SIEMENS

INSTRUCTION AND INSTALLATION

MICROPROCESSOR BASED GRADE CROSSING PREDICTOR MODEL 3000 FAMILY

MAY 2009, REVISED OCTOBER 2014

DOCUMENT NO. SIG-00-00-02
VERSION D.2

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PRINTED IN U.S.A.

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DOCUMENT HISTORY

Version	Release Date	Details of Change
A	Nov. 2001	Initial release
B	April 2002	Changes incorporated
B.1	July 2006	Changes incorporated
C		Changes incorporated
D	May 2009	Changes incorporated
D.1	May 2009, Rev Oct 2013	Changes incorporated
D.2	Sept 2014	Rebrand for Siemens Page 6-23: added the following note: 3. If the IPI island track circuit experiences same-frequency interference in adverse ballast conditions the source may be further than 5000 feet away.

NOTES, CAUTIONS, AND WARNINGS

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

⚠ WARNING

WARNING

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

⚠ CAUTION

CAUTION

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

NOTE

NOTE

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

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

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

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

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

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

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SECTION 1 – INTRODUCTION

1.1 GENERAL INFORMATION

This manual provides installation information and detailed operating instructions for Models 3000, 3000D2, 3000D2L, 3000ND, 3000ND2, 3008, and 3008D2 Grade Crossing Predictors (Model 3000 GCP's). The information is essential to proper system operation and problem diagnosis. It is strongly recommended that each system operator/maintainer become familiar with the information provided herein before attempting to program, calibrate, or troubleshoot the Model 3000 GCP system. This manual is divided as follows:

1.1.1 SECTION 1 – INTRODUCTION

The Introduction contains a brief overview of system operation plus equipment specifications and typical application drawings.

1.1.2 SECTION 2 – PRIMARY EQUIPMENT FAMILIARIZATION

This section provides a brief description of the Model 3000 Family GCP cases and plug-in modules, including indicators and controls, plus a simplified block diagram of the system.

1.1.3 SECTION 3 – AUXILIARY EQUIPMENT FAMILIARIZATION

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 this equipment, where applicable.

1.1.4 SECTION 4 – KEYBOARD/DISPLAY AND MENU DESCRIPTIONS

This section describes the functions, displays, and menus associated with each key on the keyboard/display assembly.

1.1.5 SECTION 5 – SYSTEM APPLICATION PROGRAMMING

This section provides step-by-step system programming instructions.

1.1.6 SECTION 6 – SYSTEM CALIBRATION –

This section provides step-by-step instructions for system calibration (required following programming) and operational checks to be performed immediately prior to placing the system in operation.

1.1.7 SECTION 7 – DIAGNOSTICS (MAINTENANCE)

This section includes procedures for utilizing self-diagnostic capabilities of the Model 3000 GCP. Diagnostic message code listings are also provided.

1.1.8 SECTION 8 – PROCESSOR UPGRADES

This section describes the optional Processor Modules, 80044 and 80214, which are equipped with an enhanced track shunting detection program. Also provided are detailed instructions for PROM re-placement on the standard processor module (80014) and the 80044 optional processor module, plus software update instructions for the optional 80214 processor module that is equipped with flash memory.

1.1.9 SECTION 9 – DATA RECORDER

This section describes system operations associated with optional internal Data Recorder Modules, 80015 and 80115 as well as external data recorders, such as the Safetran Event Analyzer Recorder, 80251 through the use of Recorder Interface Module, 80255 or 80265.

1.2 OPERATIONAL OVERVIEW

NOTE

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

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

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

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

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

The 3000 Grade Crossing Predictor (GCP) is a microprocessor-controlled system that is deployed to continually monitor the approach(es) 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

1.2.1 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.
    - When a train reaches the crossing, the approach circuit is reduced to minimum impedance.
- The EZ voltage 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

1.2.2 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 non-coded DC track circuits only are present.
- Narrow-band shunt - used when other AC signals are present.

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.

NOTE

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

1.2.3 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 Safetran 62785-f Tunable Insulated Joint Bypass Coupler, provided the minimum distances specified in Table 3-20 are observed.

WARNING

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

CAUTION

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

NOTE

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

The minimum distances specified in Table 3-20 do not apply to earlier model Safetran GCP equipment (Models 300, 400, 600, and 660).

For a discussion of the 62785-f Tunable Insulated Joint Bypass Coupler, refer to Section 3, Paragraph 3.5.1.

For a discussion of simulated bidirectional configuration, refer to Section 3, Paragraph 3.3.1.

1.2.4 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)

1.2.4.1 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

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.

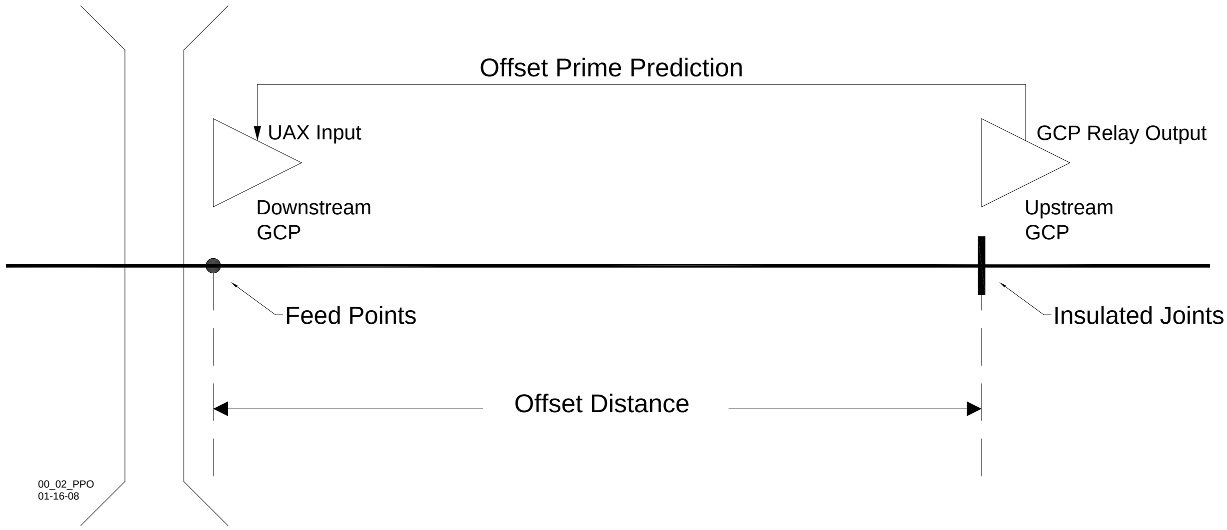


Figure 1-1: Prime Prediction Offset

1.2.4.2 DAX Functions

WARNING

ENTERING ANY VALUE 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 the Application Guidelines manual, Section 10, Model 3000 GCP DAX Applications.

To implement the DAX function one or more 80016 DAX Modules must be installed in the upstream GCP.

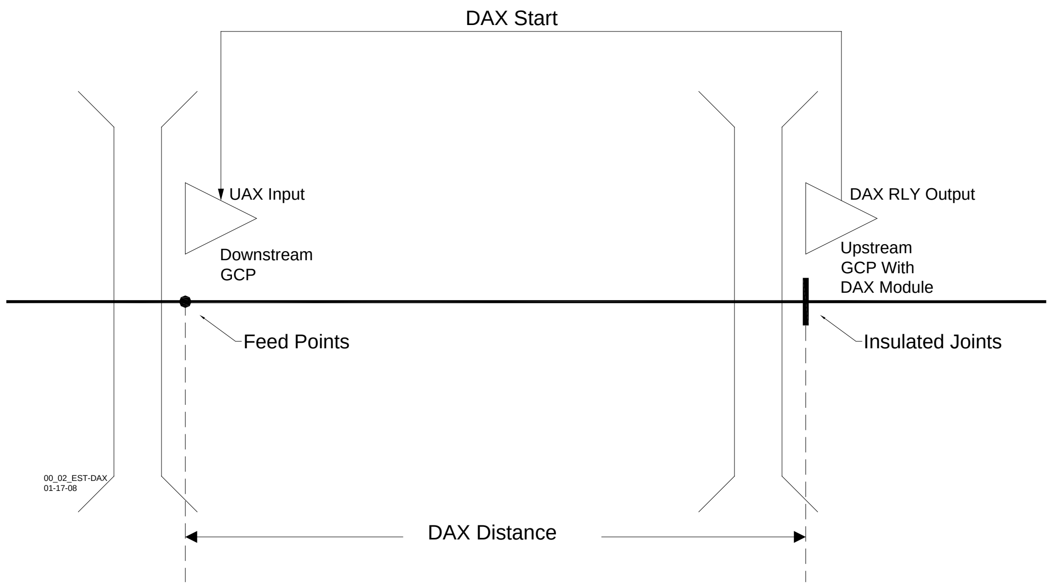


Figure 1-2:
Establishing Downstream Adjacent Crossing (DAX)

1.2.5 Traffic Signal Preemption

Traffic signal preemption can be performed by a DAX module. The front contacts of the 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. The Model 3000 GCP may also incorporate an Advanced Preempt Timer feature as described in Section 4; paragraph 4.17.21.

1.2.6 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 island circuit is established and controlled by a high-frequency module that contains separate transmitter and receiver circuits.
- The length of the island circuit is established by the location of the track connections on either side of the crossing
  - Transmitter Is placed on one side of the crossing and 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.

1.2.7 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

The Safetran 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 3, Paragraph 3.3.4.

The Model 3000 GCP may incorporate an Enhanced Detection feature as described in Section 4; paragraph 4.17.9.

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.

1.2.8 Keyboard And Display

Application parameters, including warning time, are programmable via a detachable keyboard and liquid crystal display (see Section 2, paragraph 2.4).

1.2.9 Self Check and Trouble Shooting

The self-check process in the Model 3000 GCP tests the unit at specific intervals to ensure continued reliable operation. Module status LED indicators combined with microprocessor-controlled diagnostic messages presented on the liquid crystal display permit rapid trouble-shooting.

1.3 MODEL 3000 GCP MODELS

The Model 3000 GCP operates from battery power to ensure continued operation in the event of AC power failure. Model 3000 GCP's are available as:

- Single-track systems (control single-track circuits)
- Double-track systems (control two track circuits)
- Double-track systems may be configured to operate at the same frequency or at two independent frequencies on track 1 (T1) and track 2 (T2).

Automatic transfer systems consisting of two identical module sets plus a transfer module are also available (see Table 1-1).

- 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: Model 3000 GCP Basic Model Options

GCP MODEL	CASE PART NUMBER	ONE-TRACK OPERATION	TWO-TRACK OPERATION	DUAL-FREQUENCY OPERATION	DAX CAPABILITY	INTERNAL AUTOMATIC TRANSFER
3000	80200	Yes	Yes	Yes	1 to 4	No
3000D2	80110	Yes	Yes	Yes	1 to 4	Yes
3000D2L	80140	Yes	Yes	Yes	1 to 4	Yes
3000ND	80060	Yes	No	No	None	No
3000ND2	80160	Yes	No	No	None	Yes
3008	80006	Yes	No	No	1 to 8	No
3008D2	80010	Yes	No	No	1 to 8	Yes

1.4 SYSTEM SPECIFICATIONS

Input Power:	
Voltage:	9.0-16.5 VDC; 12 VDC nominal
Current:	Single-track system - 1.50 amperes Two track system - 2.2 amperes Each optional module - up to 0.65 ampere Maximum current - 3.75 amperes
Transmitter Output Current:	
Medium power:	250 mA nominal
High power:	Up to 500 mA Varies with transmitter frequency
Program Selection:	Keystroke entry via keyboard/display Program is displayed by LCD readout
Frequencies Available:	Frequencies can be programmed between 45 and 999 Hz in 1 Hz increments.
Frequency Stability:	±0.01 percent

Island Frequencies Available:	
80011:	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 fixed and determined by individual island modules)
80211:	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 (determined by island track wire connections):	
80011:	120 feet (36.58 meters) (minimum) to 300 feet (91.44 meters) (maximum)
80211:	120 feet (36.58 meters) (minimum) to 350 feet (106.68 meters) (maximum)
Relay Drive Outputs:	400 to 1,000-ohm load
Surge Protection:	Built-in surge protection for track and battery connections. Requires only primary arresters and equalizers
Diagnostics And Monitoring:	Accomplished via two-line, 16-character, alphanumeric, liquid crystal display. Diagnostic information, application programming, and train move data plus internal voltages are displayed.
Mounting:	The Model 3000 GCP can be wall, rack, or shelf mounted. Except for certain installations that require six-wire track hookup, all track, power, and slaving connections use standard AREMA terminals.
Temperature Range:	-40° F to +158° F (-40° C to 70° C)
Operating Distance:	Tables 1-4 and 1-5 indicate minimum and maximum bidirectional and unidirectional approach lengths, respectively, for each standard Safetran Model 3000 GCP operating frequency with ballast resistances of 2, 4, and 6 ohms per 1,000 feet. Maximum operating distances for any given frequency are governed by ballast resistance conditions, increasing with higher ballast and decreasing with lower ballast. Minimum approach distances are determined by available system gain, resulting in shorter approaches at higher frequencies. The minimum approach distance figures indicate the shortest approach distance over which a given frequency will operate.

Table 1-2: Model 3000 GCP Dimension Data

MODEL	WIDTH	DEPTH	HEIGHT
3000/3008 (Single-Bay Case)	23 inches (58.4 centimeters)	11.34 inches (28.8 centimeters)	14.36 inches (36.5 centimeters)
3000D2/3008D2 (automatic transfer) (dual-bay, vertically- stacked case)	23 inches (58.4 centimeters)	11.34 inches (28.8 centimeters)	24 inches (60.9 centimeters)
3000D2L (automatic transfer) (dual-bay, side-by-side long case)	40.375 inches (102.55 centimeters)	11.34 inches (28.8 centimeters)	14.36 inches (36.5 centimeters)
3000ND (non-redundant, no backup) (single-bay case)	23 inches (58.4 centimeters)	11.34 inches (28.8 centimeters)	14.36 inches (36.5 centimeters)
3000ND2 (automatic transfer) (single-bay case)	23 inches (58.4 centimeters)	11.34 inches (28.8 centimeters)	14.36 inches (36.5 centimeters)

Table 1-3: Model 3000 GCP Weight Data

MODEL	WEIGHT (ALL MODULES IN PLACE (APPROXIMATE)
3000/3008:	32 pounds (14.5 kilograms)
3000D2/3000D2L/3008D2:	51.5 pounds (23.4 kilograms)
3000ND:	22 pounds (9.9 kilograms)
3000ND2:	30 pounds (13.6 kilograms)

Table 1-4: 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)

*Based upon use of hardwire or wideband shunts

Table 1-5: Ballast Resistance vs. Approach Length by Frequency, Unidirectional Applications

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

*Based upon use of hardwire or wideband shunts

1.5 TRACK LEADS

In most installations where a Model 3000 GCP is operating in a single track circuit, four track leads are used to connect the Model 3000 GCP to the track:

- Two transmitter leads on one side of the crossing
- Two receiver leads on the other side of the crossing
- Track lead wires from the instrument house to the rails must be twisted number 6 AWG, or larger.
- In unidirectional or simulated bidirectional installations, the transmitter leads must be located adjacent to the insulated joints.

Transmitter leads should be as short as possible, and are generally connected to the rails on the same side of the crossing as the instrument housing.

- Within the instrument housing, all wires carrying transmit and receive signals should be number 10 AWG or larger.
- Leads connecting the transmitter to the rails must not exceed the maximum lengths specified in Table 1-6.
- Surge protection must be utilized between the Model 3000 GCP unit track terminals and the track leads.
- The lengths of the wire runs inside the instrument housing should be as short as possible.
- Generally, total track lead length should be limited to 500 feet. This includes the length of both the transmitter and receiver pairs.
- Each pair of wires should be twisted at least two turns per foot.
- When an island circuit is used, the GCP transmitter pair should be separated as far as possible from the receiver pair, both below ground and within the instrument housing.

NOTE

When individual lead lengths exceed the distances specified in Table 1-6, a six-wire application should be considered.

For a discussion of simulated bidirectional installations, refer to Section 3, Paragraph 3.3.1.

Table 1-6: Maximum Transmit Wire Lengths (Four-wire Applications)

STANDARD SAFETRAN GCP FREQUENCY (HZ)	MAXIMUM TRANSMIT LEAD LENGTH (FEET)
86	100
114	125
156	150
211	200
285-970	250

WARNING

IN A SIX-WIRE APPLICATION, TWO CHECK WIRES ARE CONNECTED TO THE CORRESPONDING TRANSMITTER TRACK WIRES IN THE UNDERGROUND TO PROVIDE REMOTE SENSING OF THE TRANSMIT SIGNAL. THE CONNECTION IS MADE WITHIN 25 FEET OF THE TRANSMITTER FEED POINTS BUT NOT AT THE RAIL CONNECTIONS AND NOT WHERE THE CONNECTION CAN BE DAMAGED BY TRACK MACHINERY OR DRAGGING EQUIPMENT. EXISTING LOCATIONS THAT ARE BETWEEN 25 AND 50 FEET AND DO NOT EXPERIENCE CHECK RECEIVER ERRORS MAY REMAIN AT THEIR LOCATION.

THE CORRESPONDING XMT AND CHK WIRES MUST BE CONNECTED TOGETHER AS SHOWN IN FIGURE 1-3.

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

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

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT OR AUXILIARY TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A GCP/MS TRACK CIRCUIT THAT DOES NOT HAVE AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH 1.5.

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 1-3).

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

NOTE

When splicing track connections, welded splices should be used. Use of Kearney connectors should be avoided.

For six-wire hookups:

- The minimum wire size is number 6 AWG
- The maximum distance from the GCP to the remote track wire feed points should not exceed 3,500 feet.
- Use the 80074 Six-Wire Simulated Track Burial Assembly (see paragraph 3.3.3 and Figure 1-3) with each 6-wire application.
- One Check wire and its corresponding Transmitter wire must be connected to the 80074 Six-Wire Simulated Track Burial Assembly within 25 feet of the rail connections (see Figure 1-3).
- The other Check wire must be connected to its corresponding Transmitter wire within 25 feet of the rail connections (see Figure 1-3).

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

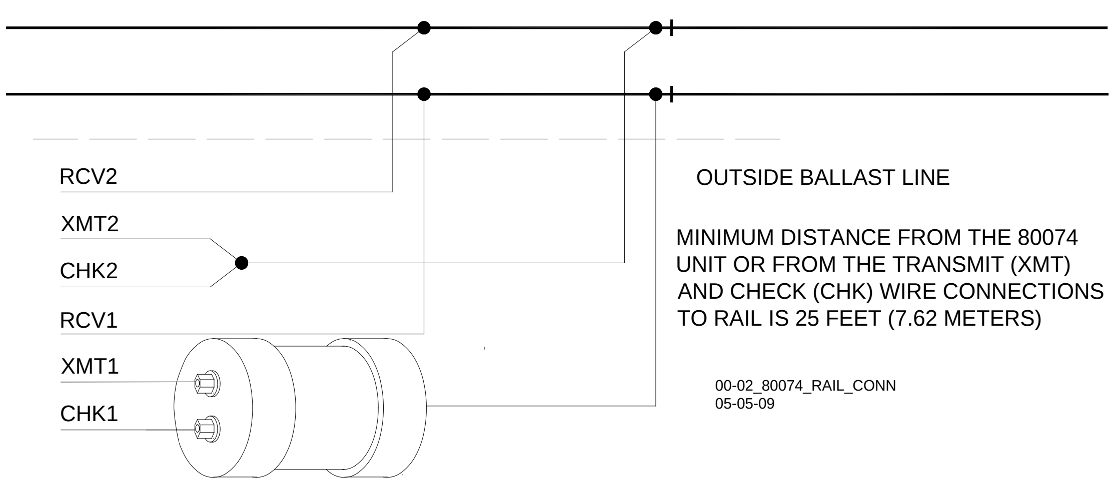
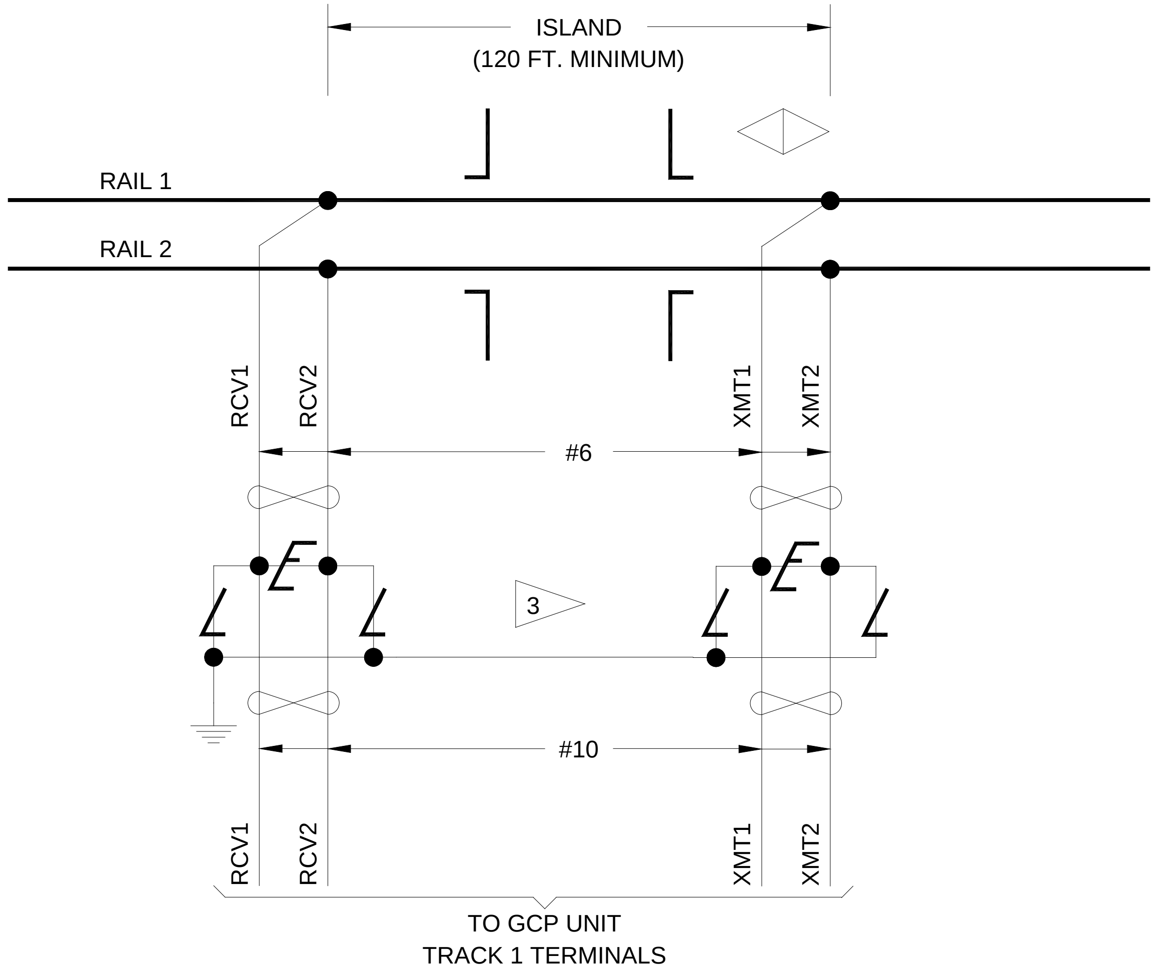


Figure 1-3:
Proper Connection of Track Leads to the Rails in Six-Wire Applications



NOTES

1. ALL WIRING #16 AWG MINIMUM UNLESS OTHERWISE NOTED.
   WIRE SIZES SHOWN ARE MINIMUM GAUGE.
2. SEE PARAGRAPH 1.5 FOR DETAILED GCP-TO-TRACK WIRING INFORMATION.
3. ARRESTERS AND EQUALIZERS MOUNTED ON SURGE PANELS (80026-XX).
   SEE PARAGRAPH 3.6 FOR DETAILS.

LEGEND

= TWIST TWO TURNS PER FOOT

= 022700-1X EQUALIZER, H.D.

= 022585-1X ARRESTER, H.D.

= EARTH GROUND

= BIDIRECTIONAL GCP UNIT

00_02_TYP_4W_RAIL_CONN
04-08-09

Figure 1-4:
Proper Connection of Track Leads to the Rails in Four-Wire Applications

1.6 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
- Length of Island
- Ballast conditions in street and approach

NOTE

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

1.7 TYPICAL APPLICATION DRAWINGS

The following figures illustrate a variety of typical Model 3000 GCP applications. For additional application drawings and further comprehensive application information, refer to the Application Guidelines Manual for the Model 3000 GCP Family.

Table 1-7: Table of Application Drawings and Mounting Dimensions

FIGURE	TITLE
Figure 1-5	Recommended Surge Suppression Wiring for Microprocessor Based Grade Crossing Predictor, Model 3000 Family
Figure 1-6	Typical Model 3000/3000D2 GCP Bidirectional Application, One Track
Figure 1-7	Typical Model 3000/3000D2 GCP Bidirectional Application, Two Tracks, Case Wiring
Figure 1-8	Typical Model 3000/3000D2 GCP Unidirectional Application, One Track, Back-to-Back
Figure 1-9	Typical Model 3000/3000D2/3000D2L GCP Unidirectional Application, Two Tracks, Back-to-Back
Figure 1-10	Typical Model 3000ND/3000ND2 GCP Unidirectional Application, One Track
Figure 1-11	Typical Model 3000/3000D2 GCP Bidirectional UAX Interconnect Application with Remote Unidirectional Unit
Figure 1-12	Typical Model 3000/3000D2/3000D2L GCP DAX-UAX Interconnections, Two Crossings
Figure 1-13	Typical Model 3000/3000D2 GCP Bidirectional Application, Unidirectional Unit with Remote Feed Point, One Track (Six Wire)
Figure 1-14	Typical Model 3000ND/3000ND2 GCP Unidirectional Application with DC Island Track Circuit, One Track, Six-Wire Hookup, Case Wiring
Figure 1-15	Proper Model 3000 GCP Four-Wire and Six-Wire Connections Using Auxiliary Track Circuit Equipment on Model 3000 GCP Operating In The Bidirectional Simulation Mode

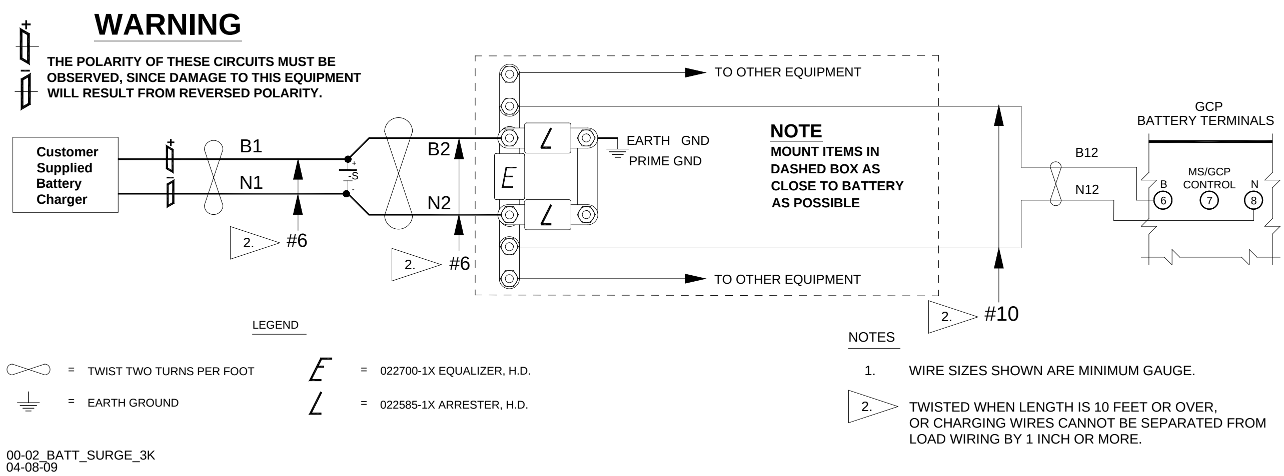
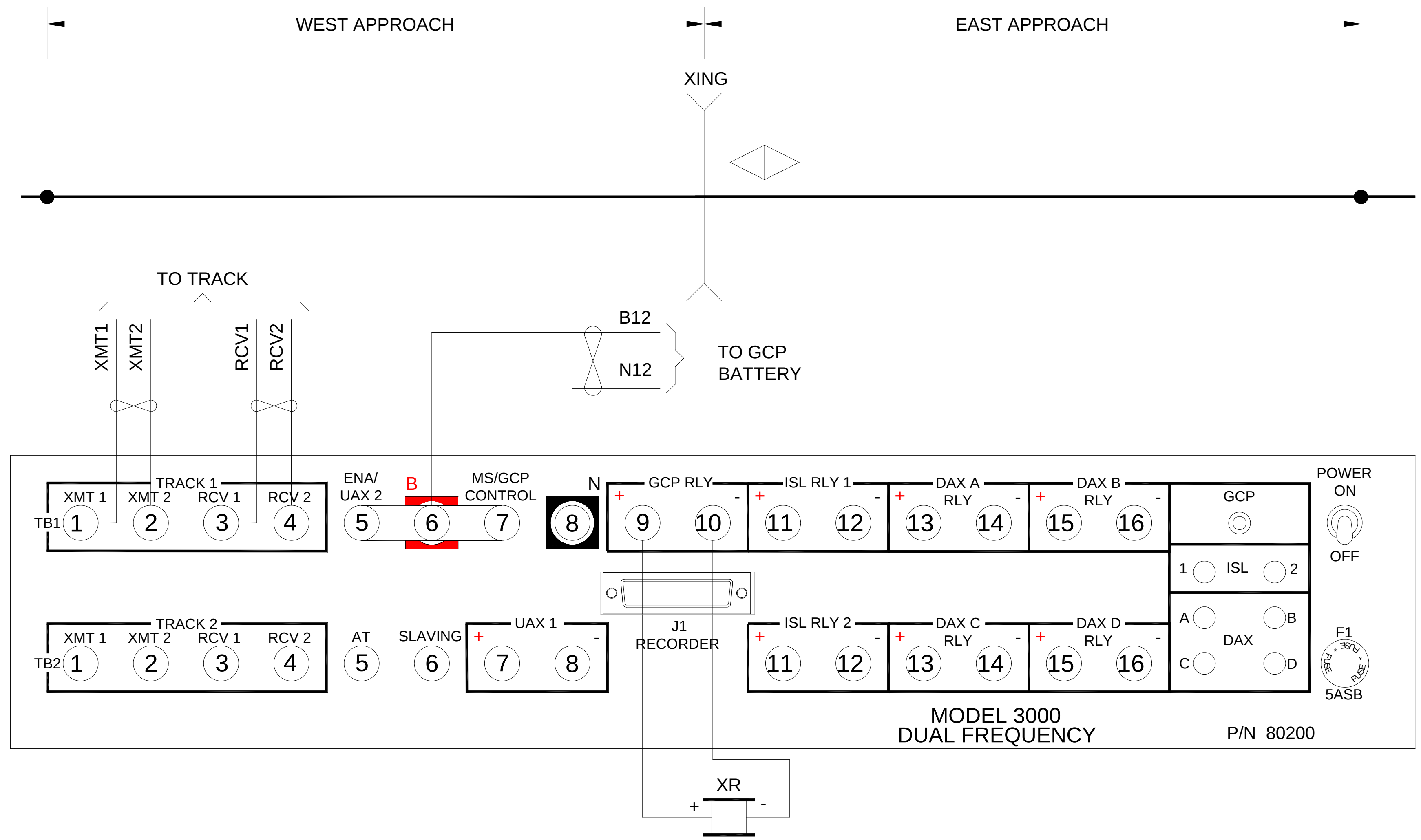


Figure 1-5: Recommended Surge Suppression Wiring for Microprocessor Based Grade Crossing Predictor, Model 3000 Family



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1-5 FOR GCP-TO-TRACK WIRING.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.

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WARNING

APPROACH DISTANCES MUST PROVIDE A MINIMUM OPERATING TIME EQUAL TO PRIME WARNING TIME SELECTED (OR PREEMPT WARNING, IF USED) PLUS 4 SECONDS FOR SYSTEM RESPONSE TIME AT MAXIMUM TRAIN SPEED.

NEVER WIRE WRAP AROUND RELAY FRONT CONTACTS BETWEEN GCP RLY (+) TB1-9 AND ENA (+) TB1-5.

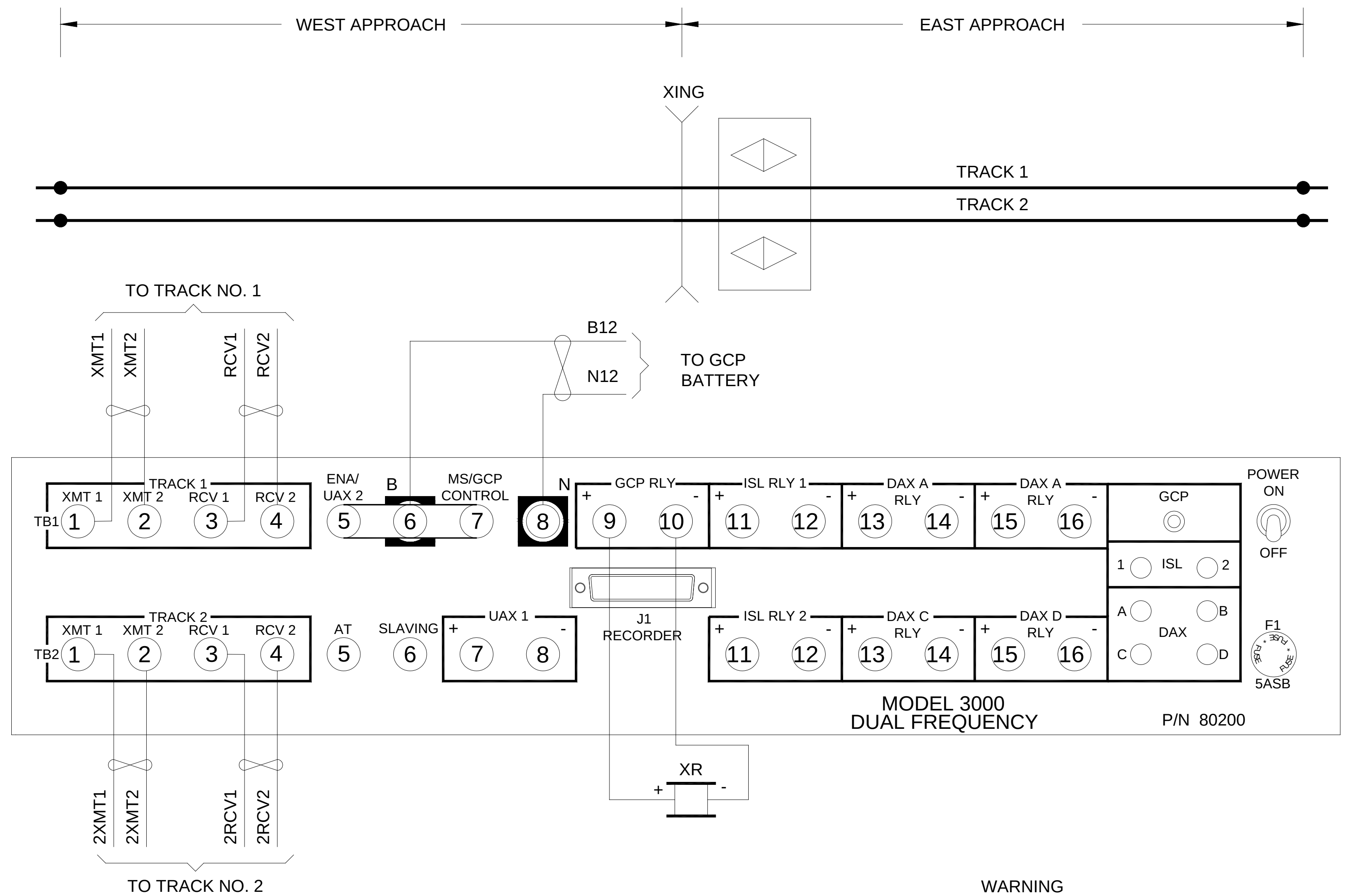
LEGEND

= TWIST TWO TURNS PER FOOT

= BIDIRECTIONAL GCP UNIT

= TERMINATION SHUNT

Figure 1-6: Typical Model 3000/3000D2 GCP Bidirectional Application, One Track



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1.5 FOR GCP-TO-TRACK WIRING.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.

WARNING

APPROACH DISTANCES MUST PROVIDE A MINIMUM OPERATING TIME EQUAL TO PRIME WARNING TIME SELECTED (OR PREEMPT WARNING, IF USED) PLUS 4 SECONDS FOR SYSTEM RESPONSE TIME AT MAXIMUM TRAIN SPEED.

NEVER WIRE WRAP AROUND RELAY FRONT CONTACTS BETWEEN GCP RLY (+) TB1-9 AND ENA (+) TB1-5.

LEGEND

= TWIST TWO TURNS PER FOOT

= BIDIRECTIONAL GCP UNIT

= TERMINATION SHUNT

= SIGNIFIES 2 TRACKS IN 1 BOX

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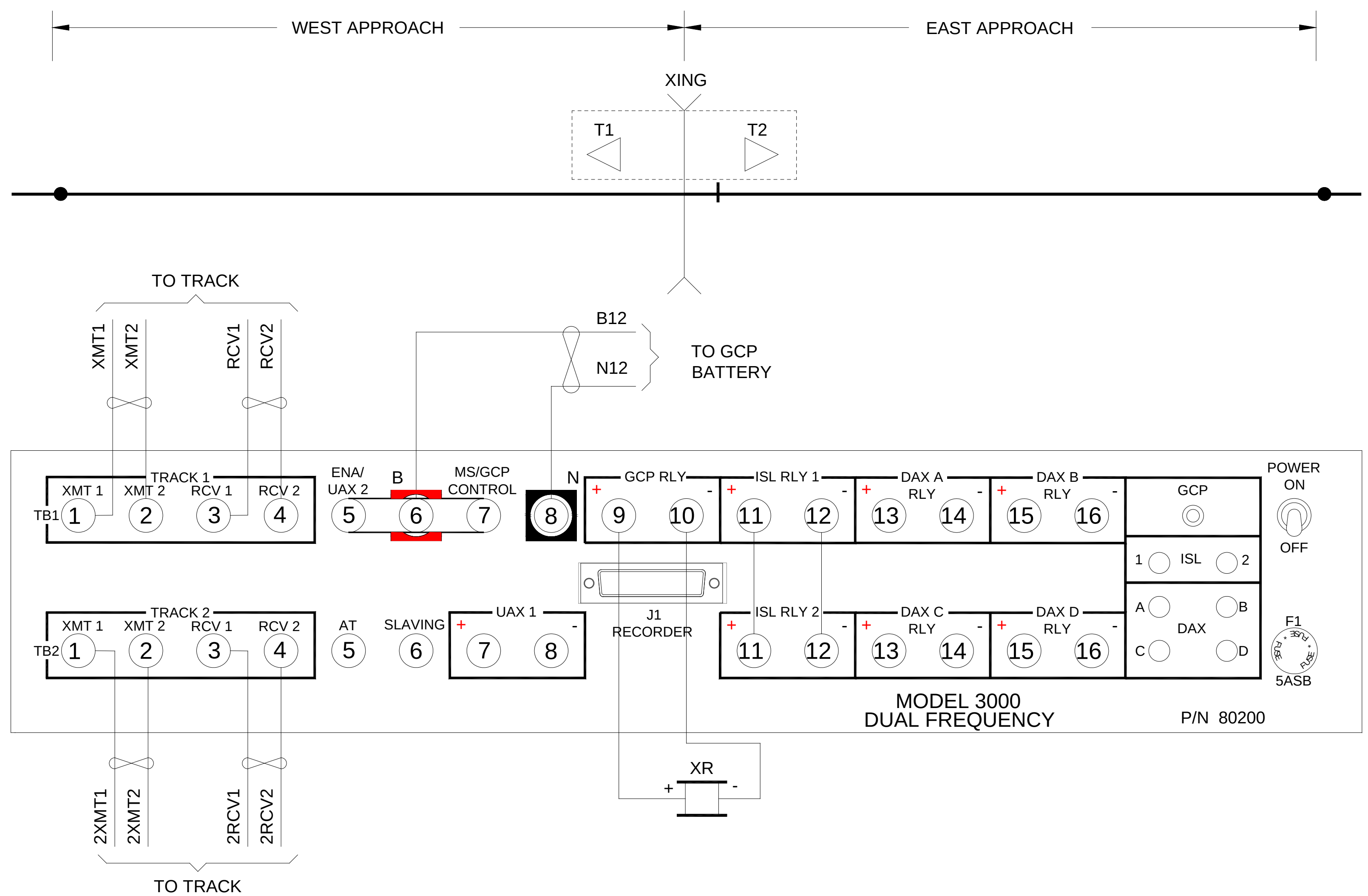
05-05-09

Figure 1-7: Typical Model 3000/3000D2 GCP Bidirectional Application, Two Tracks, Case Wiring



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, ARE NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1.5 FOR GCP-TO-TRACK WIRING.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.

WARNING

APPROACH DISTANCES MUST PROVIDE A MINIMUM OPERATING TIME EQUAL TO PRIME WARNING TIME SELECTED (OR PREEMPT WARNING, IF USED) PLUS 4 SECONDS FOR SYSTEM RESPONSE TIME AT MAXIMUM TRAIN SPEED.

NEVER WIRE WRAP AROUND RELAY FRONT CONTACTS BETWEEN GCP RLY (+) TB1-9 AND ENA (+) TB1-5.

LEGEND

= TWIST TWO TURNS PER FOOT

OR = UNIDIRECTIONAL GCP UNIT

= TERMINATION SHUNT

= 2 TRACKS - 1 BOX

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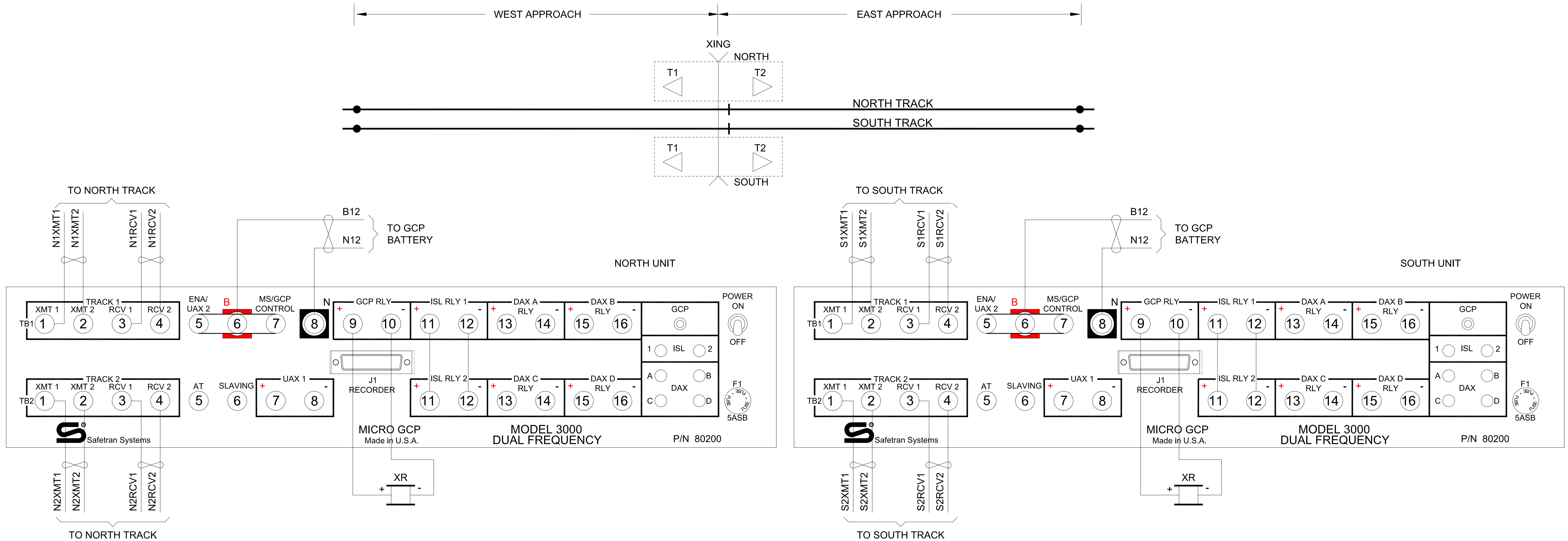
Figure 1-8: Typical Model 3000/3000D2 GCP Unidirectional Application, One Track, Back-to-Back



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1.5 FOR GCP-TO-TRACK WIRING.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.

LEGEND

= TWIST TWO TURNS PER FOOT

OR = UNIDIRECTIONAL GCP UNIT

= TERMINATION SHUNT

= 2 UNITS - 1 BOX

WARNING

APPROACH DISTANCES MUST PROVIDE A MINIMUM OPERATING TIME EQUAL TO PRIME WARNING TIME SELECTED (OR PREEMPT WARNING, IF USED) PLUS 4 SECONDS FOR SYSTEM RESPONSE TIME AT MAXIMUM TRAIN SPEED.

NEVER WIRE WRAP AROUND RELAY FRONT CONTACTS BETWEEN GCP RLY (+) TB1-9 AND ENA (+) TB1-5.

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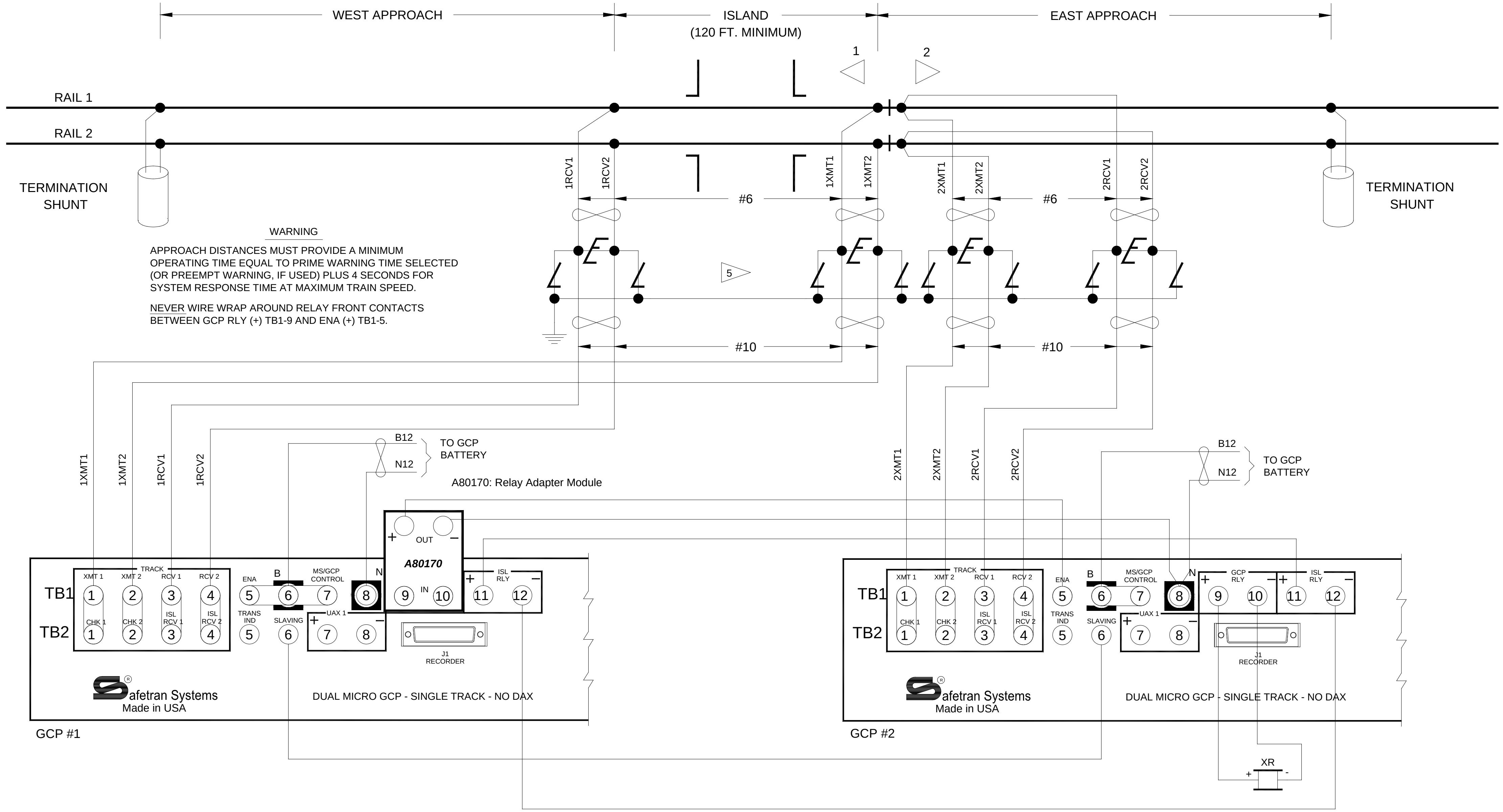
Figure 1-9: Typical Model 3000/3000D2/3000D2L GCP Unidirectional Application, Two Tracks, Back-to-Back



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE FIGURE 1-3 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.
4. SEE PARAGRAPH 1.5 FOR GCP-TO-TRACK WIRING INFORMATION.
5. ARRESTERS AND EQUALIZERS MOUNTED ON SURGE PANELS (80026-XX). SEE PARAGRAPH 3.6 FOR DETAILS.

WARNING

IF THIS 3000 GCP OR 2000 MS WILL BE USED IN AN APPLICATION WHERE THE UAX, ISL RLY, MS/GCP CONTROL AND/OR ENA INPUT ON ONE 3000 GCP AND/OR 2000 MS UNIT WILL BE DRIVEN DIRECTLY (NO RELAY ISOLATION) BY THE GCP RLY (3000 GCP) AND/OR MS RLY (2000 MS) OUTPUT OF ANOTHER UNIT, THE SAFETRAN RELAY ADAPTER MODULE A80170, MUST BE USED. SEE PARAGRAPH 2.3.10 FOR FURTHER INSTRUCTIONS

LEGEND

= TWIST TWO TURNS PER FOOT
= 022700-1X EQUALIZER, H.D.
= 022585-1X ARRESTER, H.D.
= EARTH GROUND
OR = UNIDIRECTIONAL GCP UNIT

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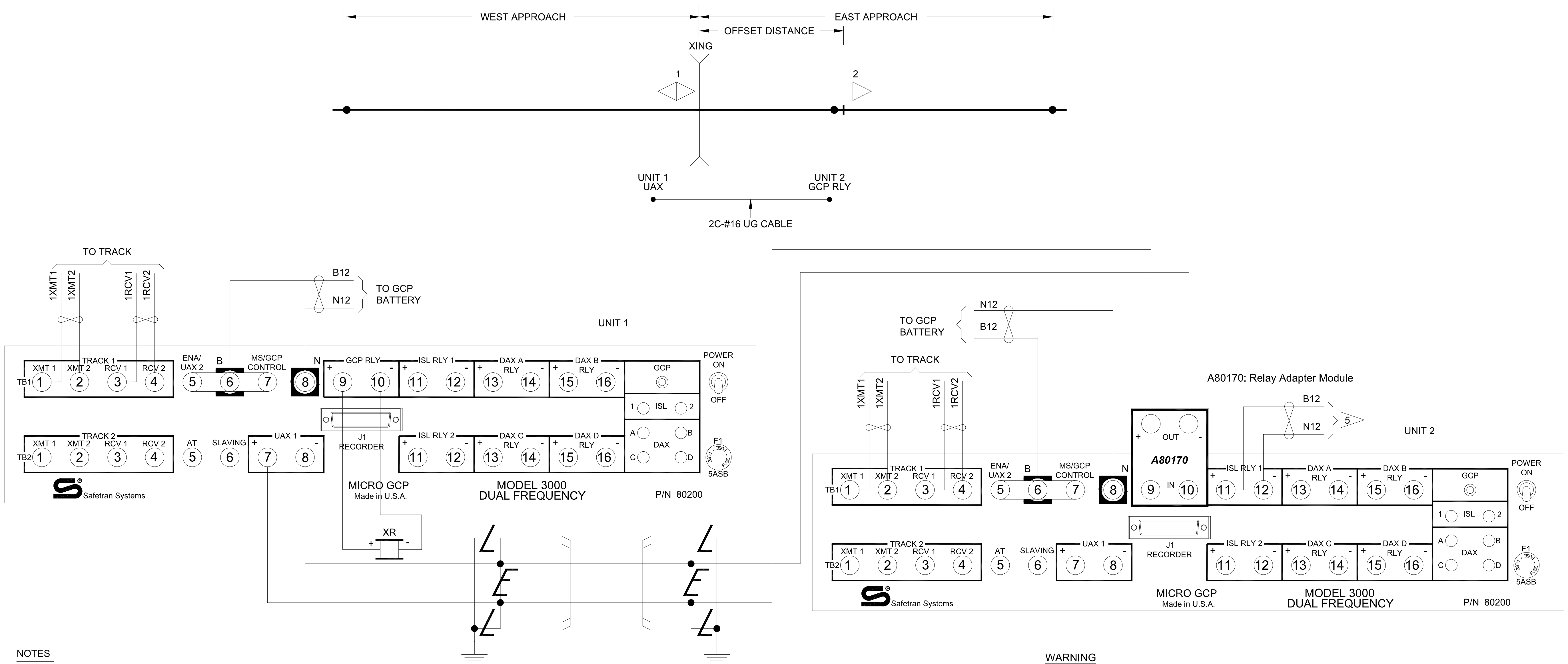
04-08-09

Figure 1-10: Typical Model 3000ND/3000ND2 GCP Unidirectional Application, One Track



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1.5 FOR GCP-TO-TRACK WIRING.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.
5. ISLAND RELAY DRIVE OUTPUT MUST BE TIED TO BATTERY B AND N TO ALLOW GCP RELAY DRIVE TO BE ENERGIZED.
6. UNIT 2 USES PRIME PREDICTION OFFSET FOR THE UAX OPERATION.

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LEGEND

= TWIST TWO TURNS PER FOOT
= BIDIRECTIONAL GCP UNIT
OR = UNIDIRECTIONAL GCP UNIT
= TERMINATION SHUNT
= 022585-1X ARRESTER, H.D.
= 022700-1X EQUALIZER, H.D.
= EARTH GROUND

WARNING
IF THIS 3000 GCP WILL BE USED IN AN APPLICATION WHERE THE UAX, ISL RLY, MS/GCP CONTROL AND/OR ENA INPUT ON ONE 3000 GCP AND/OR 2000 MS UNIT WILL BE DRIVEN DIRECTLY (NO RELAY ISOLATION) BY THE GCP RLY (3000 GCP) AND/OR MS RLY (2000 MS) OUTPUT OF ANOTHER UNIT, THE SAFETRAN RELAY ADAPTER MODULE A80170 MUST BE USED. SEE PARAGRAPH 2.3.10 FOR FURTHER INSTRUCTIONS.

WARNING
APPROACH DISTANCES MUST PROVIDE A MINIMUM OPERATING TIME EQUAL TO PRIME WARNING TIME SELECTED (OR PREEMPT WARNING, IF USED) PLUS 4 SECONDS FOR SYSTEM RESPONSE TIME AT MAXIMUM TRAIN SPEED.

Figure 1-11: Typical Model 3000/3000D2 GCP Bidirectional UAX Interconnect Application with Remote Unidirectional Unit

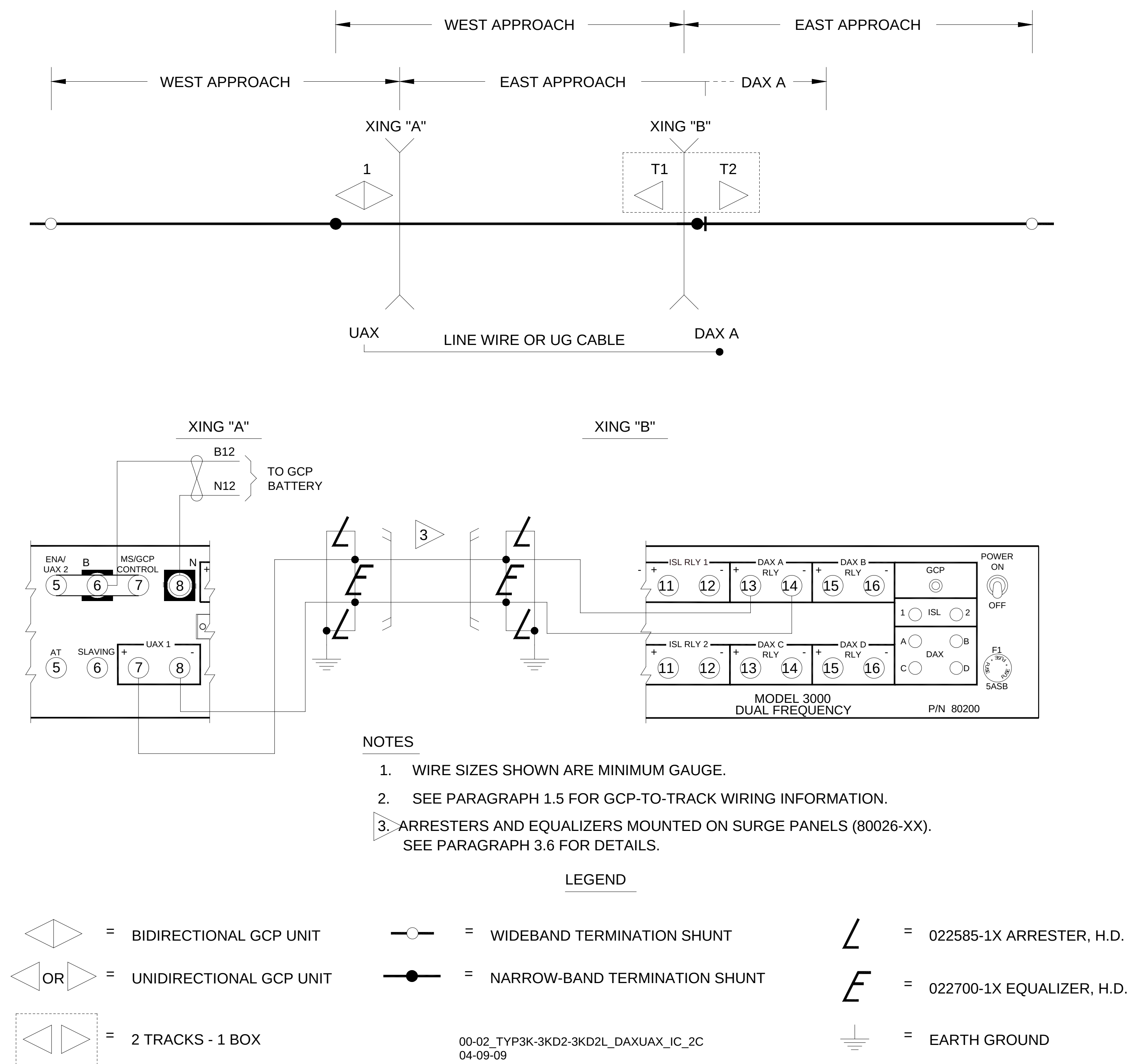
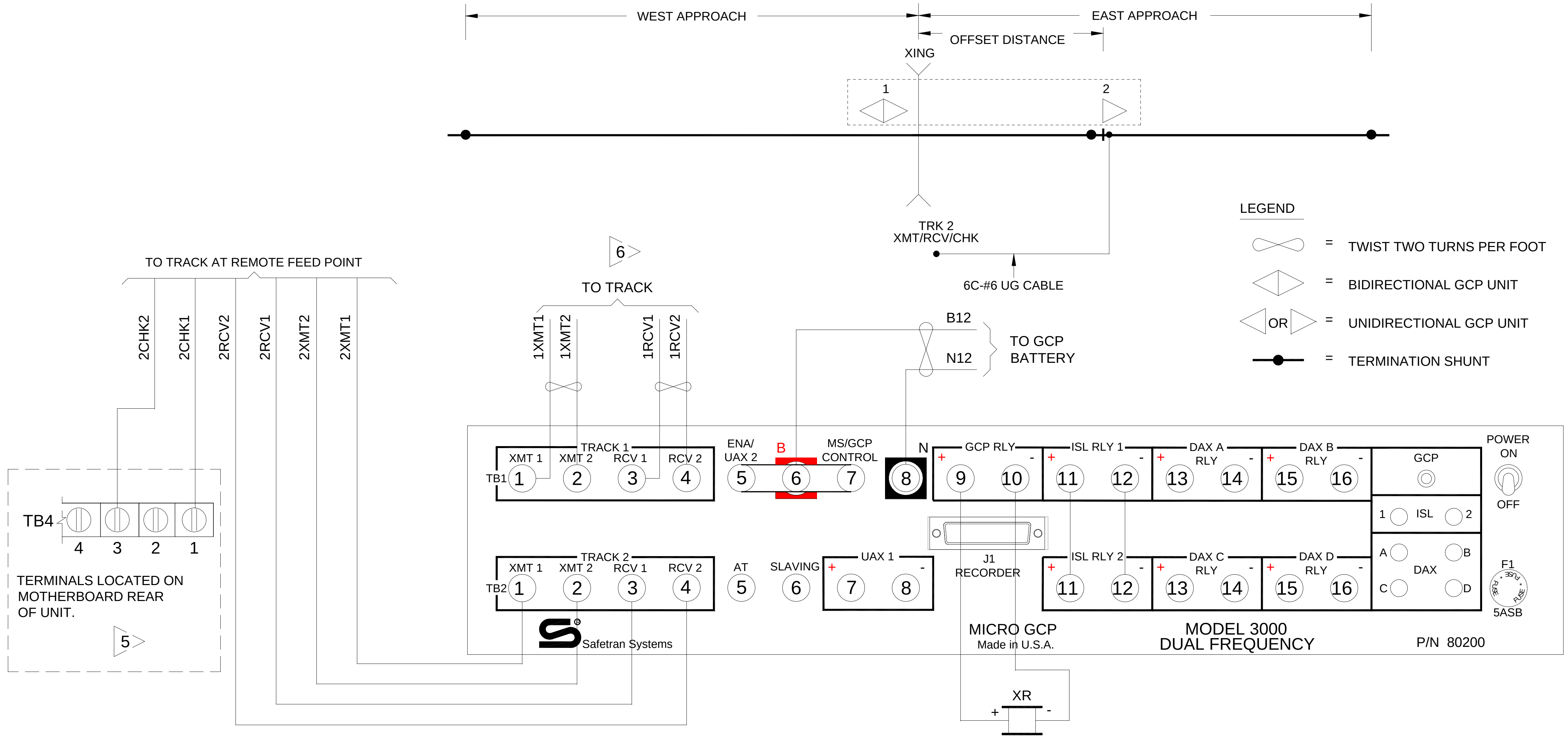


Figure 1-12: Typical Model 3000/3000D2/3000D2L GCP DAX-UAX Interconnections, Two Crossings



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF DUAL WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1-5 FOR GCP-TO-TRACK WIRING.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.
5. FOR SIX-WIRE OPERATION, THE JUMPER LINKS CONNECTING TB4-1 AND 2 AND TB4-3 AND 4 SHOULD BE REMOVED FOR TRACK NUMBER 2 AND A SHORT LENGTH OF STRANDED TWISTED PAIR WIRE CONNECTED TO TERMINALS TB4-1 AND TB4-3. THE TWISTED PAIR WIRE IS THEN ROUTED THROUGH THE EXIT HOLE IN THE SIDE OF THE CASE AND TERMINATED AT AAR TERMINALS. A NUMBER 10 AWG TWISTED PAIR CAN THEN BE USED FOR INTERCONNECTING THE TRACK ARRESTERS.
6. FOR SIX-WIRE OPERATION, THE JUMPER LINKS CONNECTING TB3-1 AND 2 AND TB3-3 AND 4 SHOULD BE REMOVED FOR TRACK NUMBER 1 AND A SHORT LENGTH OF STRANDED TWISTED PAIR WIRE CONNECTED TO TERMINALS TB3-1 (1C1) AND TB3-3 (1C2). THE TWISTED PAIR WIRE IS THEN ROUTED THROUGH THE EXIT HOLE IN THE SIDE OF THE CASE AND TERMINATED AT AAR TERMINALS. A NUMBER 10 AWG TWISTED PAIR CAN THEN BE USED FOR INTERCONNECTING THE TRACK ARRESTERS.

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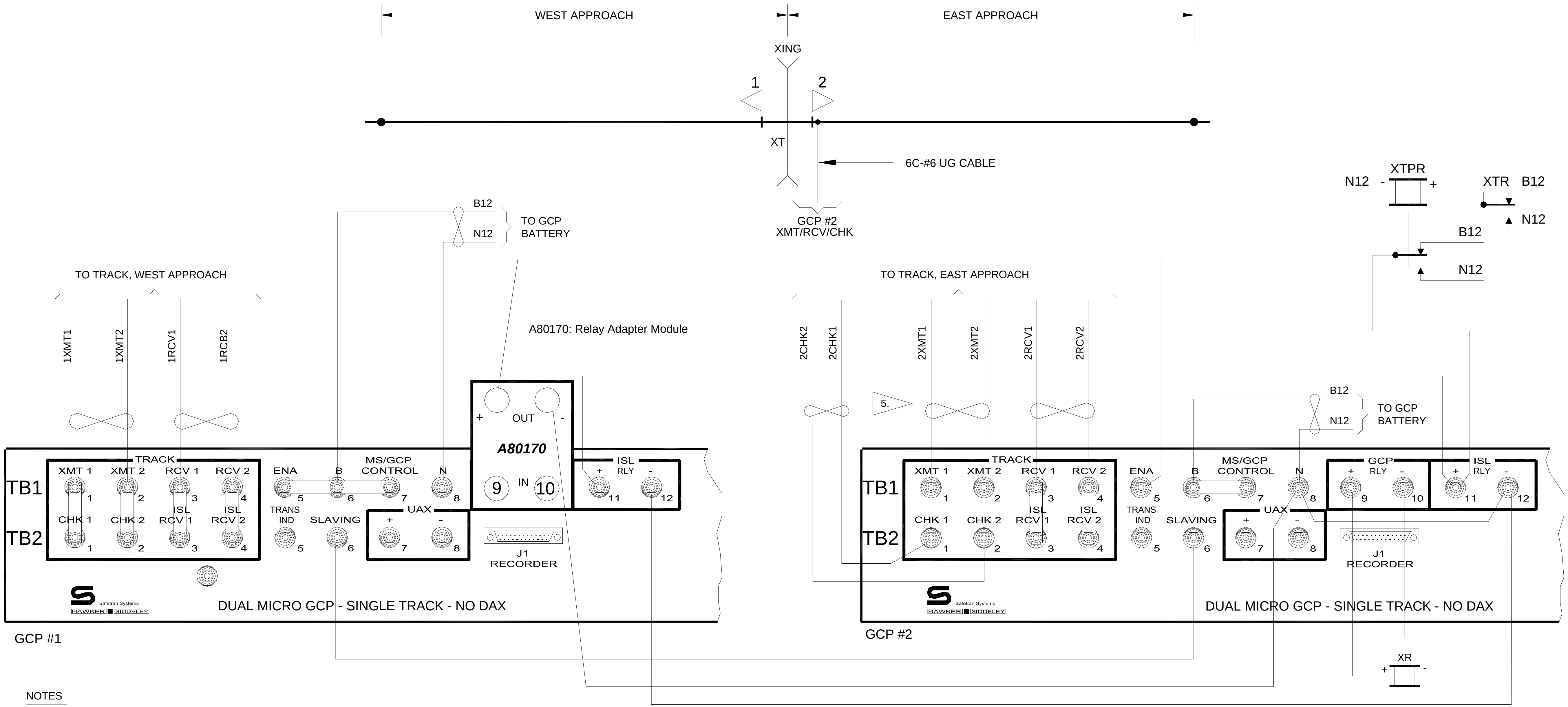
Figure 1-13: Typical Model 3000/3000D2 GCP Bidirectional Application, Unidirectional Unit with Remote Feed Point, One Track (Six Wire)



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 UPON TYPE OF TRACK CIRCUIT IN USE. THE USE OF WIDEBAND SHUNTS, PART NUMBER 8A077, IS NOT RECOMMENDED FOR MODEL 3000 GCP APPLICATIONS.
3. SEE PARAGRAPH 1.5 FOR DETAILED GCP-TO-TRACK WIRING INFORMATION.
4. SEE FIGURE 1-5 FOR GCP BATTERY CONNECTIONS AND CHARGING CIRCUIT.
5. SIX-WIRE CONFIGURATION SHOWN IS RECOMMENDED WHEN TRANSMIT WIRE LENGTH EXCEEDS MAXIMUM LENGTHS SPECIFIED IN SECTION VII OF THIS MANUAL. WHEN USING SIX-WIRE HOOKUP, SHORTING LINKS MUST BE REMOVED BETWEEN FRONT PANEL AAR TERMINALS TB1-1 AND TB2-1 AND BETWEEN TB1-2 AND TB2-2 AS SHOWN.

WARNING

IF THIS 3000 GCP WILL BE USED IN AN APPLICATION WHERE THE UAX, ISL RLY, MS/GCP CONTROL AND/OR ENA INPUT ON ONE 3000 GCP AND/OR 2000 MS UNIT WILL BE DRIVEN DIRECTLY (NO RELAY ISOLATION) BY THE GCP RLY (3000 GCP) AND/OR MS RLY (2000 MS) OUTPUT OF ANOTHER UNIT, THE SAFETRAN RELAY ADAPTER MODULE A80170 MUST BE USED PER PARAGRAPH 2.3.10.

LEGEND

= TWIST TWO TURNS PER FOOT

OR = UNIDIRECTIONAL GCP UNIT

= TERMINATION SHUNT

00-02_3KND-ND2_UNI_DC_ISL_TC_1T_6WIRE
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Figure 1-14: Typical Model 3000ND/3000ND2 GCP Unidirectional Application with DC Island Track Circuit, One Track, Six-Wire Hookup, Case Wiring

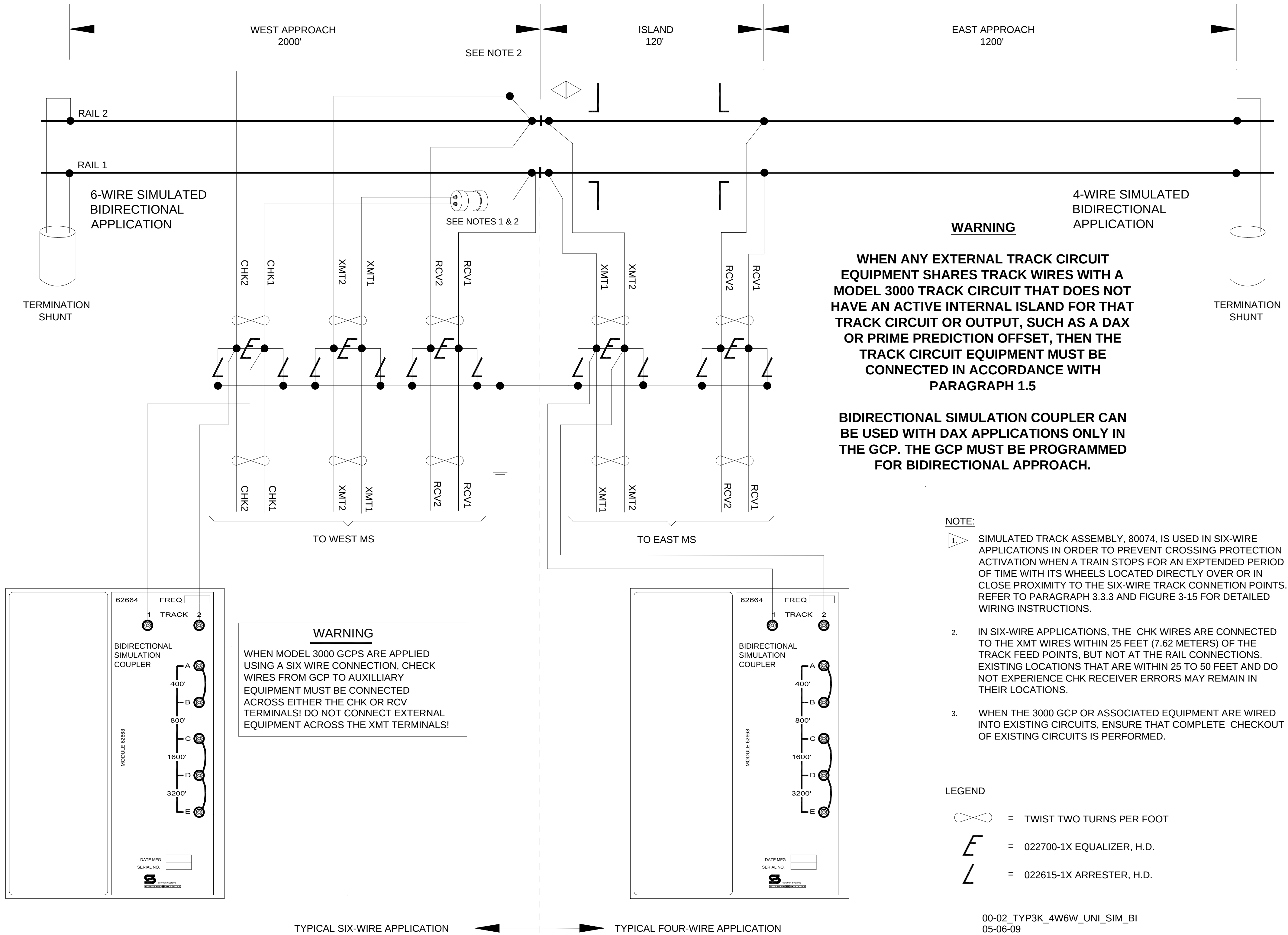


Figure 1-15: Proper Model 3000 GCP Four-Wire and Six-Wire Connections Using Auxiliary Track Circuit Equipment on Model 3000 GCP Operating In The Bidirectional Simulation Mode

SECTION 2 – PRIMARY EQUIPMENT FAMILIARIZATION

2.1 GENERAL DESCRIPTION

Each 3000 GCP is housed in an aluminum case assembly containing a backplane-mounted motherboard. The motherboard provides connectors to accommodate the GCP's plug-in-type printed circuit modules.

2.2 GCP CASE ASSEMBLIES

Currently, seven case assemblies are used with the GCP. Five of these assemblies replace older style cases that are no longer in production. A list of the seven current (advanced) assemblies and their older counterparts is provided in Table 2-1.

Table 2-1: GCP Case Assemblies

GCP MODEL NUMBER	OLD STYLE CASE PART NUMBER	ADVANCED CASE PART NUMBER
3000	80000	80200
3000D2	80100	80110
3000D2L	80130	80140
3000ND2	80150	80160
3000ND	80050	80060
3008	none	80006
3008D2	none	80010

NOTES

A dual-frequency, 80214 Processor module is provided with all new case assemblies and is completely compatible with all 3000/3008 GCP case assemblies.

The 80110, 80140, and 80200 case assemblies allow independent frequency operation on track 1 (T1) and track 2 (T2) when used with the 80214 Processor module (see paragraph 2.3.4.3).

The terminal interface of each new case assembly is identical with that of the corresponding older style case.

2.2.1 New Case Dual Frequency Switch

Systems utilizing 80110, 80140, or 80200 cases are capable of independent frequency operation on T1 and T2 when a 80214 Processor module is installed.

Toggle switch(es), located on the main chassis assembly of these cases selects the Processor module installed. Switch(es) must be placed in the:

- up position (80214 D FREQ) when the 80214 module is installed
- down position (S FREQ 80014/80044) when either the 80014 or 80044 module is installed.

NOTE

When a dual frequency case is used with the 80014 or 80044 Processor module, only single frequency operation is possible.

- Within the 80140 and 80110 cases a toggle switch is located in each bay on the main chassis assembly between the Transceiver and Relay Driver module positions.
- Within the 80200 case, a single toggle switch is located on the main chassis assembly between the Transceiver and Relay Driver module positions.

2.2.2 GCP Model Configurations

A summary of the seven 3000 GCP model configurations are provided in Table 2-2. This table lists the following for each GCP model:

- Case part number
- Physical configuration
- Maximum number of modules that can be installed
- Configurable DAX outputs
- Functional description
- Front view illustration reference.

Table 2-2:
GCP Model Summary

GCP MODEL	CASE PART NUMBER	PHYSICAL CONFIGURATION	MAX. PLUG-IN MODULES	DAX OUTPUTS	FUNCTIONAL DESCRIPTION	FIG. NO.
3000	80200	Single bay	10	0 to 4	Dual track, dual frequency operation	2-1
3000D2	80110	Dual, vertically stacked bays	21	0 to 4	Dual-track, dual-frequency operation with redundant circuits and automatic transfer	2-2
3000D2L	80140	Dual, horizontally-positioned bays	21	0 to 4	Dual-track, dual-frequency operation with redundant circuits and automatic transfer	2-3
3000ND	80060	Single bay	6	0	Single track, single-frequency operation	2-4
3000ND2	80160	Single bay	12	0	Single track, single-frequency operation with redundant circuits and automatic transfer	2-5
3008	80006	Single bay	10	1 to 8	Single track, single frequency operation	2-6
3008D2	80010	Dual, vertically stacked bays	21	1 to 8	Single-track operation with redundant circuits and automatic transfer	2-7

2.2.3 External Wiring Connections

With the exception of installations that require six-wire track hookup, all external wiring connections to a 3000/3008 GCP case are accomplished via standard AREMA terminals arranged in horizontal rows across the front panel of the case.

- When a track is connected in a six-wire configuration, the two additional check receiver wires per track are routed through a small hole equipped with a protective rubber grommet which is provided in the left side of the Model 3000, 3000D2, 3008, and 3008D2 GCP cases.
- The functions of each AREMA terminal, as well as the switches located on the case and modules, are described in the following paragraphs.

WARNING

IF IN AN APPLICATION, A 3000 "GCP RLY" OUTPUT WILL BE DIRECTLY CONNECTED (NO RELAY ISOLATION) TO INPUTS (UAX, ISL RLY, MS/GSP CONTROL AND/OR ENA) OF ANOTHER

GCP AND/OR 2000 MS UNIT, THE SAFETRAN RELAY ADAPTER MODULE A80170 MUST BE INSTALLED ON THE 3000 “GCP RLY” OUTPUT TERMINAL. SEE PARAGRAPH 2.3.10 FOR FURTHER INSTRUCTIONS.

2.3 PLUG-IN PRINTED CIRCUIT MODULES

Each plug-in module used in the 3000/3008 GCP is 8 inches (20.3 centimeters) high by 8.9 inches (22.6 centimeters) wide and is equipped with a dual 43-pin connector on one edge, which plugs into a corresponding edge connector on the motherboard. An ejector lever is mounted on the top corner of each module (except 80017, 80028, and 80153) to facilitate removal from the case. Each ejector lever is stamped with the module part number. See Table 2-3 for System Module/Assembly Requirements.

CAUTION

REMOVE POWER FROM THE 3000 GCP CASE BEFORE REMOVING OR INSTALLING MODULES.

NOTES

The following module descriptions refer to the modules comprising a single module set which occupies a single bay of a card cage. For dual-bay cases (Model 3000D2, 3008D2, and 3000D2L) or split single-bay case (Model 3000ND2), the module sets in each bay (or each half bay in the Model 3000ND2) must be identical except as indicated in Table 2-1.

The card cage module slots are numbered from left to right as viewed from the front of the case. For discussion purposes, the module slots are referred to by slot number as M1, M2, M3, etc. These numbers are indicated on the case assembly drawings but do not appear on the actual case assemblies.

