tekmar® - Data Brochure
tekmarNet®4 Setpoint Control 161

tN4

D161
08/07

Introduction

The Setpoint Control 161 is a single stage heat setpoint control that can operate on an On / Off differential or can operate on Pulse Width Modulation. The control includes special modes for hot tub, domestic hot water tank and radiant floor applications.

Features

- tN4 Compatible
- On / Off Differential
- Hot Tub Operation
- DHW Tank Operation
- Floor Operation
- Exercising
- Scenes
- Temperature Sensor Input

Table of Contents

Display and DIP Switches

DIP Switches

Lock / Unlock (DIP Switch #1)

Use the Lock / Unlock DIP switch to lock or unlock the Access Level of the 161.

• To unlock the Access Level, set the DIP switch to the unlocked (left) position.

• To lock the Access Level, set the DIP switch to the locked (right) position. Once locked, a padlock is displayed in the lower right corner of the display and the Access Level cannot be changed.

Note: The tN4 System Control's Lock / Unlock DIP switch overrides the Lock / Unlock DIP switch on the 161. Set the tN4 System Control's Lock / Unlock DIP switch to the Unlock position before Access Levels can be changed on the setpoint control.

tN4 System Control (DIP Switch #2)

A tN4 System Control is a control, not a thermostat, that the Setpoint Control 161 connects to through the tN4 bus. All tN4 compatible Outdoor Reset Modules are tN4 System Controls.

• If the setpoint control is connected to a tN4 System Control, set the tN4 System Control DIP switch to tN4 System Control (left position).

• If the setpoint control is not connected to a tN4 System Control, set the tN4 System Control DIP switch to None (right position).
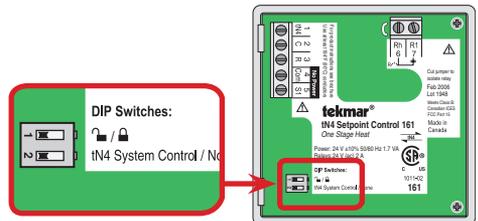
Access Levels

The Access Level restricts the number of Menus, Items and Adjustments that can be accessed by the user. The Access Level setting is found in the Miscellaneous (MISC) menu. Select the appropriate access level for the people who work with the setpoint control on a regular basis.

The 161 has five Access Levels:

• **Advanced (ADV):** access to all settings
• **Installer (InST):** settings required for installation
• **User (USEr):** for property owners
• **Limited (LTD):** limited temperature adjustment
• **Secure (SEC):** for commercial and public installations

In the Limited access level, the temperature can only be adjusted by +/-3°F (1.5°C) from the temperature setting entered prior to entering the Limited access level.

In the Secure access level, all settings, including the temperature, cannot be changed.

For more information, see the Miscellaneous (MISC) Menu section.

In the following menu tables, the access level the item is visible in is shown in the access column.

To adjust the Access Level:

1. Set the Unlock / Lock DIP switch to the unlock position. If a tN4 System Control is connected to the 161, the Unlock / Lock DIP switch on the tN4 System Control must be set to the unlock position.
2. Use the Menu button to select the MISC menu.
3. Use the Item button to select the Access item.
4. Use the Up and Down button to select the required Access Level.

Display

Menu Field
Displays the current menu

Status Field
Displays the current status of the control's inputs, outputs and operation
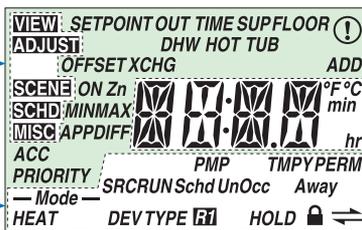
Item Field
Displays an abbreviated name of the selected item

Number Field
Displays the current value of the selected item

Symbol Description

— Mode — *HEAT*	**MODE OF OPERATION** Displays whether the device is in heating or off mode.	🔒	**LOCK** The Access Levels are locked or a menu option is visible but not adjustable.
R1	**RELAY 1** Displays when relay contact 1 is closed.	*Occ*	**OCCUPIED** Displays when operating at the occupied temperature.
⊙	**WARNING** An error is present.	*UnOcc*	**UNOCCUPIED** Displays when operating at the unoccupied setback temperature.
⇌	**tN4 COMMUNICATION** A tN4 network is detected.	*TIME* *Occ*	**TIME OCCUPIED** Displays when operating temporarily at the occupied temperature due to a remote enable or manual enable.

User Interface

Use the User Interface available on the Liquid Crystal Display (LCD) to setup and monitor the operation of the setpoint control. Use the four push buttons below the LCD (Menu, Item, Up, Down) to select settings. As the settings are entered, record the settings in the Job Record J 161.

Menu

The menus display in the Menu Field at the left of the LCD.

Up to 5 menus are available:

• VIEW
• ADJUST
• SCENE
• SCHD (Schedule)
• MISC (Miscellaneous)

To select a menu, press and release the Menu button.

Item

In each menu, a group of items can be selected. The abbreviated name of the selected item displays in the Item field of the LCD display.

• To view the next available item, press and release the Item button.
• To view the previous item, hold down the Item button and press and release the Up button.

Adjusting a Setting

To adjust a setting:

1. Use the Menu button to select the appropriate menu.
2. Use the Item button to select a menu item.
3. Use the Up or Down button to adjust the setting.

Default Item

To set the default item in the VIEW Menu, display item for more than five seconds.

After navigating menus, the display reverts back to the default item after 60 seconds of button inactivity.

Continue to next Item

Continue to next Item

Continue to next Menu
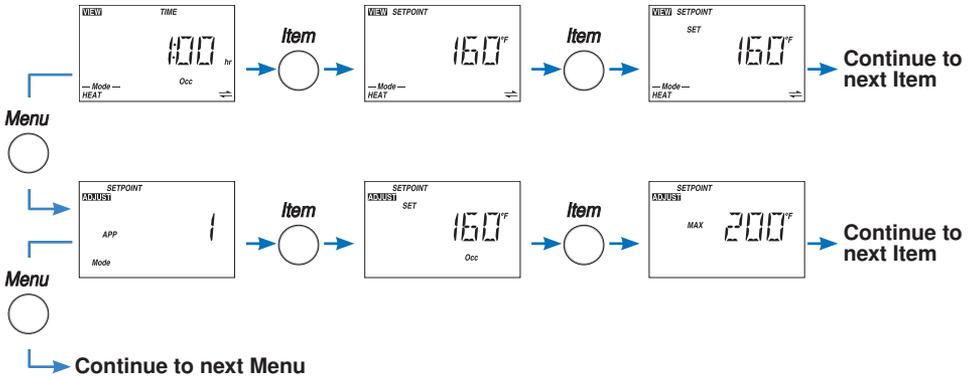
Application Overview

The Setpoint Control 161 is designed to support four different applications. The items shown in the VIEW and ADJUST Menu change depending on the Application Mode.

Set the application mode as follows:

**1)** Setpoint   **3)** DHW Tank
2) Hot Tub   **4)** Floor

The VIEW and ADJUST menus list which of the four application items are visible based upon the mode column.

