SIEMENS

INSTALLATION AND INSTRUCTION

VITAL INTERFACE UNIT 20 INPUTS / OUTPUTS (VIU-20) A80515

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DOCUMENT HISTORY

Version	Release Date	Sections Changed	Details of Change
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B.2	Oct 2019	2, 5, and 7	Added additional Cautions, Warnings, and Notes

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NOTES, CAUTIONS, AND WARNINGS

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

WARNING

⚠ WARNING

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

CAUTION

⚠ CAUTION

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

NOTE

NOTE

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

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

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

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

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

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

GLOSSARY

TERM	DESCRIPTION
AAR	Association of American Railroads – An organization that establishes uniformity and standardization among different railroad systems.
ACSES	Advanced Civil Speed Enforcement System – A Vital Interface Unit that provides functions according to Wayside Interface Unit (WIU) requirements as defined by the Association of America Railroads (AAR). It also provides functions according to ACSES Encoder requirements. Its dual function capability allows an ACSES train and a train that is capable of interfacing with a WIU to obtain wayside vital information.
Aspect	(Signal Aspect) The appearance of a fixed signal conveying an indication as viewed from the direction of an approaching train. A cab signal conveying an indication as viewed by an observer in the cab.
ATCS	Advanced Train Control System – A set of standards compiled by the AAR for controlling all aspects of train operation.
BCP	Base Communication Packet, or Base Station
CBTC	Communications Based Train Control. An automated control system for railways that ensures the safe operation of rail vehicles using data communication between various control entities that make up the system.
CETC	Centralized Electrification & Train Control
CDMA	Code Division Multiple Access. This is a form of spread spectrum signaling using different codes on one or more channels.
Checksum	A simple way to protect the integrity of data by detecting errors in data that are sent through space (telecommunications) or time (storage). It works by adding up the basic components of a message, typically the asserted bits, and storing the resulting value. Anyone can later perform the same operation on the data, compare the result to the authentic checksum, and (assuming that the sums match) conclude that the message was most likely not corrupted.
Configuration File	When changes are made to the default settings in the MCF (Master Configuration File), the custom settings are maintained in the configuration file.
CRC	Cyclic Redundancy Check. A type of function that takes an input of data stream of any length and produces as output a value of a certain fixed size. The term CRC is often used to denote either the function or the function's output. A CRC can be used as a checksum to detect alteration of data during transmission or storage. CRCs are particularly good at detecting common errors caused by noise in transmission channels.
CTV	Television Compatibility Box
DSU	Data Service Unit

TERM	DESCRIPTION
DT	Diagnostic Terminal. Siemens PC-based diagnostic software.
ECD	External Configuration Device. A serial EEPROM (Flash Memory) device used to store site-specific configuration data (MCF, SIN, UCN, etc.) for the VIU.
EEPROM	**E**lectrically **E**rasable **P**rogrammable **R**ead-**O**nly **M**emory. A type of non-volatile memory used in computers and other electronic devices to store small amounts of data that must be saved when power is removed. When larger amounts of static data are to be stored, a specific type of EEPROM called a flash memory is used.
ELS	Serial Link extenSion board.
EMP	Edge Messaging Protocol. A common message format used for edge integration. Examples of integration edges are wireless transports and various messaging systems that may be used by the various railroads (e.g., using EMP to communicate between mobile applications and back office applications using wireless communications). EMP defines the message format, header, and operating rules which facilitate interoperable message transmission, reception, decoding, and routing.
ESSR	Ethernet Spread Spectrum Radio.
FRA	Federal Railroad Administration. The purpose of FRA is to: promulgate and enforce rail safety regulations; administer railroad assistance programs; conduct research and development in support of improved railroad safety and national rail transportation policy; and consolidate government support of rail transportation activities.
GCP	Grade Crossing Predictor.
GCS	Geographic Configuration Suite. Used to program the VIU-20e MCF.
GMT	The time as measured on the prime meridian running through Greenwich, England: used in England and as a standard of calculation elsewhere. Also called **Greenwich Mean Time, Greenwich Civil Time, Universal Time**
GOL	Geographic Object Library. A collection of pre-configured track and signal elements used by Siemens Geographic Configuration Suite software for building track layouts. Each GOL object posses the necessary track element characteristics as defined by the FRA rules.
GPS	Global Positioning System.
HMAC	Keyed-Hash Message Authentication Code. A type of message authentication code (MAC) calculated using a specific algorithm involving a cryptographic hash function in combination with a secret key.
HS	Home Signal.
LCT	Line Controller Task, A function of the Siemens Mobility, Inc™ Packet Switch
LCM	Locomotive Communication Module. Radio located on board a locomotive.
LD	Line Driver

TERM	DESCRIPTION
LED	Light Emitting Diode.
LoMA	Limits of Movement Authority. The control center's safety interlocking logic uses the data from all trains to issue **limits of movement authority (LoMA)** and speed limits to each train, being careful to keep safe separation between trains. The train's onboard computer monitors the LoMA and speed limit data against actual train location and speed to determine potential and actual unsafe conditions. If the train is approaching the end of its LoMA or it is nearing its speed limit, the onboard computer warns the engineer, who is expected to take appropriate action. If the train passes the end of its LoMA, the onboard computer automatically signals for a safety brake application to bring the train to a stop.
MCF	Module Configuration File. Application specific configuration file. Defines how the VIU-20e will operate in a specific application such as the Office Monitoring or Wayside Interface applications. Contains default settings for configurable parameters.
MCP	Mobile Communications Package
MEF	Module Executable File. The VIU-20e executive software. Defines the general operation of the VIU.
NMEA	National Marine Electronics Association. **NMEA 0183** (or **NMEA** for short) is a combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonar, Anemometer (winds speed and direction), gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the US-based National Marine Electronics Association. The NMEA 0183 standard uses a simple ASCII, serial communications protocol that defines how data is transmitted in a "sentence" from one "talker" to one "listener" at a time. Through the use of intermediate expanders, a talker can have a unidirectional conversation with multiple listeners, and using multiplexers, multiple sensors can talk to a single computer port. Third-party switches are available that can establish a primary and secondary talker, with automatic failover if the primary fails.
OBC	On-Board Computer.
OCG	Office Communication Gateway. Communications traffic router, such as a packet switch, that provides the interface between the office monitoring system and the communications infrastructure.
OSI	Open Systems Interconnection. A layered, abstract description for communications and computer network protocol design. It is sometimes known as the **OSI seven layer model**. From top to bottom, the OSI Model consists of the Application, Presentation, Session, Transport, Network, Data Link, and Physical layers. A layer is a collection of related functions that provides services to the layer above it and receives service from the layer below it.
PTC	Positive Train Control.

TERM	DESCRIPTION
SIN	Site Identification Number. The 12-digit ATCS address for the VIU equipment, entered via the Web interface and stored in the ECD. 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.
SMA	Sub-Miniature version A.
TCP/IP Network	Transmission Control Protocol / Internet Protocol. The suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP. TCP/IP is built into the UNIX operating system and is used by the Internet, making it the de facto standard for transmitting data over networks.
TMC	Train Management Computer. The CBTC Computer on board a locomotive that interprets messages from the WIU and controls the locomotive operations accordingly.
TRM	Transmission Radio Modem
TSR	Temporary Speed Restriction
UCN	Unique Check Number. A 32-bit CRC calculated over the MCF, SIN and vital configuration parameters. Used to verify that the configuration is correct. It is stored in the ECD to detect file corruption.
UDP	User Datagram Protocol. One of the core protocols of the Internet protocol suite. Using UDP, programs on networked computers can send short messages sometimes known as *datagrams* (using Datagram Sockets) to one another.
UNS	Unified Numbering System.
USB	Universal Serial Bus. A serial bus standard to interface devices. USB was designed to allow many peripherals to be connected using a single standardized interface socket and to improve the plug-and-play capabilities by allowing devices to be connected and disconnected without rebooting the computer (hot swapping). Other convenient features include providing power to low-consumption devices without the need for an external power supply and allowing many devices to be used without requiring manufacturer specific, individual device drivers to be installed.
UTC	Coordinated Universal Time.
VIU	Vital Interface Unit. A device that monitors switch positions and signal aspects and then generates vital status messages reflecting the current state of the monitored equipment.
VLAN	Virtual Local Area Network
VPF	Vital Parallel Flashing (VPF) input circuit. The VIU Master I/O circuit with 10 vital inputs that runs appliance model logic and detects steady and flashing inputs. Identical Slave circuits provide10 additional vital inputs with similar functionality .

TERM	DESCRIPTION
VTP	Virtual Local Area Network (VLAN) Trunk Protocol. A Cisco proprietary Layer 2 messaging protocol that manages the addition, deletion, and renaming of VLANs on a network-wide basis. VTP reduces administration in a switched network. When you configure a new VLAN on one VTP server, the VLAN is distributed through all switches in the domain. This reduces the need to configure the same VLAN everywhere.
WCM	Wayside Communications Module. A radio, such as the MDS or Siemens ESSR radios, located at a wayside and used to transmit vital status messages generated by the VIU-20e to passing trains.
WIU	Wayside Interface Unit. Term used to refer to the VIU in CBTC applications.
WSM	Wayside Status Messages. Messages in EMP format reflecting the status of vital functions at a wayside location. These vital functions include signal aspects and switch positions. These messages are generated by the VIU and are sent to the WCM for transmission.

SECTION 1
INTRODUCTION

1.0 INTRODUCTION

1.1 GENERAL

This document describes the installation, configuration and operation of the Siemens Vital Interface Unit (VIU), part number A80515.

The VIU is a general purpose programmable logic controller that can monitor the state of its inputs, perform logic functions and generate vital communications messages to report its status or the status of devices connected to its inputs.

Each VIU unit has the ability to monitor up to twenty (20) vital inputs. If additional vital I/O is required, multiple VIU Units can be cascaded. Each VIU provides event recording capability.

The VIU supports the standard Positive Train Control (PTC) protocols and Wayside Interface Unit functionality as defined by the Interoperable Train Control (ITC) Committee. The VIU utilizes the Interoperable Train Control Messaging (ITCM) and the vital Advanced Train Control System (ATCS) communication systems to generate Wayside Status Messages that are passed to the office and to trains.

⚠ WARNING

WARNING

THE VIU IS CAPABLE OF BROADCASTING VITAL EMP STATUS MESSAGES. THE USE OF THE VIU IN A LARGER SYSTEM WITH OTHER COMPONENTS SHOULD BE CONSIDERED CAREFULLY SO AS NOT TO INADVERTENTLY COMPROMISE THE VITALITY OF THE EMP PROTOCOL.

The ATCS protocol also supports remote configuration and control of selected VIU operational parameters.

1.2 APPLICATIONS

Application specific functions performed by the VIU are controlled by a Module Configuration File (MCF). The MCF is programmed using the Siemens Geographic Configuration Suite (GCS). The MCF currently supplied with the VIU supports two applications: the Wayside Interface Application and the Office Monitoring Application. These applications are described briefly in the following paragraphs. Expanded descriptions are provided as indicated in later sections of this document.

WARNING

PLEASE REVIEW THIS USER MANUAL CAREFULLY TO ENSURE CORRECT APPLICATION AND MAINTENANCE OF THE VITAL INTERFACE UNIT (VIU). INCORRECT APPLICATION MAY RESULT IN UNSAFE OPERATION.

1.2.1 Wayside Interface Application

In the Wayside Interface application (Figure 1-1), the VIU can monitor switch positions and signal aspects controlled by other equipment in an interlocking and send the signal aspect and switch position information to an on-board system. This application is for use in PTC systems. See Section 5 for details.

NOTE

When used in a PTC application, the VIU would function as the Wayside Interface Unit or WIU.

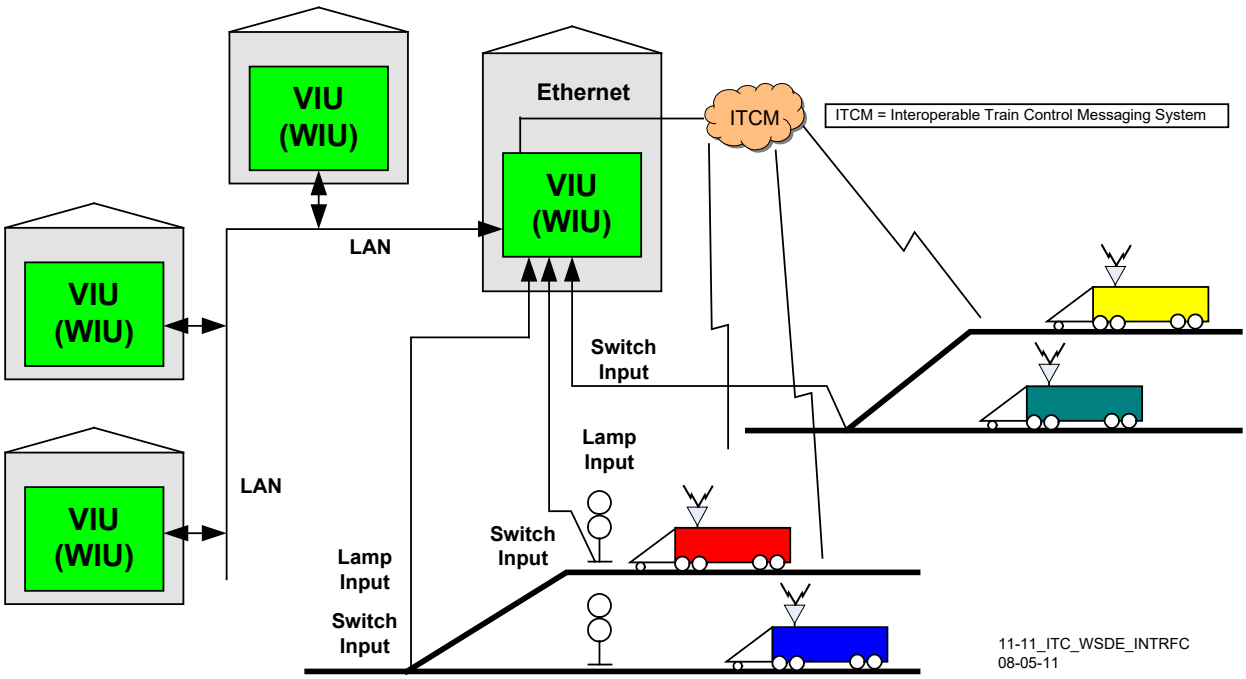


Figure 1-1 VIU Used in Wayside Interface Application

1.2.2 PTC Hand Throw Switch Monitoring Application

In the PTC Hand Throw Switch Monitoring application shown in Figure 1-2, the VIU can be used to monitor and report switch positions in both dark and signaled territory.

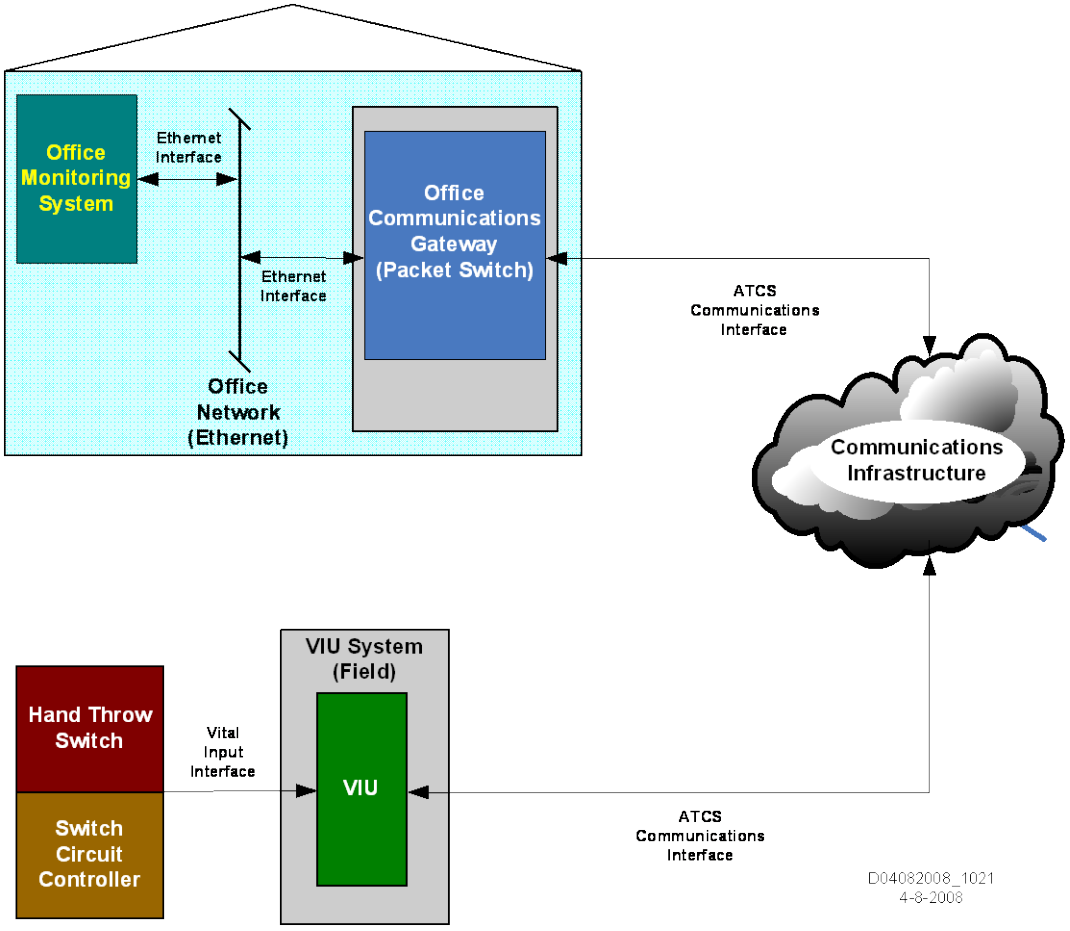


Figure 1-2 VIU Used in PTC Hand Throw Switch Monitoring Application

1.3 SYSTEM DATA LOGS

The VIU maintains several data logs as described in the following paragraphs.

1.3.1 Event Log

The Event Log is maintained by the non-vital side of the VIU. Entries in this log show application level events describing VIU system operations. This log does not contain detailed diagnostic events pertaining to the internal operation of the VIU or associated system. A separate Diagnostic Log maintains these more detailed diagnostic events (see paragraph 1.3.2for further information). Although the Event Log is stored/managed by the non-vital side of the unit, events from the vital side are stored in the log as well.

- Event Log is stored in flash memory to prevent data loss when power is removed from the VIU. It does not require a back-up battery.
- The number of events that can be stored in the Event Log is 100,000.
- Events stored in the Event Log are time stamped to the hundredth of a second.
- The log is structured as a circular buffer in that once the log is full, the newest event will overwrite the oldest recorded event.
- The entire Event Log can be downloaded to a USB drive.
- The Event Log is accessible using the web browser user interface. It can be viewed by date/time range and can be downloaded to a PC.
- The Event Log can be viewed using any of the following user interface systems:
    a. A web browser over a TCP/IP network.
    b. A web browser directly connected to a free Ethernet port on the VIU.
- Events can be viewed as they are recorded and logged into the Event Log via the **Trace Events** function on the web browser user interface.

1.3.2 Diagnostic Log

NOTE

NOTE

The buffer containing Diagnostic Log information is limited in size. As verbosity levels increase, the total number of events in the log decreases. Error level is the lowest verbosity level. It allows storage of the greatest number of log events but provides minimal information. Debug is the highest level and provides maximum information, but of much fewer events.

The diagnostic log is maintained by the non-vital side of the VIU. It contains low level diagnostic entries that detail the internal operation of the system that might otherwise clutter the event log. This data is useful for troubleshooting problems related to internal system operation.

- Diagnostic Log can contain five entry types (listed below in lowest to highest verbosity level):
    a. BASIC - entries that cannot be classified as another type or that need to be visible regardless of the VERBOSITY setting of the log (e.g. "diagnostic log initialized").
    b. ERROR – critical system errors such as hardware failures the system cannot heal or recover from.
    c. WARNING – system errors that could indicate a problem but the system can continue operating under this condition.
    d. INFORMATION – potentially useful information but does not represent a failure or fault in the system. This verbosity level is at the default setting.

e. DEBUG – information that may be useful to a software or hardware engineer in understanding the internal operation of the system but is not normally useful for anyone else.

- Diagnostic Log is stored in flash memory to prevent data loss when power is removed from the VIU. It does not require a back-up battery.
- The number of entries that can be stored in the Diagnostic Log is 10,000.
- Events stored in the Diagnostic Log are time stamped to the hundredth of a second.
- The log is structured as a circular buffer in that once the log is full, the newest event will overwrite the oldest recorded event..
- The entire Diagnostic Log can be downloaded to a USB drive.
- The Diagnostic Log is accessible using the web browser user interface. It can be viewed by date/time range and can be downloaded to a PC.
- Diagnostic Log can be viewed using any of the following user interface systems:
  a. A web browser over a TCP/IP network.
  b. A web browser directly connected to a free Ethernet port on the VIU.
- Entries can be viewed as they are recorded and logged into the Diagnostic Log via the **Trace Events** function on the web browser user interface.

1.3.3 Status, Summary and Maintenance Logs

The Status and Summary logs are maintained on the vital side of the VIU. Most of the events logged in these logs are also logged in the Event and Diagnostic logs, respectively. The Maintenance Log is maintained in the DT installation directory on the PC that is running the DT software. Each of these logs is accessible using the DT software. Please refer to Section 7 for details on viewing these logs.

The Status and Summary logs are lost when power is removed from the VIU.

1.3.4 Consolidated Logging

When one or more VIUs are operating on a network, each VIU can be configured to forward all events over the network to a “consolidated logger”. The logger will maintain all of the events for every reporting VIU. The logger can be another VIU.

To configure the VIUs to send the Event and/or Diagnostic Log entries to the logger, open the web browser user interface, select either Diagnostic Log or Event Log (or do both), enter the IP address of the logger in the Server IP dialog box. Refer to Section 8 for details.

1.4 HARDWARE DESCRIPTION

The Siemens Vital Interface Unit (VIU) (80515) is a compact fully enclosed unit with no field-replaceable components.

1.4.1 User Interface and Connectors

The VIU user interface and connectors are located on two adjacent faces of the unit, the top and the front. Refer to Figure 1-3 and Table 1-1 for location and descriptions of the connectors and the various elements of the user interface.

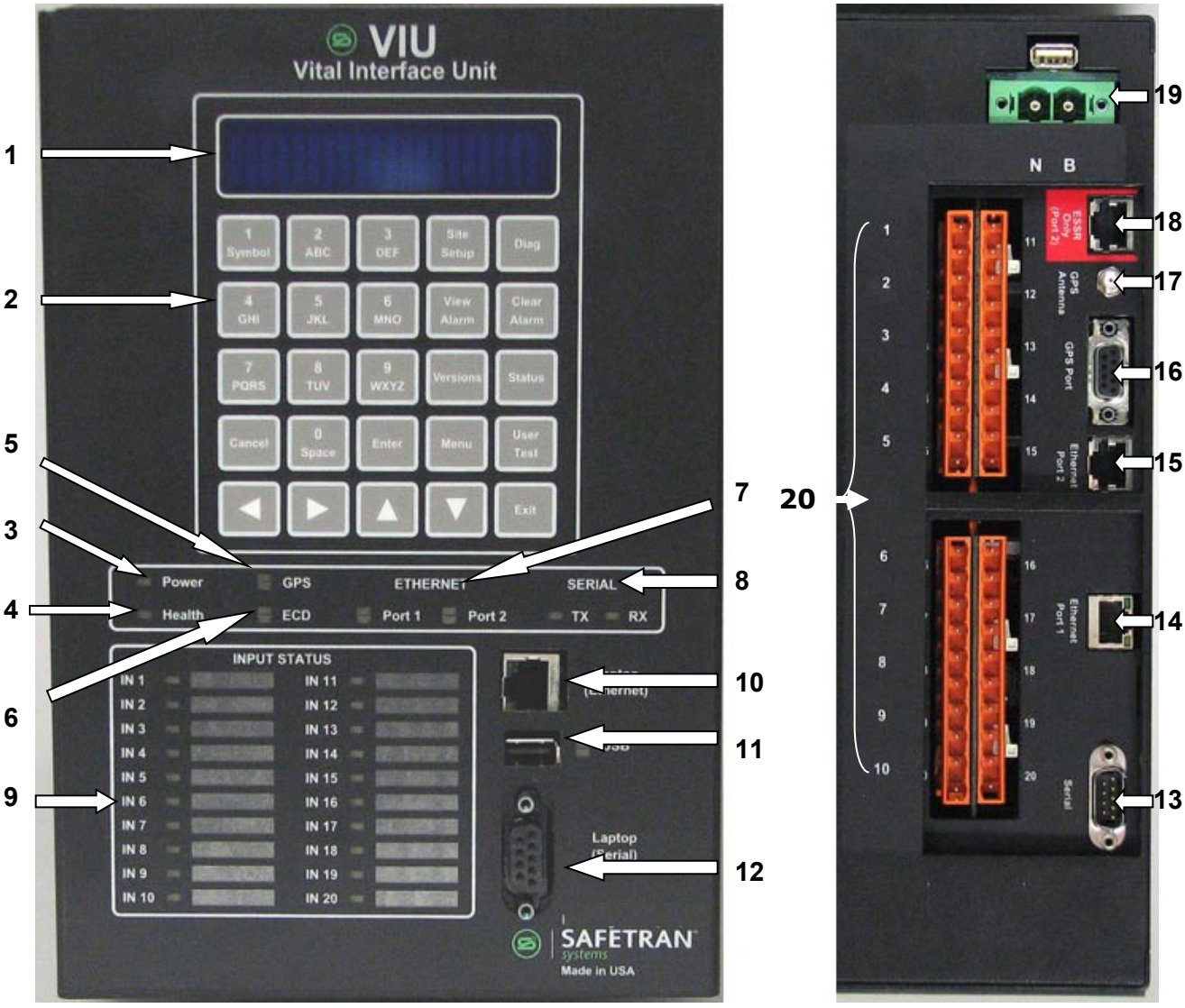


Figure 1-3 VIU User Interface and Connector Locations

Table 1-1 Control, Indicator, and Connector Locations

Item No. on Fig. 1-3	PHYSICAL DESCRIPTION	FRONT-PANEL NOMENCLATURE	FUNCTION
1	2-line X 20-character display	Display	Displays site configuration settings, error messages, log contents and system status.
2	Embossed keypad with tactile/audible feedback	25 keys with individual function text	Used to navigate through menu system.
3	Status LED	Power	Green LED lights when power is applied to the VIU.
4	Status LED	Health	Yellow LED indicates VIU health as follows: **Slow flash (0.5 Hz)** – VIU is healthy and communicating with vital CPU. **Fast flash (2 Hz)** – VIU is unhealthy.
5	Status LEDs	GPS	Yellow and green LEDs are associated with GPS connector on top of unit. LEDs indicate the following: **Green on steady** = looking for GPS satellites **Green flashing** = found satellite and generating timing pulse **Green off** = GPS failure or not used **Yellow on steady** = GPS health OK **Yellow off** = GPS health problem
6	Status LEDs	ECD	Show Write (green) & Read (red) activity between ECD located on the power connector and the internal CPU.
7	Status LEDs	ETHERNET Port 1 Port 2	Yellow and green LEDs are associated with Ethernet ports 1 and 2 on top of unit. LEDs indicate the following: **Yellow not lit** = 10 Mbps link rate **Yellow lit** = 100 Mbps link rate **Green flashing** = Link-up and message activity. NOTE: Port 2 indicators apply to either Ethernet Port 2 or ESSR only (Port 2), depending on which is in use. Both cannot be used simultaneously.
8	Status LEDs	SERIAL TX RX	Show TX (green) & RX (red) activity on serial connector located on top of VIU.
9	Status LEDs	INPUT STATUS	20 red LEDs. Indicate status of monitored vital inputs.
10	RJ-45 Ethernet Interface	Laptop (Ethernet)	10/100 Base-T Ethernet port. Yellow and green LEDs adjacent to the port indicate the following: **Yellow not lit** = 10 Mbps link rate **Yellow lit** = 100 Mbps link rate **Green flashing** = Link-up and message activity.

Item No. on Fig. 1-3	PHYSICAL DESCRIPTION	FRONT-PANEL NOMENCLATURE	FUNCTION
11	USB Interface	USB	USB 2.0 interface. Used to connect to a USB flash drive. The VIU can store logs and reports on the flash drive and receive software updates from the flash drive. The 3 LEDs (red, yellow, and green) adjacent to the USB port indicate the following: **Green on steady** = USB drive is inserted and it is safe to remove the USB drive. **Yellow flashing** = file transfer in progress, do not remove USB drive. **Red flashing** = USB drive read or write error detected.
12	Serial Interface	Laptop (Serial)	Female RS-232 diagnostic serial port used to connect to a PC using a standard RS-232 cable. Use this port when running PC-based DT software or HyperTerminal to access the VIU.
13	Serial Interface	Serial	Dedicated male RS-232 asynchronous serial port used as a general purpose communications port.
14	RJ-45 Ethernet Interface	Ethernet Port 1	Standard 10/100 Base-T Ethernet port.
15	RJ-45 Ethernet Interface	Ethernet Port 2	Standard 10/100 Base-T Ethernet port.
16	Serial Interface	GPS Port	Dedicated serial port for GPS signal output.
17	SMA Connector	GPS Antenna	Female SMA connector (1/4-36 UNS threaded coupling) for GPS antenna interface.
18	RJ-45 Ethernet Interface	ESSR Only (Port 2)	Dedicated 10/100 Base-T Ethernet port. Use to interface with a Siemens Mobility, Inc Ethernet Spread Spectrum Radio (ESSR) only. Provides radio power as well as Ethernet connectivity.
19	Power / ECD Connection		Two terminal power connector with External Configuration Device (ECD) attached. Allows VIU to be swapped out without reconfiguration. VIU configuration is stored in the ECD.
20	Discrete Vital I/O		Vital I/O connectors. Provide 5 pairs of terminals (+ and -) per connector.

1.4.2 Keypad Operations

The front panel has a 2-line, 20-character vacuum florescent display, a 25-key keypad, and a beeper. Menus are navigated with the arrow keys (◄, ►, ▲ and ▼), the **Enter**, **Cancel** and **Exit** keys. Text and numbers can easily be entered using the cell phone style number/letter keys. There are also special function keys for quick access to VIU settings and information (see Figure 1-4).

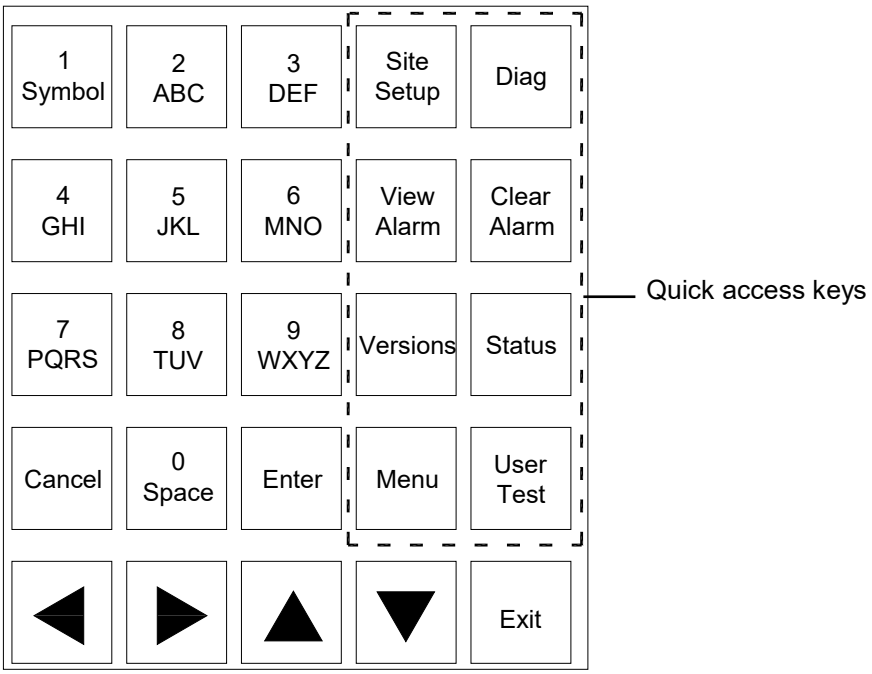
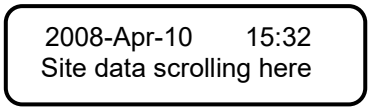


Figure 1-4 Keypad Quick Access Keys

1.4.3 Front Panel Default Display

The VIU default display shows the date and time on the first line of the display and system information on the second line. Important messages will also be displayed here.



Use the left (◄) and right (►) arrow keys to scroll through the system information on the second line of the display or wait for the information to scroll automatically.

NOTE

NOTE

If there is no activity on the front panel keypad for five minutes, it will automatically return to this default display.

1.4.4 VIU Main Menu

The VIU provides a main menu that can be viewed on the front panel display. The main menu consists of two items:

SITE SETUP	Enter Site ID Number, MCF CRC and UCN
USB	Upload/download information to/from a USB drive

With the default display showing, press the **Menu** key to access the main menu. The first item in the menu is displayed.

NOTE

NOTE

The arrow appears to the right of Site Setup only when a USB Drive in inserted in the front of the VIU unit. If no USB Drive is present, then the arrow does not appear and an error tone is produced when the right (▶) or left (◄) arrow is selected.

⚠ WARNING

WARNING

ENTERING THE WRONG UCN WILL RENDER THE VIU-20 INOPERABLE. DO NOT CHANGE THE UCN UNLESS REQUIRED BY SYSTEM CHANGES THAT HAVE BEEN APPROVED BY THE RAILROAD AND/OR AUTHORIZING AGENCY USING A UCN ASSIGNED TO THE SITE PLANS.

The character appearing after the first menu item name is a right arrow symbol (▶) indicating the key to press to scroll to the next menu item as shown in Figure 1-5.
Press the left (◄) arrow key to scroll back to the first menu item.

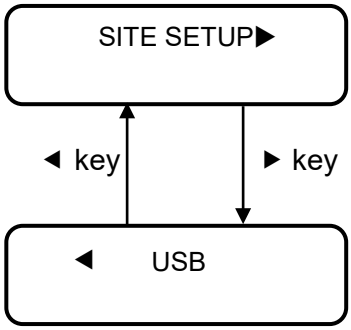


Figure 1-5 Main Menu Navigation

Press the **Cancel**, **Exit** or up (▲) arrow key to return to the default display from the main menu. To select a main menu item, scroll to the desired menu item and press **Enter** or the down (▼) arrow key.

1.4.4.1 SITE SETUP Menu

When SITE SETUP is selected from the main menu, the user is prompted to enter the vital edit mode. Use the right (►) arrow key to display **YES**, then press **Enter** or the down (▼) arrow key to select the vital edit mode. Navigate the menu and change menu entries as indicated in Figure 1-6.

NOTE

NOTE

If the vital edit mode is selected (even if no data is changed), VIU must be rebooted to return the system to normal operation.

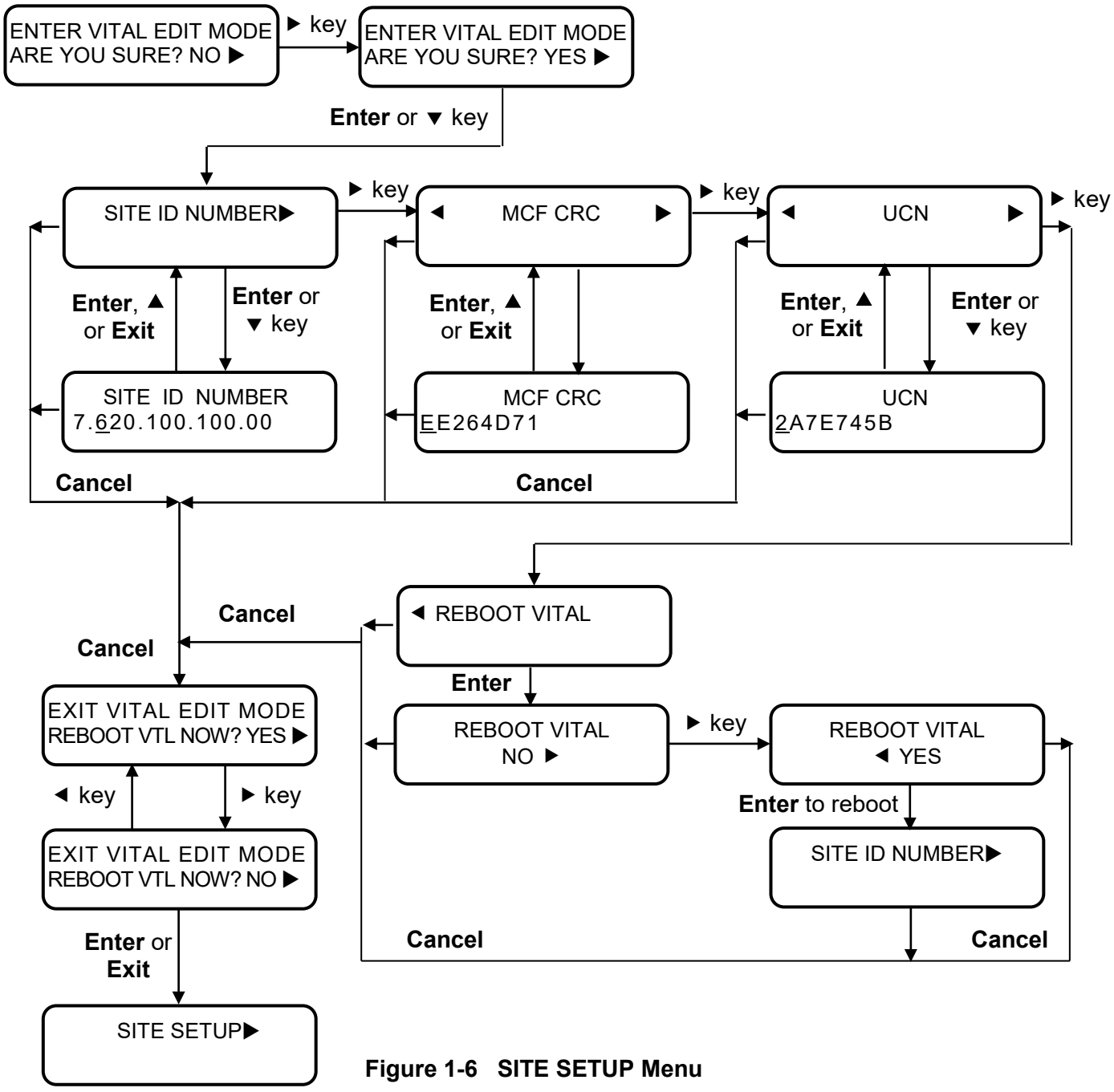


Figure 1-6 SITE SETUP Menu

1.4.4.2 Data Entry Using Keypad

The Site ID Number, MCF CRC and UCN can be changed from the front panel keypad. Position the underline cursor and save data entries as follows:

- Left (◄) and right (►) arrow keys: Move underline cursor left or right in the data string.
- **Enter,** up (▲) arrow or **Exit** key: After entering or editing data, press either of these keys to permanently store the changed data in memory.

