



MCI D-Coach ISX E-Fan Diagnostic
Software User Guide &
Troubleshooting Guide
8A003366 Rev D
Last Revised: 10/1/2018

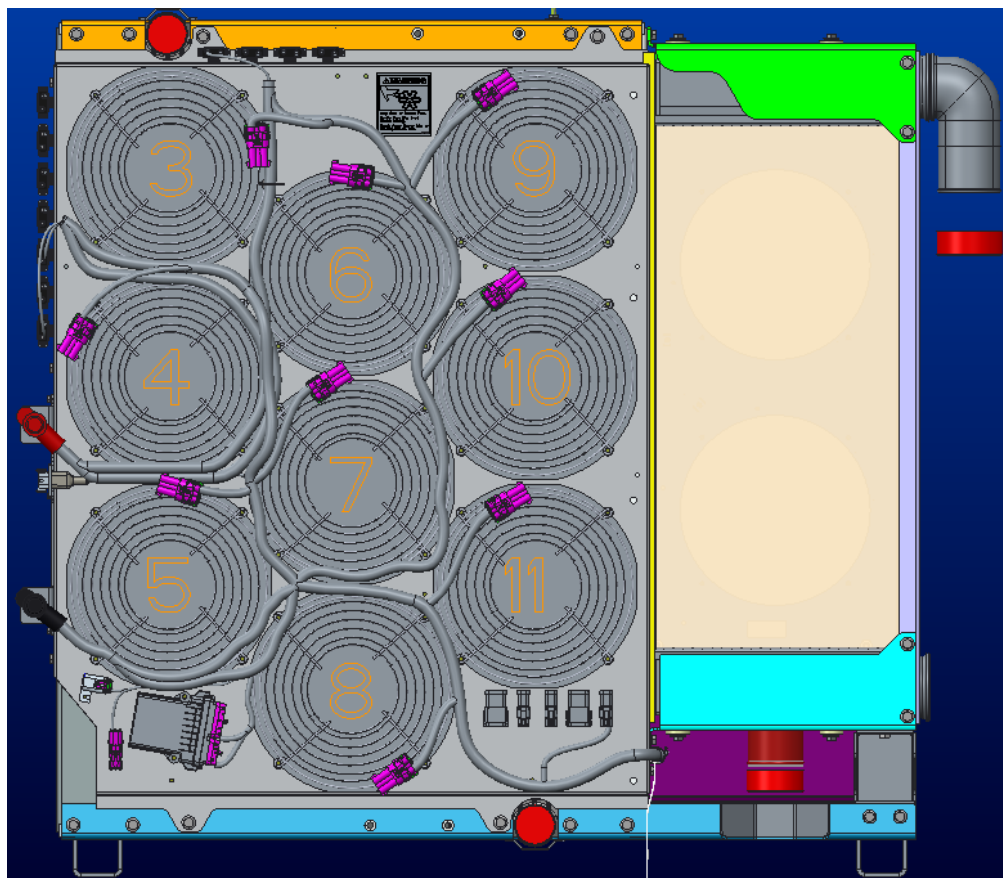




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Section 1: Introduction

This guide instructs users of the Modine EFAN system on how to connect to its diagnostic system, download data logs, monitor current status, and troubleshoot potential problems.





This troubleshooting guide applies to EFAN systems with the following controller Part Numbers:


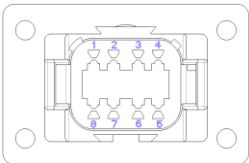

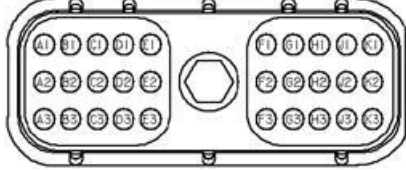
- 5A0789870000 – Cummins Diesel with Allison H40EP Hybrid




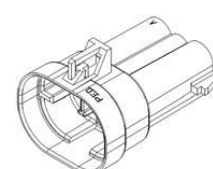


E-Fan Shroud Assembly


The Modine e-fan shroud assembly consists of 9 radiator fans and 2 CAC fans. All fans are interchangeable between heat exchangers and locations within the heat exchanger. The radiator fan's control wires (PWM, yellow wires) are connected together through a busbar creating an individual bank. The CAC fan's control wires (PWM, yellow wires) are connected together similarly using a smaller busbar. The two banks are independent of each other but both connected to the same system IO controller. All radiator fans will run at the same speed. The CAC fans will run at the same speed as each other but differently than the radiator bank.

Connector Definitions

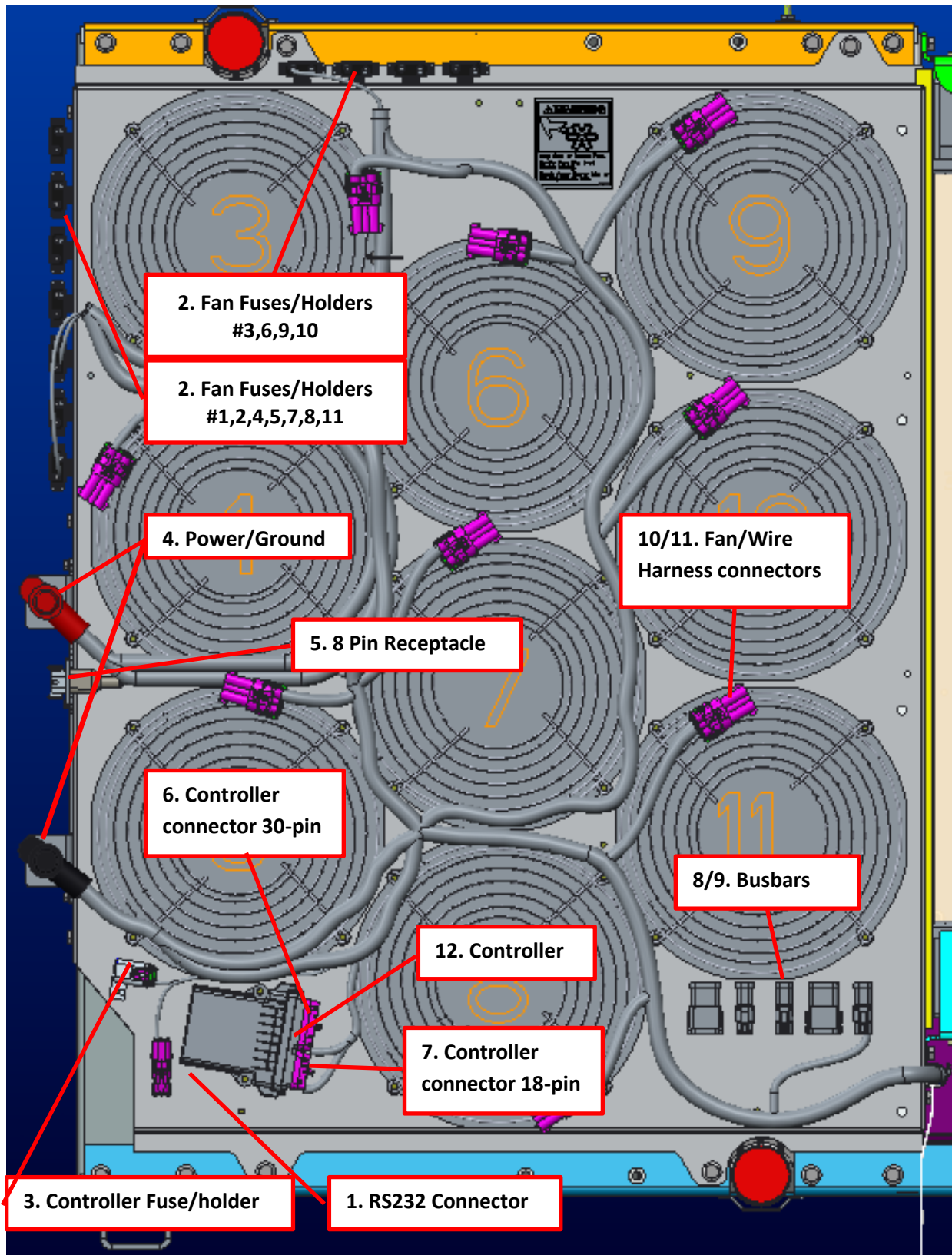
#	Name	Description	Pictorial
1.	Square RS232	RS232 connector used for connecting to controller for firmware re-programming and datalog downloading	
2.	Fuse & Holder – Fan (40A)	40A fuse to protect wires to each individual E-fan	
3.	Fuse & Holder – Controller (5A)	5A fuse to protect wires to controller	
4.	Power & Ground Studs	Studs to connect system to bus power/ground	