The TIME, SCENE, SCHD (Schedule) and MISC (Miscellaneous) menus are the same for the four application modes.

## Applications: On / Off Differential

Mode 1 Setpoint (On / Off)   ### Mode 2 Hot Tub
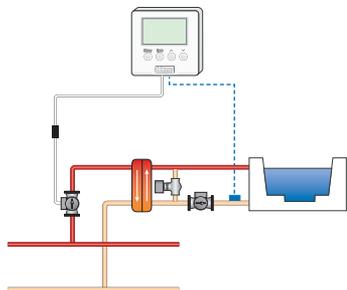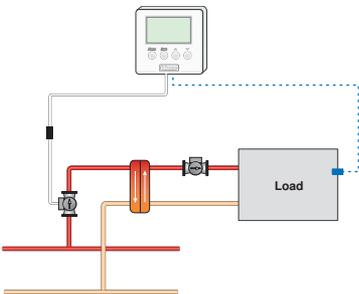
Mode 3 DHW Tank
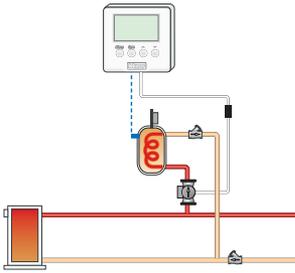
Relay 1 On / Off Differential Operation

The On / Off Differential operates by centering a differential range around the target setpoint temperature. On / Off differentials are best suited to heating loads that quickly change temperature.

Heating Operation

When heating, the setpoint control turns on Relay 1 when the temperature falls to 1/2 of the differential below the setpoint and turns off Relay 1 once the temperature reaches 1/2 of the differential above the setpoint.

Heating On / Off Differential
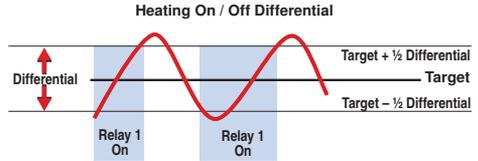
Applications: Pulse Width Modulation

Mode 4 Floor
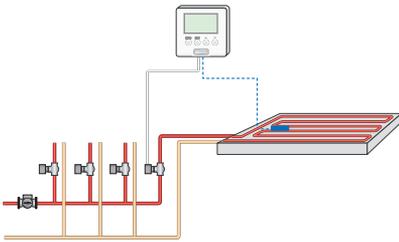
Relay 1 Pulse Width Modulation (PWM) Operation

PWM operates by centering the throttling range around the target setpoint temperature. PWM is best suited for large heating loads that do not change rapidly in temperature such as radiant floors.

Heating Operation

When the temperature is at the setpoint, Relay 1 is on for 50% of a cycle and off for 50% of a cycle. When the temperature is 1/2 of the throttling range below the setpoint, Relay 1 is on for 100% of a cycle. When the temperature is 1/2 of the throttling range above the setpoint, Relay 1 is off for 100% of a cycle. For ranges within the throttling range, Relay 1's on time increases linearly as temperature falls. The throttling range is fixed at 3°F (1.5°C).

The cycle length is either the same as the tN4 system control, or when a tN4 system control is not present, the cycle length is fixed at 15 minutes.

Heating PWM Operation
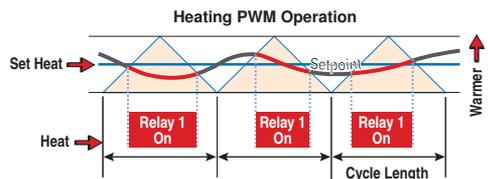
Display Menus

VIEW Menu (1 of 3)
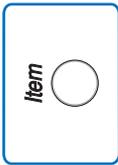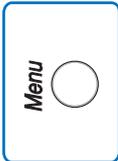
Menu ○

Item ○

The VIEW menu items display the current operating temperatures and status information of the system.

Mode	Item Field	Range	Access	Description
❶ ❷ ❹	VIEW TIME ![display showing value] hr Occ —Mode— HEAT	0:01 to 24:00 hr	LTD USEr InST ADV	**OCCUPIED TIME** *SECTION B, D, E* Displays the amount of time left on the manual override. The setpoint device operates at the Occupied temperature and then reverts back Scheduled temperature. Time counts down to 0:00 hours. Cancel the override by pressing the Up and Down buttons together at the same time or through the user switch or gateway. ***Note:*** This item is only available when a programmable setback schedule or normally unoccupied has been selected.
❶	VIEW SETPOINT ![display showing value] °F —Mode— HEAT	-31 to 266° F (-35.0 to 130.0° C)	SEC LTD USEr InST ADV	**SETPOINT** *SECTION A* Displays the measured setpoint sensor temperature.

VIEW MENU

○ Continued on next page.

Mode	Item Field	Range	Access	Description
2	VIEW *HOT TUB* — Mode — HEAT	-31 to 266 °F (-35.0 to 130.0 °C)	SEC LTD USEr InST ADV	**HOT TUB** Displays the measured hot tub temperature. *SECTION B*
3	VIEW *DHW* — Mode — HEAT	-31 to 266 °F (-35.0 to 130.0 °C)	SEC LTD USEr InST ADV	**DHW TANK** Displays the measured domestic hot water tank temperature. *SECTION C*
4	VIEW *FLOOR* — Mode — HEAT	-31 to 266 °F (-35.0 to 130.0 °C)	SEC LTD USEr InST ADV	**FLOOR** Displays the measured floor temperature. *SECTION D*
1	VIEW *SETPOINT SET* — Mode — HEAT	OFF, -4 °F (-20.0 °C) to Setpoint Maximum (variable)	USEr InST ADV	**SET SETPOINT** Display the desired temperature. *SECTION A*

VIEW MENU

Mode	Item Field	Range	Access	Description
2	VIEW SET *HOT TUB* *°F* ⇕ —Mode— HEAT	OFF, -4°F (-20.0°C) to Hot Tub Maximum (variable)	USEr InST ADV	**SET HOT TUB** Display the desired temperature. *SECTION B*
3	VIEW SET *DHW* *°F* ⇕ —Mode— HEAT	OFF, -4°F (-20.0°C) to DHW Maximum (variable)	USEr InST ADV	**SET DHW** Display the desired temperature. *SECTION C*
4	VIEW *FLOOR* SET *°F* ⇕ —Mode— HEAT	OFF, -4°F (-20.0°C) to Floor Maximum (variable)	USEr InST ADV	**SET FLOOR** Display the desired temperature. *SECTION D*
1 2 3 4	VIEW *SUP* *°F* ⇕ —Mode— HEAT	-31 to 266°F (-35.0 to 130.0°C)	InST ADV	**SUPPLY TEMP OF tN4 BUS** Actual water temperature of the tN4 bus for heating. *Note:* This item is only available when the setpoint control is connected to a tN4 System Control, DIP switch 2 is set to tN4 System Control, and the Heat Source item in the ADJUST menu is set to hydronic (HYDr). *SECTION L*

After the last item, the control returns to the first item in the menu.

