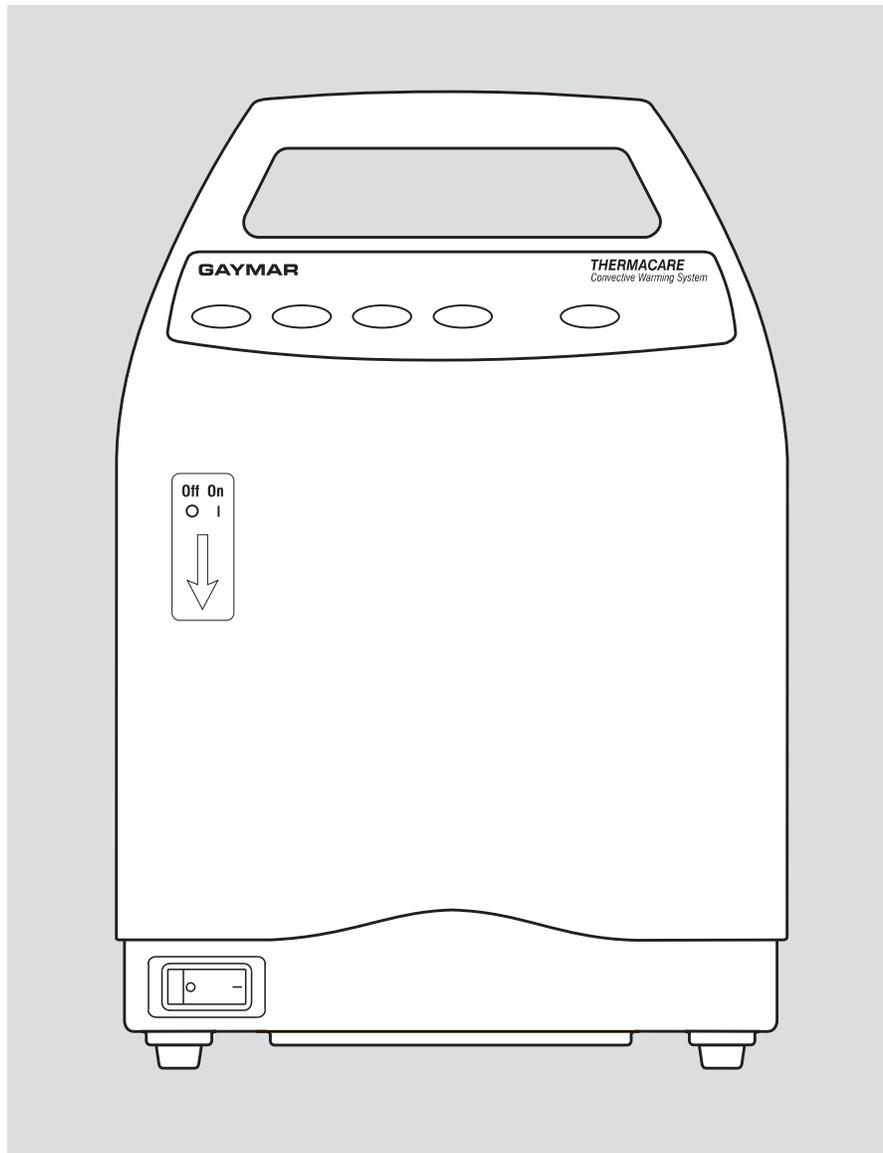


Thermacare[®] TC3146

Convective Warming Unit



Service Manual

Before you begin . . .

Important

- Refer to the *TC3146 Convective Warming System Operating Manual* for detailed operating instructions. Read and understand the *Operating Manual* and all precautions prior to using the Convective Warming System.
- Review the *SAFETY PRECAUTIONS* (see page 2) prior to servicing the Convective Warming Unit (Power Unit).
- For technical assistance, contact your local dealer or Gaymar's Technical Service Department at:

Phone: 1 800 828-7341
(716) 662-2551

Fax: (716) 662-8795

NOTE: Extremely high storage temperatures (such as those found in rail cars or automobile trunks on hot summer days) can cause the thermostats within this device to actuate. Should this occur, the *REMOVE FROM USE* indicator will light when the Power Unit is turned on. If this happens, the thermostats must be manually reset. Refer to section 7, *Functional Check and Safety Inspection*.

Symbols used within this manual:



Attention: consult accompanying documents



Dangerous voltage



Protective earth (ground)



Type BF applied equipment



Off-on switch



MIN (Fan only)



LOW (90°F, 32°C)



MED (100°F, 38°C)



HIGH (110°F, 43°C)



REMOVE FROM USE
(indicator light, amber color)



Do not use in operating room
(OR) or Intensive Care Unit (ICU)



Ambient operating temperature

Table of Contents

Contents

| <i>Section</i> | <i>Introduction</i> | <i>Page</i> |
|----------------|---|-------------|
| 1.0 | Safety Precautions | 2 |
| 2.0 | Repair Policy / Return Authorization..... | 3 |
| 3.0 | Specifications | 4 |
| 4.0 | Theory of Operation | 5 |
| 5.0 | Controls and Indicators | 7 |
| 6.0 | Preventive Maintenance | 7 |
| 7.0 | Functional Check and Safety Inspection..... | 8 |
| 8.0 | Inspection Form | 16 |
| 9.0 | Troubleshooting | 19 |
| 10.0 | Repair Procedures | 21 |
| 11.0 | Drawings/Parts List | 24 |
| 12.0 | TC20 Test Tool Schematic..... | 27 |
| 13.0 | Wiring Diagram..... | 28 |

Illustrations

| <i>Figure</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 1 | Convective Warming System | 5 |
| 2A/B | Power Unit Mounting | 5 |
| 3 | Pole Mounting Height Limit..... | 5 |
| 4 | Operator Control Panel..... | 6 |
| 5 | TC20 Test Tool | 9 |
| 6 | Temperature Sensor Location | 10 |
| 7 | Troubleshooting Chart - NO HEAT | 19 |
| 8 | Troubleshooting Chart - NO AIR FLOW | 20 |
| 9 | Drawing/Parts List..... | 24 |
| 10 | Drawing/Parts List..... | 25 |
| 11 | Drawing/Parts List..... | 26 |
| 12 | TC20 Test Tool Schematic | 27 |
| 13 | Wiring Diagram | 28 |

Tables

| <i>Table</i> | <i>Description</i> | <i>Page</i> |
|--------------|---------------------------------------|-------------|
| 1 | Air Temperatures..... | 4 |
| 2 | Functional Check/Inspection Form..... | 16 |

Section 1 - Safety Precautions

1.0 Safety Precautions

Review the following *SAFETY PRECAUTIONS* prior to testing the Power Unit.

⚠ DANGER

- Explosive hazard. Do not use in the presence of flammable anesthetics.
- Risk of electric shock. Disconnect power before servicing the TC3146 Power Unit.

⚠ WARNING

This device generates heated air flow. Excessive heat could cause thermal stress or skin lesions. Failure to follow these precautions could result in death or serious injury:

- Use this system only under direction of a physician. Read and understand the *Operating Manual, Quilt Instructions for Use*, and all precautions before using.
- Repairs should be performed only by qualified personnel such as certified biomedical electronics technicians or certified clinical engineers familiar with repair practices for servicing medical devices, and in accordance with the *Service Manual*. **Damage to the Power Unit or malfunction could otherwise result.**
- **Always perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* after making repairs and before returning the Power Unit to patient use. Document your findings on the *INSPECTION FORM*. Improper repair may result in death or serious injury, equipment damage, or malfunction.**

(continued next column)

⚠ WARNING

- After performing the thermostat test procedure, verify that the TC20 Test Tool or any installed test jumpers have been removed before returning the Power Unit to patient use.

Failure to remove the TC20 Test Tool or test jumpers may result in death, serious injury or equipment malfunction.

- **Always unplug the Power Unit before attaching or removing the TC20 Test Tool or test jumpers and when resetting thermostats. Failure to unplug the Power Unit could result in electrical shock and cause death or serious injury.**
- Use only Gaymar replacement parts as identified in the parts lists (pp. 24-27). **Use of substitute parts could lead to power unit malfunction or patient injury.**
- **The Temperature Control PC Board is pre-set at the factory. Do not attempt to calibrate it. Adjustment of the Control PC Board in the field could result in patient injury.**
- Use care when resetting the thermostats. **Excessive force (force greater than 5 pounds) can damage the overtemp protection device and/or inadvertently alter the trip temperature of the device.**

⚠ CAUTION

- **U. S. Federal law restricts this device to sale by or on the order of a physician.**
- For grounding reliability, plug only into a grounded outlet labelled "Hospital Grade."
- The HEPA filter must be installed correctly. **Failure to install the filter correctly will prevent it from functioning properly and could allow unfiltered air to reach the patient.**
- When using an I. V. pole, do not mount the Power Unit higher than 3 feet (0.9 meter). Otherwise, the Power Unit could tip over.

Section 2 - Repair Policy

2.0 Repair Policy

For customers who repair Gaymar Power Units at their location, this manual contains information to allow a qualified biomedical technician to make necessary repairs.

2.1 Limited Warranty

The Thermacare TC3146 Power Unit is warranted free of defects in material and workmanship under normal use and operation for a period of two years, under the terms and conditions of the Gaymar warranty in place at time of purchase. During the warranty period, Gaymar will repair or replace at its sole option, free of charge, any defective parts or products returned with prior authorization prepaid to Gaymar Industries. Consumable items such as filters are excluded. The full warranty is available from Gaymar upon request.

Warranty does not cover products abused, misused, or altered outside the factory. There are no obligations on the part of Gaymar for consequential damages arising out of or in connection with the use or performance of the product. Gaymar disclaims all implied warranties including, but not limited to, the implied warranties of merchantability and of fitness for a particular purpose.

2.2 In-Warranty Repairs

All in-warranty field repairs must be authorized by Gaymar's Technical Service Department before proceeding.

2.3 Out-of-Warranty Repairs

If the Power Unit becomes inoperative and the cause cannot be determined, the complete Power Unit may be returned to the factory for servicing at the purchaser's expense. Please contact Gaymar's Customer Service Department to obtain a returned goods ("RG") number prior to returning equipment.

2.4 Return Authorization

Please contact your local dealer or Gaymar's Customer Service Department at:

Phone: 1 800 828-7341
(716) 662-2551

Fax: (716) 662-8795

Section 3 - Specifications

3.0 Specifications

3.1 Physical

| | |
|-------------------|---|
| Dimensions | 16 1/4"H x 10 3/4"W x 10 1/2"D (42 cm x 28 cm x 27 cm) |
| Weight | 15 lbs (6.8 kg) |
| Enclosure | Thermoplastic |
| Filter | HEPA filtration down to 0.2 micron size |

3.2 Electrical

| | |
|--------------------------------------|--|
| Classification | Type BF, Class 1, grounded equipment suitable for continuous operation. Not classified for protection against harmful ingress of liquid. |
| Input | 120 V nominal (+4%, -10%), 60 Hz, 12 amps max |
| Motor | 1/25 HP, single phase |
| Heater | 1200W heating element |
| Power Cord | 4.6 meters, 14 AWG cord with hospital grade plug |
| Circuit Breaker | 15 amp |
| Current Leakage (Earth) | 100 microamps max. |
| Ground Resistance | 0.15 ohms nominal; 0.5 ohms maximum |
| Ambient Operating Temperature | 60°F to 85°F (16°C to 29°C) |

| Temperature Setting | | Temperature |
|---|------|--------------|
|  | MIN | Fan only |
|  | LOW | 90°F (32°C) |
|  | MED | 100°F (38°C) |
|  | HIGH | 110°F (43°C) |

Table 1 - Air Temperatures

3.3 Temperature Settings

The air temperatures are identified on the operator control panel and indicate the average air temperature at the hose end using a Quilt.

NOTE: The air temperature around the patient is affected both by the ambient room temperature and the use of an insulating blanket on top of the Quilt.

3.4 Safety System

Dual Patient Safety Temperature Limit Thermostats

Either of two independently operating thermostats will shut off the TC3146 at a preset high limit temperature. The heater element and blower will remain off until the thermostat is manually reset.

Heater Overtemp

Heater overtemp thermostat will shut off the TC3146 in the event of a blower failure or lack of air movement. The heater element and blower will remain off until the thermostat is manually reset.

