SIEMENS

INSTALLATION AND INSTRUCTION MANUAL

WAYSIDE INSPECTOR, P/N A81000

SEPTEMBER 2016 (REVISED APRIL 2021)

DOCUMENT NO. SIG-00-16-03
VERSION A.1

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www.usa.siemens.com/rail-manuals

PRINTED IN U.S.A.

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

DOCUMENT HISTORY

Version	Release Date	Sections Changed	Details of Change
A	09/22/2016		Initial release
A.1	04/01/2021	All	Updated for clarity of content. Added details for new product interfaces and features, which include: • MTSS • iLOD • WAG • GCP 3000+ • Digitalization and diagnostic data reporting • WI connection to legacy GCP 3000

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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 Mobility, Inc. Application Engineering

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

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

- Ground yourself before touching card cages, assemblies, modules, or components.
- Remove power from card cages and assemblies before removing or installing modules.
- Remove circuit boards (modules) from card cages by the ejector lever only. If an ejector lever is not provided, grasp the edge of the circuit board but avoid touching circuit traces or components.
- Handle circuit boards by the edges only.
- Never physically touch circuit board or connector contact fingers or allow these fingers to come in contact with an insulator (e.g., plastic, rubber, etc.).
- When not in use, place circuit boards in approved static-shielding bags, contact fingers first. Remove circuit boards from static-shielding bags by grasping the ejector lever or the edge of the board only. Each bag should include a caution label on the outside indicating static-sensitive contents.
- Cover workbench surfaces used for repair of electronic equipment with static dissipative workbench matting.
- 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.

GLOSSARY

TERM	DESCRIPTION
AAR:	Association of American Railroads – An organization that establishes uniformity and standardization among different railroad systems.
AREMA:	American Railroad Equipment Manufacturing Association – An organization that supersedes AAR.
ATCS:	Advanced Train Control System – A set of standards compiled by the AAR for controlling all aspects of train operation.
ECD:	External Configuration Device – A serial EEPROM (Flash Memory) device mounted inside the chassis of the GEO unit. The ECD is used to store site-specific configuration data (MCF, SIN, UCN, and card parameters) for the CPU.
EX Value	Is the phase of the received signal, which is the measure of the impedance of the track ballast. This measurement identifies how much current is leaking from one rail to another.
EZ Value	Is the measure of the received signal level.
MEF:	Module Executable File – The executive software running in the CPU or I/O Modules. The user can download the MEF through the Diag port to update the software.
MCF:	Module Configuration File – The GCP application logic file.
SIN:	Site Identification Number – The 12-digit ATCS address for the SIN has the form 7.RRR.LLL.GGG.SS stored in binary coded decimal, with each digit in one nibble. The digit 0 is represented by “A” and 0 is used as a null byte.
Site Location:	The location where GCP unit is installed.
VPI:	Vital Parallel Input – A module input circuit the function of which affects the safety of train operation.
VRO:	Vital Relay Output – A module output circuit the function of which affects the safety of train operation.

CHAPTER 1 INTRODUCTION

1.1 PURPOSE

This manual provides guidance to field maintainers and crossing installation teams to install and correctly wire the Wayside Inspector (WI) to crossings. This manual provides installation instructions and wiring of the WI to AC power, batteries, battery chargers, crossing warning systems including the Solid State Crossing Controller (SSCC), relay controlled crossing wiring, Grade Crossing Predictor (GCP) connections, the Ground Fault Tester 2, and Wireless Magnetometers. Refer to the location's circuit plans for detailed wiring and programming information.

1.2 SCOPE

This manual focuses on installation and connection of the WI. It is useful to crossing installers and field maintenance personnel intending to use the WI in crossing monitoring. This manual does not address any railroad specific crossing guidelines. This manual provides an overview of the WI programming but does not include site specific instructions. For application guidelines, see the ***Wayside Inspector MCF Configuration Tool Application Guidelines, SIG-00-16-05***.

1.3 REFERENCE MATERIAL

Table 1-1 Abbreviation Index

AP	Access Point
AREMA	American Railway Engineering and Maintenance-of-way Association
CFR	Code of Federal Regulations
DCE	Data Communication Equipment
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DTE	Data Terminal Equipment
ECD	External Configuration Device
GCP	Grade Crossing Predictor
GFT	Ground Fault Tester
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
MCF	Module Configuration File
MCT	MCF Configuration Tool
PoE	Power over Ethernet
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UI	User Interface
WI	Wayside Inspector
WiMag	Wireless Magnetometer

Table 1-2 Reference Documents

Component	Manual Title	Document Number
Battery Charger	Series SJ Battery Chargers	SIG-00-00-18
Model 4000 Grade Crossing Predictor	Model 4000 Grade Crossing Predictor (GCP 4000) Field Manual	SIG-00-08-10
	Model 4000 Grade Crossing Predictor Plus (Model 4000 GCP Plus) Field Manual	SIG-00-12-68
	Model 4000 Grade Crossing Predictor (GCP 4000) Application Guidelines	SIG-00-08-06
Model 5000 Grade Crossing Predictor	Model 5000 Grade Crossing Predictor (GCP 5000) Field Manual	SIG-00-13-03
	Model 5000 Grade Crossing Predictor (GCP 5000) Application Guidelines	SIG-00-13-04
Model 3000+ Grade Crossing Predictor	Model 3000+ Grade Crossing Predictor (GCP 3000+) Application Guidelines	SIG-00-17-04
	Model 3000+ Grade Crossing Predictor (GCP 3000+) Field Manual	SIG-00-18-01
	Model 3000+ Grade Crossing Predictor (GCP 3000+) Instruction and Installation	SIG-00-17-03
Electronic Bell	User Guide, A80301	SIG-00-04-09
Ground Fault Tester	Ground Fault Tester, A80297-01, -02, -03	SIG-00-03-05-003
	Ground Fault Tester 2 (GFT2), A81010-01, -02	SIG-00-15-06
Mini Trackside Sensor Package	User Guide. Part of SEAR II accessory group, includes MTSS (A80285, A80286-2), Gate Tip Sensor (A80281) and Electronic Bell (A80301)	SIG-00-03-05-001
Solid State Crossing Controller	Solid State Crossing Controller IIIA (SSCCIIIA) A91160 & 91165	SIG-00-02-12
	Solid State Crossing Controller III Plus (SSCCIIIPlus) A91190 & 91195	SIG-00-02-03
	Solid State Crossing Controller IV (SSCCIV) A91210 & 91215	SIG-00-03-02
Wayside Inspector	Wayside Inspector Installation and Instruction Manual	SIG 00-16-03
Wayside Inspector	MCF Configuration Tool Application Guidelines Manual	SIG 00-16-05
Wayside Inspector	Wayside Inspector Web Application User Manual	SIG-00-20-02

CHAPTER 2 OVERVIEW

WARNING

THE WAYSIDE INSPECTOR IS A NON-VITAL PRODUCT. CAUTION MUST BE TAKEN WHEN INTERFACING THE WAYSIDE INSPECTOR TO ANY VITAL SIGNAL OR CROSSING EQUIPMENT AS THE WAYSDE INSPECTOR CANNOT BE USED TO PERFORM, EITHER DIRECTLY OR INDIRECTLY, ANY VITAL FUNCTIONS. ENSURE THE WAYSIDE INSPECTOR IS INSTALLED PER MANUFACTURER'S INSTRUCTIONS, AND/OR ALL EQUIPMENT INTERCONNECTIONS ARE IN COMPLIANCE WITH RAILROAD PROCEDURES AND SPECIFICATIONS.

The Wayside Inspection system automates periodic inspections for crossings. The system has capabilities to conduct a number of automated inspections.

To achieve those goals, the system uses the Wayside Inspector (WI), installed at the crossing, to test standby power, test for grounds, monitor the crossing, and test warning times. The WI monitors the state of discrete I/O signals, battery voltages, and AC power at a crossing. From that information, the WI analyzes the operation of the crossing warning system and automatically performs periodic inspections of the crossing warning system. The WI can send alarms and automated inspection results to the back office system using several possible communication methods. The inspections are performed by the WI by executing application programmable logic. Figure 2-1 shows the context of the WI installed at a crossing.

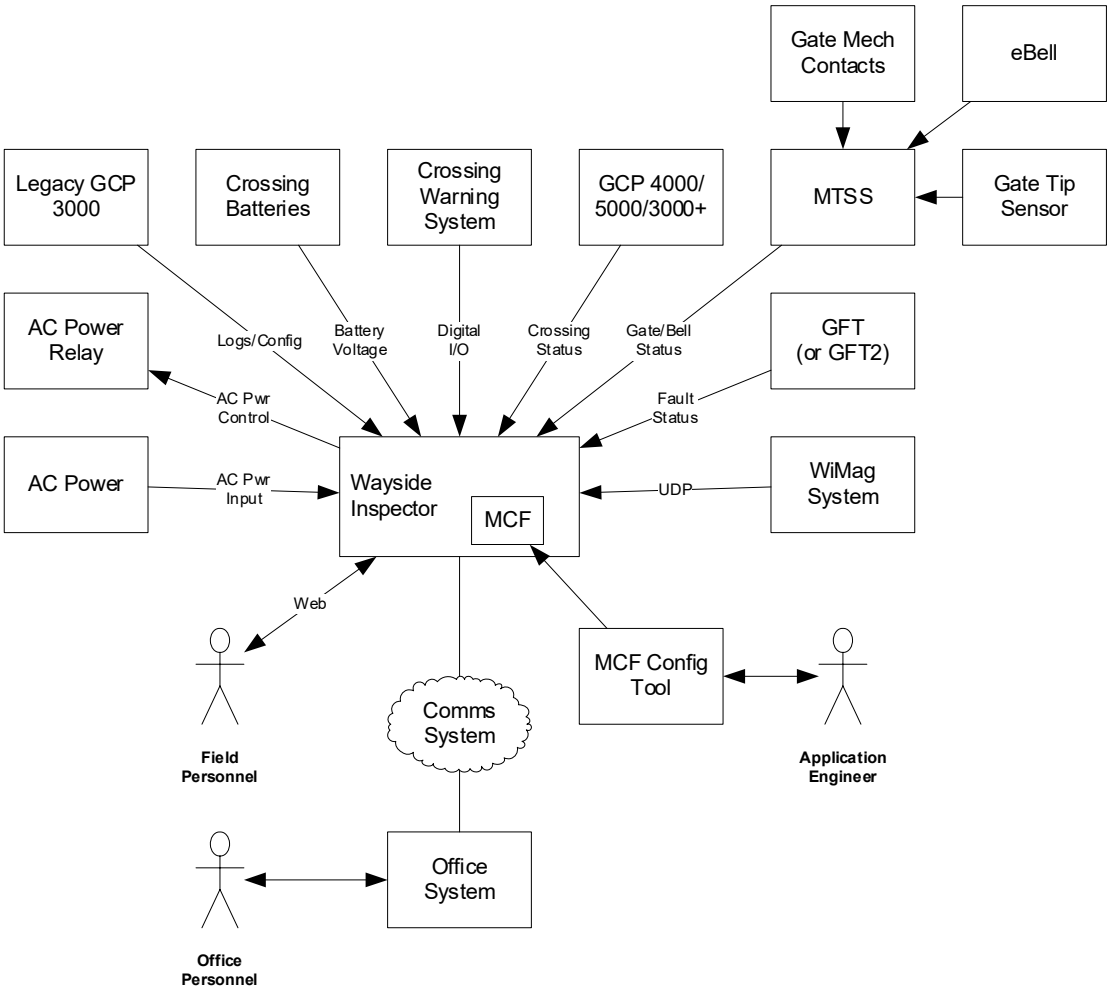

Figure 2-1 Context of WI Installed at Crossing

The WI monitors the crossing warning system I/O using digital inputs. The WI monitors the battery system voltages using analog inputs. The WI can turn off the battery chargers using an AC power control relay. The WI monitors the system for ground faults using the Siemens Ground Fault Tester 2 (GFT2).

The WI monitors the operation of the gates through the Mini-Trackside Sensor System (MTSS). An MTSS in combination with the gate tip sensor (GTS) and E-Bell, reports the following information to the WI: gate up, gate down, gate level, bell power, and bell audio.

If the crossing uses a Siemens Grade Crossing Predictor of model 4000 or later (5000 and 3000+), the WI can receive crossing statuses over a network. In addition, the WI can receive train speed and direction information in GCP 4000, 5000, and 3000+ messages.

If the WI is interfacing with a legacy GCP 3000 model, the WI is able to view the GCP 3000 logs and configuration parameters, if the appropriate equipment is installed in the GCP 3000 system.

In situations where the typical crossing I/O cannot provide the directional route information needed for the warning time test, the installation can add Wireless Magnetometer (WiMag) sensors to detect trains. The WI can receive the WiMag sensor statuses over a network.

Field personnel can interact with the WI using a web browser user interface (Web UI). The Web UI allows field personnel to adjust system settings, view status, view inspection results, download logs, etc.

Because each location (or class of locations) is different, the WI uses programmable logic to execute the inspections. The logic is loaded into the WI as a Module Configuration File (MCF). The MCF includes configuration settings and relay logic. An application engineer defines the logic and settings using the MCF Configuration Tool (MCT).

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CHAPTER 3 HARDWARE

The Wayside Inspector (WI) has the following connections and components:

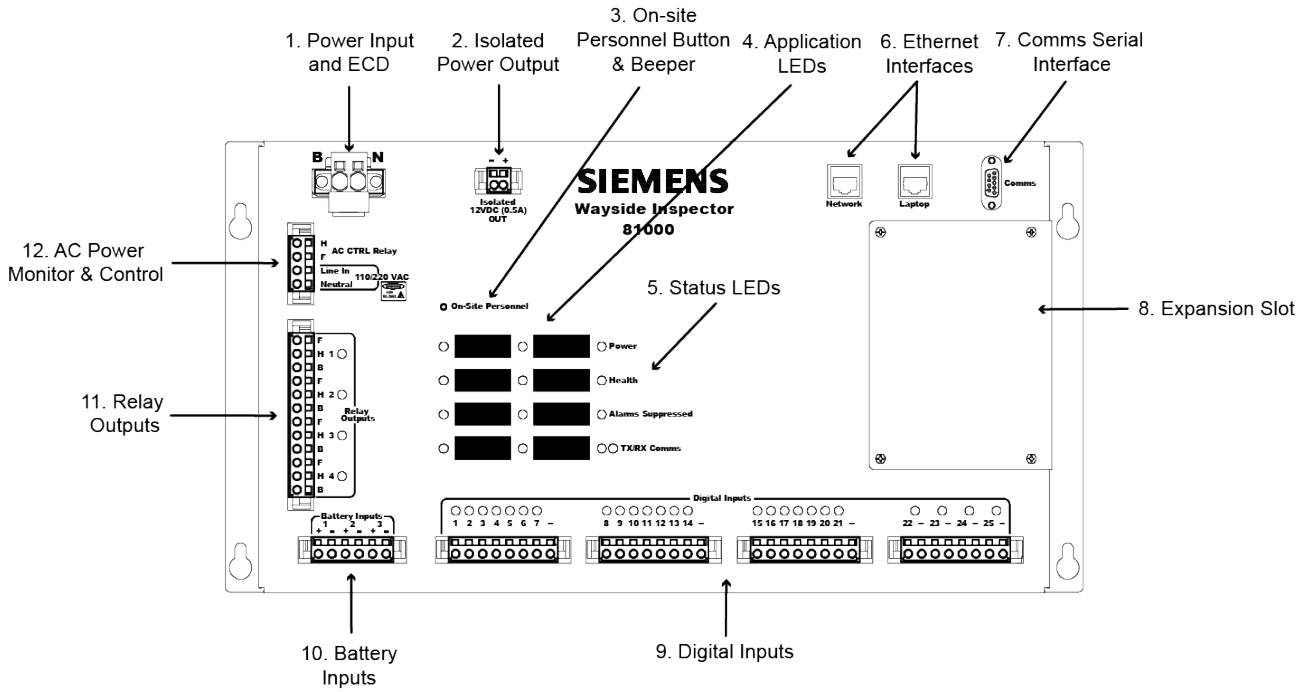

Figure 3-1 Wayside Inspector, A81000 Connectors

The WI has the following connectors, indicators, and components:

Table 3-1 WI Connectors

No.	Name	No.	Name
1.	Power Input & ECD	2.	Isolated Power Output
3.	On-site Personnel Button and Beeper	4.	Application LEDs
5.	Status LEDs	6.	Ethernet Interfaces
7.	Comms Serial Interface	8.	Expansion Slot
9.	Digital Inputs	10.	Battery Inputs
11.	Relay Outputs	12.	AC Power Monitor and Control

3.1 POWER INPUT CONNECTOR AND ECD

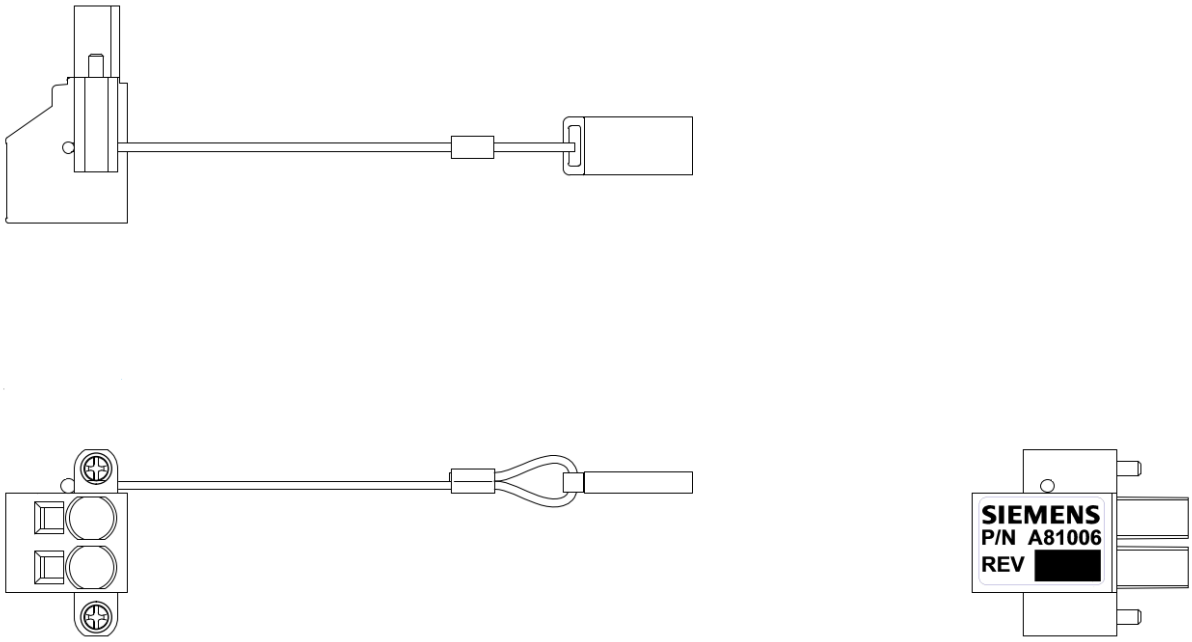

Figure 3-2 Power Input Connector and ECD

The WI is connected to the 12 VDC (nominal) battery banks as shown in section 6.1. The WI power supply provides 2000 VRMS isolation and complies with AREMA power supply standards.

The WI monitors the applied power input voltage using an internal battery input circuit, which eliminates the need to wire the input power battery bank to a separate battery input. Table 3-2 shows the power input specifications.

Table 3-2 Specifications

Parameter	Value Range
Input Voltage Range	8.0 – 20.0 VDC
Input Current	3.0 A max @ 13.8 VDC
Reverse Polarity Protection	Up to 16 VDC
Isolation	2000 VRMS, 60 Hz, 60 s
ECD Capacity	512 MB, formatted for FAT32 file system
ECD Performance	Sequential Read up to 21 MB/s Sequential Write up to 16 MB/s Enhanced endurance with Advanced Wear Leveling Algorithm
ECD Interface	Compatible with USB 2.0 (480 Mbps)
ECD Operating Temp	-40° to +85°C

The External Configuration Device (ECD) allows field personnel to replace the WI with a new unit without re-configuring it. The ECD is attached to the power input connector via a lanyard cable. The ECD is water/moisture resistant, vibration, shock, and electrostatic discharge resistant.

3.2 ISOLATED POWER OUTPUT

The WI provides 12 VDC (nominal) isolated power output. The isolated power can be used to power external communication equipment such as cell modems.

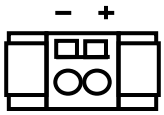

Figure 3-3 Isolated Power Output Connector

Table 3-3 lists the specification for the output power.

Table 3-3 Isolated Power Output Specifications

Parameter	Value Range
Voltage	12.0 VDC nominal (follows input voltage)
Current Limit	0.5 A max at 12.0 VDC
Short Circuit/Over Current Protection	Yes
Isolation	2000 VRMS, 60 Hz, 60 s

3.3 ON-SITE PERSONNEL BUTTON AND MAINTAINER ON-SITE MODE

The WI has an On-Site Personnel button, which field personnel use to activate Maintainer On-Site mode.

Maintainer On-Site mode allows field personnel to test and modify the crossing without sending alarm messages to the office. When field personnel press the On-Site Personnel button, the WI goes into Maintainer On-Site mode and starts a timer. The WI will not send alarm messages to the office while in Maintainer On-Site mode. The WI returns to normal operation when the timer expires. The Alarms Suppressed LED will be on while the WI is in Maintainer On-Site mode. The maintainer may re-start the timer for Maintainer On-Site mode by pressing the On-Site Personnel button again, at any time.

The WI has an internal beeper. The beeper will “chirp” when the user presses the On-site Personnel pushbutton to provide audible feedback. The MCF may also control the beeper for application-specific functions.

3.4 APPLICATION LEDS

NOTE

NOTE

During startup, the WI turns on all indicator LEDs, which allows field personnel to check for failed LEDs.

The WI has eight application programmable LEDs available to the program logic. The eight LEDs are red in color. The application logic in the MCF determines the function of the Application LEDs. There is a space next to each LED to add a sticker or write in the LEDs intended function.

3.5 STATUS LEDS

The WI has LEDs to display system status information.

Figure 3-4 Status LEDs

The Power LED is green. It turns on when power is applied to the WI.

The Health LED is green and driven by software. The Health LED flashes at a rate of 1 Hz when the system is healthy. The Health LED flashes faster when there is a detected hardware problem.

The Alarms Suppressed LED is yellow. It turns ON while in Maintainer On-Site mode and alarms are suppressed. Field personnel activate Maintainer On-Site mode by pressing the On-site Personnel button (see section 6-20 for a description of Maintainer On-Site mode). The WI software must see the button change from “pressed” to “not pressed” to activate the mode, which prevents a failed button from leaving the unit in Maintainer On-Site mode permanently.

The TX/RX Comms LEDs are green and red respectively. The green TX LED briefly flashes when the WI sends a data packet on the Comms serial interface. The red RX LED briefly flashes when receiving a valid data packet.

3.6 ETHERNET INTERFACE LEDS

The Laptop and Network Ethernet connectors each include a yellow and a green LED. The Laptop port is used when field maintenance personnel view the status of tests and equipment via the Web User Interface (Web UI). The yellow LED shows Ethernet link-up status. The yellow LED turns on when Ethernet link-up is established. The green LED shows Ethernet activity. The green LED briefly flashes when Ethernet frames are received or transmitted.

3.7 COMMS SERIAL PORT

The WI has one RS-232 asynchronous serial port, which uses a DB9 male connector with a standard DTE pin arrangement. Table 3-4 lists the Comms serial port specifications and Table 3-5 shows the pin arrangement of the connector.

Table 3-4 Comms Serial Port Specifications

Parameter	Value Range
Baud Rate	Up to 115,200 bps
Line Levels	RS-232 only
Clock Modes	Asynchronous only
Flow Control	RTS/CTS, None

Table 3-5 Comms Serial Port Pin Configuration

Pin	I/O	Function
1	I	Carrier Detect (CD)
2	I	Receive Data (RXD)
3	O	Transmit Data (TXD)
4	O	Data Terminal Ready (DTR)
5	N/A	Ground (GND)
6	I	Data Set Ready (DSR)
7	O	Request To Send (RTS)
8	I	Clear To Send (CTS)
9	N/A	No Connect

3.8 HARDWARE EXPANSION SLOT

The WI has one hardware expansion slot.

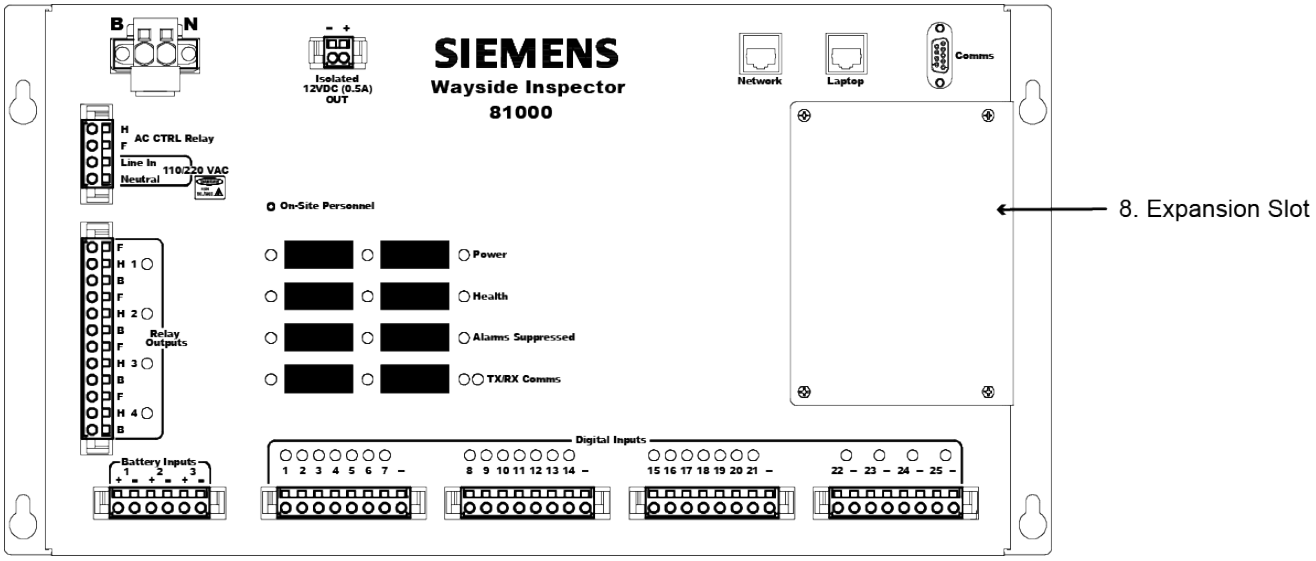

Figure 3-5 Hardware Expansion Slot

The expansion slot is reserved for future I/O or communication expansion options.

3.9 DIGITAL INPUTS

The WI has a total of 25 digital inputs. The unit has 3 groups of 7 inputs per group. Each group shares a common negative. Each input group is isolated from other input groups and the rest of the system but is not isolated from inputs within the same group. There are 4 additional digital inputs, which are individually isolated with independent negatives. The installation may wire vital signals directly to digital inputs as long as the installation follows the wiring guidelines specified in this manual in CHAPTER 6.

Each input has its own LED indicator to display the state of that input, as determined by software (the LEDs are not directly hardware driven).

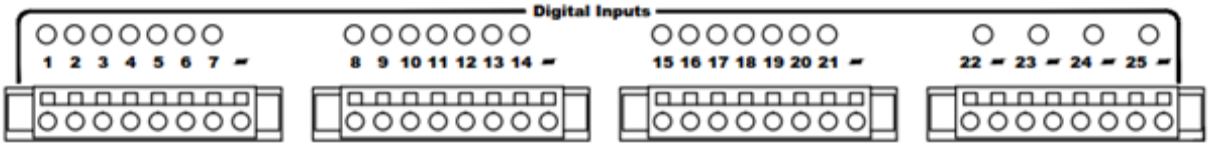

Figure 3-6 Digital Input Connectors and LEDs

Table 3-6 lists the specifications for the digital inputs.

Table 3-6 Digital Input Specifications

Parameter	Value Range	Comments
Voltage Range	0 – 120 V (AC or DC)	See Note
ON Threshold	4.0 VDC	See Note
OFF Threshold	1.0 VDC	See Note
Reverse Polarity Protection	Full input voltage range	Reverse polarity always OFF
Isolation	2000 VRMS, 60 Hz, 60 sec	

NOTE

NOTE

The specified ON and OFF DC voltage thresholds apply to the input circuit hardware. The WI executive software further samples and de-bounces the input to determine the reported input state. The ON and OFF voltage thresholds do not apply when monitoring AC voltage. The system may not reliably detect AC voltage below about 14.0 VRMS and specific de-bounce settings are required to correctly report AC input states.

See section 5.5.2 for a description of digital input processing and programming.

3.10 BATTERY INPUTS

The WI has 4 battery inputs. Three battery inputs are externally accessible through a WAGO connector. One battery input is internally connected to the power input. The battery inputs are designed to monitor battery banks with voltages ranging up to 36VDC.

Table 3-7 lists the specifications for the battery inputs.

Table 3-7 Battery Input Specifications

Parameter	Value Range
Voltage Range	0 – 36 VDC
Isolation	2000 VRMS, 60 Hz, 60 sec

3.11 RELAY OUTPUTS

The WI has 4 general purpose non-vital relay outputs. Each relay includes both the front (F) and back (B) contacts for normally open (H to F) or normally closed (H to B) wiring options. LED indicators display the status of each relay. Figure 3-7 shows the internal relay hardware:

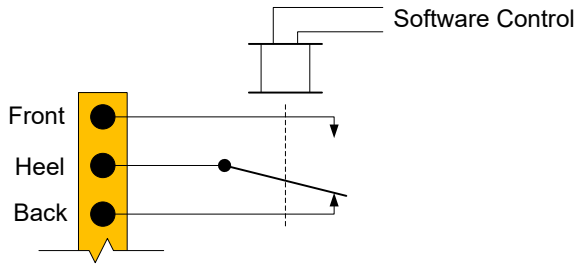

Figure 3-7 Relay Output Hardware Internals

Table 3-8 lists the specifications for the relay outputs.

Table 3-8 Relay Output Specifications

Parameter	Value Range
Current Limit	8 A @ 250 VAC, 5 A @ 30 VDC
Isolation	2000 VRMS, 60 Hz, 60 sec
Max Switching Voltage	250 VAC, 30 VDC

3.12 AC POWER MONITOR AND CONTROL

The WI has a dedicated input for monitoring 110 and 220 VAC and a dedicated relay output to control the AC power to battery chargers.

The “Line In” pin is for connection to the AC power line wire and the “Neutral” is for connection to the AC power.

The AC CTRL Relay is intended to control an external relay that removes AC power from the installed battery chargers. That is needed to perform the standby power test. The AC CTRL relay is normally open. The contacts will close to control external AC disconnect relays for each battery charger.

Siemens recommends using a 12 V relay with 100 Ohms or greater Relay Resistance Value for the AC CTRL Relay.

The AC CTRL relay has the same ratings as the general purpose relays, except only the Heel and Front contacts are available.

3.13 MOUNTING

The WI is mounted on a wall, a shelf, or a 19-inch rack. All WI connectors and indicators are front facing.

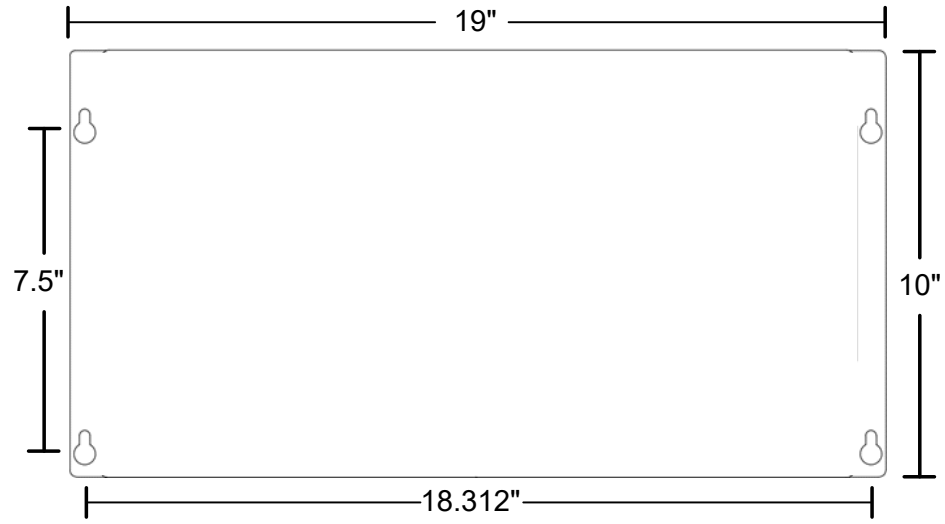

Figure 3-8 WI Mounting Dimensions

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CHAPTER 4 ANCILLARY EQUIPMENT

4.1 GROUND FAULT TESTER 2 (GFT2)

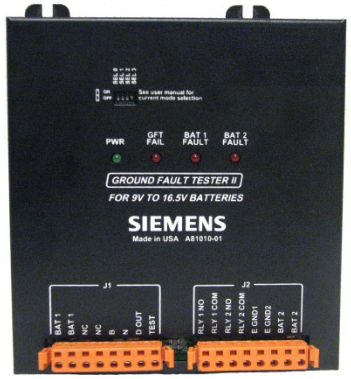


Figure 4-1 Ground Fault Tester 2: A81010-01 (9 V – 16.5 V)

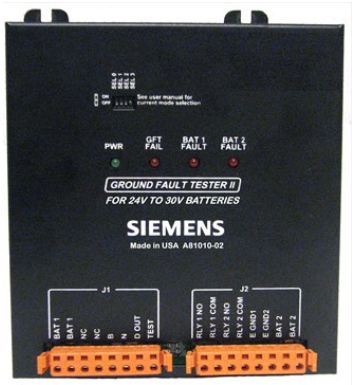


Figure 4-2 Ground Fault Tester 2: A81010-02 (24 V – 30 V)

⚠ WARNING

WARNING

THE GROUND FAULT TESTER 2 (GFT 2) SHOULD ONLY BE USED IN APPLICATIONS DESCRIBED IN THIS MANUAL.

AN INTERNAL FAILURE OF THE GFT 2 MAY RESULT IN A GROUND OF UP TO 0.8 mA ON THE BATTERY BEING MONITORED. THEREFORE, THE GFT 2 SHOULD NOT BE USED IN SAFETY CRITICAL APPLICATIONS THAT COULD BE ADVERSELY AFFECTED BY A GROUND OF UP TO 0.8 mA.

THE GFT 2 CANNOT BE GUARANTEED TO CORRECTLY DETECT AND/OR REPORT GROUND FAULTS UNDER ALL FAILURE CONDITIONS.

NOTE

NOTE

Periodic independent ground fault testing should be performed during routine maintenance of the system.

The A81010 Ground Fault Tester 2 (GFT 2) is a user configurable device used to monitor the leakage resistance between battery terminals and earth ground.

The GFT 2 is available in two hardware configurations, A81010-01 and A81010-02. The –01 configuration is used with 9 to 16 volt batteries. See Figure 4-1. The –02 configuration is used with 24 to 30 volt batteries. See Figure 4-2.

The unit can also be placed in test mode where a simulated ground fault of 1 mA is placed internally on an isolated battery input to verify that the unit is properly detecting faults.

A separate internal circuit is used to verify the GFT 2's health, as indicated by the status of the GFT FAIL LED on the front panel. The GFT 2 can be powered by a 9-30 VDC (12 VDC nominal) operating battery independently from the batteries being monitored.

