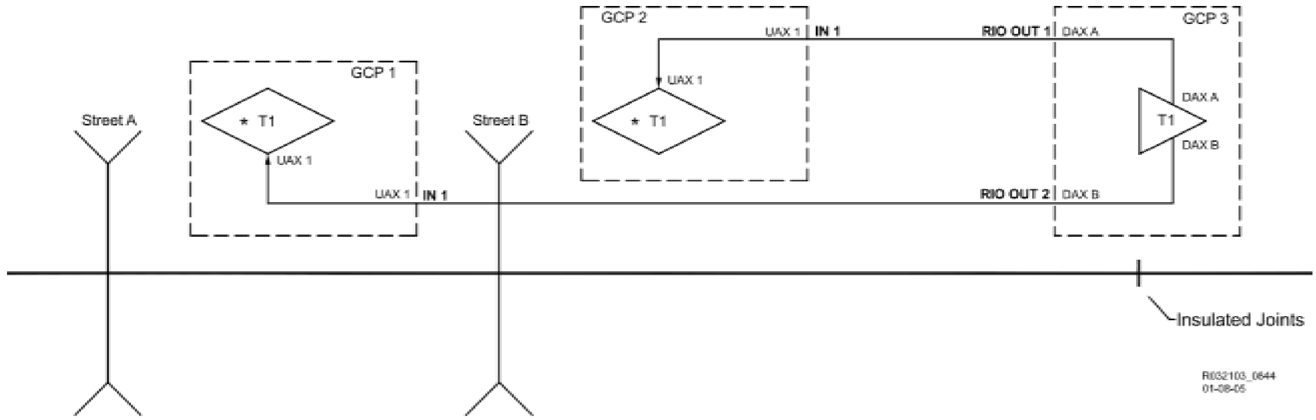


Figure 5-15 Remote Prediction for Multiple Bidirectional Crossings

Remote prediction for two adjacent crossings, where the crossings are separated by insulated joints (as shown in Figure 5-15) require a two-track model 3000+ GCP to be installed at each crossing. Both GCP tracks are configured for unidirectional operation (only the westbound [T1] circuits are shown). Warning time and offset distance is 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 2) at Crossing B. T1 DAX B (GCP 3) is set for warning time and offset distance to T1 (GCP 1) at Crossing A.

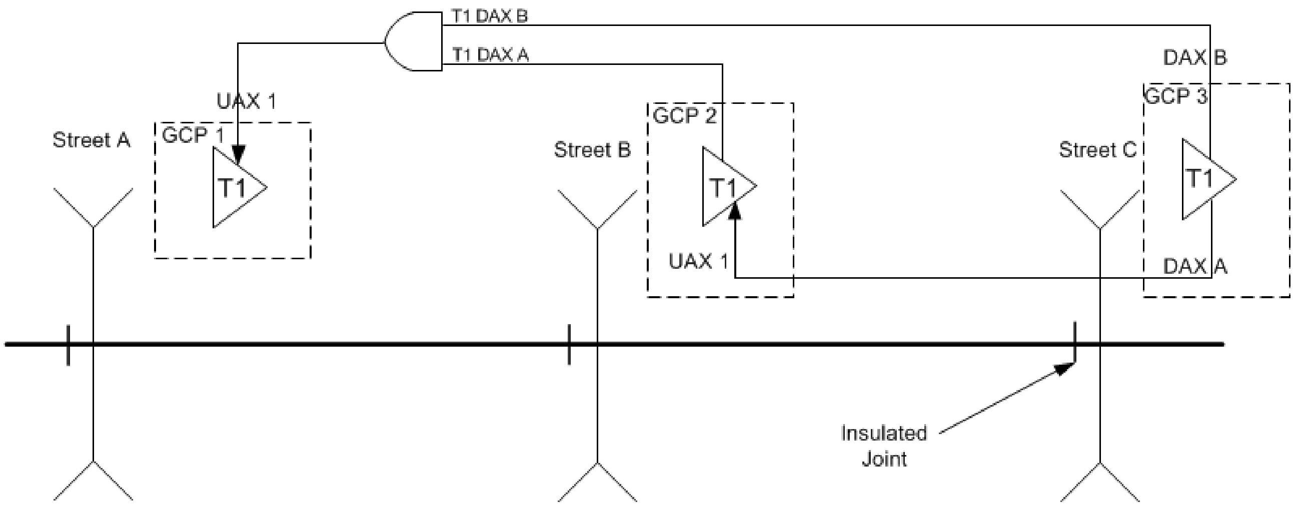


Figure 5-16 Remote Prediction between Multiple Crossings Separated by Insulated Joints

Each Model 3000+ GCP is individually programmed to provide the appropriate interface connections to physical inputs and outputs.

GCP 3 DAX A initiates GCP 2 Crossing B start.

GCP 3 DAX B also initiates GCP 1 Crossing A start.

GCP 2 DAX A can also initiate GCP 1 Crossing A start.

The GCP 2 DAX A and GCP 3 DAX B need to be ANDed together at GCP 1 using an external vital AND gate (or equivalent relay logic) and then connected to UAX 1.

5.4.5 Remote GCP Operation in an OS Track

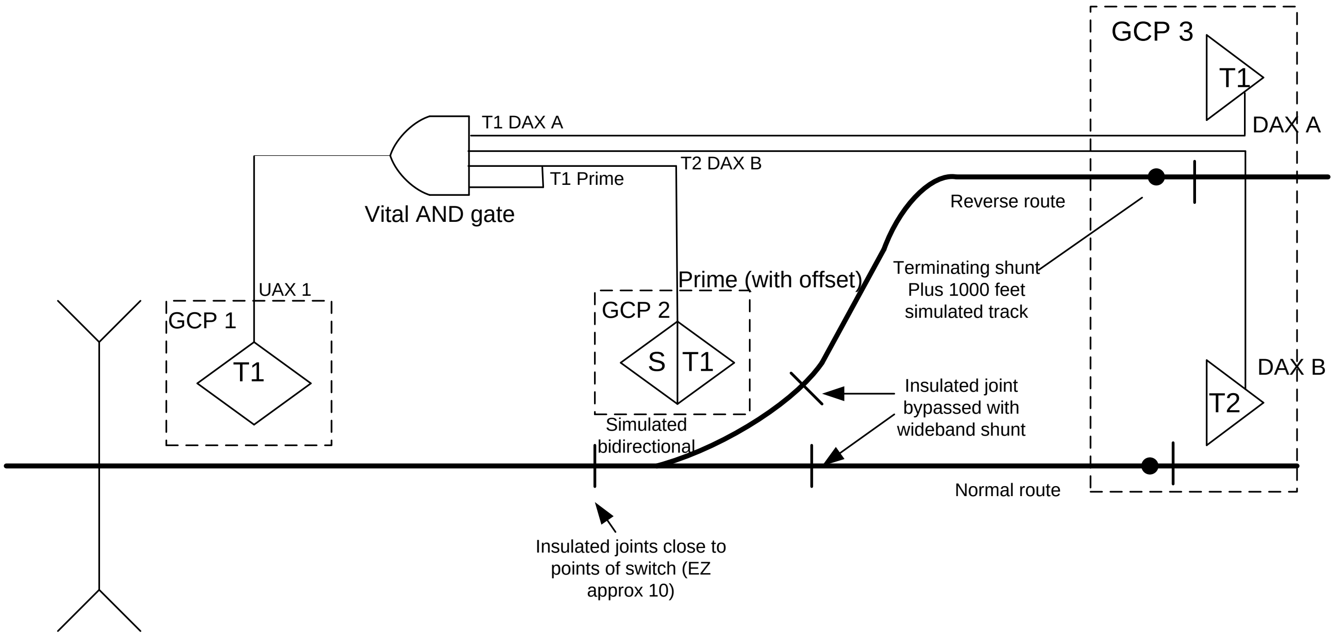


Figure 5-17 OS Track Remote Prediction Application

⚠ 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 5-17).

5.4.5.1 Approach Configuration Requirements

⚠ WARNING

WARNING

A SPECIAL REMOTE GCP APPLICATION INSIDE AN OS TRACK IS SHOWN IN THIS SECTION. IT COMBINES DAX FUNCTIONS WITH A BIDIRECTIONAL UNIT EVEN THOUGH THE GCP IS CONNECTED TO THE TRACK AT INSULATED JOINTS. THIS PARTICULAR APPLICATION REQUIRES PARALLEL OS TRACK CIRCUITS. DO NOT USE A SERIES OS CIRCUIT.

NOTE

NOTE

Take the following factors into consideration when designing Model 3000+ GCP setups 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, the three remote tracks are in two Model 3000+ GCP units. 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 bidirectional operation; however, no simulated bidirectional coupler is required due to the two actual approaches.

5.4.5.2 OS Track Remote Prediction Programming

To implement remote GCP 2, track 1 must be programmed for 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.

5.4.5.3 OS Track Remote Prediction Operation

Detection of a train by any one of the GCP track 1 or GCP 3 track 1 or 2 DAX A predictors initiates a crossing start at the crossing controlled by GCP 1 (see Figure 5-17).

The 3 inputs into the crossing are ANDed using a Vital AND gate (or equivalent relay logic) the output of which is tied to UAX 1.

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 5-17 for a typical GCP and OS installation diagram.

5.5 ENABLE APPLICATION PROGRAMMING

5.5.1 Use of ENABLE Input for Cascading Multiple GCP Unit at the Crossing

Cascading using the ENABLE function allows for two or more GCP Cases in single or multiple track applications at a crossing to provide a single GCP RLY output to the XR. This GCP RLY output combines all prime predictors together (ANDed) of multiple GCP cases to provide a single XR control. It also provides an accurate recording of crossing warning times in the Train History.

As an example, Figure 5-18 is a double track installation with back-to-back GCP units. GCP1 has the GCP RLY output wired to GCP2 ENABLE input. Whenever T1 or T2 prime predictors predicts in GCP1, the GCP2 ENABLE de-energizes and causes both T1 and T2 prime predictors on GCP2 to de-energize and drop the GCP RLY of GCP2. The ENABLE is used (instead of UAX1 or UAX2) because when de-energized, it starts the warning timers in GCP2 for both T1 and T2, thus producing accurate warning times for train moves on either track.

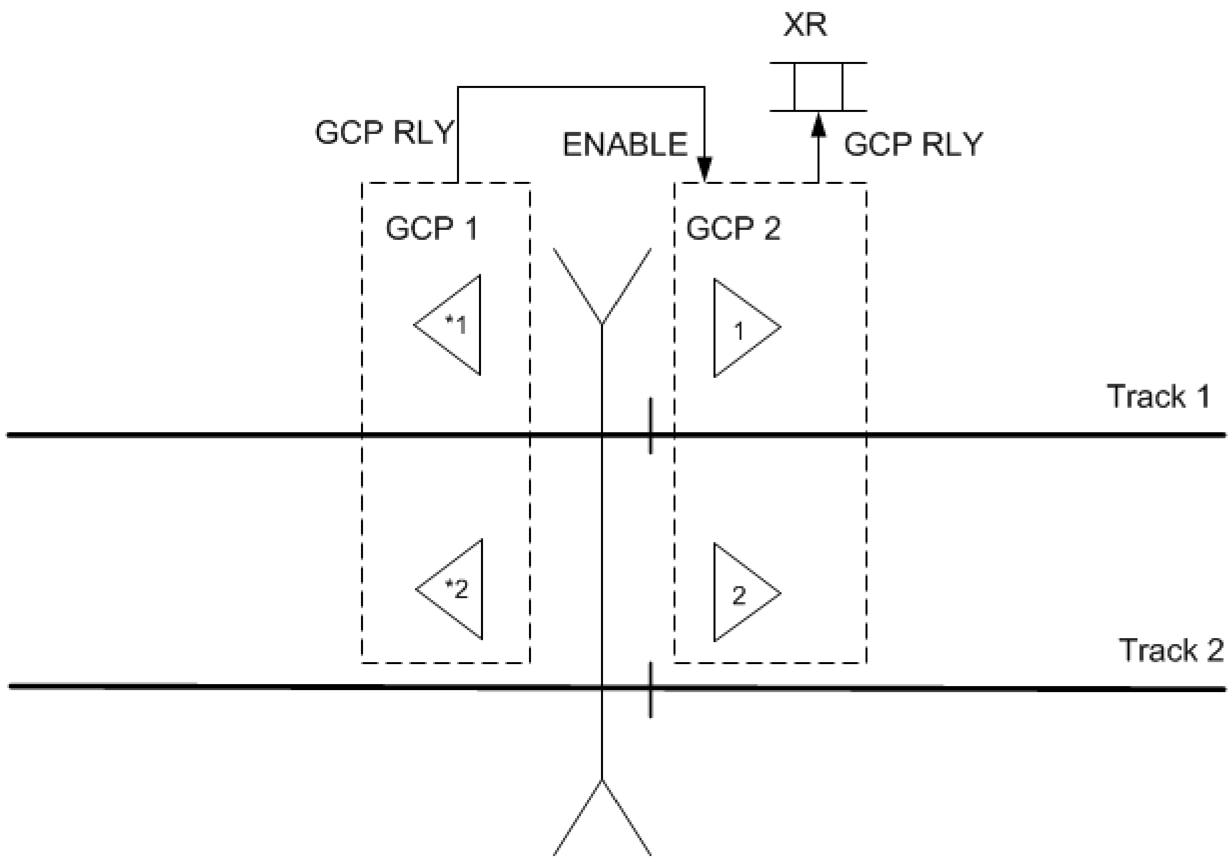


Figure 5-18 Double Track Installation with Back-to-Back GCP Units

5.5.2 Use of ENABLE Input for Cascading Remote Predictors with Offset Distances

When there are two remote DAX locations in one crossing approach, there are two options for cascading the two remotes. Option A uses prime predictors at the remotes and Option B uses DAX predictors at the remotes.

5.5.2.1 Option A – Prime Predictors at the Remotes

In Figure 5-19 the two remote GCPs have their prime predictors ANDed together (cascaded) by using the ENABLE at GCP2. The application is as follows:

1. GCP3: Program T1 prime prediction offset for the distance to the crossing (for example, 2,012 feet)
2. GCP3: Wire GCP RLY output to line circuit to GCP2 ENABLE input
3. GCP2: Program T1 and T2 prime prediction offsets for the distance to the crossing (for example, both are set to 1,455 feet)
4. GCP2: Wire GCP RLY output to line circuit to GCP1 ENABLE input

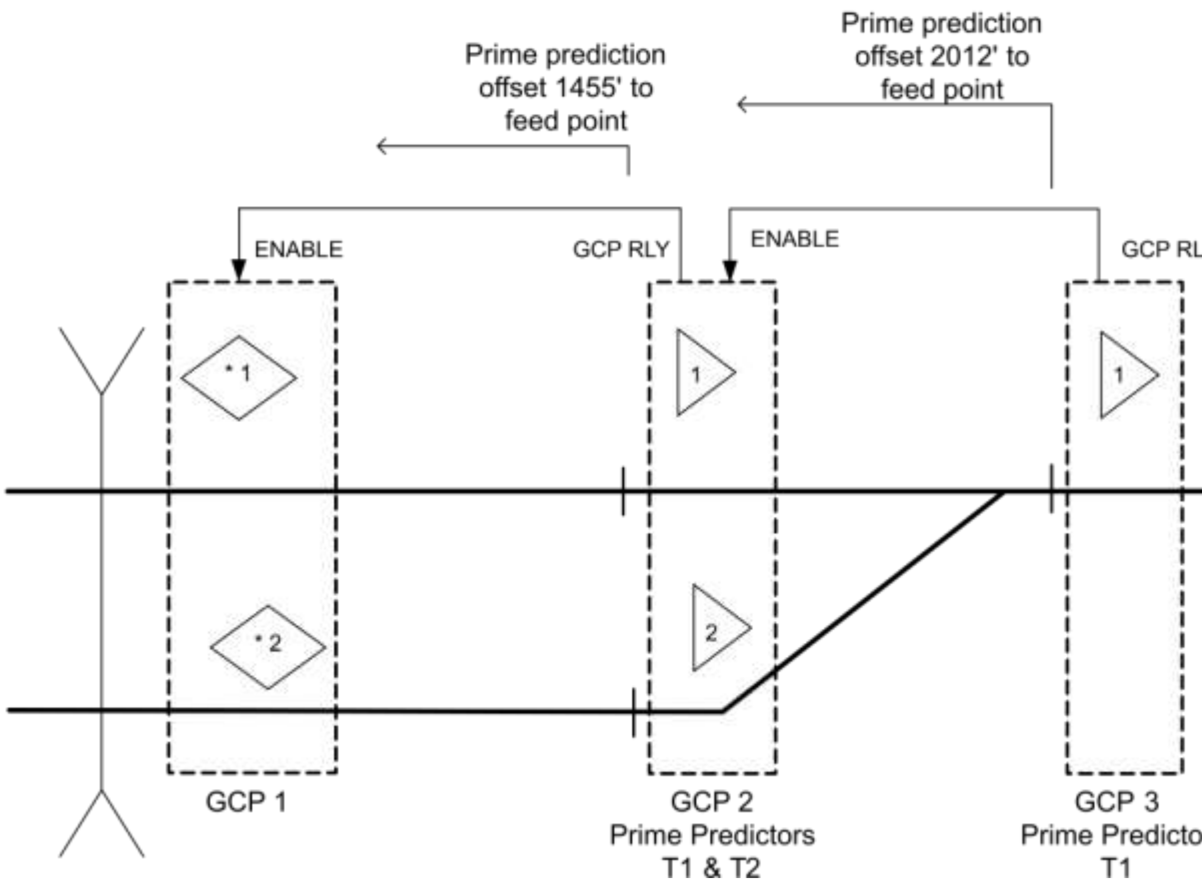


Figure 5-19 Prime Predictors at the Remotes

5.5.2.2 Option B – DAX Predictors ANDed using a 4-Input Vital AND-Gate

In Figure 5-20, the two remote GCPs have their DAX predictors ANDed together (cascaded) by using a Solid State Vital 4-Input AND-Gate. The application is as follows:

1. GCP3: Program T1 prime prediction offset for the distance to the crossing (for example, 2,012 feet)
2. GCP3: Wire GCP RLY output to line circuit. The line circuit drives 2 inputs of the Vital 4-Input AND-Gate located at GCP2.
3. GCP2: Program DAX A to T1 and DAX B to T2.
4. GCP2: Program T1 DAX A predictor offset distance for the distance to the crossing (1,455 feet). Wire DAX A RLY output to an input of the Vital 4-Input AND-Gate.
5. GCP2: Program T1 DAX A predictor offset distance for the distance to the crossing (1,455 feet). Wire DAX A RLY output to an input of the Vital 4-Input AND-Gate.
6. GCP2: Wire output of Vital 4-Input AND-Gate to line circuit going to ENABLE of GCP1.

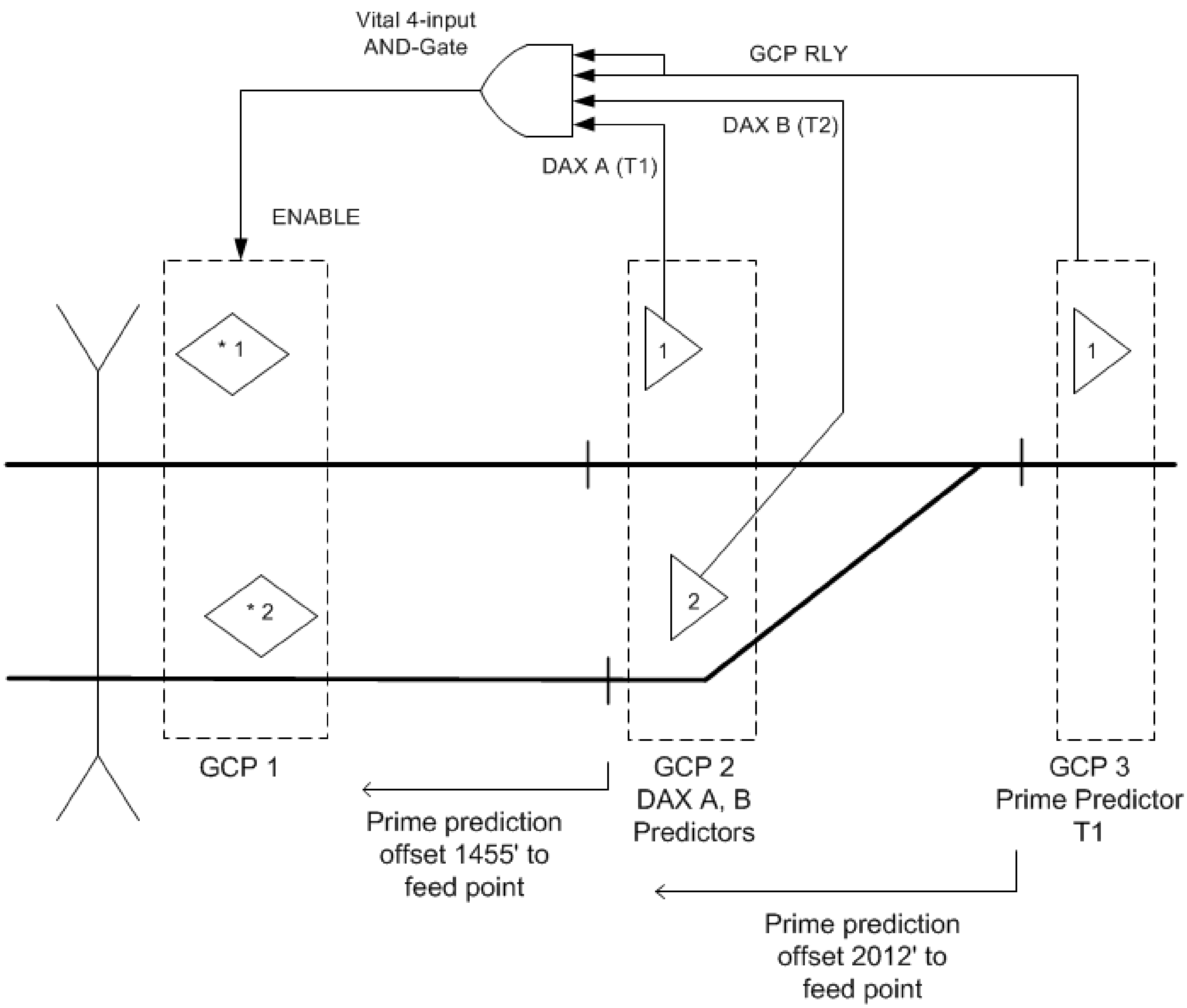


Figure 5-20 Prime Predictors ANDed Using a 4 Input Vital AND Gate

5.6 ASSOCIATING ISLANDS WITH GCP TRACKS

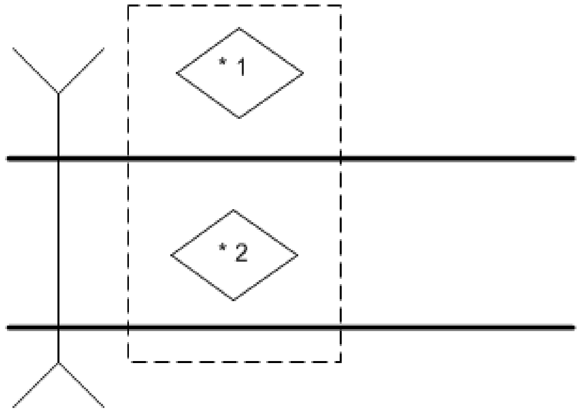


Figure 5-21 Bidirectional Mode at Two Track Crossing

Each A80418 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 5-22.

By default, the internal island on an A80418 is tied to the MS/GCP operation for that track module.

When track 1 and track 2 are used as a back-to-back unidirectional pair (as shown in Figure 5-22), the GCP RLY output includes track 1 and track 2 Prime predictors. In this case only the island on track 1 is used and the island function for track 2 uses T1's island.

To program this setup, go to the T2: GCP Basic Menu and set **Island Used** to "T1 ISL" to indicate that T2 will use the island state from T1.

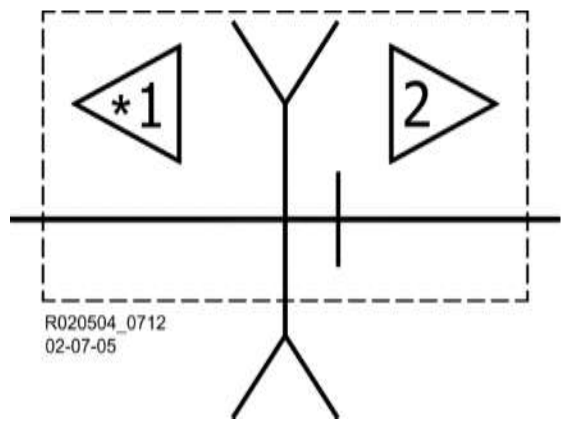


Figure 5-22 Back-to-Back Unidirectional GCP Pair at a Crossing

When island 1 is occupied, it de-energizes both T1 and T2 prime predictors, which de-energizes the GCP RLY output.

NOTE

NOTE

For back-to-back unidirectional applications at a crossing, T1 must have the island. There is no provision for T2 to have the island and T1 use T2's island.

5.6.1.1 Island Occupancy State

The island occupancy state is reflected on OUT 2 of each track module. This output will reflect the island state whether the internal island is used or an external island input is used.

5.6.1.2 Island Parameter Selection

Use the **Trk "N": GCP Basic Island Frequency** menus to select the following parameters for an internal island: Island Used, Island Frequency, Island Distance, and Island Pickup Delay.

The internal island has a built-in 2 second pickup delay; additional time can be added using ISL Pickup delays (+2 seconds).

When the island is set to external, the pickup can be set down to 0 seconds if the external equipment is providing the pickup delay. If it is not, then the pickup delay can be added here.

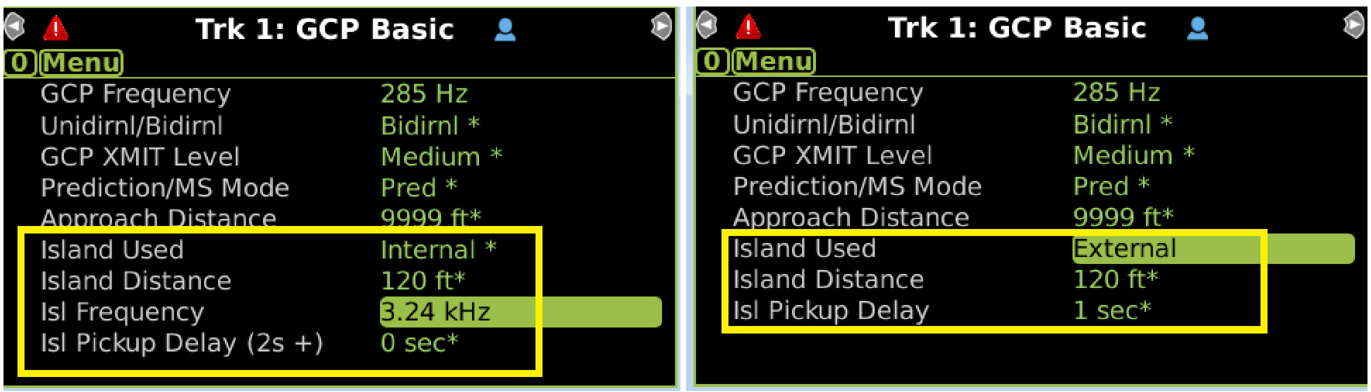


Figure 5-23 Internal Island Pickup Delay

5.6.1.3 Island Frequencies

The Island Frequencies depicted in Table 5-1 are available with the Model 3000+ GCP.

Table 5-1 Model 3000+ GCP Island Frequencies

Not Set	4.9kHz	11.5kHz
2.14kHz	5.9kHz	13.2kHz
2.63kHz	7.1kHz	15.2kHz
3.24kHz	8.3kHz	17.5kHz
4.0kHz	10kHz	20.2kHz

5.6.1.4 Pickup Delay

When the island is internal:

Pickup Delay (Loss of Shunt time): Valid delay range: 0 to 6 seconds (this is in addition to the inherent 2 second island delay).

5.7 EXTERNAL ISLANDS

When an input is required from an island circuit external to the Model 3000+ GCP, such as a DC island, set the **Island Used** as **External** for the specific track. When the island is set to **External**, an RIO module is required. RIO input 3 is used for track 1 external island input. RIO input 4 is used for track 2 external island input.

When the island is external, the Pickup Delay (Loss of Shunt time) can be set from range: 0 to 500 seconds.

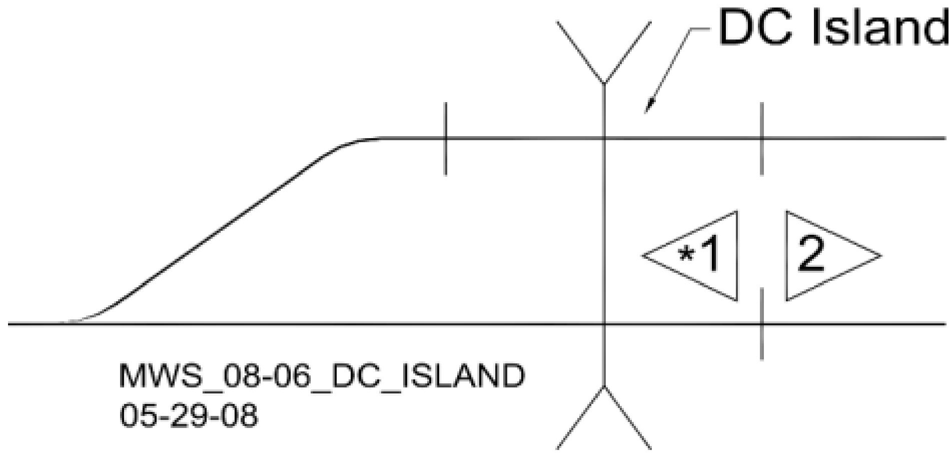


Figure 5-24 External Island Example

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 questions:

- 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 signals (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 Activation)

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 activation. 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.

Positive Start is turned on by setting the “Positive Start EZ Level” to a value other than 0. The value of 0 represents: Off.

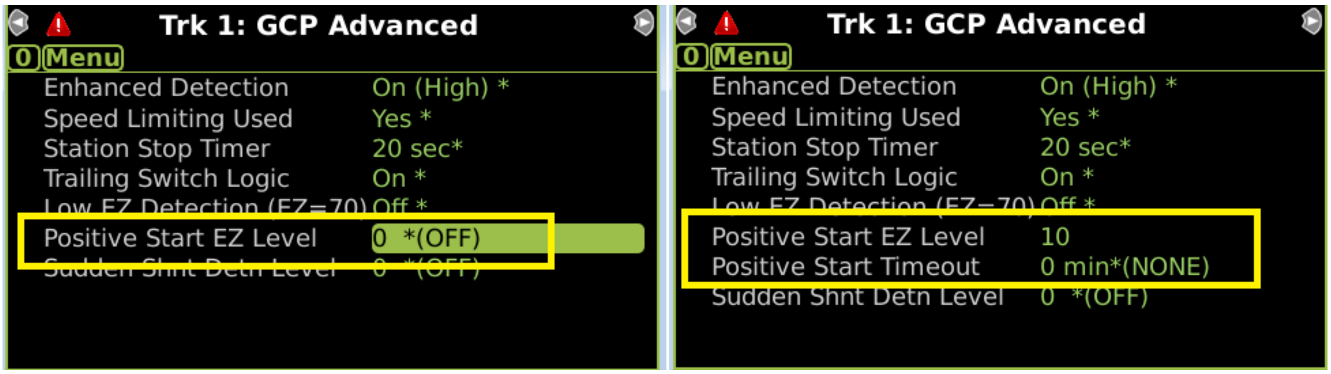


Figure 5-25 Positive Start EZ Level

When **Positive Start EZ Level** is set greater than 0, “Positive Start Timeout” is visible. This defaults to 0, meaning the timeout is not used. Set a value to indicate the timeout value in minutes.

The Positive Start function depends on whether the timeout is used as follows:

When **Positive Start Timeout** is 0:

- The prime and DAX preempts will de-energize when EZ drops below the configured EZ level without any reaction time delay.
- If the train stops, the Prime and DAX Preempt predictors will stay de-energized as long as EZ is below the configured level.
- The prime predictor and DAX Preempt will recover when the train passes the island circuit or EZ rises 5 points above the configured level and the programmed pickup time expires.

When **Positive Start Timeout** is used (greater than 0) and the EZ drops below the configured EZ level:

- the prime and DAX Preempt predictors will de-energize,
- the positive start timer will start,
- the prime and DAX Preempt predictors will recover when the 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" MS Control/Transfer screen.

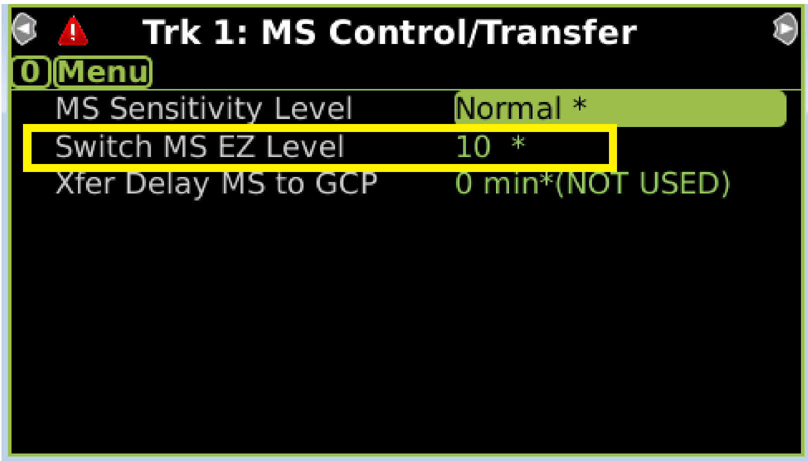


Figure 5-26 Switching from Predictor to Motion Sensor Operation

This function enables predictors with 0 offsets (Prime with 0 offset or DAX Preempts) 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 prime or DAXes if they are set to a non-zero offset.

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.
- 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: Xfer Delay MS to GCP (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 **Transfer MS to GCP** 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 and EZ of 80

Once the train stop is detected, motion sensing will be cancelled when:

- the train passes the island circuit or
- EZ goes above 80 or
- the Xfer Delay MS to GCP timer times out

To enable this function:

On the **Trk "N" MS Control/Transfer** screen

- Set **Xfer Delay MS to GCP** to a non-zero value (range 0-60 mins).
- This is used to set the time that the selected predictors function as motion sensors after a train stop is detected.
- The **Xfer Delay MS to GCP** 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.

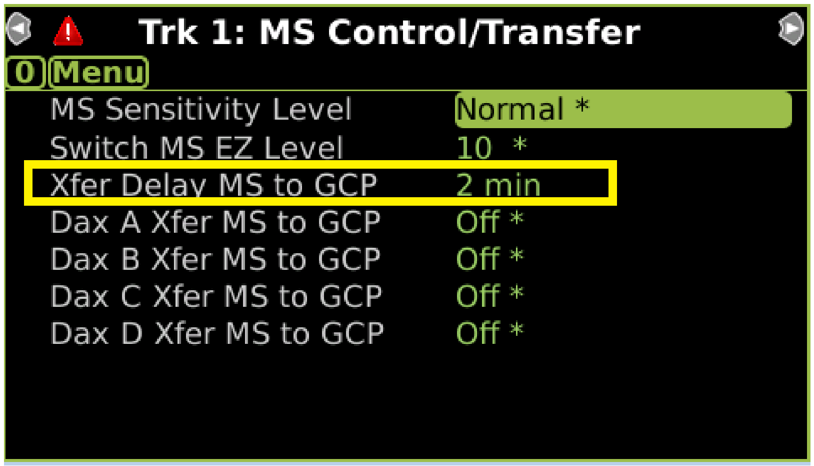


Figure 5-27 Setting Xfer Delay MS to a Non-Zero Value

If the prime or DAX Preempt has a zero offset, it is automatically changed to motion sensor. For predictors with non-zero offsets the user is allowed to specify whether these are also held as motion sensors.

5.8.3.1 Prime Xfer MS to GCP

- When the prime has a non-zero offset, this is used to select whether the prime is switched to motion sensor operation when a train stop is detected.

5.8.3.2 DAX A..D Xfer MS to GCP

- When the DAX has a non-zero offset, this is used to select whether the prime is switched to motion sensor operation when a train stop is detected.
- Only used DAXes associated with the specified track are shown.

5.8.3.3 Transfer MS to GCP Programming

The following discusses three application options for transfer delay 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 3000+ cases.
- Option 3C has a station stop in the remote approach and the crossing and remote units are in the same 3000+ case.

5.8.3.4 Option 3A: Station Stop is in the Crossing Approach

To program transfer delay operation: set the value of the **Xfer Delay MS to GCP** for the desired track, then select any non-zero offset predictors that need to be affected. See Figure 5-28 for the corresponding track configuration.

NOTE

NOTE
The GCP will only start the transfer timer if the train stops below EZ 80.

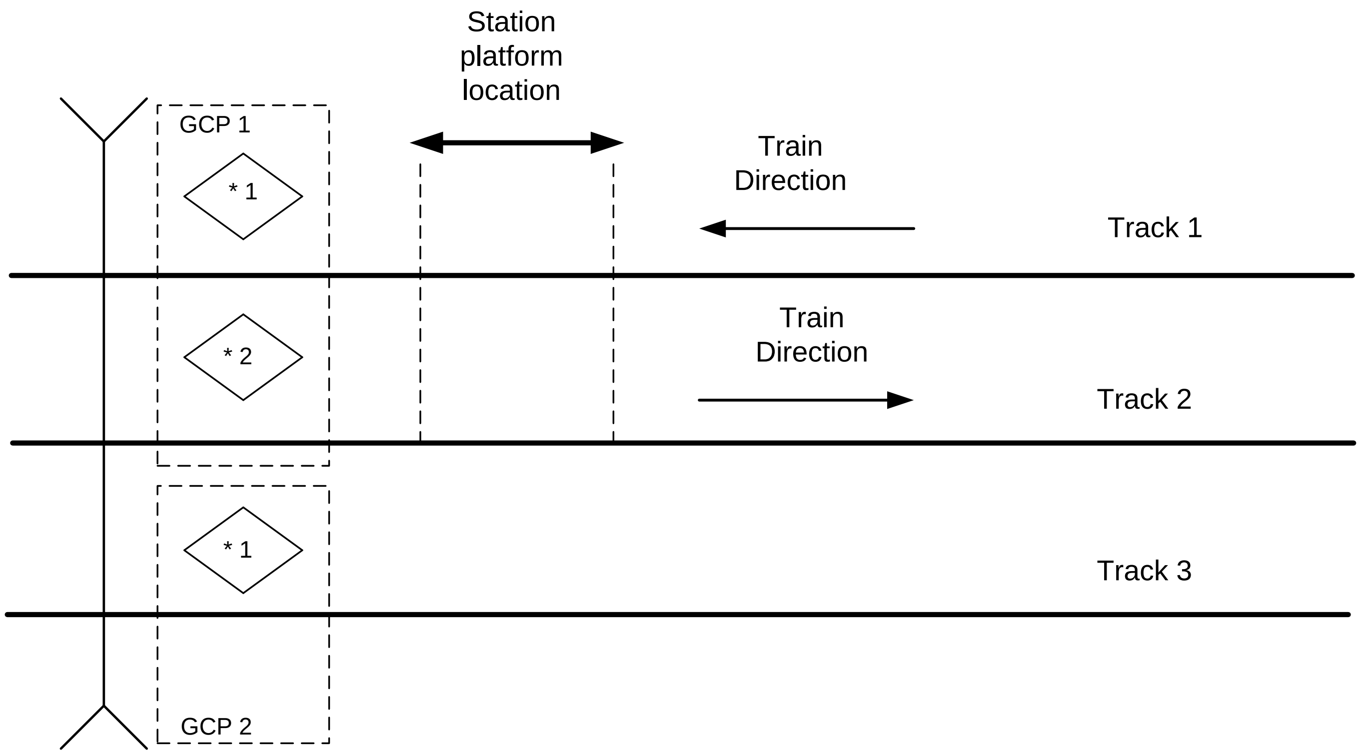


Figure 5-28 MS Restart Track Configuration

For the track configuration shown in Figure 5-28, 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 the **Xfer Delay MS to GCP** is left at 0 for Track 1 in GCP 2.

When there is a train stop on track 1 the transfer timer needs to start so set the **Xfer Delay MS to GCP** to the desired time for GCP 1 track 1.

When a train stops on track 2 since it is outbound to the crossing, there is no need to start the crossing or switch to motion sensor. So keep the GCP 1 track 2 **Xfer Delay MS to GCP** at 0.

5.8.3.5 Option 3B MS Restart for a Station Stop in Remote Approach (Separate 3000+ 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 a motion sensor restart operation, or to keep the selected crossing activated for trains that stop at the station.

For the track configuration shown in Figure 5-29, the **Switch to Motion Sensor Restart** option should be selected for both the GCP at the Remote and at the crossing.

