SIEMENS

INSTALLATION AND INSTRUCTION

VITAL INTERFACE UNIT / CODED AUDIO TRACK (VIU/CAT) A80526

NOVEMBER 2011 (REVISED APRIL 2014)

DOCUMENT NO. SIG-00-08-19
VERSION B.1

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PRINTED IN U.S.A.

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DOCUMENT HISTORY

Version	Release Date	Sections Changed	Details of Change
1	Jan 2010	- - - - -	INITIAL DRAFT
A	Feb 2010	- - - - -	Reviewed per VS2-F252
B	Nov 2011	ALL	Updated per telephone conversation with Product Line Manger regarding updating VIU family of documents to current ITC Committee requirements. Referenced in email 10/28/11, 9:59 a.m. to Dave Wright. Also inserted new VIUCAT XML File data.
B.1	Apr 2014	ALL	Convert to Siemens Format

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NOTES, CAUTIONS, AND WARNINGS

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

WARNING

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

CAUTION

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

NOTE

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

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

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

Static electricity can damage electronic circuitry, particularly low voltage components such as the integrated circuits commonly used throughout the electronics industry. Therefore, procedures have been adopted industry-wide which make it possible to avoid the sometimes invisible damage caused by electrostatic discharge (ESD) during the handling, shipping, and storage of electronic modules and components. Siemens Industry, Inc. 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.

TERM	DESCRIPTION
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
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.

TERM	DESCRIPTION
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 Safetran™ Packet Switch
LCM	Locomotive Communication Module. Radio located on board a locomotive.
LD	Line Driver
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.

TERM	DESCRIPTION
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.
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.

TERM	DESCRIPTION
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

TERM	DESCRIPTION
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 .
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.

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SECTION 1
INTRODUCTION

1.0 INTRODUCTION

1.1 GENERAL

This document describes the installation, configuration and operation of the Siemens Vital Interface Unit for Coded Audio Track (VIU/CAT), part number A80526.

Figure 1-1 Vital Interface Unit – Coded Audio Track (VIU/CAT) Front, Oblique, Top Views

The VIU/CAT (see Figure 1-1) is a general purpose programmable logic controller that can transmit and receive coded phase shift overlay information to the track, provide and monitor colored lamp signaling, 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/CAT unit has the ability to transmit and receive phase shift overlay audio information on the track, drive up to six signal lamps, activate one red retaining relay (VSTOP) circuit, accept four vital parallel inputs (VPIs) and power four vital relay outputs (VROs). Each VIU/CAT provides event recording capability. Each VIU/CAT also provides vital and non-vital sides described in later sections. If additional vital I/O is required, multiple VIU Units can be cascaded using standard Internet Protocol (IP/UDP) connectivity over the Ethernet port. In this case, the auxiliary VIU-16i/-8i units communicate with the main VIU-16i/-8i unit using vital Advanced Train Control System (ATCS) message protocols. The main VIU-16i/-8i unit consolidates the message(s) and creates one central message. Each VIU provides event recording capability.

The VIU/CAT can generate messages using the vital ATCS communications protocol to report the status of the VIU/CAT or a monitored signal. The ATCS messages are transmitted via an Ethernet network for communication between the VIU/CAT and the office management system. The ATCS protocol also supports remote configuration and control of selected VIU/CAT operational parameters.

1.2 APPLICATIONS

WARNING

THE MCF, APPLICATION LOGIC AND OTHER CONFIGURABLE ITEMS SHOULD BE VERIFIED BY SIMULATION, RACK TESTING AND IN-SERVICE INSTALLATION TESTING.
PLEASE REVIEW THIS MANUAL CAREFULLY TO ENSURE CORRECT APPLICATION AND MAINTENANCE OF THE VIU/CAT. INCORRECT APPLICATION MAY RESULT IN UNSAFE OPERATION.

The required functionality for each emplaced VIU/CAT is specified in the railroad's or agency's approved location plan. The location plan provides exact instruction regarding how that particular VIU/CAT installation is utilized. Application specific functions performed by the VIU/CAT are controlled by a Module Configuration File (MCF). The railroad or agency may broadly use a generic MCF for applications, or may tailor the MCF to the needs of specific locations. The MCF is programmed using the Siemens Geographic Configuration Suite (GCS). Whenever a MCF is created, a Quick Start Guide is produced to familiarize planners and field maintainers with the specific parameters utilized by that particular MCF.

1.2.1 Leaving Signal Application

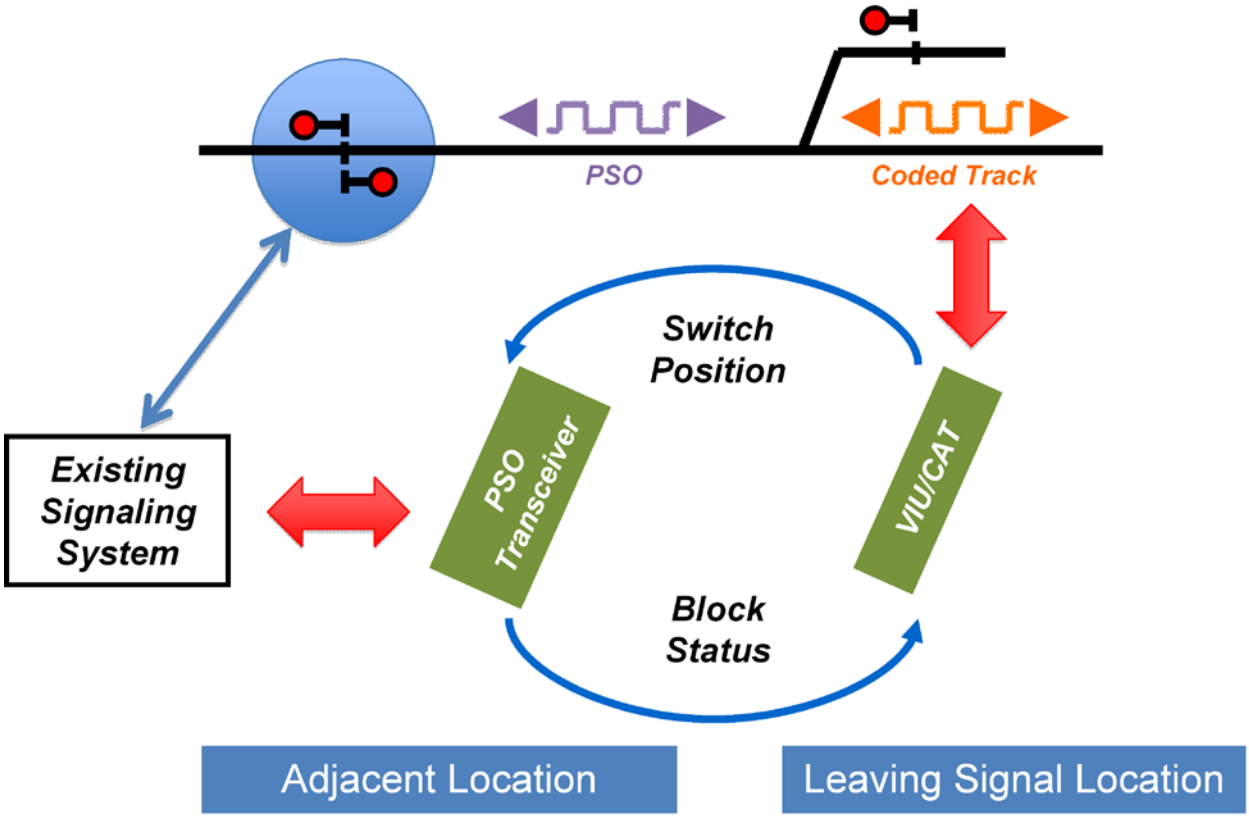


Figure 1-2 VIU/CAT Used in Leaving Signal Application

The VIU-CAT is used to monitor switch position and communicates the switch position via the PSO audio frequency track circuit to the PSO Transceiver at the adjacent signal location. The VIU-CAT will also use block information received from the adjacent signal location via the PSO audio frequency track circuit along with the switch position to determine the leaving signal aspect it should output. This application does not require the installation of cable between the switch location and the signal location. Communication is done through the rails with the PSO audio frequency track circuit.

The VIU/CAT has up to three receivers, and a transmitter that may be configured for regular track frequencies or for Island frequencies. The VIU/CAT has four Vital Relay Outputs (VROs), four Vital Parallel Inputs (VPIs), four Vital Lamp Outputs (VLOs), and a Vital Stop circuit,

The transmitter generates a modulated audio-frequency track signal. It sends a coded, 8-bit address code through the rails using an audio frequency signal as a carrier. The address transmitted is determined by the MCF. The rail connections for the coupling unit delimit the other end of the track circuit. The modulated signal is detected by the receiver where it is decoded and processed. The receiver responds only to signals of the proper frequency, address, and amplitude. The ability of VIU/CAT to differentiate between its operating signal and all other signals present on the track is due to the nonsymmetrical coded modulation and receiver decoding techniques which ensure that the system is immune to random or foreign AM, FM, and beat signals. The receiver decodes the signal and, if it qualifies the signal as valid, the receiver produces an output to energize a vital relay.

The VIU/CAT is functionally compatible with the PSO 4000 receivers and transmitters using any address code, PSO III receivers and transmitters as well as the PSO II receivers and PSO II transmitters when using an A or C address.

No insulated joints are required to confine the signal because the coupling units have low impedance at the operating frequency of the track circuit, and high impedance at all other frequencies. The VIU/CAT can also be used on the same track used for coded or non-coded DC or AC track circuits, GCP, motion detectors, and other audio frequency track circuits.

The VIU/CAT is available with up to five address codes and a wide variety of carrier frequencies. Sixteen VIU/CAT carrier frequencies, ranging from 156 Hz to 4,000 Hz, are available for use in non-electrified territory when operating as a PSO transmitter, and an additional 31 common frequencies, ranging from 500 Hz to 10200 Hz, typically used by non-Siemens equipment are also available for use. For electrified territory, ten frequencies are available ranging from 645 Hz to 4000 Hz. Fourteen island standard frequencies are available when configured as an Island transmitter and range from 2.14 kHz to 20.2 kHz and an additional 15 alternate island frequencies used by non-Siemens equipment that range from 2.3 kHz to 10.2 kHz. For installations where multiple circuits are required on the same track, the VIU/CAT has two sets of eight frequencies (five for electrified territory) each that can be connected as required with negligible interference.

1.3 SYSTEM DATA LOGS

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/CAT system operations. This log does not contain detailed diagnostic events pertaining to the internal operation of the VIU/CAT or associated system. A separate Diagnostic Log maintains these more detailed diagnostic events. 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 web browser over a TCP/IP network.
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 fill the event log. This data is useful for troubleshooting problems related to internal system operation.

- Diagnostic Log can contain up to five entry types (for the five logging levels listed below, in order from lowest to highest level):
  - 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").
  - ERROR – critical system errors such as hardware failures the system cannot heal or recover from.
  - WARNING – system errors that could indicate a problem but the system can continue operating under this condition.

  - INFORMATION – potentially useful information but does not represent a failure or fault in the system. This verbosity level is at the default setting.
  - 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 and Summary 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. 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. Each VIU retains a copy of its own log even if it sends a copy to a consolidator Logger. 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 VIU/CAT (80526) is a compact fully enclosed unit with no field-replaceable components.

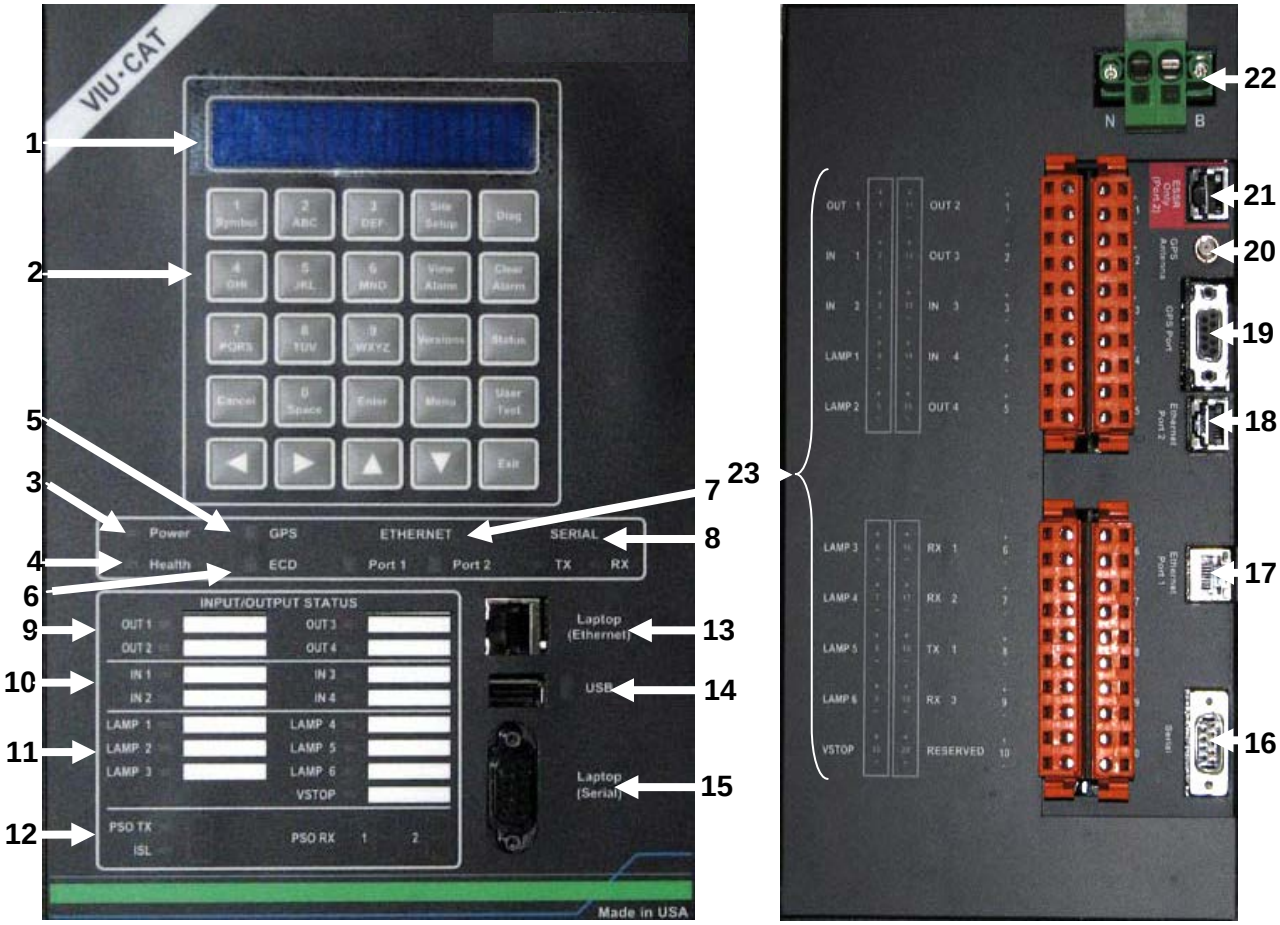


Figure 1-3 VIU/CAT User Interface & Connector Locations

1.4.1 User Interface and Connectors

The VIU/CAT 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.

Table 1-1 Control, Indicator, and Connector Functions

ITEM NO. 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/CAT health as follows: **Slow flash (0.5 Hz)** – VIU/CAT is healthy and communicating with vital CPU. **Fast flash (2 Hz)** – VIU/CAT 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	Single green LED flash indicates a read action; a single red LED flash indicates a write action; and continuous fast flashing of both indicates a file error or the ECD device is not operational.
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	OUT 1 OUT 3 OUT 2 OUT 4	Four red LEDs that indicate whether or not the vital output is energized @ ~12V (lit) or de-energized @ <~6V (unlit).

ITEM NO. FIG. 1-3	PHYSICAL DESCRIPTION	FRONT-PANEL NOMENCLATURE	FUNCTION
10	Status LEDs	IN 1 IN 3 IN 2 IN 4	Four red LEDs that indicate whether or not the vital output is energized @ ~6V (lit) or de-energized @ ~0V (unlit).
11	Status LEDs	LAMP 1 LAMP 4 LAMP 2 LAMP 5 LAMP 3 LAMP 6 VSTOP	Seven red LEDs that indicate the status of the six monitored Color Lamp Signals and one Vital Stop.
12	Status LEDs	PSO TX ISL TX PSO RX	Three red LEDs that indicate the status of the transmitter (whether configured as PSO or Island transmitter), the receiver(s), and the three separate seven segment LEDs to indicate receiver codes or status.
13	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.
14	USB Interface	USB	USB 2.0 interface. Used to connect to a USB flash drive. The VIU/CAT 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; device is unusable or may be full. Remove it and replace with another USB drive.
15	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.
16	Serial Interface	Serial	Dedicated male RS-232 asynchronous serial port used primarily to connect VIU/CAT to an external GPS receiver. May also be used as a general purpose communications port.
17	RJ-45 Ethernet Interface	Ethernet Port 1	Standard 10/100 Base-T Ethernet port.
18	RJ-45 Ethernet Interface	Ethernet Port 2	Standard 10/100 Base-T Ethernet port.

ITEM NO. FIG. 1-3	PHYSICAL DESCRIPTION	FRONT-PANEL NOMENCLATURE	FUNCTION
19	Serial Interface	GPS Port	Dedicated serial port for GPS signal output.
20	SMA Connector	GPS Antenna	Female SMA connector (1/4-36 UNS threaded coupling) for GPS antenna interface.
21	RJ-45 Ethernet Interface	ESSR Only (Port 2)	Dedicated 10/100 Base-T Ethernet port. Use to interface with a Siemens Ethernet Spread Spectrum Radio (ESSR) only. Provides radio power as well as Ethernet connectivity.
22	Power / ECD Connection		Two terminal power connector with External Configuration Device (ECD) attached. Allows VIU/CAT to be swapped out without reconfiguration. VIU/CAT configuration is stored in the ECD.
23	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/CAT settings and information (see Figure 1-4).

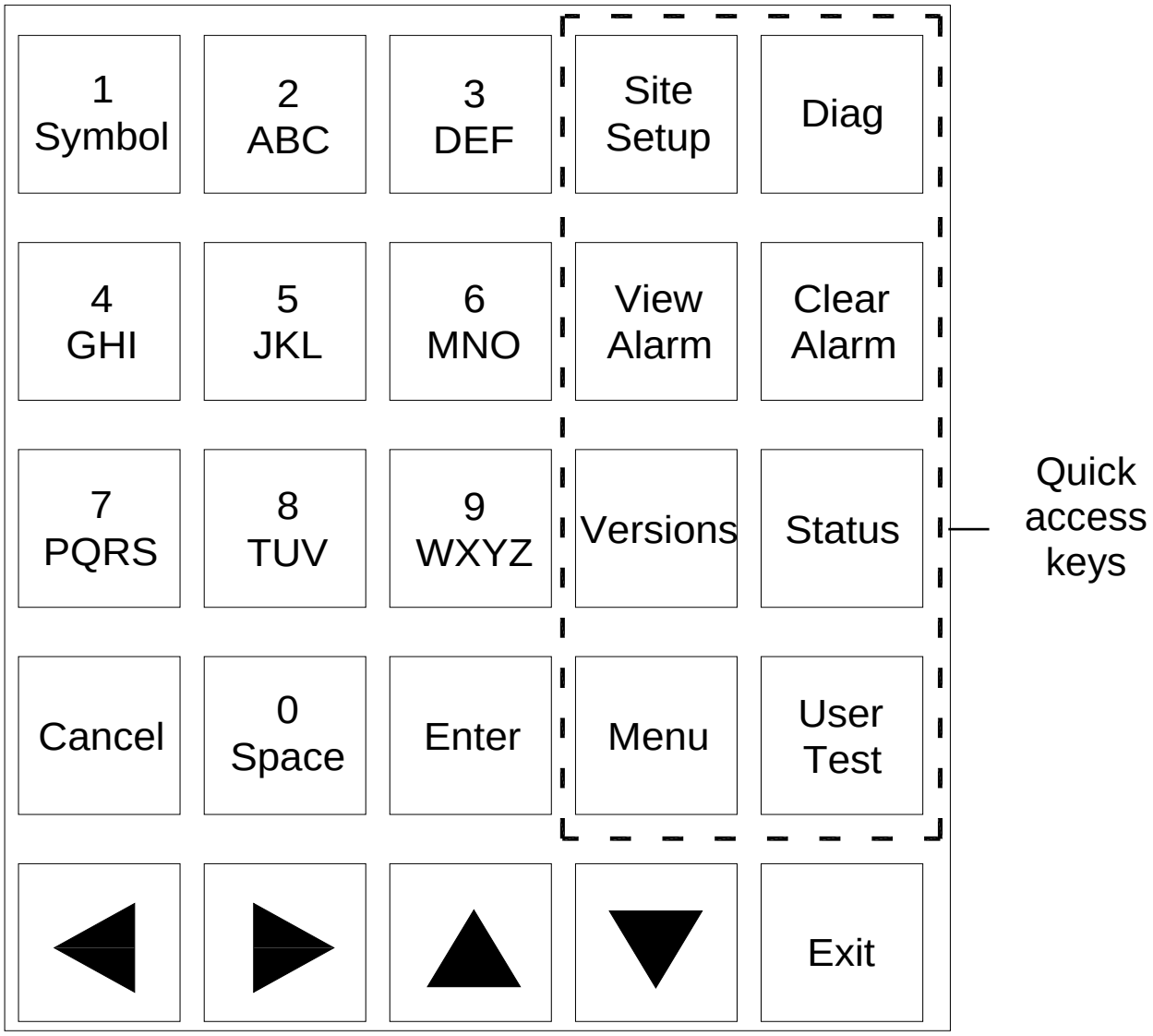
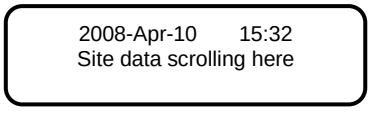


Figure 1-4 Keypad Quick Access Keys

1.4.3 Front Panel Default Display

The VIU/CAT 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/CAT Main Menu

The VIU/CAT 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
CALIBRATION Calibrate PSO and Island track circuits

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

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 **Error! Reference source not found.**.

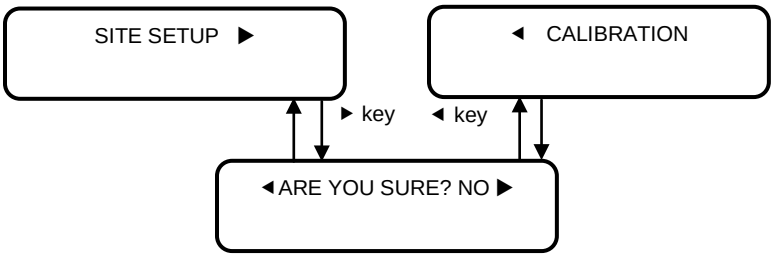


Figure 1-5 Main Menu Navigation

Press the left (◄) arrow key to scroll back to the first menu item.

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 either the 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.

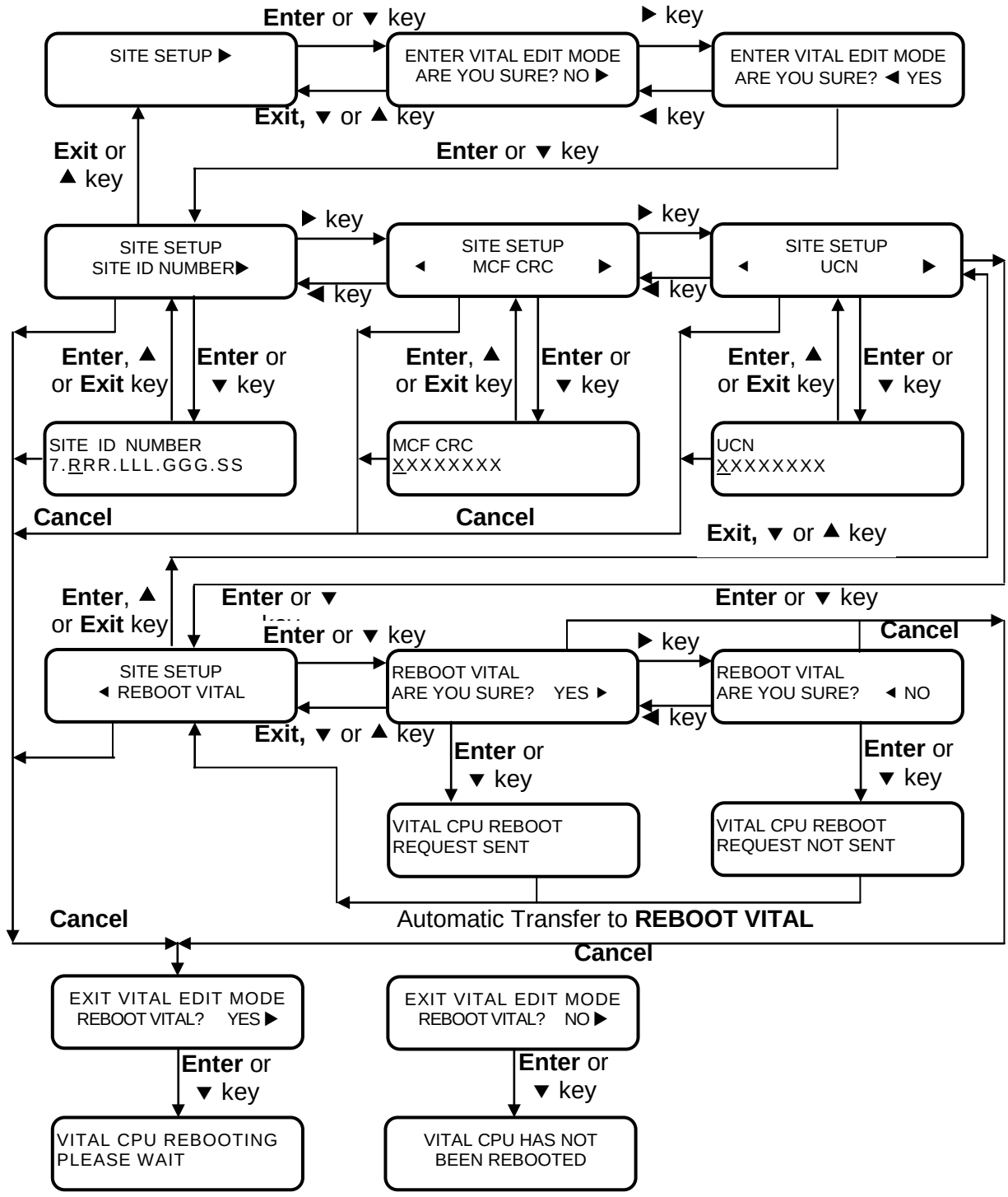


Figure 1-6 SITE SETUP Menu

NOTE

NOTE

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

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 key: After entering or editing data, press this key 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 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 1-10) 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.

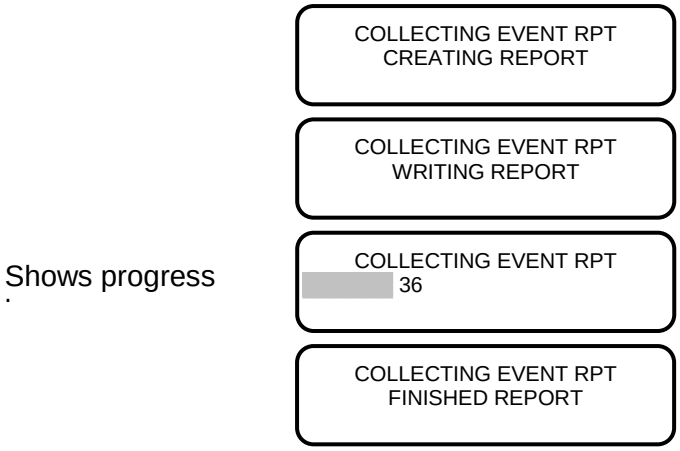


Figure 1-7 Report Function Screens

NOTE

NOTE

The progress bar will not appear if the report is small.

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.

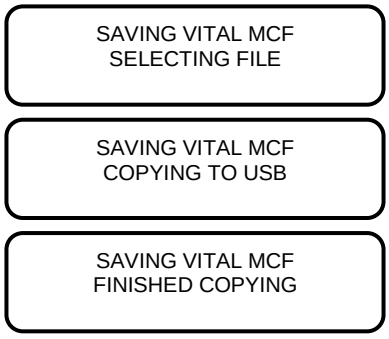


Figure 1-8 MCF or CFG Download to USB Screens

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.

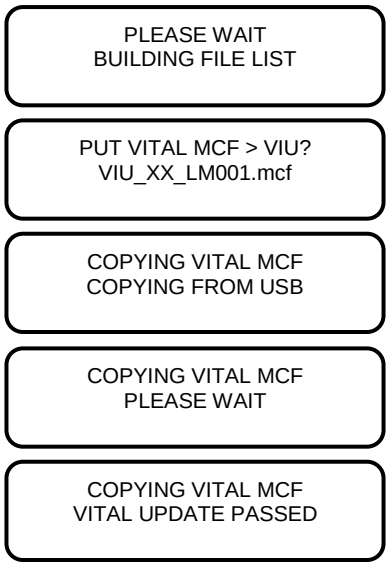


Figure 1-9 MCF or CFG Upload to VIU Screens

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.

NOTE

NOTE

The non-vital executive software will take several minutes to load. 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/CAT will automatically and intentionally reboot when the USB drive is removed from the VIU/CAT front panel following a non-vital executive software upgrade. The VIU/CAT 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 File Structure

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

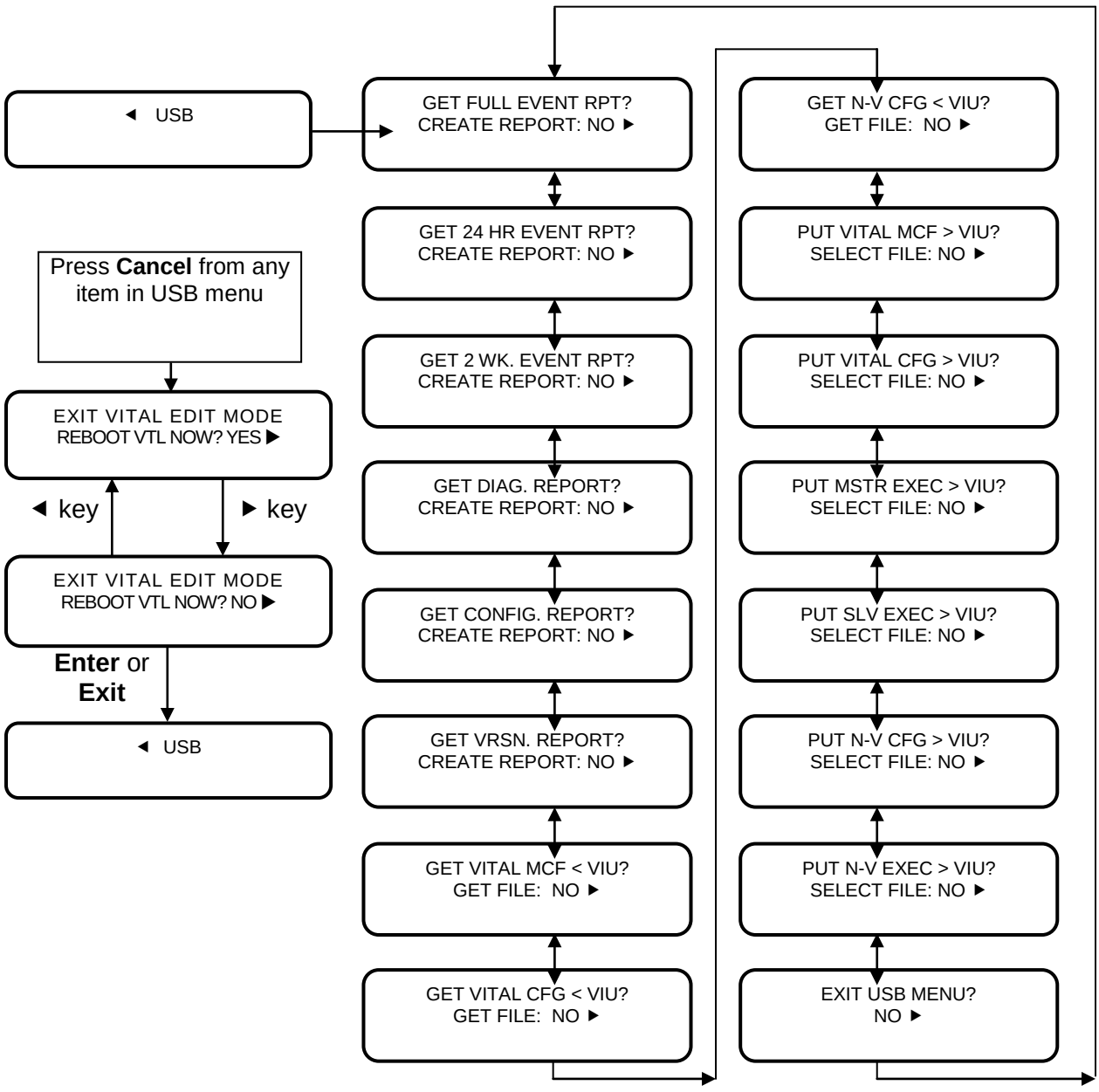


Figure 1-10 USB Menu Map

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 – Displays any current diagnostic messages
- View Alarm – Future use
- Clear Alarm – Future use
- Versions – Future use
- Status – Displays received signal levels of the enabled receivers
- User Test – Future use

1.5 VIU/CAT SPECIFICATIONS

Table 1-2 VIU/CAT Specifications

VIU/CAT 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	
GPS Antenna Connector	Female SMA,1/4-36 UNS threaded coupling
DEFAULT 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
DEFAULT TOP PANEL SERIAL PORT	
Baud rate	4800 (default)

VIU/CAT SPECIFICATIONS	
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	none
Isolation	Serial port to signal battery = 2000 VRMS
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:	8-20V = energized, < than 4V = deenergized (4-6V indeterminate)
Isolation:	2000 VRMS at 60 Hz
DEFAULT IP ADDRESSES	
VIU/CAT Default IP Addresses	192.168.1.100
Laptop	192.168.1.100
Port 1	192.168.2.100
Port2	192.168.3.100
LOGGING	
Event Logging:	100,000 events
Diagnostic Logging:	10,000 events
ENVIRONMENTAL:	
Operating Temperature Range:	-40°C to +70°C (-40°F to +158°F)
Maximum Humidity::	95% non-condensing
PHYSICAL DATA	
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/CAT ORDERING INFORMATION

The VIU/CAT is available in several configurations to meet specific application I/O requirements. Refer to Figure 1-11 for specific part numbers.

8000-80526-0 0 1 2
X

Dash No.	Mtg. Plate D39619	Right Angle Mtg Plate D39620
0	None	None
1	Yes	No
2	No	Yes

8000-80526-X X X X X

Dash No.	"N" Type Antenna Cable	"N" Type Surge to VIU/CAT 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/CAT Cable
0	None
1	5 FT.
2	10 FT.
3	15 FT.
4	20 FT.

Figure 1-11 VIU/CAT and Accessory Ordering Information

Accessories: EMI Filter for VIU/CAT Power Cable: Z590-00010-0001.

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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/CAT.
PROGRAM CHANGES MUST BE PERFORMED IN ACCORDANCE WITH RAILROAD PROCEDURES.
VERIFY THAT VIU- VIU/CAT 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.
INCORRECT WIRING AND INSTALLATION WILL LEAD TO UNSAFE FUNCTIONING OF THE VIU/CAT SYSTEM. THE USER MUST FOLLOW CORRECT INSTALLATION PROCEDURES AND PERFORM INSTALLATION TESTING TO VERIFY ACCURACY OF THE WIRING CONNECTIONS AND OTHER CONFIGURATION PARAMETERS BEFORE PLACING THE VIU/CAT SYSTEM IN SERVICE.

CAUTION

DO NOT INTENTIONALLY SHORT CIRCUIT THE VITAL LAMP OUTPUT. THIS MAY CAUSE DAMAGE TO THE VIU/CAT.

2.1 INSTALLATION

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

2.1.1 Mounting

Two mounting plate configurations are available for installing the VIU/CAT.

The rack or wall mounting plate contains holes that are spaced such that the VIU/CAT can be mounted on relay rails (Figure 2-1).

A right-angle stabilizing plate is available for shelf mounting (Figure 2-2).

