Metro

P3010
Los Angeles LRV

TRAIN CONTROLS & DIAGNOSTICS (MDS)

Section 1800
RUNNING MAINTENANCE & SERVICING MANUAL

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line.

Total number of pages in this section (1800) is **218** consisting of the following:

Draft	Draft	April 2017
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SAFETY SUMMARY

Some of the procedures in this section are preceded by warnings/cautions regarding potential hazards in handling this equipment. These warnings/cautions should be carefully read and understood before proceeding. Failure to observe these precautions may result in serious injury to personnel performing the work and/or bystanders. The key warnings for this equipment are as follows:

Electrical - The electrical equipment described in this section operates at voltages and currents that are extremely dangerous to life. Personnel should closely observe all generally prescribed cautions and warnings before performing any work on the LRV.

Chemicals – Follow safety precautions for handling hazardous chemicals as provided by the manufacturer. The manufacturer's warnings should be closely heeded to avoid personal injury.

Location – Special caution should be taken when accessing or servicing equipment located on the roof and under the car.

Weight – To prevent possible personal injury when attempting to remove or install equipment on the vehicle, adequate support of a lifting device must be used to prevent the equipment from falling. Personnel's failure to heed these warnings could result in severe injury or death and or damage to the equipment.

Contact – Some components in this equipment attain temperatures that can cause severe burns. Closely follow all warnings and recommended procedures for handling these components.

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CHAPTER 1.0

GENERAL DESCRIPTION

1.1 Introduction

The information contained in this section includes scheduled maintenance tasks, corrective maintenance, lubrication and component removal and installation information for the following Monitoring and Diagnostic System (MDS) and Train Operator Display (TOD) equipment. The MDS system is not limited to the vehicle MDS computer and TODs. There are parts of the MDS system within each of the Microprocessor Based Subsystems (MBS). This section does not describe in detail how the subsystems determine faults and events. That information is covered in the subsystem's manuals. This manual describes what subsystems comprise the MDS system, and how and when data is transferred between the subsystem MDS and the vehicle MDS. The subsystem MDS typically is a fault log resident in the specific MBS and retrievable by the specific PTU software for that subsystem. Those fault logs from the subsystems are also stored in the central repository of the MDS.

This manual should be used in conjunction with manual Section 1700, Data Communications (Train Communication Network - TCN, WTB/MVB – ETB/ECN), which describes the network structures and the devices connected to the networks that make up the MDS System. Due to the complexity and integrated nature of the networked subsystems, individual manuals have been developed to focus on these subsystems. MBS include: Propulsion, Friction Brakes, ATC/TWC, Communications, CCTV, Event Recorder, Auxiliary Power Supply, HVAC, APC, and Doors.

1.2 Acronyms and Abbreviations

Abbreviation	Definition
AADS	Automated Announcement and Display System
APS	Auxiliary Power Supply
ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
CCH	Communication Control Head
CCU	Communication Control Unit
COMM	Communication Unit
CPU	Central Processing Unit
EEI	Enhanced Ethernet Interface
ER	Event Recorder
ft-lbs.	Foot-Pounds
GPS	Global Positioning System
HMI	Human Machine Interface
HVAC	Heating, Ventilation and Air Conditioning

Abbreviation	Definition
IDDB	Identification Database
in-lbs.	Inch Pounds
INFO	Information
kg	Kilogram
LACMTA	Los Angeles County Metropolitan Transportation Authority
LED	Light Emitting Diode
LRV	Light Rail Vehicle
LVDC	Low Voltage Direct Current
MBS	Microprocessor Based Subsystem(s)
MDS	Monitor and Diagnostic System
MVB	Multi Vehicle Buss
Nm	Newton Meter
NIC	Network Interface Controller
NVR	Network Video Recorder
PA	Public Address
PAD	Personal Alert Device
PB	Pushbutton
PIC	Passenger Intercom
PID	Passenger Information Display
PIS	Passenger Information System
PTU	Portable Test Unit
RIO	Remote Input / Output
RTDG	Real Time Data Gathering
TCN	Train Control Network
TCON	Train Configuration Functionality
TOD	Train Operator Display
TWC	Train-to-Wayside Communication
VLU	Vehicle Logic Unit
VMS	Vehicle Management System
WWAS	Wayside Workers Alert System

CHAPTER 2.0

FUNCTIONAL DESCRIPTION

2.1 Introduction

This chapter provides a functional description of the Monitoring and Diagnostic System (MDS) and Train Operator Display (TOD) equipment.

The MDS is a system that is comprised primarily of the MDS computer and the TODs that provide the Human to Machine Interface (HMI). It consists of a trainlined network data communication system that allows the status of Micro Processor Based (MBS) vehicle equipment to be available at any cab in a train. It is primarily Ethernet-based but MVB data is bridged to the Ethernet system for reporting and display.

The MDS consists of local network and related vehicle equipment interfaces in each vehicle, a display screen and interface unit (TOD) in each cab, a trainlined network to provide data communication between vehicles, and all related hardware and software. All features and functions of the MDS are available in single car trains, without a functioning trainline network. Fault information from trailing LRVs is available at the leading LRV controlling cab.

The MDS continuously monitors operation of all systems and devices connected to the Train Control Network (TCN) and records and saves any operational faults in a non-volatile memory. Fault memory is resettable at the primary maintenance level. A data logger is provided, and resides in non-volatile memory. This information can be examined or retrieved by using the MDS TODs and PTU. The MDS provides reporting on fault information throughout the car or consist to the Operator and maintenance personnel. The MDS displays the fault information on the Train Operator Display (TOD). The MDS computer performs the following functions:

- Train Configuration Functionality (TCON),
- Receive the Master Time from the CCU / GPS,
- Handle Subsystem TIME synchronization (Sends current Time/Date to all the subsystems),
- Receive all subsystems fault messages (FAIL) and forward them to the FLOG for logging, and to the TODs for display,
- Provide the parameters for the proper Ethernet trainline configuration (EEIM),
- Handle VERSION request from all subsystems, and provides the version data the TODs,
- Monitors all subsystems Ethernet connection status via the Ethernet HEALTH messages.

It should be noted that the subsystem fault messages originate from multiple subsystems in similar but not the same format and messaging. Subsystem messaging is further elaborated in the respective Running Maintenance Manuals for the subsystems.

2.2 Equipment Locations

2.2.1 Monitoring and Diagnostic System (MDS)

There is one Monitoring and Diagnostic System (MDS) computer per car. It is located in the B-Unit cab, see Figure 2-1. The MDS panel assembly is shown in Figure 2-2.

The CCU / MDS computer is a “box” computer with no user serviceable parts, see Figure 2-3. The differentiation between the CCU or MDS is the software installation. Software is installed on the device via the PTU where a web page will prompt for the CCU/MDS software package.

A failure of the CCU / MDS computer will cause significant loss of data control due to the interconnected functionality of the networked subsystems. Also, loss of Ethernet communication with this device will indicate the same symptoms. The Operator would see a Yellow Flashing VMS indication which when pressed would give an indication that the MDS is Off Line. Additionally, at end of the line on a cab end change the correct train configuration will not be shown on the new cab display.

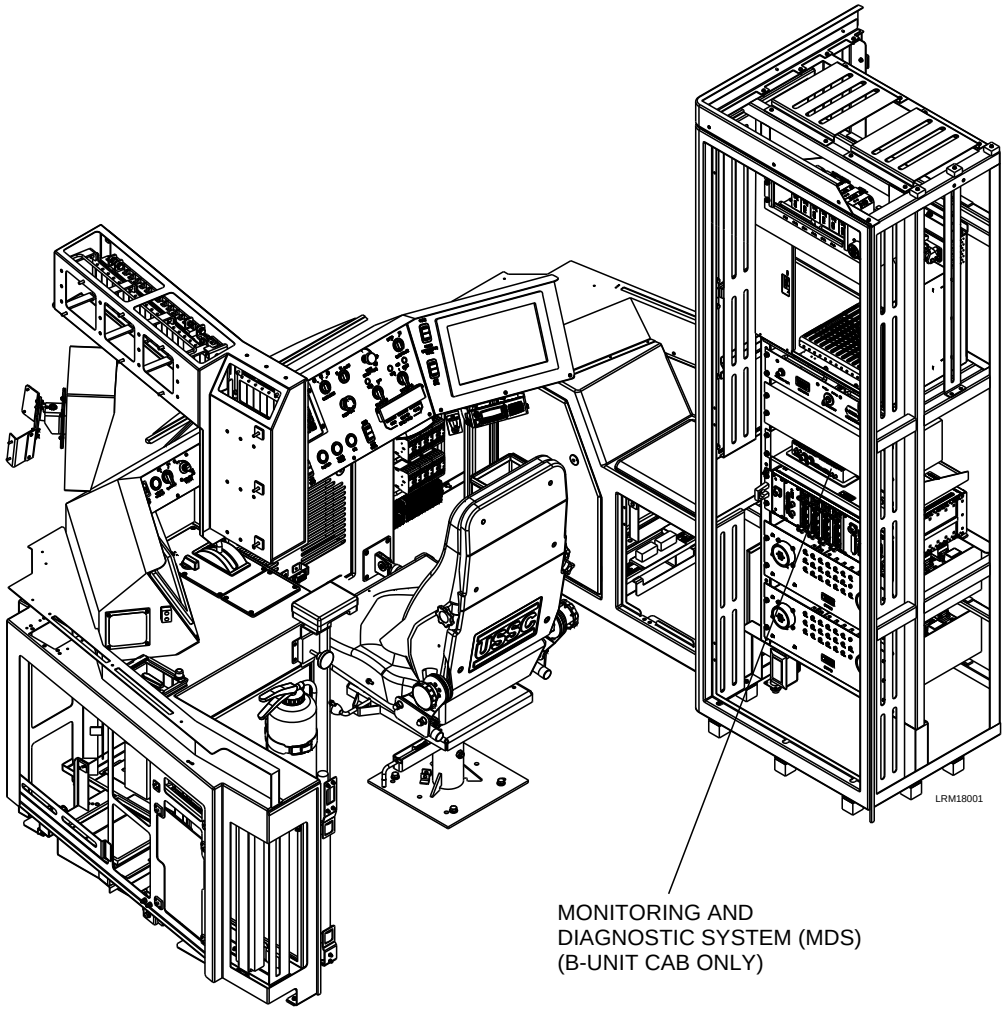

Figure 2-1: Monitoring and Diagnostic System (MDS) Computer

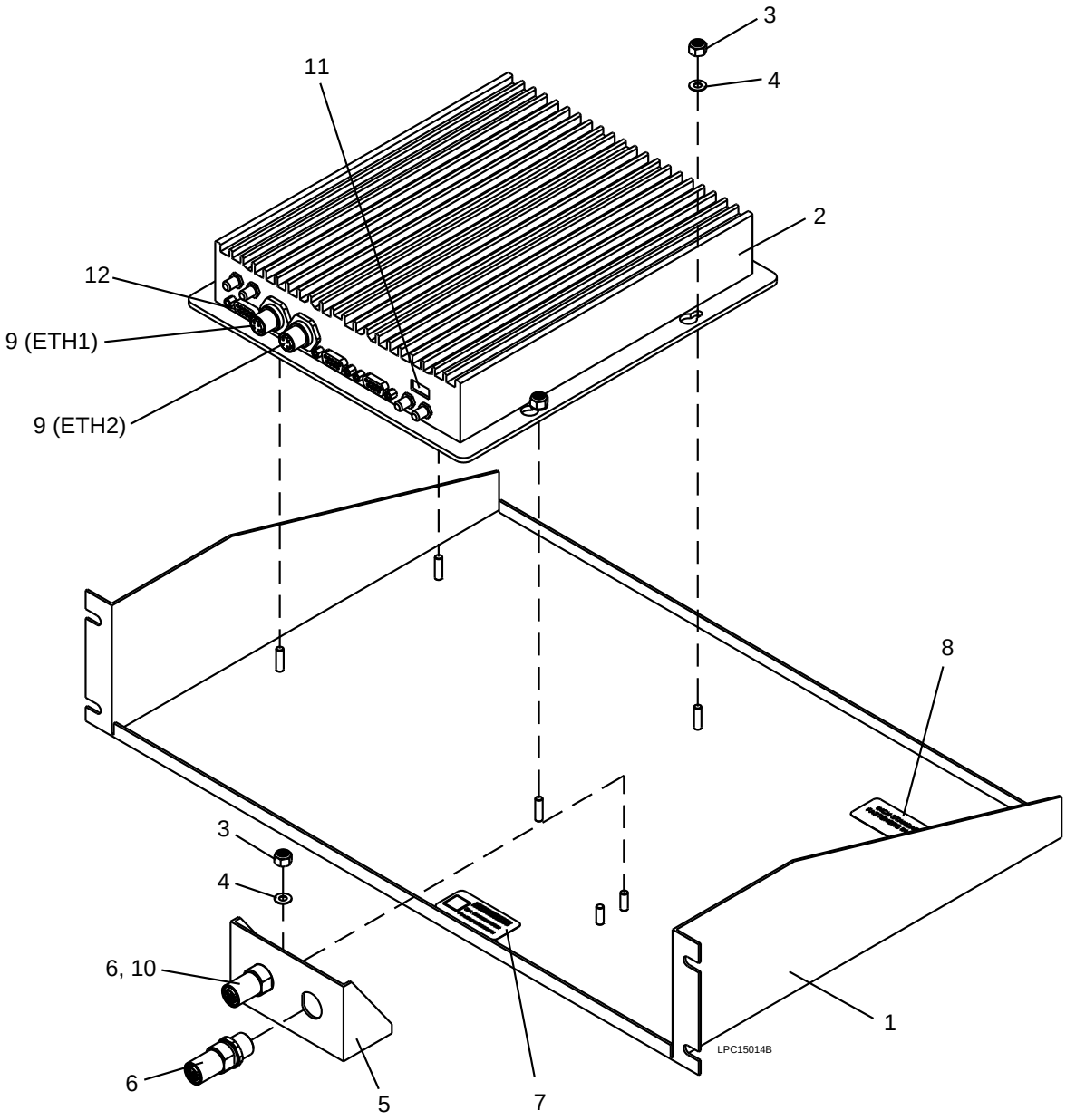

Figure 2-2: CCU / MDS Panel Assembly

Figure 2-3: CCU / MDS Computer

LED indicators are provided to indicate the state of the machine. A total of four Ethernet status LEDs, two for each Ethernet channel. They signal the link and activity status.

In addition to the four Ethernet status LEDs, there are four general status LEDs. The MDS computer front panel is shown in Figure 2-4. Refer to Section 8.6 for MDS troubleshooting.

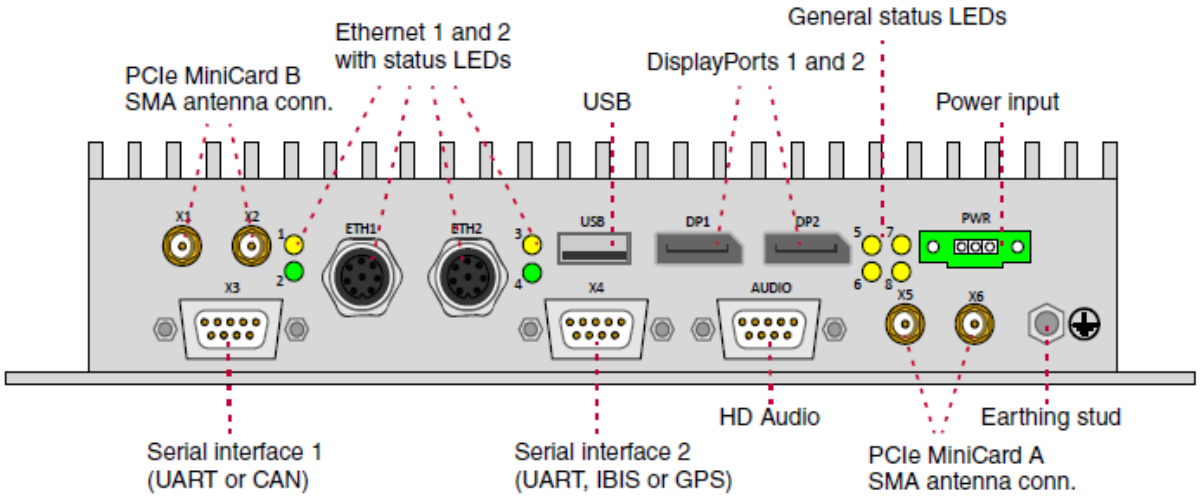

Figure 2-4: MDS Computer Front Panel

2.2.2 Train Operator Display (TOD)

There are two Train Operator Displays (TOD) in each cab located on the left and right sides of the cab console, see Figure 2-5. Each TOD is a touchscreen interface that allows the train Operator to interact with and monitor systems within the car or consist. The left TOD is the Primary TOD (Operating Screen) and the right TOD is the Secondary TOD (Communications Screen), see Figure 2-6.

If one of the TOD's in the cab fails, the other TOD will assume the duties of both TOD's.

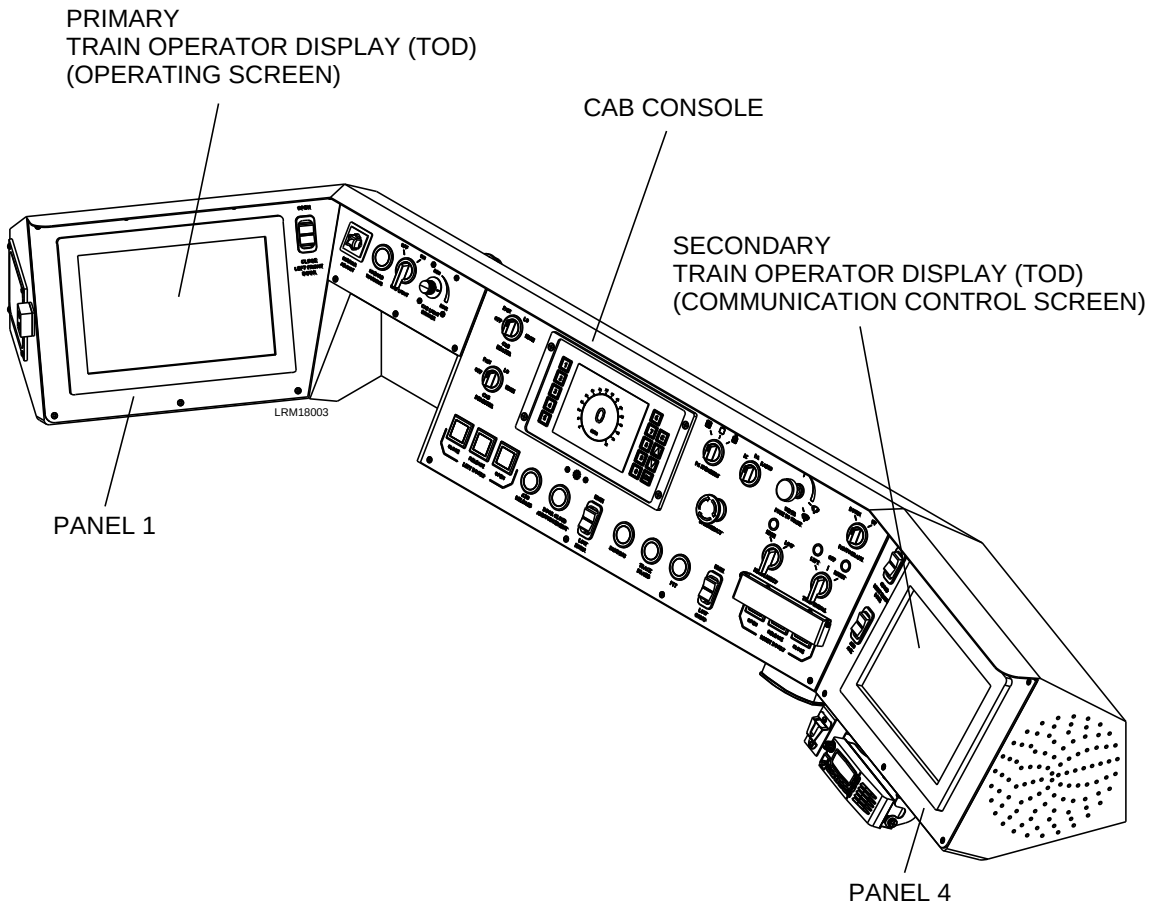

Figure 2-5: Train Operator Display (TOD)

Figure 2-6: Train Operator Display Layout

2.3 System Functionality

2.3.1 Functional Introduction

The Monitoring and Diagnostics System (MDS) consists of the main MDS application (called RTC-Intercomm – which resides on the MDS computer), a fault recorder application (called FLOG – which resides on the MDS computer), and the user interface (which are the Train Operator Displays). The MDS is responsible for the following tasks:

- Provide control/status data to other Ethernet subsystems (from TCN RIOs/ETH RIOS/ect.)
- Provide subsystem faults to the TOD and record faults for later access
- Monitor signals on the MVB and WTB networks
- Gather subsystem software versions
- Periodic check of subsystem Ethernet health (via HEALTH message)
- Synchronize time among subsystems

Figure 2-7 shows an overview of the functional connection of the MDS system within the Ethernet network. Note the system is not isolated to the B-end TOD's – information to each TOD is the same.

Figure 2-7: MDS Functional Connection Diagram Within the Vehicle Management System

The primary TOD is used by the Operator and Maintenance personnel to view the train configuration, subsystem status, fault information and a variety of other lower level maintenance functions, see Figure 2-8. The secondary TOD acts as the communication control head. It can adjust the cab speaker volume, play pre-recorded messages, answer PIC calls and set the automatic announcement routes, see Figure 2-9. It will also display the Wayside Worker Alert System (WWAS) alarm to the Operator.

Note that the two TODs are independent from each other and if the primary TOD fails the secondary TOD will perform the primary TOD's functions either automatically or manually, depending on the type of failure. If the secondary TOD fails, the primary will automatically perform the secondary TOD functions such as, annunciating the WWAS alarm and allowing the operator to perform communication control head functions.

The TOD software was developed to closely mimic the look and functionality of existing legacy Metro LRV TOD software. This familiarity should help in limiting the confusion between the two systems. However, there are some functions and screens that are different or don't exist on Metro's older LRVs. A TOD screen navigation diagram is shown is Figure 2-11. This figure illustrates the sub menus available via the Maintenance Tab screens. The Operating Screen provides information to the Operator and the Maintainer, which is accessed by pressing the top-level pushbutton.

Figure 2-8: Primary TOD (Operating Screen)

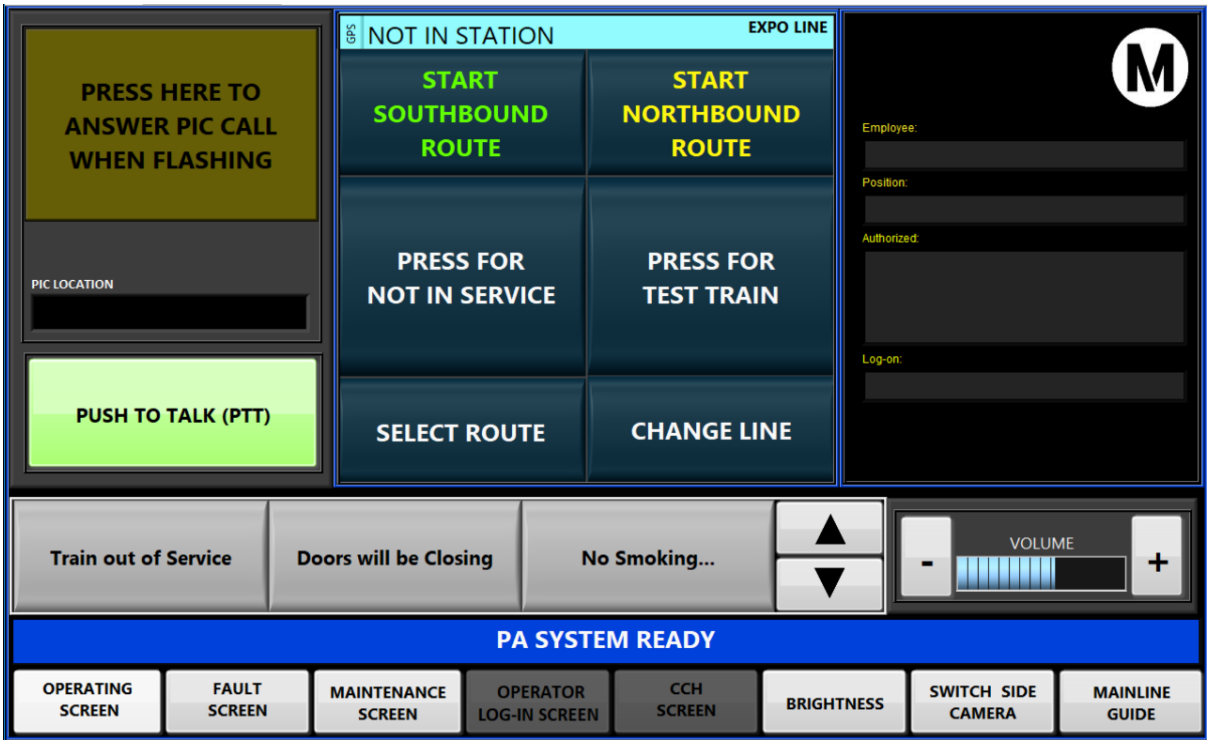

Figure 2-9: Secondary TOD (Communication Control Screen)

2.3.2 Fault Reporting and Recording

All local subsystem fault information is sent on the Ethernet network to the local MDS. The MDS main application processes the incoming information and forwards it onto all TODs in the consist (for user display Fault Popup Window and active fault screen) and the local FLOG (for fault recording). Note: with the exception of information sent for user display, the MDS uses a local vehicle architecture.

Figure 2-10 provides a visual representation of the system architecture for subsystem fault reporting/recording. In this figure, ECU A on LRV #1 and HVAC B on LRV #2 are experiencing faults. Both subsystems report the fault to the local MDS computer. The local MDS computer stores a record of the fault (via the FLOG app) and forwards the fault information to all TODs in the consist. The blue arrows represent information sent to the local TODs while the pink represent information sent across the Ethernet trainline. Note the behavior of the fault reporting is independent of the lead car.

Figure 2-10: Subsystem Fault Reporting Architecture Example

As previously discussed, the FLOG records the local subsystem faults experienced. The FLOG creates one fault log per day and stores this information on the MDS computer hard drive. This data, referred to as fault logs, are viewable on every local TOD for that specific LRV. The fault logs are also able to be downloaded using a PTU and wirelessly to the Metro Maintenance Server when the vehicle is within the connection distance to the maintenance shop access points. The fault logs are also able to be downloaded using a PTU (refer to Section 8.3 for instructions).

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2.3.3 Software Version Requests

When the version window is accessed on the TOD, the MDS initiates a version request to the subsystems, when it receives the version it is forwarded to the TOD for display. There is a delay while the query and response is made via the MDS and the subsystem response and then displayed on the TOD.

The “RTC-Intercomm” application on the MDS is responsible for providing software versions to the TODs. The MDS computer initiates the request, the subsystem reports its version back to the MDS, and the MDS then acknowledges the message. If a TOD needs the software version, the MDS will then forward the version on to the TOD. Table 2-1 shows the software version request protocol used by the MDS computer.

Table 2-1. P3010 Subsystem Software Version Request Protocol

MDSB		P3010 Subsystem
Send Version Request message	→ → → →	Received Request
Received Message	← ← ← ←	Send Version message
Send Acknowledge	→ → → →	Receive Acknowledge

2.3.4 MDS/Subsystem HEALTH Message

Every P3010 MBS Ethernet subsystem is responsible for periodically sending the Ethernet HEALTH message to the MDS computer. The MDS uses this message to determine if operation/Ethernet connection to a particular subsystem is “healthy” or not. There is a 10-minute window each subsystem has to transmit the HEALTH message to the MDS in order for the MDS to declare the subsystem online. Not all subsystems transmit their ethernet health message with the same periodicity. This function is more fully described in Section 1700, Data Communications of the Running Maintenance and Servicing Manual.

If a subsystem did not transmit within the 10-minute window, it is declared offline. When this occurs, the subsystem indicator block on the TOD will change to a flashing yellow background. After connection to/operation of a subsystem resumes, it may take up to 10 minutes for the indicator to change depending on the timing of the window closing. This time was selected to provide time for systems to boot and ascertain their status, and then provide several reports to the MDS system within the time. This is done to filter out erroneous status reporting.

NOTE: Only subsystems are responsible for sending this message – devices are not. For example, Ethernet Switches and RIOs do not send this message. The following subsystems send a health message:

- Propulsion (PLUA/PLUB)
- Friction Brakes (A/C/B)
- HVAC (A/B)
- ATC
- Doors (DCU Ethernet Gateway)
- Event Recorder
- APS
- NVR

- Passenger Counter (APC)
- TCN RIOs (A/B)
- VMS (Vehicle Management System)
  - TODs (Left/Right/A/B)
  - PID (A/B)
  - CCU/MDS

2.4 Description of TOD Screen Sections

All TOD screens are made up of three sections, refer to Figure 2-12 below:

- Screen Header
- Screen Body
- Menu Bar

Figure 2-12: Screen Sections

2.4.1 Screen Header

The Screen Header is visible on all TOD screens. It is located on the top of each screen and shows the LA METRO symbol, the screen name, the ambient temperature, time and date, and the LRV cab number.

2.4.2 Screen Body

The Screen Body is located in the center of the screen and will change its look and function depending on which screen is selected. This section contains data that is relevant to the function selected.

Whenever a new screen is selected, by the soft pushbutton on the Menu Bar, its identification title is shown in the Screen Header.

2.4.3 Menu Bar

The Menu Bar is always visible on the bottom of the screen and contains soft pushbuttons. The pushbuttons, when pushed, will display the function selected in the Screen Body. When the Menu pushbutton is grayed out and disabled, this means that this is the active screen selected or the function is unavailable or not enabled. The main pushbuttons are “Operating Screen”, “Fault Screen”, “Maintenance Screen”, “Operator Log-In Screen”, “CCH Screen”, “Brightness Screen”, “Switch Side Camera” and “Mainline Guide”.

2.5 Train Operator Display Description

When the LRV is turned Keyed ON and a cab has been selected as the active cab, the TOD screens will turn on. In the inactive cab the TOD display will be displayed by touching the display. After one minute of inactivity the screens will go dark.

The Primary TOD default screen is the Operating Screen and is shown in Figure 2-13. This screen at a glance will let the Operator know which cab they’re in as well as the actual time and date. Also displayed is the ambient temperature, the LRVs that make up the train consist, some trainline indications, line voltage, brake cylinder pressures, main reservoir air pressure, and master controller position. Selecting the LRV number pushbutton (1122, highlighted in blue, is selected in Figure 2-13) will display that LRVs local indicator panel and status indications.

Figure 2-13: Operating Screen Sections

The Operating Screen's main screen body has two main sections, the Status Panel Status Indications and the Trainline Indications. The Status Panel section displays voltages, brake cylinder pressure, main reservoir air pressure, local inhibitors, and speed limiters. The Status Panel Section also displays subsystems within the selected LRV. The subsystem pushbuttons indicate their respective condition by changing color. For example, in Figure 2-14, the door pushbuttons are enabled. This is represented by the yellow "Doors Rel." status pushbutton. A red push button indicates a fault in that subsystem. Then the status pushbuttons can be pressed to give the user a high level overview of the subsystem's variables and general condition. The system conditions are further defined in the respective subsystem manuals. Additionally, if a system indicator is flashing yellow, it indicates that the subsystem is offline or not communicating with the TOD. This could be due to a subsystem fault or a network connection fault.

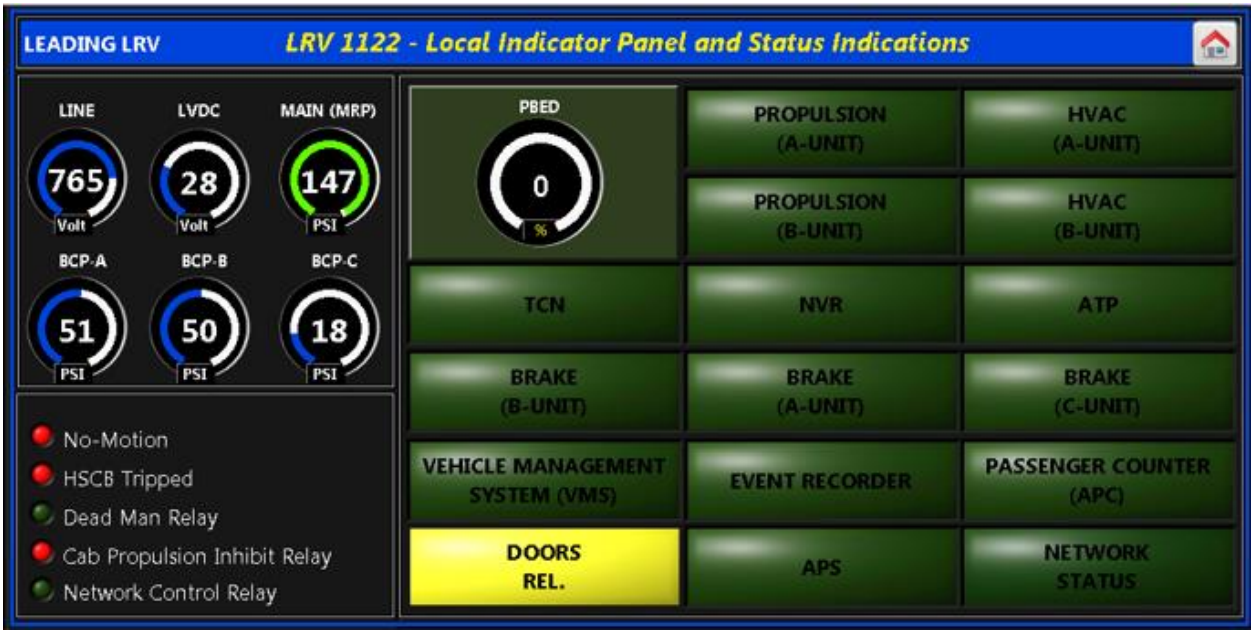

Figure 2-14: Status Panel

The Train Configuration is part of the screen header referenced in Figure 2-12. For a single LRV this indicator is made of three pieces: the leading cab, the LRV number and the trailing cab. Below, Figure 2-15 shows a two LRV consist.

Figure 2-15: Two Train Configuration Indication

When A cab is the leading cab, the indicator will change from black background to green background and vice versa if B cab is leading, see Figure 2-16. When a direction is selected by the operator, arrows will appear displaying the train's intended movement direction.

Figure 2-16: Single Train Configuration Indication

When a fault occurs on an LRV within the consist, the "FLT" indicator (shown in Figure 2-16 just left of the associated LRV number) in the configuration screen header will change from a dark green background to a red background. Pressing the LRV number will change the Local Indicator Panel from the default display (Local LRV) to the selected LRV. Once the desired LRV's Indicator Panel is displayed, one can use the subsystem status pushbuttons to further investigate what may be causing the fault.

The Local Panel and Trainline Indications Panel, shown in Figure 2-17, displays the line voltage and low voltage DC system indicators, brake cylinder and main reservoir air pressures, as well as train inhibitors and speed limiters. This panel is useful in telling the Operator what is preventing the movement of the LRV or limiting the speed of a particular LRV in the consist. Table 2-2 shows the correlation between trainline state and indicator color.

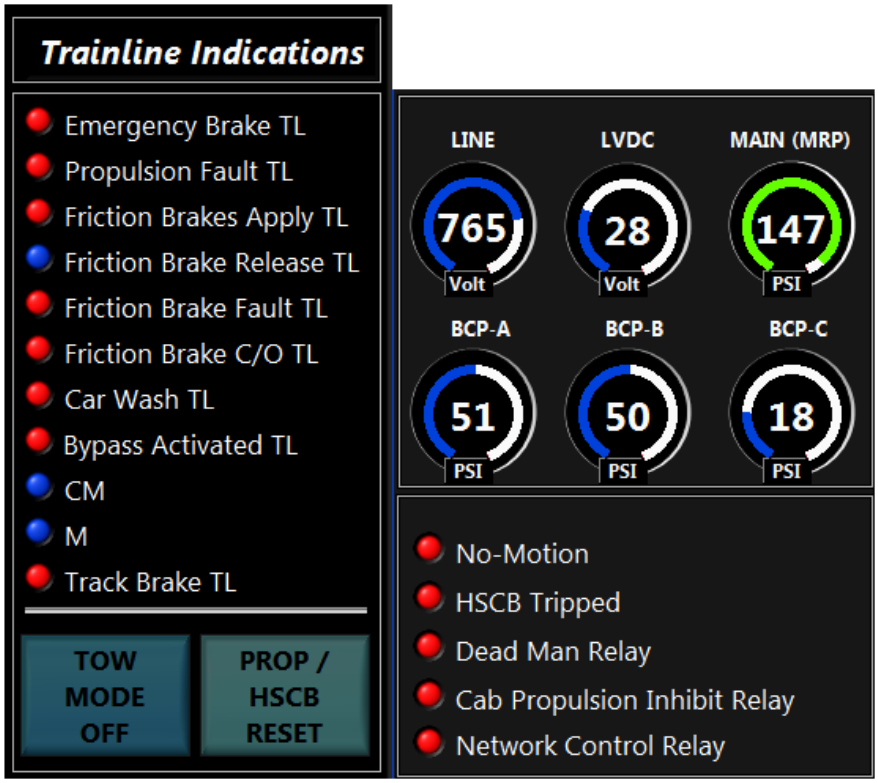

Figure 2-17: Trainline Indications and Local Indications

Table 2-2. Trainline State vs Indicator Color

	Indicator State		
	Green	Red	Blue
Emergency Brake TL	Normal State	Active	
Propulsion Fault TL	Normal State	Active	
Friction Brakes Apply TL	Normal State	Active	
Friction Brakes Release TL	Normal State		Active
Friction Brake Fault TL	Normal State	Active	
Car Wash TL	Normal State	Active	
Bypass Activated TL	Normal State	Active	
CM	Normal State		Active
M	Normal State		Active
Track Brake TL	Normal State	Active	
No Motion	Normal State	Active	
HSCB Tripped	Normal State	Active	
Dead Man Relay	Normal State	Active	
Cab Propulsion Inhibit	Normal State	Active	
Network Control Relay	Normal State	Active	

2.6 Fault Screens Description

The Active Fault pop-up screen in Figure 2-18 is displayed when a fault occurs. This screen appears on the TOD no matter what screen the operator is viewing at the time of the fault. The screen will appear and will go away after approximately 20 seconds. Details on this screen are the LRV Number, Fault Name, Fault Description, System and the Type of Fault. The fault is then logged in the list of active faults. Appendix A provides the fault descriptions.

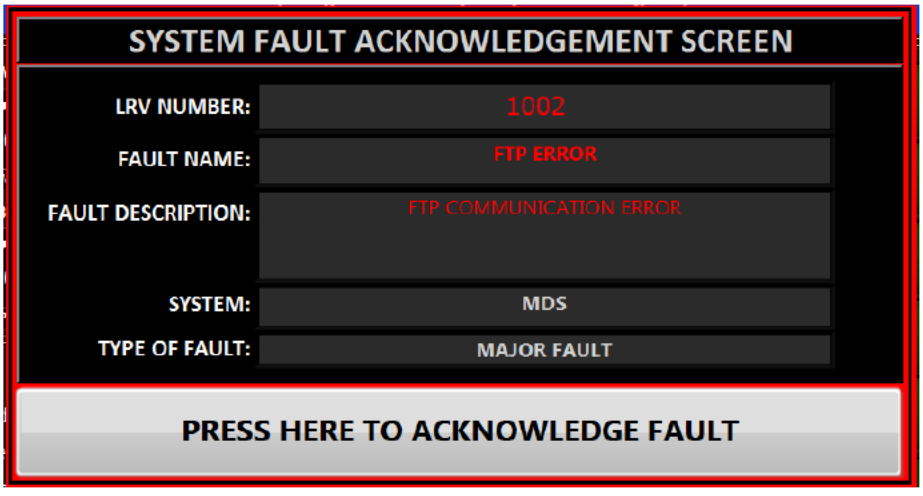

Figure 2-18: Fault Acknowledgement Screen

The next button on the Menu Bar is the “Fault Screen.” Pressing this pushbutton will display the **Active Faults Screen**, see Figure 2-19. The active faults for each LRV in the consist will be displayed on this screen. From the Active Faults Screen a “Fault Code Guide” is available. This guide consists of a hyperlinked file that displays the faults and possible corrective actions. It is based on the fault list found in Appendix A of this manual.

A Fault is detected when the subsystem is not able to perform to its designed capacity due to a malfunction in one of its components or when the subsystem performs outside of its established performance levels which may be the result of a combination of internal or external factors.

The faults are stored on the local LRV where they originated. The logs of these faults can be retrieved from the MDS via a PTU and the Filezilla program, which is a file transfer program. Section 8.3 of this document explains this process.

In addition to the faults stored on the MDS, other events may be stored in the subsystem's internal log file and, if necessary, can also be downloaded with a Portable Test Unit (PTU).

Fault definitions and corrective action, and subsystem fault log down load instructions are included in the subsystem manuals for faults displayed in the active fault screen.

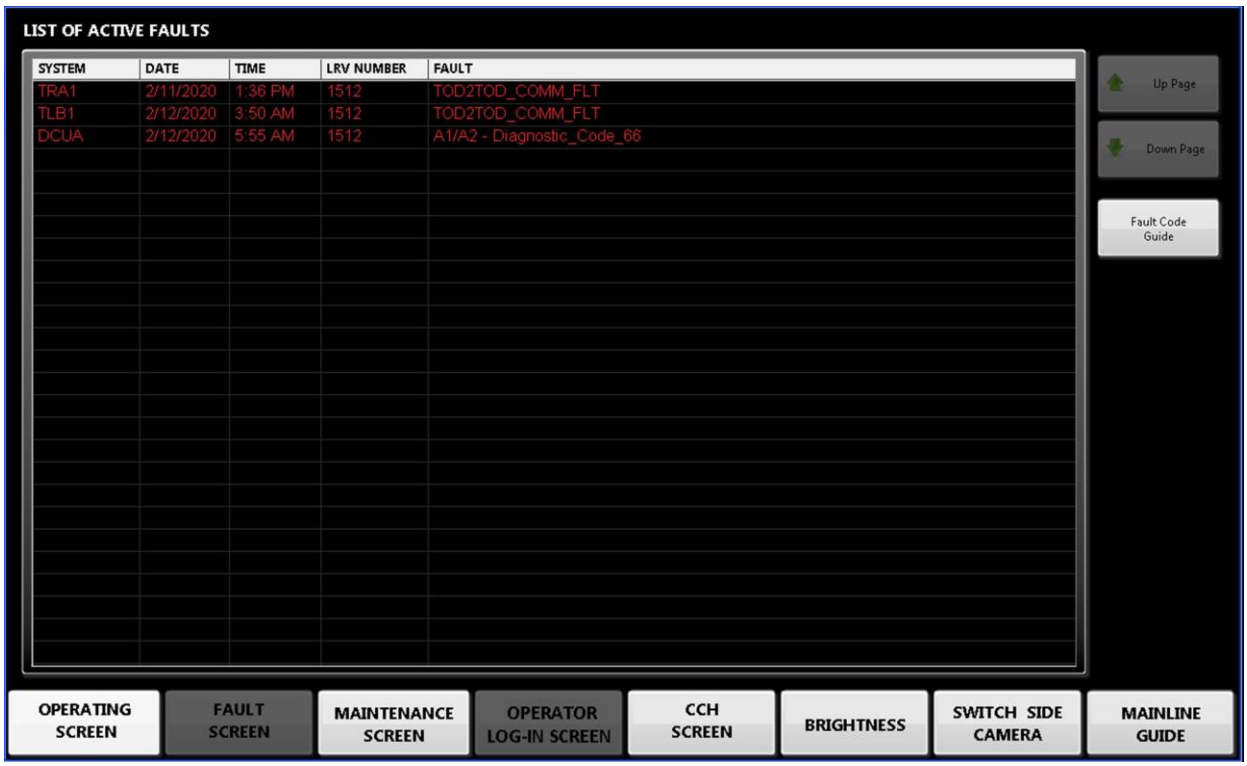

Figure 2-19: Active Faults Screen

2.7 Maintenance Screen Description

The “Maintenance Screen” has restricted access and is pass code protected so that it can only be accessed by authorized personnel. The Maintenance Screen is used to perform basic troubleshooting as well as in-depth troubleshooting and analysis of sub systems. This screen provides the maintenance personnel with simple information about the Line Voltage, Propulsion Current, Battery Voltage, Brake Cylinder Pressures, and Master Controller Position.

NOTE: Passcodes can be found in the Identification Database (IDDB).

To enter the passcode, simply start typing in the passcode number, see Figure 2-20. If a mistake occurs, press the “Backspace” key to go back one character or press the “CLEAR” key to erase the entire passcode. Once the passcode has been successfully typed, simply press the “ENTER” button to enter the passcode. If the correct passcode was entered, a personnel acknowledgement screen, Figure 2-21, will appear and then you will automatically be taken to the Default Maintenance Screen, see Figure 2-22. An invalid passcode will prompt you to re-enter the passcode.

The IDDB is part of the ID reader function. Once enabled / data base populated a maintainer will be able to us their ID card to log into the maintenance screen.

Figure 2-20: Passcode Screen

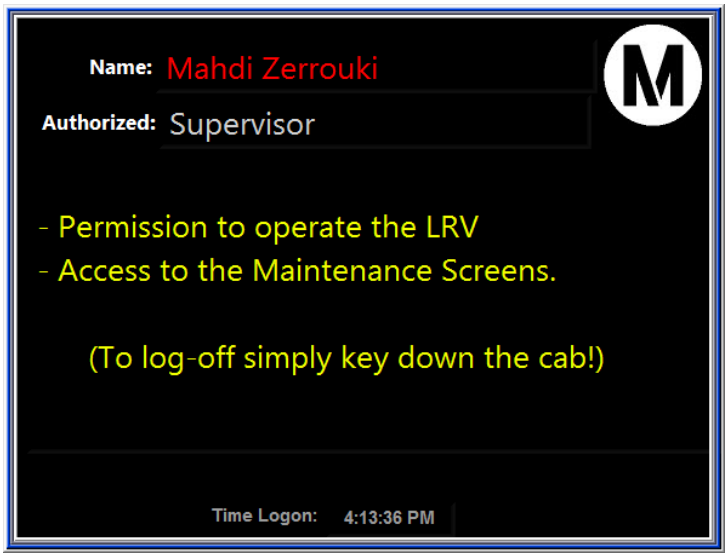

Figure 2-21: Passcode Identification Screen

2.7.1 Maintenance Screen – Default Screen

Figure 2-22 shows the Default Maintenance Screen. This screen provides the main navigation point from which you are able to view LRV subsystem data and conduct maintenance or troubleshooting tasks. Lower level screens allow the maintenance personnel to drill down to determine subsystem status. Information provided in the lower level screens display status / faults that are described more fully in the specific sub manual for the subsystem in question.

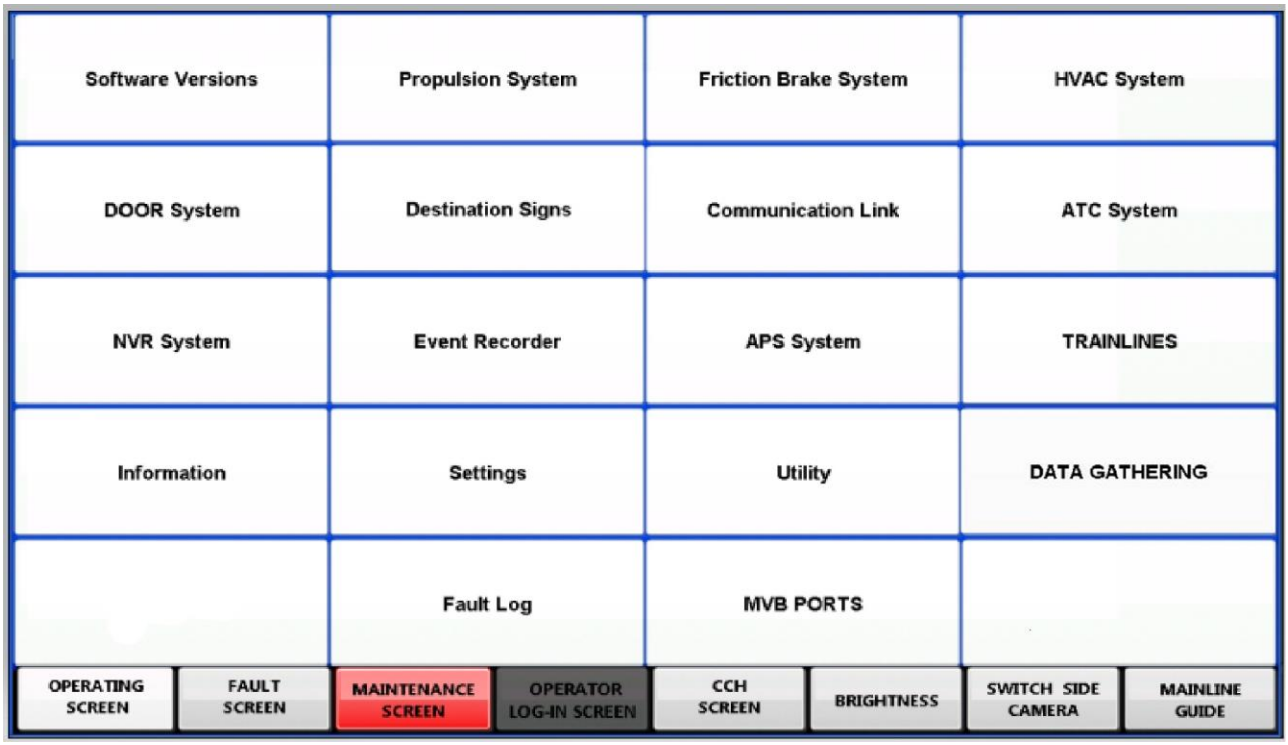

Figure 2-22: Default Maintenance Screen

2.7.2 Software Versions Screen

Figure 2-23 shows the Software Version Screen which is accessible by pressing the Software Versions pushbutton on the default maintenance screen. Pressing this pushbutton displays all the subsystem software versions for the local LRV.

It should be noted that this screen shows the software versions on the local LRV only. If the software versions from other LRVs in the consist are required, simple key up the desired LRV and follow the previously described path through the maintenance screen log in and to the Software Versions Screen.

The query for the software versions originates from the TOD to the MDS to each Subsystem and then back to the MDS to the TOD for display. When initiated, allow sufficient time for the multiple inter-related systems to process the request and display the version. Allow at least 5 minutes for the versions to fill. If they do not fill the equipment may be off line or out of service.

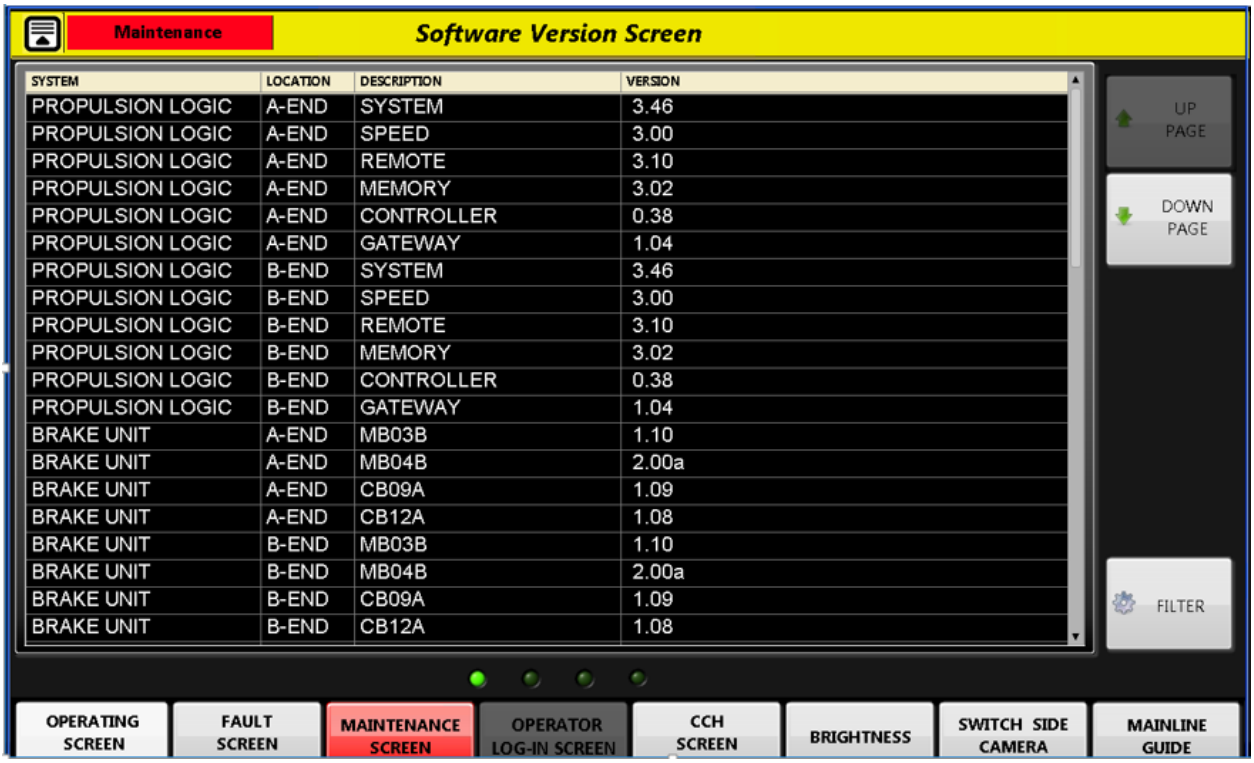

Figure 2-23: Software Version Screen

2.7.3 Propulsion Units System Status Screen

Pressing this Propulsion System pushbutton from the Default Maintenance Screen opens the Propulsion Screen shown in Figure 2-24. This screen shows numerous status and health variables for the A and B end propulsion logic units from each LRV in the consist.

The Down Page and Up Page pushbuttons on the right hand side of the screen can be used to navigate through all of the viewable variables. This is the case for many of the screens accessible from the Default Maintenance Screen.