5.	8 Pin Receptacle	<p>Pin 1 – J1939+</p> <p>Pin 2 – J1939-</p> <p>Pin 3 – J1939 Drain</p> <p>Pin 4 – Ignition</p> <p>Pin 5 – Reverse</p> <p>Pin 6 – Diagnostic</p> <p>Pin 7 – Ground</p> <p>Pin 8 – Fire Override (not used)</p>	 																																																																
6.	Controller Connector – 30 pin	<table><tr><th colspan="2">30 PIN AREA (VIEW A)</th></tr><tr><th>PIN #</th><th>FUNCTION</th></tr><tr><td>A1</td><td>RECEIVE DATA PIN A RS232</td></tr><tr><td>A2</td><td>TRANSMIT DATA PIN C RS232</td></tr><tr><td>A3</td><td>PROGRAM ENABLE PIN D RS232</td></tr><tr><td>B1</td><td>CAN HIGH (PIN A J1939)</td></tr><tr><td>B2</td><td>CAN LOW (PIN B J1939)</td></tr><tr><td>B3</td><td>SIGNAL COM PIN B RS232</td></tr><tr><td>C1</td><td>NO CONNECT</td></tr><tr><td>C2</td><td>NO CONNECT</td></tr><tr><td>C3</td><td>GROUND (-) 24 VDC - OPTIONAL</td></tr><tr><td>D1</td><td>NO CONNECT (OPTION FOR FAN 9 DIAGNOSTIC)</td></tr><tr><td>D2</td><td>NO CONNECT (OPTION FOR FAN 10 DIAGNOSTIC)</td></tr><tr><td>D3</td><td>NO CONNECT (OPTION FOR FAN 11 DIAGNOSTIC)</td></tr><tr><td>E1</td><td>NO CONNECT (OPTION FOR FAN 12 DIAGNOSTIC)</td></tr><tr><td>E2</td><td>NO CONNECT</td></tr><tr><td>E3</td><td>NO CONNECT</td></tr><tr><td>F1</td><td>FAN 1 DIAGNOSTIC</td></tr><tr><td>F2</td><td>REVERSE (PIN B, OEM)</td></tr><tr><td>F3</td><td>NO CONNECT</td></tr><tr><td>G1</td><td>FAN 2 DIAGNOSTIC</td></tr><tr><td>G2</td><td>FIRE (PIN C, OEM)</td></tr><tr><td>G3</td><td>NO CONNECT</td></tr><tr><td>H1</td><td>FAN 3 DIAGNOSTIC</td></tr><tr><td>H2</td><td>IGNITION (PIN A, OEM) (+24VDC)</td></tr><tr><td>H3</td><td>NO CONNECT</td></tr><tr><td>J1</td><td>FAN 4 DIAGNOSTIC</td></tr><tr><td>J2</td><td>FAN 5 DIAGNOSTIC</td></tr><tr><td>J3</td><td>FAN 6 DIAGNOSTIC</td></tr><tr><td>K1</td><td>NO CONNECT</td></tr><tr><td>K2</td><td>FAN 7 DIAGNOSTIC</td></tr><tr><td>K3</td><td>FAN 8 DIAGNOSTIC</td></tr></table>	30 PIN AREA (VIEW A)		PIN #	FUNCTION	A1	RECEIVE DATA PIN A RS232	A2	TRANSMIT DATA PIN C RS232	A3	PROGRAM ENABLE PIN D RS232	B1	CAN HIGH (PIN A J1939)	B2	CAN LOW (PIN B J1939)	B3	SIGNAL COM PIN B RS232	C1	NO CONNECT	C2	NO CONNECT	C3	GROUND (-) 24 VDC - OPTIONAL	D1	NO CONNECT (OPTION FOR FAN 9 DIAGNOSTIC)	D2	NO CONNECT (OPTION FOR FAN 10 DIAGNOSTIC)	D3	NO CONNECT (OPTION FOR FAN 11 DIAGNOSTIC)	E1	NO CONNECT (OPTION FOR FAN 12 DIAGNOSTIC)	E2	NO CONNECT	E3	NO CONNECT	F1	FAN 1 DIAGNOSTIC	F2	REVERSE (PIN B, OEM)	F3	NO CONNECT	G1	FAN 2 DIAGNOSTIC	G2	FIRE (PIN C, OEM)	G3	NO CONNECT	H1	FAN 3 DIAGNOSTIC	H2	IGNITION (PIN A, OEM) (+24VDC)	H3	NO CONNECT	J1	FAN 4 DIAGNOSTIC	J2	FAN 5 DIAGNOSTIC	J3	FAN 6 DIAGNOSTIC	K1	NO CONNECT	K2	FAN 7 DIAGNOSTIC	K3	FAN 8 DIAGNOSTIC	 
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8.	Busbar (PWM)	Busbar used to connect PWM output from controller to bank of E-fans. One busbar for CAC fan bank and one busbar for Radiator fan bank.																																									
9.	Busbar (Ignition Failsafe)	Busbar used to connect vehicle ignition input and provide output to controller and each individual E-fan.																																									
10.	Fan Connector – Fan Side (4300 RPM Fan)	Pin A – Power, Red Pin C – Ground, Black Pin F – PWM, Yellow Pin D – Fault / Diagnostic Wire, White Pin E – Ignition Failsafe, Red or Black																																									
11.	Fan Connector – Harness Side (4300 RPM Fan)	Pin A – Power, Red Pin C – Ground, Black Pin F – PWM, Yellow Pin D – Fault / Diagnostic Wire, White Pin E – Ignition Failsafe, Red or Black																																									
12.	Controller	Main system controller. Controller part # printed on front label.																																									

13.	Diagnostic Bulb / Reverse Switch	<p><u>Typically provided by OEM</u></p> <p>OEM rear run box typically includes reverse switch and diagnostic bulb together in rear run box panel</p>	
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Location of Connectors



Section 2: Normal Operating Conditions

Normal system response can be verified by the engine on conditions below and by running the reverse sequence.

Engine On

1. CAC fans running slowly
2. Coach diagnostic bulb illuminates for the first 3 seconds to indicate controller power is on and then remains off