The GFT 2 has an internal de-bounce circuit that monitors the channel faults for 10+/-1 sec from the instant the GFT 2 detects the presence or removal of the fault, before confirming the status of the fault visually, via LED indicators on the front panel, and to the WI via any WI digital input.

The GFT 2 has been designed using fail-safe design principles to ensure that in the event of a failure, no more than a 0.8 mA ground can be placed on the battery being monitored.

For additional information regarding the GFT 2, see ***Siemens Ground Fault Tester 2 (GFT 2), A81010 -01, -02 User's Guide, SIG-00-15-06***.

4.2 GRADE CROSSING PREDICTOR MODELS 4000, 5000, AND 3000+

Figure 4-3 The Model 4000/5000 Grade Crossing Predictor (GCP)

4.2.1 System Configurations

The Model 4000, 5000, and 3000+ Grade Crossing Predictors (GCPs) are modular microprocessor-controlled predictor systems that are deployed to continually monitor the approach(es) to railroad grade crossings.

The Model 4000 and 5000 GCPs allow for control of the lamps, gates, and bells associated with those crossings. The Model 5000 GCP and some configurations of the Model 4000 GCP have provision for an optional plug-in SEAR event recorder.

The Model 4000/5000 GCPs are available in several case configurations. A Model 4000 GCP with a legacy display (A80407) uses the GCP's Echelon communication protocol through the Wayside Access Gateway (WAG) to communicate with the WI via the Ethernet. A Model 4000 GCP with the currently released display module (A80485) and the Model 5000/3000+ GCPs have Ethernet connectivity already built in to pass information via the Ethernet.

For further information regarding the Model 4000 GCP, see ***Siemens Microprocessor Based Grade Crossing Predictor Model 4000 Family Application Guidelines, SIG-00-08-06***.

For the Model 5000 GCP, see ***Siemens Microprocessor Based Grade Crossing Predictor Model 5000 Family Application Guidelines, SIG-00-08-06***.

For the Model 3000+ GCP, see ***SIG-00-17-03, (Instruction and Installation), SIG-00-18-01 (Field Manual)***, and ***SIG-00-17-04 (Application Guidelines)***.

4.3 WIRELESS MAGNETOMETER (WIMAG) SYSTEM

The WI can receive status information from a Wireless Magnetometer (WiMag) system. The WiMag system is made up of an Access Point (or base station) and at least one sensor. Optionally, the system may use a repeater to increase the RF range of the sensors. Figure 4-4 shows an example system.

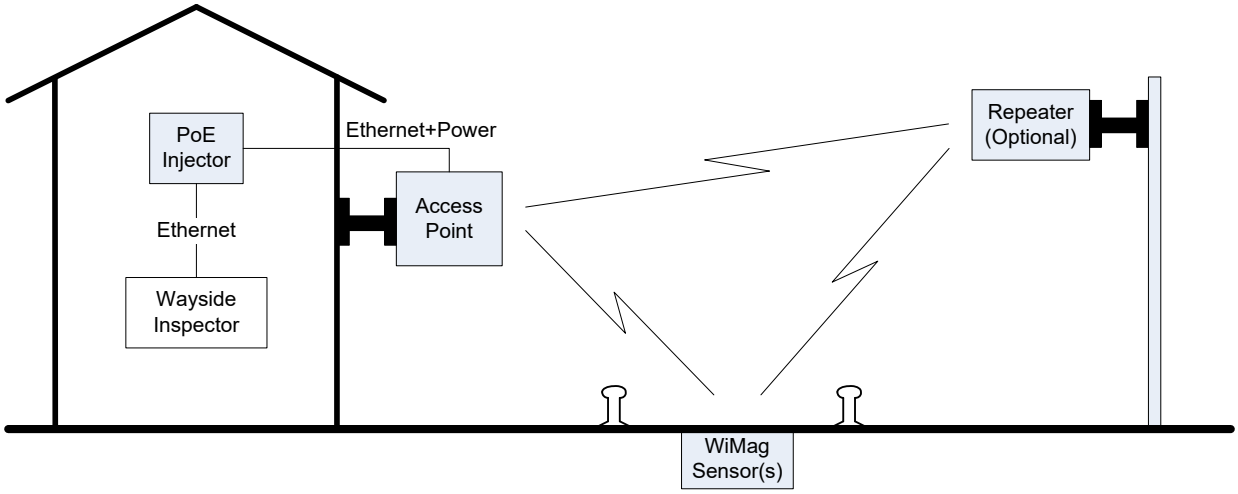


Figure 4-4 The Wireless Magnetometer (WiMag) Sensor System

The Access Point reports the status of each sensor in the system to the WI over a network using UDP messages. The sensor statuses are reported at a periodic rate. The sensor reports “detected” or “not detected” status and an error status. When a train is above a WiMag sensor, it will report “detected.”

The user may set the UDP port number and a timeout value for the Access Point messages. The timeout is used to report the health of the link with the Access Point.

The user can set a channel name, OFF name, and ON name for each sensor. The user can also set ON and OFF de-bounce values for each sensor (just like discrete digital inputs). These names are used when adding state change entries to the Event Log.

The WI can receive statuses from only 1 Access Point and at most 20 WiMag sensors.

The application engineer may use the “detected” and “error” statuses of each sensor and the “link OK” status of the Access Point in the MCF logic.

For a more detailed description of the WiMag Sensor System, see Siemens WiMag Vehicle Detection System General Handbook, Part No. 667/HB/47200/000.

4.4 iLOD

The iLOD is the Intelligent Light Out Detector module that can be used to monitor as the current to flashing crossing lamps or other devices (up to 30 A maximum, peak). The iLOD is connected to the WI to a WAG via Echelon LAN, and the WAG is connected to the Wayside Inspector via Ethernet. The iLOD Unit is designed for wall, shelf, or rack mounting (via mounting plates.) It does not require forced ventilation and the iLOD is rated for a temperature range of -40°C to +71°C (-40°F to +160°F). It is provided with internal secondary and tertiary surge protection circuits on the power input. Siemens Mobility, Inc. strongly recommends installing primary surge protection on any external lines connecting to the equipment.

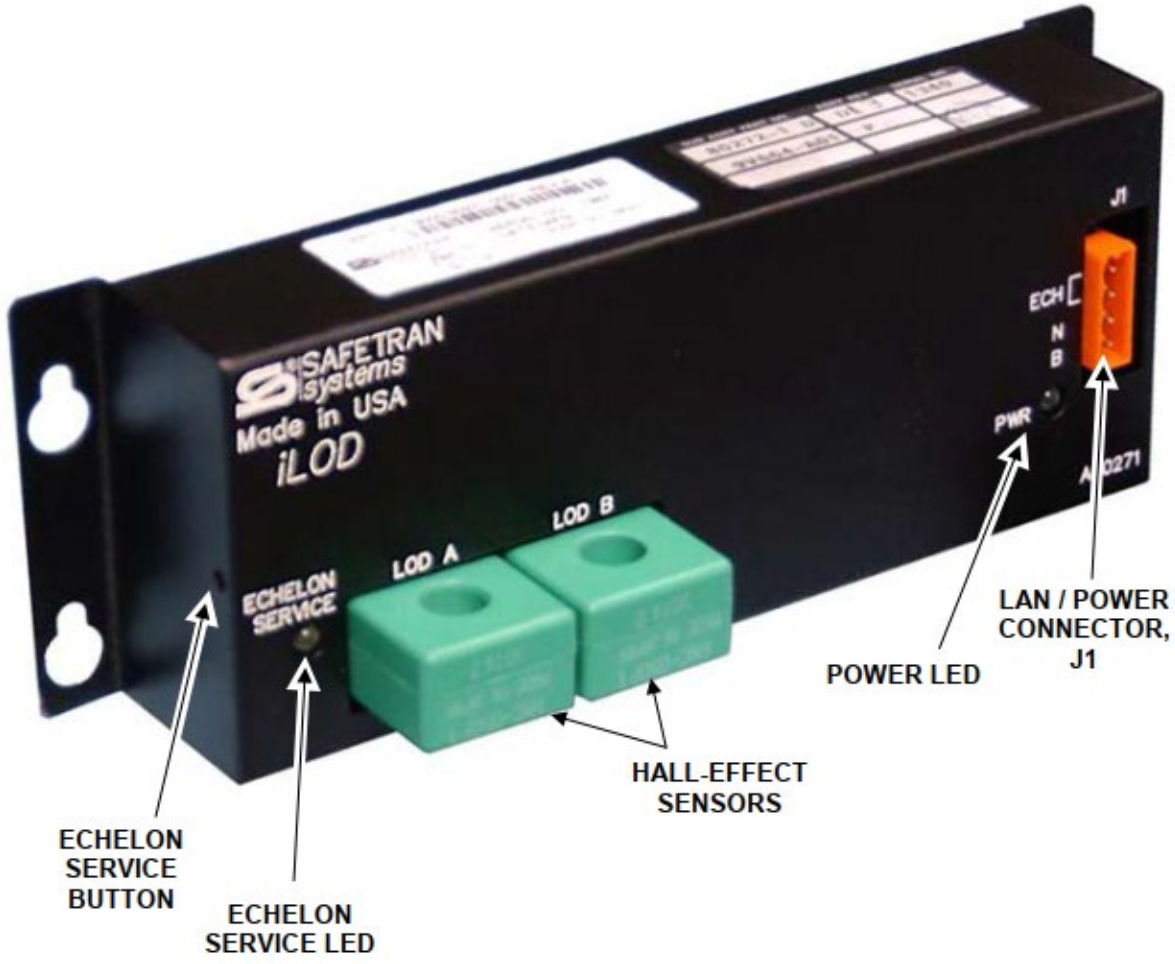


Figure 4-5 iLOD Module

DC Power is supplied to each unit via a 4-pin connector accessible from the front panel. The power pins are labeled “B” and “N” to indicate polarity (B is positive, N is negative or return) and the connectors are keyed to ensure proper orientation. The following table presents the pinout for the power and Echelon interface connector for the iLOD Unit.

Table 4-1 Pinout for Power and Echelon Interface Connector

PIN NUMBER	LABEL	SIGNAL
1	ECH	Echelon B Wire
2	ECH	Echelon A Wire
3	N	Battery Return (negative)
4	B	Battery Voltage In (positive)

The WI connects to up to 4 iLOD modules through a WAG module. The WAG module performs media conversion between the Ethernet network of the WI and the Echelon twisted-pair network used by iLOD modules. Figure 4.4 shows the connections of iLOD modules to a WI through a WAG.

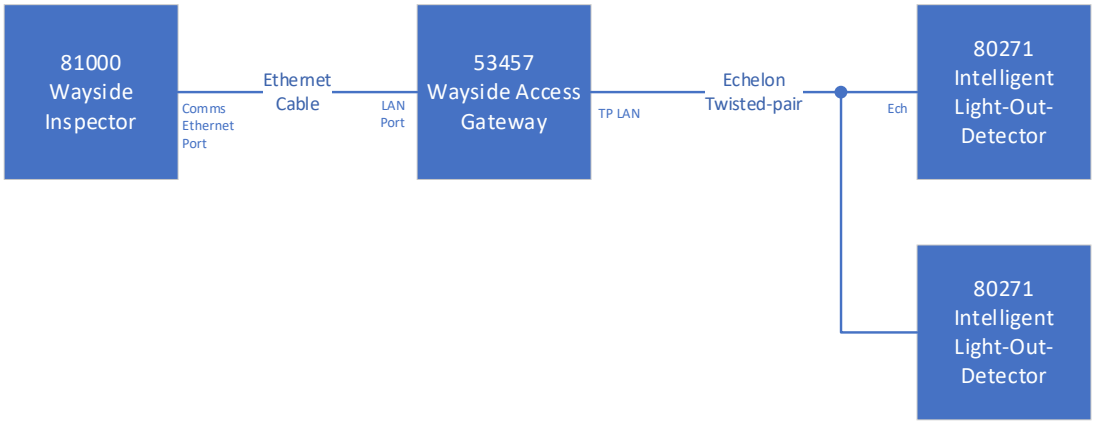


Figure 4-6 iLOD Current Sensor Wiring

For a more detailed description of the iLOD system, see the ***Siemens iLOD manual, SIG-00-03-05-005***, on how the iLOD Current Sensors should be wired into the system.

See section 5.5.2.7 for the iLOD Echelon network installation procedure.

See section 5.6 for the iLOD lamp calibration procedure.

4.5 WAG

The Wayside Access Gateway (A53457) converts Echelon® messages to Ethernet messages. This lets Siemens equipment such as the HD/Link, use Ethernet Networks for communications. The Wayside Access Gateway (WAG) can also convert Echelon received messages to serial messages. This allows the system to use modems for communication between Siemens equipment. The figure on the following page shows an example of how devices in the field can be connected and the interaction between devices.

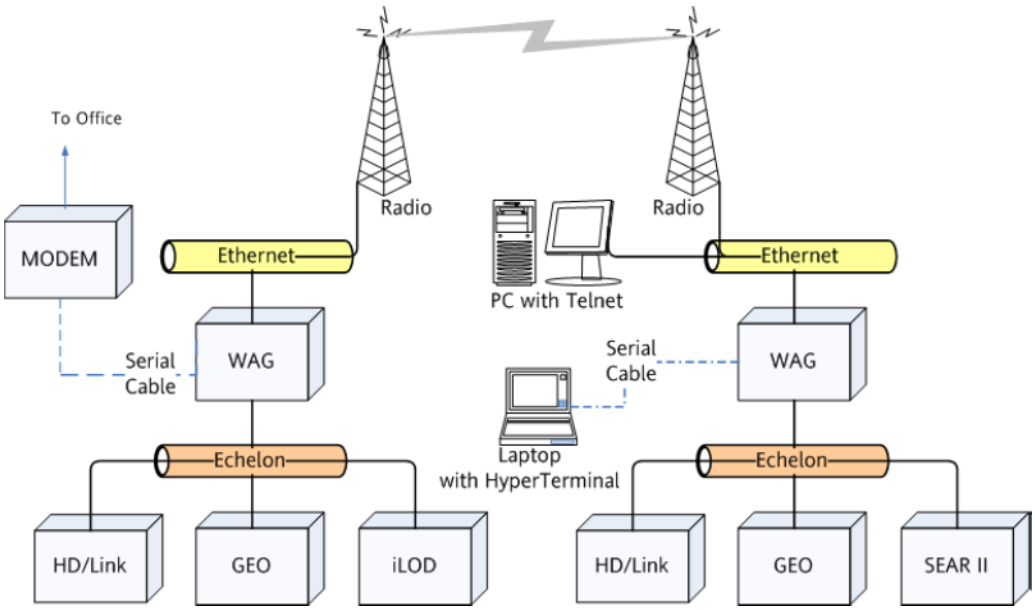


Figure 4-7 General Network Overview

4.6 MTSS

The Mini Trackside Sensor (MTSS) is the heart of the Trackside Sensor Package and is mounted inside the gate-mechanism enclosure. It monitors local inputs and sends the acquired data to the WI. Data from the various sensor inputs is assembled into a serial bitstream that only requires a single connection to a spare Digital Input on the WI. The MTSS interfaces with the various monitored signals via connector J1, a 12-pin, mass-terminated Eurostyle terminal block (board header and wiring plug), and provides LED indicators for power, when the gate is horizontal, and the bell is ringing.

See the ***MTSS user manual, SIG-00-03-05-001***, for further details.

4.7 E-BELL

The Electronic Bell is equipped with a bell sensing circuit that monitors both electrical and audio bell characteristics and continuously reports the status back to the MTSS while the Electronic bell is powered. The microphone inside the Electronic bell “listens” for the sound of the bell. When the Electronic bell is used with the MTSS in the gate mechanism and a WI in the bungalow, the diagnostic information can alert the railroad of a bell system failure.

See the ***E-Bell user manual, SIG-00-04-09***, for further details.

4.8 GATE TIP SENSOR

The Gate-Tip Sensor (GTS) is mounted inside the wiring case (junction box) of the tip-light (the last light on the gate arm) or fastened to the gate arm itself. The Gate-Tip Sensor monitors the position of the gate arm and reports it back to the Mini Trackside Sensor when the gate is within 5 degrees of horizontal. The GTS has two cable options - without a Reco light cable (80281-1) or with a Reco light cable (80281-2). When the Gate-Tip Sensor is used with the MTSS in the gate mechanism and a WI in the bungalow, the diagnostic information can alert the railroad when a gate arm is out of position (e.g., gate arm knocked off by passing vehicle).

The installation of the remote sensors (GTS and Electronic bell) does not require additional wires or any rewiring of the existing grade-crossing components. The MTSS hooks up to existing wires inside the gate mechanism enclosure and requires only one free wire to send data back to the WI.

See the ***MTSS user manual, SIG-00-03-05-001***, for further details. This manual references the GTS as part of the SEAR II accessory group.

CHAPTER 5 CONFIGURATION & PROGRAMMING

5.1 WI APPLICATION GUIDELINES & MCF CONFIGURATION TOOL

This manual provides guidance to field personnel to install and setup the Wayside Inspector (WI). The ***Wayside Inspector MCF Configuration Tool Application Guidelines, SIG-00-16-05***, provides a reference to the application engineer for all WI configuration settings and their purpose. The Module Configuration File Configuration Tool (MCT), shown in Figure 5-1, provides a means for the application engineer to create a Module Configuration File (MCF).

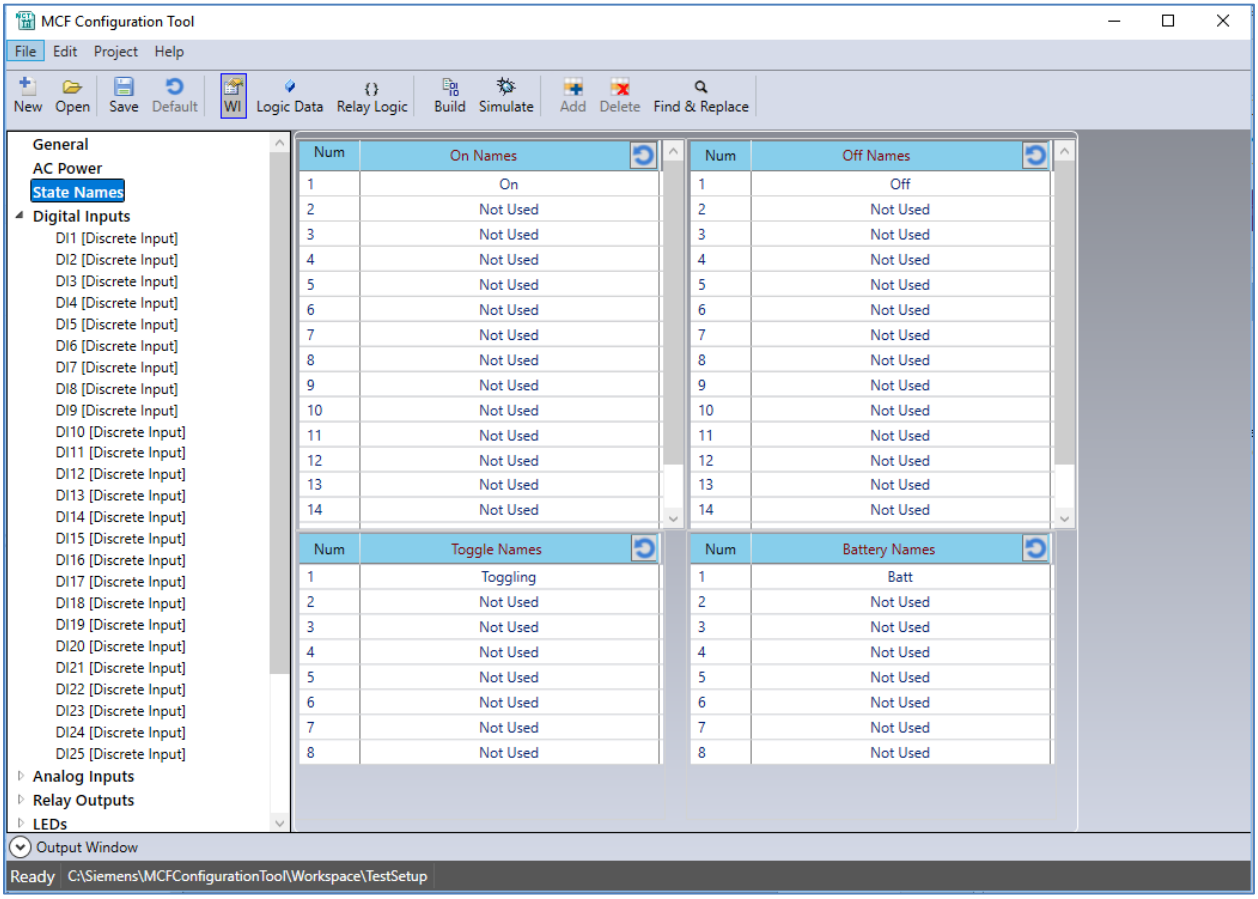


Figure 5-1 MCF Configuration Tool

An application engineer tailors the functionality of the WI by writing a Module Configuration File (MCF). The MCF includes configuration settings and the relay logic. The application engineer uses the MCT to create the MCF. The MCT presents screens to define the MCF configuration settings, configure timers and logic states, and write the logic using relay logic diagrams. For information regarding the MCF and the MCT, see manual ***SIG-00-16-05***.

5.2 WEB USER INTERFACE (WEB UI)

The field maintainer will connect a laptop computer to the Laptop Ethernet port to perform required maintenance or setup, upload software, and download reports. Office users may monitor the status of the WI remotely using the network port on the face of the WI. Office users can also reprogram and install software updates remotely with validation provided by on-site personnel.

5.3 LOGGING IN TO THE WEB UI

The WI Web UI supports the following web browsers:

- IE latest version
- Firefox latest version
- Chrome latest version

When a PC is connected to the WI's Laptop Ethernet port, the WI will automatically assign the connected computer an IP address using DHCP. If the WI is configured for secure web access, type https://192.168.255.81 in your web browser while connected to the Laptop Ethernet Port. The "s" at the end of "http" ensures the computer uses the secure version of HTTP. The browser may display the following screens regarding the connection.

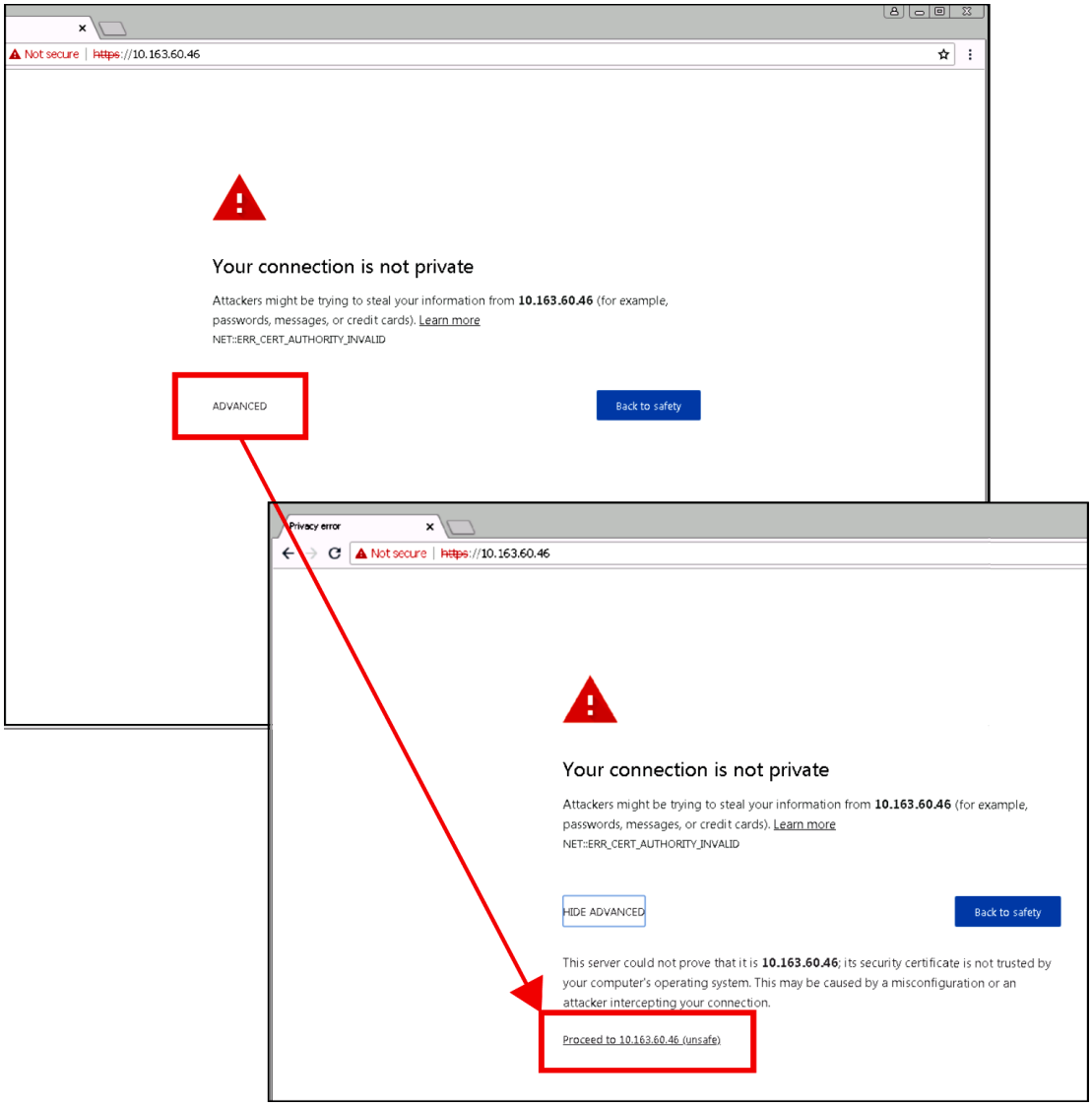


Figure 5-2 Connection Privacy Warning Screens

Click the **Advanced** option and select the option to proceed to the IP address. The Web UI will then appear. If the WI is not configured with secure access, the web browser user interface may be accessed using http://192.168.255.81.

The WI Web UI log in screen will now display and prompt the user to enter the password as shown in the following figure.

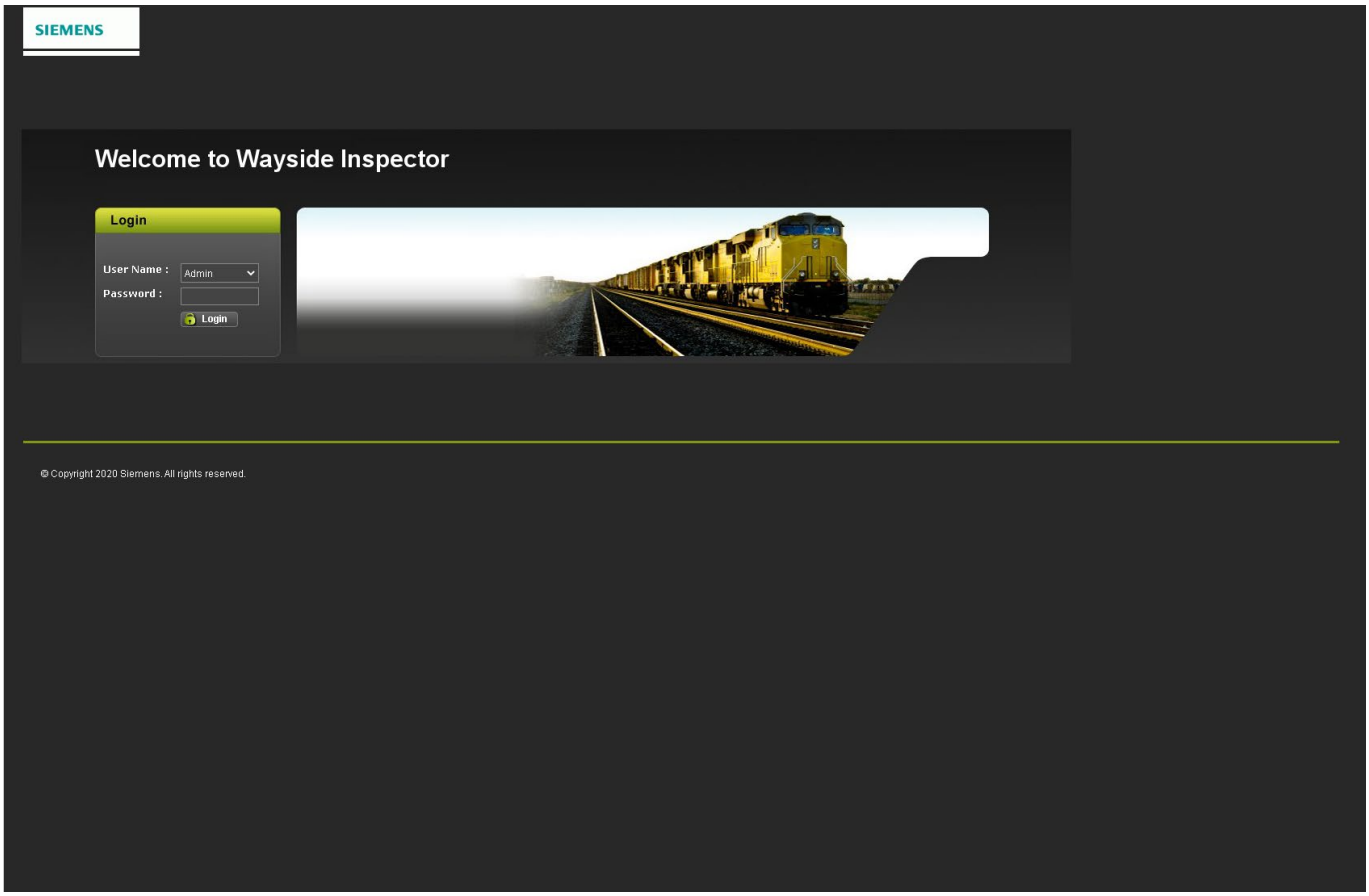


Figure 5-3 WI Web UI Login Screen

5.4 WEB UI OVERVIEW

The WI Web UI has six top level menu icons that contain all the sub-level menus needed to configure, calibrate, monitor status, download logs, upload software, and view alarms.

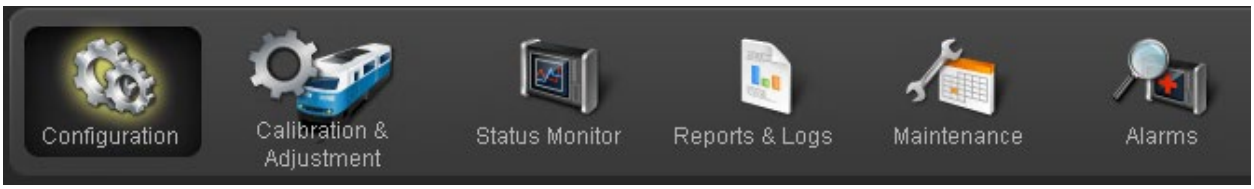


Figure 5-4 Web UI Menus

5.5 CONFIGURATION

The screens in the following section are found under the Configuration menu of the Web UI. This section provides information regarding each of the Web UI Configuration menu screens that are used to program the WI.

The MCF Configuration parameter values are set by the application engineer for each MCF. Field maintainers can neither create nor add values that do not already appear in pull down entry lists in the MCF Configuration section.

Field maintainers that modify the WI configuration settings must ensure the entries are in accordance with the railroad/agency's approved site drawings.

5.5.1 Site Configuration

For each WI setup, the unit must be uniquely configured for that site. This is done using the Site Configuration screen as shown below.

Figure 5-5 Site Configuration Screen

NOTE

NOTE

The field maintainer will ensure all parameter values set on-site conform to the values specified in the approved railroad/agency's site drawings.

The top-level Site Configuration screen allows the field maintainer to enter the following parameter's values:

- Site Name
- DOT Number
- Mile Post
- Time Zone
- ATCS Address

Table 5-1 Site Configuration Parameter Values

Parameter	Range	Default	Description
Site Name	20 characters	Inspection Site	The name of the site printed on reports and downloads.
DOT Number	7 characters	000000A	The DOT number assigned to the installation
Mile Post	20 characters	000.0	The mile post location of the installation.
Time Zone	Greenwich Mean Time (GMT), Eastern, Central, Mountain, Pacific, Alaska, Atlantic, Arizona (no DST), Newfoundland, Western Australia, Central Australia (no DST), Eastern Australia, Eastern Australia (no DST).	Eastern	The time zone of the installation.
ATCS Address	Type 7 ATCS address	7.620.100.100.03	The ATCS address of the installation.

5.5.2 MCF Configuration

The MCF Configuration menu opens the submenus shown in Figure 5-6. The exact MCF Configuration menus will vary based on the selections made when creating the MCF.

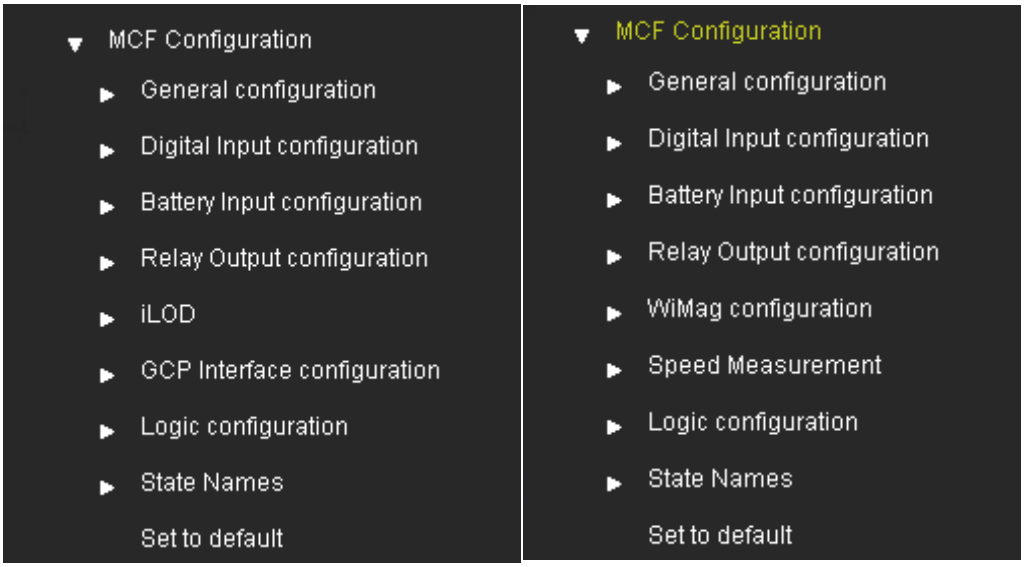


Figure 5-6 Example MCF Configuration Submenus

5.5.2.1 General Configuration

The General Configuration menu has two submenu screens:

- Maintainer On Site
- AC Power

Maintainer On Site

From this screen the user can set the amount of time the WI will stop sending alarms after a local maintainer has confirmed Maintainer On Site with the “On-Site Personnel” button on the front of the WI Unit.

Figure 5-7 Maintainer On Site Screen

Table 5-2 Maintainer On Site Parameter Values

Parameter Name	Range	Default	Description
Maintainer On Site Time	10 to 180 minutes	30 minutes	This value determines the length of time the WI will remain in Maintainer On Site mode when field personnel press the On-Site Personnel button.

AC Power

AC Power parameters, ranges and defaults are listed in Table 5-3.

