

MH-5900 Z-Wave Thermostat User Guidance



Introduction

MH-5900 thermostat is used to control up to 3 stages heating and 2 stages cooling system with 8 types control system, EM heat activation, adjustable compressor delay time and O/B changeover, it is applied for regular AC or heat pump system. With quick connecting terminals to save installer's time. Support S2 function

Technical Parameters

- Power Supply: AC/DC24V / 4*AAA dry battery(device will enter low power working state)
- Frameless Display
- Self-Consumption: <1W
- Resistive Load: < 1A
- Temp. Setting Range: 0 ~ 40°C (32~99°F)
- Precision: 0.1°C (1°F)
- Outcase: PC+ABS
- Wire Connection: Terminal
- Dimension: 113*113*19mm
- Installation: 60.3mm hole pitch
- Z-Wave Frequency: Operating frequency range, defined by the regulatory bodies (for Z-wave in Europe: 868.0 - 868.6 MHz, 869.7 - 870.0 MHz)

Features

- Application range: gas/fuel boiler, electric heating, water heating, heat pump etc. 8 types control systems.
- Z-Wave 800 series
- Touch button operation interaction.
- Simpler way to connect wires without screw driver.



Declaration of Conformity

Hereby, we declare that the device is in compliance with the essential requirements and other relevant provisions of

Directive 2014/53/EU.

• WEEE Directive Compliance



The device marked with this symbol should not be disposed of with household waste. It is the user's responsibility to deliver the used appliance to a designated recycling point.

• Z-Wave Compliance



The device is a fully compatible Z-Wave Plus device.

Wires Connection Instruction

Read the instructions before starting up the unit!

This product is not a toy. Keep out of reach of children and animals!

Do not expose the device to moisture, water or other liquids. Do not place liquids near or on the device!

Do not attempt to disassemble, repair or modify the device yourself! This product is for indoor use only. Do not use outdoors!

CAUTIONS!

Risk of Electric Shock - More than one disconnect switch may be required to de-energize the equipment before servicing.

CAUTIONS!

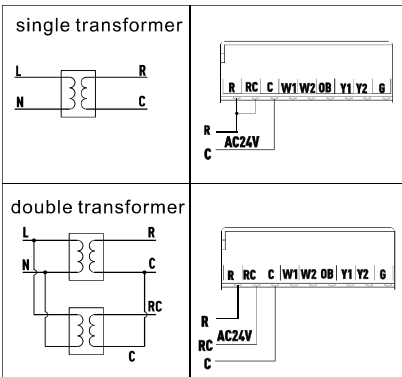
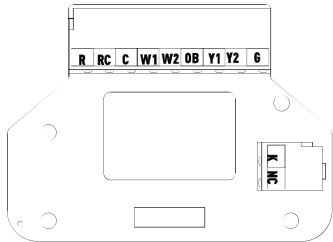
Compressor protection is bypassed during testing. To prevent equipment damage, avoid cycling the compressor quickly.

MERCURY NOTICE

If this product is replacing a control that contains mercury in a sealed tube, do not place the old control in the trash. Contact your local waste management authority for instructions regarding recycling and proper disposal.

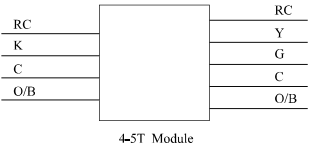
Wiring diagram

REQUIRED: 24 VAC POWER ("C" WIRE)



Terminal	Description
C	
R	AC 24V power supply
RC	
W1	1 st stage heating
W2	2 nd stage heating or auxiliary heating
G	Fan
Y1	Compressor stage1
Y2	Compressor stage2
O/B	Changeover
K	Wire with 4-5T module
EF	Reserved terminal

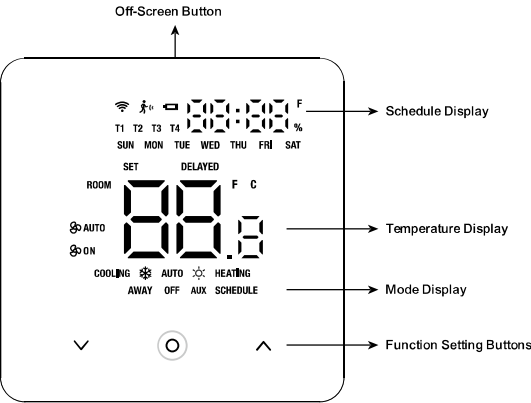
Note: A wire saver acts as a splitter for applications that do not include a 24-volt C wire. If your heating/cooling system does not include a C wire, install the wire saver in or near the main unit (furnace, air handler) of your heating/cooling system.



