TF Series

BACnet Communicating Controllers

SPECIFICATION DATA

Application

The TF Series BACnet Communicating Controllers controls fan coil units (FCU) to create a comfortable environment. These controllers communicate via BACnet MS/TP interface and can be easily integrated into a BACnet network.

The TF series thermostat adopts a two-piece structure, and is made out of two devices: driver and wall module. The driver provides the control algorithm, inputs/outputs and the BACnet communication interface. The wall module is a the user interface which provides the LCD display and a keypad for setup and operation of the controller.

The TF Series Communicating Controllers can be used for the following applications:

- **2-pipe, On/Off valve, 3-speed fan**
- **4-pipe, On/Off valve, 3-speed fan**
- **2-pipe, 0-10Vdc modulating valve, 3-speed fan**
- **Ventilation only**

Features

- Two-wire polarity-free communicating between driver and wall module
- 32-bit ARM architecture CPU
- Power and communicating status indication with LED on driver
- Multi installation method for both driver and wall module, easy to install and set-up
- Optional terminal protection cover
- Random startup, freeze protection and data storage when power off
- Super modern appearance design, suitable for office, hotel and residential building
- Multi-color wall module to match different decorations
- Big LCD display with backlit in English and icons
- Replaceable fuse
- CE and BTL certification

Functions

- Application selection via wall module or BACnet network
- Room temperature or set point temperature display option
- Manual or automatic fan speed option
- Build-in temperature sensor or remote air temperature sensor option
- Cycle per Hour (CPH) setting
- °C or °F temperature unit option
- Keypad lock
- Heat and cool set point limitation for energy saving
- Energy saving function, supports RSB1(hotel card) or/and RSB2(window contact)
- Runtime accumulation
- Purge function with 2-pipe auto changeover system
- Alert function

Specifications

Power Supply	Operation Power	220/230VAC, 50/60Hz
	Product Power Consumption	6VA
	Circuit Protection Fuse	6.3A @250VAC, replaceable
Classification	Action Type	1
	Pollution Degree	2
	Protection against electric shock class	Class I
	Electronic control software class	Class A
	Rated Impulse Voltage	2500V
	Maximum Temperature	Storage：105°C Operating： 105°C
Output	Valve Control Output TF228AD/U: Relay x 2 TF428AD/U: Relay x 4 TF223AD/U: Analog Output x1	Relay: 2(1)A at 250VAC(max.), life cycle: 100,000 2A: When the load is resistance 1A: When the load is inductance AO: 0 - 10Vdc at 10mA(max.) The valve need have overtravel-limit organ to turn off the load
	Fan Control Output Relay x 3	3(2)A at 250VAC(max.), life cycle: 100,000 3A: When the load is resistance 2A: When the load is inductance
	Whole Product Output Current	4A/3A 4A: When the load of the thermostat is resistance 3A: When the load of the thermostat is inductance
Input	Remote temperature sensor x 1 Pipe sensor x 1	20K NTC, 50046805-001
	RSB1(Hotel Card) x 1 RSB2(Window Contact) x 1	Dry contact, NO/NC selectable
BACnet	BACnet Interface	EIA-485(BACnet MS/TP)
Environment	Working Ambient Temperature	-10°C to 48°C (14°F to 118°F)
	Storage Ambient Temperature	-30°C to 65°(-22°F to 149°F)
	Relative Humidity	5% RH to 95% RH. Non-condensing.
Build-in Sensor	Display Temperature Range	-9.5°C to 48°C (14°F to 118°F)
	Calibration Temperature Range	+/- 5°C(+/-10°F)
	Accuracy	+/-0.5°C(+/-1°F)@21°C (70°F)
Terminal	Wire Gauge (recommended)	Line Voltage Terminals: 14AWG-18AWG (1.6mm – 1mm) solid BACnet Terminals: 18AWG-24AWG (1mm - 0.5mm), shielded twisted pair Other Terminals: 18AWG-24AWG(1mm - 0.5mm)
Compliance	IP Level	IP20
	Certification	CE, BTL
Applied altitude up to 2000m above sea level for all rating capacity		

