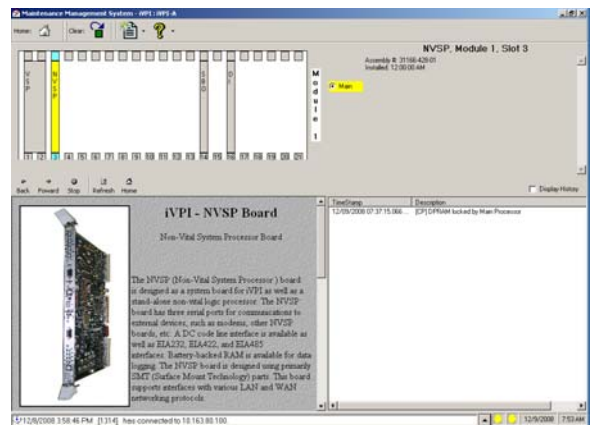
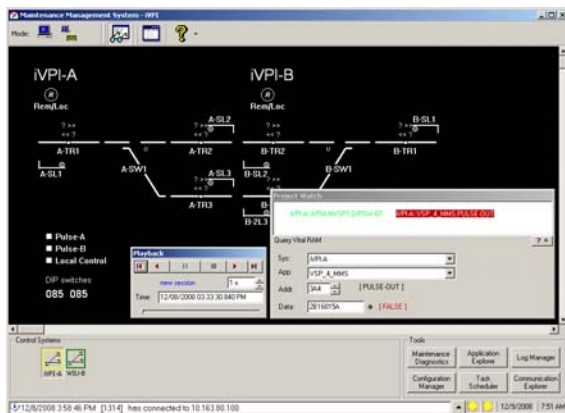


# ALSTOM

## Maintenance Management System (MMS)

for Alstom Vital Processor Interlocking Systems (VPI<sup>®</sup>, VPI<sup>®</sup> II, iVPI)

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User's Manual  
**P2509**

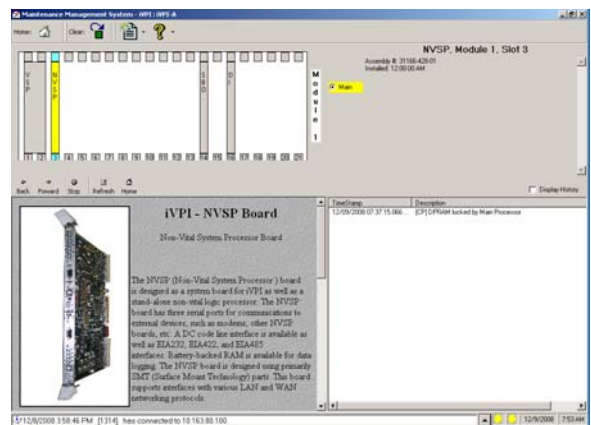
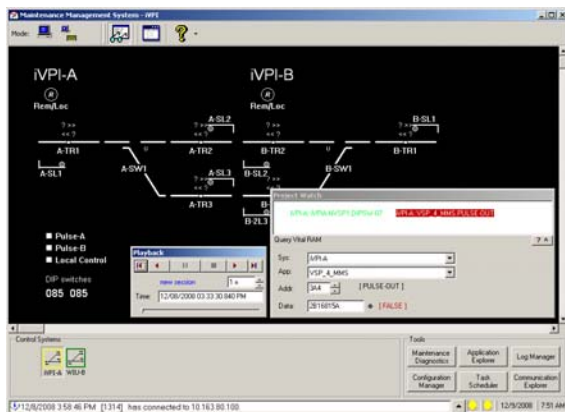


# ALSTOM

## Maintenance Management System (MMS)

for Alstom Vital Processor Interlocking Systems (VPI<sup>®</sup>, VPI<sup>®</sup> II, iVPI)

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User's Manual  
**Alstom Signaling Inc.**

P2509, Rev. January 2009, Printed in U.S.A.



## LIST OF EFFECTIVE PAGES

### **P2509, Maintenance Management System (MMS) for Alstom Vital Processor Interlocking Systems (VPI<sup>®</sup>, VPI<sup>®</sup> II, iVPI) User's Manual**

ORIGINAL ISSUE DATE: March 2005

CURRENT REVISION AND DATE: January 2009, updated to support VPI<sup>®</sup> II and iVPI Systems

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**PREFACE**

**NOTICE OF CONFIDENTIAL INFORMATION**

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**REVISION LOG**

<b>Revision</b>	<b>Date</b>	<b>Description</b>	<b>By</b>	<b>Checked</b>	<b>Approved</b>
0	March 2005	Original issue	MAS	KW	NI
1	October 2006	Updated Section 2,	MAS	KW	NI
2	January 2009	Updated to Support VPI <sup>®</sup> II and iVPI	MAS	JS	NI

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## **ABOUT THE MANUAL**

This manual is intended to provide the necessary information to maintain and ensure proper operation of the Maintenance Management System (MMS) for Alstom Vital Processor Interlocking Systems (VPI<sup>®</sup>, VPI<sup>®</sup> II, iVPI).

The information in this manual is arranged into sections. The title and a brief description of each section follow:

**Section 1 – GENERAL DESCRIPTION:** This section provides general information on the components of the Maintenance Management System (MMS).

**Section 2 – OPERATION:** This section provides information on the typical use and operation of the Maintenance Management System (MMS).

**Section 3 – MMS EDITOR:** This section describes the use of the Maintenance Management System (MMS) Editor software program.

**Section 4 – MMS RUNTIME:** This section contains describes the use of the Maintenance Management System (MMS) Runtime software program.

**Section 5 – SYMBOLS:** This section describes the layout symbols used in the MMS programs.

**Appendix A – COMMUNICATIONS:** This section contains block diagrams describing Maintenance Management System (MMS) communications.

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## **MANUAL SPECIAL NOTATIONS**

In the Alstom manuals, there are three methods used to convey special informational notations to the reader. These notations are warnings, cautions, and notes. Both warnings and cautions are readily noticeable by boldface type two lines beneath the caption.

### **Warning**

A warning is the most important notation to heed. A warning is used to tell the reader that special attention needs to be paid to the message because if the instructions or advice is not followed when working on the equipment then the result could be either serious harm or death. The sudden, unexpected operation of a switch machine, for example, or the technician contacting the third rail could lead to personal injury or death. An example of a typical warning notice follows:

#### **WARNING**

DISCONNECT MOTOR ENERGY WHENEVER WORKING ON SWITCH LAYOUT OR SWITCH MACHINE. UNEXPECTED OPERATION OF MACHINE COULD CAUSE INJURY FROM OPEN GEARS, ELECTRICAL SHOCK, OR MOVING SWITCH POINTS.

### **Caution**

A caution statement is used when failure to follow the recommended procedure could result in loss or alteration of data. A typical caution found in a manual is as follows:

#### **CAUTION**

Changing session date and time to earlier values may affect the ability of the History Window to store data correctly.

### **Note**

A note is normally used to provide minor additional information to the reader to explain the reason for a given step in a test procedure or to just provide a background detail. An example of the use of a note follows:

#### **NOTE**

A capacitor may be mounted on the circuit board with a RTV adhesive. Use the same color RTV.

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## 1. SECTION 1 – GENERAL DESCRIPTION

### 1.1. SCOPE OF MANUAL

This manual provides the necessary information to maintain and ensure proper operation of the Maintenance Management System (MMS) for Alstom Vital Processor Interlocking Systems (VPI<sup>®</sup>, VPI<sup>®</sup> II, iVPI).

#### **NOTE**

Whenever text applies to VPI<sup>®</sup>, VPI<sup>®</sup> II, and iVPI, the generic term VPI is used. If something is exclusive to one of the three systems, it is specified.

### 1.2. GENERAL

This section briefly describes the components and physical characteristics of the Maintenance Management System (MMS).

#### **NOTE**

The individual who installs MMS software must have administrator rights to the PC or laptop intended for use.

### 1.3. MAINTENANCE MANAGEMENT SYSTEM

Maintenance Management System (MMS) is a graphical Diagnostic and Maintenance Application that uses a graphical Track Layout to dynamically record and display the VPI diagnostic status, the status of linked VPI variables and play recorded data.

Additional tools are available to manage diagnostics, configuration, event and data logs, schedule maintenance tasks and view, record, and play recorded VPI application variable data.

MMS consists of two programs:

- MMS Editor is used to graphically create the MMS Project
- MMS Runtime is used to connect to VPI Systems and graphically display runtime information

1.4. REQUIREMENTS / FEATURES

Table 1–1. Minimum PC Requirements

<b>Component</b>	<b>Requirement</b>
OS	Windows™ NT 4.0 SP 6, Windows™ 2000, Windows™ XP
RAM	256 Meg
CPU	Pentium II or compatible
Hard Disk	500 Meg available
Input Device	one of: Touch screen, Mouse, Trackball, Joystick and a Keyboard
Display	SVGA (800 x 600)
Ports	one serial communication (RS-232 or USB)
Other	1.44 Diskette or CD-ROM

Table 1–2. Control System Component Requirements

<b>Component</b>	<b>Requirement</b>
VPI Application	Must be created using VPI® application built with CAAPE version 3A or later
CSEX2 Board* or	CSEX2 or CSEX3 used in VPI® Systems
CSEX3 Board* or	CSEX3 used in VPI® and VPI® II Systems
NVSP Board	NVSP Board used in iVPI Systems

\* Does not support CSE or CSEX1 boards.

1.5. GLOSSARY OF TERMS

Table 1–3. Glossary of Terms

<b>Term</b>	<b>Definition</b>
Application Explorer	Accesses the selected System's variable data obtained through the diagnostic ports. Multiple logic, message, or I/O variables can be viewed in near real time. Variables are displayed using their assigned names and their current Boolean or integer values. Application logic statements can be displayed including the current values of the variables used to generate the statements. Datalogged variable data can be displayed using the playback feature.
CAAPE	Alstom's Computer-Aided Application Programming Environment software package converts Boolean expressions into operating instructions for the VPI microprocessor to generate interlocking logic configured to meet the needs of the particular installation.
Communication Explorer	Provides access to serial ports through VT100. Display network statistics for networked connections.
Configuration Manager	Reports the expected and actual configuration items for each Application of the selected System. Both hardware and firmware items can be reported.
Control System	Hardware device connected to MMS Runtime Computer. Currently only VPI Systems are supported.
Control Variable	Data received by the VPI (MMS → VPI).
CPU II	Central Processing Unit II board used in the VPI <sup>®</sup> II Vital processor.
CPU/PD	Central Processing Unit/Polynomial Divider board used in the VPI <sup>®</sup> Vital processor.
CSEX	A family of non-vital communications and I/O control boards, including CSEX, CSEX2, and CSEX3 used in VPI <sup>®</sup> and VPI <sup>®</sup> II systems.
Data Log	MMS Runtime events, System status, Diagnostics and VPI Data Logs saved in the MMS database.
Drawing Area	The Layout area of the MMS Editor where the location model is created. This is where symbols are placed and connected.
HHT	Hand Held Terminal; a simple text-based diagnostic display device.

Table 1–3. Glossary of Terms (Cont.)

Term	Definition
Import Wizard	A set of dialogs that guide a user through the steps necessary to place VPI information into the MMS Project database.
Indication Variable	Data sent by the VPI (VPI → MMS).
iVPI	Integrated Vital Processor Interlocking, an Alstom vital wayside control system.
LCS file	The compiler's report file for a non-vital application (.lcs).
Log Manager	Handles the retrieval of VPI Data logs and the archival and display of all log data.
LVC file	The compiler's report file for a vital processor application (.lvc).
MAC port	Maintenance ACcess Port; a port used to access diagnostic data.
MMS	Maintenance Management System.
MMS Editor	An application used to create MMS Project databases.
MMS Event Log	VPI Control and Indication data is recorded as MMS Event Log data.
MMS Runtime	An application used to communicate with Control Systems to provide, record, and play health, indication, and log information.
Maintenance Diagnostics	Graphical display of control system hardware status and diagnostic data.
Vital Processor Board	A board responsible for the VPI system non-vital processing: CSEX, CSEX2, CSEX3, NVSP.
NVSP	Non-Vital System Processor non-vital communications and I/O control board used in iVPI systems.
Session	The period of time MMS Runtime is operational; a new session log is created each time MMS Runtime is started.
Status Bar	MMS Runtime information is displayed as an expandable text list; the last 50 items are displayed with their associated time stamps.
Symbol	A graphical object that represents a field device.
Task Scheduler	A basic calendar to do list allowing a user to control maintenance tasks.

Table 1–3. Glossary of Terms (Cont.)

Term	Definition
Track Layout	The graphical model of a location.
VDP	Vital Diagnostic Protocol; a means of routing Vital processor diagnostic data through the diagnostic screens of a non-vital processor board.
Vital Processor Board	A board responsible for the VPI system non-vital processing: CPU/PD, CPU II, VSP
VPI <sup>®</sup>	Vital Processor Interlocking, an Alstom vital wayside control system.
VPI <sup>®</sup> II	Vital Processor Interlocking II, an Alstom vital wayside control system.
VPI Data Log	A collection of data retrieved from VPI CSEX Data Logger; the VPI CSEX Data Logger must be enabled and the data retrieved (see Log Manager).
VSP	Vital System Processor board (used in iVPI systems).
VT100	Emulation of the DEC VT100 terminal protocol, including escape sequences for positioning and other uses.

## 1.6. CONTROL SYSTEM

The VPI system is the control system supported by the MMS.

A VPI system is generally comprised of one Vital processor board which coordinates the vital aspects of system operation and up to four non-vital processor boards. A non-vital processor board coordinates non-vital communications and handles non-vital I/O. Non-vital only VPI systems containing only non-vital processor boards are also feasible.

### 1.6.1. VPI Application

Various VPI boards contain user programming that has been developed specifically for the location where the system is installed. The programming for a particular board is called an application. Each application includes logic statements that control the board's behavior. Logic statements manipulate variables, which are memory locations containing some discrete piece of information such as the status of an I/O port or a message bit. The most common logic statement is the Boolean equation, which logically combines the values of several variables to get a single True or False value and then assigns that value to one or more results. Vital processor boards are capable of processing only Boolean equations. Non-vital processor boards are also capable of processing integer equations as well as more complex statements such as subroutines and IF/ELSE.

The application programming for a board is produced by compiling graphical or text based input files using software tools contained in the Computer-Aided Application Programming Environment (CAAPE). The compile process of the CAAPE optionally produces a report file which includes, among other things, a symbol table mapping memory locations to variable names and a logic section listing the logic statements in the application. Report files for Vital processor applications have an "LVC" extension; report files for non-vital processor applications have an "LCS" extension.

### 1.6.2. VPI Communication Ports

Boards in the non-vital processor family produce diagnostic data that can be accessed through the MAC serial port by a series of menu-driven screens which can be displayed on a VT100 video terminal or an equivalent terminal emulator program. These boards can also produce real-time variable status data in a format compatible with MMS Runtime but is not directly displayable on a video terminal. In addition, serial ports using the DT8 Sync protocol or network diagnostic ports with a Panel message can be connected to interface with MMS Runtime to provide control and indication data. MMS Runtime can also use a serial or network diagnostic port for Data Log retrieval.

The Vital processor board in a VPI provides diagnostic information in a text-based query / response format that was originally meant for viewing with a hand held terminal. Newer versions of VPI system software also have a Vital Diagnostic Protocol (VDP) option that can route diagnostic information from the Vital processor board either through a serial port or through dual-ported random access memory (RAM) to the non-vital processor board and displayed through the non-vital processor board's diagnostic screens.

## 1.7. MMS EDITOR

MMS Editor is used to:

- Graphically model a given location.
- Gather VPI application information.
- Link symbol parameters to VPI variables for each graphical element.
- Create an MMS Project database for use by MMS Runtime.

The model of the plant is entered through the user-friendly Track Layout environment, using symbols representing track circuits, switches, signals, timers, and other layout hardware.

The Import Wizard function guides the user to easily enter VPI configuration data into the MMS Project database. Individual Symbol parameters can be linked to VPI variables by the “drag and drop” of VPI variable names into the parameter tables.

See Section 3, MMS Editor for a detailed explanation of how to use the MMS Editor to create an MMS Project.

### 1.7.1. MMS Projects

MMS Projects provides a variety of standard features:

- Iconic representation of Control System status
- Symbol parameter states graphically displayed and recorded
- Board level diagnostics w/ solution guidelines
- VPI vital and non-vital variable states displayed; can be recorded [up to 128 vital variables per Application (see Table 1–4); up to 128 non-vital variables per Application]
- VPI Application logic display
- VPI Data log retrieval; play of Data logs and recorded data; Log reports
- VPI Configuration reports
- To Do list for task scheduling
- Embedded VT100 terminal emulator for serial ports

Additional features are available for newer VPI and CAAPE software versions, as summarized in Table 1–4.

Table 1–4. MMS Projects Features Available with Specific VPI and/or CAAPE Software

<b>Feature</b>	<b>Requirement</b>
View up to 16 vital variable states at one time in Application Explorer	VPI® CPU/PD system software version 40025-329 or later AND CAAPE version 4F or later
View up to 64 Vital variable states at one time in Application Explorer	VPI® CPU/PD system software version 40025-404 or later AND CAAPE version 6 or later AND MMS version 2.0 or later
View up to 128 Vital variable states at one time in Application Explorer	VPI® II (CPU II) and iVPI (VSP) using Ethernet AND CAAPE version 8 or later AND MMS version 3.0 or later
View up to 128 non-vital variable states at one time in Application Explorer	iVPI (NVSP) using Ethernet AND CAAPE version 8 or later AND MMS version 3.0 or later
Gather system status, diagnostics and vital variable state information through Vital Diagnostic Protocol	VPI® CPU/PD system software version 40025-329 or later AND CAAPE version 4F or later
View VPI signature and shadow data in the Configuration Manager	CAAPE version 4C or later

## 1.8. MMS RUNTIME

### MMS Runtime

- Communicates with control systems (VPI Systems) through
  - Serial ports using
    - Hand-Held-Terminal (HHT)
    - Maintenance Access (MAC)
    - DataTrain VIII (DT8) protocol
  - Ethernet ports using Maintenance ACcess (MAC-TCP)
- Uses a graphical point and click interface, eliminating the need to know command sets for each protocol. Displayed graphical symbols change state based on the linked control system variable data.
- Continuously monitors the health of each connected control system. If a problem is identified, diagnostic information is requested and logged.
- Displays information on designated pages:
  - Maintenance Diagnostic page - displays recorded diagnostic data: board level VPI diagnostic information along with troubleshooting and suggested solutions. Diagnostics can be filtered, cleared and history viewed.
  - Application Explorer page - displays variable states and equation logic for tracing possible problems. Variable state data can be recorded to play later. Data played later, variable state as well as VPI CSEX log data, is displayed in a timing diagram format.
  - Log Manager page - retrieves VPI CSEX data logs. These logs can be retrieved manually or automatically as a timed task. Creates reports of MMS events or data logs.
  - Configuration Manager page - displays control system hardware and firmware configuration information.
  - Task Scheduler page - provides a calendar based To Do list.
  - Communication Explorer page - a VT100 terminal emulator for those users who prefer command line formats with capture and macro support. Also displays network statistics.
- Displays recorded indications on the Track Layout using the playback feature.

MMS Runtime uses the data provided in an MMS Project database created with MMS Editor. This database contains data describing the plant model and connected Control Systems.

Control Systems are connected through serial and/or Ethernet ports to the MMS Runtime computer, allowing data to be transferred. Controls and indications, control system health, application equation and variable data, configuration information, and data log data can be transferred.

The Control System information includes:

- physical hardware layout and identification
- type of system / application
- variable data
- equation logic data
- serial port connection type and settings
- network connection type and settings

If the VPI Data Logger is configured to log the MMS port data, then the VPI logged data, once retrieved, can be displayed on the Track Layout using the playback feature. Any other logged data, once retrieved, can be displayed through the Application Explorer's timing diagram.

See Section 2 for an overview of MMS Runtime operation. See Section 4, MMS Runtime for a detailed explanation of how to access and use the data in an MMS Project.

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## **2. SECTION 2 – OPERATION**

### **2.1. GENERAL**

This section contains typical operating information on the Maintenance Management System (MMS) for the Alstom VPI System.

### **2.2. OPERATION**

Most maintenance personnel access the MMS to monitor or investigate their system. In this case, an application engineer has already created the MMS Project file for the location using MMS Editor and the user runs the MMS Runtime portion of the software to access recorded or live data.

This Section describes launching MMS Runtime and the various screens it displays. Section 3 describes the use of MMS Editor in detail, while Section 4 describes the use of MMS Runtime in detail, including how to connect to a VPI System.

### 2.2.1. Starting MMS Runtime

If the VPI System(s) is not already connected to the PC or laptop containing MMS software make the serial/network connections between the VPI System(s) and the PC.

If MMS Runtime is not already running from the PC Start menu choose Programs->Alstom Maintenance Management System->Runtime.

The first time the MMS Runtime is launched the screen prompts for a Project location. If the software has been used in the past, the last project viewed is displayed. Another Project can be selected from the Main Screen, see Figure 2–1.

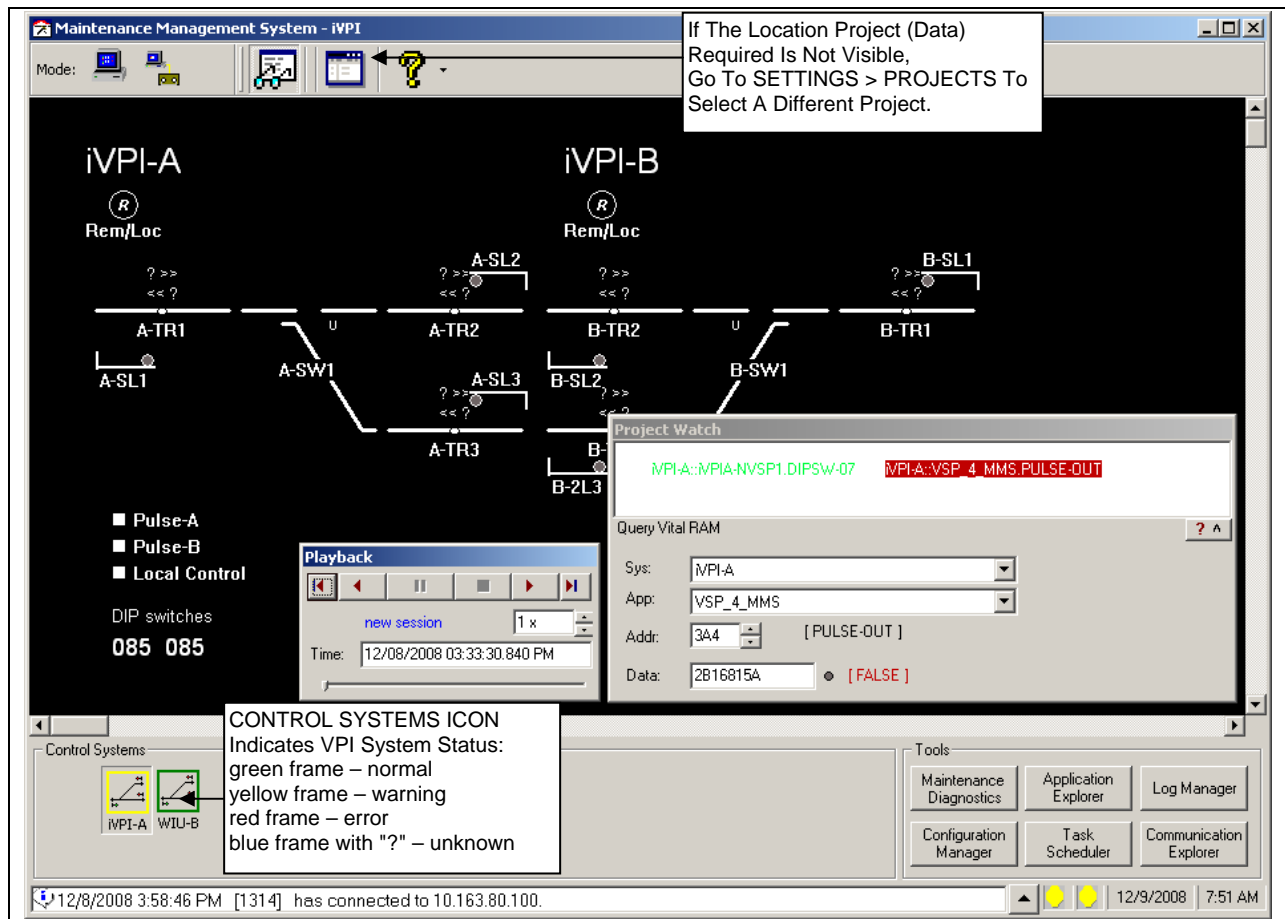


Figure 2–1. MMS Launch

See Section 4.4.1. for additional information regarding what is visible when the software launches and how to choose a project.

