SERVICE BULLETIN
MAINTENANCE OF WAY EQUIPMENT

DATE: 06-2020   **BULLETIN NO:** 20-006

TITLE: G6 JAM BOX CONVERSION KIT

RATING:

☐	**DIRECTIVE** (Action Is Required)	☐	**ALERT** (Potential Problem)
☐	**INFORMATION** (Action Is Optional)	☒	**PRODUCT IMPROVEMENT** (Enhance Product)

PRODUCT SERIES / MODEL: All Harsco Rail Equipment with Jupiter I Control System Except 6700S Tampers

SERIAL NO: All Models equipped with Jupiter I Control System

SUMMARY: All pre-existing styles of the master Jupiter controller (JAM Box) are now unavailable and are being replaced by the new style G6 JAM Box. If updating from a "Blue" JAM Box, a Conversion Kit is available to convert to the new style G6 Box that also includes a new J42 Board (to replace the existing P42 Board), Mounting Plate, Cables and Mounting Hardware. A Jupiter software upgrade will also be required.

OPERATIONAL IMPACT: The new style G6 JAM Box provides faster operation, better temperature performance, and offers greater protection from dust and dirt.

ACTION: When needing to replace a "Blue" JAM Box, (#H5991Y01, Y03 and Y04), order the new style G6 JAM Box Conversion Kit (#5109200). Be able to provide your machine serial number so it can be determined if a Jupiter software upgrade is also required. Use this Service Bulletin as a reference guide to assist in the installation and use of the new style G6 JAM Box and its associated components.

CONTACT: Contact the Part Sales Department at Harsco Rail to order the G6 JAM Box Conversion Kit (#5109200). **Important:** Be able to provide the Model Number and Serial Number of the machine that the G6 JAM Box is being installed on as a Jupiter software upgrade is also required.

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G6 JAM BOX CONVERSION KIT #5109200 COMPONENTS

1. The G6 JAM Box Conversion Kit includes the following parts to convert the old style "Blue" JAM Box to a new style G6 JAM Box. This kit includes the G6 JAM Box (replaces the "Blue" JAM Box), J42 Board (replaces the P42 Board), Universal Mounting Plate, Cables, and Mounting Hardware. See Figure 1 for a typical mounting installation of the new style G6 JAM Box and J42 Board.

    Note: See Service Bulletin SB20-007 For G6 Conversion Kits For 6700S Tampers.

ITEM	PART NO	DESCRIPTION	QTY
1	4017473	Universal Plate, JAM Box	1
2	5095084	JAM Box, G6	1
3	4016607	J42 Module Assy	1
4	F009723	#10-24 X 3/8 RD HD MS	4
5	F025837	Washer, Lock, #10, Medium, ZP	4
6	F001050	Washer, Flat, 3/16", USS, ZP	4
7	408013	Serial Cable	1
8	701113018	Cable, 18 Gauge 2 Conductor	10 Ft
9	F018229	Ty-Rap	2
10	D8197Y18	Cable Tie Sleeve	2
11	5109189	Software, G6 Upgrade	1

USB COMPONENTS

1. The new style G6 JAM Box uses a USB port to connect any keyboard, mouse or a USB type printer. Older keyboards using a traditional "PS/2" style connector will require a PS/2 - to- USB converter, or the keyboard may be replaced with a new USB connecting keyboard. If your machine currently has a printer connected to the parallel port on the old style "Blue" JAM Box, your existing printer will not work with the new style G6 JAM Box. If you want to connect a printer to the new style G6 JAM Box, consider ordering the following printer components:

ITEM	PART NO	DESCRIPTION	QTY
	351118-1	Printer (USB)	1
	2014137	Printer Cable- USB Type A-B, 2M	1
	4010266	USB Active Ext Cable(16 Ft) (USB signal booster for printer)	1
	4017998	Option, Printer Install	1

SAFETY INFORMATION

⚠ **WARNING**

■ **FOLLOW APPLICABLE RAILROAD LOCKOUT - TAGOUT PROCEDURE TO REMOVE MACHINE FROM ALL ENERGY SOURCES. FAILURE TO COMPLY COULD RESULT IN SEVERE BODILY INJURY.**

INSTALLING G6 JAM BOX CONVERSION KIT - See Figures 1 and 2

1. Follow applicable Railroad Lockout - Tagout Procedure to remove the machine from all energy sources when performing maintenance, or making adjustments or repairs to the machine.
2. **Important:** BE SURE the Jupiter Control System and the master disconnect switch are shut OFF on the machine before installing the G6 JAM Box Conversion Kit.

Remove Old "Blue" JAM and P42 Board

3. Locate the existing "Blue" JAM Box on your machine.
4. Disconnect the Touch-Screen Monitor VGA and COM cables, Keyboard cable (if present), Mouse cable (if present), Printer cable (if present) and Ethernet cable (if present) from the "Blue" JAM Box.
5. Disconnect the power plug from the "Blue" JAM Box.
6. Remove the "Blue" JAM Box from the panel and discard. Save the mounting hardware, it will be re-used.
7. Disconnect the purple Jupiter Network cable connection from the P42 Circuit Board.
8. Disconnect the power plug from the TS1 connector on the P42 Circuit Board.
9. Use a small slotted screwdriver to remove the two wires from the TS2 connector on the P42 Circuit Board. Then remove the P42 Circuit Board from the DIN rail and discard.

Install New G6 JAM and J42 Board

10. Install the new Universal Mounting Plate (1) to the panel in the same location that the "Blue" JAM Box was removed from - re-using the existing mounting hardware in the applicable aligning slots of the plate.
11. Install the new G6 JAM Box (2) to the Universal Plate (1) using the four #10 x 3/8" machine screws (4), lock washers (5) and wrought washers (6).
12. Install the new J42 Circuit Board (3) to the DIN rail in the same location that the P42 Circuit Board was removed from.

Connect Cables and Wires

13. Connect the VGA cable from the monitor to the VGA connector on the G6 JAM.
14. Connect the COM cable (if used) from the monitor to the COM 1 connector on the G6 JAM.
15. Connect the Ethernet cable (if multiple JAMs are used on the machine) to one of the LAN connectors on the G6 JAM.
16. Connect the Keyboard cable (if used) to any receptacle. Note that a traditional PS/2 connector for MS/KB does not exist on the G6 JAM.
17. Connect the Mouse Cable (if used) to any USB receptacle. Note that a traditional PS/2 connector for MS/KB does not exist on the G6 JAM.

INSTALLING G6 JAM BOX CONVERSION KIT (continued) - See Figures 1 and 2

Connect Cables and Wires (continued)

18. Connect the new Serial cable (7) to the J3 connector on the J42 Module and to the "COM 3" port on the G6 JAM.
19. Cut the new Wire (8) to the appropriate length needed. Connect one end to the +24V pin of the 3-terminal J2 connector on the J42 Board and the other end to the "+" pin of the 3-terminal +/-/O connector on the G6 JAM.
20. Cut the new Wire (8) to the appropriate length needed. Connect one end to the RTN pin of the 3-terminal J2 connector on the J42 Board and the other end to the "-" pin of the 3-terminal +/-/O connector on the G6 JAM.
21. **Note:** The N/C pin of the 3-terminal J2 connector on the J42 Board and the "O" pin (ground) of the 3-terminal connector on the G6 JAM are NOT USED.
22. Connect the existing +24V Power wire to the +24V pin of the 2-terminal J1 connector on the J42 Board.
23. Connect the existing RTN Power wire to the RTN pin of the 2-terminal J1 connector on the J42 Board.
24. Connect the purple Jupiter Network cable to the M23 connector on the J42 Board. To connect the cable end, align the pins in the cable end with the board connector and push in. Turn the cable end to start the threads on the board connector and tighten by hand or by using the special network cable wrench (#H6285X01) until it can no longer be turned. Then wiggle the cable end slightly, push in and tighten again by hand or by using the special network cable wrench until it can no longer be turned. Repeat this procedure until the cable end is securely tightened on the board connector.
25. Connect the USB printer cable (if used) to one of the USB connectors on the G6 JAM. The Printer parallel port on the G6 JAM is NOT FUNCTIONAL. If your machine previously used a parallel port connection to a line-printer, a USB capable line-printer (#351118-1) is required for the G6 JAM.
26. Use the Cable Markers (10) to identify the new Wires (8). Use the Ty-Raps (9) to secure the new Wires (8) as needed.

Boot-Up G6 JAM

27. Turn on the master disconnect switch to provide 24 volt electrical power to the machine. DO NOT start the engine. Turn on the Jupiter Control System to boot-up the G6 JAM Box.
28. As the system is booting up, the program on the memory card will be started.

   a.   If a memory card was installed with a newer program version, the newer program version will be started and all of the data files will be reset to the default settings.

   b.   If a memory card was installed that is supplied with only the base files and no application software, the JAM will boot up to the Jupiter splash screen to indicate that there is no software installed. The machine control software can be loaded using an "install.jam" file from a USB memory stick and all of the data files will be reset to the default settings.

   c.   If a newer program version was installed, be sure to record the program version and date of installation in a safe place for future reference.

INSTALLING G6 JAM BOX CONVERSION KIT (continued) - See Figures 1 and 2
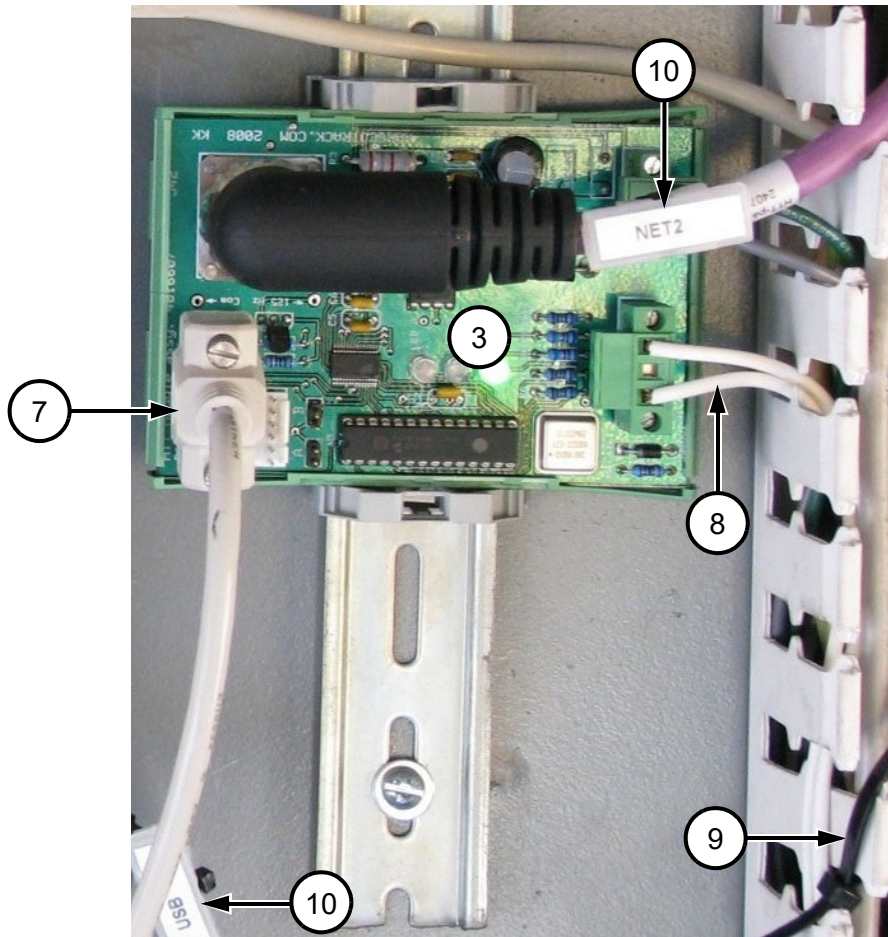
G6 JAM and J42 Board

29. There are two major components of the Conversion Kit. The G6 JAM Box (2) and the J42 Board (3) which will be explained in further detail in this Service Bulletin.

FIGURE-1
JUPITER G6 JAM BOX MOUNTING

INSTALLING G6 JAM BOX CONVERSION KIT (continued) - See Figures 1 and 2

FIGURE-2
J42 CIRCUIT BOARD

G6 JAM (Jupiter Application Master) - - See Figures 3 and 4

1. The G6 JAM consists of the following:

    (1) USB: The four USB front-side ports and one rear-side port are used to connect USB devices (printer, flash drives, memory sticks, mouse, keyboard, etc.) to the JAM.
    (2) HD AUDIO - BLUE: The audio input connection is NOT USED.
    (3) HD AUDIO - GREEN: The audio output connection is NOT USED.
    (4) VGA: The video / graphics connection is used for the Touch Screen Monitor.
    (5) POWER: The switch controls the power to the JAM. Press the switch to power down the JAM. Press the switch again to power up the JAM.
    (6) RST: The reset switch is located inside the small hole. It requires a tool small enough to be inserted through the hole to reset the JAM. When pressed and released, the JAM will shut down and then reboot.
    (7) COM 1: The serial port connection is used for the Touch Screen Monitor on many applications.
    (8) COM 2: The serial port connection is NOT USED on most applications.
    (9) COM 3: The serial port connection is used for the J42 Board.

G6 JAM (Jupiter Application Master) (continued) - See Figures 3 and 4

    (10) COM 4: The serial port connection is NOT USED on most applications.

    (11) HDMI connection: NOT USED

    (12) LAN 1: The ethernet connection is used for communication between the JAMs on machines with a multiple JAM network.

    (13) LAN 2: The ethernet connection is NOT USED on most applications.

    (14) + / - / O: The +/- pins of the 3-pin connector are used for the J42 Board. The O pin (ground) of the connector is NOT USED.

    (15) HDD LED: The LED will flash green when the internal compact flash memory card of the JAM is transmitting or receiving data.

    (16) PWR LED: The LED will illuminate green when 24V power is supplied from the J42 Board.

NOTE: If your machine previously used a parallel port connection to a line-printer, a USB capable line-printer (#351118-1) is required for the G6 JAM.

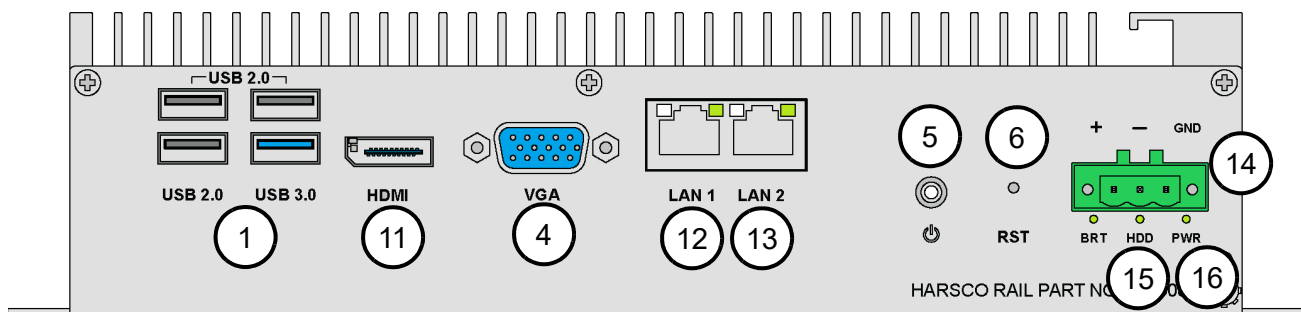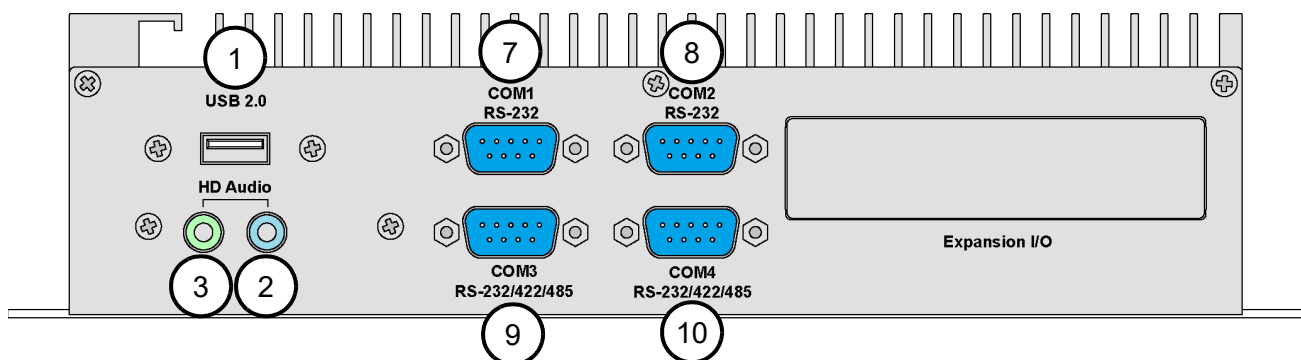FIGURE-3
G6 JAM BOX (FRONT VIEW)

FIGURE-4
G6 JAM BOX (REAR VIEW)

G6 JAM (Jupiter Application Master) (continued)

Battery Replacement - See Figure 5

1. The G6 JAM incorporates an internal Battery. The battery should be replaced when the current time and date are lost during system power-down.

2. Battery Specifications:

    a. Lithium Battery: BR2032 (see Note)
    b. Output Voltage: 3 VDC

    Note: Harsco Rail recommends using Lithium Battery BR2032 as it has better thermal performance in cold climates. Lithium Battery CR2032 is an acceptable replacement if the machine is not working in cold climates.

3. To replace the battery:

    a. **Important:** It is recommended that the battery be replaced in a static free environment. Use of an Electro Static Discharge (ESD) pad and strap is recommended to help prevent damage to static sensitive devices on the circuit boards inside of the JAM.
    b. **Important:** Make sure the Jupiter Control System is shut off.
    c. **Important**: Make sure all 24 volt electrical power on the machine is shut off.
    d. Carefully disassemble the six screws securing the bottom cover plate to the JAM. This will allow access to the correct side of the circuit board where the Battery (1) is located.
    e. Carefully remove the existing Battery (1) from the battery holder on the circuit board. Use care not to damage the battery holder or the circuit board.
    f. Be sure the new battery meets the specifications listed above before installing the battery.
    g. Install the new Battery (1) in the battery holder on the circuit board. Use care not to damage the battery holder or the circuit board.
    h. Re-assemble the bottom cover plate onto the JAM. Secure with the six screws.
    i. Turn on all 24 volt electrical power to the machine.
    j. Turn on the Jupiter Control System to boot-up the JAM.
    k. Reset the current time and date on the Jupiter main panel.

G6 JAM (Jupiter Application Master) (continued)
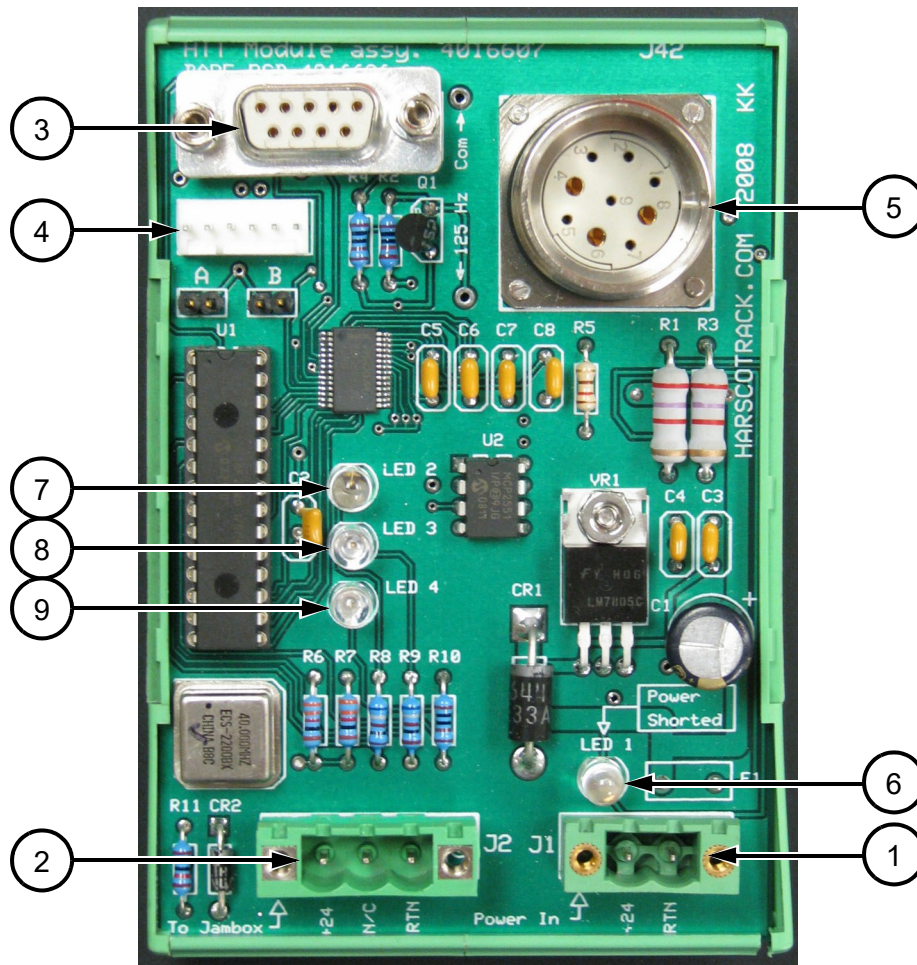
FIGURE-5
G6 JAM BOX BATTERY

J42 Board - See Figure 6

1. The J42 Board provides the communications interface between the G6 JAM and the Jupiter Network Modules (input / output) on the machine. The J42 Board provides 24 volt power to the G6 JAM via the J2 Connector and to the Jupiter Network Modules via the M23 Connector. The J42 Board improves reliability and diagnostics through the following:
    a. The connection to the 24 volt power on pins 4 and 9 of the Jupiter Network Cables (up to the first power distribution tee) is through the J42 Board.
    b. The J42 Board provides the network connections between the G6 JAM and the first Jupiter Module in the network (module #2).
    c. The terminating resistor for the beginning of the network is located on the J42 Board.
    d. The J42 Board has a signal oscillator that drives the "Daisy-Chain" signal on the Jupiter Network Cable which allows the first module in the network to establish its address. All "Daisy-Chain" inputs, outputs and connections between modules must be fully functional for each module to successfully establish its location in the network. Network module addressing is secure and network diagnostics are more comprehensive.

2. The J42 Board consists of the following:

    (1) J1: The +24V / RTN pins of the 2-pin connector are used for the J42 Board Power In.
    (2) J2: The +24V / RTN pins of the 3-pin connector are used for the JAM. The N/C pin of the connector is NOT USED.
    (3) J3: The Serial port connector is used for the JAM.
    (4) J4: The connector is NOT USED.
    (5) M23: The connector is used for the first module (CAN #2) in the Jupiter network.
    (6) LED 1 - Red: Off - Normal state.
                         On - Fuse is open (short). After fuse resets (cools), LED will go out.
                         See J42 Board Status LEDs for information.
    (7) LED 2 - Red: Off - Normal state.
                         See J42 Board Status LEDs for information.
    (8) LED 3 - Yellow: Off - Normal state.
                         See J42 Board Status LEDs for information.
    (9) LED 4 - Green: Flash at Slow Rate (Heart-Beat) – G6 JAM is in Idle Mode (not transmitting or receiving data).
                         Flash at Fast Rate (Heart-Beat) – G6 JAM is in Normal Mode (transmitting or receiving data).
                         See J42 Board Status LEDs for information.

J42 Board (continued) - See Figure 6

FIGURE-6
J42 BOARD

J42 Board - Status LEDs - See Figure 7

1. The LEDs on the J42 Board will illuminate and/or flash to help determine if CAN communication is good, or if there is a problem.

FIGURE-7
J42 BOARD STATUS LEDs

LED 1 Red 🔴	LED 2 Red 🔴	LED 3 Yellow 🟡	LED 4 Green 🟢	Flash Style	Status Description
Off	—	—	—	Red Off	Fuse F1 is OK (normal state).
On	—	—	—	Red On	Fuse F1 is open (short). After fuse cools and resets, LED will go out.
—	Flash	Off	Off	Red Flash	Bus warning (ack errors). Communication problem between JAM and Jupiter CAN bus network.
—	On	Off	Off	Red On	Buss off error. No communication between J42 Board and Jupiter CAN network.
—	Off	Flash	Off	Yellow Flash	Communication problem between JAM and J42 Board.
—	Off	On	Off	Yellow On	No communication between JAM and J42 Board.
—	Off	Off	Flash	Green Flash	Heart-beat (normal state). Slow rate when JAM is not transmitting or receiving data. Fast rate when JAM is transmitting or receiving data.
—	Off	On	Flash	Yellow On Green Flash	UART receiver framing or overrun error detected.
—	Off	Flash	Flash	Yellow and Green Flash Together	Checksum error while receiving JAM message.
—	Off	Flash	Flash	Yellow and Green Flash Alternately	Heart-beat time out error.
—	Off	Flash	On	Yellow Flash Green On	Can receive software buffer overflows detected.

J42 Board - Troubleshooting - See Figure 8

1. Confirm the following:
    a. LED 1 is not illuminated.
    b. LED 4 is flashing green.
    c. The green "Run" LED on the faceplate of module #2 is flashing and the yellow "Download" LED indicator is not illuminated or indicating a daisy chain error.
    d. The JAM is operating and communicating with module #2.
    e. If the above 4 items are confirmed, the J42 Board is working.

2. If the JAM fails to start:
    a. Use a meter to check for the presence of 24 volts at the J1 connector on the J42 Board. This is the input supply for the J42 Board. Without 24 volts at the J1 connector, the system cannot function.
    b. Use a meter to check connector voltages at the JAM end of the cable between the J42 Board and the JAM. If the 5 volts is less than 4.85 volts or more than 5.15 volts, or the 12 volts is missing, check the connections. The cable and/or the J42 Board may need to be replaced.

3. If none of the status LED indicators ("Error", "Run" and "Download") on module #2 are illuminated or flashing:
    a. Use a meter to check for the presence of 24 volts at the J1 connector on the J42 Board. This is the input supply for the J42 Board. Without 24 volts at the J1 connector, the system cannot function.
    b. Disconnect the M23 connector from the J42 Board. Use a meter to test for the presence of 24 volts between pins 2 and 3. If 24 volts is present, the cable to module #2 and/or module #2 will need to be replaced.

4. After a module download, if the green Run LED and yellow Download LED on any or all of the modules are rapidly flashing in an alternating sequence as illustrated in Figure 8, then the download may have been interrupted due to field power loss or faulty network connections. Any module displaying this LED sequence can no longer read inputs or write outputs until the module software is successfully loaded.
    a. Check all cabling, connectors and J42 board connections and then reboot the JAM.
    b. After rebooting, the JAM will detect this fault condition from the modules and attempt to re-download to all of the modules.
    c. The JAM can be rebooted until this condition no longer persists on any of the modules on the network.

FIGURE-8
FAULTY DOWNLOAD FLASH DIAGRAM

Green Run LED:

Yellow Download LED:

J42 Board - Troubleshooting (continued)

5.   Although a Jupiter Network is made up of many separate cables, the wires that carry the network messages (pins 1, 4 and 5) are all continuously connected from the beginning of the network (JAM) to the end of the network (the module with the terminator and highest address number). A fault at one location on the network will typically affect all modules on the network. There are network communication errors when:
   a.   The "Error" LED on one or more modules illuminates red from time to time.
   b.   The green heartbeat status on the JAM module diagnostic screens illuminates red or gray erratically.
   c.   The alarm message "Dead module detected" occurs (typically for more than one module).

6.   For any combinations of the above, use the following procedure:
   a.   The engine should be shut off.
   b.   Disconnect J1 connector. The resistance across resistor R5 should be approximately 60 ohms. If this resistance is closer to 120 ohms, the terminator (or terminating resistor inside the terminator) on the CAN OUT connector of the last module on the network may be missing or not connecting properly. Reconnect J1 connector.
   c.   Check the network (purple) cable for loose connections or damage. If no problems are found, do the following:
      1.   Disconnect the network cable about halfway through the network from the "CAN 1 out" connector of the module chosen to be the temporary "last module". Move the terminating plug from the "CAN 1 out" connector of the last module to the "CAN 1 out" connector of the temporary "last module".
      2.   If the modules that remain connected continue to show similar symptoms, divide the network approximately in half again.
      3.   If the symptoms are not present, reconnect and disconnect about halfway through that part of the network most recently disconnected.
      4.   Always move the terminating plug to the "CAN 1 out" connector of the temporary "last module".
      5.   Continue in this way until the problem is narrowed down to a single module.

7.   Where a problem is being caused by a bad connection, the action of disconnecting and connecting the network may fix the problem and give inconsistent and confusing results when using this method. Each time a disconnection is made, take advantage of the opportunity to check for internal corrosion and proper engagement.

8.   After narrowing down the symptoms to a single module, the problem must lie with the "CAN 1 in" connection on the module, the cable to the upstream (lower CAN numbered) module, the "CAN 1 out" connection on the upstream module, or the module itself.