SIEMENS

INSTALLATION & OPERATION

EXIT GATE MANAGEMENT SYSTEM (EGMS) (SOFTWARE VERSION 4.5)

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DOCUMENT HISTORY

Version	Release Date	Details of Change
A		Initial release
B	April 2009	• Updated title page for new version**.** • Pg 2-7, paragraph **2.2.6 Aux Output 1 Mapping** Replaced **one of the "Detect Out" functions** with **a DET-ALL, DET-XRISL, DET-XR or DET-ISL function**. • Pg 2-8, paragraph **2.2.7 Aux Output 2 Mapping** Replaced **one of the "Detect Out" functions** with **a DET-ALL, DET-XRISL, DET-XR or DET-ISL function**. • Pg 2-8, paragraph **2.2.8 Aux Output 3 Mapping** Replaced **one of the "Detect Out" functions** with **a DET-ALL, DET-XRISL, DET-XR or DET-ISL function**. • Pg 2-8, paragraph **2.2.9 Aux Output 4 Mapping** Replaced **one of the "Detect Out" functions** with **a DET-ALL, DET-XRISL, DET-XR or DET-ISL function**. • Pg 2-13, paragraph **2.4.10 Bidirectional Delay Time** Changed Bidirectional Delay Time range from **0 to 255 seconds in 1-second increments** to **0 to 25.5 seconds in 0.1 second increments**. • Pg 2-18, paragraph **2.5.10 Auxiliary Input Monitors** Added sentence to end of paragraph – "These inputs are not available in the standard EGMS chassis wiring, but may be added if necessary for specific customer requirements." • Pg 3-10, paragraph **3.7.3 Text Detector Status (LCL DETS)** In third bullet under **Detailed detector health status (HEALTH)**, changed **S - The gate** to **S - The detector.** • Pg 3-19 & 3-20, paragraph **3.8.2.1 EGMS Parameters** Bullet **TIMED EGCT** redefined**.** Bullet **ISL INH. TIME** redefined**.** Bullet **XR DET DISABLE** redefined**.** Bullet **BIDIR DELAY** – inserted "on any combination of loops" in last sentence. Bullet **EXIT UP REQ** – changed **"Gate Override output"** to **"Gate Hold output"** in three places. • Pg 3-22, paragraph **3.8.2.2 Alarm Parameters** Bullet **AUXIN 1 ENABLE** - added sentence to end of paragraph – "These inputs are not available in the standard EGMS chassis wiring, but may be added if necessary for specific customer requirements." • Pg 3-24, paragraph **3.8.2.3 Communications Parameters** Added STOP BIT default values for Local and Remote ports. Added Dual Unit port default values. • Pg 3-25 thru 3-28, paragraph **3.8.2.4 Miscellaneous Parameters** Bullet **Directional Indicators** – redefined and moved up in bullet list. Bullet **DET-ALL** – added "when DET-ALL is selected" to end of next-to-last sentence. Bullet **DET-XRISL** – added paragraph reference to end of definition for location of details on detector mapping. Bullet **DET-XR** – added paragraph reference to end of definition for location of details on detector mapping. Bullet **DET-ISL** – added paragraph reference to end of definition for location of details on detector mapping. • Pg 3-31 & 3-32, paragraph **3.8.3 Gate Parameters** Rewrote last sentence of first paragraph for clarity. Bullet **DIR** – redefined direction selections. • Pg 3-32 thru 3-34, paragraph **3.8.4 Detector Parameters** Rewrote last sentence of first paragraph for clarity. Bullet **DIR** – redefined direction selections and rewrote definition for clarity. Added bullet and definition for **DISABLE ON DOWN** parameter. • Pg 3-35 & 3-36, paragraph **3.9 EVENT VIEWER**

		Expanded description of up and down arrow buttons in third paragraph. Bullet **ALL / FILTERED** – Rewrote last sentence of first paragraph to expand directions for viewing events.
		Appendix B • Pg B-14, paragraph **B.4 LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #1)** Updated main Output Delay, Main Output Extension, Main Output Mapping and Aux Output Mapping parameter names Added software version number E4.02 for Loop 1. • Pg B-15, paragraph **B.6 LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #2) -** see above. • Pg B-16, paragraph **B.8 LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #3) -** see above. • Pg B-17, paragraph **B.10 LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #4) -** see above.
B.2	Oct 2015	Add Version 4.4 changes as follows: • Updated Title Page for the new version. • Pg. 2-7, 2-8, paragraphs 2.2.6 through 2.2.9 **add DETOBSTL option to AUX Output selections.** • Pg. 3-5, **Replace Figure 3-3** • Pg. 3-28, paragraph 3.8.2.4, AUX Mapping Parameters, h., **Add DETOBSTL description.**
B.3	Oct 2015	Add Version 4.5 changes as follows: • Pg. 3-5, **Replace Figure 3-3**

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NOTES, CAUTIONS, AND WARNINGS

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

WARNING

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

CAUTION

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

NOTE

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

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

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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.

GLOSSARY

DEGCT	**Dynamic Exit Gate Clearance Time** – A programmable, system-wide parameter that delays the activation of the Exit Gate Control output for a minimum amount of time after the beginning of entrance gate descent. During the DEGCT, the detectors are ignored and the system operates as if vehicles are present in the MTCD. Once the DEGCT expires, the exit gates are controlled based on vehicle presence.
EGCT	**Exit Gate Clearance Time** – The amount of time from the start of entrance gate descent until the start of exit gate descent. If Dynamic mode, this time may be zero. In Timed mode, this time is designed to allow vehicles passing under an entrance gate to continue beyond the exit gate and clear the crossing.
EGH	**Entrance Gate Hold** – An Output from EGMS that may be used to hold the entrance gates in the lowered position upon detection of an exit gate failure such that the exit gate cannot be raised.
EGMS	**Exit Gate Management System** – The EGMS is a system designed to monitor entrance gates and vehicle detectors, and control the operation of the exit gates accordingly.
GATO	**Gate Activation Timeout** – This feature allows the EGMS to detect extended crossing activations, generate an alarm, and (optionally) raise the exit gates in a safe, consistent manner when the crossing activation timeout is detected. This situation may occur when a track is broken, or a bond or shunt fails. This option is enabled to generate an alarm and (optionally) force the exit gates to rise after the timeout period, to allow emergency vehicles to traverse a crossing that is in the extended activation state.
MTCD	**Minimum Track Clearance Distance -** For standard two-quadrant railroad warning devices, the MTCD is the length along a highway at one or more railroad tracks, measured from the highway stop line, warning device, or 3.7 m (12 ft) perpendicular to the track centerline, to 1.8 m (6 ft) beyond the track(s) measured perpendicular to the far rail, along the centerline or edge line of the highway, as appropriate, to obtain the longer distance. For Four-Quadrant Gate systems, the MTCD is the length along a highway at one or more railroad tracks, measured either from the highway stop line or entrance warning device, to the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the centerline or edge line of the highway, as appropriate, to obtain the longer distance.
QZI	**Quiet Zone Indicator** – A visual display / indicator that is illuminated or flashes a specific pattern to the train crew, to provide visual confirmation that the crossing is functioning as intended and the quiet zone is intact. If the QZI is dark for any reason, the train crew is instructed to sound the locomotive horn upon approach to the crossing.
SSRM	**Spread-Spectrum Radio Modem** – a specific type of radio that communicates on unlicensed frequencies for short-haul communications needs. Within the EGMS, the SSRM may be used in place of hardwired serial communications in some applications.
TEGCT	**Timed Mode Exit Gate Clearance Time** - A programmable, system-wide parameter that delays the activation of the Exit Gate Control output for a minimum amount of time after the beginning of entrance gate descent. Once the TEGCT expires, the exit gate control outputs are activated and the exit gates begin descent. This parameter works in conjunction with the Timed operating mode only.

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1.0   INTRODUCTION

1.1   GENERAL

The EGMS, or Exit Gate Management System, is a microprocessor based system designed to operate as an overlay to existing entrance gate warnings systems. The EGMS operates as the exit gate / vehicle detector controller portion of a larger Four-Quadrant Gate Supplementary Safety Measure System. The EGMS provides inductive loop vehicle detectors to detect automotive traffic within the Minimum Track Clearance Distance (MTCD), which is essentially the area between the entrance and exit gates, and keep the exit gates in the raised position until all vehicular traffic is clear of the MTCD.

The EGMS also provides for operation of a Quiet Zone Indicator (QZI), a visual indication to the train crew reflecting the operational status of the EGMS. The QZI flashes a specific pattern to the train crew when the quiet zone is intact. If the indicator is dark, the train crew knows to blow the locomotive horn.
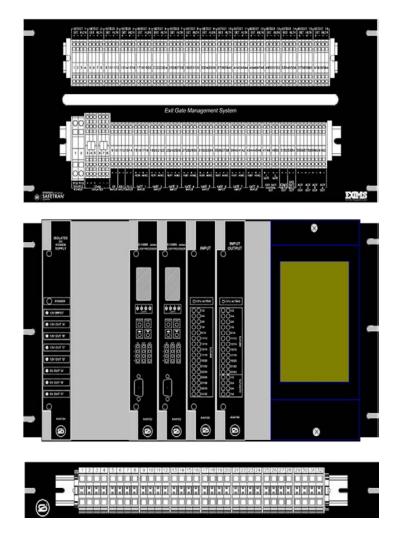
EGMS processor modules incorporate internal and external watchdog systems to prevent processor-related failures. The system power supply provides electrical isolation between the supply battery voltage and all EGMS working voltages. All input circuits are optically isolated and perform input self-checks to prevent false input voltages. In addition, software filtering is performed on all input voltages to reject AC-coupled noise. All outputs are transformer-isolated and require active circuitry and processing to drive the outputs to 12VDC. The primary CPU and auxiliary microprocessors perform extensive handshake operations to verify proper operation between the modules.

The EGMS is 19-inch rack-mounted, and occupies from 26 to 38 inches of vertical rack space, depending on the number of inductive loops required at the crossing. It consists of a System Chassis which houses all circuit boards; an upper Railroad Interface Panel which provides spring-clip style wiring termination points for all in-house wiring; and one to four Inductive Loop Termination Panels which provide AREMA style wiring termination points for all inductive loop cables.

1.2   RAILROAD INTERFACE PANEL

The EGMS Railroad Interface Panel contains all wiring termination points for equipment within the railroad bungalow. These terminations include battery source, gate position indicators, XR and Island inputs, and the gate control and health outputs. In addition, several signals between various components of the EGMS System Chassis are interconnected via this panel. Although no wiring from these interconnection points is necessary to the railroad bungalow, these wiring points allow for rapid troubleshooting of signals as necessary.

The panel provides termination points using spring-clamp connectors allowing wire gauges of #24 to #12 for signal wiring, and up to #10 for battery source. It is a 19-inch rack-mounted panel and contains two rows of connectors. Each terminal is silk screened as to signal function.

Figure 1-1 Typical EGMS Rack Layout

1.3   INDUCTIVE LOOP TERMINATION PANEL

The EGMS Inductive Loop Termination Panel contains all wiring termination points for the inductive loop detectors. These terminations include a primary loop pair and a check loop pair for each detector loop.

Each Inductive Loop Termination Panel provides termination points for up to 8 loop sets. Up to 2 termination panels may be installed, providing up to 16 loop terminations. All Inductive Loop Terminations are provided using spring-clamp connectors allowing wire gauges of #24 to #10 for the loop lead-in wiring.

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1.4   SYSTEM CHASSIS

The EGMS System Chassis contains the system circuitry. The circuit modules include the A44104 Isolated Power Supply, one A44108 Main Processor Module, one A44105 Input Module, one A44106 Input / Output Module, and from one to four A44102 Model E-1400S Inductive Loop Processor Modules. If system communications and/or enhanced event logging with USB transfer is utilized, one A44103 System Communications Module is included as well. In addition, one A44107 Graphics Touch-Screen Front Panel is mounted on the right front of the chassis, attaching in front of the A44108 CPU Module. The front panel is held in place using two quarter-turn lock screws.

A clear Lexan cover attaches in front of the full-height modules to provide dust and mechanical protection for the circuit boards. The cover is held in place using tabs on the cover that fit into slots on the chassis top.

The System Chassis is wired for module installation as shown in Figure 1-2. Note that the CPU386EX module is behind the touch-screen display.

Figure 1-2 Module Placement within EGMS Chassis

1.5   ISOLATED DC POWER SUPPLY MODULE, A44104

The EGMS operates on the 12VDC railroad battery supply. The A44104 Isolated DC Power Supply Module provides electrical isolation between the railroad battery system and the EGMS power voltages.

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The module contains three 5VDC isolated supplies for the system logic circuitry, and four 12VDC isolated supplies for the output driver circuitry and E-1400S Detector Module(s). Each supply operates independently and the output current is shared between the supplies. If any individual supply fails, the remaining supplies increase current outputs to compensate. This design allows for redundant power supply operation and fault tolerance, and reduces the current load on any one supply during normal operation, thus extending the expected supply lifetime dramatically. The current capacities of the individual supplies is such that any one supply failure will not result in reduced performance and the system will continue to function with only one functional supply per voltage.

The front panel of the module contains a toggle switch and LED indicators. The power switch allows the isolated supply voltages to be energized or de-energized for system maintenance and module replacement. The top LED, **12V IN**, is illuminated when the railroad battery voltage is applied to the module (regardless of power switch position). The remaining LEDs: **12V OUT A**, **12V OUT B**, **12V OUT C**, **12V OUT D**, **5V OUT A**, **5V OUT B**, and **5V OUT C** are illuminated to indicate proper operation of the corresponding isolated supply voltage.

1.6   INPUT AND INPUT/OUTPUT MODULES, A44105 (INPUT) AND A44106 (INPUT/OUTPUT)

The I/O module is a general-purpose module that may be configured with either 32 inputs, or 24 inputs and 8 outputs.

The base module provides the 32 input circuits plus all logic necessary to process those inputs and provide status to the EGMS CPU. The A44105 Input Module contains the silkscreen legend "**INPUT**".

An 8-channel output driver module may be attached to the base module to provide 8 output circuits. These outputs utilize the last eight inputs from the base module as output voltage monitoring circuits. The A44106 Input / Output Module contains the silkscreen legend "**INPUT/OUTPUT**".

Each I/O Module has a unique board address which is set via the board address configuration header. This header is located in the lower back corner of the board and is labeled "JP5 –BSEL". This is a four-position header with the positions numbered M, 2, 1, and 0. Individual board configurations are outlined within that board description.

The I/O module front panel includes 33 LEDs which provide information concerning system health and operation. With a quick glance, the status of the system may be determined.

The **CPU ACTIVE** LED is a single-color red indicator which flashes at a 1-Hz rate under normal operation. When the EGMS CPU and the I/O modules are functioning properly and performing the necessary "cross-checks" between the modules, THE CPU ACTIVE LED on each I/O module and

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the corresponding EGMS CPU LED will flash in a synchronized fashion. If the proper module cross-checks are not performed, the I/O module **CPU ACTIVE** LEDs will flash in a 1.5-second on / 0.5-second off rate. If an I/O module is not executing its internal software properly, the **CPU ACTIVE** LED will remain dark.

The remaining 32 LEDs on the I/O module provide state and status information for each of the input or output circuits. These are tri-color LEDs which may be in one of four states: dark, green, red, or orange. For each input or output circuit:

- **DARK** indicates that the I/O circuit is functioning properly and is currently de-energized (12VDC not applied/generated).
- **GREEN** indicates that the I/O circuit is functioning properly and is currently energized (12VDC applied/generated).
- **RED** indicates a current or latched failure of the I/O circuit and that the circuit is currently de-energized.
- **ORANGE** indicates a current or latched failure of the I/O circuit and that the circuit is currently energized.

The EGMS uses two I/O modules. One is configured as an A44106 Input / Output Module, for 24 inputs and 8 outputs. It monitors various railroad inputs and provides the outputs necessary to interface with the railroad equipment. The second I/O module is configured as an A44105 Input Module, for 32 inputs, and monitors the health and presence states from up to 16 loop detector channels (using up to 4 E-1400S Loop Processor Modules).

1.6.1   Input / Output Module (Railroad Interface), A44106

The A44106 Railroad Interface Input / Output Module is configured with 24 inputs and 8 outputs. It is the right-most I/O module within the EGMS rack. This module should be set as board #0 (the board address configuration header, JP5, should have one jumper and it should be installed on the "M" position).

The following inputs and outputs are available on the A44106 Input / Output Module, dependent on the database configuration and operating mode.

Inputs:
- **XR**: The EGMS monitors the Crossing Relay (XR) from the railroad equipment. Gate control and detector filtering may be applied based on the current state of the XR input.
- **ISL1 and ISL2**: The EGMS monitors up to two Island circuits from the railroad equipment. Gate control may be modified based on the current state of one or both Island inputs. The ISL1 input works in conjunction with the XR input to indicate the occupancy of the island by the train. The ISL2 input is typically used in conjunction with an Industrial Siding (IND-TR) or Island-Only (XTR) crossing activation, and provides a combination timed and dynamic gate operation, similar to the situation in which the XR and ISL 1 inputs are de-energized simultaneously.

- **GATE IN 1-8**: The EGMS monitors the gate positions (Vertical and Horizontal) for up to eight gates. These inputs are used to verify proper operation of the crossing equipment and EGMS, to modify loop detector operation based on gate position, and to raise exit gates in the event of entrance gate malfunction.
- **AUX IN 1 – AUX IN 4**: The EGMS is capable of monitoring up to four auxiliary inputs, log the input state changes, and generate alarm conditions based on the states of the auxiliary inputs. These inputs are not available in the standard EGMS chassis wiring, but may be added if necessary for specific customer requirements.

Outputs:
- **Exit Gate Control Out 1-2**: The EGMS energizes these outputs based on the configured operating mode. In Dynamic and Timed Exit Gate mode, each Exit Gate Out is energized when the corresponding exit gate(s) should be lowered. If the exit gate(s) should be raised, the output is de-energized ("fail-up" mode). The behavior of these outputs may be modified based on configuration options as described in the General Characteristics section of this document. In the EGMS configuration database, gates and detectors include a "direction" entry, standardized as "North" and "South". Exit Gate Out 1 is used to control all exit gates programmed as "South", while Exit Gate Out 2 is used to control all "North" exit gates.
- **EGMS Health Out**: This output remains energized as long as the EGMS processor and I/O modules are functioning properly. The output is de-energized any time an internal fault condition is detected by the EGMS. It may be used for data recording and/or to allow external fall-back gate operation in the event of EGMS system failure.
- **Entrance Gate Hold Out**: This output remains deactivated unless one or more configured exit gate horizontal position monitors are energized. At that point, the Entrance Gate Hold Out is activated. It may thus be used to force the entrance gates into the lowered position in the event that the exit gates cannot be raised. Configuration options may allow this output to remain activated any time an exit gate vertical position monitor is de-energized. It may thus be used to force the entrance gates to remain lowered until all exit gates reach the vertical position. Based on the "EGH Sense" program parameter, this output is "Activated" by either energizing to 12VDC (**B12 HOLDS**) or by de-energizing (**B12 ALLOWS**). Thus, the sense of this output is user-programmable.
- **Auxiliary Output 1** (default = EGMS Detect Out XR/ISL filtered – refer to paragraphs 2.2 and 3.8.2.3 for details on auxiliary output mapping): If any configured and mapped loop detector indicates vehicle presence, this output is de-energized. If all configured and mapped detectors are unoccupied, this output is energized. The output is "filtered" with XR and Island, such that if XR is energized (no train) or Island is de-energized (train at the crossing), the output is energized. This prevents excessive output changes during times when logging of vehicle detection is not necessary. The filtering options may be modified as described in the Auxiliary Output configuration section of this manual. If any detector channel indicates a health failure, or if EGMS Health is down, the EGMS Detect Output remains de-energized.
- **Auxiliary Output 2** (default = EGMS Detect Health Out – refer to paragraphs 2.2 and 3.8.2.3 for details on auxiliary output mapping): This output remains energized as long as all EGMS functions are normal AND the health status of all configured detector channels is good. If any

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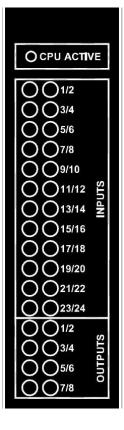
configured detector drops its health voltage, this output is de-energized. It may be used for data recording and/or to allow external fall-back gate operation in the event of detector failure.

- **Auxiliary Output 3** (default = Gate Position Out – refer to paragraphs 2.2 and 3.8.2.3 for details on auxiliary output mapping): This output is energized when all configured gates are confirmed in the vertical position. The output may be used by external crossing controller logic as an indication that all gates are vertical. If any gate is in failure mode or in any position other than vertical, this output is de-energized.
- **Auxiliary Output 4** (default = Alarm Out – refer to paragraphs 2.2 and 3.8.2.3 for details on auxiliary output mapping): This output is energized when no alarms are pending. The output is de-energized any time one or more of the defined alarm conditions are present and have not been fully repaired. The section on Alarm Options (paragraph2.5) describes the various defined alarm conditions.

The LEDs on the Input / Output (Railroad Interface) Module are defined in Table 1-1.

Table 1-1 Input / Output Module (Railroad Interface) LED Descriptions

Odd# (left) LED function	Front Panel Nomenclature	Even# (right) LED function
Gate 1 Vertical In	1/2	Gate 1 Horizontal In
Gate 2 Vertical In	3/4	Gate 2 Horizontal In
Gate 3 Vertical In	5/6	Gate 3 Horizontal In
Gate 4 Vertical In	7/8	Gate 4 Horizontal In
Gate 5 Vertical In	9/10	Gate 5 Horizontal In
Gate 6 Vertical In	11/12	Gate 6 Horizontal In
Gate 7 Vertical In	13/14	Gate 7 Horizontal In
Gate 8 Vertical In	15/16	Gate 8 Horizontal In
	17/18	XR In
Island 1 In	19/20	Island 2 In
Auxiliary 1 In	21/22	Auxiliary 2 In
Auxiliary 3 In	23/24	Auxiliary 4 In
Exit Gate 1 Out	1/2	Exit Gate 2 Out
Aux Out 1 / EGMS Detect Out	3/4	EGMS Health Out
Aux Out 2 / EGMS Detect Health Out	5/6	Entrance Gate Hold Out
Aux Out 3 / Gate Position Out	7/8	Aux Out 4 / Alarm Out

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1.6.2   Input Module (Detector Interface), A44105

The **A44105** Detector Interface Input Module is configured with 32 inputs. It is installed to the left of the Railroad Interface Input / Output Module within the EGMS rack. This module should be set as board #1 (the board address configuration header, JP5, should have a shorting jumper installed in the "M" position, and a shorting jumper installed in the "0" position).

The Detector Interface Input Module is used to monitor the detection state and health status of up to 16 loop detector channels via up to 4 of the four-channel E-1400S Inductive Loop Processor Modules. Each channel of the E-1400S module provides an output for health and an output for vehicle presence. The states of each of these signals are as follows:

*   **Detector Channel Health**: This signal is energized if the inductive loop of the corresponding channel is operating within proper tolerances, the check loop is functioning properly, and all system functions within the E-1400S are operating properly. Otherwise, this signal is de-energized.
*   **Detector Channel Presence**: This signal is energized when no vehicle presence is detected by the inductive loop of the corresponding channel. The signal is de-energized when a vehicle is detected, or when the associated channel health output is de-energized. In the case of faulty output circuitry or a break in the signal wiring (i.e. if the signal is de-energized for any reason), a vehicle is assumed to be present on the loop.

The LEDs on Detector Interface Input Module are defined in Table 1-2.

Table 1-2 Input Module (Detector Interface) LED Descriptions

Odd# (left) LED function	Front Panel Nomenclature	Even# (right) LED function
Detector Channel 1 Presence In	1/2	Detector Channel 1 Health In
Detector Channel 2 Presence In	3/4	Detector Channel 2 Health In
Detector Channel 3 Presence In	5/6	Detector Channel 3 Health In
Detector Channel 4 Presence In	7/8	Detector Channel 4 Health In
Detector Channel 5 Presence In	9/10	Detector Channel 5 Health In
Detector Channel 6 Presence In	11/12	Detector Channel 6 Health In
Detector Channel 7 Presence In	13/14	Detector Channel 7 Health In
Detector Channel 8 Presence In	15/16	Detector Channel 8 Health In
Detector Channel 9 Presence In	17/18	Detector Channel 9 Health In
Detector Channel 10 Presence In	19/20	Detector Channel 10 Health In
Detector Channel 11 Presence In	21/22	Detector Channel 11 Health In
Detector Channel 12 Presence In	23/24	Detector Channel 12 Health In
Detector Channel 13 Presence In	25/26	Detector Channel 13 Health In
Detector Channel 14 Presence In	27/28	Detector Channel 14 Health In
Detector Channel 15 Presence In	29/30	Detector Channel 15 Health In
Detector Channel 16 Presence In	31/32	Detector Channel 16 Health In

1-8

1.7 SYSTEM COMMUNICATIONS MODULE, A44103

The A44103 System Communications Module provides all serial communication ports for the user and system. The module includes three selectable RS-485/RS-422/RS-232 system ports with two of the RS-422 ports wired to the EGMS TB4 on the back of the EGMS chassis (one RS-232 port accessible through the front-panel PC-compatible DB-9 connector and one optional integrated Spread-Spectrum Radio Modem (SSRM)).

All communications ports and the SSRM are individually electrically isolated from the source power, the internal logic power, and each other. This isolation prevents ground loops and railroad ground current leaks, and it minimizes damage due to voltage surges that may occur on communications wiring. Each port contains on-board secondary surge protection with clamping diodes line-to-line and referenced to chassis ground. For protection of communications lines that may be tied to earth ground (i.e. radio antennas, etc), the Chassis Ground terminal on the Communications Module may be wired to a proper ground location within the cabinet. Any communications wires, antennas, or devices that leave the railroad equipment house should be protected with external primary surge protection to minimize the effects of lightning and other power surges.

The System Communications Module contains an isolated USB interface consisting of a USB "Host" port and a USB "Device" port. The Host port may be used to access a USB "Data Stick" for the transfer of the EGMS Event Log and EGMS Configuration Database. The Device port may be used to plug directly into a computer in lieu of the serial port interface. The USB Host port operations are available in EGMS software versions 4.3 and higher. Prior software versions are not USB-enabled. The System Communications Module also includes a slot for a Secure Digital (SD) memory card. This card is used to store extended event logging information and the EGMS Configuration Database. USB and extended event logging operation is described in the appropriate section of this manual.

The port settings such as port selection, baud rate, data bits, stop bits, and parity are all configurable within software via the user interface. DIP-style shorting jumpers are used on the board for selection of port type (RS-232/RS-485/RS-422), RTS/CTS pass-through, RTS/CTS loop-back, and RS-485/RS-422 termination resistors. Each port is configurable independently of the others.

DIP shorting jumpers are also used to set the board address. The EGMS utilizes a single communications module and automatically initializes the communications module regardless of the module address; thus, no shorting jumpers should be installed in typical EGMS applications. The System Communications Module configuration jumpers are located as shown in Figure 1-3.