To return to the Default Maintenance Screen, press the dropdown pushbutton located in the upper left-hand corner of the screen. This is the case for all of the screens accessible from the Default Maintenance Screen.

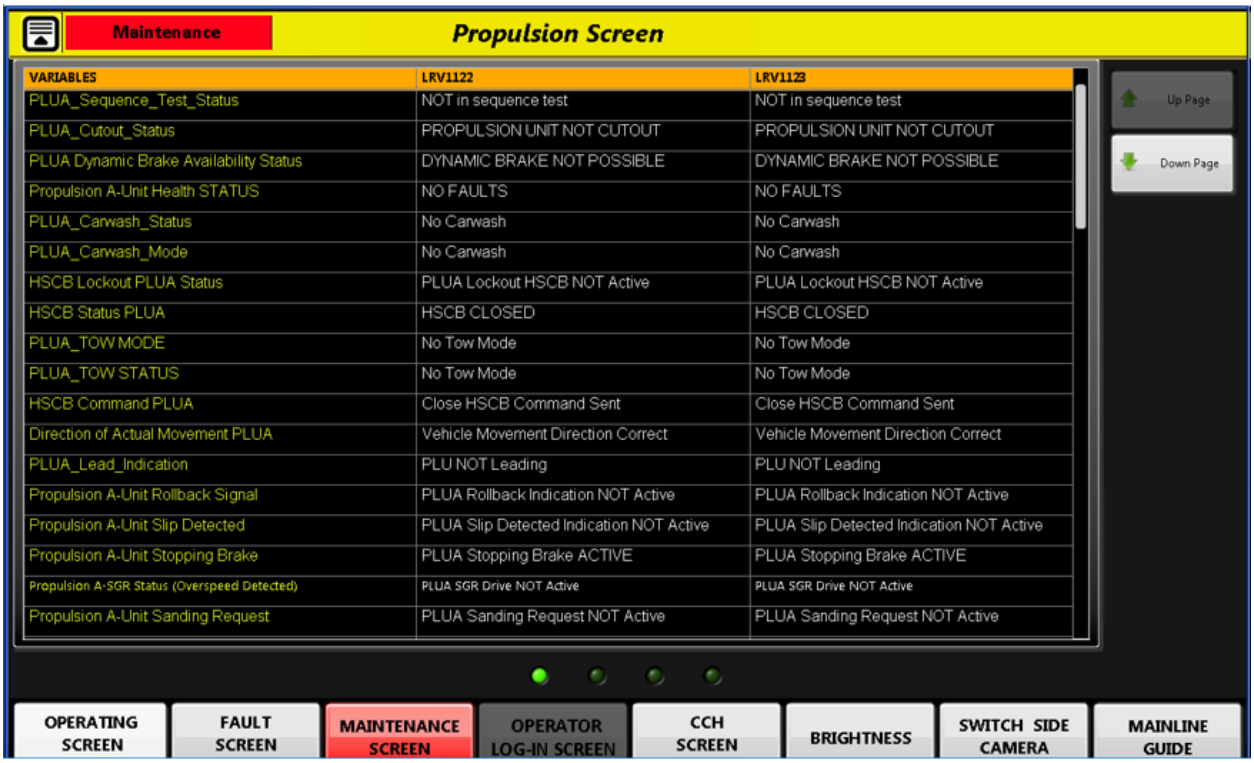

Figure 2-24: Propulsion Screen

2.7.4 Friction Brake System Status Screen

Similar to how the Propulsion Screen was viewed, to access the Brake Unit Status screen, from the Default Maintenance Screen select the “Friction Brake System” pushbutton. This will change the screen to the Brake Units status screen that is shown in Figure 2-25.

The Brake Units status screen is divided into columns that represent each of the LRVs that are in the consist. Within each LRV section, the A, B, and C truck statuses can be determined by the variables displayed. This screen contains information about the fault status, trainline status, parking brake status, service brake status, load weight and brake cylinder pressures, as well as multiple other signals.

The screen will be used to indicate the status of each brake unit in the consist.

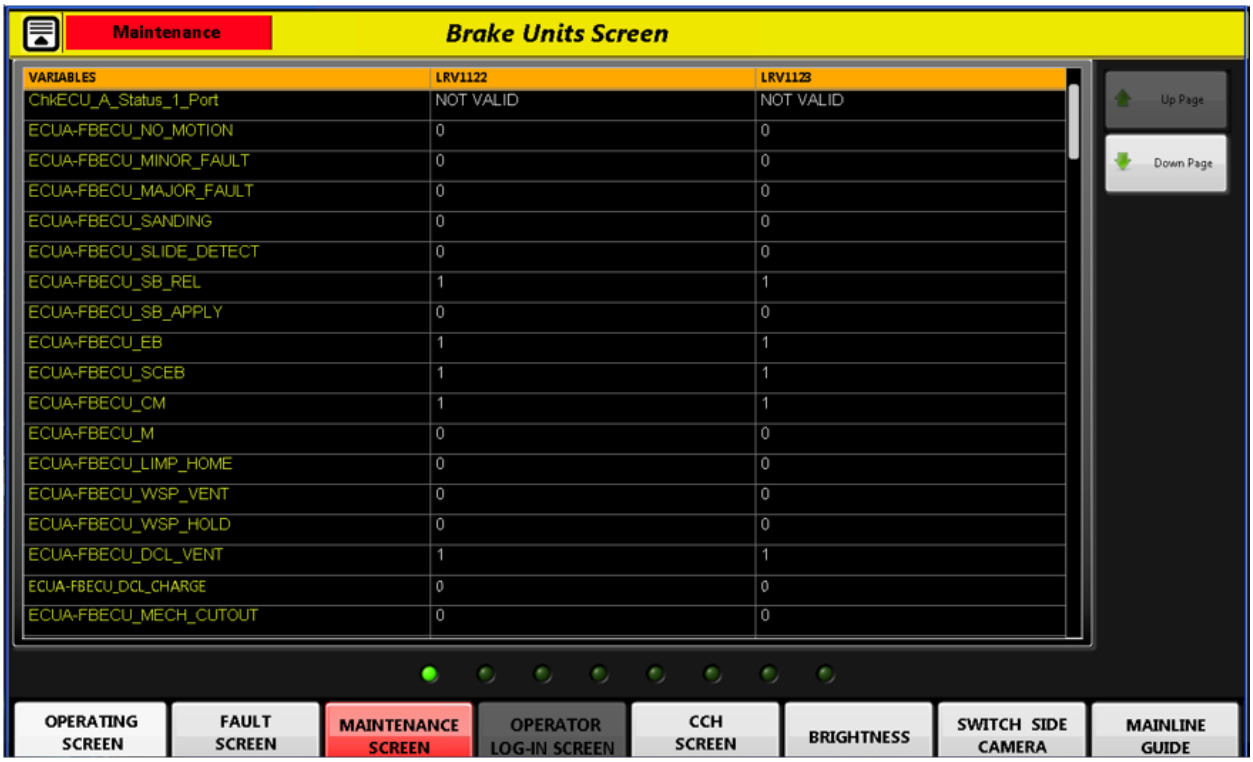

Figure 2-25: Brake Units Screen

2.7.5 HVAC Status Screen

To access the HVAC Status screen, from the Default Maintenance Screen, select the "HVAC System" pushbutton. This will change the maintenance screen to the HVAC Status screen that is shown in Figure 2-26.

The HVAC Status screen is divided into columns that represent the LRVs that are in the consist. Each LRV section contains information about A and B HVAC Units. This screen contains temperature information about Return Air, Fresh Air, Supply Air, and the temperature setpoint. Many other variables are also displayed, such as the HVAC Fault status, Load Shed status, and Health status.

This screen is useful to verify that all HVAC units are operating properly within the LRV consist.

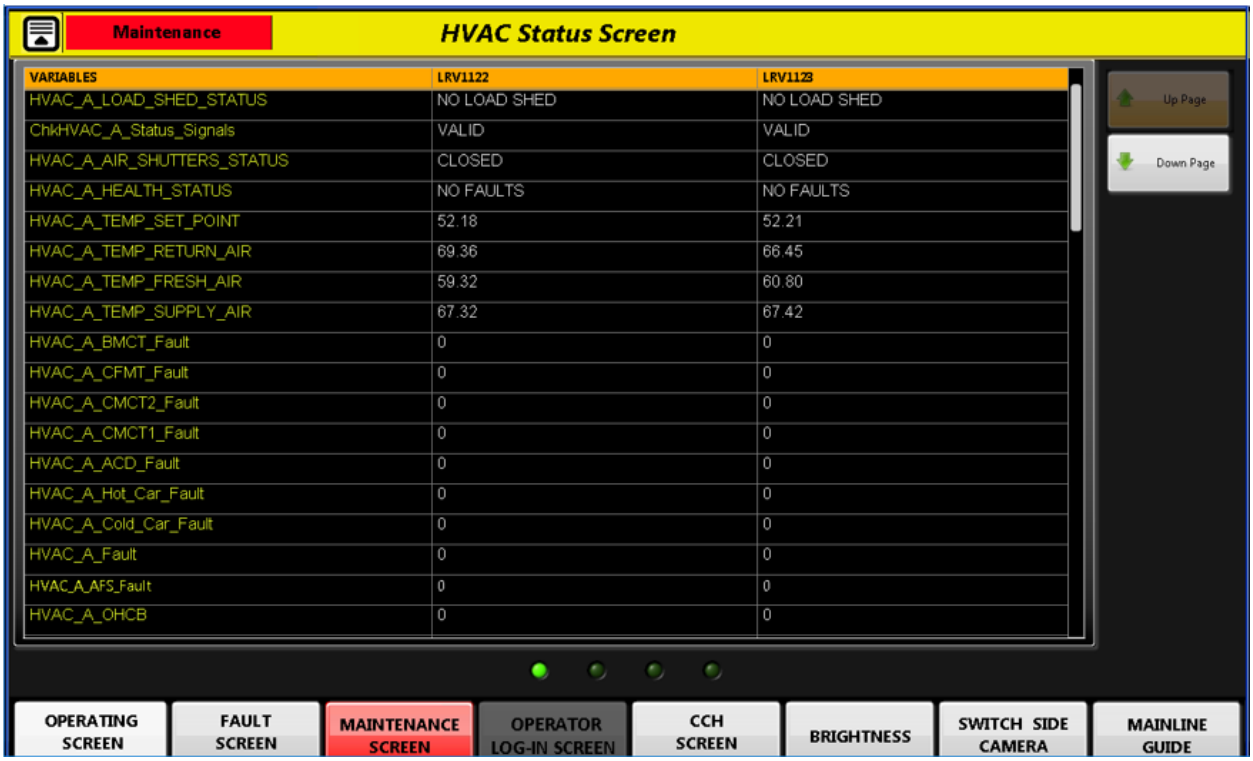

Figure 2-26: HVAC Status Screen

2.7.6 DOOR System Status Screen

The Door System Status screen is accessed, from the Default Maintenance Screen, by pressing the “DOOR System” pushbutton. This will change the maintenance screen to the Door Status screen that is shown in Figure 2-27.

The Door Status screen shows the state and status of all eight set of doors for each LRV in the consist.

The maintainer could use this screen to verify the status of the doors, whether opened, closed, enabled, or cutout.

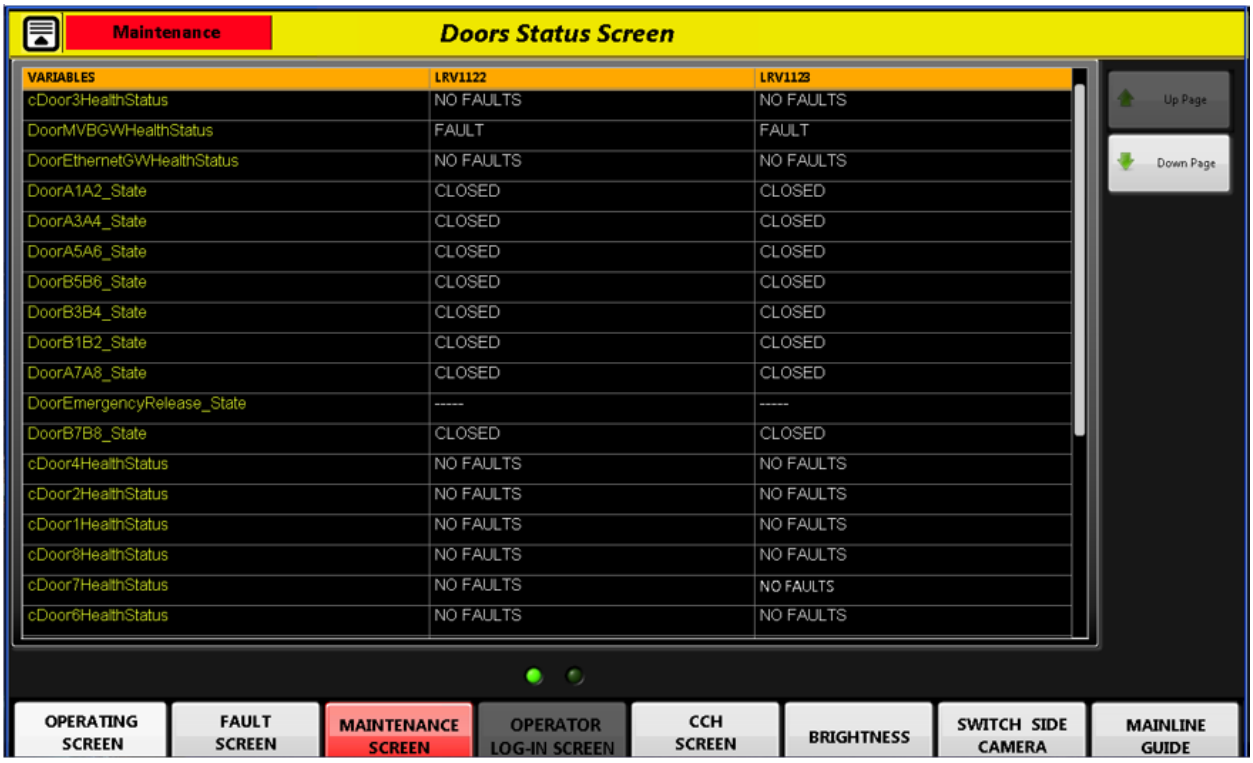

Figure 2-27: Door System Status Screen

2.7.7 Communication Link

To access the Communication Link Status screen, from the Default Maintenance Screen, simply press the “Communication Link” pushbutton. This will change the screen to the Communication Status screen that is shown in Figure 2-28.

The Communication Status screen shows the circular buffer of RS485 messages that were sent to the TOD. The messages are from the newest to oldest with the oldest going to the bottom of the list. This screen can be used to verify that the RS485 port is active and the TOD is communciating with the WWAS and RFID reader. Screen activity as show below indicates that the devices are sending messages / communicating.

The maintainer can press the Pause Collection pushbutton to see what messages were collected. This will freeze the message collection so that the messages can be observed.

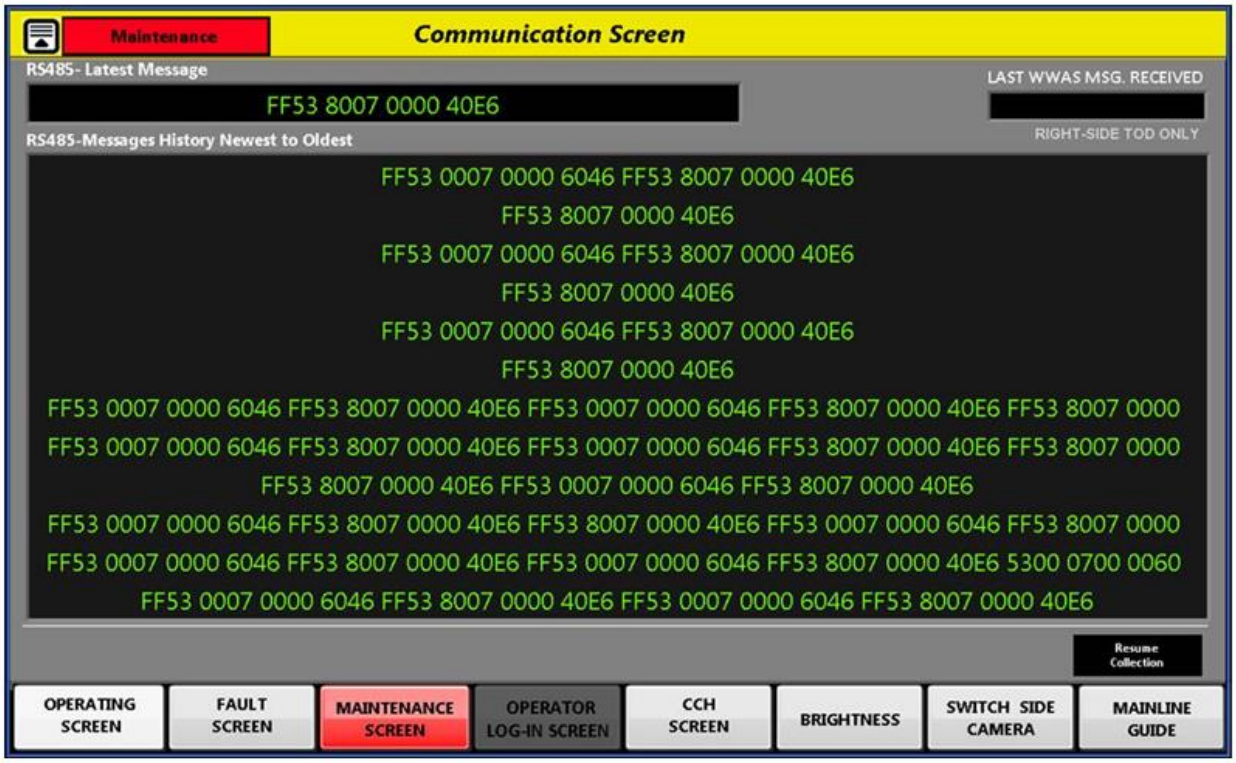

Figure 2-28: Communication Status

2.7.8 ATC Status Screen

To access the ATC Status screen, from the Default Maintenance Screen, simply press the “ATC” pushbutton. This will change the screen to the ATC Status screen that is shown in Figure 2-29.

The ATC Status screen contains ATP, ATO and TWC status indications for each LRV in the consist.

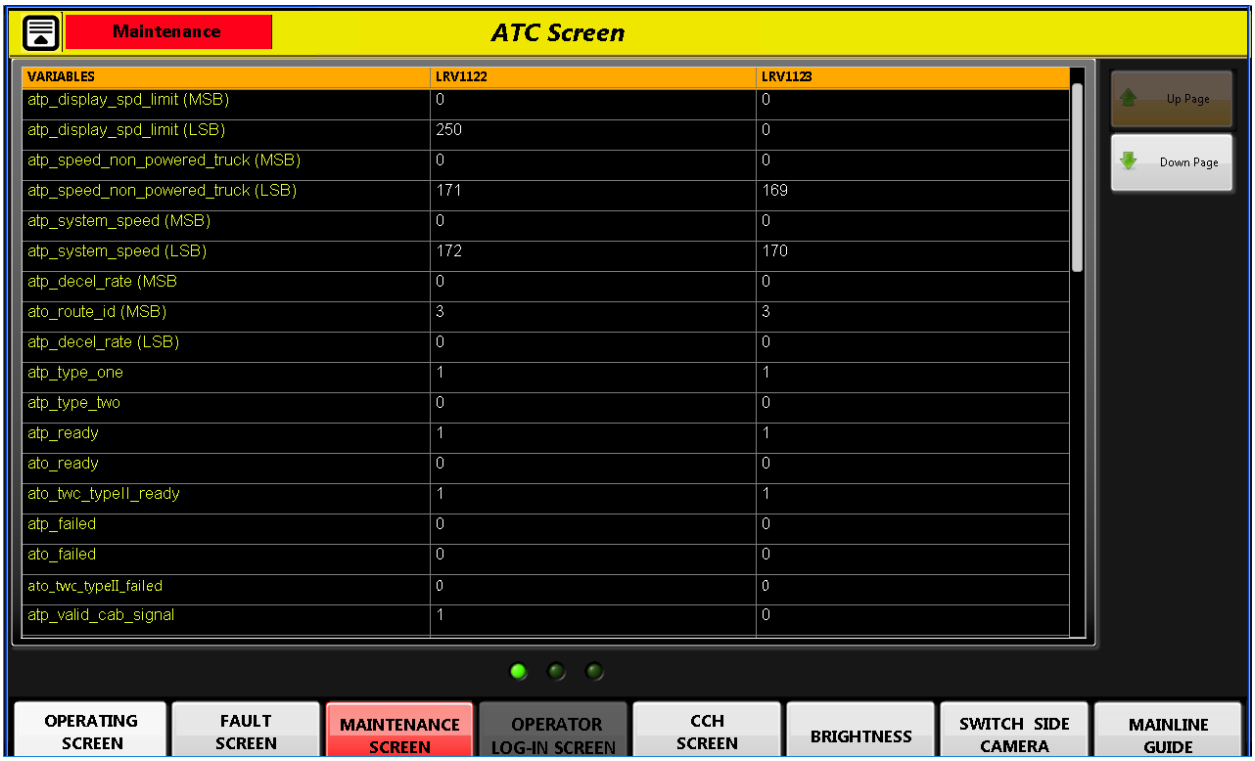

Figure 2-29: ATC Status Screen

2.7.9 NVR Status Screen

To access the Network Video Recorder (NVR) Status screen, from the Default Maintenance Screen, simply press the “NVR” pushbutton. This will change the screen to the NVR Status screen that is shown in Figure 2-30.

The NVR status screen contains information about the local LRV’s NVR Unit. This screen also contains the connection status of each camera in the surveillance system as well as some NVR failure information.

Leading, trailing, and center LRVs can be viewed by pressing the labeled pushbuttons just above the Menu Bar at the bottom of the screen.

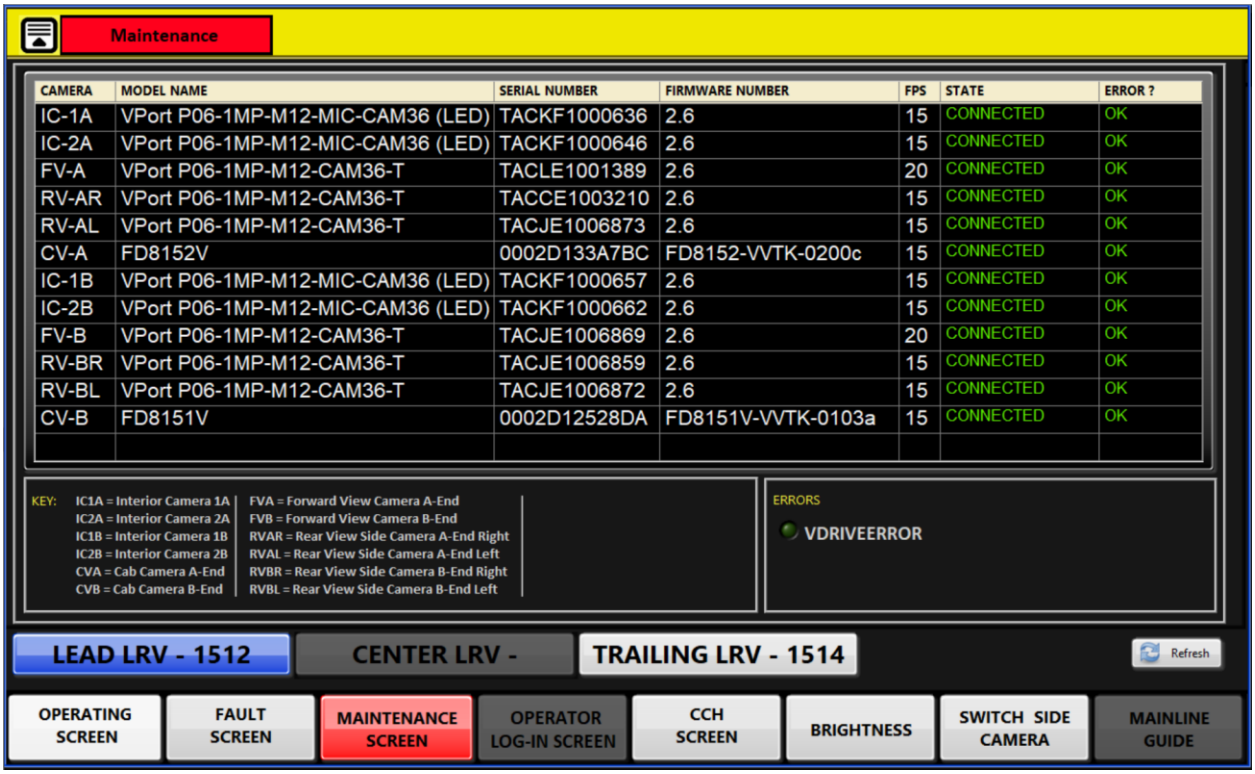

Figure 2-30: NVR Status Screen

2.7.10 Event Recorder Status Screen

To access the Event Recorder Status screen, from the Default Maintenance Screen, simply press the “Event Recorder” pushbutton. This will change the screen to the Event Recorder Status screen that is shown in Figure 2-31.

The Event Recorder Status screen has a number of status’ that indicate the health and state of the event recorder for each LRV in the consist.

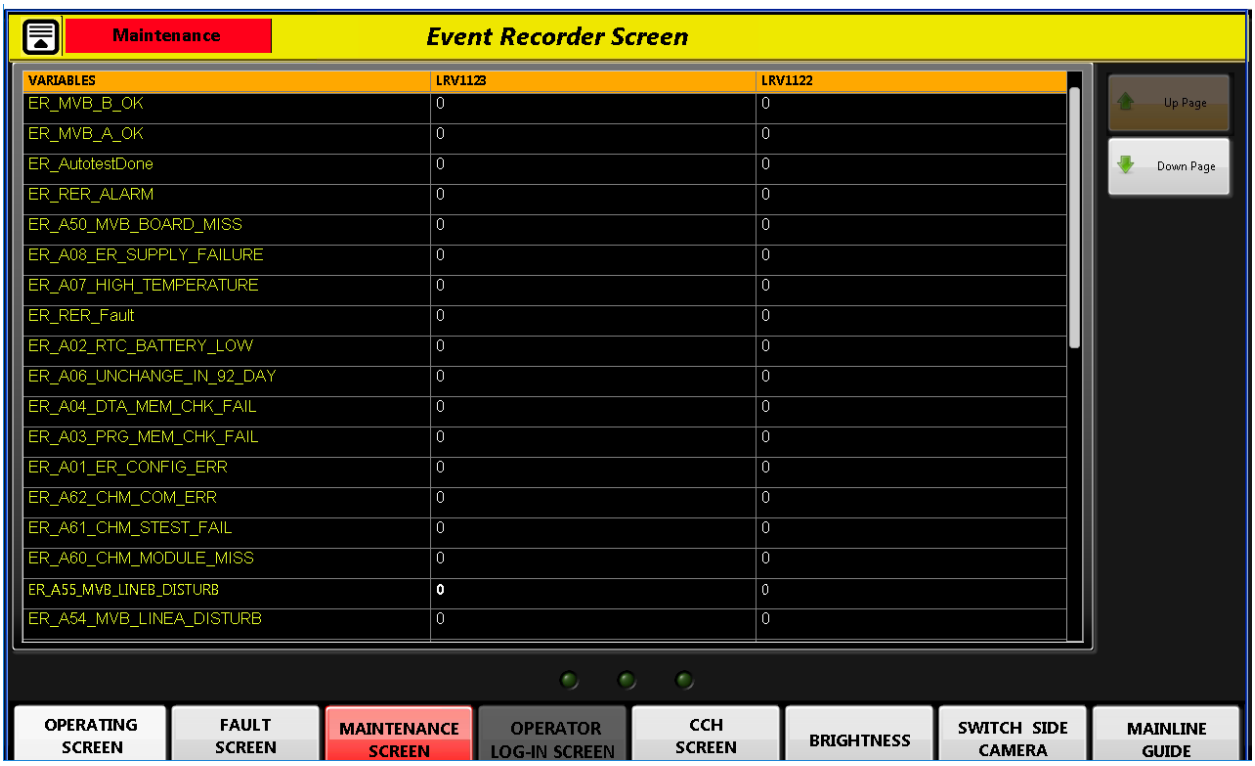

Figure 2-31: Event Recorder Status Screen

2.7.11 APS Status Screen

To access the APS Status screen, from the Default Maintenance Screen, simply press the “APS System” pushbutton. This will change the screen to the APS Status screen that is shown in Figure 2-32.

This screen shows the health and status information of the APS for each LRV in the consist. This screen contains numerous status information about the APS, such as the input voltage, LVDC output voltage and AC Inverter voltage as well as many others.

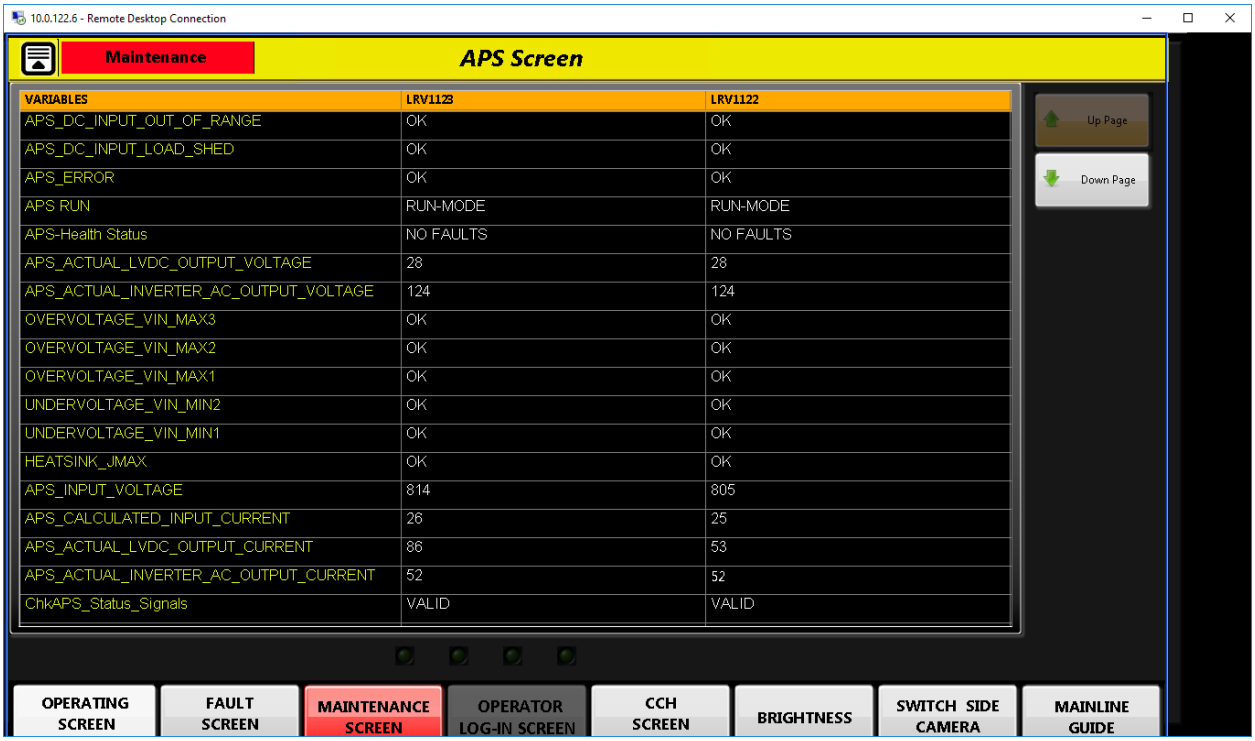

Figure 2-32: Auxiliary Power Supply (APS) Status Screen

2.7.12 Information Screen – (CPU and Memory Usage)

To access the Information Screen, from the Default Maintenance Screen, simply press the “Information” pushbutton. This will change the screen to the Information Status screen that is shown in Figure 2-33.

The Information Status screen has three menu tabs, CPU & Memory Usage, TOD system Information and Coupling History.

To view the CPU & Memory Usage, simply press the CPU & Memory Usage tab. This screen graphically show the memory usage and CPU usage. It also shows the total memory in use, total physical memory and the available memory.

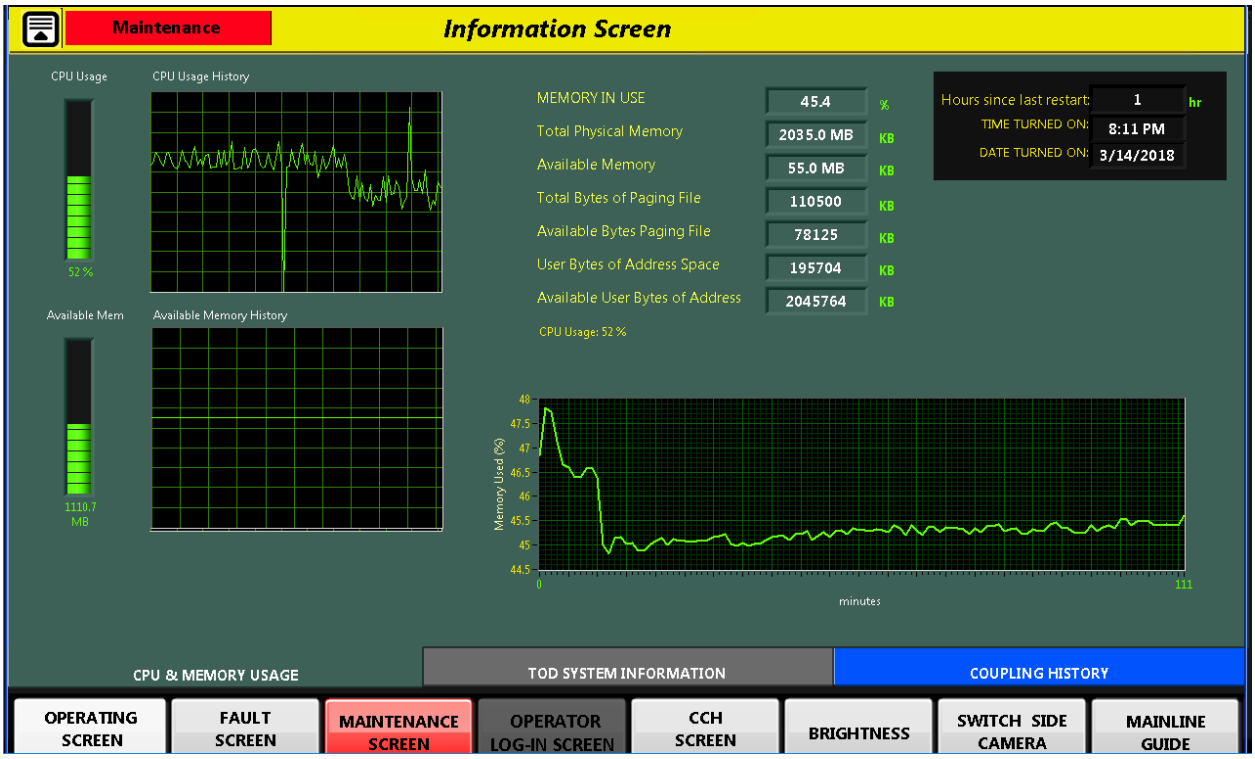

Figure 2-33: Information Status Screen (CPU & MEMORY USAGE)

2.7.13 Information Screen – (TOD System Information)

To view the TOD system information, from the Default Maintenance Screen, simply press the “Information” pushbutton. Once the Information Screen is displayed, select the “TOD System Information” tab located just above the Menu Bar at the bottom of the screen.

This screen shows detailed system information about the TOD computer such as the host name, the OS system, and the IP address for the NICs as well as other pertinent information. See Figure 2-34.

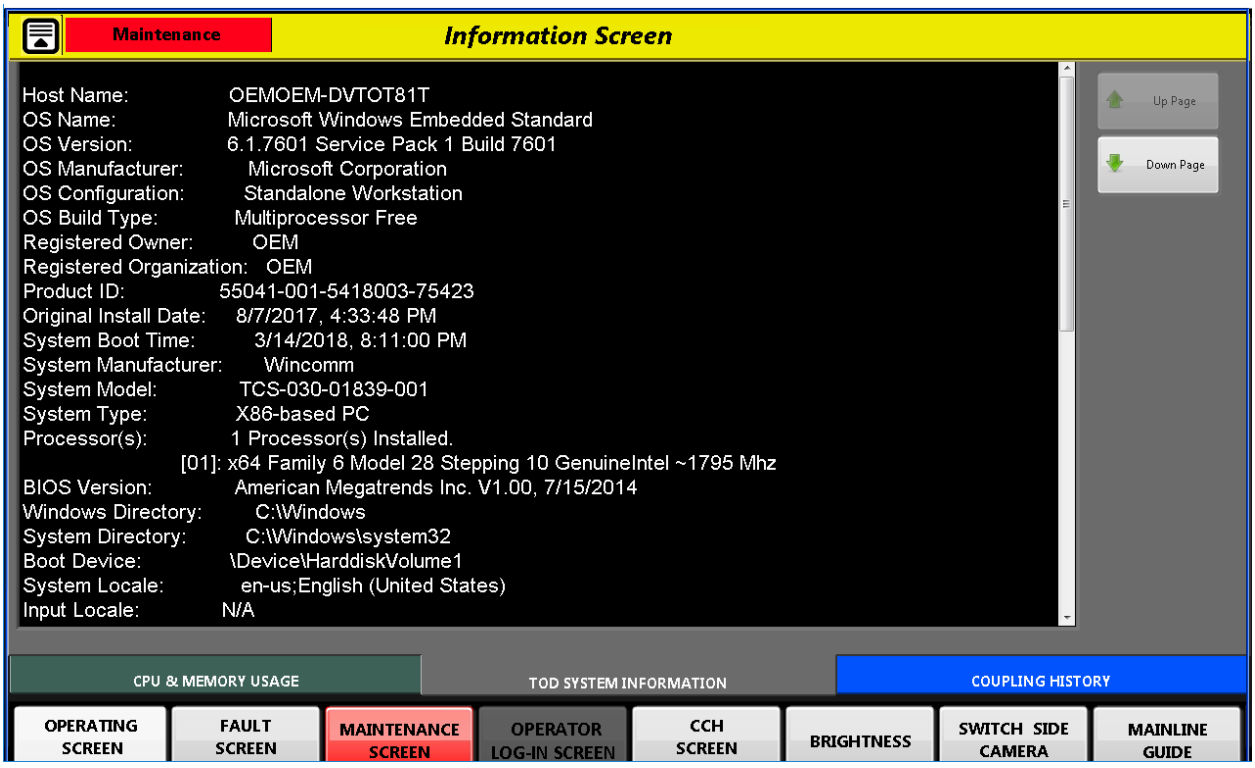

Figure 2-34: TOD System Information

2.7.14 Information Screen – (Coupling History)

To view the Coupling History, from the Default Maintenance Screen, simply press the "Information" pushbutton. Once the Information Screen is displayed, select the "Coupling History" tab located just above the Menu Bar at the bottom of the screen.

This screen shows the 30 day coupling history of the LRV. This screen contains the date, time, leading, middle and trailing LRV. See Figure 2-35.

Changes to the coupling of the LRV will generate a new log. This includes when one LRV is coupled into another LRV to make a two pack or when the two pack is uncoupled to make a single LRV.

After 30 days the oldest log will be deleted.

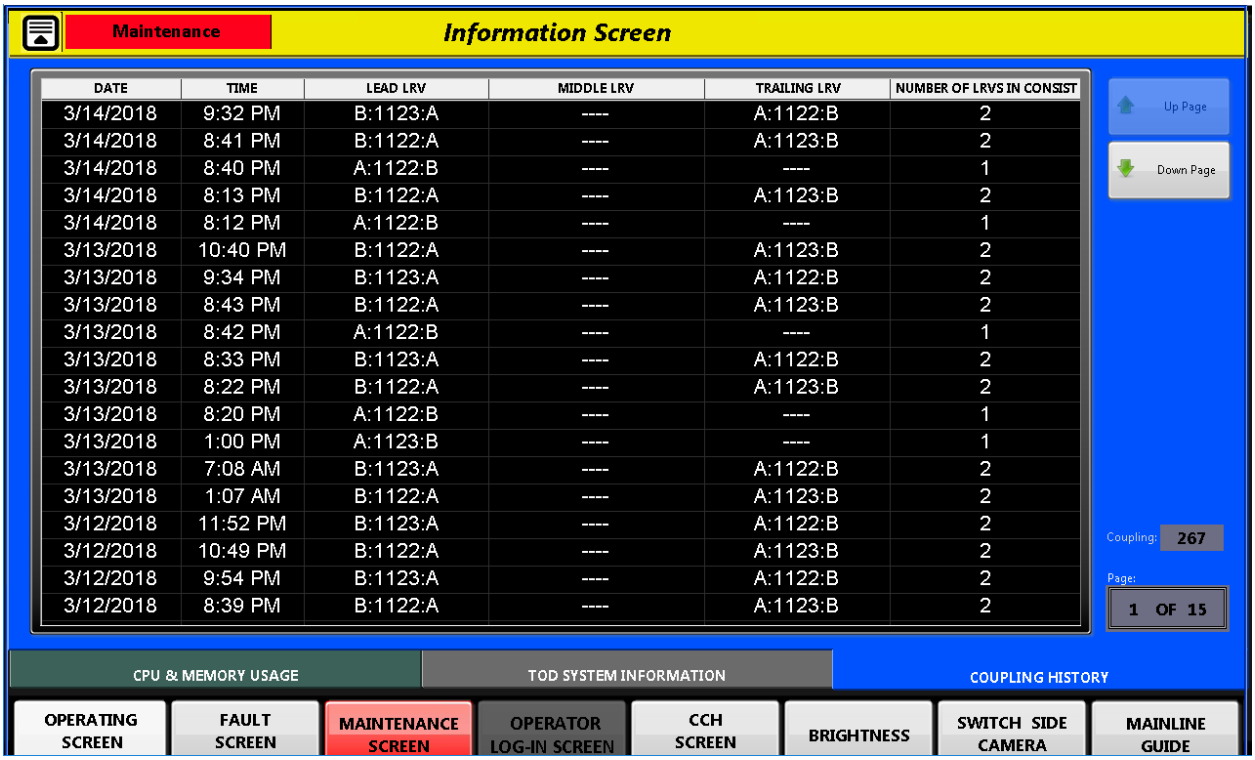

Figure 2-35: Information Status Screen (Coupling History)

2.7.15 MVB PORT - (MVB Index)

To view the MVB data, from the Default Maintenance Screen, select the “MVB Ports” pushbutton. A selection screen will then appear prompting you to chose which LRV in the consist you wish to view the data from. See Figure 2-36.

Each subsytem has its own MVB port and can be viewed using this screen. See Figure 2-37.

The MVB Index is used to monitor the subsytem MVB ports. For example, to view the Doors MVB signals select MVB-2178, see Figure 2-38.

After viewing the Doors MVB signals, if you wish to view a different port simply press the “Go to MVB Index” pushbutton located on the top right of the TOD screen to return to the MVB Index.

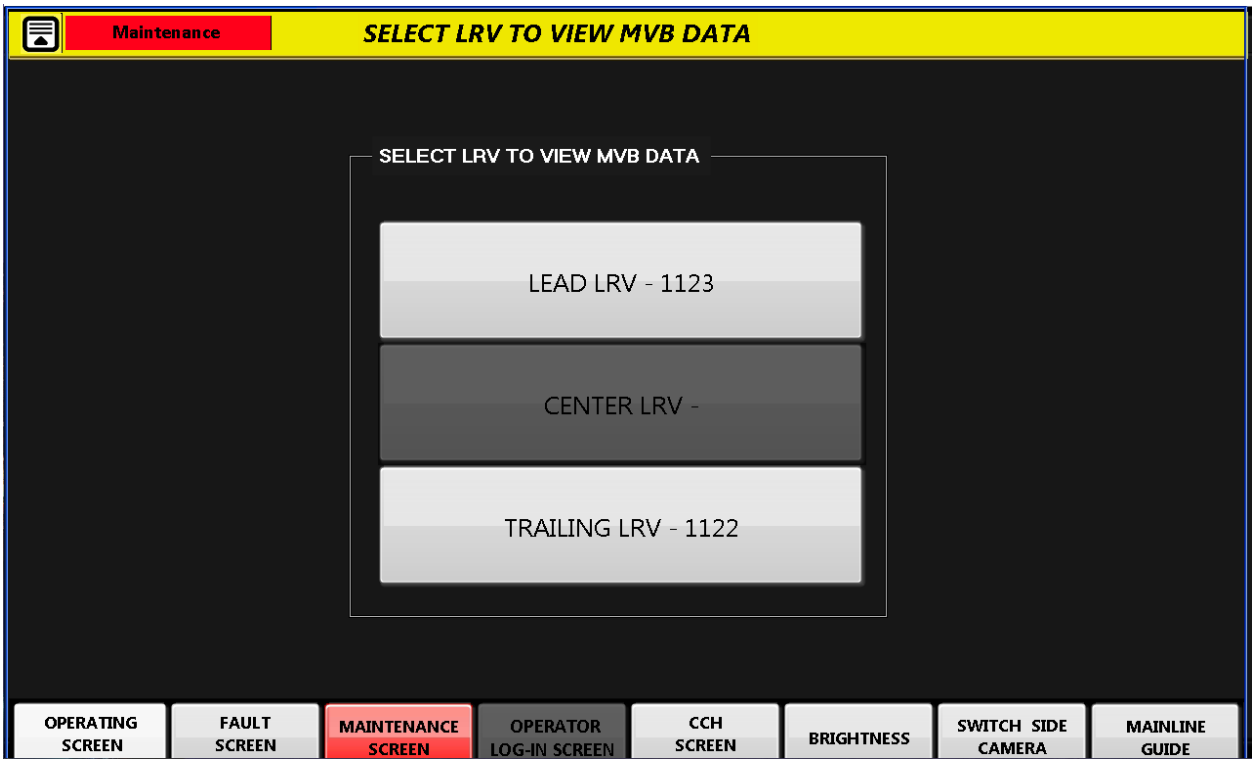

Figure 2-36: MVB Data LRV Select

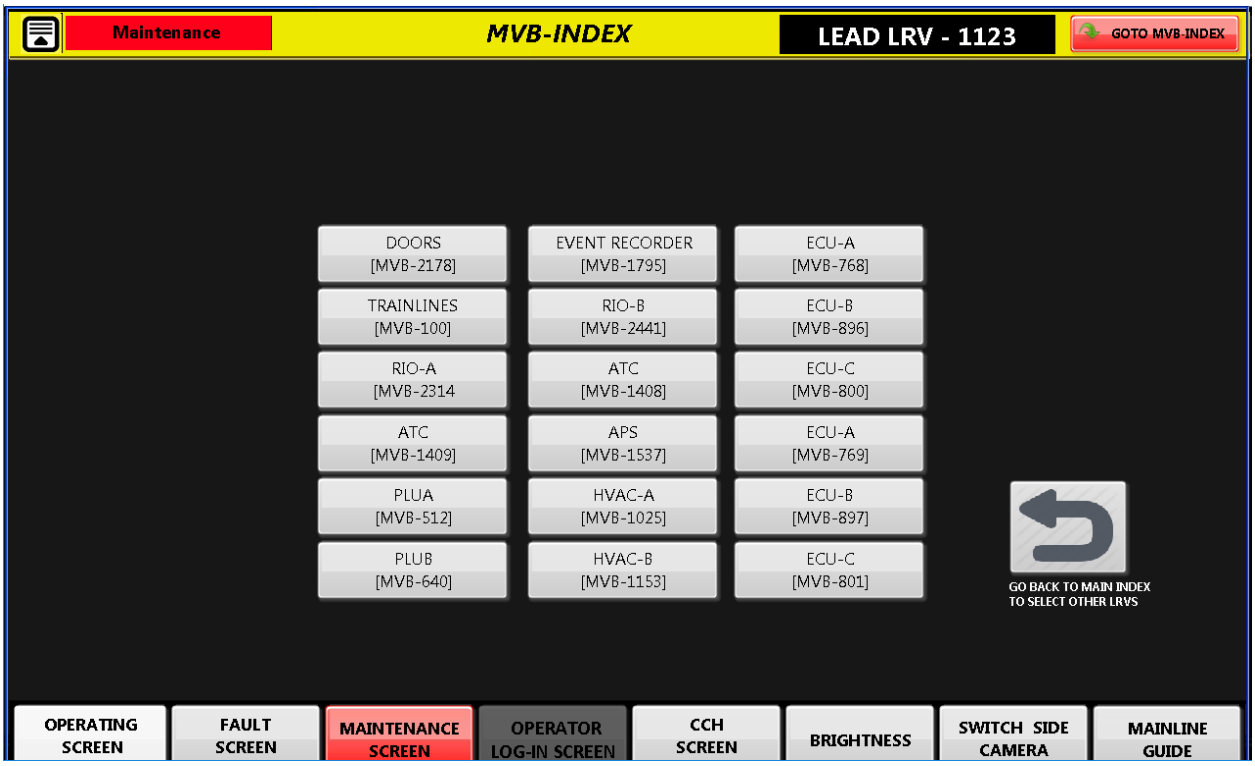

Figure 2-37: MVB Index

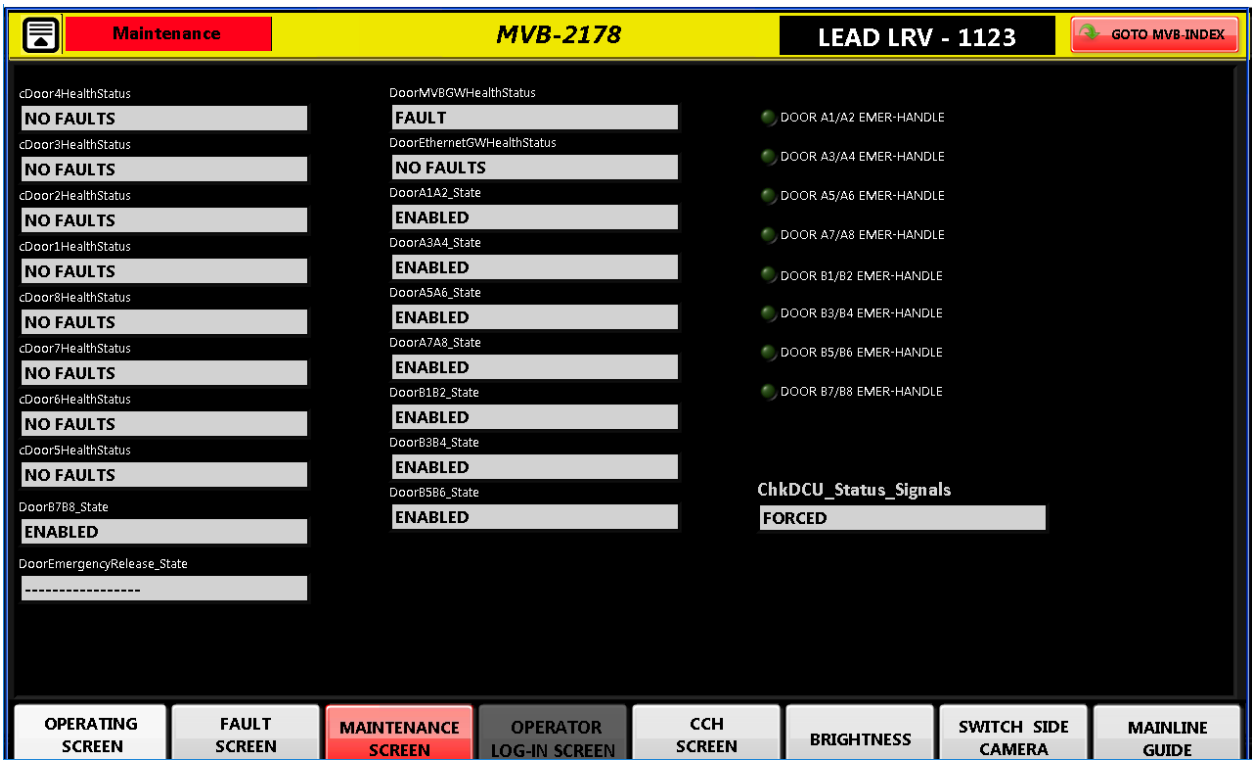

Figure 2-38: Doors MVB Port-2178

2.7.16 Settings Screen - (GPS Information)

To access the GPS Information screen simply press the Settings pushbutton from the Default Maintenance Screen. This will change the screen to the GPS Information screen that is shown in Figure 2-39.

The GPS Information screen's data is automatically obtained from the CCU periodically using the UDP TIME message. However, to verify that the TOD is getting the correct time the user can use this screen to send the CCU a TIME request message by pressing the Get System Time pushbutton in the lower left corner of the screen. The CCU will return the current GPS information.

The screen below shows the TIME message received from the CCU, the time, date, latitude and longitude of the LRV when the CCU received the TIME message.