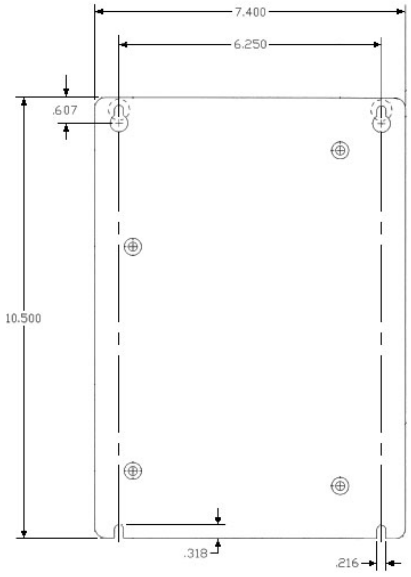

Figure 2-1 Rack or Wall-Mount Plate, D39619

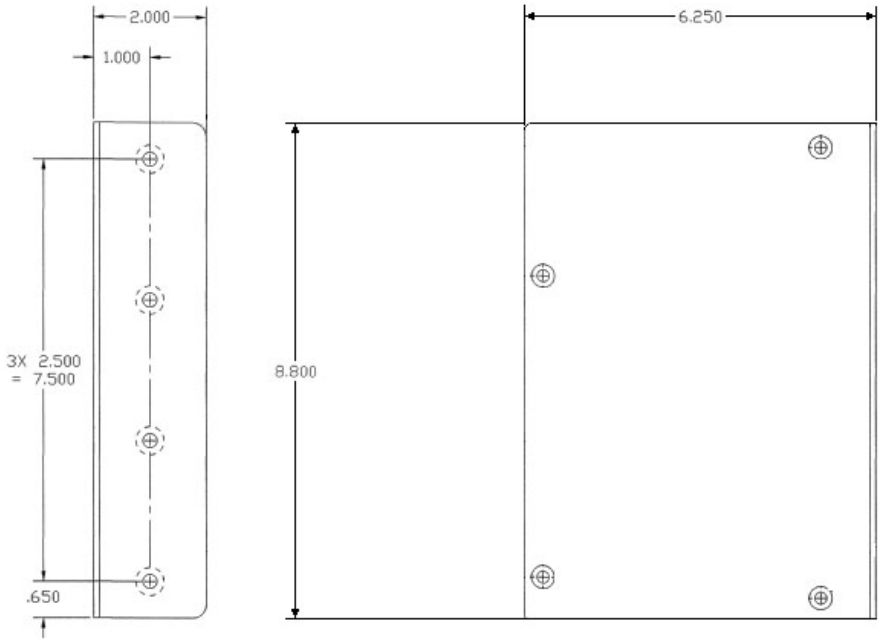

Figure 2-2 Shelf-Mount Stabilizing Plate, D39620

2.1.2 Ventilation Requirements

The VIU/CAT 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/CAT 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/CAT 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/CAT, AND THEN INSERT THE POWER CONNECTOR PORTION. DO NOT FORCE THE ECD CONNECTOR AS THE RECEPTACLE IN THE VIU/CAT MAY BECOME DAMAGED.

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:

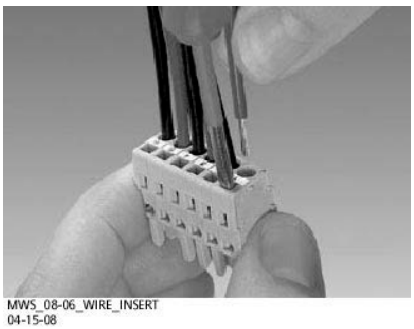

Figure 2-4 Inserting Wire in Cage Clamp Type Connector

- 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 **Error! Reference source not found.** above).
- 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/CAT 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 **Error! Reference source not found.**.

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/CAT 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/CAT**.**

2.1.5 Vital Inputs

The VIU/CAT 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/CAT (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/CAT top panel.

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/CAT 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:

Remove the supplied connector from the mating receptacle on the top of the VIU/CAT.
Select a proper gauge wire for the application (range is #28 to #14 AWG).
Strip approximately 5/16 inch (8 mm) of insulation from the end of the wire.
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).
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.
Remove screwdriver. Gently tug on the just-inserted wire to ensure the receptacle properly retains the installed wire.

Repeat for each wire to be added to the connector.

2.1.6 Serial Interfaces

The VIU/CAT is equipped with two serial ports.

2.1.6.1 Laptop (Serial) Interface

The VIU/CAT 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/CAT 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.

2.1.6.2 Serial Interface (Top Panel)

The VIU/CAT top panel provides an additional standard RS232 interface connector labeled ‘Serial’. This is a general purpose communications port for connection to external devices such as a GPS receiver. This interface is a Data Terminal Equipment (DTE) port which uses a 9-pin male (DB-9) connector.

⚠ CAUTION

CAUTION

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

2.1.7 Ethernet Interfaces

The VIU/CAT is equipped with three standard Ethernet ports and one special Ethernet port. These ports are described in Table 2-1.

⚠ CAUTION

CAUTION

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

Table 2-1 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/CAT and other Ethernet equipped devices, such as a Wayside Communications Module (WCM) or other VIU/CAT units.	Green: Flashing = message activity. Yellow: Off = 10 MBPS bit rate On = 100 MBPS bit rate
Top Panel	Ethernet Port 2	Use for communication between VIU/CAT and other Ethernet equipped devices such as other VIU/CAT units. **NOTE** This port is in parallel with **ESSR only (Port 2)**. Do not use both ports simultaneously.	n/a

PORT LOCATION	NOMENCLATURE	INTENDED USE	LED INDICATIONS
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 2-2 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/CAT. 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 2-3 for connector pin outs.

Table 2-3 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.

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SECTION 3
OPERATION

3.0 OPERATION

WARNING

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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/CAT is first powered up, it performs various vital and non-vital software checks. During this period (approximately 1 minute, 10 seconds) the display is dark and only the power LED is lit. Following the software checks the display turns on and the VIU/CAT loads various drivers (USB, Ethernet, etc.) before running the VIU/CAT executive (MEF). At approximately 1 minute, 30 seconds from power-up, the VIU/CAT lights all front panel LEDs to test for bad LEDs. At approximately 2 minutes from power-up, the VIU/CAT settles into normal operation, the input status LEDs show current input status and the health LED flashes at 0.5 Hz.

NOTE

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

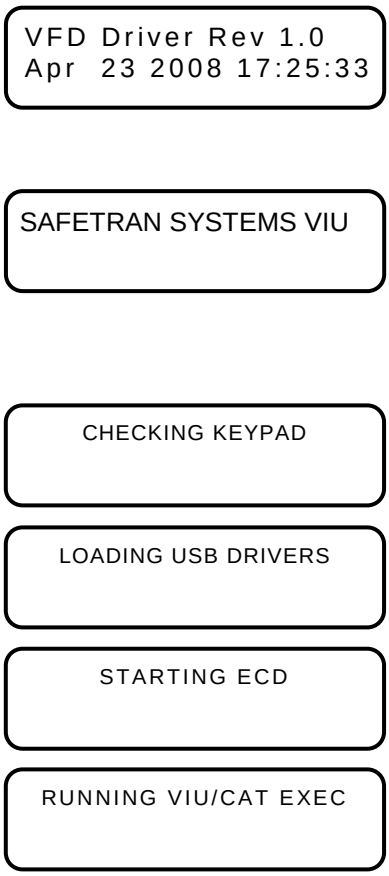
3.1.1 VIU/CAT Real-Time Clock

The real-time clock will contain invalid data when the VIU/CAT 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/CAT is not equipped with GPS, the time and date are set via the web browser interface (See Section 8).

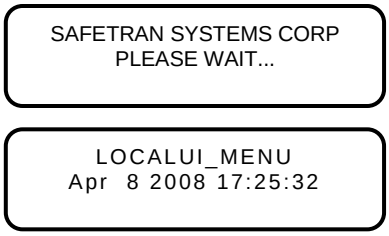
The internal power storage supplies power to the real-time clock when power to the unit is off. Under normal circumstances, the real time clock will retain valid date/time information for at least 10 years with external power removed. The VIU/CAT uses a high value capacitor to store power for the real time clock. There are **no** internal batteries in the VIU/CAT.

3.1.2Front Panel Boot Display Sequence

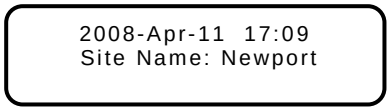
It is possible to monitor the VIU/CAT power-up process on the front panel display. The following examples show the normal boot sequence as it appears on the front panel display.



All front panel LEDs are light at this point to allow visual LED check.



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:

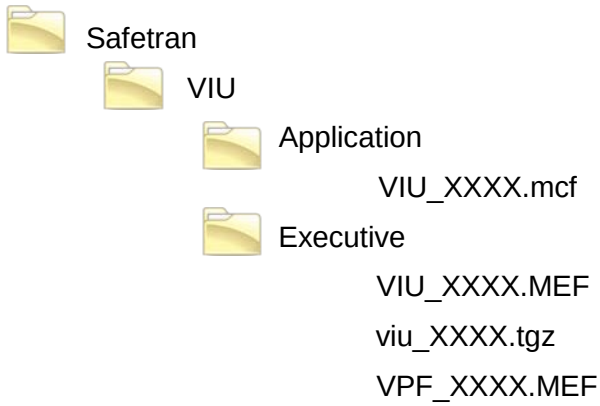
Site Name
Milepost
DOT # (Department of Transportation No.)
Site ID Number (SIN) (ATCS address)
MCF CRC
Laptop baud rate
Laptop IP Address
Port 1 IP Address
Port 2 IP Address
Status messages.

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 UPLOADING AN MCF TO THE VIU/CAT

The VIU/CAT comes from the factory with the MCF, MEFs and default configuration files installed. Following initial power up and successful boot up of the VIU/CAT, an application specific MCF can be upload via the USB port located on the front panel. That procedure is described in the following paragraph.

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



3.2.1 Upload Procedure

Insert the USB drive containing the 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/CAT 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 and configuration files is similar to the one provided above.

3.3 VIU/CAT CONFIGURATION

The VIU/CAT must be configured for the local installation. The MCF is programmed in the office with the primary programming information. Certain configuration parameters are entered using the PC-based DT software while some of the same parameters as well as others are entered through the VIU/CAT web browser interface. These configuration parameters and the method of configuration are discussed in Sections 7 and 8 of this manual.

3.4 VIU/CAT OPERATING STATES

The VIU/CAT operating states consist of the following:

Initial State: This is the VIU/CAT initial power-up state during which the VIU/CAT 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/CAT is not set correctly
VIU/CAT resets to default values

If each of the configuration items listed above passes validation, the VIU/CAT 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 DT program to allow for local configuration of operating parameters. The Main menu will display an asterisk (*) to indicate that a diagnostic message is present. The Diag menu will show the reason the VIU is unconfigured, and whether it is a vital configuration problem. For example, a status message at the top level might say: “VTL STATE IN SESSION, UNCONFIGURED, SLV HLTH BAD”.

Fully Operational State: In this state, the VIU/CAT vital parameters are configured in accordance with the location plan.

WARNING

FULLY OPERATIONAL STATE DOES NOT GUARANTEE THAT THE CONFIGURATION PARAMETER VALUES ARE IN ACCORDANCE WITH THE LOCATION PLAN. FOR EXAMPLE, EVEN THOUGH THE TOP LEVEL MAY SAY “VTL STATE IN SESSION. CONFIGURED, SLV HLTH GOOD”, FURTHER VALIDATION SHOULD STILL BE PERFORMED BEFORE PUTTING THE VIU UNIT IN SERVICE.

Shutdown State: In this state, the VIU/CAT is not receiving or transmitting vital messages.

3.5 CONFIGURATION VERIFICATION AT STARTUP

WARNING

VERIFY THAT VIU/CAT 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/CAT UNIT.
USER CONFIGURABLE ITEMS ARE UCN PROTECTED TO PROHIBIT UNAUTHORIZED CHANGES.

NOTE

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

On startup, the VIU/CAT 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/CAT goes into the Fully Operational state. If any of these checks fail, the VIU/CAT 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

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.

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

3.6 GPS TIME DIFFERENCE

When equipped with a GPS receiver, the VIU/CAT 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/CAT top panel. In the absence of GPS time information the VIU/CAT 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.

On boot up, the VIU/CAT will not transmit Wayside Status Messages (WSMs) until it receives GPS time information. If the VIU/CAT does not receive GPS information for a pre-configured time period (the default is 24 hours), the VIU/CAT will stop transmitting WSMs. If GPS information becomes available again, the VIU/CAT will resume transmitting WSMs.

3.7 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. 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.

3.8 INTEROPERABLE TRAIN CONTROL MESSAGING (ITCM) SYSTEM

When multiple VIU/CATs are used in an application, each VIU/CAT will monitor its own status, switch status, and/or track information r and report that status to the back office using Wayside Status Messages (WSMs). These WSMs are 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

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

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SECTION 4
VIU/CAT SETUP

4.0 VIU/CAT SETUP

WARNING

VERIFY THAT THE PSO MODULE'S SOFTWARE, FREQUENCY, AND ADDRESS FORMATS ARE 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 TRACK CIRCUIT.

IF ANY RECEIVER IS CALIBRATED IN POOR BALLAST CONDITIONS, IT MUST BE RE-CALIBRATED WHEN BALLAST CONDITIONS IMPROVE.

AFTER CALIBRATION, VERIFY THAT THE TRACK CIRCUIT DE-ENERGIZES WHEN THE TRACK CIRCUIT IS SHUNTED WITH THE APPROPRIATE CALIBRATION RESISTANCE (0.06, 0.2, 0.3, 0.4, OR 0.5 OHMS). FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE TRACK CIRCUIT.

FAILURE TO FOLLOW THE RAILROAD'S OR AGENCY'S GUIDELINES REGARDING UNLOCKING THE EDIT FUNCTION MAY PLACE THE UNIT IN AN UNSAFE CONDITION. ONLY UNLOCK THE EDIT FUNCTION IN THE FIELD IN ACCORDANCE WITH THE RAILROAD'S OR AGENCY'S GUIDELINES.

FOLLOWING INSTALLATION OR AFTER ANY RECEIVER MENU CHANGES HAVE BEEN MADE, RECALIBRATE THE RECEIVER AND TEST FOR PROPER OPERATION PER THE REQUIREMENTS SPECIFIED IN SECTIONS 6.5.6.1 AND 6.5.6.1.

FAILURE TO FOLLOW THE RAILROAD'S OR AGENCY'S APPROVED WIRING, INSTALLATION, OR CHECKOUT PROCEDURES OF THE SIGNAL SYSTEM MAY LEAD TO UNSAFE OPERATION.

4.1 INTRODUCTION

After a VIU/CAT or multiple VIU/CATs are installed in the field, the unit(s) must be configured for the specific site. Sections 7 and 8 of this document cover the use of the DT software and the VIU/CAT 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.

4.2 SOFTWARE LOAD AND CONFIGURATION SEQUENCE

Figure 4-1 VIU Software Load & Configuration Sequence 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.

At several points in Figure 4-1 VIU Software Load & Configuration Sequence 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.

Safetran
- VIU
  - Application
    - VIU_XXXX.mcf
  - Executive
    - VIU_XXXX.MEF
    - viu_nvmef_XXXX.tgz
    - VPF_XXXX.MEF

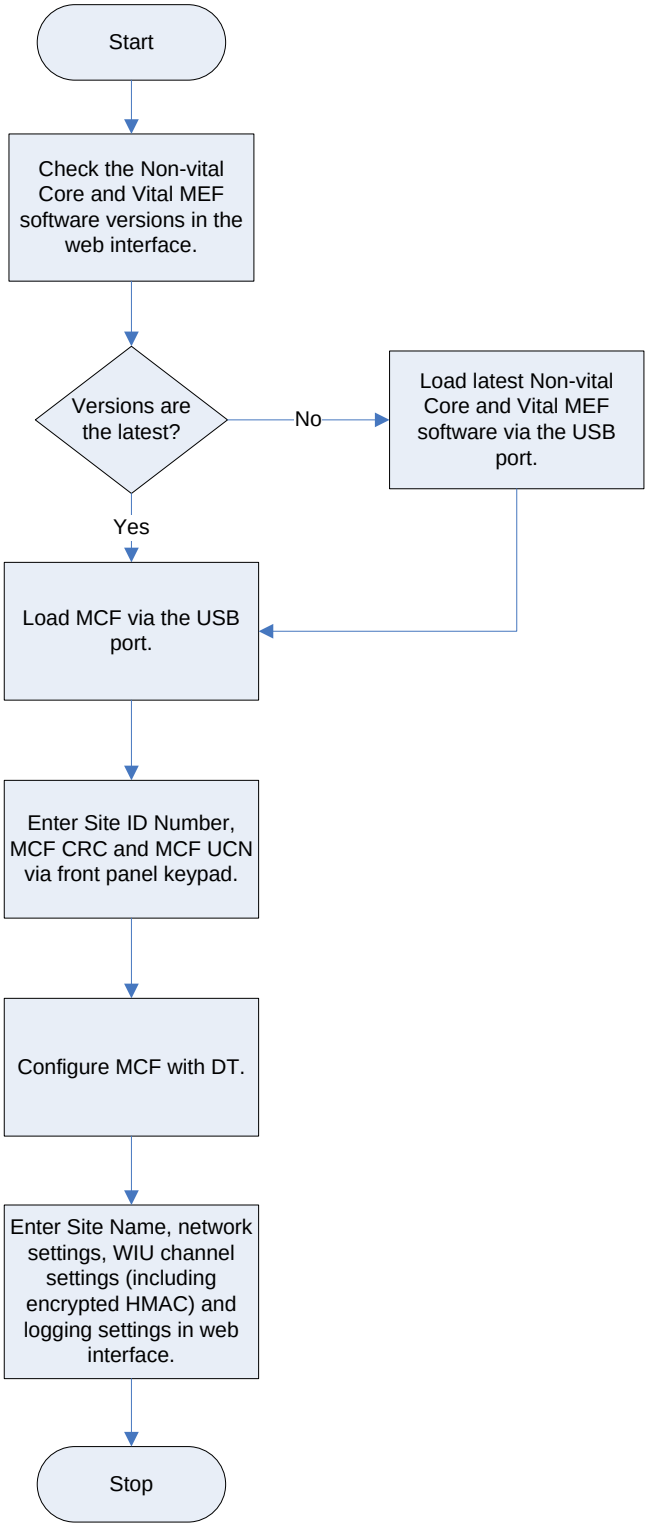

Figure 4-1 VIU Software Load & Configuration Sequence

4.3 VITAL LAMP OUTPUT CONTROL

The VIU/CAT controls up to six and drives up to three Vital Lamp Outputs (VLOs) at one time.

The VLOs are programmed using the Display Terminal (DT). The signal lamps are enabled/disabled (set to Lamp 'N' Used Yes/No) in the order prescribed by the location plan and the MCF.

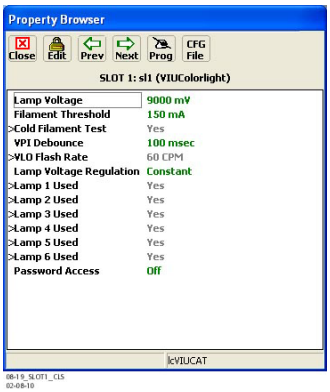

Figure 4-2 VLO Window in DT

If the VLO is enabled but not used, the LED on the VIU/CAT front panel will flash at the Light Out Relay (LOR) rate of 2 Hz and the DT will depict that VLO as block as LOR.

4.4 PROCEDURE FOR CALCULATING A NEW UCN

⚠ WARNING

WARNING

CHANGING VITAL PARAMETERS REQUIRES CALCULATION OF A NEW UCN FOR THE MODIFIED MCF. THIS SHOULD ONLY BE PERFORMED BY AUTHORIZED PERSONNEL. THE LATEST VERSION OF THE DT SOFTWARE WHICH IS EQUIPPED WITH THE UCN CALCULATOR, MUST BE USED FOR THIS PURPOSE.

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

1. From the USB menu 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 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.
19. Select **View Program** from the drop down menu.
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.

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SECTION 5
VITIAL LAMP OUTPUT INFORMATION

5.0 VITAL LAMP OUTPUT INFORMATION

5.1 VITAL LAMP OUTPUT (VLO) OVERVIEW

5.1.1 Overview

Vital Lamp Outputs (VLOs) at a location connect to a Color Light Signal (CLS) module in a VIU/CAT unit. The CLS module responds to messages from the unit by sending control voltages to the VLOs. The CLS monitors voltage and amperage levels to check signal status. Each CLS module can control up to six and drive up to three VLOs.

Inputs and outputs include:

- Six lamp outputs
- One vital output
- Two vital inputs
- Red-retaining relay output (VSTOP) This output drops signal control relay in the event of a vital failure.

5.1.2 CLS Features

Signal modules are designed to incorporate the following features:

- All inputs and outputs pass through opto-isolators that provide 2000 VAC surge protection for the module.
- Inductors mounted on each module provide additional surge suppression.
- Input filters prevent AC voltages between 25 Hz and 220 Hz from energizing an input to the module.
- A DC-DC converter provides voltage stability and isolation for the current going to the signal lamps.
- LEDs on the module panel show the states of each input or output.

5.1.3 Lamp Outputs

Lamp output voltage is adjustable through system software. Voltage can be adjusted from 9.0 to 13.0 VDC in increments of 1 mV. No external lamp resistor is required.

Lamp output (Voltage Regulation) can be programmed via the DT as either constant or variable. Variable will dynamically reduce the input current requirement and extend battery life. CLS module outputs turn signal lamps on or off or flash signal lamps.

5.1.4 Filament Checks

The CLS module tests each lamp with current to determine if the filament is intact and whether the lamp is on. The CLS sends current between 150 – 2500 mA to verify lamp filament status. A setting of 700 mA is typically used to perform filament checks.

5.1.5 Light Out Relay (LOR)

During the filament check, if the lamp filament is not intact the CLS module notes this lamp as Light Out Relay (LOR). The VIU/CAT logs this event as a LOR fault. The LOR status is reflected on the DT by the code “LOR” appearing in the VLO status block. During LOR events, the LED on the front panel flashes at 2 Hz.

5.1.6 Foreign Energy Detection

If a lamp is being energized from a source other than the VIU/CAT, the CLS module detects the condition during its lamp filament check cycle, and turns off all lamps. After the lamps are turned off, the CLS module rechecks the lines to see if the voltage is still present. If the other voltage source is still present, the VIU/CAT logs the condition as a Foreign Energy (FEN) fault. The VLOs remain deactivated until the foreign energy condition is resolved. During FEN events, the LED on the front panel flashes at 5 Hz. The red retaining relay (VSTOP) deenergizes when foreign energy is detected.

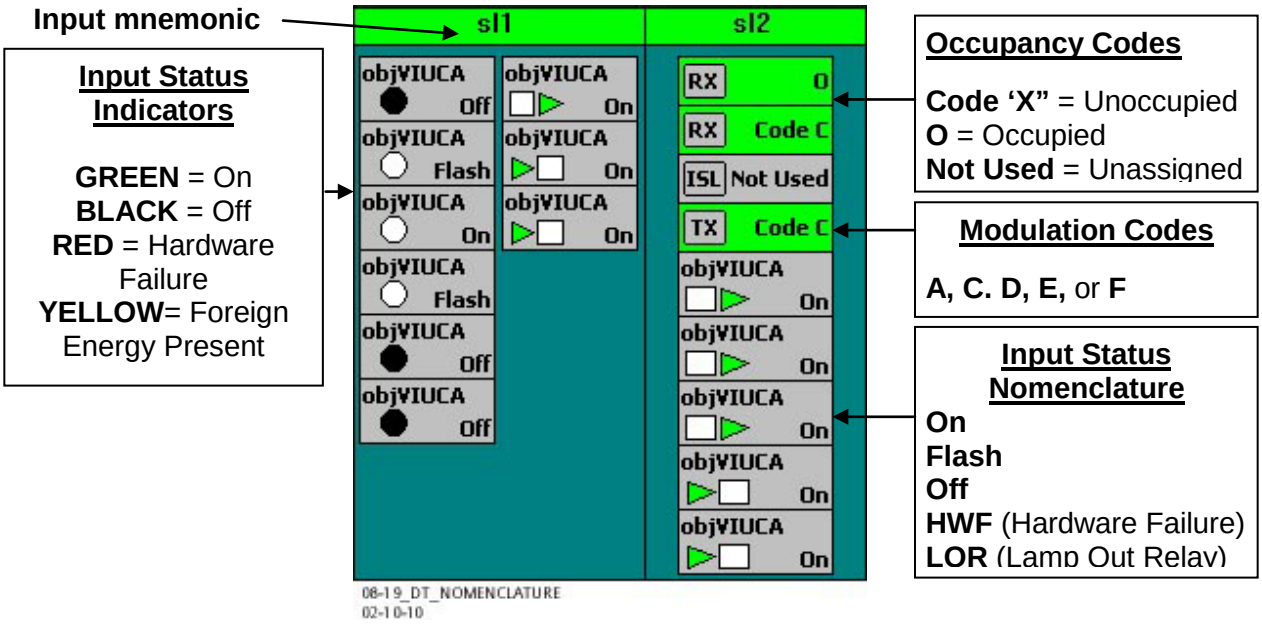


Figure 5-1 VIU/CAT Display Terminal (DT) Indications

5.1.7 VPI Debounce Time

The VPI debounce delay time (for VPI#1 and VPI#2) can be set (by using either the maintainers interface or the DTU) within a range of 20ms to 200ms in increments of 2ms. The debounce delay allows time for the inputs to settle. The set value can also be queried.

5.1.8 Red Retaining Relay (VSTOP)

The CLS module supports the red retaining relay (VSTOP) function which is used to set all associated block signals to red in the event a malfunction is detected on the CLS module or a problem is detected with the associated block signal lamp circuit. The red retaining relay (VSTOP) is controlled by the CLS module when foreign energy is detected.

If the CLS module is assigned a red retaining relay (VSTOP) output and a malfunction is detected on that module or in the associated block signal lamp circuit, the module turns off its on-board converter and deenergizes the red retaining relay (VSTOP) output. The system will see that the module is down and attempt to turn the module converter back on every 20 seconds. If the problem still exists, the converter will remain off.

When the red retaining relay (VSTOP) output on the affected CLS module is deenergized, the relay contacts disconnect all associated yellow and green block signal lamp circuits. This condition supplies a lamp out indication for the affected block signal(s) to a CTC system at a central office.

The event log for this CLS module indicates the general type of malfunction.

Table 5-1 Color Lamp (CLS) DT Programmable Data

OPERATING PARAMETER	RANGE	DESCRIPTION
Lamp Voltage	**9000** – **13000 mV** (1 millivolt increments)	Set lamp voltage
Filament Threshold	**150** – **2500 mA** (10 milliampere increments)	Sets lamp filament threshold for light out detection. **NOTE**: Should be left at default. If change is required, consult Safetran Technical Support.
Cold Filament Test	**Yes / No**	Determines whether or not the cold filament test is performed
VPI Debounce	**20** – **200 ms** (2 millisecond increments)	Set VPI debounce time
VPI Flash Rate	**40** – **70 CPM** (5 CPM increments)	Determines the flash rate of the lamps
Lamp Voltage Regulation	**Constant** or **Variable**	Set to Constant to maintain constant lamp output voltage even under low battery conditions. Set to Variable to conserve battery power if AC power goes off and the battery voltage drops. For details see previous “Lamp Outputs” section.

Table 5-2 Color Light Signal Module Data

ITEM	DESCRIPTION
SPECIFICATIONS	
Number of Lamp Outputs:	Six
Lamp Output Voltage:	9 VDC to 13.5 VDC
Lamp Bulbs Driven:	Bulbs rated between 18W and 28W (up to three 25W lit at one time)
Maximum Driveable Distance To Lamp Filament:	250 feet (through #10AWG cable, minimum)
Lamp Testing Performed:	Lamp illumination detection. Broken filament detection (with lamp on or off). Detection of shorts between lamps (a shorted lamp detected as falsely energized is disabled within one second). Flashing lamp detection. Over-current detection.
Lamp Test Protection:	Signal will not display erroneous aspect during test
Isolation	2000VAC
Colorlight Parameter Configuration:	Settable by field personnel using the DT. Lamp voltage controllable from 9.0VDC to 13.5VDC.
Failure Protection:	Lamp cannot be erroneously energized by a sneak path due to a break in the common wiring.
Lamp Flashing:	Flashing lamps supported (flash rate of 60 times per minute and mark space ratio of 1 to 1, variable from 40 to 70 times per minute). Synchronous flashing of all lamps from the same module supported.
Features:	Supports red retaining relay (VSTOP) functionality signals for signal lamps.
AVAILABLE VPI:	
Vital Interface:	Pole line / relay circuits
Quantity of VPI inputs:	2 opto-isolated vital inputs
Energized voltage range:	7.5VDC to 20VDC
Input Impedance:	1.5kΩ to 2.6kΩ (2kΩ nominal)
Isolation:	2000VAC
AC Frequency Rejection:	25-220 Hz, 65VAC maximum
AVAILABLE VRO	
Vital Interface:	Pole line / relay circuits / rate codes
Quantity of VRO outputs:	1 opto-isolated vital output
Output Voltage:	9.5VDC into 500Ω (nominal - see Appendix A for output voltages for other impedance values).
Relay Drive:	100Ω - 1000Ω load per output (designed to drive Safetran ST1 and ST2 relays, or equivalent)
Isolation:	2000VAC

SECTION 6
PSO INFORMATION

6.0 PSO INFORMATION

6.1 SPECIFICATIONS

6.1.1 Frequencies Available for Use with VIU/CAT

WARNING
NEVER USE A PSO FREQUENCY THAT IS THE SAME AS THE ISLAND FREQUENCY.

The standard Siemens PSO module frequencies depicted in **Error! Reference source not found.** are available for use with VIU/CAT when utilized as a transmitter or receiver. The alternate frequencies depicted in **Error! Reference source not found.** are those typically used by other equipment and are available for use with VIU/CAT. However, the alternate frequencies use Siemens modulation patterns and are not directly compatible with non-Siemens transmitters or receivers. When VIU/CAT Receiver-Transmitter pairs are deployed, they can be substituted for other non-PSO II/III legacy overlay equipment operating on the same channel.

Table 6-1 Frequencies Available for Use with VIU/CAT

APPLICATION TYPE	FREQUENCIES UTILIZED
Standard PSO frequencies (Hz)	156, 211, 285, 348, 430, 525, **645**, **790, 970**, **1180**, **1450**, **1770**, **2140**, **2630**, **3240**, **4000**
Alternate PSO frequencies (Hz)	500, **700**, **900**, **1000**, **1100**, **1125**, **1250**, **1300**, **1375**, **1500**, **1600**, **1640**, **1750**, **1875**, **2175**, **2300**, **2675**, **2800**, **3100**, **3500**, **4000**, **4900**, **5400**, **5900**, **6400**, **7100**, **7700**, **8300**, **8900**, **9500**, **10200**

(Frequencies in **Bold** text are recommended for use in electrified territories)

Table 6-2 VIU/CAT Track Frequency Groups

GROUP NUMBER	FREQUENCIES UTILIZED
1	156, 285, 430, 645, 970, 1450, 2140, 3240,
2	211, 348, 525, 790, 1180, 1770, 2630, 4000

All frequencies within a group are compatible and may be intermixed without restriction on the same rails without insulated joint separation.

6.1.2 Island Circuit Frequencies Available for Use with VIU/CAT

WARNING
NEVER USE A PSO FREQUENCY THAT IS THE SAME AS THE ISLAND FREQUENCY.

The standard Siemens carrier frequencies depicted in Table 6-3 are available for use in island circuits with VIU/CAT:

Table 6-3 Standard Siemens Circuit Frequencies Available for Use with VIU/CAT

2.14 kHz	**2.63 kHz**	**3.24 kHz**	**4.00 kHz**	**4.90 kHz**	**5.90 kHz**	**7.10 kHz**
8.30 kHz	**10.0 kHz**	**11.5 kHz**	**13.2 kHz**	**15.2 kHz**	**17.5 kHz**	**20.2 kHz**

The maximum operating distances shown in Table 6-4 are between transmitter and receiver track wire connections for end-fed track circuits. For center-fed track circuits, double the distances given to obtain the maximum receiver-to-receiver distance.

6.1.3 Maximum Operating Distances

Table 6-4 Maximum Operating Distances at 0.06 Ohm Shunting Sensitivity

APPLICATION	GROUP	FREQUENCY (HZ)	BALLAST	
			2 Ω/1,000 FT. OPERATING DISTANCE (FT.)	4 Ω/1,000 FT. OPERATING DISTANCE (FT.)
VIU/CAT FREQUENCIES	1	156	9,000	12,500
		285	6,900	9,800
		430	5,800	8,000
		645	4,700	6,600
		970	3,900	5,500
		1,450	3,300	4,600
		2,140	2,600	3,800
		3,240	2,100	3,000
	2	211	7,900	11,100
		348	6,300	9,000
		525	5,300	6,100
		790	4,300	5,500
		1,180	3,700	5,200
		1,770	3,000	4,200
		2,630	2,400	3,300
		4,000	2,000	2,800

NOTE

NOTE

When 0.2-ohm shunting sensitivity is required (e.g., electrified and/or light rail applications), the maximum operating distances should be 2,000 feet based on 2 ohms/1,000 feet ballast resistance. Frequencies less than 645 Hz and associated distances greater than 2000 feet are possible with certain limitations. An engineering review of usable frequencies below 645 Hz should be conducted to determine the proper operation and coverage.

The maximum operating distances shown in are between transmitter and receiver track wire connections for end-fed track circuits. For center-fed track circuits, double the distances given to obtain the maximum receiver-to-receiver distance.

6.2 VIU/CAT TRANSMITTER

The transmitter generates a signal of the proper frequency, modulation rate, address, and signal amplitude. The transmitter utilizes one of the 16 standard Siemens frequencies. The transmitter modulation frequency varies between ±1/64 of the chosen frequency (e.g. the Transmit Frequency selected is 2.14 kHz, and so the frequency ranges from 2.106 kHz to 2.173 kHz). The modulation is a Frequency Modulation providing a reoccurring eight bit non-symmetrical serial address. The address code (A, C, D, E, or F) is controlled by the MCF. The transmit amplitude is determined by the Transmit Level (Low or High Power) selected during setup.

6.2.1 Transmitter Configuration Parameters

The Transmitter Module Menu allows configuration of the Transmit Frequency Selection. The interface allows the Transmit Level to be configured to Low or High.

6.2.2 Transmitter Calibration

Calibration is not required on the VIU/CAT transmitter.

6.3 VIU/CAT RECEIVER

The VIU/CAT Receiver detects the proper frequency, address, and signal amplitude sent by the transmitter. The receiver is connected to the track via a Tuned Receiver Coupler, which is a separate piece of equipment. No insulated joints are needed to confine the signal because the coupling units have low impedance at the operating frequency of the track circuit, and high impedance at all other frequencies. The receiver will detect either one of the 16 standard Siemens frequencies or one of the 31 alternate frequencies. The modulation is a Frequency Modulation providing a reoccurring eight bit non-symmetrical serial address. The address code (A, C, D, E, or F) received is reported to the MCF. The receiver must verify frequency, address, and signal amplitude prior to energizing any output as required by the location plan.

6.3.1 Receiver Configuration Parameters

The interface allows configuration of the Receive Pickup Delay from 0 to 30s. The default is 2 seconds. Each input's pickup delay may be configured from 0 to 30s.

6.3.2 Receiver Module Calibration

The Receiver Module requires user calibration in order to set the appropriate threshold for train detection. A shunt (e.g. hardwire, 0.06Ω, 0.1 Ω, etc.) is placed at a specific location on the track and the calibration for the receiver is started. The Module monitors the signal level and stores that signal level in Non-Volatile Memory (NVRAM). This stored signal level is then used as a base line to determine whether the track is occupied.

.

6.4 VIU/CAT SYSTEM WIDE COMMON DATA

The following items of information are common across the VIU/CAT.

6.4.1 Receiver Data

The receiver signal strength for each receiver may be viewed via the menu by pressing the Status button on the face of the VIU/CAT. If receiver signal strength is being viewed, the signal strength data is refreshed at least once per second. The module code being received is shown on the face of the VIU/CAT when received. The received signal strength relative to the calibration level may also be viewed.

6.4.2 Diagnostic Data

Whenever any of the following conditions occurs, the system provides diagnostic messages via the Front Panel's Display:

Setup is required.
A receiver is not calibrated.
The Island is not calibrated.
The Island is unhealthy.
A transmitter is unhealthy.
A receiver is unhealthy.