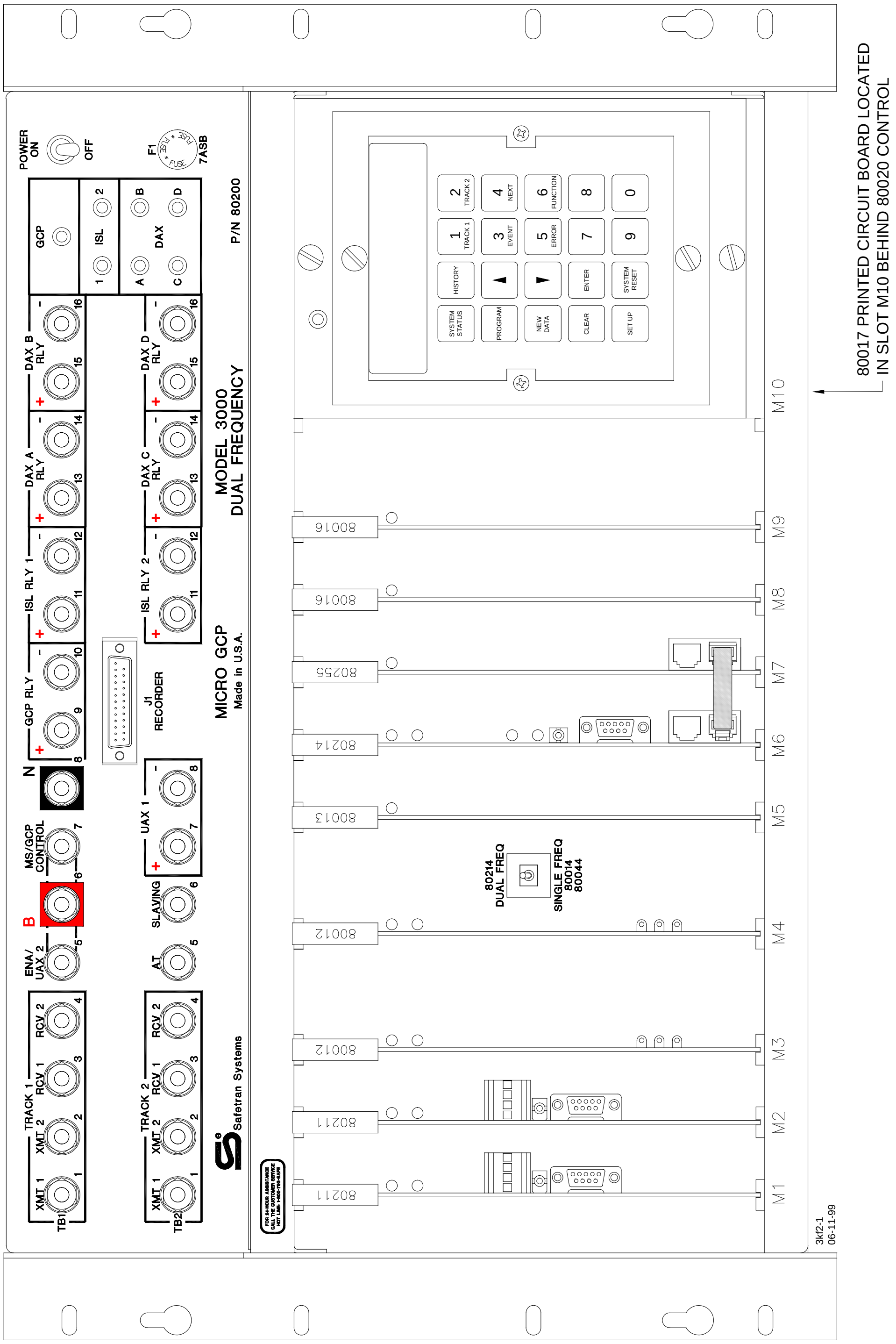


Figure 2-1:
Model GCP 3000 GCP, External Data Recorder Configuration, Front View

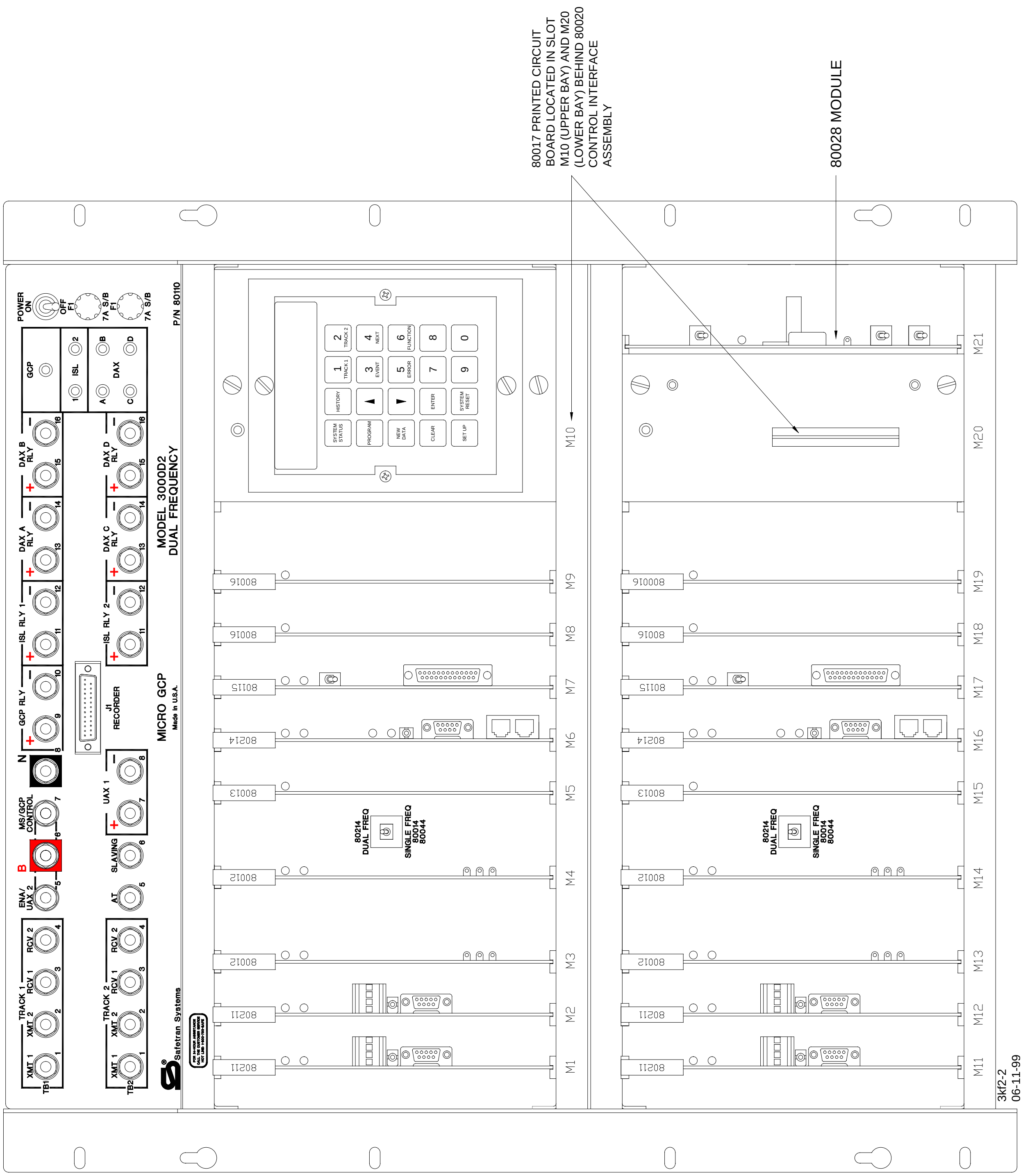


**Figure 2-2:
Model 3000D2 GCP, Internal Data
Recorder Configuration, Front View**

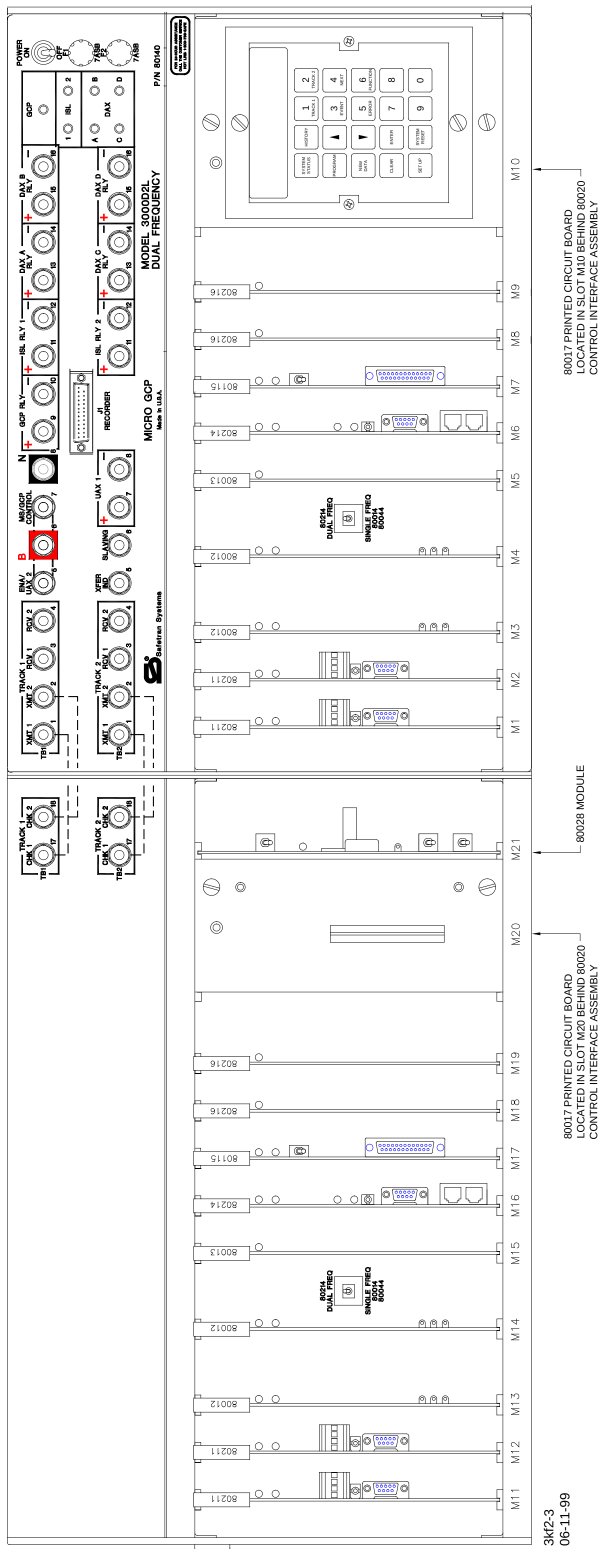


Figure 2-3:
Model 3000D2L GCP, Internal Data Recorder Configuration, Front view

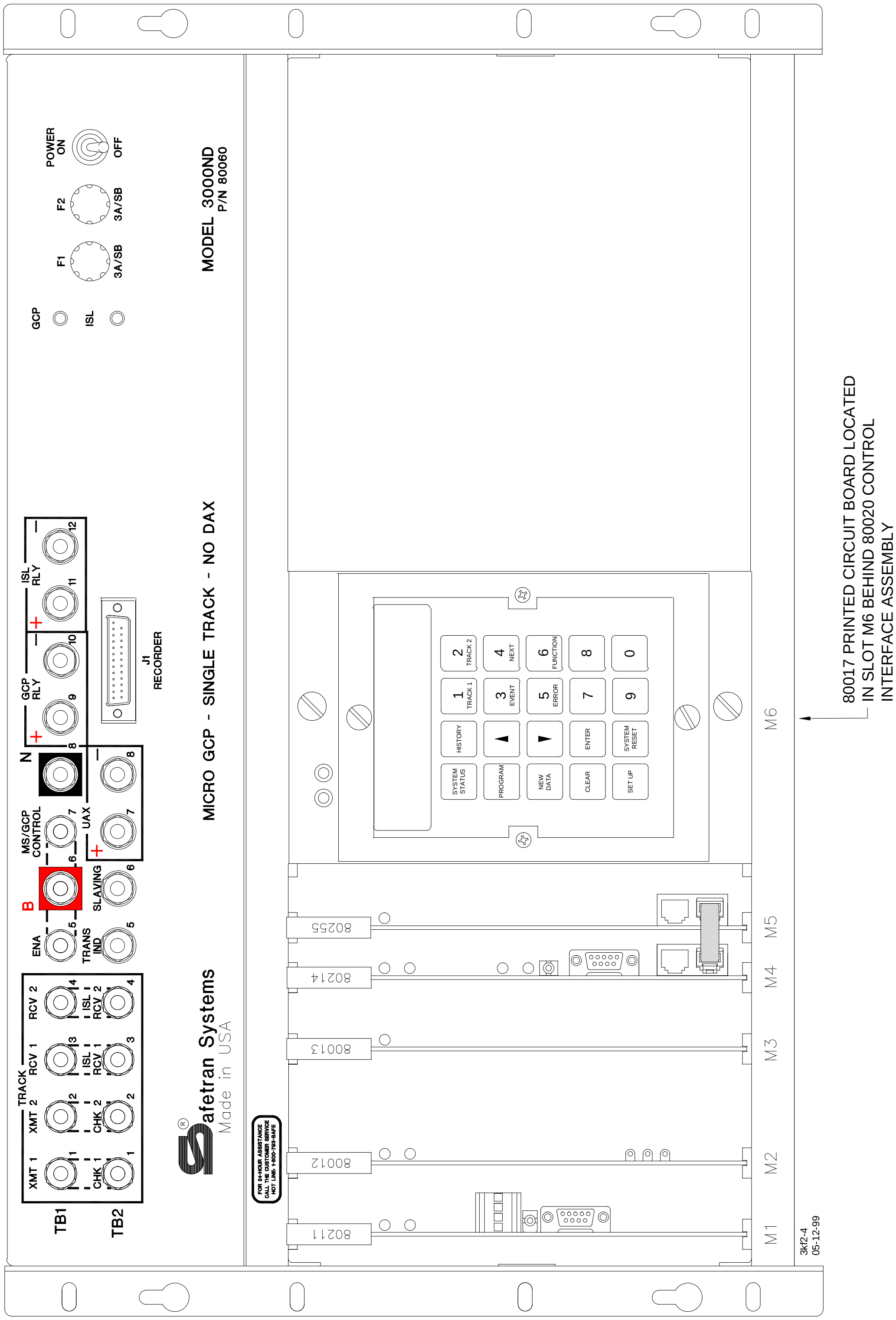


Figure 2-4:
Model 3000ND GCP, External Data Recorder Configuration, Front view

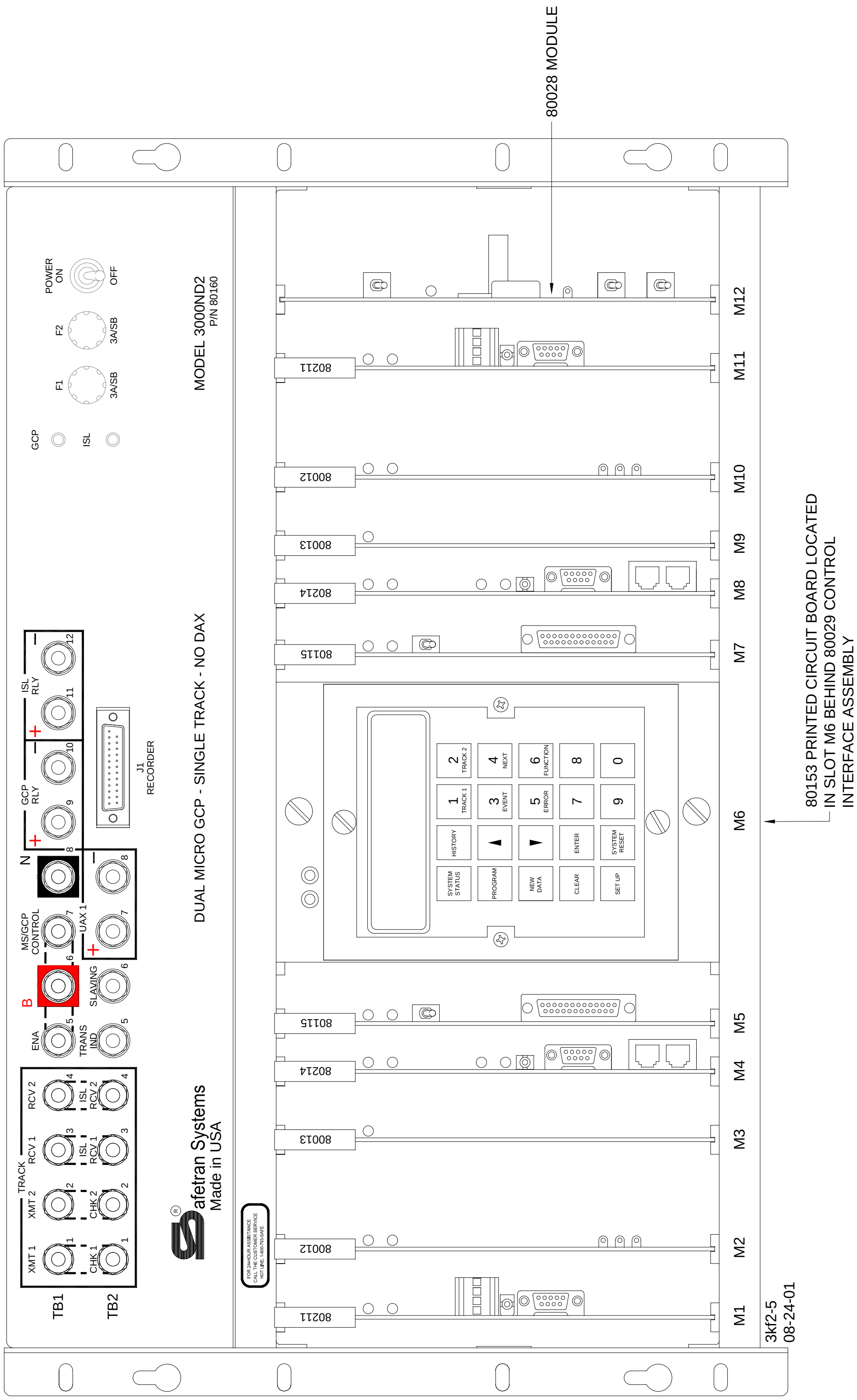


Figure 2-5:
Model 3000ND2 GCP, Internal Data Recorder Configuration, Front view

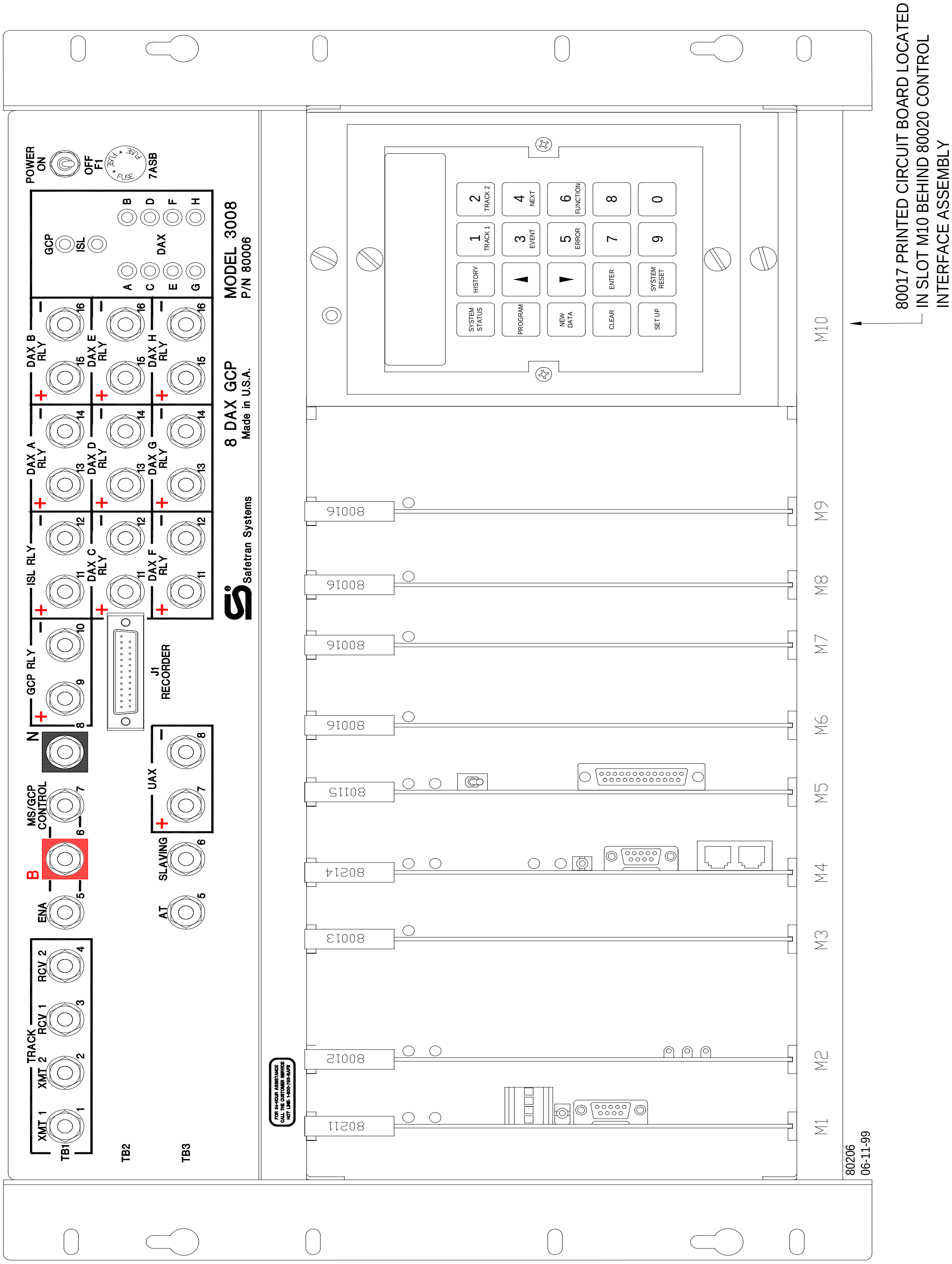


Figure 2-6:
Model 3008 GCP, Internal Data
Recorder Configuration, Front view

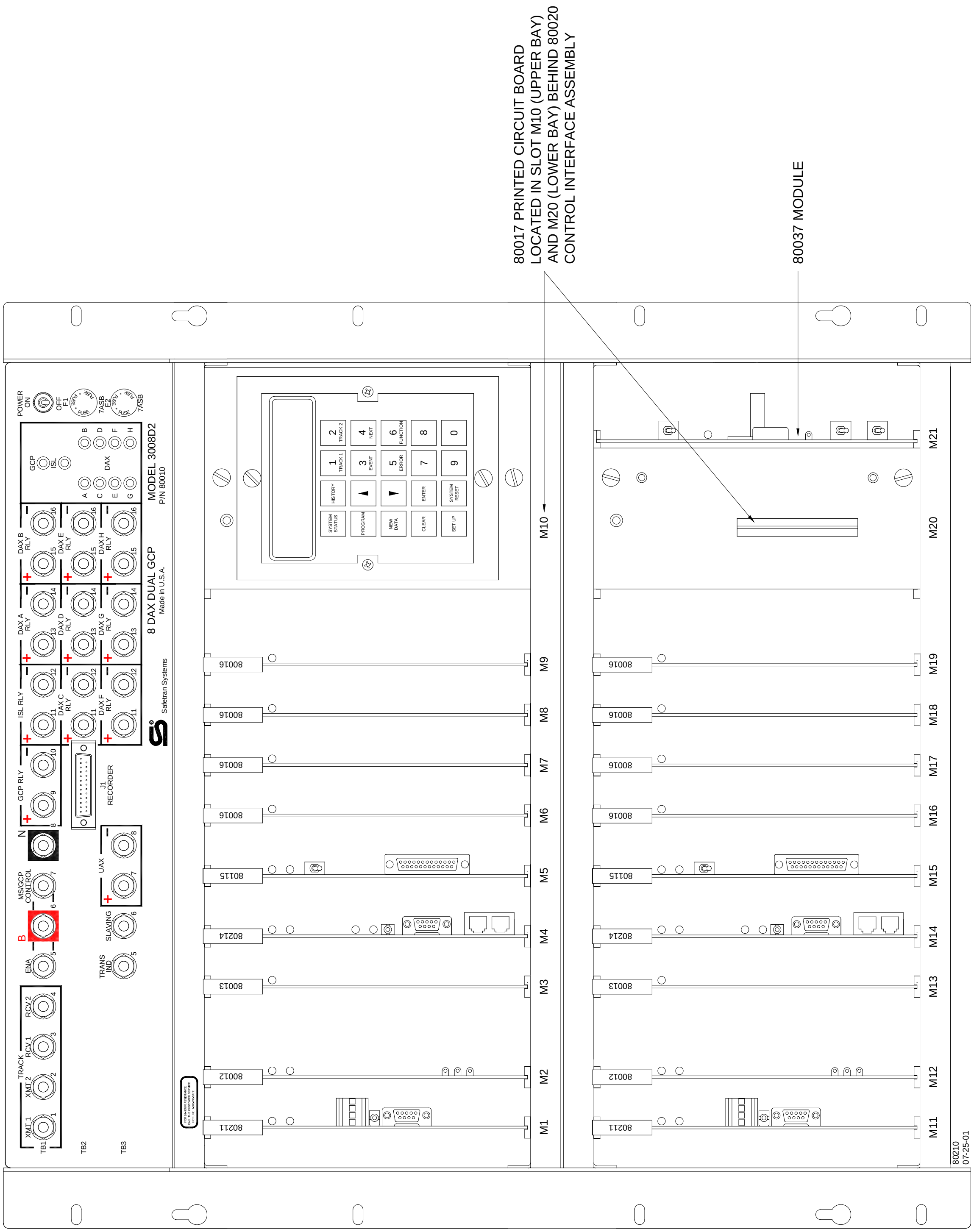


Figure 2-7:
Model 3008D2 GCP, Internal Data Recorder Configuration, Front view

Table 2-3:
System Module/Assembly Requirements

MODULE	PART NO.	SYSTEM CONFIGURATION		MODULE SLOT ASSIGNMENTS[1]				
				MODELS 3000 & 3008	MODELS 3000D2 & 3008D2	MODEL 3000D2L	MODEL 3000ND	MODEL 3000ND2
Intelligent Processor Island (1 or 2) (Optional)	80211[2]	1 Island	(Track 1)	M1	M1 & M11[3]	M1 & M11[4]	M1	M1 & M11[4]
		2 Islands[7]	(Track 1)	M1	M1 & M11[3]	M1 & M11[4]	n/a	n/a
			(Track 2)	M2	M2 & M12[3]	M2 & M12[4]	n/a	n/a
Transceiver (Minimum 1)	80012	1 Track	(Track)[11]	(M2)[8]	(M2 & M12)[9]	n/a	n/a	n/a
			Track 1	M3	M3 & M13	M3 & M13	M2	M2 & M10
		2 Tracks[5,7]		M3 & M4	M3, M4, M13, & M14	M3, M4, M13, & M14	n/a	n/a
Relay Drive	80013	All		(M3)[8] M5	(M3 & M13)[9] M5 & M15	M5 & M15	M3	M3 & M9
Processor	80214[6]	All[7]		M6	M6 & M16	M6 & M16	M4	M4 & M8
Processor	80214[10]	All 8-DAX units		(M4)[8]	(M4 & M14)[9]	n/a	n/a	n/a
Data Recorder (Optional)	80115	---		(M5)[8] M7	(M5 & M15)[9] M7 & M17	M7 & M17	M5	M5 & M7
Data Recorder Interface (Optional)	80255[12]	---		(M5)[8] M7	(M5 & M15)[9] M7 & M17	M7 & M17	M5	M5 & M7
Data Recorder Interface (Optional)	80265[13]	---		(M5)[8] M7	(M5 & M15)[9] M7 & M17	M7 & M17	M5	M5 & M7

Continued on next page

Table 2-3 Concluded

MODULE	PART NO.	SYSTEM CONFIGURATION	MODULE SLOT ASSIGNMENTS[1]				
			MODELS 3000 & 3008	MODELS 3000D2 & 3008D2	MODEL 3000D2L	MODEL 3000ND	MODEL 3000ND2
DAX (Optional)	80016	1 DAX Module	(M6)[8] M8	(M6 & M16)[9] M8 & M18	M8 & M18	n/a	n/a
		2 DAX Modules	(M6 & M7)[8] M8 & M9	(M6, M7, M16 & M17)[9] M8, M9, M18, & M19	M8, M9, M18, & M19	n/a	n/a
		3 DAX Modules[11]	(M6, M7 & M8)[8]	(M6, M7, M8, M16, M17 & M18)[9]	n/a	n/a	n/a
		4 DAX Modules[11]	(M6, M7, M8 & M9)[8]	(M6, M7, M8, M9, M16, M17, M18 & M19)[9]	n/a	n/a	n/a
Control Interface Assembly (Includes Keyboard Interface Printed Circuit Board, 80017)	80020	(3000, 3000D2, 3000D2L, 3000ND, 3008, & 3008D2)	M10	M10 & M20	M10 & M20	M6	n/a
Transfer Timer	80028	3000D2, 3000D2L, & 3000ND2	n/a	M21	M21	n/a	M12
Transfer Timer	80037	3008D2 only	n/a	(M21)[9]	n/a	n/a	n/a
Control Interface Assembly (Includes Keyboard Interface Printed Circuit Board, 80153	80029	(3000ND2)	n/a	n/a	n/a	n/a	M6

1. Module slots are numbered from left to right as viewed from the front of the case and are identified as M1, M2, M3, etc.
2. May be equipped with 80011 Island Module in place of 80211 Intelligent Processor Island Module.
3. Corresponding island modules in the upper and lower bays of the card cage should be the same frequency.
4. Corresponding island modules in the right and left halves of the card cage should be the same frequency.
5. When two transceivers are used (two tracks) in a single-frequency case, both must operate at the same frequency.
6. May be equipped with 80014 or 80044 Processor Module(s) in place of 80214 Processor Module.
7. This configuration not applicable to 8-DAX units (models 3008 & 3008D2).

8. Module slot assignment(s) for model 3008 8-DAX unit only.
9. Module slot assignment(s) for model 3008D2 8-DAX unit only.
10. 8-DAX units (3008 & 3008D2) may be equipped with 80044 Processor Module in place of 80214 Processor Module.
11. Applicable to 8-DAX units only (models 3008 & 3008D2).
12. Used only with 80214 Processor Module.
13. Used only with 80014 and 80044 Processor Modules.

2.3.1 Island Modules

The Island modules are single-board, multi-frequency, modulated, short-range track occupancy detectors.

2.3.1.1 Island Module, 80011

The 80011 Island module consists of separate transmitter and receiver circuits:

The transmitter section:

- consists of a frequency-shifted oscillator operating at a frequency between 4 to 20.2 kHz.
- provides a well defined island circuit
- accommodates an island circuit length of between 120 and 300 feet
- is transformer-coupled to the front panel XMT 1 and XMT 2 terminals.

NOTE

These terminals are connected by a pair of wires to the GCP transmit feed points on the rails, providing a path for both the GCP and island transmitter signals.

The island receiver circuits are transformer-coupled to the TRACK RCV 1 and RCV 2 terminals on the front panel.

- The transmitted signal passes through the island track circuit into the receiver where it enters a bandpass filter, an amplifier, and a two-input relay drive signal gate.
- The signal from the amplifier also follows a parallel path where the frequency shift modulation applied to the transmitter is compared to ensure that the correct signal is being received.

The output from the island's check channel is the second input to the island relay drive signal gate that maintains the island relay voltage.

- This voltage is applied to the ISL RLY terminal(s) on the front panel.
- When a train reaches the island circuit, the island relay drive signal ceases, ensuring that the voltage continues to be removed from the GCP RLY terminals.
- When the last car clears the island circuit, the transmitter signal returns to normal, activating the receiver and allowing the crossing warning device to recover.

2.3.1.2 Intelligent Processor Island Module, 80211

The Intelligent Processor Island (IPI) Module is:

- field programmable for frequency of operation and pickup delay
- microprocessor-controlled
- interchangeable with the earlier 80011 Island Module in all 3000/3008 GCP units

In operation, the IPI module:

- accommodates an island circuit length of between 120 and 350 feet
- interfaces with the rails via the AREMA terminals on the front panels of the GCP
- greatly enhances track occupancy operation in poor island track shunting environments where:
  - contaminated rail or car wheels are prevalent
  - long/light axle-load cars are encountered.

Refer to the Intelligent Processor Island (IPI) Instruction and Installation Manual (Safetran Document SIG-00-97-04) for further discussion of the IPI Module.

2.3.2 Transceiver Module, 80012

The basic 3000/3008 GCP system includes a single transceiver module. However, in models 3000, 3000D2, and 3000D2L, a second identical transceiver module can be installed to enable a single system to control two separate approaches. These approaches may consist of:

- two unidirectional approaches
- two bidirectional approaches
- one unidirectional and one bidirectional approach.

When two 80012 modules are used, each may be used to provide independent frequency operation on T1 and T2 when an 80214 Processor module is installed.

The transceiver module contains:

- transmitter and receiver transformers
- transmitter driver
- receiver filters
- amplitude and zero-crossing detectors
- digitally-controlled gain and attenuator circuits
- A high power transmitter drive that eliminates the requirement for a high-current transmitter coupler.

2.3.3 Relay Drive Module, 80013

A single relay drive module is required for each system. The relay drive module contains a relay driver circuit, analog-to-digital converters, system power supply (DC-to-DC converter), plus island, UAX1, and ENA/UAX2 isolation circuits.

WARNING

IF IN AN APPLICATION, A 3000 "GCP RLY" OUTPUT WILL BE DIRECTLY CONNECTED (NO RELAY ISOLATION) TO INPUTS (UAX, ISL RLY, MS/GSP CONTROL AND/OR ENA) OF ANOTHER GCP AND/OR 2000 MS UNIT, THE SAFETRAN RELAY ADAPTER MODULE A80170 MUST BE INSTALLED ON THE 3000 "GCP RLY" OUTPUT TERMINALS. SEE PARAGRAPH 2.3.10 FOR FURTHER INSTRUCTIONS.

2.3.4 Processor Modules

Each 3000/3008 GCP system incorporates a single processor module containing microprocessor, memory, and digitally controlled frequency generator circuits.

2.3.4.1 Processor Module, 80014

The early 80014 Processor module was used with early 3000 GCP units. The operating program for the 3000 GCP is contained in programmable read only memory (PROM) of the processor module.

- This permits operational features to be enhanced by simply installing updated firmware (system operating software stored in a hardware device).
- The basic software version number for the 80014 Processor module is 8V980-A01F.

2.3.4.2 Processor Module, 80044

The 80044 Processor module is interchangeable with the earlier 80014 processor in all 3000 GCP units, and is also used in the eight-DAX 3008 GCP units.

This module improves GCP operation in areas where poor track shunting conditions are prevalent. A unique software feature enables the module to:

- detect the nonlinear fluctuations in track impedance (EZ) that result from poor shunting
- automatically switch to an enhanced detection (ED) operating mode

In the ED mode:

- The 3000 GCP effectively operates as a highly sensitive motion sensor
- Internal software logic compensates for any track impedance fluctuations that are detected as a train approaches or moves away from a crossing.
- All preempts and DAX's are switched to the poor shunting mode to ensure adequate warning time and prevent over-rings and tail rings at the crossing.

For any train moves where the 3000/3008 GCP does not detect poor shunting conditions, the system continues to operate as a conventional grade crossing predictor.

The enhanced detection-operating mode can be activated or inhibited via system programming as required.

WARNING

EVEN THOUGH ENHANCED DETECTION IS DESIRED AND PROGRAMMED "ON", IF TRAIN TRAFFIC IS MINIMAL, ESPECIALLY IN DARK TERRITORY, RUST BUILD-UP ON THE RAILS MAY NOT ALLOW ANY TRACK SHUNTING TO OCCUR. THE 3000 GCP MUST DETECT TRAIN SHUNTING (REASONABLE EZ FLUCTUATION) IN ORDER TO DETECT POOR SHUNTING.

NOTE

Intermittent poor shunting can result just about anywhere due to numerous causes but generally occurs due to infrequent track usage, lightly weighted cars, passenger and transit operation, spillage from rail cars, and 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 improved through 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. This improves shunting and thus allows the 3000 Enhanced Detection software to function properly.

The 80049 Safetran DC Shunting Enhancer Panel provides a cost-effective solution for improving shunting in dark territory by applying a nominal 6 volts DC to the track at the crossing to break down the film on the rails. Refer to Section 3, paragraph 3.3.4 for a discussion of the 80049.

For areas where poor ballast conditions are a problem, a Low EX Adjustment mode is provided with the 80044 Processor Module. This mode:

- Allows the low EX operating threshold to be lowered below the preset value (39) when field conditions permit
- Enable the GCP to operate under ballast conditions that might otherwise prohibit GCP operation.

To accommodate the extensive requirements of the enhanced track shunting detection software program, the 80044 processor:

- Is equipped with additional onboard memory
- Operates at a faster internal clock speed.

The operating program for the 3000/3008 GCP is contained in programmable read only memory (PROM) of the processor module.

- This permits operational features to be enhanced by simply installing updated firmware (system operating software stored in a hardware device).
- The basic software version number for the 80044 Processor Module is 9V065-XXXX.

2.3.4.3 Processor Module, 80214

The 80214 Processor module is interchangeable with the earlier 80014 and 80044 processors. This module:

- Incorporates all of the features of the 80044 Processor
- Enables independent frequency operation on both track 1 (T1) and track 2 (T2) when installed in one of the dual-frequency (80110, 80140, or 80200) GCP cases.

When the 80214 Processor is installed in a single-frequency case, only single frequency operation is available.

The operating program for the 3000/3008 GCP is contained in flash memory located on the Processor module.

- This permits operational features to be enhanced by downloading new software.
- Instructions for installing new software will be provided when a new software revision level is issued.
- The basic software version number for the 80214 Processor module is 9V121-XXXX.

2.3.5 Data Recorder Modules

The optional data recorder modules allow information concerning train moves and system status messages to be stored for future use.

2.3.5.1 Data Recorder Module, 80015

The 80015 Data Recorder module contains a microprocessor, onboard memory (RAM and ROM), plus a real-time clock.

- A long-life lithium battery provides backup power in the event of failure of the primary power source.
- An RS232C interface is provided for local access to stored information via a personal computer (PC) or portable printer.

2.3.5.2 Data Recorder Module, 80115

The 80115 Data Recorder Module is a direct replacement for the earlier 80015 Data Recorder Module, which is no longer available.

The switches, LED's, and connectors of this module are identical in function and location to those on the 80015 Module.

The calibration and memory dump procedures of this module are identical to those of the 80015.

The 80115 features a 68332 microprocessor and flash memory.

Without a data recorder module installed, a basic system will retain train history information for a maximum of 20 events.

- Stores event warning time and speed.
- Does not store event date and time.

When two transceiver modules are used, a maximum of 10 moves will be retained for each track circuit (T1 and T2).

With the data recorder module installed:

- Capacity is increased to approximately 3,000 events,
- Including the date and time for each event.

Refer to Section 9, Data Recorder, for additional information.

2.3.6 Data Recorder Interface Modules (80255, 80265) For Safetran's Event Analyzer Recorder (SEAR)

The optional 80265 and 80255 Data Recorder Interface modules provide an interface to connect to Safetran's Event Analyzer/Recorder (SEA/R), 80251, and allow the SEA/R to record the following data:

- warning time
- speed
- diagnostic data

Both modules plug into the data recorder slot.

- The 80265 module is intended for use in systems with 80014 or 80044 Processor modules
- The 80255 module is designed for use in systems utilizing the 80214 Processor module.

Both modules transfer data to **Recorder** connector (**J1**) on the front panel of the GCP.

- The GCP to Network Interface Plug Assembly (80063), plugs into J1, providing the connection points for the two-wire LonTalk™ network connections to the SEAR.

2.3.7 DAX Module, 80016 (3000, 3000D2, 3008, 3008D2, And 3000D2L Only)

The 80016 DAX Module provides two independent DAX relay drives:

- A maximum of two DAX modules may be installed in the 3000, 3000D2, and 3000D2L model GCP's. This provides a maximum of 4 relay drives.
- A maximum of four DAX modules may be installed in the 3008 and 3008D2 8-DAX systems. This provides a maximum of 8 relay drives.

2.3.8 Transfer Timer Modules

The Transfer Timer modules provide operational switch over from the main GCP circuits to identical standby circuits when the main GCP circuits fail. The main GCP circuits are located in the:

- Upper bay of the 3000D2 and 3008D2 GCPs
- Left half of the bay of the 3000D2L and 3008 GCP's.

2.3.8.1 Transfer Timer, 80028

The 80028 Transfer Timer module is used with the 3000D2, 3000D2L, and 3000ND2 model GCP's. The module location within these units is shown on the following illustrations:

- 3000D2: Figure 2-2
- 3000D2L: Figure 2-3
- 3000ND2: Figure 2-4

A switchover delay ranging from 1 to 31 minutes in 1-minute increments is selectable on the module.

- Programming is generally not required, as the unit is set at the factory for the recommended delay of 3 minutes.
- During the switchover period, the crossing warning equipment (gates, lights, bells, etc.) is enabled.
- When the standby circuits fail following switch over, circuits on the 80028 module continuously search for operational GCP circuits.

The switchover delay interval is programmable via DIP switch S4 located on the 80028 module, Figure 2-8. The five S4 segments correspond to the binary values printed on the printed circuit board adjacent to S4. To select a value, set the corresponding switch lever(s) to the down or closed (ON) position as shown.

The 80028 module also controls switch over of the 3000D2 and 3000D2L GCP DAX circuits. For this reason, DIP switch S1 (see Figure 2-8) on the module must also be set to the corresponding number of DAX circuits programmed for the system.

- When the system is not programmed for an associated DAX circuit, the corresponding S1 section is set to the DAX NOT USED position

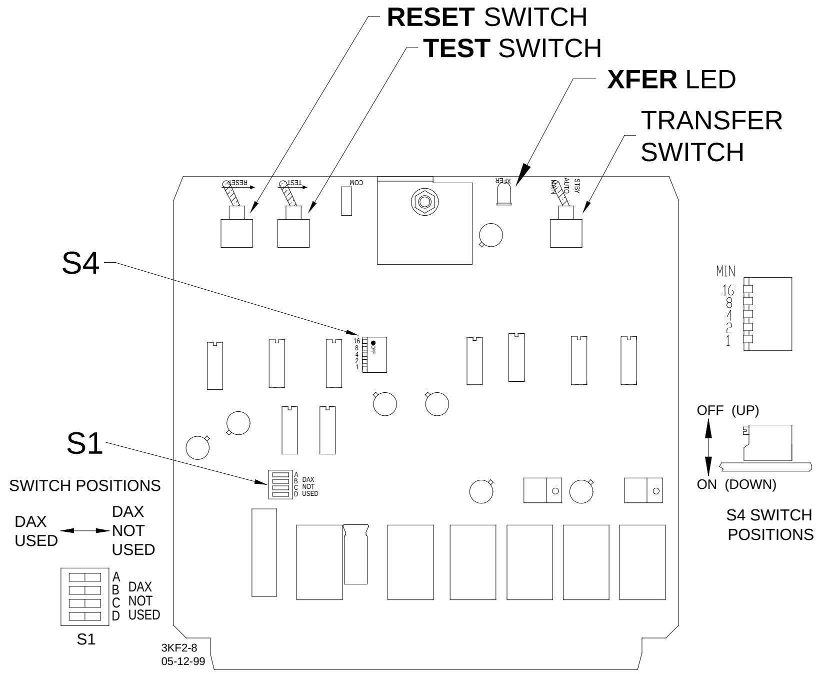


Figure 2-8:
Switch Locations on Transfer Timer Module, 80028

- When the system is programmed for one or more DAX circuits, the corresponding switch sections are set to the DAX USED position.

NOTE

For 3000ND2 GCP's, all S1 sections must be set to the DAX NOT USED position.

- For a description of the remaining switches shown in Figure 2-8, refer to Table 2-5.

2.3.8.2 Transfer Timer, 80037

The 80037 Transfer Timer module is used with the 3008D2 model GCP, Figure 2-7.

If the main GCP circuits in the upper bay fail, the 80037 module transfers operation from the main GCP circuits to the standby GCP circuits in the lower bay.

- A switchover interval ranging from 1 to 31 minutes in 1-minute increments is selectable on the module.
- Unit is set at the factory for a switchover delay of 3 minutes.
- During the switchover period, the crossing warning equipment (gates, lights, bells, etc.) is enabled.

When the standby circuits fail following switch over, circuits on the 80037 module continue to search for operational GCP circuits.

The switchover interval is programmable via DIP switch SW3 located on the 80037 module, Figure 2-9.

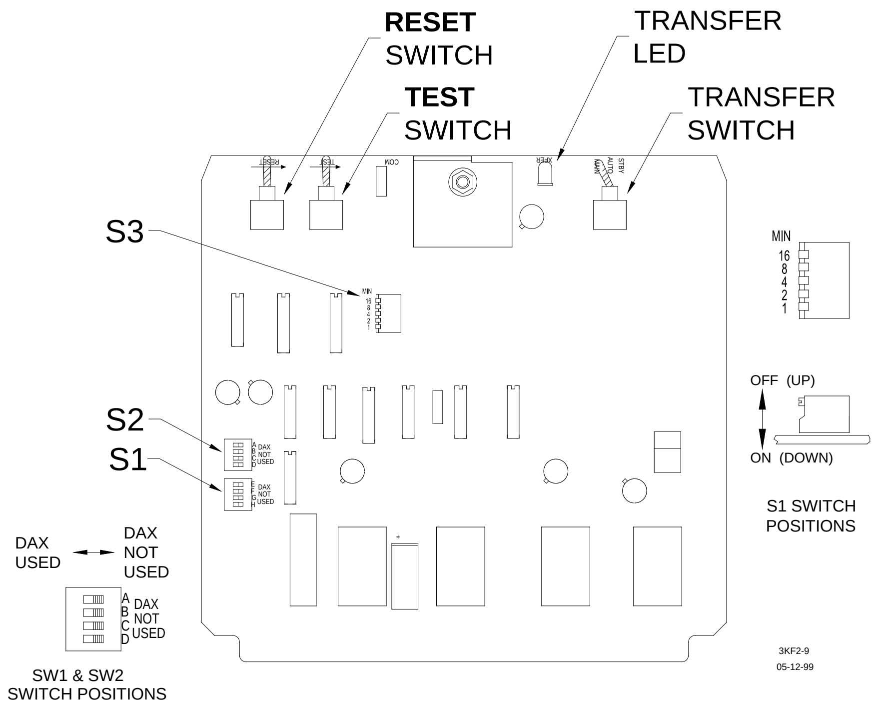


Figure 2-9:
Switch Locations on 80037 Transfer Timer Module

- The five segments of SW3 correspond to the binary values printed on the circuit board adjacent to SW3.
- To select a value, set the corresponding switch lever(s) to the down or closed (ON) position as shown.

The 80037 module also controls switch over of the 3008D2 DAX circuits. For this reason, switches S1 and S2 on the module must be set to the corresponding DAX circuits programmed for the system.

NOTE

A DAX is deselected when the corresponding switch section is in the **DAX NOT USED** position (see Figure 2-9). For example, when DAX A and B are programmed, switch sections **A** and **B** (marked on the PC board adjacent to SW2) are set to the **DAX USED** position. The remaining switch sections on S1 and S2 are set to the **DAX NOT Used** position.

The other switches identified on Figure 2-9 are described in Table 2-5.

2.3.9 Control Interface Modules (located behind Keyboard/Display Control Unit)

These modules provide the interface between the detachable 80019 Keyboard/Display Control Unit and the 3000GCP data bus.

- Data bus interface is controlled by signals received from the 80028 Transfer Timer module.

2.3.9.1 <u>Control Interface Assembly, 80020 (All Models Except 3000ND2)</u>

The 80020 Control Interface Assembly is used in all GCP Model except the 3000ND2.

- This module contains the 80017 Keyboard Interface printed circuit board.
- The 80017 provides the interface between the 80019 Keyboard and the GCP data bus.

2.3.9.2 <u>Control Interface Assembly, 80029 (3000ND2 Only)</u>

The 80029 Control Interface Assembly is used only in the Model 3000ND2 GCP.

- This module contains the 80153 Keyboard Interface printed circuit board.
- The 80153 provides the interface between the 80019 keyboard and the GCP data bus in each half of the card cage.

2.3.9.3 <u>Advanced Control Interface Assemblies (80020 and 80029)</u>

Advanced versions of the 80020 and 80029 Interface Assemblies are provided with expanded NOVRAM system memory. These advanced units are required to implement the advanced features of the 3000 GCP.

<u>NOTES</u>

Most of the advanced features of the GCP are not available when any of the following are used in an Advanced 3000 case:

- 80014 or 80044 Processor modules
- 80020/80029 Control Interface assembly using older, non-expanded memory

To identify the 80020 and 80029 Interface Assemblies having expanded memory modules, an **EXPANDED MEMORY** or a **512** sticker, is placed on the left side near the front edge of each assembly.

2.3.10 Relay Adapter Module (A80170)

Relay Adapter Module (Safetran P/N 8000-80170-001) (see Figure 2-10) must be installed in all existing and future applications where a 3000 GCP will be used to directly drive (no relay isolation) any UAX, ISL RLY, MS/GCP CONTROL and/or ENA input on one 3000 GCP and/or 2000 MS unit by the GCP RLY (3000 GCP) and/or MS RLY (2000 MS) output of another unit. The Relay

Adapter Module A80170 is installed external to the 3000 GCP unit and can be wired into the system as shown in Figure 1-10, 1-11, and 1-14.

NOTE

The Relay Adapter Module is not required where vital relays are used as an interface between the UAX, ISL RLY, MS/GCP CONTROL and/or ENA inputs of one unit and the GCP RLY (3000 GCP) or MS RLY (2000 MS) output of another unit.

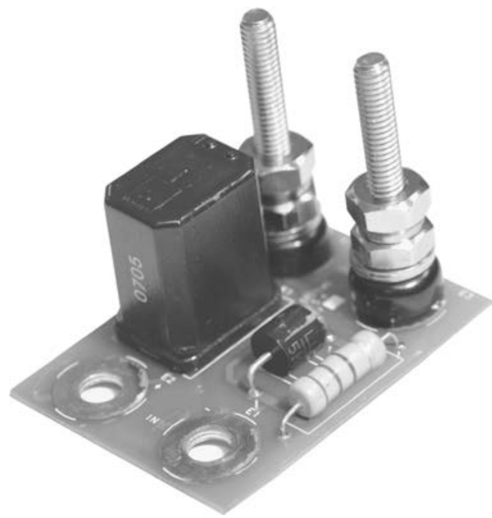


Figure 2-10:
The Relay Adapter Module, A80170

Perform the following steps to install the Relay Adapter Module on a 3000 GCP:

1. Remove all wires from terminal 9 on the front panel, including any event recorder wires (terminal 9 = GCP RLY (+)).
2. Connect all wires removed in step 1 to the OUT (+) terminal on the A80170 Relay Adapter Module.
3. Remove all wires from terminal 10 on the front panel, including any event recorder wires (10 = GCP RLY (-)).
4. Connect all wires removed in step 3 to the OUT (-) terminal on the A80170 Relay Adapter Module.
5. Slide the mounting holes at the base of A80170 Module onto terminals 9 and 10 of the 3000 GCP nit. Fasten the A80170 Module securely using appropriate AREMA-compliant hardware.
6. When installation of the A80170 module is complete, test UAX, ISL RLY, MC/GCP CONTROL and/or ENA circuits per railroad policies and procedures.

2.4 KEYBOARD/DISPLAY CONTROL UNIT, 80019

The keyboard/display control unit:

- Attaches to an edge connector on the keyboard interface printed circuit board (80017 or 80153) via an opening in the front of the control interface assembly (80020 or 80029)
- Serves as the communications interface between the user and the system.

Programming the system for specific applications is accomplished through simple keystrokes.

The liquid crystal display enables the user to view:

- diagnostic information
- application programming entries
- train move data.

2.4.1 Keyboard

The one-piece membrane keyboard (see Figure 2-11) contains 20 embossed keys arranged in four vertical columns of five keys each.

- Refer to Section 4, Keyboard/Display And Menu Descriptions, for a discussion of the keys and the function(s) that each controls.

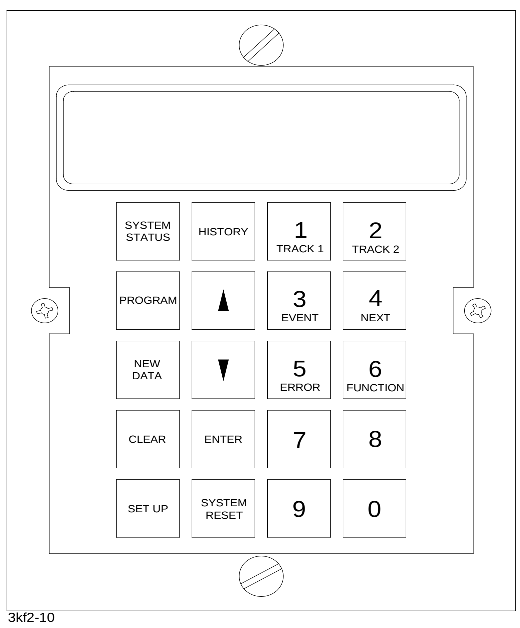


Figure 2-11:
3000 GCP Keyboard/Display

2.4.2 Liquid Crystal Display

The liquid crystal, alphanumeric display consists of two rows, each containing 16 character positions.

- All programmed parameters, system power supply voltages, and recorded data are viewed on the display.
- Figure 2-12 illustrates typical displays for each of the various keyboard selected operating modes.
- Refer to Section 4, Keyboard/Display And Menu Descriptions, for examples and explanations of each display.

Initial System Display:	**MODEL 3000** **MICRO GCP**	History Mode Display:	**HISTORY T1 <08>** **WARNING TIME: 30**
Program Mode Display:	**PROGRAM NUMBER** **OF TRACKS 2**	Reset Mode Display:	**SYSTEM RESET**
Function Mode Display:	**T1 SWITCH TO MS** **EZ: 100 EX: 87**	Setup Mode Display:	**SETUP T1**
Status Mode Display:	**STATUS T1** **EZ: 100 EX: 87**	Diagnostic Mode Display:	**ERROR 9118 <02>** **T2 GAIN CHECK**

Figure 2-12:
Operating Mode Displays

The display-viewing angle can be changed to permit easier viewing when the 3000 GCP is mounted at or below eye level.

Switch S1 (see Figure 2-13) located on the keyboard interface printed circuit board (80017 or 80153) provides viewing angle control.

- With S1 in the down position, the display is best viewed from a position where the line of sight is perpendicular to the display (eye level).
- With S1 in the up position, the display is easier to read when viewed from above at an angle of approximately 45 degrees from horizontal.

NOTE

The control interface assembly (80020 or 80029) must be removed from the 3000 GCP case to gain access to switch S1.

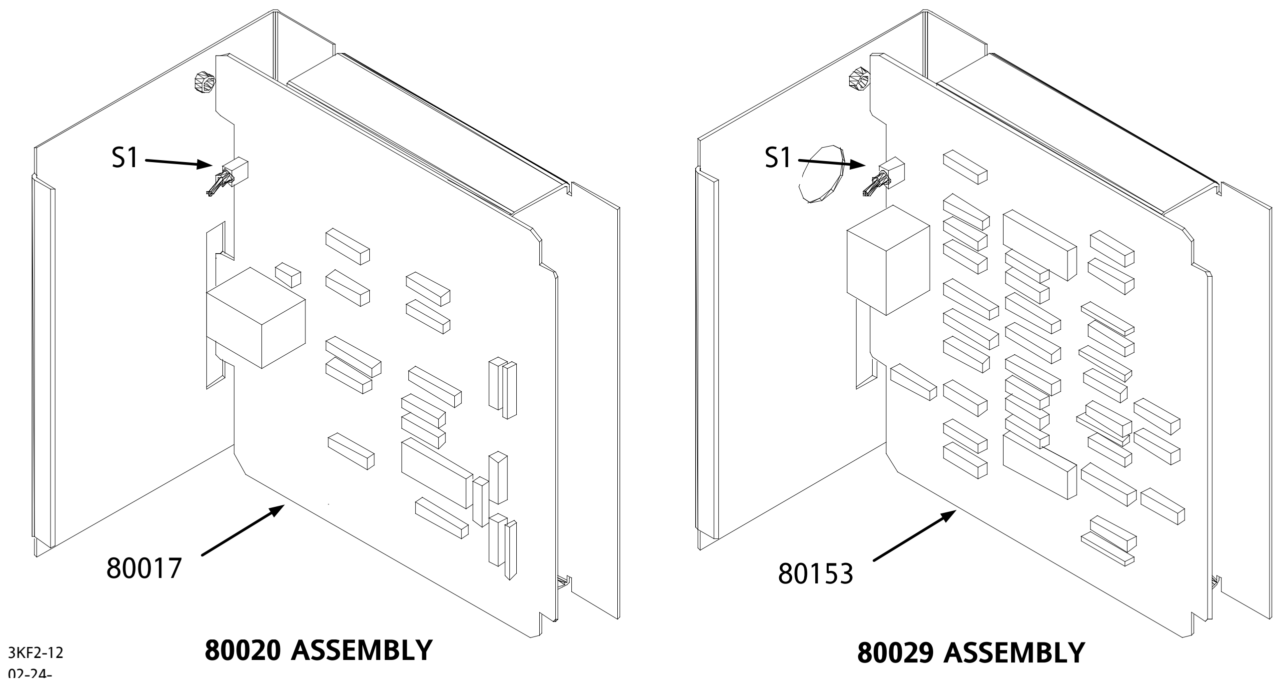
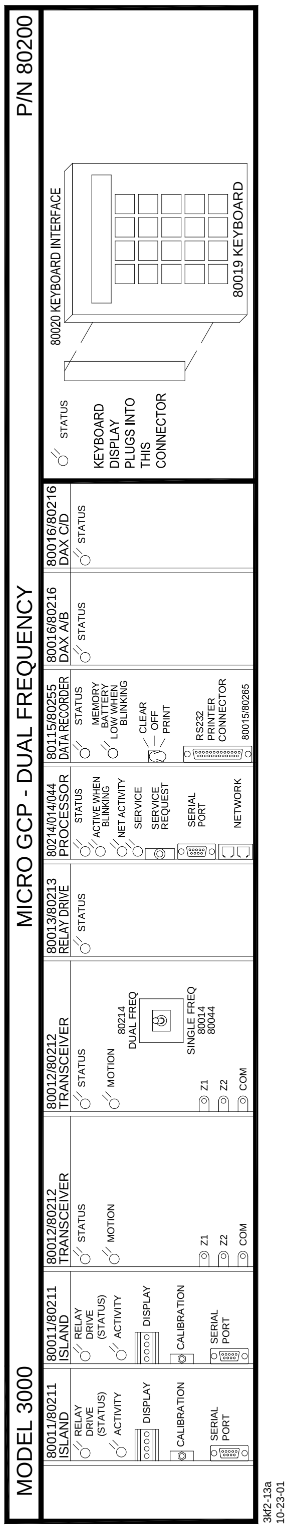


Figure 2-13:
Location of Display Viewing Angle Switch, S1

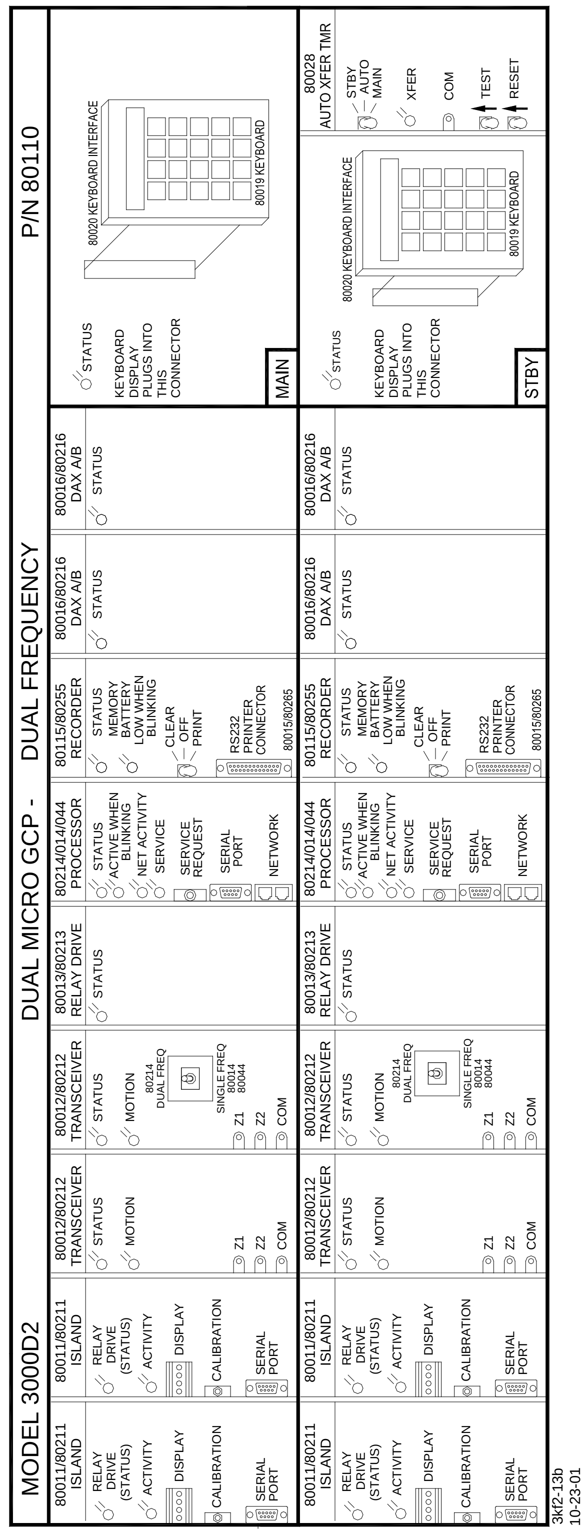
2.5 STATUS INDICATORS, CONTROLS, SWITCHES, TEST JACKS, AND CONNECTORS

The location of the status indicators, controls, switches, test jacks, and connectors of each GCP model are shown in Figures 2-13 through 2-16. The description of each of these elements is provided in:

- Table 2-4 - LED Status Indicators
- Table 2-5 - Control and Switches
- Table 2-6 - Test Jacks and Connectors

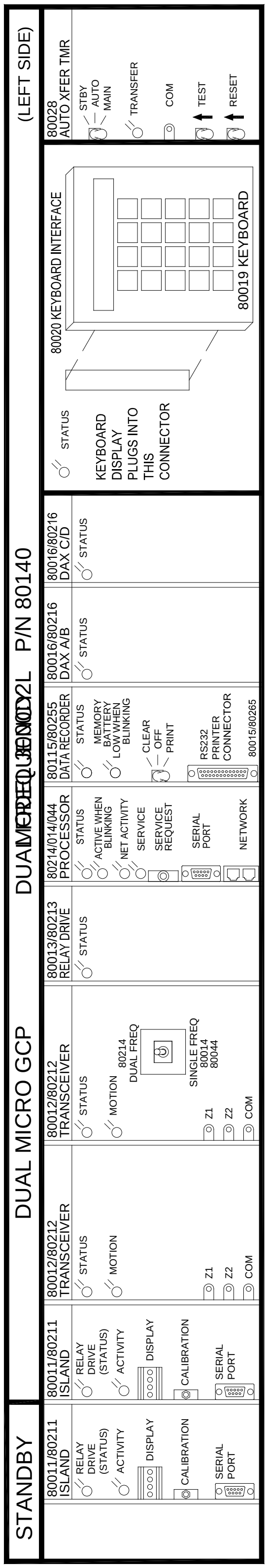


Module 3000 Module Locator Guide

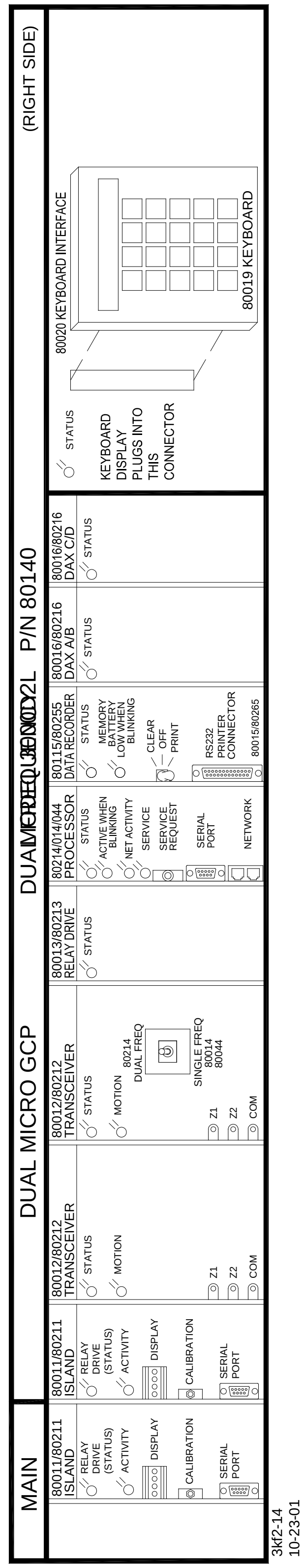


Module 3000D2 Module Locator Guide

Figure 2-14:
Model 3000 & 3000D2 Module Locator Guides

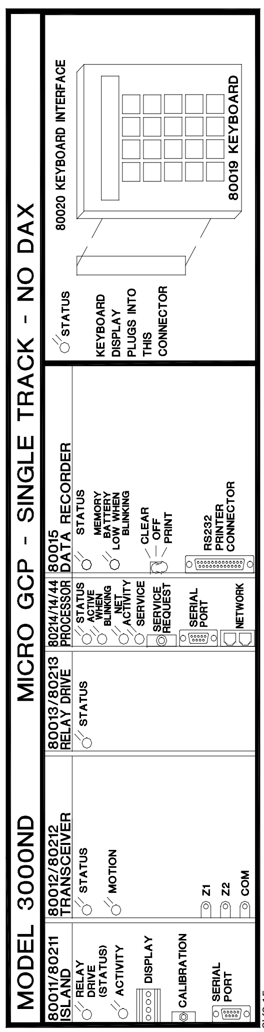


Right Side of Case

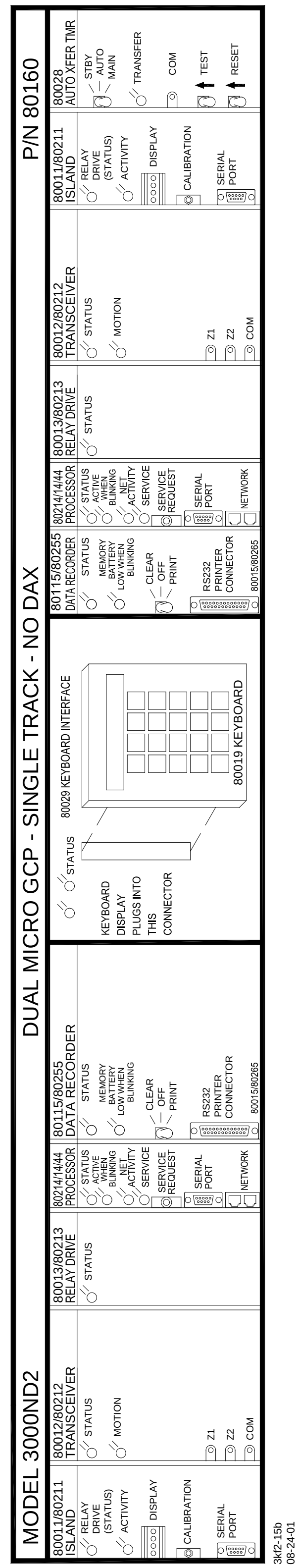


Left Side of Case

Figure 2-15:
Model 3000D2L GCP Module Locator Guide

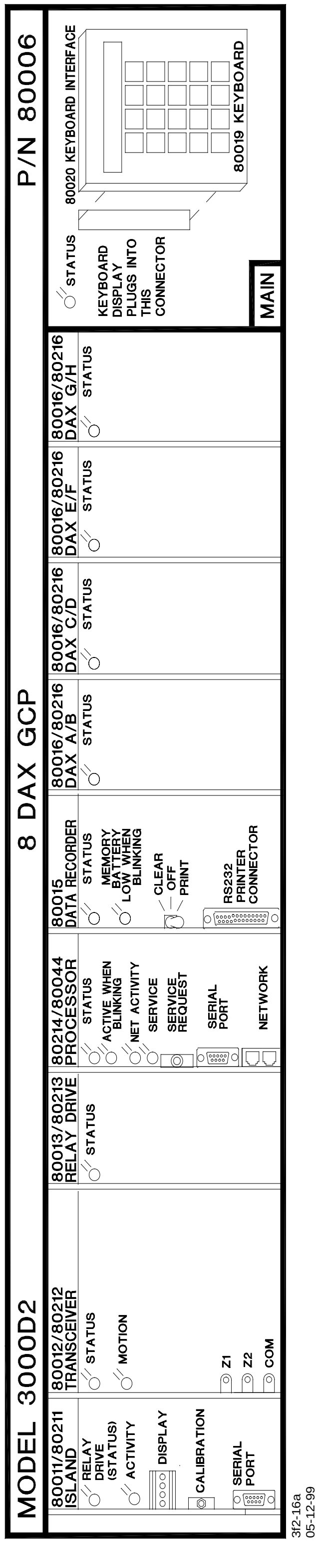


Model 3000ND Module Locator Guide

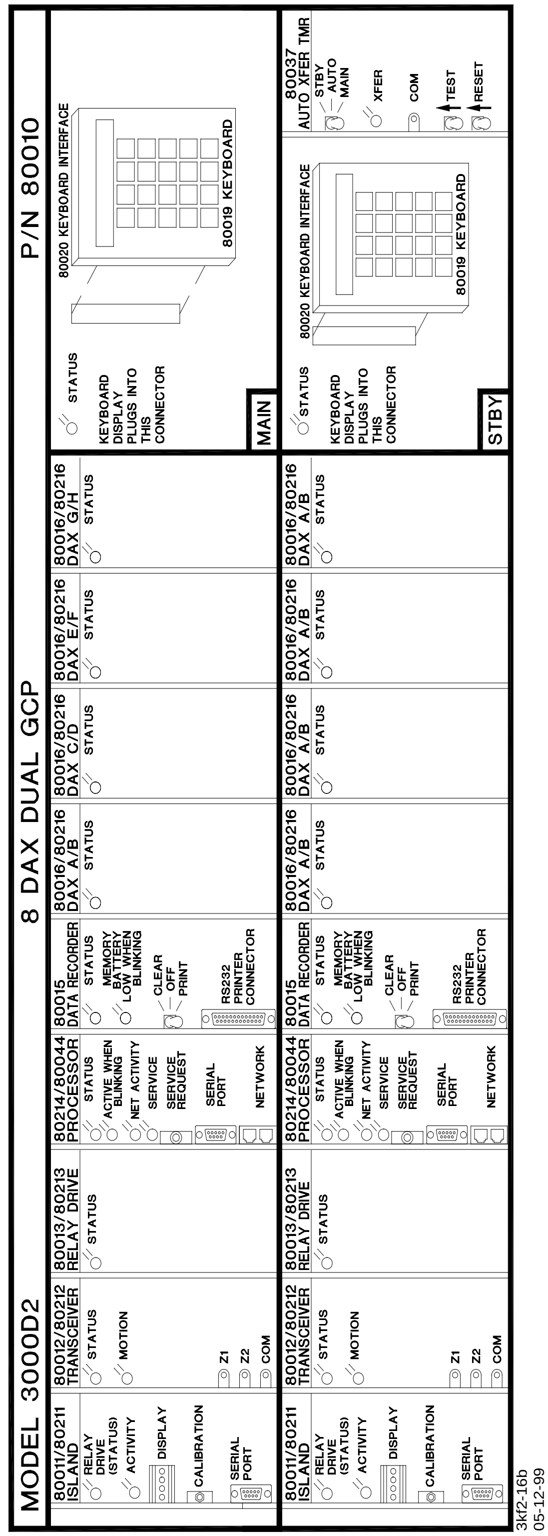


Module 3000ND2 Module Locator Guide

Figure 2-16:
Model 3000ND & 3000ND2 Module Locator Guides



Model 3008 Module Locator Guide



Model 3008D2 Module Locator Guide

Figure 2-17:
Model 3008 & 3008D2 Module Locator Guides

Table 2-4:
Module-Mounted LED Status Indicators

MODULE	NOMENCLATURE	INDICATION
80011	STATUS	Lighted steady = island relay drive present Extinguished = no island relay drive
80012	STA	Lighted steady = module operational Flashing = problem on module or track
	PRD	Motion indicator. Normally lighted; extinguished when inbound motion is detected (meaningless when a train occupies the island circuit)
80013	STA	Lighted steady = module operational Flashing = problem on module
80014	STA	Lighted steady = module operational Flashing = problem on module
	ACT	Activity indicator. Flashes when processor is operational and program is running; lighted steady or extinguished if processor fails
80015	STATUS	Lighted steady = module operational Flashing = problem on module
	LO BATT	On-board battery status indicator. Lighted steady when on-board lithium battery voltage is normal; flashes when battery is low
80016	STATUS	Lighted steady = module operational Flashing = problem on module
80020 (3000, 3008, 3000D2, 3008D2, & 3000D2L Only)	n/a	Status LED. Mounted on keyboard interface printed circuit board (80017) and extends through panel above control interface assembly. Lighted steady = assembly operational Flashing = problem on keyboard interface printed circuit board
80028 (3000D2, 3000D2L, & 3000ND2 Only)	XFER	Transfer indicator. Normally lighted; extinguishes when main-to-standby GCP transfer occurs
80029 (3000ND2 Only)	n/a	Status LED's. Mounted on keyboard interface printed circuit board (80153) and extend through panel above control interface assembly. Each LED indicates status for one of the two identical interface circuits on the printed circuit board. Lighted steady = assembly operational Flashing = problem in associated interface circuit on printed circuit board Extinguished = circuit not in use

Continued on next page

Table 2-4 Concluded

MODULE	NOMENCLATURE	INDICATION
80037 (3008D2 Only)	XFER	Transfer indicator. Normally lighted; extinguishes when main-to-standby GCP transfer occurs
80044	STA	Lighted steady = module operational Flashing = problem on module
	ACT	Activity indicator. Flashes when processor is operational and program is running; lighted steady or extinguished if processor fails
80115	STATUS	Lighted steady = module operational Flashing = problem on module
	LO BATT	Lighted steady = on-board lithium battery voltage is normal Flashing = battery is low
80211	STATUS	Lighted steady = module operational Flashing = problem on module
	ACT	Activity indicator. Flashes when processor is operational and programming is running; lighted steady or extinguished if processor fails.
	DISPLAY	Four-character alphanumeric display. See Safetran Document SIG-00-97-04 for a detailed discussion of IPI display messages
80214	STA	Lighted steady = module operational Flashing = problem on module
	ACT	Activity indicator. Flashes when processor is operational and program is running; lighted steady or extinguished if processor fails
	NETWORK ACTIVITY	Lighted during Echelon® LAN communication
	SERVICE	Flashes when the **SERVICE REQUEST** push button on the module is pressed and when the network is accessed.
80255	(DS1)	Lighted steady = module operational Flashing = problem on module
80265	STATUS	Lighted steady = module operational Flashing = problem on module
	NETWORK ACTIVITY	Lighted during Echelon® LAN communication
	SERVICE	Lighted when **SERVICE REQ.** push button is pressed

Table 2-5: Module-Mounted Control And Switches

MODULE	NOMENCLATURE	FUNCTION
80011	ADJ	Potentiometer for island circuit adjustment during system calibration (see Section 6)
80015	CLEAR-OFF-PRINT	Controls data recorder module memory clear and print functions
80028 (3000D2, 3000D2L, & 3000ND2 Only)	STBY-AUTO-MAIN	Selects standby/main operating system or automatic transfer mode
	TEST	When pressed, forces automatic transfer from main to standby GCP
	RESET	Following transfer, press to return to main GCP.
80037 (3008D2, Only)	STBY-AUTO-MAIN	Selects standby/main operating system or automatic transfer mode
	TEST	When pressed, forces automatic transfer from main to standby GCP
	RESET	Following transfer, press to return to main GCP.
80214	SERVICE REQ..	When pressed, accesses the network via the Echelon® LAN

Table 2-6: Module-Mounted Test Jacks And Connectors

MODULE	NOMENCLATURE	FUNCTION
80011	+7	+7 VDC test jack
	+4	+4 VDC test jack
	MOD	Modulation test jack. Measures -5.8 VDC when modulation has been detected.
	ENV	Envelope test jack. Voltage from +1 to -5 VDC with -3 VDC at minimum detection threshold and -5 VDC at saturation.
	COM	Signal common test jack
80012	Z1	Analog approximation (not linearized) of EZ value on main channel as displayed on 80019 display. Approximately 10 VDC when no train is present 0 VDC with a train in the island circuit
	Z2	Analog equivalent of check channel (EZ)
	COM	Signal common test jack
80015	J2	RS232 PC/printer connector
80028 (3000D2, 3000D2L, & 3000ND2 Only)	COM	Signal common test jack

Continued on next page

Table 2-6 Concluded

MODULE	NOMENCLATURE	FUNCTION
80037 (3008D2, Only)	COM	Signal common test jack
80044	J1	RS232 serial port Permits technical support personnel to monitor 3000 GCP functions via a laptop or PC.
80214	J1	Dual RJ11 connectors. For use with Echelon® bus.

2.6 FRONT PANEL TERMINALS, INDICATORS, AND CONTROLS

The front panel terminals, indicators, and controls for each GCP model are described in the tables indicated below:

Table 2-7:
GCP Terminal, Indicator, and Control Cross Reference Chart

MODEL	FIGURE	TABLE
3000	2-1	2-8
3000D2	2-2	
3000D2L	2-3	
3000ND	2-4	2-9
3000ND2	2-5	
3008	2-6	2-10
3008D2	2-7	

Refer to the referenced illustration for GCP module location.

Table 2-8:
Front Panel Terminals, Indicators, and Controls (Models 3000, 3000D2, And 3000D2L)

GCP MODEL	TERMINAL/ INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3000, 3000D2, & 3000D2L	TB1-1	TRACK 1 XMT 1	GCP track 1 transmitter output to track
	TB1-2	TRACK 1 XMT 2	GCP track 1 transmitter output to track
	TB1-3	TRACK 1 RCV 1	GCP track 1 receiver input from track
	TB1-4	TRACK 1 RCV 2	GCP track 1 receiver input from track

Continued on next page

Table 2-8 Continued

GCP MODEL	TERMINAL/ INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3000, 3000D2, & 3000D2L	TB1-5	ENA (UAX2)	Used to cascade the relay drive output (XR circuit) from another GCP. Voltage level at this terminal must be greater than +5 VDC. Normally connected to **TB1-6 (B)** when not in cascade operation. Beginning with "F" level software, the **ENA**ble terminal can provide two functions: • Conventional ENA function when programmed for zero time when cascading GCP outputs • Second UAX (**ENA/UAX2**) input for use with the track 2 section of the GCP. NOTE: A new programming step has been added to the Program menu to select a pickup delay time for the UAX2 function of the terminals. A 25-second ENA/UAX2 default time is provided.
	TB1-6	B	Battery B input to GCP case
	TB1-7	MS/GCP CONTROL	External input that can be used to convert GCP to motion sensor by connecting terminal to negative battery (+) via external relay. Relay contacts must connect terminal to positive battery (B) when not in motion sensor mode. When not used, connect to TB1-6 (B). This input is also used to implement the Advanced Preempt Timer (para 4.17.21) and Transfer Delay Timer (para 4.17.2) Functions.
	TB1-8	N	Battery N input to GCP case
	TB1-9	+ GCP RLY	Positive (+) GCP relay drive output. Drives relays of 400 to 1,000 ohms.
	TB1-10	- GCP RLY	Negative (-) GCP relay drive output. Drives relays of 400 to 1,000 ohms.
	TB1-11	+ ISL RLY 1	Positive (+) island 1 relay drive output. May be used to drive external island relay of 400 to 1,000 ohms, where desired

Continued on next page

Table 2-8 Continued

GCP MODEL	TERMINAL/ INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3000, 3000D2, &3000D2L	TB1-12	- ISL RLY 1	Negative (-) island 1 relay drive output. May be used to drive external island relay of 400 to 1,000 ohms, where desired
	TB1-13	+ DAX A RLY	Positive (+) DAX A relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-14	- DAX A RLY	Negative (-) DAX A relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-15	+ DAX B RLY	Positive (+) DAX B relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-16	- DAX B RLY	Negative (-) DAX B relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-17	TRACK 1 CHK 1	Check receiver input from track 1
3000D2L Only	TB1-18	TRACK 1 CHK 2	Check receiver input from track 1
	LED	GCP	GCP relay drive indicator. Lights when relay drive is present
3000, 3000D2, & 3000D2L	LED	ISL 1	Island 1 relay drive indicator. Lights when relay drive is present
	LED	ISL 2	Island 2 relay drive indicator. Lights when relay drive is present
	Switch	POWER ON/OFF	Controls main power to GCP circuits
	TB2-1	TRACK 2 XMT 1	GCP Track 2 transmitter output to track
	TB2-2	TRACK 2 XMT 2	GCP Track 2 transmitter output to track
	TB2-3	TRACK 2 RCV 1	GCP Track 2 receiver input from track
	TB2-4	TRACK 2RCV 2	GCP Track 2 receiver input from track
3000D2L	TB2-5	AT	Signal output used in automatic transfer applications. Connects to AT terminal on automatic transfer timer unit (80024) to indicate to the timer unit that the GCP has detected a train. No connection if not used
3000D2 Only	TB2-5	AT	Automatic transfer indication output. Terminal is at +12 VDC when main system is on-line. Terminal drops to 0 VDC when unit switches to standby system. No connection if not used
3000Only	TB2-5	TRANS IND	

Continued on next page

Table 2-8 Continued

GCP MODEL	TERMINAL/ INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3000, 3000D2, & 3000D2L	TB2-6	SLAVING	Connects to **SLAVING** terminal on other 3000 GCP when units are frequency slaved. Both GCP's must be programmed for proper slave status. No connection if not used. Provides synchronizing frequency to slave unit terminal.
3000, 3000D2, & 3000D2L	TB2-7	UAX + (UAX1)	Positive (+) input to GCP from UAX (upstream adjacent crossing). GCP must be programmed for use. No connection if not used. Beginning with "F" level software, the **UAX** front panel terminals (**TB2-7** and **TB2-8**) are referred to as UAX1 and are used exclusively for control of the track 1 section of the 3000 GCP. Only the track 1 island circuit, upon pickup, will cancel any UAX1 time remaining as the train leaves the island circuit. The pickup delay time is a programmable entry with 25 seconds as the default.
	TB2-8	UAX -	Negative (-) input to GCP from upstream adjacent crossing. GCP must be programmed for use. No connection if not used
	RS232 Connector	J1 RECORDER	Connector for data recorder interface assembly (80025) 25-line interface cable. Occupies positions **TB2-9** and **TB2-10**
	TB2-11	+ ISL RLY 2	Positive (+) island 2 relay drive output. May be used to drive external island relay, where desired. Drives relays of 400 to 1,000 ohms
	TB2-12	- ISL RLY 2	Negative (-) island 2 relay drive output. May be used to drive external island relay, where desired. Drives relays of 400 to 1,000 ohms
	TB2-13	+ DAX C RLY	Positive (+) DAX C relay drive output. Drives relays of 400 to 1,000 ohms
	TB2-14	- DAX C RLY	Negative (-) DAX C relay drive output. Drives relays of 400 to 1,000 ohms

Continued on next page

Table 2-8 Concluded

GCP MODEL	TERMINAL/ INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3000, 3000D2, & 3000D2L	TB2-15	+ DAX D RLY	Positive (+) DAX D relay drive output. Drives relays of 400 to 1,000 ohms
	TB2-16	- DAX D RLY	Negative (-) DAX B relay drive output. Drives relays of 400 to 1,000 ohms
3000D2L Only	TB2-17	TRACK 2 CHK 1	Check receiver input from track 2
	TB2-18	TRACK 2 CHK 2	Check receiver input from track 2
3000, 3000D2, & 3000D2L	LED	DAX A	DAX A relay drive indicator. Lights when relay drive is present
	LED	DAX B	DAX B relay drive indicator. Lights when relay drive is present
	LED	DAX C	DAX C relay drive indicator. Lights when relay drive is present
	LED	DAX D	DAX D relay drive indicator. Lights when relay drive is present
	Fuse	F1 7A S/B	Main power fuse, 7 ampere, slow-blow, 3 AG Upper bay in 3000D2 units Left module set in 3000D2L units
3000D2 & 3000D2L Only	Fuse	F2 7A S/B	Main power fuse, 7 ampere, slow-blow, 3 AG Lower bay in 3000D2 units Right module set in 3000D2L units

Table 2-9:
Front Panel Terminals, Indicators, And Controls (Models 3000ND And 3000ND2)

TERMINAL/INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
TB1-1	XMT 1	GCP transmitter output to track
TB1-2	XMT 2	GCP transmitter output to track
TB1-3	RCV 1	GCP receiver input from track
TB1-4	RCV 2	GCP receiver input from track
TB1-5	ENA	Used to cascade the relay drive output (XR circuit) from two or more GCP's. Voltage level at this terminal must be greater than +5 VDC. Normally connected to **TB1-6 (B)** when not in cascade operation.

Continued on next page

Table 2-9 Continued

TERMINAL/INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
TB1-5	ENA	Beginning with "F" level software, the **ENA**ble terminal of the GCP can provide two functions: Conventional ENA function when programmed for zero time when cascading GCP outputs Second UAX input for use with the track 2 section of the GCP. NOTE A new programming step has been added to the Program menu to select a pickup delay time for the UAX2 function of the terminals. A 25-second ENA/UAX2 default time is provided.
TB1-6	B	Battery B input to GCP case
TB1-7	MS/GCP CONTROL	External input that can be used to convert GCP to motion sensor by connecting terminal to negative battery (N) via an external relay. • Relay contacts must connect terminal to positive battery (B) when not in motion sensor mode. • When not used, connect to **TB1-6 (B)** This input is also used to implement the Advanced Preempt Timer (paragraph 4.17.21) and Transfer Delay Timer (paragraph 4.17.2) Functions.
TB1-8	N	Battery N input to GCP case
TB1-9	+ GCP RLY	Positive (+) GCP relay drive output. • Drives relays of 400 to 1,000 ohms
TB1-10	- GCP RLY	Negative (-) GCP relay drive output. • Drives relays of 400 to 1,000 ohms
TB1-11	+ ISL RLY	Positive (+) island relay drive output. May be used to drive external island relay of 400 to 1,000 ohms, where desired
TB1-12	- ISL RLY	Negative (-) island relay drive output. May be used to drive external island relay of 400 to 1,000 ohms, where desired
TB2-1	CHK 1	Check receiver input from track
TB2-2	CHK 2	Check receiver input from track
TB2-3	ISL RCV 1	Island receiver input from track
TB2-4	ISL RCV 2	Island receiver input from track

Continued on next page

Table 2-9 Concluded

TERMINAL/INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
TB2-5	TRANS IND (3000ND)	Signal output used in automatic transfer applications. Connects to AT terminal on automatic transfer timer unit (80024) to indicate to the timer unit that the GCP has detected a train. No connection if not used
	TRANS IND (3000ND2)	Automatic transfer indication output. Terminal is at +12 VDC when main system is on-line. Terminal drops to 0 VDC when unit switches to standby system. No connection if not used
TB2-6	SLAVING	Connects to **SLAVING** terminal on other 3000 GCP when units are frequency slaved. Both GCP's must be programmed for proper slave status. No connection when not used
TB2-7	UAX + (UAX1)	Positive (+) input to GCP from UAX. GCP must be programmed for use. No connection when not used. Beginning with "F" level software, the UAX front panel terminals (**TB2-7** and **TB2-8**) are referred to as **UAX1** and are used exclusively for control of the track 1 section of the 3000 GCP. Only the track 1 island circuit, upon pickup, will cancel any UAX1 time remaining as the train leaves the island circuit. The pickup delay time is a programmable entry with 25 seconds as the default.
TB2-8	UAX - (UAX1)	Negative (-) input to GCP from UAX. "GCP must be program-med for use. No connection when not used
RS232 Connector	J1 RECORDER	Connector for data recorder interface assembly (80025) 25-line interface cable Occupies positions TB2-9 and TB2-10
LED	GCP	GCP relay drive indicator. Lights when relay drive is present
LED	ISL	Island relay drive indicator. Lights when relay drive is present
Switch	POWER ON/OFF	Controls main power to GCP circuits
Fuse	F1 3A S/B	Main power fuse, 3 ampere, slow-blow, 3 AG (for main (left) module set)
Fuse	F2 3A S/B (3000ND2 Only)	Main power fuse, 3 ampere, slow-blow, 3 AG (for standby (right) side of card cage)

Table 2-10:
Front Panel Terminals, Indicators, And Controls (Models 3008 And 3008D2)

<table>
<tr><th>GCP MODEL</th><th>TERMINAL/-INDICATOR/CONTROL</th><th>NOMENCLATURE</th><th>FUNCTION</th></tr>
<tr><td rowspan="7">3008
&
3008D2</td><td>TB1-1</td><td>TRACK XMT 1</td><td>GCP track transmitter output to track</td></tr>
<tr><td>TB1-2</td><td>TRACK XMT 2</td><td>GCP track transmitter output to track</td></tr>
<tr><td>TB1-3</td><td>TRACK RCV 1</td><td>GCP track receiver input from track</td></tr>
<tr><td>TB1-4</td><td>TRACK RCV 2</td><td>GCP track receiver input from track</td></tr>
<tr><td>TB1-5</td><td>ENA (UAX2)</td><td>Used to cascade the relay drive output (XR circuit) from another GCP.
Voltage level at this terminal must be greater than +5 VDC.
Normally connected to TB1-6 (B) when not in cascade operation. Beginning with “F” level software, the ENAble terminal of the GCP can provide two functions:
Conventional ENA function when programmed for zero time when cascading GCP outputs
Second UAX input for use with the track 1 section of the GCP.
NOTE
A new programming step has been added to the Program menu to select a pickup delay time for the UAX2 function of the terminals. A 25-second ENA/UAX2 default time is provided.</td></tr>
<tr><td>TB1-4</td><td>TRACK RCV 2</td><td>GCP track receiver input from track</td></tr>
<tr><td>TB1-5</td><td>ENA (UAX2)</td><td>Used to cascade the relay drive output (XR circuit) from another GCP.
Voltage level at this terminal must be greater than +5 VDC.
Normally connected to TB1-6 (B) when not in cascade operation.
Beginning with “F” level software, the ENAble terminal of the GCP can provide two functions:
Conventional ENA function when programmed for zero time when cascading GCP outputs
Second UAX input for use with the track 1 section of the GCP.
NOTE
A new programming step has been added to the Program menu to select a pickup delay time for the UAX2 function of the terminals. A 25-second ENA/UAX2 default time is provided.</td></tr>
</table>

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Table 2-10 Continued

GCP MODEL	TERMINAL/-INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3008 & 3008D2	TB1-6	B	Battery B input to GCP case
	TB1-7	MS/GCP CONTROL	External input used to convert GCP to motion sensor (MS): MS operation is enabled by connecting **TB1-7** to the **N** battery input via external relay. MS operation is disabled by connecting **TB1-7** to **B** battery input via external relay. When MS function is not used, **TB1-7** is connected to **TB1-6 (B)**. This input is also used to implement the Advanced Preempt Timer (paragraph 4.17.21) and Transfer Delay Timer (paragraph 4.17.2) Functions.
	TB1-8	N	Negative battery input to GCP case
	TB1-9	+ GCP RLY	Positive (+) GCP relay drive output. Drives relays of 400 to 1,000 ohms.
	TB1-10	- GCP RLY	Negative (-) GCP relay drive output. Drives relays of 400 to 1,000 ohms.
	TB1-11	+ ISL RLY 1	Positive (+) island 1 relay drive output. May be used to drive external island relay of 400 to 1,000 ohms, where desired
	TB1-12	- ISL RLY 1	Negative (-) island 1 relay drive output. May be used to drive external island relay of 400 to 1,000 ohms, where desired
	TB1-13	+ DAX A RLY	Positive (+) DAX A relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-14	- DAX A RLY	Negative (-) DAX A relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-15	+ DAX B RLY	Positive (+) DAX B relay drive output. Drives relays of 400 to 1,000 ohms
	TB1-16	- DAX B RLY	Negative (-) DAX B relay drive output. Drives relays of 400 to 1,000 ohms
	LED	GCP	GCP relay drive indicator. Lights when relay drive is present
	LED	ISL	Island relay drive indicator. Lights when relay drive is present
	Switch	POWER ON/OFF	Controls main power to GCP circuits
	RS232 Connector	J1 RECORDER	Connector for data recorder interface assembly (80025) 25-line interface cable. Occupies positions TB2-9 and TB2-10

Continued on next page

Table 2-10 Continued

GCP MODEL	TERMINAL/-INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3008 & 3008D2	TB2-11	+ DAX C RLY	Positive (+) DAX C relay drive output. Drives relays of 400 to 1,000 ohms
	TB2-12	- DAX C RLY	Negative (-) DAX C relay drive output. Drives relays of 400 to 1,000 ohms
	TB2-13	+ DAX D RLY	Positive (+) DAX D relay drive output. Drives relays of 400 to 1,000 ohms
	TB2-14	- DAX D RLY	Negative (-) DAX D relay drive output. Drives relays of 400 to 1,000 ohms
	TB2-15	+ DAX E RLY	Positive (+) DAX E relay drive output. Drives relays of 400 to 1,000 ohms
3008 & 3008D2	TB2-16	- DAX E RLY	Negative (-) DAX E relay drive output. Drives relays of 400 to 1,000 ohms
3008 Only	TB3-5	AT	Signal output used in automatic transfer applications. Connects to **AT** terminal on 80024 Automatic Transfer Timer Unit to indicate to that unit that the GCP has detected a train. No connection if not used
3008D2 Only	TB3-5	TRANS IND	Automatic transfer indication output. Terminal is at +12 VDC when main system is on-line. Terminal drops to 0 VDC when unit switches to standby system. No connection if not used
3008 & 3008D2	TB3-6	SLAVING	Connects to **SLAVING** terminal on other 3000 GCP when units are frequency slaved. Both GCP's must be programmed for proper slave status. No connection if not used
	TB3-7	UAX + (UAX1)	Positive (+) input to GCP from upstream adjacent crossing (UAX). GCP must be programmed for use. No connection if not used
			Beginning with "F" level software, the UAX front panel terminals (**TB3-7** and **TB3-8**) are referred to as UAX1 and are used exclusively to control the track 1 section of the 3000 GCP. Upon pickup, the track 1 island circuit will cancel any UAX1 time remaining as the train leaves the island circuit. Pickup delay time is a programmable entry with 25 seconds as the default.

Continued on next page

Table 2-10 Concluded

GCP MODEL	TERMINAL/-INDICATOR/CONTROL	NOMENCLATURE	FUNCTION
3008 & 3008D2	TB3-8	UAX -	Negative (-) input to GCP from UAX (upstream adjacent crossing). GCP must be programmed for use. No connection if not used.
	TB3-11	+ DAX F RLY	Positive (+) DAX F relay drive output. Drives relays of 400 to 1,000 ohms
	TB3-12	- DAX F RLY	Negative (-) DAX F relay drive output. Drives relays of 400 to 1,000 ohms
	TB3-13	+ DAX G RLY	Positive (+) DAX G relay drive output. Drives relays of 400 to 1,000 ohms
	TB3-14	- DAX G RLY	Negative (-) DAX G relay drive output. Drives relays of 400 to 1,000 ohms
	TB3-15	+ DAX H RLY	Positive (+) DAX H relay drive output. Drives relays of 400 to 1,000 ohms
	TB3-16	- DAX H RLY	Negative (-) DAX H relay drive output. Drives relays of 400 to 1,000 ohms
	LED	DAX A	DAX A relay drive indicator. Lights when relay drive is present
	LED	DAX B	DAX B relay drive indicator. Lights when relay drive is present
	LED	DAX C	DAX C relay drive indicator. Lights when relay drive is present
	LED	DAX D	DAX D relay drive indicator. Lights when relay drive is present
	LED	DAX E	DAX E relay drive indicator. Lights when relay drive is present
	LED	DAX F	DAX F relay drive indicator. Lights when relay drive is present
	LED	DAX G	DAX G relay drive indicator. Lights when relay drive is present
	LED	DAX H	DAX H relay drive indicator. Lights when relay drive is present
3008	Fuse	F1 5A S/B	Main power fuse. 5 ampere, slow-blow, 3 AG.
3008D2	Fuse	F1 5A S/B	Upper bay main power fuse. 5 ampere, slow-blow, 3 AG.
	Fuse	F2 5A S/B	Lower bay main power fuse. 5 ampere, slow-blow, 3 AG.

2.7 SYSTEM BLOCK DIAGRAM

A simplified block diagram of the 3000 GCP system is presented in Figure 2-18.

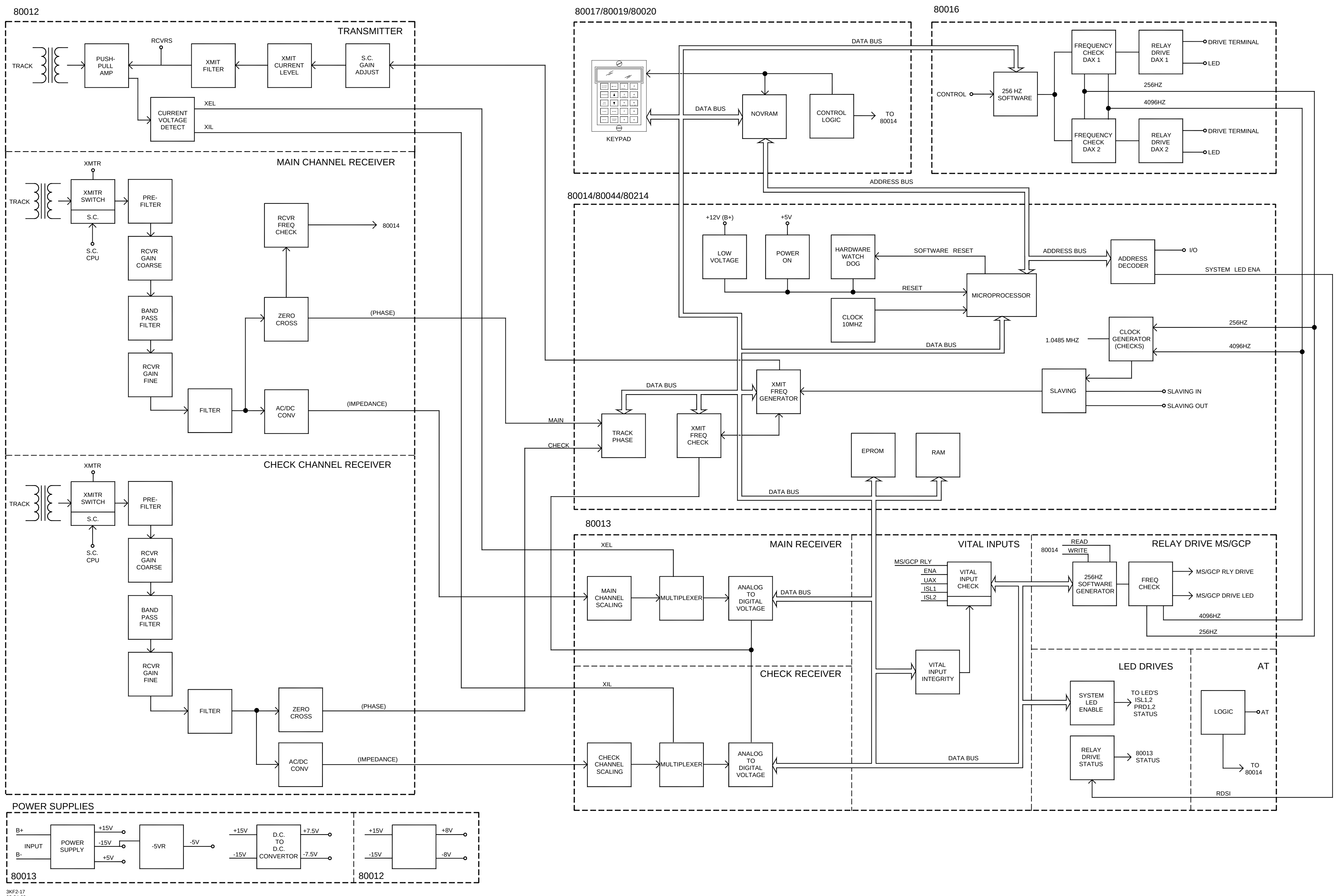

Figure 2-18:
3000 GCP Simplified Block Diagram

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SECTION 3 –
AUXILIARY EQUIPMENT

3.1 GENERAL

The equipment described in the following paragraphs may be used with the 3000 GCP. Where applicable, installation and adjustment information is provided. The following equipment is covered in this section:

Table 3-1:
Auxiliary Equipment Index

Table 3-1:
Auxiliary Equipment Index

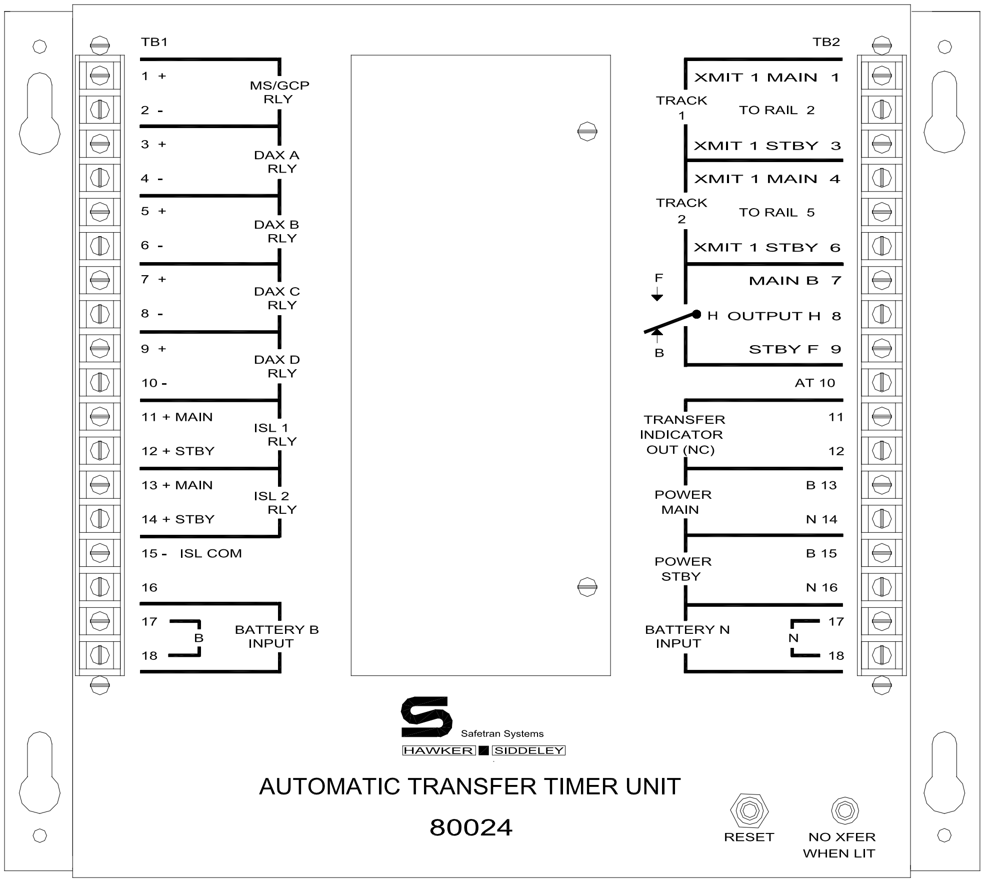
3.2 SPECIFIC MODEL 3000 GRADE CROSSING PREDICTOR AUXILIARY EQUIPMENT

The equipment shown in this section is only used with Model 3000 GCPs.

