SmartCommand Thermostat
Installation Manual

Contents

Preface

This is the GE *SmartCommand Thermostat Installation Manual* for model CC-SCSTAT. This document includes an overview of the product and detailed instructions explaining:

- how to install; and
- how to operate the thermostat.

There is also information describing how to contact technical support if you have questions or concerns.

To use this document effectively, you should have the following minimum qualifications:

- a basic knowledge of HVAC control components; and
- a basic knowledge of electrical wiring and low-voltage electrical connections.

Read these instructions and all ancillary documentation entirely <u>before</u> installing or operating this product. The most current versions of this and related documentation may be found on our website. Refer to *Online publication library* on page 39 for instructions on accessing our online publication library.

Note: A qualified service person, complying with all applicable codes, should perform all required hardware installation.

Conventions used in this document

The following conventions are used in this document:

Bold	Menu items and buttons.
Italic	Emphasis of an instruction or point; special terms.
	File names, path names, windows, panes, tabs, fields, variables, and other GUI elements.
	Titles of books and various documents.
Blue italic	(Electronic version.) Hyperlinks to cross-references, related topics, and URL addresses.
`Monospace`	Text that displays on the computer screen.
	Programming or coding sequences.

Safety terms and symbols

These terms may appear in this manual:

CAUTION: *Cautions* identify conditions or practices that may result in damage to the equipment or other property.

WARNING: *Warnings* identify conditions or practices that could result in equipment damage or serious personal injury.

Product overview

The SmartCommand thermostat (model CC-SCSTAT) provides typical thermostat functions as well as the capability to send and receive information via serial communications. This capability allows the thermostat's setpoint, mode, and fan operation to be changed remotely. In addition, the remote systems can request status of the thermostat's temperature, setpoints, modes, and other system information.

The thermostat consists of two parts, a wall display unit (WDU) and a HVAC control unit. The wall display unit looks like a traditional thermostat and is the wall-mounted user interface for the control unit. It provides a display screen, control buttons, and the temperature sensor. The wall display unit connects to the control unit by a four-wire cable. The control unit connects to the HVAC system in place of a standard thermostat and provides thermostatic control of the system. In addition, the control unit sends and receives data and commands via a twisted-pair serial communication connection for remote control of the system. The control unit can be used with up to three remote temperature sensors.

Wall display unit (WDU)

The WDU has a backlit LCD graphical display capable of both text and graphics, control buttons, LEDs, and a digital temperature sensor. The unit can display multiple screens. In the default *Thermostat control* screen (*Figure 1*) it shows the current temperature, setpoints, mode and manual fan mode, time, outside temperature and other information.

Figure 1. Wall display unit default screen
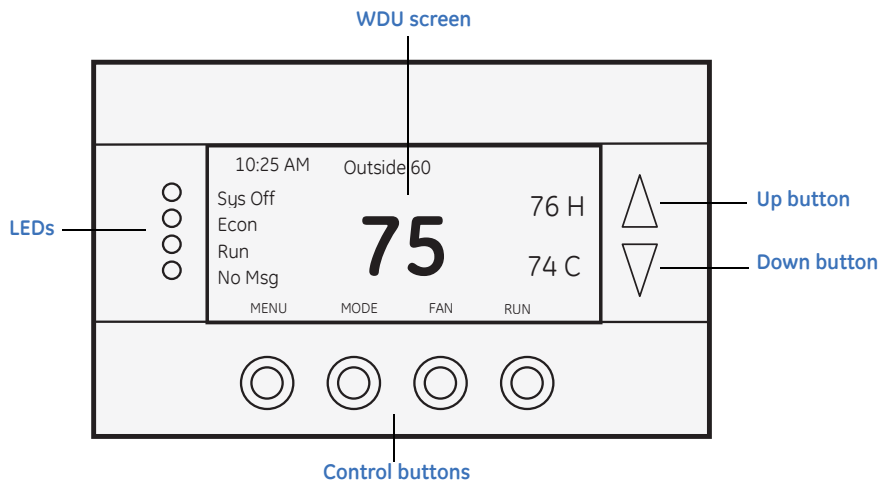
Any changes in temperature, or control button operations, are transmitted to the control unit. Updates are received from the control unit and displayed by the WDU.

WDU control buttons

Both the four control buttons and the up and down buttons on the WDU change functions when you change screens. The function of the buttons is defined by on-screen labels that are dynamic and change when you change screens.

WDU LEDs

The four LEDs on the WDU display various status information. The LEDs have dynamic on-screen labels that can change when you change screens.

WDU screens

One of the unique features of the WDU graphical display is the ability to have multiple display screens. In addition to a main *Thermostat control* screen, menus and other control screens for special functions are provided. This makes an intuitive and easy to use user interface and allows the many functions of the thermostat to be easily navigated.

The WDU screens include:

Thermostat control screen. The *Thermostat control screen* on page 4 screen is the only screen needed for basic thermostat operation. All other screens will automatically timeout and return to this screen after 120 seconds of no activity.

Minimized thermostat screen. The *Thermostat control* screen will go to a minimized screen after a 30 second timeout period. This screen presents a simple, uncluttered display of the current room temperature. You can disable the *Minimized* screen if desired.

> **Note:** You can press any button when the *Minimized* screen is displayed to restore and display the *Thermostat control* screen.

Menu selection screen. Press the **Menu** button on the *Thermostat control* screen to access the *Main menu screen* on page 7. This screen presents a list of the other functions or setup screens that you can select.

Messages screen. The unit is capable of receiving messages from the RS485 network. Messages received are displayed in the *Messages screen* on page 8.

Schedule setup screen. Use the *Schedule setup screen* on page 9 to setup and select schedules for the thermostat.

User settings screen. Use the *User settings screen* on page 12 for the initial setup of the thermostat. From this screen, you can set the clock, minimized screen timeout, Fahrenheit or Centigrade selection, sensor calibration, and display settings.

Thermostat information screen. This is a quick reference list of the thermostat firmware versions and setup. (See *Thermostat information screen* on page 16.)

Thermostat control screen

The *Thermostat control* screen (*Figure 2*) is the default display screen normally displayed on the WDU.

Figure 2.   Thermostat control screen
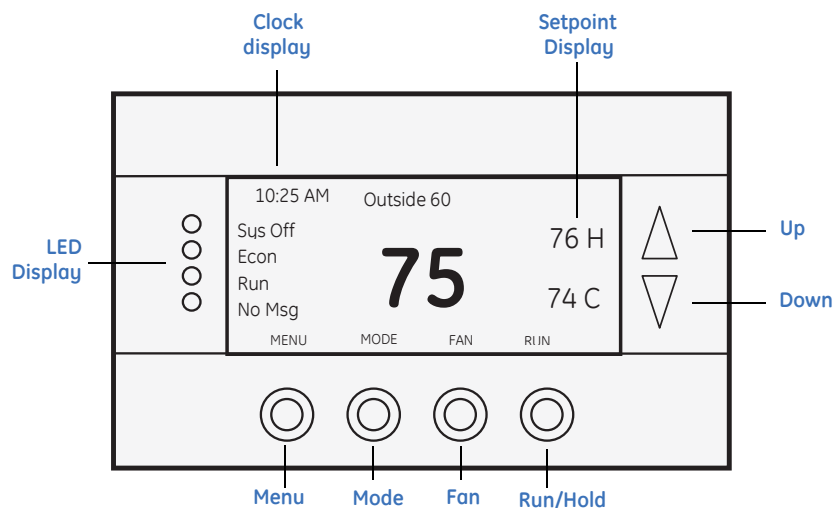
Temperature display

The WDU will normally display the current temperature from the internal digital temperature sensor or a remote sensor. The sensors have an accuracy of ± 1°F (± 0.5°C). The WDU will display temperatures from -40 to 190°F (-40 to 88°C). If averaging remote sensors are attached, the display will show the average temperature of all attached averaging sensors.

Setpoint display

The heating and cooling setpoints are displayed next to the **Up** and **Down** buttons. In heat mode, the **Up** and **Down** buttons change the heat setpoint. In cool mode, they change the cooling setpoint. When in auto mode, the buttons change the last call's heating or cooling setpoint. The setpoints will push each other if they are adjusted to within the minimum heat/cool separation (delta T) setting. This setting is default set to 4 degrees, but can be changed in the installer settings.

Clock display

The current time is displayed in the upper left corner of the main screen. Set the clock from the *User settings screen* on page 12.

Up and down buttons

The **Up** and **Down** buttons adjust the setpoint temperature. Press **Up** to increase the setpoint value by one degree and press **Down** to decrease the setpoint one degree. Pressing and holding a button down will cause the setpoint to continuously change until the button is released. The setpoints can be set from 6 to 109° (F or C), unless limited in the installer settings.

You cannot lower the cooling setpoint below the heating setpoint. The thermostat will push the heating setpoint lower if you try to lower the cooling below the heating setpoint. It maintains a setpoint delta separation between heating and cooling setpoints. The same is true for raising the heating setpoint above the cooling setpoint. Again, the thermostat will push the cooling setpoint up to maintain the setpoint delta separation.