See Section 10, Maintenance and Troubleshooting for information regarding Diagnostic Data.

6.5 INSTALLATION, CALIBRATION, CHECKOUT PROCEDURES, & DIAGRAMS

It is recommended that the following wiring and installation requirements be read before the installation is started. Follow approved railroad wiring instructions and procedures for the installation. Once the installation is complete, program each VIU/CAT module per approved railroad written instructions prior to calibration.

6.5.1 Wiring Requirements

6.5.1.1 Battery Wiring

Battery wiring to the VIU/CAT equipment should be number #16 AWG minimum and twisted in pair. The wires are connected to at the shelter battery surge suppression panel. For proper battery surge protection, the battery surge suppression panel should be wired as shown in Figure 6-1.

6.5.1.2 Case Wiring

Case wiring to the VIU/CAT equipment should be number 16 AWG, unless otherwise specified.

6.5.1.3 Track Wiring

Equipment connections to the rails should be as short as practical (preferably less than a 100-foot pair) and should be number 9 or number 6 AWG. For lengths of 100 to 300 feet, use number 6 AWG. If lengths exceed 300 feet, Receiver Rail to Line Coupler, 7A377-1-f, Receiver Rail to Line Coupler, 7A377-2-f, or Transmitter Rail to Line Coupler, 7A399-f, should be used, with the couplers placed within 100 feet of the track. Track wires should be plug connected or welded to the rails.

6.5.2 Battery Surge Application Installation

The VIU/CAT incorporates built-in surge protection. However, primary surge protection must be installed on all power supply/battery as shown in Figure 6-1. Track wire surge protection is shown on each application drawings starting with Figure 9-3.

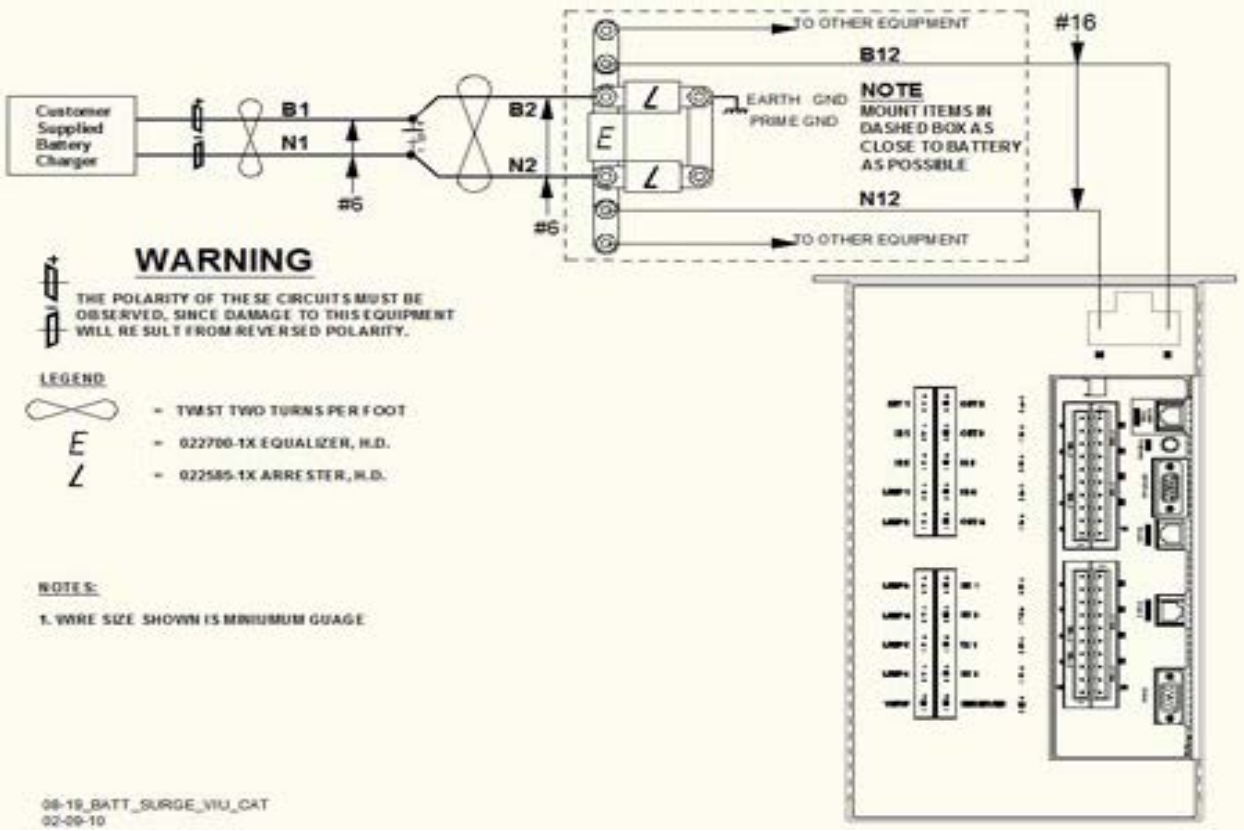


Figure 6-1 Primary Battery Surge Protection

6.5.3 Surge and Track Wire Protection for Electrified Track

WARNING

IN ELECTRIFIED TERRITORY, ENSURE THAT THE EQUALIZER IN THE TRACK SURGE PANEL IS REPLACED BY A THIRD ARRESTOR.

In electrified territory, fuses and arresters must be installed on track leads as shown in Figure 6-2.

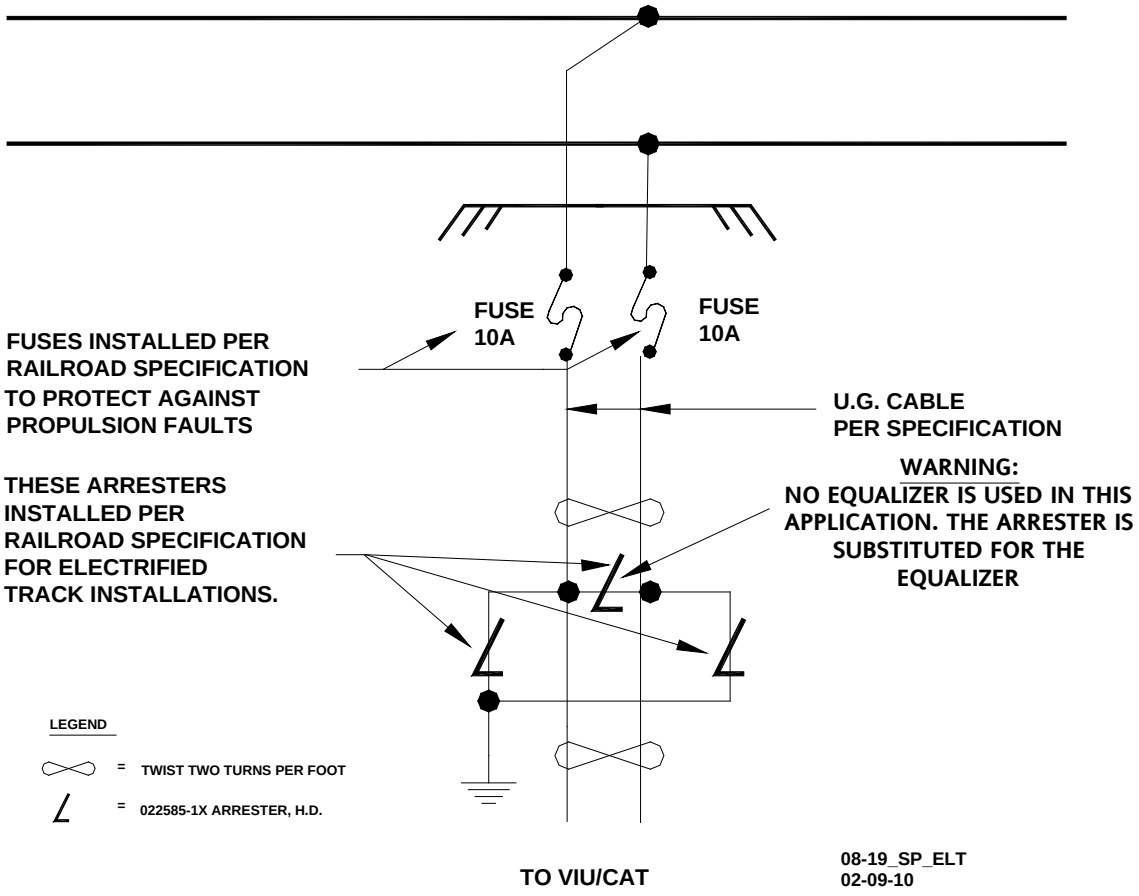


Figure 6-2 Surge and Fused Track Wire Protection in Electrified Track

6.5.4 VIU/CAT Module Installation Procedures

6.5.4.1 VIU/CAT Module Installation (All Modules)

Perform the following steps to install the VIU/CAT Modules:

1. Install and connect all auxiliary equipment in the Wayside Signaling Station per the railroad's approved wiring or installation diagram.
2. Mount the VIU/CAT Module to the rack, shelf, or wall.
3. Connect all required leads per the railroad's approved wiring or installation diagram to all required pins on the Module connectors.
4. Program the VIU/CAT per the railroad's approved written instructions.

6.5.5 VIU/CAT Calibration Procedures

6.5.5.1 Transmitter Calibration

WARNING

VERIFY THAT THE TRANSMITTER FREQUENCY AND ADDRESS FORMAT ARE AS SPECIFIED BY THE RAILROAD'S APPROVED WIRING OR INSTALLATION DIAGRAM. FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE TRACK CIRCUIT.

The Transmitter does not require calibration.

6.5.5.2 Receiver Calibration

WARNING

VERIFY THAT THE VIU/CAT RECEIVER FREQUENCY AND ADDRESS FORMATS ARE AS SPECIFIED BY THE RAILROAD'S APPROVED WIRING OR INSTALLATION DIAGRAM. FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE TRACK CIRCUIT.
FAILURE TO FOLLOW THE RAILROAD'S APPROVED WIRING OR INSTALLATION GUIDELINES REGARDING RECEIVER SETTINGS AND CALIBRATION MAY LEAD TO POSSIBLE UNSAFE OPERATION OF THE TRACK CIRCUIT.
AFTER CALIBRATION, VERIFY THAT THE TRACK CIRCUIT DE-ENERGIZES WHEN THE TRACK CIRCUIT IS SHUNTED WITH THE APPROPRIATE CALIBRATION RESISTANCE (0.06, 0.2, 0.3, 0.4, OR 0.5 OHMS). FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE TRACK CIRCUIT.
AFTER INSTALLATION OR AFTER ANY RECEIVER MENU CHANGES HAVE BEEN MADE, RECALIBRATE THE RECEIVER AND TEST FOR PROPER OPERATION.

NOTE

Prior to attempting calibration, ensure that a code is being transmitted to the VIU/CAT and that the receiver reflects that code.
On the VIU/CAT, all references to RX3 pertain to the Island Receiver. RX3 is only used with the Island.

With the VIU/CAT properly installed and programmed per railroad instructions, Calibrate the receiver (RX1 or RX2) as follows:

1. When the track ballast is dry, connect a track test shunt (0.06-ohm, 0.2-ohm, or as required) across the track at the receiver track connections. When the ballast is damp, connect the shunt across the track at a point 10 feet beyond the receiver track connections. Ensure that the shunt has solid connections to each rail.
2. Select the menu button. SITE SETUP > appears.
3. Select the right arrow (>). < CALIBRATION appears.
4. Select Enter. CALIBRATE PSO RX1? NO > appears.
5. Select the right arrow (>). YES appears
6. Select Enter. ARE YOU SURE? NO > appears
7. Select the right arrow (>). YES appears.
8. Select Enter. Then:
    - PSO RX1 CALIBRATION IN PROGRESS appears during the calibration process.
    - PASS or FAIL appears for 2 seconds when calibration is complete. When PASS appears, continue to Step 3. If FAIL appears, see the WARNING below.

WARNING

IF "FAIL" APPEARS ON THE DISPLAY, THE CALIBRATION PROCESS DID NOT COMPLETE. SHOULD THIS HAPPEN, CYCLE THE MODULE POWER AND THEN REPEAT STEP 2 ABOVE. IF "FAIL" APPEARS AGAIN, REPLACE THE UNIT.

9. CALIBRATE PSO RX2? NO > appears. If RX2 does not require calibration, proceed to Section 6.5.6. If RX2 requires calibration, select the right arrow (>) and repeat steps 1–7.

6.5.5.3 Island Calibration

Table 6-5 Hardwire Shunt Placement Distances for Various Shunting Sensitivities and Island Frequencies

ISLAND FREQUENCY (KHZ)	0.12 Ω SENSITIVITY SHUNT DISTANCE (FEET)	0.3 Ω SENSITIVITY SHUNT DISTANCE (FEET)	0.4 Ω SENSITIVITY SHUNT DISTANCE (FEET)	0.5 Ω SENSITIVITY SHUNT DISTANCE (FEET)
2.14	20.0	50.0	67.0	84.0
2.3	19.0	48.0	64.0	80.0
2.63	17.0	43.0	58.0	72.0
2.8	16.0	40.0	54.0	67.0
3.1	14.0	35.0	47.0	59.0
3.24	13.0	33.0	44.0	55.0
3.5	12.0	31.0	41.0	52.0
4.0	10.5	27.0	36.0	45.0
4.9	9.0	23.0	31.0	39.0
5.4	8.5	21.0	28.0	36.0
5.9	7.5	19.0	26.0	32.0
5.4	8.5	21.0	28.0	36.0
7.1	6.5	17.0	23.0	29.0
7.7	6.5	16.0	22.0	27.0
8.3	6.0	15.0	20.0	25.0
8.9	5.5	14.0	19.0	24.0
9.5	5.5	14.0	19.0	23.0
10.0	5.0	13.0	18.0	22.0
10.2	5.0	13.0	18.0	22.0
11.5	4.5	12.0	16.0	20.0
13.2	4.0	10.0	14.0	17.0
15.2	3.5	9.0	12.0	15.0
17.5	3.0	8.0	11.0	14.0
20.2	3.0	8.0	11.0	14.0

WARNING

AFTER CALIBRATION, VERIFY THAT THE TRACK CIRCUIT DE-ENERGIZES WHEN THE ISLAND CIRCUIT IS SHUNTED WITH THE APPROPRIATE CALIBRATION RESISTANCE ACCORDING WITH RAILROAD PROCEDURES AND APPLICABLE FRA RULES. FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE TRACK CIRCUIT.
AFTER INSTALLATION OR AFTER ANY ISLAND MENU CHANGES HAVE BEEN MADE, RECALIBRATE THE ISLAND CIRCUIT AND TEST FOR PROPER OPERATION.
FOR ALL ISLAND INSTALLATIONS WHERE POOR SHUNTING HAS BEEN EXPERIENCED OR IS ANTICIPATED, PROGRAMMING A 4-SECOND ISLAND PICKUP DELAY AND UTILIZING A 0.3 OHM SHUNTING SENSITIVITY CALIBRATION ARE RECOMMENDED.

NOTE

Table 6-5 provides hardwire shunt distance values for shunting sensitivities of 0.12, 0.3, 0.4 and 0.5 ohms for areas where poor island shunting may be a problem. Proper shunt distance also appears on the front panel Display on the VIU/CAT, providing the shunt distance for the specified frequency.

1. Select the menu button. SITE SETUP > appears.
2. Select the right arrow (>). < CALIBRATION appears.
3. Select the right arrow (>). CALIBRATE ISLAND? NO appears
4. Select the right arrow (>). YES appears
5. Select Enter. ARE YOU SURE? NO > appears
6. Select the right arrow (>). YES appears.
7. 0.12 OHM SHUNT> PLACE AT 6.5 FEET appears. If this value is correct, select ENTER. If another value is required, scroll across the menu until it appears. Temporarily connect a hardware shunt across the track at the specified distance beyond the island receiver rail connections as specified on the Display or from the hardwire shunt distance chart of Table 6-5 (0.12, 0.3, 0.4 and 0.5 ohms).r
8. Select Enter. Then:
   - ISLAND CALIBRATION INITIALIZING initially appears, then ISLAND CALIBRATION IN PROGRESS appears during the calibration process.
   - PASS or FAIL appears for 2 seconds when calibration is complete. When PASS appears, continue to Step 3. If FAIL appears, see the WARNING below.

WARNING

IF "FAIL" APPEARS ON THE DISPLAY, THE CALIBRATION PROCESS DID NOT COMPLETE. SHOULD THIS HAPPEN, CYCLE THE MODULE POWER AND THEN REPEAT STEP 2 ABOVE. IF "FAIL" APPEARS AGAIN, REPLACE THE UNIT.

9. Once the Island has been calibrated, proceed to Crossing Checkout Procedures, Section 6.5.6.2.

6.5.6 VIU/CAT Checkout Procedures

WARNING

VERIFY THAT THE PSO MODULE'S SOFTWARE, FREQUENCY, AND ADDRESS FORMATS ARE 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 TRACK CIRCUIT.
IF ANY RECEIVER IS CALIBRATED IN POOR BALLAST CONDITIONS, IT MUST BE RE-CALIBRATED WHEN BALLAST CONDITIONS IMPROVE.
FAILURE TO FOLLOW THE RAILROAD'S OR AGENCY'S APPROVED WIRING OR INSTALLATION GUIDELINES REGARDING RECEIVER SETTINGS AND CALIBRATION MAY LEAD TO POSSIBLE UNSAFE OPERATION OF THE TRACK CIRCUIT.
AFTER CALIBRATION, VERIFY THAT THE TRACK CIRCUIT DE-ENERGIZES WHEN THE TRACK CIRCUIT IS SHUNTED WITH THE APPROPRIATE CALIBRATION RESISTANCE (0.06, 0.2, 0.3, 0.4, OR 0.5 OHMS). FAILURE TO DO SO MAY LEAD TO INCORRECT OR UNSAFE OPERATION OF THE TRACK CIRCUIT.
FOLLOWING INSTALLATION OR AFTER ANY RECEIVER MENU CHANGES HAVE BEEN MADE, RECALIBRATE THE RECEIVER AND TEST FOR PROPER OPERATION PER THE REQUIREMENTS SPECIFIED IN SECTIONS ERROR! REFERENCE SOURCE NOT FOUND. **AND 6.5.6.2**

6.5.6.1 Receiver Checkout Procedures

1. Press the Status Button and release it. "PSO RX1 Code X NNNN" appears on the Display, where X represents the received code and NNNN represents the signal level received. "PSO RX2 Code X NNNN" or "PSO RX2 Not Used" appears on line 2 of the Display
2. Take note of the Signal Level
3. Remove the Transmitter signal for RX by removing the TX wires from the surge panel (see Figure 6-2).

4. Take note of the Signal Level. If the Signal Level is greater than 20, an unassociated signal of like frequency is present.

WARNING

THE CONDITION DETERMINED IN STEP 4 MUST BE RESOLVED. DO NOT PROCEED TO STEP 5 AND BEYOND UNTIL THE UNASSOCIATED SIGNAL OF LIKE FREQUENCY IS NO LONGER PRESENT.

5. If the transmitter is a VIU/CAT, verify that the PSO TX found on the face of the Display show a horizontal line, signifying no code transmitted. If the transmitter is a PSO 4000, verify that the TX wires are removed from the surge panel.
6. On the face of the VIU/CAT, verify that a Code is not shown in the PSO RX 1 or 2 windows. If a code is shown, replace the VIU/CAT.
7. Replace the Transmitter signal to the track by reconnecting the TX leads to the surge panel.
8. Verify that the code appears in the PSO RX 1 or 2 windows on the face of the display. If the no code appears, replace the VIU/CAT.
9. The system is now ready for operation. Verify proper operation of the track circuit equipment before placing in service in accordance with railroad procedures and applicable FRA rules.
10. Verify proper VIU/CAT operation by observing train moves, per railroad or agency policy.
11. The system is now ready for operation.

6.5.6.2 Island Checkout Procedures

1. Verify that hardwire shunt is in place or place a hardwire shunt at the same location used during Calibration.
2. Look at the window to the right of the ISL LED. A lowercase “o” appears, signifying that the island is occupied. If a lowercase “o” is not present or an uppercase “U” is present, replace the unit.
3. Remove the hardware island shunt. The window to the right of the LED should depict an uppercase “U”, showing that the island is unoccupied. If the LED fails to energize or if the window reflects a lowercase “o”, replace the unit.
4. Verify proper operation of the track circuit equipment before placing in service in accordance with railroad or agency procedures and applicable FRA rules.
5. Verify proper VIU/CAT operation by observing train moves, per railroad or agency policy.
6. The system is now ready for operation.

SECTION 7
DIAGNOSTIC TERMINAL (DT) SOFTWARE

7.0 DIAGNOSTIC TERMINAL (DT) SOFTWARE

7.1 INTRODUCTION

The Diagnostic Terminal (DT) is a Safetran 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 certain vital and non-vital VIU/CAT parameters, plus diagnostic tools that can be used to isolate VIU/CAT system problems (see Section 9).

⚠ WARNING

WARNING

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

NOTE

NOTE

VIU/CAT only works with DT Version 5.0.7 and newer.

7.2 DT TO VIU/CAT INTERFACE

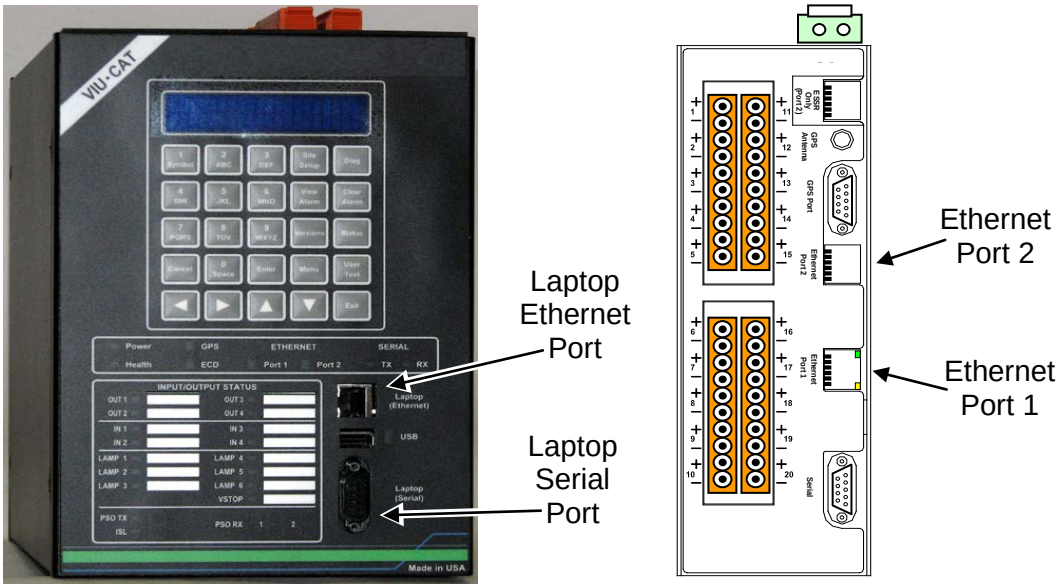


Figure 7-1 VIU/CAT Front Panel Laptop PC Interface Connectors

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

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/CAT front panel.
Via an Ethernet LAN connection between the PC and one of the Ethernet ports (Port 1 or Port 2) on the top of the VIU/CAT.

7.3 DT PROGRAM STARTUP

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

The PC is connected to the VIU/CAT as described in paragraph 7.2 above.
The VIU/CAT is fully operational.

Launch the DT Utility either from the PC Programs list or from a desk-top icon if present.

7.3.1 DT Startup Sequence

The DT Utility establishes a connection to the VIU/CAT, checks the installed VIU/CAT files and then downloads the current VIU/CAT configuration information. A progress bar appears at the bottom of the screen during the download process (Figure 7-2). 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/CAT via the Ethernet port.

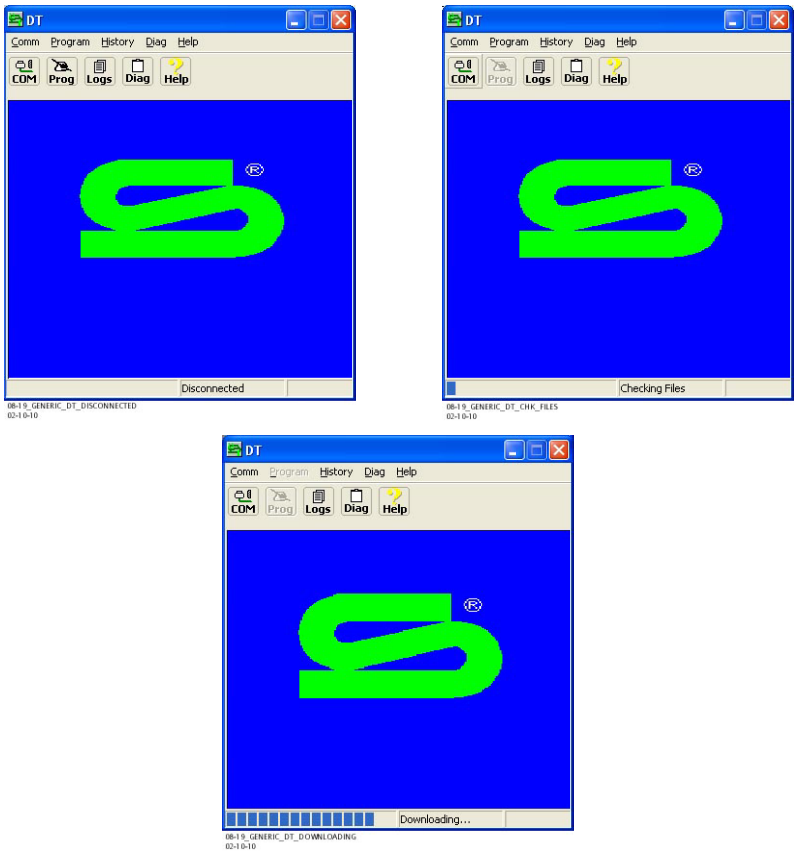


Figure 7-2 DT Start-Up Screens

If the DT Utility was already running prior to connecting the PC to the VIU/CAT, 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/CAT (Figure 7-3).

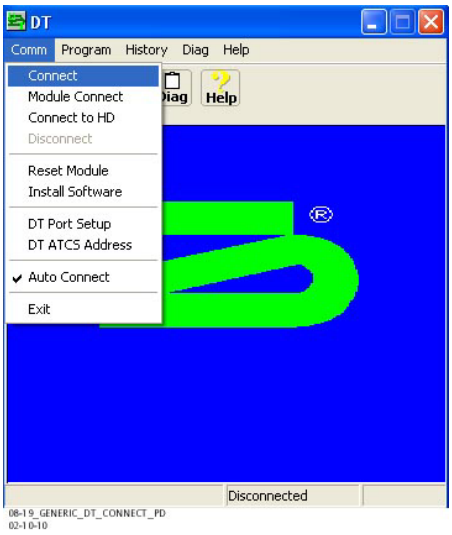


Figure 7-3 COMM Drop Down Menu

See paragraph **Error! Reference source not found.**for DT port setup.

7.4 VIU/CAT INPUT STATUS OVERVIEW SCREEN

Once the DT Utility has successfully established its connection with the VIU/CAT, **Ready** is displayed in the lower right hand message box and an overview of the VIU/CAT 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/CAT is displayed. See Figure 7-4.

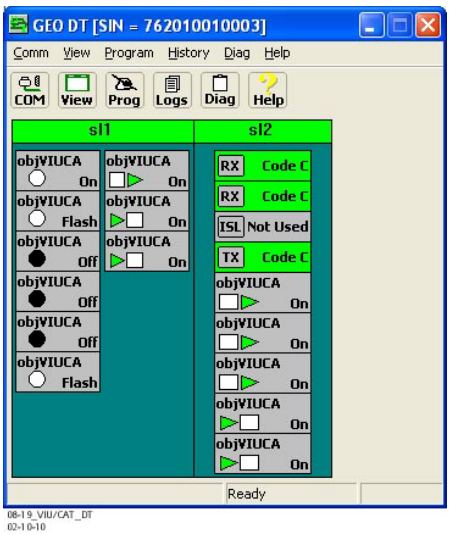


Figure 7-4 VIU/CAT Input Status Overview Screen

The input status overview screen provides a quick indication of the current VIU/CAT health and input status. If foreign energy is present, it is treated like a short and shown in yellow. See Figure 7-5.

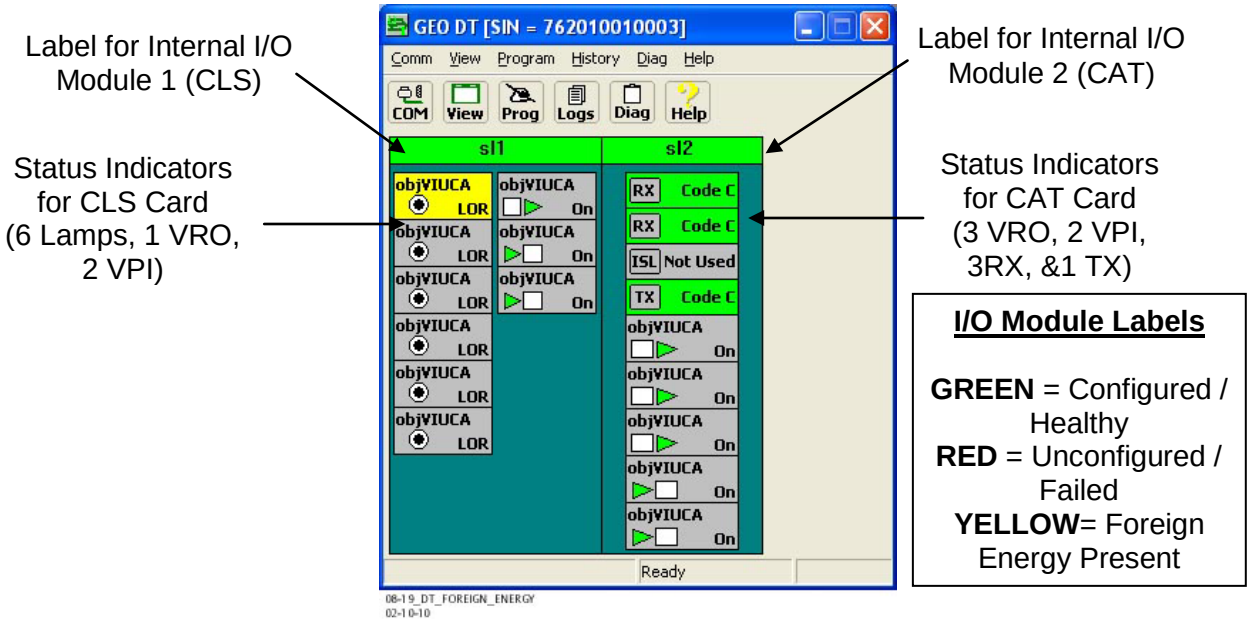


Figure 7-5 VIU/CAT Label Nomenclature

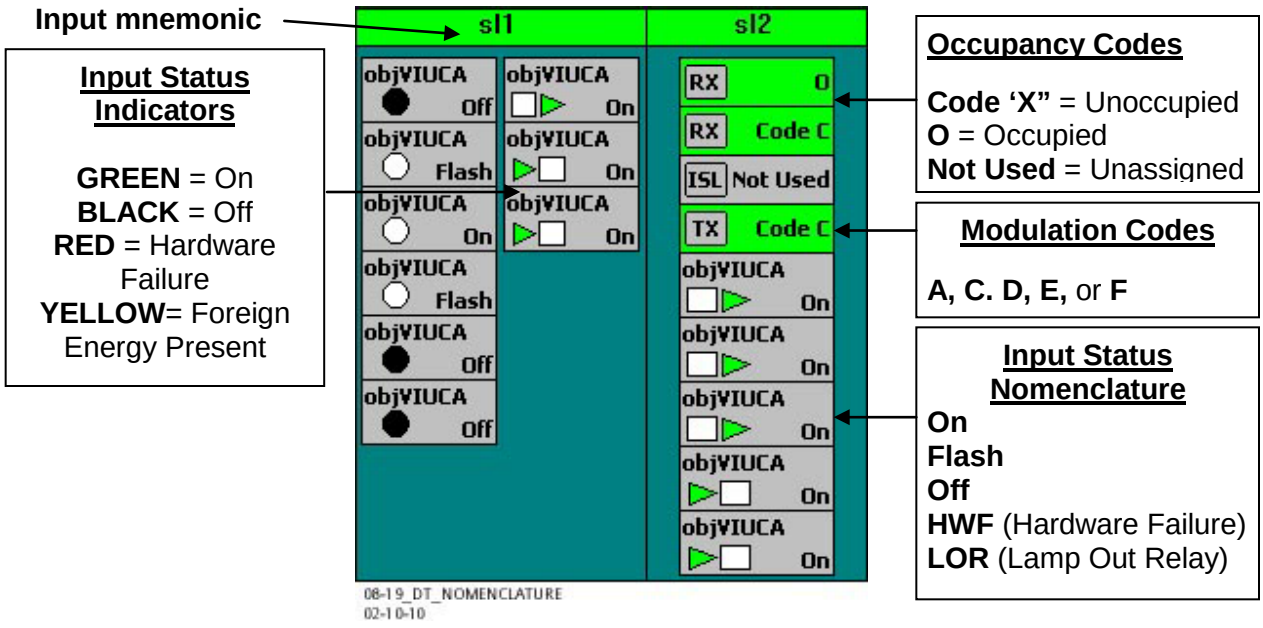


Figure 7-6 Input Status Screen Indicator Descriptions

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 7-7):

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

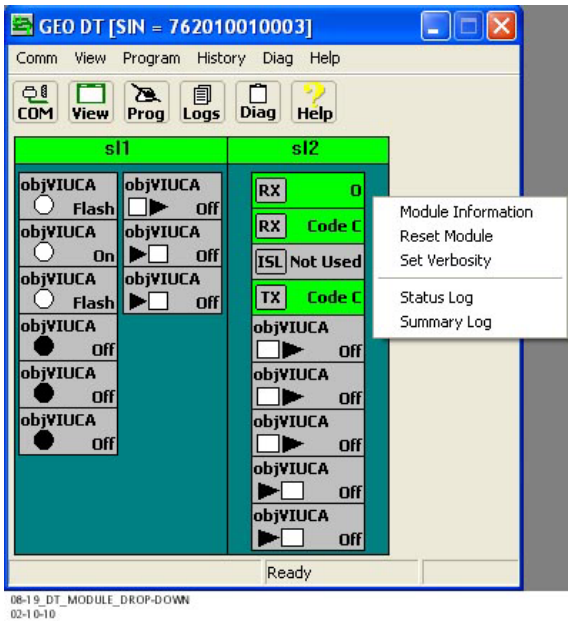


Figure 7-7 I/O Module Drop-Down Menu

NOTE

NOTE

The following information regarding screens and the various programming options available, to include address codes, inputs, and outputs, are based upon the generic MCF generated for typical VIU/CAT applications. If a specific site requires custom application options, contact Siemens Application Engineering.

7.4.1 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/CAT or to perform actions that affect the connected VIU/CAT. The function button and submenu hierarchy is shown in Figure 7-8.