High Temp Indicator

The *REMOVE FROM USE* indicator will light on the front panel when a patient safety thermostat or heater overtemp thermostat has tripped. Also, the heating element and blower will turn off.

HEPA Filter Interlock Switch

The *REMOVE FROM USE* indicator will light on the front panel when the HEPA filter has been installed incorrectly or is missing. Also, the heating element and blower will turn off.

3.5 Quilts

All Quilts are made of either a nonwoven layer bonded to a plastic film, or two nonwoven layers.

Quilt material meets U. S. flammability standards:

- NFPA 702 "Normal Flammability"
- CPSC Part 1632
- California Title 19, Subchapter 7

Clear drape material meets NFPA 702 "Normal Flammability."

Section 4 - Theory of Operation

4.0 Theory of Operation

4.1 Convective Warming System

The **Convective Warming System** (fig. 1) provides a continuous means of warming patients to help prevent and/or treat hypothermia. The system consists of a Convective Warming Unit (Power Unit) and a disposable Quilt. A connecting hose conducts heated air from the Power Unit to the Quilt.

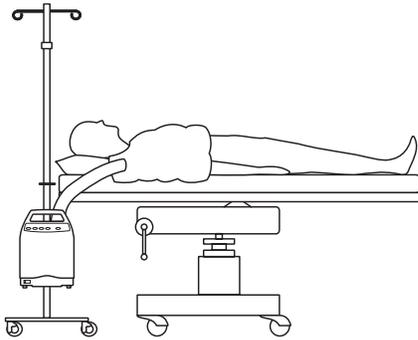


Figure 1 - Convective Warming System

4.2 TC3146 Power Unit

The **TC3146 Power Unit** provides a continuous source of air to the Quilt. The Power Unit consists of a HEPA filter, blower, heater, and temperature controller. The Power Unit is a hand-carried portable device which has dual mounting provisions. It can hang on a bedrail or footboard using the bedrail hooks on the back of the unit (see fig. 2B). It can also mount to an I. V. pole or optional accessory stand using the I. V. pole clamp (see fig. 2A). Output air temperatures may be set to one of four temperature settings: **MIN** (fan only), **LOW** (90°F, 32°C), **MED** (100°F, 38°C), or **HIGH** (110°F, 43°C).

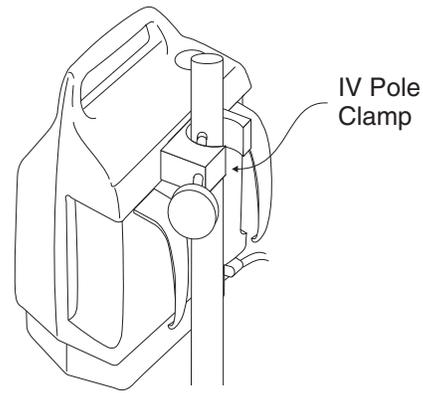


Figure 2A - I. V. Pole or Stand mounted

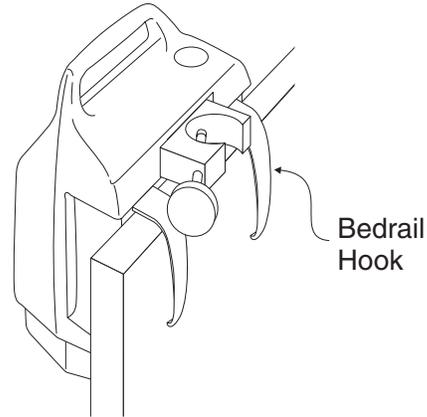


Figure 2B - Bed rail mounted



CAUTION

When using an I. V. pole, do not mount the Power Unit higher than 3 feet (0.9 meter) (see fig. 3).
Otherwise, the Power Unit could tip over.

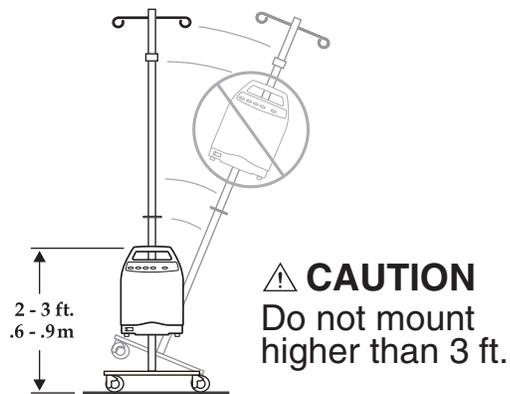


Figure 3 - Pole mounting height limit

Section 4 - Theory of Operation (cont'd)

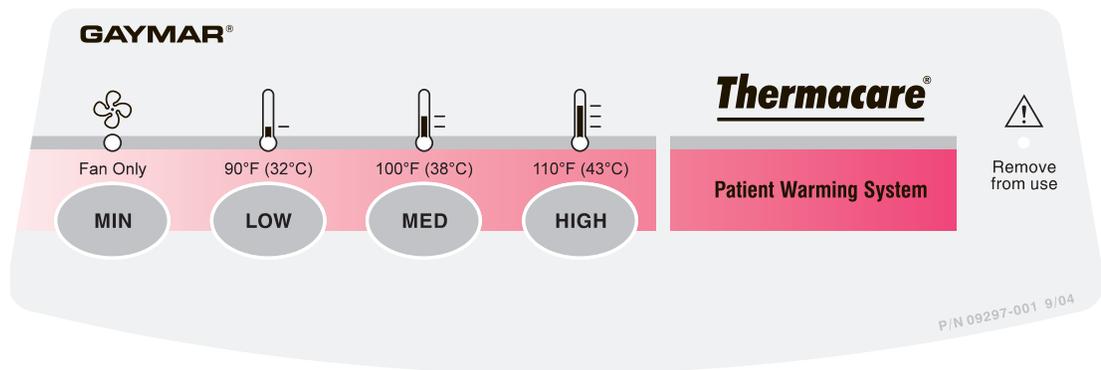


Figure 4 - Operator Control Panel

Ambient air is drawn in through air vents in the bottom of the enclosure. Air passes through a HEPA filter and across a 1200 watt, open coil heater located in the inlet of a blower. Output air temperature is monitored by a thermistor located directly in the output air stream (plenum) and provides feedback to the solid-state controller. The controller compares the output air temperature to the selected temperature and, using an on-off control scheme, turns the heater on or off accordingly. The maximum output air temperature is limited not only by the control system but by two redundant bimetallic latching thermostats. These thermostats are located in the output air stream and will interrupt power to both the heater and the blower, and light the *REMOVE FROM USE* indicator on the front panel should the output air temperature exceed predetermined limits. A similar thermostat located directly above the heater is used to protect the internal components in the event of a motor failure. It too will interrupt power to the heater and blower and light the *REMOVE FROM USE* indicator.

Air is delivered to the Quilt using a permanently attached, flexible hose. The hose has a sleeve which is stain resistant and easy to clean.

4.3 Quilts

The **Quilts** distribute air evenly over the covered areas of the patient through openings in the patient side of the Quilt. Quilts consist of layers of plastic and nonwoven material bonded together. **Refer to the instructions enclosed with each Quilt.**

Section 5 - Controls and Indicators

Section 6 - Preventive Maintenance

5.0 Controls and Indicators

5.1 Power

An **on/off circuit breaker** is located on the front of the unit in the bottom left corner. It controls power to the entire unit. When switched to the *ON* position, a power indicator in the switch will light.

5.2 Control Panel

An **operator control panel** (fig. 4, p. 6) is mounted at the top of the Power Unit:

- *[Power Up]* When the power unit is turned on, the system defaults to the *MED (100°F, 38°C)* temperature setting. A green light directly above the selector switch will glow indicating the selected temperature range.
- *[Temperature Settings]* Temperature settings are selected by pressing the appropriate push-button -- *MIN (fan only)*, *LOW (90°F, 32°C)*, *MED (100°F, 38°C)*, or *HIGH (110°F, 43°C)*.
- *[Power Interruption]* If electrical power is interrupted momentarily, the existing temperature setting will remain. If electrical power remains off, the TC3146 will default to the *MED (100°F, 38°C)* setting when power is restored.

A *REMOVE FROM USE* indicator will light:

- if a patient safety thermostat or heater thermostat has tripped.
- if the HEPA filter has been installed incorrectly or is missing.

The heating element and blower will automatically turn off when these conditions occur.

6.0 Preventive Maintenance

6.1 HEPA Filter

Dirt that has accumulated on the internal HEPA air filter will reduce the efficiency of the blower and heater. Under normal use, replace the HEPA filter every 1000 operating hours or 12 months, whichever occurs first. Replace the filter **only** with the Gaymar P/N listed (see parts list, fig. 9, p.24).

⚠ WARNING

Use only Gaymar replacement parts as identified in the parts lists (pp. 24-27).
Use of substitute parts could result in power unit malfunction or patient injury.

Refer to *Functional Check, 7.6 Filter Switch Test & Filter Replacement* (p. 14) for instructions.

6.2 Blower

The blower motor and fan do not require lubrication.

6.3 Enclosure Exterior

Clean the control panel and Power Unit exterior with a soft cloth lightly dampened with a nonstaining hospital disinfectant.

6.4 Quilts

Quilts are not sterile.
Quilts are intended for single patient use only.
Quilts should be discarded after use.

Small rips or tears in quilt material may be temporarily fixed with adhesive tape.

6.5 Hose

Clean the hose with a soft cloth lightly dampened with a nonstaining hospital disinfectant. Place the connector hose under the bed rail hooks when not in use.

6.6 Air Vents

Clean accumulated dirt from the air vents with a vacuum cleaner.

Section 7 - Functional Check and Safety Inspection

7.0 Functional Check and Safety Inspection

To assure optimum performance, dependability and safety, perform **FUNCTIONAL CHECK AND SAFETY INSPECTION** as follows:

- **After repair, and every 12 months thereafter — the FUNCTIONAL CHECK AND SAFETY INSPECTION consists of all procedures (sections 7.1 through 7.9).**

If your facility's procedures call for more frequent functional test and safety inspections, note this fact on the **INSPECTION FORM**.

Inspection Form

An **INSPECTION FORM** (table 2, pp. 16-17) is provided at the end of this section to facilitate and document the inspection process.

Test Equipment

The following test equipment (or equivalent) is required in order to perform the preventive maintenance procedures:

- Digital air thermistor thermometer (YSI 400 series)
Range: 50°F to 160°F (10°C to 71°C)
System accuracy: $\pm 1^\circ\text{F}$ ($\pm 0.6^\circ\text{C}$)
- Temperature sensor (P/N 77948-000)
NOTE:
 1. Include the accuracy of the measuring equipment when making judgments about observed temperature readings.
 2. Test Conditions: 120 VAC ± 2 , 70°F-75°F (21°C-24°C) ambient. (120 VAC with heater on. This may require the use of a variable transformer.)
- #2 Phillips screwdriver
- Current Leakage / Ground Resistance Tester
- Model TC1050, TC2050, TC2052, or TC2054 Quilt

- Stopwatch
- Adhesive Tape
- TC20 Test Tool* (P/N 08606000), or two 16 gauge insulated Test Jumpers
 - * The TC20 Test Tool is available from Gaymar. This tool was designed to allow for more convenient testing of the thermostats and eliminate the need to install jumpers. Contact Gaymar's Technical Service Department for more information.
- **INSPECTION FORM** (table 2, pp. 16-17)

Procedures

Perform the following procedures carefully, paying particular attention to test setups. Any deviation from the setups, procedures, or test equipment may result in incorrect or misleading results.

7.1 Enclosure

Examine the overall condition of the Power Unit exterior:

1. **Unplug the power unit.**
2. Examine the enclosure, checking for cracks.
3. Check that exterior screws are tight.
4. Check that labelling and markings are legible.
5. Clean accumulated dirt from the air vents with a vacuum cleaner.
6. Check hose assembly for holes and broken fittings. Replace if necessary.

7.2 Plug, Line Cord, and Strain Relief

Examine the plug, line cord, and strain relief:

1. Examine the attachment plug on the line cord to be sure it is in good condition.
2. Examine the line cord along its entire length for physical damage, such as cuts or cracked insulation. Check the quality of the strain relief. Replace, rather than repair, damaged line cords.

