
Foreword

This service manual is the result of the dedication of The Dometic Corporation and its engineers in giving service people the necessary instruction for making accurate analyses of certain conditions. Provided is a diagnostic chart leading a qualified mechanic into the service manual pages to locate and solve symptoms which may occur. Dometic has continued its commitment in providing service people with this, the most up-to-date information about servicing Dometic RV accessories.

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This program will address the most common system problems associated with the Duo-Therm Basement Air Conditioners and Heat Pumps supplied by The Dometic Corporation. Our intent is to provide you with a guideline of checks to make, should you encounter one of the following symptoms.

SYMPTOM	CAUSE	REFER TO	STEP
<u>MODEL 390XX.XXX SECTION</u>			
1. Unit does not run: No fan, no compressor	Operation AC Volts Breaker Wiring Transformer Thermostat	1.1 2.1 2.2 2.3 4.10 4.1	A,B
2. Fan operates: Compressor will not come on (does not "hum")	Operation Thermostat Wiring Relay Compressor	1.1 4.1 2.3 4.14 4.7	H
3. Fan operates: Compressor tries to start, cycles "OFF" and "hums" again, or blows circuit breaker.	AC Volts PTCR Start Capacitor Run Capacitor Overload Protector Compressor	2.1 4.6 4.5 4.4 4.8 4.7	
4. Fan operates: Compressor runs for a short while, cycles "OFF", cycles back "ON".	Short Cycle Air Flow Obstructions Air Distribution System Overload Protector Compressor Refrigerant System	5.1 5.2 5.3 4.8 4.7 7.1	A
5. Compressor runs: No fan	Wiring Thermostat Relay Run Capacitor Motor	2.3 4.1 4.14 4.4 4.3	A,B F
6. Evaporator freezes	Operation Air Flow Obstruction Air Distribution System Low Charge Capillary Tube Blockage Evaporator Blockage	1.1 5.2 5.3 7.1 7.2 7.2	A
7. Insufficient cooling, compressor runs constantly	Air Flow Obstruction Air Distribution System Heat Gain/Heat Loss Refrigerant System Compressor	5.2 5.3 6.1 7.1 4.7	A
8. Insufficient cooling with reduced air output	Air Flow Obstruction Air Distribution System	5.2 5.3	A

SYMPTOM	CAUSE	REFER TO	STEP
<u>(Model 390XX.XXX Section Continued)</u>			
9. Excessive cooling	Thermostat Wiring Relay	4.1 2.3 4.14	A,B F,H
10. Noisy operation	Loose Parts Tubing Vibration	6.2 6.3	
<u>MODEL 391XX.XXX SECTION</u>			
1. Unit does not run: No fan, no compressor	Operation AC Volts DC Volts Breaker Wiring Thermostat	1.2 2.1 3 2.2 2.3 4.1	C
2. Fan operates: Compressor will not come on (does not "hum")	Operation Thermostat Wiring Relay Compressor	1.2 4.1 2.3 4.14 4.7	C D
3. Fan operates: Compressor tries to start, cycles "OFF" and "hums" again or blows circuit breaker	AC Volts PTCR Start Capacitor Run Capacitor Overload Protector Compressor	2.1 4.6 4.5 4.4 4.8 4.7	
4. Fan operates: Compressor runs for a short while, cycles "OFF", cycles back "ON"	Short Cycle Air Flow Obstruction Air Distribution System Overload Protector Compressor Refrigerant System	5.1 5.2 5.3 4.8 4.7 7.1	A
5. Compressor runs, no fan	Wiring Thermostat Relay Run Capacitor Motor	2.3 4.1 4.14 4.4 4.3	C E
6. Fan runs, but not on all speeds	Wiring Thermostat Relay Motor	2.3 4.1 4.14 4.3	C E

SYMPTOM	CAUSE	REFER TO	STEP
(MODEL 391XX.XXX SECTION CONTINUED)			
7. Evaporator freezes	Operation 1.2 Air Flow Obstruction 5.2 Air Distribution System 5.3 Low Charge 7.1 Capillary Tube Blockage 7.2 Evaporator Blockage 7.2		A
8. Insufficient cooling, compressor runs constantly	Air Flow Obstruction 5.2 Air Distribution System 5.3 Heat Gain/Heat Loss 6.1 Refrigerant System 7.1 Compressor 4.7		A
9. Insufficient cooling with reduced air output	Air Flow Obstruction 5.2 Air Distribution System 5.3		A
10. Excessive cooling	Thermostat 4.1 Wiring 2.3 Relay 4.14		C
11. Noisy operation	Loose Parts 6.2 Tubing Vibration 6.3		D
<u>MODELS 393XX.XXX SECTION</u>			
1. Unit does not run; No fan, no compressor	Operation 1.3 AC Voltage 2.1 Breaker 2.2 Cable Assembly 4.2 Thermostat 4.1 Relay Board 4.11		E
2. Fan operates: compressor will not come on (does not "hum")	Operation 1.3 Cable Assembly 4.2 Compressor 4.7 Thermostat 4.1 Changeover Thermostat 4.12 Relay Board 4.11		E
3. Fan operates: compressor tries to start, cycles "OFF" and "hums" again, or blows circuit breaker	AC Voltage 2.1 PTCR 4.6 Start Capacitor 4.5 Run Capacitor 4.4 Overload Protector 4.8 Compressor 4.7		

SYMPTOM	CAUSE	REFER TO	STEP
(MODEL 393XX.XXX SECTION CONTINUED)			
4. Fan operates: compressor runs for a short while, cycles "OFF", cycles back "ON"	Short Cycle Air Flow Obstruction Air Distribution System Overload Protector Compressor Refrigerant System	5.1 5.2 5.3 4.8 4.7 7.1	A
5. Compressor runs: no fan	Wiring Run Capacitor Motor Thermostat Relay Relay Board	2.3 4.4 4.3 4.1 4.11 4.14	E E
6. Fan runs: but not on all speeds	Wiring Motor Cable Assembly Thermostat Relay Board	2.3 4.3 4.2 4.1 4.11	E
7. Inside coil freezes	Operation Air Flow Obstruction Air Distribution System Low Charge Capillary Tube Blockage Reversing Valve	1.3 5.2 5.3 7.1 7.2 4.9	A
8. Insufficient cooling or heating: compressor runs constantly	Air Flow Obstruction Air Distribution System Heat Gain/Heat Loss Refrigerant System Compressor	5.2 5.3 6.1 7.1 4.7	A
9. Insufficient cooling or heating with reduced air output	Air Flow Obstruction Air Distribution System	5.2 5.3	A
10. Excessive cooling or heating	Thermostat Cable Assembly Relay Board	4.1 4.2 4.11	E
11. Unit operates in wrong mode (cool instead of heat pump or reversed)	Operation Thermostat Reversing Valve	1.3 4.1 4.9	E
12. Noisy operation	Loose Parts Tubing Vibration	6.2 6.3	

SYMPTOM	CAUSE	REFER TO	STEP
<u>MODEL 39224.601 SECTION</u>			
1. Unit does not run: No fan, no compressor	Operation AC Voltage DC Voltage Breaker Cable Assembly Thermostat Relay	1.4 2.1 3 2.2 4.2 4.1 4.14	D A
2. Fan operates: Compressor will not come "ON" (does not "hum")	Operation Cable Assembly Relay Compressor	1.4 4.2 4.14 4.7	A
3. Fan operates: Compressor tries to start, cycles "OFF" and "hums" again, or blows circuit breaker.	AC Voltage PTCR Start Capacitor Run Capacitor Overload Protector Compressor	2.1 4.6 4.5 4.4 4.8 4.7	
4. Fan operates: Compressor runs for a short while, cycles "OFF", cycles back "ON"	Short Cycle Air Flow Obstruction Air Distribution System Overload Protector Compressor Refrigerant System	5.1 5.2 5.3 4.8 4.7 7.1	B
5. Compressor runs, no fan	Wiring Run Capacitor Motor Cable Assembly Thermostat Relay	2.3 4.4 4.3 4.2 4.1 4.14	D A
6. Fan runs, but not on all speeds	Wiring Motor Cable Assembly Thermostat Relay	2.3 4.3 4.2 4.1 4.14	D A
7. Evaporator freezes	Operation Air Flow Obstruction Air Distribution System Low Charge Capillary Blockage Evaporator Blockage	1.4 5.2 5.3 7.1 7.2 7.2	B
8. Insufficient cooling: Compressor runs constantly	Air Flow Obstruction Air Distribution System Heat Gain/Heat Loss Refrigerant System Compressor	5.2 5.3 6.1 7.1 4.7	B

SYMPTOM	CAUSE	REFER TO	STEP
(MODEL 39224.601 SECTION CONTINUED)			
9. Insufficient cooling with reduced air output	Air Flow Obstruction Air Distribution System	5.2 5.3	B
10. Excessive cooling	Relay Cable Assembly Thermostat	4.14 4.2 4.1	A D
11. Noisy operation	Loose Parts Tubing Vibration	6.2 6.3	
<u>MODEL 39424.601 SECTION</u>			
1. Unit does not run: No fan, no compressor	Operation AC Voltage DC Voltage Breaker Cable Assembly Relay Board Thermostat	1.5 2.1 3 2.2 4.2 4.11 4.1	E
2. Fan operates; compressor will not come on (does not "hum")	Operation Cable Assembly Compressor Relay Board Thermostat	1.5 4.2 4.7 4.11 4.1	E
3. Fan operation: Compressor tries to start, cycles "OFF", and "hums" again, or blows circuit breaker	AC Voltage PTCR Start Capacitor Run Capacitor Overload Protector Compressor	2.1 4.6 4.5 4.4 4.8 4.7	
4. Fan operates: Compressor runs for a short while, cycles "OFF", then cycles back "ON"	Short Cycle Air Flow Obstruction Air Distribution System Overload Protector Compressor Refrigerant System	5.1 5.2 5.3 4.8 4.7 7.1	B
5. Compressor runs: No fan	Wiring Run Capacitor Motor Relay Board Thermostat	2.3 4.4 4.3 4.11 4.1	E
6. Fan runs: But not on all speeds	Wiring Motor Cable Assembly Relay Board Thermostat	2.3 4.3 4.2 4.11 4.1	E

SYMPTOM	CAUSE	REFER TO	STEP
(MODEL 39424.601 SECTION CONTINUED)			
7. Inside coil freezes	Operation Air Flow Obstruction Air Distribution System Low Charge Capillary Tube Blockage Reversing Valve	1.5 5.2 5.3 7.1 7.2 4.9	B
8. Insufficient cooling or heating: Compressor runs constantly	Air Flow Obstruction Air Distribution System Heat Gain/Heat Loss Refrigerant System Compressor	5.2 5.3 6.1 7.1 4.7	B
9. Insufficient cooling or heating with reduced air output	Air Flow Obstruction Air Distribution System	5.2 5.3	B
10. Excessive cooling or heating	Cable Assembly Relay Board Thermostat	4.2 4.11 4.1	E
11. Unit operates in wrong mode (cool instead or heat pump or reversed)	Operation Thermostat Reversing Valve	1.5 4.1 4.9	E
12. Noisy Operation	Loose Parts Tubing Vibration	6.2 6.3	

SECTION 1 OPERATION

1.1 MODELS 390XX.XXX

This unit functions like a residential air conditioner.

Set the **System Switch** to COOL.

Set the **Temperature Lever** to your comfort level.

Set the **Fan Switch** to:

"AUTO": The fan cycles off and on with the compressor.

"ON": The fan will run continuously. The compressor will turn off when the room temperature is low enough to satisfy the thermostat setting.

Air Circulation Without Cooling:

Set the system switch to **"OFF"**;

Set the fan switch to **"ON"**. The fan will run continuously, circulating air.

FURNACE TO THERMOSTAT WIRING

When connecting a gas furnace to Dometic's **Heat/Cool** thermostat, the **"W"** and **"R"** terminals are used. This means there will be two wires on the **"R"** terminal (one wire from the furnace and one wire from the air conditioner).

FURNACE OPERATION

Set the fan switch to **"AUTO"**

Set the system switch to **"HEAT"**

Set the **temperature lever** to your comfort level.

The furnace will come on and heat your coach as required. The furnace and blower will cycle ON and OFF as needed to maintain your comfort.

1.2 MODELS 391XX.XXX

This unit functions like a residential air conditioner.

COOLING

Set the system switch to **"COOL"**

Set the temperature lever to your comfort level

Set the fan speed switch to **"HI"** or **"LO"** as desired.

Set the fan auto switch to:

"ON", the fan will run continuously. The cooling unit will turn OFF when the room temperature is low enough to satisfy the thermostat setting from Item 2 above.

"AUTO", The fan will cycle OFF and ON with the cooling unit.

HEATING

Set the system switch to **"HEAT"**.

Set the temperature lever to your comfort level.

Set the fan speed switch to **"HI"** or **"LO"** as desired.

Set the fan **"AUTO"** Switch to:

"ON", the fan will run continuously helping the furnace circulate air.

"AUTO", The fan will not operate.

AIR CIRCULATION with or without cooling or heating:

Set the system switch to

"OFF",

Set the fan mode switch to

"ON"

Set the fan speed to **"HI"** or

"LO" as desired

OFF

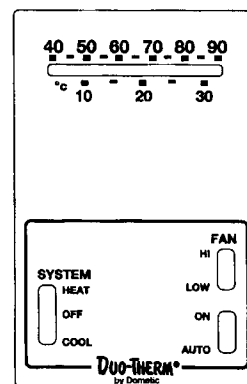
Set the system switch to

"OFF",

Set the fan mode switch to

"AUTO".

THERMOSTAT FACE PLATE



1.3 MODEL 393XX.XXX

BIMETAL THERMOSTAT OPERATION

Cooling:

Set the **SYSTEM SWITCH** to COOL.

Set the temperature **LEVER** to your comfort level.

Set the **FAN** switch to:

"AUTO", the fan cycles off and on with the compressor.

"ON", the fan will run continuously. The compressor will turn off when the room temperature is cool enough to satisfy the thermostat setting.

Heating:

Set the system switch to **HEAT**:

Set the temperature **LEVER** to your comfort level.

Set the **FAN** switch to:

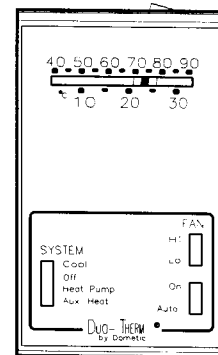
"AUTO", the fan will cycle off and on with the compressor.

"ON", The fan will run continuously. The compressor will cycle off and on with thermostat demand.

Auxiliary Heat:

Set the system switch to **AUX.HEAT**.

Set the fan switch to **AUTO**.



BIMETAL

NOTE: The auxiliary heat position is only used if:

- You have a factory installed furnace operating from the heat pump system thermostat.
- The outside temperature is above 40 degrees and you wish to operate your furnace.
- For quick interior warm up.
- There is no 115 volt AC power available to operate your heat pump and you must operate the furnace for your comfort.

Fan:

- To circulate air without heating or cooling:
Set the SYSTEM SWITCH to OFF.
Set the FAN SWITCH to ON.

Hi/Low:

- HIGH: Fan speed position
- LOW: Fan speed position

DIGITAL THERMOSTAT OPERATION

Your air conditioner is operated from the control panel of the electronic wall thermostat. When the furnace is connected to this thermostat, it will operate from the same control panel.

Identification and operational descriptions for all control panel switches and display are listed below:

Liquid Crystal Display: This display will be illuminated any time the system is in operation.

The display shows the operator both the mode of the display (indicated by the arrow at the left side of the display), and the temperature for that mode.

There are three display modes: ACTUAL, COOL and HEAT.

The operator may choose the mode he desires to view by depressing the "MODE" switch. Each time the MODE switch is depressed, the display advances to the next mode. If the display is left in either COOL or HEAT, the thermostat will automatically return the display to ACTUAL in approximately three minutes.

A description of the three modes is:

ACTUAL: When in actual mode, the display is indicating current room temperature.

COOL SET: When in COOL mode, the display is indicating the current cooling set-point temperature. At this time the cooling system set-point temperature may be adjusted up or down to meet the individual's comfort level. See "Adjusting Set-point" for further instructions.

HEAT SET: When in the HEAT mode, the display is indicating the current heating system set-point temperature. At this time, the heating system set-point temperature may be adjusted up or down to meet the operator's comfort level. See "Adjusting Set-Point" for further instructions.

All three display modes can be accessed without affecting the operation of the system. The system operation will remain normal unless a change is made to the set-point to force a change in the system operation.

System Switch: The system switch has four positions to control the operation of the heating and cooling systems. They are as follows:

COOL: When in the COOL position, the compressor will cycle from the cooling system set-point. Blower operation will be controlled by the position of the Cooling Fan Switch.

HEAT: When in the heat position, the heating system will cycle from the heating system set-point. The heating blower will operate per the heating system manufacturer specifications.

OFF: When in the OFF position, no thermostat or system operation will occur. The liquid crystal will indicate room temperature until backup power is depleted (approximately 2 minutes).

AUXILIARY HEAT:

Set the system switch to AUX. HEAT.

Set the FAN switch to AUTO.

NOTE: The AUXILIARY HEAT position is only used if:

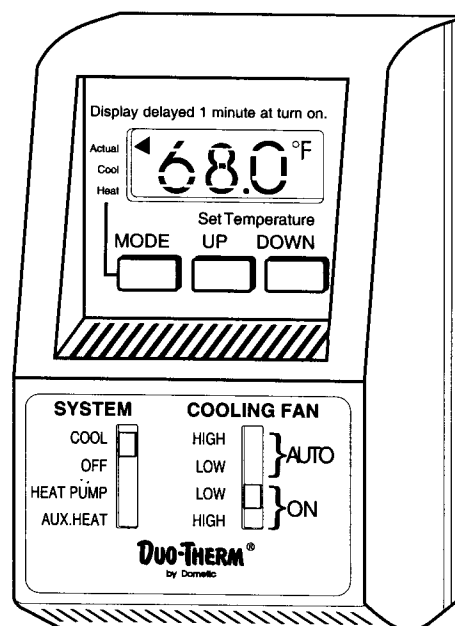
You have a factory installed furnace operating from the heat pump system thermostat.

The outside temperature is above 40 degrees and you wish to operate your furnace.

For quick interior warm-ups.

There is no 115 volt AC power available to operate your heat pump and you must operate the furnace for your comfort.

DIGITAL THERMOSTAT



FAN SWITCH: The Fan Switch has four positions from which to control the operation of the heat pump blower. The fan switch controls operation of the blower only after the system switch is placed into the COOL or HEAT PUMP position.

HIGH AUTO: When in the high auto position, the heat pump blower operates at high speed and cycles off and on with the compressor.

LOW AUTO: When in low auto position, the heat pump blower operates at low speed and cycles off and on with the compressor.

HIGH and LOW ON: When in the high or low position, the heat pump blower operates continuously. The compressor cycles off and on as needed.

MOMENTARY SWITCHES: There are three momentary switches. Momentary switches are activated by depressing the center of the switch. A description of these three switches follows:

MODE: Depressing this switch advances the display mode from ACTUAL to COOL, HEAT and back to ACTUAL. When using this switch, you are indicating your desire to check or adjust the set-point temperatures for cooling or heating. The cool setting determines the temperature at which the air conditioner will start to operate. The heat setting determines the temperature at which the heating system will start to operate.

UP: Depressing this switch increases the temperature set-point.

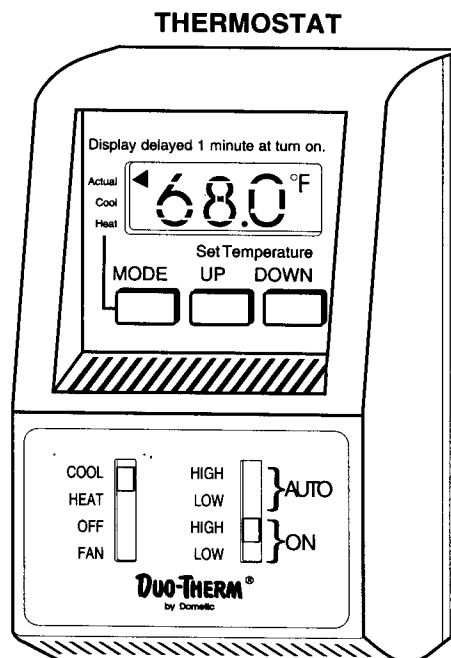
DOWN: Depressing this switch decreases the temperature set-point.

To adjust the set-point for heating or cooling, press the MODE button until the arrow on the display indicates the desired set-point you wish to change: COOL or HEAT. The display will indicate the current set-point of the thermostat. Press UP or DOWN to change the set-point. Once the new desired set-point is displayed, press the MODE button until the arrow is pointing to ACTUAL. If the thermostat is left in the COOL or the HEAT mode the display will return to ACTUAL in about three minutes. After the display returns to ACTUAL, it takes 15 to 30 seconds for the thermostat to recognize the changes made to the setpoint.

1.4 MODEL 39224.601

AIR CONDITIONER & THERMOSTAT

This packaged air conditioner contains a dual compressor refrigeration system. Each compressor is connected to a separate refrigeration circuit and air system. The system can be operated with a single compressor when the cooling requirement is low, or with two compressors when maximum cooling performance is required.



This air conditioner operates a two-stage cooling system. The first compressor and refrigeration circuit is referred to as "**Stage 1 Cooling**". The second compressor and refrigeration circuit and air system is referred to as "**2nd Stage Cooling**". The first and second stage cooling will operate as indicated below.

1st Stage Cooling (the first compressor and air system) will operate when:

The thermostat is calling for cooling.
 Power is being supplied by either shoreline or the on-board generator.

2nd Stage Cooling (the second compressor and air system) will operate when:

The thermostat senses room temperature is two degrees higher than set point.

The vehicle is being powered by the on-board generator. A 30 amp shoreline by itself will not provide enough power to operate the 1st and 2nd Stage cooling.

