



NABI EFAN Diagnostic Software User
Guide & Troubleshooting Guide
8A003336 Rev H
Last Revised: 3/23/2017





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Section 1: Introduction


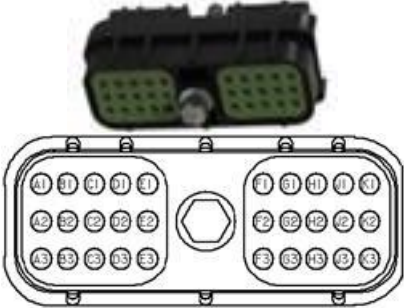

This guide instructs users of the Modine EFAN system on how to connect to its diagnostic system, download data logs, monitor current status, and troubleshoot potential problems.



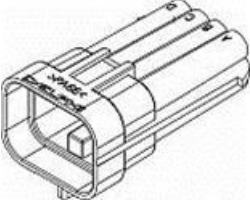



This troubleshooting guide applies to EFAN systems with the following controller Part Numbers:

- 5A0776790000 – Cummins Diesel/CNG with Allison H40EP Hybrid
- 5A0776800000 – Cummins Diesel/CNG with Allison B400 or Voith D864.5
- 5A0776810000 – Cummins Diesel/CNG with ZF Ecolife 6AP or Ecomat 4
- 5A0776820000 – Cummins Diesel/CNG with BAE Hybrid HDS100/200/300

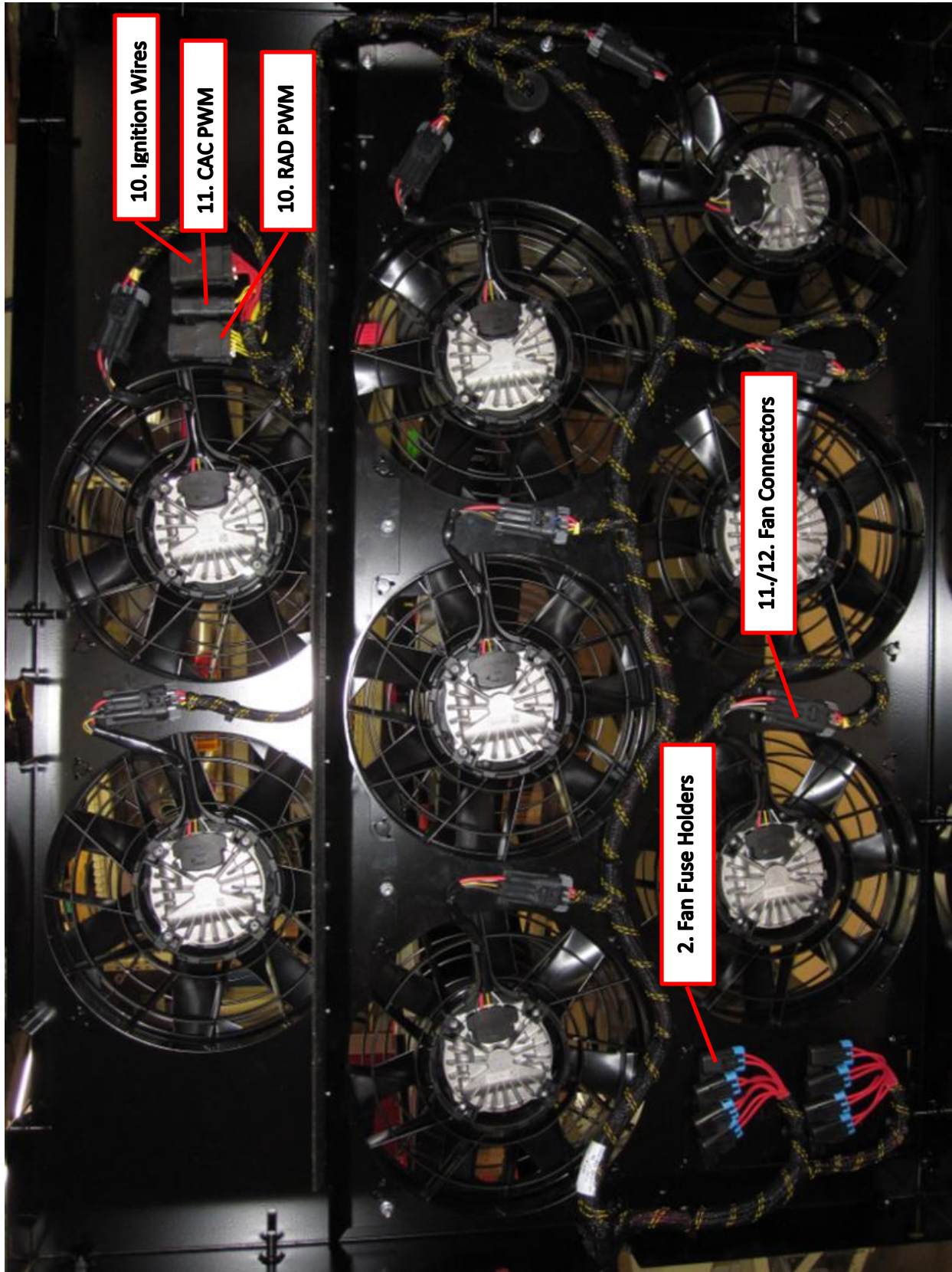
Connector Definitions

<u>#</u>	<u>Name</u>	<u>Description</u>	<u>Pictoral</u>
1.	Square RS232-Diagnostic Side	RS232 connector used for connecting diagnostic system	
2.	Fuse & Holder – Fan (30A)	30A fuse to protect wires to each individual E-fan	
3.	Fuse & Holder – Controller (5A)	5A fuse to protect wires to controller	
4.	HDP Power & Ground (see below)	HDP Connector used for connecting power and ground wires to and from E-fans	
5.	Flat 6-pin	Pin A - Ignition, Red - Input Pin B - Reverse, Blue - Input Pin C - Fire, Purple - Input Pin D – Status to Diagnostic Bulb, Brown - Output Pin E - Ground, Black	

