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Write the model and serial numbers here:

#\_\_\_\_\_ #

You can find them on a label on the thermostat.



RAK147P1 RAK163P1



The digital programmable series of thermostats offers an economical remote control solution for single-stage heat/cool and multi-stage heat pump applications. System selections include heat, cool, off or auto mode, as well as fan on or fan auto selections. Thermostats are available in the following selections: RAK163P1 (1 heat/1 cool) and RAK147P1 (2 heat/1 cool heat pump)

# Thermostat Overview



## **General Features**

FEATURE	DESCRIPTION
No batteries required for general operation.	Saves programmed setpoints in the event of a power loss.
24V AC/DC Compatible	Switch selection for either 24 VAC or 24 VDC operation.
Temperature Safety Circuit	Auto cut-off in heat mode if room temperature > 90°F and auto cut-off in cool mode if room temperature < 60°F.
°F or °C compatible	Switch selection for either Fahrenheit or Celsius degrees.
Backlit display	Display is backlit whenever a button is pressed.
Programming Modes	5+2- and 7-day programming flexibility.
Auto changeover from Heat to Cool	Automatically changes from heating to cooling.

## **Display Description**

LCD SEGMENT	DESCRIPTION
Day indicator	Indicates the day of week.
AM/PM indicator	Indicates AM or PM.
Time display	Displays time, program time or set temperature.
Program indicator	Indicates the operating or editing program (Morning, Day, Evening and Night), flashes when temporary hold.
Hold indicator	Indicates that the thermostat is in hold mode.
System mode indicator	Shows whether heat, cool, auto or off system is selected and operating.
Fan mode indicator	Indicates that the fan is in ON or Auto mode.
Temperature display	Displays room temperature, program temperature or span.
Set temp indicator	Indicates that the set temperature is shown.
Celsius mode indicator	Indicates that the temperature displayed is in Celsius scale. Default is Fahrenheit.



Figure 1: RAK163P1 and RAK147P1 Display



Figure 2: Display and Keyboard

Keyboard	Functions
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KEY	FUNCTION
<b></b>	<ul> <li>Increases data (time, temperature, etc.).</li> </ul>
	• Press with $igvee$ to enter span setting mode.
▼	<ul> <li>Decreases data (time, temperature, etc.).</li> </ul>
	• Press with $\blacktriangle$ to enter span setting mode.
HOLD/RETURN	Enters hold.
	<ul> <li>Terminates hold or temporary override.</li> </ul>
	<ul> <li>Returns from Day/Time or Program setting modes to Normal mode.</li> </ul>
DAY/TIME	<ul> <li>Enters day and time setting mode.</li> </ul>
	<ul> <li>Advances through setting of day of week, hour and minutes.</li> </ul>
PROGRAM	<ul> <li>Enters program setting mode.</li> </ul>
	<ul> <li>Advances through setting of program day, time and temperature.</li> </ul>
	<ul> <li>Changes time display format when in day and time setting mode.</li> </ul>
SYSTEM MODE	Selects the system mode of the thermostat from AUTO, HEAT, OFF and COOL.
FAN MODE	Selects the operation mode of the FAN between AUTO & ON.
RESET	Hardware resets signal to reset the thermostat.



# Initial Power Up

- The thermostat will reset after power up or if the reset button is pressed.
- During reset, all LCD segments and the LCD backlight will be turned on. After one second and when all keys are released, the thermostat ame time, the memory and I/O

ports of the MCU will be set to their default values.

After initial power up or reset, both the weekday and weekend programs are initialized as shown in the following table.

will start. At	thesa

Program	М	DRN	D	4 <i>Y</i>	EVE		NIT		
Program Setpoint	HEAT 68°F	COOL 78°F	HEAT 65°F	COOL 80°F	HEAT 68°F	COOL 78°F	HEAT 66°F	COOL 78°F	
	(TIN	ЛЕ)	(TI	ME)	(TI	ME)	(TIME)		
Monday	6 a.	m.	8 8	a.m.	5 μ	).M.	11 p.m.		
Tuesday	6 a.m.		8 8	a.m.	5 μ	).M.	11 p.m.		
Wednesday	6 a.m.		8 8	a.m.	5 μ	).M.	11 p.m.		
Thursday	6 a.m.		8 8	a.m.	5 μ	).M.	11 p.m.		
Friday	6 a.	m.	8 8	8 a.m.		5 p.m.		11 p.m.	
Saturday	6 a.	m.	8 8	a.m.	5 p.m.		11 p.m.		
Sunday	6 a.	m.	8 8	a.m.	5 p.m.		11 p.m.		