### 2.2.2. Main Screen

To display system control system status, control data, and indication data use the Main Screen.

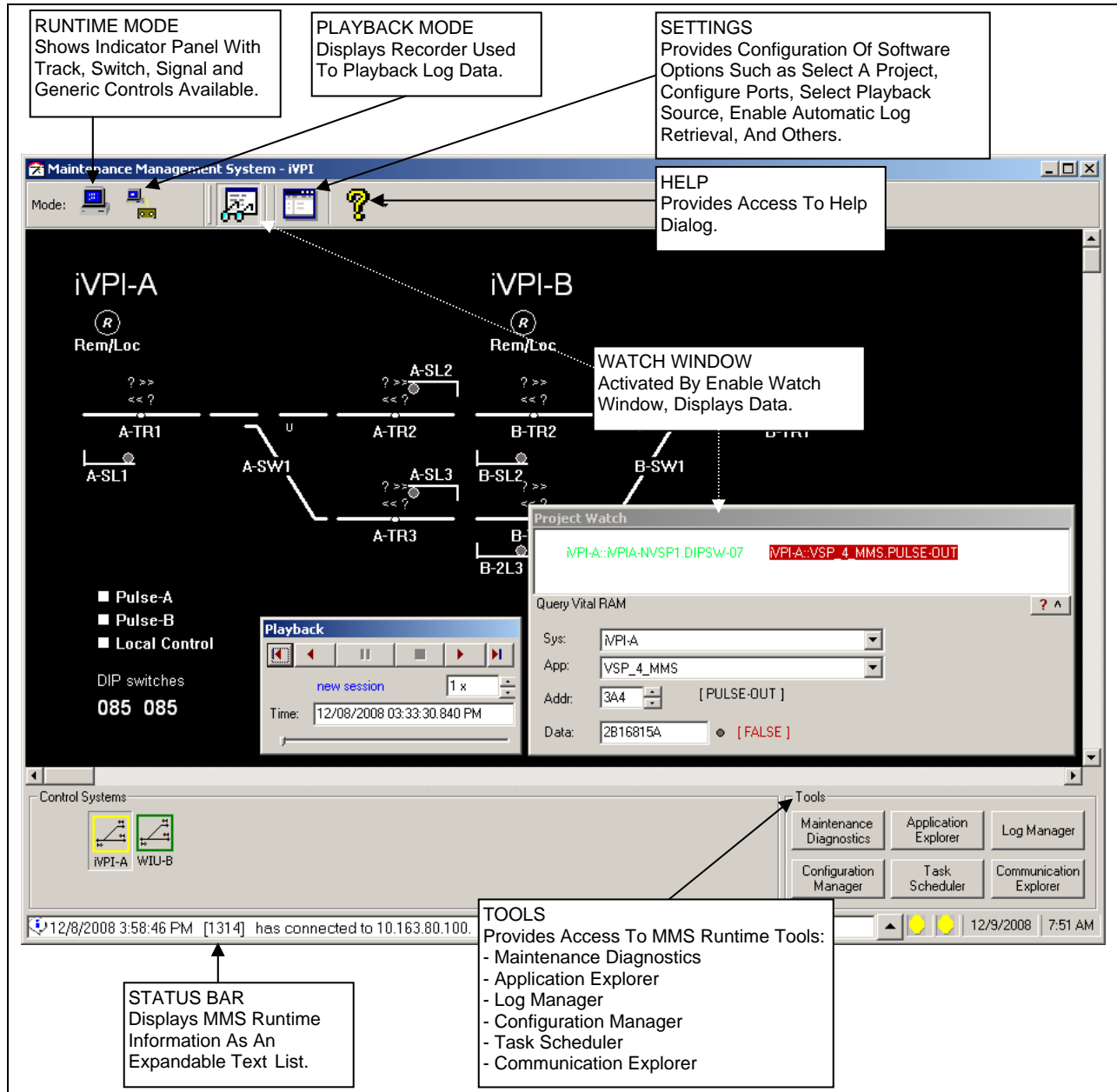


Figure 2–2. Main Screen Detail

For additional information on the Main Screen see Section 4.4.1. through 4.4.1.7.

### 2.2.3. Maintenance Diagnostics Screen

To display hardware status and diagnostic data along with troubleshooting and suggested solutions use the Maintenance Diagnostics Screen.

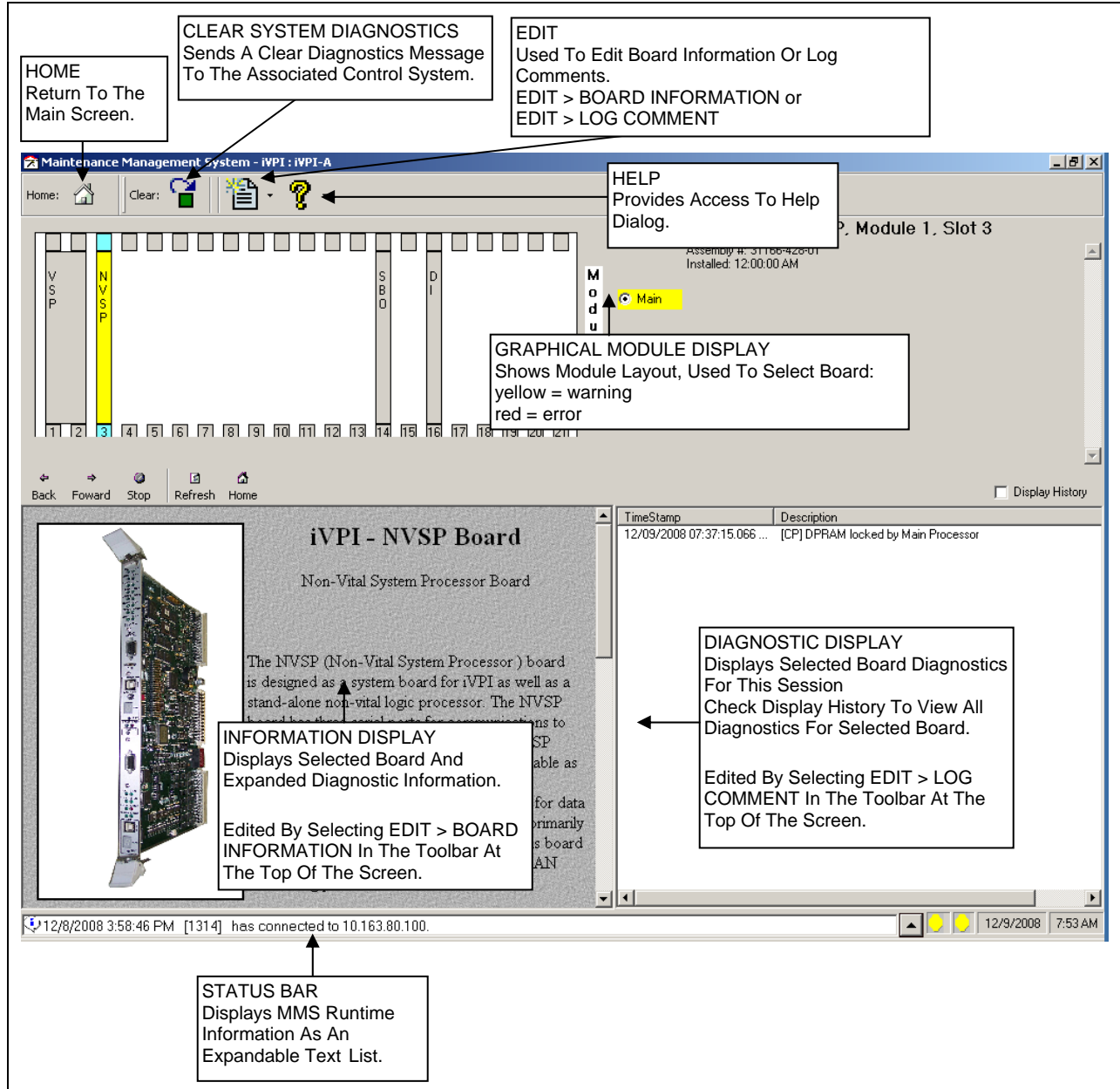


Figure 2–3. Maintenance Diagnostics Screen Detail

For additional information on the Maintenance Diagnostics Screen see Section 4.4.2.

### 2.2.4. Application Explorer Screen

To display VPI application variable data for tracing possible problems use the Application Explorer Screen.

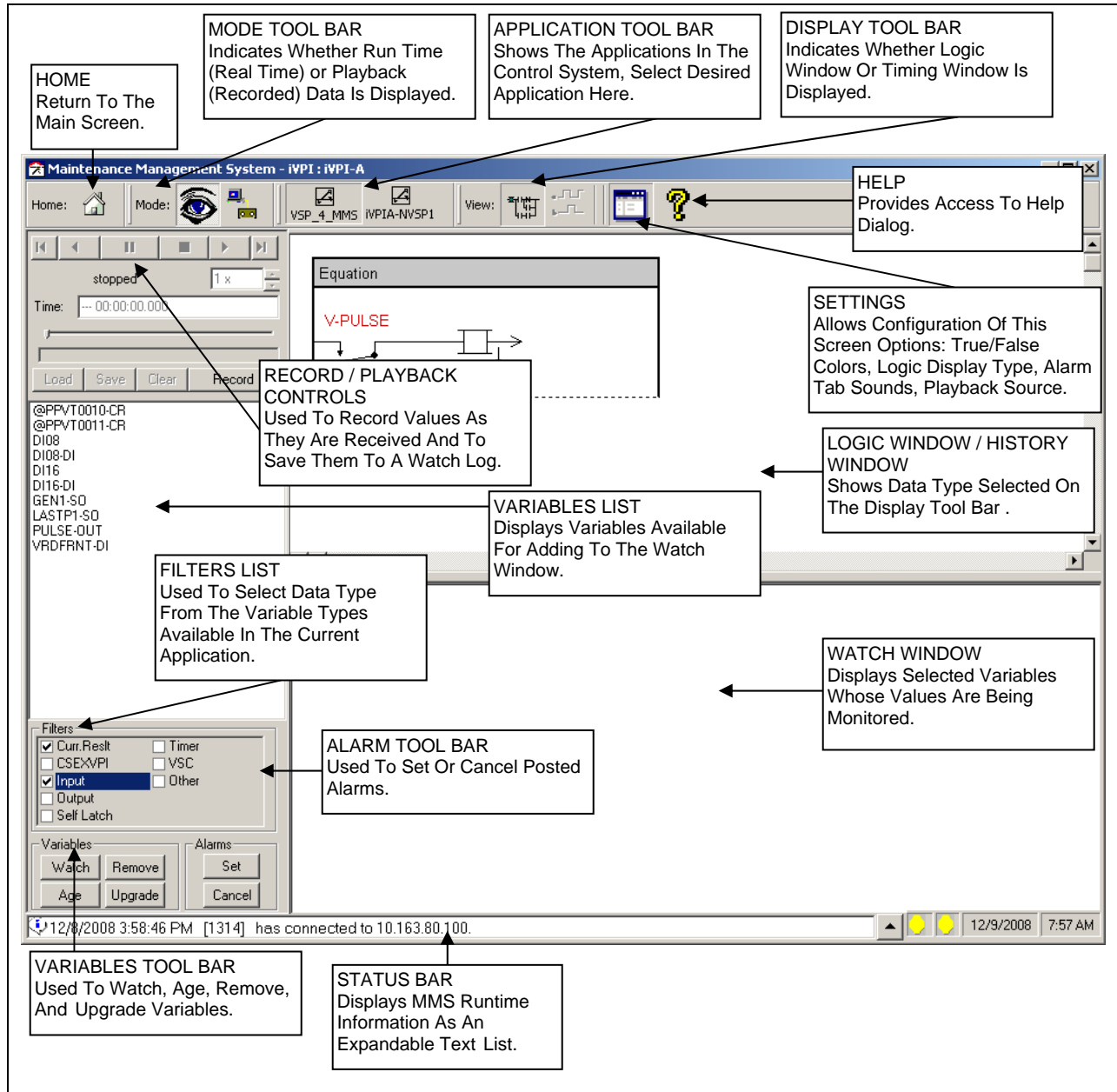


Figure 2–4. Application Explorer Screen Detail

For additional information on the Application Explorer Screen see Section 4.4.3.

### 2.2.5. Log Manager Screen

To retrieve VPI CSEX Data Logs use the Log Manager Screen.

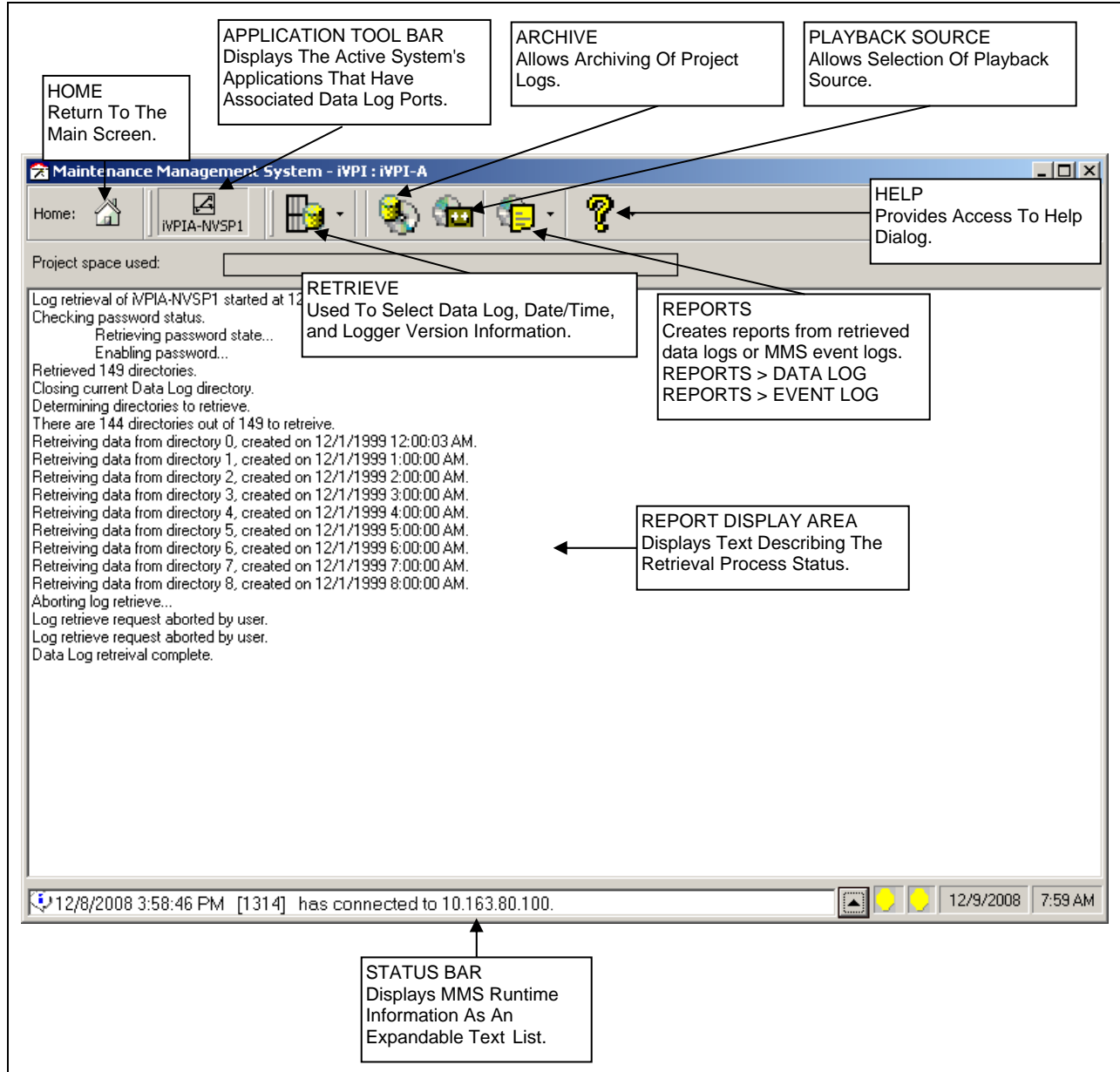


Figure 2–5. Log Manager Screen Detail

For additional information on the Log Manager Screen see Section 4.4.4.

### 2.2.6. Configuration Manager Screen

To display VPI control system hardware and firmware configuration information use the Configuration Manager Screen.

**VALIDATE**  
For Applications Reports Expected And Actual Firmware Configuration For Each Application Of The Selected System.  
For Hardware Reports Expected Hardware Configuration For Each Application Of The Selected System.  
VALIDATE > FIRMWARE  
VALIDATE > HARDWARE

**HOME**  
Return To The Main Screen.

**HELP**  
Provides Access To Help Dialog.

configuration data retrieved

**PROJECT: ivpi**

REVISION:  
TOOL REVISIONS  
MMS:

**SAVE REPORT**  
Save Data.

**PRINT**  
Prints Report To The Default Printer.

This Area Shows Validation Progress.

**SYSTEM: ivpi-A**

CUSTOMER NAME: Jim Sleight  
EQUIPMENT LOCATION: 1025 John St.  
CONTRACT NAME: MMS Development  
CONTRACT NUMBER:

**REPORT DISPLAY WINDOW**  
Displays Configuration Reports.

----- VITAL APPLICATION: VSP\_4\_MMS -----

	Expected	Actual
<b>Vital Processor</b>		
Compiler Version:	31746-600GR10 REV A	31746-600GR10 A
VPI Program Number:	00000-000-01 , REV. 01.00.00	00000-000-01 1
Compile Date/Time:	12/03/2008 AT 16:23:24	12/03/08,16:23:24
System Software Version:	40025-413GR00 REV A	40025-413GR00 A
Boot Loader Version:	40025-426GR00 REV A	40025-426GR00 A
System Software Sig.:	83DD8D09 (@124)	83DD8D09
Application Software Sig.:	E864BB9E (@128)	E864BB9E
Boot Loader Software Sig.:	929307AB	929307AB
<b>Communication Processor</b>		
Compiler Version:	31746-600-10 REV.A	31746-600-10 A
Program Number:	00000-000-020, REV. 1.00.00	00000-000-020 1.
System Software Version:	40025-416-00 REV.A	40025-416GR00 A
Boot Loader Version:	40025-417-00 REV.B	40025-417GR00 B
System Software Sig.:	3B5E	3B5E
Application Software Sig.:	3309	3309
Boot Loader Software Sig.:	5775	5775

12/8/2008 3:58:46 PM [1314] has connected to 10.163.80.100. 12/9/2008 8:02 AM

**STATUS BAR**  
Displays MMS Runtime Information As An Expandable Text List.

Figure 2–6. Configuration Manager Screen Detail

For additional information on the Configuration Manager Screen see Section 4.4.5.

### 2.2.7. Task Scheduler Screen

To display and schedule maintenance tasks use the Task Scheduler Screen.

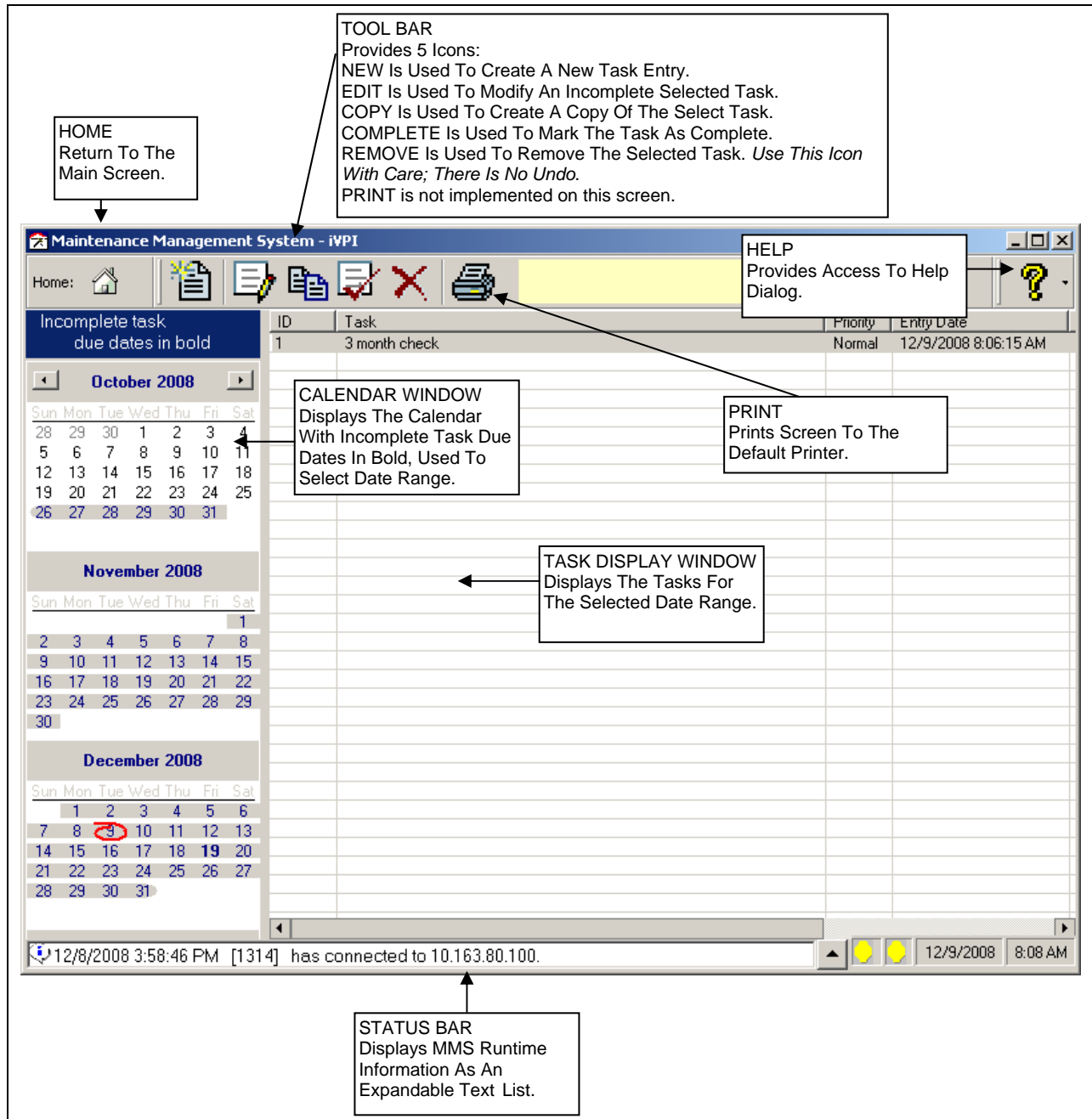


Figure 2–7. Task Scheduler Screen Detail

For additional information on the Task Scheduler Screen see Section 4.4.6.