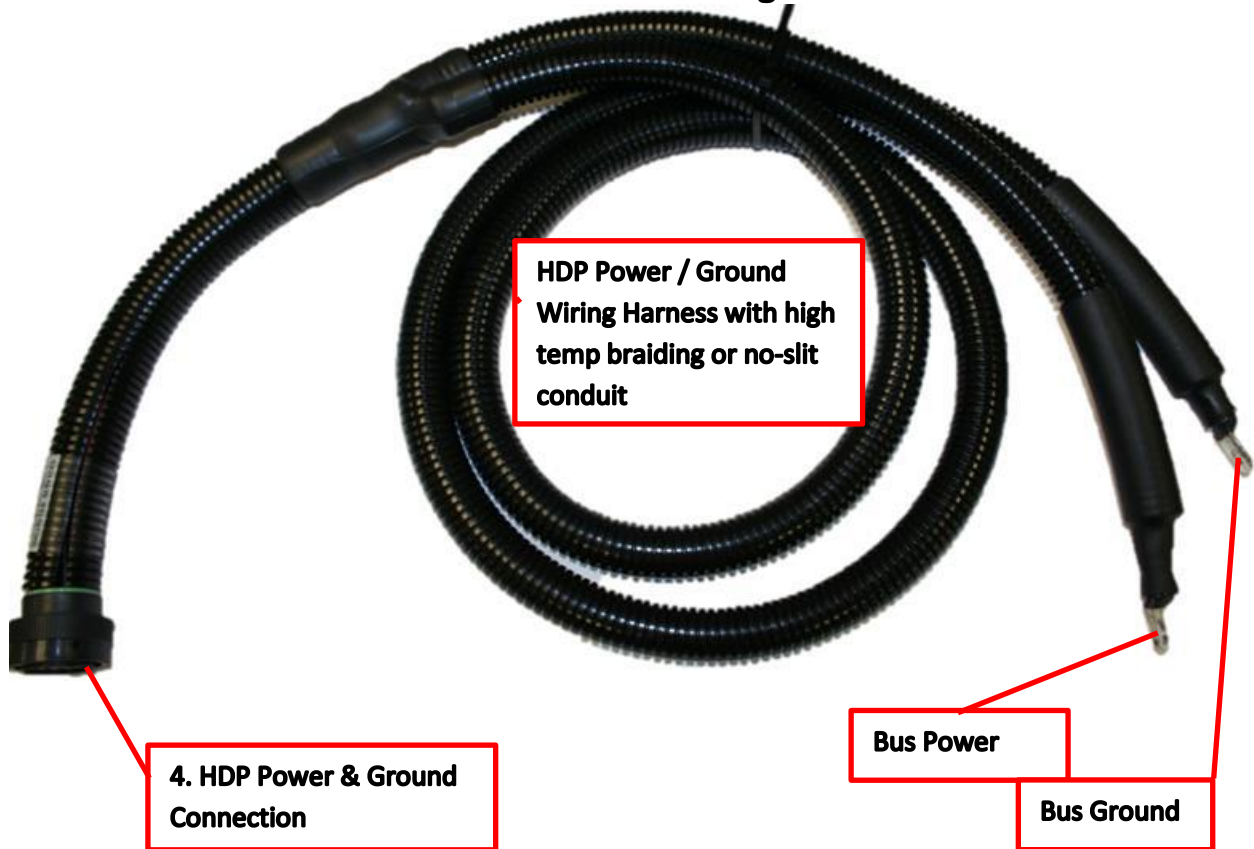
6.	J1939 (CAN)	J1939 (CAN) connection between E-fan Cooling Module and bus interface																																																																	
7.	Controller Connector – 30 pin	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">30 PIN AREA (VIEW A)</th> </tr> <tr> <th style="text-align: center;">PIN #</th> <th style="text-align: center;">FUNCTION</th> </tr> </thead> <tbody> <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> </tbody> </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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9.	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.	
10.	Busbar (Ignition Failsafe)	Busbar used to connect vehicle ignition input and provide output to controller and each individual E-fan.	
11.	Fan Connector – Fan Side (4100 RPM Fan)	Pin E – Power, Red Pin G – Ground, Black Pin B – PWM, Yellow Pin C – Fault / Diagnostic Wire, White Pin F – Ignition Failsafe, Red or Black	
12.	Fan Connector – Harness Side (4100 RPM Fan)	Pin E – Power, Red Pin G – Ground, Black Pin B – PWM, Yellow Pin C – Fault / Diagnostic Wire, White Pin F – Ignition Failsafe, Red or Black	
13.	Controller	Main system controller. Controller part # printed on front label. Power Status – Green LED Fault Status – Red LED	
14.	Diagnostic Bulb / Reverse Switch	<p style="text-align: center;">Typically provided by OEM</p> OEM rear run box typically includes reverse switch and diagnostic bulb together in rear run box panel	

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. Diagnostic bulb illuminates for the first 3 seconds of controller power on then remains off