**Default Program** 

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## Temperature Scale Selection



Figure 3: Default Display after Reset and Initial Power-Up

Default Mode



Figure 4: Example Display



Figure 5: Example of Celsius Mode and Cooling System

- The temperature scale can be selected by the C/F dip switch inside the unit. Please refer to Figure 3 in the *Installation Instructions* for identification of the correct switch.
- If C/F switch is set at "F," the temperature scale after reset is Fahrenheit. If C/F switch is set at "C," the temperature scale after reset is Celsius.
- Figure 3 shows the LCD right after reset. Fahrenheit scale is the default.

The LCD shows the time, day of week, room temperature, operating program number or hold status, and the system and fan status.

### For the example at left:

- The time is 2:05 PM Wednesday.
- The room temperature is 73°F. If the Celsius scale is selected, the **C** indicator will be displayed.
- The current operating program is **DAY**. If the indicator is flashing, temporary hold is active.
- Icon explanation:
  - If heating is selected: **FLAME** icon will be displayed.
    - If a call for heating is made: *FLAME* icon will be flashing.
  - If cooling is selected: **SNOWFLAKE** icon will be displayed.
    - If a call for cooling is made: *SNOWFLAKE* icon will be flashing.
  - If Auto-changeover is selected and system is in heating mode:
    - **AUTO** and **FLAME** icons will be displayed.
    - If heating is called while in *AUTO* mode: *FLAME* icon will flash.
  - If Auto-changeover is selected and system is in cooling mode:
    - **AUTO** and **SNOWFLAKE** icons will be displayed.
    - If cooling is called while in **AUTO** mode: **SNOWFLAKE** icon will flash.
  - All icons will be off if **OFF** is selected.

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Figure 6: Time Display Format



# Review and Change the Setpoint Temperature



Figure 7: Temperature Setpoint Example



Figure 8: Display will Flash Once



week indicator will be cleared. The setpoint temperature and **SET TEMP** indicator will be displayed. The **HEAT**, **COOL** or **AUTO** indicator will turn on indicating the current operating system.

In *NORMAL* mode, press  $\blacktriangle$  or  $\blacktriangledown$ . The clock and the day of the

- To change the setpoint temperature, press and hold either ▲ or ▼ for more than 1 second. The entire display will flash once and the setpoint temperature can be changed. Continue to hold the key or release and press again to adjust the setpoint temperature.
- Press and hold the key for 2 seconds for fast advance.
- Press the HOLD/RETURN button to return to NORMAL mode immediately or wait 5 seconds to return to NORMAL mode automatically.

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# Hold and Temporary Override



Figure 10: 'HOLD' Display

- <u>Hold</u> is the permanent bypass of program temperature setpoints. Manual release is required to return to active program mode.
- Press HOLD/RETURN in NORMAL mode for hold. The current setpoint temperature will be used. The HOLD icon will be displayed and the program numbers will be cleared.
- The *HOLD* temperature setpoint can be changed by following the directions for changing the normal temperature in the previous section.
- To release the hold, press *HOLD/RETURN* again in *NORMAL* mode to return to programmed operation. The *HOLD* icon will disappear.
- <u>**Temporary override**</u> is the temporary change of the setpoint temperature until the next program time. Refer to the previous section on changing temperature setpoints for information on adjusting the temperature.
- To release temporary override before the next setpoint comes, press *HOLD/RETURN* twice in *NORMAL* mode (the first press will change to hold and the second press will release the hold and temporary override).

Day/Time Setting Mode

Figure 11: Changing Time and Date Display

- In NORMAL mode, press DAY/TIME to enter the DAY/TIME SETTING mode. The LCD will be cleared except for the time and day of week indicator.
- When the hour is flashing, press ▲ (increase setting) or ▼ (decrease setting) to adjust hour.
- Press **DAY/TIME** again. Minutes will be flashing. Press ▲ or ▼ to adjust minutes.
- Press **DAY/TIME** again. The day will be flashing. Press ▲ or ▼ to adjust day.
- Press DAY/TIME again. The thermostat will return to NORMAL mode.
- When adjusting the day or time, press and hold ▲ or ▼ for 2 seconds for fast advance. During fast advance, the data will stop flashing.
- At any time you may press the *HOLD/RETURN* button or wait 5 seconds to return to *NORMAL* mode.
- The clock seconds will be reset to zero whenever time is changed. The clock seconds will not be affected if only the day is changed.
- The time display will be frozen in **DAY/TIME** setting mode. However, the internal clock is still running. If nothing is changed, then the frozen time will be replaced by the internal clock when you return back to the **NORMAL** mode.



