Digital Fan Controller Unit Troubleshooting

Do's and Don'ts:

ALWAYS

- ✓ Take a few minutes to FULLY read this information / data sheets BEFORE starting!!
- ✓ Check the supply voltage to the controller, making sure that it is correctly wired and fused.
- ✓ Ensure that you are aware of the limits, location, & available adjustments in the software.
- ✓ Know the Hydraulic circuit you are working on and the anticipated performance expected.
- ✓ Make sure you have the correct 'tools' to do the intended job (i.e. PC, D.V.M.) e.t.c.
- ✓ 'Isolate' this unit from all other equipment BEFORE any form of welding takes place.
- ✓ Check ALL connections to and from this unit to ensure NO ground faults / Open circuits.
- ✓ Operate the units within specified operating temperature for best & most reliable performance.
- ✓ Ensure that any unused wires / terminals are isolated/insulated and not in contact with other circuits.
- ✓ Follow the set-up procedures in this manual for best operational results.

NEVER

- ✗ Arc Weld or Charge Batteries with this driver unit connected as damage can occur.
- ✗ Attempt to use this unit if you are unsure of connections or expected operation.
- ✗ Attempt to use this unit in Areas where AC or DC coils HAVE NOT been fully suppressed.
- ✗ Use a power supply that is not rated for the correct required O/P current under full load.
- ✗ Allow wires TO or FROM the unit to short circuit (to each other or chassis / cabinet e.t.c.).
- ✗ Attempt to use this unit in areas of intense 'RF' interference without adequate screening measures.
- ✗ Disconnect or connect wires to or from this unit until it is isolated from the power supply.
- ✗ Keep High Voltage AC cables separate from Low Voltage DC signal and supply cables.
- ✗ Use this unit in temperatures that exceed those specified as operation may be effected.

