

Electronic Thermostat Controller (ETC) Service Manual

Introduction

The Electronic Thermostat Controller (ETC; Figure 1) is a dedicated, direct digital control module that provides precise and integrated control of unitary, packaged, staged HVAC systems. The Logic One[®] module efficiently controls two stages of heating and cooling, a fan, and damper operation.

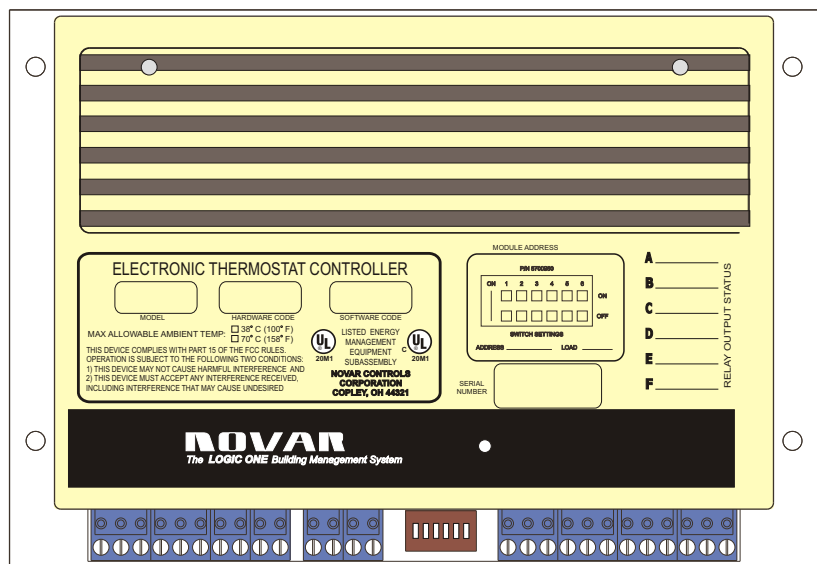


Figure 1. ETC module

This document:

- Describes the various ETC models.
- Lists precautions that those servicing ETCs must observe.
- Explains the ETC wiring connections
- Explains how to check the ETC's operation and how to set the module's address.
- Explains how to replace an ETC, if necessary
- Explains how Novar's Wall-Mount Temperature Sensor (WTS-UVC) and Remote Temperature Sensor (RTS) are used with the ETC.
- Provides troubleshooting guidelines for the following items:
 - Communications loss
 - Rooftop unit
 - WTS-UVC
 - RTS

Description

Several models of the ETC are available.

MODEL	MODEL NO.
Electronic Thermostat Controller with 6 inputs, 6 outputs (5 digital plus analog damper)	ETC-1
Electronic Thermostat Controller with 6 inputs, 6 outputs (including digital damper)	ETC-2
Electronic Thermostat Controller with 6 inputs, 6 outputs (5 digital plus analog damper), outdoor rating up to 158 F (70 C)	ETC-3
Electronic Thermostat Controller with 6 inputs, 6 outputs (including digital damper), outdoor rating	ETC-4
Electronic Thermostat Controller with 6 inputs, 6 outputs (including digital damper), 4–20 mA dehumidification control (replaces zone setpoint reset connection), outdoor rating	ETC-6

The following sensors can be used with the ETCs:

- Remote Temperature Sensor (RTS-UVC)
- Wall-Mount Temperature Sensor (WTS-UVC)
- Futura Temperature Sensor (FTS-3)
- Futura Temperature Sensor with adjustable setpoint (FTS-3A)
- Relative Humidity Sensor (space-mount) (RH-3S)

Precautions

NOTE! To perform any of the operations outlined in this manual, a person must meet *both* of the following qualifications:

- Be a licensed electrician or a licensed HVAC technician.
 - Have experience in troubleshooting building automation and HVAC controls.
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WARNING! Some service and maintenance checks in this manual require that the unit's power be turned on. Multiple voltages at the rooftop unit present an electrical shock hazard that can cause injury or death. Before attempting to service the Novar Controls equipment, turn off power to the rooftop unit at the disconnect switches. When performing the service checks that require power, turn on the power as necessary but be aware that the electrical shock hazard exists. No one should perform the operations outlined in this manual unless he or she meets the qualifications specified above and is trained and experienced in working with the following voltages:

- 24-VDC
- 24-VAC
- 110-VAC
- 208-VAC
- 277-VAC
- 480-VAC
- 560 VAC

ETC Wiring Connections

Power requirements for the ETCs are listed at 24 VAC, Class 2, voltage; 8 VA consumption.

Figure 2 shows the connections available on the ETC terminal strip. Table 2 identifies each connection. Two-conductor, shielded cable should be used to make all connections.

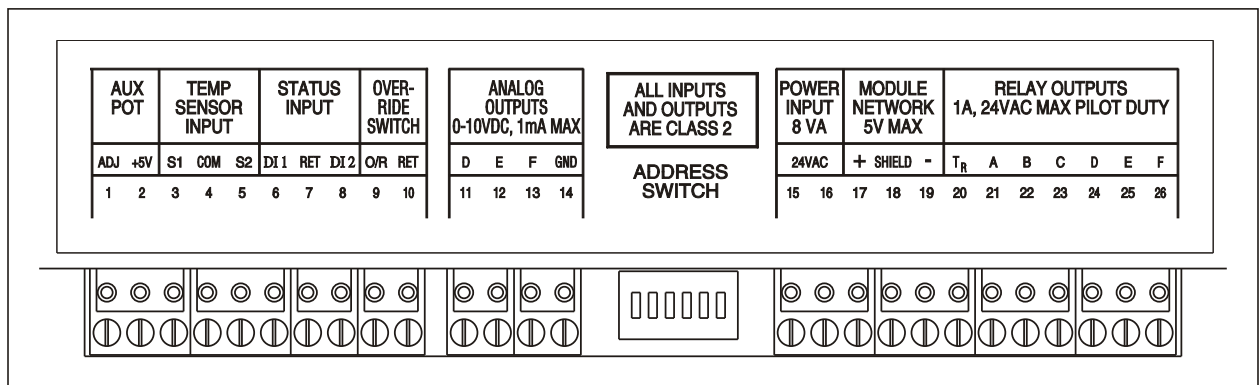


Figure 2. ETC terminal strip

Table 2. ETC Wiring Connections	
TERMINAL	CONNECTION
1	Wiper of auxiliary potentiometer
2	Clockwise wire from potentiometer <hr/> <p style="text-align: center;">NOTE! The ETC-6 uses Terminals 1 and 2 for the humidity sensor input connection. The setpoint adjustment wiring instructions for the auxiliary potentiometer <i>and</i> the Novar sensors do not apply to the ETC-6.</p> <hr/>
3	Positive (+) lead from zone sensor
4	Negative (-) lead from zone and discharge temperature sensors
5	Positive (+) lead discharge-air sensor
6	Fan status input
7	Common (fan and dirty filter status input)
8	Dirty filter status input
9	Override switch input
10	Override switch return
11–13	Analog outputs (see Table 3)
14	Ground for 0–10 VDC signal
15–16	Power input (24 VAC)
17	Positive (+) module network input
18	Shield module network input <hr/> <p style="text-align: center;">NOTE! The shield connection (Terminal 18) is not a ground like the other common grounds on the terminal strip. It is dedicated for communications only. Do <i>not</i> connect any other grounds to the shield connection.</p> <hr/>
19	Negative (-) module network input
20	24-VAC input for switching through Terminals 21–26.
21–26	Relay outputs (see Table 3)

Table 3 identifies the terminals used for the ETC’s analog and digital outputs.