Controlling Type

Item	Description	Terminals need to be wired					
		G	Y1	Y2	W1	W2	O/B
0	Conventional cool only	•	•	○			
1	Conventional heat only	•			•	○	
2	Conventional heat & cool	•	•	○	•	○	
3	Cool in heat pump	•	•	○			○
4	One-stage heat in heat hump (optional:Aux)	•	•			○	○
5	Two-stage heat in heat hump (optional:Aux)	•	•	•		○	○
6	One-stage heat&cool in heat hump (optional:Aux)	•	•			○	•
7	Two-stage heat&cool in heat hump (optional:Aux)	•	•	•		○	•

Display



Functions & Settings

Setpoint Setting

Press "▲" or "▼" to set the desired indoor temperature, default setting range: 5~37°C (setting step is 0.5) and 41~98 °F (setting step is 1) by default. During the setting, "SET" icon displays and after finishing the setting, press any button to save the setting and exit.

Mode Setting

When the screen is on, press "○" button and the current mode icon flashes, press "○" button again, it will loop to switch working mode from OFF -->HEAT -->COOL -->AUTO -->AUX (emergency heating). Press "▼" or "▲" or wait for 2 sec to confirm the current setting mode, "MODE" icon stop flashing.

Fan Mode & Schedule Setting

When the screen is on, long press "○" 3 sec and enter setting interface, the setting sequence is: FAN MODE -->SCHEDULE MODE --> WEEK -->TIME -->EXIT. Short press "▼" or "▲" to change the current value and it's icon flashes, press "○" to confirm the setting. If the SCHEDULE MODE is enabled, the main page displays "SCHEDULE" icon. Long press "○" 1 sec or without any operation over 20 sec will exit the setting.

Fan On:

In this mode, the fan is always running when the device turns on, and stops when the device turns off.

Fan Auto:

In this mode, the fan runs both in cooling and heating state; the fan stops when cooling or heating is stopped, when the device is in shutdown state, the fan stops.

Standby & Backlight Brightness Setting

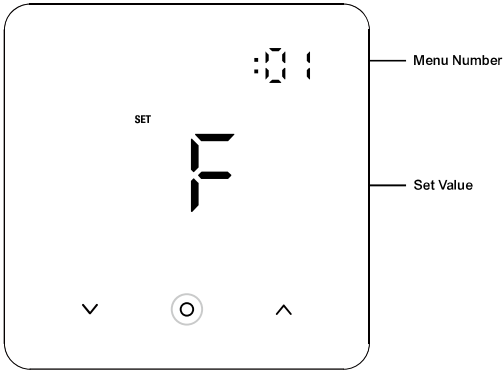
- The device will turn off the screen automatically without any operation. The default is 8 seconds for battery power supply and 1 minute for 24V power supply.
- When the screen lights up, press the top button of the device can turn off the screen. Press any buttons can light up the screen again.
- Long press the "Off-Screen" button on the top of the device to temporarily adjust the screen brightness. If the screen is turned off then turns on again, it will back to the setting from Secret Menu or Z-Wave parameter setting.
- Fan mode and humidity value icon display or not can be set by Secret Menu or Z-Wave configuration parameter (not displayed by default)
- When the Schedule function is enabled, the current time, week and time period icon display or not can be set by Secret Menu or Z-Wave configuration parameter (displayed by default).

Schedule

The schedule function can be enabled or disabled via local operation or Z-Wave parameter setting. If the main page displays "SCHEDULE", that means the SCHEDULE function is activated, if not, that means the SCHEDULE function is not activated. The SCHEDULE value can be set only from Z-Wave parameter but not in local menu, for more information, please refer to Z-Wave parameter table from 46 to 141 item. Z-Wave parameter 58-141 supports batch setting and read (CONFIGURATION_BULK_GET and CONFIGURATION_BULK_SET), a command can set and read maximum of 15 parameters.

Secret Menu

Under "OFF" interface, long press“” + “” button for 3 sec to enter parameter setting interface. Short press “” or “” button to switch the parameter value, short press“”button to set the next item. Long press“” +“”button for 1 sec or without any operation over 20 sec will exit the setting.