3.2.1 Automatic Transfer Timer Unit, 80024

The automatic transfer timer unit is connected to two Model 3000 GCPs and, in the event of a failure of the primary (main) unit, operation is automatically transferred to the stand-by (backup) unit within a pre-established time period. The transfer interval can be programmed up to 31 minutes in 1-minute increments and is normally set for 3 minutes. The automatic transfer timer will continue to switch between the two GCPs in an effort to select an operational unit.

The field programmable transfer interval is selected via DIP switch S1 located on the internal 80023 module (Figure 3-2). The five segments of S1 correspond to the binary values printed on the 80023 circuit board adjacent to S1. To select a value, press the corresponding switch lever(s) to the down or ON position as indicated in Figure 3-2. See Table 3-2 for transfer interval switch settings.



FILE: 80024A

Figure 3-1:
Automatic Transfer Timer Unit, 80024

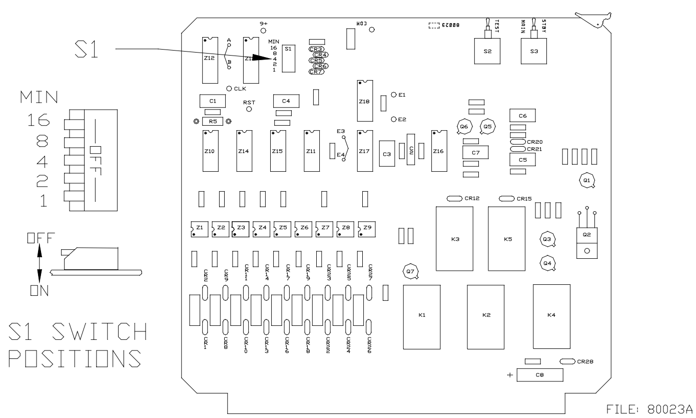


Figure 3-2:
Location of Transfer Interval Select Switch (S1) On 80023 Module

**Table 3-2:
Transfer Time Interval Selection**

TIME (MINUTES)	TRANSFER TIMER SWITCH POSITIONS				
	16	**8**	**4**	**2**	**1**
3	Up	Up	Up	Down	Down
4	Up	Up	Down	Up	Up
5	Up	Up	Down	Up	Down
6	Up	Up	Down	Down	Up
7	Up	Up	Down	Down	Down
8	Up	Down	Up	Up	Up
9	Up	Down	Up	Up	Down
10	Up	Down	Up	Down	Up
11	Up	Down	Up	Down	Down
12	Up	Down	Down	Up	Up
13	Up	Down	Down	Up	Down
14	Up	Down	Down	Down	Up
15	Up	Down	Down	Down	Down
16	Down	Up	Up	Up	Up
17	Down	Up	Up	Up	Down
18	Down	Up	Up	Down	Up
19	Down	Up	Up	Down	Down
20	Down	Up	Down	Up	Up
21	Down	Up	Down	Up	Down
22	Down	Up	Down	Down	Up
23	Down	Up	Down	Down	Down
24	Down	Down	Up	Up	Up
25	Down	Down	Up	Up	Down
26	Down	Down	Up	Down	Up
27	Down	Down	Up	Down	Down
28	Down	Down	Down	Up	Up
29	Down	Down	Down	Up	Down
30	Down	Down	Down	Down	Up
31	Down	Down	Down	Down	Down

The automatic transfer timer unit is also equipped with an LED indicator and a number of switches which are used primarily for calibration and test purposes. Each of the devices is described in Table 3-3.

Table 3-3:
Automatic Transfer Timer Unit Controls and Indicators

DEVICE & LOCATION	NOMENCLATURE	FUNCTION
Switch (800234 Module)	STBY-AUTO-MAIN	Selects standby/main operating system or automatic transfer mode.
Switch (80023 Module)	TEST	When pressed, causes transfer from main to standby GCP.
Switch (80024 Case)	RESET	Following transfer from main to standby GCP, press to return to main GCP.
LED (80024 Case)	NO XFER WHEN LIT	Transfer indicator: normally lighted; extinguished when main to standby GCP transfer occurs.

The automatic transfer timer unit is housed in an aluminum case designed for shelf- or backboard- mounting. The mounting dimensions for the unit are provided in Figure 3-3. Table 3-4 lists the front panel terminals and their GCP connections. Figure 3-4 illustrates a typical single track, bidirectional application using the automatic transfer timer unit with two 3000 GCPs.

Specifications for the automatic transfer timer unit are as follows:

Table 3-4:
Automatic Transfer Timer Unit Specifications

PARAMETER	VALUES
Environmental	-40° F to +160° F (-40° C to +71° C)
Dimensions	
Height	9.31 inches (23.6 centimeters)
Width	11.50 inches (29.2 centimeters)
Depth	11.16 inches (28.3 centimeters)
Weight	4 pounds, 12 ounces (2.15 kilograms) (approximate)

Table 3-5:
Automatic Transfer Timer Unit Terminal Connections

TERMINAL	NOMENCLATURE	CONNECTION
TB1-1	+ MS/GCP RLY	Positive terminal of GCP relay, or + GCP RLY terminal (TB1-9) on main GCP
TB1-2	- MS/GCP RLY	Negative terminal of GCP relay, or – GCP RLY terminal (TB1-10) on main GCP
TB1-3	+ DAX A RLY	If no DAX A, connect to 80024 BATTERY B INPUT (TB1-17). If DAX A is used, connect to + DAX A RLY terminal (TB1-13) on main GCP.

Continued on next page

Table 3-5 Continued

TERMINAL	NOMENCLATURE	CONNECTION
TB1-4	- DAX A RLY	If no DAX A, connect to 80024 BATTERY N INPUT (TB2-17). If DAX A is used, connect to – DAX A RLY terminal (TB1-14) on main GCP.
TB1-5	+ DAX B RLY	If no DAX B, connect to 80024 BATTERY B INPUT (TB1-17). If DAX B is used, connect to + DAX B RLY terminal (TB1-15) on main GCP.
TB1-6	- DAX B RLY	If no DAX B, connect to 80024 BATTERY N INPUT (TB2-17). If DAX B is used, connect to - DAX B RLY terminal (TB1-16) on main GCP.
TB1-7	+ DAX C RLY	If no DAX C, connect to 80024 BATTERY B INPUT (TB1-17). If DAX C is used, connect to + DAX C RLY terminal (TB2-13) on main GCP.
TB1-8	- DAX C RLY	If no DAX C, connect to 80024 BATTERY N INPUT (TB2-17). If DAX C is used, connect to - DAX C RLY terminal (TB2-14) on main GCP.
TB1-9	+ DAX D RLY	f no DAX D, connect to 80024 BATTERY B INPUT (TB1-17). If DAX D is used, connect to + DAX D RLY terminal (TB2-15) on main GCP.
TB1-10	- DAX D RLY	If no DAX D, connect to 80024 BATTERY N INPUT (TB2-17). If DAX D is used, connect to - DAX D RLY terminal (TB2-16) on main GCP.
TB1-11	+ ISL 1 RLY MAIN	Not used
TB1-12	+ ISL 1 RLY STBY	Not used
TB1-13	+ ISL 2 RLY MAIN	Not used
TB1-14	+ ISL 2 RLY STBY	Not used
TB1-15	ISL COM	Not used
TB1-16		Not used
TB1-17	BATTERY B INPUT	Positive GCP battery supply as needed for 80024 connections
TB1-18	BATTERY B INPUT	Connect to positive GCP battery terminal (B12).
TB2-1	TRACK 1 XMIT 1 MAIN	TRACK 1, XMT 1 terminal (TB1-1) on main GCP
TB2-2	TRACK 1 TO RAIL	Connect as XMT 1 wire to rail on track 1.
TB2-3	TRACK 1 XMIT 1 STBY	TRACK 1, XMT 1 terminal (TB1-1) on standby GCP
TB2-4	TRACK 2 XMIT 1 MAIN	TRACK 2, XMT 1 terminal (TB2-1) on main GCP
TB2-5	TRACK 2 TO RAIL	Connect as XMT 1 wire to rail on track 2.

Continued on next page

Table 3-5 Concluded

TERMINAL	NOMENCLATURE	CONNECTION
TB2-6	TRACK 2 XMIT 1 STBY	TRACK 2, XMT 1 terminal (TB2-1) on standby GC
TB2-7	MAIN B	Spare relay contact
TB2-8	OUTPUT H	Spare relay contact
TB2-9	STBY F	Spare relay contact
TB2-10	AT	AT (automatic transfer) terminal (TB2-5) on main GCP
TB2-11	TRANSFER INDICATOR OUT (NC)	Output for external transfer indication such as POE light on enclosure
TB2-12	TRANSFER INDICATOR OUT (NC)	Output for external transfer indication such as POE light on enclosure
TB2-13	POWER MAIN B	Positive battery supply. Connect to B battery terminal (TB1-6) on main GCP.
TB2-14	POWER MAIN N	Negative battery supply. Connect to N battery terminal (TB1-8) on main GCP.
TB2-15	POWER STBY B	Positive battery supply. Connect to B battery terminal (TB1-6) on standby GCP
TB2-16	POWER STBY N	Negative battery supply. Connect to N battery terminal (TB1-8) on standby GCP.
TB2-17	BATTERY N INPUT	Negative GCP battery supply as Needed for 80024 connections
TB2-18	BATTERY N INPUT	Connect to negative GCP battery terminal (N12).

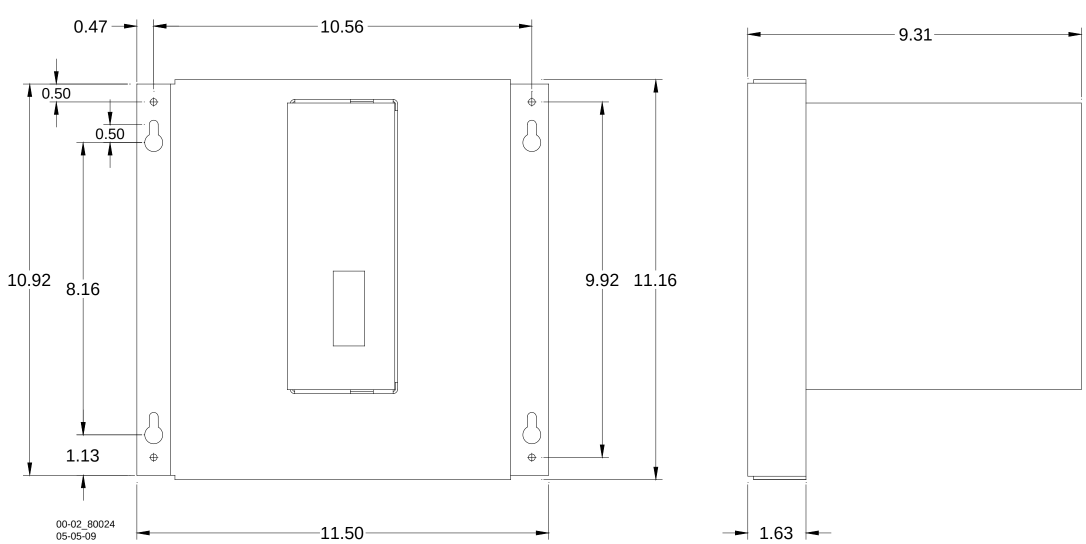


Figure 3-3:
Automatic Transfer Timer Unit Mounting Dimensions

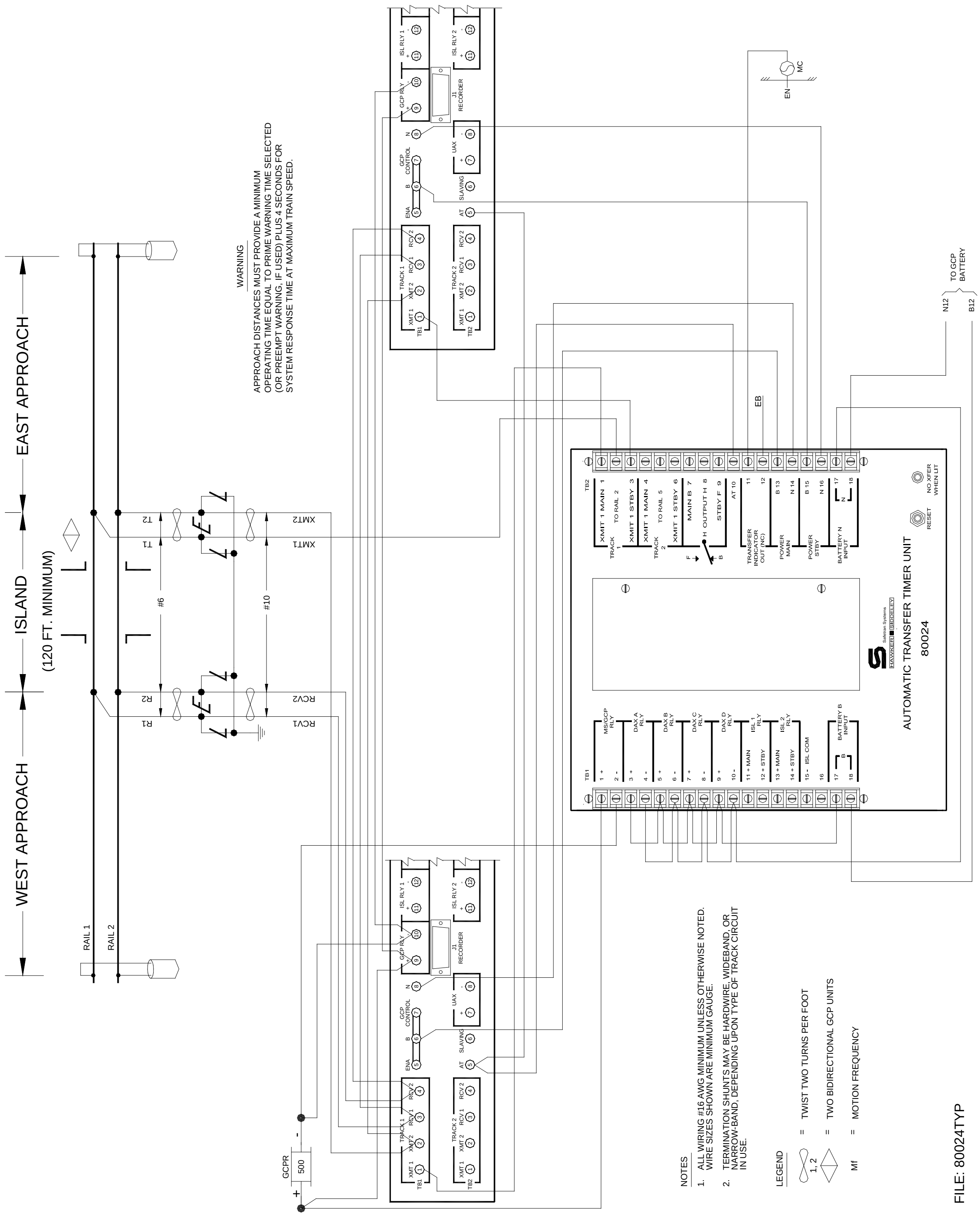


Figure 3-4:
Typical Single Track, Bidirectional Application with Automatic Transfer Timer Unit And Two 3000 GCPs

3.2.2 Data Recorder Module, 80115

Data recording capability is provided by the Data Recorder Module (80115) which plugs into a card slot in the GCP case. When used alone, the module maintains a date and time-stamped record of train warning times, detected train speed (speed of train when prediction occurred), average train speed (speed of train averaged over entire time train is sensed), and island speed (speed of train when entering island). Additionally, any errors normally detected by the GCP, either internally or in the track circuit, are also recorded (refer to Section 9, Data Recorder, in the Model 3000 GCP Instruction And Installation Manual for complete details).

NOTE

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

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

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

- Identifying slow versus fast train movements
- Distinguishing between accelerating, decelerating, and relatively constant speed train movements

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

For expanded recording capabilities, a Data Recorder Interface Assembly (80025) can be attached to the GCP to provide 16 optically-isolated external inputs (channels) to the data recorder module (see paragraph 3.2.3).

3.2.3 Data Recorder Interface Assembly, 80025

Data Recorder Interface Assembly, 80025 (Figure 3-5), enables the Data Recorder Module, 80115, to monitor and record changes of input state on 16 channels external to the 3000 GCP. The data recorder interface assembly interfaces with the data recorder via a 5-foot 25-line cable (supplied with the unit) connected between J1 (RECORDER) on the 3000 GCP front panel and J1 (RECORDER) on the data recorder interface assembly. Pin assignments for connector J1 on the data recorder interface assembly are provided in Table 3-3.

All 16 inputs on the data recorder interface assembly are electrically isolated from each other and from ground by optical isolators, allowing direct connection to vital circuits. Input changes must typically consist of voltage level changes similar to those produced by relay contact closures (i.e., low-to-high and high-to-low). Each channel input from a monitored signal circuit consists of two wires attached to screw terminals on the data recorder interface assembly. See Table 3-7 for assembly mounting dimensions.

For installations in which a modem is used, the length of the cable connecting the modem to the data recorder interface assembly should be limited to 50 feet.

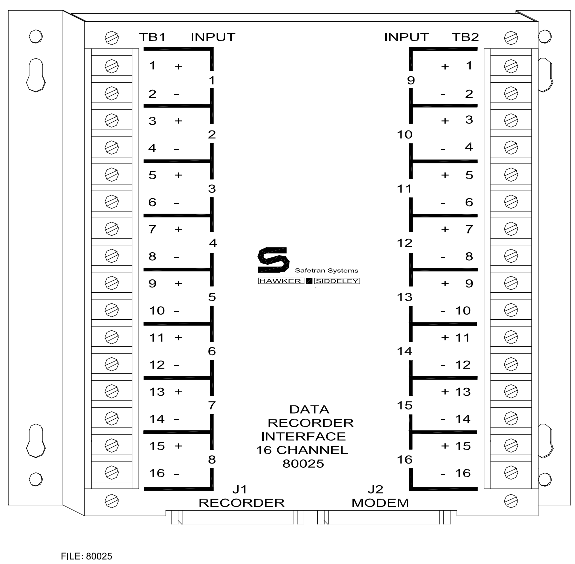


Figure 3-5:
Data Recorder Interface Assembly, 80025

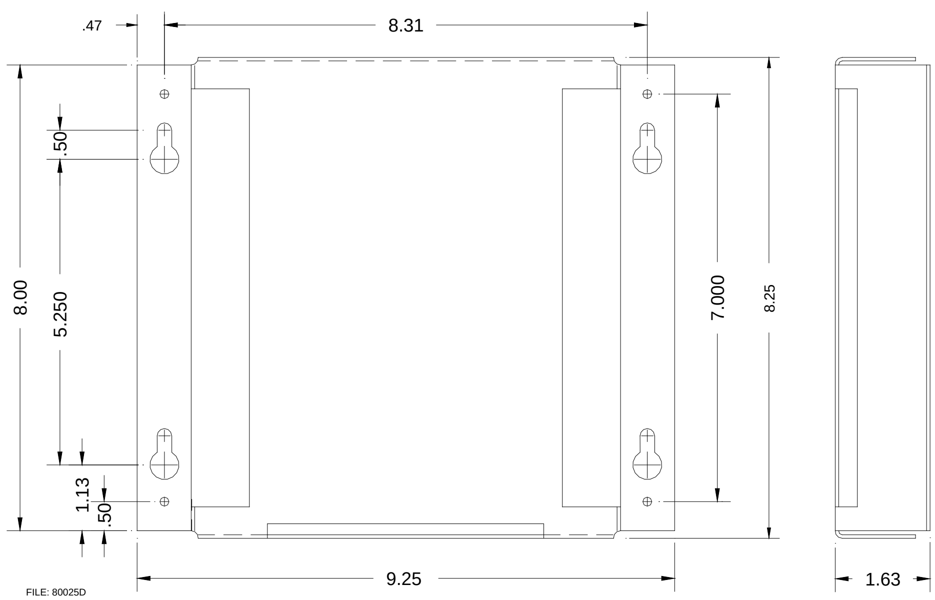


Figure 3-6:
Data Recorder Interface Assembly Mounting Dimensions

Table 3-6:
Data Recorder Interface Assembly Connector J1 Pin Assignments

Pin	Signal	Pin	Signal
1	Ground	14	Channel 16
2	Transmit Data (TxD)	15	Channel 15
3	Receive Data (RxD)	16	Channel 14
4	Request To Send (RTS)	17	Channel 13
5	Clear To Send (CTS)	18	Channel 12
6	Data Set Ready (DSR)	19	Channel 11
7	Ground	20	Data Terminal Ready (DTR)
8	Data Carrier Detect (DCD)	21	Channel 10
9	Channel 9	22	Channel 1
10	Channel 2	23	Channel 3
11	Channel 4	24	Channel 5
12	Channel 6	25	Channel 7
13	Channel 8		

Table 3-7:
Data Recorder Interface Assembly Specifications

PARAMETER	VALUES
Channel Inputs	
Number of Inputs	16
Input Resistance	5k Ohms
Input Voltage	8 to 36 VDC
Terminal Screw Size	No. 6 ANSI
Dimensions	
Height	1.88 inches (4.8 centimeters)
Width	9.25 inches (23.5 centimeters)
Depth	8.25 inches deep (21 centimeters)
Weight	1 pounds (0.45 kilograms) (approximate)

3.2.4 Relay Adapter Module, 80170

Relay Adapter Module (Safetran P/N 8000-80170-001) (see Figure 3-7) must be installed in all existing and future applications where a 3000 MS will be used to directly drive (no relay isolation) any UAX, ISL RLY, MS/GCP CONTROL and/or ENA input on one 3000 GCP and/or 2000 MS unit by the GCP RLY (3000 GCP) and/or MS RLY (2000 MS) output of another unit. The Relay Adapter Module A80170 is installed externally to the 3000 GCP unit and can be wired into the system as shown in Figure 14-14.

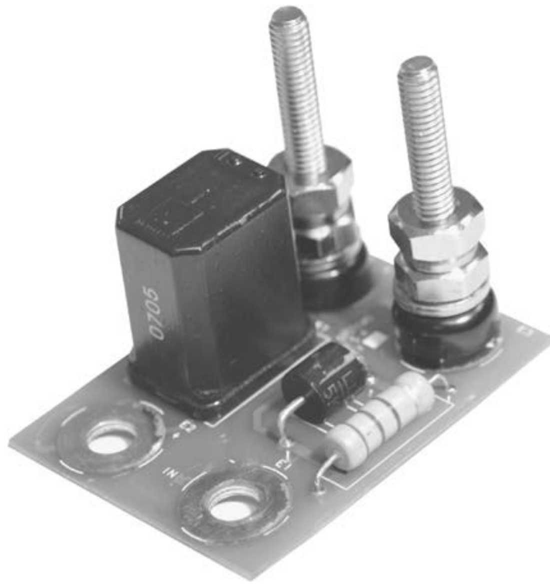


Figure 3-7:
80170 Relay Adapter Module

NOTE

The Relay Adapter Module is not required where vital relays are used as an interface between the UAX, ISL RLY, MS/GCP CONTROL and/or ENA inputs of one unit and the GCP RLY (3000GCP) or MS RLY (2000MS) output of another unit.

3.2.5 Extender Module, 80021

The Extender module can be used with all 3000 GCP plug-in modules and is primarily a troubleshooting device that permits access to a module installed in the 3000 GCP case for test purposes.

The Extender module plugs into the case connector on the motherboard and the module under test is then plugged into the Extender module.

- The 80021 Extender Module is equipped with dual 43-pin connectors.
- Test terminals are provided for each connector pin.
- The module cannot be used with any other equipment

The Extender module is 8 inches (20.3 centimeters) high by 8.9 inches (22.6 centimeters) wide.

3.2.6 3000 GCP Slaving Unit, 80065

When two 3000 GCP’s are frequency slaved in a master/slave configuration, and the two GCP’s are powered from separate batteries, a Model 3000 GCP Slaving Unit, 80065, must be used to isolate the two batteries.

- Without the isolation provided by the Slaving unit, a grounded battery would be reflected in both sets of GCP operating batteries.
- The Slaving unit prevents this interaction from occurring.
- When the two 3000 GCP’s are operated from the same battery, the Slaving unit is not required.

The Slaving unit consists of a 3-inch diameter by 5-inch long ABS plastic enclosure with mounting brackets at the base.

- Four AREMA terminals extend from the top of the assembly and accommodate connections to separate windings of an isolation transformer housed within the hermetically sealed enclosure.
- The terminals are connected between the battery **N** (**TB1-8**) and **SLAVING** (**TB2-6**) terminals on the master 3000 GCP and the same pair of terminals on the slave unit as shown in Figure 3-8.

Table 3-8:
3000 GCP Slaving Uni, 80065 Specifications

PARAMETER	VALUES
Dimensions	
Diameter	3.5 inches (8.89 centimeters)
Height	7.625 inches (19.37 centimeters) (to top of AREMA terminals)
Weight	2 pounds (0.91 kilograms) (approximate)

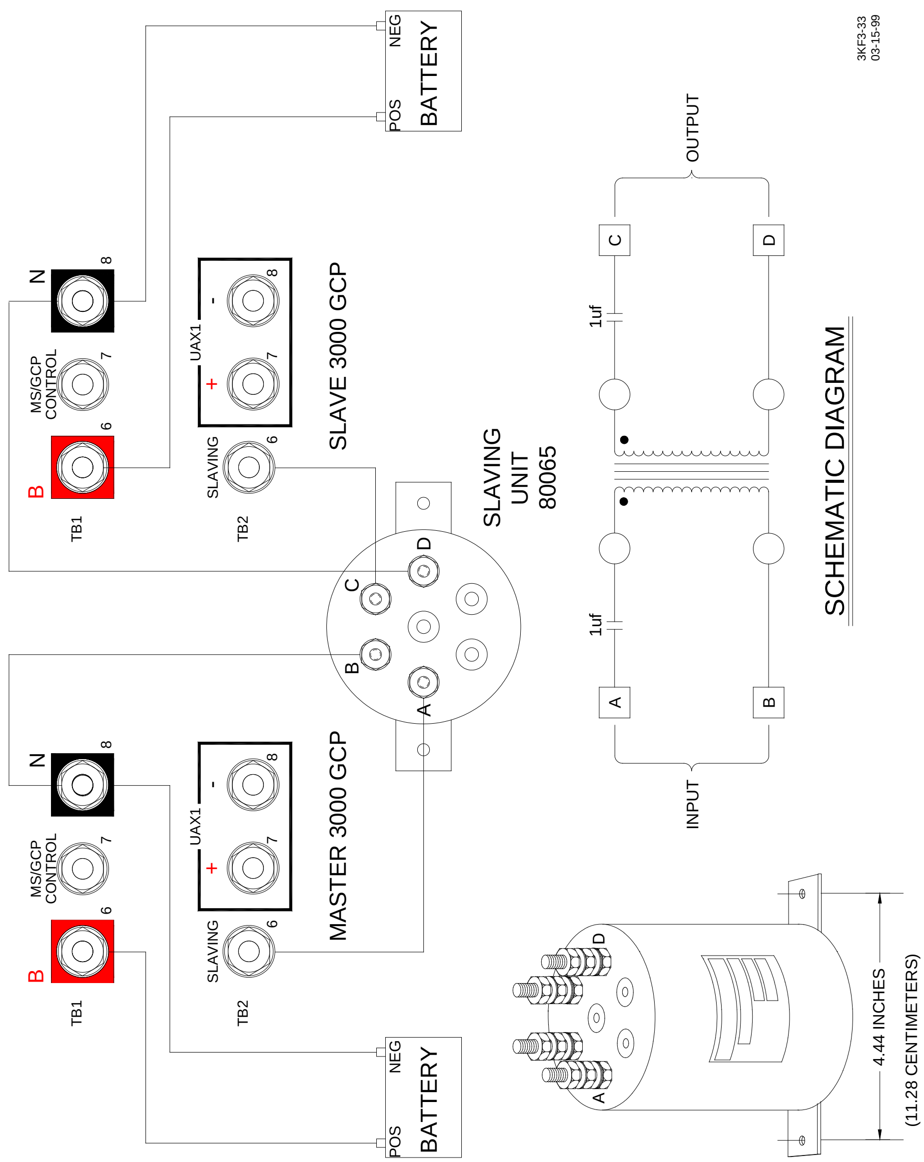


Figure 3-8:
3000 GCP Slaving Unit, 80065

3.2.7 MS/GCP to Echelon Network Interface Plug Assembly, 80063

The 80063 MS/GCP to Echelon Network Interface Plug Assembly (Figure 3-9) provides connection points for the two-wire Echelon LonTalk™ network.

- The 80063 plugs into the 25-pin J1 RECORDER connector of the GCP.
- Echelon network connection points are the ECH terminals on the front of the assembly.

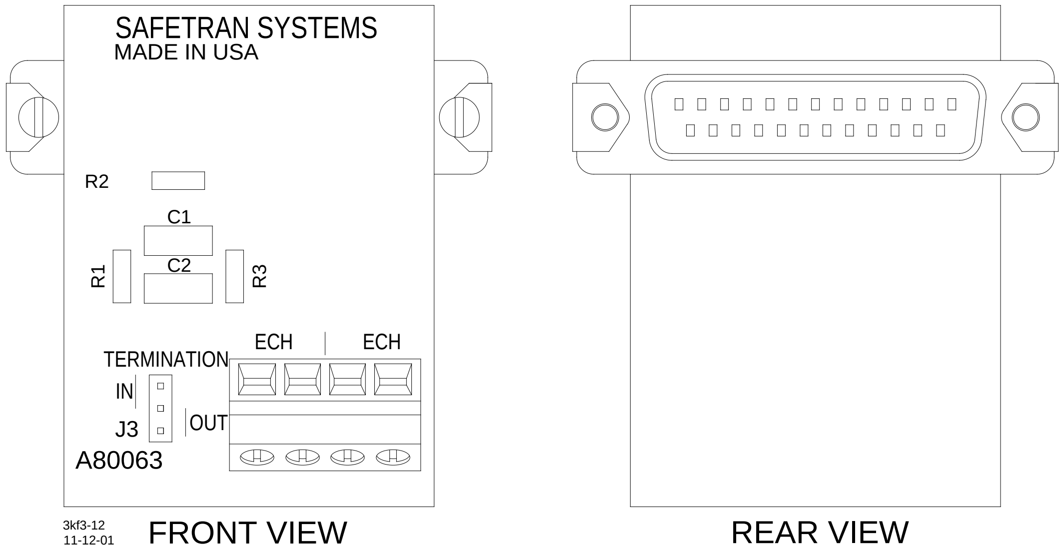


Figure 3-9:
MS/GCP to Echelon Network Interface Plug Assembly, 80063

Table 3-9:
MS/GCP to Echelon Network Interface Plug Assembly Specifications

PARAMETER	VALUES
Environmental Temperature Range:	-40 °F to +158 °F (-40 °C to +70 °C)
Dimensions	
Height	2.2 inches (5.6 centimeters)
Width	2.1 inches (5.33 centimeters)
Depth	1.12 inches (2.85 centimeters)
Weight	0.05 pounds (0.00225 kilograms) (approximate)

3.2.8 Simulated Track Assembly, 80071

Track 1 or track 2 can be temporarily removed from service by installing the 80071 Simulated Track Assembly between the applicable track 1 or track 2 transmitter output terminals (XMT 1 or XMT 2) on the front panel of the 3000 GCP case.

The Simulated Track Assembly (Figure 3-10) consists of a plastic housing containing a special simulated track inductor.

- A pair of 10-foot, number 10 AWG, stranded leads with yellow insulation and AREMA lugs extend from one end of the housing.
- The bright yellow leads permit an out-of-service track condition to be easily identified.

3.2.8.1 Instructions For Taking a Track Out of Service

Perform the following steps to temporarily take track 1 or track 2 out of service.

WARNING

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

ALWAYS VERIFY THAT THE PROPER 3000 GCP TRACK (T1 OR T2) IS BEING TAKEN OUT OF SERVICE.

INSTALLATION OF THE SIMULATED TRACK ASSEMBLY MAY AFFECT WARNING TIMES AT OTHER NEARBY OPERATING CROSSINGS. THIS CAN OCCUR WHEN APPROACHES OF THE NEARBY CROSSINGS OVERLAP THE ISLAND CIRCUIT OF THE CROSSING WHICH IS BEING TAKEN OUT OF SERVICE, OR IF THE NEARBY CROSSING(S) RECEIVE(S) A DAX SIGNAL FROM THE 3000 GCP TRACK CIRCUIT WHICH IS BEING TAKEN OUT OF SERVICE.

NOTES

When connecting the two simulated track assembly leads, place one lug on the appropriate transmitter output terminal and tighten the AREMA nut securely.

While installing the second lead, hold the lug firmly on the other terminal while tightening the nut to ensure a solid electrical connection.

If a solid electrical connection is not achieved when connecting the second lead of the simulated track assembly, apparent motion may be sensed or an error condition may be produced, de-energizing one or more relay drives. If this occurs, disconnect one lead of the simulated track assembly, wait for all relay drives to recover, and then repeat step 2.

1. Verify that no train moves are occurring on the track and that the proper relay drive voltages are present before continuing.
2. Install the two leads (Figure 3-10) of the simulated track assembly (80071) on the associated transmitter output terminals for the track that is being taken out of service (TB1-1 and TB1-2 or TB2-1 and TB2-2).

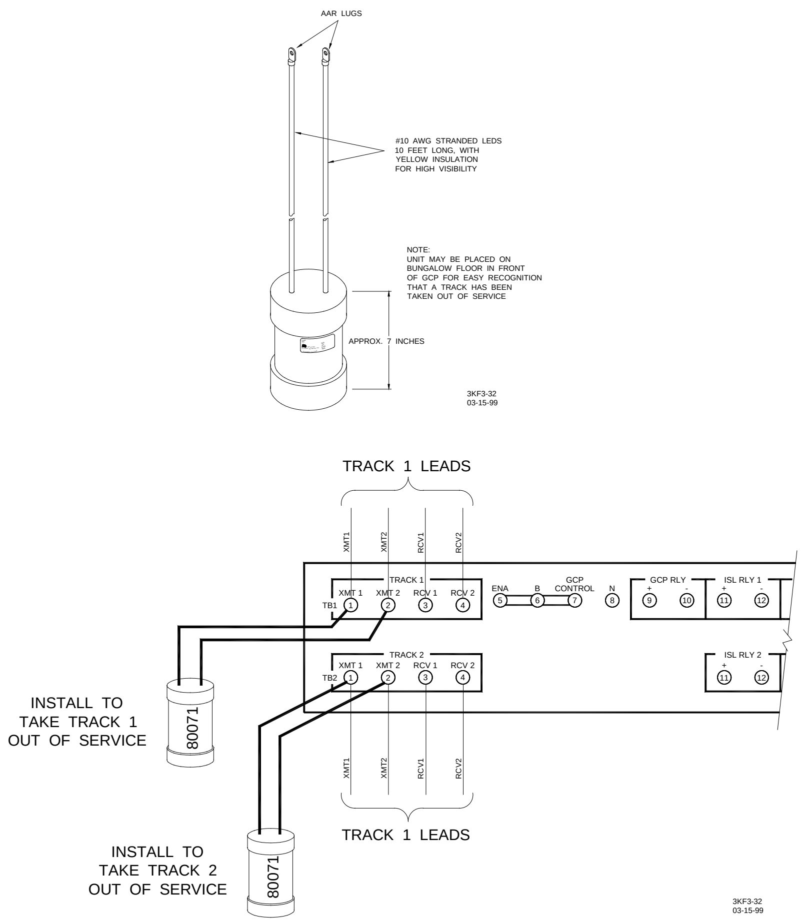


Figure 3-10:
Simulated Track Inductor Assembly, 80071

The applicable track circuit is now out of service; however, the island circuit remains operational.

3.2.9 Returning a Track to Service

1. To return track 1 or track 2 to service, disconnect the simulated track assembly (step 2).
2. With no trains operating in the approaches, verify that the track EZ value has returned to its nominal level.
3. In addition, ensure that all other railroad instructions and procedures for returning a track to service are followed.

3.3 GENERIC GRADE CROSSING PREDICTOR AUXILIARY EQUIPMENT

The following equipment is used by various Safetran Grade Crossing Predictors.

3.3.1 Bidirectional Simulation Coupler, 62664-MF

Low ballast resistance effectively reduces approach distances to a greater degree in unidirectional 3000 GCP installations than in bidirectional installations. Although the 3000 GCP can be 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 3000 GCP can provide a DAX start for an adjacent street, as well as other unidirectional applications, while operating as a simulated bidirectional GCP (GCP must be programmed for bidirectional operation).

WARNING

NO SAFETRAN GRADE CROSSING PREDICTOR PRIOR TO THE MODEL 3000 GCP CAN OPERATE UNIDIRECTIONALLY IN A SIMULATED BIDIREC-TIONAL MODE WHILE DAXING.

In a simulated bidirectional configuration, an NBS is connected in series with an adjustable inductor. The combination is then connected in parallel across the track connections so that the circuit is electrically equal to that of the actual track approach circuit. To the 3000 GCP, both approach circuits appear equal in length, even though one of the circuits consists of the shunt and inductor, which are located in the instrument housing/bungalow.

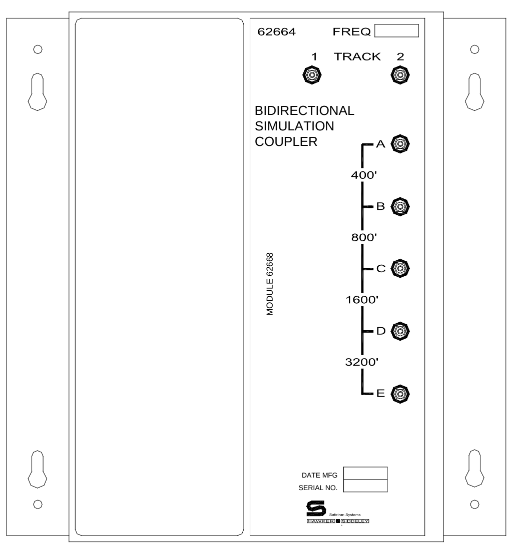


Figure 3-11:
Bidirectional Simulation Coupler, 62664-Mf

Bidirectional Simulation Coupler, 62664-Mf, (see Figure 3-11) is a convenient, compact, shelf- or backboard-mounted unit containing both an NBS of the same frequency as the GCP and an adjustable inductor (simulated track).

NOTE

The Bidirectional Simulation Coupler, 62664-Mf, cannot be used as a termination shunt.

The bidirectional simulation coupler is housed in a brushed aluminum case which contains a single plug-in type printed circuit board and four toroid-wound inductors, each of which simulates a specific length of track. The inductors are wired in series with taps provided which enable strapping of front panel terminals for selecting approach distances to closely match the actual track approach ranging from 400 to 6,000 feet as indicated in Table 3-10.

Table 3-10:
Approach Distance Selection Strapping

DISTANCE (FT)	STRAP TERMINALS	DISTANCE (FT)	STRAP TERMINALS
400	B-C, C-D, D-E	3,600	B-C, C-D
800	A-B, C-D, D-E	4,000	A-B, C-D
1,200	C-D, D-E	4,400	C-D
1,600	A-B, B-C, D-E	4,800	A-B, B-C
2,000	B-C, D-E	5,200	B-C
2,400	A-B, D-E	5,600	A-B
2,800	D-E	6,000	NO STRAPS
3,200	A-B, B-C, C-D		

Mounting dimensions for the Bidirectional Simulation Coupler Assembly are provided in Figure 3-12 while a typical application is illustrated in Figure 3-13.

Table 3-11:
Bidirectional Simulation Coupler Specifications

PARAMETER	VALUES
Environmental	-40° F to +160° F (-40° C to +71° C)
Dimensions	
Height	8.75 inches (22.2 centimeters)
Width	8.50 inches (21.6 centimeters)
Depth	9.25 inches deep (23.5 centimeters)
Weight	5 pounds (2.27 kilograms) (approximate)
Adjustment Range	400 to 6,000 feet (must be within ±10% of actual approach distance)
Loading Effect	Loading effect of internal narrow-band shunt is equivalent to that of the 62775 narrow-band shunt.

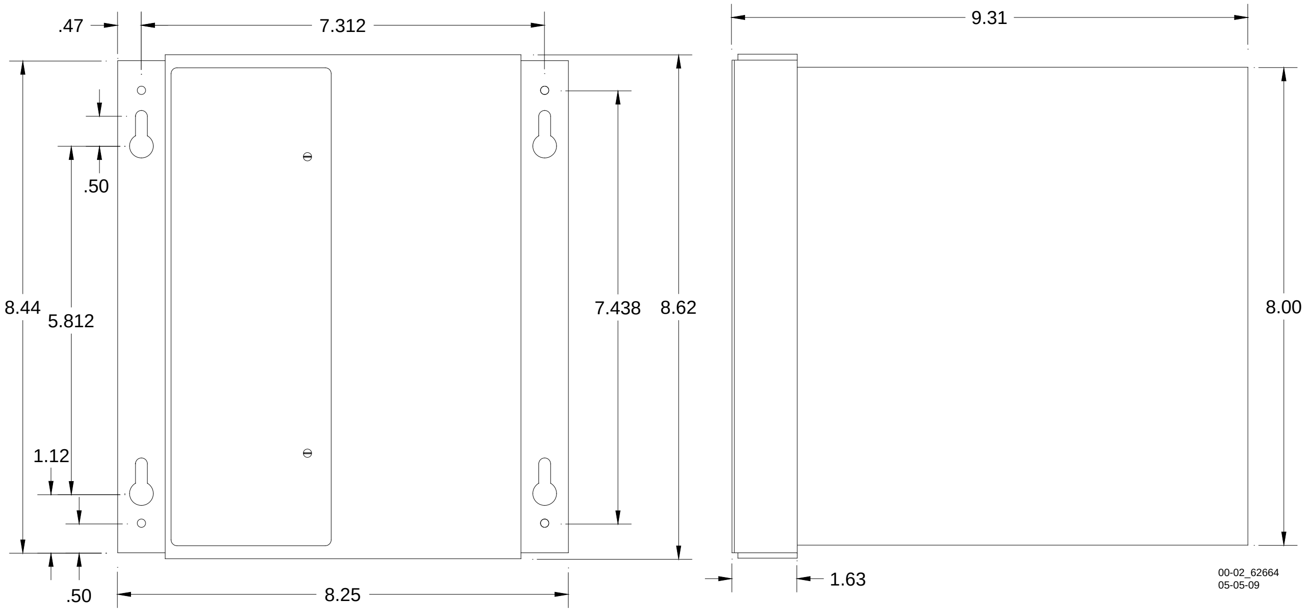


Figure 3-12:
Bidirectional Simulation Coupler (62664) Assembly Mounting Dimensions

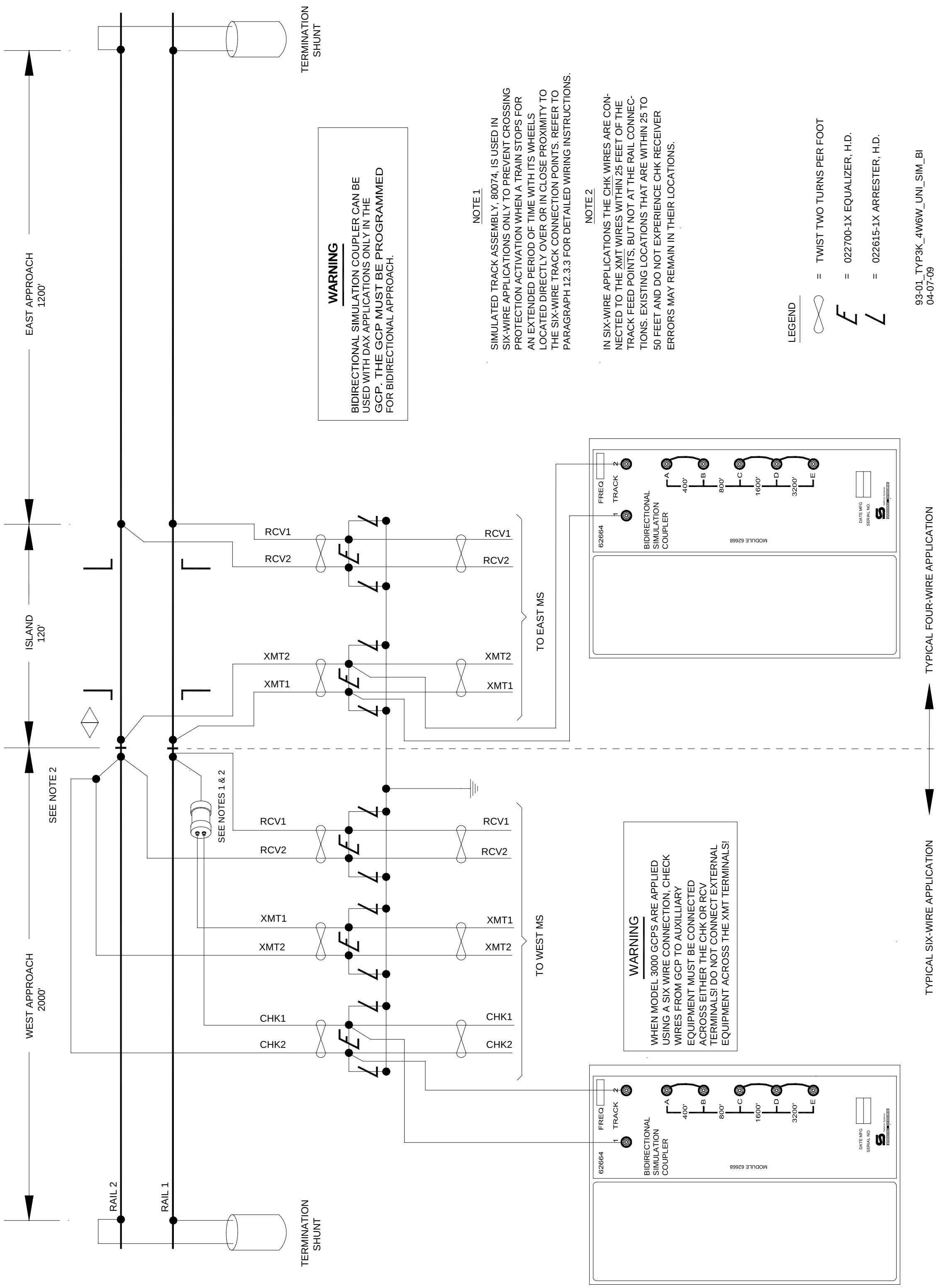


Figure 3-13:
Typical Unidirectional 3000 GCP Installation With Bidirectional Simulation Applied To East Approach

3.3.2 MS/GCP Termination Shunt Burial Kit, A62776

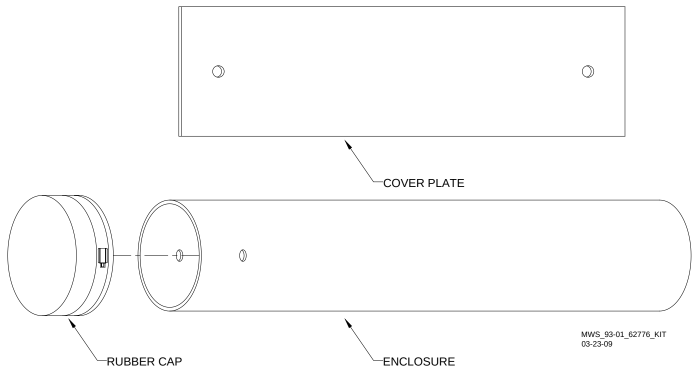


Figure 3-14:
MS/GCP Termination Shunt Burial Kit, A62776

MS/GCP Termination Shunt Burial Kit, A62776, (see Figure 3-14) is designed to protect narrow-band termination shunts that are normally buried in the space between adjacent railroad ties. The kit consists of a 26-inch length of 6-inch diameter black PVC tubing and a 7x24-inch ¼-inch thick steel plate. 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.

Table 3-12:
Dimension Data for MS/GCP Termination Shunt Burial Kit, A62776

PARAMETER	VALUES
Enclosure (PVC)	
Length	24.0 inches (60.96 centimeters) without end cap
Diameter	6.0 inches (15.24 centimeters) Inside Diameter
Thickness	0.1875 inches (0.47625 centimeters)
Cover Plate (Steel)	
Height	24.0 inches (60.96 centimeters)
Width	7.0 inches (15.24 centimeters)
Thickness	0.25 inches (0.60 centimeters)
Weight	
Enclosure	5 pounds (11.02 kilograms) (approximate)
Cover Plate	12 pounds (26.45 kilograms) (approximate)

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. See Table 3-12 for dimensional data.

3.3.3 Six-Wire Simulated Track Burial Assembly, 80074

The 80074 Six-wire Simulated Track Burial Assembly is used in six track wire applications only and ensures proper operation of the 3000 GCP self-check circuits if a train stops at or very near the track wire feed points.

The unit is connected between the transmit and check channel receiver track wires and the associated rail as shown in Figure 3-15. Once connected it is buried beside the tracks.

WARNING

IN A SIX-WIRE APPLICATION, TWO CHECK WIRES ARE CONNECTED TO THE CORRESPONDING TRANSMITTER TRACK WIRES IN THE UNDERGROUND TO PROVIDE REMOTE SENSING OF THE TRANSMIT SIGNAL. THE CONNECTION IS MADE WITHIN 25 FEET OF THE TRANSMITTER FEED POINTS BUT NOT AT THE RAIL CONNECTIONS AND NOT WHERE THE CONNECTION CAN BE DAMAGED BY TRACK MACHINERY OR DRAGGING EQUIPMENT. EXISTING LOCATIONS THAT ARE BETWEEN 25 AND 50 FEET AND DO NOT EXPERIENCE CHECK RECEIVER ERRORS MAY REMAIN AT THEIR LOCATION.

THE CORRESPONDING XMT AND CHK WIRES MUST BE CONNECTED TOGETHER AS SHOWN IN FIGURE 3-15.

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

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

WHEN ANY EXTERNAL TRACK CIRCUIT EQUIPMENT OR AUXILIARY TRACK CIRCUIT EQUIPMENT SHARES TRACK WIRES WITH A GCP/MS TRACK CIRCUIT THAT DOES NOT HAVE

AN ACTIVE INTERNAL ISLAND FOR THAT TRACK CIRCUIT OR OUTPUT, SUCH AS A DAX OR PRIME PREDICTION OFFSET, THEN THE TRACK CIRCUIT EQUIPMENT MUST BE CONNECTED IN ACCORDANCE WITH PARAGRAPH 3.3.3.

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 3-15).

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

CAUTION

THE BURIAL ASSEMBLY SHOULD BE CONNECTED AS CLOSE AS PRACTIBLE TO THE RAILS (WITHIN 10 FEET) AND, TO AFFORD MAXIMUM PROTECTION FROM PHYSICAL DAMAGE, BE ENCASED IN A PROTECTIVE ENCLOSURE OR BURIED (EITHER VERTICALLY OR HORIZONTALLY) AT AN APPROPRIATE DEPTH. IT IS NOT NECESSARY TO BURY THE ASSEMBLY BELOW THE FROST LINE. THE LENGTH OF THE SINGLE NUMBER 6 AWG LEAD FROM THE SIMULATED TRACK BURIAL ASSEMBLY TO THE TRACK FEED POINT SHOULD NOT BE LESS THAN 25 FEET.

NOTE

When splicing track connections, welded splices should be used. Use of Kearney connectors should be avoided.

A typical 3000 GCP six-wire unidirectional installation operating in the unidirectional mode and using the Track Burial Assembly is shown in Figure 3-15.

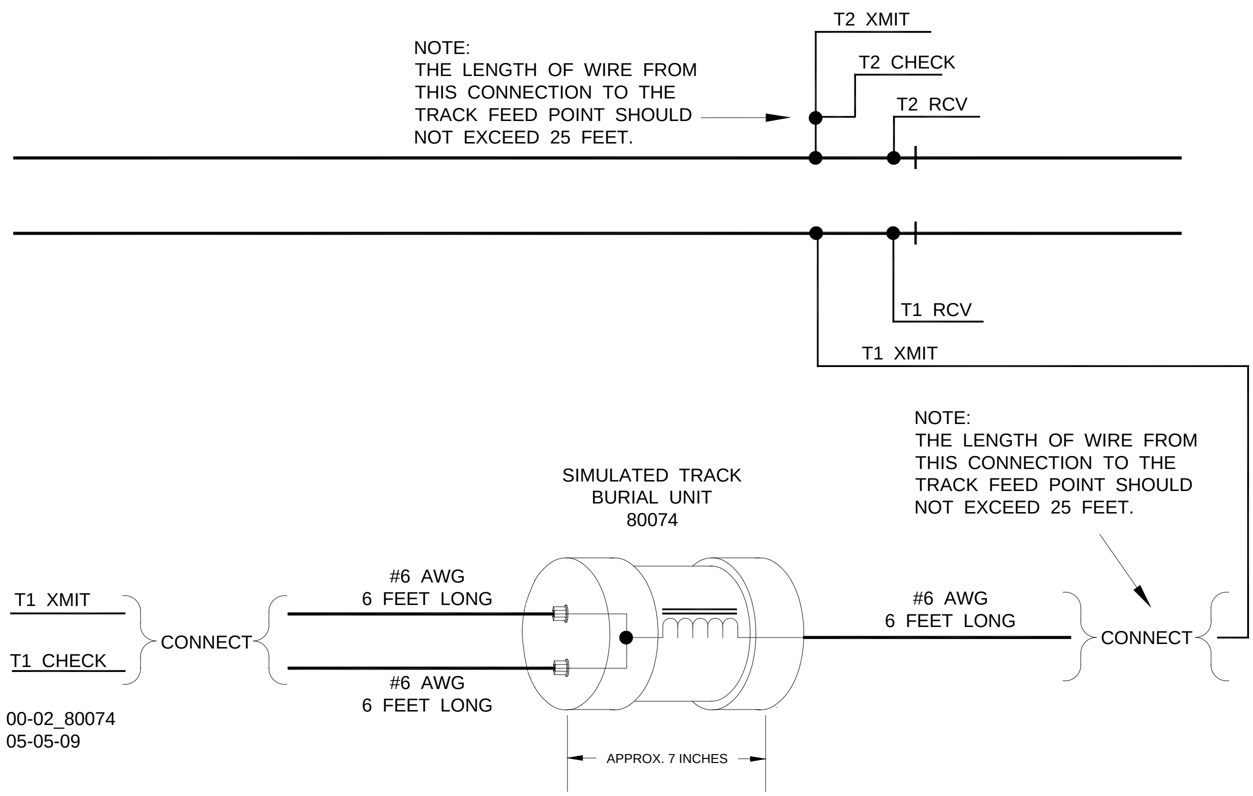


Figure 3-15:
Six-wire Simulated Track Burial Assembly, 80074

3.3.4 DC Shunting Enhancer Panel, 80049

WARNING

DO NOT CONNECT THE DC SHUNTING ENHANCER PANEL TO THE 3000 GCP UAX (UAX1) TERMINALS IF OTHER WIRES ARE ALREADY CONNECTED TO THESE TERMINALS.

IF THIS CONDITION EXISTS, CONTACT SAFETRAN ENGINEERING AT 1-800-793-7233 BEFORE PROCEEDING.

Intermittent poor shunting can result just about anywhere due to numerous causes, but generally occurs due to:

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

Lack of any shunting generally occurs in dark territory where no DC or AC track circuits exist and few trains run.

Track shunting in dark territory can be easily improved using methods similar to those employed in style-C track circuits (but without the need for so many insulated joints). This involves the:

- a minimum of one insulated joint at the far end of each approach or area (see Figure 3-17)
- application of a DC voltage to the track at the crossing

These measures improve shunting, thus allowing the 3000 Enhanced Detection software to function reliably.

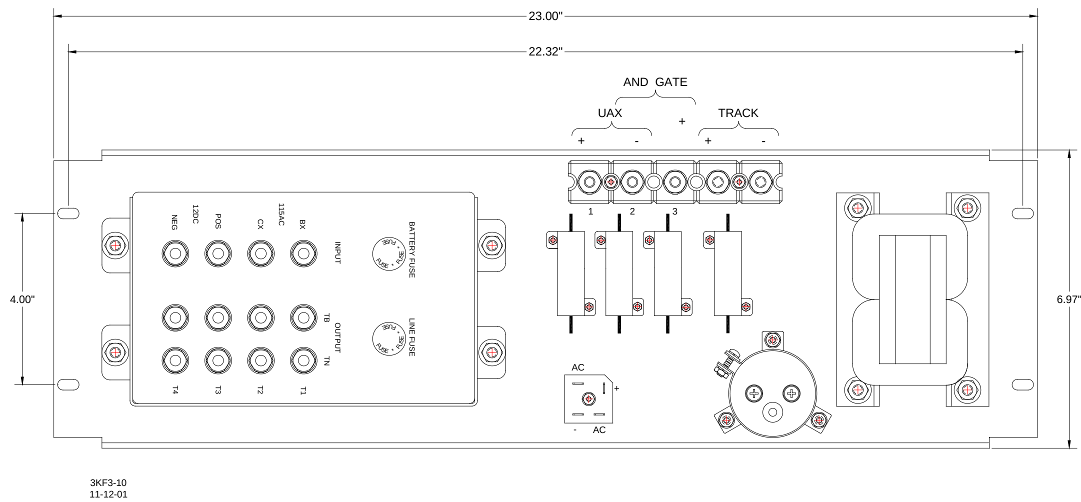


Figure 3-16:
DC Shunting Enhancer Panel, 80049

The Safetran 80049 DC Shunting Enhancer Panel, Figure 3-16, applies a nominal 6 volts DC to the track at the crossing to break down any insulating film that may develop on the rails. This DC voltage is isolated from battery and is generated from:

- 110 volt AC step-down transformer when AC is present
- Battery powered DC-to-DC converter when AC is off.
- The panel switches automatically to the DC-to-DC converter output if AC fails. The 3000 GCP UAX input monitors the presence of 6-volt DC. A minimum of two insulated joints are required to confine the 6 volts on the track with one placed at the far end of each GCP approach.
- The DC Shunting Enhancer Panel can easily be incorporated into applications involving overlapping approaches from two or more crossings without the use of additional insulated joints as shown in Figure 3-17.
- Narrow-band termination shunts must be used in all applications of the 80049 panel, since wideband and hardwire shunts negate the purpose of the panel.
- The 80049 panel can be rack, wall, or shelf mounted. See Figure 3-16 for mounting dimensions.

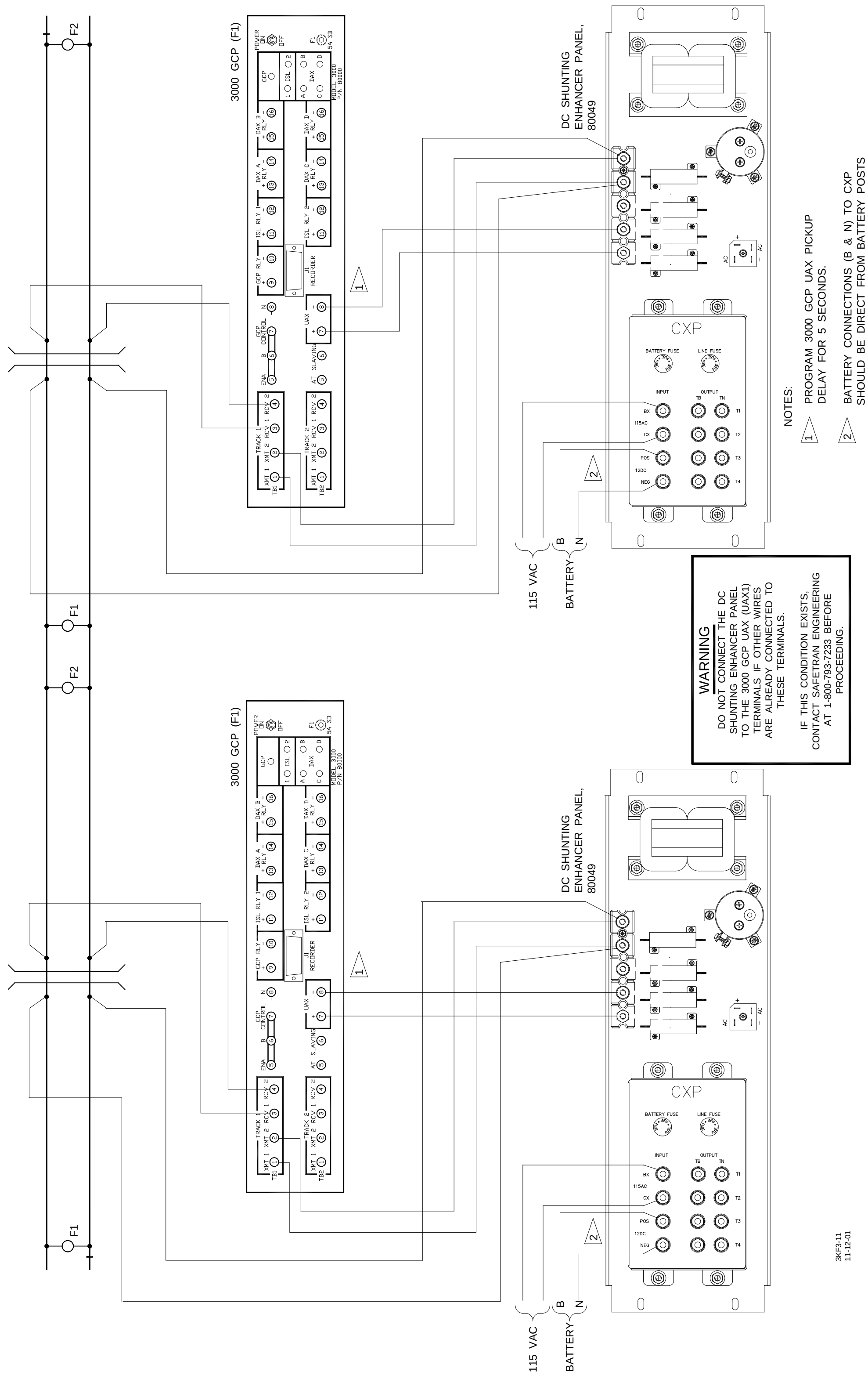


Figure 3-17:
DC Shunting Enhancer Panel, 80049,Typical Application With Overlapping Track Circuits

3.3.5 Vital AND-Gate, 2-Input 90975

The solid-state Vital 2-Input AND-gate, 90975 (see Figure 3-18), is a logic device that combines two inputs to produce a single output. The AND-gate output is energized only when both inputs are energized. The solid-state vital AND-gate inputs and output are electrically isolated from battery (B and N) within the unit.

This device is designed for applications such as cascading the outputs from two separate devices into the single input of a third device. The vital AND-gate eliminates the need for external relays which are normally used to accomplish this function. The unit is housed in a brushed aluminum case which can be installed in any convenient location within the wayside enclosure. A typical application using the vital AND-gate with the 3000 GCP is described in the following paragraphs and is illustrated in Figure 3-19.

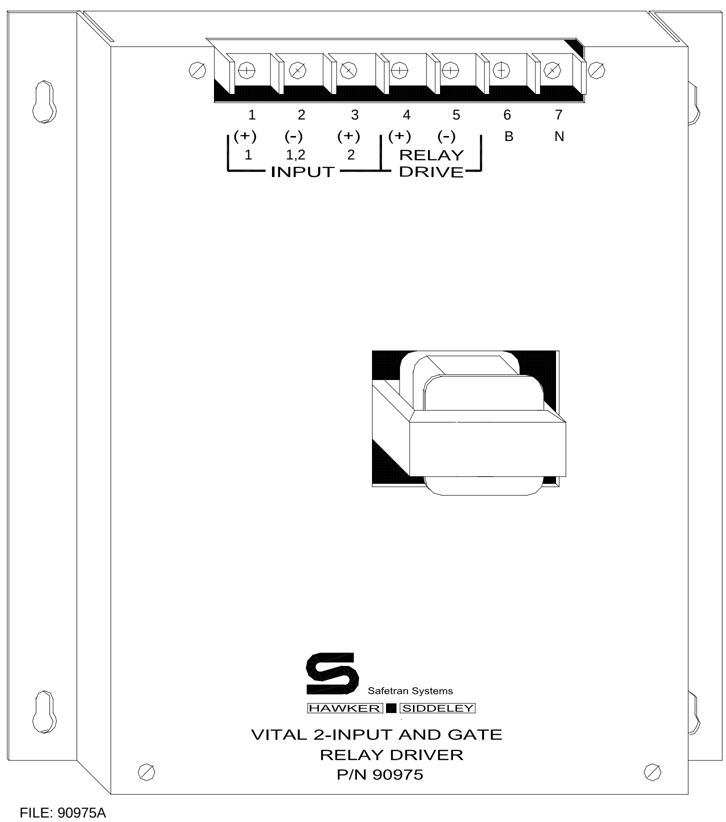


Figure 3-18:
Vital AND-Gate, 2-Input, 90975

In the example illustrated in Figure 3-19, streets A, B, and C, are 500 feet apart. Each crossing is protected by two unidirectional 3000 GCPs (or a single GCP case with two transceiver modules) with a set of insulated joints located on one side of the street that electrically isolate the two GCP systems. The insulated joints cannot be bypassed with couplers of any type. Therefore, since the approach distance between adjacent crossings is not sufficient to provide the operating time required, and the approach cannot be extended by passing the GCP frequency around the insulated joints with bypass couplers, the controls can be extended by adding a DAX Module (80016) to each GCP. Each 3000 GCP case can accommodate up to two DAX modules and each module is equipped with two DAX prediction circuits, providing a total of four independent DAX outputs.

To provide 30 seconds operating time at a maximum train speed of 30 miles-per-hour, the approach distance required in the example would be 1,496 feet (30 seconds warning time plus 4 seconds system response time multiplied by 44 feet per second equals 1,496 feet). Therefore, to provide adequate crossing start distance for both eastbound and westbound trains, two DAX circuits are required in GCP number 1 at street A, one DAX circuit each in GCPs 1 and 2 at street B, and two DAX circuits in GCP 2 at street C.

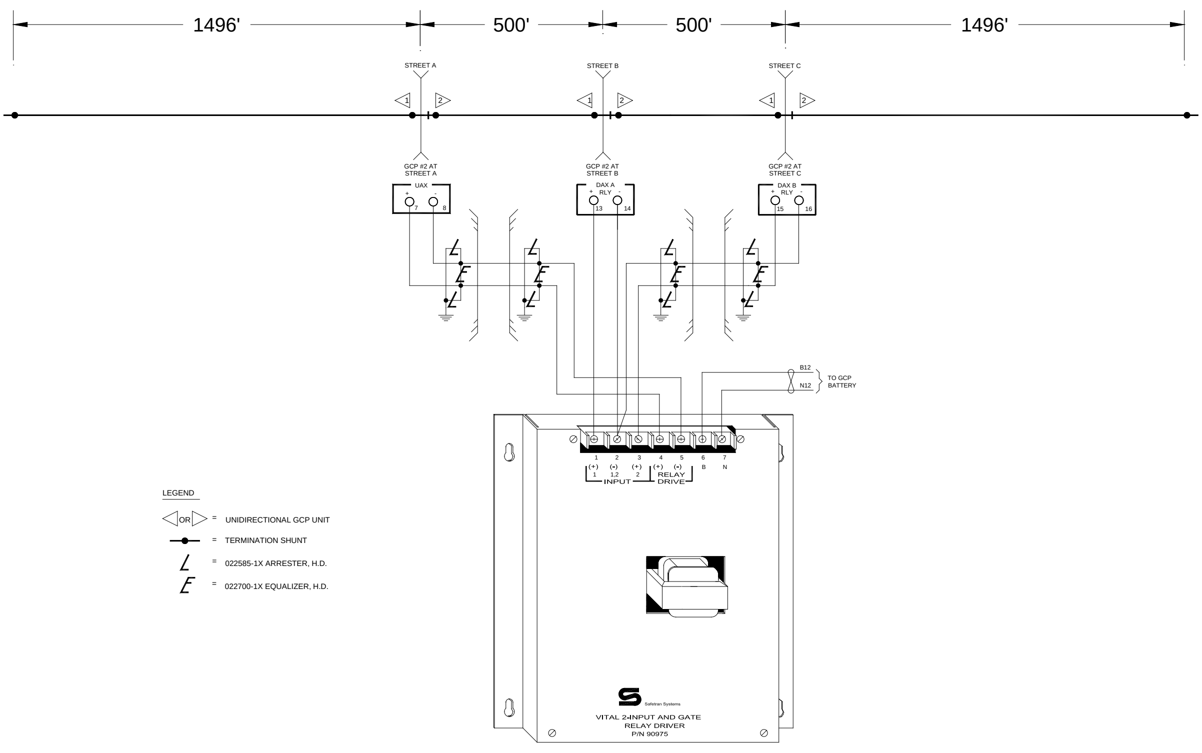


Figure 3-19:
Typical Solid-state Vital And-Gate Application

Downstream adjacent crossing (DAX) control requires a line circuit (open line or cable) between the GCP with the DAX module and the GCP receiving the normally-energized DAX output (applied to UAX terminals). In the example, the number 2 GCPs at streets B and C are both supplying a DAX output to the single UAX input on GCP 2 at street A. This is accomplished by applying the two DAX outputs to the inputs on a vital AND-gate. The single output from the AND-gate is then connected to the UAX terminals on GCP 2 at street A.

To illustrate DAX control for street A, consider a westbound train approaching street C at 30 miles-per-hour. When the train is 30 seconds from street A, the DAX B circuit in GCP 2 at street C predicts and removes relay drive from the front panel DAX B relay drive (RLY + and -) terminals.

The line circuit from these terminals extends to the vital AND-gate at street B. When energy is removed from the vital AND-gate input, the line circuit from street B (AND-gate output) to the UAX input on GCP 2 at street A is also deenergized. Removing energy from the UAX terminals de-energizes the front panel GCP RLY (relay drive) terminals on GCP 2 at street A, causing the warning signals to operate. When the train crosses the insulated joints at street C, GCP 2 at street B 'picks up' the train, causing DAX A in that unit to predict and deenergize the DAX A front panel terminals on that unit (second input to vital AND-gate). This ensures that the line circuit to the GCP UAX terminals on GCP number 2 at street A remains deenergized (the vital AND-gate output will be energized only when both inputs to the AND-gate are energized).

See Figure 3-20 for solid-state vital AND-gate assembly mounting dimensions.

Table 3-13:
Data Recorder Interface Assembly Specifications

PARAMETER	VALUES
Power Input	
Voltage	9.5 to 16.5 VDC
Current	200 milliamperes
Output	12 VDC (nominal); will drive 200 to 1,000-ohm loads
Control Inputs	7 to 18 VDC (1,000-ohm input resistance)
Input/Output Protection	Floating (optically coupled and transformer coupled); surge protected
Dimensions	
Height	6.25 inches (15.9 centimeters)
Width	6.25 inches (15.9 centimeters)
Depth	2.5 inches deep (6.4 centimeters)
Weight	1 pounds (0.45 kilograms) (approximate)

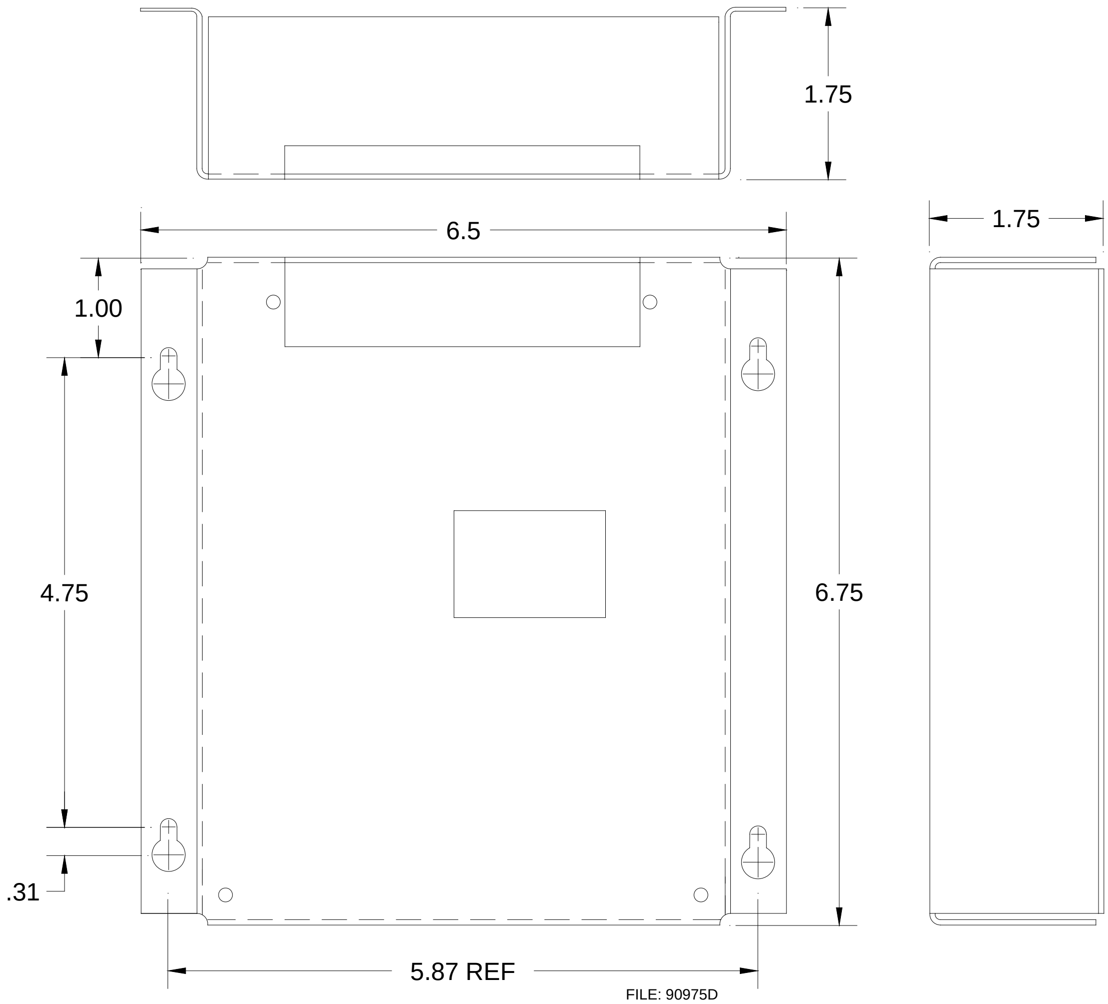


Figure 3-20:
Solid-state Vital Gate Assembly Mounting Dimensions

3.3.6 Vital AND-Gate, 4-Input, 91082

The Vital AND-Gate, 4-Input, 91082, (Figure 3-21) is a logic device that combines four DC inputs to produce a single DC output.

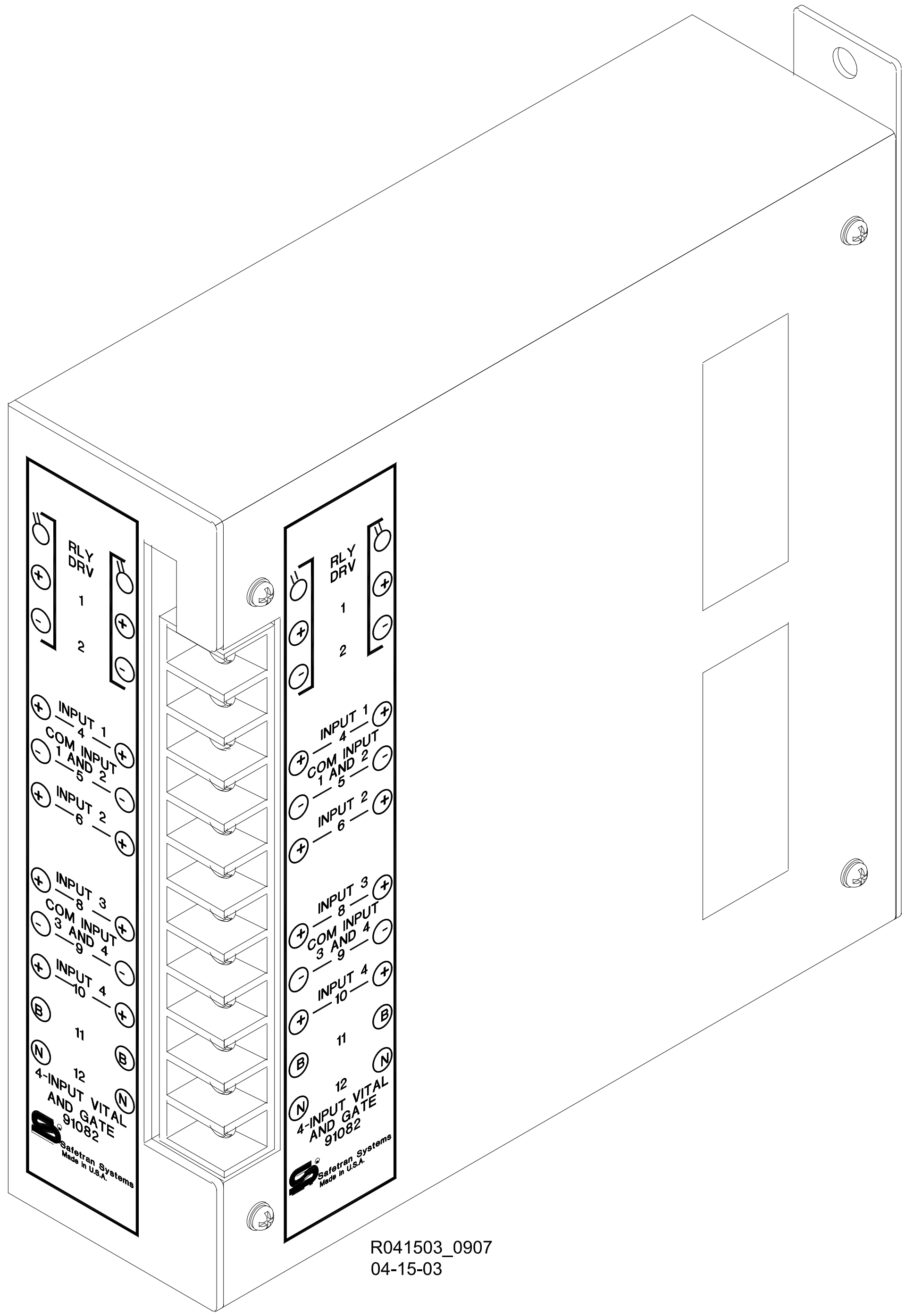


Figure 3-21:
Vital AND Gate, 4-Input, 91082

The Vital AND-Gate, 4-Input, 91082, combines four inputs to produce a single output. When a relay drive voltage is applied to all of the AND gate inputs, the drive voltage appears at the **RLY DRV** output of the gate. When the drive voltage is removed from any one of the AND gate inputs, voltage is removed from the **RLY DRV** output.

NOTE

The inputs and outputs are electrically isolated from battery (B and N) within the unit.

Table 3-14:
4-input Vital AND Gate, 91082

PARAMETER	VALUES
Environmental Temperature Range:	-40 °F to +158 °F (-40 °C to +70 °C)
Power Input	
Voltage	9.5 to 16.5 VDC
Current	200 milliamperes
Output	12 VDC (nominal); will drive 400 to 1,000-ohm loads
Control Inputs	7 to 18 VDC (1,000-ohm input resistance)
Input/Output Protection	Floating (optically coupled and transformer coupled); surge protected
Dimensions	
Height	9.38 inches (87.89 centimeters)
Width	2.44 inches (20.37 centimeters)
Depth	8.02 inches (20.37 centimeters)
Weight	4.06 pound (1.8 kilogram) (approximate)
Mounting Dimensions	The 4-input Vital AND Gate is housed in a brushed aluminum case designed for shelf or backboard mounting. The unit mounting dimensions are provided in Figure 3-22.

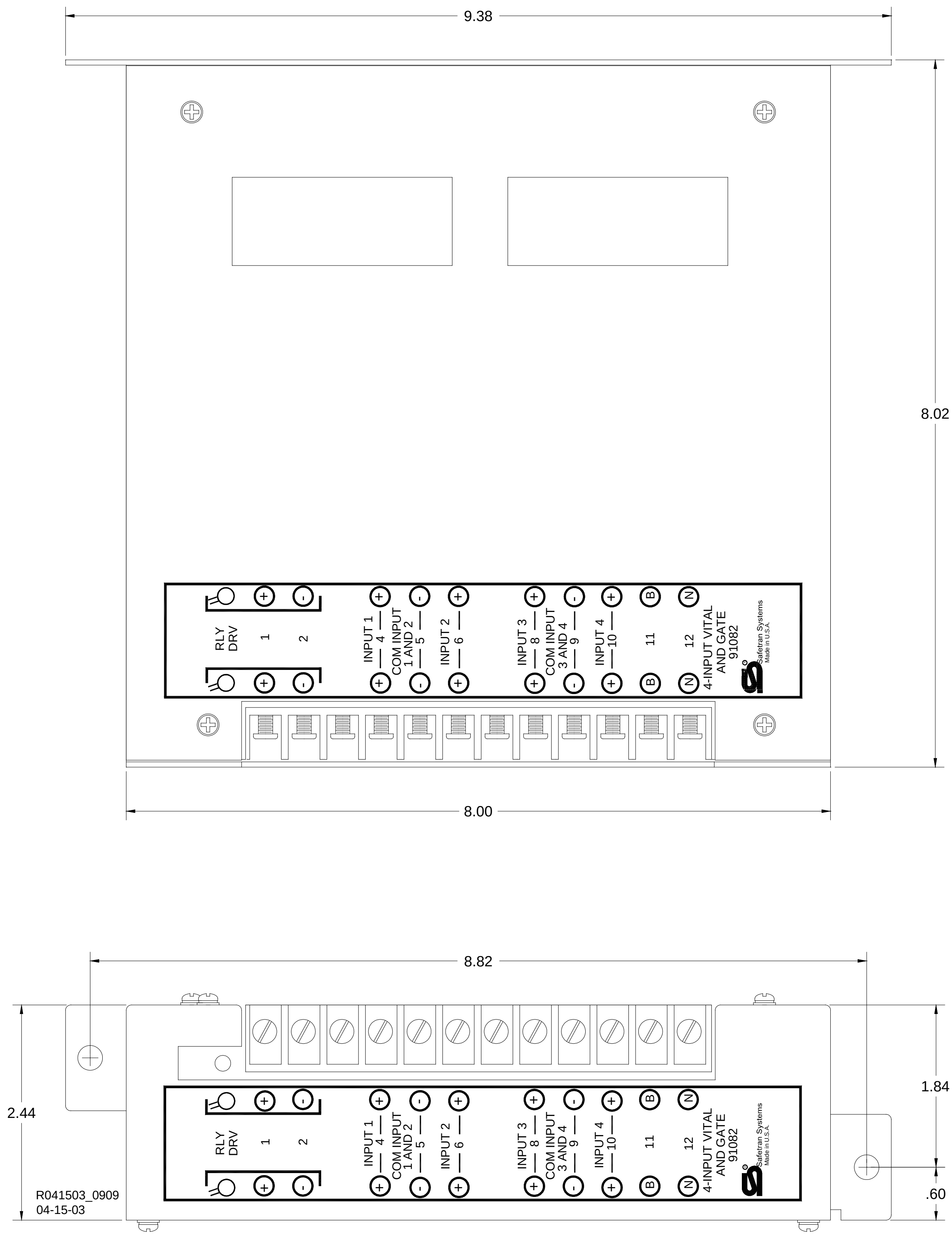


Figure 3-22:
4-input Vital AND Gate Assembly Mounting Dimensions

3.4 TRACK CIRCUIT ISOLATION DEVICES

NOTE

As there are a number of variations in DC coded track such as relay type and associated operating current, decoding method, current and voltage transmitted and received, track circuit length, transmit and receive code polarity, DC code frequency, pulse width, etc., 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 are designed for mounting inside a weatherproof enclosure.

If there are any questions concerning these recommendations or applications, contact Safetran Application Engineering for assistance.

Several types of track circuit isolation devices are available for both DC and AC coded track applications. Also, as additional field experience is gained, improved or changed application methods may result.

The following discussions are grouped by coded track circuit type.

3.4.1 Steady Energy DC Track Circuits

All DC track circuits with batteries located within a 3000 GCP approach, or less than 2,000 feet beyond the approach termination, should be equipped with a battery choke. Either of the following battery chokes may be used in Steady Energy DC Track Circuits:

- Part number 8A065A
- Part number 62648 (see limitations in following paragraphs).

However, if the track connections for the DC track circuit are 2,000 feet or more beyond the GCP approach termination shunt, a battery choke is not required (see Figure 3-23).

WARNING

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

NOTE

Operation of long DC track circuits with very low ballast conditions may be affected by the DC resistance (DCR) of the 8A065A battery choke, which has a DCR of 0.40 ohm. Such track circuits should use the 62648 battery choke, which has a DCR of 0.10 ohm and 5 mH of inductance.

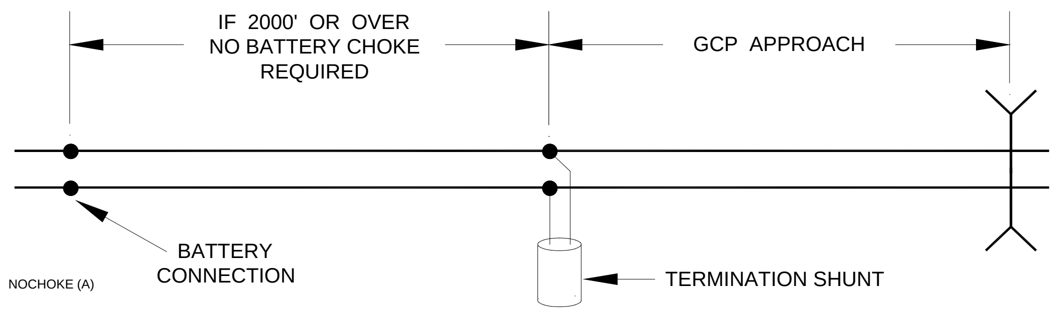


Figure 3-23:
Battery Choke Requirements

3.4.1.1 Battery Chokes, 62648 & 8A065

The 62648 and 8A065A battery chokes each consist of a large inductance coil with two top-mounted AREMA Terminals and a mounting base (Figure 3-24).

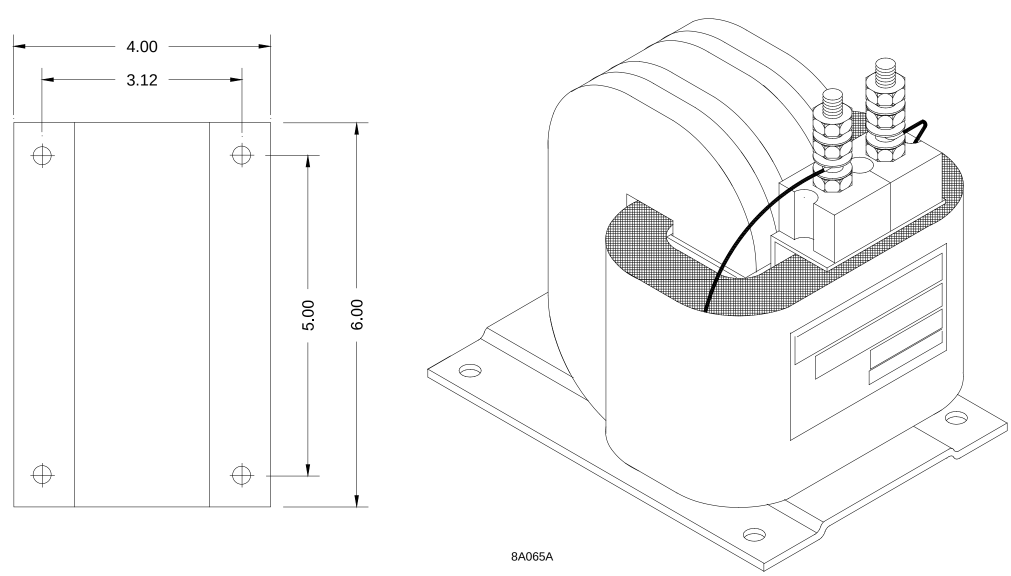


Figure 3-24:
62648/8A065A Battery Choke With Mounting Dimensions

When a rectified track circuit is used and the GCP is operating at 114 Hz, an 8A076A wideband shunt (paragraph 3.5.8) should also be used along with the battery choke to eliminate 120 Hz ripple. Figure 3-25 illustrates this application.