Section 7 - Functional Check and Safety Inspection (cont'd)

7.3 Power Switch

Check the power switch light:

1. Plug in the Power Unit. Turn the power switch on.
2. Verify that the power switch is lit.
3. Verify the Power Unit starts in the *MED* (100°F, 38°C) heat setting.

7.4 Temperature Settings Switches

Examine the overall condition of the control panel:

1. Select each of the four temperature settings. Verify that the appropriate indicator for each lights.

7.5 Thermostat and *REMOVE FROM USE* Alert

Test the Patient Limit Thermostats and *REMOVE FROM USE* Alert.

The following procedure describes two different approaches for measuring the trip points (actuation temperatures) of the Power Unit's patient limit thermostats. There are two patient limit thermostats (item 18, fig. 11, p. 26) within the Power Unit and each must be tested. The TC20 Test Tool helps simplify these tests. Steps 1 to 20 (pp. 9-11) should be followed when a TC20 Test Tool is available. For those facilities not having access to a TC20, follow steps 21 to 50 (pp. 12-13).

NOTE: A third thermostat, the heater overtemp thermostat (item 29, fig. 11, p. 26), is provided to protect internal components in the event of a motor blockage or failure. It does not need to be function tested.

7.5.1 TC20 Test Tool Procedure (steps 1 to 20) [see fig. 10, p. 25, for TC20 Test Tool part number]

1. Unplug the Power Unit.

⚠ WARNING

Always unplug the Power Unit before attaching or removing the TC20 Test Tool and when resetting thermostats. Failure to unplug the Power Unit could result in electrical shock and cause death or serious injury.

2. Remove the six screws on the back of the unit. Carefully separate the two halves of the enclosure.
3. Connect the TC20 Test Tool (fig. 5) to the 5-pin field test connector on back of the PC board and route the TC20 Test Tool cable out through the opening in the bottom of the unit (see fig. 10, p. 25). Close the two halves of the enclosure and temporarily secure it closed with adhesive (duct) tape. Plug in the power unit.

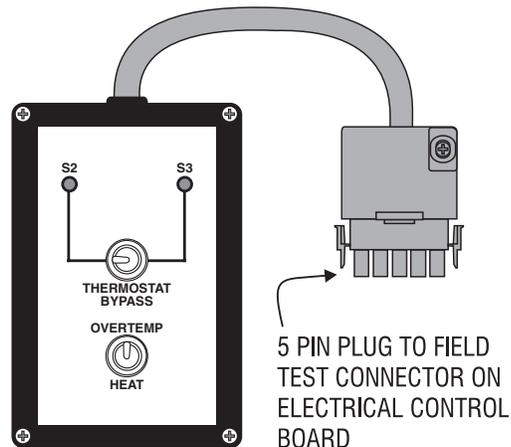


Figure 5 - TC20 Test Tool* (P/N 08606000)
(for schematic, see figure 12, p. 27)

Section 7 - Functional Check and Safety Inspection (cont'd)

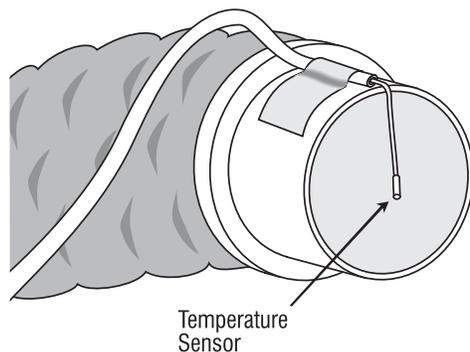


Figure 6A - Hose detail, showing sensor location

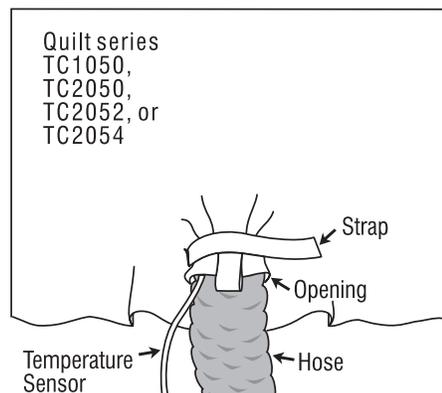


Figure 6B - Test setup

Figure 6 - Temperature sensor location

4. Set the two TC20 Test Tool toggle switches as follows:
 - *THERMOSTAT BYPASS* -- place in center position;
 - *HEAT/OVERTEMP* -- place in *HEAT* position.
5. Locate the air temperature sensor at the center of the end of the hose (fig. 6A). Secure the sensor with adhesive tape. **Verify that the sensor is located at the center of the hose.**
6. Connect the hose to a Model TC1050, TC2050, TC2052, or TC2054 Quilt (fig. 6B).
7. Turn the Power Unit on. Select the *HIGH (110°F, 43°C)* setting.
8. Run the Power Unit for 5 to 10 minutes at the *HIGH (110°F, 43°C)* setting. The temperature will oscillate. During this time interval, familiarize yourself with the following steps 9 through 14. Have a stopwatch ready.
9. Place the *HEAT/OVERTEMP* switch to *OVERTEMP*. The temperature should start to increase. When the air temperature reaches 119°F (48°C), start the stopwatch.
10. Allow the Power Unit to heat until either the S2 or S3 Test Tool thermostat indicator is lit. Stop the stopwatch and note the highest temperature displayed. This is the upper limit temperature for one of the thermostats. Record the time and temperature on the *INSPECTION FORM*.

Verify that the *REMOVE FROM USE* light is lit.

NOTE: It is acceptable if both thermostats trip simultaneously, in which case the S2 and S3 indicators will both be off. If this occurs, record the elapsed time and temperature. Verify that the REMOVE FROM USE indicator is lit. Verify that both the S2 and S3 indicators light by toggling the THERMOSTAT BYPASS switch from the S2 to S3 position. (If both thermostats have tripped, skip steps 11-14 and proceed to step 15.)

11. Switch the TC20 *THERMOSTAT BYPASS* to whichever thermostat (S2 or S3) is lit. This will short out the thermostat which opened first so that the second thermostat can be tested.

Switch the TC20 from *OVERTEMP* to *HEAT* to allow the Power Unit to return to normal operating temperature before testing the second thermostat.
12. Run the Power Unit again for 5 to 10 minutes in the *HIGH (110°F, 43°C)* setting. The temperature will oscillate. Have a stopwatch ready.
13. Place the *OVERTEMP/HEAT* switch to *OVERTEMP*. The temperature should start to increase. When the air temperature reaches 119°F (48°C), start the stopwatch.
14. Continue to monitor the TC20 Test Tool until the second thermostat indicator is lit. Stop the stopwatch and note the highest temperature displayed. This is the upper limit temperature for the other thermostat. Record the time and temperature on the *INSPECTION FORM*.

Section 7 - Functional Check and Safety Inspection (cont'd)

(table 2, pp. 16-17). Plot these values on table 2, page 18.

Verify that the *REMOVE FROM USE* light is lit.

15. Thermostat trip acceptance

Both thermostats must trip within the acceptance window (see table 2, p. 18). If this condition is not met, do not put the Power Unit in service. Call Gaymar's Technical Service Department for assistance (see inside front cover for telephone numbers).

16. **Unplug the power unit.** Open the enclosure to allow the Power Unit to cool for 5-10 minutes.

17. Locate the two patient limit thermostats (item 18, fig. 11, p. 26). Reset S2 by gently pressing the center reset button.

▲ WARNING

Use care when resetting the thermostats. **Excessive force (force greater than 5 pounds) can damage the overtemp protection device and/or inadvertently alter the trip temperature of the device.**

NOTE: Use care when resetting the thermostats since the power terminals are delicate. Avoid flexing the terminals. Thermostats with loose terminals should be replaced and retested.

18. Press the center reset button of S3. Verify it has reset (indicated by an audible "click" and tactile feedback). If it "clicks", proceed to step 19.

If you don't hear a "click", then what was assumed to be the patient limit thermostat S3 tripping was actually the heater overtemp thermostat S4 in the same circuit. This will rarely occur. If it has occurred, proceed as follows:

- a. Remove the filter retainer and nut. Remove the filter. Jumper out the S4 thermostat. Replace the filter, filter retainer and nut.
- b. Run the Power Unit for 5 to 10 minutes in the *HIGH (110°F, 43°C)* setting.
- c. Bypass S2 by placing the *THERMOSTAT BYPASS* switch in the S2 position. Place the *HEAT/OVERTEMP* Switch to

OVERTEMP. Allow the Power Unit to operate. When the air temperature reaches 119°F (48°C), start the stopwatch.

- d. Allow the Power Unit to heat until the S3 thermostat indicator is lit. Stop the stopwatch and note the highest temperature displayed. This is the upper limit temperature for the S3 thermostat. Record the elapsed time and temperature.
- e. Verify that the *REMOVE FROM USE* light is lit.
- f. The S3 thermostat must trip within the acceptance window (see table 2, p. 18). If this condition is not met, do not put the Power Unit in service. Call Gaymar's Technical Service Department for assistance (see inside front cover for telephone numbers).
- g. **Unplug the Power Unit.**
- h. Open the enclosure and allow the Power Unit to cool for 5-10 minutes.
- i. Remove the filter retainer and nut. Remove the filter. Remove the jumper from the S4 thermostat. Press the S4 reset button and insure it is reset. Replace the filter, filter retainer, and nut.
- j. Reset both the S3 and S2 thermostats by pressing their center reset buttons. (The S2 thermostat may have retripped.)

19. Remove the TC20 Test Tool.

▲ WARNING

After performing the preceding test procedure, verify that the TC20 Test Tool and all jumpers have been removed before returning the Power Unit to patient use. **Failure to do so may result in death, serious injury, or equipment malfunction.**

20. Proceed to the *FILTER SWITCH TEST* (section 7.6, p. 14).

Section 7 - Functional Check and Safety Inspection (cont'd)

7.5.2 ALTERNATE Test Jumper Procedure (steps 21 to 50)

21. Unplug the Power Unit.

▲ WARNING

Always unplug the Power Unit before attaching or removing jumpers and when resetting thermostats. Failure to unplug the Power Unit could result in electrical shock and cause death or serious injury.

22. There are two patient limit thermostats within the Power Unit and each must be tested. One 16 gauge insulated stranded wire jumper with alligator clips will be required. To help remember to remove the test jumper, label a LARGE, distinctive tag "REMOVE AFTER TEST" and tie the tag to the jumper.

Remove the six screws on the back of the unit. Install a jumper across thermostat S3 (item 18, fig. 11, p. 26). Temporarily secure the two halves of the enclosure together with adhesive (duct) tape.

23. Locate the air temperature sensor at the center of the end of the hose (fig. 6A, p. 10). Secure the sensor with adhesive tape. **Verify that the sensor is located at the center of the hose.**
24. Connect the hose to a Model TC1050, TC2050, TC2052, or TC2054 Quilt (fig. 6B, p. 10).
25. Plug in the Power Unit and turn it on. Select the *HIGH* (110°F, 43°C) setting. Run the Power Unit for 5 to 10 minutes. The temperature will oscillate. During this time interval, familiarize yourself with the following steps 26 through 31, so that the procedure can be accomplished quickly, without letting the Power Unit cool.

NOTE: Perform the following steps 26 through 31 as quickly as possible, to prevent the Power Unit from cooling down:

26. **Unplug the Power Unit.** Carefully separate the enclosure slightly.
27. Unplug the thermistor (item 13, fig. 10, p. 25) from the back of the control board.
NOTE: The power resistor on the back side of the PC board may be hot to touch.
28. Put the enclosure back together and secure it with adhesive (duct) tape.
29. Plug in the Power Unit and turn it on. Leave unit in *MED* (100°F, 38°C) temperature setting. Have a stopwatch ready.
NOTE: Do not set the TEMPERATURE SETTINGS switch to MIN (fan only) since this setting disables the heater.
30. The temperature should increase. When the air temperature reaches 119°F (48°C), start the stopwatch. The Power Unit will heat until the S2 thermostat trips. When this happens, the blower and heater will shut off. Stop the stopwatch and note the highest temperature displayed. This is the upper limit temperature for thermostat S2. Record the time and temperature on the *INSPECTION FORM* (table 2, pp. 16-17).
31. Verify that the *REMOVE FROM USE* light is lit.
- 32. Unplug the Power Unit.**
33. Open the enclosure and allow the Power Unit to cool for 5-10 minutes.
34. Locate the two patient limit thermostats (item 18, fig. 11, p. 26). Gently press the reset button in the center of each thermostat. Move the jumper across thermostat S2.