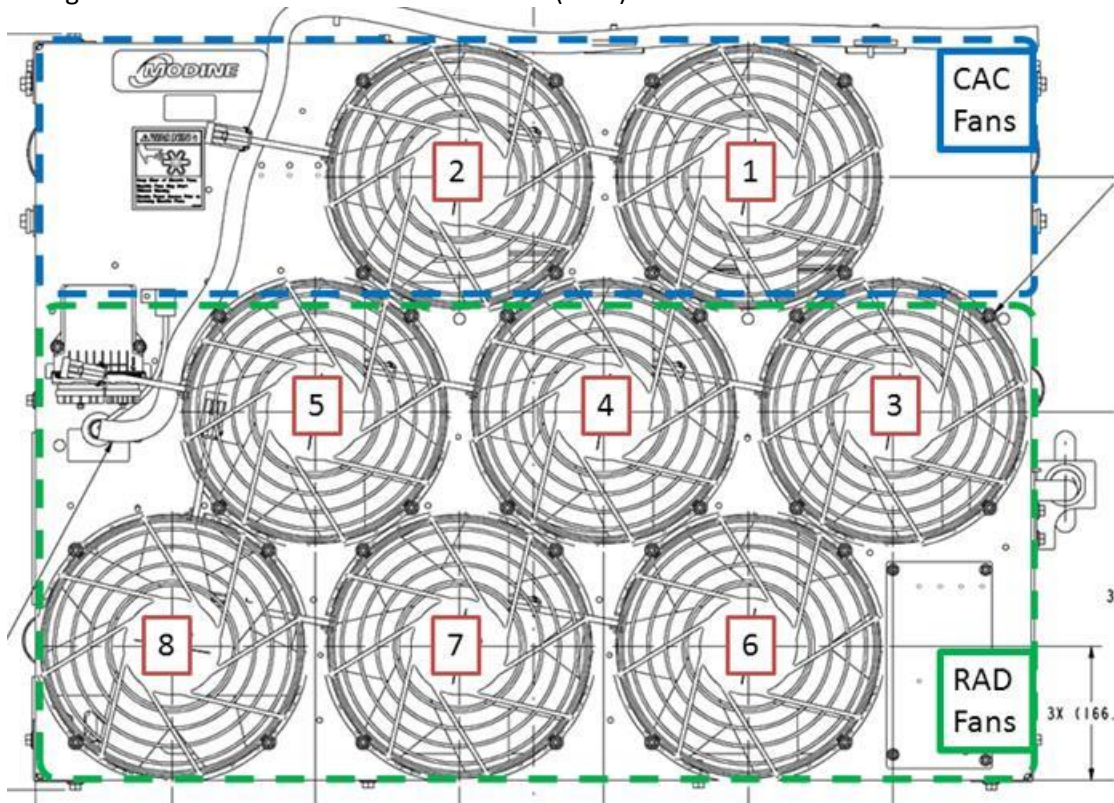
Fan Operation - Fan # Layout

Charge air cooler (CAC) fans

Run at minimum speed when engine starts

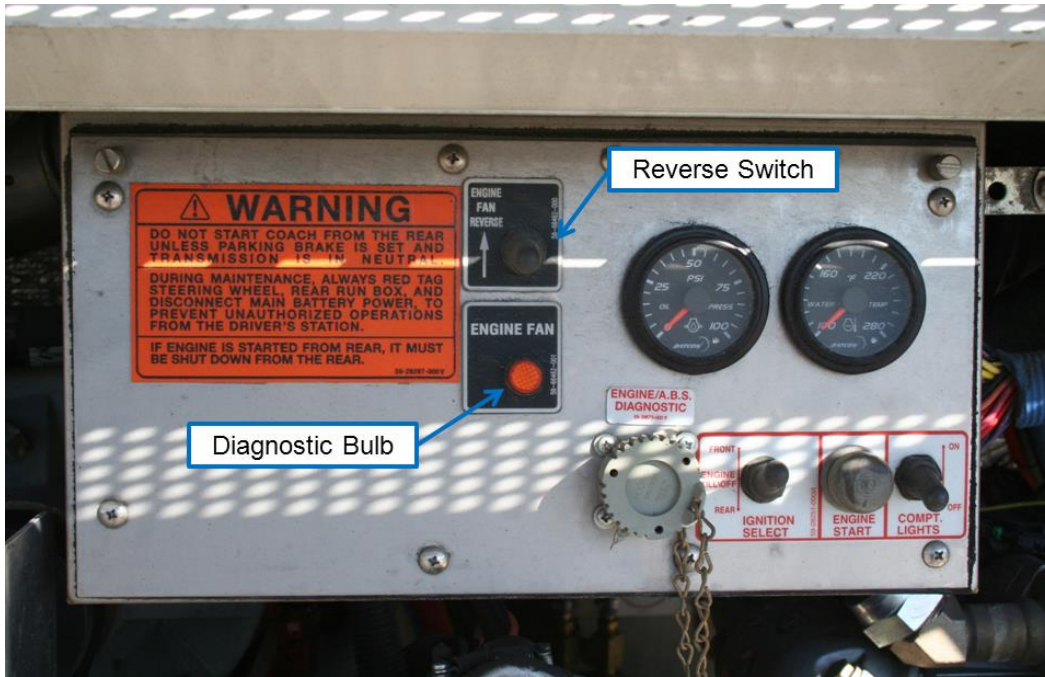
Radiator (RAD) fans

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.

Diagnostic Bulb



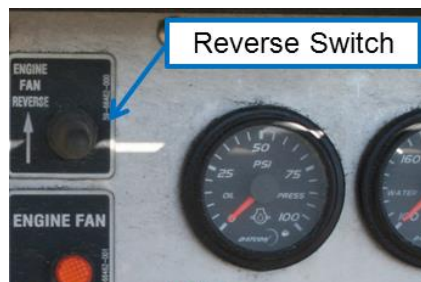
Bulb State	Meaning
Off	System is running normally
On	CAN communication with module has been lost
Flashing – 1 second on, 1 second off	Fans running in reverse sequence, use to check bulb
Flashing – Long and short duration	Indicates which fan(s) have failed. Short flashes indicate fan number, multiple numbers are separated by long pause

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)

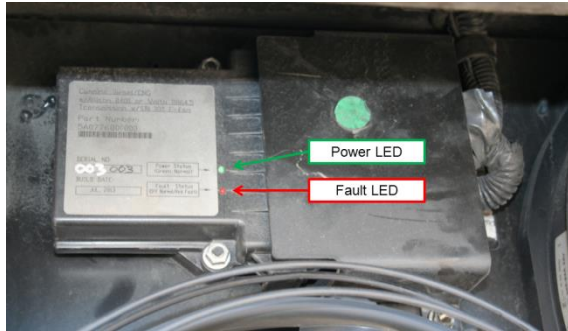
Press switch momentarily to activate reverse sequence. Fans will run in reverse for about 15 seconds. Diagnostic bulb will flash during this time. This sequence may be aborted by pressing switch again.

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

Controller LEDs



Power LED – On when controller has power. Controller is powered by vehicle ignition.

Fault LED – On when a fault has been detected and a data log has been recorded, see “Data Log Triggers” in Section 4 for more details. If condition is fixed, LED should be off next time the ignition is turned on and no additional service is needed.

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: 3S0586190000)

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

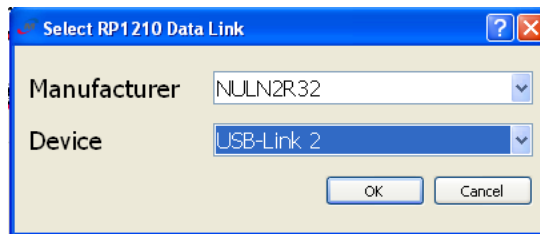
1. Enter (or click) the following address in your default internet browser:
<http://www.modine.com/transitsoftware>
 - a. Or you can perform the following steps.
 - i. Navigate to www.modine.com
 - ii. Navigate to **Products > Transit Bus** tab
 - iii. Click on **Troubleshooting & Diagnostics** on the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