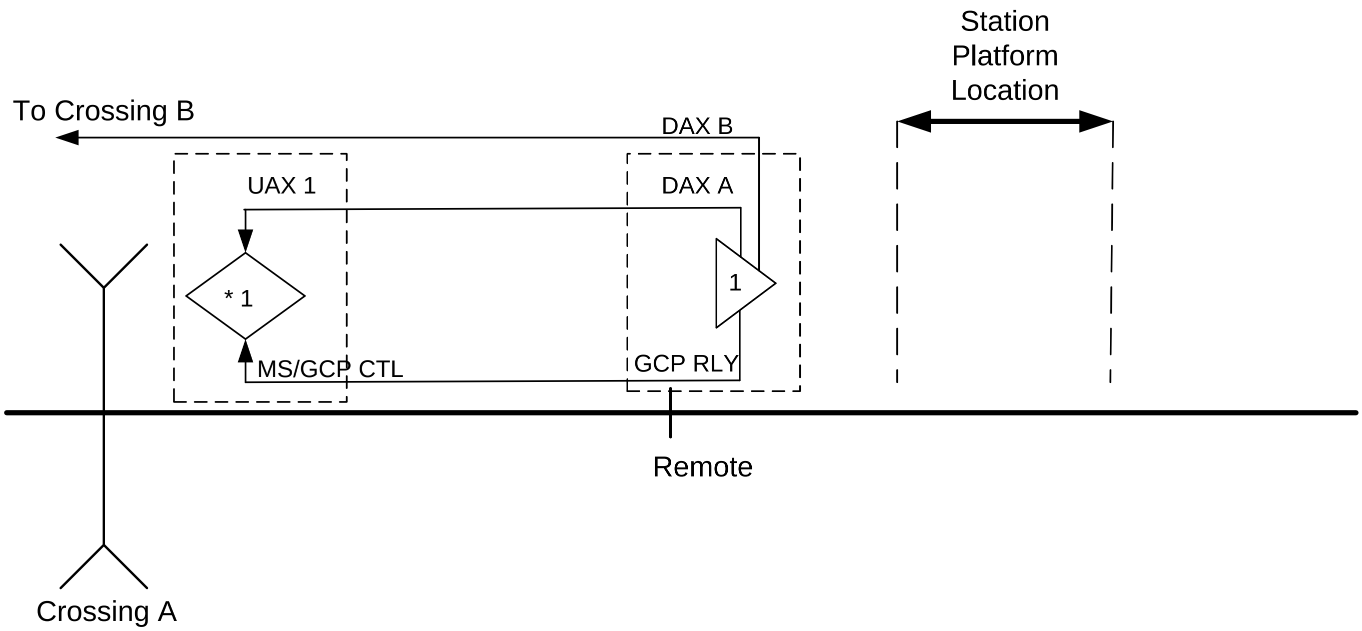


Figure 5-29 MS Restart for Crossing A

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

For the Transfer Delay operation to work in this case, the train has to predict on the approach to the remote and then recover when the train stops at the station. The prime predictor is used at the remote and programmed with a 0 offset distance. The GCP RLY output from the remote is used to control the MS/GCP CTL at crossing A. When a train approaches the remote, the prime will predict and the GCP RLY output drops; this will drop the MS/GCP CTL input at Crossing A, causing track 1 at Crossing A to switch to being a motion sensor. If the train stops at the station, the GCP RLY output will recover, and the MS/GCP CTL input at Crossing A will energize.

If the transfer delay is turned on at Crossing A, when the MS/GCP CTL energizes, it will start the transfer timer. Thus the track will be kept as a motion sensor for the duration of the transfer timer, so when the train leaves the station, the GCP at crossing 1 is still a motion sensor.

Increase the sensitivity of the motion sensor by setting the crossing MS Sensitivity Level to 40. This will allow 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.

In order to guarantee that the train is picked up quickly at the remote, the transfer delay can also be turned on there, so that when the train stops, the transfer timer starts and holds DAX A as a motion sensor.

In station stop applications, set the Remote DAX pickup delay mode (of the DAXes that switch to MS) to **Fixed** mode.

Remote Location Programming:

- Set Number of DAXes to 2
- Set Prime Prediction Offset to 0
- Set DAX A Offset distance to appropriate distance from remote to Crossing A
- Set DAX A Pickup Delay Mode to Fixed
- Set DAX A Pickup Delay to 10 sec
- Set DAX B Offset distance to appropriate distance from remote to Crossing B
- Set DAX B Pickup Delay Mode to Auto
- Set Xfer Delay MS to GCP to the expected time for the train to stop at the station
- Set DAX A Xfer MS to GCP to On (so DAX A is affected by transfer delay)
- Set DAX B Xfer MS to GCP to Off (so DAX B is not affected by transfer delay)

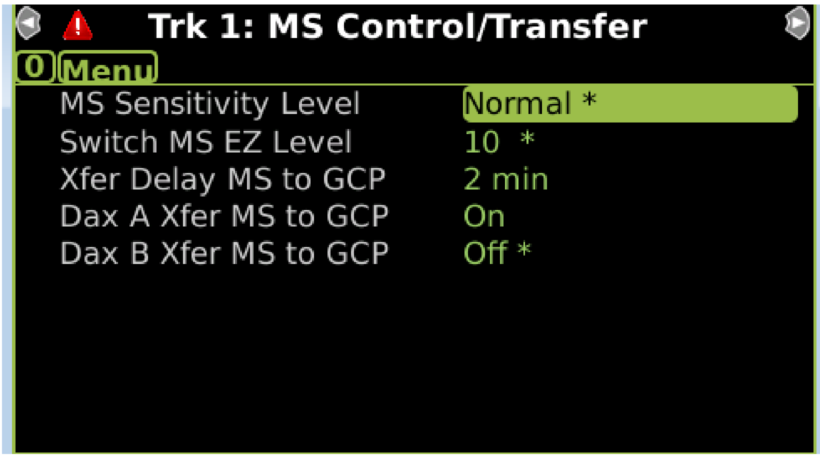


Figure 5-30 MS Control / Transfer Settings

Crossing A Programming:

- Set **UAX Pickup Delay** to 5 sec
- Set **MS Sensitivity Level** to 40
- Set **Xfer Delay MS to GCP** to the expected time for the train to stop at the station

The crossing transfer delay timer is generally set for the same time as the value used at the remote.

NOTE

NOTE

This method for handling station stops may result in slightly longer warning times for slow trains that are not stopping at the station, as the crossing will get switched to motion sensor mode when the remote's prime predictor drops.

5.8.3.6 Option 3C: Transfer Delay for a Station Stop in Remote Approach (Crossing and Remote are in Same 3000+ Case)

When remote predictors are in the same Model 3000+ case as the crossing predictor, different configuration is required. The GCP RLY output is controlled by the prime output from both track modules, so T2 Prime is programmed with the offset distance for Crossing A.

A predictor is still needed to detect the train approaching and stopping at the remote, so DAX A can be setup as a PREEMPT by setting its offset distance to 0. The DAX A RLY output is then tied to MS/GCP CTRL input.

When the train approaches the station, DAX A PREEMPT will de-energizes, dropping MS/GCP CTL and setting both track 1 and 2 to motion sensor mode. When the train stops, DAX A will recover and MS/GCP CTL will energize and start the transfer timers programmed for T1 and T2, so when the train restarts, they are still in motion sensor mode.

For the track configuration shown in Figure 5-31, switching to the motion sensor restart option will operate in both the Remote T2 and the crossing T1 modules.

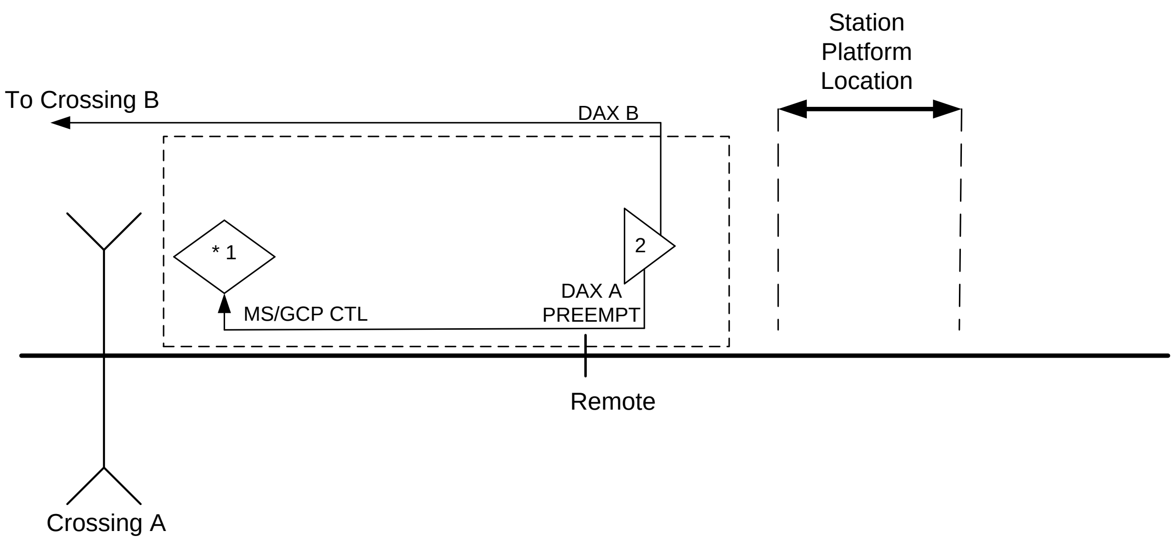


Figure 5-31 Remote MS Restart (Crossing and Remote in the Same 3000+ Case)

Figure 5-29 is the same application as shown in Figure 5-31 of option 3B, except the crossing and remote modules are in the same 3000+ case.

- Set Number of DAXes to 1
- Set Prime Prediction Offset to appropriate distance from remote to Crossing A.
- Set DAX A Track Assignment to T2
- Set DAX A Offset to 0
- Set DAX B Track Assignment to T2
- Set DAX B Offset distance to appropriate distance from remote to Crossing B.
- Set DAX B Pickup Delay Mode to Auto
- Set MS Sensitivity Level to 40
- Set Track 2 Xfer Delay MS to GCP to the expected time for the train to stop at the station
- Set Track 2 Prime Xfer MS to GCP to On (so Prime is affected by transfer delay)
- Set DAX B Xfer MS to GCP to Off (so DAX B is not affected by transfer delay)
- Set Track 1 Xfer Delay MS to GCP to the expected time for the train to stop at the station

5.8.4 Overview of MS Sensitivity Level Adjustment

In general, this adjustment option does not require changing from the default value of **Normal** (0); however, when the MS/GCP CTL input is used, the motion sensitivity should generally be set at 40. 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 **Level** field parameter. This parameter has a range of Normal (0), 20, 40, 60, 80 or 100 with default value of Normal. 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 **Normal** provides motion sensitivity of approximately 30 mph at end of a 3000-foot approach but always has 1 mph near the feed points.
- A value of **100** provides motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach.

Table 5-2 MS Detection Threshold Relative to Sensitivity Level Setting for 3000 Foot Approach

MOTION SENSITIVITY LEVEL VALUE	MOTION SENSING DETECTION THRESHOLD IN MPH
Normal	30
40	18
60	12
80	6
100	1

NOTE

NOTE

Motion sensitivity is always 1 mph near the GCP feed point regardless if the sensitivity adjustment is Normal or 100.

5.8.5 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:

- Transfer delay **MS to GCP** 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 **Transfer Delay MS to GCP** and **Sudden Shunt Detection** can both be used to provide the quickest crossing activation possible.

5.8.6 Low EZ Detection

Low EZ Detection is used to detect a significant reduction of EZ.

Low EZ Detection (EZ=70): range **On**, **Off** with default **Off**

- The EZ signal may decrease for various reasons including a false shunt
- Low EZ detection occurs when the EZ level drops below an EZ level of 70 for a period of time exceeding the low EZ detection timer value.
- Once low EZ detection occurs on a track, the Prime and DAXes associated with this track are de-energized until EZ rises above 75.

When Low EZ Detection Used (EZ=70) is set to **On**, the **Low EZ Detection Timer** is shown.

Low EZ Detection Timer: range 2 to 99 minutes, default 10 minutes.

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

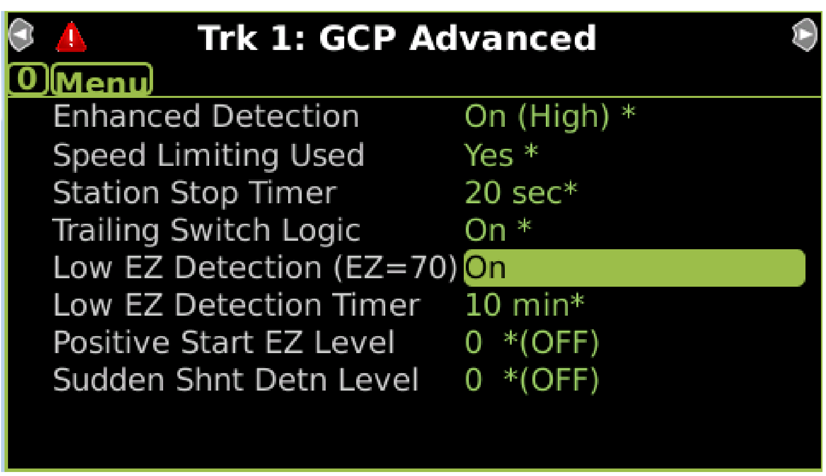


Figure 5-32 Low EZ Detection Timer Settings

5.8.7 Sudden Shunt Detection

When a signal is located close to a crossing, Sudden Shunt can be used to 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 5-33. 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.

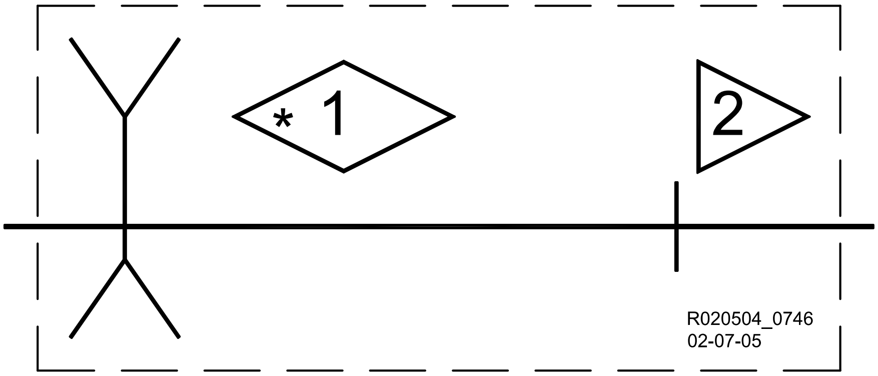


Figure 5-33 Track Application

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 Trk ‘N’: GCP Advanced screen
    - Set the **Sudden Shnt Det Level** to the EZ value required (0 indicated unused)
    - Set the **Sudden Shnt Det Offset** (in ft.)

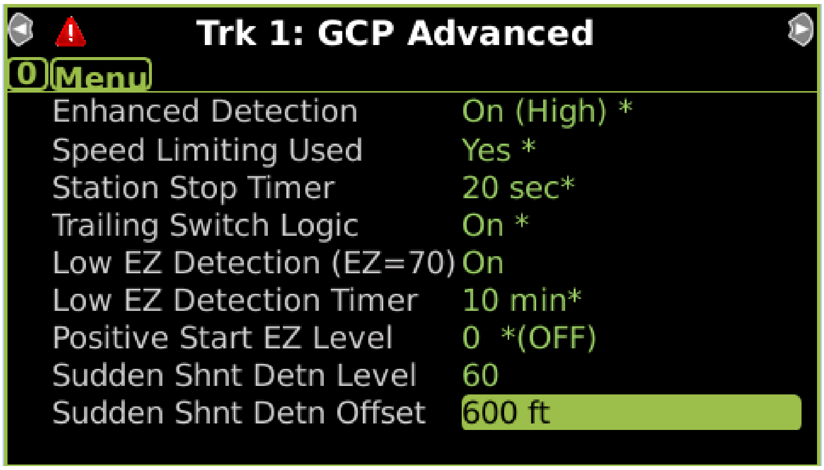


Figure 5-34 Sudden Shunt Settings

5.8.7.1 Sudden Shunt Detection 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 Detn 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.

5.8.7.2 Sudden Shunt Detection Offset:

When the crossing is unidirectional and the crossing unit has one or more DAXes in operation, the user may wish for Sudden Shunt to also drop DAXes that have smaller offset values but not ones with larger 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 Detn 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 Detection EZ level. If so, this would cause a crossing activation each time a train comes out of the trailing switch.

5.9 PROGRAMMING FOR POOR SHUNTING OPERATION (ENHANCED DETECTION)

The Model 3000+ GCP provides for advanced Poor Shunting logic. These parameters are found on the **Trk “N”: GCP Advanced** screen.

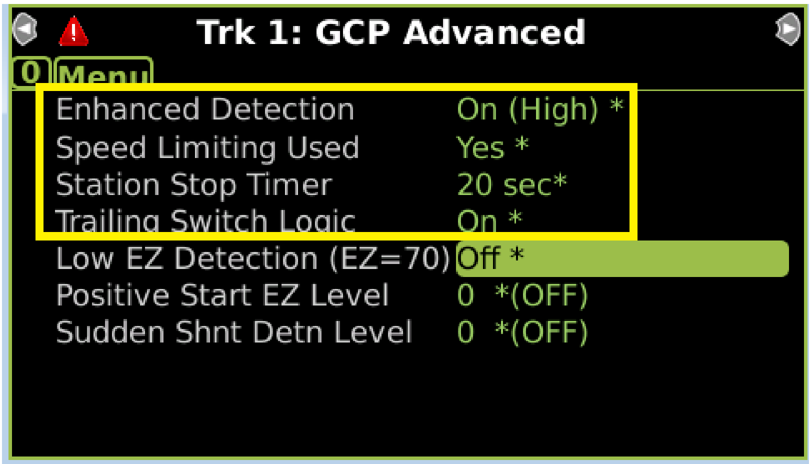


Figure 5-35 Poor Shunting Logic Parameters

The Poor Shunting programming has two parameters relating to Inbound and two relating to Outbound moves.

Inbound train movement

- Enhanced Detection (Inbound Poor Shunting Sensitivity)
- Speed Limiting Used

Outbound train movement

- Station Stop Timer (Outbound Poor Shunting Timer)
- Trailing Switch Logic

5.9.1 Enhanced Detection (Inbound PS Sensitivity):

Allows use of 3000+ GCP in areas where poor track shunting conditions may occur. Enhanced Detection is defaulted to the value: On (High).

On (Max) provides the highest sensitivity for detecting poor shunting while On (Low) provides the least sensitivity and Off turns it off. The default setting of On (High) is generally used for most applications.

When the GCP track module detects a poor shunting event, the Track Module:

- Immediately causes all predictors to 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

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, COMMUTERS, OR OTHER LIGHT RAIL VEHICLES OPERATE OR AT LOCATIONS WHERE POOR SHUNTING HAS BEEN OBSERVED IN THE PAST.

5.9.2 Speed Limiting Used

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

On the Model 3000+ GCP, an additional highly sensitive motion detection operation is in use to detect inbound motion when trains first enter an approach. When this inbound train motion is detected, the GCP switches from computing of standard train speed to speed limiting train speed.

Poor shunting causes train speeds to vary erratically. Speed Limiting stores the highest train speed detected. The system collects data every half second, storing the highest speed and allowing reductions that reflect train braking profiles.

If an inbound train stops in the approach, the GCP will revert back to standard speed detection until the train begins moving. Once inbound motion is detected, Speed Limiting will go back into operation.

5.9.3 Station Stop Timer

Station Stop Timer: range 10 to 120 sec, the default is 20 sec.

This only requires changing to a larger value if tail rings occur after an outbound train stops in the GCP approach and then continues outbound.

5.9.4 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. It can be left on for most applications.

5.10 MAINTENANCE CALL OUTPUT

The maintenance call output may be controlled by the Model 3000+ GCP.

5.10.1 Deactivation

The maintenance call output is deactivated by the Model 3000+ GCP if:

- A GCP approach or island is out of service.
- The Out Of Service inputs used are energized (even if GCP is back in service).
- An external event recorder is used and it is:
  - not in session.
  - running a non-vital logic program and is commanding the maintenance call to be de-activated.

5.11 TAKING TRACKS OUT OF SERVICE

⚠ WARNING

WARNING

THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A TRACK CIRCUIT OUT OF SERVICE SHALL BE FOLLOWED. THE INSTRUCTIONS IN THIS SECTION MAY BE FOLLOWED ONLY IF ALLOWED BY THE RAILROAD.

REQUIRED OPERATIONAL TESTS SHALL BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES WHEN RESTORING TRACKS TO SERVICE.

THE RAILROAD PROCEDURES FOR APPLYING TEMPORARY JUMPERS MUST BE FOLLOWED WHEN ENERGIZING THE "OUT OF SERVICE" INPUT(S).

NOTE

NOTE

If one or more tracks are taken out of service, the Out of Service Timeout covers all tracks taken out of service with one time interval.

If the timer is running for one or more tracks out of service, and it is desired to take another track out of service for an added amount of time, do the following:

- Return all tracks to service.
- Edit the **Out of Service Timeout** to the new value.
- Take the tracks out of service.

If the Transfer Module transfers while a track is out of service, the track will be returned to service and may activate the warning devices.

There are three Out Of Service (OOS) programming options for taking a track out of service. Each option provides unique OOS operation requirements. The options vary in the number of steps necessary to take a track out of service, as well as the degree to which the GCP functionality is taken out of service.

5.11.1 Out Of Service (OOS) Options

The three programming options are:

- Display
- Display +OOS IP (Display plus Out of Service Input)
- OOS IP (Out of Service Input only)

The last two options require the use of the Out of Service input(s) (input 2 on each track module) with 12 V (DC) applied for OOS operation to be effective. The default option is **Display**.

To view or change the current OOS programming option, on the **General Configuration Screen**:

- Set the **OOS Control** to desired value as shown below.
- Set the normal value of the OOS timeout to be used.

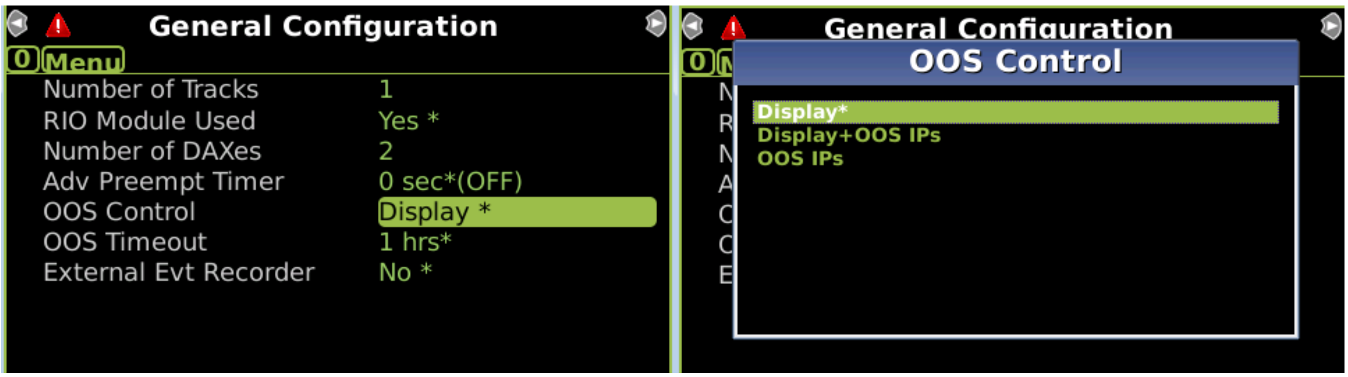


Figure 5-36 Out Of Service Display Settings

5.11.1.1 "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.

5.11.1.2 “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 Out Of Service. 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 hour.

When more than one track is taken out of service, the OOS time interval begins when the first track is taken out of service.

5.11.1.3 Main Status Screen Indications When a Track Is Out Of Service

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

5.11.1.4 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 remains on during train movements. UAX inputs are ignored. 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 de-energize or display warning times.

If the Model 3000+ GCP switches over between MAIN and STANDBY modules, OOS tracks will be placed in-service and will remain in-service until user selects tracks OOS again.

User can select a track back into service from the same display screen used to take a track OOS. No change to the GCP RLY wiring on the 3000+ case is required when taking a track OOS. The crossing will activate if

- The ENABLE input on the RIO is de-energized.

NOTE

NOTE
When a GCP is OOS but the island remains in service, the crossing will activate when the island is occupied.

5.11.1.5 “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 paragraphs.

⚠ WARNING

WARNING

INPUTS FOR “OUT OF SERVICE” SHOULD BE WIRED IN A PERMANENT MANNER IN ACCORDANCE WITH CIRCUIT PLANS.

DO NOT USE TEST TERMINALS OR SWITCHES THAT CAN VIBRATE CLOSED TO ENERGIZE OOS INPUTS.

5.11.1.6 “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.

5.11.1.7 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 the 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.

5.11.1.8 “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.

5.11.1.9 Additional Differences in OOS Operation

If Model 3000+ GCP switches over between MAIN and STANDBY, any OOS track will continue OOS once the 3000+ has completed switchover and modules have booted.

De-energizing an OOS physical input causes the track controlled by that input to be placed back into service. If the input is re-energized, corresponding tracks will return to OOS.

No timeout option is available.

5.11.1.10 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 OOS**. All track module predictor outputs remain energized. UAX inputs are ignored.

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 the 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 GCP RLY wiring to the 3000+ case is required when taking a track OOS. The crossing will activate if RIO is used and the ENABLE input is de-energized.

5.11.1.11 Additional Design Considerations

The designer needs to be careful when considering how things are taken out of service and how the system responds to inputs. The following are some examples:

- If a shunt enhancer panel health input is brought into UAX 1 (or 2) input, then taking T1 out of service will also disable the health input, which may or may not be intended, so it may be better to use the ENABLE input on the RIO.

5.12 ADVANCED APPLICATION PROGRAMMING

5.12.1 DAXing Pickup Delay Consideration

The Prime and DAX Pickup delays default to 15 seconds, but these 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 DAXs are enabled in the main menu.

5.12.1.1 Predictors with Zero Offset Distance

⚠ WARNING

WARNING

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, THEN, IN VERY LIMITED CIRCUMSTANES 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. REFER TO SECTION 5.12.2 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 GCP: Prime default settings are depicted below:

- On the Trk 1: Prime screen:
  - Prime Warning Time default is 25 sec
  - Prime Prediction Offset default is 0 ft
  - Prime Pickup Delay default is 5 sec
  - Pickup Delay Mode default is Fixed (this is hidden when prime prediction offset is 0)
  - UAX Pickup Delay default is 0 (Not Used)

5.12.1.2 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.

5.12.1.3 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.

5.12.1.4 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.

5.12.1.5 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 some time 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 delays in the remote units DAX. For example, for a total Pickup delay of 10 seconds:

On the remote unit:

- On the Dax A screen, set DAX A Pickup Delay Mode to FIXED
- Set DAX A Pickup Delay to 8 sec

On the crossing unit:

- On the Trk 1 Prime screen set UAX Pickup Delay to 5 sec

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

WARNING

WARNING

WHEN A DAX HAS A VERY SHORT OFFSET DISTANCE, 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. This recommendation is in place because when the UAX de-energizes it changes the crossing GCP into motion sensing (1 mph/1.6 km/h 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 km/h.

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 a GCP at the crossing is bidirectional, Positive Start (PS) will operate on both approaches to the crossing. The PS activate distance will extend in both directions approximately as far as the programmed short offset distance of the DAX.

The following subsections provide alternative solutions for this short DAX offset distance application. The options include:

- Option 1: Use of Positive Start
    - This option may be used when the crossing and DAX modules are in the same Model 3000+ GCP chassis
    - May not be used with Advanced Preemption
- Option 2: Use of Externally Wired UAX. This option may be used:
    - When the crossing and DAX modules are in the same or separate Model 3000+ GCP chassis
    - With or without Advanced Preemption

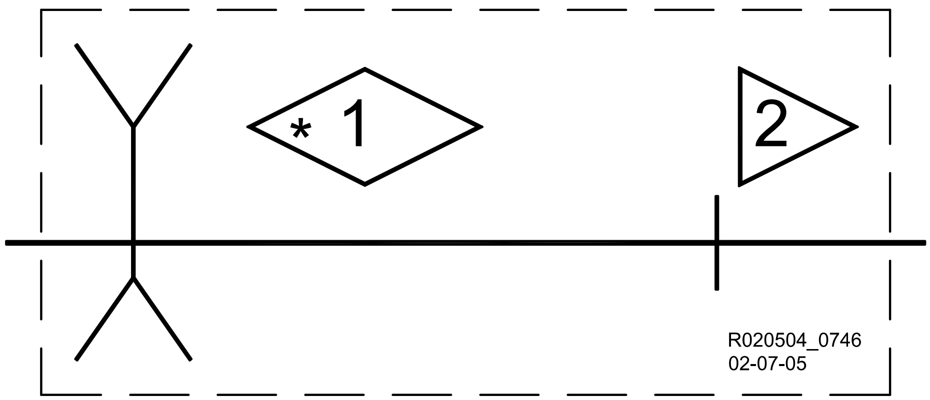


Figure 5-37 Crossing with Model 3000+ GCP and DAX in Same Chassis

NOTE

NOTE

The following subsections assume that T1 is at the crossing and T2 is a remote DAX (prime with offset) in the same 3000+ chassis (see Figure 5-37). When crossing and remote DAX are in separate 3000+ chassis, use the standard DAX to crossing UAX applications (discussed in section 5.12.2.2).

5.12.2.1 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: GCP Advanced** screen:
    - Set the **Positive Start Value** to be equal to or slightly higher than the EZ value at the insulated joints.
    - Set **Positive Start Timer** to the desired delay time
- On the **Trk 2: Prime** screen:
    - Set Prime Prediction Offset to 250 ft.
    - Set Pickup Delay Mode to FIXED
    - Set Prime Pickup Delay to 8 sec

5.12.2.2 Option 2: Use of Externally Wired UAX

In Model 3000+ GCP applications (with or without traffic signal preemption), an **Externally Wired UAX** connection can be used. The UAX is controlled by either a remote DAX in the same crossing chassis or from a remote DAX in a separate chassis. This application (DAX in same chassis) does require the addition of external wiring from the DAX output to the UAX input on the crossing GCP chassis.

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

- On the **Trk 1: Prime** screen:
  - Set T1 UAX Pickup Delay to 20 sec
- On the **Trk 2 Prime** screen:
  - Set T2 Prime Prediction Offset to the distance between T1 track wires and insulated joint at T2. For this example, that distance is 265 ft.
- Add external wires on the crossing Model 3000+ GCP chassis from:
  - T2 RLY OUT (+) to UAX 1 (+)
  - T2 RLY OUT (-) to UAX 1 (-)

If there is a second DAX to the crossing in the same 3000+ crossing chassis then an vital AND gate will be needed to AND together the DAXes.

5.12.3 DAX Utilizing Post Joint Prediction (PJP)

The Model 3000+ GCP provides Post Joint Prediction (PJP) automatically for all predictors (DAX operation) that have an Offset Distance other than zero (0) feet. The PJP provides a seamless and automated DAX prediction handover process from the DAXing GCP to the downstream GCP. It also provides prediction coverage for dead sections such as in crossovers or across track diamonds.

When a train passes a remote GCP and the GCP DAX has not predicted, it will continue calculating if the crossing signals need to activate within the next 15 seconds. If required, the GCP DAX will activate the crossing warning devices during those 15 seconds. This PJP is automatic in the Model 3000+ GCP. The Post Joint Prediction duration has two PJP times (15 and 7 seconds) depending on application programming. In the AUTO Pickup delay mode, the time duration is 15 seconds. In the FIXED Pickup delay mode the time duration is 7 seconds. In general, AUTO pickup delay is used for PJP; however, FIXED pickup delay can be used if very short trains accelerate significantly after passing the remote DAX insulated joints causing an over-ring to occur at the crossing. Over-rings typically occur due to the AUTO DAX pickup delay not recovering by the time the tail end of the train passes the crossing island circuit.

NOTE

NOTE

In a double crossover application, there are two application designs available for the crossover closest to the crossing. The first application design, which is discussed in Procedure 5.2 and is depicted in Figure 5-39 as Crossover1, is titled Double Crossover using DAX Post Joint Prediction (PJP).

5.12.3.1 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.

5.12.3.2 Calculations for Post Joint Prediction Time

Whenever there is a crossover section of track that a GCP does not monitor for train movement, the calculations in the following paragraphs 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 times (WT) (refer to Figures 5-39—5-42 for example layout). Diminished times 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 calculations in the following paragraphs will determine the amount of time that is needed and indicate the amount of island distance that needs to be programmed into the GCP to obtain this time.

WARNING

THERE CAN BE OTHER DEAD SECTIONS IN AN APPLICATION, EACH MUST BE CHECKED. IN THIS SECTION, RANGES OF TRAIN SPEEDS THAT MAY RESULT IN SHORTENED WARNING TIMES BECAUSE OF A DEAD SECTION ARE CALCULATED OR ACCOUNTED FOR.

NOTE

In the 3000+ GCP the amount of Post Joint Prediction time beyond 15 sec is set by adjusting the island distance, even though there may be no real island present at the location.

5.12.3.3 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.

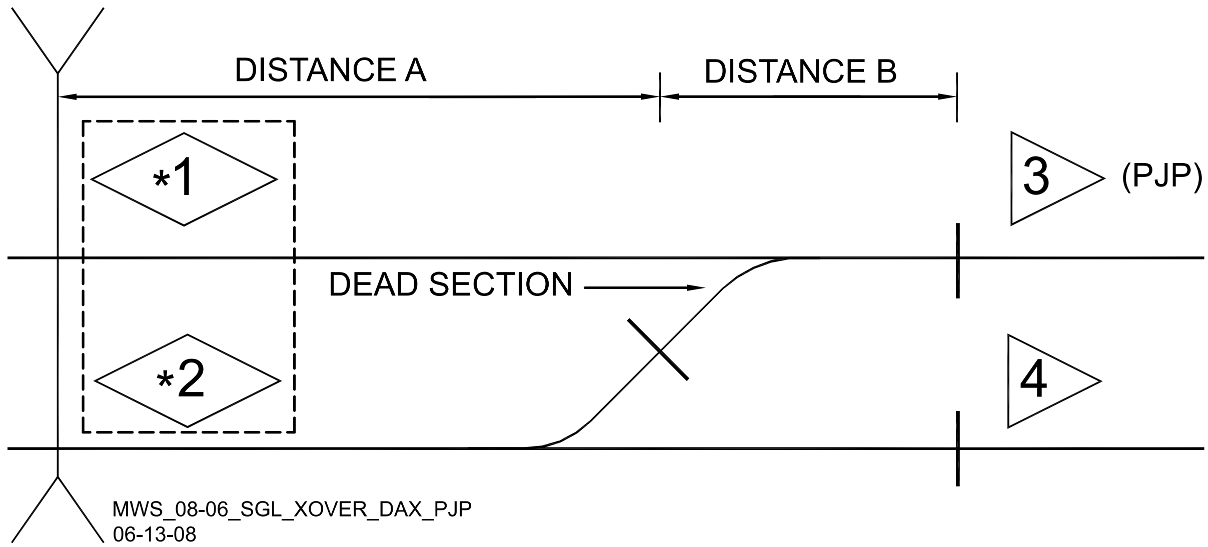


Figure 5-38 Single Crossover Using DAX Post Joint Prediction (PJP)

Procedure 5.1 Single Crossover Using DAX Post Joint Prediction (PJP)

The predictor dead section in Crossover1 in Figure 5-38 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 sec) + Clearance Time + Advance Preemption 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 km/h.
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 km/h. The ft/sec or m/sec values are used in other equations. The minimum to maximum mph/km/h 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	Subtract 15 sec from the time in Step 3. This gives us the additional amount of Post Joint detection time required.
Step 5	Multiply the additional PJ detection time from Step 4 by the speed computed in step 1, this gives us the island distance that needs to be programmed into GCP 3.

5.12.3.4 Double Crossover Using DAX Post Joint Prediction (PJP)

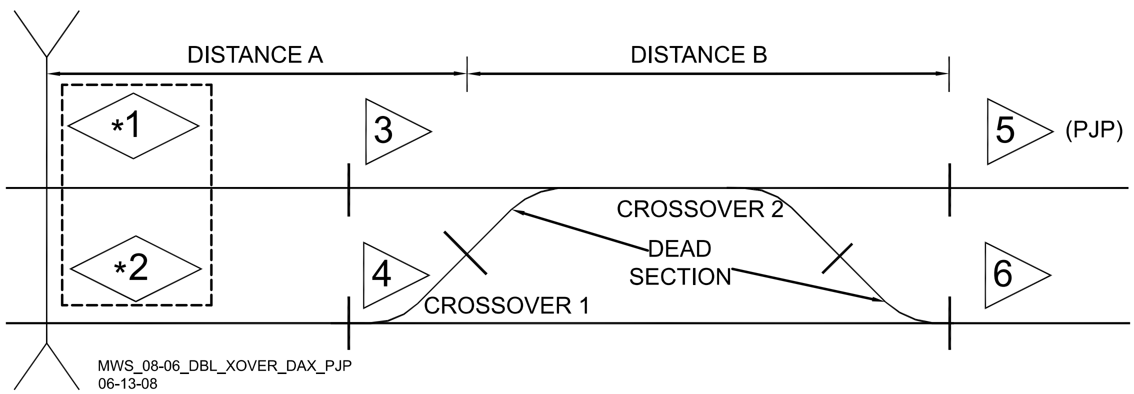


Figure 5-39 Double Crossover Using DAX Post Joint Prediction (PJP)

Procedure 5.2 Double Crossover Using DAX Post Joint Prediction (PJP)

The predictor dead zone in Crossover1 is covered by PJP in remote GCP 5 and is calculated in the following:
A = distance from edge of road to effective insulated joint 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 seconds) + 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 km/h.
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 km/h. The ft/sec or m/sec values are used in other equations. The minimum to maximum mph/km/h 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	Subtract 15 sec from the time in Step 3. This gives us the additional amount of Post Joint detection time required.
Step 5	Multiply the additional PJ detection time from Step 4 by the speed computed in Step 1, this gives us the island distance that needs to be programmed into GCP 5. The predictor dead zone for Crossover2 is covered by PJP for remote GCP 6 and requires using Procedure 5.1 Single Crossover formulas for GCP 3 for the calculations.

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

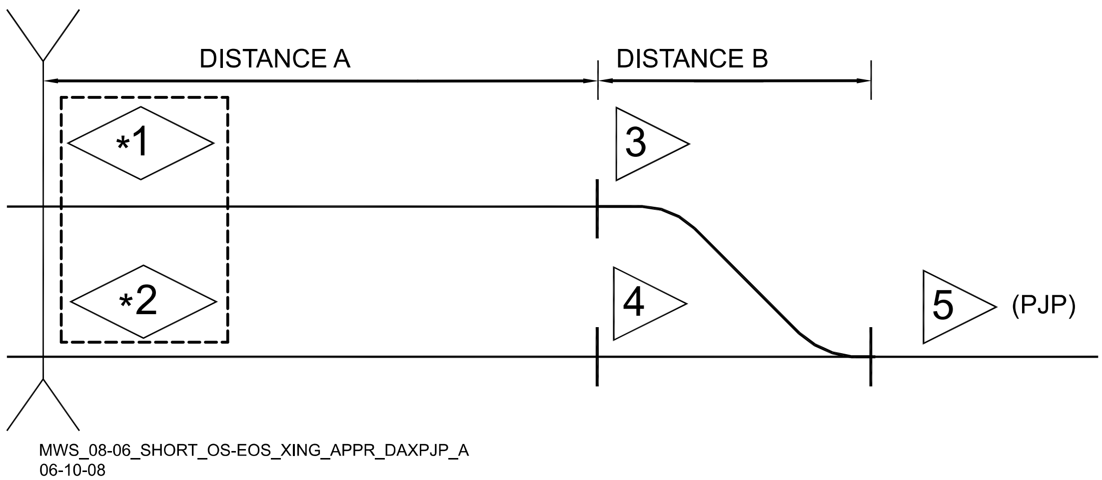


Figure 5-40 Layout A

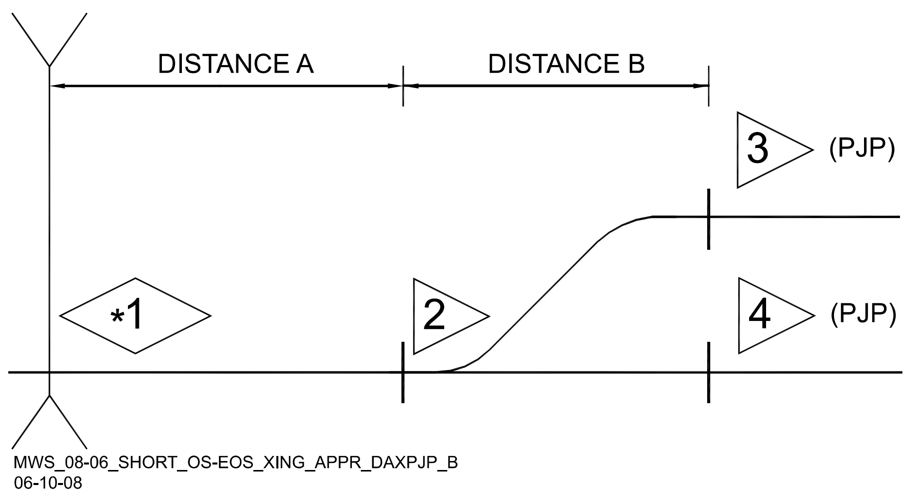


Figure 5-41 Layout B

Procedure 5.3 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 5-40 and Figure 5-41, (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 sec) + Clearance Time + Advance Preemption Additional Time).