VIEW MENU

ADJUST Menu (1 of 5)
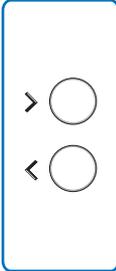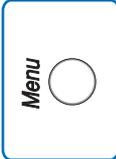
Menu   Item   ∧ ∨

The ADJUST Menu items are the programmable settings used to operate the mechanical equipment.

ADJUST MENU

Mode	Item Field	Range	Access	Description
①②③④	SETPOINT / ADJUST / APP / Mode	1, 2, 3, 4 Default = 1	InST ADV	**APPLICATION MODE** *SECTION A, B, C, D* Select the application for the setpoint control. **1 =** Setpoint **2 =** Hot Tub **3 =** DHW Tank **4 =** Floor
②	ADJUST / HEAT / Mode	HEAT, OFF Default = HEAT	USEr InST ADV	**MODE OF OPERATION** *SECTION B* Select to either heat or turn off the hot tub.
①	SETPOINT / ADJUST / SET / 160 °F / Occ	OFF, -4 °F (-20 °C) to Setpoint Maximum Default = 160 °F (71.0 °C)	LTD USEr InST ADV	**SET SETPOINT OCCUPIED** *SECTION A* Select the setpoint temperature for the occupied period. ***Note:*** In the Limited Access Level, the temperature can only be adjusted by +/-3°F (1.5°C) from the temperature setting entered prior to entering the Limited access level.

Mode	Item Field	Range	Access	Description
2	ADJUST SET HOT TUB 102°F Occ	OFF, 40°F (4.5°C) to Hot Tub Maximum Default = 102°F (39.0°C)	LTD USEr InST ADV	**SET HOT TUB OCCUPIED** *SECTION B* Select the hot tub temperature for the occupied period. *Note:* In the Limited Access Level, the temperature can only be adjusted by +/-3°F (1.5°C) from the temperature setting entered prior to entering the Limited access level.
3	ADJUST SET DHW 130°F Occ	OFF, 40°F (4.5°C) to DHW Maximum Default = 130°F (54.5°C)	LTD USEr InST ADV	**SET DHW TANK OCCUPIED** *SECTION C* Select the domestic hot water tank temperature for the occupied period. *Note:* In the Limited Access Level, the temperature can only be adjusted by +/-3°F (1.5°C) from the temperature setting entered prior to entering the Limited access level.
4	ADJUST SET FLOOR 80°F Occ	OFF, 40°F (4.5°C) to Floor Maximum Default = 80°F (26.5°C)	LTD USEr InST ADV	**SET FLOOR OCCUPIED** *SECTION D* Select the floor temperature for the occupied period. *Note:* In the Limited Access Level, the temperature can only be adjusted by +/-3°F (1.5°C) from the temperature setting entered prior to entering the Limited access level.
1	ADJUST SETPOINT MAX 200°F	50 to 239°F (10.0 to 115.0°C) Default = 200°F (93.5°C)	ADV	**SETPOINT MAXIMUM** *SECTION A,* Select the maximum setpoint temperature range adjustment.

— Continued on next page.

ADJUST MENU

Mode	Item Field	Range	Access	Description
2	ADJUST MAX HOT TUB 104 °F	50 to 104 °F (10.0 to 40.0°C) Default = 104°F (40.0°C)	ADV	**HOT TUB MAXIMUM** *SECTION B* Select the maximum hot tub temperature range adjustment.
3	ADJUST MAX DHW 140 °F	50 to 200 °F (10 to 93.5°C) Default = 140°F (60.0°C)	ADV	**DHW MAXIMUM** *SECTION C* Select the maximum domestic hot water tank temperature range adjustment.
4	ADJUST MAX FLOOR 85 °F	50 to 110 °F (10.0 to 43.5°C) Default = 85°F (29.5°C)	ADV	**FLOOR MAXIMUM** *SECTION D* Select the maximum floor temperature range adjustment.
1 2 3	ADJUST DIFF 10 °F	1 to 40 °F (0.5 to 22.0°C) Default = 10°F (5.5°C)	InST ADV	**DIFFERENTIAL** Select the differential to cycle on and off around the setpoint temperature.

Mode	Item Field	Range	Access	Description
① ② ③ ④	ADJUST / SRC / HEAT	HYDr, OTHr Default = HYDr	InST ADV	**HEAT SOURCE** *SECTION L* Select whether the heat source is hydronic (HYDr) or other (OTHr) when the setpoint control is connected to a tN4 System Control. *Note:* This item is only available when DIP switch 2 is set to tN4 System Control.
① ② ③ ④	ADJUST / XCHG / SUP / 180 °F / Occ	60 to 220 °F (15.5 to 104.5 °C) Default = 180 °F (82.0 °C)	InST ADV	**EXCHANGE SUPPLY OCCUPIED** *SECTION L* Select the desired supply water temperature required on the tN4 bus to heat the setpoint load during the occupied period. *Note:* This item is only available when DIP switch 2 is set to tN4 System Control, and the Heat Source item in the ADJUST menu is set to hydronic (HYDr).
① ② ③ ④	ADJUST / OFF / PRIORITY	On, OFF Default = OFF	InST ADV	**PRIORITY** *SECTION L* Select if the setpoint control has priority over the heating system. *Note:* This item is only available when DIP switch 2 is set to tN4 System Control, and the Heat Source item in the ADJUST menu is set to hydronic (HYDr). *Note:* Priority is not available when connected to a mix tN4 bus.

ADJUST MENU

○ Continued on next page.

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ADJUST Menu (5 of 5)

Mode	Item Field	Range	Access	Description
1 2 3 4	*PMP*	OFF, On Default = On	InST ADV	**RELAY 1 PUMP** *SECTION L* Select whether a system pump from a tN4 system control should operate whenever relay 1 is closed. *Note:* This item is only available when DIP switch 2 is set to tN4 System Control, and the Heat Source item in the ADJUST menu is set to hydronic (HYDr).
1 2 4	*SETPOINT* *DEV*	OFF, 1 to 12 Default = 1	ADV	**SETPOINT DEVICE ENABLE** *SECTION E* Select the Setpoint Device Enable number to allow a remote device such as a User Switch to activate the Time Occupied override. The control then maintains the occupied temperature for a preset amount of time. *Note:* This item is only available when the setpoint control has tN4 communication.
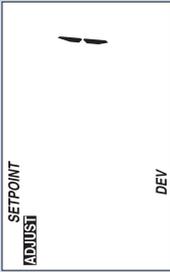
ADJUST MENU

After the last item, the control returns to the first item in the menu.

SCENE Menu (1 of 1)

The SCENE Menu items set the current scene as well as the scene settings.

	Item Field	Range	Access	Description
	TIME ⟨display⟩ hr RUN Occ SCENE	OFF, 0:05 to 24:00 hr, On (in 5 min. increments) Default = 1:00	LTD USEr InST ADV	**RUN TIME OCCUPIED** *SECTION B, D, E* Select the amount time for the setpoint control to operate at the occupied temperature when a Setpoint Device Enable is provided. ***Note:*** This item is only available in Application Mode 2 (Hot Tub) or 4 (Floor) if a programmable setback schedule is selected. ***Note:*** This item is only available in Application Mode 1 if a programmable setback schedule is selected and the Setpoint Device Enable setting in the ADJUST menu is set from 1 through 12.
	OFF ⟨display⟩ SCENE	OFF, On Default = OFF	InST ADV	**SCENE MENU** *SECTION H* Select whether or not to use the scene feature on the setpoint control.

