

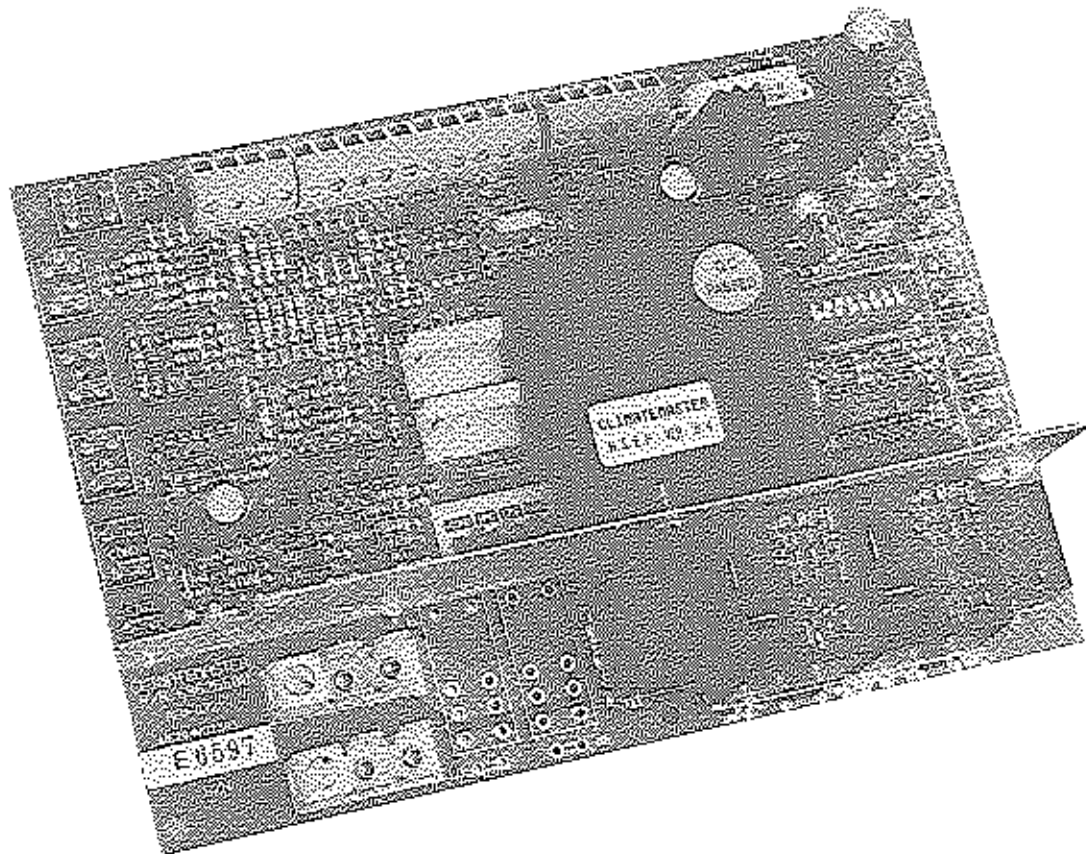
**ClimateMaster**

**CMC 2001 Series**

**Residential Electronic Controller**

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## **Installation, Operating & Maintenance Instructions**



## TABLE OF CONTENTS

General Information	3
Overview	3
General Operating Parameters	3
Relay Ratings	3
Features	3
Installation of Power Wiring	3
Single Phase Equipment	3
Three Phase Equipment and Single Phase over 10 AMPS	3
Unit Operation	4
Powering Up Unit	4
Normal Operation	4
Thermostat Inputs	4
Dip Switch Settings	4
Safety Features	4
Settings	5
Fault Indications and Diagnostic LEDs	6
Maintenance	6
Test Mode	6
Interfacing the CMC 2001 Controller with the AT908	6
Replacing a Controller Board	6
Control Board Trouble Shooting	7
Control Board Diagnostic Chart	10
Trouble Shooting Chart: CMC 2001 Controllers	11

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## GENERAL INFORMATION

### Overview

This manual includes discussion on the following controller options:

Diagnostics: Controller use with ClimateMaster thermostats, Controller use with electronic programmable thermostats.

### General Operating Parameters

The following are general operating parameters for the CMC 2001 Series Controller:

*Operating Environment:* 40° F (4.4° C) to 140° F (60° C) 5 to 95% relative humidity, non-condensing.

*Storage Environment:* 0° F (-18° C) to 158° F (70° C) 5 to 95% relative humidity, non-condensing.