Connecting to Built-in Diagnostic System

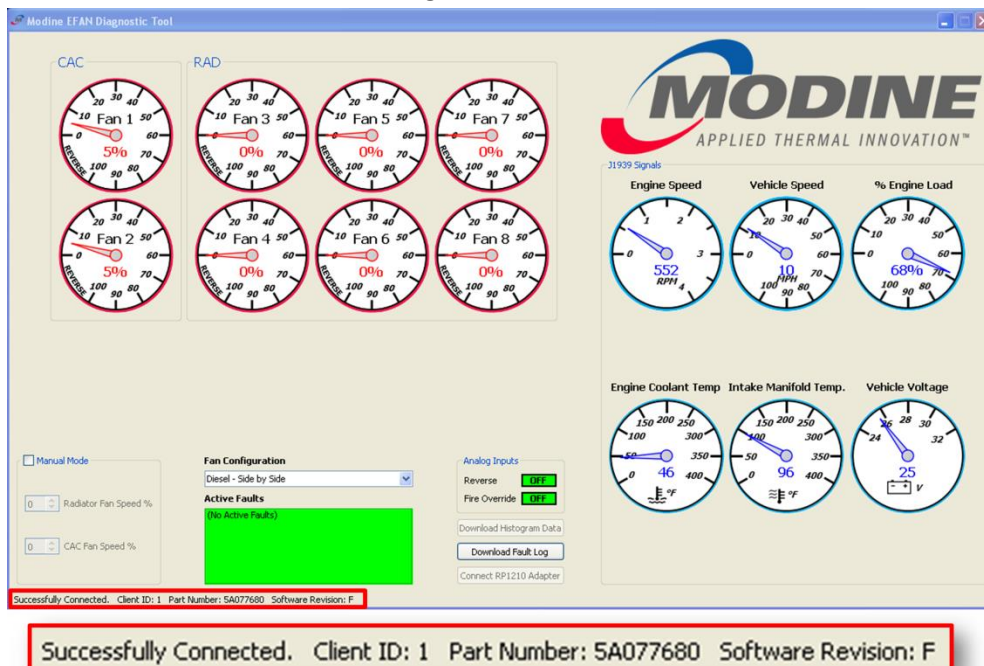
1. Make sure the latest version of Modine UDS is installed on computer that will be used for troubleshooting. See previous section.
2. Connect one of the supported data link adapters, outlined above. Drivers must be obtained through the manufacturer's website and installed.
3. Launch Modine UDS and turn 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.



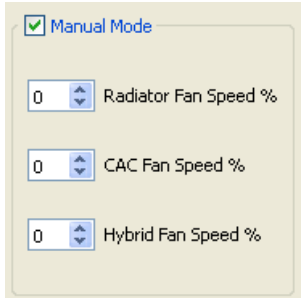
- c. Press OK to confirm selection. If connection is unsuccessful, another selection may be attempted. If connection is successful, Modine UDS will remember the selection and automatically connect the last successful device when the program is run again.
5. The bottom of the main window will display 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%).

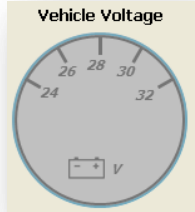


The screenshot shows a control panel with a checked checkbox labeled "Manual Mode". Below it are three spinners, each with a value of "0" and a label: "Radiator Fan Speed %", "CAC Fan Speed %", and "Hybrid Fan Speed %".

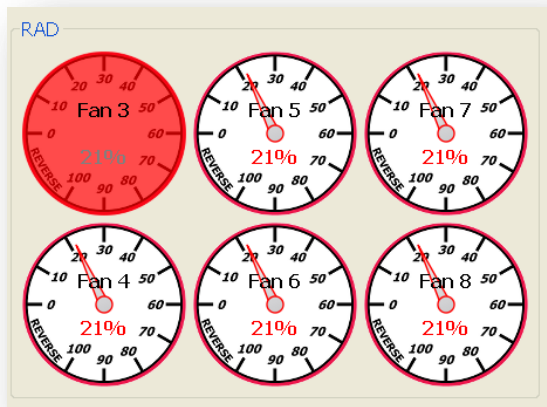
2. The fans will run at the nearest increment to the entered value. Note that this will likely not reflect the exact value entered. If the coolant temperature exceeds 99°C (210°F) or if SPN 986 – Percent Fan Request reaches 100, manual mode will be disabled until temperatures decrease.
3. Once the Manual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

Interpreting Data

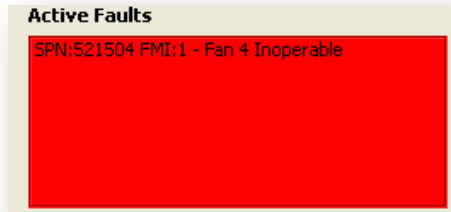
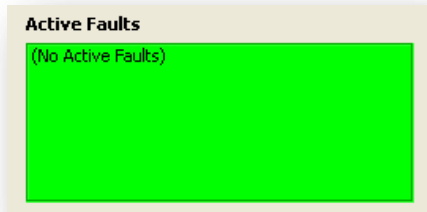
1. Gauges that are grey indicate that there is no J1939 message present.



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

The red controller fault LED indicates whether a data log trigger has been activated. Once a trigger has been activated, a snapshot of system status will be recorded on the controller.