C = ________ sec.

Formula for GCP 5 in Figure 5-40 and GCPs 3 and 4 in Figure 5-41:

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 km/h.
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 km/h. The ft/sec or m/sec values are used in other equations. The minimum to maximum mph/km/h 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 sec 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 sec. 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	Subtract 15 sec from the time in Step 5. This gives us the additional amount of post joint detection time required.
Step 7	Multiply the additional PJP detection time from Step 6 by the speed computed in Step 1, this gives us the island distance that needs to be programmed into GCP 5 (layout A) or GCP 3 and 4 (layout B).

5.13 TRAFFIC PREEMPTION

A Model 3000+ GCP Preemption output may be interconnected to traffic signal equipment. This interconnect is used to initiate a preemption sequence that systematically clears vehicular traffic from the crossing area. A preemption cycle can be initiated either in advance of crossing signals and activated using Advance Preemption or at the same time as the crossing signals activated using Simultaneous Preemption.

5.13.1 Advance Preemption

The Advance Preemption function is configured on the General Configuration screen:

- Set **Advance Preempt Timer** to desired time. Default is 0, meaning advance preemption is off, i.e. not used

A DAX then needs to be programmed to the desired preemption time and its offset distance set to 0. The DAX RLY output is then wired to an external traffic-signal-preemption-control relay. The Advance Preempt Delay Timer for each Track Module is enabled and each module timer uses the value set by the Advance Preempt Timer.

When a DAX preempt predicts, the external traffic signal preemption relay de-energizes, starting a traffic signals preemption cycle and the advance preempt timer will be started for that track.

When an Advance Preempt Timer expires it will de-energizes the Prime predictor for the corresponding track, causing the GCP RLY to de-energize and the crossing to activate. Any other DAX preempts associated with that track will also be de-energized.

If multiple DAXes are used with and without offsets, the 3000+ GCP will assume that the first DAX configured with a 0 offset for each track (i.e. configured as a Preempt) will be the one wired to the traffic-signal-preemption-control relay. This allows the flexibility to configure multiple preempts with different warning times if required, the first used one for each track will start the advance preemption timer, and when the timer expires the prime and any other preempts associated with that track will be de-energizes.

When an advance preemption timer is used, the MS/GCP CTRL input is not used for its usual function of switching the GCP to a motion sensor; instead it is used as an alternate way of starting the advance preemption timer. This is used when a remote location is DAXing to the crossing and needs to start the preemption cycle, see section 5.13.1.4 and 5.13.1.5 for examples.

This means that when the advance preemption is used and there is no remote location, the MS/GCP CTL input needs to be strapped to an energized state.

WARNING

WARNING

THE ADVANCE PREEMPTION TIME DELAY IS DETERMINED BY THE HIGHWAY AGENCY AFTER AN ENGINEERING STUDY OF THE INTERSECTION AND GRADE CROSSING.

5.13.1.1 Advance Preemption Timer Delay

Where only the DAX Preempt and prime predictors are used at a crossing (Advanced Preemption Timer set to 0), the time between the start of the traffic signal preemption cycle and the start of the crossing signals is determined by the:

- DAX Preempt predictor warning time
- Prime predictor warning time
- Train speed variation following preempt prediction

For example, with the Preempt Predictor warning time set to 40 seconds, Crossing Prime warning time set to 30 seconds, and Advance Preempt delay set to 10 seconds: A train traveling at a constant speed through the approach will result in an advance traffic preemption interval of 10 seconds.

WARNING

WARNING

IF NO PREEMPTION TIME INTERVAL DELAY WERE USED, A TRAIN THAT SLOWS AFTER THE DAX PREEMPT PREDICTS WOULD RESULT IN AN ADVANCE TRAFFIC PREEMPTION INTERVAL THAT IS GREATER THAN THAT OF THE CONSTANT SPEED TRAIN.

THIS IS LONGER-THAN-DESIRED TIME INTERVAL COULD ALLOW THE TRAFFIC SIGNAL TO CHANGE BACK TO RED BEFORE THE CROSSING SIGNALS ACTIVATE.

IF THIS HAPPENED, VEHICLES COULD PROCEED ON THE TRACKS AND BE STOPPED BY THE RED TRAFFIC SIGNAL.

THE "ADVANCE PREEMPTION TIMER" SHOULD BE USED TO PREVENT THIS POSSIBILITY.

NOTE

NOTE

When the Advance Preempt Timer is used, the interval between Prime and Preempt Predictions will never exceed the timer value.

If the Advance Preempt timer was not used and a train decelerates after the DAX 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 DAX 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, if the advance preemption timer is set at 10 seconds, it might run for only 8 seconds before the 30 second prime predictor predicts, overriding the preempt timer and activating the crossing.

5.13.1.2 Configuring Advance Preemption

To minimize the Delay Interval Reduction caused by accelerating trains, set the **Advance Preempt Timer** from the General Configuration screen.

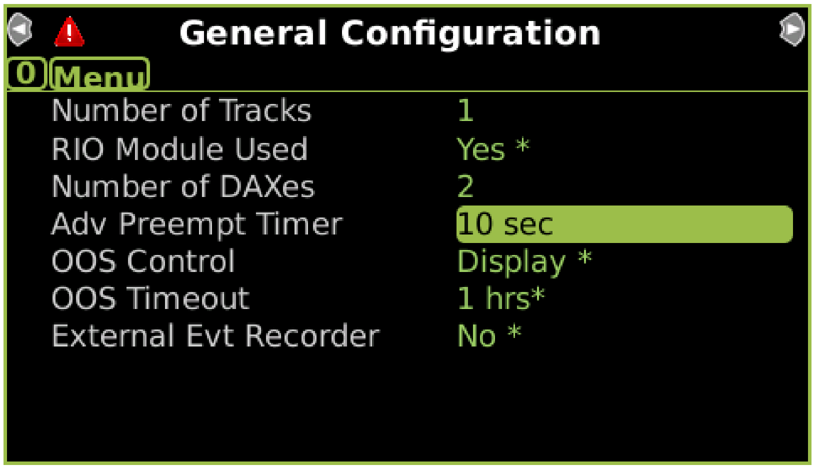


Figure 5-42 Advance Preempt Timer Settings

Set the warning time for each track Prime Predictor for 2 to 3 seconds below their normal value. Set the DAX preempt warning times to desired preemption warning time (e.g. 40 seconds as shown in Figure 5-43.)

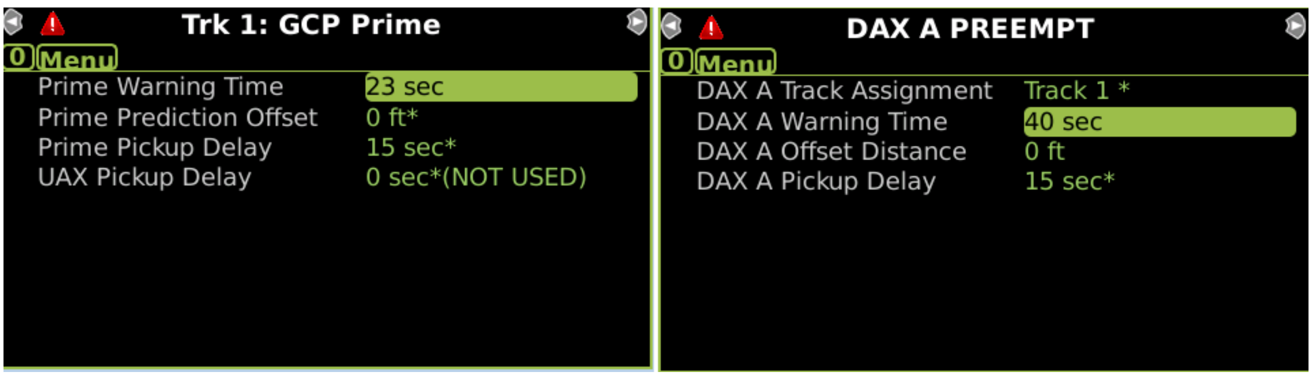


Figure 5-43 Setting Preemption Warning Time

5.13.1.3 Advance Preemption from a Remote Location

Advance preemption can be initiated from a GCP at a remote location.

5.13.1.4 Remote Advance Preemption between Modules of the Same GCP Case

An Advance Preemption application, where the Track Modules for the crossing and the Track Modules for the remote location are in the same Model 3000+ GCP case is shown in Figure 5-44.

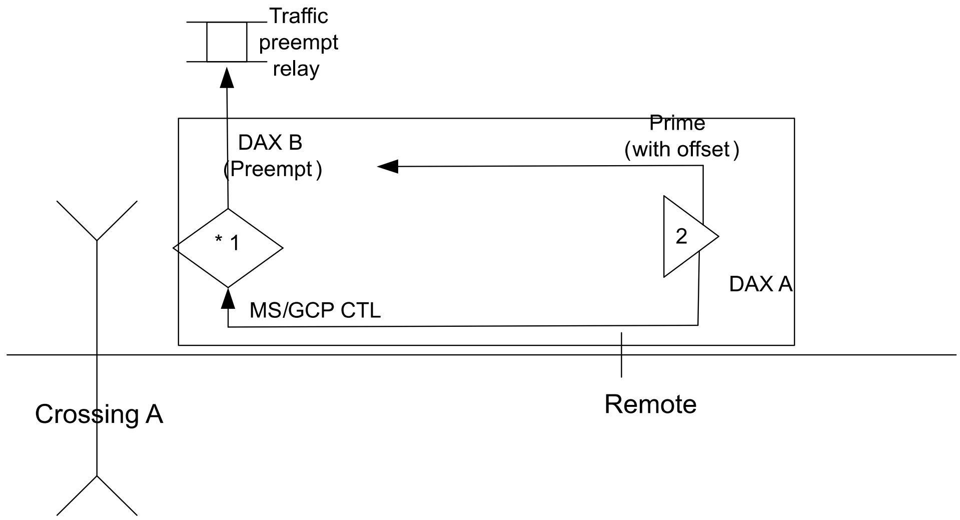


Figure 5-44 Remote Advance Preemption between Modules of the Same Case

- Set the Advance Preempt Timer to 10 sec (or desired time)
- Set Number of DAXes to 2
- Set the Track 2 Prime with the offset distance between remote and crossing
- Set the Track 2 Prime warning time a few seconds below the normal crossing warning time.
- Set DAX A Track Assignment to Track 2
- Set DAX A with the offset distance between remote and crossing
- Set DAX A with the desired preempt warning time
- Connect DAX to the MS/GCP CTL input
- Set the Track 1 Prime offset to 0
- Set the Track 1 Prime warning time a few seconds below the normal crossing warning time.
- Set DAX B with the 0 offset distance
- Set DAX B with the preempt warning time
- Connect DAX B to the traffic relay

When a fast train approaches it will cause DAX A to drop, thereby causing the MS/GCP IP to de-energize, which will in turn cause DAX B to drop and the advance preemption timer to start. When the advance preemption timer expires, it will cause the GCP RLY to drop and start the crossing. If the train were to accelerate, Track 2 Prime would drop before the advance preemption timer expires, thereby dropping the GCP RLY.

When a slow train approaches, it may not trigger DAX A or the prime at the remote. When the train goes on to the crossing approach, it will drop DAX B, which will start the advance preemption timer and drop the traffic relay. When the advance preemption timer expires, it will cause the GCP RLY to drop and start the crossing. If the train were to accelerate, Track 1 Prime would drop before the advance preemption timer expires, and drop the GCP RLY.

5.13.1.5 Remote Advance Preemption between Separate GCP Cases (Single Track)

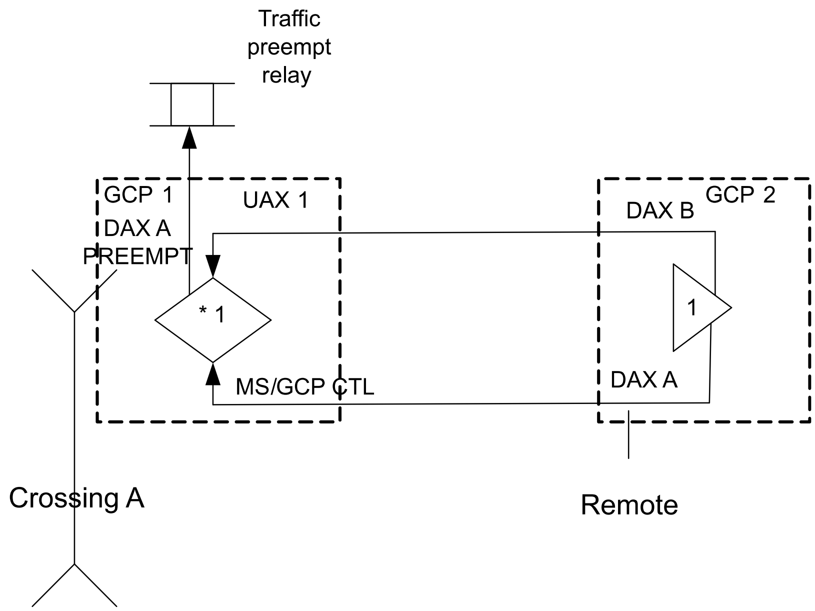


Figure 5-45 Remote Preemption from Separate Model 3000+ GCP Case

In this scenario, 2 DAXes are configured at the remote location. Both DAXes are programmed to have their offset distance set to the distance between the remote and the crossing. DAX A will be programmed with the desired preemption time, and DAX B will be configured with the normal crossing warning time minus 2-3 sec.

DAX A is wired into the MS/GCP CTL input at the crossing. DAX B is wired to UAX 1 at the crossing.

At the Remote Site:

- Set the Advance Preempt Timer to 10 sec (or desired time)
- Set Number of DAXes to 2
- On the DAX A screen set offset distance 0 and warning time to desired preemption delay.
- On the DAX B screen set offset distance 0 and warning time to 2-3s less than crossing warning time.
- Wire the MS/GCP CTL input high.

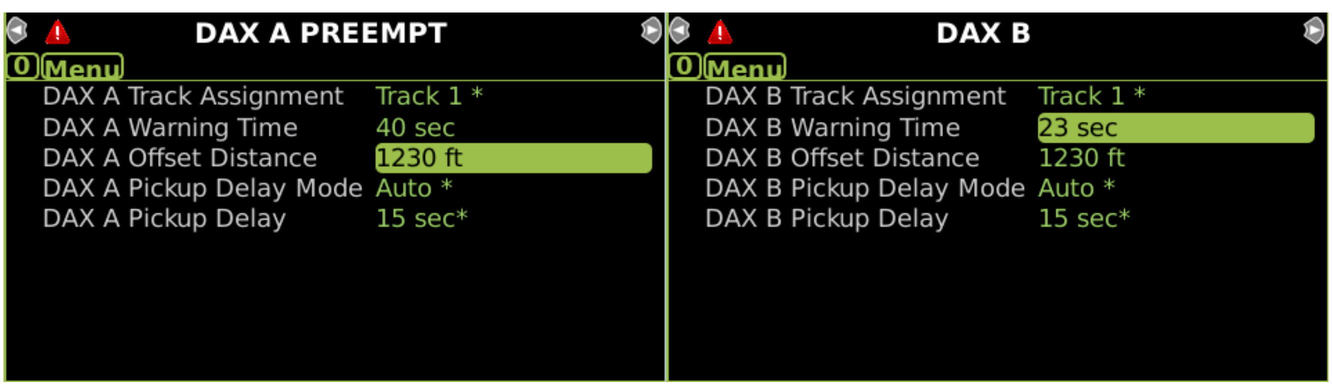


Figure 5-46 Setting the DAX Offset Distance

At the Crossing Site:

- Set the Advance Preempt Timer to 10 sec (or desired time)
- Set Number of DAXes to 1
- Set the Prime warning time to 23 sec,
- Set the UAX Pickup delay to 5 sec,
- Set the DAX A offset distance to 0
- Set the DAX A warning time 40 sec.

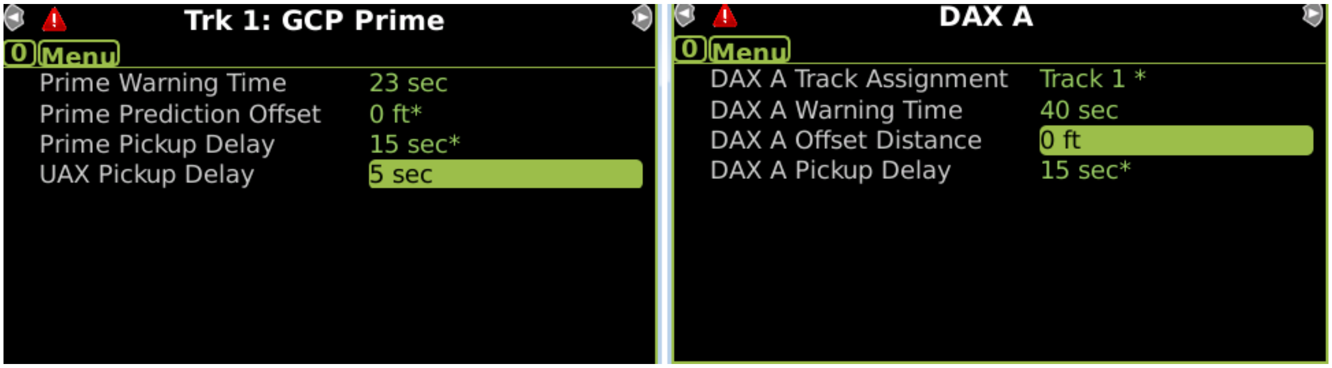


Figure 5-47 Setting UAX Pickup Delay

- Connect DAX A output from the crossing to the traffic preemption relay
- Connect DAX A from the remote to the MS/GCP CTL input at the crossing
- Connect DAX B from the remote to the UAX 1 input at the crossing

5.13.1.6 Remote Advance Preemption between Separate GCP Cases (Double Track)

When the remote predictors are in separate 3000+ cases and there are two tracks:

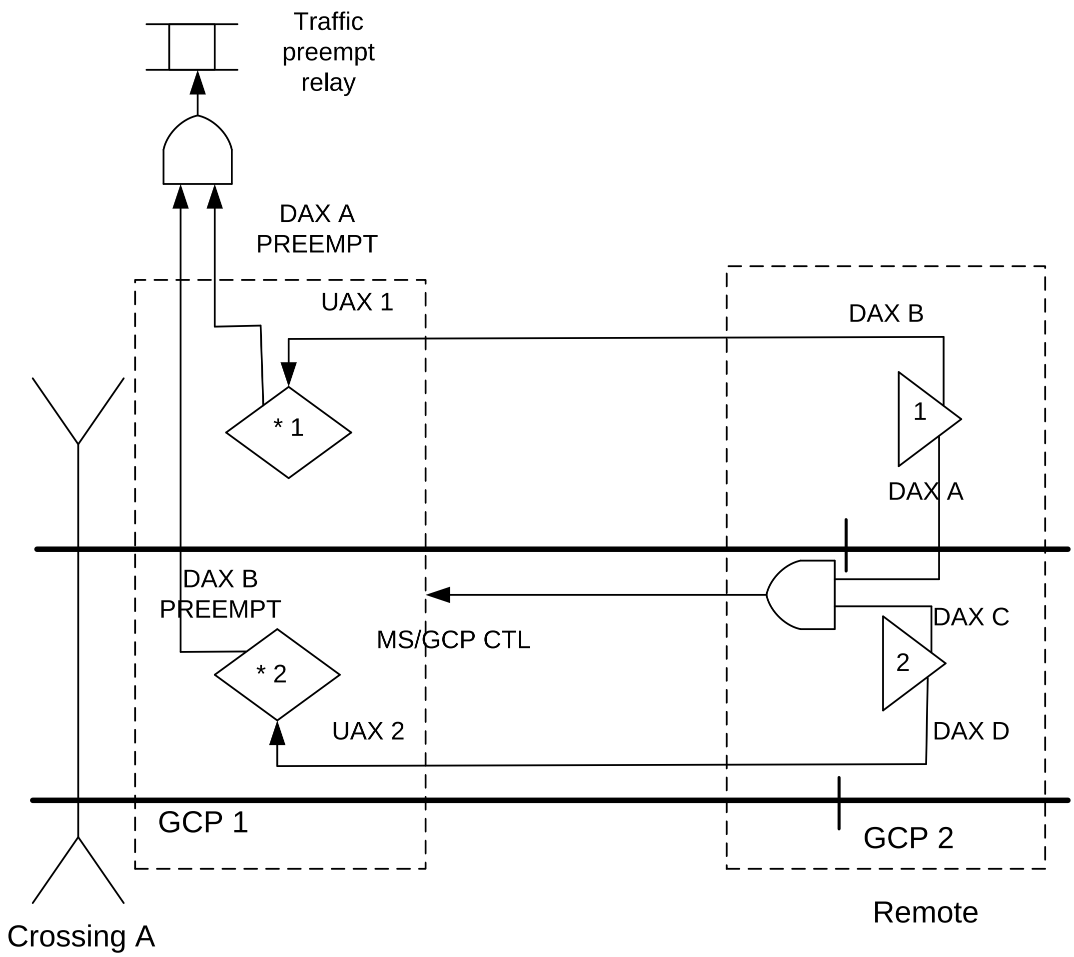


Figure 5-48 Remote Preemption from Separate Model 3000+ GCP Case Double Track

In this scenario, 4 DAXes are configured at the remote location. One DAX is used for each track to start the UAX 1 and 2 at the crossing. The other two DAXs will be programmed with the desired preemption time, and will be ANDed together at the remote.

DAX A and DAX C are wired into a vital AND gate, this is used drive the MS/GCP CTL input at the crossing. DAX B is wired to UAX 1 at the crossing; DAX D is wired to UAX 2 at the crossing,

At the Remote Site:

- On the General Configuration screen:
- Set the Advance Preempt Timer to 10 sec (or desired time)
- Set Number of DAXes to 4

On the DAX A screen:

- Set the track assignment to track 1
- Set offset distance to the distance between remote and crossing and warning time to desired preemption delay.

On the DAX B screen:

- Set the track assignment to track 1
- Set offset distance to the distance between remote and crossing and warning time to 2-3 sec less than crossing warning time.

On the DAX C screen:

- Set the track assignment to track 2
- Set offset distance to the distance between remote and crossing and warning time to desired preemption delay.

On the DAX D screen:

- Set the track assignment to track 2
- Set offset distance to the distance between remote and crossing and warning time to 2-3 sec less than crossing warning time.

Wire the MS/GCP CTL high.

At the Crossing Site:

- Set the Advance Preempt Timer to 10 sec (or desired time)
- Set Number of DAXes to 2
- Set the Trk 1 Prime warning time to 23 sec,
- Set the Trk 1 UAX Pickup delay to 5 sec,
- Set the Trk 2 Prime warning time to 23 sec,
- Set the Trk 2 UAX Pickup delay to 5 sec,
- Set the Dax A track assignment to track 1
- Set the Dax A offset distance to 0
- Set the DAX A warning time 40 sec.
- Set the Dax B track assignment to track 2
- Set the Dax B offset distance to 0
- Set the DAX B warning time 40 sec.

Wire the DAX A and DAX B into a vital AND gate and use the output from this to drive the traffic preemption relay.

- Connect Vital AND output from the remote to the MS/GCP CTL input at the crossing
- Connect DAX B from the remote to UAX 1 input at the crossing.
- Connect DAX D from the remote to UAX 2 input at the crossing.
- Connect DAX B from the remote to the UAX 1 input at the crossing

SECTION 6 AUXILIARY EQUIPMENT

6.0 GENERAL

The equipment described in this section can be used with the Model 3000+ GCP. Where applicable, installation and adjustment information is provided. The following equipment is covered:

6.1 AUXILIARY EQUIPMENT COVERED

The following equipment is covered in this section:

- Bidirectional Simulation Coupler, 62664-Mf
- DC Shunting Enhancer Panel, 80049
- Narrow-band Shunt, 62775-f
- Narrow-band Shunt, 62780-f
- Multi-frequency Narrow-band Shunt, 62775-XXXX
- Multi-frequency Narrow-band Shunt, 62780-XXXX
- Wideband Shunt, 8A076A
- Simulated Track Inductor, 8V617
- Adjustable Inductor Assembly, 8A398-6
- Track Circuit Isolation Device
- Steady Energy DC Track Circuits
- Battery Chokes, 62648 & 8A065A
- Siemens GEO Electronic DC Coded System
- ElectroCode / Genrakode Electronic DC Coded Track System
- Relay Coded DC Track
- DC Code Isolation Unit, 6A342-1
- DC Code Isolation Unit, 6A342-3
- AC Code Isolation Units
- 60 Hz AC Code Isolation Unit, 8A466-3
- 100 Hz AC Code Isolation Unit, 8A470-100
- 180 Hz AC Code Isolation Unit, 8A471-180
- Tunable Insulated Joint Bypass Coupler, 62785-f
- MS/GCP Termination Shunt Burial Kit, 627767-46
- Surge Panels, 80026-XX
- Rectifier Panel Assembly, 80033

Cable Termination Panel Assembly, 91042

CAUTION

CAUTION

THE DEVICES DESCRIBED HERE MUST BE MOUNTED IN WEATHERPROOF ENCLOSURES UNLESS STATED OTHERWISE.

NOTE

NOTE

Some equipment shown may no longer be available and is displayed for informational purposes only.

6.1.1.1 Bidirectional Simulation Coupler, 62664-mf

When a model 3000+ GCP is connected in a six-wire configuration (two receiver wires, two transmit wires, and two check wires) as shown in Figure 6-2, 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 the 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),
2. single-frequency narrow-band shunt (62775) used in conjunction with adjustable inductor (8a398 6), or
3. multi-frequency 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 6-2.

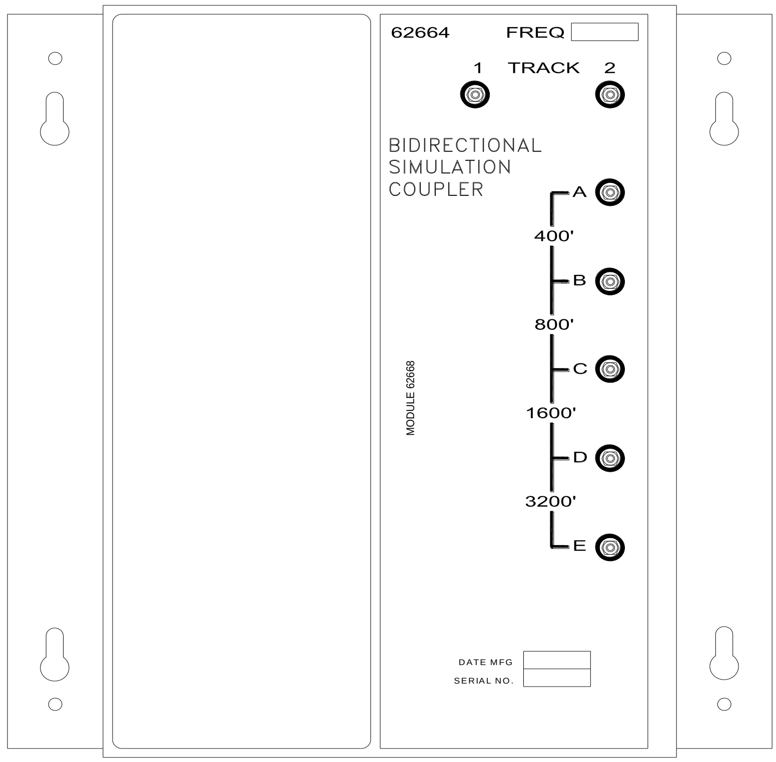
The 62664-mf Bidirectional Simulation Coupler contains a Narrow-band Shunt at the GCP termination frequency and an adjustable simulated track inductor that simulates a specific track length and is tapped and connected to front panel terminals.

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.

Low ballast resistance effectively reduces approach distances to a greater degree in unidirectional Model 3000+ GCP installations than in bidirectional installations.

- Although the Model 3000+ GCP is operated unidirectionally while DAXing, a technique referred to as bidirectional simulation can be applied to a unidirectional installation to obtain the operating benefits of a bidirectional application.
- A unidirectional Model 3000+ GCP can provide a DAX start for an adjacent street, as well as other unidirectional functions, while operating as a simulated bidirectional GCP (GCP must be programmed for bidirectional operation).

The 62664 bidirectional simulation coupler must not be used as a termination shunt.
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 “Bidirnl.”



13-04_BIRDN_SIM_CPLR
12-09-13

Figure 6-1 Bidirectional Simulation Coupler, 62664-MF

WARNING

IN STANDARD FOUR-WIRE SIMULATED BIDIRECTIONAL INSTALLATIONS UTILIZING AN INTERNAL ISLAND, THE BIDIRECTIONAL SIMULATION COUPLER (62664-MF) MUST BE CONNECTED TO THE TWO TRANSMITTER (XMT) TRACK LEADS AS SHOWN FOR T1 IN Figure 6-2. DO NOT USE THIS COUPLER AS A STANDARD TERMINATION SHUNT ON THE TRACK.

This condition exists for six-wire applications using bidirectional simulation equipment, utilizing an internal island, and located in the case/bungalow (not at the tracks) regardless of which of the following types of simulated track load is used:

4. bidirectional simulation coupler (62664 mf),
5. single-frequency narrow-band shunt (62775 mf) used in conjunction with adjustable inductor (8a398 6), or
6. multi-frequency narrow-band shunt (62775 or 62780) equipped with simulated track inductor (8v617 distance).

In standard four-track wire simulated bidirectional installations utilizing an internal island, it is permissible to connect the simulated bidirectional load to the two transmitter track leads in the bungalow as shown in Figure 6-2.

Low ballast resistance effectively reduces approach distances to a greater degree in unidirectional Model 3000+ GCP installations than in bidirectional installations.

- Although the Model 3000+ GCP is operated unidirectionally while DAXing, a technique referred to as bidirectional simulation can be applied to a unidirectional installation to obtain the operating benefits of a bidirectional application.
- A unidirectional Model 3000+ GCP can provide a DAX start for an adjacent street, as well as other unidirectional functions, while operating as a simulated bidirectional GCP (GCP must be programmed for bidirectional operation).

The 62664 bidirectional simulation coupler must not be used as a termination shunt.

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 “Bidirnl”.

6.1.2 Simulated Bidirectional Configuration

In a simulated bidirectional configuration, a narrow-band shunt is connected in series with an adjustable inductor. This combination is:

- Connected in parallel across the track connections.
- Electrically equal to that of the actual track approach circuit.

Both approach circuits appear equal in length to the Model 3000+ GCP, even though one of the circuits consists of the shunt and inductor located in the bungalow.

The 62664 Bidirectional Simulation Coupler (Figure 6-1) 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 6-1.

Table 6-1 Approach Distance Selection Strapping For Bidirectional Simulation Coupler, 62664-MF

DISTANCE (FT/M)	STRAP TERMINALS	DISTANCE (FT/M)	STRAP TERMINALS
400/122	B-C, C-D, D-E	3,600/1098	B-C, C-D
800/244	A-B, C-D, D-E	4,000/1220	A-B, C-D
1,200/366	C-D, D-E	4,400/1342	C-D
1,600/488	A-B, B-C, D-E	4,800/1464	A-B, B-C
2,000/610	B-C, D-E	5,200/1585	B-C
2,400/732	A-B, D-E	5,600/1707	A-B
2,800/854	D-E	6,000/1829	No Straps
3,200/976	A-B, B-C, C-D		

When a Model 3000+ GCP is connected in a six-wire configuration, the bidirectional simulation coupler must be connected to the check (CHK) wires as shown in Figure 6-2.

When a Model 3000+ GCP is connected in a standard four-wire configuration, the bidirectional simulation coupler is connected to the two transmit leads as shown in Figure 6-2.

Mounting dimensions for the bidirectional simulation coupler are provided in Figure 6-3. Specifications for the bidirectional simulation coupler are as depicted in Table 6-2:

Table 6-2 Bidirectional Simulation Coupler, 62664-MF

PARAMETER	VALUE
Environmental	-40°F to +160°F (-40°C to +71°C)
Dimensions	8.75 inches (22.225 centimeters) high 8.50 inches (21.590 centimeters) wide 9.25 inches (23.495 centimeters) deep
Weight	5 pounds (2.27 kilograms) (approximate)
Adjustment Range	400 to 6,000 feet (122 – 1829 meters)
Loading Effect	The loading effects of the internal narrow-band Shunt are equivalent to that of the 62775 narrow-band Shunt.

NOTE

NOTE

The adjustment must be within ± 10% of actual approach distance.

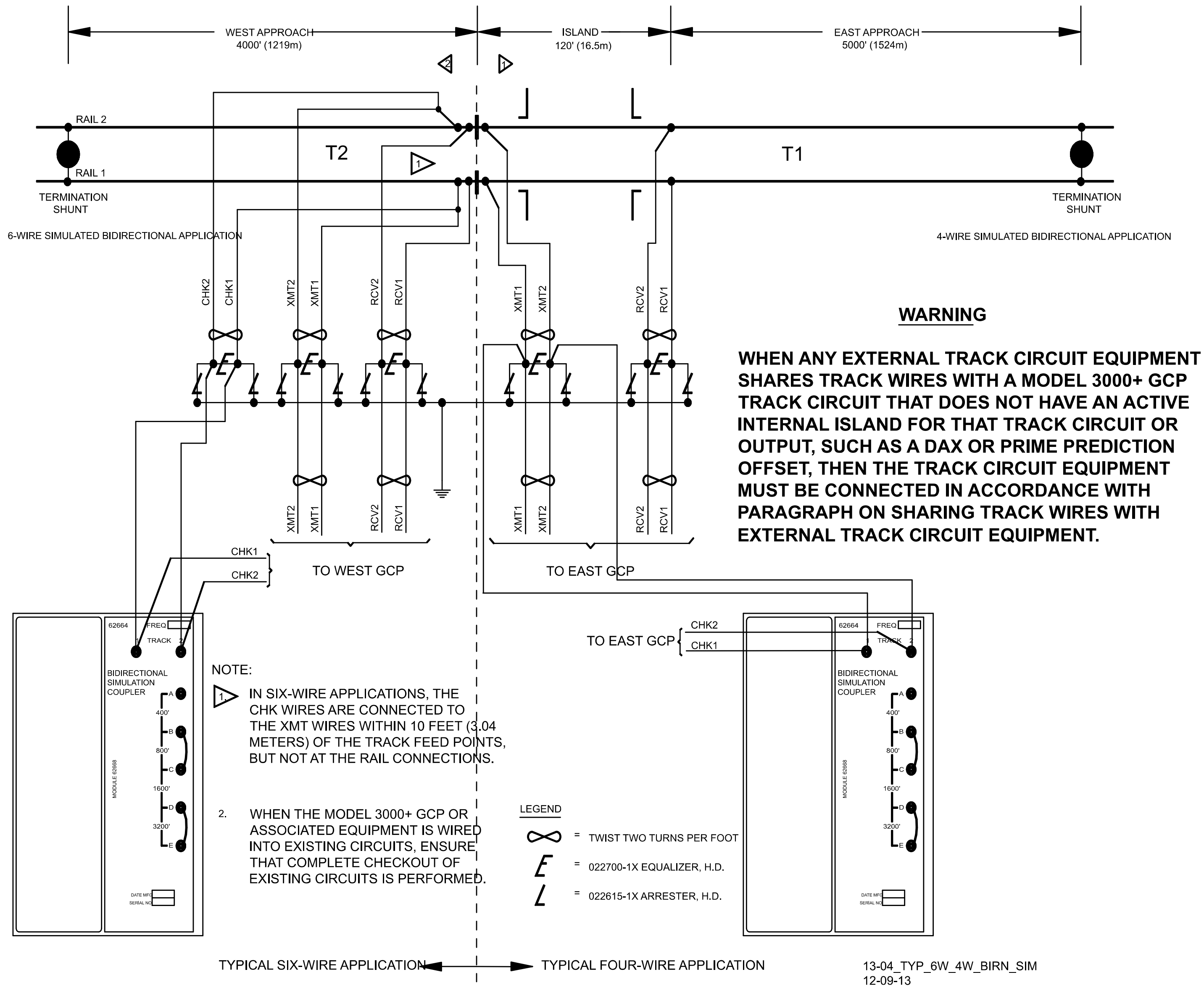


Figure 6-2 4-wire & 6-wire Connections Using Bidirectional Simulation Coupler on Model 3000+ GCP Operating in Bidirectional Simulation mode

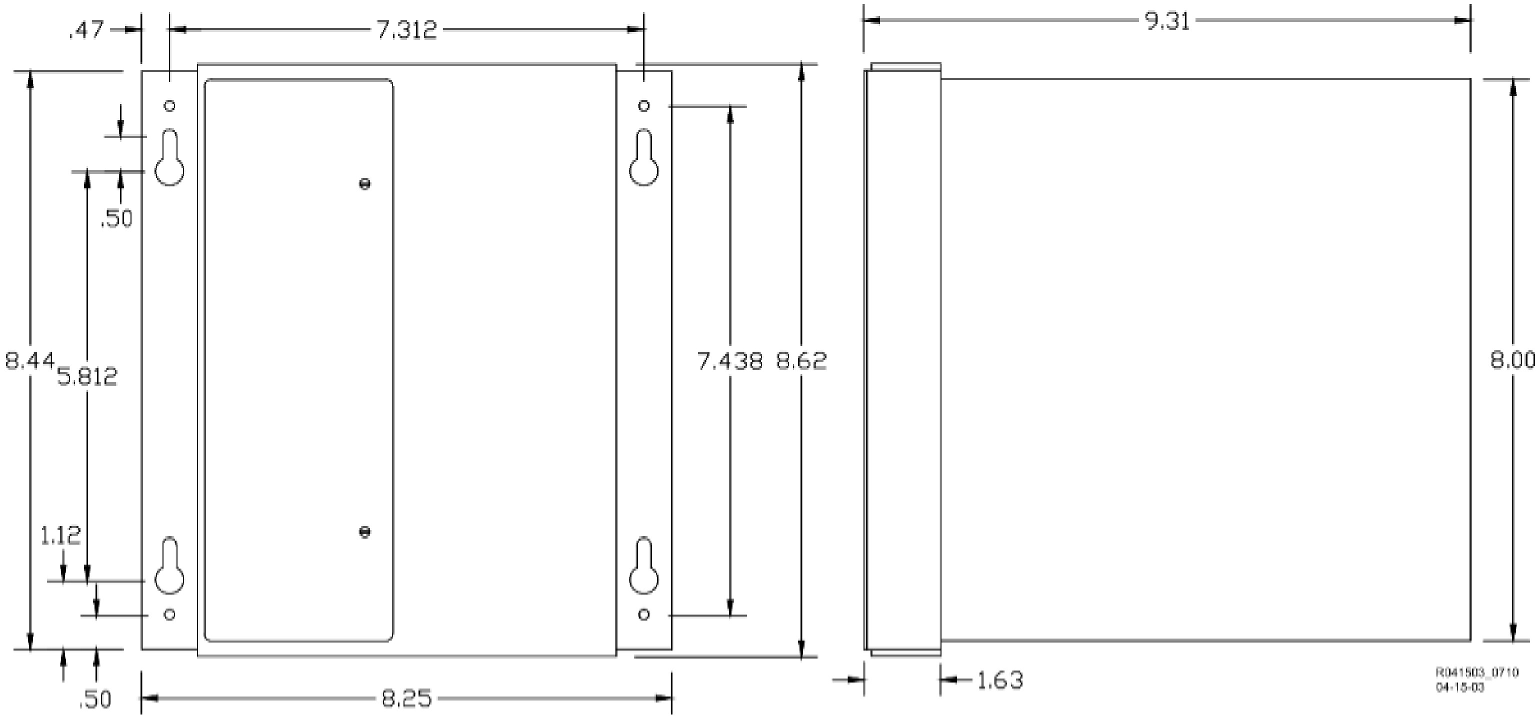


Figure 6-3 Bidirectional Simulation Coupler Assembly Mounting Dimensions

6.2 DC SHUNTING ENHANCER PANEL, 80049

Intermittent poor shunting can occur in any location due to numerous causes, but generally happens due to:

- infrequent track usage
- lightly weighted cars
- passenger and transit operation
- spillage from rail cars
- rail contamination

Lack of any shunting generally occurs in dark territory where no DC or AC track circuits exist and few trains run. Track shunting in dark territory can be easily improved using methods similar to those employed in style-C track circuits (but without the need for so many insulated joints). This involves the use of one insulated joint at the far end of each approach and the application of a DC voltage to the track at the crossing.

These measures improve shunting, thus allowing the Model 3000+ GCP Enhanced Detection software to function optimally.