Figure 5-8 AC Power Screen

Table 5-3 AC Power Parameter Values

Parameter Name	Range	Default	Description
AC Pwr Monitor Name	20 characters	ACPWR	Name used when logging state changes in the event log and included on the configuration report.
AC Pwr Monitor On Name	On state name list	On	Name used for the ON state when logging state changes in the event log. Name is selected from a user definable list of possible ON state names.
AC Pwr Monitor Off Name	Off state name list	Off	Name used for the OFF state when logging changes in the event log. Name is selected from a user definable list of possible OFF state names.
AC Pwr Monitor Off Debounce	0 to 60,000 ms	1000	Debounce timer to declare the input OFF. If the input is ON, the WI must not detect energy on the input for this period of time, continuously, before declaring it OFF.
AC Pwr Monitor On Debounce	0 to 60,000 ms	0	Debounce timer to declare the input ON. If the input is OFF, the WI must detect energy on the input for this period of time, continuously, before declaring it ON.
AC Pwr Control Name	20 characters	ACRLY	Name used when logging commanded state change in the event log and included on the configuration report.
AC Power Control On Name	On state name list	On	Name used for the ON state when logging state changes in the event log. Name is selected from a user definable list of possible ON state names.
AC Power Control Off Name	Off state name list	Off	Name used for the OFF state when logging changes in the event log. Name is selected from a user definable list of possible OFF state names.

NOTE

NOTE

The MCF may (optionally) lock the names of WI I/O to prevent field personnel from changing the channel names and state names of WI I/O.

5.5.2.2 Digital Input Configuration 1 - 25

The WI monitors the crossing using digital inputs. The user can set each digital input to operate in one of four modes: Not Used, Discrete, GFT, or MTSS.

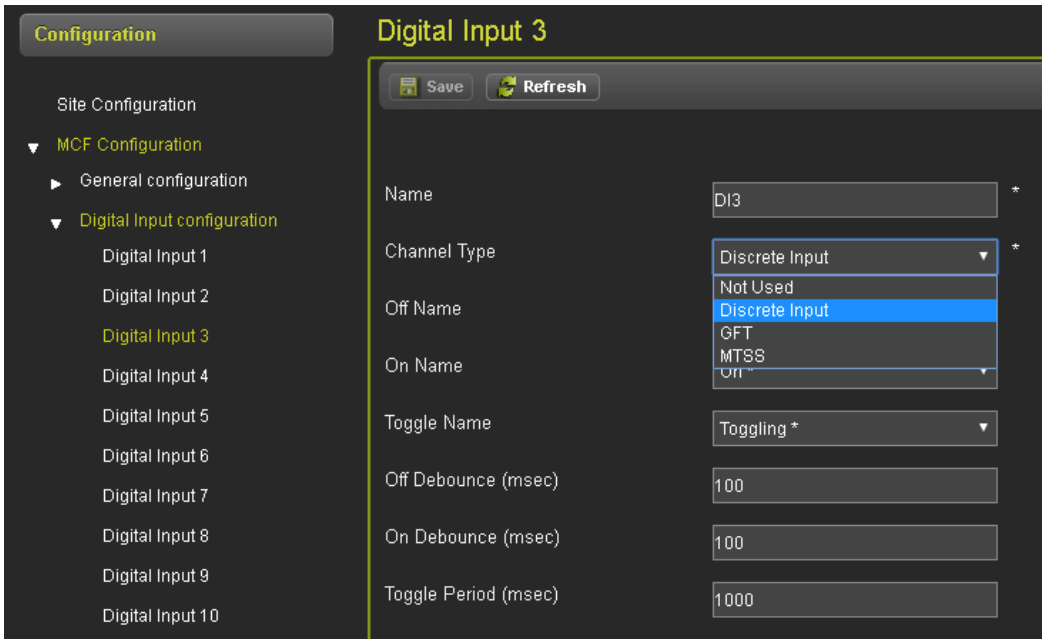


Figure 5-9 Digital Input Configuration Screen

There are 25 separate Digital Inputs. The MCF will contain the default values. Field personnel may modify the values if specified in the agency/railroad's approved site plans. Alternatively, the MCF may have some or all of the fields locked, thereby preventing changes to the channel name and state names of that channel.

Not Used Inputs

In some cases, the user may wish to ignore inputs without removing external wiring connected to that input. The user may set the input to "Not Used." In that case, the WI will not process the input or log events for that input.

Discrete Inputs

The WI considers discrete digital inputs to be in one of the following states: OFF, ON, or TOGGLING. When the software detects a state change, it adds an entry to the event log. The log entry includes the name of the input and a name for the state.

> For example, an input named “XR” with an OFF state name of “DOWN” and an ON state name of “UP would be logged as “XR DOWN” when the input turns off. The software would log “XR UP” when the input turned back on. The following is an example from an Event report:
>
> ```
> B85F  07-Apr-2016 13:42:50.35  DI     XR UP
> ```

The software determines the input’s state by sampling the input hardware. The inputs are de-bounced to prevent logging state changes caused by noise and to prevent application logic from acting on transient states. Before the software declares the input is ON, it must have consecutive energized samples for the on de-bounce time.

The software implements toggle detection to prevent filling up the log if external relays or equipment fails. When the software detects the input is toggling, it will log one single event rather than a long sequence of ON/OFF entries. If the software sees 4 or more changes on the input within the toggle period, it will declare the input as toggling.

The input state is available to the MCF for use in relay logic.

GFT Inputs

The WI can process the pulsed data signal used by the GFT. There are 4 bits of data sent by the GFT on the pulsed data signal: GFT Health (Good or Bad), GFT Mode (Normal or Test), Battery 1 Status (Fault/No Fault), Battery 2 Status (Fault/No Fault). The WI can also detect the “stuck low” and “stuck high” errors on the connection. The WI will log changes to each GFT status bit and the line status. Each status bit and the line status are available to the MCF for use in relay logic.

MTSS Inputs

The WI can process the pulsed data signal used by the MTSS. There are 5 bits of data sent by the MTSS on the pulsed data signal: Gate Up, Gate Down, Gate Level, Bell Power, and Bell Audio, each of which can be on or off.

The WI can also detect the “stuck low” and “stuck high” errors on the connection. The WI will log changes to each MTSS status bit and the line status. Each status bit and the line status are available to the MCF for use in relay logic.

Table 5-4 Digital Input Parameter Values

Parameter Name	Range	Default	Description
Name	20 characters	DI*xx*	Name used when logging state changes in the event log and included on the configuration report. This name is NOT used in the relay logic.
Channel Type	Discrete Input, GFT, MTSS, Not Used	Discrete Input	Selects the type of function the input used for. If Discrete Input, logs OFF, ON, or TOGGLE states. If GFT, the input is wired to an external Ground Fault Tester and individual ground fault states are logged. If MTSS the input is wired to an external MTSS and individual Mini Track Side Sensor states are logged. If Not Used, the input channel is ignored and nothing will be logged, regardless of physical changes on the input.
On Name	On state name list	On	Name used for the ON state when logging state changes in the event log. Name is selected from a user definable list of possible ON state names.
Off Name	Off state name list	Off	Name used for the OFF state when logging changes in the event log. Name is selected from a user definable list of possible OFF state names.
Toggle Name	Toggle state name list	Toggle	Name used for the TOGGLE state when logging changes in the event log. Name is selected from a user definable list of possible TOGGLE state names.
Toggle Period	0 to 60,000 ms	1000 ms	If an input changes state 4 or more times within the toggle period, the WI will record the input as “TOGGLING”.
Off Debounce	0 to 60,000 ms	100 ms	Debounce timer to declare the input OFF. If the input is ON, the WI must not detect energy on the input for this period of time, continuously, before declaring it OFF.
On Debounce	0 to 60,000 ms	100 ms	Debounce timer to declare the input ON. If the input is OFF, the WI must detect energy on the input for this period of time, continuously, before declaring it ON.

5.5.2.3 Battery Input Configuration

The WI monitors the battery banks at the crossing using the battery inputs. The software measures the voltage on the input by sampling the input every **Sample Period**. After sampling, the software averages the last **Average Count** samples to determine the voltage. If the voltage differs from the last logged voltage by the **Resolution** setting or greater, the software adds an entry to the Event log. The log entry includes the user-configured name of the battery bank and averaged voltage to the tenth of a volt. (e.g. OB 13.8V).

The software can compare the last logged voltage to up to 4 voltage thresholds. If the voltage is greater than or equal to the threshold, the software sets a logic state, which the MCF can use in relay logic.

Figure 5-10 Battery Input Configuration Screen

There are four separate Battery Inputs (Battery Input 1 – 3 and Power Input). If not preset in the MCF, the field maintainer will enter the values as specified in the Agency/Railroad's approved site diagram. Typically, the following values are entered: Name, Resolution (V), Sample Period (msec), Average Count, VThreshold 1 Use Field Cal Value, Voltage Threshold 1 (V), VThreshold 2 Use Field Cal Value, Voltage Threshold 2 (V), VThreshold 3 Use Field Cal Value, Voltage Threshold 3 (V), VThreshold 4 Use Field Cal Value, Voltage Threshold 4 (V). Alternatively, the MCF may have some or all of the fields locked, thereby preventing changes to the channel name and state names of that channel. Full details on each parameter can be found in Table 5-5.

Table 5-5 Battery Inputs Parameter Values

Parameter Name	Range	Default	Description
Name	20 characters	BATT*x*	Name used when logging state changes in the event log and included on the configuration report.
Resolution	0.1V to 36.0V	0.5V	Required change in voltage before the executive will log an entry.
Sample Period	100ms to 60,000ms	100ms	How often the executive will sample the input voltage.
Average Count	1 to 32	10	The number of consecutive samples the executive will average together to determine the input's voltage.
Voltage Threshold 1	0V to 36V	0V	If the last logged voltage is greater than or equal to this value, the executive will set the "Above Threshold 1" logic state for this battery channel.
Voltage Threshold 2	0V to 36V	0V	If the last logged voltage is greater than or equal to this value, the executive will set the "Above Threshold 2" logic state for this battery channel.
Voltage Threshold 3	0V to 36V	0V	If the last logged voltage is greater than or equal to this value, the executive will set the "Above Threshold 3" logic state for this battery channel.
Voltage Threshold 4	0V to 36V	0V	If the last logged voltage is greater than or equal to this value, the executive will set the "Above Threshold 4" logic state for this battery channel.

5.5.2.4 Relay Output Configuration

The WI commands the relay outputs to states as defined by the MCF. Like discrete digital inputs, each relay output has a: Name, Off Name, On Name and Toggle Name. When relay outputs are commanded to change state, the software adds an entry into the Event log showing the channel name and newly commanded state (e.g. TLITE FLASH).

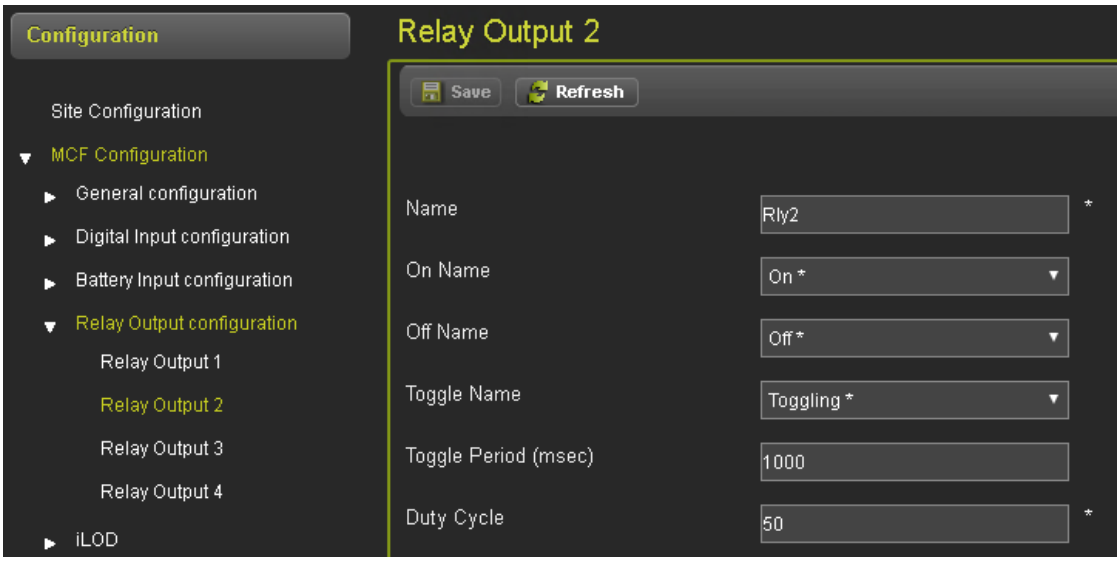


Figure 5-11 Relay Output Configuration Screen

The software automatically toggles the relay output at a user-programmable toggle rate and duty cycle when commanded to the Toggle state. The application engineer does not need to write MCF timer logic to turn the relay off and on.

There are four separate Relay Outputs. If not preset in the MCF, the field maintainer will enter the values as specified in the agency/railroad's approved site diagram. Typically, the following values are entered: Name, On Name, Off Name, Toggle Name, Toggle Period (msec), and Duty Cycle. Alternatively, the MCF may have some or all of the fields locked, thereby preventing changes to the channel name and state names of that channel.

Table 5-6 Relay Outputs Parameter Values

Parameter	Range	Default	Description
Name	20 characters	RLY*x*	Name used when logging state changes in the event log and included on the configuration report. This name is NOT used in the relay logic.
On Name	On state name list	On	Name used for the ON state when logging state changes in the event log. Name is selected from a user definable list of possible ON state names.
Off Name	Off state name list	Off	Name used for the OFF state when logging changes in the event log. Name is selected from a user definable list of possible OFF state names.
Toggle Name	Toggle state name list	Toggle	Name used for the TOGGLE state when logging changes in the event log. Name is selected from a user definable list of possible TOGGLE state names.
Toggle Period	100ms to 60,000ms	1000ms	If commanded to toggle, this is the period of time for each toggle cycle.
Duty Cycle	5% to 95%	50%	If commanded to toggle, the percentage of the toggle cycle for the relay output to be ON.

5.5.2.5 WiMag Configuration

WiMag General

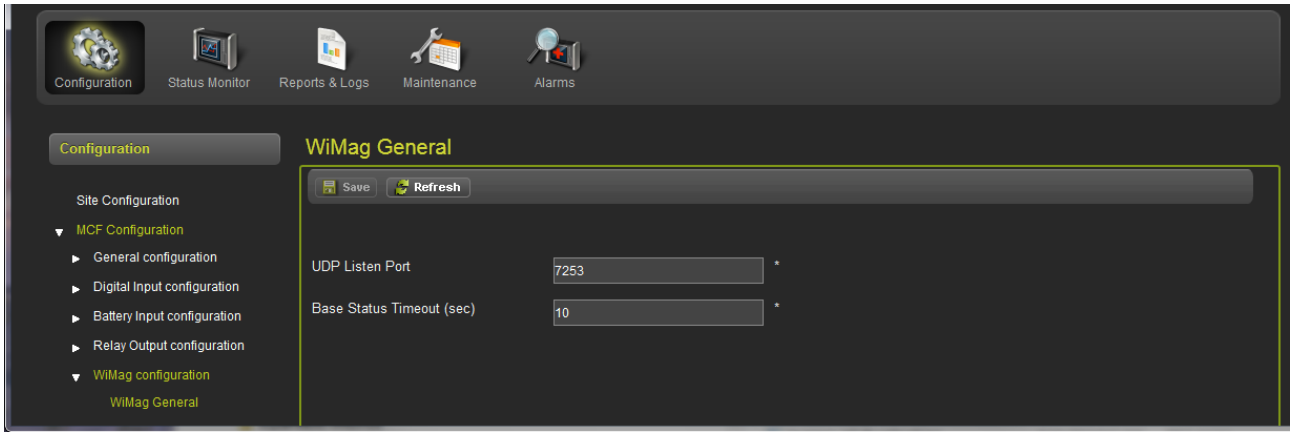


Figure 5-12 WiMag General Screen

The user may set the UDP port number and a timeout value for the Access Point messages. The timeout is used to report the health of the link with the Access Point.

The field maintainer will enter the values as specified in the agency/railroad's approved site diagram. Alternatively, the MCF may have some or all of the fields locked, thereby preventing changes to the channel name and state names of that channel.

Table 5-7 WiMag Base Parameter Values

Parameter Name	Range	Default	Description
UDP Listen Port	1 to 65535	7253	The UDP port the WI will listen on for WiMag sensor status messages.
Base Status Timeout	0s to 255s	10s	If the WI does not receive a status update from the WiMag base station in this amount of time, it will declare the link as failed.

Sensor "N" (1-20)

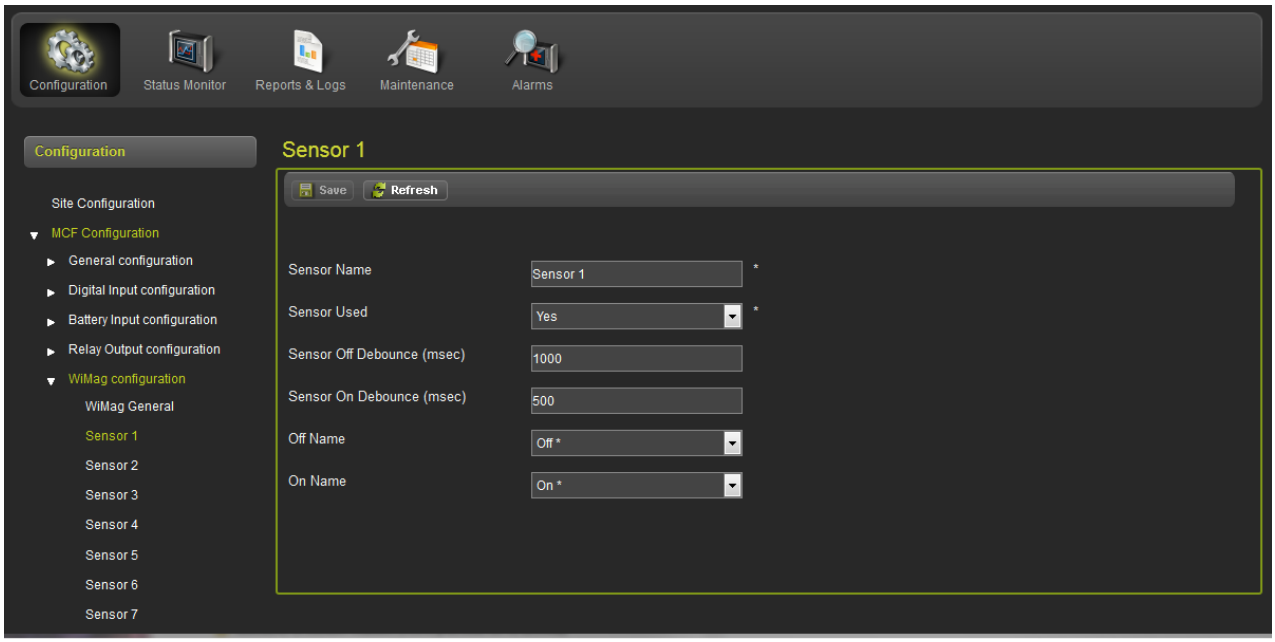


Figure 5-13 WiMag Sensor "N" Screen

There are up to 20 separate WiMag inputs. The field maintainer will enter the values as specified in the agency/railroad's approved site diagram.

The user can set a channel name, OFF name, and ON name for each sensor. The user can also set ON and OFF de-bounce values for each sensor (just like discrete digital inputs). These names are used when adding state change entries to the Event Log.

The WI can receive statuses from only 1 Access Point and at most 20 WiMag sensors.

The application engineer may use the “detected” and “error” statuses of each sensor and the “link OK” status of the Access Point in the MCF logic.

Table 5-8 WiMag Sensor Parameter Values

Parameter Name	Range	Default	Description
Senor Used	Yes or No	No	If set to Yes, the WI will expect status updates for this sensor.
Sensor Name	20 characters	Sensor *x*	The name used when logging state changes to the event log and on reports. *Only visible if Sensor Used is Yes.*
Sensor Off Debounce	0ms to 60,000ms	100ms	The sensor must report off for this length of time, continuously, before the WI will declare the status as OFF. *Only visible if Sensor Used is Yes.*
Sensor On Debounce	0ms to 60,000ms	500ms	The sensor must report on for this length of time, continuously, before the WI will declare the status as ON. *Only visible if Sensor Used is Yes.*
Off Name	Off state name list	OFF	The name used for the OFF state when logging state changes to the event log. *Only visible if Sensor Used is Yes.*
On Name	On state name list	ON	The name used for the ON state when logging state changes to the event log. *Only visible if Sensor Used is Yes.*

5.5.2.6 Speed Measurement 1

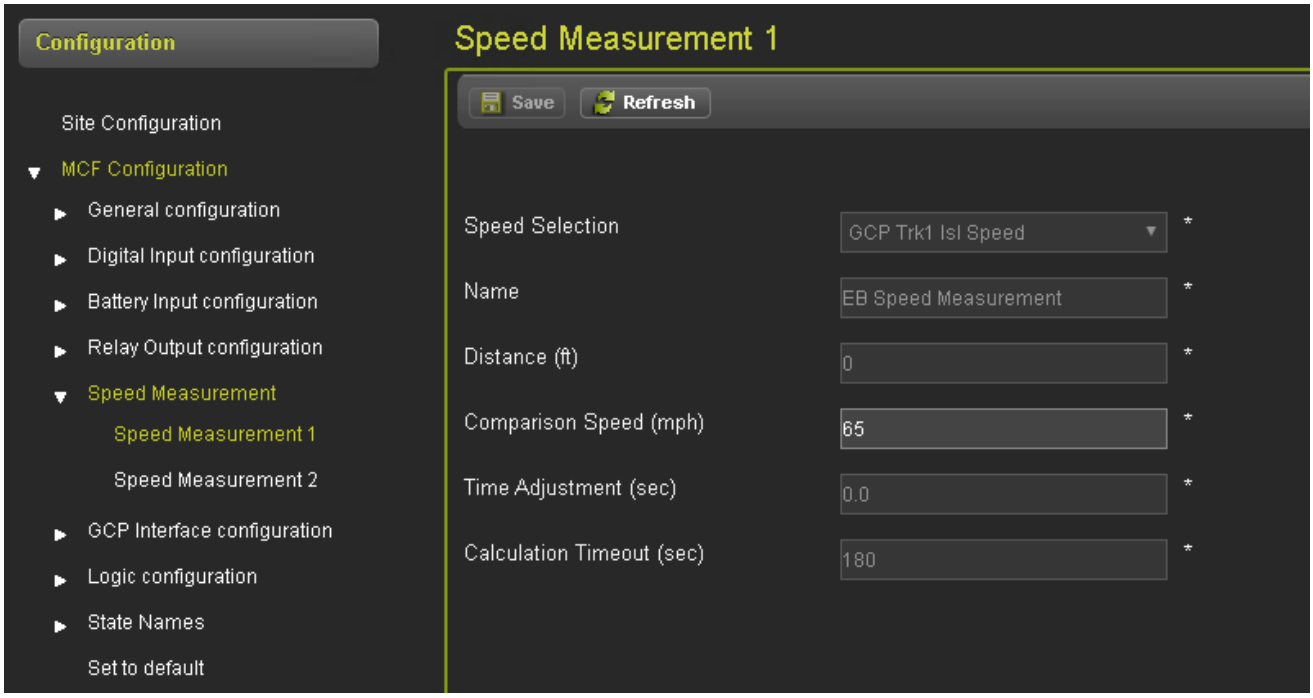


Figure 5-14 Speed Measurement Screen

To properly perform warning time tests, the WI must ensure the train was moving through the crossing at or near the maximum permissible speed for the route. The WI provides two methods to get train speed: calculate it or receive it from a GCP.

The executive software determines if the train speed is fast enough on behalf of the MCF. The MCF configuration data includes a “Speed Measurement Entry” for each speed the executive needs to check. The WI supports up to 64 entries.

At crossings using the Siemens GCP, the WI does not need to calculate the speed. The GCP can report the speed to the WI over a network. The Speed Measurement Entry will identify which island speed, reported from the GCP, to compare to the Comparison Speed. The executive will set the Speed Result logic state (and Result Ready) after the GCP reports the island speed (after the train has entered the island).

Table 5-9 Speed Measurement Parameter Values

Parameter	Range	Default	Description
Speed Selection	Calculate, GCP Trk 1 Isl Speed, - GCP Trk 6 Isl Speed	Calculate Speed	Selects the method of determining speed.
Name	0 - 20 characters	Speed Measurement	The name used for the speed measurement entry in logs and reports.
Distance (ft)	0 to 65535	Specified in MCF	Distance in feet between the two inputs used to calculate the speed. The speed is calculated by timing the changes between two inputs and using this distance value.
Comparison Speed	0 – 255 mph	Specified in MCF	The calculated speed or reported speed from the GCP must be greater than or equal to this value to set the "Speed Result" logic state.
Time Adjustment	-12.8 to 12.7 seconds	Specified in MCF	Time value used to adjust the speed calculation to account for de-bounce or other system delays. *Only relevant if Speed Selection is set to Calculate Speed.*
Calculation Timeout	0 to 65535 seconds	180 seconds	Time limit on a complete speed calculation. If both speed measurement inputs do not change state within this length of time, the speed calculation will be abandoned. *Only relevant if Speed Selection is set to Calculate Speed.*

5.5.2.7 iLOD Configuration

The WI receives current measurements from the Siemens A80271 iLOD and is able to communicate with a maximum of 4 concurrent iLOD units.

Each iLOD has three submenu screens:

- General
- Sensor 1
- Sensor 2

General

This screen is used to give the iLOD a unique name.

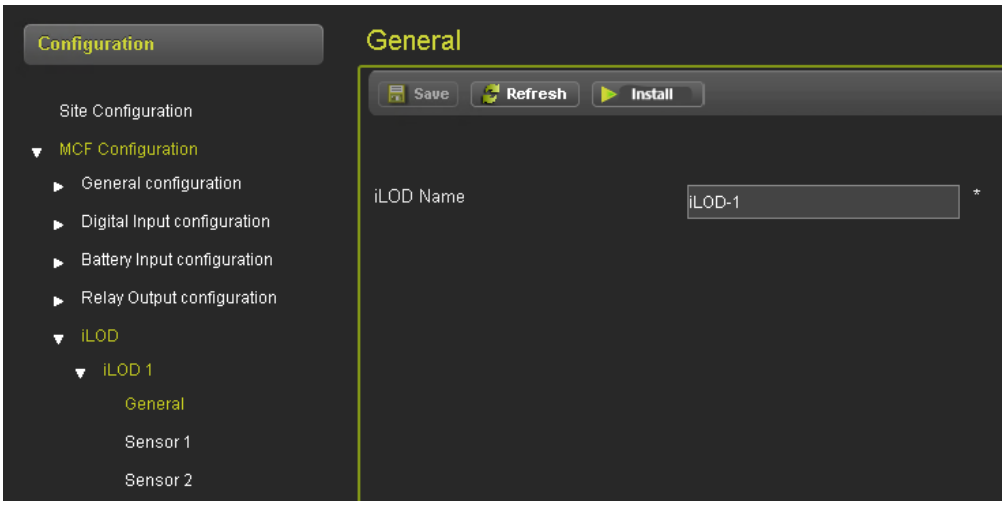


Figure 5-15 iLOD General Screen

Table 5-10 iLOD General Parameter Values

Parameter Name	Range	Default	Description
iLOD Name	0 - 20 characters	Specified in MCF	The name of the iLOD used when logging iLOD data to the event log.

Sensor 1 – 2

The sensor screens allow the user to configure the individual sensor parameters.

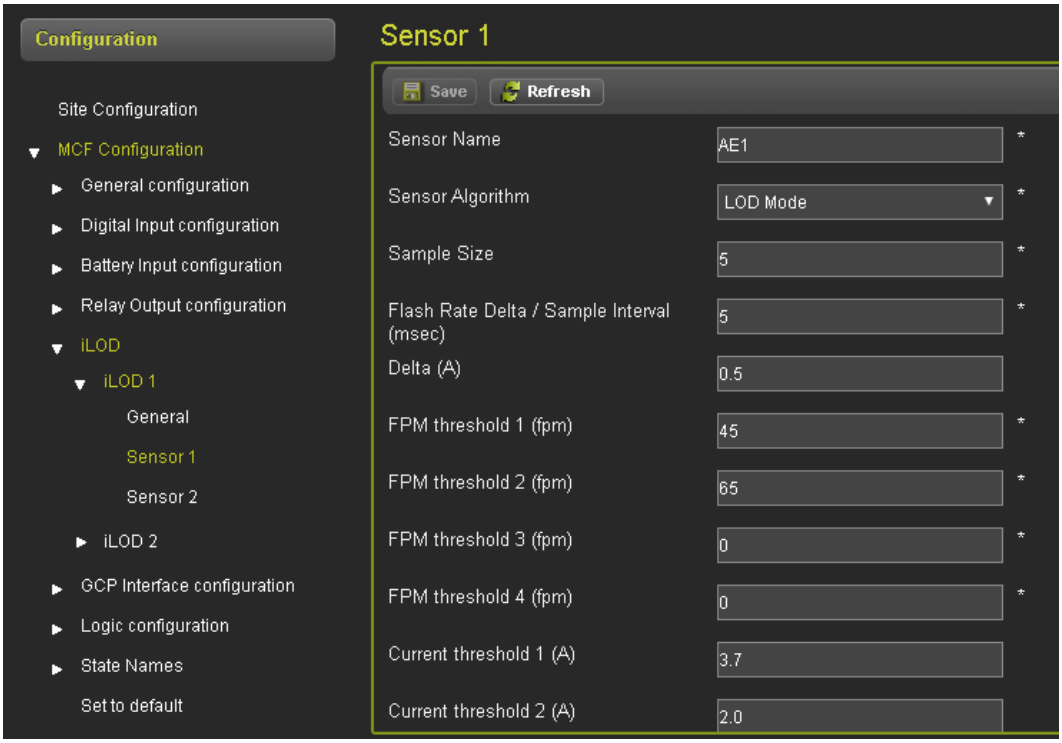


Figure 5-16 iLOD Sensor Screen

Table 5-11 iLOD Sensor Parameter Values

Parameter Name	Range	Default	Description
Sensor Name	0 - 12 characters	Specified in MCF	*X* is the iLOD number in the configuration (e.g. iLOD1 for the first iLOD, iLOD2 for the next, and so on) *Y* is either A or B, depending on which sensor is being configured.
Sensor Algorithm	LOD, Current	LOD Mode	Unused, LOD Mode, Steady Current Mode
Sample Size	5 to 32	16	If the selected sensor algorithm is “LOD Mode,” this parameter is not used. If the selected sensor algorithm is “Steady Current Mode” this parameter specifies the number of samples to average together to determine the measured current.
Flash Rate Delta / Sample Interval	10 to 200 ms	10	If the selected sensor algorithm is “LOD Mode,” this parameter specifies the change in the measured flash rate necessary to trigger a new flash rate event from the iLOD. If the selected sensor algorithm is “Steady Current Mode” this parameter specifies how often the iLOD should sample the current being measured.
Delta (A)	0.0 to 9.9 amps	0.5	Specifies the change in measured current necessary to trigger a new current measurement event from the iLOD.
FPM threshold 1 - 4	0 to 255 f/m	0	Specifies threshold values to trigger logic state changes in the MCF logic. If the reported flash rate for this sensor is greater than or equal to the threshold value, the executive software will set the corresponding logic state input to the MCF to TRUE.
Current threshold 1 - 4	0.0 to 30.0 amps	0	Specifies the threshold values to trigger logic state changes in the MCF logic. If the reported current for this sensor is greater than or equal to the threshold value, the executive software will set the corresponding logic state input to the MCF to TRUE.

iLOD Echelon Network Installation Procedure

Before the iLODs can report currents and flash rates to the WI, the iLODs must be “installed” on the Echelon network. The procedure to install them on the network must be followed for each iLOD.

Each iLOD is installed on the Echelon network by clicking the “Install” button on web browser user interface as shown in Figure 5-17. Navigate to the Configuration > MCF Configuration > iLOD > iLOD 1 > General page and follow the instructions to press the small “Echelon Service Button” on the side of the iLOD.

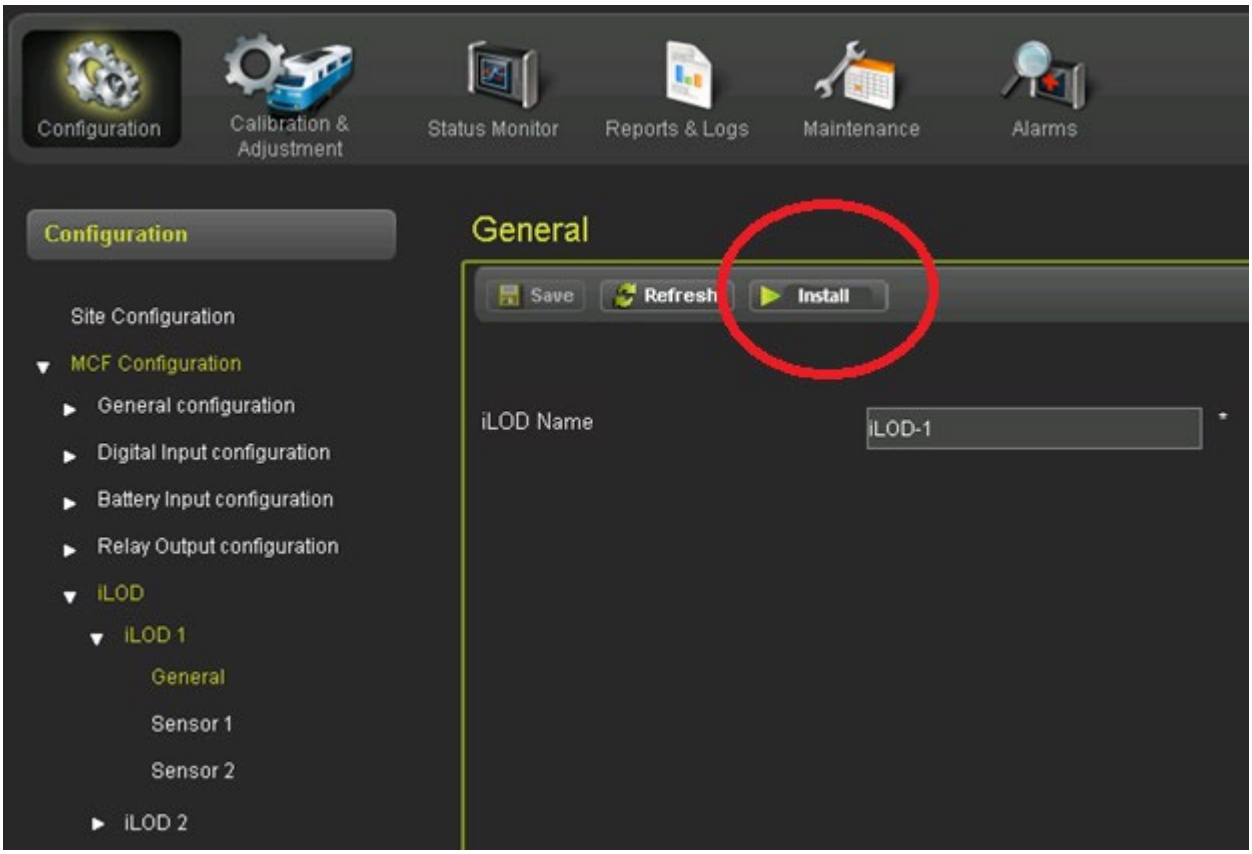


Figure 5-17 iLOD Install Button

5.5.2.8 GCP Interface Configuration

The WI can receive I/O statuses and configuration data from GCP 4000, GCP 5000, and GCP 3000+ over a network. The I/O statuses and the configuration data status are available to the MCF logic, which eliminates the need to wire physical inputs for many of the statuses. The connection configuration of the WI to the GCP is shown in Figure 5-18.