### 2.2.8. Communication Explorer Screen

Use the Communication Explorer Screen to display a VT100 terminal emulator for users who prefer command line formats with capture and macro support.

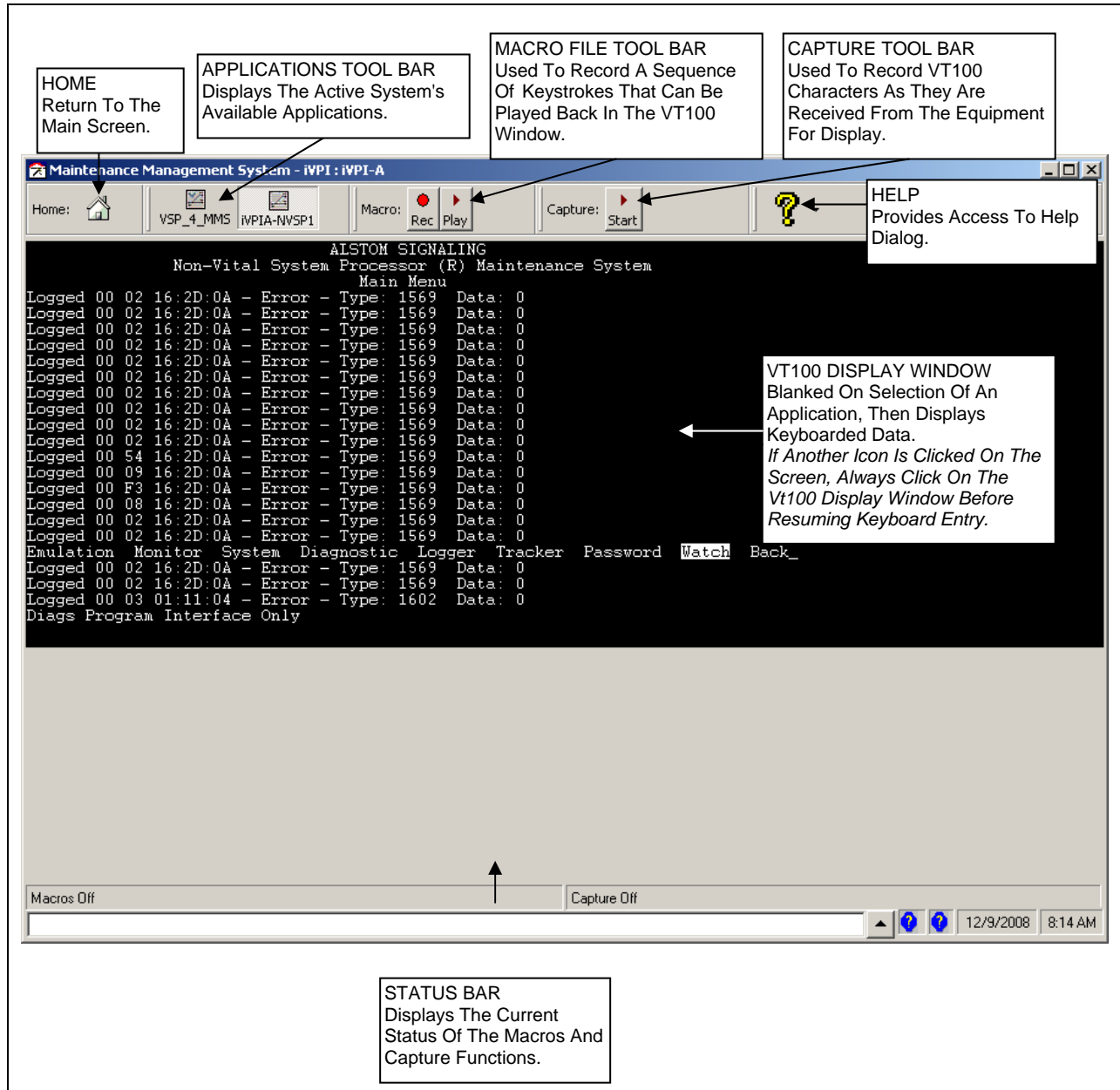


Figure 2–8. Communication Explorer Screen Detail

For additional information on the Communication Explorer Screen see Section 4.4.7

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### 3. SECTION 3 – MMS EDITOR

#### 3.1. GENERAL

This section describes the use of the Maintenance Management System (MMS) Editor software program.

#### 3.2. MAINTENANCE MANAGEMENT SYSTEM PROJECT CREATION

The MMS Editor, shown in Figure 3–1, imports CAAPE project data from an MMS file (CAAPE 6A or later) or the files listed and described in Table 3–1. Use of the MMS file is desirable as it contains additional information not gathered through the .cpb files. Table 3–2 summarizes the steps to create an MMS project in MMS Editor, while, including references to additional tables detailing the steps.

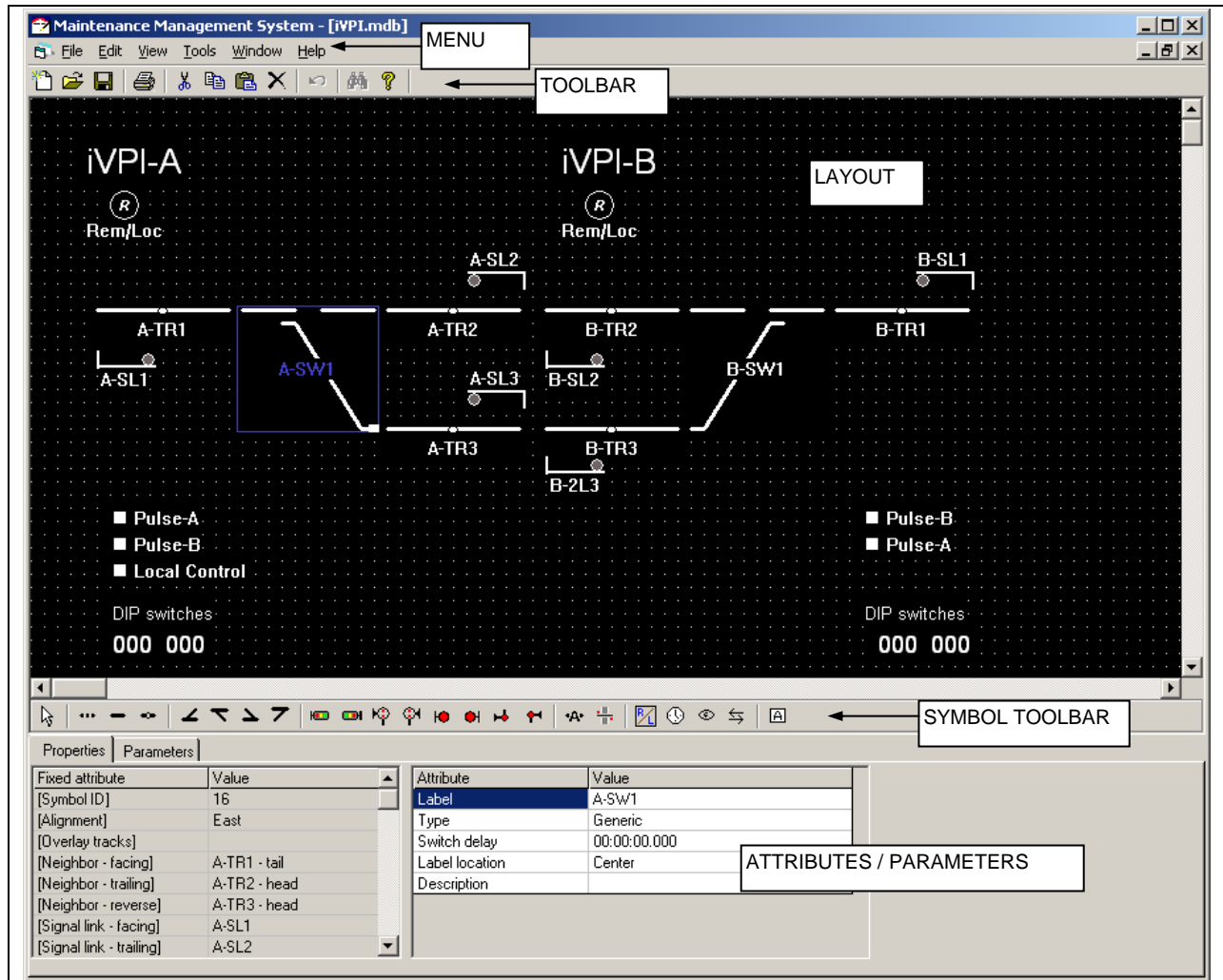


Figure 3–1. MMS Editor

Table 3–1. CAAPE Project Data Imported by the MMS Editor When .CPB is Used

<b>File Extension</b>	<b>Description</b>
.%BV	CAAPE build file for configuration information.
.caq	VPI CSEX data log variables and sources
.cfn .cfg	Configuration files created and saved in the Reports folder when a compile is done in CAAPE. These files have a .cfg extension for Vital applications and a .cfn extension for non-vital applications.
.cpb	CAAPE project file used to gather top level information and all other files
.csi	VPI CSEX data log ports and features
.css	Communications file to gather port information and VPI variables that can be linked to the graphical symbols
.lvc .lcs	Vital and non-vital variable information; files are copied as part of the MMS project data
.hdw	Module board layout description

Table 3–2. MMS Editor Project Creation Process

<b>Step</b>	<b>Action</b>
1	<p>Using CAAPE (Computer-Aided Application Programming Environment) create the VPI System application(s).            CAAPE project files are necessary for building an operational MMS project. See Section 3.3. Setting Up VPI Ports to Acquire Data.</p>
2	<p>Run MMS Editor.            From the Start menu choose Programs-&gt;Alstom Maintenance Management System-&gt;Editor.</p>
3	<p>Create a New Project.            From the Editor menu choose Files-&gt;New Project. See Table 3–3, Creating a New MMS Project.</p>
4	<p>Create the plant layout (optional).            Using the symbol toolbar choose symbols to represent field devices and graphically build the plant layout. See Table 3–4, Building the Location Model.            Modify the symbol attributes as necessary. See Section 5, Symbols, for symbol detail.</p>
5	<p>Import CAAPE project information.            From the Editor menu choose Files-&gt;Import from CAAPE. See Table 3–5, Importing CAAPE data.</p>
6	<p>Link VPI variables to the symbols.            Once CAAPE data has been imported: Select a symbol. Select the Parameters tab. Drag-and-drop variables from the variables dialog to the variable column of the Parameters grid. See Table 3–6, Linking VPI Variables to Symbol Parameters.</p>
7	<p>Add MMS port information (optional), hardware information (optional), and save the project.            From the MMS Editor menu choose Edit -&gt; Additional MMS Data. See Table 3–7, Adding MMS Specific Data.</p>

### 3.3. SETTING UP VPI PORTS TO ACQUIRE DATA

#### 3.3.1. CPU/PD Diagnostic Port

From the CPU/PD diagnostic port, the MMS uses Control System Status, Diagnostics, Vital Application variables (Application Explorer / Project Watch window), Configuration Reports and VT100 emulation when Vital Diagnostic Protocol (VDP) is not used.

For this port, the serial port configuration is 1200 baud, 8 data bits, 1 stop bit, no parity. No application programming is required.

#### 3.3.2. CSEX Diagnostic Port

From the CSEX diagnostic port, the MMS uses Non-Vital Application variables (Application Explorer / Project Watch window), Non-Vital Configuration Reports, Clock synchronization (if password not used) and VT100 data.

For this port, enter the desired diagnostic port setup data for each application, including baud rate and data format.

Default values are 9600 baud, 8 data bits, 1 stop bit and no parity unless otherwise specified.

See CAAPE online help for specifics on the input records.

#### Text Records (CSI File)

- DIAGNOSTIC TERMINAL TYPE = MAC
- DIAGNOSTIC TERMINAL BAUD RATE = baud-rate  
where baud-rate is the terminal baud rate
- DIAGNOSTIC TERMINAL DATA FORMAT = data-bits, stop-bits, parity  
where data-bits is the number of data bits, stop-bits is the number of stop bits, and parity is E for even, O for odd or N for none

#### Graphics

- Use the Terminal section of the Diagnostics tab on the CSEX board's editing dialog

### 3.3.3. CSEX Diagnostic port with Vital Diagnostic Protocol (VDP)

From CSEX diagnostic port with VDP, the MMS uses Non-Vital Application variables (Application Explorer / Project Watch window), Non-Vital Configuration Reports, Clock synchronization, Control System Status, Diagnostics, Vital Application variables (Application Explorer / Project Watch window), Vital Configuration Reports and VT100.

To configure the port for VDP to be used to route CPU/PD diagnostics through a CSEX board, enter the appropriate records for the CPU/PD and CSEX applications. VDP data can be passed from CPU/PD to CSEX either through dual-ported RAM or through a serial connection between the CPU/PD board's diagnostic port and one of the CSEX board's serial ports.

See CAAPE online help for specifics on the input records.

#### Text Records (CPU/PD - VPC File)

- For DPRAM transfer: VITAL DIAGS = CSEX BOARD board-number where board-number is the number of the CSEX board, 1 through 4
- For serial port transfer: no record

#### Text Records (CSEX - CSI File)

- For DPRAM transfer: VITAL DIAGS = DPRAM
- For serial port transfer: VITAL DIAGS = PORT port-number, csex3-mode, baud-rate where port-number is the port number, csex3-mode is an optional CSEX3 compatibility mode, and baud-rate is the baud rate

#### Graphics

- Use the Vital Diagnostics Interface section of the Diagnostics tab on the CSEX board's editing dialog.

### 3.3.4. CSEX Port with DataTrain VIII Protocol

From the CSEX port with DataTrain VIII protocol, the MMS uses symbol parameter controls and indications.

For this configuration, enter the desired port setup data for each application, including baud rate and data format.

See CAAPE online help for specifics on the input records.

#### Text Records (CSEX - CSS File)

- SERIAL PORT port number = TYPE (DT8 SYNC), LATCHED CONTROLS
- DEFAULT BAUD RATE = baud rate
- DATA FORMAT = data bits, stop bits, parity
- OPERATING MODE = RS-232
- CONTROL = ADDRESS (binary address), LENGTH (length)  
position = variable name
- INDICATION = ADDRESS (binary address), LENGTH (length)  
position = variable name

#### Graphics

- Configure the Message components and use the Board and Port tabs on the CSEX board's editing dialog.

### 3.3.5. CSEX Port for Data Log

From the CSEX port for data log, the MMS uses CSEX Data Log retrieval.

To configure this port to retrieve CSEX Data Logs, enter the appropriate records for the CSEX applications.

The Tracker Interface is used to transfer Data Log data.

See CAAPE online help for specifics on the input records.

#### Text Records (CSEX - CSI File)

- DATA LOGGING = ON
- TRACKER INTERFACE = PORT port number, INPUT ADDRESS (binary address), OUTPUT ADDRESS (binary address)

#### Text Records (CSEX - CSS File)

- SERIAL PORT port number = TYPE (DT8 SLAVE)
- DEFAULT BAUD RATE = baud rate
- DATA FORMAT = data bits, stop bits, parity
- \*DUMMY CONTROL MESSAGE
- CONTROL = ADDRESS (binary address), LENGTH (8)

1 = PERMZERO

2 = PERMZERO

3 = PERMZERO

4 = PERMZERO

5 = PERMZERO

6 = PERMZERO

7 = PERMZERO

8 = PERMZERO

- \*DUMMY INDICATION MESSAGE
- INDICATION = ADDRESS (binary address), LENGTH (8)
  - 1 = PERMZERO
  - 2 = PERMZERO
  - 3 = PERMZERO
  - 4 = PERMZERO
  - 5 = PERMZERO
  - 6 = PERMZERO
  - 7 = PERMZERO
  - 8 = PERMZERO
- TEXT CONTROL = ADDRESS (binary address), LENGTH (length), NAME (name)
- TEXT INDICATION = ADDRESS (binary address), LENGTH (length), NAME (name)

### Text Records (CSEX - LOG File)

- DATA LOGGING SECTION
- LOCATION ID = location id
- DATA PROTECT = hours HOURS, minutes MINUTES
- AUTO DUMP = OFF
- DATA LOG = PORT port (port event list)
- DATA LOG = (general event list)
- INPUT LOG = [PERIOD (minutes MINUTES, seconds SECONDS)], [SAMPLES (samples)], [CHANGE DETECT] [FLAGGED]
- OUTPUT LOG = [PERIOD (minutes MINUTES, seconds SECONDS)], [SAMPLES (samples)], [CHANGE DETECT] [FLAGGED]
- MSG LOG = [PERIOD (minutes MINUTES, seconds SECONDS)], [SAMPLES (samples)], [CHANGE DETECT] [FLAGGED]
- PRINT MODE = [FIFO], [LIFO]
- DATA LOGGING INTERFACE = TRACKER
- APPLICATION LOG MESSAGE = ADDRESS(binary address),LENGTH(length)  
position = variable name

### Graphics

- Configure the Message components and use the Data Log tab on the CSEX board's editing dialog.

### 3.3.6. Vital Board Network Ports

For MMS to use the Vital diagnostic network port, the Vital board must be configured to use networking, have a network port enabled, have diagnostics enabled on that network port, and have an IP address assigned to that network port.

See the appropriate CAAPE reference manual or online help for specifics on input records.

### 3.3.7. Non-Vital Board Network Ports

For MMS to use the non-vital diagnostic network port, the non-vital board must be configured to use networking, have a network port enabled, have diagnostics enabled on the network port, and have an IP address assigned to that network. If a Panel is used, then a Panel message must be configured. If data logs are to be archived, then the network port must be specified.

See the appropriate CAAPE reference manual or online help for specifics on input records.

### 3.3.8. Compiler Report Options

Before compiling each application, make sure that the Listing Reports section of the application's Run Controls includes at least these options (any other listing options may be selected as well):

- Generate Tracker Information
- Parameters
- Logic Equations

This data must be available in the report file for MMS Runtime to display readable variable names and logic statements and playback CSEX Data Logs

### 3.4. MMS EDITOR OPERATION

The MMS Editor screen, as shown in Figure 3–1, includes a standard pull down menu and tool bar used to perform basic windows functions such as open files, save files, and cut and paste content. The MMS Editor specific part of the screen includes displayed graphical layout, a symbol tool bar, and an attributes/parameters data input table.

#### 3.4.1. Modifying User MMS Software Preferences

To modify MMS Editor user preferences, select from the menu Tools->Options. A window is displayed with two tabs: a General tab and a Colors tab.

The General tab includes the following preferences:

- Directories: Default folders for project files
- Traffic: Text for direction (not used)
- Grid: Size in pixels of grid spacing (5 to 25); symbols are snapped to the nearest grid
- Cab Rate: Table of cab signal rates (not used)
- Show All Warnings: Enable all warning dialogs to be shown
- Show Variable Dialog on Parameters Tab: Displays variables dialog to allow variable linking

The Colors tab accesses 5 additional tabs:

- General tab
  - Background: Color of drawing area background
  - Default: Default color of Track, Switch and Grade Crossings
  - Select: Border color of symbol when selected
  - Route: Color to indicate part of route
  - Occupied: Color of Track, Switch and Grade Crossing when occupied
  - Blocked: Color of Track, Switch and Grade Crossing when blocked
  - Alternate Track: Default Alternate track color

- Switch tab
  - Locked: Color of locked indication
- Signal tab
  - Pending: Color of border when request is pending
  - Failed: Color of border when request has failed
- Timer tab
  - Running: Color of symbol when running
- Generic tab
  - Indication: Color of symbol when indication is set
  - Direction: Default color of Direction Indicator
  - Locked: Color of Direction Indicator when locked

## 3.4.2. Creating a New MMS Project

Table 3–3. Creating a New MMS Project

<b>Step</b>	<b>Action</b>
1	Select from the menu File->New (or use the new project icon on the basic tool bar). This initiates the New Project Wizard. This Wizard provides dialog that prompts the user to enter project information and choose a project template.
2	An introductory screen is displayed. Select NEXT.
3	<p>The Information Page is now displayed.</p> <p>Enter the project location (the folder must exist) and name in the fields provided.</p> <p>This screen contains additional fields provided for optional information.</p> <p>Once the Information Page is complete, select NEXT.</p>
4	<p>The Template Page is now displayed.</p> <p>A default template is available. The first time the editor is used this is the only available template. Use the default template to create a default MMS project.</p> <p>Once a project is created it can be saved as a template (using File &gt; Save As on the menu). Any previous MMS Project saved as a template appears in the list of available templates. All project data except linked variables is saved in a template. To use a template that was saved with a password, enter the password designated at file creation.</p> <p>Once a Template is selected, select NEXT.</p>
5	<p>The Summary Page is now displayed.</p> <p>This page shows the entries made on the Information and Template Pages.</p> <p>If the listed entries are correct, select FINISH and the project database is created with the default information.</p> <p>If the listed entries are not correct, select the back icon(s) to back up to the desired data page and correct any inaccurate data, then use the next icon(s) to come back to the Summary Page. Select FINISH to create the project database.</p>

### 3.4.3. Building the Location Model

The user builds the location model using symbols from the symbol tool bar. See Section 5 for a summary of the available symbols and their icons. Follow the procedure in Table 3–4 to build a location.

Table 3–4. Building the Location Model

Step	Action
1	Select a symbol from the symbol toolbar. The mouse pointer is displayed as thin cross hairs.
2	Click in the Layout Area to place the symbol (see Section 5 for symbol information). Click again to place a second one, and so forth.
3	Click the right mouse button to return the mouse pointer to the Select arrow.
4	Select a symbol by left-mouse clicking over a symbol in the layout area; the border is drawn in the selected color. Multiple symbols can be selected by holding the control key down while performing the select operation or by highlighting or “rubber banding” a selection area.
5	Symbols can be moved, cut, copied or deleted. Cut or copied symbols can be pasted. All operations may be undone. The undo buffer is limited only by available memory.

For a selected symbol, the Properties tab lists the symbol properties and values (such as connections to other symbols, display parameters, etc). Attribute property values whose Attribute names (left column) are not enclosed in square brackets [ ] can be edited. These values are edited by either choosing from a drop-down list of items or entering values. Up and Down arrow keys can be used to navigate through the properties table.

#### **NOTE**

Fixed attribute property values cannot be edited.

The Parameters tab lists the symbol parameters and linked VPI variables.

### 3.4.4. Importing CAAPE Data

VPI module board layout, communication port, link variable, data logger and configuration information is gathered from CAAPE project files. To import the data follow the procedure in Table 3–5.