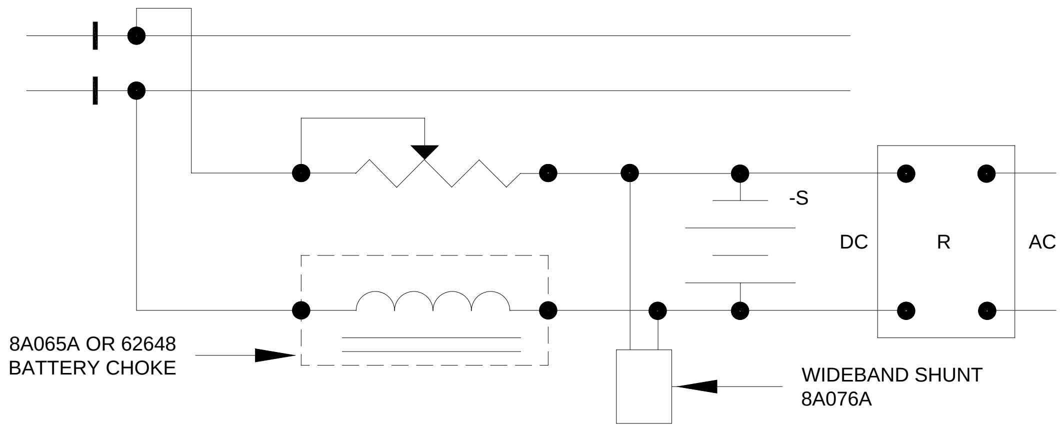


Figure 3-25:
Ripple Elimination Circuit

Table 3-15:
Battery Chokes, 62648 and 8A065, Specifications

PARAMETER	VALUES
Dimensions	
Height	8.5 inches (21.59 centimeters)
Width	4.50 inches (11.43 centimeters)
Depth	5.0 inches (12.7 centimeters)
Weight	17 pounds (7.72 kilograms) (approximate)

3.4.2 Safetran GEO Electronic DC Coded System

The standard Safetran 3000 GCP frequencies of 86 Hz and above are compatible with GEO. Isolation circuits are generally not required in the GEO transmitter rail connections. GCP Frequencies of 86, 114, 156, and 211 Hz require use of maximum current, track devices, and the GEO Track Noise Suppression Filter, A53252. The GEO Filter must be installed at the signal location for the above mentioned frequencies.

3.4.3 Electro Code Electronic Coded System

Model 3000 GCP frequencies of 86 Hz and above can normally be used with Electro Code. All frequencies of 211 Hz and lower require use of maximum current track drive. In certain instances, 285 Hz may also require maximum current.

For frequencies of 211 Hz and lower, an Electro Code track filter (TF-freq) may be required when the Electro Code transmitter is located within the 3000 GCP approach. As with any coded track system, the lower the Electro Code transmit level, the less interference with GCP units.

3.4.4 Relay Coded DC Track

3.4.4.1 DC Code Isolation Units, 6A342-1 & 6A342-3

Most relay coded DC track installations require use of DC code isolation units such as the 6A342-1 (Figure 3-26). 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 3000 GCP.

WARNING

THE CORRECT MODEL CODE ISOLATION UNIT FOR THE TYPE OF DC CODED TRACK CIRCUIT USED MUST BE INSTALLED AS INSTRUCTED IN THESE GUIDELINES.

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION AFTER INSTALLING THE ISOLATION UNIT.

The 6A342-1 DC code isolation unit is used in most single polarity code systems while the 6A342-3 unit is used in GRS Trakode (dual polarity) relay systems. The only difference between the two units is that 6A342-1 is internally wired to CR1, while the 6A342-3 is not (see note in Figure 3-26).

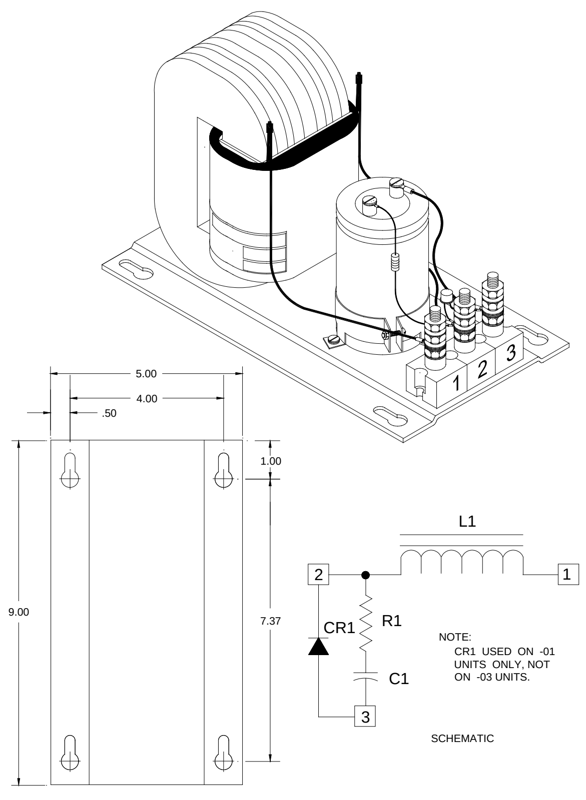


Figure 3-26:
DC Code Isolation Unit, 6A342-01, With Mounting Dimensions

All wiring to terminals 1 and 2 on the isolation units should be number 6 AWG. This significantly reduces current losses to the track relay during low track ballast conditions. Frequencies below 211 Hz require maximum current.

Table 3-16:
Battery Choke, 6A342 Specifications

PARAMETER	VALUES
Dimensions	
Height	5.75 inches (14.6 centimeters)
Width	5.0 inches (12.752 centimeters)
Depth	9.0 inches (22.86 centimeters)
Weight	15 pounds (6.81 kilograms) (approximate)

Various applications for the track isolation units are discussed in the paragraphs that follow.

3.4.5 Single Polarity Systems (Fixed Polarity)

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, and 180 ppm) are of this type. Figure 3-27 illustrates a typical 6A342-1 code isolation unit installation in a single polarity code system.

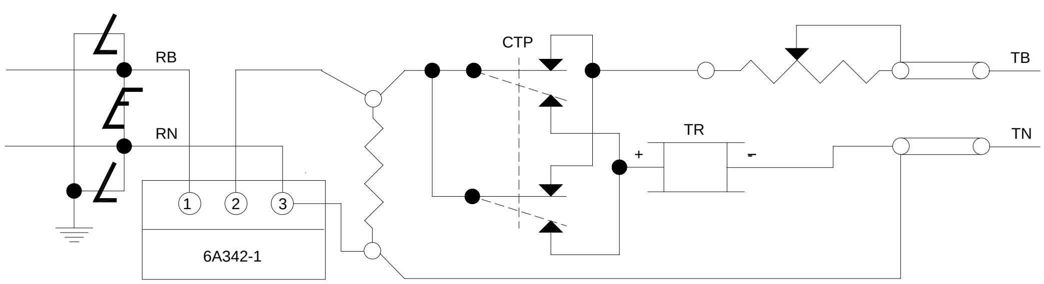


Figure 3-27:
Typical 6A342-1 Code Isolation Unit Installation in a Single Polarity Code System

3.4.6 GRS Trakode (Dual Polarity) Systems

WARNING

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

Figure 3-28 illustrates the 6A342-3 code isolation unit installed in a GRS Trakode system. 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.

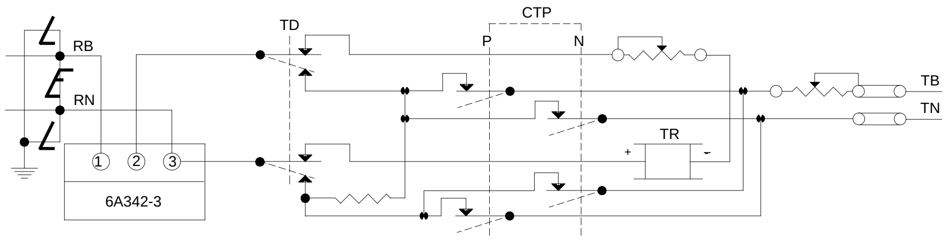


Figure 3-28:
Typical 6A342-3 Code Isolation Unit Installation in a GRS Trakode System

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

WARNING

THE CORRECT MODEL CODE ISOLATION UNIT FOR THE TYPE OF DC CODED TRACK CIRCUIT USED MUST BE INSTALLED AS INSTRUCTED IN THESE GUIDELINES.

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION AFTER INSTALLING THE ISOLATION UNIT.

A dual polarity system is one in which the received code polarity is opposite that of the transmitted code. 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 Safetran Application Engineering for assistance in dual polarity code systems.

3.4.8 AC Cab Signal

WARNING

THE CORRECT MODEL CODE ISOLATION UNIT FOR THE TYPE OF DC CODED TRACK CIRCUIT USED MUST BE INSTALLED AS INSTRUCTED IN THESE GUIDELINES.

ALWAYS VERIFY PROPER CODE SYSTEM OPERATION AFTER INSTALLING THE ISOLATION UNIT.

Application of 3000 GCP systems in cab territory using 60 Hz AC Code Isolation Unit, 8A466-3 (Figure 3-29), or 100 Hz Isolation Unit, 8A471-100 (Figure 3-32), is shown below. For other installations, contact Safetran Application Engineering for assistance.

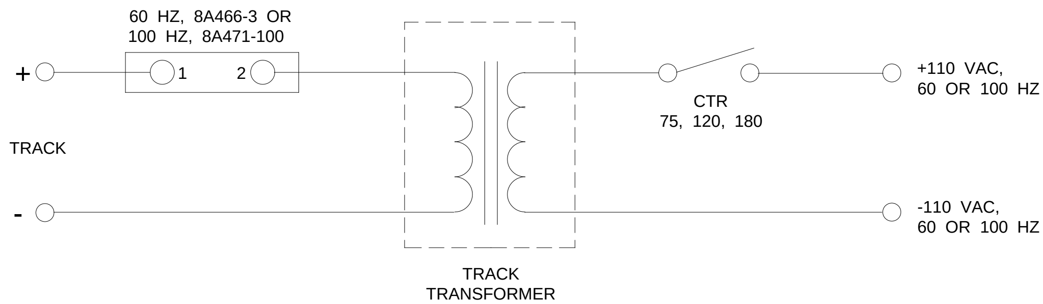


Figure 3-29:
Typical AC Code Isolation Unit Installation Application

3.4.8.1 AC Code Isolation Unit, 8A466

Specifications f for the AC Code Isolation Unit, 8A466 (Figure 3-30) are as follows:

Table 3-17:
60 Hz AC Code Isolation Unit, 8A466-3 Specifications

PARAMETER	VALUES
Dimensions	
Height	7.62 inches (19.35 centimeters)
Width	10.15 inches (25.78 centimeters)
Depth	11.78 inches (29.92 centimeters)
Weight	26 pounds (11.8 kilograms) (approximate)

3.4.8.2 AC Code Isolation Unit, 8A471-100 & 8A471-180

Specifications for the AC Code Isolation Unit, 8A471-100, (Figure 3-32) are as follows:

Table 3-18:
100 Hz AC Code Isolation Unit, 8A471-100 Specifications

PARAMETER	VALUES
Dimensions	
Height	9.0 inches (22.86 centimeters)
Width	5.0 inches (12.70 centimeters)
Depth	9.4 inches (23.88 centimeters)
Weight	5 pounds (2.27 kilograms) (approximate)

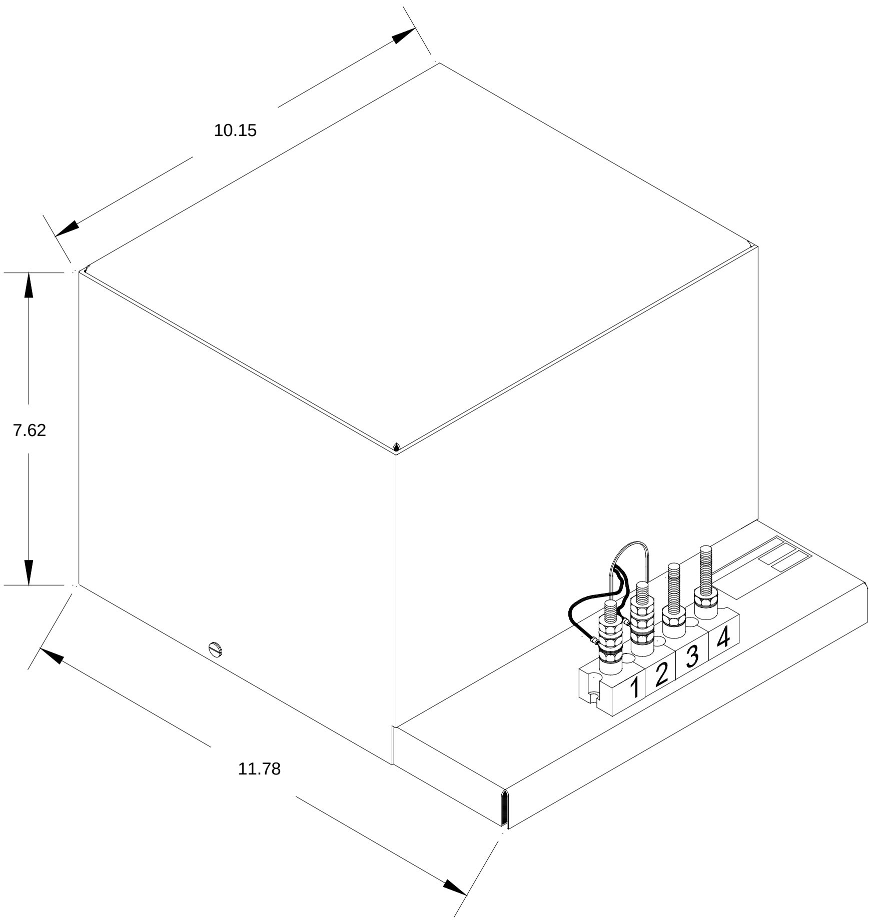


Figure 3-30:
AC Code Isolation Unit, 8A466

3.4.9 Style C Track Circuits

The 60-Hz AC code isolation unit (8A466-3) (Figure 3-31) is used with style C track circuits as shown below. For special applications, 180-Hz AC code isolation unit (8A471-180) (Figure 3-32) is also available. Contact Safetran Application Engineering for specific information.

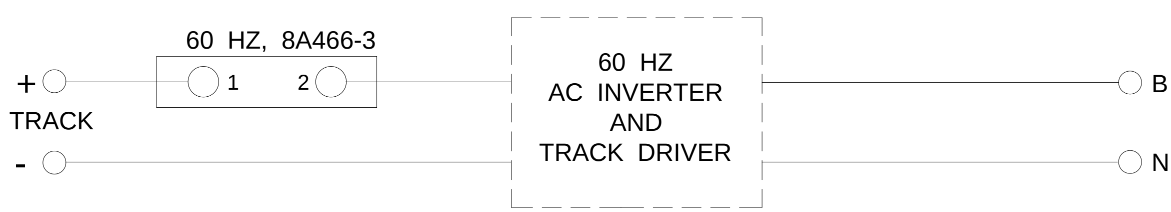


Figure 3-31:
60 Hz AC Code Isolation Unit Installation in Style C Track Circuit

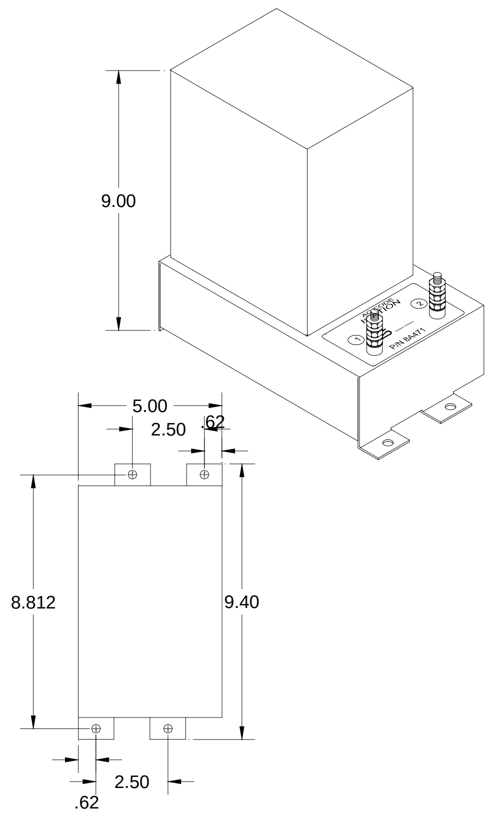


Figure 3-32:
180 Hz AC Code Isolation Unit, 8A471-100 & -180, With Mounting Dimensions

Table 3-19:
180 Hz AC Code Isolation Unit, 8A471-100 & -180 Specifications

PARAMETER	VALUES
Dimensions	
Height	9.0 inches (22.86 centimeters)
Width	5.0 inches (12.70 centimeters)
Depth	9.4 inches (23.88 centimeters)
Weight	5 pounds (2.27 kilograms) (approximate)

3.5 COUPLERS AND SHUNTS

3.5.1 Tunable Insulated Joint Bypass Coupler, 62785-F

Tunable Insulated Joint Bypass Coupler, 62785-f, is designed to replace the earlier fixed-frequency 62531-f and 62631-f insulated joint bypass couplers and must be used in all Model 3000 GCP applications; not the 62531-f and 62631-f couplers. The tunable insulated joint bypass coupler is field tuned to pass the 3000 GCP frequency (f) around insulated joints in DC coded track circuits. As a general rule, a maximum of two sets of insulated joints in each approach can be bypassed using tuned couplers. See Table 3-20 for minimum distance requirements.

Table 3-20:
Minimum Distance to Insulated Joints When Coupled
With 62785-F Tunable Insulated Joint Bypass Couplers

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	Call Safetran Application Engineering	Call Safetran Application Engineering
151 ⇳ 211	1500 ⇳ 1500	2200 ⇳ 2200
212 ⇳ 348	1000 ⇳ 1000	1400 ⇳ 1400
349 ⇳ 560	700 ⇳ 700	1000 ⇳ 1000
561 ⇳ 790	500 ⇳ 500	800 ⇳ 800
791 ⇳ 979	400 ⇳ 400	700 ⇳ 700

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

For motion sensor applications only, the 62785-f coupler can also be used when insulated joints are located anywhere within the approach. Field tuning of the coupler enables precise frequency adjustment for track and joint parameters. The 62785-f Tunable Insulated Joint Bypass Coupler is available in standard Safetran frequencies of 156 Hz through 970 Hz.

WARNING

INSULATED JOINT BYPASS COUPLERS, 62531-F AND 62631-F, MUST NOT BE USED WITH THE MODEL 3000 GCP. USE INSULATED JOINT BYPASS COUPLER (62785-F) INSTEAD.

CAUTION

CALL SAFETRAN APPLICATION ENGINEERING BEFORE USING THE 114 HZ TUNED INSULATED JOINT BYPASS COUPLER, 62785-114.

The coupler is housed in a sealed, 6-inch diameter, cylindrical case that is 2 inches larger in diameter than the 62531-f and 62631-f couplers. A pair of 10-foot number 6 AWG leads extend from one end and nine AREMA Terminals extend from the other (see Figure 3-33). Five of the terminals (labeled A through E) are equipped with special gold nuts that are used to tune the coupler. With a hard wire shunt placed across the tracks first on one side of the coupler and then on the other, one or more of the nuts is/are tightened to obtain the minimum change in EZ/ED value. Tightening the nut on terminal A produces minimum change in EZ/ED value while tightening the nut on terminal E produces maximum change. When adjustment is complete, a second AREMA nut on each of the terminals is used to lock the adjusting nuts in position. An equalizer and a gas tube arrester are connected to the remaining AREMA Terminals to provide complete surge protection. A pliable end cap is secured in place over the terminal end of the coupler by a sturdy stainless steel clamp, pro-viding protection against moisture.

NOTE

Some applications will require tuning using EX instead of EZ.

The coupler should be connected as close as possible to the rails, but no farther away than the existing leads will permit. To afford maximum protection from physical damage, the coupler should be encased in a protective enclosure or buried. Although it is not necessary to bury the coupler below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface.

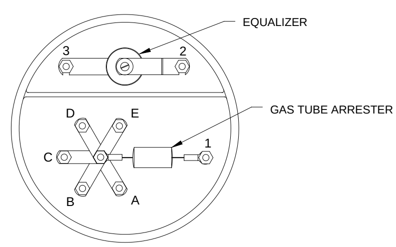


Figure 3-33:
Terminal Identification, 62785-f Tunable Insulated Joint Bypass Coupler

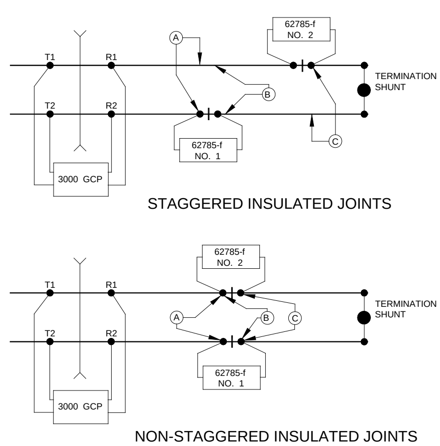


Figure 3-34:
Typical Installation Diagrams Using the Tunable Insulated Joint Bypass (IJB) Coupler, 62785-f

Refer to the appropriate installation diagram in Figure 3-34 for the following tuning procedure.

1. Ensure that the GCP has been properly calibrated using the SETUP pushbutton located on the display panel.
2. Place a hard wire shunt across the tracks at location A and record the EZ value.
3. Move the shunt to the opposite side of the insulated joints at location B and note the change in EZ value.
4. The purpose of this step is to tune the insulated joint bypass coupler to obtain an EZ value that is as close as possible to the value recorded in step 2. On the terminals labeled E, D, C, B, and A, tighten each gold AREMA nut in sequence beginning with terminal E. If tightening a nut results in an EZ value that is lower than the value recorded in step 2, 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 2, leave the nut tightened and tighten the next nut in sequence until all the nuts (E through A) have been tightened as necessary. The value of EZ should now be nearly the same as that recorded in step 2.
5. Next, move the hard wire shunt to location C on the tracks and repeat step 4 to tune coupler number 2 for the same EZ value obtained in step 4.
6. When EZ values are nearly the same in steps 4 and 5, carefully tighten a standard AREMA nut firmly against each gold nut to lock the gold nuts in position.

WARNING

ENSURE THAT A STANDARD AREMA NUT IS TIGHT-ENED SECURELY AGAINST EACH GOLD NUT ON TERMINALS A THROUGH E, INCLUDING THOSE THAT ARE NOT TIGHTENED DOWN.

7. Recalibrate the GCP and carefully check the smooth change in EZ across the couplers during a train move.

Table 3-21:
Tunable Insulated Joint Bypass (IJB) Coupler, 62785-f Specifications

PARAMETER	VALUES
Dimensions	
Height	18.0 inches (45.7 centimeters)
Diameter	6.0 inches (15.2 centimeters)
Weight	12 pounds (5.45 kilograms) (approximate)
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC
Surge Suppresser	Equalizer, 022700-21X
Part Numbers	Gas Tube Arrester, Z803-00053-0001

3.5.2 Narrow-Band Shunt, 62775-f

This narrow-band termination shunt is designed for use in areas where other AC frequencies or DC coded track circuits are present, but only the 3000 GCP frequency should be terminated. The shunt requires no special tuning and is generally preferred for most applications.

WARNING

THE SHUNT SHOULD NOT BE USED ANYWHERE WITHIN A MODEL 300 OR 400 GCP APPROACH (NARROW-BAND SHUNT, 62780-F, IS RECOMMENDED)

The narrow-band shunt (62775-f) is housed in a hermetically-sealed, cylindrical case with a pair of 10-foot leads extending from one end. The shunt should be connected as close as possible to the rails. In general, the shunt should be connected no closer than 25 feet from the rail. To afford maximum protection from physical damage, the shunt should be encased in a protective enclosure or buried. Although it is not necessary to bury the shunt below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface (see paragraph 3.3.2). The shunt is available in any fixed frequency (Hz) listed below.

Table 3-22:
Narrow-band Shunt, 62775-f Available Frequencies (Hz)

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

Table 3-23:
Narrow-band Shunt, 62775-f Specifications

PARAMETER	VALUES
Dimensions	
Height	16.0 inches (40.6 centimeters)
Diameter	5.0 inches (12.7 centimeters)
Weight	10 pounds (4.54 kilograms) (approximate)
Frequencies	See Table 3-22 above
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

3.5.3 Narrow-Band Shunt, 62780-f

Like the 62775-f narrow-band termination shunt (paragraph 3.5.1), the 62780 narrow-band shunt is designed for use in areas where other AC frequencies or DC coded track circuits are present, but only the 3000 GCP frequency should be terminated. However, the 62780 shunt produces less loading effect on adjacent frequencies (10 ohms reactance) than the 62775 shunt and, therefore, can be used in territories with overlapping Model 300 and 400 GCP approaches. The 62780 shunt is compatible with all Safetran motion sensors and GCPs and is available in any of 26 fixed frequencies ranging from 86 to 979 Hz as shown below.

Table 3-24:
Narrow-band Shunt, 62780-f Available Frequencies (Hz)

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

The 62780 narrow-band shunt is housed in a hermetically-sealed, cylindrical case with a pair of 10-foot leads extending from one end. The shunt should be connected as close as possible to the rails. In general, the shunt should be connected no closer than 25 feet from the rail.

To afford maximum protection from physical damage, the shunt should be encased in a protective enclosure or buried. Although it is not necessary to bury the shunt below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface (see paragraph 3.3.2).

Table 3-25:
Narrow-band Shunt, 62780-f Specifications

PARAMETER	VALUES
Dimensions	
Height	14.125 inches (35.9 centimeters)
Diameter	4.125 inches (10.5 centimeters)
Weight	7 pounds (3.18 kilograms) (approximate)
Frequencies	See Table 3-24 above
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

3.5.4 Adjustable Inductor Assembly, 8A398-6

NOTE

The termination shunt that that is connected to the Adjustable Inductor Assembly, 8A398-6, as well as the 8A398-6 itself, must be emplaced within a weatherproof enclosure that is located within 100 feet of the rail connection.

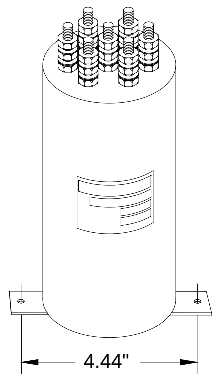


Figure 3-35:
Adjustable Inductor Assembly, 8A398-6

Insulated joints located in one approach frequently prevent both termination shunts from being installed at approximately equal distances from the MS/GCP feed point as required. When Safetran's single-frequency narrow-band shunts (62775-f/62780-f) are used to terminate these approaches, Typically, the Adjustable Inductor Assembly, 8A398-6 (Table 3-30), is used along with the shunt in the shorter approach to compensate for the reduced distance (see diagram).

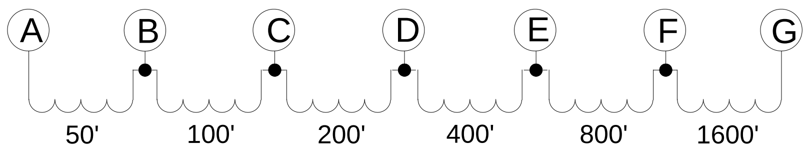


Figure 3-36:
Adjustable Inductor, 8A398-6 Schematic

The inductor assembly consists of a 3-inch diameter ABS plastic enclosure with mounting brackets at the base. Extending from the top of the assembly are seven AREMA Terminals that accommodate connections to six inductors which are wired in series and housed within the sealed unit.

Referring to Table 3-36 (following page), locate the desired simulated track length (column 1), then read across the table to determine which inductors (indicated by terminal pairs in column 2) are required to simulate that length.

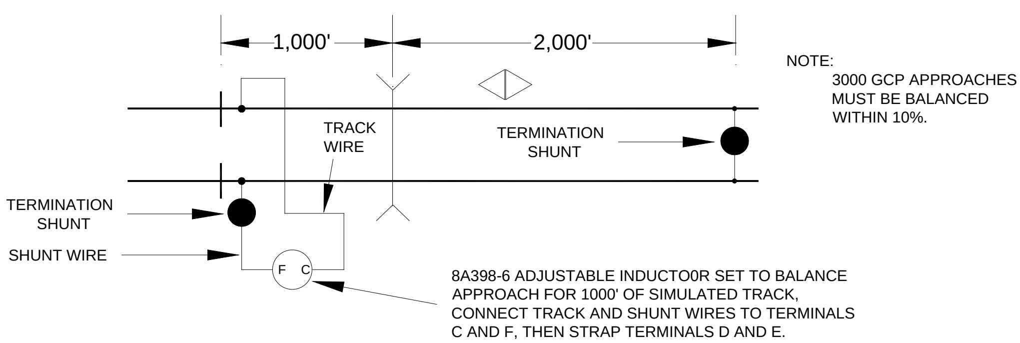


Figure 3-37:
Adjustable Inductor Used with Termination Shunt

Next, connect the track wire and the shunt wire (see example above) to the two terminals indicated in column 2. Finally, install a strap between the terminal pairs indicated in column 3 to short any inductors located between the track and shunt wire connecting terminals (see 8A398 schematic diagram at the top of next page) which are not required for the desired length. For example, if the required simulated track length is 1,000 feet, the track and shunt wires are connected to terminals C and F. A strap is then installed between terminals D and E to short the 400-foot inductor and remove it from the series circuit. Track lengths are selectable in 50-foot increments ranging from 50 to 3,150 feet.

Table 3-26:
Adjustable Inductor Assembly Terminal Connections

COL. 1	COL. 2	COL. 3	COL. 1	COL. 2	COL. 3
SIMULATED TRACK LENGTH (FEET)	**CONNECT TRACK & SHUNT WIRES TO THESE TERMINALS**	**CONNECT SHORTING STRAPS BETWEEN THESE TERMINALS**	**SIMULATED TRACK LENGTH (FEET)**	**CONNECT TRACK & SHUNT WIRES TO THESE TERMINALS**	**CONNECT SHORTING STRAPS BETWEEN THESE TERMINALS**
50	A-B		1650	A-G	B-C, C-D, D-E,& E-F
100	B-C		1650	A-G	B-C, C-D, D-E,& E-F
150	A-C		1700	B-G	C-D, D-E, E-F
200	C-D		1750	A-G	C-D, D-E, E-F
250	A-D	B-C	1800	C-G	D-E, E-F
300	B-D		1850	A-G	B-C, D-E, E-F
350	A-D		1900	B-G	D-E, E-F
400	D-E		1950	A-G	D-E, E-F
450	A-E	B-C, C-D	2000	D-G	E-F
500	B-E	C-D	2050	A-G	B-C, D-E, E-F
550	A-E	C-D	2100	B-G	C-D, E-F
600	C-E		2150	A-G	C-D, E-F
650	A-E	B-C	2200	C-G	E-F
700	B-E		2250	A-G	B-C, E-F
750	A-E		2300	B-G	E-F
800	E-F		2350	B-G	E-F
850	A-F	B-C, C-D, D-E	2400	E-G	
900	B-F	C-D, D-E	2450	A-G	B-C, C-D, D-E
950	A-F	C-D, D-E	2500	B-G	C-D, D-E
1000	C-F	D-E	2550	A-G	CD, D-E
1050	A-F	B-C, D-E	2600	C-G	D-E
1100	B-F	D-E	2650	A-G	B-C, D-E
1150	A-F	D-E	2700	B-G	D-E

Continued on next page

Table 3-26 Concluded

COL. 1	COL. 2	COL. 3	COL. 1	COL. 2	COL. 3
SIMULATED TRACK LENGTH (FEET)	**CONNECT TRACK & SHUNT WIRES TO THESE TERMINALS**	**CONNECT SHORTING STRAPS BETWEEN THESE TERMINALS**	**SIMULATED TRACK LENGTH (FEET)**	**CONNECT TRACK & SHUNT WIRES TO THESE TERMINALS**	**CONNECT SHORTING STRAPS BETWEEN THESE TERMINALS**
1200	D-F		2750	A-G	
1250	A-F	B-C, C-D	2800	D-G	D-E
1300	B-F	C-D	2850	A-G	B-C, C-D
1350	A-F	C-D	2900	B-G	C-D
1400	C-F		2950	A-G	C-D
1450	A-F	B-C	3000	C-G	
1500	B-F		3050	A-G	B-C
1550	A-F		3100	B-G	
1600	F-G		3150	A-G	

Table 3-27:
Simulated Track Inductor, 8V617 Specifications

PARAMETER	VALUES
Dimensions	
Diameter	3.375 inches (8.57 centimeters)
Height	9.0 inches (22.86 centimeters)
Weight	5 pounds, 12 ounces (2.59 kilograms) (approximate)

3.5.5 Multifrequency Narrow-Band Shunt, 62775-XXXX

Multifrequency Narrow-band Shunt, 62775-XXXX, is slightly larger than its single-frequency counterpart (paragraph 3.5.1), but exhibits the same electrical characteristics as the basic single-frequency unit.

WARNING

THIS MULTIFREQUENCY SHUNT SHOULD NOT BE USED ANYWHERE WITHIN A MODEL 300 OR 400 GCP APPROACH (MULTIFREQUENCY NARROW-BAND SHUNT (62780-XXXX) IS RECOMMENDED).

The multifrequency narrow-band shunt is available in three frequency ranges for terminating all standard Safetran equipment operating frequencies. The shunt is housed in a hermetically-sealed, cylindrical case with a pair of 10-foot leads extending from one end and seven standard AREMA

Terminals extending from the other. The terminals are labeled A through G and are jumpered to select the desired shunting frequency (see Table 3-28).

Terminal jumper hardware is supplied with each shunt and 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.

Table 3-28:
Multifrequency Narrow-band Shunt (62775-XXXX) Frequency Selection Jumpers

SHUNT PART NO.	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
62775-1543	156	A-F, C-G, D-E, C-D, E-F
	211	A-G, C-D, C-G, D-E
	285	B-C, D-G, C-D
	348	B-C, C-D
	430	B-C
62775-3497	348	A-B, C-D, E-F, B-C, D-E, F-G
	430	A-B, C-D, E-F, B-C, D-E
	525	A-B, C-D, B-C, D-E
	645	A-B, C-D, B-C
	790	A-B, B-C
	970	A-B
62775-8621	86	A-F, D-E, D-G, E-F
	114	B-G, D-E, D-G
	156	C-D, D-G
	211	C-D

CAUTION

THE SHUNT IS SHIPPED WITH NO FACTORY JUMPERS INSTALLED AND IS, THEREFORE, ELECTRICALLY OPEN AND DOES NOT LOAD ANY FREQUENCY ON THE TRACK. INSTALL JUMPERS FOR THE DESIRED FREQUENCY BEFORE PLACING THE UNIT IN SERVICE.

CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

The shunt should be connected as close as possible to the rails. In general, the shunt should be connected no closer than 25 feet from the rail. To afford maximum protection from physical damage, the shunt should be encased in a protective enclosure or buried (see paragraph 3.3.2).

Although it is not necessary to bury the shunt below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface.

Table 3-29:
Multifrequency Narrow-band Shunt, 62775-XXXX Specifications

PARAMETER	VALUES
Dimensions	
Height	22.0 inches (55.9 centimeters)
Diameter	5.0 inches (12.7 centimeters)
Weight	10 pounds (4.54 kilograms) (approximate)
Frequencies	See Table 3-28 above
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

3.5.6 Multifrequency Narrow-Band Shunt, 62780-XXXX

Multifrequency Narrow-band Shunt, 62780-XXXX, produces less loading effect on adjacent frequencies (10 Ohms reactance) than the 62775-XXXX shunts (paragraph 3.5.3) and, therefore, can be used in territories with overlapping Model 300 and 400 GCP approaches. The 62780 shunt is compatible with all Safetran motion sensors and GCPs. The 62780 narrow-band shunt is available in three multifrequency versions for terminating all 11 standard Safetran equipment operating frequencies (see Table 3-30).

The multifrequency narrow-band shunt (62780) is housed in a hermetically-sealed, cylindrical case with a pair of 10-foot leads extending from one end and seven standard AREMA Terminals from the opposite end of the case. The terminals are labeled A through G and are jumpered to select the desired shunting frequency. Terminal jumper hardware is supplied with each multifrequency shunt and 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.

CAUTION

THE MULTIFREQUENCY NARROW-BAND SHUNT IS SHIPPED WITH NO FACTORY JUMPERS INSTALLED AND IS, THEREFORE, ELECTRICALLY OPEN AND DOES NOT LOAD ANY FREQUENCY ON THE TRACK. INSTALL JUMPERS FOR THE DESIRED FREQUENCY BEFORE PLACING THE UNIT IN SERVICE. CAREFULLY TIGHTEN ALL NUTS ON ALL FREQUENCY JUMPERS, AND THEN INSTALL A SECOND NUT TO SECURELY LOCK THE ASSEMBLY.

The shunt should be connected as close as possible to the rails. In general, the shunt should be connected no closer than 25 feet from the rail. To afford maximum protection from physical damage, the shunt should be encased in a protective enclosure or buried (see paragraph 3.3.2).

Although it is not necessary to bury the shunt below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface.

Table 3-30:
Multifrequency Narrow-band Shunt (62780-XXXX) Frequency Selection Jumpers

SHUNT PART NO.	FREQUENCY (HZ)	JUMPER SHUNT TERMINALS
62780-1543	156	A-F, C-G, D-E, C-D, E-F
	211	A-G, C-D, C-G, D-E
	285	B-C, D-G, C-D
	348	B-C, C-D
	430	B-C
62780-5297	525	A-B, C-D, B-C, D-E
	645	A-B, C-D, B-C
	790	A-B, B-C
	970	A-B
62780-8621	86	A-F, D-E, D-G, E-F
	114	B-G, D-E, D-G
	156	C-D, D-G
	211	C-D

Table 3-31:
Multifrequency Narrow-band Shunt, 62780-XXXX Specifications

PARAMETER	VALUES
Dimensions	
Height	22 inches (55.9 centimeters)
Diameter	5 inches (12.7 centimeters)
Weight	10 pounds (4.54 kilograms) (approximate)
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

3.5.7 Simulated Track Inductor, 8V617

NOTE

The termination shunt that contains the Simulated Track Inductor, 8V617, must be emplaced within a weatherproof enclosure that is located within 100 feet of the rail connection.

In bidirectional motion sensor and grade crossing predictor installations, insulated joints located in one approach frequently prevent both termination shunts from being installed at approximately equal distances from the MS/GCP feed point as required. Typically, when Safetran's multifrequency narrow-band shunts (62775/62780) are used to terminate the approaches, the

Simulated Track Inductor, 8V617 (Figure 3-39), is used along with the shunt in the shorter approach to compensate for the reduced distance (see Figure 3-38 below).

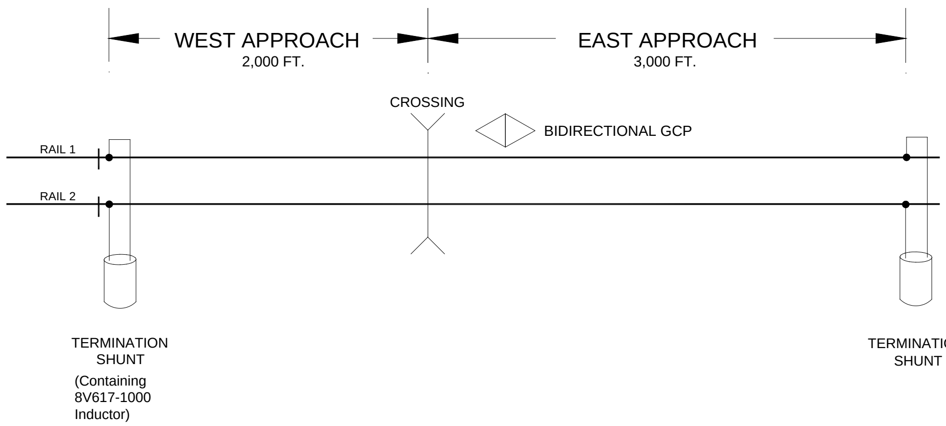


Figure 3-38:
Typical Simulated Track Inductor, 8V617, Application

The 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. The inductor is supplied in 20 configurations to simulate track lengths ranging from 200 to 4,000 feet in 200-foot increments. Each inductor is identified with the basic part number followed by a dash number indicating the simulated distance (in feet) as listed in Table 3-32.

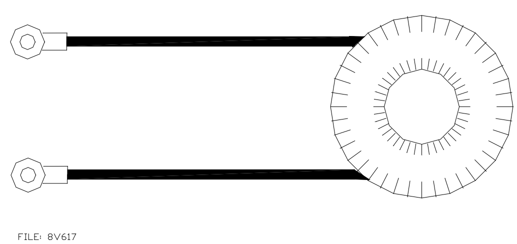


Figure 3-39:
Simulated Track Inductor, 8V617

Table 3-32:
Simulated Track Inductor Part Number Listing

BASIC PART NO.	DASH NUMBER = DISTANCE (FEET)			
8V617	-0200	-1200	-2200	-3200
	-0400	-1400	-2400	-3400
	-0600	-1600	-2600	-3600
	-0800	-1800	-2800	-3800
	-1000	-2000	-3000	-4000

To install the inductor in the narrow-band shunt, use the following procedure:

1. After determining the shunt frequency and compensating distance required, loosen the clamp and remove the end cap from the shunt to gain access to the frequency-selection terminals. Refer to the small chart inside the end cap for terminal strapping information.

WARNING

BEFORE INSTALLING THE 8V617 INDUCTOR, VERIFY THAT IT IS THE CORRECT DISTANCE VALUE SPECIFIED FOR THE APPLICATION.

NOTE

If the chart is missing or illegible, refer to Table 3-28 (62775) or Table 3-30 (62780) in this manual.

2. Refer to Table 3-34 and note the inductor mounting terminals for the applicable shunt and frequency. Remove the nuts, washers, and shorting link from the shunt terminals indicated. Discard the shorting link and install the inductor in its place by connecting the inductor leads to the two terminals. Install the washers and nuts and tighten securely.
3. Wrap the inductor in the foam insulation (included with inductor) as shown in Table 3-29 and carefully insert into the shunt housing between the terminals and case at the approximate location shown. Position the inductor with the leads extending horizontally toward the side (not upward) to prevent interference with the shunt end cap.
4. Return the end cap to its original position on the shunt and tighten the clamp securely.

Table 3-33:
Simulated Track Inductor, 8V617 Specifications

PARAMETER	VALUES
Dimensions	
Diameter	1.875 inches (4.75 centimeters)
Thickness	0.875 inches (2.23 centimeters)
Weight	5 ounces (0.69 kilograms) (approximate)

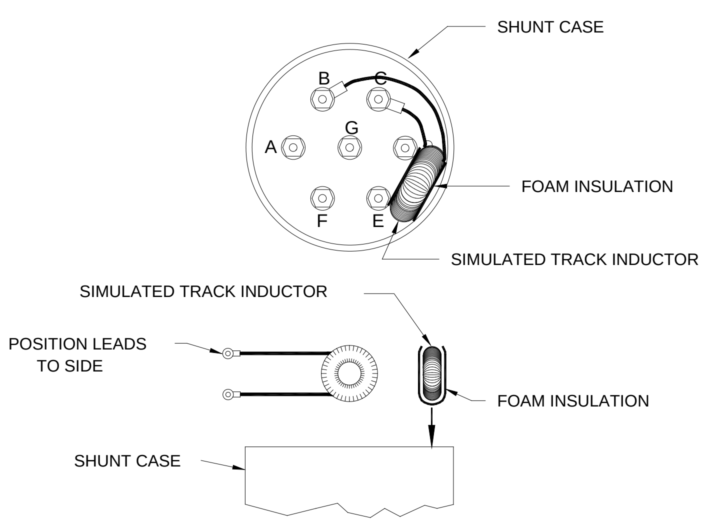


Figure 3-40:
Typical Installation of Simulated Track Inductor, 8V617, in 62775/62780 Shunt

Table 3-34:
Simulated Track Inductor, 8V617, Mounting Terminals

NARROW-BAND SHUNT PART NO.	FREQUENCY (HZ)	REMOVE SHORTING LINK AND CONNECT INDUCTOR LEADS BETWEEN SHUNT TERMINALS
62775/62780-1543	156	A And F
	211	A And G
	285	B And C
	348	B And C
	430	B And C
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
62780-5297	525	A And B
	645	A And B
	790	A And B
	970	A And B
62775/62780-8621	86	A And F
	114	B And G
	156	C And D
	211	C And D

3.5.8 Wideband Shunt, 8A076A

Wideband Shunt, 8A076A, provides an effective short circuit to AC but presents an open circuit to DC. The shunt may be used as a termination shunt where no other frequencies (other than the GCP) are present. The shunt may be used to bypass existing insulated joints required for DC signaling purposes within the track circuit but should not be used to bypass insulated joints in DC coded track circuits or where AC or coded AC circuits exist.

The wideband shunt is housed in a sealed, cylindrical case with a pair of 10-foot leads extending from one end. The shunt should be connected as close as possible to the rails, but no farther away than the existing leads will permit. Although it is not necessary to bury the shunt below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface to afford maximum protection from physical damage (see paragraph 3.3.2).

Table 3-35:
Wideband Shunt, 8A076 Specifications

PARAMETER	VALUES
Dimensions	
Height	7.5 inches (19.1 centimeters)
Diameter	3.35 inches (8.5 centimeters)
Weight	7 pounds (3.18 kilograms) (approximate)
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

3.6 SURGE SUPPRESSION PANELS, 80026-XX

3.6.1 Surge Panels 80026-01, -02, -22, --1, -32, -33, -34, -35, -36, -37, -38, -39, -41, -41A, & -50

The 80026 surge panel is available in a variety of configurations to meet specific customer requirements. Each panel is equipped with the appropriate combination of equalizers and arresters to provide the necessary protection for battery and/or track circuits. The -01, -02, and -22 units are designed for wall mounting while the remaining panels are designed for standard 24-inch rack mounting. For additional surge protection requirements and/or custom designed surge panels, contact Safetran Application Engineering. Refer to Table 3-36 for specific surge panel applications.

Table 3-36:
80026-XX Surge Panel Applications

SURGE PANEL PART NUMBER	TYPE/NUMBER OF CIRCUITS PROTECTED	MOUNTING REQUIREMENTS	NOTES
80026-01	Battery, 1 Track, 1	Wall mount only	
80026-02	Track, 1	Wall mount only	Use with –01 panel for 2nd track
80026-22	Track, 1	Wall mount only	Use for 6-wire applications
80026-31	Battery, 1 Track, 1	Rack mount	
80026-32	Battery, 1 Track, 1	Rack mount	Use with –31 panel for 2nd track & 2nd battery
80026-33	Battery, 1	Rack mount	Used with –31 panel for 2nd battery
80026-34	Track, 1	Rack mount	Used with –31 panel for 2nd track
80026-35	Track, 2	Rack mount	

Continued on next page

Table 3-36 Concluded

SURGE PANEL PART NUMBER	TYPE/NUMBER OF CIRCUITS PROTECTED	MOUNTING REQUIREMENTS	NOTES
80026-36	Track, 1	Rack mount	Used with –31 panel for 2nd track. Used with six-wire applications for transmit, receive, and check receive lead protection.
80026-37	Battery, 1	Rack mount	
80026-38	Track, 2	Rack mount	Used with –37 panel. Used in applications with six wires on one track and four on the other.
80026-39	Battery, 4 Battery Input/Output line protection for 2 DAX or 2 UAX circuits	Rack mount	Normally used with second battery when line circuit protection is required.
80026-41	110 VAC (Includes four 15-amp reset- table circuit breakers and one 15-amp GFI duplex outlet)	Rack mount	Use primarily when 20-amp solid state crossing controller (90980) is used in conjunction with 3000 GCP
80026-41A	110 VAC (Includes four 15-amp and one 25-amp reset- table circuit breakers and one 15-amp GFI duplex outlet)	Rack mount	Use primarily when 40-amp solid state crossing controller (90990) is used in conjunction with 3000 GCP
80026-50	Input/output circuits, 4	Rack mount	Generally used for UAX input or DAX output

Surge panel nomenclature and mounting dimensions are provided in the figures indicated in the following chart.

Table 3-37:
Surge Panel / Figure Number Cross Reference Chart

SURGE PANEL	FIGURE NUMBER	SURGE PANEL	FIGURE NUMBER
80026-01	Figure 3-41	80026-36	Figure 3-44
80026-02	Figure 3-41	80026-37	Figure 3-45
80026-22	Figure 3-41	80026-38	Figure 3-45
80026-31	Figure 3-42	80026-39	Figure 3-46
80026-32	Figure 3-42	80026-41	Figure 3-46
80026-33	Figure 3-43	80026-41A	Figure 3-46
80026-34	Figure 3-43	80026-50	Figure 3-48
80026-35	Figure 3-43		

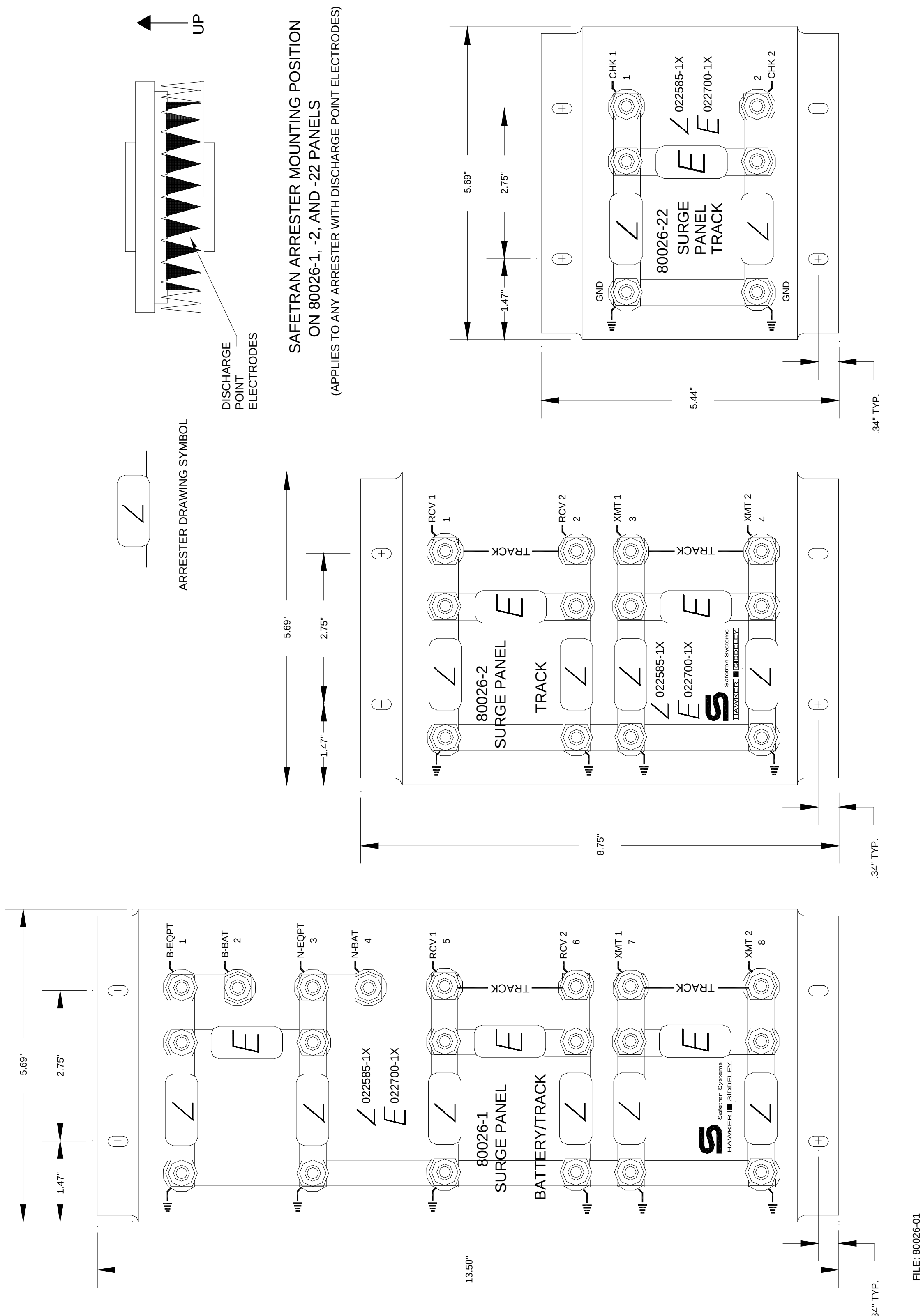


Figure 3-41:
Surge Panels, 80026-01, -02, -22

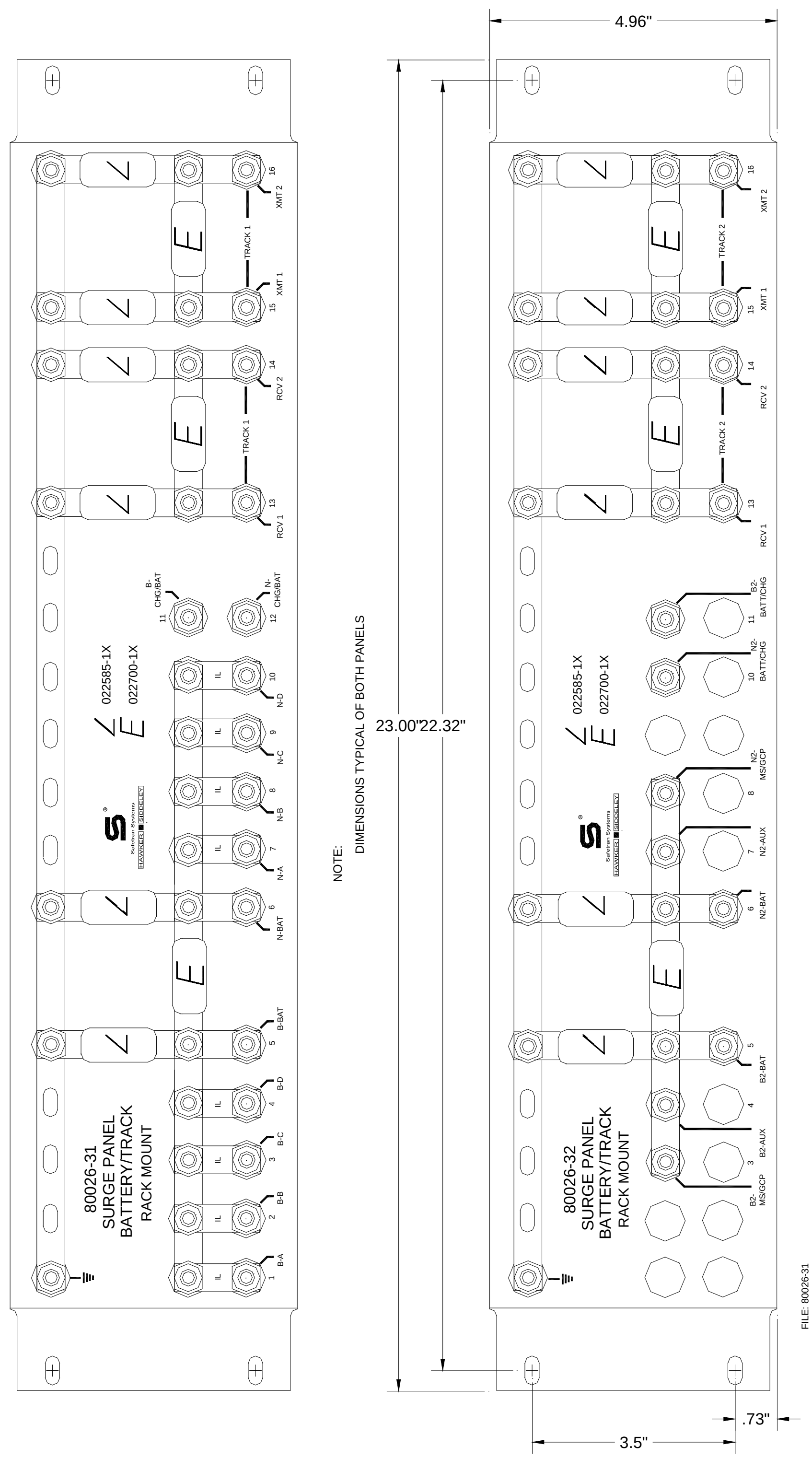


Figure 3-42:
Surge Panels, 80026-31 And -32

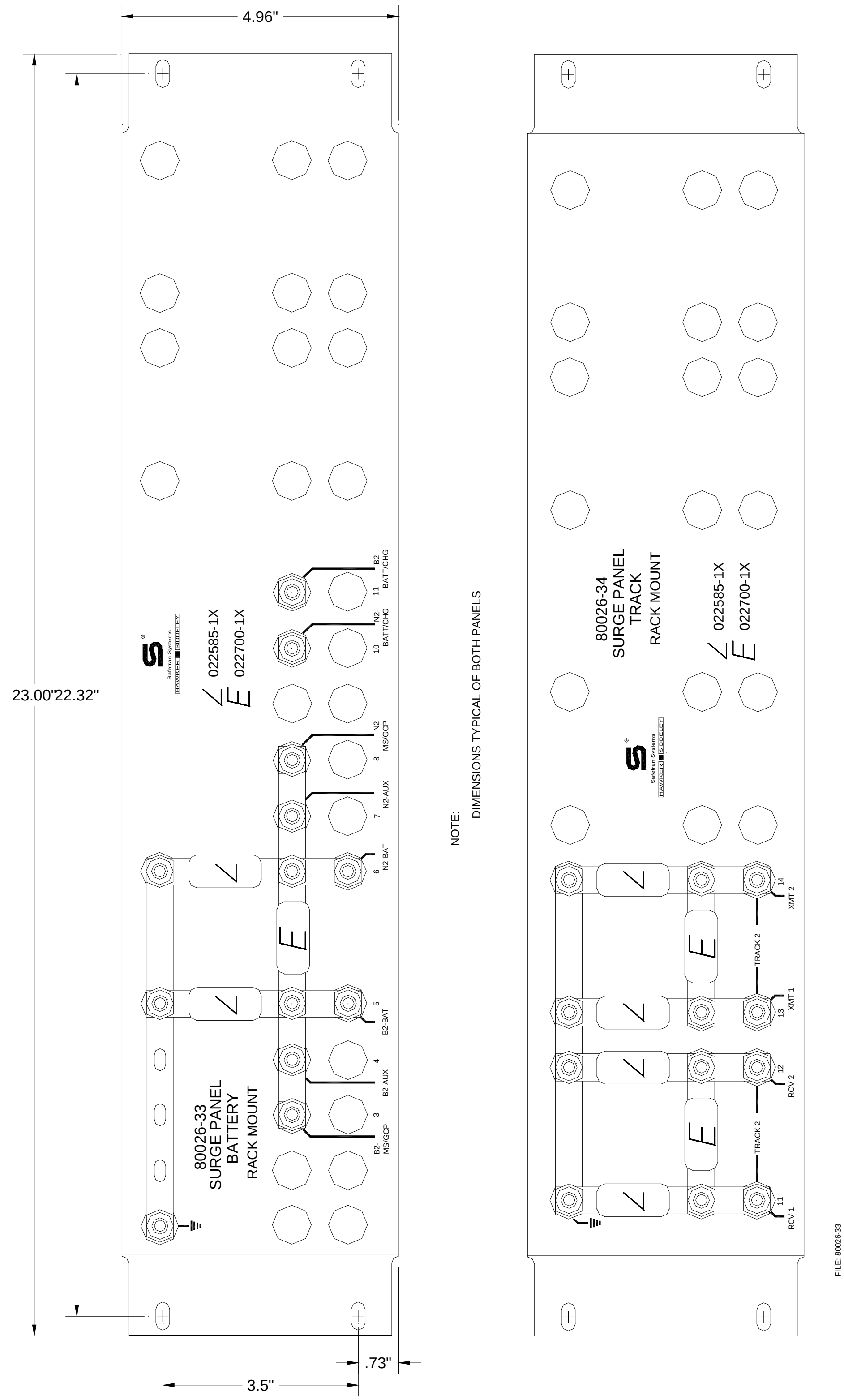


Figure 3-43:
Surge Panels, 80026-33 And -34

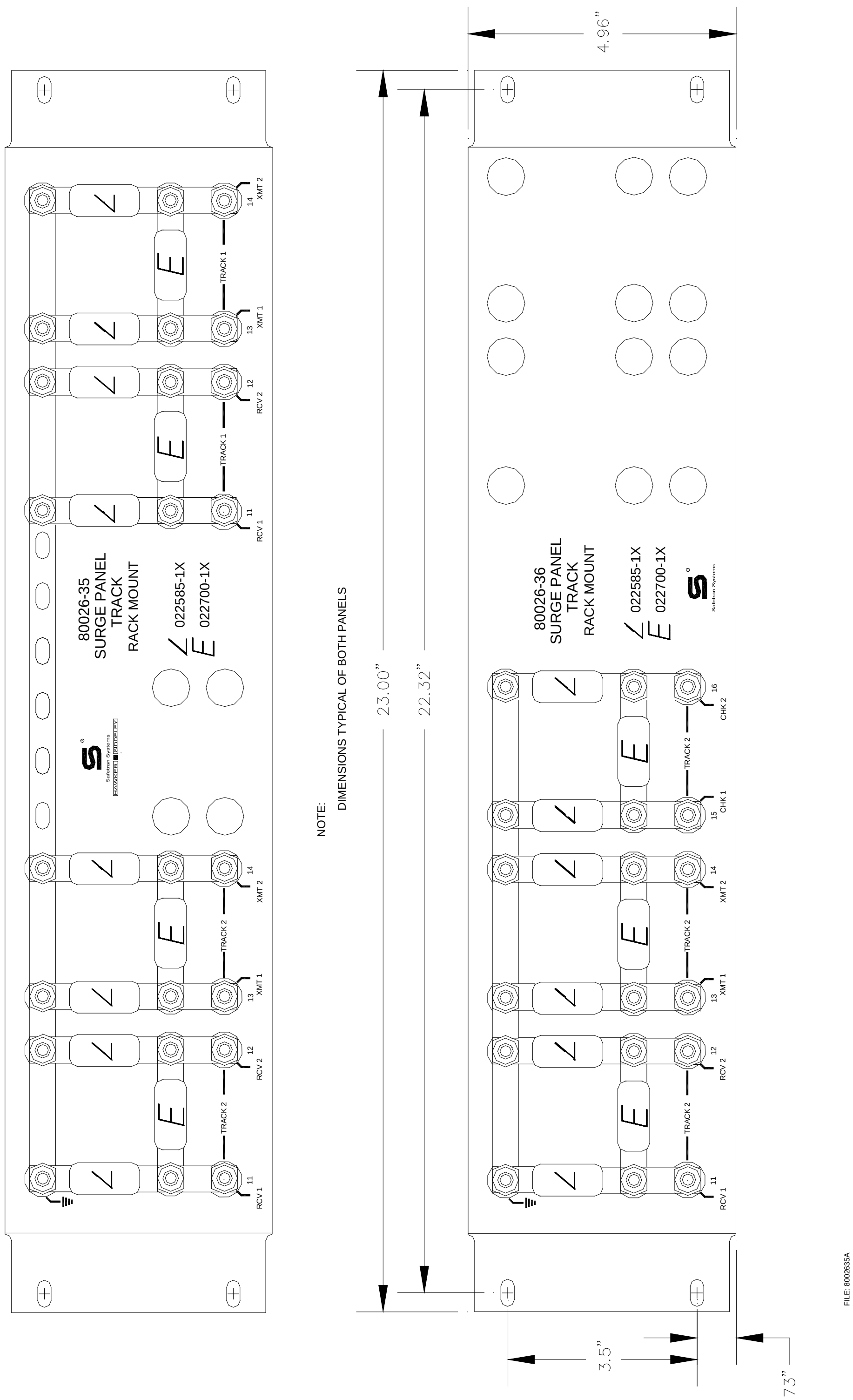


Figure 3-44:
Surge Panels, 80026-35 And -36

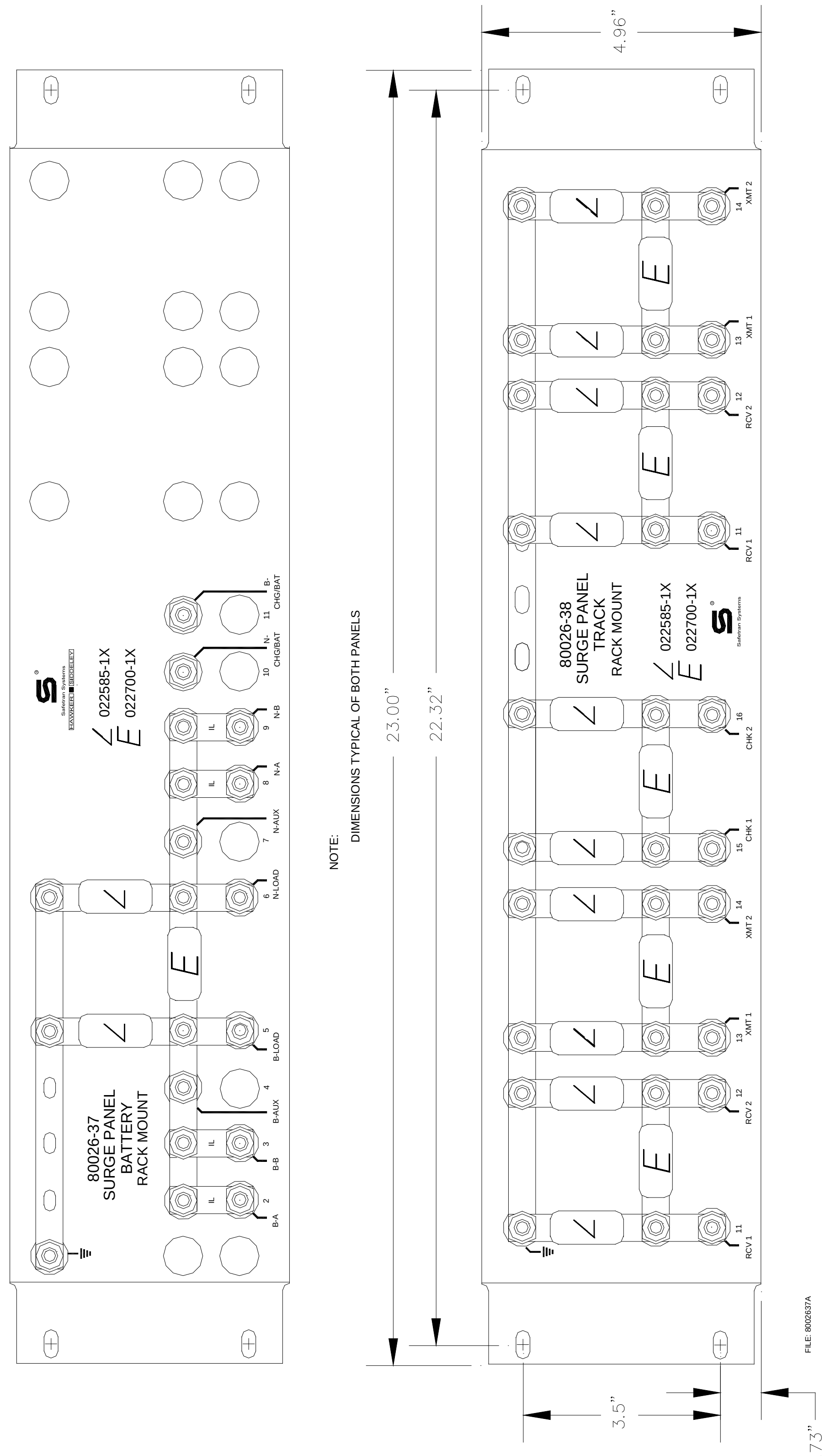


Figure 3-45:
Surge Panels, 80026-37 And -38

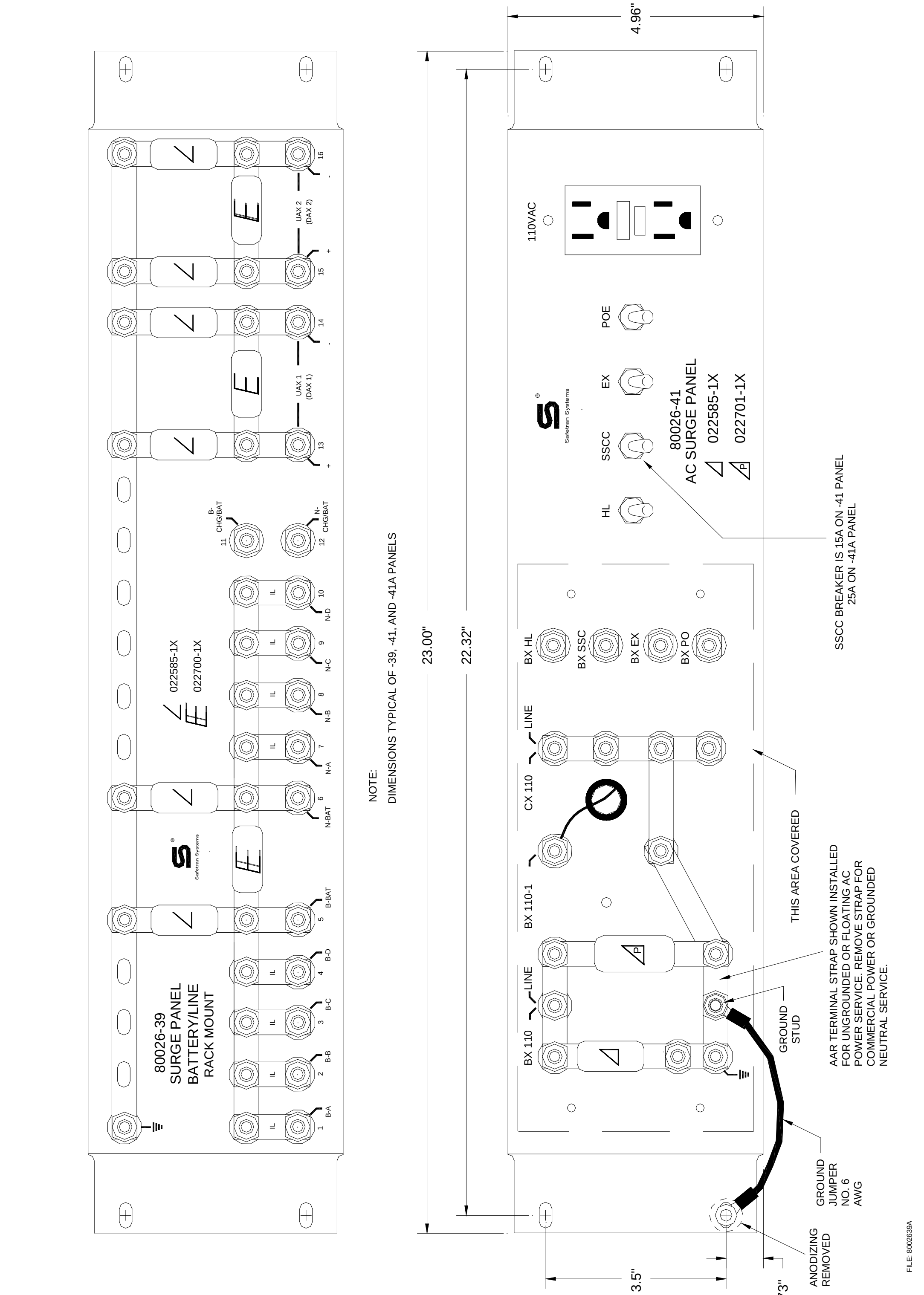


Figure 3-46:
Surge Panels, 80026-39, 41 and 41A

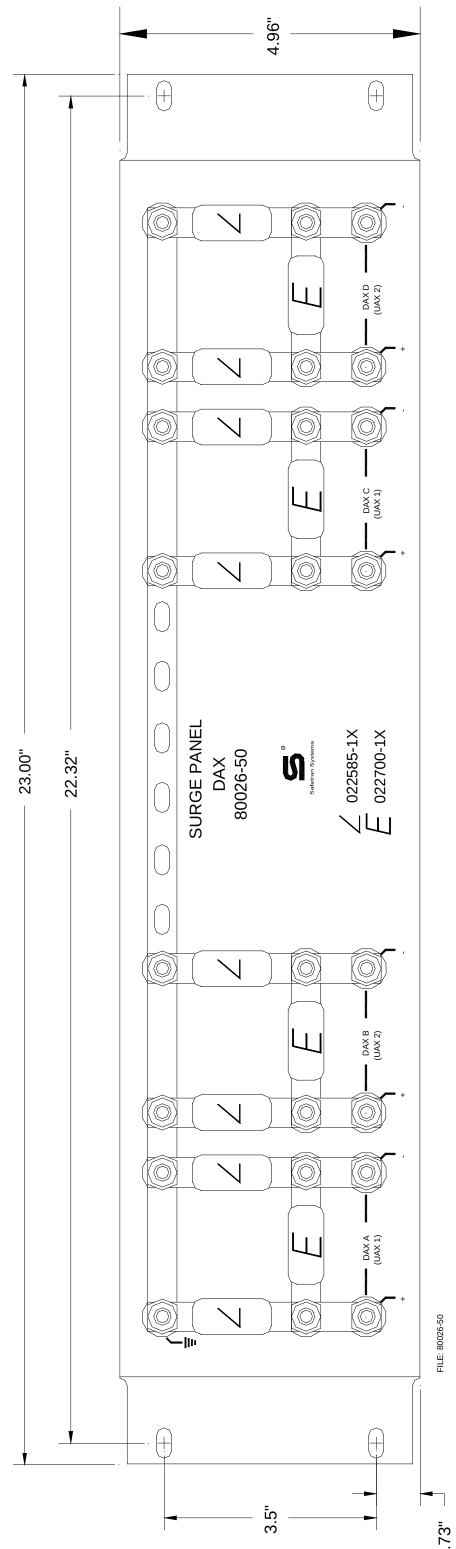


Figure 3-47:
Surge Panel, 80026-50

3.7 AUXILIARY EQUIPMENT PANELS

A number of auxiliary equipment panels are available for use with the 3000 GCP. The panels are designed for standard 24-inch rack mounting and will accommodate a variety of auxiliary equipment as described in the following paragraphs.

3.7.1 Rectifier Panel Assembly, 80033

Rectifier Panel Assembly, 80033, 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 also provided for Exide Rail Battery Charger, Model ERBC 12/20M. See Figure 3-48 for mounting dimensions.

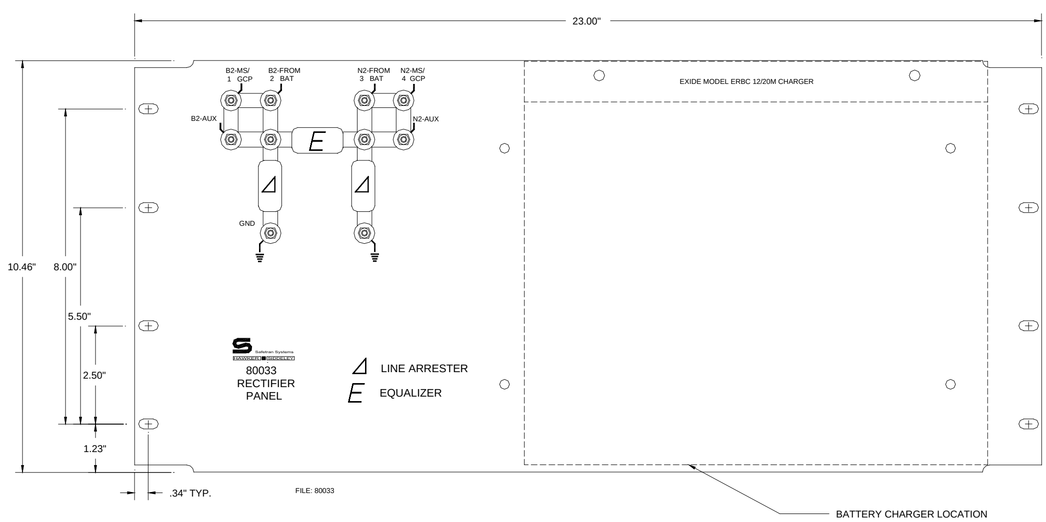


Figure 3-48:
Rectifier Panel Assembly, 80033

3.7.2 Cable Termination Panel Assembly, 91042

Cable Termination Panel Assembly, 91042, is a universal mounting panel which can be ordered with from 1 to 19 pairs of strapped AREMA terminals. See Figure 3-49 for mounting dimensions.

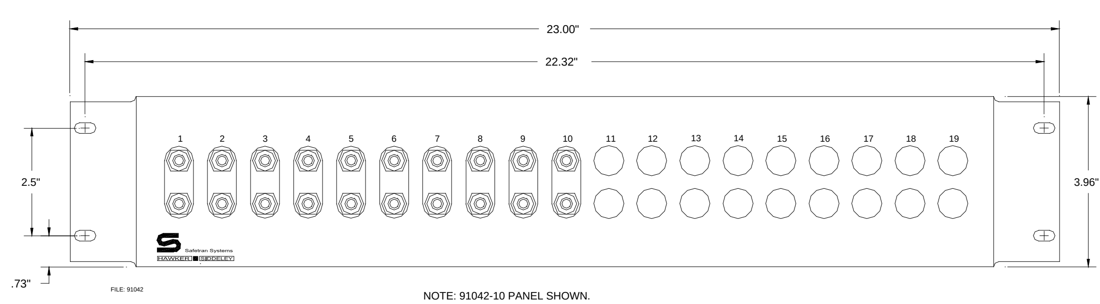


Figure 3-49:
Cable Termination Panel Assembly, 91042

3.7.3 Data Recorder Interface & Vital AND-Gate Driver Panel Assembly, 91043

Data Recorder Interface and Vital AND-Gate Driver Panel Assembly, 91043, provides mounting holes to accommodate a single vital AND-gate driver (90975), two 80025 16-channel data recorder interface assemblies (80025), or two 24-channel data recorder interface assemblies (80035). See Figure 3-50 for mounting dimensions.

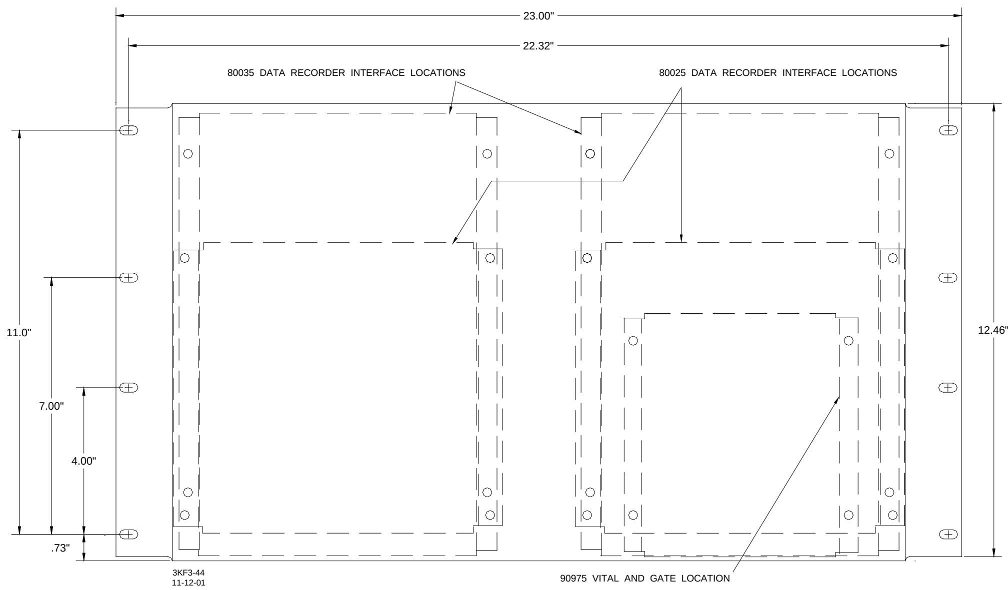


Figure 3-50:
Data Recorder Interface And Vital AND-Gate Driver Panel Assembly, 91043

3.7.4 Vital AND-Gate Driver Panel Assembly, 91044

Vital AND-Gate Driver Panel Assembly, 91044, provides mounting holes to accommodate from one to three vital AND-gate driver assemblies (90975). See Figure 3-51 for mounting dimensions.

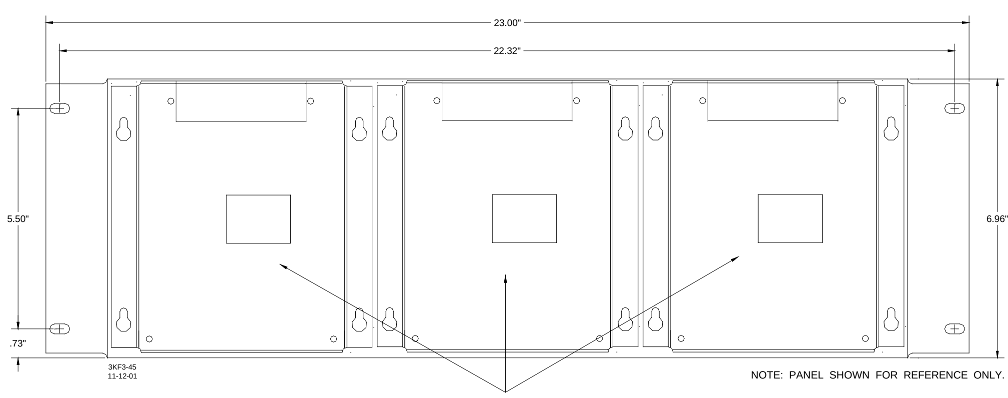


Figure 3-51:
Vital AND-Gate Driver Panel Assembly, 91044

SECTION 4 –
KEYBOARD/DISPLAY AND MENU DESCRIPTIONS

4.1 GENERAL

This section defines the functions, displays, and menus associated with each key on the keyboard/display assembly. The descriptions contained in this section are provided for general information only.

For specific programming/operating procedures, refer to the following applicable sections as required:

- Section 5, System Application Programming
- Section 6, System Calibration
- Section 7, Diagnostics (Maintenance)

In the following descriptions, each key and its primary functions are described.

- If a menu is associated with the function, the items contained in that menu and the associated displays are then described in the order in which they appear when scrolling down the menu using the down arrow key (▼) on the keyboard.
- For the larger menus, a flowchart is included which provides an overall view of the menu and the relationships of the individual items with that menu.

4.2 SYSTEM STATUS KEY

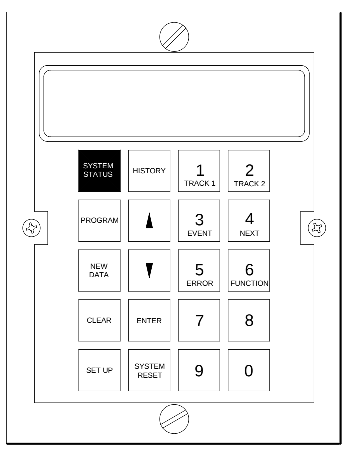


Figure 4-1:
GCP 3000 Keyboard/Display Panel System Status Key

The SYSTEM STATUS key selects the Status Mode menu.

- The Status Mode displays indicate the current levels or values of selected system operating parameters such as:

- Receiver signal levels (EZ)
- Track ballast conditions (EX)
- Transmitter voltage
- Current levels to the track
- Power supply voltages
- Parameters presented are in monitor only mode.

NOTE

When the 3000 GCP is operating in any mode other than the Status Mode (e.g., Program, History, etc.), and no keyboard entries are made within 90 seconds of the last keyboard entry, the system automatically reverts to the Status Mode and the initial Status Mode display (see paragraph 4.2.1).

The Status Mode displays are arranged in a menu format that is continuous and starts over at the beginning when the end of the menu is reached.

- The Status Mode menu is depicted in flowchart format in Figure 4-2.

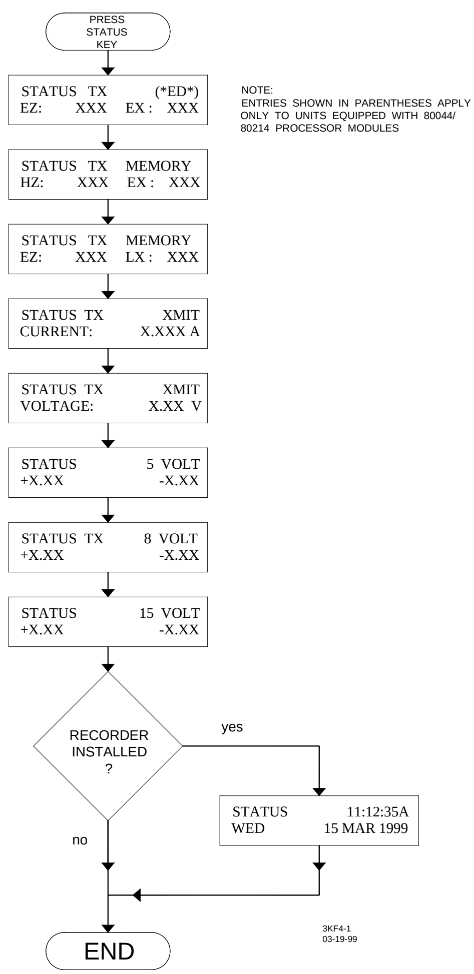


Figure 4-2:
Status Mode Menu Structure

When a system is programmed for two tracks, certain Status Mode menu items provide a separate display for each track.

- A T1 or T2 appearing in the display indicates the track to which the information applies.
- When T1 is displayed, pressing the TRACK 2 key causes similar information for track 2 to be displayed.
- Pressing the TRACK 1 key returns to the track 1 display.

4.2.1 Current Status of EZ and EX

The initial Status Mode display appears as follows:

STATUS T1			
EZ:	100	EX:	87

This display appears:

- when power is applied to the system
- after 90 seconds of keyboard inactivity
- each time the SYSTEM STATUS key is pressed.

The initial Status Mode display indicates current EZ and EX levels for the track indicated.

EZ = Track receiver signal level where:	100 =	No train
	0 =	Train in island
	100 =	Ideal
EX = Track ballast conditions where:		
	75 =	Nominal
	50 =	Poor

NOTE

When the Low EX Adjustment (see paragraph 4.17.13) is set to a value other than 0 (zero), an asterisk appears following EX: in the initial Status Mode display as shown in the example below.

STATUS T1			
EZ:	100	EX*:	87

An enhanced track-shunting detection (ED) operating mode (paragraph 4.17.9) is available in 3000 GCP's equipped with an 80044 or 80214 processor module.

- When this mode is enabled and poor shunting conditions are detected, *ED* appears in the upper right corner of the display as shown below.

STATUS T1	*ED*
EZ: 65	EX: 87

- *ED* remains on the display until the train leaves the track circuit.

4.2.2 EX at Highest EZ

STATUS T1	MEMORY
HZ: 105	EX: 95

Indicates highest EZ value recorded (Hz) for the track indicated and the EX value when that EZ value occurred.

4.2.3 EZ at Lowest EX

STATUS T1	MEMORY
EZ: 95	LX: 62

Indicates EZ value when the lowest EX (LX) value was recorded for the track indicated.

4.2.4 Transmit Current

STATUS T1	XMIT
CURRENT:	0.251 A

Indicates GCP transmit current (amperes) to the selected track.

4.2.5 Transmit Voltage

STATUS T1	XMIT
VOLTAGE:	1.32 V

Indicates GCP transmit voltage (volts) to the track indicated.

- The voltage varies for different GCP frequencies and track lengths.

4.2.6 ±5 Volt Power Supply Status

STATUS	5 VOLT
+5.02	-5.01

Indicates +5 and -5 volt power supply output levels.

- Should be 4.75 to 5.25 VDC.

4.2.7 ±8 Volt Power Supply Status

STATUS T1	**8 VOLT**
+7.99	**-8.01**

Indicates +8 and -8 volt power supply outputs for track indicated.

- Should be 7.2 to 8.8 VDC.

4.2.8 ±15 Volt Power Supply Status

STATUS	**15 VOLT**
+14.7	**-14.6**

Indicates +15 and -15 volt power supply output levels.

- Should be 14.1 to 15.9 VDC.

4.2.9 Time/Date Display With Data Recorder Module Installed

STATUS	**11:23;45A**
WED	**29 AUG 2007**

If a data recorder module (80015 or 80115) is installed, the following status display will appear.

- The current time and date, according to the data recorder, can be verified by checking this display.
- Time is in hours-minutes-seconds (hh:mm:ss) format followed by:
  - A (AM) or P (PM) in 12-hour format
  - a space in 24-hour format

4.3 PROGRAM KEY

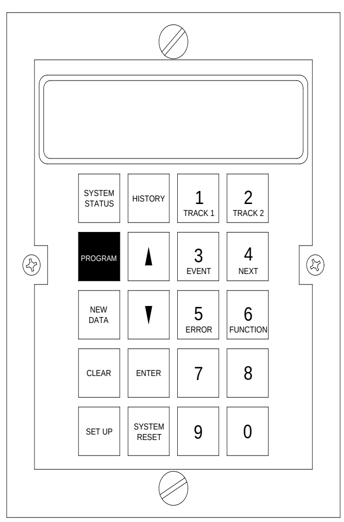


Figure 4-3:
GCP 3000 Keyboard/Display Panel Program Key

Press the PROGRAM key to select the Program Mode menu.

- The Program Mode is the primary programming mode for system application parameters (warning time, approach distance, etc.).
- To simplify operator interface with the system during programming operations, the Program Mode is menu-driven.

The Program Mode displays are arranged in a menu format that is continuous and starts over at the beginning when the end of the menu is reached.

- The Program Mode menu is depicted in flowchart format in Figure 4-4.

When a system is programmed for two tracks, some Program Mode menu items can be programmed differently for each track.

- A T1 or T2 appearing in the display indicates the track to which the information applies.
- When T1 is displayed, pressing the TRACK 2 key causes similar information for track 2 to be displayed.
- Pressing the TRACK 1 key returns to the track 1 display.

NOTES

Information programmed via the Program Mode should first be entered on the 3000 GCP Application History Card (see sample in Figure 4-25).

The application history card (located at the back of this manual) should remain with the equipment at all times and should reflect the current programmed status of the system.

The order in which the information is listed on the card coincides with the order in which the information is requested in the Program Mode menu.

The Program Mode menu items shown in Figure 4-4 can be viewed at any time by selecting the Program Mode and scrolling through the menu.

If the password feature is enabled, the four-digit password must be entered into the system via the keyboard before any program changes can be made.