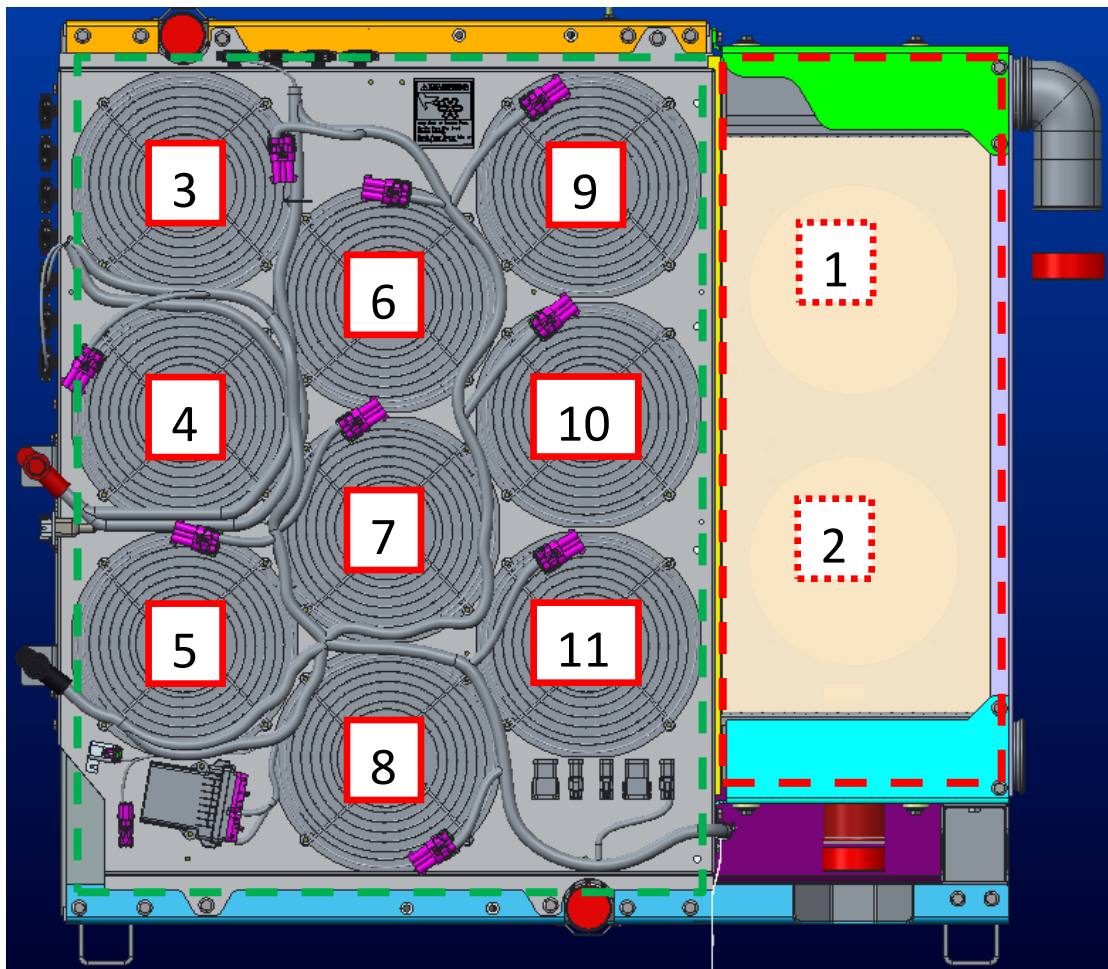
Fan Operation – Fan # Layout

Charge air cooler (CAC) fans

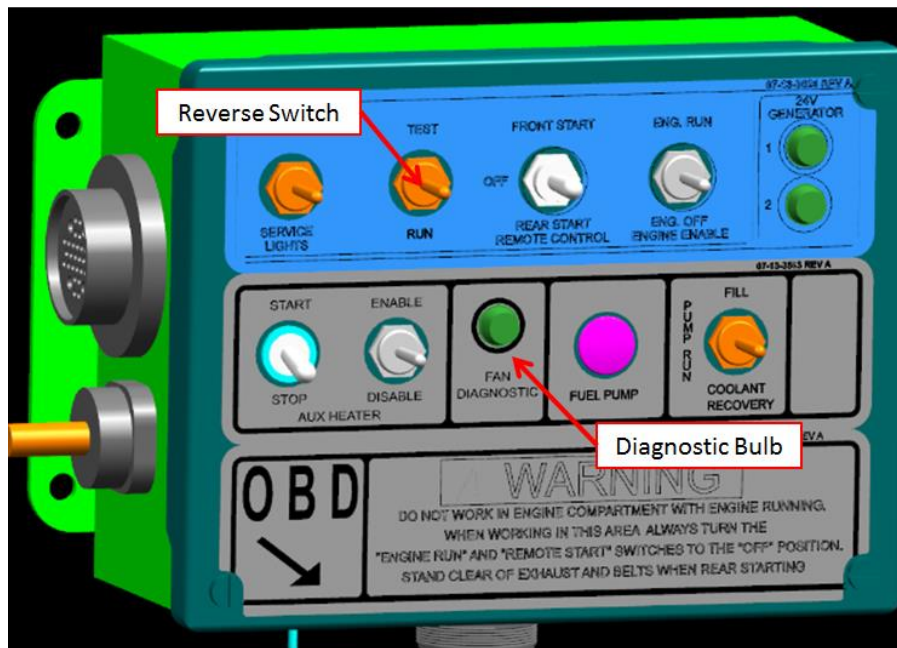
Run at minimum speed when engine starts

Radiator (RAD) fans

Do not run until coolant temperature reaches 196°F (91°C)



Note: All CACs fans turn on together at the same speed when commanded and all Radiator fans turn on together at the same speed when commanded.



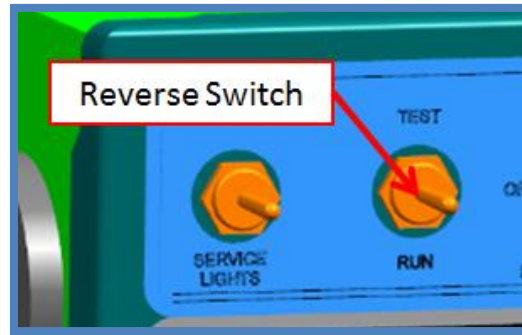
Bulb State	Meaning
Off	System is running normally
On	CAN communication with module has been lost
Flashing – 1 second on, 1 second off	Fans running in reverse sequence, use to check bulb
Flashing – Long and short duration	Indicates which fan(s) have failed. Short flashes indicate fan number, multiple numbers are separated by long pause
On for 3 seconds during initial controller power up	Indicates controller is powered on. Light must turn off after initial startup

Note: See Troubleshooting Section if CAN Communication is lost or a fan failure has occurred.

Reverse Switch (use to check if all fans are working)

Press switch momentarily to activate reverse sequence. Fans will run in reverse for about 15 seconds. Diagnostic bulb will flash during this time. This sequence may be aborted by pressing switch again.

Note: ignition must be on and the fire override (gravity switch on fan door, if installed by OEM, and any other fire override inputs from fire suppression system or IO multiplexer that OEM uses) must be off to run reverse sequence. This may be accomplished by keeping fan door closed or temporarily disconnecting switch.



Press to run fans in
reverse

Press again to abort

Section 3: Failsafe Feature Operating Conditions

Two failsafe feature operating conditions were put in place to protect the vehicle from an overheat event. These are not normal operating conditions and require further troubleshooting if they occur.

1. **CAN Communication Loss Protection** – Controller will request fans to run at a default speed near full speed.
2. **Ignition Failsafe Loss Protection** – In the event that the controller fails or loses power and the ignition wire to the fans is +24V the fans will run at a default speed near full speed.

Section 4: Diagnostic Software

The Modine Universal Diagnostic Software (UDS) package has the following functions:

- Monitor system response in real time
- Control cooling module manually
- Download internal data log (RS-232 cable required, Modine PN: 3S0585890000)

Supported Devices

All RP1210 compliant J1939 data link adapters are supported. Examples include the NexIQ USB-Link (PN: 125032) and the Cummins INLINE 6 (PN: 2892093).

Downloading Diagnostic Software

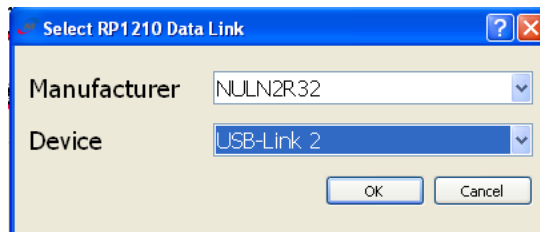
1. Enter (or click) the following address in your default internet browser:
<http://www.modine.com/transitsoftware>
 - a. Or you can perform the following steps.
 - i. Navigate to www.modine.com
 - ii. Navigate to **Products > Transit Bus** tab
 - iii. Click on **Troubleshooting & Diagnostics** on the left side of the screen.
 - iv. Click the **Transit Diagnostic Software** Link
2. Download and run the **ModineUDS.exe** file.
3. There should now be a “Modine UDS” program in your Start Menu.

Connecting to Built-in Diagnostic System

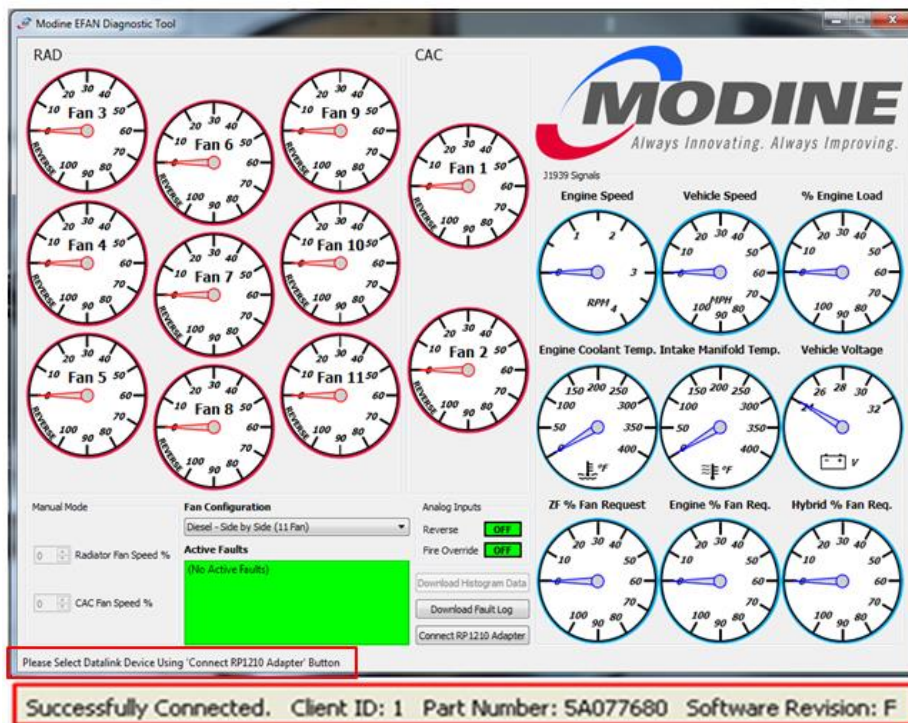
1. Make sure the latest version of Modine UDS is installed on computer that will be used for troubleshooting. See previous section.
2. Connect one of the supported data link adapters, outlined above. Drivers must be obtained through the manufacturer's website and installed.
3. Launch Modine UDS and turn on vehicle to power up controller.
4. If this is the first time running Modine UDS with a given datalink adapter:

Connect RP1210 Adapter

- a. Select the "Connect RP1210 Adapter" button.
- b. A dialog will appear. First select the Manufacturer driver, then the Device connected to the PC. This list is populated with all drivers installed on the PC.



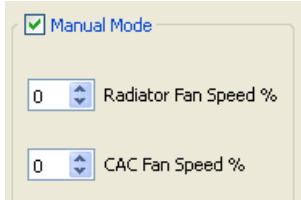
- c. Press OK to confirm selection. If connection is unsuccessful, another selection may be attempted. If connection is successful, Modine UDS will remember the selection and automatically connect the last successful device when the program is run again.
5. The bottom of the main window will display connection status along with controller part number and revision level. See image below.



6. The EFAN system status may now be monitored, fans may be manually controlled, and histogram data may be downloaded (if equipped).

Manual Control

1. To enable manual control, check the box next to Manual Control. The fan speed will now reflect the fan speed entered in the boxes below (0-100%).

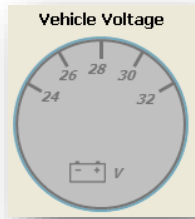


The screenshot shows a control panel with a checked checkbox labeled "Manual Mode". Below it are two input fields, each with a numeric value of "0" and a label: "Radiator Fan Speed %" and "CAC Fan Speed %".

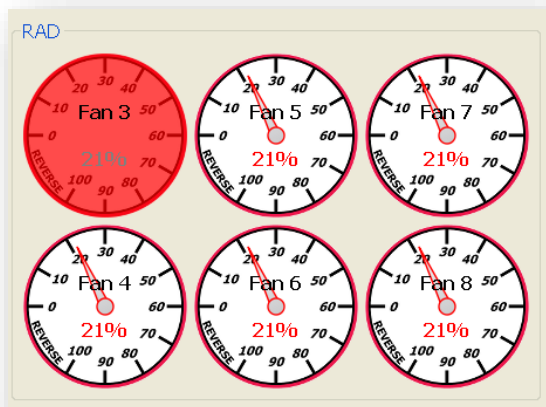
2. The fans will run at the nearest increment to the entered value. Note that this will likely not reflect the exact value entered. If the coolant temperature exceeds 99°C (210°F) or if SPN 986 – Percent Fan Request reaches 100, manual mode will be disabled until temperatures decrease.
3. Once the Manual Mode check box is unchecked, fans will resume normal operation.

Interpreting Data

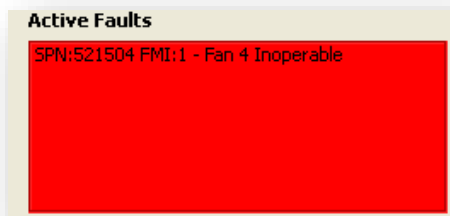
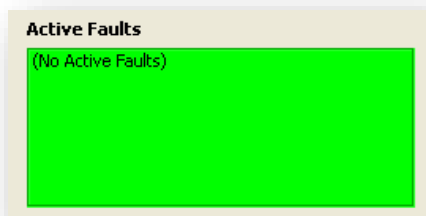
1. Gauges that are grey indicate that there is no J1939 message present.



2. Red fan gauges indicate a fan failure. In this case, fan 3 is failed.



3. Any active DM1 fault messages will be displayed in the message box at the bottom of the screen.



Downloading Data Log

1. If Windows does not recognize the USB diagnostic cable, download the driver here:
<http://www.ftdichip.com/Drivers/CDM/CDM%20v2.12.06%20WHQL%20Certified.exe>
2. Open Modine UDS
3. With the controller on, connect the USB diagnostic cable



4. Click the **Download Fault Log** button near the bottom of the screen.
5. Select the COM port assigned to the cable.
6. When data has been successfully downloaded, a CSV file with the time/date of download will be placed in C:\ModineFaultLogs\

Data Log Triggers

If any of the triggers listed below occur, the controller will record a log file that can be downloaded for diagnostic and system analysis

See Section 5: Troubleshooting - Failure Reported Via CAN or Controller Data log for troubleshooting activities.

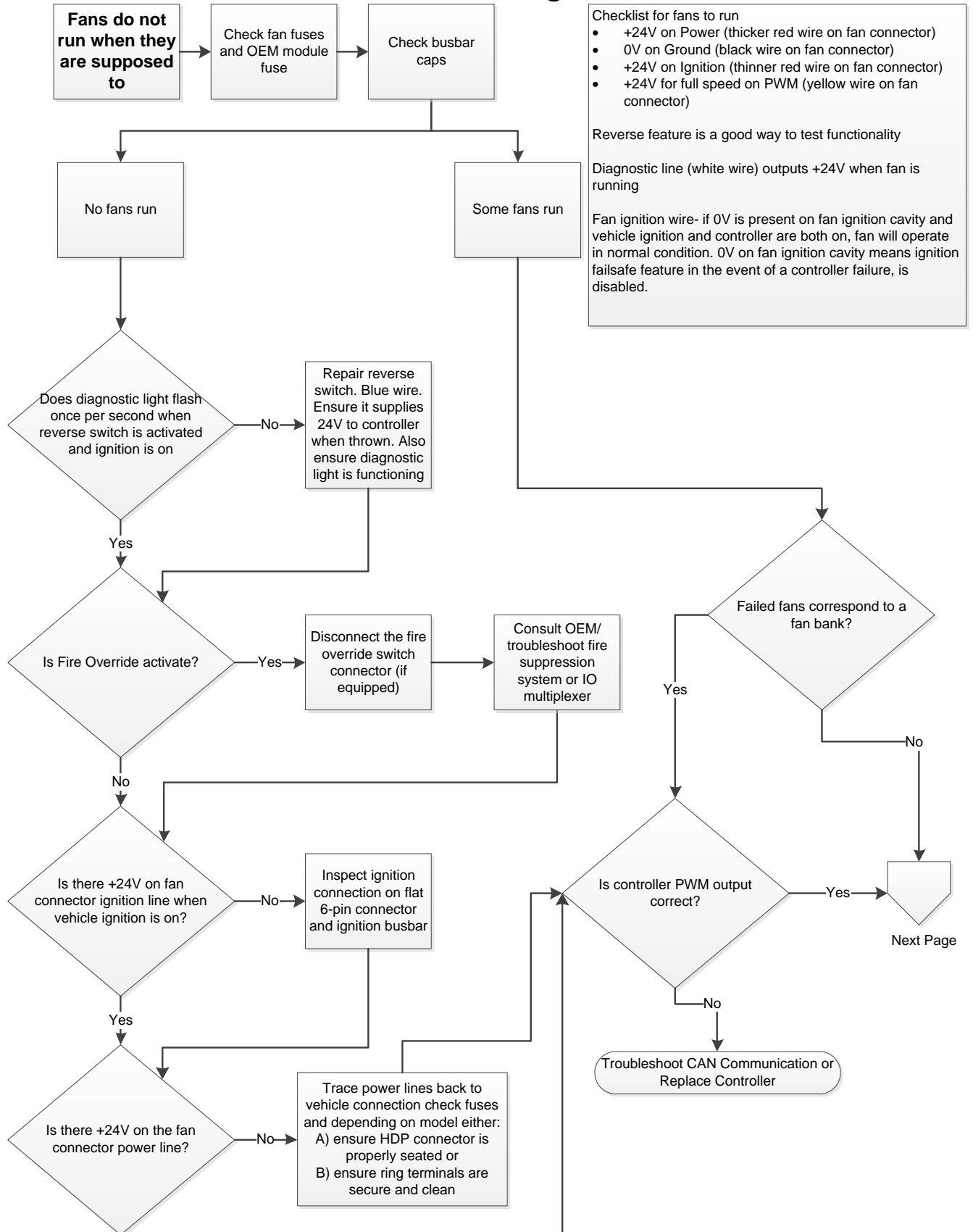
Trigger	Condition
High Coolant Temp	J1939 coolant temp is greater than 225°F (107°C)
Under or Over Voltage at Controller	Voltage at controller is < 16 VDC or > 32 VDC
Fan Failure	One or more fans are not running when they should be
High Controller Temp	Internal controller temperature is greater than 176°F (80°C)
CAN Communication loss	CAN/J1939 cable disconnected from controller

