Honeywell

TR21, TR22, and TR23 Wall Modules

SPECIFICATION DATA



GENERAL

The TR21, TR22, and TR23 are a family of direct wired wall modules for use with:

- Honeywell Excel 800, 600, 500, 100, and 80 (all fully programmable) controllers
- Excel 10 W7750, W7751[a], W7752, and W7753 controllers
- W7761 Controller
- Spyder Unitary Controllers: PUL, PVL
- ComfortPoint LON Controllers: CP-UL, CP-VL

All models have a space temperature sensor. Some models have a temperature dial for setpoint adjustment, LONWORKS® bus jack, override (bypass) with LED, and fan switch. The figure above shows the TR23 (left) and TR21 (right) models.

FEATURES

The TR21, TR22, and TR23 family of wall modules include:

- **Models with setpoint adjustment.**
- **Models with occupied/unoccupied override (bypass) with LED.**
- **Models with 3-position (auto/0/1) fan switch.**
- **LONWORKS® bus jack on all models except the TR21.**
- **Operating range 45°F to 99°F (7°C to 37°C).**
- **Models (TR22 and TR23) with user-selectable temperature setpoint dials in Fahrenheit, Celsius, and Relative (- to +).**

SPECIFICATIONS

Models: See Table 1 on page 2.

Construction: Two-piece construction, cover and internally wired subbase. Field wiring 16 to 22 AWG (1.31-0.33 sq. mm) connects to a terminal block in the subbase.

Mounting Options: All modules can be mounted on a standard two by four inch junction box or on a 60 mm diameter junction box.

Dimensions (H/W/D): See Fig. 2 on page 3.

Environmental Ratings:
Operating Temperature: 45°F to 99°F (7°C to 37°C).

Shipping Temperature: -40°F to 150°F (-40°C to 65.5°C).

Relative Humidity: 5% to 95% non condensing.

Humidity Output Accuracy: ±5% from 20–80% RH

Temperature Sensor Operating Range: 45°F to 99°F (7°C to 37°C).

Temperature Setpoint Ranges (TR22 and TR23 only): The setpoint range is determined by the temperature knob installed:

- 55°F to 85°F
- 13°C to 29°C
- Relative (- to +)

[a] The TR21, TR22, and TR23, wall modules are not compatible with W7751A,C,E,G Controllers.

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LONMARK® 3.0

Approvals:

CE; UL94 plastic enclosure; FCC Part 15, Class B

Temperature Sensor

TR21, TR22, and TR23 20K Ohm Non-linearized Sensor:

All models are furnished with a 20K Ohm non-linear NTC temperature sensor that follows a specific temperature resistance curve. See Fig. 1.

Honeywell controllers used with the TR21, TR22, and TR23, models employ an algorithm that provides readings close to the actual temperature. Sensor accuracy across the range of 55°F to 85°F (13°C to 29°C) is better than ±0.36°F (±0.2°C).

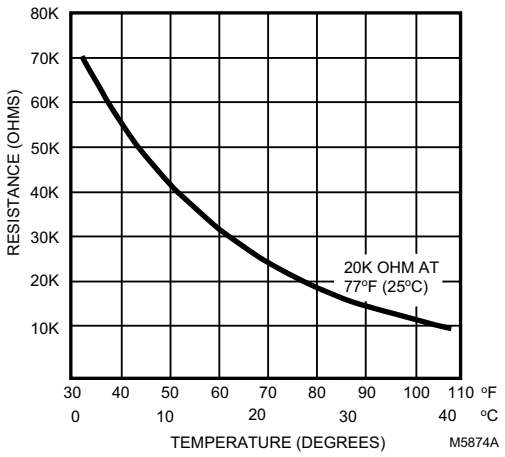


Fig. 1 Temperature vs. resistance for nonlinear sensor.

Wall Module Features

Table 1 illustrates the TR21, TR22, and TR23, wall module features and lists the existing Honeywell models that they replace.