Menu button

The **Menu** button changes the screen display to the *Main menu* screen that shows other functions available on the thermostat. These are dynamic and can change with the version of the thermostat you have, but the standard ones include:

- *Messages screen* on page 8
- *Schedule setup screen* on page 9
- *User settings screen* on page 12
- *Thermostat information screen* on page 16

Mode button

The **Mode** button controls the HVAC system mode. The current mode selected is displayed above the button. Pressing the **Mode** button will cause the mode and display to change to the next mode. The mode cycles through the following modes with each press of the **Mode** button.

Off mode. The system is off. No heating or cooling will come on. If it was on, the system will turn off.

Heat mode. Only heating operation will occur.

Cool mode. Only cooling operation will occur.

Auto mode. Heating or cooling will come on according to the heating and cooling setpoints. The system will automatically switch between heating and cooling when the temperature exceeds the setpoints.

EH mode. This mode is only displayed when *Heat Pump* HVAC system type is selected. When there is a compressor failure with the heat pump system, setting the mode to EH will allow the supplemental heat to come on whenever there is a heat call to provide heating. It also disables the compressor outputs to prevent further damage to the system.

Fan button

The **Fan** button controls the HVAC system's manual fan. The current manual fan mode is displayed above the button. Normally this button is in the Auto mode (the system fan is automatically controlled by the HVAC system). Pressing the **Fan** button once will turn the manual fan operation on. Pressing it again will turn the manual fan off and return to the Auto mode. Changes in the fan mode are sent to the control unit.

Run/Hold button

The **Run/Hold** button controls the automatic schedule operation. In hold mode, the current temperature is maintained until changed by manual or remote network command. In the run mode, the schedule loaded into the thermostat is activated and setpoints will change according to the schedule and the time and day of the week.

Away mode. There is also an away mode that you can select if you press and hold the **Run** button for three seconds. In the away mode, the setpoints are changed to preset temperatures: 66°F heating and 80°F cooling.

LED display

The Thermostat control screen has the following LED labels and descriptions, numbered from top to bottom.

LED 1 green, system operation display

LED off, *SYS OFF* **displayed.** HVAC system is off.

LED off, *SYS MOT* **displayed.** Minimum off time (MOT) delay on is active.

LED on, *SYS ON* **displayed.** HVAC system is running.

LED on, *SYS MRT* **displayed.** Minimum run time (MRT) delay off is active.

LED 2 green, system Economy mode display

LED off or on, *Econ* **displayed.** Economy or first stage heating or cooling only.

LED on, *2nd Stg* **displayed.** Stage two heating or cooling is active.

LED on, *3rd Stg* **displayed.** Stage three heating is active.

LED on, *Vent* **displayed.** Fresh air venting is active.

LED 3 green, Run/Hold display shows state of schedule Run/Hold mode

LED off, *Run* **displayed.** Schedule is running.

LED on, *Hold* **displayed.** Schedule is off, temperature setpoint hold in effect.

LED 4 red, alert LED used for messaging and other system alerts

LED off, *No msg* **displayed.** No text messages or alerts present.

LED on, mail icon or alert text displayed. Message waiting or specific alert text.

Communication error display

If the WDU is not properly wired or if communication to the control unit is interrupted, the LCD display will flash Comm Failure at the top center of the *Thermostat control* screen (where outside temperature is normally displayed). Momentary display of communication failure caused by loss of data, will clear automatically when data communication is restored. If the communication failure display stays on, check wiring or the control unit for problems.

Main menu screen

The thermostat has a menu tree that can be accessed by pressing the **Menu** button on the main *Thermostat control* screen. Various configurations of the unit can have different screen contents. The first screen that will display is the *Main menu* screen (*Figure 3*). This is a list of the other menus or functions that you can access. Standard screens are listed in this manual, your screen may vary with different configurations or revisions.

Figure 3.   Main menu screen
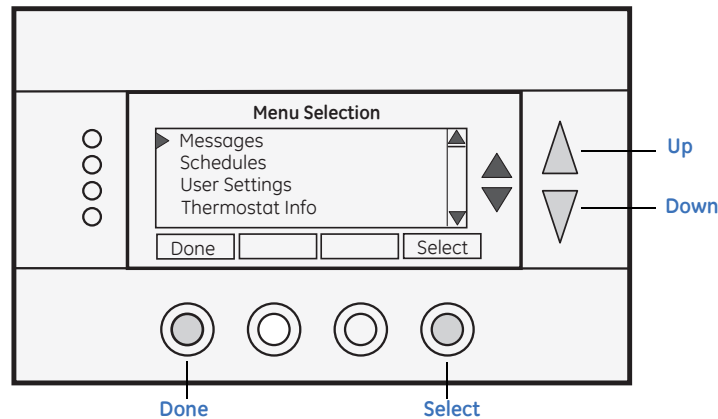
Screen options include:

Messages. Access the *Messages screen* on page 8. A text messaging subsystem allows messages of up to 80 characters to be sent to the thermostat. Messages received display when the message screen is selected. The *Messages* menu item may or may not be displayed. It can be enabled or disabled from the installer settings.

Schedules. Access the *Schedule setup screen* on page 9 to set the programmable setback schedules of the thermostat.

User settings. Access the *User settings screen* on page 12 to set the clock, screen timeout, F/C mode, sensor calibration, and backlight/display settings.

Thermostat information. Access the *Thermostat information screen* on page 16 that displays the firmware versions of the WDU and control unit, the HVAC system type and equipment options, and the network address of the thermostat.

Screen navigation buttons include:

Done. Return to *Thermostat control screen* on page 4.

Select. Select menu item at pointer.

Up. Move selection pointer up.

Down. Move selection pointer down.

Messages screen

The *Messages* screen (*Figure 4*) allows you to retrieve text messages sent from the serial network to the thermostat. The *Messages* screen features navigation buttons to read new and old messages and delete messages.

You can store up to 16 messages. If more than 16 messages are received, the oldest is erased to make room for the newest message.

Note: New messages will turn on and flash the red message LED and mail icon in the main *Thermostat control* screen.

Viewing messages makes them *old* and turns off the indicators. If you view some, but not all new messages, the new message notification LED and icon will stay on. When you first select the *Messages* screen, the most recently received message will be displayed as Message 1. If other messages are stored in memory, you can recall and view or delete them by using the *Messages* screen navigation buttons.

Figure 4.   Messages screen
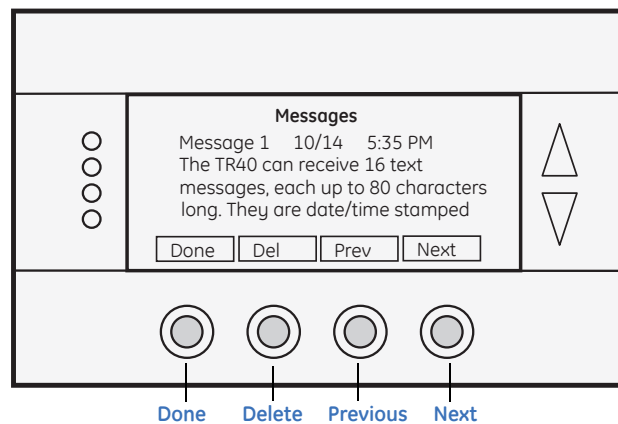
Screen navigation buttons include:

  Done. Return to main *Main menu screen* on page 7.

  Del. Delete the message being displayed.

  Prev. Display previous messages. Scroll up in the message stack.

  Next. Display the next message. Scroll down in the message stack.

Schedule setup screen

The *Schedule setup* screen allows you to review and set the setback schedule for the thermostat. The thermostat has a 4 by 7 schedule. Four times a day can be selected for heating and cooling setpoints. Each day of the week can have a different schedule. Groups of days can be copied with the same schedule. When the thermostat is set to run mode, the schedule will be executed daily, with the setpoints being changed as per that day's schedule stored in the thermostat. Hold mode stops the scheduled operation and holds the current setpoints until changed manually or by network commands.

The *Schedule setup* screen (*Figure 5*) gives you the option of setting a custom setback schedule or the option to load one of two preset schedules.

Figure 5.   Schedule setup screen
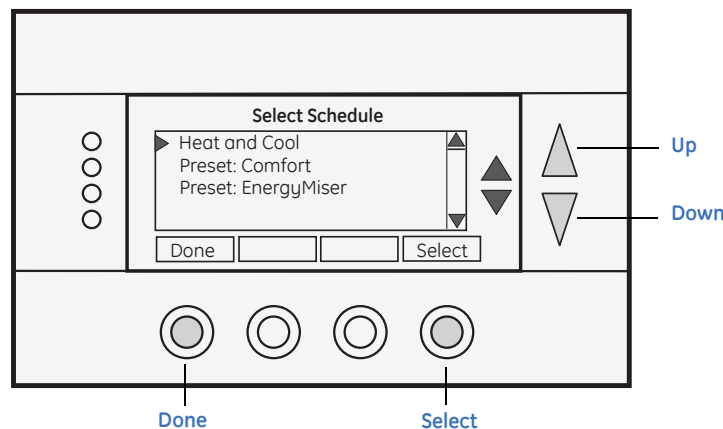
Screen options include:

Heat and cool. Change the individual day/hour and setpoints for the heating and cooling schedule (see *Heat and cool schedule screen* on page 10).

Preset: Comfort. Load the comfort schedule into the thermostat. This is a preset schedule with mild setbacks.

Preset: EnergyMiser. Load the EnergyMiser schedule into the thermostat. This is a preset schedule with deeper setbacks.