1-9
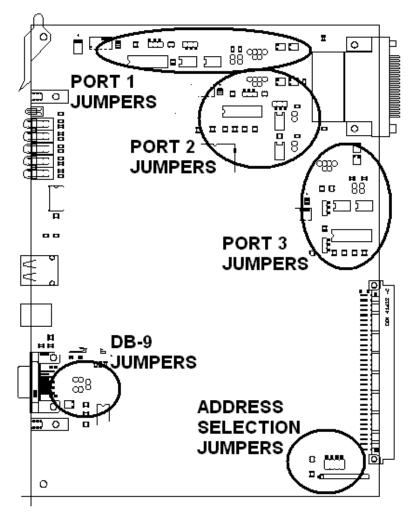
Figure 1-3 Communications Board Jumper Locations

Each of the ports (Port 1, Port 2, and Port 3) contains the following jumpers:

- **RS-232 / RS-485**:
  - If jumpered for RS-232, the RS-232 hardware interface is enabled for the port. The port hardware includes TxD (Transmit Data), RxD (Receive Data), RTS (Request to Send) and CTS (Clear to Send). The RTS and CTS wiring may be passed through the connector for external RTS/CTS flow control, or looped back to disable RTS/CTS flow control.
  - If jumpered for RS-485, the RS-485/RS-422 hardware interface is enabled for the port. The port hardware includes TMT-A / TMT-B pair (RS-422 transmitter pair), and the RCV-A / RCV-B pair (RS-422 receiver pair, also functioning as the RS-485 transceiver pair).
- **Duplex**: Half / Full – utilized only in RS-422/RS-485 mode. Ignored in RS-232 mode.
  - If jumpered for half-duplex, the port is configured for RS-485 two-wire half-duplex communications. The RCV-A / RCV-B pair is used for both transmit and receive.
  - If jumpered for full-duplex, the port is configured for RS-422 four-wire full-duplex communications. The RCV-A / RCV-B pair is always enabled for receiving data, and the TMT-A / TMT-B pair is used for transmission. The TMT-A / TMT-B pair is

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enabled only during data transmission. At all other times, it is in the "hi-z" state, thus allowing multi-drop communications.

- **TERM-HALF**: Utilized only in RS-422/RS-485 (half-duplex or full-duplex) mode. If this jumper is installed, a 120-ohm resistor is placed across the RCV-A / RCV-B pair.
- **TERM-FULL**: Utilized only in RS-422 (full duplex) mode. If this jumper is installed, a 120-ohm resistor is placed across the TMT-A / TMT-B pair.
- **CTS INTERNAL/EXTERNAL**: In the INTERNAL position, this jumper loops the RTS output back to the CTS input in the UART, effectively disabling RTS/CTS flow control. In the EXTERNAL position, this jumper requires externally applied CTS signal to allow data transmission for external RTS/CTS flow control. The RTS signal is always generated on the appropriate connector terminal regardless of the CTS jumper setting.

	NOTE
NOTE	The CTS jumper must be set to INTERNAL for any RS-422 / RS-485 operations.

The Front-Panel DB-9 connector is always configured as RS-232 and uses a CTS INTERNAL/EXTERNAL jumper to allow selection of hardware flow control or simple communications without flow control.

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The front panel of the System Communications Module provides easy access to the DB-9 port and status LEDs to monitor the communications states of each of the ports. The LEDs on the System Communications Module are defined in Figure 1-4.
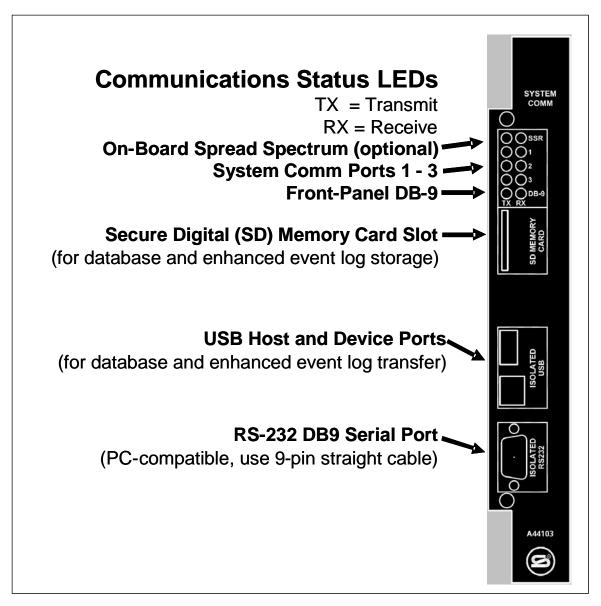
Figure 1-4 System Communications Module Front Panel Description

1.8   CPU MODULE, A44108

The A44108 CPU Module is the heart of the EGMS. It monitors inputs from the I/O modules, processes those inputs based on the configuration database, and drives the appropriate outputs. It also contains a diagnostic RS-232 serial interface, the front-panel interface, and memory for database and event logging operations.

The A44108 CPU Module contains four LEDs that assist in a quick overview of system operation. These LEDs are hidden from view when the touch-screen front panel is installed. Viewing of these LEDs is required only when a fault within the EGMS prevents the software from initializing to the point where the graphics display is active, and the user must remove the touch-screen front panel to view the LEDs. One LED is active while the system is running. Under normal operating conditions it flashes at a 1Hz rate. On system power-up, if the database is invalid due to first-time start-up or memory errors, the CPU LED flashes at a 4Hz rate to indicate the failure. Any other on-board CPU failure will result in the LED going dark.

On system power-up, the four CPU LEDs cycle through a series of indications providing diagnostic monitoring of initial system tests. If the CPU fails to begin normal operation for any reason, the four LEDs may be viewed to indicate the failure type. If this situation arises, the Siemens rail Automation Technical Support staff can assist in troubleshooting based on which LEDs are illuminated during the failure.

All user interface operations may be performed either from the Graphics Touch-Screen front panel or via the A44108 CPU Module diagnostic RS-232 serial port using a computer running HyperTerminal or an equivalent terminal emulation application. The user interface is described in detail below.

1.9 GRAPHICS TOUCH-SCREEN FRONT PANEL, A44107

The A44107 Graphics Touch-Screen Front Panel provides a complete user interface for access to the EGMS configuration database, event log viewing and real-time operating status. The panel plugs into the A44108 CPU Module(s) via two "Centronics" type 24-pin connectors and attaches to the front of the EGMS System Chassis using two quarter-turn, quick-connect screws.

The front panel includes a 240 x 320 pixel graphics liquid crystal display (LCD) with an LED backlight and integrated touch-screen. A toggle switch mounted below the LCD should always be positioned to the right.

Specific operation of the front panel is described in the user interface section of this manual.

1.10 E-1400S INDUCTIVE LOOP PROCESSOR MODULE, A44102

Up to 4 E-1400S modules may be installed in the EGMS rack to allow monitoring of up to 16 inductive loop detectors. These modules are installed in EGMS rack slots 5, 4, 3, and 2 (counting from the left). Detectors 1-4 correspond to the E-1400S installed in rack slot 5. Detectors 5-8 to rack slot 4, etc.
For information related to the configuration of the E-1400S module(s), please refer to the appropriate documentation provided with the module(s).

1.11 SPECIFICATIONS

The EGMS is designed for operation within the railroad wayside signal enclosure. The following paragraphs provide the EGMS environmental and electrical interface requirements and characteristics.

1.11.1 Environmental Conditions

The EGMS is designed to operate within the following environmental conditions:

- Operating temperature -40°C (-40°F) to +70°C (+160°F)

- Storage temperature -55°C (-67°F) to +85°C (+185°F)

- Humidity 95%, non-condensing maximum

1.11.2 Power Source Requirements

The EGMS requires a nominal 12VDC power source with a range of 9VDC – 18VDC. The maximum power requirements depend upon the number of installed E-1400S Inductive Loop Processor Modules and the loads applied to the EGMS outputs. The maximum power requirements for the various configurations are as follows:

EGMS Configuration	Maximum Source Current @ 12vdc
Basic rack with four loops	2.5A
Basic rack with eight loops	3.0A
Basic rack with twelve loops	3.5A
Basic rack with sixteen loops	4.0A
Basic rack with external detection	2.5A (see note 1)

Note 1: For external detection using the Model U-1400S shelf-style 4-channel Loop Processor (A44100), each U-1400S unit will draw less than 800mA at 12VDC when driving the high-impedance EGMS Inputs. The 3.0A @ 12VDC specified in the U-1400S manual identifies the maximum current requirements when the outputs are driving relays or other low-impedance loads.

1.11.3 Input Impedance

Each EGMS input is an isolated nominal 12VDC circuit with a nominal impedance of 1.8k-ohm – 2.0k-ohm.

1.11.4 Output Capability

Each EGMS output is an isolated nominal 12VDC circuit with an individual load capability of up to 200mA, or the capability to drive a 60-ohm load. If the load is increased beyond the maximum rating for the output, the output voltage will be reduced proportionally as the current-limited drive circuitry compensates for the overload condition.

Each EGMS Input / Output Module (A44106) contains eight outputs and the sum total current of the eight outputs must not exceed 500mA. This is equivalent to eight 200-ohm loads.

2.0   - GENERAL CHARACTERISTICS

2.1   OPERATING MODES

The EGMS system software is designed to perform in a variety of four-quadrant scenarios. In some scenarios, it may be desirable to enter a "secondary" operating mode in the event of detector loop failure. The user can program the EGMS to change automatically from "Dynamic" operation (using inductive loops for gate control) to "Timed" operation (simple timer from entrance gate descent to exit gate descent) in the event of an inductive loop failure. This option can be configured based on the needs at the individual crossing.

2.1.1   Dynamic Exit Gate Mode

Dynamic mode is the most flexible and useful mode of operation. The EGMS monitors gate positions, XR and Island states, and the loop detector states, and drives two outputs to operate the exit gates appropriately.

Dynamic mode operates as a state machine of sorts – based on the current states of inputs; the EGMS determines the proper behavior and generates its own operating state. Based on that operating state, the EGMS either raises or lowers the exit gates. Each travel direction maintains its own state, allowing directional gate control. The operating state may be viewed from the General Status display on the front panel or via the serial port interface. The possible EGMS operating states are described in the following paragraphs.

2.1.1.1   <u>Idle</u>

The Idle state indicates that the XR input is energized (crossing not active) and the Island 1 Input is energized. If the XR input is energized and the Island 1 input is down, EGMS enters the XR/ISL Fail state described below.

When in the Idle state, the exit gates are raised. Idle state is maintained while the XR and Island 1 inputs are energized, regardless of gate position inputs. Both directions of travel will enter and exit the idle state together.

2.1.1.2   <u>XR Delay</u>

The XR Delay state indicates that the XR input has just de-energized (crossing beginning activation). Upon entry to this state, the XR Delay Timer is initiated. During this time, the exit gates are kept in the vertical position regardless of entrance gate position. This prevents exit gates from beginning descent prior to the XR / Gate delay time in cases where entrance gate(s) are not vertical when the crossing is activated due to 2nd train approach or broken entrance gate(s).

Once the XR Delay Timer has expired, the XR Delay state is maintained while the entrance gates are in the vertical position. If XR is re-energized (crossing recovers) prior to timing the full XR delay, the Idle state resumes. Both directions of travel will enter and exit the XR Delay state together.

2-1

<table>
<tr><td>**NOTE**</td><td>**NOTE**
The XR Delay Time is not a user-programmable entry. It is automatically calculated by observing entrance gate release times under normal operation. Gate release time is checked for valid range (release times less than 3 seconds are discarded). Then an average of the most recent 6 gate release times is calculated. Changes are limited to a 25% of the current average so that occasional non-standard gate operations do not adversely affect the average calculation.</td></tr>
</table>

2.1.1.3   All Drop

The All Drop state indicates that the XR input is down, all entrance gates for this direction of travel have begun descent (no vertical gate position inputs are active), and no vehicles are present within the detection zone for this direction of travel. The exit gate output is energized, thus the exit gate is being lowered. At least one entrance gate for this direction of travel is in the transition state (neither vertical nor horizontal input is energized).

In the All Drop state, the exit gates are being lowered. Each direction of travel may enter and exit the All Drop state independently; that is, one direction of travel may be in the All Drop state while the other direction may be in Entr Drop state (see below).

2.1.1.4   Entr Drop

The Entr Drop state indicates that the XR input is down, all entrance gates for this direction of travel have begun descent, and vehicles are present within the detection zone for this direction of travel.

In the Entr Drop state, the exit gate output is down, thus the exit gate is being raised. Each direction of travel may enter and exit the Entr Drop state independently.

2.1.1.5   Entr Down

The Entr Down state indicates that the XR input is down and all entrance gates for this direction of travel have reached the horizontal position. Vehicles may or may not be in the detection zone during this state. The exit gate output is energized if no vehicles are in the detection zone. The exit gate output is de-energized if a vehicle presence is detected.

In the Entr Down state, entrance detectors may be deactivated based on database entries specified below. An entrance detector may be programmed to "turn off" when its entrance gate reaches horizontal to prevent the gate itself from activating the detector or to prevent vehicles from "nosing under" an entrance gate and activating the detection system. The need for this option is based on the geometry of the specific location.

2-2

2.1.1.6 All Down

The All Down state indicates that the XR input is de-energized and Island 1 input is energized (train in the approach but not occupying the crossing), and all entrance and exit gates in both directions are in the horizontal position. To reach the All Down state, there cannot be any vehicles within the detection zone – any vehicle detection would raise one or both exit gates, preventing the All Down condition.

In the All Down state, the "Delay On Down" database parameter becomes effective. If a new vehicle detection is introduced, the EGMS times the programmed Delay On Down time before acknowledging the vehicle and raising the exit gate(s). This prevents momentary detections from causing extraneous gate operation (e.g. from the train locomotive as it enters the crossing), but allows a vehicle that makes its way into the crossing to raise the exit gates after the programmed delay.

When in the All Down state, the exit gates are lowered (gate control output energized). Both directions of travel will enter and exit the All Down state together.

2.1.1.7 Isl Down

The Isl Down state indicates that the XR and Island 1 inputs are de-energized, or that the Island 2 is de-energized. The detection system is deactivated to prevent the train itself from activating the detectors and raising the exit gates. Exit gates may or may not be completely down when EGMS enters the Isl Down state, but the exit gate control outputs are energized to lower the exit gates and keep them down once they reach horizontal.

NOTE

NOTE
This state is not entered until the "Island Inhibit Timer" has expired. The island inhibit timer is initiated when the XR input is de-energized and the entrance gates begin descent. This timer allows the detection system to remain active for a minimum time even if the Island input is dropped early, as is the case with a switching move, a station stop adjacent to the crossing, or train on an industrial siding / XTR track input into the EGMS Island 2 input. Once all gates reach horizontal (the All Down state), the Island Inhibit Timer is cleared.

When in the Isl Down state, the exit gates are lowered (gate control output energized). Both directions of travel will enter and exit the Isl Down state together.

2.1.1.8 All Rise

The All Rise state indicates that the XR and Island inputs are energized and the entrance and/or exit gates are not yet vertical. This typically occurs upon departure of the train as the crossing returns to the idle state.

2-3

When in the All Rise state, the exit gates are raised (gate control output de-energized). Both directions of travel will enter and exit the All Rise state together.

2.1.1.9 XR/Isl Fail

The XR/Isl Fail state indicates that the XR input is energized but the Island 1 input is down, or that the XR, Island 1, or Island 2 input hardware has failed. This is an erroneous condition. EGMS remains in this state until all error conditions are removed and then returns to the Idle State. If the Island 1 input is de-energized prior to XR, as may happen with a switching train move, the EGMS may indicate a momentary XR/ISL Fail state, but will immediately recover when XR is de-energized and will continue proper operation in regard to dynamic exit gate operation.

When in the XR/Isl Fail state, the exit gates are raised (gate control output de-energized). Both directions of travel will enter and exit the XR/Isl Fail state together.

2.1.1.10 Activ. T/O

The Activ. T/O state indicates that the XR has been de-energized and the crossing has been active for an extended length of time, as specified by the Gate Activation Timeout Alarm Delay and Gate Activation Timeout Gate Pickup Delay parameters. Once this state is reached, EGMS *may be programmed* to de-energize the Gate Control Outputs to allow the exit gates to rise. EGMS remains in the Activ. T/O state until XR and ISL inputs are restored and all gates return to the vertical position. Both directions of travel will enter and exit this state together.

NOTE	NOTE
NOTE	The Alarm Output is de-energized prior to EGMS entering the Activ. T/O state, but the EGMS Health Output remains energized. The EGMS is healthy and is reacting to an external failure condition in a pre-programmed manner.

2.1.1.11 Failed

The Failed state indicates that a system failure has occurred in EGMS: possibly an A44105 Input Module failure, A44106 Input / Output Module failure, inter-module communications failure, bad database checksum, or bad program checksum. This state is also reached when the EGMS operating database has been altered – when the database changes, all outputs are de-energized until the unit power is cycled to prevent erratic operation during database entry and alteration.

When in the Failed state, the exit gates are raised (gate control outputs de-energized). Both directions of travel will enter and exit the failed state together.

2-4

2.1.2   Timed Exit Gate Mode

Timed Exit Gate Mode provides a simple time delay from the beginning of entrance gate descent to exit gate descent. The EGMS monitors XR and Gate Position inputs. When XR is dropped and all entrance gates begin descent (all entrance gate vertical inputs are de-energized), the Exit Gate Clearance Time (EGCT) begins timing. Once the EGCT expires, the exit gate control outputs are energized and the exit gates are lowered.

Upon departure of the train (XR input energized), the exit gate control outputs are dropped and the exit gates are raised. In timed mode, the Island 1 input does not affect operation. The Island 2 input acts identical to the XR input.

The "Require Entrance Gates Down" program option allows the exit gate descent to be contingent upon entrance gates all reaching the horizontal position. If this parameter is set to True, the EGCT must expire AND all entrance gates must be in the horizontal position before the exit gates are lowered. If the parameter is False, the exit gates may begin descent prior to entrance gates reaching full horizontal. In the latter case, the EGMS times the max gate descent timer, and if any entrance gate does not reach horizontal in the specified amount of time, the exit gates are raised until the entrance gate reaches horizontal.

2.2   DETECTOR CONFIGURATION

Up to 16 detectors may be configured for monitoring in the EGMS. Detectors are numbered from 1 to 16 in the EGMS. Detector naming convention: Detector 1 is the detector adjacent to Gate 1; Detector 2 is adjacent to Gate 2; Detector 3 is adjacent to Gate 3; and Detector 4 is adjacent to Gate 4. In multi-track installations, detectors are installed between each set of tracks in each lane of travel. The standard numbering is: Detector 5 between detectors 1 and 3; Detector 6 between detectors 2 and 4; Detectors 7 and 8 are internal (between-track) detectors as well. In cases where additional detectors are required, due to large detection zone requirements, detectors 8-16 are utilized. Due to the inherently complex nature of such a layout, the detector numbering is determined on a per-site basis.
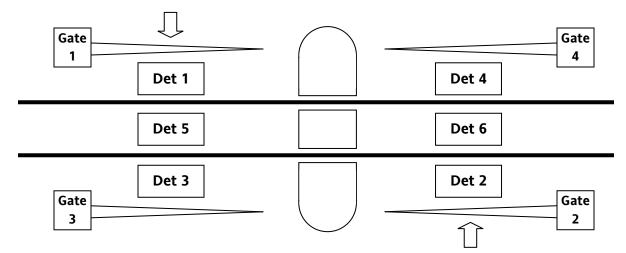
Figure 2-1 Gate Naming Convention

2-5

NOTE	**NOTE** If Dual-Unit operating mode is enabled, two EGMS units work together to provide a total of 32 detectors. Up to 16 detectors connected to the local EGMS are configured as described within this document. Up to 16 detectors connected to the remote EGMS are configured in the same manner, by the agency in charge of the remote EGMS. Refer to Appendix A at the back of this manual for details on Dual-Unit Operation.

2.2.1   Direction

The Detector Direction parameter has the following possible values: North and South (or Northbound / Southbound, East / West, Eastbound / Westbound, based on Directional Display Indicator program value). A detector may also be programmed for Direction = "BOTH". In this case, the detector immediately affects operation of both exit gates. Direction BOTH is useful when wide painted medians exist within the crossing, such that center-lane detectors are required which vehicles traveling either direction may occupy.

Each detector is configured as to flow direction. This indicates the normal direction of vehicular / automotive traffic flow across the detector. By convention, railroad tracks traverse East-West; thus, the vehicular / automotive traffic direction choices are North (Northbound flow direction) and South (Southbound flow direction). All processing for directional information, gate locations, and gate control outputs are referenced to the North/South convention. At locations where the direction of vehicular traffic is not truly North-South, the "Directional Display Indicator" program parameter allows the user to modify the displayed direction so that rather than North-South, the EGMS operates as East-West, Northbound-Southbound, or Eastbound-Westbound. In all cases, the selected direction of detectors, gates, and outputs must remain consistent for proper operation.

2.2.2   Type

The Detector Type parameter has the following possible values: None, Entrance, Exit, and Internal.

Entrance detectors are those detectors that are located directly adjacent to an entrance gate. Their behavior may be modified based on Operating Options as described below. Typically, detectors 1 and 2 are configured as Entrance detectors (corresponding to Gates 1 and 2).

Exit detectors are those detectors that are located directly adjacent to an exit gate. Their behavior may be modified based on Operating Options as described below. Typically, detectors 3 and 4 are configured as Exit detectors (corresponding to Gates 3 and 4).
Internal detectors are those that are not immediately adjacent to any gate. They are typically located between tracks at multi-track locations. Internal detectors are not affected by detector behavior modification options that affect Entrance and Exit detectors.

A detector programmed as None is not enabled and has no effect on the EGMS operation.

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2.2.3   Stretch Time

Each detector has an associated "Stretch" time parameter. This is the amount of time that a vehicle detection is extended after the detection loop becomes inactive. Stretch time is used to delay the descent of an exit gate after a vehicle leaves the detection zone.

Stretch time is a programmable value per detector, with a range of 0.0 to 25.5 seconds, set in 1/10 – second increments.

When all gates are in the horizontal position, the detector stretch timer is disabled. This prevents the stretch time from extending a brief detection beyond the "Delay On Down" time. If the vehicle detection remains active long enough to time the Delay On Down timer, the detector stretch timer is re-enabled.

2.2.4   Long-Term Obstacle Time

Each detector has a "long-term obstacle" time parameter. This is the amount of time that an individual detector may retain continuous vehicle presence prior to the generation of the "long-term obstacle" alarm condition. This alarm condition may be used to alert the proper authority of a possible stalled vehicle within the MTCD. Upon extended detector presence, the alarm output is de-energized. The long-term obstacle alarm is cleared immediately upon removal of the detector presence.

The Long-Term Obstacle Time is a per-detector programmable parameter with a range of 0 – 255 minutes, in 1-minute increments. A value of 0 disables the long-term obstacle monitoring for the detector.

2.2.5   Disable on Gate Down

If the Disable on Down parameter is programmed to "Yes", the detector may be disabled while the corresponding entrance gate(s) are fully lowered. This option applies ONLY to detectors programmed as type "Entrance", and all entrance gates with the same programmed direction must have their "horizontal" inputs energized before the detector is disabled. This option may be utilized in cases where loop placement allows potential detection of automotive vehicles that "crowd" the entrance gate when it is lowered.

2.2.6   Aux Output 1 Mapping

This option, in conjunction with the Auxiliary Output 1 Function selection, allows any combination of detectors to be utilized in the Vehicle Detect Output equation. If Auxiliary Output 1 is programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, and the detector's Aux Output 1 Mapping is programmed to "YES", then the detector is included in the Auxiliary 1 Output mapping equation. Note that each Auxiliary output uses a different set of detector Aux Output mapping parameters for increased output mapping flexibility.

If the Auxiliary Output 1 Function is not programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, the detectors' Aux Output 1 Mapping parameter is ignored. Note that

this parameter DOES NOT affect the inclusion of this detector in the Detector Health Output equation. All vehicle detectors are included in the Detector Health Output equation at all times.

2.2.7 Aux Output 2 Mapping

This option, in conjunction with the Auxiliary Output 2 Function selection, allows any combination of detectors to be utilized in the Vehicle Detect Output equation. If Auxiliary Output 2 is programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, and the detector's Aux Output 2 Mapping is programmed to "YES", then the detector is included in the Auxiliary 2 Output mapping equation. Note that each Auxiliary output uses a different set of detector Aux Output mapping parameters for increased output mapping flexibility.

If the Auxiliary Output 2 Function is not programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, the detectors' Aux Output 2 Mapping parameter is ignored. Note that this parameter DOES NOT affect the inclusion of this detector in the Detector Health Output equation. All vehicle detectors are included in the Detector Health Output equation at all times.

2.2.8 Aux Output 3 Mapping

This option, in conjunction with the Auxiliary Output 3 Function selection, allows any combination of detectors to be utilized in the Vehicle Detect Output equation. If Auxiliary Output 3 is programmed as a DET-ALL, DET-XRISL, DET-XR, DET-IS, or DETOBSTCL function, and the detector's Aux Output 3 Mapping is programmed to "YES", then the detector is included in the Auxiliary 3 Output mapping equation. Note that each Auxiliary output uses a different set of detector Aux Output mapping parameters for increased output mapping flexibility.

If the Auxiliary Output 3 Function is not programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, the detectors' Aux Output 3 Mapping parameter is ignored. Note that this parameter DOES NOT affect the inclusion of this detector in the Detector Health Output equation. All vehicle detectors are included in the Detector Health Output equation at all times.

2.2.9 Aux Output 4 Mapping

This option, in conjunction with the Auxiliary Output 4 Function selection, allows any combination of detectors to be utilized in the Vehicle Detect Output equation. If Auxiliary Output 4 is programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, and the detector's Aux Output 4 Mapping is programmed to "YES", then the detector is included in the Auxiliary 4 Output mapping equation. Note that each Auxiliary output uses a different set of detector Aux Output mapping parameters for increased output mapping flexibility.

If the Auxiliary Output 4 Function is not programmed as a DET-ALL, DET-XRISL, DET-XR, DET-ISL, or DETOBSTCL function, the detectors' Aux Output 4 Mapping parameter is ignored. Note that this parameter DOES NOT affect the inclusion of this detector in the Detector Health Output equation. All vehicle detectors are included in the Detector Health Output equation at all times.

2.3   GATE CONFIGURATION

Up to eight gates may be configured for monitoring in the EGMS. Gates are numbered from 1 to 8 in the EGMS. Gate naming convention: Gate 1 is the South-bound entrance gate; Gate 2 is the North-bound entrance gate; Gate 3 is the South-bound exit gate; and Gate 4 is the North-bound exit gate. In cases where additional gates are required, due to large roadway widths or non-standard crossing geometry, the naming convention is repeated in groups of four (i.e., gates 1 and 5 are South-bound entrance gates, gates 2 and 6 are North-Bound entrance gates, etc.).