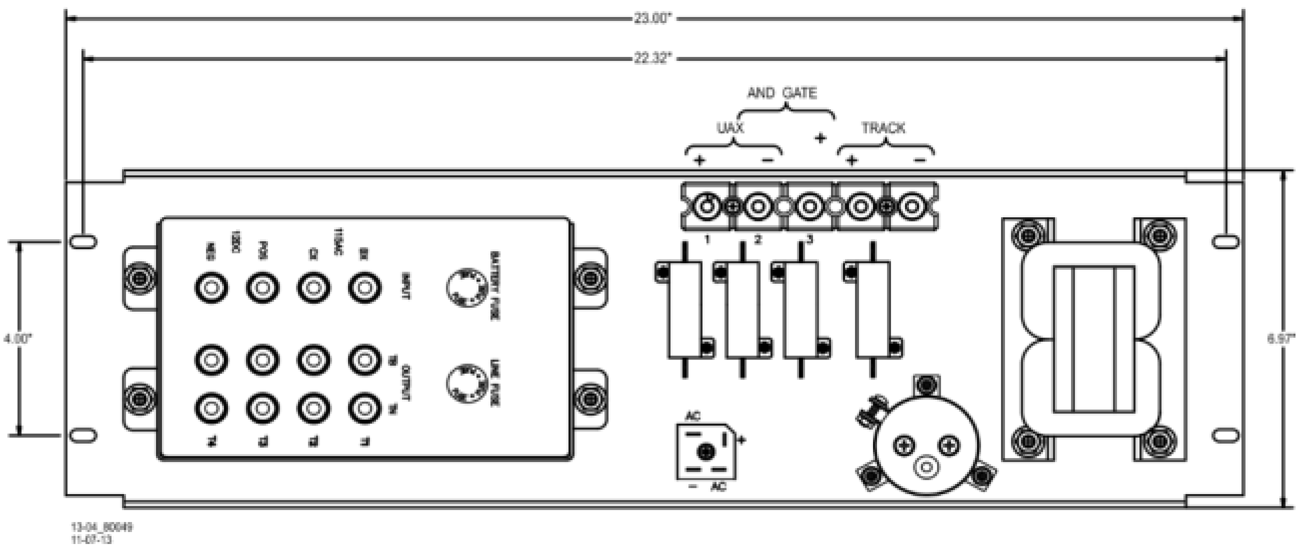


Figure 6-4 DC Shunting Enhancer Panel, 80049

6.2.1 Track Output Voltage

The Siemens 80049 DC Shunting Enhancer Panel, Figure 6-4, 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 the battery and is generated from a 110 volt AC step-down transformer when AC is present or utilizes battery powered DC-to-AC converter when AC is off. The panel switches automatically to the DC-to-AC converter output if AC fails.

6.2.2 Monitor Output Voltage

The **Monitor Output** voltage is applied to a Model 3000+ GCP UAX input for the applicable track input. Loss of the Monitor Output voltage will activate the crossing. The UAX must be programmed with a minimum of a five-second pickup delay.

6.2.3 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 6-4 for mounting dimensions.

WARNING

THE TERMINATION SHUNTS MUST BE 62775-F OR 62780-F NARROW-BAND SHUNTS.

GCP TRANSMIT WIRES MUST FIRST BE ROUTED TO THE ENHANCER PANEL TRACK CONNECTIONS AND THEN ON TO THE TRACK; IF NOT, SOME FAILURES CANNOT BE DETECTED BY THE SYSTEM. (SEE Figure 6-3).

CAUTION

WHEN TWO OR MORE DARK TERRITORY CROSSINGS OVERLAP, ENSURE THAT EACH MODEL 3000+ GCP CROSSING HAS AN 80049 PANEL IN OPERATION AND THAT THE POLARITY OF THE TRACK VOLTAGE TO THE RAIL FROM ALL 80049 PANELS IS THE SAME AT EACH CROSSING.

NOTE

The DC Shunting Enhancer Panel can be used with applications involving overlapping approaches from two or more crossings without the use of additional insulated joints.

A typical DC Shunting Enhancer Panel application drawing for a two track application is provided in Figure 6-7 and for two overlapping crossings is provided in Figure 6-8.

6.2.4 Interface Terminal Connections

The DC Shunting Enhancer Panel is equipped with eight user interface terminals. These terminals are connected as shown in Figure 6-5.

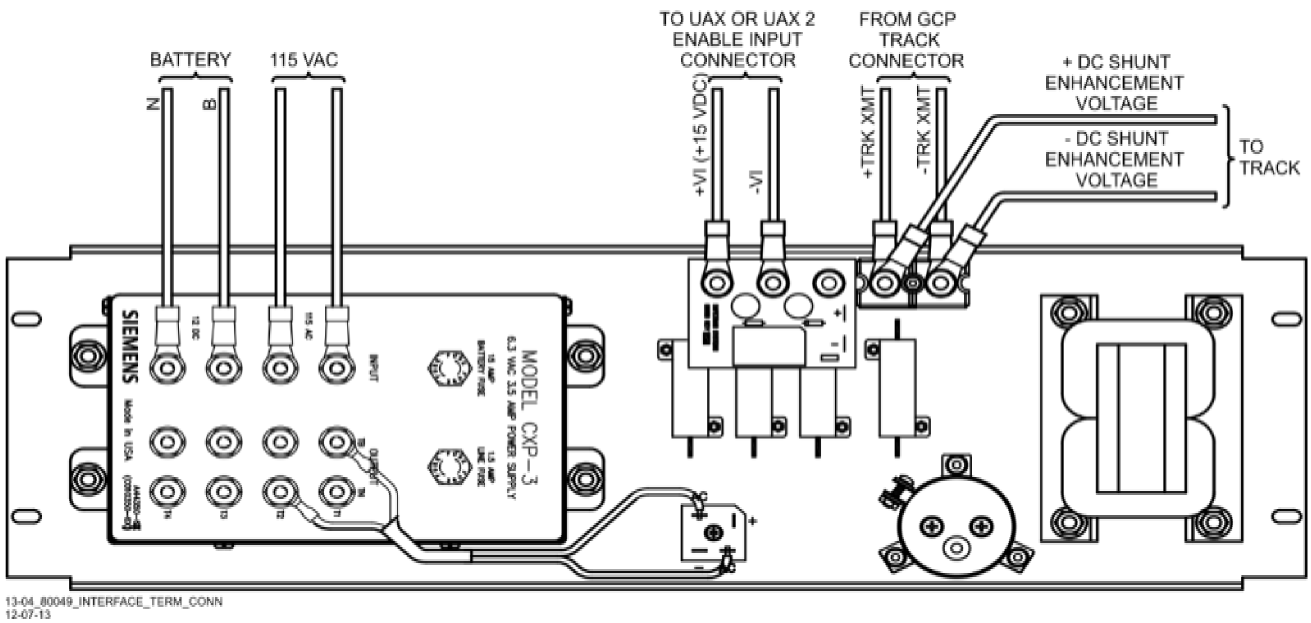


Figure 6-5 DC Shunting Enhancer Panel, 80049, Interface Terminal Connections

6.2.5 DC Shunting Enhancer Panel Specifications

Table 6-3 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

PARAMETER	VALUES
Dimensions	
-1 unit:	6.97 inches (17.704 centimeters) high 23.0 inches (58.420 centimeters) wide 10.75 inches (27.305 centimeters) deep
-5 unit:	6.97 inches (17.704 centimeters) high 23.0 inches (58.420 centimeters) wide 5.75 inches (14.605 centimeters) deep
Weight	-1 unit: 32 pounds (14.4 kilograms) (approximate) -5 unit: 17 pounds (7.65 kilograms) (approximately)
Mounting Dimensions	The DC Shunting Enhancer Panel can be rack, wall, or shelf mounted. The Panel mounting dimensions are provided in Figure 6-6.

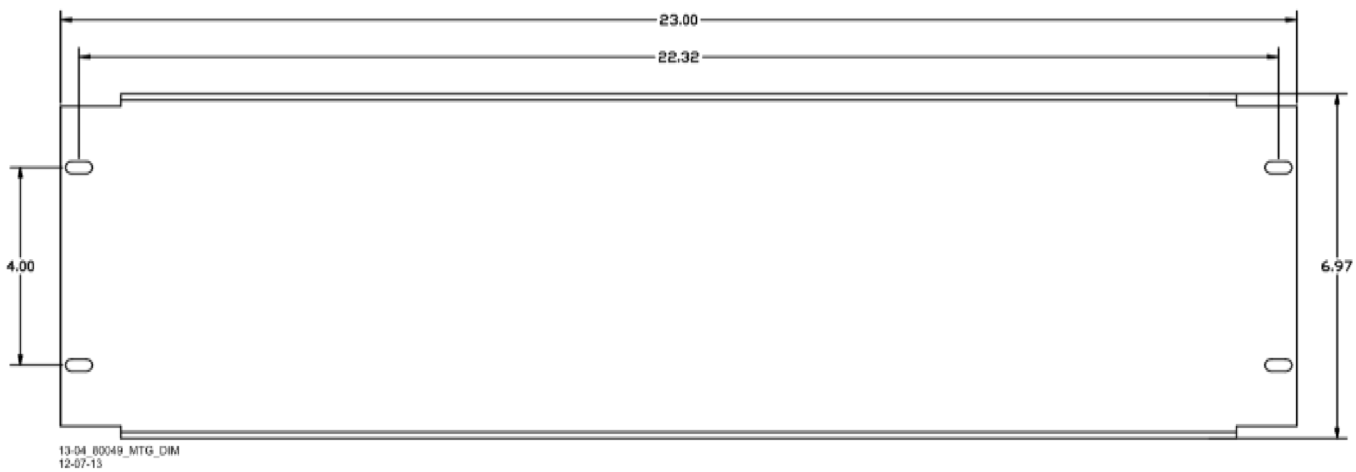


Figure 6-6 DC Shunting Enhancer Panel Mounting Dimensions

6.2.6 DC Shunting Enhancer Panel Configuration Options

Two DC Shunting Enhancer Panel configuration options are available. These configurations are described in Table 6-4.

Table 6-4 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

6.2.7 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 80049-0001 and 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 6-7.

When there are two crossings that have overlapping approaches, this application may be implemented as shown in Figure 6-8.

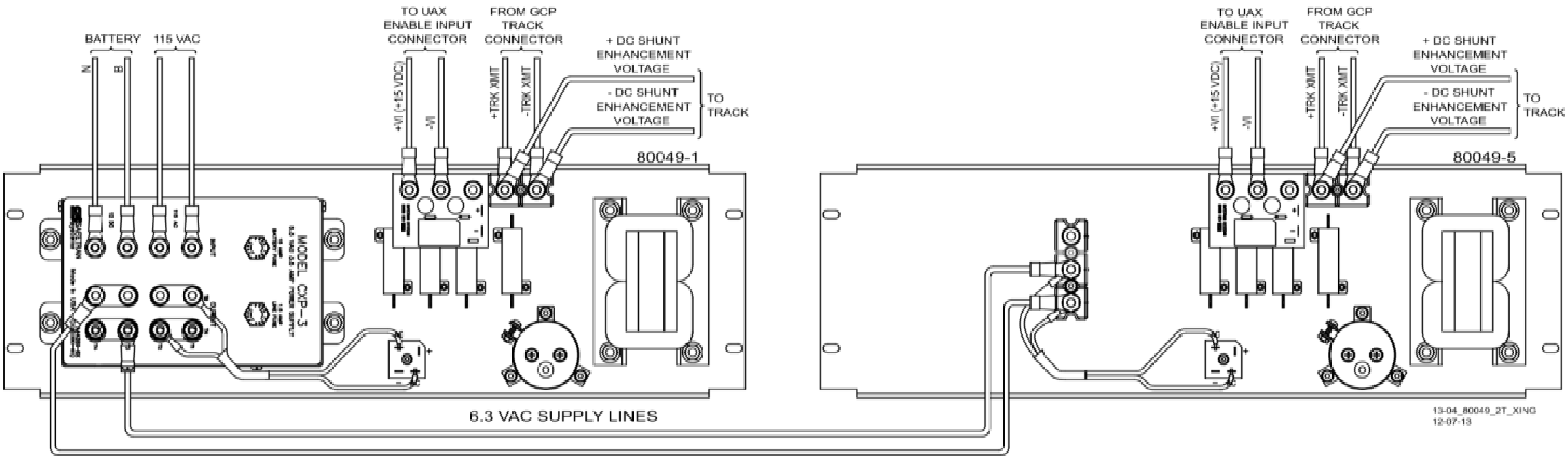


Figure 6-7   DC Shunting Enhancer Panels for Two Track Crossing

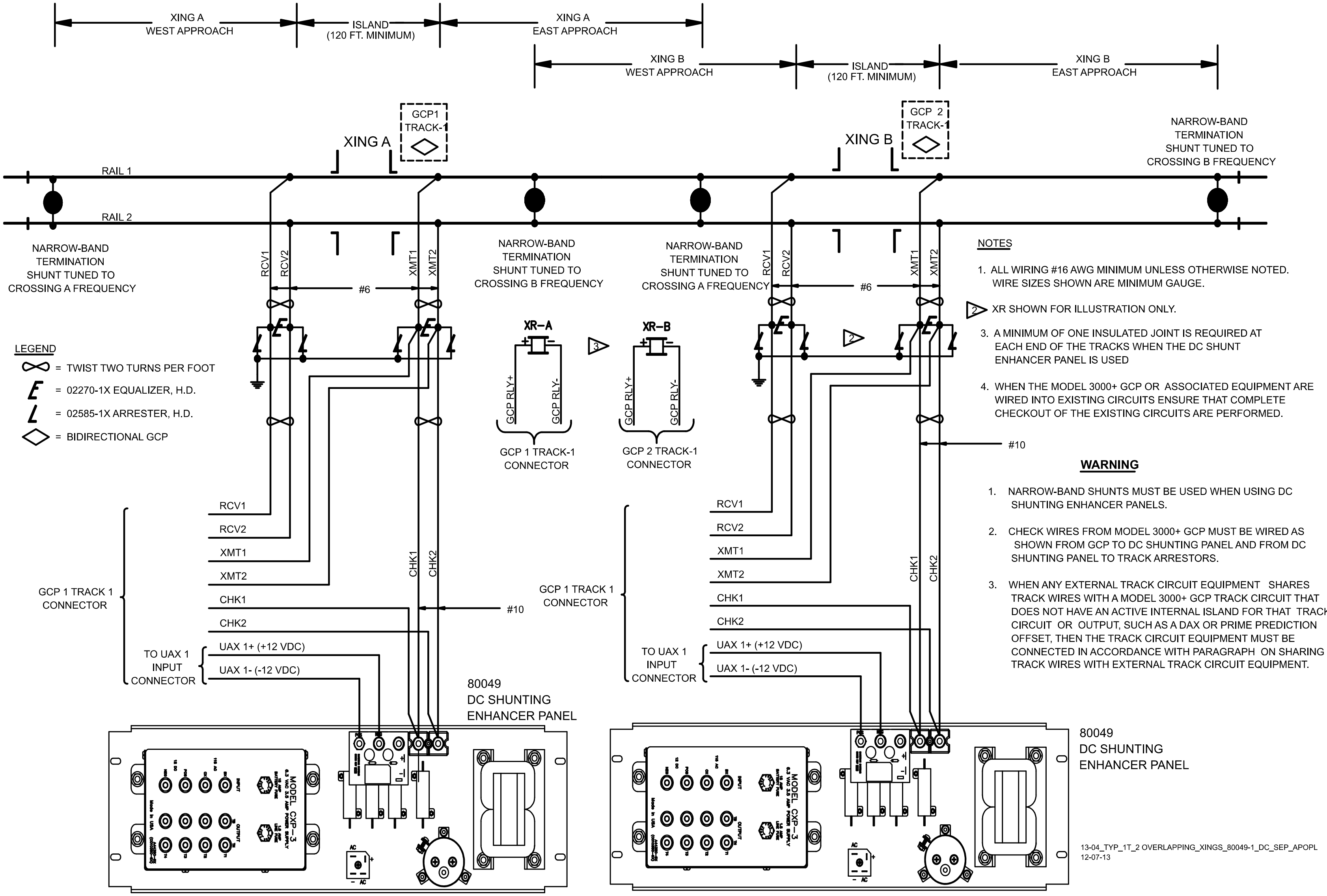


Figure 6-8 DC Shunting Enhancer Panels for Overlapping Crossings

6.3 NARROW-BAND SHUNT, 62775-F

WARNING

WARNING

THE 62775-F SHUNT MUST NOT BE USED ANYWHERE WITHIN A MODEL 300 OR 400 GCP APPROACH; NARROW-BAND SHUNT 62780-F IS RECOMMENDED FOR THESE APPLICATIONS.

CAUTION

CAUTION

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

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 10 FT. [3.04 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 TO PROVIDE MAXIMUM PROTECTION FROM PHYSICAL DAMAGE.

NOTE

NOTE

It is not necessary to bury the Narrow band shunt (62775-f) below the frost line.

The 62775-f Narrow-band Shunt (Figure 6-17) is intended for use in areas where other AC frequencies or DC coded track circuits are present, but where only the Model 3000+ GCP frequency should be terminated.

This shunt requires no special tuning and is generally preferred for most applications.

The 62775-f Narrow-band Shunt is housed in a sealed, cylindrical case with a pair of 10-foot leads extending from one end.

This shunt is available in any fixed frequency (Hz) listed in the chart below.

Table 6-5 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

6.3.1 Narrow-band Shunt, 62775-F Specifications

Dimensions:	16 inches (40.640 centimeters) long 5 inches (12.700 centimeters) in diameter
Weight:	10 pounds (approximately 4.54 kilograms)
Frequencies:	See Table 6-5
Leads:	10 feet (3.04 meters); number 6 AWG, stranded, black PVC

6.4 NARROW-BAND SHUNT, 62780-F

CAUTION

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

THE SHUNT SHOULD BE CONNECTED AS CLOSE AS PRACTICABLE TO THE RAILS (WITHIN THE #6 AWG WIRE LEAD LENGTH OF 10 FT. [3.04 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 TO PROVIDE MAXIMUM PROTECTION FROM PHYSICAL DAMAGE.

NOTE

It is not necessary to bury the shunt below the frost line.

The Narrow-band Shunt, 62780-f (Figure 6-10) is intended for use in areas where other AC frequencies or DC coded track circuits are present, but where only the Model 3000+ GCP frequency should be terminated.

- Similar to the Narrow-band Termination Shunt, 62775 (Paragraph 6.4).
- 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, 400, 3000, 3000+, 4000 and Model 5000 GCP approaches.
- The 62780 Narrow-band Shunt is compatible with all Siemens Motion Sensors and GCPs.

This shunt is available in any one of 26 frequencies ranging from 86 Hz to 979 Hz as shown in the following chart (Siemens frequencies are shown in **boldface** type).

Table 6-6   Frequencies Available with Narrow Band Shunt, 62780

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

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

6.4.1 Narrow-band Shunt, 62780-F Specifications

Dimensions: 14.125 inches (35.9 centimeters) long
4.125 inches (10.5 centimeters) in diameter
Weight: 7 pounds (approximately 3.18 kilograms)
Frequencies: See Table 6-6
Leads: 10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

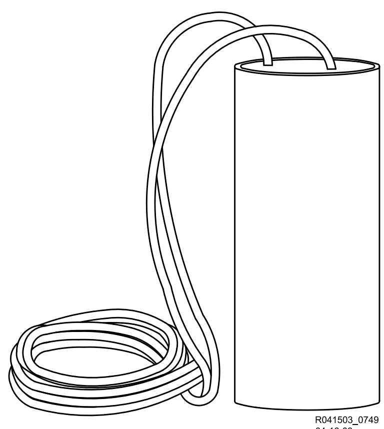


Figure 6-9   Wideband Shunt, 8A076A

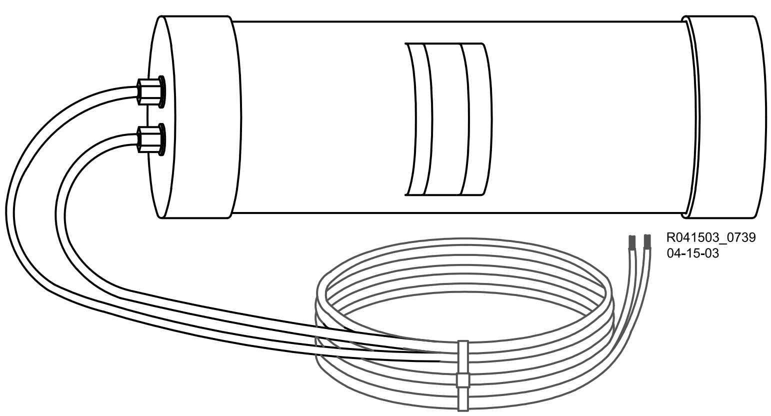


Figure 6-10   Narrow-band Shunt, 62775-F/62780-F

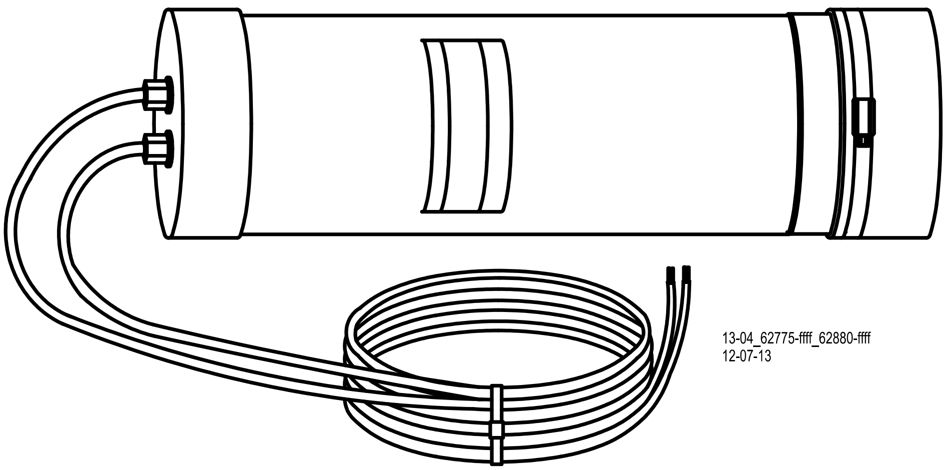


Figure 6-11   Multi-frequency, Narrow-band Shunt, 62775/62780

6.5   MULTI-FREQUENCY NARROW-BAND SHUNT, 62775

The 62775-XXXX Multi-frequency Narrow-band Shunt, like its single frequency counterpart, is designed to terminate specific track frequencies in areas where other audio frequencies or DC coded track circuits are present.

WARNING

CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUST BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEMS 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 10 FT. [3.04 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 TO PROVIDE MAXIMUM PROTECTION FROM PHYSICAL DAMAGE.

WARNING

THE 62775 MULTI-FREQUENCY NARROW-BAND SHUNT MAY NOT BE USED IF A 3000+ GCP APPROACH OVERLAPS A MODEL 300 OR A MODEL 400 GCP APPROACH. USE THE 62780-XXXX SHUNT INSTEAD.

NOTE

It is not necessary to bury the 62775-f Narrow-band Shunt below the frost line.

6.5.1 Physical Description

The Multi-frequency Narrow-band Shunt, 62775, (Figure 6-11) is slightly longer than its single-frequency counterpart (Figure 6-10), but exhibits the same electrical characteristics as the basic single-frequency unit. The Shunt is housed in a 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 covered by a removable, pliable, end cap secured in place by a sturdy stainless steel clamp.

6.5.2 Frequency Selection

The Multi-frequency Narrow-band Shunt is available in eight frequency ranges. Each frequency is selected by means of the seven standard AREMA binding posts. The terminals are labeled A through G, and jumpered to select the desired shunting frequency (Figure 6-12).

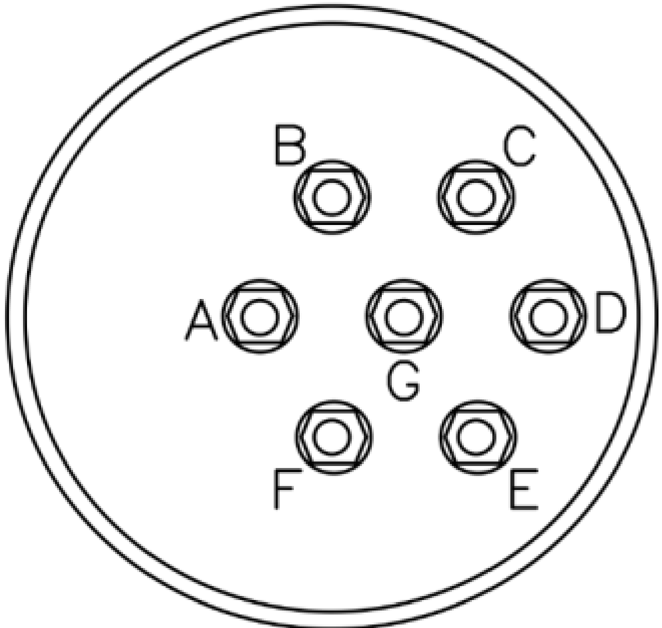


Figure 6-12 Multi-frequency Narrow-band Shunt, 62775/62780 AREMA Binding Posts

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.

6.5.3 Multi-frequency Narrow-band Shunt, 62775 Specifications

Dimensions:	22 inches (55.88 centimeters) long 5 inches (12.7 centimeters) in diameter
Weight:	10 pounds (approximately 4.54 kilograms)
Frequencies:	See Table 6-7.
Leads:	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

Table 6-7 Multi-frequency Narrow-band Shunt, 62775 Frequency Selection Jumpers

SHUNT PART NUMBER	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
62775-8621	86	A-F, G-D, D-E, E-F
	114	B-G, G-D, D-E
	156	C-D, D-G
	211	C-D
62775-1543	156	A-F, G-C, C-D, D-E, E-F
	211	A-G, G-C, C-D, D-E
	285	B-C, C-D, D-G,
	348	B-C, C-D
	430	B-C
62775-2132*	211	A-F, G-C, C-D, D-E, E-F
	267	B-G, G-C, C-D, D-E
	285	B-C, C-D, D-G
	313	B-C, C-D
	326	B-C
62775-2152	211	A-F, G-C, C-D, D-E, E-F
	285	B-C, C-D, D-E, E-G
	348	B-C, C-D, D-G
	430	B-C, C-D
	525	B-C
62775-3448*	348	A-B, B-C, C-D, D-E, E-F, F-G
	389	A-B, B-C, C-D, D-E, E-F
	392	A-B, B-C, C-D, D-E
	430	A-B, B-C, C-D
	452	A-B, B-C
	483.5	A-B
62775-3497	348	A-B, B-C, C-D, D-E, E-F, F-G
	430	A-B, B-C, C-D, D-E, E-F
	525	A-B, B-C, C-D, D-E
	645	A-B, B-C, C-D
	790	A-B, B-C
	970	A-B
62775-5274*	522	A-B, B-C, C-D, D-E, E-F, F-G
	525	A-B, B-C, C-D, D-E, E-F
	560	A-B, B-C, C-D, D-E
	645	A-B, B-C, C-D
	669.9	A-B, B-C
	746.8	A-B
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

6.6 MULTI-FREQUENCY NARROW-BAND SHUNT, 62780

WARNING

CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS MUST BE MADE TO DETERMINE THAT THE TERMINATION SHUNT DID NOT ADVERSELY AFFECT OTHER HIGHWAY CROSSING WARNING SYSTEMS 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 10 FT. [3.04 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 TO PROVIDE MAXIMUM PROTECTION FROM PHYSICAL DAMAGE.

NOTE

The Multi-frequency 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.

NOTE

It is not necessary to bury the 62780 Narrow-band Shunt below the frost line.

The Multi-frequency Narrow-band Shunt, 62780 Table 6-8, can be used in territories with overlapping Model 300, 400, 3000, 3000+, 4000 and Model 5000 GCP approaches.

The Multi-frequency Narrow-band shunt also:

- Produces less loading effect on adjacent frequencies (10 ohms reactance) than the 62775 Shunt (Paragraph 6.5)
- Is compatible with all Siemens GCPs and Motion Sensors.
- Is available in four multi-frequency versions (see Table 6-8).
- Is housed in a 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 multi-frequency 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 and is secured in place by a sturdy stainless steel clamp for protection against moisture.

Table 6-8 Multi-frequency 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

6.6.1 Multi-frequency Narrow-band Shunt, 62780 Specifications

Dimensions: 22 inches (55.88 centimeters) long
5 inches (12.7 centimeters) in diameter

Weight: 10 pounds (approximately 4.54 kilograms)

Frequencies: See Table 6-8

Leads: 10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

6.7 WIDEBAND SHUNT, 8A076A

WARNING

THE 8A076A OR 8A077 WIDEBAND SHUNTS MUST NOT BE USED TO BYPASS INSULATED JOINTS IN DC CODED TRACK CIRCUITS OR WHERE AC OR CODED AC CIRCUITS EXIST.

CAUTION

WHEN ADDING OR REPLACING TERMINATION SHUNTS, APPROPRIATE TESTS 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 10 FT. [3.04 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 TO PROVIDE MAXIMUM PROTECTION FROM PHYSICAL DAMAGE.

NOTE

The use of dual wideband couplers, part number 8A077, is not recommended for Model 3000+ GCP applications.

NOTE

It is not necessary to bury the 8A076A Wide-band Shunt below the frost line.

The Wideband Shunt, 8A076A (Table 6-9) 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 sealed, cylindrical case with a pair of 10-foot leads extending from one end.

6.7.1 Wideband Shunt Specifications

Dimensions:	7.5 inches (19.05 centimeters) long 3.35 inches (8.509 centimeters) in diameter
Weight:	7 pounds (approximately 3.18 kilograms)
Leads:	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

6.8 SIMULATED TRACK INDUCTOR, 8V617 (USED WITH MULTI-FREQUENCY SHUNTS)

The Simulated Track Inductor, 8V617 (Figure 6-13) is intended for use with Siemens' Multi-frequency 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 6-14).

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 6-9.

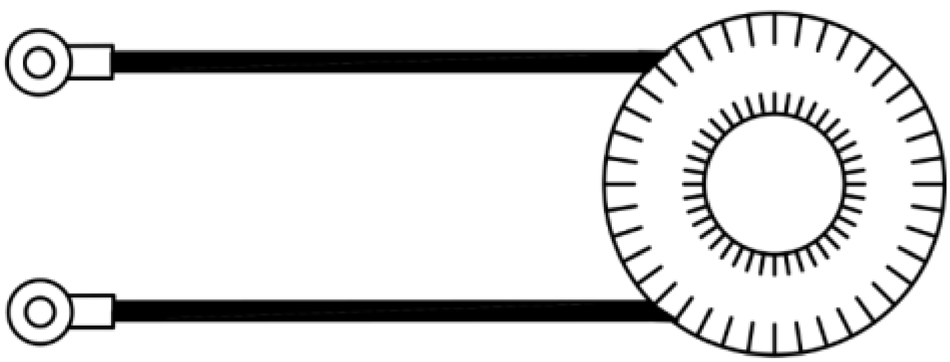


Figure 6-13 Simulated Track Inductor, 8V617

Table 6-9 Simulated Track Inductor Part Number Listing

BASIC PART NO.	DASH NUMBER = DISTANCE (FT/M)		
8V617	-0200 (61) -0400 (122) -0600 (183) -0800 (244) -1000 ((309) -1200 (366) -1400 (427)	-1600 (488) -1800 (549) -2000 (610) -2200 (671) -2400 (732) -2600 (793) -2800 (854)	-3000 (450) -3200 (976) -3400 (1037) -3600 (1098) -3800 (1159) -4000 (1220) -4400 (1342)

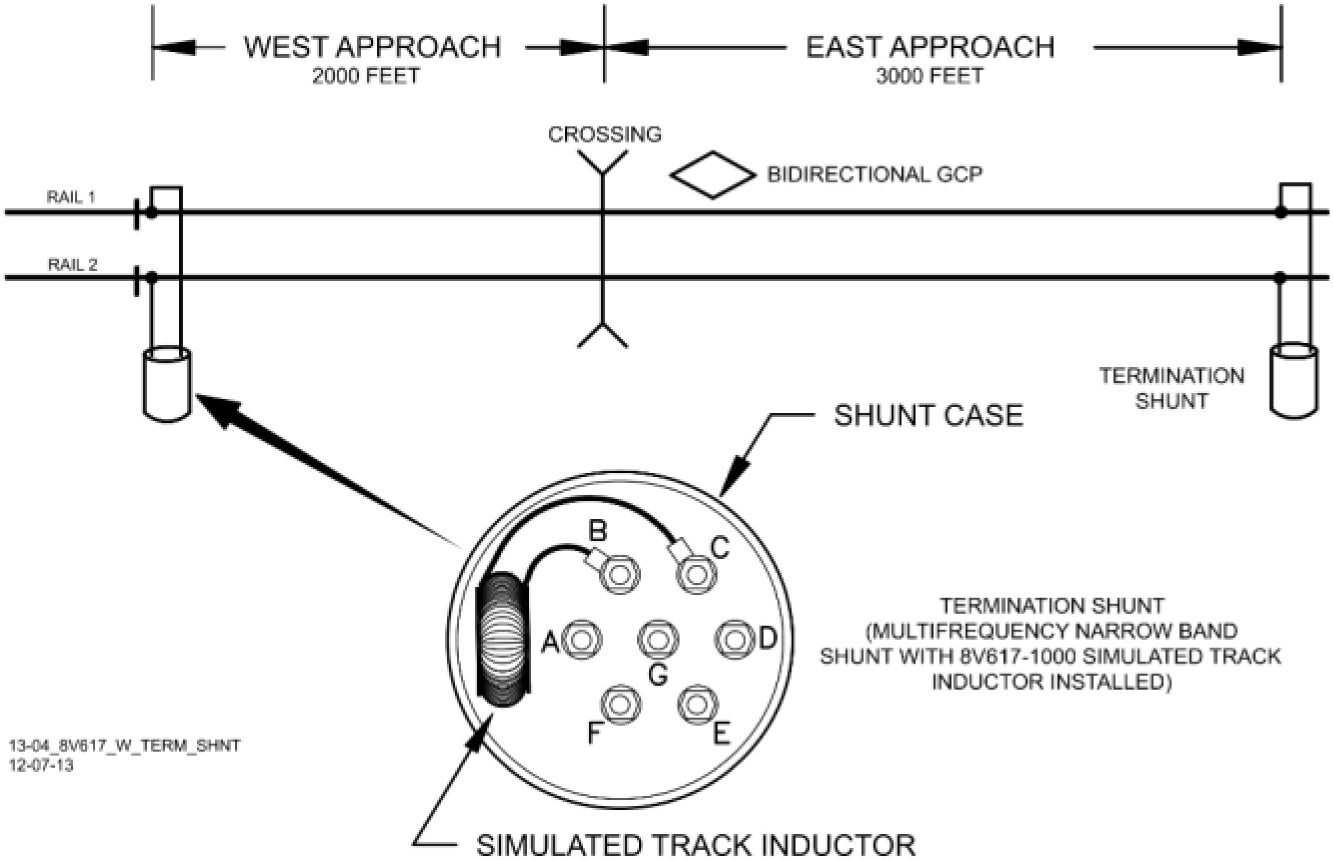


Figure 6-14 Simulated Track Inductor Used with Termination Shunt

6.8.1 Simulated Track Inductor Installation

WARNING

BEFORE INSTALLING, VERIFY THAT THE 8V617 INDUCTOR IS THE CORRECT DISTANCE VALUE FOR THE APPLICATION.

ALWAYS WRAP THE INDUCTOR IN THE FOAM INSULATION (INCLUDED WITH THE INDUCTOR) THAT PROVIDES INSULATION FROM THE TERMINAL POSTS (AS SHOWN IN Figure 6-15).

NOTE

Refer to the small chart inside the end cap for terminal strapping information. If the chart is missing or illegible, refer to Table 6-7 (62775) or Table 6-8 (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.

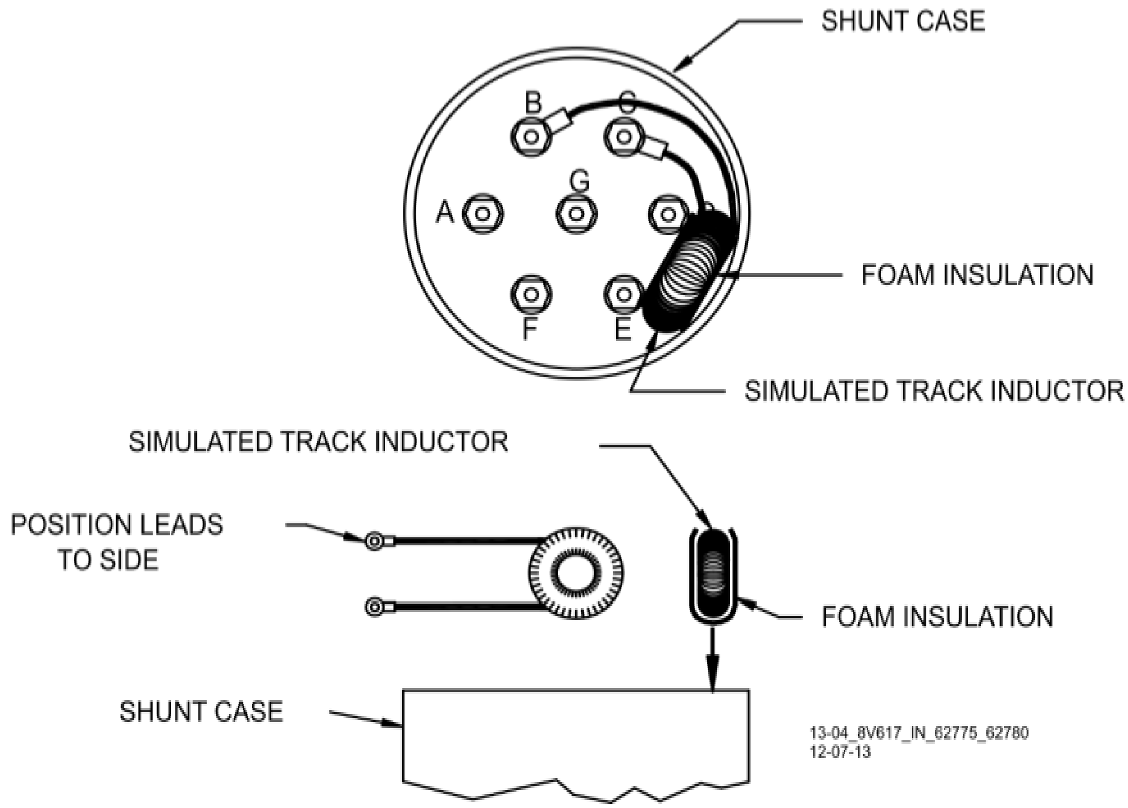


Figure 6-15   Typical Installation of 8V617 in 62775/62780 Shunt

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 6-10 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 6-15 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.

6.8.2 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 6-10 Simulated Track Inductor, 8V617, Mounting Terminals

NARROW-BAND SHUNT PART NUMBER	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
	389	A and B
	392	A and B
	430	A and B

NARROW-BAND SHUNT PART NUMBER	FREQUENCY (HZ)	REMOVE SHORTING LINK AND CONNECT INDUCTOR LEADS BETWEEN SHUNT TERMINALS
	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

6.9 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 Model 3000+ GCP feed point as required.