Table 3–5. Importing CAAPE Data

Step	Action
1	Select from the menu File >Import from CAAPE. All existing imported system applications are listed.
2	To add new system applications browse to the required CAAPE project file (extension .mms or .cpb). All system applications found in the project are added to the system/applications list. Repeat the process to enter all required CAAPE projects.
3	Check USE to include the application data in the import list. System and Application names may be modified (these names are used in MMS Runtime) in the attributes/parameters table on the screen.
4	Existing application data can be updated by selecting from the menu File -> Synchronize to CAAPE.
5	Any serial port Panel or Tracker messages are listed in the Controls/Indications list. Check USE to include this information in the imported data.
6	The station number may be modified (it must match the VPI station number for this port for communications to operate properly) in the attributes/parameters table on the screen.
7	FINISH imports the requested VPI System data.

### 3.4.5. Linking VPI Variables To Symbol Parameters

To link a VPI variable to a selected symbol's parameter follow the procedure in Table 3–6.

Table 3–6. Linking VPI Variables to Symbol Parameters

<b>Step</b>	<b>Action</b>
1	Select the Parameters tab in the attributes/parameters table.
2	Make certain that the box next to Show variable dialog on Parameters tab option is checked in Tools -> Options and that CAAPE data has been imported (see Table 3–5, Importing CAAPE Data).
3	<p>Use the mouse to “drag and drop” the symbol for the required variable to the Variable field of the Parameter.</p> <p>Control type variables can only be linked to control type parameters. Control variables are data received by the VPI (MMS → VPI).</p> <p>Indication variables can only be linked to indication parameters. Indication variables are data sent by the VPI (VPI → MMS).</p> <p>Only one indication variable can be linked to a parameter; multiple control variables can be linked to a parameter.</p>
4	To remove the link(s), select the Variable field and press the Delete key on the keyboard. There is no undo command for links.

### 3.4.6. Adding MMS Specific Data

The build wizard is used to add MMS Runtime communication port and additional hardware information to the MMS project database. Using this function of MMS Editor is not required since the communication port information can be added later in MMS Runtime and the additional hardware information is optional. MMS Editor and MMS Runtime can use the same database.

Table 3–7. Adding MMS Data to the Build File

<b>Step</b>	<b>Action</b>
1	Select from the menu Edit -> Additional MMS Data.
2	To configure the MMS Runtime communication ports see Section 4, heading 4.4.1.3 Settings.
3	Select NEXT.
4	Optional additional hardware information may be entered here.

### 3.4.7. Creating a Summary Report

A summary report can be created and results shown from the MMS Editor.

Table 3–8. Creating a Summary Report

Step	Action
1	Select from the menu Tools -> Summary Report.
2	Use the New Report button on the Summary toolbar to create the report.
	Save and print the report by using the Save and Print buttons.

### 3.4.8. Printing a Layout Drawing

The layout drawing can be printed from the MMS Editor.

Table 3–9. Printing a Layout Drawing

Step	Action
1	Select from the menu File > Print or select the Print icon on the standard toolbar.  <p style="text-align: center;"><b><u>NOTE</u></b></p> <p style="text-align: center;">The layout can only be printed on a single sheet, automatically sized to fit.</p>

## 4. SECTION 4 – MMS RUNTIME

### 4.1. GENERAL

This section describes the use of the Maintenance Management System (MMS) Runtime software program.

### 4.2. MAINTENANCE MANAGEMENT SYSTEM RUNTIME PROCESS

To launch the MMS software and access the desired system data follow the steps in Table 4–1. Detailed explanations of the various screens in MMS Runtime follow.

Table 4–1. MMS Runtime Process

Step	Action
1	If the VPI System(s) is not already connected to the PC or laptop containing MMS software: make the connections between the VPI System(s) and the PC. (See Connect to a VPI System, Section 4.3.)
2	If MMS Runtime is not already running: from the Start menu choose Programs->Alstom Maintenance Management System->Runtime. See Section 4.4.1. Main Screen for a description of what is displayed when the software launches and how to choose a project.
3	<p>Display the desired data:</p> <p>To display system control system status, control data, and indication data use the Main Screen, see Section 4.4.1 through 4.4.1.7.</p> <p>To display hardware status and diagnostic data along with troubleshooting and suggested solutions use the Maintenance Diagnostics Screen, see Section 4.4.2.</p> <p>To display VPI application variable data for tracing possible problems use the Application Explorer screen, see Section 4.4.3.</p> <p>To retrieve VPI CSEX Data Logs use the Log Manager Screen, see Section 4.4.4.</p> <p>To display VPI control system hardware and firmware configuration information use the Configuration Manager Screen, see Section 4.4.5.</p> <p>To display and schedule maintenance tasks use the Task Scheduler Screen, see Section 4.4.6.</p> <p>To display communication information, including a VT100 terminal emulator for serial connections and network statistics for network connection, see Section 4.4.7.</p> <p>Capture and macro support are included in VT100 Screen use.</p>

### 4.3. CONNECT TO A VPI SYSTEM

Up to 16 serial communications ports can be connected on the MMS Runtime computer. Each port must be configured to the appropriate type and settings (baud, parity, etc).

Table 4–2 provides a list of port types and their applicable connections. Examples of various port connections are provided in Figures 4–1 to 4–6.

Table 4–2. VPI Connection Ports

Port Type	Connection
CPU/PD MAC	<p>CPU/PD diagnostic port w/ system firmware earlier than 40025-329 (VPI CAA 31746-029). User is not able to view vital variables in Application Explorer; Project Watch window can view one vital variable at a time.</p> <p>CPU/PD diagnostic port w/ system firmware 40025-329 (VPI CAA 31746-029) to 40025-404 (VPI CAA 31746-033A). User can view up to 16 vital variables in Application Explorer.</p> <p>CPU/PD diagnostic port w/ system firmware 40025-404 (VPI CAA 31746-033A) or later. User can view up to 64 vital variables in Application Explorer.</p>
CSEX MAC	CSEX MAC port; no Vital Diagnostic Protocol (VDP) with this configuration.
CSEX-VDP MAC	CSEX MAC port w/ Vital Diagnostic Protocol (VDP); all vital communications compatible w/ CPU/PD MAC (40025-329, VPI CAA 31746-029 or later) port type routed through this port.
CPU II	<p>Preferred: CPU II network connections via Two 10/100-baseT Ethernet network controllers.</p> <p>CPU2 Main Processor diagnostic port.</p>
VSP	<p>Preferred: VSP (iVPI) network connections via Two 10/100-baseT Ethernet network controllers.</p> <p>VSP Main Processor diagnostic port.</p>
NVSP	<p>Preferred: NVSP (iVPI) connections via Two 10/100-baseT Ethernet network controllers.</p> <p>NVSP Main Processor diagnostic port (serial port 4) is used for connecting the NVSP Main Processor to a PC, supports asynchronous EIA-232, and is available at the front DB-9 connector or USB port or through P3 on the backplane (switch selectable).</p>
DATATRIN VIII	CSEX serial port w/ DataTrain VIII protocol.
DATALOG	CSEX serial port w/ Tracker interface; the Tracker Interface protocol is used by MMS Runtime to retrieve Data Logger data.

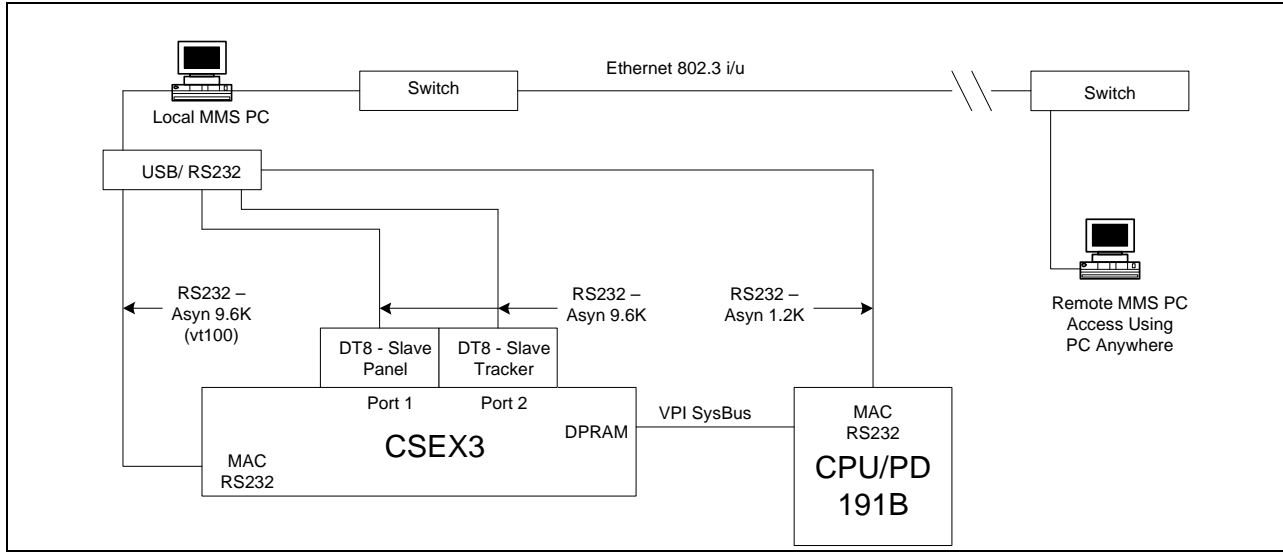


Figure 4-1. CPU/PD 191B and CSEX3 Connections In a System with 1 CSEX3 Board and a USB Port

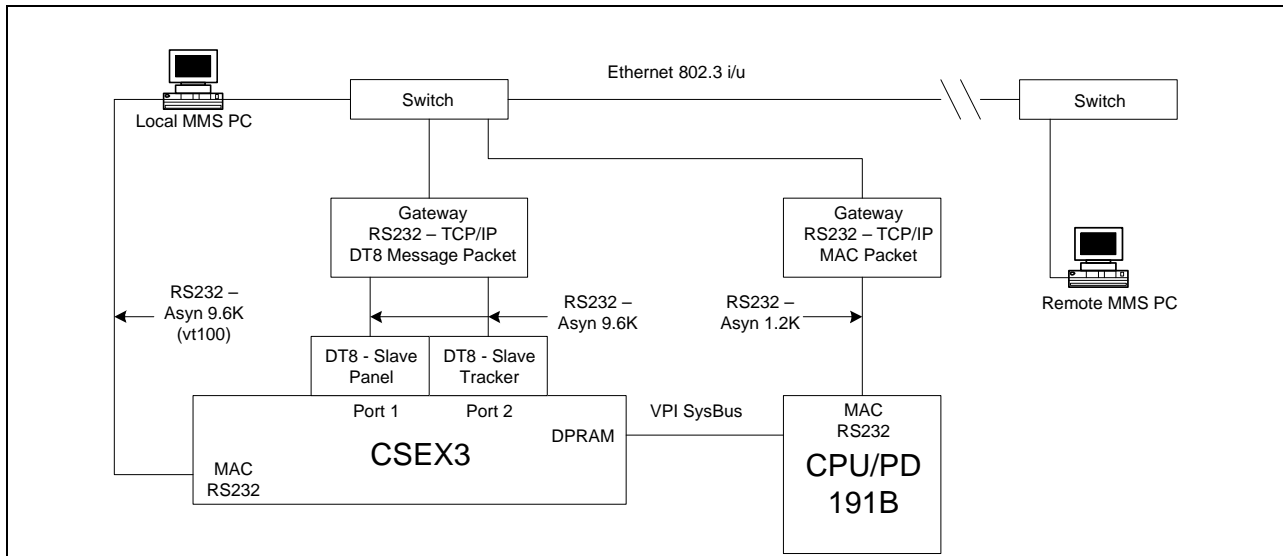


Figure 4-2. CPU/PD 191B and CSEX3 Connections In a System with 1 CSEX3 Board

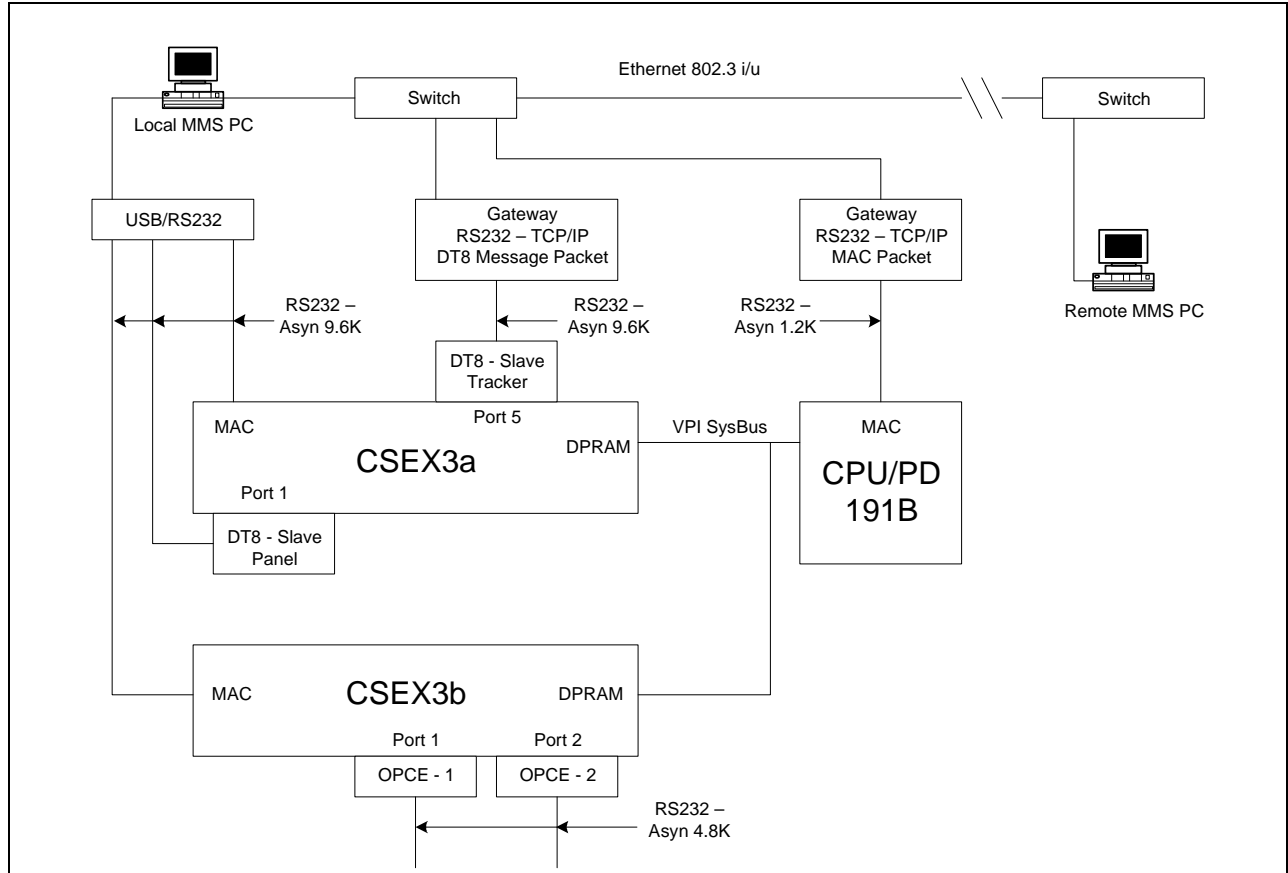


Figure 4-3. CPU/PD 191B and CSEX3 Connections In a System with 2 CSEX3 Boards

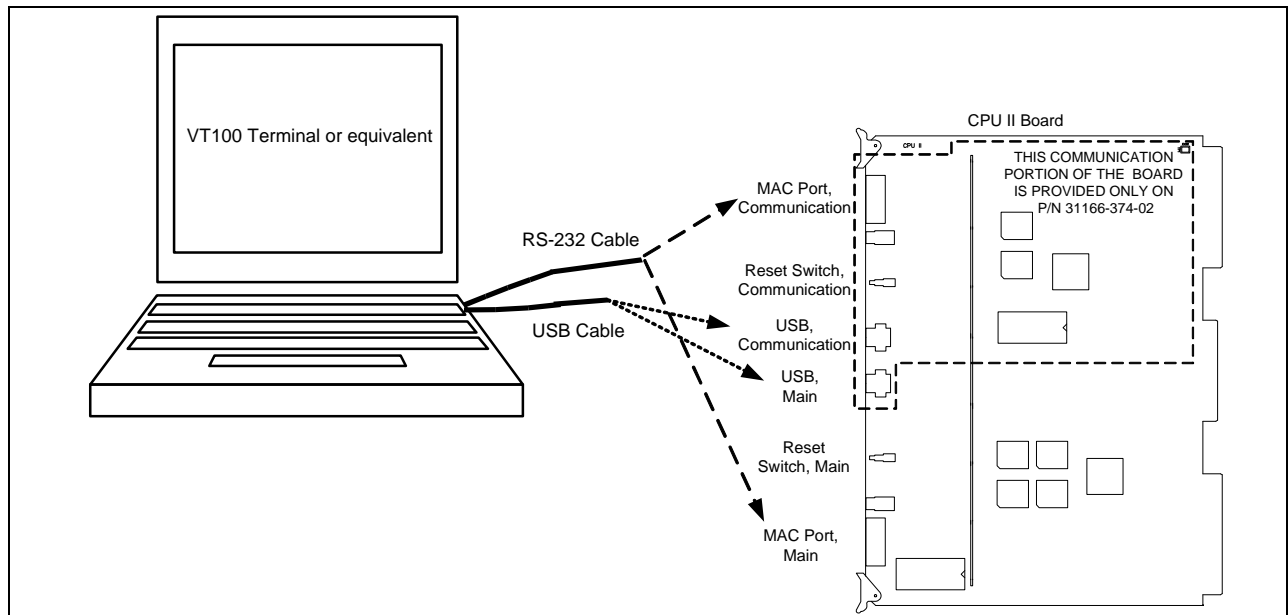


Figure 4-4. CPU II Ports

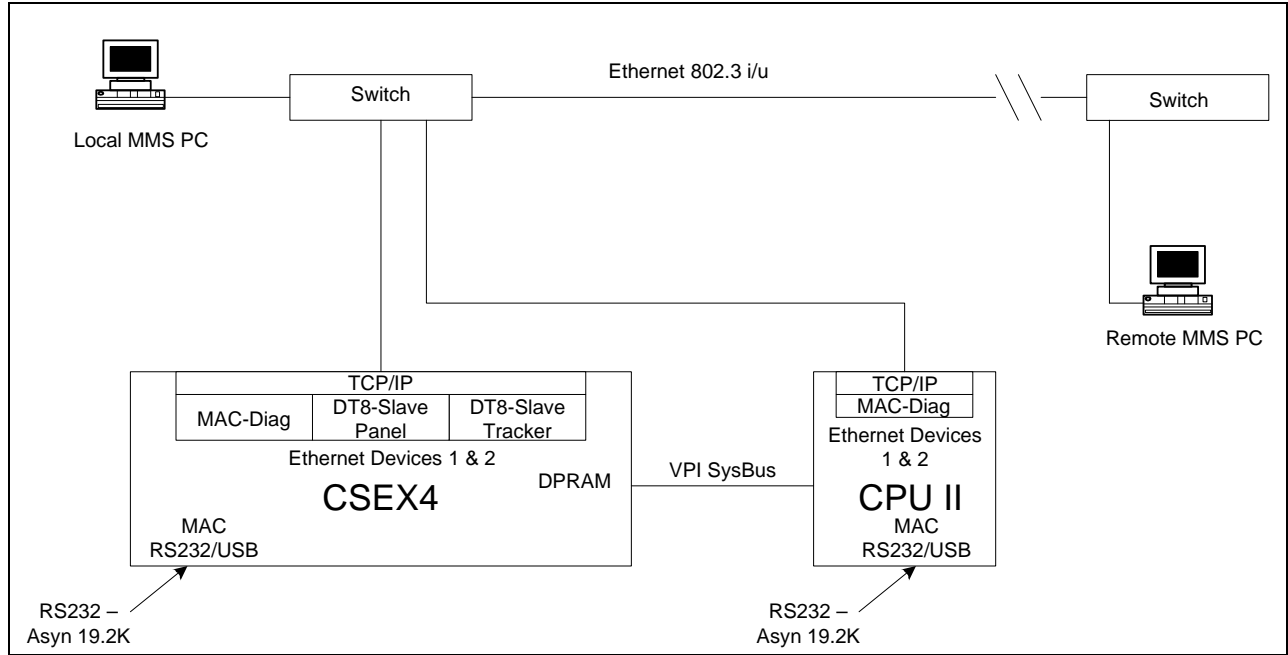


Figure 4-5. CPU II and CSEX4 Diagnostics

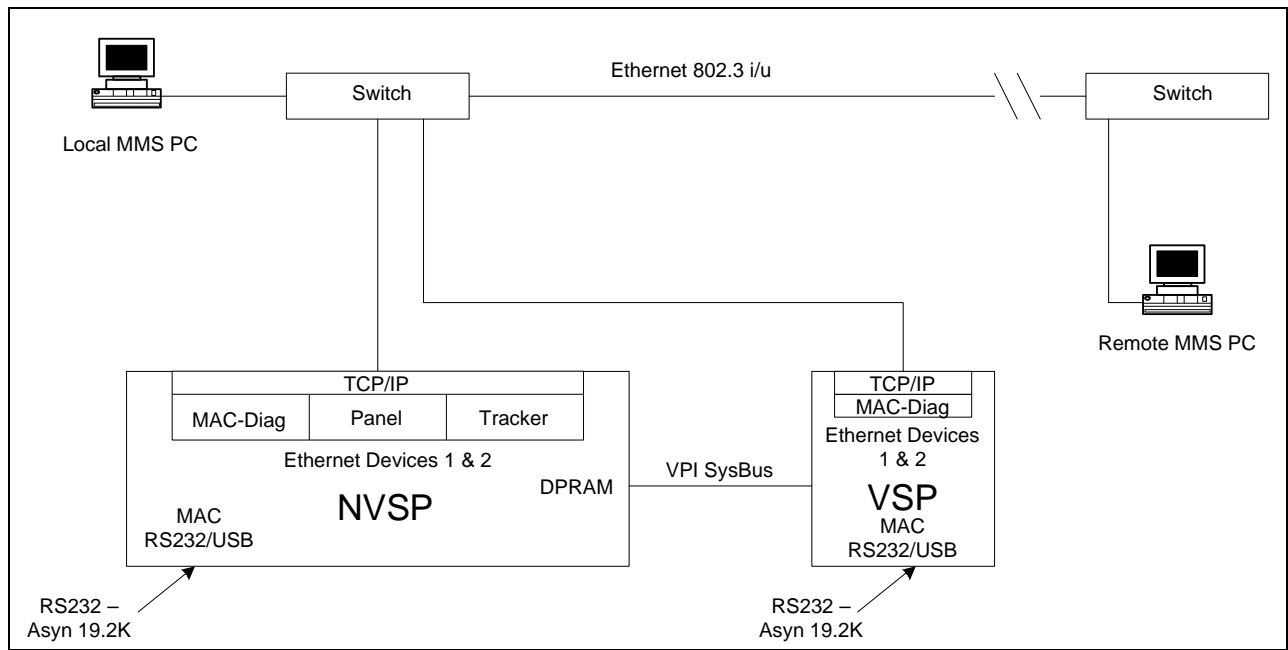


Figure 4-6. VSP and NVSP Remote Diagnostics

#### 4.3.1. Other Recommended Connection Configurations

Since many PCs do not have multiple or any serial COM ports, USB ports may be used with appropriate adapters to provide these ports.

Alstom Product Development has successfully implemented the alternate connections listed in Table 4–3.