- **Entering Numbers and Letters** : The number/letter keys on the keypad are used like cell phone keys. When entering data in an alphanumeric field, each consecutive press of a numbered key will produce the characters printed on the key. For example, pressing the #2 key repeatedly produces **2**, **A**, **B** and **C,** then the sequence is repeated. After entering a character, the cursor will move to the next character position approximately one second after the last key press.

  If the data field is numeric only, each press of a numbered key will produce only the specific number as shown on the key.

  If the data field is alphabetical only, then no numbers will be shown.

Saving Data: Changes are saved automatically when the **Enter**, up (▲) arrow or **Exit** key is pressed.

1.4.4.3 USB Menu

When USB is selected from the main menu or when a USB drive is initially installed in the USB port on the front of the VIU, the first item in the USB menu (Figure 1-8) is displayed . Use the up (▲) and down (▼) arrow keys to scroll through the menu items. Each item in this menu provides a YES or NO option. Use the left (◄) or right (►) arrow button to display the desired option, then press the **Enter** or down (▼) arrow key to perform the selected operation.

NOTE

NOTE

To perform any of the operations listed in the USB menu, a USB drive must be installed in the USB port on the front of the VIU.

For report functions, the display will indicate the progress with a series of screens similar to the ones shown here.

COLLECTING EVENT RPT
CREATING REPORT

COLLECTING EVENT RPT
WRITING REPORT

Shows progress bar

COLLECTING EVENT RPT
36

COLLECTING EVENT RPT
FINISHED REPORT

When downloading MCF or configuration (CFG) files to the USB drive, the display will indicate the progress with a series of screens similar to the ones shown here.

SAVING VITAL MCF
SELECTING FILE

SAVING VITAL MCF
COPYING TO USB

SAVING VITAL MCF
FINISHED COPYING

When uploading MCF or configuration files to the VIU, the display will indicate the progress with a series of screens similar to the ones shown here.

When the file name is displayed, press the **Enter** key to continue. If the USB drive contains more than one of the file type selected, the right arrow symbol (►) will appear to the right of the file name. Press the right (►) arrow key to scroll through the list of available files. When the desired file name is displayed, press **Enter**.

PLEASE WAIT
BUILDING FILE LIST

PUT VITAL MCF > VIU?
VIU_XX_LM001.mcf

COPYING VITAL MCF
COPYING FROM USB

COPYING VITAL MCF
PLEASE WAIT

COPYING VITAL MCF
VITAL UPDATE PASSED

NOTE

NOTE

The non-vital executive software will take several minutes to load. Various messages appear reporting loading activity; however, no progress bar is displayed during this period.
The VIU will automatically and intentionally reboot when the USB drive is removed from the VIU front panel following a non-vital executive software upgrade.

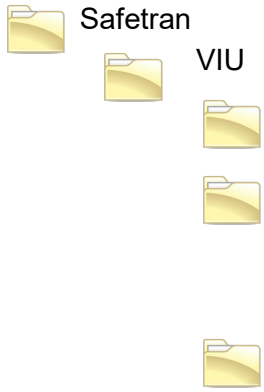
NOTE

NOTE

The non-vital executive software will take several minutes to load. Various messages appear reporting loading activity; however, no progress bar is displayed during this period. When the MEF or MEF software loads, a progress bar will appear. The progress bar does not progress in a linear fashion.
The VIU-20 will automatically and intentionally reboot when the USB drive is removed from the VIU-20 front panel following a non-vital executive software upgrade. The VIU-20 will reboot after the transfer even while the USB devise remains inserted. The USB device must be removed as soon as the reboot beep is heard.

1.4.4.4 USB Drive Structure

The file structure on the USB drive must have the following format. The VIU will look in specific folders for each file type. Folder names and relationships are exact, file names (those listed within the parenthesis with e.g.,) are for example only.



Safetran
VIU
Application
Vital MCF {VITAL MCF} (e.g., VIU_RR_LM001.mcf)
Executive
Master Executive {MSTR EXEC} (e.g., VIU01_70.MEF)
Slave Executive {SLV EXEC}(e.g., VPF01_00.MEF)
Non-Vital Core Executive {N-V EXEC}
(e.g., viu_nvmef_dev.006.4.tgz)
Configuration
Vital Configuration {VITAL CFG}
(e.g., V-4321-SafetranSystems.bin)
Non-Vital Configuration {N-V CFG}
(e.g., NV-4321-SafetranSystems.bin)
RC2 Key {RC2 KEY} (e.g., rc2key.bin)
PTC Configuration XML {PTC CFG XML}
(e.g., Broadmoor-WiuConfig.xml)

Figure 1-7 Example USB Drive File Structure

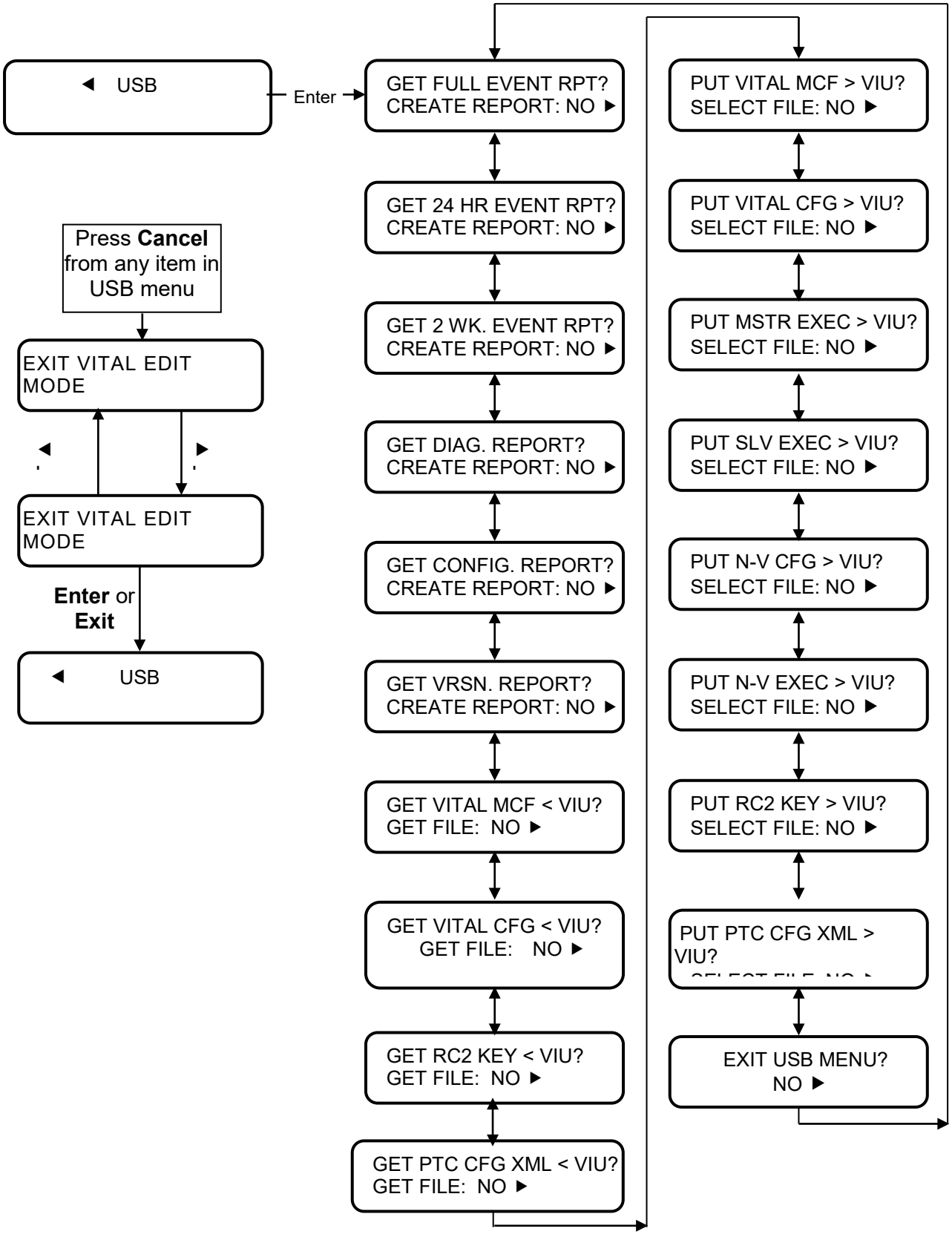


Figure 1-8 USB Menu Map Keypad Quick Access Keys

1.4.5 Keypad Quick Access Keys

Several 'quick keys' on the keypad provide shortcuts that go directly to a specific menu. Quick keys are located on the right-side of the keypad (see Figure 1-4). Descriptions of the quick keys are as follows:

- **Menu** – Displays first entry in main menu.
- **Site Setup** – Future use
- **Diag** – When errors are present on the display, DIAG will tell what that error is, e.g., * UCN ERROR
- **View Alarm** – Future use
- **Clear Alarm** – Future use
- **Versions** – Future use
- **Status** – Provides status report
- **User Test** – Future use

1.5 SPECIFICATIONS

Power:	
Input voltage:	9.0-20.0 VDC
Steady State Current:	1.9 A at 9 VDC 1.2 A at 13.5 VDC 1 A at 16.5 VDC
Inrush current	At 9 VDC input - 11 A spike followed by 40 msec at 6.2 A At 13.5 VDC input - 12 A spike followed by 40 msec at 6.4 A At 16.5 VDC input - 20 A spike followed by 40 msec at 6 A
Input Isolation:	2000 Vrms at 60 Hz
Maximum Ripple:	1.0 V (peak-to-peak)
GPS Antenna Connector	Female SMA,1/4-36 UNS threaded coupling
Laptop Serial Port:	
Baud rate	9600 (default)
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	none
Isolation	Serial port to signal battery = 2000 Vrms Serial port isolated from all other connectors except top panel serial port.

Top Panel Serial Port	
Baud rate	4800 (default)
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	none
Isolation	Serial port to signal battery = 2000 Vrms Serial port isolated from all other connectors except Laptop serial port.
Ethernet Ports:	
Standards Compliance:	IEEE 802.3u Auto-Negotiation and Parallel Detection IEEE 802.3u ENDEC, 10BASE-T IEEE 802.3u PCS, 100BASE-TX
Physical Configuration:	Ethernet RJ45
Isolation	All Ethernet ports to signal battery = 2000 Vrms All Ethernet ports isolated from all other ports.
Radio Ethernet Port Power:	Nominal 18 VDC, 350 mA, 6 Watts
USB Interface:	
Standards Compliance:	Conforms to the USB 2.0 host specification in full speed mode.
Vital I/O:	
Voltage Levels:	8V to 20V = energized, -2V to 4V = de-energized (4 to 6 V indeterminate)
Isolation:	2000 Vrms at 60 Hz
VIU Default IP Address:	192.168.1.100
Event Logging:	100,000 events
Diagnostic Logging:	10,000 events
Environmental:	
Operating Temperature Range:	-40°F to +160°F (-40°C to +70°C)
Maximum Humidity::	90% non-condensing
Physical:	
Dimensions:	8.80 inches high (22.35 centimeters) 6 inches wide (15.24 centimeters) 11.02 inches deep (27.99 centimeters)
Weight:	11 pounds (5 kilograms)

1.6 VIU ORDERING INFORMATION

The VIU is available in several configurations to meet specific application I/O requirements. Refer to Figure 1-9 and Figure 1-10 for specific part numbers.

- **VIU Assembly:**

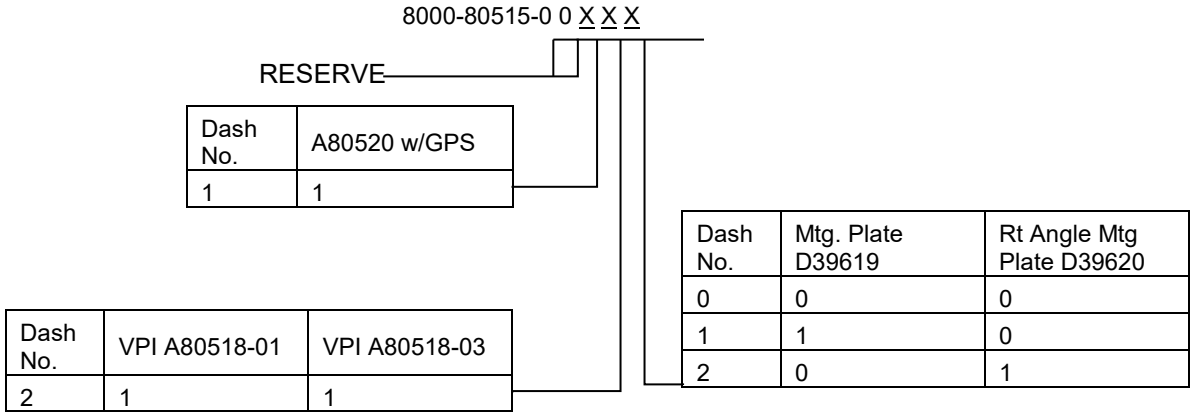


Figure 1-9 VIU Ordering Information

- **Accessories:**

  EMI Filter for VIU Power Cable: Z590-00010-0001
  VIU Accessory Ordering Information (Listing from VIU Group Assembly, A80505)

8000-80505-X X X X X

Dash No.	"N" Type Antenna Cable	"N" Type Surge to VIU Cable
0	None	None
1	6 FT.	6 FT.
2	6 FT.	15 FT.
3	6 FT.	30 FT.
4	6 FT.	50 FT.
5	15 FT.	6 FT.
6	15 FT.	15 FT.
7	15 FT.	30 FT.
8	15 FT.	50 FT.
9	30 FT.	6 FT.
A	30 FT.	15 FT.
B	30 FT.	30 FT.
C	30 FT.	50 FT.
D	50 FT.	6 FT.
E	50 FT.	15 FT.
F	50 FT.	30 FT.
H	50 FT.	50 FT.

Dash No.	Components
00	With Wilmore DC-DC Converter, 18VDC 25A Surge Arrestor, 8000-80515-00121

Dash No.	SMA(F) to N Adapter	Antenna Lightning Arrestor	GPS Antenna
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

Dash No.	MDS to VIU Cable
0	None
1	5 FT.
2	10 FT.
3	15 FT.
4	20 FT.

Figure 1-10 VIU Accessory Ordering Information

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SECTION 2
INSTALLATION

2.0 INSTALLATION

WARNING

RAILROADS OR AGENCIES ARE RESPONSIBLE FOR ENSURING ONLY PROPERLY TRAINED AND/OR AUTHORIZED PERSONNEL HAVE ACCESS TO THE VIU-20.
PROGRAM CHANGES MUST BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES.
VERIFY THAT VIU-20 HAS ALL PROPER COMPONENTS AND IS PROGRAMMED AS SPECIFIED BY THE RAILROAD'S OR AGENCY'S APPROVED WIRING OR INSTALLATION DIAGRAM. FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE SIGNAL SYSTEM.
AFTER INSTALLATION OF A UNIT, OR WHENEVER A CHANGE IS MADE TO THE SOFTWARE OR THE CONFIGURATION (TO INCLUDE MOVING THE ECD FORM ONE UNIT TO ANOTHER), THE INSTALLATION SHOULD BE FULLY OPERATIONALLY TESTED TO ENSURE SAFETY. SYSTEM OPERATION MUST BE VERIFIED PRIOR TO PLACING SYSTEM IN SERVICE OR FOLLOWING PROGRAMMING, HARDWARE CHANGES, OR WIRING CHANGES.

2.1 GENERAL

The VIU is small and compact and can be wall, rack or shelf mounted inside a signal case.

NOTE

For applications other than what are described in this manual, contact Siemens Mobility's Application Engineering.

2.1.1 Mounting

Two mounting plate configurations are available for installing the VIU.

- The rack or wall mounting plate contains holes that are spaced such that the VIU can be mounted on relay rails (Figure 2-1).
- A right-angle stabilizing plate is available for shelf mounting (Figure 2-2).

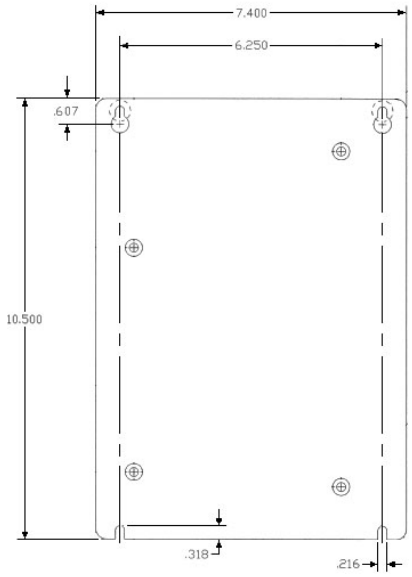


Figure 2-1 Rack or Wall-Mount Plate, D39619

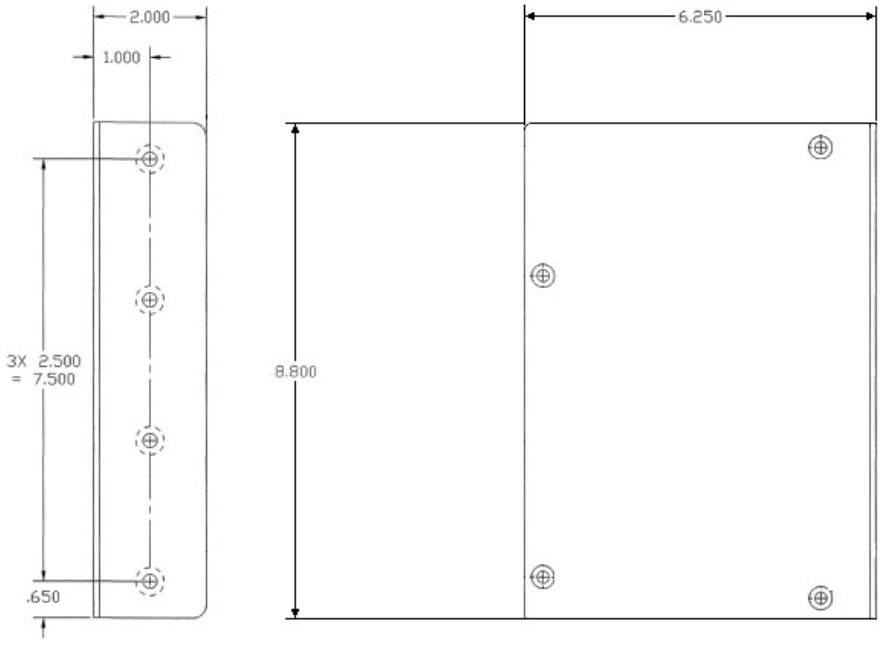


Figure 2-2 Shelf-Mount Stabilizing Plate, D39620

2.1.2 Ventilation Requirements

The VIU units do not require forced ventilation and are rated for a temperature range of -40°C to +70°C (-40°F to +158°F).

2.1.3 Power Connection

DC Power is supplied to each VIU unit via a 2-terminal screw-type connector located at the back of the top panel. This connector (Figure 2-3) also holds the External Configuration Device (ECD). The power connector and ECD can only be inserted into the corresponding connectors on the top panel in one direction. Battery polarity is indicated on the VIU top panel.

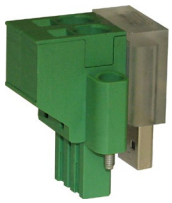


Figure 2-3 Power & ECD Connector

⚠ CAUTION

CAUTION

WHEN INSTALLING THE POWER / ECD CONNECTOR, FIRST ALIGN THE ECD CONNECTOR WITH THE RECEPTACLE IN THE VIU, AND THEN INSERT THE POWER CONNECTOR PORTION. DO NOT FORCE THE ECD CONNECTOR AS THE RECEPTACLE IN THE VIU MAY BECOME DAMAGED.

⚠ WARNING

WARNING

THE ECD SHOULD NOT BE REMOVED OR REPLACED. IT CONTAINS VITAL SITE-SPECIFIC DATA REQUIRED FOR PROPER OPERATION OF THE SIGNALING SYSTEM. IF THE ECD IS SWAPPED, THE SYSTEM MUST BE RETESTED.

2.1.3.1 Power Conductor Wire Preparation

Verify that “B” and “N” supply wires are installed in the power connector correctly before inserting the power connector into the mating connector on the top panel. Prepare the wires as follows:

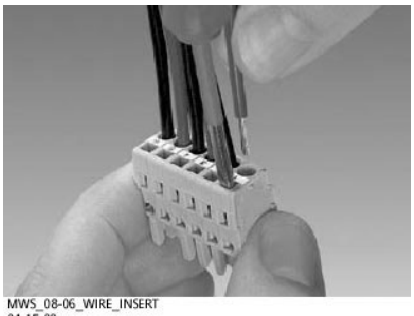


Figure 2-4 Inserting Wire in Cage Clamp Type Connector

- Strip approximately 1/4 inch (6 mm) of insulation from the end of the wire.
- Install EMI filter on cable per paragraph 2.1.3.2.
- Insert blade of appropriate sized flat bladed screwdriver in rectangular slot in connector next to wire receptor (see Figure 2-4).
- Insert the stripped end into the wire receptor until it stops.
- Hold the wire in place and remove the screwdriver blade from the slot. The wire clamp closed down on the stripped end of the wire
- Insert the Power & ECD connector to the top panel of the case and tighten the screw to approximately 4.5 inch pounds (0.5 Newton meters).

2.1.3.2 Installing EMI Filter on Power Cable

In order to reduce radiated electromagnetic interference in the VIU power cable, a clamp-on EMI filter (part number Z590-00010-0001) must be installed as follows:

Step 1: Open the clamp-on EMI filter as shown in Figure 2-5.

Figure 2-5 Clamp-on EMI Filter (open)

Step 2: Place the open EMI filter under the power cable approximately 1.5 inches from the stripped end of the wires.

Step 3:Wrap the long end of the cable around the outer surface of the filter and back through the center of the filter one time (totaling two wire runs inside the filter – see Figure 2-6.

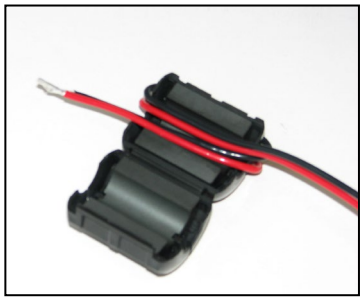


Figure 2-6 EMI Filter Installation (showing wire loops)

Step 4:Snap the filter closed (see Figure 2-7).

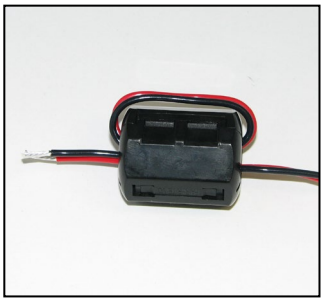


Figure 2-7 EMI Filter Installed

2.1.4 Surge Protection

The VIU unit provides internal secondary surge protection circuits on all vital inputs. Primary surge protection is required for power, track, and other input/output connections.

⚠ CAUTION

CAUTION

SIEMENS STRONGLY RECOMMENDS INSTALLING PRIMARY SURGE PROTECTION ON EXTERNAL LINES CONNECTING TO THE VIU.

2.1.5 Vital Inputs

The VIU top panel provides four male, 10-pin, cage-clamp style connectors that provide a total of 20 discrete transmit, receive, vital input, vital output, or vital lamp pairs that can be monitored by the VIU (five pairs on each connector). The wires are connected to mating female 10-pin connectors (supplied with the unit) which are then plugged into the appropriate connector on the VIU top panel.

⚠ WARNING

WARNING

VIU INPUTS SHOULD NOT BE WIRED DIRECTLY TO VITAL OUTPUTS OF ANOTHER ELECTRONIC SYSTEM WITHOUT FIRST TESTING TO PROVE THAT THE VITALITY OF THE OUTPUTS OF THE ELECTRONIC SYSTEM ARE NOT COMPROMISED DUE TO THE ELECTRICAL CHARACTERISTICS OF VIU INPUTS.
WHEN THE VIU UNIT'S VITAL INPUTS ARE USED TO MONITOR LAMP ENERGY AND THE LAMP HAS AN OPEN FILAMENT, THE VIU WILL CONTINUE TO REPORT THE LAMP AS ILLUMINATED AS LONG AS THE SYSTEM CONTINUES TO APPLY ENERGY TO THE LAMP.

2.1.5.1 Discrete Vital Input/Output Connections

Each discrete pair on the I/O connector has both a positive and a negative terminal connection. This allows for wiring of a larger variety of discrete I/O than using a common negative. It also prevents problems such as 'sneak paths' when adjacent inputs are wired. Polarity is marked on the case adjacent to each connector.

2.1.5.2 Connector Wiring Procedure

The female connectors supplied with the VIU for the vital input connections will accept wire sizes in the range of #28 AWG to #14 AWG. The connectors contain spring-loaded cage-clamps for attachment of the wires. Each connector consists of a row of wire receptors and actuator spring holes to open and close the cage clamps. Wire each connector as follows:

1. Remove the supplied connector from the mating receptacle on the top of the VIU.
2. Select a proper gauge wire for the application (range is #28 to #14 AWG).
3. Strip approximately 5/16 inch (8 mm) of insulation from the end of the wire.
4. Insert the blade of a small screwdriver into the actuator spring hole associated with the wire hole. The screwdriver blade should be no more than 0.10 inches wide and 0.020 inches thick (2.5 mm x 0.5 mm).
5. Lever the wire cage clamp open by pressing straight down on the screwdriver... Visually note that the contactor receptacle has opened up sufficiently to insert stripped wire. Fully insert wire into receptacle, taking care not to insert wire jacket insulation into metal contactors.
6. Remove screwdriver. Gently tug on the just-inserted wire to ensure the receptacle properly retains the installed wire.
7. Repeat for each wire to be added to the connector.

2.1.6 Serial Interfaces

The VIU is equipped with two serial ports.

2.1.6.1 Laptop (Serial) Interface

The VIU front panel provides a standard RS232 interface connector labeled ‘Laptop (Serial)’ for communication with a diagnostic terminal (laptop PC). This interface is a Data Communications Equipment (DCE) port which uses a 9-pin female (DB-9) connector. The cable required to connect this interface is a standard RS232 (straight-through) cable terminated in a male 9-pin (DB-9) connector at the VIU end, and terminated in an applicable connector at the diagnostic terminal (laptop PC). For example, the PC COM1 port may require a 9-pin (DB-9) or a 25-pin (DB-25) connector.

⚠ CAUTION

CAUTION

SERIAL PORTS HAVE NO SECONDARY SURGE PROTECTION. DO NOT CONNECT TO DEVICES OUTSIDE OF EQUIPMENT ENCLOSURE.

⚠ CAUTION

CAUTION

SERIAL PORTS HAVE NO SECONDARY SURGE PROTECTION. DO NOT CONNECT TO DEVICES OUTSIDE OF EQUIPMENT ENCLOSURE.

Table 2-1 Laptop (Serial) Interface Connector Pin-outs (RS232)

PIN NUMBER	INPUT/OUTPUT	SIGNAL
• 1	•	• -
• 2	• O	• Transmit Data
• 3	• I	• Receive Data
• 4	•	• -
• 5	•	• Signal Ground
• 6	•	• -
• 7	• I	• Clear To Send
• 8	• O	• Request To Send
• 9	•	• -

2.1.6.2 Serial Interface (Top Panel)

The VIU top panel provides an additional standard RS232 interface connector labeled ‘Serial’. This is a general purpose communications port for connection to external devices. This interface is a Data Terminal Equipment (DTE) port which uses a 9-pin male (DB-9) connector. Refer to Table 2-2 Serial Interface Connector Pin-outs (RS232) – Top of Unit for pin outs.

Table 2-2 Serial Interface Connector Pin-outs (RS232) – Top of Unit

PIN NUMBER	INPUT/OUTPUT	SIGNAL
• 1	• I	• Data Terminal Ready
• 2	• I	• Receive Data
• 3	• O	• Transmit Data
• 4	• O	• Carrier Detect
• 5	•	• Signal Ground
• 6	• I	• Data Set Ready
• 7	• O	• Request To Send
• 8	• I	• Clear To Send
• 9	•	• -

2.1.7 Ethernet Interfaces

The VIU is equipped with three standard Ethernet ports and one special Ethernet port. These ports are described in Table 2-3.

⚠ CAUTION

CAUTION

ETHERNET PORTS HAVE NO SECONDARY SURGE PROTECTION. DO NOT CONNECT TO DEVICES OUTSIDE OF EQUIPMENT ENCLOSURE.

Table 2-3 Ethernet Port Descriptions

PORT LOCATION	NOMENCLATURE	INTENDED USE	LED INDICATIONS
Front Panel	Laptop Ethernet)	Use as an Ethernet interface to a local laptop or desk top computer.	Green: Flashing = message activity. Yellow: Off = 10 MBPS bit rate On = 100 MBPS bit rate
Top Panel	Ethernet Port 1	Use for communication between VIU and other Ethernet equipped devices, such as a Wayside Communications Module (WCM) or other VIU units.	Green: Flashing = message activity. Yellow: Off = 10 MBPS bit rate On = 100 MBPS bit rate

PORT LOCATION	NOMENCLATURE	INTENDED USE	LED INDICATIONS
Top Panel	Ethernet Port 2	Use for communication between VIU and other Ethernet equipped devices such as other VIU units. **NOTE** This port is in parallel with **ESSR only (Port 2)**. Do not use both ports simultaneously.	n/a
Top Panel	ESSR Only (Port 2)	Special Ethernet port. Use for connection to Siemens Ethernet Spread Spectrum Radio (53325) only. This port also provides power to the radio. **NOTE** This port is in parallel with **Ethernet Port 2**. Do not use both ports simultaneously.	n/a

Table 2-4 Special ESSR Ethernet Port Connector Pin-outs (RJ45)

Pin No.	Signal Name	Abbr.	Signal Description
1	Ethernet TX	Tx (+)	Radio to Ethernet (Transmit data +)
2	Ethernet TX	Tx (-)	Radio to Ethernet (Transmit data -)
3	Ethernet RX	Rx (+)	Ethernet to Radio (Receive data +)
4	VDC	DCV (+)	Power to Radio
5	VDC	DCV (+)	Power to Radio
6	Ethernet RX	Rx (-)	Ethernet to Radio (Receive data -)
7	Ground	GND (-)	Power ground to Radio
8	Ground	GND (-)	Power ground to Radio

2.1.8 GPS Port

The GPS port is a female DB9 connector that provides the 1 pulse per second (pps) GPS signal output from the VIU. It also provides a NMEA 0183 output from the internal GPS receiver. This port is designed to connect to a CBTC Wayside Communications Module (WCM) {not to be confused with Siemens WCM, A53447} providing an accurate time source for broadcasting of wayside status messages. Refer to Table 2-5 for connector pin outs.

Table 2-5 GPS Port Connector Pin-outs

PIN NUMBER	SIGNAL
1	N/C
2	GPS TX DATA
3	N/C
4	N/C
5	GPS GND
6	N/C
7	N/C
8	GPS PPS-
9	GPS PPS+

2.1.9 GPS Antenna

The GPS antenna connector is a female SMA connector (1/4-36 UNS threaded coupling). Connect an external GPS antenna to this jack.

2.1.10 USB Interface

A standard USB 2.0 port is provided on the front panel for connecting a USB flash drive.

SECTION 3
OPERATION

3.0 OPERATION

WARNING

⚠ WARNING

RAILROADS OR AGENCIES ARE RESPONSIBLE FOR ENSURING ONLY PROPERLY TRAINED AND/OR AUTHORIZED PERSONNEL HAVE ACCESS TO THE VIU-20.
PROGRAM CHANGES MUST BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES.
VERIFY THAT VIU-20 HAS ALL PROPER COMPONENTS AND IS PROGRAMMED AS SPECIFIED BY THE RAILROAD'S OR AGENCY'S APPROVED WIRING OR INSTALLATION DIAGRAM. FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE SIGNAL SYSTEM.
AFTER INSTALLATION OF A UNIT, OR WHENEVER A CHANGE IS MADE TO THE SOFTWARE (TO INCLUDE MOVING AND/OR COPYING THE ECD) OR THE CONFIGURATION, THE INSTALLATION SHOULD BE FULLY OPERATIONALLY TESTED TO ENSURE SAFETY. SYSTEM OPERATION MUST BE VERIFIED PRIOR TO PLACING SYSTEM IN SERVICE OR FOLLOWING PROGRAMMING, HARDWARE CHANGES, OR WIRING CHANGES.

3.1 POWER-UP

When the VIU is first powered up, it performs various vital and non-vital software checks. During this period (approximately 1 minute, 10 seconds), only the power LED is lit while the display shows the following:

```
VIU SYSTEM BOOTING
PLEASE WAIT
```

Following the software checks the display turns on and the VIU loads various drivers (USB, Ethernet, etc.) before running the VIU executive (MEF). At approximately 1 minute, 30 seconds from power-up, the VIU lights all front panel LEDs to test for bad LEDs. At approximately 2 minutes from power-up, the VIU settles into normal operation, the input status LEDs show current input status and the health LED flashes at 0.5 Hz.

NOTE

NOTE

During power-up, the boot monitor checks the integrity of the MEF by performing a 32-bit CRC calculation. If the MEF is not valid, the Boot Monitor will not run it and a new MEF must be loaded.

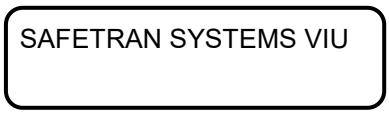
3.1.1 VIU Real-Time Clock

The real-time clock will contain invalid data when the VIU is powered up for the first time in the field. Therefore, date/time adjustments should be performed immediately following the initial power-up sequence in the field. For units equipped with a GPS receiver, the GPS will provide the time reference and no adjustment is needed. If the VIU is not equipped with GPS, such as in the office monitoring application, the time and date are set via the web browser interface (See section 7).

The internal power storage supplies power to the real-time clock when power to the unit is off. Under normal circumstances, the real time clock will retain valid date/time information for at least 10 years with external power removed. The real time clock uses a backup battery that is not field replaceable.

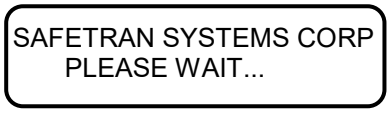
3.1.2 Front Panel Boot Display Sequence

It is possible to monitor the VIU power-up process on the front panel display. The following examples show the normal boot sequence as it appears on the front panel display.

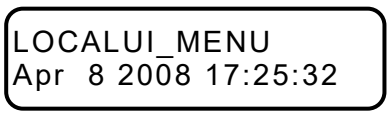


Multiple status screens briefly appear as the unit starts all of its processes. During this period the only LED that is lit is the Power LED. After all of the processes have run, the following message appears on the screen:

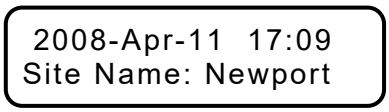
All front panel LEDs are lit at this point to allow visual LED check. The following message appears:



When the boot process is complete, a variation of the following message appears



Following a successful boot-up and launching of the MEF, the front panel display will automatically default to a date/time display similar to the one shown below:



The bottom row of the display will cycle through the following information:

- Site Name
- Milepost
- DOT # (Department of Transportation No.)
- Site ID Number (SIN) (ATCS address)
- MCF CRC
- Laptop baud rate
- Laptop IP Address
- Port 1 IP Address
- Port 2 IP Address
- Status messages.

The site name, milepost and DOT # can be entered using the web browser interface after uploading the Module Configuration File (MCF) from the USB drive.

3.2 TRANSFERRING FILES TO THE VIU

The VIU comes from the factory with the MCF, MEFs and default configuration files installed. Following initial power up and successful boot up of the VIU, an application specific MCF and supporting files can be downloaded via the USB port located on the front panel.

3.2.1 USB Drive File Structure

The file structure on the USB drive must have the following format. The VIU will look in specific folders for each file type. Folder names and relationships are exact, file names (those listed within the parenthesis with e.g.,) are for example only.

In the example below, the Archibald and Haven Railroad is placing a VIU unit into operation at the Broadmoor bungalow located at mile marker 432.1

NOTE

NOTE

The VIU will create the file folders when Reports/Logs are uploaded from the VIU to the USB drive.
The application referred to within this chapter is specific to this example only. Other applications could or would have different connections.

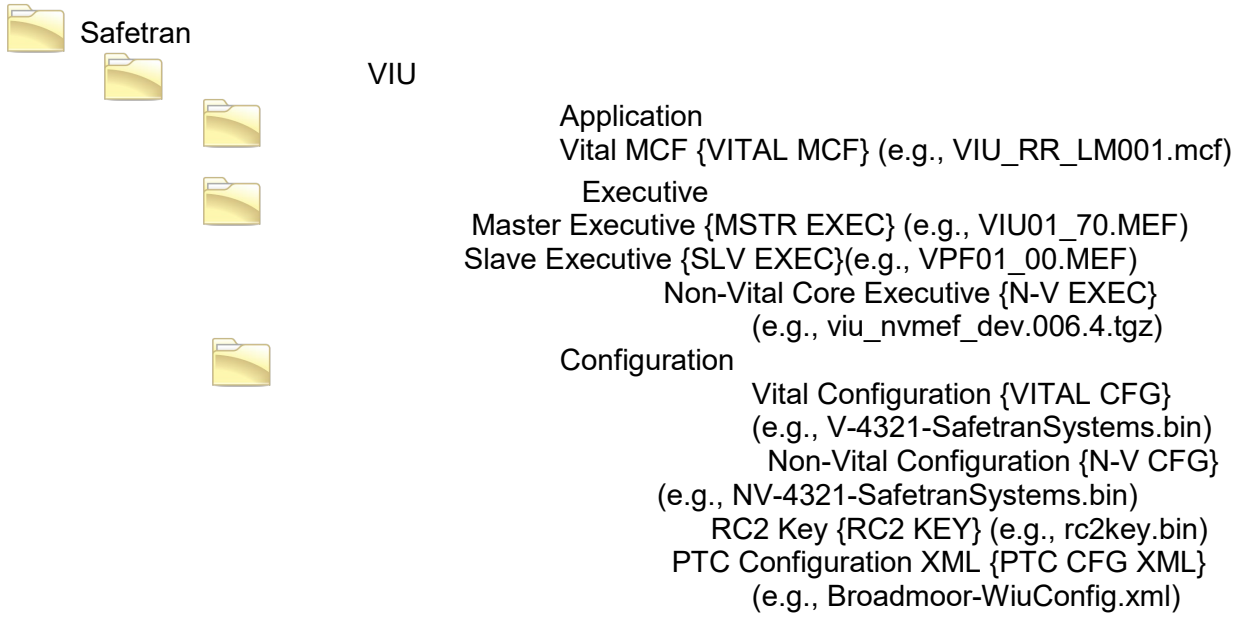


Figure 3-1 Example USB Drive File Structure

3.2.2 File Transfer Options

When a USB Drive is inserted into the front panel of the VIU, the user can scroll through the following options by toggling to either YES or NO then selecting ENTER (e.g., YES or NO can be selected by toggling the left (◄) or right (►) arrow key to display YES, then press the Enter key):

3.2.2.1 Download Reports From VIU Into USB Drive

To download (Get) reports, press ENTER until the desired report is shown, select YES, and the file will be generated and downloaded into the USB Drive.

Get full Event Report? Create Report: No Yes
Get 24 hour Event Report? Create Report: No Yes
Get 2 week Event Report? Create Report: No Yes
Get Diag. Report? Create Report: No Yes
Get Config. Report? Create Report: No Yes
Get Vrsn. Report? Create Report: No Yes

3.2.2.2 Download Files From VIU Into USB Drive

To download (Get) the desired file, press ENTER until the desired file is shown, select YES, and the file will be downloaded into the USB Drive.