Table 1. TR21-TR23 Wall Module Features.[a]

Model Number		Sensor Element Type	Sensor Type		Selectable Setpoint Adjustment: 55°F to 85°F, 13°C to 30°C, or Relative (- to +)	Override Button with LED	LON Jack	Fan Switching
Honeywell Wall Module Model	Replaces Honeywell Model		Temp	Humidity				
TR21/U	T7460A1001 RF20 CLCM1T11N	20K ohms non-linear	✓					N/A
TR21-H/U	T7560C1006 H7012B1024	20K ohms non-linear	✓	✓			✓	
TR22/U	T7460B1009 CLCM2T11N		✓		✓		✓	
TR23/U	T7460C1007 CLCM4T111		✓		✓	✓	✓	
TR23-H/U	T7560B1016 T7560B1024		✓	✓	✓	✓	✓	
TR23-F3/U	T7460E1002 CLCM5T111		✓		✓	✓	✓	3 position

[a] A check mark (✓) indicates the feature is included with the wall module.

NOTE:
Refer to the TR21, TR22, and TR23 Wall Modules – Installation Instructions, form 62-0267, for wiring diagrams. Some features may not be available with all controllers.

Module Dimensions

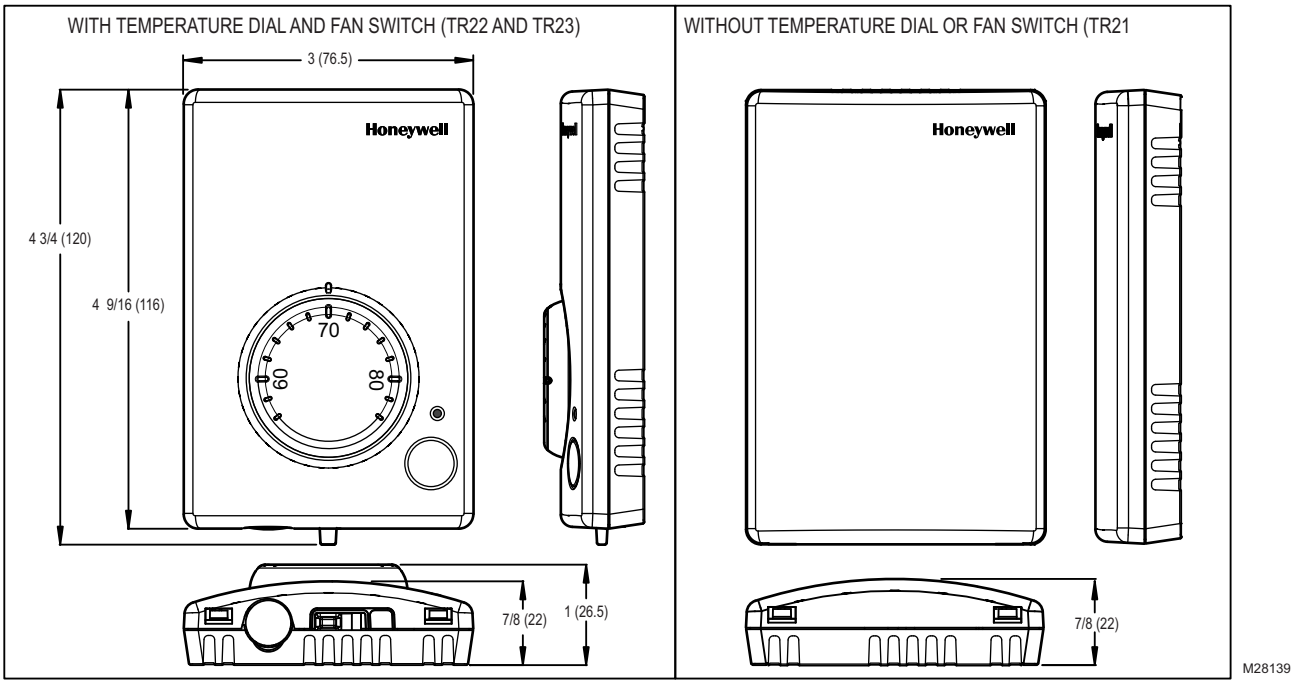
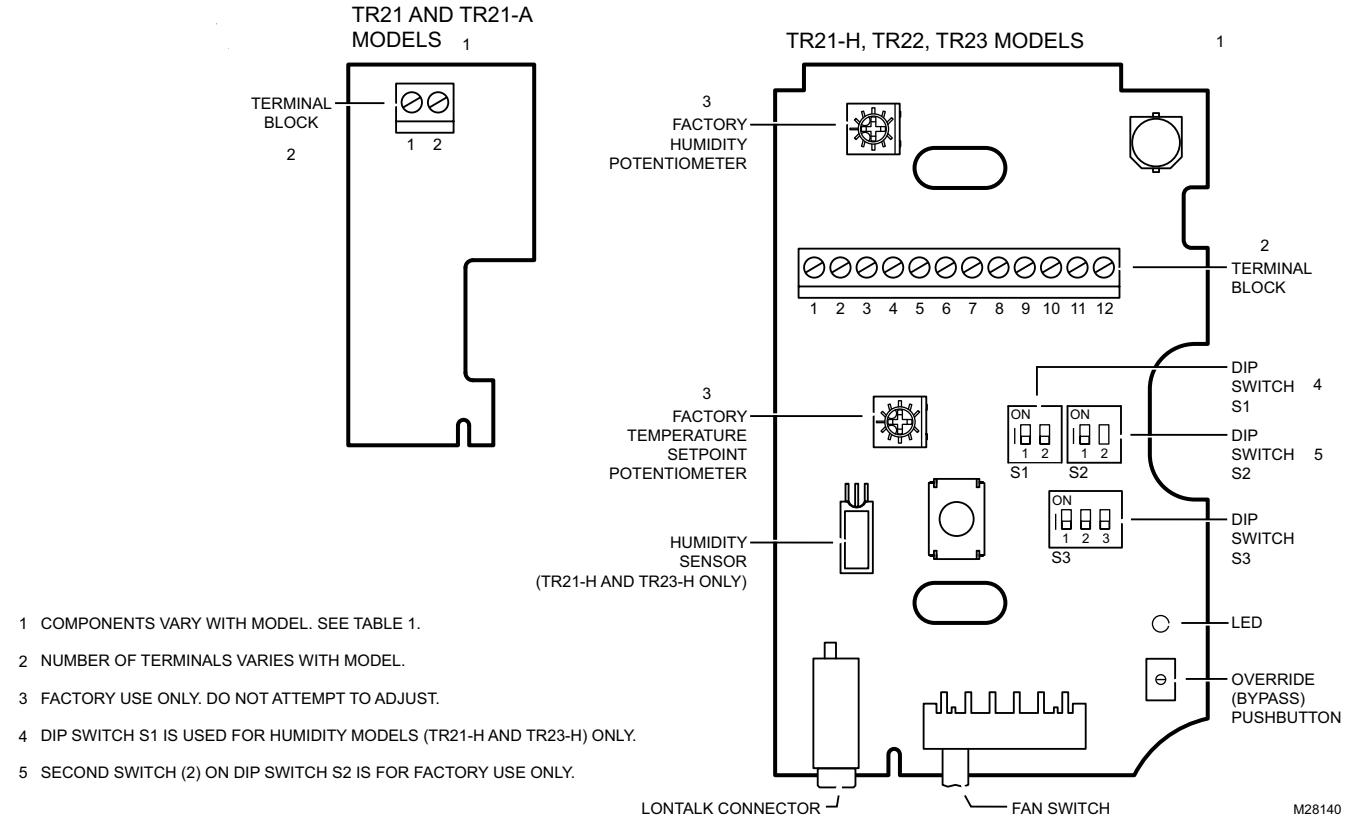