*Power Requirements:* A dedicated 24 VAC, 50-60 HZ, 1 PH, 40 VA transformer is required.

### Relay Ratings

The following relays are included with the CMC 2001 Series Controller:

- *Compressor Relay:* 2 HP at 277 VAC
- *Fan High Speed Relay:* 2 HP at 277 VAC
- *Reversing Valve Relay:* 5 Amps at 24 VAC

### Features

The CMC 2001 Series controller offers the following features which improve the operation and safety of water source heat pump systems:

- Anti-short cycle protection
- High and low pressure cutouts
- High and low voltage cutouts
- Low water temperature (freeze) protection
- Random start
- Quiet reduced cycling reversing valve operation
- Diagnostic LED's
- Reset lockout at unit or at disconnect
- Intelligent reset
- Condensate overflow sensor
- Ability to work with any electronic or electro-mechanical thermostat.
- Night set back, compressor shut down and emergency shut down.
- Elimination of time delays for field servicing

### Installation of Power Wiring

#### ⚠ WARNING

All wiring must comply with the National Electric Code and all local codes.

#### CAUTION!

The CMC 2001 Series Controller uses static sensitive CMOS components which may be damaged by static. To prevent damage to the components during service, **DO NOT TOUCH CIRCUIT BOARD COMPONENTS. HOLD THE CIRCUIT BOARD BY THE EDGES ONLY.**

### Single-Phase Equipment

Wire Single-Phase equipment requiring less than 10 amps at 240 VAC (2.4 kva) as follows:

1. Connect the incoming main power from an NEC or local code approved disconnect device to terminals L1 and L2 on the control board. Refer to the wiring diagram attached to the unit.
2. Connect a ground wire from the power source. Earth-ground couple to the chassis ground screw is provided in the control box. Use copper conductors only.
3. Do not run the AC power wiring in the same conduit with low voltage wiring.

### Three-Phase Equipment and Single-Phase over 10 AMPS:

Wire Three-Phase equipment and Single-Phase equipment requiring 10 amps or more at 240 VAC (2.4 kva) as follows:

1. Connect the incoming main power from an NEC approved disconnect device to the line voltage connections in the control box. Refer to the wiring diagram attached to the unit.
2. Connect a ground wire from the power source. Earth-ground couple to the chassis ground screw is provided in the control box. Use copper conductors only.
3. Do not run the AC power wiring in the same conduit with low voltage wiring.

## UNIT OPERATION

### Powering up Unit

Turn on power. Verify that the green LED light is illuminated. The following conditions indicate that a fault may be present.

- Green LED is not illuminated (located below dip switch - Version E)
- Four (4) alarm LED's are blinking
- One (1) alarm LED is illuminated

Refer to diagnostic and Control Board Trouble Shooting charts on pages 13-15.

### Normal Operation

The Controller operates in normal mode when the green LED is illuminated to indicate that power is applied and no alarm LED's are illuminated or blinking.

### Thermostat Inputs

**R - G Fan Only** - The fan energizes when a closure occurs. On units without fan speed control, the closure is controlled by the tap at the motor wired to meet the installation requirements. On units where the fan speed option has been supplied, closure occurs at the speed selected.

**R - Y Cooling** - The first time a closure occurs, the fan starts immediately unless one of the Hi, Me, Lo inputs are activated, due to the fan switch on the thermostat. The water valve relay is then energized, which is followed by a 5 to 80 second random start delay. At this time, a 20 second fixed delay is applied, after which the reversing valve is energized. One second later, the compressor is energized.

When the input opens, the compressor is de-energized. One second later the water valve is de-energized. After an additional 30 seconds, the fan is de-energized unless one of the Hi, Me, Lo inputs are activated.

On all subsequent closures, the sequence is the same as for the initial closure except that the 5 to 80 second random start delay is omitted.

**NOTE:** The compressor energizes 20 seconds after the water valve and the fan are energized unless the controller has damper option selected. If the damper option is selected, the 20 second delay for the

compressor is eliminated and the water valve relay is energized 30 minutes after the compressor first start-up at initial power on or the deactivation of the USD Set back function.

**R - W Heating** - R-W Heating operations follow the same sequence of functions as R-Y Cooling except that the reversing valve is *de-energized* during the heating mode.