NOTE

If Dual-Unit operating mode is enabled, two EGMS units work together to provide a total of 16 gates. Up to 8 gates connected to the local EGMS are configured as described within this document. Up to 8 gates connected to the remote EGMS are configured in the same manner by the agency in charge of the remote EGMS.

It is important to verify the consistency of detector, gate, and exit gate control wiring and program parameters. All North and South detectors, North and South gates, and Exit Gate Controls 1 and 2 must be consistent to ensure proper operations under all conditions.

2.3.1   Direction

The Gate Direction parameter has the following possible values: North and South (or Northbound / Southbound, East / West, Eastbound / Westbound, based on Directional Display Indicator program value).

Each gate is configured as to flow direction. This indicates the normal direction of vehicular / automotive traffic flow past the gate. By convention, railroad tracks traverse east-west; thus, the vehicular / automotive traffic direction choices are North (Northbound flow direction) and South (Southbound flow direction). All processing for directional information, detectors, gates, and gate control outputs are referenced to the north/south convention. At locations where the direction of vehicular traffic is not truly north-south, the "Directional Display Indicator" program parameter allows the user to modify the displayed direction so that rather than North-South, the EGMS operates as East-West, Northbound-Southbound, or Eastbound-Westbound. In all cases, the selected direction of detectors, gates, and outputs must remain consistent for proper operation.

2.3.2   Type

The Gate Type parameter has the following possible values: None, Entrance, and Exit.

Depending on the EGMS operating mode, entrance gates may be monitored to alter the exit gate control outputs. For instance, EGMS in Timed or Dynamic modes will not allow the exit gates to begin descent until the entrance gates have begun descent. In timed mode, if an entrance gate does not reach horizontal within the programmed descent time, the entrance gate is flagged as failed and the corresponding exit gate is raised to prevent entrapment.

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<table>
<tr><td>**NOTE**</td><td>**NOTE**

In Dynamic Mode and based on the setting of the "Dynamic Entrance Gate Monitor" parameter, the exit gate may be configured to remain lowered even if a corresponding entrance gate is broken. The detection system will cause the exit gate to rise if a vehicle passes beyond the normal stopping position of an entrance gate. This operation allows 3-gate operation in case of a broken entrance gate, while still providing exit gate control using the detection system.</td></tr>
</table>

Entrance gate monitoring is also used to modify detector behavior. For instance, if a detector's "Disable on Down" option is programmed, that detector is disabled when the corresponding entrance gate(s) reach their horizontal positions.

Exit gate monitoring is performed to verify the proper operation of the crossing. EGMS may be used to prevent entrance gates from rising until the exit gates are ascending. Also, the "Delay Detectors on All Gates Down" option allows the detection system to be delayed when all configured gates reach the horizontal position.

2.3.3 Chatter Timers

To prevent extraneous errors and gate operation due to gate chatter (e.g. gate bounce when gate reaches horizontal, or wind-induced bouncing of the gate off the horizontal contact), chatter timers are employed for each gate. When a gate position input changes away from its expected position, the EGMS times a delay equal to the programmed chatter timers before acknowledging the gate position change. Thus, a brief bounce (1/2 to 1-second) is not processed as a gate state change, but a longer change is registered as a valid gate movement.

Gate Chatter time is a programmable value per gate, with a range of 0.0 to 25.5 seconds, set in 1/10 – second increments. Separate values may be entered for chatter from the vertical position and from the horizontal position.

2.3.4 Ascent/Descent Timers

To assist in troubleshooting and to prevent hazardous operation if a gate malfunctions, the EGMS monitors the total ascent and descent time required for each gate for both minimum and maximum transition times. If the maximum entrance gate descent time is violated, the gate is determined to be suspect and the exit gates are raised (subject to the Dynamic Entrance Gate Monitor option described in Operating Options, paragraph 2.4). Any time a gate ascent or descent time is violated, a log entry is inserted into the event log indicating the failure and the alarm output is de-energized. Upon restoration to the expected state, a log entry is inserted into the event log indicating the recovery.

Gate Minimum Ascent, Maximum Ascent, Minimum Descent, and Maximum Descent times are programmable values per gate with a range of 0 to 255 seconds, set in 1 – second increments. A value of 0 disables the alarm processing option for that gate.

2.4   OPERATING OPTIONS

From the basic EGMS configurations, the operating options allow the EGMS to modify operation to suit particular site-specific needs. Some of these options are functional in all operating modes, while other options are dependent upon the operating mode. For instance, the Dynamic Exit Gate Clearance Time (DEGCT) is only utilized while EGMS is operating in Dynamic Mode.

2.4.1   Primary Mode

This parameter selects the primary operating mode of the EGMS. If selected for DYNAMIC mode, the EGMS utilizes the vehicle detection equipment to determine the desired position of the exit gates. If, in Dynamic Primary Mode, a problem or fault condition occurs within the vehicle detection equipment, the EGMS reverts to the programmed Secondary Mode.

If selected for TIMED mode, the EGMS operates the exit gates in the described Timed Mode and ignores any vehicle detection equipment that may be installed.

The Primary Mode is a system-wide parameter with the possible values: NONE, TIMED, and DYNAMIC.

2.4.2   Secondary Mode

This parameter selects the secondary / backup operating mode of the EGMS. If the primary operation is selected for DYNAMIC mode and a problem or fault condition occurs within the vehicle detection equipment, the EGMS reverts to this programmed Secondary Mode.

If the secondary operation is selected for TIMED mode, the EGMS operates the exit gates in the described Timed Mode until the vehicle detection equipment is restored to functional operation. At that time, the EGMS will return to the primary mode of operation.

The Secondary Mode is a system-wide parameter with the possible values: NONE and TIMED.

2.4.3   Entrance Detector Disable

This option allows a detector to be disabled when the corresponding entrance gate reaches the horizontal position. It is a useful option in cases where all entrance detectors extend into an area that may be activated by a vehicle sitting outside the MTCD with the entrance gate down.

The Entrance Detector Disable option is a system-wide parameter with the possible values: NO and YES. To disable individual entrance detectors on entrance gate down, use the per-detector "Disable on Down" parameter.

2.4.4   Delay Detectors on All Gates Down

This option delays the entire vehicle presence function when all configured gates reach the horizontal position. It is a system-wide parameter and works in conjunction with the Dynamic

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operating mode. When all gates are in the horizontal position, a vehicle presence detection must remain active for the programmed Delay on Down time period before the exit gate is raised. Once any gate raises or otherwise de-energizes the horizontal gate position input to EGMS, the detection system is immediately re-enabled.

Delay On Down is a system-wide parameter with a range of 0.0 to 25.5 seconds in 1/10 – second increments.

2.4.5   Reverse Detector Enable

This option maps exit detectors and both exit gate control outputs. It is useful in cases where crossing geometry results in situations where both exit gates should be raised when a motorist goes around a horizontal entrance gate and activates the exit detector in the opposite direction. This option works in conjunction with the Dynamic operating mode.

The Entrance Detector Disable is a system-wide parameter with the possible values: NO and YES.

2.4.6   Dynamic Exit Gate Clearance Time (DEGCT)

This parameter delays the activation of the Exit Gate Control output for a minimum amount of time after the beginning of entrance gate descent. During the DEGCT, the detectors are ignored and the system operates as if vehicles are present in the MTCD. Once the DEGCT expires, the exit gates are controlled based on vehicle presence. It is a system-wide parameter that works in conjunction with the Dynamic operating mode only and has a range of 0 to 255 seconds in 1-second increments.

2.4.7   Timed Mode Exit Gate Clearance Time (TEGCT)

This parameter delays the activation of the Exit Gate Control output for a minimum amount of time after the beginning of entrance gate descent. Once the TEGCT expires, the exit gate control outputs are activated and the exit gates begin descent. It is a system-wide parameter and works in conjunction with the Timed operating mode only, with a range of 0 to 255 seconds in 1-second increments.

2.4.8   Island Inhibit Timer

The Island Inhibit Timer is used to keep the detection system active for a minimum amount of timer after the start of crossing activation and entrance gate descent. Typically, all detectors are disabled when the Island Circuit input is dropped. This prevents the passage of the train itself from activating the detectors and raising the exit gates. However, during switching moves and adjacent train station situations, the island may drop simultaneously with the XR circuit. Under the "typical" operation, the detectors would be disabled and the entrance and exit gates would drop simultaneously without regard to the vehicle detection system. The "Island Inhibit" timer prevents the Island Circuit input from disabling the detector system for the programmed Island Inhibit time. Note that once all gates reach horizontal, any remaining Island Inhibit Time is cleared, since there are no vehicles within the crossing at that point.

2.4.9   XR Detector Disable

This parameter prevents vehicle detections from altering the EGMS Vehicle Detection outputs when the XR input is energized (idle state) in the Detector Only mode. It is useful to prevent external event recorder logs from overflowing due to vehicle detections when the crossing system is inactive.

The XR Detector Disable is a system-wide parameter with the possible values: NO and YES. It has no effect in Dynamic or Timed Exit Gate mode.

2.4.10 Bidirectional Delay Time

In normal operation, the EGMS controls the exit gates in a directional fashion – that is, the Northbound detectors control the North exit gate, and the Southbound detectors control the South exit gate (subject to detector behavior modifier parameters described above).

The Bidirectional Delay Time is a timer parameter that forces the EGMS to raise both exit gates if vehicle detections within the detection area remain active beyond the programmed amount of time. This allows the enhanced gate functionality offered by a directional detection system, but changes to a bi-directional mode (all exit gates up) if the detection area is not vacated in a timely manner.

It is a system-wide parameter and works in conjunction with the Dynamic operating mode only, with a range of 0 to 25.5 seconds in 0.1-second increments. If programmed to 0 seconds, the EGMS directional operation is effectively bypassed and vehicle presence on any detector results in raising of all exit gates immediately. If programmed to 25.5 seconds, the bidirectional delay feature is disabled and only the detectors associated with a particular direction of travel will affect the corresponding exit gate operation.

2.4.11 Dynamic Entrance Gate Monitor

This parameter, if set to YES, requires an entrance gate to function properly and reach the horizontal position within the programmed time ranges (min/max descent time) in order that the corresponding exit gate(s) may be lowered. During normal operation, exit gates may descend simultaneously with entrance gates if no vehicles are present within the MTCD. However, if the entrance gate(s) do not reach horizontal within the programmed time value, the corresponding exit gate(s) are raised. If the entrance gate(s) subsequently reach the horizontal position, the corresponding exit gate(s) will be lowered at that time.

If this parameter is set to NO, the exit gates will descend once the entrance gates leave the vertical contact, subject to vehicle detection. In this mode, the vehicle detection system is used to raise the exit gate if a motorist proceeds beyond the (possibly broken) entrance gate.

This is a system-wide parameter with possible values of NO and YES.

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2.4.12 Entrance Gates Down Required

This parameter, if set to YES, requires all entrance gate horizontal inputs to become active before the EGMS will lower the exit gates. It is utilized only in Timed Exit Gate mode. It is a system-wide parameter with possible values of: NO and YES.

2.4.13 Exit Gate Up Required

This parameter, if set to YES, requires all exit gates to reach the vertical position before de-activating the "Entrance Gate Hold" output. If set to NO, the Entrance Gate Hold output is de-activated when all exit gates begin ascent (all exit gate horizontal contacts are de-energized).

NOTE	**NOTE**
	The Entrance Gate Hold output may be used to prevent the entrance gates from rising if a problem is detected with the exit gates. This output is active from the EGMS, but the resulting functionality is subject to the wiring of the crossing control equipment external to EGMS.

2.4.14 Entrance Gate Hold Output Sense

This parameter allows the user to determine the "sense" of the Entrance Gate Hold Output based on crossing control equipment needs. If set to the "B12 HOLDS" value, the Entrance Gate Hold output will be de-energized when EGMS determines that the entrance gates may be raised, and energized to hold the entrance gates in the lowered position ("application of B12 in the circuit will HOLD the entrance gates down"). If set to the "B12 ALLOWS" value, the Entrance Gate Hold output will be energized to allow the entrance gates to rise, and de-energized when EGMS determines that the entrance gates should remain in the lowered position ("application of B12 in the circuit will ALLOW the entrance gates to raise"). Note that the Entrance Gate Hold output may request that the crossing hold the entrance gates in the lowered position, but at no time does EGMS have the ability to raise an entrance gate.

2.4.15 Island 2 Enable

The Island 2 Enable parameter allows the second EGMS Island Input to act as an "Industrial Siding" crossing activation input as follows:

If the Island 2 input is energized, the EGMS operates as described within this document.

If the Island 2 input is de-energized, the EGMS operates as if both the XR and Island 1 inputs are de-energized simultaneously. Once the entrance gates begin descent, the Island Inhibit Timer is initiated and the detection system is active. If no vehicles are present, the exit gates are lowered immediately. Once all gates reach horizontal, the detection system is disabled and all gates remain down. If the Island Inhibit timer expires, the detection system is deactivated and the exit gates are lowered.

If the Island 2 Enable parameter is set to NO, the Island 2 input is ignored.

2.4.16 Dual-Unit EGMS Operation Enable

The Dual-Unit EGMS Operation Enable parameter determines whether or not the EGMS is part of a Dual-Unit, communications-linked system. If set to NO, all display and database entries related to Dual-Unit operation are suppressed and no Dual-Unit functionality is enabled. If set to YES, then the Dual-Unit operation is enabled and functional is as described in Appendix A of this manual.

2.5   ALARM OPTIONS

EGMS performs a number of tests to verify proper crossing operation, and generates alarm conditions based on potential problems with gates, detectors, or other equipment. These alarm conditions may be enabled individually and the alarm output (any Auxiliary Output programmed to the "Alarm" function) may be monitored as desired by external crossing monitor equipment. The EGMS event log includes entries related to alarm processing for a detailed history of conditions that generate the alarms.

The alarms are categorized in two ways:
- "Cycle" alarms are conditions that arise during the operation of the crossing equipment during train approach and arrival, such as gate ascent/descent time violations, gate bounce, and gate release/response times. Once a cycle alarm is detected, the alarm output remains de-energized until a programmable number of valid train moves take place without the recurrence of the alarm. This operation prevents an alarm "ping-pong" effect in cases where a gate is intermittent.
- "Independent" alarms are conditions that may occur at any time, regardless of train approach or equipment state. These alarms include crossing activation Time-out, long-term obstacle detection, MTCD detector presence, detector failure, or auxiliary input monitors. Once an independent alarm is detected, the alarm output remains de-energized until the alarm condition is removed. The auxiliary and detector failure alarms include a programmable alarm recovery delay time, thus keeping the alarm output de-energized until the alarm condition remains cleared for a specific amount of time without recurring.

2.5.1   Gate Activation Timeout Alarm Delay

The Gate Activation Timeout (GATO) feature allows the EGMS to detect extended crossing activations, generate an alarm, and (optionally) raise the exit gates in a safe, consistent manner when the crossing activation timeout is detected. This situation may occur when a track is broken, or a bond or shunt fails. This option is enabled to generate an alarm and (optionally) force the exit gates to rise after the timeout period to allow emergency vehicles to traverse a crossing that is in the extended activation state.

Upon start of crossing activation (XR de-energized, entrance gates begin descent), the GATO Alarm Delay timer is initiated. If this timer exceeds the programmed Alarm Delay time, an alarm is generated.

The Gate Activation Timeout Alarm Delay parameter is a system-wide parameter with a range of 10-60 minutes in 1-minute increments. In addition, a parameter value of zero disables the feature completely.

2.5.2   Gate Activation Timeout Gate Pickup Delay

Once the programmed Gate Activation Timeout Alarm Delay has expired, the Gate Activation Timeout Gate Pickup Delay timer is initiated. If the crossing recovers (XR and Island are energized and all gates reach the vertical position) prior to the completion of the Gate Activation Timeout Gate Pickup Delay, the Alarm Output is re-energized and the EGMS resumes normal operation.

Upon completion of the Gate Activation Timeout Alarm Delay and Gate Pickup Delay, EGMS raises the exit gates. EGMS remains in the Activation Timeout state until the XR and Island inputs are restored and all gates return to the vertical position. At that time, the Alarm Output is re-energized and the EGMS resumes normal operation.

The Gate Activation Timeout Gate Pickup Delay parameter is a system-wide parameter with a range of 5 to 60 minutes in 1-minute increments. In addition, a parameter value of zero disables the gate pickup operation, while allowing the alarm condition to be generated based on the Alarm Delay parameter.

2.5.3   Maximum Gate Release Time

The Maximum Gate Release Time parameter allows the EGMS to monitor the time the entrance gates take to begin descent once XR is de-energized. When XR is de-energized, the gate release timer is initiated. If this timer exceeds the programmed parameter value before all entrance gates have left the vertical contacts, an alarm is generated. This allows monitoring of the gate delay.

The Maximum Gate Release Time is a system-wide parameter with a range of 0.0 – 25.5 seconds.

2.5.4   Maximum Gate Response Time

The Maximum Gate Response Time parameter allows the EGMS to monitor the time any gate takes to begin travel once the desired position of the gate has changed. Entrance gates must begin ascent (leave the horizontal contacts) within this time after XR is energized (EGMS does not start the entrance gate ascent response timer until after the Entrance Gate Hold output is de-activated). Exit gates must follow the state of the corresponding EGMS exit gate control output (either ascending or descending) within the programmed maximum response time.

The Maximum Gate Response Time is a system-wide parameter with a range of 0.0 – 25.5 seconds.

2.5.5   Cycle Restore

Once a "Cycle" alarm has been generated (Gate release, Gate response, minimum / maximum ascent, minimum / maximum descent), EGMS retains the alarm in the de-energized state until the programmed number of crossing operations is observed without any alarm conditions present. A crossing operation is defined as starting with all gates vertical and XR energized; XR de-energizes, all gates descend and reach horizontal, XR energizes, all gates ascend and reach vertical.

The Cycle Restore is a system-wide parameter with a range of 0 – 255.

2.5.6 MTCD Maximum Presence

This parameter indicates the amount of time after the start of crossing activation during which vehicular travel within the Minimum Track Clearance Distance (MTCD) is expected. After the MTCD presence timer expires, any vehicle detection will result in an EGMS alarm condition. Within the event log and the Alarm Status display, the MTCD Maximum Presence Alarm is shown as a Long-Term Obstacle alarm. Once an MTCD Maximum Presence alarm is generated, the alarm condition remains in effect until the crossing begins recovery (i.e., the XR input is energized and the gates begin to pick up).

This is a numeric system-wide parameter with a range of 0 – 100 seconds. In addition, a parameter value of zero disables the feature completely.

2.5.7 Detector Failure Alarm

This parameter determines whether a detector failure results in an alarm generation. The "Detect Health" output is independent of the Alarm output and may be used to determine detection failures separate from the alarm operations.

If this parameter is programmed as "YES", a detector failure results in an EGMS alarm condition. If "NO", detector failures do not affect the alarm output.

The Detector Failure Alarm is a system-wide parameter with possible values "NO" and "YES".

2.5.8 Detector Restore Delay

This parameter determines the amount of time following the recovery of a detector failure alarm prior to the alarm recovery. This parameter prevents alarm "ping-pong" operation in cases where an intermittent detector causes repeated short-duration failures.

The Detector Restore Delay is a system-wide parameter with a range of 0-255 minutes. A value of 0 results in alarm recovery immediately upon detection failure recovery.

2.5.9 Maximum Detector Failures

This parameter allows excessive intermittent detector failures to result in a continuous alarm condition until the unit is repaired and reset. Occasional detector failures (due to environmental conditions – weather changes, lightning, construction work near loop wiring, etc.) may not be cause for concern as long as the condition recovers. However, intermittent detector failures may result from damaged cable or equipment, and may cause repeated alarm conditions. If the programmed maximum detector failures are exceeded in any 24-hour period, the alarm is permanently generated and can be restored only upon user intervention at the EGMS.

Maximum Detector Failures is a system-wide parameter with a range of 0-255. A value of 0 disables the permanent alarm condition due to excessive detector failures.

2.5.10 Auxiliary Input Monitors

The EGMS contains four 12VDC isolated inputs (auxiliary inputs) that may be used for monitoring external equipment. Each of these inputs may be programmed independently for operation. The auxiliary inputs may be used to generate alarm conditions and changes to the input states are recorded in the event log. These inputs are not available in the standard EGMS chassis wiring, but may be added if necessary for specific customer requirements.

2.5.10.1   Aux Monitor Enable

If programmed to "YES", the auxiliary input is used to generate an alarm condition. While the input is energized, the input is considered normal. If the input is de-energized, the alarm condition is generated. If programmed to "NO", no alarms are generated due to the input. The value of this entry does not affect aux monitor event log entries.

The Aux Monitor Enable is a per-aux-input parameter (1-4), with possible values "NO" and "YES".

2.5.10.2   Aux Restore Delay

This parameter determines the amount of time following the recovery of an auxiliary input monitor alarm condition prior to the alarm recovery. This parameter allows the "extension" of the alarm condition beyond the recovery of the auxiliary input.

The Aux Restore Delay is a per-aux-input parameter with a range of 0-255 minutes. A value of 0 results in alarm recovery immediately upon alarm condition recovery.

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3.0 - USER INTERFACE

3.1 USER INTERFACE COMPONENTS

All EGMS system parameters, status, and event log may be accessed via the graphics touch-screen front panel. In addition, the A44108 CPU Module diagnostic RS-232 serial port and/or a serial port on the A44103 System Communications Module provide access to the same information and allows the download of the event log to a computer.

3.2 GRAPHICS TOUCH-SCREEN FRONT PANEL

The main user interface to the EGMS is via the front panel which incorporates a graphics LCD screen and an integrated touch-screen keypad for navigation and data entry. The user interface is fully menu-driven and provides "Help" screens describing each database parameter. Navigation through menus and screens, along with data entry methods, are consistent throughout the interface, thus providing the ability to traverse the interface efficiently and quickly.

3.3 TOUCH-SCREEN NAVIGATION

All navigation through the user interface is performed using the touch-screen. In all cases, a touch-active area is defined by the rectangular outline of a button along with text or symbols within the button that define its action. For the most part, interface screens are grouped into menus, status viewing, data viewing, and data entry. Standard sets of navigation buttons are displayed at the bottom of most interface screens.

3.3.1 Standard Navigation Buttons

On most data entry and data display screens, the bottom of the display contains the standard navigation buttons **HOME** and **ESC**. When the **HOME** button is pressed, the user interface returns to the main menu regardless of current location. When the **ESC** button is pressed, the user interface returns to the most recent previous menu.

3.3.2 Menu Selection

A menu screen displays a menu title followed by a list of options. The text for each option is located within a touch-screen button. To select a menu option, simply touch the text for that item. The user interface will continue to the next menu or display screen as appropriate.

3.3.3 Text Status Screens

The text status screens provide real-time information about various aspects of the EGMS. Within the text status screens, press the **PREV** (previous) and **NEXT** (next) buttons to scroll between each of the available status screens. These screens include general status (high-level operation of the EGMS), gate status (detailed gate information including failures and timers), detector status (detailed detector information including failures and timers), alarm status (detailed status of alarm conditions, cycle counters, and restore delay timers), and output status (display of the eight EGMS outputs, their programmed function, and their current states). If the Dual-Unit mode is enabled, additional status screens include Dual-Unit communications information and remote XR, Island, Gate, and Detector information. The status screens may be exited using the **HOME** or **ESC** buttons.

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3.3.4   Graphics Status Screen

The graphics status screen provides real-time, high-level information about the operational aspects of the EGMS. The only possible navigation from a status screen is using the **HOME** and **ESC** buttons.

3.3.5   Data Viewing Screens

The data viewing screens present the current configuration database parameters to the user. In addition to the **HOME** and **ESC** buttons, the user may move to the various data elements using the up (↑), down (↓), left (←) and right (→) arrow buttons.

One data element is always selected on each data viewing screen as indicated by inverse text for that item. As the arrow buttons are pressed, the desired data item may be selected. If all data does not fit on a single screen, the arrow buttons will cause the screen to scroll such that some data items move off the screen while other data items appear.

The data viewing screens also include a **HELP** button. When this button is pressed, a textual description of the selected data item is presented along with the type of data and range of values. The user may touch anywhere on the help display to return to the data viewing screen.

Finally, the data viewing screens include an **EDIT** button. When this button is pressed, the user is able to change the currently selected data item. This occurs using the Data Entry Screen.
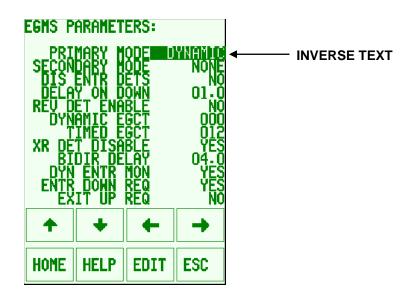
Figure 3-1 Typical Data Viewing Screen

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3.3.6   Data Entry Screens

The data entry screens provide the ability to modify one element of the configuration database. The name of the data element is displayed at the top of the screen, followed by the current value.

At the bottom of the screen are the entry and navigation buttons.

The **HOME** button operates as expected. The **BACK** button returns the user to the Data Viewing Screen.

The **++** and **- -** buttons allow the user to change the current database item by a single value. The **++** button adds one to the current value and the **- -** button subtracts one. Some items also have **+10** and **-10** buttons which add or subtract 10 from the current value, respectively.

Once a database value is changed from the original, it begins to flash to indicate to the user that a change has been made. The **ENT** button is used to save the modified data into a temporary database location. Once **ENT** has been pressed, the data item stops flashing to indicate that it has been accepted.

NOTE
EGMS operational data is not stored immediately into the permanent database – the user edits all data as desired and then must perform the "Save Database" operation described below.   This prevents undesired operation of EGMS while data is being edited.

The **CLR** button discards any changes made to the data item (prior to pressing **ENT**) and restores the item to the most recent entered data. Once **CLR** has been pressed, the data item stops flashing to indicate that it has been restored to the previous value.

In the current version of EGMS software there are five types of database parameters: Numeric, Fractional, Toggle, Character, and Alphanumeric.
 • Numeric database entries are just that – an integer numeric value with a specified range. A typical numeric entry may have a range of 000 – 255.
 • Fractional data entries are numeric entries that are entered in tenths. The **++** and **- -** buttons change the value by 0.1, while the **+10** and **-10** buttons change the value by 1.0. A typical fractional entry may have a range of 00.0 – 25.5.
 • Toggle entries are typically YES or NO options.
 • Character entries are for single-character alphanumeric entries (i.e. Local and Remote prefix entries). The **++**, **- -** , **+10** and **-10** entries allow the user to step through all available characters in the display set. The characters are arranged as symbols, then numbers, then the alphabet.
 • Alphanumeric entries are for parameters such as user name, pass codes, crossing name, crossing description, and DOT number. A telephone-style keypad is displayed with each of the ten digit

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keys also selecting a subset of the alphabet.   By pressing a key repeatedly, the currently entered character toggles between the numeric and alphabet selection.