▲ WARNING

Use care when resetting the thermostats. **Excessive force (force greater than 5 pounds) can damage the overtemp protection device and/or inadvertently alter the trip temperature of the device.**

Section 7 - Functional Check and Safety Inspection (cont'd)

NOTE: If both thermostats reset, both thermostats have tripped. This is acceptable.

NOTE: Use care when resetting the thermostats since the power terminals are delicate. Avoid flexing the terminals. Thermostats with loose terminals should be replaced and retested. Be certain the thermostats have cooled for 5-10 minutes before resetting.

NOTE: If thermostat S2 does not reset, the heater overtemp thermostat has tripped. In the unlikely event that this has occurred, perform the following:

- a) remove the filter retainer and nut;
- b) remove the filter;
- c) jumper the S4 heater overtemp thermostat; and
- d) replace the filter, filter retainer, and nut. Return to step 25.

35. Reconnect the thermistor to the control board.
36. Put the enclosure back together and secure it with tape.
37. Plug in the Power Unit. Turn it on.
38. Run the Power Unit for 5-10 minutes in the *HIGH* (110°F, 43°C) setting to stabilize the system temperature.

NOTE: Perform the following steps 39 through 44 as quickly as possible, to prevent the Power Unit from cooling down:

39. **Unplug the Power Unit.** Carefully separate the enclosure slightly.
40. Unplug the thermistor (item 13, fig. 10, p. 25) from the back of the control board.
41. Put the enclosure back together and secure it with tape.
42. Plug in the Power Unit and turn it on. Leave unit in *MED* (100°F, 38°C) temperature setting. Have a stopwatch ready.

NOTE: Do not set the **TEMPERATURE SETTINGS** switch to **MIN** (fan only) since this setting disables the heater.

43. The temperature should start to increase. When the air temperature reaches 119°F (48°C), start the stopwatch. Allow the Power Unit to heat until thermostat S3 trips. Stop the stopwatch and note the highest temperature displayed. This is the upper limit temperature for thermostat S3. Record the time and temperature on the *INSPECTION FORM* (table 2, pp. 16-17). Plot these values on table 2, p. 18.
44. Verify that the *REMOVE FROM USE* light is lit.
45. **Unplug the Power Unit.**
46. Open the enclosure and allow the Power Unit to cool for 5-10 minutes.
47. **Thermostat trip acceptance**
Both thermostats must trip within the acceptance window (see table 2, p. 18). If this condition is not met, do not put the Power Unit in service. Call Gaymar's Technical Service Department for assistance (see inside front cover).
48. Remove the jumper from the patient limit thermostat.

If a jumper was used on the S4 heater overtemp thermostat, remove the filter retainer, nut, and filter. Remove the jumper from S4. Reset S4 (indicated by an audible "click" and tactile feedback). Replace the filter, filter retainer, and nut.

▲ WARNING

After performing the preceding test procedure, verify that all test jumpers have been removed before returning the Power Unit to patient use.

Failure to remove test jumper(s) may result in death, serious injury, or equipment malfunction.

49. Reconnect the thermistor connector to the back of the control board.

(continued)

Section 7 - Functional Check and Safety Inspection (cont'd)

50. Reset the thermostats by gently pressing the center reset buttons.

▲ WARNING

Use care when resetting the thermostats. **Excessive force (force greater than 5 pounds) can damage the overtemp protection device and/or inadvertently alter the trip temperature of the device.**

NOTE: Use care when resetting the thermostats since the power terminals are delicate. Avoid flexing the terminals. Thermostats with loose terminals should be replaced and retested.

7.6 Filter Replacement and Filter Switch Test (every 12 months or 1000 operating hours, whichever occurs first)

1. **Unplug the Power Unit.** Separate the two halves of the enclosure. Lay the Power Unit on its back.
2. Remove the filter retainer and nut. Remove the filter.
3. Put the enclosure back together and secure it with tape.
4. Plug in the Power Unit. Turn it on. Verify that the blower does not start and that the *REMOVE FROM USE* light is lit.
5. A timer which counts total running hours is located inside the Power Unit for use by service personnel. Timer readings may be used to track HEPA filter usage intervals. To read the hour timer:
 - a. **Unplug the Power Unit.** Separate the two halves of the enclosure again. Locate the hour timer (see figure 10, p. 25). Plug in the Power Unit and turn it on. Read the hour timer and record the total running hours on the *INSPECTION FORM*.
 - b. Turn the Power Unit off.

6. **Unplug the Power Unit.** Install filter. (Install new filter every 1000 operating hours or 12 months, whichever occurs first.) Replace the filter **only** with the Gaymar P/N listed (see parts list, fig. 9, p. 24). Record the hour timer reading onto the new filter label. Reattach filter retainer and nut.

▲ CAUTION

The HEPA filter must be seated properly. **Failure to install the filter correctly will prevent it from functioning properly, and could allow unfiltered air to reach the patient and cause injury.**

7. Replace the six screws holding the enclosure together.

7.7 Quilt Temperature

Verify temperature output at each heat setting:

1. Prepare the Power Unit test setup, if it has not been previously prepared:
 - a. Locate the air temperature sensor at the center of the end of the hose (fig. 6A, p. 10). Secure the sensor with adhesive tape. **Verify that the sensor is located at the center of the hose.**
 - b. Connect the hose to a Model TC1050, TC2050, TC2052, or TC2054 Quilt (fig. 6B, p. 10).
 - c. Plug in the Power Unit and turn it on.
2. Set the *TEMPERATURE SETTINGS* switch to *LOW*. Run the Power Unit for 5 minutes. After 5 minutes, note the two highest and two lowest temperature readings. Record the average of these four temperatures on the *INSPECTION FORM* (table 2, pp. 16-17).

**Allowable LOW temperature:
87°F to 93°F average
(30.6°C to 33.9°C)**

Section 7 - Functional Check and Safety Inspection (cont'd)

3. Repeat step 2 for *MED* setting. Average temperatures and record.

Allowable MED temperature:
97°F to 103°F average
(36.1°C to 39.4°C)

4. Repeat step 2 for *HIGH* setting. Average temperatures and record.

Allowable HIGH temperature:
107°F to 113°F average
(41.7°C to 45.0°C)

5. If the temperatures in steps 2 through 4 are not correct, do not put the Power Unit into service. Call Gaymar's Technical Service Department for assistance (see inside front cover for phone numbers).

6. **Unplug the Power Unit.**

7.8 Ground Resistance

Check grounding resistance:

1. Use a current leakage/ground resistance tester to measure the resistance between the grounding pin on the power entry module and the I. V. pole clamp. An unplated area on the underside of the I. V. pole clamp has been provided for this test. Record the value.
2. The value should be less than 0.5 ohms.

7.9 Current Leakage

Measure current leakage:

1. Measure and record the maximum earth current leakage (ground open). An unplated

area on the underside of the I. V. pole clamp has been provided if needed for this test. Measure at all combinations of:

- line polarity
- neutral open/closed

2. The current leakage should not exceed 100 microamperes in any condition.

7.10 Completing the Functional Check and Safety Inspection

If the Power Unit has passed the *FUNCTIONAL CHECK AND SAFETY INSPECTION* for all requirements of procedures 7.1 through 7.9, the Power Unit should be considered operational and suitable for return to service.

This completes the recommended *FUNCTIONAL CHECK AND SAFETY INSPECTION* for the TC3146 series Power Unit.

Section 8 - Inspection Form

| TC3146 Power Unit Functional Check & Safety Inspection Form | | | | | |
|---|---|---|-------------------------------|---------------------|--|
| Location _____ | | Initials _____ | | Date _____ | |
| Hour timer (total hours) _____ | | Replaced HEPA Filter: Yes _____ No _____ | | Serial Number _____ | |
| Procedure (s) | Done? (check) | Action | Results ** (circle selection) | | |
| 7.1 | Enclosure | 1 Unplug Power Unit. | Pass | Fail | |
| | | 2 Check enclosure for cracks. | Pass | Fail | |
| | | 3 Check screws. | Pass | Fail | |
| | | 4 Check labelling and markings. | Pass | Fail | |
| | | 5 Check/clean air vents. | Pass | Fail | |
| | | 6 Check hose assembly. | Pass | Fail | |
| 7.2 | Plug, line cord, strain relief | 1 Examine plug. | Pass | Fail | |
| | | 2 Examine cord. Check strain relief. | Pass | Fail | |
| 7.3 | Power switch | 1 Plug in Power Unit. Check that the circuit breaker lights. | Pass | Fail | |
| | | 3 Verify that Power Unit starts in MED (100°F, 38°C) heat setting. | Pass | Fail | |
| 7.4 | TEMPERATURE SETTINGS switches | 1 Check each temperature setting. Verify appropriate indicators light. | Pass | Fail | |
| 7.5.1 | Thermostat* and REMOVE FROM USE alert (TC20 TEST TOOL PROCEDURE) | 1 Unplug Power Unit. Remove screws. | | | |
| | | 3 Connect TC20 Test Tool. Tape enclosure closed. Plug in Power Unit. | | | |
| | | 4 TC20 Test Tool settings: THERMOSTAT BYPASS--place in center position. HEAT/OVERTEMP--place in Heat position. | | | |
| | | 5 Prepare test setup. Mount air temperature sensor at the center of the end of the hose. Connect to quilt. | | | |
| | | 7 Turn Power Unit on. Select HIGH (110°F, 43°C) setting. | | | |
| | | 8 Run Power Unit for 5-10 minutes at HIGH (110°F, 43°C) setting to stabilize. | | | |
| | | 9 Place TC20 to OVERTEMP. Start stopwatch at 119°F (48°C). | | | |
| | | 10 Stop stopwatch when S2/S3 indicator on TC20 lights. Note time/temperature. Record results. _____ seconds _____°F (_____°C) | | | |
| | | Verify that REMOVE FROM USE indicator lights. | Pass | Fail | |
| | | 11 Bypass thermostat. Switch TC20 from OVERTEMP to HEAT. | | | |
| | | 12 Run Power Unit for 5-10 minutes at HIGH (110°F, 43°C) setting to stabilize. | | | |
| | | 13 Place TC20 to OVERTEMP. Start stopwatch at 119°F (48°C). | | | |
| | | 14 Stop stopwatch when S2/S3 indicator on TC20 lights. Note time/temperature. Record results. _____ seconds _____°F (_____°C) | | | |
| | | Verify that REMOVE FROM USE indicator lights. | Pass | Fail | |
| | | 15 Verify that the time/temperature values in steps 10 and 14 for both thermostats fall within the acceptance window on page 3 of the INSPECTION FORM. | Pass | Fail | |
| | | 16 Turn off Power Unit. Open enclosure. Let Power Unit cool for 5-10 minutes. | | | |
| | | 17 Reset S2 patient limit thermostat. | | | |
| | | 18 Reset S3 patient limit thermostat. If a click is heard, proceed to step 19. If click is not heard, perform steps 18a. through 18j. | | | |
| | | 19 Remove TC20 Test Tool. | | | |
| | | 20 Proceed to 7.6, FILTER SWITCH TEST. | | | |
| 7.5.2 | Thermostat* and REMOVE FROM USE alert (ALTERNATE TEST JUMPER PROCEDURE) [continued on other side] | 21 Unplug Power Unit. Remove screws. Install jumper across thermostat S3. Tape enclosure closed. | | | |
| | | 23 Prepare test setup. Mount air temperature sensor at the center of the end of the hose. Connect to quilt. | | | |
| | | 25 Turn Power Unit on. Select HIGH (110°F, 43°C) setting. Run Power Unit for 5-10 minutes at HIGH (110°F, 43°C) setting to stabilize. Label jumper "REMOVE AFTER TEST." | | | |
| | | 26 Unplug Power Unit. Separate the enclosure slightly. | | | |
| | | 27 Unplug the thermistor from the control board. | | | |
| | | 28 Tape enclosure closed. | | | |
| | | 29 Plug in and turn on Power Unit. Leave in MED (100°F, 38°C) setting. | | | |
| | | 30 Start stopwatch at 119°C (48°C). Stop stopwatch when blower/heater shuts off. Note time/temperature. Record results. _____ seconds _____°F (_____°C) | | | |
| | | 31 Verify REMOVE FROM USE indicator lights. | Pass | Fail | |
| | | 32 Unplug the Power Unit. | | | |
| | | 33 Open enclosure. Allow Power Unit to cool for 5-10 minutes. | | | |
| | | 34 Reset thermostat(s). Move jumper to thermostat S2. | | | |
| 35 Reconnect the thermistor to the control board. | | | | | |
| 36 Tape enclosure closed. | | | | | |

* If both thermostats trip simultaneously (i.e., at the same time and temperature), record the same results in 14 as in 10, and in 43 as in 30.
 ** Circling "Fail" indicates service or repair is required. Contact Gaymar's Technical Service Department for assistance.