Table 3. ETC Outputs				
OUTPUT	CONTROL OPERATION			
	ETC-1	ETC-2/ETC-4	ETC-3	ETC-6
ANALOG OUTPUTS:				
Terminal 11 (D)	Damper	Not active	Damper	Not active
Terminal 12 (E)	Not active	Not active	Not active	Not active
Terminal 13 (F)	Not active	Not active	Not active	Not active
DIGITAL (RELAY) OUTPUTS:				
Terminal 21 (A)	Fan	Fan	Fan	Fan
Terminal 22 (B)	Cooling Stage 2	Cooling Stage 2	Cooling Stage 2	Cooling Stage 2
Terminal 23 (C)	Heating Stage 2	Heating Stage 2	Heating Stage 2	Heating Stage 2
Terminal 24 (D)	Not active	Damper	Not active	Damper
Terminal 25 (E)	Heating Stage 1	Heating Stage 1	Heating Stage 1	Heating Stage 1
Terminal 26 (F)	Cooling Stage 1	Cooling Stage 1	Cooling Stage 1	Cooling Stage 1

Troubleshooting the ETC

WARNING! The precautions listed on Pages 2 and 3 of this document must be observed when any of the operations outlined on the following pages are performed.

Anyone performing service on an ETC should locate and check the following items before beginning any troubleshooting procedures:

- ETC schedule status indicator LED located on the module’s case above the terminal strip.
- ETC relay output status LEDs located on the front of the module (see Figure 1).
- ETC address switches located in the center of the terminal strip.
- Rooftop unit (RTU) communicating with the ETC.

The status light indicates if the module is communicating properly.

Table 4. ETC Status Light Operation	
IF THE STATUS LIGHT	EXPLANATION
Is completely off	The ETM has no power.
Blinks off approximately every 15 seconds	The ETM is operating in normal/occupied mode.
Blinks on every 15 seconds for 3 minutes before switching to normal mode	The ETM is going through its initial power up.
Blinks on approximately every 15 seconds	The ETM is in unoccupied mode.
Blinks off 3 times approximately every 15 seconds	The ETM address is incorrect.
Blinks on and off steadily	The ETM has power but is not communicating.

The relay output status LEDs indicate the status of each active digital output (depending on the ETC's configuration). The LEDs should be lit when the corresponding digital output is on.

The ETC's address switches must be set accurately for it to communicate with the appropriate rooftop unit and executive module. Typical ETC addresses coincide with the RTU number, as shown in Figure 3.