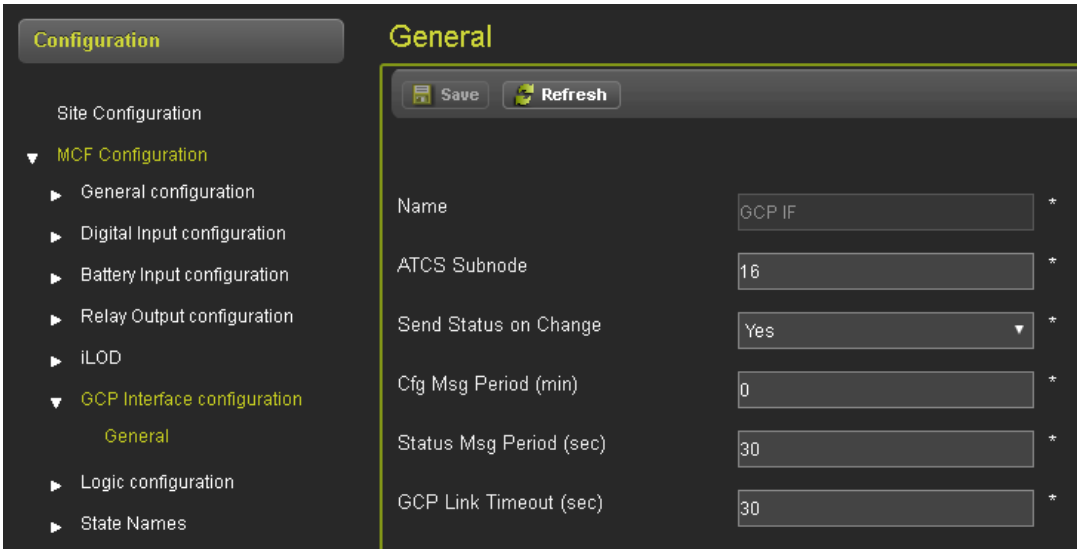


Figure 5-18 GCP Interface Configuration General Screen

The WI monitors the health of the link with the GCP. If the WI stops receiving status messages from the GCP, it will set the link to unhealthy. The application engineer can set the timeout for the GCP messages in the MCF. The link health is available to the MCF logic as an input logic state.

The WI receives the status of GCP I/O, such as XR, ISL, etc., which the executive makes available as input logic states to the MCF. Since the GCP is highly configurable, not all I/O status are relevant in all conditions. The GCP reports the I/O items used in its current configuration. The executive software also makes the "used" statuses available to the MCF logic as input logic states. See the ***Wayside Inspector MCF Configuration Tool Application Guidelines, SIG-00-16-05*** for all the logic states available to the MCF.

The WI will also log changes in the I/O and configuration statuses, as reported from the GCP, into the Event Log using the configured function name for that status.

Table 5-12 GCP Interface Configuration General Parameter Values

Parameter Name	Range	Default	Description
Name	20 characters	GCP IF	Name used for the GCP interface in logs and reports.
ATCS Subnode	0 to 99	16	The ATCS subnode of the GCP, which is required to have the same railroad, line, and group addresses as the WI.
Send Status on Change	Yes or No	Yes	If Yes, the GCP will send status changes on change of state.
Cfg Msg Period	0 to 60 minutes	0 minutes	Time period between configuration messages. If 0, the GCP will send configuration messages only on initiate of the link and on configuration data changes.
Status Msg Period	0 to 300 seconds	30 seconds	Period of status messages. If 0, the GCP will not send periodic status messages.
GCP Link Timeout	10 to 600 seconds	30 seconds	If the WI does not receive messages from the GCP for this length of time, it will declare the link as failed.

5.5.2.9 Logic Configuration

Properties

Properties are field programmable options within the MCF, created by the application engineer. The user can set or clear a property from a menu. Properties provide a logic state, which the application engineer may use in the relay logic. Properties allow the MCF to change behavior based on field personnel input on the Web UI.

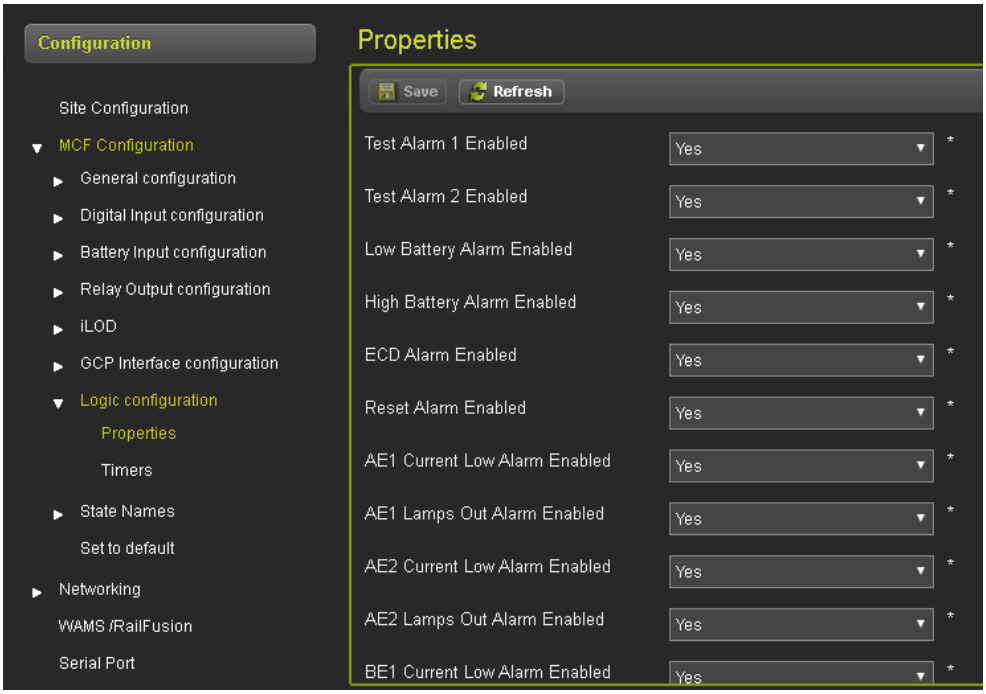


Figure 5-19 Logic Configuration: Properties Screen

NOTE

NOTE

Properties are defined by the MCF. See documentation specific to the MCF for details.

Timers

The WI supports timer relay coils in the relay logic. Each timer has a single logic state to start/run the timer and a single logic state indicating if the timer has expired or not. The application engineer creates a timer within the MCT on the “Logic Data” page.

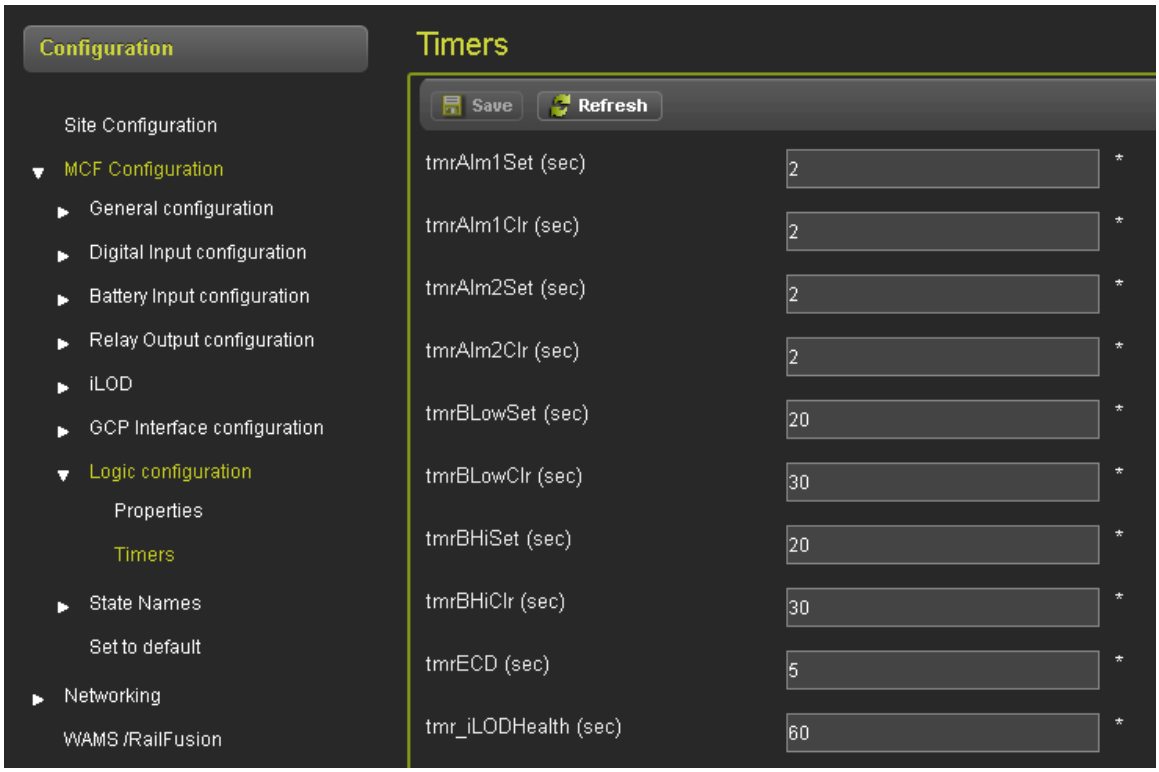


Figure 5-20 Logic Configuration: Timers Screen

NOTE

NOTE

Timers are defined by the MCF. See documentation specific to the MCF for details.

5.5.2.10 State Names

There are 16 possible values for the states On / Off. There are eight possible Toggle Names and Battery Names. Typically, the state names, toggle names, and battery names are provided by the MCF and do not need to change. However, they can be edited here if necessary. The MCF may also lock these fields, thereby preventing changes.

On Names

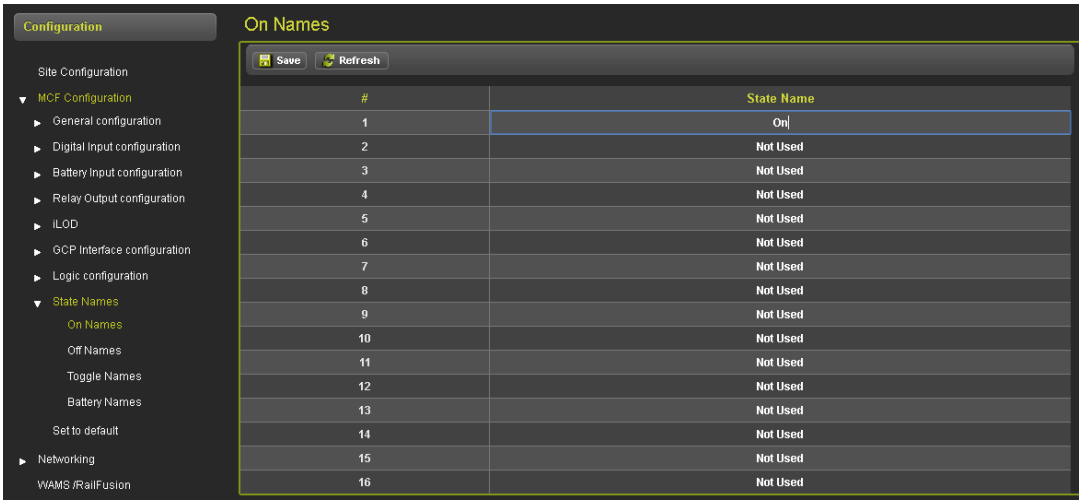


Figure 5-21 State “On” Names Screen

Table 5-13 State “On” Names Parameter Values

Parameter Name	Range	Default	Description
On Names	1 to 12 Characters	Not Used	List of names available to choose from when configuring the “On Names” for inputs and outputs that support discrete states.

Off Names

Figure 5-22 State "Off" Names Screen

Table 5-14 State "Off" Names Parameter Values

Parameter Name	Range	Default	Description
Off Names	1 to 12 Characters	Not Used	List of names available to choose from when configuring the "Off Names" for inputs and outputs that support discrete states.

Toggle Names

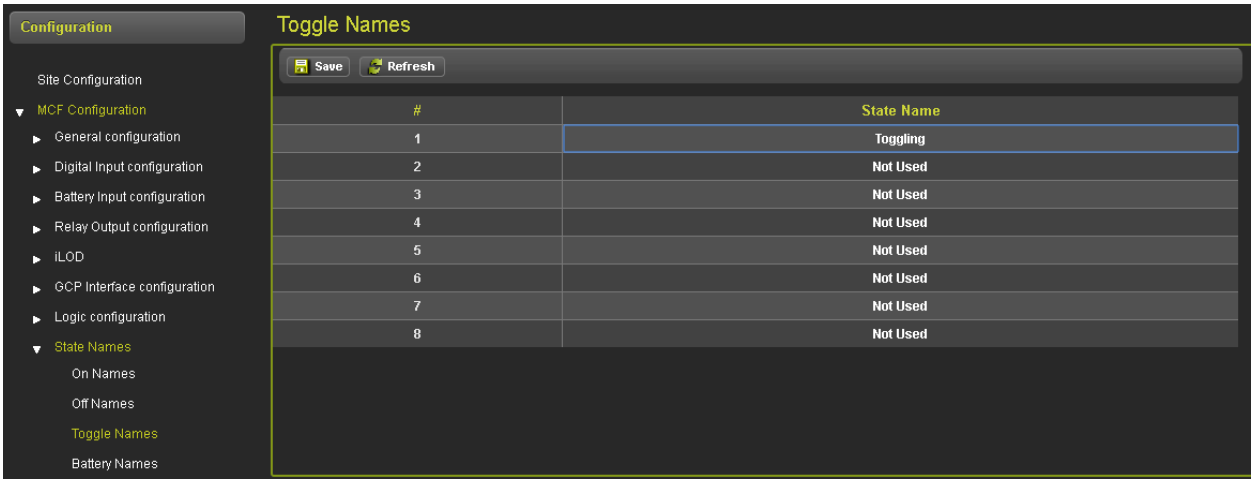


Figure 5-23 State “Toggle” Names Screen

Table 5-15 State “Toggle” Names Parameter Values

Parameter Name	Range	Default	Description
Toggle Names	1 to 12 Characters	Not Used	List of names available to choose from when configuring the “Toggle Names” for inputs and outputs that support discrete states.

Battery Names

Figure 5-24 State “Battery” Names Screen

Table 5-16 State “Battery” Names Parameter Values

Parameter Name	Range	Default	Description
Battery Names	1 to 12 Characters	Not Used	List of names available to choose from when configuring the “Battery Names” for GFT input channels.

5.5.2.11 Set to Default

Figure 5-25 MCF Configuration Set to Default Screen

Selecting the Set to Default button will return all entries in the MCF Configuration portion of the Configuration Tab menu back to the MCF Default. Selecting this button does not affect parameter values set in the Site Configuration, Networking, Log Setup, ATCS Message Routing, and Time Management portions of Configuration Tab menu.

5.5.3 Networking

5.5.3.1 Comms Interface

The Comms Ethernet interface can be configured on the screen shown in Figure 5-26. Table 5-17 describes each configurable parameter and the available options.

Figure 5-26 Networking: Comms Interface Screen

Table 5-17 Networking: Comms Interface Parameter Values

Parameter Name	Range	Default	Description
DHCP Mode	Disabled or Client	Disabled	If set to Client, the WI will request the network settings using the DHCP protocol. If set to Disabled, the interface uses static settings.
IP Address	IPv4 Address	192.168.2.100	The IPv4 address of the Network Ethernet interface. *Only visible if DHCP Mode is Disabled.*
Network Mask	IPv4 Address	255.255.255.0	The network mask of the Network Ethernet interface. *Only visible if DHCP Mode is Disabled.*
Default Gateway	IPv4 Address or Blank	Blank	The default gateway of the Network Ethernet interface. Leaving the field blank means no default gateway used. *Only visible if DHCP Mode is Disabled.*

5.5.3.2 Domain Name System

The WI may resolve symbolic names to IP addresses using the domain name system. The WI has two configurable name server IP addresses.

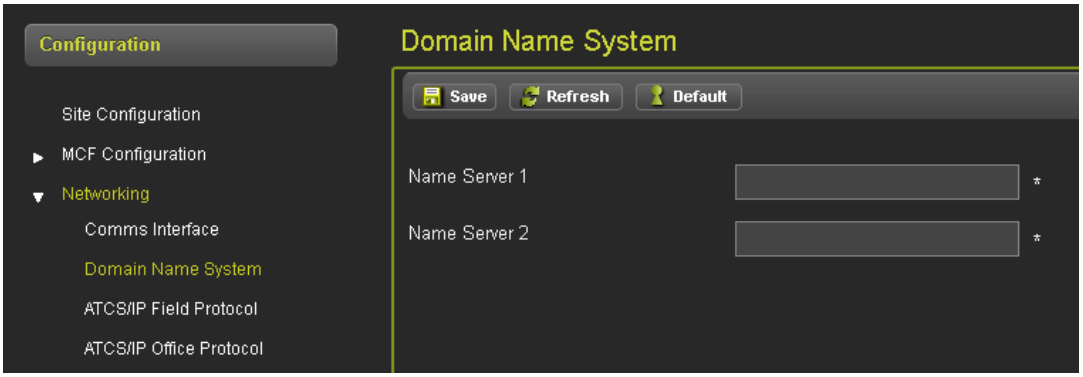


Figure 5-27 Networking: Domain Name System Screen

Table 5-18 Networking: Domain Name System Parameter Values

Parameter Name	Range	Default	Description
Name Server 1	IPv4 Address or Blank	Blank	IP address of the primary name server for use with name resolution.
Name Server 2	IPv4 Address or Blank	Blank	IP address of the secondary name server for use with name resolution.

5.5.3.3 ATCS/IP Field Protocol

The ATCS/IP Field Protocol is used for communication between the WI and other equipment installed at the location on the local network. It is used to communicate with the GCP 4000/5000/3000+ and Echelon devices connected through a WAG.

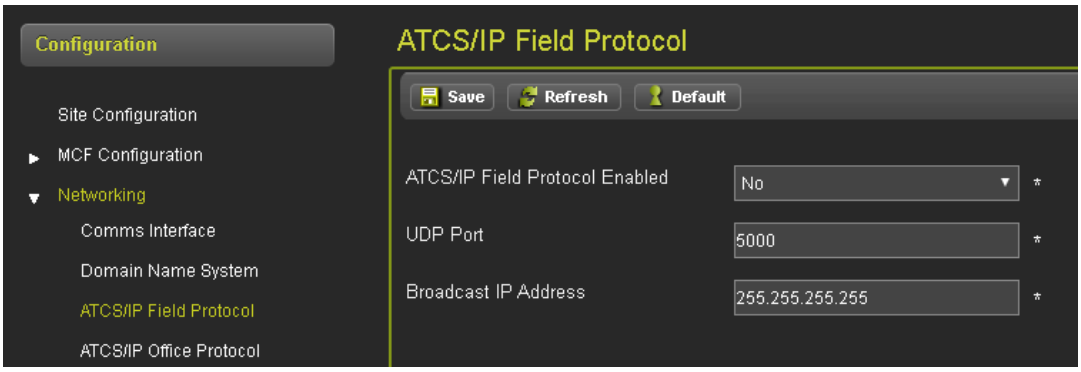


Figure 5-28 Networking: ATCS/IP Field Protocol Screen

Table 5-19 Networking: ATCS/IP Field Protocol Parameter Values

Parameter Name	Range	Default	Description
ATCS/IP Field Protocol Enabled	Yes or No	No	If set to Yes, enables the ATCS/IP Field Protocol, which is used for communication to other ATCS systems installed on a network, such as the Siemens GCP.
UDP Port	1024 to 65535	5000	The UDP port to use for the ATCS messages.
Broadcast IP Address	IPv4 Address	255.255. 255.255	The WI will send ATCS packets to this address if it has not yet discovered the IP address associated with the ATCS destination address.

5.5.3.4 ATCS/IP Office Protocol

The WI uses the ATCS/IP Office protocol to communicate with the back-office alarm management and monitoring system.

The Circuit ID is in the format of LLL.P.OO. (Line number, Port number, and Poll number). The Circuit ID is used by the OCG or packet switch to uniquely identify the field location.

The WI provides two configurable Routing Region IP Addresses. These are the IP addresses where route requests for the unit are sent. By default, the Routing Region IP addresses should not be enabled. The Web UI allows the user to configure the Routing Regions using symbolic names.

The Wayside inspector uses the first Routing Region address as a primary address for route requests and uses the second address if the first is not available. The WI has a configurable OCG Port number (UDP Port). The UDP Port number is used in the destination of route requests and route update messages. The UDP Port number defaults to 5361.

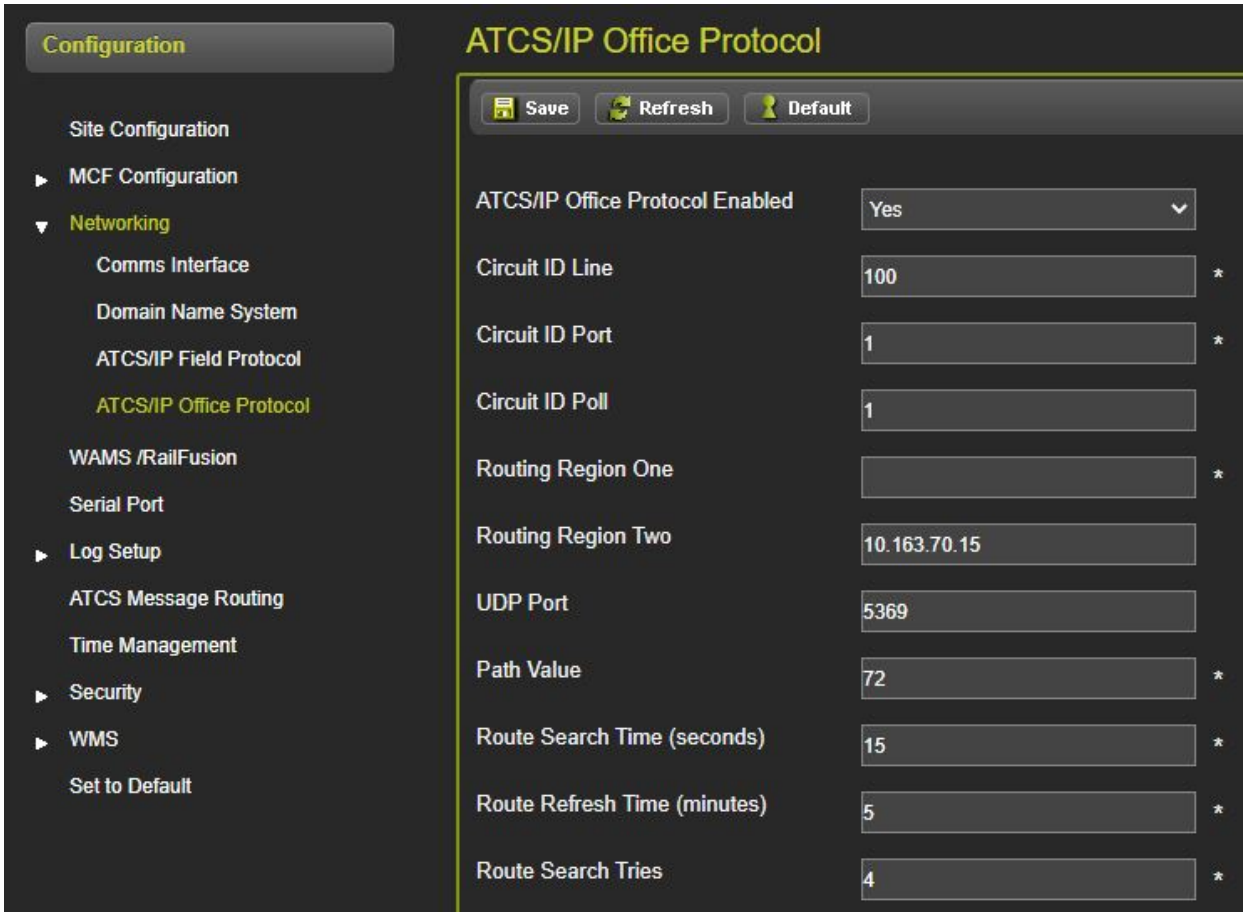


Figure 5-29 Networking: ATCS/IP Office Protocol Screen

Table 5-20 Networking: ATCS/IP Office Protocol Parameter Values

Parameter	Range	Default	Description
ATCS/IP Office Protocol Enabled	Yes or No	No	If set to Yes, enables the ATCS/IP Office network protocol.
Circuit ID Line	0 - 999	100	The circuit ID, or base ID, of every IP base belonging to this HUB is manually entered here along with its IP address. The circuit ID is an assigned 16-bit value that is used as a unique tag for each WI.
Circuit ID Port	0 - 2	1	
Circuit ID Poll	0 - 15	00	
Routing Region One	0.0.0.0 - 255.255.255.255 or Symbolic Name	Blank	This can be either a subnet broadcast or unicast IP address associated with office OCG or packet switch.
Routing Region Two	0.0.0.0 - 255.255.255.255 or Symbolic Name	Blank	This can be either a subnet broadcast or unicast IP address associated with office OCG or packet switch. The user may leave this field blank if it is not used.
UDP Port	0 - 65535	5361	Specifies the UDP port number used to send and receive messages.
Path Value	0 - 255	72	This is information used by packet switch/OCG to specify inbound path options such as main/standby, field device operation, etc.
Route Search Time	0 - 65535 seconds	15 Seconds	Route request is sent per this time interval until a route update response is received.
Route Refresh Time	0 - 65535 Minutes	5 Minutes	Once a route update response is received, a route request is periodically sent per this time interval to refresh the route table.
Route Search Tries	0 - 255	4	The number of times the WI will retry a route search if a response is not received.

5.5.4 WAMS/RailFusion

The WI communicates with WAMS using ATCS messages, which are exchanged with the back-office over one of the layer 2 protocol options (typically, the ATCS/IP Office protocol over a network).

Figure 5-30 WAMS/RailFusion Screen

Table 5-21 WAMS/RailFusion Parameter Values

Parameter Name	Range	Default	Description
WAMS/RailFusion Messaging Enabled	Yes, No	No	Setting that allows the WI to interface with WAMS and RailFusion systems.
ATCS Address	2.000.00.0000 to 2.999.99.9999	2.620.01.9100	The WI will set the destination ATCS address of packets sent to WAMS/RailFusion to this value.
Alarm Retry Time (sec)	0 to 65535 seconds	75	If an alarm is not acknowledged, the WI will try sending the alarm again after the specified number of seconds have passed. A value of 0 means alarms will not be retried.
ATCS Msg Labels	Use WI Labels, Use SEAR Labels	Use WI Labels	Selects the ATCS message label value the WI will use in communication. The user should select “Use SEAR Labels” if using the WI in place of a SEAR and the office system software has not yet been updated to use the newer WI labels.

5.5.5 Serial Port

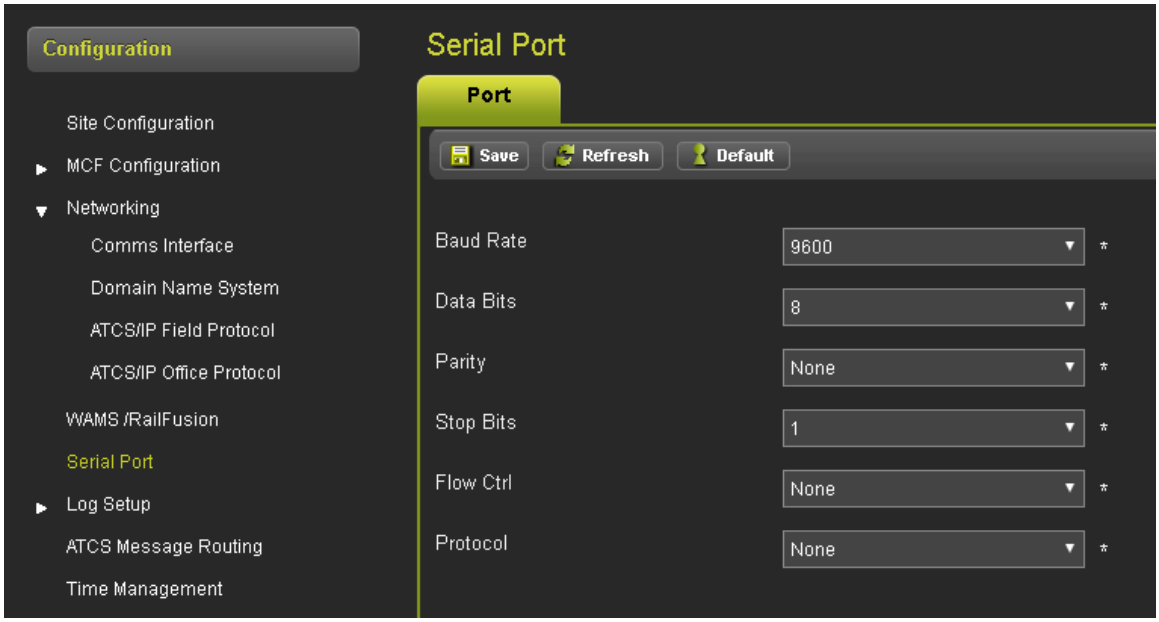


Figure 5-31 Serial Port Screen

Table 5-22 Serial Port Parameter Values

Parameter Name	Range	Default	Description
Baud Rate	1200 - 115200	9600	Sets the serial port's baud rate in bits per second.
Data Bits	7, 8	8	Sets the number of data bits to use in each character transmitted.
Parity	None, Odd, Even	None	Sets the parity bit mode.
Stop Bits	1, 2	1	Sets the number of stop bits to use in each character transmitted.
Flow Ctrl	None, Hardware, Radio/Modem	None	Select the flow control method to use for the serial port. "Hardware" selects the typical CTS/RTS handshake method. "Radio/Modem" is not currently supported.
Protocol	None, Gen/ATCS Field, Genisys Field, GCP 3000	None	Currently, the WI only supports the GCP 3000 protocol. If "GCP 3000" is selected, the WI will poll an external legacy 3000 Grade Crossing Predictor for its configuration and event information. Refer to the following subsection for further information on WI connection to a legacy 3000 GCP. Support for the "Gen/ATCS Field" protocol and the "Genisys Field" protocol may be added in a future release.

5.5.5.1 WI Connection to a Legacy 3000 GCP

The user can view and download legacy 3000 GCP logs and configuration reports from the WI web-browser user interface.

The WI's Comms serial port must be connected to the J1 DB 25 recorder port of the 3000 GCP. The legacy 3000 GCP system must have the 80115 recorder module installed, and switch SW1 on the 80115 recorder card must be set to the PRINT position, to make the serial interface available to the WI. A DB25 to DB9 cable with a null modem adapter is required to connect the 3000 GCP to the WI.

The user must configure the WI Comms serial port with the GCP 3000 serial protocol and set the "Log Extract Time (Hours)" for how often the WI will request the data from the GCP 3000. This is shown in the following figure.

Figure 5-32 Serial Port Screen Configuration for GCP 3000

The WI issues the “I” command and the “A” command to the GCP 3000 to receive the configuration and logs per the number of hours set in the “Log Extract Time (Hours)” field. The information is stored in internal memory.

The user can view and download the GCP 3000 log and configuration information from the web browser user interface by going to the Reports & Logs menu, selecting “GCP 3000”, and then selecting either “Configuration Report” or “Event Log” as shown in the following figure.

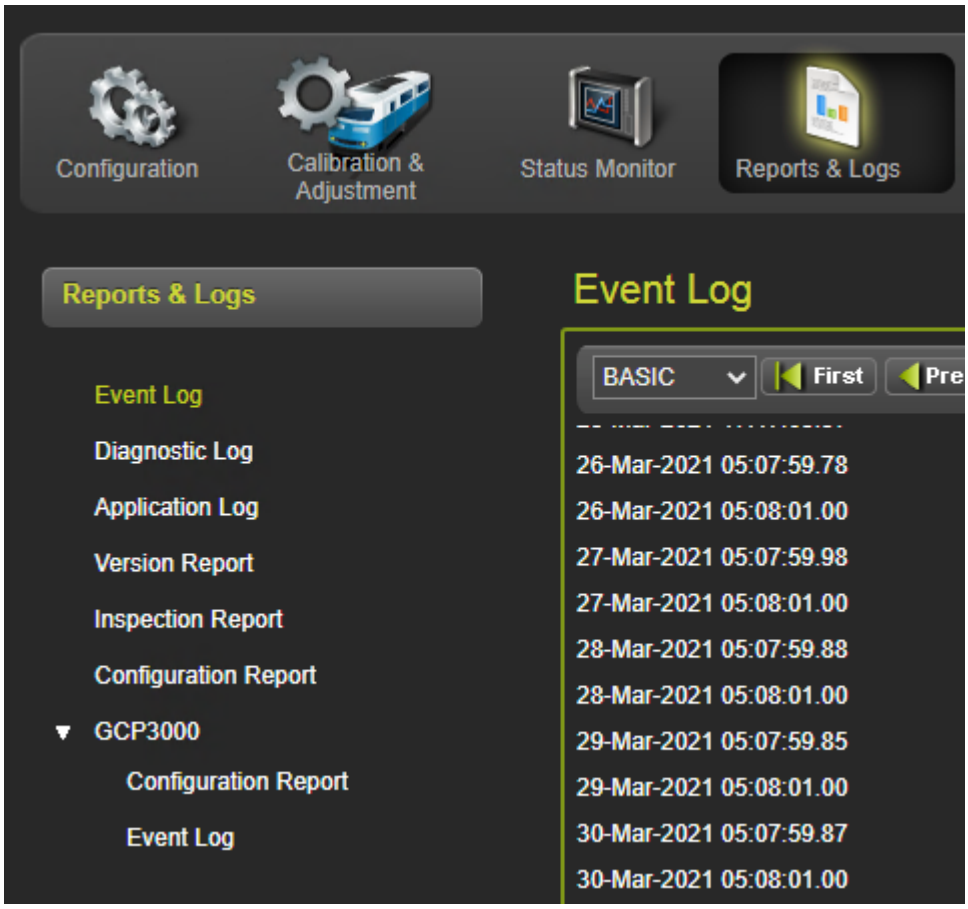


Figure 5-33 Accessing Reports and Logs for GCP 3000

The user can view the Configuration Report and Event Log in the web browser. The user may also download the Configuration Report and Event Log to their PC from these screens.

5.5.6 Log Setup

5.5.6.1 Diagnostic Logging

The user may enable or disable logging of message traffic into the diagnostic log. Typically, the message traffic logging will be used by Siemens personnel to troubleshoot communications issues. The diagnostic logging options are set on the screen shown in Figure 5-34 and described in Table 5-23.

Figure 5-34 Log Setup: Diagnostic Logging Screen

Table 5-23 Log Setup: Diagnostic Logging Parameter Values

Parameter Name	Range	Default	Description
Diagnostic Log Verbosity	Error, Warning, Info, Debug	Info	Sets the level of diagnostic entries to include in the diagnostic log. The selected level includes all entries at that level and lower (e.g. Info includes all Error, Warning, and Info entries in the diagnostic log).
WAMS/RailFusion Message Logging Enabled	Yes or No	No	Enables logging of WAMS/RailFusion messages sent and received by the WI into the WI's diagnostic log.
Routing Logging Enabled	Yes or No	No	Enables logging of the internal ATCS message router functionality, which shows ATCS messages and their contents (starting with ATCS layer 3 header) in the diagnostic log.
Comms Serial Logging Enabled	Yes or No	No	Future Feature.
Network Protocol Logging Enabled	Yes or No	No	Enables logging of any enabled network protocol, such as ATCS/IP Field. The diagnostic log will include entries showing the sent and received message data, including the network protocol specific headers.
Digi Protocol Logging Enabled	Yes or No	No	Enables logging of the Siemens Digitalization Protocol messaging to the diagnostic log.

5.5.7 ATCS Message Routing

The WI contains an internal ATCS message router. The timeout for ATCS routes can be set on the screen shown in Figure 5-35.