Table 4–3. Alternate VPI Connections

<b>Connection</b>	<b>Equipment</b>
USB to RS-232 port (DB9)	RadioShack 6 ft USB to Serial Cable (26-183) ATEN USB-Serial converter (UC-232A)
USB to 4 RS-232 ports (DB9)	Keyspan USB 4-Port Serial Adapter (P/N USA-49WLC)
USB 4 port hub	RadioShack Illuminations USB 2.0 Hub (26-137)  Note: USB 4 port hub used with USB to RS-232 port (DB9) adapters to provide 4 RS-232 ports.
RS422 to RS232	B & B RS232/422 converters (422 PP 9TB)

#### 4.4. MMS RUNTIME

The first time that MMS Runtime starts, the user is prompted to locate and select a project database file. The selected file is copied to the MMS Apps folder.

The user can choose to select a project on startup or always startup with a specific project. Archived projects can also be opened for playback. A project can be added to the project list through the Upload button.

#### **NOTE**

If a user has chosen to always open a specific project, a new project can be selected or "Choose Project On Startup" can be selected through the MMS Runtime Settings dialog.

Once MMS Runtime is started, the project layout display is shown and initialization is performed. If MMS Runtime has been configured to connect to VPI via DataTrain VIII communications ports, the status of those ports is displayed on the Status Bar (typically "Port x Station y is on-line").

The Control Systems icons indicate the VPI system status:

- green frame – normal
- yellow frame – warning
- red frame – error
- blue frame with "?" – unknown

An unknown Control System status on startup is most likely due to an MMS Runtime port to VPI MAC port communication problem.

While MMS Runtime is operational (in a session) all Control System status, diagnostics and linked indications are logged. A new session log is created each time MMS Runtime is started.

## 4.4.1. Main Screen

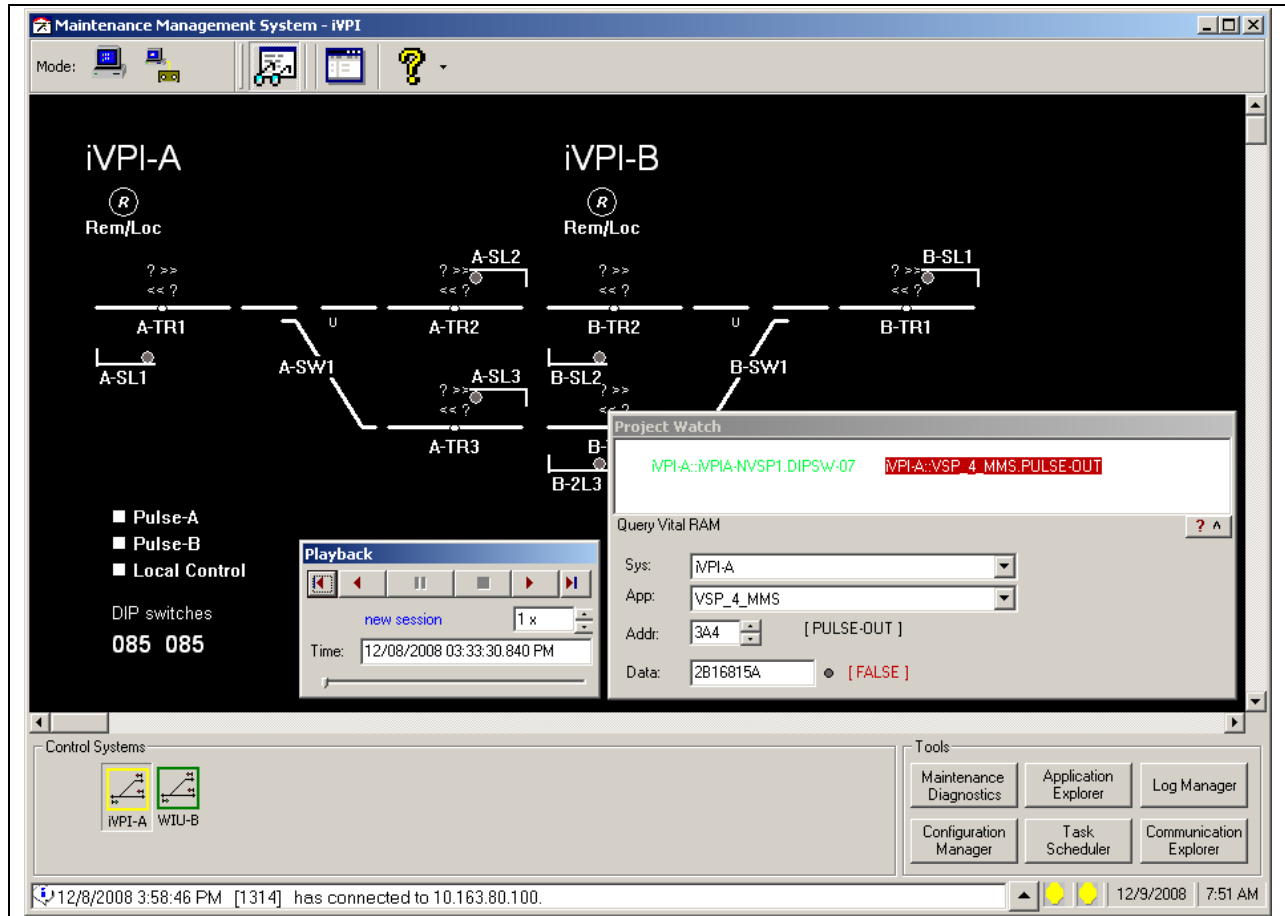


Figure 4–7. MMS Runtime, Main Screen

The Main screen is used for graphical display of control system status, control data, and indication data. It provides access to other MMS Runtime screens.

The top of the screen includes icons that provide access to the MMS Runtime modes, the Project Watch Window, Settings, and Help.

#### 4.4.1.1. Main Screen Modes

There are two Main Screen Modes accessible by icons on the top left side of the screen:

1. Runtime Mode is the normal operation mode.
2. Playback Mode, which displays the recorder. Track Layout indications display playback log data. Runtime data may still be recorded. Played back logs include MMS Event Logs or VPI Data Logs (user selectable).

The played back controls are as follows:

- |< BOB (beginning of buffer): Go to the beginning of the session or log
- >| EOB (end of buffer): Go to the end of the session or log
- < Reverse: Play data in reverse (newest to oldest)
- > Forward: Play data in forward (oldest to newest)
- || Pause: Pause record/playback; pressing key again resumes last operation
- |||| Stop: Stop record/playback

Available playback speeds include single-step, 1/10x, 1/2x, 1x, 2x and 10x.

The slider bar can position playback to start anywhere in the buffer.

#### 4.4.1.2. Project Watch Window

The Project Watch Window feature displays all variables present in Application Explorer Watch windows. Due to the VPI communications processing, System Status information is not gathered while the Project Watch window is active (serial port communication).

Individual Vital variable data can be queried through the expanded Project Watch Window. Vital variables can be dragged from the Project Watch Window to the Addr field or specific addresses can be entered. The variable name, codeword and true/false indication are displayed.

To activate this feature select the Project Watch Window button at the top of the screen.

To deactivate this feature select the Project Watch Window button (toggle) at the top of the screen

#### 4.4.1.3. Settings

The Settings icon is located at the top of the screen. Once this icon is selected, a window with the following tabs appears:

- The Access Level tab is not implemented at this time.
- The Clock Sync tab is used to synchronize all VPI System clocks to the MMS clock (VPI password cannot be used for this feature to work).
- The Projects tab is used to choose a project on startup or select a project to load at MMS Runtime startup.
- The Ports tab is used to configure the MMS serial communication ports. The initial screen shows the active ports with buttons to Add, Remove, and Show Properties.
  - Add is used to add network and serial ports
  - Remove is used to remove selected active ports
  - Properties is used to modify a selected active port properties
- The Colors tab is used to configure user settable colors.
- The Watch tab is used to identify full names (format - system::application.variable) in Project Watch Window. (Short name is just the variable name). Since variables from multiple applications can be displayed, the use of short names may cause unexpected results if two or more applications have the same variable name; data for that variable name is updated for each application.
- The Diagnostic tab is used to display detailed diagnostic data.
- The Record tab is a feature not implemented on this screen.
- The Playback tab is used to select the playback source (MMS Event log / VPI Data log) and to choose beginning / end playback times.
- The Log Retrieval tab is used to enable automatic data log retrieval. Time and length of next retrieval can be configured here.
- The Printer tab is used to select the default printer.

#### 4.4.1.4. Help

The HELP icon, located at the top of the screen, accesses the software help information, organized as follows:

- Contents and Index, displays the Help dialog
- How do I?, displays the Help 'How do I?' section
- About, displays the 'About' dialog

#### 4.4.1.5. Control Systems

The Control Systems icon is located in the lower left corner of the screen. System status is indicated the icon as follows:

- green frame – normal
- yellow frame – warning
- red frame – error
- blue frame with "?" – unknown

An unknown Control Systems status on startup is most likely due to an MMS Runtime port to VPI MAC port communication problem.

The active system is shown as depressed icon. The active system is used in the Maintenance Diagnostic, Application Explorer, Log Manager, Configuration Manager, and Communication Explorer screens.

#### 4.4.1.6. Status Bar

The status bar displays MMS Runtime information as an expandable text list. The last 50 items are displayed with their associated time stamps when the up arrow at the right of the bar is selected.

#### 4.4.1.7. Tools

The bottom right corner of the screen includes six tools icons used to run the associated tools:

- Maintenance Diagnostics
- Application Explorer
- Log Manager
- Configuration Manager
- Task Scheduler
- Communication Explorer

4.4.2. Maintenance Diagnostics

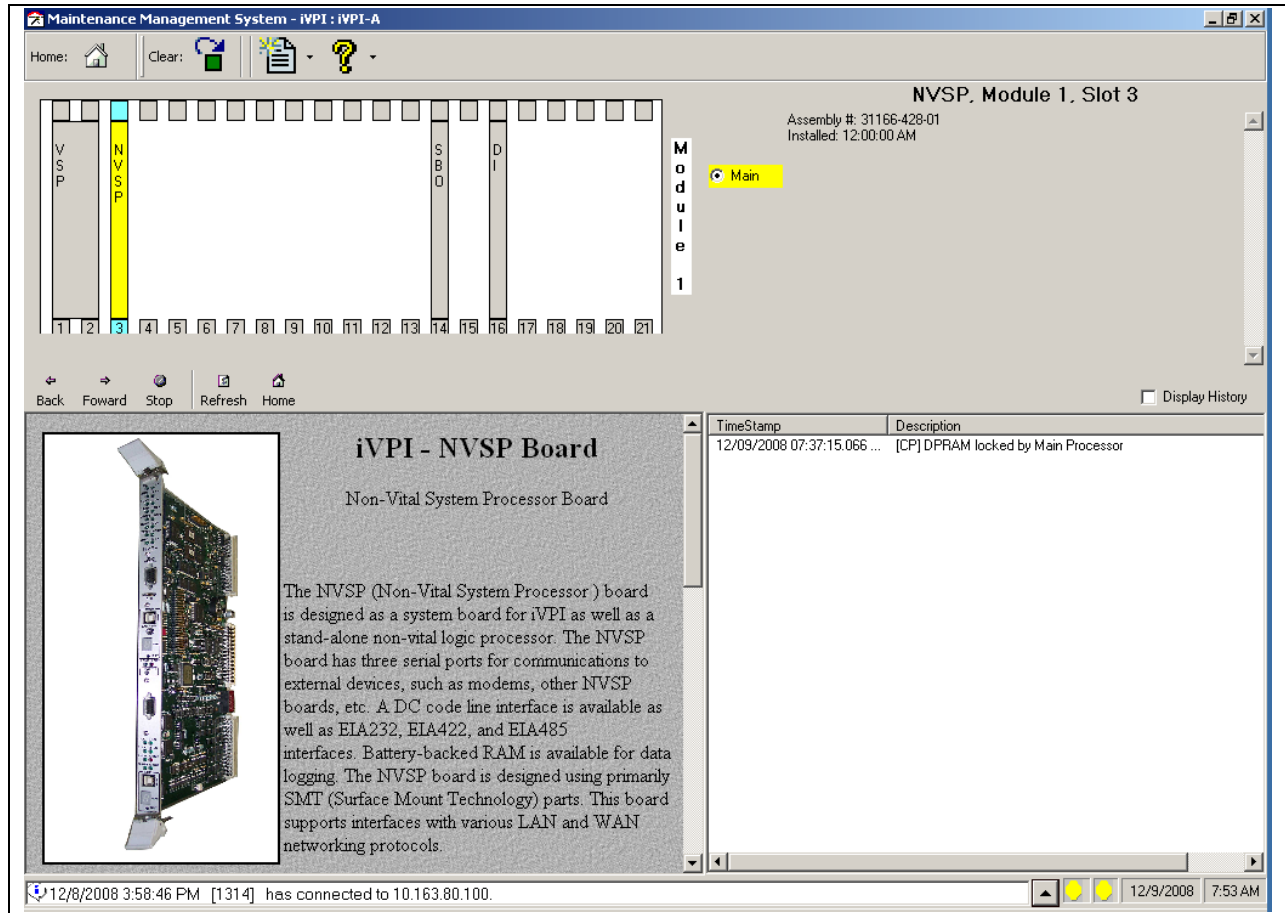


Figure 4–8. MMS Runtime, Maintenance Diagnostics Screen

The Maintenance Diagnostics tool is used for graphical display of control system hardware status and diagnostic data.

- The Home icon at the top left of the screen returns to Main screen.
- The Clear System Diagnostics icon sends a clear diagnostics command to the associated Control System.
- The Edit icon is used to edit selected board information or add log comments.
- The Help icon accesses the user Help information.
- The Graphical Module Display on the left side of the screen shows the module layout. Individual board information and diagnostics is viewed by selecting the appropriate board. Board status is indicated as yellow for warning or red for error.
- The Information Display on the left bottom of the screen displays the selected board and expanded Diagnostic information. Navigation is done through embedded links and/or the navigation keys.
- The Board Information Display at top right side of screen displays selected board information.
- The Diagnostic Display in the bottom right portion of the screen displays the selected board diagnostics for this session. Check Display History to view all diagnostics for this board. Select the diagnostic statement to display expanded information.
- The Status Bar along the bottom of the screen displays MMS Runtime information as an expandable text list. The last 50 items are displayed with their associated time stamps when the up arrow on the right side of the bar is selected. Two icons show the selected System status (left) and the worst-case status of all Systems (right).

### 4.4.3. Application Explorer

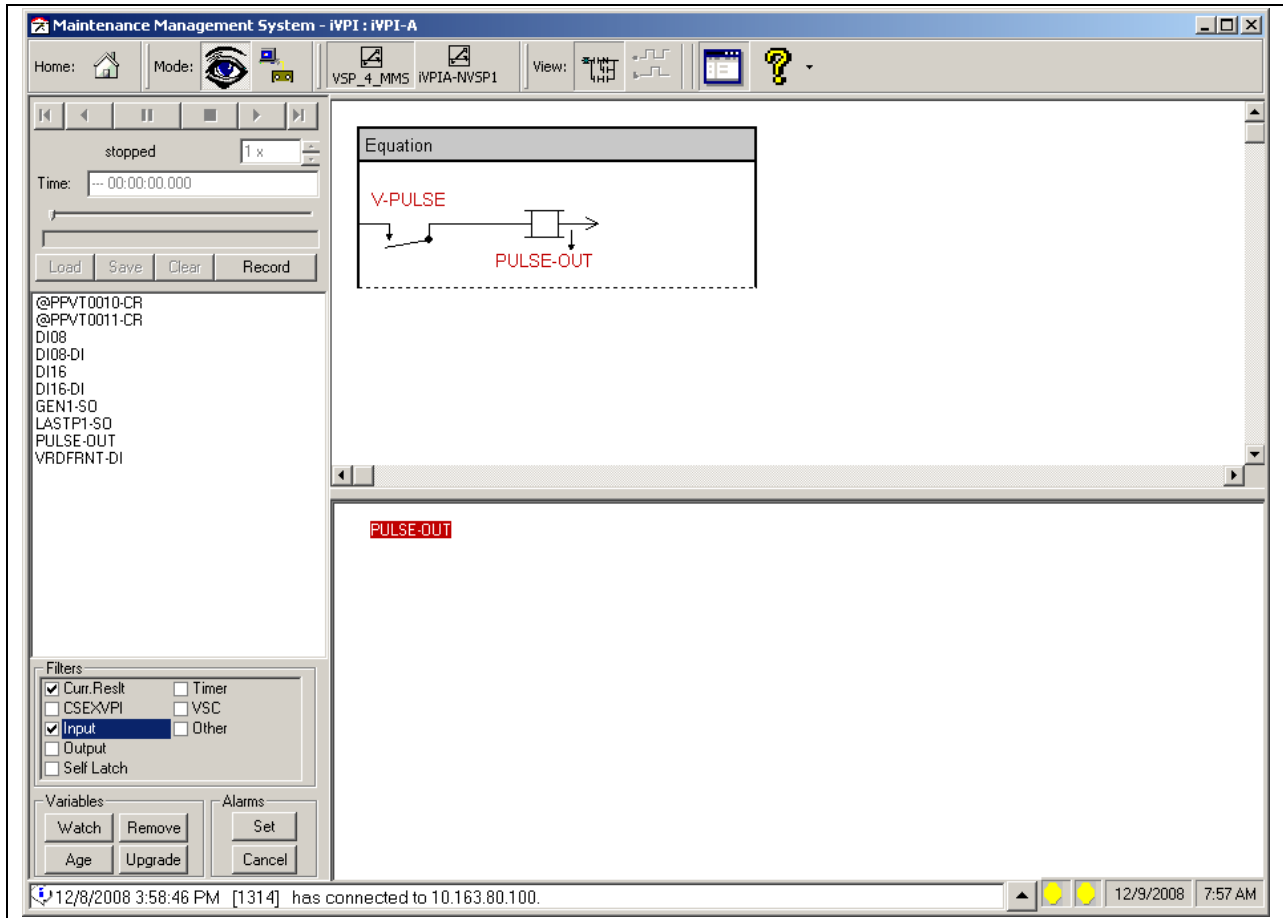


Figure 4–9. MMS Runtime, Application Explorer Screen

The Application Explorer tool aids the troubleshooting of VPI systems by accessing variable data obtained through the diagnostic ports. Multiple logic, message or I/O variables can be viewed in near real time. Variables are displayed using their assigned names and their current Boolean or integer values. Application logic statements can be displayed including the current values of the variables that comprise them.

- The Home icon at the top left of the screen returns to Main screen.
- There are three Tool bars located at the top of this screen:
  - Mode Tool Bar indicates whether Application Explorer is currently displaying real time data or playing recorded data.
  - Application Tool Bar shows the applications in the active Control System. Click on one of the icons in the tool bar to make an application active.
  - Display Tool Bar indicates whether the Logic Window or Timing Window is displayed.
- The Settings icon at the top of the screen accesses four tabs that allow the user to configure this screen:
  - The True / False Colors tab controls the color of True or False Boolean variables displayed in the Watch Window and the Logic Window.
  - The Logic Display Type tab controls the display format of logic statements in the Logic Window. Text format and three graphical formats (ladder, straight line, drop line) are available.
  - The Alarms tab controls the .wav files (sound) that are played when an alarm is sounded.
  - The Playback tab selects the playback source [MMS Event log (Watch log)/ VPI Data log] and beginning / end playback times.
- The Help icon at the top of the screen accesses the user Help information.

- Record / Playback controls are located below the Mode tool bar. The controls are used to record variable values as they are received and save them to a Watch Log File. Playback can use Watch Log files or VPI Data Logs. All playback data is displayed as a timing diagram.

|< BOB (beginning of buffer): Go to the beginning of the session or log

>| EOB (end of buffer): Go to the end of the session or log

< Reverse: Play data in reverse (newest to oldest)

> Forward: Play data in forward (oldest to newest)

|| Pause: Pause record/playback; pressing key again resumes last operation

|||| Stop: Stop record/playback

Available Playback speeds include single-step, 1/10x, 1/2x, 1x, 2x and 10x

The slider bar can position playback to start anywhere in the buffer.

- The Load icon is used to load a previously saved Watch log file for playback.
- The Save icon is used to save Application Explorer recorded data in a Watch log file.
- The Clear icon is used to clear the buffer.
- The Record icon is used to record Application Explorer data.

#### **NOTE**

One Application's selected variable data can be recorded at a time. Recorded data is lost when switching to a new application.

If the Applications recorded data needs to be saved, then save it to a Watch Log file before switching to a new application.

- The Variables List icon is located below Record / Playback icons. Variable List displays variables available for adding to the Watch Window. Variables are filtered by type.

Select one or more variables and add them to the Watch Window. Status updates are requested on the added variables. Their display in the Watch Window is updated as new status information is received.

- The Filters List is located below the Variables List. The Filters List displays the types of variables in the current application. The variable types that are checked in the Filters List determine the contents of the Variables List. The Filters List contains icons to Add (Watch), Remove, Age, or Upgrade the variables list.
- The Logic Window is located in the middle right portion of the screen. When the Equation icon on the Display tool bar is activated, this window displays selected logic statements in text or graphical format. To view a logic statement that uses a particular variable, double click on the variable in the Watch Window.

If a logic statement using that variable is found, the statement is displayed in the Logic Window and a request for status updates on its variables is issued. The display of the variables in the statement is updated in the Logic Window as new status information is received.

Browse the logic statements and view their status in the Logic Window. See Limitations (below) for information on how much variable and logic statement data can be viewed at a time.

- The History (Timing) Window is in the same position as the Logic Window. When the Timing icon on the Display tool bar is activated, this window displays a timing diagram of recorded data during playback.
- The Watch Window is the bottom right portion of the screen. It displays selected variables whose values are being monitored.
- The Status Bar along the bottom of the screen displays MMS Runtime information as an expandable text list. The last 50 items are displayed with their associated time stamps. Two icons show the selected System status (left) and the worst-case status of all Systems (right).
- The Variables Tool Bar is used to watch, age, remove, and upgrade variables. Limitations for these variables include:
  - Watch Variables for CSEX Applications using serial connections have a maximum of 64 Boolean and 4 integer watch variables, including variables visible in the Watch Window as well as temporary logic statement variables.
  - Watch Variables for CSEX/NVSP Applications using network connections have a maximum of 128 watch variables, including variables visible in the Watch Window as well as temporary logic statement variables. Variables can be a mix of either Boolean or Integer.
    - MMS Runtime is unable to monitor subroutine arguments that are passed by address rather than by value.
    - MMS Runtime is unable to monitor array variables with a calculated index.

- Watch Variables for CPU/PD, CPU II, VSP using serial connections have maximums defined in Table 4-2 which include variables visible in the Watch Window as well as temporary logic statement variables.
- Watch Variables for CPU II/VSP using network connections have a maximum of 128 Boolean watch variables, including variables visible in the Watch Window as well as temporary logic statement variables.
  - MMS Runtime is unable to handle vital output state variables because they do not have normal true or false values.
- The Alarms tool bar has icons used to Set or Cancel posted alarms.

## 4.4.4. Log Manager

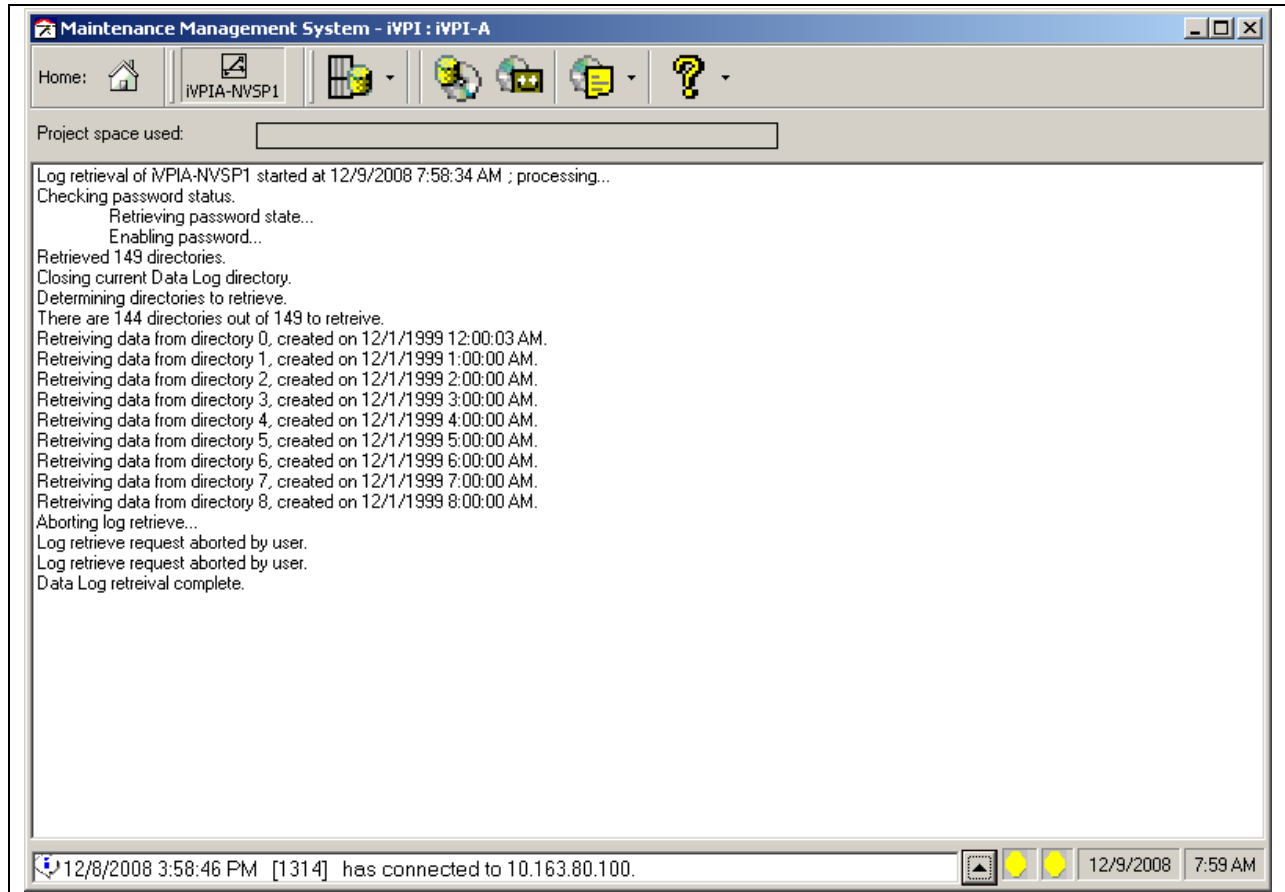


Figure 4–10. MMS Runtime, Log Manager Screen

The Log Manager screen is used to handle the retrieval of VPI Data logs, archiving, selecting a playback source, and creating log reports.

- The Home icon at the top left of the screen returns to Main screen.
- The Application Tool Bar displays the active System's Applications that have associated Data Log ports. Select an Application to retrieve its logs.
- The Project space used is a gauge indicating the amount of total space used by the current MMS log file. The maximum limit is 1 gigabyte or the amount of hard drive space available whichever is less.
  - The Action toolbar contains:
    - The Retrieve icon that starts the retrieval of the selected Application's data log. All log data is saved in the MMS project data base file (located in the Apps folder). Previously retrieved data is skipped; only new data is retrieved. The selected Application's log date, time and version can also be retrieved.
    - The Archive icon that archives (copies) the project data base file into the Archive folder. The project log data can optionally be cleared once the archive is complete.
    - The Playback Source icon selects the source of playback data. Multiple archives can be merged for playback.
    - The Reports icon requests creation of data log and MMS event log reports. Reports can be saved in text, rich text and comma separated value formats.
- Playback Tool Bar located near the top center of the screen is not implemented on this screen.
- The Help icon at the top of the screen accesses the user Help information.
- The Report Display Area in the middle of the screen displays text describing the retrieval process status.
- The Status Bar at the bottom of the screen displays MMS Runtime information as an expandable text list. The last 50 items are displayed with their associated time stamps when the up arrow on the right side of the bar is selected. Two icons show the selected System status (left) and the worst-case status of all Systems (right).

### 4.4.5. Configuration Manager

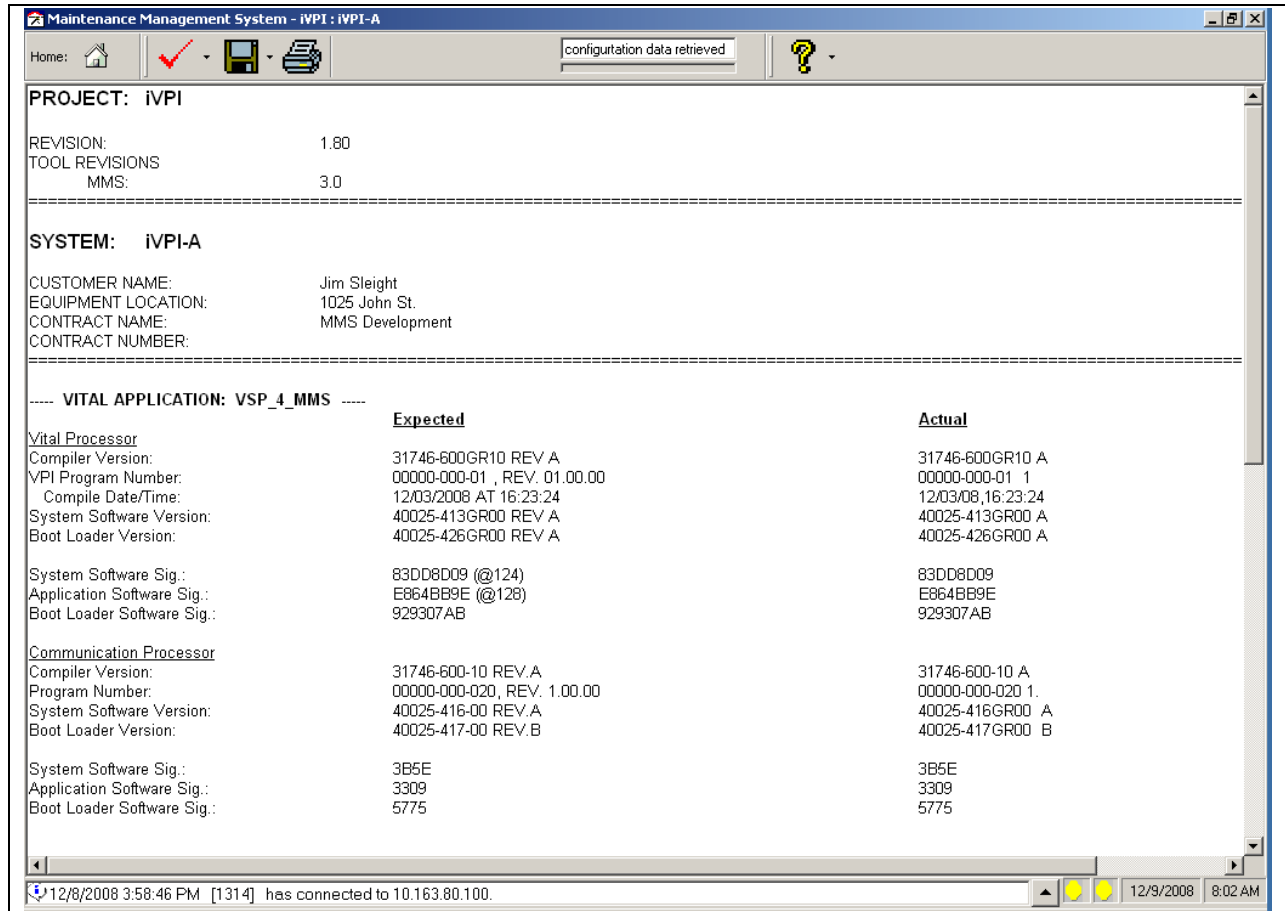


Figure 4–11. MMS Runtime, Configuration Manager Screen

The Configuration Manager tool provides reports of the expected and actual configuration items for each Application of the selected System. Both hardware and firmware items can be reported.

- The Home icon at the top left of the screen returns to Main screen.
- The Validate icon reports expected data:
  - For Applications, this icon reports the expected and actual firmware configuration items for each Application of the selected System.
  - For Hardware, this icon reports the expected and actual (if supported) hardware configuration items for each Application of the selected System.
- The Save icon saves the report in rich text format.
- The Print icon prints to the default printer.
- The Help icon at the top of the screen accesses the user Help information.
- The Report display window in the middle of the screen displays the configuration reports.
- The Status Bar at the bottom of the screen displays MMS Runtime information as an expandable text list. The last 50 items are displayed with their associated time stamps when the up arrow on the right side of the bar is selected. Two icons show the selected System status (left) and the worst-case status of all Systems (right).

4.4.6. Task Scheduler

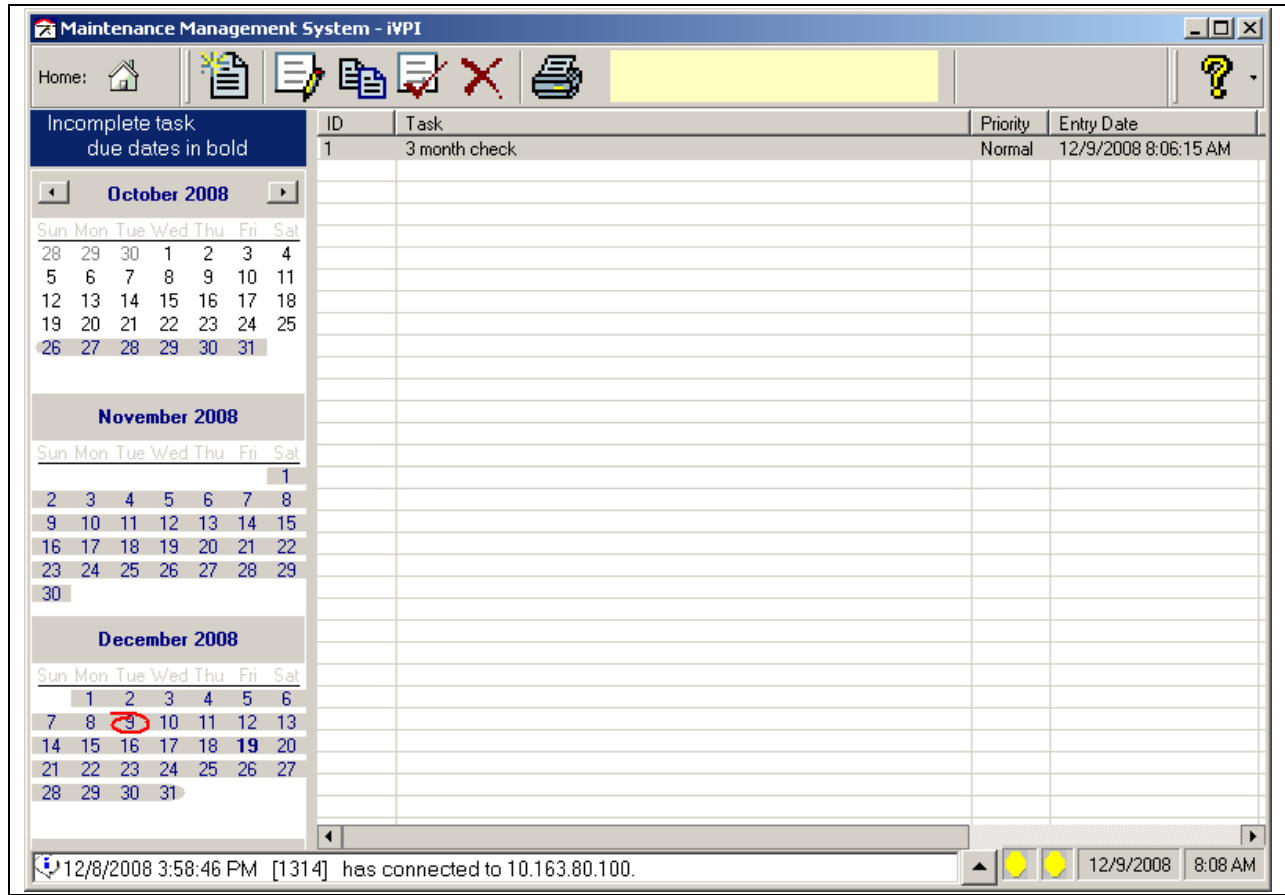


Figure 4–12. MMS Runtime, Task Scheduler Screen

The Tack Scheduler screen is a basic calendar to do list allowing a user to control maintenance tasks.

- The Home icon at the top left of the screen returns to Main screen.
- The Calendar window displays incomplete task due dates in bold. Selecting a date or range of dates (left mouse key down, drag to end date and release left mouse key) displays all the tasks with due dates falling within the date range.
- The Tool Bar provides six icons:
  - The New icon is used to create a new task entry.
  - The Edit icon is used to modify an incomplete selected task.
  - The Copy icon is used to create a copy of the selected task.
  - The Complete icon is used to mark the task as complete. The completion date/time can be entered.
  - The Remove icon is used to remove the selected task. Use this icon with care; there is no undo.
  - The Print icon prints a task list report to the default printer.
- The Help icon at the top of the screen accesses the user Help information.
- The Task Display Window on the left side of the screen displays the tasks for the selected date range.
- The Status Bar at the bottom of the screen displays MMS Runtime information as an expandable text list. The last 50 items are displayed with their associated time stamps when the up arrow on the right side of the bar is selected. Two icons show the selected System status (left) and the worst-case status of all Systems (right).

## 4.4.7. Communication Explorer – VT 100 Screen

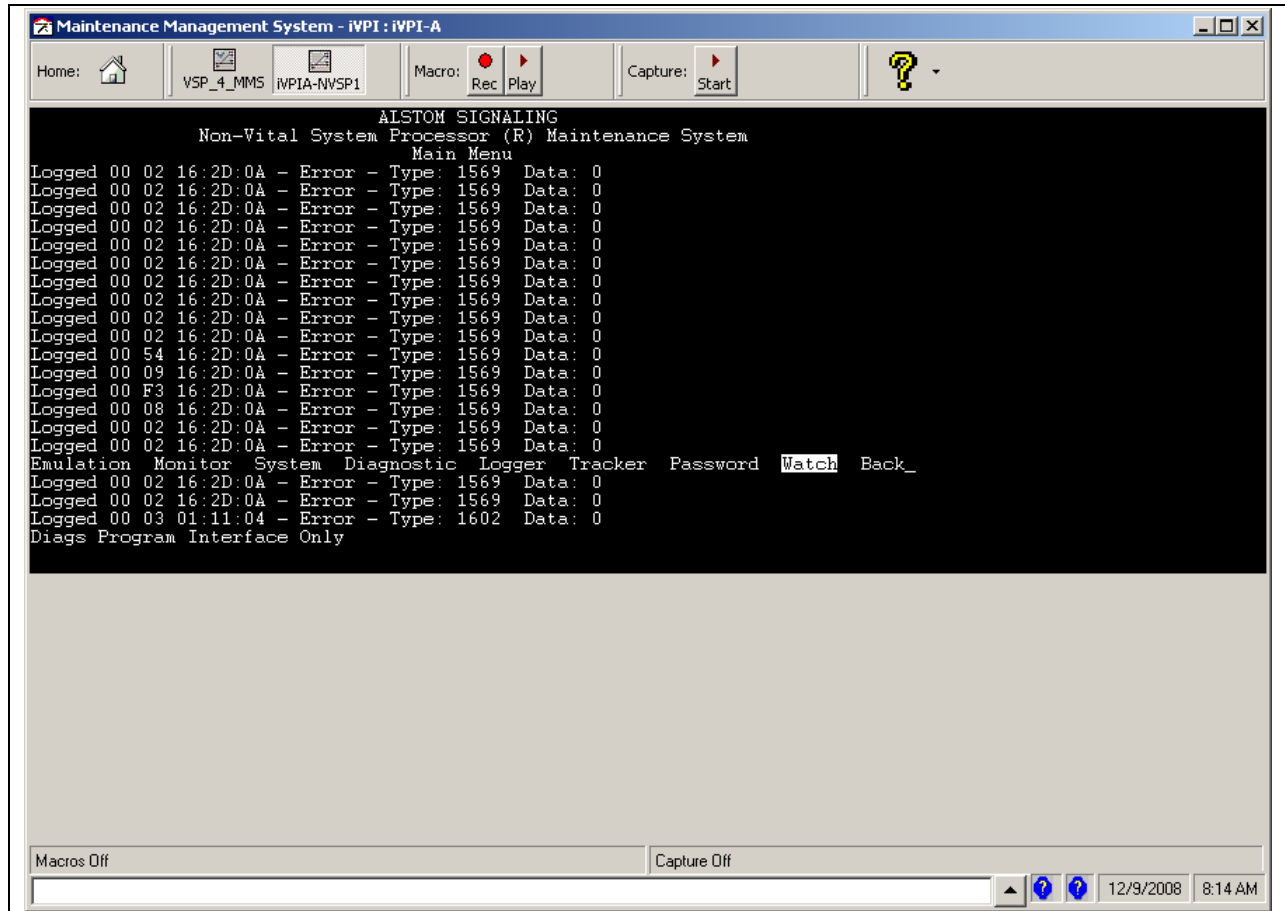


Figure 4–13. MMS Runtime, Communication Explorer – VT100 Screen

The Communication Explorer - VT100 screen provides a VT100 terminal emulation with macro and capture capabilities.

- The Home icon at the top left of the screen returns to Main screen.
- The Applications Tool Bar at the top of the screen displays the active System's available Applications.
- The VT100 Display Window in the center of the screen is blanked on selection of an Application.

Click on the VT100 Display Window and then start keying in whatever is appropriate to communicate with the selected application.

If another icon is clicked on the screen, always click on the VT100 Display Window before resuming keyboard entry. This moves input focus to the VT100 display window so that it can capture keystrokes.

- The Macro File Tool Bar is used to record a sequence of keystrokes that can be played back in the VT100 window. On playback, the saved keystrokes are sent to the equipment as if they had been typed.
  - The Rec icon in the Macro Files tool bar is used to start recording a macro file. Start keying in characters. As the VT100 window processes the data it also records the data in the macro file buffer.

Once the Rec icon is selected, Step, Pause, and Save icons appear in the Macro File tool bar.

- The Pause icon is selected to temporarily stop recording characters. Once selected, a Resume icon takes its place. To resume recording, click the Resume icon.
- The Step icon is used to insert a pause in the macro.

When the macro file is played back, the saved keystrokes are played immediately without pausing. Inserting a pause after playing back some keystrokes forces the program to pause, allowing viewing of the screen before continuing. To insert a pause, click the Step icon or key in Ctrl-Enter.

- The Save icon is used to stop recording and save the file.

Recording automatically stops if a new application is selected or the VT100 screen is left.

- The Play icon in the Macro File tool bar is used to play back a previously recorded macro file. After selecting the Play icon, enter the name of the macro file to be played. Once the Play icon is selected and a file name entered Step and Stop icons appear in the Macro File tool bar.

Playback proceeds to the next pause or "step" in the file. When a pause is encountered, the Step icon is enabled.

- The Step icon is used to perform the next step. When all steps in the macro file have been played back, playback mode is stopped automatically.
- The Stop icon is used to end playback before the file is done.
- The Capture Tool Bar is used to record VT100 characters as they are received from the equipment for display. They can also record a snapshot of the entire VT100 window at once.

### **NOTE**

Captured data must be examined using a text editor; there is no capture file playback in Application Explorer.

- The Start icon located in the Capture area is used to start the capture process. Enter the name of the capture file. As data is received for display, it is saved in the file. Once the Start icon is activated, Snap, Pause, and End icons appear in the Capture Files tool bar.
  - The Snap icon is used to capture a snapshot of the entire VT100 window.
  - The Pause icon is used to temporarily stop recording data. Once the Pause icon is selected, a Resume icon takes its place on the screen. The Resume icon is used to resume recording.
  - To end capture, the End icon is used to end capture.

Capture automatically stops if a new application is selected or the VT100 screen is left.

- The Status Bar at the bottom of the screen displays the current status of the macros and capture functions.

## 4.4.8. Communication Explorer – Network Statistics

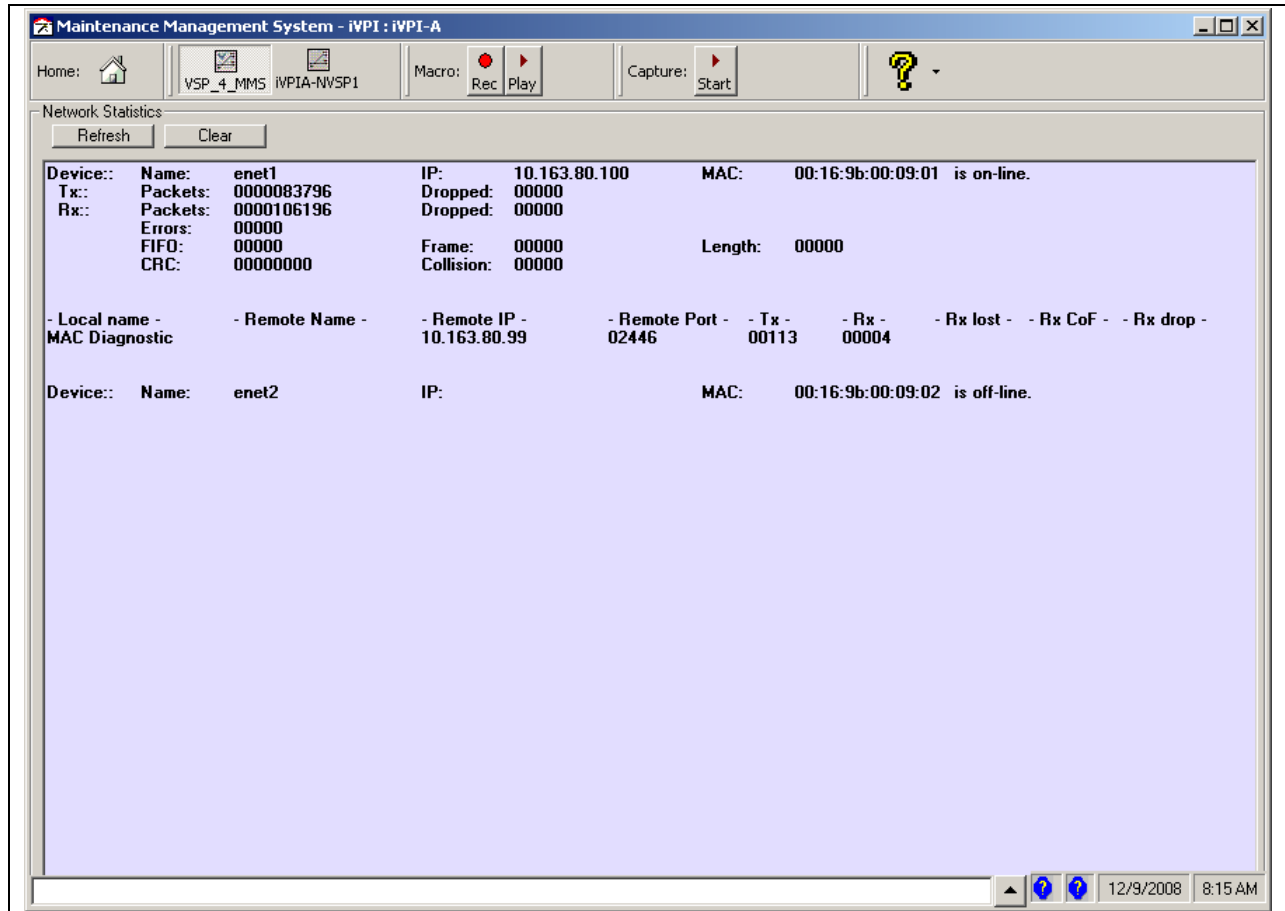


Figure 4–14. Communication Explorer – Network Statistics Screen

The Communication Explorer – Network Statistics screen displays the Application's network statistics including number of received and transmitted messages, possible error counts, and nodes connected. Statistics can be cleared and updated by using the Clear and Refresh buttons.

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## **5. SECTION 5 – SYMBOLS**

### 5.1. GENERAL

This section describes the symbols used in MMS layout configuration.

### 5.2. PHILOSOPHY

Each symbol has a tool bar icon used to select the symbol and an associated image (symbol) that appears on the layout screen.

### 5.3. ALTERNATE TRACK SYMBOLS

The following track symbol is used to indicate non-rail traffic (i.e. bus routing):

**Toolbar Icon:** 


**Symbol image:** 

Table 5–1. Alternate Track Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Track type	No		Alternate Traffic
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "TR"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right, Center	Bottom
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

#### Limiting Parameters – Controls

None

Table 5–2. Alternate Track Symbol Parameters – Indications

Parameter	State	Description
TRACK_STATUS	OCCUPIED	Indicates track occupancy If set track color = occupied Otherwise color = default Set_User_Preferences
TRACK_STATUS	BLOCKED	Indicates a track is blocked from traffic If set track color = blocked OCCUPIED overrides BLOCKED

5.4. CODED TRACK SYMBOLS

The following track symbol is used to indicate coded track circuits:

**Toolbar Icon:** 

**Symbol image:** 

Table 5–3. Coded Track Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Overlay Tracks	Overlay tracks associated with this track	No		
Neighbor-Head	Symbol linked to the head end of this track	No		
Neighbor-Tail	Symbol linked to the tail end of this track	No		
Type	Type of Track	Yes	AC Coded, DC Coded	DC Coded
Loss of Shunt Delay	Time to wait after loss of shunt	Yes	hh:mm:ss.msecs	00:00:00.000
Entry/Exit	Allow use as entry/exit track	Yes	Yes, No	No
Cab Signal	Allow cab signal display	Yes	Enabled, Disabled	Disabled
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "TR"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right, Center	Bottom
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

Table 5–4. Coded Track Symbol Parameters – Controls

Parameter	State	Description
ENTRY_EXIT_CALL (if enabled)	ENTRY	Request track as entry point in NX operation
ENTRY_EXIT_CALL (if enabled)	EXIT	Request track as exit point in NX operation

Table 5–5. Coded Track Symbol Parameters – Indications

Parameter	State	Description
TRACK_STATUS	OCCUPIED	Indicates track occupancy If set track color = occupied Otherwise color = default
TRACK_STATUS	BLOCKED	Indicates a track is blocked from traffic If set track color = blocked OCCUPIED overrides BLOCKED
TRACK_ROUTE	LOCKED	Indicates the track is part of a locked route If set track color = route
TRACK_ROUTE	POSSIBLE	Indicates the track is an Entry or Exit point If set and Entry/Exit is Yes a mid-section of the track color = route TRACK_STATUS overrides TRACK_ROUTE
EAST/WEST CODES	CODE_1 thru CODE_9	Indicates track codes EAST CODES displayed as: code-list >> WEST CODES displayed as: << code-list ? indicates unknown code
CAB_RATE (if enabled)	RATE_1 thru RATE_7	Indicates cab signal rate Rate index is displayed as: [index] * indicates invalid index

5.5. COLOR LIGHT

The following signal symbol is used to indicate a color light:

**Toolbar Icons:** 

**Symbol image:** 

Table 5–6. Color Light Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Alignment	East/West alignment	No		
Type	Type of signal	No		Color Light
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "CL"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right	Bottom (East), Top (West)
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""
Head (A/B/C)	Enable up to three heads per Color light	Yes	Enabled, Disabled	A-Enabled B/C-Disabled
Flashing	Enable flashing for this head	Yes	Enabled, Disabled	Disabled
Flash Rate	Flash rate for this head	Yes	0, 40,45,50,55,60,65	0
Red Aspect	Enable Red aspect for this head	Yes	Enabled, Disabled	Enabled
Yellow Aspect	Enable Yellow aspect for this head	Yes	Enabled, Disabled	Enabled
Green Aspect	Enable Green aspect for this head	Yes	Enabled, Disabled	Enabled

Table 5–6. Color Light Symbol Attributes (Cont.)

<b>Attribute</b>	<b>Description</b>	<b>User Defined</b>	<b>Possible Entries</b>	<b>Default</b>
Lunar Aspect	Enable Lunar aspect for this head	Yes	Enabled, Disabled	Disabled
Track Select Aspect	Enable Track Select aspect for this head	Yes	Enabled, Disabled	Disabled

Table 5–7. Color Light Symbol Parameters – Controls

<b>Parameter</b>	<b>State</b>	<b>Description</b>
ASPECT_CALL	CANCEL	Remove the request of permissive signal call
ASPECT_CALL	CALL	Request for signal
ASPECT_CALL	CALL_ON	Request signal for move into occupied territory
ASPECT_CALL	FLEET	Reclear signal to allow following moves

Table 5–8. Color Light Symbol Parameters – Indications

<b>Parameter</b>	<b>State</b>	<b>Description</b>
ACTIVE_ASPECT	(head)_ (aspect color)	Indicates aspect color for each head
ASPECT_STATUS	(head)_ (aspect color)_ OPEN	Indicates the filament status
FLEET		Indicates fleeting enabled If fleeted displays "F" in fleet color Otherwise no "F" displayed
REQUEST_STATUS	PENDING	Indicates signal call is pending If pending signal border = pending color
REQUEST_STATUS	FAILED	Indicates signal call has failed If failed signal border = failed color

5.6. DIRECTION INDICATOR

The following symbol is used to indicate direction of traffic:

Toolbar Icon: 

Symbol image: 

Table 5–9. Direction Indicator Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Generic type	No		Direction Indicator
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "Gn"
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

Parameters – Controls: none

Table 5–10. Direction Indicator Symbol Parameters – Indications

Parameter	State	Description
GENERIC_TRAFFIC	DIRECTION	Indicates direction of arrow If set arrow is pointing to the left Otherwise arrow is pointing to the right
GENERIC_TRAFFIC	LOCK	Indicates if the direction is locked If locked direction indicator color = locked

5.7. GENERIC

The following symbol is used for True/False control and/or indication:

**Toolbar Icon:** 

**Symbol image:** 

Table 5–11. Generic Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Generic type	Yes	Indication only, Control only, Indication & Control	Indication & Control
Delay Time	Active pulse time	Yes	hh:mm:ss.msecs	00:00:00.000
Protect Flag	Enables "Are you sure?" dialog on control	Yes	Enabled, Disabled	Disabled
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "Gn"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right	Right
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

Table 5–12. Generic Symbol Parameters – Controls

Parameter	State	Description
GENERIC_OUTPUT (if enabled)		True/False Control bit

Table 5–13. Generic Symbol Parameters – Indications

Parameter	State	Description
GENERIC_INPUT (if enabled)		Indicates state of input If set generic color = generic indication

5.8. GRADE CROSSING

The following symbol is used to indicate the state of a grade crossing:

**Toolbar Icon:** 

**Symbol image:**



Table 5–14. Grade Crossing Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Grade Crossing type	No		Generic
Loss of Shunt Delay	Time to wait after loss of shunt	Yes	hh:mm:ss.msecs	00:00:00.000
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "GX"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right, Center	Bottom
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

**Parameters – Controls**

None

Table 5–15. Grade Crossing Symbol Parameters – Indications

<b>Parameter</b>	<b>State</b>	<b>Description</b>
CROSSING_STATUS	OCCUPIED	Indicates track occupancy If set track color = occupied Otherwise color = default
CROSSING_STATUS	BLOCKED	Indicates a track is blocked from traffic If set track color = blocked OCCUPIED overrides BLOCKED
CROSSING_ROUTE		Indicates the crossing is part of a locked route If set track color = route
GATE_STATUS	UP	Indicates the status of the crossing gates If up gate is not displayed and signals are dark *
GATE_STATUS	DOWN	Indicates the status of the crossing gates If down gate is displayed steady and signals are flashing *

\* If neither GATE\_STATUS.UP nor GATE\_STATUS.DOWN is set then the gates and signals are flashing.

5.9. NON-CODED TRACK

The following track symbol is used to indicate track circuits without codes:

**Toolbar Icon:** 

**Symbol image:** 

Table 5–16. Non-Coded Track Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Overlay Tracks	Overlay tracks associated with this track	No		
Neighbor-Head	Symbol linked to the head end of this track	No		
Neighbor-Tail	Symbol linked to the tail end of this track	No		
Type	Type of Track	Yes	AC No Code, DC No Code	DC No Code
Loss of Shunt Delay	Time to wait after loss of shunt	Yes	hh:mm:ss.msecs	00:00:00.000
Entry/Exit	Allow use as entry/exit track	Yes	Yes, No	No
Cab Signal	Allow cab signal display	Yes	Enabled, Disabled	Disabled
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "TR"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right, Center	Bottom
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

Table 5–17. Non-Coded Track Symbol Parameters – Controls

Parameter	State	Description
ENTRY_EXIT_CALL (if enabled)	ENTRY	Request track as entry point in NX operation
ENTRY_EXIT_CALL (if enabled)	EXIT	Request track as exit point in NX operation

Table 5–18. Non-Coded Track Symbol Parameters – Indications

Parameter	State	Description
TRACK_STATUS	OCCUPIED	Indicates track occupancy If set track color = occupied Otherwise color = default
TRACK_STATUS	BLOCKED	Indicates a track is blocked from traffic If set track color = blocked OCCUPIED overrides BLOCKED
TRACK_ROUTE	LOCKED	Indicates the track is part of a locked route If set track color = route
TRACK_ROUTE	POSSIBLE	Indicates the track is an Entry or Exit point If set and Entry/Exit is Yes a mid-section of the track color = route TRACK_STATUS overrides TRACK_ROUTE
CAB_RATE (if enabled)	RATE_1 thru RATE_7	Indicates cab signal rate Rate index is displayed as [index] * indicates invalid index

5.10.OVERLAY TRACK

The following track symbol is used to indicate overlay track circuits (typically placed over other tracks/switches):

**Toolbar Icon:** ""

**Symbol image:** -----

Table 5–19. Overlay Track Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Overlaid Symbols	Tracks/Switches associated with this track	No		
Type	Type of Track	No		Overlay
Loss of Shunt Delay	Time to wait after loss of shunt	Yes	hh:mm:ss.msecs	00:00:00.000
Cab Signal	Allow cab signal display	Yes	Enabled, Disabled	Disabled
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "TR"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right, Center	Bottom
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

**Parameters – Controls**

None

Table 5–20. Overlay Track Symbol Parameters – Indications

<b>Parameter</b>	<b>State</b>	<b>Description</b>
TRACK_STATUS	OCCUPIED	Indicates track occupancy If set track color = occupied Otherwise color = default
TRACK_STATUS	BLOCKED	Indicates a track is blocked from traffic If set track color = blocked OCCUPIED overrides BLOCKED
TRACK_ROUTE	LOCKED	Indicates the track is part of a locked route If set track color = route
TRACK_ROUTE	POSSIBLE	Indicates the track is an Entry or Exit point If set and Entry/Exit is Yes a mid-section of the track color = route TRACK_STATUS overrides TRACK_ROUTE
CAB_RATE (if enabled)	RATE_1 thru RATE_7	Indicates cab signal rate Rate index is displayed as [index] * indicates invalid index

5.11.POSITION LIGHT

The following signal symbol is used to indicate a position light:

**Toolbar Icons:** 

**Symbol image:** 

Table 5–21. Position Light Symbol Attributes

<b>Attribute</b>	<b>Description</b>	<b>User Defined</b>	<b>Possible Entries</b>	<b>Default</b>
Symbol ID	ID number of the symbol	No		Set By Application
Alignment	East/West alignment	No		
Type	Type of signal	No		PositionLight
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "PL"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right	Bottom (East), Top (West)
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""
Head (A/B/C)	Enable up to three heads per Position light	Yes	Enabled, Disabled	A-Enabled B/C-Disabled
Flashing	Enable flashing for this head	Yes	Enabled, Disabled	Disabled
Flash Rate	Flash rate for this head	Yes	0, 40,45,50,55,60,65	0
Red Aspect	Enable Red aspect for this head	Yes	Enabled, Disabled	Enabled
Yellow Aspect	Enable Yellow aspect for this head	Yes	Enabled, Disabled	Enabled
Green Aspect	Enable Green aspect for this head	Yes	Enabled, Disabled	Enabled

Table 5–21. Position Light Symbol Attributes (Cont.)

Attribute	Description	User Defined	Possible Entries	Default
Lunar Aspect	Enable Lunar aspect for this head	Yes	Enabled, Disabled	Disabled
Track Select Aspect	Enable Track Select aspect for this head	Yes	Enabled, Disabled	Disabled

Table 5–22. Position Light Symbol Parameters – Controls

Parameter	State	Description
ASPECT_CALL	CANCEL	Remove the request of permissive signal call
ASPECT_CALL	CALL	Request for signal
ASPECT_CALL	CALL_ON	Request signal for move into occupied territory
ASPECT_CALL	FLEET	Reclear signal to allow following moves

Table 5–23. Position Light Symbol Parameters – Indications

Parameter	State	Description
ACTIVE_ASPECT	(head)_ (aspect color)	Indicates aspect color for each head
ASPECT_STATUS	(head)_ (aspect color)_ OPEN	Indicates the filament status
FLEET		Indicates fleeting enabled If fledged displays "F" in fleet color Otherwise no "F" displayed
REQUEST_STATUS	PENDING	Indicates signal call is pending If pending signal border = pending color
REQUEST_STATUS	FAILED	Indicates signal call has failed If failed signal border = failed color

5.12.REMOTE/LOCAL CONTROL

The following signal symbol is used to indicate a remote/local control and indication:

Toolbar Icons: 

Symbol image: 

Table 5–24. Remote/Local Control Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Remote/Local type	No		Remote/Local
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "Gu"
Mode Change Timeout	Change request timeout	Yes	00:00:01:000 to 23:59:59:000	00:00:05:000

Table 5–25. Remote/Local Control Symbol Parameters – Controls

Parameter	State	Description
OP_MODE_CALL	REMOTE LOCAL	Request Remote mode Request Local mode

Table 5–26. Remote/Local Control Symbol Parameters – Indications

Parameter	State	Description
OP_MODE	LOCAL	Indicates the operational mode (Remote/Local)

5.13.SEARCH LIGHT

The following signal symbol is used to indicate a search light:

**Toolbar Icons:** 

**Symbol image:** 

Table 5–27. Search Light Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Alignment	East/West alignment	No		
Type	Type of signal	No		Search Light
Mech Delay	Time delay for search light mechanism operation	Yes	hh:mm:ss.msecs	00:00:00.000
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "SL"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right	Bottom (East), Top (West)
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""
Head (A/B/C)	Enable up to three heads per Search light	Yes	Enabled, Disabled	A-Enabled B/C-Disabled
Flashing	Enable flashing for this head	Yes	Enabled, Disabled	Disabled
Flash Rate	Flash rate for this head	Yes	0, 40,45,50,55,60,65	0
Red Aspect	Enable Red aspect for this head	Yes	Enabled, Disabled	Enabled
Yellow Aspect	Enable Yellow aspect for this head	Yes	Enabled, Disabled	Enabled
Green Aspect	Enable Green aspect for this head	Yes	Enabled, Disabled	Enabled

Table 5–27. Search Light Symbol Attributes (Cont.)

Attribute	Description	User Defined	Possible Entries	Default
Lunar Aspect	Enable Lunar aspect for this head	Yes	Enabled, Disabled	Disabled
Track Select Aspect	Enable Track Select aspect for this head	Yes	Enabled, Disabled	Disabled

Table 5–28. Search Light Symbol Parameters – Controls

Parameter	State	Description
ASPECT_CALL	CANCEL	Remove the request of permissive signal call
ASPECT_CALL	CALL	Request for signal
ASPECT_CALL	CALL_ON	Request signal for move into occupied territory
ASPECT_CALL	FLEET	Reclear signal to allow following moves

Table 5–29. Search Light Symbol Parameters – Indications

Parameter	State	Description
ACTIVE_ASPECT	(head)_ (aspect color)	Indicates aspect color for each head
ASPECT_STATUS	(head)_OPEN	Indicates the filament status
REPEATER_STATUS	(head)_ (aspect color)	Indicates repeater status for each aspect of each head
FLEET		Indicates fleeting enabled If fleeted displays "F" in fleet color Otherwise no "F" displayed
REQUEST_STATUS	PENDING	Indicates signal call is pending If pending signal border = pending color
REQUEST_STATUS	FAILED	Indicates signal call has failed If failed signal border = failed color

5.14.SEMAPHORE LIGHT

The following signal symbol is used to indicate a semaphore light:

Toolbar Icons: 

Symbol image: 

Table 5–30. Semaphore Light Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Alignment	East/West alignment	No		
Type	Type of signal	No		Semaphore Light
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "PL"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right	Bottom (East), Top (West)
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""
Head (A)	Enable Semaphore light head	Yes	Enabled, Disabled	Enabled
Flashing	Enable flashing for this head	Yes	Enabled, Disabled	Disabled
Flash Rate	Flash rate for this head	Yes	0, 40,45,50,55,60,65	0

\* Always contains Red, Yellow, Green and Lunar aspects.

Table 5–31. Semaphore Light Symbol Parameters – Controls

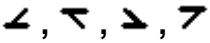
<b>Parameter</b>	<b>State</b>	<b>Description</b>
ASPECT_CALL	CANCEL	Remove the request of permissive signal call
ASPECT_CALL	CALL	Request for signal
ASPECT_CALL	CALL_ON	Request signal for move into occupied territory
ASPECT_CALL	FLEET	Reclear signal to allow following moves

Table 5–32. Semaphore Light Symbol Parameters – Indications

<b>Parameter</b>	<b>State</b>	<b>Description</b>
ACTIVE_ASPECT	A_(aspect color)	Indicates aspect color
ASPECT_STATUS	A_(aspect color)_ OPEN	Indicates the filament status
FLEET		Indicates fleeting enabled If fleeted displays "F" in fleet color Otherwise no "F" displayed
REQUEST_STATUS	PENDING	Indicates signal call is pending If pending signal border = pending color
REQUEST_STATUS	FAILED	Indicates signal call has failed If failed signal border = failed color

5.15.SWITCH

The following symbol is used to indicate a switch.

Toolbar Icons: 

Symbol image: 

Table 5–33. Switch Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Overlay Tracks	Overlay tracks associated with this switch	No		
Neighbor-Facing	Symbol linked to the facing end of this switch	No		
Neighbor-Trailing	Symbol linked to the trailing end of this switch	No		
Neighbor-Reverse	Symbol linked to the reverse end of this switch	No		
Alignment	Alignment of switch	No		
Type	Type of Switch	Yes	Generic	Generic
Switch Delay	Time to wait for switch operation	Yes	hh:mm:ss.msecs	00:00:00.000
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "SW"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right, Center	Center
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

Table 5–34. Switch Symbol Parameters – Controls

<b>Parameter</b>	<b>State</b>	<b>Description</b>
POSITION_CALL	NORMAL	Request switch position to normal
POSITION_CALL	REVERSE	Request switch position to reverse
POSITION_CALL	AUTOMATIC	Request application to determine switch position based on routing

Table 5–35. Switch Symbol Parameters – Indications

<b>Parameter</b>	<b>State</b>	<b>Description</b>
POSITION	NORMAL	Indicates switch position is normal (facing end to trailing end solid line)
POSITION	REVERSE	Indicates switch position is reverse (facing end to reverse end solid line)
CONTROL	NORMAL	Indicates switch is going normal
CONTROL	REVERSE	Indicates switch is going reverse
LOCK_STATUS		Indicates switch locking If locked displays "L" in locked color Otherwise displays "U" in default color
REQUEST_STATUS	PENDING	Indicates position call is pending Switch flashes in direction of CONTROL If CONTROL is unknown entire switch flashes
REQUEST_STATUS	FAILED	Indicates position call has failed

5.16.TEXT BOX

The following symbol used to provide a text box to display text:

**Toolbar Icon:** 

**Symbol image:** 

Table 5–36. Text Box Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Text box type	Yes	Static, Numeric	Static
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "TB"
Font Size	Size of symbol label	Yes	10 pt, 12 pt, 14 pt, 16 pt, 20 pt, 28 pt, 36 pt, 48 pt	10 pt

**Parameters – Controls**

None

Table 5–37. Text Box Symbol Parameters – Indications

Parameter	State	Description
TEXTBOX_VALUE (if type is dynamic)	BIT_1 thru BIT_8	Displays a byte length number Number displayed is decimal format (0 .. 255)

5.17.TIMER

The following symbol is used to indicate timer:

**Toolbar Icon:** 

**Symbol image:** 

Table 5–38. Timer Symbol Attributes

Attribute	Description	User Defined	Possible Entries	Default
Symbol ID	ID number of the symbol	No		Set By Application
Type	Text box type	Yes	Generic	Generic
Delay Time	Running time of timer	Yes	hh:mm:ss.msecs	00:00:00.000
Label	Text label of symbol	Yes	Any Text (128 char. max)	Symbol ID + "TM"
Label Location	Location of symbol label	Yes	Top, Bottom, Left, Right	Bottom
Description	Optional text description	Yes	Optional, Any Text (255 char. max)	""

**Parameters – Controls**

None

Table 5–39. Timer Symbol Parameters – Indications

Parameter	State	Description
TIMER_STATUS	START	Indicates timer is starting
TIMER_STATUS	RUNNING	Indicates timer is running If running timer = running color
TIMER_STATUS	DONE	Indicates time delay has expired

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**A. APPENDIX A – COMMUNICATIONS**

**A.1. GENERAL**

This section contains block diagrams describing MMS communications.

