Commercial Touchscreen Thermostat

INSTALLATION INSTRUCTIONS

APPLICATION

The Lennox Commercial Touchscreen Thermostat provides electronic control of 24 Vac heating and cooling systems. See Table 1 for a description.

Table 1 - Thermostat Description

Feature	Description
Powering Methods	• Battery only • Direction connection to a 24 Vac transformer only. • Direct connection to a 24 Vac transformer with battery backup.
System Types	• Conventional (up to 2 heat, 2 cool stages) • Heat Pump (up to 3 heat, 2 cool stages)
Changeover	Manual or automatic changeover (selectable)
System Settings	Heat-Off-Cool-Auto
Fan Settings	Auto-on

MERCURY NOTICE

If this control is replacing a control that contains mercury in a sealed tube, do not place your old control in the trash. Dispose of properly.

Contact your local waste management authority for instructions regarding recycling and the proper disposal of an old control.
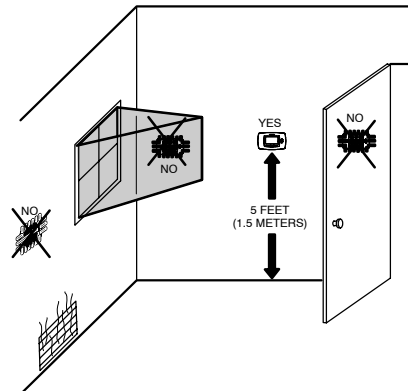
INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check ratings given in instructions and on the product to ensure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

⚠ CAUTION

Electrical Shock or Equipment Damage hazard.
Can shock individuals or short equipment circuitry.
Disconnect power supply before installation.

Select Thermostat Location

Select a location for the thermostat about 5 feet (1.5m) above the floor in an area with good air circulation at average temperature (see figure 1).

Figure 1 - Select Thermostat Location

Do not install the thermostat where it can be affected by:
- Drafts or dead spots behind doors and in corners.
- Hot or cold air from ducts.
- Radiant heat from sun or appliances.
- Concealed pipes and chimneys.
- Unheated (uncooled) areas such as an outside wall behind the thermostat.

Separate Wallplate from Thermostat

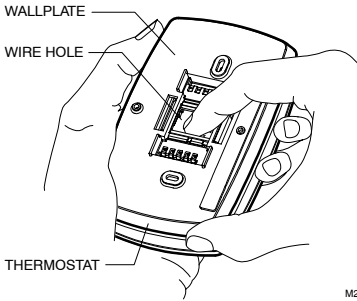1- Separate the wallplate from the thermostat (see figure 2).

Figure 2 - Separate Wallplate from Thermostat

Install Wallplate (See Figure 3)

Mount the thermostat horizontally on the wall:
1. Pull the wires through the wire hole on the wallplate.
2. Position the wallplate on the wall with the arrow pointing up. Level the wallplate for appearance only.
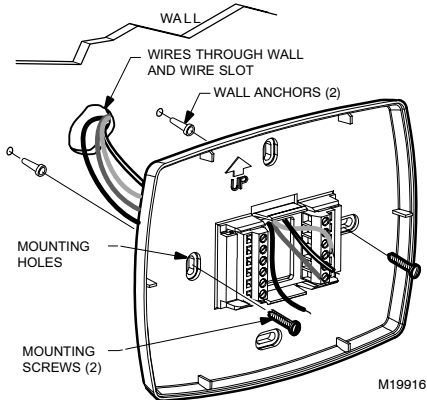3. Use a pencil to mark the mounting holes.

Figure 3 - Install Wallplate

4. Remove the wallplate from the wall and drill two 3/16 inch holes in the wall (if drywall) as marked. For firmer material such as plaster, drill two 7/32 inches holes. Tap the wall anchors (provided) into the drilled holes until flush with the wall.
5. Pull the wires through the wire hole on the wallplate and position the wallplate over the wall anchors.
6. Insert the mounting screws into the wall anchors and tighten.