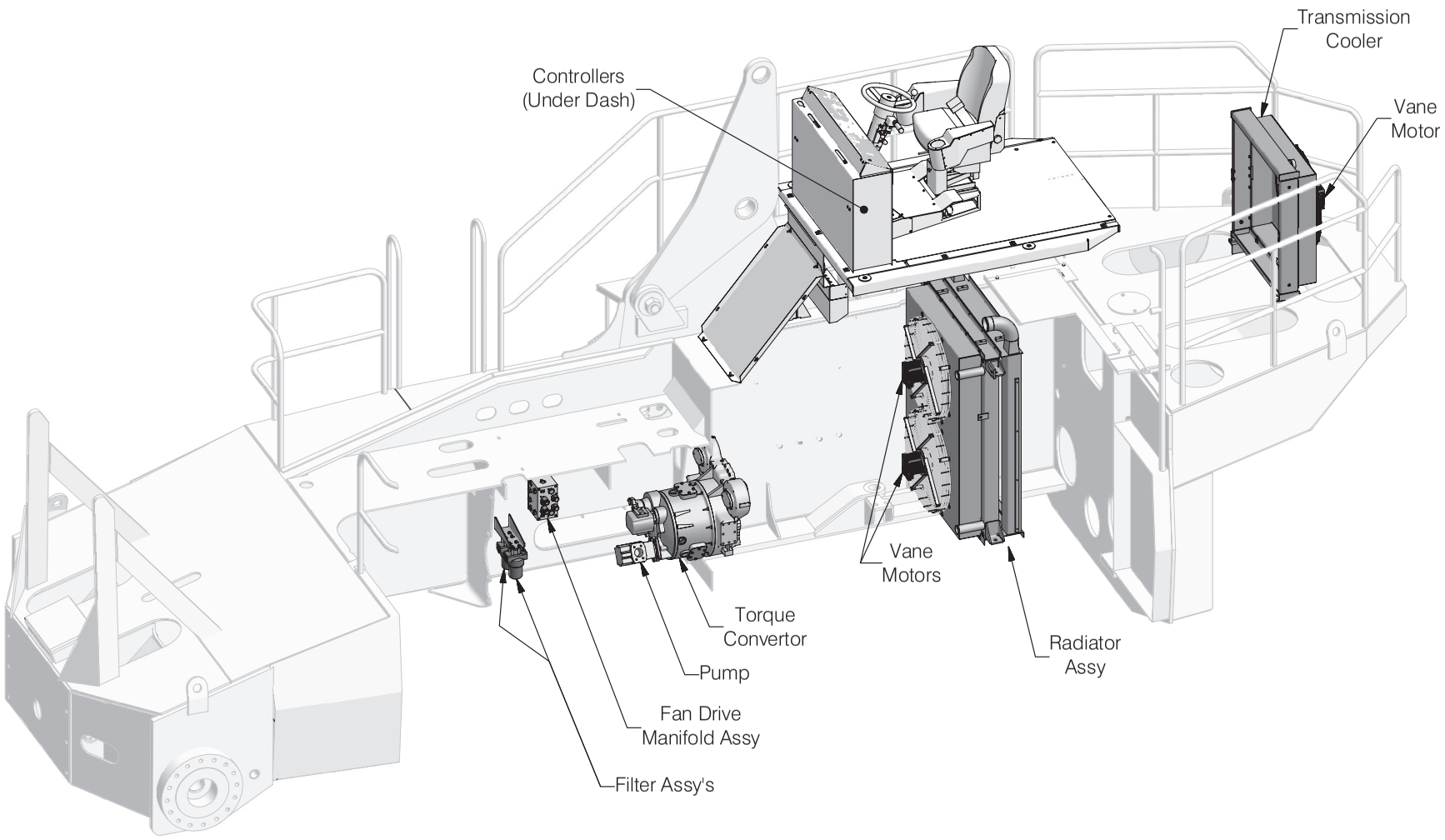


Figure 1 - System Component Locations (*Note: Part of chassis shown removed for clarity.)*

General

Your machine is equiped with a hydraulically driven, digitally controlled cooling system. This cooling system includes both the transmission cooler circuit and the radiator/charge air cooler circuit, and allows for proportional control of the fan speeds based on system temperatures. This “on-demand” cooling can increase fuel economy by up to 9% by reducing both overheating and overcooling conditions.

System Description

Refer to Figures 1 and 2 for component locations on a typical Wagner Lumberjack Logstacker. Your system component locations may vary from those shown here.

The two Digital Fan Controller Units, mounted in the cab on the terminal panel assembly, receive signals from thermistors mounted on the machine. The transmission cooling fan controller receives a signal from a thermistor mounted on the converter regulator valve. The radiator/charge air cooler fan controller receives signals from two thermistors; one is mounted on the engine thermostat housing port, and one is mounted on a charge air cooler tube located after the charge air cooler. These thermistors signal the temperature of their respective systems to the controllers.

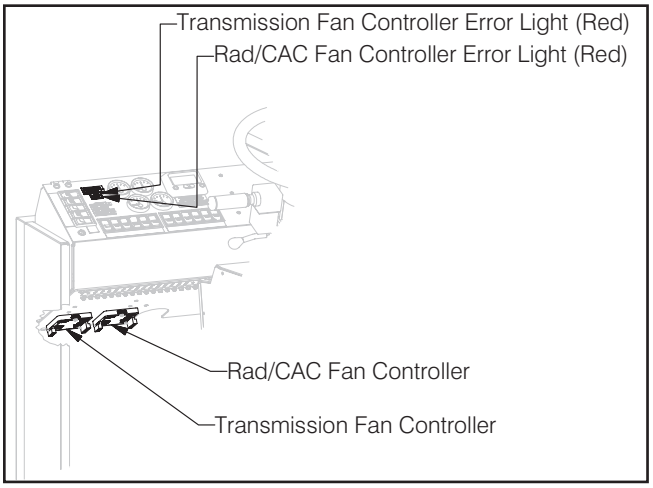


Figure 2 - Controller & Error Light Locations

The controller will attempt to maintain the temperature of the system, as read from the thermistor, at or near a pre-determined **Setpoint**. It will alter the fan speed as necessary to regulate the system temperature. If the system temperature reaches the pre-determined **Overtemp** setting, the controller will output an alarm signal, visible on the controller itself, and on the instrument panel. Refer to the section on troubleshooting for more information on this and other error conditions, and troubleshooting guidelines.