After the last item, the control returns to the first item in the menu.

SCENE MENU

SCHD (Schedule) Menu (1 of 1)

Menu

Item

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The SCHEDULE menu allows the setpoint control to follow a schedule.

Item Field	Range	Access	Description
SCHD NONE *Schd*	NONE, Mbr1, Mbr2, Mbr3, Mbr4, UnOc Default = NONE	InST ADV	**HEAT SCHEDULE** *SECTION G* Selects the schedule used by the setpoint control. If a schedule is not required, select NONE. If the schedule is set on another thermostat or setpoint control, select Mbr1 to Mbr4. UnOc is not available in Mode 3. **Note:** This item can be viewed in the USEr and InST (Installer) access levels but can only be adjusted in the ADV (Advanced) access level.

SCHEDULE MENU

After the last item, the control returns to the first item in the menu.

MISC (Miscellaneous) Menu (1 of 2)
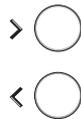
The Miscellaneous menu items set display and control options such as access level and temperature units.

Item Field	Range	Access	Description
MISC **ACC** _USEr_	SEC, LTD, USEr, InST, ADV Default = USEr	SEC LTD USEr InST ADV	**ACCESS LEVEL** The access level of the setpoint control. The access column shows which items are visible in each access level. **Note:** This item is only available when DIP switch 1 is set to the Unlock position and the tN4 system control DIP switch is set to the Unlock position. *SECTION J*
MISC _°F_	°F, °C Default = °F	USEr InST ADV	**UNITS** Select Fahrenheit or Celsius as the temperature units.
MISC _LItE_ _TMPY_	ON, TMPY, OFF Default = TMPY	InST ADV	**BACKLIGHT** Select whether the backlight displays permanently, temporarily, or is off. The temporary backlight lasts for 30 seconds. *SECTION K*

MISC MENU

MISC (Miscellaneous) Menu (2 of 2)

Item Field	Range	Access	Description
MISC — DEV	– – –, 1 to 24	ADV	**NUMBER OF DEVICES** *SECTION L* Number of tN4 devices connected to this tN4 bus. **Note:** This item is only available when the setpoint control has tN4 communication.
MISC AUTO ADD	bus#:01 to bus#:24, AUTO Default = AUTO	SEC LTD USEr InST ADV	**ADDRESS** *SECTION L* The tN4 bus address of this setpoint control. Auto allows the tN4 system to automatically assign an address to the setpoint control. To manually set the address, use the Up or Down buttons while in the ADV (Advanced) or InST (Installer) access level. **Note:** This item is only available when the setpoint control has tN4 communication.
MISC dEF		InST ADV	**RESTORE DEFAULTS** Press the Up and Down buttons together to load the factory defaults. The SELECT icon appears and then the display shows DONE when the factory defaults have been completed.
MISC 161 TYPE	161, Software Version	SEC LTD USEr InST ADV	**TYPE** Product number of this setpoint control. Hold the Up button to view the software version.

After the last item, the control returns to the first item in the menu.

MISC MENU

Sequence of Operation

Application Mode 1 - On / Off Setpoint *SECTION A*

Application Mode 1 is a generic setpoint control operation using an on/off differential for heating. The sensor is required to be located at the temperature control point. The setpoint control can have an occupied temperature setting. The setpoint load is not heated during the unoccupied or away periods.
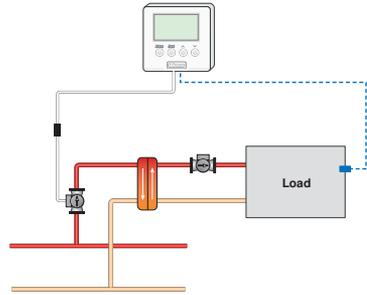
Relay 1 Operation

Relay 1 operates using an on/off differential to maintain the load at the Occupied temperature. Relay 1 does not operate during the Unoccupied or Away periods.

Setting the Setpoint Off

The setpoint temperature can be set to Off. When set to Off, Relay 1 will not turn on. If the heating area is outdoors, or the heating system has the potential to freeze, it is recommended that the setpoint always be set to a temperature and not set to Off.

The setpoint can be set to Off if the heating system can be drained or the pump should remain off.

The setpoint control power should never be shut off, otherwise an error message will appear on the rest of the tN4 system.

Application Mode 2 - Hot Tub *SECTION B*

Application Mode 2 is designed specifically to heat hot tubs using an on/off differential. A sensor must be located in a temperature well on the recirculation pipe. The hot tub can have an occupied temperature setting.
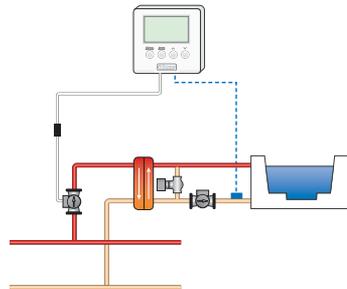
Relay 1 Operation

Relay 1 operates using an on/off differential to maintain the load at the Occupied temperature. During the Unoccupied period, Relay 1 is operated to maintain 10°F (5.5°C) less than the Occupied temperature setting. During the Away scene, Relay 1 is operated to maintain the Hot Tub at 50°F (10.0°C).

Mode of Operation

The hot tub mode of operation can be set to either Heat or Off. While set to Off, Relay 1 remains off. The Off setting should only be used when the hot tub is drained or when there is no possibility of freezing. Power should never be removed from the setpoint control as this will result in an error message on the tN4 system.

Occupied Time

The setpoint control can temporarily override the scheduled temperature and operate at the occupied temperature on a timer.

Press the Up or Down buttons while in the View menu to set the amount of time that the occupied temperature should remain in effect.

To use this feature, a programmable schedule must be set or the schedule be set to normally operate at the unoccupied setting. When the schedule is set to unoccupied, the setpoint control operates at the unoccupied setting until activated.

The length of time the setpoint remains at the occupied temperature is preset by the Run Time Occupied item located in the Scene menu.

To cancel the temporary occupied time, press and hold the Down button until the display shows OFF, at which point, the setpoint control returns to the schedule.

Pressing the UP button while in the VIEW menu starts operation of the Hot Tub for the time set.

To Stop operation press the DOWN button until the time shows OFF.

Application Mode 3 - DHW Tank   *SECTION C*

Application Mode 3 is designed specifically to operate a domestic hot water (DHW) tank using an on/off differential. A sensor must be located in a temperature well inside the DHW tank. The DHW tank can have an occupied temperature setting. The DHW tank is not heated during the unoccupied and away periods.
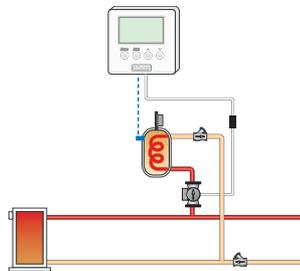
Relay 1 Operation

Relay 1 operates using an on/off differential to maintain the load at the Occupied temperature. Relay 1 does not operate during the Unoccupied or Away periods.