WIRING

IMPORTANT
- *All wiring must agree with applicable codes, ordinances and regulations*
- *Use 18 gauge thermostat wire. Shielded cable is not required.*

NOTES:
- *Sensor wires must have a cable separate from the thermostat control cable.*
- *Refer to Table 2 for terminal designation descriptions.*
- *See figure 7 through 10 for wiring diagrams from specific equipment applications.*

1. Select conventional set of terminal identifications which correspond to the system type (conventional or heat pump (see figure 4). Lennox commercial equipment does not use the heat pump system terminals.
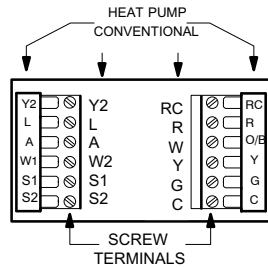

Figure 4 - Terminal Identifications for System Type

2. Loosen screw terminals used for the application.
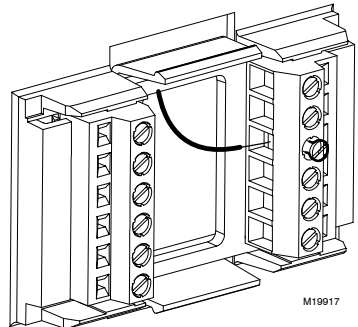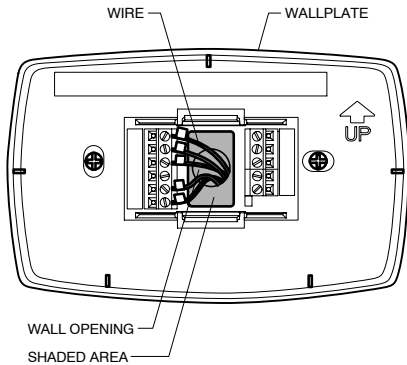3. Insert the wires into the terminal block and tighten each screw terminal (see figure 5).

Figure 5 - Insert Wires into Terminal Block

4. Push excess wire back into the wall opening and restrict wires to the shaded area (see figure 6).
5. Plug the wall opening with non-flammable insulation to prevent drafts from affecting the thermostat.

Figure 6 - Restrict Wires to Shaded Area of Wire Hole

Table 2 - Terminal Designation Descriptions

Terminal Designation	Description
Rc (see note 1)	Power for cooling-connect to secondary side of cooling system transformer.
R (see note 1)	Power for heating-connect to secondary side of heating system transformer.
Y	Compressor output.
C (see note 2)	Command wire from secondary side of cooling system transformer.
W	Heat relay.
G	Fan relay.
W2	Second stage heat relay.
Y2	Second stage cooling.
O/B (see note 3)	Changeover valve for heat pumps. Terminal not used with Lennox commercial equipment.
A (see note 4)	Economizer/Time-of-Day (TOD) output-powered via R terminal.
S1 (see note 5)	Optional outdoor or indoor remote sensor.
S2 (see note 5)	Optional outdoor or indoor remote sensor.
L	Powers red LED behind plastic in upper right corner of the thermostat.

NOTES:
1. When used in a single-transformer system, leave metal jumper wire in place between Rc and R. If used on a two-transform system, remove metal jumper wire between Rc and R.
2. Common wire is optional when thermostat is used with batteries. When using separate transformer for heating and cooling, the common must come from the cooling transformer.
3. Lennox commercial heat pumps do not use this terminal to energize the reversing valve. Thermostat will always be conventional type.
4. Reference economizer literature for wiring details. When set for economizer operation, the A terminal provides the occupancy signal. (Power indicates occupied.)
5. Sensor wires must have a cable separate from the thermostat control cable.

Terminal A Wiring Details for Economizers

- Wire the "A" terminal as shown in diagrams in figures 7, 8, 9 and 10.