Get Vital MCF < VIU? Get File: No Yes
Get Vital CFG < VIU? Get File: No Yes
Get Non-Vital CFG < VIU? Get File: No Yes
Get RC2 Key < VIU? Get File: No Yes
Get PTC CFG XML < VIU? Get File: No Yes

3.2.2.3 Upload Files From USB Drive Into VIU

⚠ CAUTION	**CAUTION** DO NOT REMOVE POWER FROM THE UNIT WHEN THE MESSAGE “PLEASE WAIT. DO NOT REMOVE POWER FROM UNIT” APPEARS. IF POWER IS REMOVED BEFORE THE TRANSFER IS COMPLETE, THE UNIT WILL REMAIN UNCONFIGURED AND NOT RETURN TO OPERATION.

To upload (Put) the desired file, press ENTER until the desired file is shown, select YES, and the file will be uploaded into the USB Drive.

- Put Vital MCF > VIU? Select File: No Yes
- Put Vital CFG > VIU? Select File: No Yes
- Put Mstr Exec > VIU? Select File: No Yes
- Put Slv Exec > VIU? Select File: No Yes
- Put N-V CFG > VIU? Select File: No Yes
- Put N-V Exec > VIU? Select File: No Yes
- Put RC2 Key > VIU? Select File: No Yes
- Put PTC CFG XML > VIU? Select File: No Yes

- **Example 1: Upload Vital MCF From USB Drive Into VIU**

  Insert the USB drive containing the Vital MCF into the front panel USB port.

  The first item in the USB menu appears on the front panel display.

  Using the up (▲) or down (▼) arrow key on the front panel keypad, scroll through the menu to PUT VITAL MCF > VIU?

  Use the left (◄) or right (►) arrow key to display YES, then press the Enter key.

  The operation will pause while the VIU builds the file list.

  If the USB drive contains more than one of the file type selected, the right arrow symbol (►) will appear to the right of the file name. Press the right (►) arrow key to scroll through the list of available files until the desired file name is displayed.

  Press the Enter key.

  Following successful upload of the MCF, the menu will advance to the next item.

  Scroll to EXIT USB MENU?

  Select YES, then press Enter to exit the USB menu.

The procedure for uploading MEFs, configuration files, and the RC2 Key is similar to the one provided in Example 1.

3.2.3 Exiting the USB Drive

To exit the USB Drive functions, either scroll to Exit USB Menu? No Yes, select Yes and remove the USB Drive from the front panel or simply remove the USB Drive whenever the USB Drive LED is green. The unit will automatically reboot the vital side.

3.3 VIU CONFIGURATION

The VIU must be configured for the local installation. Vital configuration parameters are entered using the PC-based DT software while non-vital configuration parameters are entered through the VIU web browser interface. These configuration parameters and the method of configuration are discussed in Sections 6 & 7 of this manual.

3.4 VIU OPERATING STATES

The VIU operating states consist of the following:

- Initial State: This is the VIU initial power-up state during which the VIU performs its power-up self test routine to validate the hardware, Executive software, Module Configuration File (MCF) and corresponding MCF CRC, and the vital configuration using the Unique Check Number (UCN). Once the power-up self-test has been successfully completed, the unit will transition to an Un-configured State if there is a problem with the configuration such as one of the following:
  - MCF CRC is incorrect
  - UCN is incorrect
  - ATCS address for VIU is not set correctly
  - VIU resets to default values
- If each of the configuration items listed above passes validation, the VIU will transition to the Fully Operational state.
- Un-Configured State: In this state the VIU is installed but not configured correctly. It will successfully complete its power-up self tests but will not send out any vital messages or respond to any vital messages. It will respond, however, to input from the front panel keypad, messages from the VIU web browser interface and to messages from the Diagnostic Terminal (DT) program to allow for local configuration of operating parameters.
- Fully Operational State: In this state, the VIU vital parameters are configured in accordance with the office plan.
- Shutdown State: In this state, the VIU is not receiving or transmitting vital messages.

3.5 CONFIGURATION VERIFICATION AT STARTUP

⚠ WARNING

WARNING

VERIFY THAT VIU IS PROGRAMMED AS SPECIFIED BY THE RAILROAD'S OR AGENCY'S WITH THE CORRECT MCFCRC, UCN, ATCS SITE IDENTIFICATION NUMBER (SIN). FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE INDICATIONS ON THE VIU UNIT.
USER CONFIGURABLE ITEMS ARE UCN PROTECTED TO PROHIBIT UNAUTHORIZED CHANGES.

NOTE

NOTE

When vital configuration changes are made in the MCF, a new UCN must be calculated and entered into the VIU to validate the changes. The UCN is calculated using a special version of the DT software (see Section 4).

On startup, the VIU validates its configuration by verifying the following:

The MCF is valid.
The MCF CRC matches the MCF.
The correct UCN is entered.

If the MCF is valid, has the correct CRC, the vital configuration parameters are set and the correct UCN is entered, then the VIU goes into the Fully Operational state. If any of these checks fail, the VIU goes into the Un-Configured state. This will be indicated by a vital status message scrolling on the bottom row of the front panel display.

NOTE

NOTE

The status message is refreshed with each complete cycle of the displayed information and may take approximately 2 minutes to cycle completely and update the message. If the status "UNCONFIGURED" and "SLV HEALTH BAD" displays, this may appear for a few cycles until the message updates.

When the VIU is in the Un-Configured state, it does not send out any VIU vital messages or respond to any VIU vital messages. It does, however, respond to input via the front panel keypad and to messages from the Diagnostic Terminal (DT) program.

3.6 INTEROPERABLE TRAIN CONTROL MESSAGING (ITCM) SYSTEM

When the VIU is used in a Wayside Interface Unit Application, it will monitor signal aspects and switch positions controlled by an existing interlocking, and/or defect detector status and send the signal aspect and switch status, and/or detector status information to the locomotive and/or the back office using Wayside Status Messages (WSMs). These WSMs and EMP messages are transferred into the ITCM system using the Class D protocol. The ITCM will deliver the WSMs to the locomotive or back office.

⚠ WARNING

WARNING

THE APPLICATION LOGIC MUST INCORPORATE STABILIZATION LOGIC TO PREVENT UNSTABLE DATA BEING SENT FROM MONITORED SYSTEMS.

3.7 GPS TIME REFERENCE

When equipped with a GPS receiver, the VIU synchronizes its time with the GPS receiver via the GPS Interface. This can be either the internal GPS receiver or an external GPS receiver connected to the serial port on the VIU top panel. Alternately, the time reference can be from Class C EMP messages or via SNTP. In the absence of GPS time information the VIU is capable of maintaining its internal clock time so that the drift from GPS time does not exceed +/- 2000 ms within a 24 hour period.

3.8 MULTIPLE VIUS IN A SYSTEM

In larger interlockings, multiple VIUs may be required to monitor all of the signal lamps, switches, and/or defect detectors. In this case, auxiliary VIUs will send vital ATCS messages to a Main VIU (Master). All I/O data is consolidated by the Main VIU and it transmits the consolidated message to the on-board system and/or back office.

Please refer to Section 4 for details on setting up a multi-VIU system.

SECTION 4
VIU SETUP

4.0 VIU SETUP

⚠ WARNING

WARNING

RAILROADS OR AGENCIES ARE RESPONSIBLE FOR ENSURING ONLY PROPERLY TRAINED AND/OR AUTHORIZED PERSONNEL HAVE ACCESS TO THE VIU-20. PROGRAM CHANGES MUST BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES.
VERIFY THAT VIU-20 HAS ALL PROPER COMPONENTS AND IS PROGRAMMED AS SPECIFIED BY THE RAILROAD'S OR AGENCY'S APPROVED WIRING OR INSTALLATION DIAGRAM. FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE SIGNAL SYSTEM.
AFTER INSTALLATION OF A UNIT, OR WHENEVER A CHANGE IS MADE TO THE SOFTWARE OR THE CONFIGURATION (TO INCLUDE MOVING THE ECD FORM ONE UNIT TO ANOTHER), THE INSTALLATION SHOULD BE FULLY OPERATIONALLY TESTED TO ENSURE SAFETY. SYSTEM OPERATION MUST BE VERIFIED PRIOR TO PLACING SYSTEM IN SERVICE OR FOLLOWING PROGRAMMING, HARDWARE CHANGES, OR WIRING CHANGES.

4.1 INTRODUCTION

After a VIU or multiple VIUs are installed in the field, the unit(s) must be configured for the specific site. Sections 6 and 7 of this document cover the use of the DT software and the VIU web browser user interface for setting vital and non-vital parameters. This section provides general setup information plus typical procedures for system setup.

⚠ WARNING

WARNING

INCORRECT ENTRY OF VITAL CONFIGURABLE PARAMETERS WILL LEAD TO UNSAFE FUNCTIONING OF THE VIU UNIT. THE VITAL FIELD CONFIGURABLE PARAMETERS MUST BE VERIFIED FOR CORRECTNESS BEFORE THE EQUIPMENT IS PLACED IN SERVICE.

⚠ WARNING

WARNING

USER CONFIGURABLE ITEMS MUST BE UCN PROTECTED TO PROHIBIT UNAUTHORIZED CHANGES.

WARNING

IN VOLTAGE SENSING APPLICATIONS, WHEN THE VIU UNIT'S VITAL INPUTS ARE USED TO MONITOR LAMP ENERGY AND THE LAMP HAS AN OPEN FILAMENT, THE VIU WILL CONTINUE TO REPORT THE LAMP AS LIT AS LONG AS THE SYSTEM CONTINUES TO APPLY ENERGY TO THE LAMP.

4.2 SOFTWARE LOAD AND CONFIGURATION SEQUENCE

The VIU comes from the factory with the MEFs and default configuration files installed. Following initial power up and successful boot up of the VIU, an application specific MCF can be upload via the USB port located on the front panel. That procedure is described in the following paragraph. At several points in Figure 4-2 the user is directed to upload software to the VIU from a USB drive. Ensure that the USB drive file structure and file type locations are as indicated below.

The file structure on the USB drive must have the following format. The VIU will look in specific folders for each file type. Folder names and relationships are exact, file names (those listed within the parenthesis with e.g.,) are for example only.

In the examples referred to in this section, the Archibald and Haven Railroad is placing a VIU unit into operation at the Broadmoor bungalow located at mile marker 432.1

NOTE

NOTE

The application referred to within this chapter is specific to this example only. Other applications could or would have different connections.

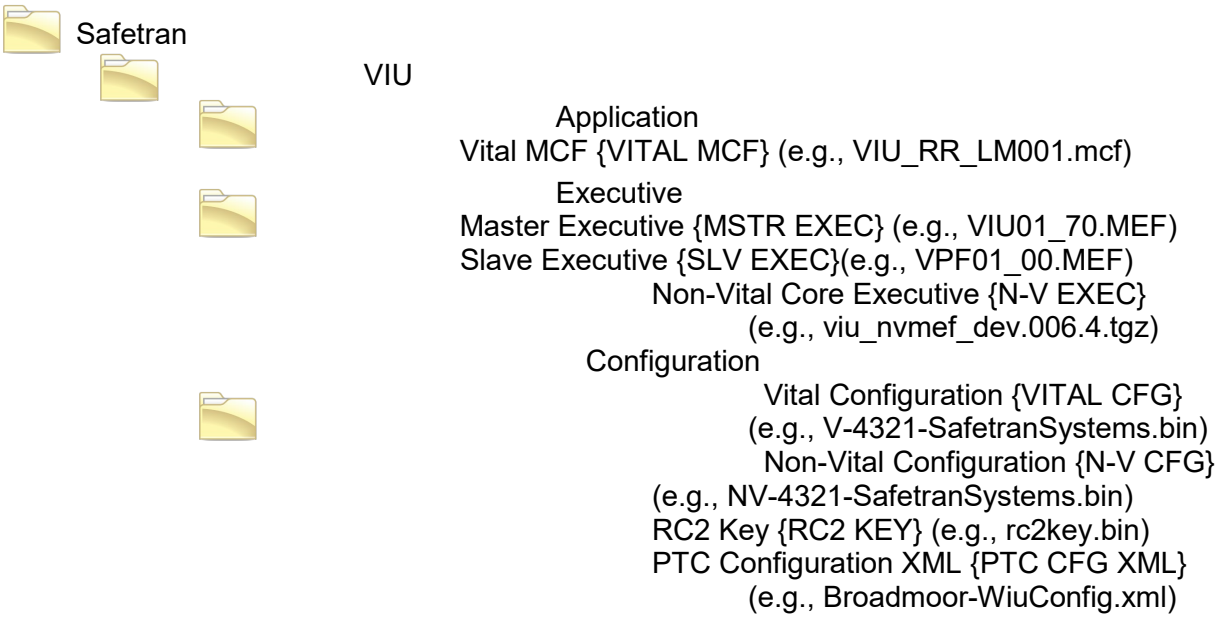


Figure 4-1 Example USE Drive File Structure

Figure 4-2 indicates the order in which software should be loaded and at what points the vital and non-vital parameters should be configured for a normal VIU installation. If multiple VIUs are involved, apply the same process to each unit.

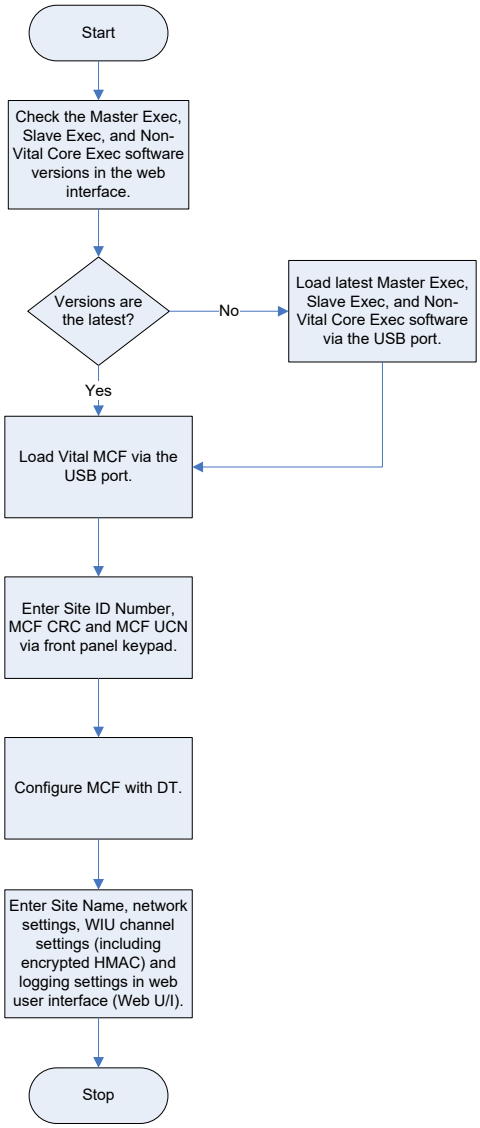


Figure 4-2 VIU Software Load and Configuration Sequence

4.3 HOW SIGNALS AND SWITCHES ARE MAPPED TO VITAL INPUTS

The number of VIUs required to monitor the wayside signals and switches at a location is dependent on the number of signal lamps, switches, and hazard detectors.

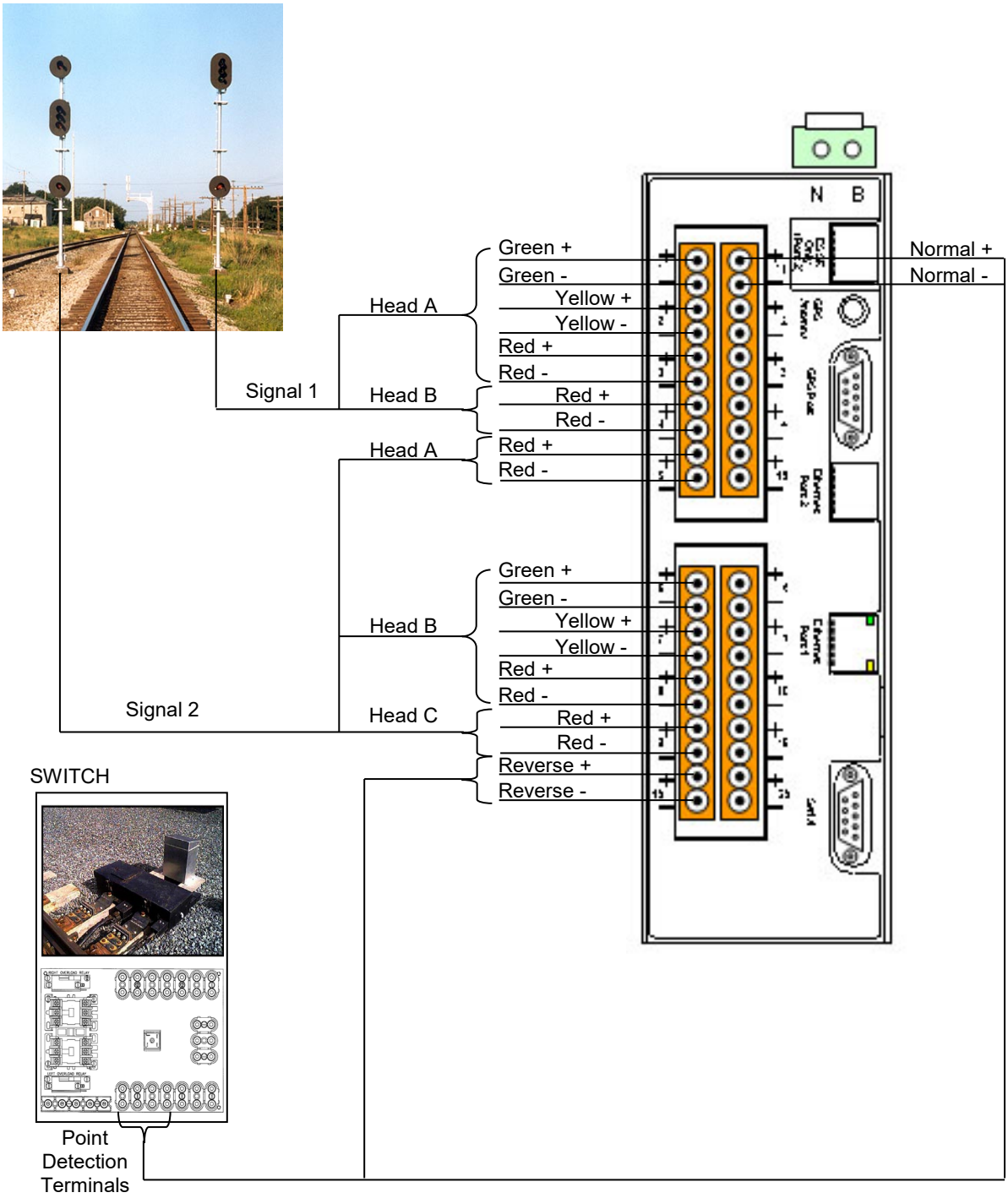


Figure 4-3 Example 1 Vital Input Wiring for Signal Lamp & Switch Monitoring

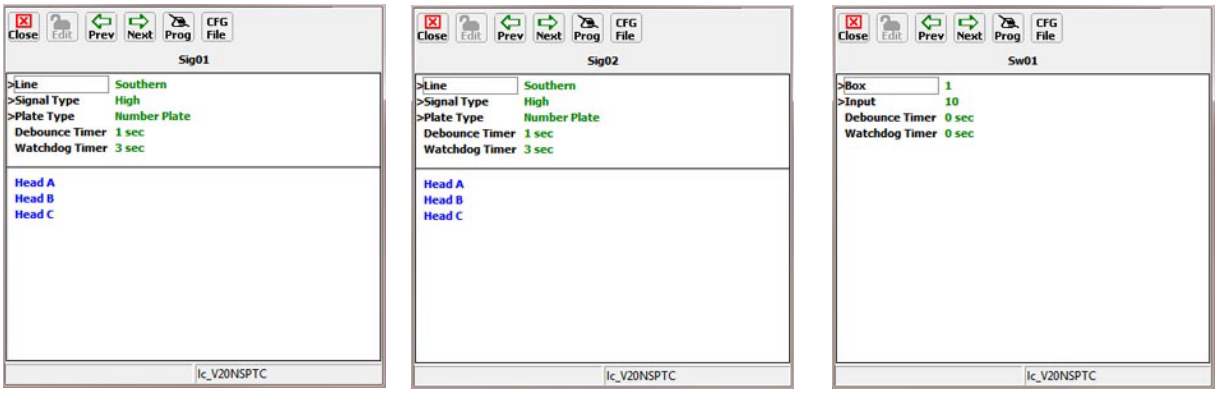
Each lamp in a signal head requires one input; each switch requires two inputs (one for normal, one for reverse) and each hazard detector requires one input.

NOTE

NOTE

It is up to the user to verify that multiple devices are not allocated to the same input.

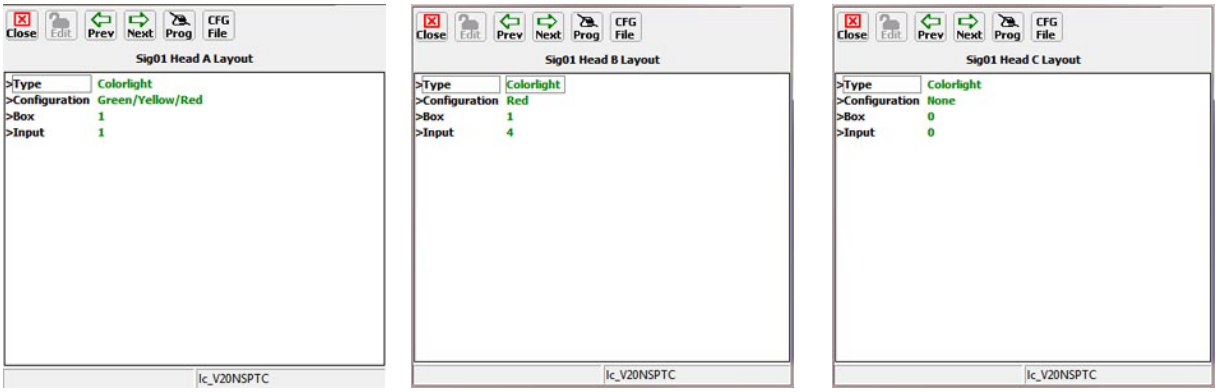
VIU MCFs, such as those shown Figure 4-4 below, allow users to specifically define which input on each particular box to use. Using the example provided in Figure 4-3, this interlocking consists of two signals (Sig01 and Sig02) and one switch (Sw01) (see Figure 4-4).



Signal 1 **Signal 2** **Switch**

Figure 4-4 Interlocking Equipment: Signal 1, Signal 2, and Signal 3

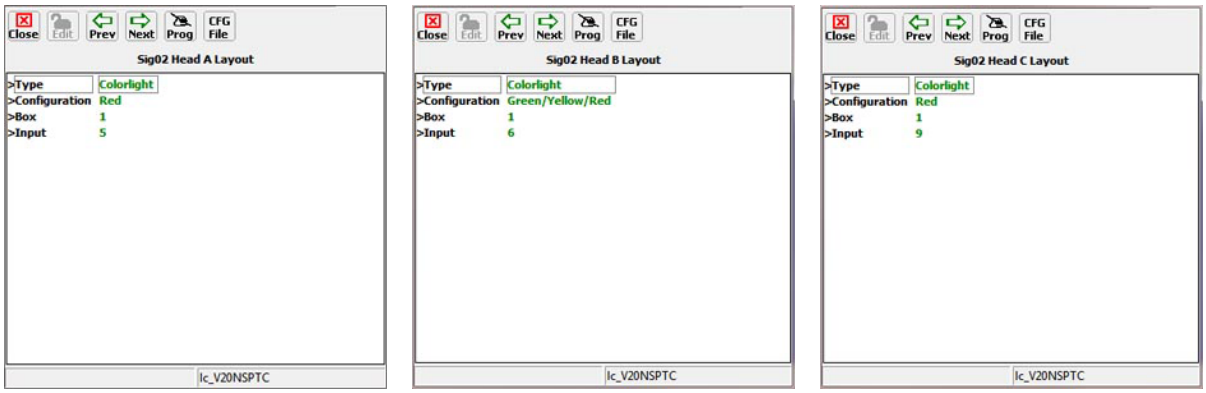
Sig01 Head A will use Box 1, Input #1, which then automatically programs Input #1 as green, #2 as yellow and #3 as red, with Head B using Box 1, Input #4 which then programs Input #4 as red, and Head C is programmed as not used (see Figure 4-5).



Sig01, Head A **Sig01, Head B** **Sig01, Head C**

Figure 4-5 Signal 1, Heads A, B, and C

Signal 2, Head A will use Box 1, Input #5, which automatically programs Input #5 as red; Head B will use Box 1, Input #6, , which then automatically programs Input #6 as green, #7 as yellow and #8 as red; and Head C will use Box 1 Input #9, which automatically programs Input #9 as red (see Figure 4-6.



Sig02, Head A **Sig02, Head B** **Sig02, Head C**

Figure 4-6 Signal 2, Heads A, B, and C

Switch 1 will use Box 1, Input #10, which automatically programs Input #10 as Reverse and Input #11 as Normal (see Figure 4-7).

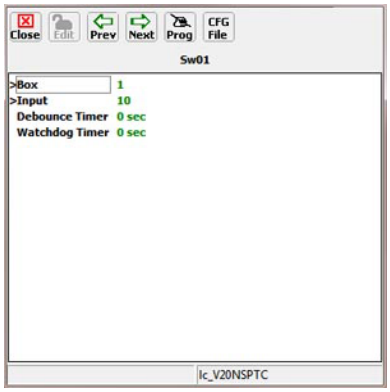


Figure 4-7 Switch 01

If more than 20 inputs are required, auxiliary VIUs can be added via an Ethernet LAN. Each additional VIU will add 20 more inputs to the number of available inputs. The user can choose to map any of the inputs on the used units.

The VIU Wayside Interface Application can support up to 6 signals, 6 switches, and 6 hazard detectors (block faults {Bf}), and a maximum of 4 boxes. The typical application allows for 1 main unit and 3 auxiliary units, giving a total of 80 inputs.

4.4 SAMPLE ASPECT CODES DECODED BY VIU

The following aspect codes are typical of what is sent to the WSM by the VIU.

Table 4-1 Aspect Codes Decoded By VIU

CODE	RULE	SOU RULE #	N&W RULE #	CR RULE #
1	AN_CLEAR_TO_CP			N280a
2	AN_MEDIUM_CLEAR			N283
3	AN_CLEAR	301	281	N281
4	AN_APPROACH_LIMITED			N281b
5	AN_ADVANCED_APPROACH	303	282-A	N282a
6	AN_APPROACH_MEDIUM			N282
7	AN_APPROACH_RESTRICTED	306		
8	AN_APPROACH	307	285	N285
9	AN_DIVERGING_CLEAR	304	283	
10	AN_DIVERGING_APPROACH_DIVERGENG		283-B	
11	AN_MEDIUM_APPROACH_MEDIUM			N283a
12	AN_DIVERGING_APPROACH	308	286	
13	AN_RESTRICTING	309	290	N290
15	AN_STOP	310	292	N292
16	AN_TAKE_SIDING_INDICATOR	317		
17	AN_MEDIUM_APPROACH			N286
18	AN_LIMITED_CLEAR			N281c
19	AN_APPROACH_SLOW			N284
20	AN_SLOW_APPROACH		288	N288
21	AN_APPROACH_DIVERGING	302	282	
22	AN_SLIDE DETECTOR_WARNING_SIGNAL			N294a
23	AN_CLEAR_SLIDE_DETECTOR_SIGNAL			N294
24	AN_SLOW_CLEAR		287	N287
25	AN_APPROACH_DISTANT		285-A	
25	AN_APPROACH_RESTRICTING			N293c
25	AN_NON_AUTOMATIC_BLOCK_APPROACH	312	294	
26	AN_DIVERGING_APPROACH_RESTRICTED	306.1		
27	AN_HOLDING_SIGNAL	318		
28	AN_APPROACH CLEAR			N293b
28	AN_NON_AUTOMATIC_BLOCK_CLEAR	311	293	
29	AN_DRAGGING_EQUIPMENT_INDICATOR	316		
30	AN_ALL_DARK			
31	AN_INVALID			

4.5 PROCEDURE FOR CALCULATING A NEW UCN

The procedure for calculating a new UCN is provided below. This is typically an office procedure but will be useful if vital parameter changes become necessary once units are in operation.

⚠ WARNING

WARNING

CHANGING VITAL PARAMETERS REQUIRES CALCULATION OF A NEW UCN FOR THE MODIFIED MCF. THIS SHOULD ONLY BE PERFORMED BY AUTHORIZED PLANNING PERSONNEL. THE LATEST VERSION OF THE DT UCN CALCULATOR SOFTWARE MUST BE USED FOR THIS PURPOSE.
USER CONFIGURABLE ITEMS ARE UCN PROTECTED TO PROHIBIT UNAUTHORIZED CHANGES.

1. From either a USB Drive or from a railroad database, download the MCF to a USB drive.
2. Transfer the MCF from the USB drive to the PC hard drive.
3. Make sure that the PC is NOT connected to the VIU.
4. Launch the DT program.
5. Click the PROG (program) button at the top of the DT screen.
6. Click the NEW button at the top of the DT screen.
7. Locate the MCF just copied from the USB drive.
8. Select and open that MCF. The DT MAIN PROGRAM menu is displayed.
9. Select SITE Configuration from the menu.
10. Select ATCS SIN from the SITE configuration menu.
11. Enter the SIN for the VIU being configured (record this for later use).
12. Click the APPLY button.
13. Click the CLOSE button.
14. Click the PROG button and then make all necessary parameter changes.
15. When changes are complete, click the CFG FILE button at the top right corner of the DT screen.
16. Select Save Configuration from the drop down menu.
17. Save the file with a new name.
18. Click the CFG FILE button again.
19. Select View Program from the drop down menu of the CFG File.
20. Select Location and SIN from the Program Report screen.
21. Verify that the SIN is correct.
22. Click the NEXT button at the top of the DT screen.
23. Record displayed MCF CRC and Calculated UCN (these will be needed in the field).
24. Click the CLOSE button.
25. Click the CLOSE button again.

4.6 CONFIGURE A VIU-20

NOTE

NOTE

To configure a VIU-20, perform the following steps as depicted in Figure 4-2. To load the individual software files, follow the steps shown in Section 3.2.

1. Power up VIU unit. Connect to the unit's Ethernet Port 1 for the Web UI and by the Laptop Serial Port for the DT.
2. Open a browser, and connect to the unit using the IP provided by the railroad or agency for Ethernet Port 1.
3. Login to the Web UI using the password provided by the railroad or agency, if required.
4. Install the USB Drive in the Ethernet Port on the front of the VIU and follow the steps described in paragraph 3.2.2.3.1. Scroll down to PUT MSTR EXEC>VIU.

5. On the browser, select REPORTS > VERSION REPORT.
   a. Scroll down to Card 1 of 2 S/W Version Information. This provides the MSTR EXEC file data. Compare this data to the file provided by the railroad or agency. If the file name and version is the same, go to step b. If the file does not match the file provided by the railroad, install the version supplied by the railroad.
      i. Press the right (►) arrow until the desired file name appears.
      ii. Press ENTER.
      iii. Wait while file uploads. Do not disconnect power while file uploads. When complete, press the up (▲) arrow.
   b. Scroll down to Card 2 of 2 S/W Information. This provides the SLV EXEC file data. Compare this data to the file provided by the railroad or agency. If the file name and version is the same, go to step c. If the file does not match the file provided by the railroad, install the version supplied by the railroad.
      i. Press enter until PUT SLV EXEC > VIU appears.
      ii. Press the right (►) arrow until the desired file name appears.
      iii. Press ENTER.
      iv. Wait while file uploads. Do not disconnect power while file uploads. When complete, press the up (▲) arrow.
   c. Scroll up to the Non-Vital Core Version. This provides the N-V-EXEC file data. Compare this data to the file provided by the railroad or agency. If the file name and version is the same, go to step d. If the file does not match the file provided by the railroad, install the version supplied by the railroad.
      i. Press enter until PUT SLV EXEC > VIU appears.
      ii. Press the right (►) arrow until the desired file name appears.
      iii. Press ENTER.
      iv. Wait while file uploads. Do not disconnect power while file uploads. When complete, press the up (▲) arrow.
6. On the front of the VIU panel, scroll down to PUT VITAL MCF > VIU. Install the Vital MCF.
   a. Press the right (►) arrow until the desired file name appears.
   b. Press ENTER.
   c. Wait while file uploads. Do not disconnect power while file uploads. When complete, press the up (▲) arrow.
7. Scroll down to EXIT USB MENU. Press Enter. Remove USB Drive.
8. Press Menu on the front panel of the VIU. When SITE SETUP appears, select Enter.
   a. Enter VITAL EDIT MODE ARE YOU SURE? NO YES appears. Select Yes.
   b. SITE SETUP SITE ID NUMBER appears. Select Enter. Enter the SIN provided by the railroad or agency. Select Enter.
   c. Press the right (►) arrow. MCF CRC appears. Select Enter. Enter the MCF CRC provided by the railroad or agency. Select Enter.
   d. Press the right (►) arrow. UCN appears. Select Enter. Enter the UCN provided by the railroad or agency. Select Enter.
   e. Press the right (►) arrow. REBOOT VITAL appears. Select Enter. REBOOT VITAL ARE YOU SURE? YES NO appears. Select YES
   f. VITAL CPU REBOOT REQUEST SENT.
   g. Press EXIT twice.

9. On the Web UI, enter all required Non-Vital Configuration parameters specified by the railroad or agency.
   a. When required, unlock the Edit button when required to edit specific parameters.
   b. When the changes are complete, select Save and then select Reboot.
   c. Set values as described in Section 7 in accordance with the railroad or agency site plan.
   d. Close the Web UI.
10. On the Web UI, enter all required Non-Vital Configuration parameters specified by the railroad or agency.
   a. When required, unlock the Edit button when required to edit specific parameters.
   b. When the changes are complete, select Save and then select Reboot.
   c. Set values as described in Section 7 in accordance with the railroad or agency site plan.
   d. Close the Web UI.

4.7 PLACE A VIU-20 IN OPERATION

1. Verify signal aspects reported by the VIU-20 against the actual signals on the ground.
2. If switches are programmed, verify the switch position reported by the VIU-20 against the actual switch position on the ground.
3. If hazard detectors, such as high-water detectors, slide fences, etc., are programmed, verify the function by removing the input from the VIU-20.
4. Observe train moves to verify proper operation of the signal system.

SECTION 5
WAYSIDE INTERFACE APPLICATION

5.0 WAYSIDE INTERFACE APPLICATION

5.1 INTRODUCTION

Positive Train Control (PTC) is an automated control system for railways that ensures the safe operation of trains using data communication between the various control entities that make up the system. As part of a PTC system, the VIU-20 interfaces with the signals and switches on an interlocking and compiles vital messages concerning signal aspect and switch position using the Wayside Interface Unit (WIU) application. These messages are passed through the ITCM system for transmission to any locomotive within radio range.

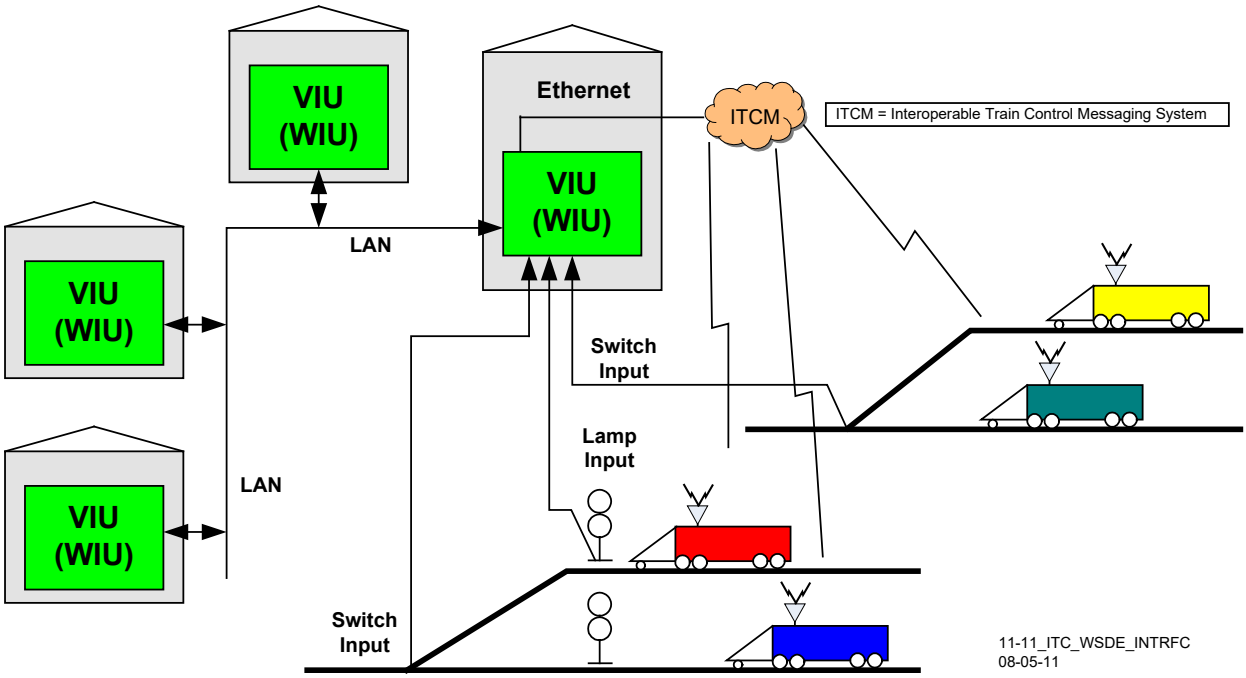


Figure 5-1 VIU Monitoring Switches and Signals in an Interlocking

5.2 WAYSIDE INTERFACE SYSTEM

A VIU Wayside Interface System consists of three major components:

- VIU (WIU)
- Interoperable Train Control Messaging (ITCM)
- Train Management Computer (TMC)

NOTE

NOTE

The VIU-20 contains no replaceable parts. If the unit fails, replace the VIU-20 but leave the ECD/Power connector installed. The newly installed VIU-20 will obtain its configuration from the ECD.

5.2.1 Vital Interface Unit (VIU)

The VIU is installed at a wayside location within an interlocking and monitors signal aspects and switch positions at that location via its vital inputs. Each VIU can monitor up to 20 vital inputs. The VIU compiles the switch and signal information into a vital Wayside Status Message (WSM) and sends them to the ITCM via one of the Ethernet ports on the VIU top panel. These WSMs are in Edge Message Protocol (EMP) format.

5.2.1.1 Multiple VIUs in a Large Interlocking

In larger interlockings, multiple auxiliary VIU modules may be necessary to report the status of all switches and signals in the interlocking. The auxiliary VIUs monitor switches and signals via their vital inputs and send the information to the main VIU in vital ATCS messages.

The main VIU creates a WSM for each WIU channel and broadcasts the messages periodically as determined by a configurable broadcast time parameter.