Application Mode 4 configures the setpoint control for floor warming and floor heating applications using pulse width modulation. Floor warming is not necessarily designed to heat the room, but to make the floor feel warm to the touch. This is common especially in bathrooms. A sensor must be located within the slab between the heating pipes. The setpoint control allows a Floor temperature to be set for the occupied period. The floor is not heated during the unoccupied or away periods.
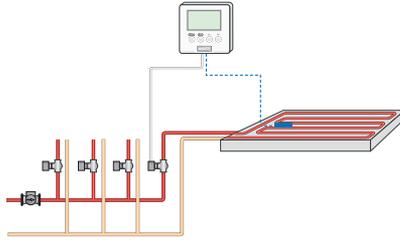
Relay 1 Operation

Relay 1 operates using pulse width modulation to maintain the load at the Occupied temperature. Relay 1 does not operate during the Unoccupied or Away periods.

Occupied Time

The setpoint control can temporarily override the scheduled temperature and operate at the occupied temperature on a timer.

Press the Up or Down buttons while in the View menu to set the amount of time that the occupied temperature should remain in effect.

To use this feature, a programmable schedule must be set or the schedule be set to normally operate at the unoccupied setting. When the schedule is set to unoccupied, the setpoint control operates at the unoccupied setting until activated.

The length of time the setpoint remains at the occupied temperature is preset by the Run Time Occupied item located in the Scene menu.

To cancel the temporary occupied time, press and hold the Down button until the display shows off, at which point, the setpoint control returns to the schedule.

Pressing the UP button while in the VIEW menu starts operation of the Hot Tub for the time set.

To Stop operation press the DOWN button until the time shows OFF.

To use the Remote Enable / Disable feature, the setpoint control must be set to Mode 1 (Setpoint), 2 (Hot Tub), or 4 (Floor). When the setpoint control is connected to a tN4 system, a User Switch or tN4 Gateway can remotely signal a setpoint control (or multiple setpoint controls) to override the unoccupied temperature to temporarily operate at the occupied temperature. The Setpoint Control, User Switch and tN4 Gateway each have a setting called Setpoint Device Enable that can be assigned a number between 1 and 12. When devices have the same Setpoint Device Enable number, then either pressing the button on the User Switch or activating the feature on the tN4 Gateway causes the Setpoint Control to operate at the occupied temperature. Sending a second Setpoint Device Enable cancels the override and the setpoint control returns to the unoccupied temperature. A total of 12 different Setpoint Devices Enables can be configured on the tN4 system.

To create a Setpoint Device Enable:

1) DIP switch 2 must be set to tN4 system control.
2) A User Switch or tN4 Gateway should be connected to one of the tN4 buses.
3) Set the Setpoint Device Enable item in the Adjust menu to a number between 1 and 12.
4) Set the Setpoint Device Enable on the User Switch or tN4 Gateway to the same number between 1 and 12.

Setpoint Control   **User Switch**

=

Setpoint Device Enable Number   **Setpoint Device Enable Number**
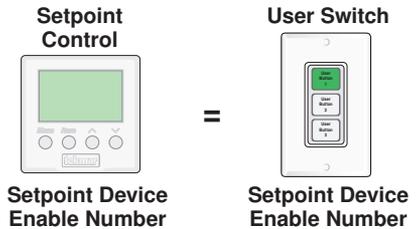
The schedule on the setpoint control must be set to either Schedule Member, or to Unoccupied to allow the temporary occupied time override to operate. When the schedule is set to Unoccupied, the setpoint control operates at the unoccupied setting until activated.

The length of time the setpoint remains at the occupied temperature is preset by the Run Time Occupied item located in the Scene menu.

Remote activation of the setpoint control requires the same Setpoint Device enable number to be set on the setpoint control and on a User Switch 480 or 481 (or tN4 Gateway).

Setpoint Control   **User Switch**   **Setpoint Control**

UnOcc   Occ

Press Button
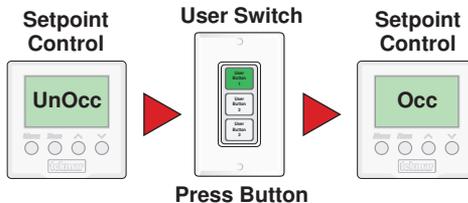
Sensor Input

The Setpoint Control 161 requires a temperature sensor (Universal Sensor 071 included) to be connected to the sensor input on the back of the control. All tekmar sensors are compatible. Choose the sensor type that best meets the requirements of the application. See application mode diagrams for the recommended location of the sensor.

Setting the Schedule

To provide greater energy savings, the setpoint control can follow a schedule master when connected to a tN4 system. Alternatively, the setpoint control can normally operate at the unoccupied temperature until activated to the occupied temperature.

During the Unoccupied and Away periods, the Setpoint, DHW tank, and the Floor are not heated.

During the Unoccupied period, the Hot Tub is heated to the Occupied temperature minus 10°F (5.5°C). While in the Away scene, the Hot Tub is maintained at 50°F (10.0°C).
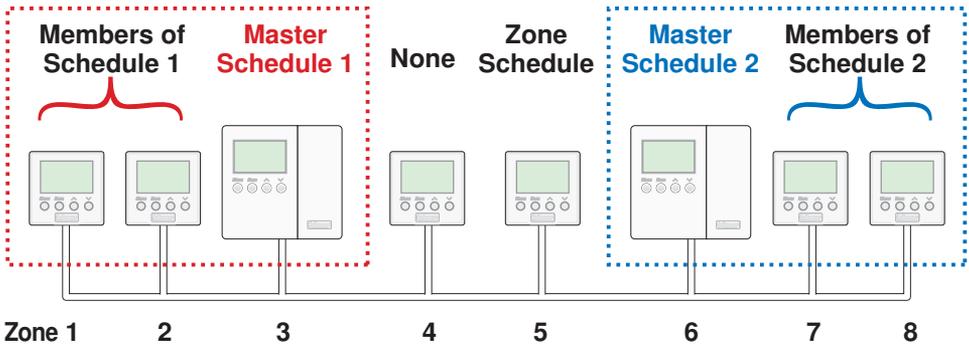
Schedule Member

If a Master Schedule is available on the tN4 system, the setpoint control can follow the Master Schedule as a member.

To follow a master schedule as a member:

1. Assign the setpoint control to follow a master schedule by setting the Schedule menu item in the Schedule menu to Member (MBR) 1 to 4. The number must match that of the Master.

Normally Unoccupied

The setpoint control can be set to normally operate at the unoccupied temperature. This allows the setpoint control to temporarily be set to the occupied temperature by either pressing the Up or Down buttons in the View menu or by a remote enable.

Scenes are a system override feature available when the setpoint control is part of a tN4 system. Scenes allow the user to change the entire tN4 system to operate at preset temperatures.