3.4   INITIALIZATION DISPLAY

When power is applied to the EGMS, it performs an initialization process in which system memory is verified (CRC-32 check), the database is verified, the event log is prepared for operation, and all system components perform start-up self-checks and cross-checks. Any problems that may be detected during startup will be displayed momentarily and entered into the event log.

During startup initialization, the EGMS checks for the existence of a System Communications Module, a functioning USB Subsystem, and the presence of a Secure Digital (SD) Memory Card. When present, the EGMS compares any database on the SD card to the CPU module's database. If the SD card database does not exist or is corrupt, the EGMS automatically creates a database file on the SD card. If the database exists and does not match the CPU module's database, a database mismatch is flagged. This typically occurs if a CPU module has been swapped out for some reason.
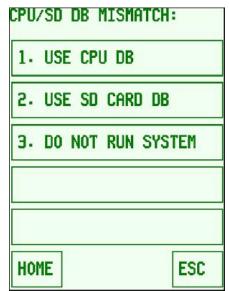
Figure 3-2 Startup Database Mismatch Display

In the case of a database mismatch, the user may choose to:
- Use the database residing on the CPU module, in which case the CPU database file is copied onto the SD card and the system begins normal operation.
- Use the database residing on the SD card, in which case the SD Card database is copied into the CPU temporary memory and the user is prompted to review and save the database into permanent memory.
- Stop system operation and remain in a shut-down state.

When a database mismatch occurs, the EGMS is prevented from operating until the user follows through with one of the options above. This is to allow a CPU module change-out without concern that the system may be operated with the incorrect configuration data.

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3.5   START-UP DISPLAY

After the initialization process is complete, the display enters the "start-up" mode. It provides title information, software version, software and database CRC (checksums), CPU module serial number, and product / company information using alternating displays. If the Start-up Logo parameter is programmed to a particular railroad, that railroad's logo will be displayed as well. During the start-up mode, the entire screen acts as a button so that pressing any point on the screen will advance the display to the main menu.

Figure 3-3 Typical EGMS Start-up Display

3.6   MAIN MENU

The **MAIN MENU** provides a starting point for all access to the user interface. The **MAIN MENU** display is shown in Figure 3-4.

Figure 3-4 EGMS MAIN MENU Display

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3.7   DISPLAY MENU

The **DISPLAY MENU** allows the user to select one of the real-time operating status display options. These options include Text Status and Graphics Status. In addition, the user may select to return to the startup display to view the software version.

Figure 3-5 DISPLAY MENU Screen

3.7.1   Text General Status (GEN STAT)

The **GEN STAT** (general status) display provides access to several screens containing real-time information regarding the operation of the EGMS. Pressing the **PREV** or **NEXT** button pages the text status display through the various information screens. The first screen is **GEN STAT** (general status). It provides an overview of each gate and detector state plus the overall health status, gate control output states, and operational timers that may be in effect at the time. A typical general status display is shown in Figure 3-6.

Figure 3-6 Typical General Status Display

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The general status display provides the following information:

- Current date and time on the top line of the display. If the time has not been set, the date/time line is followed by **INV** indicating invalid time.

- Non-operation reason. If the EGMS is non-functional due to internal health reasons, the 2nd line of the display indicates the reasons. For example, the display may indicate **NON-OP: DET I/O BAD** meaning the EGMS inter-module communications between the CPU Module and I/O #2 (A44105 detector Input board) is inoperable and the EGMS is not functioning. When the EGMS is functioning properly, the 2nd line of the display is blank.

- Mode and Health. This line of the display indicates the current EGMS operating mode and the state of the EGMS Health output. The operating modes include none (**NONE**), timed (**TIME**), and dynamic (**DYN**). The health may be either **OK** or **FAIL**.

- The XR / Island states are displayed. XR and Island inputs each may be failed (**FL**), energized (**UP**) or de-energized (**DN**). In addition, if the Island 2 Enable flag is set to false, the ISL2 input will be displayed as none (**NON**).

- Gate Control states. The next three lines relate to the gate control outputs. Gate controls 1 and 2 are determined independently for directional exit gate control. The display indicates the current state of each gate control output (**UP** or **DOWN**), along with the internal EGMS gate processing state which is producing that gate output (**IDLE**, **ENTR DROP**, **ALL DROP**, **ENTR DOWN**, **ALL DOWN**, **ISL DOWN**, **ALL RISE**). These states are described in an earlier section of this document. In addition, if the XR Delay Timer (**XRDLY**), Exit Gate Clearance Time (**EGCT**), Island Inhibit (**ISLINH**), or Gate Activity Timeout (**ACTIVE**) timers are active, those timers are displayed along with the gate control information. If a Gate Control Output is being disabled due to an alarm condition (i.e. Dynamic Entrance Gate Monitor), that Gate Control information line will be highlighted on the status display.

- Gate status. The remaining lines of the general status display are used to provide an overview of gate and detector states. Gates are combined into direction and type so that multiple gates programmed for the same direction and height are shown as a single status. The gate information includes the gate direction (**N/S/E/W/NB/SB/EB/WB**), gate type (**ENTR** or **EXIT**), and the current state of the gate: horizontal (**HORZ**), vertical (**VERT**), transition (**TRAN**) meaning neither **HORZ** or **VERT** inputs are energized, or failed (**FAIL**) which indicates that a gate input hardware failure has occurred. If a Gate is currently in an alarm condition (i.e. Min/Max descent/ascent failure, excessive gate bounce, etc.), that gate information line will be highlighted on the status display.

- Detector status. Detectors are combined into direction and type so that multiple detectors programmed for the same direction and height are shown as a single status. The detector information includes the detector direction (**N/S/E/W/NB/SB/EB/WB**), detector type (**ENTR**, **EXIT**, or **INTR**), and the current state of the detector: unoccupied (**..**), occupied with a vehicle (**CALL**), or failed (**FAIL**) . If a Detector is currently in an alarm condition (i.e. loop health fail, long-term obstacle), that detector information line will be highlighted on the status display.

3.7.2 Text Gate Status (GATE STAT)

The **GATE STAT** (gate status) display provides detailed real-time information regarding the operation of the EGMS gates. This information includes the current status of the gate inputs, the positions of the gates, the results of gate ascent and descent timings, and the gate transition and chatter timers. In addition, the top few lines of the gate status display provide some of the general status information to assist with interpretation of the current gate states.

Figure 3-7 Typical Gate Status Display

The gate status display provides the following information:

- Current date and time, non-operational reason, EGMS state/health, and exit gate control states are identical to the corresponding fields on the general status display.
- Gate direction. **N,S,E,W,NB,SB,EB,WB**, entrance (**EN**) or exit (**EX**).
- Gate position. Vertical (**VERT**), horizontal **(HORZ)**, transition (**TRAN**), or failed (**FAIL**).
- Detailed gate health status (**HEALTH/STATUS**). This display consists of eight health parameters, each displayed as a single character on the health status line. The possible gate health status parameters are:
  - **I** – Input circuitry for the gate is bad.
  - **V** – EGMS has detected a gate failure when the gate was expected to be in the vertical position.
  - **H** – EGMS has detected a gate failure when the gate was expected to be in the horizontal position.
  - **B** – EGMS has detected simultaneous activations of both the vertical and horizontal gate inputs.
  - **D** – The gate descent time has exceeded the programmed maximum allowed descent time value.
  - **A** – The gate ascent time has exceeded the programmed maximum allowed ascent time value.
  - **M** – The maximum allowable number of gate failures and recoveries has been exceeded.
  - **S** – The gate is marked as failed due to a general system fault or failure.

3-8

- Gate transition timer (**TRANS**). This timer begins counting from 000.0 seconds in 1/10-second increments when the gate breaks a position contact (horizontal or vertical), and continues counting until the gate makes a contact position. If the gate position change is expected due to the state of XR and/or exit gate control outputs, the transition timer begins immediately upon breaking the position contact. If the gate position change is not expected, the transition timer begins after the chatter/bounce timer increments to the programmed chatter time value. Once the gate makes a position contact, the timer value is "latched" so that the most recent gate transition time is displayed until the gate begins movement again.
- Gate chatter/bounce timer (**CHAT**). This timer counts from 00.0 seconds in 1/10-second increments, up to the programmed vertical or horizontal chatter timer value when the gate changes from the vertical or horizontal position, respectively. This timer is active only when the gate position change is not expected (i.e. EGMS determines that the gate was in the correct position based on XR input and exit gate output states at the time). Once it counts to the programmed value, the gate position change is acknowledged by EGMS.

3.7.3 Text Detector Status (LCL DETS)

The **LCL DETS** (local detector status) display provides detailed real-time information regarding the operation of the EGMS detectors. This information includes the current status of the detector inputs, the occupancy state, the health status, the number of detector failures that have been recorded, and the detector stretch timer. In addition, the top few lines of the gate status display provide some of the general status information to assist with interpretation of the current detector states. There are two detector status screens. The first provides information for detectors 1-8, and the second provides information for detectors 9-16.

Figure 3-8 Typical Detector Status Display, Detectors 1-8

The detector status display provides the following information:
- Current date and time, non-operational reason, EGMS state/health, and exit gate control states are identical to the corresponding fields on the general status display.
- Detector direction. **N**, **S**, **E**, **W**, **NB**, **SB**, **EB**, **WB**, entrance (**EN**) or exit (**EX**), or internal (**IN**).

3-9

- Detector occupancy state (**STATE**). Unoccupied (displayed as "**..**"), Occupied (displayed as "**CALL**"), or failed.
- Detailed detector health status (**HEALTH**). This display consists of three health parameters, each displayed as a single character on the health status line. The possible detector health status parameters are:
  - **I** – Input circuitry is bad, or the detector health input is de-energized.
  - **M** – The maximum allowable number of detector failures and recoveries has been exceeded.
  - **S** – The detector is marked as failed due to a general system fault or failure.
- Detector presence timer (**PRES**). This timer counts up from 0 seconds, in 1-second increments, to a maximum value of 99 minutes and 59 seconds when the detector becomes occupied. For timer values between 0 and 59 seconds, the display shows the number of seconds. Beyond 59 seconds, the display shows MM:SS where MM = number of minutes and SS = number of seconds. When the detector becomes unoccupied, the timer is latched so that the most recent detector presence timer value is displayed until the next detector occupancy.
- Detector stretch timer (**STRCH**). This timer is set to the programmed detector stretch value when the detector is occupied (unless all gates are down, in which case the detector stretch is disabled). When the detector becomes unoccupied, the timer counts down to 00.0 in 1/10-second increments.

3.7.4   Text Alarm Status

The **ALARMS** (alarm status) screen provides information related to current alarm conditions and reasons why the Alarm output may be down. With a quick glance, the user may determine which alarms are currently in effect, why the alarm output may be down, and the most recent detection subsystem alarm time. Figure 3-9 shows a typical alarm status display (but is atypical in that not all alarms are displayed simultaneously):

Figure 3-9 Typical Alarm Status Display

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The first few lines of the **ALARMS** display are identical to the other text status displays in that they provide EGMS mode, health, XR/Island status, and gate control information. Descriptions of these lines are provided in paragraph 3.7.1. Also included is the Detector Subsystem state **DETS:** occupied **("CALL")** or unoccupied ("**..**") and health **HLTH: OK** or **FAIL**.

The next line (**ALARM STATE**) contains the current alarm state. The alarm state will be one of the following:

- **ALARM!** indicates that one or more alarms is currently in effect.
- **W4DOWN** (wait for all down) occurs when all alarms have been cleared, but the EGMS is in the alarm recovery state and is waiting for the crossing to activate and all gates to move to the horizontal position.
- **W4IDLE** (wait for crossing idle / clear) occurs when all alarms have been cleared, EGMS is in the alarm recovery state, all gates have been lowered properly, and EGMS is waiting for all gates to rise to the vertical position.
- **NO ALARMS** state indicates that no alarms are in effect and the alarm output is UP.

The remainder of this line (**RSTCYCLES=x**) indicates the number of crossing operation cycles that must be observed before the alarm state may be cleared. After one or more alarms occur, the EGMS must see a user-programmable number of proper crossing operations before the alarm output is restored. This prevents "ping-pong" operation of the alarm output (and QZI) caused by intermittent gate operation that may generate a brief alarm, clear, and recur during train moves.

If a detector failure has generated the alarm and the detector restore timer has not expired, the remainder of the line will indicate the amount of time remaining before the alarm is cleared after the detector failure is repaired. In that case, the line will display **DETRESTORE=xxx** where xxx is the number of seconds remaining until alarm is cleared.

The remainder of the display indicates the current alarms that are in effect and the alarms that had been in effect and are still in the process of being cleared. Each alarm type has a specific location on the display so the alarms may be spaced strangely within the display area. In the case of each alarm, if the text is displayed in normal mode, the alarm is currently in effect. If displayed in "inverse" text, the alarm has recovered but the number of valid crossing operations must be observed before the alarm recovers. If no text is displayed, the alarm is not present and is not the cause of the alarm output being down.

The following alarm types are possible:

- **HEALTH IN**:   The "Health" input from a detector module is bad.
- **GFAIL-UP**:   A gate has failed while supposed to be in the vertical (up) position.
- **GFAIL-DWN**:   A gate has failed while supposed to be in the horizontal (down) position.
- **GFAILBOTH**:   A gate has reported being both vertical and horizontal simultaneously.
- **MAX DSCNT**: A gate transitioned from vertical to horizontal too slowly.
- **MAX ASCNT**: A gate transitioned from horizontal to vertical too slowly.

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- **DETOBSTCL**: A detector maintained vehicle presence longer than the programmed maximum time, or vehicle presence is detected beyond the programmed "MTCD Maximum Presence" alarm time value.
- **SYS FAIL**: An internal EGMS system failure was detected. The system is halted.
- **MIN DSCNT**: A gate transitioned from vertical to horizontal too quickly.
- **MAX ASCNT**: A gate transitioned from horizontal to vertical too quickly.
- **GATE RESP**: A gate responded to a command change (XR change, vehicle detection) too slowly.
- **AUX INPUT**: An enabled auxiliary input was de-energized, indicating an external alarm.
- **DET FAIL**: A loop detector has failed for some reason.
- **G.A.T-OUT**: A gate activation timeout has occurred (refer to the Alarms section for details).
- **XR-ISL FAIL**: XR is energized but Island is down. A non-standard crossing operation state.
- **REM ALARM**: (Dual-Unit mode) – the remote EGMS is in alarm condition for some reason, as described in Appendix A.

The final line of the Alarm status (**QZI STATE**) indicates the current state of the Quiet Zone Indicator.

3.7.5 Output Status

The Output Status display shows the current status of the eight EGMS Outputs, along with the name of each output and its programmed function.
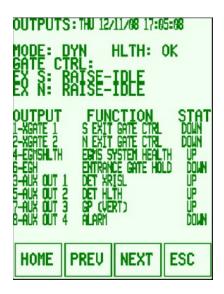
Figure 3-10 Typical Output Status Display

The first four outputs: (Exit Gate Controls 1 and 2, EGMS Health, and Entrance Gate Hold), operate in a fixed manner. The remaining four outputs are the programmable Auxiliary Outputs and the displayed function is based on the configuration parameter for that output. In each case, the

3-12

STAT line shows the current status of that output, which may be either **UP** (energized) or **DOWN** (de-energized).

3.7.6   GRFX Status

The graphics display does not provide all the timers and states of the EGMS, but it does allow a quick view of current crossing operation in an easy-to-interpret layout. There are two base display options in the graphics status: single-track and dual-track.

The single-track graphics display includes a track, four gates, and four vehicle detection loops. Each gate and loop corresponds to one or more configured gates and loops. For instance, if the crossing geometry included three loops on the northbound vehicle approach, the single graphical loop representing the northbound approach would display the combined state of all three configured loops.

The dual-track graphics display includes two tracks, four gates, and six vehicle detection loops. The additional two loops are located between the tracks.
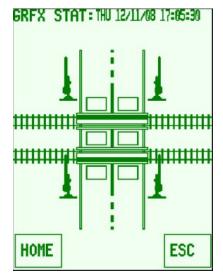
Figure 3-11 Typical Graphics Status Display (Crossing Idle)

3-13
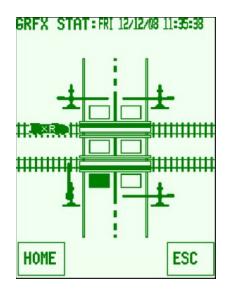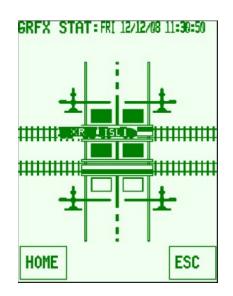
Figure 3-12 Typical Graphics Status Display (Train on Approach, Vehicle on SB Exit Loop)

Figure 3-13 Typical Graphics Status Display (Train at Crossing)

The graphics display represents EGMS data in the following manner:

- Train on Approach: If XR is down, a locomotive is displayed on the track to the left of the crossing. The locomotive flashes **XR** within its body to indicate that XR is down. If the display includes two tracks, the "XR locomotive" is displayed on both tracks since EGMS cannot determine which track the approaching train may be occupying.

- Train at Crossing: When the main island (ISL1) is down, the locomotive is displayed on the track over the crossing, and a train car is displayed behind the locomotive to indicate the continued de-energized state of XR. The locomotive flashes **ISL1** to indicate that the Island 1 input is down.

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- Industrial siding: When the Island 2 Input (ISL2) is down, the locomotive is displayed on the siding track (bottom track in the dual-track configuration). The locomotive flashes **ISL2** within its body to indicate that the Island 2 input is down. The Island 2 input is typically used in conjunction with an Industrial Siding (IND-TR) or Island-Only (XTR) crossing activation.
- Gates: The gates are displayed in one of three possible positions:
    o Vertical indicates that all configured gates for that direction and type (i.e. NB Entr, SB Exit, etc.) are confirmed in the vertical position.
    o Horizontal indicates that all configured gates are confirmed in the horizontal position.
    o If any of the configured gates are not confirmed in vertical or horizontal position, the gate is shown in transition (45-degree angle). Also, if two or more gates are configured for the direction and type, and the gates are not all in the same confirmed state (vertical or horizontal), the resulting display is transition.
    o If any of the configured gates are failed, the display shows the gate with an **X** on top of it indicating gate failure.
    o If a gate is in an alarm condition, it will flash periodically (on for 1.5 seconds, off for 0.5 seconds) to indicate the alarm.
- Detectors: The detectors are represented as rectangular boxes in the appropriate locations on the approaches to the crossing. If there is no vehicle presence, the detector is drawn as an outline. When vehicle(s) are present, the detector is drawn as a solid box. Detector failures are also shown as a solid box. If a detector is in an alarm condition, it will flash periodically (on for 1.5 seconds, off for 0.5 seconds) to indicate the alarm. Note that the detector presence is displayed even if the Island is down and the detectors are disabled. Therefore, it is common to see "vehicle presence" when the island is occupied, caused by the train's influence on the inductive loops.

3.7.7 Start-Up Display

From the **DISPLAY MENU**, select **STARTUP DISPLAY** to return to the initial start-up screen which displays the software version.

3.8 LOCAL DATABASE MENU

The **LOCAL DATABASE** menu allows the user to select one of the database editing options. These options include EGMS operational parameters, gate parameters, and detector parameters. It also includes a Default data configuration option and an option to save the database to the permanent (non-volatile) memory.

3-15
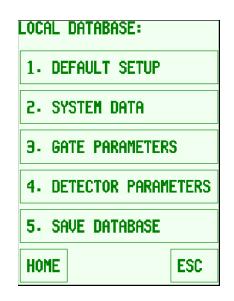
Figure 3-14 LOCAL DATABASE Menu Display

3.8.1   DEFAULT SETUP

The **DEFAULT SETUP** option allows the user to quickly set all EGMS database values to the most common operating configurations. These default configurations include: One-Track Dynamic, Two-Track Dynamic,

Figure 3-15 Database Default Configuration Menu Display

All of the default modes configure the majority of the system in an identical fashion. The default database entries are listed at the end of this document in Appendix B. The differences between the modes are:

- One-Track Dynamic configures the system to operate in dynamic mode with four loop detectors enabled, two for each direction.

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- Two-Track Dynamic configures the system to operate in dynamic mode with six loop detectors enabled, three for each direction, so that loops may be located between the tracks.
- Timed Mode configures the system to operate in timed mode, with no loop detectors enabled.

3.8.2   SYSTEM DATA

The **SYSTEM DATA** option displays a submenu (Figure 3-16) with choices for EGMS, Alarm, Communications and Miscellaneous.
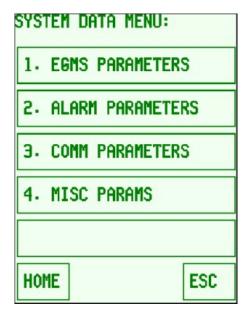
Figure 3-16 SYSTEM DATA MENU Display

3.8.2.1   EGMS Parameters

The **EGMS PARAMETERS** data display refers to all the system-wide EGMS operational data. The display shows a maximum of 12 parameters at a time. The up (↑) and down (↓) arrow buttons move the cursor to select other data parameters and cause the display to scroll through all the available parameters.

3-17
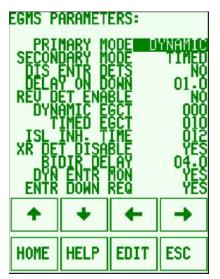
Figure3-17 Typical EGMS PARAMETERS Database Entry Display

The data descriptions are as follows (see the corresponding operational description section of this manual for more details about functionality of each parameter):

- **PRIMARY MODE**. Toggle entry. Possible selections are **NONE**, **TIMED**, and **DYNAMIC**. This parameter selects the desired operating mode of the EGMS.

- **SECONDARY MODE**. Toggle entry. Possible selections are **NONE** and **TIMED**. This parameter selects the backup operating mode of the EGMS in the event of detector failure. If the primary mode is timed, then the secondary mode is ignored.

- **DIS ENTR DETS**. Toggle entry. Possible selections are **NO** and **YES**. This parameter allows the entrance detectors to be disabled when the corresponding entrance gate(s) reach the horizontal position.

- **DELAY ON DOWN**. Fractional entry. Range **00.0 – 25.5** seconds. This parameter determines the duration of vehicle detection within the detection area with all gates in the horizontal position before the appropriate exit gate(s) are raised. It is used to prevent the improper detection of the train as it enters the crossing, if the train speed is such that the detectors are activated before the Island circuit has time to drop to disable the detection system. It is also used to minimize the effects of vehicles attempting to "nudge under" gates after all gates are lowered while not completely disabling the detection system.

- **REV DET ENABLED**. Toggle entry. Possible selections are **NO** and **YES**. This parameter allows the detector(s) located at an exit gate to raise both exit gates upon activation. It is useful in complex crossing geometries in which a motorist attempting to drive around an entrance gate may be confused by a descending exit gate.

- **DYNAMIC EGCT**. Numeric entry. Range **000 – 255** seconds. This parameter provides a delay from when XR drops and the entrance gates begin descent, before the exit gates may descend. The exit gates remain in the vertical position, regardless of vehicle detection, until the DEGCT expires. At that point, the exit gate operation is based on the vehicle detection status.

3-18

- **TIMED EGCT**. Numeric entry. Range **000 – 255** seconds. After the XR drops and the entrance gates begin descent, this parameter establishes a time delay that runs until the exit gates begin descent.
- **ISL INH. TIME**. Numeric entry. Range **000 – 255** seconds. This parameter prevents the immediate disabling of the vehicle detection system in cases where a train stops short of the crossing and then restarts, dropping the XR and Island 1 inputs within the ISL INH. TIME selected or when Island 2 input (XTR / IND-TR) drops. When XR drops and the entrance gates begin descent, the Island Inhibit Timer is activated and begins counting down to zero. While this timer is non-zero, the detection system remains active regardless of the state of either Island input. Once the timer expires, the detection system will be disabled when the island is occupied. When the Island 2 input drops, the EGMS operates as if the XR and Island 1 inputs drop simultaneously.

<table>
<tr><td>NOTE</td><td>**NOTE**
If no vehicles are present in the detection area, the exit gates will descend. Once all gates reach the horizontal position, any remaining Island Inhibit time will be cleared out immediately.</td></tr>
</table>

- **XR DET DISABLE**. Toggle entry. Possible selections are **NO** and **YES**. This parameter operates in the Dynamic mode. When set to **YES**, it prevents vehicle detection from being recorded in the EGMS event log when the crossing is not active. The purpose of this setting is to prevent overflow of event logs and data recorders due to normal vehicular traffic movement when the crossing is not active.
- **BIDIR DELAY.** Fractional entry. Range **00.0 – 25.5** seconds. This parameter allows the EGMS to switch from directional exit gate control **(on**ly raises exit gate in the direction of vehicle travel) to bidirectional exit gate control (raises both exit gates). When a vehicle is present within the detection area, the appropriate exit gate is raised and the bidirectional delay timer is initiated. If vehicle presence remains on any combination of loops for the programmed period of time, the EGMS raises both exit gates.
- **DYN ENTR MON**. Toggle entry. Possible selections are **NO** and **YES**. This parameter is used in the dynamic mode to enable entrance gate monitoring to override exit gate operation. When set to **YES**, the entrance gate(s) must reach the horizontal position within the programmed max descent time, or EGMS will raise the corresponding exit gate(s) regardless of vehicle presence within the MTCD. When set to **NO**, EGMS will allow the exit gate(s) to lower when the MTCD is clear of vehicles, even if the corresponding entrance gate(s) do not reach the horizontal position properly.
- **ENTR DOWN REQ**. Toggle entry.   Possible selections are **NO** and **YES**. This parameter is used for timed mode. When set to **YES**, all entrance gates must achieve the horizontal position before the exit gates may begin descent. If set to **NO**, the exit gates may begin descent upon completion of the EGCT, even if the entrance gates have not yet achieved the horizontal position. The entrance gate descent time is monitored and if an entrance gate exceeds the programmed maximum descent time, the exit gates are raised until the entrance gates reach horizontal.

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- **EXIT UP REQ**. Toggle entry. Possible selections are **NO** and **YES**. This parameter is used in conjunction with the Entrance Gate Hold output. If set to **YES**, the Entrance Gate Hold output is de-energized when any exit gate is in the non-vertical position. If set to **NO**, the Entrance Gate Hold output is de-energized when all exit gates are in the horizontal position.
- **EGH SENSE**: Toggle Entry. Possible selections are **B12 HOLD** and **B12 ALLW**. If set to **B12 HOLD**, the Entrance Gate Hold output will be energized to hold the entrance gates in the lowered position. If set to **B12 ALLW**, the Entrance Gate Hold output will be energized to allow the entrance gates to rise.
- **ISL 2 ENABLE**. Toggle entry. Possible selections are **NO** and **YES**. This parameter enables the Island 2 (industrial siding / island only activation) input. If set to **YES**, the EGMS interprets the loss of the Island 2 input as if both the XR and main island input were dropped simultaneously – the exit gate descent would be based on vehicle presence within the detection zone and the Island Inhibit timer would be timed as described above. If this parameter is set to **NO**, the Island 2 input is ignored.
- **DUAL-EGMS ENAB**. Toggle entry. Possible selections are **NO** and **YES**. This parameter enables the Dual-Unit communications-based link. For details refer to Appendix A at the back of this manual.