5.2.1.2 Message Time Stamp

The VIU maintains clock synchronization from an external device with a one second resolution. Two methods are supported by the WIU for this synchronization: EMP based time messages transported over Class C or SNTP version 4 as per RFC 4330. Both time synchronization methods are supported but only one is enabled in the WIU configuration at a time.

The 32-bit timestamp uses Greenwich Mean Time (GMT) and indicated Absolute Time, which is UTC time expressed as the absolute number of seconds since midnight, January 1, 1970, including leap seconds. A 32-bit timestamp is used by the system. The system uses GMT for the timestamp when creating reports or saving configuration files.

5.2.1.3 Message Security

The WIU uses a keyed-Hash Message Authentication Code (HMAC) as a protection scheme for the vital data portion of the message. The WIU uses a RC2 Decryption Key to decrypt the encrypted HMAC Key to validate the message under PTC. The HMAC is stored in an encrypted format in the WIU. The RC2 Decryption Key may be loaded in the field, but the Key values are not viewable.

The non-encrypted HMAC key size is fixed at 20 bytes. The encrypted size is 24 hex bytes. The RC2 key is 20 bytes. Trailing 0’s in the entered 20-byte RC2 key shall be truncated, and the truncated value is used in the computation. If a shorter HMAC string is entered, it shall be padded with 0’s to make 24 bytes.

The HMAC key is proved in TXT format for cut and paste or copy operation to the VIU.

⚠ WARNING

WARNING

THE USER MUST ENSURE THAT EACH SITE IS GIVEN A UNIQUE HMAC KEY.

5.2.2 Interoperable Train Control Messaging (ITCM)

The Wayside Interface Unit System relies on the ITCM to transmit the Wayside Status Messages (WSMs) at a fixed interval. The WSMs are transmitted via the ITCM using a variety of means. The basic requirement of the ITCM is to relay the wayside status information generated by the WIU to the locomotive and/or back office.

Although the ITCM is not considered vital or safety critical, an ITCM failure can result in significant and negative operational impacts to railroad service since the on-board PTC system would be required to initiate a safe action in the event that a required signal/device status is not known.

5.2.3 Train Management Computer (TMC)

The on-board Train Management Computer system listens for status messages along the track. Status for every local wayside device in the on-board track database must be ‘heard’ by the locomotive. The system continues to listen for status messages as the locomotive approaches the monitored wayside devices.

Stale messages are detected by a synchronized timestamp. The TMC verifies message validity and then displays the messages for action by the train crew.

5.2.4 Typical Wayside Interface System Interconnect Diagram (Single VIU)

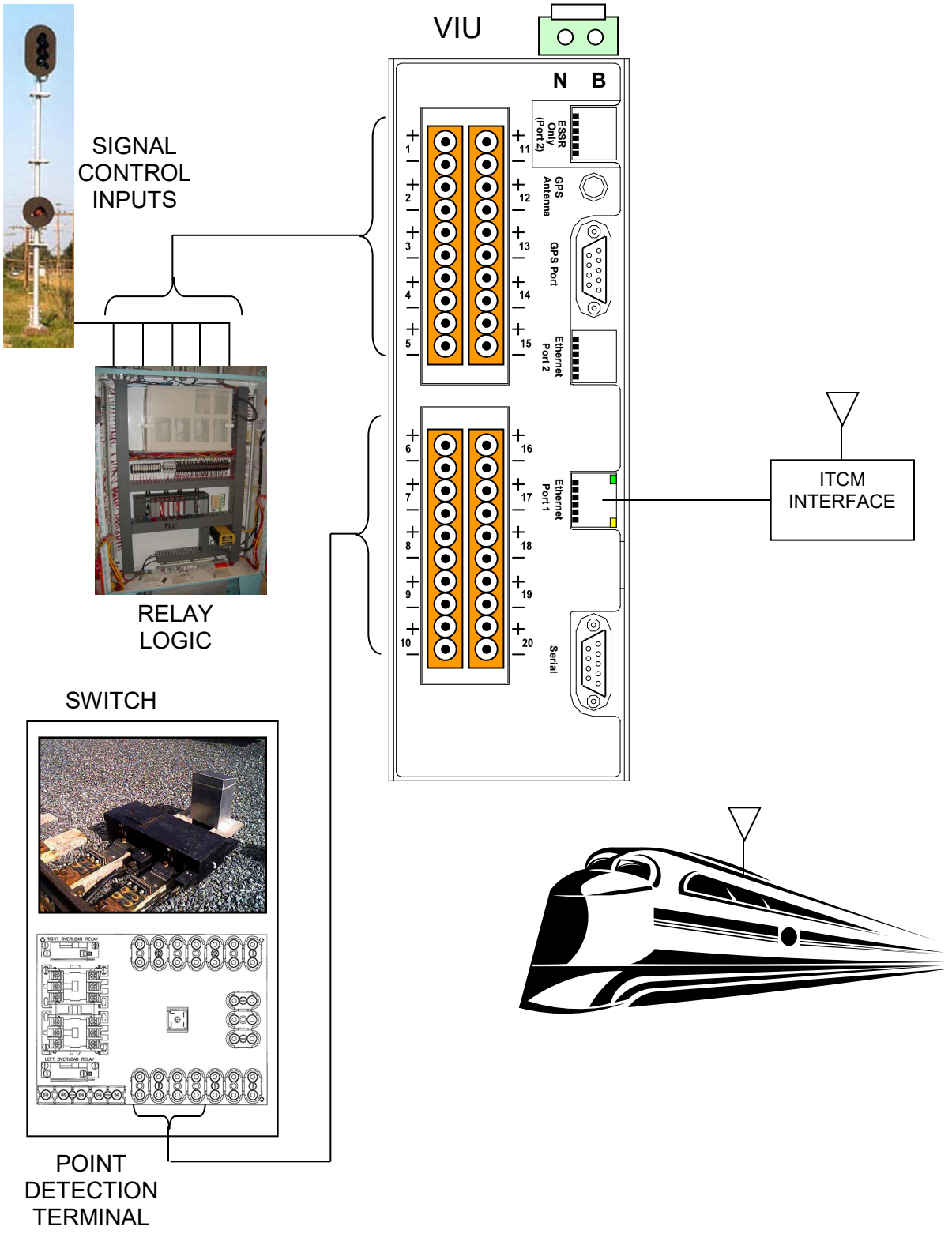


Figure 5-2 Typical Wayside Interface System Interconnect Diagram (Single VIU)

5.2.5 Typical Wayside Interface System Interconnect Diagram (Multiple VIUs)

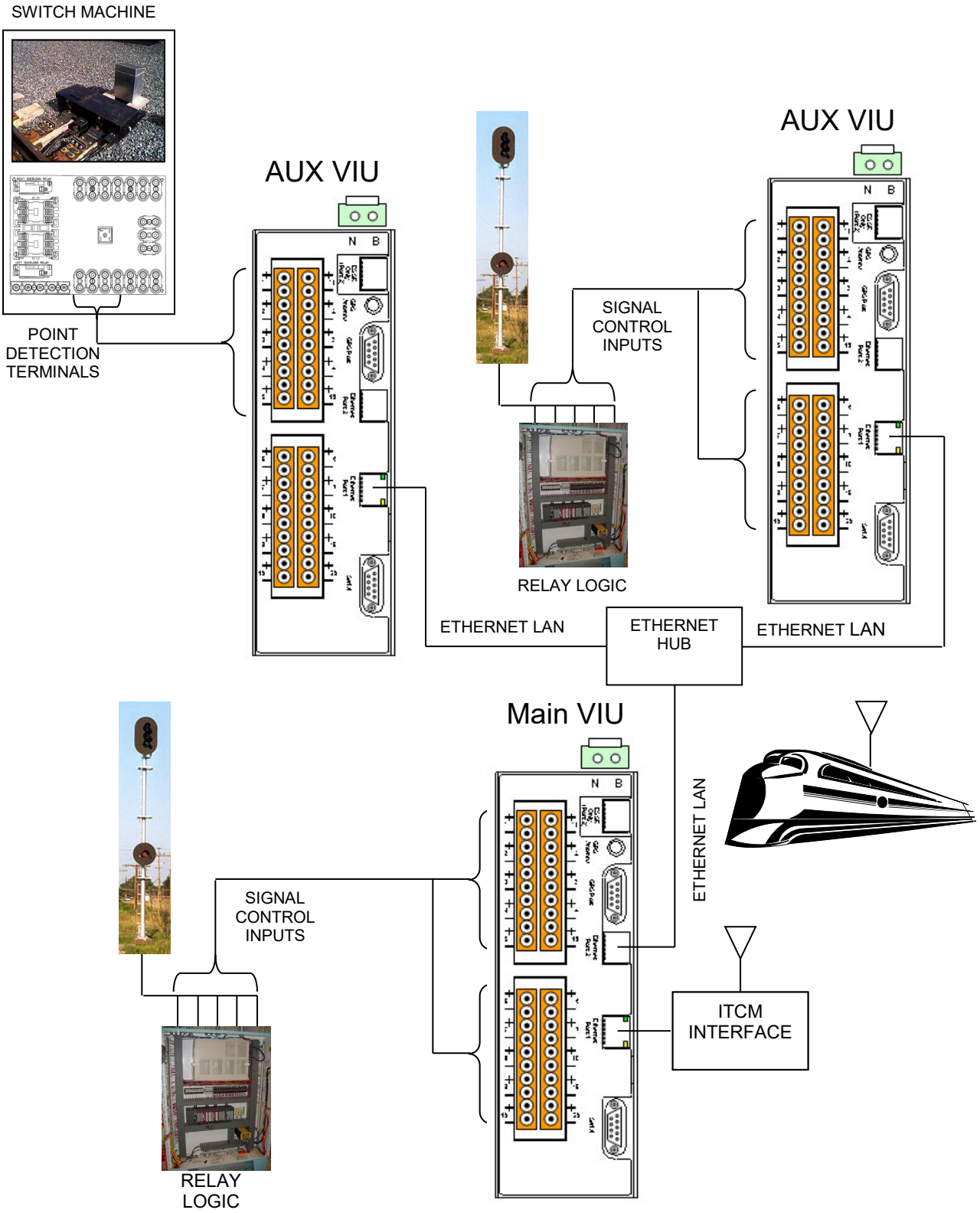


Figure 5-3 Typical Wayside Interface System Interconnect Diagram (Multiple VIUs)

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SECTION 6
DIAGNOSTIC TERMINAL (DT) SOFTWARE

6.0 DIAGNOSTIC TERMINAL (DT) SOFTWARE

6.1 INTRODUCTION

The Diagnostic Terminal (DT) is a Siemens developed Windows® based utility program designed to run on a laptop PC. The DT provides a user interface that allows for local or remote configuration of vital and certain non-vital VIU parameters, plus diagnostic tools that can be used to isolate VIU system problems (see Section 8).

⚠ WARNING

WARNING

INCORRECT ENTRY OF VITAL CONFIGURABLE PARAMETERS WILL LEAD TO UNSAFE FUNCTIONING OF THE VIU UNIT. THE VITAL FIELD CONFIGURABLE PARAMETERS MUST BE VERIFIED FOR CORRECTNESS BEFORE THE EQUIPMENT IS PLACED IN SERVICE.

6.2 DT TO VIU INTERFACE

The DT can be interfaced to the VIU by either of the following means:

Primary Method: an Ethernet LAN connection between the PC to the Laptop Ethernet port on the VIU front panel. Alternatively, the host PC Ethernet port can be connected to either Ethernet Port 1 or Port 2 located on the top of the VIU.

Another method is a straight 9-pin female to 9-pin male cable connected between the host PC serial port and the 9-pin, RS-232 **Laptop (Serial)** port on the VIU front panel. See paragraph 6.5.1 for information on Comm settings on DT.

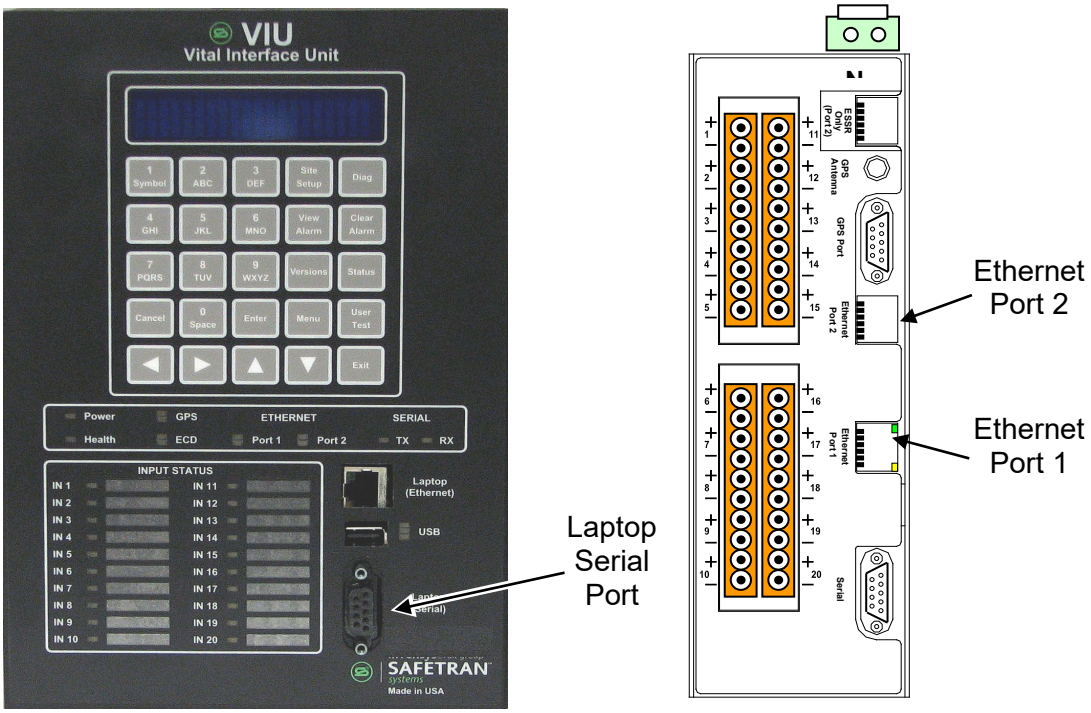


Figure 6-1 VIU Front Panel Laptop PC Interface Connectors

NOTE

NOTE

The DT is typically connected via Ethernet Port 1, with the discovery Protocol enabled. When the DT is connected serially, uncheck the enable block and select a baud rate of 38400 with the Negotiate Rate block unchecked.

6.3 DT PROGRAM STARTUP

Before launching the DT Utility program, verify that the following conditions are met:

- The PC is connected to the VIU as described in paragraph Figure 6-2 above.
- The VIU is powered up.

Launch the DT Utility either from the PC Programs list or from a desktop icon if present.

6.3.1 DT Startup Sequence

The DT Utility establishes a connection to the VIU, checks the installed VIU files and then downloads the current VIU configuration information. A progress bar appears at the bottom of the screen during the download process (Figure 6-2). Status messages appear in the message box at the bottom right of the screen. The **IP Connecting** message is displayed only if the PC is interfaced to the VIU via the Ethernet port.

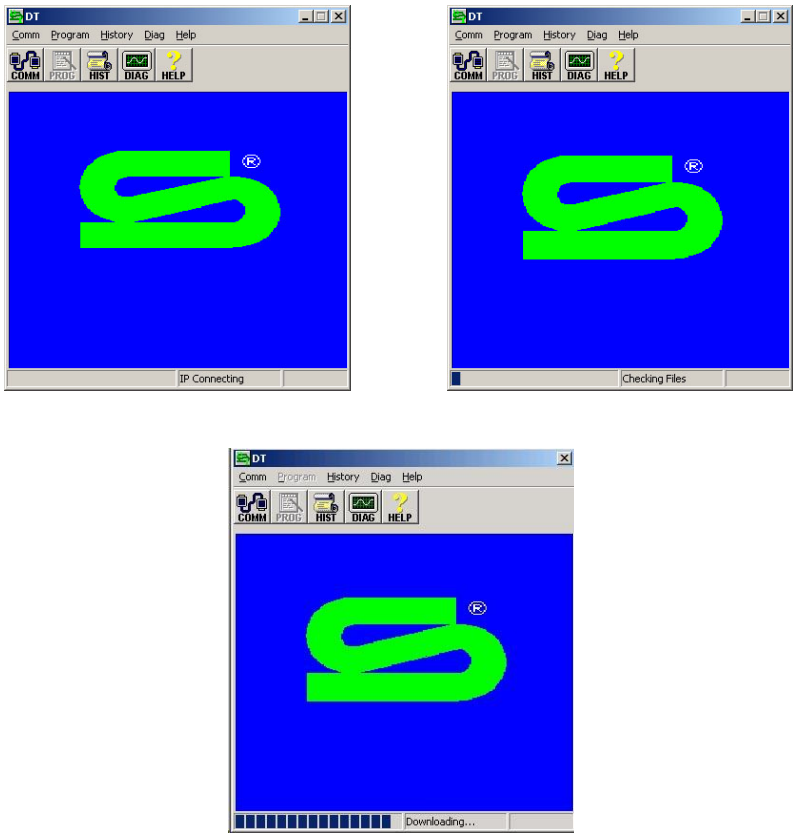


Figure 6-2 DT Start-Up Screens

If the DT Utility was already running prior to connecting the PC to the VIU, click on the **COMM** button at the top of the screen to display the communications drop down menu. Select **Connect** from the drop down menu to initiate a data connection between the DT Utility and the VIU (Figure 6-3 COMM Drop Down Menu).

See paragraph 6.5.1 for DT port setup.

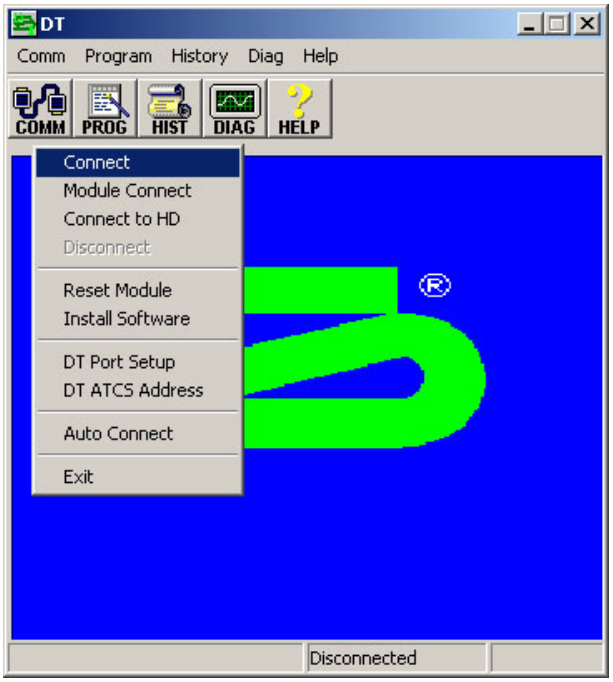


Figure 6-3 COMM Drop Down Menu

6.4 VIU INPUT STATUS OVERVIEW SCREEN

Once the DT Utility has successfully established its connection with the VIU, **Ready** is displayed in the lower right hand message box and an overview of the VIU input status is displayed. Note that at the top of the DT Utility screen the Site ID Number [SIN] or ATCS address of the attached VIU is displayed. See Figure 6-4.

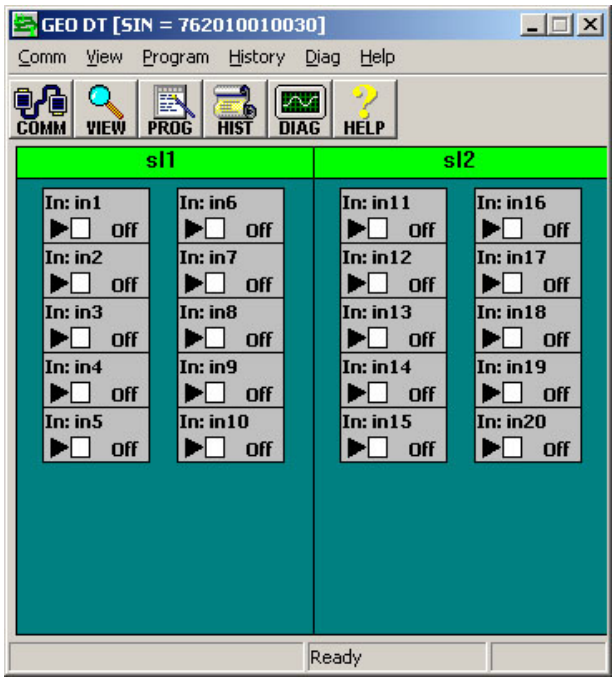


Figure 6-4 VIU Input Status Overview Screen

The input status overview screen provides a quick indication of the current VIU health and input status. See Figure 6-5 Input Status Screen Indicator Descriptions.

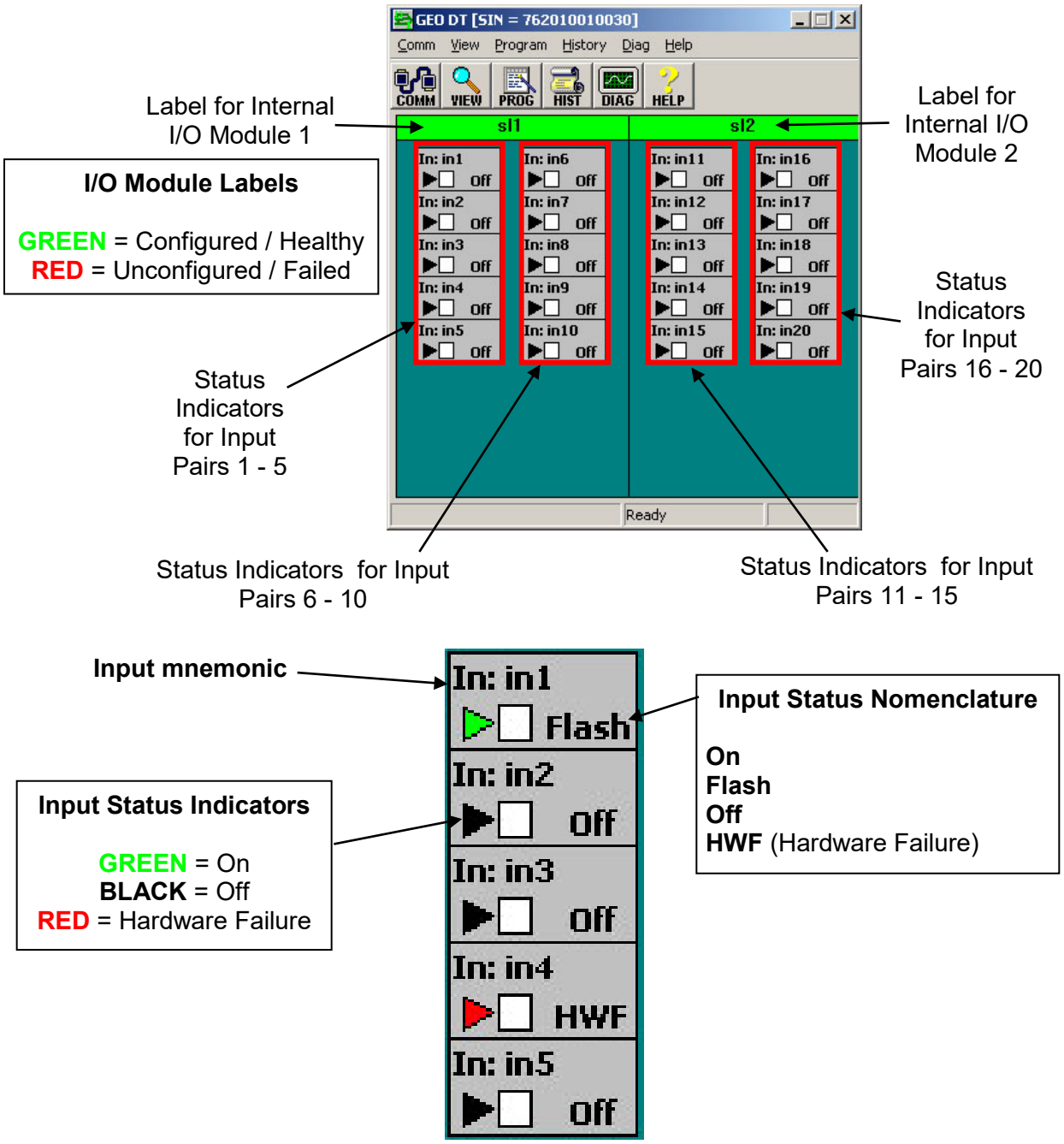


Figure 6-5 Input Status Screen Indicator Descriptions

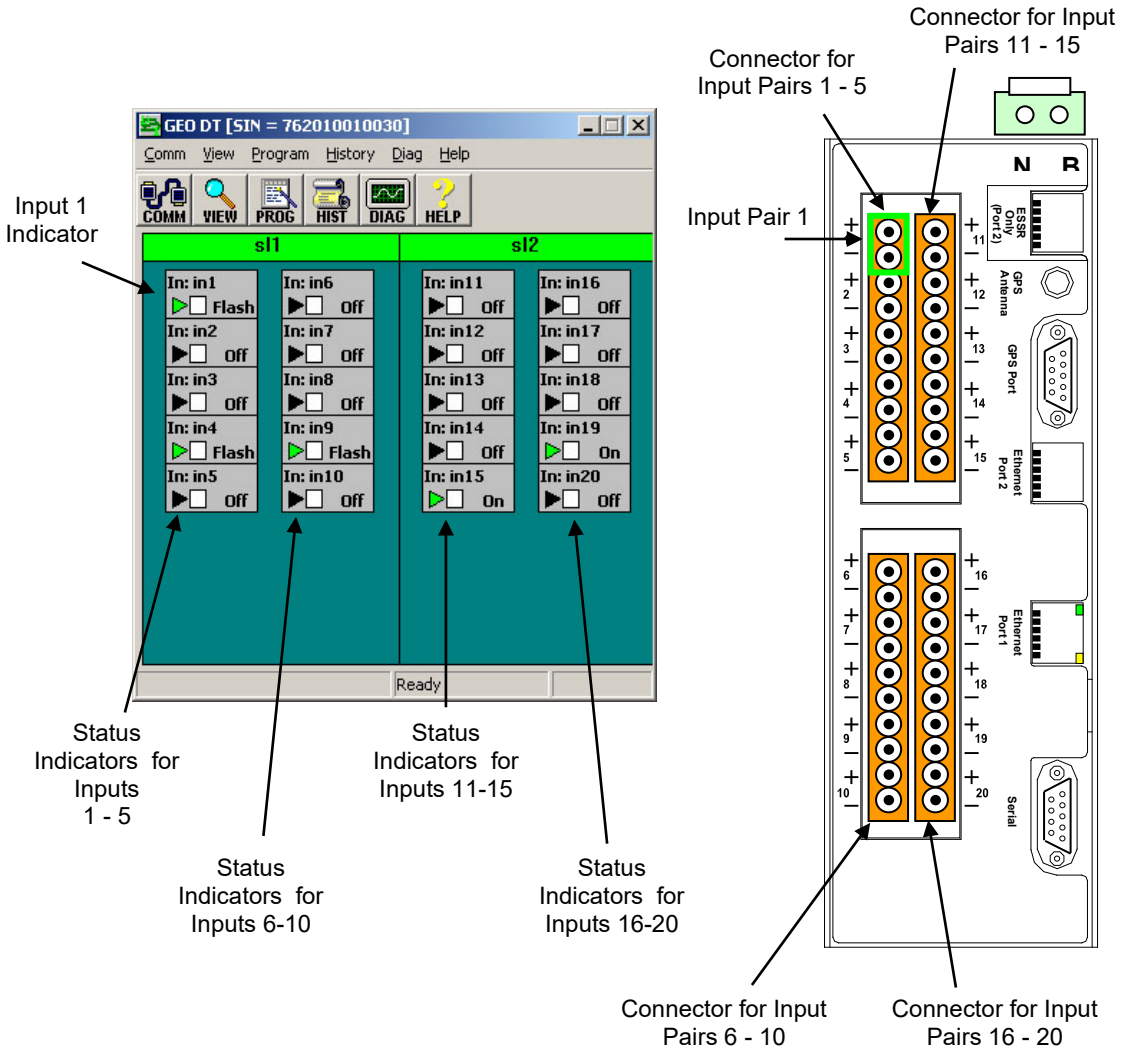


Figure 6-6 Status Screen Input Indicator to Physical Input Connector Relationships

Right click on the I/O Module label to display the module drop-down menu. Select items from the menu to view or perform the following (Figure 6-7):

- View Specific Module information
- Reset Module
- Set verbosity (control of amount of information saved to the log)
- View Status Log
- View Summary Log

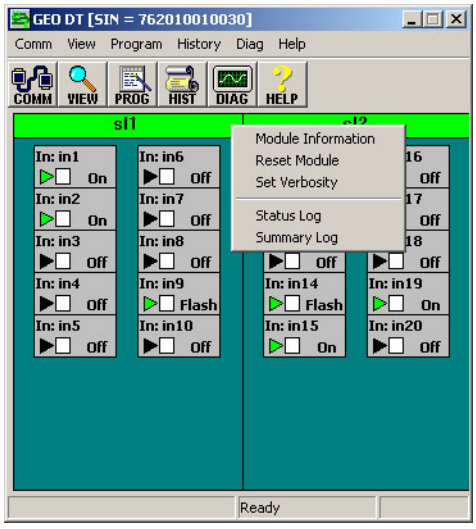


Figure 6-7 I/O Module Drop-Down Menu

6.4.1 Input Status Overview Screen Button Descriptions and Menus

The function buttons at the top of the Input Status Screen provide access to submenus. Use these submenus to access specific information about the connected VIU or to perform actions that affect the connected VIU. The function button and submenu hierarchy is shown in Figure 6-8.

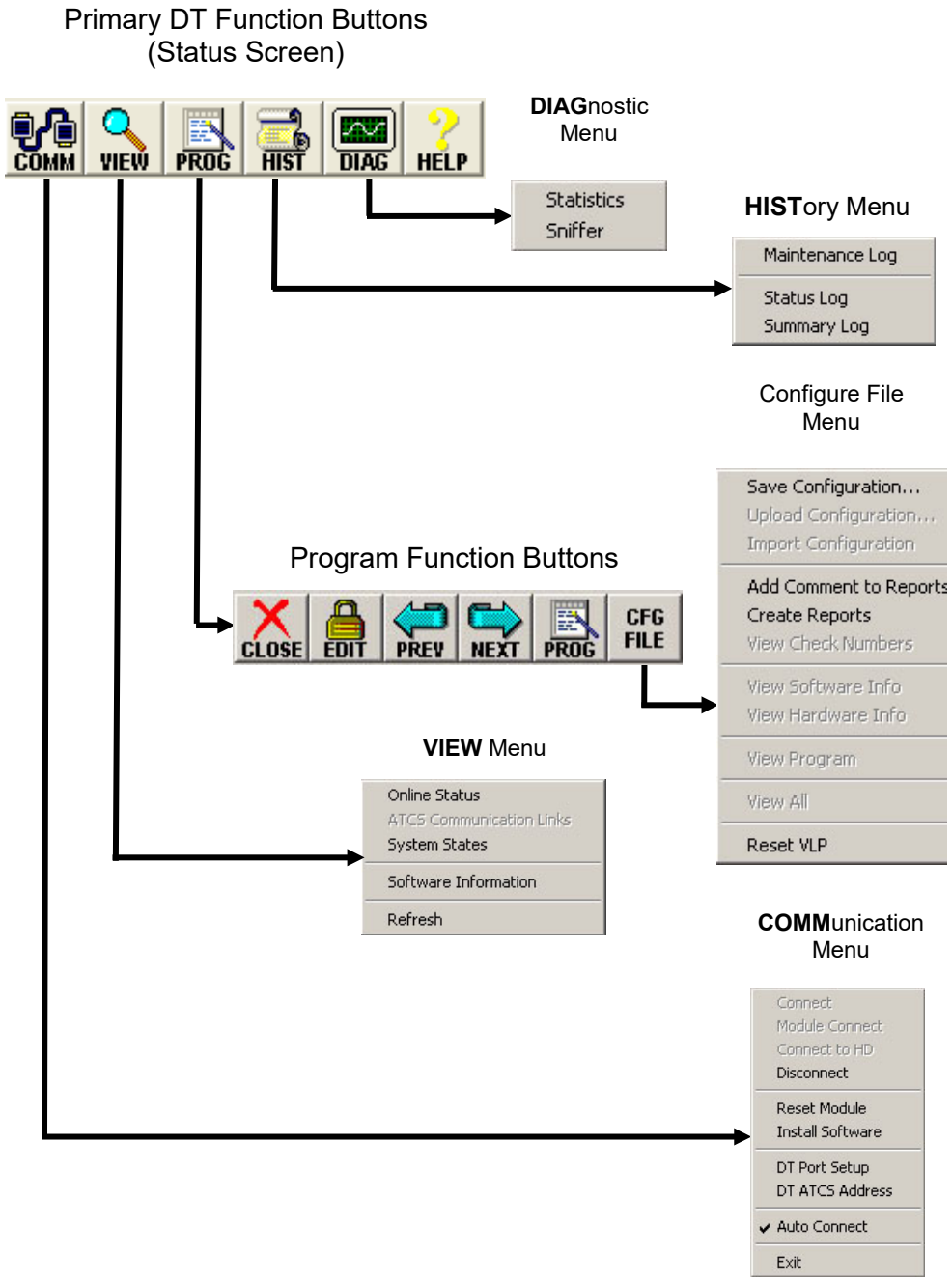
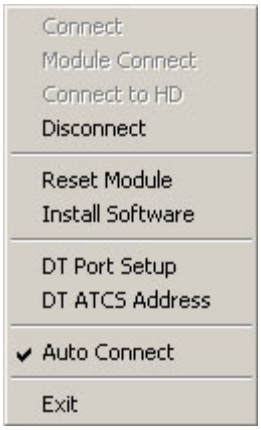


Figure 6-8 DT Function Button and Menu Hierarchy

6.5 COMM (COMMUNICATIONS) BUTTON MENU

Click on the **COMM** (Communications) button at the top of the Input Status Screen to display the communications drop-down menu.



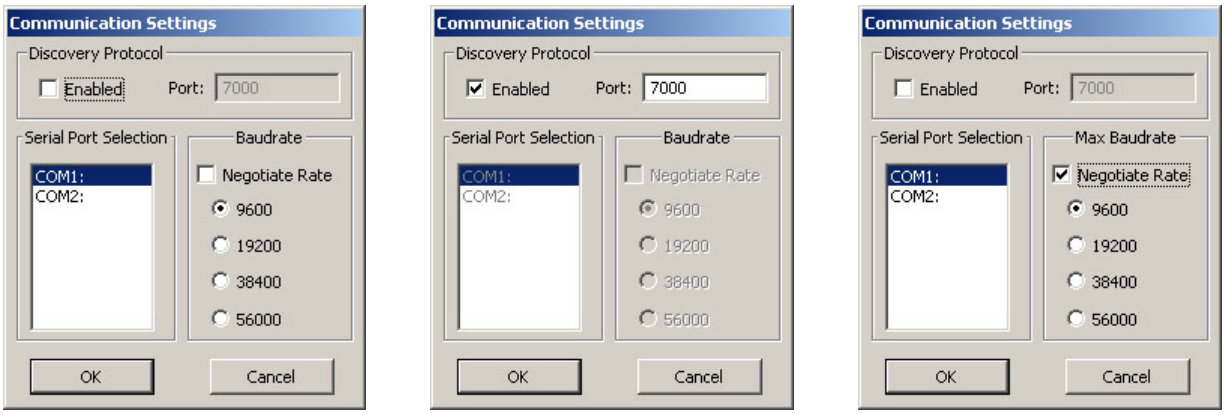
6.5.1 DT Port Setup

NOTE

NOTE

The DT is typically connected via Ethernet Port 1, with the discovery Protocol enabled. When the DT is connected serially, uncheck the enable block and select a baud rate of 38400 with the Negotiate Rate block unchecked.

Select **DT Port Setup** from the drop-down menu to display the Communications Settings dialog box (Figure 6-9).



A B C

Figure 6-9 DT Communications Settings Dialog Box

When communicating with the VIU via a serial port, use this screen to configure the baud rate of the selected PC communications port (Figure 6-9A).

The **Negotiate Rate** function is for another application of the DT. If the check box next to the Negotiate Rate label is checked as shown in Figure 6-9C, deselect it. Select the baud rate of 38400, then select OK. 38400 is the recommended baud rate.

If several VIUs are connected to a Local Area Network (LAN), connect the PC to this network and then select the **Discovery Protocol Enabled** check box (Figure 6-9B). The DT will locate each VIU on the LAN and present them in a list (Figure 6-10). Select the desired VIU from the list. This screen refreshes approximately every 15 seconds.

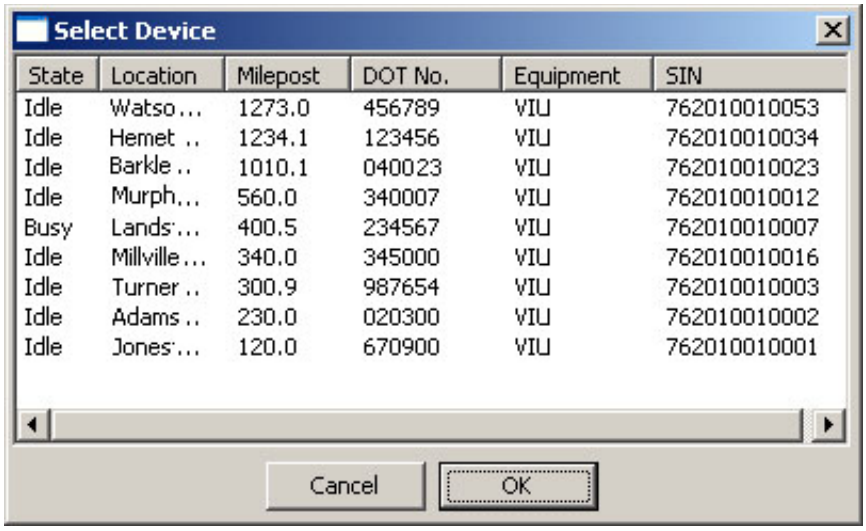
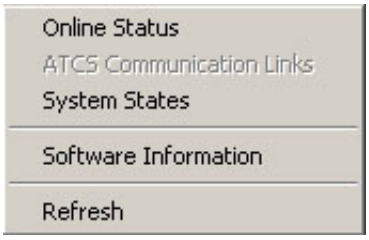


Figure 6-10 List of Networked VIU Devices

6.6 VIEW BUTTON MENU

Click the **VIEW** button at the top of the Input Status Screen to display the View drop-down menu.



6.6.1 Software Information

Select **Software Information** from the View drop-down menu to view information about the currently installed MCF and MEF (Executive).