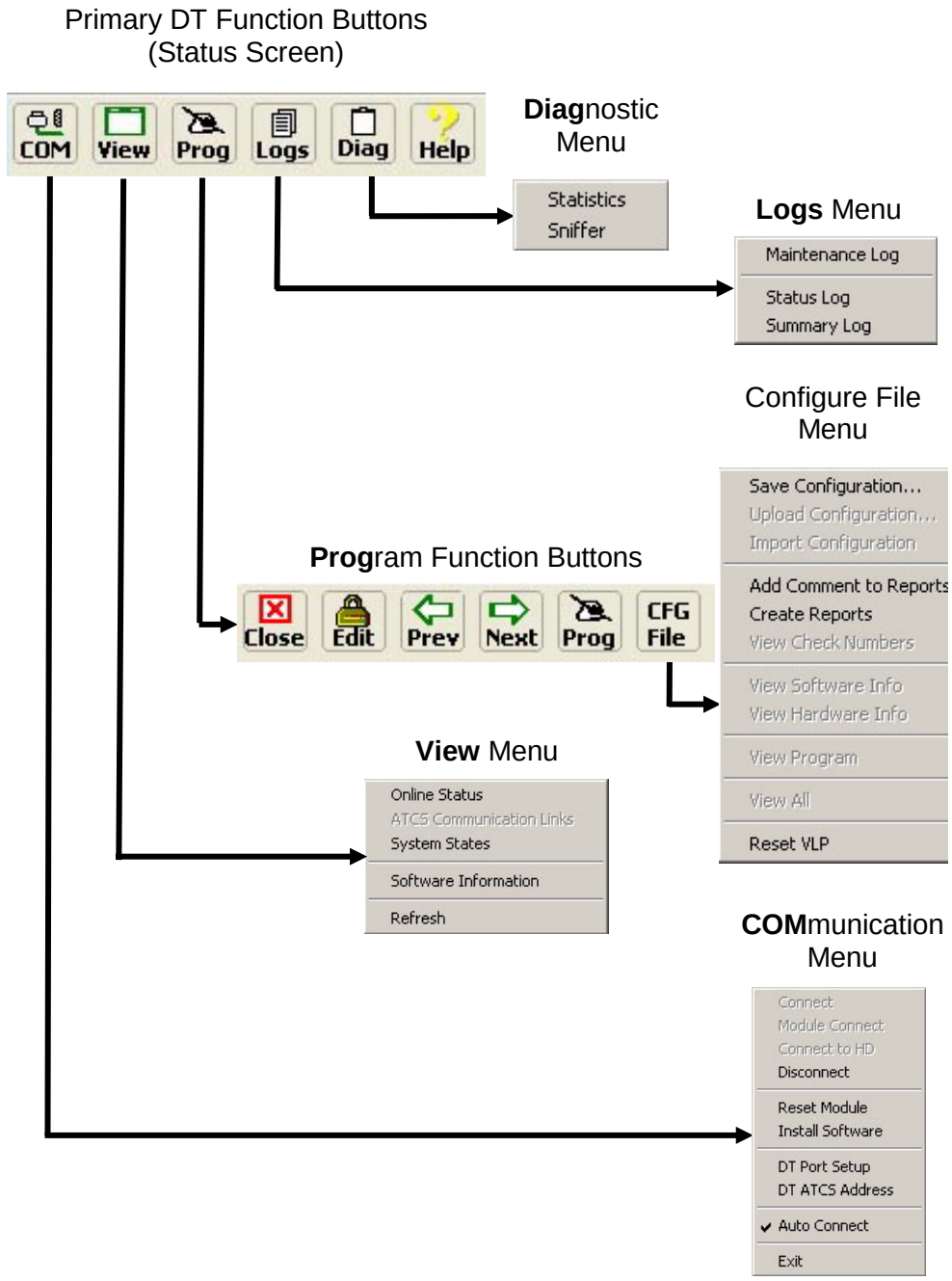


Figure 7-8 DT Function Button and Menu Hierarchy

7.5 COM (COMMUNICATIONS) BUTTON MENU

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

Figure 7-9 The COMM Drop-Down Box

7.5.1 DT Port Setup

Select DT Port Setup from the drop-down menu to display the Communications Settings dialog box (Figure 7-10).

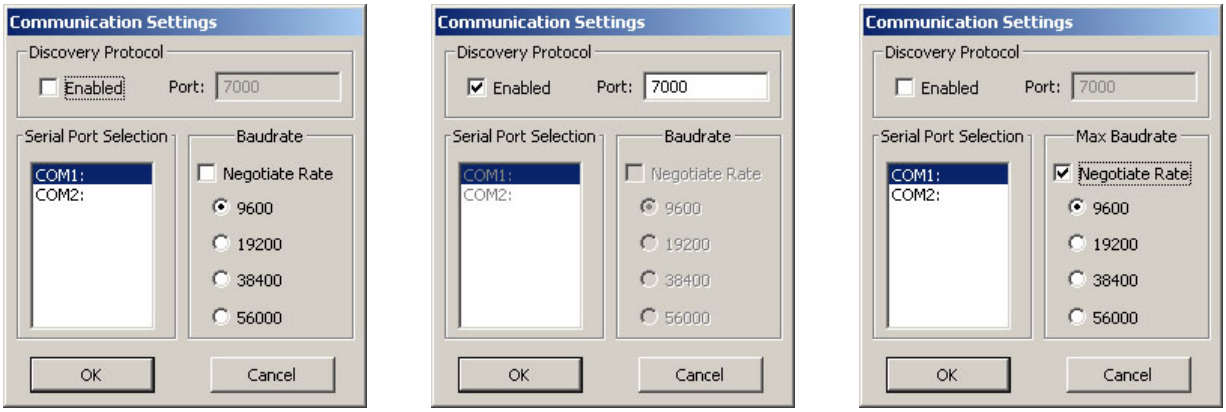


Figure 7-10 DT Communications Settings Dialog Box

This screen is used to configure the baud rate of the selected PC communications port (Figure 7-10A) when communicating with the VIU/CAT via a serial port.

If several VIU/CATs are connected to a Local Area Network (LAN), connect the PC to this network and then select the **Discovery Protocol Enabled** check box (Figure 7-10B). The DT will locate each VIU/CAT on the LAN and present them in a list (Figure 7-11). Select the desired VIU/CAT from the list. This screen refreshes approximately every 15 seconds.

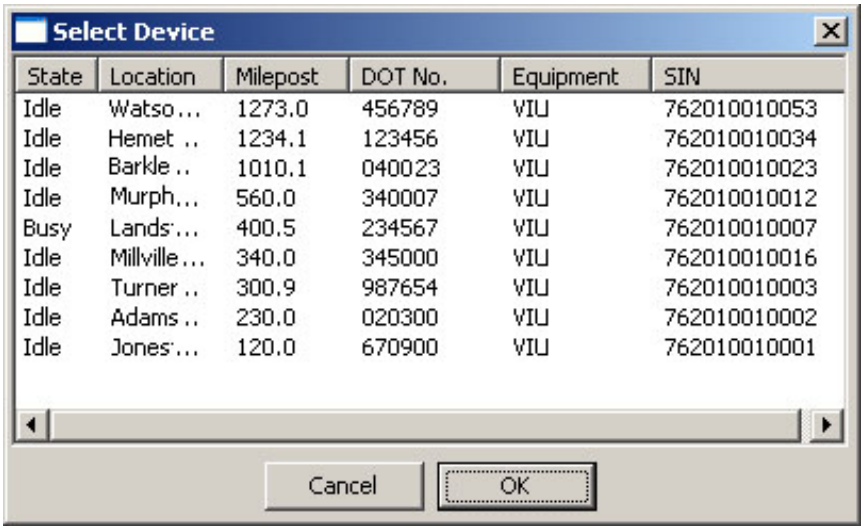


Figure 7-11 List of Networked VIU/CAT Devices

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 7-10C, deselect it.

7.6 VIEW BUTTON MENU

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

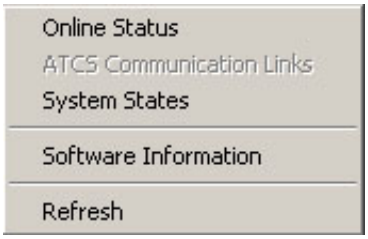


Figure 7-12 The View Drop-Down Box

7.6.1 Software Information

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

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.

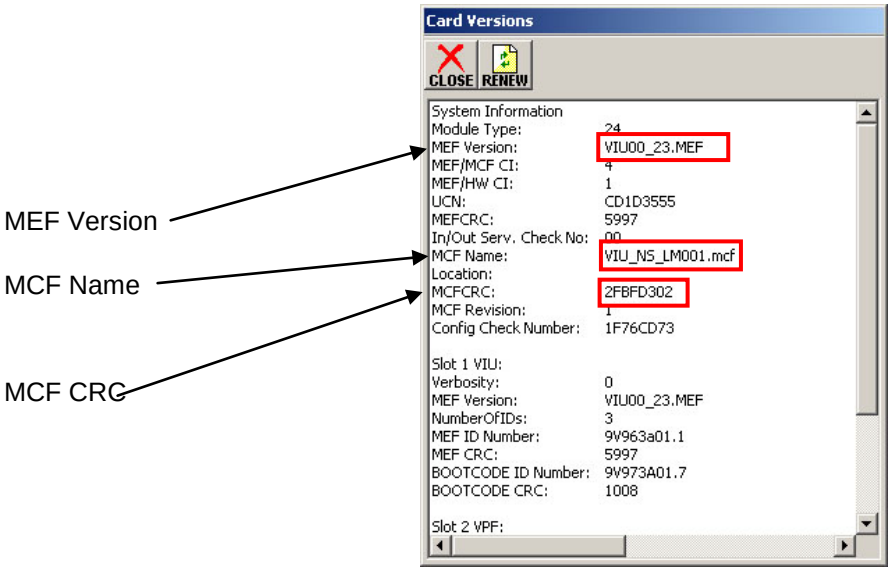


Figure 7-13 Software Information Screen

7.6.2 System States

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

Select the “+” symbol > Inputs > **GET** button at the top of the screen to display the input states.

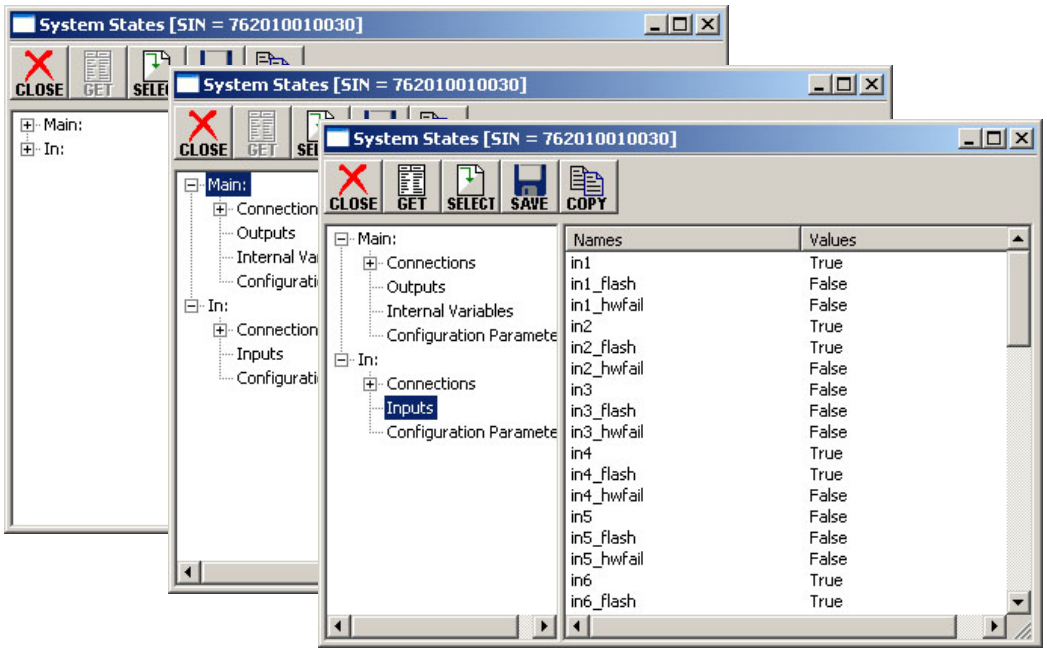


Figure 7-14 Viewing Input States Using System States Function

7.6.2.1 Viewing Input Logic States

To view the logic states for these inputs:

- Click the **SELECT** button at the top of the System States screen to display the Select Range dialog box (Figure 7-15).
- Enter the number of the first and last logic states to be viewed.
- Click the **OK** button.

Figure 7-15 Logic State Select Range Dialog Box

7.6.2.2 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 7-16.

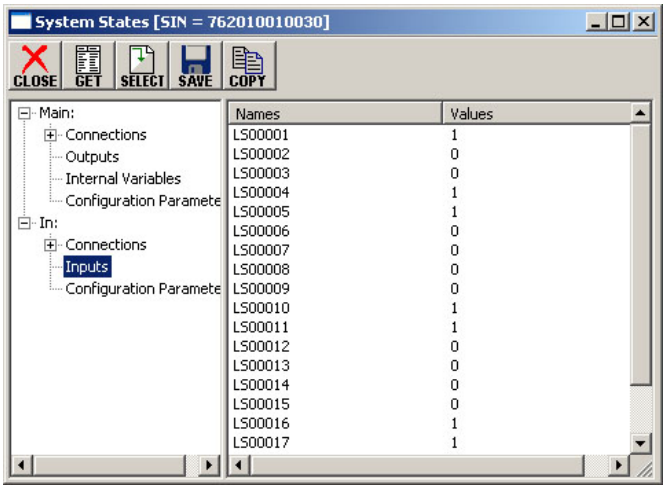


Figure 7-16 Input Logic States Display

7.6.3 Online Status

Select the **Online Status** function from the View drop-down menu to view the internal VIU/CAT status log in real-time. This listing only includes events for the current DT session (Figure 7-17).

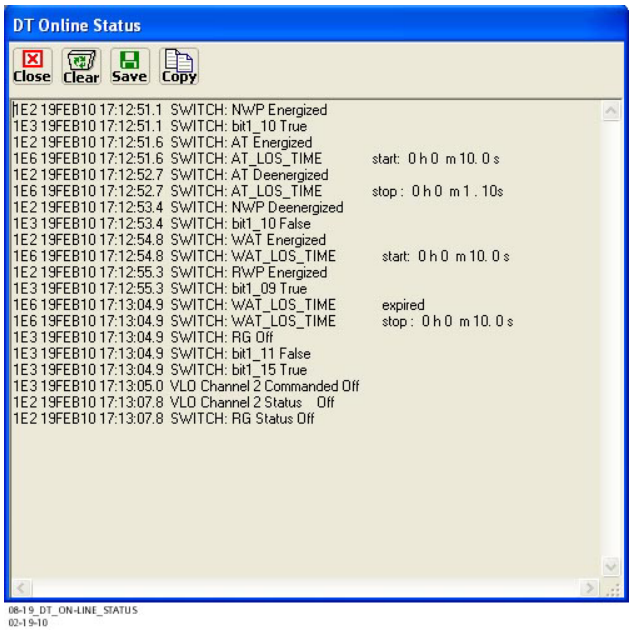


Figure 7-17 DT Online Status Screen

7.7 MAIN PROGRAM MENU

Click the **PROG** (Program) button at the top of the Input Status Screen to display the **MAIN PROGRAM menu** (Figure 7-18). Select an item from the menu to display the associated DT screen.

This menu provides access to the configurable parameter screens.

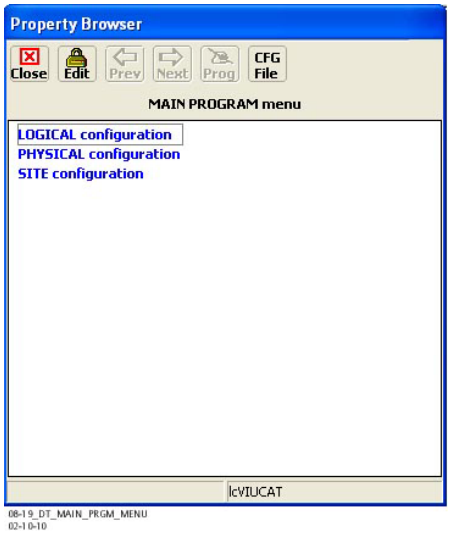


Figure 7-18 MAIN PROGRAM Menu Screen

7.7.1 Changing Locked Configuration Parameters

WARNING

FAILURE TO FOLLOW THE RAILROAD'S OR AGENCY'S GUIDELINES REGARDING UNLOCKING THE EDIT FUNCTION MAY PLACE THE UNIT IN AN UNSAFE CONDITION. ONLY UNLOCK THE EDIT FUNCTION IN THE FIELD IN ACCORDANCE WITH THE RAILROAD'S OR AGENCY'S GUIDELINES.
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/CAT PUTS THE VIU/CAT IN AN UNCONFIGURED STATE. THEREFORE, CHANGE THESE PARAMETERS IN THE MCF OFF-LINE AND THEN UPLOAD THE NEW MCF TO THE VIU/CAT.
IF EDITING OF PARAMETERS MUST BE DONE UNDER FIELD CONDITIONS, UNLOCKING CONFIGURATION PARAMETERS FOR EDITING CAUSES THE SYSTEM TO GO INTO A RESTRICTIVE STATE. THIS WILL EFFECT THE VITAL SIGNALING OPERATION. A NEW UCN IS REQUIRED AFTER ANY CHANGES ARE MADE. PROCEDURES OUTLINING HOW TO CREATE A NEW UCN ARE FOUND IN SECTION 4. ENTER THE NEW UCN USING THE FRONT PANEL DISPLAY. A VITAL REBOOT IS REQUIRED IN ORDER TO PUT THE VIU/CAT FULLY BACK INTO OPERATION.

NOTE

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

To perform a vital reboot: (ALL OF THIS CHANGED)

- Select the menu button on the face of the VIU/CAT
- Select enter when "site setup" appears
- Scroll to yes, then press enter when "enter vital edit mode appears"
- Scroll to "reboot vital" and select enter
- Select enter when "reboot vital are you sure?" appears
- "VITAL CPU REBOOT REQUEST SENT" appears on screen and VIU/CAT reboots
- Select the exit button until the top level messages appear

The parameters preceded by a right angle bracket (>) are vital parameters. 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.

To unlock the configuration parameters, click the **Edit** button at the top of the screen (Figure 7-19).

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.

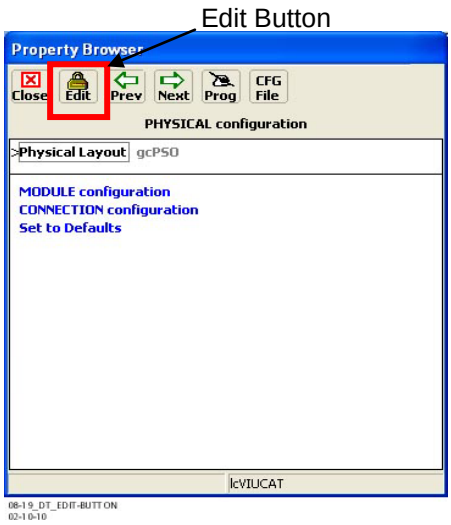


Figure 7-19 Edit Button Location

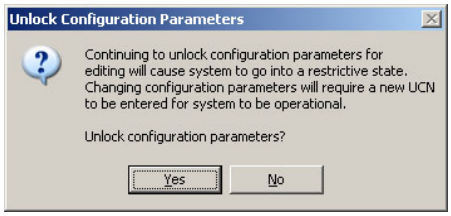


Figure 7-20 Unlock Configuration Parameters

Once all UCN protected changes have been made, follow the procedures of section 4 to create a new UCN and then reboot the VIU/CAT as described above.

7.7.2 LOGICAL Configuration

Select the **LOGICAL Configuration** function from the MAIN PROGRAM menu screen to view the LOGICAL configuration screen (Figure 7-21). Additionally, the system can be reset to the default parameters by selecting Set to Defaults.

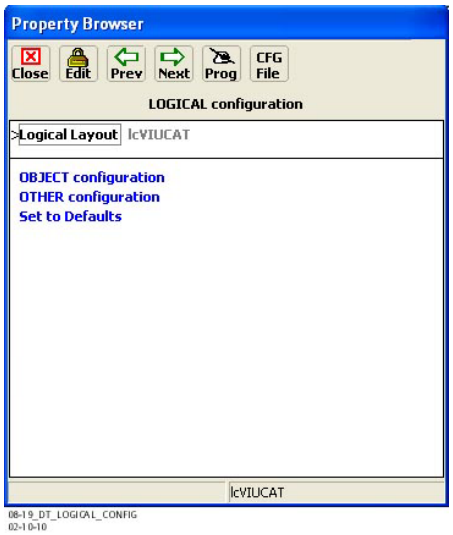


Figure 7-21 LOGICAL Configuration Screen

7.7.2.1 Logical Layout

The Logical Layout is a template consisting of a set of objects, the connections between them and the list of I/O that is to be activated for this application. These items are defined in the MCF.

If more than one Logical Layout template is available, select the desired template in the top list box and then select the **Update** button. This parameter is UCN protected. To modify it, select the **EDIT** button to enable the edit mode. The value will be displayed green when edit mode is enabled.

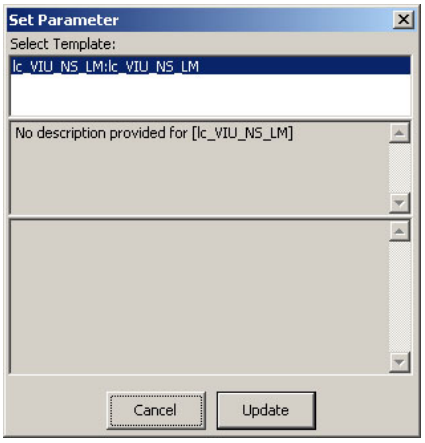


Figure 7-22 Logical Layout Selection Screen

7.7.2.2 OBJECT Configuration

Select **OBJECT configuration** from the LOGICAL configuration screen to display the OBJECT configuration screen (Figure 7-23).

Main (only item listed) is an object in the MCF that represents the main VIU/CAT in a network configuration. This is the only VIU/CAT in the system that has configurable parameters.

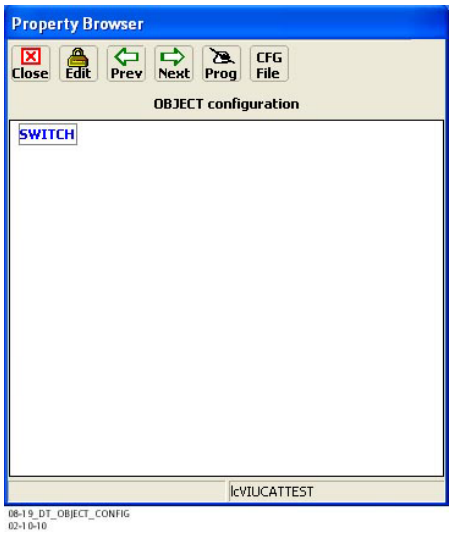


Figure 7-23 OBJECT Configuration Screen

7.7.2.3 OBJECT List

Select the object list item (**SWITCH**) from the OBJECT configuration screen to display a screen listing each of the available items supported by the VIUCAT object in the MCF (Figure 7-24).

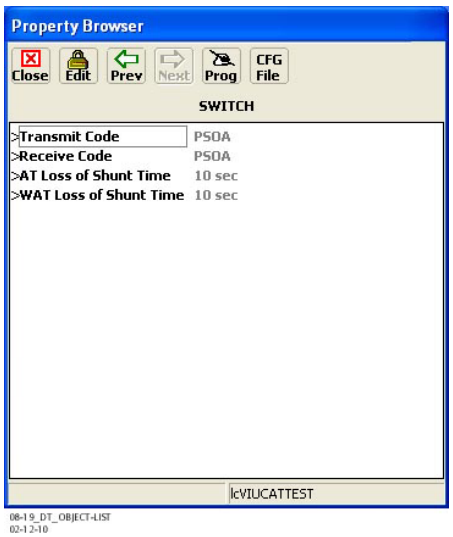


Figure 7-24 OBJECT List Screen

The parameters that appear on the OBJECT list screen are MCF dependent; each parameter is individually chosen and appropriately titled during the construction of the MCF. Contact Siemens Applications Engineering for further information regarding MCF selection and creation requirements.

7.7.2.4 OTHER Configuration Screen

This window is depicts other configuration parameters. There currently are no other parameters in the MCF, so at this time the selections are inactive.

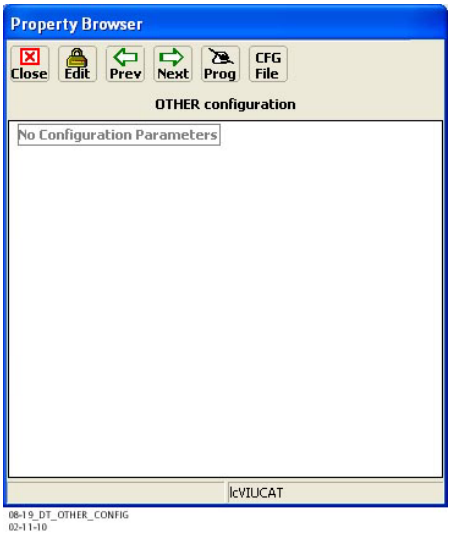


Figure 7-25 OTHER Configuration Screen

7.7.2.5 Set Configuration Parameters to Default

Prior to programming a VIU/CAT for the first time, or following installation of a new MCF, set the VIU/CAT configuration parameters to their default settings. Select **Set to Default** on the LOGICAL configuration screen (Figure 7-21). A prompt is displayed asking the user for confirmation to proceed (Figure 7-26).

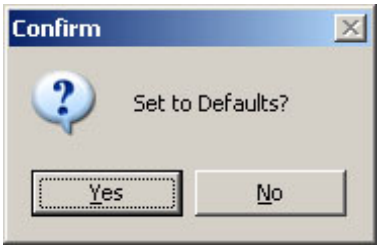


Figure 7-26 Set Parameters to Default Prompt

7.7.3 PHYSICAL Configuration

Select the **PHYSICAL Configuration** function from the MAIN PROGRAM menu screen to view the PHYSICAL configuration screen (Figure 7-27).

A list of physical configuration options is displayed. These options are described in the following paragraphs.

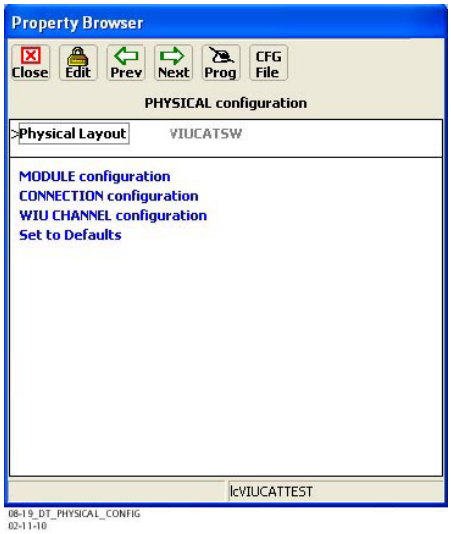


Figure 7-27 PHYSICAL Configuration Screen

7.7.3.1 MODULE Configuration

Select **MODULE configuration** from the PHYSICAL configuration screen to display the MODULE configuration screen (Figure 7-28). From the list of internal I/O modules, select a module to view the configurable parameters for that module.

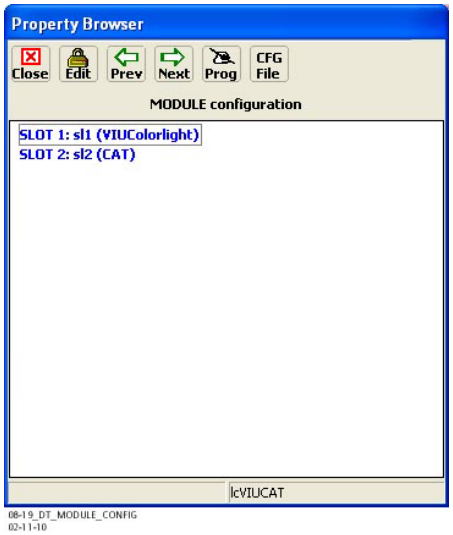


Figure 7-28 MODULE Configuration Screen

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.

Depending on the module selected, one of the following screens is displayed.

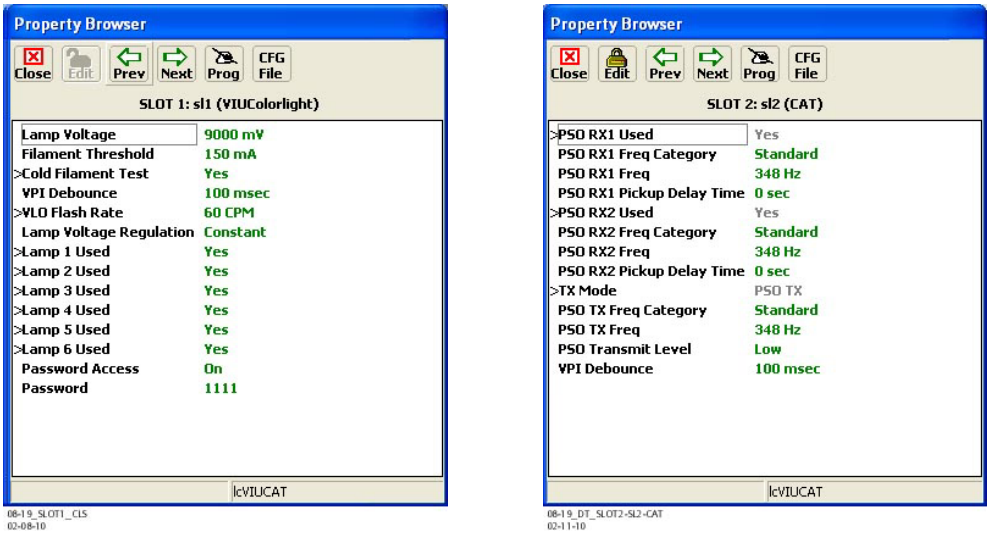


Figure 7-29 Slot 1 & Slot 2 Module Configuration – A: CLS; B: CAT

The setting for each of these configurable parameters falls into one of four categories: a binary list of values; a multiple list of values; or a numerical value. The Set Parameter screens for the three parameter types are shown in Figure 7-30. After entering the number or selecting the option, click the **Update** button to activate the new setting.

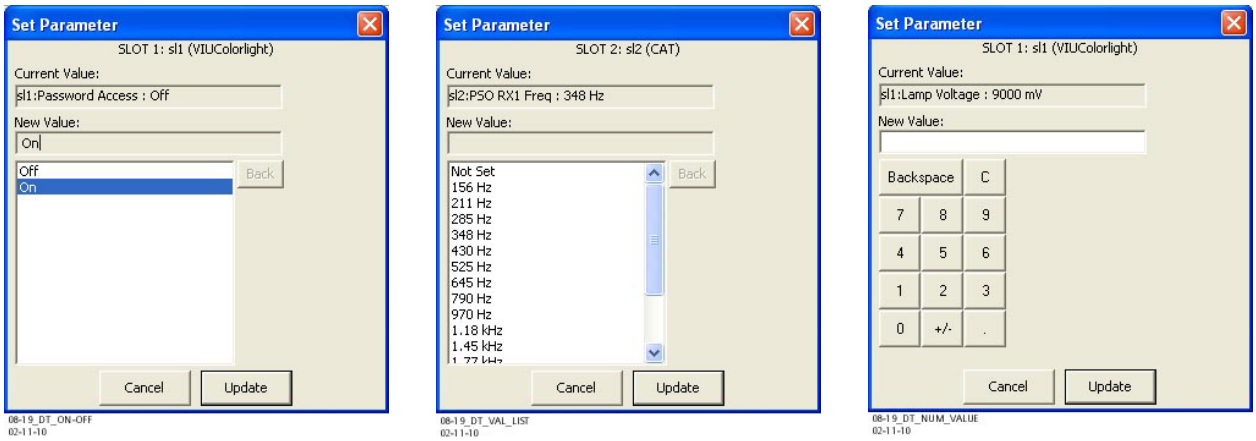


Figure 7-30 Typical Set Parameter Screens

The following parameters appear on the SLOT 1: sl1 (VIUColorlight) Color Light Signal screen (see Figure 7-29A). The functions specified in the MCF will determine the order of appearance and whether or not all values are depicted on the screen.

- **Lamp Voltage**

The Lamp Voltage function is a global setting that is applied to all lamps serviced by this internal I/O module. It sets the voltage level delivered to all lamps. It is selectable in 1 mV increments. No external lamp resistor is required.

Valid Lamp Voltage range:**9000** to **13000** mV (default is **9000 mV**).

- **Filament Threshold**

The Filament Threshold function sets lamp filament threshold for light out detection. The generic setting for successful filament threshold is approximately 700 mV. A setting of 700 mA is typically used to perform filament checks.

Valid Lamp Voltage range:**150** to **2500** mV (default is **150 mV**).

- **Cold Filament Test**

When Cold Filament Test is set to yes, the CLS module apply periodic short test currents to lamps which are off, in order to check that the filament is not burned out. If LED signals are being used, this may result is a momentary flash of the LED, depending on the kind of LED signal. To prevent this flash, Cold Filament Test can be set to No.

Valid options are: **Yes**, **No** (default is **Yes**).

- **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).

- **VLO Flash Rate**

The Flash Rate function determines the flash rate of the lamps. Typical rate is 60 times per minute and mark space ratio of 1 to 1). The VIU/CAT supports synchronous flashing of all lamps from the same module.

Valid options are: 40 CPM – 70 CPM in 5 CPM increments (default is 60 CPM).

- **Lamp Voltage Regulation**

The Lamp Voltage Regulation is set to either constant or variable. Setting the parameter to constant maintains constant lamp output voltage even under low battery conditions. Setting the parameter to variable dynamically reduces the input current requirement and extends battery life.

Valid options are: **Constant**, **Variable** (default is **Constant**).

- **Lamp ‘N’ Used**

The Lamp ‘N’ Used function enables/disables each CLS lamp.

Valid options are: **Yes**, **No** (default is **Yes**).

- **Password Access**

The internal I/O module for slot 1 also controls password access for changing VIU/CAT 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 7-31). This is the actual password. The default password is 1111.

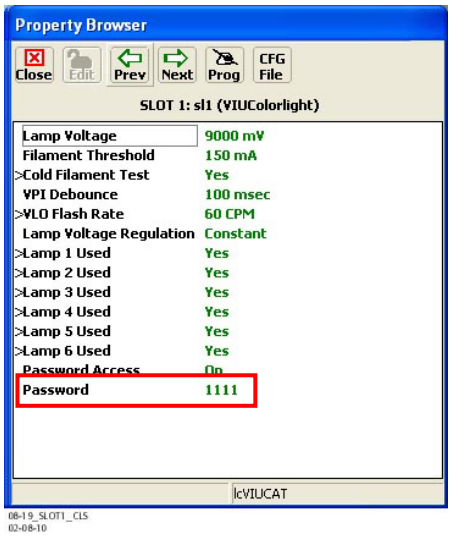


Figure 7-31 Password Enabled

To change the password, click on the green numbers to the right of the word **Password** (1111 in Figure 7-31). The Set Parameter dialog box for changing the password is displayed (Figure 7-32).

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**

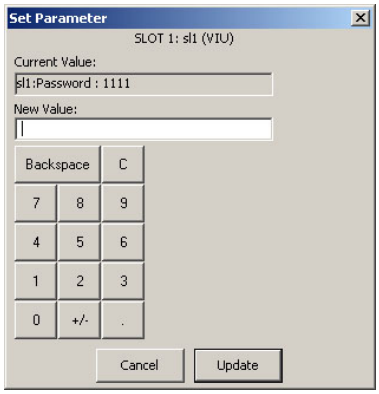


Figure 7-32 Password – Set Parameter Dialog Box

The following parameters appear on the SLOT 2: sl2 (CAT) Coded Audio Track screen. The functions specified in the MCF will determine the order of appearance and whether or not all values are depicted on the screen.

NOTE

NOTE

Address/Modulation Codes used are determined by the MCF. Additionally, all inputs and outputs are programmed within the MCF. Verify correct functionality prior to placing the unit into service.

- **PSO RXN (RX1, RX2) Used**

The PSO RXN Used function enables/disables the receivers determined to be available by the MCF.

Valid options are: **Yes**, **No** (default is **Yes**).

- **PSO RXN (RX1, RX2) Frequency Category**

See Section 6.1.1 for PSO RX Frequency Category information.

Valid options are: **Standard**, **Alternate** (default is **Standard**).

- **PSO RXN (RX1, RX2) Freq**

See Section 6.1.1 for PSO RX Frequency information.

The default frequency setting in either case is **Not Used**.

- **PSO RXN (RX1, RX2) Pickup Delay Time**

The PSO RXN (RX1, RX2) Pickup Delay Time function sets the amount of time the system waits before reacting to the loss of shunt.

Valid options are: 2 – 30 Sec in 1 Sec increments (default is 2 Sec).

VIU/CAT Using Island And Slot 2(CAT) With Island Parameters

- **TX Mode**

The TX Mode function determines whether the transmitter is functioning as a PSO type transmitter with the frequency range of 156 Hz – 10400 Hz or as an Island transmitter with a frequency range of 2.14 kHz through 20.2 kHz.

Valid options are: **PSO TX, ISLAND** (default is **Not Used**).

PSO TX Frequency Category

See Section 6.1.1 for PSO TX Frequency Category information.

Valid options are: **Standard**, **Alternate** (default is **Standard**).

- **PSO TX Freq**

See Section 6.1.1 for PSO TX Frequency information.