- Adjustable Inductor Assembly, 8A398-6 (Figure 6-16), may be used along with the Shunt in the shorter approach to compensate for the reduced distance as shown in Figure 6-17.
- 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 ft (15.2 meter) increments ranging from 50 to 3150 ft (15.2-960.1 meters)

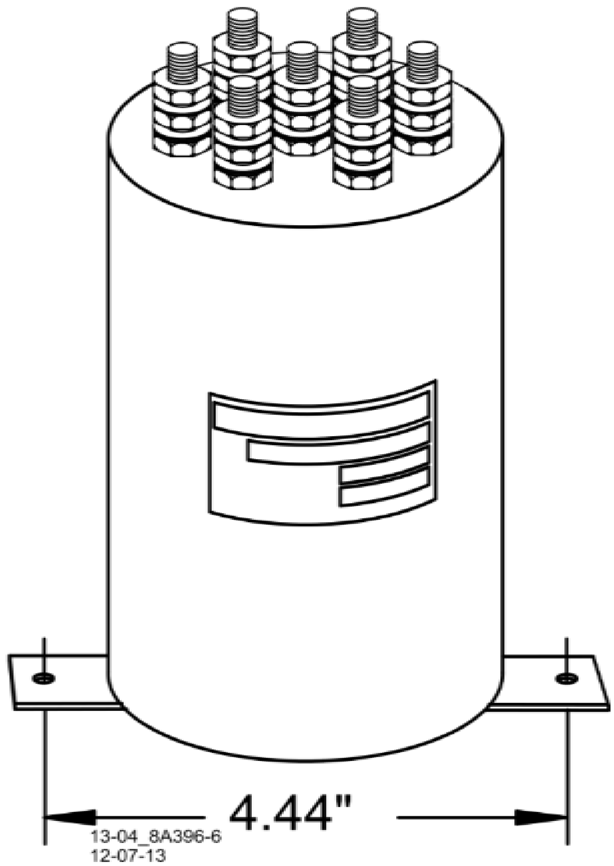


Figure 6-16   Adjustable Inductor Assembly, 8A398-6

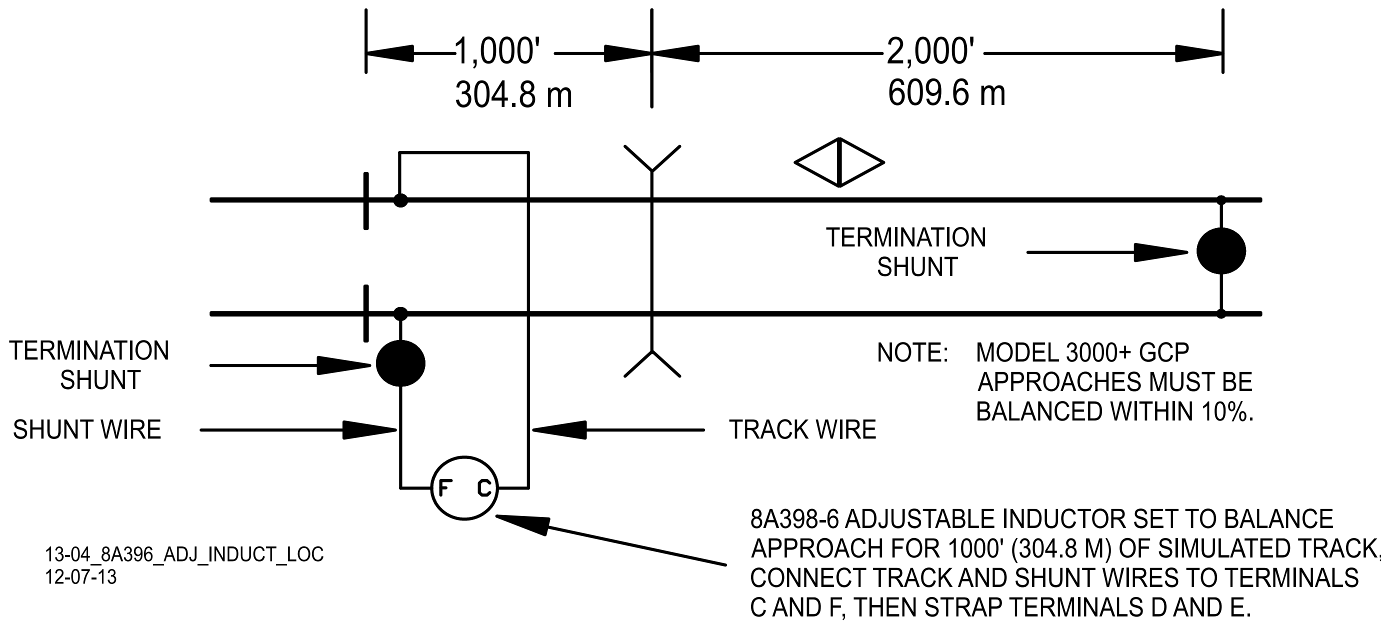


Figure 6-17 Adjustable Inductor Used with Termination Shunt

6.9.1 Adjustable Inductor Configuration

Step 1: Refer to Table 6-11 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 6-17) 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 6-17) 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 6-11 Adjustable Inductor Assembly, 8A398-6, Terminal Connections

COLUMN 1 SIMULATED TRACK LENGTH FEET/METERS	COLUMN 2 SET TRACK & SHUNT WIRES TO TERMINALS	COLUMN 3 CONNECT SHORTING STRAP(S) TO THESE TERMINALS	COLUMN 1 SIMULATED TRACK LENGTH FEET/METERS	COLUMN 2 CONNECT TRACK AND SHUNT WIRES TO TERMINALS	COLUMN 3 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	AG	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	C-D, D-E, E-F
1600/488	F-G		3150/961	A-G	C-D, D-E, E-F

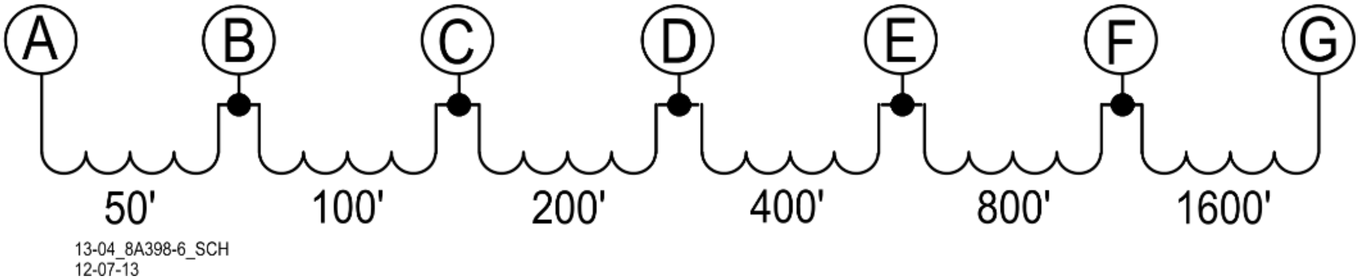


Figure 6-18 Adjustable Inductor, 8A398-6 Schematic

6.9.2 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)

6.10 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 types.

NOTE

NOTE

The recommendations presented in the following paragraphs are general in nature and no attempt has been made to cover all applications.

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

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

6.10.1 Steady Energy DC Track Circuits

NOTE

NOTE

If the track connection for the DC track circuit are 2,000 ft (609.8 m) or more beyond the GCP approach termination shunt, a battery choke is not required (see Figure 6-19).

A DC track circuit should be equipped with a battery choke when its battery is located:

- Within the Model 3000/4000/5000/3000+ GCP approach
- Less than 2,000 ft. (609.8 m) beyond the approach termination.

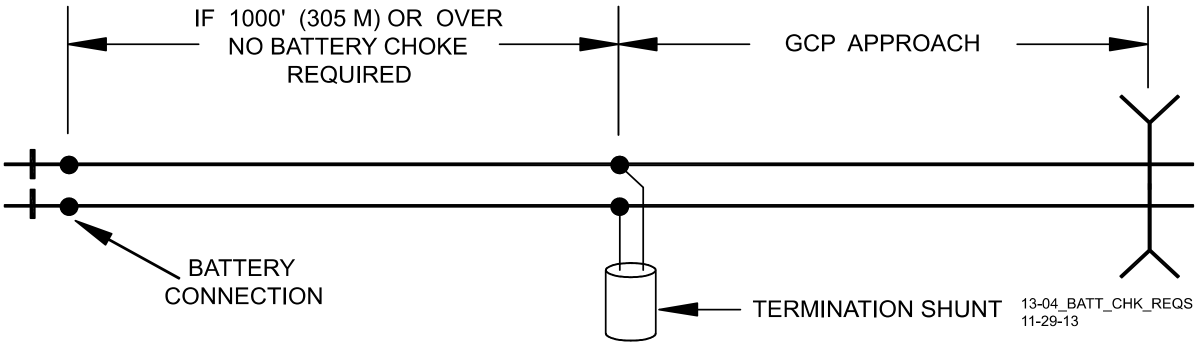


Figure 6-19 Battery Choke Requirements

Either of the following Battery Chokes may be used: (see limitations in the following paragraphs):

- Part number 8A065A
- Part number 62648.

The use of battery chokes is subject to the following limitations:

- Operation of long DC track circuits with very low ballast conditions may be affected by the DC resistance (DCR) of the 8A065A Battery Choke (DCR of 8A065A is 0.40 ohm). Such track circuits should use the 62648 Battery Choke, which has a DCR of 0.10 ohm.
- When a rectified track circuit is used and the GCP is operating at 114 Hz, an 8A076A Wideband Shunt (Paragraph 6.7) should be used together with the Battery Choke to eliminate 120 Hz ripple. This application is illustrated in Figure 6-20.

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 6-21).

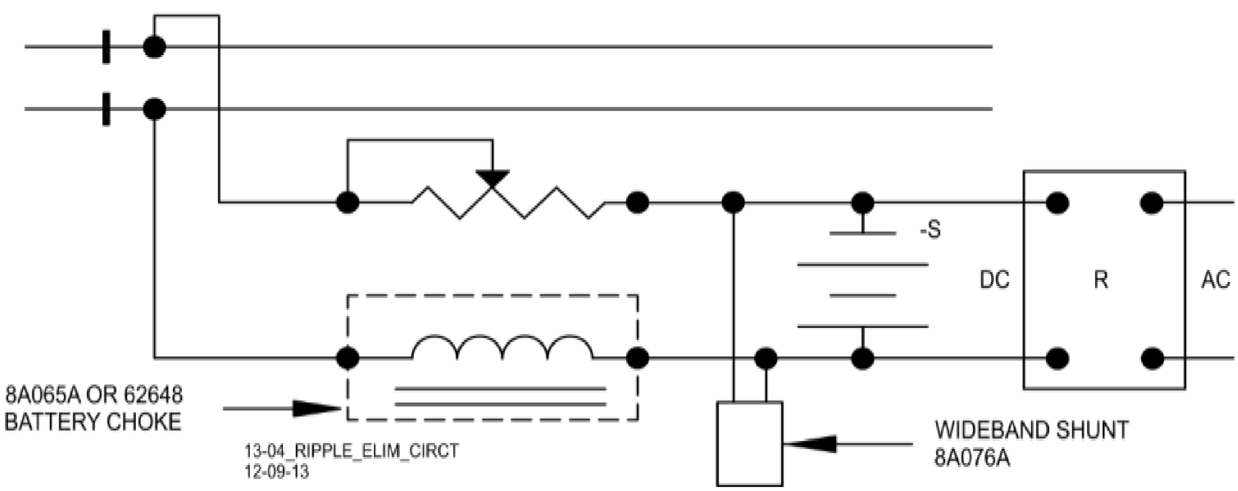


Figure 6-20 Ripple Elimination Circuit

6.10.1.1 Battery Chokes Specifications, 62648 and 8A065A

Diameter: 4.5 inches (11.43 centimeters) wide
5 inches (12.7 centimeters) deep
8.5 inches (21.59 centimeters) high (to top of terminal studs)

Weight: 17 pounds (approximately 7.72 kilograms)

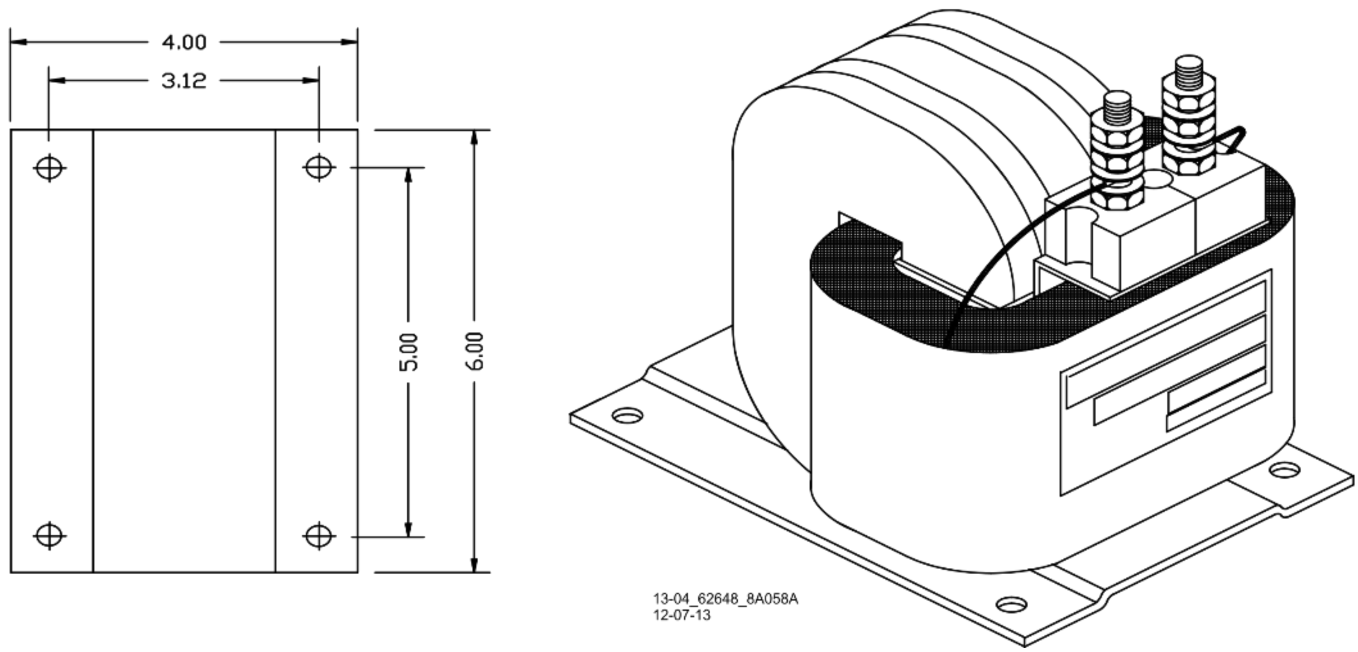


Figure 6-21 Battery Choke with Mounting Dimensions, 62648/8A065A

6.10.2 Siemens GEO Electronic DC Coded Track System

The standard Siemens Model 3000+ GCP frequencies of 86 Hz and above are compatible with the 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 track transmit power, and the GEO Track Noise Suppression Filter, A53252. The GEO Filter must be installed at the signal location for the above mentioned frequencies.

6.10.3 ElectroCode or Genrakode Electronic Coded Track System

Model 3000+ GCP frequencies of 86 Hz and above can normally be used with ElectroCode or Genrakode Electronic Coded Track System.

- All frequencies of 211 Hz and lower require use of high track transmit power.
- In certain instances, 285 Hz may also require high track transmit power.
- For frequencies of 211 Hz and lower, a 6A342-5 filter may be required when the ElectroCode or Genrakode transmitter is located within the Model 3000+ GCP approach. It is acceptable to have ElectroCode TF-f filters installed at existing locations.

NOTE

NOTE

Under some circumstances, an external track filter may be required when electronic coded track is located within the Model 3000+ GCP approach. As with any coded track system, the lower the transmit level, the less interference to GCP units.

6.10.4 Relay Coded DC Track Circuit

Most relay coded DC track installations require the use of DC Code Isolation units. A code isolation unit is a special battery choke that aids in preventing coded track battery and track relays from causing high interference with the Model 3000+ GCP. There are three Siemens DC Code Isolation units: the 6A342-1 DC Code Isolation Unit, used in single polarity systems, the 6A342-3 DC Code Isolation Unit, which is used in dual polarity systems, and the 6A342-5 DC Code Isolation Unit, which is used with the Electronic Coded Track Systems.

6.10.5 DC Code Isolation Unit, 6A342-1

The 6A342-1 DC Code Isolation Unit, is used in most single polarity code systems. It consists of filter components (L1, C1, R1, and CR1) and three AREMA binding posts on a mounting base. The 6A342-3 DC Code Isolation Unit is used in GRS Trakode (dual polarity) relay systems.

WARNING

WARNING

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

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

NOTE

NOTE

All wiring to terminals 1 and 2 on the Isolation units should be number 6 AWG. This significantly reduces current losses to the track relay during low track ballast conditions. Frequencies below 211 Hz require high track transmit power.

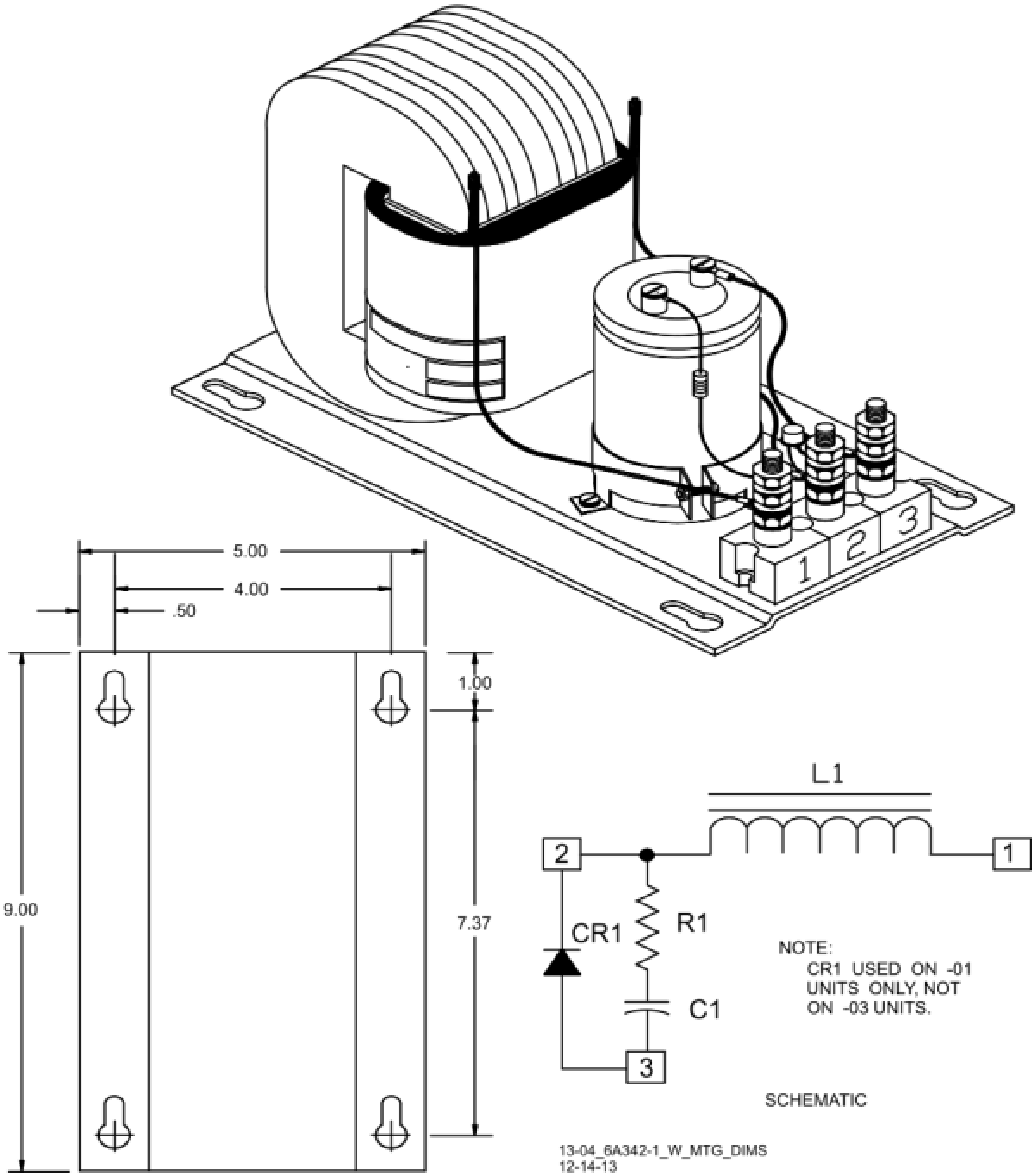


Figure 6-22 DC Code Isolation Unit, 6A342-3, with Mounting Dimensions

WARNING

WARNING

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

6.10.5.1 DC Code Isolation Unit, 6A342-1 Specifications

Diameter:	5 inches (12.7 centimeters) wide 9 inches (22.86 centimeters) deep 5.75 inches (14.605 centimeters) high
Weight:	15 pounds (approximately 6.81 kilograms)

6.10.5.2 DC Code Isolation Unit, 6A342-1 Applications

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

6.10.5.3 Single Polarity Systems (Fixed Polarity)

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 6-23 illustrates a typical 6A342-1 Code Isolation unit installation in a single polarity code system.

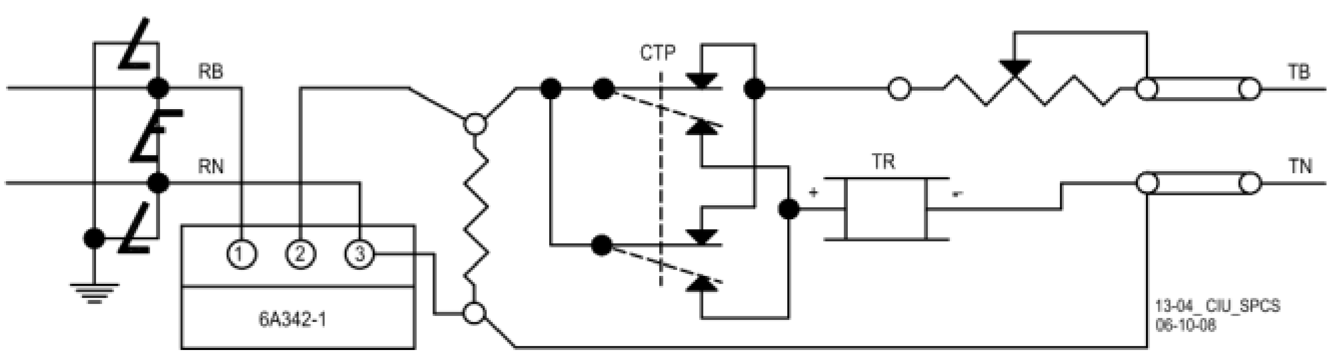


Figure 6-23 Code Isolation Unit in a Single Polarity Code System

6.10.5.4 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.

Figure 6-24 illustrates the 6A342-1 Code Isolation unit installed in a GRS Trakode system.

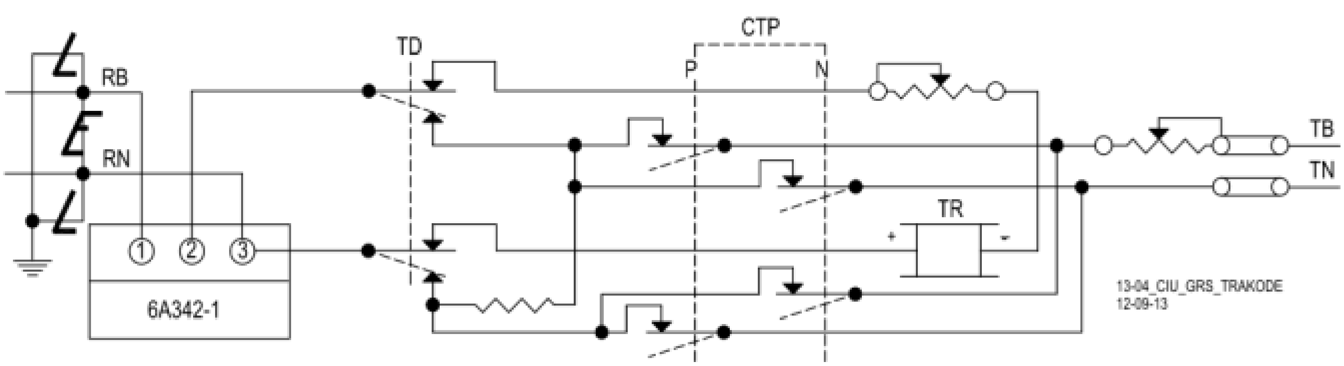


Figure 6-24 Code Isolation Unit Installation in GRS Trakode System

6.10.5.5 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.

6.10.6 DC Code Isolation Unit, 6A342-3

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.

6.10.7 AC Code Isolation Units

WARNING

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

CAB signal and style C track circuit installations require the use of an AC Code Isolation unit such as the 8A466-3 (Figure 6-25) or the 8A470-100 (Figure 6-26). 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.

6.10.7.1 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.

6.10.7.2 AC Code Isolation Unit, 8A466-3 Specifications

Dimensions:	10.15 inches (25.781 centimeters) wide
	11.78 inches (29.921 centimeters) deep
	7.62 inches (19.355 centimeters) high
Weight:	26 pounds (approximately 11.8 kilograms)

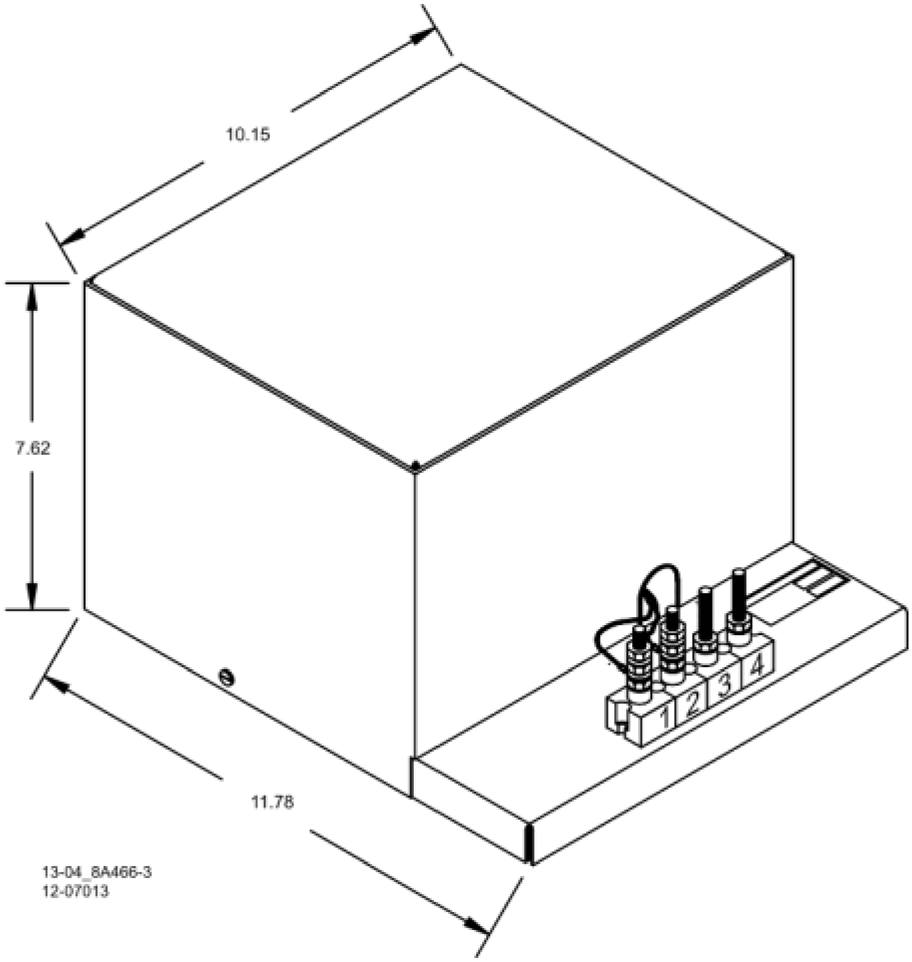


Figure 6-25 AC Code Isolation Unit, 8A466-3

6.10.7.3 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.

6.10.7.4 Code Isolation Unit, 8A470-100 AC Specifications

Dimensions:	5 inches (12.7 centimeters) wide
	9.4 inches (23.876 centimeters) deep
	9 inches (22.86 centimeters) high
Weight:	5 pounds (approximately 2.27 kilograms)

6.10.7.5 Cab Signal AC

WARNING

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

Application of Model 3000+ GCP systems in cab territory using the 8A466-3, 60 Hz AC Code Isolation Unit or the 8A470-100, 100 Hz Isolation Unit is shown in Figure 6-27.

For other installations, contact Siemens Technical Support for assistance.

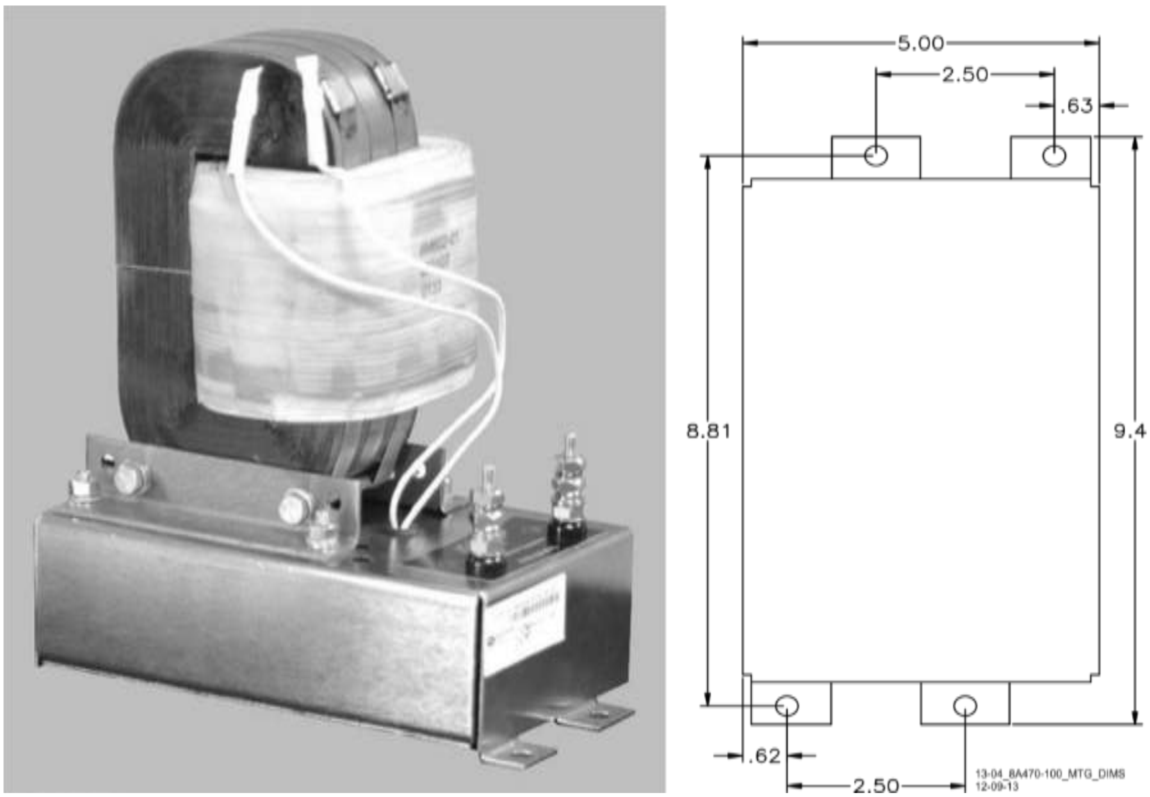


Figure 6-26 AC Code Unit, 8A470-100, with Mounting Dimensions

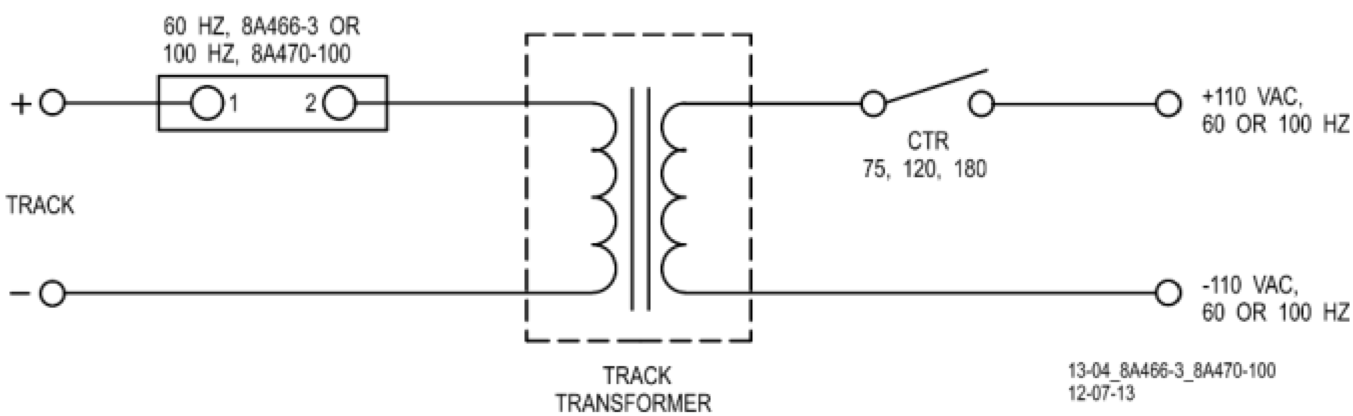


Figure 6-27 AC Code Isolation Unit Used in CAB Territory

6.10.7.6 Style C Track Circuits

The 60 Hz AC Code Isolation unit (8A466-3) is used with style C track circuits as shown in Figure 6-28.

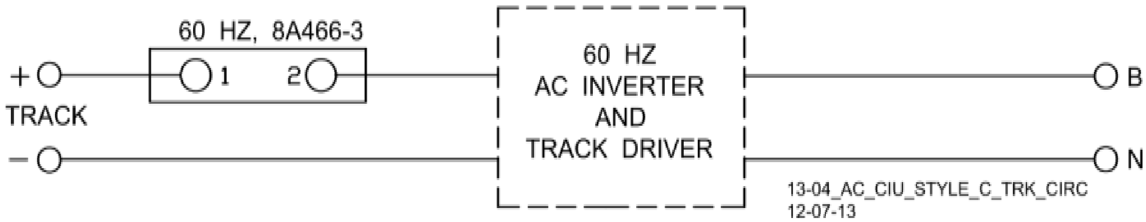


Figure 6-28   AC Code Isolation Unit Used in Style C Track Circuits

6.10.7.7 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.

6.11 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 Model 3000+ GCP for bypassing insulated joints in DC coded track.

- The 62785-f Bypass Coupler is used in all Model 3000+ GCP applications requiring the use of an insulated joint bypass coupler.
- The 62785-f Coupler is available in standard Siemens frequencies of 156 Hz through 970 Hz.

⚠ WARNING

WARNING

INSULATED JOINT BYPASS COUPLERS, 62531-F AND 62631-F, MUST NOT BE USED WITH THE MODEL 3000+ GCP.

WHEN THE MODEL 3000+ GCP IS PROGRAMMED AS A PREDICTOR, THE 62785-F COUPLER CANNOT BE USED TO BYPASS INSULATED JOINTS WITHIN THE INNER TWO-THIRDS OF AN APPROACH, EXCEPT AS SPECIFIED IN Table 6-12

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

ONLY 62785-F TUNED BYPASS COUPLERS MAY BE USED TO BYPASS INSULATED JOINTS IN CODED DC TRACK CIRCUITS.

The application guidelines for Tunable Insulated Joint Bypass Coupler, 62785-f when used only with the Model 3000+ GCP have been expanded as follows:

- In DC coded track circuits, the insulated joints within an approach may be bypassed using the Siemens 62785-f Tunable Insulated Joint Bypass Coupler, provided the minimum distances specified in Table 6-12 are observed.
- The 62785-f Coupler must be field tuned to pass the Model 3000+ GCP operating frequency (f) around insulated joints in DC or coded DC track circuits.
- Field tuning of the Coupler enables precise frequency adjustment for track and joint parameters.
- The Coupler must be located within 10 feet of the insulated joints that it is coupling.
- The minimum distance to the insulated joints is generally a function of the Model 3000+ GCP operating frequency; i.e., the lower the operating frequency, the longer the minimum distance.

Two sets of insulated joints may be coupled in any single approach, provided the minimum operating distances specified in Table 6-12 are observed.

Table 6-12 indicates the minimum operating distances (in feet) to the first and second set of insulated joints that are coupled with 62785-f couplers for Model 3000+ GCP operation.

Table 6-12 Minimum Distance to Insulated Joints When Coupled with Tunable Insulated Joint Bypass Coupler, 62785-F

FREQUENCY (HZ)	MINIMUM DISTANCE TO FIRST SET OF INSULATED JOINTS (FEET)	MINIMUM DISTANCE TO SECOND SET OF INSULATED JOINTS (FEET)
86	N/A	N/A
114	2000/610	3000/914
151 – 211	1500/458	2200/671
212 – 348	1000/305	1400/427
349 – 560	700/214	1000/305
561 – 790	500/153	800/244
791 – 979	400/122	700/214

*Distance applies to insulated joints located on the same side of the crossing.

The Coupler is housed in a sealed, 6-inch (15.24 cm) diameter case.

- A pair of 10 foot, number 6 AWG leads extend from one end
- Eight AREMA terminals extend from the other end (see Figure 6-29)
- 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 THE 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 the terminal E produces maximum change in EZ value. Tightening the nut on terminal A produces minimum change.

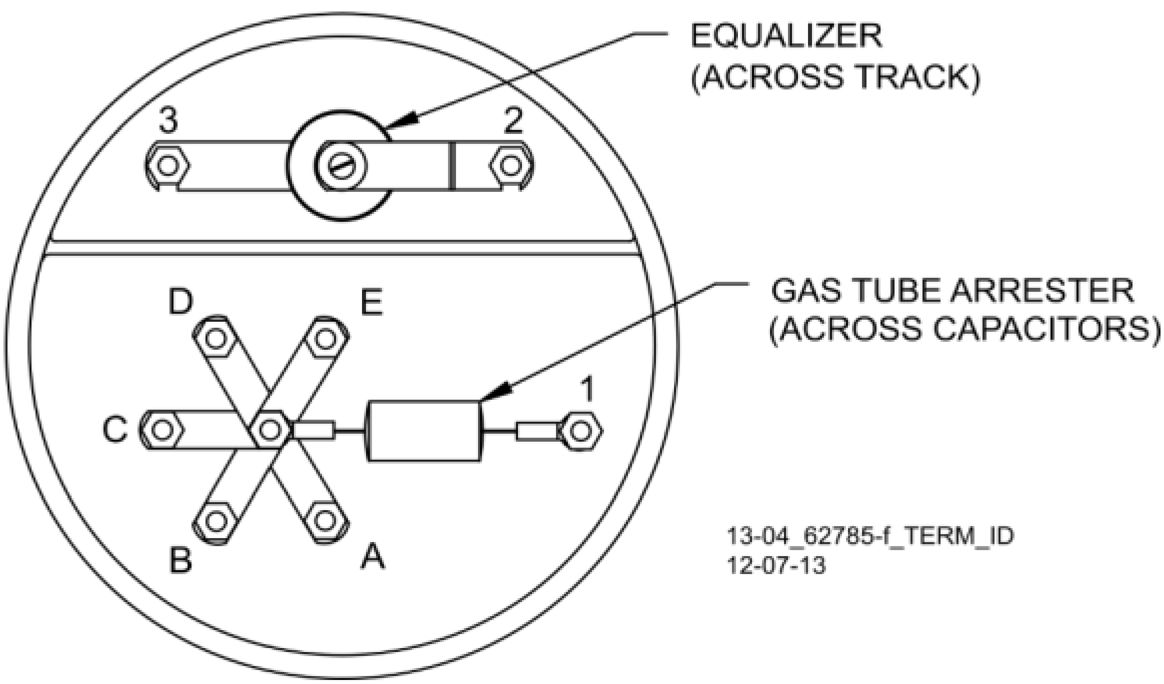


Figure 6-29 Terminal Identification, 62785-f Tunable Insulated joint Coupler

The Coupler is tuned in the following sequence:

- The gold nut on terminal E is tightened first.
- Calibrate the Model 3000+ GCP so that the EZ value is 100
- Next, a hardwire shunt is placed across the tracks, first on one side of the coupler and then on the other, tightening one or more of the remaining nuts in sequence to obtain the minimum change in EZ value across the joint.

NOTE

NOTE

Tightening the nut on terminal E produces maximum change in EZ value and tightening the nut on terminal A produces minimum change.

- When the adjustment is complete, a second (standard) AREMA nut is tightened on each of the terminals to lock the gold adjusting nuts firmly in position.
- Next, an equalizer and a gas tube for capacitor protection are connected to the remaining AREMA terminals to provide complete surge protection.
- Finally, a pliable end cap is secured in place over the terminal end of the coupler by a sturdy stainless steel clamp to provide protection against moisture and dust.

There are two different tuning procedures to tune the Tunable Insulated Joint Bypass Coupler depending on where the coupler(s) is/are located in the approach. Use the procedure outlined in Paragraph 6.11.1 primarily. Use the procedure outlined in Paragraph 6.11.2 as an alternate. Refer to Figure 6-30 when performing either of the following tuning procedures.

CAUTION

CAUTION

THE COUPLER SHOULD BE CONNECTED WITHIN 10 FEET (3.04 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 TO PROVIDE MAXIMUM PROECTION FROM PHYSICAL DAMAGE.

NOTE

NOTE

Multiple couplers often require the procedures in Paragraph 6.11.2 for proper setup.

NOTE

NOTE

It is not necessary to bury the coupler below the frost line.

6.11.1 Field Tuning Procedure #1

Refer to the appropriate installation diagram in Figure 6-30 for the following tuning procedure.

Step 1: Tighten the gold nut securely on terminal E of each coupler.
Step 2: Calibrate the Model 3000+ GCP so that the EZ value is 100.
Step 3: Place a hardwire test shunt across the track at location A (refer to Figure 6-30).
Step 4: Make note of the EZ value appearing on the Model 3000+ GCP display.
Step 5: Move the test shunt to location B.
Step 6: Tune the Tunable Insulated Joint Bypass Coupler #1 to the same EZ value noted in Step 4.

- Tighten the gold nut on the Coupler #1 terminals labeled D, C, B, and A, in sequence beginning with terminal D.
- If tightening a nut results in an EZ value that is lower than the value recorded in step 4, loosen the nut and tighten the next nut in sequence.
- If, after tightening a nut, the EZ value remains higher than the value recorded in step 4, leave the nut tightened and tighten the next nut in sequence.
- Continue to tighten nuts D through A as necessary to obtain an EZ value that is approximately the same as that recorded in step 4.

Step 7: Move the test shunt to location C.

