T21HTW-0 HEAT PUMP NON-PROGRAMMABLE THERMOSTAT

Installation and Operation Manual

T21HTW-0 HEAT PUMP NON-PROGRAMMABLE THERMOSTAT Installation and Operation Manual

SPECIFICATIONS

Power Supply:	20VAC-30VAC 50-60HZ
Terminal Load:	1.0A per terminal, 3.0A maximum total load
Setpoint Temp. Range:	45ºF to 90ºF (7ºC to 32ºC)
Accuracy:	+/- 1ºF or +/- 0.5ºC
Dimensions:	6.0” W X 4.7” H X 1.1” D
Color:	White

FEATURES

- Large LCD display with backlight, continuous backlight option
- Independent heat and cool setpoints
- Simultaneous display of room temperature, setpoint, and current time
- Fan switch with ON and AUTO functions
- Permanent user setting retention during power loss - no batteries are required*
- Operates on 24VAC
- Air filter service indicator
- Low battery indicator
- Temperature calibration
- Configurable compressor short cycling protection
- Compatible with 2 heat/1 cool heat pump systems with emergency heat

**Two “AA” batteries required to maintain clock function.*

IMPORTANT SAFETY INFORMATION

- Use a professional contractor to install this thermostat.
- Read all of the information in this manual before installing this thermostat.
- ***WARNING! Electrical Shock Hazard.*** Always turn off power at the main power source by removing the fuse or switching the circuit breaker to the “OFF” position before installing, removing, cleaning, or servicing this thermostat.
- ***WARNING! Do not install on voltages higher than 30 VAC.*** This is a 24VAC low-voltage thermostat.
- All wiring must conform to local and national building and electrical codes and ordinances.
- Do not short (jumper) across terminals on the gas valve or at the system control to test installation. This will damage the thermostat and void the warranty.
- Do not run the system in cooling if the outside temperature is below 50ºF (10ºC). This may damage the air conditioning system.
- Replace batteries when the low battery icon flashes.
- Clean or replace the air filter when “SERVICE FILTER” begins flashing.
- Use this thermostat only as described in this manual.

THERMOSTAT LIQUID CRYSTAL DISPLAY (LCD)