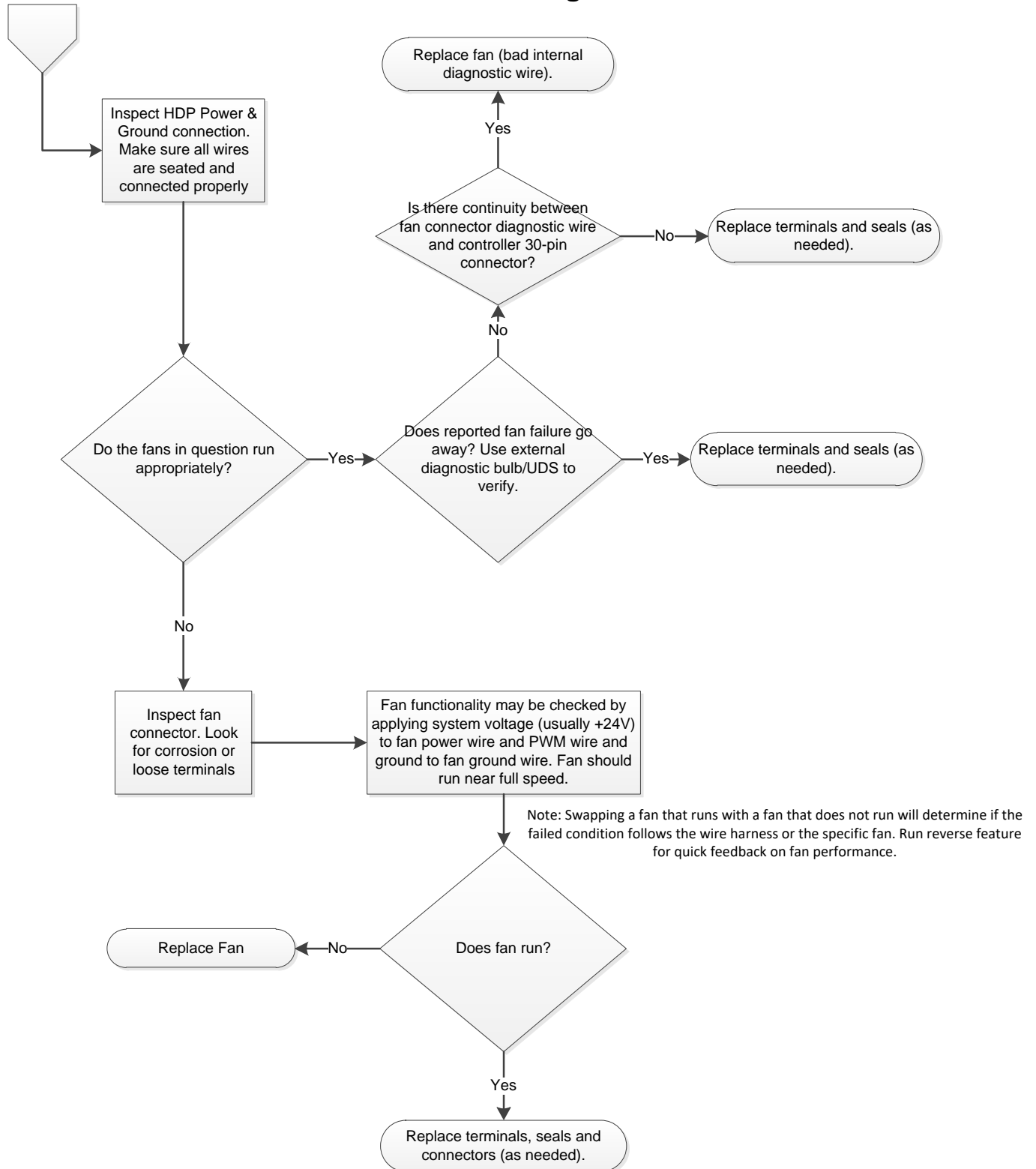
Section 5: Troubleshooting

Fans Do Not Run When They Are Supposed To

Possible Cause		Remedy
See Flowchart below for step-by-step diagnosing		
Fire Override Active (+24 V on Pin C of 6 pin).	Tilt switch active (if present).	Replace fire override tilt switch.
	Fire override active from IO multiplexer/fire suppression input.	Consult OEM
Incorrect PWM output from controller – (3% is Off, 40% is min speed, 92% is max speed)		Troubleshoot CAN Connection. Replace controller.
Fan(s) not receiving +24V	Blown fan fuse or OEM module fuse.	Replace blown fuse.
	Inspect HDP power & ground connection to make sure all wires are seated properly and connector seats completely.	Clean wires and replace terminals, seals and connectors as needed.
	Corrosion on fan connector wires.	
Loss of ground connection	Inspect HDP power & ground connection to make sure all wires are seated properly and connector seats completely.	
	Corrosion on fan connector wires.	
Reported fan failure when fan is operating normally	If no continuity exists on white diagnostic wire between fan and controller. Ensure all connectors are connected correctly.	Replace fan, bad internal power/ground or PWM connection.
	If continuity exists on white diagnostic wire between fan and controller.	
Failed fan wiring or fan motor	Apply +24V to power and PWM cavities and ground to ground cavity of individual fan. Wait 15 seconds; fan should begin to spin near full speed.	

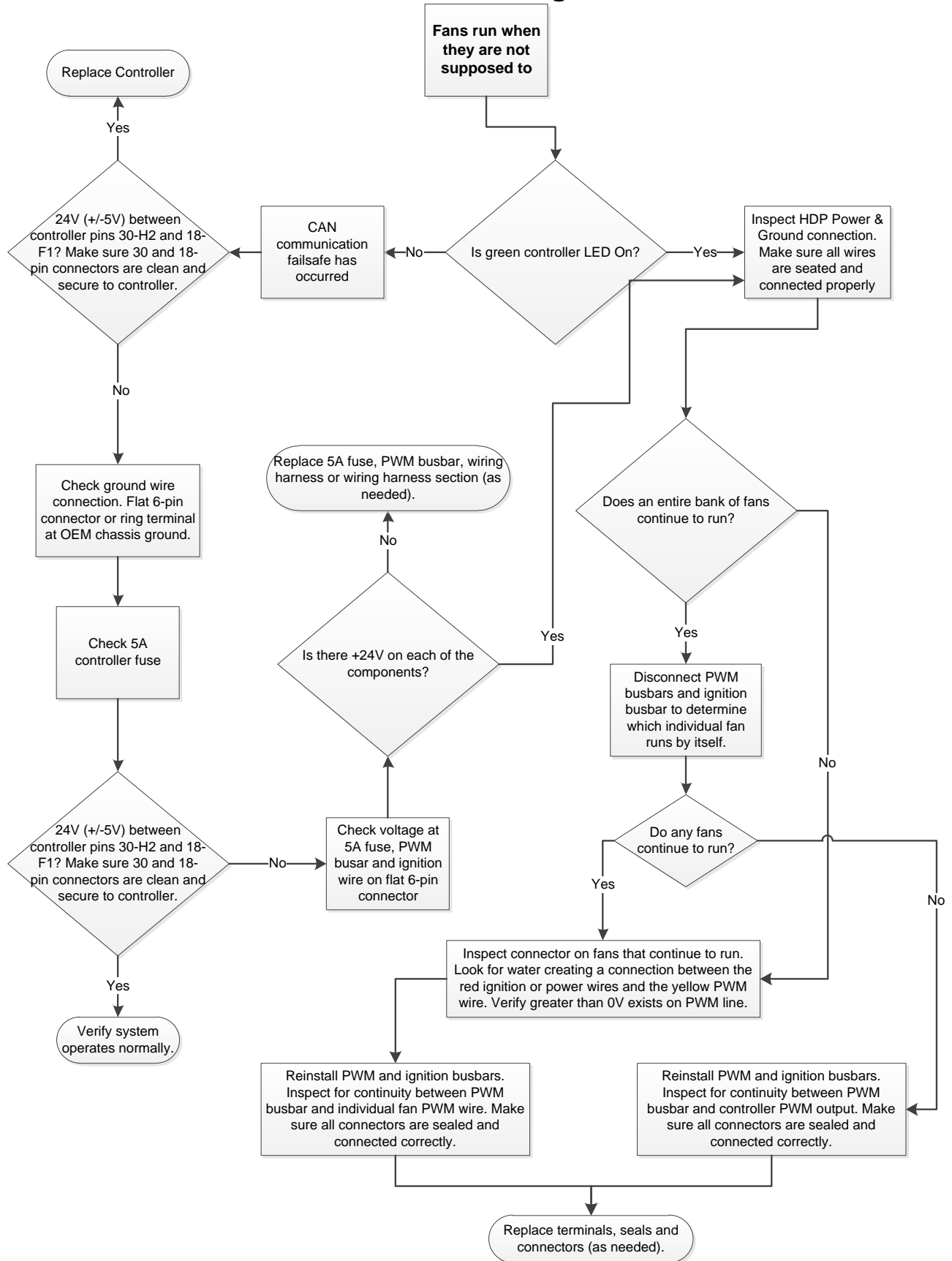
Note: Use RTMD real time data monitoring / download data files and OEM reverse feature function as needed for diagnosing.