**A.2. SYSTEM STATUS AND DIAGNOSTIC SERIAL CONNECTION PROCESSING**

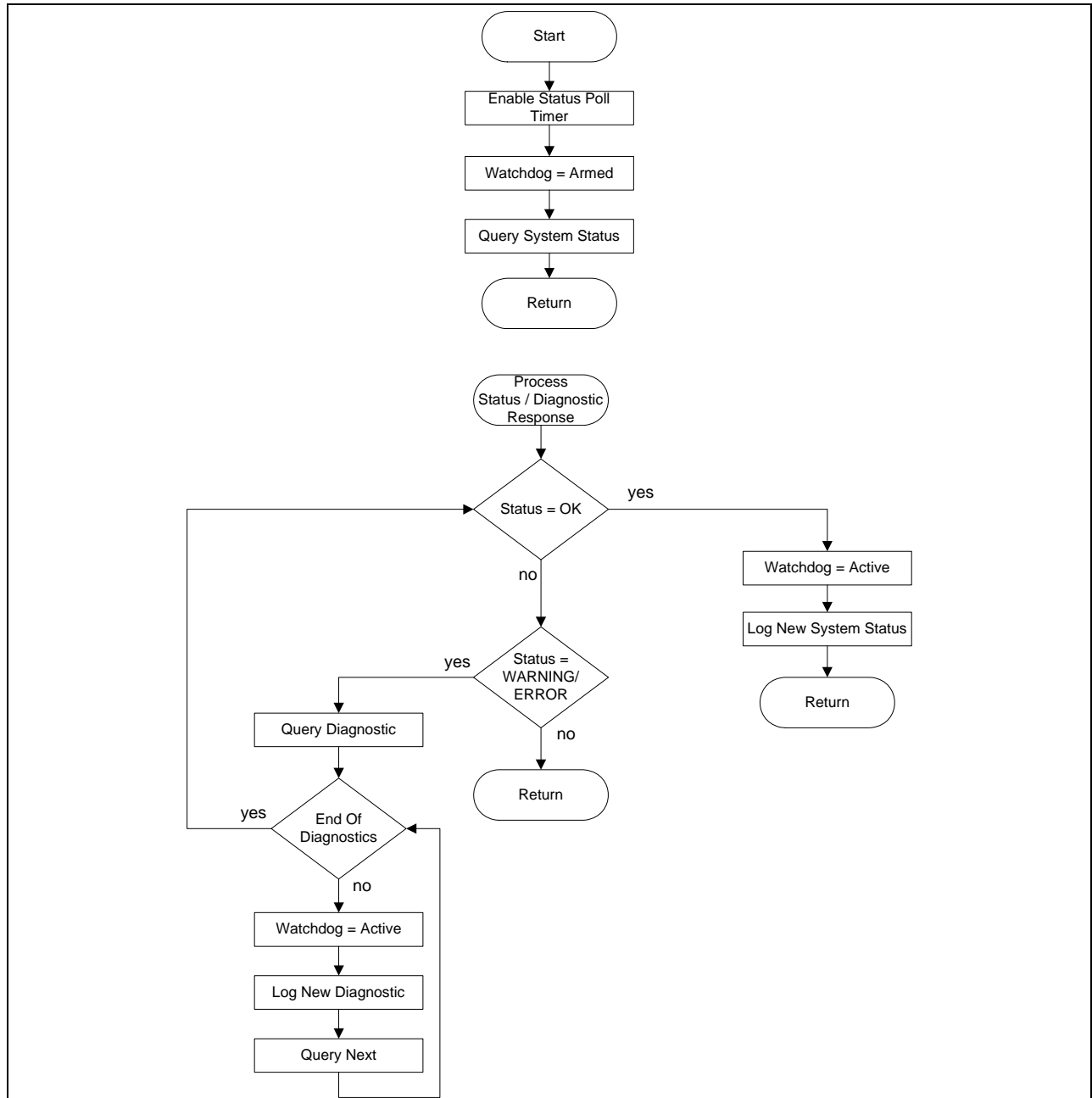


Figure A-1. System Status and Diagnostic Processing

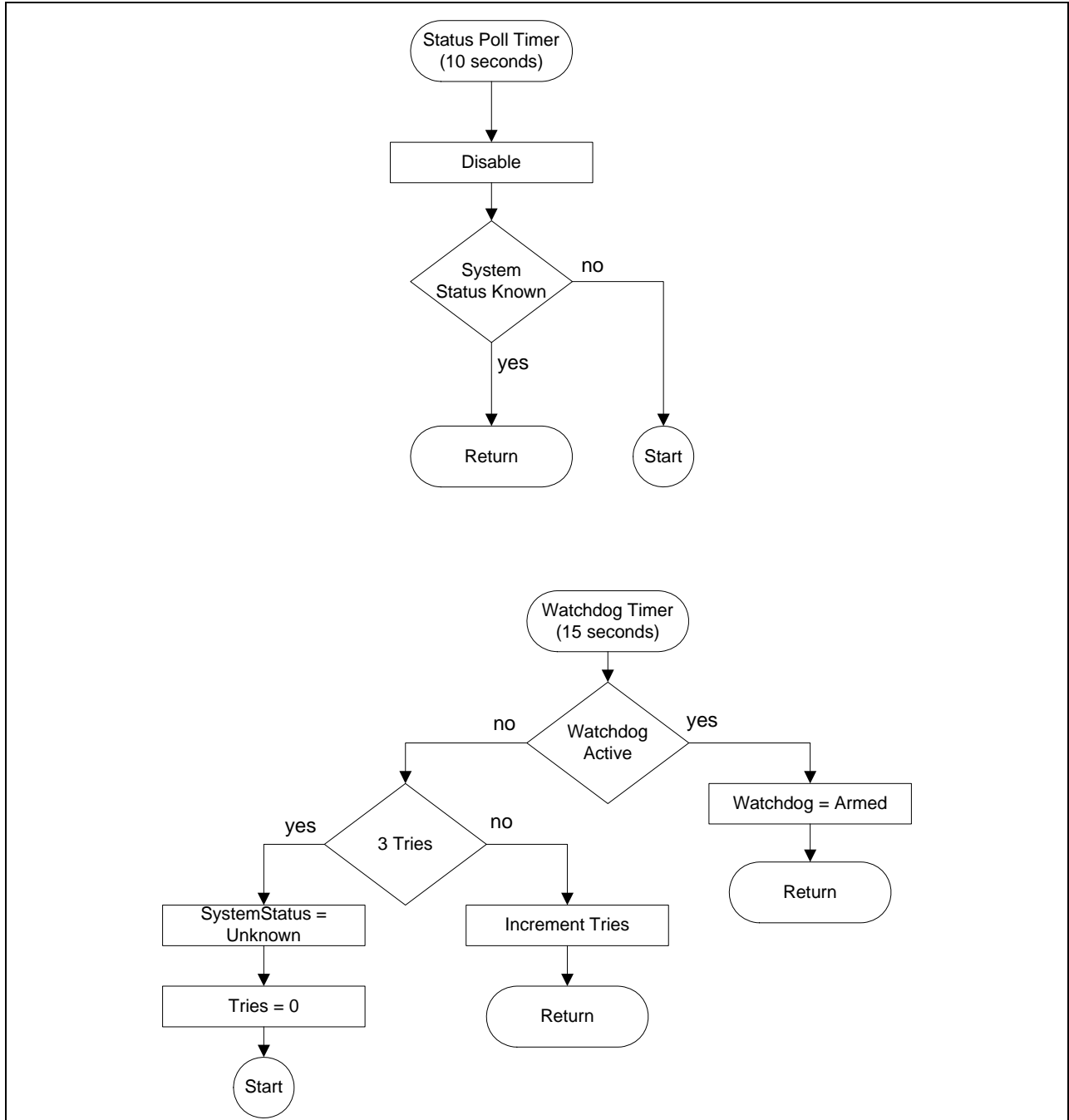


Figure A-1. System Status and Diagnostic Processing (Cont.)

A.3. PANEL MESSAGE PROCESSING

A.3.1. DataTrain VIII Sync Message Processing

DataTrain VIII communications between MMS Runtime and VPI use Sync mode with networked connections and can use Sync mode with serial connections. Message retries are fixed at 3 tries.

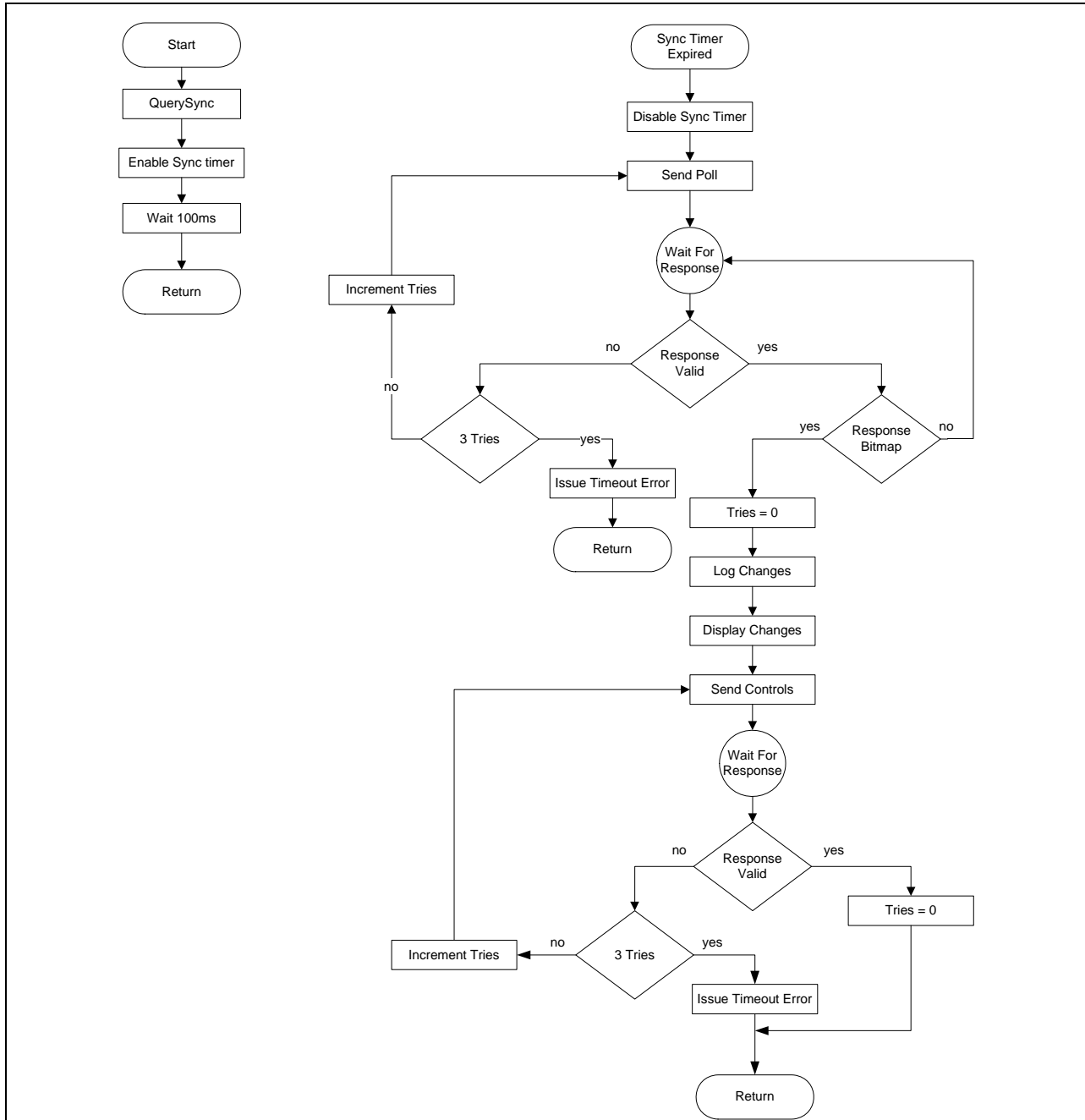


Figure A-2. DataTrain VIII Sync Message Processing

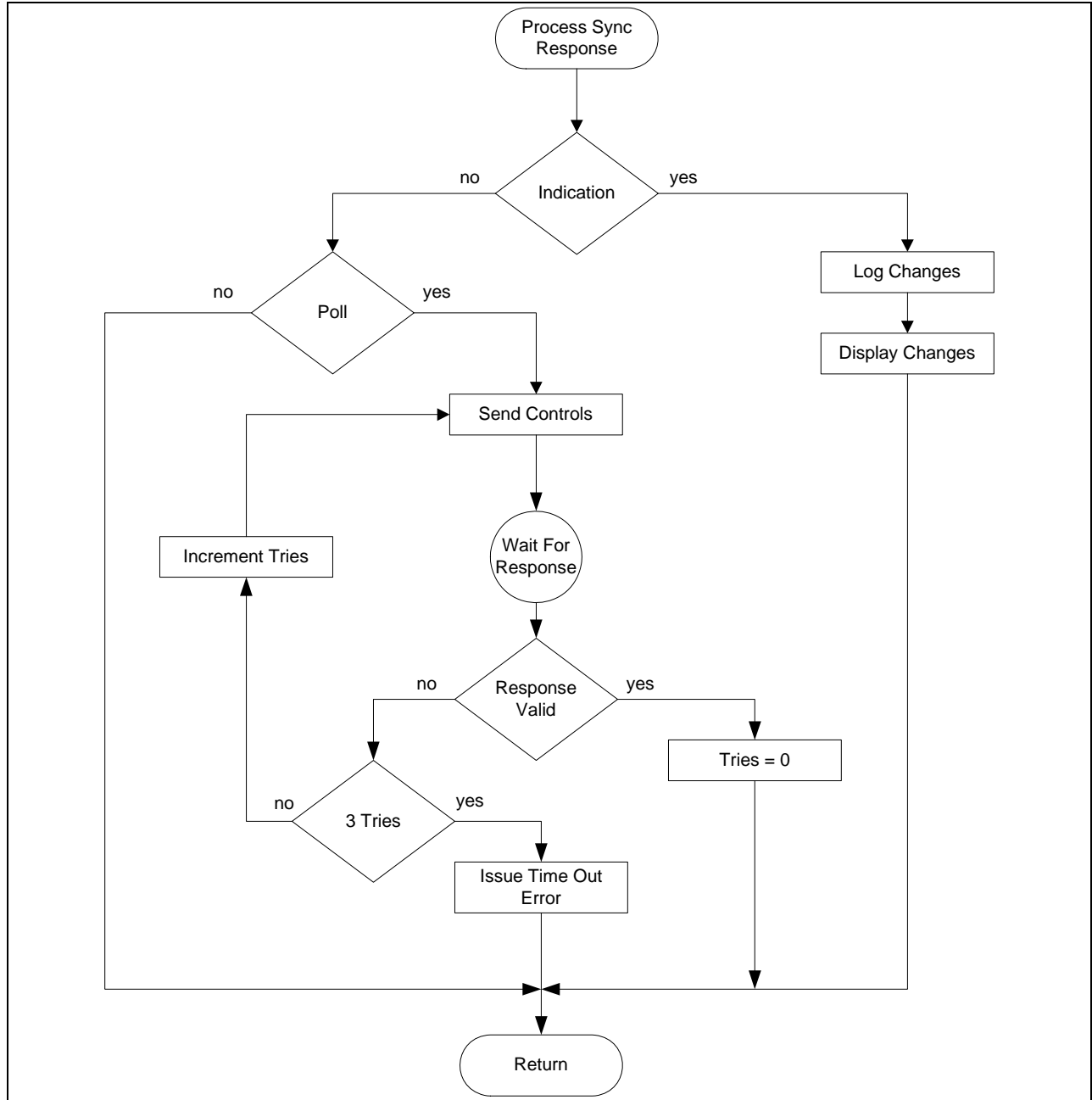


Figure A-2. DataTrain VIII Sync Message Processing (Cont.)

A.3.2. DataTrain VIII Master/Slave Message Processing

DataTrain VIII communications between MMS Runtime and VPI use Sync can use Master/Slave mode with MMS Runtime as the Master on serial connections. The default poll time is 250 ms, response timeout is 100 ms. Message retries are fixed at 3 times.

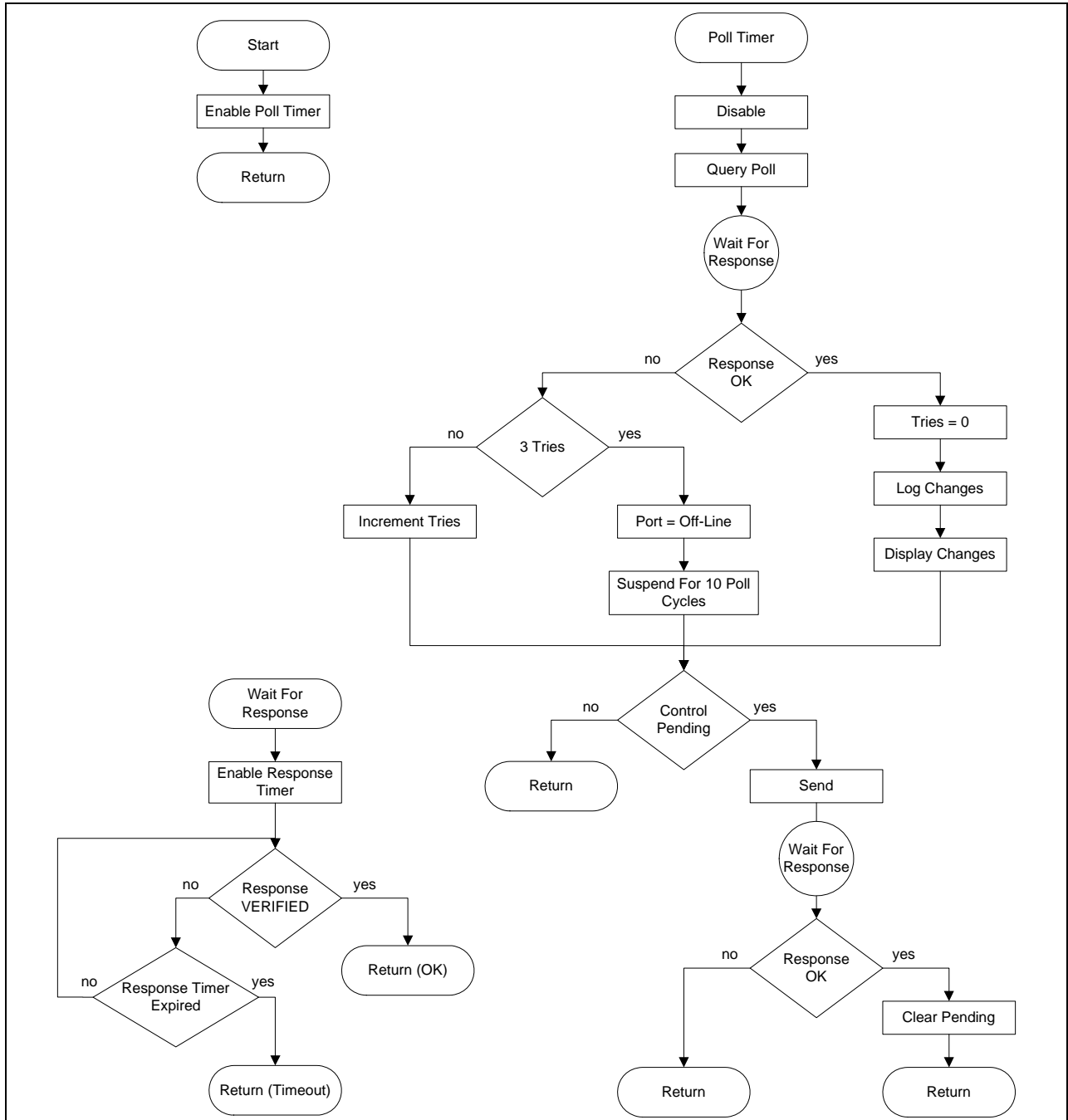


Figure A-3. DataTrain VIII Master/Slave Message Processing

A.4. DATA LOG RETRIEVAL PROCESSING

Data log retrieval use DataTrain VIII communications in a multi-drop Master/Slave mode with MMS Runtime as the Master. There is no cycled polling; default response timeout is 250 ms. Message fixed at 3 tries.

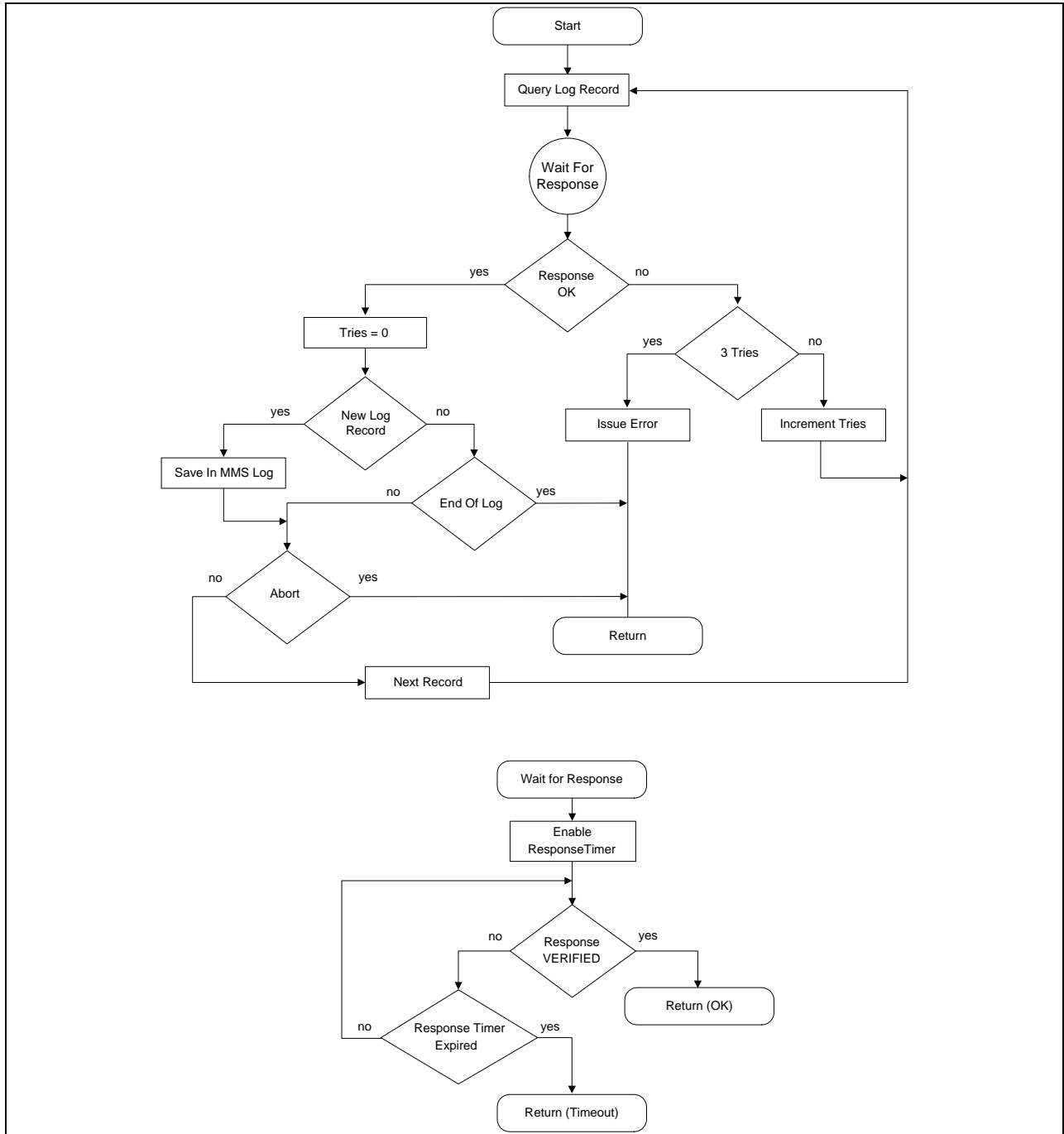


Figure A-4. Data Log Retrieval Processing



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