3.8.2.2   Alarm Parameters

The **ALARM PARAMS** (alarm parameter) data refers to all the system-wide EGMS alarm processing data. Additional alarm-processing data is entered on a per-detector (long-term obstacle) and per-gate (chatter, transition timers) basis.

Figure 3-18 Typical ALARMS Database Entry Display

The alarm parameter descriptions are as follows (see the corresponding operational description section of this manual for more details about the functionality of each parameter):

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- **GATO ALARM DLY**: Numeric entry, range **10-60** minutes, **0** disables the feature. Gate Activation Timeout (GATO) Alarm drop delay time. This parameter sets the amount of time, in minutes, that the crossing can remain active (XR down, entrance gates not vertical) before EGMS determines that a gate activation timeout has occurred and the Alarm Output should be dropped. Once this time expires, EGMS drops the Alarm Output and begins timing the GATO gate pickup delay. If this value is set to 0, the GATO feature is disabled and EGMS never alters operation due to extended crossing activations.
- **GATO GATE DLY**: Numeric entry, range **5-60** minutes. Gate Activation Timeout (GATO) Gate pickup delay time. This parameter sets the amount of time, in minutes, that EGMS keeps the Alarm Output de-energized, due to extended crossing operations, prior to picking up the exit gates.
- **MAX GATE REL**: Numeric entry, range **00.0 – 25.5** seconds. Maximum time from when XR drops until all entrance gates break vertical position contacts, before generating an alarm condition.
- **MAX GATE RESP**: Numeric entry, range **00.0 – 25.5** seconds. Maximum time from when XR raises until all entrance gates break horizontal position contacts, before an alarm condition is generated. Maximum time from when an EGMS exit gate control output changes states until all corresponding exit gate(s) break the previous gate position contacts, before an alarm condition is generated.
- **CYCLE RESTORE**: Numeric entry, range **0 – 255**. Number of crossing operations required without any alarms present, prior to clearing the alarm condition.
- **MTCD PRESENCE:** Numeric entry, range **0 – 100** seconds, **0** disables the feature. Maximum amount of time, from the start of crossing activation, until a vehicle presence detection will cause an alarm condition to be generated.
- **DET FAIL ALARM**: Toggle entry, possible values **NO** and **YES**. If set to **YES**, any detector failure (due to module problems, wiring problems, or environmental conditions) will result in an EGMS alarm condition (EGMS Alarm output de-energized). If set to **NO**, the detector subsystem will not generate alarms.

NOTE	**NOTE** The EGMS Detector Subsystem Health output always reflects the health state of the detection subsystem, regardless of this entry. This entry allows the detection subsystem to be monitored either together with other alarms, or separately via the detector health output.

- **DET REST DELAY**: Numeric entry, range **0-255** minutes. Amount of time after recovery from detector subsystem failure until the EGMS alarm condition is cleared. If the **DET FAIL ALARM** parameter is set to **NO**, this parameter is ignored.
- **MAX DET FAILS**: Numeric entry, range **0-255**. Maximum number of detector subsystem failure/recovery changes acceptable over a 24-hour period prior to generating a "permanent" alarm condition (alarm output remains de-energized until maintainer/user interaction and reset is performed). A value of **0** disables this feature and prevents "permanent" alarm conditions.

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- **AUXIN 1 ENABLE**: Toggle entry, possible values **NO** and **YES**. If set to **YES**, the Aux 1 input is monitored for alarm generation – when the input is energized, no alarm exists, and if the input is de-energized, an alarm condition is generated. If set to **NO**, the Aux 1 input does not affect the alarm output. These inputs are not available in the standard EGMS chassis wiring, but may be added if necessary for specific customer requirements.

> **NOTE**
>
> **NOTE**
> Even if this parameter is set to NO, state changes on the aux inputs result in event log entries.

- **AUXIN 1 RESTORE**: Numeric entry, range **0-255** minutes. Amount of time from recovery of aux 1 input to the energized state, until the EGMS alarm condition is cleared. If the **AUXIN 1 ENABLE** parameter is set to **NO**, this parameter is ignored.
- **AUXIN 2 ENABLE**: Toggle entry, possible values **NO** and **YES**. If set to **YES**, the Aux 2 input is monitored for alarm generation – when the input is energized, no alarm exists, and if the input is de-energized, an alarm condition is generated. If set to **NO**, the Aux 2 input does not affect the alarm output.

> **NOTE**
>
> **NOTE**
> Even if this parameter is set to NO, state changes on the aux inputs result in event log entries.

- **AUXIN 2 RESTORE**: Numeric entry, range **0-255** minutes. Amount of time from recovery of aux 2 input to the energized state, until the EGMS alarm condition is cleared. If the **AUXIN 2 ENABLE** parameter is set to **NO**, this parameter is ignored.
- **AUXIN 3 ENABLE**: Toggle entry, possible values **NO** and **YES**. If set to **YES**, the Aux 3 input is monitored for alarm generation – when the input is energized, no alarm exists, and if the input is de-energized, an alarm condition is generated. If set to **NO**, the Aux 3 input does not affect the alarm output.

> **NOTE**
>
> **NOTE**
> Even if this parameter is set to NO, state changes on the aux inputs result in event log entries.

- **AUXIN 3 RESTORE**: Numeric entry, range **0-255** minutes. Amount of time from recovery of aux 3 input to the energized state, until the EGMS alarm condition is cleared. If the **AUXIN 3 ENABLE** parameter is set to **NO**, this parameter is ignored.
- **AUXIN 4 ENABLE**: Toggle entry, possible values **NO** and **YES**. If set to **YES**, the Aux 4 input is monitored for alarm generation – when the input is energized, no alarm exists, and if the input is de-energized, an alarm condition is generated. If set to **NO**, the Aux 4 input does not affect the alarm output.

NOTE

Even if this parameter is set to NO, state changes on the aux inputs result in event log entries.

- **AUXIN 4 RESTORE**: Numeric entry, range **0-255** minutes. Amount of time from recovery of aux 4 input to the energized state, until the EGMS alarm condition is cleared. If the **AUXIN 4 ENABLE** parameter is set to **NO**, this parameter is ignored.

3.8.2.3   Communications Parameters

The Communications Parameters data refers to configuration of the optional System Communications module. Communications ports may be configured for a Local Port (serial-based user interface with full read-write database access), a Remote Port (serial-based user interface with read-only database access), and the Dual-Unit Port (serial-based interface to a second EGMS for Dual-Unit operation – only if the **DUAL EGMS ENAB** parameter is set to **TRUE**).
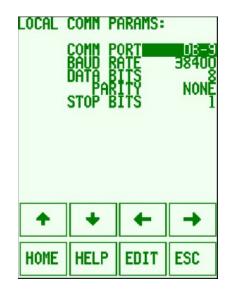
Figure 3-19 Typical LOCAL COMM PARAMS Database Entry Display

The Local and Remote Port configurations are identical, with the following parameters:
- **COMM PORT**: Toggle entry. Possible values **NONE**, **PORT1**, **PORT2**, **PORT3**, **SSRM**, or **DB-9**. Selects the port to be configured for operation.

NOTE

If the same port is selected for multiple configurations (i.e. DB-9 selected for both Local and Remote Ports), the Local Port functionality will be operational and the Remote Port functionality will be disabled..

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- **BAUD RATE**: Toggle entry. Possible values **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, **57600**, or **115200**.
- **DATA BITS**: Toggle entry. Possible values **7** or **8**.
- **PARITY**: Toggle entry. Possible values **NONE**, **EVEN**, or **ODD**.
- **STOP BITS**: Toggle entry. Possible values **1**, **1.5**, or **2**.

The default values for the Local Port are 19200 baud, 8 data bits, no parity, 1 stop bit. The default values for the Remote Port are 9600 baud, 8 data bits, no parity, 1 stop bit.

The Dual-Unit Communications Parameters includes port, baud, data, parity, and stop bit selection as above, and the following entry:

- **LINK TIMEOUT**: Fractional Entry, range **00.0 – 25.5** seconds. This parameter selects the amount of time that may elapse without a valid run-time communications message from the Remote EGMS, until the communications link is determined to be in failure mode. Once in failure mode, the EGMS generates an event log entry indicating the failure and ceases all gate control functions.

If the **DUAL EGMS ENAB** parameter is set to **TRUE**, the default values for the Dual Unit Port are 9600 baud, 8 data bits, no parity, 1 stop bit, and 01.0 second link timeout.

3.8.2.4   Miscellaneous Parameters

The Miscellaneous Parameters menu includes the Display Parameters, Auxiliary Output Mapping, Daylight Savings Parameters, and the Security Parameters. If the security level of the logged-in user is insufficient to view the security parameters, only the first three selections are available.

Figure 3-20 MISC PARAMETERS Menu Display

- Display Parameters

The Display Parameters include all entries that are used for modification / customization of status and event log displays, but do not affect EGMS functionality.

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Figure 3-21 Typical DISPLAY PARAMS Database Entry Display

The display parameters are as follows:

- **Startup Logo**: Toggle Entry. Possible entries are **NONE**, **UP**, **CSX**, **TRE**, **UTA**, and **BNSF**. If other than **NONE**, the selected logo is displayed alternately with EGMS logo on the graphics display start-up screen. Other logos may be added at the request of purchasing railroads.

- **Backlight Timeout**: Numeric Entry, range **000 – 250** seconds. This entry determines the number of minutes without any touch-screen activity until the display backlight turns off. An entry of **000** disables the timeout and results in constant backlight illumination.

- **Buzzer Enable**: Toggle entry. Possible entries are **NO** and **YES**. If set to **YES**, the touch-screen display generates an audible "beep" each time a valid key/button is pressed. If set to **NO**, there is no audible touch-screen feedback.

- **Directional Indicators**: Toggle Entry. Possible entries are ↓**S** ↑**N;** ↓**W** ↑**E;** ↓**N** ↑**S;** ↓**E** ↑**W;** ↓**SB** ↑**NB;** ↓**WB** ↑**EB;** ↓**NB** ↑**SB;** ↓**EB** ↑**WB; or** ↓**0** ↑**1**. This parameter determines how gates and detectors for each direction of automotive traffic are displayed. The **"↓" Directional Indicator** corresponds to all detectors and gates associated with the Exit Gate Control #1 output and shown on the graphics display for vehicular traffic headed from top to bottom on the left side of the roadway. The **"↑" Directional Indicator** corresponds to all detectors and gates associated with the Exit Gate Control #2 output and shown on the graphics display for vehicular traffic headed from bottom to top on the right side of the roadway.

NOTE	**NOTE**
	The alpha character selection associated with either the "↓" or the "↑" Directional Indicator DOES NOT affect any gate or detector configuration or any functionality of the EGMS. This alpha character only changes the nomenclature and display names of the detectors and gates associated with the directional indicator.

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- **Bungalow Quad**: Toggle Entry. Possible entries are **NONE**, **SB ENTR**, **NB ENTR**, **SB EXIT**, and **NB EXIT**. This entry allows display of bungalow icon on graphics status display. Assists operator/maintainer in retaining proper orientation when viewing graphics display.
- **Display QZI**: Toggle Entry. Possible entries are **NO** and **YES**. A **YES** entry here results in the display of a "Quiet Zone Indicator" icon on the graphics status display reflecting the current state of the EGMS Alarm output.
- **Local Prefix**: Character entry. Possible values include all printable alphanumeric characters and symbols available to the EGMS graphics display. Default value = blank. This entry allows the user to select a single number, character, or symbol as a prefix to any event log entry for gates, detectors, or islands monitored directly by the EGMS. For instance, if the Local Prefix is set to **L**, then a change in detector #2 will result in an event log entry displayed as **DET L2 CHG:**.
- **Remote Prefix**: Character entry. Possible values include all printable alphanumeric characters and symbols available to the EGMS graphics display. Default value = **R**. This entry allows the user to select a single number, character, or symbol as a prefix to any event log entry for gates, detectors, or islands monitored by the remote EGMS in Dual-Unit operating mode. For instance, if the Remote Prefix is set to **R**, then a change in detector #2 of the remote EGMS will result in an event log entry displayed as **DET R2 CHG:**. Note that if Dual-Unit mode is not in use, the Remote Prefix is not utilized.
- **XING NAME**: Alphanumeric entry, maximum 14 characters. This is a short textual name of the crossing. It is used for event log printout headers and for the creation of folder paths in the SD card and USB data stick during enhanced event log operations (with the optional System Communications Module installed).
- **XING DESCR**: Alphanumeric entry, maximum 38 characters. This is a longer textual description of the crossing. It is used for event log printout headers and for a better description of the crossing when reviewing the configuration database.
- **XING DOT#**: Alphanumeric entry, maximum 20 characters. This is a field that may be used to retain the DOT Crossing number, or optionally an additional general-purpose description field of the crossing. It is used for event log printout headers and for a better description of the crossing when reviewing the configuration database.

- Auxiliary Output Mapping Parameters

The Auxiliary Output Mapping Parameters enable the user to select which alarm/monitoring output function(s) are to be driven through the four auxiliary outputs. In previous versions, the four outputs were hard-coded to the default function. Starting in software version 4.2, each of the four functions can be driven out of any one (or more) of the four outputs.

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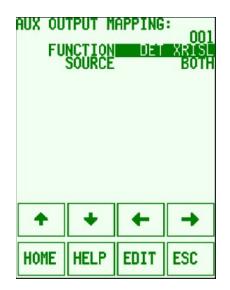
Figure 3-22 Typical AUX OUTPUT MAPPING Database Entry Display

The auxiliary output mapping parameters are as follows:

- **Function**: Toggle entry. Possible entries are:
    a.   **NONE** – results in the output remaining de-energized at all times.
    b. **ALARM** – output energized when the ALARM processing indicates no fault / alarm conditions are present. De-energized if alarm present or if EGMS System Health is failed.
    c. **DET HLTH** – output energized when all configured detectors' "health" inputs are energized, and indicates no detector failure conditions are present. De-energized if detector failure present or if EGMS System Health is failed.
    d. **DET-ALL** – output energized when all configured detectors that are assigned to this Aux Output indicate no vehicle presence. De-energized if vehicle present on any of the configured and mapped detectors, or if EGMS System Health is failed. Refer to 2.2.6 - 2.2.9 for details on detector mapping to the Aux outputs when **DET-ALL** is selected. In the **DET-ALL** mode, the Aux Output follows the detector states regardless of crossing operation.
    e. **DET-XRISL** – output operates in manner similar to **DET-ALL**, except that the output is "wrapped" (detector presence is ignored) when the XR input is energized or the Island input is de-energized. This mode may be used in conjunction with external event logging since the output is wrapped during times when the crossing is not active (vehicles driving across detection zone on a regular basis while the gates are raised) and when the island is occupied (train generates "vehicle" detections). Refer to 2.2.6 - 2.2.9 for details on detector mapping to the Aux outputs when **DET-XRISL** is selected.
    f. **DET-XR** – output operates in manner similar to **DET-ALL**, except that the output is "wrapped" (detector presence is ignored) when the XR input is energized. This mode may be used to prevent excessive output activations when the crossing is not active (vehicles driving across detection zone on a regular basis), but will result

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in intermittent output activations when the train is on the island and generating "vehicle" detections. Refer to 2.2.6 - 2.2.9 for details on detector mapping to the Aux outputs when **DET-XR** is selected.

g. **DET-ISL** – output operates in manner similar to **DET-ALL**, except that the output is "wrapped" (detector presence is ignored) when the Island input is de-energized. This mode may be used in conjunction with external traffic controller interfaces since the output provides all vehicle detections, even when the crossing is not active (vehicles driving across detection zone on a regular basis while the gates are raised), but prevents "vehicle" detection caused by the train while the island is occupied. Refer to 2.2.6 - 2.2.9 for details on detector mapping to the Aux outputs when **DET-ISL** is selected.

h. **DETOBSTCL** – output operates in manner similar to **DET-ALL**, except that the output is "wrapped" (detector presence is ignored) when the Island input is de-energized. This mode may be used in conjunction with external traffic controller interfaces since the output provides all vehicle detections, even when the crossing is not active (vehicles driving across detection zone on a regular basis while the gates are raised), but prevents "vehicle" detection caused by the train while the island is occupied. Refer to 2.2.6 - 2.2.9 for details on detector mapping to the Aux outputs when **DETOBSTCL** is selected.

i. **GP (VERT)** – output energized when all configured gates are indicating vertical (all configured gates' Vertical Input are energized). De-energized if any configured gate is non-vertical or if EGMS System Health is failed.

- **Source**: Toggle entry. Possible entries are **LOCAL**, **REMOTE**, and **BOTH**. In Dual-Unit mode, each aux output may be selected to reflect the state of the local devices, remote devices, or both (i.e., setting Function to **DET HLTH** and Source to **REMOTE** results in the output being driven based on the health of the detectors in the remote unit).

NOTE	**NOTE**
	This parameter is used only in Dual-Unit mode. When Dual-Unit mode is disabled, the source value is always interpreted as LOCAL.

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- Daylight Savings Parameters

The Daylight Savings Parameters allow the user to enable or disable daylight savings operation and program the date/time that daylight savings is to be performed.

Figure 3-23 Typical DAYLIGHT SAVINGS Database Entry Display

Default operations are **SPRING** (2nd Sunday of March at 2:00am) and **FALL** (1st Sunday of November at 2:00am). The daylight savings parameters are as follows:

- **ENABLE**: Toggle entry, values = **NO** and **YES**. If **NO**, daylight savings is not performed. If **YES**, the time clock is set forward one hour at the user-programmable month, week-of-month, day-of-week, and hour specified for "SPRING" operation, and is set backward one hour at the user-programmable "FALL" operation.
- **SPRING MONTH**: Numeric entry, range **1**-**12**. The month (**1**=January, **12**=December) to "spring forward".
- **SPRING WEEK**: Toggle entry, values = **FIRST**, **SECOND**, **THIRD**, **FOURTH**, and **LAST**. The week-of-month to "spring forward". Note that if set to **LAST**, DST will occur on either the fourth or fifth week of the month, depending on which the last is (some years may see 5 Sundays, other may only see 4 Sundays in the same month).
- **SPRING DOW**: Toggle entry, values = **SUN**, **MON**, **TUE**, **WED**, **THU**, **FRI**, and **SAT**. The day-of-week to "spring forward".
- **SPRING HOUR**: Numeric entry, range **1**-**23**. The hour of day to "spring forward".
- **FALL MONTH**: Numeric entry, range **1**-**12**. The month (**1**=January, **12**=December) to "fall back".
- **FALL WEEK**: Toggle entry, values = **FIRST**, **SECOND**, **THIRD**, **FOURTH**, and **LAST**. The week-of-month to "fall back".

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NOTE	**NOTE**
	If set to LAST, DST will occur on either the fourth or fifth week of the month, depending on which the last is (some years may see 5 Sundays, other may only see 4 Sundays in the same month).

- **FALL DOW**: Toggle entry, values = **SUN**, **MON**, **TUE**, **WED**, **THU**, **FRI**, and **SAT**.   The day-of-week to "fall back".
- **FALL HOUR**: Numeric entry, range **1**-**23**. The hour of day to "fall back"

- *Security Parameters*

The Security Parameters refer to user names, passwords, and access levels for up to eight separate users or user classes. Using the EGMS security, groups of privilege levels may be provided to various users.
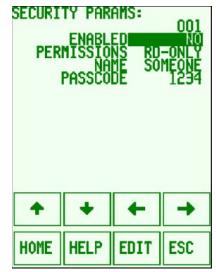
Figure 3-24 Typical SECURITY PARAMS Database Entry Display

The security parameters are duplicated for each of up to eight users/classes as follows:
- **ENABLED**: Toggle entry, values = **NO** and **YES**. If set to **NO**, this user is not enabled and the remaining information for this user is ignored.

NOTE	**NOTE**
	If one or more user entries are enabled, then user name and password for an enabled user must be entered for access to the EGMS. If NONE of the user entries are enabled, then EGMS security is disabled and no login is necessary for full access to the EGMS.

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- **PERMISSIONS**: Toggle entry, values = **Read-Only**, **RD/WR**, or **ADMIN**. If selected for **Read-Only**, the logged-in user may view all event logs, status displays and configuration data (except for the security parameters), but may not edit any configuration data. If selected for **RD/WR**, the logged-in user has full access to database items (except for the security parameters) and may edit and save data. If selected for **ADMIN**, the logged-in user may access all screens and data, including the security parameters screens.
- **NAME**: Alphanumeric entry, any printable numbers, characters, or symbols available to the EGMS graphics display, maximum length 7 characters. This is the "public" name of the user or user class for log-in. Any time a user logs in or logs out, this user name is included in an event log entry indicating that the user has logged in or logged out. Any time the database is updated by a user (with RD/WR or ADMIN permissions), an event log entry is generated that includes this user name.
- **PASSWORD**: Numeric entry, maximum length 7 digits. The Password is entered in the same manner as the user Name, but only digits are allowed rather than characters and symbols. When entered during log-in, the password is displayed as asterisks for security reasons. When viewing / editing from the Security Parameters screen, the password is visible.

3.8.3   Gate Parameters

The Gate Data refers to all information regarding individual gate configuration. This includes gate direction, type and timer values. The "direction" of gates and detectors is intended simply to specify which EGMS gate control output the gates and detectors are associated with. For instance, if the track runs in an east-west fashion, the north entrance gate would be the gate located on the northbound vehicle approach to the crossing. In locations where the track does not run in an east-west fashion, any desired selection of north and south is acceptable via programming of the Directional Indicators program parameter, so long as all selections are consistent within the system. With the default Directional Indicators selected as ↓**S** ↑**N**, the gates and detectors encountered by a southbound vehicle are associated with the EGMS exit gate control output #1, and the gates and detectors encountered by a northbound vehicle are associated with EGMS exit gate control output #2.

Multiple gates may be assigned as the same type and direction, allowing the EGMS to monitor complex crossing arrangements. Up to eight gates may be monitored by the EGMS.

Figure 3-25 Typical GATE PARAMETERS Database Entry Display

The gate data consists of the following entries (see the corresponding operational description section of this manual for more details about each parameter's functionality):

- **TYPE:** Toggle entry. Possible selections are **NONE**, **ENTRANCE**, and **EXIT**. This parameter indicates the type of gate. If a gate type is set to **NONE**, the corresponding input and the remaining gate parameters are ignored.
- **DIR** (Direction): Toggle entry. Possible selections are ↓**S** ↑**N;** ↓**W** ↑**E;** ↓**N** ↑**S;** ↓**E** ↑**W;** ↓**SB** ↑**NB;** ↓**WB** ↑**EB;** ↓**NB** ↑**SB;** ↓**EB** ↑**WB; or** ↓**0** ↑**1** (available direction choices are based on the current value of the Directional Indicators configuration parameter). This parameter is used to associate groups of gates to a single direction of vehicle travel.
- **V-CHAT:** Fractional entry. Range **00.0 – 25.5** seconds. This parameter is used to delay the acknowledgement of gate movement when the gate changes from the vertical position. It is helpful in cases where the gate "bounces" in the vertical position, causing momentary loss of the vertical contact.
- **H-CHAT:** Fractional entry. Range **00.0 – 25.5** seconds. This parameter is used to delay the acknowledgement of gate movement when the gate changes from the horizontal position. It is helpful in cases where the gate "bounces" in the horizontal position, causing momentary loss of the horizontal contact.
- **MINASC** (Min Ascent Time): Numeric entry. Range **000 – 255** seconds. This parameter is used to monitor the gate ascent time, and causes a gate failure indication if the gate takes less time than this to move from the horizontal to the vertical position.
- **MAXASC** (Max Ascent Time)**:** Numeric entry. Range **000 – 255** seconds. This parameter is used to monitor the gate ascent time, and causes a gate failure indication if the gate takes longer than this time to move from the horizontal to the vertical position.
- **MINDSC (**Min Descent Time)**:** Numeric entry. Range **000 – 255** seconds. This parameter is used to monitor the gate descent time, and causes a gate failure indication if the gate takes less time than this to move from the vertical to the horizontal position.
- **MAXDSC (**Max Descent Time)**:** Numeric entry. Range **000 – 255** seconds. This parameter is used to monitor the gate descent time, and causes a gate failure indication if the gate takes longer than this time to move from the vertical to the horizontal position.

3.8.4   Detector Parameters

The Detector Data refers to all information regarding individual detector configuration. This includes detector direction, type and timer values. The "direction" of gates and detectors is intended simply to specify which EGMS gate control output the gates and detectors are associated with. For instance, if the track runs in an east-west fashion, the north entrance detector would be the detector located on the northbound vehicle approach to the crossing, just after the north entrance gate. In locations where the track does not run in an east-west fashion, any desired selection of north and south is acceptable via programming of the Directional Indicators program parameter, so long as all selections are consistent within the system. With the default Directional Indicators selected   as ↓**S** ↑**N**, the gates and detectors encountered by a southbound vehicle are associated with the EGMS gate control output #1, and the gates and detectors encountered by a northbound vehicle are associated with EGMS gate control output #2.

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Multiple detectors may be assigned as the same type and direction, allowing the EGMS to monitor complex crossing arrangements and multiple-lane roadways. Up to sixteen (16) detectors may be monitored by the EGMS.
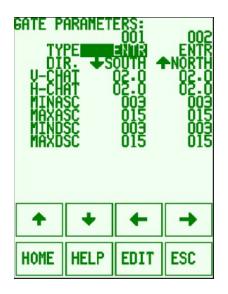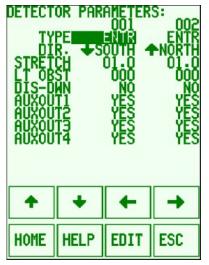

Figure 3-26 Typical DETECTOR PARAMETERS Database Entry Display

The detector data consists of the following entries (see the corresponding operational description section of this manual for more details about the functionality of each parameter):

- **TYPE:** Toggle entry. Possible selections are **NONE**, **ENTR** (entrance), **EXIT**, and **INTER** (internal). This parameter indicates the type of detector. Entrance detectors are located between the entrance gates and the first set of tracks. Exit detectors are located between the last set of tracks and the exit gates. Internal detectors are typically located between tracks in multi-track crossing installations. If a detector type is set to **NONE**, the corresponding inputs and the remaining detector parameters are ignored.

- **DIR** (Direction): Toggle entry. Possible selections are ↓**S** ↑**N;** ↓**W** ↑**E;** ↓**N** ↑**S;** ↓**E** ↑**W;** ↓**SB** ↑**NB;** ↓**WB** ↑**EB;** ↓**NB** ↑**SB;** ↓**EB** ↑**WB; or** ↓**0** ↑**1** (available direction choices are based on the current value of the Directional Indicators configuration parameter). This parameter is used to associate groups of detectors to a single direction of vehicle travel.   A detector may also be programmed for Both Directions. In this case, the detector immediately affects operation of both exit gates. Possible selections are ↕**S/N;** ↕**W/E;** ↕**N/S;** ↕**E/W;** ↕**SB/NB;** ↕**WB/EB;** ↕**NB/SB;** ↕**EB/WB; or** ↕**0/1** (available direction choices are based on the current value of the Directional Indicators configuration parameter). Selecting both directions for a detector is useful when wide painted medians exist within the crossing, such that center-lane detectors are required for vehicles traveling either direction if they inappropriately occupy the median.