Fig. 2. Wall module dimensions in inches (mm).

Circuit Board

Fig. 3 illustrates the location of the terminal block and other features on the TR21, TR22, and TR23 models' circuit board. Table 2 on page 4 describes the terminal connections by model number.



1 COMPONENTS VARY WITH MODEL. SEE TABLE 1.

2 NUMBER OF TERMINALS VARIES WITH MODEL.

3 FACTORY USE ONLY. DO NOT ATTEMPT TO ADJUST.

4 DIP SWITCH S1 IS USED FOR HUMIDITY MODELS (TR21-H AND TR23-H) ONLY.

5 SECOND SWITCH (2) ON DIP SWITCH S2 IS FOR FACTORY USE ONLY.

Fig. 3. Wall module circuit board components.

Table 2. TR21, TR22, and TR23 Wall Module Terminal Connections.[a]

Wall Module Model	When Used With Controller Model(s)	Terminal Usage and Number (See Fig. 3 on page 3)											
		GND[b]	Sensor	LON +[c]	LON –	SETPT (Setpoint)	Override Return	LED	LED Return	Override / Fan	Override	Humidity	18–24 Vac[d]
		1	2	3	4	5	6	7	8	9	10	11	12
TR21/U	W7761	✓	✓										
TR21-H/U		✓	✓	✓	✓							✓	✓
TR22/U	W7750, W7751, W7752, and W7753 Excel 600, 500, 100, and 80	✓	✓	✓	✓	✓							
TR23/U	W7753	✓	✓	✓	✓	✓		✓			✓		
TR23-F3/U		✓	✓	✓	✓	✓		✓		Fan	✓		
TR23-H/U		✓	✓	✓	✓	✓		✓			✓	✓	✓
TR23/U	W7750, W7751, and W7752 Spyder: PUL, PVL	✓	✓	✓	✓	✓		✓		Override			
TR23-F3/U		✓	✓	✓	✓	✓		✓		Override / Fan			
TR23-H/U		✓	✓	✓	✓	✓		✓		Override		✓	✓
TR23-F3/U	Excel 600, 500, 100, and 80 with Fan	✓	✓	✓	✓	✓		✓	✓	Override / Fan			
TR23/U	Excel 600, 500, 100, and 80 without Fan	✓	✓	✓	✓	✓	✓	✓	✓	Override			
TR23-H/U		✓	✓	✓	✓	✓	✓	✓	✓	Override		✓	✓

[a] A check mark (✓) indicates the terminal is used in this wall module and controller configuration.

[b] Earth Ground.

[c] LONWORKS® terminals (+ and –) are polarity insensitive.

[d] Power coming from the controller to power the humidity sensor.

Communications

All wall modules (except the TR21 and TR21-A models) have a LONMARK® bus communications port. If needed, the jack plug must be removed in the field, and terminals 3 and 4 wired according to the installation instructions.

LONMARK® bus communication is not applicable when the wall modules are used with Excel 600/500/100/80 Controllers. The LONMARK® bus is insensitive to polarity, minimizing installation errors due to mis-wiring.

The recommended wire size for the LONMARK® bus is Level IV, 22 AWG (0.34 sq.mm) plenum or non-plenum rated, unshielded, twisted pair, solid conductor wire.

TR22 and TR23 Setpoint Adjustment

For the TR22 and TR23 Wall Modules with a setpoint adjustment, the controller must be programmed for the values in Table 3 and Table 4.

Table 3 Setpoint Values.

Setpoint Value	Program Setting
55°F (13°C)	2.773 V
65°F (18°C)	2.148 V
75°F (24°C)	1.345 V
85°F (29°C)	0.43 V

Table 4 Wall Module Setpoint Configuration.

Model	Setpoint	Resistance (Ohms)
°F Absolute	55°F	9574
	85°F	1426
Relative	-9°F offset from 70°F	9574
	+9°F offset from 70°F	1426
°C Absolute	12°C	9945
	30°C	1150

Humidity Settings (DIP switch S1)

The humidity sensing control mode is set with this 2-position DIP switch. Refer to Fig. 3 on page 3 for location of DIP switch S1.

NOTE:
These switch settings apply only to the TR21-H and TR23-H models.

To change the setting, first disconnect the power, then set SW1 and SW2 according to Table 5.

The switch settings are used to indicate the sensing control between the humidity sensor on the wall module and the connected controller model.

Table 5 DIP Switch S1 Settings.

Wall Module Model	Sensing Control	Individual Switches	
		1	2
TR21-H TR23-H	0-10 Vdc	OFF	OFF
	0-5 Vdc	OFF	ON
	4-20 mA	ON	OFF

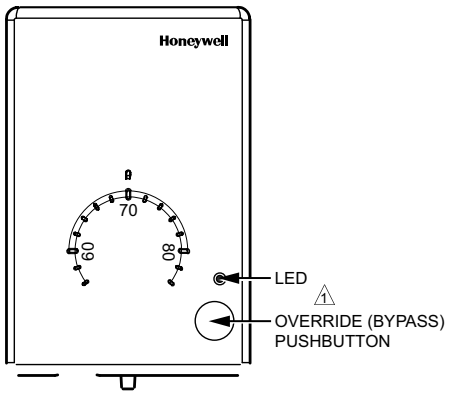
DIP Switches S2 and S3

See Fig. 3 on page 3 for location of these DIP switches. To set these DIP switches, refer to the TR21, TR22, and TR23 Wall Modules – Installation Instructions, form 62-0267.

TR23 Wall Module Override (Bypass) Pushbutton and LED Operation

When Used With Excel 10 Controllers:

The Excel 10 controllers (W7750, W7751, W7752, and W7753) provide timed occupied and unoccupied temperature setpoints for the Wall Module, see Fig. 4. The override pushbutton is used to change the controller into the modes shown in Table 6 and illustrated in Fig. 5 on page 6. The override (bypass) LED displays the override status of the controller.