### Dip Switch Settings

*Check Board Revision Before proceeding.*

#### CMC-2001 Revision E

**Dip Switch #1-5** - Not Used.

**Dip Switch #6** - "ON".

**Dip Switch #7** - "OFF" - Safety contacts LTS, LPS, and HPS are normally closed.

**Dip Switch #8** - "ON" - Resets board from main power switch on a console unit. A horizontal or vertical unit, reset is accomplished by momentarily turning the system switch to the "OFF" position at the thermostat. "OFF" Reset function by cycling the main power only.

**NOTE:** To reset the board at the thermostat, the fan switch on the thermostat must be in the "AUTO" position.

#### CAUTION

After changing dip switch settings, turn the unit off at the disconnect and power up to initiate the new unit settings.

### Safety Features

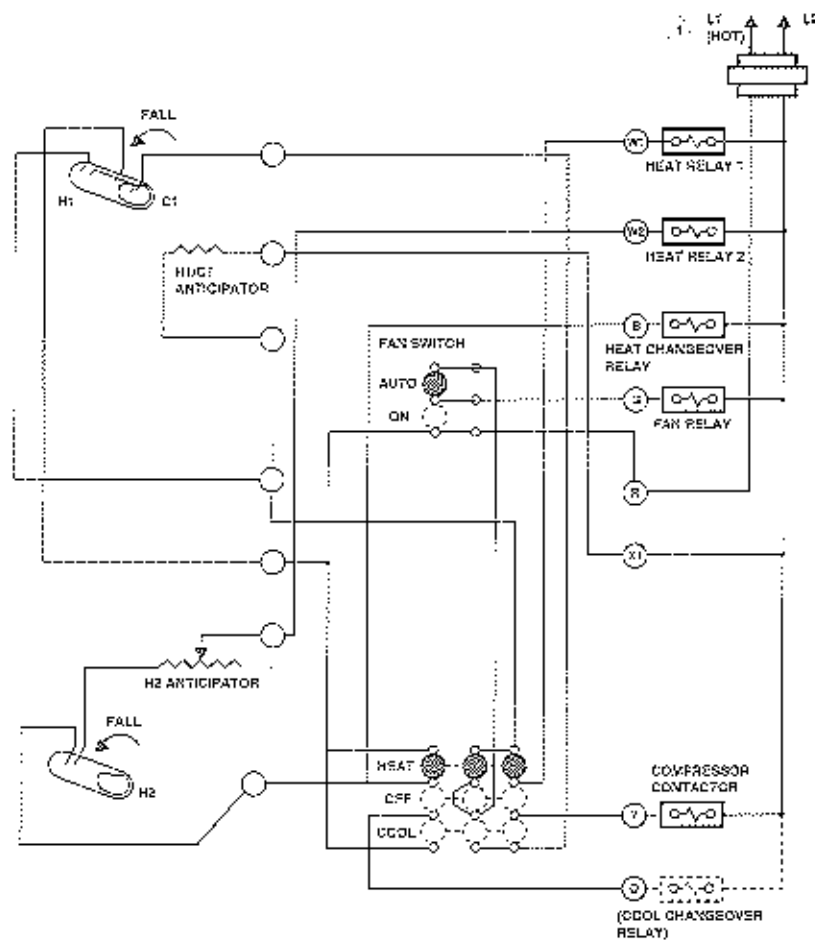
The following safety features are provided to protect the compressor, heat exchanger, wiring and other components from damage caused by operation out of the range of design conditions.

#### HPS - High Pressure Switch (NC) - Green LED

This switch opens at a refrigerant pressure of 375 PSI. The high pressure LED is lit.

#### LPS - Low Pressure Switch (NC) - Orange LED

This switch opens at pressure drops below specification. This input will be ignored for the first two minutes after a demand for heating or cooling. The low Pressure LED is lit.



1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

Figure 1 - Internal schematic and typical wiring diagram for T841B. Thermostat provides two-stage heating, one-stage cooling and manual changeover. Common (X1) wiring must be connected for proper operation.

## Settings

**Heat Anticipator Setting** - As show in Figure 1 above. Move the adjustable indicator to match the current draw of the second stage heating primary control or the anticipator setting of the thermostat.

**Temperature Setting** - Move the set point lever to the desired comfort position

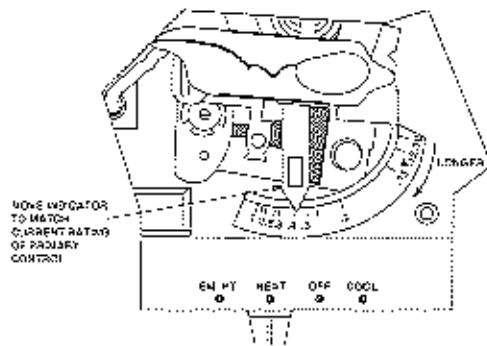


Figure 2 - Second stage adjustable heat anticipator indicator

**System Switch Setting** - Set system switching position to control system operation as follows:

**EM,HT** - Emergency heat relay is energized. Cooling system is off. Compressor is de-energized. Fan runs with call for heat in AUTO position. EM,HT LED is ON.

**HEAT** - Heating system is automatically controlled by the thermostat. Cooling system is off.

**OFF** - Both heating and cooling systems are off. If fan is in AUTO position, the cooling fan is also off.

**COOL** - Cooling system is automatically controlled by the thermostat. Heating system is off.

**Fan Switch Setting** - Set fan switch as follows:

**AUTO**- Fan operates automatically as heating or cooling equipment cycles on

**ON** - Fan operates continuously

## LTS - Low Temperature Switch (NC) - Red LED

This switch opens when the temperature of the water entering the condenser bundle drops below the set point. The low temperature (freeze) LED is lit.

## HCLS - Condensate Overflow Sensor - Yellow LED

Closure of this input activates the lock-out circuit. This input operates when the water level in the condensate pan rises to the height of the sensor. The condensate overflow LED is lit.

## Under and Over Voltage Protection

When an under or over voltage condition exists the controller locks out the unit. When the condition clears the controller releases the unit to normal operation and the compressor runs after random start and anti-short-cycle timers are met. All alarm LED's flash.

## Faulty Wiring

If the thermostat is wired incorrectly or when there is a simultaneous call for heating and cooling, the 2 inner alarm LED's are lit (Green and Orange).

## Reset of Lockout

The controller is reset at the thermostat or at the disconnect switch. See Dip Switch #8. settings.

The controller has an intelligent reset feature. After a safety control activates, the controller locks out the unit for 10 minutes. At the end of this period, the controller checks to verify that all faults have cleared. If faults have cleared, the controller restarts the unit. Should any fault occur within the subsequent 30 minutes, the controller locks out the unit until the unit is manually reset.

## Fault Indication

The "X" terminal on the thermostat connector turns on when any fault occurs. This illuminates an LED on the thermostat sub-base. (Optional thermostat).

## Maintenance

Check the condensate sensor for operation twice a year. Clean the sensor of any dirt that may have accumulated.

## Test Mode

Test mode allows the serviceman to check the operation of the controller quickly. A jumper across the test terminals on the circuit board activates test mode. All time delays are eliminated. **IMPORTANT: Remove the jumper upon completion of service.**

## Interfacing The CMC 2001 Controller with ClimateMaster Thermostats

The CMC 2001 has a 10 pin terminal block for thermostat wiring.

Table 1. Wiring Table

Term on Board	Terminal on Thermostat			Function
	AT908	AT4354	AT12124	
R	R	R	R	24 VAC control power
W	W1	W	W2	Heat mode
Y	Y1	Y	Y	Cool mode
G	G	G	G	Fan only mode

## Replacing a Controller Board

Follow the steps below to replace a controller board:

1. Disconnect main power to the unit.
2. Label all wires or refer to the wiring diagram. Disconnect all wires from the controller.
3. Remove the controller from the control box. Use long nose pliers to "squeeze" the plastic stand offs and pull the controller board out of the box.
4. Align the six holes on the controller board above the six stand offs and push the replacement controller board into place.
5. Connect all wires according to the wiring diagram or according to the wire labels.
6. Apply power to the unit.
7. Test the unit to assure proper operation.

Parts List For CMC 2001 Revision E	
Component	Part Number
Basic Controller	69626500
208/220 - 24 Transformer	68538028
Condensate Sensor Kit	69180118