Model Selection

Wall Modules

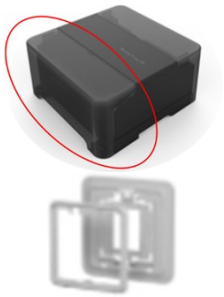
Material	Color
TFWNAP/U	white
TFDNAP/U	Black
TFLNAP/U	Sliver Hairline
TFKNAP/U	Rose Gold

BACnet controllers

Material	Application
TF228AD/U	2-pipe On/Off Valve
TF428AD/U	4-pipe On/Off Valve
TF223AD/U	2-pipe 0-10Vdc modulating Valve

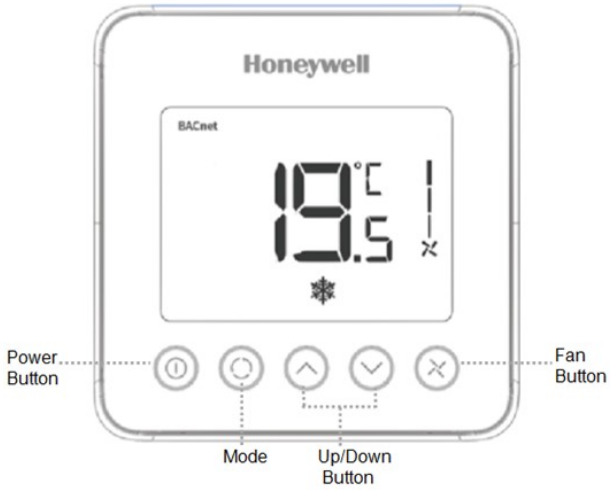
Accessories

Material	Application
TFDC	Controller terminal cover
WP428-1	Auxiliary wall plate for 2x4 junction box installation, white color
WP428-2	Auxiliary wall plate for 2x4 junction box installation, black color