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

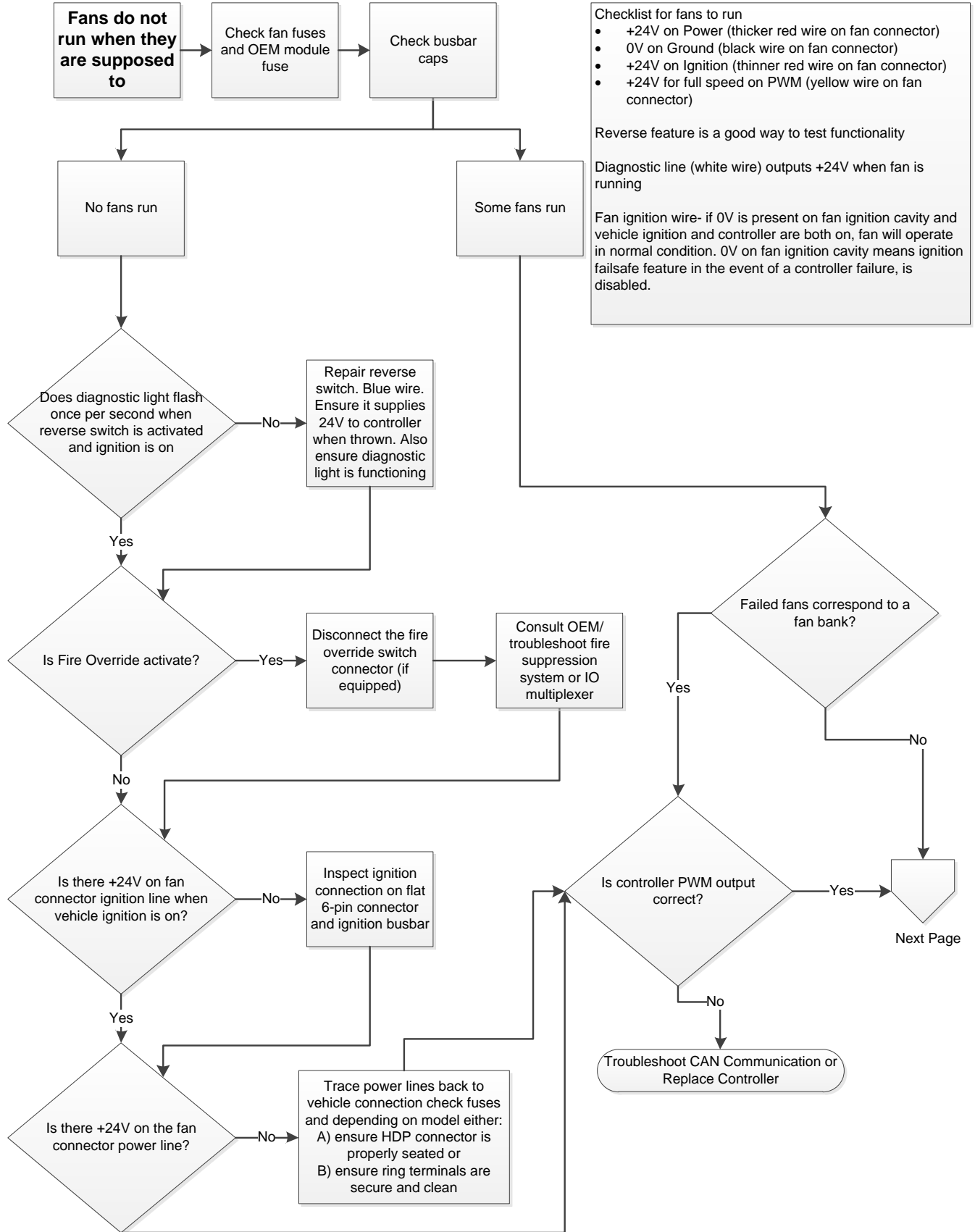
Fans Do Not Run When They Are Supposed To

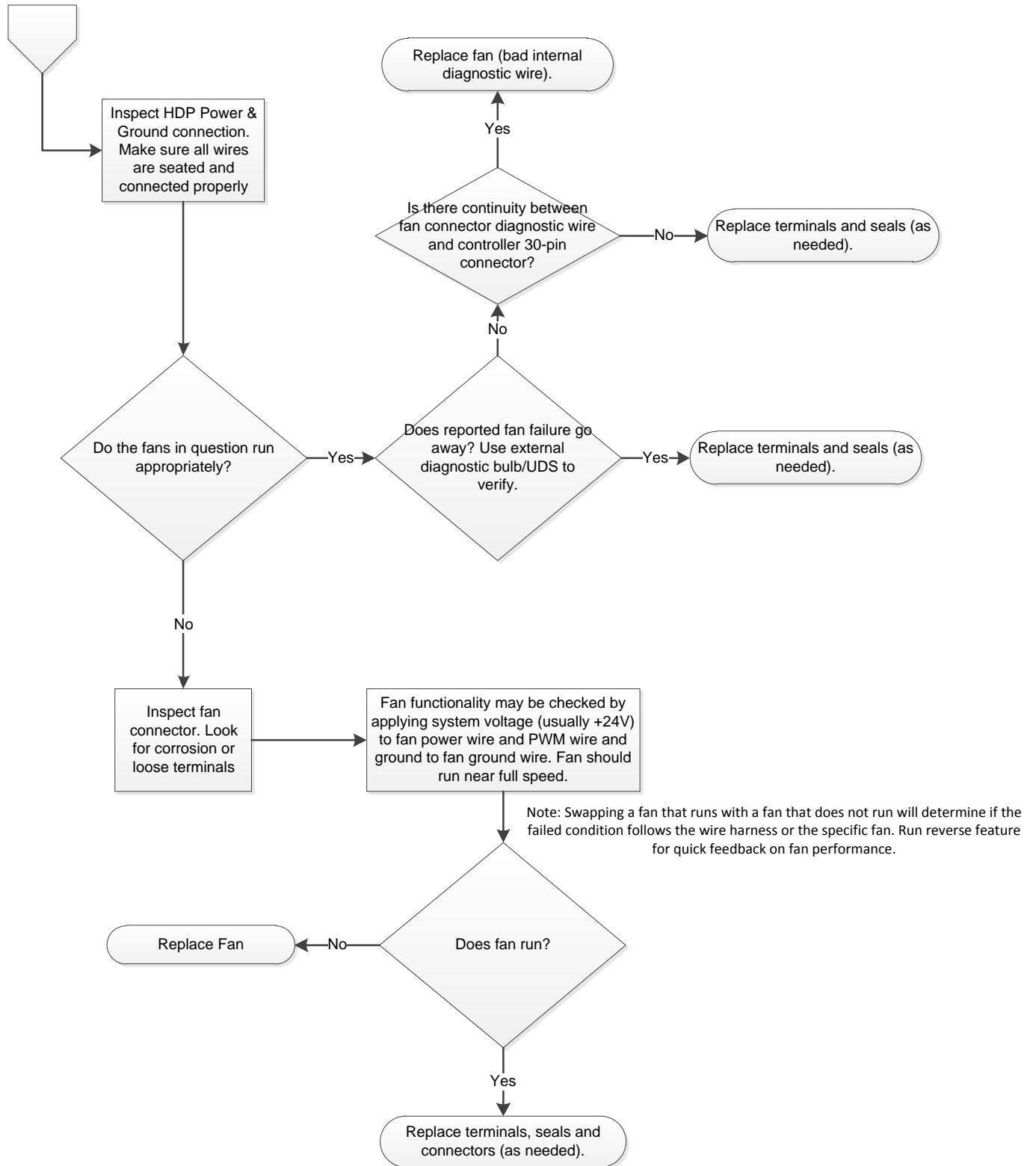
Possible Cause		Remedy
See Flowchart below for step-by-step diagnosing		
Fire Override Active (+24 V on Pin C of 6 pin).	Tilt switch active (if present).	Replace fire override tilt switch.
	Fire override active from IO multiplexer/fire suppression input.	Consult OEM
Incorrect PWM output from controller – (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.	
Inspect HDP power & ground connection to make sure all wires are seated properly and connector seats completely.		
Loss of ground connection	Corrosion on fan connector wires.	Clean wires and replace terminals, seals and connectors as needed.
	Inspect HDP power & ground connection to make sure all wires are seated properly and connector seats completely.	
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.