- The "A" signal is powered from the "R" terminal and energizes the economizer to signal occupied status and drive the damper to the set minimum position.
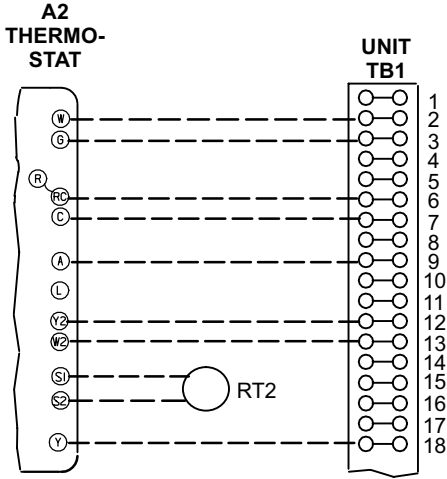
Figure 7 - Wire LG/LC/LH/SG/SC Units.
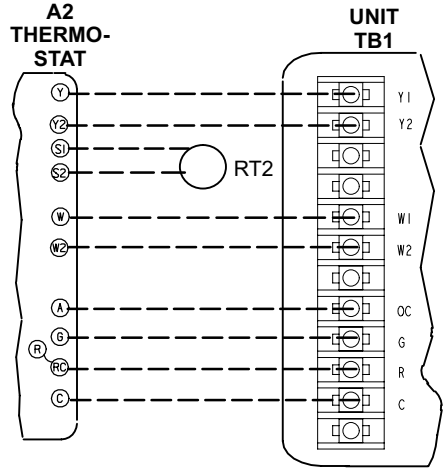
Figure 9 - Wire TG/TC/TH 036-060 Units
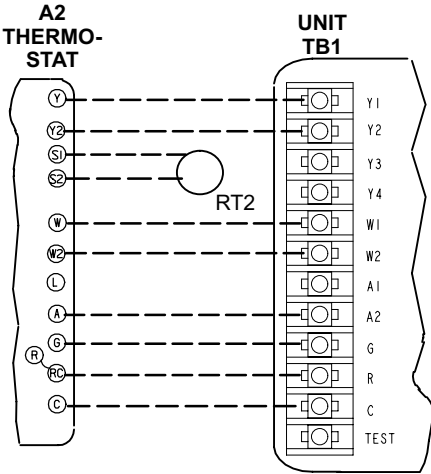
Figure 8 - Wire TG/TC/TH 090-300S Units
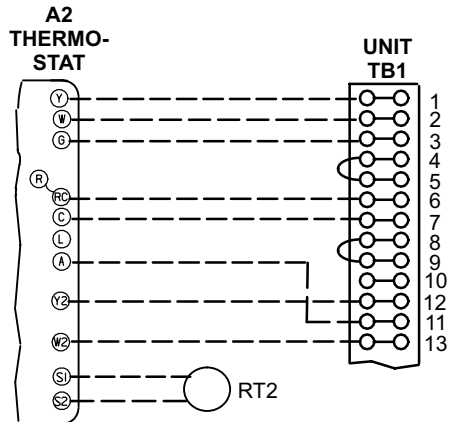
Figure 10 - Wire CB/CBH17 Used with HS29 and HP29 Units

Sensor Wiring for Temperature Averaging

SUBBASE

(S1)   (S2)

20K Ohm   20K Ohm
—ᴧᴧᴧ—   —ᴧᴧᴧ—

20K Ohm   20K Ohm
—ᴧᴧᴧ—   —ᴧᴧᴧ—

SUBBASE

(S1)   (S2)

10K Ohm   10K Ohm
—ᴧᴧᴧ—   —ᴧᴧᴧ—

SUBBASE

(S1)   (S2)

20K Ohm   10K Ohm
—ᴧᴧᴧ—   —ᴧᴧᴧ—

20K Ohm
—ᴧᴧᴧ—

SUBBASE

(S1)   (S2)

20K Ohm   20K Ohm
—ᴧᴧᴧ—   —ᴧᴧᴧ—

20K Ohm   10K Ohm   10K Ohm
—ᴧᴧᴧ—   —ᴧᴧᴧ—   —ᴧᴧᴧ—
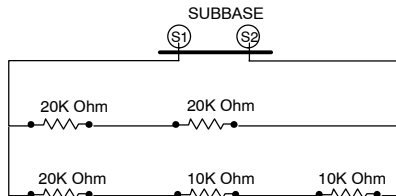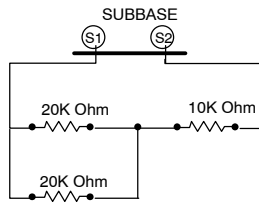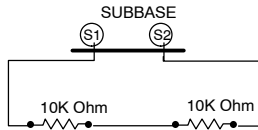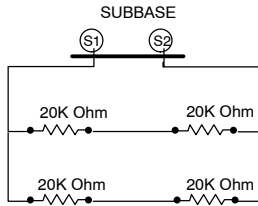
All combinations of sensors shown here have an equivalent resistance
of 20K ohms. Select option 4 on installer setup number 0340.