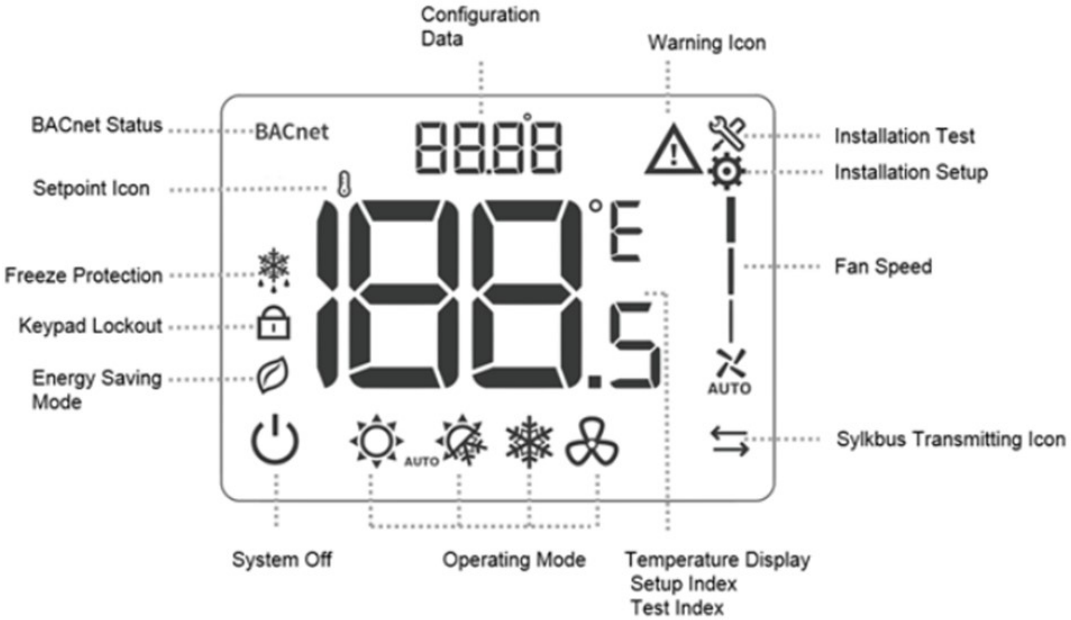


Product Design

Appearance/keypad

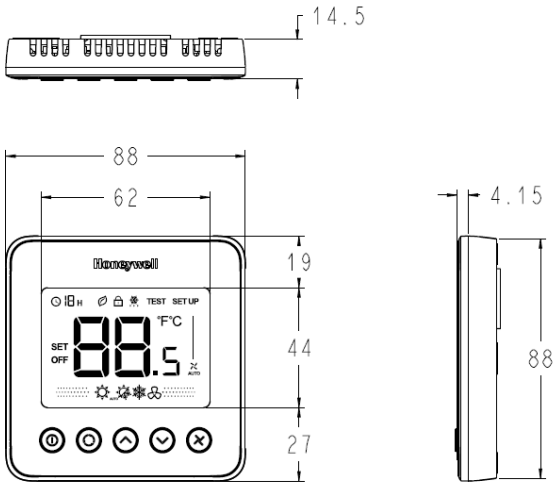


LCD display

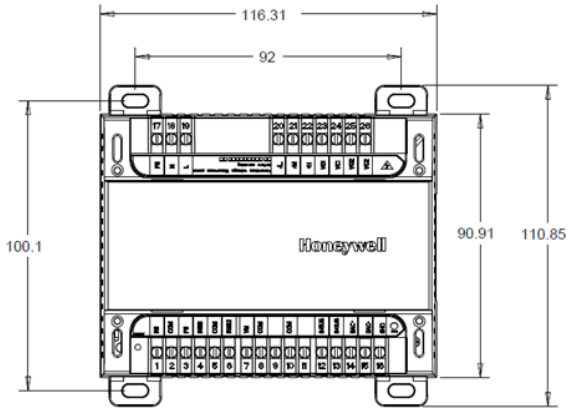


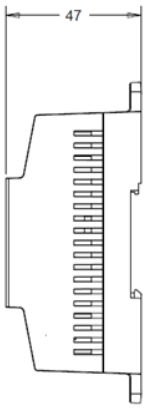
Dimensions (mm)

Wall module

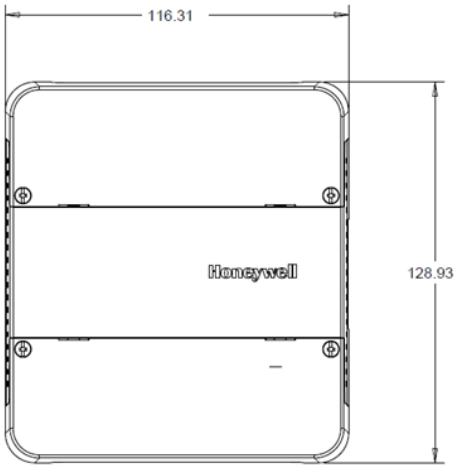


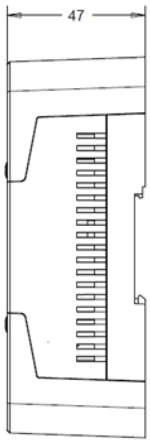
Driver without terminal covers





Driver with terminal covers





Functions

System Mode

Comfort mode
In comfort mode, the thermostat operates with the comfort set point. This set point can be set via the up/down buttons of the wall module or via BACnet bus, the fan can be set to auto or manual speed: Low, medium or high.

Energy saving (ES) mode
ES mode can be active by the input of “RSB1(hotel card)” or by holding mode button for 3s.
If the ES mode is active by holding Mode button, pressing any button could inactive it.
In ES mode, the thermostat operates with the ES set point. This set point can be defined via ISU configuration. The fan speed will be auto or low speed which could be set in ISU configuration (Fan mode in ES mode)

Ventilation mode
The thermostat can be switched to ventilation mode by pressing “mode” button.
In ventilation mode, the fan can be set to manual speed: Low, medium or high.

Freeze protection mode
When the thermostat is in power off mode and the room temperature is lower than 6°C (43°F), the thermostat will enter freeze protection mode.
In freeze protection mode, the thermostat will start to heating until the room temperature reach 8°C (46 °F) or power on.
Note: Protection mode will not be active when the system type is cool only, or the system type is 2 pipe auto and pipe water is cool

Off mode
Off mode can be active/inactive by the input of “RSB2 (window contact)” or pressing power button. If the Off mode is entered by “RSB2 (window contact)”, it could be only inactive by “RSB2 (window contact)”.