Time: HHMMSS
Date: MMDDYYYY
Latitude: Decimal Degrees
Longitude: Decimal Degrees

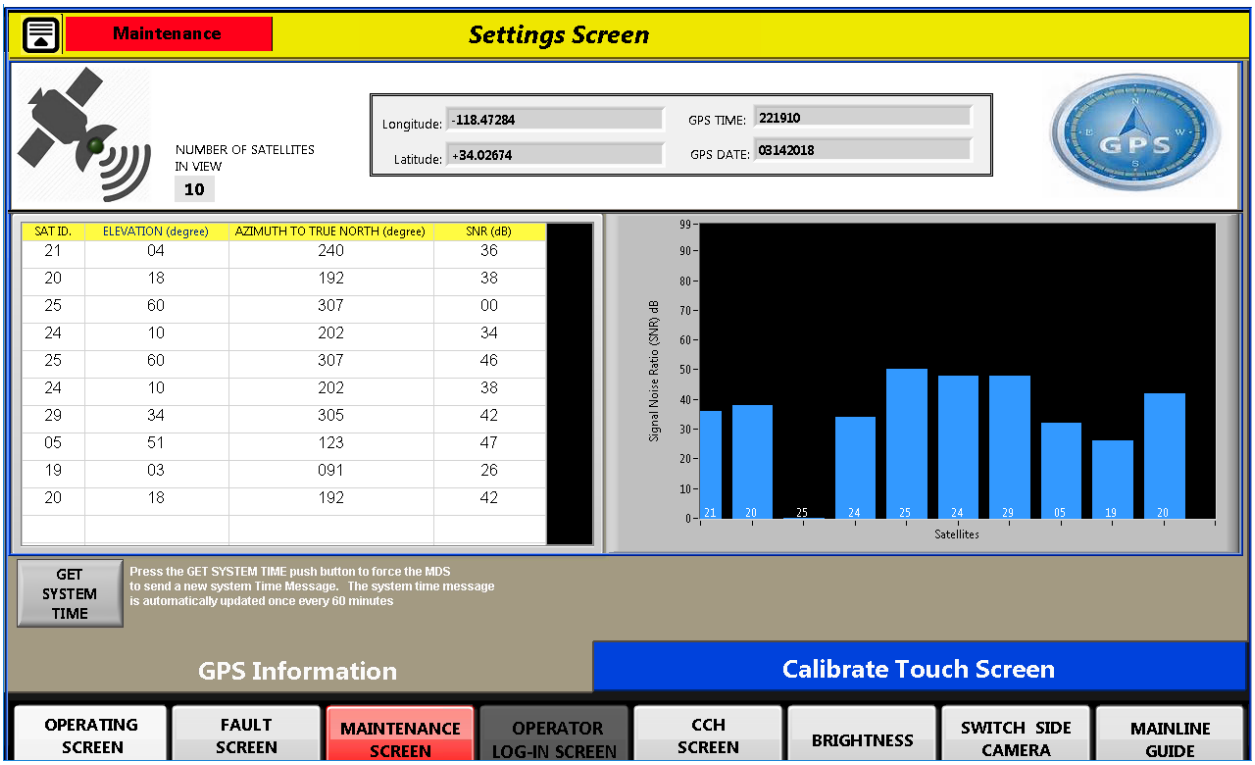

Figure 2-39: Settings (GPS Information)

2.7.17 Settings Screen - (Calibrate Touch Screen)

To access the Calibrate Touch Screen simply press the Settings pushbutton from the Default Maintenance Screen. This will change the screen to the GPS Information screen that is shown in Figure 2-39. Then press the Calibrate Touch Screen tab located at the bottom right of the screen. Just above the menu bar. The resulting TOD Calibration screen is shown in Figure 2-40.

This screen is used to calibrate the TOD's touch screen. Simply press the pushbutton in the middle of the screen. This will launch a program that is used to calibrate the touch screen. The program prompts you to touch targets that appear on the screen. Once the program has finished then it will automatically close and return back to the Calibrate Touch Screen.

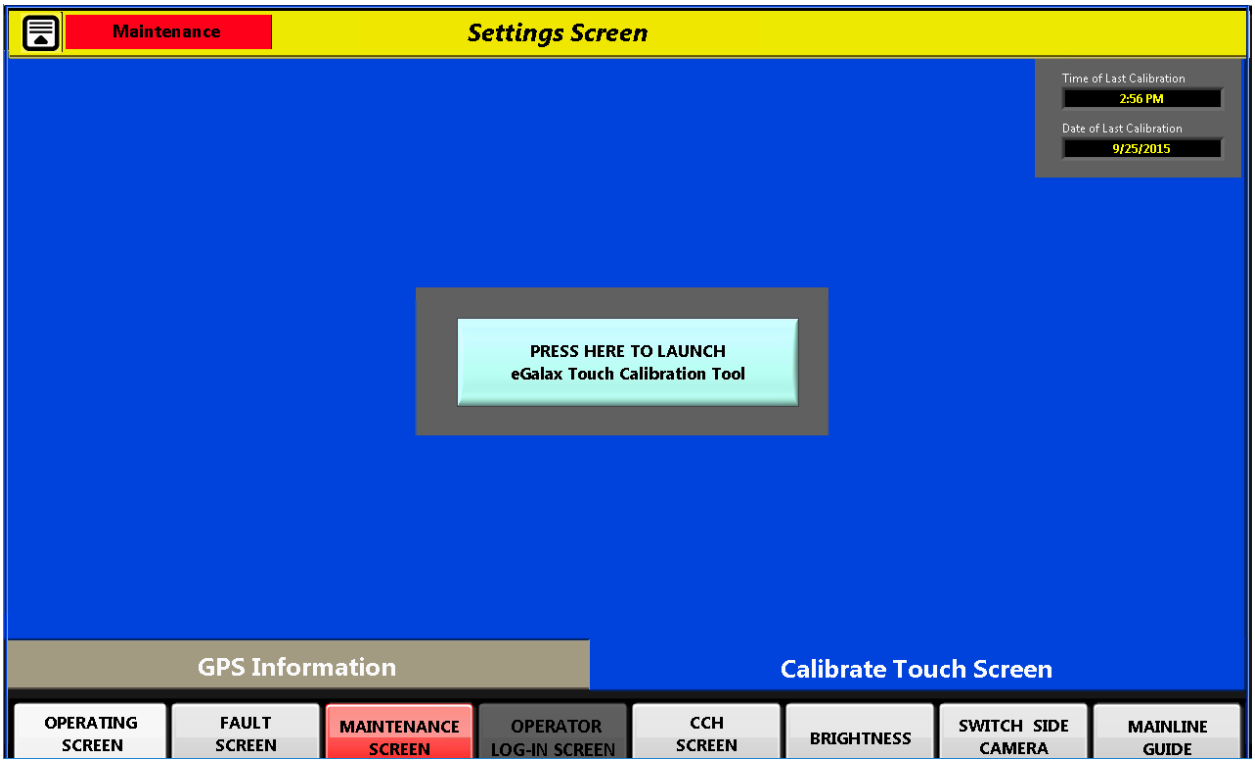

Figure 2-40: Settings (Calibrate Touch Screen)

The Touch Screen can be calibrated from an "inactive cab." This is the most common approach if a screen is seriously out of calibration.

Hold a finger on the screen for > 10 Seconds. Remove finger touch; this enables the calibration routine. Touch each corner to calibrate the screen to the display. Follow the prompts on the screen to calibrate.

2.7.18 Utility Screen - (Wheel Diameters)

To access the Wheel Diameters screen simply press the Utility pushbutton from the Default Maintenance Screen. This will change the screen to the Wheel Diameters screen that is shown in Figure 2-41.

The Wheel Diameters screen is used to set the wheel diameter of the trued wheels. This is necessary to ensure the distance traveled remains accurate. Simply press the plus (+) or minus (-) pushbutton to change the diameter of the wheel. Once the desired size is input, press the green Update Wheel Diameter pushbutton to submit the changes. This screen will initially default to a new wheel setting of 711mm (28 inches). Note that the other axle wheel diameter is calculated based on the update by the control units.

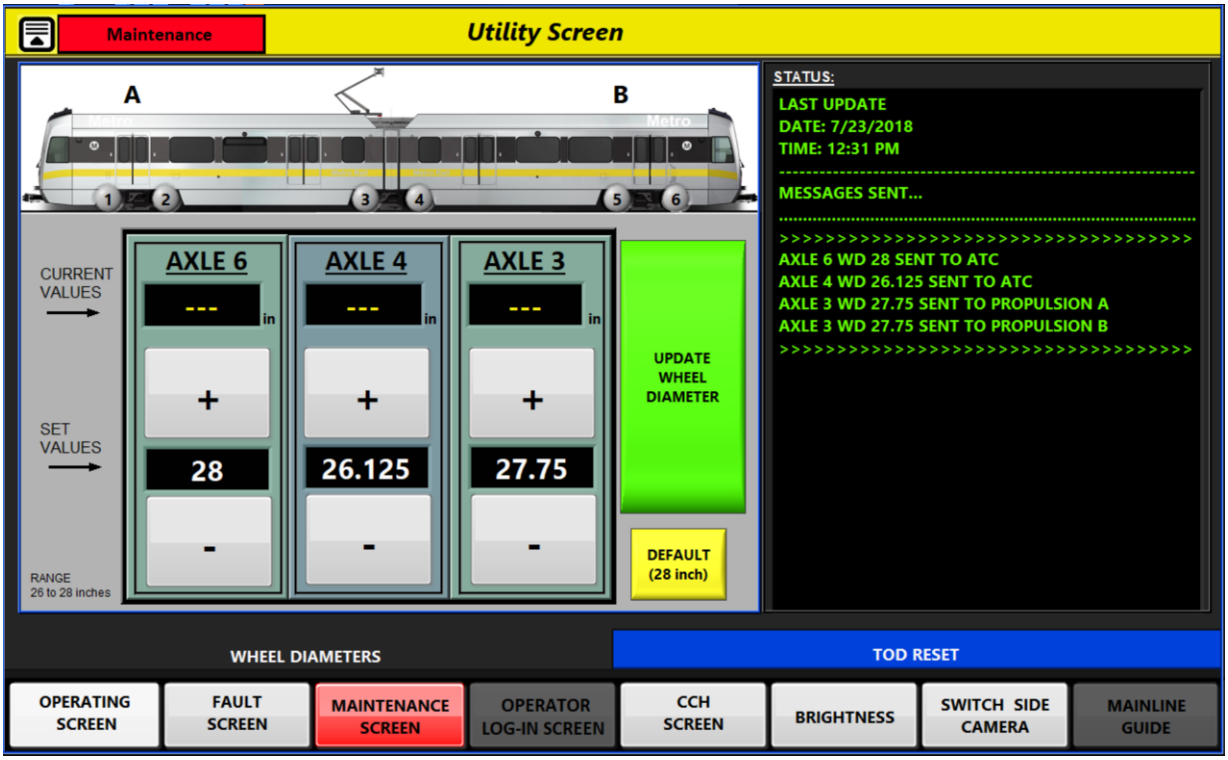

Figure 2-41: Utility Screen (Wheel Diameters)

2.7.19 Utility - (TOD Reset)

To access the TOD Reset screen simply press the Utility pushbutton from the Default Maintenance Screen. This will change the screen to the Wheel Diameters screen that is shown in Figure 2-41. Then press the TOD Reset tab located at the bottom right of the screen. Just above the menu bar. The resulting TOD Reset screen is shown in Figure 2-42.

The TOD Reset screen will most likely be used infrequently. However, if the need arises, this screen will have the option to quit the TOD Application or reboot the TOD. Stopping the TOD HMI program might be useful when updating the TOD software or troubleshooting the TOD. The Reboot TOD pushbutton will be useful if the TOD is required to be reset after settings have been changed or software has been uploaded.

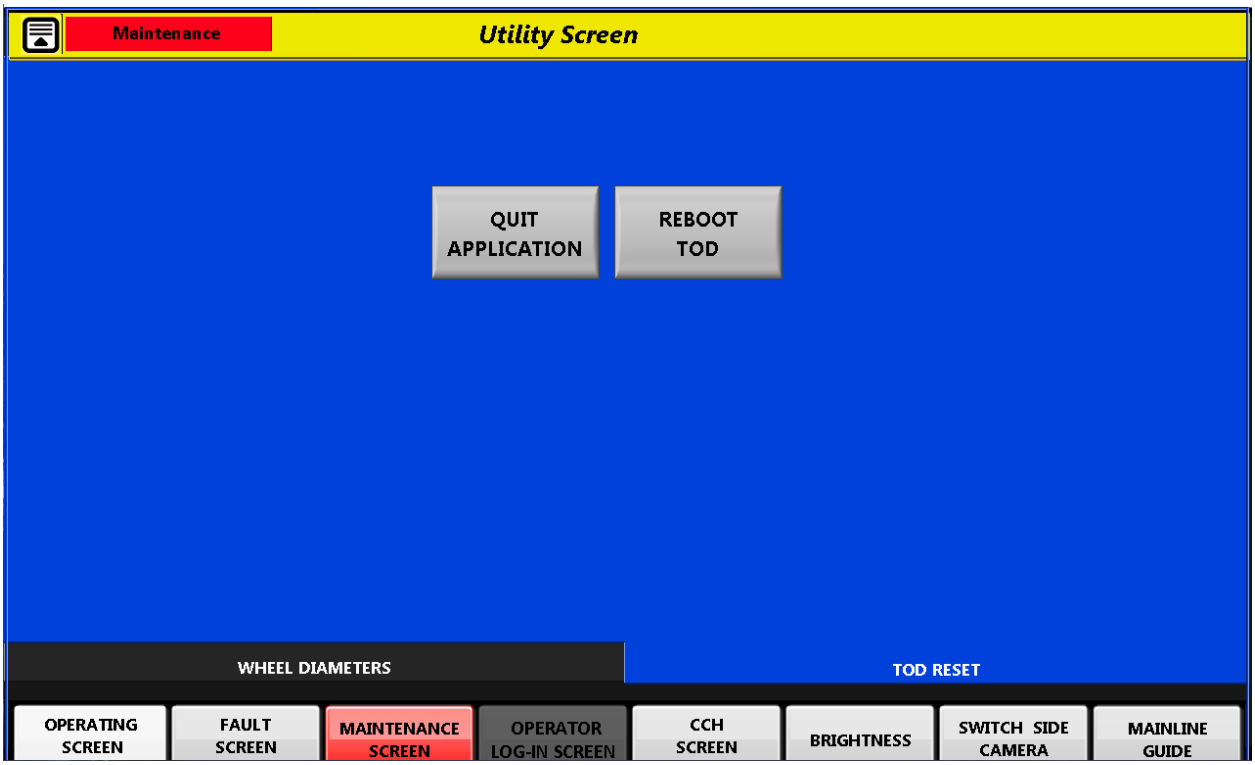

Figure 2-42: Utility Screen (TOD Reset)

2.7.20 Fault Log Screens - Select Fault Log

To view the Fault Log Screen, from the Default Maintenance Screen, simply press the “Fault Log” pushbutton.

When the Fault Log is selected. The TOD retrieves the Faults from the MDS (FLOG) and displays the list of directories. The maintainer will then be prompted to select a date stamped fault log folder, see Figure 2-43. The folders are created daily and the label of the folders are made up of the month the day and the year. A maximum of 30 days of folders will be saved with the oldest folder being deleted after the 30th day.

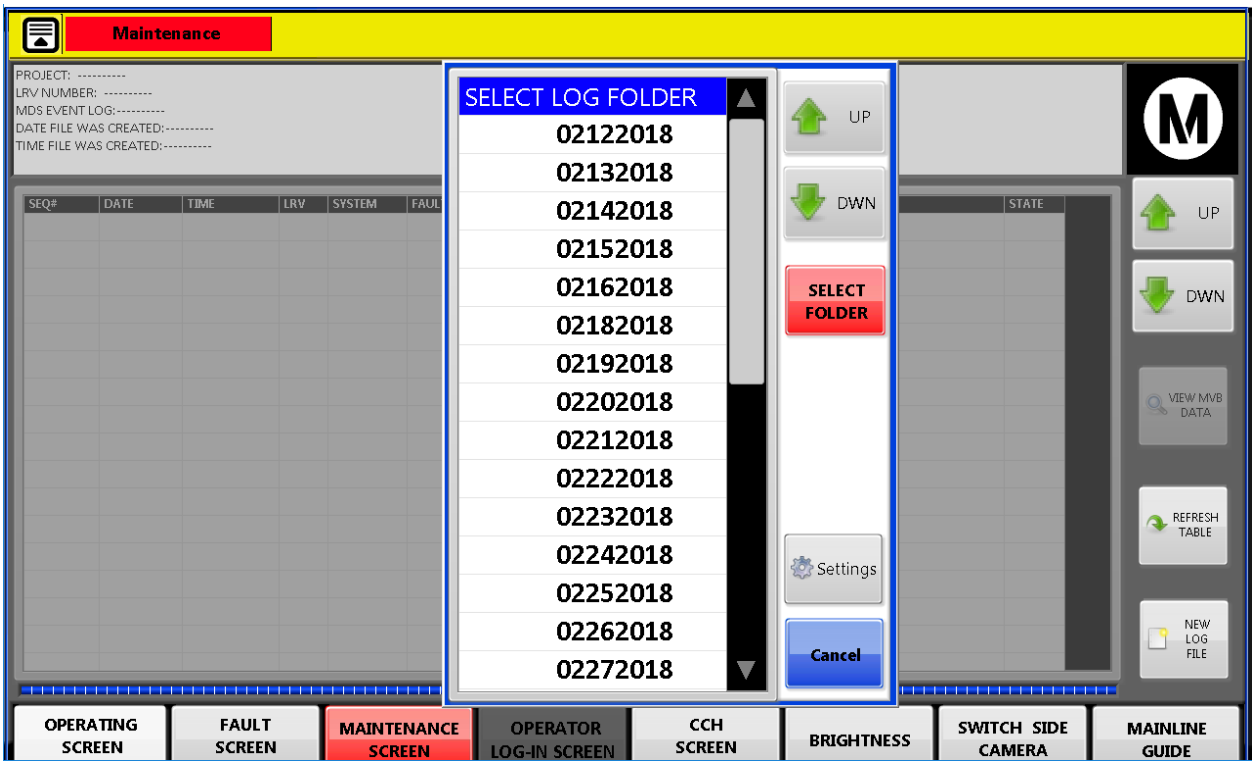

Figure 2-43: Select Log Folder Screen

Once the desired folder is highlighted, press the red “Select Folder’ pushbutton. The resultant Fault Log Screen will display all of the recorded faults that occurred on the date selected, see Figure 2-44. The faults are organized from the oldest to the newest. The fault table consist of the Date, Time, LRV, System, Fault Name, and the condition of the fault.

Date = The Date that the Fault occurs.

Time = The Time that the Fault occurs.

LRV = The LRV the fault occurred on.

System = The system such as the Doors, Propulsion, Brake… etc.

Fault = The name of the Fault.

State = Defines if the Fault was Set or Reset.

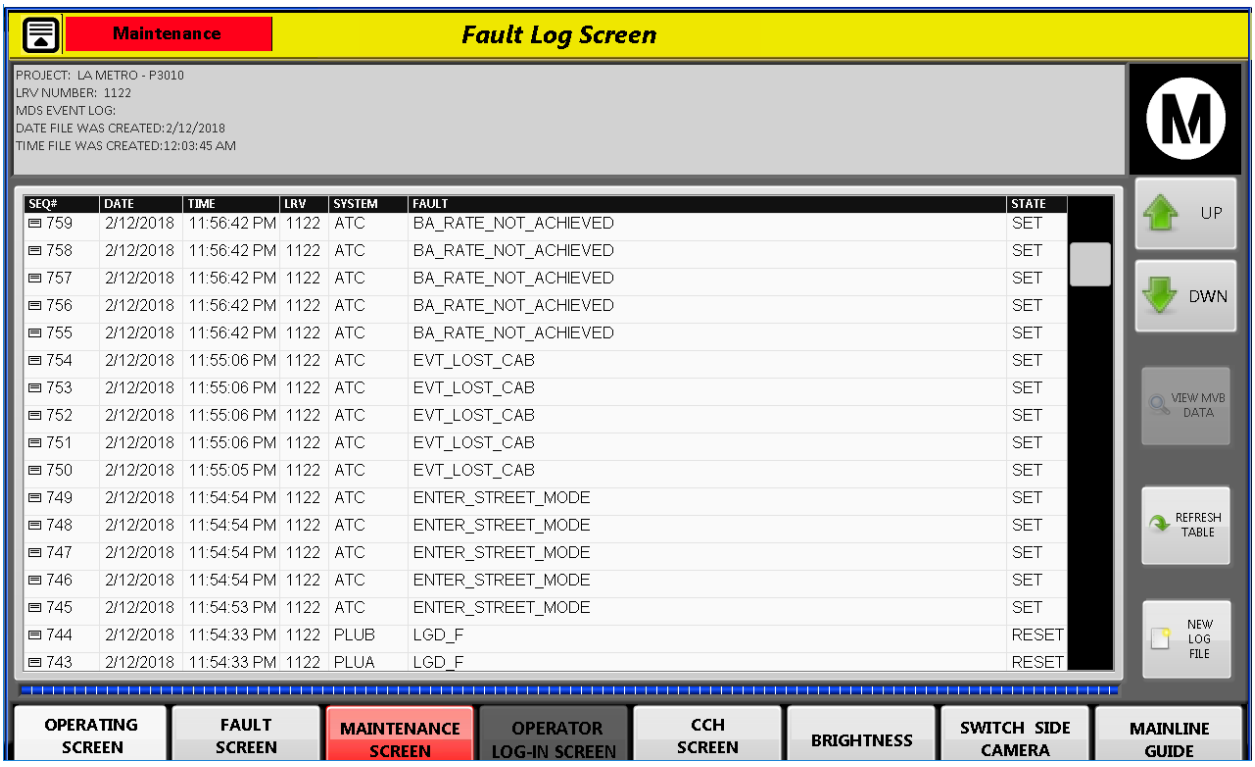

Figure 2-44: Fault Log Screen

2.7.21 Fault Log Screens – Selected Fault MVB Data

As stated before, the faults are organized from the oldest to the newest. The fault table consists of the Date, Time, LRV, System, Fault Name, and the condition of the fault. Use the bar on the right side of the screen to scroll up and down.

If you located a fault you would like to inspect in more detail, touch the screen to highlight the desired fault, see Figure 2-45. Press the “View MVB Data” pushbutton on the right side of the screen.

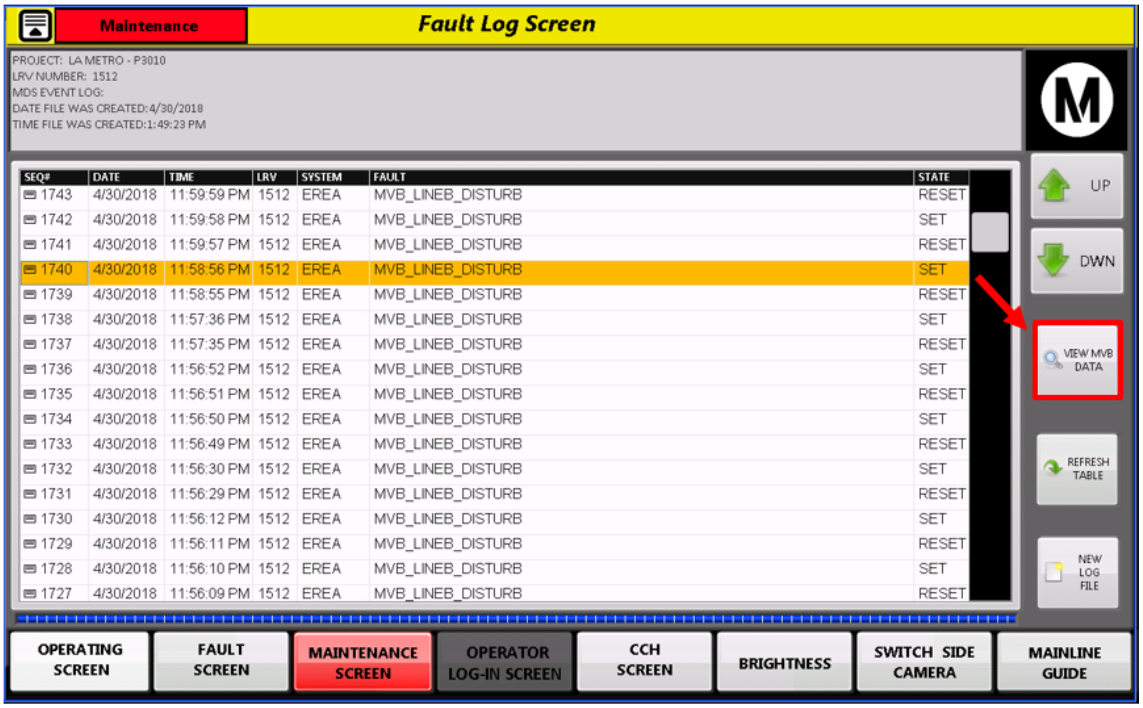

Figure 2-45: Select Fault from Fault Log Screen

This will allow you to view the MVB data recorded at the time of the fault. The resultant screen is shown in Figure 2-46. This screen provides you with the ability to inspect the recorded MVB data for any conditions that may have been the cause of the fault, if not already known. The “Filter” button on the right side of the screen can be used to filter the MVB data by a specific subsystem.

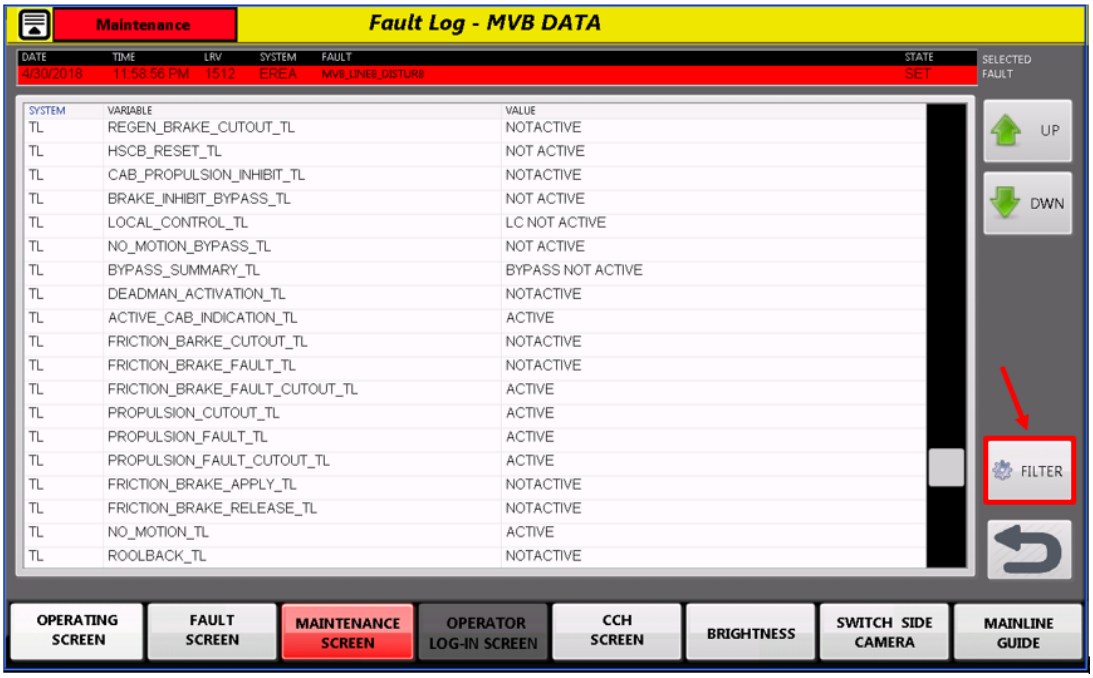

Figure 2-46: Fault Log – Selected Fault MVB Data

2.7.22 Destination Sign Screen

A destination sign test routine is built into the TOD. Patterns can be initiated from the test screen, as shown in Figure 2-47 below, to confirm proper sign operation. Additionally, a PTU manual is provided that can be referenced to function test the signs and to update firmware if required. Destination signs are covered in Section 1400, Communications of the Running Maintenance and Servicing Manual.

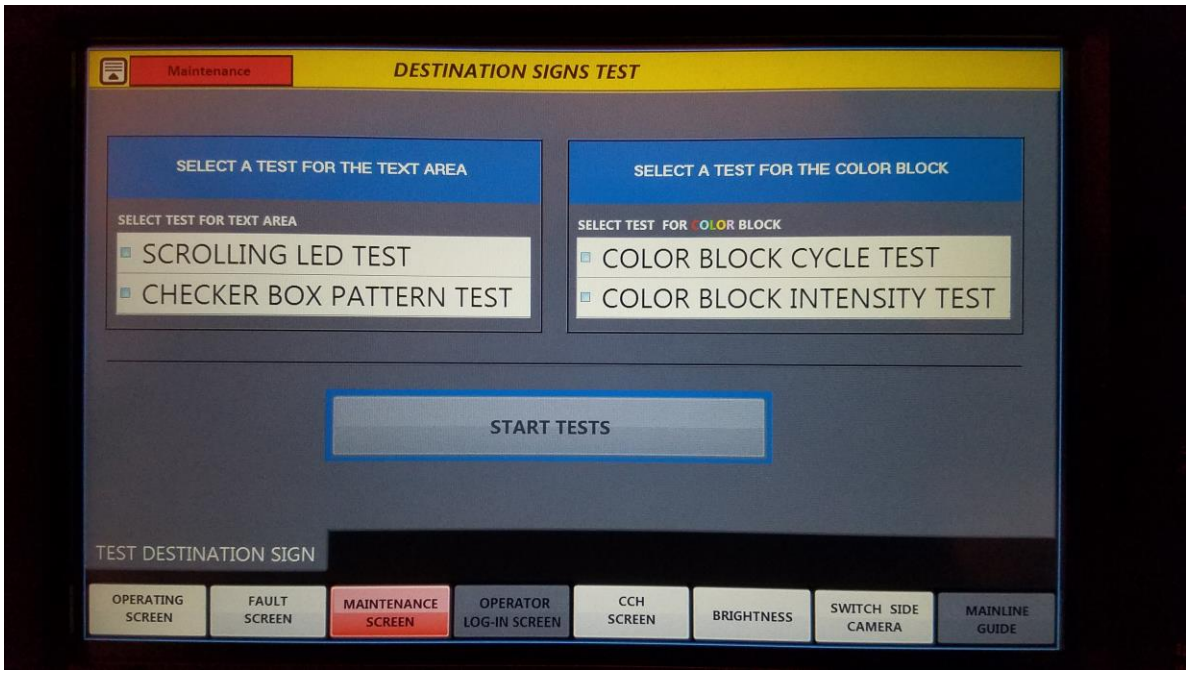

Figure 2-47: Destination Signs Test Screen

2.7.23 Trainlines

To assist in troubleshooting, Trainline status screens are included as part of the Maintenance display. See Figures 2-48 through 2-51. These variables show the status of the trainline function and represent various controls and functions on the vehicle/train.

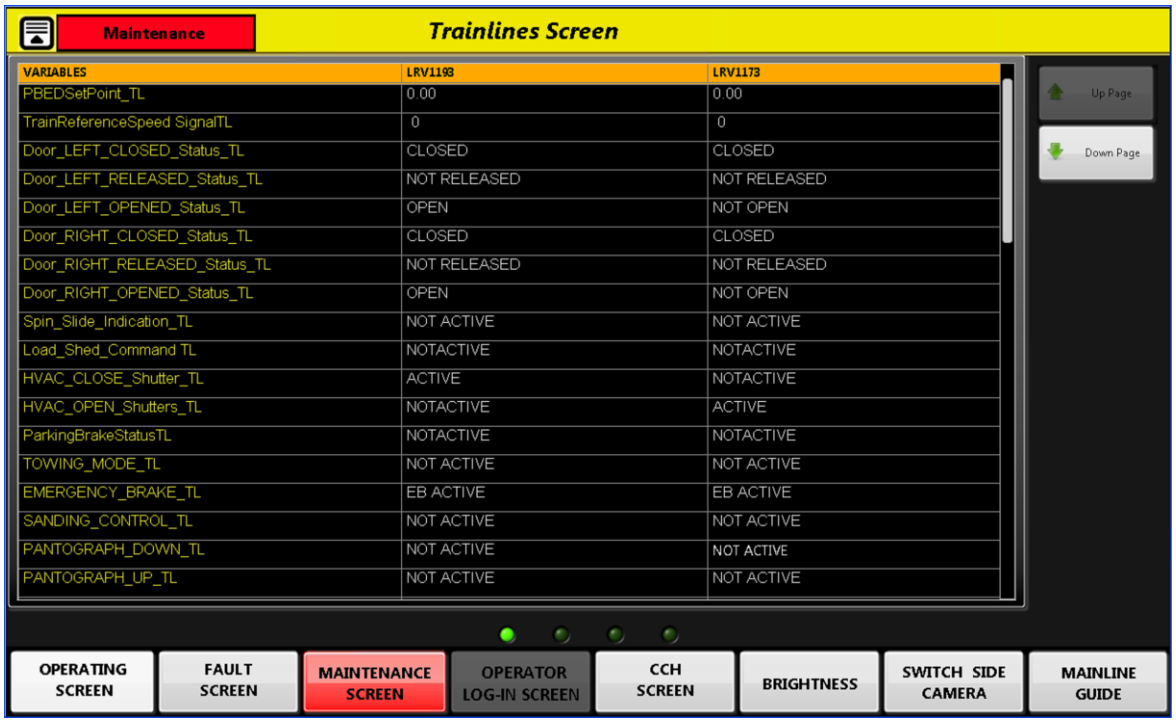

Figure 2-48: Trainline Screen 1

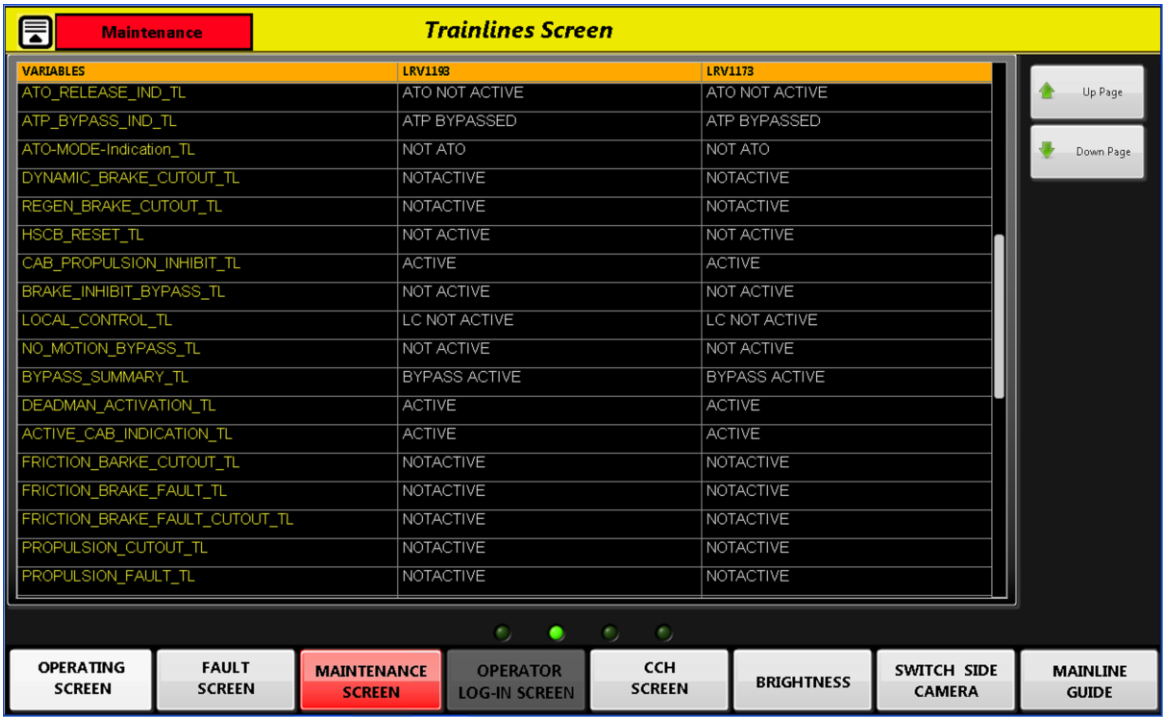

Figure 2-49: Trainline Screen 2

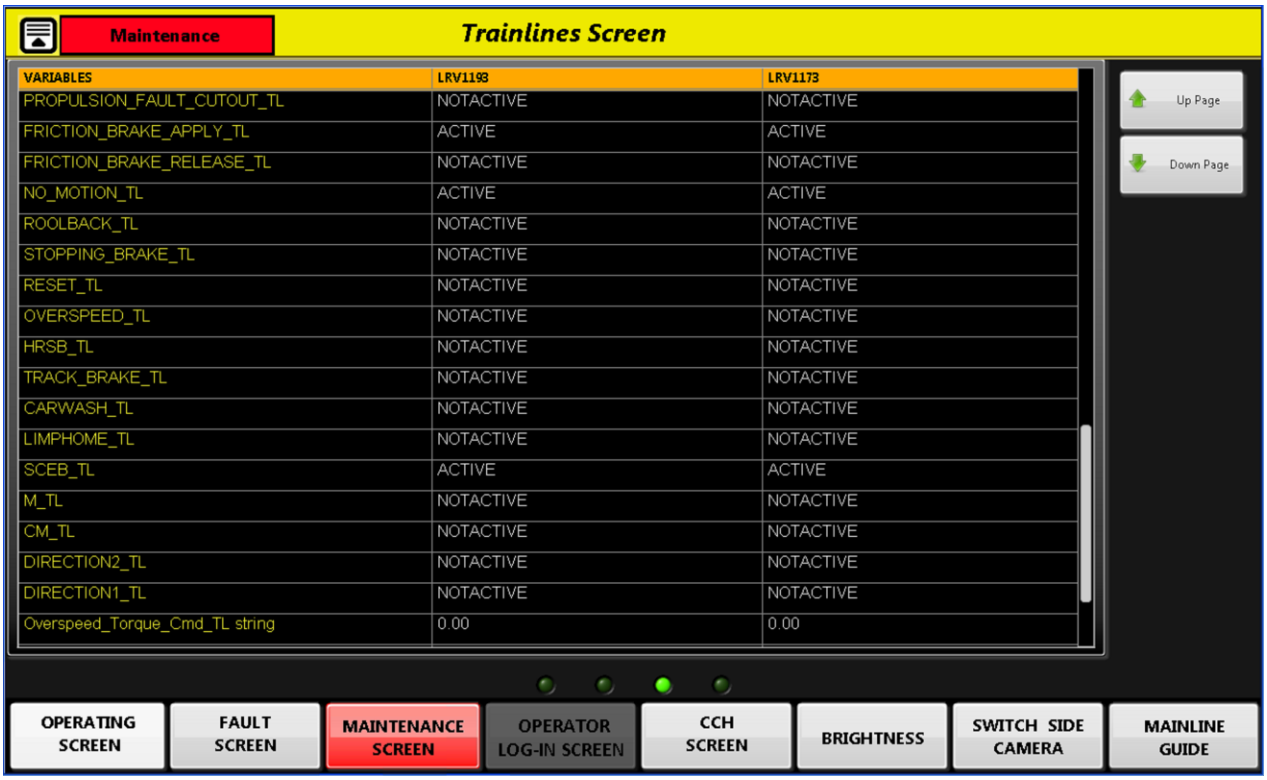

Figure 2-50: Trainline Screen 3

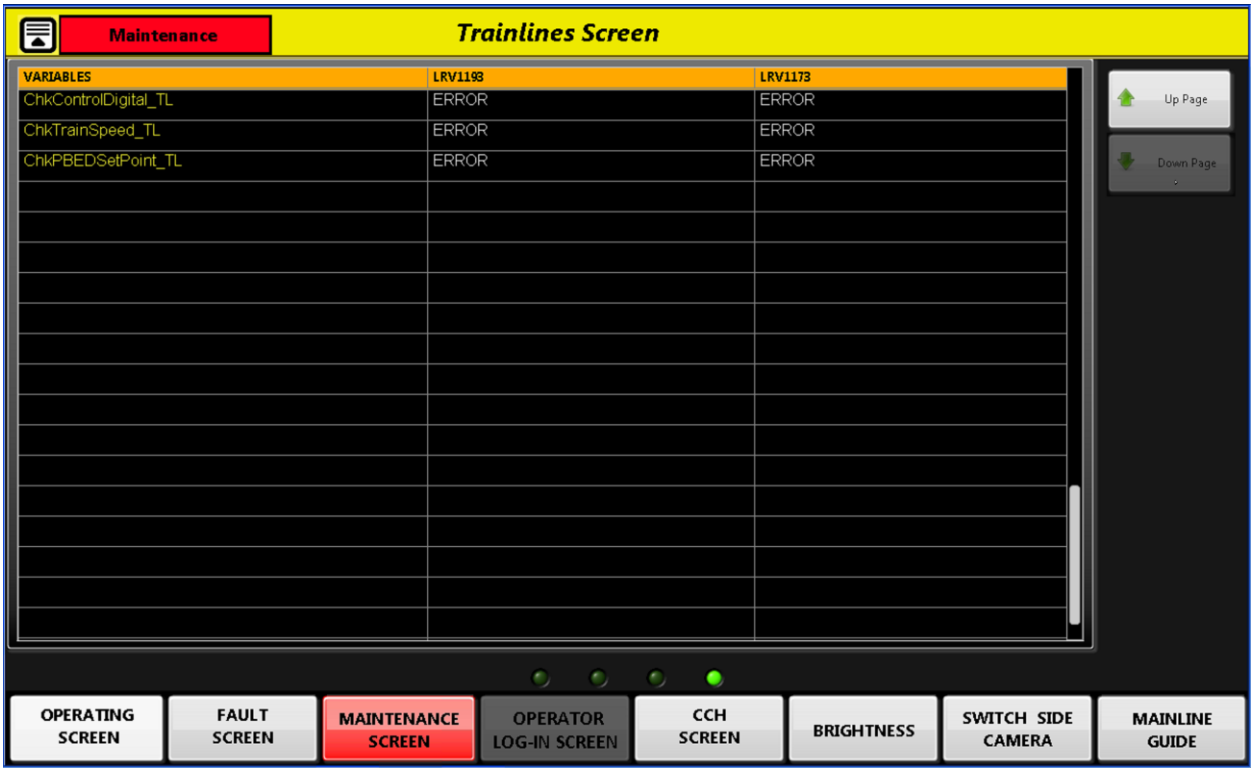

Figure 2-51: Trainline Screen 4

2.7.24 Real Time Data Gathering (RTDG)

To assist in gathering data while the vehicle is in use on the TOD, the Real Time Data Gathering function is present. The RTDG function recieves the vehicle control data forwarded from the MVB controller on the local vehicle for storage and later review.

Upon selecting the RTDG screen from the Maintenance screen the user will be presented with the overview screen. The overview screen shows the LRV number, the status of recording. Additionally, if the RTDG application is not running the user can start a session by entering the recording time. If the RTDG application is running then they will be able to pause or stop a recording.

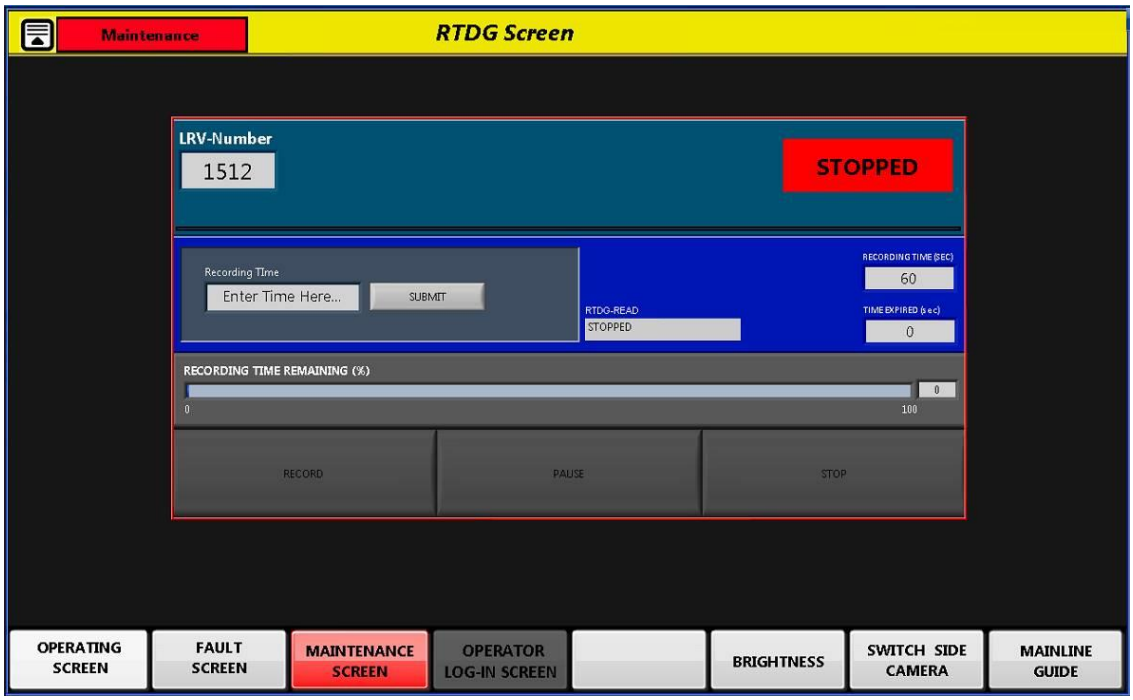

Figure 2-52 : RTDG Overview Screen

If the users wish to start a recording session they will touch the recording time button and will be presented with the time entry screen. The user will then be able to enter time in minutes, hours and days for recording.

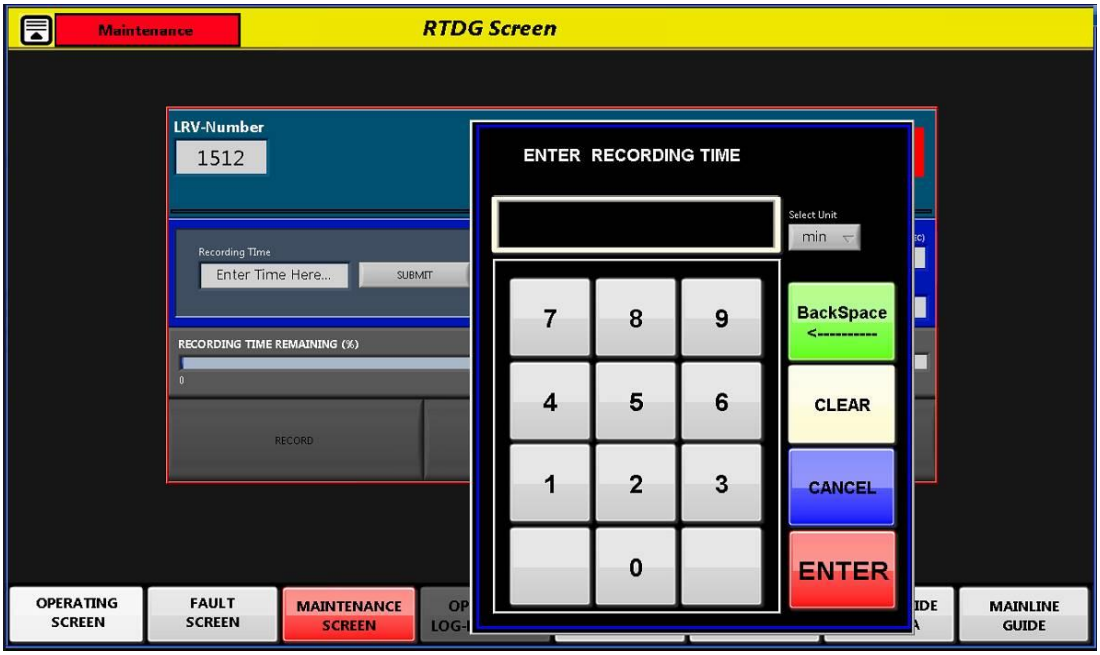

Figure 2-53: RTDG Recording Time Screen

Once the user has entered the desired time they will be presented with the option to start the recording. The status bar in the upper left corner of the screen will change to “READY” to provide feedback to the user to know that they have successfully set the recording time.

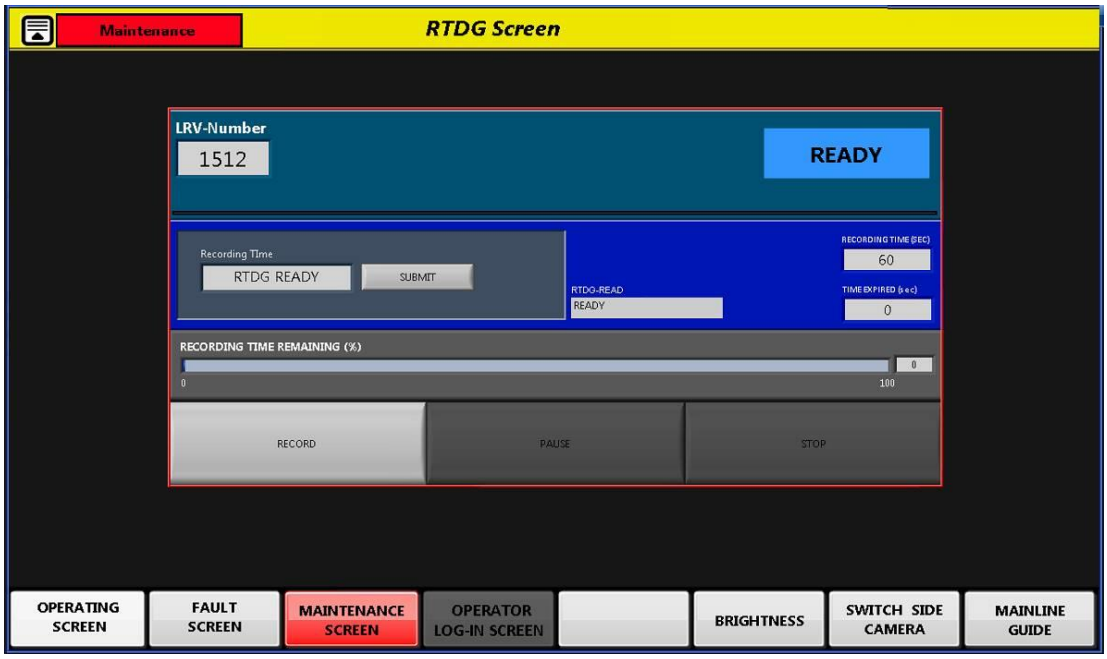

Figure 2-54: RTDG Ready Screen

When the user clicks the record button on the left of the RTDG screen the application will start recording the data sent to the TOD from the MVB RIO across the Ethernet. The information is recorded as it is received from the MVB RIO and this information will be recorded until the user's specified time has expired or the user stops recording form the RTDG screen. If the car is powered off the RTDG application will start recording again when the vehicle is restarted the elapsed time will pause while the vehicle is powered off. When RTDG is reocording, the Operating Screen will change the Metro logo to show that recording is ongoing.

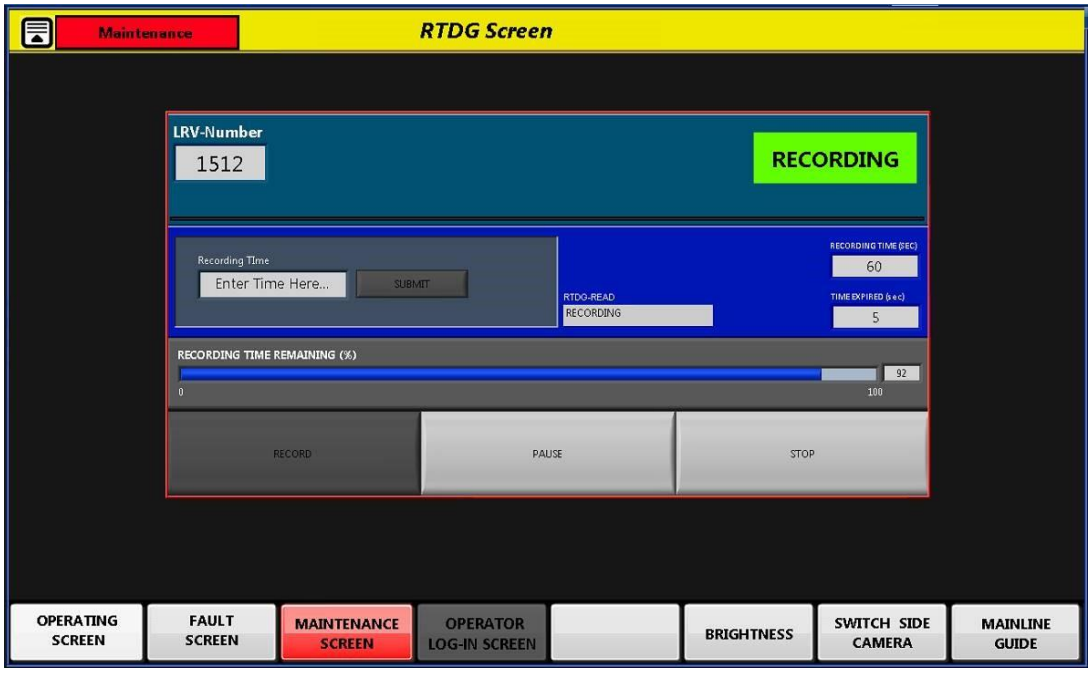

Figure 2-55: RTDG Recording Screen

Figure 2.56: Operating Screen – Recording

While the RTDG application is recording, the user will have the option to pause or stop recording. If the users pauses recording then the RTDG screen will change to the paused screen which will allow the user to resume the recording process. Additionally, the Metro logo on the operating screen will change to display recording paused.

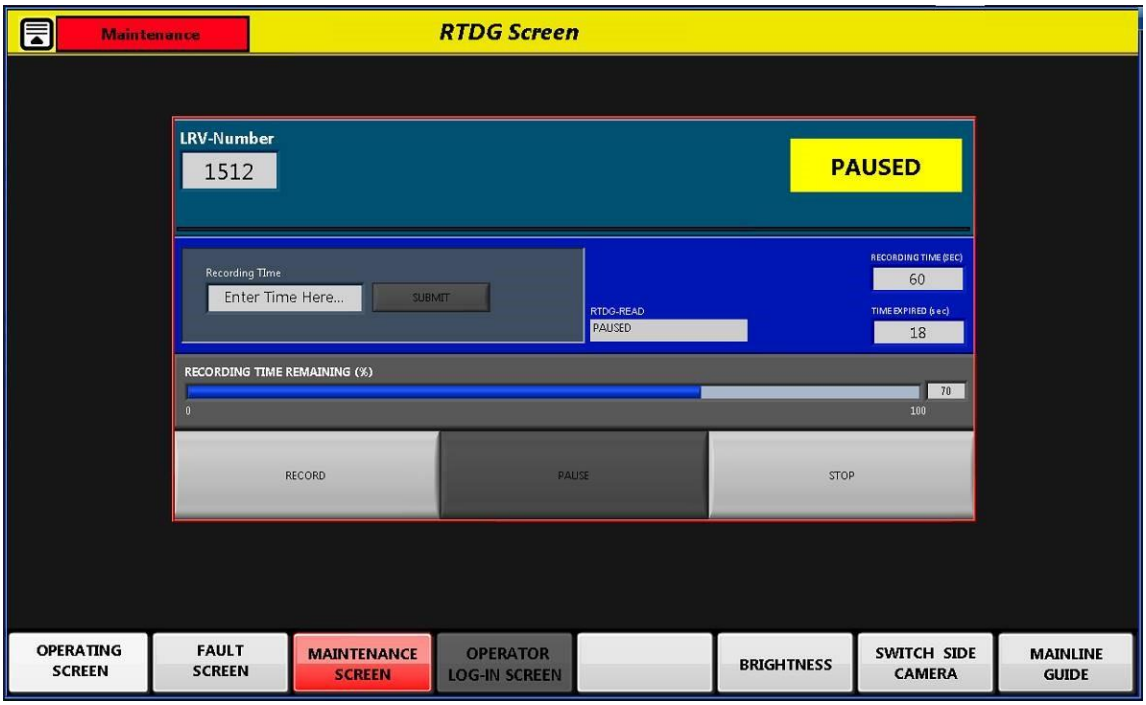

Figure 2-57: RTDG Paused Screen

Figure 2.58: Operating Screen – Recording Paused

2.8 Communication Control Head (CCH) Description

The CCH screen is the default screen for the Secondary TOD screen, see Figure 2-52. The CCH is also accessible on the Primary TOD screen. However, unless the Secondary TOD is inoperable, the functions of the CCH screen on the Primary TOD will be disabled. This is done to prevent the operator from sending conflicting commands from both TODs.