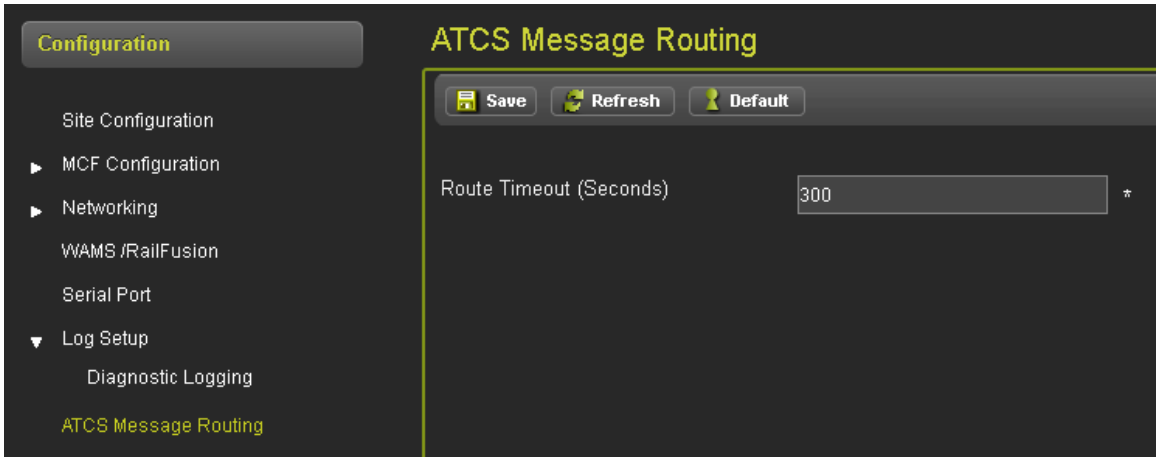


Figure 5-35 ATCS Message Routing Screen

Table 5-24 ATCS Message Routing Parameter Values

Parameter Name	Range	Default	Description
Route Timeout	0 to 172,800 seconds	300 seconds	The length of time, in seconds, the WI will hold the ATCS route information for a discovered device before discarding it. A value of 0 means entries will never time out.

5.5.8 Time Management

The WI may use several sources for time. Currently, the WI only supports the “Manual Only” time source, which allows users to set the time from the web UI and send time updates on an active back-office interface.

Figure 5-36 Time Management Screen

Table 5-25 Time Management Parameter Values

Parameter Name	Range	Default	Description
Time Source	Manual Only	Manual Only	The Manual Only is currently the only supported option. The user can set the time from the web browser user interface and the WI will set the time when a message is received on the WAMS interface or the Digitalization Interface.
Minimum Time Difference	0 – 60 sec	2	Minimum amount of time difference between reference time and machine time before the WI will set the time from the time source.

5.5.9 Security

The Security tab has two sub-menus:

- Password
- Web UI Configuration

5.5.9.1 Password

In the password sub-menu, the web UI login password and the session inactivity timeout for a logic can be changed, as shown in Figure 5-37.

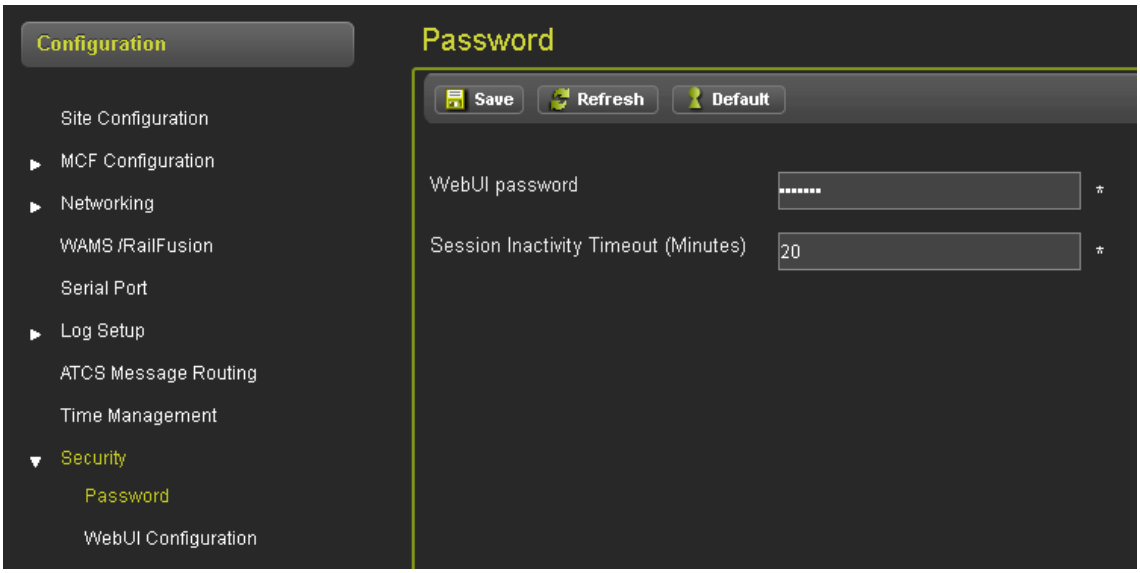


Figure 5-37 Password Screen

Table 5-26 Password Parameter Values

Parameter Name	Range	Default	Description
WebUI password	20 characters	Siemens	Sets the password the user must enter to access the web browser UI.
Session Inactivity Timeout	5 to 60 Minutes	20 minutes	The number of minutes of inactivity before the WI will automatically log out a connected user from the web browser UI.

5.5.9.2 Web UI Configuration

In the Web UI configuration sub-menu, the user can select whether to access the web UI using the secure http protocol (https) or the original http protocol. This also determines what the user must type when accessing the web UI. If the browser access is set to secure, the user must be sure to type “https” in the web browser address bar.

Figure 5-38 Web UI Configuration Screen

Table 5-27 Web UI Configuration Parameter Values

Parameter Name	Range	Default	Description
Browser Access	Secure (https) or Non-Secure (http)	Secure (https)	Selects whether or not the web browser is accessed using http or https.

5.5.10 WMS

The WI can receive digitalization messages from a connected Wayside Messaging Server (WMS). Digitalization messages include data and measurements taken by the WI, which may be used for office and cloud applications. The WI supports the Class D protocol to connect to the application gateway within the WMS. The WI supports the EMP protocol for processing and routing of digitalization messages sent and received on the Interoperable Train Control Messaging (ITCM) system.

5.5.10.1 WMS: Digitalization Interface Settings

The user can enable or disable the digitalization interface and set the encryption and authentication options for the digitalization interface on the screen shown in Figure 5-39.

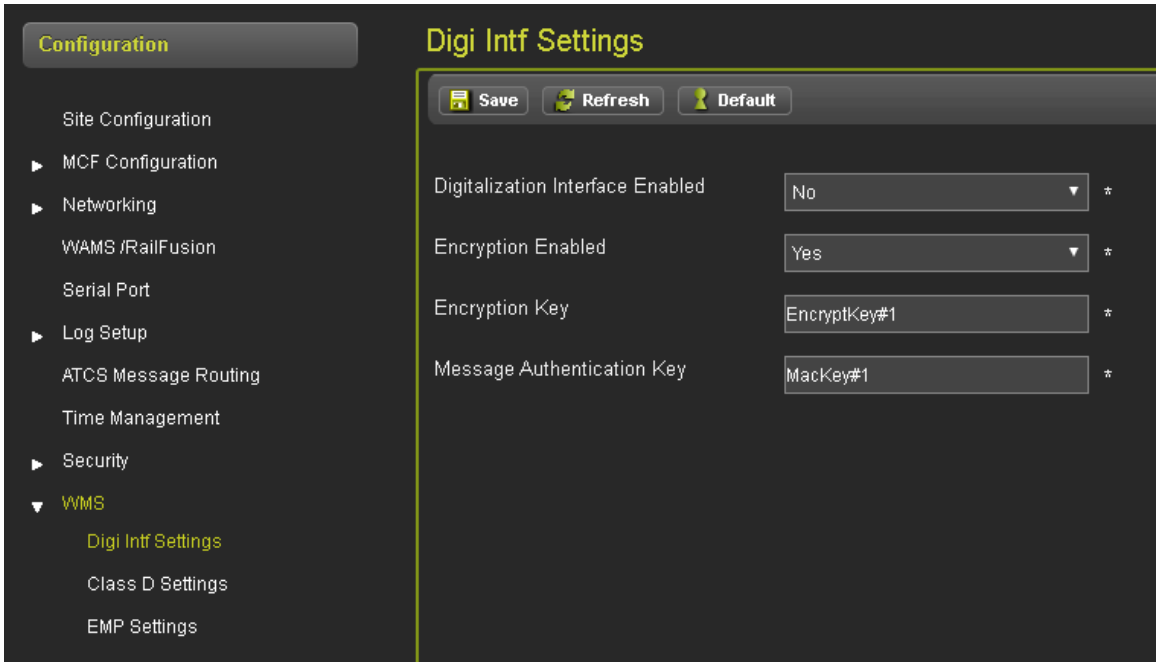


Figure 5-39 WMS: Digitalization Interface Settings Screen

Table 5-28 WMS: Digitalization Interface Settings Parameter Values

Parameter Name	Range	Default	Description
Digitalization Interface Enabled	Yes, No	No	The digitalization interface may be enabled or disabled with this setting.
Encryption Enabled	Yes, No	Yes	If set to Yes, the WI will encrypt digitalization messages using the specified encryption key.
Encryption Key	1 to 20 characters	Encryptkey#1	If encryption is enabled, this key will be used by the WI to encrypt all digitalization messages. The office software must use this same key value to decode the messages and to encode any messages sent to the WI.
Message Authentication Key	1 to 20 characters	MacKey#1	Each digitalization message is authenticated using a message authentication code (MAC). This field specifies the key to use in the message authentication process. The office software must use this same key value to authenticate the messages received from the WI and to create the MAC on any messages sent to the WI.

5.5.10.2 WMS: Class D Settings

If the Digitalization Interface Enabled parameter is set to Yes, the user interface allows the user to set the following parameters for the Class D interface to the ITCM Messaging system. Users may refer to the Association of American Railroads (AAR) standard S-9356 for a detailed description of the Class D protocol and its configuration settings.

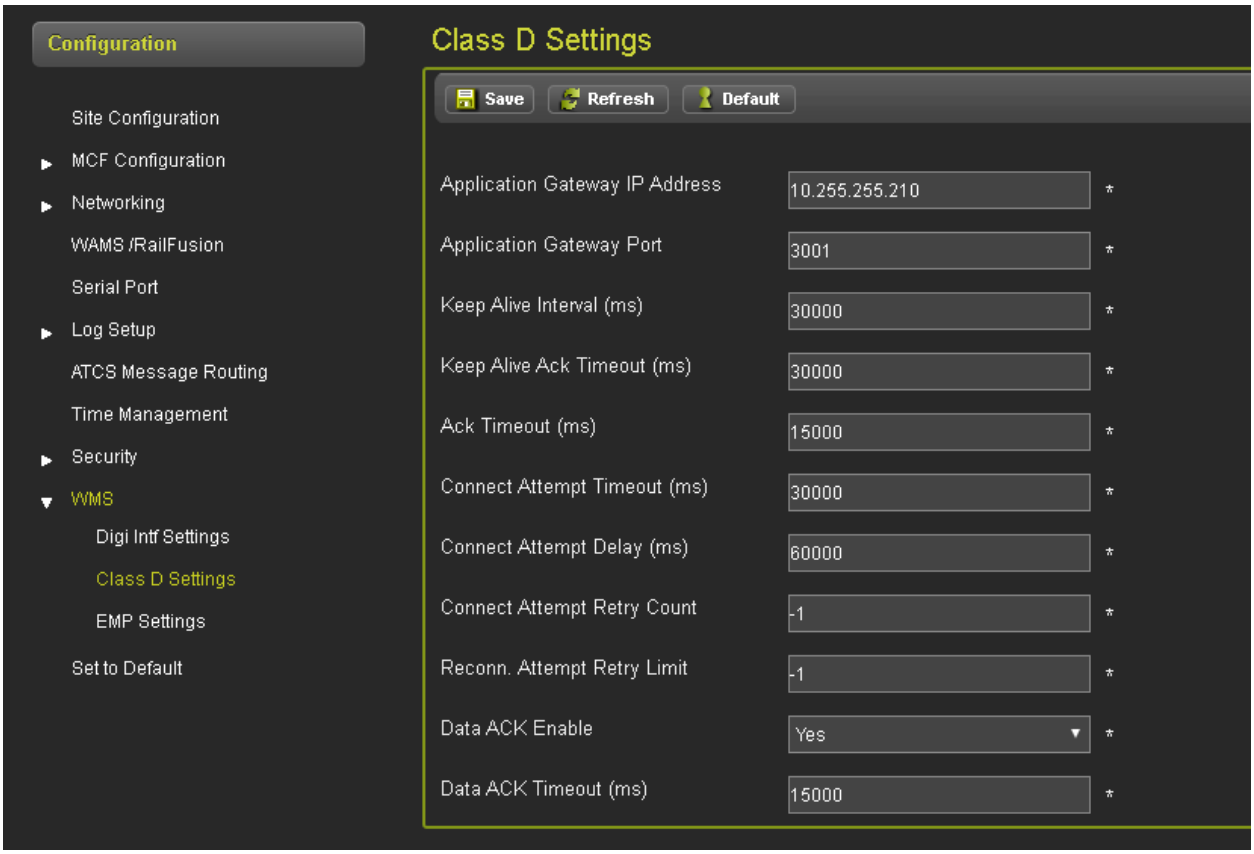


Figure 5-40 WMS: Class D Settings Screen

Table 5-29 WMS: Class D Settings Parameter Values

Parameter Name	Range	Default	Description
Application Gateway IP Address	0 to 64 characters	10.255.255.210	Specifies the IP address of the application gateway service to use for communication.
Application Gateway Port	1024 to 65535	3001	Specifies the TCP port number to use for the Class D connection to the application gateway.
Keep Alive Interval	0 to 60000 ms	30000	Specifies the interval between Class D keep alive ack messages.
Keep Alive Ack Timeout	0 to 60000 ms	30000	Specifies the timeout for Class D keep alive ack messages.
Ack Timeout	0 to 60000 ms	15000	Specifies the timeout for Class D ack messages.
Connect Attempt Timeout	1 to 60000 ms	30000	Specifies the connection timeout for Class D connections.
Connect Attempt Delay	1 to 60000 ms	60000	Specifies the delay between attempts to connect.
Connect Attempt Retry Count	-1 to 10000	-1	Specifies the limit on connection attempts. A value of -1 means the WI will attempt to connect indefinitely.
Reconn. Attempt Retry Limit	-1 to 10000	-1	Specifies the limit on reconnection attempts. A value of -1 means the WI will attempt to re-connect indefinitely.
Data ACK Enable	Yes, No	Yes	Enables or disables data ack messages.
Data Ack Timeout	1 to 60000 ms	15000	Sets the time for data ACKs.

5.5.10.3 WMS: EMP Settings

For a detailed explanation of the EMP protocol and settings, see the AAR standard S-9354.

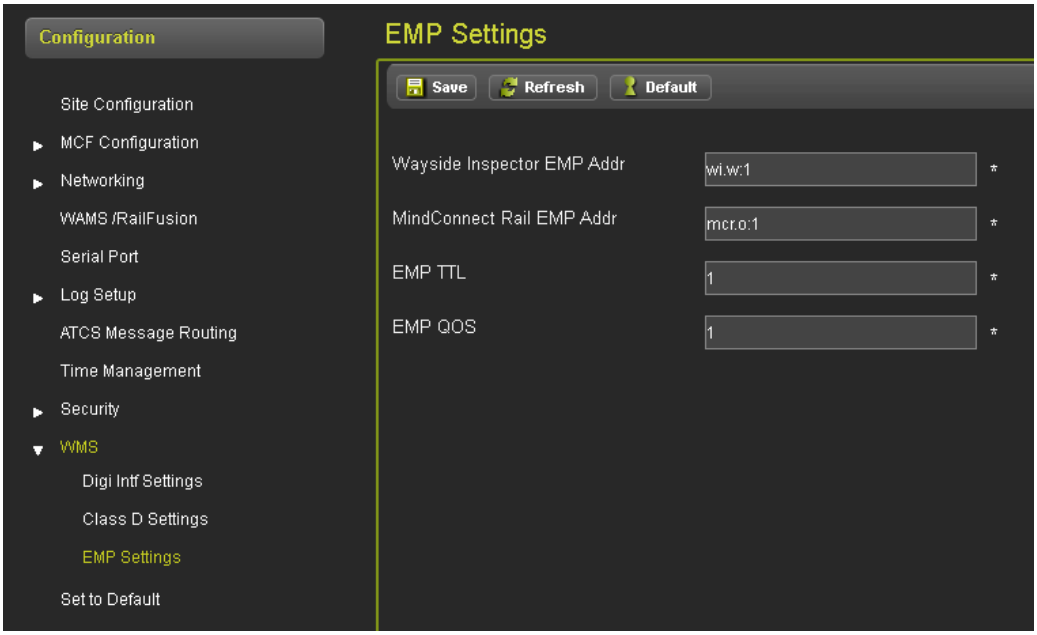


Figure 5-41 WMS: EMP Settings Screen

Table 5-30 WMS: EMP Settings Parameter Values

Parameter Name	Range	Default	Description
Wayside Inspector EMP Addr	0 – 64 characters	wi.w:1	The EMP address used for the WI unit.
MindConnect Rail EMP Addr	0 – 64 characters	mcr.o:1	The EMP address used for the MindConnect Rail server, which is the digitalization gateway system for the WI.
EMP TTL	0 to 65535	1	Specifies the EMP TTL value to use in digitalization messages.
EMP QOS	0 to 65535	1	Specifies the EMP QOS value to use in digitalization messages.

5.5.11 Set to Default

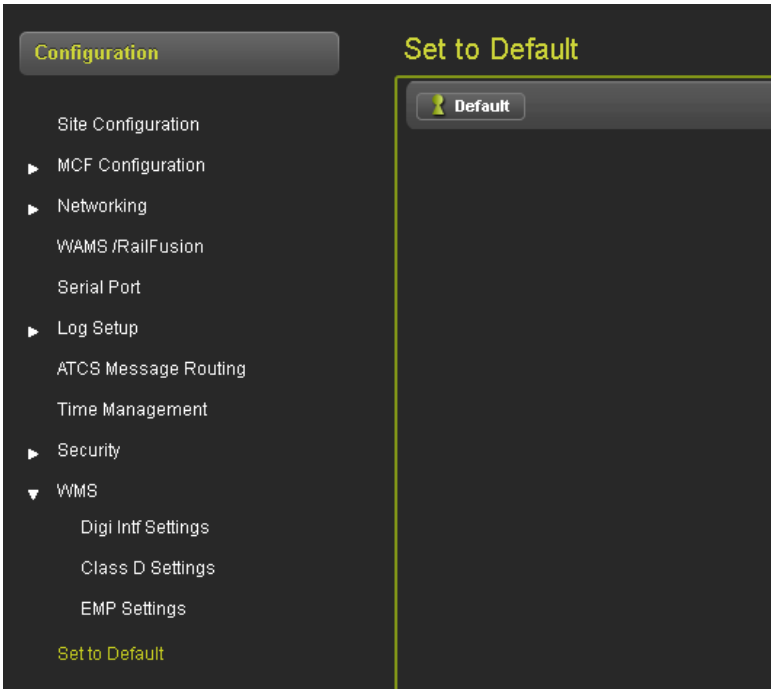


Figure 5-42 Set to Default Screen

The Set to Default screen resets all values entered within the Configuration Tab. It will reset all parameters other than MCF Configuration parameters to the default condition.

NOTE

NOTE

Once the system is set to default it cannot be undone.

Ensure that this action is intended prior to clicking the **Default** button.

5.6 CALIBRATION & AJUSTMENT

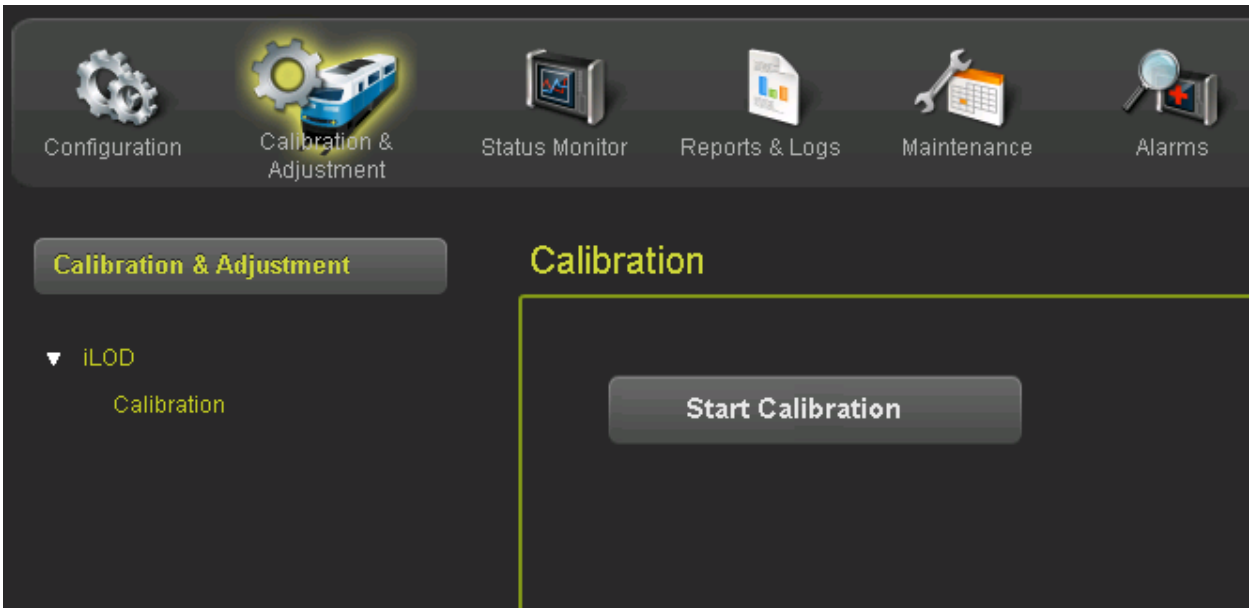


Figure 5-43 iLOD Calibration Screen

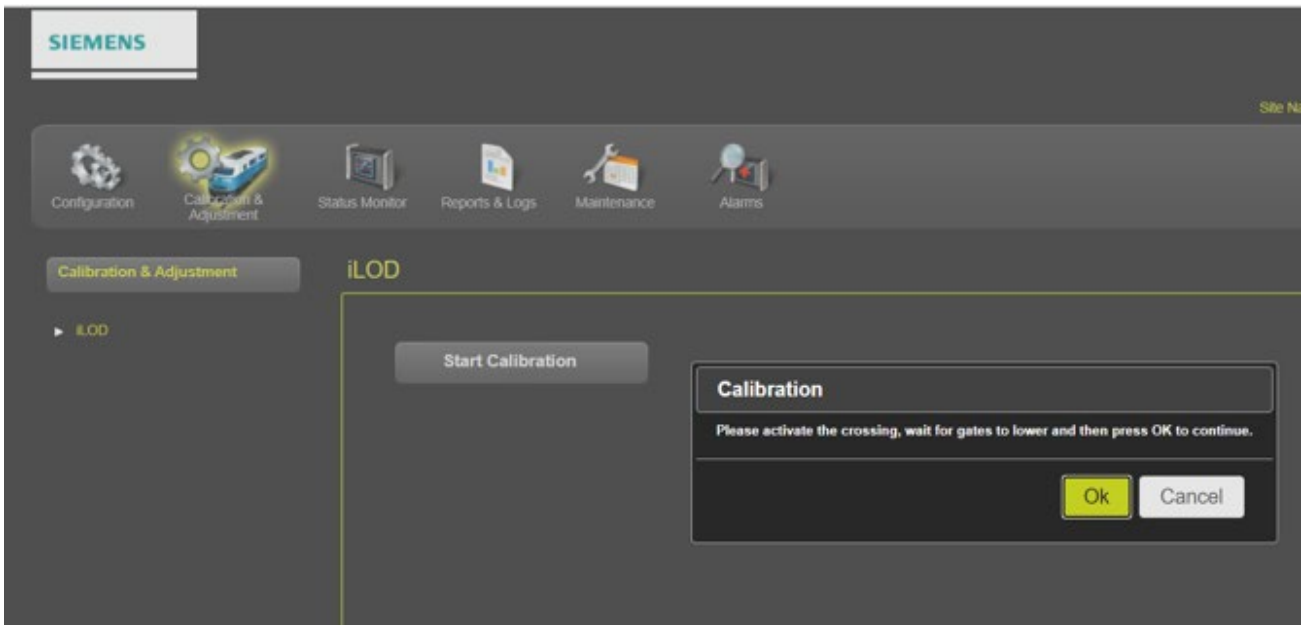


Figure 5-44 iLOD Calibration Screen after selecting "Start Calibration"

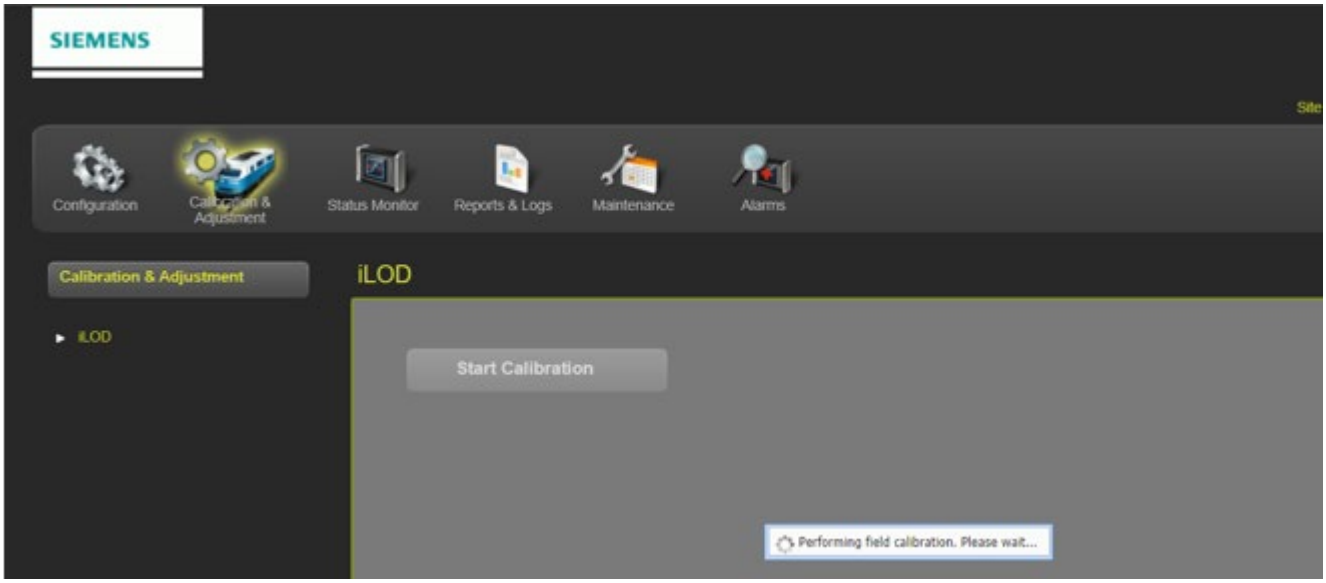


Figure 5-45 iLOD Calibration in Progress

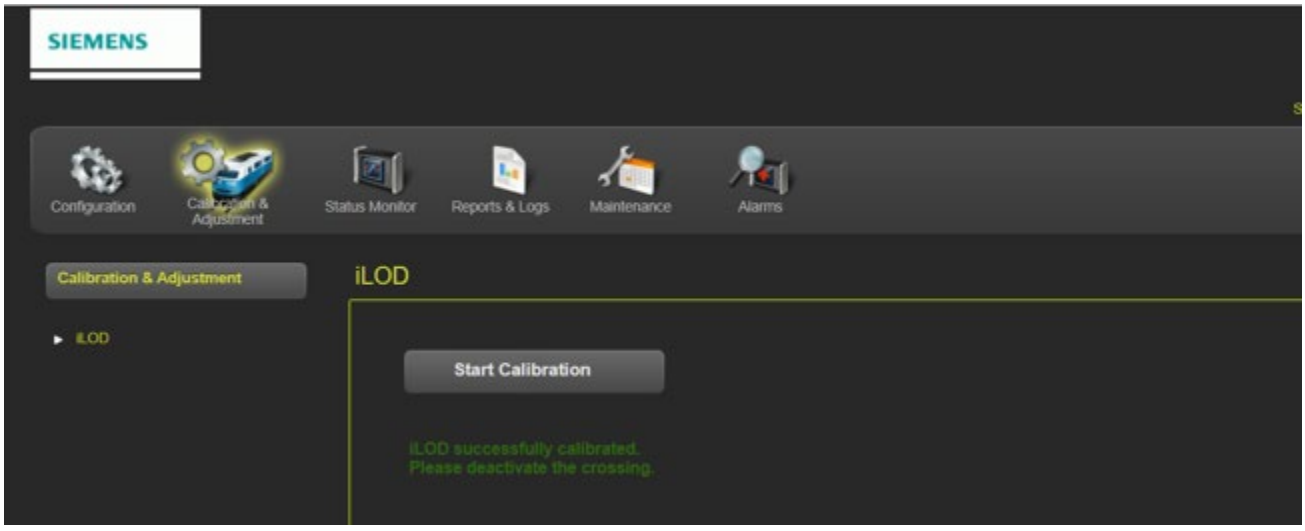


Figure 5-46 iLOD Calibration Complete

The iLOD module requires a field lamp calibration procedure to set internal thresholds necessary to correctly monitor the flashing lamps. Before performing the field lamp calibration procedure, all iLOD modules must have been installed on the Echelon network first (see section 5.5.2.7). The field calibration procedure calibrates all iLOD modules at once and only needs to be performed one time for all iLODs.

The user performs the field calibration procedure as follows:

1. Field personnel start the Field Calibration procedure from the screen shown in Figure 5-43 by clicking the “Start Calibration” button.
2. The WI requests the field personnel to activate the Crossing Warning System. Field personnel will need to activate the crossing using the appropriate method for the installed crossing warning system equipment.
3. Once all the lamps are flashing and the gates are level, field personnel confirm the Crossing Warning System has been activated by clicking the “Ok” button as shown in Figure 5-44.
4. The UI will countdown, while the iLOD performs an internal field calibration procedure, then sends a Field Calibration Message to the WI to indicate the calibration is complete as shown in Figure 5-45.
5. When calibration completes, the WI logs that the iLOD Field Calibration procedure has been calibrated and displays to the “iLOD Field Calibration Complete” message as shown in Figure 5-46.

5.7 STATUS MONITOR

The Status Monitor tab provides the status of the WI I/O.

5.7.1 Digital Inputs

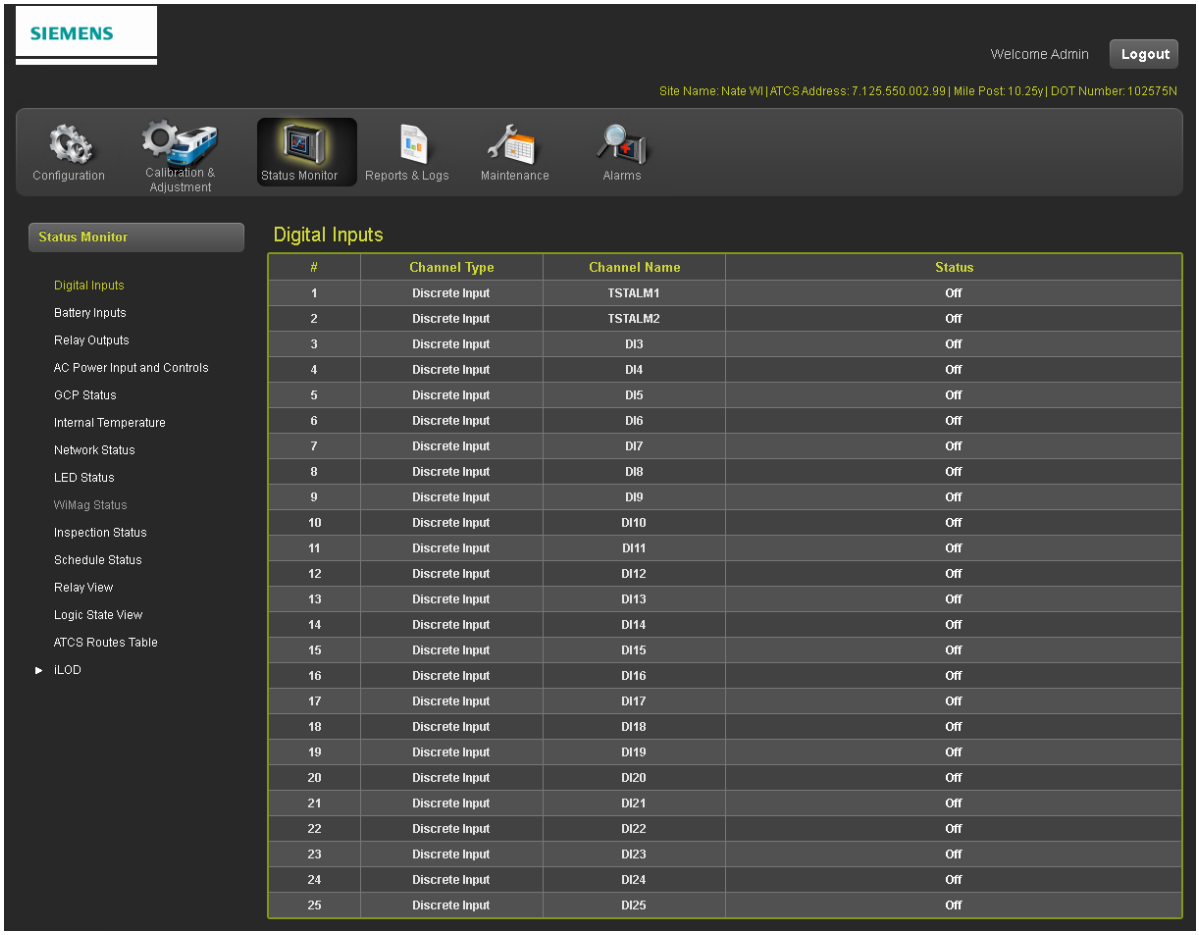


Figure 5-47 Digital Inputs Screen

The Digital Input screen provides the status of the WI's 25 digital inputs.