POWER THE THERMOSTAT

You can choose from three methods to power the thermostat:

- Batteries only (AAA alkaline).
- 24 Vac direct connection only.
- 24 Vac direct connection with battery backup (AAA alkaline).

Wiring 24 Vac Common

- Single-Transformer System-Connect the common side of the transformer to the C screw terminal of the thermostat wallplate. Leave the metal jumper wire in place between Rc and R.
- Two-Transformer System-Connect the common side of the cooling transformer to the C screw terminal of the thermostat wallplate. Remove the metal jumper wire between Rc and R.

Installing Batteries

1. Install three AAA alkaline batteries on the back of the thermostat as marked (see figure 11).
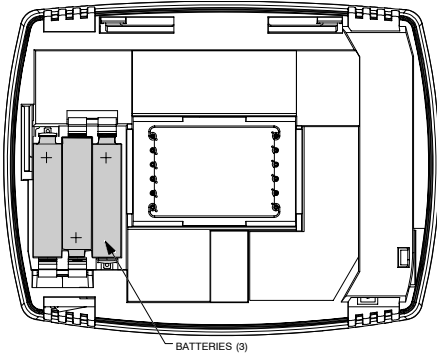
BATTERIES (3)

Figure 11 - Installing Batteries

2. Locate and remove the tab labeled Remove (see figure 12).

IMPORTANT

> *This tab must be removed in order to set the real-time clock.*
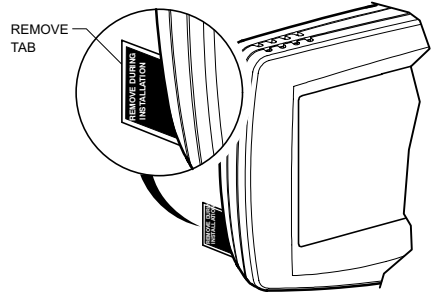
REMOVE TAB

Figure 12 - Remove tab labeled REMOVE from thermostat back.

Setting Calendar and Time

Setting Calendar

This thermostat is designed to, under normal use, automatically keep current time and day in memory for up to ten years once the calendar is set. There are two ways to set the calendar for this thermostat:

SETTING CALENDAR WHEN THERMOSTAT IS FIRST POWERED
When the thermostat is first powered, the display is ready to set the calendar and time. The thermostat proceeds through a sequence of setup screens (see figure 13).

SETTING CALENDAR AFTER THERMOSTAT IS ALREADY FUNCTIONING
See steps 1 through 4, in the Advanced Settings section to set year, month and day.

SET CURRENT DAY
SET MONTH

USE ARROWS TO SET YEAR AND TIME

Figure 13 - Setting Date and Time after Initial Powerup

Mount Thermostat to Wallplate

1. Align the terminal screw blocks with the pins on the back of the thermostat.
2 Push the thermostat straight onto the wallplate until it snaps into place (see figure 14).
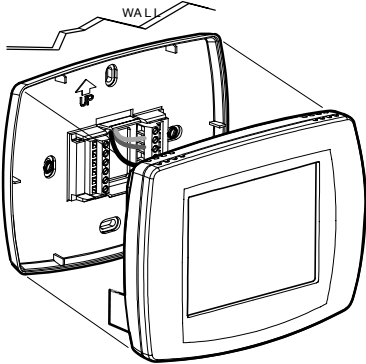
Figure 14 - Mount Thermostat to Wallplate.

Advance Settings

The thermostat has advanced settings to match the HVAC system. These settings can be adjusted to match specific needs. Access to these settings is obtained as follows:

1. From the main screen, press SYSTEM. Five blank touch keys show on the bottom on the screen between DONE and CANCEL.
2. Press and hold the two blank keys on either side of the center blank key for approximately five seconds (see figure 15).
3. The Setup Number displays to the lower-left area of the screen. It is a four-digit code beginning with zero. The current setting is displayed to the right.

NOTE: To cycle through the Setup Numbers, press the up or down arrow.

INSTALLER SETUP NUMBERS, SETTINGS AND TESTS

Figure 15. Entering Installer Setup.