Menu Number	Item	Range	Default	Description
1	Temp. Unit	C/F	F	C: Celsius F: Fahrenheit
2	Power Failure Memory	0-1	1	When power on again: 0: Device will be in shutdown state (OFF). 1: Device will stay the last status of working mode.
3	SCREEN OFF	0-90min	1min	Automatic screen off time, When the device is charged by C&R port: 0: The screen will not turn off automatically; Set 1-90mins to automate turn off the screen. When the device is powered by battery: Set 3-90secs to automate turn off the screen; 0-2: After 8sec the screen will be turned off automatically.
4	Beep Set	0-1	1	0:OFF 1:ON
5	Backlight Brightness	0-8	8	1-8: 8 level backlight brightness, 1 is the dimmest, 8 is the brightest
6	Temp. Upper Limit	1-99℃	37℃	Temp. upper limit value, accuracy n*1
		1-99F	98F	
7	Temp. Lower Limit	0-99℃	5℃	Temp. lower limit value, accuracy n*1
		1-99F	41F	
8	Temp. Offset	-99~99℃	0℃	Temp. offset value(℃ or ℉), accuracy 0.1 (n*0.1)
		-99F-99F	0F	
9	Humidity Offset	-20~+20	0	Humidity offset value
10	Fan and Humidity Display Select	0-3	0	Fan and Humidity Display mode selection 0: The most simplest display, fan mode and humidity will not display. 1: Display fan mode 2: Display humidity 3: Display fan mode and humidity Note: When schedule function is enabled, the time, week, and time period are displayed, if the humidity display at the same time, the humidity and time are displayed alternately.
				0: Disabled 1: Secret Menu operation is invalid, except for modifying parameter 11, other operation is valid. 2: Secret Menu operation, changing mode and setpoint is invalid, only valid for adding/removing network or modifying parameter 11. 3: Only valid for adding/removing network.
11	Panel Lock	0-3	0	
12	1st Temp. Hysteresis	3-90,n*0.1℃	10	Specifies the minimum temperature difference between the room temperature and the desired setpoint before the first stage of heating or cooling is allowed to turn on. (0.3-9 degrees). For example, if the heat setpoint is 68° and the 1st stage hysteresis is set to 2 degrees, the room temperature will need to reach 66° before the heat turns on.
		3-90,n*0.1F	20	
13	2nd Temp. Hysteresis	3-90,n*0.1F 3-90,n*0.1℃	10 20	Specifies the additional minimum temperature difference after the first stage turns on before the second stage is activated. (0.3-9 degrees)
14	3rd Temp. Hysteresis	3-90,n*0.1F 3-90,n*0.1℃	10 20	Specifies the additional minimum temperature difference after the second stage turns on before the third stage is activated. (0.3-9 degrees)

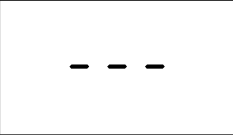
Menu Number	Item	Range	Default	Description
15	System Control Type	0-7	7	Conventional cooling/heating system 0=cool only 2C 1=heat only 2H 2=cool/heat 2C/2H Heat Pump cooling/heating System 3=cool only 2C = Y1+Y2 4=heat only 2H = Y1+W2(AUX) 5=two stages heat 3H = Y1+Y2+W2(AUX) 6=single cool/single heat+AUX 7=two stages cool/heat+AUX Note: This parameter does not change after factory settings are restored. To be more compatible with gateways, after setting this parameter, please add in the gateway again.
				0=When the heat pump starts cooling, O/B turns on; when the heat pump starts heating, O/B turns off 1=When the heat pump starts heating, O/B turns on; when the heat pump starts cooling, O/B turns off
16	Changeover Valve Logic	0-1	0	
17	Compressor Protection Time	0~10min	1min	The setting of compressor delay time from shutdown to startup, unit: min
18	EM Emergency (AUX) Heat Mode	0-1	0	1: ON 0: OFF Note: This mode is only valid for heat pump system with heating function
				When Schedule function is activated: 0: Time, week, current time period displays. 1: Week and current time period displays. 2: Time, week and current time period does not display.
19	Time Display Selection	0-2	0	
20	Fan Shutdown Delay Time	0-127	0	This parameter is valid only when the fan mode is AUTO. 0: When the compressor is shut down, the fan is also shut down. 1-127: The fan shuts down in a delay of n*minutes after the compressor is shut down, unit: minute
98	RESET FACTORY	0-1	0	1: Restore factory setting
99	Firmware Version (Read only)	--	1	1-255

Z-Wave Setting

1. Adding/Removing into Z-Wave network

Under the normal working interface, long press “”and“” button synchronously for 3sec, the device will enter Z-WAVE MENU interface for INCLUSION or EXCLUSION as below picture. Before the device included into network, “- - -” will display on the screen. Then short press “”button, device will enter learning mode to get a node ID. If INCLUSION is success, a node ID will display on the screen in a few seconds. Long press “” and “” button synchronously for 3sec or after 20sec without any operation will back to main page.

Note: Follow the same steps to exclude the device from the network. When removed from the Z-Wave network, the device restores it’s Z-Wave factory setting.



Before Inclusion(No Node ID)



After Inclusion(Node ID is 007)

2. Z-WAVE Command Class :

Support S2:

COMMAND_CLASS_VERSION,
COMMAND_CLASS_DEVICE_RESET_LOCALLY,
COMMAND_CLASS_BATTERY,
COMMAND_CLASS_THERMOSTAT_SETPOINT,
COMMAND_CLASS_THERMOSTAT_OPERATING_STATE,
COMMAND_CLASS_THERMOSTAT_FAN_STATE,
COMMAND_CLASS_TIME_PARAMETERS,
COMMAND_CLASS_ASSOCIATION,
COMMAND_CLASS_ASSOCIATION_GRP_INFO,

COMMAND_CLASS_MANUFACTURER_SPECIFIC,
COMMAND_CLASS_POWERLEVEL,
COMMAND_CLASS_SENSOR_MULTILEVEL,
COMMAND_CLASS_THERMOSTAT_MODE,
COMMAND_CLASS_THERMOSTAT_FAN_MODE,
COMMAND_CLASS_TIME,
COMMAND_CLASS_CONFIGURATION,
COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION,
COMMAND_CLASS_FIRMWARE_UPDATE_MD

Not support S2:

COMMAND_CLASS_ZWAVEPLUS_INFO.
COMMAND_CLASS_SECURITY_2.
COMMAND_CLASS_TRANSPORT_SERVICE.
COMMAND_CLASS_SUPERVISION

3. Association Group

AG Identifier	Max Node ID	Command Class	Trigger situation
0x01	1	COMMAND_CLASS_SENSOR_MULTILEVEL_V5, SENSOR_MULTILEVEL_REPORT_V5	The change between the current detected temperature and the last reported gateway temperature is greater than the value set in parameter 2. The change between the current detected humidity and the last reported gateway humidity is greater than the value set in parameter 3.
		COMMAND_CLASS_THERMOSTAT_MODE_V2, THERMOSTAT_MODE_REPORT	Thermostat mode changes
		COMMAND_CLASS_THERMOSTAT_OPERATING_STATE, THERMOSTAT_OPERATING_STATE_REPORT	Thermostat status changes
		COMMAND_CLASS_THERMOSTAT_SETPOINT_V2, THERMOSTAT_SETPOINT_REPORT_V2	Set point value changes
		COMMAND_CLASS_THERMOSTAT_FAN_MODE, THERMOSTAT_FAN_MODE_REPORT	Fan mode changes
		COMMAND_CLASS_THERMOSTAT_FAN_STATE, THERMOSTAT_FAN_STATE_REPORT	Fan status changes
		COMMAND_CLASS_DEVICE_RESET_LOCALLY, DEVICE_RESET_LOCALLY_NOTIFICATION	Restore factory setting
		COMMAND_CLASS_BATTERY, BATTERY_REPORT	The change in battery power is greater than 5%