## CONTROL BOARD TROUBLE SHOOTING

Power Problems	Indicator	Solution
		<b>Green LED Off</b> <b>4 Alarm LED's Blinking</b>
	Possible Cause	Solution
LTS Low Temperature Switch Lock-Out	Reduced or no Water Flow	Check pump operation and/or valve settings; adjust to proper flow rate per design
	Water Temperature Out of Range	Bring water temperature to design conditions
	Bad Low Temperature Switch	Disconnect, then reconnect main power to reset any tripped safety switches. If unit does not run, jumper the LTS terminals on the control board. If unit runs while jumper is attached, replace the LTS switch. If unit still does not run, replace board.
LPS Low Pressure Switch Lock-Out	Loss of Refrigerant Charge	Check system pressures
	Water Temperature Too Low	Increase water temperature in loop
	Low Water Flow (Heating Mode)	Check pump operation and/or valve settings; adjust to proper flow rate per design
	Inadequate Air Flow (Cooling Mode)	Check air filter and ductwork
	Bad Low Pressure Switch	Disconnect, then reconnect main power to reset any tripped safety switches. If unit does not run, jumper the LPS terminals on the control board. If the unit runs, while the jumper is attached, replace the LPS switch. If the unit still does not run, replace board.
HPS High Pressure Switch Lock-Out	Reduced or no Water Flow (Cooling Mode)	Check pump operation and/or valve settings; adjust to proper flow rate per design
	Water Temperature Out of Range	Bring water temperature to design conditions
	Inadequate Air Flow (Heating Mode)	Check air filter and ductwork
	Bad High Pressure	Disconnect, then reconnect main power to reset any tripped safety switches. If unit does not run, jumper the HPS terminals on the control board. If the unit runs, while the jumper is attached, replace the HPS switch. If the unit still does not run, replace board.

## Control Board Troubleshooting (Con't)

Condensate Over-Flow Switch	Possible Cause	Solution
	<b>Blocked Drain</b>	Check for blockage and clean drain-pan
	<b>Improper "P" Trap</b>	Check trap, rework if required
	<b>Overflow Sensor Shorted</b>	Check for short and dirt on sensor pins
	<b>Sensor Location</b>	Move sensor to new location
	<b>Control Board</b>	If unit still locks-out on condensate, disconnect one wire from condensate terminal, If unit still locks-out, replace control board
<b>Unit Short Cycles</b>	<b>Loose Wiring</b>	Check wires and terminals for loose connections
	<b>Dirty Filter</b>	Check and clean air filter
	<b>Water Flow</b>	High water flow and high temperature can short cycle the unit in heating. Assure that water flow and temperature are within design conditions
	<b>Unit Selection</b>	Unit may be oversized for the space. Check size versus design calculations
	<b>Compressor Overload</b>	Check and replace if necessary
<b>Only Fan Runs</b>	<b>Thermostat Position*</b>	Ensure that thermostat is in "ON" mode. Adjust thermostat to a demand position.
	<b>Wiring</b>	Check "Y" and "W" terminal wiring. Jumper between "R" and "Y" or between "R" and "W". If compressor starts, check wiring and thermostat. If compressor does not start, replace board.
		*If test terminals are not jumpered, wait for the 5 minute anti-short cycle time delay.
<b>Only Compressor Runs</b>	<b>Fan Motor Relay</b>	Connect jumper between "R" and "G" on thermostat connector. Check voltage on both load and line side of the fan motor relay on the control board. If no voltage on load side but voltage on line side, replace control board.
	<b>Fan Motor</b>	If fan relay is used as a pilot relay to drive the fan contactor, check to see that the fan relay is closed. Check voltage across the fan contactor.
		If voltage is present but the contactor is not closed, change contactor.
		If contactor is closed but fan does not run, check for line voltage on load side of contactor.
		If line voltage is present, check wiring to fan motor.
		If wiring is correct, change the fan motor.
		If voltage is acceptable on motor terminals and fan capacitor is functioning, replace the fan motor.