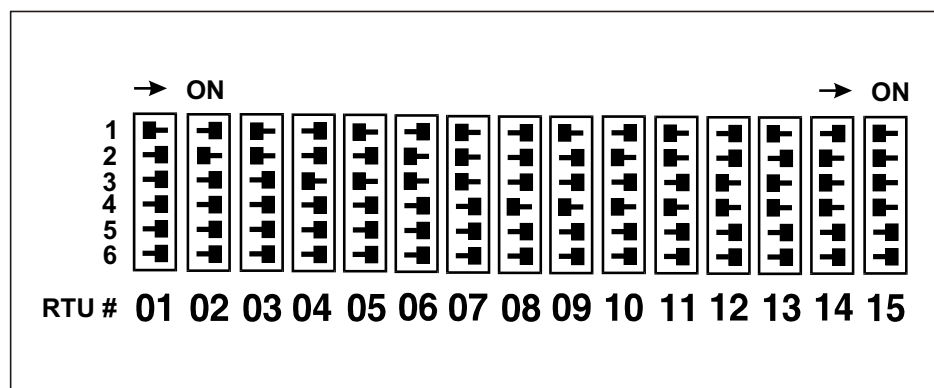
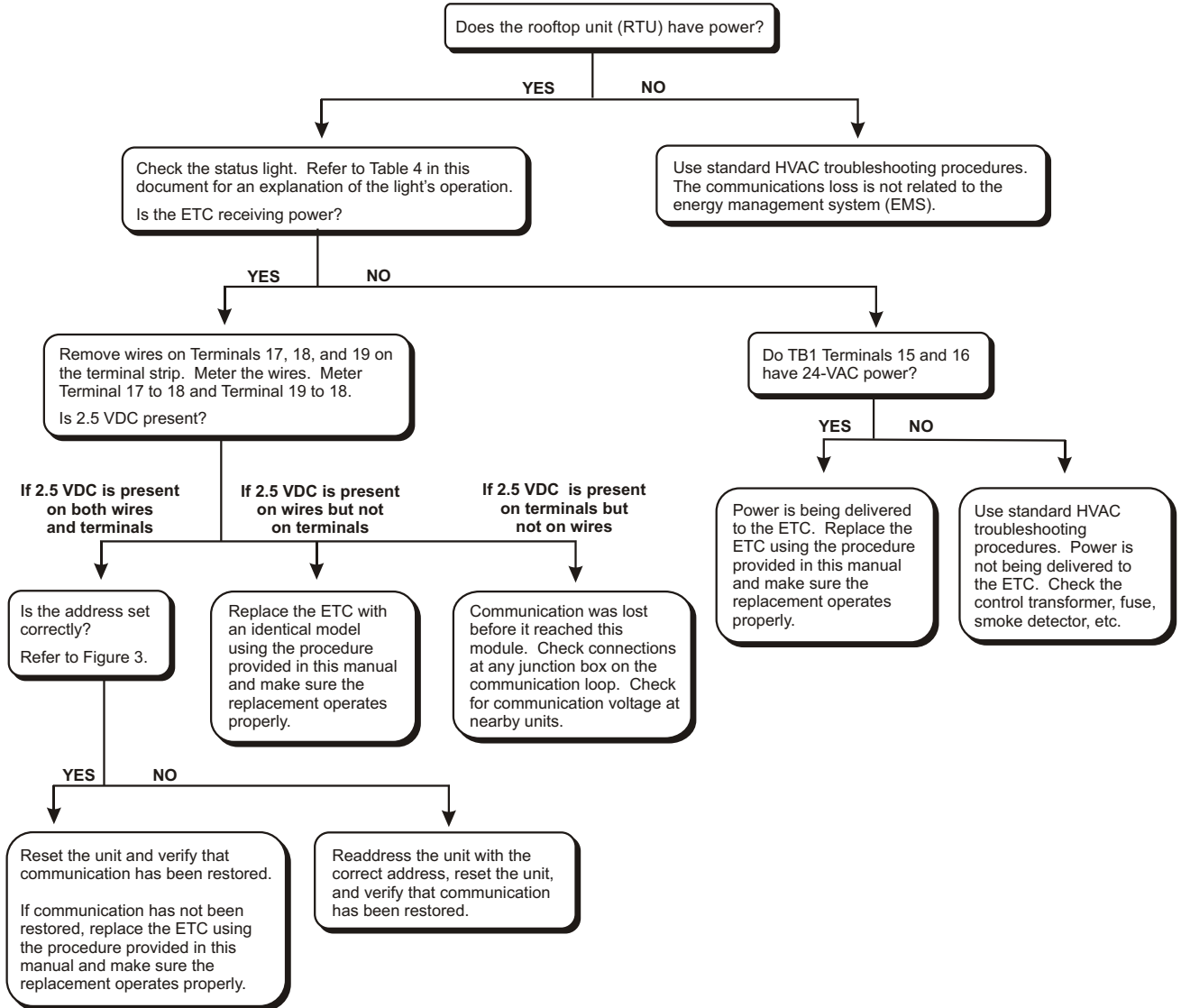