Switching and control of the 1st and 2nd Stage cooling is automatic. When operating from shoreline, the system automatically limits operation to 1st Stage cooling only. When the shoreline is plugged into the on-board generator, the system automatically allows 1st and 2nd Stage cooling. However, if powering both systems from the generator and cooling demand does not required both systems to operate, Stage 2 will shut down and only Stage 1 will operate.

THERMOSTAT:

This thermostat controls 12 volt DC heating and air conditioning systems. It can control one stage of heat and two stages of cooling. Changeover from heating to cooling is operator controlled — the thermostat can not make this change. Time delay circuits have been incorporated to protect the cooling system components.

The time delay is 3 minutes between "OFF" and "ON" cycles. There is a 30 second delay when the compressors turn on. This allows time for the generator to stabilize on initial starting. The balance of the delay (2.5 minutes) occurs when the compressor cycles off. This is to allow the compressor pressures to balance before restarting. There is a 30 second delay and 2 degrees between 1st and 2nd stage cooling operation.

OPERATION

Your air conditioner is operated from the control panel of the electronic wall thermostat. When the furnace is connected to this thermostat, it will operate from the same control panel.

Identification and operational descriptions for all control panel switches and display are listed below: (Refer to Figure 6A)

A. LIQUID CRYSTAL DISPLAY: This display will be illuminated any time the system is in operation.

The display shows the operator both the mode of the display (indicated by the arrow at the left side of the display) and the temperature for that mode. There are three display modes: **ACTUAL**, **COOL** and **HEAT**. The operator may choose the mode to view by depressing the "**MODE**" switch. Each time the **MODE** switch is depressed, the display advances to the next mode. If the display is left in either **COOL** or **HEAT**, the thermostat will automatically return the display to **ACTUAL** in approximately three minutes.

A description of the three modes is:

ACTUAL: When in this mode, the display is indicating current room temperature.

COOL SET: When in this mode, the display is indicating the current cooling set-point temperature. At this time the cooling system set-point temperature may be adjusted up or down to meet the individual comfort level. See "Adjusting Set-Point" for further instructions.

HEAT SET: When in this mode, the display is indicating the current heating system set-point temperature. At this time, the heating system set-point temperature may be adjusted up or down to meet the operator's comfort level. See "Adjusting Set-Point" for further instructions.

All three display modes can be accessed without affecting the operation of the system. The system operation will remain normal unless a change is made to the set-point to force a change in the system operation.

B. SYSTEM SWITCH: The system switch has four positions to control the operation of the heating and cooling systems. They are as follows:

COOL: When in the "**COOL**" position, 1st and 2nd Stage cooling will cycle from the cooling system set-point. Blower operation will be controlled by the position of the Cooling Fan Switch.

HEAT: When in this position, the heating system will cycle from the heating system set-point. The heating blower will operate per the heating system manufacturer specifications.

OFF: When in the "**OFF**" position, no thermostat or system operation will occur. The liquid crystal display will indicate room temperature until backup power is depleted (approximately 2 minutes).

FAN: When in the fan position, the blower will operate continuously at high speed.

C. COOLING FAN SWITCH: The fan switch has four positions to control the operation of the cooling blower. The fan switch controls operation of the cooling blower only after the system switch is placed into the **COOL** position.

With the system switch in any other position, the fan switch will have no effect on the operation of the cooling blower. Fan switch positions and their resulting functions are as follows:

HIGH AUTO: When in the high auto position, the cooling blower operates at high speed and cycles "OFF" and "ON" with the 1st Stage compressor. The 2nd Stage cooling will cycle "ON" and "OFF" as needed.

LOW AUTO: When in LOW AUTO position, the cooling blower operates at low speed and cycles "OFF" and "ON" with the 1st Stage compressor, the 2nd Stage cooling will cycle "ON" and "OFF" as needed.

HIGH and LOW ON: When in the HIGH or LOW ON positions, the cooling blower operates continuously. The 1st and 2nd Stage compressors cycle OFF and ON as needed.

D. MOMENTARY SWITCHES: Momentary Switches are activated by depressing the center of the switch. There are three momentary switches:

MODE: Depressing this switch advances the display mode from **ACTUAL** to **COOL**, **HEAT** and back to **ACTUAL**.

When using this switch, you are indicating your desire to check or adjust the set-point temperatures for cooling or heating.

The cooling setting determines the temperature at which the air conditioner will start to operate. The heat setting determines the temperature at which the heating system will start to operate.

UP: Depressing this switch increases the temperature set-point.

DOWN: Depressing this switch decreases the temperature set-point.

ADJUSTING SETPOINT

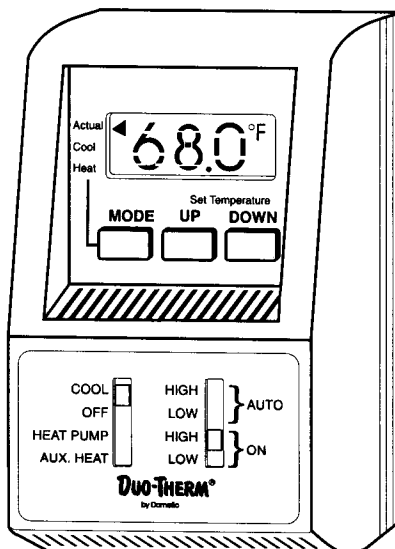
To adjust the setpoint for heating or cooling, press the MODE button until the arrow on the display indicates the desired set-point you wish to change, cool or heat. The display will indicate the current set-point of the thermostat. Press UP or DOWN to change the set-point. Once the new desired set-point is displayed, press the MODE button until the arrow is pointing to ACTUAL. If the thermostat is left in the COOL or HEAT mode, the display will return to ACTUAL in about 3 minutes. After the display returns to ACTUAL, it takes 15 to 30 seconds for the thermostat to recognize the changes made to the set-point.

1.5 MODEL 39424.601

AIR CONDITIONER & THERMOSTAT

This packaged air conditioning heat pump contains a dual compressor refrigeration system. Each compressor is connected to a separate refrigeration circuit and air system. The system can be operated with a single compressor when the cooling requirement is low, or with two compressors when maximum cooling performance is required.

THERMOSTAT



The first compressor and refrigeration circuit is referred to as "Stage 1 Cooling". The second compressor and refrigeration circuit and air system is referred to as "2nd Stage Cooling". The first and second stage cooling will operate as indicated below.

1st Stage Cooling (the first compressor and air system) will operate when:

The thermostat is calling for cooling.

Power is being supplied by either shoreline or the on-board generator.

2nd Stage Cooling (the second compressor and air system) will operate when:

The thermostat senses room temperature is two degrees higher than set point.

The vehicle is being powered by the on-board generator. A 30 amp shoreline by itself will not provide enough power to operate the 1st and 2nd Stage cooling.

Switching and control of the 1st and 2nd Stage cooling is automatic. When operating from shoreline, the system automatically limits operation to 1st Stage cooling only. When the shoreline is plugged into the on-board generator, the system automatically allows 1st and 2nd Stage cooling. However, if powering both systems from the generator and cooling demand does not require both systems to operate, Stage 2 will shut down and only Stage 1 will operate.

THERMOSTAT

This thermostat controls the 12V DC heating and air conditioning systems. It can control one stage of heat and two stages of cooling and has an auxiliary heat mode for gas heating. Changeover from heating to cooling is operator controlled. The thermostat can not make this change. Time delay circuits have been incorporated to protect the heat pump system components. The time delay is 3 minutes between off and on cycles. Thirty seconds delay is at the turn "ON" of the compressors. This is to allow time for the generator to stabilize on initial starting. The balance of the delay (2.5 minutes) occurs when the compressor cycles "OFF". This is to allow the compressor pressures to balance before restarting. There is a thirty second delay and two degrees between the first and second stage cooling operation.

OPERATION

Your air conditioner is operated from the control panel of the electronic wall thermostat. When the furnace is connected to this thermostat, it will operate from the same control panel.

Identification and operational descriptions for all control panel switches and display are listed below:

A. LIQUID CRYSTAL DISPLAY: This display will be illuminated any time the system is in operation.

The display shows the operator both the mode of the display (indicated by the arrow at the left side of the display) and the temperature for that mode. There are three display modes: **ACTUAL**, **COOL** and **HEAT**. The operator may choose the mode to view by depressing the **"MODE"** switch. Each time the **MODE** switch is depressed, the display advances to the next mode. If the display is left in either **COOL** or **HEAT**, the thermostat will automatically return the display to **ACTUAL** in approximately three minutes.

A description of the three modes is:

ACTUAL: When in this mode, the display is indicating current room temperature.

COOL SET: When in this mode, the display is indicating the current cooling set-point temperature. At this time the cooling system set-point temperature may be adjusted up or down to meet the individual comfort level. See "Adjusting Set-Point" for further instructions.

HEAT SET: When in this mode, the display is indicating the current heating system set-point temperature. At this time, the heating system set-point temperature may be adjusted up or down to meet the operator's comfort level. See "Adjusting Set-Point" for further instructions.

All three display modes can be accessed without affecting the operation of the system. The system operation will remain normal unless a change is made to the set-point to force a change in the system operation.

B. SYSTEM SWITCH: The system switch has four positions to control the operation of the heating and cooling systems. They are as follows:

COOL: When in the **"COOL"** position, 1st and 2nd Stage cooling will cycle from the cooling system set-point. Blower operation will be controlled by the position of the Cooling Fan Switch.

HEAT: When in this position, the heating system will cycle from the heating system set-point. The heating blower will operate per the heating system manufacturer specifications.

OFF: When in the **"OFF"** position, no thermostat or system operation will occur. The liquid crystal display will indicate room temperature until backup power is depleted (approximately 2 minutes).

AUX. HEAT: When in the auxiliary heat mode the gas furnace will heat your coach. The fan will operate per

manufacturer specifications. **NOTE: THE FAN SWITCH MUST BE IN THE "AUTO" POSITION WHEN OPERATING FROM THE AUX. HEAT MODE.**

C. FAN SWITCH: The fan switch has four positions from which to control the operation of the blower. The fan switch controls operation of the heat pump air conditioner blower.

HIGH AUTO: When in the high auto position, the cooling blower operates at high speed and cycles **"OFF"** and **"ON"** with the 1st Stage compressor. The 2nd Stage cooling will cycle **"ON"** and **"OFF"** as needed.

LOW AUTO: When in LOW AUTO position, the cooling blower operates at low speed and cycles **"OFF"** and **"ON"** with the 1st Stage compressor, the 2nd Stage cooling will cycle **"ON"** and **"OFF"** as needed.

HIGH and LOW ON: When in the HIGH or LOW ON positions, the cooling blower operates continuously. The 1st and 2nd Stage compressors cycle OFF and ON as needed.

E. MOMENTARY SWITCHES: Momentary Switches are activated by depressing the center of the switch. There are three momentary switches:

MODE: Depressing this switch advances the display mode from ACTUAL to COOL, HEAT and back to ACTUAL.

When using this switch, you are indicating your desire to check or adjust the set-point temperatures for cooling or heating.

The cooling setting determines the temperature at which the air conditioner will start to operate. The heat setting determines the temperature at which the heating system will start to operate.

UP: Depressing this switch increases the temperature set-point.

DOWN: Depressing this switch decreases the temperature set-point.

ADJUSTING SET-POINT

To adjust the set-point for heating or cooling, press the MODE button until the arrow on the display indicates the desired set-point you wish to change, cool or heat. The display will indicate the current set-point of the thermostat. Press UP or DOWN to change the set-point. Once the new desired set-point is displayed, press the MODE button until the arrow is pointing to ACTUAL. If the thermostat is left in the COOL or HEAT mode, the display will return to ACTUAL in about 3 minutes. After the display returns to ACTUAL, it takes 15 to 30 seconds for the thermostat to recognize the changes made to the set-point.

SECTION 2

AC VOLTAGE REQUIREMENTS

2.1 AC VOLTAGE

The unit is a 115V AC, 60 Hz. appliance. The proper operation range is between 103 volts and 126.5 volts. The voltage reading should be taken at the heat pump power supply leads. One test should be performed when the heat pump is turned OFF and another with it under a load. If the voltage is not within the proper operating range, it must be corrected before operating the heat pump.

NOTE: Models 39045.601 and 39115.616 are 50/60 Hz. units. On 50 Hz. power, 100 volts, the operation range is 90 to 110 volts, 50 Hz.



THIS IS AN ENERGIZED CIRCUIT. SHOCK CAN OCCUR IF NOT TESTED PROPERLY. TESTING TO BE DONE BY A QUALIFIED SERVICE TECHNICIAN.

NOTE: AC volts below 100 can cause relay points to weld closed.

Check for proper AC volts at the connections at the unit's electronic control box.

The dual units (Models 39224 and 39424) have two AC volt circuits to them. Verify that Circuit 1 is wired into CIR 1 terminal block, and Circuit 2 is wired into CIR 2 terminal block. Check for proper AC volts at each terminal block.

2.2 BREAKER



MAKE SURE THAT THE POWER SUPPLY TO THE UNIT IS DISCONNECTED BEFORE PERFORMING ANY WORK ON THE UNIT TO AVOID THE POSSIBILITY OF SHOCK INJURY OR DAMAGE TO THE EQUIPMENT.

The unit circuit is to be protected by a time delay fuse or HACR (heating, air conditioner, refrigerator) breaker. By taking an amp reading at the unit AC voltage supply line, you can determine if the breaker is tripping prematurely. Place a clamp-on type ammeter around the black wire from the breaker going to the unit. Turn on the unit and record amp draw. If the breaker trips before the rated amperage, replace the breaker.

2.3 WIRING



MAKE SURE THAT THE POWER SUPPLY TO THE UNIT IS DISCONNECTED BEFORE PERFORMING ANY WORK ON THE UNIT TO AVOID THE POSSIBILITY OF SHOCK INJURY OR DAMAGE TO THE EQUIPMENT.

MODELS		CIRCUIT PROTECTION
39015.601 39015.616		15 amp T.D. Fuse or 15 amp HACR Breaker
39025.502 39035.601 39045.601		20 amp T.D. Fuse or 20 amp HACR Breaker
39115.601 39115.602		15 amp T.D. Fuse or 15 amp HACR Breaker
39325.503 39325.502 39325.603 39335.616 39335.626		20 amp T.D. Fuse or 20 amp HACR Breaker
39225.601	Circuit 1	15 amp T.D. Fuse or 15 amp HACR Breaker
	Circuit 2	15 amp T.D. Fuse or 15 amp HACR Breaker
39424.601	Circuit 1	15 amp T.D. Fuse or 15 amp HACR Breaker
	Circuit 2	15 amp T.D. Fuse or 15 amp HACR Breaker

With the line circuit breaker turned OFF, check to see if the unit is wired correctly. Each unit is supplied with a wiring diagram. Check all wires for proper location and tight connections. If you have difficulty in reading wiring diagrams or schematics, please enroll in an electricity course at your local high school or college.

NOTE: BE SURE TO USE THE WIRING DIAGRAM FOR THE SPECIFIC MODEL OR UNIT YOU ARE DIAGNOSING.

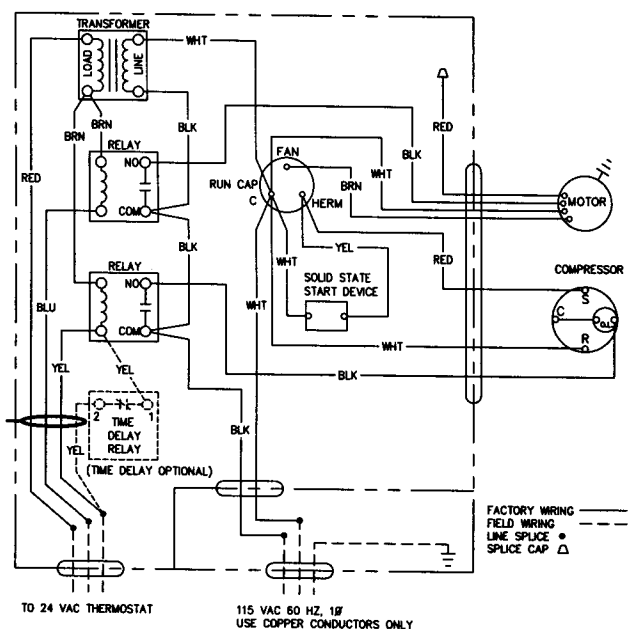
On Models 39224.601 and 39424.601, there are two 9-pin connectors. Verify all wires are tight in each connector.

TERM 1- Compressor (C)	TERM 6- Hi Fan (motor)
TERM 2- Compressor (R)	TERM 7- Lo Fan (motor)
TERM 3- Compressor (S)	TERM 8- Reversing Valve
TERM 4- Common (motor)	TERM 9- Reversing Valve
TERM 5- Capacitor (motor)	

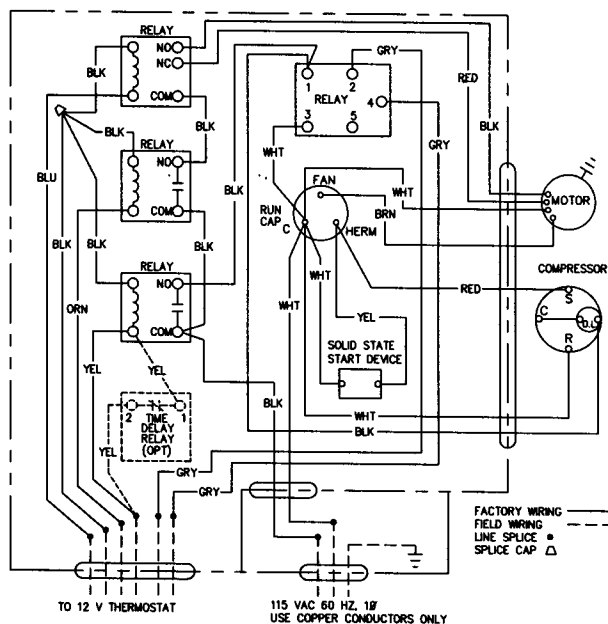
Terminals 8 and 9 are OPEN on Model 39224

TAB	CIRCUIT 1	CIRCUIT 2
○ 7 ○ 4 ○ 1	1- Black	1- Orange
○ 8 ○ 5 ○ 2	2- White	2- Gray
○ 9 ○ 6 ○ 3	3- Red	3- Brown
	4- White	4- White
	5- Brown	5- Brown
	6- Black	6- Black
	7- Red	7- Red
	8- Violet/Open	8- Open
	9- Violet/Open	9- Open

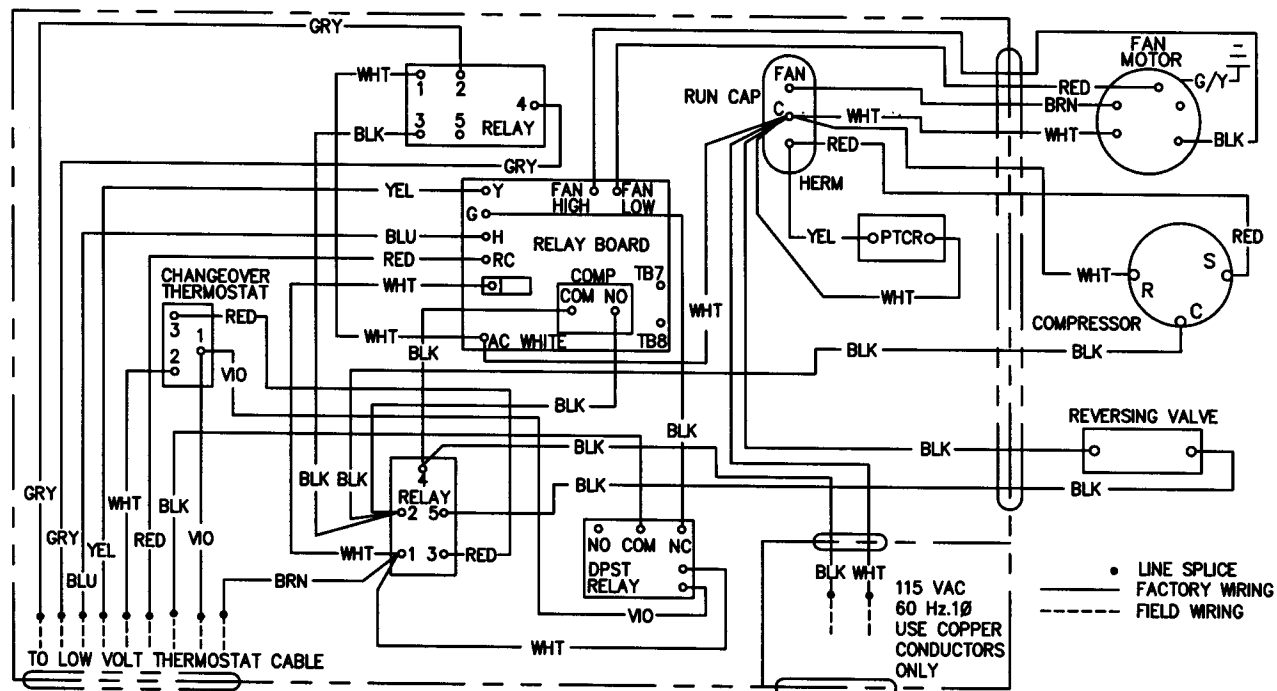
TYPICAL WIRING DIAGRAM FOR MODELS 390XX.XXX