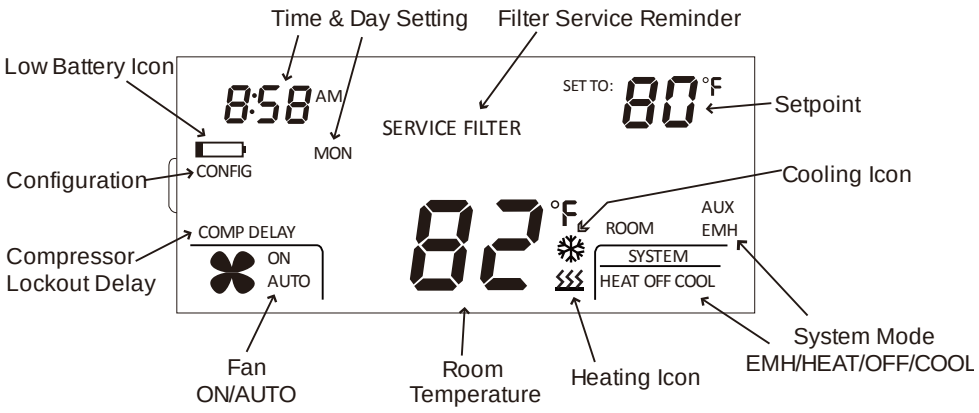


Figure 1

THERMOSTAT BUTTONS AND SWITCHES

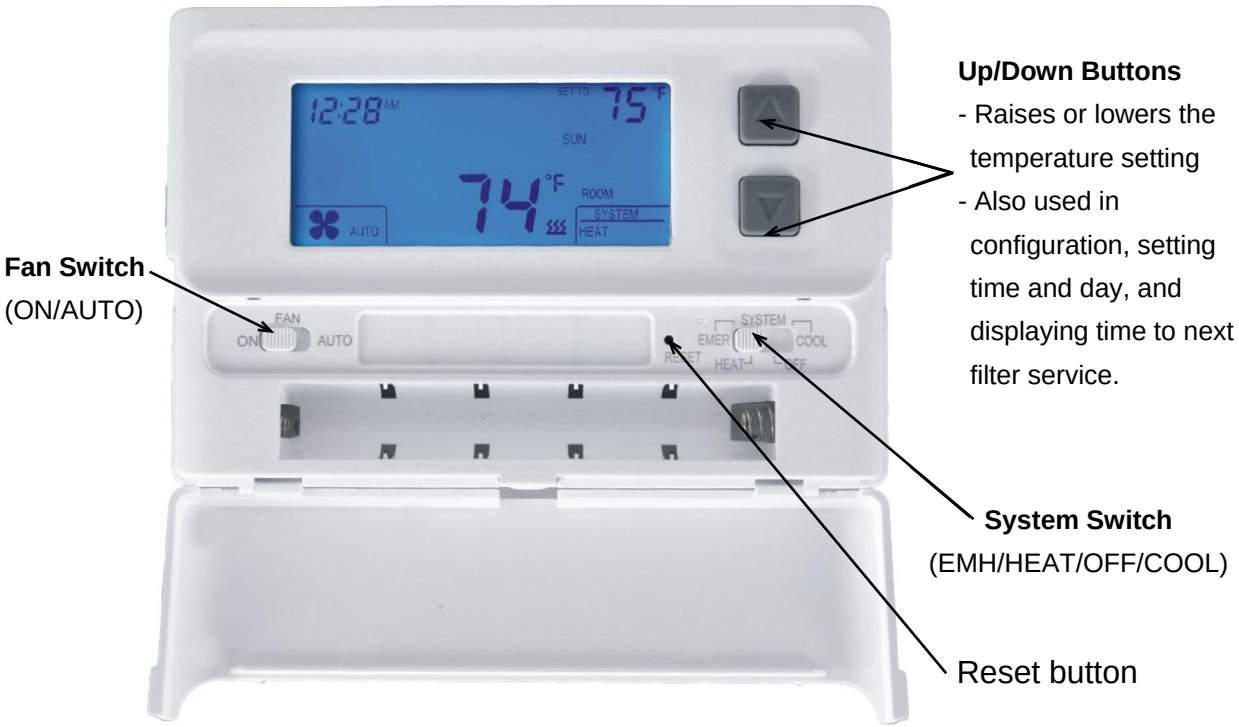


Figure 2

REMOVE THE OLD THERMOSTAT

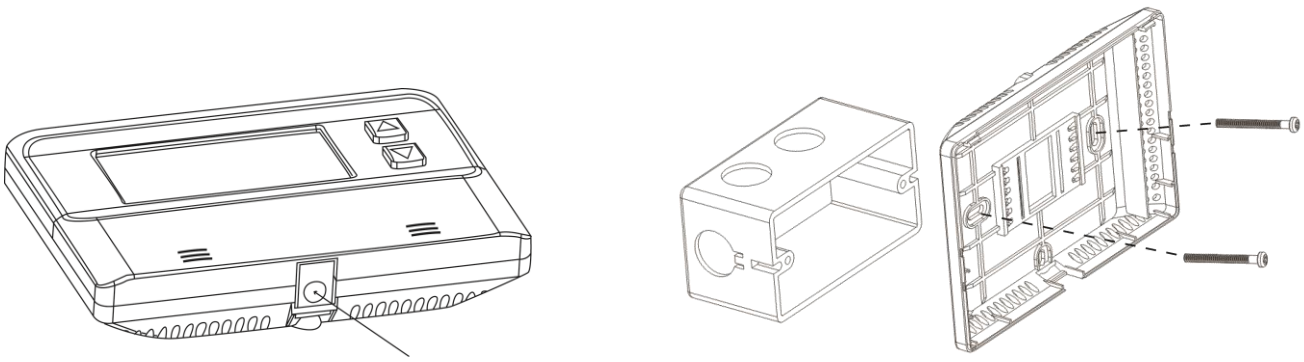
***WARNING! E**lectrical Shock Hazard*

1. Turn off power to the thermostat at the main service panel by removing the fuse or switching the appropriate circuit breaker to the “OFF” position before removing the existing thermostat.
2. Turn off power to the heating and cooling system by removing the fuse or switching the appropriate circuit breaker to the “OFF” position.
3. Remove the cover of the old thermostat. This should expose the wires.
4. Label the wires from the existing thermostat using the enclosed wire markers and record in the chart below before removing.