To access the CCH screen simply press the “CCH Screen” pushbutton that is located in the main Menu Bar. This will change the screen to the CCH screen.

The upper right section is used with the RFID reader to indicate the authorized employee name, position, authorization and log on time.

The center section of the CCH is used to select the Line, Route, and Destination Sign information used for the Automated Announcement and Display System (AADS).

The Communication Control Head is described more fully in the Section 1400, Communications System of the Running Maintenance and Servicing Manual. The following screen shot is provided for information.

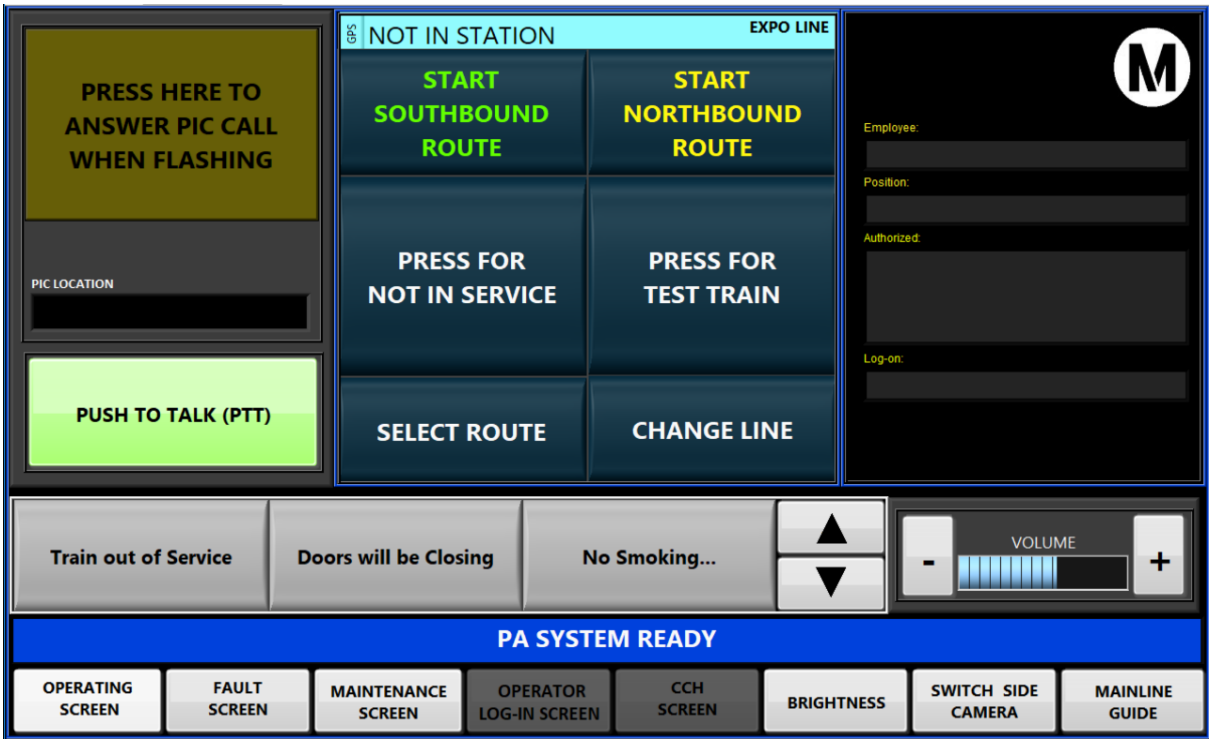

Figure 2-59: Communication Control Head (CCH)

The left section of the CCH is used to operate the Public Address (PA) system and answer Passenger Intercom (PIC) calls. When passengers press the Passenger Intercom pushbutton that is in the passenger compartment, the “Answer PIC Call” indicator will flash. Pressing the “Push to Talk” will acknowledge the PIC call and let the Operator talk to the active PIC. The PIC location will indicate which PIC made the call.

The Passenger Information System (PIS) pre-recorded announcements are located on the gray bar below the PA and AADS sections. They can be played by simply pressing the desired pushbuttons. If buttons are grayed out, indicating that there is a configuration fault, the manual hard pushbuttons and footswitch PTT can be used redundantly to make voice announcements.

The Cab Speaker volume adjustment is also part of this screen. Simply press the (+) pushbutton to increase the volume and press the (-) pushbutton to decrease the volume to the desired level.

2.9 Brightness Screen

The Brightness Screen is used to change from the default setting of automatic brightness to manual brightness which allows the brightness of the screen to be changed by the operator, see Figure 2-53. If the user decides to dim the screen they can select the Manual Brightness pushbutton and change the brightness of the TOD screen. If the user selects the Auto Brightness pushbutton, the brightness will automatically change.

When the TOD reboots the brightness setting will be set to Auto Brightness control.

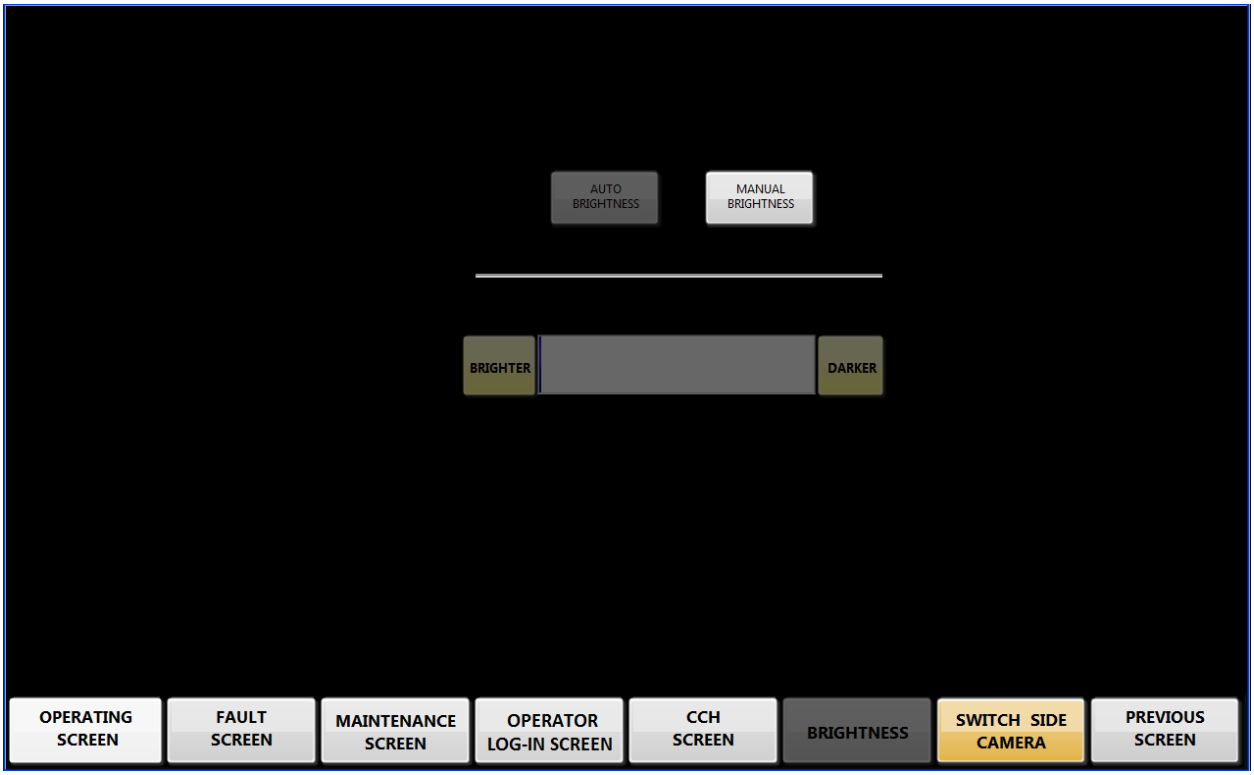

Figure 2-60: TOD Brightness Screen

2.10 Wayside Worker Alert Description

The Wayside Worker Alert System (WWAS) will alert the train operator with an audible and visual notification. Personnel equipped with a Personal Alert Device (PAD) within range of the LRV will trigger the alarm. When the WWAS Alert is active, a visual notification will be displayed on the Secondary TOD and an alarm will also be sounding in the cab, see Figure 2-54.

The WWAS has a number of different alarms such as Track Workers, High Rail Equipment and Speed Restriction.

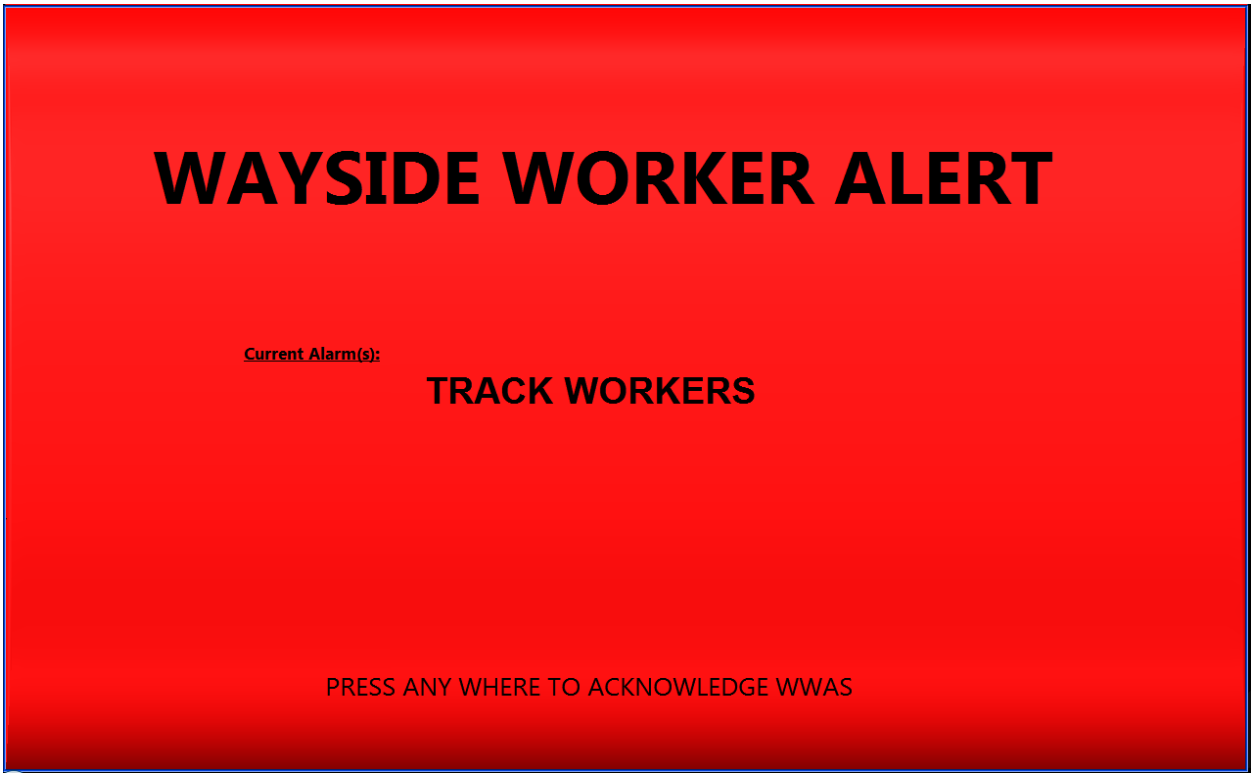

Figure 2-61: Wayside Worker Alert System Silence Alarm

To silence the audible alarm the operator must press the touch screen on the Secondary TOD. This will reduce the WWAS notification from a full screen indication to a smaller indicator on the top left of the Secondary TOD, see Figure 2-55.

The WWAS Alert shown in Figure 2-55 will be present until the LRV is away from the hazard. When this happens the WWAS Warning indicator will automatically go away indicating to the operator that the WWAS Alert has passed.

If a new alarm is triggered at any time, then the full screen visual notification will be displayed and the alarm will be sounded again.

The Wayside Worker Alert System is described more fully in the Section 1400, Communications System of the Running Maintenance and Servicing Manual. These screen shots are provided for information.

Figure 2-62: Wayside Worker Alert Alarm

2.11 Switch Between Rear View Cameras Description

The pushbutton in Figure 2-56 that is labeled “Switch Side Camera” is a toggle type pushbutton that switches the Rear View Display screen between the Rear and Front side cameras.

In the event that the operator’s view is obstructed at the station, the operator can select the other end side view camera. This will give the operator a different view of the side of the LRV. To select the other camera the operator simply has to press the “Switch Side Camera” pushbutton.

The Primary TOD has the “Switch Side Camera’ pushbutton that will toggle the side camera view on the left Rear View Display. The Secondary TOD has the “Switch Side Camera” pushbutton that will toggle the side camera view on the right Rear View Display. The Rear View Display screen locations can be seen in Figure 2-6.

When the LRV moves, the Rear View Display shows the Front side view camera automatically. The Rear View Display is described more fully in the Section 1900, CCTV of the Running Maintenance and Servicing Manual. The below screen shot is provided for information.

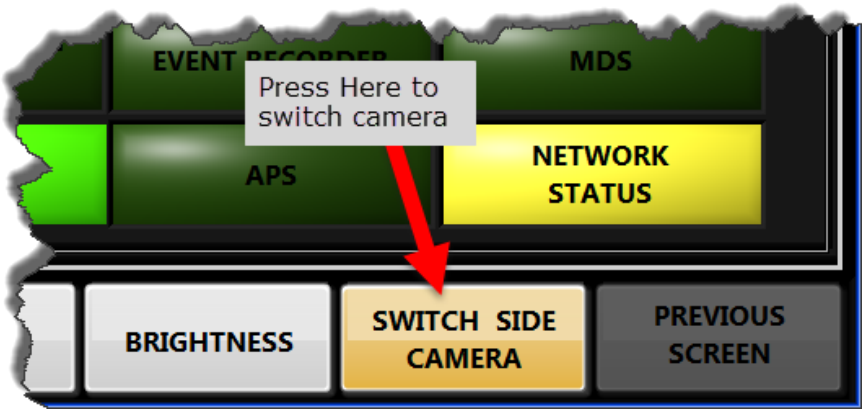

Figure 2-63: Switch Camera PB

CHAPTER 3.0

SPECIAL TOOLS AND MATERIALS

3.1 Introduction

No special tools are required. However, this section of the running maintenance manual includes the possibility of removing and installing hardware that interfaces with the LRV's Ethernet network where M12 Connectors are used for Ethernet connections. Connectivity issues and faults in the Ethernet network can occur with improperly seated connectors. Therefore, the use of a M12 torque screwdriver and a M12 torque bit is recommended.

The following are the part numbers for special tools:

- M12 Torque Screwdriver: TSD 08 SAC – 1212597 (Figure 3-1)
- M12 Torque Bit: SACC BIT M12-D20 – 1208445 (Figure 3-2)

Figure 3-1: M12 Torque Screwdriver

Figure 3-2: M12 Torque Bit

If necessary to connect a PTU to the network systems an RJ-45 to M12 PTU cable is required. This patch cable is included with the PTUs supplied to Metro.

CHAPTER 4.0

SCHEDULED MAINTENANCE TASKS

4.1 Introduction

This chapter provides scheduled maintenance tasks in the form of a quick reference table. A thorough visual inspection should be performed before proceeding. Obvious malfunctions from damage observed during the visual inspection are to be corrected.

4.2 Scheduled Maintenance Index

Table 4-1 is a scheduled maintenance index, which lists maintenance intervals and each maintenance task for the Monitoring and Diagnostic System (MDS). The reference column indicates the section of this manual that details these maintenance procedures.

Table 4-1. Scheduled Maintenance Index

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 1800 Train Controls & Diagnostics (MDS) Running Maintenance & Servicing Manual Section Reference
30,000 Miles	Monitoring and Diagnostic System (MDS)	Visually inspect for loose components and secure panel mounting hardware	5.3.1
		Confirm log freshness to confirm logging function	
As required	Monitoring and Diagnostic System (MDS)	Download and save the vehicle fault logs. Logs are stored for 30 days	8.3

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CHAPTER 5.0

CORRECTIVE MAINTENANCE

5.1 Introduction

This chapter provides inspection and adjustment procedures for the Monitoring and Diagnostic System (MDS) and Train Operator Display (TOD) equipment.

5.2 Safety Information

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

CLEANING MATERIALS CAN BE TOXIC AND DANGEROUS TO HANDLE. READ THE HANDLING INSTRUCTIONS BEFORE USING, AND FOLLOW THE MANUFACTURER'S RECOMMENDATIONS.

WARNING

ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THESE DEVICES AND/OR ANY COMPONENT PARTS MUST BE CUT-OFF BEFORE THESE DEVICES AND/OR COMPONENT PART ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT.

WARNING

TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TEST, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING

SHUT OFF POWER TO THE CAR BEFORE ATTEMPTING TO SERVICE ANY ROOF MOUNTED EQUIPMENT.

WARNING

MUCH OF THE EQUIPMENT ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

INSULATED GLOVES MUST BE WORN AND EXTREME CARE TAKEN TO PREVENT BURNS WHEN HANDLING HEATED PARTS.

5.3 Corrective Maintenance Procedures

5.3.1 Monitoring and Diagnostic System (MDS)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

5.3.1.1 30,000 Mile Maintenance Interval

1. Visually inspect MDS computer and mounting panel for loose components and secure panel mounting hardware every 30,000 miles.

5.4 Adjustments

This section requires no adjustments for the Monitoring and Diagnostic System (MDS) equipment.

CHAPTER 6.0

LUBRICATION

6.1 Introduction

This section requires no lubrication on the Monitoring and Diagnostic System (MDS) equipment.

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CHAPTER 7.0

COMPONENT REMOVAL AND INSTALLATION

7.1 Introduction

This chapter provides general guidelines on component removal and installation of the Monitoring and Diagnostic System (MDS) and Train Operator Display (TOD) equipment.

7.2 Safety Precautions

The following statements of warning and caution apply to the handling of the MDS and TOD equipment and appear as appropriate throughout this manual.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TEST, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING

WHEN REMOVING DAMAGED GLASS, WEAR LEATHER GLOVES AND SAFETY GLASSES TO PREVENT SKIN AND EYE INJURY.

CAUTION

WEAR SAFETY SHOES AND HARD HATS WHEN WORKING WHERE OBJECTS MIGHT FALL.

WARNING

ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THESE DEVICES AND/OR ANY COMPONENT PARTS MUST BE CUT-OFF BEFORE THESE DEVICES AND/OR COMPONENT PART ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT.

WARNING

MUCH OF THE EQUIPMENT ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

INSULATED GLOVES MUST BE WORN AND EXTREME CARE TAKEN TO PREVENT BURNS WHEN HANDLING HEATED PARTS.

7.3 Removal and Installation Standard Shop Practices

The following paragraphs provide mounting hardware and torqueing practices applicable to all installation and removal work of the MDS and TOD equipment.

7.3.1 Mounting Hardware

All fastening bolts on the LACMTA P3010 LRV are Grade 5, or higher. When removing any component from the vehicle, replacement fasteners MUST BE Grade 5 or better. See Figures 7-1 and 7-2.

7.3.2 Torqueing Practices and Procedures

All safety related fasteners, including truck and brake equipment bolts and all fasteners exposed to fatigue loads must be torqued to a minimum preload equal to 75% of their proof load and torqued striped after torqueing by paint or equally approved means. All other fasteners must be torqued so that they do not loosen in service.

7.3.3 Torqueing Methods

1. Select the correct wrench and avoid using wrenches that are oversized or undersized for the torque required.

2. Pull the wrench - Pulling is no more accurate than pushing, however, when a part fails unexpectedly, finger and knuckle injuries are prevented.

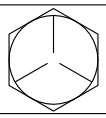
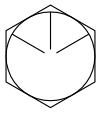
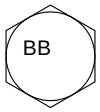
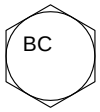
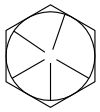
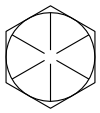
Grade Marking	Specification	Material
 NO MARK	SAE-Grade 1	Low or Medium Carbon Steel
	ASTM-A 307	Low Carbon Steel
	SAE-Grade 2	Low or Medium Carbon Steel
	SAE-Grade 5	Medium Carbon Steel, Quenched and Tempered
	ASTM-A 449	
	SAE-Grade 5.2	Low Carbon Martensite Steel, Quenched and Tempered
	ASTM-A 325 Type 1	Medium Carbon Steel, Quenched and Tempered
	ASTM-A 325 Type 2	Low Carbon Martensite Steel, Quenched and Tempered
	ASTM-A 325 Type 3	Atmospheric Corrosion (Weathering) Steel Quenched and Tempered
	ASTM-A 354 Grade BB	Low Alloy Steel, Quenched and Tempered
	ASTM-A 354 Grade BC	Low Alloy Steel, Quenched and Tempered
	SAE-Grade 7	Medium Carbon Alloy Steel, Quenched and Tempered Roll Threaded After Heat Treatment
	SAE-Grade 8	Medium Carbon Alloy Steel, Quenched and Tempered
	ASTM-A 354 Grade BD	Alloy Steel, Quenched and Tempered
	ASTM-A 490	Alloy Steel, Quenched and Tempered

Figure 7-1: Standard Grade Marking Chart

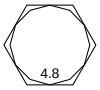
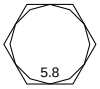
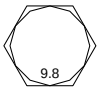
Property Class Marking	Property Class Designation	Material
	4.6	Low or Medium Carbon Steel
	4.8	Low or Medium Carbon Steel, Fully or Parially Annealed
	5.8	Low or Medium Carbon Steel, Cold Worked
	8.8	Medium Carbon Steel, Quenched and Tempered
	A325M Type 1	
	8.8	Low Carbon Boron Steel, Quenched and Tempered
	A325M Type 2	
	A325M Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered
	9.8	Medium Carbon Steel, Quenched and Tempered
	9.8	Low Carbon Boron Steel, Quenched and Tempered
	10.9	Medium Carbon Alloy Steel, Quenched and Tempered
	A490M Type 1	

Figure 7-2: Metric Grade Marking Chart
(Sheet 1 of 2)

Property Class Marking	Property Class Designation	Material
	10.9	Low Carbon Boron Steel, Quenched and Tempered
	A490M Type 2	
	A490M Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered
	12.9	Alloy Steel Quenched and Tempered

Figure 7-2: Metric Grade Marking Chart
(Sheet 2 of 2)

3. Add the run-down resistance - Tight threads and locknuts produce added resistance to the desired torque. Read the scale on the last rotation or as close to the make-up point as possible, then add the ft-lbs. (or in-lbs.) of resistance to the desired torque to obtain the value required.

4. Don’t stop at set or seizure - When a fastener pops it has seized. Accurate torque settings are not possible before the point of last rotation. To break a set, back off and again apply torque. Lightly lubricate the thread and seat when conditions allow.

7.3.4 General Guide for Maximum Torque Values

When manufacturer's specifications are not available, Tables 7-1 and 7-2 may be used as a guide to the maximum allowed torque for a given fastener and thread (standard or metric).

Table 7-1. Standard Fastener Torques for LACMTA P3010 LRV

Diameter / Pitch	Force / Torque	Stainless Steel Group 1, 2, 3 Condition CW		Steel Fastener			
				Grade 5		Grade 8	
		A	B	A	B	A	B
1/4 - 20	ft-lbs. Nm kg cm	6 8 80	5 6 60	8 11 110	6 8 80	12 16 165	9 12 120
5/16 - 18	ft-lbs. Nm kg cm	13 18 180	10 14 140	17 23 230	13 18 180	25 34 350	18 24 250
3/8 - 16	ft-lbs. Nm kg cm	24 33 330	18 24 250	31 42 430	23 31 320	44 60 610	33 45 460
7/16 - 14	ft-lbs. Nm kg cm	38 52 530	28 38 390	49 67 680	37 50 510	70 95 970	53 72 730
1/2 - 13	ft-lbs. Nm kg cm	58 78 800	43 58 590	76 103 1050	57 77 790	105 142 1450	80 108 1100
5/8 - 11	ft-lbs. Nm kg cm	115 155 1590	85 115 1190	150 205 2070	125 170 1730	210 285 2900	160 215 2200
3/4 - 10	ft-lbs. Nm kg cm	140 190 1940	105 145 1500	265 360 3660	200 270 2770	370 500 5120	280 380 3870
7/8 - 9	ft-lbs. Nm kg cm	225 305 3110	170 230 2350	430 585 5940	320 435 4430	600 815 8300	450 610 6220
1 - 8	ft-lbs. Nm kg cm	340 460 4700	255 345 3530	640 870 8850	480 650 6640	910 1230 12500	580 925 9400

NOTE A: DO NOT USE LUBRICANT FOR FASTENERS – DRY

NOTE B: TO BE OILED OR WAXED ON THREADS OF FASTENERS - LUBRICATED

Table 7-2. Standard Metric Torques for LACMTA P3010 LRV

	Grade 4.6 (4T)		Grade 4.8		Grade 5.6 (5T)	
Nominal diameter	Dry	Oil	Dry	Oil	Dry	Oil
	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)
M5	2.5	2.1	3.3	2.8	3	2.5
	(25)	(21)	(34)	(29)	(31)	(26)
M6	3.9	3.5	5.6	4.8	5.1	4.3
	(40)	(35)	(57)	(49)	(52)	(44)
M8	9.8	8.5	14	12	12	10
	(100)	(85)	(140)	(120)	(130)	(110)
M10	22	17	27	23	25	21
	(220)	(170)	(270)	(230)	(250)	(210)
M12	37	30	47	40	43	36
	(380)	(300)	(480)	(410)	(440)	(370)
M14	60	46	75	65	68	58
	(620)	(470)	(760)	(650)	(690)	(590)
M16	95	72	120	100	110	90
	(1000)	(730)	(1200)	(1000)	(1100)	(920)
M18	120	100	160	135	150	130
	(1300)	(1000)	(1650)	(1400)	(1500)	(1300)
M20	170	140	230	195	210	180
	(1800)	(1400)	(2300)	(2000)	(2100)	(1800)
M22	240	190	310	265	280	240
	(2500)	(1950)	(3160)	(2700)	(2900)	(2400)
M24	300	245	400	335	360	300
	(3100)	(2500)	(4000)	(3400)	(3600)	(3100)
M27	460	355	580	490	520	440
	(4700)	(3600)	(5900)	(5000)	(5300)	(4500)
M30	630	485	780	660	710	600
	(6500)	(4900)	(8000)	(6800)	(7200)	(6100)

Table 7-2. Standard Metric Torques for LACMTA P3010 LRV (cont'd.)

	Grade 5.8		Grade 6.8 (6T)		Grade 8.8 (7T)	
Nominal diameter	Dry	Oil	Dry	Oil	Dry	Oil
	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)
M5	4.1	3.4	4.7	4	6.2	5.2
	(41)	(35)	(48)	(41)	(63)	(53)
M6	6.9	5.8	8	6.8	10	8.9
	(70)	(59)	(81)	(69)	(110)	(91)
M8	17	14	19	16	25	22
	(170)	(140)	(200)	(170)	(260)	(220)
M10	33	28	38	32	50	43
	(340)	(290)	(390)	(330)	(510)	(440)
M12	58	49	67	57	91	77
	(590)	(500)	(680)	(580)	(930)	(790)
M14	92	78	110	90	150	120
	(940)	(790)	(1100)	(920)	(1500)	(1300)
M16	140	120	170	140	230	190
	(1500)	(1200)	(1700)	(1400)	(2300)	(2000)
M18	200	170	230	190	310	260
	(2000)	(1700)	(2300)	(2000)	(3200)	(2700)
M20	280	240	320	280	440	370
	(2800)	(2400)	(3300)	(2800)	(4500)	(3800)
M22	380	320	440	370	600	510
	(3900)	(3300)	(4500)	(3800)	(6100)	(5200)
M24	480	410	560	470	760	650
	(4900)	(4200)	(5700)	(4900)	(7800)	(6600)
M27	710	600	820	690	1100	950
	(7200)	(6100)	(8400)	(7100)	(11000)	(9700)
M30	960	820	1100	940	1500	1300
	(9800)	(8300)	(11000)	(9600)	(15000)	(13000)

Table 7-2. Standard Metric Torques for LACMTA P3010 LRV (cont'd.)

	Grade 9.8		Grade 10.9		Grade 12.9	
Nominal diameter	Dry	Oil	Dry	Oil	Dry	Oil
	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)	N*m(kgf cm)
M5	6.9	5.9	8.8	7.5	10	8.8
	(71)	(60)	(90)	(77)	(110)	(89)
M6	12	10	15	13	18	15
	(120)	(100)	(150)	(130)	(180)	(150)
M8	28	24	36	31	43	36
	(290)	(250)	(370)	(320)	(430)	(370)
M10	57	48	72	61	84	72
	(580)	(490)	(740)	(630)	(860)	(730)
M12	100	84	130	110	150	130
	(1000)	(850)	(1300)	(1100)	(1500)	(1300)
M14	160	130	200	170	230	200
	(16000)	(1400)	(2000)	(1700)	(2400)	(2000)
M16	240	210	310	270	360	310
	(2500)	(2100)	(3200)	(2700)	(3700)	(3200)
M18			430	370	500	430
			(4400)	(3700)	(5100)	(4300)
M20			610	520	710	610
			(6200)	(5300)	(7300)	(6200)
M22			830	710	970	820
			(8400)	(7200)	(9900)	(8400)
M24			1100	900	1200	1000
			(11000)	(9100)	(13000)	(11000)
M27			1500	1300	1800	1500
			(16000)	(13000)	(18000)	(16000)
M30			2100	1800	2400	2100
			(21000)	(18000)	(25000)	(21000)

7.4 Removal

The following sections contain the instructions for the removal of the Monitoring and Diagnostic System (MDS).

7.4.1 Monitoring and Diagnostic System (MDS)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Open the right-side electrical locker door located in the B-Unit. See Figure 7-5.
2. Disconnect the two Ethernet electrical connectors, power connector, and grounding strap from the MDS computer front panel. See Figure 7-3.
3. Disconnect the carbody Ethernet electrical connector from the back side PTU port 1. See Figure 7-4.
4. Remove the four M6 x 16 screws (#1, Figure 7-5), M6 lock washers (#2, Figure 7-5), and M6 plain washers (#3, Figure 7-5) that secure the panel to the electrical locker.
5. Carefully remove the MDS Control Unit Panel from the electrical locker. (#4, Figure 7-5).
6. The MDS box computer is the lowest level replaceable unit. The unit can be removed from the panel mount shelf by loosening and removing the 4 nuts and flat washers that hold it to the panel. See Figure 2-2.

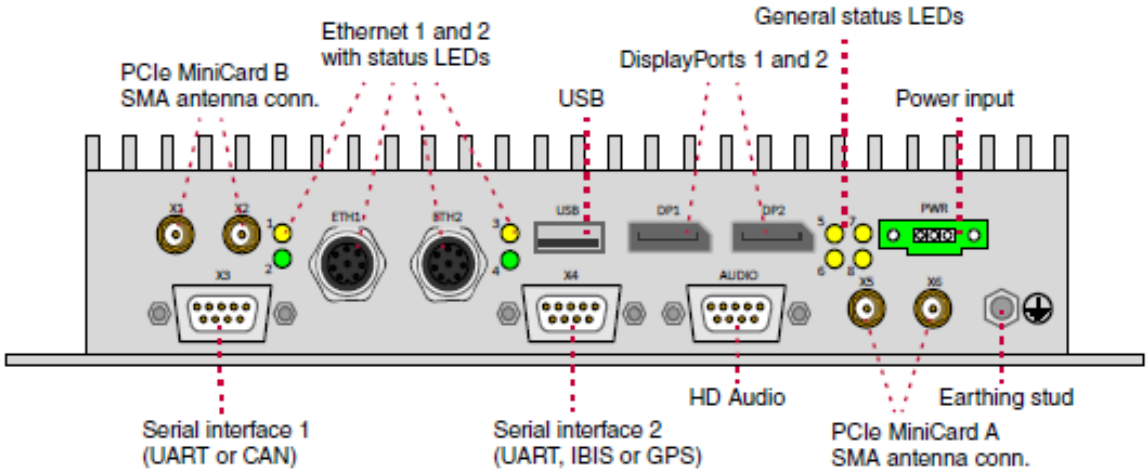


Figure 7-3: MDS Computer Front Panel

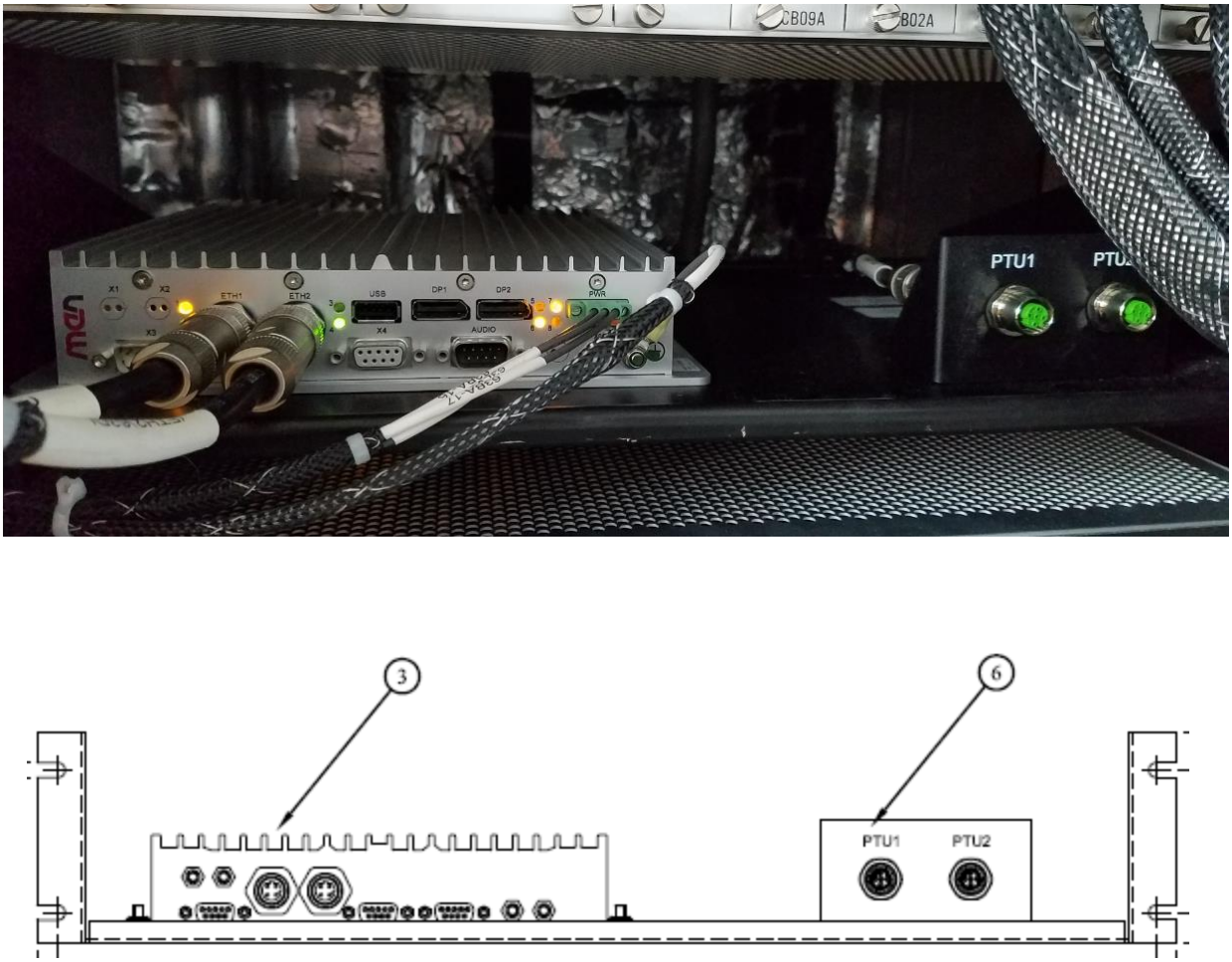


Figure 7-4: MDS Control Unit Panel

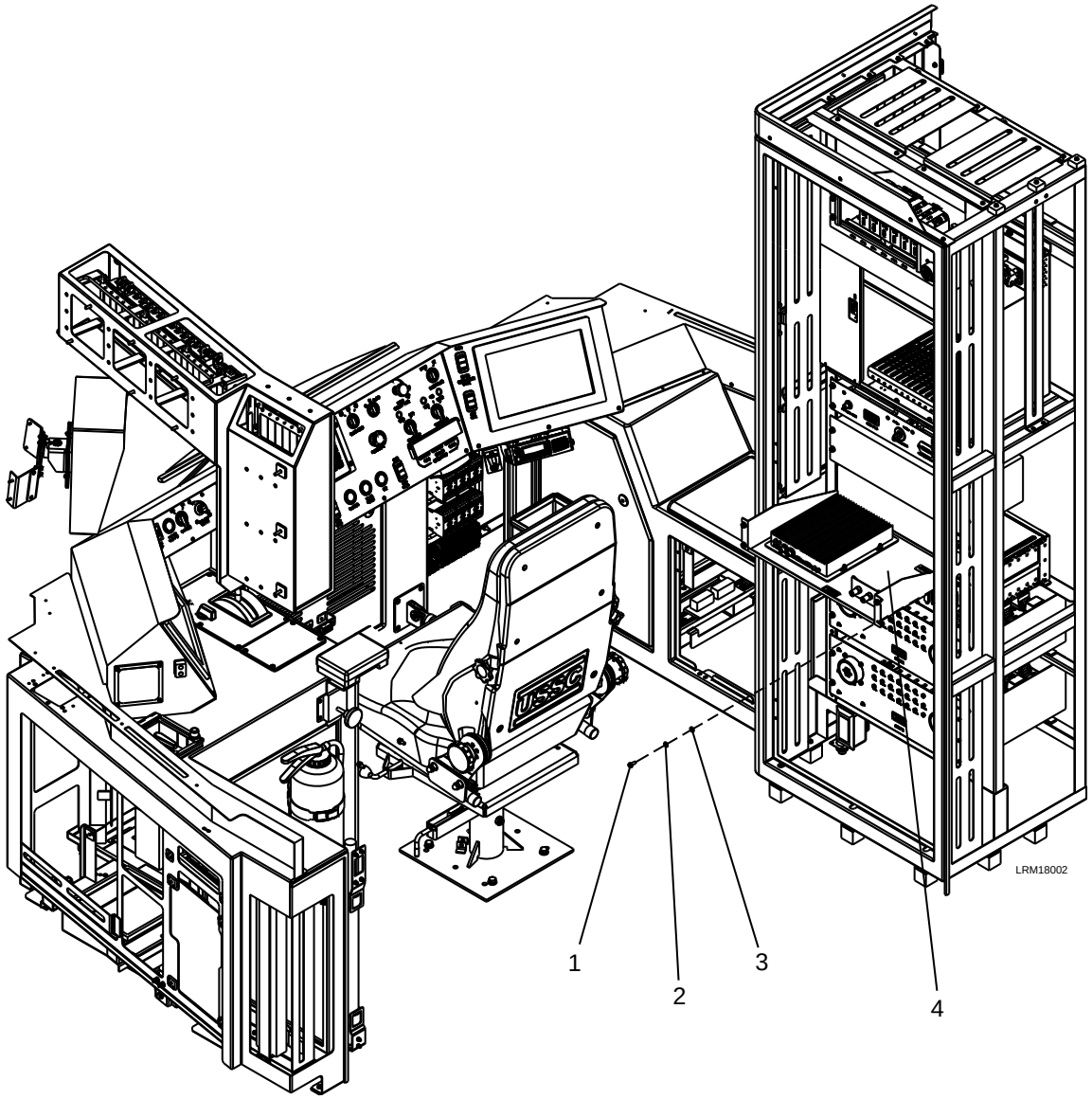


Figure 7-5: Monitoring and Diagnostic System (MDS)

7.5 Installation

The following sections contain the instructions for the installation of the Monitoring and Diagnostic System (MDS).

7.5.1 Monitoring and Diagnostic System (MDS)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Open the right-side electrical locker door located in the B-Unit. See Figure 7-5.

2. Carefully install the MDS Control Unit Panel into the electrical locker by aligning the mounting holes. (#4, Figure 7-5)

3. Install the four M6 x 6 screws (#1, Figure 7-5), M6 lock washers (#2, Figure 7-5), and M6 plain washers (#3, Figure 7-5) that secure the panel to the electrical locker.

4. Tighten the hardware using a lightly lubricated 3.5 Nm torque.

5. Connect the carbody Ethernet electrical connector to the back side PTU port 1. Torque to 0.4Nm using the M12 torque screwdriver. See Figure 7-4.

6. Connect the two Ethernet electrical connectors, power connector, and grounding strap to the MDS computer front panel. See Figure 7-3.

7. IMPORTANT: Confirm on reinstallation that the proper Ethernet electrical connectors are connected to the proper ports on the MDS computer. These connectors are not keyed and can connected to the wrong ports causing network errors.

8. If the MDS panel installed is not the same MDS panel removed. The configuration of the Enhanced Ethernet Interface Modules must be updated as well. Section 7.6.2 covers this process.

9. The MDS box computer is the lowest level replaceable unit. The unit can be installed to the panel mount shelf by installing the 4 nuts and flat washers and tightening it to the panel. See Figure 2-2.

10. Close the right-side electric locker door located in the B-Unit.

7.6 Software Installation

The following sections contain the instructions for the software installation of the Monitoring and Diagnostic System (MDS). In addition to the instructions provided below. Please refer to the ***Communications Equipment Programming Guide***. This guide includes the Programming of the MDS and EEI panel.

7.6.1 Monitoring and Diagnostic System (MDS)

1. Open the right-side electrical locker door located in the B-Unit. See Figure 7-5.
2. Using a PTU and M12 Ethernet cable, connect to PTU port 1 located on the MDS panel, See Figure 7-4. (Note: Port 2 is not an active ethernet port in this equipment).
3. Ensure the PTU is set to obtain its IP address automatically (TCP/IPv4 setting).
4. Navigate to the MDS webpage using an internet browser installed on the PTU by typing the IP address into the URL bar. The IP address of the LRV's MDS computer will be (10.0.XX.4). "XX" represents the LRV number. For example, the MDS's IP address on LRV 1122 would be (10.0.122.4). The MDS IP address on LRV 1018 would be (10.0.18.4). Refer to Section 1700, Data Communications of the Running Maintenance and Servicing Manual.
5. Navigate to the software update page by using the navigation bar at the top of the MDS webpage.
6. Upload the CCU/MDS installer package and use the "Start Update" button to begin the software installation.
7. Once the software update is complete, a notification will be displayed on the webpage. Changing out the MDS also requires updating the EEI. Refer to Section 7.6.2.
8. At this point you may close the web browser and disconnect the PTU from the LRV.
9. Close the right-side electrical locker door when complete.
10. To confirm software installation, key the car off and then back on. Then from the TOD maintenance screen request the software version. Wait until the versions fill and then check that the proper software version is displayed.

7.6.2 Enhanced Ethernet Interface (EEI) Panel

The EEI gateways are configured by the MDS. The EEI is located in the A Cab electric locker. The configuration must be updated if the EEI panel is replaced. Note that if the MDS is replaced, this configuration must also be updated. Section 8.4 of the Data Communications Running Maintenance and Servicing Manual should also be referenced when performing an EEI Panel or MDS replacement.

This can be done via the MDS webpage using the following steps:

1. Open the right-side electrical locker door located in the B-Unit. See Figure 7-5.
2. Using a PTU and M12 Ethernet cable, connect to PTU port 1 located on the MDS panel, See Figure 7-4.

3. Ensure the PTU is set to obtain its IP address automatically (TCP/IPv4 setting).

4. Navigate to the MDS webpage using an internet browser installed on the PTU by typing the IP address into the URL bar. The IP address of the LRV's MDS computer will be (10.0.XX.4). "XX" represents the LRV number. For example, the MDS's IP address on LRV 1122 would be (10.0.122.4). The MDS IP address on LRV 1018 would be (10.0.18.4).

5. Navigate to the "EEI Replacement" page by using the navigation bar at the top of the MDS webpage.

6. Two text boxes will appear. Enter the MAC addresses of the EEI gateways. The MAC address location is shown in Figure 7-6.

7. Ensure the appropriate MAC address for each module is entered into the correct text box. If this is not correct the Ethernet trainline will not function. The Module locations and associated IP addresses are shown in Figure 7-7.

8. Once the MAC addresses are entered and verified to be in the correct text box, press the "Submit Update" button.

9. Once the update is complete, a notification will be displayed on the webpage. At this point you may close the web browser and disconnect the PTU from the LRV.

10. Close the right-side electrical locker door when complete.

Figure 7-6: EEI Module MAC address

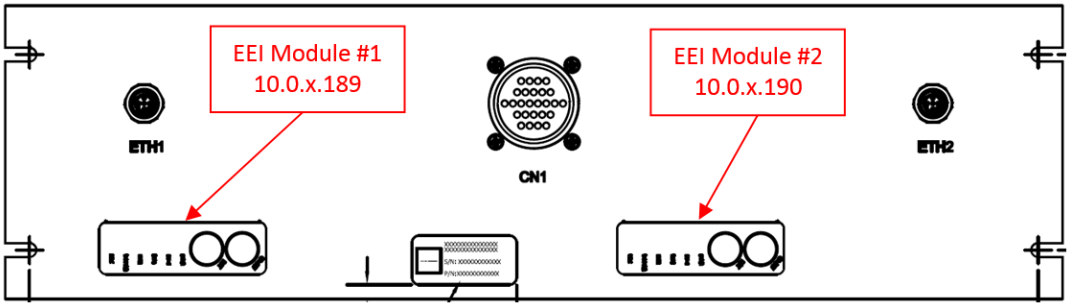


Figure 7-7: EEI Panel with Module Identification (A Cab Electric Locker)

CHAPTER 8.0

TROUBLESHOOTING

8.1 Introduction

This section provides troubleshooting tips and methods for fault determination that could be considered involved with the Monitoring and Diagnostic System (MDS) and Train Operator Display (TOD) equipment.

It should be noted that all possible paths of fault determination are not described in this chapter. A combination of Running Maintenance Manual sections may need to be referenced and utilized to accurately troubleshoot the LRV.

The vehicle circuits should always be on hand when troubleshooting.

8.2 Troubleshooting Tips

Before fault isolation, perform a thorough visual equipment inspection to determine if a malfunction is being caused by some obvious defect such as a damaged component, defective wiring, etc. Otherwise, fault isolation should follow a logical sequence designed to isolate a malfunction to a single component.

Symptoms of a fault are typically identified by a loss of function. The function lost, inoperative or malfunctioning, will provide a means to identify a course of troubleshooting. The vehicle schematics will provide information to troubleshoot wiring and connectivity issues. Intermittent connectivity issues are the most difficult to troubleshoot. Ensure that all connectors are properly installed and properly tightened.

Before deciding that a system/subsystem is malfunctioning, check that all related circuit breakers, switches, control devices are set properly for normal operation.

8.3 Downloading Fault Logs

1. Fault Logs can be reviewed for faults that will provide symptoms of ongoing or repetitive fault activity. Using a PTU with the Filezilla client program, download the LRV fault logs from the MDS for review.

2. The Host should be the IP address of the LRV's MDS computer (10.0.XX.4). For example, Figure 8-1 shows the individual connecting the MDS of LRV 1122. Note that device addressing is included in Appendix A of Section 1700, Data Communications of the Running Maintenance and Servicing Manual.

3. The Username is User1, the Password is P3010, and the Port should be left blank. This does not change from one LRV to another.

4. After this information is entered press the quick connect button. The connection window should be used to verify you are connected.

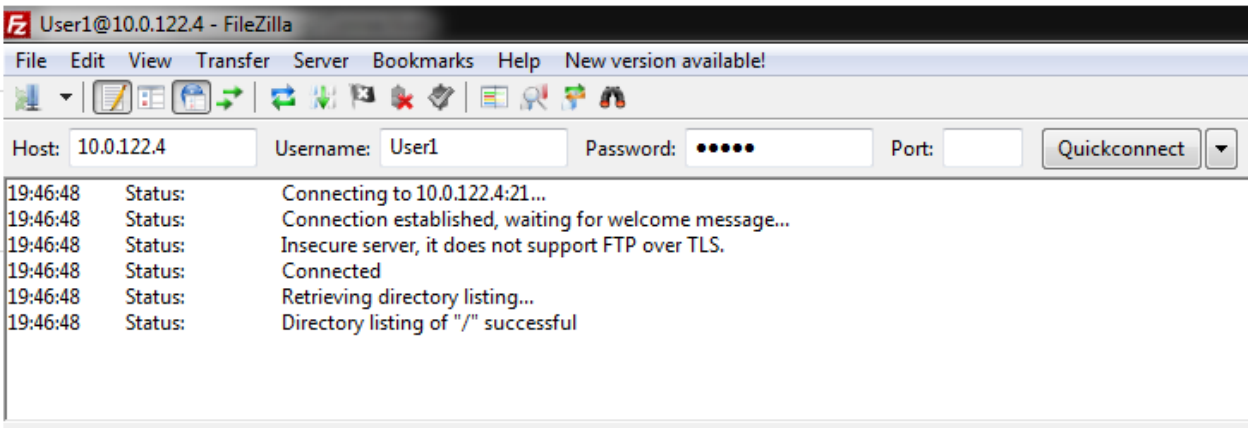


Figure 8-1: Filezilla Client Connection Interface

5. Below the connection window the screen will be split into two partitions by a vertical divider. The left partition represents the local computer you are using to access the network. The right partition represents the MDS computer (Figure 8-2). From here you can drag and drop the date folders required from the MDS computer to an appropriate location on your local computer.

6. When you have saved the fault logs required, exit the Filezilla client program.

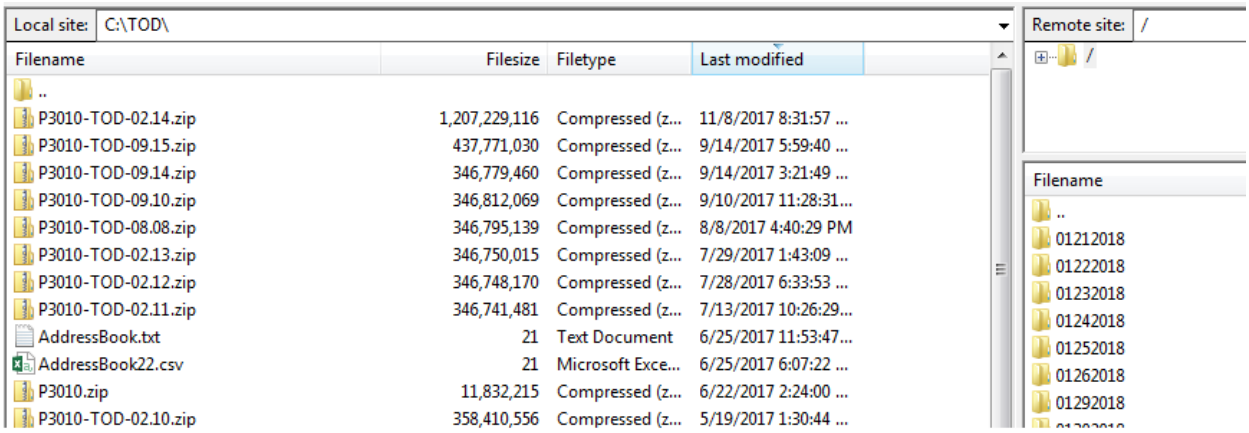


Figure 8-2: Filezilla Client File Transfer Interface

7. Review the logs, examine for unexpected events, symptoms and follow troubleshooting procedures per the subsystem manual for the suspected faulty device.

8.4 Ethernet Health Monitor

The subsystem Ethernet health status is defined by the HEALTH message. This message is periodically sent from each subsystem to the MDS.

The subsystem indicators, on the status panel portion of the TOD screen (Refer to Figure 8-3), are defined by the *ESTA* message. This message is sent from the MDS to the TODs. The *ESTA* message is used to provide the TODs the status of the Ethernet connectivity between all the subsystems in the vehicle and the MDS.

The MDS tracks this status based on the arrival of *HEALTH* messages from each subsystem.

For network issues, refer to Section 1700, Data Communications of the Running Maintenance and Servicing Manual.

General Description:

This feature provides the Ethernet connection status (ONLINE/OFFLINE) of all the following 23 sub-systems:

- APS
- APC
- PLUA
- PLUB
- ECUA
- ECUB
- ECUC
- DCU Ethernet Gateway
- NVR
- HVAC A
- HVAC B
- ATC
- TCN RIO A-END
- TCN RIO B-END
- TOD RIGHT A-CAB
- TOD LEFT A-CAB
- TOD RIGHT B-CAB

- TOD LEFT B-CAB
- Event Recorder
- PID A-END
- PID B-END
- CCU
- MDS

The subsystem health status is defined by the *HEALTH* message. This message is periodically sent from the sub-system to the MDS.