The controller outputs a proportional pulse-width modulated (PWM) signal to the valve coil on the fan drive manifold assembly, which regulates the flow of hydraulic oil to the vane fan motors mounted directly to the radiator or transmission cooler. Hydraulic pressure is supplied by a tandem vane pump mounted directly to the torque converter.

The system is designed so that at maximum PWM voltage, the fan speed is at its lowest, while at 0 PWM voltage, the fan is at full speed. This fail-safe ensures that maximum cooling continues in the event of catastrophic controller failure. See Table 1 for the correlation between system temperature, voltage, fan speed, vane motor hydraulic pressure, and the proportional valve output LED color.

Fan Purge

Both cooling systems have the option to reverse the fan rotation (purge) to clear the cooler tubes of debris. This is a temporary condition, and is not intended to be a permanent running option. This “purge” condition will cancel automatically anytime the affected system reaches its **Overtemp** setting, and the fan rotation will return to normal.

The purge condition is initiated when the operator depresses either the “**Purge Trans Fan**” intermittent switch or the “**Purge Rad/CAC Fan**” button on the instrument panel. Once initiated, the fan speed will slow to 0 RPM, pause, reverse direction for a pre-determined time, slow to 0 RPM, pause, then return to normal forward RPM as required.

Proportional Valve Output Voltage	Proportional Valve Output LED Color	System Temperature	Motor Pressure	Fan RPM
27	Green	Cool	270	574
19	Orange	212	270	574
13	Red-Orange	221	1015	1650
8	Red	229	1025	1700
0	Red	237	1010	1700

Table 1 - Conditions for a Properly Operating Transmission Cooling System

Error Indications

Typically, the operator's first indication of a problem with the cooling system will be the illumination of either the Transmission Fan Controller Error light or the Rad/CAC Fan Controller light on the left side of the instrument panel (see Figure 2). The severity of the error will be indicated by either the light showing a "**Steady ON**" state, or a "**Pulsed ON/OFF**" state.

Steady ON: Non-Critical Errors. These errors should be corrected as soon as possible, but do not immediately endanger the machine or personnel.

Pulsed ON/OFF: Critical Errors. These errors indicate that the operator **MUST** immediately move the machine to level ground, lower the bucket/boom to the ground, and shut off the engine. The problem must be fixed before the machine is returned to service.

⚠ WARNING

Warning: Failure to immediately attend to a critical error of the cooling system may result in damage to the machine and the risk of serious personal injury or death to personnel.

The digital controller is able to indicate a variety of errors. Service personnel must note the condition of several LED's on the controller unit during an error to begin the troubleshooting process. Use the table in the troubleshooting section to determine specific error conditions. Some errors may require you to use the information in Table 1 for baseline system readings. The relationship between system temperature, proportional valve output LED color, proportional valve output voltage, vane motor pressure, and fan RPM are indicated for a system that is working correctly. Deviations from these readings may help determine the root cause of the error.

The readings in Table 1 were taken on the transmission cooling system, with the transmission in a "stall" condition. The voltage was read at the junction box, the LED color was read on the controller unit, the transmission temperature was read on the Powerview display module, the motor pressure was read at the fan control manifold, and the fan RPM was read at the transmission cooler.

Controller Unit LEDs

The controller units are able to convey both system operating conditions and diagnostic information by the use of the LEDs on the front face of the controller. Refer to Figure 3.

Thermistor Input Status LEDs: The **RED** LED for the thermistor that is controlling the fans comes on steadily while the other thermistor LEDs are off, if no more than one thermistor is above setpoint. If multiple thermistors are above setpoint, the thermistor that is controlling the PI process has a blinking LED and the others above setpoint are on steady.