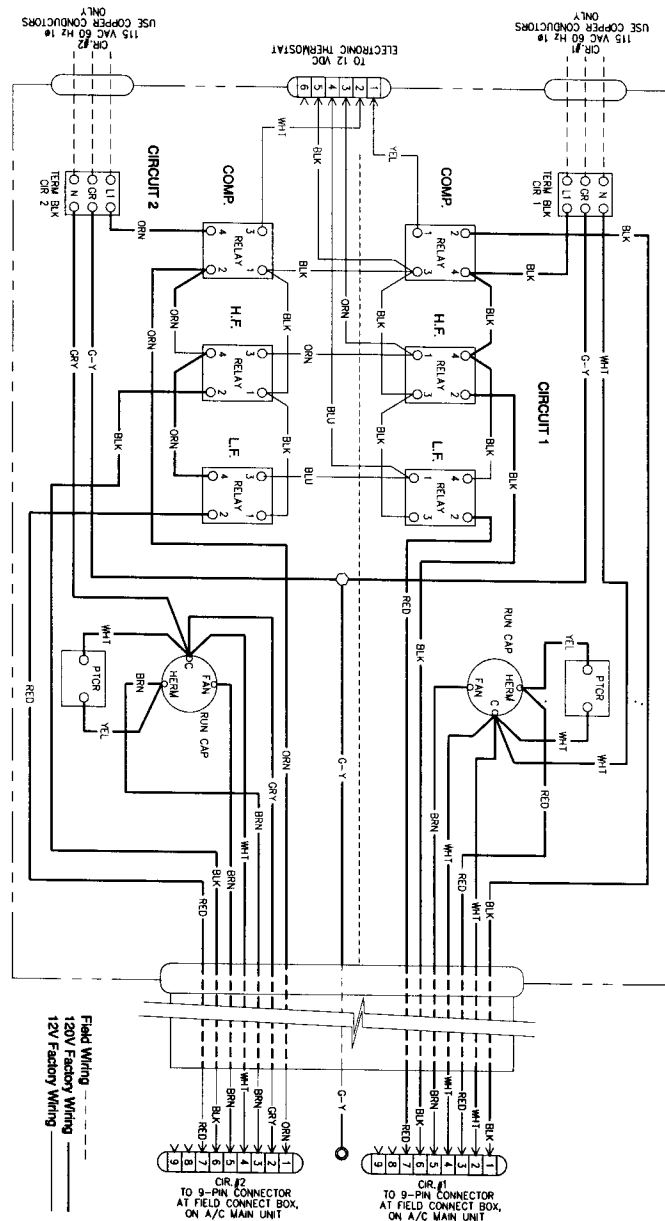
TYPICAL WIRING DIAGRAM FOR MODELS 391XX.XXX



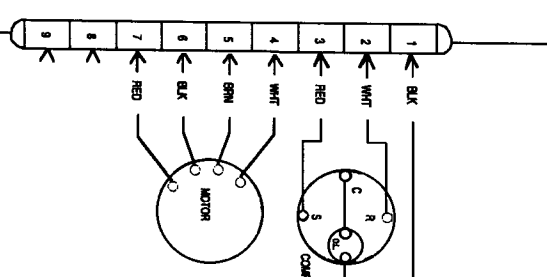
TYPICAL WIRING DIAGRAM MODEL 393XX.XXX



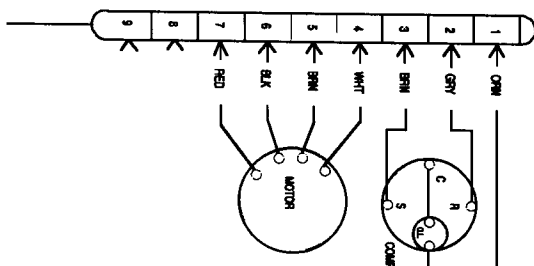
TYPICAL WIRING DIAGRAM MODEL 39224.601



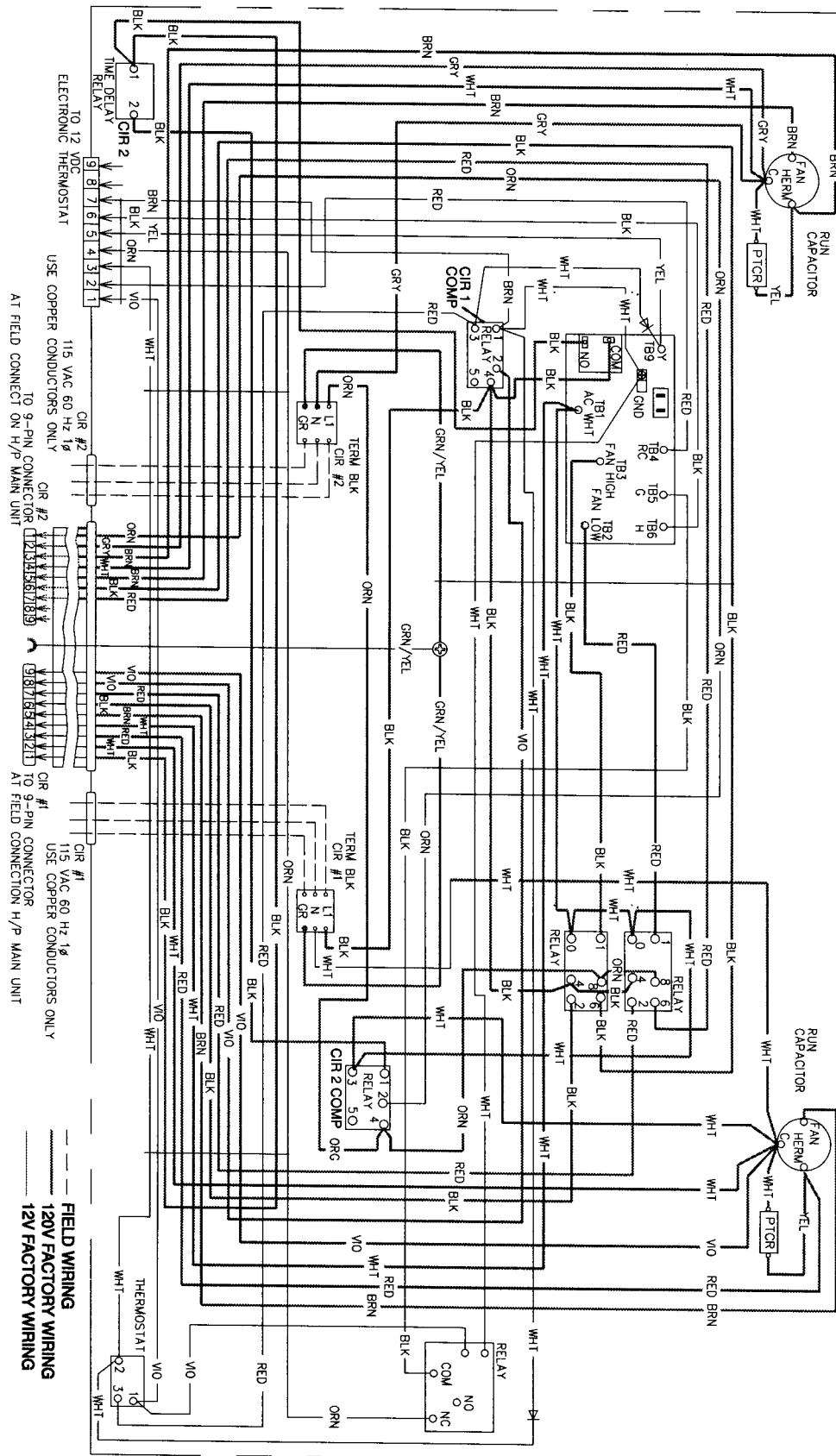
CIR #1



CIR #2



TYPICAL WIRING DIAGRAM FOR MODELS 39424.601



SECTION 3

DC VOLT REQUIREMENTS

3.1 DC VOLTS

On models 391XX.XXX, a DC volt supply is supplied to the thermostat location: Positive (+) DC volt wires to R terminal on the thermostat; and negative (–) DC volt wires to the black wire from the unit. Polarity is crucial for proper operation.

The operating range is 10 to 16 volts DC.

NOTE: See Section 4.1B for thermostat wiring.

SECTION 4

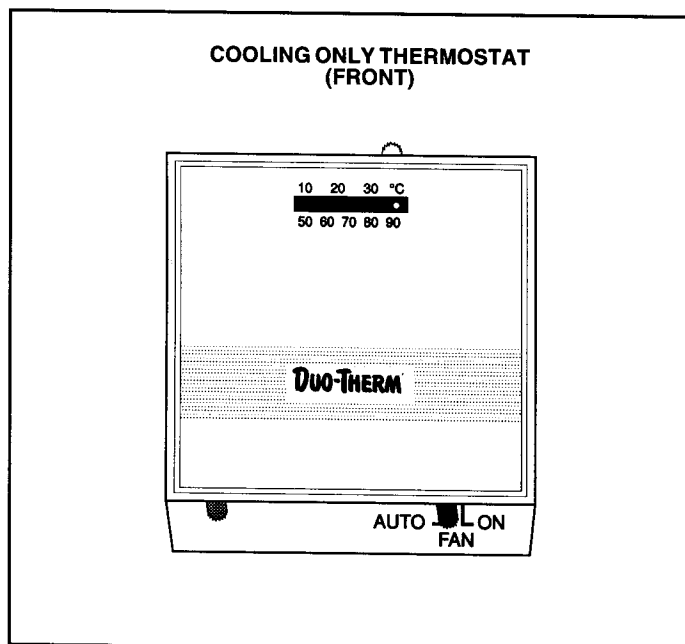
COMPONENTS

4.1 THERMOSTAT

A. MODEL 39015.601 and 39025.501

Two thermostats were used on these models: a cooling only thermostat and a heating and cooling thermostat. Both are 24V AC controlled systems.

On the base of the **cooling only thermostat**, there is a FAN switch with two positions, AUTO and ON. This operates the air conditioner only. A separate thermostat is needed for the furnace.



Verify that the thermostat wiring is correct.

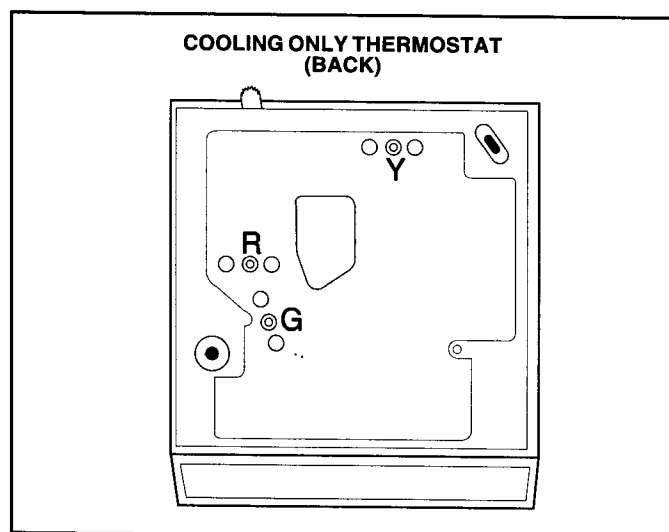
A three connector cable 19 to 22 AWG is to be used for low voltage connections. Low voltage wires in the control compartment are marked "R", "G" and "Y". Route low voltage cable from thermostat to unit electrical box.

Connect "R" from thermostat to red wire in control compartment. Connect "G" from thermostat to blue wire in control box. Connect "Y" from thermostat to yellow wire in control box. Use wire nuts to ensure good connections.

To check the thermostat, be sure the OFF switch is all the way to the right side. Next, disconnect all three wires at the terminals R, G and Y.

Next, using an ohmmeter, check for continuity between R and G and/or Y in the following manner. With room temperature above the set point temperature and FAN switch in AUTO position, continuity should exist between R to Y and R to G. With room temperature below the set point and FAN switch AUTO position, no continuity should exist between R to Y and R to G.

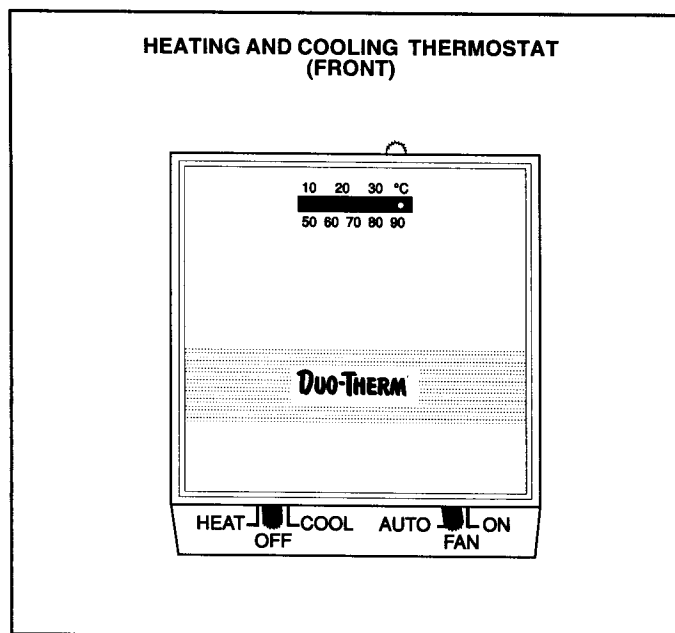
With FAN switch to ON position, continuity should exist between R to G regardless of room temperature.



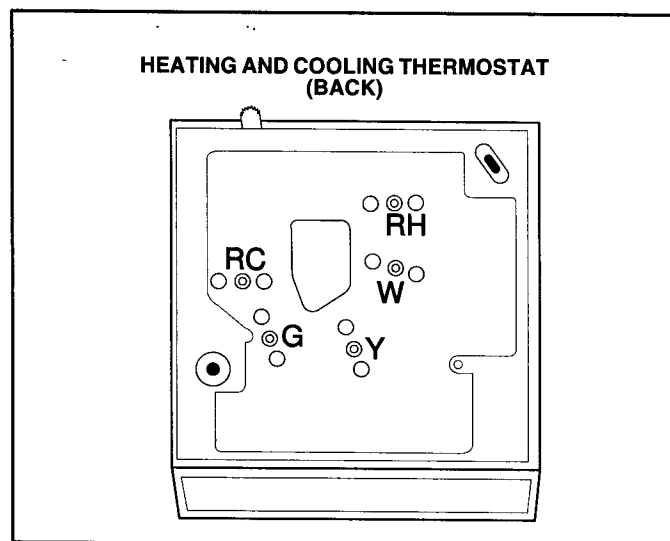
To check ACTIVE terminals, place one lead from ohm meter to R terminal and the other lead to the ACTIVE terminal.

SWITCH COMBINATION FAN SWITCH	IF ROOM TEMP. IS ABOVE/BELOW SET-POINT TEMP.:	TERMINALS THAT ARE "ON"	
		G	Y
AUTO	ABOVE	X	X
	BELOW		
ON	ABOVE	X	X
	BELOW	X	

The heating and cooling thermostat has two switches on the base. They are HEAT-OFF-COOL on the left side, and FAN-AUTO-ON on the right. This thermostat will operate an air conditioner and a furnace.



With HEAT-OFF-COOL switch to HEAT and FAN switch to AUTO position, no continuity should exist between **RC** to **Y** and **RC** to **G** regardless of room temperature. With FAN switch to ON position, continuity should exist between **RC** to **G** and no continuity between **RC** to **Y** regardless of room temperature. With room temperature below set-point temperature, continuity should exist between **RH** to **W**. With room temperature above set-point temperature no continuity should exist between **RH** to **W**.



Verify that the wiring to the thermostat is correct.

A three-connector cable 19 to 22 AWG is to be used for low voltage connections. Low voltage wires in the control compartment are marked "R", "G" and "Y". Route low voltage cable from thermostat to unit electrical box. Use .50 dia. snap-bushing for routing cable into electrical box.

Connect **RC** from thermostat to red wire in control compartment. Connect **G** or **F** from thermostat to blue wire in control box. Connect **Y** from thermostat to yellow wire in control box. Use wire nuts to ensure good connections.

When connecting a gas furnace to this thermostat, the **RH** and **W** terminals are used.

To check the thermostat remove all wires. Next, using an ohm meter, put the HEAT-OFF-COOL switch in the COOL position. With room temperature above the set-point temperature and FAN switch in AUTO position, continuity should exist between **RC** to **Y** and **RC** to **G**. With room temperature below set point temperatures, no continuity should exist between **RC** to **Y** and **RC** to **G**. With FAN switch to ON position, continuity should exist between **RC** to **G** regardless of room temperature.

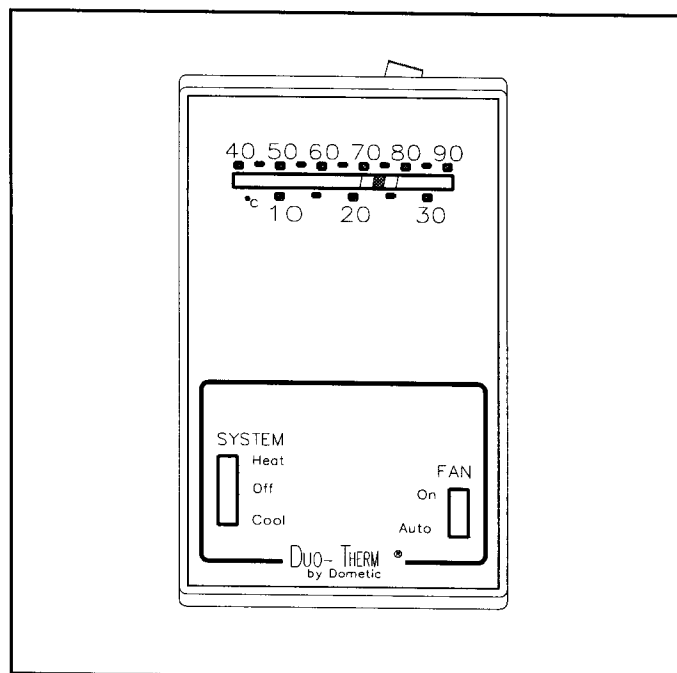
With HEAT-OFF-COOL switch in the OFF position and FAN switch in the AUTO position, no continuity should exist between **RC** to **Y** and **RC** to **G** regardless of room temperature. With FAN switch to ON position, continuity should exist between **RC** to **G** and no continuity between **RC** to **Y** regardless of room temperature.

To check ACTIVE terminals, place one lead from ohm meter to **RC** (cooling) or **RH** (heating) terminal and the other lead to the ACTIVE (ON) terminal.

SWITCH COMBINATION		IF ROOM TEMP. IS ABOVE/BELOW SET-POINT TEMP.:	TERMINALS THAT ARE "ON"		
SYSTEM SWITCH	FAN SWITCH		G	Y	W
COOL	AUTO	ABOVE	X	X	
		BELOW			
	ON	ABOVE	X	X	
		BELOW	X		
OFF	AUTO	ABOVE			
		BELOW			
	ON	ABOVE	X		
		BELOW	X		
HEAT	AUTO	ABOVE			
		BELOW			X
	ON	ABOVE	X		
		BELOW	X		X

B. MODELS 39025.502, 39035.601, 39045.601 & 39045.616

The thermostat is a 24V AC controlled system and is a bimetal type. It has two switches on the face of the thermostat. On the left side there is a SYSTEM switch and on the right side there is a FAN switch. This thermostat will operate an air conditioner and a furnace.



Verify the thermostat wiring is correct.

A three-conductor cable 18 to 22 AWG is to be used for low voltage connections. Route low voltage cable from thermostat to unit electrical box. Use .50 dia. snap-bushing for routing cable into electrical box.

Connect **R** from thermostat to red wire in control compartment. Connect **G** or **F** from thermostat to blue wire in control box. Connect **Y** from thermostat to yellow wire in control box. Use wire nuts to ensure good connections.

When connecting a gas furnace to Dometic's Heat/Cool thermostat, the **W** and **R** terminals are used. This means there will be two wires on the **R** terminal (one wire from the furnace and one wire from the air conditioner).

To check the thermostat, remove all wires. Next, using an ohm meter with the SYSTEM switch in COOL position and the FAN switch in AUTO position and the room temperature above the set-point temperature, continuity should exist between **R** to **Y** and **R** to **G**. No continuity should exist between **R** to **W**. With room temperature below set-point temperature, no continuity should exist between **R** to **Y**, **R**

to **W** and **R** to **G**. With the FAN switch to ON position and the room temperature above the set point temperature continuity should exist between **R** to **Y** and **R** to **G**. No continuity should exist between **R** to **W**. With the room temperature below the set point temperature, continuity should exist between **R** to **G** and no continuity between **R** to **Y** and **R** to **W**.

With the SYSTEM switch in OFF position and the FAN switch in AUTO position, no continuity should exist **R** to **Y**, **R** to **G** and **R** to **W**. With the FAN switch to ON position, continuity should exist between **R** to **G** and no continuity between **R** to **Y** and **R** to **W** regardless of room temperature.

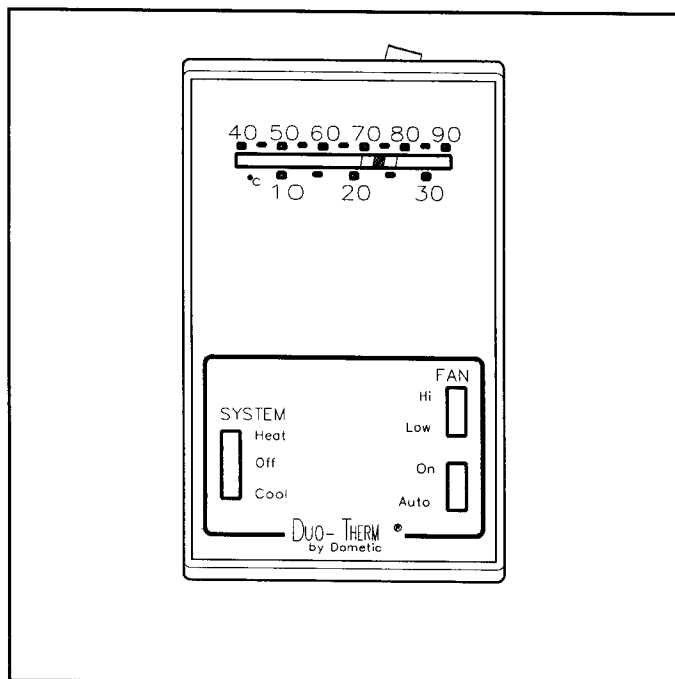
With the SYSTEM switch in HEAT position, FAN switch in AUTO and room temperature above set-point temperature, no continuity should exist between **R** to **Y**, **R** to **G** and **R** to **W**. With room temperature below set point temperature, continuity should exist between **R** to **W** and no continuity between **R** to **Y** and **R** to **G**. With the FAN switch to ON, continuity should exist between **R** to **G** regardless of room temperature.