To use the scene function, go to the Scene menu and set the Scene setting to On.

The tN4 scene can be changed through the scene menu on a tN4 thermostat, a tN4 User Switch or through a tN4 Gateway. The setpoint control reacts to the scene as follows:

Scene	Setpoint Control Temperature
1	Follows the schedule
2	Away
3	Unoccupied (no effect if schedule is Off)
4	Not valid, remains at previous scene
5	Not valid, remains at previous scene
6	3 hour Occupied
7	Not valid, remains at previous scene
8	Not valid, remains at previous scene

The default is for the tN4 system to remain in Scene 1.

During the Unoccupied and Away periods, the Setpoint, DHW tank, and the Floor are not heated.

During the Unoccupied period, the Hot Tub is heated to the Occupied temperature minus 10°F (5.5°C). While in the Away scene, the Hot Tub is maintained at 50°F (10.0°C).

Example:

A house is normally in scene 1. There is a living room that operates on a schedule and there is a hot tub that is normally at the unoccupied temperature. When entertaining guests, the scene is changed to scene 6. Scene 6 has been pre-programmed to change the hot tub to operate at the occupied temperature.

Living room thermostat:

Scene 1 is set to Schedule.
Scene 6 is set to Schedule.

Hot tub setpoint control:

Scene 1 is set to Unoccupied.
Scene 6 is set to Occupied.

70°F
Living Room
94°F
Scheduled **Hot Tub**
Event **Unoccupied**

70°F
Living Room
104°F
Scheduled **Hot Tub**
Event **Occupied**
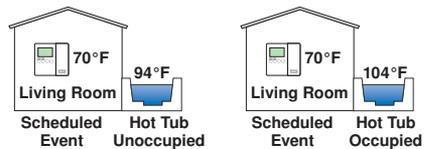
Restore Factory Defaults
SECTION I

To restore the factory defaults, locate the Default item in the Miscellaneous menu and press and hold the Up and Down buttons for 1 second. The display will show "SELECT" and when completed it will show "DONE".

Temperature Units
SECTION J

The setpoint control can display temperatures in either Fahrenheit (°F) or in Celsius (°C).

• Locate the units setting in the Miscellaneous menu.

Backlight
SECTION K

Use the setpoint control's backlight to increase the visibility of the display. The backlight can be set to On, Temporary, or Off. If Temporary is selected, the back-light comes on for 30 seconds when a button is pressed. By default, the backlight is Temporary. If Off is selected the backlight remains permanently off.

• Locate the Backlite setting in the Miscellaneous menu.

tN4 Features
SECTION L

When the setpoint control is connected to a tN4 system, the setpoint control has additional features not present when operating alone.

tN4 Bus

When connecting the setpoint control to a tN4 system, there may be several tN4 buses available. The setpoint control should be connected to the tN4 bus that best represents the water temperature required for the setpoint load. Typically, the setpoint control should be connected to the boiler tN4 bus for Application Modes 2 (Hot Tub) and 3 (DHW Tank). Typically the setpoint control should be connected to a mix tN4 bus for Application Mode 4 (Floor).

Heat Source

When the setpoint control is part of a tN4 system, the Heat Source item in the Adjust menu allows the setpoint control to inform the tN4 system control whether the heat is hydronic (HYDr) or provided by another (OTHr) heat source.

Exchange Supply

When the setpoint control is connected to a tN4 system control and Heat Source item is set to hydronic (HYDr), the setpoint control requests that the Exchange Supply Occupied water temperature be maintained on the tN4 bus whenever Relay 1 is heating the load.

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Relay 1 System Pump

In order to accommodate many different piping and pumping configurations, the setpoint control is able to choose whether a "system" pump is required to operate at the same time as Relay 1. This allows each manifold on a water temperature to have a "system" pump when using zone valves or when using zone pumps together with primary secondary piping. Only the manifold that has zones requiring heat should have their "system" pump turned on.

When the setpoint control is connected to the tN4 boiler bus, the "system" pump is the primary pump located on the tN4 system control.

When the setpoint control is connected to a tN4 mix bus, the "system" pump is the mix system pump located on the tN4 system control or on a mixing expansion module.

To turn on the "system" pump together with Relay 1, set the Relay 1 Pump item in the Adjust menu to On. This is the factory default.

To turn on Relay 1 without the "system" pump, set the Relay 1 Pump item in the Adjust menu to Off.
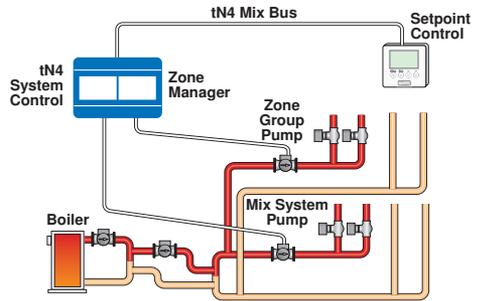
Purging

When the setpoint control is used with a tN4 system control, the setpoint control purges heat from the boiler into the setpoint zone if it is the last zone to shut off. The length of the purge is dependent on time, the temperature of the boiler, and the temperature of the setpoint load.

Priority

When the setpoint control is connected to a boiler tN4 bus, a priority setting is available. When priority is set to On, the setpoint control has priority over the thermostats. First, all heating thermostats are shut off. If there is sufficient boiler capacity, boiler temperature zones are turned on in order of their tN4 address from 1 to 24. Second, boiler temperature second stage heating zones are turned on in order of their tN4 address from 1 to 24. Last, all mixing outputs are increased up to normal operating levels.

tN4 Address

When connected to other tN4 devices through a tN4 bus, the setpoint control is automatically assigned a network address. The Address item in the Miscellaneous menu displays the current address of the setpoint control. A total of 24 devices can be connected to each tN4 bus.

If the 161 is operating as a member of a thermostat / setpoint only network, the address consists of a device number with no bus number. If the 161 is not connected to a tN4 network, the address item in the MISC menu is not available.

When the setpoint control is connected to a tN4 boiler bus, the address range is b:01 through to b:24.

When the setpoint control is connected to the tN4 mix 1 bus, the address range is 1:01 through to 1:24.

When the setpoint control is connected to the tN4 mix 2 bus, the address range is 2:01 through to 2:24.

When the setpoint control is connected to the tN4 mix 3 bus, the address range is 3:01 through to 3:24.

The address number determines the heating priority for each zone. A device with address number 1 has a higher priority than address number 24. The tN4 address allows the tN4 system control to shut off low priority zones when the heat source is unable to heat all zones simultaneously. In some cases, the installer may want to change the device's address in order to change the thermostat's priority relative to other devices.

Note: Keep track of manually set tN4 addresses. When a tN4 address is manually set, tN4 devices using the Auto address setting will automatically be assigned new addresses. If two devices are manually set to the same address, an error message will appear. The error remains until one of the addresses is manually changed to a vacant address.

Zone Test

The tN4 system control has a Zone Test feature, which allows each tN4 device to be individually operated for up to 5 minutes. When the setpoint control is selected, the display shows "Zn TEST" and Relay 1 is turned on. When the setpoint control is not selected, the display shows "Zn TEST" and Relay 1 is turned off.