EFAN Troubleshooting Guide Latest Revision: 3/2/2017

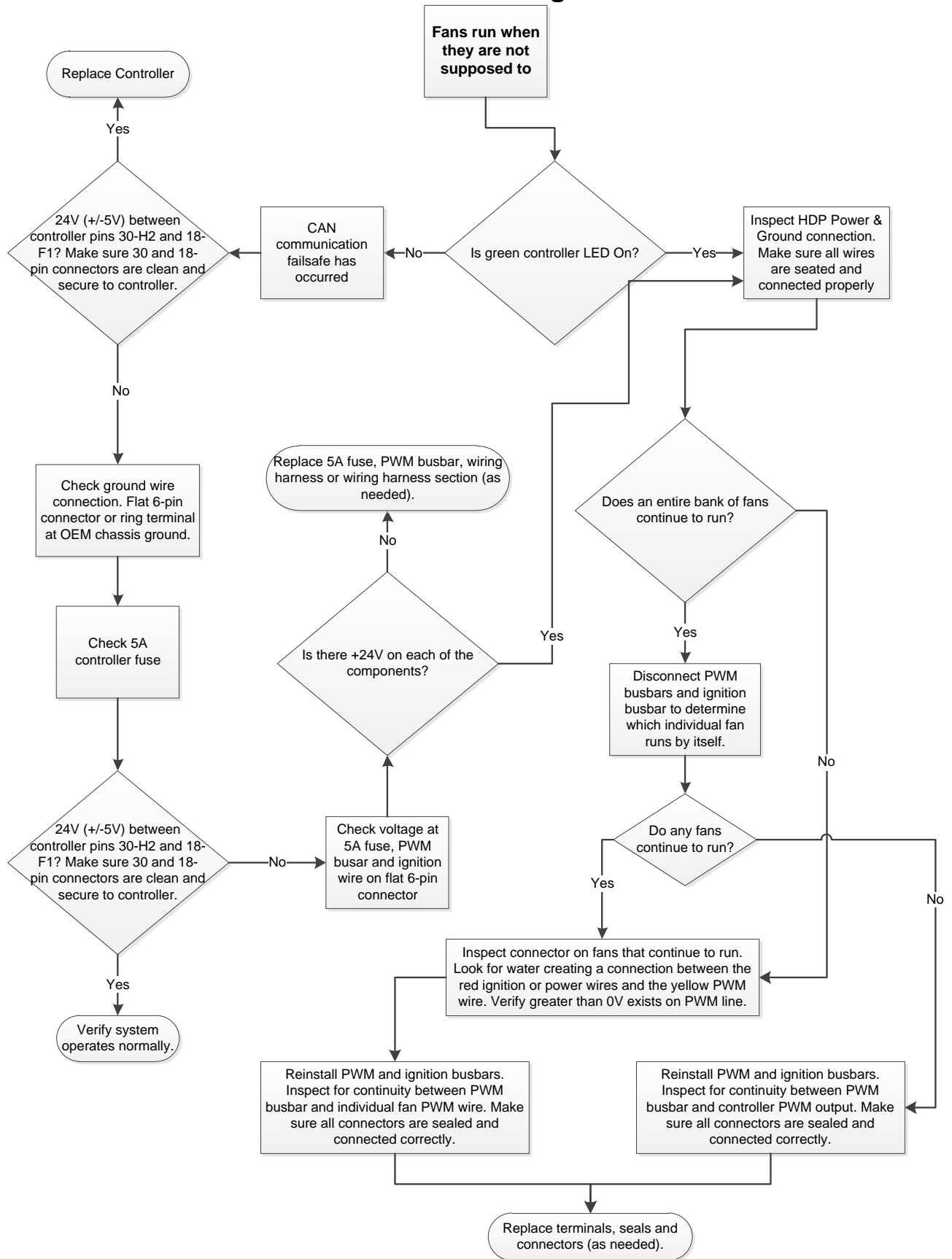






Fans Run When They Are Not Supposed To or Failsafe Features Activated

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.