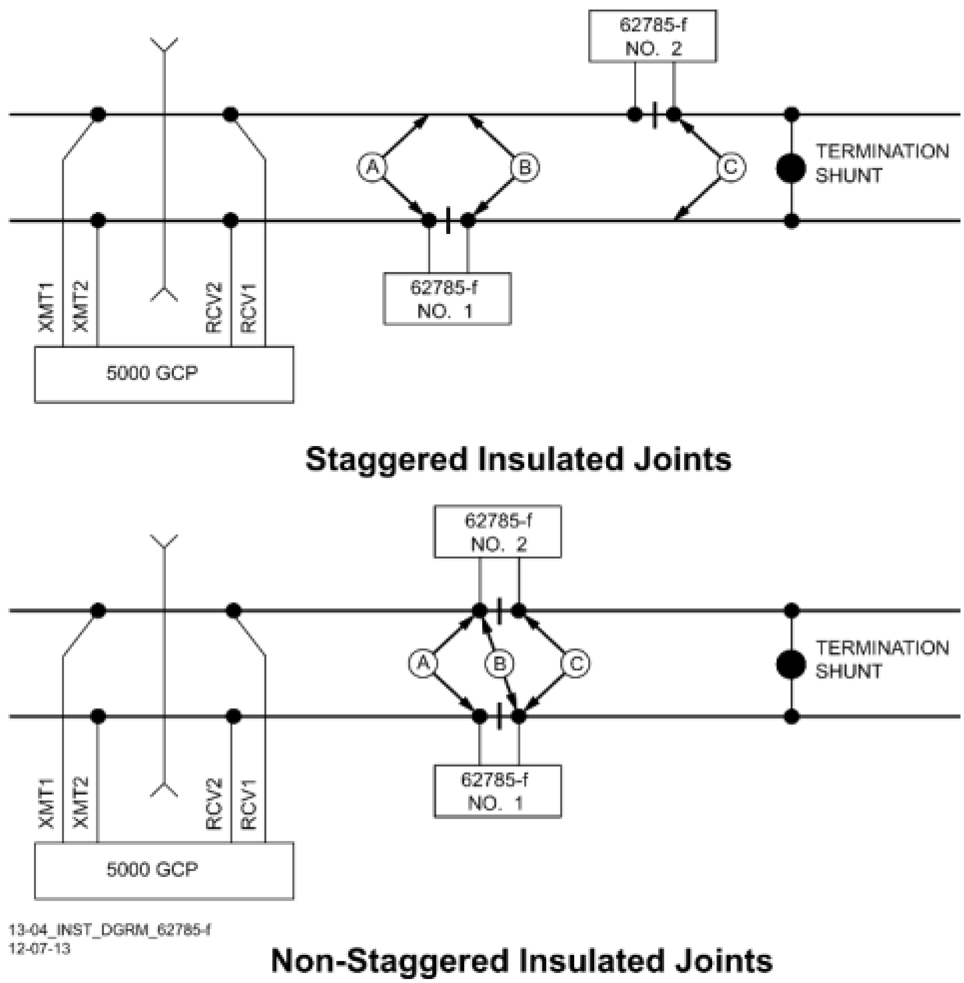


Figure 6-30 Typical Installation Diagrams Using the 62785-f Coupler

Step 8: Tune the No. 2 Tunable Insulated Joint Bypass Coupler to the EZ value noted in step 4.

- Tighten the gold nut on the Coupler #1 terminals labeled D, C, B, and A, in sequence beginning with terminal D.
- If tightening a nut results in an EZ value that is lower than the value recorded in step 4, loosen the nut and tighten the next nut in sequence.
- If, after tightening a nut, the EZ value remains higher than the value recorded in step 4, leave the nut tightened and tighten the next nut in sequence. Continue to tighten nuts D through A as necessary to obtain an EZ value that is approximately the same as that recorded in step 4.

Step 9: Remove the test shunt and tighten a standard AREMA nut against each gold nut to ensure all nuts are securely locked in position.

WARNING

ENSURE THAT A STANDARD AREMA NUT IS TIGHTENED SECURELY AGAINST EACH GOLD NUT ON TERMINALS A THROUGH E, INCLUDING THE TERMINALS THAT ARE NOT TIGHTENED DOWN.

Step 10: Completely recalibrate the Model 3000+ GCP and perform all operational checks while observing the smooth change in the EZ value across the couplers during a train move.

6.11.2 Field Tuning Procedure #2 for Couplers

Step 1: Tighten the gold nut securely on terminal E of each coupler.
Step 2: Calibrate the Model 3000+ GCP EZ value to 100.
Step 3: Place a hardwire test shunt across the track at location A (refer to Figure 6-30).
Step 4: Make a note of the EZ and EX values on the Model 3000+ GCP display.
Step 5: Move the test shunt to location B.
Step 6: Tune the Tunable Insulated Joint Bypass Coupler #1 EX value to above 75. The EZ value may be as much as 8 points above the value noted in Step 4.
Step 7: Move the test shunt to location C.
Step 8: Tune the Tunable Insulated Joint Bypass Coupler #2 so the EX value stays above 75. The EZ value may be as much as 16 points above the value note in Step 4.
Step 9: Remove the test shunt and tighten a standard AREMA nut against each gold nut to ensure all nuts are securely locked in position.

WARNING

ENSURE THAT A STANDARD AREMA NUT IS TIGHTENED SECURELY AGAINST EACH GOLD NUT ON TERMINALS A THROUGH E. TERMINALS THAT ARE NOT USED FOR TUNING THE COUPLER MUST HAVE THEIR GOLD NUTS REMOVED.

Step 10: Completely recalibrate the Model 3000+ GCP and perform all the operational checks while observing the relatively smooth change in the EZ value across the couplers during a train move.

6.11.3 Tunable Insulated Joint Bypass Coupler, 62785-f Specifications

Dimensions:	18 inches (45.72 centimeters) long 6 inches (15.24 centimeters) in diameter
Weight:	12 pounds (approximately 5.45 kilograms)
Leads:	10 feet (3.04 meters); #6 AWG, stranded, black PVC
Surge Suppresser:	Equalizer, 022700-21X, Siemens No. Z803-00052-0001
Part Numbers:	Gas Tube Arrester, Siemens No. Z803-00053-0001

6.12 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.

6.12.1 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).

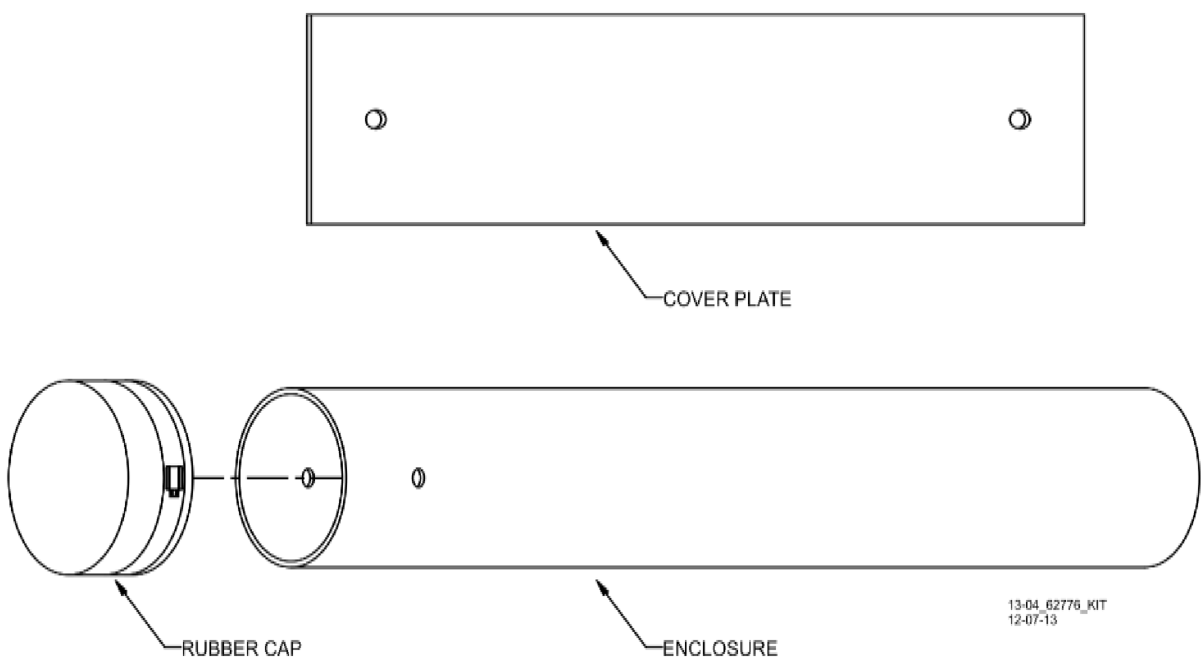


Figure 6-31 MS/GCP Termination Shunt Burial Kit, 62776

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.

6.12.2 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.

6.12.3 62776 Shunt Kit Assembly Specifications

Dimensions	
Enclosure (PVC):	24 inches (60.96 centimeters) long (w/o end cap)
	6 inches (15.24 centimeters) in diameter (inside)
Cover Plate (Steel):	24 inches (60.96 centimeters) long
	7 inches (17.78 centimeters) wide
	0.25 inches (0.635 centimeters) thick
Weight	
Enclosure:	5 pounds (2.27 kilograms)
Cover Plate:	12 pounds (5.44 kilograms)

6.13 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 SAFETY OR MODEL 3000+ GCP SYSTEM. FOR EXAMPLE, BUT NOT LIMITED TO UNINTENTIONAL EARTH GROUNDS ON CONTROL CIRCUITS OR SHORTS ON TRACK CIRCUITS.

6.13.1 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 6-13. Rack mount Surge Panel applications are listed in Table 6-14.

NOTE

NOTE

For surge protection requirements not listed or for custom designed Surge Panels, contact Siemens Technical Support.

6.13.2 Surge Panel Nomenclature and Mounting Dimensions

Surge panel nomenclature and mounting dimensions are provided on the figures identified in Table 6-13 and Table 6-14.

6.13.3 Surge Panel Arresters

WARNING

> **WARNING**
>
> **DO NOT MOUNT ARRESTERS WITH ELECTRODES POINTED IN THE DOWN POSITION TO MINIMIZE THE POTENTIAL OF SHORT CIRCUIT.**

A typical Surge Panel arrester is shown in Figure 6-32.

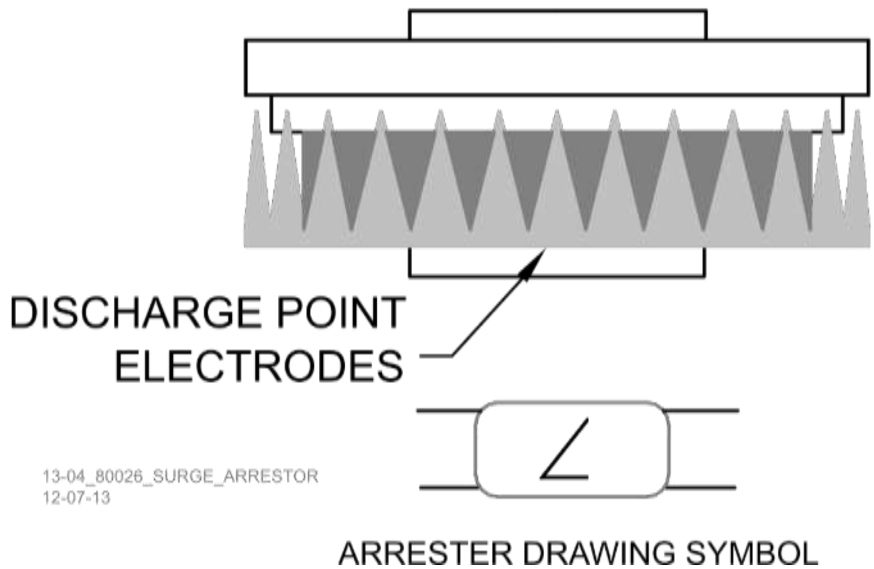


Figure 6-32 Typical 80026 Surge Panel Arrester Mounting Position

Table 6-13 Wall Mount Surge Panels

PART NO.	FIG.	DESCRIPTION	DIMENSIONS	WEIGHT
80026-01	6-33	Protects 1 battery and 1 track circuit.	Height: 13.5 in (34.29 cm) Width: 5.69 in (14.453 cm) Depth: 3.625 in (9.208 cm)	6 lb (2.72 kg) (approximate)
80026-02	6-33	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 lb (1.82 kg) (approximate)
80026-22	6-33	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 lb (1.36 kg) (approximate)

Table 6-14 Rack Mount Surge Panels

PART NO.	FIG.	DESCRIPTION	DIMENSIONS	WEIGHT
80026-31	6-33	Protects 1 track and 1 battery circuit.	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	5 lb. (2.26 kg) (approximate)
80026-32	6-33	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 in (58.42 cm) Depth: 4.535 in (11.519 cm)	6 lb. (2.72 kg) (approximate)
80026-33	6-34	Protects 1 battery circuit. • Use with -31 panel for subsequent battery circuit protection.	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	7 lb. (3.18 kg) (approximate)
80026-34	6-35	Protects 1 track circuit. • Use with -31 panel for subsequent track circuit protection.	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	6 lb. (2.72 kg) (approximate)
80026-35	6-36	Protects 2 track circuits.	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	7 lb. (3.18 kg) (approximate)
80026-36	6-36	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 in (58.42 cm) Depth: 4.535 in (11.519 cm)	6 lb. (2.72 kg) (approximate)
80026-37	6-37	Protects 1 battery circuit.	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	6 lb. (2.72 kg) (approximate)
80026-38	6-37	Protects 2 track circuits. • Used in application with six wires on one track and four on the other	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	8 lb (3.64 kg) (approximate)
80026-39	6-38	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 in (58.42 cm) Depth: 4.535 in (11.519 cm)	6 lb. (2.72 kg) (approximate)

PART NO.	FIG.	DESCRIPTION	DIMENSIONS	WEIGHT
80026-41	6-38	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 in (58.42 cm) Depth: 4.535 in (11.519 cm)	9 lb (4.09 kg) (approximate)
80026-41A	6-38	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 in (58.42 cm) Depth: 4.535 in (11.519 cm)	9 lb (4.09 kg) (approximate)
80026-47	6-39	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 in (58.42 cm) Depth: 4.535 in (11.519 cm)	7 lb (3.18 kg) (approximate)
80026-50	6-39	Protects 4 vital Input/output circuits. • Generally used for UAX inputs or DAX start outputs	Height: 4.96 in (12.598 cm) Width: 23 in (58.42 cm) Depth: 4.535 in (11.519 cm)	7 lb (3.18 kg) (approximate)

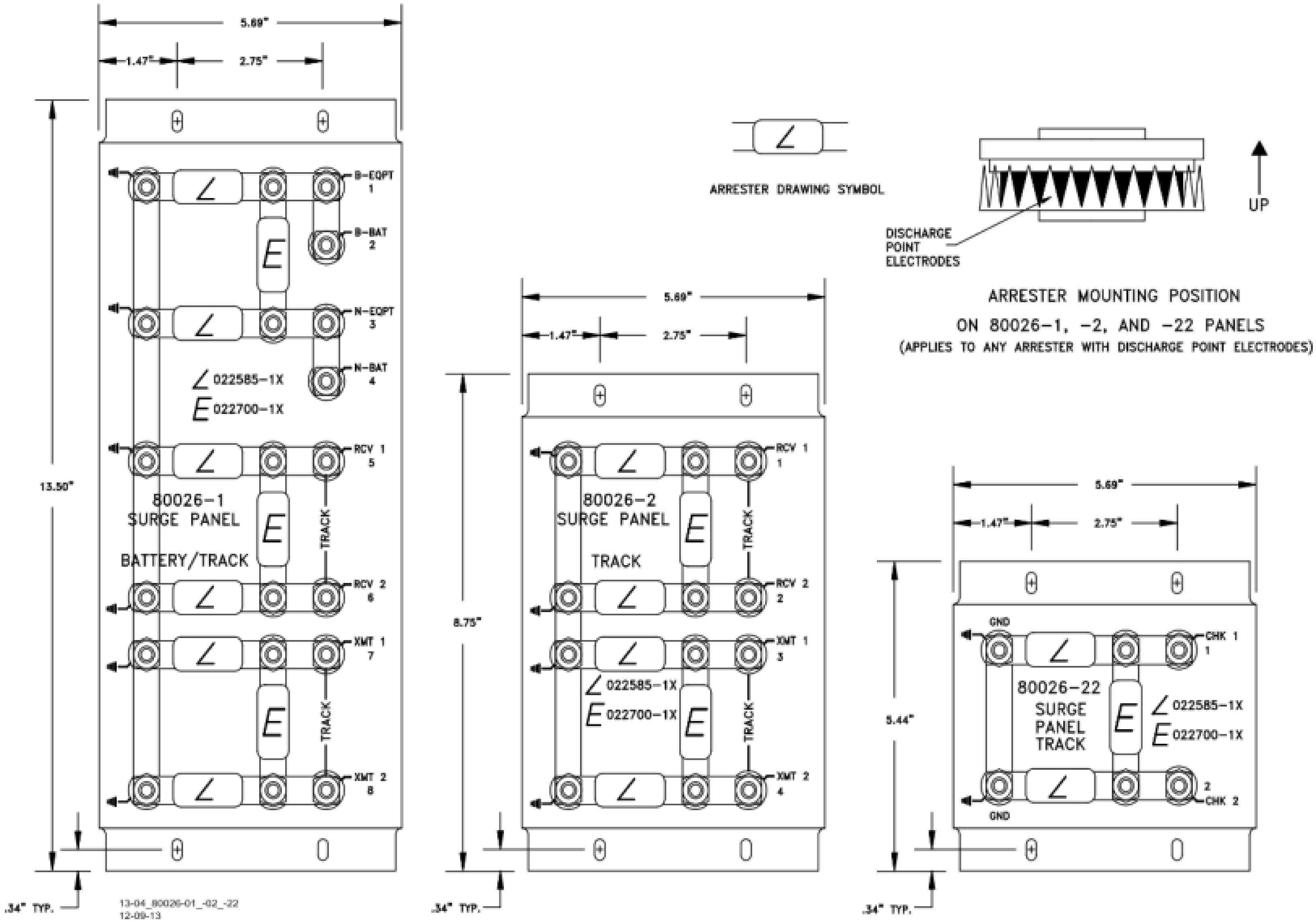


Figure 6-33 Wall Mount Surge Panels, 80026-01, -02, and -22

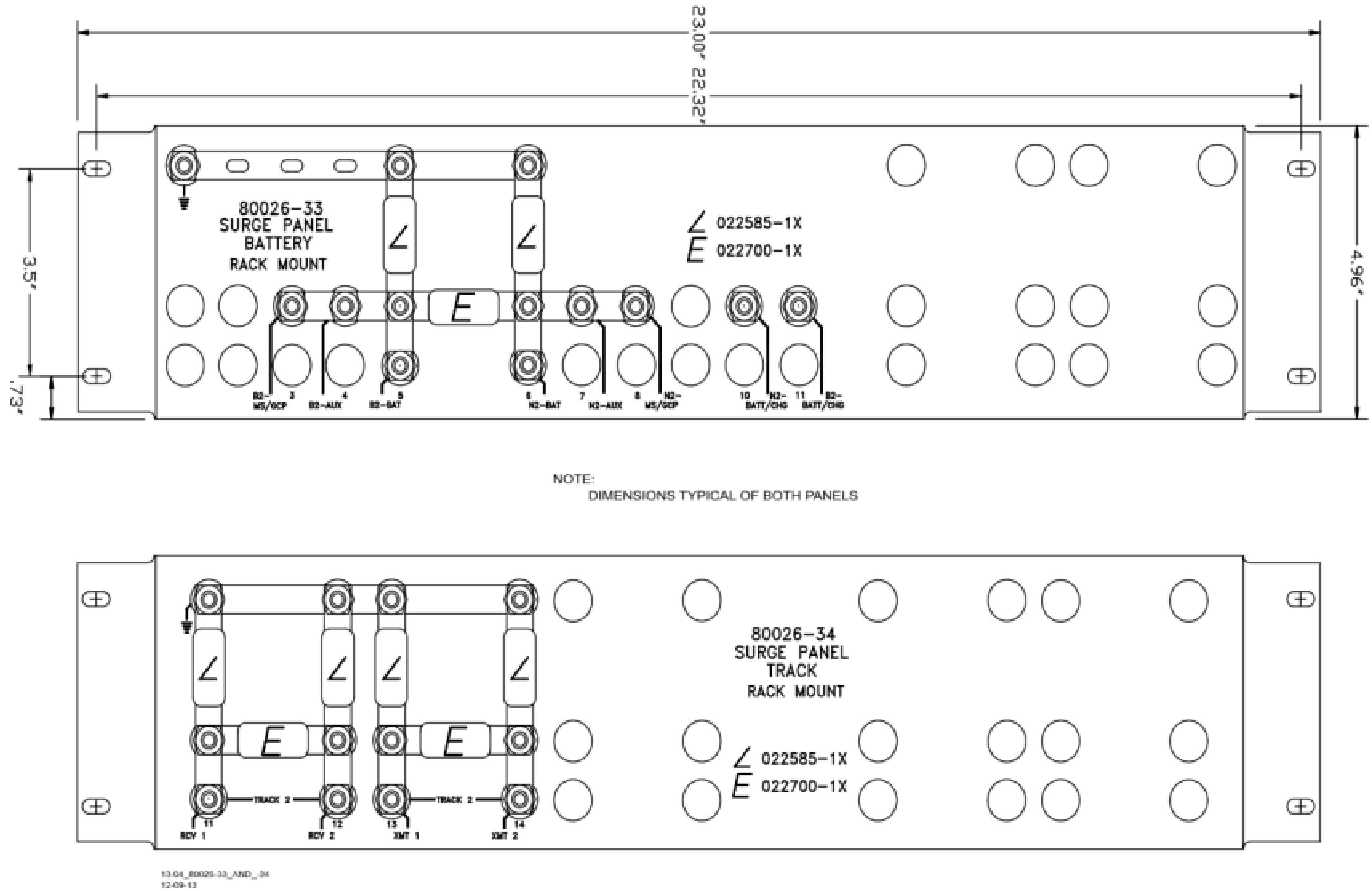


Figure 6-34 Rack Mounted Surge Panels, 80026-31 and -32

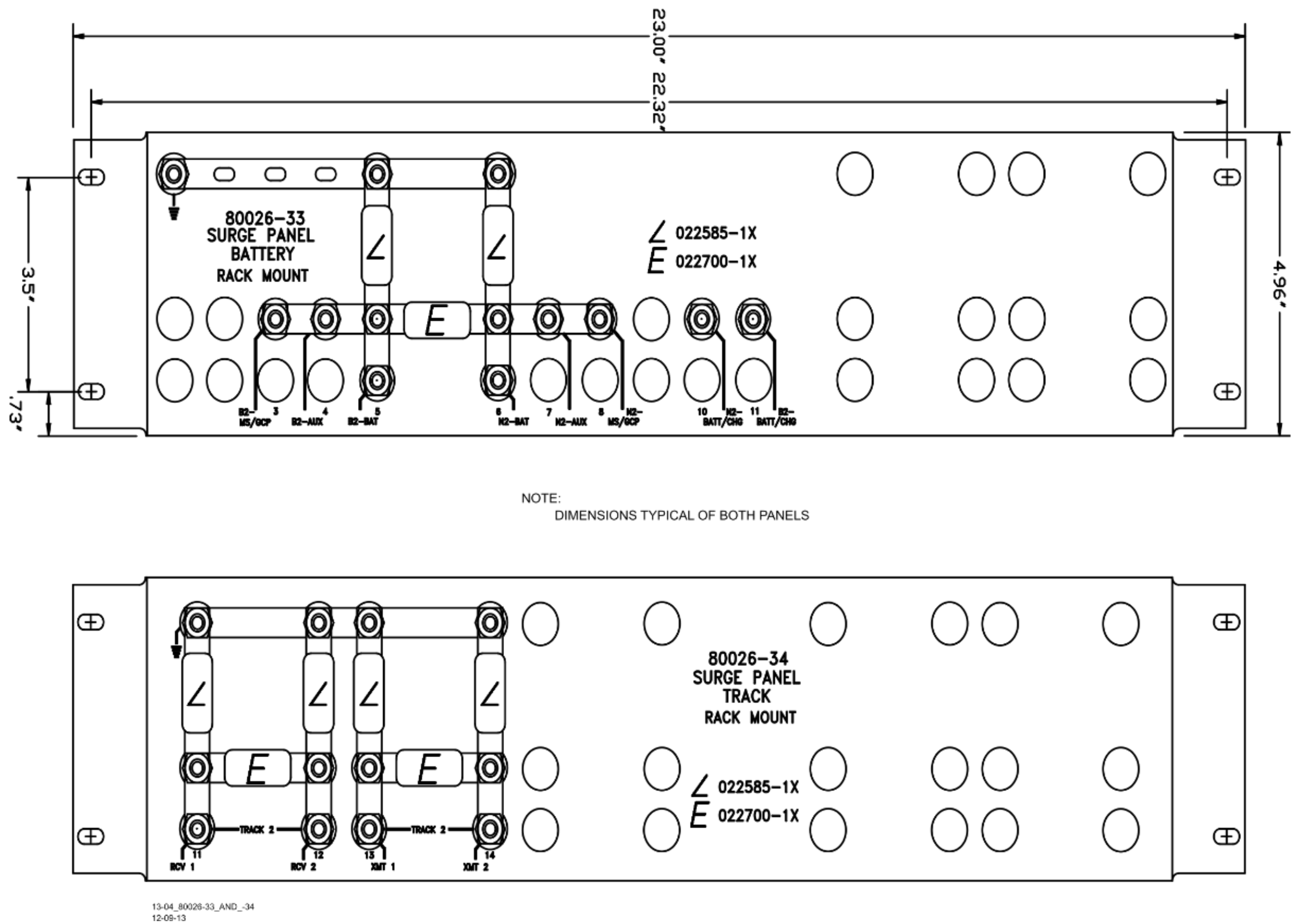


Figure 6-35 Rack Mounted Surge Panels, 80026-33 and -34

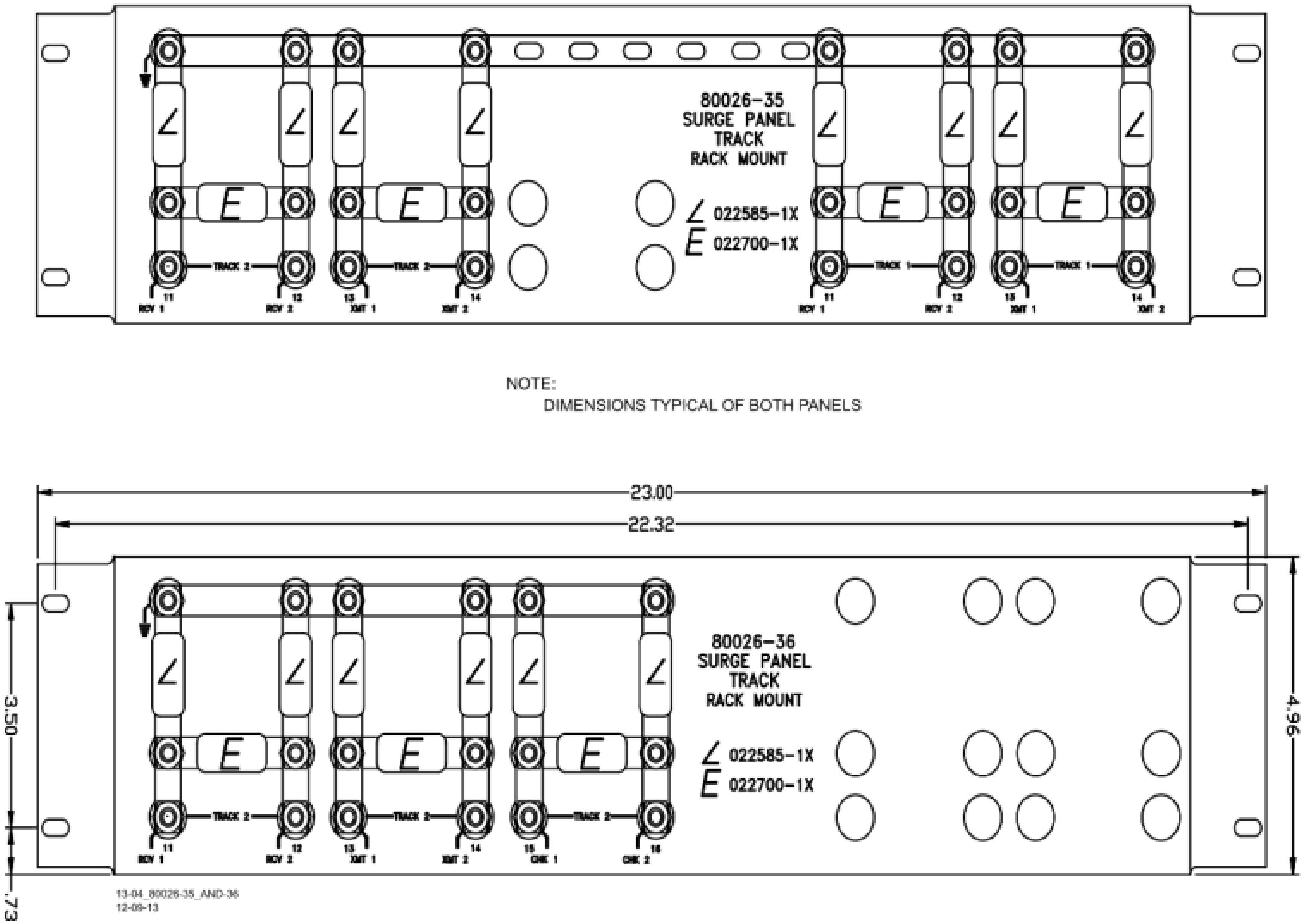


Figure 6-36   Rack Mounted Surge Panels, 80026-35 and -36

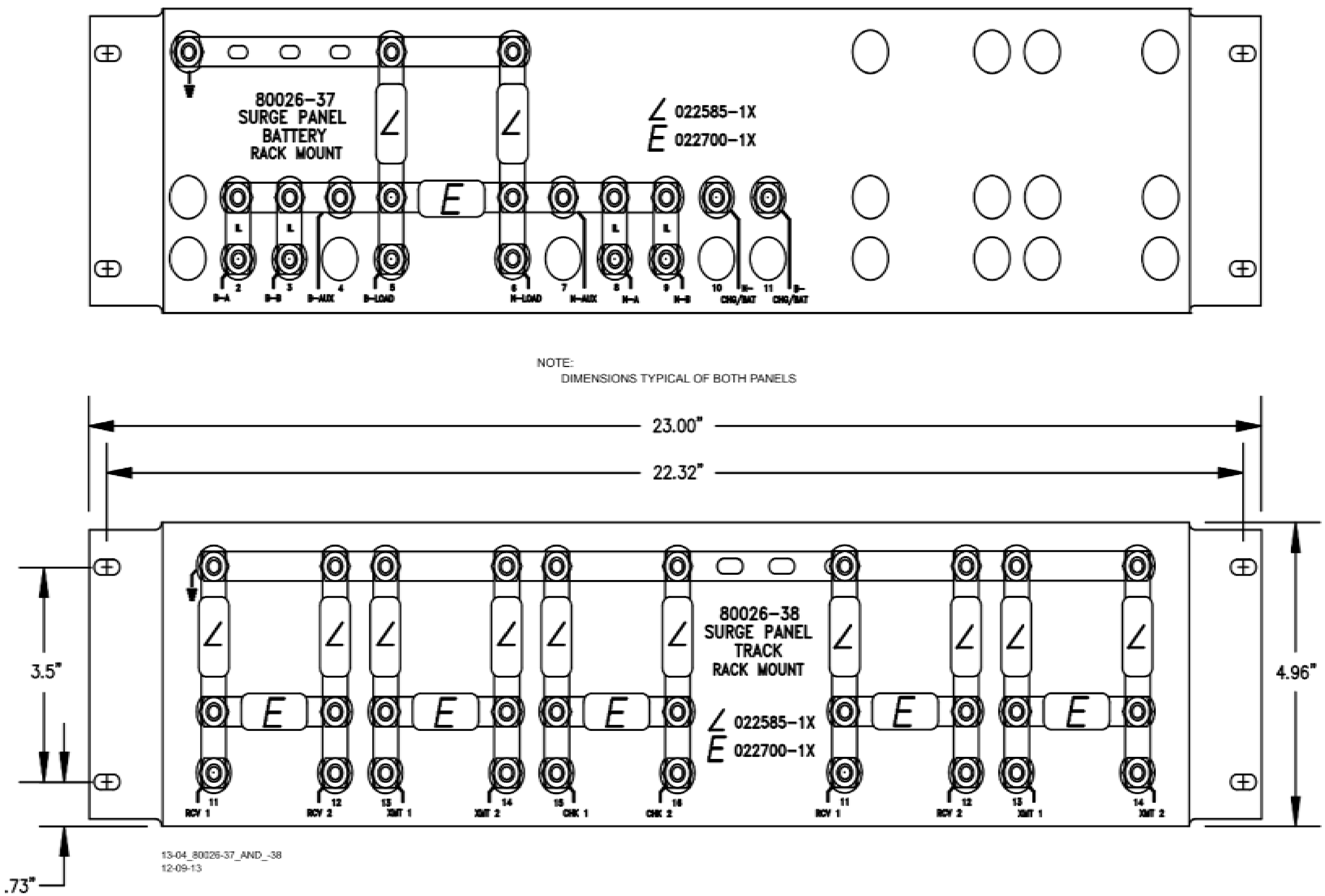


Figure 6-37 Rack Mounted Surge Panels, 80026-37 and -38

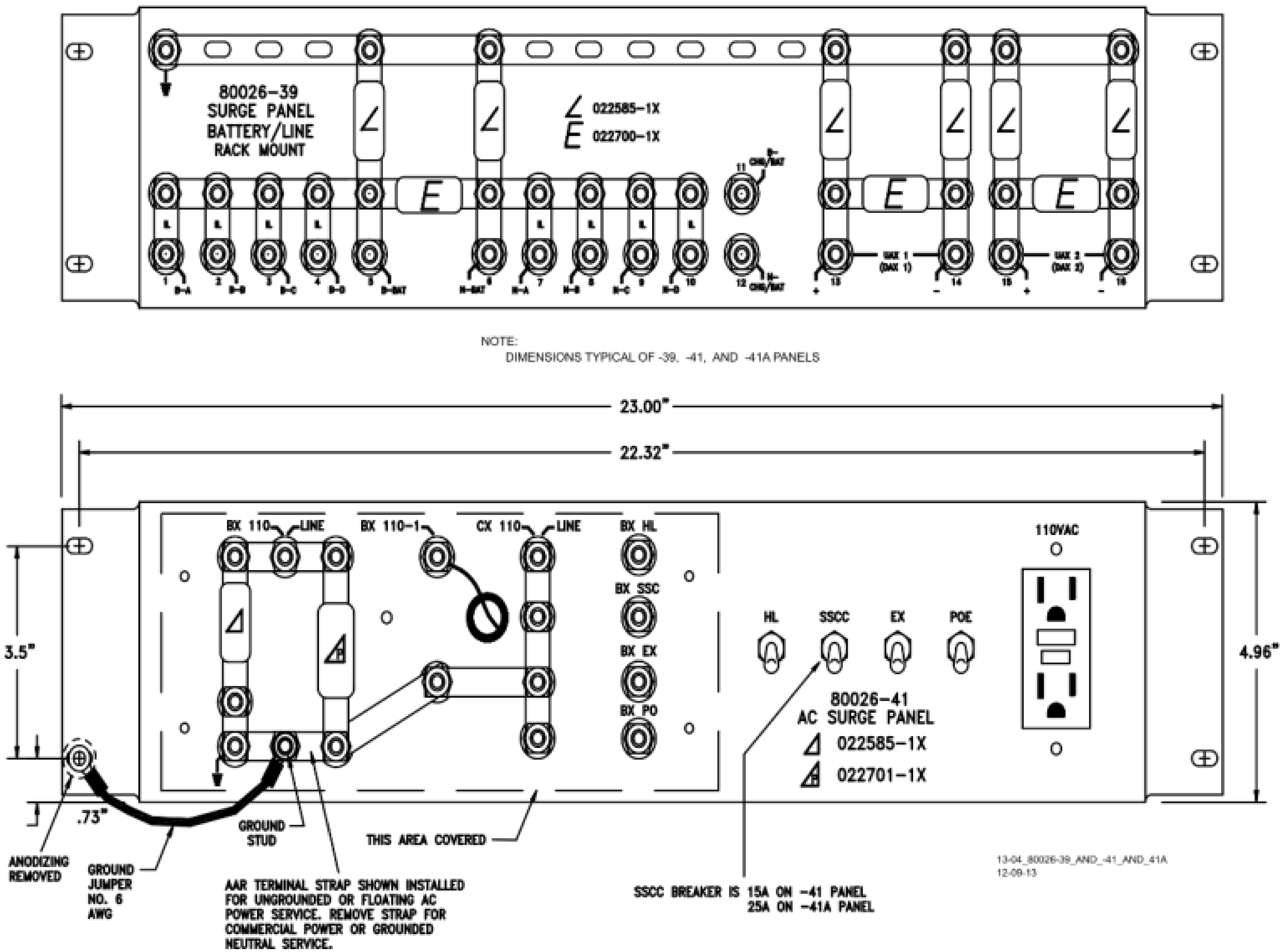


Figure 6-38 Rack Mounted Surge Panels, 80026-39, -41 and -41A

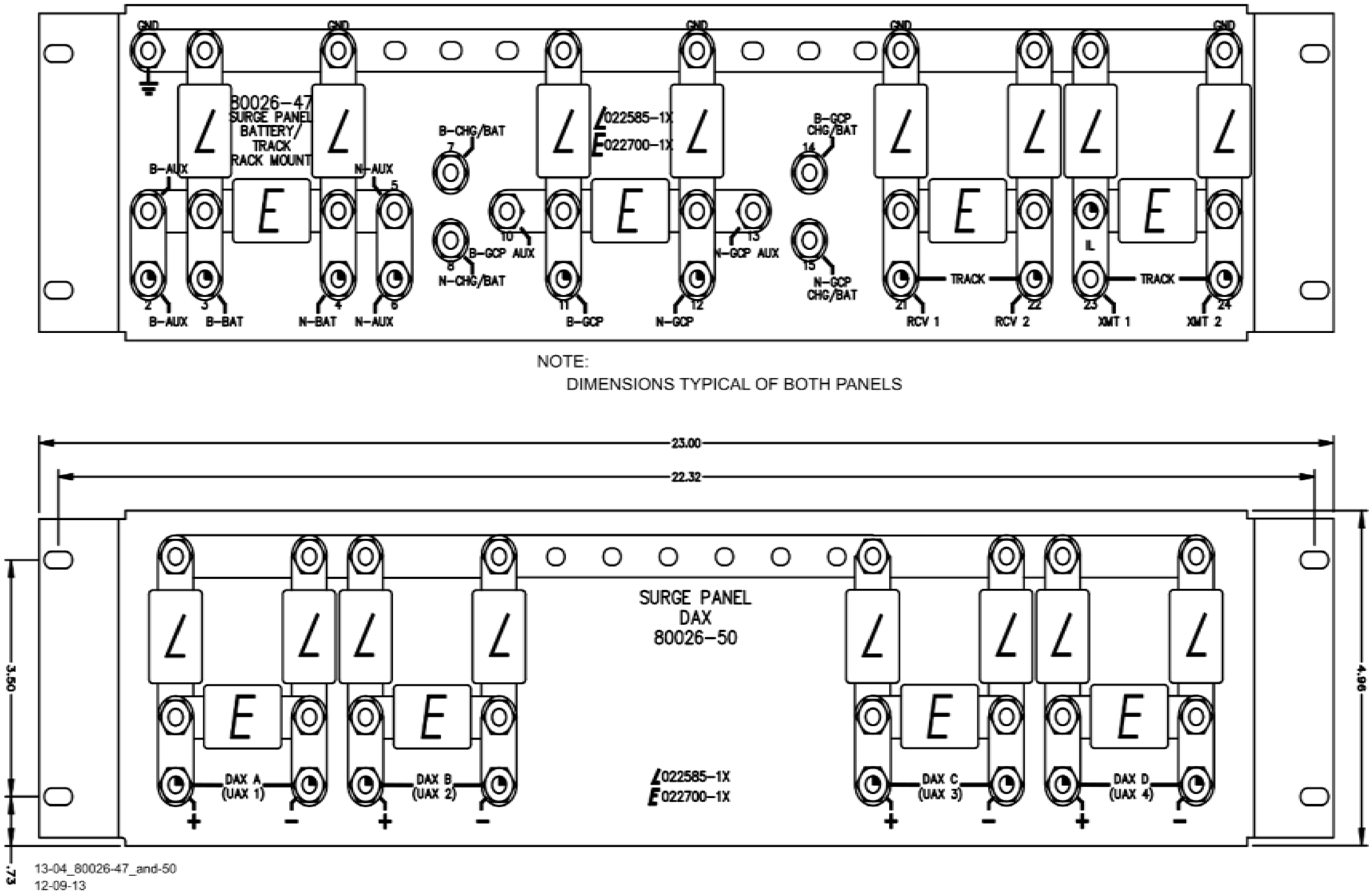


Figure 6-39 Rack Mounted Surge Panels 80026-47 and 80026-50

6.14 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.

6.14.1 Rectifier Panel Assembly Nomenclature and Mounting Dimensions

Rectifier Panel Assembly, 80033 nomenclature and mounting dimensions are provided on Figure 6-40.