Maximum Heat

The tN4 system control has a Maximum Heat feature, which operates all tN4 devices, including the setpoint control, at the occupied temperature setting plus 5°F (3°C). While in the maximum heat operation, the setpoint control display shows the "MAX HEAT" symbols.
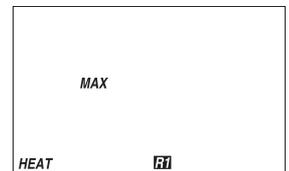
Exercising

When connected to a tN4 system control, the setpoint control exercises Relay 1 for 10 seconds after 3 days of inactivity. Exercising helps prevent pump seizure. While the setpoint control is exercising, the display shows "TEST".

Exercising does not occur when:

• Mode of Operation is set to Off.
• Heat Source is set to Other.
• DIP switch 2 is set to None.

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Error Messages

Local Errors and Device Errors

Error messages are used to indicate a problem somewhere in the system. There are two types of error messages: Local Errors and Device Errors.

A Local Error indicates an error specific to a device. For example, a thermostat with a sensor short circuit will show a Sensor Short Error on its display. No other devices will show this specific error (unless they also have a sensor short circuit).

A Device Error is used to indicate that there is a local error somewhere else on the system. For example, if a thermostat has a sensor short circuit, that thermostat will show a Local Error indicating specifically what the problem is. All other devices on the network will show Device Errors, indicating the address of the device with the Local Error. In other words, Device Errors are nothing more than pointers, showing you that there is a local error somewhere on the system and where to find it.

Error Priority

Only one error can be shown on a particular device at a time. If there is more than one error on the system, the highest priority error will be the one that is shown. The table on pages 30 to 33 lists error messages in order of high priority to low priority.

How to Locate an Error Message

If the warning symbol (flashing circle with exclamation mark) is visible on screen, this indicates that there is an error somewhere on the system. To view the error message, you must first put the control into the Advanced or Installer access level (available in MISC menu). When an error message is present, it is available as an item in the VIEW menu.
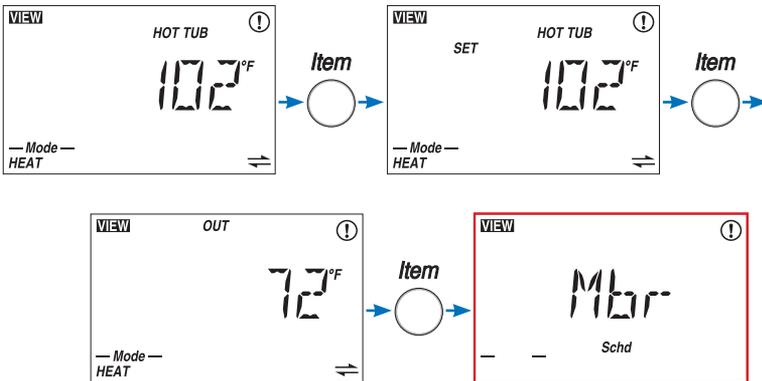

While in the View Menu, press the item button until the error message is displayed. You may have to advance through several View Menu items before the message is displayed.

If the error message is a Device Error (if "DEV" or "DEV ERR" is shown on screen), read the address shown and go to the device with that address. That device will have a Local Error indicating specifically what the problem is. When the problem is corrected, the error message will automatically clear.

Access Levels

In some cases, it is not desirable to let day-to-day users view error messages. In these cases, by lowering the access level of the thermostat or setpoint device to 'User' or lower, error messages cannot be seen in the View menu and the warning symbol only appears if there is a local error or a device error caused by a critical error on another device. If there is an error message on the system that you cannot find on a particular thermostat, make sure that the access level on that thermostat is set to Installer or Advanced.

Sensor Temperature Errors

If a control is unable to display a temperature due to a sensor malfunction or communication problem, the word "Err" is displayed in place of the temperature. This usually indicates that there is an error somewhere on the system but is not the actual error message. Keep looking through the View menu to find the actual error message.
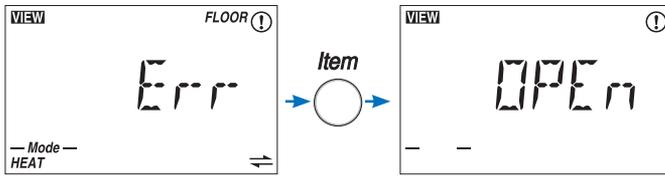
Device is attempting to show floor temperature but cannot because of sensor problem.

Keep pressing the Item button to find the actual error message

Once error is corrected, the temperature can be displayed

Note: Error Messages are only visible while in the Advanced or Installer access level.

Error Message	Description
⊙ E01 VIEW — |	**ADJUST ERROR** The setpoint control failed to read the ADJUST menu settings from memory and has reloaded the factory default settings. Operation stops until the ADJUST menu settings are checked. *Note:* To clear the error, the access level must be set to Advanced before checking all settings in the ADJUST menu.
⊙ E03 VIEW — |	**SCENE ERROR** The setpoint control failed to read the SCENE menu settings from memory and has reloaded the factory default settings. The setpoint control continues to operate while displaying this error. *Note:* To clear the error, the access level must be set to Advanced before checking all settings in the SCENE menu.
⊙ E04 VIEW — |	**SCHEDULE ERROR** The setpoint control failed to read the SCHEDULE menu settings from memory and has reloaded the factory default settings. The setpoint control continues to operate while displaying this error. *Note:* To clear the error, the access level must be set to Advanced before checking all settings in the SCHEDULE menu.
⊙ E05 VIEW — |	**MISCELLANEOUS ERROR** The setpoint control failed to read the MISCELLANEOUS menu settings from memory and has reloaded the factory default settings. The setpoint control continues to operate while displaying this error. *Note:* To clear the error, the access level must be set to Advanced before checking all settings in the MISCELLANEOUS menu.
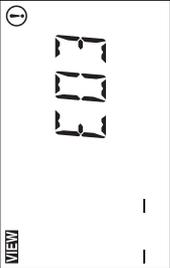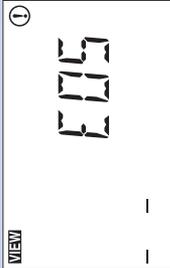
Error Messages (2 of 4)

Note: Error Messages are only visible while in the Advanced or Installer access level.

Error Message	Description
VIEW ☉ ⇕ `Err` —	**BUS ERROR** Due to an open or short circuit, communication is lost with the tN4 bus. Check the wires for damage or loose connections. Check the wires for continuity. The error message will clear once the error condition has been corrected. *Note:* In some cases, the setpoint control is intentionally removed from the tN4 system. Press the Up and Down buttons together to clear the address and set Dip 2 to the 'None' position. This will also clear the bus error message.
VIEW ☉ `CTRL` —	**NO tN4 SYSTEM CONTROL** DIP switch 2 is set to tN4 System Control and the setpoint control does not detect the tN4 System Control. Once the tN4 System Control is detected, this error will clear automatically. *Note:* If a tN4 System Control is not installed, set the tN4 System Control DIP switch 2 to None.
VIEW ☉ ADD `Err` —	**ADDRESS ERROR** Two tN4 devices have been manually set to the same address. The setpoint control continues to operate with this error but does not communicate with the tN4 bus. To clear this error, manually select an unused address. This can be done automatically by setting the Address item to Auto.
VIEW ☉ `LIM` — DEV	**DEVICE LIMIT** There are more than 24 devices on the tN4 bus. The additional devices must be removed and reconnected to a different tN4 bus if possible.