Power LED: The **RED** LED indicates power supply status with the LED "OFF" for less than 8 VDC, "ON" for 8-40 VDC, and flashes "ON/OFF" for more than 40 VDC.

Proportional Valve Output LED: This variable LED is **GREEN** at the lowest fan speed, and **RED** at full fan speed, with shades of green, yellow, orange, and red to indicate intermediate values. See Table 1.

Reverse (Purge) Output LED: The **RED** LED is ON with the output to the reversing coil during a "Purge" cycle. The LED blinks on for about 0.1 seconds then off for about 0.1 seconds to indicate shorts in the circuit, and blinks on for about 0.5 seconds and then off for about 0.5 seconds to indicate opens in the circuit. In either case, the Error LED on the instument panel comes on steady to indicate an error.

Error LED (Controller): The **RED** LED is used to indicate an error condition. Refer to the section on Troubleshooting for details of how to read the error "blink" codes. The "blink rate" will be 0.5 seconds on, 0.5 seconds off, with a 2 second delay before it repeats.

Reverse (Purge) Input LED: The **RED** LED is used to indicate an input signal from the instrument panel to initiate a "Purge" cycle.

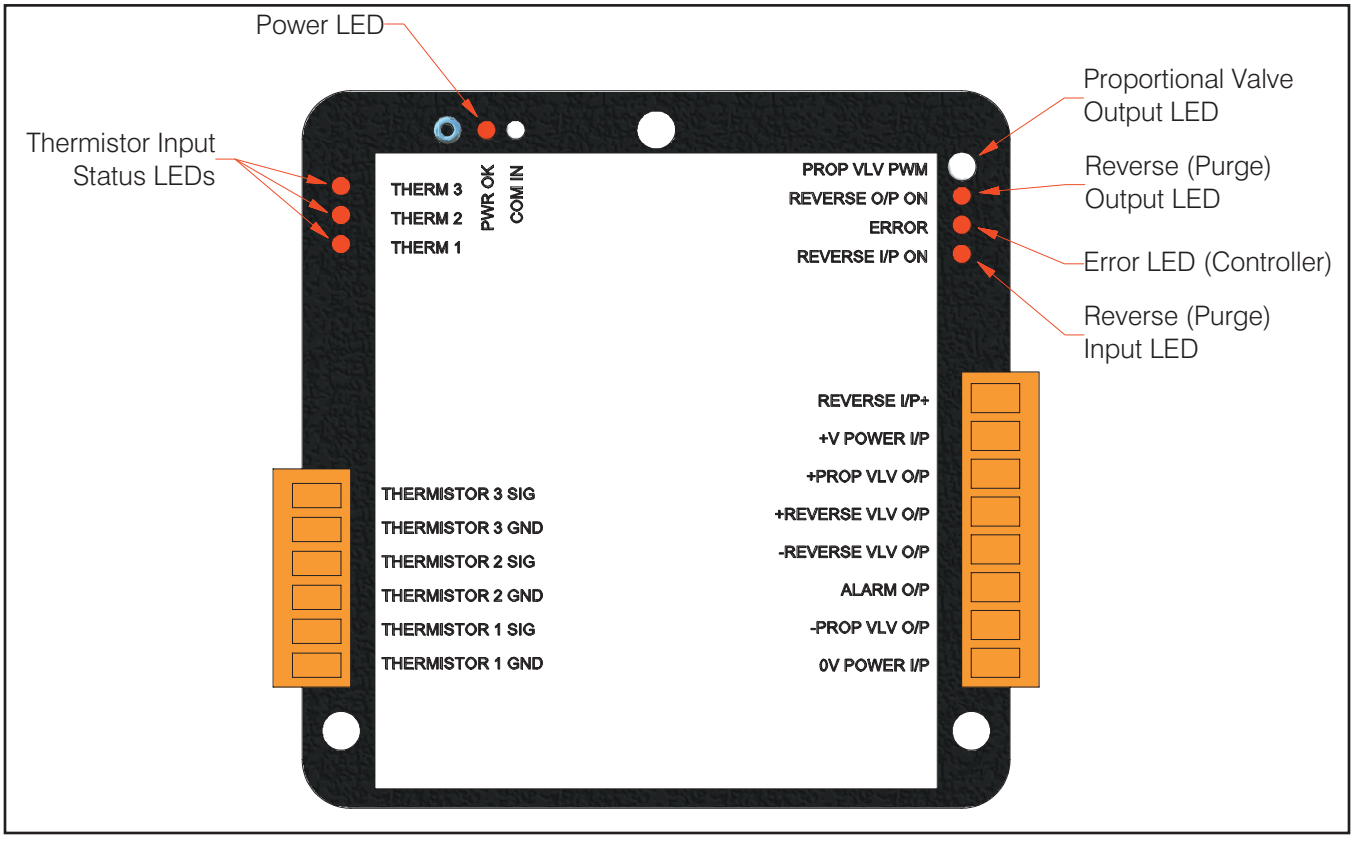


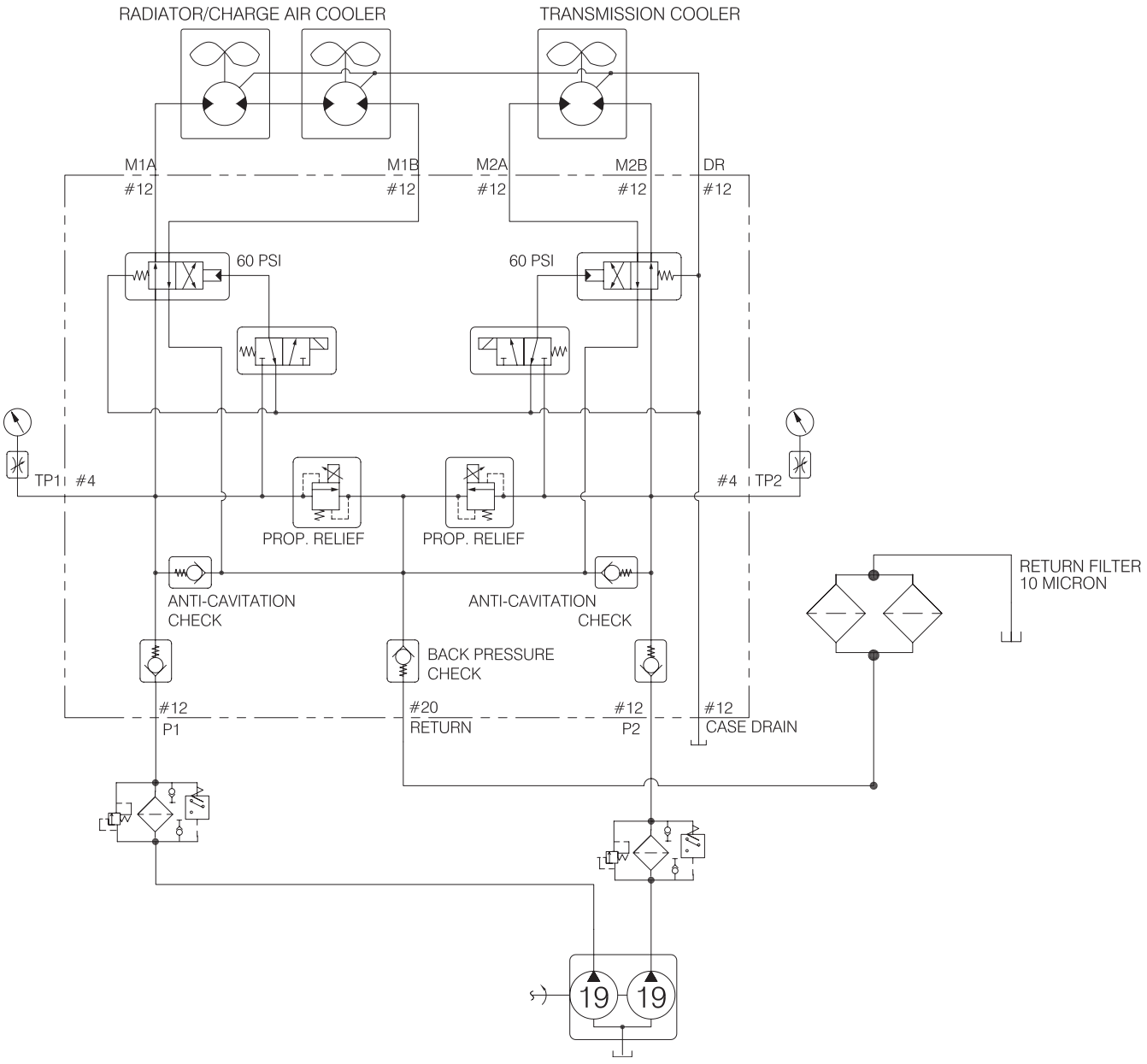
Figure 3 - Controller Unit LED Locations