Table 6-15 Rectifier Panel Assembly, 80033 Specifications

PARAMETER	VALUE
Height	10.46 in (26.568 cm)
Width	23 in (58.42 cm)
Depth	2.75 in (6.985 cm)
Weight	7 lbs (3.18 kg) (approximate)

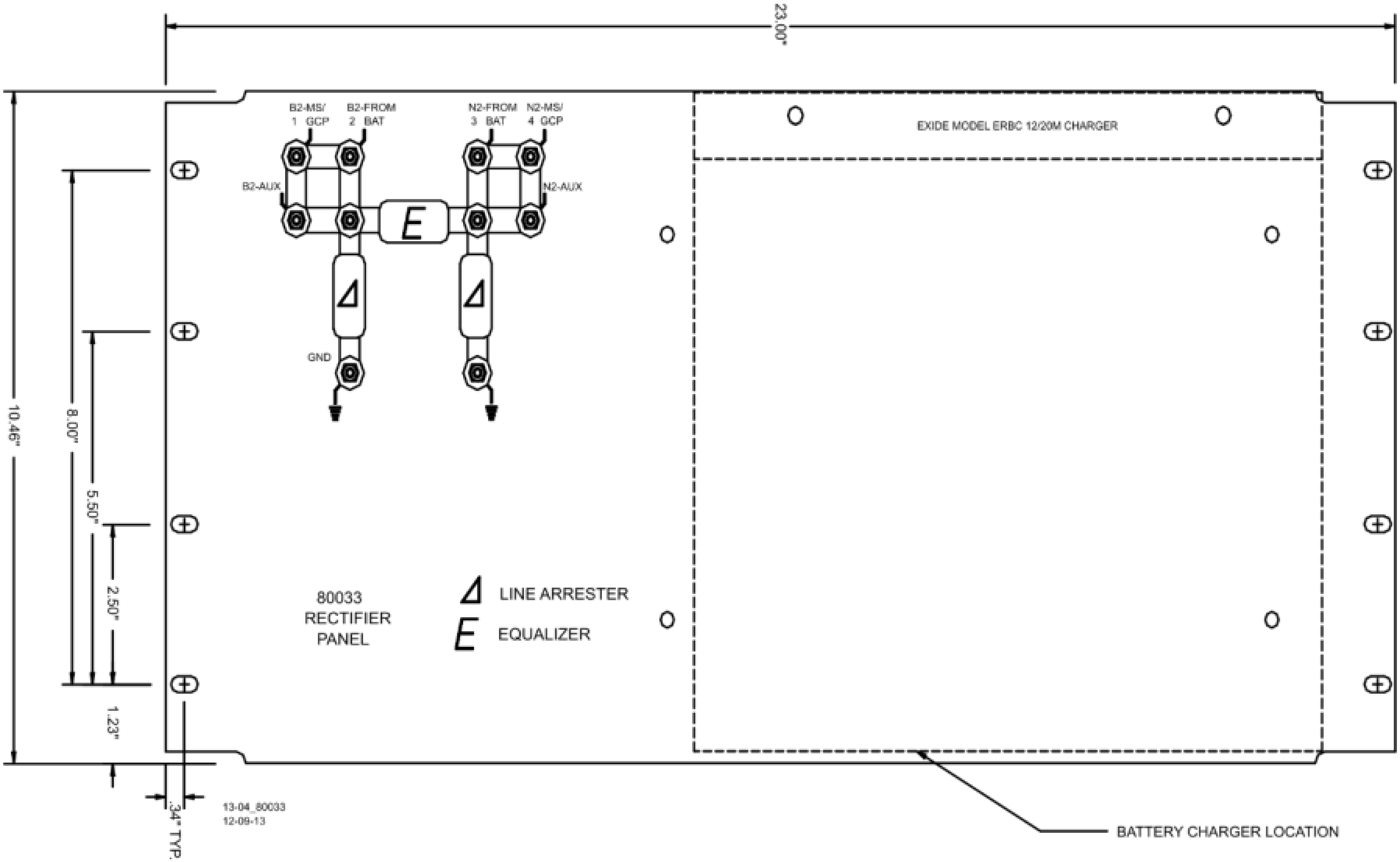


Figure 6-40 Rectifier Panel Assembly, 80033

6.15 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 6-41.

Table 6-16 Cable Termination Panel Assembly, 91042 Specifications

PARAMETER	VALUE
Height	3.96 in (10.058 cm)
Width	23 in (58.42 cm)
Depth	2.25 in (5.715 cm)
Weight	7 lbs (3.18 kg) (approximate)

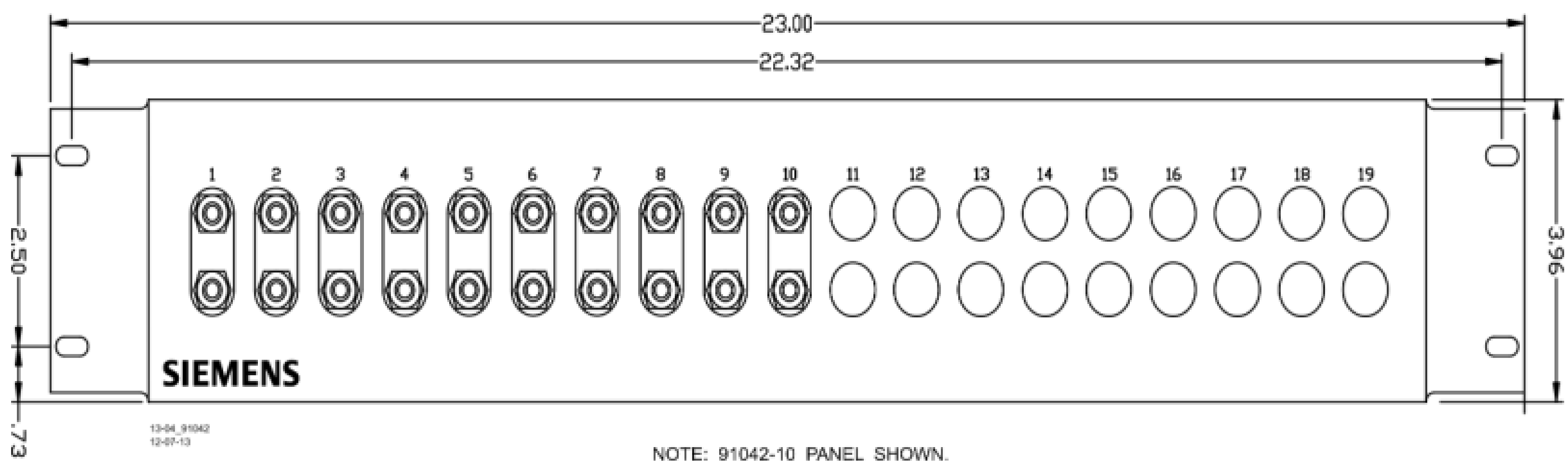


Figure 6-41 Cable Termination Panel Assembly, 91042

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SECTION 7 DETAILED CASE AND MODULE DESCRIPTION

7.0 PRIMARY EQUIPMENT DESCRIPTION

7.1 GENERAL PHYSICAL DESCRIPTION

Each 3000+ GCP consists of:

- a case assembly
- a motherboard
- plug-in circuit modules
- plug-in external wiring connectors

7.1.1 Case Assemblies

Each 3000+ GCP case assembly consists of:

- powder-coated steel case
- backplane-mounted motherboard

Refer to Table 7-1 for key features of each case configuration.

Table 7-1 3000+ GCP Case Feature Overview

CASE PART NO.	FEATURE				Ref Paragraph
	No. of Track Modules	Main/Standby Transfer Sys	I/O (RIO) Module	Echelon LAN Functions	
A81040	1 or 2 tracks	Yes	0, 1	Yes	2.5

7.1.2 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

7.1.3 Plug-In Circuit Modules

Each 3000+ GCP plug-in circuit module is equipped with:

- 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

7.1.4 External Wiring Connectors and Wire Size

All external wiring to a 3000+ GCP Assembly is by means of plug-in connectors.

The orange cage-clamp connectors for the signal circuits should use 16 to 12 AWG wire.

The orange cage-clamp connector for the LONTALK® LAN (Echelon®) should use communication grade twisted wires of at least 20 AWG.

The green screw terminal power connector can be as large as 10 gauge wire.

NOTE

NOTE
Generic spare connectors that are not keyed for specific modules may be ordered. Refer to the catalog for ordering information.

7.1.5 Wire Preparation

Strip insulation from the end of the wire as follows:

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.

7.1.6 Screw-terminal Connector Wire Insertion

Wires are secured to the screw-terminal connector as follows:

1. Insert the stripped end of a wire into the wire receptor of the connector until it stops
2. Tighten the screw to a torque of 4.5 inch pounds (0.508 Newton meters)

7.1.7 Cage-Clamp Connector Wire Insertion

Wires are secured to the cage-clamp connector as follows:

1. Place a flat bladed screwdriver in the rectangular slot in the connector next to the wire receptor (see figure below).
2. Use a screwdriver blade 0.10 in. wide and 0.020 in. thick (2.5mm x 0.5mm)
3. Lever the wire cage clamp open by pressing straight down on the screwdriver
4. Insert the stripped end of a wire into the fully-open wire receptor until it stops
5. Hold the wire in place and release the screwdriver blade pressure
6. The wire receptor closes on the stripped end of the wire

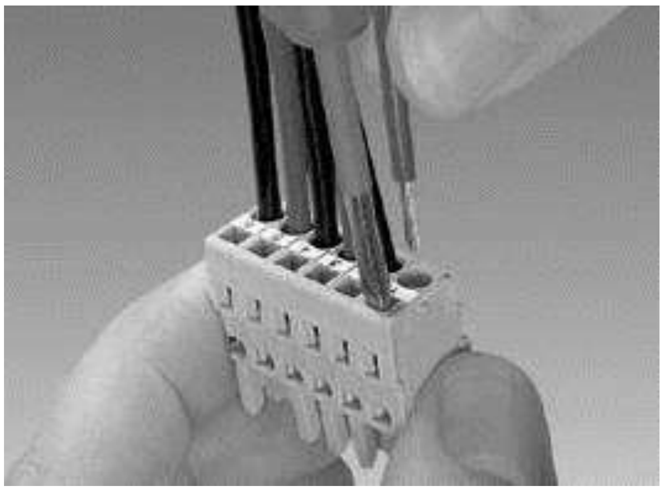


Figure 7-1 Inserting Wires

7.2 A81040 3000+ GCP CASE

The 3000+ GCP Track case is shown in Figure 7-2.

> **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.

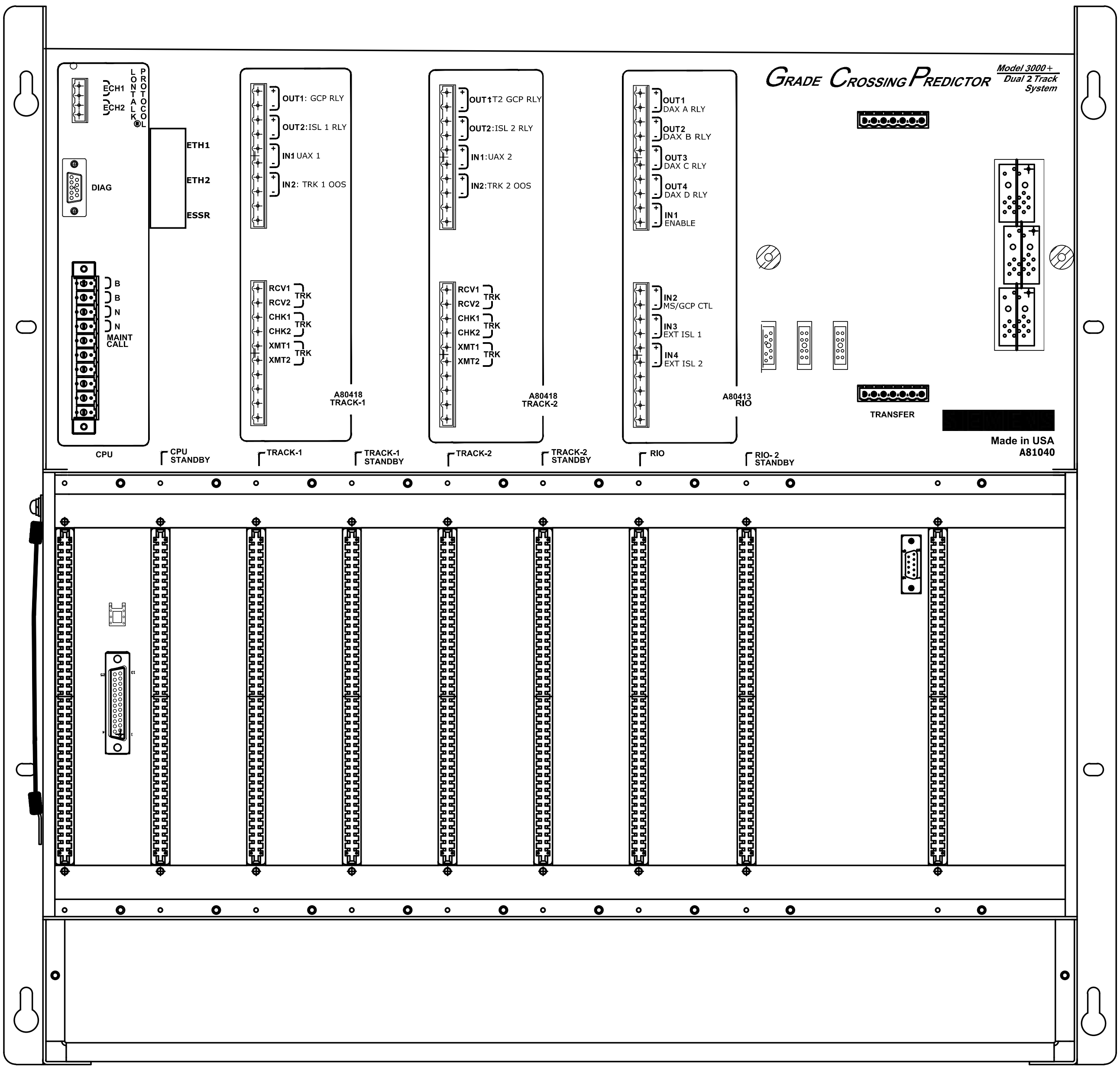


Figure 7-2 A81040 Dual Two Track Case

7.2.1 3000+ Case Modules and Subassembly

The A81040 case with the following modules installed is shown in Figure 7-3:

- A80403 Central Processor Unit Plus (CPU II+) modules in slot positions M1 and M2
- Four A80418 Track modules in slot positions M3 – M6
- Two A80413 RIO modules in slot positions M7 and M8
- A80485 Display Module in slot position M9
- A80468 Transfer module located in the center of the top connector interface panel (slot position M11)

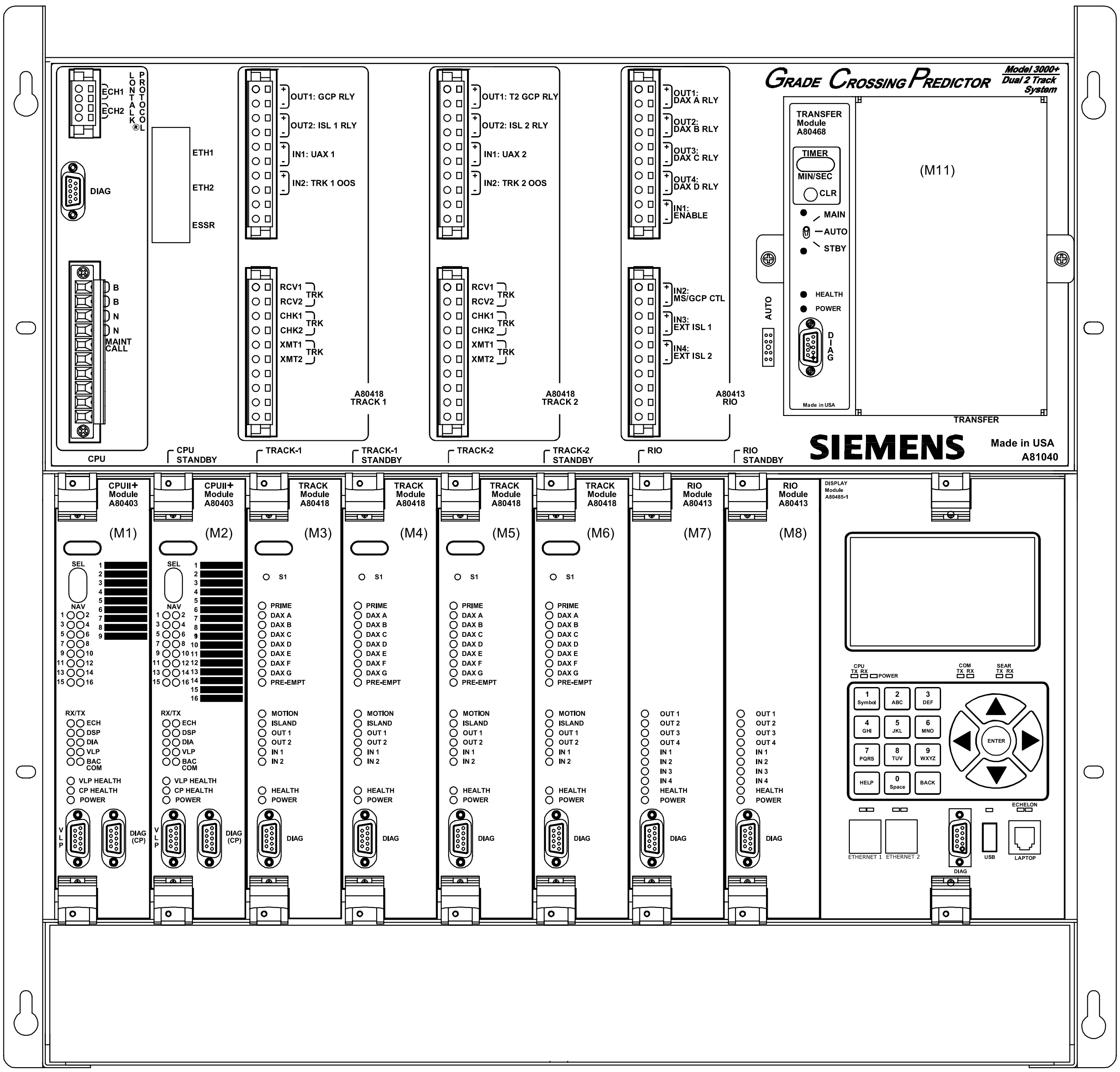


Figure 7-3 A81040 Case with Modules Installed

During normal operation, power is applied to the module set selected from the A80468 Transfer assembly (see paragraph 7.3.5).

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.

Refer to paragraph 7.3.6 for selecting Transfer Interval Time and section 7.3.7 for details on how to use the 3000+ GCP without the transfer module.

Backup (standby) modules are not provided for the:

1. A80485 Display module assembly
2. A80468 Transfer assembly

7.2.2 Interface Connector to Module Relationship

The relationship between the interface connectors and the modules is shown in Table 7-2.

Table 7-2 Module to Interface Connector Relationship

MODULE	SLOT POSITION	INTERFACE CONNECTOR
A80403	M1	CPU
A80403	M2	CPU Standby
A80418	M3	Track-1
A80418	M4	Track-1 Standby
A80418	M5	Track-2
A80418	M6	Track-2 Standby
A80413	M7	RIO
A80413	M8	RIO Standby
A80485	M9	Display
A80468	M11	Transfer

7.2.3 External Wiring Connectors

The external wiring connectors for the case are shown in Figure 7-4 and described in Table 7-3.

Table 7-3 External Wiring Connectors

Ref No.	Connector Description	Connector Designation
1	4-pin cage clamp, female	**LONTALK® PROTOCOL**
2	Keyed 10-pin cage clamp, female	Upper **Track-1**
3		Upper **Track-2**
4	Keyed 10-pin cage clamp, female	Upper RIO
5	Keyed 10-pin cage clamp, female	CPU
6	Keyed 10-pin cage clamp, female	Lower **Track-1**
7		Lower **Track-2**
8	Keyed 10-pin cage clamp, female	Lower RIO

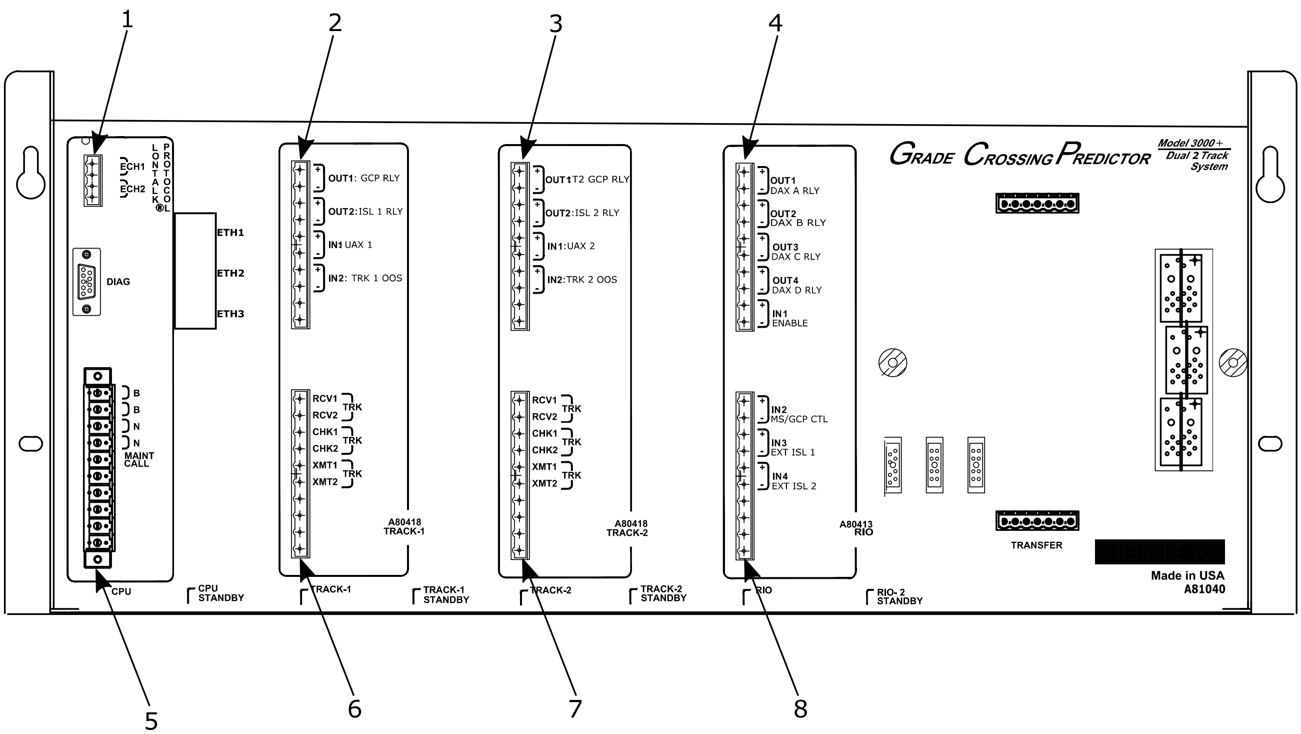


Figure 7-4 External Wiring Connectors

7.3 PLUG-IN MODULES AND SUBASSEMBLIES

7.3.1 CPU II+ Module, A80403

The A80403 CPU II+ Module is a central processing unit that:

- provides all vital logic processing functions for all 3000+ GCP chassis
- controls GCP LAN and non-vital serial communications
- interfaces with front panel CPU connectors

7.3.1.1 CPU II+ Module User Interface

The CPU II+ front panel is shown in Figure 7-5. The CPU II+ user interface is described in Table 7-4.

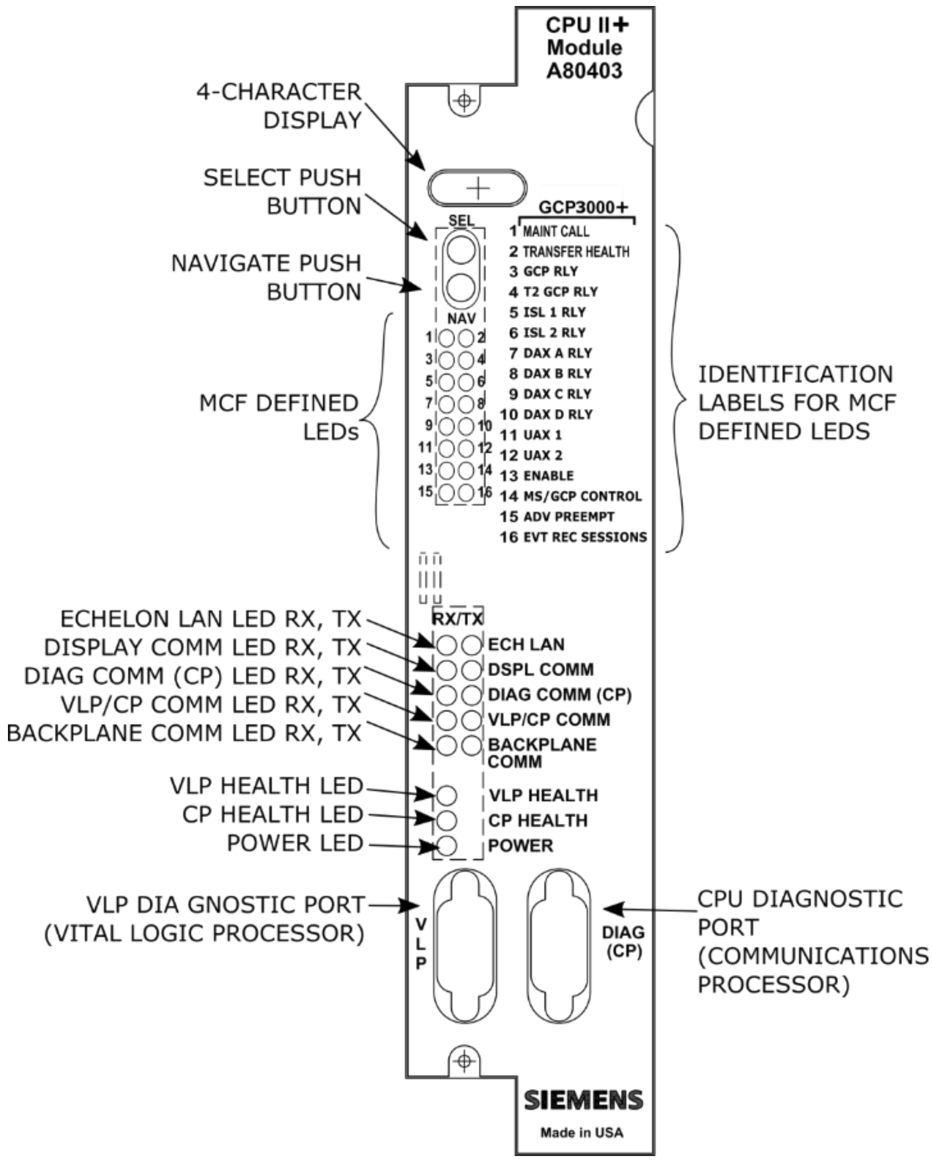


Figure 7-5 CPU II+ Front Panel

Table 7-4 CPU II+ User Interface

Component	Function		
4-Character Display	Displays alphanumeric representation of currently selected function menu item.		
Select Push Button (SEL)	Used to select menu items displayed on 4-Character Display.		
Navigate Push Button (NAV)	Used to select an available function menu.		
16 MCF Defined LEDs	**Color**	**Function**	**Indication**
1 (MAINT CALL)	Red	Maintenance Call: see maintenance call logic section	On – maintenance call output on Off – maintenance call output off
2 (TRANSFER HEALTH)	Red	Transfer Output: see transfer output section	On – transfer signal is being generated, transfer cards should not be counting down Off- transfer signal is not being generated, if transfer card is in AUTO it should be counting down
3 (GCP RLY)	Red	GCP RLY output state	On – GCP RLY is energized Off – GCP RLY is de-energized
4 (T2 GCP RLY)	Red	Track 2 GCP RLY output state	On – Track 2 GCP RLY output is energized Off – Track 2 GCP RLY output is de-energized or Not Used
5 (ISL 1 RLY)	Red	Island 1 Relay output state	On – Island 1 is unoccupied or Island 1 is not used Off – Island 1 is occupied
6 (ISL 2 RLY)	Red	Island 2 Relay output state	On – Island 2 is unoccupied or Island 2 is not used Off – Island 2 is occupied
7 (DAX A RLY)	Red	DAX A Relay output state	On – DAX A RLY output is energized or DAX A RLY is not used Off – DAX A RLY output is de-energized
8 (DAX B RLY)	Red	DAX B Relay output state	On – DAX B RLY output is energized or DAX B RLY is not used Off – DAX B RLY output is de-energized

Component	Function		
9 (DAX C RLY)	Red	DAX C Relay output state	On – DAX C RLY output is energized or DAX C RLY is not used Off – DAX C RLY output is de-energized
10 (DAX D RLY)	Red	DAX D relay output state	On – DAX D RLY output is energized or DAX D RLY is not used Off – DAX D RLY output is de-energized
11 (UAX 1)	Red	Track 1 UAX input state	On – Track 1 UAX input is energized or Track 1 UAX input is not used Off – Track 1 UAX input is de-energized
12 (UAX 2)	Red	Track 2 UAX input state	On – Track 2 UAX input is energized or Track 2 UAX input is not used Off – Track 2 UAX input is de-energized
13 (ENABLE)	Red	Enable input state	On – Enable input is energized or not used (i.e. RIO not used) Off – Enable input is de-energized
14 (MS/GCP CONTROL)	Red	MS/GCP Control input state	On – MS/Control input is energized or not used (i.e. RIO not used or Adv Preemption used) Off – MS/Control input is de-energized
15 (ADV PREEMPT IP)	Red	ADV Preempt Control Input state	On – Advance Preemption input is energized or not used (i.e. RIO not used or Advance Preemption input is de-energized and Advance Preemption is used
16 (EVT REC SESSION)	Red	External Event recorder session state	On – external event recorder is in session or no external event record used Off – external event recorder is used but not in session
ECH LAN LEDs	**TX** flashes red when the CPU II+ is transmitting an ATCS message via the **LONTALK® LAN**.		
	RX flashes green when the CPU II+ is receiving an ATCS message via the **LONTALK® LAN**.		
DSPL COMM LEDs	**TX** flashes red when the CPU II+ is transmitting data to the Display Panel.		
	RX flashes green when the CPU II+ is receiving data from the Display Panel.		

Component	Function
DIAG COMM (CP) LEDs	**TX** flashes red when the CPU II+ is transmitting data on the communications processor diagnostic (**DIAG CP**) serial port.
	RX flashes green when the CPU II+ is receiving data from the communications processor diagnostic (**DIAG CP**) serial port.
VLP/CP COMM LEDs	**TX** flashes red when the Vital Logic Processor (VLP) is transmitting data to the Communications Processor (CP).
	RX flashes green when the Vital Logic Processor (VLP) is receiving data from the Communications Processor (CP).
BACKPLANE COMM LEDs	**TX** flashes red when the Vital Logic Processor (VLP) is sending data onto the serial bus.
	RX flashes green when the Vital Logic Processor (VLP) is receiving data from the serial bus.
VLP HEALTH LED	Flashes yellow to indicate that the Vital Logic Processor is functioning normally.
CP HEALTH LED	Flashes yellow to indicate that the Communications Processor is functioning normally.
POWER LED	Illuminates green to indicate that power is applied to the CPU II+ module.
VLP Serial Port	9-pin diagnostic serial port for Vital Logic Processor.
DIAG (CP) Serial Port	9-pin diagnostic serial port for Communications Processor.

NOTE

NOTE

The state of LEDs 1-16 are chosen so that in a normal healthy 3000+ GCP, with the GCP RLY output energized, all 16 LEDS will be on. If an LED is off, it will either represent an input or output that is currently in use is de-energized, or an unhealthy condition exists.

7.3.2 Track Module, A80418

The A80418 Track module performs the predictor and island train detection functions.

GCP frequency can be any frequency listed in Table 7-5.

Island circuit frequency can be any of fourteen frequencies listed in Table 7-5.

Vital I/O functions:

- Two isolated vital inputs
- Two isolated vital outputs

Table 7-5 Frequencies

Standard Track Frequencies:	86, 114, 156, 211, 285, 348, 430, 525, 645, 790, and 970 Hz
Offset Track 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 Track Frequencies: **(for compatibility with other manufacturer's equipment and for areas where power line interference is a problem)**	44, 45, 46, 141, 149, 151, 237, 239, 249, 250, 267, 326, 392, 452, 522, 560, 630, 686, 753, 816, 881, 979, 999 Hz
Island Frequencies:	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

7.3.2.1 Track Module Front Panel

The Track module front panel is shown is Figure 7-6. The user interface is described in Table 7-6.

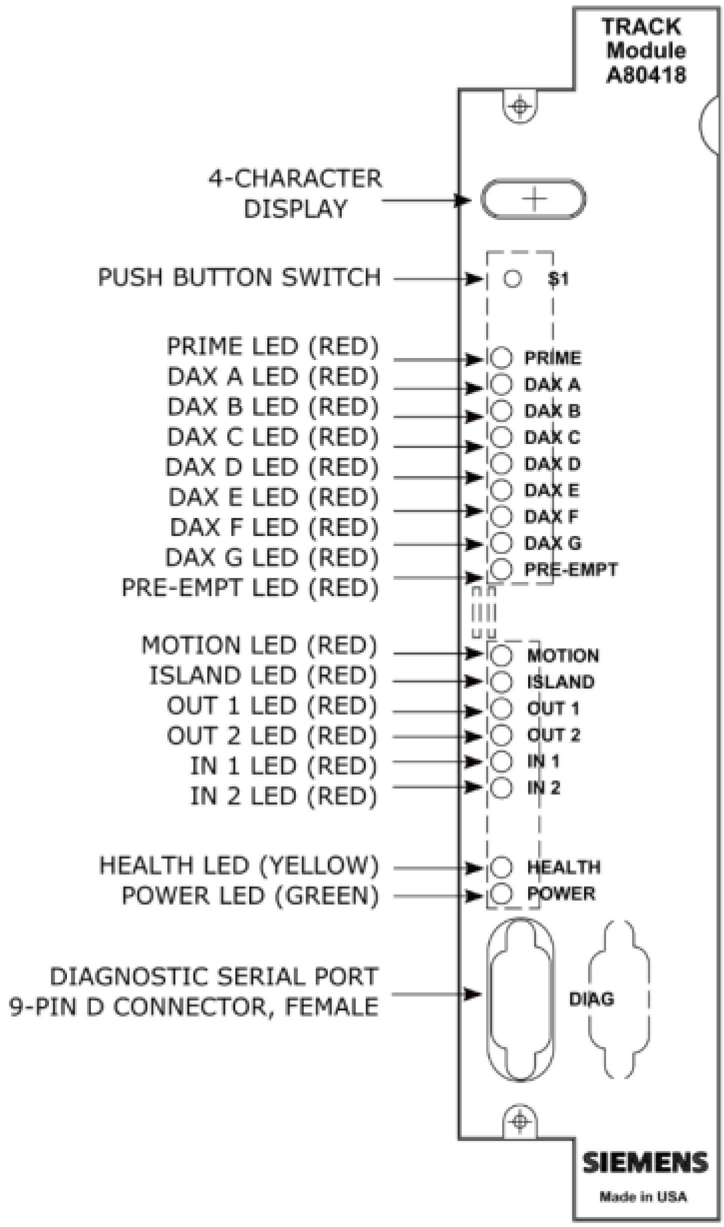


Figure 7-6 Track Module Front Panel

NOTE

The track module is common with 4000 GCP, 5000 GCP, 3000+ GCP and MS4000 systems. Some functions are not applicable when used in the 3000+ GCP.

Table 7-6 Track Module User Interface

Component	Function
4-Character Display	Displays module, track status, and diagnostic messages.
S1 Push Button Switch	For future applications
PRIME LED (red)	On – Prime predictor is energized Off – Prime predictor is de-energized or not used Flashing – Prime predictor is running the programmed pickup delay See note [1]
DAX A – DAX D 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 See note [2]
DAX E – DAX G LEDS (red)	These are not used in the 3000+ GCP and will be off
PRE-EMPT LED (red)	This is not used in the 3000+ GCP and will be off
MOTION LED (red)	On – GCP has not detected motion Off – GCP has detected motion
ISLAND LED (red)	On – Internal Island is used and unoccupied Off – Internal Island is not used or Internal Island is occupied Flashing – Island is running its pickup delay See note [3]
OUT 1 LED (red)	On – output energized Off – output de-energized Flashes – output unhealthy
OUT 2 LED (red)	On – output energized Off – output de-energized Flashes – output unhealthy
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 the 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

NOTE

NOTE

The Prime predictor LED on a track module represents the state of the Prime prediction process from that track module. It does not represent the state of the final GCP RLY (or T2 GCP RLY) output. The track's Prime prediction process is an input into the final GCP RLY / T2 GCP RLY output state. To see the actual state of the GCP RLY / T2 GCP RLY output look at CPU Module LEDs 3 and 4 respectively.

NOTE

NOTE

The DAX predictor LEDs on a track module represent the state of the DAX prediction process from that track module. They do not represent the state of the final DAX RLY output. The track's DAX prediction process is an input into the final DAX RLY output state. To see the actual state of the DAX RLY output, look at CPU Module LEDs 7-10.

NOTE

NOTE

The ISLAND LED on a track module represents the occupancy state from the internal island on that module. It does not represent the state of the final ISL RLY output. If the internal island is not being used, the ISLAND LED will be off. To see the actual state of the ISL RLY output look at CPU Module LEDs 5-6.

7.3.3 RIO Module, A80413

The A80413 RIO module provides four isolated vital inputs and four isolated vital outputs.

The I/O functions have predefined functions in the 3000+ GCP.

7.3.3.1 RIO Module User Interface

The RIO module front panel is shown in Figure 7-7 and the user interface is described in Table 7-7.

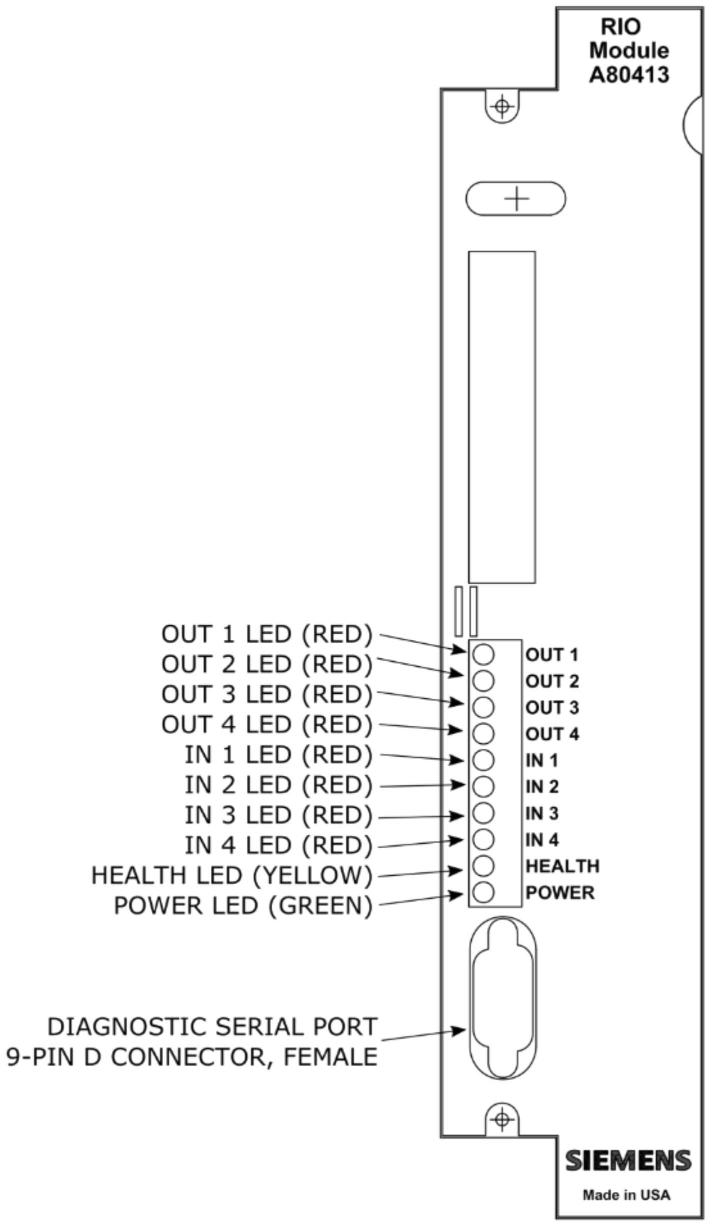


Figure 7-7 RIO Module Front Panel

Table 7-7 RIO Module User Interface

Component	Function
OUT 1 LED (red)	On – DAX A RLY output is energized. Flashes when output is unhealthy.
OUT 2 LED (red)	On – DAX B RLY output is energized. Flashes when output is unhealthy.
OUT 3 LED (red)	On – DAX C RLY output is energized. Flashes when output is unhealthy
OUT 4 LED (red)	On – DAX D RLY output is energized. Flashes when output is unhealthy.
IN 1 LED (red)	On – ENABLE input is energized.
IN 2 LED (red)	On – MS/GCP Control input is energized.
IN 3 LED (red)	On – External Island 1 input is energized.
IN 4 LED (red)	On – External Island 2 input is energized.
HEALTH LED (yellow)	Slow (1Hz) – module is healthy and communicating with CPU Fast (1Hz) – module is healthy but not communicating with the 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 **Diagnostic Serial Port**	9-pin diagnostic serial port for RIO module.

7.3.4 Display Module, A80485

The A80485 display module, Figure 7-8, provides a touch-screen display to allow:

- Configuration programming
- Application programming
- Calibration programming
- System diagnostics
- System parameter display
- Track status display

The display module is reset by actuation of the RESET push button switch.