Installer System Tests

Use the Installer System Test to test the heating, cooling and fan. Refer to the latter portion of Table 3.

> ⚠️ **CAUTION**
>
> **Equipment Damage hazard.**
> **Minimum compressor off time is by-passed during installer system test.**
> Avoid cycling compressor quickly.

IMPORTANT

Use Installer System Test to test heating, cooling and fan. The setting chosen for System Type (Installer Setup Number 0170) can prevent some System Test Numbers from appearing.

Table 3 - Installer Setup Menu

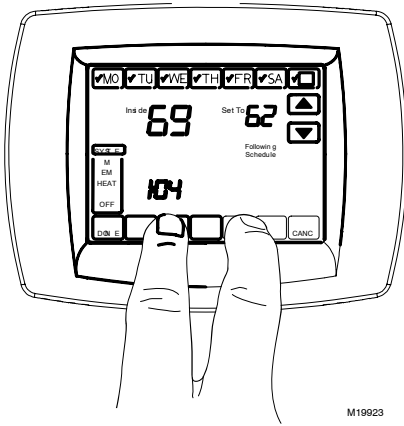| Installer Setup Number	Installer Setup Name	Default Setting	All Settings	Notes
0120	Date (Year Upper)	20	20-22xx 21-21xx	Available year range:2001-2178
0130	Date (Year Lower)	04	00-99	Available year range:2001-2178
0140	Date (Month)	6	1-12	
0150	Date (Day)	15	1-31 (Month Dependent)	
0160	Schedule Options	4	0-Non-Programmable 4-Programmable	
0170	System Selection	8	1-1H/1C 2-1H/1C HP* 3-1H w/o fan 4-1H with fan 6-1C 7-2H/1C HP* 8-2H/2C Conv 9-2H/1C Conv 10-1H/2C Conv 11-2H/2C HP* 12-3H/2C HP*	*Setting not used with Lennox commercial equipment.
0175	TOD/Econo-mizer output (terminal A)	0	0-Unused 1-TOD 2-Economizer	Economizer energizes A during a call for cool. TOD energizes A during Occupied period and de-energizes A during Unoccupied. Use 1-TOD.
0180	Heat Fan Operation	0	0-Fossil 1-Electric	Only shown for conventional system with heat stages and fan capability selected. If heat pump is selected, fan defaults to electric.
0185	Pre-occupancy Purge Duration	0	0-No duration 1-One hour 2-Two hours 3-Three hours	Shown only if system has fan and schedule pro-grammable. Pre-occupancy purge enabled by nonzero duration (and sends economizer to minimum position).
0190	Reversing Valve O/B	0	0-O (O/B On Cool) 1-B (O/B On Heat)	O or B setting not used with Lennox commercial equipment.
0220	Cycles Per Hour (CPH) for first stage com-pressor	3	1-6	Only shown for system with cool stages. Selec-tion in this stage changes default CPH of sec-ond stage cool.

Table 3 - Installer Setup Menu (Continued)