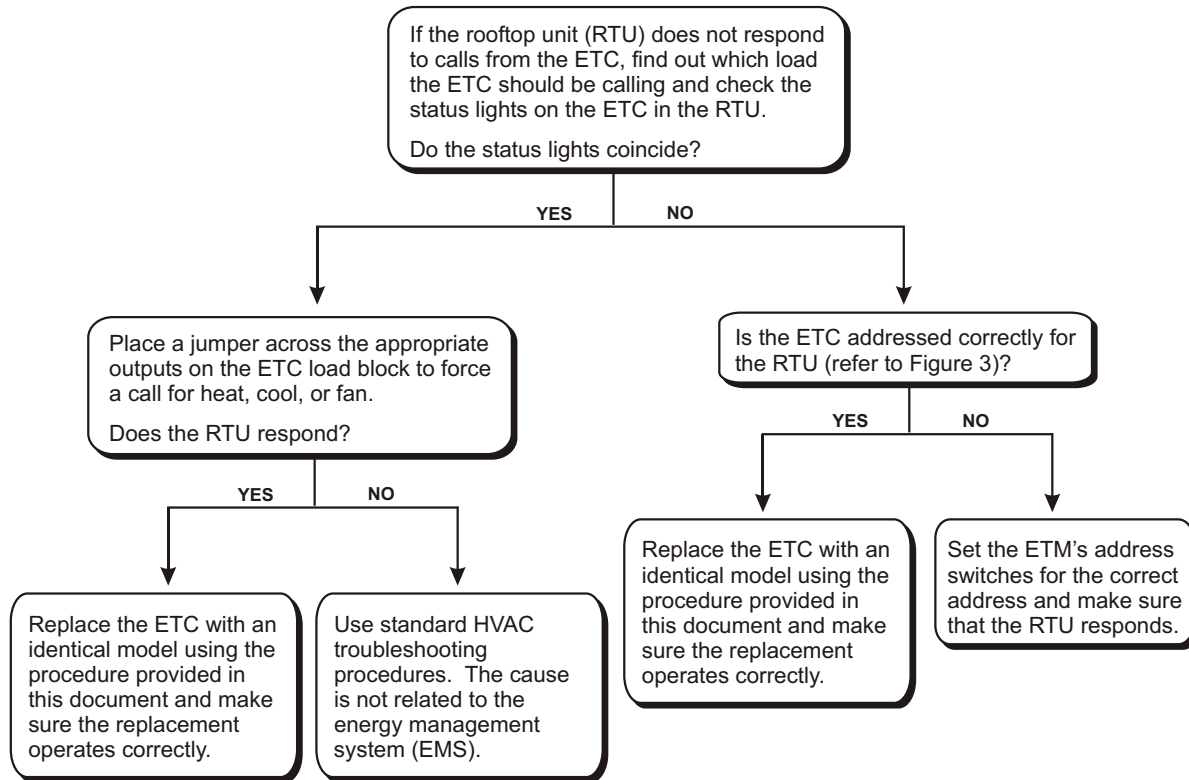
Figure 3. ETC address settings

The following chart can be used to troubleshoot communications loss.

**Communications Loss
ETC Troubleshooting Chart 1**



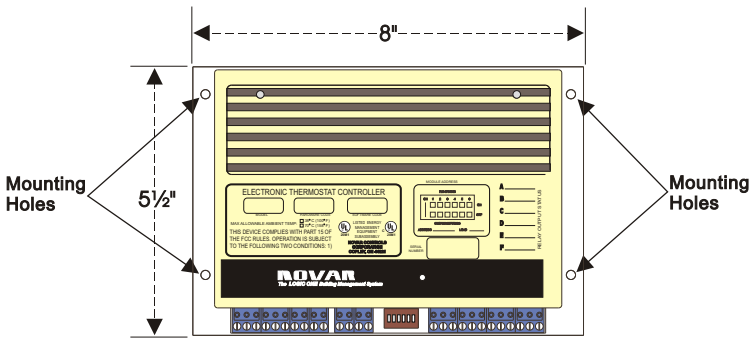
**Rooftop Unit Does Not Respond to ETC Calls
Troubleshooting Chart**



Replacing an ETC

If it is necessary to replace an ETC, the following procedure should be used.