Valve & Fan Speed Control
Thermostat measures the room temperature via integrated sensor or remote temperature sensor and maintains the setpoint by delivering on/off valve control command outputs.

The fan setting can be selected as manual or automatic 3-speed operation. When in “manual” mode, the fan is switched to the selected speed via control output FH (high), FM (Medium) , FL (Low).

While in “automatic“ mode, fan speed depends on the difference between room temperature and setpoint. When room temperature reaches the setpoint, the valve will be closed, and the fan will be closed as well.

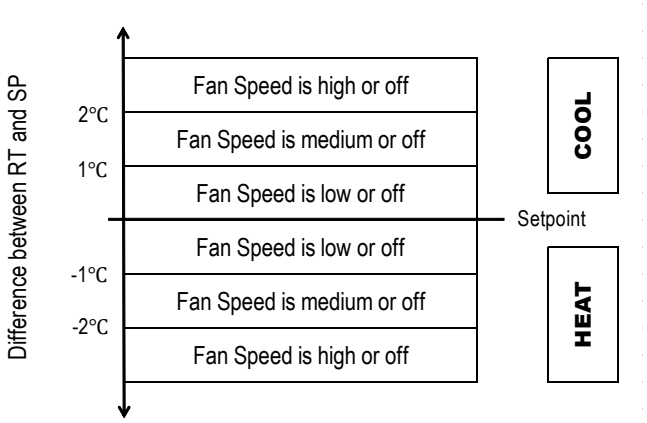


Fig. 1. Fan Speed Ramping Control Algorithm

Memorized Time Off
The memorized time off feature will automatically turn off the thermostat after a selectable amount of time. To change the time setting, press and hold the power button for more than 3 seconds and press “up” and “down” button to change the value when the thermostat is working .

NOTE: The setting range is from 0 to 12 hours. The step is 1 hour and the default value is 0.

Backlight
To turn on the backlight, press any key. The backlight will timeout 8 seconds after the last key is pressed. When in ISU and Installation test mode, the backlight will timeout 60 seconds after the last key is pressed.

Keypad Lockout
Keypad lockout can be set in ISU and the default status is “all keys available”. Keypad lock can be optioned to “mode button locked”, “Fan and mode buttons locked”, “all buttons (except power button) locked” and “all buttons locked”.

Temperature Display
The displayed temperature can be set to room temperature or setpoint. The setting can be changed during ISU (Installation Set Up) process.

Cycle Per Hour (CPH)
In order to achieve more accurate temperature control, the CPH function enables the thermostat to open the valve several times per hour as the room temperature gets close to the setpoint.

The value can be changed in the ISU, the default values are 4 for heating and 3 for cooling.

ISU (Installation Setup)

Press and hold the “mode” and “up” buttons together for more than 3 seconds to enter or exit ISU. Change the ISU code by pressing the “mode” button and then change the option setting by pressing the “up” and “down” button refer to the following introduction.

ISU Code	Description	Configuration Data
0	BACnet MAC Address	0-99, **default 1**
1	System Type	0 - Heat only
		1 - Cool only
		2 - Two pipe manual(default)
		3 - Two pipe auto (pipe sensor needed)
		4 - Four pipes manual
		5 - Four Pipes Auto
2	Sensor Option	**0 - Onboard Sensor(default)**
		1 - Remote Sensor
3	Hotel Card (Dry Contact)	**0 - Disabled (default)**
		1 - Enabled
4	Window Contact (Dry Contact)	**0 - Disabled (default)**
		1 - Enabled
12	Hotel Card Option	**0 - NO (default)**
		1 - NC
13	Window Contact Option	**0 - NO（default）**
		1 - NC
20	Temperature Scale	0 - °F **1 - °C(default)**
21	Fan Control Type	0 - Cycle only
		1 - Constant only low-med-high
		2 - User can choose Cycle or Constant(default) low -med-high-auto
26	Display Temperature adjustment	-5°C -5°C (-10°F -10°F), **default 0,** step 0.5°C(1°F)
27	Temperature Display Mode	**0 - Display room temperature(default)**
		1 - Display Setpoint
28	Minimum range stop of setpoint	10°C - 32°C(50°F-90°F), **default 10°C (50°F),** step: 0.5°C(1°F)
29	Maximum range stop of setpoint	10°C - 32°C(50°F-90°F), **default 32°C (90°F),** step: 0.5°C(1°F)
30	Keypad lockout	**0 All keys available(default)**
		1 System button Locked out
		2 Fan and System button Locked out
		3 All button locked out except power button
		4 All buttons are locked
32	ES Heating Setpoint	10°C - 21°C(50°F -70°F), **default 18°C(64°F)**
33	ES Cooling Setpoint	22°C - 32°C(72°F - 90°F), **default 26 °C(79°F)**
35	Power recovery Status	0 - OFF
		1 - Previous Status (default)
37	Fan mode in ES mode	0 - Run as Auto fan speed when ISU_21 =2
		1 - Run as Low fan speed when ISU_21 = 2 (default)
38	Device ID	0-9999 **default 5555**