To check ACTIVE terminals, place one lead from the ohm meter to the **R** terminal and the other lead from the meter to the ACTIVE (ON) terminal.

SWITCH COMBINATION		IF ROOM TEMP. IS ABOVE/BELOW SET-POINT TEMP.:	TERMINALS THAT ARE "ON"		
SYSTEM SWITCH	FAN SWITCH		G	Y	W
COOL	AUTO	ABOVE	X	X	
		BELOW			
	ON	ABOVE	X	X	
		BELOW	X		
OFF	AUTO	ABOVE			
		BELOW			
	ON	ABOVE	X		
		BELOW	X		
HEAT	AUTO	ABOVE			
		BELOW			X
	ON	ABOVE	X		
		BELOW	X		X

C. MODELS 39115.601, 39115.602, 39115.616 & 39115.626

The thermostat is a 12V DC controlled system and is a bimetal type. It has three (3) switches on the face of the thermostat. On the left side there is a SYSTEM switch and on the right side there are two FAN switches. The top switch is for HI or LOW FAN and the bottom one is for ON or AUTO. This thermostat will operate an air conditioner and a furnace.



Verify the wiring is correct.

A 2-conductor cable, 18 to 22 AWG is required for the 12V DC power source. This can be routed into the system at either the unit or the thermostat.

Select the shortest direct route between the power supply and the system. A negative wire must be supplied. Frame work grounding is not adequate.

At the unit, route both leads from the 12V DC supply and the four wires from the thermostat up through the plastic bushing in the bottom left of the electric box for connection.

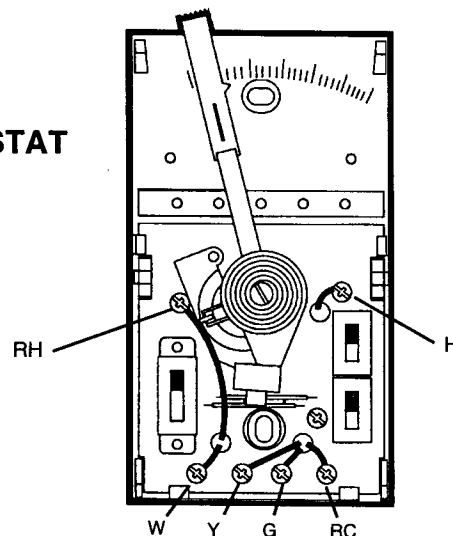
Or at the thermostat, route both leads from the 12V DC supply through the wall and behind the thermostat.

Route the four wires from the thermostat up through the plastic bushing in the bottom left of the electric box for connection.

For furnace hookup or use of another thermostat, consult the installation instructions provided with the furnace and/or the thermostat. Normally, the furnace will connect to the **RH** and **W** terminals of the thermostat.

WIRE CONNECTIONS:

THERMOSTAT BASE



There are four low voltage wires in the electric box of the air conditioner. They are black, yellow, blue and orange. The black wire goes to negative (-) DC volt power source. The yellow goes to thermostat **Y** terminal. The blue goes to thermostat **H** terminal and the orange goes to thermostat **G** terminal. The DC volt positive (+) from the power source goes to thermostat **RC** terminal. If a furnace is wired to the heat-cool thermostat, one furnace thermostat wire goes to terminal **RH** on the thermostat. The other furnace thermostat wire goes to terminal **W** on the thermostat.

	T'stat Terminal	Unit Wire Color	Power Source
AC	RC	---	+12V DC -12V DC
	---	Black	
	Y H G	Yellow Blue Orange	Field Supply Wires ↑
HEAT	RH & W	(Furnace Option)	

To check the thermostat remove all wires. Next, using an ohm meter, with the SYSTEM switch in the COOL position and the FAN switches in AUTO and HI and the room temperature above the set-point temperature, continuity should exist between RC to G, RC to Y and RC to H. No continuity should exist between RH to W. With room temperature below set-point temperature, no continuity would exist between RC to G, RC to Y and RC to H, and RH to W. With FAN switches in AUTO and LOW, and room

temperature above set-point temperature, continuity should exist between **RC** to **G** and **RC** to **Y**. No continuity should exist between **RC** to **H** and **RH** to **W**. With the FAN switches in ON and LOW and the room temperature above the set-point temperature, continuity should exist between **RC** to **G** and **RC** to **Y**. No continuity should exist between **RC** to **H** and **RH** to **W**.

With the room temperature below the set-point temperature, continuity should exist between **RC** to **G**. No continuity should exist between **RC** to **Y**, **RC** to **H**, and **RH** to **W**. With FAN switches to ON and HI and room temperature above set-point temperature, continuity should exist between **RC** to **G**, **RC** to **Y** and **RC** to **H**. There should be no continuity between **RH** to **W**. With room temperature below set point temperature, continuity should exist between **RC** to **G** and **RC** to **H**; and no continuity should exist between **RC** to **Y** and **RH** to **W**.

With the SYSTEM switch to OFF and FAN switches to AUTO and HI or LOW and room temperature **above or below** set point temperature, no continuity should exist between **RC** to **G**, **RC** to **Y**, **RC** to **H** and **RH** to **W**. With FAN switches to ON and LOW and room temperature above or below set-point temperature, continuity should exist between **RC** to **G** and no continuity between **RC** to **Y**, **RC** to **H** and **RH** to **W**. With FAN switches to ON and HI and room temperature above or below set-point temperature. Continuity should exist between RC to G and RC to H and no continuity between RC to Y and RH to W.

With the SYSTEM switch HEAT position, FAN switches to AUTO and HI or LOW positions, and room temperature above set-point temperature. No continuity would exist between RC to G, RC to Y, RC to H and RH to W. With room temperature below set-point temperature continuity would exist

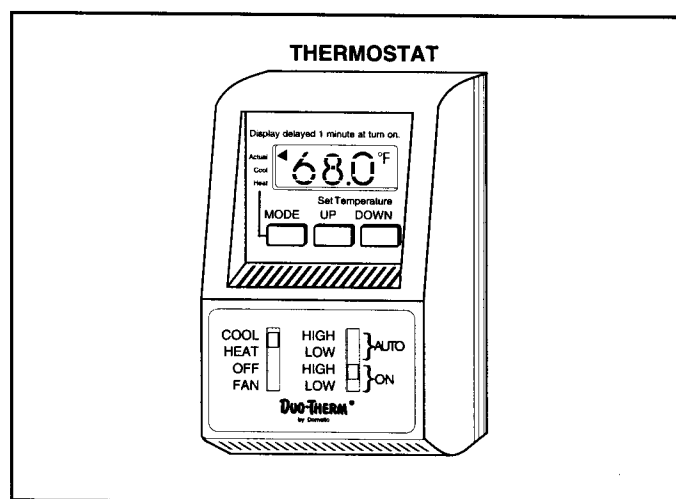
between RC to G, RC to Y and RC to H. With FAN switches to ON and LOW and room temperature above set-point temperature, continuity would exist between RC to Y, RC to H, and RH to W. With room temperature below set-point temperature, continuity should exist between RC to G and RH to W. No continuity would exist between RC to Y and RC to H. With FAN switches to ON and HI and room temperature above set-point temperature, continuity should exist between RC to G and RC to H and no continuity between RC to Y and RH to W. With room temperature below set-point temperature, continuity should exist between RC to G, RC to H and RH to W. No continuity would exist between RC to Y.

To check ACTIVE (ON) terminals, place on lead from ohm meter to RC or RH terminal and the other lead from the meter to the ACTIVE terminal.

SWITCH COMBINATION		IF ROOM TEMP. IS ABOVE/BELOW SET-POINT TEMP.:	TERMINALS THAT ARE "ON"			
SYSTEM SWITCH	FAN SWITCH		G	Y	H	W
COOL	HI AUTO	ABOVE	X	X	X	
		BELOW				
	LO AUTO	ABOVE	X	X		
		BELOW				
	LO ON	ABOVE	X	X		
		BELOW	X			
	HI ON	ABOVE	X	X	X	
		BELOW	X		X	
OFF	HI AUTO	ABOVE	X	X		
		BELOW				
	LO AUTO	ABOVE				
		BELOW				
	LO ON	ABOVE	X			
		BELOW	X			
	HI ON	ABOVE	X		X	
		BELOW	X		X	
HEAT	HI AUTO	ABOVE				
		BELOW				X
	LO AUTO	ABOVE				
		BELOW				X
	LO ON	ABOVE	X			
		BELOW	X			X
	HI ON	ABOVE	X		X	
		BELOW	X		X	X

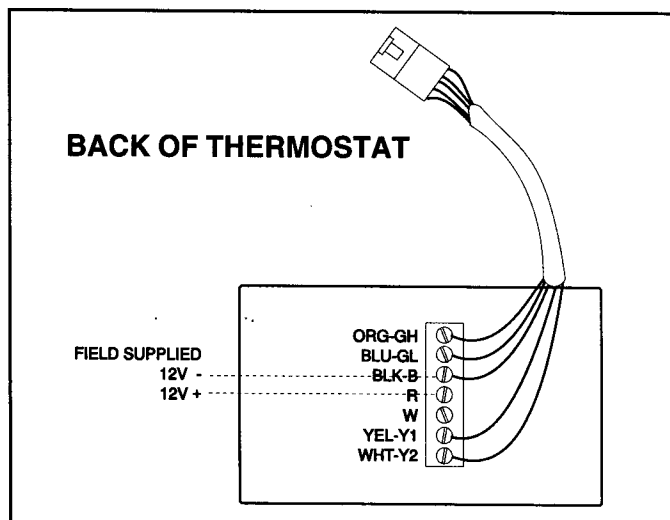
D. MODEL 39224.601

This thermostat is designed to operate DC volt controlled air conditioner systems and an independent heat system. It is a manual changeover thermostat between heating and cooling. It also incorporates time delay circuitry to protect against system short cycling. This thermostat has delay circuitry on start-up so Circuit 1 compressor starts after fan motors, then delay circuitry for Circuit 2 compressor start. It is an electronic thermostat with three pushbuttons (MODE, SET TEMPERATURE UP AND DOWN) and an LCD (Liquid Crystal Display).



To check the thermostat, first verify the wiring to it is correct. A two-conductor cable, 18 to 22 AWG is required for the DC volt power source. This **MUST** be routed to the system at the thermostat. There is a nine-terminal block on the back of the thermostat.

Looking at the back of the thermostat, the terminal designation from right-to-left is **Y2, Y1, W, R, B, GH, GL** and the last two are not designated. DC volt supply wires into terminal **R**, positive (+); and terminal **B**, negative (-). There is a five-wire (white, yellow, black orange and blue) harness assembly that wires into the terminal block also. White goes to **Y2**, yellow goes to **Y1**, black goes to **B** (this makes two wires on this terminal), orange goes to **GH**, and blue goes to **GL**. If a furnace is wired to the thermostat the two furnace thermostat wires **MUST** be wired correctly. The furnace has two wires for thermostat connections. One wire should be marked 12V DC or (+) and the other wire may be unmarked, or labeled "thermostat". The wire marked 12V DC or (+) must be wired to terminal **W**. The unmarked wire (or one labeled "thermostat") must be wired to **B** terminal (this will be the third wire to this terminal).



To check the thermostat, first verify positive (+) DC is to terminal **R** and negative (-) is to terminal **B**, at the back of the thermostat. Operating range is 10 to 16 volts DC. **NOTE:** To check voltage between terminals, at the back of the thermostat, place the negative (-) lead from the voltmeter to terminal **B** and the positive (+) lead from the voltmeter to the **ACTIVE** terminal.

With the **SYSTEM** switch to **COOL** and **FAN** switch to **HIGH AUTO** and room temperature **ABOVE** set-point temperature, you should have voltage between terminal **B** (black wire) to terminal **Y1** (yellow wire) and terminal **B** (black wire) to terminal **GH** (orange wire). You should **NOT** have voltage between terminal **B** (black wire) to terminals **GL** (blue wire) and **W**. With room temperature **BELOW** set-point temperature you should **NOT** have voltage between terminal **B** (black wire) to terminals **Y1, Y2, GL, GH** or **W**.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three minute delay in "active" terminals. If set-point temperature is more than two degrees from room temperature, there will be a thirty second delay to **Y2** terminal after **Y1** terminal is active.

With **SYSTEM** switch to **COOL** and **FAN** switch to **AUTO LOW**, and room temperature is above set-point temperature, you should have voltage between terminal **B** (black wire) to terminal **Y1** (yellow wire) and terminal **B** (black wire) to terminal **GL** (blue wire). You should **NOT** have voltage between terminal **B** (black wire) to terminals **GH** (orange) and **W**. With room temperature **BELOW** set-point temperature you should **NOT** have voltage between terminal **B** (black wire) to terminals **Y1, Y2, GL, GH** and **W**.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three minute delay in "active" terminals. If set-point temperature is more than two degrees from room temperature, there will be a thirty second delay to **Y2** terminal after **Y1** terminal is active.

With the SYSTEM switch to COOL and FAN switches to LOW ON, and room temperature ABOVE set-point temperature, you should have voltage between terminal **B** (black wire) to terminals **Y1** (yellow wire) and **GL** (blue wire). You should **NOT** have voltage between terminal **B** (black wire) to terminals **GH** (orange wire) and **W**. With room temperature BELOW set-point temperature, you should have voltage between terminal **B** (black wire) to terminal **GL** (blue wire). You should **NOT** have voltage between terminal **B** (black wire) to terminals **Y1**, **Y2**, **GH** and **W**.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals. If set-point temperature is more than two degrees from room temperature, there will be a thirty second delay to **Y2** terminal after **Y1** terminal is active.

With the SYSTEM switch to COOL and FAN switches to HIGH ON and room temperature ABOVE set-point temperature, you should have voltage between terminal **B** (black wire) to terminals **Y1** (yellow wire) and **GH** (orange wire).

You should NOT have voltage between terminal **B** to terminals **GL** and **W**. With room temperature BELOW set-point temperature, you have voltage between terminal **B** (black wire) to terminal **GH** (orange wire). You should NOT have voltage between terminal **B** to terminals **Y1**, **Y2**, **GL** and **W**.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals. If set-point temperature is more than two degrees from room temperature, there will be a thirty second delay to **Y2** terminal after **Y1** terminal is active.

With the SYSTEM switch to OFF and FAN switches to AUTO HIGH, AUTO LOW, ON LOW and ON HIGH with room temperature ABOVE or BELOW set-point temperature, you should **NOT** have voltage between terminal **B** to **Y1**, **Y2**, **GL**, **GH** or **W**.

With the SYSTEM switch to FAN and FAN switches to AUTO HIGH, AUTO LOW, ON LOW or ON HIGH with room temperature ABOVE or BELOW set-point temperature, you should have voltage between terminal **B** (black) to terminal **GH** (orange). You should NOT have voltage between terminal **B** to terminals **Y1**, **Y2**, **GL** or **W**.

With the SYSTEM switch to HEAT and FAN switches to AUTO HIGH, AUTO LOW, ON LOW or ON HIGH and room temperature ABOVE set-point temperature, you should NOT have voltage between terminal **B** to any other terminal (**Y1**, **Y2**, **GL**,

GH or **W**) except **R**. With room temperature BELOW set-point temperature, you should have voltage between **B** (black) to terminal **W**. You should **NOT** have voltage between terminal **B** to **Y1**, **Y2**, **GL** or **GH**.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals. If set-point temperature is more than two degrees from room temperature, there will be a thirty second delay to **Y2** terminal after **Y1** terminal is active.

SWITCH COMBINATIONS		IF ROOM TEMP. IS ABOVE/BELOW SET-POINT TEMP:	TERMINALS THAT ARE "ON"				
SYSTEM SWITCH	FAN SWITCH		Y1 Yellow	Y2 White	GL Blue	GH Orange	W
COOL	HI AUTO	ABOVE	X			X	
		BELOW					
	LO AUTO	ABOVE	X		X		
		BELOW					
	LO ON	ABOVE	X		X		
		BELOW			X		
	HI ON	ABOVE	X			X	
		BELOW				X	
OFF	HI AUTO	ABOVE					
		BELOW					
	LO AUTO	ABOVE					
		BELOW					
	LO ON	ABOVE					
		BELOW					
	HI ON	ABOVE					
		BELOW					
FAN	HI AUTO	ABOVE			X		
		BELOW			X		
	LO AUTO	ABOVE			X		
		BELOW			X		
	LO ON	ABOVE			X		
		BELOW			X		
	HI ON	ABOVE			X		
		BELOW			X		
HEAT	HI AUTO	ABOVE					
		BELOW					X
	LO AUTO	ABOVE					
		BELOW					X
	LO ON	ABOVE					
		BELOW					X
	HI ON	ABOVE					
		BELOW					X

To check ACTIVE terminals: Place the negative (–) lead from the DC voltmeter on terminal B (black wire) and the positive (+) lead to the ACTIVE terminal. When the SYSTEM switch is in the COOL position and room temperature is more than two degrees ABOVE set point temperature, terminal Y2 is ACTIVE thirty seconds after terminal Y2 is ACTIVE.

E. MODEL 39424.601 & 393XX.XXX DIGITAL

This thermostat is designed to operate 12V DC single-stage heat pump and an independent single-stage auxiliary heat system. It is a manual changeover thermostat between heating, cooling and auxiliary heat. It also incorporates time delay circuitry to protect against system short cycling.

There is a time delay of approximately three minutes between OFF and ON cycles.

Default temperatures of 65°F. for heat and 75°F. for cool have been incorporated into this thermostat. If the thermostat is without power for 10 to 15 seconds, it will default to these temperatures.

Operating temperatures for both heating and cooling systems are changeable to suit the comfort needs of the occupants.

This thermostat is used as a remote wall mounted thermostat. The heat pump can have an air distribution box or a ducted system. To check the operation, refer to Section 1.4.

Next, verify the wiring to the thermostat is correct.

Thermostat Wiring for DIGITAL Thermostat:

Route the ten-conductor cable from the 14" x 14" opening to the thermostat location. Route a two-conductor cable from the coach's 12 volt DC power source to the thermostat location. Connect 12 volt **positive** lead to the green wire on the thermostat cable.

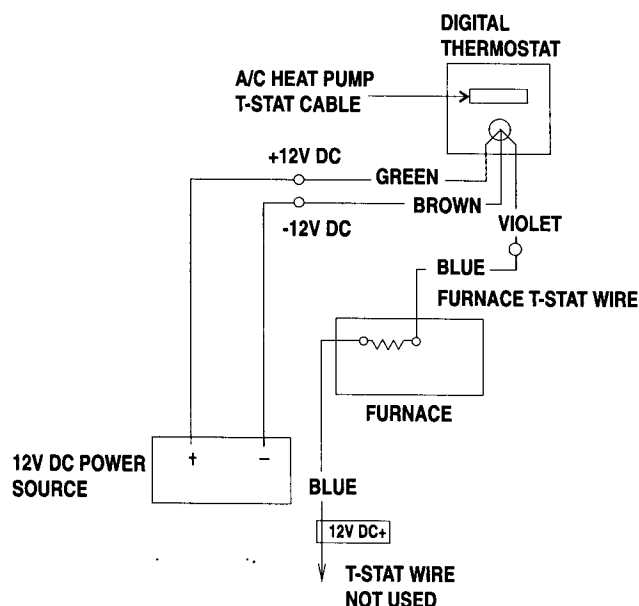
Connect the 12 volt DC **negative** lead to the brown lead. Secure both connections using wire nuts.

NOTE: The DC volt connections are needed to power the liquid crystal display (LCD) and thermostat in the AUX. HEAT mode when 115 volt AC is not available.

At the thermostat location, leave about six inches of cable extending through the wall. Plug the thermostat cable into the thermostat connector.

When an auxiliary furnace is used with the heat pump, a single-wire conductor must be routed from the furnace to the thermostat location. Connect this wire from the furnace to the violet pigtail at the thermostat and secure with wire nut. Tuck the excess wire back into the wall and fill opening with insulation to prevent drafts that could affect the thermostat operation. Using the two screws provided, secure the thermostat to the wall.

THERMOSTAT CONNECTIONS



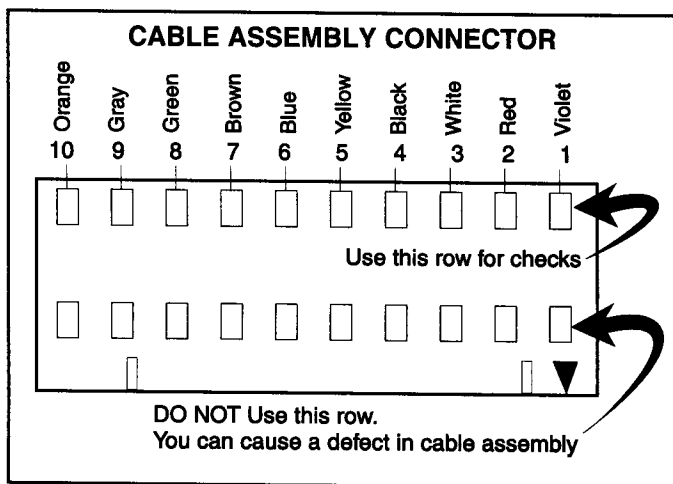
NOTE: The furnace has two wires for thermostat connections. One wire should be marked 12V DC or (+) and the other wire may be unmarked, or labeled "thermostat". The wire marked 12V DC or (+) should be capped and not used with the heat pump setup. The wire marked "thermostat" or the unmarked wire is the wire to connect to the violet thermostat pigtail.

If the 12V DC(+) is hooked to the violet wire at the thermostat, the heat pump fan motor will NOT operate in any mode.

Before checking the thermostat for operation, first determine that the thermostat is receiving DC power from the relay board then disconnect the cable assembly from the back of the thermostat.