Table 2 - Functional Check / Inspection Form (p. 1)

Section 8 - Inspection Form (cont'd)

| TC3146 Power Unit Functional Check & Safety Inspection Form | | | | | | |
|---|---|------------------|--|----------------------------------|---------------|-------|
| Procedure(s) | | Done? (check) | Action | Results ** (circle selection) | | |
| 7.5.2 | Thermostat* and REMOVE FROM USE alert (ALTERNATE TEST JUMPER PROCEDURE) [continued from other side] | | 37 Plug in Power Unit. Turn unit on. | | | |
| | | | 38 Run the Power Unit for 5-10 minutes in the HIGH(110°F, 43°C) setting to stabilize. | | | |
| | | | 39 Unplug Power Unit. Separate the enclosure slightly. | | | |
| | | | 40 Unplug the thermistor from the control board. | | | |
| | | | 41 Tape enclosure closed. | | | |
| | | | 42 Plug in and turn on Power Unit. Leave in MED (100°F, 38°C) setting. | | | |
| | | | 43 Start stopwatch at 119°F (48°C). Stop stopwatch when blower/heater shuts off. Note time/temperature. Record results. _____ seconds _____°F (_____°C) | | | |
| | | | 44 Verify REMOVE FROM USE indicator lights. | | Pass | Fail |
| | | | 45 Unplug Power Unit. | | | |
| | | | 46 Open enclosure. Allow Power Unit to cool for 5-10 minutes. | | | |
| | | | 47 Verify that the time/temperature values in steps 30 and 43 for both thermostats fall within the acceptance window on page 3 of the INSPECTION FORM. | | Pass | Fail |
| | | | 48 Remove the jumper(s) from the patient limit thermostat and heater overtemp thermostat. | | | |
| | | | 49 Reconnect the thermistor to the control board. | | | |
| | | | 50 Reset the thermostats by pressing center reset buttons. | | | |
| 7.6 | Filter replacement and filter switch test | | 1 Unplug Power Unit. Separate enclosure halves. | | | |
| | | | 2 Remove filter retainer and nut. Remove filter. | | | |
| | | | 3 Tape the enclosure closed. | | | |
| | | | 4 Plug in Power Unit. Verify the blower does not turn on. | | Pass | Fail |
| | | | Verify the REMOVE FROM USE indicator lights. | | Pass | Fail |
| | | | 5 Unplug Power Unit. Separate enclosure. Plug in Power Unit, turn it on, and read hour timer. Record total running hours on new filter label and INSPECTION FORM. Turn off Power Unit. | | | |
| | | | 6 Unplug Power Unit. Install new filter if necessary. Record hour timer reading onto new filter label. Replace filter retainer and nut. | | | |
| | 7 Close enclosure. Reattach screws. | | | | | |
| 7.7 | Quilt temperature | | 1 Prepare test setup. Mount air temperature sensor at the center of the end of the hose. Plug in Power Unit. | | | |
| | | | 2 Turn on Power Unit. Set HEAT SETTINGS to LOW. Run Power Unit for 5 minutes. Note 2 highest and 2 lowest temperatures. Average the 4 readings. Record value : _____°F (_____°C) [Average of 90°F (32°C) values must be between 87°F and 93°F (30.6°C and 33.9°C)] | Pass | Fail | |
| | | | 3 Repeat step 2 for MED setting. Record value: _____°F (_____°C) [Average of 100°F (38°C) values must be between 97°F and 103°F (36.1°C and 39.4°C).] | Pass | Fail | |
| | | | 4 Repeat step 2 for HIGH setting. Record value: _____°F (_____°C) [Average of 110°F (43°C) values must be between 107°F and 113°F (41.7°C and 45.0°C).] | Pass | Fail | |
| | | | 5 Unplug the Power Unit. | | | |
| 7.8 | Ground resistance | | 1 Unplug the Power Unit. Measure and record ground resistance: _____ ohms [Ground resistance must be less than 0.5 ohms.] | Pass | Fail | |
| 7.9 | Current leakage | | 1 Measure current leakage at the following settings: | | | |
| | | | | NEUTRAL LINE | LINE POLARITY | VALUE |
| | | | Open | Normal | | |
| | | | Open | Reverse | | |
| | | | Closed | Normal | | |
| | | | Closed | Reverse | | |
| | | | 2 Verify current leakage does not exceed 100 µA for all above conditions. | | Pass | Fail |

* If both thermostats trip simultaneously (i.e., at the same time and temperature), record the same results in 43 as in 30.
 ** Circling "Fail" indicates service or repair is required. Contact Gaymar's Technical Service Department for assistance.

Table 2 - Functional Check / Inspection Form (p. 2)

Section 8 - Inspection Form (cont'd)

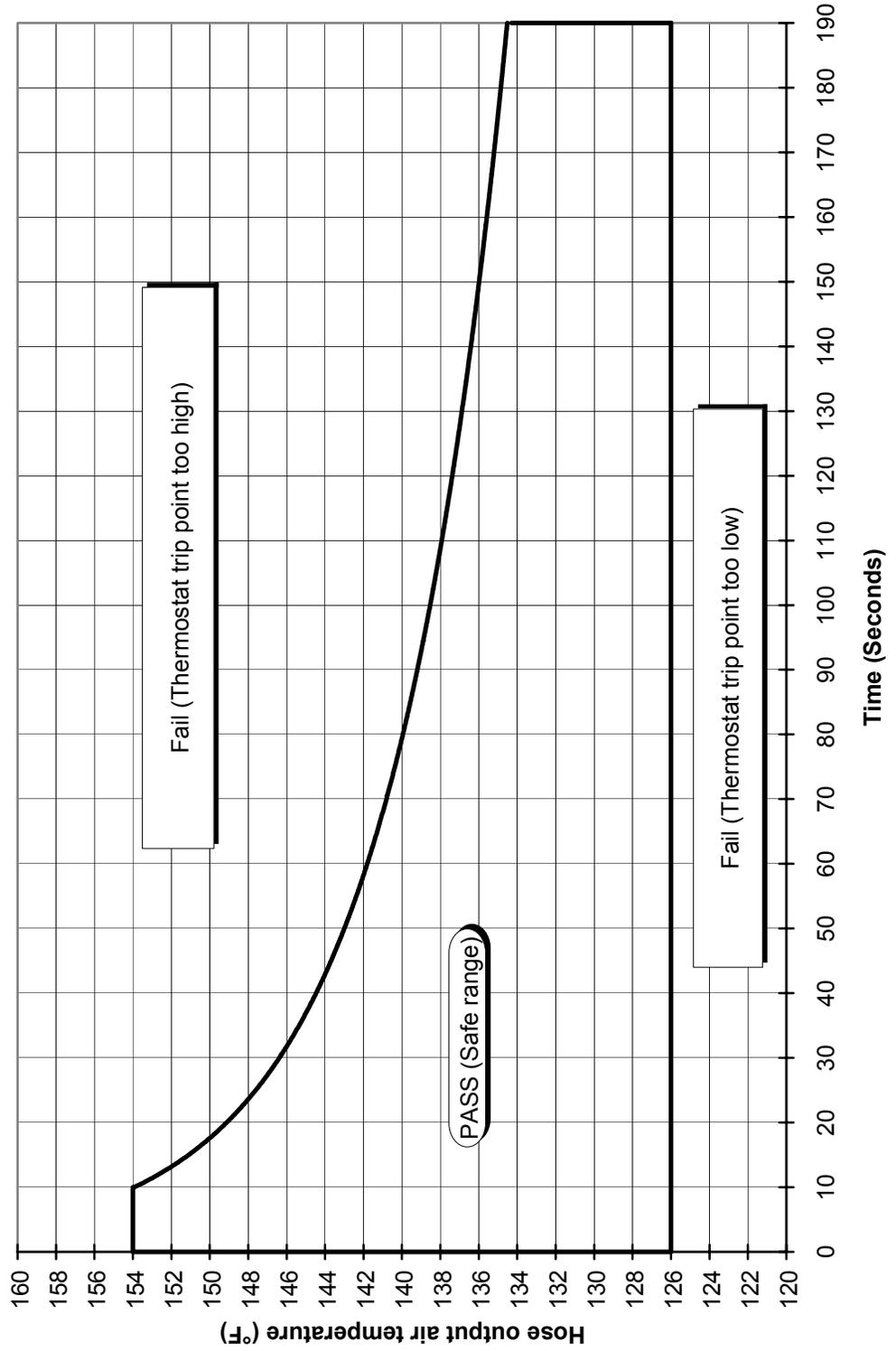


Table 2 - Functional Check / Inspection Form (p. 3)

Section 9 - Troubleshooting

⚠ WARNING

Always perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* after making repairs and before returning the Power Unit to patient use. **Failure to perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* could result in patient injury.**

In addition to the following troubleshooting charts, refer to *PREVENTIVE MAINTENANCE* (section 6, p. 7) and *REPAIR PROCEDURES* (section 10, pp. 21-23).

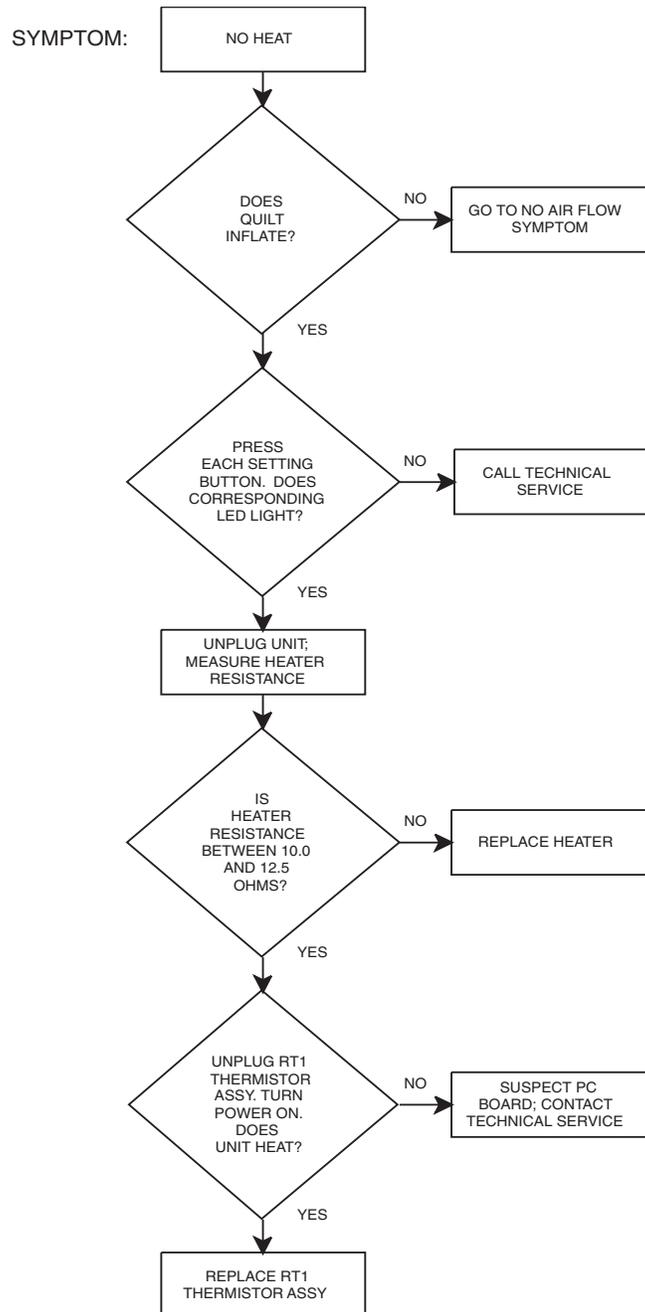


Figure 7 - Troubleshooting Chart - NO HEAT

Section 9 - Troubleshooting (cont'd)