EFAN Troubleshooting Guide Latest Revision: 3/2/2017

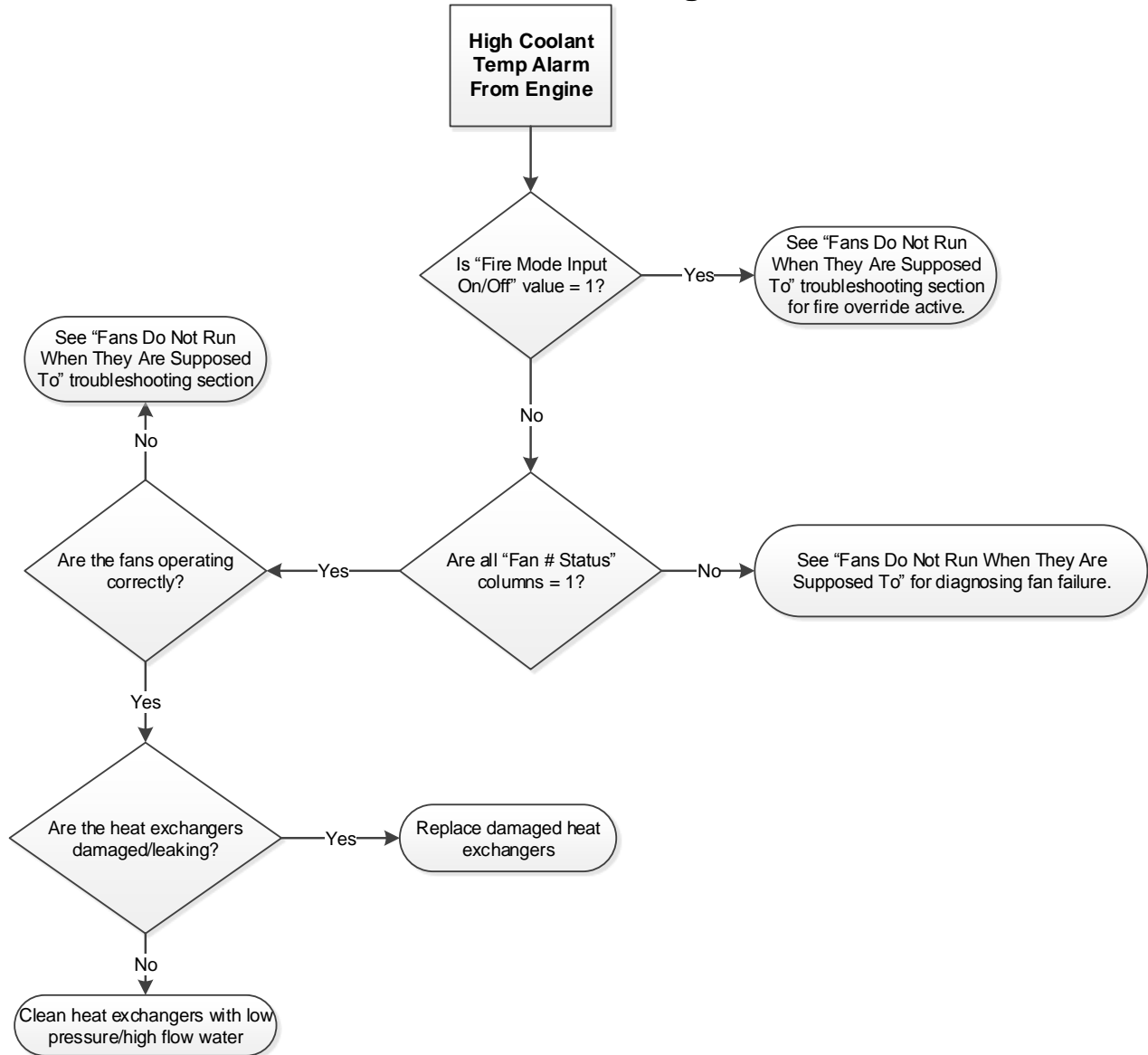
Failure Reported Via CAN or Controller Data Log

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

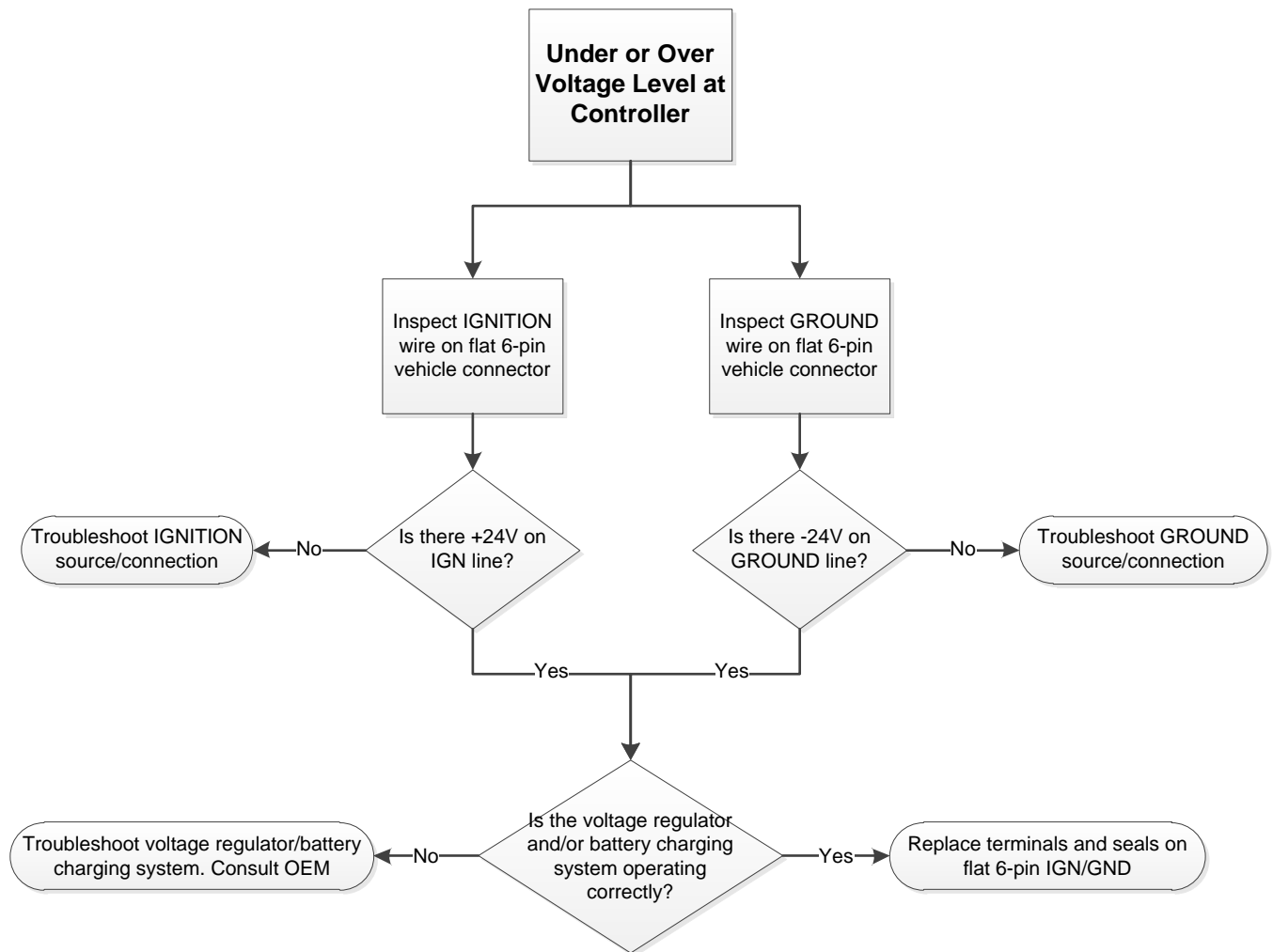
Possible Cause		Remedy
See Flowchart below for step-by-step diagnosing		
Fans do not run when they are supposed to	Fire mode input on (value = 1).	See “Fans Do Not Run When They Are Supposed To” troubleshooting section.
	Fans in present state show they are not running when supposed to.	
Heat exchanger 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.