NOTE

NOTE

Refer to 3.1, for detailed instructions on the Display module.

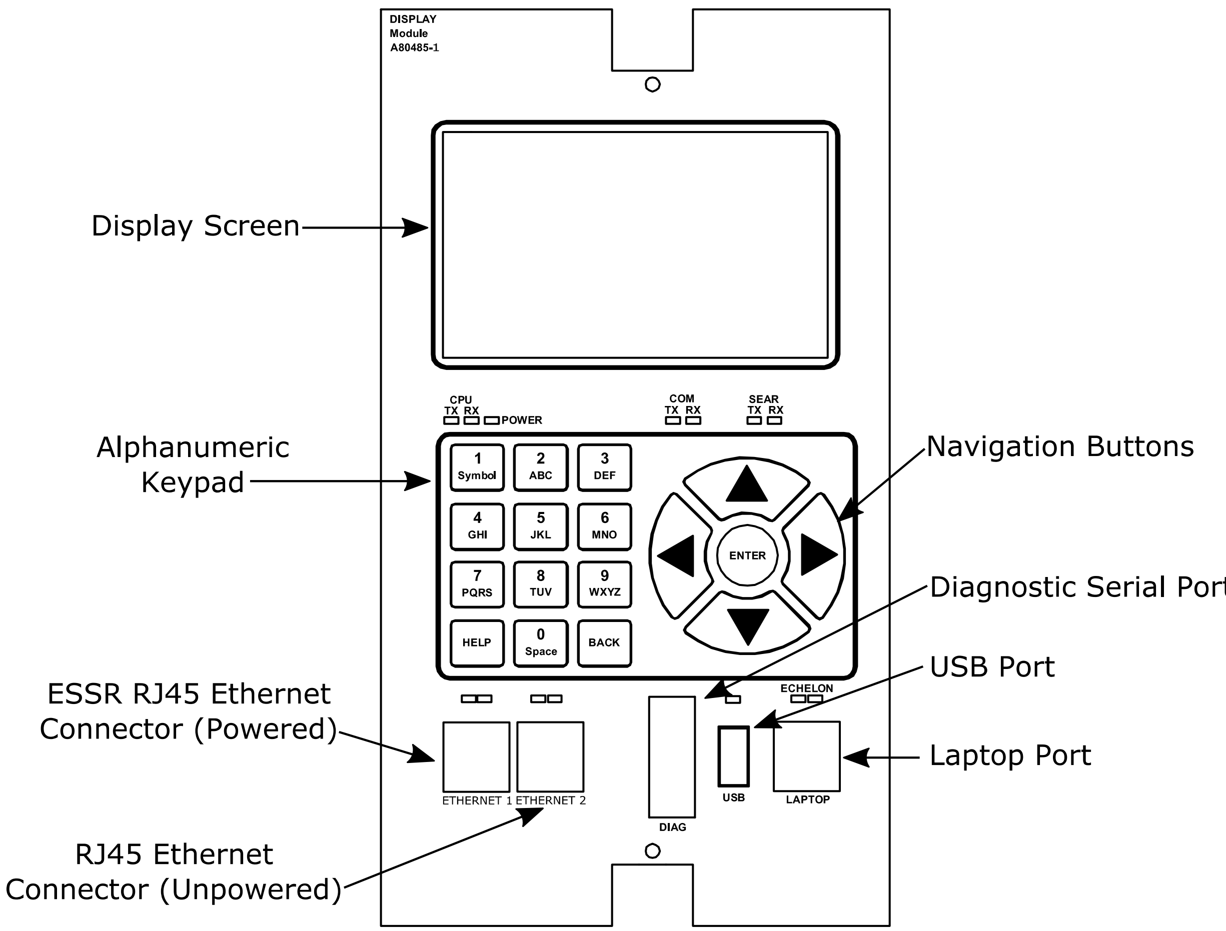


Figure 7-8 Display Module

7.3.5 Transfer Assembly, A80468

The A80468 Transfer assembly provides operational switchover from the main modules to the standby GCP modules when main module failure is detected. Switchover occurs after a set transfer delay interval.

NOTE

NOTE

The standby modules are powered off and disconnected from the interface connectors until switchover occurs.

7.3.5.1 Transfer Assembly User Interface

The Transfer assembly front panel is shown in Figure 7-9. The user interface is described in Table 7-8.

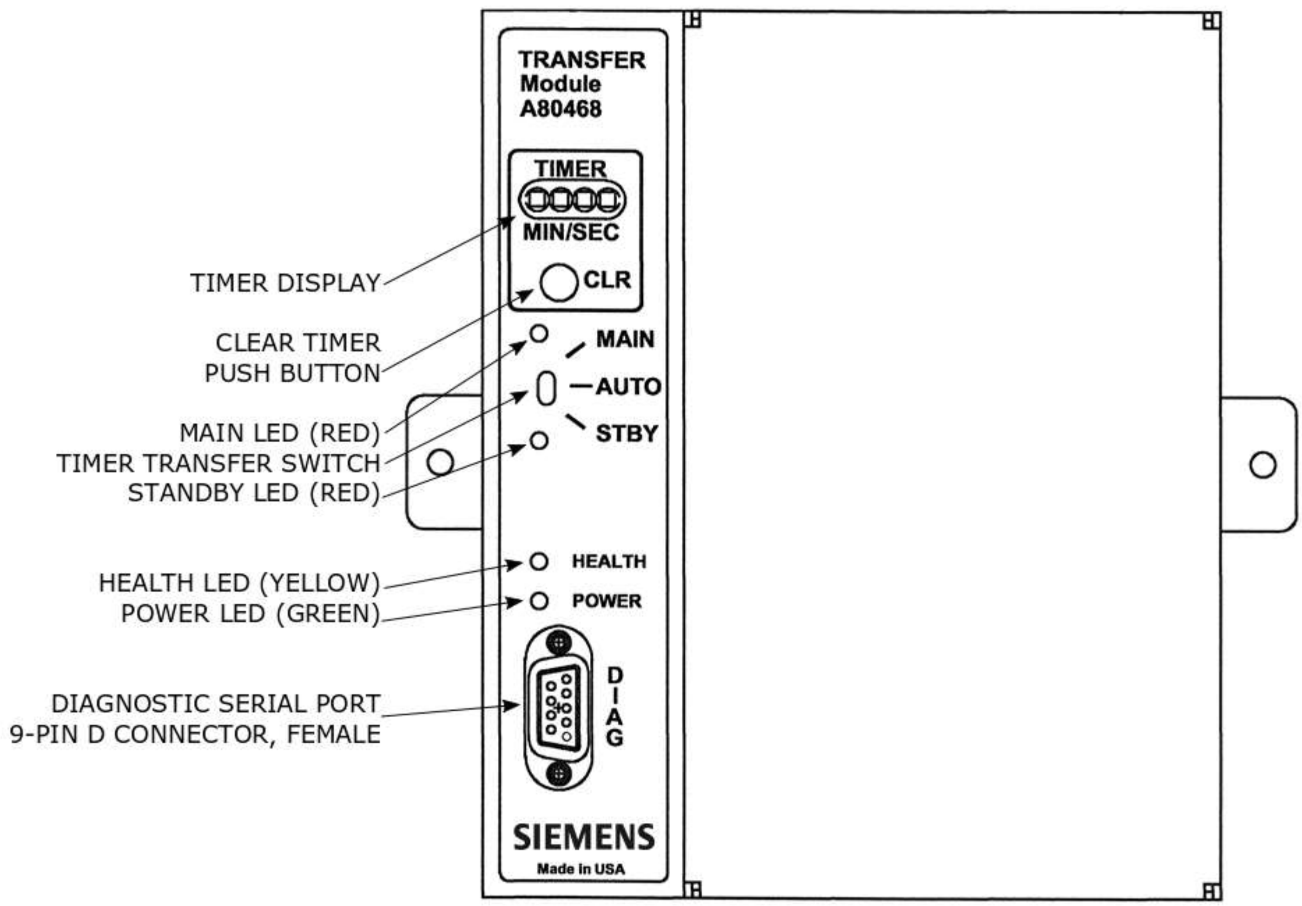


Figure 7-9 Transfer Assembly Front Panel

Table 7-8 Transfer Module User Interface

Component	Function
Timer Display	When transfer delay is set using the DIP switch (S3), the **TIMER** Display: 1. Shows the set transfer delay in minutes and seconds 2. Shows transfer timer delay count down in one second increments
CLR (Clear Timer) push button	Clears transfer delay time from the counter. When pressed during timer countdown: • Sets the timer to the selected Transfer Delay Interval • Initiates immediate transfer of GCP operation to opposite modules
MAIN LED (red)	On when: • Main modules are enabled while the Transfer Timer Switch is set to AUTO • Or Timer Transfer Switch is set to MAIN position
Time 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 <u>when the transfer time is not counting down</u>, move the switch from AUTO to the desired position (MAIN or STBY) then return switch to AUTO.

Table 7-8 Continued

Component	Function
STANDBY LED (red)	On when: Standby modules are enabled while Transfer Timer Switch is set to AUTO Timer Transfer Switch is set to STBY position
HEALTH LED (yellow)	Flashes to indicate that the Transfer module is functioning normally
POWER LED (green)	LED is on steady when power is applied to the Transfer module.
DIAG Diagnostic Port	9-pin diagnostic serial port for Transfer module

NOTE

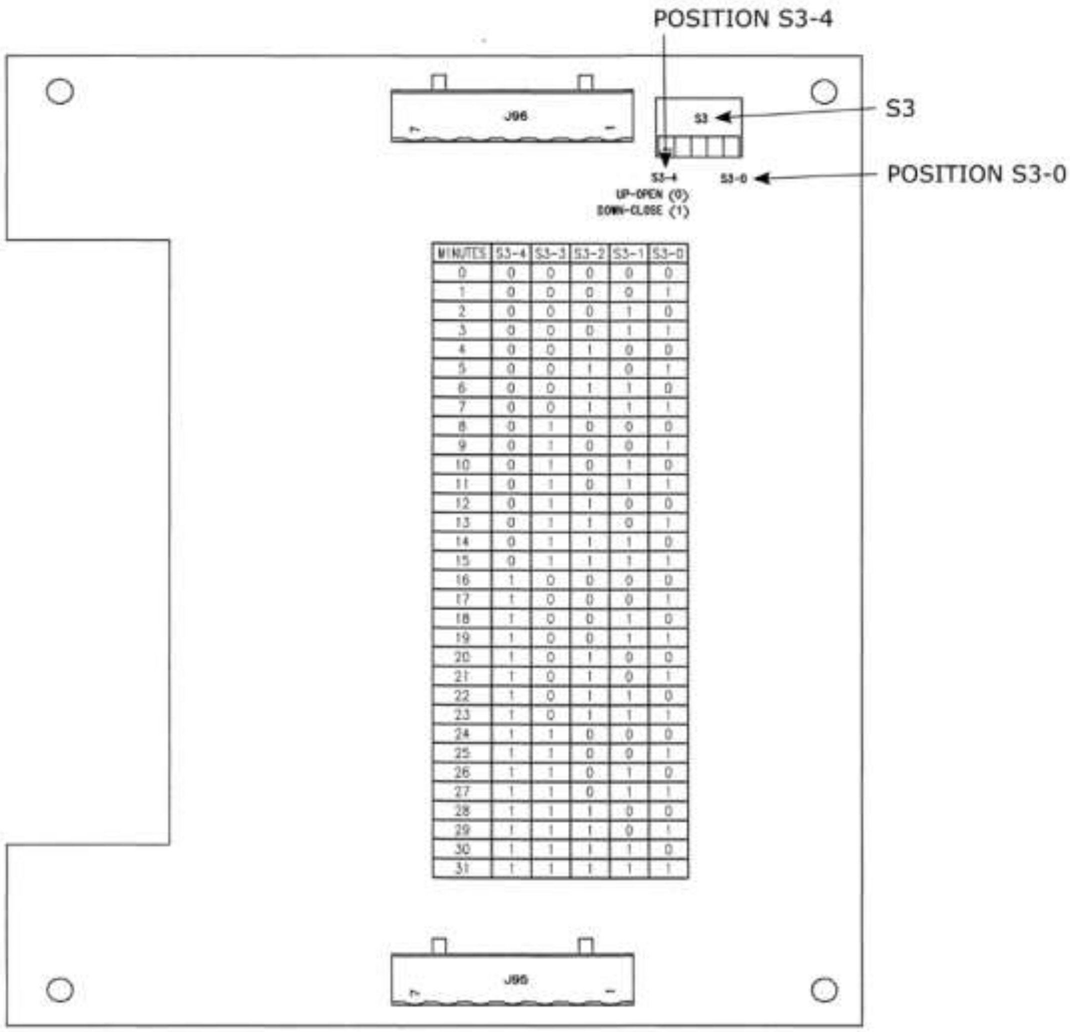
1. A switchover interval ranging from 1 to 31 minutes is selectable from the Transfer module.
    a. The module is set at the factory for a switchover delay of three minutes.
2. During the switchover period, the crossing gates, lights, and bells are activated.

7.3.6 Transfer Interval Selection

The transfer time interval is preset in the factory for three minutes and normally does not require any change. A shorter time than three 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 A80468 Transfer Module as shown in Figure 7-10.

- The module is accessible by removing the mounting screws on either side of the A80468 assembly and unplugging the unit from the front of the Model +3000 GCP case.
- The switch levers of S3 are set to the positions designated in Table 7-9 to obtain the required delay time (see Figure 7-10).



MINUTES	S3-4	S3-3	S3-2	S3-1	S3-0
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1

Figure 7-10 Transfer Module Assembly, A80468, S3 Switch Position

Table 7-9 Transfer Delay Interval Table (for S3 on A80468 Module Assembly)

MINUTES S3-0	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

0 = OPEN 1 = CLOSED **Bold** = Default

7.3.7 Operation without Transfer Module Assembly, A80468

To disable the A80468 Transfer Module Assembly, remove the module from the chassis, then move the fuse from the terminal labeled AUTO and insert it into the fuse terminal for the side that is to be powered, either MAIN or STANDBY (see Figure 7-11).

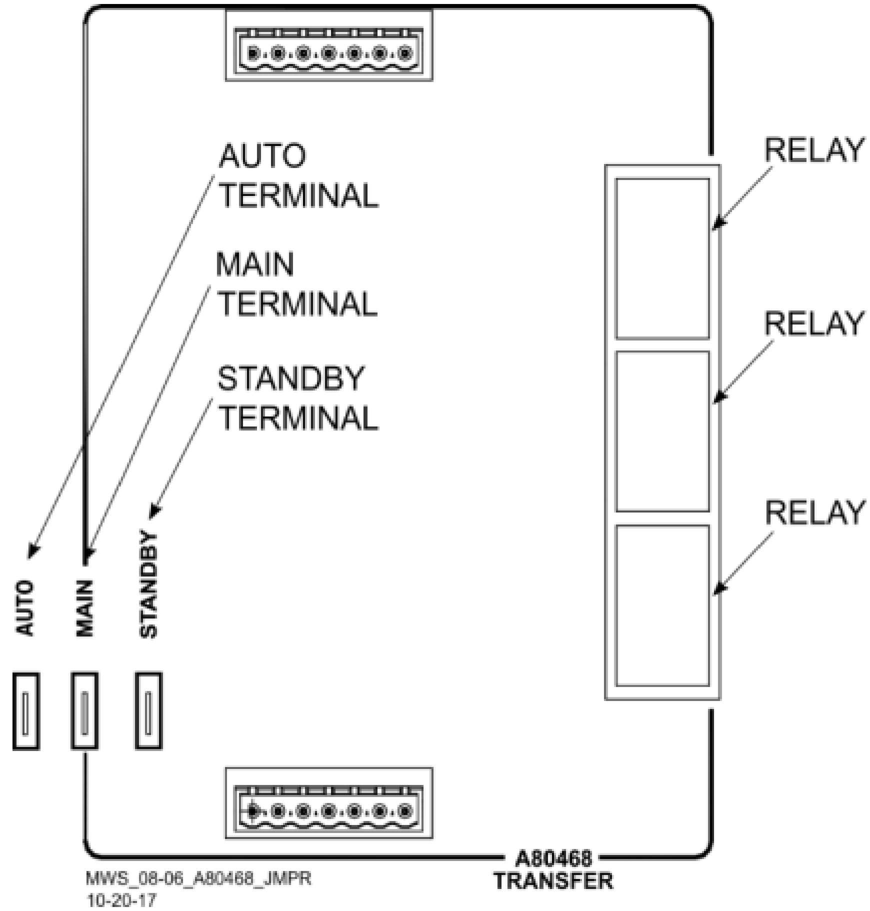


Figure 7-11 Transfer Module (A80468) Fuse Positions

7.3.8 External Configuration Device (ECD) A80435

The ECD is a factory installed plug-in device on the 3000+ GCP backplane (see Figure 7-12). The ECD stores the module configuration file (MCF) application program for the 3000+ GCP. Both the Main and the Standby CPU Modules copy the MCF from the ECD. 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.**

7.3.9 Chassis Identification Chip (CIC)

The CIC is:

- A non-volatile memory chip
- Installed adjacent to the ECD on the GCP backplane (see Figure 7-12).

Each CIC stores site-specific information for both Main and Standby vital operations.

WARNING
IF THE CIC IS REPLACED, THE USER MUST SET THE SYSTEM BACK TO DEFAULTS AND REPROGRAM THE SYSTEM. FAILURE TO DO THIS COULD RESULT IN THE SYSTEM RUNNING WITH THE WRONG CONFIGURATION FOR THE SITE.

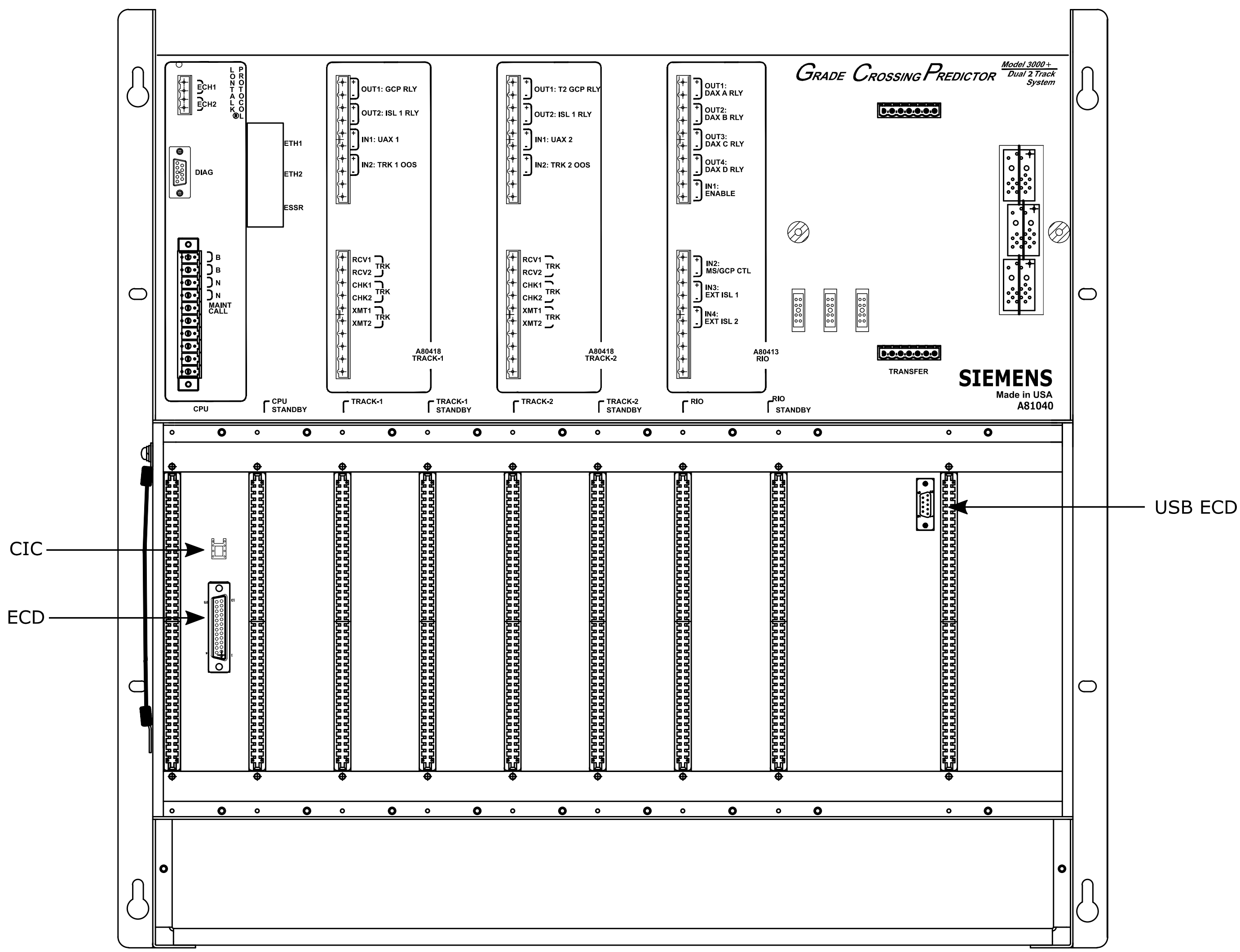


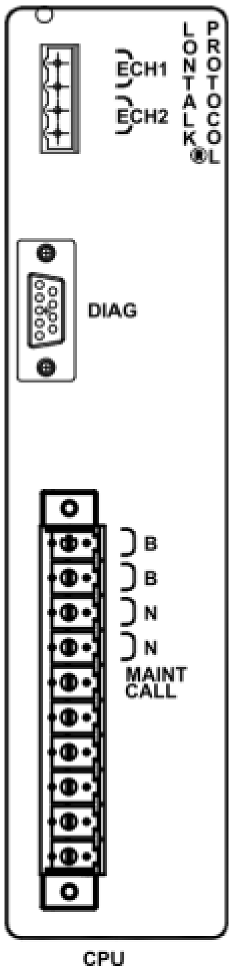
Figure 7-12 Typical ECD & CIC Locations on Backplane

7.3.10 Interface Connector Functions

The Model 3000+ GCP interface connector functions are described in Table 7-10 through Table 7-13.

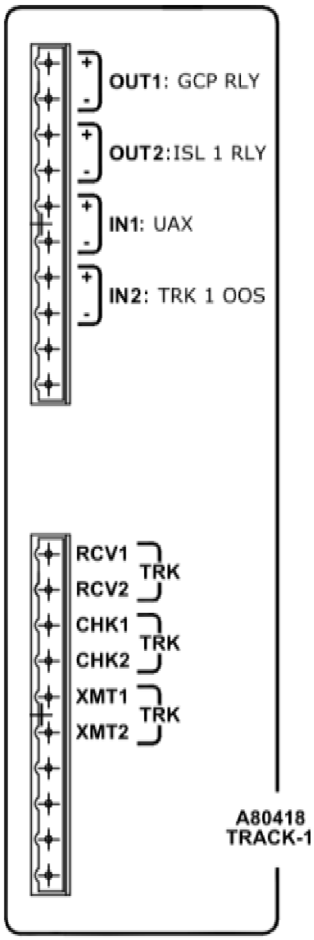
7.3.10.1 CPU Connectors

Table 7-10 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 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.

7.3.10.2 Track 1 Connectors



TRACK-1

Table 7-11 Track 1 Connectors

Connector	Pinout*		Function
TRACK-1	+	GCP RLY	GCP RLY for 3000+ (see note)
	-		
	+	ISL 1 RLY	Island relay output for track 1
	-		
	+	UAX 1	UAX input for track 1
	-		
	+	TRK 1 OOS	Out of service input for track 1
	-		
	+		Not used in 3000+ GCP
	-		
	TRK RCV1		Receiver input from track
	TRK RCV2		
	TRK CHK1		Check input from track
	TRK CHK2		
	TRK XMT1		Transmit output to track
	TRK XMT2		

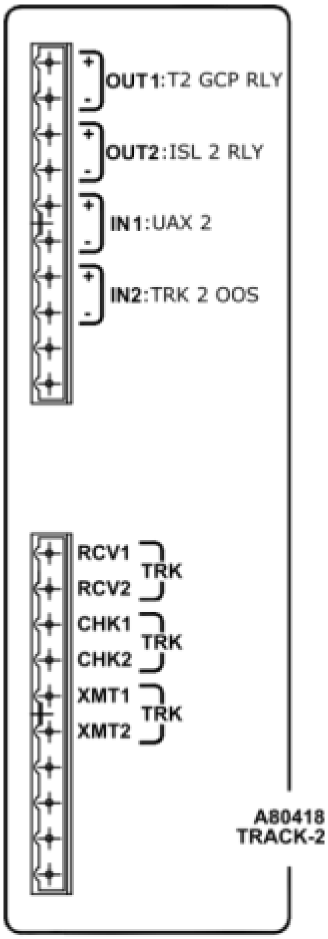
NOTE

NOTE

The GCP RLY output combines the track prime predictors from both track 1 and track 2 (if track 2 is used).

7.3.10.3 Track 2 Connectors

Table 7-12 Track 2 Connectors



TRACK-2

Connector	Pinout*		Function
TRACK-2	**+**	**T2 GCP RLY**	Track 2 GCP RLY for 3000+ (see note)
	-		
	+	**ISL 2 RLY**	Island relay output for track 2
	-		
	+	**UAX 2**	UAX input for track 2
	-		
	+	**TRK 2 OOS**	Out of service input for track 2
	-		
	+		Not used in 3000+ GCP
	-		
	TRK RCV1		Receiver input from track
	TRK RCV2		
	TRK CHK1		Check input from track
	TRK CHK2		
	TRK XMT1		Transmit output to track
	TRK XMT2		

NOTE

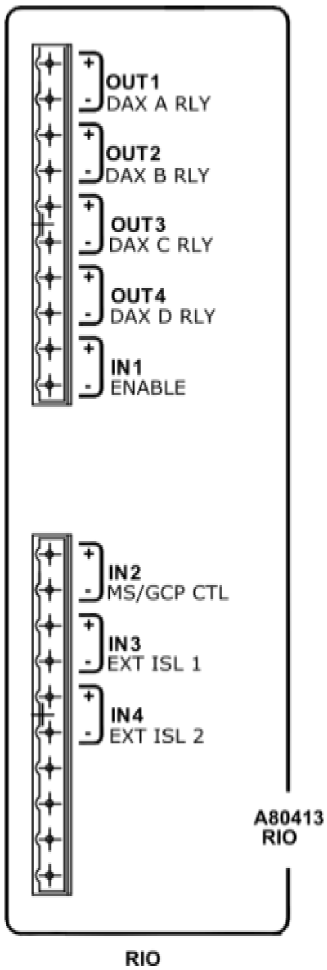
NOTE

The T2 GCP RLY output is the prime output for just track 2.

7.3.10.4 RIO Connectors

The RIO Module is an optional module on the 3000+ GCP and provides additional vital inputs and outputs. This module is required if DAX or DAX Preempt outputs, Enable, MS/GCO control, or external islands are used in the application.

Table 7-13 RIO Connectors



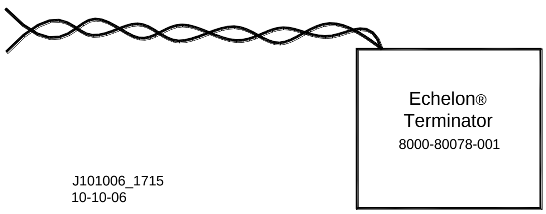
Connector	Pinout*		Function
RIO	+	**DAX A RLY**	DAX A Relay output
	-		
	+	**DAX B RLY**	DAX B Relay output
	-		
	+	**DAX C RLY**	DAX C Relay output
	-		
	+	**DAX D RLY**	DAX D Relay output
	-		
	+	**ENABLE**	Enable input
	-		
	+	**MS/GCP CTRL**	MS/GCP CTRL input
	-		
	+	**EXT ISL 1**	External island 1 input
	-		
	+	**EXT ISL 2**	External island 2 input
	-		

7.4 LAN COMMUNICATIONS

Each 3000+ GCP communicates with other Siemens equipment, such as the SEAR or Argus, via the LONTALK® LAN (Echelon®). Refer to Echelon manual (COM-00-07-09) for further information.

7.4.1 Rules for Using Echelon® LAN

- Wire size required is from #22AWG to #16AWG, in a stranded twisted pair.
- Each connection (node) must be wired in a daisy chained bus configuration, no drops allowed (see Figure 7-13).
- Maximum wiring length of LAN bus wiring is 425 feet (130m) within a signal case or bungalow, but wiring should be kept as short as practical.
- A maximum of 8 connections (nodes) is recommended within 53 feet (16m) of cable. If necessary, additional cable may be added so that no more than 8 nodes are located within any 53 foot length. If additional connections are required, contact Siemens California Technical Support for assistance.
- In general, the Echelon® network requires a terminator for proper data transmission



- The Echelon network can be connected to ECH1 on the 3000+ GCP
- The Echelon terminator can be connected to ECH2 on the 3000+ GCP
- Order Network Echelon Termination Unit, P/N: 8000-80078-001

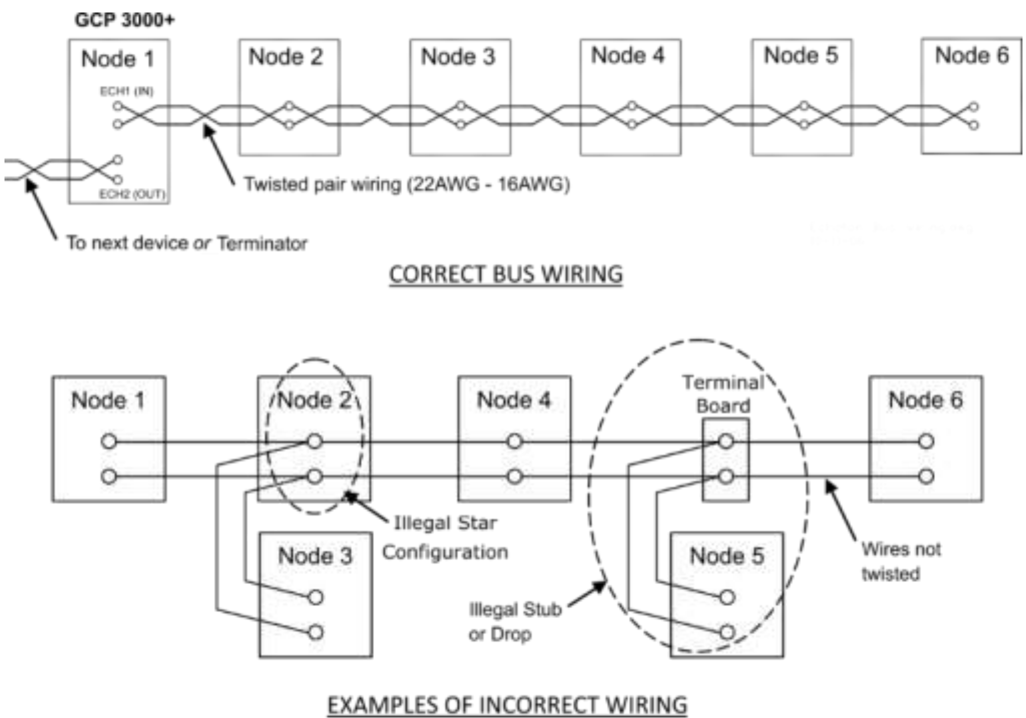


Figure 7-13 LAN Bus Wiring

CAUTION

CAUTION

BECAUSE THE ECHELON® INTERFACE IS NOT SURGE PROTECTED, NETWORK CONNECTIONS MUST BE RESTRICTED TO THE EQUIPMENT CONTAINED INSIDE A SIGNAL CASE OR BUNGALOW.

NOTE

NOTE

For additional information concerning the Echelon® LAN, contact Siemens Technical Support.

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APPENDIX A INTERFERENCE

A.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 seconds 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 High EZ, Frequency, and Self Check.

Many times the system will not operate normally for any extended time; having almost constant false activations.

A.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.

A.3 MEASURE 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 5 VRMS or smaller, the interference falls into the Low Voltage category. If the value is greater than 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

For additional information concerning the troubleshooting AC Interference issues, contact Siemens Technical Support.

When looking for low voltage problems, check other AC track circuits. Especially look for other GCPs 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

BE VERY CAREFUL WHEN INVESTIGATING POWER COMPANY ISSUES. IN SOME AREAS VOLTAGES CAN BE OVER 50VRMS WITH SIGNIFICANT CURRENT. THIS CAN BE A HAZARD TO BOTH PERSONNEL AND EQUIPMENT.

The power company issues usually will involve transmission line situations. Typically a power line or large industry is in or near the crossing. There may also be substations and/or power plants as well. The history of the location can be important. The local personnel probably know an area which has always had a power-related issue.

Another major cause can be related to bad insulated joints. A shorted joint can cause a major electrical imbalance which can result in conduction of power company signals and their harmonics on to the track.

As stated above, other items can come into play such as: Isolation/filter units, Surge protection, battery chokes, or other track appliances. In this situation, be especially watchful for damage due to surge protection issues.

A.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

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 and 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 VRMS), then working on identifying and minimizing the voltage must be attempted. There are two categories- Cab Signal Environment and Power related environment.

A.5 CAB SIGNAL ENVIRONMENT

In the Cab Signal Environment there is little flexibility to reduce amplitudes. One needs to consider the following options:

1. Change the GCP Frequency
2. For Frequencies 211 Hz and lower, use 62770 Shunts with Max GCP transmit current.
3. For Frequencies above 211 Hz, use 62780 Shunts
4. Ensure that the appropriate cab signal filters are being used (if required) in the cab signal feeds to the track.

A.6 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 Hz 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 best for the situation.

If the problem still persists after determining the amplitude remaining after using one of the above shunts, 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 7-14 Devices Specially Designed for Interference Mitigation

PART NUMBER	RATING	APPLICATION
62780	Low Current	60 Hz and 180 Hz Shunt
62770	Medium and High Currents	86 Hz – 211 Hz Termination Shunts
62765	Medium and Higher Currents – 3 Amps	60 Hz and 180 Hz Shunts
62760	High Current – 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 B INSTALLATION OF FERRITE BEADS

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 B-14. 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.

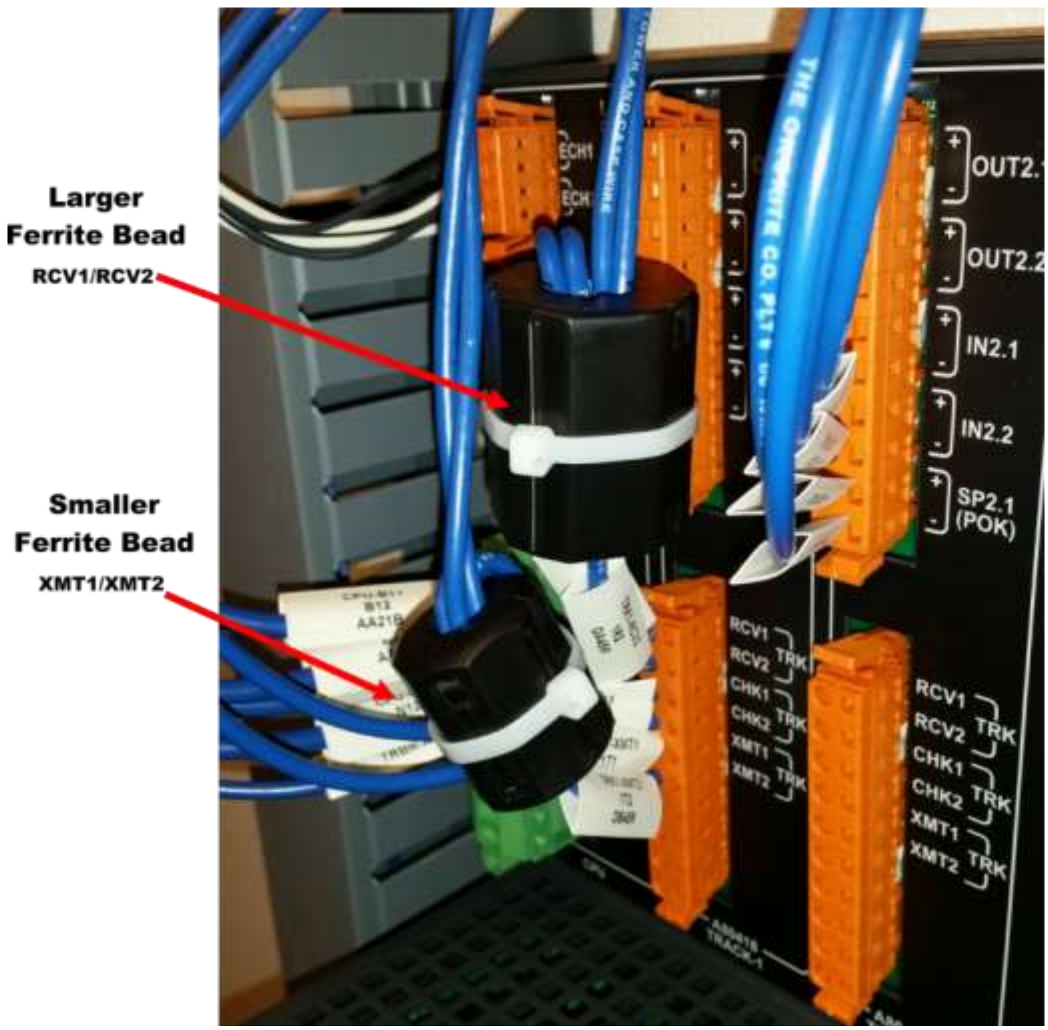

Figure B-14 Ferrite Bead Sizes

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 B-15. 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 B-15. 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.

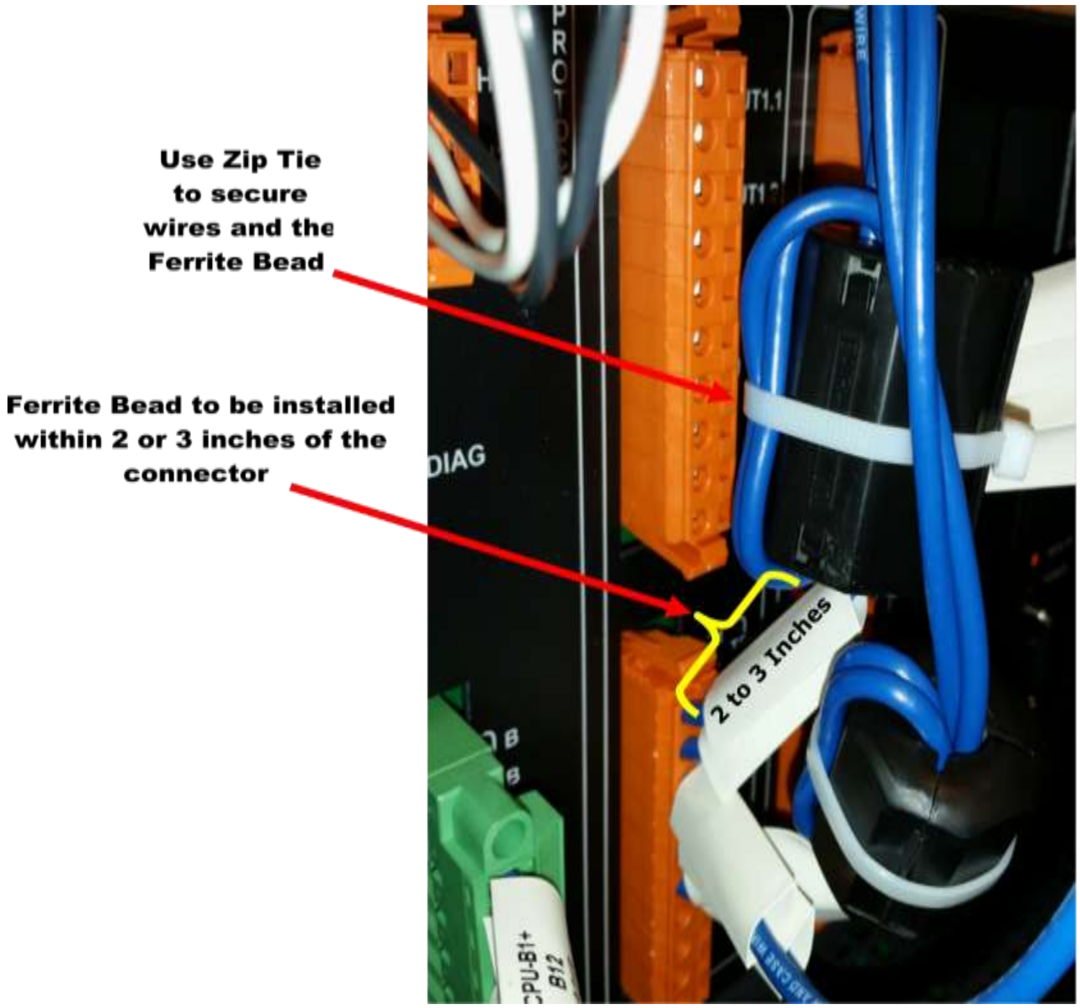

Figure B-15   Ferrite Bead Installation Guide

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.

Ferrite Bead Kit Ordering Information

A Ferrite Bead Kit for the 80418 Track Card will be provided by Siemens.

Table B-15 Ferrite Bead 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 Rail Automation Technical Support at (800) 793-7233 Option 1.