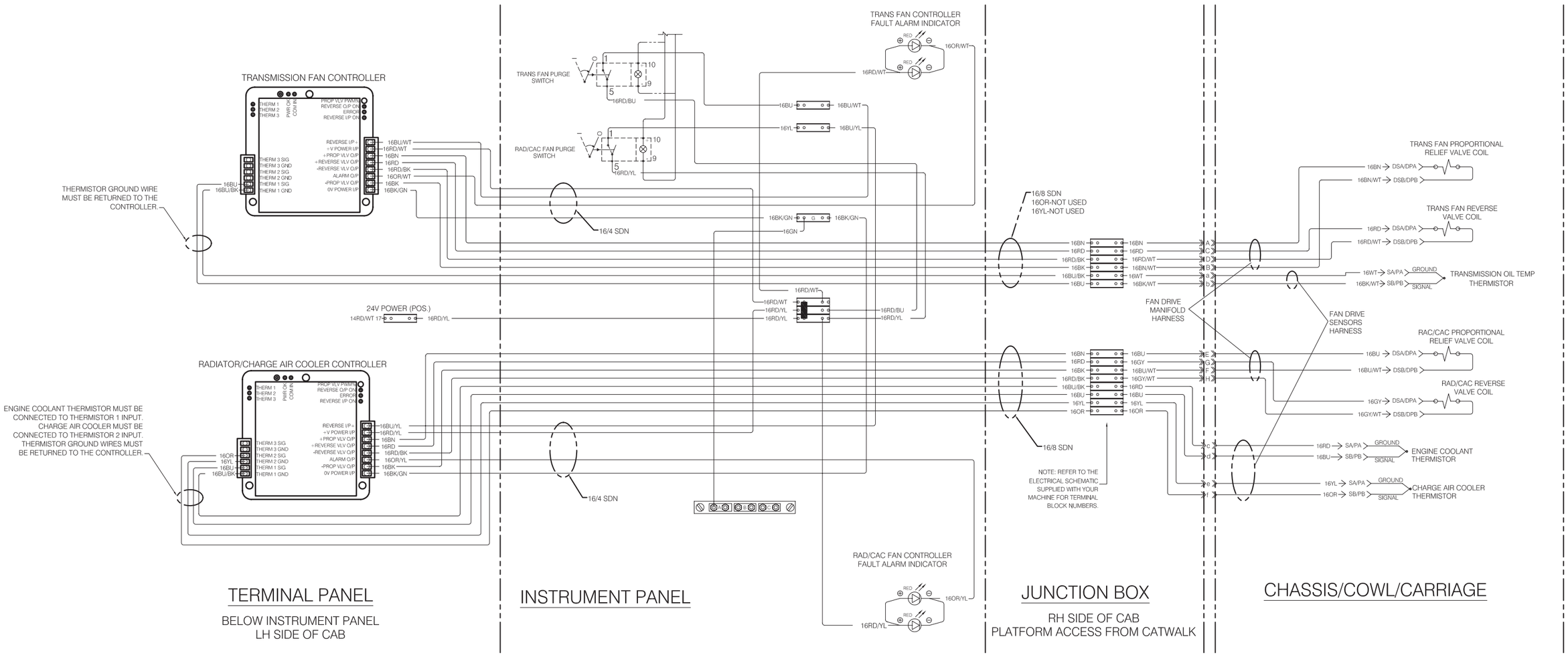
Troubleshooting

Indications		Error Condition	Correction
Error LED (Instrument Panel) :	One Blink	Memory Check-sum Failure	Move the machine to level ground, lower the bucket/boom to the ground, and shut off the engine. Reload Flash or Data File.
Error LED (Controller) :	One Blink		
Power LED :	No Change		
Reverse Output LED :	One Blink		
Proportional Valve Output LED :	Green/Blink with Error LED		
Thermistor LED's :	One Blink		
Error LED (Instrument Panel) :	Two Blinks	Controller Unit Exceeds 75° C	Move the machine to level ground, lower the bucket/boom to the ground, and shut off the engine until unit <70° C.
Error LED (Controller) :	Two Blinks		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	No Change		
Error LED (Instrument Panel) :	Two Blinks	Controller Unit Exceeds 80° C	Move the machine to level ground, lower the bucket/boom to the ground, and shut off the engine until unit <70° C.
Error LED (Controller) :	Two Blinks		
Power LED :	No Change		
Reverse Output LED :	Two Blinks		
Proportional Valve Output LED :	Red/Blink with Error LED		
Thermistor LED's :	Two Blinks		
Error LED (Instrument Panel) :	On Steady	Thermistor Input Shorted	Refer to electrical schematic and troubleshoot affected circuit (from affected thermistor to controller).
Error LED (Controller) :	Three Blinks		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	Three Blinks (Shorted Therm.)		
Error LED (Instrument Panel) :	On Steady	Thermistor Input Open	Refer to electrical schematic and troubleshoot affected circuit (from affected thermistor to controller).
Error LED (Controller) :	Four Blinks		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	Four Blinks (Open Therm.)		
Error LED (Instrument Panel) :	Off	Alarm Output (To Instrument Panel Error LED) Shorted	Refer to electrical schematic and troubleshoot affected circuit (from controller to instrument panel error LED).
Error LED (Controller) :	Five Blinks		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	No Change		
Error LED (Instrument Panel) :	On Steady	Thermistor Input Over Temperature	Shut down the machine and allow to cool. Troubleshoot affected system.