Screen navigation buttons include:

Done. Return to *Main menu screen* on page 7.

Select. Select the schedule to view or modify.

Up. Move selection pointer up.

Down. Move selection pointer down.

Heat and cool schedule screen

When you select the *Heat and cool schedule* menu item, the *Heat and cool schedule* screen (*Figure 6*) opens
and the schedule for the current day will be displayed. Use the scroll buttons to highlight the data to be
modified. Once the data has been highlighted, use the **Up (+)** and **Down (-)** buttons to change the value of the
data.

To copy a day's schedule to another day or group of days, move the cursor to *C* on the bottom right of the
screen. When you highlight *C*, the button below will change from **Next** to **Copy**. Press this button to access the
Copy schedule screen on page 11.

Figure 6.   Heat and cool schedule screen
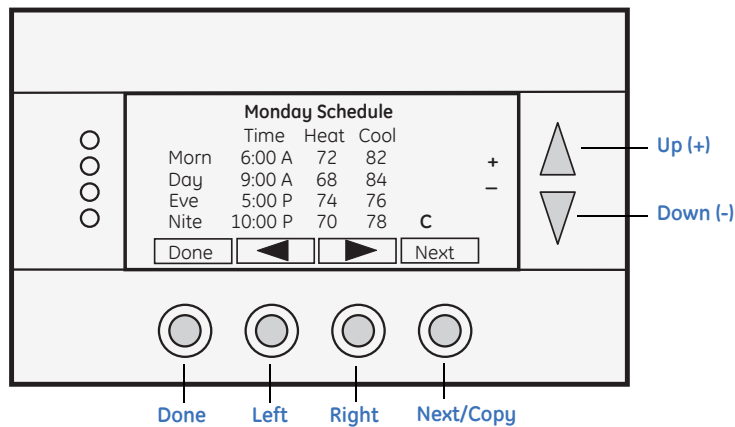
Screen navigation buttons include:

Done. Return to the *Main menu screen* on page 7.

Left. Scroll back.

Right. Scroll forward.

Next/Copy. When the button shows **Next**, select the next day's schedule. When the button shows **Copy**,
go to the *Copy schedule screen* on page 11.

Up (+). Increase time or temperature.

Down (-). Decrease time or temperature.

Copy schedule screen

The *Copy schedule* screen (*Figure 7*) is a sub screen of the *Heat and cool schedule screen* on page 10. The *Copy schedule* screen allows you to copy a day's schedule to another day or group of days.

To copy a day's schedule, do the following:

1. Select the day to be copied in the *Heat and cool schedule* screen. Scroll to the *C* at the bottom of the *Heat and cool schedule* screen to highlighted it. The **Next** button will change to the **Copy** button. Press **Copy** to open the *Copy schedule* screen (see *Heat and cool schedule screen* on page 10).

2. Scroll through the days in the *Copy schedule* screen and select the days the schedule is to be copied to by setting the *N* under each day to *Y,* using the **Up** (**Yes)** and **Down (No)** buttons.

3. After selecting all the days desired, press **Copy**.

4. Press **Back** to exit the *Copy schedule* screen.

Figure 7.   Copy schedule screen
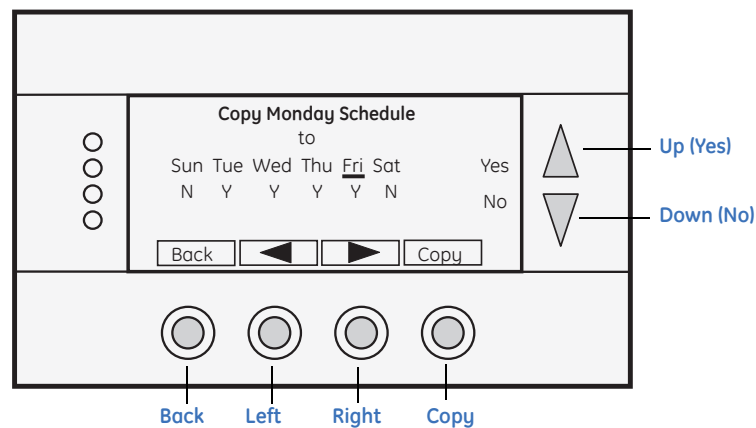
Screen navigation buttons include:

Back. Return to the *Heat and cool schedule screen* on page 10.

Left. Move the selection bar back.

Right. Move the selection bar forward.

Copy. Copy the schedule to the selected days.

Up (Yes). Copy the schedule to this day.

Down (No). Do not copy to this day.

User settings screen

The *User settings* screen (*Figure 8*) allows you to set or change various user options of the thermostat such as the clock, minimized screen timeout, Fahrenheit/Centigrade mode, sensor calibration, and backlight settings.

Figure 8.   User settings screen
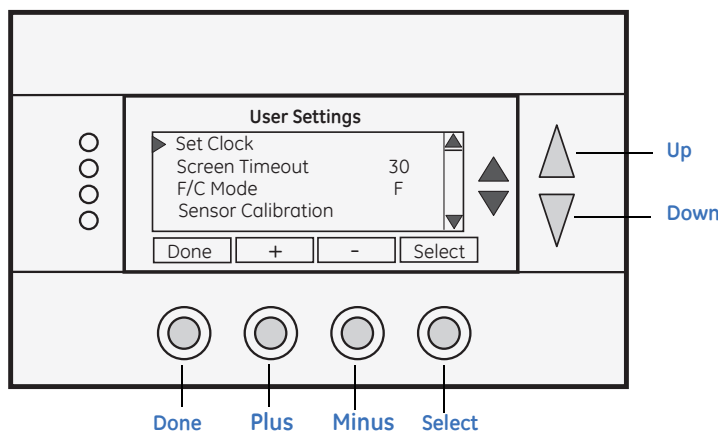
Screen options include:

Set clock. Access the *Set clock screen* on page 13.

Screen timeout. Set the screen timeout time in seconds. Options are 0 or 15 to 127 (default is 30 seconds). This is the time before any screen reverts to the *Minimized* screen after you stop pushing buttons. You can disable the *Minimized* screen feature by setting this time to 0. If this is disabled, all screens revert to the main *Thermostat control screen* on page 4 after 120 seconds.

F/C select. Select which temperature display mode you desire, Fahrenheit (F) or Centigrade (C) with the + and - buttons.

Sensor calibration. Access the *Sensor calibration screen* on page 14.

Backlight/Display. Access the *Backlight display screen* on page 15.

Screen navigation buttons include:

Done. Return to the *Main menu screen* on page 7.

Plus. Increase the selected value.

Minus. Decrease the selected value.

Select. Select the function to be set.

Up. Move selection pointer up.

Down. Move selection pointer down.

Set clock screen

The *Set clock* screen (*Figure 9*) is a sub screen of the *User settings* screen. The *Set clock* screen allows you to set the thermostat's internal clock.

To set the time and day, do the following:

1. Move the cursor with the navigation arrows until the data you want to change is highlighted.

2. Press **Up** (+) or **Down** (-) to increase or decrease the value to the desired setting.

3. Press **Set** to set the time and return to the main *Menu* screen or wait for the screen to timeout.

Note: If the clock has been reset by an extended power outage, the clock display on the *Thermostat control* screen will be blinking. Pressing **Menu** button will take you directly to this screen to set the clock.

Figure 9.   Set clock screen
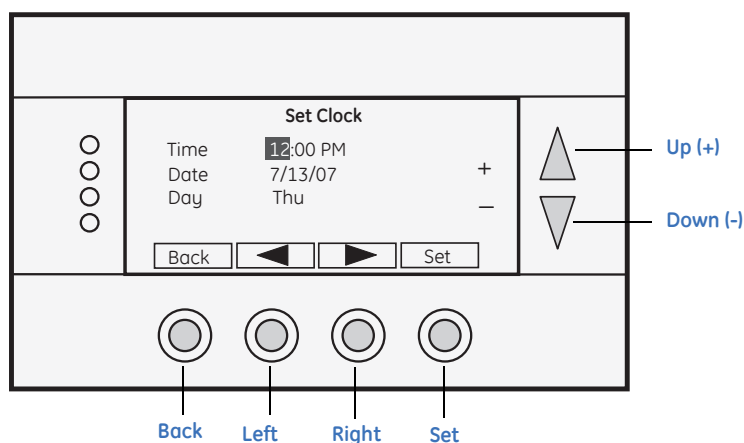
Screen navigation buttons include:

Back. Cancel and return to the *User settings screen* on page 12.

Left. Move the selection box backward.

Right. Move the selection box forward.

Set. Set the time and return to the *User settings screen* on page 12.

Up (+). Increase the selected value.

Down (-). Decrease the selected value.

Sensor calibration screen

The *Sensor calibration* screen (*Figure 10*) is a sub screen of the *User settings screen* on page 12. The *Sensor calibration* screen allows you to change the temperature calibration for the internal and any external remote temperature sensors attached to the thermostat. You can change the temperature calibration by ± 7 degrees.

When the *Sensor calibration* screen is selected it will show the internal and all detected remote sensors. Each sensor found will show the current temperature and the current number of degrees of offset being applied. In the screen, *n/a* indicates that the remote sensor is not attached.

To change the temperature calibration, press **Up** or **Down** to select the internal or remote sensor. Once selected, press **Plus** (+) or **Minus** (-) to change the temperature calibration to the desired setting.

Press **Refresh** (right blank button) to update the information on this screen.

Note: When you change a temperature calibration and exit this screen, it may take a few seconds for the new temperature to be displayed on the *Thermostat control screen* on page 4.

Figure 10. Sensor calibration screen
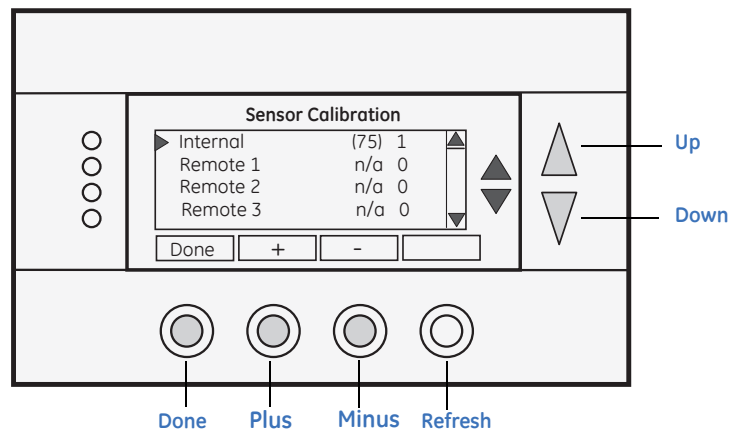
Screen navigation buttons include:

Done. Return to the *Main menu screen* on page 7.

Plus. Increase the temperature by one degree.

Minus. Decrease the temperature by one degree.

Refresh. Blank button. Refresh screen temperatures.

Up. Move selection pointer up.

Down. Move selection pointer down.

Backlight display screen

The *Backlight display* screen (*Figure 11*) is a sub screen of the *User settings* screen. The *Backlight display* screen allows you to set the backlight on and off brightness levels and contrast.

Figure 11. Backlight display screen
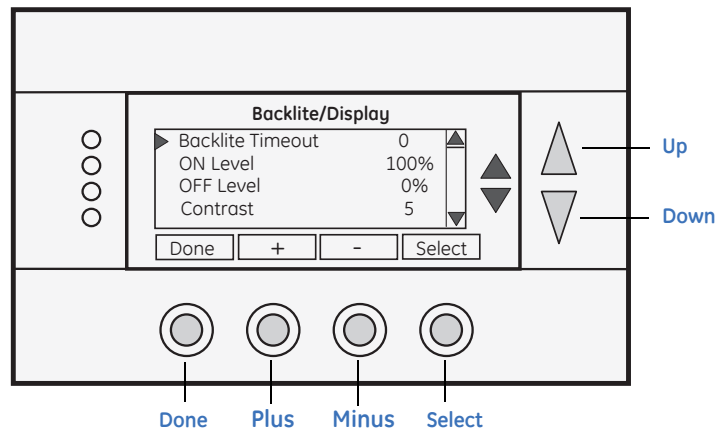
Screen options include:

Backlight timeout. Set the time after the last button press that the backlight will timeout and turn off. You can adjust the time to 0 or from 20 to 40 seconds. If set to 0, the backlight will never timeout and will always be on. If set in the 20 to 40 second range, the backlight will turn off after the selected time expires.

On level. Set the brightness of the backlight when it is on. You can adjust this setting in 10% steps, 0 to 100%. If set to 0, the backlight will never be on. Typically this setting is set to 100%.

Off level. Set the brightness of the backlight when off. You can adjust this setting in 10% steps, 0 to 100%. If you do not want the backlight to go completely dark when off, you can set an off brightness to something greater than 0%. When you select an on or off brightness, the display changes to that level for you to observe the brightness setting.

Contrast. Set the contrast level of the LCD display. You can adjust this setting from 0 to 10. Use this control to adjust the darkness of the display. Too light and the display looks faded, too dark and dark lines will appear in the display. Typically 5 is the correct setting.

Screen navigation buttons include:

Done. Return to the *User settings screen* on page 12.

Plus. Increase the selected value.

Minus. Decrease the selected value.

Select. Select the function to be set.

Up. Move selection pointer up.

Down. Move selection pointer down.

Thermostat information screen

The *Thermostat information* screen (*Figure 12*) displays the current configuration of the thermostat wall display unit and the HVAC control unit. This information is useful for quick check of firmware versions and HVAC system setup. It also shows the network address setting

Thermostat information displayed includes:

> **Wall display unit.** Model and firmware version number.

> **Control unit.** Model and firmware version number.

> **System type setting.** Standard or Heat Pump (HP) HVAC system.

> **Fan type setting (for standard systems).** No fan with heat (gas systems) or fan with heat (electric systems).

> **Changeover setting (for heat pump systems).** Changeover with cool or changeover with heat.

>> **Note:**   You will see a Fan type setting for standard systems or a Changeover setting for HP systems.

> **Network address setting.** RS485 network address, 1 to 254 (default 1).

Figure 12. Thermostat information screen
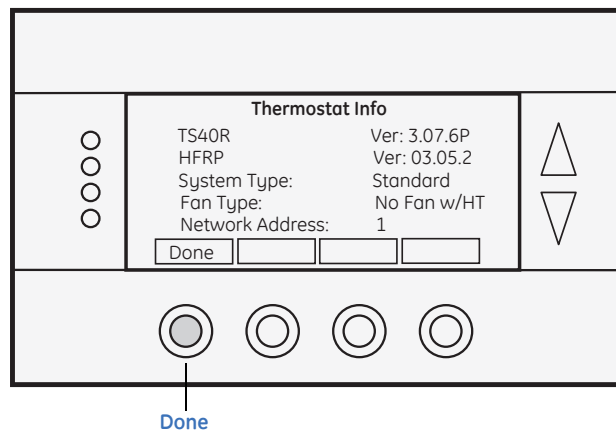
Done

Thermostat information screen has one navigation button, the **Done** button. Press **Done** to return to *User settings screen* on page 12.

Installer settings screen

The *Installer settings* screen is a hidden screen designed for installer use only. Do not change any settings in this screen unless you are a qualified service technician. Changing these settings will affect the operation of the heating/cooling system.

To enter this screen, go to the and press and hold the two inner control buttons for three seconds until the *Installer settings* screen (*Figure 13*) appears.

The *Installer settings* screen displays the current internal settings of the thermostat. You can view and change the settings from this screen. Scroll to the desired function and press **Plus** (**+**) or **Minus** (**-**) to change the value.

Figure 13. Installer settings screen
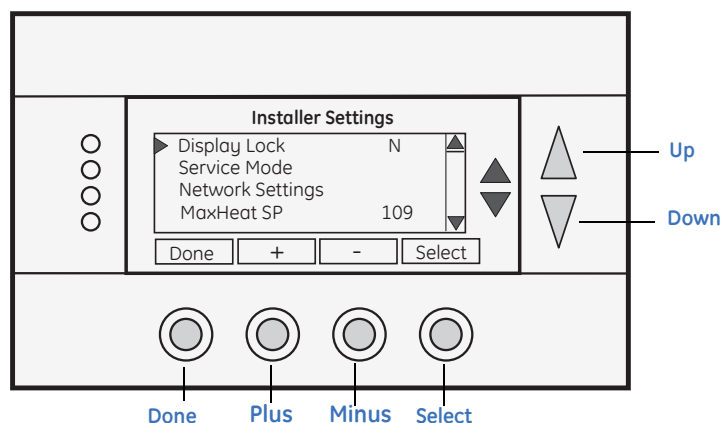
Screen navigation buttons include:

Done. Return to the *Main menu screen* on page 7.

Plus. Increase value by 1 or change from N to Y.

Minus. Decrease value by 1 or change from Y to N.

Select. Select menu item to go to a submenu.

Up. Move selection pointer up.

Down. Move selection pointer down.

Screen options include:

Display lock: Y or N (default N). Use this setting to lock or unlock the thermostat wall display unit buttons. When the buttons are locked (Y), you can still access the *Menu* screen, but you will not be allowed to select any menu options. The *Installer settings* screen hidden button operation is always operational, allowing you to return to this screen and turn the display lock off.

Service mode submenu: Y or N (default N). Use this setting to turn on the service mode. When the service mode is on (Y), it sets the thermostat to a test mode with short delays. All routine and staging delays are reduced to 15 seconds to speed up system checkout and testing.

⚠️ **CAUTION:** The compressor short cycle protection is lost in this mode.

Network settings submenu.

Network address: 1 to 254 (default 1). Use this setting to set the serial communication network address (0 and 255 are reserved addresses).

Autosend: Y or N (default N). Use this setting to turn on the autosend. If autosend is on (Y), it sends a network message when there is a change in temperature, setpoints, and mode. If autosend is off (N), it is in polled mode and only responds to polling requests.

Maximum heating setpoint: 10 to 109 (default 109). Set the maximum heating setpoint that is allowed. Will not ramp or accept setpoints higher than this maximum.

Minimum cooling setpoint: 6 to 110 (default 6). Set the minimum cooling setpoint that is allowed. Will not ramp or accept setpoints lower than this minimum.

Minimum run time: 1 to 9 minutes (default 6). Set the minimum run time before a heating/cooling cycle can turn off.

Minimum off time: 5 to 9 minutes (default 6). Set the minimum off time before another heating/cooling cycle can begin. Five minutes minimum is the compressor short cycle protection delay.

Delta T settings submenu. This is a submenu of the delta, or difference between, the setpoint and current temperature for determining when a heat or cool call comes on. Deltas are the number of degrees away from setpoint.

H/C delta: 3 to 15 degrees (default 4). Set the minimum separation between heating and cooling setpoints. Attempts to lower the cooling below the heating setpoint by this amount will push the heating setpoint down to maintain this separation. In the same way, attempts to set the heating setpoint above the cooling setpoint will push the cooling setpoint up to maintain this separation.

Heating delta stage 1 on: 1 to 8 degrees (default 1). Set the delta from setpoint that stage 1 heating starts. Stage 1 turns off at setpoint.

Heating delta stage 2 on: 1 to 8 degrees (default 3). Set the delta from setpoint that stage 2 heating starts. Stage 2 turns off at setpoint.

Heating delta stage 3 on: 1 to 8 degrees (default 5). Set the delta from setpoint that stage 3 heating starts. Stage 3 turns off at setpoint.

Cooling delta stage 1 on: 1 to 8 degrees (default 1). Set the delta from setpoint that stage 1 cooling starts. Stage 1 turns off at setpoint.

Cooling delta stage 2 on: 1 to 8 degrees (default 3). Set the delta from setpoint that stage 2 cooling starts. Stage 2 turns off at setpoint.

WDU settings submenu.

Messaging enable: Y or N (default N). Enable (Y) or disable (N) the network messaging function. If you intend to use the messaging capability of the thermostat, you must enable it here by setting it to *Y*. *Messages* will then appear as a menu item in the main *Menu* screen and you will be able to receive and browse through the messages.

⚠ **CAUTION:** Do not change the installer settings unless you are sure of the effect these changes will make. Changing the network address will make the thermostat not respond if the address is incorrect.

Installation overview

Before you remove an existing thermostat and install the SmartCommand thermostat, follow these guidelines:

- Record existing wiring information.
- Do the bench test.
- Check WDU wiring before applying power to the control unit.
- Be sure to install a freeze protection device as required.

Figure 14 shows the standard thermostat wiring versus retrofit applications.

Figure 14. Wiring overview
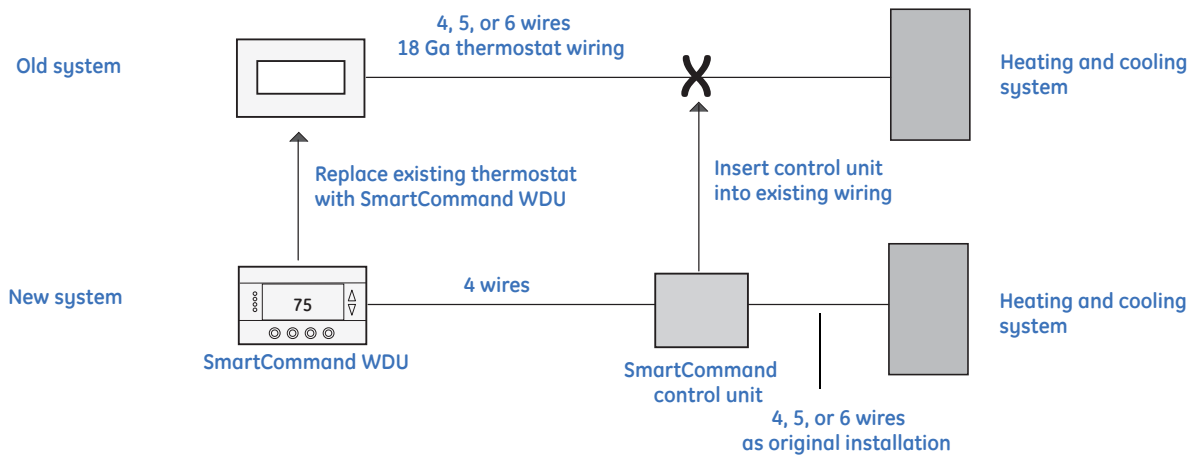
Freeze protection

⚡ **WARNING:** Do not use this thermostat for freeze protection.

In cold climates that require the heating system to be used for building freeze protection, a mechanical backup freeze protection device must be installed on the heating system. This can be a simple mechanical heating thermostat or a preset thermoswitch installed in the heated area (*Figure 15*).

Figure 15. Freeze protection
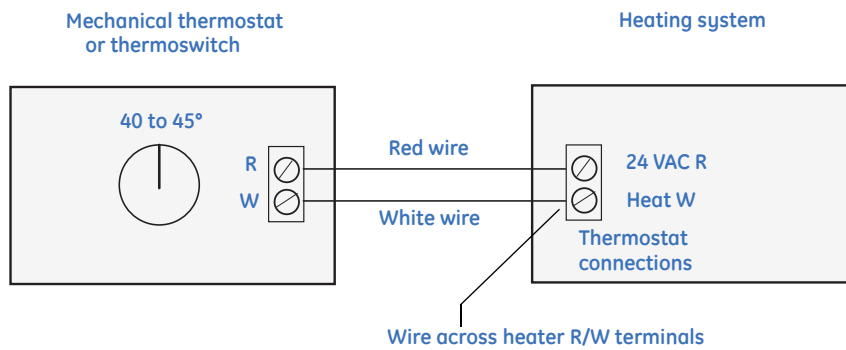
Wall display unit installation

Choose a location for the wall display unit (WDU) that best represents the temperature of the area to be controlled. Avoid locations that are subject to drafts or areas with direct sunlight exposure.

Mounting

To mount the WDU, see *Figure 16* and do the following:

1. To open the WDU case, pull from the lower corners of the case.

Figure 16. Opening and closing the WDU case
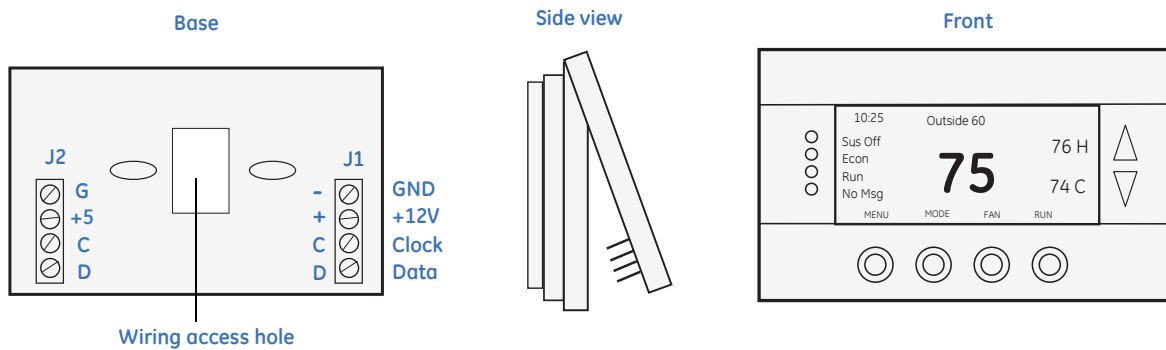
2. Route the wires to the WDU through the access hole in the back of the case (see *Wiring*).

3. Mount the WDU to the wall with the screws and anchors provided. Be sure to plug any large access hole in the wall with sealer or insulation to prevent wall drafts from affecting WDU operation.

4. To close the case hook the top of the WDU and rotate into the base. Be sure pins engage in the connector correctly

Wiring

For new construction, we recommend you use a two twisted-pair cable, 22 Ga minimum, to the WDU from the control unit. Category 5 wiring is preferred, but not required. In retrofit applications, the existing 18 Ga thermostat wiring (at least four wires) is adequate and usually will work without problems. However, such nontwisted wiring can be subject to interference due to adjacent in-wall high voltage wiring.

To wire the WDU to the control unit, connect the four-wire cable from the control unit to the WDU terminal block. Two wires are for data and two are for power. WDU power is 12 VDC and provided by the control unit.

⚠️ **CAUTION:** Do not miswire the power and data lines, damage will result. Check your wiring before applying power.

Remote sensor connection

The WDU base (*Figure 16*) has a remote sensor connection (J2) to connect an external remote temperature sensor. Refer to the remote sensor documentation for the wiring diagram to connect the sensor to the WDU.

Control unit installation

Install the control unit in a protected, convenient, indoor location near the HVAC system or in a service accessible area such as an equipment closet or garage. Mount the control unit in a vertical position on a wall or sturdy structural member. If you mount the control unit on the HVAC system, be careful to avoid the hot burner section and high vibration areas.

The control unit is connected to the HVAC system and to the WDU unit as well as the serial communication and power connections.

Control unit to WDU wiring

Connect the WDU to the control unit with existing thermostat wiring in retrofit installations. For new installations, 22/24 Ga twisted-pair, typically CAT 3 or CAT 5 wiring is preferred (*Figure 17*).

Figure 17. Control unit to WDU wiring
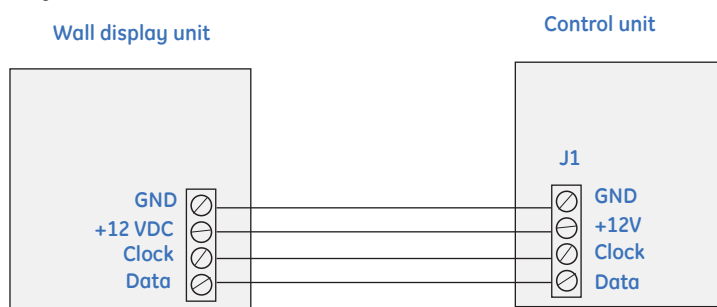
CAUTION: Do not miswire the power and data lines, damage will result. Check your wiring before applying power.