The default frequency setting in either case is **Not Used**.

- **TX Transmit Level**

The TX Transmit Level determines whether the frequency is transmitted using Low or High power.

Valid options are: **Low**, **High** (default is **Low**).

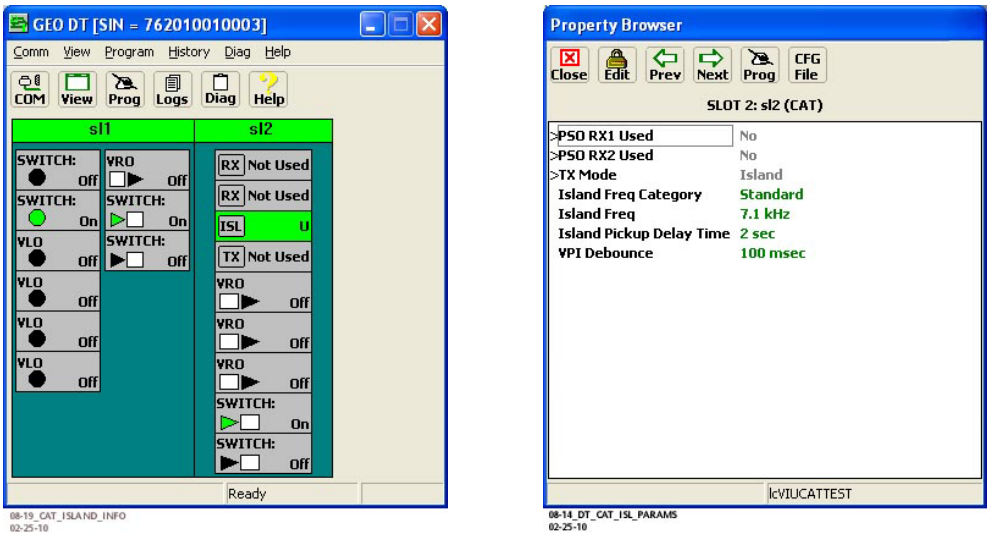


Figure 7-33 VIU/CAT Using Island (Left Screen) and Slot 2 (CAT) with Island Parameters (Right Screen)

- **Island Frequency Category**

See Section 6.1.1 for PSO TX Frequency Category information.

Valid options are: **Standard**, **Alternate** (default is **Standard**).

- **ISLAND Freq**

See Section 6.1.1 for PSO TX Frequency information.

The default frequency setting in either case is **Not Used**.

- **ISLAND Pickup Delay Time**

The ISLAND Pickup Delay Time function sets the amount of time the system waits before reacting to the loss of shunt.

Valid options are: 2 – 30 Sec in 1 Sec increments (default is 2 Sec).

- **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).

7.7.3.2 CONNECTION Configuration

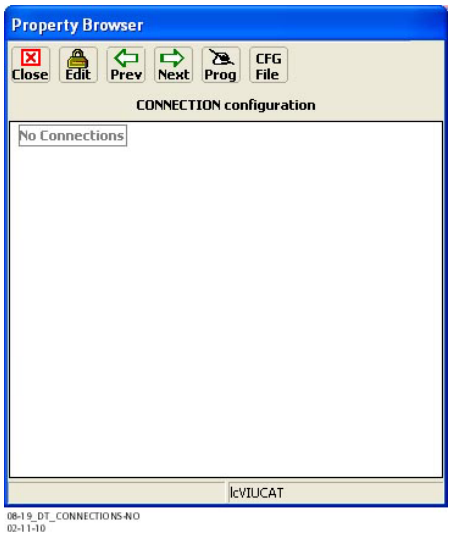


Figure 7-34 CONNECTION Parameters

The parameter is not typically used in generic VIU/CAT applications. The words “No Connections” appear on the screen. If a specific application requires connections, they appear as shown in Figure 7-34.

If Connections are used, then the items listed on Figure 7-35 represent the connection names in the MCF for the geographic messaging links between the Main and Remote VIUs.

- r1 = remote VIU 1
- r2 = remote VIU 2
- r3 = remote VIU 3

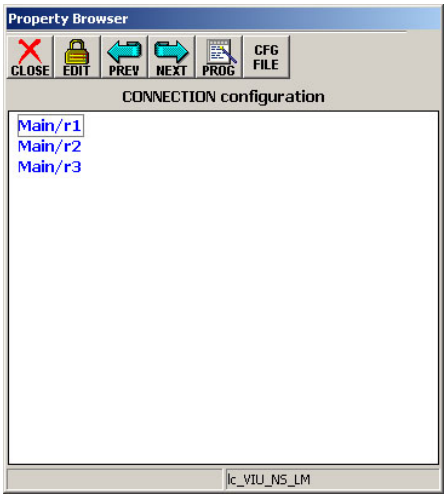


Figure 7-35 CONNECTION Configuration Screen – Connections Used

7.7.3.3 Connection Configuration Parameters

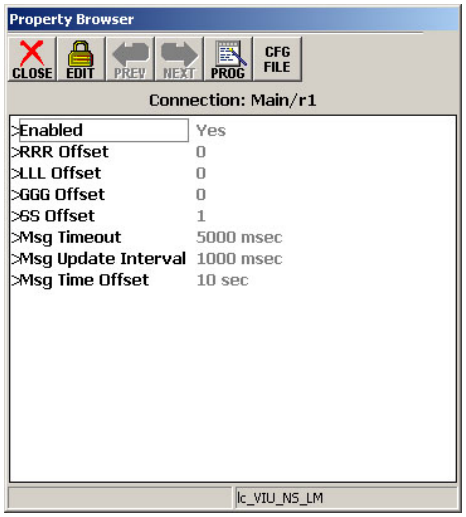


Figure 7-36 CONNECTION Parameter Screen

Select one of the connection links listed on the CONNECTION configuration screen to view the configurable parameters for that link. A similar screen is available for each of the listed links. These parameters apply to the geographic messaging between VIUs. These parameters are all UCN protected. To modify these parameters, select the **EDIT** button to enable the edit mode. The values will be displayed green when edit mode is enabled.

The setting for each of these configurable parameters falls into one of two categories; numerical value or a listed option. Typical Set Parameter screens for both parameter types are shown in Figure 7-37. After entering the number or selecting the option, click the **Update** button to activate the new setting.

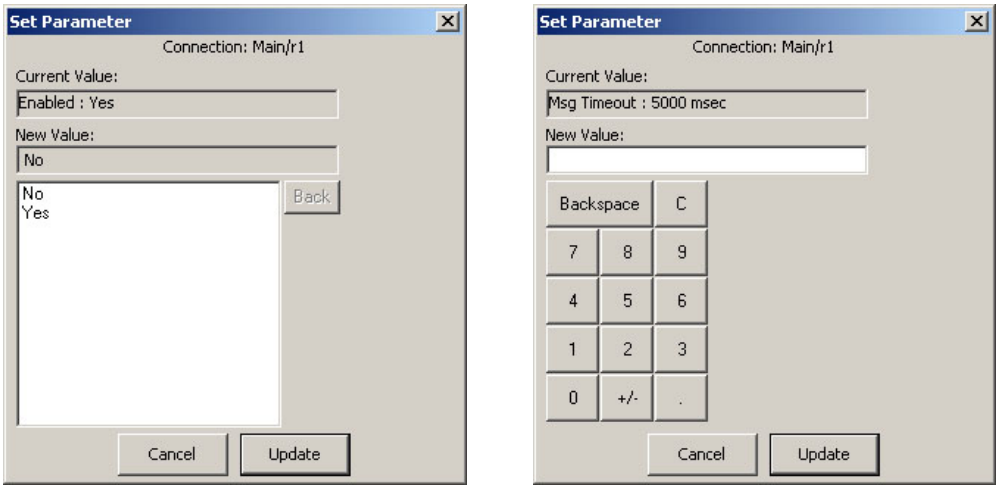


Figure 7-37 Typical Connection Links Parameter Screens

- **Enabled**

Select to Yes to enable the connection between the Main VIU and the indicated Remote VIU.

- Enabled options: **Yes / No** (default – none set).

- **RRR Offset**

This parameter sets the ATCS address railroad number offset. This offset is the difference between the connected Remote VIU railroad number and the railroad number of the Main VIU.

- RRR Offset range: **-999 to 999** (default – not set).

- **LLL Offset**

This parameter sets the ATCS address line number offset. This offset is the difference between the connected Remote VIU line number and the line number of the Main VIU.

- LLL Offset range: **-999 to 999** (default – not set).

- **GGG Offset**

This parameter sets the ATCS address group number offset. This offset is the difference between the connected Remote VIU group number and the group number of the Main VIU.

- GGG Offset range: **-999 to 999** (default – not set).

- **SS Offset**

This parameter sets the ATCS address subnode offset. This offset is the difference between the connected Remote VIU subnode and the subnode of the Main VIU.

- SS Offset range: **-99 to 99** (default – not set).

- **Msg Timeout**

This parameter sets the period of time the Main VIU will wait for a valid message from the remote VIU. If a message is not received within the timeout period, the remote VIU is logged as being in the most restrictive state.

  - Msg Timeout range: **1000** to **60000 msec** (default – not set).

- **Msg Update Interval**

This parameter sets the interval between repeat messages transmitted from the Remote VIU to the Main VIU. Messages are sent immediately if a change of input state occurs at the Remote VIU.

  - Msg Update Interval range: **400** to **30000 msec** (default – not set).

- **Msg Time Offset**

This parameter sets the length of time the Main VIU will wait for a message before classifying it as a stale message.

Msg Time Offset range: **5** to **30 sec** (default – not set).

7.7.3.4 WIU CHANNEL Configuration

Select **WIU CHANNEL configuration** from the PHYSICAL configuration screen to display the WIU CHANNEL configuration screen (Figure 7-38).

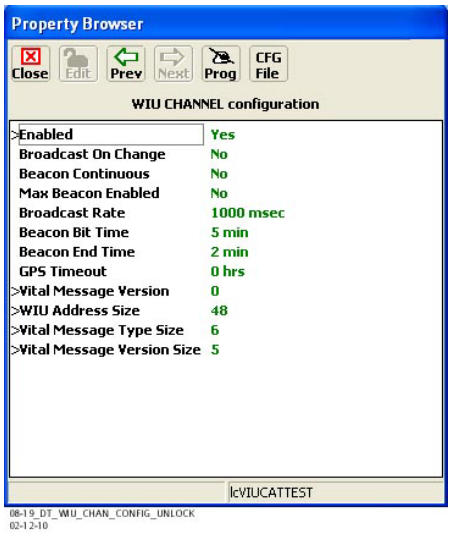


Figure 7-38 WIU Channel Configuration Parameter Screen

Parameters with the right angle bracket (>) to the left of the parameter name are UCN protected. To modify these parameters, select the **EDIT** button to enable the edit mode. The values will be displayed green when edit mode is enabled.

- **Enabled**

The Enabled function determines whether the WIU CHANNEL Configuration is enabled or disabled. If disabled, the WIU CHANNEL configuration parameters do not appear.

Valid options: **Yes** / **No** (default is **No**).

- **Broadcast On Change**

The VIU can be configured to broadcast a status message for a WIU channel whenever an input on that channel changes state. To enable this function set the **Broadcast on Change** function to **Yes**.

Valid options are: **Yes**, **No** (default is **No**).

- **Beacon Continuous**

When the Beacon Continuous function is set, the VIU/CAT sends WIU Channel messages periodically at the configured Broadcast rate, or when a state change occurs if the "Broadcast on Change" configuration parameter is set.

When the Beacon Continuous function is not set, the VIU/CAT sends messages an interval specified by the Max Beacon Interval either when a period of time has elapsed equal to sum of the configured Beacon On Time plus the Beacon End Time of since the last update message or when a state change occurs if the Broadcast on Change configuration parameter is set.

Valid options are: **Yes**, **No** (default is **No**).

- **Max Beacon Enabled**

The Max Beacon Enabled function determines whether messages are transmitted at the time specified in the Max Beacon Interval setting.

Valid options are: **Yes**, **No** (default is **No**).

- **Broadcast Rate**

Each WIU channel in the VIU can be configured to broadcast status messages on a regular basis. Set the **Broadcast Rate** function to the number of milliseconds between regular status message broadcasts.

Valid Broadcast Rate range: **250** to **60000** msec (default is **1000** ms).

- **Beacon Bit Time**

The Beacon Bit Time function specifies the duration of the Beacon Bit.

Valid Beacon Bit Time range: **1** to **30** minutes (default is **5** minutes).

- **Beacon End Time**

The Beacon End Time function specifies the expiration time of the Beacon Bit following its transmission.

Valid Beacon End Time range: **1** to **30** minutes (default is **5** minutes).

- **Max Beacon Interval**

The Max Beacon Enabled function specifies the maximum amount of time in minutes between transmissions of WIU update messages. This is set only when the Max Beacon Enabled parameter is set to Yes.

Valid Beacon Bit Time range: **1** to **24** minutes (default is **15** minutes).

- **GPS Timeout**

The VIU uses a GPS time reference for the time stamp on the Wayside Status Messages (WSMs). This reference may be supplied by either the internal GPS receiver or a customer supplied GPS receiver interfaced to the VIU via the top panel serial port. The GPS Timeout function sets the length of time the VIU will go without a GPS time update before it stops sending WSMs. This setting is configurable for each WIU channel.

Valid GPS Timeout range: **0** to **48** hours (default is **24** hours).

- **Vital Message Version**

The Vital Message Version function sets the type of vital message to be transmitted by the WIU.

Valid Vital Message Version range: **0** to **65535** (default is **0**).

- **WIU Address Size**

The WIU Address Size function sets the size in bits of the WIU Address.

Valid Test Message Interval range: **0** to **48** (default is **48**).

- **Vital Message Type Size**

The Vital Message Type Size function sets the size in bits of the vital message type.

Valid Test Message Interval range: **0** to **16** bits (default is **6** bits).

- **Vital Message Version Size**

The Vital Message Version Size sets the size in bits of the vital message version.

Valid Test Message Interval range: **0** to **16** bits (default is **5** bits).

7.7.3.5 Set Configuration Parameters to Default

Prior to programming a VIU for the first time, or following installation of a new MCF, set the VIU configuration parameters to their default settings. Select **Set to Default** on the PHYSICAL configuration screen (Figure 7-27). A prompt is displayed asking the user for confirmation to proceed (Figure 7-39).

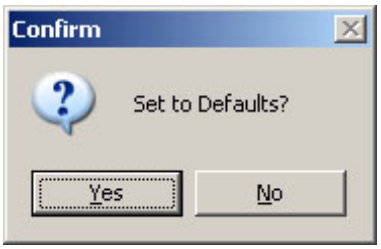


Figure 7-39 Set Parameters to Default Prompt

7.7.4 SITE Configuration

NOTE

NOTE

Data pertaining to SITE INFORMATION (i.e., Site Name, Milepost, DOT Number, and Time Zone) can only be set and/or edited using the Web User Interface (Web U/I). For further information regarding the Web U/I, refer to Section 8).

Select the **SITE Configuration** function from the MAIN PROGRAM menu screen to view the SITE configuration screen (Figure 7-40).

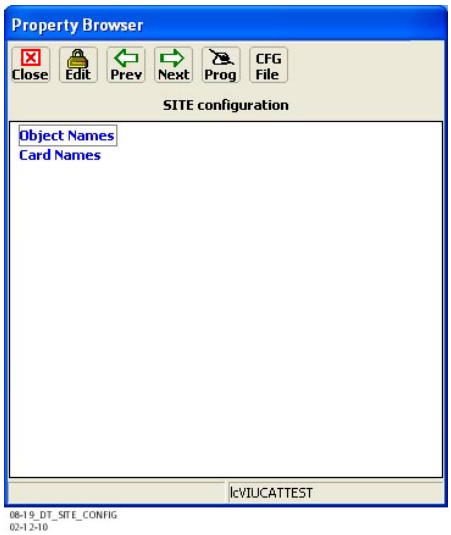


Figure 7-40 SITE Configuration Screen

7.7.4.1 Object Names

Select **Object Names** on the SITE configuration screen to display the Object Name Editor (Figure 7-41).

Use this editor to create unique names for objects used in the MCF. After entering the name using the PC keyboard, click the **APPLY** button.

In this example the names assigned are:

- **Main** = Main VIU/CAT
- **MnIn** = a remote object residing in the Main VIU/CAT
- **Rem1** – Rem3 = Remote VIU/CATs

To reset the name to the default name, click the **Reset to Default** button.

NOTE

NOTE

Object names are changed using the Object Name Editor. Changes made to the object are global in nature, and change all objects at once. Changing the object name does not require reboot.

When finished, click the **CLOSE** button to return to the SITE configuration screen.

Figure 7-41 Object Name Editor

7.7.4.2 Card Names

Select **Card Names** on the SITE configuration screen to display the Card Name Editor (Figure 7-42).

Use this editor to create unique names for the internal I/O modules and the WIU channels, if desired. After entering a name using the PC keyboard, click the **APPLY** button.

To reset a name to the default name, select the name from the list and then click the **Reset to Default** button.

When finished, click the **CLOSE** button to return to the SITE configuration screen.

Figure 7-42 Card Name Editor

7.8 HIST (HISTORY) BUTTON MENU

Click the **HIST** button at the top of the Input Status Screen to display the History drop-down menu. This menu provides access to several history logs. These logs are in addition to the Event Log and Diagnostic Log maintained by the VIU/CAT.

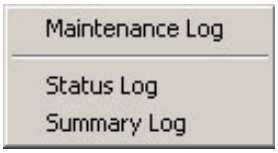


Figure 7-43 History Drop-Down Dialog Box

7.8.1 Maintenance Log

Select **Maintenance Log** from the History drop down menu to display the Maintenance Log screen. The VIU/CAT Maintenance Log (Figure 7-44) contains the following types of information:

Changes in VIU/CAT operational status
Parameter changes
User entered maintenance notes

Each entry in the log is date and time stamped. The log is maintained in the DT install directory on the PC. If more than one VIU/CAT is accessed via a network, the Maintenance Log will be common to all VIU/CATs.

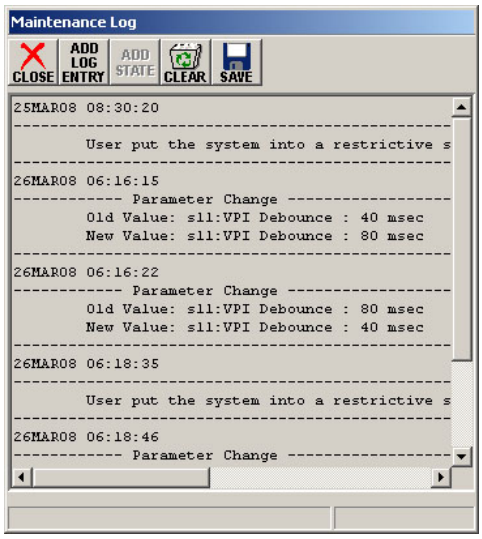


Figure 7-44 Maintenance Log Screen

7.8.2 Status Log

Select **Status Log** from the History drop down menu to display the status log screen. The VIU/CAT status log (Figure 7-45) is a record of all VIU/CAT system events and is primarily a diagnostic tool.

The log contains entries from both the master and slave I/O circuit logs. These logs are lost when VIU/CAT power is cycled.

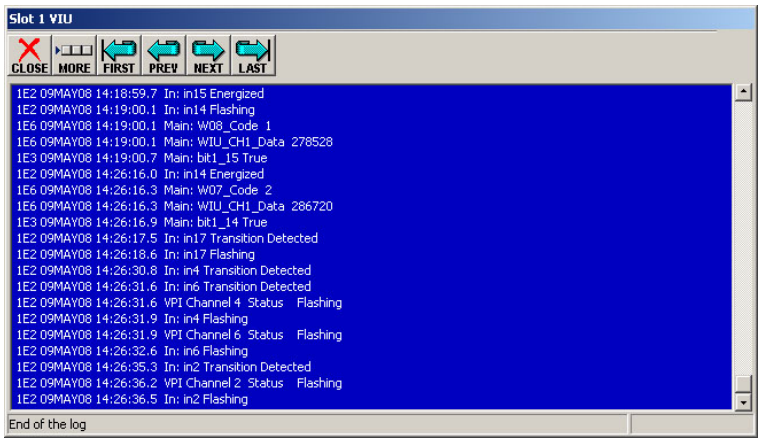


Figure 7-45 Status Log Screen

7.8.3 Summary Log

Select **Summary Log** from the History drop down menu to display the summary log screen. The VIU/CAT summary log (Figure 7-46) is a summary of significant events from the status log.

It also includes error events. This log is primarily a diagnostic tool. These logs are lost when VIU/CAT power is cycled.

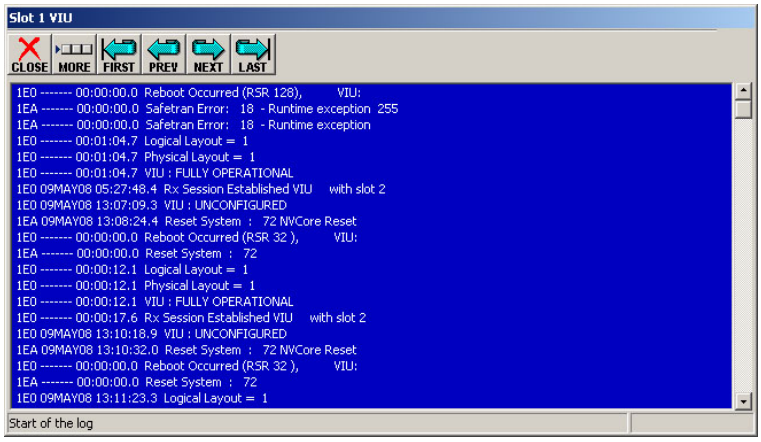


Figure 7-46 Summary Log Screen

7.9 DIAG (DIAGNOSTICS) BUTTON MENU

Please refer to Section 9 for a discussion of the DIAG button menu and the diagnostic functions it provides.

7.10 HELP BUTTON

The Help button displays the Diagnostic Terminal copyright information and version number. After viewing the information click the OK button.

7.11 VIU/CAT XML FILE

The UCN Calculator version of the Display Terminal's Office Configuration Editor has the ability to generate XML files regarding the devices (Signals, Switches, or Hazard Detectors) present in the MCF. This capability provides an additional method for the planner to provide clear instructions to installation teams. This functionality is not supported in field units because loading this data directly from a field unit into the locomotive may represent a common mode failure where the database in the train always matches the unit. However, this may not match the actual installation and could result in the train using an incorrect signal aspect.

WARNING

THE XML FILE OUTPUT IS NON-VITAL; IT DOES NOT CONTAIN CORRUPTION OR SAFETY PROTECTION. THE USER OF THE DATA MUST VERIFY THE VALIDITY OF THE FILE CONTENTS.

To open the VIU XML File window, open the DT offline and either open the selected MCF or a .pac file of that MCF. When the Office Configuration Editor opens, select CFG File > VIU XML File.

Figure 7-47 VIU OCE Window with VIU XML File Selected

This action then opens the VIU XML File window.

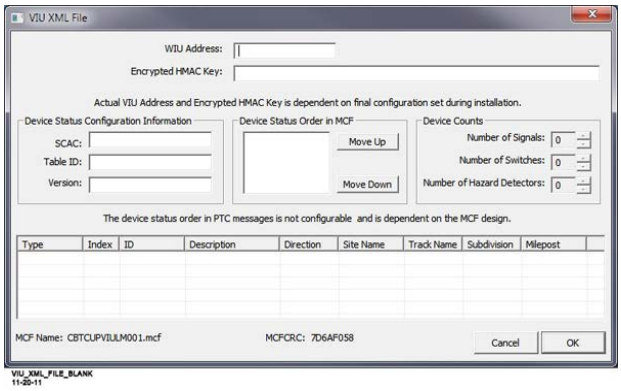


Figure 7-48 VIU/CAT XML File Window

The window initially opens with the WIU Address, Encrypted HMAC Key, Device Status Configuration Information, Device Status Order in MCF, Device Counts, and Device Section fields blank. The MCF Name field and MCFCRC fields are populated with data entries. The XML file is created based upon the site application and the railroad or agency approved site drawing plans.

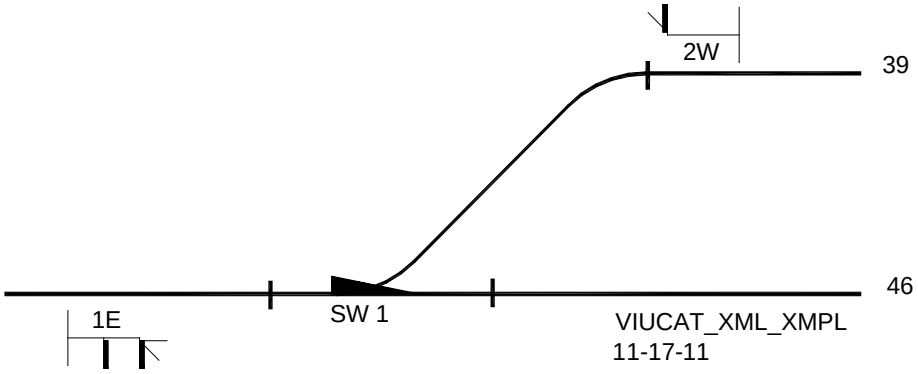


Figure 7-49 Generic VIU/CAT Application Diagram

In the example depicted in Figure 7-49, the application MCF contains a left facing switch leading onto a spur line. There are three signals controlling movement across the main line (Track 46) or off of the spur line (Track 39).

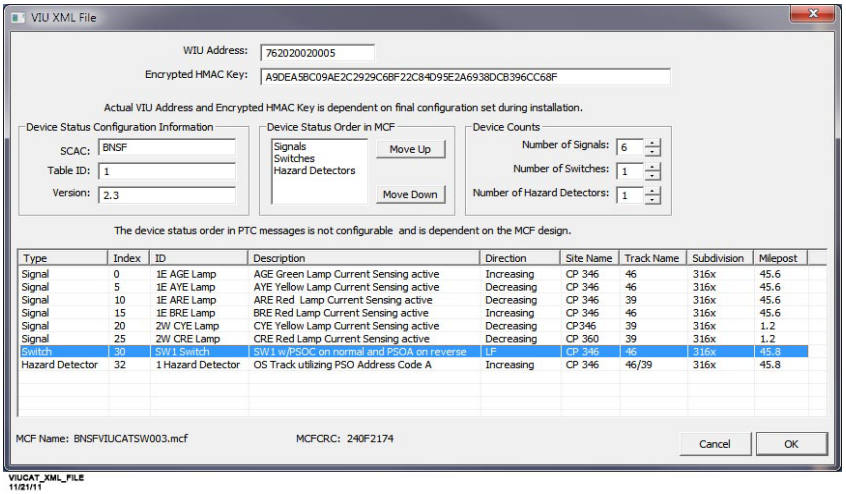


Figure 7-50 VIU/CAT XML File Window

As shown in Figure 7-48, the VIUCAT initially assembles the data found within the MCF regarding the site and places that data into an XML file. The planner then assembles information drawn from the site specific configuration data settings to set the Device Counts and Device Status Order in MCF fields. For each device status, the DT creates the corresponding device section in the file for the device type. These individual lines appear in the lower portion of the window (see Figure 7-50). However, setting the device counts/order in the VIU XML File does not change them in the MCF. Changing site specific configuration data settings is the only method that configures the MCF.

Table 7-1 VIU/CAT XML File Manually Populated Fields

ELEMENT	DESCRIPTION
Number of Signals	The number of Signals found in the site specific configuration data settings
Number of Switches	The number of Switches found in the site specific configuration data settings
Number of Hazard Detectors	The number of Hazard Detectors found in the site specific configuration data settings
Device Status Order in MCF	The device types (Signals, Switches, or Hazard Detectors) listed in the above three elements. The user may use the Move Up or Move Down buttons to set the order of devices.
Type	The device section type (Signal, Switch, or Hazard Detector) taken from the WSM site specific configuration data setting.
Index	The offset id determined from the site specific configuration data by listing the devices in order taken from the Device Status Order in MCF field and applying an offset of 5 for Signals, an offset of 2 for Switches, and an offset of 1 for Hazard Detectors.
ID	The ID is pre-determined from the MCF and the site specific configuration data represented by a number and the device name (1E Signal or 2W Switch) The planner may need to change this value to match IDs to specific devices.

When initially preparing the VIU XML File listing, the planner enters the WIU Address and Encrypted HMAC Key data by referring to the railroad's or agency's approved site plan. This information may be typed or pasted into the fields. The planner then enters the data for the Device Status Configuration Information portion of the window by entering the SCAC, Table ID, and Version information. The DT will not save the XML file without this information present in the file. The following fields are mandatory for using the VIUCAT XML File functionality:

Table 7-2 VIU/CAT XML File Mandatory Fields

ELEMENT	DESCRIPTION
WIU Address	The type 7 address using 12 digits (7RRRLLLGGGSS) that are entered without dots (762010010004)
Encrypted HMAC Address	The encrypted 24 hexadecimal (48 character) HMAC address that is either typed or pasted into place.
SCAC	Data taken from the railroad or agency approved site plan
Table ID	Data taken from the railroad or agency approved site plan
Version	Data taken from the railroad or agency approved site plan

The planner determines the order of the devices (Signals, Switches, or Hazard Detectors) presented in the Device Status Order in MCF portion of the VIU XML File window. This order governs the order of devices presented in the Individual Device Listing. The DT then prompts the planner to enter the optional fields data listed by device in the Individual Device Listing found in the lower section of the window. The planner may leave these fields blank and of so, the DT will not write the element into the XML file. The DT will default these fields with any values it can determine from the MCF and site specific configuration data. The following fields are optional for using the VIUCAT XML File functionality:

Table 7-3 VIU/CAT XML File Optional Fields

ELEMENT	DESCRIPTION
Description	The description of the device provided by the planner.
Direction	For a Signal the values are Increasing or Decreasing, and for a Switch the values are Left Facing (LF), Left Reverse (LR), Right Facing (RF) or Right Reverse (RR).
Site Name	Data taken from the railroad or agency approved site plan
Track Name	Data taken from the railroad or agency approved site plan
Subdivision	Data taken from the railroad or agency approved site plan
Milepost	Data taken from the railroad or agency approved site plan

To enter the optional data, double click one of the device lines.

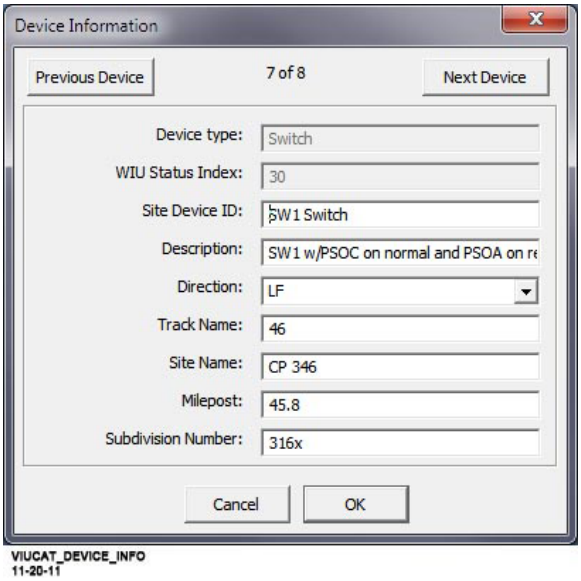


Figure 7-51 VIU/CAT Device Information Window

The XML file created is found in Config_********-WiuConfig. xml. The ******** is the file name given to the .pac file. The actual XML file appears as follows:

Table 7-4 Sample VIU/CAT XML WIU Configuration Report

```
<?xml version="1.0" encoding="UTF-8" ?>
- <WIUConfig xsi:noNamespaceSchemaLocation="WIU_config.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <Timestamp>2011-11-20T19:20:58Z</Timestamp>
  <WIUAddress>762020020005</WIUAddress>
  <WIUName>VIU CAT</WIUName>
  <BeaconFlag>N</BeaconFlag>
  <EncryptedHMACkey>A9DEA5BC09AE2C2929C6BF22C84D95E2A6938DCB396CC68F</EncryptedHMACkey>
  <ConfigCRC>7606B147</ConfigCRC>
  <AppProgramName>BNSFVIUCATSW003.mcf</AppProgramName>
  <AppProgramCRC>240F2174</AppProgramCRC>
  <DeviceStatusConfigSCAC>BNSF</DeviceStatusConfigSCAC>
  <DeviceStatusConfigTableId>1</DeviceStatusConfigTableId>
  <DeviceStatusConfigVersion>2.3</DeviceStatusConfigVersion>
- <Signal>
  <SiteDeviceId>1E Signal</SiteDeviceId>
  <Description>Green/Yellow/Red Signal no plate</Description>
  <SiteName>CP 346</SiteName>
  <TrackName>46</TrackName>
  <SubdivisionNumber>316x</SubdivisionNumber>
  <Milepost>45.6</Milepost>
  <WIUStatusIndex>0</WIUStatusIndex>
  <SignalDirection>Increasing</SignalDirection>
    </Signal>
- <Signal>
  <SiteDeviceId>1W Signal</SiteDeviceId>
  <Description>Green/Yellow/Red Signal no plate</Description>
  <SiteName>CP 346</SiteName>
  <TrackName>46</TrackName>
  <SubdivisionNumber>316x</SubdivisionNumber>
  <Milepost>45.9</Milepost>
  <WIUStatusIndex>5</WIUStatusIndex>
  <SignalDirection>Decreasing</SignalDirection>
    </Signal>
- <Signal>
  <SiteDeviceId>1 Signal</SiteDeviceId>
  <Description>Yellow/Red Signal no plate</Description>
  <SiteName>CP 346</SiteName>
  <TrackName>39</TrackName>
  <SubdivisionNumber>316x</SubdivisionNumber>
  <Milepost>1.2</Milepost>
  <WIUStatusIndex>10</WIUStatusIndex>
  <SignalDirection>Decreasing</SignalDirection>
    </Signal>
- <Switch>
  <SiteDeviceId>SW1 Switch</SiteDeviceId>
  <Description>SW1 with PSOA on reverse</Description>
  <SiteName>CP 346</SiteName>
  <TrackName>46</TrackName>
  <SubdivisionNumber>316x</SubdivisionNumber>
  <Milepost>45.8</Milepost>
  <WIUStatusIndex>15</WIUStatusIndex>
  <SwitchDirection>LF</SwitchDirection>
    </Switch>
  - <HazardDetector>
  <SiteDeviceId>1 Hazard Detector</SiteDeviceId>
  <Description>OS Track indicated by PSOA</Description>
  <SiteName>CP 346</SiteName>
  <TrackName>46/39</TrackName>
  <SubdivisionNumber>316x</SubdivisionNumber>
  <Milepost>45.8</Milepost>
  <WIUStatusIndex>17</WIUStatusIndex>
  <SwitchDirection>Increasing</SwitchDirection>
    </HazardDetector>
    </WIUConfig>
```

SECTION 8
VIU/CAT WEB BROWSER USER INTERFACE

8.0 VIU/CAT WEB BROWSER USER INTERFACE

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 INTRODUCTION

The VIU/CAT Web browser user interface will run on Windows Explorer (versions 6 & 7) and on Mozilla Firefox browser (version 2). The Web browser user interface allows local or remote configuration of certain VIU/CAT non-vital parameters, plus access to the Event and Diagnostic logs that can be used to isolate VIU/CAT system problems (see Section 9 – Maintenance and Troubleshooting).

8.2 LAUNCHING THE VIU/CAT WEB BROWSER

NOTE

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

8.2.1 User Computer Setup

Setting up a computer to connect with the Communication Manager follows standard fundamental LAN protocol. The User Ethernet Port defaults as a DHCP Server. Setting the computer as a DHCP client will enable the Communications Manager 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 Communications Manager 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.