5.7.2 Battery Inputs

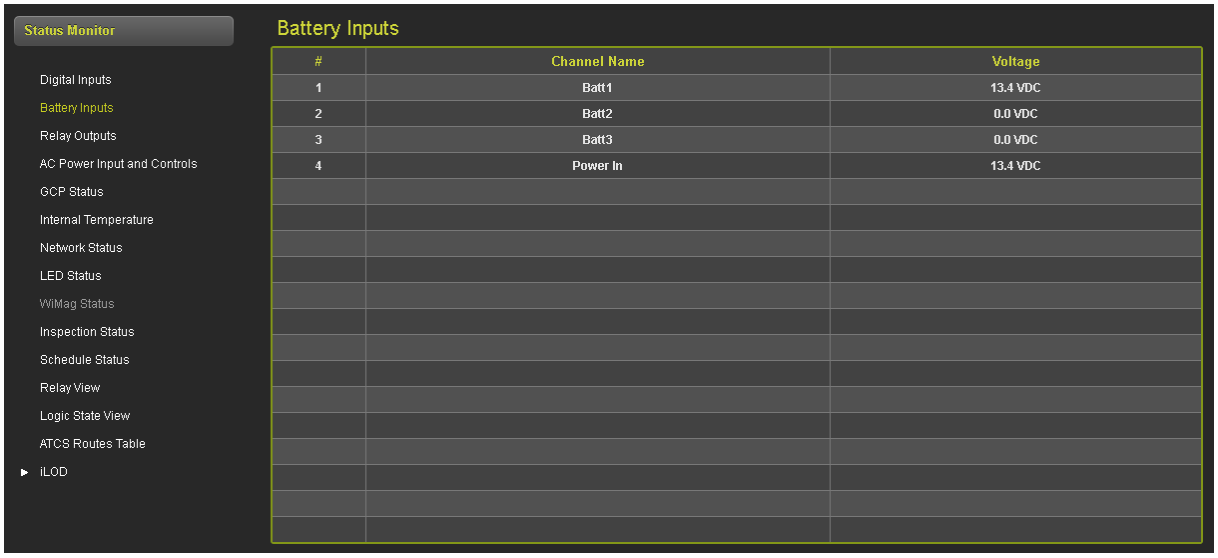


Figure 5-48 Battery Inputs Screen

The Battery Inputs screen provides the status of up to four batteries with their respective Channel Names and their voltages.

5.7.3 Relay Outputs

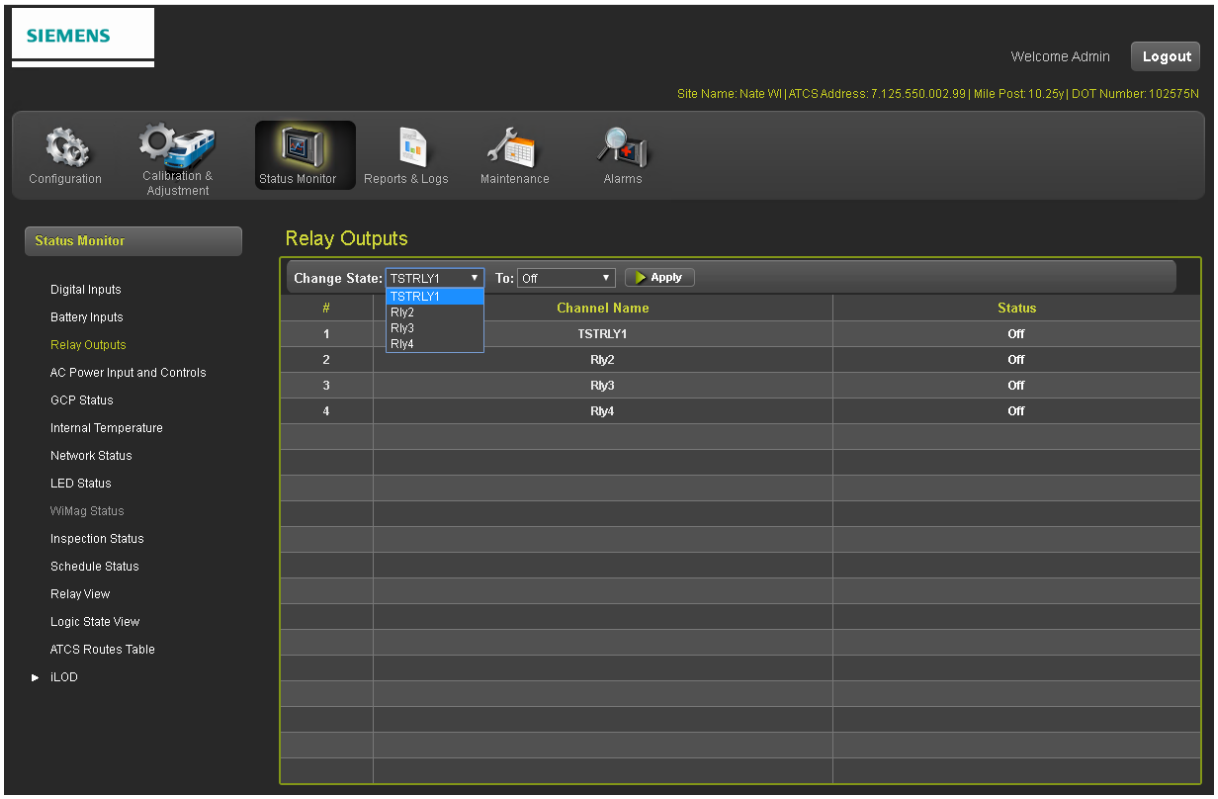


Figure 5-49 Relay Outputs Screen

The Relay Outputs screen provides the status of each Relay Output and depicts the Channel Name and Relay Status. From this screen, the user can command the relay off, on, or to toggle.

5.7.4 AC Power Input and Controls

Figure 5-50 AC Power Input and Controls Screen

The AC Power Input and Controls screen provides the Channel Name and Status of AC Power In and the AC Power Switch. The AC Control Relay is commanded off and on from this screen.

5.7.5 GCP Status

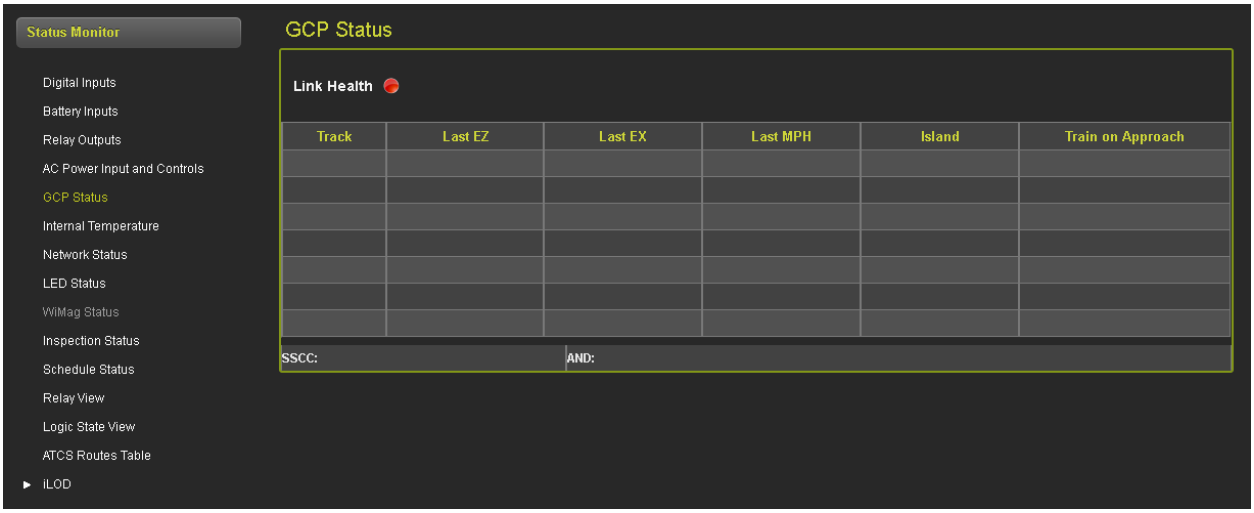


Figure 5-51 GCP Status Screen

The GCP Status screen provides data for up to six tracks, providing Last EZ, Last EX, Last MPH, Island, and Train on Approach for each track as well as SSCC & AND status.

5.7.6 Internal Temperature

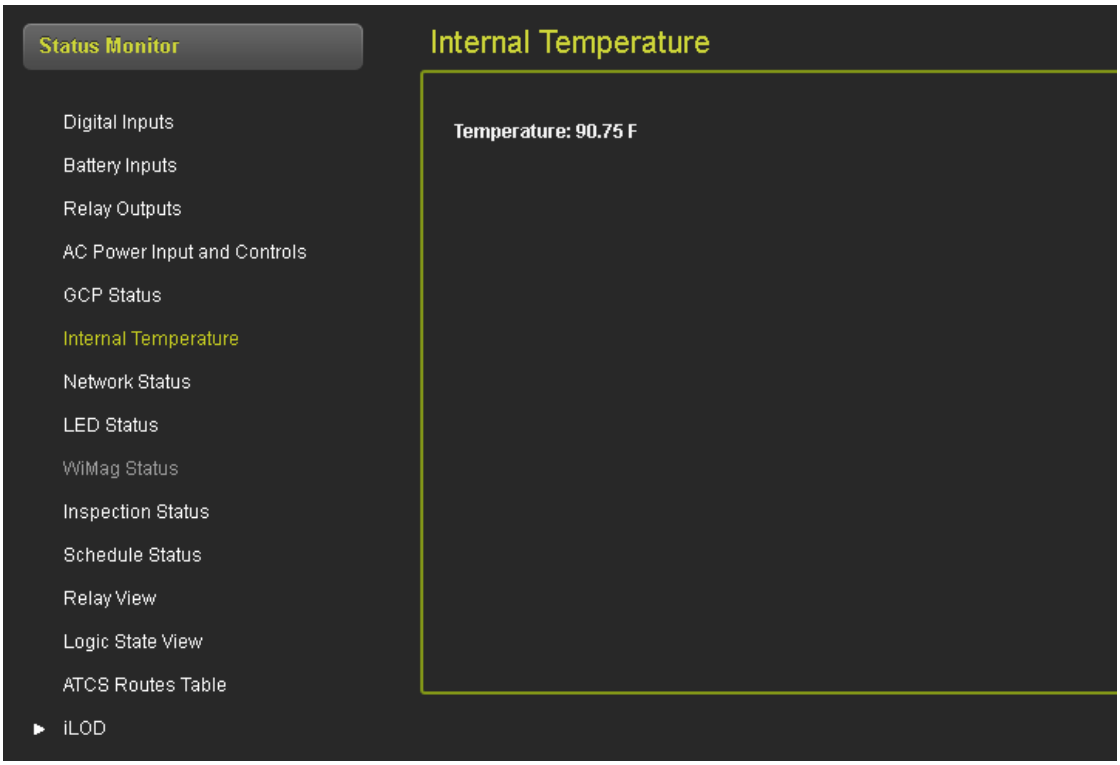


Figure 5-52 Internal Temperature Screen

The Internal Temperature screen provides the current internal temperature of the WI.

5.7.7 Network Status

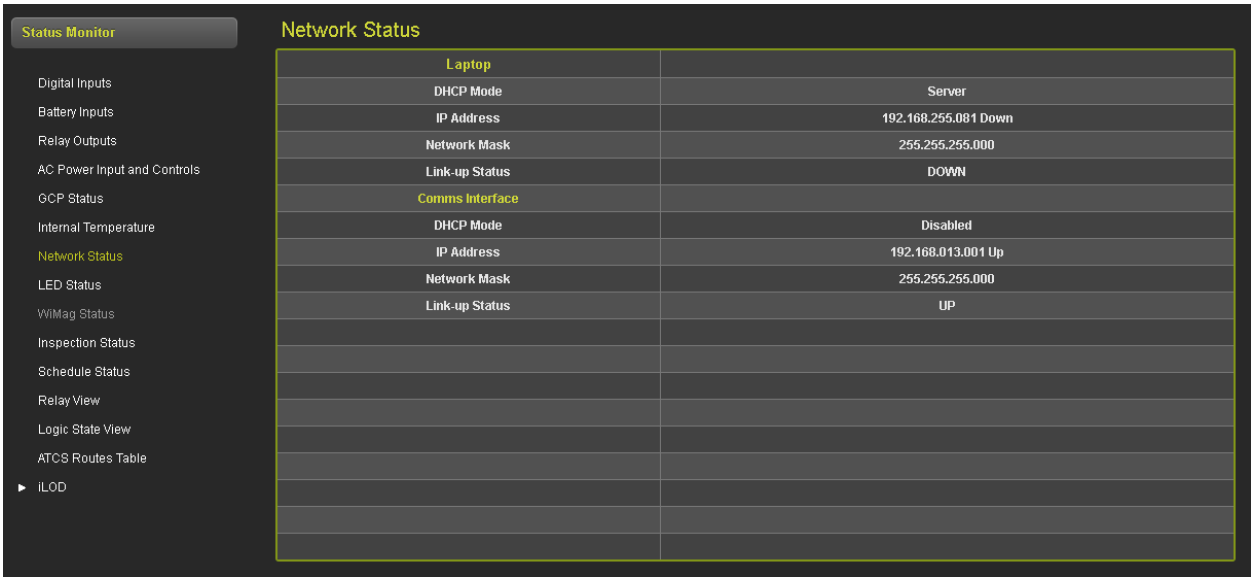


Figure 5-53 Network Status Screen

The Network Status screen provides network data for the Laptop and Comms Interface connectors.

5.7.8 LED Status

Figure 5-54 LED Status Screen

The LED Status screen provides the name and status of each of the eight Application LEDs.

5.7.9 Inspection Status

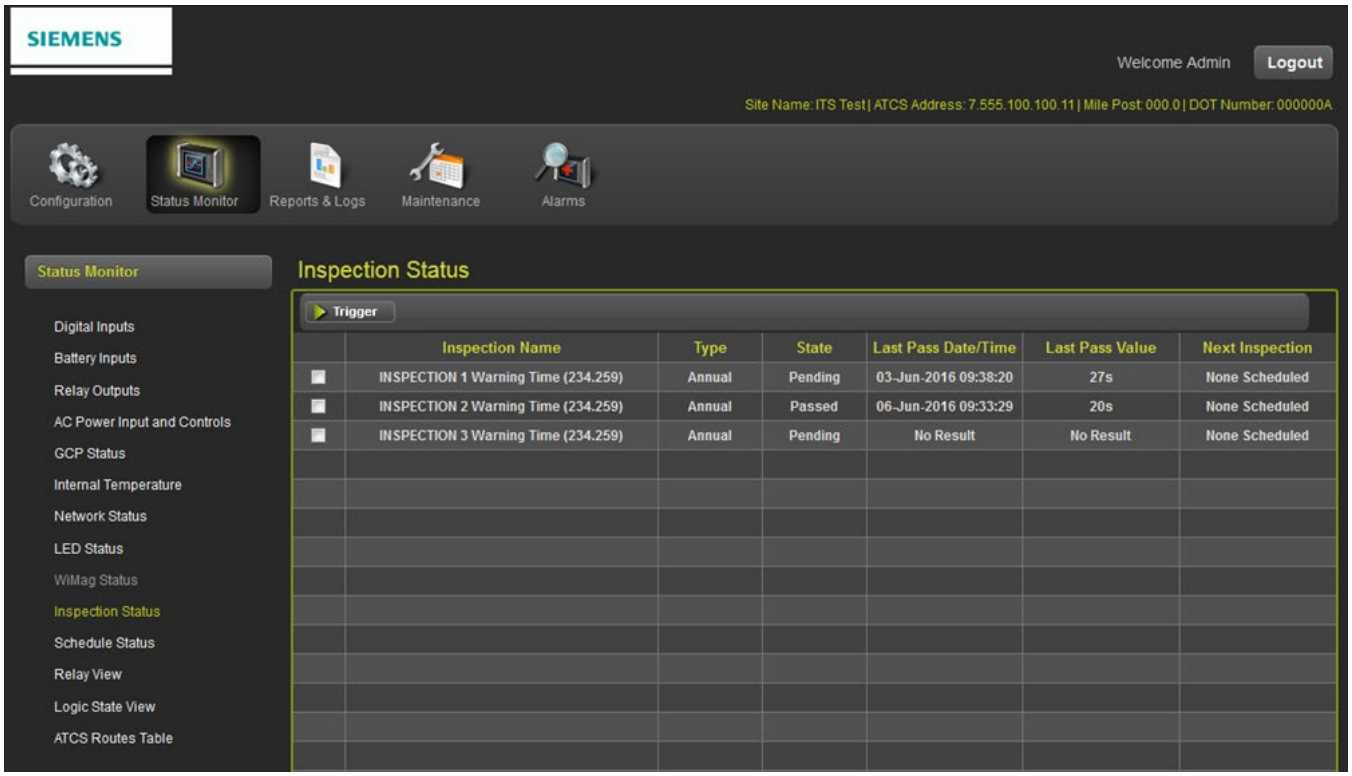


Figure 5-55 Inspection Status Screen

The Inspection Status screen shows the status of currently programmed tests. This screen also allows the user to select and trigger programmed tests with the **Trigger** button.

5.7.10 Schedule Status

Figure 5-56 Schedule Status Screen

The Schedule Status screen shows the schedule times for each set of inspections and the current status. The screen also shows the CRC of the currently loaded Inspection Schedule.

5.7.11 Relay View

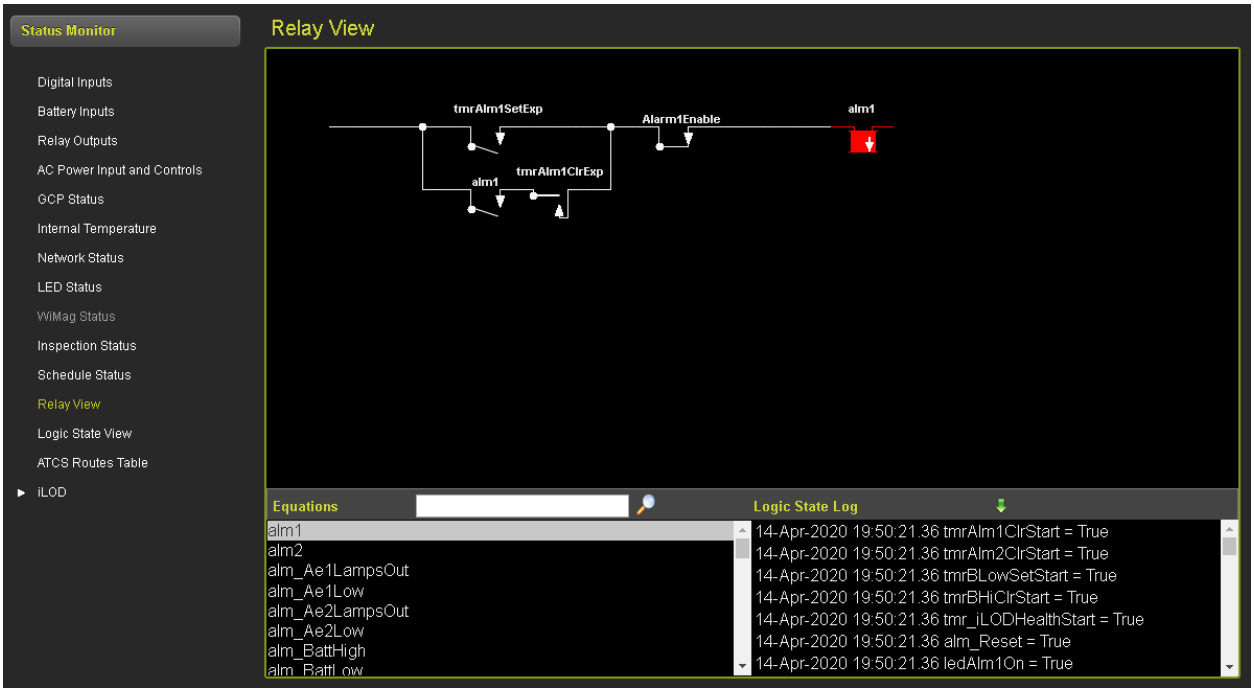


Figure 5-57 Relay View Screen

The Relay View screen displays the MCFs relay logic circuits and the contact and coil states in real time. The user may view any relay logic circuit defined in the MCF on this screen. This screen may be useful to application engineers to troubleshoot the MCF's relay logic.

5.7.12 Logic State View

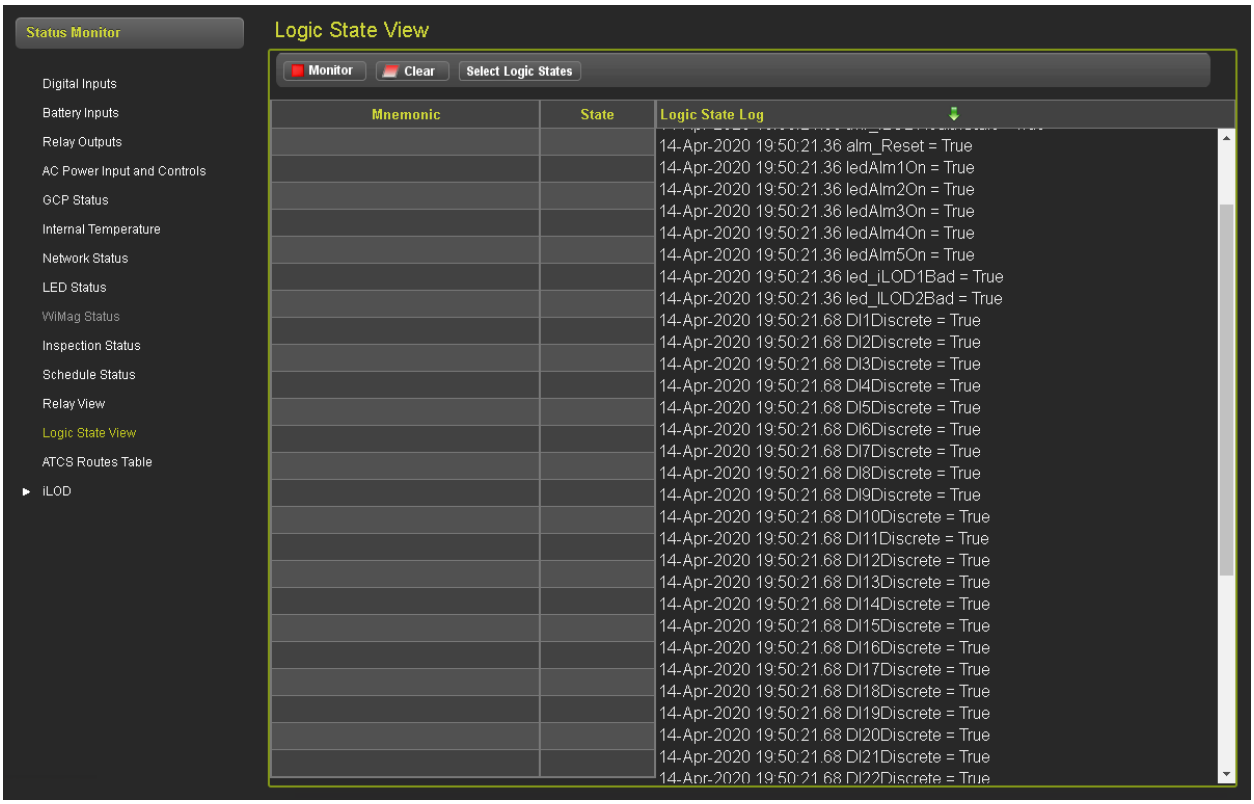


Figure 5-58 Logic State View Screen

The Logic State View screen displays a real-time log showing the state changes for all logic states in the MCF. The user may select a subset of logic states to monitor on this screen. This screen may be useful to application engineers to troubleshoot the MCF's relay logic.

5.7.13 ATCS Routes Table

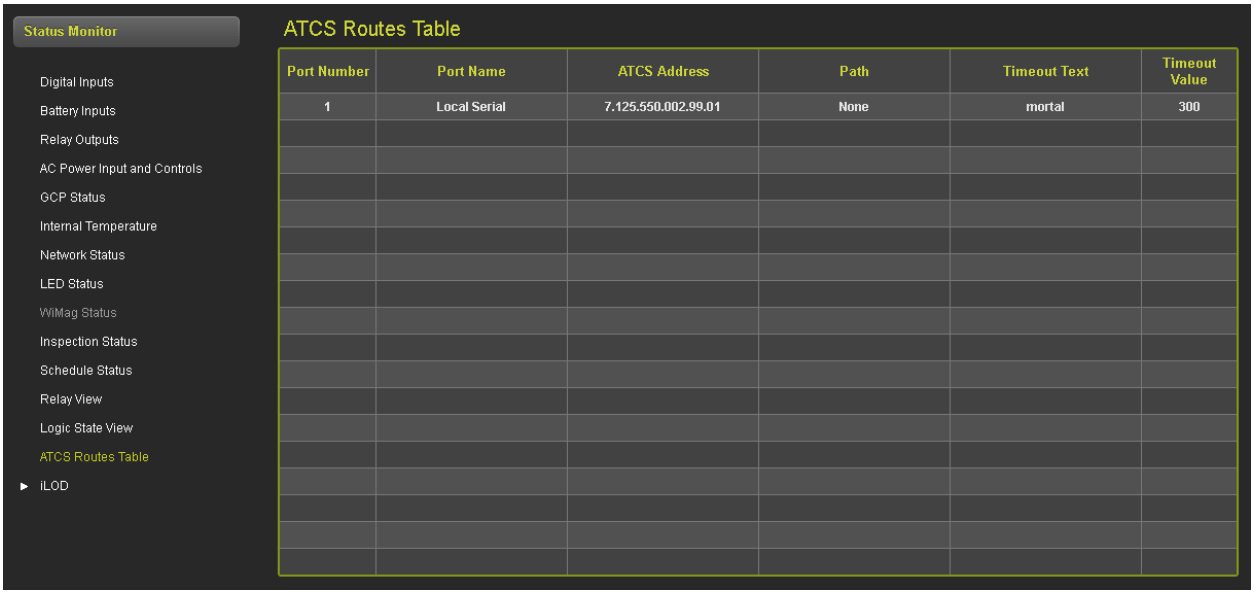


Figure 5-59 ATCS Routes Table Screen

The ATCS Routes Table provides the list of Routes used in the WI.

5.7.13.1 iLOD Status Screen

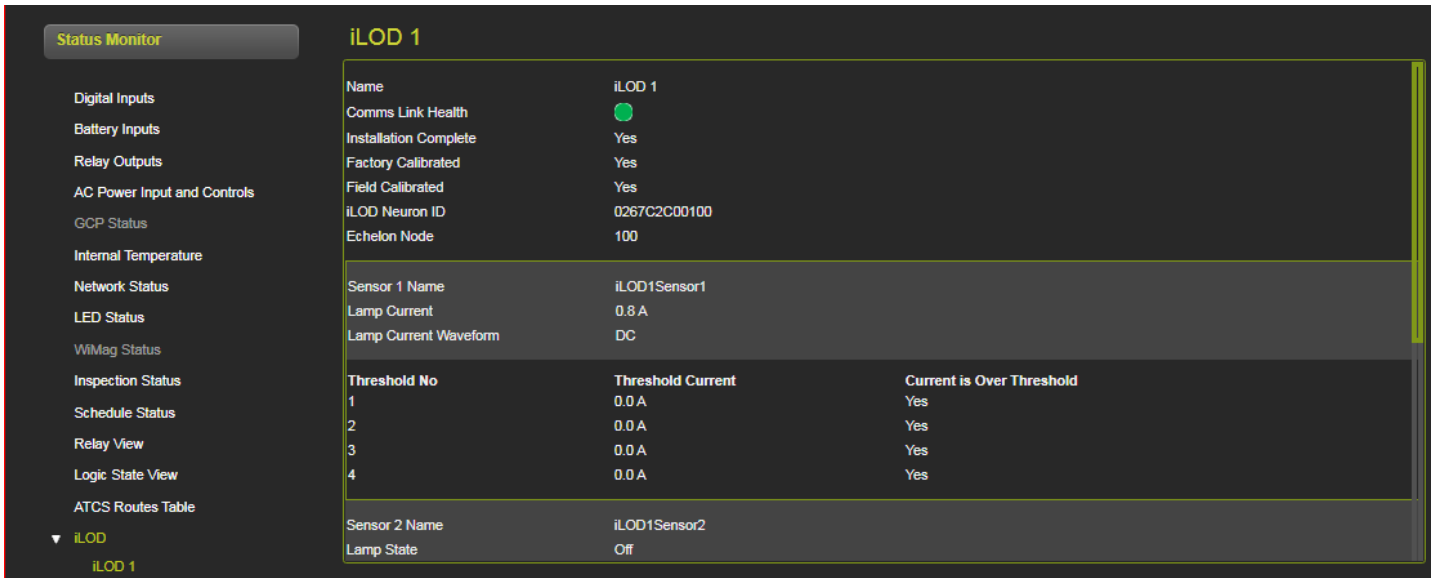


Figure 5-60 iLOD Status Monitor Screen

Figure 5-61 iLOD Status Monitor 1 Screen

The iLOD status screens show the state of the link with the iLOD modules and the last reported data from the modules. The data includes the measured current and calibration states for the module. The screen also shows whether the current is above the configured current thresholds for the MCF logic.

5.8 REPORTS & LOGS

The WI keeps three logs: the Event Log, the Diagnostic Log, and the Application Log.

The Event Log contains entries showing external crossing events detected by the WI. The Event Log is useful to investigate crossing operation.

The Diagnostic Log contains entries showing internal WI operations and data. The Diagnostic Log is useful to troubleshoot the WI itself.

The Application Log contains only the entries that were created by the MCF.

The WI always logs entries in chronological order. The time stamp may change forward or backward as the user changes the time; however, events are always added to the log in the order they occurred.

5.8.1 Event Log

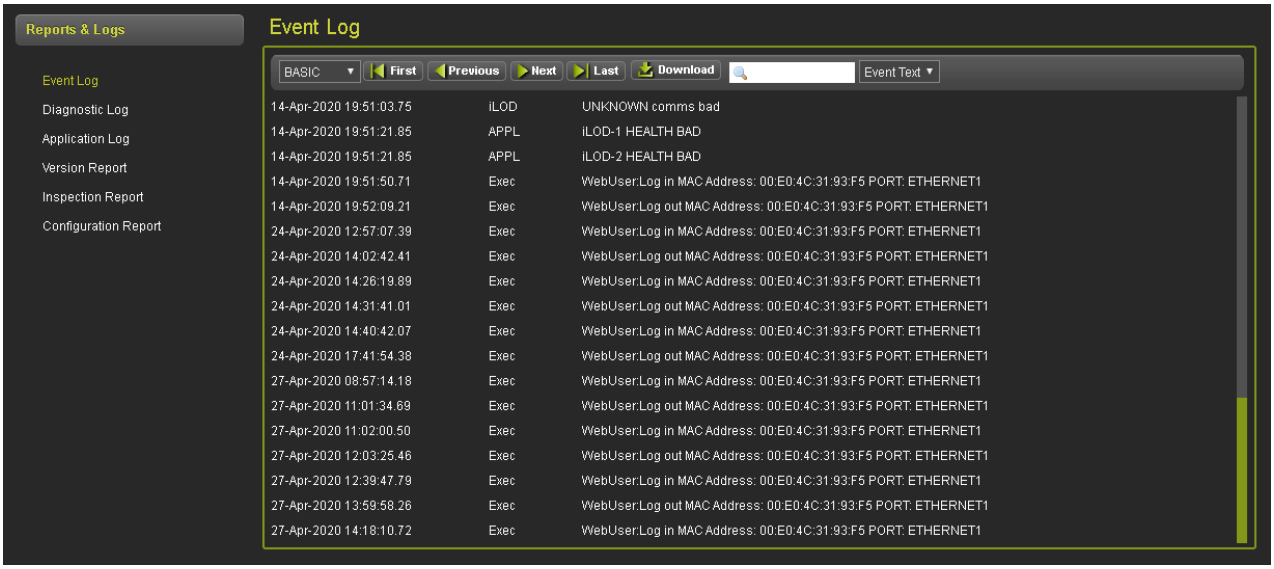


Figure 5-62 Event Log Screen

The event log will hold up to 172,800 entries. The following is an example event log entry:

```
095D  11-Apr-2016 13:26:15.30  AI     Power In 12.0 V
```

5.8.2 Diagnostic Log

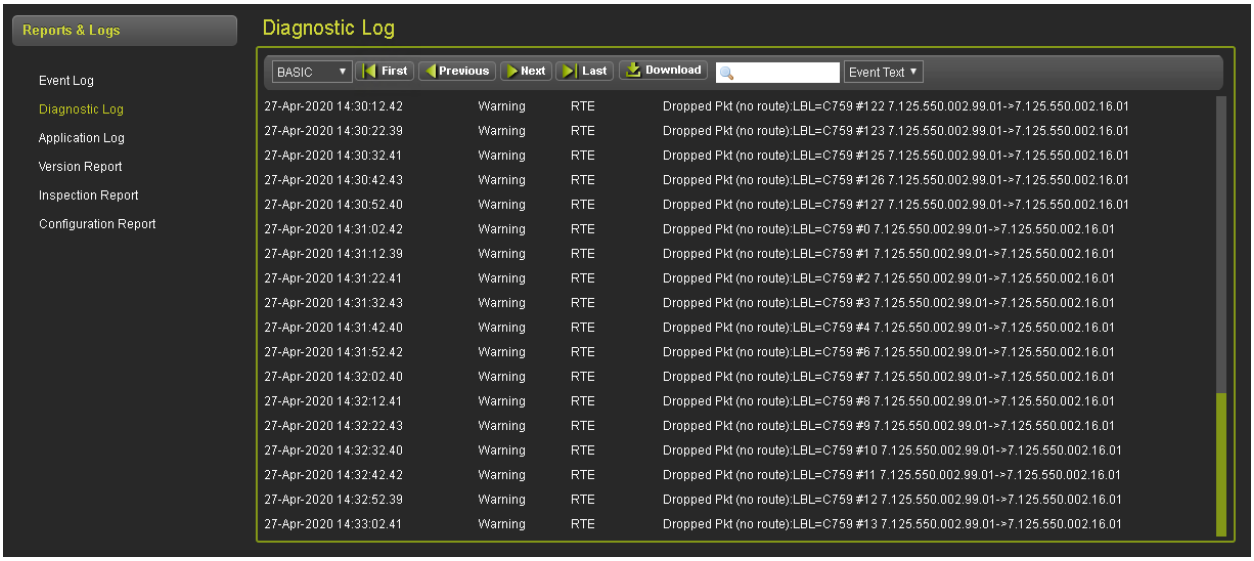


Figure 5-63 Diagnostic Log Screen

Field personnel can change the diagnostic log verbosity level using the Web UI. The verbosity level defaults to “Info”, which means the diagnostic log contains entries at verbosity level Basic, Error, Warning, and Info. It will not include Debug level entries.

Each entry has a verbosity level associated with it. The diagnostic log also has a logging verbosity level. The WI will only add entries with the same verbosity level or lower to the diagnostic log. The user may turn the verbosity up or down to control how much information is in the diagnostic log. If turned all the way up, the diagnostic log may include a lot of information in a short amount of time, limiting the duration of time the log covers. If turned all the way down, the diagnostic log may cover a long duration of time but not include much detail.

The diagnostic log will hold up to 172,800 entries. The diagnostic log entries contain the same data as the event log entries with the addition of the “Verbosity” field. The following is an example of a Diagnostic Log entry:

```
DA75  24-Mar-2016 13:59:27.33  INFO  TMON   Thread Registered:wimag id:10
```

5.8.3 Application Log

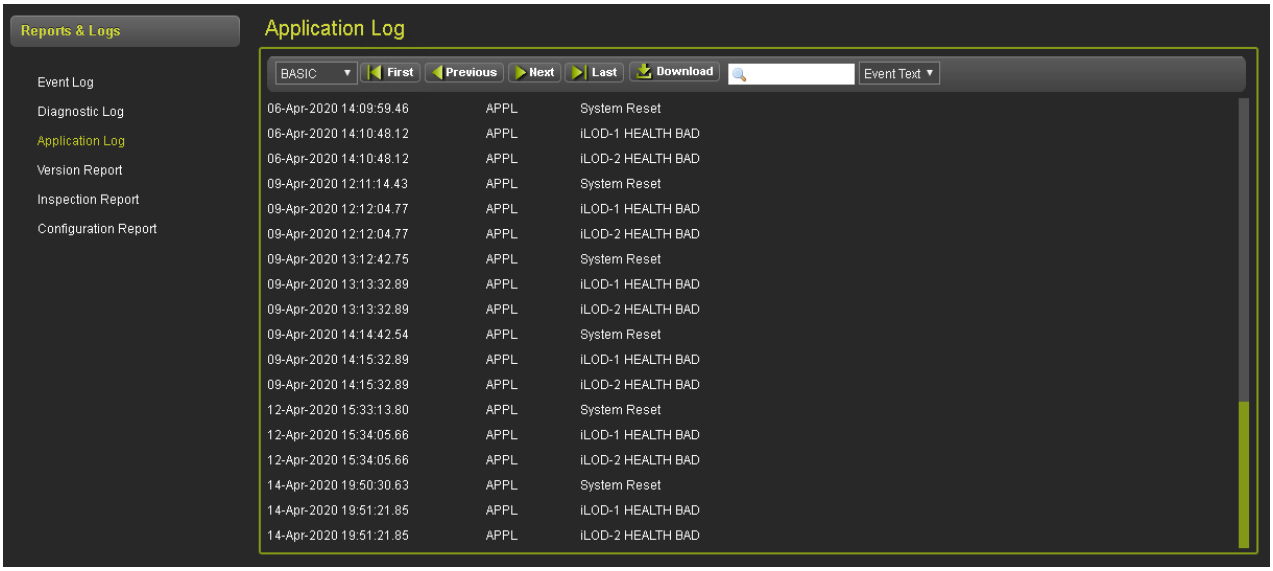


Figure 5-64 Application Log Screen

The Application Log is a filtered version of the Event Log that shows only the entries added to the Event Log by the MCF logic.