- **STRETCH:** Fractional entry. Range **00.0 – 25.5** seconds. This parameter is used to extend the effected vehicle detection. When a detector changes from occupied to unoccupied, the detector stretch time is counted prior to the removal of the detection to the EGMS. Stretch is not timed when all gates are in the horizontal position. However, if the detector is occupied long enough to raise the exit gate (after timing the Delay on Down time), the detector stretch time becomes active.

- **LT OBST:** Numeric entry, range **000 – 255** minutes. This parameter is used to generate an alarm condition due to excessively long continuous vehicle presence upon the detector. If set to 0, the feature is disabled.
- **DISABLE ON DOWN:** Toggle Entry. Possible selections are **NO** and **YES**. If set to "Yes", the detector may be disabled while the corresponding entrance gate(s) are fully lowered. This option applies ONLY to detectors programmed as type "Entrance", and all entrance gates with the same programmed direction must have their "horizontal" inputs energized before the detector is disabled. This option may be utilized in cases where loop placement allows potential detection of automotive vehicles that "crowd" the entrance gate when it is lowered.
- **AUXOUT 1:** Toggle Entry. Possible selections are **NO** and **YES**. If set to YES, this detector is used in the equation for Auxiliary Output #1, if (and only if) Auxiliary Output #1 is programmed for one of the Detect Out functions (DET-ALL, DET-XR, DET-ISL, or DET-XRISL).
- **AUXOUT 2:** Toggle Entry. Possible selections are **NO** and **YES**. If set to YES, this detector is used in the equation for Auxiliary Output #1, if (and only if) Auxiliary Output #1 is programmed for one of the Detect Out functions (DET-ALL, DET-XR, DET-ISL, or DET-XRISL).
- **AUXOUT 3:** Toggle Entry. Possible selections are **NO** and **YES**. If set to YES, this detector is used in the equation for Auxiliary Output #1, if (and only if) Auxiliary Output #1 is programmed for one of the Detect Out functions (DET-ALL, DET-XR, DET-ISL, or DET-XRISL).
- **AUXOUT 4:** Toggle Entry. Possible selections are **NO** and **YES**. If set to YES, this detector is used in the equation for Auxiliary Output #1, if (and only if) Auxiliary Output #1 is programmed for one of the Detect Out functions (DET-ALL, DET-XR, DET-ISL, or DET-XRISL).

3.8.5   Save Database

Once the user has modified the database as desired, the database must be saved to the non-volatile permanent location. When the user selects the save database option, he is prompted with the message that the database is about to be stored, and may either continue or cancel the update and discard the changed data.

Figure 3-27 Database Save Confirmation Display

When the database is updated, all outputs from the EGMS are de-energized and the EGMS ceases all operation until power is cycled and EGMS is restarted.

3.9   EVENT VIEWER

The event viewer allows the user to observe the history of all events that have been logged to the non-volatile event database. The current version of EGMS holds up to 16000 events in non-volatile memory. When the event limit is reached, the oldest events are discarded to make room for the newest events. Thus the most recent 16000 events are always maintained.

With the event viewer, the user may view the actual events, set event filters to limit the visible events, or reset the event filters to allow viewing of all events. The Event Viewer menu is shown below.

```
EVENT VIEWER:

  1. VIEW EVENTS

  2. EVENT FILTER

  3. RESET FILTERS



 HOME           ESC
```

Figure 3-28 EVENT VIEWER Menu Display

On the EVENT LOG display, the up and down arrow buttons navigate through the event log when the log is "frozen" (see the "RUN/FRZ" description below. The up and down arrows step the event log forward and back by 10 events, respectively. In addition, any of the visible events may be moved to the top line of the event display by touching that event line.

The EVENT LOG viewer displays the events starting with the most recent, with older events following. The most recent event is always displayed as "EVENT #0". A typical event log view is shown in the following figure.

Figure 3-29 Typical EVENT LOG Display

The bottom of the event view includes buttons that assist in viewing the event log in varying formats. The buttons are as follows:

- **TIME / DATE / REL. / XR+X**: This button toggles between the four time/date display modes. The button text reflects the currently selected mode:
    - **TIME**: Displays the absolute event time, in the format "HH:MM:SS".
    - **DATE**: Displays the absolute event date, in the format "MM/DD/YY".
    - **REL.**: Displays the relative time between events (i.e. the amount of time that has passed since the most recent previous event to the current event). The relative time may be displayed for an elapsed time up to 99 hours, 59 minutes and 59 seconds. If the time is outside that range, the absolute time is displayed. Relative format is "+HH:MM:SS"
    - **XR+X**: Displays the event time relative to the most recent XR change. This allows the user to view event time based on the start of the corresponding train move. The XR+X event time is displayed in the format "+HH:MM:SS". Each XR change time is displayed in absolute format.
- **RUN / FRZ**: This button toggles between event log view update modes. When in **RUN** mode, the event viewer is updated each time a new event is logged and the most recent events are always displayed. When in **FRZ** (Freeze) mode, the event log is not updated and the user may scroll through all events using the up and down arrow buttons or by touching a specific event text line. The up and down arrow buttons advance the display by ten (10) events. Touching an event line moves that event entry to the top position in the list.
- **ALL / FILTERED**: This button toggles between the "All Events" view and the "Filtered Events" view. Once the user configures the event filtering options, this button provides an easy method of toggling between the filtered events and all events. When toggling, the currently selected event remains on the screen. For example, the user may configure filtering to show only XR changes, scroll to the desired train move to monitor, touch that event to place it at the top of the display, and then change to ALL events to display all the events for that train move.

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Each event includes:

- Event number. These numbers continue to 16000 then wrap to zero.
- Event Time or Date. Absolute date, or absolute/relative/XR+X view of time, as described above.
- Event text – this includes the type of event and any data associated with the event. The following events are logged in the software version 4.4:
    - **System Startup**: Indicates a system power-up or restart.
    - **Op Mode Change**: *mode*. Indicates a change in operating mode. *Mode* may be None, Timed, Dynamic, or Det-Only.
    - **DB Change**: *(username)*. Indicates the database has been changed and the EGMS has ceased operation until restart. If security is enabled, the username that was logged in at the time of the change is included in the event entry.
    - **DB BAD**: Indicates that, on power-up, EGMS has detected a problem with the database, and has ceased operation until restart.
    - **User Login**: *(username)*. Indicates that a user has logged into the user interface. User name is included in the event entry. If no security is enabled, this event is not generated.
    - **User Logout**: *(username)*. Indicates that a user has logged out of the user interface. User name is included in the event entry. If no security is enabled, this event is not generated.
    - **User Timeout**: *(username)*. Indicates that a user has been automatically logged out of the user interface due to inactivity timeout. The timeout value is set based on the Backlight Timeout configuration parameter. User name is included in the event entry. If no security is enabled, this event is not generated.
    - **I/O HLTH Change**: *state*. Indicates a A44105 Input or A44106 Input / Output module failure detected. State may be **BAD** (board initialization failure), **WDT** (I/O module internal watchdog self-check failed), **VCHK** (I/O module input circuitry self-check failure), **TMOUT** (handshaking between I/O module and CPU failed), **V-OUT** (inconsistency between I/O module and CPU module on expected output state), **NOVIO** (I/O module not found at proper location within the system), or **NOOUT** (Input / Output Module does not have the output "daughter board" installed).
    - **Gate *nn* FAIL**: *state*. Indicates that gate *nn* has failed. State may be **INBAD** (input module problem exists), **UP** (gate has left the vertical position unexpectedly), **DOWN** (gate has left the horizontal position unexpectedly), **BOTH** (both vertical and horizontal position contacts are made simultaneously), **MNDSC** (minimum descent time), **MXDSC** (maximum descent time), **MNASC** (minimum ascent time), **MXASC** (maximum ascent time), **RSPNS** (release/response time), or **SYSFL** (gate failure due to overall system failure).
    - **Gate *nn* REPR**: *state*. Indicates that gate *nn* has been repaired and/or has resumed normal operation. The state indicates the failure that has been repaired.
    - **Gate *nn* CHG**: *state*. Indicates that gate nn has changed state or position. State may be **Vertical**, **Horizontal**, or **Transition**.
    - **Det nn CHG**: *state*. Indicates that detector nn has changed state. *State* may be **CALL** (detector becomes occupied), **. .** (no call – detector occupancy is removed), or **(CL)** (detector was occupied at the time that XR state changed from Up to Down – used if detector state change log is disabled with XR up). If a detector health fails, *state* will be

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FAIL. Upon restoration of the detector health, a **Det *nn* CHG** event entry will be generated with the current state of the detector (**CALL** or **..**)

- **XR CHG**: *state*. Indicates that the XR input has changed state. *State* may be **UP** or **DOWN**.
- **ISL *nn* CHG**: *state*. Indicates that the Island *nn* input has changed state. *State* may be **UP** or **DOWN**.
- **Gate CTL *dd***: *state*. Indicates that the Gate *C*ontrol output for direction ***dd*** has changed. *State* may be **UP** or **DOWN**. The value of ***dd*** is based on the programmed Directional Indicator Parameter and may be ***N/S/E/W/NB/SB/EB/WB***.
- **EGH CHG**: *state*. Indicates that the Entrance Gate Hold output has changed. *State* may be **UP** or **DOWN**.
- **DETOUT CHG**: *state*. Indicates that the Detector Presence output has changed. *State* may be **UP** or **DOWN**.
- **EGMS Health**: *state*. Indicates that the EGMS Health output has changed. *State* may be **UP** or **DOWN**.
- **Det Health**: *state*. Indicates that the Detector Health output has changed. *State* may be **UP** or **DOWN**.
- **Alarm Output CHG**: *state*. Indicates that the Alarm output has changed. *State* may be **UP** or **DOWN**.
- **G.A. Timeout**. Indicates that the gate activation timeout timer has expired and EGMS is raising the exit gates due to the timeout.
- **Time/Date Set**. Indicates that the time / date has been set, either by the user or via Daylight Saving processing. Note that the event time corresponds to the NEW time.
- **DST OPS: *ops***. Indicates that Daylight Saving has been performed. *Ops* may be "SPRING" or "FALL". Note that the DST OPS event time corresponds to the OLD time. Immediately following this event, a Time/Date Set event is logged, with the updated time stamp.
- **CRC FAIL: *crc***. Indicates that the CPU's internal checksum routine has detected a memory failure within the system program memory locations, and EGMS has ceased operation. *Crc* is the calculated 32-bit CRC value that caused the shutdown problem.
- **Aux In *nn* CHG**: state. Indicates a change in the Auxiliary *nn* input.
- **REM STAT**: *state*. Indicates change in remote unit status (Dual-Unit mode only).
- **REM DATA**: *state*. Indicates change in remote unit data configuration (Dual-Unit mode only).
- **Startup Info**: *S/N, Version*. Provides CPU Module serial number and software version information on system startup.
- **CRC Good**: *CRC*. Indicates that the initial startup CRC calculation was successful, and provides the value of that CRC on system startup.

With event filtering, the user can mask off certain events to assist in finding problems, train moves, etc. For instance, the user can mask off all but XR and ISL state changes to get a quick view of train move times. If all events except failure type events are masked, the user may get a quick view of any faults that may have occurred over time.

3-39
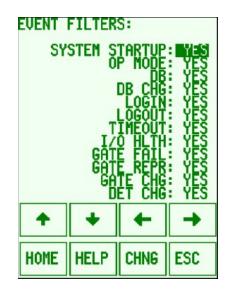
Figure 3-30 Typical EVENT FILTERS Display

Note that event filtering DOES NOT AFFECT the logging of events to memory. All events are logged all the time. The filtering simply selects which events are to be displayed on the screen. While event filtering is active, the user can tell that an event is not displayed because the event numbering will indicate skipped numbers for the events that are not displayed.

3.10   UTILITIES

The Utilities menu contains the Time Set and USB Access screens.

Figure 3-31 Utilities Menu Display

3.10.1 Set Time

Using this screen, the user can set the system time and date. Data entry for time/date is identical to other database entries using numeric and toggle entries.
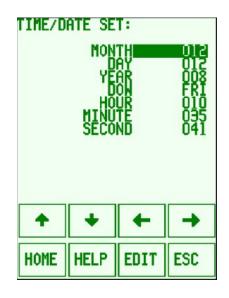
Figure 3-32 SET TIME Display

When a time entry is set, it is not immediately saved. Rather, when the **ESC** button is pressed from the time setting display, the user is prompted to update the time. The display shows the current time, the new time to be set, and the function buttons to allow setting the new time or reverting to the old time. The user may either update the time to the new value or discard the changes and keep the existing system time set. This screen allows the user to set the time slightly into the future, then wait until the exact time occurs to set the clock precisely.

Figure 3-33 TIME UPDATE CONFIRM Display

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The time is set to the "NEW TIME" when the area surrounding the new time display is pressed. If the **ESC** button is pressed, the display reverts to the TIME/DATE SET screen. If the **HOME** button is pressed, the time setting display is exited and the time is not changed.

3.10.2 USB Utilities

The USB Utilities menu allows the user to access the USB subsystem features on the communications module. These features include the ability to import and export the EGMS configuration database to/from a USB data module, export the EGMS event log to a USB data module, and monitor the status of the USB subsystem.

Figure 3-34 USB UTILITIES Menu Display

3.10.2.1   USB and SD Card File Structure

The USB and Secure Digital (SD) Card file structures are created based on a number of factors, including the company and product name (i.e. Safetran EGMS), the user-programmed crossing name, and the CPU module serial number. This structure is designed to allow multiple EGMS databases and event logs to be stored on a single USB module, and to allow swap-out of CPU modules while retaining the data on the SD card.

All files are stored under the "SAFETRAN\EGMS" folder. The current database is stored in the "ACTIVE" folder on the SD card so that if a CPU module is changed, the active database file for the location may be loaded into the new CPU module.

3-42

Figure 3-35 Typical SD Card Active Database Folder Structure

The event log data is stored on the SD card folder based on the user-programmed crossing name and CPU module serial number. In this way, if a CPU module is swapped out, the old CPU module event log files are retained for reference and a new set of event log files are created for the new CPU module.

Figure 3-36 Typical SD Card Event Log Data Folder Structure

3-43

When exporting a database or event log, the files are stored on the USB device under the "SAFETRAN\EGMS" folder in a folder based on the user-programmed crossing name and the CPU module serial number. The database file is always named "DATABASE.DAT", while event log data files and event log export files are given a name based on the time stamp at the time the files are created.   Note that if multiple event log exports are performed on the same day, a single file will be created during the first export operation and subsequent export information will be appended to the end of the original file.

When exporting a database, the folder structure is created automatically. When importing a database, the user may browse the device and select the DATABASE.DAT file from any folder location. This allows a single USB device to retain data for multiple locations and allows the user to restore the data based on his or her selection.
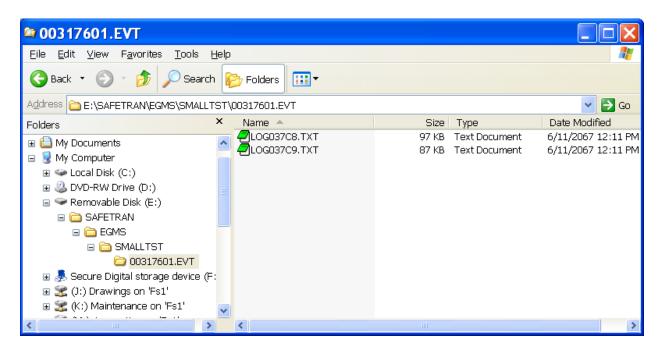
Figure 3-37 Typical SD Card Event Log Export Files

3.10.2.2   Database Import

The Database Import option allows the transfer of an EGMS configuration database file from a USB data module into the EGMS. The user may traverse folders and select a database file from the USB data module and import that configuration data into the EGMS database. Upon selection, the EGMS reads the data file, verifies correct format and checksum, and then copies that database into the temporary EGMS database location. The user can then review the database via the database screens.

3-44
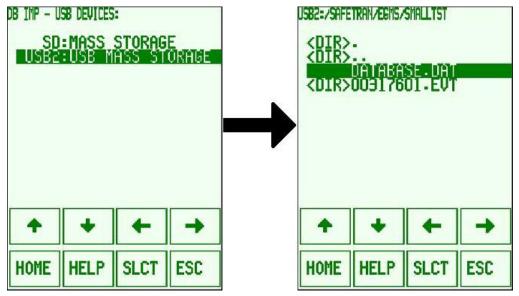
Figure 3-38 Typical USB DATABASE IMPORT Selection Displays

After importing a database, the user must save the database to the non-volatile permanent database location using the "SAVE DATABASE" mechanism described in paragraph 3.8.5. The user is taken directly to the DATABASE menu upon successful completion of the database import action.

Figure 3-39 USB DATABASE IMPORT Status Display

3.10.2.3 Database Export

The Database Export option allows the transfer of an EGMS configuration database file from the EGMS to a USB data module. The user may select the desired device (USB or SD card) onto which the database file is to be exported.

3-45

Figure 3-40 Typical USB DATABASE Export Selection Display

Once the user selection is complete, the EGMS automatically creates a folder structure based on the company (Safetran) and product (EGMS) names plus the EGMS configuration data for the crossing name. It then writes the database file and reads it back to verify correct format and checksum.

<table>
<tr><td>**NOTE**</td><td>**NOTE**

The database file that is created on the USB data module is named based on the programmed "Crossing Name" parameter. Thus, a user may export multiple EGMS databases, each with a unique crossing name, onto a single USB data module.</td></tr>
</table>

3.10.2.4   Event Log Export

The Event Log Export option allows the transfer of the EGMS event log entries from the SD memory card to a USB data module. The user may select the event log export date range ("From" and "To" dates), the format (text, binary, or Motorola S-Records), and the log order (oldest-to-newest or newest-to-oldest).

3-46
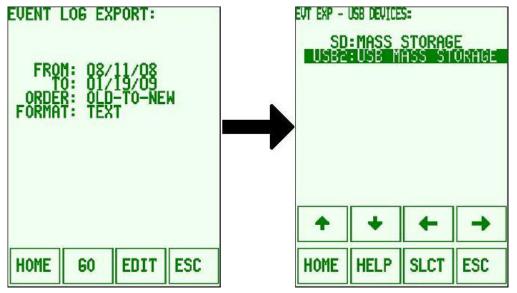
Figure 3-41 USB Event Log Export Selection Displays

The user may Edit the export settings, or GO to select the desired export device.

Figure 3-42 USB Event Log Export Settings Displays

The user then selects the desired device (USB or SD card) onto which the event log is to be exported.

Once the user selection is complete, the EGMS creates a folder structure based on the EGMS configuration data for the crossing name and creates the event log file. The Event Log Export Status screen is displayed to indicate the progress of the export operation.

3-47
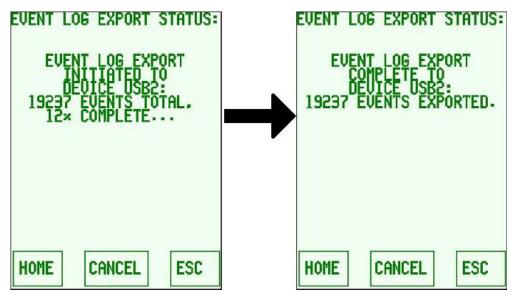
Figure 3-43 Typical USB Event Log Export Status Displays

During the event log export operation, the user may navigate away from the Event Log Export Status screen to perform other operations on the EGMS. However, no subsequent USB operations are permitted until the export is complete. If the user attempts a new USB operation, the EGMS jumps to the Event Log Export Status screen.

3.10.2.5   SD / USB Status

The SD / USB Status display allows the user to view the current status of the USB / Event Logging Subsystem operation. The communications link between the USB Subsystem and the EGMS, the current status of the SD Card Database and SD Card Event Log, and any connected USB devices are all shown on this display.
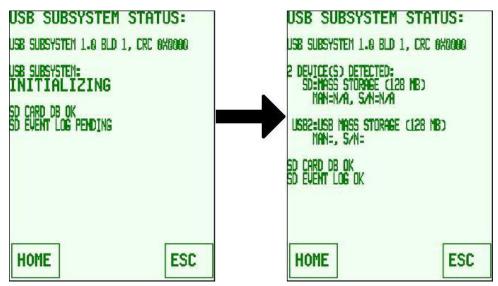
Figure 3-44 Typical USB Subsystem Status Displays

3-48
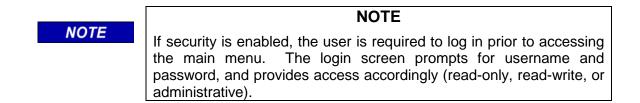
3.11   SERIAL (RS-232) BASED INTERFACE

The A44108 CPU Module provides a diagnostics RS-232 serial interface for user access via an RJ-11 "phone jack" on the front of the circuit board. If the A44103 System Communications Module is installed, two additional serial interfaces are available through that module. Each serial interface allows user access using a computer and a simple text-based terminal emulator application such as HyperTerminal. The interface settings on the CPU module are fixed at 19.2kbps, 8 data bits, 1 stop bit, no parity. The settings for the serial interfaces using the System Communications Module are determined by the LOCAL COMM and/or REMOTE COMM configuration parameters.

⚠ CAUTION	**CAUTION** THE SERIAL PORT ON THE A44108 CPU MODULE DOES NOT PROVIDE ELECTRICAL ISOLATION FROM THE EGMS LOGIC POWER. CARE SHOULD BE USED WHEN ACCESSING THE SERIAL USER INTERFACE VIA THIS PORT. UNISOLATED EQUIPMENT PLUGGED INTO THE CPU MODULE DIAGNOSTICS SERIAL PORT MAY COMPROMISE THE RAILROAD EQUIPMENT BATTERY ISOLATION FROM GROUND.

3.11.1 Main Menu

NOTE	**NOTE** If security is enabled, the user is required to log in prior to accessing the main menu. The login screen prompts for username and password, and provides access accordingly (read-only, read-write, or administrative).

The Main menu allows the user to select from four or five choices, depending on security options: Status display, Event Log, Database configuration, Diagnostics Display, and Log Out (if security is enabled). The main menu appears as follows:

3-49

```
Exit Gate Management System Ver. 403 Build 6, DB 112
Copyright 2009 Safetran Systems, All Rights Reserved.
Main Menu:
1. Status
2. Event Log
3. Database
4. Diagnostics
Enter selection (1-4):
```

Figure 3-45 Serial Interface Main Menu

3.11.2 Status Display

The Status display provides operational information such as gate/detector processing states, failure status, and operating mode. The screen has several sub-screen displays and pressing the **1** key toggles between these sub-screens. The sub-screens are **General Status**, **Gates**, **Detectors**, **Alarms**, and **Outputs**. If Dual-Unit mode is enabled, additional screens are shown for **Remote Detectors** and **Dual-Unit Comm**.

3-50

```
EGMS Operational Status (General):  FRI 02/06/09 10:52:03


      MODE: DYNAMIC    HEALTH: OK
DET SYSTEM:  ..         HEALTH: OK
XR=UP    ISL1=UP    ISL2=NONE


EXIT GATE CONTROL:


     EXIT 1: RAISE - IDLE           EXIT 2: RAISE - IDLE



GATES:
 ENTR: S-BND = VERT  N-BND = VERT
 EXIT: S-BND = VERT  N-BND = VERT

 DETS:
 ENTR: S-BND =  ..   N-BND =  ..
 INTR: S-BND =  ..   N-BND =  ..
 EXIT: S-BND =  ..   N-BND =  ..
Press '1' for previous screen, '2' for next screen, '0' for main menu...
```

Figure 3-46 Typical General Status Display

The remaining status screens provide detailed information about the subsystems (gates, detectors, dual-unit, and alarms). The displays provide the same information as the touch-screen status displays and are described in those sections of the manual.

3.11.3 Event Log Viewer

The Event Log Viewer allows the user to view the current EGMS event log and download the event log to the PC for long-term storage and analysis. The user has three options from the event viewer selection: 1) to list the events, 2) to view the most recent events in real-time (thus updating with the most recent events as they occur), or 3) to "download" the event log database in "Motorola S-Record" format. If dumping the Motorola S-record event log, the Event Text strings may be dumped as well. The event log viewing options are shown below.

3-51

```
EGMS+ SMALLTST - Event Log Display Options:


Print Page Header?  : YES
Number of events per page (18):20
0. Return to Main Menu
1. List Events (Text Mode)
2. Show Run-Time Event Updates
3. Dump Event Log (Motorola S-Records)
4. Dump Event Text (Motorola S-Records)
5. Set Event Viewer Options.
Enter Selection (0-5):
```

Figure 3-47 Event Log Viewing Options

The option to list the events allows the events to be displayed either one page at a time, pressing a key to continue; or continuous, whereby events scroll off the screen until all have been displayed. Page-at-a-time is useful for viewing the event log on the computer while continuous allows for rapid download of the event log with minimal user interaction. When listing events, the following options are provided:

```
Event Log: 2141 events.
0. Quit Event Viewer
1. List one page of events
2. List continuous log.
Enter selection (0-2):
```

Figure 3-48 Event Listing Options

3-52

Once a selection is made, the event viewer displays the following:

```
EGMS+ SMALLTST - Event Log Display: FRI 02/06/09 10:52:34, page 1
Event#   Date     Time      Event Text
    0  02/06/09 07:40:53.3 - OP MODE: DYNAMIC
    1  02/06/09 07:40:53.3 - GATE  4 CHG: VERT
    2  02/06/09 07:40:53.3 - GATE  3 CHG: VERT
    3  02/06/09 07:40:53.3 - GATE  2 CHG: VERT
    4  02/06/09 07:40:53.3 - GATE  1 CHG: VERT
    5  02/06/09 07:40:42.0 - CRCGOOD-DB: C7593B0F
    6  02/06/09 07:40:42.0 - CRCGOOD-APP: EA0C7636
    7  02/06/09 07:40:42.0 - S/N 317601 VER 4.3
    8  02/06/09 07:40:42.0 - SYSTEM STARTUP
    9  02/06/09 07:39:41.8 - LOGOUT: (COM)
   10  02/06/09 07:39:33.3 - OP MODE: DYNAMIC
   11  02/06/09 07:39:33.3 - GATE  4 CHG: VERT
   12  02/06/09 07:39:33.3 - GATE  3 CHG: VERT
   13  02/06/09 07:39:33.3 - GATE  2 CHG: VERT
   14  02/06/09 07:39:33.3 - GATE  1 CHG: VERT
   15  02/06/09 07:39:22.7 - CRCGOOD-DB: C7593B0F
   16  02/06/09 07:39:22.7 - CRCGOOD-APP: EA0C7636
   17  02/06/09 07:39:22.7 - S/N 317601 VER 4.3
   18  02/06/09 07:39:22.7 - SYSTEM STARTUP
   19  02/06/09 07:35:47.3 - OP MODE: DYNAMIC
Press 0 to quit, 1 for next page, 2 for continuous list:
```

Figure 3-49 Typical Event Log Display

The mode may be changed between page-at-a-time and continuous at any time during the event listing by pressing **1** or **2**, respectively. Also, the event listing may be canceled at any time in either mode by pressing **0**.