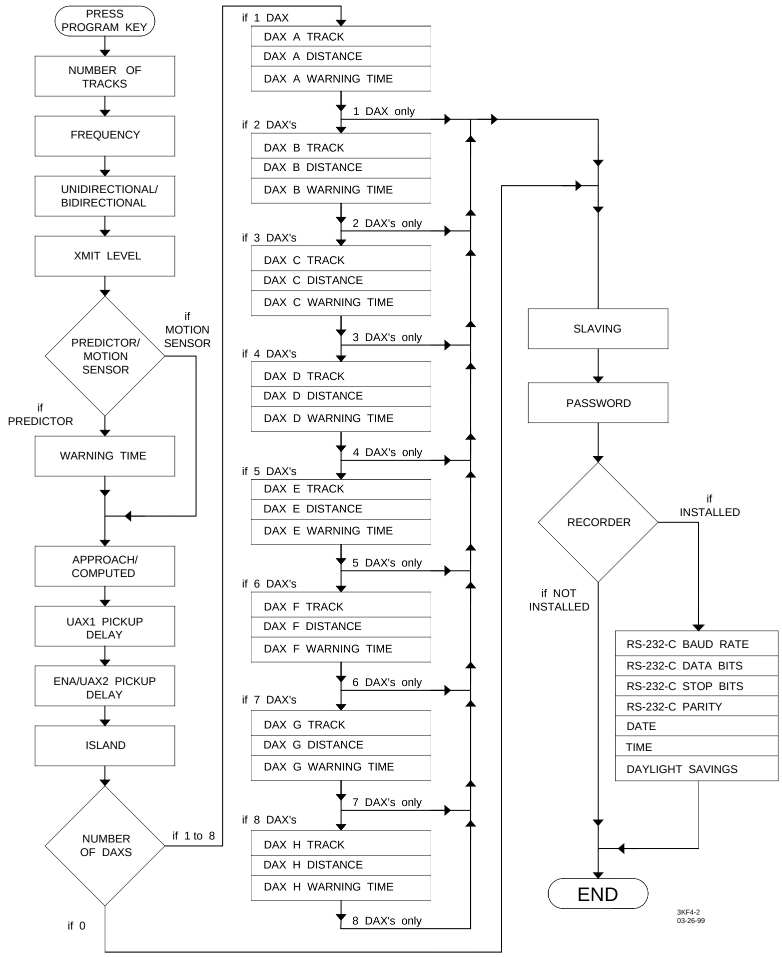


Figure 4-4:
Program Mode Menu Structure

4.3.1 Number of Tracks

The initial Program Mode display appears as follows:

PROGRAM NUMBER **OF TRACKS: 2**

This display appears when the PROGRAM key is pressed.

The item requested is the first system application parameter in the menu.

- The information requested is the number of operational transceiver modules (80012) per system contained in the 3000 GCP case.
- The value to enter is either 1 or 2, whichever applies.
- For single-track cases, this parameter is set to 1.

4.3.2 Frequency

PROGRAM FREQUENCY: 790	PROGRAM T1 FREQUENCY: 790

The transmitter frequency for the transceiver module(s) (80012) is requested.

- In dual-track, single-frequency systems, the same frequency is used for both transceiver modules.
- In dual-track, dual-frequency systems, different frequencies may be used for each transceiver module.
- The range of values is from 45 to 999 Hz in 1-Hz increments.

4.3.3 Unidirectional/Bidirectional

```
PROGRAM T1
UNIDIRECTIONAL
```

The system application for each track is requested.

- Select BIDIRECTIONAL or UNIDIRECTIONAL.

<u>WARNING</u>

3000 GCP'S WHICH ARE OPERATED IN A SIMULATED BIDIRECTIONAL APPLICATION MUST BE PROGRAMMED BIDIRECTIONAL.

4.3.4 XMIT Level

```
PROGRAM T1 XMIT
LEVEL:   MEDIUM
```

Select the transmit level for each track (transceiver) in use.

- Valid level selections are MAXIMUM and MEDIUM.
- MEDIUM is used for most applications
- In high track noise environments MAXIMUM is recommended.

4.3.5 Predictor/Motion Sensor

```
PROGRAM T1
PREDICTOR
```

Select the operating mode for each track.

- Choose PREDICTOR or MOTION SENSOR.
- Each track can be programmed independently for PREDICTOR or MOTION SENSOR.
- When MOTION SENSOR is selected, all DAX's associated with that track remain predictors, unless the DAX's are programmed as preempts.

4.3.6 Warning Time

```
PROGRAM T1
WARNING TIME:     35
```

Enter the warning time for each track.

- Also known as Prime Warning Time.
- The adjustment range is 25 to 99 seconds.

WARNING

IF INCREASING WARNING TIME FOR TRAIN ACCELERATION DOES NOT PROVIDE ADEQUATE OPERATION, OTHER OPTIONS SHOULD BE CONSIDERED.

NOTES

The warning time display appears only when PREDICTOR is selected as the operating mode for the indicated track.

Increasing warning time by up to 10 seconds is intended to provide better warning time performance for accelerating trains.

4.3.7 Approach (Distance)

```
PROGRAM T1
APPROACH:        3000
```

For bidirectional applications, enter the actual distance (in feet) measured from the feed wires on the side of the street that is closest to the termination shunt in the longest physical approach.

- Disregard an approach in which a dummy track load (inductance) is used to simulate a longer approach.

For unidirectional applications, enter the actual distance (in feet) from the receiver track wires to the termination shunt regardless of whether a simulated track inductor is used.

NOTE

When the calibration setup procedure is complete, the approach-distance display shown above alternates with the display shown below.

```
PROGRAM T1
COMPUTED:        3240
```

The value indicated is the electrical approach distance computed by the system during setup for approach. This value is based on:

- Track length
- Ballast conditions
- Characteristics of the termination shunt(s)
- Any simulated track installed in series with the shunt.

4.3.8 UAX Pickup Delay

Model 3000 GCP's can be programmed to accommodate two separate UAX inputs.

- The **UAX (UAX1)** terminals accept inputs from track 1 DAX's
- The **ENA (UAX2)** terminal provides an input for track 2 DAX's

```
PROGRAM          UAX
PICKUP DELAY:     25
```

```
PROGRAM ENA/UAX2
PICKUP DELAY:      25
```

NOTE

When the ENA is programmed for zero time, the ENA terminal (positive control input) functions as an enable input for cascading relay drives from two separate units. When the ENA terminal input is not used, it must be strapped to the B (battery) terminal to enable operation of MS/GCP relay drive.

When both UAX inputs are controlled from remote DAX units, select the desired UAX pickup delay time.

- Valid selections are from 1 to 500 seconds.
- Default is 25 seconds.

When the UAX1 (UAX) input is not used, select 0 (zero) seconds.

- Produces an OFF indication on the 3000 GCP display
- Strapping of the UAX1 terminals to battery is not required.

WARNING

WHEN THE UAX FEATURE FOR UAX1 IS OFF (ZERO TIME ENTERED), THE FRONT PANEL UAX (UAX1) TERMINALS HAVE NO CONTROL OVER THE MS/GCP RELAY DRIVE VOLTAGE

NOTE

When UAX and/or ENA/UAX2 is programmed between 1 and 500 and the drive voltage is removed from either UAX terminal, MS/GCP relay drive voltage is immediately removed. When 12 volts is reapplied to both the UAX1 and/or ENA/UAX2 terminals, MS/GCP relay drive voltage returns after the applicable UAX pickup delay time has elapsed (providing no other condition inhibits the MS/-GCP relay drive).

4.3.9 Island (Distance)

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.

PROGRAM T1	
ISLAND:	0

Enter the island length between GCP transmit and receive track wires for each track (T1 and T2).

- The value entered is in feet with a valid range from 0 to 999.
- If not used, enter zero (0) distance.

4.3.10 Number of DAX's

NOTE

Program Mode menu items relating to DAX installations and discussed in paragraphs 4.3.10 through 4.3.13 are not applicable to Models 3000ND and 3000ND2 GCP's. For these models, program the number of DAX's for 0.

PROGRAM	NUMBER
OF DAXS:	0

Select the number of DAX circuits used in the system.

- For GCP models 3000, 3000D2, and 3000D2L, numbers from 1 to 4 and 0 (zero) are valid entries.
- For GCP models 3008 and 3008D2, numbers from 1 to 8 and 0 (zero) are valid entries.
- Two DAX circuits are available on each DAX module.

NOTES

If 0 (zero) is entered, the next menu item to appear is slaving.

When a number from 1 to 4 (8) is entered, three additional menu items for each DAX selected follow immediately.

- The three displays appear sequentially first for DAX A, then DAX B, DAX C, DAX D, etc.

The DAX affected (A, B, C, D, etc.) is indicated in the top row of the display (see paragraphs 4.3.11 through 4.3.13)

GCP models 3000, 3000D2, and 3000D2L equipped with an 80044 or 80214 processor module, numbers representing four additional DAX circuits (5 through 8) can be entered for the number of DAX's.

- These entries are reserved exclusively for 8-DAX GCP Models 3008 and 3008D2.

Since the Models 3000, 3000D2, and 3000D2L GCP's can accommodate a maximum of two DAX modules (four DAX circuits), the numbers for DAX circuits identified as E (5), F (6), G (7), and H (8) will also be displayed if an invalid entry (5, 6, 7, or 8) is made, along with subsequent displays for track assignment, DAX distance, and DAX warning time. However, since the additional modules are not present, these invalid-programming entries will have no effect on system operation.

4.3.11 DAX Track (Track Assignment)

The track assignment (1 or 2) must be entered for each DAX circuit indicated (A, B, C, D, E, F, G or H).

- Track assignment is associated with the 80012 transceiver module(s) installed in the GCP case (see Table 2-1 for module locations).
- For the 8-DAX models (3008 and 3008D2) the track assignment for all DAX's used must be 1.
- For models 3000, 3000D2, and 3000D2L:
- the transceiver module installed in the leftmost transceiver module slot controls track 1 and the transceiver installed on the right controls track 2.
- Any of the DAX circuits can be assigned to either track (transceiver module).

PROGRAM	DAX A
TRACK:	1

WARNING

ASSIGNING A DAX CIRCUIT TO THE WRONG TRANSCEIVER MODULE MAY RESULT IN SHORT OR NO WARNING TIME.

NOTE

If necessary, review the track wiring diagrams to determine proper DAX assignments.

4.3.12 DAX Distance

Enter the distance (in feet) between crossings or between the remote location and the crossing it is controlling.

- As shown in Figure 4-5, the distance is measured either from the:
  - insulated joints at crossing A
  - insulted joint at the remote location
  - receiver track wires at crossing A.
- The valid range is from 1 to 9,999 feet.

PROGRAM	DAX A
DISTANCE:	0

PROGRAM	DAX A
DISTANCE:	PREEMPT

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.

NOTE

If the 3000 GCP DAX's (paragraph 4.3.12) or prime prediction (4.17.5) are programmed for an offset distance other than 0 (zero), these relay drive outputs will not switch from predictor to motion sensor.

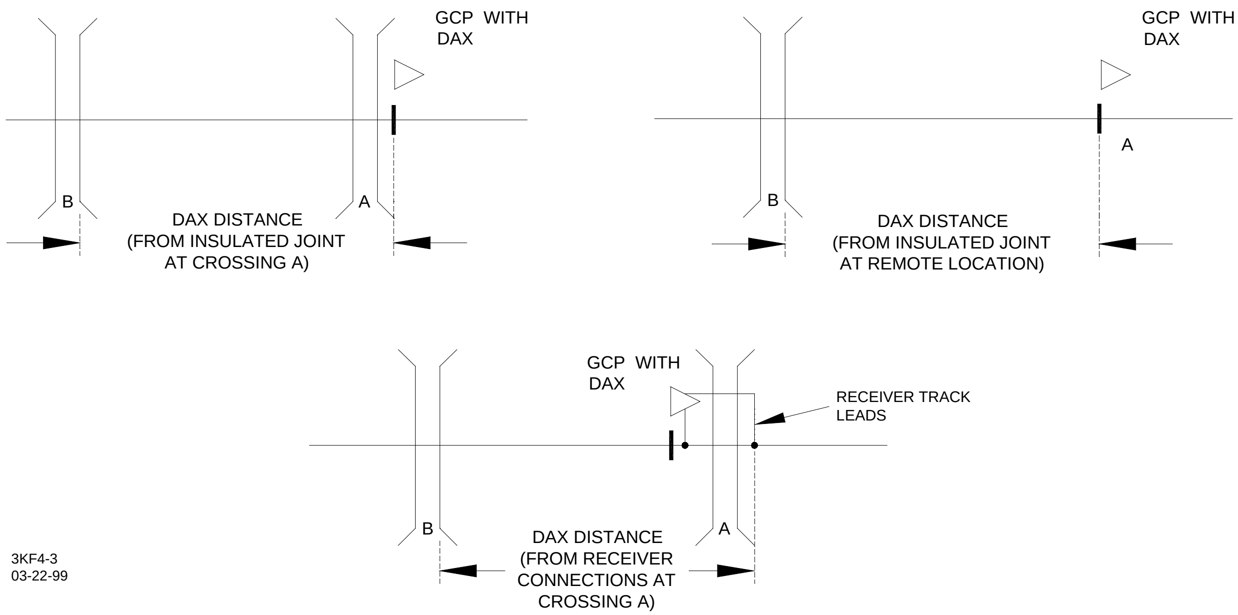


Figure 4-5:
DAX Measurement Distance

To use the DAX for a traffic signal preemption application, enter 0 (zero) and a PREEMPT indication appears on the display.

All necessary logic for the preempt function is included when the DAX is programmed for preempt.

- In addition to the preempt warning time control of the preempt relay drive, preempt relay drive is also removed any time the associated island or UAX drive (when used) is removed.

WARNING

ENTERING ANY VALUE DISABLES THE PREEMPT FUNCTION SO THAT THE ISLAND AND UAX DO NOT AFFECT THE DAX RELAY DRIVE.

DAX circuits are applied in unidirectional applications (looking one direction from a set of insulated joints) while preempting can be applied in either bidirectional or unidirectional applications.

4.3.13 DAX Warning Time

Enter the warning time (in seconds) for the indicated DAX.

- The valid range is from 25 to 99.
- The DAX warning time is generally selected to be the same or up to 10 seconds longer than the prime warning time.
- When the indicated DAX is used for the preempt function, the preempt warning time is generally selected to be 10 to 15 seconds longer than the prime warning time.

```
PROGRAM         DAX A
WARNING TIME:      35
```

WARNING

INCREASING DAX WARNING TIME BY UP TO 10 SECONDS IS INTENDED TO PROVIDE MINIMUM WARNING TIME FOR ACCELERATING TRAINS. IF THIS WARNING TIME IS INSUFFICIENT FOR AN APPLICATION OTHER OPTIONS SHOULD BE CONSIDERED.

4.3.14 Slaving Master/Slave

The master/slave function is used when two or more 3000 GCP cases are physically located at the same location and are required to use the same operating frequency.

- The 3000 GCP designated as the master supplies a synchronizing frequency to the other 3000 GCP’s (slaves) at the location.

- Synchronizes the slave unit's transmit frequency
- A maximum of two slave units may be assigned to each master 3000 GCP.
- When only one 3000 GCP is used at a crossing, it must be programmed as a master.
- If two or more 3000 GCP's are used at a location and each is required to operate at a different frequency, then each unit must be programmed as a master.
- When two dual-frequency systems are slaved together, it requires one transceiver in each unit to be set to a common frequency.

PROGRAM SLAVING MASTER

NOTES

A wire must be installed between the front panel SLAVING terminal (TB2-6) on the master 3000 GCP and the SLAVING terminal (TB2-6) on each slave 3000 GCP operating at the same frequency.

The master/slave function can be used only to slave 3000 GCP's to other 3000 GCP's or MS 2000's. The master/slave function cannot be implemented between the 3000 GCP and earlier GCP models (Models 600, 660, etc.)

Select the GCP frequency slaving status for the 3000 GCP case, either master or slave.

- The entry made in this programming item in each unit determines whether the SLAVING terminal is an output (master unit) or an input (slave unit).

4.3.15 Password Disabled/Enabled

A user-selectable, four-digit password provides protection from unauthorized changes to the application programming.

- The password feature can be enabled (installed) at the time of installation or any time thereafter if the need arises via this menu item.
- This menu item is also used to change or disable the password at any time, providing the correct password is entered first.

PROGRAM PASSWORD DISABLED	or	PROGRAM PASSWORD ENABLED

When the password feature is enabled, the correct four-digit password must be entered via the keyboard/display unit before any changes to application parameters (in the Program and Function Mode menus) can be made.

- Application program parameters can be viewed at any time without entering the password.

- For specific procedures relating to the password feature, refer to the applicable paragraphs in Section 5.

4.3.16 Recorder Not Installed/Installed

The data recorder module (80015 or 80115) is an optional item in the 3000 GCP.

- This menu item is used to disable (NOT INSTALLED) or enable (INSTALLED) the recorder function.
- When the recorder function is disabled (NOT INSTALLED), this is the last item from the Program Mode menu to be displayed.

```
PROGRAM  RECORDER
NOT INSTALLED
```

- When the data recorder module is installed in the 3000 GCP case, the entry for this menu item must be changed to INSTALLED to enable the data recorder.

NOTE

With the data recorder function enabled **(INSTALLED)**, additional menu items appear in the Program menu.

The first four items relate to an external PC or printer that can be connected to the data recorder module via a 25-pin RS232C connector on the front edge of the module.

Consult the PC software or printer manufacturer's documentation to determine the correct values for the four entries.

4.3.17 RS232C Baud Rate

Enter the PC/printer baud rate.

- Valid baud rates are 300, 1200, 2400, 4800, or 9600.
- For 3000 GCP's equipped with an 80044 or 80214 processor module, the default value is 9600.

```
PROGRAM RS-232-C
BAUD RATE:      9600
```

4.3.18 RS232C Data Bits

Enter the number of data bits (data length) for the PC/printer being used.

- The value to enter is 7 or 8.

- For 3000 GCP's equipped with an 80044 or 80214 processor module, the default value is 8.

PROGRAM RS-232-C
DATA BITS: 8

4.3.19 RS232C Stop Bits

Enter the number of stop bits for the PC/printer.

- The value to enter is 1 or 2.
- For 3000 GCP's equipped with an 80044 or 80214 processor module, the default value is 1.

PROGRAM RS-232-C
STOP BITS: 1

4.3.20 RS232C Parity

Enter the type of parity used by the PC/printer.

- Valid entries are NONE, ODD, EVEN, MARK, and SPACE
- The default is NONE

PROGRAM RS-232-C
PARITY: NONE

4.3.21 Date

Enter the current day and date in the format shown in the example below.

PROGRAM DATE
FRI 07 JUL 2007

4.3.22 Time

Enter the current time in hours-minutes-seconds (hh:mm:ss) format as shown in the example below.

- When using the 24-hour (military) format, follow the time entry with (24 HR).
- When using the standard 12-hour format, follow the time entry with AM or PM, whichever is appropriate.

PROGRAM TIME
12:45:56 (24 HR)

4.3.23 Daylight Savings Time

NOTE

Safetran Systems software does not support the changes passed by the US Congress in regards to shifting Daylight Savings Time from the traditional dates as has been the case since October/November 2007.

If the 3000 GCP will be operating on daylight savings time, select ON.

- The data recorder will change the time setting automatically at the beginning and end of the daylight savings time period. Daylight savings:
  - starts at 2:00 a.m. on the first Sunday in April
  - ends at 2:00 a.m. on the last Sunday in October

```
PROGRAM   DAYLIGHT
SAVINGS:       OFF
```

Select OFF if the system will be operating on standard time only.

4.4 NEW DATA KEY

The NEW DATA key is a support key that must be pressed just prior to entering a new value while changing system-operating parameters in the Program, Setup, or Function Modes.

- The NEW DATA key performs a similar function in the Event Mode and in the approach and linearization setup procedures.

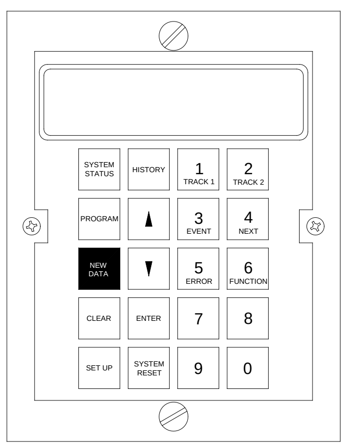


Figure 4-6:
GCP 3000 Keyboard/Display Panel New Data Key

4.5 CLEAR KEY

The CLEAR key is a support key used to clear (delete) incorrect data entries.

- When changing system operating parameters in either the Program or Function Mode, if an incorrect data entry is made but the ENTER key has not yet been pressed, the CLEAR key can be pressed to remove the new data and return to the previous value.
- The CLEAR key is also used when disabling the password function.

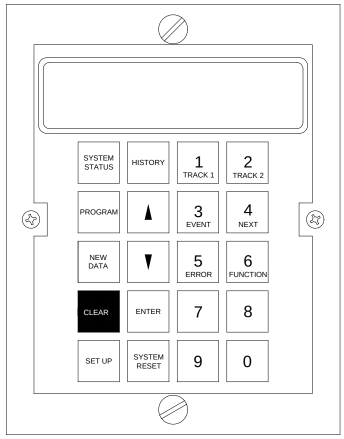


Figure 4-7:
GCP 3000 Keyboard/Display Panel Clear Key

4.6 SETUP KEY

Press and hold the SETUP key for a minimum of 3 seconds to select the Setup Mode.

- The Setup Mode consists of three automatic system calibration procedures:
  - Setup For Calibration
  - Setup For Approach Length
  - Setup For Linearization
- The steps for performing each of these procedures are provided in Section 6, System Calibration.

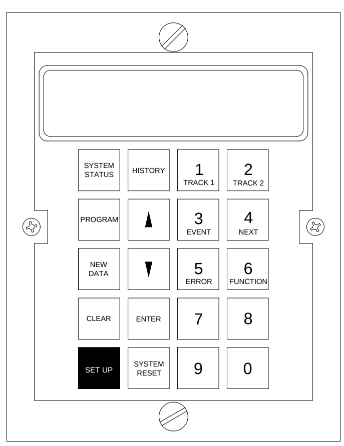


Figure 4-8:
GCP 3000 Keyboard/Display Panel Setup Key

Whenever the Setup Mode is selected, the following display appears:

SETUP T1 FOR CALIBRATION

This display identifies the Setup For Calibration procedure, which is the first procedure in the Setup Mode menu.

With the Setup Mode selected, any of the three system calibration procedures can be selected from the Setup Mode menu by pressing the up (▲) or down (▼) arrow keys.

- These procedures are described in the following paragraphs.

4.6.1 Setup For Calibration Procedure

The Setup For Calibration procedure must be performed after each of the following:

- initial installation
- the system is returned to default parameters
- module replacement (see Table 6-1 for further information)
- programming changes (see Table 6-2 for further information)
- changes to existing track equipment. (see Table 6-3 for further information)

Refer to paragraph 6.5.2, Setup For Calibration, for further information.

4.6.2 Setup For Approach Length Procedure

The Setup For Approach Length procedure must be performed when calibrating any 3000 GCP installation and after each of the following:

- module replacement (see Table 6-1 for further information)
- programming changes (see Table 6-2 for further information)
- changes to existing track equipment. (see Table 6-3 for further information)

The display shown below identifies the Setup For Approach Length procedure.

SETUP T1 FOR APROACH LENGTH

Refer to paragraph 6.5.3, Setup For Approach Length and Linearization, for further information.

4.6.3 Setup For Linearization Procedure

The Setup For Linearization procedure must be performed at the time of calibration and after each of the following:

- module replacement (see Table 6-1 for further information)
- programming changes (see Table 6-2 for further information)
- changes to existing track equipment. (see Table 6-3 for further information)

The display shown below identifies the Setup For Linearization procedure.

SETUP T1 FOR
LINEARIZATION

Refer to paragraph 6.5.3, Setup For Approach Length and Linearization, for further information.

4.7 HISTORY KEY

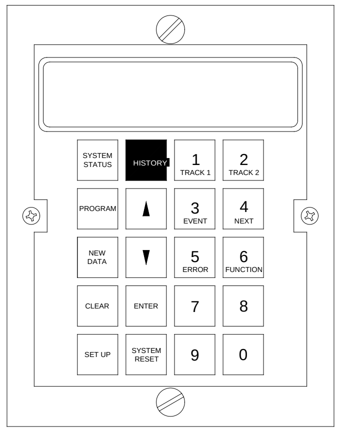


Figure 4-9:
GCP 3000 Keyboard/Display Panel History Key

Press the HISTORY key to select the History Mode.

- The History Mode provides a record of the previous 20 train moves (events) on a single track or 10 train moves per track when two tracks are monitored.
- Four important parameters are stored:
  - warning time
  - detected speed (speed of train when unit predicts)
  - average speed (average speed of train throughout the move)
  - island speed (speed when entering the island circuit).
- The initial history display (see sample below) identifies:
  - the track on which the move(s) were recorded
  - the number of events recorded (in angled brackets < >)
  - the warning time (in seconds) for the last event recorded.

HISTORY T1 <10>
WARNING TIME: 35

The events occurring on track 2 can be viewed by pressing the TRACK 2 key.

The up (▲) and down (▼) arrow keys are used to select the train move number (as indicated on the display) for which the parameters will be displayed.

- Each time one of the keys is pressed, the train move number in the angled brackets increments or decrements (depending upon the key that is pressed).

- Once the desired train move number is displayed, use the NEXT key to scroll through the menu of the four parameters.
- The menu is continuous and starts over when the end is reached.

4.7.1 Warning Time (History)

This initial History Mode display shows the warning time in seconds for the indicated train move (number in brackets < >) on the track indicated.

```
HISTORY  T1        <08>
WARNING TIME:        30
```

4.7.2 Detected Speed (History)

This display shows a snapshot of the speed of the train when the unit predicted for the indicated train move on the applicable track (value shown in miles-per-hour). See the Note under paragraph 1.2.

```
HISTORY  T1        <08>
DET. SPEED:          46
```

4.7.3 Average Speed (History)

This display shows the average of the snapshots regarding the speed of the train throughout the approach for the train move indicated on the applicable track (value in miles-per-hour). See the Note under paragraph 1.2.

```
HISTORY  T1        <08>
AVG. SPEED:          47
```

4.7.4 Island Speed (History)

This display shows the island speed (speed when entering the island circuit) for the train move indicated on the applicable track (value in miles-per-hour). See the Note under paragraph 1.2.

```
HISTORY  T1        <08>
ISL. SPEED:          49
```

4.8 UP ARROW KEY (□)

The up arrow key (▲) is used in the:

- System Status, Program, and Function Modes to scroll up a menu (reverse order)
- Error and History Modes to scroll through a list of recorded entries in descending order.
- Linearization Setup procedure to increment the linearization value.

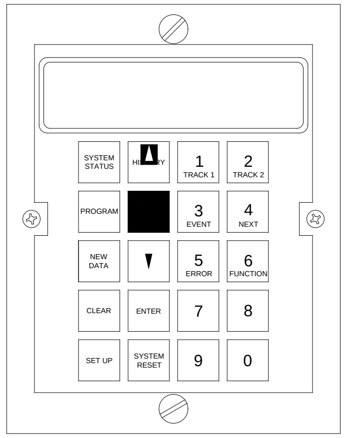


Figure 4-10:
GCP 3000 Keyboard/Display Panel Up Arrow Key

4.9 DOWN ARROW KEY (□)

The down arrow key (▼) is used in the:

- System Status, Program, and Function Modes to scroll down a menu (normal order)
- Error and History Modes to scroll through a list of recorded entries in ascending order
- Linearization Setup procedure to decrement the linearization value.

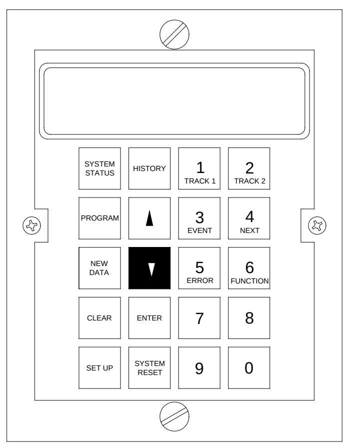


Figure 4-11:
GCP 4000 Keyboard/Display Panel Down Arrow Key

4.10 ENTER KEY

- When operating in the Program and Function (extended programming) Modes, press the ENTER key following a data entry to enter that data in the program.
- In the Setup and System Reset Modes, the ENTER key is used to select a function such as Calibration Setup or to clear errors, respectively.

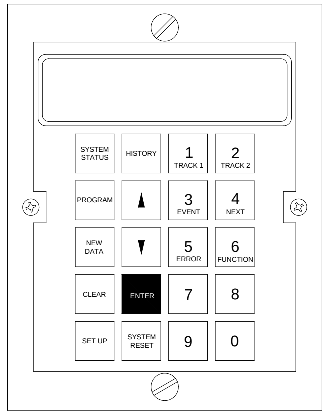


Figure 4-12:
GCP 4000 Keyboard/Display Panel Enter Key

4.11 SYSTEM RESET KEY

NOTE

If the EZ value is less than 3 and power to the 3000 GCP is interrupted for any reason, or a system error occurs, relay drive will not recover until the EZ value becomes greater than 3. However, if a train in the approach is the cause of the low EZ value, this condition can be manually overridden by initiation of a system reset.

The SYSTEM RESET key selects a menu that consists of three functions:

- Clear Errors (diagnostic messages)
- Clear History
- Reset System.

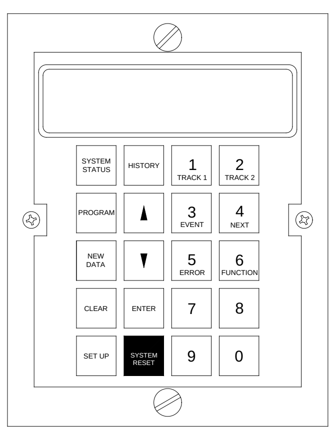


Figure 4-13:
GCP 3000 Keyboard/Display Panel System Reset Key

These functions are identified by menu entries in the Reset menu.

- When the RESET key is pressed and held for a minimum of 3 seconds, the following display appears:

PRESS ENTER TO CLEAR ERRORS

- This display:
  - indicates that the Clear Mode is selected
  - identifies the clear errors (diagnostic messages) function.
  - The Clear errors function:
  - Is the first function in the Reset Mode menu
  - permits the operator to clear all system diagnostic messages from system memory that were recorded during system programming, calibration, or normal operation.

NOTE

These messages are described further in Section 7, Diagnostics (Maintenance).

  - resets the HZ and LX memories.

During normal operation, the 3000 GCP records warning time and train speeds in history.

The clear history function permits the operator to clear all recorded train move information from system memory.

The display shown below identifies the clear history function.

PRESS ENTER TO CLEAR HISTORY

The reset system function clears both the error and history portions of memory simultaneously but will cause the crossing to operate for approximately 30 seconds.

- The system reset does not affect the levels established by the Setup Mode or system programming.
- The display shown below identifies the system-reset function.

PRESS ENTER TO RESET SYSTEM

4.12 TRACK 1 KEY (1)

The TRACK 1 key is used while in the Program, Function, System Status, Setup, and History Modes to select a display for track 1.

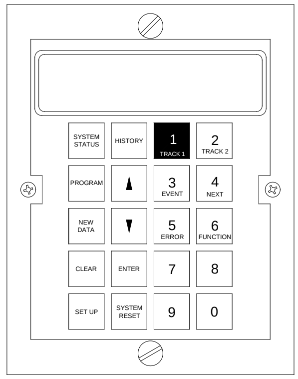


Figure 4-14:
GCP 3000 Keyboard/Display Panel Track 1 Key (1)

- The T1 indicates a track 1 display.

STATUS T1			
EZ:	**100**	**EX:**	**87**

The dual-function TRACK 1 key is also used to enter the digit 1 for numerical data entries.

4.13 EVENT KEY (3)

The EVENT key is used when a data recorder module (80015 or 80115) is installed to select an event number other than 1 (default value) as the starting point for a file download to a PC or a hard copy printout.

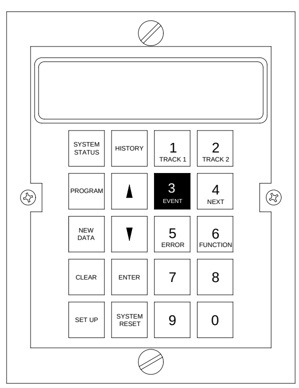


Figure 4-15:
GCP 3000 Keyboard/Display Panel Event Key (3)

- In the sample EVENTS display below, the number shown in brackets (< 34>) indicates the total number of events recorded.
- The number in the lower right corner indicates the event number where the printout will begin.

EVENTS	< 34>
START PRINT:	**1**

The dual-function EVENT key is also used to enter the digit 3 for numerical data entries.

4.14 ERROR KEY (5)

Press the ERROR (diagnostic) key to select the Diagnostic Mode.

- The Diagnostic Mode provides a visual indication of the 10 most recent diagnostic messages recorded by the system.
- These messages are identified by four-digit codes and are cross-referenced in Table 7-2.

The ERROR (diagnostic) key is a dual-function key and is used to enter the digit 5 for numerical data entries.

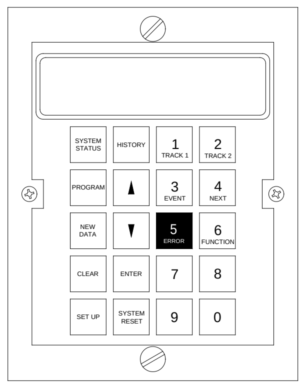


Figure 4-16:
GCP 3000 Keyboard/Display Panel Error Key (5)

4.15 TRACK 2 KEY (2)

The TRACK 2 key is used while in the Program, Function, System Status, Setup, and History Modes to select a display for track 2.

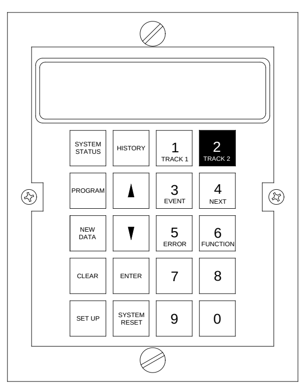


Figure 4-17:
GCP 3000 Keyboard/Display Panel Track 2 Key (2)

- The T2 indicates a track 2 display.

STATUS T2			
EZ:	**100**	**EX:**	**87**

The TRACK 2 key is a dual-function key and is used to enter the digit 2 for numerical data entries.

4.16 NEXT KEY (4)

When viewing recorded events in the History Mode, use the NEXT key to scroll through the menu of four parameters (warning time, detected speed, average speed, and island speed) associated with each event.

- The menu is continuous and starts over when the end is reached.

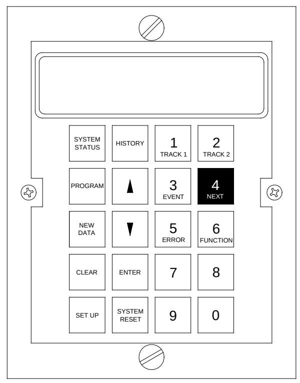


Figure 4-18:
GCP 3000 Keyboard/Display Panel Next Key (4)

The NEXT key is a dual-function key and is used to enter the digit 4 for numerical data entries.

4.17 FUNCTION KEY (6)

Press the FUNCTION key to select the Function (extended programming) Mode. The Function Mode:

- is an extension of the Program Mode
- permits fine-tuning of certain system parameters to compensate for unusual track conditions or system requirements.

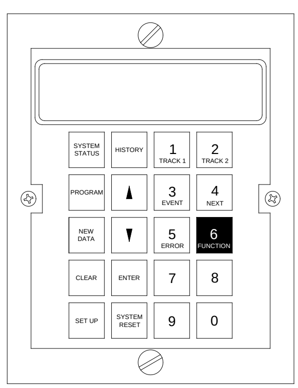


Figure 4-19:
GCP 3000 Keyboard/Display Panel Function Key (6)

The Function Mode displays are arranged in a menu format that is continuous and starts over at the beginning when the end of the menu is reached.

- The Function Mode menu is depicted in flowchart format in Figure 4-20.

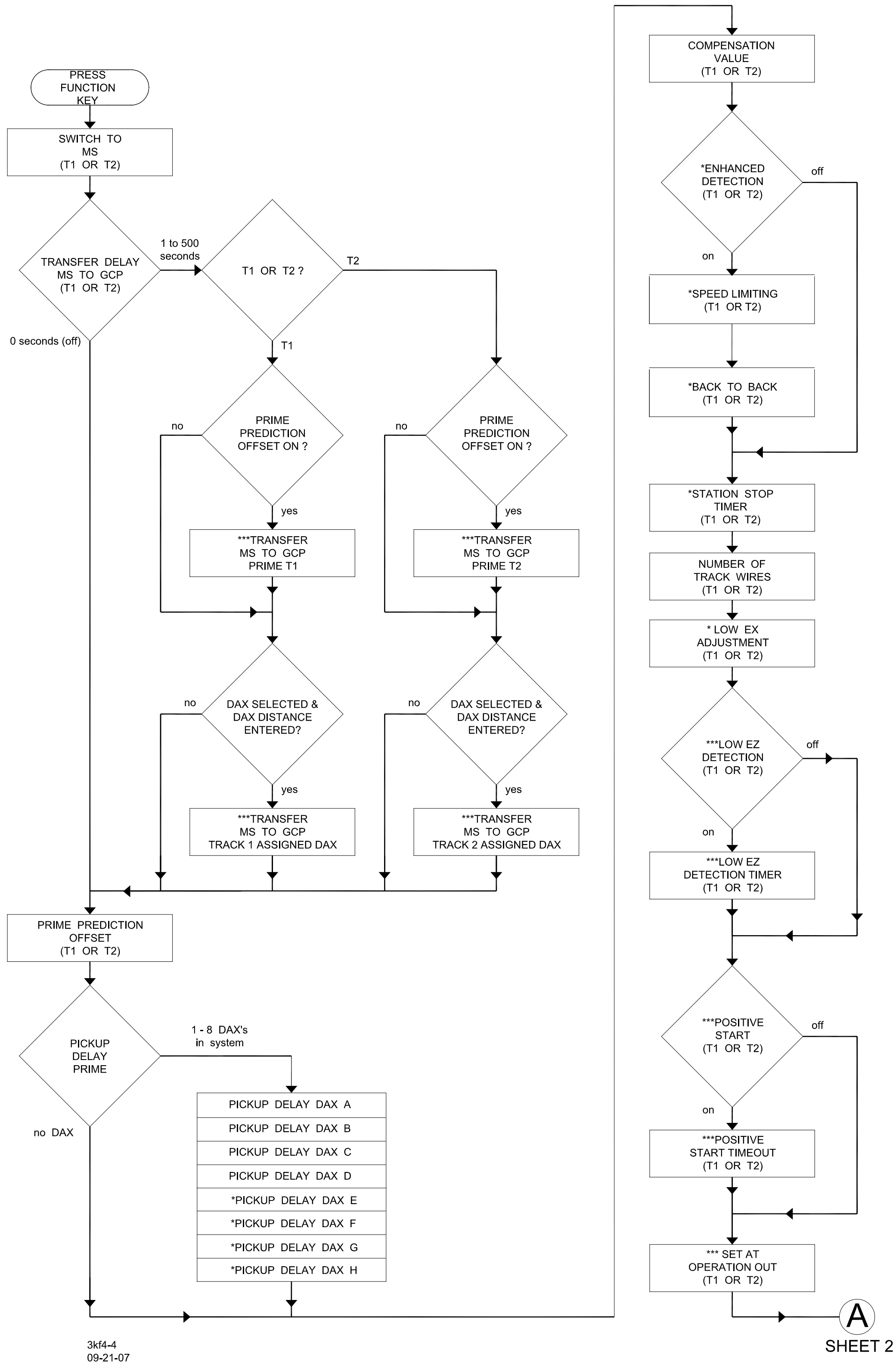
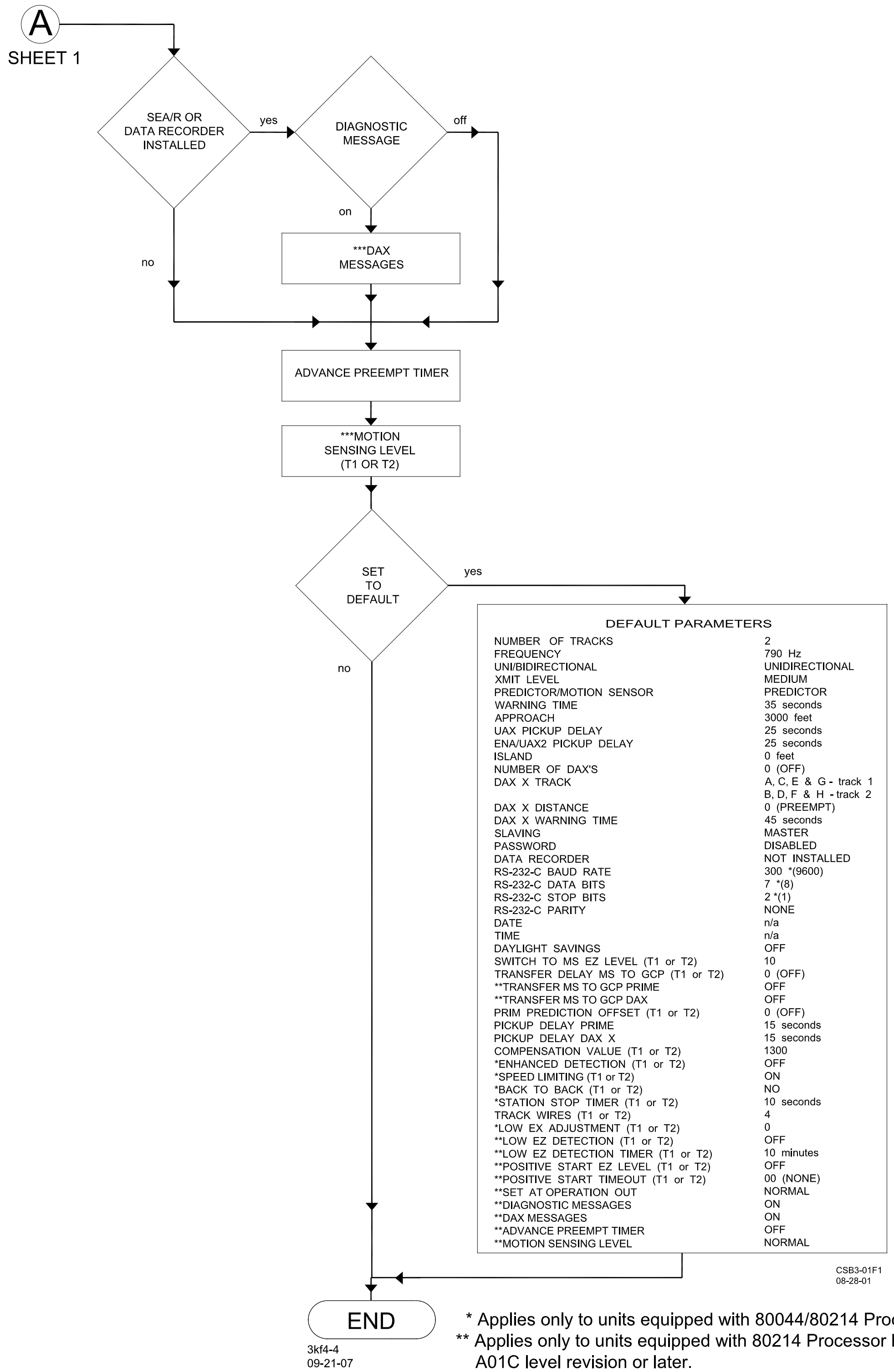


Figure 4-20:
Function Mode Menu Structure (Sheet 1 of 2)



* Applies only to units equipped with 80044/80214 Processor
** Applies only to units equipped with 80214 Processor having A01C level revision or later.
*** Applies only to units equipped with 80214 Processor having A01H revision level or later.

Figure 4-21:
Function Mode Menu Structure (Sheet 2 of 2)

NOTE

Information programmed via the Function Mode should first be entered on the 3000 GCP Application History Card (Figure 4-25). The card should remain with the equipment at all times and should reflect the current programmed status of the system. The order in which the information is listed on the card corresponds with the order in which the information is requested in the Function Mode menu.

When a system is programmed for two tracks, certain Function Mode menu items can be programmed differently for each track.

- A T1 or T2 appearing in the display indicates the track to which the information applies.
- When T1 is displayed, pressing the TRACK 2 key causes similar information to be displayed for track 2.
- Pressing the TRACK 1 key returns to the track 1 display.

The FUNCTION key is a dual-function key that is also used to enter the digit 6 for numerical data entries.

NOTES

1. The following Function Mode menu items can be viewed at any time by selecting the Function Mode and scrolling through the menu.

2. If the password feature is enabled, the four-digit password must be entered before any program changes can be made.

4.17.1 Switch to MS EZ Level

This is the first menu item in the Function Mode menu.

- The information requested is the level of EZ at which the 3000 GCP switches from predictor status to motion sensor status.
- If the system is programmed as a motion sensor, this parameter can be ignored.
- Valid range is from 0 (zero) to 100.
- A 0 (zero) entry produces an OFF indication on the display.

T1 SWITCH TO MS	
EZ LEVEL:	**10**

This menu item is useful at locations where a station stop is located within the approach distance and near the crossing.

- The Switch to MS EZ value is programmed to the level expected while the train is at the station stop location within the approach.

The GCP will switch to motion sensor mode at the first indication of motion as the train leaves the station.

Activation of the crossing will occur sooner than when the GCP is operating as a predictor.

WARNING

IF THE 3000 GCP DAX'S (PARAGRAPH 4.3.12) OR PRIME PREDICTION (4.17.5) ARE PROGRAMMED FOR AN OFFSET DISTANCE OTHER THAN 0 (ZERO), THESE RELAY DRIVE OUTPUTS WILL NOT SWITCH FROM PREDICTOR TO MOTION SENSOR.

4.17.2 Transfer Delay MS to GCP

When programmed to a specific time value, the Transfer Delay timer enables the appropriate GCP to operate as a motion sensor while the timer is running.

- This is implemented by programming the Transfer Delay MS to GCP value on T1 and/or T2 with the time in seconds that the GCP will function as a motion sensor.
- Both T1 and T2 timers can be programmed up to 500 seconds (8 minutes and 20 seconds).
- An entry of 0 (zero) will produce an OFF indication on the display.

STATUS T2			
EZ:	100	EX:	87

Once Transfer Delay MS To GCP is programmed to a time value (T1 and/or T2), the timer will start counting down when one of the following occurs:

- The GCP output drive is restored.
- Restoration of the GCP output starts the transfer timer but only on the track (T1 or T2).
- 12 VDC is removed and then reapplied to the CONTROL terminal on the front panel of a GCP.

4.17.2.1 Station Stop MS Restart Function

NOTES

1. Passenger trains are capable of high rates of acceleration when leaving a station. This can result in shorter than designed warning times for a street near the station. While Train Operating rules generally address this situation, it still can be a concern especially when Traffic Signal Preemption is involved.

2. The Station Stop MS Restart function described below applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01J revision level or later.

Where there is a station stop either in the approach to a crossing or in a remote DAX approach, the warning system performance may often be improved by utilizing the Station Stop MS Restart function of the Advanced 3000 GCP.

- This application allows the system to operate as a predictor for through move trains, but as a Motion Sensor for trains that first stop at a station and then proceed toward a crossing.
- The Motion Sensor operation can also be extended to applicable DAX controls.

This application begins with programming the Transfer Delay Timer (see paragraph 4.17.2).

NOTE

This function can also be used together with the Transfer MS to GCP Prime (see paragraph 4.17.5) and/or the Transfer MS to GCP DAX (see paragraph 4.17.4) programming functions.

- The prime relay and programmed DAX functions of the 3000 GCP will then operate in the motion sensors mode while the timer is running.
- Most applications also require adjustment of the Motion Sensing Level as described in paragraph 4.17.22.
- Transfer Delay time is generally calculated by first determining the maximum time a train will remain stopped at a station and then adding 60 seconds to that value.

The Station Stop MS Restart function begins when:

- The 3000 predicts and then recovers while the train is in the station.

Prediction recovery starts the Transfer Delay timers on both T1 AND T2 if they are both programmed with time.

- 12 volts is removed and reapplied to the CONTROL terminal on the front of the 3000.
- In most applications remote units provide this control.

NOTE

The Transfer Delay timers will also start counting down when first programmed to a time value or when powering up the GCP unit.

An “M” (Motion mode) on the EZ and EX status display indicates when a T1 or T2 Transfer timer is in operation.

If a GCP does not predict prior to a train stopping at a station, the application can be designed to ensure prediction so that motion sensor switching occurs on each station stop. This requires that the GCP output be dedicated exclusively to switching to MS operation. This may be accomplished through a combination of:

- programming a longer warning time
- reducing prime prediction offset
- programming the Switch to MS EZ level to a value that occurs beyond the station stop platform.

NOTE

The GCP relay drive may not be used for any direct control of the crossing during this dedicated operation.

4.17.3 Transfer MS to GCP Prime

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01J revision level or later.

This display appears only after the following are programmed:

- Transfer Delay MS to GCP (see paragraph 4.17.2)
- Prime Prediction Offset (see paragraph 4.17.5)

The display toggles between NO and YES each time the NEW DATA key is pressed.

- The default is OFF
- When set to ON, motion sensor operation is enabled for the duration of the Transfer Delay Timer following the prime prediction of a train.

TRANSFER MS TO
GCP PRIME T1: OFF

4.17.4 Transfer MS to GCP DAX

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01J revision level or later.

This display appears only after one or more DAX is selected and the following are programmed:

- Transfer Delay MS to GCP (see paragraph 4.17.2)
- DAX distance other than zero (see paragraph 4.3.12)

The display toggles between NO and YES each time the NEW DATA key is pressed.

- The default is OFF
- When set to ON, the GCP is allowed to switch to motion sensor operation following the prediction of a train by the corresponding DAX circuit.

Motion sensor function is enabled for the duration of the Transfer Delay timer.

TRANSFER MS TO
GCP DAX A: OFF

4.17.5 Prime Prediction Offset

Enter the distance (offset) from the normal zero prediction point to a remote zero prediction point.

- Valid entries range from 0 to 9999 feet
- An entry of 0 (zero) produces an OFF indication on the display.

PRIME PREDICTION
OFFSET T1: OFF

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.

This menu item enables an upstream remote 3000 GCP (not located at a crossing) to provide the equivalent of a single DAX output without the need for a DAX module.

- The remote unit is programmed to delay prime prediction to compensate for the offset distance between the insulated joints and the downstream crossing feed points.

The offset distance is measured from the insulated joints at point A to the feed wires at the edge of the downstream crossing as shown in Figure 4-22.

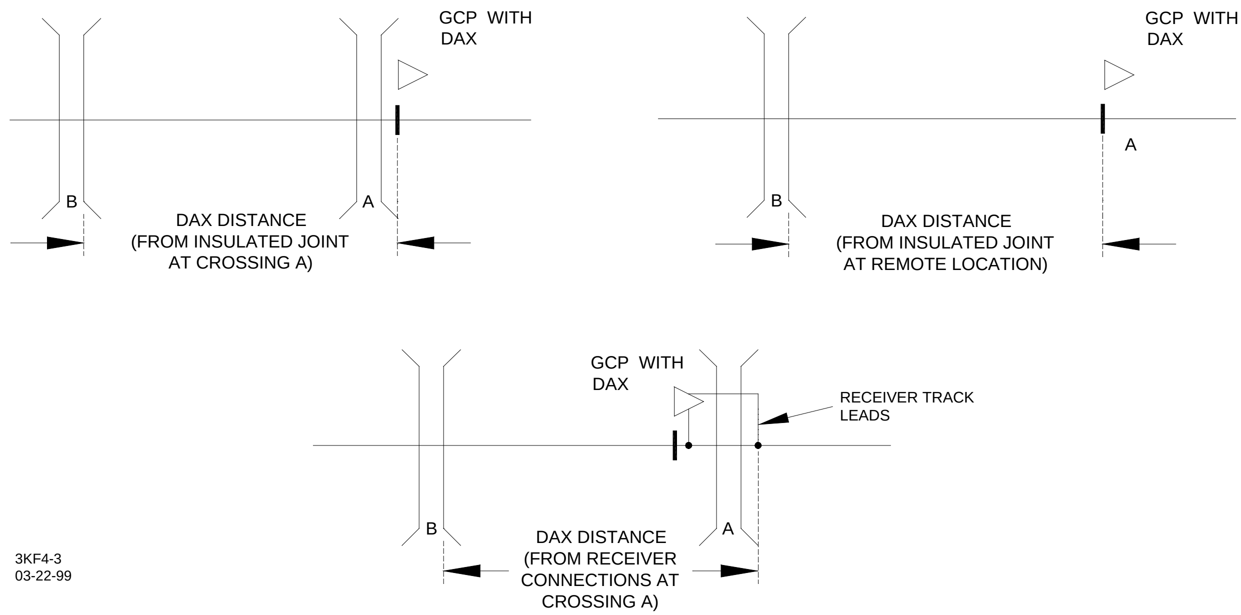


Figure 4-22:
Remote GCP Offset Distance

WARNING

FOR GCP'S EQUIPPED WITH THE 80044 OR 80214 PROCESSOR, WHEN PRIME PREDICTION OFFSET IS PROGRAMMED FOR ANY VALUE OTHER THAN 0 (ZERO), THE ISLAND CIRCUIT WILL NOT CONTROL THE GCP RELAY DRIVE OUTPUT OF THE GCP (TERMINALS TB1-9 AND TB1-10).

4.17.6 Pickup Delay Prime

Enter the time interval (seconds) beginning from when prediction recovers and relay drive returns.

- Valid entries range from 8 to 500 seconds.

PICKUP DELAY	
PRIME	**15**

NOTE

The default value is 15 seconds and is normally not changed; however, a pickup delay of up to 500 seconds can be used if required for transit station stops, poor shunting, and etc.

When a train stops in a 3000 GCP approach, actual prime pickup delay time is determined by the time that has been programmed.

The following is applicable only when Prime Prediction Offset (paragraph 4.17.5) is programmed.

For through-move trains the prime pickup delay time is automatically calculated by the system based upon the speed of the train and offset distance programmed.

- Applies to GCP's equipped with 80044 or 80214 processors or with an 80014 processor with "F" level software or above.
- Pickup delay time is calculated so that prime relay drive is applied just as a train arrives at the street that is controlled by the prime prediction offset.

NOTE

When short, rapidly accelerating trains leaving a station are present, such as those encountered in transit operations, possible overrings may occur at the crossing. These overrings:

- are the result of errors in prime pickup delay calculations caused by the rapidly accelerating trains.
- can be remedied by programming a fixed pickup delay prime time instead of using the calculated time.

A fixed pickup prime time is implemented as follows:

Step 1: Program the pickup delay prime interval for a nominal time between 8 and 20 seconds.

Step 2: Press the NEW DATA key.

Step 3: Enter 999 on the keyboard.

Step 4: Press the ENTER key.

The display will change to indicate Fixed followed by the time that was entered (12 seconds in the example shown below). The pickup delay time will now remain constant, regardless of the speed of the trains.

PICKUP DELAY	
PRIME: FIXED	**12**

Step 5: To return to the automatically calculated prime pickup delay time, repeat steps 2 through 4.

PICKUP DELAY	
PRIME	15

The word Fixed will no longer be displayed indicating that the automatically calculated pickup delay is again operational.

4.17.7 Pickup Delay DAX

Enter the time interval between DAX prediction recovery and gates pick up, in the event the train stops in the DAX approach.

- Valid entries range from 0 to 500 seconds
- An entry of 0 (zero) produces an OFF indication on the display.
- This format is displayed for each DAX in the system (A, B, C, etc.).

NOTE

PICKUP DELAY	
DAX A	15

The default value is 15 seconds and, generally, is not changed; however, a pickup delay of up to 500 seconds can be used if required for transit station stops, poor shunting, etc.

When a train stops in a 3000 GCP approach, actual DAX pickup delay time is determined by the time that has been programmed for the applicable DAX circuit.

For through-move trains the prime pickup delay time is automatically calculated by the system based upon the speed of the train and offset distance programmed.

- Applies to GCP's equipped with 80044 or 80214 processors or with an 80014 processor with "F" level software or above.
- DAX pickup delay time is calculated so that DAX relay drive is applied just after a train arrives at the street that is controlled by the applicable DAX circuit.

NOTE

When short, rapidly accelerating trains leaving a station are present, such as those encountered in transit operations, possible overrings may occur at the crossing. These overrings:

- are the result of errors in prime pickup delay calculations caused by the rapidly accelerating trains.
- can be remedied by programming a fixed DAX pickup delay prime time instead of using the calculated time.

A fixed DAX pickup delay time is implemented as follows:

Step 1: Program the DAX pickup delay interval for the applicable DAX circuit for a nominal time between 8 and 20 seconds.

Step 2: Press the NEW DATA key.

Step 3: Enter 999 on the keyboard.

Step 4: Press the ENTER key.

The display will change to indicate Fixed followed by the time that was entered (12 seconds in the example shown below). The pickup delay time will now remain constant, regardless of the speed of the trains.

PICKUP DELAY	
DAX A: FIXED	**12**

Step 5: To return to calculated DAX pickup delay, repeat steps 2 through 4.

The word Fixed will no longer be displayed indicating that the automatically calculated DAX pickup delay is again operational.

PICKUP DELAY	
DAX A	**15**

4.17.8 Compensation Value

The compensation value is a correction factor used to fine tune the system for varying ballast loads on the track.

- This value is selected automatically to maintain a stable EZ value over changing ballast conditions.

NOTE

The EZ value can be monitored using the Status Mode (see Section 7, Diagnostics [Maintenance]).

- The valid range of entries is 1000 to 2000
- The default depends on the software level installed.
- The default value may not be sufficient for all applications, especially those with severe loading (salted crossings).

COMPENSATION	
VALUE T1	**1300**

WARNING

THIS VALUE IS SELECTED AUTOMATICALLY BY THE SYSTEM ANY TIME THE FREQUENCY IS CHANGED. THE VALUE CAN BE CHANGED MANUALLY VIA THIS MENU ITEM BUT SHOULD NOT BE CHANGED UNLESS SPECIFICALLY INSTRUCTED BY SAFETRAN TO DO SO. IF THE VALUE IS CHANGED, SETUP FOR CALIBRATION MUST BE PERFORMED.

4.17.9 Enhanced Detection, T1/T2

This programming step applies only to a 3000 GCP that is equipped with an 80044 or 80214 processor module.

This display:

T1 ENHANCED	
DETECTION:	***OFF**

The enhanced detection mode is for use in areas where poor track shunting conditions exist.

- When the enhanced detection feature is ON, the system will automatically switch to the poor-shunting logic when poor shunting conditions are detected.
- The enhanced detection feature is designed to detect the nonlinear fluctuations of the track signal resulting from poor shunting and automatically switch from GCP operation to the poor shunting mode highly sensitive motion sensor.
- All preempts and DAX's are also switched to the poor shunting mode to ensure adequate warning time and prevent over-rings and tail rings at the crossing.
- For any train moves where the 3000 GCP does not detect poor shunting conditions, the system continues to operate as a conventional grade crossing predictor.

WARNING

EVEN THOUGH ENHANCED DETECTION IS DESIRED AND PROGRAMMED TO ON, IF TRAIN TRAFFIC IS MINIMAL, ESPECIALLY IN DARK TERRITORY, RUST BUILD-UP ON THE RAILS MAY NOT ALLOW ADEQUATE TRACK SHUNTING TO OCCUR. THE 3000 GCP MUST DETECT REASON-ABLE EZ FLUCTUATION IN ORDER TO DETECT POOR SHUNTING.

NOTES

Intermittent poor shunting can result just about anywhere due to numerous causes but generally occurs due to infrequent track usage, lightly weighted cars, passenger and transit operation, spillage from rail cars, and 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 to improve shunting and thus allow the 3000 Enhanced Detection software to function properly.

The Safetran 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 3, Paragraph 3.5.

When enhanced detection mode is enabled and poor shunting conditions are detected:

- the system switches to the ED operating mode
- ED appears in the upper right corner of the display (see example below)

STATUS T1			*ED*
EZ:	100	EX:	87

The ED indication remains on the display until the train leaves the track circuit

NOTE

EZ and EX values shown in the preceding sample status message are example values only; actual values may differ.

4.17.9.1 Speed Deceleration Limiting Operation (Speed Limiting) T1/T2

In poor shunting or high noise environments, the system may report slowing rates that are physically impossible for trains to perform. Speed Limiting is a process wherein a limit is imposed on the amount by which the train speed is allowed to decrease. In situations where false deceleration exists from noise or poor shunting, Speed Limiting reduces the time for prediction to occur, improving warning time consistency. Typically this operation would remain turned on; however it could be turned off if there is a switch in the crossing and false predictions occur due to the train changing track.

```
T1 ENHANCED
DETECTION:      *OFF
```

The asterisk that appears before “On” or “Off” signifies that the speed limiting mode is operating.

To turn speed limiting on or off:

Step 1: From the Program screen, press the Function Key (6) and scroll down to the T1 Enhanced Detection On/Off screen

Step 2: Press the New Data key on the Keyboard/Display Panel

Step 3: Either:

Press “4000” on the Keyboard/Display Panel to turn on speed limiting.

or

Press “4001” on the Keyboard/Display Panel to turn off speed limiting.

Step 4: Press the Enter key on the Keyboard/Display Panel

4.17.9.2 Erratic Shunting Recognition

NOTE

The following discussion assumes familiarity with the error mode display and the error code log. For a discussion of the error mode function refer to Section 7, paragraph 7.4.

To determine whether erratic shunting may have occurred, proceed as follows:

Step 1 Press the 3000 GCP ERROR key. The error mode message displays.

Step 2 Review the error code log and note all recorded errors.

If any of the following error codes are noted, erratic shunting may have occurred and further investigation is warranted:

- 8201/02 (T1/T2 Frequency)
- 9011/13 (T1/T2 Low EX)
- 9015/16 (T1/T2 High EZ)
- 9115/16 (T1/T2 EX Processing)

NOTES

1. Although erratic shunting is generally recognized by the occurrence of the above error codes, each of these codes may also be generated as a result of other track related issues. Although erratic shunting may not be the root cause, further investigation is always advisable.

2. Erratic shunting may also occur due to maintenance vehicle traffic.

Step 3 Clear the error code log.

4.17.9.3 Enhanced Detection Design and Operations Considerations

Activation of the Enhanced Detection feature can result in longer than programmed Warning Times. This is especially true at DAX locations and at crossings where slower trains are encountered. Longer than programmed warning times may be a concern when employing certain other applications.

With Advanced Traffic Preemption, different programming and design may be required. This may involve:

- the use of additional features within the 3000 GCP
- external hardware changes

WARNING

IN AREAS WHERE TRAINS MOVE THROUGH A CROSSING, PROCEED OUTBOUND, STOP AND THEN RETURN THROUGH THE CROSSING THE WARNING TIME ON THE RETURN MOVE MAY BE REDUCED.

NOTES

The warning time reduction:

- is dependant on programming and the location of the stop
- may be mitigated by using the Positive Start function of the Advanced 3000 system (refer to paragraph 4.17.16).

If Positive start is not available then other design options must be considered.

4.17.9.4 Enhanced Detection Sensitivity Adjustment Procedure

Due to the increased sensitivity while the Enhanced Detection feature is active, frequent crossing activation may occur due to:

- erratic shunting in an approach
- electrical interference
- normal switching activity
- This may occur when:
- a train stops before reaching the crossing
- a local is switching in the approach

If frequent crossing activation is a problem the enhanced sensitivity can be adjusted to allow for more consistent crossing operation as follows:

Step 1 Press the 3000 GCP FUNCTION key. The following message displays:

```
T1 SWITCH TO MS
EZ LEVEL:        10
```

Step 2 Press the down (▼) arrow key until the following message is displayed:

```
T1 ENHANCED
DETECTION:    *OFF
```

Step 3 Press the NEW DATA key. The display changes from OFF to ON and the cursor begins to blink.

NOTES

1. When the enhanced detection feature is ON, the detection sensitivity is at the highest level.

2. In the following steps the numbers entered are not displayed.

Step 4 Enter 1003, 1004, or 1005 on the keypad:

NOTES

1. The number selected depends on the level of sensitivity desired. The lower the number the higher the sensitivity.

2. Begin adjustment by reducing sensitivity by one step; e.g., enter 1003 if reducing the sensitivity from the maximum setting.

Step 5 Press the ENTER key. If 1003 was entered in step 4, the following message displays:

T1 ENHANCED DETECTION: *ON 3

To return to maximum sensitivity proceed as follows:

Step 1 Press the NEW DATA key. The display changes to OFF.

Step 2 Press the NEW DATA key again. The display changes to ON with a blinking cursor as shown below:

T1 ENHANCED DETECTION: █ON

Step 3 Press the ENTER key without entering a number. The blinking cursor disappears indicating that enhanced detection is set for maximum sensitivity.

4.17.10 Back To Back T1 And T2

This programming step applies only to a 3000 GCP that is equipped with an 80044 or 80214 processor module.

This display:

- appears only when the ED operating mode has been selected as described in paragraph 4.17.9 above
  - selects the back-to-back operating mode
  - toggles between NO and YES each time the NEW DATA key is pressed.
  - YES is selected when the 3000 GCP feed point is located at a pair of insulated joints.
  - The default is NO.

BACK TO BACK	
T1 AND T2:	NO

4.17.11 Station Stop Timer (Units Equipped With 80044/80214 Processors Only)

This programming step applies only to a 3000 GCP that is equipped with an 80044 or 80214 processor module with an A01J revision level or earlier. This display appears only when the ED operating mode has been selected as described in paragraph 4.17.9.

NOTE

When a passenger station stop is located in an outbound 3000 GCP approach and the enhanced detection feature is ON, the station stop timer is generally programmed for a longer time interval than the train would normally remain stopped. For example, if a passenger train normally remains stopped for 60 seconds, program the timer for approximately 90 seconds.

- The time interval is entered on the numeric keypad
- The maximum delay is 500 seconds
- The default value is 10 seconds
- For a two-track installation, this operating parameter must also be set for each track.

STATION STOP	
TIMER T1:	10

WARNING

IN AREAS WHERE TRAINS MOVE THROUGH A CROSSING, PROCEED OUTBOUND, STOP AND THEN RETURN THROUGH THE CROSSING THE WARNING TIME ON THE RETURN MOVE MAY BE REDUCED.

NOTE

The Station Stop Timer is normally left at the default setting of 10 seconds. The timer is initiated automatically after a train leaves the island circuit and operates in conjunction with the enhanced detection logic. If the train makes a station stop after passing the crossing, the timer can be programmed for up to 500 seconds to prevent tail rings due to poor shunting after the train has stopped and then departs from the station. This timer is active only if Enhanced Detection is programmed to ON. This programming step applies only to a 3000 GCP that is equipped with an 80044 or 80214 processor module with an A01J revision level or earlier.

4.17.12 Number of Track Wires

This programming step selects either a four or six track wire configuration used at an installation.

- Each track (T1 and T2) must be programmed for either four track wire or six track wire operation.
- Enter either a 4 or a 6 when programming.
- When either track is connected in a six-wire configuration, the additional two check receiver wires per track are routed through a small hole provided in the left side of the Model 3000, 3000D2, 3008, and 3008D2 GCP cases.
- On Model 3000D2L, 3000ND, and 3000ND2 GCP's, front panel terminals are provided for connection of the check receiver wires.

```
NUMBER OF TRACK
WIRES T1:          4
```

The number of track wires selected for track 2 can be viewed by pressing the TRACK 2 key.

4.17.13 Low EX Adjustment

This programming step applies only to Units Equipped with 80044/80214 Processors.

The EX value is a numerical indication of track ballast conditions relative to the leakage resistance between the rails.

- As ballast resistance decreases, the leakage increases.
  - Leakage resistance can be affected by the presence of water, mud, salt, or other contaminates that are deposited in the track ballast.
  - High concentrations of these contaminates in a localized area (e.g., at a crossing), results in a lump-loading (high leakage between rails) condition.

An EX value of 100 represents optimum track ballast conditions.

When ballast is clean, and of the right makeup (no iron content, dry, etc.), an EX value of 100 is possible.

- Normally, the EX value falls in the range from 70 up to 100.
- When contamination or lump loading occurs, the EX value can approach the GCP EX operating threshold of 39.
  - At these low EX levels, the operation of the GCP can be affected.

NOTE

The EX operating threshold has been lowered from 45 to 39 in the 80044 and 80214 processors.

The Low EX Adjustment programming step applies only to a 3000 GCP that is equipped with an 80044 or 80214 processor module.

- This step allows the low EX operating threshold to be lowered below the preset value (39) and thus allow the GCP to operate under extremely poor ballast conditions.
- The adjustment value is entered on the numeric keypad:
  - The maximum adjustment is 5
  - An adjustment of 5 lowers the threshold from 39 to 34
  - The default value is 0.
- For a two-track installation, this operating parameter should be set for each track (T1 and T2) as needed.

T1 LOW EX ADJUSTMENT: 0

WARNING

DO NOT ARBITRARILY REDUCE THE EX OPERATING THRESHOLD. IMPROPER ADJUST-MENT MAY CAUSE SHORT OR NO WARNING TIME. THE EX OPERATING THRESHOLD HAS BEEN REDUCED TO 39 IN THE 80044 AND 80214 PROCESSORS AND SHOULD BE SUFFICIENTLY LOW FOR MOST APPLICATIONS.

BEFORE REDUCING THE THRESHOLD, PERFORM APPROACH TESTING AS OUTLINED IN SECTION 7, PARAGRAPH 7.7.3.2.

When the Low EX Adjustment parameter is set to a value other than 0 (zero), an asterisk (*) appears next to the EX value in the initial Status Mode display (paragraph 4.2.1) as shown below.

STATUS T1 EZ: 100 EX: * 89

4.17.14 Low EZ Detection

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

When selected this programming step detects a significant reduction of EZ.

- The EZ signal may reduce for various reasons including a false shunt.
- Low EZ detection occurs when EZ is constantly less than 70 for a period of time exceeding the Low EZ Detection Timer value (see paragraph 4.17.15).
- Once Low EZ detection occurs, the crossing is continuously activated until EZ rises to 75 or above.

Each time the NEW DATA key is pressed, the display toggles between OFF and ON.

- The default is **OFF**.

For a two-track installation, Low EZ Detection may be programmed for each track independently (T1 and T2).

LOW EZ DETECTION	
EZ=70	T1:OFF

4.17.15 Low EZ Detection Timer

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

This display appears only when Low EZ Detection is selected as described in paragraph 4.17.14.

- The EZ detection timer delay is generally programmed for a time interval longer than trains would normally remain in the GCP approach.
- The selectable timer delay values are from 2 to 99 minutes.
- The default is 10.
- For a two-track installation, Low EZ Detection Timer may be programmed for each track independently (T1 and T2).

LOW EZ DETECTION	
TIMER T1:	10

4.17.16 Positive Start EZ Level Option

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

When enabled, this option immediately activates the crossing when the EZ level is less than the programmed Positive Start EZ value.

- There is no 4-second reaction delay time.
- Once Positive Start occurs, the crossing is continuously activated until any of the following occur:
  - The train enters and then clears the island circuit
  - The EZ value rises to a number 5 greater than the programmed positive start EZ level
  - The Positive Start timer exceeds the programmed timer delay of 1 to 99 minutes.

NOTE

A new Positive Start sequence may be initiated once EZ exceeds the programmed Positive Start EZ level by 5.

The Positive Start EZ level may be set to any value between 0 and 100,

NOTE

It is recommended that this value not be set above 95.

- An entry of 0 (zero) produces an OFF indication on the display
- The default is OFF.

POSITIVE START	
EZ LEVEL T1:	OFF

For a two-track installation, Positive Start may be programmed for each track independently (T1 and T2). The Positive Start option is only available in Advanced GCP cases (See Program Compatibility Guideline).

4.17.17 Positive Start Timeout

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

This display appears only when the Positive Start EZ Level option is enabled.

- The selected timeout value allows a continuous positive start to timeout after a programmed delay time of 0 to 99 minutes.
- An entry of 0 (zero) produces an NONE indication on the display
- The default value is NONE (no timeout).

POSITIVE START	
TIMEOUT T1:	NONE

For a two-track installation, Positive Start Timeout may be programmed for each track independently (T1 and T2).

4.17.18 Set AT Operation Out

This programming step applies only to Units Equipped with 80214 Processors With A01C Revision Level or Later.

This option can configure the AT terminal output for specialized applications.

- The display toggles between NORMAL and DIAGNOSTIC each time the NEW DATA key is pressed.
- The default is NORMAL.

SET AT OPERATION OUT: NORMAL

NOTE

This new option cannot be used in D2 redundant 3000 systems. All 3000 D2 redundant units must have the AT terminal programmed to NORMAL.

When programmed to NORMAL, the AT terminal operates as a standard output used for redundant operation of two separate 3000 units wired to an 80024 Automatic Transfer Unit.

When programmed to DIAGNOSTIC, the AT terminal functions only as an error indicator and will not support automatic transfer operation. While in the diagnostics mode, the AT terminal functions as follows:

- During normal operation, the AT terminal provides a constant 256 Hz AC signal output.
- When an error is detected, the AT terminal output changes to a DC level.

The SET AT Operation Out option is only available in Advanced GCP cases that contain AT terminals (See Program Compatibility Guideline).

4.17.19 Diagnostic Messages

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

This display appears only when an 80115 Data Recorder module with A01E revision level or later is installed or when a SEAR Node has been programmed into the GCP from a SEAR.

This option is normally selected ON and permits a large number of new GCP diagnostic messages to be sent either to the 80115 Data Recorder module or the SEAR recorder by the new 80214 software.

These messages are sent to the SEAR via an 80255 Recorder Interface Module installed in the 80015 Recorder Module slot.

The messages are date and time stamped and include the EZ and EX values whenever the following activate or deactivate:

- Prediction or motion sensing
- Island
- Errors
- UAX 1
- ENA/UAX2

* All field changes of application program parameters are recorded.
* All GCP program parameters may be recorded by request from the SEAR menu.

NOTE

The SEAR must be equipped with modified executive software in order to receive the new GCP messages. The applicable software releases are identified as either ER25 or 2.0 (or later).

Each time the NEW DATA key of the GCP is pressed the display toggles between OFF and ON.

- The default is ON.
- The new diagnostic messages are available in any 3000 GCP using a 80214 Processor module.

DIAGNOSTIC	
MESSAGES:	ON

4.17.20 DAX Messages

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

This display appears only when a SEAR NODE has been programmed into the GCP from a SEAR.

- This option is normally selected ON and permits additional DAX diagnostic messages to be sent to the SEAR.
- These messages are date and time stamped and include the EZ and EX values at the time of prediction and recovery for each operational DAX (A through H).

Each time the NEW DATA key is pressed the display toggles between OFF and ON.

- The default is ON.
- The new DAX diagnostic messages are available in any 3000 GCP using an 80214 processor.

DAX	
MESSAGES:	OFF

4.17.21 Advance Preempt Timer

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01E revision level or later.

The Advance Preempt Timer (APT) represents the difference between the traffic signal preemption warning time and the crossing warning time.

- This feature is required where advance preemption is used to insure that the time difference between traffic signal preemption and warning device activation is never longer than the APT timer setting.

NOTES

If the time difference were allowed to increase beyond the design specification, the track clearance green phase may end prior to activation of the warning devices, thus defeating the intent of the preemption clearance cycle.

APT and the MS to GCP Transfer delay function (see paragraph 4.17.2) can not be used in the same 3000 GCP. To implement both of these functions separate 3000 GCP's must be employed.

Advance Preempt Timer operation is controlled by a Traffic Preemption relay located at the crossing.

- When the relay is energized, a front contact provides battery voltage to the MS/GCP CONTROL terminal (TB1-7).

The operation of the MS/GCP control terminal changes to Advanced Preemption Timer operation when the APT function is programmed to a time value.

- The Advance Preempt Timer starts when the preemption relay deenergizes, removing battery voltage from the MS/GCP control terminal.
- When the timer times out, the GCP relay drive output is removed.
  - Relay drive remains removed as long as the preemption relay remains deenergized.

If voltage is removed momentarily from the MS/GCP control terminal:

- the timer will run its programmed time to completion
- the GCP relay drive output will be removed until the programmed pickup delay time has timed out.

Whenever the preemption timer is counting down, the prediction process remains activated, thus allowing accelerating trains to initiate prediction prior to the completion of the countdown.

- This prediction backup minimizes reduced warning times should a train accelerate after starting the preemption timer.
- The prediction backup operation is normally adjusted by setting the actual crossing warning time for 2 to 5 seconds less than the total warning time.

NOTES

The Total Warning may in no case be less than the Minimum Warning Time defined in AREMA Signal Manual Part 3.3.10.

The total 3000 minimum crossing warning time is 25 seconds. However, when the Advance Preempt Timer is programmed ON, warning time may be reduced to 23 seconds (2 seconds less) as required.

The Advance Preempt Timer option is programmed ON by selecting a desired time in seconds and is programmed OFF by selecting 00 (OFF).

- The default is OFF.

ADVANCE PREEMPT	
TIMER:	OFF

4.17.22 Motion Sensing Level

This programming step applies only to an Advanced 3000 GCP equipped with an 80214 Processor module with an A01J revision level or later. This function is normally used in conjunction with Transfer Delay timer operation.

This display provides control of motion sensitivity.

- Motion sensing level values of between 0 and 100 may be programmed.
- Motion sensitivity is increased when a value other than 0 is selected.
- An entry of **0** (zero) produces a **NORMAL** indication on the display.
    - Provides motion sensitivity of approximately 30 mph at end of 3000-foot approach.
- An entry of **100** produces maximum motion sensitivity.
    - Provides motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach.

MOTION SENSING	
LEVEL T1:	NORMAL

NOTE

When extended NOVRAM is not provided by the 80020 or 80029 Display Interface module or when an 80214 Processor module is installed in an older style case, the system will display the following:

MOTION LEVEL
NOT AVAILABLE

4.17.23 Set to Default

When initially installed and power is applied, the system must be initialized by installing a set of default parameters prior to system programming.

- The system default parameters are listed in Table 4-1.
- The default parameters are automatically installed in the system when the Set To Default function is enabled as described in paragraph 4.17.23 or paragraph 5.2.

SET TO DEFAULT

Once a system is operational, it is normally not necessary to return to the default values unless specific hardware changes are made. The changes include:

- Replacement of the Control interface assembly (80020 or 80029)
- Replacement of the Control interface assembly printed circuit board (80017 or 80153) (see Figure 4-24).
- Replacement of the Processor module (80014, 80044, or 80214) with another containing a different software level.
- Replacement of the program PROM’s on the Processor module (80014 or 80044) with PROM’s containing a different software level.
- Changing of the 80214 Processor module program to a different software level.
- Relocation of the entire 3000 GCP case, including all associated modules, to another location.

Table 4-1:
System Default Parameters

PARAMETER	DEFAULT VALUE	REFERENCE PARAGRAPH
Number of Tracks	2	4.3.1
Frequency	790 Hz	4.3.2
Unidirectional/Bidirectional	Unidirectional	4.3.3
XMIT Level	Medium	4.3.4
Predictor/Motion Sensor	Predictor	4.3.5
Warning Time	35 Seconds	4.3.6
Approach	3000 Feet	4.3.7
UAX Pickup Delay	25 Seconds	4.3.8
ENA/UAX2 Pickup Delay	25 Seconds	4.3.8
Island Distance	0 Feet	4.3.9
Number of DAX’s	0	4.3.10

Continued on next page

Table 4-1 Continued

PARAMETER	DEFAULT VALUE	REFERENCE PARAGRAPH
DAX X Track[1]	A, C, E And G Track 1 B, D, F And H Track 2	4.3.11
DAX X Distance[1]	0 (Preempt)	4.3.12
DAX X Warning Time[1]	45 Seconds	4.3.13
UAX Pickup Delay	25 Seconds	4.3.8
ENA/UAX2 Pickup Delay	25 Seconds	4.3.8
Island Distance	0 Feet	4.3.9
Number of DAX's	0	4.3.10
DAX X Track[1]	A, C, E And G Track 1 B, D, F And H Track 2	4.3.11
DAX X Distance[1]	0 (Preempt)	4.3.12
DAX X Warning Time[1]	45 Seconds	4.3.13
Slaving	Master	4.3.14
Password	Disabled	4.3.15
Data Recorder	Not Installed	4.3.16
RS232C Baud Rate	300 (9600)[2]	4.3.17
RS232C Data Bits	7 (8)[2]	4.3.18
RS232C Stop Bits	2 (1)[2]	4.3.19
RS232C Parity	None	4.3.20
Date	n/a	4.3.21
Time	n/a	4.3.22
Daylight Savings Time	Off	4.3.23
Switch to MS EZ Level	10	4.17.1
Transfer Delay MS to GCP	0 (Off)	4.17.2
Transfer MS to GCP Prime	OFF	4.17.3
Transfer MS to GCP DAX	OFF	4.17.4
Prime Prediction Offset	0 (Off)	4.17.5
Pickup Delay Prime	15 Seconds	4.17.6
Pickup Delay DAX X[1]	15 Seconds	4.17.7
Compensation Value	1300	4.17.8
Enhanced Detection[2]	Off[2]	4.17.9
Back to Back T1 And T2[2]	No[2]	4.17.10
Station Stop Timer[2]	10 Seconds[2]	4.17.11
Number of Track Wires	4	4.17.12
Low EX Adjustment[2]	0[2]	4.17.13

Continued on next page

Table 4-1 Concluded

PARAMETER	DEFAULT VALUE	REFERENCE PARAGRAPH
Low EZ Detection	OFF	4.17.14
Low EZ Detection Timer	10 minutes	4.17.15
Positive Start EZ Level	OFF	4.17.16
Positive Start Timeout	00 (None)	4.17.17
Set AT Operation Out	Normal	4.17.18
Diagnostic Messages	On	4.17.19
DAX Messages	On	4.17.20
Advanced Preempt Timer	Off	4.17.21
Motion Sensing Level	Normal	4.17.22

[1] The “X” in parameters identified with a (1) is replaced by A, B, C, D, E, F, G, or H on the display and identifies the DAX affected. The default values associated with the parameters apply to all eight DAX’s.

[2.] Applies only to units equipped with 80044 or 80214 processor module(s)

4.18 NUMBER KEYS

These keys are used for entering numerical data. Keys 1 through 6 are dual-function keys and are also described elsewhere under the assigned function.

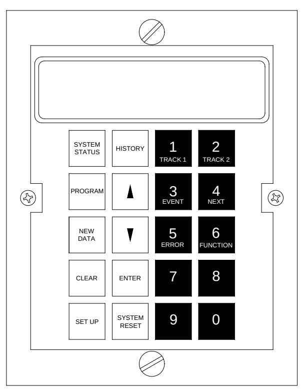


Figure 4-23:
GCP 3000 Keyboard Display Panel Number Keys

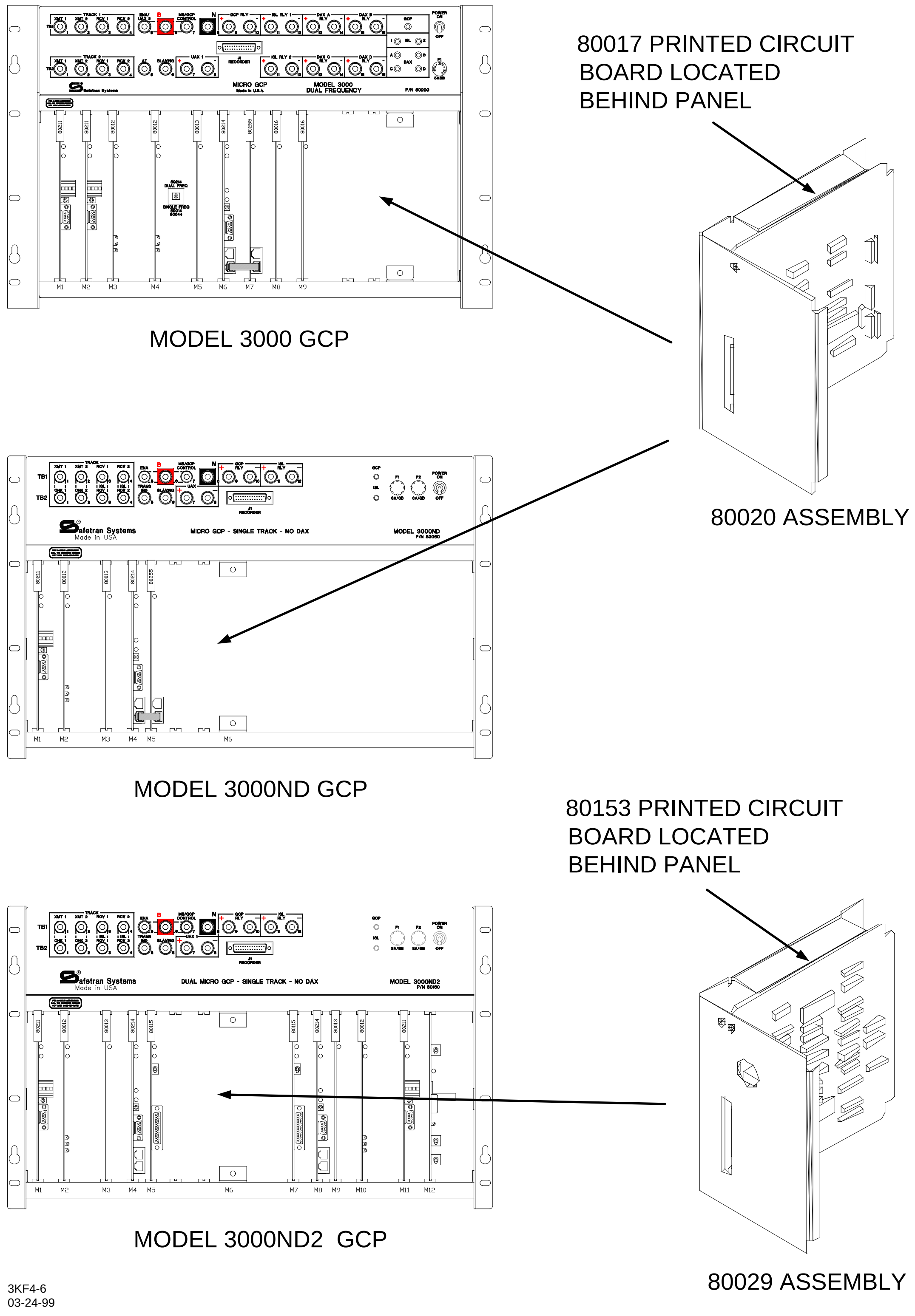


Figure 4-24:
Location of Keyboard/Display Interface Assembly (80020 or 80029) With Keyboard/Display Control Unit (80019) Removed

3000 GCP APPLICATION HISTORY CARD (For Units Equipped With Processor Module 80014, 80044 or 80214)

Equipment: 3000 ☐ 3000D2 ☐ 3000D2L ☐ 3000ND ☐ 3000ND2 ☐ 3008 ☐ 3008D2 ☐ Date Installed: ________

Unit/Serial No.: ________ Crossing No.: ________ Island Frequency: T1: ____ kHz T2: ____ kHz

PROGRAMMING HISTORY

Press PROGRAM key		Initial Programmed Value Date:	Program Change Date:	Program Change Date:
NUMBER OF TRACKS (Transceiver Modules)		1☐ 2☐	1☐ 2☐	1☐ 2☐
[1] FREQUENCY (MS/GCP)	T1:	____ Hz	____ Hz	____ Hz
	T2:	____ Hz	____ Hz	____ Hz
UNIDIRECTIONAL/BIDIRECTIONAL	T1:	UNI ☐ BI ☐	UNI ☐ BI ☐	UNI ☐ BI ☐
	T2:	UNI ☐ BI ☐	UNI ☐ BI ☐	UNI ☐ BI ☐
XMIT LEVEL	T1:	MAX☐ MED☐	MAX☐ MED☐	MAX☐ MED☐
	T2:	MAX☐ MED☐	MAX☐ MED☐	MAX☐ MED☐
PREDICTOR/MOTION SENSOR	T1:	PRED ☐ MS☐	PRED ☐ MS☐	PRED ☐ MS☐
	T2:	PRED ☐ MS☐	PRED ☐ MS☐	PRED ☐ MS☐
WARNING TIME SELECTED	T1:	____ Sec.	____ Sec.	____ Sec.
	T2:	____ Sec.	____ Sec.	____ Sec.
APPROACH DISTANCE → SELECTED	T1:	____ Ft.	____ Ft.	____ Ft.
	T2:	____ Ft.	____ Ft.	____ Ft.
→ COMPUTED	T1:	____ Ft.	____ Ft.	____ Ft.
	T2:	____ Ft.	____ Ft.	____ Ft.
UAX1 PICKUP DELAY (UAX) (0 = OFF)		____ Sec.	____ Sec.	____ Sec.
ENA/UAX2 DELAY (0 = ENA)		____ Sec.	____ Sec.	____ Sec.
ISLAND DISTANCE (Between transmit & receive track wire connections)	T1:	____ Ft.	____ Ft.	____ Ft.
	T2:	____ Ft.	____ Ft.	____ Ft.
NUMBER OF DAX'S (For 3000ND and 3000ND2 units, set to 0)		0☐ 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐	0☐ 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐	0☐ 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐
DAX A TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
DAX A DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
DAX A WARNING TIME		____ Sec.	____ Sec.	____ Sec.
DAX B TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
DAX B DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
DAX B WARNING TIME		____ Sec.	____ Sec.	____ Sec.
DAX C TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
DAX C DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
DAX C WARNING TIME		____ Sec.	____ Sec.	____ Sec.
DAX D TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
DAX D DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
DAX D WARNING TIME		____ Sec.	____ Sec.	____ Sec.
[2] DAX E TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
[2] DAX E DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
[2] DAX E WARNING TIME		____ Sec.	____ Sec.	____ Sec.
[2] DAX F TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
[2] DAX F DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
[2] DAX F WARNING TIME		____ Sec.	____ Sec.	____ Sec.
[2] DAX G TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
[2] DAX G DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
[2] DAX G WARNING TIME		____ Sec.	____ Sec.	____ Sec.
[2] DAX H TRACK ASSIGNMENT		T1:☐ T2: ☐	T1:☐ T2: ☐	T1:☐ T2: ☐
[2] DAX H DISTANCE (0 = Preempt)		____ Ft.	____ Ft.	____ Ft.
[2] DAX H WARNING TIME		____ Sec.	____ Sec.	____ Sec.
SLAVING MASTER/SLAVE		MASTER ☐ SLAVE ☐	MASTER ☐ SLAVE ☐	MASTER ☐ SLAVE ☐
PASSWORD ENABLED		DISABLED ☐ ENABLED ☐	DISABLED ☐ ENABLED ☐	DISABLED ☐ ENABLED ☐
RECORDER INSTALLED		NOT INSTALLED ☐ INSTALLED ☐ EXTERNAL NODE # ____	NOT INSTALLED ☐ INSTALLED ☐ EXTERNAL NODE # ____	NOT INSTALLED ☐ INSTALLED ☐ EXTERNAL NODE # ____
RS-232-C BAUD RATE		____ bps	____ bps	____ bps
RS-232-C DATA BITS		7 ☐ 8 ☐	7 ☐ 8 ☐	7 ☐ 8 ☐
RS-232-C STOP BITS		1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
RS-232-C PARITY		NONE ☐ ODD ☐ EVEN ☐ SPACE ☐ MARK ☐	NONE ☐ ODD ☐ EVEN ☐ SPACE ☐ MARK ☐	NONE ☐ ODD ☐ EVEN ☐ SPACE ☐ MARK ☐
DATE (e.g., THU 03 APR 1997)		____	____	____
TIME (e.g., 11:25:43 AM)		____	____	____
DAYLIGHT SAVINGS		ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
DATE (e.g., THU 03 APR 1997)		____	____	____
TIME (e.g., 11:25:43 AM)		____	____	____
TO OBTAIN THE FOLLOWING DATA, PRESS SYSTEM STATUS, THEN PRESS THE BUTTON FOUR TIMES UNTIL "TRACK 'n' TCN APPEARS.				
TRACK 1 TCN		____	____	____
TRACK 2 TCN		____	____	____
CONFIGURATION CCN		____	____	____

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[1] Dual frequency operation available only in Dual-Frequency 3000 GCP's equipped with 80214 processors.
[2] Applicable to 3008 and 3008D2 8-DAX GCP's only.