Control unit to HVAC wiring

Electrically, the control unit looks like a standard thermostat to your HVAC system. All connections to the HVAC system are made at the normal thermostat connections on the HVAC unit. Refer to your HVAC system's documentation for specific information on its thermostat connections and set up requirements. You will need to know the following:

HVAC system type. Gas, electric, heat pump, radiant, or hydronic.

Fan requirement. No fan with heat or fan with heat.

For heat pump system. Changeover with cool or with heat (O or B connection).

Retrofit wiring

You may find that you have additional wires when you disconnect your old thermostat. Usually these wires are for auxiliary functions such as filter or trouble indicators. For heat pump systems there may be emergency heat (EH) wiring or both O and B changeover connections. These wires are not used in the SmartCommand installation and, in most cases, these extra wires are not required for normal HVAC system operation. See HVAC wiring for wiring diagrams for your type of HVAC system: standard or heat pump.

HVAC system wiring

Wiring will differ depending on if your system is a standard gas or electric system or if your system is a heat pump system.

Standard HVAC system wiring

Figure 18 shows the wiring diagram for a standard gas or electric HVAC system. Wiring colors are typical thermostat wiring color codes.

Note: For typical central heating/cooling systems, leave jumper JP1 installed. If you have separate heating and cooling system transformers, cut jumper JP1. Wire RC to the cooling system transformer and RH to the heating system transformer.

Figure 18. Standard HVAC system wiring
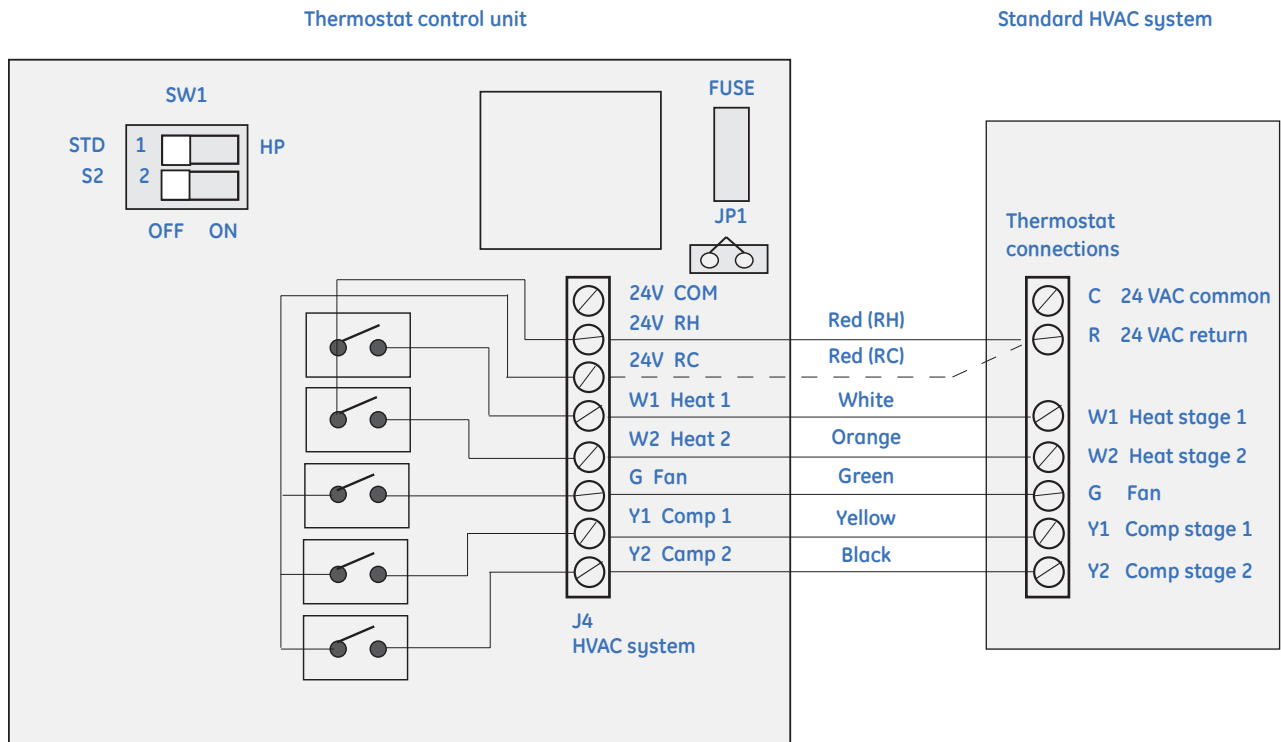
Note: Wire R to either RH or RC for common transformer HVAC systems.

For standard HVAC systems, follow these guidelines:

Single-stage systems. Use W1 for heating stage 1, and Y1 for cooling stage 1.

Two-stage heating systems. Use W1 for stage 1, and W2 for stage 2 heating.

Two-stage cooling systems. Use Y1 for stage 1 and Y2 for stage 2 cooling.

HVAC system 24 VAC transformer

If you have an integrated heating and cooling system with a single transformer, do not cut jumper JP1. Wire the 24V Return (red) wire to either RH or RC. This is typical of most central systems.

If you have separate heating and cooling systems with separate transformers, cut jumper JP1. Wire the heating 24V Return (red) wire to the control unit's RH terminal and run the cooling system's 24V Return (red) wire to the control unit's RC terminal. Wire the cooling system's 24 VAC Com to the control unit's 24 VAC Com terminal. Do not connect the heating system's common wire to the control unit.

DIP switches

To set the SW1 DIP switches for standard HVAC systems, do the following:

1. Set SW1-1 (position 1) to the Off (STD) position. This is the default setting.

2. Set SW1-2 (position 2) to the correct fan setting for your HVAC system.

   - For gas furnaces that do not require fan output for heating operations, set SW1-2 to the Off position (to the left). This is the default setting).
   - For electric furnaces that do require fan output for heating operation, set SW1-2 to On position (to the right).

Heat pump HVAC system wiring

Figure 19 shows the wiring diagram for a heat pump HVAC system. Wire colors are typical thermostat color codes.

Note: Do not cut JP1 for heat pump systems. RC and RH are common for heat pumps.

Figure 19. Heat pump HVAC system wiring
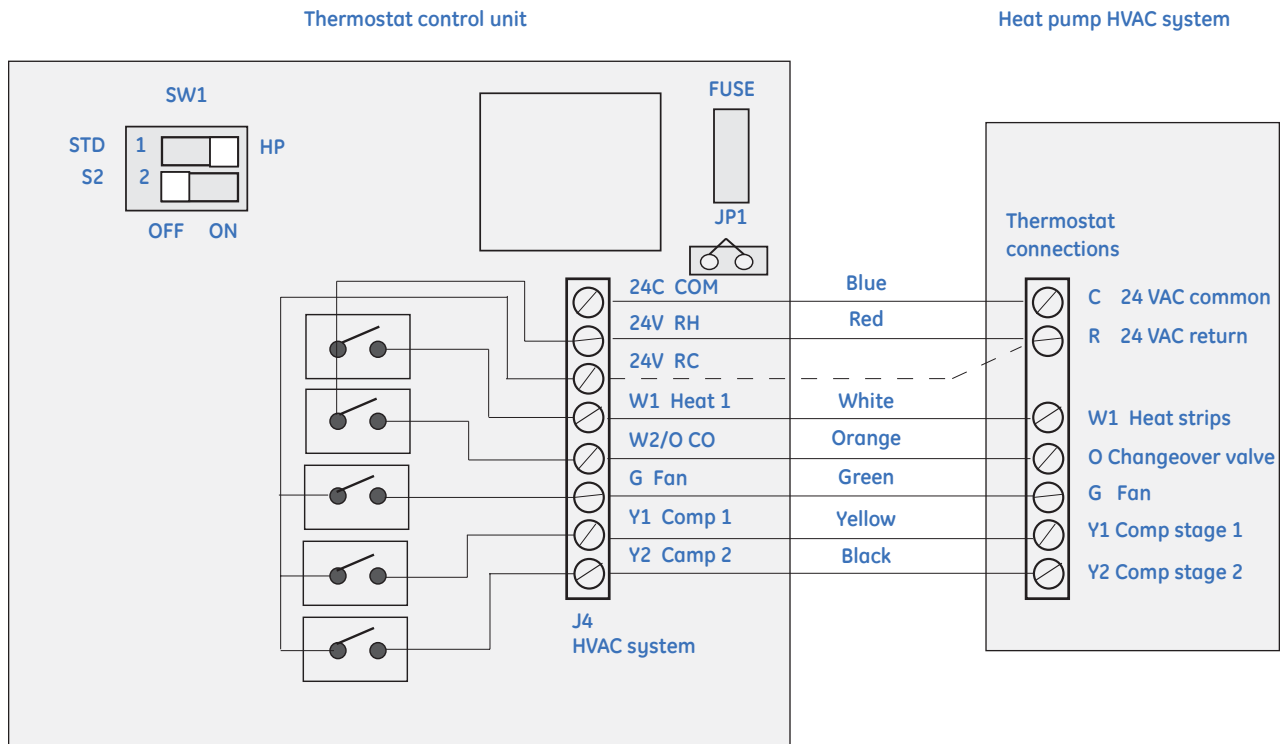
For heat pump HVAC systems, follow these guidelines:

Single-stage compressor systems. Use Y1 for stage 1 heating/cooling, and W1 for stage 2 heating (heat strips).