Installer Setup Number	Installer Setup Name	Default Setting	All Settings	Notes
0230	CPH for second stage compressor	3	1-6	Only shown if two stages of cool selected.
0240	CPH for first stage conventional heat	5	1-12	Only shown if system is conventional with heat stages. Selection in this stage changes default CPH of second stage heat.
0250	CPH for second stage conventional heat	5	1-12	Only shown with at least two stages conventional heat or 2H/1C heat pump selected.
0260	CPH for third Stage Heat	9	1-12	Only shown if 3H/2C heat pump is selected.
0270	CPH for Auxiliary Heat	9	1-12	Only shown if multi-stage heat pump is selected (heat pump with more heat than cool stages).
0280	Continuous Backlight	0	0-No 1-Yes	Always shown. If AC power not present the option is overridden and normal backlight operation occurs.
0300	Changeover	1	0-Manual 1-Auto	Only shown if system has both heat and cool stages.
0310	Deadband	3°F (2°C)	2 (1.5)-2°F (1.5°C) 3 (2.0)- 3°F (2.0°C) 4 (2.5)- 4°F (2.5°C) 5 (3.0)- 5°F (3.0°C) 6 (3.5)- 6°F (3.5°C) 7 (4.0)-7°F (4.0°C) 8 (4.5)- 8°F (4.5°C) 9 (5.0)- 9°F (5.0°C)	Only shown if Automatic Changeover Selected
0320	Temperature Indication Scale	0	0-°F 1- °C	
0330	Daylight Saving	2	0-Disabled, 1-Enabled (US, 1987) 2-Enabled (2007), 3-Enabled (Europe)	
0340	Remote Temperature Sensor	0	0-None 1-Outdoor for Display 2-Outdoor for Control 3-Remote 10K Indoor 4-Remote 20K Indoor	Averaging would not include on- board sensor. It is accomplished by series/parallel combinations. 2 applies only to Heat Pump applications (allowing compressor lockout while displaying temperature). Set for total equal resistance for combination of sensors.
0350	Heat Pump Compressor Lockout	0	0- None 15(-9.5)-15°F(-9.5°C) 20(- 6.5)-20°F(- 6.5°C) 25(- 4.0)-25°F(- 4.0°C) 30(- 1.0)-30°F(- 1.0°C) 35(1.5)-35°F(1.5°C) 40(4.5)-40°F(4.5°C) 45(7.0)-45°F(7.0°C)	Lennox commercial equipment does not use heat pump mode. Only shown for heat pump systems with more heat stages than cool selected and remote sensor selection is outdoor for control. Must enforce a dead band between this and Auxiliary Lockout

Table 3 - Installer Setup Menu (Continued)

Installer Setup Number	Installer Setup Name	Default Setting	All Settings	Notes
0360	Heat Pump Auxiliary Lockout	0	0- None 40(4.5)-40°F(4.5°C) 45(7.0)-45°F(7.0°C) 50(10.0)-50°F(10.0°C) 55(13.0)-55°F(13.0°C) 60(15.5)-60°F(15.5°C)	Lennox commercial equipment does not use heat pump systems with more heat stages than cool selected and remote sensor selection is outdoor for control. Must enforce a dead band between this and Heat Pump Compressor Lockout.
0535	Temporary Occupied Duration Limit	3	0-None 1-one hour 2-two hours 3-three hours 4- four hours	0 means no limit
0540	Number of Periods	4	2- 2 Periods 4- 4 Periods	Does not appear if Non- programmable is chosen. Applies to all days of the week. With 2 selected the "Cancel Period" option does not appear on the display.
0580	Minimum Compressor Off Time	0	0- Off 2- 2 minutes 3- 3 minutes 4- 4 minutes 5- 5 minutes	Only shown if system has cool stages. Set to 0. Not needed for 3 phase systems.
0600	Heat Temperature Range Stops	90	40 to 90° F (4 to 32° C)	Only shown if system has heat stages.
0610	Cool Temperature Range Stops	50	50 to 99°F (10 to 37°C)	Only shown if system has cool stages.
0640	Clock Format	12	12-12 Hour 24- 24 Hour	
0650	Extended Fan-on time Heat	0	0-Off 90- 90 seconds	Not displayed with fan set to fossil or with cool-only systems.
0660	Extended Fan-on time Cool	0	0-Off 40- 40 seconds	Only shown if system has cool stages.
0670	Keypad Lockout	0	0-Unlocked 1-Partial Lockout 1 2-Partial Lockout 2 3-Fully Locked	Unlocked: All functions accessible. Partial 1: Locks all but Holiday, Override, and Up/Down. Partial 2: Locks all but Holiday and Override. Full: Entire interface locked/non-functional.
0680	Temperature Control Heat	2	1-Less Aggressive 2-Standard 3-More Aggressive	Only shown if system has heat stages. Only integral gains affected. Affects control operation in all control regimes (not just recovery or setpoint change). More Aggressive stops signal prior to reaching the setpoint. (For use with oversized equipment.)