Figure 4-25:
3000 GCP Application History Card (Part 1)

EXPANDED PROGRAMMING HISTORY (Function Mode)

■ Press FUNCTION key	Initial Programmed Value Date:	Program Change Date:	Program Change Date:
SWITCH TO MS (Enter EZ value)	T1: ________ EZ	________ EZ	________ EZ
	T2: ________ EZ	________ EZ	________ EZ
TRANSFER DELAY MS TO GCP (0 = OFF)	T1: ________ Sec.	________ Sec.	________ Sec.
	T2: ________ Sec.	________ Sec.	________ Sec.
[7] TRANSFER MS TO GCP PRIME	T1: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
(When PRIME PREDICTION OFFSET is on)	T2: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX A	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX B	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX C	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX D	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX E	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX F	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX G	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[7] TRANSFER MS TO GCP DAX H	T1 ☐ T2 ☐ ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
PRIME PREDICTION OFFSET (0 = OFF)	T1: ________ Ft.	________ Ft.	________ Ft.
	T2: ________ Ft.	________ Ft.	________ Ft.
PICKUP DELAY PRIME	________ Sec.	________ Sec.	________ Sec.
PICKUP DELAY DAX A	________ Sec.	________ Sec.	________ Sec.
PICKUP DELAY DAX B	________ Sec.	________ Sec.	________ Sec.
PICKUP DELAY DAX C	________ Sec.	________ Sec.	________ Sec.
PICKUP DELAY DAX D	________ Sec.	________ Sec.	________ Sec.
[2] PICKUP DELAY DAX E	________ Sec.	________ Sec.	________ Sec.
[2] PICKUP DELAY DAX F	________ Sec.	________ Sec.	________ Sec.
[2] PICKUP DELAY DAX G	________ Sec.	________ Sec.	________ Sec.
[2] PICKUP DELAY DAX H	________ Sec.	________ Sec.	________ Sec.
COMPENSATION VALUE	T1: ________	________	________
	T2: ________	________	________
[3] SPEED LIMITING)	T1: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
	T2: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[3] ENHANCED DETECTION (ED)	T1: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
	T2: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[3] BACK TO BACK T1 AND T2 (When ED is on)	NO☐ YES ☐	NO☐ YES ☐	NO☐ YES ☐
[3] STATION STOP TIMER (When ED is on)	T1: ________ Sec.	________ Sec.	________ Sec.
	T2: ________ Sec.	________ Sec.	________ Sec.
NUMBER OF TRACK WIRES	T1: 4 ☐ 6 ☐	4 ☐ 6 ☐	4 ☐ 6 ☐
	T2: 4 ☐ 6 ☐	4 ☐ 6 ☐	4 ☐ 6 ☐
[3] LOW EX ADJUSTMENT	T1: ________	________	________
	T2: ________	________	________
[4] LOW EZ DETECTION	T1: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
	T2: ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[4] LOW EZ DETECTION TIMER (When low EZ detection is on)	T1: ________ Min.	________ Min.	________ Min.
	T2: ________ Min.	________ Min.	________ Min.
[4] POSITIVE START (0 = OFF) (Enter EZ value)	T1: ________ EZ	________ EZ	________ EZ
	T2: ________ EZ	________ EZ	________ EZ
[4] POSITIVE START TIMEOUT (0 = NONE) (When positive start is on)	T1: ________ Min.	________ Min.	________ Min.
	T2: ________ Min.	________ Min.	________ Min.
[4] SET AT OPERATION	NORMAL ☐ DIAGNOSTIC ☐	NORMAL ☐ DIAGNOSTIC ☐	NORMAL ☐ DIAGNOSTIC ☐
[5,6] DIAGNOSTIC MESSAGES	ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[5,6] DAX MESSAGES	ON☐ OFF ☐	ON☐ OFF ☐	ON☐ OFF ☐
[5] ADVANCE PREEMPT TIMER	________ Sec.	________ Sec.	________ Sec.
[7] MOTION SENSING LEVEL (0 = NORMAL)	T1: ________ %	________ %	________ %
	T2: ________ %	________ %	________ %

[3] Applicable only to 3000 GCP's equipped with 80044 or 80214 processors.

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[4] Applicable only to 3000 GCP's equipped with 80214 processors with A01C revision and later.

[5] Applicable only to 3000 GCP's equipped with 80214 processors with A01E revision and later.

[6] Applicable only when a SEA/R node has been programmed into the GCP from a SEA/R.

[7] Applicable only to 3000 GCP's equipped with 80214 processors with A01H revision and later.

Figure 4-26:
3000 GCP Application History Card (Part 2)

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1=	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP $\pm$	EZ
Z2=	Z2=									
EAST/NORTH	TRACK 1									
WEST/SOUTH	TRACK 1									
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

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Figure 4-27:
3000 GCP Application History Card
(Part 3)

SECTION 5 –
3000 GCP SYSTEM PROGRAMMING PARAMETERS

5.1 GENERAL

This section provides step-by-step application programming instructions for the 3000 GCP System.

- Included at the end of this section (Section 5.4) are condensed programming procedures which are provided as a reference for system users who are familiar with the general programming procedure but require occasional prompting during programming.
- The procedures contained in this section apply to initial programming as well as reprogramming of the 3000 GCP.
- Follow the steps in the order listed and perform all steps necessary for the specific application.
- See Section 4 of this manual for descriptions of the programming menu items.

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

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

When power is initially applied to the system, displays similar to the following appear in sequence:

MODEL 3000 **MICRO GCP**

plus one of the following:

SOFTWARE VERSION **8V980-AO1F**	**SOFTWARE VERSION** **9V065-B01D**	**SOFTWARE VERSION** **9V121-A02J**
(Units equipped with 80014 Processor module)	(Units equipped with 80044 Processor Module)	(Units equipped with 80214 Processor Module)

NOTE

The software version indicates the revision level.

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SYSTEM TEST
....

When the system status message indicated below is displayed, the system is ready for programming (EZ and EX values shown are example values only; actual values may vary).

STATUS T1	
EZ: 100	**EX: 87**

NOTE

If the 3000 GCP is equipped with an 80044 or 80214 processor module, and the enhanced track-shunting detection (ED) operating mode (paragraph 4.17.9) is enabled, ***ED*** appears in the upper right corner of the system status display (see example below) when poor shunting conditions are detected. The ***ED*** indication remains on the display for the duration of the train move (until the train leaves the track circuit).

STATUS T1	***ED***
EZ: 65	**EX: 89**

The 3000 GCP provides two application-programming modes:

- Program Mode – This is the primary programming mode for system application parameters.
- Function Mode – This extended programming mode is provided for programming additional parameters.

Each of these modes is menu driven.

- This simplifies operator interface when programming the system according to specific application requirements.

NOTE

Application information to be programmed into the Program and Function menus should first be entered on the 3000 GCP Application History Card (see Figures 4-27 through Figure 4-29). The History Card can then be used as a reference during programming. The order in which the information is listed on the card corresponds to the order in which the information is requested in the Program and Function menus.

The Program and Function menus are selected by pressing the corresponding key on the 3000 GCP keyboard/display assembly.

- When a menu is selected, each item in that menu can be viewed by using the down arrow key (▼) to scroll through the menu.
- The menu is continuous in that it starts over at the beginning when the end of the menu is reached.
- During programming, enter the information requested and then press the down arrow key (▼) to proceed to the next menu item.
- The up arrow key (▲) can be used to scroll through the menu in reverse order.

If, while programming, a keyboard entry is not made within 90 seconds of the last keyboard entry, the system automatically reverts to the Status Mode (see Section 4, paragraph 4.2) and the initial Status Mode display appears.

- If this occurs, reselect the programming mode by pressing the appropriate key (**PROGRAM** or **FUNCTION**), scroll to the menu item where the programming interruption occurred, and proceed as before.

NOTE

If the message **ENTER PASSWORD** appears on the display while reprogramming an operational system, enter the proper four-digit password and press the **ENTER** key to continue.

Each menu contains a number of system application parameters that require specific inputs for each track controlled by the system. This specific input requirement is identified by the following designations appearing in the application parameter display:

- **T1** (for track 1)
- **T2** (for track 2)

Systems programmed for a single track (**T1** displayed) will accept data inputs for track 1 only. For two-track systems proceed as follows:

Step 1. Enter the track 1 data when **T1** appears on the display.

Step 2. Press the **TRACK 2** key to select the **T2** display.

T1 in the display changes to **T2**

Step 3 Enter the track 2 data.

Step 4 Press the **TRACK 1** key

The display is returned to track 1 with **T1** replacing **T2** in the display.

NOTE

Pressing the **TRACK 2** key when the system is programmed for one track causes the following message to appear on the display for 2 seconds.

ONLY ONE TRACK IS SELECTED

If incorrect digits are entered while making numerical data entries during programming, but the **ENTER** key has not yet been pressed, press the **CLEAR** key to return to the original value displayed. The correct digits may then be entered.

5.2 MAKING PROGRAM CHANGES

Program changes can be made on in-service 3000 GCP's at any time, providing no train is present in the approach. To make a program change:

- Select the appropriate programming menu (Program or Function)
- Scroll to the menu item to be changed and enter the new parameter value
- Record the new value in the proper location on the 3000 GCP Application History Card.

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.

Instructions for changing each menu item in the Program and Function menus are provided in paragraph 5.3. Table 5-1lists each menu item in the Program and Function menus and the corresponding programming step(s) in paragraph 5.3 required to change each item.

Table 5-1:
Programming Step Index

PARAMETER	REFERENCE STEP NO.	PARAMETER	REFERENCE STEP NO.
Set to Default	1	Time	24
Number of Tracks	2	Daylight Savings	25
Transceiver Frequency	3	Switch to MS EZ Level	26
Unidirectional/Bidirectional	4	Transfer Delay MS to GCP	27
Transceiver Transmit Level	5	Transfer Delay MS to GCP DAX	28
Predictor/Motion Sensor	6	Prime Prediction Offset	29
Warning Time	7	Transfer MS to GCP Prime	30
Approach Distance	8	Pickup Delay Prime	31
UAX1 Pickup Delay	9	Pickup Delay DAX	32
ENA/UAX2	10	Compensation Value	33
Island Distance	11	Enhanced Detection T1/T2	34
Number of DAX's	12	Back-to-Back T1 And T2	35
DAX Track Assignment	13	Station Stop Timer T1/T2	36
DAX Approach Distance	14	Number of Track Wires	37
DAX Warning Time	15	Low EX Adjustment	38
Slaving Status	16	Low EZ Detection	39
Password (Enable)	17	Low EZ Detection Timer	40
Password (Change)	17.7	Positive Start EZ Level	41
Password (Disable)	17.15	Positive Start Timeout	42
Data Recorder Option	18	Set AT Operation Out	43
RS-232-C Baud Rate	19	Diagnostics Messages	44
RS-232-C-Data Bits	20	DAX Messages	45
RS-232-C Stop Bits	21	Advance Preempt Timer	46
RS-232-C Parity	22	Motion Sensing Level	47
Date	23		

Table 5-2:
Programming Changes Requiring System Recalibration

PROGRAM CHANGE	SETUP FOR CALIBRATION	SETUP FOR APPROACH LENGTH*	SETUP FOR LINEARIZATION*
Increased Number of Tracks From 1 to 2	Required For Track 2 Only	Required For Track 2 Only	Required For Track 2 Only
GCP Frequency	Required For Both Tracks	Required For Both Tracks	Required For Both Tracks
Unidirectional to Bidirectional or Bidirectional to Unidirectional	Required For Changed Track Only	Required For Changed Track Only	Required For Changed Track Only
Transmit Level Changed From Medium to Maximum or Maximum to Medium	Required For Changed Track Only	Not Required	Not Required
Approach Length	Required For Changed Track Only	Required For Changed Track Only	Required For Changed Track Only
Ballast Compensation Value	Required For Changed Track Only	Not Required	Not Required

* Setup For Approach Length and Setup For Linearization are combined into a single calibration procedure. See Section 6, paragraph 6.5.3.

WARNING

IF ANY OF THE PROGRAM CHANGES LISTED IN TABLE 5-2 ARE MADE, SYSTEM RECALIBRATION IS REQUIRED (SEE SECTION 6 OF THIS MANUAL).

5.3 SYSTEM PROGRAMMING

SET TO DEFAULT REQUIRED

If any of the conditions listed below apply, relay drive is inhibited and the following message is flashed on the display every 2 seconds.

- Initial installation
- Processor module is replaced with another containing a different software level.
- Program PROM's on the 80014 or 80044 Processor Module are replaced with PROM's containing a different software level.
- Program in flash memory on the 80214 Processor Module is changed to a different software level.
- Control interface assembly (80020 or 80029) is replaced (includes attached printed circuit board (80017 or 80153).

The system must be programmed to Set To Default parameters to initialize the database before proceeding with application programming.

- When the Set To Default parameters have been reset, the system must be completely reprogrammed.
- To initialize the database, proceed with programming step number 1.
- However, if none of the conditions listed above apply, skip step number 1 and proceed to step number 2 to begin application programming.

5.3.1 SET TO DEFAULT

Step 1 Press the **FUNCTION** key. The following message is displayed:

T1 SWITCH TO MS **EZ LEVEL: 10**

Step 1.1 Press the up arrow key (▲) once. The following message is displayed:

SET TO DEFAULT

Step 1.2 Press the **NEW DATA** key. The following message is displayed:

SET TO DEFAULT **PRESS ENTER**

Step 1.3 Press the **ENTER** key. The system must now be completely programmed starting with step 2. The following message may appear intermittently, indicating the system requires calibration (refer to Section 6 of this Manual,):

SETUP T1 AND T2 **REQUIRED**

The following message is displayed when installation of default parameters is complete.

SET TO DEFAULT **COMPLETE**

NOTE

The word **COMPLETE** momentarily appears in the above display after 2 seconds.

5.3.2 APPLICATION PROGRAMMING

NOTE

The value/parameter messages displayed in the following steps indicate the system default settings. If the current data displayed is correct, do not press the **NEW DATA** key but simply press the down arrow key (▼) to advance to the next step.

Step 2 Press the **PROGRAM** key. The following message is displayed:

PROGRAM NUMBER	
OF TRACKS:	**2**

Step 2.1 Press the **NEW DATA** key.

Step 2.2 Enter the number of tracks (1 or 2) which are monitored by the system.

Step 2.3 Press the **ENTER** key.

Step 3 Press the down arrow key (▼) once. One of the following messages is displayed, depending on the processor module installed:

PROGRAM	
FREQUENCY:	**790**

PROGRAM T1	
FREQUENCY:	**790**

Step 3.1 Press the **NEW DATA** key.

Step 3.2 Enter the frequency of the transceiver module (**45** to **999** Hz).

Step 3.3 Press the **ENTER** key.

Step 3.4 If the system is equipped with an 80014 or 80044 processor, proceed to step 4.

Step 3.5 If the system is equipped with an 80214 processor, press the **TRACK 2** key and repeat steps 3.1, 3.2, and 3.3 for track 2.

NOTE

If the 80214 is installed in a single frequency case, the frequency for track 2 must be set to the same frequency as track 1. Otherwise, a Track 2 Transmit Frequency Error will occur.

Step 3.6 Press the **TRACK 1** key.

Step 4 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM T1 **UNIDIRECTIONAL**

Step 4.1 Press the **NEW DATA** key. The system application for the track indicated toggles between unidirectional and bidirectional each time the **NEW DATA** key is pressed.

Step 4.2 Press the **ENTER** key when the desired application is displayed.

Step 4.3 If the system was programmed for one track in step 2.2, proceed to step 5.

Step 4.4 If the system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 4.1 and 4.2 for track 2.

Step 4.5 Press the **TRACK 1** key.

Step 5 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM T1 XMIT **LEVEL: MEDIUM**

Step 5.1 Press the **NEW DATA** key. The transceiver-transmit level for the track indicated toggles between **MEDIUM** and **MAXIMUM** each time the **NEW DATA** key is pressed.

Step 5.2 Press the **ENTER** key when the desired transmit level is displayed.

Step 5.3 If the system was programmed for one track in step 2.2, proceed to step 6.

Step 5.4 If the system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 5.1 and 5.2 for track 2.

Step 5.5 Press the **TRACK 1** key.

Step 6 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM T1 **PREDICTOR**

Step 6.1 Press the **NEW DATA** key. The mode of operation for the track indicated toggles between **PREDICTOR** and **MOTION SENSOR** each time the **NEW DATA** key is pressed.

Step 6.2 Press the **ENTER** key when the desired mode of operation is displayed.

Step 6.3 If the system was programmed for one track in step 2.2, proceed to step 7

Step 6.4 If the system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 6.1 and 6.2 for track 2.

Step 6.5 Press the **TRACK 1** key.

Step 7 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM T1	
WARNING TIME:	**35**

Step 7.1 Press the **NEW DATA** key.

Step 7.2 Enter the warning time for the track indicated (**25** to **99**).

Step 7.3 Press the **ENTER** key.

Step 7.4 If the system was programmed for one track in step 2.2, proceed to step 8

Step 7.5 If the system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 7.1, 7.2, and 7.3 for track 2.

Step 7.6 Press the **TRACK 1** key.

Step 8 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM T1	
APPROACH:	**3000**

NOTE

The approach distance display shown above alternates with the following display:

PROGRAM T1	
COMPUTED:	**3240**

The value indicated is the approach distance computed by the system during calibration (Section 6 of this Manual).

Step 8.1 Press the **NEW DATA** key.

Step 8.2 Enter the approach distance for the track indicated (**0000** to **9999**) (value is in feet).

Step 8.3 Press the **ENTER** key.

Step 8.4 If the system was programmed for one track in step 2.2, proceed to step 9.

Step 8.5 If the system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 8.1, 8.2, and 8.3 for track 2.

Step 8.6 Press the **TRACK 1** key.

Step 9 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM	**UAX**
PICKUP DELAY:	**25**

Step 9.1 Press the **NEW DATA** key.

Step 9.2 Enter the pickup delay time (**0** (**OFF**) to **500** seconds) for UAX 1.

WARNING

WHEN THE UAX FEATURE IS OFF (0 IS ENTERED), THE FRONT PANEL UAX TERMINALS HAVE NO CONTROL OVER PRIME RELAY DRIVE.

Step 9.3 Press the **ENTER** key.

Step 10 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM ENA/UAX2	
PICKUP DELAY:	**25**

Step 10.1 Press the **NEW DATA** key.

Step 10.2 Enter the pickup delay time (**0** (**ENA**) to **500** seconds) for UAX 2.

NOTE

When UAX2 is programmed to zero (0) seconds, the terminal functions as ENA with no pickup delay and is typically used for cascading multiple GCP outputs.

Step 10.3 Press the **ENTER** key.

Step 11 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM T1	
ISLAND:	**0**

Step 11.1 Press the **NEW DATA** key.

Step 11.2 Enter the island distance for the track indicated (**0** to **999** feet).

Step 11.3 Press the **ENTER** key.

Step 11.4 If the system was programmed for one track in step 2.2, proceed to step 12.

Step 11.5 If the system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 11.1, 11.2, and 11.3 for track 2.

Step 11.6 Press the **TRACK 1** key.

Step 12 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM	**NUMBER**
OF DAXS:	**0**

Step 12.1 Press the **NEW DATA** key.

Step 12.2 Enter the number of DAX circuits in the system (**0** to **4** possible with 80014 processor, **0** to **8** possible with 80044 and 80214 processors).

NOTE

For 3000 GCP's equipped with an 80044 or 80214 Processor Module, numbers representing four additional DAX circuits (5 through 8) can be entered; however, these entries are reserved exclusively for 8-DAX GCP Models 3008 and 3008D2. Because GCP Models 3000, 3000D2, and 3000D2L can only accommodate a maximum of two DAX modules (four DAX circuits), the parameters for DAX circuits identified as E(5), F(6), G(7), and H(8) will be displayed on these units (if the number of DAX circuits entered is greater than 4), but will be ignored by the system.

Step 12.3 Press the **ENTER** key.

Step 12.4 If **0** (zero) is entered in step 12.2, proceed to step 16.

Step 12.5 If a number from **1** to **8** is entered, proceed to step 13.

Step 13 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM	**DAX A**
TRACK:	**1**

Step 13.1 Press the **NEW DATA** key.

Step 13.2 Enter the track assignment for the DAX indicated (1 for T1 or 2 for T2). The default for track 1 is A, C, E, & G. The default for track 2 is B, D, G, & H.

Step 13.3 Press the **ENTER** key.

Step 14Press the down arrow key (▼) once. One of the following message is displayed, depending on the processor module installed.

PROGRAM	**DAX A**
DISTANCE:	**0**

PROGRAM	**DAX A**
DISTANCE:	**PREEMPT**

Step 14.1 Press the **NEW DATA** key.

Step 14.2 Enter the offset distance for the DAX indicated (**0** (**PREEMPT**) to **9999** feet).

Step 14.3 Press the **ENTER** key.

Step 15Press the down arrow key (▼) once. One of the following message is displayed, depending on the processor module installed:

PROGRAM	**DAX A**
WARNING TIME:	**35**

PROGRAM	**DAX A**
WARNING TIME:	**45**

Step 15.1 Press the **NEW DATA** key.

Step 15.2 Enter the warning time for the DAX indicated (**25** to **99** seconds).

Step 15.3 Press the **ENTER** key.

Step 15.4 If two or more DAX circuits were selected in step 12.2, repeat steps 13 through 15.3 for each additional DAX.

Step 16 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM	**SLAVING**
MASTER	

Step 16.1 Press the **NEW DATA** key. The display toggles between **MASTER** and **SLAVE** each time the **NEW DATA** key is pressed

Step 16.2 Select the slaving status for the 3000 GCP case (**MASTER** or **SLAVE**).

Step 16.3 Press the **ENTER** key.

Step 17Press the down arrow key (▼) once. One of the following messages will be displayed, depending on the current status of the password feature:

PROGRAM PASSWORD DISABLED	or	PROGRAM PASSWORD ENABLED

- To leave the password feature in its current status, proceed to step 18.
- To enable the password feature, proceed to step 17.1.
- To change the current password code, proceed to step 17.7.
- To disable the password feature, proceed to step 17.15.

5.3.3 ENABLE PASSWORD

Step 17.1 Press the **NEW DATA** key. The following message is displayed:

ENTER NEW
PASSWORD:

Step 17.2 Enter the new four-digit password.

Step 17.3 Press the **ENTER** key. The following message is displayed:

CONFIRM NEW
PASSWORD:

Step 17.4 Re-enter the new password.

Step 17.5 Press the **ENTER** key. The following message is displayed, indicating that the password feature is enabled and the password is installed:

PROGRAM PASSWORD
ENABLED

Step 17.6 Proceed to step 18.

5.3.4 CHANGE PASSWORD

Step 17.7 Press the **NEW DATA** key. The following message is displayed:

ENTER OLD
PASSWORD:

Step 17.8 Enter existing four-digit password.

Step 17.9 Press the **ENTER** key. The following message is displayed:

ENTER NEW
PASSWORD:

Step 17.10 Enter new four-digit password.

Step 17.11 Press the **ENTER** key. The following message is displayed:

CONFIRM NEW
PASSWORD:

Step 17.12 Re-enter the new password.

Step 17.13 Press the **ENTER** key. The following message is displayed, indicating that the new password is installed:

PROGRAM PASSWORD
ENABLED

Step 17.14 Proceed to step 18.

5.3.5 DISABLE PASSWORD

Step 17.15 Press the **NEW DATA** key. The following message is displayed:

ENTER OLD
PASSWORD:

Step 17.16 Enter the current four-digit password.

Step 17.17 Press the **ENTER** key. The following message is displayed:

ENTER NEW
PASSWORD:

Step 17.18 Press the **CLEAR** key. The following message is displayed, indicating that the password feature is disabled:

PROGRAM PASSWORD DISABLED

NOTE

Steps 18 through 25.2 apply to the Data Recorder Module (80015/80115). Perform these steps as required.

5.3.6 DATA RECORDER PROGRAMMING

Step 18Press the down arrow key (▼) once. One of the following messages is displayed, depending upon the current data recorder status:

PROGRAM RECORDER NOT INSTALLED	**or**	**PROGRAM RECORDER INSTALLED**

Step 18.1 Press the **NEW DATA** key. Each time the **NEW DATA** key is pressed, the entry toggles between **NOT INSTALLED** and **INSTALLED**.

- If the data recorder option is to be used, select **INSTALLED**.
- If the data recorder option is not to be used, select **NOT INSTALLED**.

Step 18.2 Press the **ENTER** key when the applicable data recorder option is displayed.

Step 18.3 If **INSTALLED** is selected, proceed to step 19.

NOTES

Steps 19 through 22.3 set the RS232C interface port parameters to enable the 3000 GCP to communicate with an external PC or printer, and may be performed at a future date prior to downloading recorded data to a PC or printing.

An external PC or printer, may be connected to the data recorder module (80015/801115) via the 9-pin RS232C connector located on the front edge of the module. Refer to the applicable PC software or printer manufacturer's manual to determine the appropriate values to enter. For the most efficient operation, Safetran recommends settings of 9600, 8, 1, and none.

Step 18.4 If **NOT INSTALLED** is selected, proceed to step 26.

Step 19 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS-232-C
BAUD RATE: 9600

Step 19.1 Press the **NEW DATA** key.

Step 19.2 Use the up (▲) or down (▼) arrow keys to display the PC/printer baud rate (**300**, **1200**, **2400**, **4800**, or **9600**).

- The default value for units equipped with an 80014 Processor module is 300.
- The default value for units equipped with an 80044 or 80214 Processor module is 9600.

Step 19.3 Press the **ENTER** key.

Step 20 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS-232-C
DATA BITS: 8

Step 20.1 Press the **NEW DATA** key.

Step 20.2 Use the up (▲) or down (▼) arrow keys to display the number of data bits for the PC/printer (**7** or **8**).

- The default value for units equipped with an 80014 Processor module is 7.
- The default value for units equipped with an 80044 or 80214 Processor module is 8.

Step 20.3 Press the **ENTER** key.

Step 21 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS-232-C
STOP BITS: 1

Step 21.1 Press the **NEW DATA** key.

Step 21.2 Use the up (▲) or down (▼) arrow keys to display the number of stop bits for the PC/printer (1 or 2).

- The default value for units equipped with an 80014 Processor module is 2.
- The default value for units equipped with an 80044 or 80214 Processor module is 1.

Step 21.3 Press the **ENTER** key.

Step 22 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS-232-C
PARITY: NONE

Step 22.1 Press the **NEW DATA** key.

Step 22.2 Use the up (▲) or down (▼) arrow keys to display the type of parity used by the PC/printer (**NONE**, **ODD**, **EVEN**, **MARK**, or **SPACE**).

Step 22.3 Press the **ENTER** key.

Step 23Press the down arrow key (▼) until the date display message (similar to that shown below) appears.

PROGRAM DATE
FRI 07 JUL 2007

Step 23.1 Press the **NEW DATA** key. The cursor appears at the first digit of the day-of-the-month entry.

Step 23.2 Enter the day of the month.

- The entry must consist of two digits (**01**, **12**, **27**, etc.).
- When the second digit is entered, the cursor moves to the first letter of the month entry.

Step 23.3 Use the up (▲) or down (▼) arrow keys to display the desired month entry.

Step 23.4 Press the **NEW DATA** key. The cursor appears at the first digit of the year entry.

Step 23.5 Enter all four digits for the year entry (**1999**, **2000**, etc.). As the last digit is entered, the applicable day of the week is automatically displayed and the cursor moves to the first letter of the day-of-the-week entry.

Step 23.6 Review all time entries and change any if necessary.

Step 23.7 Press the **ENTER** key.

Step 24Press the down arrow key (▼) once. A time display message similar to that shown below appears.

PROGRAM TIME
12:45:56 (24 HR)

Time is displayed in hours:minutes:seconds (hh:mm:ss) format.

Step 24.1 Press the **NEW DATA** key. The cursor appears at the first digit of the hours entry.

Step 24.2 Enter the hours. The entry must consist of two digits (**01**, **02**. etc.).

When the second digit is entered, the cursor moves to the first digit of the minutes entry.

NOTE

If 24-hour (military) time format is used, be sure to enter the hours in the same format (01, 12, 18, 21, etc.).

Step 24.3 Enter the minutes. The entry must consist of two digits (01,12, 21, etc.).

- When the second digit is entered, the cursor moves to the first digit of the seconds entry.

NOTE

To ensure precise time setting, it may be helpful to set the minutes entry approximately two minutes ahead of the actual time to allow sufficient time to complete steps 24.4 and 24.5 below. Then, when the entered minutes time arrives, step 24.6 can be performed.

Step 24.4 Enter the seconds. The entry must consist of two digits (01, 12, 21, etc.).

- When the second digit is entered, the cursor moves to the first character of the time format (AM, PM, 24 HR) entry.

Step 24.5 Use the up (▲) or down (▼) arrow keys to display the desired time format entry.

- When using 24-hour (military) format, follow the time entry with 24 HR.
- When using standard 12-hour format, follow the time entry with AM or PM, whichever is appropriate.

Step 24.6 Press the **ENTER** key at the exact second when real time coincides with the time entered on the display.

Step 24.7 Verify that the seconds portion of the display is advancing.

Step 25Press the down arrow key (▼) once. The following daylight savings time message is displayed.

PROGRAM DAYLIGHT	
SAVINGS:	**OFF**

NOTE

Safetran Systems software does not support the changes passed by the US Congress in regards to shifting Daylight Savings Time from the traditional dates as has been the case since October/November 2007.

Step 25.1 Press the **NEW DATA** key. Each time the **NEW DATA** key is pressed, the entry toggles between **OFF** and **ON**.

- If daylight savings time is to be used, select **ON** and the recorder will change the time setting automatically at the beginning (2:00 a.m. on the first Sunday in April) and end (2:00 a.m. on the last Sunday in October) of the daylight savings time period.
- If daylight savings time is not to be used, select **OFF**.

Step 25.2 Press the **ENTER** key when the applicable condition is displayed.

5.3.7 EXTENDED APPLICATION PROGRAMMING

Step 26 Press the **FUNCTION** key. The following message is displayed:

T1 SWITCH TO MS	
EZ LEVEL:	**10**

Step 26.1 Press the **NEW DATA** key.

Step 26.2 Enter the EZ level at which the indicated track circuit switches from predictor to motion sensor mode (**0** (**OFF**) to **100**).

Step 26.3 Press the **ENTER** key.

Step 26.4 If a single track is selected in step 2.2, proceed to step 27.

Step 26.5 If the system is programmed for two tracks, press the **TRACK 2** key and repeat steps 26.1 through 26.3 above for track 2.

Step 26.6 Press the **TRACK 1** key.

Step 27 Press the down arrow key (▼) once. The following message is displayed:

TRANSFER DELAY **MS TO GCP T1: OFF**

Step 27.1 Press the **NEW DATA** key.

Step 27.2 Enter the amount of time that the indicated track circuit will remain in the motion sensor mode before reverting to the grade crossing predictor mode (**0** (**OFF**) to **500** seconds).

NOTE

The Transfer Delay and the Advance Preempt Timer functions both exercise control of the MS/GCP CONTROL terminal; therefore, only one of these functions may be used at one time.

Step 27.3 Press the **ENTER** key.

Step 27.4 If the system was programmed for one track in step 2.2, proceed to step 27.7.

Step 27.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 27.1 through 27.3 for track 2.

Step 27.6 Press the **TRACK 1** key.

Step 27.7 If the system is equipped with an 80214 Processor Module having a revision level of A01E or later and a transfer delay value of 1 to 500 seconds is set in step 27.2, proceed to step 28.

Step 27.8 If the system is equipped with an 80044 processor module or an 80214 Processor Module having a revision level of A01D or earlier or the transfer delay value set in step 27.2 is 0 (OFF), proceed to step 29.

Step 28 Press the down arrow key (▼) once.

NOTE

If one or more DAX circuits are selected (step 12.2) and corresponding DAX distance values greater than zero are assigned (step 14.2), the following message displays:

TRANSFER MS TO
GCP DAX A: OFF

If no DAX circuits are selected (step 12.2) or no distance value is set for the assigned DAX circuit (step 14.2), the following message displays. When this occurs, proceed to step 29.1

PRIME PREDICTION
OFFSET T1: OFF

Step 28.1 Press the **NEW DATA** key. The display toggles between **OFF** and **ON** each time the **NEW DATA** key is pressed.

Step 28.2 Press the **ENTER** key when the desired low EZ detection entry is displayed.

Step 28.3 If two or more DAX circuits are selected (step 12.2), repeat steps 28 through 28.2 for each additional DAX circuit.

Step 28.4 If the system was programmed for two tracks (step 2.2), press the **TRACK 2** key and repeat steps 28.1 through 28.3 for track 2.

Step 28.5 Press the **TRACK 1** key.

Step 29 Press the down arrow key (▼) once. The following message displays:

PRIME PREDICTION
OFFSET T1: OFF

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.

Step 29.1 Press the **NEW DATA** key.

Step 29.2 Enter the prime prediction offset distance for the indicated track (**0** (**OFF**) to **9999** feet).

Step 29.3 Press the **ENTER** key.

Step 29.4 If the system was programmed for one track in step 2.2, proceed to step 29.7.

Step 29.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 29.1 through 29.3 for track 2.

Step 29.6 Press the **TRACK 1** key.

Step 29.7 If the system is equipped with an 80214 Processor Module having a revision level of A01E or later and the prime prediction offset distance is set to a value greater than 0, proceed to step 30.

Step 29.8 If the prime prediction offset distance is set to **OFF**, proceed to step 32.

Step 30 Press and release the up arrow key (▲) until the following message displays:

TRANSFER MS TO
GCP PRIME T1: OFF

Step 30.1 Press the **NEW DATA** key. The display toggles between **OFF** and **ON** each time the **NEW DATA** key is pressed.

Step 30.2 Press the **ENTER** key when the desired transfer timer function is displayed

Step 30.3 If the system was programmed for two tracks (step 2.2), press the **TRACK 2** key and repeat steps 30.1 and 30.2 for track 2.

Step 30.4 Press the **TRACK 1** key.

Step 31 Press and release the down arrow key (▼) until the following message is displayed:

PICKUP DELAY	
PRIME:	**15**

Step 31.1 Press the **NEW DATA** key.

Step 31.2 Enter the length of time from the point at which motion ceases in the approach until the gates pick up (**8** to **500** seconds).

Step 31.3 Press the **ENTER** key.

Step 32 Press the down arrow key (▼) once. The following message is displayed only when the system is programmed for one or more DAX:

PICKUP DELAY	
DAX A:	**15**

Step 32.1 Press the **NEW DATA** key.

Step 32.2 Enter the length of time from the point at which motion ceases in the indicated DAX approach until the gates pick up when a train stops in the DAX approach (**0** (**OFF**) to **500** seconds).

Step 32.3 Press the **ENTER** key.

Step 32.4 Repeat steps 32 through 32.3 for each additional DAX circuit in the system (B, C, and D).

Step 33 Press the down arrow key (▼) once. The following message is displayed:

COMPENSATION	
VALUE T1:	**1300**

WARNING

THE DEFAULT COMPENSATION VALUE IS AUTOMATICALLY CALCULATED BY THE 3000 GCP SYSTEM. DO NOT CHANGE THIS VALUE WITHOUT PROPER INSTRUCTIONS.

Step 33.1 Press the **NEW DATA** key.

Step 33.2 Enter the compensation value for the track indicated (**1000** to **2000**).

Step 33.3 Press the **ENTER** key.

Step 33.4 If the system was programmed for one track in step 2.2, proceed to step 33.7.

Step 33.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 33.1, 31.2, and through 33.3 for track 2.

Step 33.6 Press the **TRACK 1** key.

Step 33.7 If the system is equipped with an 80044 or 80214 Processor module, proceed to step 34.

Step 33.8 If the system is equipped with an 80014 Processor module, proceed to step 36.

Step 34 Press the down arrow key (▼) once. The following message is displayed:

T1 ENHANCED	
DETECTION:	**OFF**

WARNING

RUST BUILD-UP ON THE RAILS MAY NOT ALLOW TRACK SHUNTING TO OCCUR EVEN THOUGH ENHANCED DETECTION IS PROGRAMMED TO ON. IF RUST WERE TO BUILD UP TO A DEGREE THAT NO TRACK SHUNTING OCCURS (EZ DOES NOT CHANGE), THE MODEL 3000 GCP WILL NOT SENSE TRAIN MOVEMENTS.

DO NOT CONNECT THE DC SHUNTING ENHANCER PANEL TO THE 3000 GCP UAX (UAX1) TERMINALS IF OTHER WIRES ARE ALREADY CONNECTED TO THESE TERMINALS.

IF THIS CONDITION EXISTS, CONTACT SAFETRAN ENGINEERING AT 1-800-793-7233 BEFORE PROCEEDING.

NOTES

Intermittent poor shunting can result just about anywhere due to numerous causes but generally occurs due to infrequent track usage, lightly weighted cars, passenger and transit operation, spillage from rail cars, and 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. 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 to improve shunting and thus allow the 3000 Enhanced Detection software to function properly.

The Safetran DC Shunting Enhancer Panel, 80049, (see Section 3) provides a cost effective solution for improving shunting in dark territory:

- A nominal 6 volts DC is applied to the track at the crossing to break down the film on the rails.
- This DC voltage is isolated from the battery.
- A minimum of two insulated joints are required, one at the far end of each approach on the opposite rails.
- The DC Shunting Enhancement Panel can also be easily incorporated in applications involving overlapping approaches from two or more crossings.
- Narrow-band termination shunts must be used. Do not use wideband or hardwire shunts for terminations.

Step 34.1 Press the **NEW DATA** key. The ED operating mode for track 1 toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.

Step 34.2 Press the **ENTER** key when the desired mode status is displayed.

Step 34.3 If the system was programmed for one track in step 2.2, proceed to step 34.6.

Step 34.4 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 34.1 and 34.2 above for track 2.

Step 34.5 Press the **TRACK 1** key.

Step 34.6 If the ED operating mode is programmed to **ON**, proceed to step 35.

Step 34.7 If the ED operating mode is programmed to **OFF**, proceed to step 37.

Step 35 Press the down arrow key (▼) once. The following message is displayed:

BACK TO BACK	
T1 AND T2:	**NO**

Step 35.1 Press the **NEW DATA** key. The back-to-back display toggles between **NO** and **YES** each time the **NEW DATA** key is pressed.

NOTE

Select **YES** when two unidirectional units are in the same 3000 GCP case and the associated approaches are located on opposite sides of the same pair of insulated joints.

Step 35.2 Press the **ENTER** key when the applicable condition is displayed.

Step 36 Press the down arrow key (▼) once. The following message is displayed:

STATION STOP	
TIMER T1:	**10**

WARNING

IN SOFTWARE VERSIONS J AND EARLIER, WHEN THE STATION STOP TIMER IS PROGRAMMED TO A TIME OTHER THAN 10 SECONDS (MINIMUM VALUE), THERE MUST NOT BE ANY TRAIN MOVES APPROACHING THE CROSSING BETWEEN THE TIME A TRAIN LEAVES THE ISLAND AT THE CROSSING AND THE PROGRAMMED TIME OF THE STATION STOP TIMER ELAPSES

NOTES

1. In software versions J and earlier, the Station Stop Timer can be programmed to run for up to a maximum of 500 seconds, but should normally be left at the default setting of 10 seconds.

2. The timer is initiated automatically after a train leaves the island circuit and operates in conjunction with the enhanced detection logic.

3. If the train makes a station stop after passing the crossing, the timer can be programmed for up to 500 seconds to prevent tail rings due to poor shunting after the train has stopped and then departs from the station.

4. This timer is active only if Enhanced Detection is programmed **ON**.

Step 36.1 Press the **NEW DATA** key.

Step 36.2 Enter the required Station Stop Timer value on the alphanumeric keypad (**10** to **500**).

NOTE

1. This entry is used when a passenger station platform is located within the 3000 GCP approach.

2. The value entered on the keypad establishes the time interval (in seconds) that the internal loss-of-shunt timer is inhibited.

Step 36.3 Press the **ENTER** key when the desired time interval is displayed.

Step 36.4 If the system was programmed for one track in step 2.2, proceed to step 37.

Step 36.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 36.1, 34.2, and through 36.3 for track 2.

Step 36.6 Press the **TRACK 1** key.

Step 37 Press the down arrow key (▼) once. The following message is displayed:

NUMBER OF TRACK	
WIRES T1:	**4**

Step 37.1 Press the **NEW DATA** key.

Step 37.2 Enter the number of track wires for the indicated track (4 or 6).

Step 37.3 Press the **ENTER** key.

Step 37.4 If the system was programmed for one track in step 2.2, proceed to step 37.7.

Step 37.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 37.1, 35.2, and through 37.3 for track 2.

Step 37.6 Press the **TRACK 1** key.

Step 37.7 If the system is equipped with an 80044 or 80214 Processor Module, proceed to step 38.

Step 37.8 If the system is equipped with an 80014 processor module, proceed to step 44.

Step 38 Press the down arrow key (▼) once. The following message is displayed:

T1 LOW EX
ADJUSTMENT: 0

Step 38.1 If Low EX Adjustment is required for track 1, proceed to step 38.2; otherwise, proceed to step 38.6.

Step 38.2 Press the **NEW DATA** key.

WARNING

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

NOTES

1. The EX operating threshold has been reduced to 39 in the 80044 and 80214 processors and should be low enough for most applications.

2. Before reducing the threshold, thoroughly test the ballast at the location to determine whether conditions permit the threshold reduction (see Section 7, paragraph 7.7.3 for the Low EX Test Process).

Step 38.3 Enter the low EX threshold adjustment value for the indicated track (**0** to **5**).

Step 38.4 Press the **ENTER** key.

Step 38.5 If the system was programmed for one track in step 2.2, proceed to step 38.8.

Step 38.6 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 38.2, 36.3, and through 38.4 for track 2.

Step 38.7 Press the **TRACK 1** key.

Step 38.8 If the system is equipped with an 80214 Processor Module having a revision level of 9V121– A01C or later, proceed to step 39.

Step 38.9 If the system is equipped with an 80044 processor module or an 80214 Processor Module having a revision level of 9V121– A01B or earlier, proceed to step 44.

Step 39 Press the down arrow key (▼) once. The following message is displayed:

LOW EZ DETECTION	
EZ=70	T1:OFF

Step 39.1 Press the **NEW DATA** key. The entry toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.

NOTES

1. When programmed ON this function detects a significant reduction of EZ.

2. Low EZ detection occurs when EZ is constantly less than 70 for a period of time exceeding the Low EZ Detection Timer value (see Section 4, paragraph 4.17.4).

Step 39.2 Press the **ENTER** key when the desired low EZ detection entry is displayed.

Step 39.3 If the system was programmed for one track in step 2.2, proceed to step 39.6.

Step 39.4 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 39.1 and 39.2 for track 2.

Step 39.5 Press the **TRACK 1** key.

Step 39.6 If low EZ detection is programmed to **ON**, proceed to step 40.

Step 39.7 If low EZ detection is programmed to **OFF**, proceed to step 41.

Step 40 Press the down arrow key (▼) once. The following message is displayed:

LOW EZ DETECTION	
TIMER:	10

Step 40.1 Press the **NEW DATA** key.

Step 40.2 Enter the value for low EZ detection timer (**02** to **99** minutes).

Step 40.3 Press the **ENTER** key.

Step 40.4 If the system was programmed for one track in step 2.2, proceed to step 41.

Step 40.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 40.1 through 40.3 for track 2.

Step 40.6 Press the **TRACK 1** key.

Step 41 Press the down arrow key (▼) once. The following message is displayed:

POSITIVE START
EZ LEVEL T1: OFF

Step 41.1 Press the **NEW DATA** key.

NOTE

When programmed, the positive start function enables the activation of the crossing warning device whenever the track EZ level drops below the programmed positive start EZ value.

Step 41.2 Enter the positive start EZ level value (**00** (**OFF**) to **99**).

Step 41.3 Press the **ENTER** key.

Step 41.4 If the system was programmed for one track in step 2.2, proceed to step 41.7.

Step 41.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 41.1 through 41.3 for track 2.

Step 41.6 Press the **TRACK 1** key.

Step 41.7 If the positive start EZ level value is set to **00** (**NONE**), proceed to step 43.

Step 41.8 If the positive start EZ level value is set to a value between **01** and **99**, proceed to step 42.

Step 42 Press the down arrow key (▼) once. The following message is displayed:

NOTE

This display appears only when the Positive Start EZ Level option is enabled.

POSITIVE START
TIMEOUT T1: NONE

Step 42.1 Press the **NEW DATA** key.

Step 42.2 Enter the positive start timeout value (**NONE** (**0**) to **99** minutes).

NOTE

The programmed value determines when Continuous Positive Start timeout will occur.

Step 42.3 Press the **ENTER** key.

Step 42.4 If the system was programmed for one track in step 2.2, proceed to step 43.

Step 42.5 If the system was programmed for two tracks, press the **TRACK 2** key and repeat steps 42.1 through 42.3 for track 2.

Step 42.6 Press the **TRACK 1** key.

Step 43 Press the down arrow key (▼) once. The following message is displayed:

SET AT OPERATION
OUT: NORMAL

Step 43.1 Press the **NEW DATA** key. The entry toggles between **NORMAL** and **DIAGNOSTICS** each time the **NEW DATA** key is pressed.

NOTE

This function allows the automatic transfer (AT) output to be utilized either as a drive for an external Automatic Transfer unit or as an error indication signal. To select normal External Automatic Transfer unit operation, select **NORMAL**. To select the AT error indication function, select **DIAGNOSTICS**.

Step 43.2 Press the **ENTER** key when the desired automatic transfer function is displayed.

Step 43.3 If a Data Recorder module or a SEA/R node is installed, proceed to step 44.

Step 43.4 If no data recorder is installed, proceed to step 46.

Step 44 Press the down arrow key (▼) once. The following message is displayed:

DIAGNOSTIC
MESSAGES: ON

NOTE

This display appears only when a Data Recorder module is installed or when a SEA/R Node has been programmed into the GCP from a SEA/R.

Step 44.1 Press the **NEW DATA** key. The entry toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.

NOTE

When programmed ON and this function allows a large number of new GCP diagnostic messages to be sent to either the Data Recorder module or the SEA/R recorder by the 80214 software.

Step 44.2 Press the **ENTER** key when the desired entry is displayed.

Step 44.3 If Diagnostic Messages are programmed to **ON**, proceed to step 45.

Step 44.4 If Diagnostic Messages are programmed to **OFF**, proceed to step 46.

Step 45 Press the down arrow key (▼) once. The following message is displayed:

DAX	
MESSAGES:	**OFF**

Step 45.1 Press the **NEW DATA** key. The entry toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.

Step 45.2 Press the **ENTER** key when the desired entry is displayed.

Step 46 Press the down arrow key (▼) once. The following message is displayed:

ADVANCE PREEMPT	
TIMER:	**OFF**

Step 46.1 Press the **NEW DATA** key.

Step 46.2 Enter the advance preempt timer value (**0** (**OFF**) TO **99**).

NOTE

The value programmed sets the time interval between the start of traffic signal preemption and the start of the crossing signals.

Step 46.3 Press the **ENTER** key when the desired entry is displayed.

Step 47 Press the down arrow key (▼) once. The following message is displayed:

MOTION SENSING
LEVEL T1: NORMAL

NOTE

This function is normally used in conjunction with Transfer Delay timer operation.

Step 47.1 Press the **NEW DATA** key.

Step 47.2 Enter the motion sensing level value (**NORMAL** (**0**) to **100**).

NOTES

1. The motion sensing level function enables control of motion sensitivity.

2. An entry of **0** (**ZERO**) produces a **NORMAL** indication on the display and establishes motion sensitivity of approximately 30 mph at end of a 3000-foot approach.

3. An entry of 100 produces maximum motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach(es).

Step 47.3 Press the **ENTER** key.

Step 47.4 If a single track was selected in step 2.2, proceed to step 48.

Step 47.5 If the system is programmed for two tracks, press the **TRACK 2** key and repeat steps 47.1 through 47.3 for track 2.

Step 47.6 Press the **TRACK 1** key.

Step 48 Press the down arrow key (▼) once. The following message is displayed:

SET TO DEFAULT

NOTE

The routine performed by step 47 was performed in step 1, or it was not required.

This completes system application programming.

5.4 CONDENSED PROGRAMMING PROCEDURES

The condensed programming procedures are provided in Table 5-3 through Table 5-9 as a reference for system users who are familiar with the general programming procedure but require occasional prompting during system programming.

The step numbers listed in the condensed procedures correspond with the step numbers in paragraph 5.3.

Table 5-3:
Set to Default

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
1	**FUNCTION**			**T1 SWITCH TO MS** **EZ LEVEL: 10**
1.1	☐			**SET TO DEFAULT**
1.2	**NEW DATA**			**SET T0 DEFAULT** **PRESS ENTER**
1.3	**ENTER**		Setup message may intermittently appear; this indicates that Calibration (page 52) is required.	**SETUP T1 AND T2 REQUIRED**
			SET TO DEFAULT message displays when installation of default parameters is complete. After a delay of 2 seconds, the word **COMPLETE** momentarily appears in the display. The system must now be completely reprogrammed starting with step 2.	**SET TO DEFAULT COMPLETE**

Table 5-4:
Application Programming Procedures

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
2	**PROGRAM**		Default value is **2**.	**PROGRAM NUMBER OF TRACKS: 2**
2.1	**NEW DATA**			
2.2		**1** or **2**	Enter number of tracks monitored	
2.3	**ENTER**			
3	☐		Default value is **790 Hz.**	**PROGRAM FREQUENCY: 790 or** **PROGRAM T1 FREQUENCY: 790** Display is determined by Processor module installed.
3.1	**NEW DATA**			
3.2		**45 to 999**	Enter frequency of transceiver module.	
3.3	**ENTER**			
3.4			If system is equipped with 80014 or 80044 Processors, proceed to step 4.	
3.5	**TRACK 2**		If system is equipped with 80214 Processor, press **TRACK 2** key and repeat steps 3.1 thru 3.3 for track 2.	
3.6	**TRACK 1**			

NOTE

If the 80214 is installed in a single frequency case, the frequency for track 2 must be the same as track 1, otherwise a **Track 2 Frequency Error** will occur.

Table 5-4 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
4	▼		Default is UNIDIRECTIONAL.	**PROGRAM T1 UNIDIRECTIONAL** or **PROGRAM T1 BIDIRECTIONAL**
4.1	**NEW DATA**		System application toggles between **UNIDIRECTIONAL** and **BIDIRECTIONAL** each time **NEW DATA** key is pressed.	
4.2	**ENTER**		Press **ENTER** key when desired application is displayed.	
4.3			If system was programmed for one track in step 2.2, proceed to step 5.	
4.4	**TRACK 2**		If system was programmed for two tracks in step 2.2, press **TRACK 2** key and repeat step 4.1 and 4.2 for track 2.	
4.5	**TRACK 1**			
5	▼		Default is **MEDIUM**.	**PROGRAM T1 XMIT LEVEL: MEDIUM** or **PROGRAM T1 XMIT LEVEL: MAXIMIUM**
5.1	**NEW DATA**		Transceiver transmit level toggles between **MEDIUM** and **MAXIMUM** each time **NEW DATA** key is pressed.	
5.2	**ENTER**		Press **ENTER** key when desired transmit level is displayed.	
5.3			If system was programmed for one track in step 2.2, proceed to step 6.	
5.4	**TRACK 2**		If system was programmed for two tracks in step 2.2, press **TRACK 2** key and repeat step 5.1 and 5.2 for track 2.	
5.5	**TRACK 1**			
6	▼		Default is **PREDICTOR**.	**PROGRAM T1 PREDICTOR**
6.1	**NEW DATA**		Display toggles between **PREDICTOR** and **MOTION SENSOR** each time **NEW DATA** key is pressed.	

Continued on next page

Table 5-4 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
6.2	**ENTER**		Press **ENTER** key when desired mode of operation is displayed.	**PROGRAM T1 PREDICTOR**
6.3			If system was programmed for one track in step 2.2, proceed to step 7.	
6.4	**TRACK 2**		If system was programmed for two tracks in step 2.2,, press **TRACK 2** key and repeat steps 6.1 & 6.2 for track 2.	
6.5	**TRACK 1**			
7	▼		Default is **35** seconds.	**PROGRAM T1 WARNING TIME: 35**
7.1	**NEW DATA**			
7.2		**25** to **99**	Enter track-warning time in seconds.	
7.3	**ENTER**			
7.4			If system was programmed for one track in step 2.2, proceed to step 8	
7.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press **TRACK 2** key and repeat steps 7.1 thru 7.3 for track 2.	
8	▼		Default is **3000** feet.	**PROGRAM T1 APPROACH: 3000** The approach distance display alternates with the computed display: **PROGRAM T1 COMPUTED: 3240**
8.1	**NEW DATA**			
8.2		**0000 to 9999**	Enter approach distance in feet.	
8.3	**ENTER**			
8.4			I If system was programmed for one track in step 2.2, proceed to step 9.	
8.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press **TRACK 2** key and repeat steps 8.1, 8.2, and 8.3 for track 2.	
9	▼		Default is 25 seconds.	**PROGRAM UAX1 PICKUP DELAY: 25**
9.1	**NEW DATA**			
9.2		**0 (OFF) to 500**	Enter pickup delay time in seconds for UAX 1.	
9.3	**ENTER**			

Continued on next page

WARNING

WHEN THE UAX FEATURE IS OFF (0 IS ENTERED), THE FRONT PANEL UAX TERMINALS HAVE NO CONTROL OVER PRIME RELAY DRIVE.

Table 5-4 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
10	▼		Default is **25** seconds.	**PROGRAM ENA/UAX2 PICKUP DELAY: 25**
10.1	**NEW DATA**			
10.2		**0** (**ENA**) to **500**	Enter pickup delay time for UAX 2 in seconds.	

NOTE

When UAX2 is programmed to zero (0) seconds, the terminal functions as ENA with no pickup delay and is typically used for cascading multiple GCP outputs.

Table 5-4 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
10.3	**ENTER**			
11	▼		Default is **0** feet.	**PROGRAM T1 ISLAND: 0**
11.1	**NEW DATA**			
11.2		**0** to **999**	Enter island distance in feet.	
11.3	**ENTER**			
11.4			If system was programmed for one track in step 2.2, proceed to step 12.	
11.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press **TRACK 2** key and repeat steps 11.1 thru 11.3 for track 2.	
11.6	**TRACK 1**			

Continued on next page

Table 5-4 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
12	▼		Default is **0**.	**PROGRAM NUMBER OF DAXS: 0**
12.1	**NEW DATA**			
12.2		**0** to **8**	Enter number of DAX's in system.	
12.3	**ENTER**			
12.4			If 0 (zero) is entered in step 12.2, proceed to step 16.	
12.5			If a number from 1 to 8 is entered in step 12.2, proceed to step 13.	

NOTE

For 3000 GCP's equipped with an 80044 or 80214 Processor Module, numbers representing four additional DAX circuits (5 through 8) can be entered; however, these entries are reserved exclusively for 8-DAX GCP Models 3008 and 3008D2. Because GCP Models 3000, 3000D2, and 3000D2L can only accommodate a maximum of two DAX modules (four DAX circuits), the parameters for DAX circuits identified as E(5), F(6), G(7), and H(8) will be displayed on these units (if the number of DAX circuits entered is greater than 4), but will be ignored by the system.

Table 5-4 Continued

STEP NO	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
13	▼		Default for track 1 is A, C, E, & G Default for track 2 is B, D, F, & H	**PROGRAM DAX A TRACK: 1**
13.1	**NEW DATA**			
13.2		**1** or **2**	Enter DAX track assignment (1 for T1 or 2 for T2).	
13.3	**ENTER**			
14	□		Default is **0** (preempt).	**PROGRAM DAX A DISTANCE: 0** Or **PROGRAM DAX A DISTANCE: PREEMPT**
14.1	**NEW DATA**			
14.2		0 (PREEMPT) to 9999	Enter the DAX offset distance in feet.	
14.3	**ENTER**			

Continued on next page

Table 5-4 Concluded

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
15	▼		Default is **35** or **45** seconds depending on Processor module	**PROGRAM DAX A WARNING TIME: 35** or **PROGRAM DAX A WARNING TIME: 45**
15.1	**NEW DATA**			
15.2		**25** to **99**	Enter the DAX warning time in seconds.	
15.3	**ENTER**			
15.4			If two or more DAX's are selected (step 12.2), repeat steps 13 through 15.3 for each additional DAX.	
16	☐		Default is **MASTER**.	**PROGRAM SLAVING MASTER**
16.1	**NEW DATA**		The display toggles between Master and Slave each time the **NEW DATA** key is pressed.	
16.2		**MASTER or SLAVE**	Select the slaving status for the 3000 GCP case.	
16.3	**ENTER**			

NOTE

Default is **DISABLED**. To leave the password feature in its current status, proceed to step 18.

Table 5-5:
Password Programming Procedures

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
17	▼		To enable the password feature (**DISABLED** is displayed), proceed to step 17. 1.	**PROGRAM PASSWORD DISABLED** or **PROGRAM PASSWORD ENABLED** Display determined by current password status

Continued on next page

NOTE

To change the current password code (ENABLED is displayed), proceed to step 17. 7. To disable the password feature, proceed to step 17. 15.

Table 5-5 Concluded

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
17.1	**NEW DATA**			**ENTER NEW PASSWORD:**
17.2		****	Enter new four-digit password.	
17.3	**ENTER**			**CONFIRM NEW PASSWORD**
17.4		****	Re-enter new password.	
17.5	**ENTER**		Password feature enabled and new password installed.	**PROGRAM PASSWORD ENABLED**
17.6			Proceed to step 18.	
17.7	**NEW DATA**			**ENTER OLD PASSWORD:**
17.8		****	Enter existing four-digit password.	
17.9	**ENTER**			**ENTER NEW PASSWORD:**
17.10		****	Enter new four-digit password.	
17.11	**ENTER**			**CONFIRM NEW PASSWORD:**
17.12		****	Re-enter new password.	
17.13	**ENTER**		New password installed.	**PROGRAM PASSWORD ENABLED**
17.14			Proceed to step 18.	
17.15	**NEW DATA**			**ENTER OLD PASSWORD:**
17.16		****	Enter current four-digit password.	
17.17	**ENTER**		Enter no number	**ENTER NEW PASSWORD:**
17.18	**CLEAR**		Password feature disabled.	**PROGRAM PASSWORD DISABLED**

NOTE

Steps 18 through 25.2 apply to the Data Recorder Module (80015/80115). Perform these steps as required.

Table 5-6:
Data Recorder Programming

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
18	▼		Default is NOT INSTALLED.	**PROGRAM RECORDER NOT INSTALLED** or **PROGRAM RECORDER INSTALLED** Display determined by current recorder status
18.1	**NEW DATA**		Each time **NEW DATA** key is pressed, entry toggles between **NOT INSTALLED** and **INSTALLED**. If Data Recorder module is installed, select **INSTALLE**D. If Data Recorder module is not installed, select **NOT INSTALLED**	
18.2	**ENTER**		Press **ENTER** key when applicable data recorder option is displayed.	
18.3			If I**NSTALLED** is selected, proceed to step 19.	
18.4			If **NOT INSTALLED** is selected, proceed to step 26.	

NOTE

Steps 19 through 22.3 set the RS232C interface port parameters to enable the 3000 GCP to communicate with an external PC or printer, and may be performed at a future date prior to downloading recorded data to a PC or printing. An external PC or printer, may be connected to the data recorder module (80015/801115) via the 9-pin RS232C connector located on the front edge of the module. Refer to the applicable PC software or printer manufacturer's manual to determine the appropriate values to enter.

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
19	▼		Default value for units equipped with 80014 Processor Module is **300**. Default value for units equipped with 80044 or 80214 Processor Module is **9600**.	**PROGRAM RS-232-C BAUD RATE: 9600**
19.1	**NEW DATA**			
19.2	☐ **or** ☐	**300, 1200, 2400, 4800, or 9600**	Use arrow keys to display the PC/printer baud rate.	
19.3	**ENTER**			

Table 5-7:
External PC or Printer Programming

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
20	▼		Default value for units equipped with 80014 Processor module is 7. Default value for units equipped with 80044 or 80214 Processor module is 8.	**PROGRAM RS-232-C** **DATA BITS: 8**
20.1	**NEW DATA**			
20.2	□ **or** □	**7** or **8**	Use arrow keys to display the number of data bits for the PC/printer.	
20.3	**ENTER**			
21	□		Default value for units equipped with 80014 Processor module is 2. Default value for units equipped with 80044 or 80214 Processor module is 1.	**PROGRAM RS-232-C** **STOP BITS: 1**
21.1	**NEW DATA**			
21.2	□ **or** □	**1** or **2**	Use arrow keys to display the number of stop bits for the PC/printer.	
21.3	**ENTER**			
22	▼		Default is NONE.	**PROGRAM RS-232-C** **PARITY: NONE**
22.1	**NEW DATA**			
22.2	□ **or** □	NONE, ODD, EVEN, MARK, or SPACE	Use arrow keys to display the type of parity used by the PC/printer.	
22.3	**ENTER**			

Table 5-8:
Date and Time Programming

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
23	□			**(Example)** **PROGRAM DATE** **FRI 03 JAN 2008**
23.1	**NEW DATA**			
23.2		**##**	Enter the day of the month. The entry must consist of two digits (01, 12, 27, etc.).	

Continued on next page

Table 5-8 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
23.3	☐ **or** ☐		Use arrow keys to display the desired month entry.	
23.4	**NEW DATA**			
23.5		**####**	Enter all four digits for the year entry (1999, 2000, etc.). As the last digit is entered, the applicable day of the week is automatically displayed.	**(Example)** **PROGRAM DATE** **FRI 03 JAN 2008**
23.6			Review all time entries and change as necessary.	
23.7	**ENTER**			

NOTE

If 24-hour (military) time format is used, be sure to enter the hours in the same format (01, 02 18, etc.).

Table 5-8 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
24	☐			
24.1	**NEW DATA**			**PROGRAM TIME** **12:45:56 (24 HR)**
24.2		**##**	Enter hours. Entry must consist of two digits (01, 02. etc.).	

NOTE

To ensure precise time setting, it may be helpful to set the minutes entry approximately two minutes ahead of the actual time to allow sufficient time to complete steps 24.4 and 24.5 below. Then, when the entered minutes time arrives, step 24.6 can be performed.

Safetran Systems software does not support the changes passed by the US Congress in regards to shifting Daylight Savings Time from the traditional dates as has been the case since the change became effective in October/November 2007.

Table 5-8 Concluded

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
24.3		**##**	Enter minutes. Entry must consist of two digits (06,12, 18, etc.).	**PROGRAM TIME 12:45:56 (24 HR)**
24.4		**##**	Enter seconds. Entry must consist of two digits (05, 15, 30, etc.).	
24.5	☐ **or** ☐	**24 HR, AM, or PM**	Use arrow keys to display desired time format entry.	
24.6	**ENTER**			
24.7			Verify that the seconds portion of the display is now advancing.	
25	☐		Default is **OFF**.	**PROGRAM DAYLIGHT SAVINGS: ON**
25.1	**NEW DATA**		Each time **NEW DATA** key is pressed, entry toggles between **OFF** and **ON**. Select **ON** for daylight savings time. Select **OFF** for standard time.	
25.2	**ENTER**			

Table 5-9:
Extended Application Programming

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
26	**FUNCTION**		Default is **EZ = 10**.	**T1 SWITCH TO MS EZ LEVEL: 10**
26.1	**NEW DATA**			
26.2		**0** (**OFF**) to **100**	Enter EZ level at which predictor to motion sensor switchover occurs.	
26.3	**ENTER**			
26.4			If system was programmed for one track in step 2.2, proceed to step 27.	
26.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 26.1 thru 26.3 for track 2.	
26.6	**TRACK 1**			
27	☐		Default is **0** (OFF)	**TRANSFER DELAY MS TO GCP T1: OFF**
27.1	**NEW DATA**			
27.2		**0** (**OFF**) to **500**	Enter the time in seconds that the track circuit will remain in motion sensor mode before reverting to the grade crossing predictor mode.	

Continued on next page

NOTE

The Transfer Delay and the Advance Preempt Timer functions both exercise control of the MS/GCP CONTROL terminal; therefore, only one of these functions may be used at one time.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
27.3	**ENTER**			**TRANSFER DELAY MS TO GCP T1: OFF**
27.4			If system was programmed for one track in step 2.2, proceed to step 27.7.	
27.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 27.1 thru 27.3 for track 2.	
27.6	**TRACK 1**			
27.7			If the system is equipped with an 80214 Processor having a revision level of A01E or later and a transfer delay value of 1 to 500 seconds is set in step 27.2, proceed to step 28	
27.8			If the system is equipped with an 80044 Processor module or the transfer delay value set in step 27.2 is **0** (OFF), proceed to step 29.	
28	▼		Message display when one or more DAX circuits are selected (step 12.2) and corresponding DAX distance values are assigned (step 14.2). When message displays, proceed to step 28.1. Default is **OFF**.	**TRANSFER MS TO GCP DAX A: OFF**
			Message display when no DAX circuits are selected (step 12.2) or no distance value is set for the assigned DAX (step 14.2). When message displays, proceed to step 29.1. Default is **OFF**.	
28.1	**NEW DATA**		Each time **NEW DATA** key is pressed, entry toggles between **OFF** and **ON**.	

Continued on next page

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
28.2	**ENTER**		Press the **ENTER** key when the desired transfer status is displayed.	**TRANSFER MS TO GCP DAX A: OFF**
28.3			If two or more DAX circuits are selected (step 12.2), repeat steps 28 thru 28.2 for each additional DAX circuit.	

WARNING

ENTERING AN INCORRECT DAX AND/OR PRIME PREDICTION OFFSET DISTANCE MAY RESULT IN SHORT OR NO WARING 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.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
28.4	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 28.1 thru 28.3 for track 2.	**TRANSFER MS TO GCP DAX A: OFF**
28.5	**TRACK 1**			
29	☐		Default is **0** (OFF)	**PRIME PREDICTION OFFSET T1: OFF**
29.1	**NEW DATA**			
29.2		**0 (OFF) to 9999**	Enter the prime prediction offset distance for the indicated track in feet.	
29.3	**ENTER**			
29.4			If system was programmed for one track in step 2.2, proceed to step 29.7.	

Continued on next page

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
29.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 29.1 thru 29.3 for track 2.	
29.6	**TRACK 1**			
29.7			If the system is equipped with 80214 Processor Module having a revision level of A01E or later & prime prediction offset is set for a value greater than 0, proceed to step 30.	**PRIME PREDICTION OFFSET T1: OFF**
29.8			If the prime prediction offset distance is set to OFF, proceed to step 32.	
30	☐		Press and release the up arrow (▲) until the **Transfer MS to GCP Prime** message displays.	
30.1	**NEW DATA**		Each time **NEW DATA** key is pressed, entry toggles between **OFF** and **ON**.	
30.2			Press the ENTER key when the desired transfer timer function is displayed.	**TRANSFER MS TO GCP PRIME T1: OFF**
30.3	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 30.1 and 30.2 for track 2.	
30.4	**TRACK 1**			
31	▼		Press and release the down arrow (▼) until the Pickup Delay Prime message displays.	
31.1	**NEW DATA**			
31.2		**8** to **500**	Enter the length of time in seconds from the point at which motion ceases in the approach until the gates pick up.	**PICKUP DELAY PRIME: 15**
31.3	**ENTER**			

Continued on next page

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
32	▼		Default is **15** seconds. This step is applicable only when the system is programmed for one or more DAX.	**PICKUP DELAY DAX A: 15**
32.1	**NEW DATA**			
32.2		**0** (**OFF**) to **500**	Enter the length of time in seconds from the point at which motion ceases in the indicated DAX approach until the gates pick up when a train stops in the DAX approach.	
32.3	**ENTER**			
32.4			Repeat steps 32 thru 32.3 for each additional DAX circuit in the system (B, C, and D).	
33	☐			

WARNING

THE DEFAULT COMPENSATION VALUE IS AUTOMATICALLY CALCULATED BY THE 3000 GCP SYSTEM. DO NOT CHANGE THIS VALUE WITHOUT PROPER INSTRUCTIONS.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
33.1	**NEW DATA**			**COMPENSATION VALUE T1: 1300**
33.2		1000 to 2000	Enter the compensation value for the track indicated.	
33.3	**ENTER**			
33.4			If system was programmed for one track in step 2.2, proceed to step 33.7.	
33.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 33.1 thru 33.3 for track 2.	

Continued on next page

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
33.6	**TRACK 1**			**COMPENSATION VALUE T1: 1300**
33.7			If the system is equipped with an 80044 or 80214 Processor module, proceed to step 34.	
33.8			If the system is equipped with an 80014 Processor module, proceed to step 36.	
34	☐		Default is **OFF**.	**T1 ENHANCED DETECTION: *OFF**

WARNING

RUST BUILD-UP ON THE RAILS MAY NOT ALLOW TRACK SHUNTING TO OCCUR EVEN THOUGH ENHANCED DETECTION IS PROGRAMMED TO "ON." IF RUST WERE TO BUILD UP TO A DEGREE THAT NO TRACK SHUNTING OCCURS (EZ DOES NOT CHANGE), THE MODEL 3000 GCP WILL NOT SENSE TRAIN MOVEMENTS.

DO NOT CONNECT THE DC SHUNTING ENHANCER PANEL 80049 TO THE MODEL 3000 GCP UAX (UAX1) TERMINALS IF OTHER WIRES ARE ALREADY CONNECTED TO THESE TERMINALS.

IF THIS CONDITION EXISTS, CONTACT SAFETRAN ENGINEERING AT 1-800-793-7233 BEFORE PROCEEDING.

NOTE

Intermittent poor shunting can result just about anywhere due to numerous causes but generally occurs due to infrequent track usage, lightly weighted cars, passenger and transit operation, spillage from rail cars, and 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. 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 to improve shunting and thus allow the 3000 Enhanced Detection software to function properly.

The Safetran DC Shunting Enhancer Panel, 80049, provides a cost effective solution for improving shunting in dark territory:

- A nominal 6 volts DC is applied to the track at the crossing to break down the film on the rails.
- This DC voltage is isolated from the battery.
- A minimum of two insulated joints are required, one at the far end of each approach.
- The DC Shunting Enhancement Panel can also be easily incorporated in applications involving overlapping approaches from two or more crossings.
- Narrow-band termination shunts must be used. Do not use wideband or hardwire shunts for terminations.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
34.1	**NEW DATA**		The ED operating mode for track 1 toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.	
34.2	**ENTER**		Press the **ENTER** key when the desired mode status is displayed.	**T1 ENHANCED DETECTION: *OFF**
34.3			If system was programmed for one track in step 2.2, proceed to step 34.6.	

Continued on next page

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
34.4	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 34.1 and 34.2 for track 2.	**T1 ENHANCED DETECTION: *OFF**
34.5	**TRACK 1**			
34.6			If the ED operating mode is programmed to **ON**, proceed to step 35.	
34.7			If the ED operating mode is programmed to **OFF**, proceed to step 37.	
35	▼		Default is **NO**.	**BACK TO BACK T1 AND T2: NO**
35.1	NEW DATA		The back-to-back display toggles between **NO** and **YES** each time the **NEW DATA** key is pressed.	

NOTE

Select YES when two unidirectional units are in the same Model 3000 GCP case and the associated approaches are located on opposite sides of the same pair of insulated joints and are at a crossing.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
35.2	ENTER		Press the **ENTER** key when the applicable condition is displayed.	
36	▼		Default is **10** seconds.	**STATION STOP TIMER T1: 10**

Continued on next page

WARNING

IN SOFTWARE VERSIONS J AND EARLIER, WHEN THE STATION STOP TIMER IS PROGRAMMED TO A TIME OTHER THAN 10 SECONDS (MINIMUM VALUE), THERE MUST NOT BE ANY TRAIN MOVES APPROACHING THE CROSSING BETWEEN THE TIME A TRAIN LEAVES THE ISLAND AT THE CROSSING AND THE PROGRAMMED TIME OF THE STATION STOP TIMER ELAPSES.

NOTE

In software versions J and earlier, the Station Stop Timer can be programmed to run for up to a maximum of 500 seconds, but should normally be left at the default setting of **10** seconds. The timer is initiated automatically after a train leaves the island circuit and operates in conjunction with the enhanced detection logic. If the train makes a station stop after passing the crossing, the timer can be programmed for up to 500 seconds to prevent tail rings due to poor shunting after the train has stopped and then departs from the station. This timer is active only if Enhanced Detection is programmed **ON**.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
36.1	**NEW DATA**			**STATION STOP TIMER T1: 10**
36.2		10 to 500	Enter the required Station Stop Timer value in seconds on the alphanumeric keypad.	

NOTE

This entry is used when a passenger station platform is located within the 3000 GCP approach. The value entered on the keypad establishes the time interval (in seconds) that the train stops in the station.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
36.3	**ENTER**			**STATION STOP TIMER T1: 10**
36.4			If system was programmed for one track in step 2.2, proceed to step 37.	
36.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 36.1 thru 36.3 for track 2.	
36.6	**TRACK 1**			
37	☐		Default is **4**.	**NUMBER OF TRACK WIRES T1: 4**
37.1	**NEW DATA**			
37.2		**4** to **6**	Enter the number of track wires for the indicated track.	
37.3	**ENTER**			
37.4			If system was programmed for one track in step 2.2, proceed to step 37.7.	
37.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 37.1 thru 37.3 for track 2.	
37.6	**TRACK 1**			
37.7			If the system is equipped with an 80044 or 80214 Processor module, proceed to step 38.	
37.8			If the system is equipped with an 80014 Processor module, proceed to step 44.	
38	☐		Default is **0**. Optional, perform only if needed.	**T1 LOW EX ADJUSTMENT: 0**
38.1			If Low EX Adjustment is required for track 1, proceed to step 38.2; otherwise, proceed to step 38.6.	
38.2	**NEW DATA**			

Continued on next page

WARNING

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

NOTE

The EX operating threshold has already been reduced to 39 in the 80044 and 80214 processors and should be sufficiently low for most applications.

Before reducing the threshold, thoroughly test the ballast at the location to determine whether conditions permit the threshold reduction (see Section 7, paragraph 7.7.3.2 for the Low EX Test Procedure).

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
38.3		**0** to **5**	Enter the low EX threshold adjustment value for the indicated track.	**T1 LOW EX ADJUSTMENT: 0**
38.4	**ENTER**			
38.5			If system was programmed for one track in step 2.2, proceed to step 38.8.	
38.6	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 38.2 thru 38.4 for track 2.	
38.7	**TRACK 1**			
38.8			If the system is equipped with an 80214 Processor module having a revision level of 9V121 – A01C or later, proceed to step 39.	
38.9			If the system is equipped with an 80044 Processor module or an 80214 Processor module with a revision level of 9V121 – A01B or earlier, proceed to step 44.	

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Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
39	☐		Default is **OFF**.	**LOW EZ DETECTION** **EZ=70 T1:OFF**
39.1	**NEW DATA**		The entry toggles between **NO** and **YES** each time the **NEW DATA** key is pressed.	

NOTE

When programmed ON this function detects a significant reduction of EZ.

Low EZ detection occurs when EZ is constantly less than 70 for a period of time exceeding the Low EZ Detection Timer value (see Section 4, paragraph 4.17.4).

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
39.2	**ENTER**		Press the **ENTER** key when the desired EZ detection entry is displayed.	**LOW EZ DETECTION** **EZ=70 T1:OFF**
39.3			If system was programmed for one track in step 2.2, proceed to step 39.6.	
39.4	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 39.1 and 39.2 for track 2.	
39.5	**TRACK 1**			
39.6			If low EZ detection is programmed to **ON**, proceed to step 40.	
39.7			If low EZ detection is programmed to **OFF**, proceed to step 41.	
40	☐		Default is **10** minutes.	**LOW EZ DETECTION** **TIMER T1: 10**
40.1	**NEW DATA**			
40.2		**02** to **99** minutes	Enter the low EZ detection timer value in minutes.	

Continued on next page

NOTE

This value is the time between the detection of a low EZ value and the de-energizing of the associated track prime and DAX relay drive outputs.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
40.3	**ENTER**			**LOW EZ DETECTION TIMER T1: 10**
40.4			If the system is programmed for one track (step 2.2), proceed to step 41.	
40.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 40.1 thru 40.3 for track 2.	
40.6	**TRACK 1**			
41	☐		Default is **OFF**.	**POSITIVE START EZ LEVEL T1: OFF**
41.1	**NEW DATA**			

NOTE

When programmed, the positive start function enables the immediate activation of the crossing warning device whenever the track circuit EZ level drops below the programmed positive start EZ value.

Table 5-9:
Extended Application Programming (Continued)

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
41.2		**0** (**OFF**) to **99**	Enter the positive start EZ level value.	**POSITIVE START EZ LEVEL T1: OFF**
41.3	**ENTER**			
41.4			If system was programmed for one track in step 2.2, proceed to step 41.7.	
41.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 41.1 thru 41.3 for track 2.	

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Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
41.6	**TRACK 1**			**POSITIVE START EZ LEVEL T1: OFF**
41.7			If the positive start EZ level value is set to **00** (NONE), proceed to step 43.	
41.8			If the positive start EZ level value is set to a value between **01** and **99**, proceed to step 42.	
42	☐		Default is **NONE**.	**POSITIVE START TIMEOUT T1: NONE**

NOTE

This display appears only when the Positive Start EZ Level option is enabled.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
42.1	**NEW DATA**			**POSITIVE START TIMEOUT T1: NONE**
42.2		**NONE** (**0**) to **99**	Enter the positive start timeout value.	

NOTE

The programmed value determines when Continuous Positive Start timeout will occur.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
42.3	**ENTER**			**POSITIVE START TIMEOUT T1: NONE**
42.4			If system was programmed for one track in step 2.2, proceed to step 43.	
42.5	**TRACK 2**		If system was programmed for two tracks in step 2.2, press the TRACK 2 key and repeat steps 42.1 thru 42.3 for track 2.	

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Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
42.6	**TRACK 1**			**POSITIVE START TIMEOUT T1: NONE**
43	☐		Default is **NORMAL**.	**SET AT OPERATION OUT: NORMAL**
43.1	**NEW DATA**		The entry toggles between **NORMAL** and **DIAGNOSTICS** each time the **NEW DATA** key is pressed.	

NOTE

This function allows the automatic transfer (AT) output to be utilized either as a drive for an external Automatic Transfer unit or as an error indication signal. To select normal External Automatic Transfer unit operation, select NORMAL. To select the AT error indication function, select DIAGNOSTICS.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
43.2	**ENTER**		Press the **ENTER** key when the desired automatic transfer function is displayed.	**SET AT OPERATION OUT: NORMAL**
43.3			If a Data Recorder Module or a SEAR node is installed, proceed to step 44.	
43.4			If no data recorder is installed, proceed to step 46.	
44	☐		Default is **ON**.	**DIAGNOSTIC MESSAGES: ON**
44.1	**NEW DATA**		The entry toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.	

NOTE

This display appears only when a Data Recorder module is installed or when a SEAR Node has been programmed into the GCP from a SEAR.

When programmed ON, this function allows a large number of new GCP diagnostic messages to be sent to either the Data Recorder module or the SEA/R recorder by the 80214 software.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
44.2	**ENTER**		Press the **ENTER** key when the desired entry is displayed.	**DIAGNOSTIC MESSAGES: ON**
44.3			If Diagnostic Messages are programmed to **ON**, proceed to step 45.	
44.4			If Diagnostic Messages are programmed to **OFF**, proceed to step 46.	
45	☐		Default is **ON**.	**DAX MESSAGES: OFF**
45.1	**NEW DATA**		The entry toggles between **ON** and **OFF** each time the **NEW DATA** key is pressed.	
45.2	**ENTER**		Press the **ENTER** key when the desired entry is displayed.	
46	☐		Default is OFF.	**ADVANCE PREEMPT TIMER: OFF**
46.1	**NEW DATA**			
46.2		**OFF** (**0**) to **99**	Enter the advance preempt timer value.	
46.3	**ENTER**		Press the **ENTER** key when the desired entry is displayed.	
47	☐		Default is **NORMAL**.	**MOTION SENSING LEVEL T1: NORMAL**

NOTE

This function is normally used in conjunction with Transfer Delay timer operation.

Table 5-9 Continued

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
47.1	**NEW DATA**			**MOTION SENSING LEVEL T1: NORMAL**
47.2		NORMAL 0 to 99	Enter the motion sensor level value.	

NOTE

The motion sensing level function enables control of motion sensitivity.

An entry of 0 (zero) produces a NORMAL indication on the display and establishes motion sensitivity of approximately 30 mph at end of a 3000-foot approach.

An entry of 100 produces maximum motion sensitivity of approximately 1 mph at the feed points and 2 mph within the approach(es).

Table 5-9 Concluded

STEP NO.	KEY PRESSED	DATA ENTRY KEY SEQUENCE	COMMENTS	MESSAGE DISPLAYED
47.3	**ENTER**		Press the **ENTER** key when the desired entry is displayed.	**MOTION SENSING LEVEL T1: NORMAL**
47.4			If system was programmed for one track in step 2.2, proceed to step 48.	
47.5			If system was programmed for two tracks in step 2.2, press the **TRACK 2** key and repeat steps 47.1 through 47.3 for track 2.	
	☐		See step 1.	**SET TO DEFAULT**

SECTION 6 –
SYSTEM CALIBRATION

6.1 GENERAL

System calibration is divided into the following automated setup procedures:

- setup for calibration
- setup for approach length
- setup of linearization.

During system calibration:

- User interface is minimal, requiring only occasional inputs via the keyboard/display assembly.
- Meters or external test equipment are not required.

When the unit is in either the Program or Status Mode, a message is flashed on the keyboard/display assembly, indicating that system calibration is required. The calibration reminder message also designates the number of tracks programmed for the system as follows:

SETUP T1 AND T2 REQUIRED	**SETUP T1 REQUIRED**	**SETUP T2 REQUIRED**

NOTES

1. The 3000 GCP software inhibits system relay drive output when setup for calibration procedure is required.

2. Before proceeding with system calibration, make sure that the required bypass couplers and termination shunts are properly installed.

6.2 SYSTEM PROGRAMMING REQUIREMENTS

For initial system installations:

- Program the system according to the procedure provided in Section 5, System Application Programming.
- Beginning with Set To Default (step 1), completely program all parameters listed in the Program and Function menus for both track 1 and track 2 (if applicable) in accordance with the railroad application instructions.

When the system has previously been programmed:

- Verify that system programming corresponds to the railroad application instructions for the applicable tracks by reviewing all Program and Function menu items.

- Refer to the 3000 GCP Application History Card or railroad installation drawing for the correct programming entries.

6.3 SET TO DEFAULT, REPROGRAMMING, AND RECALIBRATION REQUIREMENTS

Set to default, reprogramming, and recalibration must each be performed if any of the following conditions exist:

- A Processor module is replaced with another containing a different software level.
- The program PROM's on the 80014 or 80044 Processor modules are replaced with PROM's containing a different software level.
- The program in flash memory on the 80214 Processor module is changed to a different software level.
- The Control Interface Assembly (80020 or 80029) or the attached printed circuit board (80017 or 80153) is replaced.

CAUTION

REMOVE POWER FROM THE 3000 GCP CASE BEFORE REMOVING OR INSTALLING MODULES.

When any of the above conditions occur, relay drive is inhibited and the following message is flashed on the display every 2 seconds.

SET TO DEFAULT REQUIRED

NOTE

For complete set to default, programming, and reprogramming instructions, refer to Section 5, Paragraph 5.3, System Programming.

6.4 RECALIBRATION REQUIREMENTS FOR IN-SERVICE 3000 GCP'S

The recalibration and reprogramming requirements for an in-service 3000 GCP are listed in Tables 6-1 through 6-3 and described in the following paragraphs.

6.4.1 Recalibration/Reprogramming Requirements Due to Module Replacement

Table 6-1 indicates recalibration, reprogramming, and adjustment requirements when any of the modules listed are replaced. For example:

- When an island module (80011/80211) is replaced, island adjustment is required only for the track associated with the island module and no other setup or adjustment procedures are required.

However, any time a processor module (80014 or 80044) is replaced with another processor module that contains a different software level, the system must be set to the default parameters before program and calibration initiation.

Current software levels are identified by the:

- Part number labels on PROM's Z7 and Z8 of the 80014 Processor module (see Figure 8-1)
- Part number labels on PROM's U20 and U21 of the 80044 Processor module (see Figure 8-2)
- GCP display following GCP power off/on cycling or reset when using the 80214 Processor.

Table 6-1:
Recalibration/Reprogramming Requirements Due to Module Replacement

MODULE/ASSEMBLY REPLACEMENT REQUIRING RECALIBRATION		SETUP FOR CALIBRATION REQUIRED?	SETUP FOR APPROACH LENGTH AND LINEARIZATIO N REQUIRED?	ISLAND ADJUSTMENT REQUIRED?	SET TO DEFAULT AND REPROGRAMMIN G REQUIRED?
80011/80211	Island/Intelligent Processor island	No	No	Yes[3]	No
80012	Transceiver	Yes (For track associated with 80012 only)	No	No	No
80013	Relay Drive	No	No	No	No
80014/80044/ 80214	Processor	No	No	No	No
80014/80044/ 80214	Processor (With new software level)[1]	Yes (Both tracks)	Yes[2] (Both tracks)	No	Yes (Both tracks)
80015/80115	Data Recorder	No	No	No	No
80016	DAX	No	No	No	No
80020/80029	Control Interface Assembly1	Yes (Both tracks)	Yes[2] (Both tracks)	No	Yes (Both tracks)
80023/80028/ 80037	Switch Over	Yes (Both tracks)	No	Yes (Both tracks)	No

1. When a new software level is added (new PROM's) or the control interface assembly is replaced, first set the system tothe default parameters and then perform complete reprogramming and recalibration.

2. Can be accomplished by re-entering the EZ and linearization data from the History Card.

3. For track associated with 80011/80211 only.

6.4.2 Recalibration/Reprogramming Requirements Due to Programming Changes

Table 6-2 indicates the recalibration and setup for approach length and linearization requirements that result from any of the indicated programming changes. For example if the number of tracks in the installation is increased from one to two, the following procedures must be performed for track 2 only:

- Setup for calibration
- Setup for approach length
- Linearization

Table 6-2:
Recalibration/Reprogramming Requirements Due to Programming Changes

PROGRAMMING CHANGES REQUIRING RECALIBRATION	SETUP FOR CALIBRATION REQUIRED?	SETUP FOR APPROACH LENGTH AND LINEARIZATION REQUIRED?
Increased Number of Tracks From 1 to 2	Yes (For track 2 only)	Yes (For track 2 only)
GCP Frequency Changed	Yes (Both tracks)	Yes (Both tracks)
Application Changed From: Unidirectional to Bidirectional Or Bidirectional to Unidirectional	Yes (Only for changed track)	Yes (Only for the track that was changed)
Transmit Level Changed From: Medium to Maximum Or Maximum to Medium	Yes (Only for changed track)	No
Approach Length Changed	Yes (Only for changed track)	Yes (Only for the track that was changed)
Ballast Compensation Value Changed	Yes (Only for changed track)	No

6.4.3 Recalibration/Reprogramming Requirements Due to Track Equipment Changes

Table 6-3 indicates the recalibration, setup for approach length and linearization procedures, as well as island adjustments required when any of the changes listed are made to the existing track equipment. For example, when existing termination shunts in an installation are replaced or moved to a different location:

- The approach length entered in the Program menu must be changed to reflect the new approach length and
- Both the setup for calibration and the setup for approach length and linearization procedures must be performed.

Table 6-3:
Recalibration/Reprogramming Requirements Due to Track Equipment Changes

TRACK EQUIPMENT CHANGES REQUIRING RECALIBRATION	SETUP FOR CALIBRATION REQUIRED?	SETUP FOR APPROACH LENGTH AND LINEARIZATION REQUIRED?	ISLAND ADJUSTMENT REQUIRED?
Termination Shunts Changed or Moved to New Location*	Yes	Yes	No
Termination Shunts of Other Frequencies Added, Removed From, or Moved Within 3000 GCP Approach(es)	Yes	Yes	No
Wideband Insulated Joint Coupler (8A076) Replaced in 3000 GCP Approach(es)	Yes	No	No
Tuned Insulated Joint Couplers (62785-f) Replaced in 3000 GCP Approach(es)	Yes	Yes	No
3000 GCP Track Wire(s) Replaced	Yes	No	Yes

*Approach length in the Program menu must be changed to reflect the new approach length.

6.5 CALIBRATION PROCEDURE

Perform the following steps to calibrate the 3000 GCP.

WARNING

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

NOTES

Before proceeding with calibration, ensure that track bonding is good and that all termination shunts, all insulated joint couplers, and all track isolation devices (battery chokes, code isolation units, etc.) are installed.

Refer to Section 3, paragraph 3.15 for tunable insulated joint coupler tuning instructions.

If the 3000 GCP is calibrated under poor ballast conditions, it may require recalibration when the ballast conditions improve.

6.5.1 Automatic Switch Over Systems Only (Main Unit)

Step 1 If either of the following conditions exist, set the STBY/AUTO/MAIN transfer switch located on the associated transfer timer module to the MAIN position (see Figure 6-1):

- The GCP is a dual system with automatic switchover.
- Two Model 3000 GCP's are operated in conjunction with an 80024 Automatic Transfer Timer Unit.

NOTE

The following dual-system GCP models incorporate automatic switchover: 3000D2, 3000D2L, 3008D2, and 3000ND2.

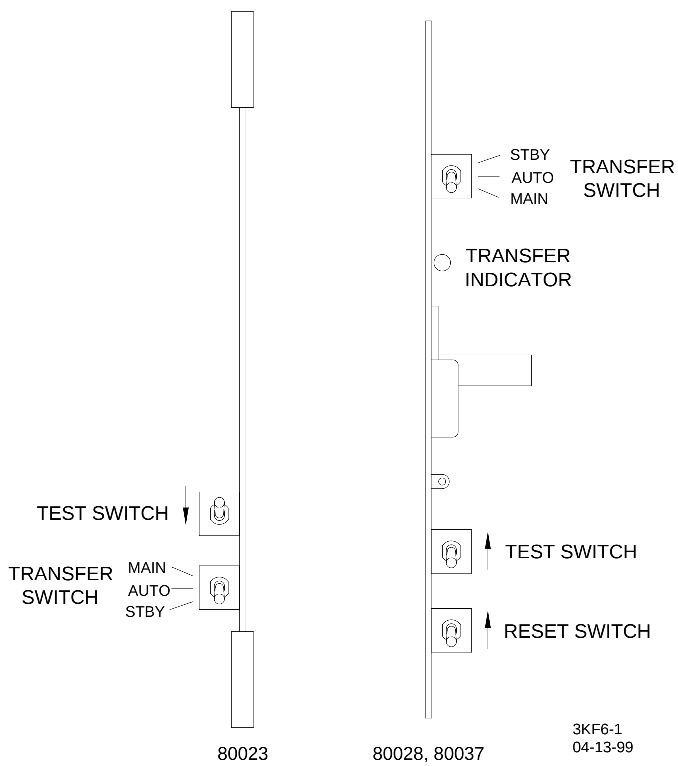

Figure 6-1:
Transfer Switch Location on 80023/80028/80037 Modules

6.5.2 SETUP FOR CALIBRATION - TRACK 1 AND TRACK 2

Step 2 If a 60 or 100 Hz cab signal is in use, turn it off at this time.

Step 2.1 Press the **TRACK 1** key.

Step 2.2 Press and hold the **SETUP** key until the following message is displayed:

SETUP T1 FOR **CALIBRATIONS**

Step 2.3 Press the **ENTER** key.

The following message is displayed while setup is in progress.

SETUP T1 **IN PROGRESS: 3**

NOTES

1. Setup requires approximately 70 seconds to complete.

- The number at the right end of the lower display line increases to 6 as setup progresses.
- Once automatic setup begins, pressing any key on the keyboard aborts the setup procedure.
- When setup is complete, the message shown below is displayed for approximately 2 seconds.

SETUP T1 **COMPLETE**

2. A status display similar to that shown below then appears.

STATUS T1 **EZ: 100 EX: 87**

3. The EZ and EX values displayed are calibrated values.

- The EZ value should be between 98 and 102

- EX should be between 50 and 100. If the EX value is 40 or lower (possibly even a negative value), phasing of the 3000 track wires may be incorrect.

Step 2.4 Record the EZ and EX values from the status display in the **CALIBRATION HISTORY** section of the **3000 GCP APPLICATION HISTORY CARD** as shown in Figure 6-2.

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1=	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP $\pm$	EZ
Z2=	Z2=									
EAST/NORTH	TRACK 1	100	87							
WEST/SOUTH	TRACK 1									
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

Figure 6-2:
CALIBRATION HISTORY Section with EZ and EX Values Entered for Track 1

NOTE

Located at the lower front edge of the 80012 module are three test jacks labeled "Z1", “Z2” and “COM” (see Figure 6-3). In a normally operating system with no problems:

- a DC voltage ranging from 7.5 to 10.0 is present on test jacks **Z1** and **Z2** of the 80012 Transceiver module (see Figure 6-3)
- both voltage levels are the same
- the DC voltage varies depending on ballast and approach length

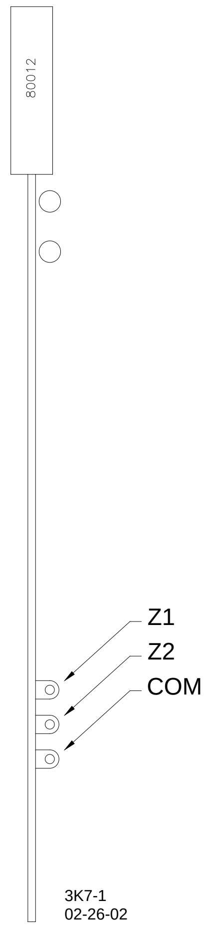

Figure 6-3:
80012 Transceiver Module

Step 2.5 If the EX value is 40 or lower and EZ is 115 or higher, refer to Section 7, paragraph 7.7 for troubleshooting procedures.

Step 2.6 Measure and record the **Z1** and **Z2** values for the track being calibrated in the appropriate space on the **3000 GCP APPLICATION HISTORY CARD** (see Figure 6-4).

Step 2.7 If the **Z1** and **Z2** values are higher or lower than the normal range or are different by more than 0.5 volt, refer to Section 7, paragraph 7.7 for troubleshooting shooting procedures.

Step 2.8 If the GCP is programmed for two tracks, press the **TRACK 2** key and repeat steps 2.2 through 2.7.

Step 2.9 If the cab signal was turned off in step 2, turn it on.

6.5.3 SETUP FOR APPROACH LENGTH AND LINEARIZATION (COMBINED CALIBRATION PROCEDURE)

WARNING

INSULATED JOINT BYPASS COUPLERS, 62531-F AND 62631-F, MUST NOT BE USED WITH THE 3000 GCP.

THE MINIMUM DISTANCES TO THE INSULATED JOINTS SPECIFIED IN TABLE 3-13 APPLY TO THE 3000 GCP ONLY; NOT TO ANY EARLIER SAFETRAN GCP'S (MODELS 660, 600, 400, AND 300).

WHEN THE 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 3-13.

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

THE SETUP FOR APPROACH LENGTH AND LINEARIZATION CALIBRATION PROCEDURE MUST BE PERFORMED AT EACH INSTALLATION TO ENSURE WARNING TIME ACCURACY.

NOTES

The setup for approach length and setup for linearization procedures are combined into a single procedure to simplify track-shunting requirements.

- The combined procedure calculates a modified approach length based on actual approach length (distance to the termination shunt from the crossing track wires) plus the electrical characteristics of the termination shunt and any simulated track placed in series with the shunt.
- This procedure is essential to achieving warning time accuracy, especially for DAX and prime prediction offset circuits.

The linearization procedure compensates for lumped loads in the 3000 GCP approach that can affect the linearity of EZ over the length of the approach and thus is also essential to achieving warning time accuracy.

The types of loads that can affect linearity include:

- Narrow-band shunts of other frequencies in the 3000 GCP approaches. This may occur when MS/GCP approaches overlap in unidirectional or bidirectional installations.
- Other track equipment in the 3000 GCP approaches such as audio frequency overlays, coded track, etc.
- Missing or incorrect type battery chokes.

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1= 9.5	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP $\pm$	EZ
Z2= 9.5	Z2=									
EAST/NORTH	TRACK 1	100	87							
WEST/SOUTH	TRACK 1									
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

Figure 6-4:
CALIBRATION HISTORY Section with Example Z1 and Z2 Values Entered for Track 1

Step 3 If the GCP is equipped with either an 80044 or 80214 processor, verify that the Enhanced Detection mode in the Function menu is programmed to **OFF** before continuing.

Step 3.1 Press the **TRACK 1** key.

NOTES

1. Where applicable, record the requested information at each step and on the Application History Card.

2. The Programmed approach length recorded on the Application History Card is the distance from the termination shunt to the GCP track wires at the crossing (see Figure 6-5). For Bidirectional

applications, the recorded value is the longest shunt-to-track-wire distance.

3. Measure and record within ±1% of the actual distance.

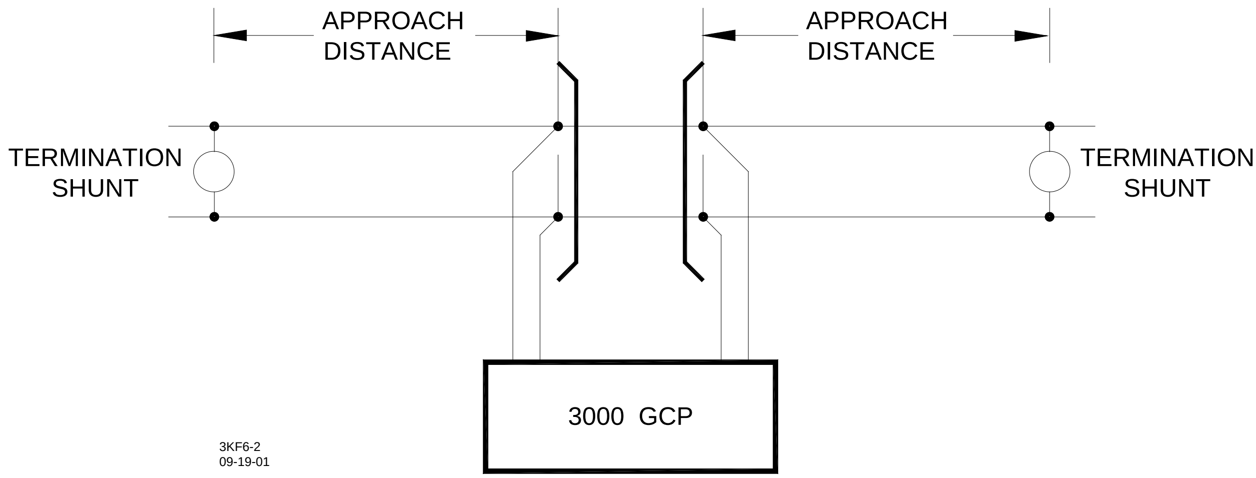

Figure 6-5:
Programmed Approach Distance

Step 3.2 Place a hardwire shunt across the termination shunt.

NOTE

For bidirectional installations, use the termination shunt farthest from the crossing.

Step 3.3 Record the EZ value at the termination shunt on the **CALIBRATION HISTORY** section of the **3000 GCP APPLICATION HISTORY CARD** (see Figure 6-6).

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1= 9.5	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP ±	EZ
Z2= 9.5	Z2=									
EAST/NORTH	TRACK 1	100	87	88		44				
WEST/SOUTH	TRACK 1									
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

Figure 6-6:
CALIBRATION HISTORY Section with Measured EZ and Calculated EZ/2 Values for Track 1 Entered

NOTES

1. Depending upon the frequency and approach length, EZ values down to the high 60's may occur.

2. Simulated track inductors in series with the termination shunt will also affect EZ values.

Step 3.4 Divide the EZ value recorded in step 3.3 by 2. The result is the calculated EZ value at the 50% point in the approach.

Step 3.5 Record the calculated EZ/2 value (see Figure 6-6).

Step 3.6 Remove the hardwire shunt from across the termination shunt.

Step 3.7 Accurately locate the midpoint (50%) in the approach (±1%) and place the hardwire shunt at that point (see Figure 6-7).

Step 3.8 Record the EZ value at the 50% point of the approach (see Figure 6-8).

Step 3.9 Remove the hardwire shunt.

Step 3.10 If the approach is unidirectional (or simulated bidirectional) proceed to step 3.19. Otherwise, install the hardwire shunt at the 50% point of the other approach.

Step 3.11 Record the EZ value at the 50% point of the approach (see Figure 6-8).

Step 3.12 Remove the hardwire from the 50% point.

Step 3.13 Install the hardwire shunt across the termination shunt in the same approach (as step 3.12).

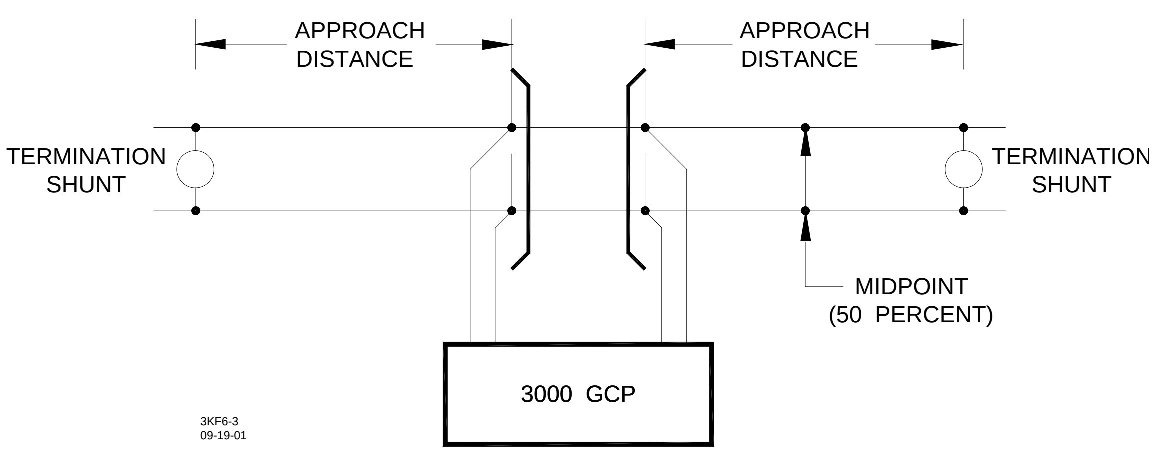

Figure 6-7: Midpoint Location

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1= 9.5	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP $\pm$	EZ
Z2= 9.5	Z2=									
EAST/NORTH	TRACK 1	100	87	88		44	40			
WEST/SOUTH	TRACK 1						35			
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

Figure 6-8:
CALIBRATION HISTORY Section with Measured EZ and Calculated EZ/2 Values for Track 1 Entered

Step 3.14 Record the EZ value at the termination shunt.

Step 3.15 Remove the hardwire shunt.

Step 3.16 Divide the EZ value recorded in step 3.14 by 2. The result is the calculated EZ value at the 50% point in the approach.

Step 3.17 Record the calculated EZ value for the 50% point in the approach (see Figure 6-9).

Step 3.18 Press and hold the **SETUP** key for approximately 3 seconds, then press the down arrow key (▼) until the following message is displayed:

SETUP T1 FOR
APPROACH LENGTH

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1= 9.5	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP $\pm$	EZ
Z2= 9.5	Z2=									
EAST/NORTH	TRACK 1	100	87	88		44	40			
WEST/SOUTH	TRACK 1			92		46	35			
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

Figure 6-9:
CALIBRATION HISTORY Section with Measured EZ and Calculated EZ/2 Values for Opposite Approach of Track 1 Entered

Step 3.19 Press the **ENTER** key. The following message displays.

TERMINATE T1
APPROACH EZ: ##

Step 3.20 Press the **NEW DATA** key.

Step 3.21 Select the smaller of the two EZ values recorded in steps 3.3 and 3.14 and enter this value.

NOTE

If one approach has a simulated track inductor installed to balance the approach lengths, use the EZ value from the other approach.

A display reflecting the entered EZ value displays.

TERMINATE T1
APPROACH EZ: 88

Step 3.22 Press the **ENTER** key.

The display alternates between the programmed approach length and the computed approach length (see sample displays below).

PROGRAM T1	**PROGRAM T1**
APPROACH: 3000	**COMPUTED: 3000**

NOTE

The values shown above are for example only and may vary.

Step 3.24 Record the programmed (**SELECTED**) and **COMPUTED** approach distances on the front of the **3000 GCP APPLICATION HISTORY CARD** (see Figure 6-10).

WARNING TIME SELECTED		T1:		Sec.		Sec.		Sec.
		T2:		Sec.		Sec.		Sec.
APPROACH DISTANCE	SELECTED	T1:	3000	Ft.		Ft.		Ft.
		T2:		Ft.		Ft.		Ft.
	COMPUTED	T1:	3140	Ft.		Ft.		Ft.
		T2:		Ft.		Ft.		Ft.
UAX1 PICKUP DELAY (UAX) (0 = OFF)				Sec.		Sec.		Sec.

Figure 6-10:
Front of History Card with Approach Distances

6.5.4 LINEARIZATION

Step 4 If the 3000 GCP is a unidirectional or simulated bidirectional installation go directly to step 4.2. If the 3000 GCP is a bidirectional installation continue to step 4.1.

Step 4.1 From the **3000 GCP APPLICATION HISTORY CARD** (see Figure 6-9) compare the highest recorded **NO LINEARIZATION EZ** value at the 50% point with the corresponding calculated **EZ/2 VALUE**.

- If the two values are within ±1 of each other, no further action is required for this installation. Proceed to step 4.12.
- If the two EZ values are not within ±1 of each other, continue to step 4.2.

Step 4.2 Press and hold the **SETUP** key for approximately 3 seconds. The following message displays:

SETUP T1 FOR **CALIBRATION**

Step 4.3 Press and release the down arrow key (▼) until the following message is displayed.

SETUP T1 FOR **LINEARIZATION**

Step 4.4 Press the **ENTER** key. The following message is displayed:

LINEARIZATION T1 **VALUE:+ 0 EZ: ##**

NOTE

Steps 4.5, 4.6 and4.7 calculate the correction steps needed to maintain the linearity of EZ over the length of the approach. The examples shown utilize the values provided in Figure 6-9.

Step 4.5 Subtract the EZ value recorded in step 3.8 from the EZ/2 value calculated in step 3.5.

Example: EZ/2 – EZ = delta (Δ) value
44 – 40 = + 4

NOTE

When the EZ value is greater than the calculated EZ/2 value the Δ value will have a negative (-) value. If the EZ value measured was 49 then 44 - 49 = - 5 and a negative value (-10) to be entered in step No 4.6.

Step 4.6 Multiply the Δ value calculated in step 4.5 by 2 to obtain the linearization correction steps.

Example: +4 x 2 = + 8 (plus 8 steps)

Step 4.7 Record the linearization correction steps obtained in step 4.7 (see Figure 6-11).

CALIBRATION HISTORY

80012 DC VOLTAGE READINGS AFTER CALIBRATION		CALIBRATION HISTORY		LINEARIZATION HISTORY						
		EZ/EX VALUES (TRACK UNOCCUPIED)		HARDWIRE SHUNT AT TERMINATION SHUNT			HARDWIRE SHUNT AT 50 PERCENT POINT OF TRACK			
T1	T2						NO LINEARIZATION		LINEARIZATION COMPLETE	
Z1= 9.5	Z1=	EZ	EX	EZ VALUE	EX VALUE	$\frac{EZ}{2}$ VALUE	EZ	EX	STEP ±	EZ
Z2= 9.5	Z2=									
EAST/NORTH	TRACK 1	100	87	88		44	40		+8	
WEST/SOUTH	TRACK 1			92		46	35			
EAST/NORTH	TRACK 2									
WEST/SOUTH	TRACK 2									

Figure 6-11:
CALIBRATION HISTORY Section with Track 1 Linearization Step ± Value Entered

Step 4.8 Press the **NEW DATA** key.

Step 4.9 Press and release the up (▲) or down (▼) arrow keys until the linearization step value (number displayed to the left of the EZ value) and its sign (+/-) equals the **LINEARIZATION STEP** ± value recorded in step 4.8.

NOTES

1. Pressing the up arrow key (▲) increases the linearization step value while pressing the down arrow key (▼) decreases the linearization step value.

2. If the linearization step value exceeds ± 25, an abnormal lumped load may exist and the condition should be investigated. This may be the result of:

- an incorrect frequency termination shunt

- an incorrect shunt location in the 3000 GCP approach
- high resistance bonds
- improperly installed battery chokes
- defective joint couplers.

Step 4.10 Press the **ENTER** key to enter the linearization steps and return to the Status display. The status message is again displayed.

STATUS T1			
EZ:	**100**	**EX:**	**87**

NOTE

The actual EZ and EX values may vary from those shown.

Step 4.11 For two-track systems, press the **TRACK 2** key and repeat steps 3.2 through 4.11 for track 2. At completion of step 4.11, proceed to step 4.13.

Step 412 If the Enhanced Detection mode in the Function menu was originally programmed **ON** and then programmed to **OFF** in Step 3, program the Enhanced Detection mode again to **ON**.

Step 4.13 Press the **SYSTEM STATUS** key. The 3000 GCP returns to the System Status Mode.

NOTES

1. If the 3000 GCP includes one or two island modules (80011), perform the following island circuit adjustment procedure for track 1 first (leftmost 80011 module in the case) then for track 2, if applicable.

2. If the microprocessor-based Intelligent Processor Island (IPI) module (80211) is used in place of the 80011, skip steps 5 through 5.3 and perform the IPI Track Circuit calibration procedure in steps 6 through 6.9.

6.5.5 80011 ISLAND ADJUSTMENT - TRACK 1 AND TRACK 2

Step 5 Determine the island frequency of the track circuit to be adjusted.

Step 5.1 Temporarily install a hardwire shunt at the distance beyond the island receiver rail connections specified for the corresponding island frequency in Table 6-4.

Table 6-4:
Island Frequency Shunt Distance (80011 Module)

SLAND FREQUENCY (KHZ)	0.12 OHM SENSITIVITY SHUNT DISTANCE (FEET)	0.3 OHM SENSITIVITY SHUNT DISTANCE (FEET)	0.4 OHM SENSITIVITY SHUNT DISTANCE (FEET)	0.5 OHM SENSITIVITY SHUNT DISTANCE (FEET)
4.0	10.5	27	36	45
4.9	9.0	23	31	39
5.9	7.5	19	26	32
7.1	6.5	17	23	29
8.3	6.0	15	20	25
10.0	5.0	13	18	22
11.5	4.5	12	16	20
13.2	4.0	10	14	17
15.2	3.5	9	12	15
17.5	3.0	8	11	14
20.2	3.0	8	11	14

NOTE

For all installations where poor shunting has been experienced or is anticipated, 0.3 ohm shunting sensitivity calibration is recommended.

Step 5.2 Adjust the Island module gain potentiometer (**ADJ**) CW until the 80011 module **STATUS** LED indicator lights, then slowly adjust the potentiometer CCW until the indicator just goes out.

NOTE

At some installations, the **STATUS** LED indicator may not light even when the island gain potentiometer is adjusted to the fully CW position. This condition is satisfactory if the indicator lights when the hardwire shunt installed in step 5.1 is removed from the rails.

Step 5.3 Remove the hardwire shunt from the rails.

CAUTION

LOWERING THE ISLAND FREQUENCY MAY BE REQUIRED IN LONGER CIRCUITS WITH POOR BALLAST CONDITIONS.

NOTE

At installations where poor island shunting is encountered, an adjustment procedure using 0.3 ohm shunting sensitivity or higher can be used.

Step 5.4 Place a 0.06-ohm shunt across the track at the receiver track wires.

Step 5.5 Verify that the shunt causes the island to deenergize and the crossing to activate.

Step 5.6 Remove the shunt installed in step 5.4 and place it across the transmitter track wires.

Step 5.7 Verify that the shunt causes the island to deenergize and the crossing to activate.

Step 5.8 Remove the 0.06-ohm shunt installed in step 5.6.

6.5.6 80211 IPI TRACK CIRCUIT CALIBRATION – TRACK 1 AND TRACK 2

Step 6 Cycle GCP case power and note the software version of the IPI module.

NOTE

The software version is identified on the IPI display for approximately 5 seconds at power up.

Step 6.1 Set the 3000 GCP case **POWER** switch to the **OFF** position.

Step 6.2 Remove the Intelligent Processor Island (IPI) module (80211) from the case.

Step 6.3 Select the desired IPI operating frequency by installing the provided shorting block across the appropriate pair of frequency selection pins on the 16-position header (see Figure 6-12).

Step 6.4 If the software version noted in step 6 is A01D or earlier, proceed to step 6.6.

Step 6.5 On modules running software version A01E or later set the pick up delay time for the IPI module as required using the A and B header positions (see Figure 6-12). Refer to Table 6-5 for proper jumper placement.

NOTE

Modules running software version A01E and later are supplied with two pickup delay time selection jumpers.

Table 6-5:
Pickup Delay Jumper Placement

INSTALL JUMPER IN THESE HEADER POSITIONS	PICKUP DELAY TIME ADDED (SECONDS)
A & B	0
A	2
B	4
no jumper on A or B	6

Step 6.6 Reinstall the IPI module in the case.

Step 6.7 Set the 3000 GCP case **POWER** switch to the **ON** position.

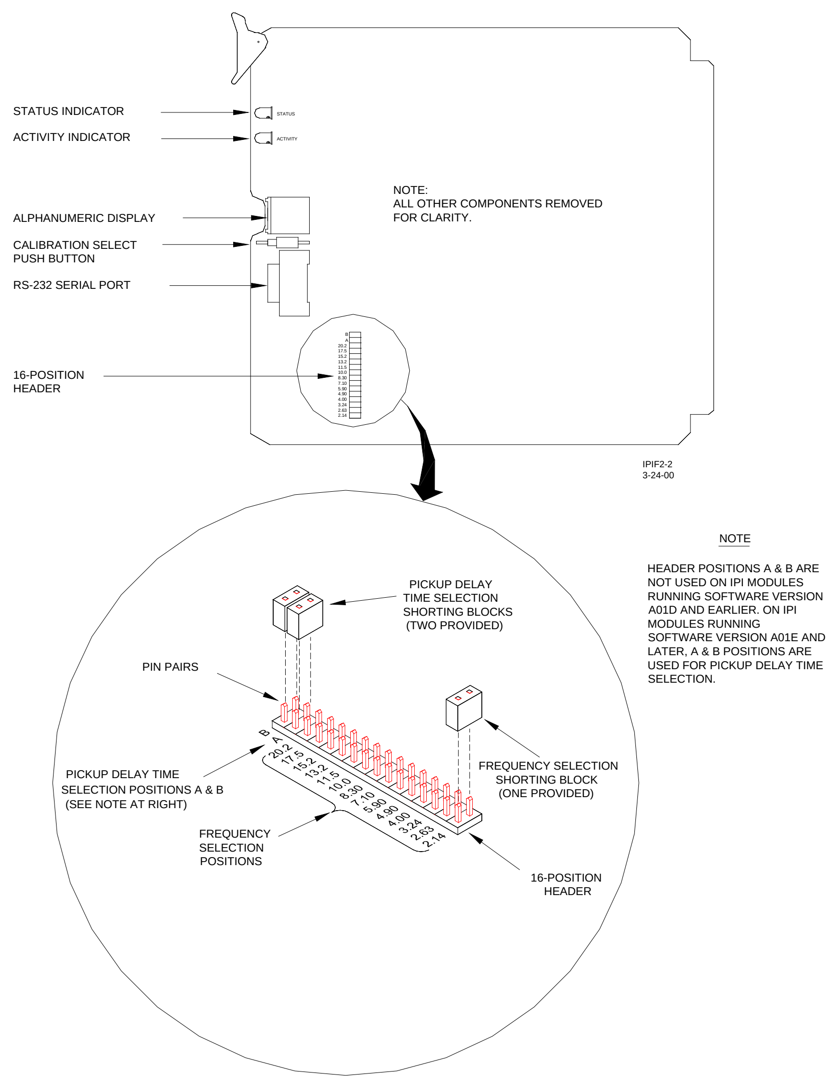

Figure 6-12:
Jumper Position on IPI 16-Position Header

NOTE

Make sure that power is applied to the IPI module for a minimum of 20 seconds before proceeding to step 6.8.

Only one frequency selection jumper is allowed. A missing frequency jumper, or two or more frequency jumpers, render an invalid selection.

Step 6.8 Temporarily install a **hardwire** shunt at the appropriate distance beyond the receiver rail connections as specified in Table 6-6.

NOTE

The island circuit shunting sensitivity chart below provides shunt distance values for shunting sensitivities of 0.12 and 0.3 ohm plus 0.4 and 0.5 ohm for areas where poor shunting is a problem.

Table 6-6:
IPI Shunt Distance

ISLAND FREQUENCY (KHZ)	0.12 OHM SENSITIVITY SHUNT DISTANCE (FEET)	0.3 OHM SENSITIVITY SHUNT DISTANCE (FEET)	0.4 OHM SENSITIVITY SHUNT DISTANCE (FEET)	0.5 OHM SENSITIVITY SHUNT DISTANCE (FEET)
2.14	20.0	50	67	84
2.63	17.0	43	58	72
3.24	13.0	33	44	55
4.0	10.5	27	36	45
4.9	9.0	23	31	39
5.9	7.5	19	26	32
7.1	6.5	17	23	29
8.3	6.0	15	20	25
10.0	5.0	13	18	22
11.5	4.5	12	16	20
13.2	4.0	10	14	17
15.2	3.5	9	12	15
17.5	3.0	8	11	14
20.2	3.0	8	11	14

NOTE

For all installations where poor shunting has been experienced or is anticipated, a 4-second pickup delay jumper setting and 0.3 ohm shunting sensitivity calibration are recommended.

Step 6.9 Press and hold the IPI calibration select push button for 2 seconds until **REL** (release) appears on the display. Immediately release the push button and then momentarily press it again within 2 seconds.

The automated calibration process starts and **CAL*** appears on the display.

NOTES

1. The IPI module remains in the automatic Calibration mode for approximately 20 seconds. During this time, the display indicates **CAL*** for 6 seconds, **DONE** momentarily, **BOOT** for 9 seconds, and then the software revision level is displayed for 5 seconds. When the calibration process is complete, the IPI operating frequency is displayed (alternates with pickup delay setting when running A01E and later software versions).

2. If **FAIL** appears on the display, the calibration process did not complete. Should this happen, cycle the GCP power and then repeat step 6.9. If **FAIL** appears again, replace the IPI module.

3. In certain applications with adverse ballast conditions the IPI track circuit may experience interference from islands with the same frequency at distances further than 5000 feet away.

Step 6.10 Once the calibration cycle is complete and the IPI operating frequency (and pickup delay setting if applicable) appears on the display, verify the following:

- IPI operating frequency is correct
- pickup delay setting is correct (if applicable)
- IPI Status indicator is off
- IPI relay drive voltage is 0 VDC

Step 6.11 Remove the hardwire shunt installed in step 6.8 and then verify the following:

- IPI STATUS indicator is lit
- IPI relay drive voltage is more than 10 VDC

Step 6.12 Place a 0.06-ohm shunt across the track at the receiver track wires.

Step 6.13 Verify that the shunt causes the island to deenergize and the crossing to activate.

Step 6.14 Remove the shunt installed in step 6.12 and place it across the transmitter track wires.

Step 6.15 Verify that the shunt causes the island to deenergize and the crossing to activate.

Step 6.16 Remove the 0.06-ohm shunt installed in step 6.14.

6.5.7 AUTOMATIC SWITCH OVER SYSTEMS (STANDBY UNIT) (MODELS 3000D2, 3000D2L, 3008D2, AND 3000ND2)

Step 7 If either of the following conditions exist, set the STBY/AUTO/MAIN transfer switch located on the associated transfer timer module to the STBY position (see Figure 6-1). Otherwise proceed to OPERATIONAL CHECKS, paragraph 6.6.

- The GCP is a dual system with automatic switch over.
- Two Model 3000 GCP's are operated in conjunction with an 80024 Automatic Transfer Timer Unit.

NOTE

The following dual-system GCP models incorporate automatic switchover: 3000D2, 3000D2L, 3008D2, and 3000ND2.

Step 7.1 Repeat steps 2 through 6.16 for the standby unit. At completion of step 6.16, proceed to step 8.

NOTE

If necessary, move the Keyboard/Display assembly to the standby module set. The standby module set is located in:

- The lower bay in 3000D2 and 3008D2 units
- The left side of case in 3000D2L.

6.5.8 DAX SETTING ON TRANSFER TIMER MODULE (80028/80037) (3000D2, 3000D2L, 3008D2, AND 3000ND2 UNITS ONLY)

Step 8 Set the 3000 GCP case **POWER** switch to the **OFF** position.

Step 8.1 Remove the Transfer Timer module (80028/80037) from the case.

Step 8.2 Set the Transfer Timer module DAX selection switch(es) (Figure 6-12) according to the following:

- If an 80028 Transfer Timer module is used in a 3000D2 or 3000D2L unit, configure switch S1 on the module to correspond to the DAX's programmed for the system.
- For example, when A and B DAX circuits are used, S1 is set as follows:

- Slide the controls for sections A and B to the DAX used position (left side of switch as viewed in Figure 6-12).
- Slide the controls for sections C and D to the **DAX NOT USED** position (labeled to right of switch).

- If an 80028 Transfer Timer module is used in a 3000ND2 unit, set all switch S1 sections to the **DAX NOT USED** position.
- If an 80037 Transfer Timer module is used in a 3008D2 unit, configure switches SW1 and SW2 on the module to correspond to the DAX circuits programmed for the system.
- For example, when DAX circuits A through F are used, SW1 and SW2 are set as follows:
  - Slide the controls for switch SW2 sections A, B, C, and D (labeled on board) to the DAX used position (left side of switches as viewed in Figure 6-13).
  - Slide the controls for switch SW1 sections E and F, (labeled on board) to the DAX used position (left side of switches as viewed in Figure 6-13).
  - Slide the controls for SW1 sections G and H to the **DAX NOT USED** position (labeled to right of switch).

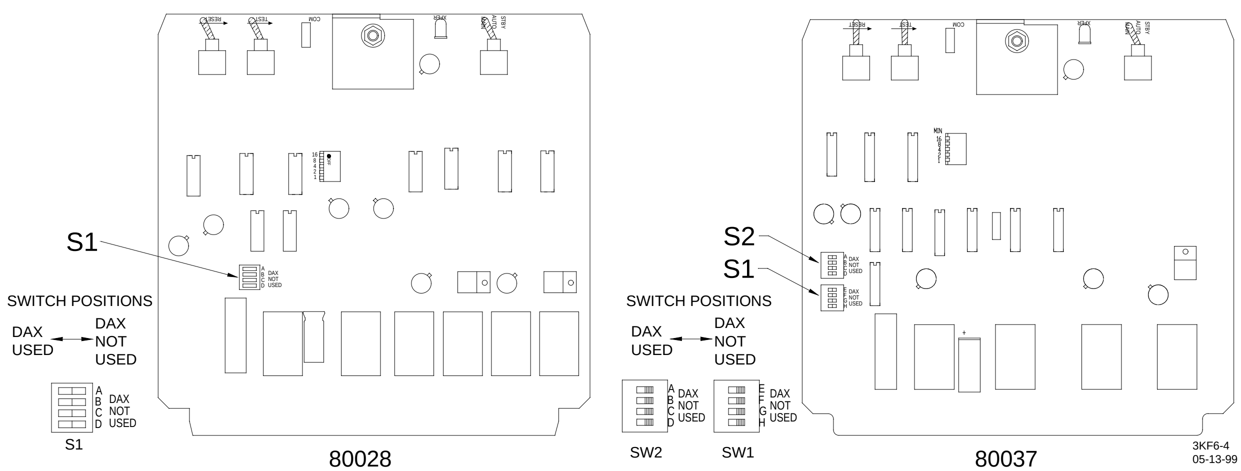

Figure 6-13:
Location of DAX Selection DIP Switches S1 (80028) And SW1/SW2 (80037)

Step 8.3 Return the transfer timer module to its original card slot in the GCP case.

Step 8.4 Set the GCP case **POWER** switch to the **ON** position.

6.5.9 AUTOMATIC SWITCH OVER TEST - MODELS 3000, 3000D2, 3000D2L, 3008D2, 3000ND, AND 3000ND2 GCP'S THAT OPERATE IN CONJUNCTION WITH EXTERNAL AUTOMATIC TRANSFER TIMER UNIT, 80024

Step 9 On the automatic transfer timer module (80028, 80037, or 80023), set the **STBY/AUTO/MAIN** transfer switch (see Figure 6-14 for location) to the **AUTO** (center) position.

Step 9.1 Reset the transfer timer as follows:

- If using the automatic transfer timer module (80028 or 80037) momentarily hold the **RESET** switch in the up position until the **XFER** LED on the 80028/80037 module is lighted (see Figure 6-14 for switch and LED location).
- If using the automatic transfer timer unit (80024), momentarily press the **RESET** push button until the **NO XFER WHEN LIT** LED indicator on the 80024 unit is lighted (see Figure 6-14 for push button and LED location).

Step 9.2 On the automatic transfer timer module, hold the **TEST** switch (see Figure 6-14 for location) in the **TEST** position until the corresponding **XFER** LED is extinguished.

The light should extinguish within 4 seconds, verifying that that the timer is operational and that transfer to the standby has occurred.

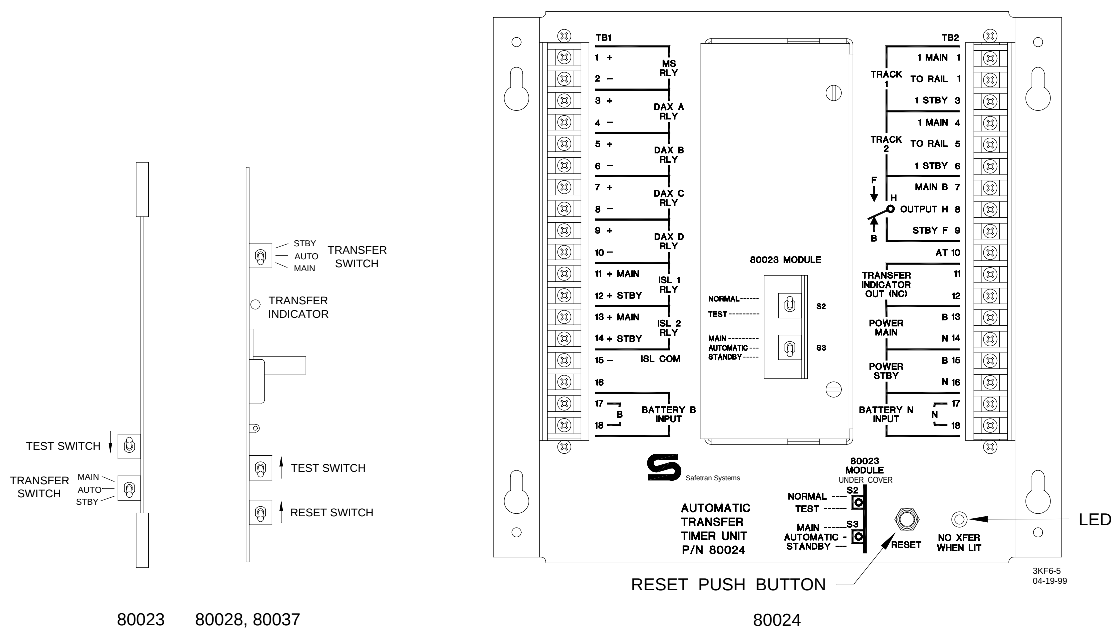

Figure 6-14:
Reset Switch and Transfer Indicator Locations

NOTE

During normal operation, transfer occurs within 3 minutes (factory default setting), or the time interval selected by DIP switch S1 (80023), S4 (80028), or SW3 (80037) if a failure is detected in one module set (see Figure 6-15 for switch locations).

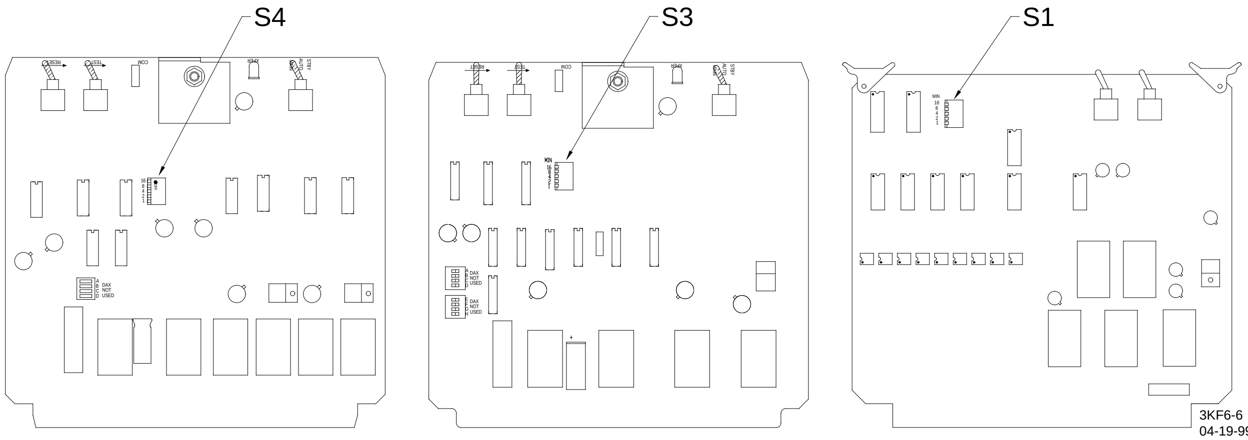

Figure 6-15:
Location of DIP Switches S1, S3, And S4

Step 9.3 Perform the following applicable operation:

- If using the automatic transfer timer module (80028/80037), momentarily place the **RESET** switch in the **RESET** (up) position.
- If using the automatic transfer timer unit (80024), momentarily press the **RESET** push button (see Figure 6-15 for switch and push button locations).

Step 9.4 Verify that the main GCP module set is operating and the **XFER** LED indicator on the 80028/80037 module or the **NO XFER WHEN LIT** LED indicator on the 80024 unit (whichever is applicable) is lighted. The unit is now ready to perform the transfer function in the event a module failure is detected. Proceed to Operational Checks, paragraph 6.6.

NOTE

If necessary, return the keyboard/display assembly to its original position in the main module set.

6.6 OPERATIONAL CHECKS

Following system calibration and prior to placing the system in service, perform the operational checks and memory clear functions (optional) described in the following procedure.

6.6.1 UAX CHECKOUT

Step 1 If the 3000 GCP is programmed for UAX (value other than 0 entered in the Program menu for UAX pickup delay time), remove the wire connected to TB2-7 (+UAX) (TB3-7 on 8-DAX units).

Otherwise, proceed to step 1.7.

Step 1.1 Verify that the crossing warning devices immediately activate.

WARNING

WHEN THE UAX FEATURE IS OFF (NO TIME ENTERED), THE UAX TERMINALS ON THE GCP FRONT PANEL HAVE NO CONTROL OVER MS/GCP RELAY DRIVE.

Step 1.2 Return the wire removed in step 1 to the +UAX terminal.

Step 1.3 Verify that the crossing warning devices continue to operate for the length of time programmed for the UAX pickup delay.

Step 1.4 Deenergize the line circuit that controls the UAX terminals at the far end.

Step 1.5 Verify that the UAX is deenergized while the line circuit is deenergized and the crossing is activated.

Step 1.6 Reenergize the line circuit.

Step 1.7 If the 3000 GCP is programmed for UAX2 (value other than 0 entered in the Program menu for UAX2 pickup delay), remove the wire connected to TB1-5 (ENA/UAX2). Otherwise, proceed to step 2.

Step 1.8 Verify that the crossing warning devices immediately activate.

Step 1.9 Return the wire removed in step 1.7 to the ENA/UAX2 terminal.

Step 1.10 Verify that the crossing warning devices continue to operate for the length of time programmed for the UAX2 pickup delay.

Step 1.11 Deenergize the line circuit that controls the ENA/UAX2 terminal at the far end.

Step 1.12 Verify that the UAX2 is deenergized while the line circuit is deenergized.

Step 1.13 Reenergize the line circuit.

6.6.2 TRACK WIRE VERIFICATION (TRACK WIRE ROUTING CONNECTIONS CHECKS)

NOTE

Failure of the following tests indicates problems in the track wire routing and/or connections.

Step 2 Press the **SYSTEM STATUS** key. The following display appears (actual EZ and EX values may vary):

STATUS T1			
EZ:	**99**	**EX:**	**97**

Step 2.1 Select track 1 or track 2 display, as applicable.

Step 2.2 Remove one transmit wire from the rail connection.

Step 2.3 Verify that:

- the crossing activates
- the associated island circuit (if used) deactivates
- the displayed EZ value changes to 0
- Error 8113 (T1) or Error 8117 (T2) displays

NOTES

1. If the transmit wire is removed from the rail of track 1, the following messages alternate on the display (actual EX value may vary):

STATUS T1			
EZ:	**0**	**EX:**	**106**

ERROR 8113	**<1>**
T1 XMIT CURRENT	

2. If the transmit wire is removed from the rail of track 2, the following messages alternate on the display (actual EX value may vary):

STATUS T2			
EZ:	**0**	**EX:**	**106**

ERROR 8117	**<1>**
T1 XMIT CURRENT	

Step 2.4 Measure the DC voltages at test jacks **Z1** and **Z2** of the 80012 Transceiver module for the associated track (see Figure 6-3). Verify that 0 VDC is measured at both jacks.

Step 2.5 Replace the transmit wire and allow the 3000 GCP to time out.

Step 2.6 Perform steps 5 through 5.2 to clear the error message.

Step 2.7 Press the **SYSTEM STATUS** key. The Status Mode display again appears

Step 2.8 Remove one receiver wire from the rail connection.

Step 2.9 Verify that:

- the crossing activates
- the associated island circuit (if used) deactivates

- the displayed EZ value changes to 0
- Error 9111 (T1) or Error 9112 (T2) displays

NOTES

1. If the receiver wire is removed from the rail of track 1, the following messages alternate on the display (actual EX value may vary):

```
STATUS T1
EZ:     0   EX:     106
```

```
ERROR 9111        <1>
T1 GAIN CHECK
```

2. If the receiver wire is removed from the rail of track 2, the following messages alternate on the display (actual EX value may vary):

```
STATUS T2
EZ:     0   EX:     106
```

```
ERROR 9112        <1>
T2 GAIN CHECK
```

Step 2.10 Measure the DC voltages at test jacks **Z1** and **Z2** of the 80012 Transceiver module for the associated track (see Figure 6-3). Verify that 0 VDC is measured at **Z1** and 7.5 to 10.0 VDC is measured at **Z2**.

Step 2.11 Replace the receiver wire and allow the 3000 GCP to time out.

Step 2.12 Perform steps 5 through 5.2 to clear the error message.

Step 2.13 Press the **SYSTEM STATUS** key. The Status Mode display again appears.

Step 2.14 Place a hardwire shunt across the track at the transmit wires.

Step 2.15 Verify that:

- the associated island circuit (if used) deactivates
- the displayed EZ value changes to less than 2

Step 2.16 Measure the DC voltages at test jacks **Z1** and **Z2** of the 80012 Transceiver module for the associated track (see Figure 6-3). Verify that a value less than 0.25 VDC is measured at both jacks.

Step 2.17 Remove the shunt installed in step 2.14 and place it across the receiver track wires.

Step 2.18 Verify that:

- the associated island circuit (if used) deactivates
- the displayed EZ value changes to less than 2

Step 2.19 Measure the DC voltages at test jacks **Z1** and **Z2** of the 80012 Transceiver module for the associated track (see Figure 6-3). Verify that a value less than 0.25 VDC is at **Z1**.

- In a four-wire application verify that a value less than 2.0 VDC is at **Z2**.
- In a six-wire application verify that a value less than 0.25 VDC is at **Z2**.

Step 2.20 Remove the shunt installed in step 2.17.

Step 2.21 For single-track systems, proceed to Operational Performance Checks.

Step 2.22 For two-track systems, repeat Steps 2.1 through 2.20 for the other track. At completion of step 2.20, proceed to Operational Performance Checks.

6.6.3 OPERATIONAL PERFORMANCE CHECKS

System operational performance must be verified by observing system operation and the change in EZ during inbound train moves on each approach. Proceed with the operational checks below:

Step 3 Press the **SYSTEM STATUS** key. The following display appears (actual EZ and EX values may vary):

STATUS T1			
EZ:	**99**	**EX:**	**97**

Step 3.1 Select track 1 or track 2 display as applicable.

Step 3.2 Verify that the crossing warning operates properly and that the EZ value changes in accordance with the following:

- The EZ value for a good shunting track must begin to decrease from the no-train value (ideally 100) as an incoming train passes the termination shunt and should decrease smoothly to zero (0) as the train arrives at the crossing.
- For bidirectional installations, the value should increase as the train leaves the crossing and continue increasing smoothly until the last car passes the termination shunt.

WARNING

IF A RAPID CHANGE OCCURS IN THE VALUE OF EZ AT ANY TIME WHILE THE TRAIN IS MOVING WITHIN THE TERMINATION SHUNTS, TRACK DISCONTINUITY CAUSED BY A HIGH RESISTANCE BOND OR A DEFECTIVE COUPLER IS INDICATED. LOCATE AND CORRECT THE PROBLEM IMMEDIATELY.

NOTE

In some bidirectional applications, approaches are of different lengths and a simulated track is placed in one approach circuit to make the approaches appear electrically equal. In this application, there is a normal and acceptable decrease in EZ as a train just enters the GCP approach when passing a set of insulated joints.

Step 3.3 For applications where poor shunting is expected, verify that the Enhanced Detection mode has been programmed **ON** in the Function menu and that the crossing warning operates properly.

- Enhanced detection software is available only with 80044 and 80214 processor modules.

WARNING

ENSURE THAT INBOUND TRAIN SHUNTING IS ADEQUATE FOR 3000 GCP ENHANCED DETECTION OPERATION BY VERIFYING THAT EZ IS CONSISTANTLY VARYING (CHANGING) ON INBOUND TRAINS THROUGHOUT THE GCP APPROACH CIRCUIT. ALSO VERIFY THAT EZ IS CONSISTANTLY LESS THAN 25 WHEN THE HEAD END OF EACH TRAIN ARRIVES AT A POINT APPROXIMATELY 50 FEET PRIOR TO THE GCP TRACK WIRES AT THE CROSSING. IF THERE IS ANY QUESTION REGARDING THE SHUNTING CHARACTERISTICS AT AN INSTALLATION, CONTACT SAFETRAN TECHNICAL SUPPORT.

Step 3.4 If the 6-volt DC Shunting Enhancer Panel, 80049, (see Section 3) is used to improve wheel-to-rail shunting, verify that there is a minimum of 5.0 volts DC on the track with no train present. Otherwise, proceed to step 3.8.

Step 3.5 Remove AC power from the panel.

Step 3.6 Verify that a minimum of 4.5 volts DC is still present on the track.

Step 3.7 Restore AC power to the panel.

Step 3.8 Verify proper warnings times on speed limit train moves, including all DAX and preempt circuits.

Step 3.9 For two-track systems, Repeat Steps 3.1 through 3.9 for the other track.

This completes vital calibration of the 3000 GCP.

6.6.4 CLEARING RECORDED DIAGNOSTIC MESSAGES FROM MEMORY

During programming, calibration, or normal system operation, any diagnostic messages generated by the system are stored in memory. The messages are identified by four-digit codes that are cross-referenced in Table 7-2 of Section 7. To view the recorded messages, first press the **ERROR** (diagnostic) key and then use the arrow keys to scroll through the messages.

Following system installation or maintenance, it is frequently desirable to clear the portion of memory where these messages are stored prior to leaving the crossing site. This ensures a fresh start with no old data contained in memory. Clearing this portion of memory also resets the HZ (highest EZ value recorded) and LX (lowest EX value recorded) values in memory to the present values of EZ and EX.

To clear the recorded messages from memory and reset the HZ and LX values, proceed as follows:

Step 4 Press the **SYSTEM RESET** key. The following message is displayed:

SYSTEM RESET

Step 4.1 Press and hold the **SYSTEM RESET** key (approximately 3 seconds) until the following message is displayed:

PRESS ENTER TO **CLEAR ERRORS**

Step 4.2 Press the **ENTER** key. When memory is clear, the following message is displayed:

ERROR	**<0>**

6.6.5 CLEARING TRAIN MOVE HISTORY FROM MEMORY

During normal operation, the system records certain parameters relating to train moves within the track section monitored by the 3000 GCP (warning time, detected speed, average speed, and island speed). The recorded train move data is stored in memory and can be viewed by pressing the **HISTORY** key on the keyboard.

To clear all recorded train move data from memory, proceed as follows:

Step 5 Press the **SYSTEM RESET** key. The following message is displayed:

SYSTEM RESET

Step 5.1 Press and hold the **SYSTEM RESET** key for approximately 3 seconds. The following message is displayed.

PRESS ENTER TO
CLEAR ERRORS

Release the **SYSTEM RESET** key.

Step 5.2 Press the down arrow key (▼) once. The following message is displayed:

PRESS ENTER TO
CLEAR HISTORY

Step 5.3 Press the **ENTER** key. The following message is displayed, indicating all events in memory have been cleared:

HISTORY T1	**<0>**
7	

6.7 DATA RECORDER MODULE SETUP

For systems equipped with the optional data recorder module (80015/80115), use the following procedure to set the date and time.

NOTE

Ensure that the data recorder option is installed before continuing with this procedure (see Section 5, paragraph 5.4, step 18 Condensed Programming Procedures).

6.7.1 Setup the Data Recorder Module

Step 1 Verify that the **STATUS** and **LO BATT** LED's on the data recorder module are lighted steady (see Figure 6-16 for LED locations).

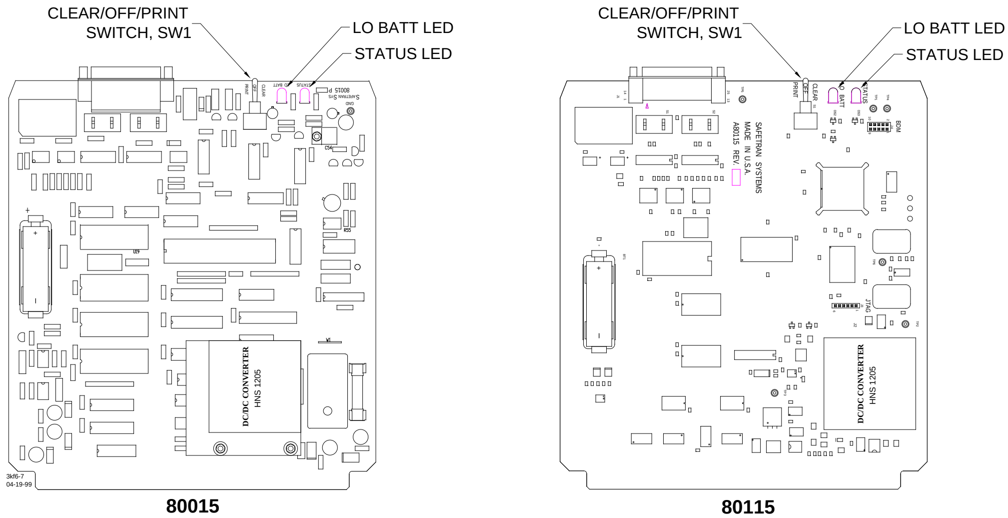

Figure 6-16:
Data Recorder Component Location

NOTES

1. If the **LO BATT** LED is flashing, replace the memory retention battery on the data recorder module. See Section 9, paragraph 9.2.9 for procedure.

2. Steps 2 through 4.2 correspond to steps 23 through 25.2, respectively, in the programming procedure (see Section 5). If the parameters affected by these steps were previously programmed, perform steps 2 through 4.2 to verify correct date and time.

6.7.2 Program the Date

Step 2 Press the down arrow key (▼) until the date display message (similar to that shown below) appears.

PROGRAM			**DATE**
FRI	**07**	**SEP**	**2007**

Step 2.1 Press the **NEW DATA** key. The cursor appears at the first digit of the day-of-the-month entry.

Step 2.2 Enter the day of the month. The entry must consist of two digits (**01, 12, 27, etc**.). When the second digit is entered, the cursor moves to the first letter of the month entry.

Step 2.3 Use the up (▲) or down (▼) arrow keys to display the desired month entry.

Step 2.4 Press the **NEW DATA** key. The cursor appears at the first digit of the year entry.

Step 2.5 Enter all four digits for the year entry (**1999**, **2000**, etc.). As the last digit is entered, the applicable day of the week is automatically displayed and the cursor moves to the first letter of the day-of-the-week entry.

Step 2.6 Review all time entries and change any if necessary.

Step 2.7 Press the **ENTER** key.

6.7.3 Program the Time

Step 3 Press the down arrow key (▼) once. A time display message similar to that shown below appears.

PROGRAM	**TIME**
12:45:56	**<24 HR>**

Time is displayed in hours:minutes:seconds (hh:mm:ss) format.

Step 3.1 Press the **NEW DATA** key. The cursor appears at the first digit of the hours entry.

Step 3.2 Enter the hours. The entry must consist of two digits (**01**, **02**. etc.). When the second digit is entered, the cursor moves to the first digit of the minutes entry.

NOTE

If 24-hour (military) time format is used, be sure to enter the hours in the same format (01, 12, 18, 21, etc.).

Step 3.3 Enter the minutes. The entry must consist of two digits (**01**,**12**, **21**, etc.). When the second digit is entered, the cursor moves to the first digit of the seconds entry.

NOTE

To ensure precise time setting, it may be helpful to set the minutes entry approximately two minutes ahead of the actual time to allow sufficient time to complete steps 3.4 and 3 .5 below. Then, when the entered minutes time arrives, step 3.6 can be performed.

Step 3.4 Enter the seconds. The entry must consist of two digits (**01**, **12**, **21**, etc.). When the second digit is entered, the cursor moves to the first character of the time format (**AM**, **PM**, **24 HR**) entry.

Step 3.5 Use the up (▲) or down (▼) arrow keys to display the desired time format entry. When using 24-hour (military) format, follow the time entry with **24 HR**. When using standard 12-hour format, follow the time entry with **AM** or **PM**, whichever is appropriate.

Step 3.6 Press the **ENTER** key at the exact second when real time coincides with the time entered on the display.

Step 3.7 Verify that the seconds portion of the display is advancing.

6.7.4 Program Daylight Savings Time

NOTE

Safetran Systems software does not support the changes passed by the US Congress in regards to shifting Daylight Savings Time from the traditional dates as has been the case since October/November 2007.

Step 4 Press the down arrow key (▼) once. The following daylight savings time message is displayed.

PROGRAM DAYLIGHT **SAVINGS: OFF**

Step 4.1 Press the **NEW DATA** key. Each time the **NEW DATA** key is pressed, the entry toggles between **OFF** and **ON**.

- If daylight savings time is to be used, select **ON** and the recorder will change the time setting automatically at the beginning (2:00 a.m. on the first Sunday in April) and end (2:00 a.m. on the last Sunday in October) of the daylight savings time period.
- If daylight savings time is not to be used, select **OFF**.

Step 4.2 Press the **ENTER** key when the applicable condition is displayed.

Step 5 To clear the data recorder memory, press and hold the **CLEAR/OFF/PRINT** switch (see Figure 6-16) in the **CLEAR** position for approximately 5 seconds until the **LO BATT LED** indicator begins to flash. The recorder memory is now clear.

NOTE

Data recorder memory should be cleared at initial installation by performing this step immediately prior to placing the system in operation.

6.8 DATA RECORDER OPERATIONAL CHECKS

With a data recorder module (80015 or 80115) installed and the system programmed to enable the option, perform the following operational checks to verify proper data recorder operation before placing the 3000 GCP in service.

- Refer to Section 5, paragraph 5.16, programming steps 18 and 23 through 25.2, for Data Recorder programming instructions.
- For procedures for downloading recorded data to a computer file or printing recorded data, refer to Section 9, paragraph 9.2.3 or 9.2.4, respectively.

6.8.1 VERIFY CORRECT TIME AND DATE

Step 1 Press the **SYSTEM STATUS** key.

Step 1.1 Use the up arrow key (▲) to scroll through the Status menu until the time/date display similar to that shown below appears.

Step 1.2 Verify that the time and date appearing on the display are correct.

STATUS	**12:45:23**
FRI	**17 SEP 2007**

6.8.2 VERIFY EVENT RECORDING OPERATION

Step 2 Press the **EVENT** key. A display similar to that shown below appears. Note the value in the upper right corner (17 in the following example).

Step 2.1 Observe one or more train moves.

EVENTS	**< 17>**
START PRINT:	**1**

Step 2.2 Press the **EVENT** key.

Step 2.3 Verify that the number in the upper right corner of the display has advanced (note the new value).

Step 2.4 If any of the 16 external inputs to the data recorder are used, activate one of the inputs at the interface panel by momentarily removing and then restoring the input.

NOTE

Removing and restoring an input constitutes two input changes.

Step 2.5 Press the **EVENT** key.

Step 2.6 Verify that the number in the upper right corner of the display has advanced by 2.

Step 2.7 Repeat steps 2.4 and 2.6 for each of the external inputs being used.

Step 2.8 Clear the data recorder memory by momentarily placing the **CLEAR/OFF/PRINT** switch on the data recorder module (see Figure 6-16) in the **CLEAR** position (approximately 5 seconds) until the **LO BATT LED** on the module begins to flash.

The recorder memory is now clear.

6.9 INPUT AND OUTPUT TESTS

Following system calibration and prior to placing the system in service, perform the Input and Output tests described in the following pages.

WARNING

WHENEVER SYSTEM TESTING OR MONITORING IS PERFORMED AT A HIGHWAY GRADE CROSSING, ENSURE ADEQUATE PROTECTION IS PROVIDED FOR PERSONNEL, VEHICLES AND TRAINS.

NOTE

After completion of any system configuration changes or software changes, perform the Input and Output Tests described on the following pages.

Prior to monitoring operation with trains, the following items should be verified:

1. One at a time, open all inputs to **UAX 1** and **UAX 2** terminals and verify that warning system operates.
2. One at a time, power off all GCP systems that feed **ENA** for this 3000 GCP. Verify that warning system operates.
3. If Advanced Preemption is selected, open input to **MS/CP CONTROL** terminal. Verify correct time interval prior to warning system operation.

4. One at a time, open each DAX output. Verify DAX relay or UAX at proper crossing drops out.
5. Verify that all other external logic (Wraps, XTrk, Sticks, DC Islands, etc.) operate warning system as intended.
6. One at a time, shunt Island Receive Wires with a hardwire shunt. Verify that the proper island drops and warning system operates. Verify that EZ and Z1 are equal to zero with shunt on track.

NOTE

Warning system may not operate if Prime Prediction Offset is used or Model 3000 GCP is applied as a remote.

7. From the crossing, go out to the 25% point in the approach. Place one side of a hardwire shunt solidly on one rail. Repeatedly bounce the other side multiple times on the other rail until the warning system activates. This may require up to 10 seconds.

- If train movement will not occur for a long period of time, perform the following alternative test before placing in service.

8. Alternately shunt each termination and verify that EZ drops to the value recorded in the “Setup for Approach Length and Linearization” calibration procedure on the Model 3000 GCP History Card.

SECTION 7 – DIAGNOSTICS (MAINTENANCE)

7.1 GENERAL

The advanced self-diagnostic capabilities of the 3000 GCP software provide the system maintainer with three simple but effective diagnostic tools. These consist of the:

- Status Mode that enables the maintainer to monitor vital system parameters such as track ballast conditions, receiver signal levels, and critical voltage levels.
- Error (Diagnostic) Mode that provides a visual indication in the form of diagnostic messages of abnormal internal and external system status.

NOTE

Internal status can include memory and processor-related problems.

External status includes track conditions that vary greatly from accepted levels.

- History Mode that provides a record of warning times and train speeds for the 20 most recent train moves (events) on a single-track system (10 per track if two tracks are monitored).

Each of these modes is described in some detail in the paragraphs that follow. Diagnostic message code reference tables are also provided.

Maintainer interface with these modes is accomplished via the 80019 Keyboard/Display control unit that attaches to the front of the 3000 GCP case.

In addition to the three diagnostic modes, the system provides the maintainer with further diagnostic input through the use of status LED indicators located on each of the modules installed in the 3000 GCP case. The function of each of these indicators is described in paragraph 7.6.

7.2 STATUS MODE

The Status Mode permits the maintainer to monitor:

- track ballast conditions (EX)
- main receiver signal levels (EZ)
- transceiver voltage and current levels
- outputs of the ±5, ±8, and ±15-volt power supplies.

When power is initially applied to the 3000 GCP, or following a system reset, the unit executes a system test and initialization routine. When the routine is completed, an initial Status Mode display similar to that shown below appears.

```
STATUS T1
EZ:   100   EX:      87
```

The Status Mode is the system default mode and the initial Status Mode display is the default display.

- When the 3000 GCP is operating in any mode (e.g., Status, Program, History, etc.) and no keyboard entries are made within 90 seconds, the display automatically defaults to this display.

If the 3000 GCP is equipped with an 80044 or 80214 processor module, and the enhanced track-shunting detection (ED) operating mode (paragraph 4.17.9) is enabled, *ED* appears in the upper right corner of the system status display when poor shunting conditions are detected (see example below).

STATUS T1			***ED***
EZ:	**65**	**EX:**	**89**

NOTE

The *ED* indication remains on the display for the duration of the train move; i.e., until the train leaves the GCP approach.

7.3 VIEWING STATUS MODE MENU ENTRIES

The Status Mode is selected by pressing the SYSTEM STATUS key.

- When the initial Status Mode display appears, additional system parameters can be viewed by using the arrow keys to scroll through the Status Mode menu.
- The menu is continuous in that it starts over at the beginning when the end of the menu is reached.
- The Status Mode menu is depicted in flowchart format in Figure 4-2.

The system parameters described in the following paragraphs are presented in the order in which they appear in the Status Mode menu when scrolling with the down arrow key (▼). The values appearing in each of these parameter displays are updated every ½ second.

If the system is programmed for two tracks, pressing the TRACK 2 key causes similar information for track 2 to be displayed. Pressing the TRACK 1 key returns to the track 1 display.

7.3.1 Current Status of EZ And EX

A typical initial Status Mode display is shown below and indicates the current level of each of the parameters shown for the track indicated.

STATUS T1			
EZ:	**100**	**EX:**	**87**

EZ = Main receiver level where:	100 = Unoccupied track	
EX = Indication of track conditions where:	100 = Ideal track	
	85 = Nominal conditions	50 = Poor ballast

7.3.2 EX at Highest EZ

The display shown below indicates the highest EZ value recorded (HZ) for the track indicated and the value of EX when HZ was last updated.

STATUS T1		**MEMORY**	
EZ:	**108**	**EX:**	**45**

7.3.3 EZ at Lowest EX

The following display indicates the value of EZ when the lowest value of EX (LX) was recorded for the track indicated.

STATUS T1		**MEMORY**	
EZ:	**95**	**LX:**	**62**

7.3.4 Transmit Current

The following display indicates the transmitter current (in amperes) for the indicated track and is updated every 1/2 second.

STATUS T1	**XMIT**
CURRENT:	**0.251 A**

7.3.5 Transmit Voltage

The following display indicates the transmitter voltage (in volts) for the track indicated and is updated every 1/2 second.

STATUS T1	**XMIT**
VOLTAGE:	**1.32 V**

7.3.6 ±5 Volt Power Supply Status

The following display indicates the output voltage levels of the plus and minus 5-volt power supplies and is updated every 1/2 second.

STATUS	**5 VOLT**
+5.02	**-5.01**

7.3.7 ±8 Volt Power Supply Status

The following display indicates the output voltage levels of the plus and minus 8-volt power supplies for the track indicated and is updated every 1/2 second.

STATUS T1	**8 VOLT**
+7.99	**-8.01**

7.3.8 ±15 Volt Power Supply Status

The following display indicates the output voltage levels of the plus and minus 15-volt power supplies and is updated every 1/2 second.

STATUS	**15 VOLT**
+14.7	**-14.6**

7.3.9 Time/Date Display With Data Recorder Module Installed

If the data recorder option is installed and selected, the following status display is selectable:

STATUS	**11:23:45A**
WED 10 SEP 2007	

This display indicates current time and date. Time is shown in 12-hour format as hh:mm:ss followed by A (AM) or P (PM) or by a space in 24-hour format.

7.4 ERROR MODE

The Error (diagnostic) Mode provides a visual indication of abnormal internal and external system status.

- Internal status messages can indicate memory and processor errors.
- Diagnostic messages indicating external system status are recorded when track conditions vary greatly from established levels.

Select the Error Mode by pressing the ERROR key. If no diagnostic messages have been recorded, the display appears as follows:

ERROR

If one or more messages have been recorded, the initial Error Mode display indicates the most recent diagnostic message recorded. A typical Error Mode display is shown below.

```
ERROR      9112   <  4>
T2 GAIN CHECK
```

The four-digit number immediately following the word Error is a code corresponding to a specific diagnostic message.

- The value enclosed by the bracket symbols (< #>) indicates the number of messages recorded.

Use the up (▲) and down (▼) arrow keys to view the other recorded messages.

- Each time an arrow key is pressed, the number in the brackets increments or decrements, depending upon which key is pressed, and the four-digit code corresponding to the associated diagnostic message is displayed.
- A brief statement describing the diagnosed problem appears in the second row of the display.
- Table 7-2 at the end of this section lists the four-digit diagnostic message codes and provides a brief description of each message.

To determine if the four-digit diagnostic message code is current and has not been corrected, perform a system reset as instructed in paragraph 7.4.1 to clear the memory.

Any error codes remaining after memory is cleared indicate currently active error situations.

NOTE

Clearing this portion of memory also resets the HZ (highest EZ value recorded) and LX (lowest EX value recorded) values in memory to the present values of EZ and EX.

7.4.1 Clearing the Memory

To clear the recorded messages from memory and reset the HZ and LX values, proceed as follows:

1. Press the SYSTEM RESET key. The following message is displayed:

```
SYSTEM RESET
```

2. Press and hold the SYSTEM RESET key (for approximately 3 seconds) until the following message is displayed:

```
PRESS ENTER TO
CLEAR ERRORS
```

3. Press the ENTER key.

When memory is clear, the following message is displayed providing all error situations have been corrected. However, any currently active error situation(s) will be indicated by the appropriate diagnostic message code(s).

ERROR	**< 0>**

7.5 HISTORY MODE

The History Mode provides a record of four important parameters associated with the 20 most recent train moves on a single track or 10 train moves per track when two tracks are monitored. The parameters include:

- warning time
- detected speed (speed of train when the GCP predicted)
- average speed (average speed of a train throughout the move)
- island speed (speed entering the island).

Each train move is assigned a number:

- 1 to 10 or 1 to 20, depending upon the number of tracks monitored.
- Train move number 1 is the oldest and the highest numbered is the most recent.
- When the number of train moves exceeds 10 (20), the next train move recorded is assigned the highest number (10 or 20), all previously recorded train moves drop to the next lowest number, and the oldest recorded train move is removed from the record.
- Performing a system reset clearing the history, or removing power from the equipment for an extended period of time clears that portion of memory containing the train move records.

To view the train move records, select the History Mode by pressing the HISTORY key. The initial history display (see example below) identifies the:

- track for which the train moves were recorded
- number of train moves recorded in brackets (< ##>)
- warning time (in seconds) for the last train move recorded.

HISTORY T1	**<08>**
WARNING TIME:	**30**

To view the recorded train moves for track 2, press the TRACK 2 key. Press the TRACK 1 key to return to the track 1 display.

The up (▲) and down (▼) arrow keys are used to select the train move number (indicated on the display) for which the parameters will be displayed.

- Each time one of these keys is pressed, the train move number in the brackets increments or decrements, depending upon the key that is pressed.
- Once the desired train move number is displayed, use the NEXT key to scroll through the menu of the four parameters.

- The menu is continuous. Pressing the NEXT key when the last parameter (Island Speed display) is present causes the menu to advance to the beginning of the menu (Warning Time display).

The following paragraphs describe the display formats for the four parameters in the order in which they appear as the menu is scrolled.

7.5.1 Warning Time

The following History Mode display indicates the warning time (in seconds) for the indicated train move (number in brackets) on the associated track.

```
HISTORY  T1        <08>
WARNING TIME:        30
```

7.5.2 Detected Speed

The following display indicates the speed of the train at the time of prediction for the indicated train move on the associated track (value shown in miles-per-hour).

```
HISTORY  T1        <08>
DET.   SPEED:        46
```

7.5.3 Average Speed

The following display indicates the average speed of the train (from prediction to the island) for the indicated train move on the track shown (value shown in miles-per-hour).

7.5.4 Island Speed

```
HISTORY  T1        <08>
AVG.  SPEED:         46
```

The following display indicates the island speed (speed just prior to entering the island) for the indicated train move on the track shown (value shown in miles per hour).

```
HISTORY  T1        <08>
ISL.  SPEED:         47
```

7.6 MODULE-MOUNTED STATUS INDICATORS

Each module installed in the 3000 GCP case (except the 80028 and 80037 transfer timers) contains a status LED indicator which is located on the front edge of the module near the top.

- A glance at these normally lighted indicators will quickly lead the maintainer to a malfunctioning module.

- Certain modules are equipped with a second LED indicator (located immediately below the status LED) that indicates the status of a vital system function directly associated with the module.
- These indicators are under direct control of the microprocessor and are identified in Table 7-1.

Table 7-1:
Module-Mounted Status Indicators

MODULE PART NO.	INDICATOR NOMENCLATURE	INDICATION
80011	STATUS	Lighted steady = island relay drive present Extinguished = no island relay drive
80012	STA	Lighted steady = module operational Flashing = problem on module or associated track or wires
	PRD	Motion indicator. Normally lighted; extinguished when inbound motion is detected
80013	STA	Lighted steady = module operational Flashing = problem on module
80014/80044	STA	Lighted steady = module operational Flashing = problem on module
	ACT	Activity indicator. Flashes when processor is operational and program is running; lighted steady or extinguished if processor fails
80015/80115	STATUS	Lighted steady = module operational Flashing = problem on module
	LO BATT	On-board battery status indicator. Lighted steady when on-board lithium battery voltage is normal; flashes when battery is low
80016	STATUS	Lighted steady = module operational Flashing = problem on module
80020 (3000, 3008, 3000D2, 3008D2, & 3000D2L only)	N/a	Status LED. Mounted on keyboard interface printed circuit board (80017) and extends through panel above control interface assembly. Lighted steady = assembly operational Flashing = problem on keyboard interface printed circuit board
80028 (3000D2, 3000D2L, & 3000ND2 only)	XFER	Transfer indicator. Normally lighted; extinguishes when main-to-standby GCP transfer occurs

MODULE PART NO.	INDICATOR NOMENCLATURE	INDICATION
80029 (3000ND2 only)	N/a	Status LED's. Mounted on keyboard interface printed circuit board (80153) and extend through panel above control interface assembly. Each LED indicates status for one of the two identical interface circuits on the printed circuit board. Lighted steady = assembly operational Flashing = problem in associated interface circuit on printed circuit board Extinguished = circuit not in use
80037 (3008D2 only)	XFER	Transfer indicator. Normally lighted.; extinguishes when main-to-standby GCP transfer occurs
80214	STA	Lighted steady = module operational Flashing = problem on module
	ACT	Activity indicator. Flashes when processor is operational and programming is running; lighted steady or extinguished if processor fails.
	NET ACTIVITY	Lighted during Echelon® LAN communication
	SERVICE	Flashes when SERVICE REQ. push button on the module is pressed and when the network is accessed
80255	(DS1)	Lighted steady = module operational Flashing = problem on module
80265	STATUS	Lighted steady = module operational Flashing = problem on module
	NETWORK ACTIVITY	Lighted during Echelon® LAN communication
	SERVICE	Lighted when SERVICE REQ. push button is pressed

7.7 TROUBLESHOOTING

When the 3000 GCP detects a failure, the cause of the failure may be isolated by:

- Noting the EZ and EX values and any error code appearing on the GCP display.
- The displayed EZ and EX values reflects current track circuit status.
- The error code identifies the source of the failure (track wires, couplers, termination shunts, bonds) or the 3000 GCP unit).

NOTES

1. When a failure is detected the crossing-warning devices are activated and the GCP display alternates between the Status Mode and the Error Mode messages shown below.

2. The messages displayed are typical for a broken track wire.

```
STATUS T1
EZ:      186  EX:      0
```

```
ERROR 8113         <1>
T1 XMIT CURRENT
```

- Locating the displayed error code in the Troubleshooting Chart located at the back of this manual and determining the source of the failure.
  - When the 3000 GCP is determined to be the cause of the problem, the chart indicates which module to change out.
  - When the track circuit is identified as the sources of the failure, the cause may be isolated using the procedures provided in the following paragraphs:

NOTE

The most common track failures are open or shorted track circuits:

- a low EZ value usually indicates a short
- a high EZ value usually indicates an open

7.7.1 Isolating The Fault To The Approach

This procedure provides the means of isolating the failure to an approach within a bidirectional track circuit.

NOTE

In a normally operating system with no problems:

- a DC voltage ranging from 7.5 to 10.0 is present on test jacks Z1 and Z2 of the 80012 Transceiver module (see Figure 7-1)
- both voltage levels are the same

- the DC voltage varies depending on ballast and approach length

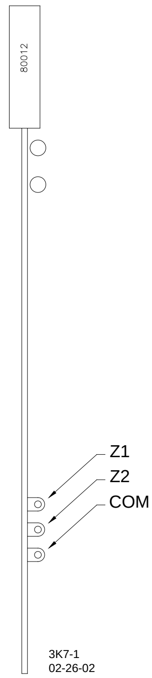

Figure 7-1:
80012 Transceiver Module

1. Measure the voltage at test jack Z1
2. Measure the voltage at test jack Z2.
3. Note the relationship of each voltage to the normal voltage range and to each other.

- If the Z1 and Z2 voltages are higher or lower than the normal operating range (7.5 to 10.0 VDC), but remain equal to each other, the problem in the track circuit lies on the transmitter side of the crossing.
- If the Z1 and Z2 voltages are higher or lower than the normal operating range (7.5 to 10.0 VDC), but their values differ by more than 0.5 VDC, the problem in the track circuit most likely lies on the receiver side of the crossing.

7.7.2 High Signal Detection (Open Track)

An open track generally causes a high signal condition:

- error codes 9015 or 9016
- EZ in excess of 115

This can be caused by:

- open termination shunts
- defective insulated joint couplers
- open or high resistance bonds
- High resistance track connection

Refer to the following paragraphs for specific troubleshooting information.

7.7.2.1 Defective Termination Shunts

There are three types of termination shunts:

- hardwire
- wideband
- narrow-band (NBS)

To test a termination shunt, proceed as follows:

1. Note the EZ value.
2. Place a hardwire shunt across the termination.
3. Note the change in EZ.

- If termination is hardwire, no EZ change should occur.
- If termination is wideband, a change of no more than ±2 should occur.
- If termination is NBS, a decrease in EZ of up to 35 can occur depending upon frequency and approach length.

NOTE

Lower frequencies and shorter approaches produce greater change.

- If termination is NBS and an increase in EZ is noted, the NBS is defective.

7.7.2.2 Defective Couplers

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.

INSULATED JOINT BYPASS COUPLERS, 62531-F AND 62631-F, MUST NOT BE USED WITH THE 3000 GCP.

NOTE

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

There are two types of insulated joint couplers:

- Wideband
- Tunable Insulated Joint Couplers (TIJC).

These couplers can be field tested for proper operation as follows:

1. Connect a hardwire shunt on the crossing side of the joint coupler.
2. Note the EZ value.
3. Move the hardwire shunt to the termination side of the joint coupler
4. Note the EZ value.
5. Remove the hardwire shunt.
6. Note the difference in EZ values between steps 2 and 4.

NOTE

If the coupler is a wideband shunt, a difference in EZ of no more than ±2 should occur or the wideband shunt is defective.

If the coupler is a TIJC (located in the outer half of the approach), the EZ difference should be no more than ±3 or the TIJC is mistuned or defective.

7.7.2.3 Open Or High Resistance Bond, Broken Rail

When EZ is unstable or in high signal, it can be the result of:

- varying bond resistance
- intermittent open track due to bad bonds or broken rail.
- Interference or lumped ballast loading.

If bonding is suspected, proceed as follows

NOTE

EZ must be greater than 15 for this test to work.

1. Note the EX value with no shunt.
2. Place a hardwire shunt at the 50% point of the approach.
3. Note the EX value.
4. Note the difference in the EX values recorded in steps 1 and 3.
   - EX must always increase in value as a shunt is placed closer to the crossing. It does not matter if the shunt is a train or hardwire – EX MUST INCREASE!
   - If the EX value recorded in step 3 is greater than the EX value in step 1, the bad bond is between the hardwire and the termination.
   - If the EX value recorded in step 3 is lower than the EX value in step 1, the bad bond is between the hardwire and the crossing.
5. Continue placing the hardwire shunt closer or father away from the starting point based on the value in step 3. When EX increases in value, the last bond passed is the bad bond.

7.7.3 Low EX

WARNING

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

NOTES

The EX operating threshold has been reduced to 39 in the 80044 and 80214 processors and should be low enough for most applications.

Before reducing the threshold, thoroughly test the ballast at the location to determine whether conditions permit the threshold reduction.

7.7.3.1 At New Installations

If a low EX condition is occurring at a cutover of a new installation, check for the following:

- Bad bonds
- Defective insulated joint couplers
- Missing battery choke in approaches
- Defective gauge rods or switch rods
- Open termination shunt
- Improper application of other frequency NBS in the approaches. Refer to 3000 GCP Application Guidelines Manual, Section 3

7.7.3.2 At In-service Installations (3000 GCP's Equipped With 80044 Or 80214 Processor Modules Only)

If track conditions are extremely wet (possibly salted crossing) at an in-service crossing and a low EX condition is presently occurring (EX below 39), then perform the Low EX Test procedure provided below to determine if the low EX threshold can be reduced below 39.

Low EX Test (80044 and 80214 Processors Modules Only)

1. With EX in failure (below 39), connect a hardwire shunt at the termination shunt of the longest approach.
2. Note the EZ value.
3. Move the hardwire shunt in to the 90% point of the approach.
4. Note the EZ value.

- The EZ value at the 90% point (step 4) must be at least 5 less than the EZ value at the termination shunt (step 2) to allow safe adjustment of the EX threshold below 39.

Low EX Adjustment (80044 and 80214 Processors Modules Only)

This adjustment must be initially made at low ballast when EZ is less than 39 and the “Low EX Test” provided above has been passed (EZ changes a minimum of 5). IF NOT - DO NOT PROCEED!

1. Press the STATUS key.
2. Note the value of EX. Ex must be between 34 and 39 to be valid.
3. If EX is between 34 and 39 (inclusive), subtract the EX value from 39 The remainder should be between 0 and 5.
4. Note this value.
5. Press the FUNCTION key and then press the up arrow key (▲) twice.
6. Verify that LOW EX ADJUSTMENT is displayed.
7. Press the NEW DATA key.
8. Enter the value (remainder) noted in step 4.
9. Press the ENTER key.
10. Verify that the value entered remains on the display.
11. Enter the low EX adjustment value on the 3000 GCP Application History Card for track(s) affected.

Table 7-2:
Diagnostic Message Code Reference

ERROR CODE	TEXT DISPLAYED	DESCRIPTION	POSSIBLE CAUSE
1100	ROM	ROM Checksum Error	80014/80044/80214 Processor Module
1200	RAM	RAM Read/Write Error	80014/80044/80214 Processor Module
1300	NOVRAM	NOVRAM Checksum Error	80020/80029 Keyboard/Display Interface Module
1400	ROM	ROM Checksum Error (System Reset)	80014/80044/80214 Processor Module
1500	RAM	RAM Read/Write Error (System Reset)	80014/80044/80214 Processor Module
1600	NOVRAM	NOVRAM Checksum Error (System Reset)	80020/80029 Keyboard/Display Interface Module
4000	ENA INPUT	ENA Input Error	80013 Relay Drive Module
4001	UAX INPUT	UAX Input Error	80013 Relay Drive Module
4002	T1 ISLAND INPUT	Island Relay Drive 1 Input Error	80013 Relay Drive Module
4003	T2 ISLAND INPUT	Island Relay Drive 2 Input Error	80013 Relay Drive Module
4004	MS/GCP CONTROL	MS/GCP Control Input Error	80013 Relay Drive Module

ERROR CODE	TEXT DISPLAYED	DESCRIPTION	POSSIBLE CAUSE
4100	DAX A OUTPUT	DAX A Relay Drive Output Error	80016 DAX Module Number 1*
4101	DAX B OUTPUT	DAX B Relay Drive Output Error	80016 DAX Module Number 1*
4102	GCP OUTPUT	Prime GCP Relay Drive Output Error	80013 Relay Drive Module
4103	DAX C OUTPUT	DAX C Relay Drive Output Error	80016 DAX Module Number 2*
4104	DAX D OUTPUT	DAX D Relay Drive Output Error	80016 DAX Module Number 2*
4105	AT OUTPUT	Approach Track Output Error	80013 Relay Drive Module
4106	DAX E OUTPUT	DAX E relay driver output error	80016 DAX Module Number 3*
4107	DAX F OUTPUT	DAX F relay driver output error	80016 DAX Module Number 3*
4108	DAX G OUTPUT	DAX G relay driver output error	80016 DAX Module Number 4*
4109	DAX H OUTPUT	DAX H relay driver output error	80016 DAX Module Number 4*
5001	DATA RECORDER	Data Recorder Not Responding	80015/80115 Data Recorder Module
5002	DATA RECORDER	Incorrect Data Transmission	80015/80115 Data Recorder Module
5003	RECORDER ROM	Recorder ROM Checksum Error	80015/80115 Data Recorder Module
5004	RECORDER RAM	Recorder RAM Checksum Error	80015/80115 Data Recorder Module
8001	-5 VOLT SUPPLY	- 5 Volt Power Out of Range	80013 Relay Drive Module
8002	+5 VOLT SUPPLY	+5 Volt Power Out of Range	80013 Relay Drive Module
8003	T1 –8V SUPPLY	Track 1 –8 Volt Power Out of Range	80012 Transceiver Module (left)
8004	T1 +8V SUPPLY	Track 1 +8 Volt Power Out of Range	80012 Transceiver Module (left)
8005	T2 –8V SUPPLY	Track 2 –8 Volt Power Out of Range	80012 Transceiver Module (right)
8008	+15 VOLT SUPPLY	+15 Volt Power Supply Out of Range	80013 Relay Drive Module
8111	T1 XMT VOLTAGE	Track 1 Transmit Voltage Too Low	80012 Transceiver Module or High Voltage on Track
8112	T1 XMT VOLTAGE	Track 1 Transmit Voltage Too High	80012 Transceiver Module or High Voltage on Track
8113	T1 XMIT CURRENT	Track 1 Transmit Current Low	80012 Transceiver Module (left), transmit track wires
8114	T1 XMIT CURRENT	Track 1 Transmit Current High	80012 Transceiver Module (left)
8115	T2 XMT VOLTAGE	Track 2 Transmit Voltage Too Low	80012 Transceiver Module or High Voltage on Track

ERROR CODE	TEXT DISPLAYED	DESCRIPTION	POSSIBLE CAUSE
8116	T2 XMT VOLTAGE	Track 2 Transmit Voltage Too High	80012 Transceiver Module or High Voltage on Track
8117	T2 XMIT CURRENT	Track 2 Transmit Current Low	80012 Transceiver Module (right), transmit track wires
8118	T2 XMIT CURRENT	Track 2 Transmit Current High	80012 Transceiver Module (right)
8200	FREQUENCY	Processor Frequency Out of Range	80014/80044/80214 Processor Module
8201	T1 FREQUENCY	Track 1 Frequency Out of Range	80012 Transceiver Module (left)
8202	T2 FREQUENCY	Track 2 Frequency Out of Range	80012 Transceiver Module (right)
8203	T1 XMIT FREQ	Processor frequency out of range	80214 Processor Module
8204	T2 XMIT FREQ	Processor frequency out of range	80214 Processor Module
8300	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (left)
8301	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (right)
8411	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8412	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8413	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8414	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8421	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8422	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8431	T1 SELF-CHECK	Track 1 Self-check Not Successful	Relay Drive Module or 80214 Processor Module
8432	T2 SELF-CHECK	Track 2 Self-check Not Successful	Relay Drive Module or 80214 Processor Module
8441	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8442	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module

ERROR CODE	TEXT DISPLAYED	DESCRIPTION	POSSIBLE CAUSE
8451	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8452	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8453	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8454	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8461	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8462	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
9001	T1 LOW PHASE	Track 1 Phase Low	80012 Transceiver Module or Track Wires
9002	T1 HIGH PHASE	Track 1 Phase High	80012 Transceiver Module or Track Wires
9003	T2 LOW PHASE	Track 2 Phase Low	80012 Transceiver Module or Track Wires
9004	T2 HIGH PHASE	Track 2 Phase High	80012 Transceiver Module or Track Wires
9011	T1 LOW EX	Track 1 EX Under Low Limit	Low Ballast
9012	T1 HIGH EX	Track 1 EX Over High Limit	80012 Transceiver Module (left)
9013	T2 LOW EX	Track 2 EX Under Low Limit	Low Ballast
9014	T2 HIGH EX	Track 2 EX Over High Limit	80012 Transceiver Module (right)
9013	T2 LOW EX	Track 2 EX Under Low Limit	Low Ballast
9014	T2 HIGH EX	Track 2 EX Over High Limit	80012 Transceiver Module (right)
9015	T1 HIGH EZ	Track 1 EZ Over High Limit	Bond, termination, tunable insulated joint bypass couplers, or connections
9016	T2 HIGH EZ	Track 2 EZ Over High Limit	Bond, termination, tunable insulated joint bypass couplers, or connections
9021	T1 CHECK CHANNEL	Track 1 Channel 2 EZ Over High Limit	80012 Transceiver Module (left), transmit track wires
9022	T2 CHECK CHANNEL	Track 2 Channel 2 EZ Over High Limit	80012 Transceiver Module (right), transmit track wires

ERROR CODE	TEXT DISPLAYED	DESCRIPTION	POSSIBLE CAUSE
9023	T1 LOW EZ DETECT	Indicates Track 1 EZ Below 70 with Low EZ Option Selected	
9024	T2 LOW EZ DETECT	Indicates Track 2 EZ Below 70 with Low EZ Option Selected	
9031	T1 LOW EX *ADJ*	Track 1 EX Under Low Adjustment	Low Ballast
9032	T1 ADJ LOW EX	Track 1 EX Under 39	Low Ballast
9033	T2 LOW EX *ADJ*	Track 2 EX Under Low Adjustment	Low Ballast
9034	T2 ADJ LOW EX	Track 2 EX Under 39	Low Ballast
9111	T1 GAIN CHECK	Track 1 Channel 2 Out of Range	Bond Within Island, Receiver Connection, track wires
9112	T2 GAIN CHECK	Track 2 Channel 2 Out of Range	Bond Within Island, Receiver Connection, track wires
9115	T1 EX PROCESS	Track 1 EX Process Error	High Resistance Bond
9116	T2 EX PROCESS	Track 2 EX Process Error	High Resistance Bond
9400‡	T1 ENHANCED DET	Track 1 Switched to *ED* Mode	Poor Track Shunting Conditions on Track 1
9401‡	T2 ENHANCED DET	Track 2 Switched to *ED* Mode	Poor Track Shunting Conditions on Track 2

‡ Applies only to units equipped with 80044 or 80214 processor modules.

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SECTION 8 –
PROCESSOR UPGRADES

8.1 GENERAL

New operating features can be added to the 3000 GCP system by upgrading the application software of the system processor module.

Processor module application software is upgraded in one of two ways, depending on the type of processor module:

80014 and 80044 Processor modules are updated by the installation of a new PROM.
The 80214 Processor module is updated by downloading program upgrades to the module flash memory using a customer supplied laptop computer. As software upgrades become available, they will be supplied to the customer on data storage media.