Two-stage compressor systems. Use Y1 for stage 1, Y2 for stage 2 heating/cooling, and W1 for stage 3 heating (heat strips).

DIP switches

To set the SW1 DIP switches for standard HVAC systems, do the following:

1. Set SW1-1 (position 1) to the On (HP) position (to the right).

2. Set SW1-2 (position 2) to the correct changeover (reversing valve) setting for your HVAC system:

   - For systems with changeover with cooling, set SW1-2 to Off position (to the left). This is the default setting.
   - For systems with changeover with heating, set SW1-2 to On position (to the right).

Note: You must configure your changeover valve setting to work correctly with your HVAC system. Set DIP switch SW1 as described for correct changeover operation. Changeover with cool is typical for most systems. Check your system information to be sure. If you get cooling when you expect heating, change SW1-2 to the other position.

Control unit connection

The control unit requires 24 VAC power from the HVAC system it is controlling. Connect the 24 VAC Common (blue wire/terminal) and 24 VAC R (red wire/terminal) from the HVAC system to the control unit's HVAC system terminal block J4's 24V Com and 24V RH (or 24V RC) terminals. The RH and RC terminals are connected together by JP1 (factory default).

Common or split transformer systems

Most HVAC systems have a common heating and cooling transformer. Connector JP1 is jumpered to common the RH and RC inputs together for this configuration. If you have a system with separate heating and cooling transformers, you will need to split the RH and RC jumper by cutting the JP1 jumper.

When wiring split systems, wire the heating system's 24VAC R (red wire) to the control unit's RH terminal and wire the cooling systems 24VAC R (red wire) to the control unit's RC terminal. Wire the cooling system's 24VAC Com to the control unit's 24 VAC Com terminals. Do not connect the heating system's common wire to the control unit.

Serial communication

Serial communication includes:

- RS485 com port
- RS485 address
- RS485 protocol
- Thermostat network commands

RS485 com port

The thermostat has a RS485 serial com port. This is a two-wire (plus ground), half-duplex communication network. Typically, the thermostat will be used on the SmartCommand network and connected to the Smart Command automation controller.

The RS485 com port communication setup is 9600 baud, 8 data bits, 1 stop bit, and no parity. Flow control is set to *None*.

Transmission delay

The thermostat will delay responses to request messages for 5 msec to conform to the SmartCommand network protocol. This is necessary for RS485 half-duplex devices to use *send data control* for automatic flow control.

RS485 address

You can check the network address setting of the thermostat by pressing **Menu** to open the main *Menu* screen. Scroll down to the *Thermostat info* menu item and press **Select**. The *Thermostat information screen* on page 16 will show the current network address of the thermostat. The default network address is 1.

Changing the network address

The network address is set from the *Installer settings screen* on page 17 on the WDU. This is a hidden menu and does not appear in the main *Menu screen* selections. To change the network address, do the following:

1. Press **Menu** to open the *Main menu screen* on page 7.

2. While in the *Menu* screen, press and hold the middle two control buttons on the WDU for five seconds until the *Installer settings screen* on page 17 opens.

3. Scroll down to the *Network menu* item in the *Installer settings* screen and press **Select**. You can set the network address from 1 to 254.

Note: Network address 0 is reserved for the host system address and 255 is reserved for global commands.

RS485 protocol

The thermostat has a robust serial protocol. It is based on a simple ASCII message format as described in the *Serial Communications Protocol* manual, DCN: 150-00225.

Note: Not all of the commands/variables defined in the protocol document are applicable to the SmartCommand thermostat, check Section 8 of the protocol manual for details.

Thermostat network commands

Serial commands received by the control unit can set a new setpoint or a new mode and when received, they are sent to the WDU to update its display.

The thermostat also responds to request for status by serial commands and can provide all thermostat data and setup information as well as the current revisions of the WDU and controller firmware.

The following thermostat information can be sent or requested from the thermostat by the serial protocol:

- Temperature
- Heating setpoint
- Cooling setpoint
- System mode
- Fan mode
- F/C mode
- HVAC output status
- Network address
- Any system variable
- System firmware revisions

System checklist

We strongly recommend that you hook-up and run a simple bench test before installing the thermostat. Not only will this save you time in system checkout, but will also make you familiar with the thermostat's operation.

Thermostat bench test

To bench test the thermostat, do the following:

1. Connect the WDU to the control unit with a short (12 to 24 in.) four-wire cable.

2. Before power up, set the control unit DIP switch, SW1 to ALL OFF.

3. Connect power to the control unit.

4. Verify the control unit status LED is blinking.

5. Verify the WDU display comes on and shows the current temperature:

   - If no display and backlights are not on, check your wiring to the control unit.
   - If a CommFailure display is shown on the WDU, check your wiring to the control unit.
   - Do not proceed until the current temperature is displayed on the WDU.

   With the current temperature displayed on the WDU, you have verified communication between the WDU and the control unit. Any communication problems will result in a CommFailure (communications failure) display on the WDU and must be fixed before proceeding.

6. Press the **Fan** button on the WDU until *Fan On* is displayed. The control unit's fan LED and relay should turn on. Press the **Fan** button again and the fan LED and relay should turn off.

7. Press the **Mode** button on the WDU until *Heat Mode* is displayed.

8. Press the setpoint **Up** button until the setpoint is above the current temperature. The heat LED and relay should come on. If they don't come on, make sure the status LED is not flashing twice indicating minimum off delay. Wait until the LED stops flashing twice before proceeding.

9. Press the **Mode** button on the WDU until *Off Mode* is displayed. The heat LED and relay will turn off.

10. Wait six minutes for the minimum off delay to expire. The status LED will stop flashing twice.

11. Press the **Mode** button on the WDU until *Cool Mode* is displayed.

12. Press the setpoint **Down** button until the setpoint is below the current temperature. The compressor and fan LEDs and relays should turn on.

13. Press the **Mode** button on the WDU until *Off Mode* is displayed. The cool LED and relay should turn off.

When you have successfully completed this process, you have verified that the thermostat is working correctly.

Serial communication test

Connect the thermostat to a PC via an RS232/485 converter to a PC serial com port.

Note: Any RS232 to RS485 adapter used with SmartCommand serial thermostats must have automatic send data control.

To use Windows HyperTerminal, do the following:

1.   Set up a direct connection session to the com port you will be using on the PC.

2.   Configure port settings to 9600 baud, 8 bit, no parity, 1 stop bit, and no flow control.

3.   Under the *Settings* tab, go *ASCII setup*.

4.   Set ASCII sending to *Echo characters* and *No delays*.

5.   Set ASCII receiving to *Append line feeds* and *Wrap lines*.

Note: Serial ASCII commands are case sensitive.

Verify serial communication by typing the following command sequence:

A=1 R=1 <cr>

The Thermostat should reply with the R1 status message:

A=00 O=1 T=xx SP=xx SPC=xx SPH=xx M=xx FM=x

If you have problems communicating, check addresses and port settings.

HVAC system testing

If you have difficulty with the HVAC system operation, you can do the following test to verify the HVAC system is operational.

Thermostats, like the SmartCommand thermostat, are just switches to the HVAC system as shown in the *Figure 20*. This is a simplified example of a thermostat and a standard HVAC wiring diagram. You can test the HVAC system operation by duplicating the thermostat switch operation by shorting across the thermostat terminals on the HVAC system.

Figure 20. HVAC system wiring example
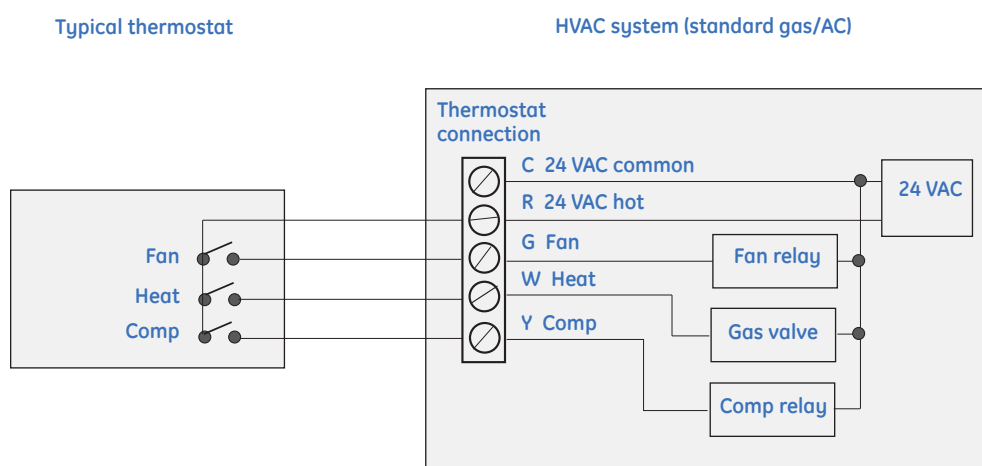
Note: The HVAC system and thermostat connection voltage is 24 VAC. This is a safe voltage to work with, but be careful to avoid shorting the 24 VAC common (C) and 24 VAC return (R) terminals. This may blow a fuse in the HVAC system.