Thermostat Terminals	Cable Wire Color
C	
L	
Y	
AUX	
E	
O	
B	
G	
R	

5. Remove the wires from the wire terminals.
6. Remove the existing thermostat from the wall.

THERMOSTAT MOUNTING



A. Push button on the bottom of the thermostat and gently pull front cover straight off the base.

B. Use the mounting screws provided to mount the thermostat base to the wall or junction box.

Figure 3

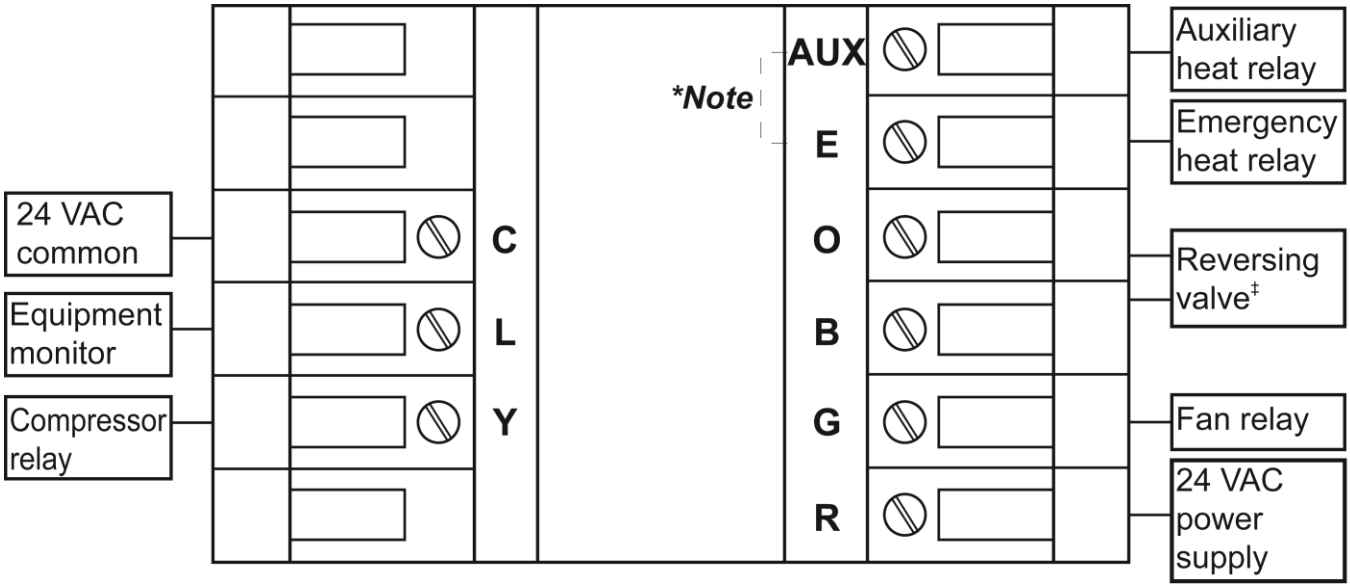
INSTALL THE NEW THERMOSTAT

***WARNING! E**lectrical Shock Hazard*

Ensure that power is turned off. See steps 1 and 2 in previous section.

1. Place the **SYSTEM** switch in the **OFF** position. (See Figure 2)
2. Place the **FAN** switch in the **AUTO** position. (See Figure 2)
3. Push the button on the bottom of the thermostat and gently pull the front cover straight off the base. (See Figure 3A)
4. Using thermostat base, identify the placement of the thermostat on the wall or junction box. Ensure that the base is oriented so that the button latch (from step 3) is at the bottom, and feed the wires through the wire opening in the base.
5. Using the mounting screws (and anchors) provided, mount the thermostat base loosely to the wall or junction box. (See Figure 3B)
6. Place a level against the bottom of the base and adjust until level, then tighten the screws. (Leveling is for appearance only and will not affect thermostat operation.)
7. Insert stripped, labeled wires into matching wire terminals. (See Figure 4 below)
   CAUTION: Be sure exposed portions of wires do not touch other wires.

WIRING DIAGRAMS



Notes:

**** Auxiliary and emergency heat operate from a single relay, and the "AUX" and "E" terminals may be jumpered as necessary.***

‡ Reversing valve activates in cooling when wired to the "O" terminal and activates in heating when wired to the "B" terminal.

The common must be connected to operate the system. If batteries are installed, they will only maintain the clock during power outages.