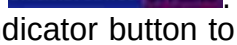
MDS Detection Description:

The MDS continuously (about 100 msec period) listens for *HEALTH* messages from each of the sub-systems.

During a period of 10 minutes, the MDS tracks each *HEALTH* message and accumulates them. Note that health messages from various subsystems differ in period. Once the 10 minutes period elapses, the MDS sets/clear the ESTA bits according to the *HEALTH* message analysis. Each sub-system is analyzed independently. A bit is SET if the MDS received at least 1 new *HEALTH* message from the subsystem (meaning ONLINE) during the 10-minute period. If a subsystem did not send a new message within this check period, then its bit will be CLEARED (meaning OFFLINE).

Note that if a subsystem did not send the *HEALTH* message during the appropriate time, but it recovered later, the OFFLINE status will remain active until the next MDS check period elapses (10 minutes).

TOD Display Description:

During start-up, (from Local off / completely powered off LRV) the first 10 minutes (plus MDS startup time) of operation the Ethernet Health status is not defined, therefore the TOD status indicator buttons will not reflect the Ethernet connectivity status and the Ethernet Status field will be inactive (grayed out) 

. Unless a subsystem has a FAULT, which sets the subsystem status indicator button to RED, all the buttons will remain Grayed-out until the TOD receives the first *ESTA* message.

After the first MDS Ethernet check, and the TOD receives the first *ESTA* message, the TOD will take the following actions for each subsystem:

1. If the subsystem *ESTA* bit is set to 1, the subsystem's status indicator button turns GREEN, and the ETHERNET STATUS indicator within the subsystem status indicator screen button will be changed to a GREEN ONLINE text box. 

2. If the subsystem *ESTA* bit is set to 0, the subsystem's status indicator button will FLASH YELLOW/GREEN, and the ETHERNET STATUS indicator within the subsystem status indicator button will be changed to a RED OFFLINE textbox. Press the system status indicator push button on the TOD to view Status Indicator. 

3. Example: If the subsystem had a FAULT prior to going OFFLINE, the subsystem's indicator status button would be solid RED, then as the MDS determined the subsystem was OFFLINE, and the TOD received the *ESTA* message, the subsystem indicator status button would FLASH YELLOW/RED.

4. Note: the subsystem Ethernet OFFLINE condition will display a pop-up window on the TOD, these events are recorded in the FLOG on the MDS, however, they are not shown on the Active Faults screen accessed from the TOD Menu Bar.

8.5 TOD Troubleshooting Tools

The TOD is a valuable tool for troubleshooting. From the TOD, the maintainer can quickly check a subsystem's status.

As stated in Section 8.4, the TOD displays the Ethernet Health Monitor subsystem status. A flashing yellow subsystem indicator represents an Ethernet connectivity issue with the subsystem that is flashing. The fault could be that the equipment is offline or a connectivity issue. Pressing the subsystem indicator pushbutton provides additional details.

If the subsystem status indicator on the TOD is red, this indicates that a fault is being communicated to the Monitoring and Diagnostic System. Check the list of active faults to determine if there is an active fault that impacts the communications equipment or network equipment. Additionally, from the Maintenance Tab, the Fault Log Screen will also provide information on faults that have occurred over time. This screen can provide an indication of intermittent faults that have cleared.

The Vehicle Management System (VMS) pushbutton indicator will provide a status of Ethernet Connectivity to the MDS, see Figure 8-3. The Ethernet connection status of the CCU, TODs, and PIDs controllers can also be found under the VMS pushbutton, see Figure 8-4.

Refer to Section 1700, Data Communications of the Running Maintenance and Servicing Manual to troubleshoot network issues.

Refer to the Communications System Equipment Programming Guide for software installation. The MDS uses (5) pieces of software: MDS system software, Watchdog software, FLOG software, EEIM software, FileZilla software.

The TOD (Train Operator Display) troubleshooting / calibration is discussed in RMM Section 1900.

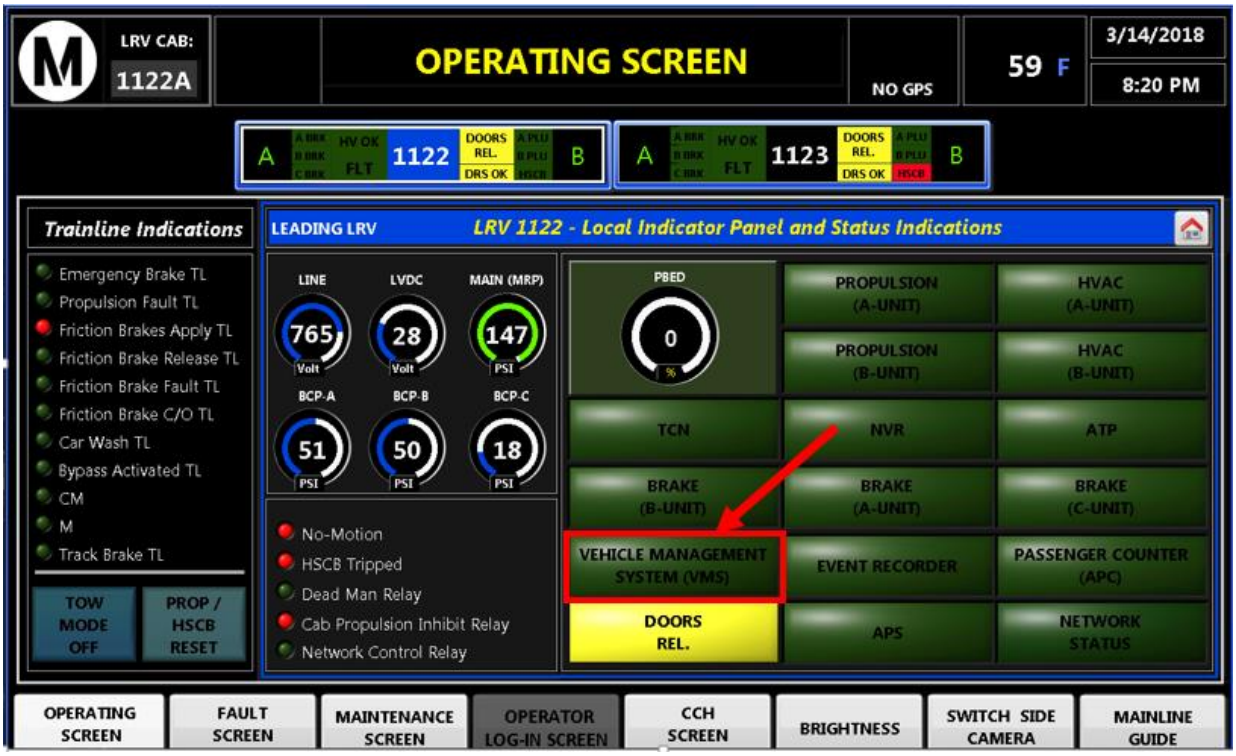


Figure 8-3: Operating Screen VMS Indicator

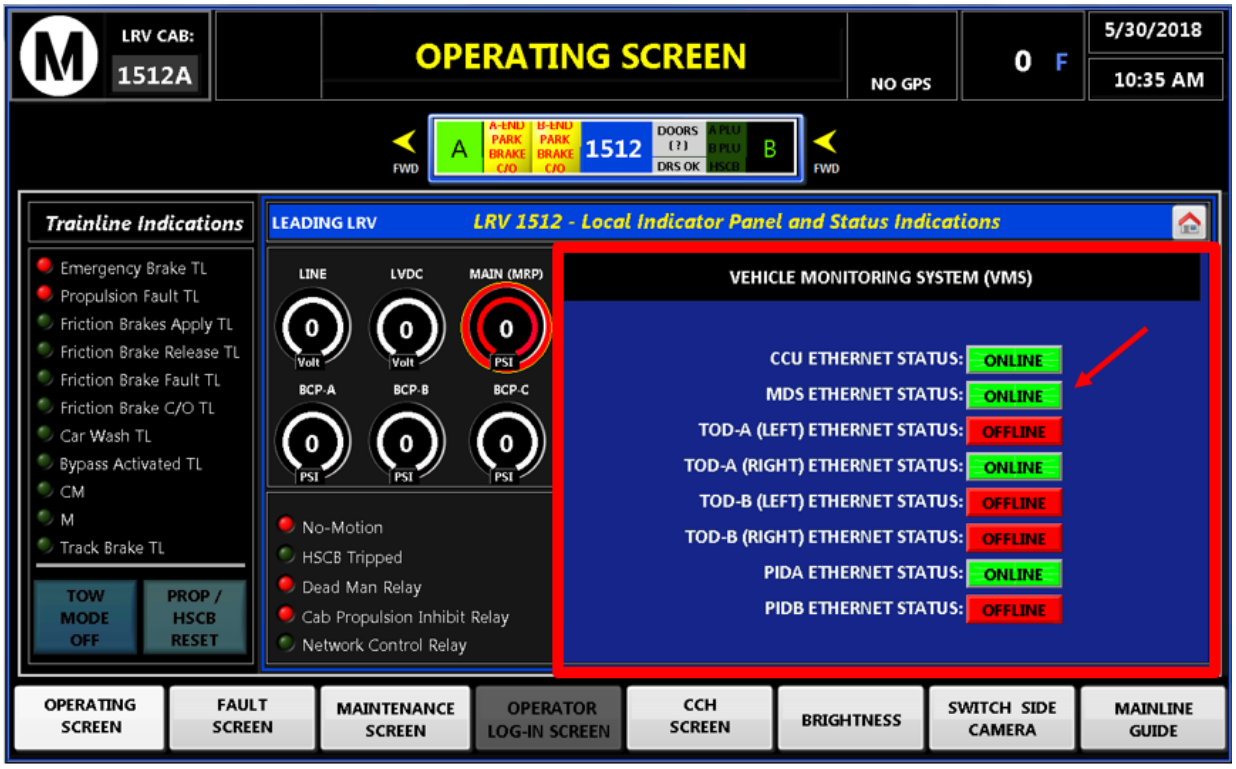


Figure 8-4: Vehicle Management System Indicator Pushbutton Screen

In addition to the VMS pushbutton indicator, an Ethernet test is available from the Network Status button for all Ethernet connected devices, see Figure 8-5.

The Ethernet test can be used to ping any device on the Ethernet network, see Figure 8-6. The “Start Complete Network Test” pushbutton will ping every device on the local car network. If the device fails the test it will be placed in the Device Not Connected table. By pressing the device in the table, it will automatically retest the communication between the TOD and the selected device. If the device passes the retest, the device will be removed from this table and a green PASS will replace the red FAIL that is beside the device name in the “List of Devices” table. If the device fails the retest then it will remain in the table of devices not connected. Alternatively, the “Ping Device” pushbutton can be used to test the connection status of individual device instead of the entire network of devices.

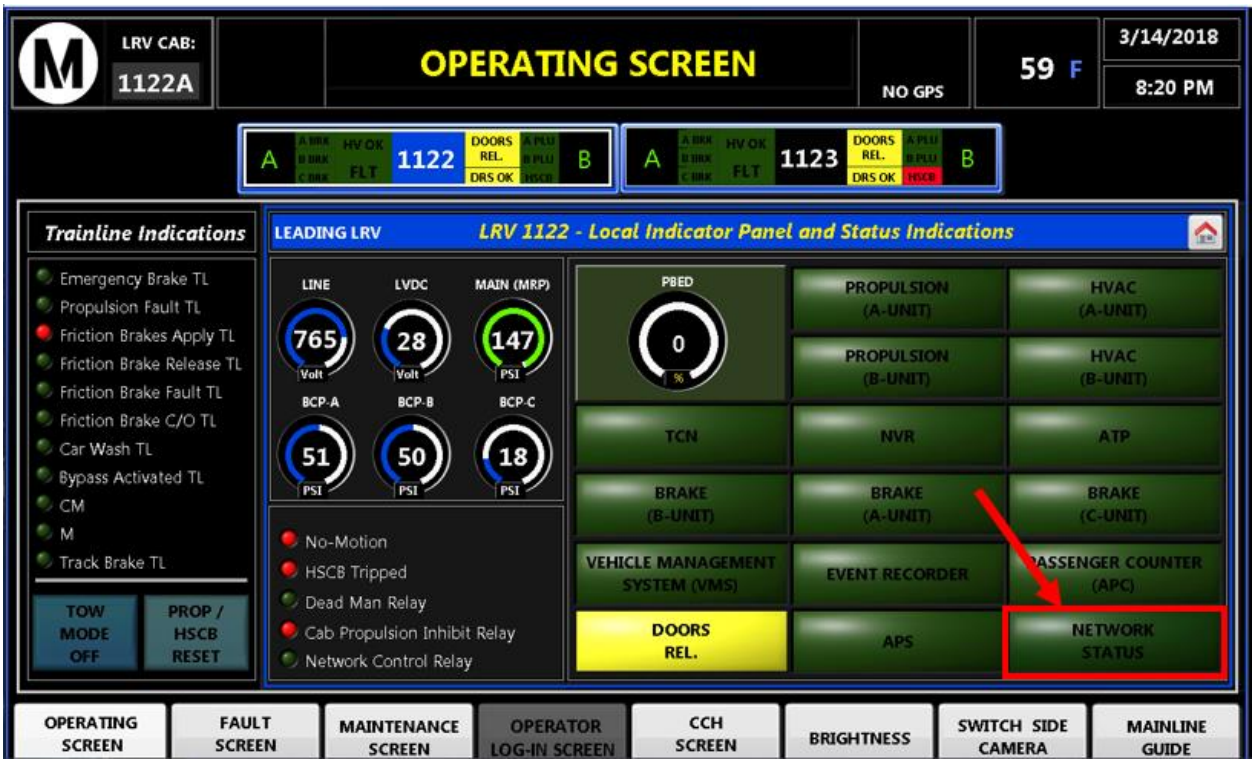


Figure 8-5: Network Status

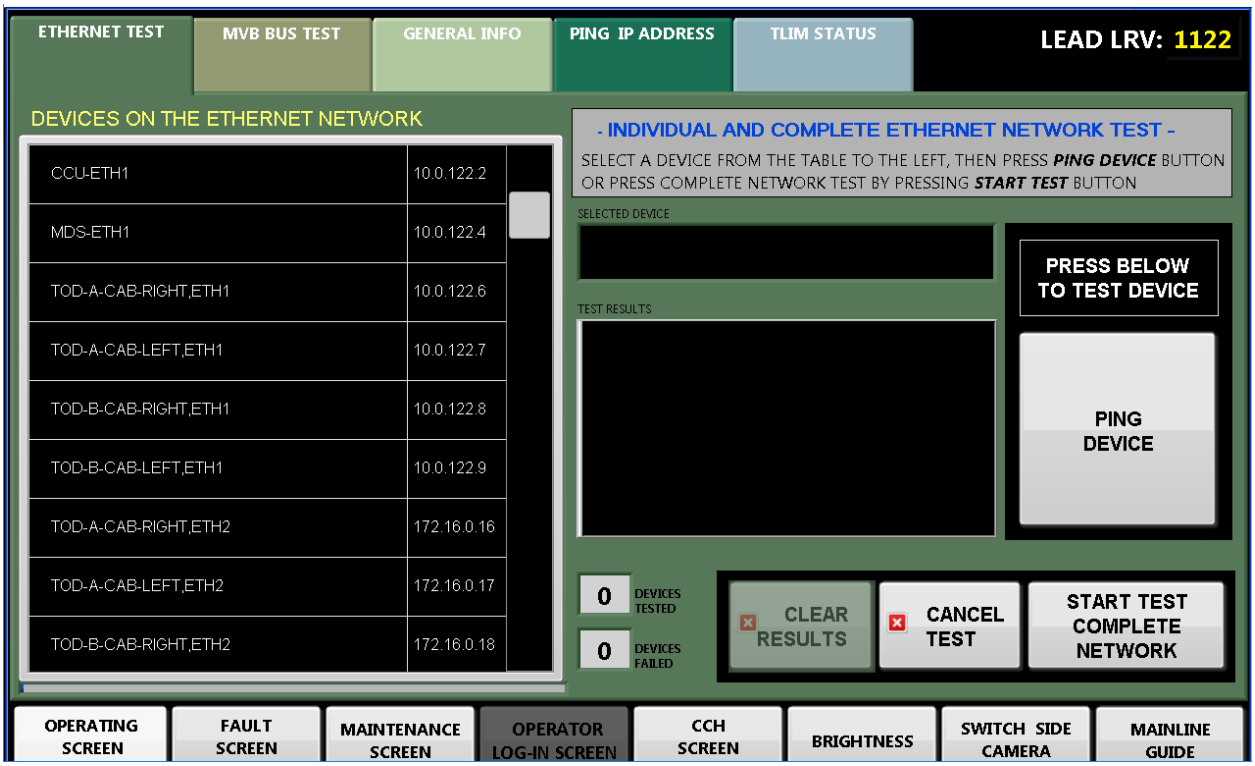


Figure 8-6: Ethernet Test

If a device fails to connect after multiple attempts, the P3010 LRV Circuit Diagrams can be used to troubleshoot the connection. Circuit sheets 800-849 show the communications and networking section of the circuits, this includes the Ethernet network connections. The switch and port locations that the devices use to connect to the Ethernet network can be found amongst these circuit sheets.

Look for groupings of lost functionality. If an Ethernet Switch is lost, all items connected to that switch would provide an indication to troubleshoot that switch or the signal source to that switch.

8.6 MDS Troubleshooting

The MDS computer has a few visual indications that can be used for troubleshooting. There are two different sets of status LEDs on the MDS computer. Ethernet status LEDs and general status LEDs, see Figure 8-7. The Ethernet status LEDs, two for each Ethernet channel. They signal the link and activity status, see Figure 8-8. The general status LEDs also represent different MDS computer conditions. The general LED descriptions can be seen in Figure 8-9.

If troubleshooting the MDS for hardware issues is unsuccessful, confirm that software is the correct version and is loaded properly. Programming the MDS is described in the Communications Equipment Programming Guide manual. Ensure that only the programs required for the MDS are installed. A listing is provided in the Programming Guide.

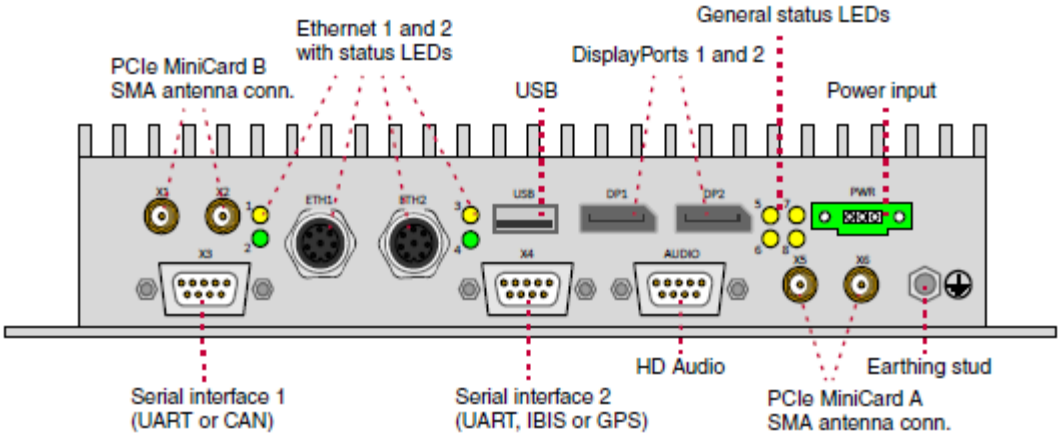


Figure 8-7: MDS Computer Front Panel

LED	Description	Color	Function
1	Port 1 link	green	on, when connection established
2	Port 1 activity	yellow	on, when Ethernet communication on Rx or Tx
3	Port 2 link	green	on, when connection established
4	Port 2 activity	yellow	on, when Ethernet communication on Rx or Tx

Figure 8-8: MDS Ethernet Status LED Description

If the Ethernet status LEDs are not illuminated, a connectivity issue between the MDS and the LRV network exists. The LRV circuits can be used to determine network connection locations and failure isolation can begin from this point.

LED	Description	LED	Description
5	User LED A	7	Onboard 12V OK
6	User LED B / Status	8	User LED C

Figure 8-9: MDS Ethernet Status LED Description

LED 5 and 8 are user defined by the application and can be programmed to represent specific conditions based on the application requirements. They are not programmed in this application. Therefore, they do not represent any specific conditions. LED 7 signals whether or not the onboard DC/DC converter is within a valid tolerance. LED 6 is a status LED connected to the MDS board controller. It could be in an error state that flashes repeatedly *n* times and pauses for 1 second until it is restarted or powered-off. If the system is in an error condition then the error code corresponds to the *n* number of flashes, see Figure 8-10.

If an internal failure occurs, and powering off the system does not reset the system, the CCU/MDS computer has failed such that it must be returned to the OEM for repair.

Error Code	Description	Solution
1	+V3.3A Voltage Failure	internal failure
2	Input Voltage Failure	internal failure
3	External Power Supply Failure	check power supply voltage range
4	CPU too hot	check thermal constraints
5	BIOS Live Sign Timeout	internal failure
6	System Reset Timeout	internal failure
7	Platform Reset Failure	internal failure
8	Chipset Handshake Failure	internal failure
9	System Power OK Failure	internal failure
255	Invalid PIC state	internal failure

Figure 8-10: MDS LED 6 Error Code Descriptions

8.7 MDS Troubleshooting Flow Chart

The flow chart shown in Figure 8-11 can be used to troubleshoot a suspected failure of the MDS hardware and/or software. Proper failure and fault isolation is pivotal to a timely and cost effective solution, whether that entails hardware replacement or repetitive software failures that require more in-depth engineering investigation.

It should be noted that this is not the only path of fault or failure determination and the LRV circuits should always be used as the primary method of troubleshooting or, at the very least, in conjunction with the flow chart shown in Figure 8-11.

APPENDIX A

The following fault code definitions are presented in this appendix. These fault codes compile a list of fault codes transmitted to the MDS by the various subsystems.

Please refer to the subsystem manuals as necessary for additional information and troubleshooting techniques.

- Automatic Passenger Counter (APC)
- Auxiliary Power Supply (APS)
- Automatic Train Control (ATC)
- Communications Control Unit (CCU)
- Door Control Unit (DCU)
- Network Video Recorder (NVR)
- Electronic Control Unit (ECU)
- Event Recorder (ER)
- Heating, Ventilation and Air Conditioning (HVAC)
- Monitoring and Diagnostic System (MDS)
- Propulsion Logic Unit (PLU)
- Train Control Network (TCN)
- Train Operator Display (TOD)
- TOA Communication System (TOA)

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APC Fault Code Definitions

The following table describes the Fault Codes and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Automatic Passenger Counter (APC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Automatic Passenger Counter System (APC) – APC Analyzer			
No connection / timeout– (see notes)	APCB has no connection to the APC analyzer	No connection	Check connection
Configuration error	APCB and APC analyzer configuration mismatch	Wrong configuration	Adapt configuration
Action failed	APCB failed to request counts from APC analyzer	Intermittent connection	Check connection
System error	APC analyzer report to APCB a system error	Error in the APC analyzer	Check APC analyzer and APC sensors
Software update failed	APCB failed to update the analyzer	Software update error	Check APC analyzer and run the update manually
Automatic Passenger Counter System (APC) – CoPilotPC Real Time Clock			
Defective	APCB has no connection to the integrated RTC clock	Internal hardware error	Replace APCB unit
Low battery	RTC clock report to APCB low battery voltage	Internal hardware error	Replace APCB unit
Automatic Passenger Counter System (APC) –PIC			
Defective	APCB has no connection to the integrated PIC	Internal hardware error	Replace APCB unit
Automatic Passenger Counter System (APC) – Internal EEPROM			
Defective	APCB has no connection to the integrated EEPROM	Internal hardware error	Replace APCB unit
Automatic Passenger Counter System (APC) – External EEPROM			
Defective	APCB has no connection to the external EEPROM	Internal hardware error or error with EEPROM in the backplane	Replace APCB unit or the backplane (mounting plate)
Automatic Passenger Counter System (APC) – Compact Flash Card			
Software update failed	The CF card of COPILOTpc is full.	No files can be uploaded	Check the connection between APCB and MDSB.

Automatic Passenger Counter (APC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Automatic Passenger Counter System (APC) – APC Sensor			
Defective	The connection between the APC analyzer and APC sensor is nonfunctional.	Sensor failure or connection issue	Check sensor and sensor cable
No connection / timeout– (	APCB has no connection		
Sabotage	APC sensor is sabotaged	Sensor failure	Check sensor and if sensor is covered
Illegal request	Counts from APC sensor are requested during “door open” state	Different door state between APC analyzer and APCB unit	Check APC analyzer door input

APS Fault Code Definitions

The following table describes the Fault Codes and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Auxiliary Power Supply (APS)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
APS_GeneralFaultAC	1. Firmware incorrect; 2. CAN-Bus faulty; 3. Power supply 15V faulty; 4. Self-test failed;	1) Software is incorrect 2) CAN-Bus cable defective; CAN-Bus plug is not correct connected. 3) power 15V is below 13,5V 4) Self-test failed, Sensor check failed etc.	1) New software upload is necessary 2) Check cable and plugs 3) Check wiring, replace power supply etc. **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_VinOutOfRangeAC	Input voltage too low or too high	1) Supply voltage too low or too high 2) Senssor defective 3) Input module (A101) defective	1) ------- 2) replace voltage sensor 3) replace module **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OverTemperatureAC	Over temperature at IVPS or INV detected	1) Ambient temperature too high 2) Over load	1) 2) load shed **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OverCurrentAC	Over current at IVPS or INV detected	1) Over load 2) Sensor defective	1) load shed 2) replace current sensor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OutputUnderVoltageAC	Inverter output voltage too low	1) Cable break 2) IGBT control defect 3) Sensor defect	1) Check wiring and if necessary replace cables 2) Replace module 3) Replace voltage sensor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OutputOverVoltageAC	Inverter output voltage too high	1) Voltage overshoot because of a big load shedding at the output 2) Output voltage sensor defective	1) Regulation too slow, resetting regulation parameter 2) replace voltage sensor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_InputOverVoltageAC	Input over voltage at IVPS	1) Supply voltage too high 2) Input voltage sensor defective 3) Input module (A101) defective	1) ------- 2) replace voltage sensor 3) replace module **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_GeneralFaultDC	1. Firmware incorrect; 2. CAN-Bus faulty; 3. Power supply 15V faulty; 4. Self-test failed;	1. Software incorrect 2. CAN-Bus cable defect; CAN-Bus plug is not correct connected. 3. Power 15V is below 13,5V 4. Self-test failed, Sensor check failed etc.	1) New software upload is necessary 2) Check cable and plugs 3) Check wiring, replace power supply etc. **For better fault analyze connect and open TT diagnostic tool ProDiag3000**

Auxiliary Power Supply (APS)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
APS_VinOutOfRangeDC	Input voltage too low or too high	1) Supply voltage too low or too high 2) Sensor defective 3) Input module (A101) defective	1) ------- 2) replace voltage sensor 3) replace module **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_BattSensFault	Battery temperature sensor failure (cable break or shorted)	1) Sensor not connected 2) Sensor shorted	1) Check all connections 2) Replace sensor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OverTemperatureDC	Heatsink over-temperature at LVPS section	1) Ambient temperature too high 2) Over load	1) 2) load shed **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OverCurrentDC	Overcurrent at LVPS detected	1) Over load 2) Sensor defect	1) load shed 2) replace current sensor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_OutputOverVoltageDC	LVPS output voltage too high	1) Voltage overshoot because of a big load shedding at the output 2) Output voltage sensor defective	1) Regulation too slow, resetting regulation parameter 2) replace voltage sensor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_InputOverVoltageDC	LVPS input voltage too high	1) Supply voltage too high 2) Input voltage sensor defective 3) Input module (A101) defective	1) ------- 2) replace voltage sensor 3) replace module **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_GeneralFaultCCU	1. Firmware incorrect; 2. CAN-Bus faulty; 3. Power supply 15V faulty; 4. Self-test failed; 5. Active Input Filter module is faulty;	1) Software incorrect 2) CAN-Bus cable defect; CAN-Bus plug is not correct connected. 3) power 15V is below 13,5V 4) Self-test failed 5) Input module overload or is defect	1) New software upload is necessary 2) Check cable and plugs 3) Check wiring, replace power supply etc. **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_DBS_Fault	DBS is faulty	1) DBS is defective 2) Loose connection of the DBS run feedback contact 3) CAN IO-board is faulty	1) Replace DBS module 2) Check wiring 3) Replace board **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_Fan_Fault	Internal fan is faulty	1) Fan is defect 2) Loose connection 3) CAN IO-board is faulty	1) Replace fan 2) Check wiring and connection 3) Replace IO-board **For better fault analyze connect and open TT diagnostic tool ProDiag3000**

Auxiliary Power Supply (APS)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
APS_CapacityLoss_Error	Capacity of the input capacitor is too low	1) Capacitor is defective or too old 2) Discharge resistor is defective	1) Replace input capacitor 2) Replace resistor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_CapacityLoss_Warning	Capacity of the input capacitor is too low	1) Capacitor is defective or too old 2) Discharge resistor is defective	1) Replace input capacitor 2) Replace resistor **For better fault analyze connect and open TT diagnostic tool ProDiag3000**
APS_ID	Transtechnik project identifier (Example 60200)	----------	----------
APS_APS_serial_number	APS serial number (Example U-011155)	----------	----------

ATC FAIL Fault Code Definitions

The following table describes the Fault Codes and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens. Note that it recommended that the ATC PTU be used for detailed fault review.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
TACH_SPIN_DETECTED	Tach Spin Detected	Triggered when the ATP system detects an abnormal acceleration from the tachometers that are outside the physical capabilities of the vehicle, 4mph/s.	Reset when the acceleration between the two tachometer sensors agree for one second and no speed mismatch is active.
TACH_SLIDE_DETECTED	Tach Slide Detected	Triggered when the dv/dt of either tachometer is greater than 6mph/s	Reset when the difference between speed sensors is less than 5 mph and the calculated decelerometer speed is within 5 mph of both sensors. Also reset by the operator key off and key on the active cab.
TACH_SPEED_MISMATCH	Tach Speed Sensor Mismatch	Triggered when the tachometer inputs are reading a difference in speed greater than6 mph for 16 seconds.	Check the tachometers to verify continuity to the system. If the problem persists, replace the tachometers. If the problem still persists, replace the multifunction board. If the problem still persists, the issues is outside the ATC Rack.
TACH_LOST_SENSORS_EVNT	Tach Loss of Sensors Detected	Triggered when a sudden drop to 0 mph on both tachometers occurs that is unrealistic.	Key the cab out and then back in to clear the crosscheck condition. If the problem still persists, check the tachometer installation. Check wires from tachometers to ATC rack. If the problem still persists, replace the multifunction board. If the problem still persists, the issue is outside the ATC rack.
TACH_LOST_SENSORS	Tach Loss of Sensors Error Detected	Triggered when a loss of sensors event is declared for more than 10 seconds.	Key the cab out and then back in to clear the crosscheck condition. If the problem still persists, check the tachometer installation. Check wires from tachometers to ATC rack. If the problem still persists, replace the multifunction board. If the problem still persists, the issue is outside the ATC rack.
DECEL_NOT_LEVEL	Decel Not Level	A decelerometer calibration was performed but the final values were outside the allowed level tolerance	Perform a decelerometer calibration and adjust the decelerometer to 128/128 +/- 2 bits.
DECEL_CAL_START	Decel Calibration Started	Triggered when a decelerometer calibration is started by the operator.	Informational event. No reset conditions.
DECEL_CAL_FAIL	Decel Calibration Failed	Triggered when a decelerometer calibration is started, but the calibration timed out or the values are outside the allowed tolerance.	Perform a decelerometer calibration and adjust the decelerometer to 128/128 +/- 2 bits.
DECEL_CAL_PASS	Decel Calibration Passed	Triggered when a decelerometer calibration is started and the values are accepted by the operator within the allowed time limit.	Informational event. No reset conditions.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
DECEL_CAL_EXIT	Decel Calibration Exited	Triggered when a decelerometer calibration was started, but rejected by the operator before accepted the new values.	Informational event. No reset conditions.
DECEL_CAL_INVALID	Decel Calibration Invalid	Triggered when a hardware or software error occurs on the decelerometer and the ATP can no longer trust the validity of the calibration.	Perform a successful decelerometer calibration.
ADU_LINK_FAILED	ADU link data is not being received	Triggered when the ATP is not receiving valid responses from the Adu within a certain time period.	Check the connection to the ADU and verify no loose or frayed wires are present. Verify continuity between the Adu and ATC rack. If the problem persists, replace the Adu. If the problem still persists, replace the ATP processor board.
FB_FAULT_ACTIVE	Friction Brake Fault Active	Triggered when the friction brake fault input to the ATP system is low.	Reset when the friction brake fault input goes high. Verify what caused a fault on the friction brake system.
MOTION_LINE_CHANGE	Line Type Change in Motion	triggered when the line selector switch is moved while the vehicle is in motion	Reset when the vehicle is at Vzero.
MOTION_MODE_CHANGE	Mode Change in Motion	Triggered when the mode selector switch is moved while the vehicle is in motion	Reset when the vehicle is at Vzero.
MOTION_REV_CHANGE	Reverser Change in Motion	Triggered when the reverser input changes direction while the vehicle is moving	Reset when the vehicle is at Vzero.
INVALID_MODE	Invalid Mode	Multiple mode inputs are on at the same time and the ATP cannot decide which mode the system should be in.	Ensure that only ATO or Manual mode is selected.
SPEED_LIMIT_CTRL_ACTIVE	Speed Limit Control Mode Activated	Triggered when the propulsion fault input is active to the ATP system.	Reset when the propulsion fault input turns off.
STUCK_ATP_RESET_SW_ERR	ATP Acknowledge Stuck Push Button	Triggered when the ATP acknowledge button input is on for 30 consecutive seconds or more	Reset by turning the ATP acknowledge button input off.
ENTER_MANUAL_MODE	Manual Mode entered	Triggered when the ATP enters manual mode	Informational event. No reset conditions.
ENTER_ATO_MODE	ATO Mode entered	Triggered when the ATC system enters ATO mode	Informational Event. No reset conditions.
ENTER_SP_MODE	Stop and Proceed Mode entered	Triggered when the ATC system enters stop and proceed mode.	Informational event. No reset conditions.
ENTER_CAR_WASH_MODE	Car Wash Mode entered	Triggered when the ATC system enters car wash mode.	Informational event. No reset conditions.
ENTER_STREET_MODE_MANUAL	Street Mode entered manually	Triggered when the ATC system enters street mode	Informational event. No reset conditions.
ENTER_LOCAL_MODE	Local Mode entered	Triggered when the ATC system enters Local Mode	Informational event. No reset conditions.
EVT_ATC_IN_BYPASS	Bypass Mode entered	Triggered when the ATC is placed in Bypass	Reset when the bypass input goes low and the ATC system enters normal operations.
EVT_ATC_NOT_IN_BYPASS	Bypass Mode exited	Triggered when the ATC is placed in normal mode from bypass mode	Informational event. No reset conditions.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EVT_DT_START	Departure Test Start	Triggered when the operator requests a departure test	Informational event. No reset conditions.
EVT_DT_MON_COND_FAILURE	Departure Test Monitor Condition Failed	Triggered when one of the initial conditions for the departure test are lost and the departure test must abort	Re-establish the initial conditions required to run a departure test and ensure the conditions are satisfied for the duration of the departure test. Train is in Manual Mode (No sub mode are active, eg Street Running) Train is at Vzero Direction is Forward Friction brakes are applied EB is released Penalty brake is clear No propulsion faults No friction brake faults Doors are closed
EVT_DT_PASS	Departure Test Passed	Triggered when the departure test is executed and passed	Informational event. No reset conditions.
EVT_DT_FAILED	Departure Test Failed	Triggered when the departure test is executed and failed.	Informational event. No reset conditions. Check events 68-81 four cause of failure.
EVT_DT_FSB_XCHK_FAILURE	Departure Test FSB Crosscheck Failure	Triggered when the departure test detects a failure of the Full Service Brake backcheck. The commanded relay is in the same state as the backcheck input	Verify the circuit for the backcheck continuity. Verify the safety relay is operating normally. If the problem persists, replace the relay associated with the output. If the problem still persists, replace the Mixed IO board.
EVT_DT_ABORT	Departure Test Abort	Triggered when the operator cancels the departure test before the test is completed.	Informational event. No reset conditions.
EVT_DT_OVRSPEED_FAIL	Departure Test Overspeed Failure - EB	Triggered when the departure test detects an issue with the emergency brake backcheck. The emergency brake output is in the same state as the backcheck input	Verify the PN159 relay is wired correctly and the connection is secure. Verify the multifunction board and mixed IO boards are securely installed in the ATC rack. If the problem persists, replace the PN159. If the problem still persists, replace the Multifunction board and Mixed IO board.
EVT_DT_MODE_FAILURE	Departure Test Mode Failure	Triggered when a departure test request is received but one or more of the initial conditions are not satisfied	Verify all initial conditions are satisfied and rerun the departure test. Train is in Manual Mode (No sub mode are active, eg Street Running) Train is at Vzero Direction is Forward Friction brakes are applied EB is released Penalty brake is clear No propulsion faults No friction brake faults Doors are closed

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EVT_DT_DCT_FAILURE	Departure Test Door Crosscheck Failure	Triggered when the door enable output is in the same state as the backcheck input	Verify the circuit for the backcheck continuity. Verify the safety relay is operating normally. If the problem persists, replace the relay associated with the output. If the problem still persists, replace the Mixed IO board.
EVT_DT_NO_ACK_PRESSED	No Acknowledge Pressed	Triggered when the operator fails to press the acknowledge button at the end of a departure test	Rerun the departure test and press the acknowledge button.
EVT_DT_CSRD_FAILED	CSRD Self test failure	Triggered when the ATC is running a departure test and the CSRD reports back a self test failure	Rerun the departure test. If the problem persists, replace the CSRD board.
EVT_CODE_A_NOT_ACHIEVED	Dept Test: Code Rate for Cab A Failed	Triggered when the departure test is expecting a code rate to be received and validated by the CSRD but the CSRD never reports the expected code rate on the A end of the vehicle.	Verify the multifunction board is securely installed in the ATC Rack. Verify the CSRD is able to receive cab signal. If no cab signal is received by the CSRD, verify pickup coils are installed and functioning properly. If CSRD and coils are working properly, replace the multifunction board. If problem persists, replace the CSRD board.
EVT_EB_APPLIED_TEST_FAILED	Dept Test: EB Applied Test failed	Triggered when the departure test detects an issue with the emergency brake backcheck. The emergency brake output is in the same state as the backcheck input	Verify the PN159 relay is wired correctly and the connection is secure. Verify the multifunction board and mixed IO boards are securely installed in the ATC rack. If the problem persists, replace the PN159. If the problem still persists, replace the Multifunction board and Mixed IO board.
SLIDE_TOO_LONG_WITH_BAD_DECEL	Slide with Bad Decel	Triggered when the ATP system detects a slide condition for over 2.75 seconds and the decelerometer is reporting an error and the values cannot be trusted	Recalibrate the decelerometer. If the problem persists, verify the 5v power supply line is within tolerance. If problem persists, replace decelerometer. If problem still persists, replace the multifunction board and power supply.
EVT_CODE_B_NOT_ACHIEVED	Dept Test: Code Rate for Cab B Failed	Triggered when the departure test is expecting a code rate to be received and validated by the CSRD but the CSRD never reports the expected code rate on the B end of the vehicle.	Verify the multifunction board is securely installed in the ATC Rack. Verify the CSRD is able to receive cab signal. If no cab signal is received by the CSRD, verify pickup coils are installed and functioning properly. If CSRD and coils are working properly, replace the multifunction board. If problem persists, replace the CSRD board.
EVT_ROLLBACK	Rollback	Triggered when the tach direction is expected to go in the FORWARD direction, but the tachometers are showing reverse movement. Triggered when the speed is above Vzero or the train moves 20 inches.	Verify the installation of the tachometers is 90 degrees from the gear teeth. Verify the wire and grounds are secure. If the problem persists, replace the tachometers. If the problem still persists, replace the multifunction board.
EVT_ROLLAWAY	Rollaway	Triggered when the tachometer are showing speed in the forward direction, but the M and CM trainlines are not indicating propulsion. Triggered when the speed is above Vzero or the train moves 20 inches.	Verify the master control is in the propulsion position and the input is being received by the ATC rack. Verify the tachometers are installed correctly. If the problem persists, replace the multifunction board. If the problem still persists, replace the vital input board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EVT_DT_DECEL_ERROR	Decelerometer error during departure test	Triggered during a departure test when the decelerometer is not calibrated or reporting a hardware failure.	Recalibrate the decelerometer. If the problem persists, verify the 5v power supply line is within tolerance. If problem persists, replace decelerometer. If problem still persists, replace the multifunction board and power supply.
EVT_CSRD_SELF_TEST_PASSED	Csrd Self Test Passed	Triggered when the CSRD Self Test reports a passed status to the ATP	Informational event. No reset conditions.
EVT_CSRD_SELF_TEST_REQUESTED	The Atp has requested a csrd Self Test	Triggered when the ATP system requests the CSRD to run a Self Test.	Informational event. No reset conditions.
EVT_DT_OVERSPEED_FSB_FAIL	Departure Test Overspeed Failure - Friction	Triggered when the departure test detects a failure of the ATC FSB relay.	Informational event. No reset conditions.
EPROM_INVALID_WHEEL_SIZE	Invalid Wheel Size	Triggered when the ATP detects a wheel size outside the allowed range.	Perform a valid wheel size calibration. If the problem persists, replace the EEPROM.
EPROM_INVALID_WS_COMPLEMENT	Invalid Wheel Size Complement	Triggered when the ATP reads the wheel size from the EEPROM but the complement of the wheel size does not match.	Perform a valid wheel size calibration. If the problem persists, replace the EEPROM.
EVT_FSK_TRACK_ID_BAD	Bad Track ID	A track circuit ID was detected that is not in the ATP track map.	This is a wayside track circuit problem. The track circuit has the wrong track ID programmed.
EVT_DT_6840_SPEED_TEST_FAILURE	Departure Test 6840 speed test failed	Departure Test 6840 speed test failed	Key off and key back on the cab. Then run departure test again. If problem persists replace the Multifunction PCB.
EVT_DT_VIA_SPEED_TEST_FAILURE	Departure Test VIA speed test failed	Departure Test VIA speed test failed	Key off and key back on the cab. Then run departure test again. If problem persists replace the Multifunction PCB.
ENTER_STREET_MODE_AUTO	Street Mode entered automatically	Street Mode was entered automatically	Informational event. No reset conditions.
EVT_FSK_INVALID_DIR	Invalid Direction	Triggered when the CSRD is reporting a direction value outside the allowed range	Informational event. No reset conditions.
EVT_FSK_TRACK_OUT_OF_SEQ	Track ID Out of Sequence	Triggered when the Atp detects a track circuit ID that is out of the expected order of track circuits	Check wayside equipment for proper functionality. If the problem persists, replace the CSRD board.
EVT_LOST_CAB	Lost Cab Signal	Triggered when the CSRD loses cab signal or the cab signal message cannot be validated	Run the departure test and verify that the test passes. If the test fails check for the following events: ATP CSRD Failure Event Rcvd, ATP_CSRD Module Fail, CSRD FSK Message Cleared Due to Mismatch.
EVT_INVALID_ORIENT	Invalid Orientation	Triggered when the orientation of the vehicle cannot be determined	Have the vehicle cross a wayside bond in either ATP or ATO mode to re-establish orientation.
SUDDEN_SPEED_DOWNGRADE	Sudden Speed Limit Downgrade Occurred	Triggered when the ATP detects a sudden downgrade in the allowed speed limit.	Informational event. No reset conditions.
ENFORCED_SPEED_EXCEEDED	Enforced Speed Limit has been exceed	Triggered when the vehicle speed is above the allowed speed limit.	Bring the vehicle under the speed limit and acknowledge any alarms

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
TARGET_NOT_FOUND	Target track circuit not found	Triggered when the target track circuit ID is outside the tabled track circuits.	Verify wayside equipment is functioning properly. If problem persists, replace the CSRD board.
ATO_LINK_DOWN_IN_ATO	The Ato link is down	Triggered when communication from the ATP to the ATO is lost	Verify both the ATP and ATO boards are securely installed in the ATC rack. Verify the power supply voltages are within tolerance. If problem persists, replace the ATO board. If problem still persists, replace the ATP board.
ATP_CSRD_SELF_TEST_FAILED	The Atp has reported the csrd self test to have failed.	Triggered when the ATP receives a failed self test status from the CSRD	Rerun a departure test. If the problem persists, replace the CSRD board.
ATP_WHEEL_SIZE_UPDATED_FROM_PTU	The wheel size has been updated from the PTU	Triggered when the user updates the wheel size from the PTU	Informational event. No reset conditions.
ATP_WHEEL_SIZE_UPDATED_FROM_TOD	The wheel size has been updated from the TOD	Triggered when the user updates the wheel size from the TOD	Informational event. No reset conditions.
ATP_PVID_UPDATED	The PVID has been updated	Triggered when the user updates the PVID	Informational event. No reset conditions.
ATP_SOFTWARE_UPLOAD_STARTED	The software upload had started	Triggered when a software upload has been requested and accepted by the ATP system	Informational Event. No reset conditions.
EVT_DOORS_NOT_CLOSED_PB	Doors are open while vehicle is moving	Triggered when the doors are open while the vehicle is moving above the No Motion limit of 0.5 mph.	Close the doors and bring the vehicle to a stop. Press acknowledge to clear any alarms. If problem persists, reset the ATC rack.
EVT_VEHICLE_RELEASE_PB	Vehicle release pressed while in ATO and moving	Triggered when the release pushbutton is pressed while in AUTO mode and the vehicle is in motion.	Depress the release pushbutton.
EVT_SPEED_IN_DEPT_TEST_EB	Speed was detected while in the dept. test	Triggered when the ATP detects speed pulses while the departure test is running.	Informational Event. No reset conditions.
EVT_OVERSPEED_BA_FAIL_EB	Brake assurance has failed	Triggered during an overspeed condition and the required brake assurance rate of 2.0 mph/s was not achieved	If the problem persists, check the braking system on the vehicle to ensure adequate brakes are being applied. Check the decelerometer calibration is valid.
EVT_PROFILE_OSL_EXCEEDED_EB	The OSL profile has been exceeded	Triggered during ATO mode when the ATO has exceeded the OSL profile and the ATP applied brakes	Reset when the vehicle speed is below the speed limit
EVT_BM_FAILED_EB	Brake monitoring has failed	Triggered when the brake monitoring function has determined the brakes are not achieving the required deceleration rate of 1.12 mph/s on a type II system.	Check the braking system to ensure adequate braking is being achieved
EVT_MARINE_BUMPER_DISTANCE_IEB	Fifteen ft distance in Marine bumper track exceeded	If the ATP position is greater than 15 feet when the vehicle is travelling west and the track circuit ID is the Marine platform exit track the ATP will apply the EB.	There is no clearing this event. The operator has to change the train direction and position the train in the Marine platform track.
EVT_MARINE_WEST_DISTANCE_IEB	Too far into Marine bumper with a missed bond	If the ATP misses the exit bond of the Marine platform track and the vehicle is travelling west and the track circuit ID is the Marine platform exit track the ATP will apply the EB.	There is no clearing this event. The operator has to change the train direction and position the train in the Marine platform track.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EVT_TRAIN_LENGTH_OUT_RANGE	Train length reported by MVB is out of range	The vehicle is reporting a train length greater than 3 or the MVB is down. When the MVB is down the train length sent to the ATC is 15.	Check that the vehicle TCMS is functioning correctly.
EVT_FB_FAULT_DOORS_NOT_CLOSED_IEB	Friction fault while doors not closed	The vehicle has indicated there are no friction brakes applied while the doors are open. Per CPUC guidelines brakes must be applied while doors are open. EB is applied to insure brakes are applied.	Will clear once vehicle indicates friction brakes are applied.
EVT_ILLEGAL_REVERSE_FSB	Illegal reverse	Vehicle put into reverse while in ATP or ATO mode. Reverse is only allowed in car wash mode.	Will clear once the reverser is Forward.
EVT_CPU_RESET_WITH_SPEED_FSB	Speed detected during Atp reset	The multifunction PCB is reporting that the train is still moving while the system is starting up.	If train is at Vzero and event is triggered replace multifunction PCB.
EVT_DOORS_ENABLED_FSB	Doors are enabled	Informational event that the FSB is applied because the doors are enabled.	N/A
EVT_DOORS_NOT_CLOSED_FSB	Doors are not closed	Informational event that the FSB is applied because the doors are open.	N/A
EVT_SW_UPLOAD_FSB	Software upload brakes	Informational event that the FSB is applied because software is being loaded.	N/A
EVT_DOOR_OVERRIDE_BY_OP	The doors have been overridden by the operator	The operator has used the door enable bypass function on the ADU.	N/A
EVT_DT_FSK_CAB_DETECTED_AT_DT_START	FSK Cab Signal was detected at the start of Dept Test	The ATP detected FSK cab signal at Dept Test start and will use this signal to test cab antennas (Type II only)	N/A
EVT_DT_NO_CAB_SIGNAL_DETECTED_AT_DT_START	FSK Cab Signal was not detected at the start of Dept Test	The ATP did not detect FSK cab signal at Dept Test start and will use signal the ATO to generate a test signal (Type II only)	N/A
EVT_EB_APPLIED_OUTSIDE_SYSTEM	The emergency brake has been applied by an outside subsystem.	Informational event where the emergency brake has been applied by an outside subsystem.	The event will reset when the conditions are no longer met.
EVT_ATO_INHIBITED	The ATP has inhibited the ATO from moving.	The ATP has detected a track that is not allowed while in ATO mode. A UES brake is applied.	The ATC will need to be bypassed. Reset the ATC once the vehicle is no longer in the non permitted track circuit.
EVT_NO_FRICTION_APP_DOORS_NOT_CLOSED_IEB	Friction brake is not applied and the door are not closed.	The vehicle has indicated there are no friction brakes applied while the doors are open and the vehicle is stopped. Per CPUC guidelines brakes must be applied while doors are open. EB is applied to insure brakes are applied.	Will clear once vehicle indicates friction brakes are applied.
EEPRM_NOT_MANUAL_MODE	Attempt to change eeprom while not in manual mode	The EEPROM data tried to be updated in an invalid state.	Place vehicle into manual mode.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EEPRM_NOT_VZERO	Attempt to change eeprom while not at vzero	The EEPROM data tried to be updated in an invalid state.	Make sure the vehicle is at Vzero.
EEPRM_NOT_NO_POWER	Attempt to change eeprom while propulsion request	The EEPROM data tried to be updated in an invalid state.	Make sure the master controller is in the FSB position.
EEPRM_ADJ_TIMEOUT	The time to adjust eeprom data has expired	The timeout has expired to update EEPROM data.	N/A
EEPRM_CLEAR_DECEL_CAL_FLAG	The decel calibration flag has been cleared	Triggered when the ATP clears the decelerometer calibration flag in EEPROM. This could occur during a failed calibration session, if the decelerometer becomes unstable, or if the EEPROM data becomes corrupted	Perform a successful decelerometer calibration.
EEPRM_DEFAULTS_SET	The eeprom defaults have been restored	Triggered when the ATP tries to read the EEPROM but the data returned is corrupted or the complement of the data does not match the stored value.	Informational event. No reset conditions.
EEPRM_BRAKES_NOT_SET	Eeprom - brakes not set	The EEPROM data tried to be updated in an invalid state.	Make the sure the friction brakes applied input is on.
ERR_BRN_TEST	Branch test failure	An internal CPU diagnostic has executed a branch command but returned to the incorrect address	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_REG_TEST	Register Test Failure	An internal CPU diagnostic has found an error while testing the internal registers of the CPU. The CPU Tried to read/write to a CPU register but never received a response	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_INST_TEST	Instruction Test Failure	An internal CPU diagnostic tested all assembly instructions and determined the improper response was received.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_STK_TEST	Stack Test Failure	An internal CPU diagnostic determined that the stack pointer has become corrupted.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_ROM_TEST	ROM Test Failure	The Read only memory of the microprocessor has been corrupted and cannot be read	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_RAM_TEST	RAM Test Failure	The Random access memory of the microprocessor has been corrupted and cannot be used	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_ADDR_BUS	Address Bus Test	The address lines of the microprocessor has become unstable or corrupted.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_DATA_BUS	Data Bus Test	The information on the data bus has become unstable or corrupted.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_STK_BOUNDS	Stack Boundaries Corrupted	The microprocessor stack pointer was tested and found to be outside the allocated range	Reset the ATP processor. If the problem persists, replace the ATP processor board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_RETURN_ADDR	Bad Return Address	The CPU has failed to function properly due to a microprocessor return address invalid	Reset the ATP processor. If the problem persists, replace the ATP processor board.
TIME_SOURCE	Time Source Failure	The CPU has failed to function properly due to a microprocessor failure of the primary or secondary time source interrupt falling outside the allowed range	Reset the ATP processor. If the problem persists, replace the ATP processor board.
ERR_TASK_CHECK_SUM	Task Checksum Failure	The CPU got caught in an infinite loop or the processing time was longer than the allowed cycle time.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
INV_EXCEPTION	Invalid Exception	The CPU has detected an undefined interrupt or unexpected interrupt.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
EEPROM_WRITE_FAIL	Eeprom Write Failure	The EEPROM never returned a write success or the write instruction timed out.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
DESTRUCTOR_CALLED	Destructor was called	The CPU tried to execute code inside the class destructor which should never be executed. The failure caused the CPU to shutdown.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
BUS_ERROR	Bus Error	The Bus lines on the ATP are corrupted or unresponsive	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VI1_TASK_CALL	Vital Input Task Error	The vital input driver did not execute all expected functions within the driver	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VI2_TASK_CALL	Vital Input 2 Task Error	The vital input driver did not execute all expected functions within the driver	Reset the ATP processor. If the problem persists, replace the ATP processor board.
MFB_TASK_CALL	Multifunction Board Task Error	the multifunction board driver did not execute all the expected functions within the driver	Reset the ATP processor. If the problem persists, replace the ATP processor board.
MFB_NVI_TASK_CALL	Mixed Vital I/O Board Task Error	The Mixed Vital I/O board driver did not execute all the expected functions within the driver	Reset the ATP processor. If the problem persists, replace the ATP processor board.
TASK_CALL_ERR	ATP Task Called Error	The ATP processor failed to execute all of the expected ATP logic.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
PURE_VIRTUAL	Pure Virtual Function Called	This error is received when the c++ has a run-time problem resolving a function address	Reset the ATP processor. If the problem persists, replace the ATP processor board.
SPURIOUS_INTERRUPT	Spurious Interrupt	The spurious interrupt handler was executed unexpectedly which cased the ATP processor to fail.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
MINE_FIELD_EVT	Mine Field Encountered	The CPU processor has a corrupted program counter or memory that caused the program counter to jump to an undefined area in memory.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
DB_COMPARE_ERR	Database Comparison Error	An internal comparison of the track map failed.	Reset the ATC CB. If the problem persists replace the ATP CPU.
SYSTEM_STARTUP	System Startup	Informational event of when the ATC startups.	N/A