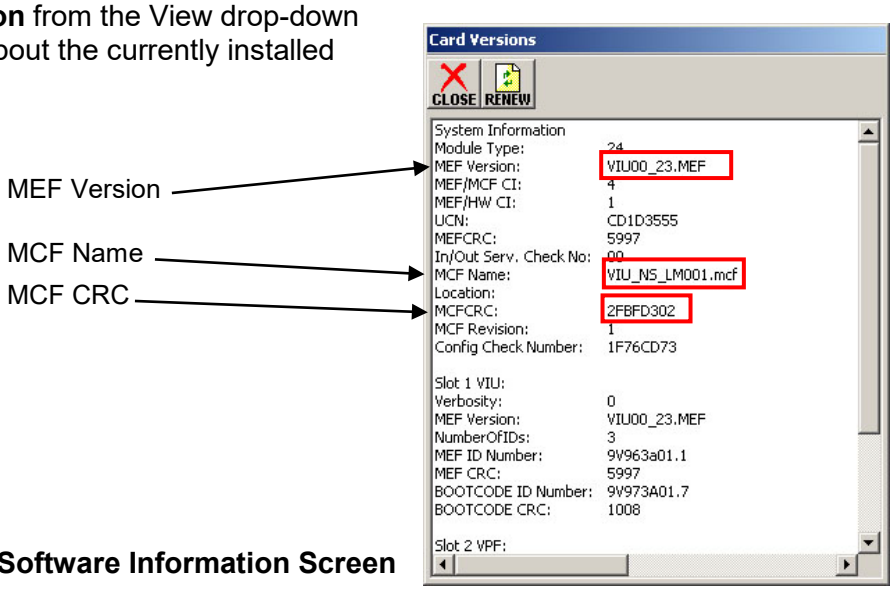


Figure 6-11 Software Information Screen

NOTE

NOTE

The software information presented on this display applies to vital components only. Use the web browser user interface to view complete software information

6.6.2 System Status

Select **System States** from the View drop-down menu to view the current status of each VIU vital input. On the initial System States screen:

1. Select the "+" symbol next to the name on the top line to expand the directory.
2. Select **Inputs**.
3. Click the **GET** button at the top of the screen to display the input states.

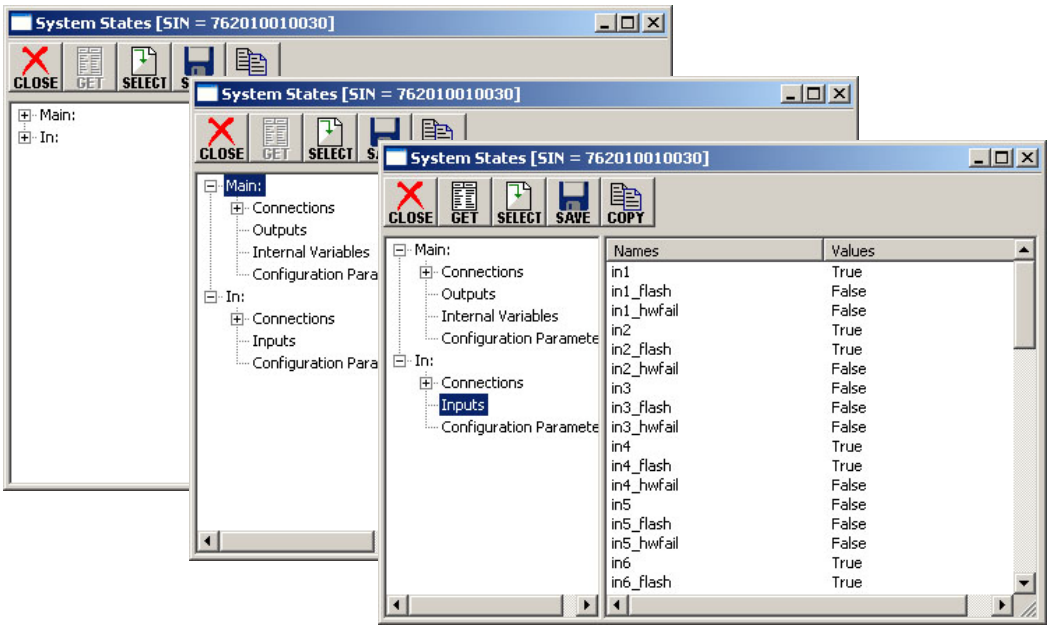


Figure 6-12 Viewing Input States Using System States Function

6.6.2.1 Viewing Input Logic Status

To view the logic states for these inputs:

1. Click the **SELECT** button at the top of the System States screen to display the Select Range dialog box (Figure 6-13).
2. Enter the number of the first and last logic states to be viewed.
3. Click the **OK** button.

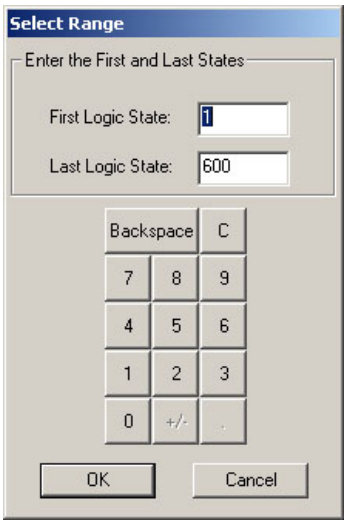


Figure 6-13 Logic State Select Range Dialog Box

6.6.2.2 Input Logic States Display

There are three logic states for each input.

- The first logic state represents the On/Off status of the input: 1 = On, 0 = Off.
- The second logic state represents the flash function: 1 = Flashing, 0 = Not Flashing.
- The third logic state represents the hardware fail status: 1 = Failed, 0 = Not Failed

NOTE

NOTE

The 1 logic state corresponds to a 'True' statement and the 0 logic state corresponds to a 'False' statement on the System States screen shown in Figure 6-12.

The 1 logic state corresponds to a 'True' statement and the 0 logic state corresponds to a 'False' statement on the System States screen shown in Figure 6-12.

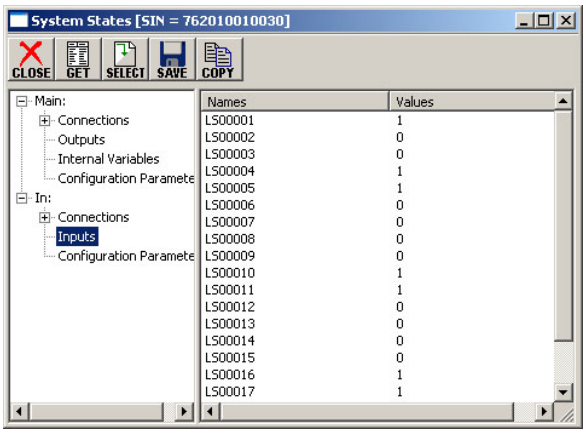


Figure 6-14 Input Logic States Display

6.6.3 On-Line Status

Select the **On-line Status** function from the View drop-down menu to view the internal VIU status log in real-time. This listing only includes events for the current DT session (Figure 6-15).

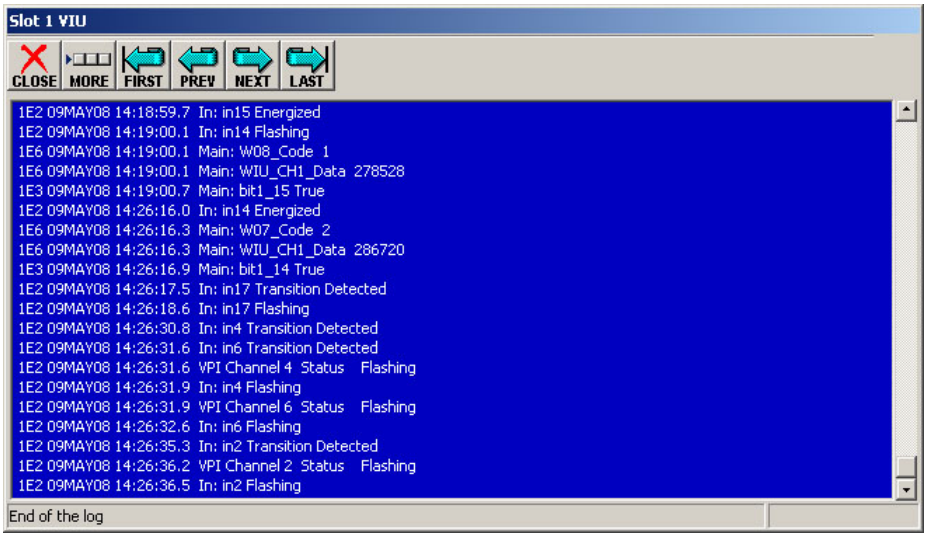


Figure 6-15 Real-Time View of VIU Status Log

6.7 PROG (PROGRAM) BUTTON MENU

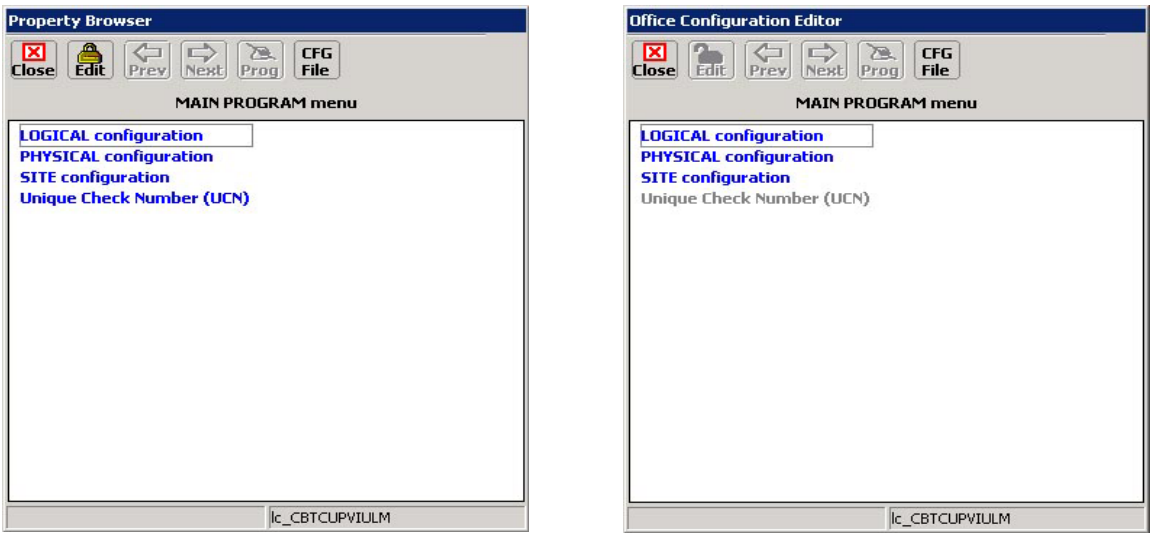
Click the **PROG** (Program) button at the top of the Input Status Screen to display the **MAIN PROGRAM menu**. Select an item from the menu to display the associated DT screen.

This menu provides access to the configurable parameter screens.

6.7.1 Online and Offline Display Screens

Note that Figure 6-16A is displayed when the DT is online (connected to a VIU) as indicated by "Property Browser" in the title bar, and Figure 6-16B is displayed when running the DT offline (not connected to a VIU) as indicated by "Office Configuration Editor" in the title bar. This version is only used by office personnel.

There are a few instances where a parameter or function can only be configured offline using the Office Configuration Editor (OCE) - for example, calculating a UCN. In such cases the special function will only appear in the offline Office Configuration Editor screen. Field personnel do not have access to the UCN calculator version.



(**A**) (**B**)

Figure 6-16 MAIN PROGRAM Menu Screen

6.7.2 Changing Locked Configuration Parameters

The parameters preceded by a right angle bracket (>) are vital parameters, those parameters that are used to calculate the UCN.. The current values for these parameters are displayed in gray text. These parameters may be reset in the field using the DT utility after unlocking the configuration parameters. When vital parameters are changed, a new UCN must be calculated by office personnel and transmitted to the field personnel.

To unlock the configuration parameters, click the **Edit** button at the top of the screen (Figure 6-17). A prompt is displayed indicating that unlocking the parameters will place the system in a restrictive state and that a new UCN is required to make the system operational. Click the **Yes** button to unlock the parameters. When unlocked, the parameters displayed in gray text change to green.

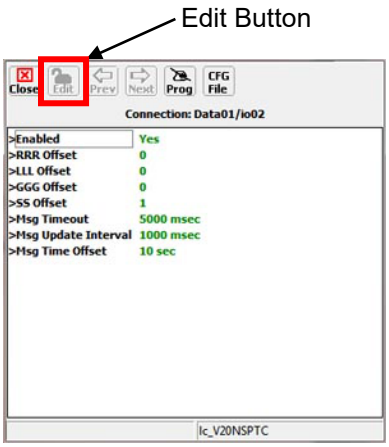


Figure 6-17 Edit Button Location

NOTE

NOTE

Refer to Section 4 for instructions on how to calculate a new UCN.

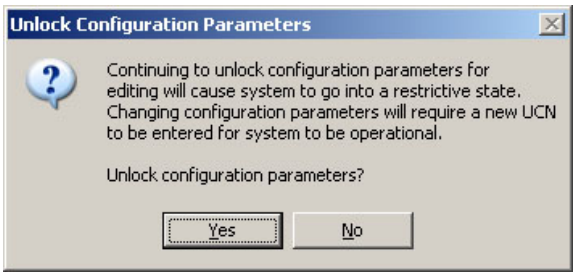


Figure 6-18 Unlock Configuration Parameters Prompt

WARNING

WARNING

PARAMETERS DISPLAYED WITH A RIGHT-ANGLE BRACKET (>) TO THE LEFT OF THE PARAMETER NAME ARE VITAL PARAMETERS WHICH ARE PART OF THE UCN. CHANGING THESE PARAMETERS WHILE CONNECTED TO THE VIU PUTS THE VIU IN AN UNCONFIGURED STATE. EDIT MODE IS USED TO CHANGE THE VITAL PARAMETERS, AFTER WHICH A NEW UCN MUST BE ENTERED. THE NEW UCN SHOULD BE PROVIDED BY OFFICE OR DESIGN PERSONNEL.

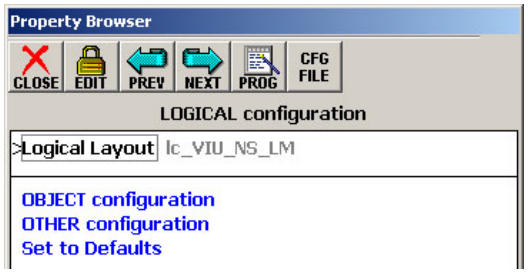
6.7.3 PHYSICAL Configuration

NOTE

NOTE

Siemens recommends that users program the PHYSICAL configuration parameters prior to programming the LOGICAL configuration parameters. In many cases, the changes to the PHYSICAL configuration menus executes a Set to Default action, and any LOGICAL configuration settings are reset to their default settings.

Select the **PHYSICAL Configuration** function from the MAIN PROGRAM menu screen to view the PHYSICAL configuration screen (Figure 6-19).



A list of physical configuration options is displayed

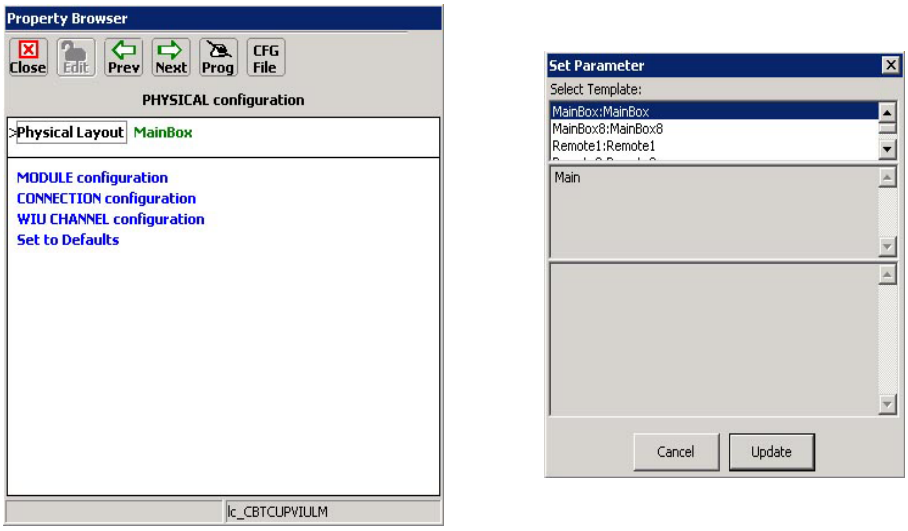


Figure 6-19 PHYSICAL Configuration Screen

6.7.3.1 Physical Layout

Each Physical Layout file describes the physical content of the associated object. For instance, the Mainbox is the main VIU.

The Physical Layout file for this object defines the types of circuits installed in the main VIU. Click the MainBox (green text) to select a different template (i.e., MainBox8:MainBox8, Remote1:Remote1, etc.). The contents of these files are defined in the MCF.

6.7.3.2 MODULE Configuration

Path: MAIN PROGRAM menu > PHYSICAL configuration > MODULE configuration

Select **MODULE configuration** from the PHYSICAL configuration screen to display the MODULE configuration screen (Figure 6-20).

From the list of internal I/O modules, select a module to view the configurable parameters for that module. Depending on the module selected, one of two screens is displayed.

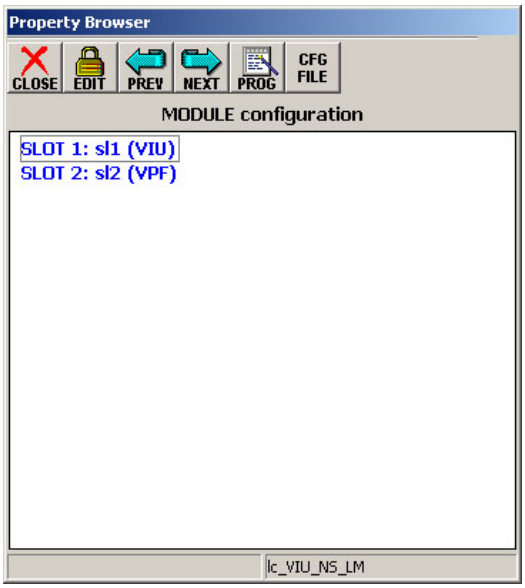


Figure 6-20 MODULE Configuration Screen

NOTE

NOTE

These internal modules are not removable or serviceable. They are groups of circuits associated with the vital I/O connectors and are labeled as shown here for reference only.

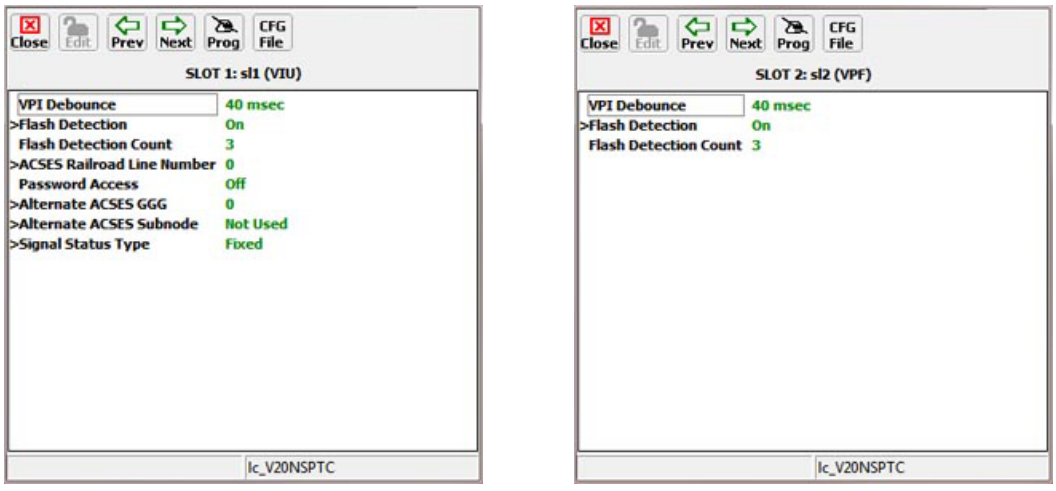


Figure 6-21 Slot 1 (VIU) & Slot 2 (VPF) Module Configuration Screens

The setting for each of these configurable parameters falls into one of two categories; numerical value or an "**On**/**Off**" option. The Set Parameter screens for both parameter types are shown in Figure 6-22. After entering the number or selecting the option, click the **Update** button to activate the new setting.

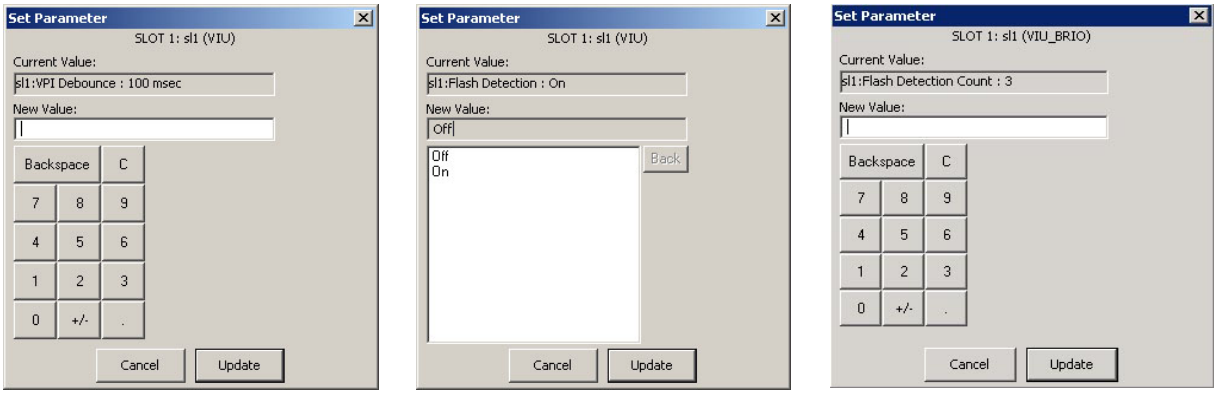


Figure 6-22 Typical Set Parameter Screens

- **VPI Debounce**

The VPI Debounce function is a global setting that is applied to all vital inputs serviced by this internal I/O module. It sets the period of time a level change must be present on an input before it can be considered a "Change-of-State".

Valid VPI Debounce range: **20** to **200** ms (default is **20** ms).

- **Flash Detection**

The Flash Detection function is used to configure the physical inputs to detect whether a level that cycles on and off on the input represents a flashing input.

Valid options are: **On**, **Off** (default is **On**).

When flash detection is on, a new energized / de-energized state will not be reported until it has persisted for 1 second.

- **Flash Detection Count**

The Flash Detection Count setting determines how many on/off cycles are required on the input before the software determines that the level on the input represents a flashing signal.

Valid Flash Detection Count values: **2** to **8** (default is **3**).

- **ACSES Railroad Line Number (LLL)**

Not used in VIU-20 MCF.

- **Password Access**

The internal I/O module for slot 1 also controls password access for changing VIU parameters. The Password Access function determines whether or not a password is required.
Password Access options: **ON** = password required. **OFF** = no password required (default is **OFF)**.

- **Password**

If the Password Access function is set to **On**, an additional password function is displayed (Figure 6-23). This is the actual password. The default password is 1111.

To change the password, click on the green numbers to the right of the word **Password** (1111 in Figure 6-23). The Set Parameter dialog box for changing the password is displayed (Figure 6-24).

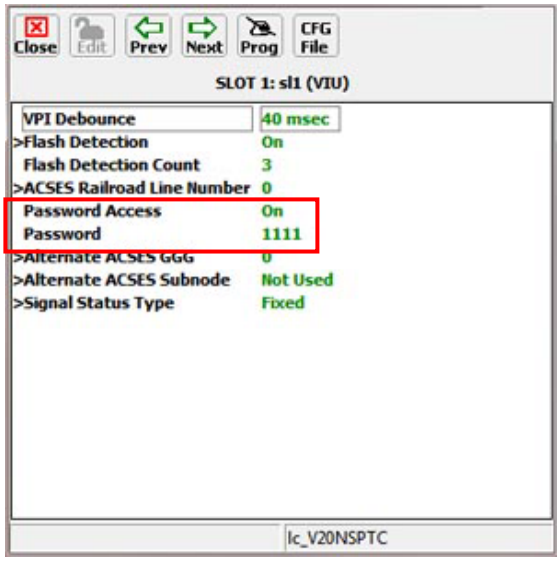


Figure 6-23 Password Enabled

Enter the new password consisting of any four numbers from 1 to 9 plus 0. Click the **Update** button to save the new password. After exiting the programming function, the password will be required to access any of the programming functions as long as the password function is enabled.

Valid password number range: **1111** to **9999**

Figure 6-24 Password – Set Parameter Dialog Box

- **Alternate ACSES GGG**

Not used in VIU-20 MCF.

- **Alternate ACSES Subnode**

Not used in VIU-20 MCF.

- **Signal Status Type**

Not used in VIU-20 MCF.

SECTION 7
VIU WEB BROWSER USER INTERFACE

7.0 VIU WEB BROWSER USER INTERFACE

7.1 INTRODUCTION

The VIU Web browser user interface will run on Windows Explorer (versions 6 & 7) and on Mozilla Firefox browser (version 2 or higher). The Web browser user interface allows local or remote configuration of certain VIU non-vital parameters, plus access to the Event and Diagnostic logs that can be used to isolate VIU system problems (see Section 8 – Maintenance and Troubleshooting).

7.2 LAUNCHING THE VIU WEB BROWSER

NOTE

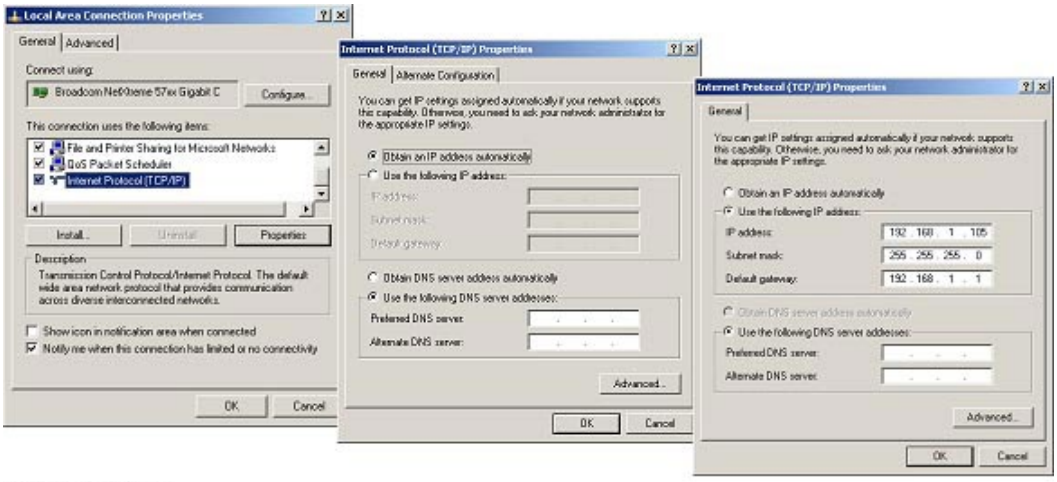
NOTE

Railroad or agency guidelines may require IT support and/or authorization prior to changing computer settings.

7.2.1 User Computer Setup

Setting up a computer to connect with the VIU-20 follows standard fundamental LAN protocol. The User Ethernet Port defaults as a DHCP Server. Setting the computer as a DHCP client will enable the VIU-20 to assign the computer an IP address. The user can also manually set up the computer's TCP/IP properties (e.g. IP address 192.168.1.105, subnet as 255.255.255.0) to connect with the VIU-20 as shown in the figure below. The example shown is for Windows XP and varies between Windows versions (Vista, Windows 7). This procedure is NOT necessary unless the intent is to set up the laptop Ethernet port to something other than a default configuration.

.



08-19_WEBUI_CONNECT
02-19-10

Figure 7-1 Establishing WEB U/I Setup Parameters

If the PC is not already connected to the VIU, using an RJ-45 terminated Ethernet cable connect between the PC Ethernet port and the **Laptop (Ethernet)** port on the VIU front panel. This connection can also be made remotely through an Ethernet network connection to the VIU.

Launch the Internet Explorer (or Mozilla Firefox browser) on the PC. On the URL line enter the IP address of the connected VIU (Figure 7-2). If this is a new VIU the default IP address is 192.168.1.100.

Figure 7-2 Internet Explorer URL Line

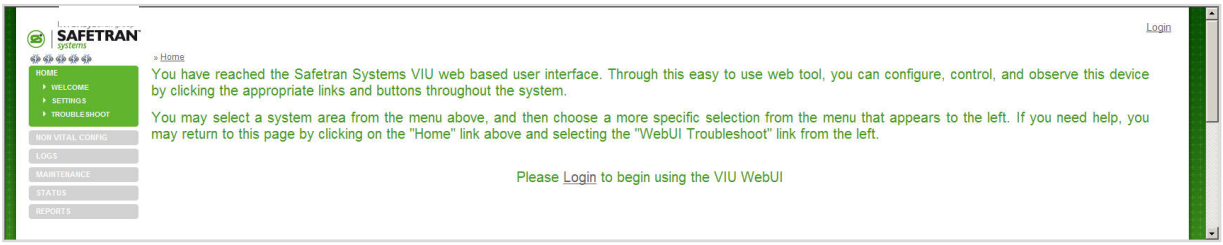


Figure 7-3 VIU Web Browser Login Screen

Select **Login** either in the upper right corner or the center of the login screen (Figure 7-3. Enter the username and password when prompted (Figure 7-4). Click the **Login** button.

- Default user name: admin
- Default password: safetran

These entries are all lower case and are case sensitive.

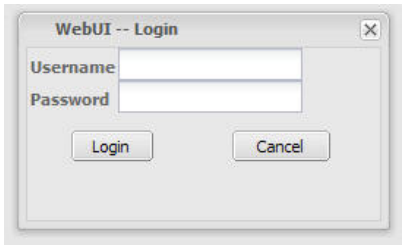


Figure 7-4 Web Browser Login Dialog Box

The Welcome screen is displayed (Figure 7-5).

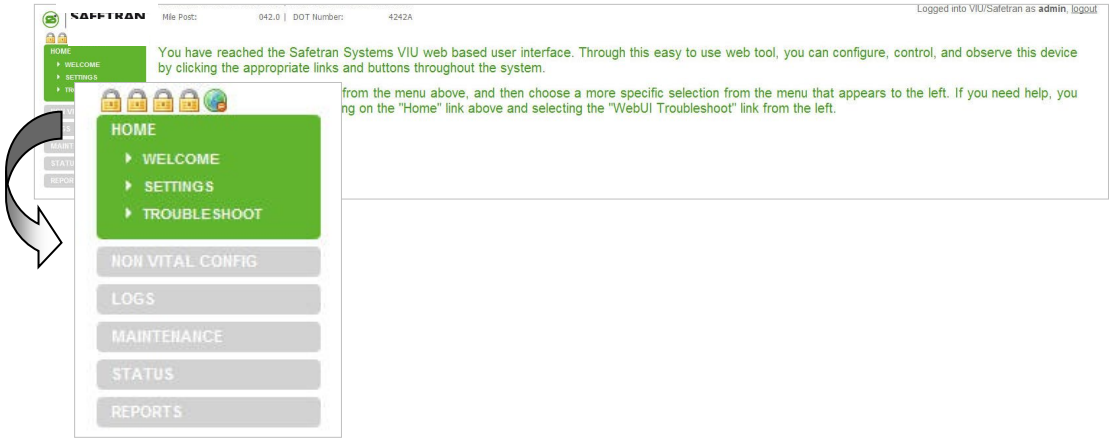


Figure 7-5 Web Browser Welcome Screen

7.2.2 Web Browser Icons

In the upper left corner of the screen below the Siemens logo is a row of five icons. When the Web browser is first opened, these icons appear as broken links as shown below. If you hover the cursor over these links, a help message appears indicating that you are not currently logged into the VIU.

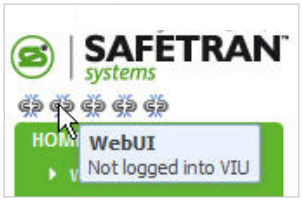


Figure 7-6 Web Browser Initial Icons

After login, these icons will change appearance depending on system status. From left to right the icons indicate the following status:

- Vital Core Session
- Vital Core Status
- Vital Slave Session
- Non Vital Core Health
- GPS Slave status

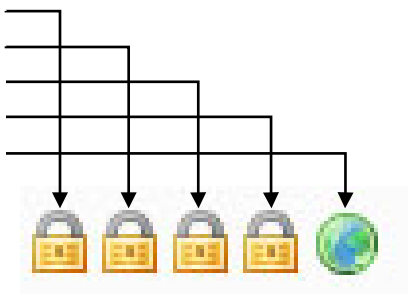


Figure 7-7 Status Icons

Hovering the cursor over an icon identifies the function indicated and the current status of that function. The following icons illustrate some of the status indications.


Indicates that internal GPS is active.


Indicates that internal GPS is missing or unhealthy.


Indicates that function is healthy or in session.


Alternates with caution symbol when function is unhealthy or out of session.


Alternates with open padlock symbol when function is unhealthy or out of session.

Figure 7-8 Icon Definitions

Each screen is provided with a standard set of edit buttons for manipulating the parameters.

Figure 7-9 Standard VIU Non-Vital Parameter Update Buttons

- The Refresh button refreshes the current parameter value displays.
- The Default button sets the parameters to the default values.

If either Refresh or Default is selected the Save and Discard buttons are enabled.

Figure 7-10 Standard VIU Non-Vital Parameter Update Confirmation Buttons

- The Save button saves the current parameter values to the VIU unit.
- The Discard button returns the parameter values to what they were before the change.

Several parameters accessible from the Web browser are vital parameters (Site's ATCS Address, MCF CRC). The text fields for these parameters are normally grayed out (disabled). The screen containing these parameters (Site Info) has an **Edit Mode** button to the right of the standard edit buttons.

Figure 7-11 Standard VIU Vital Parameter Update Buttons

When the vital edit mode is selected, the **Edit Mode** button changes to **Reboot,** the text fields for the vital parameters are enabled and a lightning bolt icon appears to the right of the globe icon at the top of the screen. The Vital Core Status and Vital Slave Session icons will also alternate between the unlocked padlock and the caution symbol while in vital edit mode.

Lightning bolt icon

Figure 7-12 Edit Mode Reboot Indicator

After changing the vital parameters the system must be rebooted by selecting the **Reboot** button. The **Reboot** button will reboot the vital core only, not the entire system. A reboot is the only way to remove the VIU from Edit Mode. When the reboot button is pressed a command is given to the Vital Core requesting a reboot which removes the VIU from Edit Mode. Following a reboot, the lightning bolt icon is removed from the screen.

Several screens contain multiple tabs for the parameters. If a parameter value is changed on a tab and another tab is selected without saving the new value, the tab with the unsaved change will display an asterisk (*) to the right of the tab name. After the values are saved, the asterisk goes away.

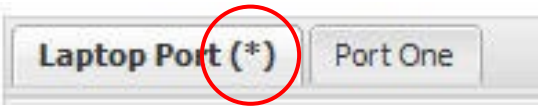


Figure 7-13 Value Change Rending Indicator

If an invalid entry is made in a data field and the **Save** button is pressed, the data field will be outlined in red and the save process will be halted.

Hover the cursor over the data field with the bad entry and a message will appear explaining the limits for the entry.

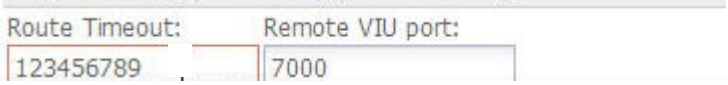


Figure 7-14 Invalid Entry Highlighted

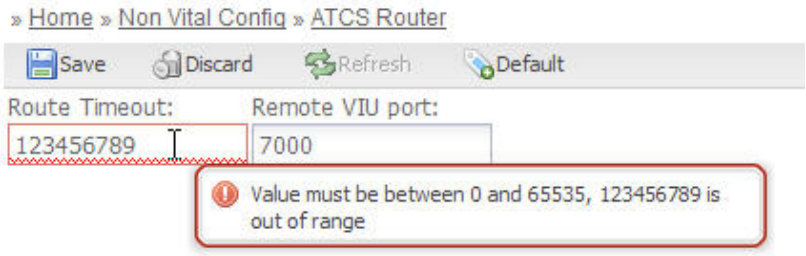


Figure 7-15 Invalid Entry Explanation Window

7.3 ACCESSING NON-VITAL CONFIGURATION PARAMETERS

Select **Non-Vital Config** from the menu on the left side of the screen to display the Non Vital Config menu ().

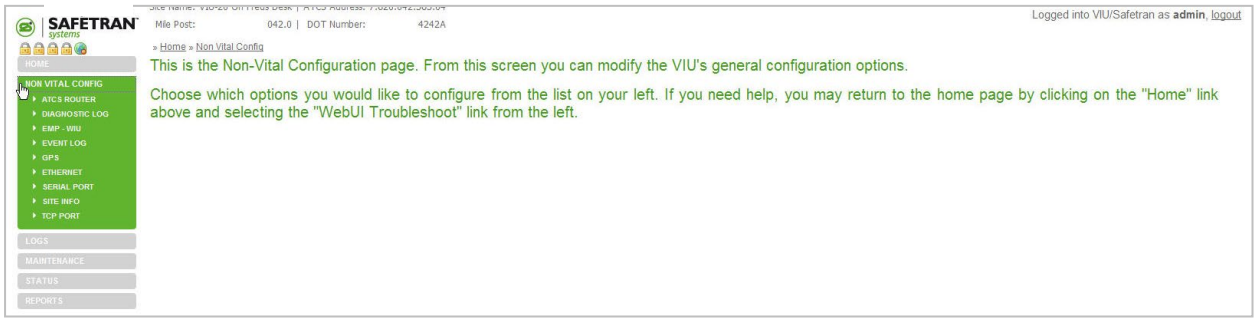


Figure 7-16 Initial Non-Vital Configuration Menu Screen

On the initial Non-Vital Configuration screen, select the desired parameter group from the Non-Vital Config menu (Figure 7-17).

Figure 7-17 Non-Vital Configuration Screen

7.3.1 ACSES II Network

The ACSES II Network configuration screen in shown in Figure 7-18.

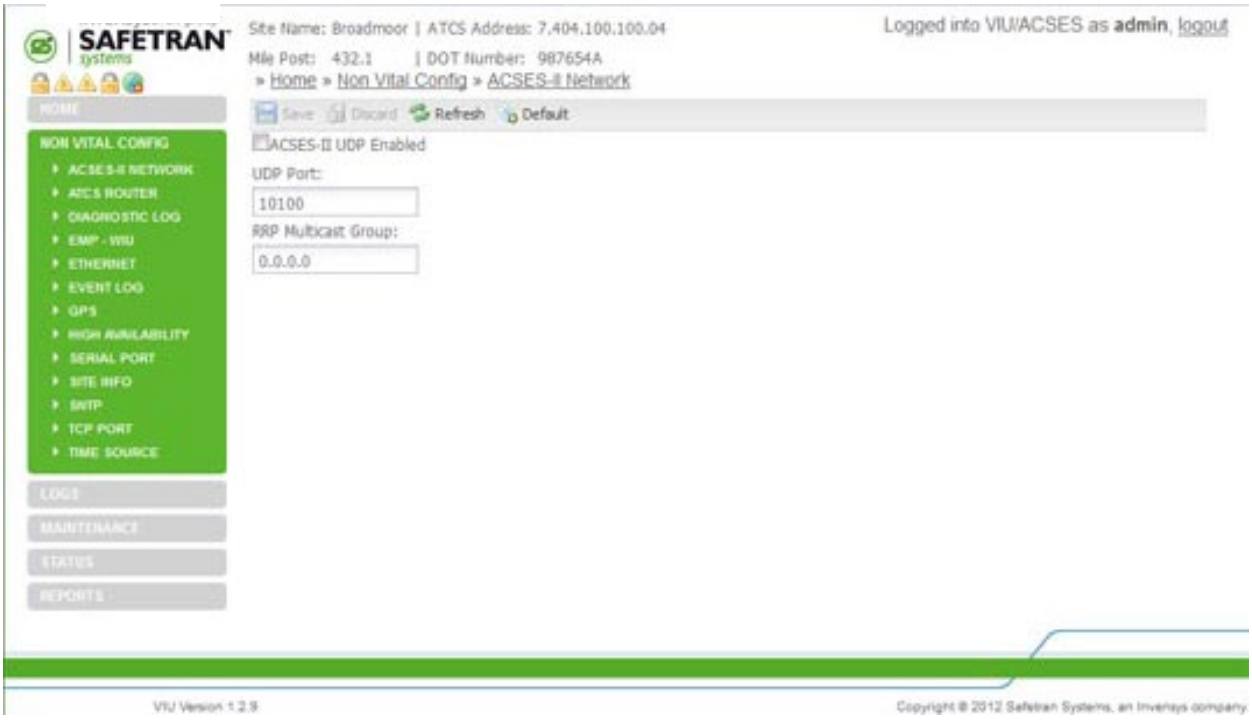


Figure 7-18 ACSES II Network Configuration Menu

7.3.1.1 ACSES-II UDP Enabled

Used in the VIU-20e. Not used in the VIU-20.

7.3.1.2 UDP Port

Not used in the VIU-20.

7.3.2 ATCS Router Configuration

Not used in the VIU-20

7.3.2.1 Route Timeout

Not used in the VIU-20

7.3.2.2 Remote VIU Port

Not used in the VIU-20

7.3.3 Diagnostic Log Configuration

The Diagnostic Log configuration screen is shown in Figure 7-19.

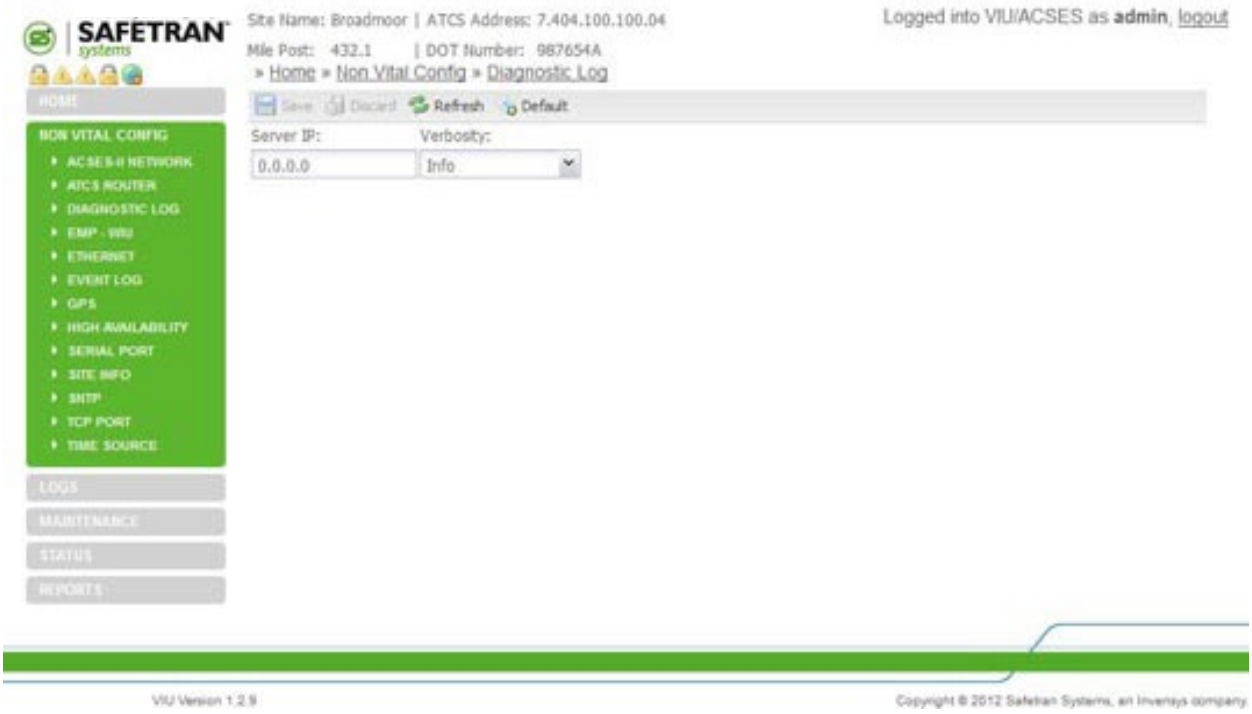


Figure 7-19 Diagnostic Log Configuration Screen

7.3.3.1 Server IP

When one or more VIUs are operating on a network, each VIU can be configured to forward all events over the network to a "consolidated logger". The logger will maintain all of the events for every reporting VIU. The logger can be another VIU.

To configure each VIU to send the Diagnostic Log entries to the logger, enter the IP address of the logger in the Server IP dialog box.

Server IP: **valid IP address** (default is **0.0.0.0**).

7.3.3.2 Diagnostic Log Verbosity

NOTE

NOTE

The buffer containing Diagnostic Log information is limited in size. Error level is the lowest verbosity level and Debug is the highest level and provides maximum information. The size of the log and the number of entries does not change with the verbosity level; the higher the verbosity level, the more often entries are added to the log. Therefore, the higher the verbosity level, the smaller the time period the log covers. The log always contains 10,000 events, but at the higher verbosity levels, it will take less time to generate 10,000 events.

Figure 7-20 Diagnostic Log Verbosity Levels

Use this setting to determine the type of events to be entered in the Diagnostic Log. If set to Debug, every event will be logged. If set to Error, only error events are logged.

Diagnostic Log Verbosity options: **Debug, Info, Warning, Error**

Default is **Info**

7.3.4 EMP-WIU Configuration

WARNING

VERIFY THAT VIU-20 IS PROGRAMMED AS SPECIFIED BY THE RAILROAD'S OR AGENCY'S WITH THE CORRECT MCFCRC, UCN, ATCS SITE IDENTIFICATION NUMBER (SIN). FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE INDICATIONS ON THE VIU-20 UNIT.

EMP-WIU configuration screen (Figure 7-21) allows the encrypted RC2 key to be entered, message parameters to be set, the WIU source address to be assigned, additional addressing information, plus port and additional message configuration parameters. All parameter settings are described in the following paragraphs.

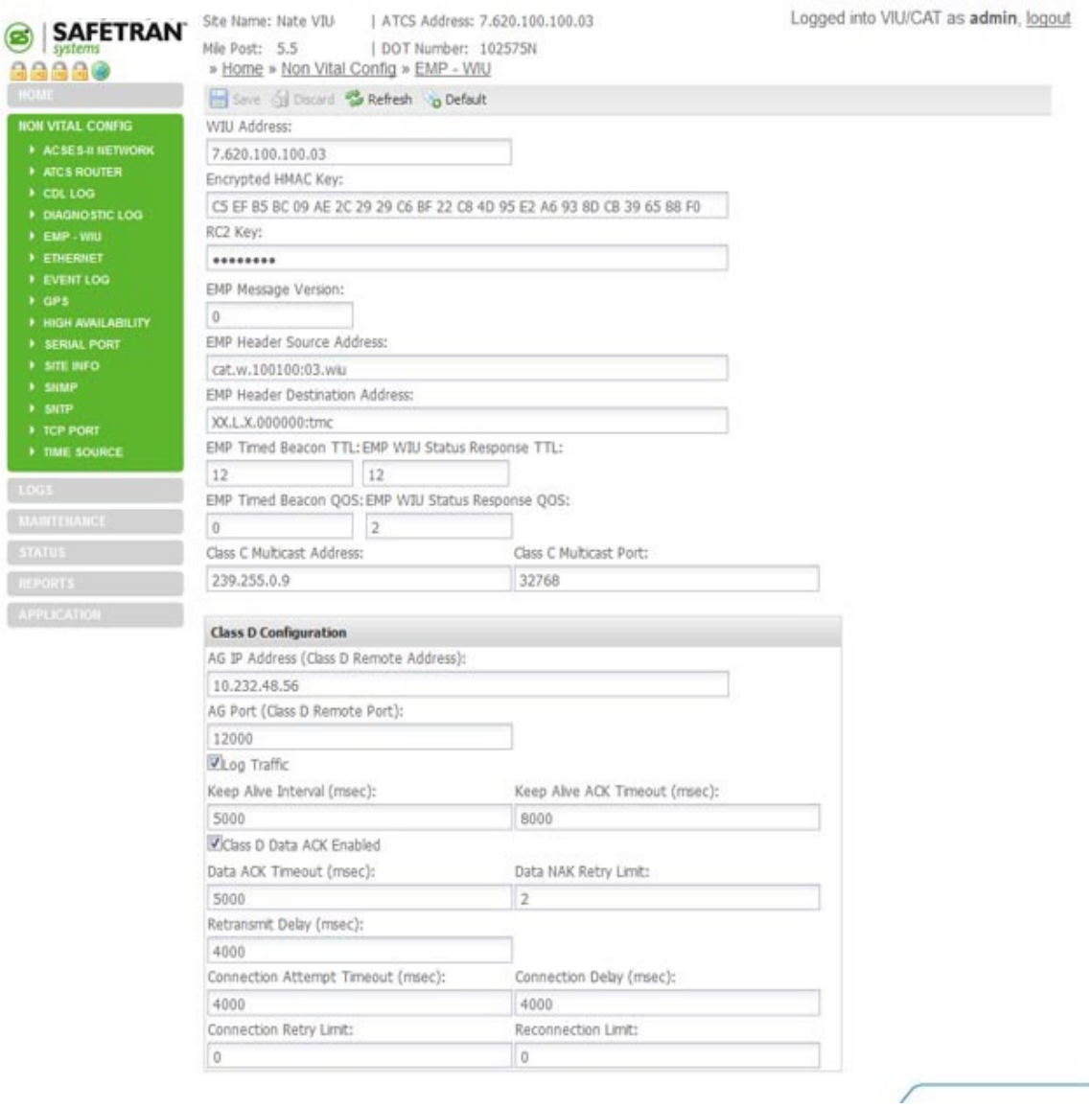


Figure 7-21 EMP-WIU Configuration Screen

7.3.4.1 WIU Address

This ATCS address is assigned by the railroad or agency for each specific WIU. The WIU Address need not be set to the same value as the Site ATCS Address, it may be identified by a separate node.

WIU Address: **valid IP address** (default is **0.0.0.0**).

⚠ WARNING

WARNING

THE WIU ADDRESSES MUST BE UNIQUE FOR EACH VIU.

7.3.4.2 Encrypted HMAC Key

An HMAC function is used by the message sender to produce a HMAC value that is formed by condensing a secret key, the RC2 key, and the message input. (The HMAC is similar to a CRC, but requires the use of an HMAC encryption key to create it.) The HMAC is placed in the message and sent to the message receiver. The receiver computes the HMAC on the received message using the same secret key and HMAC function as was used by the sender, and compares the result computed with the received HMAC. If the two values match, the message has been correctly received.

HMAC Key: 24 hex bytes (default = all zeros (00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00)).

⚠ WARNING

WARNING

IF A MESSAGE WITH AN INCORRECT CRC IS TRANSMITTED BY A VIU, THE RECEIVER OF THE MESSAGE SHOULD CHECK THE CRC AND REJECT THE MESSAGE AS CORRUPT.

7.3.4.3 RC2 Key

The RC2 Key is a password used to encrypt the HMAC value. It can be a maximum of 20 characters. The value is displayed with asterisks because the VIU must not display the actual, unencrypted text in this field. The VIU allows the RC2 key to be copied to a USB device, and copied from a USB device in the VIU. The RC2 key is stored in the USB device in an encrypted form, so that the user cannot read it and obtain the RC2 key number.

RC2 Key range: Null terminated string. Up to 20 bytes (default = **Blank Line**)

7.3.4.4 Message Version

The VIU sets the Message Version field of the EMP message to this value. Normally, this setting does not need to be changed from the default.

- Message Version range: **0** – **255** hex (default is **0**).

7.3.4.5 EMP Header Source Address

The VIU will use this EMP address as the source address in EMP mesages. The string can be set to anything that may be needed by the wayside-to-locomotive network and is case sensitive.

Example: **ns.w.lllggg:ss.wiu** or **csx.w.lllggg:ss.wiu** (where **lll,ggg** and **ss** are the constituent parts of the ATCS WIU address, **7.rrr.lll.ggg.ss**)

String is null terminated (up to 63 bytes) (default = **Blank Line**).

7.3.4.6 EMP Header Destination Address

The VIU will use this EMP address as the destination address in broadcasted WSMs. Normally this string is set to **XX.L.X.000000:tmc**.

Destination Address range: Null terminated string. Up to 63 bytes (default = **Blank Line**)

7.3.4.7 EMP Timed Beacon TTL

This is the normal "**Time To Live**" value, which is when a message is determined to be stale..

Time To Live range: 0 – 65535 (default = **12**)

7.3.4.8 EMP WIU Status Response TTL

This is the alternate "**Time To Live**" value, which describes the number of Interoperability Transport "hops" that a message can make before being discarded – if the message is being conveyed by the VIU through an alternate talk path to the Interoperability Server.

Alternate Time To Live range: **0** – **65535** (default = **12**).

7.3.4.9 EMP Timed Beacon QOS

This is the **QOS** value used in beaconed WSMs.

QOS range: **0** – **65535** (default = **0**).

7.3.4.10 EMP WIU Status Response QOS

This is the "**QOS**" value used in WSMs in response to a **WiuGetStatus** message.

QOS range: **0** – **65535** (default = **0**).

7.3.4.11 Class C Multicast IP Address

This is a Multicast IP address which is used by the VIU to listen for Multicast UDP messages containing Class "C" Time Updates as defined in the PTC specification.

Class D Address range: **0.0.0.0** – **255.255.255.255** (default = **239.255.0.5**

7.3.4.12 Access Gateway (AG) IP Address (Class D Remote Address)

This is the IP address of the Interoperability Train Control Server or "application gateway" computer to which the VIU connects. PTC messages are conveyed across a TCP connection to this IP address.

Access Gateway IP: valid IP address or DNS (default = 10.255.255.210.

7.3.4.13 Access Gateway (AG) Port (Class D Remote Port)

This is the TCP port number that the VIU connects to in conjunction with the ITC Server IP address.

Access Gateway Port Address Range: **1024** – **65535** (default = 3001)

7.3.4.14 Log Traffic

This optional attribute indicates whether or not link traffic should be logged for debugging purposes. When checked (set to yes), all link traffic is logged in a text file, with binary data expressed in hexadecimal format.

Log Traffic range: Unchecked (No), Checked (Yes) (default = Unchecked (No))

7.3.4.15 Keep Alive Interval (msec)

This timer value indicates the rate at which keep-alive messages shall be sent to an Interoperability Train Control Server or “application gateway”. A value of 0 shall indicate that no keep-alive messages are sent or expected. The keep-alive interval attribute is configured as 0 on both ends of a link if keep-alive operation is to be disabled.

Keep Alive Timer range: **0 – 60000** (default = **30000**)

7.3.4.16 Keep Alive ACK Timeout (msec)

This timer value is the number of milliseconds the VIU will wait for acknowledgment to a keep alive message before terminating the link.

Keep Alive ACK Timeout range: **0 – 60000** (default = **15000**)

7.3.4.17 Class D Data ACK Enabled

This required attribute indicates whether or not acknowledgments (and negative acknowledgements) shall be sent or expected in response to data messages.

Class D Data ACK range: Checked (Yes), Unchecked (No) (default = Checked (Yes))

7.3.4.18 Data ACK Timeout (msec)

This attribute indicates how much time shall be allowed to elapse between the sending of a data message and the receipt of an acknowledgement message. It is required when Data ACK Enabled is set to Yes.

No ACK Retry Timer range: **2 – 60000** (default = **15000**)

7.3.4.19 Data NAK Retry Limit

This attribute indicates how many times a sending node shall attempt to send a message for which it receives a negative acknowledgment. The error code associated with a negative acknowledgment determines whether or not retries are to be made. If the error code indicates that no retries are to be made, this attribute is ignored.

No ACK Retry Count range: **0 – 10** (default = **3**)

7.3.4.20 Retransmit Delay (msec)

This required attribute indicates how much time the node shall wait before retrying a connection after the previous attempt failed.

Retransmit Delay range: **0 – 10000** (default = **1000**)

7.3.4.21 Connection Attempt Timeout (msec)

This attribute indicates how much time shall be allowed to elapse while making a single attempt to establish a connection.

Connection Attempt Timeout range: **1 – 60000** (default = **30000**)

7.3.4.22 Connection Delay (msec)

This attribute indicates how much time the node shall wait before retrying a connection after the previous attempt failed.

Connection Attempt Delay range: **1 – 60000** (default = **60000**)

7.3.4.23 Connection Retry Limit

This attribute indicates how many times an attempt shall be made to establish a connection in the event that connection attempts are failing. It is configurable and expressed as an integer with a valid range of -1 to 10000. A value of -1 means retry forever.

Connection Attempt Retry Count range: **-1 – 10000** (default = **-1**)

7.3.4.24 Reconnection Limit

This attribute indicates the number of attempts to reconnect the link before giving up. It is configurable and expressed as an integer with a valid range of -1 to 10000. A value of -1 means retry forever. The number of reconnection attempts is not reset between successful reconnections, only at system startup.

Reconnection Limit range: **1 – 10000** (default = **-1**)

7.3.5 Ethernet Configuration

The Ethernet configuration screen allows address and network configuration settings to be made for the three Ethernet ports on the VIU (Figure 7-22). These include the Laptop Ethernet port on the front panel and the Ethernet ports 1 and 2 on top of the unit (Figure 7-23 and Figure 7-24). A separate tab is provided for each port

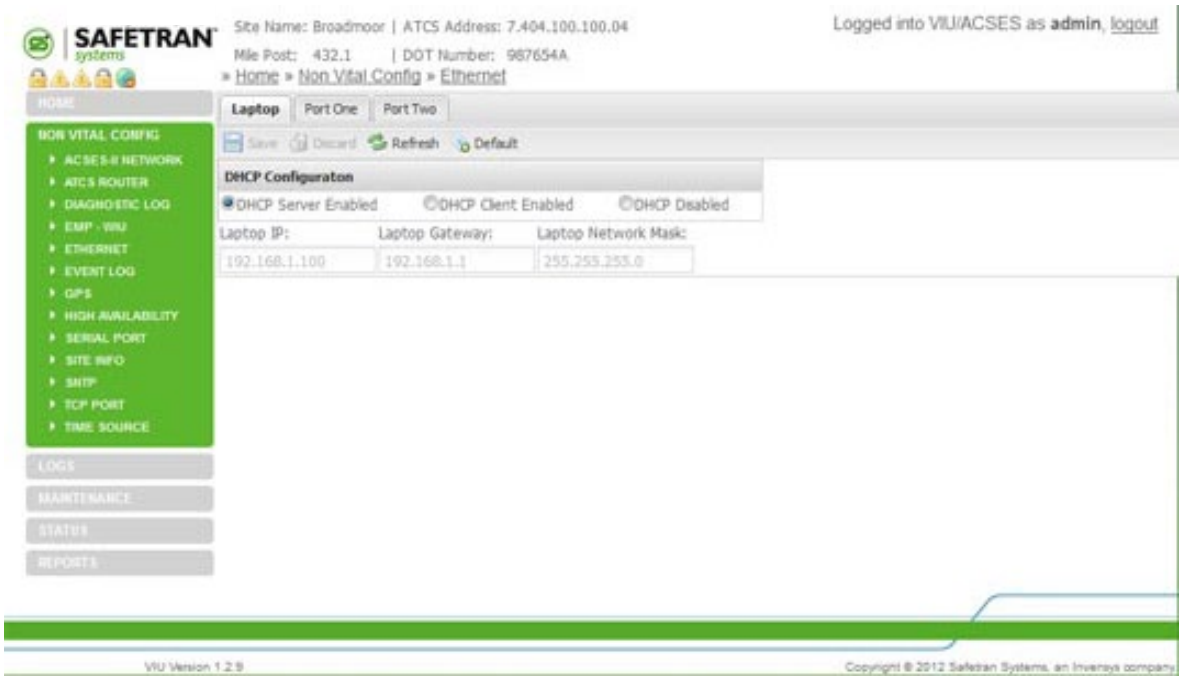


Figure 7-22 Ethernet Configuration Screen (Laptop Tab)

7.3.5.1 DHCP Configuration (Laptop tab)

Select whether the Laptop port will be a DHCP-configured server, DHCP configured client, or disabled.

DHCP Configuration buttons: DHCP Server Enabled; DHCP Client Enabled; DHCP Disabled.

Default is DHCP Server Enabled.

7.3.5.2 Laptop IP (Laptop tab)

Enter the Laptop port IP address (if the DHCP server is enabled, leave this entry at the default).

Laptop IP range: **0.0.0.0** – **255.255.255.255** (default is **192.168.1.100**).

7.3.5.3 Laptop Gateway (Laptop tab)

Enter the Laptop port IP address.

Laptop Gateway address range: **0.0.0.0 – 255.255.255.255** (default is **192.168.1.1**).

7.3.5.4 Laptop Network Mask (Laptop tab)

Enter the Laptop port network mask.

Laptop Gateway address range: **0.0.0.0 – 255.255.255.255** (default is **255.255.255.0**).

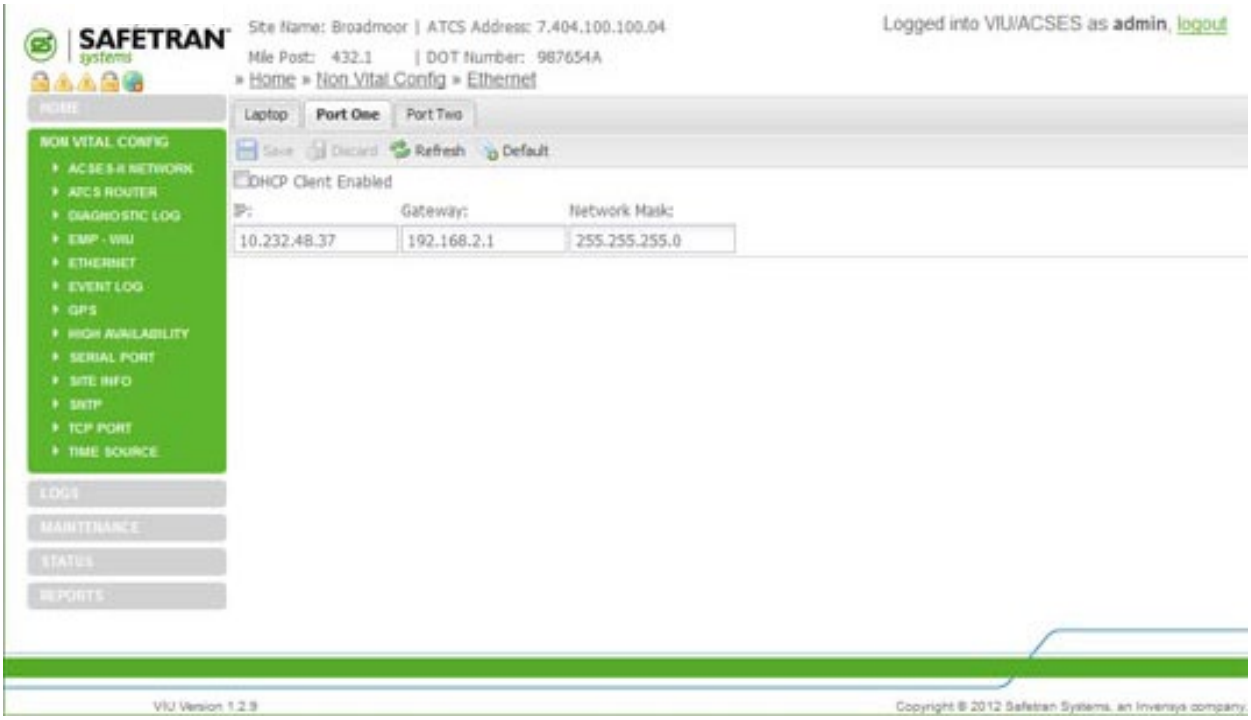


Figure 7-23 Ethernet Configuration Screen (Port One Tab)

7.3.5.5 DHCP Configuration (Port 1)

Select whether the Port 1 DHCP client is enabled.

Port 1 DHCP Client enabled options: **checked, not checked.** Default is **checked**.

7.3.5.6 IP (Port 1)

Enter the Port 1 IP address.

IP range: 0.0.0.0 – 255.255.255.255 (default is 192.168.2.100).

7.3.5.7 Gateway (Port 1)

Enter the Port 1 IP address.

Gateway address range: **0.0.0.0 – 255.255.255.255** (default is **192.168.2.1**).

7.3.5.8 Network Mask (Port 1)

Enter the Port 1 network mask.

Gateway address range: **0.0.0.0 – 255.255.255.255** (default is **255.255.255.0**).

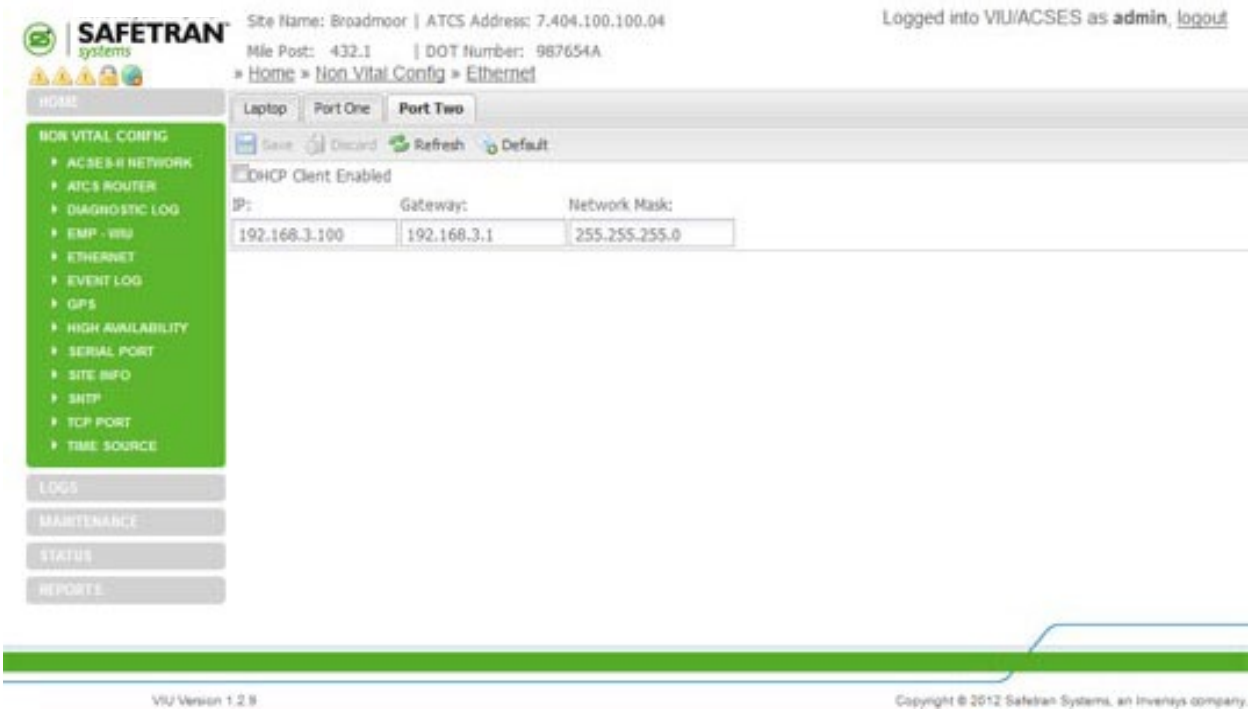


Figure 7-24 Ethernet Configuration Screen (Port Two Tab)

7.3.5.9 DHCP Configuration (Port 2)

Select whether the Port 2 DHCP client is enabled.

Port 2 DHCP Client enabled options: **checked, not checked.**

Default is **checked**.

7.3.5.10 IP (Port 2)

Enter the Port 2 IP address.

IP range: 0.0.0.0 – 255.255.255.255 (default is 192.168.3.100).

7.3.5.11 Gateway (Port 2)

Enter the Port 2 IP address.

Gateway address range: **0.0.0.0 – 255.255.255.255** (default is **192.168.3.1**).

7.3.5.12 Network Mask (Port 2)

Enter the Port 2 network mask.

Gateway address range: 0.0.0.0 – 255.255.255.255 (default is 255.255.255.0).

7.3.6 Event Log Configuration

The Event Log configuration screen is shown in Figure 7-25.

7.3.6.1 Server IP

When one or more VIUs are operating on a network, each VIU can be configured to forward all events over the network to a “consolidated logger”. The logger will maintain all of the events for every reporting VIU. The logger can be another VIU.

To configure each VIU to send the Event Log entries to the logger, enter the IP address of the logger unit in the Server IP dialog box.

Server IP: **valid IP address** (default = **0.0.0.0**).

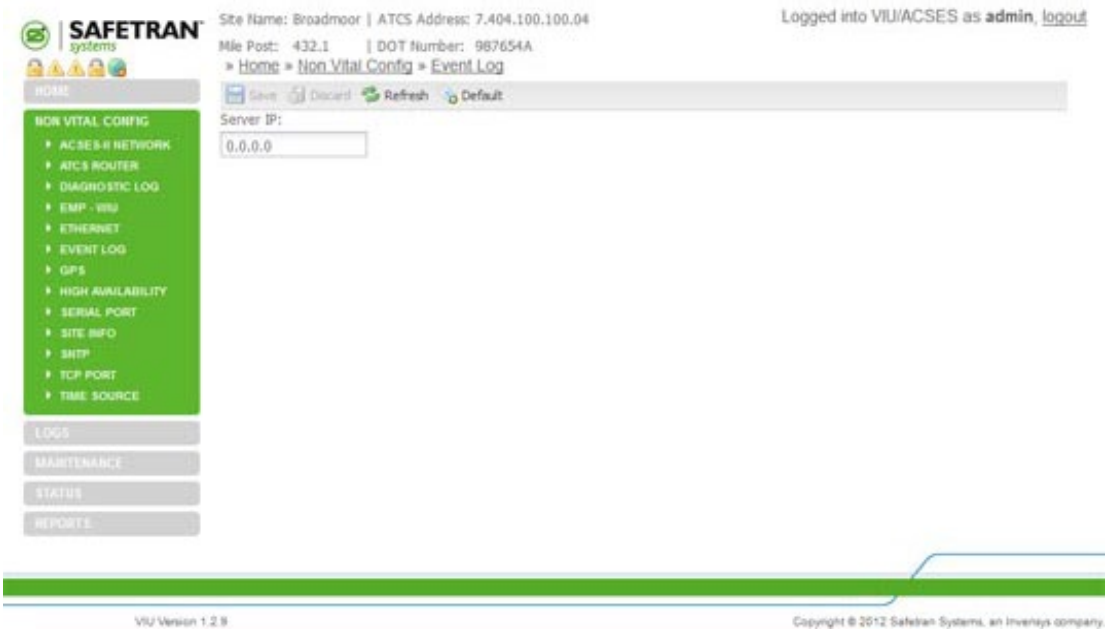


Figure 7-25 Event Log Configuration Screen

7.3.7 GPS CONFIGURATION

Use this screen to set parameters for either the internal GPS receiver or an external GPS receiver (Figure 7-26).

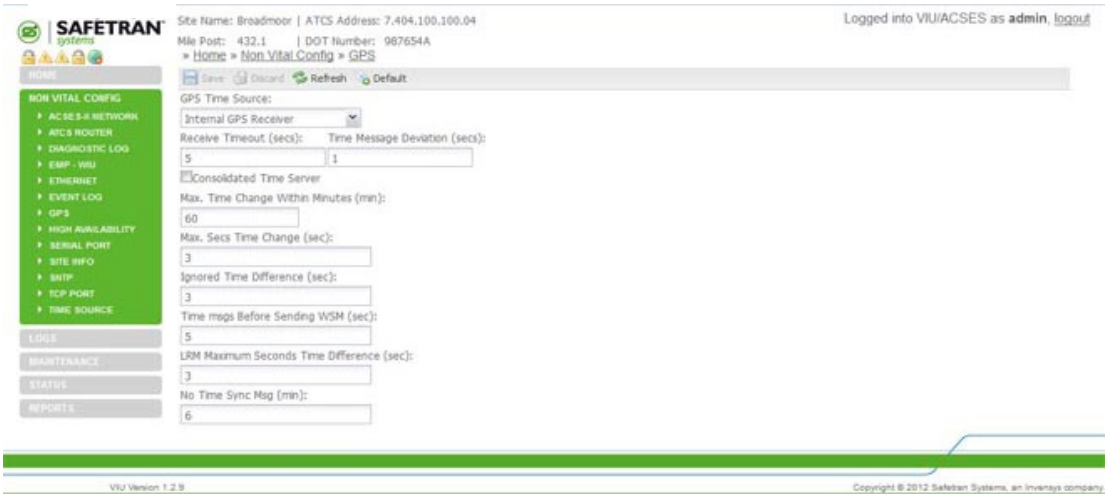


Figure 7-26 GPS Configuration Screen

7.3.7.1 Internal GPS Enabled

This drop-down selection menu (Figure 7-27) provides options available for the GPS to capture the current time and date.

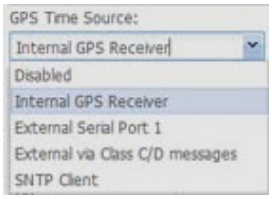


Figure 7-27 GPS Time Source Selection Menu

- **Disabled**

When this option is selected, the internal GPS receiver in the VIU is disabled and no date and time information is expected.

- **Internal GPS Receiver**

When this option is selected, the internal GPS receiver in the VIU is used as the means to provide the current time and date.

- **External Serial Port 1**

When this option is selected, the internal GPS receiver in the VIU is ignored and an external GPS receiver using NMEA 0183 format data is connected to the VIU's top serial interface.

- **External via Class C/D Messages**

When this option is selected, the internal GPS receiver in the VIU is ignored and current time and date information is provided by the Interoperable Train Control messages being received via Ethernet.

- **SNTP Client**

When this option is selected, the internal GPS receiver in the VIU is ignored and current time and date information is provided via SNTP.

7.3.7.2 Receive Timeout (secs)

If the VIU does not receive a valid NMEA data stream or time message within the "Receive Timeout" number of seconds, it will declare the GPS status bad. For the internal GPS receiver, this will only occur if the internal receiver or circuit board malfunctions. For an external GPS receiver this will occur if the GPS-to-VIU cable is unplugged.

Receive Timeout range: **0** (off) **– 86400** seconds (24 hours) in increments of 1 second (default = **5** seconds).

7.3.7.3 Time Message Deviation (secs)

If the Time/date received in the GPS NMEA data stream differs from the internal VIU clock by an amount equal to or greater than the Time Difference setting in seconds, the VIU will set its internal clock to the time/date in the GPS data. Otherwise, the VIU will not adjust its clock.

Time Difference range: **0 – 3** seconds (default = **1** second).

7.3.7.4 Consolidated Time Server (checkbox)

When this box is checked, the VIU becomes a Consolidated Time Server. If the VIU has a GPS time source – either its internal GPS receiver, an external GPS receiver, or a time source via Class C/D Ethernet -- the VIU will issue time and date information via Ethernet to all other VIUs once every hour. This allows VIUs which are co-located at a site to require only one Internal GPS Receiver or one externally mounted GPS antenna, provided the co-located VIUs are connected via the same Ethernet subnet.

One VIU may be configured to be Consolidated Time Server to all other VIUs, provided the other VIUs do not already have an active GPS source for time and date. If a VIU is configured to be a Consolidated Time Source and has an active GPS receiver (either internal, external, or via Ethernet) the VIU will ignore time and date messages sent by any other VIUs that are configured as Consolidated Time Sources.

7.3.7.5 Max Time Change Within Minutes (min)

This is the number of minutes that the VIU keeps Time Update records for. If it is set to 60 minutes, the VIU keeps track of all Time Updates for the past 60 minutes. If the total accumulated drift of time within those 60 minutes exceeds a configurable number of seconds, the VIU disallows the sending of Wayside Status Messages to the Application Gateway and the VIU starts a time resynchronization process. Time Update records that are older than 60 minutes get discarded so that at any one moment in time, the VIU has a record of only the latest 60 minutes of Time Update information in its RAM.

Time Difference range: **1 – 120** minutes (default = **60** minutes).

7.3.7.6 Max Secs Time Change (sec)

This is the maximum number of permitted accumulated seconds of time drift in the above “X” minute window set in the parameter above. When it is set to 6, if time drift accumulates in excess of 6 seconds over the past 60 minutes, the VIU will disallow Wayside Status Messages being sent to the Application Gateway and the VIU will perform its time resynchronization process.

Time Difference range: **1 – 20** seconds (default = **3** seconds).

7.3.7.7 Ignored Time Difference (sec)

This value is used to determine whether a Time Update from the GPS Receiver should be ignored or not. If the VIU gets a Time Update that exceeds or equals this value, if it is the first time the VIU has received a Time Update the Time Update is accepted however if the VIU has been getting Time Updates and suddenly receives a Time Update that equals or exceeds this value, it may be ignored. If the *next* Time Update also exceeds this configuration value, the Time Update will be accepted because back-to-back values are considered legitimate.

Time Difference range: **1 – 10** seconds (default = **3** seconds).

7.3.7.8 Time Msgs Before Sending WSM (sec)

The VIU must receive a certain number of Time Updates before it is allowed to send Wayside Status Messages to the Application Gateway. If this value is set to 5, the VIU must receive 5 consecutive Time Updates messages which were consistent and did not result in the VIU’s system time being updated. (We ignore 1 second of jitter because our clock’s resolution is 1 second.)

Time Difference range: **1 – 10** seconds (default = **5** seconds).

7.3.7.9 LRM Maximum Seconds Time Difference (sec)

The VIU will log an event and may send an alarm if a LRM is received whose time stamp is forward of the WIU’s internal clock by an amount greater than the LRM Maximum Seconds Time Difference configuration value.

Time Difference range: **0 – 20** seconds (default = **3** seconds).

7.3.7.10 No Time Sync Msg (min)

The VIU will log an event and may send an alarm if a Time sync message is not received after power on or reboot after No Time Sync Message default 6 minutes.

Time Difference range: **1-6** minutes (default = **6** minutes).

7.3.8 High Availability (Connection 1 – Connection 12)

Enable using check box. If enabled, for each alternate connection specify the IP address, TCP port number, Idle Timeout enabled, and if so, the Idle Timeout Seconds.

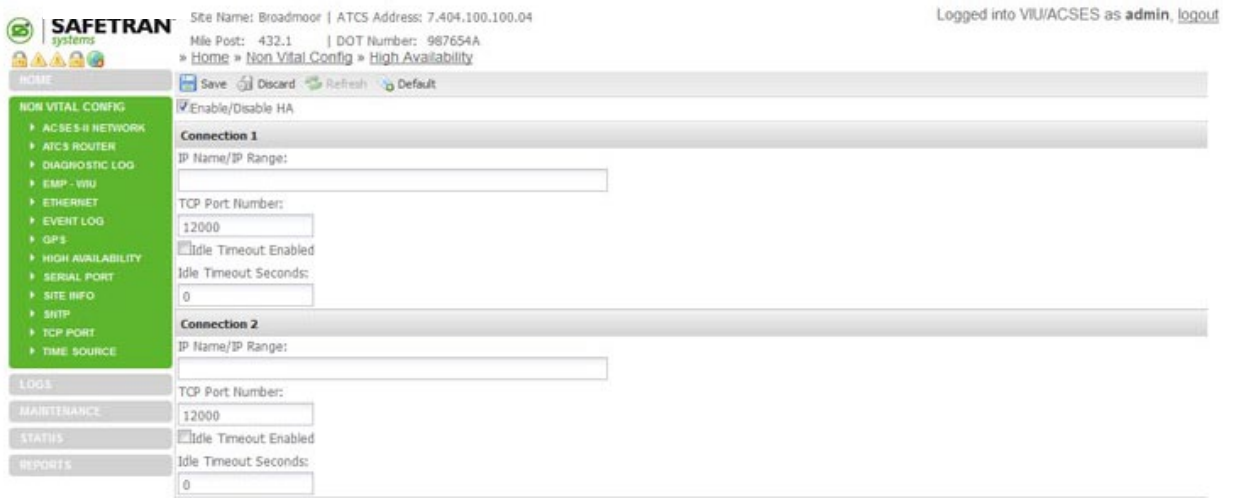


Figure 7-28 High Availability (Enabled) Configuration Menu

7.3.9 Serial Port Configuration

The Serial Port configuration screen allows port settings to be made for the two serial ports on the VIU. These include the Laptop serial port on the front panel and Serial Port One on top of the unit. A separate tab is provided on this screen for each port (see Figure 7-29 {Laptop Port} and Figure 7-30 {Port 1}).

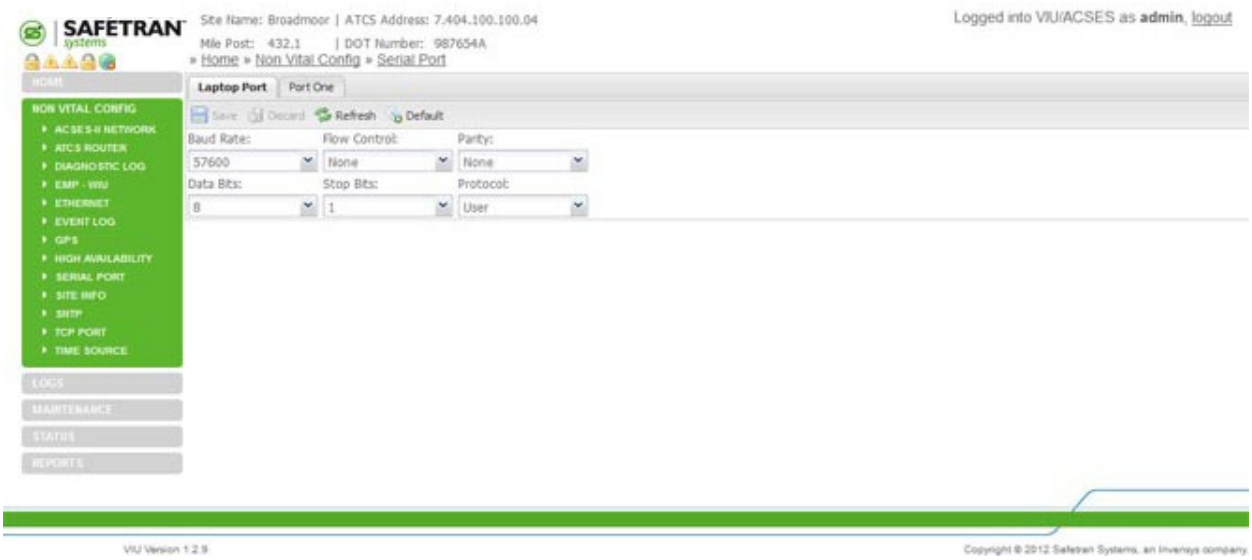


Figure 7-29 Serial Port Configuration Menu – Laptop Tab

7.3.9.1 Baud Rate (Laptop tab)

Select the baud rate for the Laptop Serial port.

Laptop Serial Port Baud Rate options: **300**, **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, **57600**, **115200** (default = **9600**).

7.3.9.2 Flow Control (Laptop tab)

Select the flow control for the Laptop Serial port.

Laptop Serial Port Flow Control options: **None**, **Hardware** (default = **None**).

7.3.9.3 Parity (Laptop tab)

Select the parity setting for Laptop Serial port.

Laptop Serial port Parity options: **None, Odd, Even** (default = **None**).

7.3.9.4 Data Bits (Laptop tab)

Select the data bit setting for Laptop Serial port.

Laptop Serial port Data Bit options: **7**, **8** (default = **8**).

7.3.9.5 Stop Bits (Laptop tab)

Select the stop bit setting for Laptop Serial port.

Laptop Serial port Stop Bit options: **1**, **2** (default = **1**).

7.3.9.6 Protocol (Laptop tab)

Select the Protocol setting for Laptop Serial port.

Laptop Serial port Protocol options: **User, NMEA, ACSES** (default = **User**).

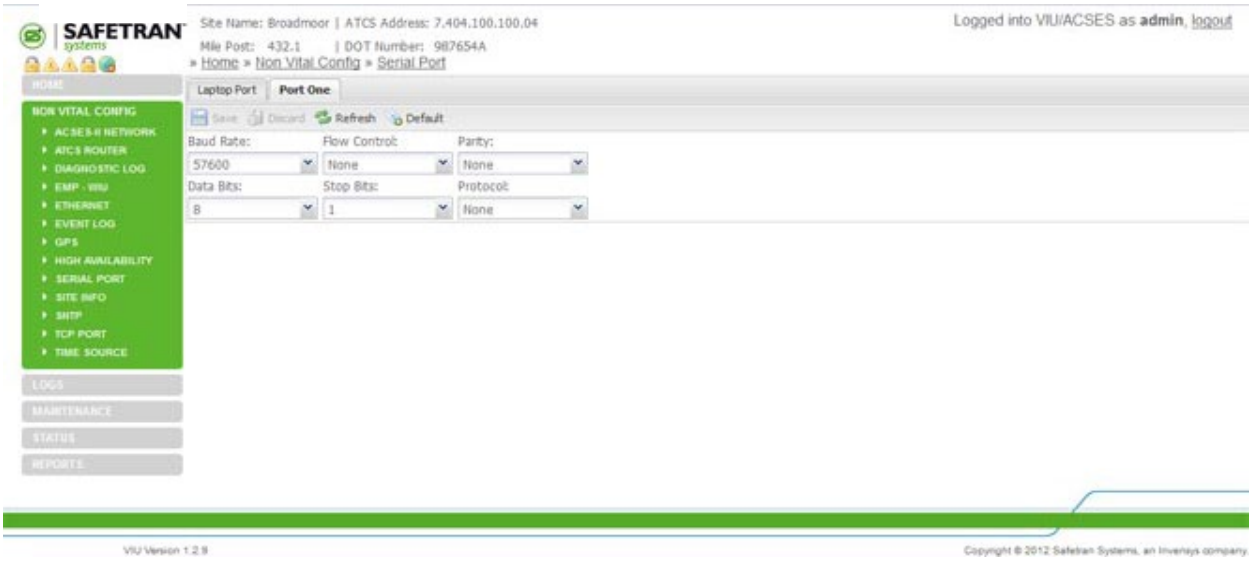


Figure 7-30 Serial Port Configuration Menu – Port One Tab

7.3.9.7 Baud Rate (Port One tab)

Select the baud rate for Serial Port One.

Serial Port One Baud Rate options: **300**, **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, **57600**, **115200** (default = **4800**).

7.3.9.8 Flow Control (Port One tab)

Select the flow control for the Serial Port One.

Serial Port One Flow Control options: **None**, **Hardware** (default = **None**)

7.3.9.9 Parity (Port One tab)

Select the parity setting for Serial Port One.

Serial Port One parity options: **None**, **Even**, **Odd** (default = **None**).

7.3.9.10 Data Bits (Port One tab)

Select the data bit setting for Serial Port One.

Serial Port One Data Bit options: **7**, **8** (default = **8**).

7.3.9.11 Stop Bits (Port One tab)

Select the stop bit setting for Serial Port One.

Serial Port One Stop Bit options: **1**, **2** (default = **1**).

7.3.9.12 Protocol (Port One tab)

Select the protocol setting for Serial Port One.

Serial Port One protocol options: **User, NMEA, ACSES** (default = **User**).

7.3.10 Site Info Configuration

The Site Info screen (Figure 7-31) provides fields for entering a site name, the mile post number and DOT number for the VIU wayside location. It also allows selection of the local time zone. This screen contains two vital parameters that can only be changed after selecting the Edit Mode (Figure 7-32). When finished with Edit Mode, the Vital Core must be rebooted to remove the VIU from the Edit Mode (). This reboots the Vital Core only, and not the entire VIU.

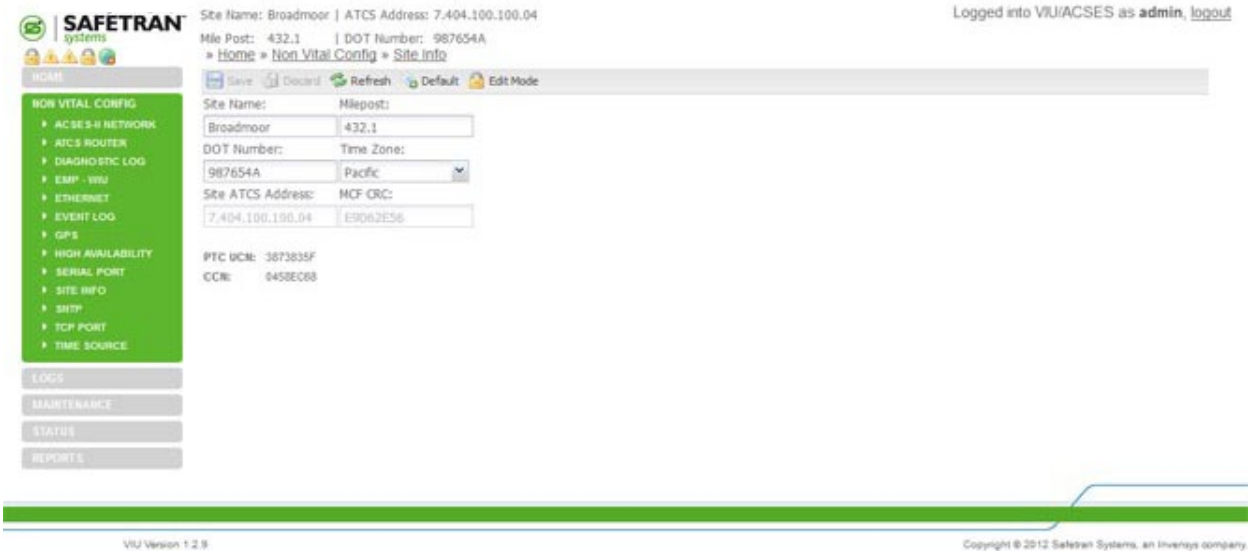


Figure 7-31 Site Info Configuration Screen – Edit Mode Locked

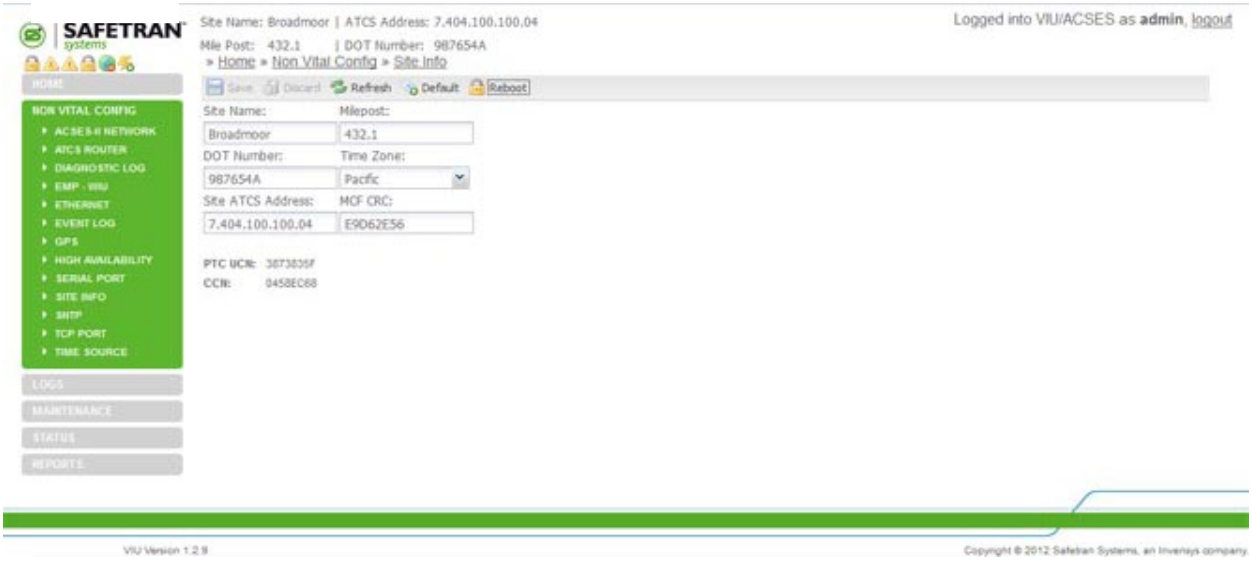


Figure 7-32 Site Info Configuration Screen – Edit Mode Unlocked

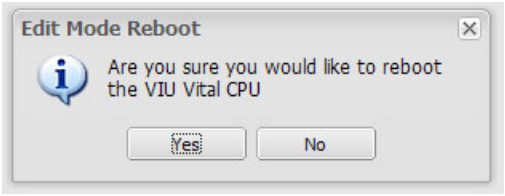


Figure 7-33 Site Info Edit Mode Reboot Prompt

7.3.10.1 Site Name

Enter a name for the VIU location. The VIU will also report his string in the sysName variable via SNMP.

Site Name range: Up to 20 characters (default is **Safetran Systems**).

7.3.10.2 Milepost

Enter the milepost number at the VIU location. The VIU will also report his string in the sysLocation variable via SNMP.

Milepost range: Up to 10 characters (default is **000.0**).

7.3.10.3 DOT Number

Enter the DOT Number for the VIU location.

DOT Number range: Up to 7 characters (default is **000000A**).

7.3.10.4 Time Zone

Enter the time zone that the VIU site is located in.

Time Zone options: **GMT, Eastern, Central, Mountain, Pacific, Alaska, Atlantic, Arizona, Newfoundland, Aus Western, Aus Central, Aus Central (No DST), Aus Eastern, Aus Eastern (No DST)** (default is **Eastern**).

WARNING

VERIFY THAT VIU-20 IS PROGRAMMED AS SPECIFIED BY THE RAILROAD'S OR AGENCY'S WITH THE CORRECT MCFCRC, UCN, ATCS SITE IDENTIFICATION NUMBER (SIN). FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE INDICATIONS ON THE VIU-20 UNIT.

7.3.10.5 Site's ATCS Address

Site ATCS Address is one of the vital parameters. Edit Mode must be selected before a change can be made. When done, the correct UCN must be entered and the Vital Core rebooted to remove the VIU from Edit Mode (this reboots the Vital Core only, and not the entire VIU).

Site ATCS Address range: **7.000.000.000.00** – **7.999.999.999.99** (default is **7.620.100.100.03**).

7.3.10.6 MCF CRC

MCF CRC is one of the vital parameters. Edit Mode must be selected before a change can be made and the vital CPU must be rebooted in order to get out of Edit Mode. This reboots the vital CPU only and not the entire VIU.

The MCF CRC is determined by the MCF contents.

7.3.10.7 Additional Data

The Site Info screen also reports the following values: PTC UCN, and CCN. These values are only reported here and cannot be edited on this screen.

7.3.11 SNTP

SNTP stands for the Simple Network Time Protocol. SNTP is used to synchronize the VIUs to a network time source.

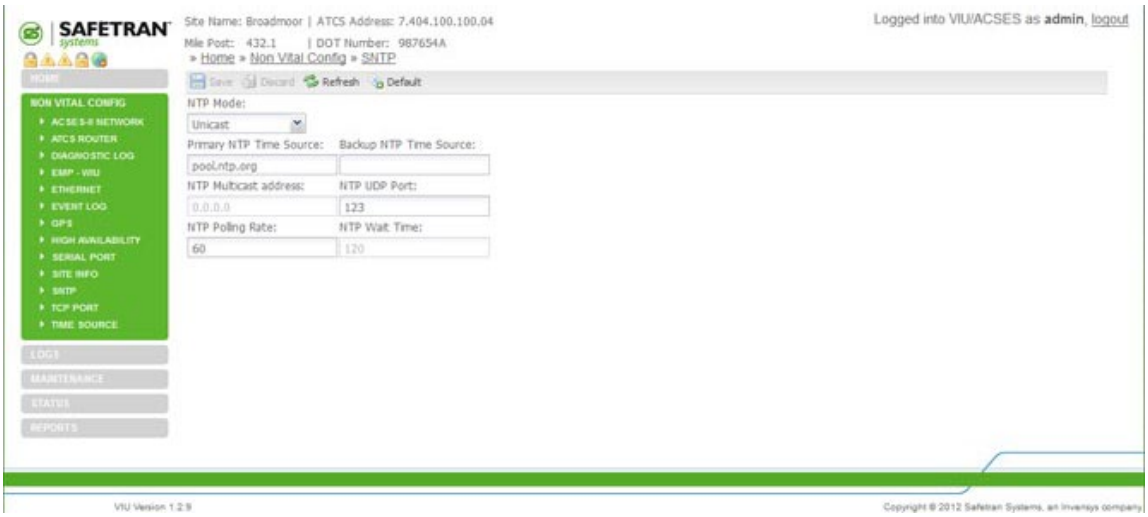


Figure 7-34 SNTP Configuration Screen

7.3.11.1 NTP Mode

There are two Network Time Modes: Unicast and Broadcast (multicast).

- **Unicast Time Mode**

In Unicast mode, the VIU requests time from a primary and a backup time server. The user must supply the IP addresses or DNS names of the servers.

- **Broadcast Time Mode**

In Broadcast (multicast) mode, the VIU listens for time updates from any server that is either broadcasting time updates or sending them to a multicast group.

7.3.11.2 Primary NTP Time Source

The IP address or DNS name of the primary time server, if in Unicast mode.

Primary NTP Time Source range: valid IP address or DNS name (default = **0.0.0.0**).

7.3.11.3 Backup NTP Time Source

The IP address or DNS name of the backup time server, if in Unicast mode.

Backup NTP Time Source range: valid IP address or DNS name (default = **0.0.0.0**).

7.3.11.4 NTP Multicast address

When mode is Broadcast/Multicast and the user wants the VIU to join a specific multicast group for SNTP time updates, that multicast group address is entered here. This address is optional. The VIU will still receive broadcasted time updates if this field is set to 0.0.0.0.

NTP Multicast Address range: valid IP address (default = **0.0.0.0**).

7.3.11.5 NTP UDP Port

The UDP port number to use for SNTP messages.

NTP UDP Port range: **0 – 65535** (default = **123**).

7.3.11.6 NTP Polling Rate

The NTP Polling Rate determines how often the VIU requests updates from the Time Server, measured in seconds, when in Unicast mode.

NTP Polling Rate range: **0 – 65535** seconds (default = **60** seconds).

7.3.11.7 NTP Wait Time

The time period in which the VIU expects to receive a time update when in Broadcast/Multicast mode. If no time update is received, the time source is considered offline.

NTP Wait Time range: **0 – 65535** seconds (default = **120** seconds).

7.3.12 TCP Port Configuration

The TCP Port Configuration screen is shown in Figure 7-35.

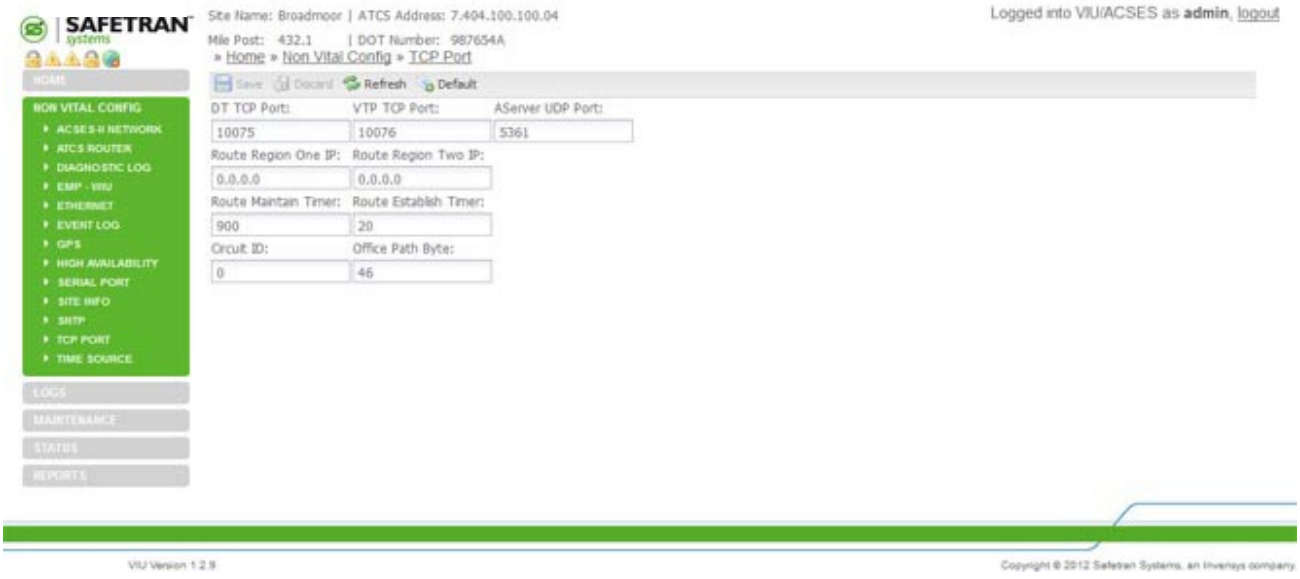


Figure 7-35 TCP Port Configuration Screen

7.3.12.1 DT TCP Port

The DT TCP Port setting is the TCP port number used by the VIU to communicate with DT over a TCP/IP network.

DT TCP Port range: **10** – **65535** (default = **10075**).

7.3.12.2 VTP TCP Port

The VTP TCP Port setting is the TCP port number used to communicate to the vital office system equipment when sending I/O statuses to the office. This setting is a legacy system and is no longer used for PTC.

VTP TCP Port range: **10** – **65535** (default = **10076**).

7.3.12.3 AServer UDP Port

The AServer UDP port setting is the UDP port number used to communicate with the AServer program running in the office. It is also the port number used for route requests with office systems equipment.

AServer UDP Port range: **10** – **65535** (default = **5361**).

7.3.12.4 Route Region One IP

Enter the IP address for TCP Route Region One.

Route Region One IP range: valid IP address (default = **0.0.0.0**).

7.3.12.5 Route Region Two IP

Enter the IP address for TCP Route Region Two.

Route Region Two IP range: valid IP address (default = **0.0.0.0**).

7.3.12.6 Route Maintain Timer

Once a route is established to the office, the VIU will request routes again after this timer expires and the VIU has not received a route update or a message from the office. If no route updates or messages are received, the route is deleted.

Route Maintain Timer range: **10** – **65535** (default = **900**).

7.3.12.7 Route Establish Timer

When there is no route present for the office, the VIU will request routes at an interval set in this parameter..

Route Establish Timer range: **10** – **65535** (default = **20** seconds).

7.3.12.8 Circuit ID

This is a unique identifier required by the office system used in routing messages to the VIU.

Circuit ID range: **10** – **65535** (default = **0**).

7.3.12.9 Office Path Byte

The "Office Path Byte" is included in messages sent to the office system and is used by office system equipment when routing messages sent by the VIU.

Office Path Byte range: **0** – **255** (default = **46**).

7.3.13 Time source

Select the box to enable up to six separate time sources in order of priority.

Figure 7-36 Time Source (Enabled) Configuration Window

7.4 VIEWING LOGS

The Web browser user interface provides access to two logs maintained by the VIU: the Diagnostic Log and the Event Log. To access these logs, select Logs from the menu bar in the upper left corner of the screen to display the Logs screen (Figure 7-37).

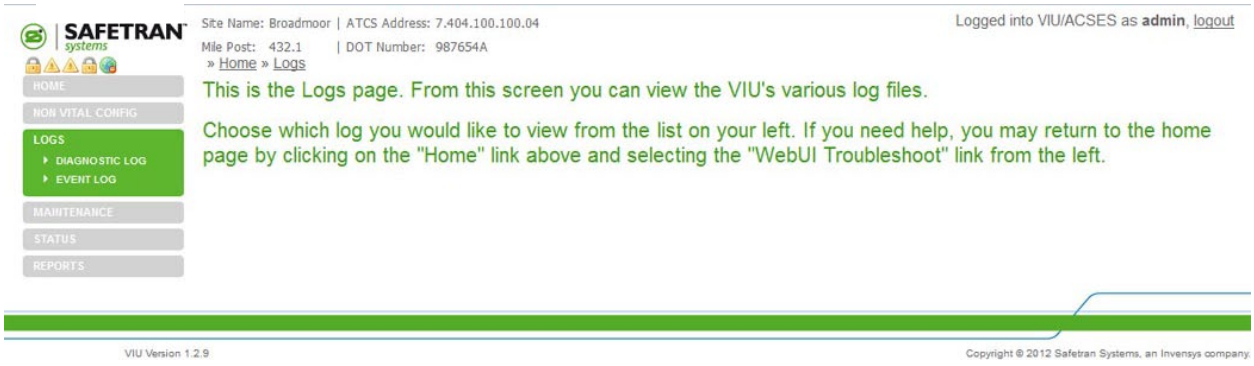


Figure 7-37 Logs Screen

On the Logs screen, select the desired log from the Logs menu at the left side of the screen.

7.4.1 Diagnostic Log

The Diagnostic Log first displays in the basic view (Figure 7-38). Buttons provided at the top of the log display allow the user to view the first event in the log, the last event in the log and to progress through the log one page at a time using Next and Previous buttons. A button is also provided to download the entire log contents to a PC.

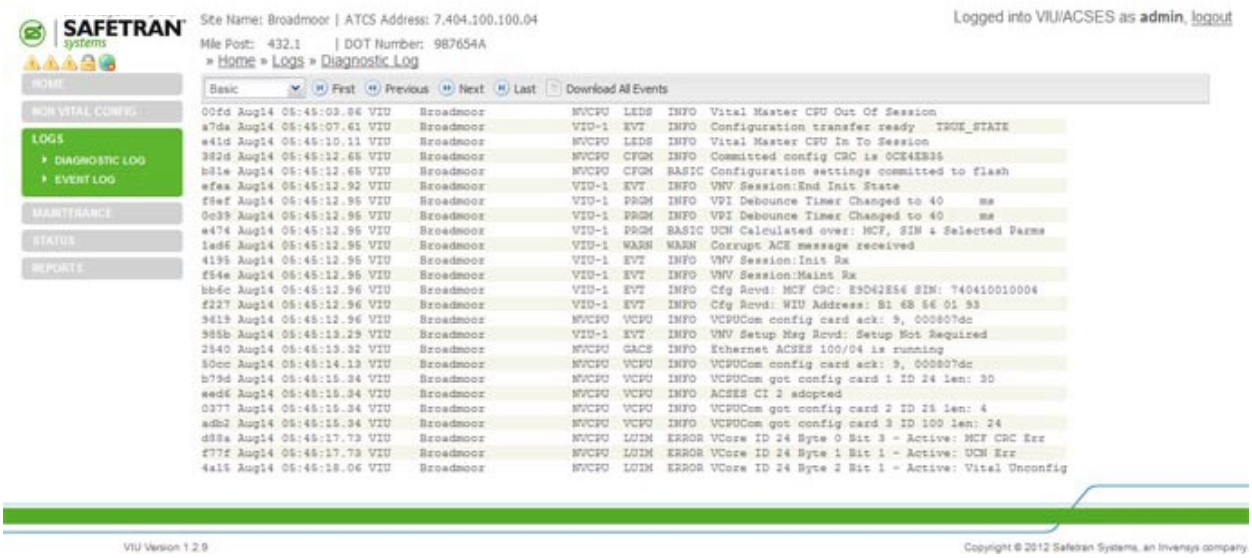


Figure 7-38 Diagnostic Log – Basic View

When the Download All Events button is selected, a prompt queries to open or save the log file (Figure 7-39).

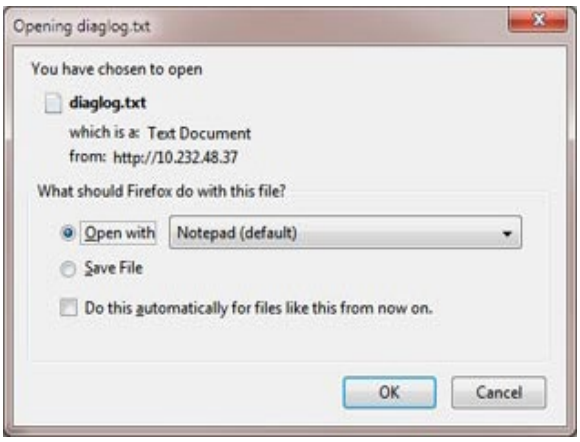


Figure 7-39 File Download Prompt

If Save is selected and the user is operating WIN7 or newer, the file is automatically saved to the Downloads file. If using an earlier version of Windows, the user is prompted for a location and file name for the saved file.

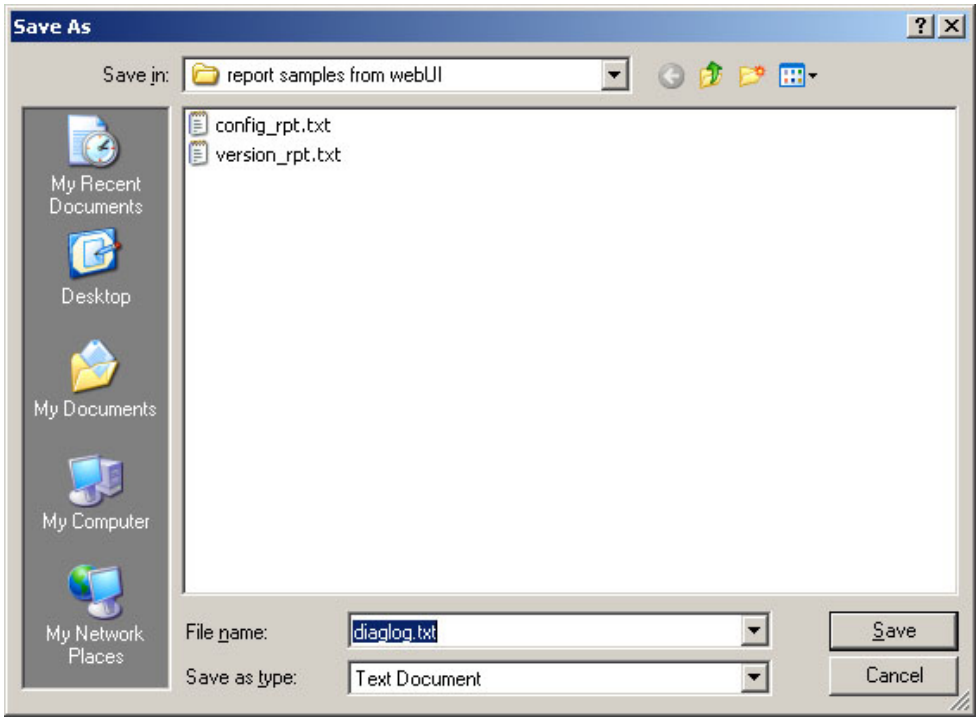


Figure 7-40 File Save Screen

If Open is selected, the file contents are displayed in a text editor such as Microsoft® Notepad.

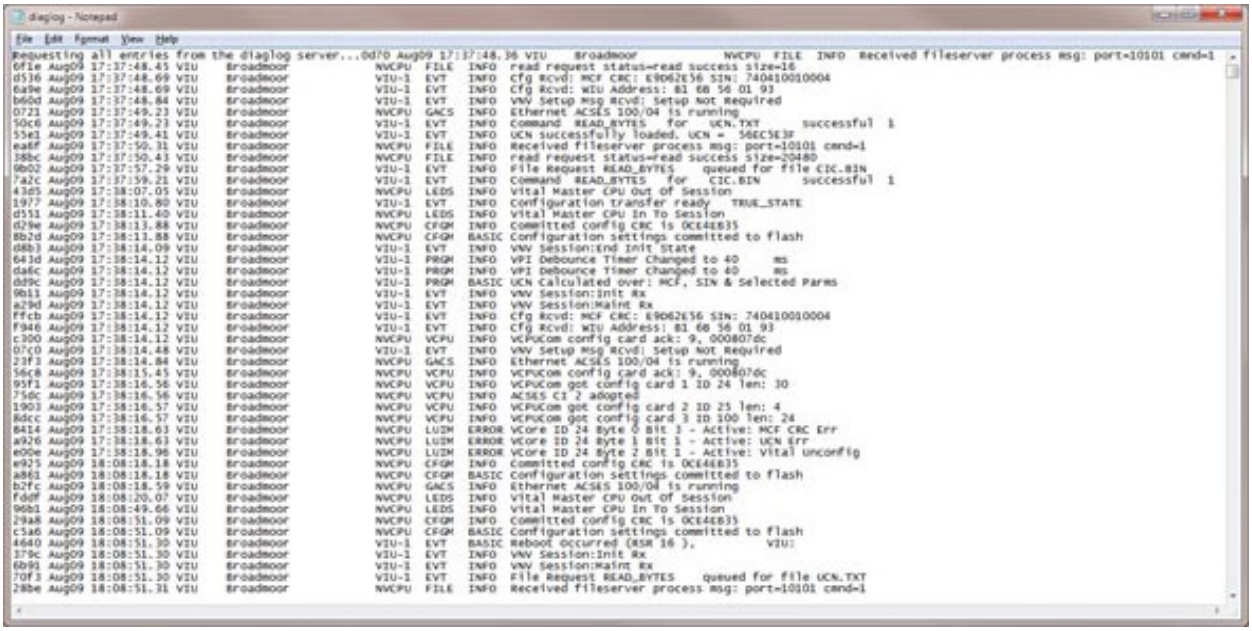


Figure 7-41 File Opened in Notepad

To view the Diagnostic Log in the Advanced view, select Advanced from the drop down menu to the left of the First button (Figure 7-42).

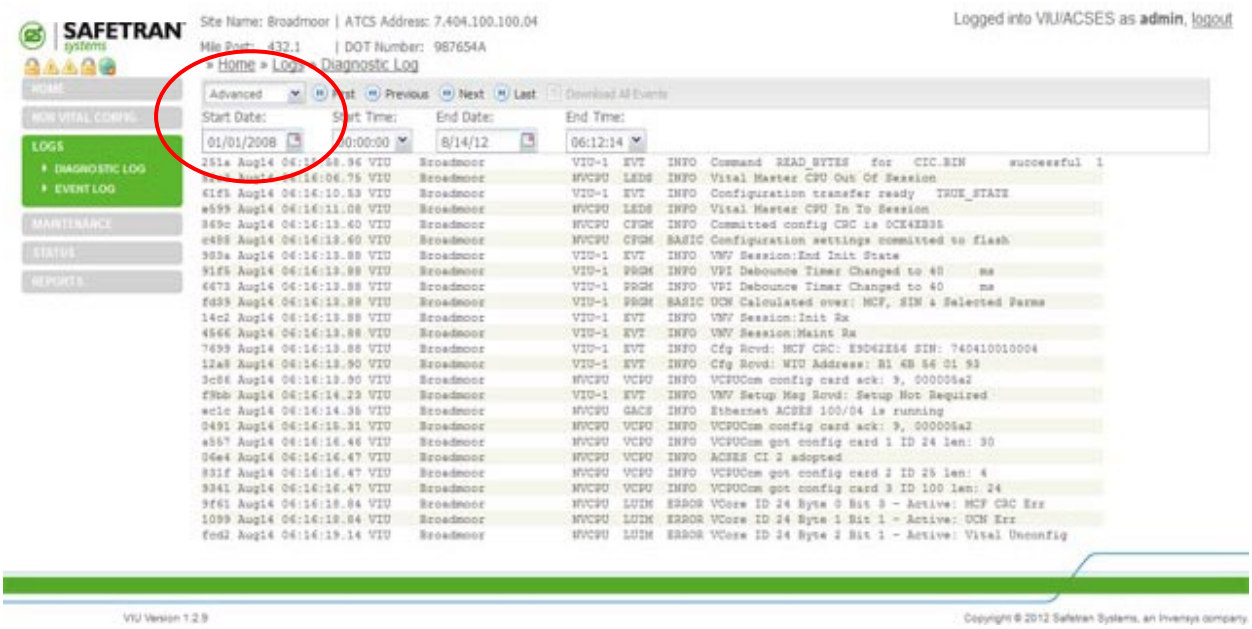


Figure 7-42 Log View Drop Down Menu

The Advanced view (Figure 7-43) provides the same navigation buttons as the Basic view. However, below the buttons are several data entry fields that allow the log to be searched within date and time parameters.

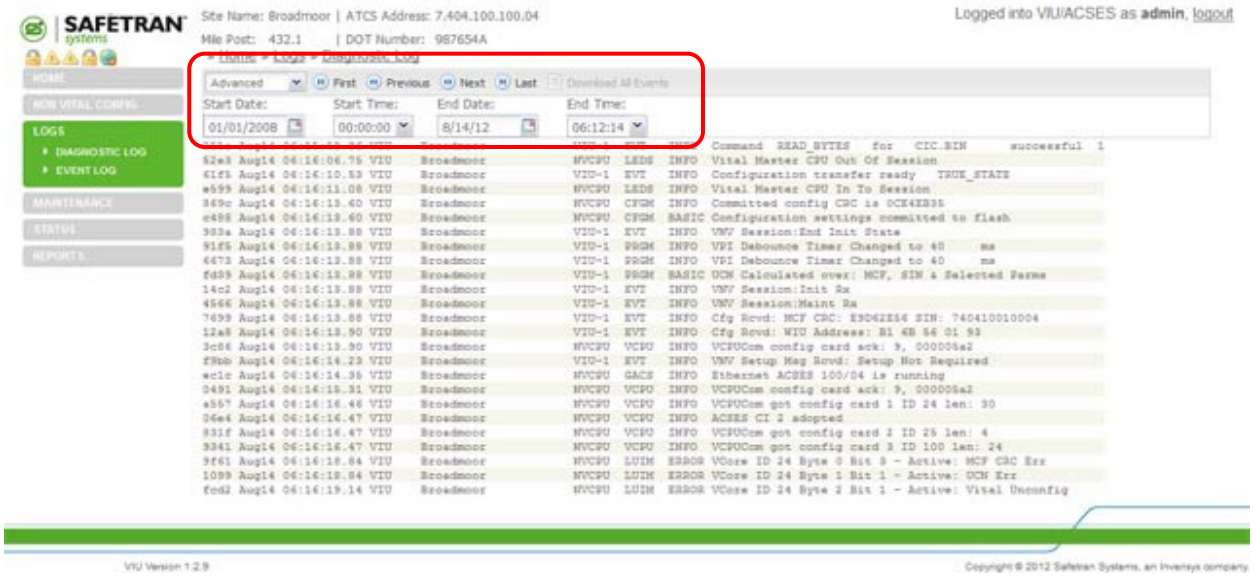


Figure 7-43 Diagnostic Log – Advanced View

Dates can be entered directly in the date fields or the calendar icon at the right end of the date field or can be selected to display a calendar. The time fields are similar except that a drop down list provides a list of times or the time can be entered directly in the field.

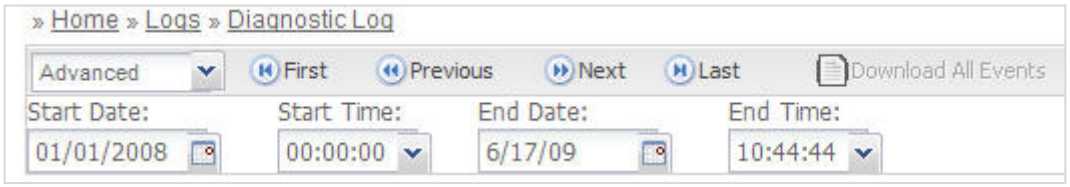


Figure 7-44 Diagnostic Log Advanced Settings

The final selection from the view drop down list is Trace Events (Figure 7-45). Select this view to see events as they are logged into the Diagnostic Log. This screen refreshes every 5 seconds so there is a short delay between the time the event occurs and it is displayed.

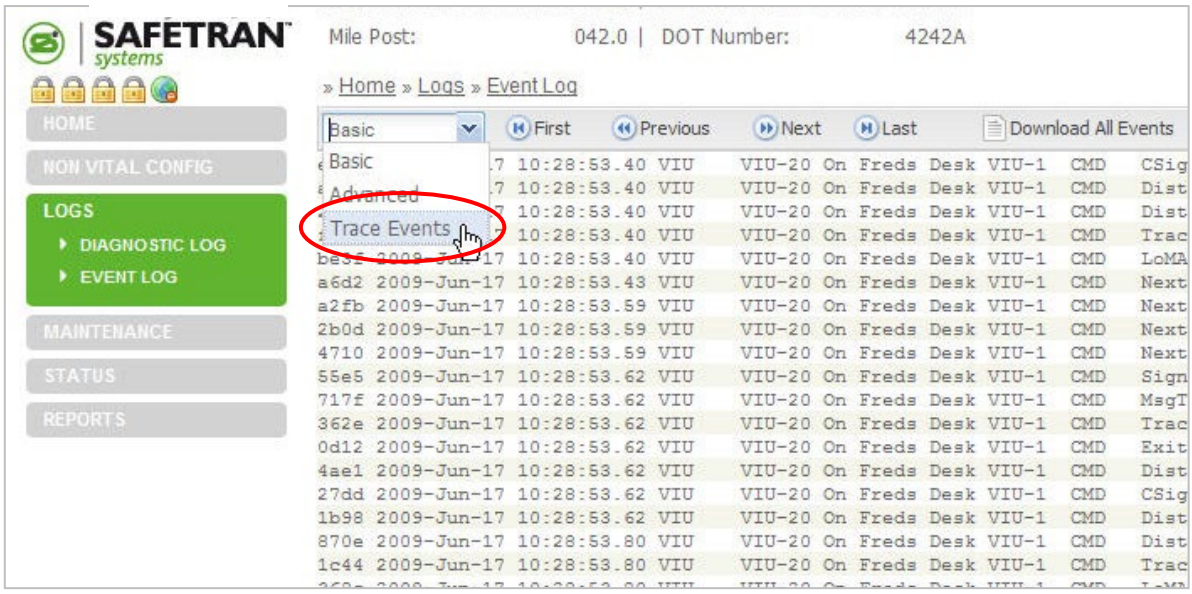


Figure 7-45 Diagnostic Log – Trace Events View

7.4.2 Event Log

The Event Log screen provides structure, options and features similar to those described in paragraph 7.4.1 for the Diagnostic Log.

7.5 MAINTENANCE

The Web browser user interface provides access to the maintenance functions that allows the VIU to test handling of Class D messages and to change the date and time to be set if a GPS receiver is not present Figure 7-46). To access the date/time set function, select Maintenance from the menu bar in the upper left corner of the screen to display the Maintenance screen.

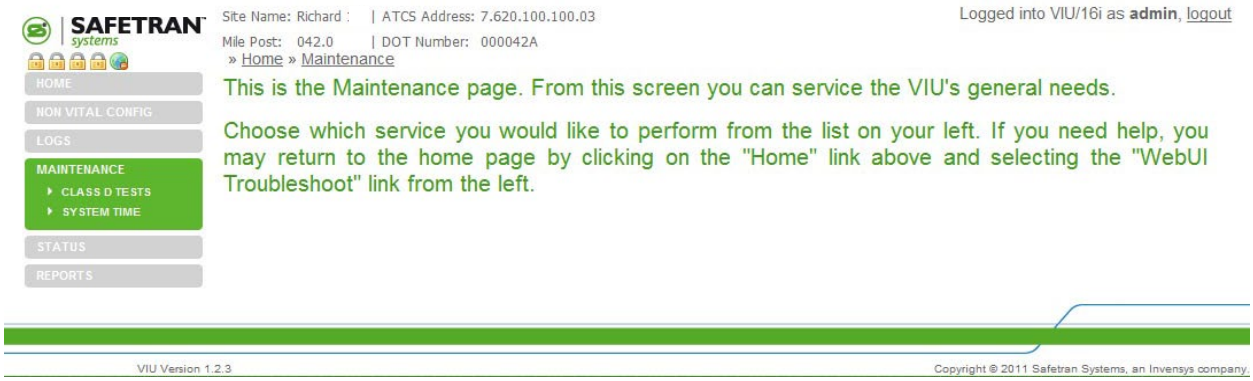


Figure 7-46 Maintenance Screen

7.5.1 Class D Tests

The Web browser U/I configures the Test Server data that handles Class D messages. Test messages are sent by selecting the Test button on the right end of the menu bar.

7.5.1.1 Test Server IP Address:

Enter the Test Server IP address.

Laptop IP range: 0.0.0.0 – 255.255.255.255 (default is 192.168.1.110).

7.5.1.2 Test Server Port Number

This entry is the test server port number used for the exchange of Class D messages.

The UDP port number range: 0 - 65535 (default = 12100).

7.5.1.3 Test Frame Count

The number of test messages to be sent during each test iteration.

The test frame count range: 1 - 65535 (default = 10).

7.5.1.4 Delay Between Test Frames (msec)

This entry is the delay period measured in milliseconds between each test frame being transmitted.

The UDP port number range: 100 - 65535 (default = 1000).

7.5.1.5 ITC Class D Starting Comm ID

This entry is the ITC Class ID starting comm identification number.

The ITC Class ID Starting Comm ID range: 0 - 9 (default = 1).

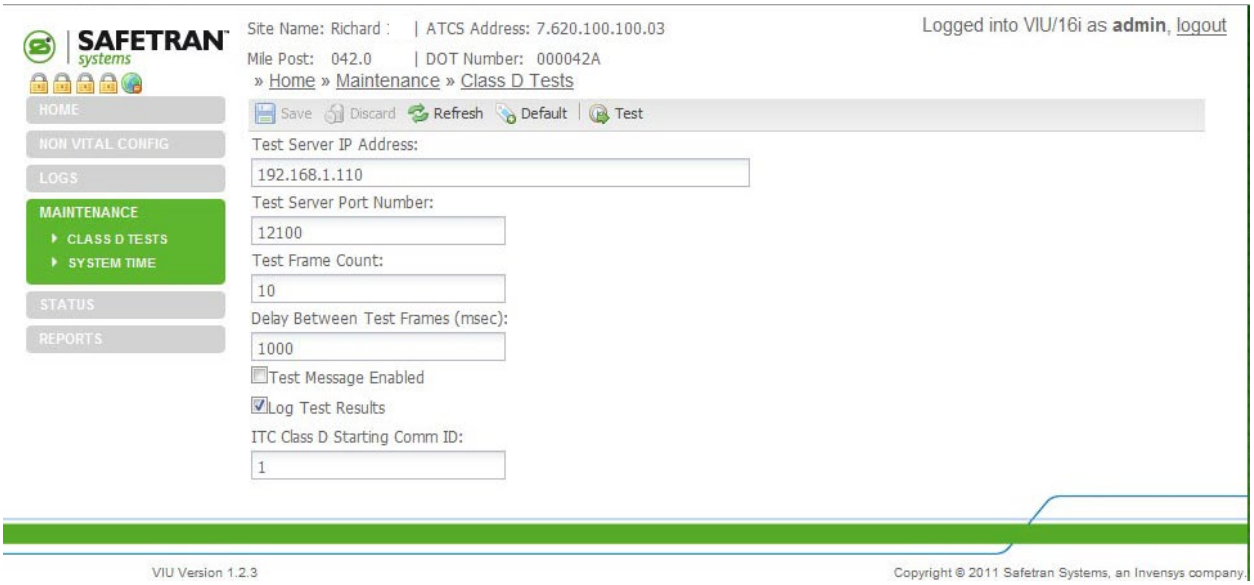


Figure 7-47 Class D Tests Screen

7.5.2 System Time

On the Maintenance screen, select System Time from the Maintenance menu at the left side of the screen.

The System Time screen provides two data fields and three time set buttons (Figure 7-48). These are described in the following paragraphs.

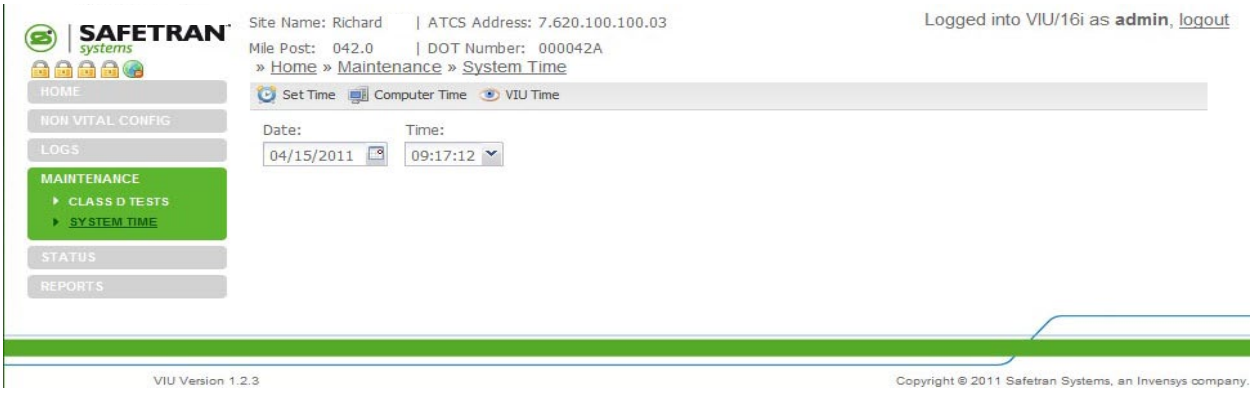


Figure 7-48 System Time Screen

The first data field is for the date. The date can be typed directly in the field or a calendar can be displayed by selecting the small calendar icon to the right of the data field.

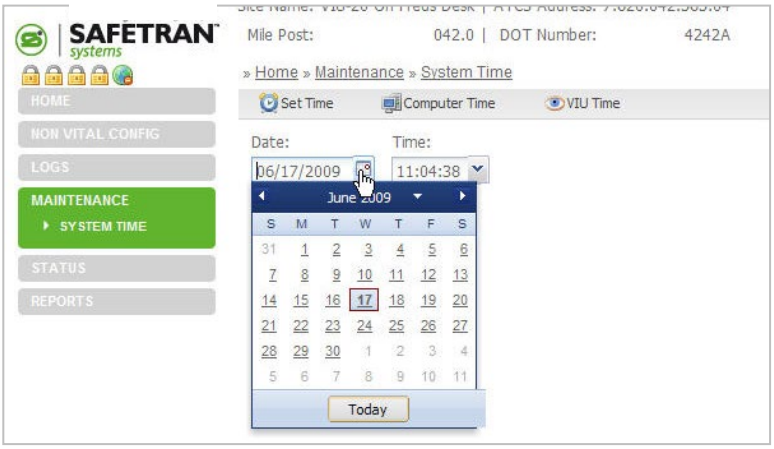


Figure 7-49 Date Field with Calendar Displayed

In a similar manner the system time can be typed directly in the time data field or the drop-down list containing set times can be displayed. If a set time is selected from the list, it can be adjusted by typing over the portion of the time display to be changed.

1. Set Time Button

Once the date and time are entered in the data fields, select the Set Time button to update the VIU to the displayed time.

2. Computer Time

If the VIU is to be set to the date and time on the connected PC, select the Computer Time button.

3. VIU Time

To display the date and time currently set on the VIU, select the VIU Time button.

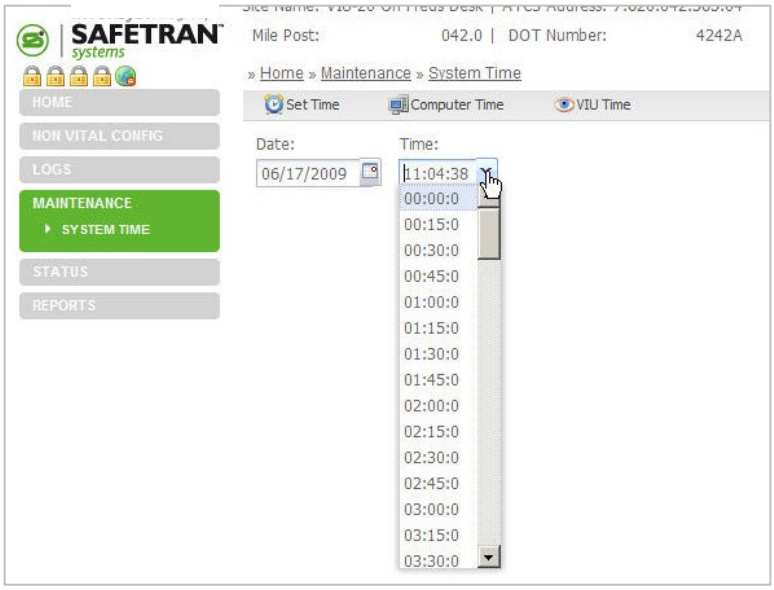


Figure 7-50 Time Field with Drop Down List of Times

7.6 STATUS

The Web browser user interface provides access to a status function that allows the status of the GPS receiver to be checked as well as the overall health of the system vital and non-vital functions.

To access the status function, select Status from the main menu on the left side of the screen to display the Status screen (Figure 7-51).

Figure 7-51 Status Screen

On the Status screen, select GPS or Health from the Status menu at the left side of the screen to view the indicated status category.

7.6.1 GPS

The GPS screen indicates general information on the number of GPS satellites plus the latitude and longitude of the GPS receiver (Figure 7-52).

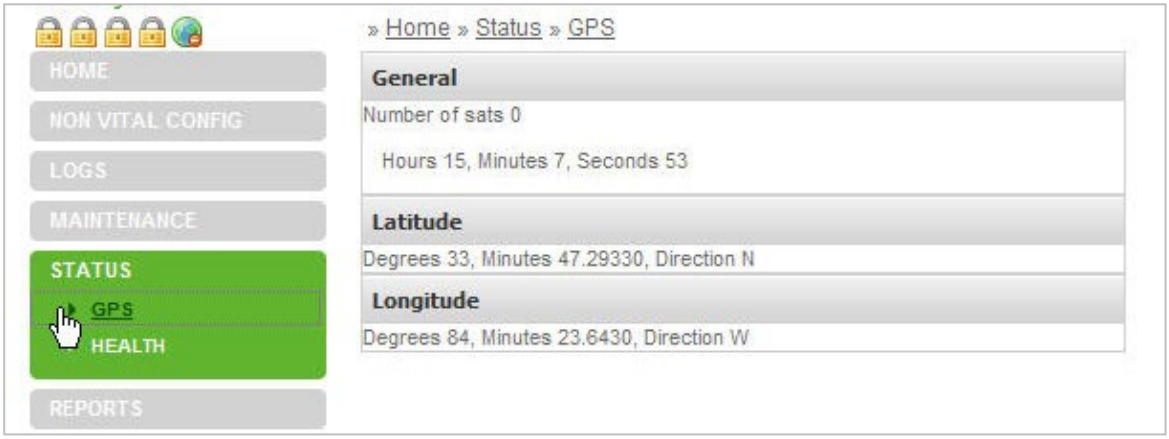


Figure 7-52 GPS Status Screen

7.6.2 Health

The Health screen shows the current health status for the main vital and non-vital functions (Figure 7-53).

On the vital side are the following:

- Vital Core State
- Slave Session
- Vital Session
- Edit Mode

On the non-vital side are the following:

- Non Vital Core Health
- GPS Health

Figure 7-53 Health Status Screen

7.6.3 Reports

The Web browser user interface provides access to two reports generated by the VIU: the Configuration Report and the Version Report. To access these reports, select Reports from the main menu on the left side of the screen to display the Reports screen (Figure 7-54).

Figure 7-54 Reports Screen

On the Reports screen, select the desired report from the Reports menu.

7.6.4 Config Report

The Configuration Report lists all of the parameters set from the Web browser user interface including the Site ATCS Address and MCF CRC (Figure 7-55). These parameters are listed in the following order:

- Site Settings
- Ethernet Port Settings
- Serial Port Settings
- GPS Settings
- Diagnostic Log Settings
- Event log Settings
- WIU Channel Settings

Use the scroll bars at the bottom and right edges of the screen to view the entire report.

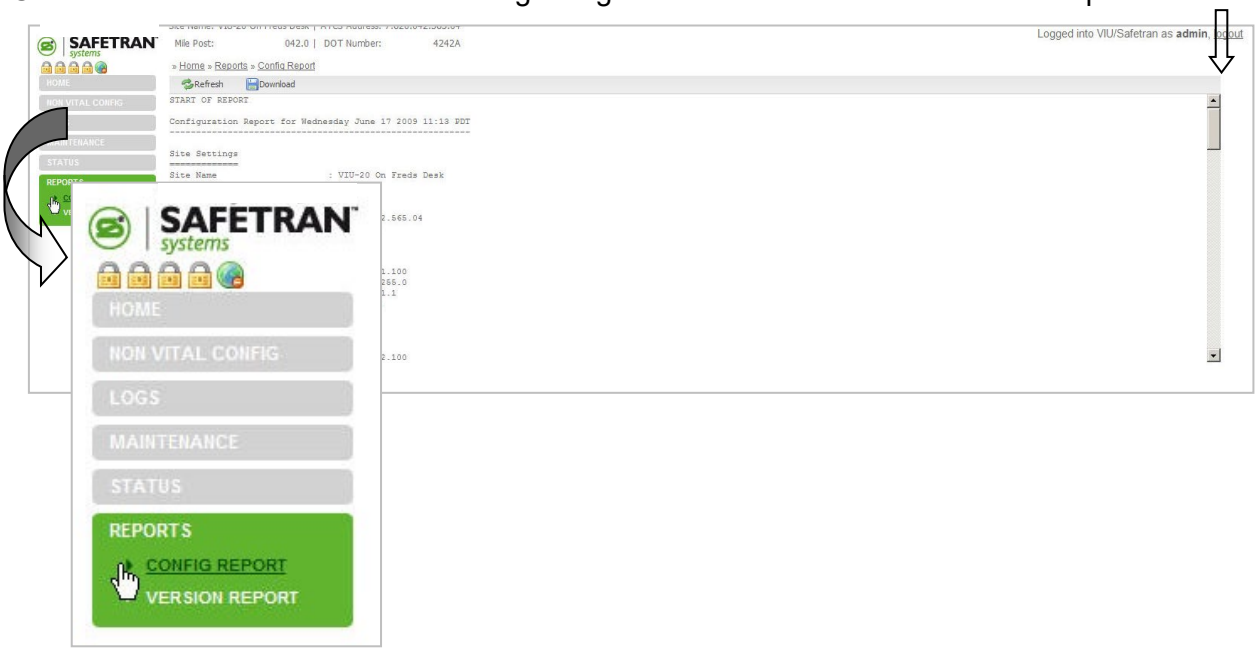


Figure 7-55 Typical Configuration Report Screen

The Download button at the top of the Reports screen allows the user to save the report to a PC. When the Download button is selected, the user is prompted to open or save the log file.

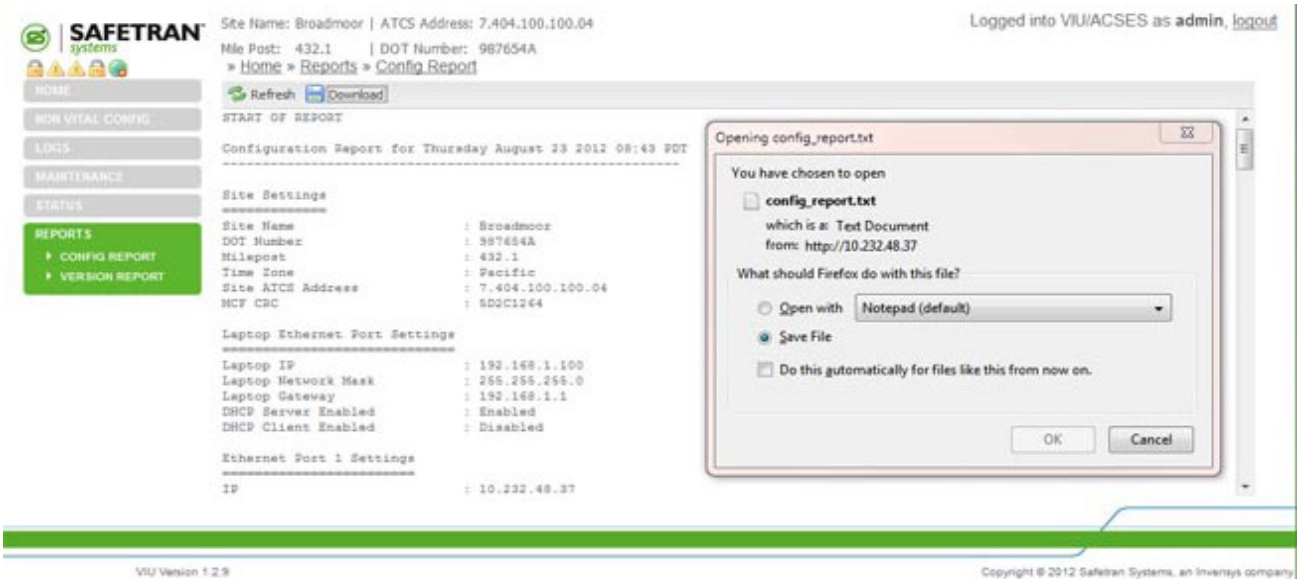


Figure 7-56 Report Download Prompt

If Save is selected the user is prompted for a location and file name for the saved report.

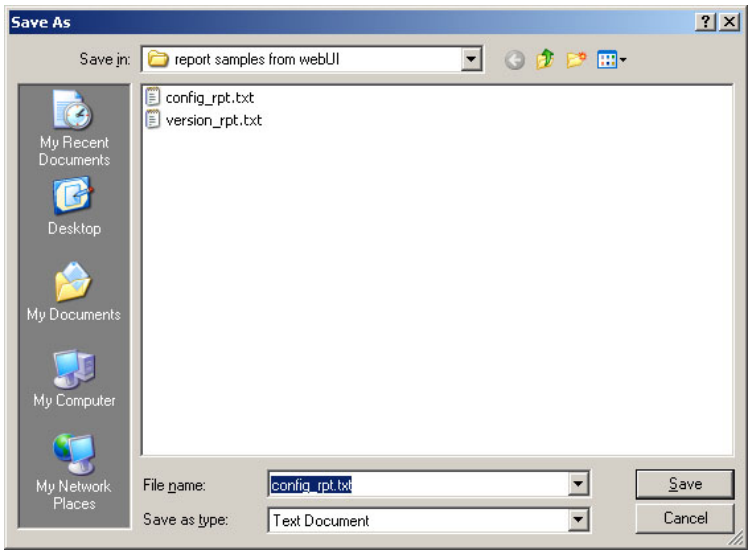


Figure 7-57 Report Save Screen

If Open is selected, the report contents are displayed in a text editor such as Microsoft® Notepad.

The Refresh button on the report display updates the display when pressed.

7.6.5 Version Report

The Version Report identifies the VIU site and then lists the current versions of the VIU firmware, software and hardware (Figure 7-58). Use the scroll bar at the right edge of the screen to view the entire report.

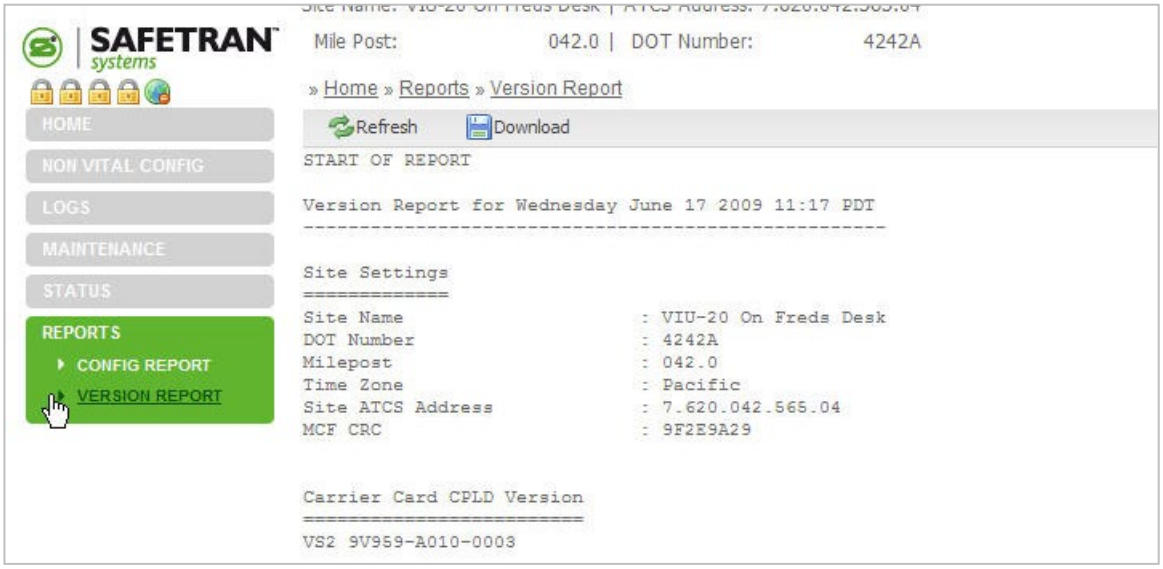


Figure 7-58 Typical Version Report Screen

All other functions associated with the Version Reports screen are identical to those described above for the Configuration Reports screen.

SECTION 8
MAINTENANCE AND TROUBLESHOOTING

8.0 MAINTENANCE AND TROUBLESHOOTING

⚠ WARNING

WARNING

THE USER MUST PROVIDE TIMELY MAINTENANCE UPON FAILURE OF THE VIU UNIT. FAILURE TO PROVIDE TIMELY MAINTENANCE MAY POTENTIALLY LEAD TO UNSAFE FUNCTIONING OF THE UNIT.
THE USER MUST ENSURE THAT THE VIU SYSTEM APPLICATION LOGIC IS NOT TAMPERED WITH OR APPLIED INCORRECTLY. ANY UNAUTHORIZED ACTIVITY PERFORMED TO CHANGE THE APPLICATION LOGIC CAN LEAD TO UNSAFE FUNCTIONING OF THE UNIT.

8.1 MAINTENANCE

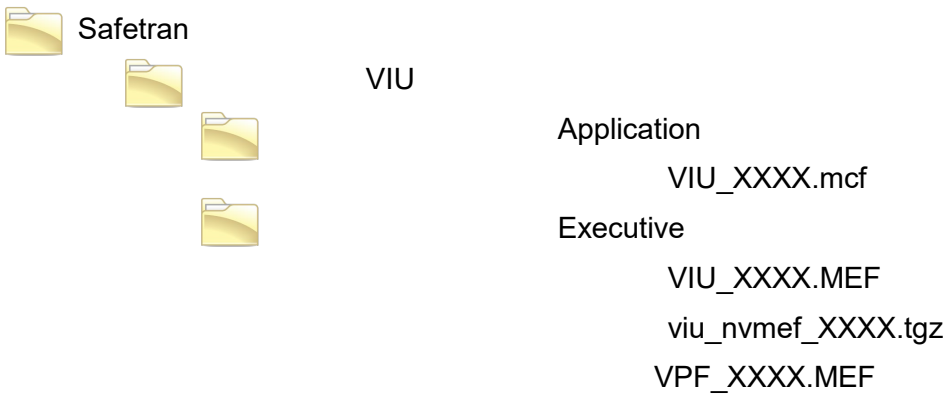
8.1.1 Battery Maintenance

The VIU has no internal backup battery; therefore, no regular backup battery maintenance or replacement is required.

8.1.2 Uploading Software To The VIU From A USB Drive

Occasionally, it may be necessary to update software to the VIU. This process is accomplished using the USB port on the VIU front panel.

The file structure on the USB drive must have the following format. The VIU will look in specific folders for each file type. Folder names and relationships are exact, file names shown are for example only.



To upload software from the USB drive:

1. Insert a USB drive containing the new software in the USB port.
2. The VIU will initiate the USB interface function and display the first entry in the USB menu.
3. Use up (▲) and down (▼) arrow keys to scroll to the desired software upload function.
4. Use left (◄) or right (►) arrow key to display **YES**.
5. Press **Enter**.

⚠ WARNING

WARNING

THE USER MUST VERIFY THAT THE CORRECT VERSION OF SOFTWARE IS LOADED DURING INSTALLATION TESTING. THE USE OF AN INCORRECT VERSION OF SOFTWARE MAY POTENTIALLY LEAD TO UNSAFE FUNCTIONING OFTHE UNIT.

NOTE

NOTE

The application referred to within this chapter is specific to this example only. Other applications could or would have different connections.

8.1.3 Downloading Event and Diagnostic Logs From The VIU to a USB Drive

As a part of routine maintenance or to aid in diagnostics of system problems, all or part of the VIU Event Log, Diagnostic Log, Configuration and Version reports can be downloaded to the USB drive for easier viewing on a PC.

To download reports to the USB drive:

1. Insert a USB drive in the USB port.
2. The VIU will initiate the USB interface function and display the first entry in the USB menu.
3. Use up (▲) and down (▼) arrow keys to scroll to the desired report download function.
4. Use left (◄) or right (►) arrow key to display **YES**.
5. Press **Enter**.

8.2 TROUBLESHOOTING

8.2.1 Status LEDs

Several status LEDs are provided on the VIU. These LEDs can provide initial indication of system health and potential problems. Refer to Table 8-1 VIU Status LED Indications for indications provided by these LEDs.

Table 8-1 VIU Status LED Indications

LED NOMENCLATURE	FUNCTION
Power	Green LED lights when power is applied to the VIU.
Health	Yellow LED indicates VIU health as follows: **Slow flash** (0.5Hz) = VIU is healthy and communicating with internal CPU. **Fast flash** (2Hz) = VIU is unhealthy.
GPS	Yellow and green LEDs are associated with GPS connector on top of unit. LEDs indicate the following: **Green on steady** = looking for GPS satellite **Green flashing** = found satellite and generating timing pulse **Green off** = GPS failure or not used **Yellow on steady** = GPS health OK **Yellow off** = GPS health problem
ECD	Show TX (green) & RX (red) activity between ECD located on the power connector and the internal CPU.
ETHERNET Port 1 Port 2	Yellow and green LEDs are associated with Ethernet ports 1 and 2 on top of unit. LEDs indicate the following: **Yellow not lit** = 10 Mbps link rate **Yellow lit** = 100 Mbps link rate **Green flashing** = message activity. NOTE: Port 2 indicators apply to either **Ethernet Port 2** or **ESSR only (Port 2)**, depending on which is in use. Both cannot be used simultaneously.
SERIAL TX RX	Show TX (green) & RX (red) activity on serial connector located on top of VIU.
INPUT STATUS	20 red LEDs. Indicate status of monitored vital inputs as determined by software.
USB	USB 2.0 interface activity indicators: **Green on steady** = USB drive is inserted and it is safe to remove the USB drive. **Yellow flashing** = file transfer in progress, do not remove USB drive. **Red flashing** = USB drive read or write error detected.

Several status LEDs are provided on the VIU. These LEDs can provide initial indication of system health and potential problems. Refer to Table 8-1 for indications provided by these LEDs.

8.2.2 LED Activity at Power-Up

LED activity at power-up is as follows:

First minute following power-up, the display reads VIU SYSTEM BOOTING PLEASE WAIT and only the power LED is lit.

At approximately 1 minute, 30 seconds from power-up, all front panel LEDs light to test for bad LEDs.

At approximately 2 minutes from power-up, the VIU settles into normal operation, the input status LEDs show current input status and the health LED flashes at 0.5 Hz.

8.2.3 Possible System Problems

Table 8-2 lists some possible VIU system problem conditions with causes and remedies.

Table 8-2 Possible VIU System Problems

PROBLEM	CAUSE	REMEDY
Power LED does not light, VIU does not power up	Poor power cable connection	Check for correct power to B and N terminals on power connector. Check for poor wire connections at power connector and battery. Ensure power connector is firmly seated in the connector on the top of the VIU.
	Insufficient power	Verify that voltage level at B & N terminals of power connector > 8.5 volts.
	Incorrect battery polarity	Reverse B & N connections at power connector.
Health LED flashing at 2 Hz rate.	VIU unconfigured, internal communication failure, VIU unhealthy.	View status message on display (indicates if VIU is unconfigured, out of session, and health of master & slave vital I/O circuits). Verify that MCF CRC, UCN and SIN are correct. Download and review Diagnostic Log for problem indications. Try a reboot of the VIU. If none of the above fixes the problem, replace the VIU. In systems with multiple VIUs, perform checks as above plus: Verify connections between main and auxiliary VIUs. Verify that IP addresses and configuration in general are correct.
No Ethernet communications, Ethernet status LEDs not lit.	Bad Ethernet cable	Replace cable
	Bad Ethernet port	Try another port or replace VIU
	Bad LAN connections	Check all LAN connections
No serial port communications, Serial status LEDs not lit.	Bad serial cable	Replace cable
	Serial port not configured properly on connected device	Configure device properly
	Bad connections	Check all serial cable connections
VIU prompts user to insert USB drive when executive starts.	Failed or corrupted factory test results	Return VIU to factory
USB drive not recognized.	Unsupported device	Use appropriate USB device

8.2.4 Using DT Diagnostic Tools

Connect a PC containing the Diagnostic Terminal software to the VIU as described in Section 7. Launch the DT program.

Click the **DIAG** button at the top of the DT Input Status Screen to display the diagnostic drop-down menu. This menu contains links to diagnostic tools (Statistics, Sniffer) that may be helpful in isolating communications problems internal to the VIU or between the VIU and a connected PC running the DT software.

Figure 8-1 The Diagnostic Drop Down Menu

8.2.4.1 Statistics

Select **Statistics** from the diagnostic drop down menu to display the DT Statistics screen (Figure 8-2). This screen provides a snapshot of communications statistics pertaining to the Laptop Serial port on the VIU. These statistics indicate the number of valid / invalid Diagnostic Terminal data packets transmitted and received via this port.

- Click the **RENEW** button to update the current DT Statistics display.
- Click the **CLEAR** button to delete the current statistics record and return all values to zero.

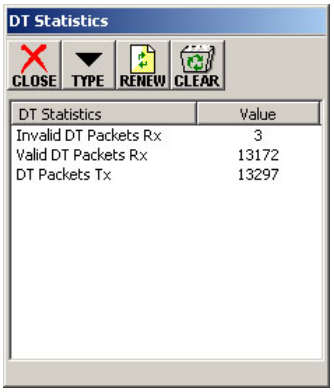


Figure 8-2 DT Statistics

The **TYPE** button displays a drop-down menu of statistic types that can be viewed (Figure 8-3). However, only the **DT Statistics** option is valid. All other selections will return a 'No data found' message.

Click the **CLOSE** button to return to the Input Status Screen.

NOTE

NOTE

These statistics are retained in RAM and are lost when the VIU is rebooted

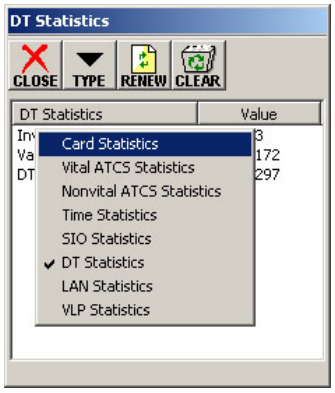


Figure 8-3 Statistics Type Drop Down Menu

8.2.4.2 Sniffer

Select **Sniffer** from the diagnostic drop down menu to display the Sniffer screen (Figure 8-4).

The Sniffer is provided as a diagnostic tool primarily for use by Siemens Engineering personnel.

The Sniffer monitors ATCS message activity between the VIU and the DT program and displays the message bytes for evaluation.

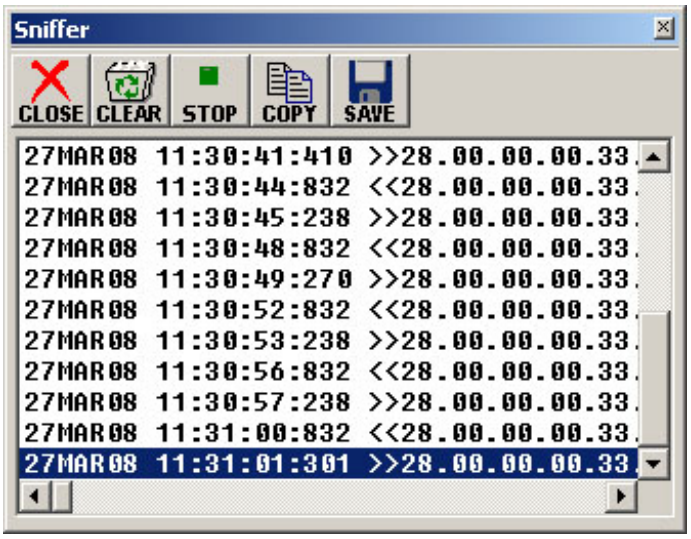


Figure 8-4 Sniffer Screen

This is a dynamic display. As new message traffic occurs, it is added to the bottom of the display and the message list scrolls up screen.

Click the **STOP** button to freeze the display so that currently displayed messages can be examined. The button label changes to **START**. Click the button again to continue monitoring messages as they occur.

Use the scroll bar at the bottom of the screen to view the full length of the messages.

Click the **CLEAR** button to remove all currently displayed messages from the screen. New messages will appear on the screen as they are sent or received.

Click the **SAVE** button to save a snapshot of the record to a file or to create a real time recording of the messages to a file.

Click the **CLOSE** button to return to the Input Status Screen.

8.2.5 Other Useful DT Tools

The DT Status Log and Summary Log may be useful in identifying problems with the VIU system. Please refer to Section 7 for details on accessing these logs.