# Programming Mode

The RAK163P1 and RAK147P1 are capable of programming in either 5+2 or 7 day formats. The table below is the default program for both the

heating and cooling programs. If nothing is changed, these will be the times and temperatures that are active.

## Default Program

Program	М	DRN	D	4 <i>Y</i>	EVE		٨	ITE	
Program Setpoint	HEAT 68°F	COOL 78°F	HEAT 65°F	COOL 80°F	HEAT 68°F	COOL 78°F	HEAT 66°F	COOL 78°F	
	(TIN	ЛЕ)	(TIME)		(TIME)		(TIME)		
Monday	6 a.	m.	8 a.m.		5 p.m.		11 p.m.		
Tuesday	6 a.m.		8 a	ı.m.	5 p	).m.	11 p.m.		
Wednesday	6 a.m.		8 a	ı.m.	5 p	).m.	11 p.m.		
Thursday	6 a.m.		8 a	ı.m.	5 p	).m.	11 p.m.		
Friday	6 a.	6 a.m.		ı.m.	5 p	).m.	11 p.m.		
Saturday	6 a.	m.	8 a	ı.m.	5 p.m.		11 p.m.		
Sunday	6 a.	m.	8 a	ı.m.	5 p.m.		11 p.m.		



Figure 12: Program Setting Display

To review or change the program, press **PROGRAM** in **NORMAL** mode. The time period **MORNING** of the Weekday Program will be displayed first. The system icon in Figure 12 indicates it is in the heating program. If the cooling program is needed, press the **MODE** button as shown in Figure 10 to change to the **SNOWFLAKE** icon and the cooling program. All other segments are cleared.

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Figure 13: Program Time-Hour Flashing



Figure 14: Program Time-Minute Flashing



Figure 15: Program Temperature Flashing

## **Programming Steps**

- Press **PROGRAM** from the **NORMAL** mode. The program timehour will be flashing and the **MORNING** time period will be active. Press ▲ or ▼ to adjust time. To change programming days press **DAY/TIME** button. The order of the day programming is:
  - Weekday Program (i.e. Monday through Friday)
  - Weekend Program (i.e. Saturday and Sunday)
  - 7 Day Program (i.e. Monday through Sunday on individual days)
- Press **PROGRAM** again. The program time-minute will be flashing. Press ▲ or ▼ to adjust. Program time-minute advances 10 minutes per step.

 $\Im$ Press **PROGRAM** again. The program temperature will be<br/>flashing. Press  $\blacktriangle$  or  $\triangledown$  to adjust.

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Figure 16: Next Program Time Period Displayed

- Press *PROGRAM* again. The next program time period will be displayed. The order of the time periods within one day are:
  - 1. Morning
  - **2.** Day
  - **3.** Evening
  - 4. Night (Nite)

### Additional Instructions

- After programming all four time periods for the weekday program, the weekend program will be displayed. Repeat steps 1–5 for the weekend program.
- After programming all four time periods for the weekend program, the individual day program will be displayed. If the programming is complete, press the *HOLD/RETURN* button to return to the *NORMAL* display and to activate the program. If any changes or additional programming are required, follow steps 1–5 for the individual 7-day programming.
- When adjusting the program time or temperature, press and hold ▲ or ▼ for 2 seconds for fast advance. During fast advance, the data will stop flashing.
- To return to **NORMAL** mode at any time, press the **HOLD/RETURN** button or wait 5 seconds with no action and the display will return to **NORMAL** mode.
- The setpoint temperature cannot be set beyond the thermostat's control range of 60°F to 90°F (15°C to 32°C).
- Switching between the heating and cooling programs is done by pressing the **MODE** button. The **FLAME** icon will be displayed when heating is selected, and the **SNOWFLAKE** icon will be displayed when cooling is selected. When **AUTO** is selected and the **AUTO** icon is displayed, the unit will use both of the heating and cooling programs in the auto-changeover mode of operation.
- There is no 'OFF Program' that can be selected. The program will always be active unless the thermostat is turned off.

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# Fan Control

If **FAN AUTO** is selected, the fan will cycle On/Off with the system. If **FAN ON** is selected, the Fan will be on all the time.

# Auto Changeover

The auto changeover feature is a special operation of the thermostat that does not require the user to change the system mode from heating to cooling. Once the programs are set and the thermostat is put in the **AUTO** mode, the switching from heating to cooling is accomplished completely by the thermostat.



# LCD Backlight



- LCD backlight is activated when any key is pressed. Any subsequent key press or switch change will extend the period. When there is no key pressed for five seconds, the backlight will automatically turn off.
- The LCD backlight will not operate when there is no external 24 VAC or 24 VDC power supplied.