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VV_COMPARE	Vital Variable Compare Error	Both copies of the vital variable do not match at the end of the cycle. The double path function that sets the variable produced different results for each copy.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_BOUNDS_CHECK	Vital Variable Bounds Check	A vital variable was set to a value that is outside the allowed range for that variable.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_INV_INSTANTIATION	Vital Variable Invoke Instantiation	There are too many vital variables or the CPU memory has become corrupted.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_VITAL_TABLE_CORRUPTED	Vital Variable Vital Table Corrupted	The CPU detected a vital variable that was declared but never initialized or the vital index pointer is outside the allowable range.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_BAD_POINTERS	Vital Variable Bad Pointer	The internal vital diagnostics has determined a mismatch on a vital variable pointer.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_CHECKSUM_ERROR	Vital Variable Checksum Error	The checksum of the vital variable's allowed values, or the table of allowed values has become corrupted.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_VITAL_TIMER_MISMATCH	Vital Variable Vital Timer Mismatch	One copy of the vital timer does not match the other copy and cannot be trusted. The failure caused the CPU to shutdown.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_TABLE_ECHO_FAILURE	Vital Variable Table Echo Failure	The vital variable table has become corrupted.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
VV_ARRAY_OUT_OF_BOUNDS	Vital Variable array index out of bounds	The vital variable index has been set to a value outside the allowable range.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
MIXED_VIN_TASK_CALL	Mixed IO Board Task Error	The mixed I/0 board missed or failed to execute all expected functions.	Reset the ATP processor. If the problem persists, replace the ATP processor board.
EEPROM_WRITE_VERIFY_FAIL	Eeprom Write Verify Failure	Triggered when a write to the EEPROM is executed but when reading back the data, the values do not match.	Reset the ATP processor. If the problem persists, replace the EEPROM board. If the problem still persists, replace the ATP processor board.
APP_CRC_MISMATCH	ATP Application CRC mismatch	Triggered when the calculated CRC does not match the CRC stored in memory	Reprogram the ATP Application logic. If the problem persists, replace the ATP CPU Board.
ATP_MISSED_BOND	Track circuit detected without a bond detect	Triggered when the ATP detects a new track circuit ID without validating a bond crossing.	The event will reset automatically. If problem persists (event occurs more than 20 times on a single Type II round trip) verify the installation of the pickup coils. Verify that the height is 3-6 inches above top of rail. Also, run the departure test and verify departure test passes.
ATP_BOND_SPI_BUSY	Unable to access bond data due to SPI being busy	Triggered when the ATP processor is too busy to process a bond crossing event.	Informational event. No reset condition.
VI_1_PCB_ERR	Vital Input 1 PCB Parent	N/A	N/A
VI_1_ECHO_REG_ERR	Vital Input 1 - Echo Register Error	An internal hardware check of the vital input board failed.	Reset the ATC CB. If the problem persists replace the vital input board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_TYPE_REG_ERR	Vital Input 1 - Type Error	An internal hardware check of the vital input board failed.	Reset the ATC CB. If the problem persists replace the vital input board.
VI_1_VPA_COMPARE_ERR	Vital Input 1 - VPA Compare Error	An internal hardware check of the vital input board failed.	Reset the ATC CB. If the problem persists replace the vital input board.
VI_1_INPUT_0_UNSTABLE	Vital Input 1 - Input 1 Unstable	Input 1 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Master Controler FSB A.
VI_1_INPUT_1_UNSTABLE	Vital Input 1 - Input 2 Unstable	Input 2 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Master Controller Coast A.
VI_1_INPUT_2_UNSTABLE	Vital Input 1 - Input 3 Unstable	Input 3 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Master Controller FSB B.
VI_1_INPUT_3_UNSTABLE	Vital Input 1 - Input 4 Unstable	Input 4 on the vital input board has toggled between states enough to reach the instability limit.. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Master Controller Coast B.
VI_1_INPUT_4_UNSTABLE	Vital Input 1 - Input 5 Unstable	Input 5 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, A End.
VI_1_INPUT_5_UNSTABLE	Vital Input 1 - Input 6 Unstable	Input 6 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, B End.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_6_UNSTABLE	Vital Input 1 - Input 7 Unstable	Input 7 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Type I.
VI_1_INPUT_7_UNSTABLE	Vital Input 1 - Input 8 Unstable	Input 8 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Type II.
VI_1_INPUT_8_UNSTABLE	Vital Input 1 - Input 9 Unstable	Input 9 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, ATP Bypass.
VI_1_INPUT_9_UNSTABLE	Vital Input 1 - Input 10 Unstable	Input 10 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Doors Closed A.
VI_1_INPUT_10_UNSTABLE	Vital Input 1 - Input 11Unstable	Input 11 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Doors Closed B.
VI_1_INPUT_11_UNSTABLE	Vital Input 1 - Input 12 Unstable	Input 12 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal Friction Brakes Applied A.
VI_1_INPUT_12_UNSTABLE	Vital Input 1 - Input 13 Unstable	Input 13 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Friction Brakes Applied B.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_13_UNSTABLE	Vital Input 1 - Input 14 Unstable	Input 14 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Friction Brake Fault.
VI_1_INPUT_14_UNSTABLE	Vital Input 1 - Input 15 Unstable	Input 15 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Propulsion Fault.
VI_1_INPUT_15_UNSTABLE	Vital Input 1 - Input 16 Unstable	Input 16 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, ATP Acknowledge.
VI_1_INPUT_0_SHORTED	Vital Input 1 - Input 1 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Master Controller FSBA.
VI_1_INPUT_1_SHORTED	Vital Input 1 - Input 2 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Master Controller Coast A.
VI_1_INPUT_2_SHORTED	Vital Input 1 - Input 3 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Master Controller FSB B.
VI_1_INPUT_3_SHORTED	Vital Input 1 - Input 4 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Master Controller Coast B.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_4_SHORTED	Vital Input 1 - Input 5 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, A End.
VI_1_INPUT_5_SHORTED	Vital Input 1 - Input 6 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, B End.
VI_1_INPUT_6_SHORTED	Vital Input 1 - Input 7 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Type I.
VI_1_INPUT_7_SHORTED	Vital Input 1 - Input 8 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Type II.
VI_1_INPUT_8_SHORTED	Vital Input 1 - Input 9 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, ATP Bypass.
VI_1_INPUT_9_SHORTED	Vital Input 1 - Input 10 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Doors Closed A.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_10_SHORTED	Vital Input 1 - Input 11 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Doors Closed B.
VI_1_INPUT_11_SHORTED	Vital Input 1 - Input 12 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Friction Brakes Applied A.
VI_1_INPUT_12_SHORTED	Vital Input 1 - Input 13 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Friction Brakes Applied B.
VI_1_INPUT_13_SHORTED	Vital Input 1 - Input 14 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Friction Brake Fault.
VI_1_INPUT_14_SHORTED	Vital Input 1 - Input 15 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Propulsion Fault.
VI_1_INPUT_15_SHORTED	Vital Input 1 - Input 16 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, ATP Acknowledge.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_0_MON_FAIL	Vital Input 1 - Input 1 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Master Controller FSB A.
VI_1_INPUT_1_MON_FAIL	Vital Input 1 - Input 2 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Master Controller Coast A.
VI_1_INPUT_2_MON_FAIL	Vital Input 1 - Input 3 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Master Controller FSB B.
VI_1_INPUT_3_MON_FAIL	Vital Input 1 - Input 4 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Master Controller Coast B.
VI_1_INPUT_4_MON_FAIL	Vital Input 1 - Input 5 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, A End.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_5_MON_FAIL	Vital Input 1 - Input 6 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, B End.
VI_1_INPUT_6_MON_FAIL	Vital Input 1 - Input 7 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Type I.
VI_1_INPUT_7_MON_FAIL	Vital Input 1 - Input 8 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Type II.
VI_1_INPUT_8_MON_FAIL	Vital Input 1 - Input 9 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, ATP Bypass.
VI_1_INPUT_9_MON_FAIL	Vital Input 1 - Input 10 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Doors Closed A.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_10_MON_FAIL	Vital Input 1 - Input 11 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Doors Closed B.
VI_1_INPUT_11_MON_FAIL	Vital Input 1 - Input 12 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Friction Brakes Applied A.
VI_1_INPUT_12_MON_FAIL	Vital Input 1 - Input 13 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Firction Brakes Applied B.
VI_1_INPUT_13_MON_FAIL	Vital Input 1 - Input 14 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Friction Brake Fault.
VI_1_INPUT_14_MON_FAIL	Vital Input 1 - Input 15 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Propulsion Fault.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_1_INPUT_15_MON_FAIL	Vital Input 1 - Input 16 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 1 is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and is causing the input to remain in an active state, ATP Acknowledge.
VI_2_PCB_ERR	Vital Input 2 PCB Parent	N/A	N/A
VI_2_ECHO_REG_ERR	Vital Input 2 - Echo Register Error	An internal hardware check of the vital input board failed.	Reset the ATC CB. If the problem persists replace the vital input board.
VI_2_TYPE_REG_ERR	Vital Input 2 - Type Error	An internal hardware check of the vital input board failed.	Reset the ATC CB. If the problem persists replace the vital input board.
VI_2_VPA_COMPARE_ERR	Vital Input 2 - VPA Compare Error	An internal hardware check of the vital input board failed.	Reset the ATC CB. If the problem persists replace the vital input board.
VI_2_INPUT_0_UNSTABLE	Vital Input 2 - Input 1 Unstable	Input 1 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Manual Mode.
VI_2_INPUT_1_UNSTABLE	Vital Input 2 - Input 2 Unstable	Input 2 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, ATO Mode.
VI_2_INPUT_2_UNSTABLE	Vital Input 2 - Input 3 Unstable	Input 3 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, M Trainline.
VI_2_INPUT_3_UNSTABLE	Vital Input 2 - Input 4 Unstable	Input 4 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, CM Trainline.
VI_2_INPUT_4_UNSTABLE	Vital Input 2 - Input 5 Unstable	Input 5 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Power Cut.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_5_UNSTABLE	Vital Input 2 - Input 6 Unstable	Input 6 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Forward.
VI_2_INPUT_6_UNSTABLE	Vital Input 2 - Input 7 Unstable	Input 7 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Reverse.
VI_2_INPUT_7_UNSTABLE	Vital Input 2 - Input 8 Unstable	Input 8 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, EB Applied.
VI_2_INPUT_8_UNSTABLE	Vital Input 2 - Input 9 Unstable	Input 9 on the vital input board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Safety Relay Backcheck Forward.
VI_2_INPUT_9_UNSTABLE	Vital Input 2 - Input 10 Unstable	Input 10 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Safety Relay Backcheck Reverse.
VI_2_INPUT_10_UNSTABLE	Vital Input 2 - Input 11 Unstable	Input 11 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Safety Relay Backcheck Power Cut.
VI_2_INPUT_11_UNSTABLE	Vital Input 2 - Input 12 Unstable	Input 12 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, **Vzero Backcheck**.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_12_UNSTABLE	Vital Input 2 - Input 13 Unstable	Input 13 on the vital input board has toggled between states enough to reach theinstability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Safety Relay Back Check Departure Test Select.
VI_2_INPUT_13_UNSTABLE	Vital Input 2 - Input 14 Unstable	Input 14 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Spare.
VI_2_INPUT_14_UNSTABLE	Vital Input 2 - Input 15 Unstable	Input 15 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Spare.
VI_2_INPUT_15_UNSTABLE	Vital Input 2 - Input 16 Unstable	Input 16 on the vital input board has toggled between states enough to reach the instability limit. 3 of 20 samples during the 20 ms sampling period disagree with the other 17 reads. The input is considered off until the condition clears.	Ensure the vital input board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal, Spare.
VI_2_INPUT_0_SHORTED	Vital Input 2 - Input 1 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Manual Mode.
VI_2_INPUT_1_SHORTED	Vital Input 2 - Input 2 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, ATO Mode.
VI_2_INPUT_2_SHORTED	Vital Input 2 - Input 3 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, M Trainline.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_3_SHORTED	Vital Input 2 - Input 4 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, CM Trainline.
VI_2_INPUT_4_SHORTED	Vital Input 2 - Input 5 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Power Cut.
VI_2_INPUT_5_SHORTED	Vital Input 2 - Input 6 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Forward.
VI_2_INPUT_6_SHORTED	Vital Input 2 - Input 7 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Reverse.
VI_2_INPUT_7_SHORTED	Vital Input 2 - Input 8 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, EB Applied.
VI_2_INPUT_8_SHORTED	Vital Input 2 - Input 9 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Backcheck Forward.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_9_SHORTED	Vital Input 2 - Input 10 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Backcheck Reverse.
VI_2_INPUT_10_SHORTED	Vital Input 2 - Input 11 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Backcheck Power Cut.
VI_2_INPUT_11_SHORTED	Vital Input 2 - Input 12 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Spare.
VI_2_INPUT_12_SHORTED	Vital Input 2 - Input 13 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Backcheck Departure Test Slect.
VI_2_INPUT_13_SHORTED	Vital Input 2 - Input 14 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Spare.
VI_2_INPUT_14_SHORTED	Vital Input 2 - Input 15 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Spare.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_15_SHORTED	Vital Input 2 - Input 16 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Spare.
VI_2_INPUT_0_MON_FAIL	Vital Input 2 - Input 1 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital input board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure, Manual Mode.
VI_2_INPUT_1_MON_FAIL	Vital Input 2 - Input 2 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, ATO Mode.
VI_2_INPUT_2_MON_FAIL	Vital Input 2 - Input 3 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, M Trainline.
VI_2_INPUT_3_MON_FAIL	Vital Input 2 - Input 4 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, CM Trainline.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_4_MON_FAIL	Vital Input 2 - Input 5 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Power Cut.
VI_2_INPUT_5_MON_FAIL	Vital Input 2 - Input 6 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Forward.
VI_2_INPUT_6_MON_FAIL	Vital Input 2 - Input 7 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Reverse.
VI_2_INPUT_7_MON_FAIL	Vital Input 2 - Input 8 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, EB Applied.
VI_2_INPUT_8_MON_FAIL	Vital Input 2 - Input 9 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Safety Relay Backcheck Forward.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_9_MON_FAIL	Vital Input 2 - Input 10 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Safety Relay Backcheck Reverse.
VI_2_INPUT_10_MON_FAIL	Vital Input 2 - Input 11 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Safety Relay Backcheck Power Cut.
VI_2_INPUT_11_MON_FAIL	Vital Input 2 - Input 12 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Spare.
VI_2_INPUT_12_MON_FAIL	Vital Input 2 - Input 13 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issue is outside of the ATC enclosure and is causing the input to remain in an active state, Safety Relay Backcheck Departure Test Select.
VI_2_INPUT_13_MON_FAIL	Vital Input 2 - Input 14 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Spare.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
VI_2_INPUT_14_MON_FAIL	Vital Input 2 - Input 15 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Spare.
VI_2_INPUT_15_MON_FAIL	Vital Input 2 - Input 16 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the Vital Input board 2 is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the vital input board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Spare.
MFB_ECHO_REG_ERR	Multifunction Board Echo Register Error	The ATP processor tried to write a value to the multifunction board but did not receive a response.	Ensure the correct multifunction board is installed. Ensure the board is securely plugged into the correct slot inside the card file. Ensure no bent pins on the backplane and the board. If the problem persists, replace the multifunction board.
MFB_TYPE_REG_ERR	Multifunction Board Type Register Error	The ATP processor was expecting a different multifunction board type than what was received.	Ensure the correct multifunction board is installed. Ensure the board is securely plugged into the correct slot inside the card file. Ensure no bent pins on the backplane and the board. If the problem persists, replace the multifunction board.
MFB_WRITE_COMP_ERR	Multifunction Board Write Compare Error	The echo and type checks passed on the multifunction board, but the read back returned a different value than what was written.	Ensure the correct multifunction board is installed. Ensure the board is securely plugged into the correct slot inside the card file. Ensure no bent pins on the backplane and the board. If the problem persists, replace the multifunction board.
MFB_DECEL_ADC_BUSY	Decelerometer ADC busy	The multifunction board tried to read the decelerometer but the register reported a busy status.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. If the problem persists, replace the multifunction board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MFB_DECEL_NOT_NEAR_ZERO	Decelerometer not near zero	The ADC circuit was briefly turned off to verify the ADC circuit was not stuck high. The test turned off the circuit, but was still reading values from the ADC.	Check the multifunction board is securely plugged into the correct slot inside the card file. Check the 5v reference voltages on the power supply. Check the + and - 12v reference voltages on the power supply to ensure they are within tolerance. Verify ground connections are installed and secure since this is typically an outside noise issue. If the problem persists, replace the decelerometer and multifunction board. If the problem still persists, the issue is outside the ATC enclosure
MFB_DECEL_UNSTABLE	Decelerometer not stable	This event is associated with the Decelerometer bad data and Decelerometer not near 0 events. If either of the above events are triggered long enough, a hardware error is declared and the unstable event is triggered.	Check the multifunction board is securely plugged into the correct slot inside the card file. Check the 5v reference voltages on the power supply. Check the + and - 12v reference voltages on the power supply. Verify ground connections are installed and secure. Perform a static 10 turns test on the decelerometer to ensure the accuracy. If the problem persists, replace the decelerometer and multifunction board.
MFB_BAD_DECEL_VALUES	Decelerometer is reporting bad values	The decelerometer readings from the analog to digital converters are reporting values outside of the allowed tolerance.	Check the multifunction board is securely plugged into the correct slot inside the card file. Check the 5v reference voltages on the power supply. Check the + and - 12v reference voltages on the power supply. Verify ground connections are installed and secure. If the problem persists, replace the multifunction board. If the problem still persists, replace the power supply.
DECEL_CAL_INVALID_LOW_FLUID	Decel Cal Invalid - Low Fluid	Triggered when the low fluid algorithm is reporting that the decelerometer acceleration rate is above the calculated tachometer rate for 4 out of the last 5 tests. The decelerometer calibration is invalidated and all brake rates are set to 0.	Perform a static 10 turns test on the decelerometer to ensure proper readings. Recalibrate the decelerometer. If the problem persists, replace the decelerometer. If the problem still persists, replace the multifunction board.
MFB_NVI_INPUT_1_UNSTABLE	Non-Vital Input 0 Unstable	Input 1 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Track Brake Applied.
MFB_NVI_INPUT_2_UNSTABLE	Non-Vital Input 1 Unstable	Input 2 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, TWC Cutout.
MFB_NVI_INPUT_3_UNSTABLE	Non-Vital Input 2 Unstable	Input 3 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Spare.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MFB_NVI_INPUT_4_UNSTABLE	Non-Vital Input 3 Unstable	Input 4 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Spare.
MFB_NVI_INPUT_5_UNSTABLE	Non-Vital Input 4 Unstable	Input 5 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Safety Relay Backcheck Amp Power A End.
MFB_NVI_INPUT_6_UNSTABLE	Non-Vital Input 5 Unstable	Input 6 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Safety Relay Backcheck Amp Power B End.
MFB_NVI_INPUT_7_UNSTABLE	Non-Vital Input 6 Unstable	Input 7 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Battery Over Voltage.
MFB_NVI_INPUT_8_UNSTABLE	Non-Vital Input 7 Unstable	Input 8 on the multifunction board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the multifunction board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the multifunction board, Battery Under Voltage.
MFB_OUTPUT1_FAIL	Vital Output 0 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, Forward.
MFB_OUTPUT2_FAIL	Vital Output 1 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, Reverse.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MFB_OUTPUT3_FAIL	Vital Output 2 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, Power Cut.
MFB_OUTPUT4_FAIL	Vital Output 3 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, **Spare**.
MFB_OUTPUT5_FAIL	Vital Output 4 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, **Spare**.
MFB_OUTPUT6_FAIL	Vital Output 5 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, Spare.
MFB_OUTPUT7_FAIL	Vital Output 6 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, Departure Test Select.
MFB_OUTPUT8_FAIL	Vital Output 7 Fail	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the multifunction board. If the problem still persists, the issues are outside of the ATC enclosure, Spare.
MFB_MONITOR_FAIL	Monitor Fail	The monitor circuit that ensures the outputs are in the expected state has reported a critical error to the CPU board.	Ensure the multifunction board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. If the problem persists, replace the multifunction board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EVT_DECEL_MAX_DIST	Decel test not run within maximum distance	Test not run within 100 miles and decel needs re-calibrated.	Calibrate decel.
DECEL_LOW_FLUID_TEST_FAIL	Decel low fluid test failed	informational event triggered when all criteria for the low fluid test have been satisfied and the test failed within the required distance	Perform a static 10 turns test on the decelerometer to ensure proper readings. Recalibrate the decelerometer. If the problem persists, replace the decelerometer. If the problem still persists, replace the multifunction board.
DECEL_LOW_FLUID_TEST_PASS	Decel low fluid test passed	Triggered when all criteria for the low fluid test have been satisfied and the test passed within the required distance	No reset conditions. This is an informational event.
CSRD_PCB_ERROR	CSRD PCB Parent	No trigger conditions, this is a parent ID	No reset conditions for Parent ID
ATP_CSRD_CH1_MSG_BAD_CRC_ERROR	CSRD Ch1 Msg Bad Crc Error	Triggered when the CSRD channel 1 message CRC has an error.	Informational Event. No reset conditions.
ATP_CSRD_CH2_MSG_BAD_CRC_ERROR	CSRD Ch2 Msg Bad Crc Error	Triggered when the CSRD channel 2 message CRC has an error	Informational Event. No reset conditions.
ATP_CSRD_CH1_MSG_SEQ_NUM_ERROR	CSRD Ch1 Msg Seq Num Error	Triggered when the CSRD channel 1 sequence number is stale or corrupted	Informational Event. No reset conditions.
ATP_CSRD_CH2_MSG_SEQ_NUM_ERROR	CSRD Ch2 Msg Seq Num Error	Triggered when the CSRD channel 2 sequence number is stale or corrupted	Informational Event. No reset conditions.
ATP_CSRD_IMP_MSG_BAD_CRC_ERROR	CSRD Imp Msg Bad Crc Error	Not used.	Not used.
ATP_CSRD_IMP_MSG_SEQ_NUM_ERROR	CSRD Imp Msg Seq Num Error	Not used.	Not used.
ATP_CSRD_STS_MSG_BAD_CRC_ERROR	ATP CSRD Sts Msg Bad Crc Error	Triggered when the CSRD status message has a CRC error.	Informational Event. No reset conditions.
ATP_CSRD_STS_MSG_SEQ_NUM_ERROR	ATP CSRD Sts Msg Seq Num Error	Triggered when the CSRD Status message sequence number is corrupted or stale.	Informational Event. No reset conditions.
CSRD_INVALID_EVENT	CSRD Invalid	Corrupted message.	If issue persists reset the ATC rack.
CSRD_UNDEFINED	CSRD Undefined	The CSRD has triggered an event that is listed as a valid event, but undefined in the ATP system.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_UNKNOWN	CSRD Unknown	The CSRD has triggered an event that is listed as a valid event, but undefined in the ATP system.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_DATA_BUS_ERR	CSRD Data Bus Err	The internal diagnostic on the CSRD has determined the data bus on the CSRD is corrupted or failed	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_ADDRESS_BUS_ERR	CSRD Address Bus Err	The internal diagnostic on the CSRD has determined the address bus on the CSRD is corrupted or failed	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_POWERON_RAM_ERR	CSRD Power on Ram Err	The CSRD performed a memory check on the RAM boundaries and the check has failed	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CSRD_PERIODIC_RAM_ERR	CSRD Periodic Ram Err	The CSRD performed a memory check on the RAM and the check has failed	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_POWERON_CODE_ERR	CSRD Power on Code Err	The CSRD has shut down because it detected a code rate before completing the power up sequence	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_PERIODIC_CODE_ERR	CSRD Periodic Code Err	The CSRD has shut down because it detected a code rate before completing the power up sequence	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_REG_TEST_ERR	CSRD Reg Test Err	An internal CSRD diagnostic has detected an error with one of its registers and shut down.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INSTRUCT_TEST_ERR	CSRD Instruct Test Err	The CSRD has failed a internal diagnostic on one of the assembly instruction tests.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_STACK_BOUNDS_ERR	CSRD Stack Bounds Err	The CSRD has detected that the internal stack bounds are outside of the allowed tolerance	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_SPURIOUS_INT_ERR	CSRD Spurious Interrupt	The CSRD has encountered an interrupt that is not defined in the vector table. The spurious interrupt handler has been called and caused a system error.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_TASK_CHECKSUM_ERR	CSRD Task Checksum Err	Not all the executive functions were called within the allowed cycle time which caused the a checksum mismatch.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INVALID_BOOL	CSRD Invalid Bool	The CSRD has detected that the boot program has failed to launch or does not exist	**Power cycle the ATC rack**. If the problem persists, reload the boot program. If the problem still persists, replace the CSRD.
CSRD_INVALID_INT	CSRD Invalid Int	The internal INT16 type has become corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD.
CSRD_INVALID_INT16	CSRD Invalid Int16	The internal INT16 type has become corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD.
CSRD_INVALID_U_BYTE	CSRD Invalid U Byte	The internal U_BYTE type has become corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INVALID_U_INT	CSRD Invalid U Int	the internal U_INT32 type has become corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INVALID_U_INT16	CSRD Invalid U Int16	the internal U_INT16 type has become corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INVALID_U_INT32	CSRD Invalid U Int32	the internal U_INT32 type has become corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_SYS_CAL_MSG	CSRD Inv Sys Cal Msg	The ATP has communicated to the CSRD an invalid system calibration message. The message was corrupted going to the CSRD	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CSRD_INV_SYS_COMMAND_MSG	CSRD Inv Sys Command Msg	The ATP has communicated to the CSRD an invalid system command message. The message was corrupted going to the CSRD	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_TEST_SIG_TYPE	CSRD Invalid Test Signal Type Received	Triggered when an unknown test signal type is received by the CSRD	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_NO_NEW_MSG_DATA	CSRD No New Msg Data	The CSRD expects periodic messages from the ATP and has not received a new message in the allocated time.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_CH_FREQ	CSRD Inv Ch Freq	The CSRD tested its hardware by using a known test signal, but the signal returned an unexpected value and caused the CSRD to shutdown.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_IMP_ASPECT_NUM	CSRD Inv Imp Aspect Num	Triggered when the CSRD reports an aspect number outside of the allowed range	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_IMP_CYCLE_TO_DETECT	CSRD Inv Imp Cycle To Detect	Triggered when the CSRD has detected a cycle to detect outside the allowed range.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_IMP_PERIOD	CSRD Inv Imp Period	Triggered when the CSRD detects an impulse period outside the allowed range	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_MC_ASPECT_NUM	CSRD Inv Mc Aspect Num	Triggered when the CSRD detects an modulated carrier aspect number outside the allowed range	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_MC_DUAL_CARRIER_MODE	CSRD Inv Mc Dual Carrier Mode	Triggered when the CSRD detects an invalid modulated dual carrier mode.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_MC_DUTY_CYCLE	CSRD Inv Mc Duty Cycle	Triggered when the CSRD detects a duty cycle outside the allowed range of the modulated carrier mode.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_MC_PERIOD	CSRD Inv Mc Period	Triggered when the CSRD detects a period outside the allowed range while in modulated carrier mode	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INV_MC_TRANS_TO_DETECT	CSRD Inv Mc Trans To Detect	Triggered when the CSRD detects the transitions to detect has fallen outside the allowed range for modulated carriers	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board
CSRD_CYCLE_TIMER_CONFIG	CSRD Cycle Timer Config	Triggered when the CSRD cycle timer configuration has fallen outside the allowed tolerance.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board
CSRD_CRIT_COMP_CHK_FAILURE	CSRD Crit Comp Chk Failure	Triggered when one processor disagrees with the other processor and the CSRD goes into a system failure	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board
CSRD_CRIT_DEMOD_TEST_FAILURE	CSRD Crit Demod Test Failure	Triggered when the demodulation test reports a failure	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CSRD_DEMOD_TEST_REQUIRED	CSRD Demod Test Required	Triggered when the CSRD determines that a CSRD Self Test is required	Run a departure test. If the problem persists, replace the CSRD board.
CSRD_TEST_DEF_FREQ_MISMATCH	CSRD Test Def Freq Mismatch	Triggered when the test frequency's between processors have a mismatch	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_BOARD_RESET_ISSUED	CSRD Board has been reset	Triggered by the CSRD on power up.	Informational Event. No reset conditions.
CSRD_UART1_FRAME_ERROR	CSRD UART 1 Framing Error	Triggered when the CSRD detects a UART 1 Framing Error	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_UART1_RX_OVERRUN_ERROR	CSRD UART 1 Overrun Error	Triggered when the CSRD UART 1 Overrun Error is detected by the CSRD.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_UART1_RX_QUEUE_FULL	CSRD UART 1 Rx Queue Full	Triggered when the UART 1 Rx Queue is full	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_RX_ARB_WAIT_TIME_EXCEED_2X	CSRD Rx Wait Time Exceeded	Triggered when the RX wait timer has expired	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INVALID_SYSTEM_CAL_MSG	CSRD Invalid System Calibration	Triggered when the CSRD detects a corrupted or missing System Calibration value.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_INVALID_SYSTEM_COMMAND	CSRD Invalid System Command	Triggered when the System Command message is corrupted	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_UART1_TX_QUEUE_FULL	CSRD UART 1 Tx Queue Full	Triggered when the CSRD UART 1 transmit queue is full	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_UART1_TX_OVERRUN_ERR	CSRD UART 1 Tx Queue Overrun Error	Triggered when the Transmit queue on UART 1 has an overrun in its limits	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_TX_ARB_WAIT_TIME_EXCEED_2X	CSRD Arbitration Wait Time Exceeded	Triggered when the CSRD Arbitration wait time exceeded its maximum value.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_LEDS_DISABLED	CSRD LEDs Disabled	Triggered when the CSRD receives the disable LED command by the ATP.	Informational Event. No reset conditions.
CSRD_INV_TEST_SIG_TYPE_RECEIVED	CSRD Invalid Test Signal Type Received	Triggered when an unknown test signal type is received by the CSRD	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CSRD_SAFE_ASP_DATA_MSG_USED	CSRD Safe Aspect Message Data Used	Triggered when the safe aspect message data is being used by the CSRD	Informational Event. No reset conditions.
CSRD_SAFE_TEST_MSG_DATA_USED	CSRD Safe Test Message Data Used	Triggered when the CSRD safe Test message data is being used.	Informational Event. No reset conditions.
CSRD_CONFIG_CRC_ERROR	CSRD Configuration CRC Error	Triggered when the CSRD configuration CRC error is received.	**Power cycle the ATC rack**. If the problem persists, reload the configuration pages. If the problem still persists, replace the CSRD board.
CSRD_PROJECT_CONFIG_CRC_ERR	CSRD Project Configuration CRC Error	The CSRD project configuration has a CRC error and can not be trusted	Reload the Project Configuration file on both processors. If the problem persists, replace the CSRD board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CSRD_INVALID_CONFIG	CSRD Configuration Invalid	Triggered when the CSRD configuration file is invalid.	Reload the configuration files. If the problem persists, replace the CSRD board.
CSRD_IMPULSE_ASP_MISMATCH	CSRD Impulse Aspect Mismatch	Not used.	Not used.
CSRD_FSK_MSG_CLEARED	CSRD FSK Message Cleared Due to Mismatch	Triggered when a mismatch in the data between the two halves of the CSRD disagree.	Key down cab and restart. If problem persists move the train out of the current track circuit in ATC Bypass mode.
CSRD_INVALID_PROJECT_CONFIG	CSRD Invalid Project Configuration	Triggered when the project configuration is detected to be invalid.	Reload the Project Configuration file on both processors. If the problem persists, replace the CSRD board.
CSRD_FSK_BAD_CRC	CSRD Bad FSK CRC	A track circuit message with a bad CRC was detected.	Informational event. If the problem persists verify that the receiver coils are 3-6 inches above the top of rail. Run departure test if departure test fails replace CSRD PCB.
CSRD_ARBITRATION_TIMEOUT	CSRD Arbitration Timed Out	CSRD Arbitration Timed Out	Power cycle the ATC rack. If the problem persists, replace the CSRD board.
CSRD_CRC_ERROR	CSRD CRC Error	CSRD detected a CRC error	Power cycle the ATC rack. If the problem persists, replace the CSRD board.
ATP_FSK_MSG_BAD_CRC_ERROR	Atp FSK Message Bad CRC Error	The ATP received a track circuit message from the CSRD with a bad CRC.	Informational event. If the problem persists replace CSRD PCB.
ATP_FSK_MSG_SEQ_NUM_ERROR	Atp FSK Message Sequence Number Error	The ATP received a track circuit message from the CSRD with a bad sequence number.	Informational event. If the problem persists replace CSRD PCB.
ATP_CSRD_LINK_DOWN	ATP CSRD Link Down	Triggered when the ATP no longer receives responses from the CSRD	**Power cycle the ATC rack**. If the problem persists, ensure the CSRD is securely plugged into the system. If the problem persists, replace the CSRD board.
ATP_CSRD_FAILURE_EVNT_RCVD	ATP CSRD Failure Event Rcvd	Triggered when the ATP receives a failure event indication from the CSRD	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
ATP_CSRD_UNEXPECTED_SELFTEST_REQ	ATP CSRD Unexpected Self test Req	Triggered when the CSRD starts a self test but was not told to do so by the ATP	Informational Event. No reset conditions.
ATP_CSRD_DATA_MISMATCH_ERROR	ATP_CSRD Data Mismatch Error	Triggered when there is a data mismatch between processors on the CSRD board.	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
ATP_CSRD_MODULE_FAIL	ATP_CSRD Module Fail	Triggered when the CSRD module has a critical failure	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
ATP_CSRD_PROJECT_CONFIG_MISMATCH	CSRD Project Config Revision Mismatch	Triggered when the project configuration revision has a mismatch between processors.	Reload the Project Configuration file on both processors. If the problem persists, replace the CSRD board.
ATP_CSRD_SYSTEM_CONFIG_MISMATCH	CSRD System Config Revision Mismatch	Triggered when the system configuration revision has a mismatch between processors.	Reload the system configuration file on both processors. If the problem persists, replace the CSRD board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ATP_CSRD_SW_CONFIG_MISMATCH	CSRD Software Application Revision Mismatch	Triggered when the CSRD detects a application software revision mismatch between processors.	Reload the application software on the CSRD. If the problem persists, replace the CSRD board.
ATP_CSRD_SELF_TEST_UNRESPONSIVE	CSRD Self test Unresponsive	Triggered when the self test timer in the CSRD has expired	**Power cycle the ATC rack**. If the problem persists, replace the CSRD board.
CROSSCHECK	Crosscheck Parent	N/A	N/A
CC_KEYED_CAB	Keyed Cab Crosscheck Error	Triggered when both cabs indicate they are keyed up.	Check that both cabs are not keyed up. If problem persists replace vital input board.
CC_LINE_SEL	Line Selector Crosscheck Error	Indicates both Type I and Type II modes are selected.	Check that the line selector switch is to either type I or type II. If problem persists replace vital input board.
CC_FSB_RLY	FSB Relay Backcheck Error	The FSB relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_ELD_RLY	L Door Enable Relay Backcheck Error	The left door enable relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_ERD_RLY	R Door Enable Relay Backcheck Error	The right door enable relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_DPT_SRC_SIG_RLY	Depart Cab Source Backcheck Error	The departure test cab source relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_FWD_REV	Fwd-Rev Crosscheck Error	Triggered when both Forward and Reverse Trainlines are set.	Ensure that either the fwd or rev input is on at any given time.
CC_VZ_DECEL	Vzero/Decel Crosscheck Error	Triggered when the Atp detects movement on the decelerometer without associated tachometer pulses. The movement threshold has been exceeded and the tachometers are no longer trusted	Ensure the tachometers are installed correctly and providing sufficient pulses. Recalibrate the decelerometer on level tangent track. If the problem persists, replace the tachometers.
CC_DIRECTION	Direction Crosscheck Error	Triggered when both Forward and Reverse Trainlines are set.	Check that the vehicle is in either Forward or Reverse. If problem persists replace vital input board.
CC_CAB_SIG_SEL_A_RLY	Cab Signal A Backcheck Error	The A End Cab Signal Select relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_CAB_SIG_SEL_B_RLY	Cab Signal B Backcheck Error	The B End Cab Signal Select relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_PC_RLY	Propulsion Cut Relay Backcheck Error	The Propulsion Cut relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_FORWARD_RLY	Forward Backcheck Error	The Forward relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_REVERSE_RLY	Reverse Backcheck Error	The Reverse relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_MODE_SEL	Mode Select Crosscheck Error	Triggered when both ATO and ATP mode are selected at the same time.	Verify that the mode selector switch is in the correct position.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CC_TEST_SIG_SEL_A_RLY	Test Signal Select A Backcheck error	The Test Signal Select A relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_TEST_SIG_SEL_B_RLY	Test Signal Select B Backcheck error	The Test Signal Select B relay back contact does not match the state of the front contact.	Reset ATC rack circuit breaker. If problem persists replace safety relay board.
CC_ATP_BYPASS	Bypass Selector Crosscheck Error	Triggered when input indicates ATP is bypassed and not bypassed.	Check that the ATP bypass switch is in either the bypass or not bypassed position. If the problem persists replace the vital input board.
CC_EB_XCHK	EB Crosscheck Error	Triggered when the ATC requests EB but the vehicle trainline indicates the EB is not applied.	N/A
EMERG_BRK_APPLIED	Emergency Brake Applied	Informational event triggered anytime the ATP requests an emergency brake.	Clear the condition that is causing the emergency brake. Make sure the vehicle is at Vzero and acknowledge any alarms. Key out and Key in the Cab. If problem persists, reset the ATP.
PENALTY_BRK_APPLIED	Penalty brake applied	A condition to trigger the penalty brake is true.	Acknowledge the penalty brake. If the problem persists reset the ATC CB.
PROP_CUT_THRESH_EXCEEDED	Propulsion Cut Threshold Exceeded	The vehicle speed is above the OSL and power cut was applied.	N/A
IES_BRAKE_APPLIED	IES Brake applied	A condition to trigger the IES brake is true.	Acknowledge the IES brake. If the problem persists reset the ATC CB.
UES_BRAKE_APPLIED	UES Brake applied	A condition to trigger the UES brake is true.	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
BM_RATE_NOT_ACHIEVED	Brake Monitoring Rate not achieved	Brake assurance in Type II has failed and the EB has been applied.	N/A
BA_RATE_NOT_ACHIEVED	Brake Assurance rate not achieved	Brake assurance in Type I has failed and the EB has been applied.	N/A
MIX_VIO_ECHO_REG_ERR	Mixed IO Vital Register Error	The ATP processor tried to write a value to the mixed I/O board but did not receive a response.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors or backplane. If the problem persists, replace the Mixed I/O board.
MIX_VIO_TYPE_REG_ERR	Mixed IO Vital Type Error	The ATP processor was expecting a different mixed I/O board type than what was received.	Ensure the correct Mixed I/O board is installed. Ensure the board is securely plugged into the correct slot inside the card file. Ensure no bent pins on the backplane and the board. If the problem persists, replace the Mixed I/O board.
MIX_WRITE_COMP_ERR	Mixed IO Vital Write Compare Error	The echo and type checks passed on the mixed I/O board, but the read back returned a different value than what was written.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connectors or backplane. If the problem persists, replace the Mixed I/O board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MIX_VI_INPUT_0_UNSTABLE	Mixed IO Input 0 Unstable	Input 1 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Enable Left Doors.
MIX_VI_INPUT_1_UNSTABLE	Mixed IO Input 1 Unstable	Input 2 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Enable Right Doors.
MIX_VI_INPUT_2_UNSTABLE	Mixed IO Input 2 Unstable	Input 3 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Full Service Brake.
MIX_VI_INPUT_3_UNSTABLE	Mixed IO Input 3 Unstable	Input 4 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Enable Left Doors, Safety Relay Checkback Cab Signal A Select.
MIX_VI_INPUT_4_UNSTABLE	Mixed IO Input 4 Unstable	Input 5 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Enable Left Doors, Safety Relay Checkback Cab Signal B Select.
MIX_VI_INPUT_5_UNSTABLE	Mixed IO Input 5 Unstable	Input 6 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Depature Test Coil Select A End.
MIX_VI_INPUT_6_UNSTABLE	Mixed IO Input 6 Unstable	Input 7 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, Safety Relay Checkback Depature Test Coil Select B End.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MIX_VI_INPUT_7_UNSTABLE	Mixed IO Input 7 Unstable	Input 8 on the Mixed I/O board has toggled between states enough to reach the instability limit. The input is considered off until the condition clears.	Ensure the Mixed I/O board is securely plugged into the correct slot inside the card file and no bent pins are present. Check the source of the input is providing a stable signal. If the problem persists, replace the mixed I/O board, ATP Not Bypassed.
MIX_VI_INPUT_0_SHORTED	Mixed IO Input 0 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Checkback Enable Left Doors.
MIX_VI_INPUT_1_SHORTED	Mixed IO Input 1 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosureSafety Relay Checkback Enable Right Doors.
MIX_VI_INPUT_2_SHORTED	Mixed IO Input 2 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosureSafety Relay Checkback Full Service Brake.
MIX_VI_INPUT_3_SHORTED	Mixed IO Input 3 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Checkback Cab Signal Select A End.
MIX_VI_INPUT_4_SHORTED	Mixed IO Input 4 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Checkback Cab Signal Select B End.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MIX_VI_INPUT_5_SHORTED	Mixed IO Input 5 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Checkback Depature Test Coil Select A End.
MIX_VI_INPUT_6_SHORTED	Mixed IO Input 6 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Safety Relay Checkback Depature Test Coil Select B End.
MIX_VI_INPUT_7_SHORTED	Mixed IO Input 7 Shorted	The CPU tested the input while it was on by briefly turning the input off. The test fails when another input also changes state during this time.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pins are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, ATP Not Bypassed.
MIX_VI_INPUT_0_MON_FAIL	Mixed IO Input 0 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Enable Left Doors.
MIX_VI_INPUT_1_MON_FAIL	Mixed IO Input 1 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Enable Right Doors.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MIX_VI_INPUT_2_MON_FAIL	Mixed IO Input 2 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Full Service Brake.
MIX_VI_INPUT_3_MON_FAIL	Mixed IO Input 3 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Cab Signal Select A End.
MIX_VI_INPUT_4_MON_FAIL	Mixed IO Input 4 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Cab Signal Select B End.
MIX_VI_INPUT_5_MON_FAIL	Mixed IO Input 5 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Depature Test Coil Select A End.
MIX_VI_INPUT_6_MON_FAIL	Mixed IO Input 6 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, Safety Relay Checkback Depature Test Coil Select B End.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MIX_VI_INPUT_7_MON_FAIL	Mixed IO Input 7 Monitor Failure	The CPU diagnostics turned the input's monitor circuit off to verify the input is not stuck in the ON position, but the input remained in the ON state.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the input to the source and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure and are causing the input to remain in an active state, ATP Not Bypassed.
MIX_OUTPUT1_FAIL	Mixed IO Output 1 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Enable Left Doors.
MIX_OUTPUT2_FAIL	Mixed IO Output 2 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Enable Right Doors.
MIX_OUTPUT3_FAIL	Mixed IO Output 3 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Full Service Brake.
MIX_OUTPUT4_FAIL	Mixed IO Output 4 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Emergency Brake.
MIX_OUTPUT5_FAIL	Mixed IO Output 5 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Cab Signal Select A.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MIX_OUTPUT6_FAIL	Mixed IO Output 6 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Cab Signal Select B.
MIX_OUTPUT7_FAIL	Mixed IO Output 7 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Test Coil Select A.
MIX_OUTPUT8_FAIL	Mixed IO Output 8 Monitor Failure	The monitor circuit ensures the vital output is in the correct state by comparing the output state to a set of known voltages. If the output state does not match, the error is generated for the associated output.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. Trace the output to the destination load and verify no loose or frayed wires are present. If the problem persists, replace the mixed I/O board. If the problem still persists, the issues are outside of the ATC enclosure, Test Coil Select B.
MIX_MONITOR_FAIL	Mixed IO Monitor Fail	The monitor circuit that ensures the outputs are in the expected state has reported a critical error to the CPU board.	Ensure the mixed I/O board is securely plugged into the correct slot inside the card file. Ensure no bent pits are on the connections. If the problem persists, replace the mixed I/O board.
CCB_LINK_DOWN	CCB Link Down	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_ERR_NO_DATA	DPRAM Error No Data	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_ERR_NO_READ_ACCESS	DPRAM Read Access Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_ERR_BAD_SECTOR	DPRAM Bad Sector Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_ERR_BAD_SIZE	DPRAM Bad Size Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_ERR_NO_NEW_DATA	DPRAM No New Data Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_ERR_NO_WRITE_ACCESS	DPRAM No Write Access Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_NO_NEW_CCB_DATA	No New CCB Data	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CCB_LINK_UP	CCB Link Up Parent	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_NO_ERROR	DPRAM No Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
CCB_PCB_ERROR	CCB PCB Parent	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DIAG_COMPLETE	Diagnostics complete	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_DPRAM_FAILURE	DPRAM Access Failure	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_BAD_ROM	Bad ROM	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_BAD_RAM	Bad RAM	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_BAD_STACK	Bad Stack	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_SKIPPED_CYCLE	Skipped Cycle	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_UNEXPECTED_IRQ	Unexpected IRQ	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_LOGS_INIT	Logs Initialized	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_COMM_INIT	COMM Initialized	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_INVALID_OUTMSG	Invalid output message size	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_INVALID_INMSG	Invalid input message size	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_G96_DIAG_ERR_L1	Link 1 - G96 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_MVB_DIAG_ERR_L2	Link 2 - MVB Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_ETH_DIAG_ERR_L3	Link 3 - Ethernet Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_ETH_DIAG_ERR_L4	Link 4 - Ethernet Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_RS232_DIAG_ERR_L5	Link 5 - RS232 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EVT_RS232_DIAG_ERR_L6	Link 6 - RS232 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_RS232_DIAG_ERR_L57	Link 7 - RS232 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_RS232_DIAG_ERR_L8	Link 8 - RS232 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_RS232_DIAG_ERR_L9	Link 9 - RS232 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_RS232_DIAG_ERR_L10	Link 10 - RS232 Diagnostics Error	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EVT_CRC_INVAL	ATP CRC check failed	The CPU has failed to function properly due to a microprocessor internal error	Reset the ATC circuit breaker. If the problem persists, replace the CCB board.
EV_M_CROSSCHECK	M Relay Backcheck Error	The M output signal does not match the trainline	Check M trainline
EV_CM_CROSSCHECK	CM Relay Backcheck Error	The CM output signal does not match the trainline	Check CM trainline
EV_TWC_ENABLE_CROSSCHECK	TWC Enable Relay Backcheck Error	The safety relay feedback does not match the output	Check the relay card
EV_TWC_COIL_A_CROSSCHECK	TWC Coil A Select Relay Backcheck Error	The safety relay feedback does not match the output	Check the relay card
EV_TWC_COIL_B_CROSSCHECK	TWC Coil B Select Relay Backcheck Error	The safety relay feedback does not match the output	Check the relay card
EV_TWC_LINK_FAIL	TWC Link Failure	TWC communications have not been established while over a TWC loop	Event will reset automatically. Verify that the TWC modem switch settings match the maintenance manual. If problem continues replace TWC Modem PCB. If problem persists check tuning of wayside TWC loop and verify TWC PC or LATS is working correctly.
EV_TWC_CENTRAL_LINK_FAIL	TWC Link to Central Failure	The central link bit in the TWC communication link is not asserted	Check communication link between wayside and central.
EV_LOST_VALID_CONTROL	ATP to ATO Communication Failure	ATC system data is no being received by the ATO subsystem.	Ensure CCB and ATO are properly seated in the cardfile.
EV_BOND_BASED_STATION_STOP	Bond Based Station Stop	No valid transpositions were detected in the station stop.	Event will reset automatically. Verify that the TWC modem switch settings match the maintenance manual. If the problem persists check the tuning of wayside TWC loop, check the tuning/calibration of the track circuits entering the platform, or verify TWC PC or LATS is working correctly.
EV_NEG_DISTANCE_TO_GO	Negative Distance To Go	ATO subsystem has detected that the distance to go has exceeded 20 feet past the target	Check for the following events: TWC Bypassed, No TWC Detected, No Valid Transpositions, Missed Bond, Bond Based Station Stop, High Brake Rate Commanded, No CTM was detected in the platform, Large Position Adjustment, Large XPOS Position Adjustment, or ATO Detected Slide.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EV_WHEELSIZE_DISCREPANCY	ATP/ATO Wheel Diameter Discrepancy	The ATP calibrated and ATO measured wheel sizes mismatch by more than 3 inches	Check wheel calibration
EV_TWC_BAD_DATA_RECVD	Invalid TWC Data	Invalid TWC header	Check TWC communications.
EV_TWC_BAD_PVID	Incorrect TWC PVID	The TWC PVID does not match the vehicle PVID while berthed	NA
EV_ATP_BAD_DATA_RECVD	Invalid ATP Data or ATP Comm Lost	The ATO has received train length or track circuit ID of 0 while not at vzero	Check MVB and train Ethernet connections
EV_MISSED_BOND	Missed Bond	ATO detected a new track circuit ID without getting a bond crossing event.	Event will reset automatically.
EV_ATP_BAD_PVID	Invalid ATP PVID	ATC is configured with a PVID of 0	NA
EV_VOLTAGE_FAULT	Input 24V Battery Voltage Fault Detected	ATO detected 24V battery out of tolerance out of tolerance	Check the power supply
EV_NEW_WHEEL_DIA_CALC	New Wheel Diameter Calculated	The ATO has calculated a new wheel diameter	The vehicle wheels should be measured and the new dimeters should be entered into the ATC.
EV_PSS_GOOD	Station Stop Valid	The ATO determined that the vehicle stopped in the correct location with berth	NA
EV_PSS_BERTHED	Station Stop Berthed Received	The vehicle received the berth signal	NA
EV_PSS_UNDERSHOOT	Station Stop Undershoot	The ATO determined that the vehicle stopped a least 3 feet short of the target stopping location	Check for the following events: TWC Bypassed, No TWC Detected, No Valid Transpositions, Missed Bond, Bond Based Station Stop, High Brake Rate Commanded, No CTM was detected in the platform, Large Position Adjustment, Large XPOS Position Adjustment, or ATO Detected Slide.
EV_PSS_OVERSHOOT	Station Stop Overshoot	The ATO determined that the vehicle stopped at least 3 feet past the target stopping location	Check for the following events: TWC Bypassed, No TWC Detected, No Valid Transpositions, Missed Bond, Bond Based Station Stop, High Brake Rate Commanded, No CTM was detected in the platform, Large Position Adjustment, Large XPOS Position Adjustment, or ATO Detected Slide.
EV_PSS_NOT_BERTHED	Station Stop without Berth	The ATC did not detect berth within seven seconds	Check for overshoot or undershoot. Check for Bond Based Station, Stop, No TWC detected, and No Valid Transpositions events. If this event is occuring on multiple trains there is a problem with the wayside track circuit.
EV_PSS_ABORT	Programmed station stop aborted	The ATP aborted the PSS **because wayside berth bit was not received within 7 seconds of the train speed dropping below 0.5 mph.**	Check for overshoot or undershoot. Check for Bond Based Station, Stop, No TWC detected, and No Valid Transpositions events.
EV_PSS_HIGH_BRAKE_RATE	High Brake Rate Commanded	The ATO determined it was necessary to apply a higher brake rate than normal during a PSS to achieve the correct stopping profile.	Event will reset automatically.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EV_LARGE_BOND_ADJ	Large Position Adjustment	The ATO has adjusted the PSS distance to go by a value greater than 10 feet in 100ms.	Event will reset automatically.
EV_TWC_BYPASS	TWC Bypassed	The Type II TWC system has been bypassed.	NA
EV_NO_TWC	No TWC detected	ATO passed 2 consecutive TWC loops with establishing TWC communication.	Event will reset automatically. Verify that the TWC modem switch settings match the maintenance manual. If problem continues replace TWC Modem PCB. If problem persists check tuning of wayside TWC loop and verify TWC PC or LATS is working correctly.
EV_NO_VALID_XPOSN	No Valid Transpositions	The vehicle stopped in a platform without detecting any valid transpositions.	Event will reset automatically. Verify that the TWC modem switch settings match the maintenance manual. If problem continues replace TWC Modem PCB. If problem persists check tuning of wayside TWC loop and verify TWC PC or LATS is working correctly.
EV_TWC_NO_CTM	No CTM was detected in the platform	No CTM was detected in the platform	Event will reset automatically. Verify that the TWC modem switch settings match the maintenance manual. If problem persists check tuning of wayside TWC loop and verify TWC PC or LATS is working correctly.
EV_LARGE_XPOS_ADJ	Large XPOS Position Adjustment	ATO has made a position adjustment greater than 20 feet based on the detection of a transposition.	Event will reset automatically. Verify that the TWC modem switch settings match the maintenance manual. If problem persists check tuning of wayside TWC loop.
EV_CRAWL_MODE	ATO crawl mode entered	ATO has entered crawl mode **due** either to excessive spin, excessive slide, or passing the center xpos estimate distance without detecting any xpos during PSS	Reset when either PSS has been complete, mode change, or active cab reset
ADU_PARENT_EVENT	ADU Parent Event	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_QUEUE_OVERFLOW	Event Queue Overflow	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_DESTRUCTOR_CALLED	Class Destructor Called	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_RESET	ADU Reset	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_INIT	ADU Initialized	The ADU has been initialized.	Informational Event. No reset conditions.
EV_ADU_HW_ERROR	ADU HW Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_TIMING	ADU Timing Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EV_ADU_STUCK_KEYS	ADU Stuck Keys	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_SRAM_CHECK_ERROR	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_INIT_TRAFFICSTORE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_INIT_PARAMETER	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_INIT_NO_MVBC	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_INIT_MVBC_RESET	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_START_TRAFFICSTORE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_START_MVBC_INIT	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_GETPORT_TRAFFICSTORE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_GETPORT_MVBC_STOP	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_GETPORT_PORT_UNDEF	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_GETPORT_NO_SINK	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_GETPORT_OLD_DATA	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_PUTPORT_TRAFFICSTORE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_PUTPORT_PORT_UNDEF	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_PUTPORT_NO_SOURCE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_IDLE_TRAFFICSTORE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_STOP_TRAFFICSTORE	ADU MVB API Error	The ADU has failed to function properly due to a microprocessor internal error	Reset the ADU circuit breaker. If the problem persists, replace the ADU.
EV_ADU_BAD_SPEED	ADU Bad Speed	The speed received over the MVB is outside of valid range.	If problem persists reset ADU circuit breaker.

Automatic Train Control (ATC)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
EV_ADU_BAD_SPEED_LIMIT	ADU Bad Speed Limit	The speed limit received over the MVB is outside of a valid range.	If problem persists reset ADU circuit breaker.
EV_ADU_BAD_DEST_ID	ADU Bad Dest ID	The destination ID entered is invalid for Type II.	If problem persists reset ADU circuit breaker.
EV_ADU_ATC_COMM_LOST	ADU ATC Comm Loss	The ADU lost communication with the ATC over the MVB.	If problem persists reset ADU circuit breaker.
EV_ADU_VEH_COMM_LOST	ADU Vehicle Comm Loss	The ADU lost communication with the vehicle logic over the MVB.	If problem persists reset ADU circuit breaker.
EV_ADU_TWC_COMM_LOST	ADU TWC Comm Loss	The ADU has lost communication with the H&K TWC CCU over the RS485 serial port.	If problem persists reset ADU and H&K CCU circuit breaker.
EV_ADU_CROSSCHECK	ADU Crosscheck error	Both ADU's indicate they are active.	Check that only 1 cab is keyed up.
EV_ADU_TWC_BAD_DATA_RECVD	ADU TWC Bad Data received	The ADU has received a corrupted message from the H&K CCU.	If problem persists reset ADU circuit breaker.

CCU FAIL Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Communications Control Unit (CCU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
PA_EXT_R_SPKR_ACM8_ERROR	PA Exterior Speaker RIGHT ACM to CCU General Error	ACP1A ACM8 Unit Error Detected	Check Eth ACP1A ETH8 port, Check Eth Switch LAN2A-Port 8, Replace ACP1A ACM1 Module
PA_INT_SPKR_ACM7_ERROR	PA Interior Speaker ACM to CCU General Error	ACP1A ACM7 Unit Error Detected	Check Eth ACP1A ETH7 port, Check Eth Switch LAN1A-Port 10, Replace ACP1A ACM1 Module
CAB_SPKR_A_ACM6_ERROR	CAB-A Speaker ACM to CCU General Error	ACP1A ACM6 Unit Error Detected	Check Eth ACP1A ETH6 port, Check Eth Switch LAN1A-Port 11, Replace ACP1A ACM1 Module
RADIO_A_ACM5_ERROR	RADIO-A Speaker ACM to CCU General Error	ACP1A ACM5 Unit Error Detected	Check Eth ACP1A ETH5 port, Check Eth Switch LAN1A-Port 12, Replace ACP1A ACM1 Module
MIC_A_ACM4_ERROR	MIC-A ACM to CCU General Error	ACP1A ACM4 Unit Error Detected	Check Eth ACP1A ETH4 port, Check Eth Switch LAN1A-Port 13, Replace ACP1A ACM1 Module
PIC2A_ACM3_ERROR	PIC2A ACM to CCU General Error	ACP1A ACM3 Unit Error Detected	Check Eth ACP1A ETH3 port, Check Eth Switch LAN1A-Port 14, Replace ACP1A ACM1 Module
PIC1A_ACM2_ERROR	PIC1A ACM to CCU General Error	ACP1A ACM2 Unit Error Detected	Check Eth ACP1A ETH2 port, Check Eth Switch LAN1A-Port 15, Replace ACP1A ACM1 Module
PA_EXT_L_SPKR_ACM8_ERROR	PA Exterior Speaker LEFT ACM to CCU General Error	ACP1B ACM8 Unit Error Detected	Check Eth ACP1B ETH8 port, Check Eth Switch LAN2B-Port 10, Replace ACP1B ACM8 Module
SPARE_ACM7_ERROR	SPARE ACM to CCU General Error	ACP1B ACM7 Unit Error Detected	Check Eth ACP1B ETH7 port, Check Eth Switch LAN1B-Port 10, Replace ACP1B ACM7 Module
CAB_SPKR_B_ACM6_ERROR	CAB-B Speaker ACM to CCU General Error	ACP1B ACM6 Unit Error Detected	Check Eth ACP1B ETH6 port, Check Eth Switch LAN1B-Port 11, Replace ACP1B ACM6 Module
RADIO_B_ACM5_ERROR	RADIO-B Speaker ACM to CCU General Error	ACP1B ACM5 Unit Error Detected	Check Eth ACP1B ETH5 port, Check Eth Switch LAN1B-Port 12, Replace ACP1B ACM5 Module
MIC_B_ACM4_ERROR	MIC-B ACM to CCU General Error	ACP1B ACM4 Unit Error Detected	Check Eth ACP1B ETH4 port, Check Eth Switch LAN1B-Port 13, Replace ACP1B ACM4 Module
PIC2B_ACM3_ERROR	PIC2B ACM to CCU General Error	ACP1B ACM3 Unit Error Detected	Check Eth ACP1B ETH3 port, Check Eth Switch LAN1B-Port 14, Replace ACP1B ACM3 Module
PIC1B_ACM2_ERROR	PIC1B ACM to CCU General Error	ACP1B ACM2 Unit Error Detected	Check Eth ACP1B ETH2 port, Check Eth Switch LAN1B-Port 15, Replace ACP1B ACM2 Module
PA_EXT_R_SPKR_ACM8_COMM_FAULT	PA Exterior Speaker RIGHT ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM8 unit failure	Check Eth ACP1A ETH8 port, Check Eth Switch LAN2A-Port 8, Replace ACP1A ACM1 Module
PA_INT_SPKR_ACM7_COMM_FAULT	PA Interior Speaker ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM7 unit failure	Check Eth ACP1A ETH7 port, Check Eth Switch LAN1A-Port 10, Replace ACP1A ACM1 Module

Communications Control Unit (CCU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
CAB_SPKR_A_ACM6_COMM_FAULT	CAB-A Speaker ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM6 unit failure	Check Eth ACP1A ETH6 port, Check Eth Switch LAN1A-Port 11, Replace ACP1A ACM1 Module
RADIO_A_ACM5_COMM_FAULT	RADIO-A Speaker ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM5 unit failure	Check Eth ACP1A ETH5 port, Check Eth Switch LAN1A-Port 12, Replace ACP1A ACM1 Module
MIC_A_ACM4_COMM_FAULT	MIC-A ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM4 unit failure	Check Eth ACP1A ETH4 port, Check Eth Switch LAN1A-Port 13, Replace ACP1A ACM1 Module
PIC2A_ACM3_COMM_FAULT	PIC2A ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM3 unit failure	Check Eth ACP1A ETH3 port, Check Eth Switch LAN1A-Port 14, Replace ACP1A ACM1 Module
PIC1A_ACM2_COMM_FAULT	PIC1A ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1A ACM2 unit failure	Check Eth ACP1A ETH2 port, Check Eth Switch LAN1A-Port 15, Replace ACP1A ACM1 Module
PA_EXT_L_SPKR_ACM8_COMM_FAULT	PA Exterior Speaker LEFT ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1B ACM8 unit failure	Check Eth ACP1B ETH8 port, Check Eth Switch LAN2B-Port 10, Replace ACP1B ACM8 Module
CAB_SPKR_B_ACM6_COMM_FAULT	CAB-B Speaker ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1B ACM6 unit failure	Check Eth ACP1B ETH6 port, Check Eth Switch LAN1B-Port 11, Replace ACP1B ACM6 Module
RADIO_B_ACM5_COMM_FAULT	RADIO-B Speaker ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1B ACM5 unit failure	Check Eth ACP1B ETH5 port, Check Eth Switch LAN1B-Port 12, Replace ACP1B ACM5 Module
MIC_B_ACM4_COMM_FAULT	MIC-B ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1B ACM4 unit failure	Check Eth ACP1B ETH4 port, Check Eth Switch LAN1B-Port 13, Replace ACP1B ACM4 Module
PIC2B_ACM3_COMM_FAULT	PIC2B ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1B ACM3 unit failure	Check Eth ACP1B ETH3 port, Check Eth Switch LAN1B-Port 14, Replace ACP1B ACM3 Module
PIC1B_ACM2_COMM_FAULT	PIC1B ACM to CCU Communication Failure	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or ACP1B ACM2 unit failure	Check Eth ACP1B ETH2 port, Check Eth Switch LAN1B-Port 15, Replace ACP1B ACM2 Module
FDS_22_COMM_FAULT	Unable to communicate with B-End SIDE Destination Sign	Communication Timeout between Destination Sign with ID: 2-2 and CCU	Check Eth Switch LAN2A-Port 2, Check Sign Connectors Check Sign Connectivity via TOD Replace Sign
FDS_21_COMM_FAULT	Unable to communicate with A-End SIDE Destination Sign	Communication Timeout between Destination Sign with ID: 2-1 and CCU	Check Eth Switch LAN2A-Port 3, Check Sign Connectors, Check Sign Connectivity via TOD Replace Sign
FDS_82_COMM_FAULT	Unable to communicate with B-End FRONT Destination Sign	Communication Timeout between Destination Sign with ID: 8-2 and CCU	Check Eth Switch LAN2B-Port 4, Check Sign Connectors Check Sign Connectivity via TOD Replace Sign
FDS_81_COMM_FAULT	Unable to communicate with A-End FRONT Destination Sign	Communication Timeout between Destination Sign with ID: 8-1 and CCU	Check Eth Switch LAN2B-Port 8, Check Sign Connectors Check Sign Connectivity via TOD Replace Sign

Communications Control Unit (CCU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
FDS_22_ERROR	B-End SIDE Destination Sign Error Received	Error Received from the Destination Sign with ID: 2-2	Check Eth Switch LAN2A-Port 2, Replace Sign
FDS_21_ERROR	A-End SIDE Destination Sign Error Received	Error Received from the Destination Sign with ID: 2-1	Check Eth Switch LAN2A-Port 3, Replace Sign
FDS_82_ERROR	B-End FRONT Destination Sign Error Received	Error Received from the Destination Sign with ID: 8-2	Check Eth Switch LAN2B-Port 4, Replace Sign
FDS_81_ERROR	A-End FRONT Destination Sign Error Received	Error Received from the Destination Sign with ID: 8-1	Check Eth Switch LAN2B-Port 8, Replace Sign
GPS_COMM_FAULT	No data is being received from the GPS receiver	Absence of serial data from the GPS – GPS Receiver failure	A-End Only – Check cable from the GPS antenna to/from the CCU Replace GPS Receiver/Antenna
GPS_DATA_ERROR	GPS receiver serial data corrupted	Consecutive data errors (invalid checksums) detected in the GPS data packets	A-End Only – Check cable from the GPS antenna to/from the CCU Replace GPS Receiver/Antenna
COMM_ERRORS_CHECK_FAULT_SCREEN	Some PA ACMs are Missing	The CCU could not find the Interior Speaker, Active Cab MIC, Active Cab Speaker or Radio Interface ACM.	Check Ethernet Wiring on the CCU and all the Panels ACP1A and ACP1B, replace if necessary.
INVALID_TRAIN_DETECTED_TL_FAULT	ACM Configuration is not Possible	Ethernet Trainline Failure	Refer to the Ethernet Trainline subsystem troubleshooting
CCU_RE_STARTING_PLEASE_WAIT	No ACMs Found	The CCU could not found any ACMs	Check Ethernet Wiring on the CCU and all the Panels ACP1A and ACP1B, replace if necessary.
PA_SYSTEM_NOT_READY	PA System is Initializing	Status	N/A
PA_SYSTEM_READY	PA Components Ready	Status	N/A
CCU_INITIALIZATION_ERROR	CCU detected at least one error during initialization	Error during an internal CCU Process or Communication Socket creation	Replace CCU Unit

DCU FAIL Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens. Each door control unit will provide a set of the parameters in this table, for a total of 8 sets of data.

Door Control Unit (DCU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Diagnostic_Code_7	Motor current monitoring at opening sequence was activated on a fixed number of successive opening attempts	The motor current or way-/time monitoring was activated on a fixed number of successive opening attempts	Signal input of the door position sensor at the DCU, door drive mechanism, door movement, adjustment of the door, adjustment and wiring of the limit switch “door closed/locked” and input circuit of the DCU to be checked
Diagnostic_Code_6	Obstruction detection at closing sequence was activated on a fixed number of successive closing sequences	The motor current or way-/time monitoring was activated on a fixed number of successive closing sequences, and the door did not reach the closed/locked position meanwhile	Door drive mechanism, movement of the door, adjustment of the door, adjustment and wiring of the limit switch “door closed/locked” and input circuit of the DCU to be checked
Diagnostic_Code_5	Door position sensor fails	On a fixed number of successive door movements no pulses from the door position sensor are counted	Door position sensor and input circuit of the DCU to be checked
Diagnostic_Code_4	Door leaf (right) detection switch (S9) fails	The limit switch “door closed & locked” indicates a closed door and at least one door leaf detection switch indicates an open door	Door leaf detection switch, limit switch "door closed & locked" and input circuit of the DCU to be checked
Diagnostic_Code_3	Door leaf (left) detection switch (S8) fails	The limit switch “door closed & locked” indicates a closed door and at least one door leaf detection switch indicates an open door	Door leaf detection switch, limit switch "door closed & locked" and input circuit of the DCU to be checked
Diagnostic_Code_44	Door leaves the closed/locked position without permission	The limit switch “door closed/locked” indicates a not closed/locked door	Mechanical adjustment of the emergency release device, adjustment of the limit switch of the emergency release device, door locking mechanism, door drive mechanism, adjustment and wiring of the limit switch “door closed/locked” and input circuit of the DCU
Diagnostic_Code_2	Limit switch “door closed/locked” fails	When the door drive motor is activated and the door position sensor detects a door movement	Adjustment and wiring of the limit switch “door closed/locked” and input circuit of the DCU to be checked
Diagnostic_Code_1	Broken wire in the circuit of the door drive motor	The door drive motor is activated, but no current is measured	Motor circuit, wiring, output circuit of the DCU and motor to be checked
Diagnostic_Code_20	Short circuit at the output A7 of the DCU	The output A7 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A7, wiring and output of the DCU to be checked

Door Control Unit (DCU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Diagnostic_Code_19	Short circuit at the output A6 of the DCU	The output A6 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A6, wiring and output of the DCU to be checked
Diagnostic_Code_17	Short circuit at the output A5 of the DCU	The output A5 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A5, wiring and output of the DCU to be checked
Diagnostic_Code_16	Short circuit at the output A4 of the DCU	The output A4 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A4, wiring and output of the DCU to be checked
Diagnostic_Code_15	Short circuit at the output A3 of the DCU	The output A3 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A3, wiring and output of the DCU to be checked
Diagnostic_Code_14	Short circuit at the output A2 of the DCU	The output A2 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A2, wiring and output of the DCU to be checked
Diagnostic_Code_13	Short circuit at the output A1 of the DCU	The output A1 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A1, wiring and output of the DCU to be checked
Diagnostic_Code_8	Internal safety relay of the DCU fails	The state of the safety relay (checked by the signal “observation safety relay", which is internally hardwired to the .µP) do not correspond to the activating signals of the relay	The activation of the safety relay according to the block diagram of the DCU and according to the wiring diagram has to be checked, otherwise the DCU has to be replaced
Diagnostic_Code_33	Service push button on the DCU fails	The input signal at the DCU is longer activated than a fixed time duration	Service push button of the DCU to be checked
Diagnostic_Code_61	Crew switch fails	The input signal at the DCU is longer activated than a fixed time duration	Crew switch, input circuit of the DCU and wiring to be checked
Diagnostic_Code_32	Door open push button(s) fails	The input signal at the DCU is longer activated than a fixed time duration	Door open push button(s), input circuit of the DCU and wiring to be checked
Diagnostic_Code_25	Sensitive edge steady activated	The input signal at the DCU is longer activated than a fixed time duration	Sensitive edge switch, finger protection rubber, input circuit of the DCU and wiring to be checked
Diagnostic_Code_27	Sensitive edge at right door leaf (inside view) fails	The electrical connection to the sensitive edge is interrupted	Sensitive edge switch of the right door leaf, input circuit of the DCU and wiring to be checked

Door Control Unit (DCU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Diagnostic_Code_24	Sensitive edge steady activated	The input signal at the DCU is longer activated than a fixed time duration	Sensitive edge switch, finger protection rubber, input circuit of the DCU and wiring to be checked
Diagnostic_Code_26	Sensitive edge at left door leaf (inside view) fails	The electrical connection to the sensitive edge is interrupted	Sensitive edge switch of the left door leaf, input circuit of the DCU and wiring to be checked
Diagnostic_Code_21	Short circuit at the output A8 of the DCU	The output A8 is activated and the current exceeds the nominal value or a short circuit is detected by the DCU	Component connected to output A8, wiring and output of the DCU to be checked
Diagnostic_Code_66	Door is not closed/locked and way sensor indicates a not closed door	Door is not close/locked and way sensor indicates a not closed door.	Door out of service mechanism, input circuit of DCU, and wiring to be checked.
Diagnostic_Code_91	System does not detect closed position at defined time	System needs more than two times of 3 second closing time.	Check of the whole gear
Diagnostic_Code_90	System does not detect opened position at defined time	System needs more than two times of 2.5 second opening time.	Check of the whole gear
Diagnostic_Code_42	Data Bus Communication fails	The connection to the door data bus is interrupted.	Door data bus cable, connectors and bus interface to be checked.
Diagnostic_Code_48	Door Code Faulty	The door coding is not correct.	Door coding has to be checked.
Diagnostic_Code_41	Signal levels "door release" are different	The two signals “door release”, hard wired and from the data bus, are different.	Signal at data bus, hard wired signal, input circuit of the DCU and wiring to be checked.
Diagnostic_Code_40	Signal levels "no motion" are different	The two signals “no motion”, hard wired and from the data bus, are different.	Signal at data bus, hard wired signal, input circuit of the DCU and wiring to be checked.
Diagnostic_Code_22	Battery backup of the diagnostic memory fails	At switch off of supply voltage of the DCU, the battery backup of the NOVRAM is not in function	Change the NOVRAM mounted in the DCU.

Network Video Recorder (NVR) Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Network Video Recorder (NVR)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
IC2B ERROR	Camera error	Network, power, firmware freeze, wrong configuration.	Restart the camera, disconnect & reconnect to the switch
IC1B ERROR			
CAB-A ERROR			
RVAL ERROR			
RVAR ERROR			
FVA ERROR			
IC2A ERROR			
IC1A ERROR			
CAB-B ERROR	Camera error	Network, power, firmware freeze, wrong configuration.	Restart the camera, disconnect & reconnect to the switch
RVBL ERROR			
RVBR ERROR			
FVB ERROR			

ECU FAIL Fault Detail Data Definitions

The following tables describe the Fault Detail Data field and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_MB04_1_GENERAL_ERROR_ECU_A	ECU General Failure; Group fault	Internal Card Errors occurred on the MB04. MB04_1_CAN_COM; MB04_1_NV_ACCESS; MB04_1_NV_TIMEOUT; MB04_1_DRV_IO_ACCESS; MB04_1_ACTIVATE_FCT; MB04_1_CONFIGURATION; MB04_1_EEP_FAILURE; MB04_1_BOARD_CODING	
ERR_MB04_1_SHORT_PWROUT11_ECU_A	Short circuit in the power output stage for the Apply Magnet Valve	Faulty wiring/valve causing a short to be detected by the MB04_01 board	
ERR_MB04_1_SHORT_PWROUT_12_ECU_A	Short circuit in the power output stage for the Release Magnet Valve	Faulty wiring/valve causing a short to be detected by the MB04_01 board	
ERR_MB04_1_OPEN_PWROUT11_ECU_A	Open circuit in the power output stage for the Apply Magnet Valve	Faulty wiring/valve causing a open to be detected by the MB04_01 board	
ERR_MB04_1_OPEN_PWROUT12_ECU_A	Open circuit in the power output stage for the Release Magnet Valve	Faulty wiring/valve causing a open to be detected by the MB04_01 board	
ERR_MB04_1_OPEN_CUTOFF_PWROUT1x_ECU_A	Safety timer expired for one of the four power outputs POP1-4	Safety timer expired for one of the four power outputs POP1-4	
ERR_MB04_1_ECU_FAILURE_ECU_A	Failsafe path or monitoring processor is down	Possible hardware problem with the MB04_01 board	
ERR_MB03_2_GENERAL_ERROR_ECU_A	ECU General Failure; Group fault	Internal Card Errors occurred on the MB03. MB03_2_CAN_COM; MB03_2_NV_ACCESS; MB03_2_NV_TIMEOUT; MB03_2_DRV_IO_ACCESS; MB03_2_ACTIVATE_FCT; MB03_2_CONFIGURATION; MB03_2_EEP_FAILURE; MB03_2_BOARD_CODING	
ERR_MB03_2_SHORT_PWROUT11_ECU_A	Short circuit in the power output stage that controls the hold valve	Faulty wiring/valve causing a short to be detected by the MB03_02 board	
ERR_MB03_2_SHORT_PWROUT12_ECU_A	Short circuit in the power output stage that controls the release valve	Faulty wiring/valve causing a short to be detected by the MB03_02 board	
ERR_MB03_2_OPEN_PWROUT11_ECU_A	Open circuit in the power output stage that controls the hold valve	Faulty wiring/valve causing a open to be detected by the MB03_02 board	

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_MB03_2_OPEN_PWROUT12_ECU_A	Open circuit in the power output stage that controls the release valve	Faulty wiring/valve causing a open to be detected by the MB03_02 board	
ERR_MB03_2_OPEN_CUTOFF_PWROUT1x_ECU_A	Safety timer expired for one of the four power outputs POP1-4	Safety timer expired for one to the four power outputs POP1-4	
ERR_MB03_2_ECU_FAILURE_ECU_A	Failsafe path or monitoring processor is down	Possible hardware problem with the MB03_02 board	
AE_ERR_CB12_28_CB12_HWSD_ECU_A	Hardware issue with CB12 card	Possible hardware issue with CB12 card	
ERR_ACCESS_TO_MASTERERRORTAB_28_ECU_A	Error MB03_02 detected reading master table of errors of node 28	Incorrect software Defective board	
ERR_ACCESS_TO_MASTERERRORTAB_22_ECU_A	Error MB03_02 reading master table of errors of node 22	Incorrect software Defective board	
ERR_ACCESS_TO_MASTERERRORTAB_1_ECU_A	Error MB03_02 reading master table of errors of node 1	Incorrect software Defective board	
ERR_DV1_WSP_ECU_A	Speed deviation of +-40% of this sensor (Axle 1) from the average speed of Axles 2 and 3	Defective speed sensor Excessive sliding during brake application Location: Axle 1 Speed Sensor 2 Channel 2	
ERR_DV2_WSP_ECU_A	Speed deviation of +-40% of this sensor (Axle 2) from the average speed of Axles 1, and 3	Defective speed sensor Excessive sliding during brake application Location: Axle 2 Speed Sensor 3 Channel 1	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV3_WSP_ECU_A	Speed deviation of +-40% of this sensor (Axle 3) from the average speed of Axles 1 and 2	Defective speed sensor Excessive sliding during brake application Location: Axle 3 Speed Sensor 4 Channel 2	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV4_WSP_ECU_A	Not Used for Power Truck	Not Used for Power Truck	Not Used for Power Truck
AE_ERR_KN_22_NV_1_TIMEOUT_ECU_A	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_4_NV_3_TIMEOUT_ECU_A	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the EB01_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_2_NV_10_TIMEOUT_ECU_A	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the MB03_02 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_1_NV_2_TIMEOUT_ECU_A	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the MB04_01 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_EB01_3_GENERAL_ERROR_ECU_A	ECU EB01_03 General Failure; Group fault	Internal Card Errors occurred on the EB01. EB01_3_CAN_COM; EB01_3_NV_ACCESS; EB01_3_NV_TIMEOUT; EB01_3_DRV_IO_ACCESS; EB01_3_ACTIVATE_FCT; EB01_3_CONFIGURATION; EB01_3_EEP_FAILURE; EB01_3_BOARD_CODING	Refer to individual event entry
ERR_CB12_28_GENERAL_ERROR_ECU_A	ECU CB12_28 General Failure; Group fault	Internal Card Errors occurred on the CB12. CB12_28_CAN_COM; CB12_28_NV_ACEESS; CB12_28_NV_TIMEOUT; CB12_28_DRV_IO_ACCESS; CB12_28_ACTIVATE_FCT; CB12_28_CONFIGURATION; CB12_28_EEP_FAILURE; CB12_28_BOARD_CODING	Refer to individual event entry
ERR_EB01_3_RELAY0_ECU_A	Relay #1 on EB01_3 board defective	Relay #1 on EB01_3 board defective	Replace EB01_03 board
ERR_EB02_4_GENERAL_ERROR_ECU_A	ECU General Failure; Group fault	Internal Card Errors occurred on the EB02. EB02_4_CAN_COM; EB02_4_NV_ACEESS; EB02_4_NV_TIMEOUT; EB02_4_DRV_IO_ACCESS; EB02_4_ACTIVATE_FCT; EB02_4_CONFIGURATION; EB02_4_EEP_FAILURE; EB02_4_BOARD_CODING	Refer to individual event entry
DIA_PRC_CONFIG_ECU_A	Brake pressure regulator configuration error	The pressure regulator function detected a configuration error	Verify brake pressure transducer & wiring Replace MB04 board
ERR_CB09_22_ERROR_GROUP_ECU_A	ECU General Failure; Group fault	Internal Card Errors occurred on the CB09 CB09_22_CAN_COM; CB09_22_NV_ACCESS; CB09_22_NV_TIMEOUT; CB09_22_DRV_IO_ACCESS; CB09_22_ACTIVATE_FCT; CB09_22_CONFIGURATION; CB09_22_EEP_FAILURE; CB09_22_BOARD_CODING	Refer to individual event entry
ERR_MVB_PORT_GENERAL ERROR_ECU_A	An error has been detected in receiving information on a port of the MVB	ERR_MVB_PORT_100; ERR_MVB_PORT_150; ERR_MVB_PORT_512; ERR_MVB_PORT_640	Confirm MVB bus is operational Replace CB09 board

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_CB09_22_CB09_MVBC_ECU_A	An internal error has been detected by the CB09 board	The periodic supervision of the MVBC Chip has detected a failure due to abnormal hardware or software behavior	Confirm correct software loaded Replace CB09 board.
DIA_PRC_OFFSET_ECU_A	Brake pressure regulator offset error	Defective pressure transducer and/or wiring issue	Verify brake pressure transducer & wiring Replace MB04 board
DIA_PRC_DEVIATION_ECU_A	Brake pressure deviation on error	Defective pressure transducer and/or wiring issue Incorrect wiring to AMV/RMV brake control valves	Verify brake pressure transducer & wiring Replace MB04 board
ERR_LOAD_SIGNAL_OOR_ECU_A	The Load Weight Transducer reading is out of its normal operating range	The current from the load weight pressure transducer is less than 5ma or greater than 14mA	Verify load pressure transducer & wiring Replace MB04 board
ERR_LOAD_SIGNAL_INVALID_ECU_A	The Load Weight Transducer is reading is out of its valid range	The current from the load weight pressure transducer is less than 3.5ma or greater than 20.5mA	Verify transducer & wiring Replace MB04 board
ERR_BYTE_5_BIT_7_NOT_USED_ECU_A	Spare	Spare	
ERR_BYTE_5_BIT_6_NOT_USED_ECU_A	Spare	Spare	
ERR_TRAINLINE_MISMATCH_ECU_A	Invalid state of the Trainlines	The ECU has detected an invalid state of the Trainlines	Confirm correct operation of Master controller and confirm there are no wiring problems
ERR_BRKCYLNTRAN_INVALID_ECU_A	The brake cylinder transducer reading is out of its valid range	The current from the brake cylinder pressure transducer is less than 3.8ma or greater than 21mA	Verify brake cylinder transducer & wiring Replace MB04 board
ERR_NO_PBED_SIGNAL_ECU_A	No PBED signal detected while in motion	Occurs when PWM <1%, not in limp home mode, and not in stand still mode	Check PBED source Check wiring
ERR_CONTROLVOLTRAN_INVALID_ECU_A	The control volume transducer reading is out of its valid range	The current from the control volume pressure transducer is less than 3.8ma or greater than 21mA	Verify transducer & wiring Replace MB04 board
ERR_NO_MOTION_MISMATCH _ECU_A	There is a mismatch fault between the relay output and no motion input; only applicable to PT-A	No motion mismatch between relay output and no motion input; only applicable to PT-A	Verify wiring Replace EB01_3 board
ERR_PARKBRAKECIRCUIT_Fault_ECU_A	The park Brake switches have reported an invalid state-> both applied and released.	The park Brake switches have reported an impossible situation, both applied and released.	Verify switches & wiring Replace board
ERR_CONTROLDEVIATION_Fault_ECU_A	There is a discrepancy between the target pressure and actual control volume pressure	The ECU's target pressure and the resulting pressure (brake cylinder) are outside the acceptable range.	Verify transducers & wiring Replace MB04 board
ERR_TRAINMOVEDCUTOUT_ECU_A	The friction brakes on this truck were disabled when the train was moved.	The friction brakes on this truck were disabled when the train was moved.	No corrective action; status information only

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_KN_22_NV_11_TIMEOUT_ECU_A	The MB04 board reports this error when it is unable to receive NV11 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_4_NV_3_TIMEOUT_ECU_A	The MB04 board reports this error when it is unable to receive NV3 from the EB02_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_3_NV_4_TIMEOUT_ECU_A	The MB04 board reports this error when it is unable to receive NV4 from the EB01_03 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_25_TIMEOUT_ECU_A	The MB04 board reports this error when it is unable to receive NV25 from the MB03_02oard.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_SLC_CFG_EB02_4_ECU_A	Slave configuration error	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board. Replace backplane
ERR_SLAVE_REP_TIMEOUT_EB02_4_ECU_A	Internal CAN bus Communication timeout	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board. Replace backplane
ERR_KN_22_NV_24_TIMEOUT_ECU_A	The MB03 board reports this error when it is unable to receive NV24 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_4_NV_3_TIMEOUT_ECU_A	The MB03 board reports this error when it is unable to receive NV3 from the EB02_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_3_NV_4_TIMEOUT_ECU_A	The MB03 board reports this error when it is unable to receive NV4 from the EB01_03 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_3_TIMEOUT_ECU_A	The MB03 board reports this error when it is unable to receive NV3 from the MB04_01 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_SLC_CFG_EB01_3_ECU_A	Slave configuration error	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board.
ERR_SLAVE_REP_TIMEOUT_EB01_3_ECU_A	Internal CAN bus Communication timeout	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board.
ERR_EB01_3_IO_WATCHDOG_ECU_A	I/O Watchdog timer error	I/O Watchdog timer error	Confirm correct software loaded Replace board.
ERR_KN_22_NV_22_TIMEOUT_ECU_A	The MB04 board reports this error when it is unable to receive NV22 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_28_NV_1_TIMEOUT_ECU_A	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_10_TIMEOUT_ECU_A	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_3_TIMEOUT_ECU_A	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_2_TIMEOUT_ECU_A	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_1_TIMEOUT_ECU_A	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_MB04_1_GENERAL_ERROR_ECU_C	ECU MB04_01 General Failure; Group fault	Internal Card Errors occurred on the MB04. MB04_1_CAN_COM; MB04_1_NV_ACCESS; MB04_1_NV_TIMEOUT; MB04_1_DRV_IO_ACCESS; MB04_1_ACTIVATE_FCT; MB04_1_CONFIGURATION; MB04_1_EEP_FAILURE; MB04_1_BOARD_CODING	Refer to individual event entry

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_MB04_1_SHORT_PWROUT11_ECU_C	Short circuit in the power output stage for the Apply Magnet Valve	Faulty wiring/valve causing a short to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_SHORT_PWROUT12_ECU_C	Short circuit in the power output stage for the Release Magnet Valve	Faulty wiring/valve causing a short to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_OPEN_PWROUT11_ECU_C	Open circuit in the power output stage for the Apply Magnet Valve	Faulty wiring/valve causing a open to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_OPEN_PWROUT12_ECU_C	Open circuit in the power output stage for the Release Magnet Valve	Faulty wiring/valve causing a open to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_OPEN_CUTOFF_PWROUT1x_ECU_C	Safety timer expired for one of the four power outputs POP1-4	Safety timer expired for one of the four power outputs POP1-4	Remove short from one of the four power outputs POP 1 through POP 4 Replace MB04_1 board
ERR_MB04_1_ECU_FAILURE_ECU_C	Failsafe path or monitoring processor is down	Possible hardware problem with the MB04_01 board	Confirm correct software is loaded Replace MB04_1 board
ERR_MB03_2_GENERAL_ERROR_ECU_C	ECU MB03_02 General Failure; Group fault	Internal Card Errors occurred on the MB03. MB03_2_CAN_COM; MB03_2_NV_ACCESS; MB03_2_NV_TIMEOUT; MB03_2_DRV_IO_ACCESS; MB03_2_ACTIVATE_FCT; MB03_2_CONFIGURATION; MB03_2_EEP_FAILURE; MB03_2_BOARD_CODING	Refer to individual event entry
ERR_BYTE_1_BIT_6_NOT_USED_ECU_C	spare	spare	spare
ERR_MB03_2_SHORT_PWROUT11_ECU_C	Short circuit in the power output stage that controls the hold valve	Faulty wiring/valve causing a short to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_SHORT_PWROUT12_ECU_C	Short circuit in the power output stage that controls the release valve	Faulty wiring/valve causing a short to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_OPEN_PWROUT11_ECU_C	Open circuit in the power output stage that controls the hold valve	Faulty wiring/valve causing a open to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_OPEN_PWROUT12_ECU_C	Open circuit in the power output stage that controls the release valve	Faulty wiring/valve causing a open to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_OPEN_CUTOFF_PWROUT1x_ECU_C	Safety timer expired for one of the four power outputs POP1-4	Safety timer expired for one ot the four power outputs POP1-4	Remove short from one of the four power outputs POP 1 through POP 4 Replace MB03 2 board
ERR_MB03_2_ECU_FAILURE_ECU_C	Failsafe path or monitoring processor is down	Possible hardware problem with the MB03_02 board	Confirm correct software is loaded Replace MB03_2 board

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
AE_ERR_CB12_28_CB12_HWSD_ECU_C	Hardware issue with CB12 card	Possible hardware issue with CB12 card	Confirm correct software loaded Replace CB12_28 board.
ERR_ACCESS_TO_MASTERERRORTAB_28_ECU_C	Error MB03_02 detected reading master table of errors of node 28	Incorrect software Defective board	Check ESRA system bus Replace the CB12_28 board; this is the board required to send the information
ERR_ACCESS_TO_MASTERERRORTAB_22_ECU_C	Error MB03_02 reading master table of errors of node 22	Incorrect software Defective board	Check ESRA system bus Replace the CB09_22 board; this is the board required to send the information
ERR_ACCESS_TO_MASTERERRORTAB_1_ECU_C	Error MB03_02 reading master table of errors of node 1	Incorrect software Defective board	Check ESRA system bus Replace the MB04_01 board; this is the board required to send the information
ERR_DV1_WSP_ECU_C	Speed deviation of +-40% of this sensor (Axle 3) from the average speed of Axles 2, 4 and 5	Defective speed sensor Excessive sliding during brake application Location: Axle 3 Speed Sensor 5 Channel 2	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV2_WSP_ECU_C	Speed deviation of +-40% of this sensor (Axle 4) from the average speed of Axles 2, 3 and 5	Defective speed sensor Excessive sliding during brake application Location: Axle 4 Speed Sensor 6 Channel 1	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV3_WSP_ECU_C	Speed deviation of +-40% of this sensor (Axle 5) from the average speed of Axles 2, 3 and 4	Defective speed sensor Excessive sliding during brake application Location: Axle 5 Speed Sensor 8 Channel 1	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV4_WSP_ECU_C	Speed deviation of +-40% of this sensor (Axle 2) from the average speed of Axles 3, 4 and 5	Defective speed sensor Excessive sliding during brake application Location: Axle 2 Speed Sensor 3 Channel 2	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
AE_ERR_KN_22_NV_1_TIMEOUT_ECU_C	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_4_NV_3_TIMEOUT_ECU_C	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the EB01_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_2_NV_10_TIMEOUT_ECU_C	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the MB03_02 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_1_NV_2_TIMEOUT_ECU_C	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the MB04_01 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_EB01_3_GENERAL_ERROR_ECU_C	ECU EB01_03 General Failure; Group fault	Internal Card Errors occurred on the EB01. EB01_3_CAN_COM; EB01_3_NV_ACCESS; EB01_3_NV_TIMEOUT; EB01_3_DRV_IO_ACCESS; EB01_3_ACTIVATE_FCT; EB01_3_CONFIGURATION; EB01_3_EEP_FAILURE; EB01_3_BOARD_CODING	Refer to individual event entry
ERR_CB12_28_GENERAL_ERROR_ECU_C	ECU CB12_28 General Failure; Group fault	Internal Card Errors occurred on the CB12. CB12_28_CAN_COM; CB12_28_NV_ACEESS; CB12_28_NV_TIMEOUT; CB12_28_DRV_IO_ACCESS; CB12_28_ACTIVATE_FCT; CB12_28_CONFIGURATION; CB12_28_EEP_FAILURE; CB12_28_BOARD_CODING	Refer to individual event entry
ERR_EB01_3_RELAY0_ECU_C	Relay #1 on EB01_3 board defective	Relay #1 on EB01_3 board defective	Replace EB01_03 board
ERR_EB02_4_GENERAL_ERROR_ECU_C	ECU EB02_04 General Failure; Group fault	Internal Card Errors occurred on the EB02. EB02_4_CAN_COM; EB02_4_NV_ACEESS; EB02_4_NV_TIMEOUT; EB02_4_DRV_IO_ACCESS; EB02_4_ACTIVATE_FCT; EB02_4_CONFIGURATION; EB02_4_EEP_FAILURE; EB02_4_BOARD_CODING	Refer to individual event entry
DIA_PRC_CONFIG_ECU_C	Brake pressure regulator configuration error	The pressure regulator function detected a configuration error	Verify brake pressure transducer & wiring Replace MB04 board
ERR_CB09_22_ERROR_GROUP_ECU_C	ECU General Failure; Group fault	Internal Card Errors occurred on the CB09 CB09_22_CAN_COM; CB09_22_NV_ACCESS; CB09_22_NV_TIMEOUT; CB09_22_DRV_IO_ACCESS; CB09_22_ACTIVATE_FCT; CB09_22_CONFIGURATION; CB09_22_EEP_FAILURE; CB09_22_BOARD_CODING	Refer to individual event entry

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_MVB_PORT_GENERAL ERROR_ECU_C	An error has been detected in receiving information on a port of the MVB	ERR_MVB_PORT_100; ERR_MVB_PORT_150; ERR_MVB_PORT_512; ERR_MVB_PORT_640	Confirm MVB bus is operational Replace CB09 board
ERR_CB09_22_CB09_MVBC_ECU_C	An internal error has been detected by the CB09 board	The periodic supervision of the MVBC Chip has detected a failure due to abnormal hardware or software behavior	Confirm correct software loaded Replace CB09 board.
DIA_PRC_OFFSET_ECU_C	Brake pressure regulator offset error	Defective pressure transducer and/or wiring issue	Verify brake pressure transducer & wiring Replace MB04 board
DIA_PRC_DEVIATION_ECU_C	Brake pressure deviation on error	Defective pressure transducer and/or wiring issue Incorrect wiring to AMV/RMV brake control valves	Verify brake pressure transducer & wiring Replace MB04 board
ERR_LOAD_SIGNAL_OOR_ECU_C	The Load Weight Transducer reading is out of its normal operating range	The current from the load weight pressure transducer is less than 5ma or greater than 14mA	Verify load pressure transducer & wiring Replace MB04 board
ERR_LOAD_SIGNAL_INVALID_ECU_C	The Load Weight Transducer is reading is out of its valid range	The current from the load weight pressure transducer is less than 3.5ma or greater than 20.5mA	Verify transducer & wiring Replace MB04 board
ERR_MRP_LOW_ECU_C	The main reservoir pressure is below 90psi and the train is in motion (CT only)	Failure of the ASU or pressure transducer	Confirm ASU is functional Confirm pressure transducer is functional
ERR_MRP_LOW_RATE_ECU_C	The main reservoir pressure build rate is less than the required rate (CT only)	Failure of the ASU or pressure transducer	Confirm ASU is functional Confirm pressure transducer is functional
ERR_TRAINLINE_MISMATCH_ECU_C	Invalid state of the Trainlines	The ECU has detected an invalid state of the Trainlines	Confirm correct operation of Master controller and confirm there are no wiring problems
ERR_BRKCYLNTRAN_INVALID_ECU_C	The brake cylinder transducer reading is out of its valid range	The current from the brake cylinder pressure transducer is less than 3.8ma or greater than 21mA	Verify brake cylinder transducer & wiring Replace MB04 board
ERR_NO_PBED_SIGNAL_ECU_C	No PBED signal detected while in motion	Occurs when PWM <1%, not in limp home mode, and not in stand still mode	Check PBED source Check wiring
ERR_CONTROLVOLTRAN_INVALID_ECU_C	The control volume transducer reading is out of its valid range	The current from the control volume pressure transducer is less than 3.8ma or greater than 21mA	Verify transducer & wiring Replace MB04 board
ERR_CONTROLDEVIATION_Fault_ECU_C	There is a discrepancy between the target pressure and actual control volume pressure	The ECU's target pressure and the resulting pressure (brake cylinder) are outside the acceptable range.	Verify transducers & wiring Replace MB04 board
ERR_TRAINMOVEDCUTOUT_ECU_C	The friction brakes on this truck were disabled when the train was moved.	The friction brakes on this truck were disabled when the train was moved.	No corrective action; status information only

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_KN_22_NV_11_TIMEOUT_ECU_C	The MB04 board reports this error when it is unable to receive NV11 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_4_NV_3_TIMEOUT_ECU_C	The MB04 board reports this error when it is unable to receive NV3 from the EB02_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_3_NV_4_TIMEOUT_ECU_C	The MB04 board reports this error when it is unable to receive NV4 from the EB01_03 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_25_TIMEOUT_ECU_C	The MB04 board reports this error when it is unable to receive NV25 from the MB03_02oard.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_SLC_CFG_EB02_4_ECU_C	Slave configuration error	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board. Replace backplane
ERR_SLAVE_REP_TIMEOUT_EB02_4_ECU_C	Internal CAN bus Communication timeout	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board. Replace backplane
ERR_KN_22_NV_24_TIMEOUT_ECU_C	The MB03 board reports this error when it is unable to receive NV24 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_4_NV_3_TIMEOUT_ECU_C	The MB03 board reports this error when it is unable to receive NV3 from the EB02_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_3_NV_4_TIMEOUT_ECU_C	The MB03 board reports this error when it is unable to receive NV4 from the EB01_03 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_3_TIMEOUT_ECU_C	The MB03 board reports this error when it is unable to receive NV3 from the MB04_01 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_SLC_CFG_EB01_3_ECU_C	Slave configuration error	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board.
ERR_SLAVE_REP_TIMEOUT_EB01_3_ECU_C	Internal CAN bus Communication timeout	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board.
ERR_EB01_3_IO_WATCHDOG_ECU_C	I/O Watchdog timer error	I/O Watchdog timer error	Confirm correct software loaded Replace board.

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_KN_22_NV_22_TIMEOUT_ECU_C	The MB04 board reports this error when it is unable to receive NV22 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_28_NV_1_TIMEOUT_ECU_C	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_10_TIMEOUT_ECU_C	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_3_TIMEOUT_ECU_C	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_2_TIMEOUT_ECU_C	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_1_TIMEOUT_ECU_C	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_MB04_1_GENERAL_ERROR_ECU_B	ECU General Failure; Group fault	Internal Card Errors occurred on the MB04. MB04_1_CAN_COM; MB04_1_NV_ACCESS; MB04_1_NV_TIMEOUT; MB04_1_DRV_IO_ACCESS; MB04_1_ACTIVATE_FCT; MB04_1_CONFIGURATION; MB04_1_EEP_FAILURE; MB04_1_BOARD_CODING	Refer to individual event entry
ERR_MB04_1_SHORT_PWROUT11_ECU_B	Short circuit in the power output stage for the Apply Magnet Valve	Faulty wiring/valve causing a short to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_SHORT_PWROUT_12_ECU_B	Short circuit in the power output stage for the Release Magnet Valve	Faulty wiring/valve causing a short to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_OPEN_PWROUT11_ECU_B	Open circuit in the power output stage for the Apply Magnet Valve	Faulty wiring/valve causing a open to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board
ERR_MB04_1_OPEN_PWROUT12_ECU_B	Open circuit in the power output stage for the Release Magnet Valve	Faulty wiring/valve causing a open to be detected by the MB04_01 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB04_1 board

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_MB04_1_OPEN_CUTOFF_PWROUT1x_ECU_B	Safety timer expired for one of the four power outputs POP1-4	Safety timer expired for one of the four power outputs POP1-4	Remove short from one of the four power outputs POP 1 through POP 4 Replace MB04_1 board
ERR_MB04_1_ECU_FAILURE_ECU_B	Failsafe path or monitoring processor is down	Possible hardware problem with the MB04_01 board	Confirm correct software is loaded Replace MB04_1 board
ERR_MB03_2_GENERAL_ERROR_ECU_B	ECU General Failure; Group fault	Internal Card Errors occurred on the MB03. MB03_2_CAN_COM; MB03_2_NV_ACCESS; MB03_2_NV_TIMEOUT; MB03_2_DRV_IO_ACCESS; MB03_2_ACTIVATE_FCT; MB03_2_CONFIGURATION; MB03_2_EEP_FAILURE; MB03_2_BOARD_CODING	Refer to individual event entry
ERR_MB03_2_SHORT_PWROUT11_ECU_B	Short circuit in the power output stage that controls the hold valve	Faulty wiring/valve causing a short to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_SHORT_PWROUT12_ECU_B	Short circuit in the power output stage that controls the release valve	Faulty wiring/valve causing a short to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_OPEN_PWROUT11_ECU_B	Open circuit in the power output stage that controls the hold valve	Faulty wiring/valve causing a open to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_OPEN_PWROUT12_ECU_B	Open circuit in the power output stage that controls the release valve	Faulty wiring/valve causing a open to be detected by the MB03_02 board	Evaluate faulty or incorrect wiring/valve configuration Replace MB03_2 board
ERR_MB03_2_OPEN_CUTOFF_PWROUT1x_ECU_B	Safety timer expired for one of the four power outputs POP1-4	Safety timer expired for one ot the four power outputs POP1-4	Remove short from one of the four power outputs POP 1 through POP 4 Replace MB03_2 board
ERR_MB03_2_ECU_FAILURE_ECU_B	Failsafe path or monitoring processor is down	Possible hardware problem with the MB03_02 board	Confirm correct software is loaded Replace MB03_2 board
AE_ERR_CB12_28_CB12_HWSD_ECU_B	Hardware issue with CB12 card	Possible hardware issue with CB12 card	Confirm correct software loaded Replace CB12_28 board.
ERR_ACCESS_TO_MASTERERRORTAB_28_ECU_B	Error MB03_02 detected reading master table of errors of node 28	Incorrect software Defective board	Check ESRA system bus Replace the CB12_28 board; this is the board required to send the information
ERR_ACCESS_TO_MASTERERRORTAB_22_ECU_B	Error MB03_02 reading master table of errors of node 22	Incorrect software Defective board	Check ESRA system bus Replace the CB09_22 board; this is the board required to send the information
ERR_ACCESS_TO_MASTERERRORTAB_1_ECU_B	Error MB03_02 reading master table of errors of node 1	Incorrect software Defective board	Check ESRA system bus Replace the MB04_01 board; this is the board required to send the information
ERR_DV1_WSP_ECU_B	Speed deviation of +-40% of this sensor (Axle 6) from the average speed of Axles 4 and 5	Defective speed sensor Excessive sliding during brake application Location: Axle 6 Speed Sensor 9 Channel 1	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_DV2_WSP_ECU_B	Speed deviation of +-40% of this sensor (Axle 5) from the average speed of Axles 4, and 6	Defective speed sensor Excessive sliding during brake application Location: Axle 5 Speed Sensor 8 Channel 2	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV3_WSP_ECU_B	Speed deviation of +-40% of this sensor (Axle 4) from the average speed of Axles 5 and 6	Defective speed sensor Excessive sliding during brake application Location: Axle 4 Speed Sensor 6 Channel 2	Verify software Verify speed sensors are ok Verify wiring is ok Replace MB03_2 board
ERR_DV4_WSP_ECU_B	Not Used for Power Truck	Not Used for Power Truck	Not Used for Power Truck
AE_ERR_KN_22_NV_1_TIMEOUT_ECU_B	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_4_NV_3_TIMEOUT_ECU_B	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the EB01_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_2_NV_10_TIMEOUT_ECU_B	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the MB03_02 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
AE_ERR_KN_1_NV_2_TIMEOUT_ECU_B	The CB12 board reports this error when it is unable to receive at least one of the expected network variables from the MB04_01 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_EB01_3_GENERAL_ERROR_ECU_B	ECU General Failure; Group fault	Internal Card Errors occurred on the EB01. EB01_3_CAN_COM; EB01_3_NV_ACCESS; EB01_3_NV_TIMEOUT; EB01_3_DRV_IO_ACCESS; EB01_3_ACTIVATE_FCT; EB01_3_CONFIGURATION; EB01_3_EEP_FAILURE; EB01_3_BOARD_CODING	Refer to individual event entry
ERR_CB12_28_GENERAL_ERROR_ECU_B	ECU CB12_28 General Failure; Group fault	Internal Card Errors occurred on the CB12. CB12_28_CAN_COM; CB12_28_NV_ACEESS; CB12_28_NV_TIMEOUT; CB12_28_DRV_IO_ACCESS; CB12_28_ACTIVATE_FCT; CB12_28_CONFIGURATION; CB12_28_EEP_FAILURE; CB12_28_BOARD_CODING	Refer to individual event entry
ERR_EB01_3_RELAY0_ECU_B	Relay #1 on EB01_3 board defective	Relay #1 on EB01_3 board defective	Replace EB01_03 board

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_EB02_4_GENERAL_ERROR_ECU_B	ECU EB02_04 General Failure; Group fault	Internal Card Errors occurred on the EB02. EB02_4_CAN_COM; EB02_4_NV_ACEESS; EB02_4_NV_TIMEOUT; EB02_4_DRV_IO_ACCESS; EB02_4_ACTIVATE_FCT; EB02_4_CONFIGURATION; EB02_4_EEP_FAILURE; EB02_4_BOARD_CODING	Refer to individual event entry
DIA_PRC_CONFIG_ECU_B	Brake pressure regulator configuration error	The pressure regulator function detected a configuration error	Verify brake pressure transducer & wiring Replace MB04 board
ERR_CB09_22_ERROR_GROUP_ECU_B	ECU General Failure; Group fault	Internal Card Errors occurred on the CB09 CB09_22_CAN_COM; CB09_22_NV_ACCESS; CB09_22_NV_TIMEOUT; CB09_22_DRV_IO_ACCESS; CB09_22_ACTIVATE_FCT; CB09_22_CONFIGURATION; CB09_22_EEP_FAILURE; CB09_22_BOARD_CODING	Refer to individual event entry
ERR_MVB_PORT_GENERAL ERROR_ECU_B	An error has been detected in receiving information on a port of the MVB	ERR_MVB_PORT_100; ERR_MVB_PORT_150; ERR_MVB_PORT_512; ERR_MVB_PORT_640	Confirm MVB bus is operational Replace CB09 board
ERR_CB09_22_CB09_MVBC_ECU_B	An internal error has been detected by the CB09 board	The periodic supervision of the MVBC Chip has detected a failure due to abnormal hardware or software behavior	Confirm correct software loaded Replace CB09 board.
DIA_PRC_OFFSET_ECU_B	Brake pressure regulator offset error	Defective pressure transducer and/or wiring issue	Verify brake pressure transducer & wiring Replace MB04 board
DIA_PRC_DEVIATION_ECU_B	Brake pressure deviation on error	Defective pressure transducer and/or wiring issue Incorrect wiring to AMV/RMV brake control valves	Verify brake pressure transducer & wiring Replace MB04 board
ERR_LOAD_SIGNAL_OOR_ECU_B	The Load Weight Transducer reading is out of its normal operating range	The current from the load weight pressure transducer is less than 5ma or greater than 14mA	Verify load pressure transducer & wiring Replace MB04 board
ERR_LOAD_SIGNAL_INVALID_ECU_B	The Load Weight Transducer is reading is out of its valid range	The current from the load weight pressure transducer is less than 3.5ma or greater than 20.5mA	Verify transducer & wiring Replace MB04 board
ERR_TRAINLINE_MISMATCH_ECU_B	Invalid state of the Trainlines	The ECU has detected an invalid state of the Trainlines	Confirm correct operation of Master controller and confirm there are no wiring problems

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_BRKCYLNTRAN_INVALID_ECU_B	The brake cylinder transducer reading is out of its valid range	The current from the brake cylinder pressure transducer is less than 3.8ma or greater than 21mA	Verify brake cylinder transducer & wiring Replace MB04 board
ERR_NO_PBED_SIGNAL_ECU_B	No PBED signal detected while in motion	Occurs when PWM <1%, not in limp home mode, and not in stand still mode	Check PBED source Check wiring
ERR_CONTROLVOLTRAN_INVALID_ECU_B	The control volume transducer reading is out of its valid range	The current from the control volume pressure transducer is less than 3.8ma or greater than 21mA	Verify transducer & wiring Replace MB04 board
ERR_PARKBRAKECIRCUIT_Fault_ECU_B	The park Brake switches have reported an invalid state-> both applied and released.	The park Brake switches have reported an impossible situation, both applied and released.	Verify switches & wiring Replace board
ERR_CONTROLDEVIATION_Fault_ECU_B	There is a discrepancy between the target pressure and actual control volume pressure.	The ECU's target pressure and the resulting pressure (brake cylinder) are outside the acceptable range.	Verify transducers & wiring Replace MB04 board
ERR_TRAINMOVEDCUTOUT_ECU_B	The friction brakes on this truck were disabled when the train was moved.	The friction brakes on this truck were disabled when the train was moved.	No corrective action; status information only
ERR_KN_22_NV_11_TIMEOUT_ECU_B	The MB04 board reports this error when it is unable to receive NV11 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_4_NV_3_TIMEOUT_ECU_B	The MB04 board reports this error when it is unable to receive NV3 from the EB02_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_3_NV_4_TIMEOUT_ECU_B	The MB04 board reports this error when it is unable to receive NV4 from the EB01_03 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_25_TIMEOUT_ECU_B	The MB04 board reports this error when it is unable to receive NV25 from the MB03_02oard.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_SLC_CFG_EB02_4_ECU_B	Slave configuration error	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board. Replace backplane
ERR_SLAVE_REP_TIMEOUT_EB02_4_ECU_B	Internal CAN bus Communication timeout	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board. Replace backplane
ERR_KN_22_NV_24_TIMEOUT_ECU_B	The MB03 board reports this error when it is unable to receive NV24 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_4_NV_3_TIMEOUT_ECU_B	The MB03 board reports this error when it is unable to receive NV3 from the EB02_04 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem

Electronic Control Unit (ECU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ERR_KN_3_NV_4_TIMEOUT_ECU_B	The MB03 board reports this error when it is unable to receive NV4 from the EB01_03 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_3_TIMEOUT_ECU_B	The MB03 board reports this error when it is unable to receive NV3 from the MB04_01 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_SLC_CFG_EB01_3_ECU_B	Slave configuration error	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board.
ERR_SLAVE_REP_TIMEOUT_EB01_3_ECU_B	Internal CAN bus Communication timeout	Incorrect software installed Defective board Defective backplane	Confirm correct software loaded Replace board.
ERR_EB01_3_IO_WATCHDOG_ECU_B	I/O Watchdog timer error	I/O Watchdog timer error	Confirm correct software loaded Replace board.
ERR_KN_22_NV_22_TIMEOUT_ECU_B	The MB04 board reports this error when it is unable to receive NV22 from the CB09_22 board.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_28_NV_1_TIMEOUT_ECU_B	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_10_TIMEOUT_ECU_B	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_2_NV_3_TIMEOUT_ECU_B	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_2_TIMEOUT_ECU_B	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem
ERR_KN_1_NV_1_TIMEOUT_ECU_B	The CB09 board reports this error when it is unable to receive at least one of the expected network variables with the initial setpoints.	Incorrect software installed Defective board Defective backplane	Check ESRA system bus Replace the other board(s) that is required to send the NV information to this board. This board is typically not the problem

Event Recorder (ER) FAIL Fault Data Definitions

The following table describes the Fault Data Detail.

Event Recorder (ER)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ER_CONFIG_ERR	ER Configuration file missing or invalid	Missing or corrupt file (fault)	Reload configuration file
RTC_BATTERY_LOW	ER Real Time Clock battery low	Low battery (alarm)	Replace RTC clock battery
PRG_MEM_CHK_FAIL	ER Program Memory Check Fail	Memory hardware failure (fault)	Replace unit
DTA_MEM_CHK_FAIL	ER Data Memory Check Fail	Memory hardware failure (fault)	Replace unit
UNCHANGE_IN_92_DAY	No ER inputs change in 92 day	Possible loose connector or failed CPU board.(alarm/fault)	Check connections. Replace CPU Board
HIGH_TEMPERATURE	High Temperature	Ventilation fault (alarm)	Confirm rack ventilation
ER_SUPPLY_FAILURE	Internal ER Power Supply Failure	Power supply failure (fault)	Replace unit
USB_PRC_HALT	USB communication process halted	Process unexpectedly interrupted (alarm)	USB drive was removed prior to completion of download. Retry USB operation.
USB_PRC_ERR	USB communication process system error	Process unexpectedly interrupted (alarm)	Retry USB operation. Replace ER Unit.
MVB_BOARD_MISS	MVB board Missing	Loose or missing board (fault)	Reseat board. Replace CPU Board. Replace unit
MVB_BRD_HW_FAIL	MVB board hardware failure	Loose, missing or faulty board. (fault)	Reseat board. Replace board. Replace unit.
MVB_BRD_COM_ERR	MVB board communication error	Loose, missing or faulty board. (fault)	Reseat board. Replace board. Replace unit.
MVB_BRD_CFG_ERR	MVB board Configuration error	Loose, missing or faulty board. (fault)	Reseat board. Replace board. Replace unit.
MVB_LINEA_DISTURB	MVB Line A disturbed	Network disturbance, connectivity issue (alarm)	Investigate MVB network
MVB_LINEB_DISTURB	MVB Line B disturbed	Network disturbance, connectivity issue (alarm)	Investigate MVB network
CHM_MODULE_MISS	Crash Hardened Memory module missing	Loose connection. Faulty CHMM (fault)	Check connectivity. Replace CHMM
CHM_STEST_FAIL	Self test failed on Crash Hardened Memory	Loose connection. Faulty CHMM (fault)	Check connectivity. Replace CHMM
CHM_COM_ERR	Crash Hardened Memory module communication error	Loose connection. Faulty CHMM (fault)	Check connectivity. Replace CHMM
EMM_MODULE_MISS	Events Mirror Memory module missing	Loose, missing or faulty board (fault)	Reseat board. Replace board. Replace unit.
EMM_STEST_FAIL	Self test failed on Events Mirror Memory module	Loose, missing or faulty board (fault)	Reseat board. Replace board. Replace unit.
EMM_COM_ERR	Events Mirror Memory module communication error	Loose, missing or faulty board (fault)	Reseat board. Replace board. Replace unit.
ESM_MODULE_MISS	Events Spooler Memory device is missing	Loose, missing or faulty board (fault)	Reseat board. Replace board. Replace unit.
ESM_STEST_FAIL	Self test failed on Events Spooler Memory module	Loose, missing or faulty board (fault)	Reseat board. Replace board. Replace unit.

Event Recorder (ER)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ESM_COM_ERR	Events Spooler Memory communication error	Communication error(fault)	Reseat board. Replace CPU board. Replace unit.
ESM_FULL_ERR	Events Spooler Memory is full	Memory error (fault)	Reseat board. Replace CPU board. Replace unit.
PTU_PRC_HALT	PTU communication process halted	PTU disconnected in process	Retry PTU Operation
PTU_PRC_ERR	PTU communication process system error	Process error (fault)	Retry PTU Operation
RIO_PRC_HALT	RIO board Management Process halted	Process error (fault)	Replace CPU Board. Replace Unit
RIO_PRC_ERR	RIO board Management Process System error	Process error (fault)	Replace CPU Board. Replace Unit
MVB_PRC_HALT	MVB communication process halted	Process error (fault)	Reseat board. Replace board. Replace unit.
MVB_PRC_ERR	MVB communication process system error	Process error (fault)	Reseat board. Replace board. Replace unit.
CHM_PRC_HALT	Crash Hardened Memory management process halted	Process error (fault)	Check connectivity. Replace CHMM
CHM_PRC_ERR	Crash Hardened Memory management process system error	Process error (fault)	Check connectivity. Replace CHMM
EVE_PRC_HALT	Events scanning process halted	Process error (fault)	Replace CPU Board. Replace Unit
EVE_PRC_ERR	Events scanning process software system error	Process error (fault)	Replace CPU Board. Replace Unit
MDS_PRC_HALT	MDS process halted	Process error (fault)	Check connectivity. Replace Unit.
MDS_PRC_ERR	MDS process system error	Process error (fault)	Check connectivity. Replace Unit.
MDS_COM_ERR	MDS communication error	Connectivity issue or failed unit	Check connectivity. Replace Unit.

HVAC FAIL Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

HVAC			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
HVAC ACCU Failure	Fault/indicator	Internal Hardwar or Software failure	Check correct ACCU mode LED is illuminated Check ACCU Fault LED is not illuminated, if so check fault log Reboot HVAC controller, if fault persists, test ACC using ACCU BTE If Fault persists replace ACCU
Cold Car	Fault/indicator	Temperature out set point during heating mode	Check temperature sensor: Check wiring is connected properly and not damaged Check sensor operation –use digital thermometer Verify there are no blower failures (circuit breaker or contactor) and the airflow switch is operational Troubleshoot overhead heater related faults; Test overhead heater for proper operation, replace overhead heater
Hot Car	Fault/indicator	Temperature out set point during cooling mode	Check temperature sensor: Check wiring is connected properly and not damaged Check sensor operation –use digital thermometer Verify there are no blower failures (circuit breaker or contactor) and the airflow switch is operational Verify that the condenser fan is operational - troubleshoot any CFM related faults. Verify that the compressors are operational – troubleshoot any compressor related faults.
208VAC Absence	Fault/indicator	No detection or abnormal voltage	Verify presence of 208 VAC at the ACD Verify ACD is set properly; see schematic (Sheet A-2). Verify that the quality of the power supply is within correct parameters. If the power supply appears to be within the defined parameters, replace the ACD.
Compressor 1 feedback	Fault/indicator	Current drawn is out of range	Confirm proper compressor operation using PTU
Compressor 2 feedback	Fault/indicator	Current drawn is out of range	Confirm proper compressor operation using PTU
Condenser fan motor feedback	Fault/indicator	Current drawn is out of range	Check contactor for visible signs of damage. Verify contactor is physically functioning properly Verify wiring is correct and not damaged. Perform electrical troubleshooting Test ACCU using ACCU Tester. If fault persists in either case, replace the component.

HVAC			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Blower fan motor feedback	Fault/indicator	Current drawn is out of range	Check contactor for visible signs of damage. Verify contactor is physically functioning properly Verify wiring is correct and not damaged. Perform electrical troubleshooting Test ACCU using ACCU Tester. If fault persists in either case, replace the component.
Overhead Heater 1 contactor feedback	Fault/indicator	No feedback	Check contactor for visible signs of damage. Verify contactor is physically functioning properly Verify wiring is correct and not damaged. Perform electrical troubleshooting refer per maintenance manual. Test ACCU using ACCU Tester. If fault persists in either case, replace the component.
Overhead Heater 2 contactor feedback	Fault/indicator	No feedback	Check contactor for visible signs of damage. Verify contactor is physically functioning properly Verify wiring is correct and not damaged. Perform electrical troubleshooting refer per maintenance manual. Test ACCU using ACCU Tester. If fault persists in either case, replace the component.
Compressor 1 C/B feedback	Fault/indicator	C/B tripped	Check wiring is connected properly and not damaged Verify breaker is physically functioning properly Set CB On, if CB trips perform electrical troubleshooting, Replace CB
Compressor 2 C/B feedback	Fault/indicator	C/B tripped	Check wiring is connected properly and not damaged Verify breaker is physically functioning properly Set CB On, if CB trips perform electrical troubleshooting, Replace CB
Condenser fan motor C/B feedback	Fault/indicator	C/B tripped	Check wiring is connected properly and not damaged Verify breaker is physically functioning properly Set CB On, if CB trips perform electrical troubleshooting, Replace CB
Blower fan motor C/B feedback	Fault/indicator	C/B tripped	Check wiring is connected properly and not damaged Verify breaker is physically functioning properly Set CB On, if CB trips perform electrical troubleshooting, Replace CB
Overhead Heater 1 and 2 C/B feedback	Fault/indicator	C/B tripped	Check wiring is connected properly and not damaged Verify breaker is physically functioning properly Set CB On, if CB trips perform electrical troubleshooting, Replace CB

HVAC			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
Air Flow Detection	Fault/indicator	No air flow coming out of the Evaporator Fan Motor	Troubleshoot loss air flow per running maintenance manual. Check evaporator blower CB, Check fan, check blower contactor. Check blower fan motor. Check filters.
Fresh Air Temp. Sensor	Fault/indicator	Reading is out of limits	Verify temperature sensor using digital thermometer Replace Temperature sensor
Return Air Temp. Sensor	Fault/indicator	Reading is out of limits	Verify temperature sensor using digital thermometer Replace Temperature sensor
Supply Air Temp. Sensor	Fault/indicator	Reading is out of limits	Verify temperature sensor using digital thermometer Replace Temperature sensor
Low Pressure Transducer 1	Fault/indicator	Reading is out of limits	Check transducer for proper operation. Check refringent charge.
High Pressure Transducer 1	Fault/indicator	Reading is out of limits	Check condenser coil for dirt restricting air flow. Confirm condenser fan operation. Check refrigerant charge. Check operation of thermo expansion valve.
Low Pressure Transducer 2	Fault/indicator	Reading is out of limits	Check transducer for proper operation. Check refringent charge.
High Pressure Transducer 2	Fault/indicator	Reading is out of limits	Check condenser coil for dirt restricting air flow. Confirm condenser fan operation. Check refrigerant charge. Check operation of thermo expansion valve.
Overhead Heater over temperature	Fault/indicator	Any of the Overheat Protection Device 1 has actuated.	Confirm OHC operation. Check for air flow restriction.
Damper 1 out of position	Fault/indicator	Damper 1 is out of position	Confirm damper operation using PTU
Damper 2 out of position	Fault/indicator	Damper 2 is out of position	Confirm damper operation using PTU
Operating Status	Fault/indicator	HVAC ON or OFF	Status indication
Compressor 1 C/B Status	Fault/indicator	OPEN (TRIPPED) / CLOSED	Status indication
Compressor 2 C/B Status	Fault/indicator	OPEN (TRIPPED) / CLOSED	Status indication
Condenser fan motor 1 C/B Status	Fault/indicator	OPEN (TRIPPED) / CLOSED	Status indication
Blower fan motor C/B Status	Fault/indicator	OPEN (TRIPPED) / CLOSED	Status indication
Overhead Heater C/B Status	Fault/indicator	OPEN (TRIPPED) / CLOSED	Status indication
Fresh Air Damper Position	Fault/indicator	OPEN / CLOSED	Confirm damper operation using PTU

MDS FAIL Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS/CCU for displaying in the Fault screens.

Monitoring and Diagnostic System (MDS)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MVB_RIOB_COMM_FAULT	MDS cannot communicate with the MVB RIOB Rack	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or TCN LCU Rack unit failure	Check B-END TCN LCU Rack Ethernet ETH1 port, Check Eth Switch LAN1B-Port 7, Check TCN Circuit Breaker Replace TCN Rack
MVB_RIOA_COMM_FAULT	MDS cannot communicate with the MVB RIOA Rack	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or TCN LCU Rack unit failure	Check A-END TCN LCU Rack Ethernet ETH1 port, Check Eth Switch LAN1A-Port 7, Check TCN Circuit Breaker Replace TCN Rack
ETH_RIO_2B_COMM_FAULT	MDS cannot communicate with the Ethernet RIO 2B Unit	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or the ETH_RIO_2B unit failure	Check ETH_RIO_2B port, Check Eth Switch LAN2B-Port 9, Replace the ETH_RIO_2B Unit
ETH_RIO_1B_COMM_FAULT	MDS cannot communicate with the Ethernet RIO 1B Unit	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or the ETH_RIO_1B unit failure	Check ETH_RIO_1B port, Check Eth Switch LAN1B-Port 8, Replace the ETH_RIO_1B Unit
ETH_RIO_2A_COMM_FAULT	MDS cannot communicate with the Ethernet RIO 2A Unit	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or the ETH_RIO_2A unit failure	Check ETH_RIO_2A port, Check Eth Switch LAN2A-Port 14, Replace the ETH_RIO_2A Unit
ETH_RIO_1A_COMM_FAULT	MDS cannot communicate with the Ethernet RIO 1A Unit	Connection failure to the Ethernet system. Caused by the Ethernet subsystem failure, or the ETH_RIO_1A unit failure	Check ETH_RIO_1A port, Check Eth Switch LAN1A-Port 8, Replace the ETH_RIO_1A Unit
MDS_INITIALIZATION_ERROR	MDS detected at least one error during initialization	Error during an internal MDS Process or Communication Socket creation	Replace MDS Unit

PLU FAIL Fault Data Definitions

The following table describes the Fault Data Detail.

Propulsion Logic Unit (PLU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ID_F	Truck ID Abnormality	ID Input signal mismatch	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
TSPD_F	Trailer Axle Speed Sensor Fault	Trailer Axle Speed Sensor Fault	Check Speed Sensor
HSCB_F	HSCB Fault Detection	HSCB Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
LCC_F	LCC Fault Detection	LCC Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
LS_F	LS Fault Detection	LS Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
SPD_F	Motor Axle Speed Sensor Fault	Motor Axle Speed Sensor Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
FDR_F	Propulsion Serious Fault	Propulsion Serious Fault	When vehicle speed is zero, Push the Propulsion Reset Switch
CBTD_F	HSCB or LS or LCC Fault Detection	Circuit Breaker fault (HSCB or LS or LCC)	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
HSCBT_F	HSCB Tripped	Detection HSCB Self Trip(3200A)	Automatically reset (Protection)
CFD_F	Inverter Gate Fault	IGBT Fault (Inverter U, V, W)	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
CFDB_F	Bch Gate Fault	IGBT Fault（Bch1,2)	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
PUD_F	Phase current imbalance	Ground fault at the motor line	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
MMOCD2_F	Frequent output overcurrent	Detection of "output overcurrent " 4 times	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
PBFR_F	Input command abnormality	FWD and REV at the same time or signal inconsistency between trainline and MVB	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
FCD_F	Abnormal charging	IGBT fault (ON mode) or main circuit ground fault or charging resistor fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
THD2_F	IGBT Overheat Protection (Inverter)	Heatsink or Air filter abnormal	Automatically reset (Resettable after depression of the temperature) (Protection)
XO_F	Crystal Oscillator Fault	Abnormal CPU clock Frequency	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)

Propulsion Logic Unit (PLU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
GPLVD_F	Gate Voltage source fault	Gate Voltage source PCB Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
PWLV_F	Control Voltage fault	Control voltage source PCB Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
P15LVD_F	Current Transducer Power Source fault	Current Transducer Power Source PCB fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
P28LVD_F	Analog Signal Power Low Voltage	Analog Output Voltage source PCB Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
WD_F	Watch Dog Fault	CPU fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
MMOCD1_F	Output Overcurrent	Disturbance (Overhead Line)	Automatically reset (Protection)
OVD_F	Filter Capacitor Overvoltage	Disturbance (Overhead Line)	Automatically reset (Protection)
SOVD_F	Filter Capacitor Voltage Rising	Disturbance (Overhead Line)	Automatically reset (Protection)
LVD_F	Filter Capacitor Low Voltage	Disturbance (Overhead Line)	Automatically reset (Protection)
BSM_F	Rollback Detection		Automatically reset when no motion condition is detected.
BSLP_F	Adhesion failure (Powering)	Disturbance (Track Condition)	Automatically reset (Protection)
BSLB_F	Adhesion failure (Breaking)	Disturbance (Track Condition)	Automatically reset (Protection)
LGD_F	Line Gap Detected	Catenary Gap	Line Voltage > 750V or 20 sec Dynamic Braking
TEFF_F	Propulsion Power Effort Fault	More than 5% of difference between aimed and achieved torque	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
LOFM_F	Propulsion Protection Detection	Propulsion Protection Detection	Automatically reset
PGF_F	Propulsion Ground Fault	Propulsion Ground Fault	Automatically reset (Protection)
RYTD_F	Relay abnormality (NMR)	Relay fault (NMR)	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
WDC_F	Wheel Diameter Fault	Wheel Abrasion	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
BROH_F	Bch resistor overheat	Disturbance	
MLOFM_F	Frequent Protection Detection	Protection detected 3 times in 1 min or continued for 3 min.	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
CHIF_F	BCh Fault	Ground fault at Brake resistance lines	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)

Propulsion Logic Unit (PLU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
ILOV_F	Input Overcurrent	Line Overcurrent Detected	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
ESLVD_F	Line Low Voltage	Line Low Voltage	Automatically reset (Protection)
BRRE_F	Friction Brake Not Release	Disturbance (BCU)	Automatically reset (Protection)
MTP_F	Traction Motor Over Heat		
THDB_F	IGBT Overheat Protection (Bch)	Heatsink or Air filter abnormality	Automatically reset (Resettable after depression of the temperature) (Protection)
THD1_F	Control switching Due to Rising IGBT Temperature	Heatsink or Air filter abnormality	Automatically reset (Resettable after depression of the temperature) (Protection)
HB28_F	HSCB Power source abnormality	HSCB Power source abnormality or HSCB-CB off	HSCB Power On
FAN1KM	Fan motor speed fault	Fan motor abnormality	Automatically reset (Protection)
THB_F	Thermistor Fault (Bch)	Thermistor Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
THI_F	Thermistor Fault (Inverter)	Thermistor Fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
CHR_F	Charging resistor protection	Frequent charging	Only Warning
HSCBLOC_F	HSCB Lockout	Frequent Input Over Current	When vehicle speed is zero, Push the HSCB Reset Switch on PTU (Serious Fault)
ITD_F	Illegal torque Detection	Calculation abnormality	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
FCC_F	Filter capacitor capacitance fault	Filter capacitance fault	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
MCMIS_F	Motor Lead Miss Connection	Motor Lead Miss Connection	When vehicle speed is zero, Push the Propulsion Reset Switch (Serious Fault)
ETH_F	Ethernet Fault	Ethernet Communication Fault	Only Warning
MVB1_F	MVB No.1 Fault	MVB Communication (MVB1) Fault	Only Warning
MVB2_F	MVB No.2 Fault	MVB Communication (MVB2) Fault	Only Warning
MVB_F	MVB Fault	MVB Communication Fault	When vehicle speed is zero, Push the HSCB Reset Switch on PTU (Serious Fault)
TL_F	Trainline and PBED Fault	Command Confliction between M, CM and PBED	Only Warning
CN_F	SCEB Fault	SCEB Command Confliction	Only Warning

Propulsion Logic Unit (PLU)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
LWA_F	A Truck Load Weight Failure	Illegal A Truck load weight signal from ECU	Only Warning
LWB_F	B Truck Load Weight Failure	Illegal B Truck load weight signal from ECU	Only Warning
LWC_F	C Truck Load Weight Failure	Illegal C Truck load weight signal from ECU	Only Warning
AC208_F	AC Fan Power Supply Fault	AC 208V Power Supply Fault	Only Warning

TCN FAIL Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Train Control Network (TCN)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MVB_RIO_AUX_BOARD_DATA_FAULT	AUX Module Data is NOT Available or Invalid	AUX MVB Port Failure – Data Freshness Counter Expired	Check RIO AUX Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace AUX Module
MVB_RIO_AUX_BOARD_SAFE_MODE	AUX Module Reported a SAFE Mode State to the CPU	Internal Hardware Error	Check RIO AUX Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace AUX Module
MVB_RIO_AUX_BOARD_FAULT	AUX Module Reported a Fault State to the CPU	Internal Hardware Error	Check RIO AUX Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace AUX Module
MVB_RIO_PWM_BOARD_DATA_FAULT	PWM Module Data is NOT Available or Invalid	PWM MVB Port Failure – Data Freshness Counter Expired	Check RIO PWM Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace PWM Module
MVB_RIO_PWM_BOARD_SAFE_MODE	PWM Module Reported a SAFE Mode State to the CPU	Internal Hardware Error	Check RIO PWM Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace PWM Module
MVB_RIO_PWM_BOARD_FAULT	PWM Module Reported a Fault State to the CPU	Internal Hardware Error	Check RIO PWM Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace PWM Module
MVB_RIO_DI1-1_BOARD_DATA_FAULT	DI1-1 Module Data is NOT Available or Invalid	DI1-1 MVB Port Failure – Data Freshness Counter Expired	Check RIO DI1-1 Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace DI1-1 Module
MVB_RIO_DI1-1_BOARD_SAFE_MODE	DI1-1 Module Reported a SAFE Mode State to the CPU	Internal Hardware Error	Check RIO DI1-1 Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace DI1-1 Module
MVB_RIO_DI1-1_BOARD_FAULT	DI1-1 Module Reported a Fault State to the CPU	Internal Hardware Error	Check RIO DI1-1 Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace DI1-1 Module
MVB_RIO_DI1-2_BOARD_DATA_FAULT	DI1-2 Module Data is NOT Available or Invalid	DI1-2 MVB Port Failure – Data Freshness Counter Expired	Check RIO DI1-2 Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace DI1-2 Module
MVB_RIO_DI1-2_BOARD_SAFE_MODE	DI1-2 Module Reported a SAFE Mode State to the CPU	Internal Hardware Error	Check RIO DI1-2 Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace DI1-2 Module

Train Control Network (TCN)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
MVB_RIO_DI1-2_BOARD_FAULT	DI1-2 Module Reported a Fault State to the CPU	Internal Hardware Error	Check RIO DI1-2 Module location in the TCN LCU Rack. Remove and Re-insert module in the correct location. Replace DI1-2 Module
WTB_MVB_Gateway_FAULT	WTB Gateway Module MVB Data is Invalid	WTB Gateway Module Internal Error	Replace Gateway in TCN Rack Module

TOD FAIL Fault/Status Bytes Definitions

The following table describes the Fault and Status bytes, and their associated text which is provided to the TOD by the MDS for displaying in the Fault screens.

Train Operator Display (TOD)			
Fault Name	**Description of the Fault**	**The cause of the Fault**	**The Corrective Action**
IDDB_MISSING_FLT	The MDS is missing the Identification database file	File missing on the MDS	Install missing file on MDS
IDDB_MDS_OLD_FLT	The MDS Identification database file is older than what is on the TOD	File on the MDS is an older file	Install newest file on MDS
TOD2TOD_COMM_FLT	The TOD is not communicating with other TOD in cab	TODs are not communicating.	Verify connectors, switches, and wiring. Replace bad TOD
TOD2WWAS_COMM_FLT	TOD not communicating with the WWAS	The TOD is not receiving WWAS RS485 messages	Check connectors and wiring. Check WWAS and TOD.
RTEFILEMISSING_FLT	PID Route File is missing on the MDS	PID Route File missing on MDS	Install missing file on MDS
RTE_MDS_OLD_FLT	MDS PIDS Route File is older then what is on the TOD	MDS PIDS Route File is older than what is on the TOD.	Install newest file on the MDS
FTP_COMM_FLT	Could not FTP file from MDS	Issue with FTP server or client	Verify that server is running on MDS

TOA FAIL Fault/Status Bytes Definitions

Fault Name	Description of the Fault	The Cause of the Fault	The Corrective Actions
ACP(B) Fault	ACP(B) does not respond to the request from ACP(A)	The ACP(A) can not communicate with the ACP(B). ACP(B) doesn't respond to the request from ACP(A).	1. Switch MCB ON/OFF to reset the system to see whether system can be recovered. 2. Remove and insert the connector. (To check the network condition between two ACP(A) and (B)). If the fault is still remained, replace the ACP(B).
ACP(A) CF Card Content Error	Missing file of ACP(A) CF setting	Data in the CF card is not correct.	1. Remove and insert the CF card. 2. Refresh the data inside CF card. If the fault is still remained, replace the ACP(A).
ACP(A) IO Error	Communication Error between CPU board and PIO board inside ACP(A)	The 485 communication between PCBs inside ACP(A) fails.	Replace the ACP(A).
ACP(A) CCH Error	CCH(A) does not respond to the request from ACP(A)	The ACP(A) cannot communicate with the CCH(A).	1. Switch MCB ON/OFF to reset the system to see whether system can be recovered. 2. Remove and insert the connector. (To check the network condition between ACP(A) and CCH(A). If the fault is still remained, replace the CCH(A).
PIC(A#1) Error	PIC(A#1) Error (SELF TEST is needed)	The ACP(A) cannot receive the normal sounds where it's input from inside Mic of PIC(A#1), correctly.	1. Swap faulty PIC and healthy PIC to see whether fault report is moved on the log or not. If the fault is moved, replace the PIC.
PIC(A#2) Error	PIC(A#2) Error (SELF TEST is needed)	The ACP(A) cannot receive the normal sounds where it's input from inside Mic of PIC(A#2), correctly.	1. Swap faulty PIC and healthy PIC to see whether fault report is moved on the log or not. If the fault is moved, replace the PIC.
Audio Output Line Error for Interior Speaker	ACP(A) audio output line error for Interior Speaker (SELF TEST is needed)	The audio output line for interior speaker inside ACP(A), and car wiring to each interior speakers may have something error.	1. Check the car wiring visually. 2. Check the speaker visually 3. Swap ACP and re-test If the fault is removed on step3, replace the ACP. If the fault is still detect, replace the speakers one by one until fault is cleared.
Audio Output Line Error for Exterior Speaker	ACP(A) audio output line error for Exterior Speaker (SELF TEST is needed)	The audio output line for exterior speaker inside ACP(A), and car wiring to each interior speakers may have something error.	1. Check the car wiring visually. 2. Check the speaker visually 3. Swap ACP and re-test If the fault is removed on step3, replace the ACP. If the fault is still detect, replace the speakers one by one until fault is cleared.

Fault Name	Description of the Fault	The Cause of the Fault	The Corrective Actions
ACP(A) Fault	ACP(A) does not respond to the request from ACP(B)	The ACP(B) cannot communicate with the ACP(A). ACP(A) doesn't respond to the request from ACP(B).	1. Switch MCB ON/OFF to reset the system to see whether system can be recovered. 2. Remove and insert the connector. (To check the network condition between two ACP(A) and (B).) If the fault is still remained, replace the ACP(A).
ACP(B) CF Card Content Error	Missing file of ACP(B) CF setting	Data in the CF card is not correct.	1. Remove and insert the CF card. 2. Refresh the data inside CF card. If the fault is still remained, replace the ACP(B).
ACP(B) IO Error	Communication Error between CPU board and PIO board inside ACP(B)	The 485 communication between PCBs inside ACP(A) fails.	Replace the ACP(B).
ACP(B) CCH Error	CCH(B) does not respond to the request from ACP(B)	The ACP(A) cannot communicate with the CCH(A).	1. Switch MCB ON/OFF to reset the system to see whether system can be recovered. 2. Remove and insert the connector. (To check the network condition between ACP(B) and CCH(B).
PIC(B#1) Error	PIC(B#1) Error (SELF TEST is needed)	The ACP(B) cannot receive the normal sounds where it's input from inside Mic of PIC(B#1), correctly.	1. Swap faulty PIC and healthy PIC to see whether fault report is moved on the log or not. If the fault is moved, replace the PIC.
PIC(B#2) Error	PIC(B#2) Error (SELF TEST is needed)	The ACP(B) cannot receive the normal sounds where it's input from inside Mic of PIC(B#2), correctly.	1. Swap faulty PIC and healthy PIC to see whether fault report is moved on the log or not. If the fault is moved, replace the PIC.
Audio Output Line Error for Interior Speaker	ACP(B) audio output line error for Interior Speaker (SELF TEST is needed)	The audio output line for interior speaker inside ACP(B), and car wiring to each interior speakers may have something error.	1. Check the car wiring visually. 2. Check the speaker visually 3. Swap ACP and re-test If the fault is removed on step3, replace the ACP. If the fault is still detect, replace the speakers one by one until fault is cleared.
Audio Output Line Error for Exterior Speaker	ACP(B) audio output line error for Exterior Speaker (SELF TEST is needed)	The audio output line for exterior speaker inside ACP(B), and car wiring to each interior speakers may have something error.	1. Check the car wiring visually. 2. Check the speaker visually 3. Swap ACP and re-test If the fault is removed on step3, replace the ACP. If the fault is still detect, replace the speakers one by one until fault is cleared.
FDS(#1) Error	FDS(#1) Error (Disconnection or Inside Error)	The ACP(A) cannot communicate with FDS(#1).	1. Switch ON/OFF the system. 2. Remove and insert the connector. (To check the network condition.) If the fault is still remained, replace the FDS(#1).

Fault Name	Description of the Fault	The Cause of the Fault	The Corrective Actions
SDS(#1) Error	SDS(#1) Error (Disconnection or Inside Error)	The ACP(A) cannot communicate with SDS(#1).	1. Switch ON/OFF the system. 2. Remove and insert the connector. (To check the network condition.) If the fault is still remained, replace the SDS(#1).
PIDS Controller (#1) Error	PIDS Controller (#1) Error (Disconnection or Inside Error)	The ACP(A) cannot communicate with PIDS(#1).	1. Switch ON/OFF the system. 2. Remove and insert the connector. (To check the network condition.) If the fault is still remained, replace the PIDS(#1).
FDS(#1) internal error	FDS(#1) Error (Error response)	FDS(#1) fails.	Replace the FDS(#1).
SDS(#1) internal error	SDS(#1) Error (Error response)	SDS(#1) fails.	Replace the SDS(#1).
FDS(#2) Error	FDS(#2) Error (Disconnection or Inside Error)	The ACP(B) cannot communicate with FDS(#2).	1. Switch ON/OFF the system. 2. Remove and insert the connector. (To check the network condition.) If the fault is still remained, replace the FDS(#2).
SDS(#2) Error	SDS(#2) Error (Disconnection or Inside Error)	The ACP(B) cannot communicate with SDS(#2).	1. Switch ON/OFF the system. 2. Remove and insert the connector. (To check the network condition.) If the fault is still remained, replace the SDS(#2).
PIDS Controller (#2) Error	PIDS Controller(#2) Error (Disconnection or Inside Error)	The ACP(B) cannot communicate with PIDS(#2).	1. Switch ON/OFF the system. 2. Remove and insert the connector. (To check the network condition.) If the fault is still remained, replace the PIDS(#2).
FDS(#2) internal error	FDS(#2) Error (Error response)	FDS(#2) fails.	Replace the FDS(#2).
SDS(#2) internal error	SDS(#2) Error (Error response)	SDS(#2) fails.	Replace the SDS(#2).
TOAE Network Error	I/F Unit(B) cannot communicate with ACP(A) or ACP(B)	There is malfunction inside network pass between I/F Unit and ACP(A) or ACP(B). Cause of the fault will be Ethernet switch or cables. I/F Unit change the status of this bit as error to notify the faulty condition inside TOAE network.	1. Check actual fault status on screen of CCH(A) and (B) 2. Follow the instruction of listed fault. 3. Switch ON/OFF the system to see whether system can be recovered. 4. Remove and insert the connectors at the equipment shown in CCH screen If fault is still remained, replace relevant equipment for TOAE network
I/F Unit Error	Disconnect communication between two CPUs inside I/F Unit	The CPU for RTC network cannot communicate with another one for TOAE network. (Note : This fault will be detected at only RTC network side and it's sent to MDS)	Replace the I/F Unit.

Fault Name	Description of the Fault	The Cause of the Fault	The Corrective Actions
Error with TCN connection	TOAE Network does not receive the MVB0103 and 0151 port status.	I/F Unit(B) cannot communicate with the TCNA. And ACP(A) or (B) cannot receive the status from TCNA for operation.	Switch ON/OFF the system to see whether system can be recovered. If the fault is still remained, check the vehicle's TCN sub-system for proper operation
Error with RIO(A) connection	RIO A SIDE Communication Error	I/F Unit(B) cannot communicate with the TCNA. And ACP(A) or (B) cannot receive the status from RIO(A) for operation.	Switch ON/OFF the system to see whether system can be recovered. If the fault is still remained, replace the unit.
Error with RIO(B) connection	RIO B SIDE Communication Error	I/F Unit(B) cannot communicate with the TCNA. And ACP(A) or (B) cannot receive the status from RIO(B) for operation.	Switch ON/OFF the system to see whether system can be recovered. If the fault is still remained, replace the unit.
No Route Set	The Operator does not set the Route by TOA CCH and the train starts running	The Operator does not set the Route by OA CCH Display before the train starts TOA CCH Display before the train starts starts running	The Operator does not set the Route by OA CCH Display before the train starts TOA CCH Display before the train starts starts running

APPENDIX B

SUBSYSTEM BINARY SIGNALS

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ECUA - 768

Signal Name	Description / Scale / Units
FBECU_SB_Apply	1 = Service Brake Applied
FBECU_SB_Rel	1 = Service Brake Released
FBECU_Slide_Detect	1 = FBECU has detected wheel slide
FBECU_Sanding	1 = FBECU requests for sand
FBECU_Major_Fault	1 = FBECU has an active fault that requires immediate attention
FBECU_Minor_Fault	1 = FBECU has an active fault that requires maintenance
FBECU_NO_Motion	1 = FBECU has detected No Motion
FBECU_Limp_Home	Status of LIMP HOME Trainline Input (1 = Active)
FBECU_M	Status of M Trainline Input (1 = Active)
FBECU_CM	Status of CM Trainline Input (1 = Active)
FBECU_SCEB	Status of SCEB Trainline Input (1 = Active)
FBECU_EB	Status of EB Trainline Input (1 = Active)
FBECU_PB_Rel_PS	1 = Park Brake Released
FBECU_PB_Apply_PS	1 = Park Brake Applied
FBECU_Elec_Cutout	1 = FBECU/BCU is cut out (Electrical)
FBECU_Mech_Cutout	1 = FBECU/BCU is cut out (Mechanical)
FBECU_DCL_Charge	FBECU Apply Magnet Valve Status (1 = Active)
FBECU_DCL_Vent	FBECU Release Magnet Valve Status (1 = Active)
FBECU_WSP_Hold	FBECU WSP Hold valve Status (1 = Active)
FBECU_WSP_Vent	FBECU WSP Vent valve Status (1 = Active)
LoadWeight	Load Weight on the truck
BCPressure	Brake Cylinder Pressure
CVPressure	Control Volume Pressure
MB04MajorNumber	Software Release Number Location ??.xx.xx
MB04MinorNumber	Software Release Number Location xx.??.xx
MB04AlphaCode	Software Release Number Location xx.xx.??
MB03MajorNumber	Software Release Number Location ??.xx.xx
MB03MinorNumber	Software Release Number Location xx.??.xx
MB03AlphaCode	Software Release Number Location xx.xx.??
CB09MajorNumber	Software Release Number Location ??.xx.xx

Signal Name	Description / Scale / Units
CB09MinorNumber	Software Release Number Location xx.??.xx
CB09AlphaCode	Software Release Number Location xx.xx.??
CB12MajorNumber	Software Release Number Location ??.xx.xx
CB12MinorNumber	Software Release Number Location xx.??.xx
CB12AlphaCode	Software Release Number Location xx.xx.??

ECUB - 896

Signal Name	Description / Scale / Units
FBECU_SB_Apply	1 = Service Brake Applied
FBECU_SB_Rel	1 = Service Brake Released
FBECU_Slide_Detect	1 = FBECU has detected wheel slide
FBECU_Sanding	1 = FBECU requests for sand
FBECU_Major_Fault	1 = FBECU has an active fault that requires immediate attention
FBECU_Minor_Fault	1 = FBECU has an active fault that requires maintenance
FBECU_NO_Motion	1 = FBECU has detected No Motion
FBECU_Limp_Home	Status of LIMP HOME Trainline Input (1 = Active)
FBECU_M	Status of M Trainline Input (1 = Active)
FBECU_CM	Status of CM Trainline Input (1 = Active)
FBECU_SCEB	Status of SCEB Trainline Input (1 = Active)
FBECU_EB	Status of EB Trainline Input (1 = Active)
FBECU_PB_Rel_PS	1 = Park Brake Released
FBECU_PB_Apply_PS	1 = Park Brake Applied
FBECU_Elec_Cutout	1 = FBECU/BCU is cut out (Electrical)
FBECU_Mech_Cutout	1 = FBECU/BCU is cut out (Mechanical)
FBECU_DCL_Charge	FBECU Apply Magnet Valve Status (1 = Active)
FBECU_DCL_Vent	FBECU Release Magnet Valve Status (1 = Active)
FBECU_WSP_Hold	FBECU WSP Hold valve Status (1 = Active)
FBECU_WSP_Vent	FBECU WSP Vent valve Status (1 = Active)
LoadWeight	Load Weight on the truck Units: PSI
BCPressure	Brake Cylinder Pressure Units: PSI
CVPressure	Control Volume Pressure Units: PSI
MB04MajorNumber	Software Release Number Location ??.xx.xx
MB04MinorNumber	Software Release Number Location xx.??.xx
MB04AlphaCode	Software Release Number Location xx.xx.??
MB03MajorNumber	Software Release Number Location ??.xx.xx
MB03MinorNumber	Software Release Number Location xx.??.xx

Signal Name	Description / Scale / Units
MB03AlphaCode	Software Release Number Location xx.xx.??
CB09MajorNumber	Software Release Number Location ??.xx.xx
CB09MinorNumber	Software Release Number Location xx.??.xx
CB09AlphaCode	Software Release Number Location xx.xx.??
CB12MajorNumber	Software Release Number Location ??.xx.xx
CB12MinorNumber	Software Release Number Location xx.??.xx
CB12AlphaCode	Software Release Number Location xx.xx.??

ECUC - 800

Signal Name	Description / Scale / Units
FBECU_SB_Apply	1 = Service Brake Applied
FBECU_SB_Rel	1 = Service Brake Released
FBECU_Slide_Detect	1 = FBECU has detected wheel slide
FBECU_Sanding	1 = FBECU requests for sand
FBECU_Major_Fault	1 = FBECU has an active fault that requires immediate attention
FBECU_Minor_Fault	1 = FBECU has an active fault that requires maintenance
FBECU_NO_Motion	1 = FBECU has detected No Motion
FBECU_Limp_Home	Status of LIMP HOME Trainline Input (1 = Signal Active)
FBECU_M	Status of M Trainline Input (1 = Signal Active)
FBECU_CM	Status of CM Trainline Input (1 = Signal Active)
FBECU_SCEB	Status of SCEB Trainline Input (1 = Signal Active)
FBECU_EB	Status of EB Trainline Input (1 = Signal Active)
FBECU_Elec_Cutout	1 = FBECU/BCU is cut out (Electrical)
FBECU_Mech_Cutout	1 = FBECU/BCU is cut out (Mechanical)
FBECU_DCL_Charge	FBECU Apply Magnet Valve Status (1 = Signal Active)
FBECU_DCL_Vent	FBECU Release Magnet Valve Status (1 = Signal Active)
FBECU_WSP_Hold	FBECU WSP Hold valve Status (1 = Signal Active)
FBECU_WSP_Vent	FBECU WSP Vent valve Status (1 = Signal Active)
LoadWeight	Load Weight on the truck
	Units: PSI
BCPressure	Brake Cylinder Pressure
	Units: PSI
CVPressure	Control Volume Pressure
	Units: PSI
MRPressure	Main Reservoir Pressure
	Units: PSI
MB04MajorNumber	Software Release Number
	Location ??.xx.xx
MB04MinorNumber	Software Release Number
	Location xx.??.xx
MB04AlphaCode	Software Release Number
	Location xx.xx.??
MB03MajorNumber	Software Release Number
	Location ??.xx.xx
MB03MinorNumber	Software Release Number
	Location xx.??.xx

Signal Name	Description / Scale / Units
MB03AlphaCode	Software Release Number
	Location xx.xx.??
CB09MajorNumber	Software Release Number
	Location ??.xx.xx
CB09MinorNumber	Software Release Number
	Location xx.??.xx
CB09AlphaCode	Software Release Number
	Location xx.xx.??
CB12MajorNumber	Software Release Number
	Location ??.xx.xx
CB12MinorNumber	Software Release Number
	Location xx.??.xx
CB12AlphaCode	Software Release Number
	Location xx.xx.??

HVACA

Signal Name	Description / Scale / Units
HVAC_A_Temp_Set_Point	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_Temp_Fresh_Air	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_Temp_Return_Air	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_Temp_Supply_Air	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_BMCT_Fault	1 = Blower Motor current out of limits
HVAC_A_CFMT_Fault	1 = Condenser Fan Currrent out of limits
HVAC_A_CMCT2_Fault	1 = Compressor 2 Current out of limits
HVAC_A_CMCT1_Fault	1 = Compressor 1 Current out of limits
HVAC_A_ACD_Fault	1 = A/C Voltage or Phase Incorrect
HVAC_A_Hot_Car_Fault	1 = Car Temperature too high
HVAC_A_Cold_Car_Fault	1 = Car Temperature too low
HVAC_A_Fault	1 = Hardware or Software Error
HVAC_A_AFS_Fault	1 = No Air flow with Blower Running
HVAC_A_OHCB	1 = Overhead Circuit Breaker Tripped
HVAC_A_BMCB	1 = Blower Motor Circuit Breaker Tripped
HVAC_A_CFMCB	1 = Condenser Fan Circuit Breaker Tripped
HVAC_A_CMCB2	1 = Compressor 2 Circuit Breaker Tripped
HVAC_A_CMCB1	1 = Compressor 1 Circuit Breaker Tripped
HVAC_A_OHCA2	1 = Overhead Contactor 2 does not match
HVAC_A_OHCA1	1 = Overhead Contactor 1 does not match
HVAC_A_OHPT	1 = Overhead Protection Thermostat Tripped
HVAC_A_HPT2_Fault	1 = Compressor 2 High Pressure Out of Limits
HVAC_A_LPT2_Fault	1 = Compressor 2 low Pressure Out of Limits
HVAC_A_HPT1_Fault	1 = Compressor 1 High Pressure Out of Limits
HVAC_A_LPT1_Fault	1 = Compressor 1 low Pressure Out of Limits
HVAC_A_SAT_Fault	1 = Supply Air Temperature Out of Limits
HVAC_A_RAT_Fault	1 = Return Air Temperature Out of Limits
HVAC_A_FAT_Fault	1 = Fresh Air Temperature Out of Limits
HVAC_A_Damper_Fault	1 = Any of the Dampers/Shutters is Out of Position

HVACB

Signal Name	Description / Scale / Units
HVAC_A_Temp_Set_Point	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_Temp_Fresh_Air	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_Temp_Return_Air	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_Temp_Supply_Air	Degrees F Range: -327.68 to +327.67 degF
HVAC_A_BMCT_Fault	1 = Blower Motor current out of limits
HVAC_A_CFMT_Fault	1 = Condenser Fan Currrent out of limits
HVAC_A_CMCT2_Fault	1 = Compressor 2 Current out of limits
HVAC_A_CMCT1_Fault	1 = Compressor 1 Current out of limits
HVAC_A_ACD_Fault	1 = A/C Voltage or Phase Incorrect
HVAC_A_Hot_Car_Fault	1 = Car Temperature too high
HVAC_A_Cold_Car_Fault	1 = Car Temperature too low
HVAC_A_Fault	1 = Hardware or Software Error
HVAC_A_AFS_Fault	1 = No Air flow with Blower Running
HVAC_A_OHCB	1 = Overhead Circuit Breaker Tripped
HVAC_A_BMCB	1 = Blower Motor Circuit Breaker Tripped
HVAC_A_CFMCB	1 = Condenser Fan Circuit Breaker Tripped
HVAC_A_CMCB2	1 = Compressor 2 Circuit Breaker Tripped
HVAC_A_CMCB1	1 = Compressor 1 Circuit Breaker Tripped
HVAC_A_OHCA2	1 = Overhead Contactor 2 does not match
HVAC_A_OHCA1	1 = Overhead Contactor 1 does not match
HVAC_A_OHPT	1 = Overhead Protection Thermostat Tripped
HVAC_A_HPT2_Fault	1 = Compressor 2 High Pressure Out of Limits
HVAC_A_LPT2_Fault	1 = Compressor 2 low Pressure Out of Limits
HVAC_A_HPT1_Fault	1 = Compressor 1 High Pressure Out of Limits
HVAC_A_LPT1_Fault	1 = Compressor 1 low Pressure Out of Limits
HVAC_A_SAT_Fault	1 = Supply Air Temperature Out of Limits
HVAC_A_RAT_Fault	1 = Return Air Temperature Out of Limits
HVAC_A_FAT_Fault	1 = Fresh Air Temperature Out of Limits
HVAC_A_Damper_Fault	1 = Any of the Dampers/Shutters is Out of Position

DOORS

Signal Name	Description
DoorEmergencyRelease_State	00000000 = No Handles Activated
	00000001 = Door A1/A2 Emergency Open Handle Activated
	00000010 = Door A3/A4 Emergency Open Handle Activated
	00000100 = Door A5/A6 Emergency Open Handle Activated
	00001000 = Door A7/A8 Emergency Open Handle Activated
	00010000 = Door B1/B2 Emergency Open Handle Activated
	00100000 = Door B3/B4 Emergency Open Handle Activated
	01000000 = Door B5/B6 Emergency Open Handle Activated
	10000000 = Door B7/B8 Emergency Open Handle Activated

EVENT RECORDER

Signal Name	Description
ER_MVB_B_OK	1 = MVB A Line Problem
ER_MVB_A_OK	1 = MVB B Line Problem
ER_AutotestDone	1 = Autotest in Progress
ER_RER_Fault	1 = Active Fault on ER
ER_RER_Alarm	1 = Active Alarm on ER
ER_A01_ER_CONFIG_ERR	1 = Fault Condition Active
ER_A02_RTC_BATTERY_LOW	1 = Fault Condition Active
ER_A03_PRG_MEM_CHK_FAIL	1 = Fault Condition Active
ER_A04_DTA_MEM_CHK_FAIL	1 = Fault Condition Active
ER_A06_UNCHANGE_IN_92_DAY	1 = Fault Condition Active
ER_A07_HIGH_TEMPERATURE	1 = Fault Condition Active
ER_A08_ER_SUPPLY_FAILURE	1 = Fault Condition Active
ER_A50_MVB_BOARD_MISS	1 = Fault Condition Active
ER_A51_MVB_BRD_HW_FAIL	1 = Fault Condition Active
ER_A52_MVB_COMM_ERR	1 = Fault Condition Active
ER_A53_MVB_BRD_CFG_ERR	1 = Fault Condition Active
ER_A54_MVB_LINEA_DISTURB	1 = Fault Condition Active
ER_A55_MVB_LINEB_DISTURB	1 = Fault Condition Active
ER_A60_CHM_MODULE_MISS	1 = Fault Condition Active
ER_A61_CHM_STEST_FAIL	1 = Fault Condition Active
ER_A62_CHM_COM_ERR	1 = Fault Condition Active
ER_A65_EMM_MODULE_MISS	1 = Fault Condition Active
ER_A66_EMM_STEST_FAIL	1 = Fault Condition Active
ER_A67_EMM_COMM_ERR	1 = Fault Condition Active
ER_A70_ESM_MODULE_MISS	1 = Fault Condition Active
ER_A71_ESM_STEST_FAIL	1 = Fault Condition Active
ER_A72_ESM_COM_ERR	1 = Fault Condition Active
ER_A73_ESM_FULL_ERR	1 = Fault Condition Active
ER_A76_PTU_PRC_HALT	1 = Fault Condition Active
ER_A77_PTU_PRC_ERR	1 = Fault Condition Active
ER_A84_MVB_PRC_HALT	1 = Fault Condition Active
ER_A85_MVB_PRC_ERR	1 = Fault Condition Active
ER_A88_CHM_PRC_HALT	1 = Fault Condition Active

Signal Name	Description
ER_A89_CHM_PRC_ERR	1 = Fault Condition Active
ER_A92_EVE_PRC_HALT	1 = Fault Condition Active
ER_A93_EVE_PRC_ERR	1 = Fault Condition Active

ATP/TWC

Signal Name	Description / Scale / Units
ato_twc_typeII_failed	1= TWC Type II Failed / 0 = TWC Type II is not Failed
ato_failed	1= ATO is Failed / 0 = ATO is not Failed
atp_failed	1= ATP is Failed / 0 = ATP is not Failed
ato_twc_typeII_ready	1= TWC Type II is Ready / 0 = TWC Type II is not Ready
ato_ready	1= ATO is Ready / 0 = ATO is not Ready
atp_ready	1= ATP is Ready / 0 = ATP is not Ready
atp_type_two	1= Is Type II / 0 = Not Type II
atp_type_one	1= Is Type I / 0 = Not Type I
atp_valid_cab_signal	1= Valid Cab Signal available / 0 = Valid Cab Signal not available
ato_twc_bad_stop	1= ATO Bad Stop / 0 =
atp_dwell_expired	1= ATP Dwell Expired / 0 = ATP Dwell not Expired
atp_train_berthed	1= ATP Berthed declared / 0 = ATP not Berthed
atp_twc_bypass	1= TWC is bypassed / 0 = TWC not bypassed
atp_bypass	1= ATP is bypassed / 0 = ATP not bypassed
atp_cab_b_active	1= ATP Cab B active / 0 = ATP Cab B not active
atp_cab_a_active	1= ATP Cab A active / 0 = ATP Cab A not active
mvb581h_spare1	Spare (set to 0)
atp_active_events	1= ATP has active events / 0 = ATP has no active events
atp_slide_detect	1= ATP Slide declared / 0 = ATP Slide not declared
atp_spin_detect	1= ATP Spin declared / 0 = ATP Spin not declared
atp_overspeed	1= ATP Overspeed declared / 0 = ATP Overspeed not declared
atp_rollaway	1= ATP Rollaway declared / 0 = ATP Rollaway not declared
atp_vzero_declared	1= ATP Vzero declared / 0 = ATP Vzero not declared
atp_no_motion	1= ATP No Motion declared / 0 = ATP No Motion not declared
atp_dept_test_status	Departure Test Status (0=Not Run, 1=In Progress, 2=Passed, 3=Failed, 4=Cancelled, 5=Shop Failure)
atp_oper_mode	Operational Mode (0=Off, 1=Local,2=Manual, 3=Manual with ATO, 4=Street Running, 5=CarWash, 6=Stop & Proceed)

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