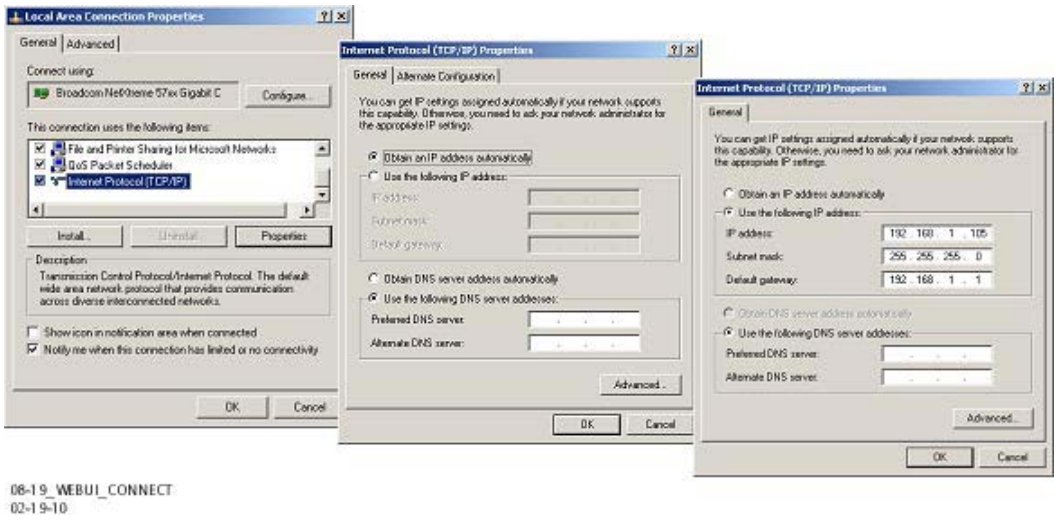


Figure 8-1 Establishing WEB U/I Setup Parameters

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

Launch the Internet Explorer (or Mozilla Firefox browser) on the PC. On the URL line enter the IP address of the connected VIU/CAT (Figure 8-2). If this is a new VIU/CAT the default IP address is 192.168.1.100.

Figure 8-2 Internet Explorer URL Line

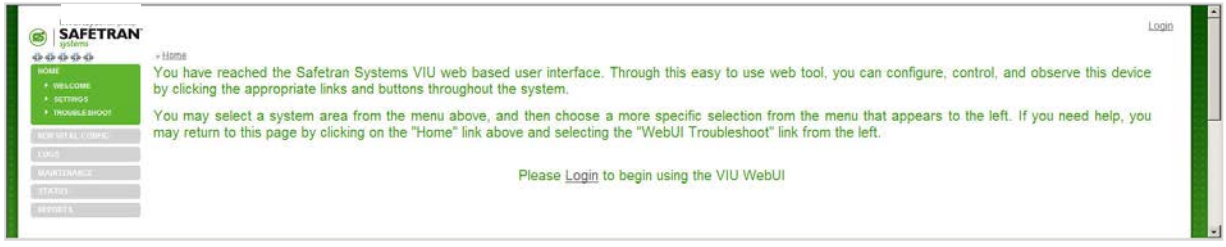


Figure 8-3 VIU/CAT Web Browser Login Screen

Select **Login** either in the upper right corner or the center of the login screen (Figure 8-3). Enter the username and password when prompted (Figure 8-4). Click the **Login** button.

- Default user name: admin
- Default password: safetran

These entries are all lower case and are case sensitive.

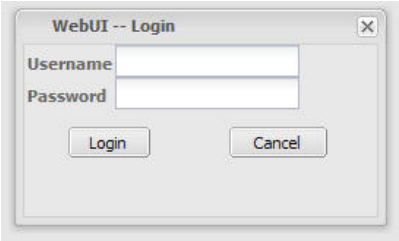


Figure 8-4 Web Browser Login Dialog Box

The Welcome screen is displayed (Figure 8-5).

NOTE

NOTE

For optimum viewing, display the Web browser window in full screen.

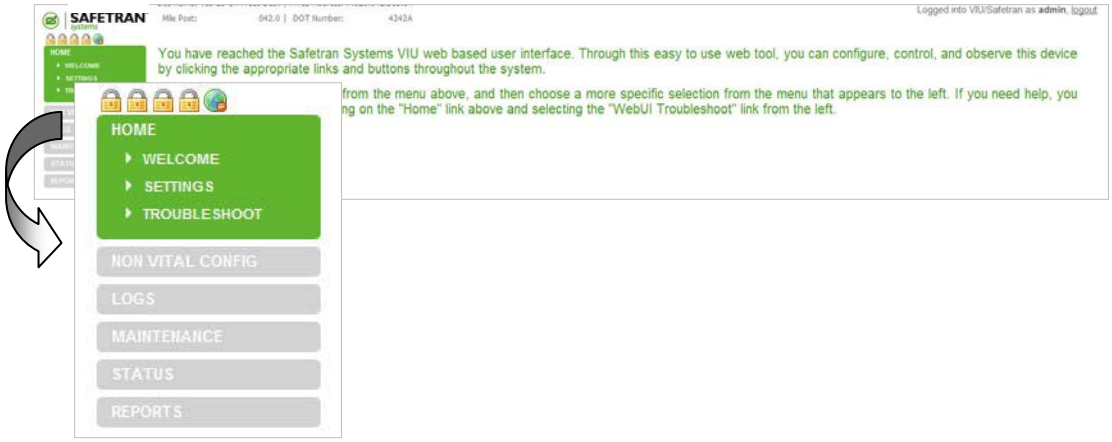


Figure 8-5 Web Browser Welcome Screen

8.2.2 Web Browser Icons

In the upper left corner of the screen below the Safetran 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/CAT.

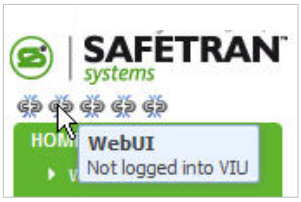
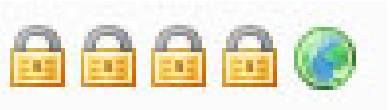


Figure 8-6 Web Browser Initial Icons

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

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.

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

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.

The Save button saves the current parameter values to the VIU/CAT 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.

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.

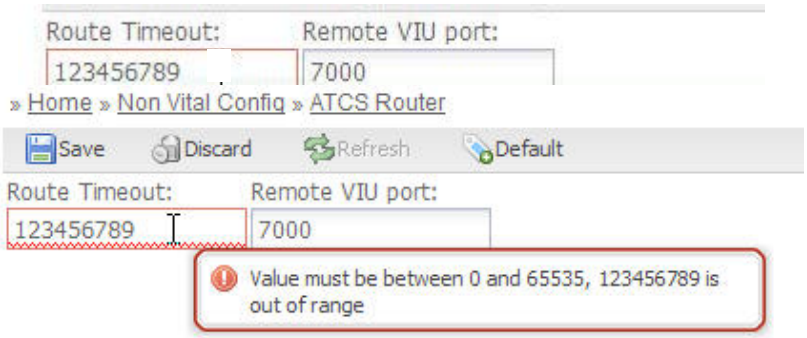
Lightning bolt icon

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/CAT from Edit Mode. When the reboot button is pressed a command is given to the Vital Core requesting a reboot which removes the VIU/CAT 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.

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.



8.3 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 (**Error! Reference source not found.**).

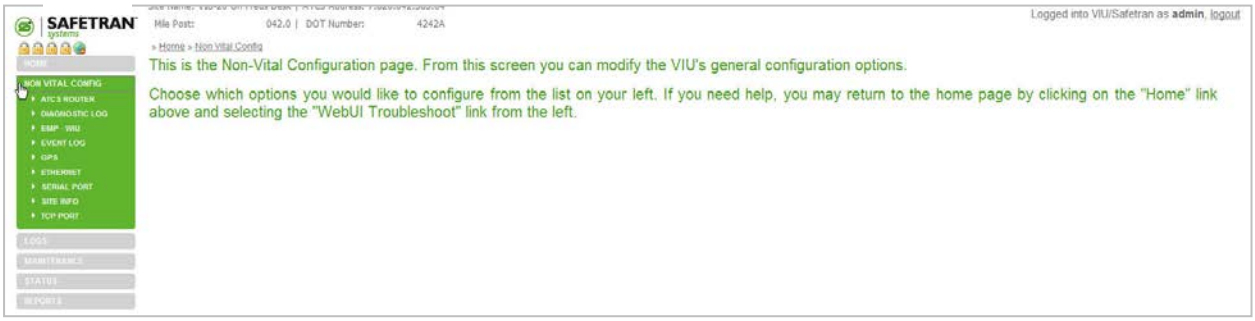


Figure 8-7 Initial Non-Vital Configuration Screen

On the initial Non-Vital Configuration screen, select the desired parameter group from the Non Vital Config menu (**Error! Reference source not found.**).

Figure 8-8 Non-Vital Configuration Screen

8.3.1 ATCS Router Configuration

The ATCS Router configuration screen is shown in **Error! Reference source not found.**.

8.3.1.1 Route Timeout

The VIU/CAT internally keeps a routing table that maps ATCS addresses to IP addresses. Each route table entry has a timer that will expire if no traffic is heard from that address within the Route Timeout setting.

- Route Timeout range: **0** - **65535** seconds (default is **7500** seconds).

8.3.1.2 Route Timeout

This entry is the UDP port number used for the exchange of ATCS messages on the LAN.

The UDP port number range: **0** - **65535** (default is **7000**).

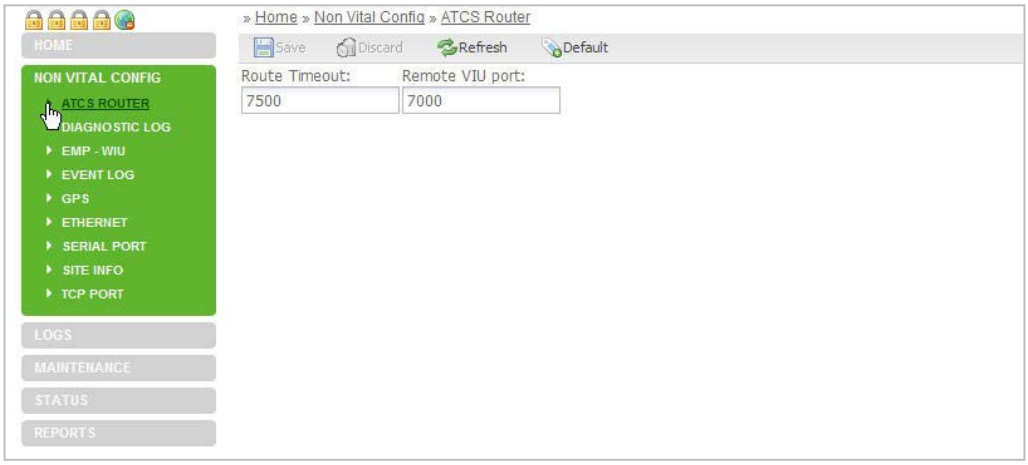


Figure 8-9 ATCS Router Configuration Screen

8.3.2 Diagnostic Log Configuration

The Diagnostic Log configuration screen is shown in **Error! Reference source not found.**.

8.3.2.1 Server IP

When one or more VIU/CATs are operating on a network, each VIU/CAT 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/CAT. The logger can be another VIU/CAT.

To configure each VIU/CAT 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**).

8.3.2.2 Diagnostic Log Verbosity

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.

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

Diagnostic Log Verbosity options: **Error**, **Warning**, **Info, Debug** (default is Info)

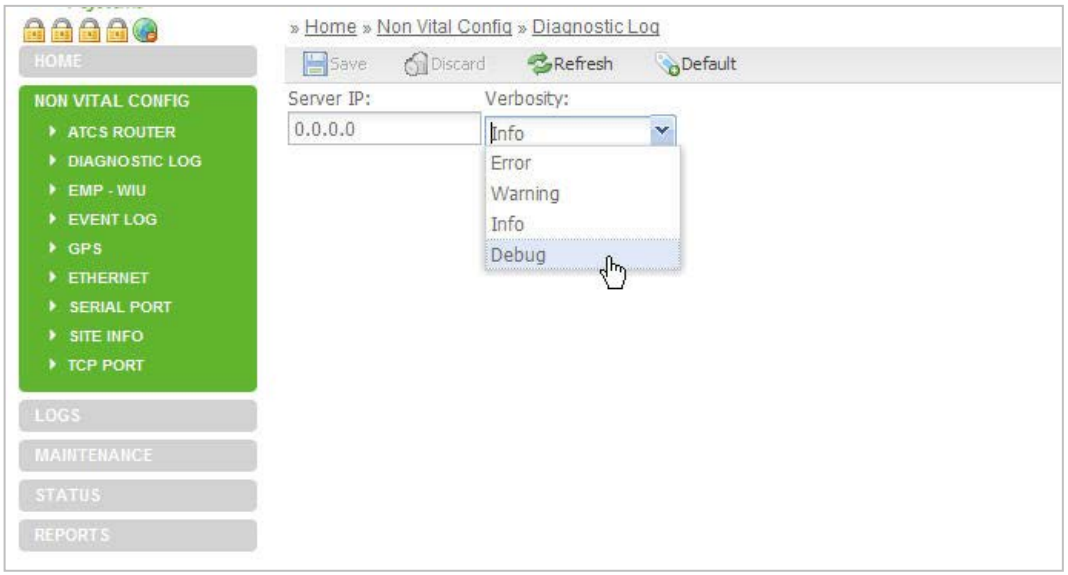


Figure 8-10 Diagnostic Log Configuration Screen

8.3.3 EMP-WIU Configuration

NOTE

NOTE

MCFs created earlier than February 2010 do not support this functionality. It only appears in this document as a basic description and a point of future reference. This includes the non-support of ITC EMP functionality. For additional information consult Siemens Technical Support.

EMP-WIU configuration provides two screen views for parameter changes. The basic view shown in Figure 8-11 allows the encrypted RC2 key to be entered, message parameters to be set, the WIU source address to be assigned. The advanced view shown in Figure 8-12 includes additional addressing information plus port and additional message configuration parameters. These parameters are described in the following paragraphs.

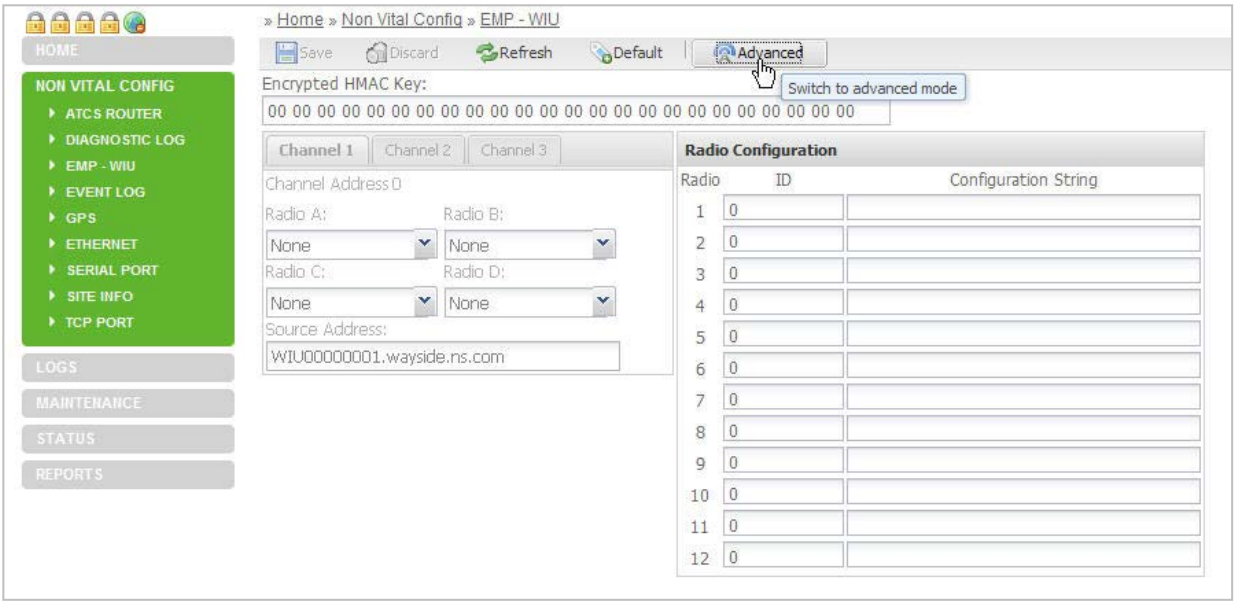


Figure 8-11 EMP-WIU Configuration Screen (Basic View)

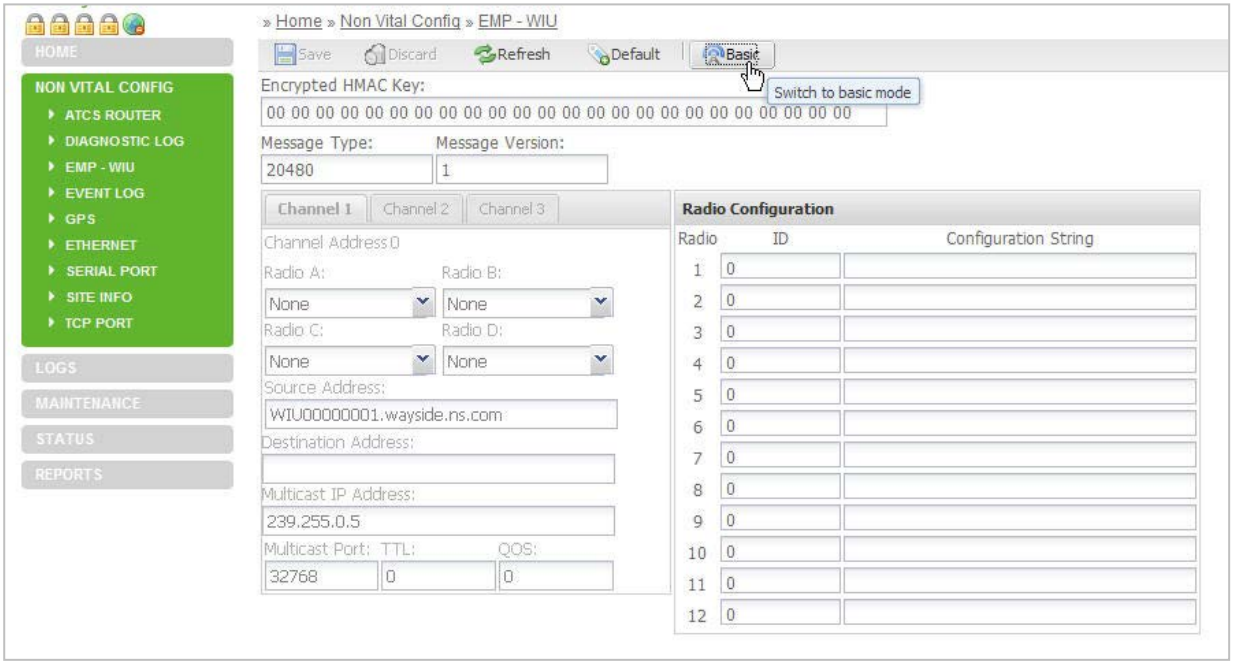


Figure 8-12 EMP-WIU Configuration Screen (Advanced View)

8.3.3.1 Encrypted HMAC Key

NOTE

NOTE

This function is not fully operational and is not currently supported. For additional information consult Siemens Technical Support.

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 is all zeros (**0**)).
- Appears on both Basic and Advanced views.

⚠ WARNING

WARNING

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

8.3.3.2 Message Type

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

- Message Type range: **0** – **65535** hex (default is **5000**).
- Appears on Advanced view only.

8.3.3.3 Message Version

The VIU/CAT 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**).
- Appears on Advanced view only.

8.3.3.4 Source Address

User defined address. The VIU/CAT will set the Source Address field of the EMP to this string. The string can be set to anything that may be needed by the wayside-to-locomotive network and is usually set to WIUXXXXXXXX.wayside.rr.com where the Xs are replaced with the configured WIU address.

- Example: LCMXXXXXXXX.locomotive.rr.com
- Source Address range: Null terminated string XXXXXXXX in example above is string representation of LCM serial number (padded to 8 characters). String is null terminated (up to 64 bytes) (default is 0).
- Appears on both Basic and Advanced views.

8.3.3.5 Destination Address

User definable address. The VIU/CAT sets this field in the EMP message. Normally this string is left blank.

- Destination Address range: Null terminated string. Up to 64 bytes (default is 0)
- Appears on both Basic and Advanced views.

8.3.3.6 Multi Cast IP Address

The VIU/CAT sends its EMP messages to this address on the network. Normally, this setting does not need to be changed from the default.

- Class D Address range: **0.0.0.0** – **255.255.255.255** (default is **239.255.0.5**)
- Appears on Advanced view only.

8.3.3.7 Multi Cast Port

The VIU/CAT sends its EMP messages to this IP port number on the network. Normally, this setting does not need to be changed from the default.

- Class D Port range: **0** – **65535** (default is **32768**)
- Appears on Advanced view only.

8.3.3.8 Time-to-live (TTL)

The VIU/CAT sets the Time-to-live field in the EMP message to this value. Normally, this setting is not changed from the default

- Time-to-live range: **0** – **65535** (default is **12**)
- Appears on Advanced view only.

8.3.3.9 Quality of Service (QoS)

The VIU/CAT sets the Quality of Service field within the EMP message to this value. Normally, this setting does not need to be changed from the default.

- Quality of Service range: **0** – **65535** (default is **0**)
- Appears on Advanced view only.

8.3.4 Event Log Configuration

The Event Log configuration screen is shown in **Error! Reference source not found.**.

8.3.4.1 Server IP

When one or more VIU/CATs are operating on a network, each VIU/CAT 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/CAT. The logger can be another VIU/CAT.

To configure each VIU/CAT to send the Event 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**).

Figure 8-13 Event Log Configuration Screen

8.3.5 GPS Configuration

Use this screen to set parameters for either the internal GPS receiver or an external GPS receiver (Figure 8-14).

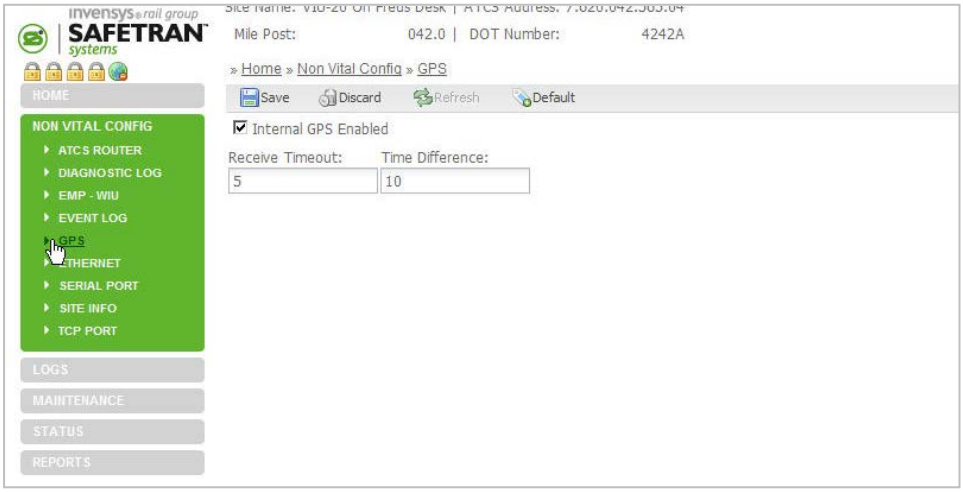


Figure 8-14 GPS Configuration Screen

8.3.5.1 Internal GPS Enabled

If the internal GPS receiver is used, check this box to enable the receiver.

- Internal GPS Enabled options: **checked**, **not checked** (default is not **checked**).

8.3.5.2 Receive Timeout

If the VIU/CAT 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/CAT cable is unplugged.

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

8.3.5.3 Time Difference

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

- Time Difference range: **0** – **65535** seconds (default **2** seconds).

8.3.6 Ethernet Configuration

The Ethernet configuration screen allows address and network configuration settings to be made for the three Ethernet ports on the VIU/CAT (Figure 8-15). These include the Laptop Ethernet port on the front panel and Ethernet ports 1 and 2 on the top of the unit (Figure 8-16). A separate tab is provided on this screen for each port.

8.3.6.1 DHCP Configuration (Laptop tab)

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

- Laptop DHCP Configuration options: DHCP **Server Enabled**, DHCP **Client Enabled**, DHCP **Disabled** (default is DHCP **Server Enabled**)

8.3.6.2 Laptop IP (Laptop tab)

Enter the Laptop port IP address.

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

8.3.6.3 Laptop Gateway (Laptop tab)

Enter the Laptop port gateway address.

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

8.3.6.4 Laptop Network Mask (Laptop tab)

Enter the Laptop port network mask.

- Laptop Network Mask range: **0.0.0.0** – **255.255.255.255** (default is **255.255.255.0**).

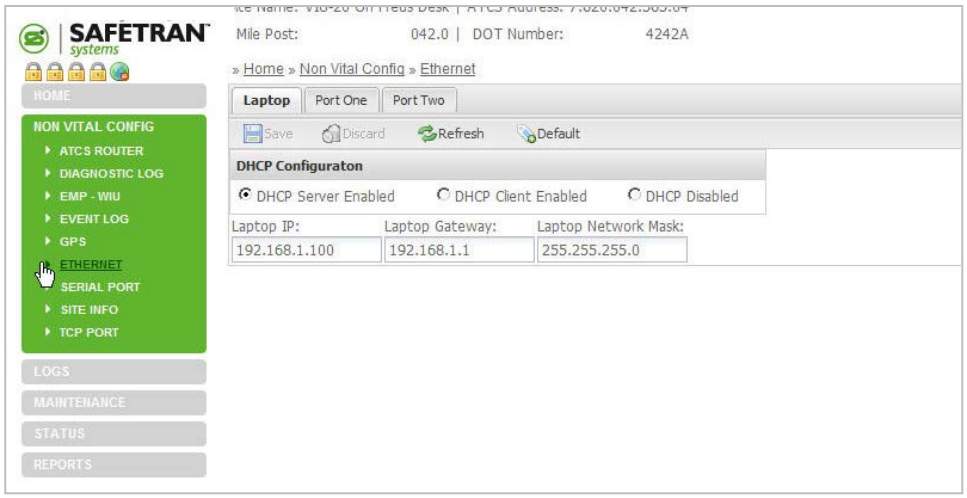


Figure 8-15 Ethernet Configuration Screen (Laptop Tab)

8.3.6.5 DHCP Client Enabled (Port One tab)

Select whether the Port 1 DHCP client is enabled.

- Port 1 DHCP Client Enabled options: **checked**, **not checked** (default is **checked**)

8.3.6.6 IP (Port One tab)

Enter the Port 1 IP address.

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

8.3.6.7 Gateway (Port One tab)

Enter the Port 1 gateway address.

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

8.3.6.8 Network Mask (Port One tab)

Enter the Port 1 network mask.

- Network Mask range: **0.0.0.0** – **255.255.255.255** (default is **255.255.255.0**).

8.3.6.9 DHCP Client Enabled (Port Two tab)

Select whether the Port 2 DHCP client is enabled.

- Port 2 DHCP Client Enabled options: **checked**, **not checked** (default is **checked**)

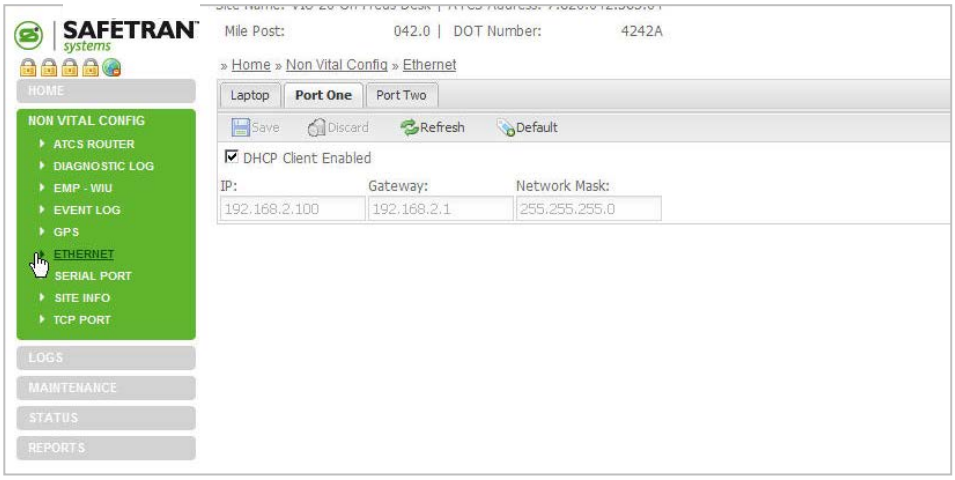


Figure 8-16 Ethernet Configuration Screen (Typical of Port One & Port Two Tabs)

8.3.6.10 IP (Port Two tab)

Enter the Port 2 IP address.

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

8.3.6.11 Gateway (Port Two tab)

Enter the Port 2 gateway address.

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

8.3.6.12 Network Mask (Port Two tab)

Enter the Port 2 network mask.

- Network Mask range: **0.0.0.0** – **255.255.255.255** (default is 255.255.255.0).

8.3.7 Serial Port Configuration

The Serial Port configuration screen allows port settings to be made for the two serial ports on the VIU/CAT. 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 (Figure 8-17).

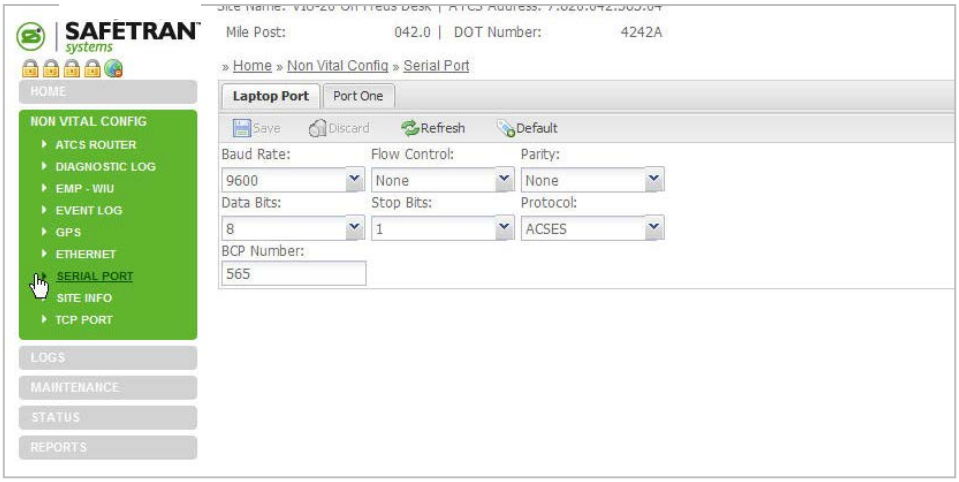


Figure 8-17 Serial Port Configuration Screen (Laptop Tab)

8.3.7.1 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 is **9600**).

8.3.7.2 Flow Control (Laptop tab)

Select the baud rate for the Laptop Serial port.

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

8.3.7.3 Parity (Laptop tab)

Select the parity setting for Laptop Serial port.

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

8.3.7.4 Data Bits (Laptop tab)

Select the data bit setting for Laptop Serial port.

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

8.3.7.5 Stop Bits (Laptop tab)

Select the stop bit setting for Laptop Serial port.

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

8.3.7.6 Protocol (Laptop tab)

Select the Protocol setting for Laptop Serial port.

- Laptop Serial port Protocol options: **User, NMEA** (default is **User**).

8.3.7.7 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 is **9600**).

8.3.7.8 Flow Control (Port One tab)

Select the baud rate for the Serial Port One.

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

8.3.7.9 Parity (Port One tab)

Select the parity setting for Serial Port One.

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

8.3.7.10 Data Bits (Port One tab)

Select the data bit setting for Serial Port One.

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

8.3.7.11 Stop Bits (Port One tab)

Select the stop bit setting for Serial Port One.

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

8.3.7.12 Protocol (Port One tab)

Select the protocol setting for Serial Port One.

- Serial Port One protocol options: **None**, ACSES, **External GPS** (default is **ACSES**).

8.3.7.13 BCP Number (Port One tab)

The BCP Number defaults to the “GGG” component of the “Site ATCS Address” located on the SITE INFO screen.

8.3.8 Site Info Configuration

NOTE

NOTE

Data pertaining to SITE INFORMATION (i.e., Site Name, Milepost, DOT Number, and Time Zone) can only be set and/or edited using the Web User Interface (Web U/I). The Site Info screen (Figure 8-18) provides fields for entering a site name, the mile post number and DOT number for the VIU/CAT 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 8-19). When finished with Edit Mode, the Vital Core must be rebooted to remove the VIU/CAT from the Edit Mode (Figure 8-20). This reboots the Vital Core only, and not the entire VIU/CAT.

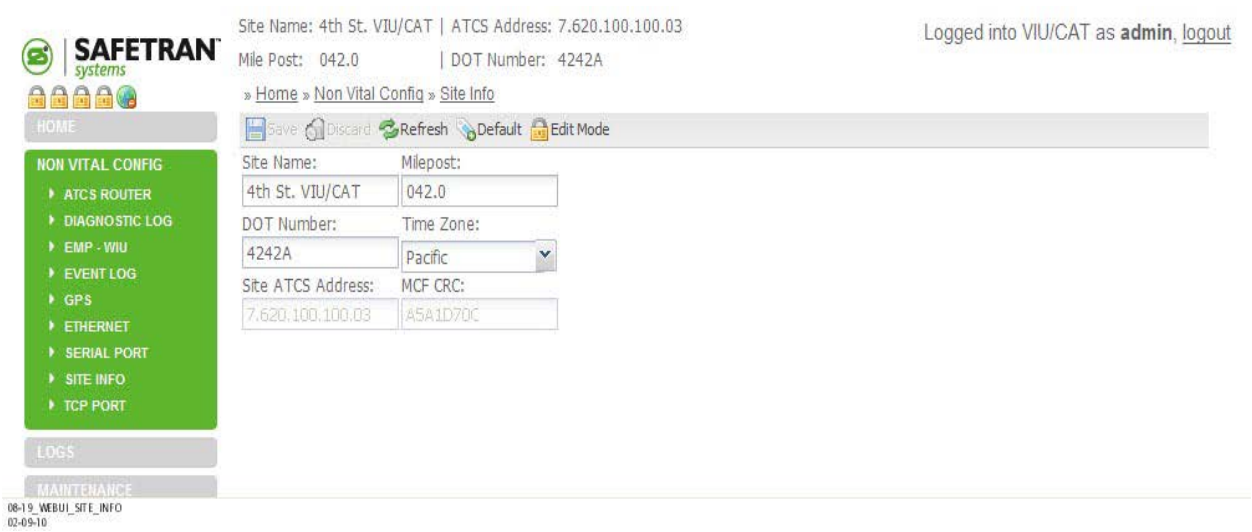


Figure 8-18 Site Info Configuration Screen

8.3.8.1 Site Name

Enter a name for the VIU/CAT location.

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

8.3.9 Milepost

Enter the milepost number at the VIU/CAT location.

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

8.3.9.1 DOT Number

Enter the DOT Number for the VIU/CAT location.

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

8.3.9.2 Time Zone

Enter the time zone that the VIU/CAT 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 = Eastern).

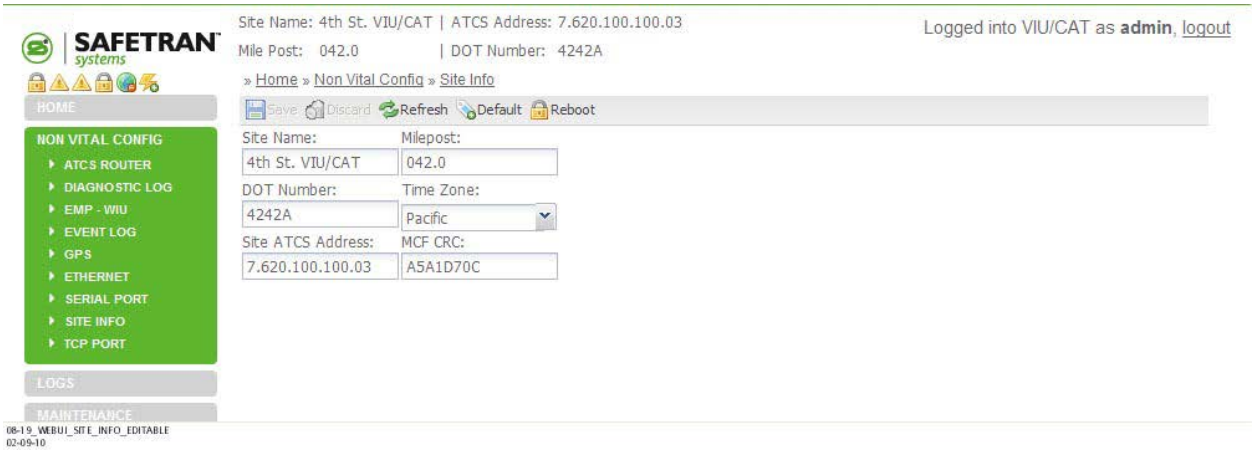


Figure 8-19 Site Info Configuration Screen in Edit Mode

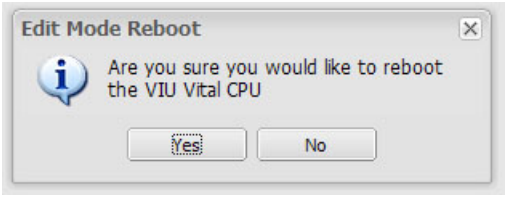


Figure 8-20 Site Info Edit Mode Reboot Prompt

8.3.9.3 Site 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/CAT from Edit Mode (this reboots the Vital Core only, and not the entire VIU/CAT).