Fans Run When They Are Not Supposed To or Failsafe Features Activated

Possible Cause		Remedy
See Flowchart below for step-by-step diagnosing		
Loss of fan ground connection	Inspect HDP power & ground connection to make sure all wires are seated properly and connector seats completely.	
	Corrosion on fan connector wires	Clean wires and replace terminals, seals and connectors.
Fan not receiving PWM output from controller	Check continuity on PWM wire from fan to PWM busbar to controller PWM output cavity and ensure all connectors are properly seated.	Clean wires and replace terminals, seals, connectors and PWM busbar caps as needed.
CAN Communication Loss		See "CAN Communication Loss" troubleshooting section.
Controller not receiving +24V (+/- 5 volts)	Check voltages at 5A fuse, Ignition busbar, flat 6-pin (pin A).	Replace 5A fuse, ignition busbar, wiring harness or wiring harness section. Clean wires and replace terminals, seals and connectors as needed
Failed Controller	Verify +24V (+/- 5 volts) volts is across pins H2 (30 pin) and F1 (18 pin) and that 18 and 30 pin connectors are properly seated.	Replace controller
Voltage on fan PWM wire when vehicle ignition is off	Check individual fan connectors and PWM busbars for water penetration or corrosion. Verify greater than 0V exists on fan PWM wire when PWM busbar is removed.	Clean wires and replace terminals seals and connectors.



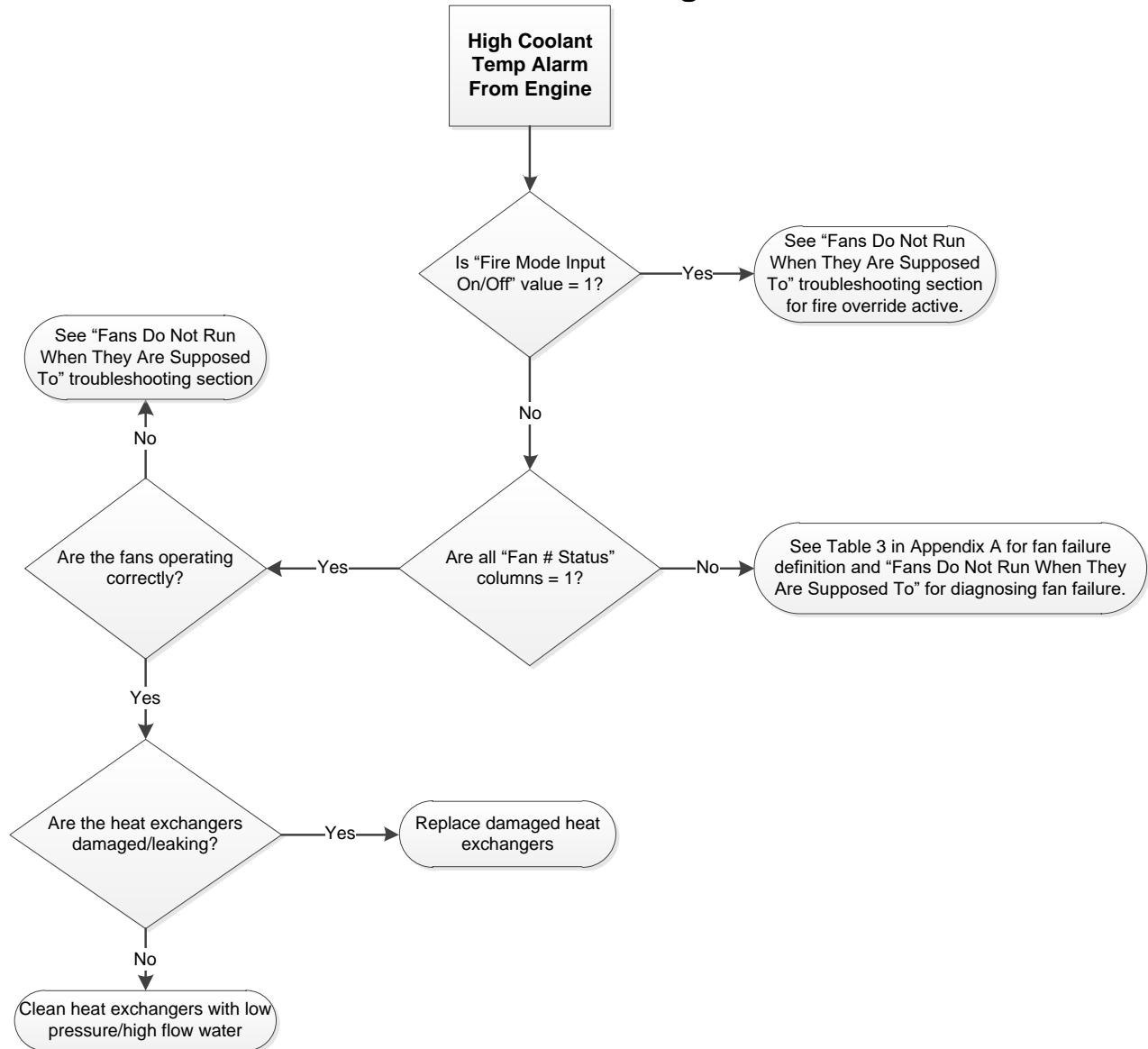
Failure Reported Via CAN or Controller Data Log

The following are the current controller recognized fault codes for the internal data logger: The trigger that created the data log file is located at the bottom row of the log event. Note: Controller can store roughly 100 events and they are first in first out.