Figure 4

8. Double check that each wire is connected to the proper terminal. Tighten the screws on the terminal block. Gently tug on each wire to ensure proper connection.
9. Set the **FAN OPTION** switch on the back of the front cover to the proper position. (See Figure 5 below) If your system REQUIRES the thermostat to turn on the fan during a call for emergency heat, such as electric strip heat, place the fan option switch in the **ELEC** position. If your system does NOT require the thermostat to energize the fan during a call for emergency heat, such as a fossil fuel (gas, oil, etc.), forced air, or hydraulic heating system, place the fan option switch in the **GAS** position. If you are unsure of your application, contact a qualified HVAC contractor.

FAN OPTION SWITCH

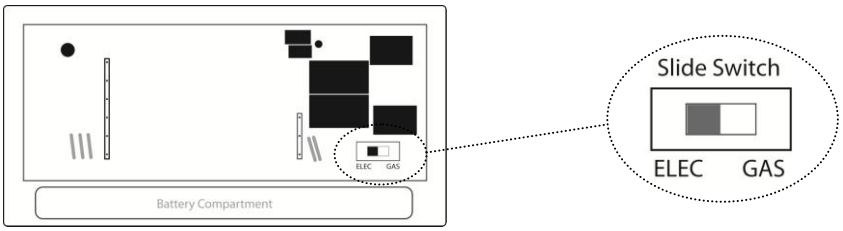


Figure 5

10. Carefully align the cover with the base and push the cover straight onto the base to snap it into place.
11. Optional – battery installation. Batteries may be installed to ensure that clock function and continuous room temperature display are maintained during a power outage. Slide the lower portion of the thermostat cover (door) downward to expose the battery compartment. Install two fresh “AA” alkaline batteries in the battery compartment.
    CAUTION: Installing batteries backwards can damage the thermostat.
    Be sure to match positive (+) and negative (-) ends of the batteries with the proper terminals in the battery compartment. Note: if the low battery icon is flashing, it indicates that the batteries need to be replaced.
12. Slide the door upward and click into place.
13. Turn on power at the main service panel.
14. Configure the thermostat and perform system check as described in the following sections.

CONFIGURATION

The configuration menu allows you to set the thermostat parameters.

1. Slide the door downward to reveal the switches.
2. Move the **SYSTEM** switch to the **OFF** position and press and hold the ▲ and ▼ buttons at the same time to enter the configuration menu. The display will show the first parameter in the configuration menu (CC – cooling cycle rate) and “CONFIG”.
3. Press the ▲ button to scroll through available parameter values. Stop at the desired value.
4. Press the ▼ button to move to the next parameter.
5. Repeat steps 3 and 4 to continue through all parameters. (See “Configuration Menu Chart”)
6. Move the **SYSTEM** switch to the **EMH, HEAT,** or **COOL** position to exit the configuration menu and return to normal operation. If no buttons are pressed within two minutes, the

thermostat will automatically exit to the **OFF** mode. Note: All changes made in the configuration menu are automatically saved.

CONFIGURATION MENU CHART

See "Parameters" section for a detailed explanation of parameters and values.

Parameter	Parameter Value Options	Description	Factory Defaults
CC	FA or SL	Select cooling cycle rate: FA= fast SL = slow	FA
HC	FA or SL	Select heating cycle rate: FA= fast SL = slow	FA
CP	0 to 5	Select compressor lockout delay: 0 = none, 1 to 5 = number of minutes delayed after last call	5
AU	1 to 10	Select auxiliary heat offset: 1to 10 = number of degrees below setpoint	4
bL	1, 2, or 3	Select LCD backlight duration: (1) = OFF (2) = 30 seconds after any button push (3) = always ON	2
FL	00, 1 to 12	Select filter service time: 00 = deactivated 1 to 12 = number of months (1 month = 30 days)	00
FC	F or C	Select temperature scale: F = °Fahrenheit C = °Celsius	F
CL	-4 to 4	Select temperature calibration value: -4 to 4 = number of degrees above or below room temperature	0

PARAMETERS

CC - Select Cooling Cycle Rate

The FA setting produces shorter cooling cycles. The SL setting produces longer cooling cycles. FA cycles the system at a 0.75ºF differential (0.5°C), and SL cycles the system at a 1.5ºF differential (1°C).

HC - Select Heating Cycle Rate

The FA setting produces shorter heating cycles. The SL setting produces longer heating cycles. FA cycles the system at a 0.75ºF differential (0.5°C), and SL cycles the system at a 1.5ºF differential (1°C).