4. Z-Wave Parameters Settings

Number	Name	Size	Information	Default	Possible Values
1	Temp. Unit	1	Secret menu No. E20: 0: Celsius 1: Fahrenheit	0	0-1
2	Temp. Difference Reporting	2	Unit 0.1°C 0: Disabled 3-255: n*0.1°C automatically report the temperature to the gateway when temperature variation greater than this value Unit 0.1F 0: Disabled 3-255: n*0.1F automatically report the temperature to the gateway when temperature variation greater than this value	5 10	0, 3-255 0, 3-255
3	Humidity Difference Reporting	1	0: Disabled 1-99: Automatically report the humidity to the gateway when humidity variation greater than this value	4	0-99
12	Power Failure Memory	1	Secret menu No. E2 When power on again: 0: Device will be in shutdown state (OFF), 1: Device will stay the last status of working mode	1	0-1
13	SCREEN OFF		Secret menu No. E3 Automatic screen off time. When the device is charged by C&R port: 0: The screen will not turn off automatically; Set 1-90mins to automate turn off the screen. When the device is powered by battery: Set 3-90secs to automate turn off the screen; 0-2: After 8sec the screen will be turned off automatically.		
14	Beep Set	1	Secret menu No. E4: 0:OFF 1:ON	1	0-1
15	Backlight Brightness	1	Secret menu No. E5: 1-8: 8 level backlight brightness, 1 is the dimmest, 8 is the brightest	8	1-8
16	Temp. Upper Limit	1	Secret menu No. E06: Temperature upper limit value, accuracy n*1	37 (Celsius) 98 (Fahrenheit)	1-99
17	Temp. Lower Limit	1	Secret menu No. E07: Temperature lower limit value, accuracy n*1	5 (Celsius) 41 (Fahrenheit)	0-98
18	Temp. Offset	1	Secret menu No. E08: Temperature offset value (°C or F), accuracy 0.1 (n*0.1)	0	(-99→+99) (Celsius) (-99→+99) (Fahrenheit)
19	Humidity Offset	1	Secret menu No. E09: Humidity offset value	0	-20→+20

Number	Name	Size	Information	Default	Possible Values
47	The 2 nd period from Mon-Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 8	Byte1: 0-59 Byte2: 0-23
48	The 3 rd period from Mon-Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 18	Byte1: 0-59 Byte2: 0-23
49	The 4 th period from Mon-Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 22	Byte1: 0-59 Byte2: 0-23
50	Heat SetPoint for 1 st period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:210 Fahrenheit: 700	The range is greater than the lower limit and smaller than the upper limit
51	Heat SetPoint for 2 nd period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:165 Fahrenheit: 620	The range is greater than the lower limit and smaller than the upper limit
52	Heat SetPoint for 3 rd period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius: 210 Fahrenheit: 700	The range is greater than the lower limit and smaller than the upper limit
53	Heat SetPoint for 4 th period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:165 Fahrenheit: 620	The range is greater than the lower limit and smaller than the upper limit
54	Cool SetPoint for 1 st period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius: 255 Fahrenheit: 780	The range is greater than the lower limit and smaller than the upper limit
55	Cool SetPoint for 2 nd period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:295 Fahrenheit: 850	The range is greater than the lower limit and smaller than the upper limit
56	Cool SetPoint for 3 rd period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:255 Fahrenheit: 780	The range is greater than the lower limit and smaller than the upper limit
57	Cool SetPoint for 4 th period from Mon-Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius: 280 Fahrenheit: 820	The range is greater than the lower limit and smaller than the upper limit
58-64	The 1 st period for Mon...Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 6	Byte1: 0-59 Byte2: 0-23
65-71	The 2 nd period for Mon...Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 8	Byte1: 0-59 Byte2: 0-23
72-78	The 3 rd period for Mon...Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 18	Byte1: 0-59 Byte2: 0-23
79-85	The 4 th period for Mon...Sun	2	Byte1(MSB): Minute Byte2(LSB): Hour	Byte1: 0 Byte2: 22	Byte1: 0-59 Byte2: 0-23
86-92	The 1 st heat SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius: 210 Fahrenheit: 700	The range is greater than the lower limit and smaller than the upper limit
93-99	The 2 nd heat SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius: 165 Fahrenheit: 620	The range is greater than the lower limit and smaller than the upper limit
100-106	The 3 rd heat SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:210 Fahrenheit: 700	The range is greater than the lower limit and smaller than the upper limit
107-113	The 4 th heat SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:165 Fahrenheit: 620	The range is greater than the lower limit and smaller than the upper limit
114-120	The 1 st cool SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:255 Fahrenheit: 780	The range is greater than the lower limit and smaller than the upper limit
121-127	The 2 nd cool SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:295 Fahrenheit: 850	The range is greater than the lower limit and smaller than the upper limit
128-134	The 3 rd cool SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius: 255 Fahrenheit: 780	The range is greater than the lower limit and smaller than the upper limit
135-141	The 4 th cool SetPoint for Mon...Sun	2	n*0.1 Celsius or n*0.1 Fahrenheit	Celsius:280 Fahrenheit: 820	The range is greater than the lower limit and smaller than the upper limit
255	Factory Restore	1	1: Restore factory setting 0: Invalid	0	0-1

1-Year Limited Warranty

FCC Caution.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.