Trigger	Condition
High Coolant Temp	J1939 coolant temp is greater than 225°F (107°C)
Under or Over Voltage at Controller	Voltage at controller is < 16 VDC or > 32 VDC
Fan Failure	One or more fans are not running when they should be
High Controller Temp	Internal controller temperature is greater than 176°F (80°C)
CAN Communication loss	CAN/J1939 cable disconnected from controller

High Coolant Temp Alarm From Engine

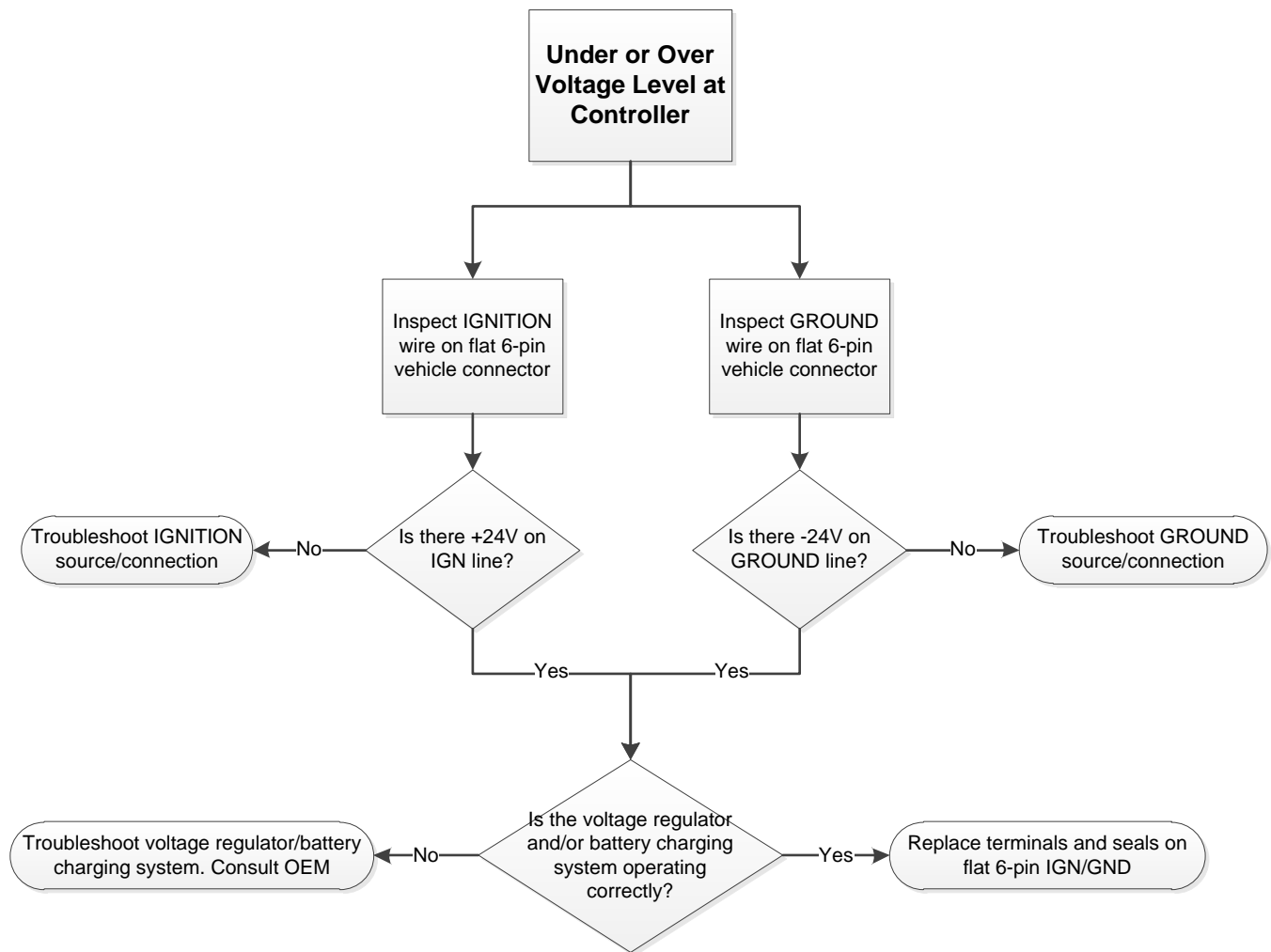
Possible Cause		Remedy
See Flowchart below for step-by-step diagnosing		
Fans do not run when they are supposed to	Fire mode input on (value = 1).	See “Fans Do Not Run When They Are Supposed To” troubleshooting section.
	Fans in present state show they are not running when supposed to.	
	Fan fail bits from diagnostic input value are not 255.	See Table 3 in Appendix A. Fan failures reported have contributed to engine overheat.
Heat exchanger cores clogged		Clean cores with low pressure, high flow water.
Cooling system leak		Replace damaged component.



Under or Over Voltage Level at Controller

Possible Cause	Remedy
See Flowchart below for step-by-step diagnosing	
Controller not receiving +24V	Inspect ignition connection on 6-pin vehicle connector
Loss of ground connection	Inspect ground connection on 6-pin vehicle connector. Trace back to bus ground and troubleshoot.
Poor voltage regulator/battery charging system	Troubleshoot voltage regulator/battery charging system. Consult OEM.

Note: If the red LED illuminates and the data trigger occurs directly after startup and the system is running normal, allow system to charge, key ignition off and restart to remove red LED light.

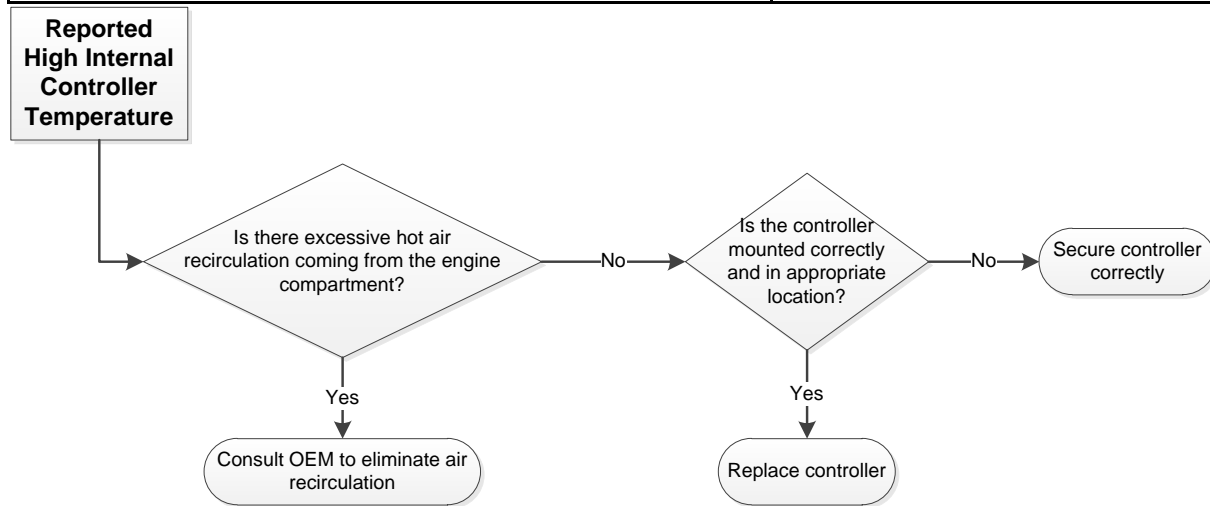


Fan Failure

When a fan failure is reported in the log file, review the “Fan # Status” columns to determine which fan failure location has been identified. A value of 1 means the fan is working, a value of 0 indicates a fan fault. See the “Fans Do Not Run When They are Supposed To” Section for further troubleshooting.