Figure 18: Blank Display



**Operating Instructions** 

# Installation Instructions

Thermostats

RAK147P1

RAK163P1

If you have questions, call 800-GECARES or visit our Website at: www.GEAppliances.com

# **BEFORE YOU BEGIN**

Read these instructions completely and carefully.

- **IMPORTANT** Save these instructions for local inspector's use.
- **IMPORTANT** Observe all governing codes and ordinances.
- Note to Installer Be sure to leave these instructions with the Consumer.
- Note to Consumer Keep these instructions for future reference.
- **Skill level** Installation of this appliance requires basic mechanical skills.
- Completion time 1 hour
- Proper installation is the responsibility of the installer.
- Product failure due to improper installation is not covered under the Warranty.

## THERMOSTAT LOCATION

• On an interior wall, since the temperature of an exterior wall varies with outdoor conditions, approximately 5 ft (1.5 m) above the floor.



• No less than 18 inches from the junction of an outside wall and away from direct sunlight, radiant heat, air discharge grilles, stairwells, outside doors or behind doors.



• Away from steam pipes, water pipes or warm-air stacks in adjacent rooms.





# **MOUNTING AND WIRING**

**CAUTION:** Disconnect the electrical power supply before wiring connections are made to prevent damage to the thermostat.

## 1 REMOVE BASE FROM THERMOSTAT

Open the cover on the thermostat and insert a small coin or flat-bladed screwdriver in the slot on the top of the thermostat and twist 1/4 turn. Grasp the base from the side and remove from the thermostat.



# MOUNTING AND WIRING (CONT.)

## **2** FEED THROUGH WIRES

Feed the thermostat control wires through the rectangular opening in the base and, using the base as a template, mark the location of the two vertical mounting holes.



## **3 MOUNT BASE TO WALL**

Use the supplied anchors and screws to mount the base to the wall by drilling two 3/16'' (4.7 mm) holes at the marked locations, and tap the nylon anchors flush to the wall surface.



## **4** CONNECT WIRES

Connect the wires from the existing system to the thermostat terminals according to the wiring diagrams in Table 1 and Table 2. Push any excess wire back into the wall and seal the hole with putty or a caulking material to prevent drafts from affecting the ambient temperature of the sensor. All wiring must comply with local electrical codes and such National codes as they apply.



# **5 RE-INSTALL THERMOSTAT TO BASE**

To re-install the thermostat to the base, attach the tabs on the bottom of the thermostat front to the small slots on the base bottom and push up until they snap in place.



## TABLE 1: TERMINALS FOR FIVE WIRES HEAT/COOL SYSTEM (RAK163P1 ONLY)

TERMINAL NO.	TERMINAL NAME	FUNCTION
1	W	Heating
2	С	Common
3	R	24 VAC or VDC
4	Y	Cooling
5	G	Fan



Figure 1: RAK163P1 5-Wire Connection

## TABLE 2: TERMINALS FOR SIX WIRES 2 HEAT/1 COOL SYSTEM (RAK147P1 ONLY)

TERMINAL NO.	TERMINAL NAME	FUNCTION
1	W	Auxiliary Heating
2	С	Common
3	R	24 VAC or VDC
4	Y	Cooling
5	G	Fan
6	В	Heat Pump Reversing Valve



Figure 2: RAK147P1 6-Wire Connection

## **TABLE 3: DIP SWITCH FUNCTION**

DIP SWITCH	SWITCH SELECTION	FUNCTION
1	ON	DC Voltage: 24 VDC
	OFF	AC Voltage: 24 VAC
2	ON	J°
	OFF	٥È
3	ON	Keypad locked
	OFF	Keypad unlocked
4	ON	Backlight Override. Backlight does not operate if this switch is on.
	OFF	Backlight is operating. Anytime a button is pressed, the backlight display will turn on.