NOTE! The replacement model should be identical to the model being replaced.

Step	Procedure
1	Turn off the rooftop unit at the disconnect.
2	Disconnect all wires connected to the ETC terminal strip. <ul style="list-style-type: none"> ■ Use a small common screw driver to pry the plugs up and off the mounting pins. Use caution to avoid damaging the pins.
3	Remove the mounting screws used to mount the ETM (Figure 4). <div style="text-align: center;">  <p>The diagram shows a yellow and black Electronic Thermostat Controller (ETC) with a terminal strip at the bottom. A dashed line above the device indicates a width of 8 inches. On the left and right sides, dashed lines indicate mounting holes, each 5 1/2 inches from the center. The device is labeled 'ELECTRONIC THERMOSTAT CONTROLLER' and 'NOVAR The Latest Great Building Management System'. The terminal strip at the bottom has several colored pins (blue, red, white, black) with corresponding wire connections.</p> </div> <p style="text-align: center;">Figure 4. Locations of ETC mounting screws</p>
4	Set the address switches on the replacement ETC to match the address setting on the original ETC. <ul style="list-style-type: none"> ■ Refer to Figure 3, if necessary.
5	Align the replacement ETC over the mounting holes, insert the mounting screws, and tighten to secure the module.
6	Reconnect all wiring to the terminal strip connections.
7	Turn the RTU on at the disconnect.
8	Wait 3 minutes, then check the status light to make sure it is blinking (communication has been restored).

Contact any Novar Technology Center (NTC) or Novar account representative to obtain instructions for returning the defective ETC.

Wall-Mount Temperature Sensor

Novar's Wall Temperature Sensor (WTS-UVC; Figure 5) can be used with the ETC.

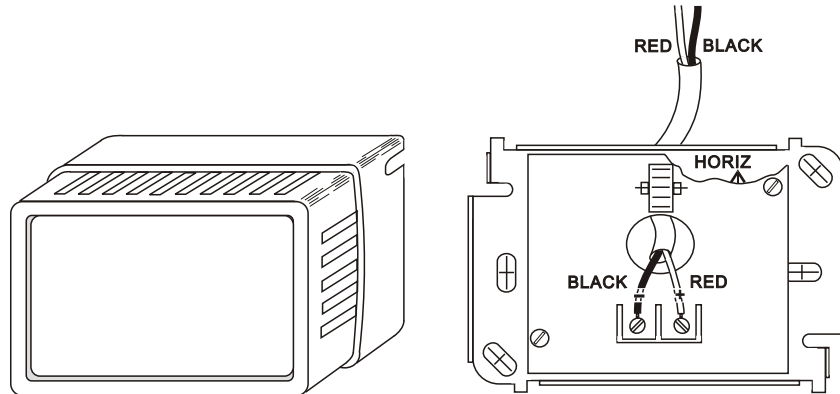


Figure 5. WTS-UVC

The sensor is mounted in the zone controlled by each RTU and uses a shielded two-wire cable to:

- Receive power from the ETC:
 - 0.55 VDC with the sensor attached
 - 5 VDC with the sensor unattached or polarity reversed

NOTE! Polarity must be observed when the sensor is wired.

- Send the ETC a DC voltage signal proportional to the zone temperature. The ETC translates the signal into a 40° to 150°F reading as shown in Table 3.