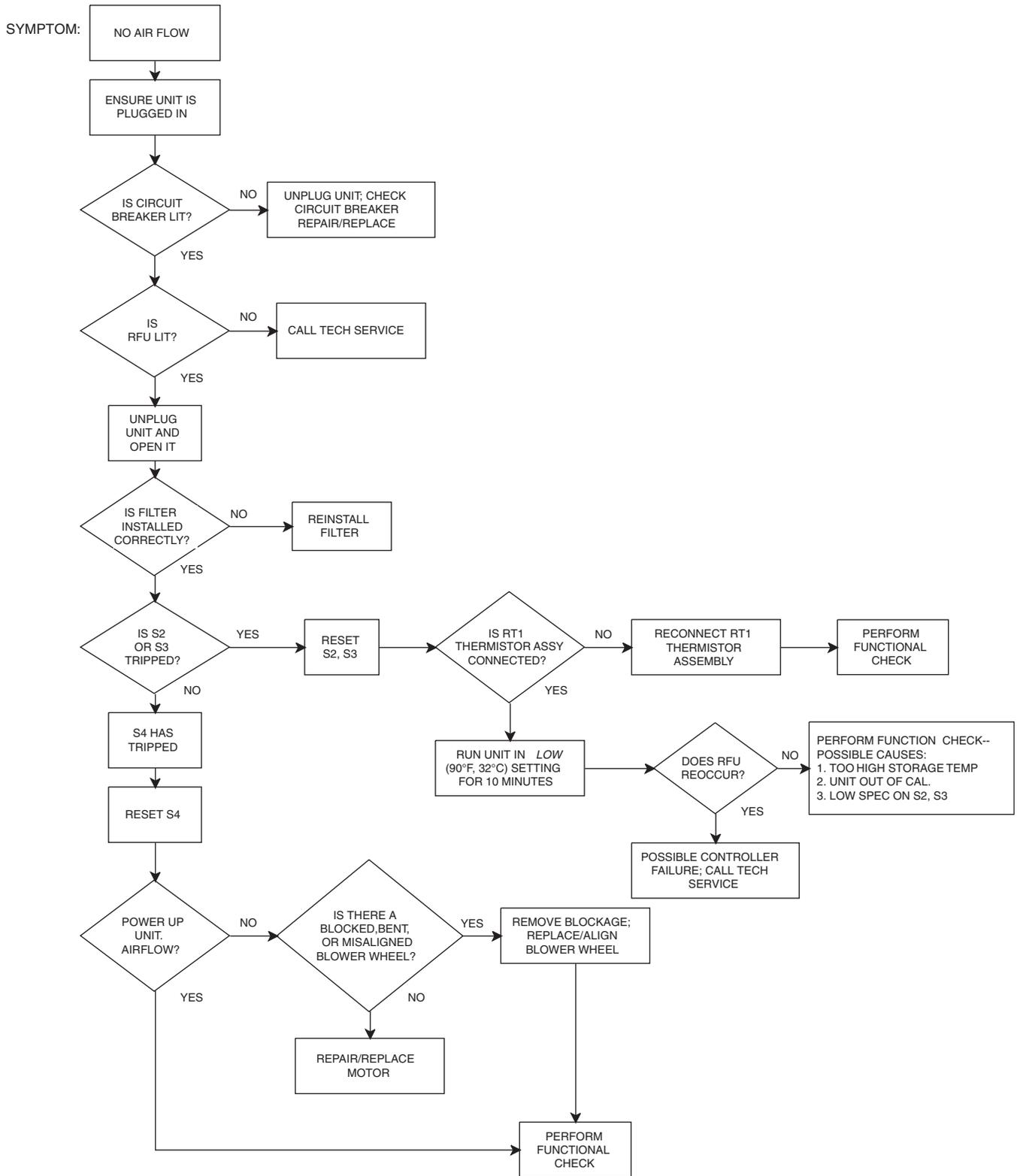


Figure 8 - Troubleshooting Chart - NO AIR FLOW

Section 10 - Repair Procedures

10.0 Repair Procedures

▲ WARNING

Use only Gaymar replacement parts as identified in the parts lists (pp. 24-27).

Use of substitute parts could result in power unit malfunction or patient injury.

To identify replacement parts, refer to figures 9-11 (pp. 24-27). To order replacement parts, contact Gaymar's Customer Service Department:

Telephone: 1 800 828-7341
(716) 662-2551

Fax: (716) 662-8795

10.1 Replacing the Patient Limit Thermostat(s) (S2 & S3)

To replace either thermostat (item 18, fig. 11):

1. **Unplug the Power Unit.**
2. Remove the six screws securing the enclosure. Open the enclosure.
3. Carefully unplug the terminals from the thermostat.
4. Remove the two #4 nuts from the thermostat.
5. Replace the thermostat. Reinstall the nuts.
6. Carefully replace the terminals.
7. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

10.2 Replacing the Heater

To replace the heater (item 3, fig. 9):

1. **Unplug the Power Unit.**
2. Remove the six screws securing the enclosure. Open the enclosure.

3. Remove the filter retainer and nut. Remove the HEPA filter.
4. Remove the ten screws securing the filter inlet plate.
5. Remove the screw and lock washer securing the ground wire to the backing plate. Remove the two screws securing the terminal block.
6. Carefully lift the filter inlet plate, exposing the blower wheel.
7. Remove the blower wheel using $\frac{1}{8}$ " hex wrench through hole in one blade of blower wheel.
8. Remove the two #6 screws holding the heater to the motor bracket.
9. Disconnect the short wire from the heater to the motor.
10. Remove the red heater wire from terminal block location TB1-3 (see figure 11). Remove cable ties.
11. Remove the heater.
12. Install the replacement heater.
13. Reroute the red wire through the 4-hole grommet.
14. Reconnect both wires. Refer to TB1 designators in the schematic (figure 13) and terminal block wiring designators in figure 11. Install cable ties.
15. Reinstall the blower wheel, making sure there is 0.10" (2.5 mm) clearance between the wheel and the blower inlet ring (see fig. 9). NOTE: the hex screw must be aligned with the flat on the motor shaft.
16. Place the filter inlet plate back on top of the scroll. Secure the ten screws.
17. Replace the terminal block. Reconnect the ground wire to the backing plate; make sure the lock washer is reinstalled.
18. Replace the HEPA filter. Secure it with the filter retainer and nut.
19. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

Section 10 - Repair Procedures (cont'd)

10.3 Replacing the Thermistor Assembly (RT1)

To replace the thermistor assembly (item 4, figs. 9-10):

1. **Unplug the Power Unit.**
2. Remove the six screws securing the enclosure. Open the enclosure.
3. Unplug the thermistor assembly from the PC board.
4. Cut the cable ties holding the thermistor wires to the wire harness and enclosure standoff. Be careful not to cut the insulation on the standoff.
5. Remove the filter retainer and nut. Remove the filter.
6. Remove the ten screws securing the filter inlet plate.
7. Remove the two screws securing the terminal block. Remove the screw and lock washer securing the ground wire to the backing plate.
8. Depending on the method of mounting, either use wire cutters to remove the spring clip, or loosen the speed nut securing the thermistor assembly to the filter inlet plate.
9. Replacement thermistor assemblies may be slightly larger than the original. If necessary, open hole slightly, to $\frac{1}{4}$ ".
10. Replace the thermistor assembly. Secure it with the new speed nut supplied with the thermistor assembly.
11. Place filter inlet plate back on top of the scroll. Secure the ten screws.
12. Replace the terminal block. Reconnect the ground wire to the backing plate. Make sure the lock washer is reinstalled.
13. Plug the thermistor assembly into the control board. Use the cable ties supplied with the thermistor assembly to hold the thermistor wires to the PC board wire harness and enclosure standoff.
14. Replace the HEPA filter. Secure it with the filter retainer and nut.
15. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

10.4 Replacing the motor

To replace the motor:

1. **Unplug the Power Unit.**
2. Remove the six screws securing the enclosure. Open the enclosure.
3. Remove the filter retainer and nut. Remove the filter.
4. Remove the ten screws securing the filter inlet plate.
5. Remove the screw securing the ground wire to the backing plate. Remove the two screws securing the terminal block.
6. Carefully lift the filter inlet plate, exposing the blower wheel.
7. Remove the blower wheel using a $\frac{1}{8}$ " hex wrench through hole in one blade of blower wheel.
8. Cut wire tie holding wiring harness (fig. 11).
9. Unplug terminals from the motor.
10. Remove the two #8 screws and two #8 nuts from the bottom of motor.
11. Loosen the two #8 screws on top of motor. Slide filter support bracket off. Loosen corresponding screws on new motor and replace filter support bracket. Tighten screws.
12. Remove and replace the motor.
13. Secure with mounting hardware.
14. Reconnect the terminals.
15. Secure wire harness to motor with a wire tie.
16. Reinstall the blower wheel, making sure there is 0.10" (2.5 mm) clearance between the wheel and the blower inlet ring (see fig. 9). NOTE: the hex screw must be aligned with the flat on the motor shaft.
17. Place the filter inlet plate back on top of the scroll. Secure the ten screws.
18. Replace the terminal block. Reconnect the ground wire to the backing plate; make sure the lock washer is installed.
19. Replace the HEPA filter. Secure it with the filter retainer and nut.

Section 10 - Repair Procedures (cont'd)

20. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

10.5 Replacing the I. V. Pole Mount Bracket

To replace the I. V. pole mount bracket:

1. **Unplug the Power Unit.**
2. Remove the six screws securing the enclosure. Open the enclosure.
3. Remove the two screws securing the terminal block from the backing plate.
4. Remove the two screws and the lock washer holding the I. V. pole mount bracket to the backing plate.
5. Remove the I. V. pole mount bracket from the rear half of the enclosure.
6. Insert new I. V. pole mounting bracket into rear half of the enclosure.
7. Replace the two screws and the lock washer into the backing plate and I. V. pole mounting bracket.
8. Replace the terminal block.
9. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

10.6 Replacing the Power Cord

To replace the power cord:

1. **Unplug the Power Unit.**
2. Disconnect the blue and brown wires from the circuit breaker and cut wire tie securing these wires.
3. Remove the top ground wire only (green with yellow stripe) from the filter inlet plate.
4. Using a pair of pliers, from the outside, gently squeeze the strain relief and pull it out.
5. Remove the power cord.
6. Attach strain relief to new power cord and insert with pliers into case.

NOTE: Replace the power cord only with the P/N listed on figure 11, page 26.

7. Connect brown and blue wires to the circuit breaker (refer to label on inside of case).
8. Reconnect ground wire to filter inlet plate.
9. Secure wires with wire tie provided.
10. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

10.7 Temperature Control PC Board

⚠ WARNING

The Temperature Control PC Board is pre-set at the factory. Do not attempt to calibrate it. Adjustment of the Control PC Board in the field could result in patient injury.

To replace the PC. board assembly (item 11, fig. 10):

1. **Unplug the Power Unit.**
2. Remove the six screws securing the enclosure. Open the enclosure.
3. Cut the four cable ties which secure the PC board wires together.
4. Unplug the following wires from the PC board assembly at the terminal block (item 27, fig. 11):
 - Yellow wire from TB1-1C
 - Gray wire from TB1-2C
 - Red wire from TB1-3C
 - White wire from TB1-4C
 - Black wire from TB1-5C
5. Unplug the main harness (5-pin connector) from PC board.
6. Unplug the 2-pin harness from the PC board.
7. Remove the six screws securing the PC board assembly.
8. Remove the old PC board assembly and install the new PC board assembly.
9. Reassemble in reverse order.
10. Perform the *FUNCTIONAL CHECK AND SAFETY INSPECTION* (section 7, pp. 8-15).