Figure 3: RAK163P1 and RAK147P1 Factory Default DIP Switch Settings

# **SPECIFICATIONS**

THERMOSTAT COVERED	RAK163P1, RAK147P1
Power Requirements	18–30 VAC or VDC electronic thermostat for 5-wire 1H/1C systems (RAK163P1) and 6-wire 2H/1C systems (RAK147P1)
Temperature Measurement Range	50 to 99°F with 1°F display resolution (10 to 37°C with 1°C display resolution)
Temperature Control Range	60 to 90°F with 1°F display resolution (15 to 32°C with 1°C display resolution)
Storage Temperature Range	-4 to 131°F (-20 to 50°C)
Time Display Format	12 hour with AM/PM
Program	<ul> <li>5+2 and 7-day program with 4 time periods per day</li> <li>10 Minute resolution for both heating and cooling programs</li> <li>Independent heating and cooling programs</li> <li>Auto Changeover Feature</li> </ul>
Temperature Override	<ul> <li>Temporary program temperature override</li> <li>Permanent program temperature override with <i>HOLD</i> feature</li> </ul>
Recommended Wire Size	24–18 Gauge
Safety Circuit	<ol> <li>Auto cut-off in heat mode if room temperature &gt; 90°F</li> <li>Auto cut-off in cool mode if room temperature &lt; 60°F</li> </ol>
Memory Backup	Lithium Battery CR2032 Battery life > 10 years
Others	EL type LCD backlight
Dimensions	4" x 4-5/8" x 1-5/16" (101.6 x 117.5 x 33.3 mm)
Shipping Weight	Approximately 0.5 lb. (0.231 kg)



Save time and money! Review the chart on this page first and you may not need to call for service.

Problem	Possible Causes	What To Do
No display/faint display	Supply voltage not correct.	• Using a voltmeter, check the supply voltage to the thermostat. Voltage operating range for the thermostat is 18-30 VAC/VDC. If measured voltage is out of this range, troubleshoot the supply voltage to the unit.
	Thermostat is damaged.	• Replace with a new thermostat. Check the supply voltage to the unit before connecting second thermostat (see above).
	Power wiring to unit is incorrect.	• Refer to Figures 1 & 2 in the <i>Installation Instructions</i> for correct wiring.
Keypad buttons do not work.	No power to the unit.	• Make sure the display is working correctly. If not, follow step one above.
	Thermostat is damaged.	• Replace with a new thermostat. Check the supply voltage to the unit before connecting second thermostat (see above).
Thermostat will not call for heat.	Thermostat setpoint is satisfied.	• Raise the temperature setpoint more than 2° above current temperature.
	Unit wiring is incorrect.	• Refer to Figures 1 & 2 in the <i>Installation Instructions</i> for correct wiring.
	Unit is 'OFF.'	• Make sure the <b>FLAME</b> icon is displayed and blinking. If not, push the <b>MODE</b> button until it is displayed.
Thermostat will not call for cooling.	Thermostat setpoint is satisfied.	• Lower the temperature setpoint more than 2° below current temperature.
	Unit wiring is incorrect.	• Refer to Figures 1 & 2 in the <i>Installation Instructions</i> for correct wiring.
	Unit is 'OFF.'	• Make sure the <b>SNOWFLAKE</b> icon is displayed and blinking. If not, push the <b>MODE</b> button until it is displayed.
	Short cycle delay still active.	• Wait 4 minutes. The unit's short cycle timer is in operation.
Fan does not turn on with the system.	Fan failure.	• Place a jumper between the R and G terminals. The fan should come on. If it does, replace the thermostat.

**Troubleshooting Tips** 

Safety Instructions

**Operating Instructions** 

	Notes.
Safety Instructions	
<b>Operating Instructions</b>	
Installation Instructions	
Troubleshooting Tips	



Please place in envelope and mail to:

*General Electric Company* Warranty Registration Department P.O. Box 32150 Louisville, KY 40232-2150

	Notes.
Safety Instructions	
<b>Operating Instructions</b>	
Installation Instructions	
Troubleshooting Tips	

Staple your receipt here. Proof of the original purchase date is needed to validate the warranty.

## For The Period Of: GE Will Replace:

**One Year** From the date of the original purchase *Full Replacement* of the thermostat which fails due to a defect in materials or workmanship.

### What GE Will Not Cover:

Service trips to your location.

- Improper installation. If you have an installation problem, contact your installer. You are responsible for providing adequate electrical connections to the product.
- Failure of the product resulting from modifications to the product or due to unreasonable use, including failure to provide reasonable and necessary maintenance.
- In commercial locations, labor necessary to move the unit, after it has been initially installed, to a location where it is accessible for service by an individual technician or if the instructions included in this manual have been disregarded.
- Replacement of location fuses or the resetting of circuit breakers.
- Damage to the product caused by improper power supply voltage, accident, fire, floods or acts of God.
- Incidental or consequential damage caused by possible defects with this thermostat.

This warranty is extended to the original purchaser and any succeeding owner for products purchased for home use within the USA. In Alaska, the warranty excludes the cost of shipping or service calls to your home.

Some states do not allow the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. To know what your legal rights are, consult your local or state consumer affairs office or your state's Attorney General.

Warrantor: General Electric Company. Louisville, KY 40225

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