5.8.4 Version Report

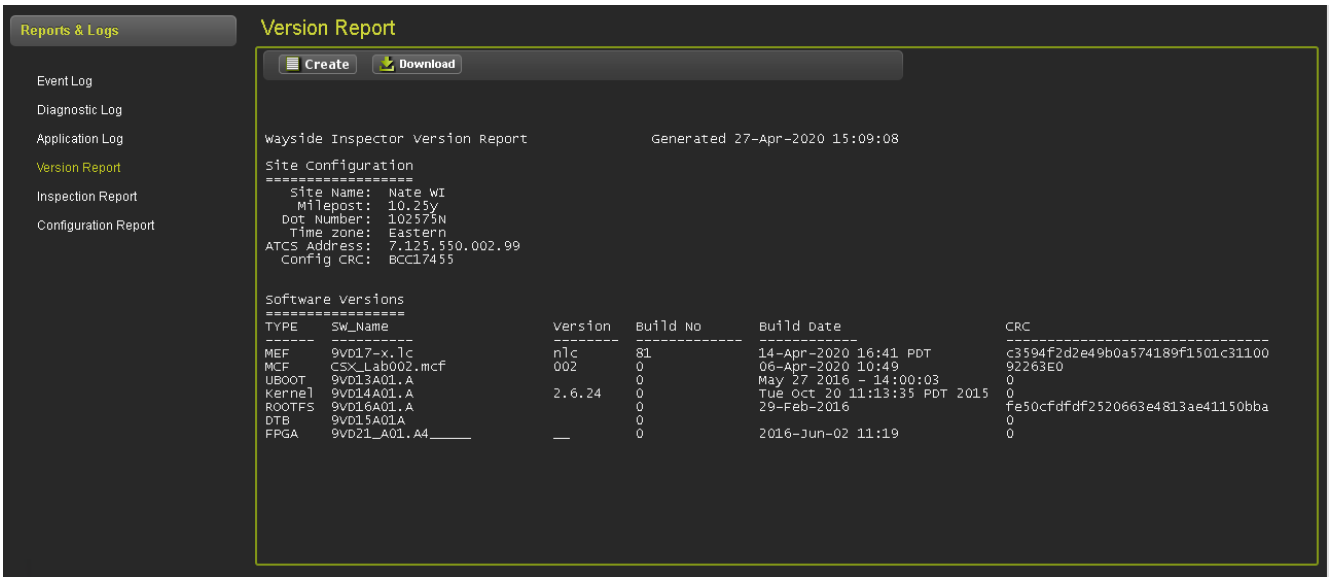


Figure 5-65 Version Report Screen

The Version report contains all the software/firmware information for the software/firmware currently loaded on the WI. It also contains the Site Configuration details.

5.8.5 Inspection Report

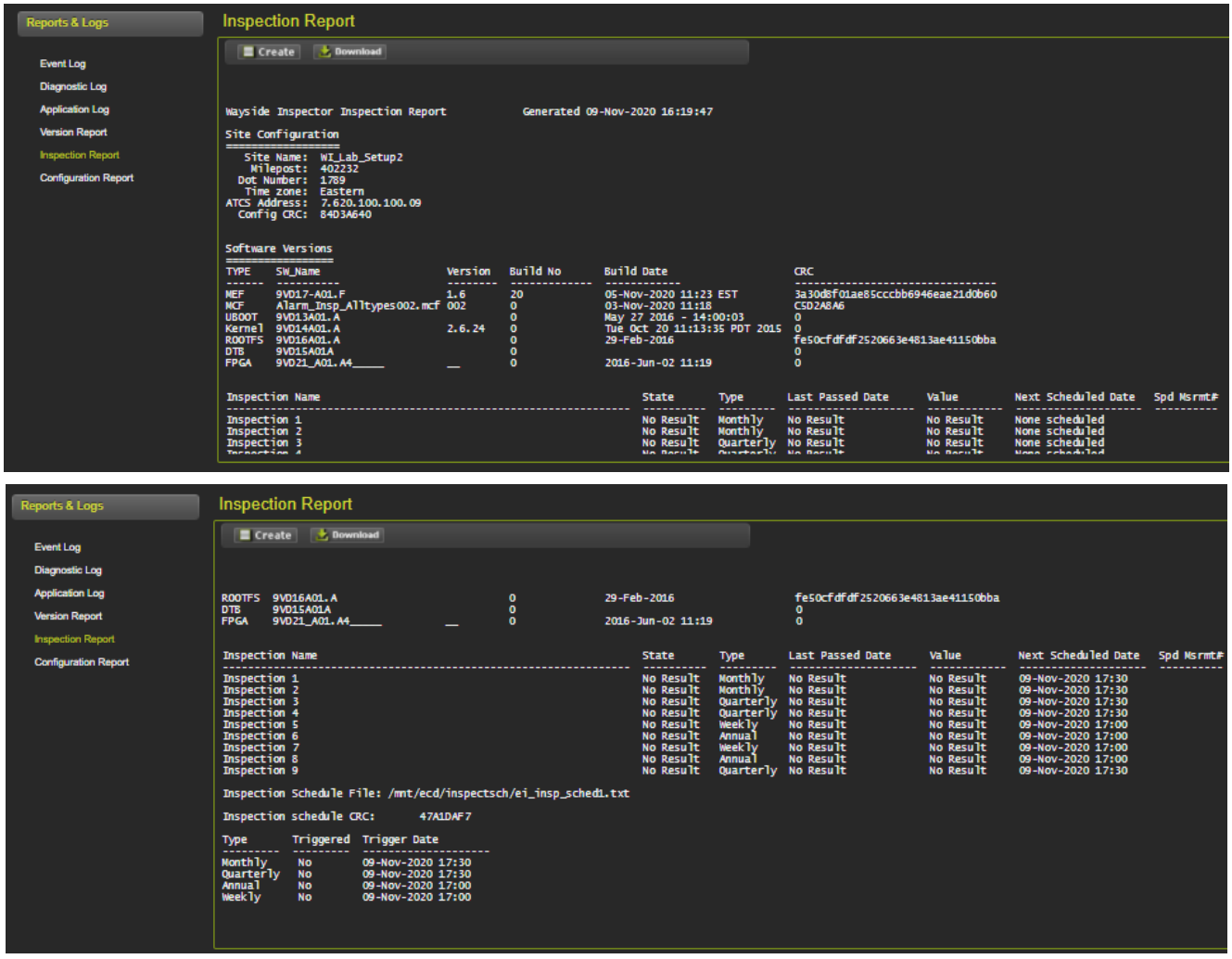


Figure 5-66 Inspection Report Screen

The Inspection Report is the same as the Version Report except that it also contains any programmed inspections and the inspection schedule.

5.8.6 Configuration Report

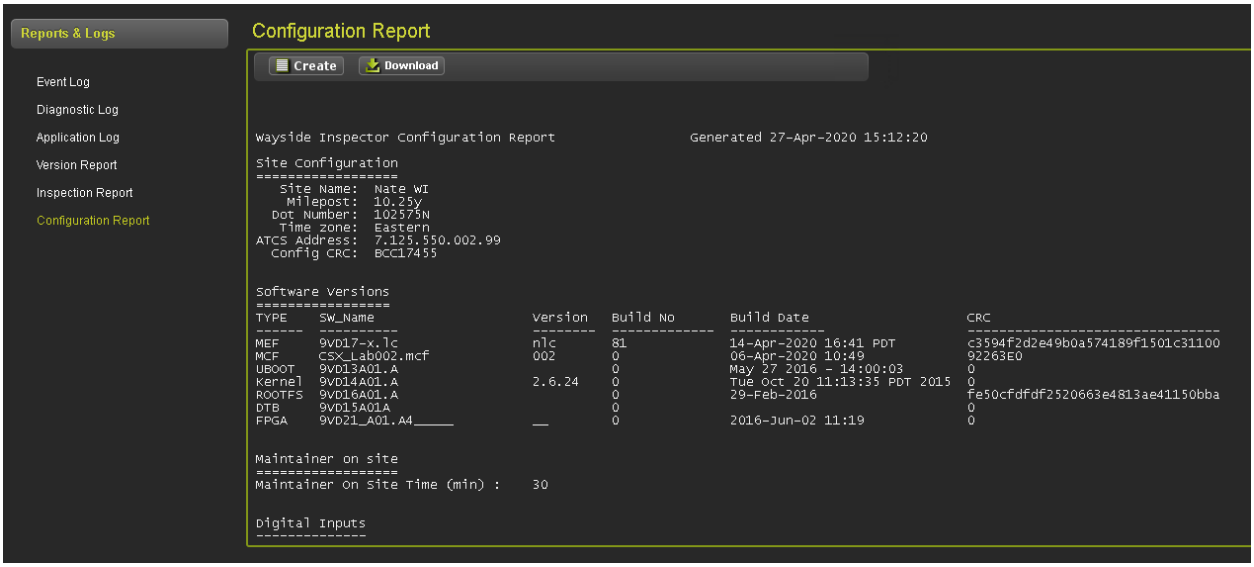


Figure 5-67 Configuration Report Screen

The Configuration Report contains all the Wayside Inspectors configuration parameters, including the Site Configuration and the software/firmware information.

5.9 MAINTENANCE

5.9.1 Date/Time

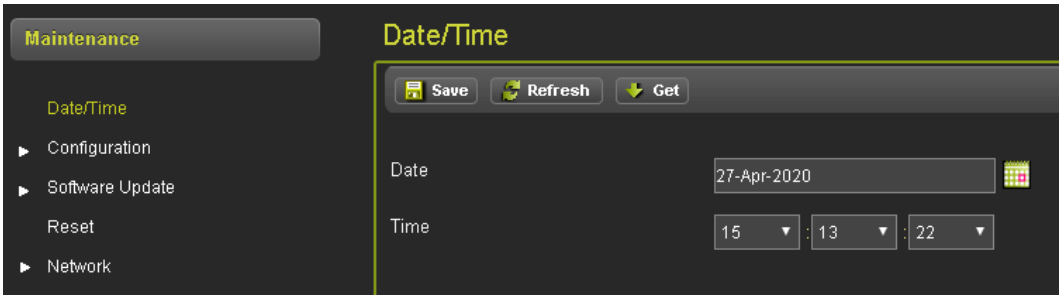


Figure 5-68 Date/Time Screen

The field maintainer may set the time by manually entering it on the screen or using the **Get** button to retrieve the time from the PC running the web browser. After the time has been retrieved, the user may press the **Save** button to set that time in the WI.

5.9.2 Configuration

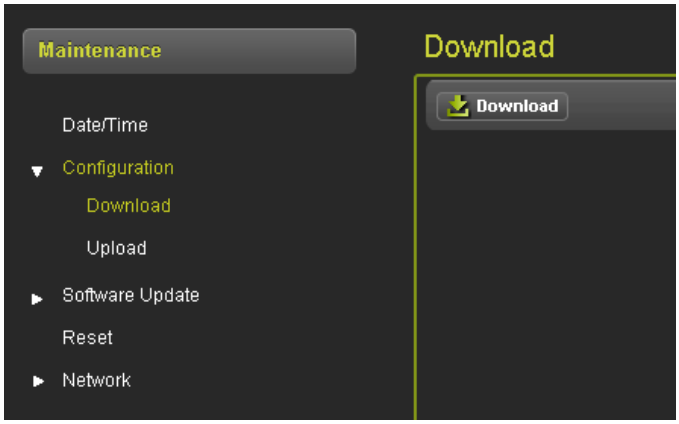


Figure 5-69 Configuration: Download Screen

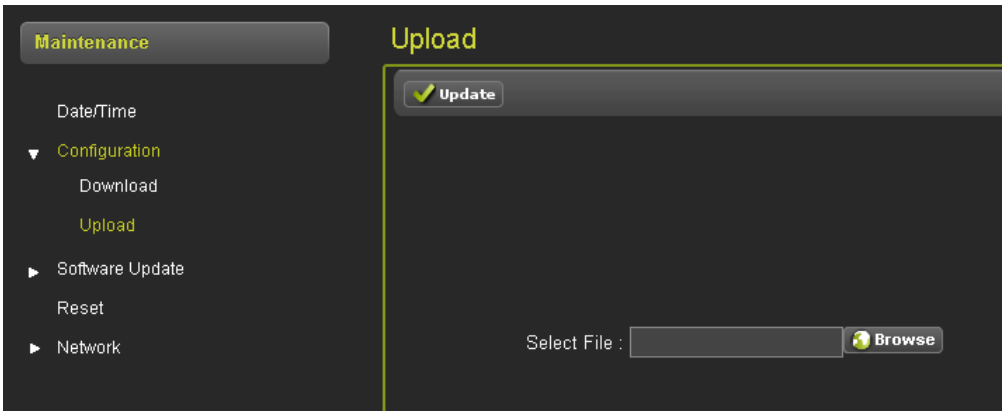


Figure 5-70 Configuration: Upload Screen

The Configuration Download and Upload screens allow a configuration package to be downloaded from one site and uploaded to another WI as an exact duplicate.

5.9.3 Software Update

Within the Software Update tab, the following screens may be updated: Executive, MCF, Inspection Schedule, Delete MCF, Erase ECD.

5.9.3.1 Loading Executive Software

To update the executive software, select the **Browse** button, then navigate to the desired file.

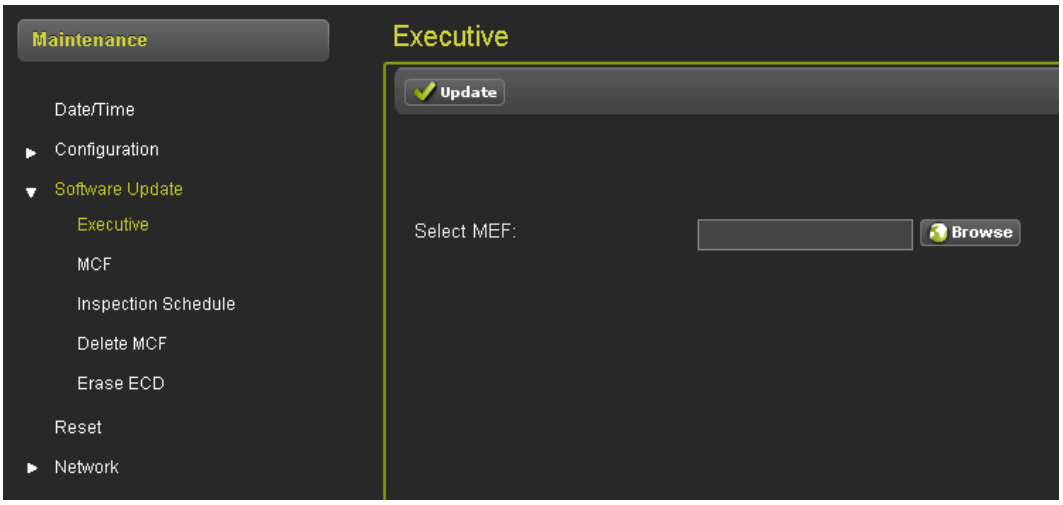


Figure 5-71 Software Update: Executive Screen

After selecting the desired MEF from the dialog box, select **Open.**

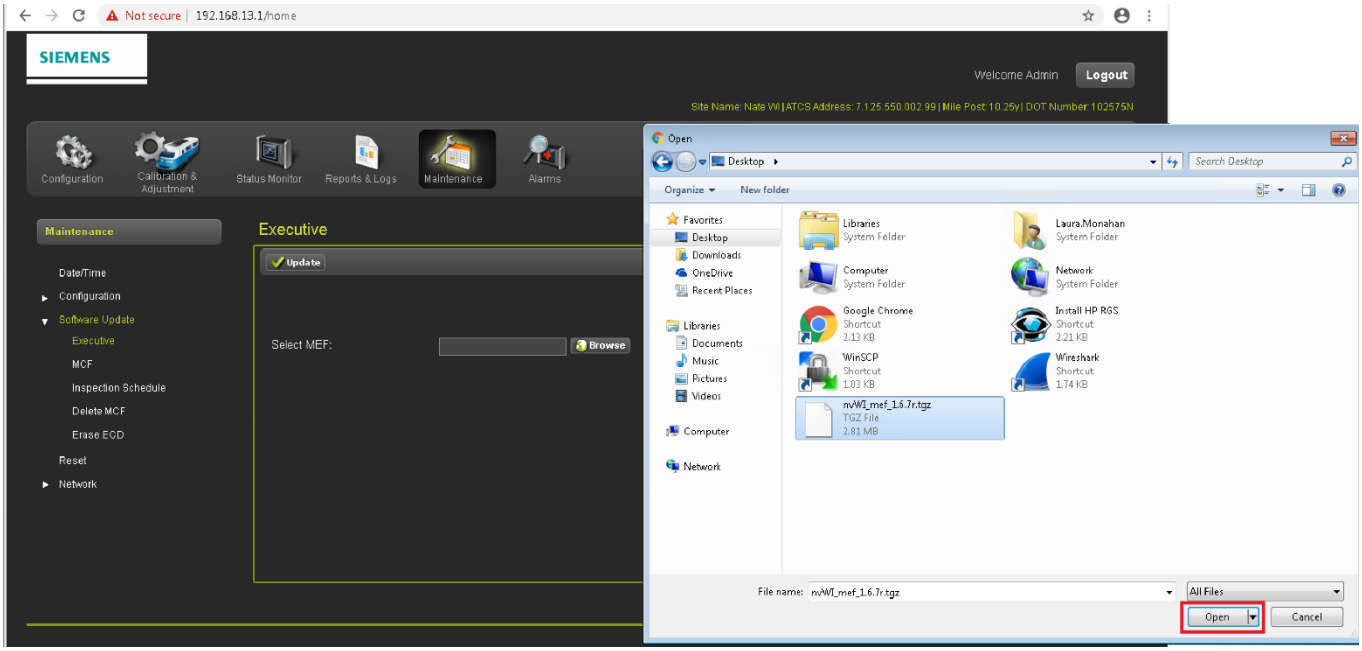


Figure 5-72 Open MEF to Load Dialog Box

After the desired software file is uploaded, select the **Update** button. This will begin the MEF update process.

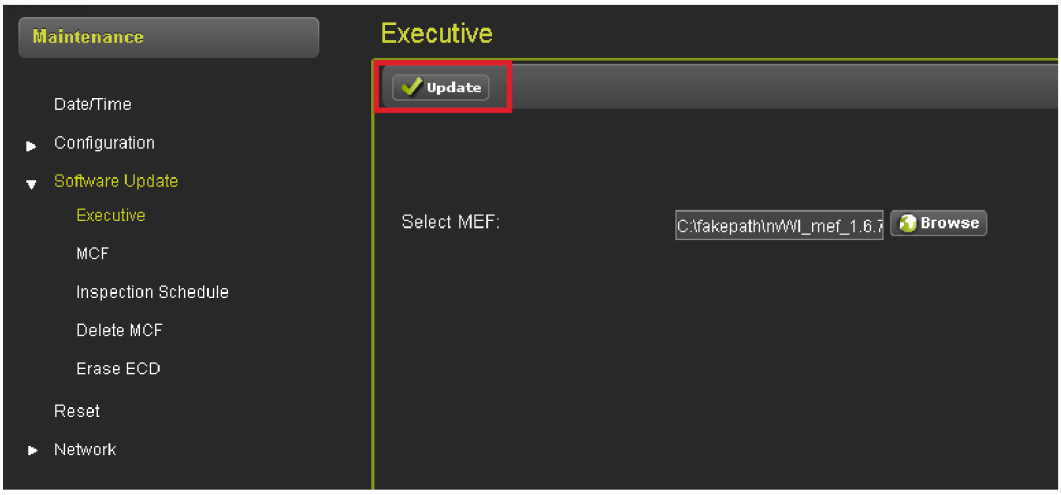


Figure 5-73 Update MEF View

While the MEF is uploading, a status bar will be displayed on the screen to indicate progress as shown below.

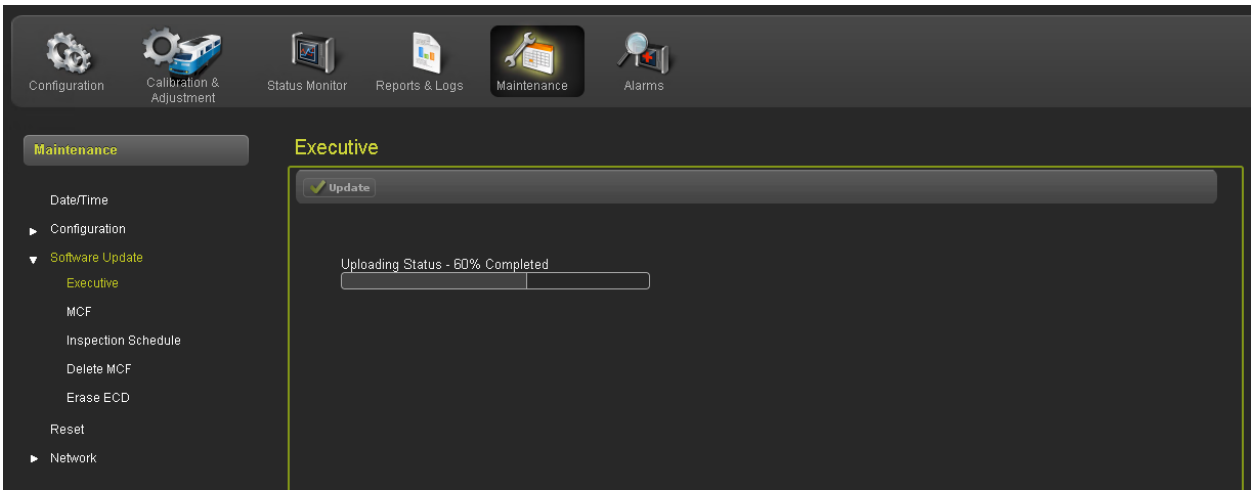


Figure 5-74 MEF Update in Process View

Once the upload has reached 90% the Web UI will prompt the user to acknowledge that a reboot is required.

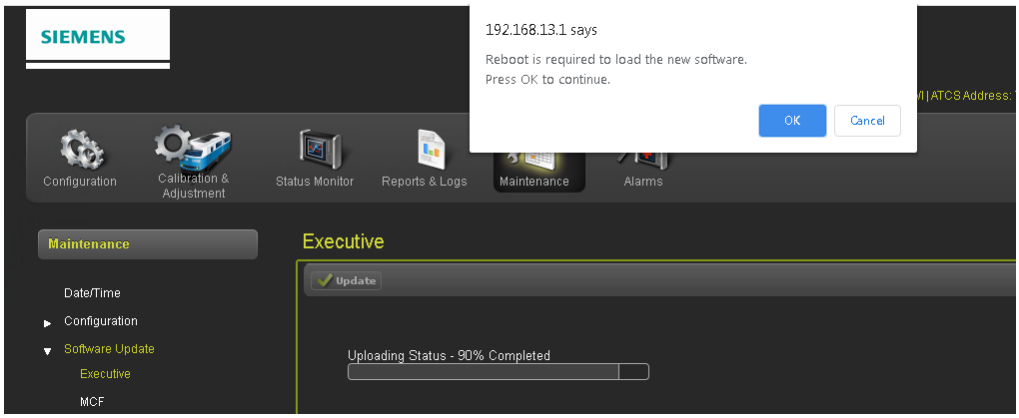


Figure 5-75 Reboot Required Dialog Box

After the software has been successfully updated, the Web UI will display the message shown in the figure below.

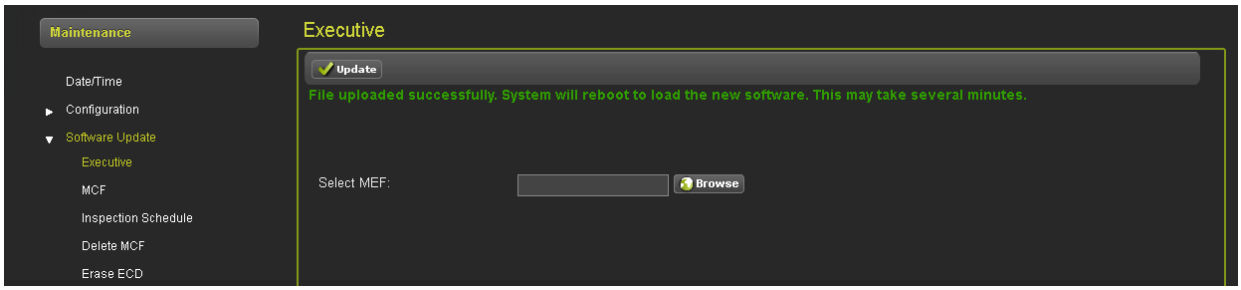


Figure 5-76 Executive Software Upload Complete View

5.9.3.2 Loading MCF

The MCF upload procedure is the same as the procedure for the MEF (section 5.9.3.1). From the Update MCF Software screen, select the MCF from the available files, then select **Update**.

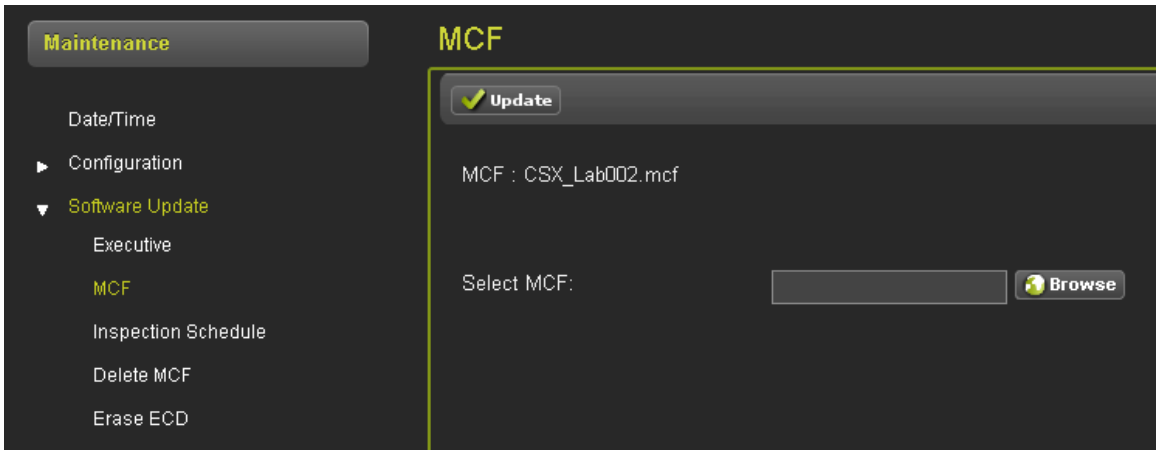


Figure 5-77 Software Update: MCF Screen

Once the MCF has been updated, the Web UI will display the message shown below.

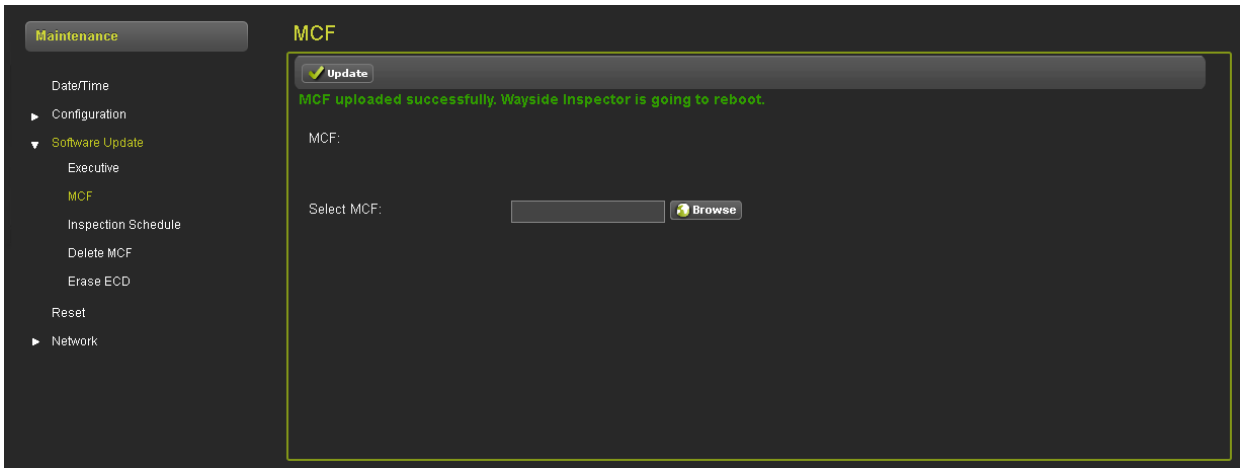


Figure 5-78 MCF Upload Complete View

5.9.3.3 Inspection Schedule

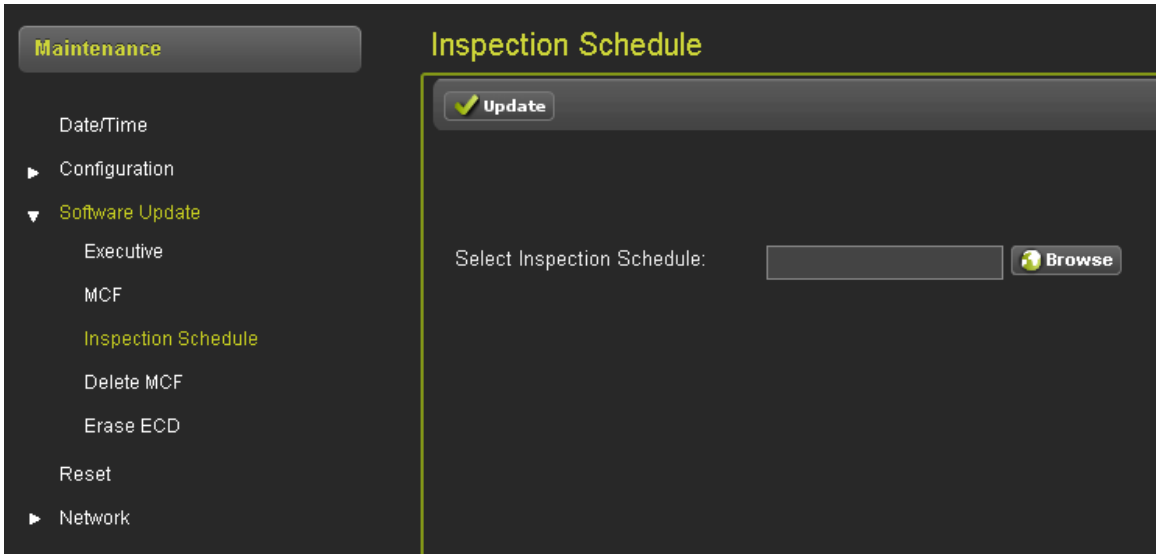


Figure 5-79 Software Update: Inspection Schedule Screen

From this screen, a new Inspection Schedule may be uploaded. Locate the applicable .txt file, make the updates, save the file, and click the **Update** button on the screen.

5.9.3.4 Delete MCF

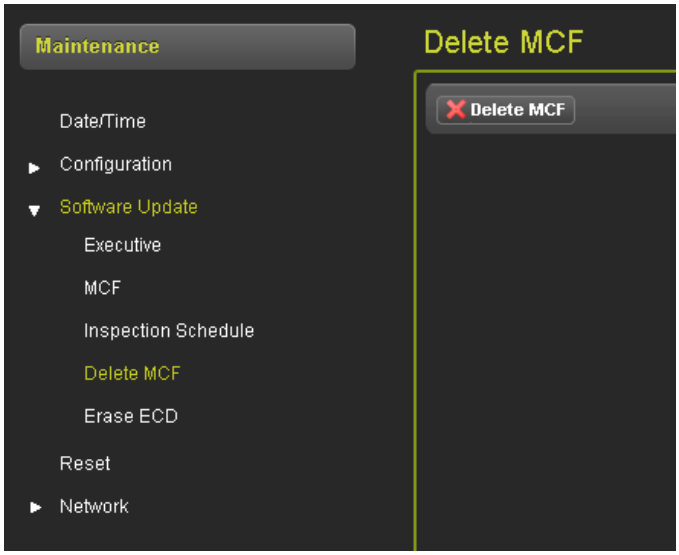


Figure 5-80 Software Update: Delete MCF Screen

From this screen, the currently loaded MCF may be deleted.

NOTE

NOTE

Once the MCF has been deleted it cannot be undone.

Ensure that this action is intended prior to clicking the **Delete MCF** button.

5.9.3.5 Erase ECD

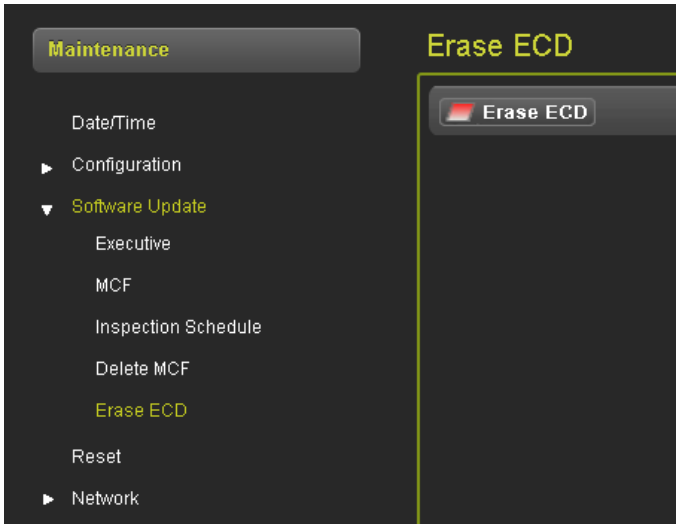


Figure 5-81 Software Update: Erase ECD Screen

From this screen, the ECD may be erased.

NOTE

NOTE

Once the ECD has been erased it cannot be undone.

Ensure that this action is intended prior to clicking the **Erase ECD** button. Erasing the ECD will restore the unit to its factory default settings.