Error Messages (3 of 4)

Note: Error Messages are only visible while in the Advanced or Installer access level.

Error Message	Description
ⓘ VIEW *d IP2* —Mode—	**DIP SWITCH 2 MODE** The tN4 System Control DIP switch 2 is set to None and the setpoint control has detected a tN4 System Control. The setpoint control does not operate until this error is corrected. The tN4 System Control DIP switch 2 must be set to tN4 System Control.
ⓘ VIEW *SHRT*	**SETPOINT SENSOR SHORT CIRCUIT** Due to a short circuit, the setpoint control failed to read the sensor input. The setpoint control displays the error and stops operation until the error message is cleared. Check the wire for short circuits. Locate and repair the problem as described in the Data Brochure D 070. The error message clears automatically once the error is corrected.
ⓘ VIEW *OPEn*	**SETPOINT SENSOR OPEN CIRCUIT** Due to an open circuit, the setpoint control failed to read the sensor input. The setpoint control displays the error and stops operation until the error message is cleared. Check for loose or broken wires. Locate and repair the problem as described in the Data Brochure D 070. The error message clears automatically once the error is corrected.
ⓘ VIEW *Mbr* *Schd*	**SCHEDULE MEMBER ERROR** The setpoint control can no longer detect its schedule master. Ensure that the Schedule Master number has not been changed. Check the communication connections for open or short circuits. Once the schedule master has been detected, the error message clears.
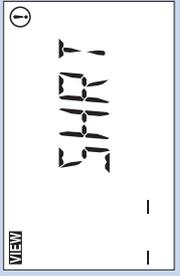
Error Messages (4 of 4)

Note: Error Messages are only visible while in the Advanced or Installer access level.

Error Message	Description
VIEW ⊕ ⇅ _Ei:U i_ _DEV_	**DEVICE ERROR AT ADDRESS #:##** #:## is the address of the device with the error. The bus number displays before the colon, and the device number displays after. Go to the device with the address displayed. Possible Addresses: **01** to **24** - Device Error on Thermostat only network **b:01** to **b:24** - Device Error on Boiler Bus **1:01** to **1:24** - Device Error on Bus 1 **2:01** to **2:24** - Device Error on Bus 2 **3:01** to **3:24** - Device Error on Bus 3 **CTRL** - Device Error on System Control **MIX1** - Device Error on Mixing Expansion Module (See System Control for local error) **MIX2** - Device Error on Mixing Expansion Module (See System Control for local error) **MIX3** - Device Error on Mixing Expansion Module (See System Control for local error)

Cleaning the Control

The control's exterior can be cleaned using a damp cloth. Moisten the cloth with water and wring out prior to wiping the control. Do not use solvents or cleaning solutions.

Notes

Limited Warranty and Product Return Procedure

Limited Warranty *The liability of tekmar under this warranty is limited. The Purchaser, by taking receipt of any tekmar product ("Product"), acknowledges the terms of the Limited Warranty in effect at the time of such Product sale and acknowledges that it has read and understands same.*

The tekmar Limited Warranty to the Purchaser on the Products sold hereunder is a manufacturer's pass-through warranty which the Purchaser is authorized to pass through to its customers. Under the Limited Warranty, each tekmar Product is warranted against defects in workmanship and materials if the Product is installed and used in compliance with tekmar's instructions, ordinary wear and tear excepted. The pass-through warranty period is for a period of twenty-four (24) months from the production date if the Product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

The liability of tekmar under the Limited Warranty shall be limited to, at tekmar's sole discretion: the cost of parts and labor provided by tekmar to repair defects in materials and / or workmanship of the defective product; or to the exchange of the defective product for a warranty replacement product; or to the granting of credit limited to the original cost of the defective product, and such repair, exchange or credit shall be the sole remedy available from tekmar, and, without limiting the foregoing in any way, tekmar is not responsible, in contract, tort or strict product liability, for any other losses, costs, expenses, inconveniences, or damages, whether direct, indirect, special, secondary, incidental or consequential, arising from ownership or use of the product, or from defects in workmanship or materials, including any liability for fundamental breach of contract.

The pass-through Limited Warranty applies only to those defective Products returned to tekmar during the warranty period. This Limited Warranty does not cover the cost of the parts or labor to remove or transport the defective Product, or to reinstall the repaired or replacement Product, all such costs and expenses being subject to Purchaser's agreement and warranty with its customers.

Any representations or warranties about the Products made by Purchaser to its customers which are different from or in excess of the tekmar Limited Warranty are the Purchaser's sole responsibility and obligation. Purchaser shall indemnify and hold tekmar harmless from and against any and all claims, liabilities and damages of any kind or nature which arise out of or are related to any such representations or warranties by Purchaser to its customers.

The pass-through Limited Warranty does not apply if the returned Product has been damaged by negligence by persons other than tekmar, accident, fire, Act of God, abuse or misuse; or has been damaged by modifications, alterations or attachments made subsequent to purchase which have not been authorized by tekmar; or if the Product was not installed in compliance with tekmar's instructions and / or the local codes and ordinances; or if due to defective installation of the Product; or if the Product was not used in compliance with tekmar's instructions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH THE GOVERNING LAW ALLOWS PARTIES TO CONTRACTUALLY EXCLUDE, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DURABILITY OR DESCRIPTION OF THE PRODUCT, ITS NON-INFRINGEMENT OF ANY RELEVANT PATENTS OR TRADEMARKS, AND ITS COMPLIANCE WITH OR NON-VIOLATION OF ANY APPLICABLE ENVIRONMENTAL, HEALTH OR SAFETY LEGISLATION; THE TERM OF ANY OTHER WARRANTY NOT HEREBY CONTRACTUALLY EXCLUDED IS LIMITED SUCH THAT IT SHALL NOT EXTEND BEYOND TWENTY-FOUR (24) MONTHS FROM THE PRODUCTION DATE, TO THE EXTENT THAT SUCH LIMITATION IS ALLOWED BY THE GOVERNING LAW.

Product Warranty Return Procedure All Products that are believed to have defects in workmanship or materials must be returned, together with a written description of the defect, to the tekmar Representative assigned to the territory in which such Product is located. If tekmar receives an inquiry from someone other than a tekmar Representative, including an inquiry from Purchaser (if not a tekmar Representative) or Purchaser's customers, regarding a potential warranty claim, tekmar's sole obligation shall be to provide the address and other contact information regarding the appropriate Representative.

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tekmar ®
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D 161 - 08/07.