Section 11 - Drawings/Parts Lists

| Item | Description | Part Number |
|------|-------------------------|-------------|
| 1 | HEPA filter | 78029-000 |
| 2 | Filter retainer nut | 91396-005 |
| 3 | Heater | 77947-000 |
| 4 | RT1 Thermistor assembly | 77942-000 |
| 5 | Blower wheel | 91369-000 |
| 6 | a. Clip | 90228-004 |
| | b. Ratchet | 91428-002 |
| 7 | Label, Caution | 08985-000 |
| 8 | Bed rail hook | 77943-000 |

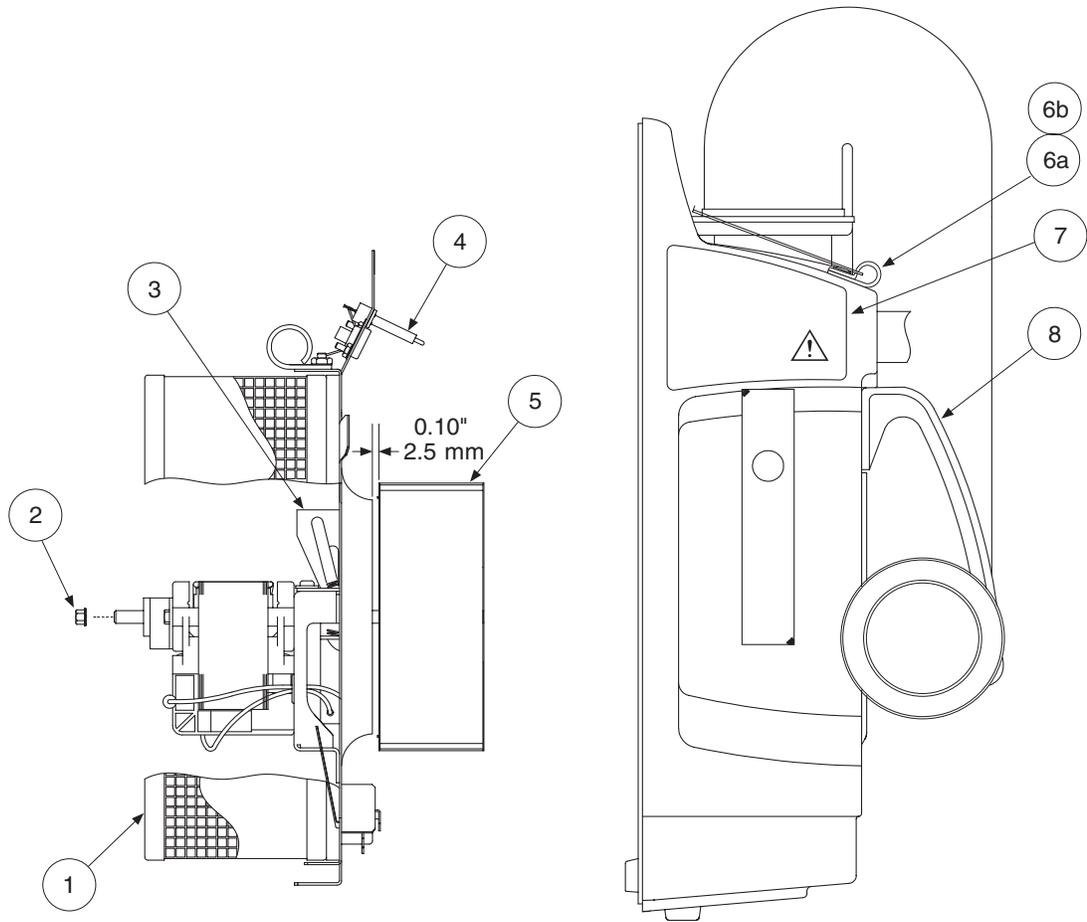


Figure 9 - TC3146 Detail Drawing

Section 11 - Drawings/Parts Lists (cont'd)

| Item | Description | Part Number |
|------|---------------------------------------|-------------|
| 9 | Rubber foot | 77944-000 |
| 10 | Standoff | 77945-000 |
| 11 | P. C. board assembly kit | 78436-000 |
| 12 | Mounting screws | 77946-000 |
| 13 | Front housing kit (includes labeling) | 78437-000 |
| 14 | Circuit breaker | 90961-007 |
| -- | Label, Control Panel | 09297-001 |
| -- | Label, UL | 12771-000 |
| -- | Label, On/Off | 09023-000 |
| | TC20 Test Tool | 08606-000 |

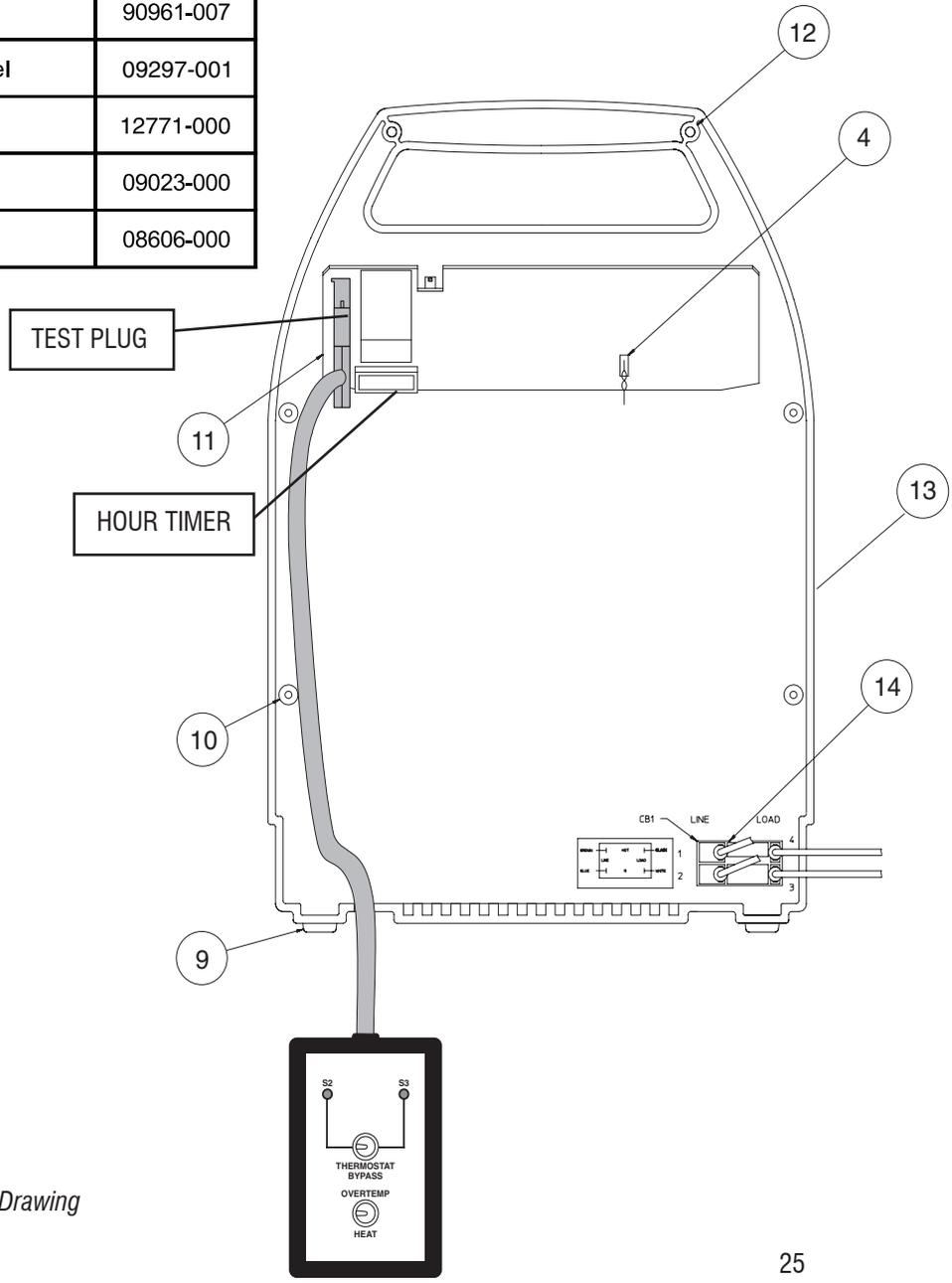
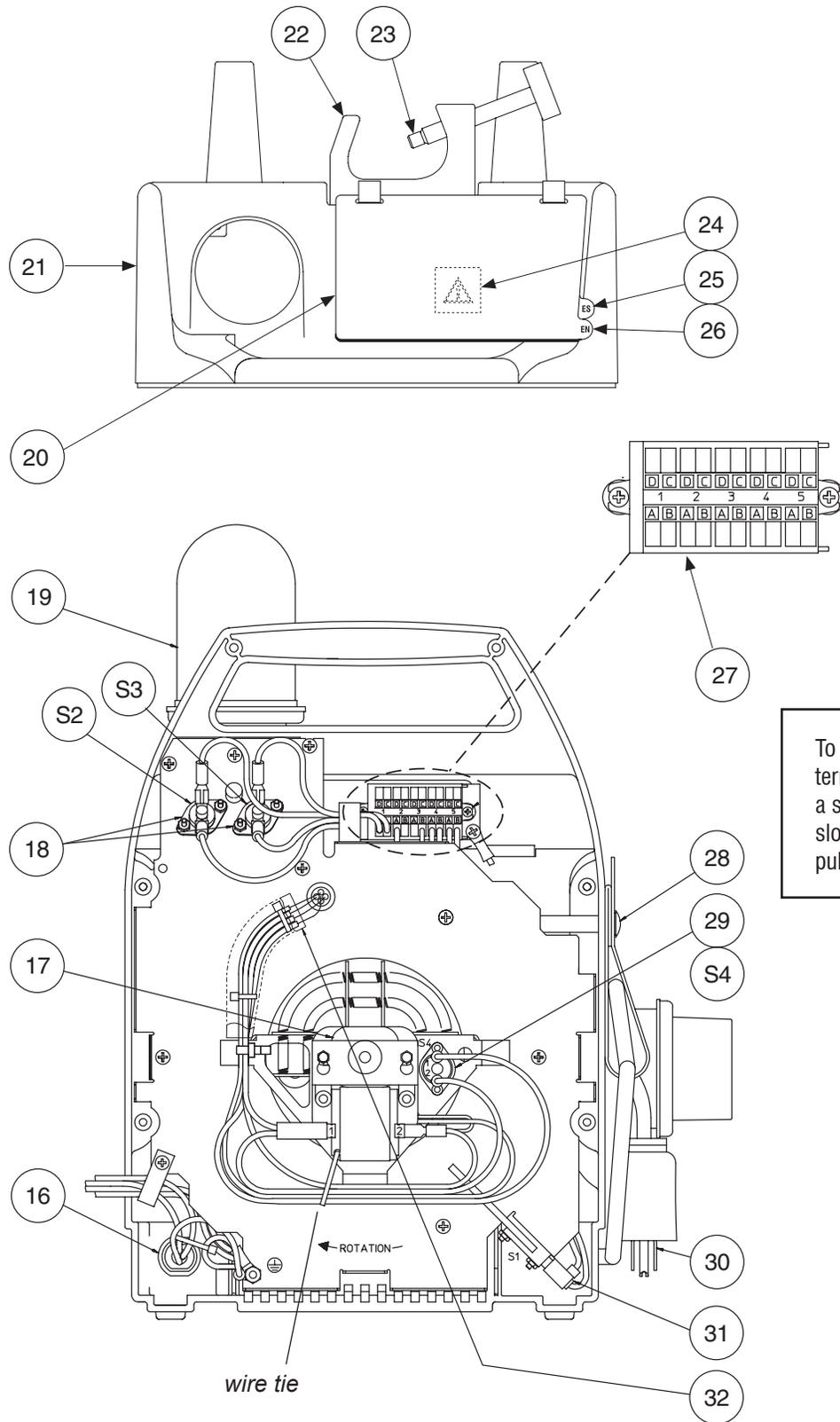


Figure 10 -
TC3146 Detail Drawing

Section 11 - Drawings/Parts Lists (cont'd)



To release wires from terminal block, insert a small screwdriver in slot nearest wire and pull towards center.