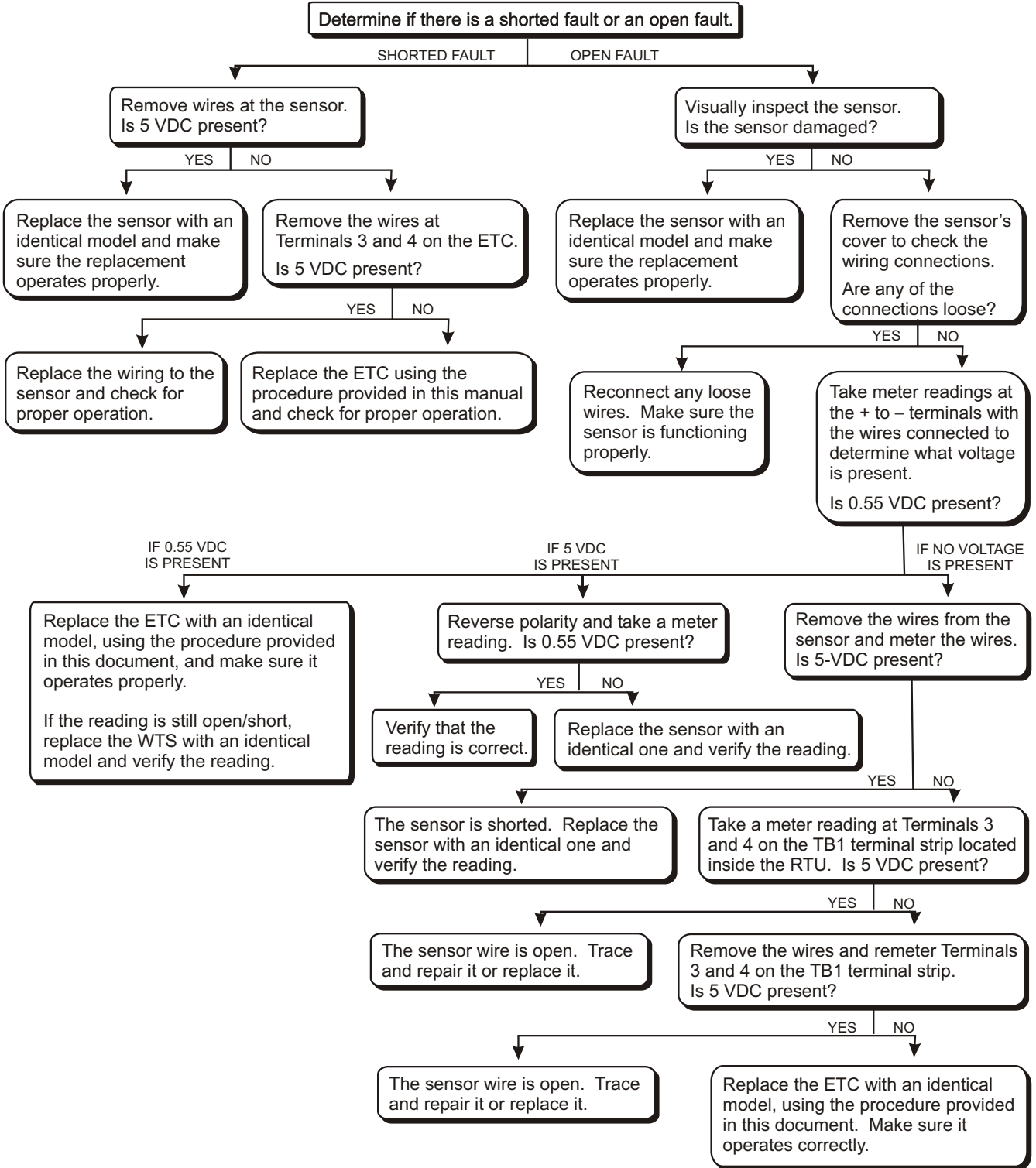
APPROXIMATE VOLTAGE	APPROXIMATE TEMPERATURE (IN DEGREES FAHRENHEIT)
0.591	50
0.582	57
0.557	77
0.535	95
0.510	115
0.465	150

The sensor is permanently calibrated at the factory.

The following chart should be used to troubleshoot WTS-UVC faults.

**Wall Temperature Sensor Open/Shorted Faults
Troubleshooting Chart**

NOTE! An open fault will read 31°F. Troubleshoot accordingly.