Error LED (Controller) :	Six Blinks		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	Six Blinks (Overtemp Therm.)		

Indications		Error Condition	Correction
Error LED (Instrument Panel) :	On Steady	PWM Output Shorted	Refer to electrical schematic and troubleshoot affected circuit (from controller to fan drive manifold assembly).
Error LED (Controller) :	Off		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	Flashing Red/Off		
Thermistor LED's :	No Change		
Error LED (Instrument Panel) :	On Steady	PWM Output Open	Refer to electrical schematic and troubleshoot affected circuit (from controller to fan drive manifold assembly).
Error LED (Controller) :	Off		
Power LED :	No Change		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	Flashing Green/Off		
Thermistor LED's :	No Change		
Error LED (Instrument Panel) :	On Steady	Reverse Output Shorted	Refer to electrical schematic and troubleshoot affected circuit (from controller to fan drive manifold assembly).
Error LED (Controller) :	Off		
Power LED :	No Change		
Reverse Output LED :	Flashing Quickly		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	No Change		
Error LED (Instrument Panel) :	On Steady	Reverse Output Open	Refer to electrical schematic and troubleshoot affected circuit (from controller to fan drive manifold assembly).
Error LED (Controller) :	Off		
Power LED :	No Change		
Reverse Output LED :	Flashing Slowly		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	No Change		
Error LED (Instrument Panel) :	Off	Power Supply To Controller Is Less Than 8VDC	Refer to electrical schematic and troubleshoot circuit supplying power to controller.
Error LED (Controller) :	Off		
Power LED :	Off		
Reverse Output LED :	Off		
Proportional Valve Output LED :	Off		
Thermistor LED's :	Off		
Error LED (Instrument Panel) :	On Steady	Power Supply to Controller is Greater Than 40VDC	Refer to electrical schematic and troubleshoot circuit supplying power to controller.
Error LED (Controller) :	No Change		
Power LED :	Blinking		
Reverse Output LED :	No Change		
Proportional Valve Output LED :	No Change		
Thermistor LED's :	No Change		