Site ATCS Address range: 7.000.000.000.00 – 7.999.999.999.99 (default is 7.620.100.100.01).

8.3.9.4 MCF CRC

MCF CRC 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/CAT from Edit Mode (this reboots the Vital Core only, and not the entire VIU/CAT).

The MCF CRC is determined by the MCF contents.

8.3.10 TCP Port Configuration

The TCP Port Configuration screen is shown in Figure 8-21.

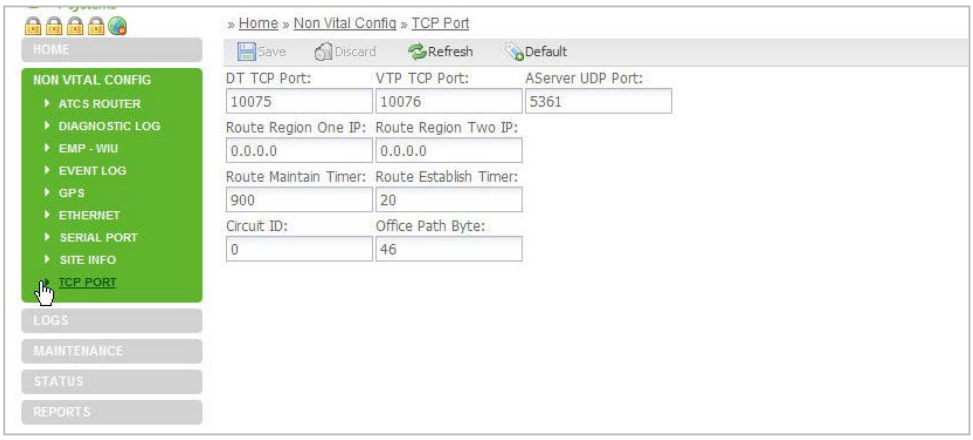


Figure 8-21 TCP Port Configuration Screen

8.3.10.1 DT TCP Port

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

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

8.4 VIEWING LOGS

The Web browser user interface provides access to two logs maintained by the VIU/CAT: the Diagnostic Log and the Event Log. To access these logs, select **Logs** from the menu bar on the left side of the screen to display the Logs screen (Figure 8-22).

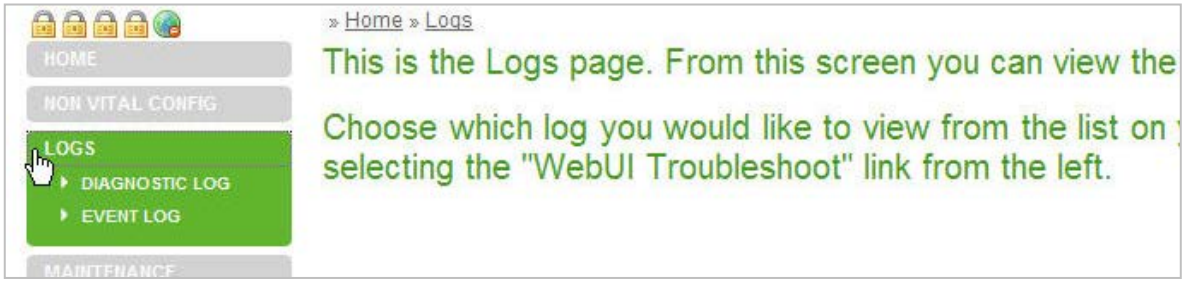


Figure 8-22 Log Screen

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

8.4.1 Diagnostic Log

The Diagnostic Log first displays in the basic view (Figure 8-23). 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 event at a time using **Next** and **Previous** buttons. A button is also provided to download the entire log contents to a PC.

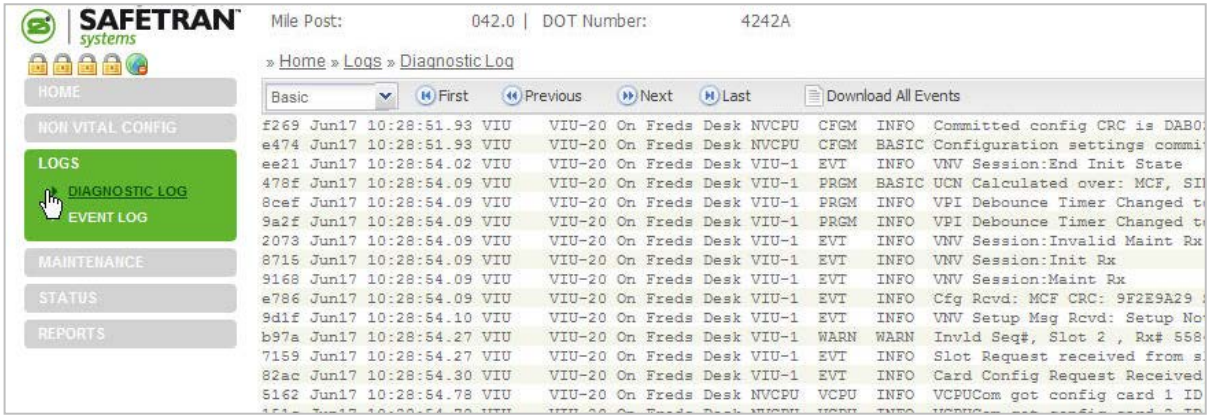
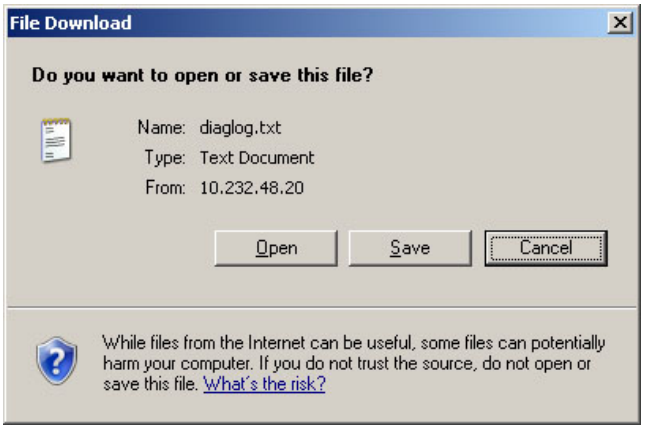


Figure 8-23 Diagnostic Log – Basic View

When the Download All Events button is selected, a prompt queries to open or save the log file.



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

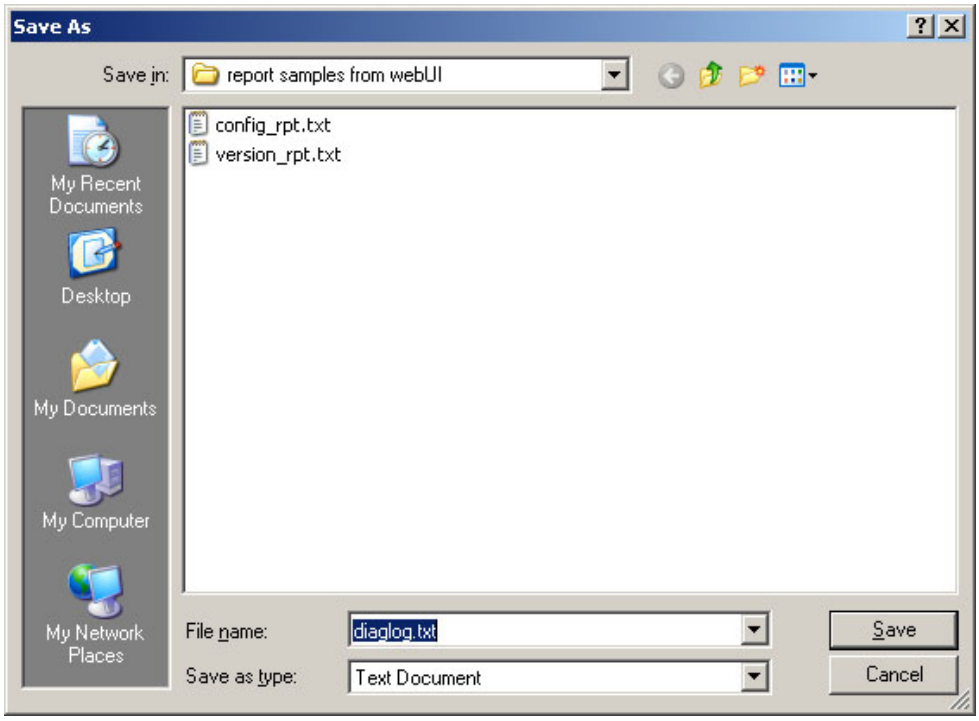


Figure 8-25 File Save Screen

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

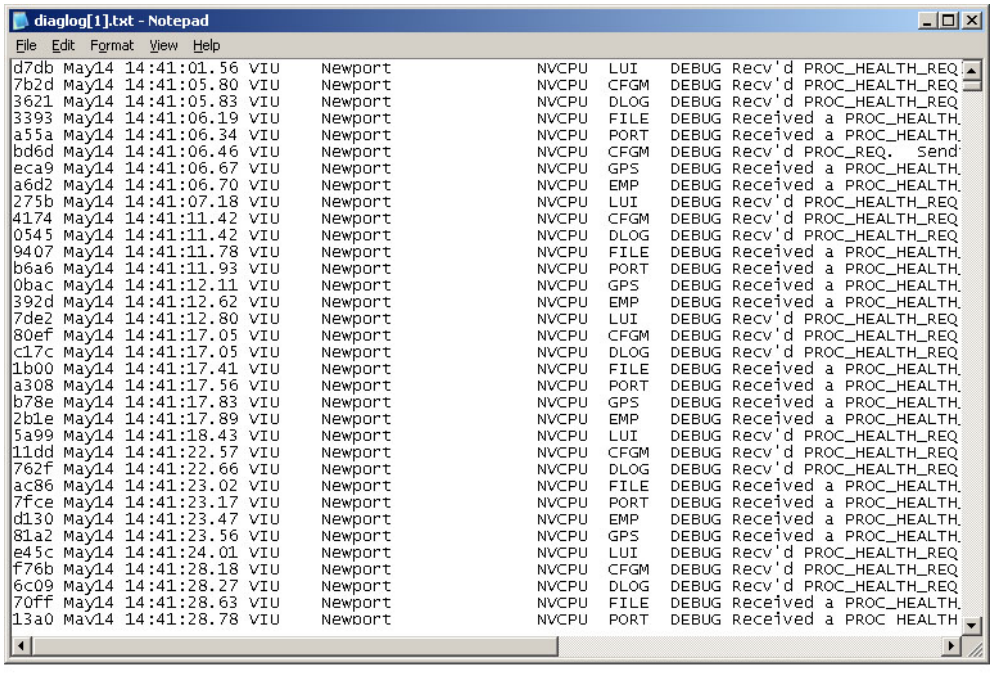


Figure 8-26 File Opened in Notepad

To view the Diagnostic Log in the Advanced view, select Advanced from the drop down menu to the left of the **First** button (Figure 8-27).

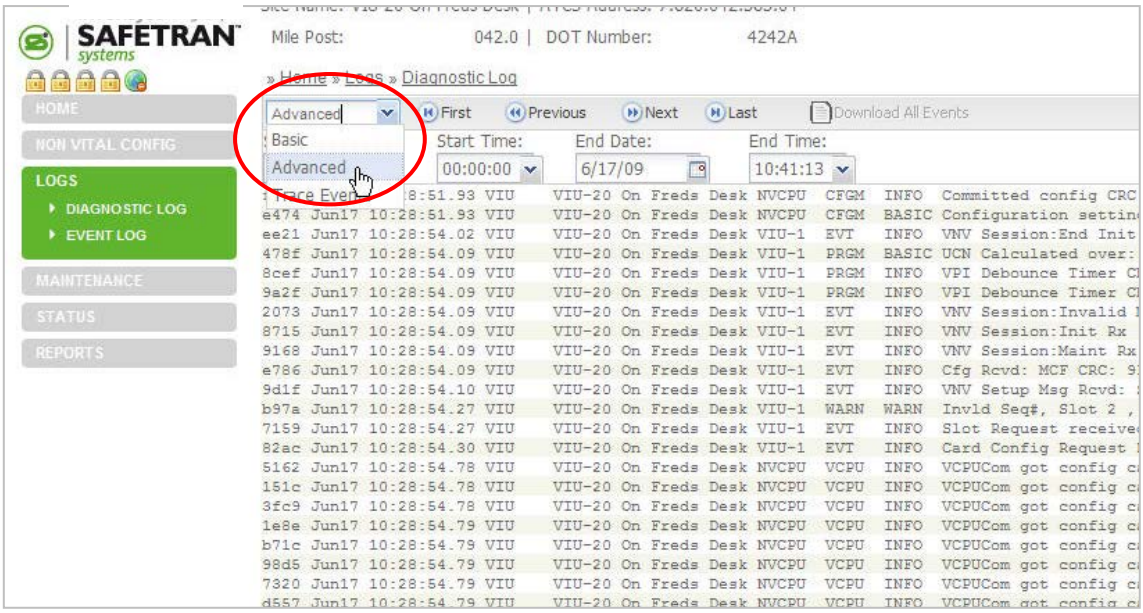


Figure 8-27 Log View Drop Down Menu

The Advanced view (Figure 8-28) 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.

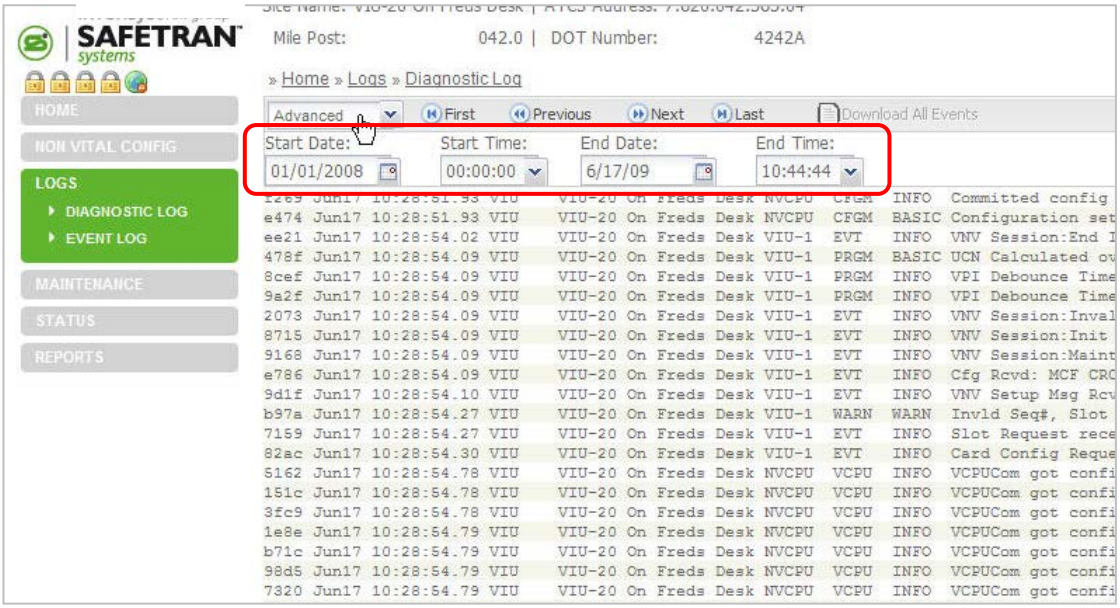


Figure 8-28 Diagnostic Log – Avanced View

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.

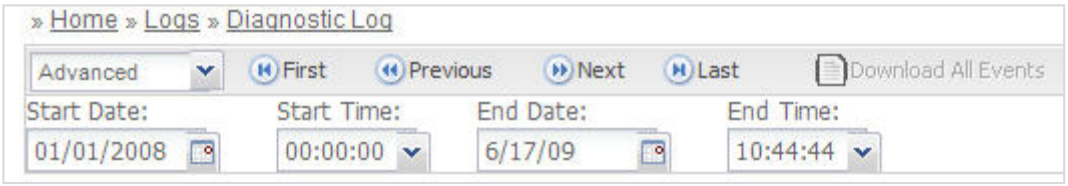


Figure 8-29 Setting Dates

The final selection from the view drop down list is **Trace Events** (Figure 8-30). 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.

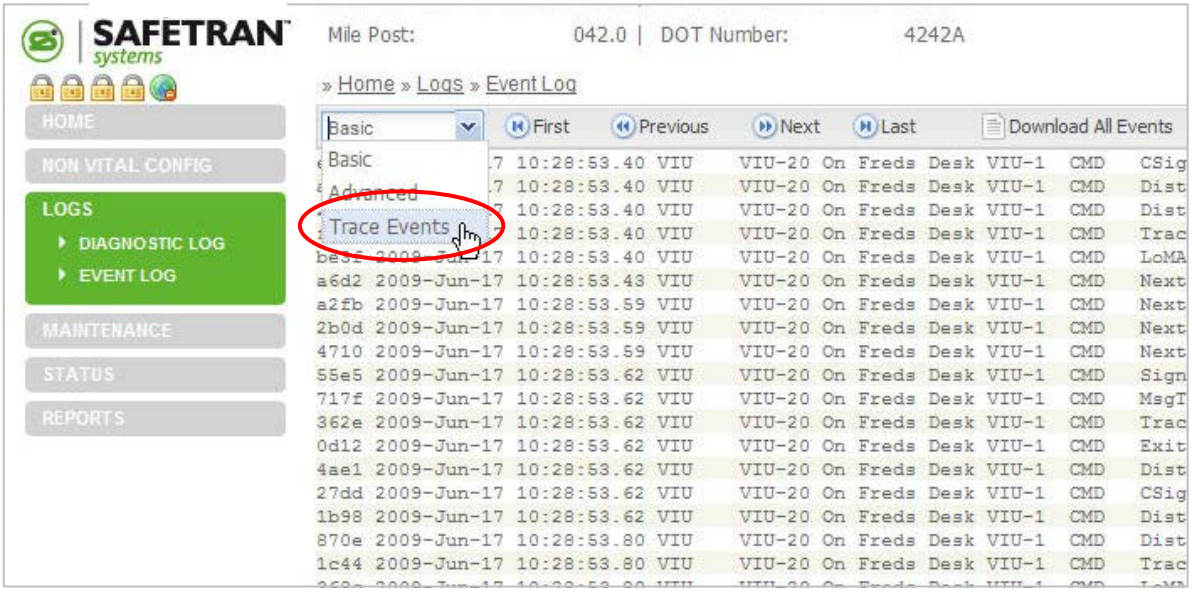


Figure 8-30 Diagnostic Log – Trace Event View

8.4.2 Events Log

The Events Log screen provides structure, options and features similar to those described in paragraph 8.4.1 for the Diagnostic Log.

8.5 MAINTENANCE

The Web browser user interface provides access to a single maintenance function that allows the VIU/CAT date and time to be set if a GPS receiver is not present (Figure 8-31). To access the date/time set function, select **Maintenance** from the menu bar in the upper right corner of the screen to display the Maintenance screen.

Figure 8-31 Maintenance Screen

8.5.1 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 8-32). These are described in the following paragraphs.

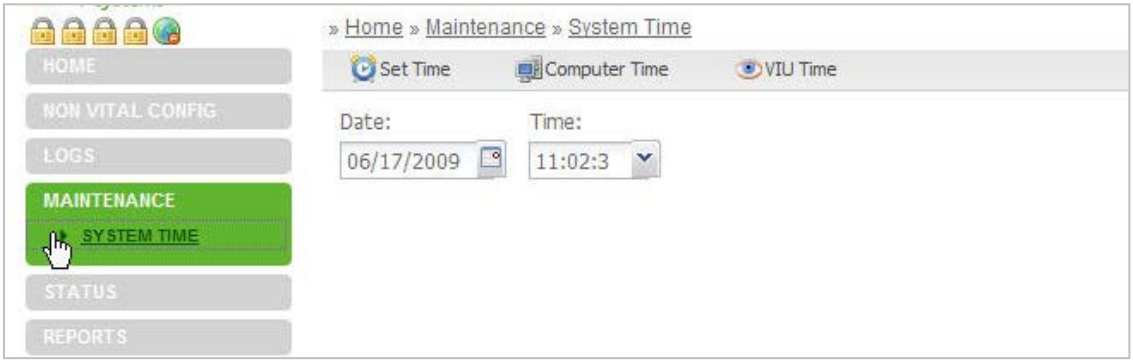


Figure 8-32 System Time Screen

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.

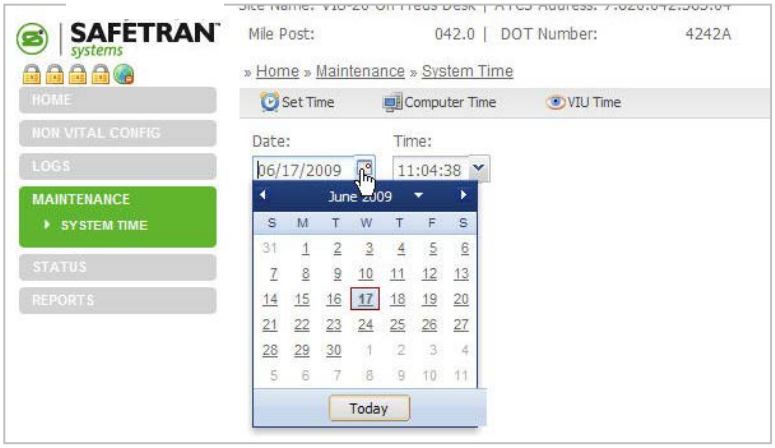


Figure 8-33 Date Field with Calendar Displayed

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.

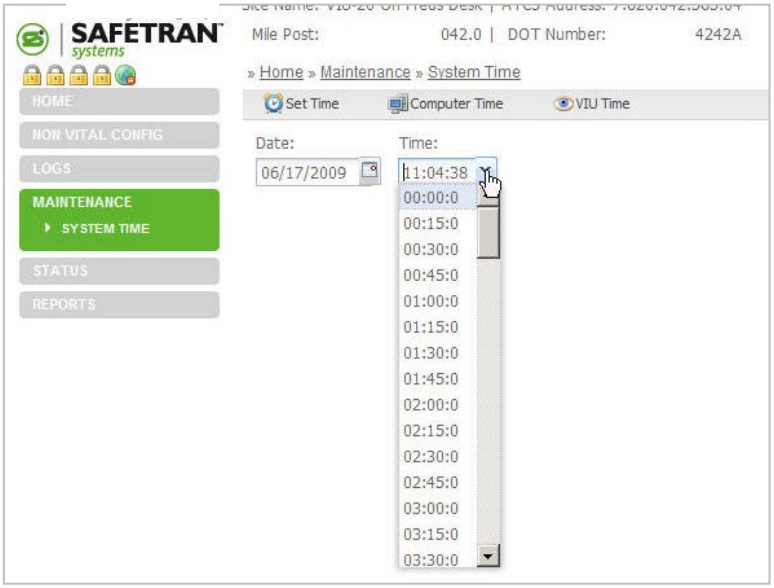


Figure 8-34 Time Field Drop Down List of Times

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

If the VIU/CAT is to be set to the date and time on the connected PC, select the **Computer Time** button. To display the date and time currently set on the VIU/CAT, select the **VIU Time** button.

8.6 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 8-35).

Figure 8-35 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.

8.6.1 GPS

The GPS screen indicates general information on the number of GPS satellites plus the latitude and longitude of the GPS receiver (Figure 8-36).

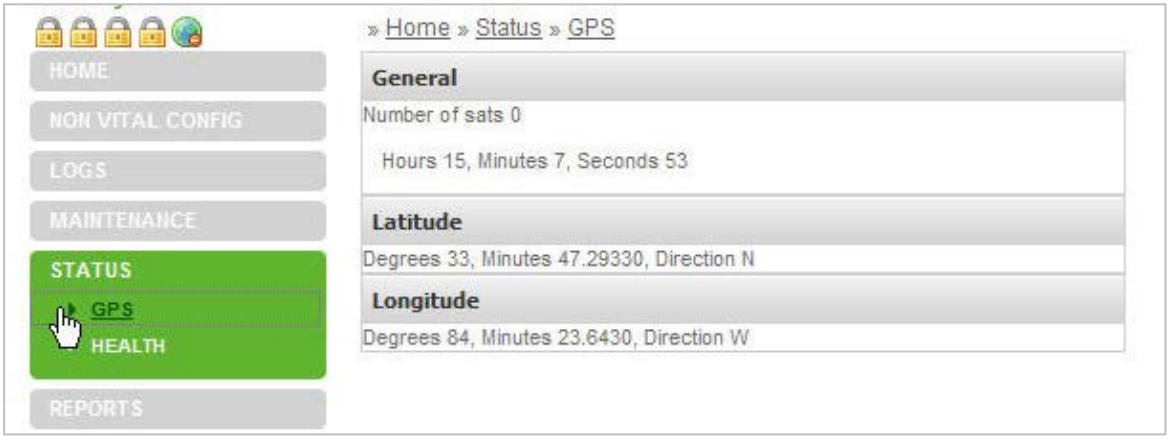


Figure 8-36 GPS Status Screen

8.6.2 Health

The Health screen shows the current health status for the main vital and non-vital functions (Figure 8-37).

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 8-37 Health Status Screen

8.7 REPORTS

The Web browser user interface provides access to two reports generated by the VIU/CAT: 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 8-38).

Figure 8-38 Report Screen

8.7.1 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 8-39). 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.

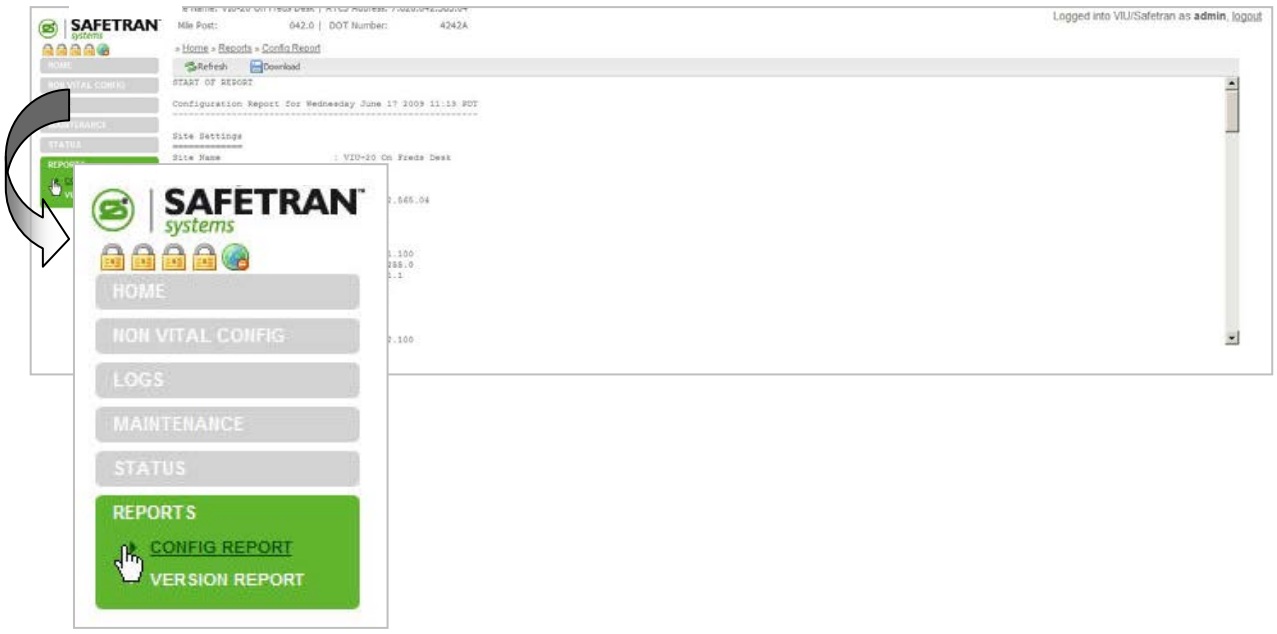


Figure 8-39 Typical Configuration Report

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.

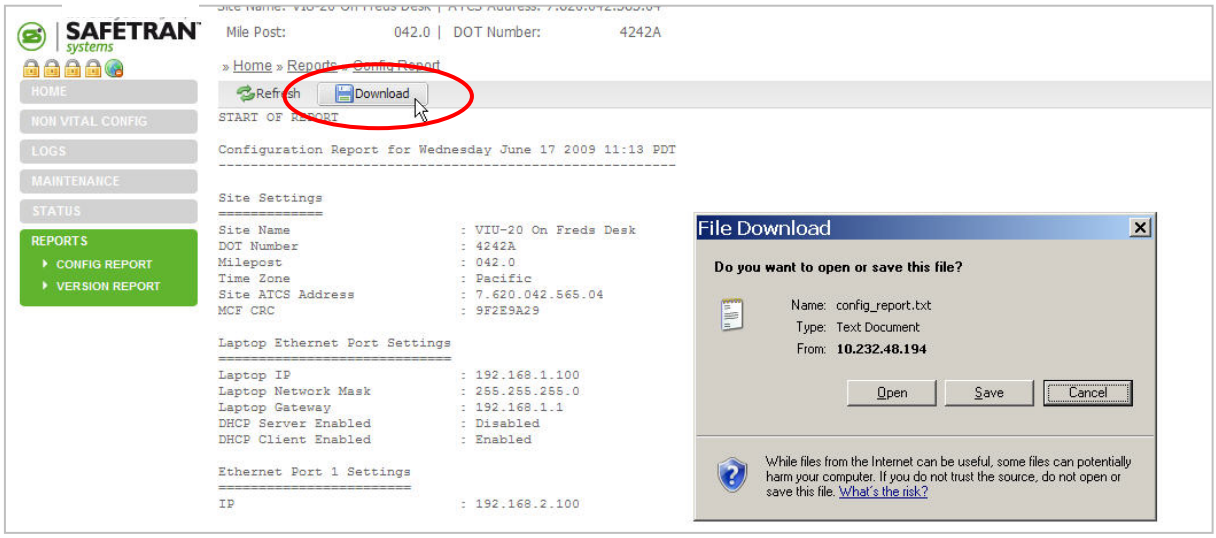


Figure 8-40 Report Download Prompt

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

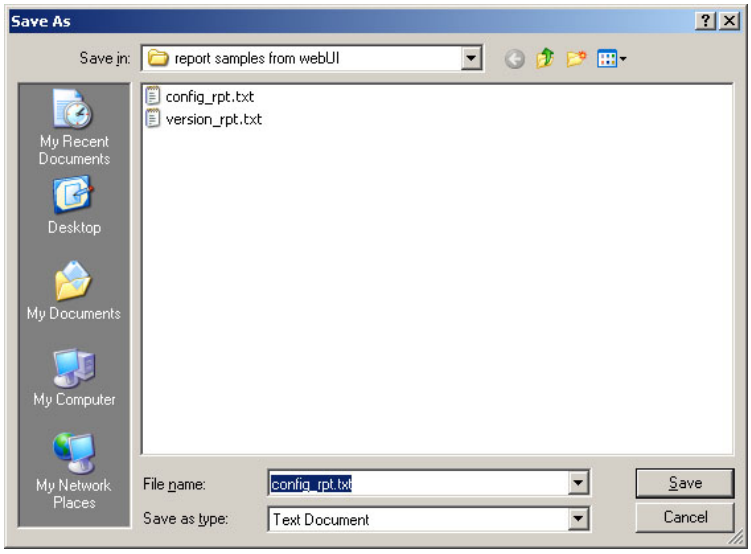


Figure 8-41 Report Save Screen

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.

8.7.2 Version Report

The Version Report identifies the VIU/CAT site and then lists the current versions of the VIU/CAT firmware, software and hardware (Figure 8-42). This version information can be valuable when troubleshooting system problems.

Use the scroll bar at the right edge of the screen to view the entire report.

Figure 8-42 Typical Version Report

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

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SECTION 9
TYPICAL VIU/CAT APPLICATIONS

9.0 TYPICAL VIU/CAT APPLICATIONS

9.1 VIU/CAT APPLICATION INSTALLATION DRAWINGS

This section contains typical VIU/CAT installation diagrams. Connections are also shown for Auxiliary Equipment.

NOTE

NOTE

1. In the following application drawings, all wiring is #16 AWG stranded wire unless otherwise noted.
2. In electrified territory, Ensure that the normal equalizer placed across the PSO track leads in the track surge panel is replaced by a third arrestor as shown in Figure 9-2. Ensure that the PSO track leads have fuses installed as shown in Figure 9-2.
4. Receiver Line to Rail Coupler, 7A377-1-f and 7A377-2-f and the Transmitter Line to Rail Coupler 7A399-f must be mounted in a weatherproof housing near the track.

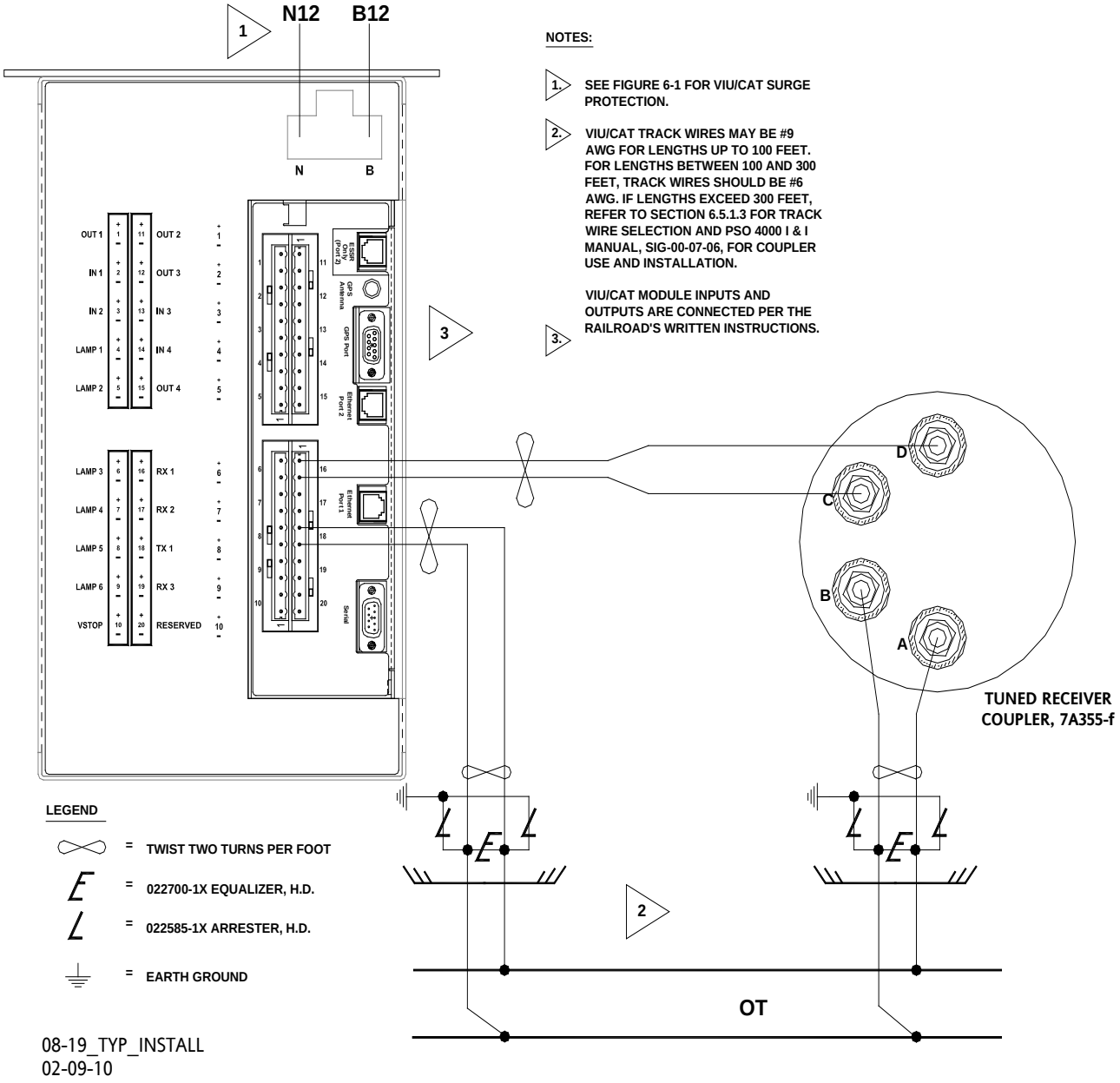


Figure 9-1 Typical VIU/CAT Application

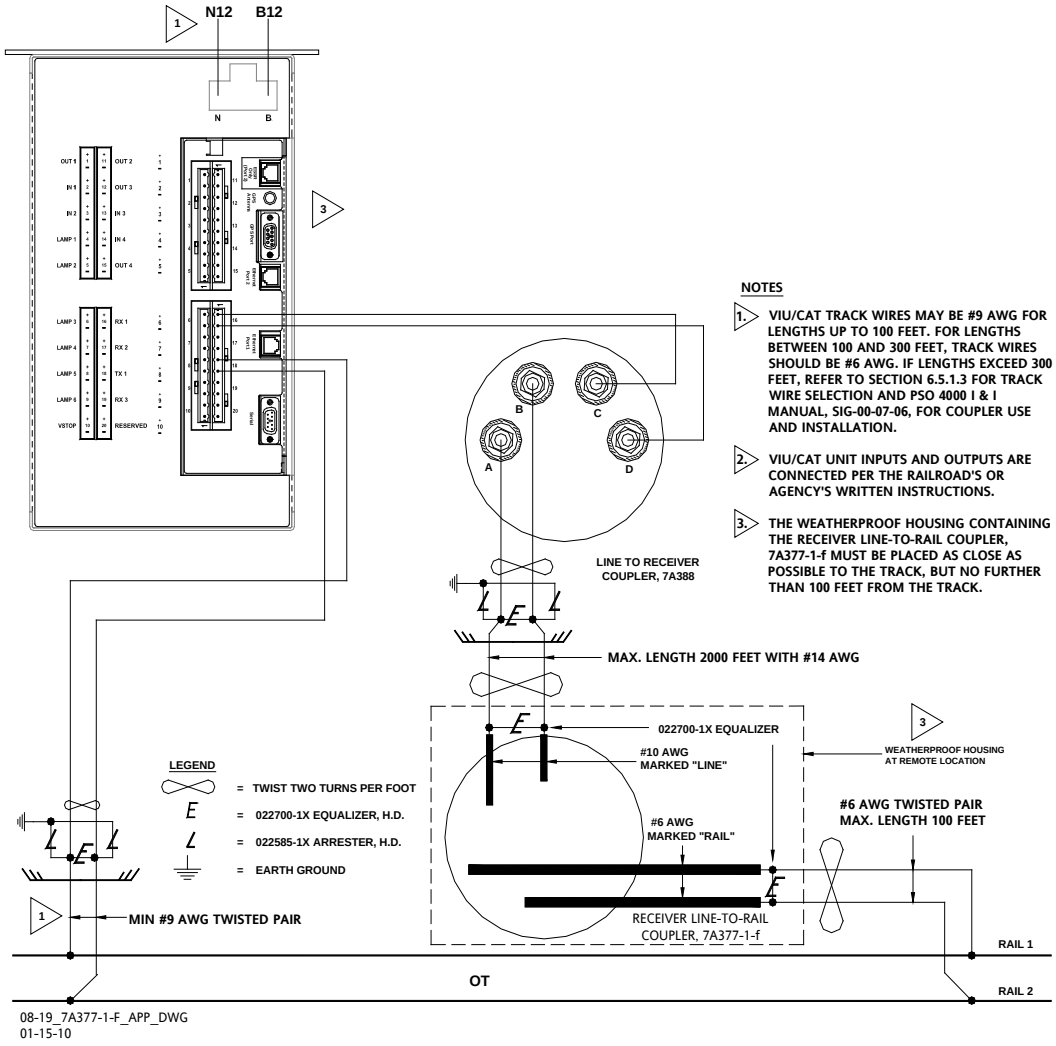


Figure 9-2 VIU/CAT Application Using Line to Receiver Coupler, 7A388 and Receiver Line to Rail Coupler, 7A377-1-f

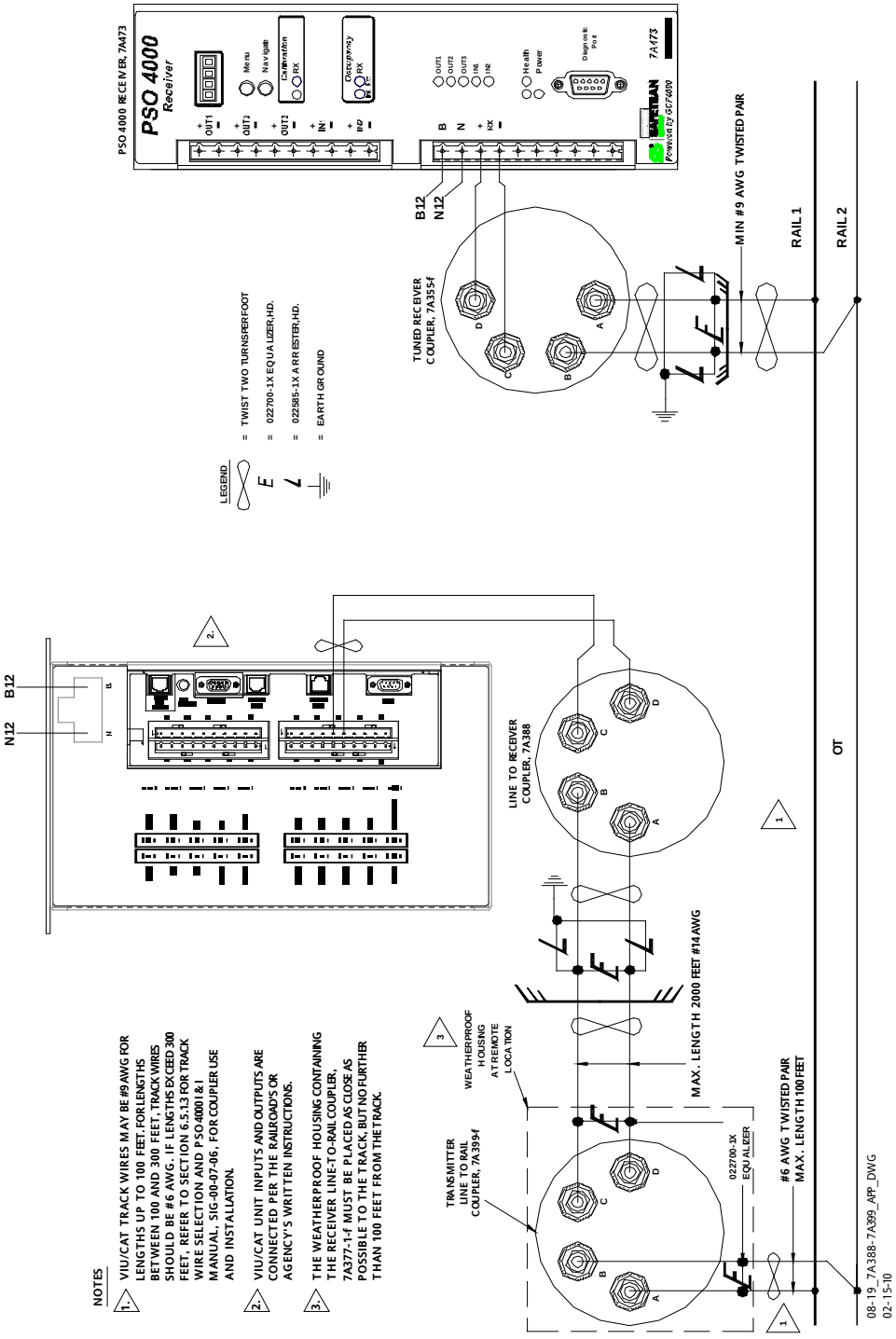


Figure 9-3 VIU/CAT Application Using Transmitter Line to Rail Coupler, 7A399-f, Line to Receiver Coupler, 7A388

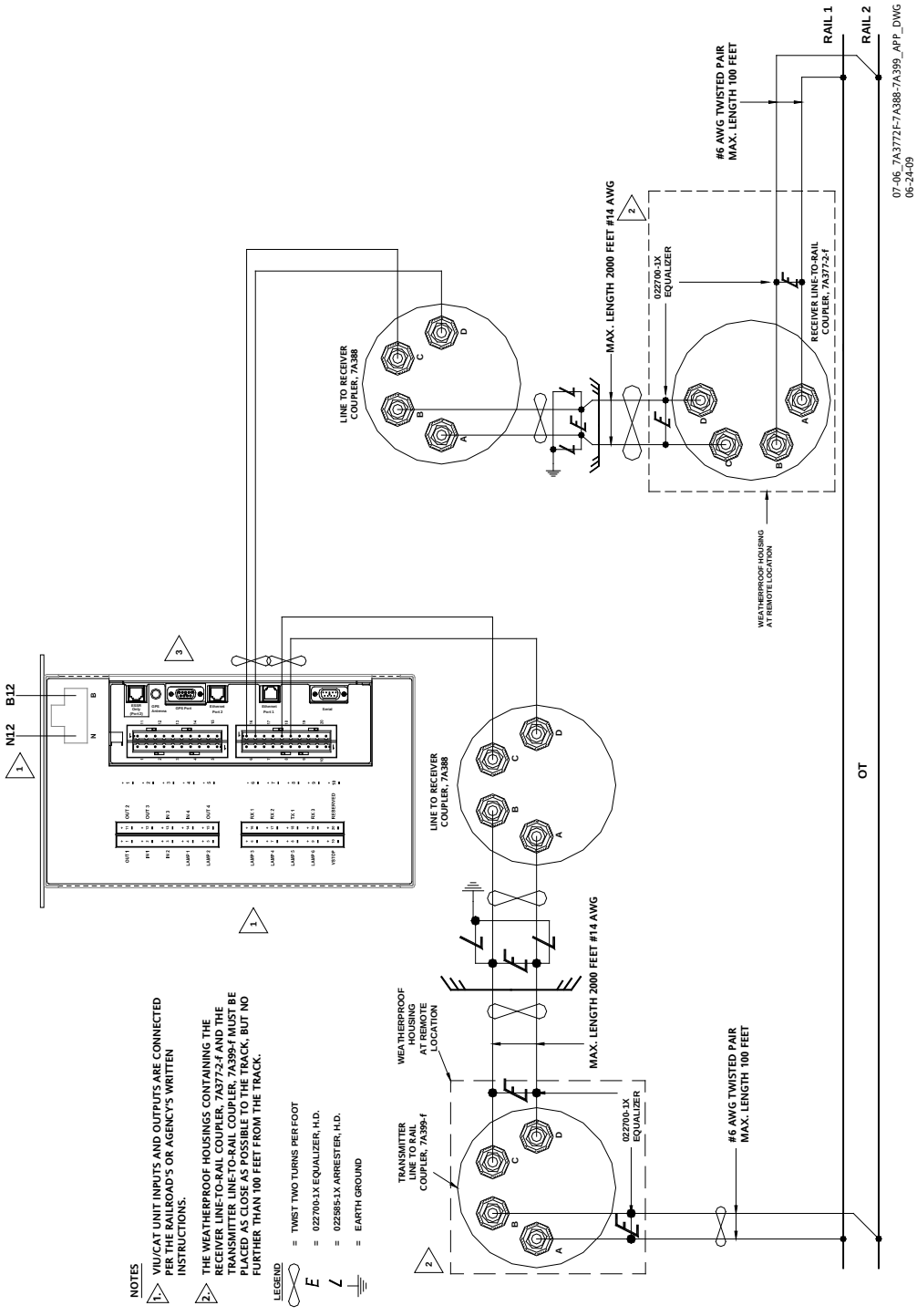


Figure 9-4 VIU/CAT Application Using Transmitter Line to Rail Coupler, 7A399-f, Line to Receiver Coupler, 7A388 with Line to Receiver Coupler, 7A388 and Receiver Line to Rail Coupler, 7A377-1-f

9.2 APPLICATION EXAMPLE

The following is an example of a VIU/CAT used at a dwarf signal in conjunction with a switch.

In this application, the VIU/CAT at the switch passes switch, lamp, and track occupancy information to the unit at the end of the track circuit.

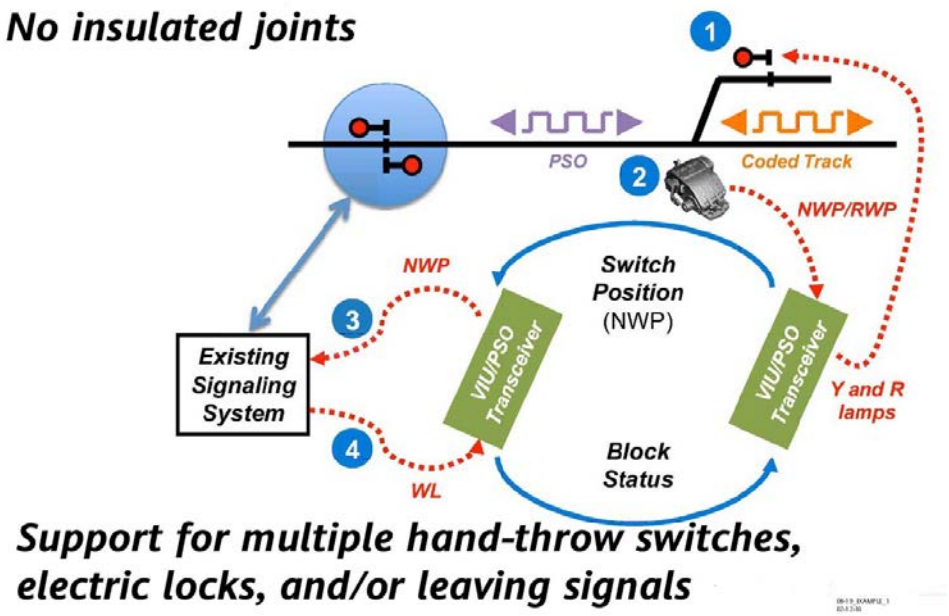


Figure 9-5 Example Site Layout

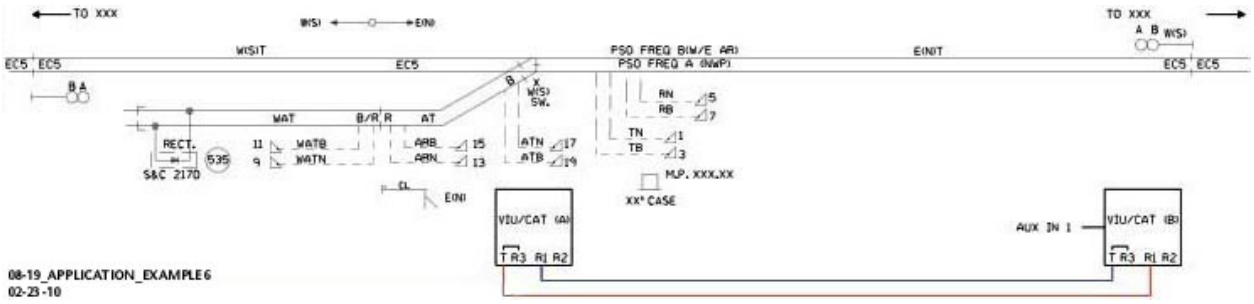


Figure 9-6 4th St. VIU/CAT Location Plan Illustration Example

In this example, VIU/CAT A, located at the switch, has the site name 4th St. VIU/CAT. VIU/CAT B is located at the end of the track circuit, and its programming is not addressed here. The MCF written for this 4th St. VIU/CAT's leaving signal application is programmed to support the following:

- Four switch inputs
  - Placing the switch in NORMAL position energizes switch input 1 & switch input 3 and de-energizes switch input 2 & switch input 4. With the switch NORMAL (switch inputs 1 & 3 high) the VIU/CAT energizes Lamp 2 and enables Code A transmission.

  - Placing the switch in REVERSE position energizes switch input 2 & switch input 4 and de-energizes switch input 1 & switch input 3. With the switch REVERSE (switch inputs 2 & 4 high) the VIU/CAT de-energizes Lamp 2 and disables Code A transmission.
- One PSO transmitter/receiver pair that is enabled and transmits Code A when Switches 1 and 3 are NORMAL.
- One Vital Lamp Output that is energized when Switches 1 and 3 are NORMAL.

The System Configuration Report Example provided in **Error! Reference source not found.** details each programmed value.

Table 9-1 4th St. VIU/CAT System Configuration Report Example

System Configuration Report	
---	PHYSICAL configuration
	sl1: Physical Layout = BNSFVIUCATSW ">"
Location and SIN	
---	SLOT 1: sl1 (VIUColorlight)
DOT Number: 000000A	sl1: Lamp Voltage = 9000 mV
Milepost Number: MP Not Set	sl1: Filament Threshold = 700 mA
Site Name: Location Not Set	sl1: Cold Filament Test = Yes ">"
	sl1: VPI Debounce = 100 msec
SIN: 762010010003	sl1: VLO Flash Rate = 60 CPM ">"
	sl1: Lamp Voltage Regulation = Constant
MCF Version	sl1: Lamp 1 Used = Yes ">"
---	sl1: Lamp 2 Used = Yes ">"
MCF Name: BNSFVIUCATSW001.mcf	sl1: Lamp 3 Used = Yes ">"
MCF Revision: 001	sl1: Lamp 4 Used = Yes ">"
MCFCRC: 77F91571	sl1: Lamp 5 Used = Yes ">"
Geo Unit UCN: 0C1A6F61	sl1: Lamp 6 Used = Yes ">"
	sl1: Password Access = Off
Program	
---	SLOT 2: sl2 (CAT)
LOGICAL configuration	sl2: PSO RX1 Used = No ">"
sl1: Logical Layout = lcVIUCATTEST ">"	sl2: PSO RX2 Used = No ">"
	sl2: TX Mode = Island ">"
SWITCH	sl2: Island Freq Category = Standard
SWITCH: Transmit Code = PSOA ">"	sl2: Island Freq = 7.1 kHz
SWITCH: Receive Code = PSOA ">"	sl2: Island Pickup Delay Time = 2 sec
SWITCH: AT Loss of Shunt Time = 10 sec ">"	sl2: VPI Debounce = 100 msec
SWITCH: WAT Loss of Shunt Time = 10 sec ">"	
WIU CHANNEL configuration	WIUOUT: Beacon Continuous = No
WIUOUT: Enabled = Yes ">"	WIUOUT: Max Beacon Enabled = No
WIUOUT: Broadcast On Change = No	WIUOUT: Broadcast Rate = 1000 msec
WIUOUT: Beacon Bit Time = 5 min	HW Rev. Shipped: 0000
WIUOUT: Beacon End Time = 2 min	Serial Number: 000000
WIUOUT: GPS Timeout = 0 hrs	Build Date: 0000000000

WIUOUT: Vital Message Version = 0 ">" WIUOUT: WIU Address Size = 48 ">" WIUOUT: Vital Message Type Size = 6 ">" WIUOUT: Vital Message Version Size = 5 ">" ">" Parameter is part of Unique Check Number (UCN) calculation. Software Information ---------- Slot 1 VIU Colorlight: MEF Version: VIUCLS01_00 MEF ID Number: 9V521A01.A MEF CRC: 23FA BOOTCODE ID Number: 9V511A01.A BOOTCODE CRC: 3851 Hardware Information (**ACTUAL DATA INPUT WHEN MANUFACTURED)** Slot 1 VIU Colorlight: Manufacturing: Part Number: 8000-000000-0000	SW ID Shipped: 9V0000000000 SW ID2 Shipped: 9V0000000000 Slot 2 CAT: Manufacturing: Part Number: ~~~~~~~(~~~X~~~ HW Rev. Shipped: ~~~~ Serial Number: ~~ ~d~ Build Date: ~~L~~~~~~~ SW ID Shipped: p~~~X~~~~DF8 SW ID2 Shipped: |~~~d~~~~S.X Latest HW Revision: ~~~~ Comments: d~~~L~~~9~~~p~~~X~~~k~~~|~~~d~~~ ~~~~~~~ Configuration Package File ---------- Filename: CONFIG-ISLANDA-2010Feb25.pac Path: C:\Safetran\DT\ Date/Time: 2/25/2010 12:13:25 DT Version: 5.0.9

To successfully program the VIU/CAT:

- The DT is programmed with the CLS and CAT data from the location plan
- The UCN is created using the DT
- The MCF and Configuration Files (.pac files), are uploaded to the VIU/Cat using the memory stick via the USB connection on the face plate of the VIU/CAT.
- The UCN is entered using the face plate of the VIU/CAT
- The PSO is then calibrated.
- A Vital Reboot is commanded from the face plate of the VIU/CAT and the system is provides a status of “VITAL STATE IN SESSION, CONFIGURED, SLV HLTH GOOD”

To program the VIU/CAT for this enter the parameters depicted in Table 9-1.

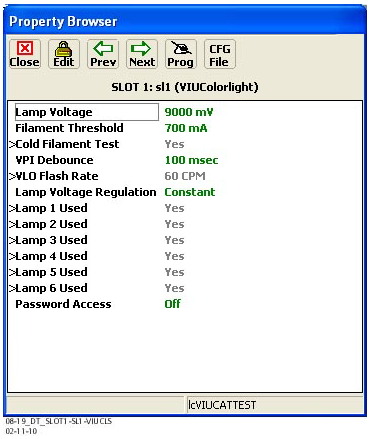


Figure 9-7 VIU/CAT DT Programming for the CLS Card

To program the CLS Card:

- Set Lamp Voltage – 9000 mV
- Set Filament Threshold – 700 mA. This is the value generally used in filament checks
- Set VPI Debounce – 100 msec
- Set Lamp Voltage Regulation – Constant
- Set Password Access – Off

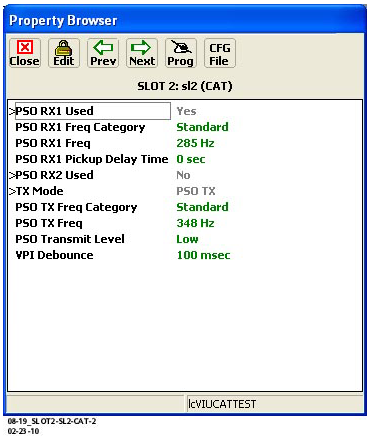


Figure 9-8 VIU/CAT DT Programming for the CAT Card

To program the CAT Card:

- Set RX1 Freq Category – Standard
- Set PSO RX1 Freq – 285 Hz
- Set RX1 Pickup Delay Time – 0 sec
- Set PSO TX Freq Category – Standard
- Set PSO TX – 348 Hz
- Set PSO Transmit Level – Low
- Set VPI Debounce Time – 100 msec

In this example, when the switch is in NORMAL position, VPIs 1 & 3 are energized, the signal lamp is energized, and the CAT transmits a Code A signal (see Figure 9-9 Left) on the Display Terminal (DT). As a train passes through the track circuit, the DT reflects the track circuit's occupancy by showing status "O" for the receiver 1 (RX1) section.

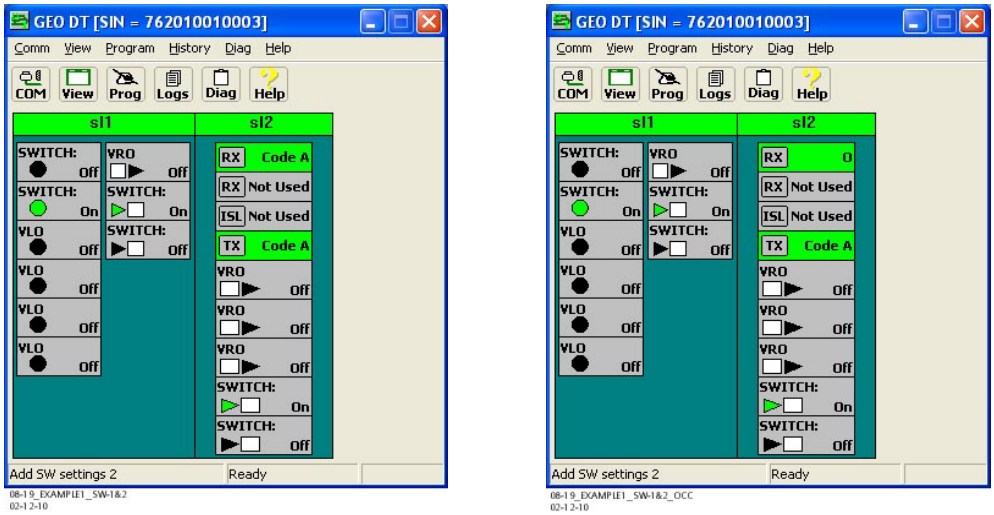


Figure 9-9 VIU/CAT Screens: (Left Screen) Track Unoccupied; & (Right Screen) Occupied

In preparation to put the switch reverse, input 3 is energized and the lamp output drops (see Figure 9-10 Left Screen). Once any through trains have cleared the track circuit, input 4 is energize, the switch is thrown REVERSE, and the transmitter is disabled, showing the track circuit occupied until the departing train has left the track circuit and the switch is returned to the NORMAL position (see Figure 9-10 Right Screen).

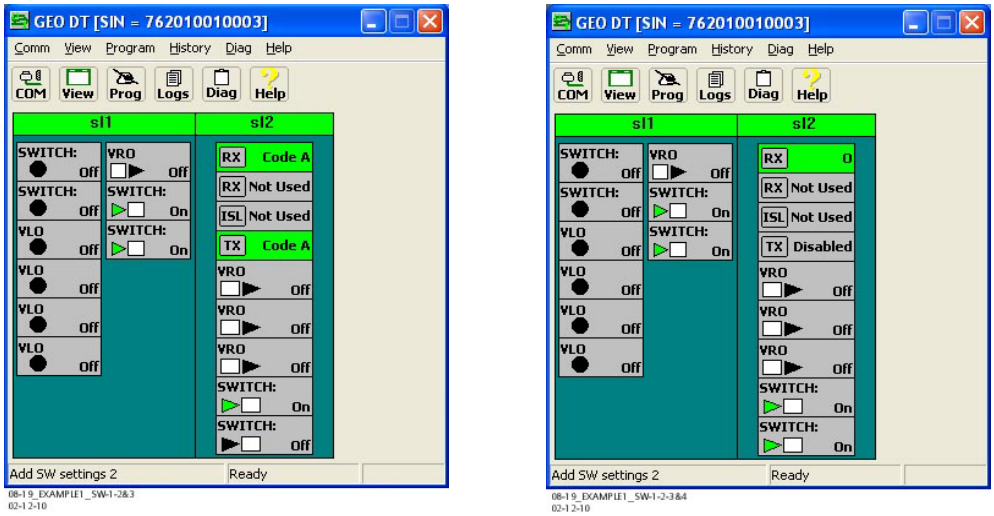


Figure 9-10 VIU/CAT Screens: (Left Screen) Preparing to Reverse Switch; & (Right Screen) Switch Reversed

SECTION 10
MAINTENANCE AND TROUBLESHOOTING

10.0 MAINTENANCE AND TROUBLESHOOTING

WARNING

THE USER MUST PROVIDE TIMELY MAINTENANCE UPON FAILURE OF THE VIU/CAT UNIT. FAILURE TO PROVIDE TIMELY MAINTENANCE MAY POTENTIALLY LEAD TO UNSAFE FUNCTIONING OF THE UNIT.
THE USER MUST ENSURE THAT THE VIU/CAT 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.

10.1 MAINTENANCE

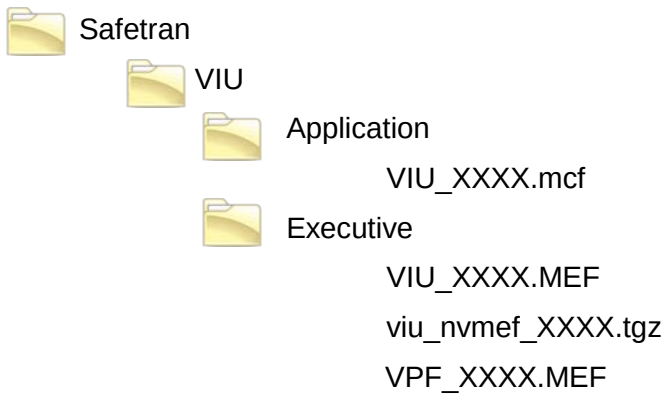
10.1.1 Battery Maintenance

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

10.1.2 Uploading Software To The VIU/CAT From A USB Drive

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

The file structure on the USB drive must have the following format. The VIU/CAT 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:

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

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 THE UNIT.

10.1.3 Downloading Event And Diagnostic Logs From The VIU/CAT To A USB Drive

As a part of routine maintenance or to aid in diagnostics of system problems, all or part of the VIU/CAT 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:

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

10.2 TROUBLESHOOTING

10.2.1 Status LEDs

Several status LEDs are provided on the VIU/CAT. These LEDs can provide initial indication of system health and potential problems. Refer to Table 10-1 for indications provided by these LEDs.

Table 10-1 VIU/CAT Status LED Indications

LED NOMENCLATURE	FUNCTION
Power	Green LED lights when power is applied to the VIU/CAT.
Health	Yellow LED indicates VIU/CAT health as follows: **Slow flash** (0.5Hz) = VIU/CAT is healthy **Fast flash** (2Hz) = VIU/CAT 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/CAT.
OUT 1 OUT 3 OUT 2 OUT 4	Four red LEDs that indicate whether or not the vital output is energized @ ~12V (lit) or de-energized @ <~6V (unlit).
IN 1 IN 3 IN 2 IN 4	Four red LEDs that indicate whether or not the vital output is energized @ ~6V (lit) or de-energized @ ~0V (unlit).
LAMP 1 LAMP 4 LAMP 2 LAMP 5 LAMP 3 LAMP 6 VSTOP	Seven red LEDs that indicate the status of the six monitored Color Lamp Signals and one Vital Stop.
PSO TX ISL TX PSO RX	Three red LEDs that indicate the status of the transmitter (whether configured as PSO or Island transmitter), the receiver(s), and the three separate seven segment LEDs to indicate receiver codes or status.
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.

10.2.2 LED Activity at Power-Up

LED activity at power-up is as follows:

- 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/CAT settles into normal operation, the input status LEDs show current input status and the health LED flashes at 0.5 Hz.

10.2.3 Possible System Problems

Table 10-2 lists some possible VIU/CAT system problem conditions with causes and remedies.

Table 10-2 Possible VIU/CAT System Problems

PROBLEM	CAUSE	REMEDY
Power LED does not light, VIU/CAT 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/CAT.
	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/CAT unconfigured, internal communication failure, VIU/CAT unhealthy.	View status message on display (indicates if VIU/CAT 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/CAT. If none of the above fixes the problem, replace the VIU/CAT. In systems with multiple VIU/CATs, perform checks as above plus: Verify connections between main and auxiliary VIU/CATs. 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/CAT
	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/CAT prompts user to insert USB drive when executive starts.	Failed or corrupted factory test results	Return VIU/CAT to factory
USB drive not recognized.	Unsupported device	Use appropriate USB device

10.2.4 VIU/CAT Error Codes

A list of common DIAG messages is listed in Table 10-3

Table 10-3 VIU/CAT Diagnostic (DIAG) Messages

ERROR CODE	MESSAGE	REASON
300	"MCF ChkSum Err"	MCF is corrupt. Load valid MCF
301	"MCF CRC Err"	MCF CRC is not valid. Check that the correct MCF and MCF CRD are loaded.
302	"MCF Chk Err"	MCF is corrupt – reload the MCF
303	"Mod Type Err"	MEF is not valid for the hardware – load the correct MCF
304	"HW CI Err"	MEF is not valid for the hardware version of the card
305	"MCF CI Err"	The MCF is not supported by the MEF
306	"SIN Err"	ATCS Site ID (SIN) is invalid
307	"UCN Err"	UCN is incorrect
308	"MCF Cfg Err"	MCF is not supported by the MEF
309	"Vital Unconfig"	Vital programming is unconfigured
310	"In Edit Mode"	CIU/CAT in edit mode
400	"PSO Rx1 Freq Not Set"	PSO receiver1 frequency is not set
401	"PSO 1 Unhealthy"	PSO 1 is unhealthy
402	"PSO 1 Wrong Code"	PSO 1 is not receiving the expected code
403	"PSO 1 Cal Reqd"	PSO 1 requires calibration
404	"PSO Rx2 Freq Not Set"	PSO receiver 2 frequency is not set
405	"PSO 2 Unhealthy"	PSO 2 is unhealthy
406	"PSO 2 Wrong Code"	PSO 2 is not receiving the expected code
407	"PSO 2 Cal Reqd"	PSO 2 requires calibration
417	"No Slv Comms"	No communications between PSO and VIU/CAT
408	"PSO TX Freq Not Set"	PSO transmit frequency is not set
409	"PSO TX Unhealthy"	PSO transmitter is unhealthy
410	"Isl Freq Not Set"	Island frequency is not set
411	"Isl Unhealthy"	Island is unhealthy #1
412	"Isl Cal Reqd"	Island calibration is required
413	"Isl Unhealthy"	Island is unhealthy #2
414	"Isl Unhealthy"	Island is unhealthy #3
415	"VRO Error"	VRO error
416	"Cmd Error (?)"	The CLS or PSO module is receiving an invalid command msg from the logic. Check the application logic

10.2.5 Using DT Diagnostic Tools

Connect a PC containing the Diagnostic Terminal software to the VIU/CAT 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/CAT or between the VIU/CAT and a connected PC running the DT software.

Figure 10-1 The Diagnostic Drop Down Menu

10.2.5.1 Statistics

Select **Statistics** from the diagnostic drop down menu to display the DT Statistics screen (Figure 10-1). This screen provides a snapshot of communications statistics pertaining to the Laptop Serial port on the VIU/CAT. 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.

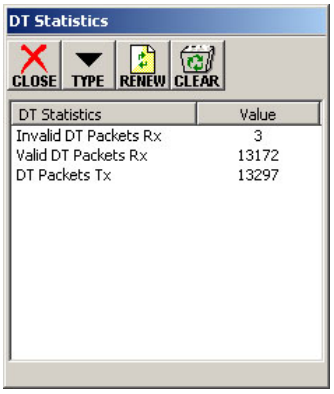


Figure 10-2 DT Statistics

The **TYPE** button displays a drop-down menu of statistic types that can be viewed (Figure 10-2). 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/CAT is rebooted

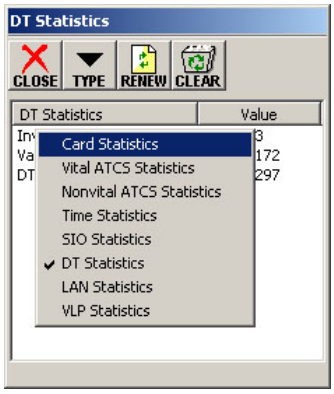


Figure 10-3 Statistics Type Drop Down Menu

10.2.5.2 Sniffer

Select **Sniffer** from the diagnostic drop down menu (Figure 10-3) to display the Sniffer screen (Figure 10-4).

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

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

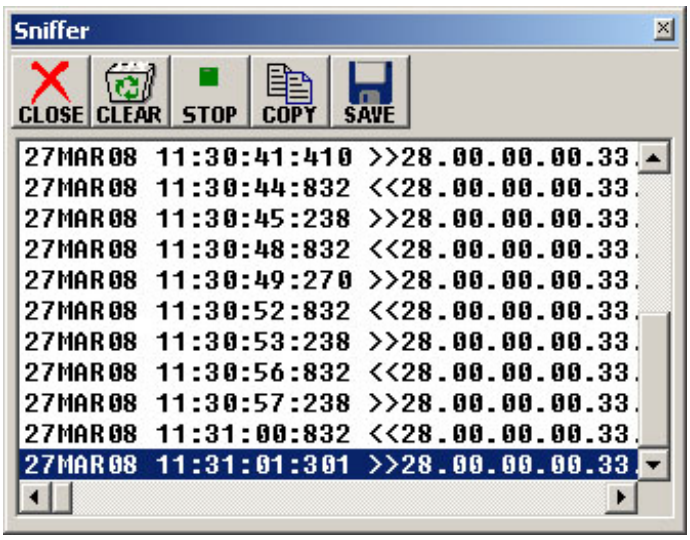


Figure 10-4 Sniffer Screen

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.

10.2.6 Other Useful DT Tools

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

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