Remote Temperature Sensor

Novar's supply-air Remote Temperature Sensor (Figure 6) uses a two-wire cable to:

- Receive DC voltage from the ETC.
 - 0.55 VDC with the sensor attached
 - 5 VDC with the sensor unattached or polarity reversed

NOTE! Polarity must be observed when the sensor is wired.

- Send the ETC a DC voltage signal proportional to the supply-air temperature. The ETC translates that signal into a 40°–150°F reading as shown in Table 6.

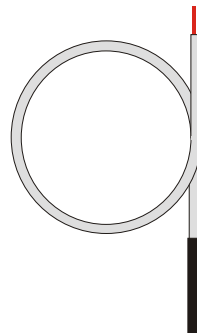


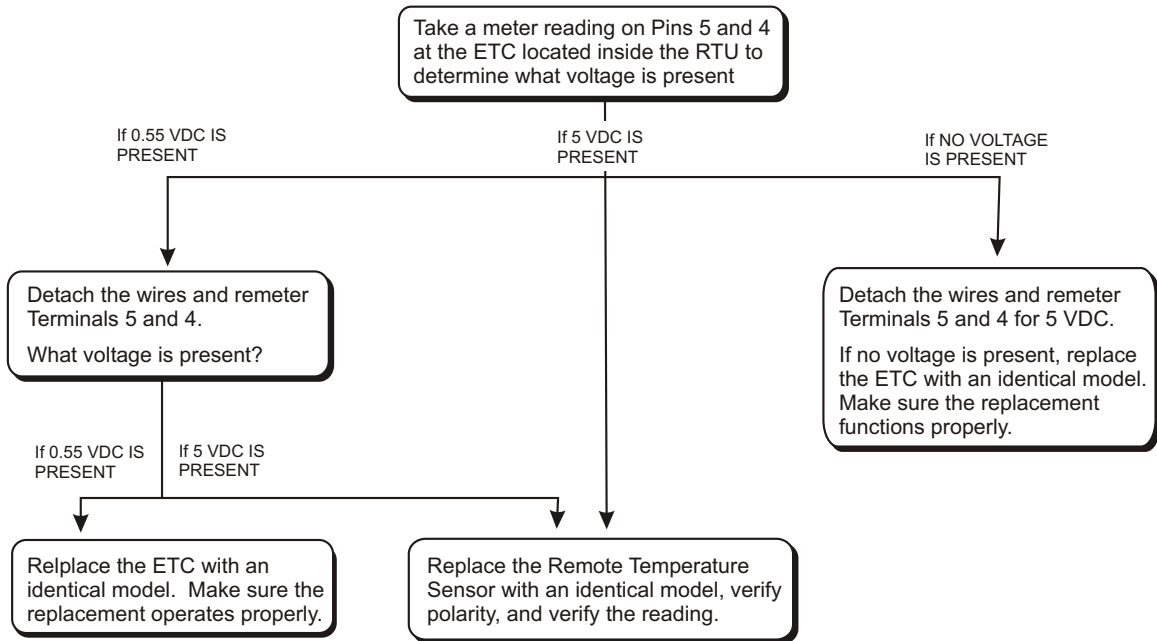
Figure 6. Remote Temperature Sensor

Table 6. RTS Signal Translation	
APPROXIMATE VOLTAGE	APPROXIMATE TEMPERATURE (IN DEGREES FAHRENHEIT)
0.591	50
0.582	57
0.557	77
0.535	95
0.510	115
0.465	150

The sensor is permanently calibrated at the factory.

The following troubleshooting chart should be used to troubleshoot Remote Temperature Sensor faults.

Remote Temperature Sensor Open/Shorted Faults
Troubleshooting Chart



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Novar; 6060 Rockside Woods Blvd., Cleveland, OH 44131
Tel.: 800.348.1235 www.novar.com

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