CP - Select Compressor Lockout Delay

To protect the compressor from short cycling, you can select the minimum length of time the compressor will turn off between cycles from 0 to 5 minutes in 1 minute increments. When a compressor lockout delay occurs, "COMP DELAY" will flash.

AU - Select Auxiliary Heat Offset

This feature allows you to select when the auxiliary heat system will turn on. This offset can be set from 1 to 10 (degrees), in 1° increments, and the auxiliary system will turn on (in addition to first stage of heat) when the room temperature is below the setpoint by the selected number of degrees plus heating cycle rate value (HC). For example, if 4 is selected for the auxiliary heat offset and SL is selected as the heating cycle rate, the auxiliary heat will turn on when the room temperature shows 6° below setpoint:

4° for offset + 1.5° for SL cycle rate = 5.5° (rounded to 6° on thermostat display)

bL - Select LCD Backlight Duration

The LCD backlight improves display contrast in low lighting conditions. Select 1 for no backlight. Select 2 for the backlight to come on for approximately 30 seconds when any button on the thermostat is pressed. Select 3 for the backlight to remain on continuously.

FL - Select Filter Service Time

The thermostat will display “SERVICE FILTER” after a set time of operation. This is a reminder to clean or replace your air filter. This time can be set from 1 to 12 months in 1 month increments. Note: 1 month = 30 days, and the number of days is also displayed in the upper left corner of the LCD. A selection of 00 will deactivate this feature. When “SERVICE FILTER” is displayed, in **EMH**, **HEAT** or **COOL** mode it can be cleared by pressing the ▲ and ▼ buttons at the same time. This resets the timer and starts counting down the days until the next filter service.

FC - Select ºF or ºC Temperature Scale

Selects the temperature scale to be displayed – (F)ahrenheit or (C)elsius - as desired.

CL - Select Temperature Calibration Value

This feature allows you to adjust the displayed room temperature from 1° to 4º higher or lower than the actual room temperature. Your thermostat can be accurately calibrated to match your previous thermostat. The temperature displayed will reflect the adjusted temperature. Select 0 if no calibration is desired.

Setting the Time and Day

1. Move the **SYSTEM** switch to the **OFF** position, then press and hold the ▼ button for 3 seconds to enter the time/day setting mode. The display will flash the hour first.
2. Press the ▲ button to set the desired value.
3. Press the ▼ button to move to the next item (minutes and day of the week).
4. Repeat steps 2 and 3 until time and day are both set.
5. Press the ▼ button or move the **SYSTEM** switch to the **EMH, HEAT,** or **COOL** position to exit the time/day setting mode. If no buttons are pressed within 15 seconds, the thermostat will automatically exit to the **OFF** mode.

SYSTEM CHECK

If at any time during testing your system does not operate properly, contact a qualified HVAC contractor.

Ensure that there is power to the system.

Fan Operation

(If your system does not have a “G” (Fan) terminal connection, skip to the “Heating System” section.)

1. Move the **SYSTEM** switch to the **OFF** position.
2. Move the **FAN** switch to the **ON** position. The blower should begin to operate.
3. Move the **FAN** switch to the **AUTO** position. The blower should stop immediately.

Heating System

1. Move the **SYSTEM** switch to the **HEAT** position. If the auxiliary heating system has a standing pilot, be sure to light it.
2. Adjust the setpoint to a temperature above the current room temperature.
   - If the (FA)st heating cycle rate is selected in the configuration menu (see “Configuration Menu Chart”), the thermostat will call for heat when the room temperature is 0.75ºF (0.5ºC) below setpoint and turn off at setpoint.
   - If the (SL)ow heating cycle rate is selected, the thermostat will call for heat when the room temperature is 1.5ºF (1ºC) below setpoint and turn off at setpoint.
   - The auxiliary heat will activate when the room temperature is below the setpoint by the auxiliary heat offset value (AU) plus heating cycle rate value (HC), as established during configuration. When auxiliary heat turns on “AUX” will be displayed. (See “Configuration Menu Chart”, “Parameters”, and Figure 1.)