Figure 11 - TC3146 Detail Drawing

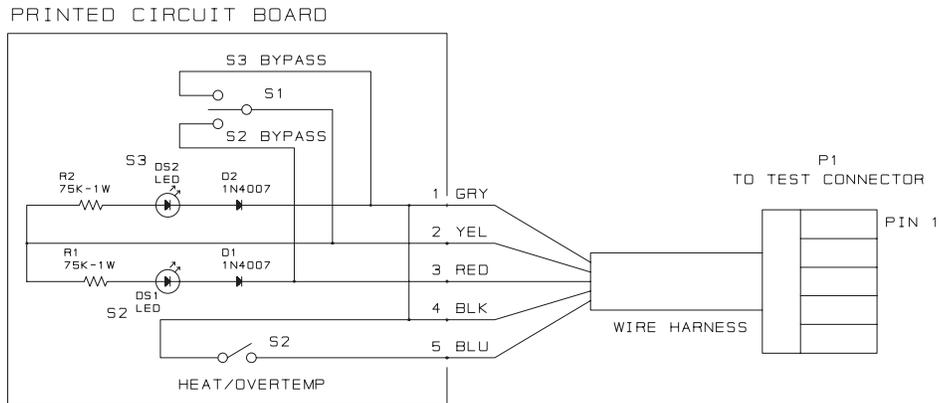
Section 11 - Drawings/Parts Lists (cont'd)

| Item | Description | Part Number |
|------|--------------------------------------|-------------|
| 16 | Strain relief bushing | 90426-001 |
| 17 | Motor kit | 77949-000 |
| 18 | Patient limit thermostats (S2, S3) | 91323-005 |
| 19 | Hose assembly | 78423-000 |
| 20 | Kit, card/label replacement | 78109-000 |
| 21 | Rear housing kit (includes labeling) | 78438-000 |
| 22 | I. V. pole clamp assembly | 08614-000 |
| 23 | Toggle shoe | 91439-000 |
| 24 | Label, caution | 09960-000 |

| Item | Description | Part Number |
|------|--|-------------|
| 25 | Card, contraindication, Spanish/Portuguese | 09873-000 |
| 26 | Card, contraindication, English/French | 09872-000 |
| 27 | Terminal block | 91346-000 |
| 28 | Cord strap assembly | 03791-000 |
| 29 | Heater thermostat (S4) | 78025-000 |
| 30 | Power cord assembly | 08374-000 |
| 31 | Interlock switch | 91375-000 |
| 32 | Sleeving, 4 1/2" LG | 81054-000 |

(see Figure 11)

Section 12 - TC20 Test Tool Schematic



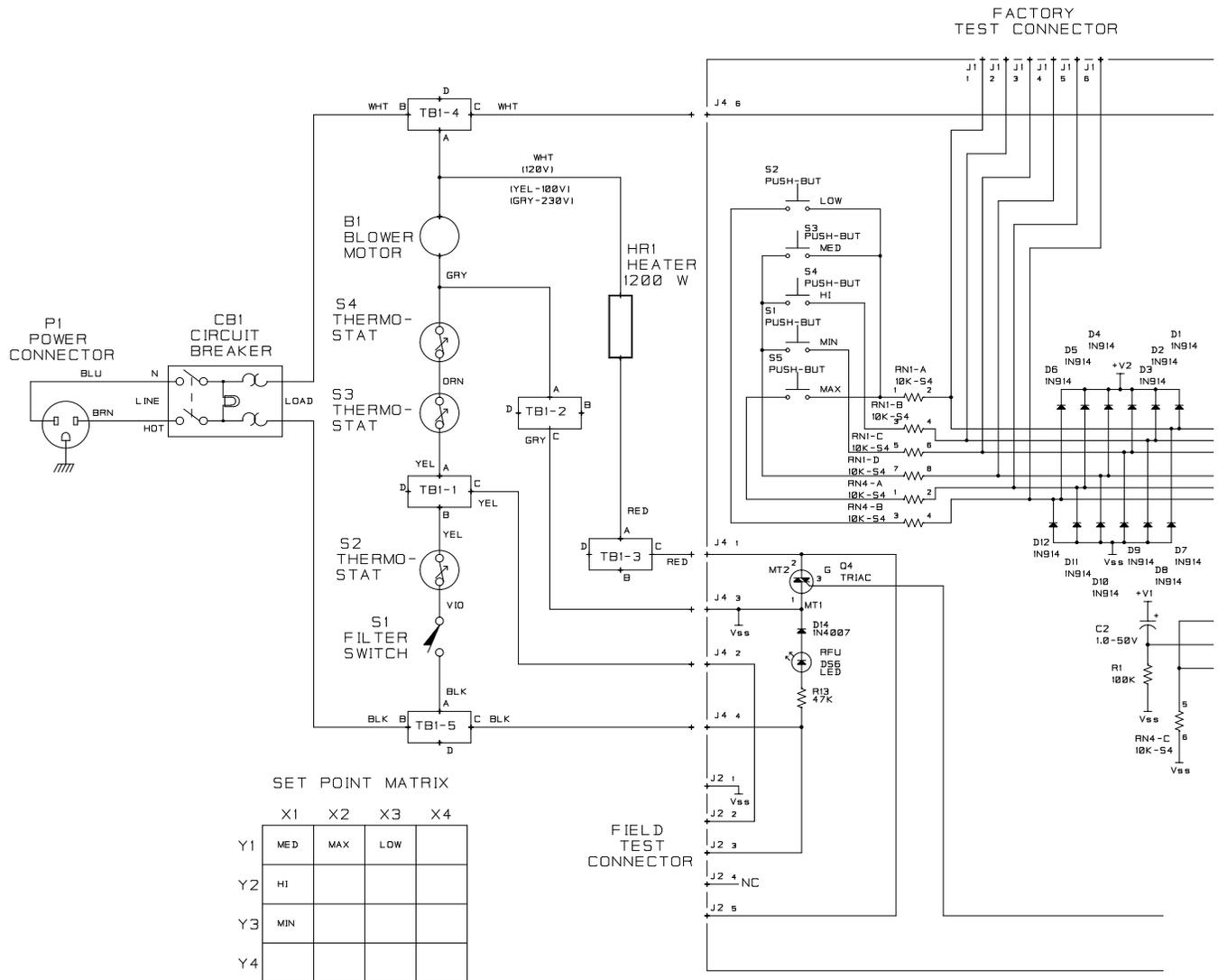
NOTES:

1. ALL RESISTANCES ARE IN OHMS.
2. THIS DRAWING CORRELATES TO DRAWING (B) 08016 REVISION: A.
3. CAUTION: THE ACTUAL ASSEMBLIES ARE SUSCEPTIBLE TO DAMAGE FROM ELECTROSTATIC DISCHARGE. HANDLING OF THE ASSEMBLIES SHALL BE ACCOMPLISHED WITH ADEQUATE GROUNDING PROVISIONS TO PREVENT ELECTROSTATIC DISCHARGE DAMAGE.



Figure 12 - TC20 Test Tool Schematic

Section 13 - Wiring Diagram



NOTES:

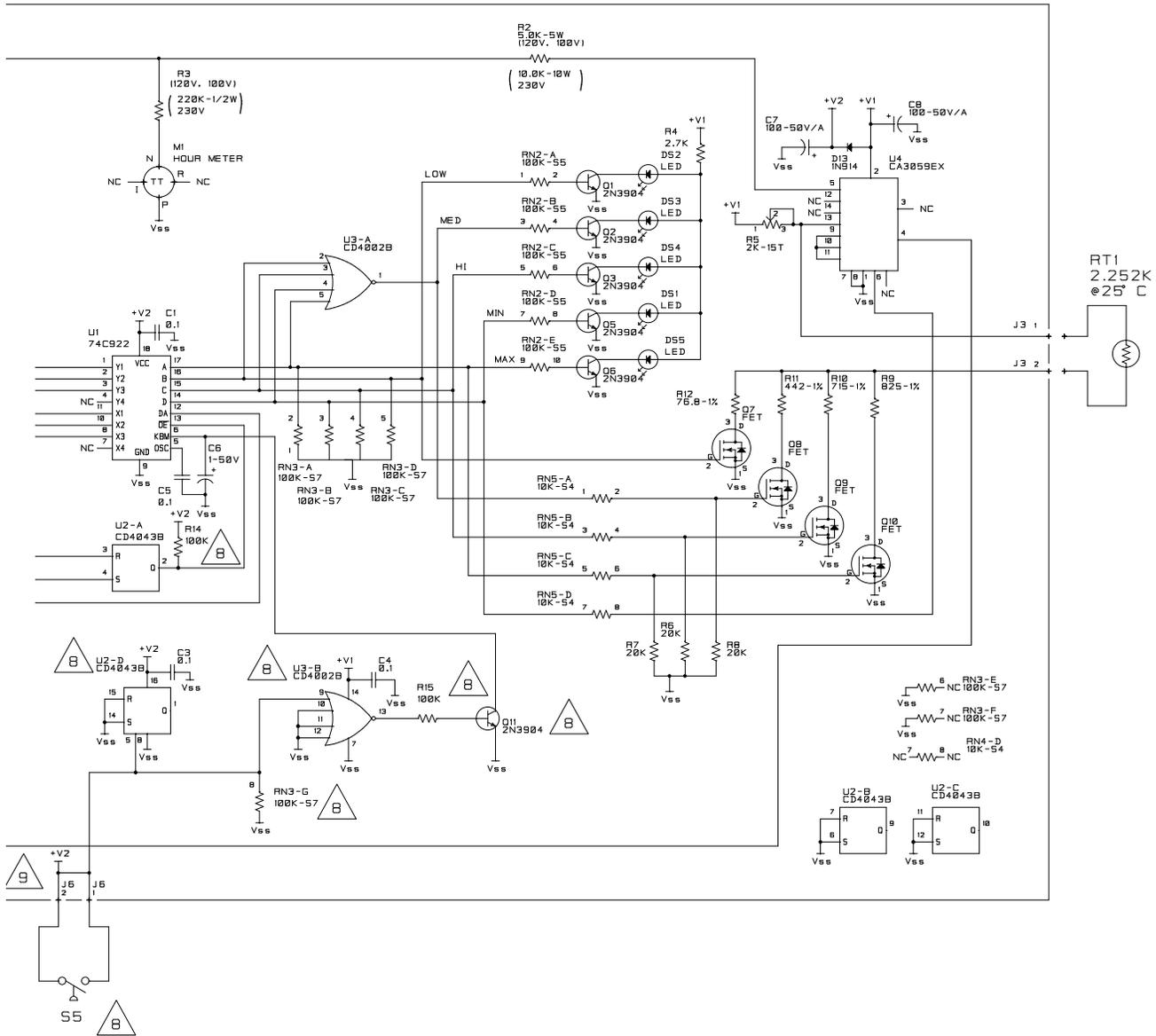
1. V_{SS} IS THE HOT SIDE OF THE AC LINE. DO NOT CONNECT GROUND LEADS OF PROTECTIVELY EARTHED MEASURING DEVICES TO THIS POINT.
2. V₁, V₂: 6-7 VDC.
3. ALL RESISTANCES ARE IN OHMS.
4. ALL RESISTORS ARE 5% UNLESS NOTED.
5. ALL CAPACITORS ARE IN MICROFARADS UNLESS NOTED.
6. CAUTION: THE ACTUAL ASSEMBLIES ARE SUSCEPTIBLE TO DAMAGE FROM ELECTROSTATIC DISCHARGE. HANDLING OF THE ASSEMBLIES SHALL BE ACCOMPLISHED WITH ADEQUATE GROUNDING PROVISIONS TO PREVENT ELECTROSTATIC DISCHARGE DAMAGE.
7. THIS DRAWING CORRELATES TO DRAWING (D) 12425 REVISION: -.



8. THE FOLLOWING COMPONENTS ARE USED ONLY ON OPTIONAL INTERLOCK FEATURE: R14, R15, RN3-G, U2-D, U3-B, Q11 AND S5 OFF BOARD.
9. THE CONNECTION BETWEEN J6 1 AND J6 2 IS NOT USED ON OPTIONAL INTERLOCK FEATURE.

Figure 13 - Wiring Diagram

Section 13 - Wiring Diagram (cont'd)





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