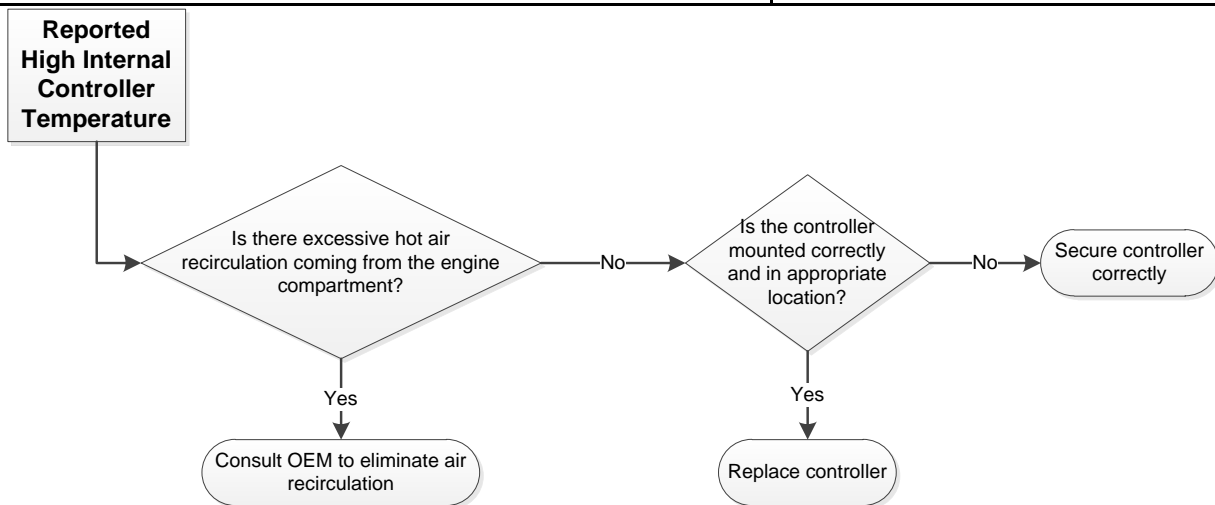


Fan Failure

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.

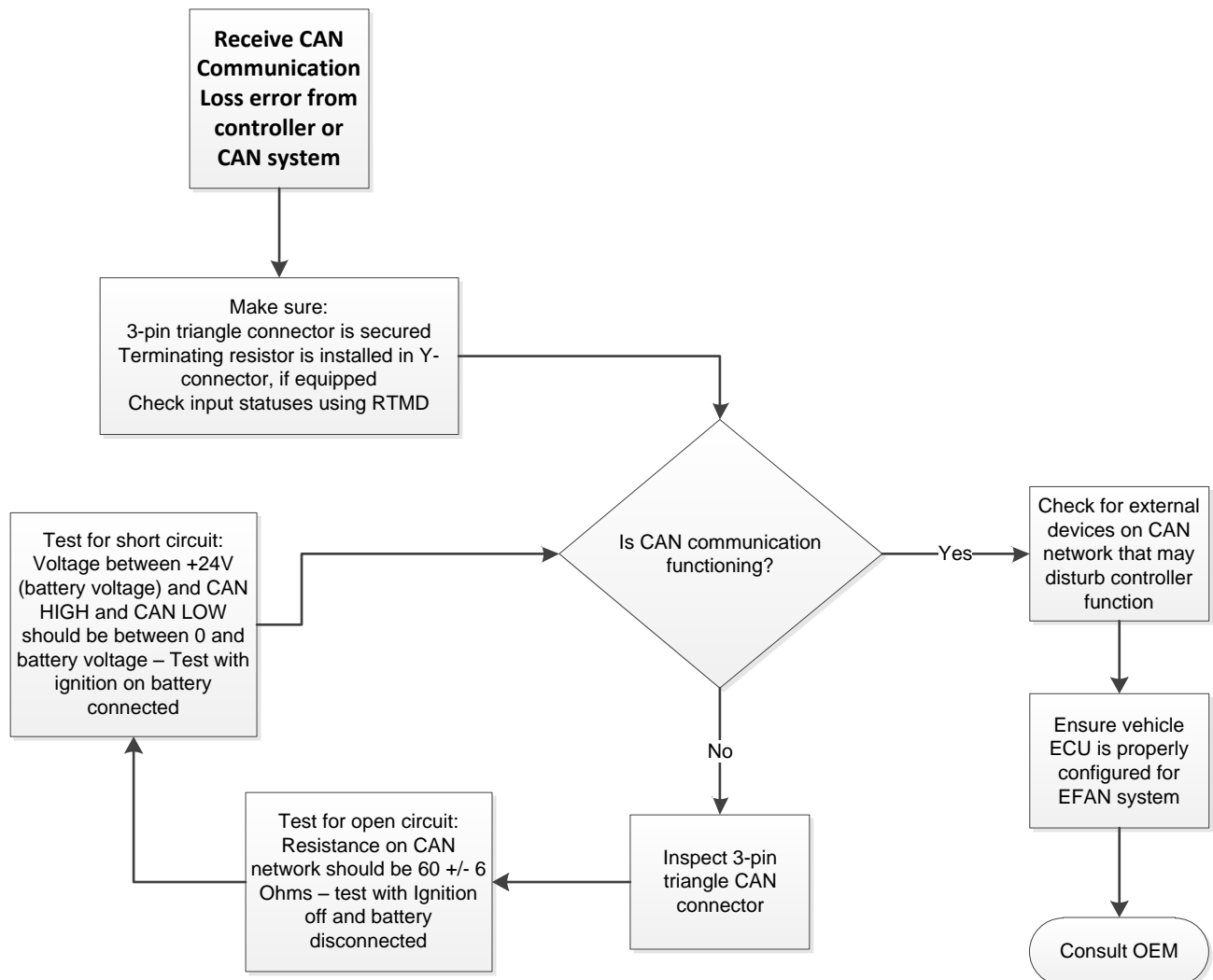
High Controller Internal Temperature

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.





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 1 J1939 Failsafe Mode	Controller	Fans are running properly but operating conditions form 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			
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



Revision Log

Revision	Description	Date	CR
A	Released to production.	3/14/14	
B	Full redesign to become more useful.	7/3/14	64718
C	Improve FTP instructions. Add barcode.	10/24/14	66169
D	Replace FTP instructions with Modine.com.	1/27/15	4000509
E	Cover photo, Title, Section 2 – Engine on, Section 4, Section 5, Deleted Appendix A	9/15/15	4002102
F	Deleted Appendix A, Updated Diagnostic Software	1/13/16	4002984
G	Updated title, added DM1 messages	3/2/2017	4007098
H	Removed Common Service Parts Appendix	3/23/2017	4007362