5.9.4 Reset

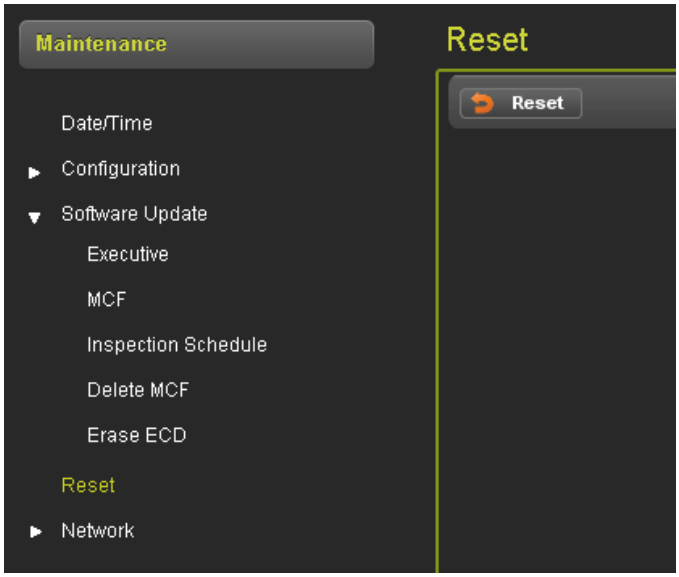


Figure 5-82 Reset Screen

Using the Reset function triggers the WI to reboot.

5.9.5 Network

5.9.5.1 Ping

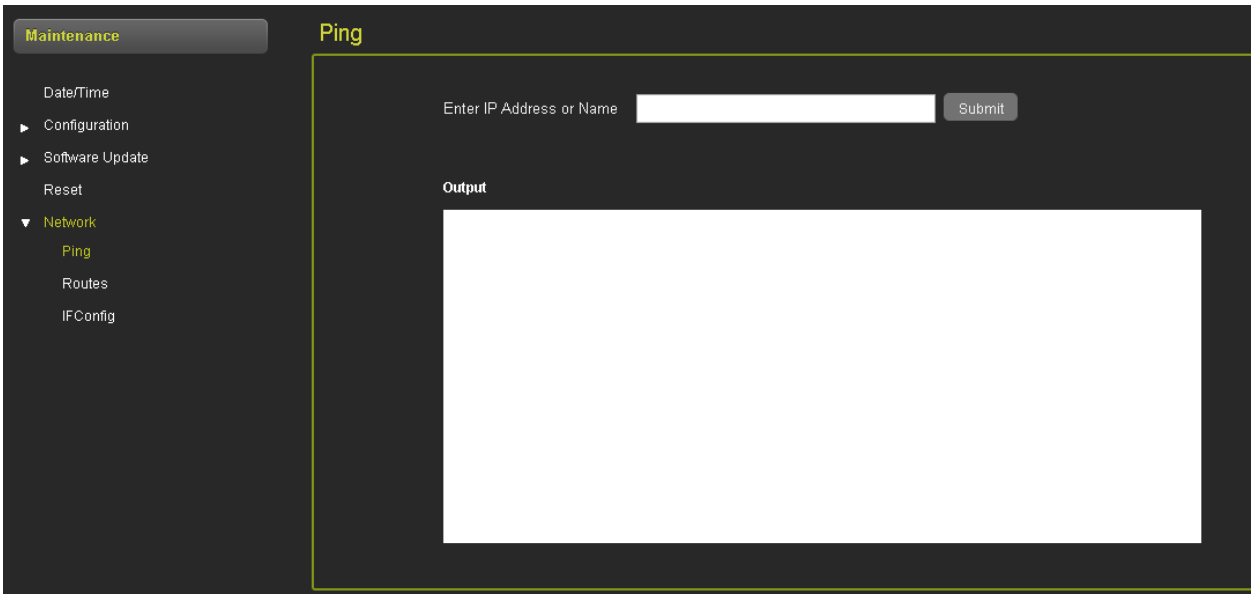


Figure 5-83 Network: Ping Screen

The Web UI allows the user to perform a network ping.

5.9.5.2 Routes

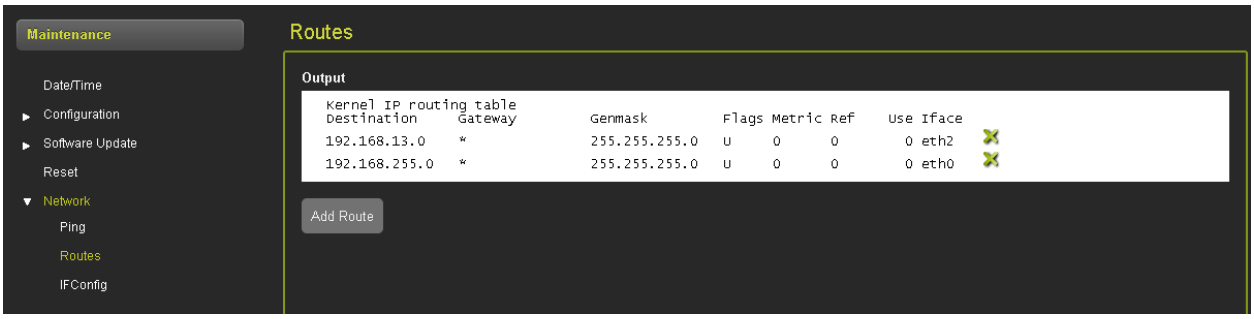


Figure 5-84 Network: Routes Screen

The Routes screen allows the user to view the currently configured networking routes in the WI. The user may also add or remove route table entries from this screen.

5.9.5.3 IFConfig

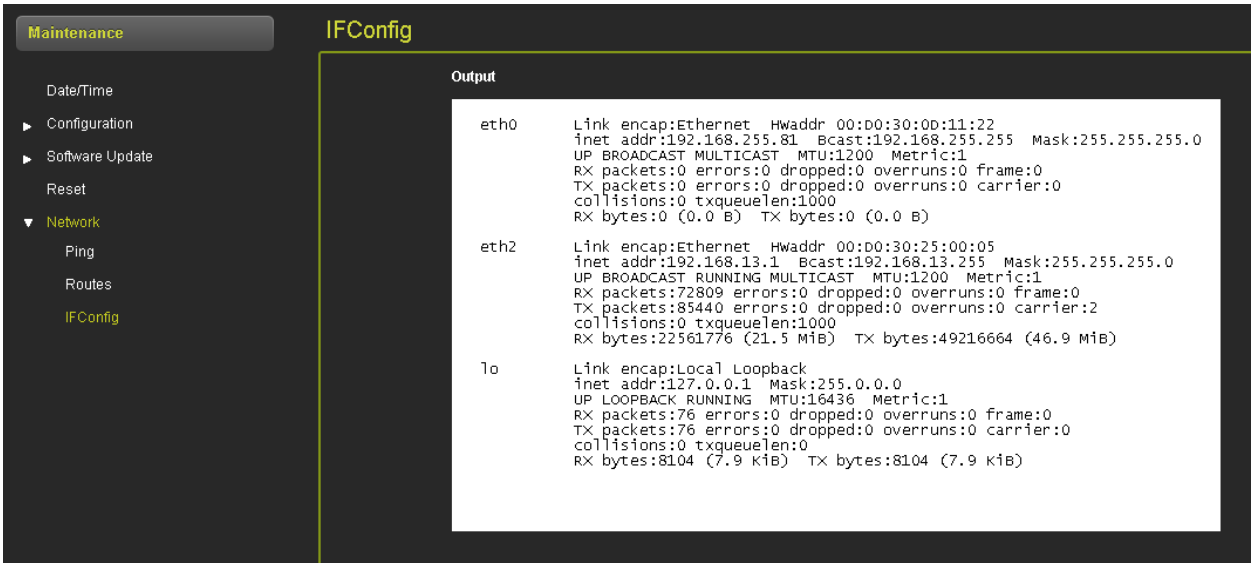


Figure 5-85 Network: IFConfig Screen

The IFConfig screen allows the user to view the network interface details.

5.9.5.4 ARP

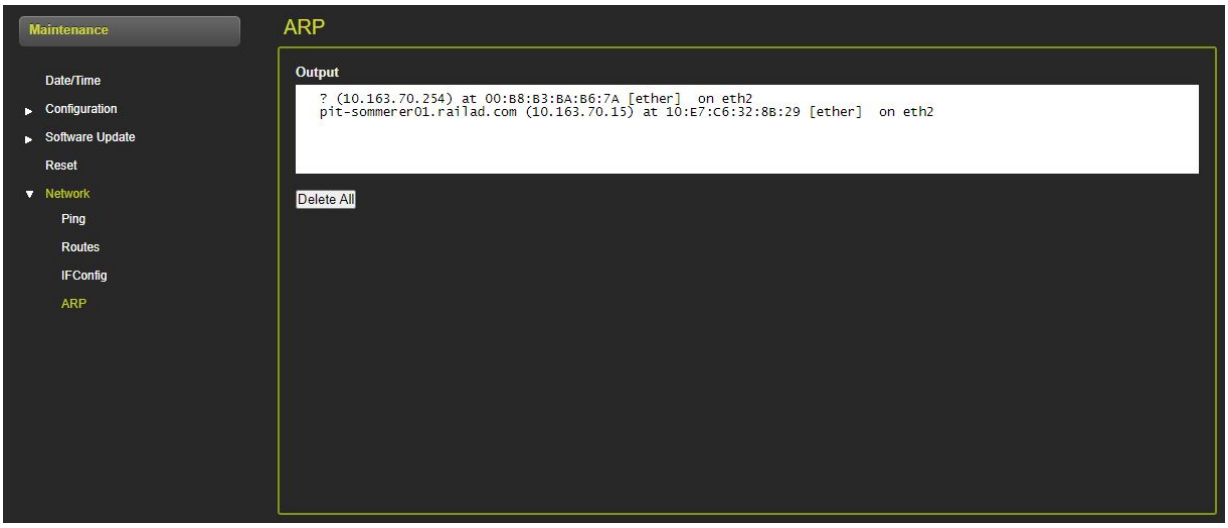
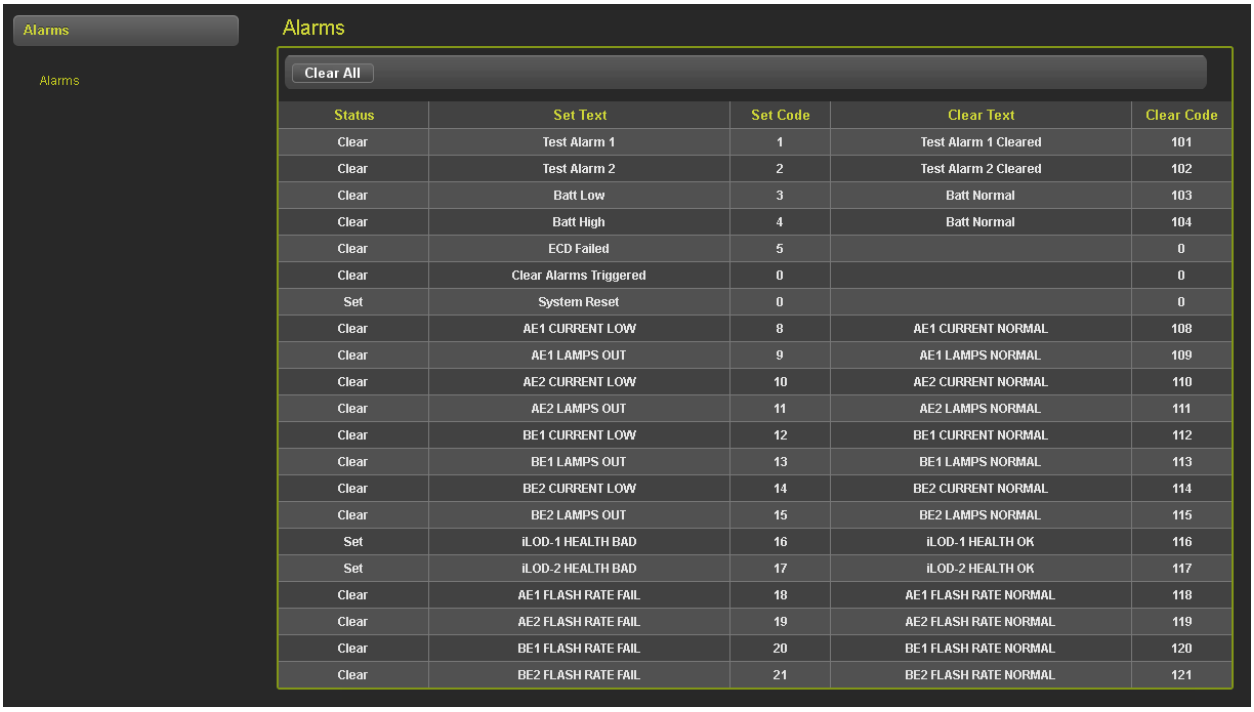


Figure 5-86 Network: ARP Screen

The ARP screen allows the user to view the Address Resolution Protocol used to discover link layer addresses.

5.10 ALARMS



Status	Set Text	Set Code	Clear Text	Clear Code
Clear	Test Alarm 1	1	Test Alarm 1 Cleared	101
Clear	Test Alarm 2	2	Test Alarm 2 Cleared	102
Clear	Batt Low	3	Batt Normal	103
Clear	Batt High	4	Batt Normal	104
Clear	ECD Failed	5		0
Clear	Clear Alarms Triggered	0		0
Set	System Reset	0		0
Clear	AE1 CURRENT LOW	8	AE1 CURRENT NORMAL	108
Clear	AE1 LAMPS OUT	9	AE1 LAMPS NORMAL	109
Clear	AE2 CURRENT LOW	10	AE2 CURRENT NORMAL	110
Clear	AE2 LAMPS OUT	11	AE2 LAMPS NORMAL	111
Clear	BE1 CURRENT LOW	12	BE1 CURRENT NORMAL	112
Clear	BE1 LAMPS OUT	13	BE1 LAMPS NORMAL	113
Clear	BE2 CURRENT LOW	14	BE2 CURRENT NORMAL	114
Clear	BE2 LAMPS OUT	15	BE2 LAMPS NORMAL	115
Set	iLOD-1 HEALTH BAD	16	iLOD-1 HEALTH OK	116
Set	iLOD-2 HEALTH BAD	17	iLOD-2 HEALTH OK	117
Clear	AE1 FLASH RATE FAIL	18	AE1 FLASH RATE NORMAL	118
Clear	AE2 FLASH RATE FAIL	19	AE2 FLASH RATE NORMAL	119
Clear	BE1 FLASH RATE FAIL	20	BE1 FLASH RATE NORMAL	120
Clear	BE2 FLASH RATE FAIL	21	BE2 FLASH RATE NORMAL	121

Figure 5-87 Alarms Screen

The Alarms screen provides a listing of all programmed alarms and their current state.

CHAPTER 6 INSTALLATION & WIRING

6.1 WAYSIDE INSPECTOR INSTALLATION & WIRING

The WI is wall, shelf, or rack mountable. It must be installed in accordance with the railroad/agency's approved site drawing. In Figure 6-1, the WI is wired to perform the Standby Power Inspection (CFR, Title 49, §234.251).

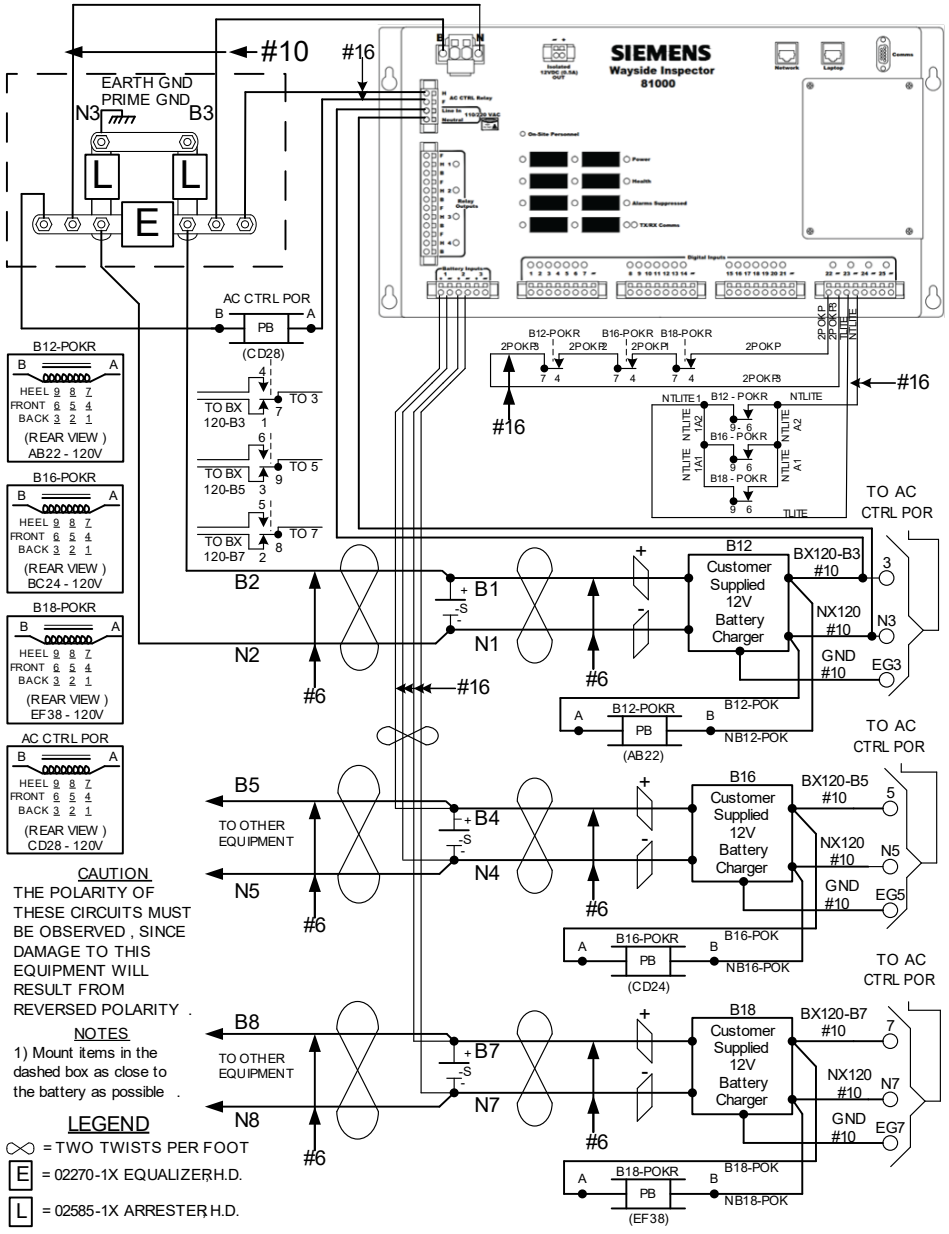


Figure 6-1 Recommended Battery Surge Protection Wiring for WI, with WI Configured for Stand-By Power Inspection

6.2 ANCILLARY EQUIPMENT INSTALLATION & MOUNTING

All ancillary equipment used with the WI is wall or rack mountable. The following ancillary equipment is installed and wired as shown:

1. WI connected to the Ground Fault Tester 2 (GFT2) and configured for Grounds Inspection.
2. WI connected to the Model 5000 Grade Crossing Predictor (GCP) and configured for Warning Time Inspection.
3. WI connected to the Model 4000 Grade Crossing Predictor (GCP) via the Wayside Access Gateway (WAG) and configured for Warning Time Inspection.

6.2.1 WI Connected to the GFT2 and Configured for Grounds Inspection

The GFT2 is wall, shelf, or rack mountable. The Data Out wire may be connected to any unused Digital Input. In Figure 6-2, the WI is configured to perform the Grounds (CFR, Title 49, §234.249) Inspection. The GFT2 must be installed in accordance with the railroad/agency's approved site drawing.

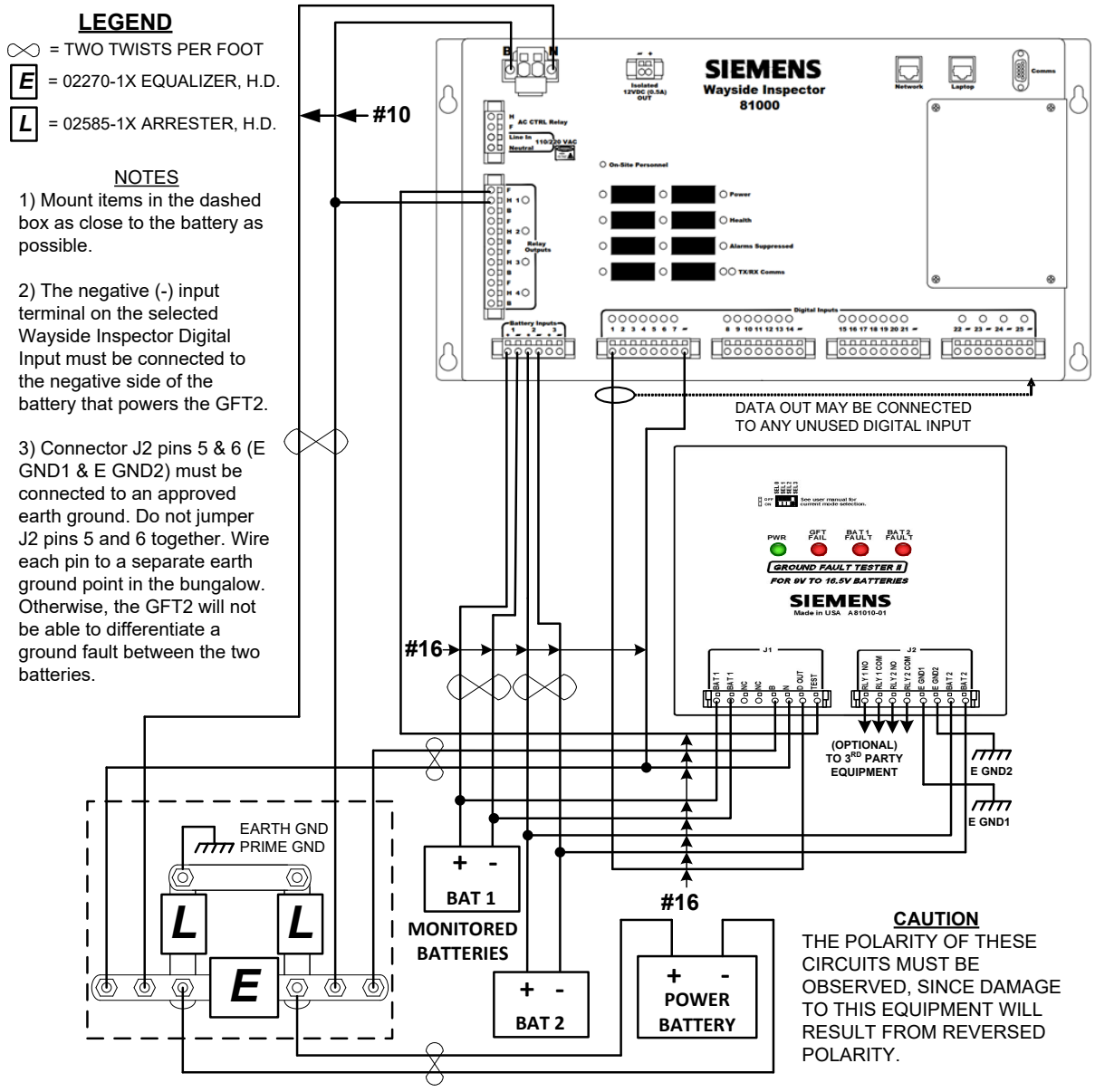


Figure 6-2 Recommended Wiring for WI Connected to GFT2 with WI Configured for Grounds Inspection

6.2.2 WI Connected to Model 5000 GCP with WI Configured for Warning Time Inspection

NOTE

NOTE

Customer supplied ethernet hubs may be used to ensure connectivity between all ethernet capable equipment in the shelter.

The Model 5000 GCP is wall, shelf, or rack mountable. The GCP automatically provides the WI with Warning Time ((CFR, Title 49, §234.259) Inspection data. The Model 5000 is network capable and is connected via Cat 5 cable to the WI in either the ETH1 or ETH2 connector in accordance with the Railroad/Agency's approved site drawing.

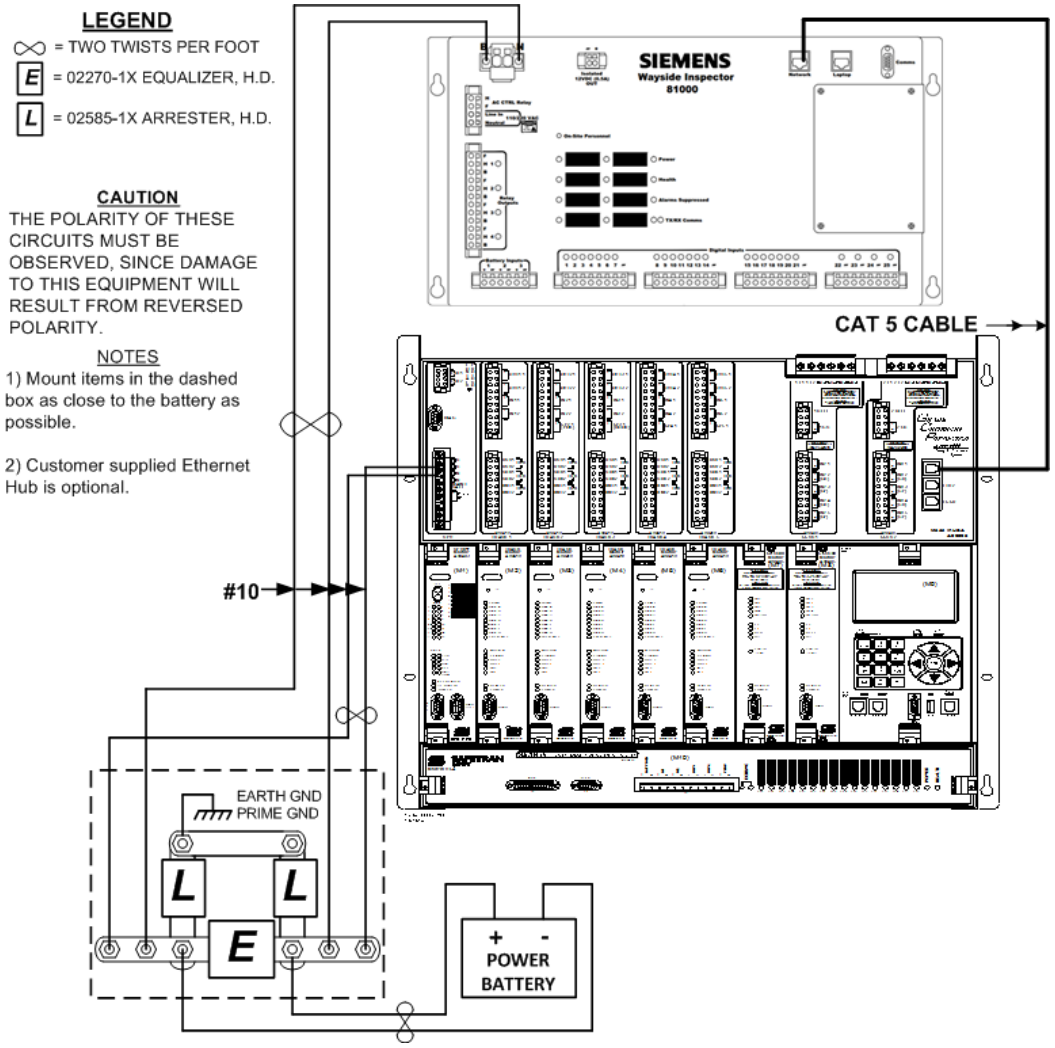


Figure 6-3 WI Connected to Model 5000 GCP with WI Configured for Warning Time Inspection

6.2.3 WI Connection to Model 4000 GCP

NOTE

NOTE

Customer supplied ethernet hubs may be used to ensure connectivity between all ethernet capable equipment in the shelter.

The Model 4000 GCP is wall, shelf, or rack mountable. The GCP automatically provides the WI with Warning Time (CFR, Title 49, §234.259) inspection data.

Model 4000 GCPs that use older display modules (A80407) cannot be directly connected to the WI and must be connected via the Echelon connector to the Wayside Access Gateway (WAG), with the WAG connected to the WI in accordance with the railroad/agency's approved site drawing.

If the Model 4000 GCP is using the current display (A80485), then the WI can plug directly into either Ethernet 1 or Ethernet 2 of the display module or into a common network used by either of those ports, without the need for a WAG. This is shown in the following figure where the CAT 5 cable connects to the display in place of the WAG.

The network interface IP addresses and netmask of both systems must be configured correctly. Siemens does not recommend plugging the WI into the Laptop Ethernet port, which is reserved for on-site personnel.

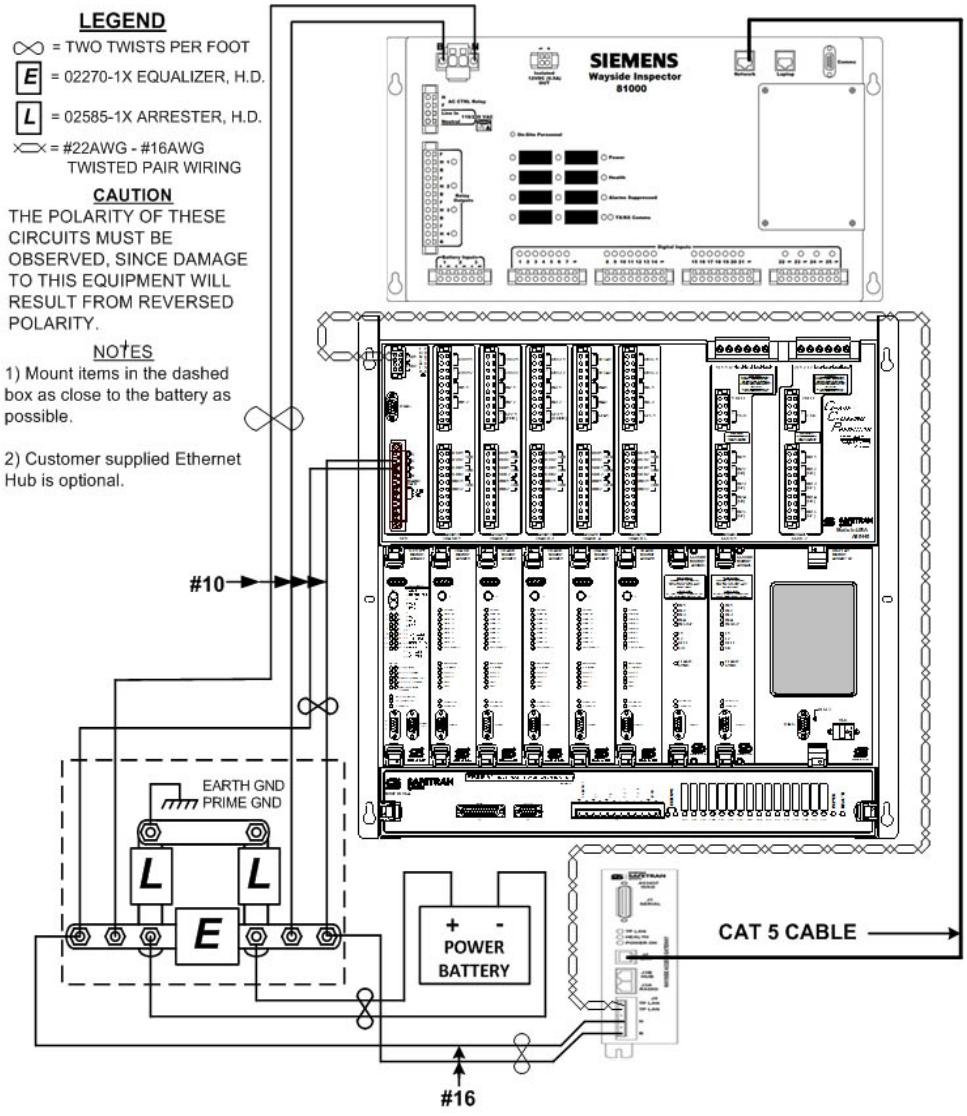


Figure 6-4 WI Connected to Model 4000 GCP with WI Configured for Warning Time Inspection

CHAPTER 7 OFFICE SYSTEM INTERFACES

7.1 INTERFACES TO OFFICE SYSTEMS

The WI supports two protocol stack interfaces to communicate with office systems: WAMS and Digitalization. Both interfaces use the network Ethernet port of the WI.

7.1.1 WAMS/RailFusion Interface

The WI supports a Siemens proprietary protocol for reporting alarms and other information to a Wayside Alarm Management System (WAMS) running in the office. The interface supports alarm messages, logs, limited configuration data, and getting and setting the time for the unit. The WAMS/RailFusion interface protocol stack uses proprietary messages embedded in ATCS packets, which are transported across a network in UDP datagrams. For details on the WAMS/RailFusion interface protocol stack, contact Siemens Mobility, Inc.

7.1.2 Digitalization Interface

The Digitalization Interface is used for communication between the WI and a Digitalization Platform. The Digitalization Platform provides connectivity to applications running in the cloud or in an on-premise server (Cloud Apps). The Digitalization Platform can be one provided by Siemens Mobility but may also be provided by third parties.

The WI digitalization interface protocol stack uses the Interoperable Train Control Messaging (ITCM) System to transport messages. The following figure shows the context for the digitalization interface.

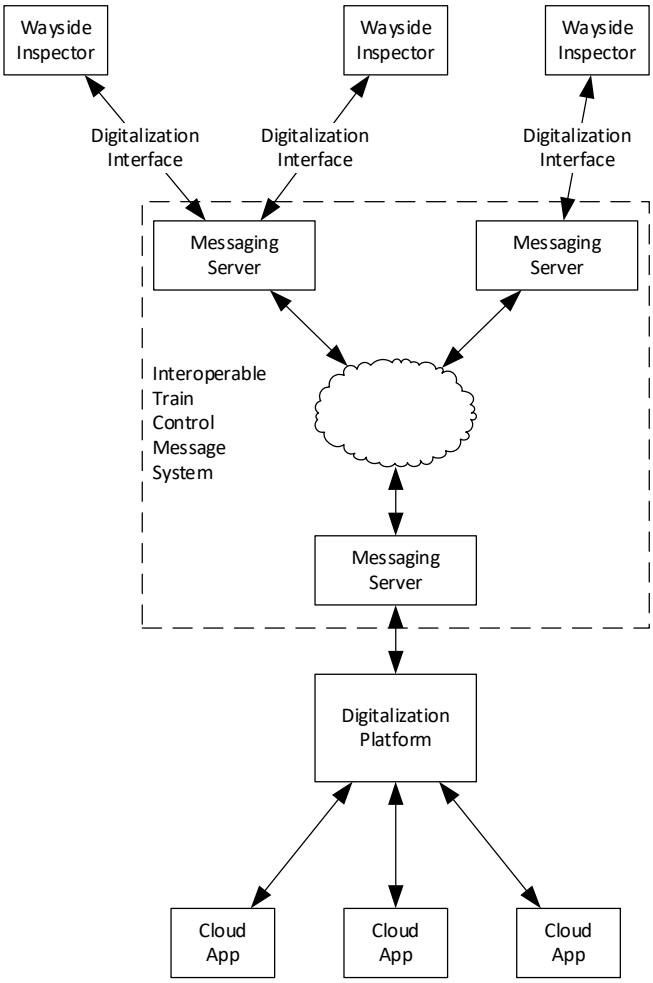


Figure 7-1 Digitalization Interface Overview

7.1.3 MindSphere, MindConnect Rail and the WI Web Application

Siemens provides a digitalization platform and a web application to go with the WI using Siemens MindSphere and MindConnect Rail.

MindSphere is the Siemens Industrial IoT operating system comprising the core cloud services and applications. In MindSphere, submitted data by a WI is processed and stored for analysis and further management purposes. MindConnect Rail is an office connectivity application used to pre-process and securely route WI data from the field into the MindSphere platform.

The WI web application is an application that runs on the MindSphere platform, which then communicates with WIs through MindConnect Rail and the digitalization interface. Users access the WI web application using a web browser on a laptop, desktop, tablet, or smartphone. For more information about the WI web application, see manual ***SIG-00-20-02***.