Next, use a DC voltmeter and check from red wire or Pin 2 on cable assembly (positive [+] lead from voltmeter) to brown wire or Pin 7 (negative [–] lead from voltmeter). You should get a voltage reading of approximately 12V DC. Next, move the negative (–) lead from the voltmeter to each of the following wires or pins:

Blue (Pin 6), Yellow (Pin 5), Black (Pin 4) White (Pin 3). You should get a voltage reading of approximately 12V DC on each wire. This indicates the relay board and cable assembly are providing proper power and circuits to the thermostat.



NOTE: Pin 2 (red wire) is positive DC volts when ambient (outside) air is above 40°F. Pin 1 (violet wire) is positive DC volts when ambient (outside) air is below 40°F. When ambient (outside) air is below 40°F., only "FAN LO ON" and "HI ON" will operate in the heat pump.

If the above voltage checks are correct and the unit does not operate correctly, check the thermostat.

To check the thermostat, first verify positive (+) DC is to red wire (Pin 2), and negative (–) DC is to brown wire (Pin 7) at the back of the thermostat. Operating range is 10 to 16 volts DC.

With System Switch in COOL, Fan Switch in HI AUTO and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4), yellow wire (pin 5) and blue wire (Pin 6). You should **NOT** have voltage between brown wire to violet or white wires. With room temperature BELOW set-point temperature, you should **NOT** have voltage between brown wire to violet, white, black, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in COOL, Fan Switch in LO AUTO and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and yellow wire (P5). You should NOT have voltage between brown wire to violet, white or blue wires. With room temperature BELOW set-point temperature, you should NOT have voltage between brown wire to violet, white, black, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in COOL, Fan Switch in LO ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and yellow wire (Pin 5). You should NOT have

voltage between brown wire to violet, white or blue wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4). You should NOT have voltage between brown wire to violet, white, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in COOL, Fan Switch in HI ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4), yellow wire (Pin 5) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet or white wire. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet, white or yellow wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in COOL, Fan Switch in LO ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and yellow wire (Pin 5). You should NOT have voltage between brown wire to violet, white or blue wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4). You should NOT have voltage between brown wire to violet, white, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in COOL, Fan Switch in HI ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4), yellow wire (Pin 5) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet or white wire. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet, white or yellow wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in the OFF, Fan Switch in HI AUTO or LO AUTO and room temperature ABOVE or BELOW set-point temperature, you should NOT have voltage between brown wire to violet, white, black, yellow or blue wires.

With System Switch in OFF, Fan Switch in LO ON and room temperature ABOVE or BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4). You should NOT have voltage between brown wire to violet, white, yellow or blue wires.

With System Switch in OFF, Fan Switch in HI ON and room temperature ABOVE or BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet, white or yellow wires.

With System Switch in HEAT PUMP, Fan Switch in HI AUTO and room temperature ABOVE set-point temperature, you should NOT have voltage between brown wire to violet, white, black, yellow or blue wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to white wire (Pin 3), black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet or yellow wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in HEAT PUMP, Fan Switch in LO AUTO and room temperature ABOVE set-point temperature, you should NOT have voltage between brown wire to violet, white, black, yellow or blue wires. With room temperature BELOW set-point temperature, You should have voltage between brown wire (Pin 7) to white wire (Pin 3) and black wire (Pin 4). You should NOT have voltage between brown wire to violet, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in HEAT PUMP, fan switch in LO ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4). You should NOT have voltage between brown wire to violet, white, yellow or blue wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to white wire (Pin 3) and black wire (Pin 4). You should NOT have voltage between brown wire to violet, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in HEAT PUMP, Fan Switch in HI ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet, white or yellow wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to white wire (Pin 3), black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet or yellow wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

Before checking the thermostat for operation in AUX. HEAT, verify that DC volts (10 to 16) are available between the green wire (+) and brown wire (-) at the back of the thermostat.

With System Switch in AUX HEAT, Fan Switch in HI AUTO and room temperature ABOVE set-point temperature, you should NOT have voltage between brown wire to violet, white, black, yellow or blue wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to violet wire (Pin 1). You should NOT have voltage between brown wire to white, black, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in AUX HEAT, Fan Switch in LO AUTO and room temperature ABOVE set-point temperature, you should NOT have voltage between brown wire to violet, white, black, yellow or blue wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to violet wire (Pin 1). You should NOT have voltage between brown wire to white, black, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in AUX HEAT, Fan Switch in LO ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4). You should NOT have voltage between brown wire to violet, white, yellow or blue wires. With room temperature BELOW set-point temperature, you should

have voltage between brown wire (Pin 7) to violet wire (Pin 1) and black wire (Pin 4). You should NOT have voltage between brown wire to white, yellow or blue wires.

NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

With System Switch in AUX HEAT and fan switch in HI ON and room temperature ABOVE set-point temperature, you should have voltage between brown wire (Pin 7) to black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to violet, white or yellow wires. With room temperature BELOW set-point temperature, you should have voltage between brown wire (Pin 7) to violet wire (Pin 1), black wire (Pin 4) and blue wire (Pin 6). You should NOT have voltage between brown wire to white or yellow wires.

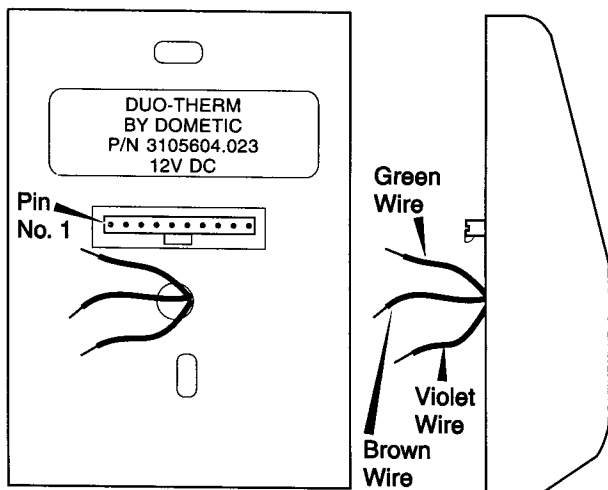
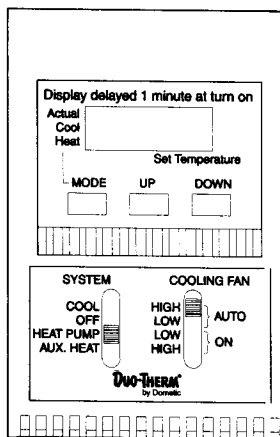
NOTE: When set-point temperature is changed above or below room temperature, there will be a three (3) minute delay in "active" terminals.

SWITCH COMBINATIONS AND THEIR CORRESPONDING "ACTIVE" TERMINALS

SWITCH COMBINATIONS		If room Temp. is Above/ Below set-point temp:	Terminals that are "ON"				
System Switch	Fan Switch		Pin 3 White	Pin 1 Violet	Pin 5 Yellow	Pin 6 Blue	Pin 4 Black
COOL	HI Auto	Above			X	X	X
		Below					
	LO Auto	Above			X		X
		Below					
	LO On	Above			X		X
		Below					X
	HI On	Above			X	X	X
		Below				X	X
OFF	HI Auto	Above					
		Below					
	LO Auto	Above					
		Below					
	LO On	Above					X
		Below					X
	HI On	Above				X	X
		Below				X	X
HEAT PUMP	HI Auto	Above					
		Below	X			X	X
	LO Auto	Above					
		Below	X				X
	LO On	Above					X
		Below	X				X
	HI On	Above				X	X
		Below	X			X	X
AUX HEAT	HI Auto	Above					
		Below		X			
	LO Auto	Above					
		Below		X			
	LO On	Above					X
		Below		X			X
	HI On	Above				X	X
		Below		X		X	X

TO CHECK "ACTIVE" TERMINALS: Place the negative (–) lead from the voltmeter on Pin 7 or Brown wire and the positive (+) lead from the voltmeter to the "ACTIVE" pin or wire to read DC voltage.

After set-point temperature is changed, there could be a three (3) minute delay on some "ACTIVE" terminals.



BIMETAL

This thermostat is designed to operate 12V DC single-stage heat pump and an independent single-stage auxiliary heat system. It is a manual changeover thermostat between heating, cooling and auxiliary heat. Operating temperatures for both heating and cooling systems are changeable to suit the comfort needs of the occupants.

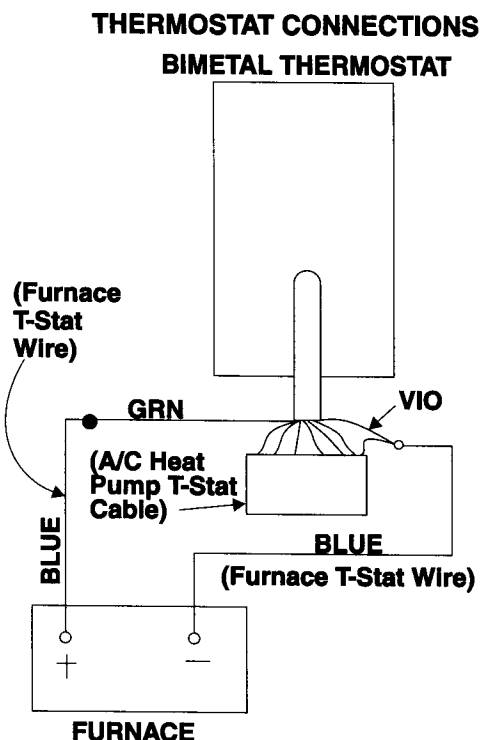
This thermostat is used for a remote wall mounted thermostat. To check the operation refer to Section 1.5. Next, verify the wiring to the thermostat is correct.

Thermostat Wiring for Dometic Bimetal Thermostat:

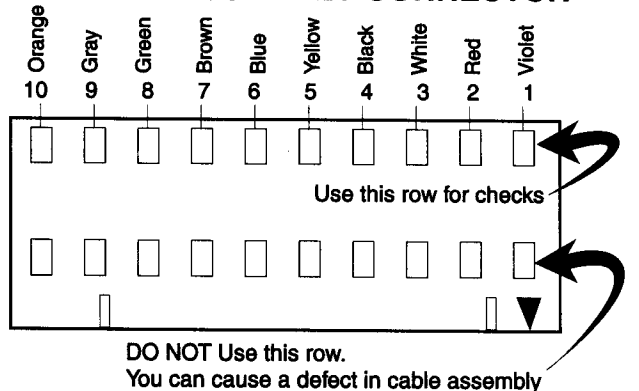
Route the ten-conductor cable from the unit to the thermostat location. Leave enough cable to connect to the low voltage cable. At the thermostat location, leave about six (6") inches of cable extending through the wall. Plug the thermostat cable into the thermostat connector cable.

When an auxiliary furnace is used with the heat pump, a two conductor cable must be routed from the furnace to the thermostat location. Connect one wire from the furnace to the violet wires with a wire-nut. Connect the other wire from the furnace to the green wire in the thermostat cable and secure with a wire nut. Tuck the excess wire back into the wall and fill opening with insulation to prevent drafts that could affect the thermostat operation. Secure the thermostat to the wall using the two screws.

NOTE: Verify the heat anticipator is set properly for the auxiliary furnace. Failure to set the anticipator can cause incorrect operation or failure of thermostat in AUX HEAT or HEAT PUMP setting.



CABLE ASSEMBLY CONNECTOR



Before checking the thermostat for operation, first determine that the thermostat is receiving DC power from the relay board then disconnect the cable assembly from the back of the thermostat.

Next, use a DC voltmeter and check from red wire or Pin 2 on cable assembly (positive [+] lead from voltmeter) to brown wire or Pin 7 (negative [-] lead from voltmeter). You should get a voltage reading of approximately 12V DC. Next, move the negative (-) lead from the voltmeter to each of the following wires or pins:

Blue (Pin 6), Yellow (Pin 5), Black (Pin 4) White (Pin 3). You should get a voltage reading of approximately 12V DC on each wire. This indicates the relay board and cable assembly are providing proper power and circuits to the thermostat.

NOTE: Pin 2 (red wire) is positive DC volts when ambient (outside) air is above 40°F. Pin 1 (violet wire) is positive DC volts when ambient (outside) air is below 40°F.

If the above voltage checks are correct and the unit does not operate correctly, check the thermostat.

If the above voltage checks are not as described, check the relay board (Section 4.5) and the cable assembly (4.3).

To check the thermostat, first remove it from its mounting on the wall. Then disconnect the thermostat assembly from the cable assembly in the wall. Now you are ready to do a continuity check on the thermostat assembly. Place the positive (+) lead from the ohm meter on red wire (Pin 2) and negative (-) lead from the ohm meter to the active pin or wire to read continuity. **POLARITY IS IMPORTANT FOR A PROPER CHECK TO BE DONE.**

With System Switch in COOL, Fan Switch in HI AUTO and room temperature ABOVE set-point temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4), yellow wire (Pin 5) and blue wire (Pin 6). You should NOT have continuity between red wire to violet or white wires.

With room temperature **BELOW** setpoint temperature, you should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires.

With System Switch in **COOL**, Fan Switch in **LOW** **AUTO** and room temperature **ABOVE** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and yellow wire (Pin 5). You should **NOT** have continuity between red wire to violet, white or blue wires. With room temperature **BELOW** setpoint temperature, you should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires.

With system switch in **COOL**, Fan Switch in **LOW ON** and room temperature **ABOVE** setpoint temperature you should have continuity between red wire (Pin 2) to black wire (Pin 4) and yellow wire (Pin 5). You should **NOT** have continuity between red wire to violet, white, or blue wires. With room temperature **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4). You should **NOT** have continuity between red wire to violet, white, yellow or blue wires.

With System Switch in **COOL**, Fan Switch in **HI ON** and room temperature **ABOVE** setpoint temperature you should have continuity between red wire (Pin 2) to black wire (Pin 4), yellow wire (Pin 5) and blue wire (Pin 6). You should **NOT** have continuity between red wire to violet or white wires. With room temperature **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and blue wire (Pin 6). You should **NOT** have continuity between red wire to violet, white or yellow wires.

With System Switch in **OFF**, Fan Switch in **HI AUTO** or **LOW AUTO** and room temperature **ABOVE** or **BELOW** setpoint temperature, you should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires.

With System Switch in **OFF**, Fan Switch in **LOW ON** and room temperature **ABOVE** or **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4). You should **NOT** have continuity between red wire to violet, white, yellow or blue wires.

With System Switch in **OFF**, Fan Switch in **HI ON** and room temperature **ABOVE** or **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and blue wire (Pin 6). You should **NOT** have continuity between red wire to violet, white or yellow wires.

With System Switch in **HEAT PUMP**, Fan Switch in **HI AUTO** and room temperature **ABOVE** setpoint temperature, you should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires. With room temperature **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to white wire (Pin 3), black wire (Pin 4), and blue wire (Pin 6). You should **NOT** have continuity between red wire to violet or yellow wires.

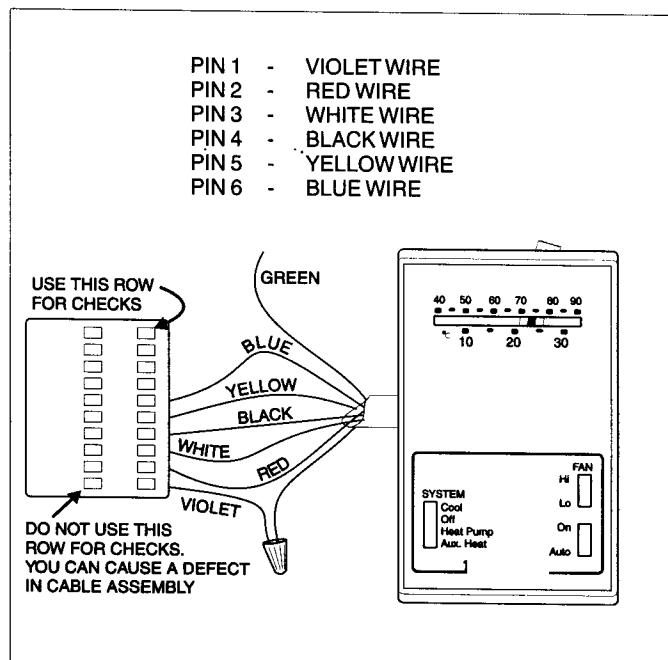
With System Switch in **HEAT PUMP**, Fan Switch in

LOW AUTO and room temperature **ABOVE** setpoint temperature, you should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires. With room temperature **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to white wire (Pin 3) and black wire (Pin 4). You should **NOT** have continuity between red wire to violet, yellow or blue wires.

With System Switch in **HEAT PUMP**, Fan Switch in **LOW ON** and room temperature **ABOVE** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4). With room temperature **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to white wire (Pin 3) and black wire (Pin 4). You should **NOT** have continuity from red wire to violet, yellow or blue wires.

With System Switch in **HEAT PUMP**, Fan Switch in **HI ON** and room temperature **ABOVE** setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and blue wire (Pin 6). You should **NOT** have continuity between red wire to violet, white or yellow wires. With room temperature **BELOW** setpoint temperature, you should have continuity between red wire (Pin 2) to white wire (Pin 3), black wire (Pin 4) and blue wire (Pin 6). You should **NOT** have continuity between red wire to violet or yellow wires.

With System Switch in **AUX HEAT**, Fan Switch in **HI AUTO** and room temperature **ABOVE** setpoint temperature, you should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires. With room temperature **BELOW** setpoint temperature, you should have continuity between violet wire (Pin 1) and green wire. You should **NOT** have continuity between red wire to violet, white, black, yellow or blue wires.



With System Switch in AUX HEAT, Fan Switch in LOW AUTO and room temperature ABOVE setpoint temperature, you should NOT have continuity between red wire to violet, white, black, yellow or blue wires. With room temperature BELOW setpoint temperature, you should have continuity between violet wire (Pin 1) and green wire. You should NOT have continuity between red wire to violet, white, black, yellow or blue wires.

With System Switch in AUX HEAT, Fan Switch in LOW ON and room temperature ABOVE setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4). You should NOT have continuity between red wire to violet, white, yellow or blue wires. With room temperature BELOW setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and between violet wire (Pin 1) to green wire. You should NOT have continuity between red wire to violet, white, yellow or blue wires.

With System Switch in AUX HEAT, Fan Switch in HI ON and room temperature ABOVE setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and blue wire (Pin 6). You should NOT have continuity between red wire to violet, white or yellow wires. With room temperature BELOW setpoint temperature, you should have continuity between red wire (Pin 2) to black wire (Pin 4) and blue wire (Pin 6) and between violet wire (Pin 1) and green wire. You should NOT have continuity between red wire to violet, white or yellow wires.

SWITCH COMBINATIONS AND THEIR CORRESPONDING "ACTIVE" TERMINALS

To check "ACTIVE" terminals, place the positive (+) lead from the ohm meter on Pin 2 or red wire and negative (-) lead from ohm meter to the "active" pin or wire to read continuity.

With System Switch in AUX HEAT and room temperature BELOW setpoint temperature, continuity will exist between violet wire and green wire. With room temperature ABOVE setpoint temperature, continuity will NOT exist between violet and green wire.

SWITCH COMBINATIONS		If room Temp. is Above/ Below setpoint temp:	Terminals that are "ON"				
System Switch	Fan Switch		Pin 3 White	Pin 1 Violet	Pin 5 Yellow	Pin 6 Blue	Pin 4 Black
COOL	HI Auto	Above			X	X	X
		Below					
	LO Auto	Above			X		X
		Below					
	LO On	Above			X		X
		Below					X
OFF	HI Auto	Above					
		Below					
	LO Auto	Above					
		Below					
	LO On	Above					X
		Below					X
HEAT PUMP	HI Auto	Above					
		Below	X			X	X
	LO Auto	Above					
		Below	X				X
	LO On	Above					X
		Below	X				X
AUX HEAT	HI On	Above				X	X
		Below	X			X	X
	LO Auto	Above					
		Below					
	LO On	Above					X
		Below					X
AUX HEAT	HI On	Above				X	X
		Below				X	X

4.2 CABLE ASSEMBLY

A. MODEL 39224.601 (AIR CONDITIONER)

The cable assembly is a five-wire assembly. The thermostat end has a five-pin flat connector:

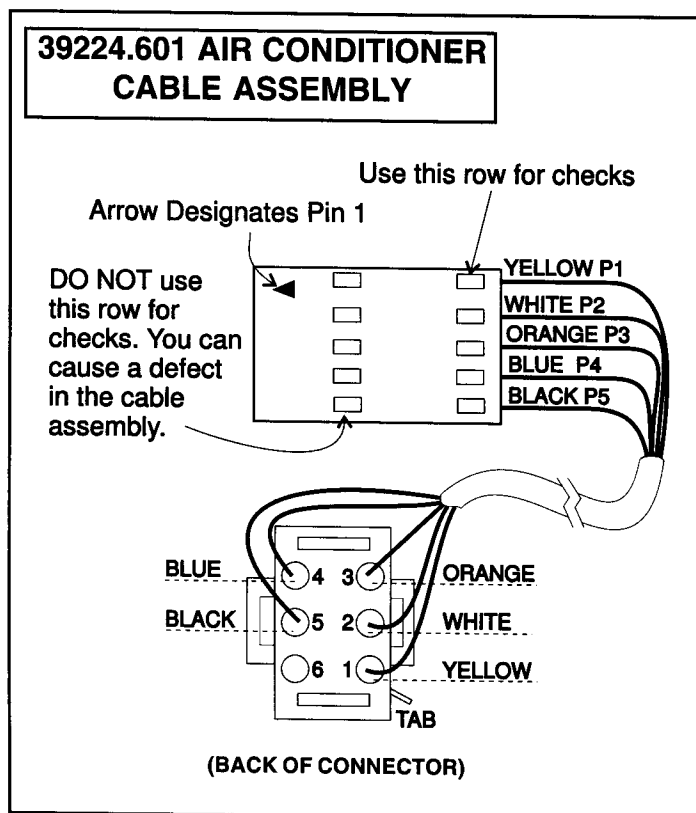
Pin 1	=	Yellow Wire
Pin 2	=	White Wire
Pin 3	=	Orange Wire
Pin 4	=	Blue Wire
Pin 5	=	Black wire

The unit end has a six-pin square connector.