The option to view events in run-time results in a display that appears similar to the event list, except it is repeatedly refreshed and any new events are displayed pushing older events off the bottom of the screen.

The options to dump the event log and event text in Motorola S-Record format allow the user to extract the events via HyperTerminal, or other text terminal program, in a format that may be imported into event logging display utilities that require the binary event information. This option is typically not useful under normal circumstances.

The user may "Set the Event Viewer Options" to indicate whether the event dump should include page headers on each page and how many events to display on each page. If a header is not to be displayed on each page, the events are displayed without any page breaks or header information. The Event Viewer Option settings are temporary and if the system is restarted, they revert to the default values of 18 events per page with headers displayed.

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3.11.4 Database Configuration

The database viewing and configuring via the RS-232 and System Communications serial ports are similar to the touch-screen operation. Refer to that section of this document for a detailed description of each parameter. Numeric and fractional data parameters are entered simply by typing the desired number (e.g., 12 for numeric, 3.5 for fractional). "Toggle" entries are changed by pressing the space bar (the data is toggled through all possible selections). Once the desired data is entered, press the **ENTER** key to move the new value into the temporary location.

As with the front-panel data entry, the user must specifically save the database into permanent memory before changes take effect. Upon saving to permanent memory, the EGMS de-energizes all outputs and remains inactive until the unit is restarted. Note that the port selected as REMOTE COMM using the System Communications Module provides read-only access, thus database items cannot be altered through the REMOTE COMM port.

The database options also contain the ability to set the real-time clock chip on the A44108 CPU Module. When the option is selected, the user is prompted to enter the month, day, year, hour, minute, second, and day-of-week. The user is then prompted to press any key to set the clock at the exact desired time.

3.11.5 Diagnostics Displays

The Diagnostics Display provides very-low-level information regarding the operation of the I/O boards and internal EGMS operations. This information typically is not useful to the user and is used only in troubleshooting board-level problems on the workbench. In troubleshooting cases, field support personnel may instruct the user to navigate the diagnostics display to determine causes and solutions.

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APPENDIX A – EGMS DUAL-UNIT OPERATION
(Software Version 4.5)

TABLE OF CONTENTS

LIST OF FIGURES

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A.1 GENERAL DESCRIPTION

Functionality and parameter definitions of the EGMS are described fully within the main body of this manual. This appendix provides details on the additional functionality of the EGMS when operating in the "Dual-Unit" mode.

The primary use of the Dual-Unit operating mode is to allow two independent railroads to implement four-quadrant gate control at a shared crossing, with fully integrated functionality, and with a well-defined, distinct jurisdictional boundary and distinct maintenance responsibilities. Each EGMS unit resides within and monitors the operation of one railroad's equipment. The information from each EGMS unit is shared via a serial communications link. Each railroad thus has control of its own equipment and has access to the current operating state of all equipment maintained by both railroads.

Another use of the Dual-Unit operating mode is for complex crossing arrangements in which the eight gate and sixteen detector capability of the standard EGMS is exceeded. Two EGMS units may be located within the same railroad equipment house, thus doubling the monitoring capabilities to up to sixteen gates and thirty-two detectors.

The Dual-Unit operating mode is an extension of the standard EGMS operation which utilizes two complete EGMS units and a communications link between the two units to achieve synchronization, data sharing, plus functionality and resulting operation as a single four-quadrant crossing. All detector, gate, and crossing information is shared between the two units, and all exit gate control logic utilizes the data from both units.

In addition, the monitoring of crossing operation and alarm processing is extended to determine the source of any alarm conditions (i.e., the EGMS "local" to the gate or detector in question).

A.1.1   Terminology

The two EGMS units in Dual-Unit operating mode function in a "Peer-to-Peer" mode. There is no "Master" or "Primary" unit. Each unit executes identical software and performs identical processing. In order for an EGMS unit to allow the lowering of its Exit Gate(s), both units must be functioning and the communications link must be intact.

Terminology is established to distinguish which EGMS unit is being discussed and monitored. The terminology is relative to the unit being discussed, as follows:
- LOCAL: The "Local" EGMS is the unit at the user's physical location. Any display of information listed as "Local" refers to the information obtained directly by the "Local" EGMS.
- REMOTE: The "Remote" EGMS is the unit that is not local to the user's physical location. Any display of information listed as "Remote" refers to the information obtained by the "Remote" EGMS and transmitted via the serial communications link.

For instance, in a Dual-Unit configuration at a crossing shared by Railroad "A" and Railroad "B", each railroad would maintain one EGMS unit. Within Railroad A's equipment house, the EGMS would display

Railroad A's gates and detectors as "Local" and Railroad B's gates and detectors as "Remote". Meanwhile, Railroad B's EGMS would display Railroad B's gates and detectors as "Local" and Railroad A's gates and detectors as "Remote". Thus, each gate and each detector is considered "Local" to one EGMS unit and "Remote" to the other EGMS unit.

A.1.2   Communications Link Details

The Serial Communications Link between the two EGMS units utilizes the A44103 System Communications Module. The physical communications configuration is determined by Communications Module setup options and EGMS database configuration.

The Communications Module may be configured for either industry-standard RS-232 (full-duplex short-range capability) or industry-standard RS-422 (longer-range full-duplex capability). A full description of the System Communications Module is included in the main body of this manual. Typically, RS-422 is utilized for a hard-wired serial link between the units and the physical connection between the two units uses four wires configured as two twisted pairs. The RS-422 provides adequate data transmission speeds (typically 9600 baud) over several hundred feet of cable and the twisted pairs minimize the effects of any eternal noise that may otherwise generate periodic communications failures. If other physical configurations are utilized (spread-spectrum/wireless, serial-to-Ethernet adaptors, or similar), either RS-232 or RS-422 provide equal functionality and may be used based on the interface to the external devices (radios, adaptors, etc).

The EGMS database configuration for Dual-Unit operation allows the selection of baud rate and parity, along with specific communications timeout parameters as described in the database section below. Typically, the default values are used (9600 baud, 8 data bits, 1 stop bit, no parity).

The communications protocol itself is a proprietary protocol developed specifically for the EGMS Dual-Unit operation. Full monitoring of data and status is maintained by each unit, and data transfer is such that the system is immune to intermittent communications packet losses. Excessive communications packet loss results in the shutdown of the EGMS control until such time as the communications link is restored. Recovery from long-term communications failures is automatic, thus, no user interaction is necessary for the resumption of normal operation.

A.2   SPECIFIC CHARACTERISTICS OF DUAL-UNIT OPERATING MODE

A.2.1   Operating Modes

EGMS in Dual-Unit operating mode functions exactly the same as does a single-unit EGMS. The underlying software adds the processing of the remote gates and detectors into the logic equations and bases exit gate control logic decisions on the states of all gates and detectors (local and remote).

Each EGMS in Dual-Unit operating mode maintains a configuration database of its own local gates and detectors as well as the system parameters as detailed within the main body of this manual. In addition, each EGMS maintains a Read-Only copy of the remote unit's configuration database items necessary for

proper Dual-Unit operation. Prior to operation of the EGMS in Dual-Unit mode, each unit must "Accept" the configuration parameters from the remote unit, thus ensuring that both railroads/jurisdictional authorities are in agreement with the configuration database of not only their local EGMS, but of the remote EGMS as well. This also ensures that any changes to the configuration database of an EGMS must be accepted by all responsible parties prior to implementation of those changes.

Each EGMS in Dual-Unit operating mode generates a desired control state for exit gates in both directions of vehicular travel, even if exit gates for only one direction of travel are controlled locally by the EGMS. Each unit also monitors gate and detector operations and can generate alarm conditions based on operation outside the programmed parameters. The result is a dual-process operation in which both EGMS units, operating with access to the same gate and detector information, must arrive at the same exit gate control decisions for operation of the exit gates.

In the event of any equipment failure (local or remote), both EGMS units cease to allow exit gate descent and the crossing reverts to two-quadrant operation. This prevents anomalous operations in which one half of the crossing would operate in two-quadrant mode while the other half operates in four-quadrant mode.

In addition to the serial communications link connecting the two EGMS units, hard-wired XR and GP circuits are required between the railroad equipment houses. The EGMS unit functionality is limited to Exit Gate control based on gate and detector states, and the EGMS cannot be responsible for relaying primary crossing control signals such as XR and GP between the entrance gate crossing control equipment.

Each EGMS monitors the XR status for its associated crossing, and exit gate operation is allowed when XR is dropped at either crossing. The EGMS status displays indicate XR states for both crossings.

A.3   USER INTERFACE

The EGMS Touch-Screen User Interface operates exactly as it does in standard (single-unit) mode, and as detailed in the main body of this manual. Specific display and database screens are modified to include information and configuration parameters for the Remote Unit as described in this appendix.

A.3.1   Dual-Unit Status Displays

The EGMS status displays are detailed in the main body of this manual. When Dual-Unit operation is selected, the Text Status and Graphics Status displays are modified as described below.

A.3.1.1   Text General Status

The text status display provides several pages of real-time information regarding the operation of the EGMS. Pressing the **PREV** or **NEXT** button pages the text status through the various pages of information. The first page is **GEN STAT** (General Status). It provides an overview of each gate and

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detector state plus the overall health status, gate control output states, and operational timers that may be in effect at the time.

The top lines of the **GEN STAT** display are similar for standard and Dual-Unit Operations. The **XR** and **ISL** status line is amended to display both the Local XR/Islands and the Remote XR/Islands (second line). The Gate Position (**GATES**) and Detector State (**DETS**) lines are modified as well. The Local gate position information is displayed on the left side of the screen, and the Remote gate position information is displayed on the right side of the screen. A vertical bar separates the local and remote information. The Detector State lines are duplicated for local and remote detectors in a similar manner. A typical Dual-Unit General Status display is shown in the following figure.
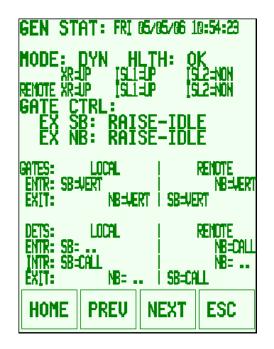
Figure A-1 Typical Dual-Unit General Status Display

A.3.1.2   Text Gate Status

The text gate status displays are identical for local and remote gates. When programmed for Dual-Unit operation, the EGMS displays two pages of Gate Status, one for Local Gates (up to eight) and one for Remote Gates (up to eight). The display indicates "Local" or "Remote" to reflect the gates being viewed.

A.3.1.3   Text Detector Status

The text detector status displays are identical for local and remote detectors. When programmed for Dual-unit operation, the EGMS displays four pages of Detector Status: Local Detectors 1-8, Local Detectors 9-16, Remote Detectors 1-8, and Remote Detectors 9-16. The display indicates "Local" or "Remote" to reflect the detectors being viewed.

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A.3.1.4 Text Dual-Unit Communications Status

A Dual-Unit communications status display (**D.U. STAT**) is offered in Dual-Unit mode and provides details on how the Dual-Unit communications are functioning. For both the transmit data and receive data, the display lists the sequence number (increments with each communications packet to prevent data duplication), received heartbeat status, received CRC (database configuration) acceptance, system operational status, time clock master status (which unit, if any, is responsible for time synchronization), and the actual database CRC values. A typical Dual-Unit Status display appears as follows:

Figure A-2 Typical Dual-Unit Status Display

A.3.1.5 Graphics Status

The graphics status display is arranged and displayed identically for both standard (single-unit) and Dual-Unit EGMS operation. To distinguish local and remote gates and detectors, remote equipment is displayed in a gray shade, while local equipment is displayed in black. The INTR loops are divided into two sets so that Local INTR loops and Remote INTR loops are shown separately.

A special case is utilized in the graphics status display for atypical gate/detector position and direction. As with the standard (single-unit) EGMS graphics display, gate and detector states are combined based on programmed position and direction. For instance, all Southbound Entrance gates are combined and displayed as a single gate in the upper-left corner of the display. If all Southbound Entrance gates are local gates, the displayed gate is black. If all Southbound Entrance gates are remote gates, the displayed gate is gray. However, if for some reason there are both local and remote gates programmed as Southbound Entrance, the displayed gate flashes between black and gray to indicate that a single display icon is representing both local and remote equipment.

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A second special case is utilized for the display of XR and Island indications. Each EGMS maintains its own XR and Island inputs. When an EGMS XR input drops, the graphics display updates for the corresponding track showing the locomotive icon at the appropriate track approach area. When an EGMS Island input drops, the graphics display updates for the corresponding track showing the locomotive and boxcar icons at the appropriate island location. If the ISL1 input is down, the locomotive icon flashes **ISL1**. If the ISL2 input is down, the locomotive icon flashes **ISL2**. If both ISL1 and ISL2 are down, the locomotive alternates between **ISL1** and **ISL2**. Thus, by observing the tracks on the graphics display, the current status of the XR, ISL1, and ISL2 inputs for both crossings may be determined simultaneously.

A.3.2   Database Menu
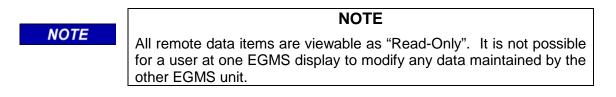
Individual database entry screens are identical in standard (single-unit) and Dual-Unit operating modes. For Dual-Unit modes, the configuration database entries that are shared between the units result in the duplication of database entry and viewing screens, one for the local data and one for the remote data.

When programmed for Dual-Unit operation, the initial Database Menu allows the selection of the local or remote database access as shown below.

Figure A-3 DATABASE MENU Display

If **LOCAL DATABASE** is selected, all database submenus and screens are accessed exactly as in standard (single-unit) operating mode. If **REMOTE DATABASE** is selected, the database submenus and screens including all data shared between the units is accessed.

NOTE	**NOTE**
	All remote data items are viewable as "Read-Only". It is not possible for a user at one EGMS display to modify any data maintained by the other EGMS unit.

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The **REMOTE DATABASE** submenu appears as shown below.

```
REMOTE DATABASE:
┌─────────────────────────┐
│                         │
├─────────────────────────┤
│ 2. SYSTEM DATA          │
├─────────────────────────┤
│ 3. GATE PARAMETERS      │
├─────────────────────────┤
│ 4. DETECTOR PARAMETERS  │
├─────────────────────────┤
│ 5. ACCEPT DATABASE      │
├───────────┬─────────────┤
│ HOME      │        ESC  │
└───────────┴─────────────┘
```

Figure A-4 REMOTE DATABASE Submenu Display

The **REMOTE DATABASE** menu is similar to the standard (single-unit) **LOCAL DATABASE** menu. To maintain consistency between the local and remote database menus, the **REMOTE DATABASE** menu starts with item #2, **SYSTEM DATA**. In the **LOCAL DATABASE** menu, item #1 is **DEFAULT SETUP**. Since a user may not change the remote data, there is no option for remote default setup.

The **SYSTEM DATA** submenu presents a limited subset of the configuration data for the Remote Database. Only the EGMS Parameters and Alarm Parameters are shared between the two units – the communications, display, and other miscellaneous parameters are not provided to the Remote EGMS since they do not affect Dual-Unit operation in any way. The **GATE PARAMETERS** and **DETECTOR PARAMETERS** data screens are formatted identically for the Local Database and Remote Database (again, Remote Database is Read-Only).

Also, item #5 is **SAVE DATABASE** in the **LOCAL DATABASE** menu, but it is **ACCEPT DATABASE** in the **REMOTE DATABASE** menu. Prior to proper EGMS operation, a user at each EGMS must "Accept" the remote EGMS database. Once the user views and verifies the remote EGMS database, the **ACCEPT DATABASE** item is selected to reveal the **REMOTE DB ACCEPTANCE** display. This display allows the remote database to be accepted.

Once in the **REMOTE DB ACCEPTANCE** display, the user may either accept or reject the remote EGMS database. The **REMOTE DB ACCEPTANCE** display is shown below.

REMOTE DB ACCEPTANCE:

1. ACCEPT DATA

2. REJECT DATA

NOTE -ACCEPTING DATA IS

NECESSARY TO ALLOW DUAL

UNIT EGMS OPERATIONS.

HOME   ESC

Figure A-5 REMOTE DB ACCEPTANCE Display

If a user decides that a previously accepted EGMS database is no longer acceptable, the database may be rejected, thus halting EGMS operations. Both EGMS units will cease exit gate control and will drop all outputs until such time as the remote database is accepted again.

If a user accepts the EGMS database, certain elements of the remote data are verified for consistency with the local database and, if consistent, the data becomes available for use immediately. Upon acceptance of remote data at both EGMS units, the Dual-Unit EGMS operation will begin at once. There is no need to cycle power or restart the equipment at this time.

Upon system startup, and upon restoration of communications following failures, each EGMS unit transfers its local configuration database to the remote unit for verification of that data. If a user attempts to accept a database while the communications link is failed, or before the EGMS has completed transfer of the remote data, the database acceptance is not acknowledged and the display will indicate the reason for the database acceptance failure.

The Gate and Detector configurations are fully flexible within each EGMS unit. However, key items in the System Data configuration must be identical in both units for proper operation. Upon selection of **ACCEPT DATA**, the EGMS confirms that the local and remote data are consistent for these key items. If there are inconsistencies, the display will indicate that the remote data is not accepted and will indicate which item(s) caused the inconsistencies.   The database items that must be identical in both units for proper operations include:

1. **PRIMARY OP MODE**: Both units must be programmed with the same operating modes for proper operation.
2. **SECONDARY OP MODE**: see #1 above.

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3. **DELAY ON DOWN**: Both units must delay detector operation for the same amount of time once all gates are confirmed in the horizontal position.
4. **REVERSE DET ENABLE**: Both units must handle reverse detectors in the same manner.
5. **DYNAMIC EGCT**: Both units must delay exit gate descent for the same amount of time.
6. **TIMED EGCT/ISL INHIBIT**: Both units must keep loops enabled for the same duration if an island input drops prior to all gates horizontal.
7. **BIDIR DELAY TIME**: Both units must handle the bidirectional delay function identically.
8. **DYNAMIC ENTR GATE MON**: Both units must handle entrance gate monitoring identically.
9. **ENTR GATE DOWN REQ**: Both units must require the same entrance gate operation for timed-mode exit gate control.
10. **EXIT GATE UP REQ**: Both units must require the same exit gate operation for the "Entrance Gate Hold" functionality.

Each of these parameters is described fully in the main body of this manual.

Some entries have been added to the Local Database to aid in the display of local vs. remote information in the EGMS event log. Specifically, within the **SYSTEM DATA->DISPLAY PARAMS** submenu, entries have been added for "Local Prefix" and "Remote Prefix". These entries allow the user to pick a single alphanumeric character to precede any event log entries for local gate, detector, island, or XR state changes, and a separate single alphanumeric character to precede any event logging entries for remote gate, detector, islands, or XR state changes. Each EGMS maintains a separate set of these parameters so that each railroad or jurisdictional agency may choose the terminology for use within its own event log. While each prefix may be any alphanumeric character or symbol within the EGMS table, some "typical" terminology may be used as follows:
- "L" = Local, "R" = Remote.
- [blank] = Local, "R" = Remote.
- "A" = Railroad A, "B" = Railroad B.
- "R" = Railroad, "T" = Transit.

A.3.3   Event Viewer

The functionality of the Event Viewer is identical for standard (single-unit) and Dual-Unit operations. The addition of the "Local" and "Remote" display prefix provides easy distinction between local and remote detectors and gates.

The addition of two specific event types, "REM. STAT" and "REM. DATA", allow event entries related to the status of the remote EGMS communications and database status, respectively. Possible REM. STAT events are:
- **COMFAIL**: The communications link to the remote unit is not functioning. Indicates communications problem with the inbound data path.
- **COM NAK**: Valid data is being received from the remote unit but the remote unit is not acknowledging valid communications from the local unit. Indicates communications problem with the outbound data path.

- **CRC NAK**: Valid data is being received but the remote unit does not acknowledge the configuration database checksum. Indicates that the local configuration database has changed and/or the remote railroad has not performed an "Accept Remote Data" operation.
- **SYSOP**: Valid data is being received but the remote unit is in system failure mode. Indicates some sort of internal / equipment failure within the remote EGMS unit.
- **DB CRC**: Valid data is being received from the remote unit but the remote unit's configuration database checksum does not match the accepted database value. Indicates that the remote data has been changed and/or the local railroad has not performed an "Accept Remote Data" operation.
- **GOOD**: All communications and database checks are valid and the Dual-Unit EGMS is fully functional.

Possible REM. DATA events are:
- **ACCEPT**: A user has performed the "Accept Remote Data" operation and the data has been successfully accepted.
- **REJECT**: A user has performed a "Reject Remote Data" operation.

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APPENDIX B – EGMS DATABASE CONFIGURATION SHEETS

(Software Version 4.5)

TABLE OF CONTENTS

B.1. GENERAL

The default configuration values provided in this appendix are for a generic application. Customer site-specific configurations can be provided on request.

B.2. EGMS DUAL-UNIT, FOUR-QUAD GATE CONFIGURATION FORM (GENERIC)

Dual Unit operation is configured with an EGMS Dual Unit with an A44103 Communications Module in each of two railroad crossing bungalows communicating with each other where the right of way of both railroads share one MTCD. Both EGMS units have control of their respective entrance gate(s), exit gate(s), and vehicle detector loops. Each unit is a Master unit requiring coordination to accept the remote Operational Parameters of the other unit in order to function as one system.

LOCAL RAILROAD: _____

DOT #: _____

Crossing Name: _____

Mile Post: _____

City: _____

Date: _____

Time: (start)_____ (complete) _____

EGMS Software Version: _____ **Build:** _____

Inspector: _____

REMOTE RAILROAD: _____

Remote Railroad Inspector: _____

Comments:_____

_____

_____

_____

_____

_____

_____

Railroad: _____

Gate ____

Gate ____

Dets ____

Dets ____

Traffic
Direction ___

Dets ___

Dets ____

Railroad Right of Way Line

Dets ___

Dets ____

Traffic
Direction ___

Dets ____

Dets ____

Gate ____

Gate ____

Railroad: _____

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B.3. EGMS PARAMETERS

B.3.1. Display Parameters:

LOCAL Parameters	Default Value	Change from Default Value *
Startup Logo	NONE	
Backlight Timeout	015	
Buzzer Enable	YES	
Direction Indicators	↓ S ↑ N	
Bungalow Quad	NONE	
Display QZI	NO	
Local Prefix	' '	
Remote Prefix	'R'	
Xing Name		
Xing Description		
Xing DOT#		

* If value is to be changed from the Default value, indicate changes in this column.

B.3.2. Security Parameters:

LOCAL Params	User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8
Enabled								
Permissions								
Name								
Password								

Note: Default is NONE enabled. Read/write capability is available in the default level until one user is enabled and provided with read/write security.

B.3.3. EGMS Operational Parameters

LOCAL Parameters			REMOTE Param – READ ONLY	
Parameter	Default Value	Change from Default Value*	*Default Value*	*Change from Default Value**
Primary Mode	DYNAMIC		*DYNAMIC*	
Secondary Mode	NONE		*NONE*	
Disable Entrance Detectors	NO		*NO*	
Delay on Down	01.0		*01.0*	
Reverse Detector Enable	NO		*NO*	
Dynamic EGCT	000		*000*	
Timed EGCT	012		*012*	
Island Inhibit Time	012		*012*	
XR Detector Disable	YES		*YES*	
Bidirectional Delay	04.0		*04.0*	
Dynamic Entrance Gate Monitor	YES		*YES*	
Entrance Down Required	YES		*YES*	
Exit Up Required	NO		*NO*	
EGH Sense	B12 HOLDS		*B12 HOLDS*	
Island 2 Enable	NO		*NO*	
Dual EGMS Enabled	NO	YES* (for Dual-Unit mode only)		

* If value is to be changed from the "Default One-Track Dynamic" mode, indicate changes in this column.

B.3.4. EGMS Alarm Parameters

LOCAL Parameters			REMOTE Parameters – READ ONLY	
Parameter	Default Value	Change from Default Value*	*Default Value*	*Change from Default Value**
GATO Alarm Delay	000		*000*	
GATO Gate Delay	000		*000*	
Max Gate Release	09.0**		*09.0** *	
Max Gate Response	03.0**		*03.0** *	
Cycle Restore	001		*001*	
MTCD Presence	000		*000*	
Det Fail Alarm	YES		*YES*	
Det Restore Delay	000		*000*	
Max Det Fails	000		*000*	
Aux 1 Enable	NO		*NO*	
Aux 1 Restore	000		*000*	
Aux 2 Enable	NO		*NO*	
Aux 2 Restore	000		*000*	
Aux 3 Enable	NO		*NO*	
Aux 3 Restore	000		*000*	
Aux 4 Enable	NO		*NO*	
Aux 4 Restore	000		*000*	

* If value is to be changed from the Default value, indicate changes in this column.

** Adjust gate release, response times in field based on actual gate operations, as necessary

B.3.5. EGMS Aux Output Mapping

AUX OUTPUT	1	2	3	4)
Function	(DET OUT)	(DET HEALTH)	(GP)	(ALARM)
Source	(BOTH)	(BOTH)	(BOTH)	(BOTH)

Default values in parentheses – indicate changes from default value next to default.

B.3.6. EGMS Daylight Savings Parameters

Parameter	Default Value	Change from Default Value*
Enabled	YES	
Spring Month	003	
Spring Week-of-Month	SECOND	
Spring Day-Of-Week	SUN	
Spring Hour	002	
Fall Month	011	
Fall Week-of-Month	FIRST	
Fall Day-Of-Week	SUN	
Fall Hour	002	

* If value is to be changed from the Default value, indicate changes in this column.

B.3.7. Local Gate Parameters (Gates 1-4)

LOCAL GATE	1	2	3	4
Gate Type *	ENTR	ENTR	EXIT	EXIT
Gate Direction	↓ (S)	↑ (N)	↓ (S)	↑ (N)
Vertical Chatter Time	02.0	02.0	02.0	02.0
Horizontal Chatter Time	02.0	02.0	02.0	02.0
Minimum Ascent Time	003	003	003	003
Maximum Ascent Time	015	015	015	015
Minimum Descent Time	003	003	003	003
Maximum Descent Time	015	015	015	015

*Gates 1 & 2 default to "ENTR" and gates 3 & 4 default to "EXIT".