BACnet Integration

Specifications for a Honeywell EIA-485 network

Cable Type: Twisted pair 18AWG-24AWG (1mm – 0.5mm), Shield
Distributed Capacitance between conductors: less than 100pF/m
Max length per segment: 1000m
Polarity: Polarity sensitive
Network wiring: Daisy-chain
Maximum number of node per EIA-485 network: 63
Baud rate: 9600, 19200, 38400, 76800(auto detect)
Termination: 80~130 Ω (should be installed at each end)
Note: Less than 40 devices are recommended in a EIA - 485 network and shall use shielded twisted pair.

MAC address

The driver is delivered from the factory with the default MAC address set at 1 (referred to ISU of wall module). To enable BACnet communication, set the local MAC address configuration property of the driver to any valid value from 0 to 99.

Device object ID and device object name

The BACnet Data Link layer has two key parameters: the device object name and the device object ID.
The device object ID must be unique from any other BACnet device object ID on the entire BACnet network (i.e. not just the MS/TP sub-network).
Device Name and Device ID properties are writable in Honeywell device object. Both properties can be renamed from any BACnet network management tool if the tool itself gives access to write to these properties.
Device ID can also be changed by wall module.

BACnet services

The BACnet communicating driver meets all requirements for designation as an Application Specific Controller (B-ASC), the detail information refer to PICS.

BACnet objects

Configuration Data

Name	Description	R/W for Network	Settings
AV35FObjMACAddress	BACnet Address	R/W	[0-99], default value is 1
ISU_01_SysType	System Type	R/W	0 - Heat Only 1 - Cool Only 2 - 2 pipe manual (default) 3 - 2 pipe auto changeover 4 - 4 pipe manual 5 - 4 pipe auto
ISU_02_SenOpt	Sensor Option	R/W	0 - Onboard sensor(default) 1 - Remote sensor
ISU_03_RS1	Hotel Card Enable/Disable	R/W	0 - Disable (default) 1 - Enable
ISU_04_RS2	Window Contact Enable/ Disable	R/W	0 - Disable (default) 1 - Enable
ISU_12_RS1Opt	Hotel Card Configuration	R/W	0 - NO (default) 1 – NC
ISU_13_RS2Opt	Window Contact Configuration	R/W	0 - NO (default) 1 - NC
PS_threshold_C	Pipe Sensor Threshold for cool	R/W	10°C-22°C(50°F-72°F), default 15.5°C(60°F)
PS_threshold_H	Pipe Sensor Threshold for heat	R/W	24°C-32°C(75°F-90°F), default 26.5°C (80°F)
AV38FObjTempScale	F/C display	R/W	0 - °F 1 - °C(default)