Pin 1	=	Yellow Wire
Pin 2	=	White Wire
Pin 3	=	Orange Wire
Pin 4	=	Blue Wire
Pin 5	=	Black Wire

To check the cable assembly, first unplug each end of the cable assembly. Next, check for continuity on each wire such as Pin 1 to Pin 1, etc. Continuity should be present from Pin 1 to Pin 1, etc.

Next, check for continuity from one wire to each of the other wires, such as Pin 1 to Pin 2; then Pin 1 to Pin 3, etc. No continuity should be present from one wire to any other wire in the assembly. Be sure to check each wire.



39424.601 HEAT PUMP CABLE ASSEMBLY

B. MODEL 39424.601 HEAT PUMP

The cable assembly is a ten-wire cable with seven of the ten wires used. The thermostat end has a ten-pin flat connector with seven positions used.

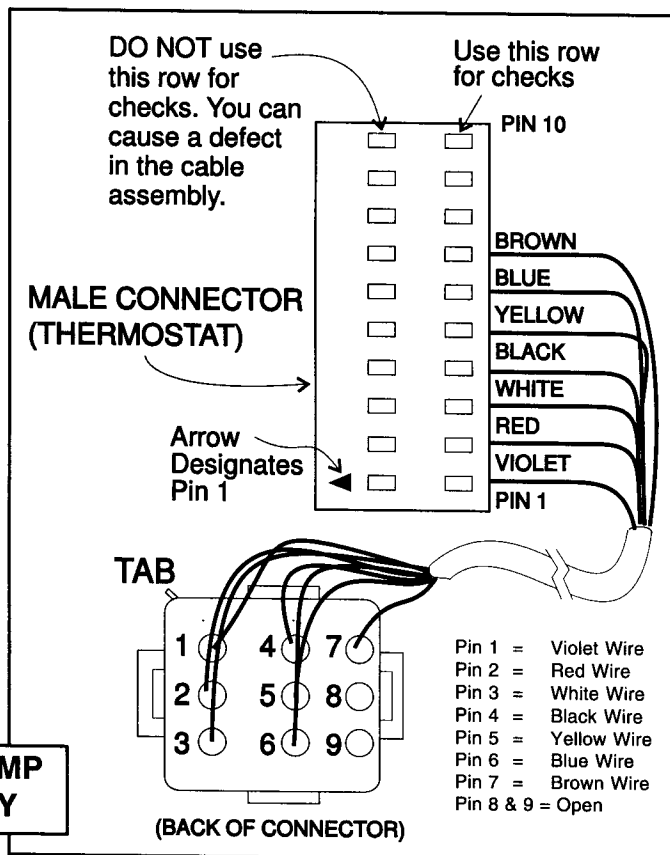
Pin 1	=	Violet Wire
Pin 2	=	Red Wire
Pin 3	=	White Wire
Pin 4	=	Black Wire
Pin 5	=	Yellow Wire
Pin 6	=	Blue Wire
Pin 7	=	Brown Wire

The unit end has a nine-pin square connector with seven positions used.

Pin 1	=	Violet Wire
Pin 2	=	Red Wire
Pin 3	=	White Wire
Pin 4	=	Black Wire
Pin 5	=	Yellow Wire
Pin 6	=	Blue Wire
Pin 7	=	Brown Wire

To check the cable assembly, first unplug each end of the cable assembly. Next, check for continuity on each wire, such as Pin 1 to Pin 1, then Pin 2 to Pin 2, etc. Continuity should be present from Pin 1 to Pin 1, then Pin 2 to Pin 2, etc.

Next, check for continuity from one wire to each of the other wires, such as Pin 1 to Pin 2, then Pin 1 to Pin 3, etc. NO continuity should be present from one wire to any other wire in the assembly. Be sure to check each wire.



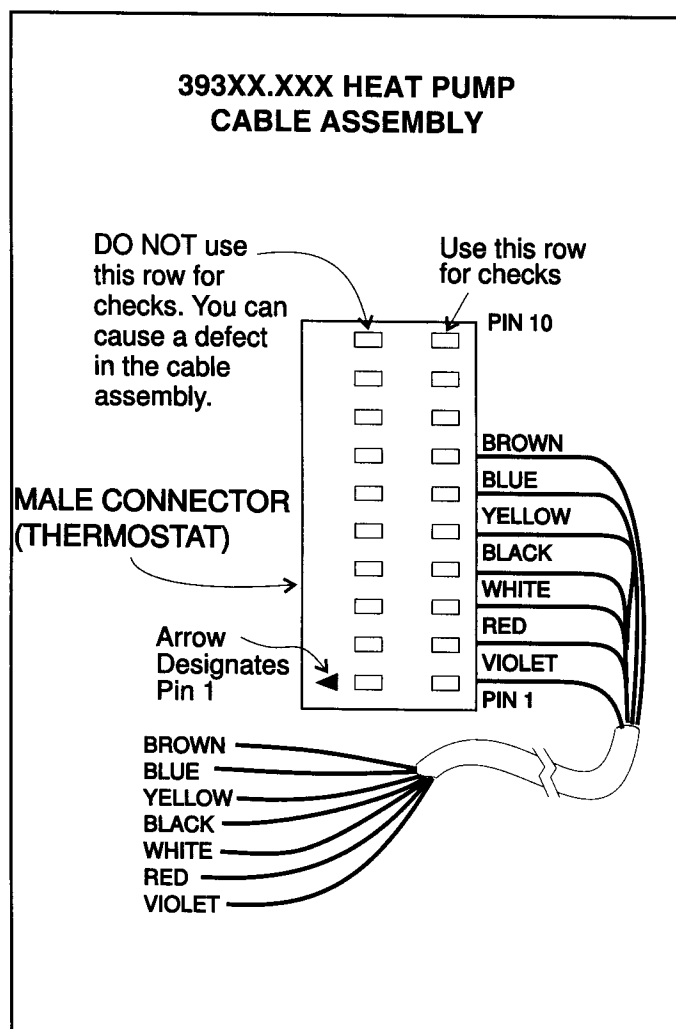
C. MODEL 39325.XXX AND 39335.XXX HEAT PUMPS

The cable assembly is a ten wire cable with seven of the ten wires used. The thermostat end has a ten-pin flat connector with seven positions used.

- Pin 1 = Violet Wire
- Pin 2 = Red Wire
- Pin 3 = White Wire
- Pin 4 = Black Wire
- Pin 5 = Yellow Wire
- Pin 6 = Blue Wire
- Pin 7 = Brown Wire

The unit end has the above seven wires stripped and needs to be wired to the corresponding color of wire in the electric box of the unit. To check the cable assembly, first unplug the thermostat end and disconnect each wire at the unit. Next, check for continuity on each wire such as violet to violet, red to red, etc. Continuity should be present from violet to violet, red to red, etc.

Next, check for continuity from one wire to each of the other wires. NO continuity should be present from one wire to any other wire in the assembly.



4.3 BLOWER MOTOR

A. SINGLE COMPRESSOR UNITS

The units that have a single compressor are Models:

- 39015.XXX
- 39025.XXX
- 39035.XXX
- 39045.XXX
- 39115.XXX
- 39325.XXX
- 39335.XXX

To check the motor, turn the unit circuit breaker OFF. With an AC voltmeter, verify that the circuit has no AC voltage.

Next, locate the electric box and remove its cover. The motor leads will connect to a relay or a power module board and the run capacitor (see Section 2.3, Wiring). Disconnect the motor leads.

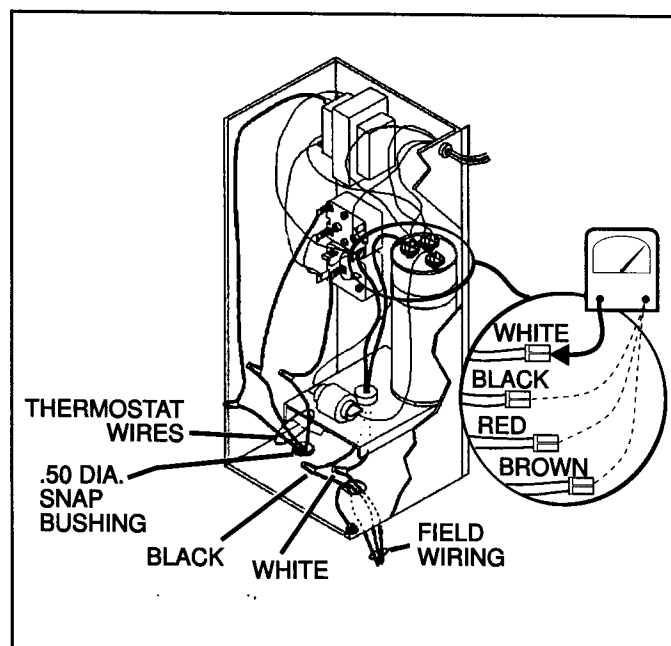
Set your ohm meter to its highest scale for these tests. Check for continuity between the white wire and each of the other wires. Lack of continuity between the white wire and any of the other wires indicates an open circuit and requires that the motor be changed. Next, scrape some paint off the motor casing and check for continuity between each wire and unit casing or the motor casing. If you get continuity between any of the wires and the motor casing, you have a grounded motor and it must be replaced.

There are two types of motors used on these models.

One is a single-speed motor and the other is a two-speed motor (high and low).

The single speed motor has three wires: White (common), Black (high) and Brown (capacitor).

The two-speed has four wires: White (common), Black (high), Red (low) and Brown (capacitor).



B. DUAL COMPRESSOR UNITS

The units that have dual compressors are Models:

39224.601 and 39424.601

To check the motor, turn the unit circuit breaker or breakers OFF. With an AC volt meter, verify that the circuit has no AC voltage. The wires from the motor connect to a nine-pin connector. The motor leads are white (common - Terminal 4), black (high - Terminal 6) and red (low - Terminal 7). Set your ohm meter to its highest scale for these tests. Check for continuity between the white wire and each of the other wires.

Lack of continuity between the white wire and any of the other wires indicates an open circuit and requires that the motor be changed. Next, check for continuity between each wire and the green/yellow wire. If you get continuity, you have a grounded motor and it must be replaced.

TAB		
○ 7	○ 4	○ 1
○ 8	○ 5	○ 2
○ 9	○ 6	○ 3

CIRCUIT 1	CIRCUIT 2
1- Black	1- Orange
2- White	2- Gray
3- Red	3- Brown
4- White	4- White
5- Brown	5- Brown
6- Black	6- Black
7- Red	7- Red
8- Violet	8- Open
9- Violet	9- Open

TERM 1- Compressor (C)	TERM 6- Hi Fan (motor)
TERM 2- Compressor (R)	TERM 7- Lo Fan (motor)
TERM 3- Compressor (S)	TERM 8- Reversing Valve
TERM 4- Common (motor)	TERM 9- Reversing Valve
TERM 5- Capacitor (motor)	

4.4 RUN CAPACITOR

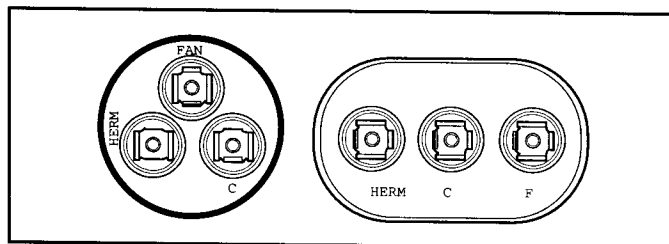
The run capacitor may be one of two different kinds: Either a single capacitor for the fan or compressor, or a combination capacitor for both the fan and the compressor.

The run capacitor should be checked with a capacitor tester. Follow the tester manufacturer's testing procedures. If one is not available, an ohm meter may be used. Only use a dial-type meter. Most digital meters will not do a proper test. Turn the air conditioner circuit breaker OFF. Verify there are no AC volts to the unit before doing any tests.

WARNING

THERE MAY BE A CHARGE ON THE CAPACITOR UNTIL DISCHARGED.

The run capacitor must be manually discharged. Using an AC voltmeter set at the 500 volt scale or higher, connect meter leads to the terminals of the capacitor. After discharging the capacitor, disconnect the wires to the capacitor. Next, set the dial-type VOM meter to the highest ohm scale and connect the probes to the capacitor terminals. The reading should rapidly move toward continuity and slowly return to infinity. You should reverse the leads and repeat the procedure. If there is no reading, or a prolonged reading, replace the run capacitor. The combination run capacitor has three terminals. The terminals are marked "F", "C" and "HERM". To check the combination run capacitor, follow the discharge procedures above. Again, make sure you test from "C" (common) to "F" (fan) and "C" (common) to "HERM" (compressor)



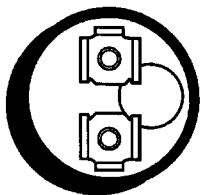
4.5 START CAPACITOR

The start capacitor should be checked with a capacitor tester. Follow the tester manufacturer's testing procedures. If one is not available, an ohm meter may be used. Use a dial-type meter ONLY, most digital meters will not do a proper test. Turn the unit's circuit breaker OFF. Verify there are no AC volts to the unit before doing any tests.

WARNING

THERE MAY BE A CHARGE ON THE CAPACITOR UNTIL DISCHARGED.

The start capacitor must be manually discharged. Using an AC voltmeter set at the 500 volt scale or higher, connect meter leads to the terminals of the capacitor. Next, disconnect the wires to the capacitor. Set the dial-type VOM to the highest ohm scale and connect the probes to the capacitor terminals. The reading should rapidly move toward continuity and slowly return to infinity. Next, reverse the leads and repeat the procedure. If there is no reading or a prolonged reading, replace the start capacitor.



4.6 PTCR DEVICE

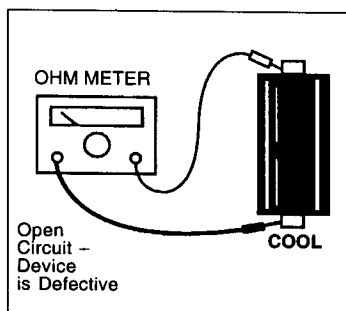
The positive temperature coefficient resistor, or PTCR has replaced the compressor start relay and the start capacitor, on some models. It should be checked in two different ways:

First, check continuity. Turn the air conditioner circuit breaker to OFF. Disconnect the PTCR from the circuit. Check for continuity. If there is no continuity, replace PTCR.

⚠ WARNING

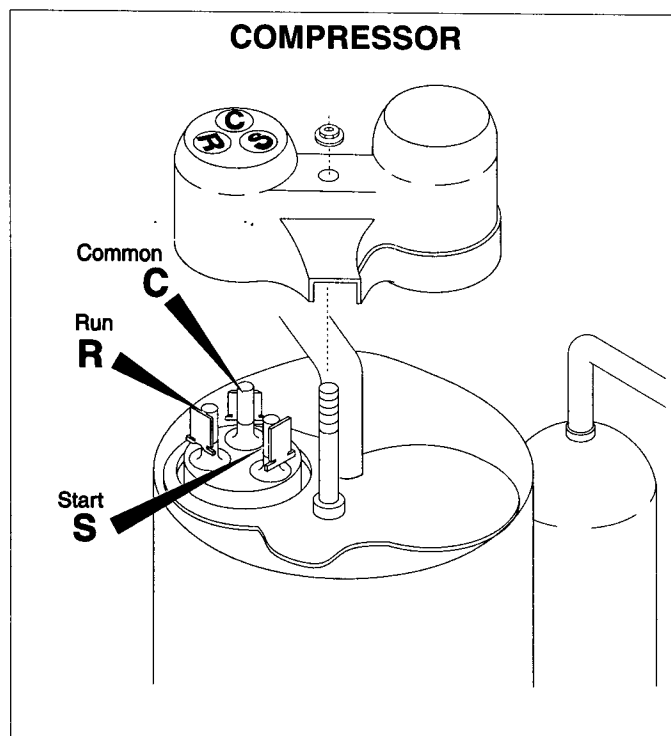
THIS IS AN ENERGIZED CIRCUIT. SHOCK CAN OCCUR IF NOT TESTED PROPERLY. TESTING TO BE DONE BY A QUALIFIED SERVICE TECHNICIAN.

The second check to take is an amperage reading. Clamp an ammeter around the wire from the PTCR to the capacitor. Turn the air conditioner circuit breaker to ON and start the air conditioner. When the compressor starts, there will be an amperage reading for approximately one second or less. If there is no reading, or if there is a prolonged reading, the PTCR or start relay is faulty and must be replaced.



4.7 COMPRESSOR

To check compressor, turn the air conditioner circuit breaker to OFF. Disconnect the wires from the COMMON, START and RUN terminals. With the ohm meter set on the lowest ohm scale, check for continuity between all three terminals. Lack of continuity between any of the terminals indicates faulty windings in the compressor, and the compressor should be replaced. Next, scrape some paint off the casing of the compressor and check for continuity between each terminal and the casing. If a reading is obtained, the windings are shorted to the casing and the compressor must be replaced.



4.8 OVERLOAD PROTECTOR

An overload protector is a component that will open the AC volt circuit to the compressor if the compressor overheats due to an electrical problem. Some compressors have the overload protector built inside the compressor. This type, if defective, requires a complete compressor replacement.

Most compressors have the overload protector mounted on the exterior of the compressor casing. To check this type of protector, turn the air conditioner circuit breaker OFF. Make sure that the overload is at ambient temperature and measure continuity across its terminals. If open, it should be replaced. A weak overload protector in the

electrical system will cause the compressor to start and stop rapidly or short-cycle. This situation would be difficult to test. An exact replacement overload protector should be used whenever a replacement is required.

4.9 REVERSING VALVE

The reversing valve is the heart of a heat pump. It directs refrigerant flow to the coils to achieve proper direction of flow that allows the same system to supply heated or cooled air to enter the inside atmosphere of the structure according to occupants' desires.

The reversing valve's solenoid can be energized in either HEAT or COOL mode of operation. Most Duo-Therm Heat Pumps have the solenoid energized in the COOL mode of operation. The Dual (Model 39424) has the solenoid energized in the HEAT mode of operation.

One way to check the reversing valve is to feel the refrigerant line at the top of the inside coil. In the COOL mode, this line will be cool or cold to the touch. In the HEAT mode, this line will be warm or hot to the touch. If you do not achieve these results, direction of refrigerant flow is not correct.

The ohms resistance of the reversing valve solenoid coil is approximately 465 ohms plus or minus ($\pm$) 10%. If ohms reading is within this range, the solenoid coil is good. If ohms reading is outside this range, replace the solenoid coil.

On Model 39424, verify AC volts are to the solenoid coil when in HEAT mode. If AC volts are NOT present, verify wiring is correct and the 9-pin terminal connector is proper; and connection is completed through it. Next, verify power module board and the relay are good. If AC volts are present and solenoid coil is good, but refrigerant flow is not proper, the reversing valve assembly needs to be replaced.

On all other models verify AC volts is to the solenoid coil when in COOL mode. If AC volts is NOT present, verify wiring is correct and the 6-pin terminal connector is proper; and connection is completed through it. Next, verify power module board is correct, then verify relay is correct. If AC volts are present and solenoid coil is good, but the refrigerant flow is not proper, the reversing valve assembly needs to be replaced.

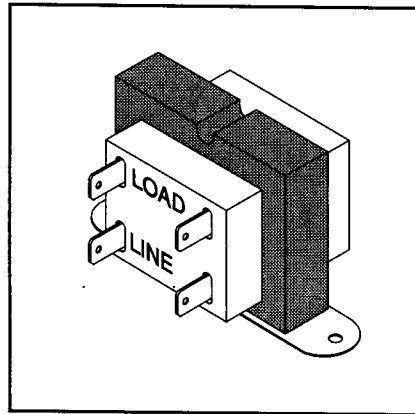
4.10 TRANSFORMER

The transformer supplies low AC volts for the control circuit on the following air conditioner models:

39025.XXX, 39035.XXX & 39045.XXX

The transformer is a 120 volt AC, 50/60 Hz. primary (line terminals) with a 24 volt AC secondary (load terminals), and will handle up to 20 volt-amps.

To check the transformer, first verify 120 volt AC is to the line terminals. Next, verify at least 24 volt AC is on the load terminals. If 24 volt AC is present on the load terminals, the transformer is good. If 24 volt AC is **NOT** present on the load terminals and 120 volt AC is present on the line terminals, the transformer is defective.



4.11 RELAY BOARD

The relay board is used on heat pump models:

39325.XXX, 39335.XXX & 39424.601

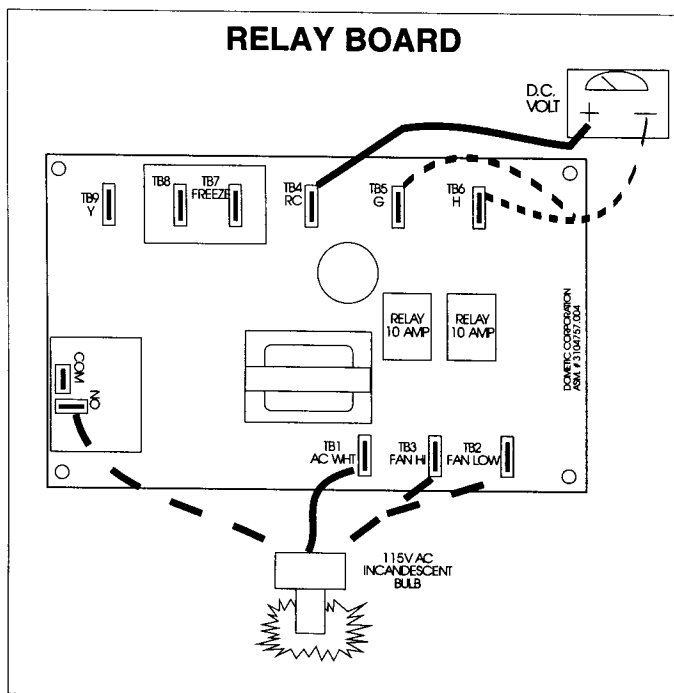
The relay board consists of a transformer, compressor relay, two fan relays and other components. If any one of these are defective, the complete relay board must be replaced.