     * Note: Auxiliary heat will only activate in conjunction with the compressor and fan and therefore will be affected by compressor lockout delay settings. (See “Configuration Menu Chart”) Once activated, auxiliary heat will continue to run until the room temperature is less than 2°F (1°C) below setpoint, and the first stage of heat will complete the call.
3. When the thermostat calls for heat, ≋ will display. If ≋ is not displayed and “COMP DELAY” is flashing, the compressor lockout delay feature is operating in the heat pump mode. (See “Configuration Menu Chart”)

Emergency Heating System

The Emergency Heat System bypasses the heat pump to use the heat source connected to terminal “E” on the thermostat. It is typically used when compressor operation is not desired or you prefer to use the backup heating system only.

1. Move the **SYSTEM** switch to the **EMH** position. “EMH” will flash on the display as long as

the switch stays in this position.

2. Adjust the setpoint to a temperature above the current room temperature.
   - If the (FA)st heating cycle rate is selected in the configuration menu (see “Configuration Menu Chart”), the thermostat will call for emergency heat when the room temperature is 0.75ºF (0.5ºC) below setpoint and turn off at setpoint.
   - If the (SL)ow heating cycle rate is selected, the thermostat will call for emergency heat when the room temperature is 1.5ºF (1ºC) below setpoint and turn off at setpoint.
3. In emergency heat mode, “AUX” will display when the thermostat is in a call for heat. **Note – ♨ will not display.**

Cooling System

CAUTION: To prevent compressor and/or property damage, if the outdoor temperature is below 50ºF (10ºC), DO NOT operate the cooling system.

1. Move the **SYSTEM** switch to the **COOL** position.
2. Adjust the setpoint to a temperature below the current room temperature.
   - If the (FA)st cooling cycle rate is selected in the configuration menu (see “Configuration Menu Chart”), the thermostat will call for cooling when the room temperature is 0.75ºF (0.5ºC) above setpoint and turn off at setpoint.
   - If the (SL)ow cooling cycle rate is selected, the thermostat will call for cooling when the room temperature is 1.5ºF (1ºC) above setpoint and turn off at setpoint.
3. When the thermostat calls for cooling, ❄ will display. If ❄ is not displayed and “COMP DELAY” is flashing, the compressor lockout delay feature is operating. (See “Configuration Menu Chart”)

Equipment Monitor

The “L” terminal on the thermostat allows for an equipment monitor input. For example, a compressor drip pan overflow alarm could be wired. When a 24 VAC signal is sent to the “L” terminal, the thermostat will flash “SERVICE” on the LCD to indicate that action is required. Contact your HVAC contractor for details on what may be wired to the “L” terminal.

If all functions listed above operate properly, the thermostat is installed correctly.

BASIC THERMOSTAT OPERATION

Setting the Thermostat

1. This thermostat is very easy to operate. Move the **SYSTEM** switch to either **EMH, HEAT,** or **COOL**, then press either the ▲ or ▼ button to adjust the setpoint to the desired value.
2. Move the **FAN** switch to either **AUTO** or **ON**. **AUTO** will run the fan only when the thermostat calls for heating, emergency heating (depending on the position of the FAN OPTION switch – see page 5), or cooling. **ON** will run the fan continuously. Note – continuous fan will run in **EMH, HEAT**, **COOL**, and **OFF** system settings.

3. To turn the system off, move the **SYSTEM** switch to the **OFF** position and the **FAN** switch to the **AUTO** position.

Filter Review

1. Move the **SYSTEM** switch to the **EMH, HEAT,** or **COOL** position, then press and hold the ▲ and ▼ buttons at the same time for 5 seconds to enter the filter review mode. (Note – When "SERVICE FILTER" message is displayed and after filter has been cleaned or replaced, this same process is used to clear "SERVICE FILTER" message.)
2. The number of days left until filter cleaning or replacement will be displayed.
3. Press either the ▲ or ▼ button one time to exit the filter review mode. If no buttons are pressed within 15 seconds, the thermostat will exit to normal operation.
4. In filter review mode, press and hold the ▲ and ▼ buttons at the same time to reset the amount of time until the next filter service. The display will flash "dEF" to indicate that reset has been completed, unless FL has been deactivated, selection 00. (See "Configuration Menu Chart")

TROUBLESHOOTING

If a voltage spike or static discharge blanks out the display or causes erratic thermostat operation:

1. You can reset the thermostat by pressing the reset button. (See Figure 2)
2. Remove power (and batteries, if installed) until display goes blank. Then restore power (and reinstall batteries).
3. If the thermostat has power, has been reset, and still does not function correctly, contact a qualified HVAC contractor.