Standard HVAC system quick test

You can do a quick test of the HVAC system by shorting across the appropriate terminals on the HVAC system's thermostat connector. Use a short 6-in. wire to connect across the terminals shown in *Table 1*.

Table 1.   Standard system quick test

Function test	HVAC terminals	Result
Fan	R to G	Fan should come on.
Heating	R to W	Heat cycle should start for heating.
Cooling	R to Y and G	Compressor and fan should start for cooling.

Heat pump system quick test

You can do a quick test for heat pump operation by shorting across the appropriate terminals on the heat pump system's thermostat connector. Note that heat pumps have an additional thermostat terminal (O) for the changeover valve. The changeover valve determines whether heating or cooling is provided. Typical heat pump systems have changeover with cooling and require the O terminal to be powered to get cooling operation. Use a short 6-inch wire to connect across the terminals as shown in *Table 2*.

Table 2.   Heat pump system quick test

| Function test	HVAC terminals	Result
Fan	R to G	Fan should come on.
Heating	R to Y and G	Compressor and fan should start and heating occurs.
Cooling	R to Y and G and O	Compressor and fan should start. CO valve operates and cooling occurs.

Note: If you have the CO selection incorrect, you will get cooling when you expect heating and vice versa. Change the DIP switch SW1-2 changeover setting to correct this problem.

Control unit wiring

Figure 21 shows the control unit wired to a wall display unit and the HVAC system. Wire colors are typical thermostat wiring colors. The fuse is a mini ATO 2 amp.

Note: For heat pump HVAC systems, the orange wire (O) is the changeover valve.

Figure 21. Control unit wiring
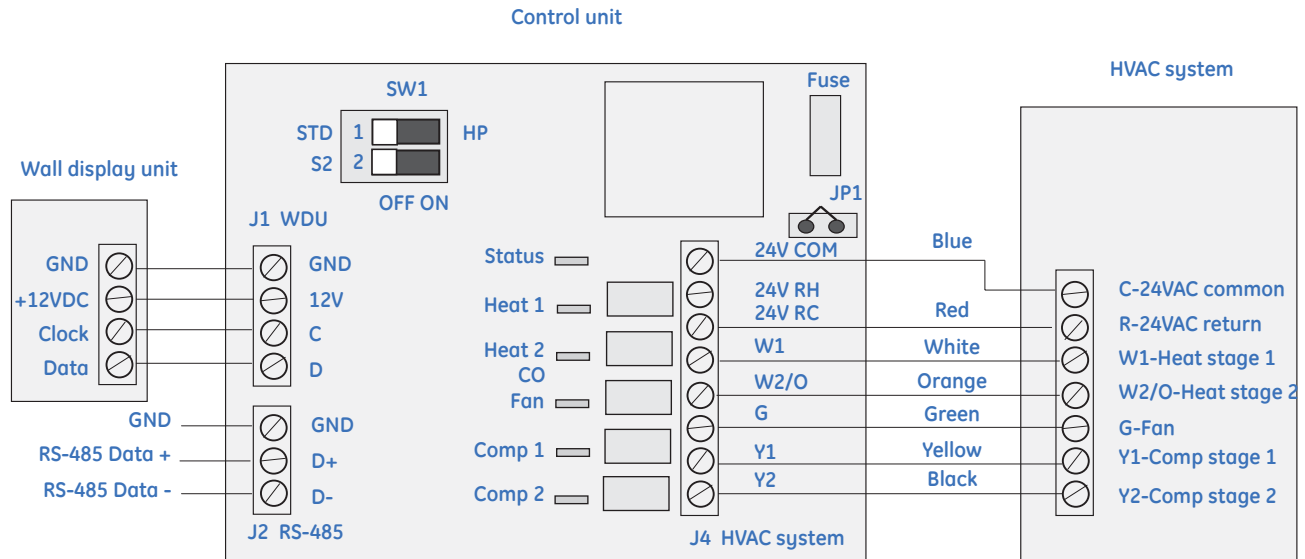
HVAC system transformer

Most central HVAC systems have a common heating and cooling transformer. This is the factory default setting for jumper JP1. In some cases you may have separate heating and cooling systems, each with their own transformer. In that case, cut jumper JP1 and wire the heating transformer red wire to the RH terminal and the cooling system transformer red wire to the RC terminal. Wire the cooling system's 24 VAC Com to the control unit's 24 VAC Com terminal. Do not connect the heating system's common wire to the control unit.

DIP switch SW1 settings

White indicates a switch is in the On position. Set the DIP switches as follows:

SW1-S1. HVAC system type selection. Standard or heat pump.

> Set S1 to Off (STD) for gas/electric systems (default setting).
> Set S1 to On (HP) for heat pump systems.

SW1-S2. This is a dual-use switch that depends on the switch S1 setting.

If S1 is set to Standard HVAC system type, then S2 selects the HVAC fan type.

> Set S2 to Off for gas systems that normally do not require fan w/heat operation (default setting).
> Set S2 to On for electric systems that normally do require fan w/heat operation.

If S1 is set to Heat pump operation, then S2 selects the changeover valve operation.

> Set S2 to Off for changeover with cooling (default setting).
> Set S2 to On for changeover with heating.

If the heat pump supplies heating when you expect cooling or vice versa, change the SW1-S2 switch.

Serial network command and variable list

Refer to the *Serial Communications Protocol Manual* 150-00225 for format details.

Network commands

Table 3 shows the network commands and a description of each command.

Table 3.   Network commands

Command	Description
BF	Set setback flag
CFM	Set F or C temperature mode
Date	Set date
DL	Set display lock
DOW	Set day of week
F	Set fan mode
M	Set system mode
OT	Set outside air temperature data (for network supplied OT)
SC	Set schedule control run/hold mode
SEd/x	Set schedule entry for day and entry
SP	Set setpoint (for single setpoint system)
SPC	Set cool setpoint
SPH	Set heat setpoint
SVx	Set variable number x
Time	Set time
R=1	Request status message 1: Thermostat data (temperature, setpoints, modes)
R=2	Request status message 2: HVAC operation data (heating/cooling/fan status)
R=3	Request status message 3: Temperature data only
R=4	Request status message 4: Setpoint data only
R=5	Request status message 5: Mode data only
R=6	Request status message 6: WDU/Control unit model/version data
R=7	Request status message 7: Time and DOW
R=8	Request status message 8: Not used
R=9	Request status message 9: HVAC system setup data (SW1 settings)

Network variables

Table 4 shows the network variables for use with the system variable, SVx command.

Table 4.   Network variables

Variable number	Name	Variable data	Default value	Notes
1	System type	0, 1	0	0 = gas/electric, 1 = heat pump
2	Fan type	0, 1	0	0 = gas (no fan w/heat), 1 = electric
3	Changeover type	0, 1	0	0 = c/o w/cool, 1 = c/o w/heat
4	C/F type	0, 1	0	0 = Centigrade, 1 = Fahrenheit
5	Network address	1 to 254	1	Reserved: 0 = host, 255 = global
9	Display lock	0, 1	0	0 = unlocked, 1 = locked
10	MOT	5 to 9 minutes	6 minutes	0 = 20-second test time
11	MRT	0 to 9 minutes	6 minutes	0 = 20-second test time
12	H delta stage 1 on	0 to 8 degrees	1 degree	
14	H delta stage 2 on	0 to 8 degrees	3 degrees	
16	H delta stage 3 on	0 to 8 degrees	5 degrees	
18	C delta stage 1 on	0 to 8 degrees	1 degree	
20	C delta stage 2 on	0 to 8 degrees	3 degrees	
24	Setpoint h/c delta	3 to 15 degrees	4 degrees	Minimum delta T between h/c setpoints
69	Service (test) mode	0, 1	0	1 = test mode, sets MRT/MOT = 20 seconds
74	Autosend mode	0, 1	0	0 = off, 1 = on, send temp/mode on change

The system type, fan type, and changeover type variables are determined by the controller DIP switch SW1 setting. They can be viewed by the system variable command, but cannot be changed from the network.

Contacting technical support

For assistance installing, operating, maintaining, and troubleshooting this product, refer to this document and any other documentation provided. If you still have questions, you may contact technical support during normal business hours (Monday through Friday, excluding holidays, between 6 a.m. and 5 p.m. Pacific Time).

Table 5.   Sales and support contact information

	Sales	Technical support
Phone:	**Toll-free:** 888.GESECURity (888.437.3287 in the US, including Alaska and Hawaii; Puerto Rico; Canada). Outside the toll-free area: 503.885.5700.	
E-mail	info@gesecurity.com	generaltech@ge.com
Fax	800.483.2495	**541.752.9096** (available 24 hours a day)

Note: Be ready at the equipment before calling for technical support.

Online publication library

Another great resource for assistance with your GE Security products is our online publication library, available to all of our customers on our website. To access our publication library, go to our website at the following location:

    http://www.gesecurity.com

In the **Tools** area at the top, click the *Publication Library* link. After you register and log on, you may search through our online library for the documentation you need.[1]

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1.   Many GE Security documents are provided as PDFs (portable document format). To read these documents, you will need Adobe Acrobat Reader, which can be downloaded free from Adobe's website at www.adobe.com.