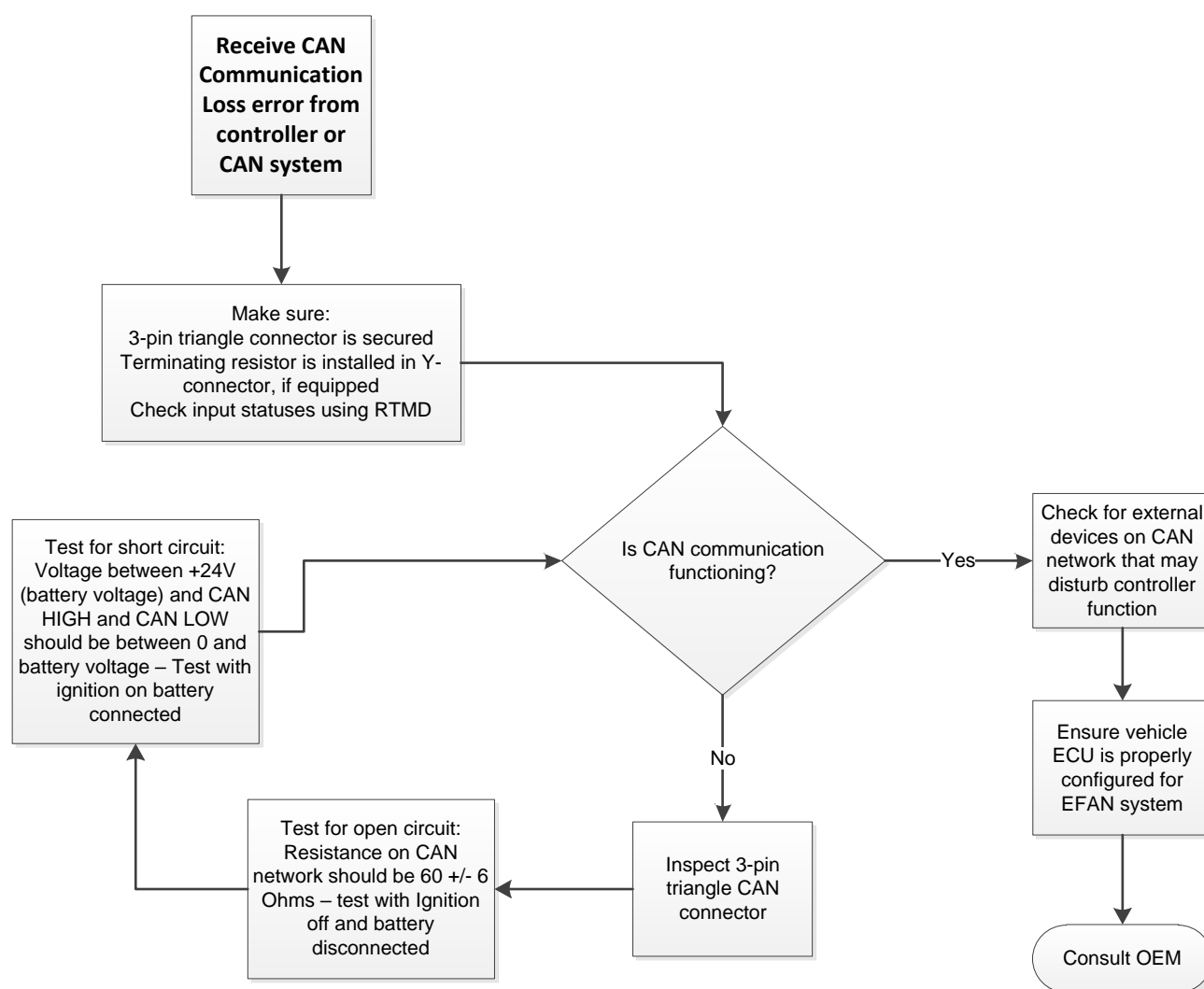
High Controller Internal Temperature

Possible Cause	Remedy	
See Flowchart below for step-by-step diagnosing		
Excessive hot air recirculation	Inspect cooling system air seals near controller.	Consult OEM to eliminate air recirculation.
Controller improperly mounted	Inspect mounting of controller and match location listed in “Location of Connectors” section	Secure controller in original location.
Faulty controller circuitry	Replace controller.	



CAN Communication Loss

Possible Cause		Remedy
See Flowchart below for step-by-step diagnosing		
Loose CAN connection at controller	Inspect 3-way Deutsche CAN connector	Replace terminals, seals and connectors.
External CAN device interference		Troubleshoot CAN network. Consult OEM
Vehicle ECU Incorrectly configured for E-fan		Troubleshoot ECU to accept variable speed fan. Consult OEM.



Maintenance

For all additional preventative maintenance requirements for the cooling system consult the MCI published preventative maintenance documents.

Weekly Inspections

- Test the function of the fan reverse switch and LED indicator. Operating the fan reverse switch will clear debris from the heat exchanger cores, and will also confirm operation of the LED indicator which is used to display diagnostic fault codes. Note: Reverse switch is typically not installed for rooftop modules.

Yearly Inspections

- Inspect the main positive and ground cables for wear or frayed insulation. Ensure the protective rubber boots are in place and in good condition (for modules using power/ground studs).
- Check the main power cable connections for tightness and torque to 25 Nm (for modules using power/ground studs).
- Inspect the condition of the inner and outer nylon bushings on the main power cable pass-through studs (for modules using power/ground studs.)
- Inspect main wiring harness and connections to the system controller and all fans
- Inspect fuses and fuse holders.
- Inspect support structure for any damage or loose mounting hardware.
- Visually inspect heat exchangers for signs of core clogging. Use low pressure water spray to remove any signs of debris.

Fan Replacement

When replacing a fan, be sure not over tighten the mounting hardware (6ft-lbs). Ensure wire hand guard is installed and not obstructing fan blade. When connecting to the wire harness, verify all connections are clean and free of corrosion prior to connecting. Coat wire harness side in dielectric grease and insert to fan connector verifying the orange seal is not pinched and is fully inserted. Use the provided cable ties and insert through locking feature on connector prior to attaching to the shroud. Reference Modine document 8A003349 for crimping instructions (will be included in any service kit purchase).

Fuse/General Connector Replacement

All fan fuses use 30 or 40 amp fuses (depending on fan model) and are labeled with the corresponding fan numbers (see section 2 for fan numbering scheme). The IO controller uses a 5 amp mini-fuse.

Reference Modine document 8A003349 for crimping instructions (will be included in any service kit purchase).

Welding Guidelines

Prior to welding, ensure master battery switch is off, power and ground cables are removed from the cooling system and all J1939 (CAN) as well as ignition lines are disconnected from e-fan. Ensure welder ground is in close proximity to the point of weld and is not connected to the cooling system frame or



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heat exchangers. **Once work is completed, ensure all cables and connectors are connected properly prior to testing the system.**

Appendix A – J1939 Messages

DM1 Fault Messages

Fault Type	Source	Description	J1939 SPN	J1939 FMI	J1939 Lamp	Diagnostic Lamp	Internal Data log trigger?
Fan 1 Inoperable	Fan Motor	Diagnostic feedback from fan motor indicates that fan blades are not spinning when commanded to	521501	1	None	Flash corresponding to failed fan number	Yes
Fan 2 Inoperable			521502	1			
Fan 3 Inoperable			521503	1			
Fan 4 Inoperable			521504	1			
Fan 5 Inoperable			521505	1			
Fan 6 Inoperable			521506	1			
Fan 7 Inoperable			521507	1			
Fan 8 Inoperable			521508	1			
Fan 9 Inoperable			521509	1			
Fan 10 Inoperable			521510	1			
Fan 11 Inoperable			521511	1			
Fan 1 J1939 Failsafe Mode	Controller	Fans are running properly but operating conditions from the vehicle CAN bus have been lost. Fans are running at failsafe speed	521501	2	None	Solid ON	Yes
Fan 2 J1939 Failsafe Mode			521502	2			
Fan 3 J1939 Failsafe Mode			521503	2			
Fan 4 J1939 Failsafe Mode			521504	2			
Fan 5 J1939 Failsafe Mode			521505	2			
Fan 6 J1939 Failsafe Mode			521506	2			
Fan 7 J1939 Failsafe Mode			521507	2			
Fan 8 J1939 Failsafe Mode			521508	2			
Fan 9 J1939 Failsafe Mode			521509	2			
Fan 10 J1939 Failsafe Mode			521510	2			
Fan 11 J1939 Failsafe Mode			521511	2			
Over-Voltage	Controller	Voltage at the system controller above 32V	521201	0	None	None	Yes
Under-Voltage	Controller	Voltage at the system controller below 17V	521202	1	None	None	Yes
Fire Override Active	Controller	Fire Override input is active	521204	0	None	None	No
Reverse Active	Controller	Controller is in reverse sequence	521205	0	None	Flash at 1 Hz during sequence	No

Performance Messages

Description	Pri	PGN	SA	Byte [1-8]	Factor	Offset	Units	Rate [ms]	Notes
PWM % - Fan Bank 1	18	B100	4E	5	0.4	0	%	1000	Minimum fan speed = 40% PWM Maximum fan speed ≥ 90% PWM
PWM % - Fan Bank 2	18	B200	4E	5	0.4	0	%	1000	
PWM % - Fan Bank 3	18	B300	4E	5	0.4	0	%	1000	

System Identification

Description	Pri	PGN	SA	Rate	Length [bytes]	Data
Request message	18	EA4E	Any	N/A	3	18 EA 00
Controller Part Number	18	FEDA	4E	On Request	8	Byte 2-6 = Last 5 digits of controller part number
Firmware Revision	18	FEDA	4E	On Request	8	Byte 7 = Firmware revision



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Revision Log

Revision	Description	Date	CR
A	Released to production.	2/24/2015	NPR
B	Added Maintenance section and edited Section 1. Added DM1 Appendix	4/4/16	4003742
C	Blank Revision		
D	Update Maintenance Section	10/1/2018	