B.3.8. Local Gate Parameters (Gates 5-8)

LOCAL GATE	5	6	7	8
Gate Type *	NONE	NONE	NONE	NONE
Gate Direction	↓ (S)	↓ (S)	↓ (S)	↓ (S)
Vertical Chatter Time	02.0	02.0	02.0	02.0
Horizontal Chatter Time	02.0	02.0	02.0	02.0
Minimum Ascent Time	003	003	003	003
Maximum Ascent Time	015	015	015	015
Minimum Descent Time	003	003	003	003
Maximum Descent Time	015	015	015	015

*Gates 5-8 default to "NONE".

B.3.9. Remote Gate Parameters (Gates 1-4)

REMOTE GATE – Read Only	1	2	3	4
Gate Type *	ENTRANCE	ENTRANCE	EXIT	EXIT
Gate Direction	↓ (S)	↑ (N)	↓ (S)	↑ (N)
Vertical Chatter Time	02.0	02.0	02.0	02.0
Horizontal Chatter Time	02.0	02.0	02.0	02.0
Minimum Ascent Time	003	003	003	003
Maximum Ascent Time	015	015	015	015
Minimum Descent Time	003	003	003	003
Maximum Descent Time	015	015	015	015

Note: Remote gates available only if Dual EGMS is enabled.
* Gates 1 & 2 default to "ENTR" and gates 3 & 4 default to "EXIT".

B.3.10. Remote Gate Parameters (Gates 5-8)

REMOTE GATE – Read Only	5	6	7	8
Gate Type *	NONE	NONE	NONE	NONE
Gate Direction	↓ (S)	↓ (S)	↓ (S)	↓ (S)
Vertical Chatter Time	02.0	02.0	02.0	02.0
Horizontal Chatter Time	02.0	02.0	02.0	02.0
Minimum Ascent Time	003	003	003	003
Maximum Ascent Time	015	015	015	015
Minimum Descent Time	003	003	003	003
Maximum Descent Time	015	015	015	015

Note: Remote gates available only if Dual EGMS is enabled.
* Gates 5-8 default to "NONE".

B.3.11. EGMS Detector Parameters (Detectors 1-4)

DETECTOR	1	2	3	4
Detector Type *	ENTR	ENTR	EXIT	EXIT
Detector Direction	↓ (S)	↑ (N)	↓ (S)	↑ (N)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

Detectors 1 & 2 default to "ENTR", detectors 3 & 4 default to "EXIT".

B.3.12. EGMS Detector Parameters (Detectors 5-8)

Note: Detectors 5 – 16 default to "NONE" when 1TK default configuration is selected.

DETECTOR	5	6	7	8
Detector Type	* INT	* INT	NONE	NONE
Detector Direction	↓ (S)	↑ (N)	↓ (S)	↓ (S)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Detectors 5 & 6 default to 'INT' when 2TK default configuration is selected.

B.3.13. EGMS Detector Parameters (Detectors 9-12)

DETECTOR	9	10	11	12
Detector Type *	NONE	NONE	NONE	NONE
Detector Direction	↓ (S)	↓ (S)	↓ (S)	↓ (S)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Detectors 9-12 default to "NONE".

B.3.14. EGMS Detector Parameters (Detectors 13-16)

DETECTOR	13	14	15	16
Detector Type *	NONE	NONE	NONE	NONE
Detector Direction	↓ (S)	↓ (S)	↓ (S)	↓ (S)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Detectors 13-16 default to "NONE".

B.3.15. Remote EGMS Detector Parameters (Detectors 1-4)

REMOTE DETECTOR – Read Only	1	2	3	4
Detector Type *	ENTR	ENTR	EXIT	EXIT
Detector Direction	↓ (S)	↑ (N)	↓ (S)	↑ (N)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Detectors 1 & 2 default to "ENTR", detectors 3 & 4 default to "EXIT".

B.3.16. Remote EGMS Detector Parameters (Detectors 5-8)

Note: Detectors 5 – 16 default to "NONE" when 1TK default configuration is selected.

REMOTE DETECTOR – Read Only	5	6	7	8
Detector Type	* INT	* INT	NONE	NONE
Detector Direction	↓ (S)	↑ (N)	↓ (S)	↓ (S)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Detectors 5 & 6 default to 'INT' when 2TK default configuration is selected.

B.3.17. Remote EGMS Detector Parameters (Detectors 9-12)

REMOTE DETECTOR – Read Only	9	10	11	12
Detector Type *	NONE	NONE	NONE	NONE
Detector Direction	↓ (S)	↓ (S)	↓ (S)	↓ (S)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Remote Detectors 9-12 default to "NONE", and parameters must be configured manually.

B.3.18. Remote EGMS Detector Parameters (Detectors 13-16)

REMOTE DETECTOR – Read Only	13	14	15	16
Detector Type *	NONE	NONE	NONE	NONE
Detector Direction	↓ (S)	↓ (S)	↓ (S)	↓ (S)
Stretch Time	01.0	01.0	01.0	01.0
Long-Term Obstacle	000	000	000	000
Disable on Down	NO	NO	NO	NO
Aux Output 1	YES	YES	YES	YES
Aux Output 2	YES	YES	YES	YES
Aux Output 3	YES	YES	YES	YES
Aux Output 4	YES	YES	YES	YES

* Remote Detectors 13-16 default to "NONE", and parameters must be configured manually.

B.3.19. Communication Parameters

LOCAL COMM	Default Value	Change from Default Value
Comm Port	DB-9	
Baud Rate	19200	
Data Bits	8	
Parity	None	
Stop Bits	1	

B.3.20. Communication Parameters

REMOTE COMM (Remote user interface read only)	Default Value	Change from Default Value
Comm Port	None	
Baud Rate	9600	
Data Bits	8	
Parity	None	
Stop Bits	1	

B.3.21. Communication Parameters

DUAL UNIT COMM	Default Value	Change from Default Value
Comm Port	Port 1	
Baud Rate	9600	
Data Bits	8	
Parity	None	
Stop Bits	1	
Link Timeout	01.0	

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B.4. LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #1)

- Record information during cutover tests.
- Note that your version of software may not have Options 8 & 9 available.
- The values displayed in *italics* are offered as a base reference point. Verify actual program values on the circuit plan for your specific application and field test sensitivity level and adjust as necessary.

Function	Loop 1 (*1)	Loop 2 (*2)	Loop 3 (*3)	Loop 4 (*4)
Frequency Setting	*2*	*4*	*6*	*8*
Sensitivity Setting	*6*	*6*	*6*	*6*
Option 1 (Temp L Display)				
Option 2 (Temp ΔL/L Display)				
Option 3 (Noise Filter)	*3.00*	*3.00*	*3.00*	*3.00*
Option 4 (Tracking)	*4.02*	*4.02*	*4.02*	*4.02*
Option 5 (Sensitivity Boost)	*5.00*	*5.00*	*5.00*	*5.00*
Option 6 (Temp Audible Signal)	*OFF*	*OFF*	*OFF*	*OFF*
Checkloop Interval	*005*	*005*	*005*	*005*
Detector ID (DL=255)	** *000*			
Option 7 (Sync) (DL=7.00)	** *7.01*			
Option 8 (Island Function)	*OFF*			
Option 9 (Shunt Enhancement)	*OFF*		*OFF*	
Main Output Delay	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Extension	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Mapping (DL=00)	*10*	*20*	*40*	*80*
Aux Output Mapping (DL=000)	*001*	*002*	*004*	*008*
Software Version	*E4.02*			

(*) Denotes EGMS Loop Numbering Nomenclature

(**) Set this Detector ID to 000 to establish master unit when series sync 7.01 is used.

B.5. LOOP DETECTOR MODULE INITIAL SETUP MEASUREMENTS (A44102 E-1400S DETECTOR MODULE #1)

- Record information during cutover tests.

Value	Loop 1 (*1)	Loop 2 (*2)	Loop 3 (*3)	Loop 4 (*4)
Primary Loop Frequency (kHz)				
Primary Loop Resistance (Ω)				
Check Loop Resistance (Ω)				
Primary Loop Insulation (MΩ)				
Check Loop Insulation (MΩ)				
Primary Loop Inductance (µH)				

B.6. LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #2)

- Record information during cutover tests.
- Note that your version of software may not have Options 8 & 9 available.
- The values displayed in *italics* are offered as a base reference point. Verify actual program values on the circuit plan for your specific application and field test sensitivity level & adjust as necessary.

Function	Loop 1 (*5)	Loop 2 (*6)	Loop 3 (*7)	Loop 4 (*8)
Frequency Setting	*2*	*4*	*6*	*8*
Sensitivity Setting	*6*	*6*	*6*	*6*
Option 1 (Temp L Display)				
Option 2 (Temp ΔL/L Display)				
Option 3 (Noise Filter)	*3.00*	*3.00*	*3.00*	*3.00*
Option 4 (Tracking)	*4.02*	*4.02*	*4.02*	*4.02*
Option 5 (Sensitivity Boost)	*5.00*	*5.00*	*5.00*	*5.00*
Option 6 (Temp Audible Signal)	*OFF*	*OFF*	*OFF*	*OFF*
Checkloop Interval	*005*	*005*	*005*	*005*
Detector ID (DL=255)	*001*			
Option 7 (Sync) (DL=7.00)	*7.01*			
Option 8 (Island Function)	*OFF*			
Option 9 (Shunt Enhancement)	*OFF*		*OFF*	
Main Output Delay	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Extension	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Mapping (DL=00)	*10*	*20*	*40*	*80*
Aux Output Mapping (DL=000)	*001*	*002*	*004*	*008*
Software Version	*E4.02*			

(*) Denotes EGMS Loop Numbering Nomenclature

B.7. LOOP DETECTOR MODULE INITIAL SETUP MEASUREMENTS (A44102 E-1400S DETECTOR MODULE #2)

- Record information during cutover tests

Value	Loop 1 (*5)	Loop 2 (*6)	Loop 3 (*7)	Loop 4 (*8)
Primary Loop Frequency (kHz)				
Primary Loop Resistance (Ω)				
Check Loop Resistance (Ω)				
Primary Loop Insulation (MΩ)				
Check Loop Insulation (MΩ)				
Primary Loop Inductance (µH)				

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B.8. LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #3)

- Record information during cutover tests.
- Note that your version of software may not have Options 8 & 9 available.
- The values displayed in *italics* are offered as a base reference point. Verify actual program values on the circuit plan for your specific application and field test sensitivity level & adjust as necessary.

Function	Loop 1 (*9)	Loop 2 (*10)	Loop 3 (*11)	Loop 4 (*12)
Frequency Setting	*2*	*4*	*6*	*8*
Sensitivity Setting	*6*	*6*	*6*	*6*
Option 1 (Temp L Display)				
Option 2 (Temp ΔL/L Display)				
Option 3 (Noise Filter)	*3.00*	*3.00*	*3.00*	*3.00*
Option 4 (Tracking)	*4.02*	*4.02*	*4.02*	*4.02*
Option 5 (Sensitivity Boost)	*5.00*	*5.00*	*5.00*	*5.00*
Option 6 (Temp Audible Signal)	*OFF*	*OFF*	*OFF*	*OFF*
Checkloop Interval	*005*	*005*	*005*	*005*
Detector ID (DL=255)	*002*			
Option 7 (Sync) (DL=7.00)	*7.01*			
Option 8 (Island Function)	*OFF*			
Option 9 (Shunt Enhancement)	*OFF*		*OFF*	
Main Output Delay	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Extension	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Mapping (DL=00)	*10*	*20*	*40*	*80*
Aux Output Mapping (DL=000)	*001*	*002*	*004*	*008*
Software Version	*E4.02*			

(*) Denotes EGMS Loop Numbering Nomenclature

B.9. LOOP DETECTOR MODULE INITIAL SETUP MEASUREMENTS (A44102 E-1400S DETECTOR MODULE #3)

- Record information during cutover tests.

Value	Loop 1 (*9)	Loop 2 (*10)	Loop 3 (*11)	Loop 4 (*12)
Primary Loop Frequency (kHz)				
Primary Loop Resistance (Ω)				
Check Loop Resistance (Ω)				
Primary Loop Insulation (MΩ)				
Check Loop Insulation (MΩ)				
Primary Loop Inductance (μH)				

B.10. LOCAL LOOP DETECTOR MODULE INITIAL SETUP PARAMETERS (A44102 E-1400S DETECTOR MODULE #4)

- Record information during cutover tests.
- Note that your version of software may not have Options 8 & 9 available.
- The values displayed in *italics* are offered as a base reference point. Verify actual program values on the circuit plan for your specific application and field test sensitivity level & adjust as necessary.

Function	Loop 1 (*13)	Loop 2 (*14)	Loop 3 (*15)	Loop 4 (*16)
Frequency Setting	*2*	*4*	*6*	*8*
Sensitivity Setting	*6*	*6*	*6*	*6*
Option 1 (Temp L Display)				
Option 2 (Temp ΔL/L Display)				
Option 3 (Noise Filter)	*3.00*	*3.00*	*3.00*	*3.00*
Option 4 (Tracking)	*4.02*	*4.02*	*4.02*	*4.02*
Option 5 (Sensitivity Boost)	*5.00*	*5.00*	*5.00*	*5.00*
Option 6 (Temp Audible Signal)	*OFF*	*OFF*	*OFF*	*OFF*
Checkloop Interval	*005*	*005*	*005*	*005*
Detector ID (DL=255)	*003*			
Option 7 (Sync) (DL=7.00)	*7.01*			
Option 8 (Island Function)	*OFF*			
Option 9 (Shunt Enhancement)	*OFF*		*OFF*	
Main Output Delay	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Extension	*00.0*	*00.0*	*00.0*	*00.0*
Main Output Mapping (DL=00)	*10*	*20*	*40*	*80*
Aux Output Mapping (DL=000)	*001*	*002*	*004*	*008*
Software Version	*E4.02*			

(*) Denotes EGMS Loop Numbering Nomenclature

B.11. LOOP DETECTOR MODULE INITIAL SETUP MEASUREMENTS (A44102 E-1400S DETECTOR MODULE #4)

- Record information during cutover tests.

Value	Loop 1 (*13)	Loop 2 (*14)	Loop 3 (*15)	Loop 4 (*16)
Primary Loop Frequency (kHz)				
Primary Loop Resistance (Ω)				
Check Loop Resistance (Ω)				
Primary Loop Insulation (MΩ)				
Check Loop Insulation (MΩ)				
Primary Loop Inductance (μH)				

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B.12.   MENU STRUCTURE – EGMS DUAL UNIT (SOFTWARE VERSION 4.4)

MAIN MENU	Submenu 1					
1)DISPLAY	1) Text Status	1) General Status	(data displayed)			
		2) Gate Status Local	(data displayed)			
		3) Gate Status Remote (Dual Unit enabled)	(data displayed)			
		4) Local Detector 1-8 Status	(data displayed)			
		5) Local Detector 9-16 Status	(data displayed)			
		6) Remote Detector 1-8 Status (Dual Unit enabled)	(data displayed)			
		7) Remote Detector 9-16 Status (Dual Unit enabled)	(data displayed)			
		8) Alarm Status	(data displayed)			
		9) Dual-Unit Comm. Status (Dual Unit enabled)	(data displayed)			
		10) Output Status	(data displayed)			
1)DISPLAY	2) Graphics Status	(select to view)				
1)DISPLAY	3) Startup Screen	(select to view)				
2) DATABASE	1)Local Database	1)Default Setup	1) One-Track Dynamic	(select to activate)		
			2) Two-Track Dynamic	(select to activate)		
			3) Timed Mode	(select to activate)		
2) DATABASE	1)Local Database	2) System Data	1)EGMS Parameters	Primary Mode	Dynamic, Timed, or None	
				Secondary Mode	Timed or None	
				Disable Entrance Detectors	Y/N	
				Delay on Down	00.0-25.5	
				Reverse Detector Enable	Y/N	
				Dynamic EGCT	0-255	
				Timed EGCT	0-255	
				Island Inhibit Time	0-255	

MAIN MENU	Submenu 1					
				XR Detector Disable	Y/N	
				Bidirectional Delay	00.0-25.5	
				Dynamic Entrance Gate Monitor	Y/N	
				Entrance Down Required	Y/N	
				Exit Up Required	Y/N	
				EGH Sense	B12 Holds or B12 Allows	
				Island 2 Enable	Y/N	
				Dual EGMS Enabled	Y/N	
2) DATABASE	1)Local Database	2) System Data	2) Alarm Parameters	GATO Alarm Delay	000 or 010-060	
				GATO Gate Delay	000 or 005-060	
				Max Gate Release	00.0-25.5	
				Max Gate Response	00.0-25.5	
				Cycle Restore	000-255	
				Det Fail Alarm	Y/N	
				MTCD Presence	000-100	
				Det Restore Delay	000-255	
				Max Det Fails	000-255	
				Aux In 1 Enable	Y/N *(Not wired in Present Chassis)*	
				Aux In 1 Restore	000-255	
				Aux In 2 Enable	Y/N *(Not wired in Present Chassis)*	
				Aux In 2 Restore	000-255	
				Aux In 3 Enable	Y/N *(Not wired in Present Chassis)*	
				Aux In 3 Restore	000-255	
				Aux In 4 Enable	Y/N *(Not wired in Present Chassis)*	
				Aux In 4 Restore	000-255	
2) DATABASE	1)Local Database	2) System Data	3) Comm Parameters	1) Local Comm	Comm Port	None, Port1, Port2, Port3, DB9, or SSRM
					Baud Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200
					Data Bits	7 or 8
					Parity	None, Odd or Even
					Stop Bits	1, 1.5 or 2
				2) Remote Comm	Comm Port	None, Port1, Port2, Port3, DB9, or SSRM
					Baud Rate	1200, 2400, 4800,

MAIN MENU	Submenu 1					
						9600, 19200, 38400, 57600 or 115200
					Data Bits	7 or 8
					Parity	None, Odd or Even
					Stop Bits	1, 1.5 or 2
				3) Dual Unit Comm	Comm Port	Port1, Port2, Port3, DB9, or SSRM
					Baud Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200
					Data Bits	7 or 8
					Parity	None, Odd or Even
					Stop Bits	1, 1.5 or 2
					Link Timeout	00.0–10.0
2) DATABASE	1)Local Database	2) System Data	4) Misc Parameters	1) Display Parameters	Startup Logo	None or select RR Logo
					Backlight Timeout	0-60
					Buzzer Enable	Y/N
					Direction Indicators	↓0 ↑1; ↓S ↑N; ↓W ↑E; ↓N ↑S; ↓E ↑W; ↓SB ↑NB; ↓WB ↑EB; ↓NB ↑SB; or ↓EB ↑WB
					Bungalow Quadrant	Entr or Exit *(qualified by Direction Indicator selected above)*
					Display QZI	Y/N
					Local Prefix	Select ' ' for None or keyboard characters: !, ", #, $, x, &, ', (,), *, +, ,, -, ., /, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, :, ;, <, =, >, ?, @, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
					Remote Prefix	Select ' ' for None or keyboard characters: !, ", #, $, x, &, ', (,), *, +, ,, -, ., /, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, :, ;, <, =, >, ?, @, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R,

MAIN MENU	Submenu 1					
						S, T, U, V, W, X, Y, Z
					Crossing Name	Enter up to 14 Alphanumeric char
					Crossing Description	Enter up to 40 Alphanumeric char
					Crossing DOT#	Enter up to 20 Alphanumeric char
				2) Aux Output Mapping	Aux Out 001 Function	None, Alarm, Det Hlth, Det XRISL, Det XR, Det ISL, DETOBSTCL, Det ALL, or GP (Vert)
					Aux Out 001 Source	Local, Remote, or Both
					Aux Out 002 Function	None, Alarm, Det Hlth, Det XRISL, Det XR, Det ISL, DETOBSTCL, Det ALL, or GP (Vert)
					Aux Out 002 Source	Local, Remote, or Both
					Aux Out 003 Function	None, Alarm, Det Hlth, Det XRISL, Det XR, Det ISL, DETOBSTCL, Det ALL, or GP (Vert)
					Aux Out 003 Source	Local, Remote, or Both
					Aux Out 004 Function	None, Alarm, Det Hlth, Det XRISL, Det XR, Det ISL, DETOBSTCL, Det ALL, or GP (Vert)
					Aux Out 004 Source	Local, Remote, or Both
				3) Daylight Savings Parameters	Enable	Y/N
					Spring Month	001-012
					Spring Week-of-Month	First, Second, Third, Fourth, or Last
					Spring Day-of-Week	Mon, Tue, Wed, Thu, Fri, Sat, or Sun
					Spring Hour	000-022

MAIN MENU	Submenu 1					
					Fall Month	001-012
					Fall Week-of-Month	First, Second, Third, Fourth, or Last
					Fall Day-of-Week	Mon, Tue, Wed, Thu, Fri, Sat, or Sun
					Fall Hour	000-023
				4) Security Parameters *(Note: 001-008 Entries Available)*	Enabled	Y/N
					Permissions	RD-Only, RD/WR, or Admin
					Name	Enter up to 7 Alphanumeric char
					Password	Enter up to 7 Numeric char
2) DATABASE	1)Local Database	3) Gate Parameters *(Note: 001-008 Entries Available)*	Gate Type	None, Entr, or Exit		
			Gate Direction	↓? or ↑? *(qualified by Direction Indicator selected above)*		
			Vertical Chatter	00.0-25.5		
			Horizontal Chatter	00.0-25.5		
			Minimum Ascent	000-255		
			Maximum Ascent	000-255		
			Minimum Descent	000-255		
			Maximum Descent	000-255		
2) DATABASE	1)Local Database	4) Detector Parameters *(Note: 001-016 Entries Available)*	Detector Type	None, Entr, Exit, or Intr		
			Detector Direction	↓? or ↑? or ↕?/? *(qualified by Direction Indicator selected above)*		
			Stretch	00.025.5		
			Long-Term Obstacle	000-255		
			Disable-on-Down	Y/N		
			Aux Output 1	Y/N		
			Aux Output 2	Y/N		
			Aux Output 3	Y/N		

MAIN MENU	Submenu 1					
			Aux Output 4	Y/N		
2) DATABASE	2) Remote Database	5) Save Database	1) Save New Data	(select to activate)		
			2) Discard Changes	(select to activate)		
2) DATABASE	2) Remote Database	---				
2) DATABASE	2) Remote Database	2) System Data	1)EGMS Parameters *(Note: all are READ ONLY)*	Primary Mode	*Dynamic, Timed, or None*	
				Secondary Mode	*Timed or None*	
				Disable Entrance Detectors	*Y/N*	
				Delay on Down	*00.0-25.5*	
				Reverse Detector Enable	*Y/N*	
				Dynamic EGCT	*0-255*	
				Timed EGCT	*0-255*	
				Island Inhibit Time	*0-255*	
				XR Detector Disable	*Y/N*	
				Bidirectional Delay	*00.0-25.5*	
				Dynamic Entrance Gate Monitor	*Y/N*	
				Entrance Down Required	*Y/N*	
				Exit Up Required	*Y/N*	
				EGH Sense	*B12 Holds or B12 Allows*	
				Island 2 Enable	*Y/N*	
2) DATABASE	2) Remote Database	2) Remote System Data	2) Remote Alarm Parameters *(Note: all are READ ONLY)*	GATO Alarm Delay	*000 or 010-060*	
				GATO Gate Delay	*000 or 005-060*	
				Max Gate Release	*00.0-25.5*	
				Max Gate Response	*00.0-25.5*	
				Cycle Restore	*000-255*	
				Det Fail Alarm	*Y/N*	
				MTCD Presence	*000-100*	
				Det Restore Delay	*000-255*	
				Max Det Fails	*000-255*	
				Aux In 1 Enable	*Y/N (Not wired in Present Chassis)*	
				Aux In 1 Restore	*000-255*	
				Aux In 2 Enable	*Y/N (Not wired in Present Chassis)*	

MAIN MENU	Submenu 1					
				Aux In 2 Restore	*000-255*	
				Aux In 3 Enable	*Y/N (Not wired in Present Chassis)*	
				Aux In 3 Restore	*000-255*	
				Aux In 4 Enable	*Y/N (Not wired in Present Chassis)*	
				Aux In 4 Restore	*000-255*	
2) DATABASE	2) Remote Database	3) Remote Gate Parameters *(Note: 001-008 Entries Available - all are READ ONLY)*	Gate Type	*None, Entr, or Exit*		
			Gate Direction	*↓? or ↑? (qualified by Direction Indicator selected above)*		
			Vertical Chatter	*00.0-25.5*		
			Horizontal Chatter	*00.0-25.5*		
			Minimum Ascent	*000-255*		
			Maximum Ascent	*000-255*		
			Minimum Descent	*000-255*		
			Maximum Descent	*000-255*		
2) DATABASE	2) Remote Database	4) Remote Detector Parameters *(Note: 001-016 Entries Available - all are READ ONLY)*	Detector Type	*None, Entr, Exit, or Intr*		
			Detector Direction	*↓? or ↑? or ↕?/? (qualified by Direction Indicator selected above)*		
			Stretch	*00.025.5*		
			Long-Term Obstacle	*000-255*		
			Disable-on-Down	*Y/N*		
			Aux Output 1	*Y/N*		
			Aux Output 2	*Y/N*		
			Aux Output 3	*Y/N*		
			Aux Output 4	*Y/N*		
2) DATABASE	2) Remote Database	5) Accept Remote Database	1) Accept Data	(select to activate)		
			2) Reject Data	(select to activate)		
3)EVENT VIEWER	1) View Events	(data displayed)				

MAIN MENU	Submenu 1					
3)EVENT VIEWER	2) Event Filters	System Startup	Y/N			
		Op Mode Change	Y/N			
		Database Bad	Y/N			
		Database Change	Y/N			
		User Login	Y/N			
		User Logout	Y/N			
		User Timeout	Y/N			
		I/O Health Change	Y/N			
		Gate Fail	Y/N			
		Gate Repair	Y/N			
		Gate Change	Y/N			
		Detector Change	Y/N			
		XR Change	Y/N			
		Island Change	Y/N			
		Gate Control Change	Y/N			
		EGH Output Change	Y/N			
		Detector Output Change	Y/N			
		System Health Change	Y/N			
		Detector Health Change	Y/N			
		Alarm Output Change	Y/N			
		Gate Timeout	Y/N			
		Time	Y/N			
		DST Change	Y/N			
		CRC Fail	Y/N			
		Aux Input State Change	Y/N			
		Remote Data Change	Y/N			
		Remote Status Status	Y/N			
		Startup Info	Y/N			
		CRC Good	Y/N			
3)EVENT VIEWER	3) Reset Filters	(select to activate)				
4) UTILITIES	1) Set Time	Month	001-012			
		Day	001-031			
		Year	000-099			
		Day of Week	Mon, Tue, Wed, Thu, Fri, Sat, or Sun			
		Hour	000-023			
		Minute	000-059			

MAIN MENU	Submenu 1					
		Second				
		Time Update Confirm	(select to accept)			
4) UTILITIES	1) USB Utilities	1) Database Import	Device Selection			
			Folder / File Selection			
		2) Database Export	Device Selection			
		3) Event Log Export	Device Selection			
		4) SD / USB Status	(status displayed)			