1 LED AND OVERRIDE (BYPASS) PUSHBUTTON AVAILABLE ONLY ON THE TR23 MODELS.

Fig. 4 LED and override pushbutton locations (TR23-F Wall Module shown).

Table 6 Wall Module Operation.

Pushbutton Held Down	Controller Model	LED Status
0 to 1 second	No override	Off
1 to 4 seconds	Timed occupied override	On
4 to 7 seconds	Unoccupied override	Single blink per second
Longer than 7 seconds	No override	Off
not applicable	Continuous occupied override[a]	Two blinks per second

[a] Remote function, which is generated from the network.

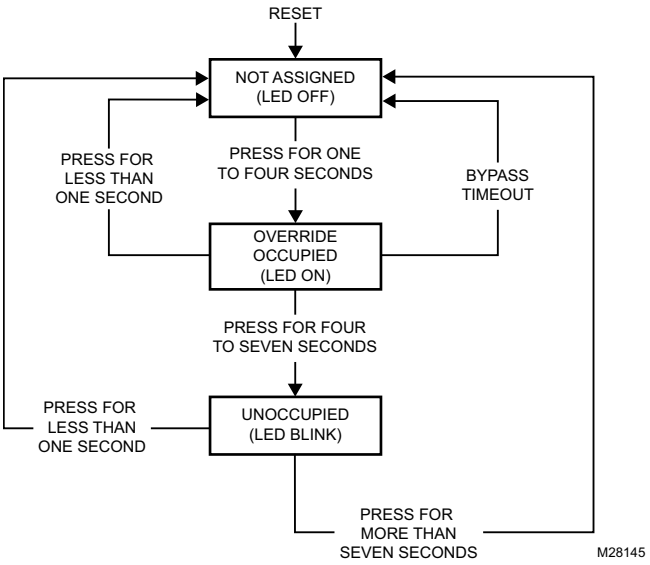


Fig. 5 Override pushbutton operation.

When Used With Excel 600/500/100/80 Controllers:

The application engineer/programmer can program the override (bypass) and LED to operate in any manner desired. The override (bypass) input is a dry contact, normally open, momentary digital input when the wall module does not have a fan switch. When a fan speed switch (basically a series of resistances based on fan switch position) is present, the override button is an analog input. See Table 8 for resistances.

When Used With T7350 Thermostat:

TR21, TR21-H, TR22, and TR23 are the models compatible with the T7350 thermostat. When using with the T7350 thermostat be sure to use the relative +/- offset knob only. The Celsius and Fahrenheit knobs will not work properly with the T7350 Thermostat.

TR23-F3/U Wall Module Fan Switch

With the switch in the far left position (Auto), the fan automatically runs at the speed determined by the controller temperature control algorithm.

With the switch in the 0 position, the fan is off. Position 1 is fan on.

The wall module fan speed switch overrides the temperature control algorithm.

When Used With Excel 10 Controllers:

The Excel 10 Controllers (W7750, W7751, W7752, and W7753) can be programmed so that the fan speed switch and override button function the way that the application engineer/programmer wants. See Table 7 for controller-programming resistances. Switch 1 on Dip Switch S2 adds 10k Ohms resistance when OPEN (for Excel 600-80 controllers) and removes it when CLOSED (for Excel 10 controllers).

Table 7 Program Settings for Wall Modules with Fan Switch using Excel 10 Controllers.

For Switch Position	Resistance (Ohms)	Comment
Auto	1861 ±119	Left most position
0	2686 ±127	Fan Off position
1	3866 ±139	
Override button closed	Closed circuit	

When Used With Excel 600/500/100/80 Controllers:

Excel 600/500/100/80 Controllers can be programmed so that the fan speed switch and override button function the way that the application engineer/programmer wants. See Table 8 for controller-programming resistances. Switch 1 on Dip Switch S2 adds 10k Ohms resistance when OPEN (for Excel 600-80 controllers) and removes it when CLOSED (for Excel 10 controllers).

Table 8 Program Settings for Wall Modules with Fan Switch using Excel 600/500/100/80 Controllers.

For Switch Position	Resistance (Ohms)	Comment
Auto	11.861K ±119	Left most position
0	12.686K ±127	Fan Off position
1	13.866K ±139	
Override button closed	10K ±100	

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63-1321E-06 I Rev. 09-23

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