The relay board completes circuits to the fan motor and compressor depending on what mode switch and temperature setting is on the thermostat.

Remove the cover from the electric box and verify the red wire is on terminal RC, black wire is on terminal G, blue wire is on terminal H and yellow wire is on terminal Y.

With AC power to the relay board, check between terminals RC and G or H. There should be 12 volts DC. If no voltage is detected, the transformer on the relay board is defective. Replace the relay board.

If 12 volts DC is available, disconnect power to the heat pump and remove the HI FAN wire (black) and the LOW FAN wire (red) and the compressor wire (large black) from the NO terminal on the compressor relay on the relay board.



Next, remove the red, yellow, black and blue wires from terminals RC, Y, G and H on the relay board. Place a jumper from terminal RC to terminal Y. Provide power to the heat pump. Using an incandescent bulb, check from AC white terminal (one lead from bulb) to NO terminal on compressor relay on the relay board (other lead from bulb). The bulb should illuminate. Remove the jumper and the bulb would NOT illuminate. Next, place a jumper from terminal RC to terminal G. Now place one lead from bulb to AC white terminal and the other lead from bulb to LOW FAN terminal. The bulb should illuminate. Remove the jumper and the bulb should not illuminate. Next, place a jumper from terminal RC to terminals G and H. Now place one lead from bulb to AC white terminal and the other lead from bulb to HIGH FAN. The bulb should illuminate. Remove the jumper and the bulb should not illuminate. If these tests are correct, the relay board is good. DO NOT replace it. If any one of these tests are incorrect, replace the relay board.

4.12 CHANGEOVER THERMOSTAT

The changeover thermostat is used on heat pump models:

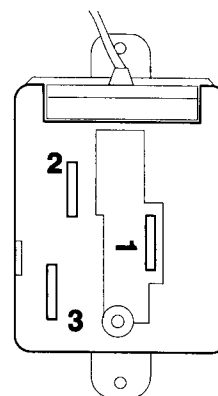
39325.XXX, 39335.XXX and 39424.601

The changeover thermostat is a capillary tube/bellows-type switch. Its function is to allow the compressor to operate only when outside ambient is 40°F. or warmer.

To check the changeover thermostat, first verify the air temperature at the capillary tube. If the temperatures are above 45°F., continuity should be between terminals 2 to 3 and no continuity between terminals 2 to 1. For temperatures below 40°F., continuity should be between terminals 2 to 1 and no continuity between terminals 2 to 3.

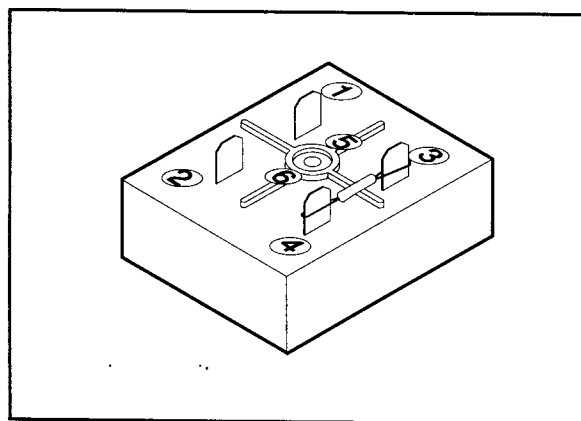
NOTE: A defective changeover thermostat can keep the compressor from operating in the COOL or HEAT PUMP modes.

CHANGEOVER THERMOSTAT



4.13 TIME DELAY RELAY

The time delay relay is used on Model 39424.601. Its purpose is to provide a thirty second delay of power to Circuit 2 System after Circuit 1 System. To check the relay, use a voltmeter. Place one lead of voltmeter to Circuit 1 terminal block **N** (neutral) and the other lead of voltmeter to terminal **1** of relay. Thirty seconds after terminal **1** receives AC volts, move voltmeter lead to terminal **2** of relay. AC volts should be present.

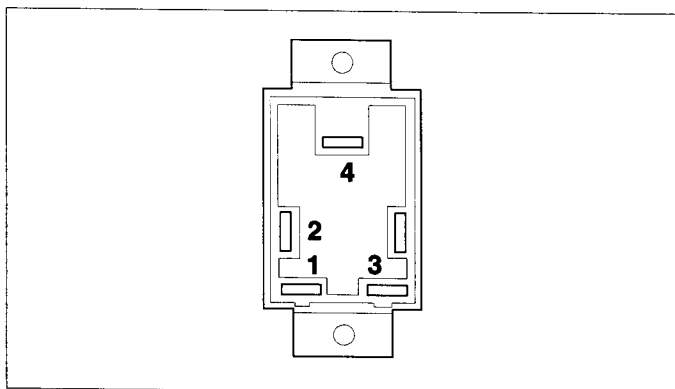


4.14 RELAY

A. Relay, SPST (single pole/single throw) is used on Models 39224.601 and 39424.601.

On Model 39224.601, it is used to complete the 115 volt AC circuit to the compressors, high fan and low fan. On Model 39424.601, it is used to complete 115 volt AC to the reversing valves for Circuit 1 and Circuit 2.

The relay has a DC volt coil. The coil terminals are 1 and 3. When the coil is NOT energized (no power to terminals 1 and 3), no continuity will exist between terminals 4 to 2. When the coil is energized (power to terminals 1 and 3), continuity will exist between terminals 4 to 2.



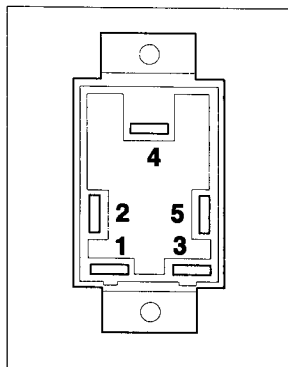
B. Relay, SPDT (single pole/double throw) is used on Models 39325.XXX and 39335.XXX.

On Model 39325.XXX it is used to complete the 115 volt AC circuit to the reversing valve.

On Model 39335.XXX is used to complete the 115 volt AC circuit to the reversing valve and to the furnace blower relay coil. The relay has a DC volt coil.

Terminals 1 and 3 are the coil terminals. When the coil (terminals 1 and 3) is NOT energized (no power to terminals 1 and 3), continuity should exist between terminals 4 to 5; and no continuity between terminals 2 to 4.

When the coil (terminals 1 and 3) is energized (power to terminals 1 and 3), continuity should exist between terminals 2 to 4 and no continuity between terminals 4 to 5.



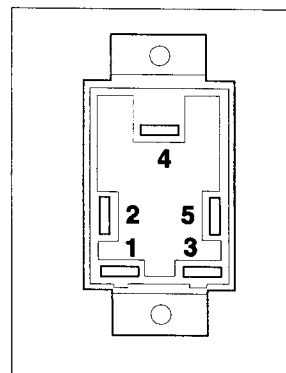
C. Relay, SPDT (single pole/double throw) is used on Models 39424.601, 39115.626, 39125.601, 39335.601 and 39335.636.

On Model 39424.601 it is used to complete 115 volt AC circuit to Circuit 2 compressor. On Models 39115.626, 39125.601, 39335.601 and 39335.636 it is a furnace blower relay.

The relay has a 115 volt AC coil.

Terminals 1 and 3 are the coil terminals. When the coil (terminals 1 and 3) is NOT energized (no power to terminals 1 and 3), continuity should exist between terminals 4 to 5; and no continuity between terminals 2 to 4.

When the coil (terminals 1 and 3) is energized (power to terminals 1 and 3), continuity should exist between terminals 2 to 4 and no continuity between terminals 4 to 5.

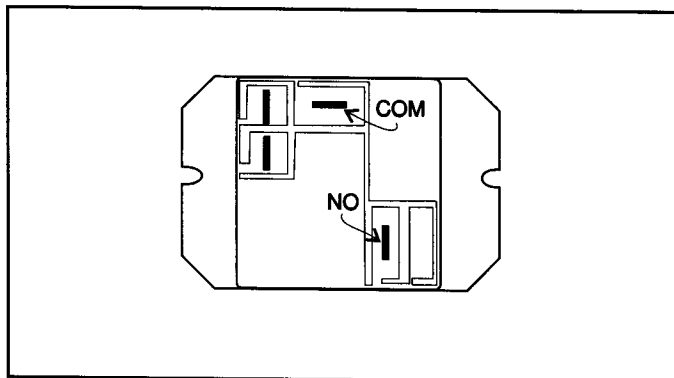


D. Relay, SPST (single pole/single throw) is used on Models 39115.602, 39115.616 and 39115.626.

On these models it is used to complete 115 volt AC circuits to the compressor and for fan speeds.

The relay has a DC volt coil. To check the relay, first verify AC volts have been turned off to the unit.

Next, verify the relay coil is NOT energized (no DC power). No continuity should exist between terminals COM to NO. Energize the coil with DC volts (10 to 16). Continuity should exist between terminals COM to NO. If the above checks are correct, the relay is good – DO NOT replace it. If the previous checks are not correct, the relay is defective and should be replaced.



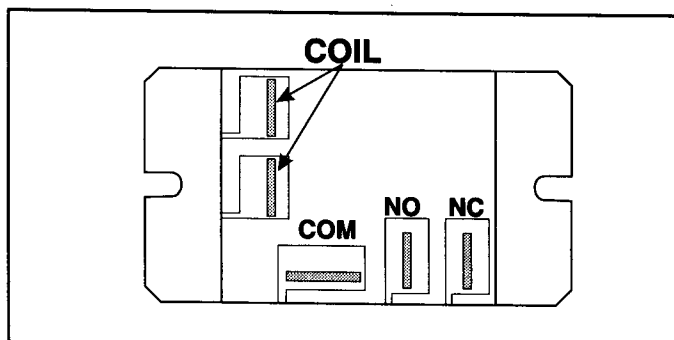
E. Relay, SPDT (single pole/double throw) is used on Models 39115.XXX, 39325.XXX, 39335.XXX and 39424.601.

On Models 39115.XXX it controls HIGH and LOW FAN speeds. On Models 39325.XXX, 39335.XXX and 39424.601, it opens the control circuit for the fan motor when the coil is energized.

NOTE: Incorrect wiring to the thermostat can energize the relay coil on heat pump models 39325.XXX, 39335.XXX and 39424.601.

The relay has a DC volt coil. To check the relay, first verify all AC volts have been turned off to the unit.

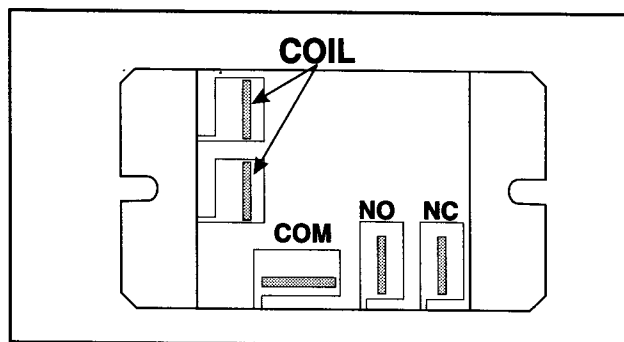
Next, remove the wires from COM and NC terminals. Verify the relay coil is not energized (no DC power). Continuity should exist between terminals COM and NC and no continuity between terminals COM and NO. Next, energize the relay coil with DC volts (10 to 16). Continuity should exist between terminals COM and NO and no continuity between COM and NC. If the above checks are correct, the relay is good – DO NOT replace it. If the above checks are not correct, the relay is defective and should be replaced.



F. Relay, SPDT (single pole/double throw) is used on Models 390XX.XXX. It controls the fan motor.

The relay has a 24 volt AC coil. To check the relay, first verify all AC volts have been turned off to the unit.

Next, remove the wires from COM and NC terminals. Verify the relay coil is not energized (no AC power). Continuity should exist between terminals COM and NO. Next, energize the relay coil with 24 volts AC. Continuity should exist between terminals COM and NO and no continuity between COM and NC. If the above checks are correct, the relay is good – DO NOT replace it. If the above checks are not correct, the relay is defective and should be replaced.

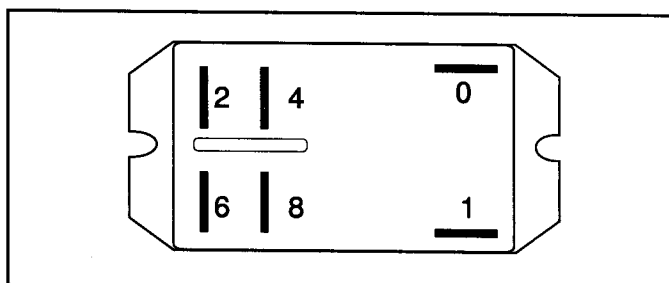


G. Relay, DPST (double pole/single throw) is used on model 39424.601.

It controls HIGH FAN and LOW FAN on Circuit 1 and 2. If this relay is not wired correctly, Circuit 1 fan will not operate with Circuit 1 compressor.

The relay has a 120 volt AC coil. To check the relay, first verify all AC volts have been turned off to the unit.

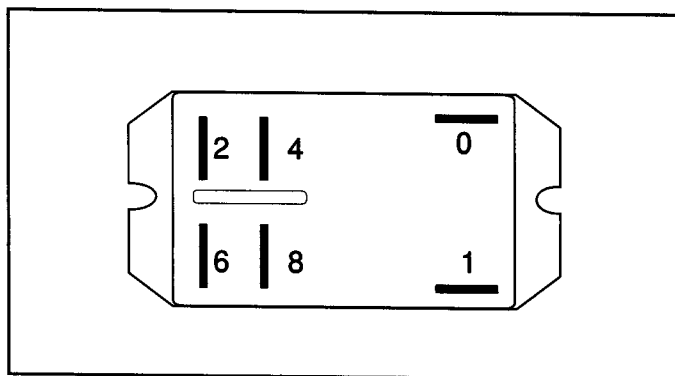
Next remove the wires from terminals 2, 4, 6 and 8. Verify the coil (terminals 0 and 1) are not energized (no AC power). Continuity should not exist between terminals 2 to 4 or terminals 6 to 8. Next, energize the coil (terminals 0 and 1). Continuity should exist between terminals 2 to 4 and terminals 6 to 8. If the above checks are correct, the relay is good DO NOT replace it. If the checks are not correct, the relay is defective – replace it.



H. Relay, DPST (double pole/single throw) is used on Models 390XX.XXX. It controls the compressor.

The relay has a 24 volt AC coil. To check the relay, first verify all AC volts have been turned off to the unit.

Next, remove the wires from terminals 2, 4, 6 and 8. Verify the coil (terminals 0 and 1) are not energized (no AC power). Continuity should not exist between terminals 2 to 4 or terminals 6 to 8. Next, energize the coil (terminals 0 and 1). Continuity should exist between terminals 2 to 4 and terminals 6 to 8. If the above checks are correct, the relay is good – **DO NOT** replace it. If the checks are not correct, the relay is defective – replace it.



SECTION 5

AIR FLOW

5.1 SHORT CYCLE

Short cycle could be caused by cold air being circulated directly on the wall control unit. Make sure you do not have a ceiling register too close to the wall control. Verify the duct connection at the air conditioner is not leaking cold air into return air. Seal all problem areas.

5.2 AIR FLOW OBSTRUCTION

The coils and filters must be kept clean. Obstructions reduce the amount of air passing through the coils. Dirt acts as an insulator reducing the heat transfer across the fins. Turn the air conditioner circuit breaker to OFF. Brush the fins with a soft bristle brush, and vacuum up the residue.

AIR FILTER: Your air conditioner will operate more efficiently with a clean filter. Replace the filter with a new one every three months.

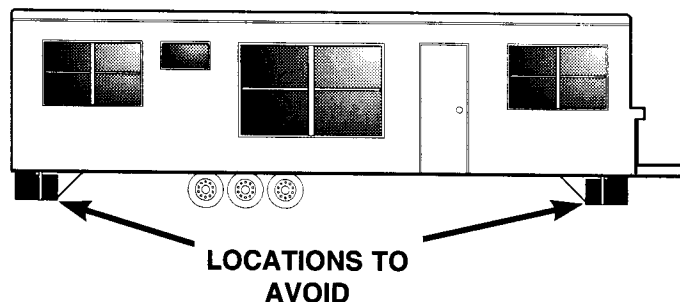
To maintain efficient operation, the exposed **CONDENSER COIL** should be cleaned as often as necessary to keep it free of dirt and debris. Be careful not to damage the coil fins when cleaning.

5.3 AIR DISTRIBUTION SYSTEM

A. MODELS 390XX.XXX, 391XX.XXX AND 393XX.XXX

LOCATION

The system is intended for installation in a recreational vehicle where the interior is essentially one undivided space. When locating the unit, avoid any area where the unit could be damaged when transporting. An area to avoid during mounting is the extreme front and rear of the unit.



CONDENSER SECTION

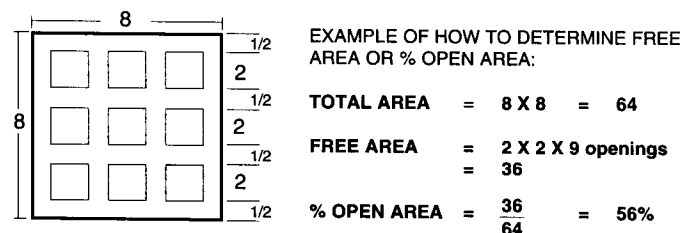
The condenser coil is designed to have a fresh supply of air. If skirting is installed, allow a 15" x 22" opening (330 square inches) for supply air and a 15" x 22" opening (330 square inches) for discharge air. Use the cross flow method for good air circulation.

CAUTION

DO NOT TOTALLY ENCLOSE THE UNDERSIDE OF THE UNIT. AIR CIRCULATION PREVENTS HEAT FROM BUILDING UNDER UNIT AND YOUR SYSTEM WILL PERFORM AS DESIGNED.

The condenser section is a "blow-through" type. When the face of the coil is positioned behind a louvered or other type of restrictive opening, the **FREE AREA** of the opening must be **at least 330 square inches**.

FREE AREA — is the opening that remains in a grill or louvered panel after the restrictions are taken away. For example; an opening of 10 x 20 inches has 200 square inches. When this opening is covered with a grill that is 56 percent open, the **FREE AREA** is (200 x .56), 112 square inches.



Expanded and perforated metal grills in general vary from 30 percent to 60 percent open. Be certain that **294 square inches** of FREE AREA is available to the face of the condenser.

NOTE: Service access must always be supplied either as clearance or as a defined access panel.

MOUNTING

Vibration eliminators should be used at the unit's surface contact points to prevent the transmittance of vibration into the living area. Use a rubber or ethafoam pad to absorb any unit vibration that may occur.

The air conditioning unit may be attached to rails beneath the vehicle, attached to the frame, or mounted directly to the floor of some vehicles.

Unit should be mounted with a tilt toward the rear (condenser) a half-bubble using a level. Unit rear should be 1/4" lower than the front.

SERVICE ACCESS

Be sure **NOT** to block the inlet or discharge air, or service access, when mounting.

EVAPORATOR SECTION: CLEARANCES

The minimum clearances to the evaporator are zero inches to the bottom, top, left and right sides. Access to the electrical connections and drain connection must be provided when making the installation.



Be sure to allow sufficient room to service the electrical components.

INLET AIR

The evaporator section must have free access to room air. **A minimum of 255 square inches** of FREE AREA opening is required. Where the return air must be provided through louvers or mesh screen, the FREE AREA percentage of the material used shall be taken into consideration when making this determination. An example of how to determine FREE AREA is included under "**CONDENSER SECTION**".

Refer to "Grills and Registers" on page 44.

GRILLS AND REGISTERS

NOTE: The return air grill must have the same square surface as the coil face (15"H x 17"L).

For each air conditioning system, there must be a return grill to bring cabin air back into the unit. There must also be at least four discharge grills per unit.

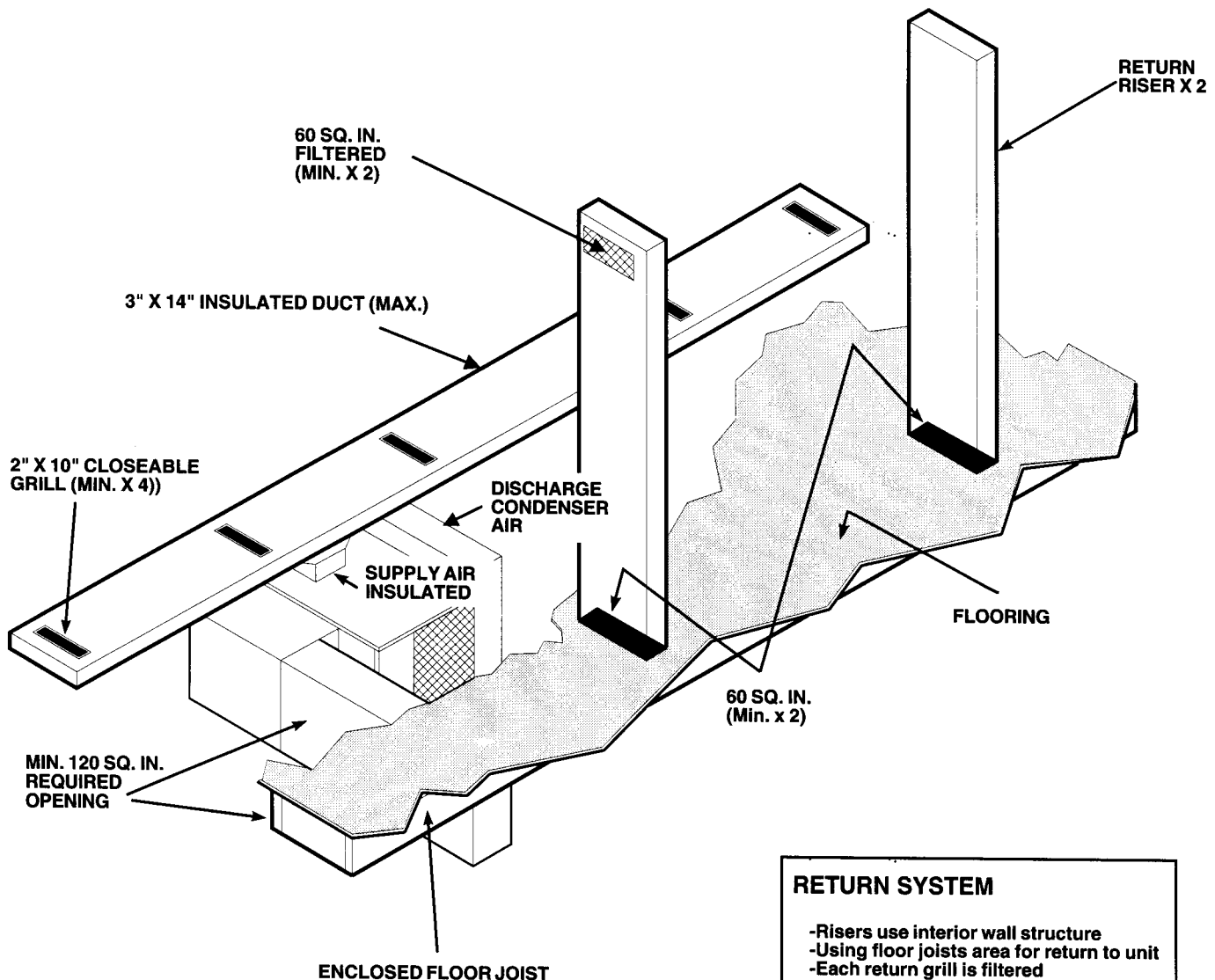
Return air grills must be located in a high wall area (next to the ceiling) for good air circulation. Each return air grille must be filtered and accessible for cleaning or replacement.

OUTLET AIR

The central air conditioning unit is designed to use a 3" x 14" max. discharge air duct at a static pressure of .10 to .25 inches water column. This duct size is necessary to maintain proper air flow without loss of static pressure and provide good air circulation.

All air handling ducts must be properly insulated to prevent condensation forming on their surface during operation. A vapor barrier must also be supplied on the outer surface of the insulation to prevent moisture from traveling through the insulation and condensing on the cold ductwork.

NOTE: If the air conditioning unit is attached to the central furnace, a damper must be installed at the furnace outlet to prevent cold air from circulating through the furnace heat exchanger.

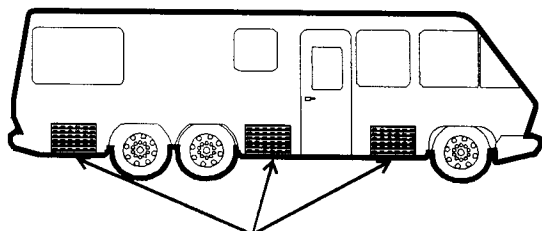


B. MODELS 39224.601 AND 39424.601 LOCATION

This system is intended for installation in a recreational vehicle where the interior is essentially one undivided space.

A **Condenser Section** intended to be installed with DIRECT access to the out-of-doors.

The thermostat can be located up to twenty-five (25) feet from the electrical box.



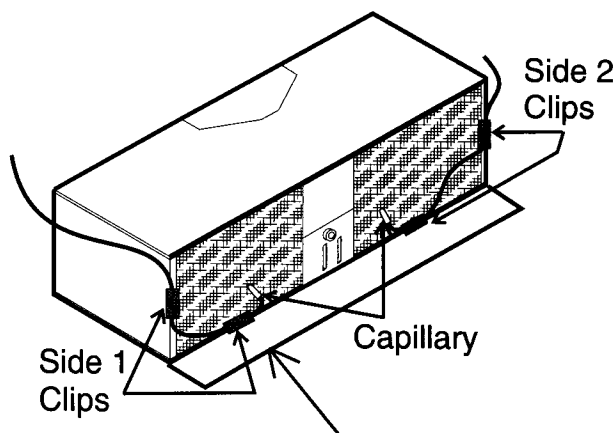
POSSIBLE LOCATIONS

CONDENSER SECTION SUPPLY AIR

The inlet of the condenser coil should be positioned so that it draws air from outside the vehicle. **SPECIAL CARE MUST BE TAKEN TO PREVENT THE DISCHARGE AIR FROM RECIRCULATING TO THE INLET OF THE CONDENSER COIL.** Shields should be added to ensure fresh air supply.

! WARNING

DO NOT INSTALL THE CONDENSER WHERE THE FAN WILL DRAW AIR FROM THE EXHAUST OF THE VEHICLE, A MOTOR GENERATOR SET, TRANSMISSION, ROAD HEAT OR ANY OTHER HEAT PRODUCING SOURCE.



FIELD INSTALLED SHIELD THAT WILL PREVENT RECIRCULATION OF CONDENSER AIR.

The condenser section is a "draw-through" type. When the face of the coil is positioned behind a louvered or other type of restrictive opening, the **FREE AREA** of the opening must be **at least 460 square inches**.

FREE AREA — is the opening that remains in a grill or louvered panel after the restrictions are taken away. For example, an opening of 10 x 20 inches has 200 square inches. When this opening is covered with a grill that is 56 percent open, the **FREE AREA** is (200 x .56), 112 square inches.

Expanded and perforated metal grills in general vary from 30 percent to 60 percent open. Be certain that **460 square inches** of **FREE AREA** is available to the face of the condenser.

The diagram shows a large square with a side length of 8. Inside this square is a 3x3 grid of smaller squares. The spacing between the grid squares and the outer boundary is 1/2 unit. The side length of each opening is 2 units.

EXAMPLE OF HOW TO DETERMINE FREE AREA OR % OPEN AREA:

TOTAL AREA = 8 X 8 = 64

FREE AREA = 2 X 2 X 9 openings
= 36

% OPEN AREA = $\frac{36}{64}$ = 56%

NOTE: The auxiliary heat position on the wall mount thermostat allows you to switch to the gas furnace mode at any outside temperature or any time you wish.

CHANGEOVER THERMOSTAT CAPILLARY INSTALLATION (MODEL 39424.601 ONLY)

The changeover thermostat is located in the remote electrical box. After the electrical box is installed and the dual heat pump is in position:

1. Locate the two (2) nylon clips. (See electrical kit package);
2. Locate the capillary tube for the changeover thermostat;
3. The changeover thermostat capillary must be located in the air stream of the condenser coil;
4. The nylon clips should be placed on the unit cabinet. Use side (1) or side (2), depending upon where the electrical box is located;
5. Use care uncoiling the capillary tube and extending it over to the air conditioning unit. Hook the capillary tube into the nylon clip as shown in illustration.

CLEARANCES

The air conditioning unit clearances depend on:

1. Inlet air access used;
2. Discharge air duct arrangement;

3. Return air duct;
4. Storage compartment location and design.

A one inch clearance is required on three sides of the air conditioner if the top return is used. When using the side access for return, please allow a minimum of eight inches for the return air duct. Access to the electrical connections must be provided when making the installation.

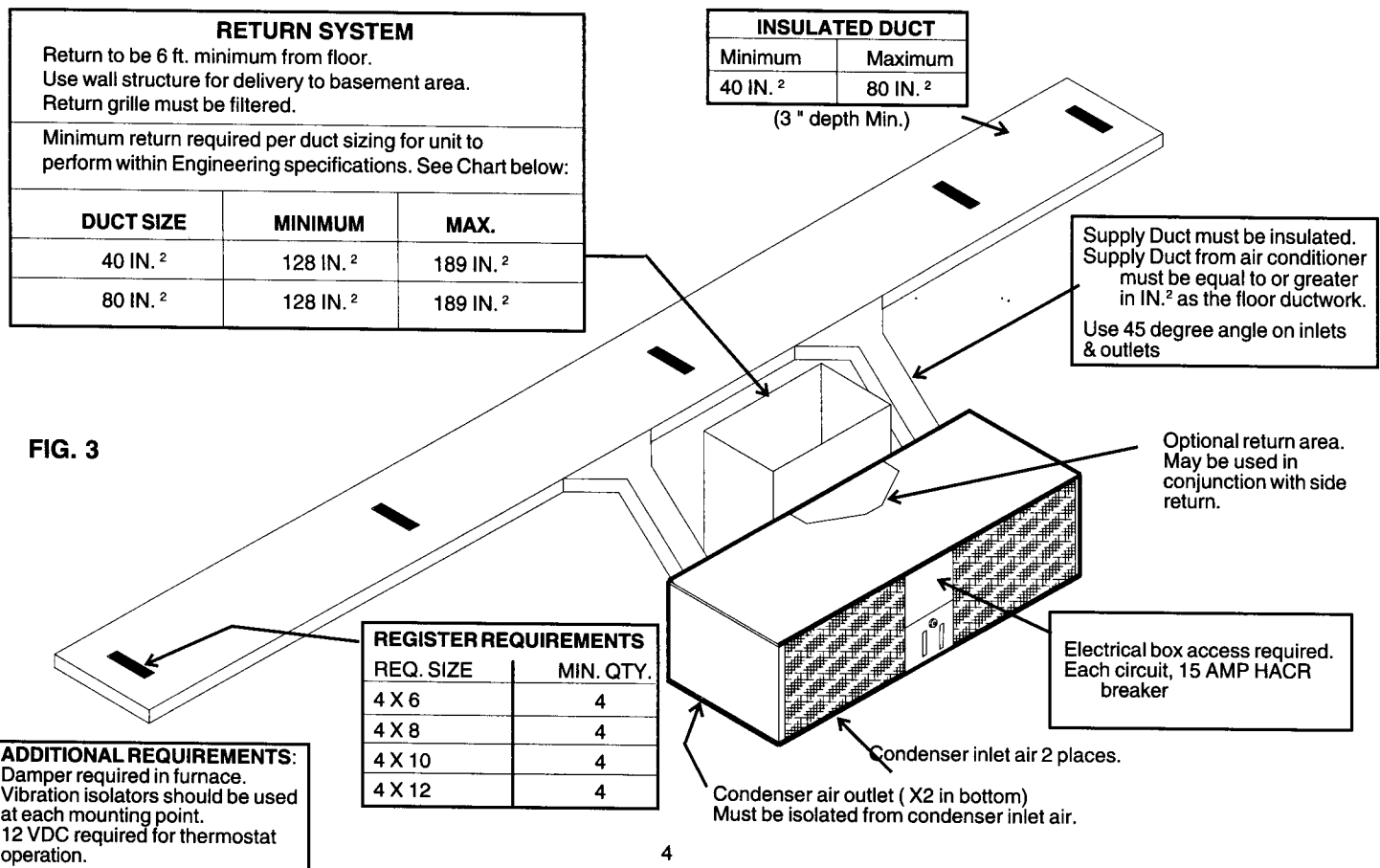
EVAPORATION SECTION INLET AIR

The evaporation section must have free access to room air. A minimum of 128 square inches of FREE AREA opening is required. Where the return air must be provided through louvers or mesh screen, the FREE AREA percentage of the material used shall be taken into consideration when making this determination. An example of how to determine FREE AREA is included under "2. CONDENSER SECTION".

GRILLS

NOTE: The return air grill must have the same square surface as the return air duct.

- 1) For each air conditioning system, there must be a return grill to bring cabin air back into the unit. There must also be at least four discharge grills per unit.



- 2) Return grills must be mounted in front of the evaporator. If this is not possible, make sure there is nothing blocking the air flow from the grill to the evaporator.
- 3) The unit must have a return filter between the grill and the unit. This filter must be accessible for periodic cleaning.

OUTLET AIR

The air diffusion system, supplied by the installer, must be sized to maintain a static pressure at the blower outlet between .4 and 1.2 inches water column.

All air handling ducts must be properly insulated to prevent condensation forming on their surface during operation. A vapor barrier must also be supplied on the outer surface of the insulation to prevent moisture from traveling through the insulation and condensing on the cold ductwork.

CONDENSATE DRAIN

A .50 dia. hole for condensate drainage is located between the condenser coils. A 1/4" NPT fitting with tubing may be added to direct condensation.

NOTE: Drain fitting and tubing must be used if installed in a finished compartment.

SECTION 6 OTHER

6.1 HEAT GAIN/HEAT LOSS

HEAT GAIN can be caused by several factors: A hot, humid and sunny day, a large number of people in the coach, frequent opening of the door, excessive showering and cooking, etc.

Other factors to be taken into consideration as possible heat gain causes are the size of the air conditioner relative to the size of the coach; the "R" factor of insulation; and the size and placement of windows.

HEAT LOSS can be caused by several factors:

Loose windows or no storm windows, frequent opening of the door, or anything that would allow excessive heat loss to the outside atmosphere.

Other factors to take into consideration as possible heat loss causes are the size of the unit relative to the size of the coach, the "R" factor of the insulation and the size and placement of windows.

The manufacturer of the RV should be consulted for recommendations on HEAT GAIN or HEAT LOSS.

6.2 LOOSE PARTS

Loose parts can cause the air conditioner to operate noisily. Check for any loose bolts, any component rubbing against its housing, or any plastic parts which might be cracked. Repair or replace parts as necessary to correct any noise problems.

6.3 TUBING VIBRATION

If any of the copper tubing is rubbing against itself or any other part, verify that the proper tubing has been installed. Duo-Therm air conditioners are designed to avoid this problem if the correct tubing is used. Replace or position tubing as necessary.

SECTION 7

SEALED SYSTEM

7.1 RECHARGING

NOTE: The *Clean Air Act* of 1990 set guidelines in regard to recapturing or disposition of refrigerants. Check with local authorities for proper handling or evacuation of refrigerants.

NOTE: DO NOT attempt to check high and low side pressures below 75° ambient (outside) temperature.

The equipment items needed to properly evacuate and recharge a sealed system are: a piercing type clamp-on saddle valve; a braze-on processing valve; a core removal tool; a process tube fitting; a set of compound gauges; a vacuum pump; equipment to weigh a precise amount of refrigerant; R-22 refrigerant; gas welding equipment; a R-22 refrigerant leak detector and recapturing or recycling equipment. **If you have not been properly trained in sealed system repairs, do not attempt this procedure.**

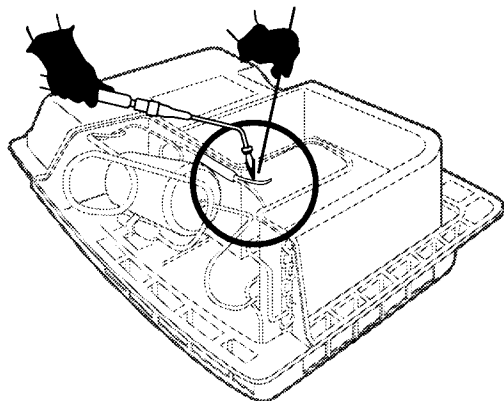
NOTE: This is not a thorough sealed system repair training program. For additional information or training, you may want to attend a basic air conditioning course at your local college.

To drain the R-22 refrigerant, attach a clamp-on saddle valve on the low side process tube. If the air conditioner does not have a low side process tube, attach a saddle valve at the point where you will add a process tube.

Slowly drain the R-22 refrigerant by using recapturing or recycling equipment. Do not leave the clamp-on saddle valve on the unit as it will cause leaks.

If you are going to use the braze-on processing valve, once the refrigerant has been drained, use a tubing cutter and cut the tube near the end. Do this on both the low and high side processing tubes.

Next weld the process tube in place. We recommend using a brazing material which melts between 950° and 1450° Fahrenheit, and contains a minimum of 2% silver, and 5% to 10% phosphorous. This type of brazing material does not require the use of a flux to join copper to copper. If you are using the weld on the process valve, be sure the valve core is removed before any heat is applied.



Connect the blue colored low pressure line of the compound gauges to the charging port on the low side pressure tubing. Next, connect the red colored high pressure line of the compound gauges to the charging port on the high side pressure tubing.

Next, connect the yellow colored line of the compound gauges to the charging cylinder and add two or more ounces of R-22 refrigerant to the sealed system and check all weld joints for leaks. Allow the refrigerant to stay in the system for at least 10 minutes. If a leak is detected, drain the system and repair the leak before you proceed.

When you are certain the system is sealed, drain any refrigerant from the system and connect the yellow common line of the compound gauges to the vacuum pump.

Open the pressure relief valve on the vacuum pump. This allows the major contaminants from the sealed system to escape into the atmosphere rather than enter the oil in the vacuum pump.

Both the low and high side valves on the compound gauge set should be opened and the vacuum pump turned on.

After five minutes, close the pressure relief valve on the vacuum pump. Check the blue gauge after running the vacuum pump for 10 minutes. A vacuum reading of zero to 10 inches would indicate a leak in the system or the hose connections. Check all hose connections for tight-

ness. If the low side gauge does not change, there is a leak in the sealed system. Locate the leak and correct it before proceeding.

If the blue low side gauge is well below 10 inches of vacuum, continue the evacuation for at least 40 to 45 minutes or until **you have a dry system**.

At this time there should be a good, deep evacuation, or dry atmosphere inside the sealed system. Close both the low and high side valves on the compound gauge set and turn off the vacuum pump.

Disconnect the yellow colored hose at the vacuum pump and connect it to the bottom port or connection on the charging cylinder. Open the valve on the cylinder.

For the correct amount of R-22 refrigerant charge, check the data plate of the air conditioner you are working on. To compensate for the red liquid line, on the gauge set (approx. 30—36 inches long), add one ounce to the data plate amount. You are now ready to do a weighted charge.

The air conditioner charge is critical and must be exact for proper cooling. The proper charge is noted on the data plate of the unit.

Allow the refrigerant charge to equalize by waiting 10 minutes before starting the system. After 10 minutes, do a cooling performance test to determine whether the problem was in the amount of charge or within the components of the system.

Now the blue low side and the red high side lines should be disconnected. Make sure that the air conditioner connection is sealed before removing the lines. The process tube can be pinched off in two places; the charging port cut off, and the end of the tube brazed for a hermetically sealed system.

7.2 SEALED SYSTEM PROBLEMS

One mechanical problem you may encounter is refrigerant flow restriction. There are two types of restrictions, high side and low side. The basics to use to determine a restriction are amp draw and pressure. This check will only work above 75°F.

To determine the high side pressure, add 32 degrees to your ambient temperature. Find that temperature on the chart on Page 27. The pressure listed to the right of the temperature should be your correct high side pressure, plus or minus 7 PSIG. For the low side pressure, divide the high side pressure by four. This will be the low side pressure, plus or minus 3 PSIG.

High side restriction will cause higher than normal amp draw, drastically higher than normal high side pressures, and slightly higher than normal low side pressures.

Low side restriction will cause lower than normal amp draw, drastically lower than normal low side pressures and slightly lower than normal high side pressures.

A restriction that would not follow these basic conditions is a liquid line restriction, which is in the high side of the air conditioner. It will give the same results as a low side restriction.

The most common restriction is the capillary tube or tubes. If there is a restriction in the liquid line, there will be a temperature drop from one side of the restriction to the other side.

In the case of a capillary tube restriction, one tube would be normal (warm to the touch) and the restricted tube would be cool or cold to the touch, and could even sweat if operated long enough.

A restriction in the filter-drier would cause a temperature drop at the point of the restriction. A buildup of frost or sweat could be evident if operated long enough.

Refrigerant leaks can occur from an improper weld, a broken line or other damage. Compressor oil will often be noticeable at the location of major leaks.

Replace any parts that are found to be bad. Whenever a component is replaced in the sealed system, or the system has been opened to the atmosphere, a good, deep evacuation and an exact weighted charge is required.

REFRIGERANT VAPOR PRESSURES (PSIG)

Temp. Deg. F.	Pressure PSIG R-22	Temp. Deg. F.	Pressure PSIG R-22	Temp. Deg. F.	Pressure PSIG R-22	Temp. Deg. F.	Pressure PSIG R-22
20	43.0	57	96.1	94	179.1	131	300.7
21	44.1	58	97.9	95	181.8	132	304.6
22	45.3	59	99.8	96	184.6	133	308.6
23	46.4	60	101.6	97	187.4	134	312.6
24	47.6	61	103.5	98	190.2	135	316.6
25	48.8	62	105.4	99	193.0	136	320.7
26	50.0	63	107.3	100	195.9	137	324.8
27	51.2	64	109.3	101	198.8	138	328.9
28	52.4	65	111.2	102	201.8	139	333.1
29	53.6	66	113.2	103	204.7	140	337.3
30	54.9	67	115.2	104	207.7	141	341.5
31	56.2	68	117.3	105	210.3	142	345.8
32	57.5	69	119.4	106	213.8	143	350.1
33	58.8	70	121.4	107	216.9	144	354.5
34	60.1	71	122.5	108	220.0	145	358.9
35	61.5	72	125.7	109	223.2	146	363.4
36	62.8	73	127.8	110	226.4	147	367.8
37	64.2	74	130.0	111	229.6	148	372.4
38	65.6	75	132.2	112	232.8	149	376.9
39	67.1	76	134.5	113	236.1	150	381.5
40	68.5	77	136.7	114	239.4	151	386.2
41	70.0	78	139.0	115	242.7	152	390.9
42	71.5	79	141.3	116	246.1	153	395.6
43	73.0	80	143.6	117	249.5	154	400.4
44	74.5	81	146.0	118	253.0	155	405.2
45	76.0	82	148.4	119	256.4	156	410.0
46	77.6	83	150.8	120	259.9	157	414.9
47	79.2	84	153.2	121	263.5	158	419.9
48	80.0	85	155.7	122	267.0	159	424.8
49	82.4	86	158.2	123	270.6	160	429.9
50	84.0	87	160.7	124	274.3	161	434.9
51	85.7	88	163.2	125	278.0	162	440.1
52	87.4	89	165.8	126	281.7	163	445.2
53	89.1	90	168.4	127	285.4	164	450.4
54	90.8	91	171.0	128	289.2	165	455.7
55	92.6	92	173.7	129	293.0		
56	94.3	93	176.4	130	296.8		