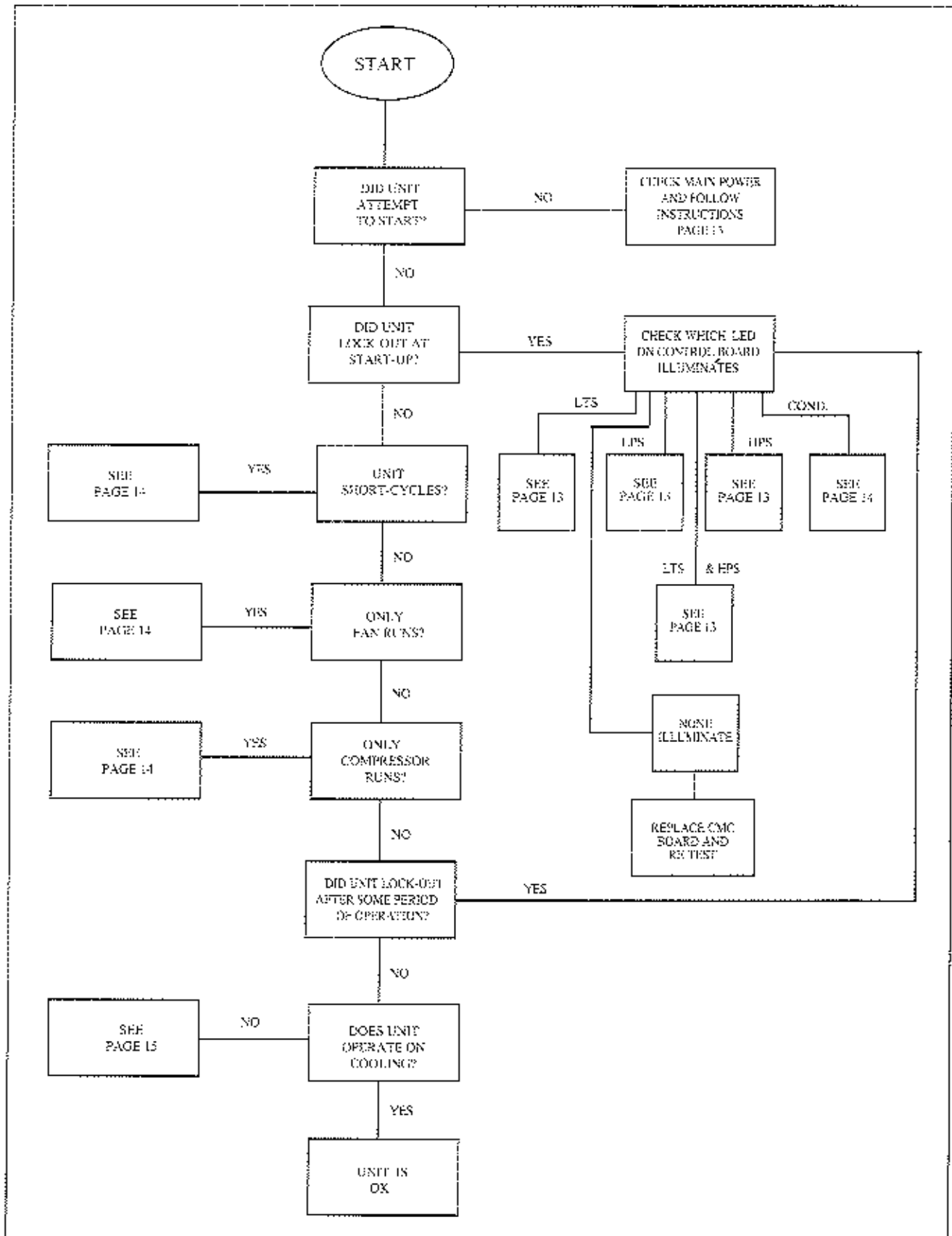
## Control Board Troubleshooting (Con't)

Does Not Operate on Cooling	Possible Cause	Solution
	<p>Reversing Valve</p> <p>Defective Reversing Valve</p> <p>Reversing Valve Stuck</p>	<p>Set thermostat on demand for cooling. Check for 24 VAC on the Reversing Valve terminals on the control board. If 24 VAC is missing and the unit runs in heating, replace the control board.</p> <p>If there is 24 VAC to the Reversing Valve solenoid, replace the solenoid</p> <p>Replace the Reversing Valve.</p>
<p>LTS and HPS Switches Illuminate</p>	<p>"R" to "Y" and "R" to "W" are closed at the same time</p>	<p>Disconnect the thermostat. Jump "R" to "G" and "R" to "Y". If unit runs in cooling, remove "R" to "Y" jumper and jump "R" to "W". If unit runs in heating, correct problems in the thermostat or the wiring.</p>

## Control Board Diagnostics Chart

CMC 2001 Terminals	Voltage
Between L1 & L2	Line voltage application only. 208 VAC. Single phase units less than 3 tons.  Pilot-duty application. 24 VAC. (all 3 phase units and single phase units 2 tons and above)
RV	24 VAC
Water Valve	Dry Contacts (OV) 5A @ 24VAC
Between C1 & P1	24 VAC
<b>Revision E</b>	
Between C2 & P2	24 VAC
Between C3 & P3	24 VAC
Between C4 & P4	24 VAC
Between R & C	24 VAC
Between X & C	24 VDC
Between L1 & Compressor	Application Specific. See Drwgs
Between L1 & FAN	Application Specific. See Drwgs

# Trouble Shooting Chart CMC 2001 Controllers



04-M1101-9401-0  
PART # 69626507

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