8.2 PROM REPLACEMENT (FIRMWARE UPGRADE)

The following paragraphs contain the procedures to be followed when replacing the PROM devices which contain the system operating program and are located on the processor module. These procedures apply to the 80014 and 80044 processor modules only.

8.2.1 Guidelines For Handling Modules And PROMs

Before proceeding with any software upgrade, review the:

Electrostatic Discharge (ESD) Precautions preceding Section1
Guidelines for proper handling of static-sensitive electronic devices listed below.

These precautions and guidelines should be reviewed to ensure that high static voltage or electrostatic fields do not accidentally damage the PROM internal circuits.

CAUTION

REMOVE POWER FROM THE 3000 GCP CASE BEFORE
REMOVING OR INSTALLING MODULES.

1. Except when necessary, avoid touching the PROM leads.

2. Use of integrated circuit extractor/inserter tools designed to remove and install electrostatic-sensitive PROM’s is highly recommended. Use OK Industries, Inc., Model EX-2 Extractor and Model MOS-40 Inserter (or equivalent).

3. When replacing the PROM’s, always lay the module on the electrostatic bag provided, not directly on the work surface. The bag will:

- protect the pins extending from the solder side of the module from the work surface
- prevent possible damage to the PROM's or module.

4. Following removal from a module, old PROM's should be:

    - Inserted into the conductive foam material supplied with the upgrade PROM's
    - Returned to Safetran at the address shown below for subsequent reprogramming.

      Safetran Systems Corporation
      California Division
      10655 7th Street
      Rancho Cucamonga, CA 91730

CAUTION

ALL UPGRADE PROM'S SHOULD REMAIN IN CONDUCTIVE FOAM MATERIAL UNTIL IN-STALLED ON THE MODULE.

8.2.2 PROM Replacement Procedure - 80014/44 Processors Only

Perform the following steps when replacing PROM.

Step 1 IMPORTANT - Review the Program and Function Mode menus and compare the current system operating parameters (warning time, frequency, etc.) with those recorded on the Application History Card.

Step 2 IMPORTANT - Update the history card for future reference as necessary.

Step 3 Set the POWER switch on the 3000 GCP case to the OFF position.

Step 4 Locate the processor module and remove it from the 3000 GCP case.

Step 5 Refer to the figure indicated below and locate the module's version A (AXXX) PROM.

- 80014 module - PROM Z7 (see Figure 8-1)
- 80044 module - PROM U53 (see Figure 8-2)

Step 6 Note the location of the PROM's notched end.

Step 7 Using the extractor tool, carefully remove the PROM from its socket.

Step 8 Refer to Table 8-1 and, using the inserter tool, install the applicable upgrade PROM in the PROM socket with the notched end of the PROM in the same position as noted in step 6 to ensure proper pin 1 orientation.

Table 8-1:
80014/80044 Processor Module PROM ID And Software Version Numbers

PROCESSOR MODULE	PROM ID AND SOFTWARE VERSION NUMBER	PROM ID AND SOFTWARE VERSION NUMBER
80014	Z7 8V980-AXXX	Z8 8V980-BXXX
80044	U53 9V065-AXXX	U52 9V065-BXXX

Step 9 Refer to the figure indicated below and locate the module's version B (BXXX) PROM.

- 80014 module - PROM Z8 (see Figure 8-1)
- 80044 module - PROM U52 (see Figure 8-2)

Step 10 Note the location of the PROM's notched end.

Step 11 Using the extractor tool, carefully remove the PROM from its socket.

Step 12 Refer to Table 8-1 and, using the inserter tool, install the applicable upgrade PROM in the PROM socket with the notched end of the PROM in the same position as noted in step 9. This ensures proper pin 1 orientation.

CAUTION

FAILURE TO INSTALL THE PROM'S IN THE APPROPRIATE SOCKETS WITH PROPER PIN 1 ORIENTATION WILL RESULT IN INTERNAL DAMAGE TO THE PROM'S.

Step 13 Return the processor module to its original position in the 3000 GCP case and ensure that the module is fully seated in the edge connector.

Step 14 In redundant systems which use backup module sets (3000D2, 3000D2L, 3008D2, and 3000ND2), repeat steps 3 through 11 for the other processor module.

Step 15 Set the 3000 GCP case POWER switch to the ON position.

Step 16 Observe the 3000 GCP display and wait for the initial Status Mode display to appear before proceeding.

STATUS T1			
EZ:	**100**	**EX:**	**87**

Step 17 Press the FUNCTION key.

Step 18 Press the up arrow (▲) key one time.

Step 19 Verify that the Set To Default display appears as follows:

SET TO DEFAULT

Step 20 Press the NEW DATA key.

Step 21 Press the ENTER key.

Step 22 Press the PROGRAM key.

Step 23 Enter all non-default Program Mode values recorded on the Application History Card (step 2).

Step 24 Press the FUNCTION key.

Step 25 Enter the non-default Function Mode values recorded on the Application History Card (step 2).

Step 26 Refer to Section 6 and perform the appropriate system calibration procedures for each track.

After completing the applicable procedures, the system is fully operational.

8.3 SOFTWARE UPGRADES FOR THE 80214 PROCESSOR MODULE

As software upgrades are issued, the procedure for updating the flash memory of the 80214 Processor module will be distributed with the upgrade.

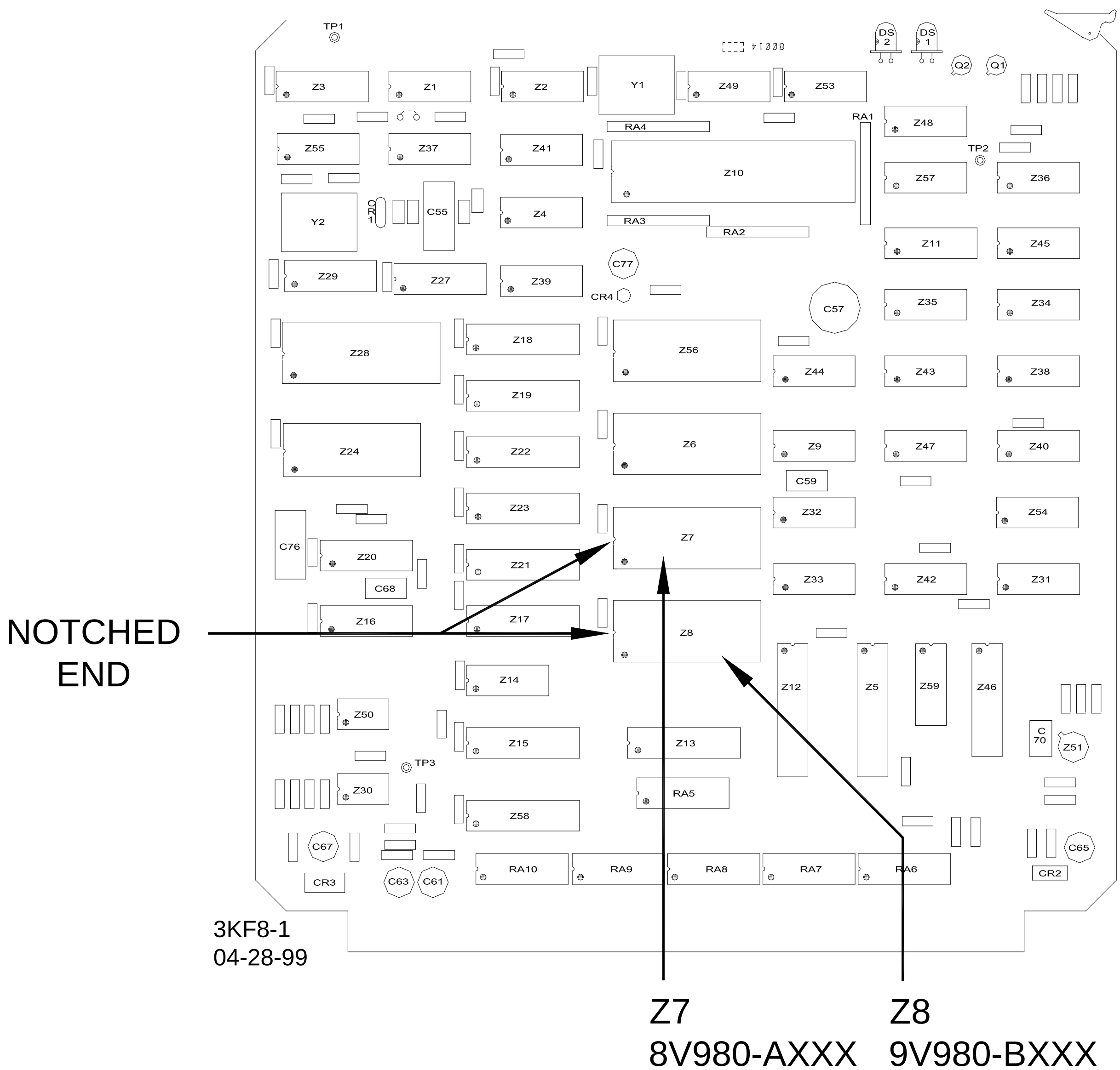


Figure 8-1:
PROM Locations on 80014 Processor Module

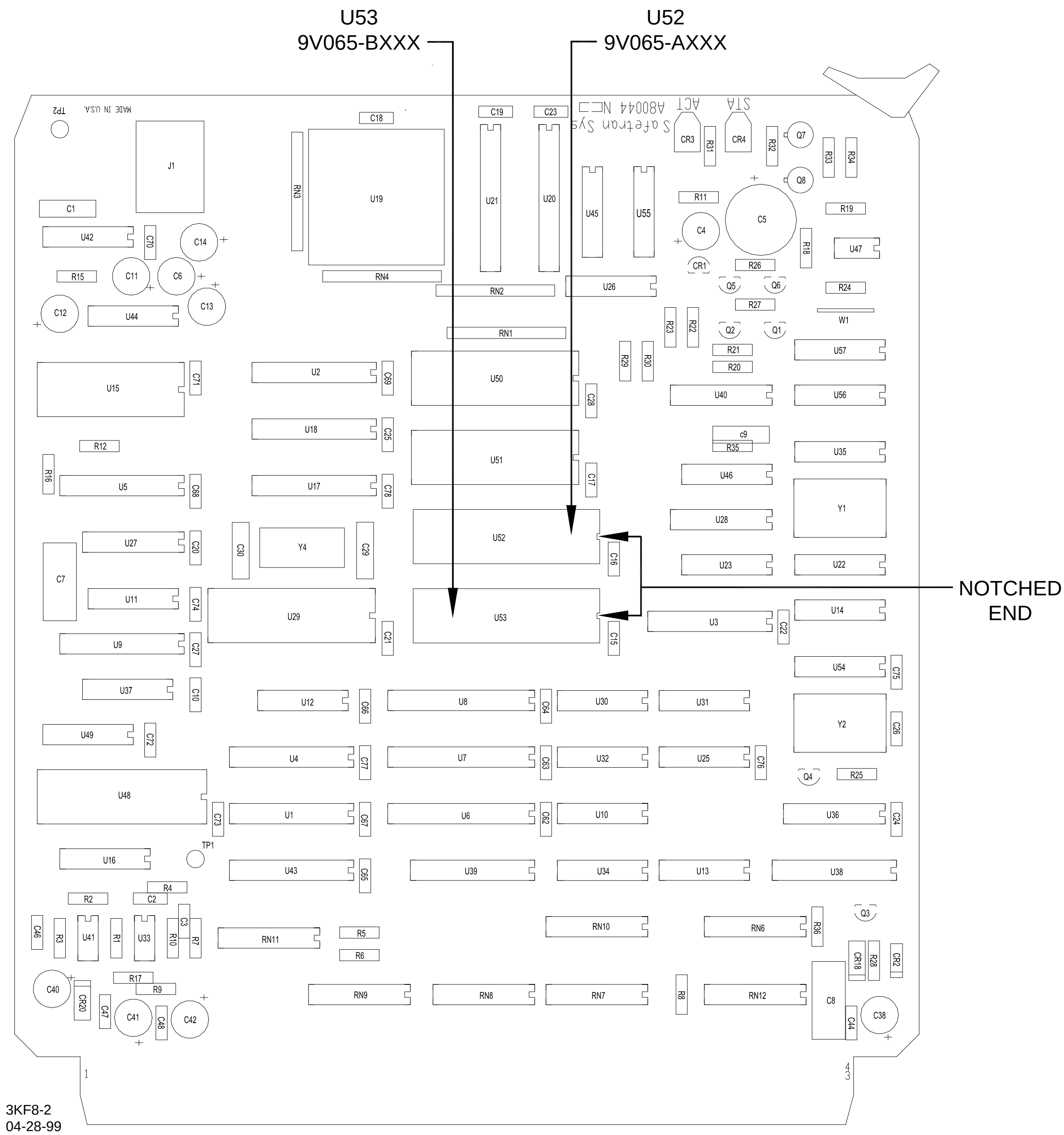


Figure 8-2:
PROM Locations on 80044 Processor Module

SECTION 9 –
DATA RECORDERS

9.1 GENERAL

The 3000 series GCP may be optionally configured for either an internal (80015/80115) or for the external Safetran Event Analyzer Recorder (SEAR).

9.2 80015 AND 80115 INTERNAL DATA RECORDERS

The optional 80015 and 80115 Data Recorder modules, are solid-state data recording devices that maintain event records, including date and time of occurrence, for several types of events, both internal and external to the 3000 GCP. These events include:

- Train move data (warning time and train speeds)
- Input changes that occur on any of the 16 external channels
- External channels are monitored through the 80025 Data Recorder Interface assembly via RECORDER connector J1 located on the 3000 GCP front panel.
- GCP error (diagnostic) messages
- GCP power on/off and system reset indications
- Track calibration indications

Refer to paragraph 9.2.5 (PC File/Printout Format) for a description of each type of event.

On-board data memory consists of 64k bytes of RAM with battery backup.

- Approximate memory capacity is 3,000 events.
- When memory becomes full, the oldest data is overwritten by the newest data and the next oldest event remaining in memory then becomes event number 1.

STATUS and LO BATT LED’s located on the front edge of each module (see Figure 9-1) are normally lighted steady, indicating that the:

- module is functioning properly
- on-board battery has sufficient charge to protect the stored data.

When the battery voltage is low, the LO BATT LED begins to flash, indicating the battery should be replaced.

The multifunction CLEAR/OFF/PRINT toggle switch SW1, located on the front edge of each module, controls the following functions:

- memory clear (CLEAR position is momentary)
- memory file download/print

NOTE

With a data recorder installed in the 3000 GCP and enabled in the Program menu, data recording begins when power is applied to the 3000 GCP. Data can be recorded with CLEAR/OFF/PRINT switch SW1 set to either the OFF or PRINT position.

System programming and on-board DIP switches allow the on-board data recorder I/O circuits to be configured to accommodate a wide variety of PC/laptops, modems, and printers.

A 25-pin RS232C serial connector located on the front edge of the module provides a temporary interface between the module and an external PC/laptop, modem, or serial data printer.

A serial data printer may also be connected directly to the 3000 GCP front panel RECORDER connector J1.

A permanent installation that provides recorded data to a remote PC/laptop via a modem may be configured as follows:

- A cable is placed between RECORDER connector J1 on the 3000 GCP front panel and RECORDER connector J1 on the 80025 Data Recorder Interface Assembly.
- A modem is then connected to the MODEM connector J2 on the Data Recorder 80025 Interface Assembly.

9.2.1 Data Recorder Programming

With a Data Recorder Module installed in the 3000 GCP, the system must be programmed to enable the recorder and to set the correct date and time.

- Computer/printer parameters associated with downloading the recorder's memory contents to a file or printing it can be programmed at the time of installation or any time prior to initiating the memory downloading or printing process.
- The recorder programming procedure is also included in Section 5, System Application Programming.

<u>NOTE</u>

Programming steps 2 through 9.2 that follow correspond to steps 18 through 25.2 in Section 5.

Step 1 Press the PROGRAM key.

Step 2 Press the down arrow key (▼) until one of the following messages is displayed:

PROGRAM RECORDER NOT INSTALLED	PROGRAM RECORDER INSTALLED

Step 2.1 Press the NEW DATA key.

Each time the NEW DATA key is pressed, the entry toggles between NOT INSTALLED and INSTALLED.

- If the data recorder option is to be used, select INSTALLED.
- If the data recorder option is not to be used, select NOT INSTALLED.

Step 2.2 Press the ENTER key when the applicable condition is displayed.

Step 2.3 If INSTALLED is selected, proceed to step 3.

NOTES

1. Steps 3 through 6.3 set the RS232C interface port parameters to enable the 3000 GCP to communicate with an external PC or printer, and may be performed at a future date prior to downloading recorded data to a PC or printing.

2. An external PC or printer, may be connected to the Data Recorder module (80015/80115) via the 9-pin RS232C connector located on the front edge of the module. Refer to the applicable PC software or printer manufacturer's manual to determine the appropriate values to enter.

Step 2.4 If NOT INSTALLED is selected, proceed to step 26 in Section 5 for extended application programming.

Step 3 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS - 232 - C	
BAUD RATE:	**9600**

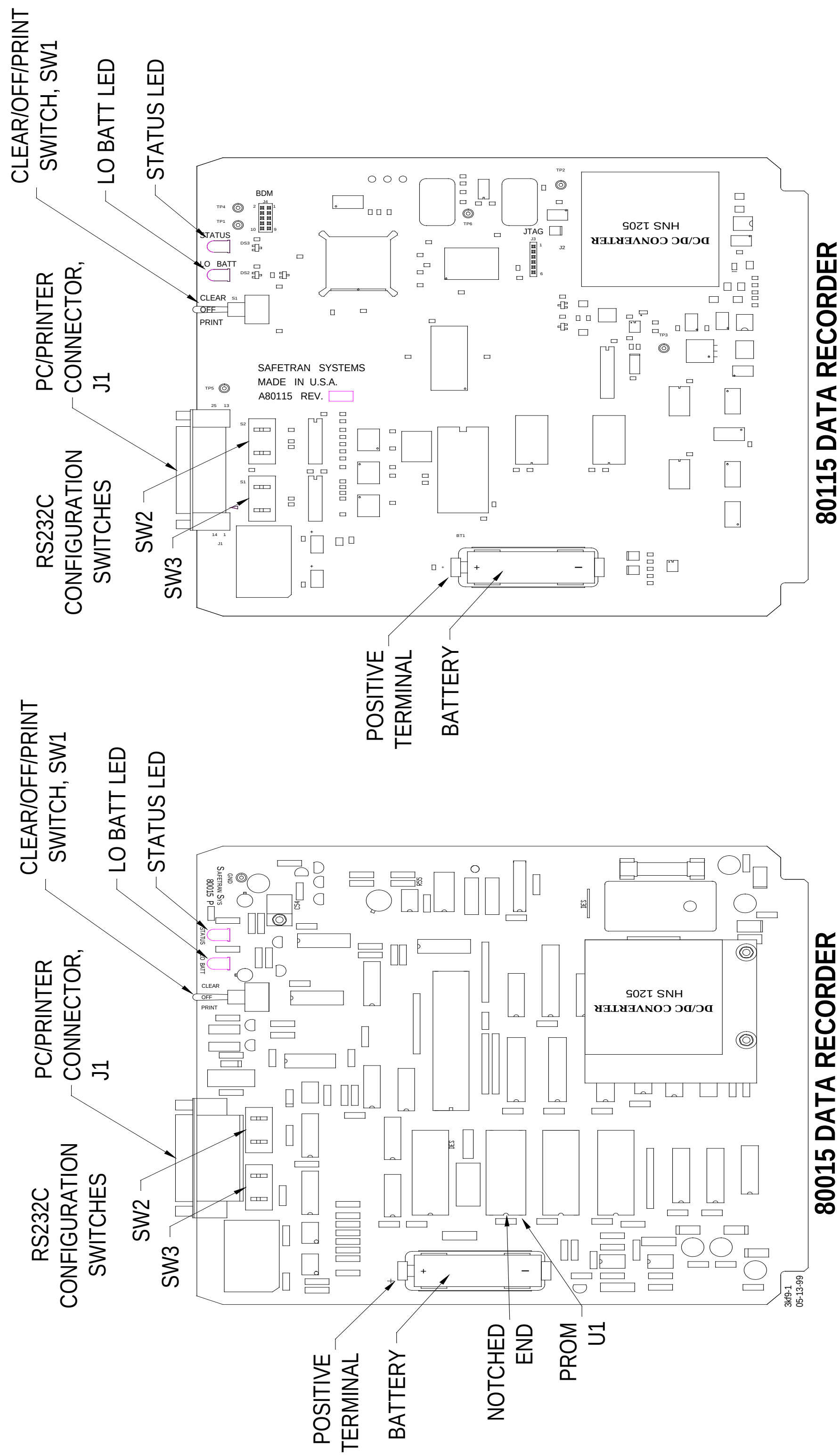


Figure 9-1:
Data Recorder Modules

Step 3.1 Press the NEW DATA key.

Step 3.2 Use the up (▲) or down (▼) arrow keys to display the PC/laptop, modem, or printer baud rate (300, 1200, 2400, 4800, or 9600).

- The default for units equipped with an 80014 Processor module is 300.
- The default for units equipped with an 80044 or 80214 Processor module is 9600.

If the memory contents will be downloaded to a PC/laptop computer file set the baud rate to 9600.

Step 3.3 Press the ENTER key.

Step 4 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS–232–C
DATA BITS: 8

Step 4.1 Press the NEW DATA key.

Step 4.2 Use the up (▲) or down (▼) arrow keys to display the number of data bits for the PC/laptop, modem, or printer (7 or 8).

- The default for units equipped with an 80014 processor module is 7.
- The default for units equipped with an 80044 or 80214 Processor module is 8.

If the memory contents will be downloaded to a PC/laptop computer file, set the data bits to 8.

Step 4.3 Press the ENTER key.

Step 5 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS–232–C
STOP BITS: 1

Step 5.1 Press the NEW DATA key.

Step 5.2 Use the up (▲) and down (▼) arrow keys to display the number of stop bits for the PC/laptop, modem, or printer (1 or 2).

- The default for units equipped with an 80014 Processor module is 2.
- The default for units equipped with an 80044 or 80214 Processor module is 1.

If the memory contents will be downloaded to a PC/laptop computer file set the number of stop bits to 1.

Step 5.3 Press the ENTER key.

Step 6 Press the down arrow key (▼) once. The following message is displayed:

PROGRAM RS–232–C
PARITY: NONE

Step 6.1 Press the NEW DATA key.

Step 6.2 Use the up (▲) and down (▼) arrow keys to display the type of parity used by the PC/printer (NONE, ODD, EVEN, MARK, or SPACE). The default is NONE.

Step 6.3 Press the ENTER key.

Step 7 Press the down arrow key (▼) until the date display message similar to that shown below appears.

PROGRAM	DATE
MON 10 SEP 2007	

Step 7.1 Press the NEW DATA key.

The cursor appears at the first digit of the day-of-the-month entry.

Step 7.2 Enter the day of the month.

- The entry must consist of two digits (01, 12, 27, etc.).

When the second digit is entered, the cursor moves to the first letter of the month entry.

Step 7.3 Use the up (▲) and down (▼) arrow keys to display the desired month entry.

Step 7.4 Press the NEW DATA key. The cursor appears at the first digit of the year entry.

Step 7.5 Enter all four digits for the year entry (2000, 2001, etc.).

As the last digit is entered, the applicable day of the week is automatically displayed and the cursor moves to the first letter of the day-of-the-week entry.

Step 7.6 Review all time entries and change any if necessary.

Step 7.7 Press the ENTER key.

Step 8 Press the down arrow key (▼) once. A time display message similar to that shown below appears.

PROGRAM	TIME
12:34:56	(24 HR)

Time is displayed in hours:minutes:seconds (hh:mm:ss) format.

Step 8.1 Press the NEW DATA key. The cursor appears at the first digit of the hours entry.

Step 8.2 Enter the hours. The entry must consist of two digits (01, 02, etc.).

When the second digit is entered, the cursor moves to the first digit of the minutes entry.

NOTE

If 24-hour (military) time format is used, be sure to enter the hours in the same format (01, 12, 18, 21, etc.).

Step 8.3 Enter the minutes. The entry must consist of two digits (01, 12, 21, etc.).

When the second digit is entered, the cursor moves to the first digit of the seconds entry.

NOTE

To ensure precise time setting, it may be helpful to set the minutes entry approximately two minutes ahead of the actual time to allow sufficient time to complete steps 8.4 and 8.5. Then, when the entered time arrives, step 8.6 can be performed.

Step 8.4 Enter the seconds. The entry must consist of two digits (01, 12, 21, etc.).

When the second digit is entered, the cursor moves to the first character of the time format (AM, PM, 24 HR) entry.

Step 8.5 Use the up (▲) and down (▼) arrow keys to display the desired time format entry.

- When using 24-hour (military) format, follow the time entry with 24 HR.
- When using standard 12-hour format, follow the time entry with AM or PM, whichever is appropriate.

Step 8.6 Press the ENTER key at the exact second when real time coincides with the time entered on the display.

Step 8.7 Verify that the seconds portion of the display is now incrementing.

Step 9 Press the down arrow key (▼) once. The following daylight savings time message is displayed.

PROGRAM DAYLIGHT SAVINGS: OFF

Step 9.1 Press the NEW DATA key.

- Each time the NEW DATA key is pressed, the entry toggles between OFF and ON.
- If daylight savings time is to be enabled, press the NEW DATA key until ON is displayed.
- If daylight savings time is not to be used, select OFF.

NOTE

When daylight savings is selected, the recorder will change the time setting automatically at the beginning (2:00 a.m. on the first Sunday in April) and end (2:00 a.m. on the last Sunday in October) of the daylight savings time period.

Safetran Systems software does not support the changes passed by the US Congress in regards to shifting Daylight Savings Time from the traditional dates as has been the case since October/November 2007.

Step 9.2 Press the ENTER key

9.2.2 Clearing Data Recorder Memory

Once the Data Recorder is enabled (Installed status) and configured, it may be desirable to clear the recorder memory before leaving the crossing site. To clear recorder memory proceed as follows:

Step 1 Place and hold the CLEAR/OFF/PRINT switch on the Data Recorder module (Figure 9-1) in the CLEAR position (approximately 5 seconds).

Step 2 Release the switch when the LO BATT LED begins to flash. The recorder memory is now clear.

NOTE

This procedure may be performed at any time, but it is required at:

- initial installation prior to placing the equipment in service
- when the on-board battery is replaced

9.2.3 Downloading Recorded Data To A Computer File

The following procedures enables downloading of data recorder memory contents to a PC/laptop using the Microsoft® Windows® or Windows® 95/98 Terminal applications.

- A number of other widely used software programs are available that can be used to accomplish the same task.
- When using another program, refer to the documentation supplied with the software package for applicable instructions.

9.2.3.1 Microsoft® Windows® Application Procedure

Step 1. Connect an appropriate interface cable (see paragraph 9.1.10) between PC/printer connector J1 on the front edge of the data recorder module (see Figure 9-1) and an available serial port on the PC/laptop (normally COM1 or COM2).

Step 2 Apply power to the PC/laptop.

Step 3 Type WIN at the DOS prompt (C:\>WIN).

Step 4 Press the ENTER key. The Windows™ screen displays.

Step 5 If the Windows™ Accessories group is not already open, select the Accessories group.

Step 6 From the Accessories group select the Terminal application.

Step 7 From the Terminal application menu bar select Settings.

Step 8 From the Settings menu select Communications. The dialog box shown in Figure 9-2 displays.

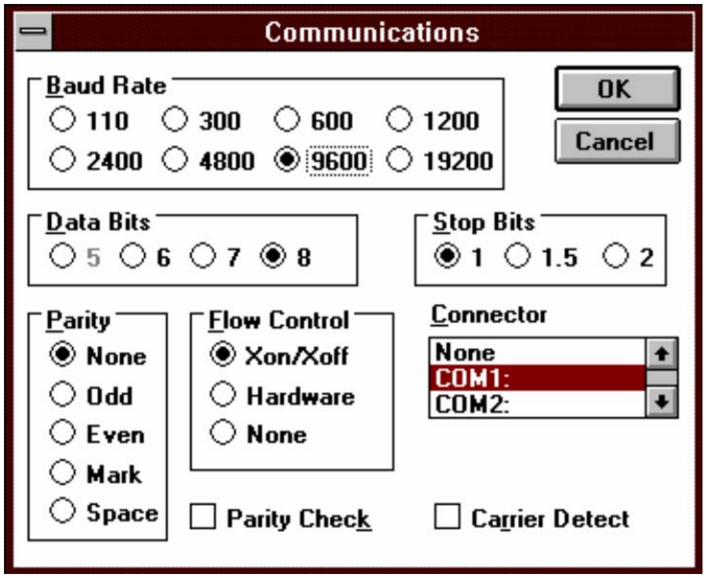


Figure 9-2:
The Windows™ Terminal Communications Dialog Box

Step 9 From the Communications dialog box, select the connector first (normally COM1 or COM2; however, either COM3 or COM4 may also be used if available) and then select the following parameters:

- Baud Rate: 9600
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Flow Control: Xon/Xoff

NOTE

The above settings must be the same as those set for the data recorder module in paragraph 5.3.6, steps 18 through 25.2.

Step 10 From the Communications dialog box, select the connector first (normally COM1 or COM2; however, either COM3 or COM4 may also be used if available) and then select the following parameters:

- Baud Rate: 9600
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Flow Control: Xon/Xoff

NOTE

The above settings must be the same as those set for the data recorder module in paragraph 9.1.1, steps 3.2 through 6.2.

Step 11 Within the Communications dialog box click on the OK button.

Step 12 From the Terminal application menu bar select the Transfers menu.

Step 13 From the Transfers menu select Receive Text File. The dialog box shown in Figure 9-3 displays.

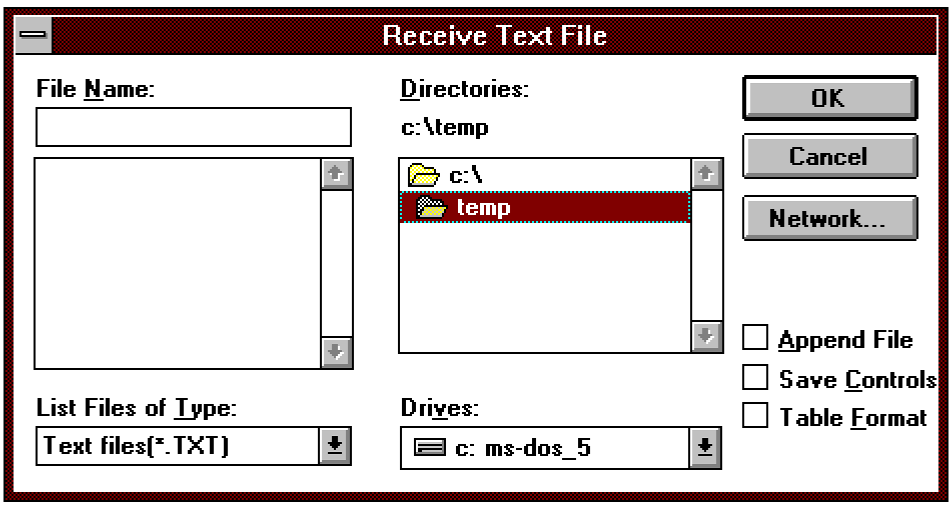


Figure 9-3:
The Receive Text File Dialog Box

Step 14 In the File Name text box enter the name of the destination file where the data recorder contents are to be copied. Always include the directory path in the file name (e.g., C:\TEMP\filename.TXT) or set the directory path in the Directories list box.

Step 15 Click on the OK button.

Step 16 On the 3000 GCP keypad, press the PROGRAM key.

Step 17 Use the up arrow key (▲) on the 3000 GCP keypad to scroll through the Program menu to the data recorder RS-232-C parameters and set or verify the parameters as follows:

- Parity: None
- Stop Bits: 1
- Data Bits: 8
- Baud Rate: 9600

Step 18 On the data recorder module, set CLEAR/OFF/PRINT switch SW1 to the PRINT position. The download process begins. The recorded data appears on the computer display as it is being downloaded.

The download process may be controlled from the keyboard as follows:

- To interrupt (pause) the downloading process at any time, press and hold the Ctrl key on the PC/laptop keyboard and then press the letter S key.
- To resume the downloading process following a pause, press and hold the Ctrl key on the PC/laptop keyboard and then press the letter Q key.
- To abort the downloading process, press and hold the Ctrl key on the PC/laptop keyboard and then press the letter C key.
- To start the downloading process at the beginning (event number 1 or specified start print event) after the downloading process has been aborted, momentarily press the ENTER key on the PC/laptop keyboard.

Step 19 When file downloading has been completed, select the STOP button located in the lower left corner of the display to save the file.

Step 20 On the data recorder module, set CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the OFF position.

The file can now be printed out any time a hard copy is needed.

9.2.3.2 <u>Microsoft® Windows® 95/98 HyperTerminal Application Procedure</u>

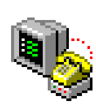
Step 1 Connect an appropriate interface cable (see paragraph 9.1.10) between PC/printer connector J1 on the front edge of the data recorder module (see Figure 9-1) and an available serial port on the PC/laptop (normally COM1 or COM2).

Step 2 Apply power to the PC/laptop and start Windows® 95/98 by typing WIN at the DOS prompt (C:\>WIN).

Step 3 Click on the Start button in the taskbar at the bottom of the screen. The Windows start menu displays.

Step 4 Place the cursor over Programs in the start menu. A list of program folders displays.

Step 5 Place the cursor over Accessories. A list of programs within the Accessories folder displays.



Hypertrm.exe

Step 6 Click on HyperTerminal within the displayed list. The HyperTerminal window displays.

Step 7 From the window select the HyperTerminal application. The New Connection – HyperTerminal window, Figure 9-4, displays. The Connection Description dialog box appears within the window.

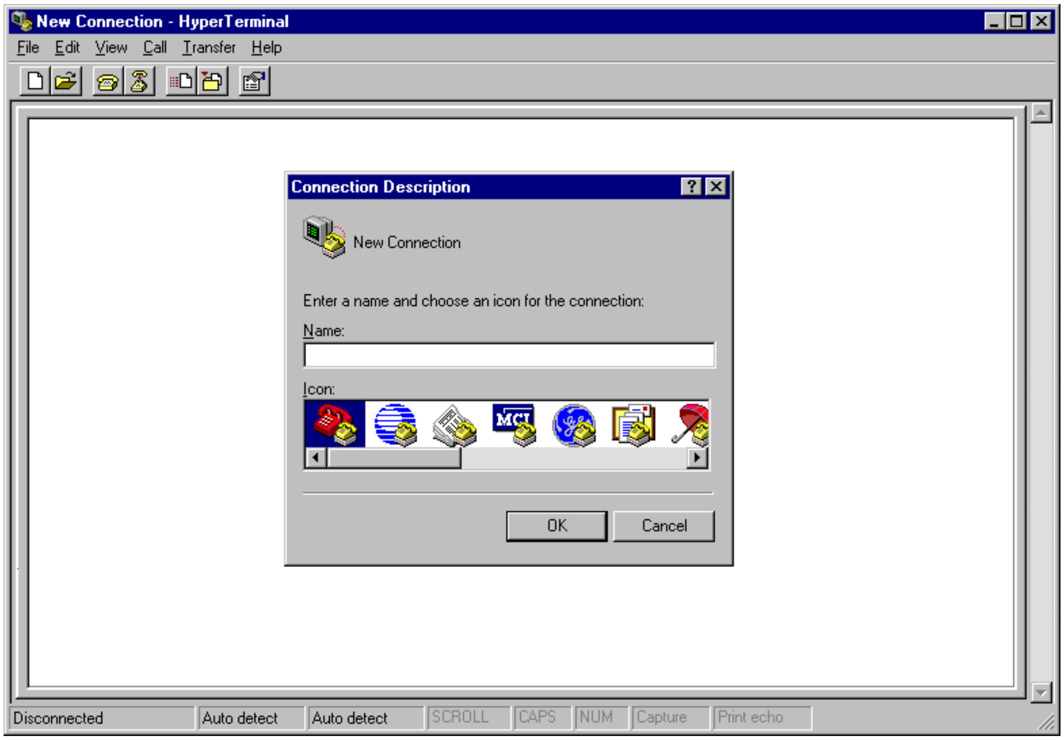


Figure 9-4:
The New Connection – HyperTerminal Window

Step 8 In the Name: box, type a name for the connection.

Step 9 From the Icon: box, select an icon for the connection.

Step 10 Click on the dialog box OK button. The Connection Description dialog box closes and is replaced by the Phone Number dialog box, Figure 9-5.

Figure 9-5:
The Phone Number Dialog Box

Step 11 From the Connect using: drop down box, select the PC/laptop serial port.

Step 12 Click on the Phone Number dialog box OK button. The Phone Number dialog box closes and is replaced by the COM1 Properties dialog box, Figure 9-6.

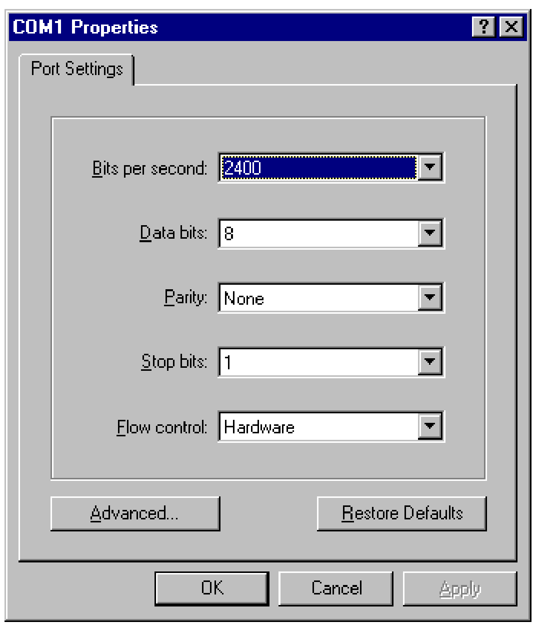


Figure 9-6:
The COM1 Properties Dialog Box

Step13 From the Port settings drop-down boxes, select the following parameters:

- Baud Rate: 9600
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: Xon/Xoff

NOTE

The above settings must be the same as those set for the data recorder module in paragraph 9.2.1, steps 3.2 through 6.2.

Step 14 From the COM1 Properties dialog box click on the OK button.

The COM1 Properties dialog box closes.

Step 15 On the 3000 GCP keypad, press the PROGRAM key.

Step 16 Use the up arrow key (▲) on the 3000 GCP keypad to scroll through the Program menu to the data recorder RS-232-C parameters and set or verify the parameters as follows:

- Parity: None
- Stop Bits: 1
- Data Bits: 8
- Baud Rate: 9600

Step 17 From the Transfer menu select Capture text. The Capture Text dialog box, Figure 9-7, displays.

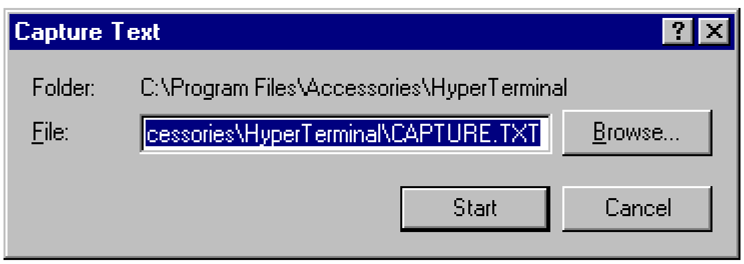


Figure 9-7:
The Capture Text Dialog Box

Step 18 In the File text box enter the name of the destination file where the data recorder contents are to be captured. The file name must include the directory path (e.g., C:\TEMP\filename.TXT).

Step 19 From the Capture Text dialog box click on the Start button.

Step 20 On the data recorder module, set CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the PRINT position.

The download process begins.

- The recorded data appears within the HyperTerminal window as it is being downloaded (see Figure 9-8).

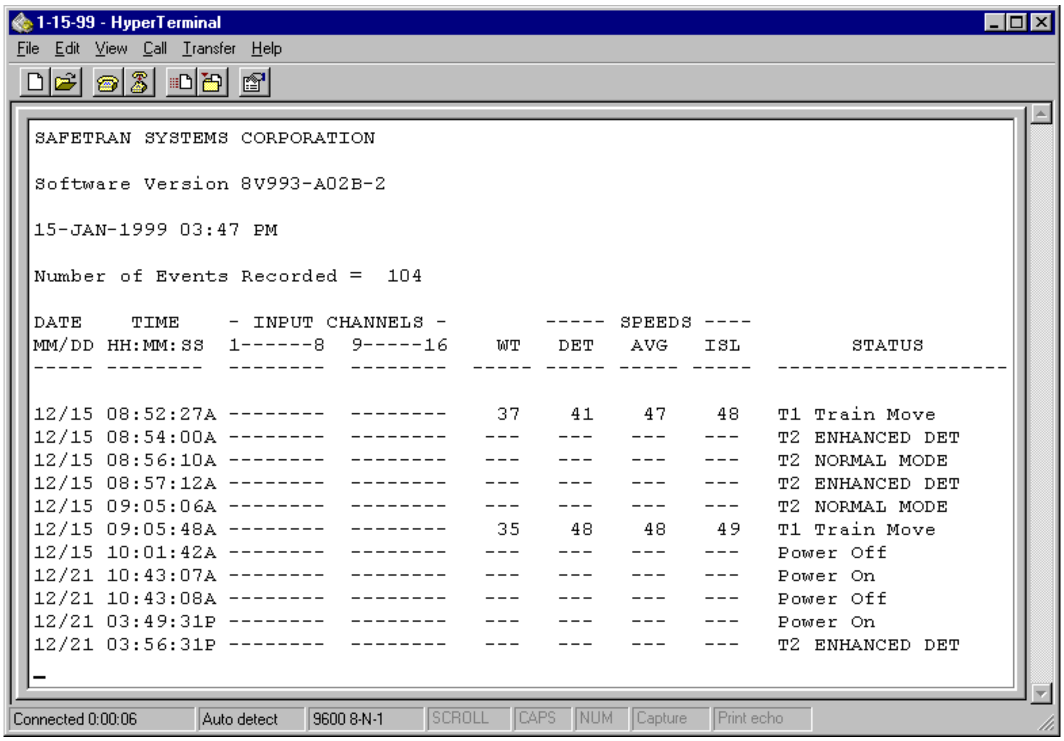


Figure 9-8:
The Data Recorder Download Display

The download process may be controlled from the keyboard as follows:

- To interrupt (pause) the downloading process at any time, press and hold the Ctrl key on the PC/laptop keyboard and then press the letter S key.
- To resume the downloading process following a pause, press and hold the Ctrl key on the PC/laptop keyboard and then press the letter Q key.
- To abort the downloading process, press and hold the Ctrl key on the PC/laptop keyboard and then press the letter C key.
- To start the downloading process at the beginning (event number 1 or specified start print event) after the downloading process has been aborted, momentarily press the Enter key on the PC/laptop keyboard.

Step 21 When file downloading is completed, set the CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) on the data recorder module to the OFF position.

Step 22 From the File menu select Exit. The HyperTerminal dialog box, Figure 9-9, appears within the HyperTerminal window.

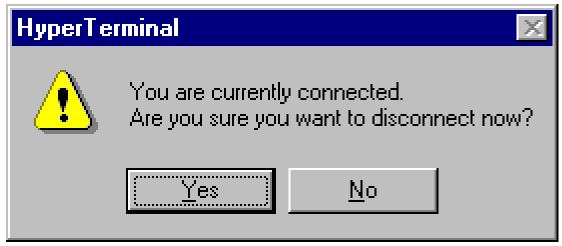


Figure 9-9:
The HyperTerminal Disconnect Dialog Box

Step 23 Click on the Yes button. The HyperTerminal dialog box, Figure 9-10, displays within the HyperTerminal window.

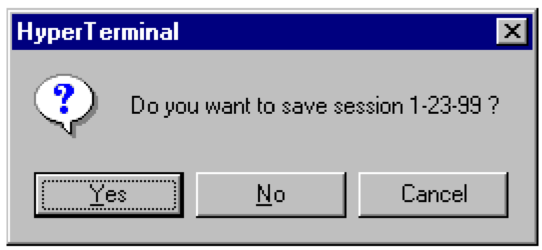


Figure 9-10:
The HyperTerminal Save Session Dialog Box

Step 24 Click on the Yes button.

The dialog box and the HyperTerminal window close. The file can now be printed out any time a hard copy is needed.

9.2.4 Printing Recorded Data

The data recorder memory contents are printed beginning with the earliest recorded (oldest) data in memory (event number 1) and ending with the last event recorded prior to initiating the print function.

- Memory contents can be printed from beginning to end, or the print can be started at a designated event number.
- Printing is controlled from the data recorder module using CLEAR/OFF/PRINT switch SW1 (see Figure 9-1).
- The print function can also be controlled from the printer if it is equipped with a keyboard. Printer interface requirements and printing procedures are described in the paragraphs that follow.

9.2.4.1 Printer Compatibility

To obtain a hard-copy printout of the data recorder memory contents, the data recorder module must be connected to a suitable printer via RS232C serial PC/printer connector J1 (see Figure 9-1) located on the front edge of the module.

- Generally, any 80-column serial printer can be used.
- The data recorder module supports Xon/Xoff protocol.

Before printing, ensure that the data recorder module is programmed for compatibility with the printer being used.

- Refer to the printer manufacturer's instruction manual
- Program the data recorder module baud rate, number of data bits, number of stop bits, and parity accordingly
- See paragraph 9.1.1, steps 3 through 6.3 for programming instructions.

9.2.4.2 Printing Procedure

Perform the following steps to print the memory contents of the data recorder module.

NOTES

When a printout is initiated, the first event printed is event number 1 (oldest data).

If a large number of events have been recorded, the printout can be quite lengthy. However, it is possible to begin the printout at any point other than event number 1 and review events of specific interest while reducing the length of the printout.

To select an alternate starting point (event number) for the printout, proceed as directed in steps 1 through 1.4; otherwise, proceed to step 2.

SELECTING A SPECIFIC EVENT FOR PRINTOUT

Step 1 Press the EVENT key. A display similar to that shown below appears.

```
EVENTS          <34>
START PRINT:       1
```

NOTES

The number appearing in brackets indicates the total number of events recorded.

The 1 in the lower right corner indicates the event number where the print will start (event number 1 is the oldest event in memory and is the default start point).

Step 1.1 Press the NEW DATA key.

Step 1.2 Enter the event number where the printout is to begin. The number should not exceed the total number of events recorded. The number entered appears in the lower right corner of the display.

Step 1.3 Press the ENTER key.

NOTES

After the ENTER key is pressed, do not press any other key on the 3000 GCP keyboard/display assembly until printing has started.

If the Events display is replaced by any other display, the event number where the printout will begin reverts to 1.

PRINTING

Step 2 On the data recorder module, set CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the OFF position (if not already in this position).

Step 3 Apply power to the printer.

Step 4 Set CLEAR/OFF/PRINT switch SW1 to the PRINT position.

The printer should begin printing the memory contents. Refer to paragraph 9.1.5 for a description of the printout format.

NOTES

Printing continues until the last event recorded in memory prior to beginning the print function is printed.

Events recorded after the print function is started are stored in memory but are not printed. The print function must be stopped and started again to print newly recorded data.

The print function can be stopped (terminated) at any time by setting CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the OFF position. Returning the switch to the PRINT position restarts the printout at the beginning (event number 1 or designated event number start point).

Step 5 When printing is complete, set CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the OFF position.

9.2.4.3 <u>Print Control Option</u>

When using a printer equipped with a keyboard, the data recorder print function can be controlled from the printer after CLEAR/OFF/PRINT switch SW1(see Figure 9-1) on the data recorder module has been set to the PRINT position.

The printout process may be controlled from the printer keyboard as follows:

- To interrupt (pause) the printout at any time, press and hold the Ctrl key on the printer keyboard while pressing the letter S key.
- To resume the printout following a pause, press and hold the Ctrl key on the printer keyboard while pressing the letter Q key.
- To abort the printout, press and hold the Ctrl key while pressing the letter C key.
- To start the printout at the beginning (event number 1 or specified start point) after the print function has been aborted, momentarily press the Enter key on the printer keyboard.

9.2.5 PC File/Printout Format

The hard copy printout provides a permanent record of several types of events, both internal and external to the 3000 GCP, which are recorded and stored by the data recorder module. These events include

- Train move data (warning time and train speeds)
- Input changes on the 16 external channel inputs
- GCP error (diagnostic) messages
- GCP power on/off
- System reset
- Track calibration indications.

The printout format (Figure 9-11) consists of:

- An identification header followed by column headings identifying the data fields
- One or two lines of data for each recorded event appear below the column headings.
- Safetran Systems Corporation appears in the first line of the header
- The data recorder module software version appears in the second line.
- The date the printout was generated appears next in the following format::
- Day of the month/month/year/time/AM or PM.

Below the date line is a statement indicating the total number of events recorded between the time memory was last cleared and the date and time indicated for the printout.

If an event number other than 1 is designated as the start point for the printout, a statement identifying that event number appears below the statement indicating the number of events recorded.

```
SAFETRAN SYSTEMS CORPORATION

Software Version 8V993-A01C

10-APR-1997 04:01 PM

Number of Events Recorded = 1568

Start Print Event          = 1562

DATE     TIME       - INPUT CHANNELS -      ----- SPEEDS -----
MM/DD    HH:MM:SS   1-------8  9-------16   WT     DET    AVG    ISL    STATUS
-------- ---------- -------------------------  ------ ------ ------ ------ -------------------------
-
 04/09   02:21:15A  1--4--78    -012-4-6    35     37     39     36     T1 Train Move
 04/09   02:22:57A  12-4--78    -012-4-6    ---    ---    ---    ---    Input Change
 04/09   02:34:12A  12-4--78    -012-4-6    ---    ---    ---    ---    ERROR 9111
                                                                        T1 GAIN CHECK
 04/10   10:27:15A  12-4--78    -012-4-6    ---    ---    ---    ---    Power Off
```

Figure 9-11:
Typical Data Recorder Printout

Data lines are printed beginning with the earliest (oldest) event recorded in memory (event number 1), or with a designated event number (see paragraph 9.1.4.2), and ending with the last event recorded before the print was initiated.

- The first two data fields in each data line indicate the date and time when the event was recorded.
- The next two data fields indicate the current status of external input channels 1 through 8 and 9 through 16.
- The next four data fields indicate warning time and train speeds recorded during a train move. Data appears in these four fields only if the data line is for a train move.

NOTE

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

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

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

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

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

- The last data field indicates the type of event the data line represents.

The DATE data field appears in each data line and indicates the month and day (MM/DD) the event was recorded.

The TIME data field appears in each data line and indicates the hour, minute, and second (HH:MM:SS) the event was recorded.

- Also indicated after the seconds entry is A for AM or P for PM when the standard time format is used, or a blank when the 24-hour (military) time format is used.

The INPUT CHANNELS fields appear in each data line regardless of whether an input change occurred.

- For all data lines where no input change occurred, the last recorded input states are indicated.

If an input state changed, the data line is labeled as an input change in the last data field (Status) and the new channel input states are shown.

- A high (energized) state on an input is indicated by the presence of the channel number in the corresponding channel column of the data field (second digit of the channel number shown for two-digit numbers).
- A low (de-energized) input state is indicated by a dash in the channel column.

The SPEEDS data fields contain data only when the data line is for a train move (Status data field indicates track (T1 or T2) and train move).

- The first data field in this group indicates the warning time (WT) recorded during the train move.
- The next three data fields indicate the detected speed (DET), average speed (AVG), and island speed (ISL) for that move.

The STATUS data field indicates the type of event for which the data was recorded.

- Table 9-1 indicates the six types of events recorded, their corresponding entry in the Status data field, and a brief description of the event.

Table 9-1:
Data Recorder Printout Status Message Descriptions

EVENT TYPE	STATUS DATA FIELD ENTRY	EVENT DESCRIPTION
Train Move	**T1 Train Move**	Train move on track 1
	T2 Train Move	Train move on track 2
Input Change	**Input Change**	Input change (active to inactive or inactive to active) occurred on one or more of the 16 external channel inputs.
Error (Diagnostic) Message Generated	**Error (followed by four-digit message code and a brief description in the second line)**	Error (diagnostic) message identified by four-digit code has been recorded. See table 7-2 for message descriptions for each code.
Power Applied to 3000 GCP	**Power On**	Indicates 3000 GCP POWER switch was set to the ON position, or in a 3000D2, power was applied to the module set containing the data recorder module.
Power Removed From 3000 GCP	**Power Off**	Indicates 3000 GCP POWER switch was set to the OFF position, or in a 3000D2, power was removed from the module set containing the data recorder module.
Calibration Procedure Performed	**T1 Calibration**	Setup For Calibration procedure performed on track 1
	T2 Calibration	Setup For Calibration procedure performed on track 2
System Reset	**System Reset**	Complete system reset has been performed

9.2.6 Reference Information For Serial Port Configuration

Electronic devices such as PC/laptops, modems, and printers that are equipped with RS232C serial interface connectors (ports), operate either as data terminal equipment (DTE) or data communications equipment (DCE). The difference lies in the serial connector pin assignments (see Table 9-2).

Table 9-2:
Data Recorder Module RS232C Connector (J1) Pin Assignments

PIN	SIGNAL - DTE MODE[1]	SIGNAL - DCE MODE[2]
1	Ground	Ground
2	Transmit Data (TxD)	Receive Data (RxD)
3	Receive Data (RxD)	Transmit Data (TxD)
4	Request To Send (RTS)	Request To Send (RTS)
5	Clear To Send (CTS)	Clear To Send (CTS)
6	Data Set Ready (DSR)	Data Set Ready (DSR)
7	Ground	Ground
8	Data Carrier Detect (DCD)	Data Carrier Detect (DCD)
20	Data Terminal Ready (DTR)	Data Terminal Ready (DTR)

[1]Serial port configured for modem communications

[2]Serial port configured for PC/laptop and printer communications

To enable the data recorder module (80015/80115) to communicate with any of these external devices over a standard pin-to-pin serial cable (no pins swapped), the operating modes (DTE or DCE) for the two devices must be opposite.

Since the majority of these serial devices generally operate in the DCE mode, the data recorder module is shipped from the factory with the RS232C PC/printer serial port (J1) configured in the DCE mode.

A pair of double-pole rocker switches (SW2 and SW3) are provided on the data recorder module (refer to Figure 9-1) to control the module operating mode (DCE or DTE) by switching pin assignments of connector J1 as shown in Figure 9-12.

NOTE

Both sections of rocker switches (SW2 and SW3) should always be set to the same positions. The rocker positions are toward connector J1 for DCE mode and away from the connector for DTE mode.

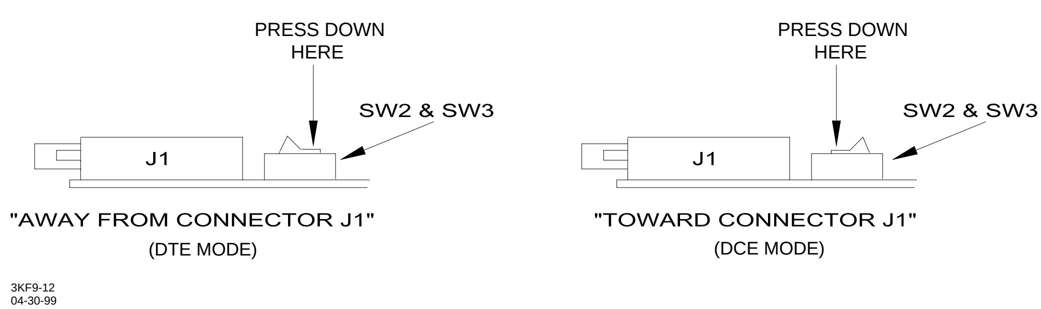


Figure 9-12:
Data Recorder Module Serial Port Mode Select Switch Positions

9.2.7 Data Recorder Module (80015 and 80115) Specifications

Power:

Voltage	9.0 – 16.5 VDC
Ampere Hour Rating	2.6Ah
Battery ,	3.6V Lithium
P/N	LS14500
Ordering Information	EDP No.: Z801-02193-0000

Data Inputs:

(Internal)	Via 3000 GCP 8-bit data/access bus
(External)	1 to 16 channels (parallel) via interface assembly (80025) and 3000 GCP front panel RECORDER connector J1
Input Resistance	5k ohms (opto-isolator interfaces on 80025 assembly)
Input Voltage	8-36 VDC (opto-isolator interfaces on 80025 assembly)
Signal Persistence	0.500 milliseconds (minimum)

Memory Capacity: 64k bytes of data; approximate capacity = 3,000 events

Time Base: Crystal controlled; 24 hour, minutes, seconds

Resolution	1 second
Stability	Accurate to within 2 minutes per year
Signature	Time and date recorded with each event or change of input state

Date: Day/month/year (in printout header)

Month/day (for each data line printed)

Operating Temperature: -40°F to +160°F (-40°C to +71°C)

Dimensions:

Data Recorder Module (80015/80115)	8.00 inches (20.32 cm) wide 8. 9 inches (22.6 cm) long
Interface Assembly (80025), 16 Channel	1.875 inches (4.76 cm) high 9.375 inches (23.81 cm) wide 8.375 inches (21.27 cm) deep

Weight:

Data Recorder Module (80015)	1 pound (0.45 kg) (approximate)

Data Recorder Module (80115)	0.7 pound (0.32 kg) (approximate)
Interface Assembly (80025), 16 Channel	1 pound (0.45 kg) (approximate)

9.2.8 PROM Replacement For 80015 Data Recorder (Firmware Upgrade)

The versatility of microprocessor-controlled equipment permits operational features to be enhanced by simply installing upgraded firmware (system operating program stored in a hardware device).

- On the data recorder module (80015), the operating program is contained in a PROM device (U1 on Figure 9-1).
- Perform the procedure in the following paragraphs to replace the PROM.

9.2.8.1 <u>Guidelines For Handling Modules And PROM's</u>

Before proceeding with any software upgrade, review the following guidelines concerning proper handling of static-sensitive electronic devices. Improper handling of the PROM's could result in accidental damage to their internal circuits due to high static voltages or electrostatic fields.

<u>CAUTION</u>

REMOVE POWER FROM THE 3000 GCP CASE BEFORE REMOVING OR INSTALLING MODULES.

Step1. Except when necessary, avoid touching the PROM leads.

Step 2. Use of integrated circuit extractor/inserter tools designed to remove and install electrostatic-sensitive PROM's (OK Industries, Inc., Model EX-2 Extractor and Model MOs-40 Inserter, or equivalent) is highly recommended.

Step 3. When replacing a PROM, always lay the module on the electrostatic bag provided, not directly on the work surface. The bag will isolate the pins extending from the solder side of the module from the work surface and prevent possible damage to the PROM or module.

Step 4. Following removal from a module, old PROM's should be inserted into the conductive foam material supplied with the upgrade PROM's and returned to Safetran in California for subsequent reprogramming.

<u>CAUTION</u>

ALL UPGRADE PROM'S SHOULD REMAIN IN CONDUCTIVE FOAM MATERIAL UNTIL INSTALLED ON THE MODULE.

9.2.8.2 PROM Replacement Procedure

Step 1 Set the POWER switch on the 3000 GCP case to the OFF position.

Step 2 Remove the 80015 Data Recorder module from the 3000 GCP case.

Step 3 Refer to Figure 9-1 and locate PROM U1.

Step 4 Note the location of the notched end of the PROM

Step 5 Using an extractor tool, carefully remove U1 from the socket.

Step 6 Install the upgrade PROM in the U1 socket with the notched end of the PROM in the same position as noted in step 4. This ensures proper pin 1 orientation.

Step 7 Install the data recorder module in the proper card slot in the 3000 GCP case and ensure that the module is fully seated in the edge connector.

Step 8 Set the POWER switch on the 3000 GCP case to the ON position.

Step 9 Place the data recorder module CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) in the CLEAR position and hold it there until the LO BATT LED on the module begins to flash. Flashing starts in approximately 5 seconds.

Step 10 Connect a PC/laptop or printer to the data recorder module RS232C PC/printer serial connector (J1).

NOTE

If a PC/laptop/printer was not previously used with the data recorder module, or if a different device is to be used, verify that the device is compatible with the data recorder module and that the system is programmed as described in paragraph 9.2.1.

Step 11 Apply power to the PC/laptop or printer.

Step 12 Set data recorder module CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the OFF position.

Step 13 Set CLEAR/OFF/PRINT switch SW1 to the PRINT position.

The PC/laptop or printer should begin displaying or producing the file/printout header and data lines for any data recorded since the data recorder memory was last cleared.

Step 14 Verify that the file/printout format is the same as that shown in Figure 9-11.

Step 15 When file downloading or printing is complete, set CLEAR/OFF/PRINT switch SW1 (see Figure 9-1) to the OFF position.

9.2.9 Battery Replacement

The on-board lithium battery is provided to retain the data recorder memory contents in the event the battery supply to the 3000 GCP is interrupted.

- If the LO BATT LED on the front edge of the module (see Figure 9-1) begins to flash, the battery voltage is low and the battery must be replaced.

Perform the following steps to replace the battery.

NOTE

If the battery fails or is removed from the data recorder module, and power is then removed from the 3000 GCP case or the data recorder module is removed from its slot in the 3000 GCP case, all data in memory will be lost.

Step 1 Set the POWER switch on the 3000 GCP case to the OFF position.

Step 2 Remove the data recorder module (80015/80115) from the 3000 GCP case.

Step 3 Locate the battery (see Figure 9-1). Note the location of the battery positive terminal and carefully remove the battery from the holder.

Step 4 Install the fresh battery with the positive terminal toward the front edge of the module as noted in step 3 above.

Step 5 Return the data recorder module to its original position in the 3000 GCP case (step 2). Ensure that the module is fully seated in the edge connector.

Step 6 Set the 3000 GCP case POWER switch to the ON position.

Step 7 On the data recorder module, press and hold CLEAR/OFF/PRINT switch SW1(see Figure 9-1) in the CLEAR position for approximately 5 seconds until the LO BATT LED on the front edge of the module begins to flash. Release the switch.

Step 8 Refer to paragraph 9.2.1, steps 7 through 9.2 and reprogram the date and time.

9.2.10 Interface Cables

Table 9-1 lists a number of typical interface cable configurations required to download recorded data to a PC/laptop or to print the information.

Recorded data can be downloaded directly via RS232C PC/printer serial connector J1 on the data recorder module (80015/80115), or from MODEM connector J2 on the 80025 Data Recorder Interface assembly via RECORDER connector J1 on the 3000 GCP front panel.

Table 9-3:
Interface Cable Configurations

APPLICATION	CONNECTOR/PIN CONNECTIONS	COMMENTS
PC/printer connector J1 on the Data Recorder module (80015/80115) to a PC/laptop or modem	DB-25 to DB-25. Straight- through wiring (pins 1-1, 2-2, 3-3, etc.)	25-pin male to 25-pin female. For PC/laptop connection, configuration switches SW2 and SW3 on the data recorder module must be set toward PC/printer connector J1(DCE mode). For modem connection, SW2 and SW3 must be set away from J1 (DTE mode) (see paragraph 9.26).
PC/printer connector J1 on the data recorder module (80015/80115) to a modem or to a Texas Instruments, Silent 700 printer	DB-25 to DB-25. Straight through wiring (1-1, 2-2, 3-3, etc.)	25-pin male to 25-pin male. For modem connection, configuration switches SW2 and SW3 on the data recorder module must be set away from PC/printer connector J1 (DTE mode). For printer connection, switches SW2 and SW3 must be set toward J1 (DCE mode) (see paragraph 9.1.6).

9.3 EXTERNAL DATA RECORDING

The 80251 Safetran Event Analyzer Recorder (SEAR) is an external recorder that receives data from an 80258 Digital/Analog I/O Unit and/or one or more GCP's located at the same crossing and equipped with an 80255 or 80265 recorder interface module.

- The 80258 and the GCP's communicate with the SEAR via a high-speed, two-wire local area network (LAN) (see Figure 9-14).

- The 80255/80265 module plugs into the 80015 data recorder slot of a GCP, providing an interface to the LAN.
- Each GCP at a crossing sends warning time, train speed, and diagnostic code data via the LAN to the SEAR.

To enable the SEAR to recognize the source of the data it receives each device on the LAN is given a unique address number called a node.

- Nodes must be installed in each device before the data from that device can be recognized and captured by the SEAR.
- Most node numbers have been pre-assigned by Safetran to a specific type of device; i.e., nodes 6, 7, and 8 are assigned to GCP’s.
- Node installation enables the SEAR to associate an assigned node with a specific device on the LAN.

NOTES

Any 3000 GCP system in the field may be retrofitted with an 80255 (with 80214) or 80265 (with 80014 or 80044) recorder interface module. However, when either of these interface modules are installed in an automatic transfer system (3000D2 or 3000ND2), the 80028 transfer timer module must have a D1 revision level or later; i.e., D2, D3, E1, etc.

The revision level of the 80028 module is printed on a sticker located on the component side of the module.

- On modules having a bar code sticker, the revision level is printed at the far right end of the sticker; e.g., E1.
- Otherwise, the revision number appears on a small sticker located near the edge of the module; e.g., REV E1.

Any 80028 module may be upgraded to a D1 revision level or later.

9.3.1 80255 and 80265 Wiring Requirements

Ensure that the following wiring requirements have been completed and the appropriate recorder interface module(s) (80255 or 80265) is (are) installed in the data recorder slot(s) prior to node installation.

9.3.1.1 80255 Module Only –Interconnection Cable

An interconnection cable must be installed between the modular connector of the 80214 Processor module and the modular connector of the 80255 module as shown in Figure 9-13. Each GCP at a crossing containing an 80255 module must have this cable installed.

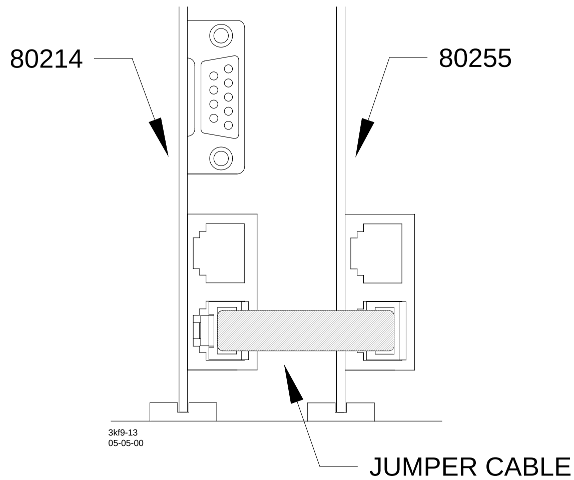


Figure 9-13:
Recorder Interface Module Jumper Installation

NOTE

This cable allows data to be transferred between the 80214 module and the front panel RECORDER J1 connector via the 80255 module. This cable is not needed when the 80265 module is installed.

9.3.1.2 80255 and 80265 Modules – 80063 LAN Connections

- An 80063 GCP to network interface plug assembly must be plugged into the RECORDER J1 connector.
- Two #20 AWG stranded, twisted wires must be connected between the 80063 and the Safetran Event Analyzer Recorder (SEAR) as shown in Figure 9-14.

NOTE

All other GCP's at the crossing that are sending data to the SEAR must be connected to the Echelon® LAN as shown in Figure 9-14.

9.3.2 80255 Node Installation Procedure

The 80255 Recorder Interface Module may be installed in any 3000 GCP system containing the 80214 Processor.

NOTE

A node installed in a GCP system utilizing an 80255 Module must be reinstalled only when the 80020/80029 Control Interface Assembly Module of that GCP are replaced, or when its program parameters have been Set To Default. However, all GCP nodes must be reinstalled when the 80251 SEAR Processor Display Unit is replaced.

Step 1 Depending on the number of GCP systems with interface modules at the crossing, select a GCP unit designation and a corresponding node assignment from the following table:

Table 9-4:
GCP Node Cross Reference Chart

GCP UNIT DESIGNATION	MAIN SYSTEM NODE	STANDBY SYSTEM NODE
First	6	16
Second	7	17
Third	8	18

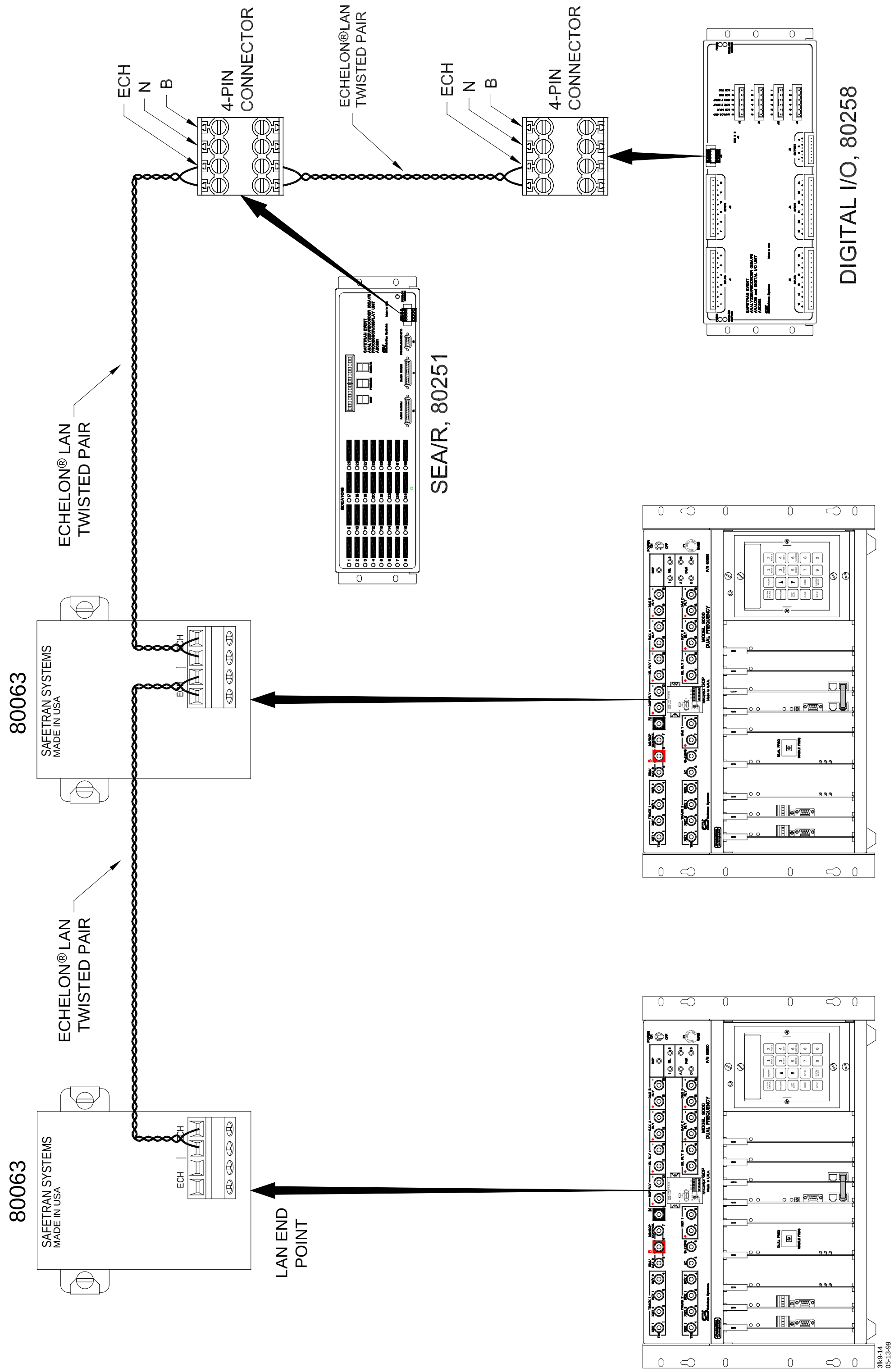


Figure 9-14:
GCP Echelon LAN Interconnection Diagram

NOTE

For further information regarding the Echelon LAN system and how connections are accomplished, please refer to Safetran's Echelon Configuration Handbook User' Guide, COM-00-07-09.

Step 2 Follow the Install Node instructions given in Safetran Event Analyzer Recorder (SEAR) Basic Crossing Configuration Handbook (Safetran Document SIG-00-98-05-XXX).

Step 2.1 When the SEAR requests Hit Service Button, momentarily press the Service Request push button on the appropriate 80214 Processor Module. The following message is presented on the GCP Keyboard alphanumeric display.

PRESS ENTER TO **INSTALL RECORDER**

Step 2.2 Press the ENTER key on the GCP keyboard. A message similar to the following is presented on the GCP Keyboard alphanumeric display and the installed node number is displayed:

PROGRAM RECORDER **EXTERNAL NODE 6**

NOTE

Installed GCP node assignment numbers can be easily checked or verified by means of the Wink Node or Identify Node procedures given in Safetran Event Analyzer Recorder (SEAR) Basic Crossing Configuration Handbook (Safetran Document SIG-00-98-05-XXX).

Step 3 If a dual (main/standby) system is in service:

- Move the Transfer Switch on the 80028 Transfer Timer Module or the 80024 Automatic Transfer Timer Unit from MAIN to STBY (Standby)
- Repeat steps 1 through 2.2, installing the associated standby system node number provided in the node assignment table.

Step 4 Repeat steps 1 through 3 for any additional GCP's at the crossing.

9.3.3 80265 Node Installation Procedure

The 80265 Recorder Interface Module may be installed in 3000 GCP systems containing the 80014 or 80044 Processors.

NOTE

A node installed in a GCP system utilizing an 80265 Module must be reinstalled only when the 80265 Module is replaced. However, all GCP nodes must be reinstalled when the 80251 SEAR Processor Display Unit is replaced.

Step 1 Press the PROGRAM key on the GCP keyboard.

Step 2 Press the up arrow key (▲).

Step 2.2 Press the NEW DATA key on the GCP keyboard (as required) until the following message is presented in the GCP keyboard alphanumeric display:

PROGRAM RECORDER
INSTALLED

Step 2.3 Press the ENTER key on the GCP keyboard.

Step 3 Depending on the number of GCP systems with interface modules at the crossing, select a GCP unit designation and a corresponding node assignment from the following table.

Table 9-5:
GCP Node Cross Reference Chart

GCP UNIT DESIGNATION	MAIN SYSTEM NODE	STANDBY SYSTEM NODE
First	6	16
Second	7	17
Third	8	18

Step 4 Follow the Install Node instructions given in Safetran Event Analyzer Recorder (SEAR) Basic Crossing Configuration Handbook (Safetran Document SIG-00-98-05-XXX).

Step 4.1 When the unit node is displayed by the SEAR, press the Service Request switch on the 80265 Recorder Interface Module.

Step 5 Press the SYSTEM STATUS key on the GCP keyboard.

Step 5.1 Press the up arrow key (▲) and verify that the following message is presented in the GCP keyboard alphanumeric display:

A80265 INSTALLED

NOTE

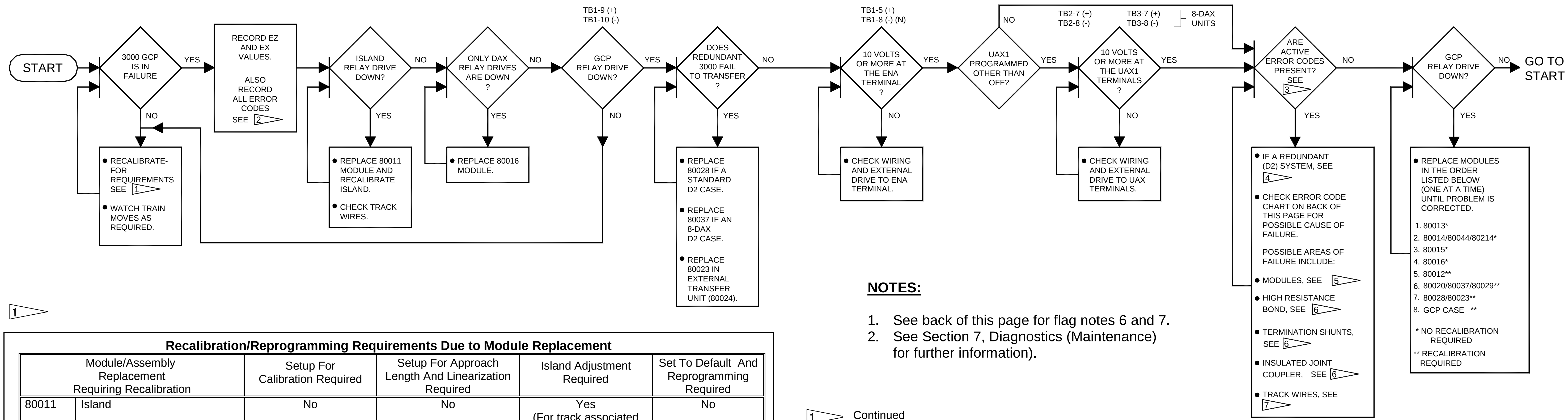
Installed GCP node assignment numbers can be easily checked or verified by means of the Wink Node or Identify Node procedures given in Safetran Event Analyzer Recorder (SEAR) Basic Crossing Configuration Handbook (Safetran Document SIG-00-98-05-XXX).

Step 6 If a dual (main/standby) system is in service:

- Move the Transfer Switch on the 80028 Transfer Timer Module or the 80024 Automatic Transfer Timer Unit from MAIN to STBY (Standby)
- Repeat steps 1 through 5.1, installing the associated standby system node number provided in the table of step 2.

Step 7 Repeat steps 1 through 6 for any additional GCP's at the crossing.

3000 GCP TROUBLESHOOTING CHART



NOTES:

1. See back of this page for flag notes 6 and 7.
2. See Section 7, Diagnostics (Maintenance) for further information).

1

Recalibration/Reprogramming Requirements Due to Module Replacement

Module/Assembly Replacement Requiring Recalibration		Setup For Calibration Required	Setup For Approach Length And Linearization Required	Island Adjustment Required	Set To Default And Reprogramming Required
80011	Island	No	No	Yes (For track associated with 80011 only)	No
80012	Transceiver	Yes (For track associated with 80012 only)	No	No	No
80013	Relay Drive	No	No	No	No
80014, 80044, 80214	Processor	No	No	No	No
80014, 80044, 80214	Processor (With new software level)*	Yes (Both tracks)	Yes** (Both tracks)	No	Yes (Both tracks)
80015	Data Recorder	No	No	No	No
80016	DAX	No	No	No	No
80020, 80029	Control Inter-face Assembly*	Yes (Both tracks)	Yes** (Both tracks)	No	Yes (Both tracks)
80023, 80028, 80037	Switch Over	Yes (Both tracks)	No	Yes (Both tracks)	No

*When a new software level is added (new PROM's) or the control interface assembly is replaced, first set the system to the default parameters and then perform complete reprogramming and recalibration.
**Can be accomplished by re-entering the EZ and linearization data from the History card.

Recalibration/Reprogramming Requirements Due to Programming Changes

Programming Changes Requiring Recalibration	Setup For Calibration Required	Setup For Approach Length And Linearization Required
Increased Number of Tracks From 1 to 2	Yes (For track 2 only)	Yes (For track 2 only)
GCP Frequency Changed	Yes (Both tracks)	Yes (Both tracks)
Application Changed From: Unidirectional to Bidirectional or Bidirectional to Unidirectional	Yes (Only for the track that was changed)	Yes (Only for the track that was changed)
Transmit Level Changed From: Medium to Maximum or Maximum to Medium	Yes (Only for the track that was changed)	No
Approach Length Changed	Yes (Only for the track that was changed)	Yes (Only for the track that was changed)
Ballast Compensation Value Changed	Yes (Only for the track that was changed)	No

1 Continued

Recalibration/Reprogramming Requirements Due to Track Equipment Changes

Track Equipment Changes Requiring Recalibration	Setup For Calibration Required	Setup For Approach Length And Linearization Required	Island Adjustment Required
Termination Shunts Changed or Moved to New Location*	Yes	Yes	No
Termination Shunts of Other Frequencies Added, Removed From, or Moved Within 3000 GCP Approach(es)	Yes	Yes	No
Wideband Insulated Joint Coupler, 8A076 Replaced in 3000 GCP Approach(es)	Yes	No	No
Tuned Insulated Joint Couplers (62785-f) Replaced in 3000 GCP Approach(es)	Yes	Yes	No
3000 GCP Track Wire(s) Replaced	Yes	No	Yes

*Approach length in the Program menu must be changed to reflect the new approach length.

2

Erratic shunting, including that caused by maintenance vehicles, is generally recognized by multiple error codes which may include any combination of the following:

Track 1		Track 2	
Error Code	Text Displayed	Error Code	Text Displayed
8201	T1 FREQUENCY	8202	T2 FREQUENCY
9011	T1 LOW EX	9013	T2 LOW EX
9015	T1 HIGH EZ	9016	T2 HIGH EZ
8300	T1 SELF-CHECK	8301	T2 SELF-CHECK

NOTE: When using an 80044 or 80214 processor module with the Enhanced Detection (ED) operating mode enabled (On), erratic shunting will produce message code 9400 (T1) or 9401 (T2) instead of the above error codes.

3

To determine if there are current active error codes, proceed as follows:

1. Press and hold SYSTEM RESET key for approximately 3 seconds until the following message is displayed.

   PRESS ENTER TO CLEAR ERRORS

2. Press the ENTER key.

Notes: **1.** Any error codes that remain after the above steps are performed are active and current. Locate error code number(s) in the Error Code Chart on the back of this page to determine possible cause.

2. If EZ value is less than 3 and 3000 GCP power is interrupted for any reason, or a system error occurs, relay drive will not recover until EZ value is greater than 3. However, if the low EZ is caused by a train in the approach, this condition can be manually overridden with a "system reset".

4

If a redundant (D2) system, then switch to the standby unit and see if the identical failure is present. If it is, the problem is generally track related.

5

See Error Code Chart on the back of this page.

3000TRBL1.DOC

3000 GCP TROUBLESHOOTING CHART

6

High resistance bonds, insulated joint couplers/track connections, or termination shunts/track connections can produce the following error codes:

Error Code	Text Displayed	Track Affected
9015	T1 HIGH EZ	T1
9016	T2 HIGH EZ	T2

7

Possible increased track wire resistance or track connections can produce the following error codes:

Error Code	Text Displayed	Track Affected
8113	T1 XMIT CURRENT	T1
8117	T2 XMIT CURRENT	T2
9111	T1 GAIN CHECK	T1
9112	T2 GAIN CHECK	T2
9021	T1 CHECK CHANNEL	T1
9022	T2 CHECK CHANNEL	T2

5

ERROR CODE CHART

Error Code	Text Displayed	Description	Possible Cause
1100	ROM	ROM Checksum Error	80014/80044/80214 Processor Module
1200	RAM	RAM Read/Write Error	80014/80044/80214 Processor Module
1300	NOVRAM	NOVRAM Checksum Error	80020/80029 Keyboard/Display Interface Module
1400	ROM	ROM Checksum Error (System Reset)	80014/80044/80214 Processor Module
1500	RAM	RAM Read/Write Error (System Reset)	80014/80044/80214 Processor Module
1600	NOVRAM	NOVRAM Checksum Error (System Reset)	80020/80029 Keyboard/Display Interface Module
4000	ENA INPUT	ENA Input Error	80013 Relay Drive Module
4001	UAX INPUT	UAX Input Error	80013 Relay Drive Module
4002	T1 ISLAND INPUT	Island Relay Drive 1 Input Error	80013 Relay Drive Module
4003	T2 ISLAND INPUT	Island Relay Drive 2 Input Error	80013 Relay Drive Module
4004	MS/GCP CONTROL	MS/GCP Control Input Error	80013 Relay Drive Module
4100	DAX A OUTPUT	DAX A Relay Drive Output Error	80016 DAX Module Number 1 *
4101	DAX B OUTPUT	DAX B Relay Drive Output Error	80016 DAX Module Number 1 *
4102	GCP OUTPUT	Prime GCP Relay Drive Output Error	80013 Relay Drive Module
4103	DAX C OUTPUT	DAX C Relay Drive Output Error	80016 DAX Module Number 2 *
4104	DAX D OUTPUT	DAX D Relay Drive Output Error	80016 DAX Module Number 2 *
4105	AT OUTPUT	Approach Track Output Error	80013 Relay Drive Module
4106	DAX E OUTPUT	DAX E Relay Drive Output Error	80016 DAX Module Number 3 *
4107	DAX F OUTPUT	DAX F Relay Drive Output Error	80016 DAX Module Number 3 *
4108	DAX G OUTPUT	DAX G Relay Drive Output Error	80016 DAX Module Number 4 *
4109	DAX H OUTPUT	DAX H Relay Drive Output Error	80016 DAX Module Number 4 *
5001	DATA RECORDER	Data Recorder Not Responding	80015/80115 Data Recorder Module
5002	DATA RECORDER	Incorrect Data Transmission	80015/80115 Data Recorder Module
5003	RECORDER ROM	Recorder ROM Checksum Error	80015/80115 Data Recorder Module
5004	RECORDER RAM	Recorder RAM Checksum Error	80015/80115 Data Recorder Module
8001	-5 VOLT SUPPLY	- 5 Volt Power Out of Range	80013 Relay Drive Module
8002	+5 VOLT SUPPLY	+5 Volt Power Out of Range	80013 Relay Drive Module
8003	T1 -8V SUPPLY	Track 1 -8 Volt Power Out of Range	80012 Transceiver Module (left)
8004	T1 +8V SUPPLY	Track 1 +8 Volt Power Out of Range	80012 Transceiver Module (left)
8005	T2 -8V SUPPLY	Track 2 -8 Volt Power Out of Range	80012 Transceiver Module (right)
8006	T2 +8V SUPPLY	Track 2 +8 Volt Power Out of Range	80012 Transceiver Module (right)
8007	-15 VOLT SUPPLY	-15 Volt Power Supply Out of Range	80013 Relay Drive Module
8008	+15 VOLT SUPPLY	+15 Volt Power Supply Out of Range	80013 Relay Drive Module
8111	T1 XMT VOLTAGE	Track 1 Transmit Voltage Too Low	80012 Transceiver Module or high voltage on track
8112	T1 XMT VOLTAGE	Track 1 Transmit Voltage Too High	80012 Transceiver Module or high voltage on track
8113	T1 XMIT CURRENT	Track 1 Transmit Current Low	80012 Transceiver Module (left), transmit track wires
8114	T1 XMIT CURRENT	Track 1 Transmit Current High	80012 Transceiver Module (left)
8115	T2 XMT VOLTAGE	Track 2 Transmit Voltage Too Low	80012 Transceiver Module or high voltage on track
8116	T2 XMT VOLTAGE	Track 2 Transmit Voltage Too High	80012 Transceiver Module or high voltage on track
8117	T2 XMIT CURRENT	Track 2 Transmit Current Low	80012 Transceiver Module (right), transmit track wires
8118	T2 XMIT CURRENT	Track 2 Transmit Current High	80012 Transceiver Module (right)
8200	FREQUENCY	Processor Frequency Out of Range	80014/80044/80214 Processor Module
8201	T1 FREQUENCY	Track 1 Frequency Out of Range	80012 Transceiver Module (left)
8202	T2 FREQUENCY	Track 2 Frequency Out of Range	80012 Transceiver Module (right)
8203	T1 XMIT FREQ	Processor frequency out of range	80214 Processor Module
8204	T2 XMIT FREQ	Processor frequency out of range	80214 Processor Module
8300	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (left)
8301	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (right)

* Numbered from the left

5 Continued

ERROR CODE CHART (continued)

Error Code	Text Displayed	Description	Possible Cause
8411	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8412	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8413	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8414	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8421	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8422	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8431	T1 SELF-CHECK	Track 1 Self-check Not Successful	80013 Relay Drive Module or 80214 Processor Module
8432	T2 SELF-CHECK	Track 2 Self-check Not Successful	80013 Relay Drive Module or 80214 Processor Module
8441	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8442	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8451	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8452	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8453	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8454	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
8461	T1 SELF-CHECK	Track 1 Self-check Not Successful	80012 Transceiver Module (for T1) or 80214 Processor Module
8462	T2 SELF-CHECK	Track 2 Self-check Not Successful	80012 Transceiver Module (for T2) or 80214 Processor Module
9001	T1 LOW PHASE	Track 1 Phase Low	80012 Transceiver Module or Track Wires
9002	T1 HIGH PHASE	Track 1 Phase High	80012 Transceiver Module or Track Wires
9003	T2 LOW PHASE	Track 2 Phase Low	80012 Transceiver Module or Track Wires
9004	T2 HIGH PHASE	Track 2 Phase High	80012 Transceiver Module or Track Wires
9011	T1 LOW EX	Track 1 EX Under Low Limit	Low Ballast
9012	T1 HIGH EX	Track 1 EX Over High Limit	80012 Transceiver Module (left)
9013	T2 LOW EX	Track 2 EX Under Low Limit	Low Ballast
9014	T2 HIGH EX	Track 2 EX Over High Limit	80012 Transceiver Module (right)
9015	T1 HIGH EZ	Track 1 EZ Over High Limit	Bond, Termination, tunable insulated joint bypass couplers, or connections
9016	T2 HIGH EZ	Track 2 EZ Over High Limit	Bond, Termination, tunable insulated joint bypass couplers, or connections
9021	T1 CHECK CHANNEL	Track 1 Channel 2 EZ Over High Limit	80012 Transceiver Module (left), transmit track wires
9022	T2 CHECK CHANNEL	Track 2 Channel 2 EZ Over High Limit	80012 Transceiver Module (right), transmit track wires
9023	T1 LOW EZ DETECT	Indicates Track 1 EZ Below 70 with Low EZ Option Selected	
9024	T2 LOW EZ DETECT	Indicates Track 2 EZ Below 70 with Low EZ Option Selected	
9031	T1 LOW EX *ADJ*	Track 1 EX Under Low Adjustment	Low Ballast
9032	T1 ADJ LOW EX	Track 1 EX Under 39	Low Ballast
9033	T2 LOW EX *ADJ*	Track 2 EX Under Low Adjustment	Low Ballast
9034	T2 ADJ LOW EX	Track 2 EX Under 39	Low Ballast
9111	T1 GAIN CHECK	Track 1 Channel 2 Out of Range	Bond Within Island, Receiver Connection, track wires
9112	T2 GAIN CHECK	Track 2 Channel 2 Out of Range	Bond Within Island, Receiver Connection, track wires
9115	T1 EX PROCESS	Track 1 EX Process Error	High Resistance Bond
9116	T2 EX PROCESS	Track 2 EX Process Error	High Resistance Bond
9400‡	T1 ENHANCED DET	Track 1 Switched to *ED* Mode	Poor Track Shunting Conditions on Track 1
9401‡	T2 ENHANCED DET	Track 2 Switched to *ED* Mode	Poor Track Shunting Conditions on Track 2

‡ Applies only to units equipped with 80044 or 80214 processor modules.