Table 3 - Installer Setup Menu (Continued)

Installer Setup Number	Installer Setup Name	Default Setting	All Settings	Notes
0690	Temperature Control Cool	2	1-Less Aggressive 2-Standard 3-More Aggressive	Only shown if system has cool stages. Only integral gains affected. Affects control operation in all control regimes (not just recovery or setpoint change). More Aggressive stops signal prior to reaching the setpoint. (For use with oversized equipment.)
0685	Recovery Heat Ramp Rate	5	0-20°F/hour	Only shown if system has heat stages. 0 disables ramped recovery (step setpoint change at period start time).
0695	Recovery Cool Ramp Rate	3	0-20°F/hour	Only shown if system has cool stages. 0 disables ramped recovery (step setpoint change at period start time).
0700	Temperature Display Offset	0	-3 (-1.5) -3°F(-1.5°C) -2 (-1.0)- -2°F (-1.0°C) -1 (-0.5)- -1°F (-0.5°C) 0 (0.0)-0°F (0.0°C) 1 (0.5)-1°F (0.5°C) 2 (1.0)- 2°F (1.0°C) 3 (1.5)-3°F (1.5°C)	This offset applies to both the control temperature and to the display temperature for indoor sensor (and remote indoor sensor).
0710	Restore Factory Defaults	0	0 -No 1-Yes	Resets all ISU parameters to default values and resets the schedule to default Energy Star. Retains only calendar settings and time.
INSTALLER TESTS				
Test 1	Installer Test Cool	0	0-Off 1-Cool Stage 1 2-Cool Stage 2	
Test 2	Installer Test Fan	0	0-Off 1-Fan On	
Test 3	Installer Test Heat	0	0-Off 1-Heat Stage 1 2-Heat Stage 1 and 2 3- Heat Stage 1, 2 and 3	
Test 4	Installer Test Auxiliary Heat	0	0-Auxiliary Heat Off 1-Auxiliary Heat On	
Test 8	Installer Test TOD/Economizer	0	0-TOD/Economizer Off 1-TOD/Economizer On	

NOTE: Press the Done button to exit the Installer System Test.

OPERATION

System Settings

Heat-Thermostat controls the heating system.
Off-both heating and cooling systems are off.
Cool-Thermostat controls the cooling system.
Auto-Thermostat automatically changes between heat and cool operation, depending on indoor temperature.

Fan Settings

Auto-Fan runs only when heating/cooling system is on.
On-Fan runs continuously.

Table 4 shows default program settings. See Owner's Guide for complete instructions to change the program.

Table 4 - Energy Star Default Program Settings

| Schedule Period | Time | Setpoints | | Fan Setting |
		Heat	Cool	
Occ1	08:00 am	70ºF (21ºC)	75ºF (24ºC)	Auto
Unocc1	10:00 pm	55ºF (10ºC)	85ºF (29.5ºC)	Auto
Occ2[a]	----			
Unocc2[a]	----			

[a] The thermostat default setting is two period only. To use four periods, change the appropriate setup parameter.

Outdoor or Indoor Temperature Sensor

Allow outdoor or indoor temperature sensor to absorb the air for a minimum of five minutes before taking a reading. See the Sensor instructions for more information.

Economizer/TOD Logic (Table 5)

Table 5 - Terminal A Operation

| Effective Occupancy | Call for Cool | Terminal A |
		TOD
Occupied	-	Energized
Unoccupied	Yes	De-energized
Unoccupied	No	De-energized
Override	-	Energized

TROUBLESHOOTING (TABLE 6)