Cooling System Hydraulic Schematic




TRANSMISSION FAN CONTROLLER
THERM 1
THERM 2
THERM 3
PWR OK
COM IN
PROP VLV PWM/I/P
REVERSE O/P ON
ERROR
REVERSE I/P ON
THERM 3 SIG
THERM 3 GND
THERM 2 SIG
THERM 2 GND
THERM 1 SIG
THERM 1 GND
REVERSE I/P +
+V POWER I/P
+PROP VLV O/P
+REVERSE VLV O/P
-REVERSE VLV O/P
ALARM O/P
-PROP VLV O/P
0V POWER I/P
16BU
16BU/BK
16BU/WT
16RD/WT
16BN
16RD
16RD/BK
16OR/WT
16BK
16BK/GN
THERMISTOR GROUND WIRE MUST BE RETURNED TO THE CONTROLLER.
TRANS FAN PURGE SWITCH
16RD/BU
RAD/CAC FAN PURGE SWITCH
16RD/YL
16/4 SDN
TRANS FAN CONTROLLER FAULT ALARM INDICATOR
RED
16OR/WT
16RD/WT
16BU/YL
16YL
16BK/GN
16GN
16RD/BU
16RD/YL
24V POWER (POS.)
14RD/WT 17
RADIATOR/CHARGE AIR COOLER CONTROLLER
16BU/YL
16RD/YL
16BN
16RD
16RD/BK
16OR/YL
16BK
16BK/GN
16OR
16YL
16BU
16BU/BK
ENGINE COOLANT THERMISTOR MUST BE CONNECTED TO THERMISTOR 1 INPUT. CHARGE AIR COOLER MUST BE CONNECTED TO THERMISTOR 2 INPUT. THERMISTOR GROUND WIRES MUST BE RETURNED TO THE CONTROLLER.
RAD/CAC FAN CONTROLLER FAULT ALARM INDICATOR
16OR/YL
16RD/YL
16/8 SDN
16OR-NOT USED
16YL-NOT USED
16BN
16RD
16RD/BK
16RD/WT
16BK
16BN/WT
16BU/BK
16WT
16BU
16BK/WT
16GY
16BU/WT
16GY/WT
16YL
16OR
NOTE: REFER TO THE ELECTRICAL SCHEMATIC SUPPLIED WITH YOUR MACHINE FOR TERMINAL BLOCK NUMBERS.
TRANS FAN PROPORTIONAL RELIEF VALVE COIL
DSA/DPA
DSB/DPB
TRANS FAN REVERSE VALVE COIL
SA/PA
SB/PB
GROUND
SIGNAL
TRANSMISSION OIL TEMP THERMISTOR
FAN DRIVE MANIFOLD HARNESS
FAN DRIVE SENSORS HARNESS
RAC/CAC PROPORTIONAL RELIEF VALVE COIL
RAD/CAC REVERSE VALVE COIL
ENGINE COOLANT THERMISTOR
CHARGE AIR COOLER THERMISTOR
TERMINAL PANEL
BELOW INSTRUMENT PANEL
LH SIDE OF CAB
INSTRUMENT PANEL
JUNCTION BOX
RH SIDE OF CAB
PLATFORM ACCESS FROM CATWALK
CHASSIS/COWL/CARRIAGE