Name	Description	R/W for Network	Settings
ISU_21_FanCtrl	Fan control type	R/W	0 - Cycle 1 - Constant; 2 – Cycle and Constant (default)
Differential	Differential for 4 pipe	R/W	1°C -3°C(2°F-6°F), default 1.5C(3°F)
CPH_Heat	Heat Cycle Rate	R/W	[1-12], default 4 (only for TF228AD, TF428AD）
CPH_Cool	Cool Cycle Rate	R/W	[1-6], default 3 (only for TF228AD, TF428AD）
FanAutoConfig	Fan Auto Configuration	R/W	0, Off-Low-Med-High in Auto mode(default) 1, Low-Med-High in Auto mode
ISU_26_TempAdj	Temp Display adjust	R/W	-5°C -5°C (-10°F -10°F), default 0, step 0.5°C(1°F)
ISU_27_DispType	Display Type	R/W	0 – Room(default) 1 - Setpoint
ISU_28_SP_min	Setpoint minimum value	R/W	10°C - 32°C(50°F-90°F), default 10°C (50° F), step 0.5°C (1°F)
ISU_29_ SP_max	Setpoint maximum value	R/W	10°C - 32°C(50°F-90°F), default 32°C (90° F), step 0.5°C (1°F)
AV37ObjLockOption	Keypad Lockout	R/W	0 – None (default) 1 – “Mode”button 2 – “Fan” and “Mode” buttons 3 - All except “Power” buttons 4 – ALL buttons
ISU_32_ES_SP_H	ES Heating Setpoint	R/W	10°C - 21°C(50°F -70°F), default 18°C(64° F)
ISU_33_ES_SP_C	ES Cooling Setpoint	R/W	22.5°C - 32°C(72°F - 90°F), default 26 °C (79°F)
ISU_35_Pwr Recovery	Power recover status	R/W	0 - OFF; 1 - Previous Status (default)
ISU_37_ES_Fan	Fan mode in ES	R/W	0 - Run auto fan 1 - Run low fan (default)
Object Identifier	Device ID	R/W	0-9999, default 5555

Run Data

Name	Description	R/W for Network	Settings
RoomTemperature	Room Temperature	R	-9.5°C -48°C
Setpoint	setpoint	R/W	10°C - 32°C(50°F -90°F), default 25.5°C (78°F), 0.5°C(1°F)
FanSwitch	Fan status	R/W	0 - Auto 1 - Low (default) 2 - Med 3 - High
SystemSwitch	System type(Heat/cool/Auto/ vent)	R/W	0 - Auto 1 - Cool 2 - Heat(default) 3 - Vent
PowerSwitch	Power On/Off	R/W	0 - OFF 1 - ON(default)
FreezeProtectState	Freeze protection	R	0 - Normal mode 1 - Freeze protection mode
ES mode	Energy saving mode	R	0 - Normal mode (default) 1 - ES mode
AV39MObjSylkStatus	Sylkbus communication status	R	0 – Offline 1 - Online

Inputs/Outputs

Name	Description	R/W for Network	Settings
AI0RS	Remote sensor	R	The remote sensor temperature
AI1PS	Pipe sensor	R	The pipe sensor temperature.
AI2RSB1	Remote setback1	R	0 - Open 1 - Short
AI3RSB2	Remote setback2	R	0 – Open 1 - Short
BO0FL	Fan low	R/W	0 - OFF 1 - ON
BO1FM	Fan Medium	R/W	0 - OFF 1 - ON
BO2FH	Fan High	R/W	0 - OFF 1 - ON
BO3VO1	Heat Valve	R/W	0 - OFF 1 – ON (Only For TF228AD, TF428AD)
BO5VO2	Cool Valve	R/W	0 - OFF 1 – ON (Only For TF428AD)
VM	Modulating Valve	R/W	0-10V (For TF223AD)

Others

Name	Description	R/W for Network	Settings
AV48FObjAppNo0	The application number of driver	R	0 - 2 pipe on/off 1 - 4 pipe on/off 2 - 2 pipe modulating
VO1Runing time	Heat relay Runing time	R	Unit : second (only for TF228AD, TF428AD)
VO2Running time	cool relay Runing time	R	Unit : second (only for TF228AD, TF428AD)
FLRunning time	fan low Runing time	R	Unit : second
FM Running time	fan med Runing time	R	Unit : second
FH Running time	fan highRuning time	R	Unit : second
ResetVOAccumulate	Clear Heat and Cool valve running time	R/W	0 - Not clear 1 - Clear (only for TF228AD, TF428AD)
ResetFanAccumulate	Clear all the fan relay running time.	R/W	0 - Not clear 1 - Clear

Note:
Please use the parameters listed in above parameter table, others are not in guarantee.

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