Symptom	Possible Cause	Action
Display does not come on.	Thermostat is not being powered.	Check for 24 Vac between C and Rc. Check that AAA batteries are installed correctly and are good.
Temperature settings do not change.	The upper or lower temperature limits were reached.	Check temperature setpoints. Check Installer Setup Numbers 0600 and 0610; modify as needed.
	The keypad is fully locked.	Check Installer Setup Number 0670 to change keypad locked options.
Heating or cooling does not come on.	Thermostat minimum off-time is activated.	Wait up to five minutes for the system to respond.
	System selection not set to Heat or Cool.	Set system Selection to correct position.
	System type Selection is incorrect.	Check Installer Setup Number 0170 and make sure correct System type is chosen.
Thermostat is calling for Heat (Heat on) or Cool (Cool on) but no heating or cooling is running.	Heating or cooling equipment is not operating.	Check wiring. Check Installer Setup Number 0170 and make sure correct system type is chosen. Verify operation of equipment in System Test mode.
Heat does not turn on (Heat On is solid in the display).	Heating equipment failure.	Check for 24Vac at the equipment on the secondary side of the transformer between power and common. If voltage is not present, check the heating equipment to find the cause of the problem. Check for 24 Vac between the heat terminal (W) and transformer common. If 24 Vac is present, the thermostat is functional. Check the heating equipment to find the cause of the problem.
	Loose or broken wire connection between thermostat and heating equipment.	Check for 24 Vac between the heat terminal (W) and transformer common. If voltage is not present, check wire connection (loose or broken) between the thermostat and the heating equipment.
Both the heating and cooling equipment are running at the same time.	The heating equipment is not a heat pump but the System Type (Installer Setup Number 0170) is set to Heat Pump.	Set System Type (Installer Setup Number 0170) to match the installed heating and/or cooling equipment
	Heating and cooling wires are shorted together.	Separate the shorted heating and cooling wires.
Cooling does not turn on (Cool On is solid in the display).	Cooling equipment failure.	Check for 24 Vac at the equipment on the secondary side of the transformer between power and common. If voltage is not present, check the cooling equipment to find the cause of the problem. Check for 24 Vac between the cool terminal (Y) and transformer common. If 24 Vac is present, the thermostat is functional. Check the cooling equipment to find the cause of the problem.
	Loose or broken wire connection between thermostat and cooling equipment.	Check for 24 Vac between the cool terminal (Y) and transformer common. If voltage is not present, check the wire connection (loose or broken) between the thermostat and the cooling equipment.

Fan does not turn on in a call for heat (electric furnace).	Fan Control in Heating is set to Gas or Oil Furnace (Setting 0180).	Set Fan Control in Heating to Electric Furnace (Setting 0180).
Heating equipment is running in the cool mode.	Heating equipment is not a heat pump but System Type (Installer Setup Number 0170) is set to Heat Pump.	Set System Type (Installer Setup Number 0170) to match the installed heating and/or cooling equipment.
Heating equipment does not turn off and heat temperature setting is set below room temperature (Heat On is not in the display).	Heating equipment is not a heat pump but System Type (Installer Setup Number 0170) is set to Heat Pump.	Set System Type (Installer Setup Number 0170) to match the installed heating and/or cooling equipment.
Cannot set the system setting to Heat.	System Type (Installer Setup Number 0170) is set to Cool Only.	Set System Type (Installer Setup Number 0170) to match the installed heating and/or cooling equipment.
Cannot set the system setting to Cool.	System Type (Installer Setup Number 0170) is set to Heat Only or Heat Only with Fan.	Set System Type (Installer Setup Number 0170) to match the installed heating and/or cooling equipment.
Heat On is not in the display.	System setting is not set to Heat and/or temperature setting is not set above room temperature.	Set the system setting to Heat and set the temperature setting above the room temperature.
Cool On is not in the display.	System setting is not set to Cool and/or the temperature setting is not set below room temperature.	Set the system setting to Cool and set the temperature setting below the room temperature.
Wait is in the display.	Compressor minimum off timer is active.	Wait up to five minutes for the cooling or heating (heat pump) equipment to turn on.
"Screen Locked" appears on the screen and all or some of the keys do not respond.	The keypad is fully or partially locked.	Check ISU 0670 to change keypad locked options.

SPECIFICATIONS

Electrical Ratings:

W (Heating)	20 - 30 Vac	0.02 - 1.0A
Y (Cooling)	20 - 30 Vac	0.02 - 1.0A
G (Fan)	20 - 30 Vac	0.02 - 0.60A
A (Economizer/TOD)	20 - 30 Vac	0.02 - 1.0A

Temperature Setting Range:
Heating: 40°F to 90°F (4.5°C to 32°C).
Cooling: 50°F to 99°F (10°C to 37°C).

Operating Ambient Temperature:
0°F to 120°F (-18°C to 49°C).

Shipping Temperature:
-30°F to 150°F (-34.4°C to 65.6°C).

Operating Relative Humidity (Non-condensing):
5% to 90%.

Thermostat Dimensions: 3-3/4 in. (95mm) high x 6 in. (152mm) wide x 1-3/8 in. (35mm) deep.

Accessories:
X4148 Outdoor Sensor: 10K ohm NTC.
29M55 Wall-Mount Remote Indoor Sensor: