PYROBOX3-TRACE

PYROBOX3C-TRACE

PYROBOX5-TRACE

Installation and Operating manual

meitav-tec

Rev.1.2

Index

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Introduction

The PYROBOX3/3C/5-TRACE power boxes together with the PYROTRACE controller and interface panel, offer smart and easy control for HEAT TRACING SYSTEMS.
It can operate up to 4 heating zones and one auxiliary zone, with selectable sequencing method.
Typical applications include pipes, valves and gutters.

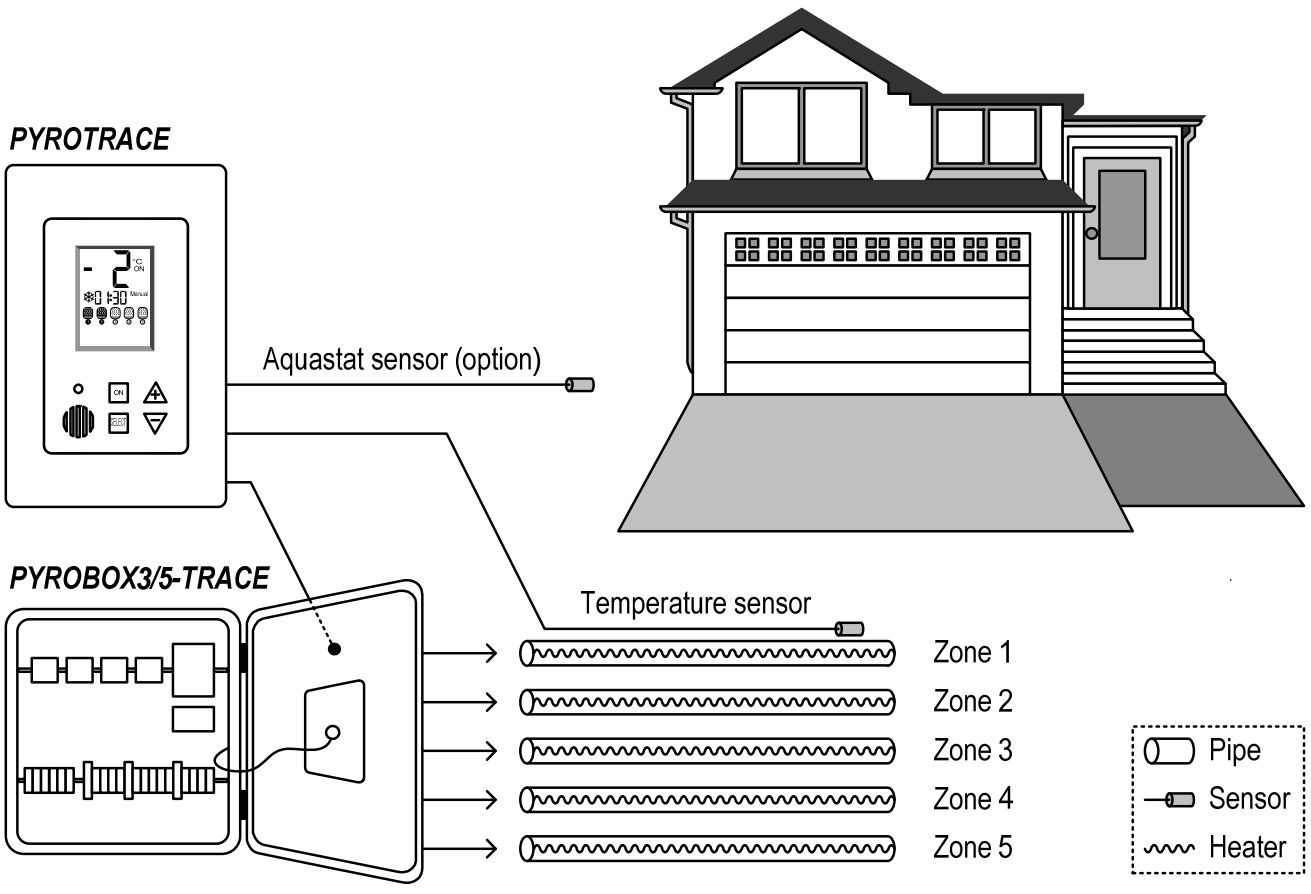
The backlit LCD screen provides full interface and information to the system status.

The Use of several zones staggering allow covering longer pipes length with less available electrical power.

The PYROTRACE offers various operating and programming options such as:

- Switchable temperature scales (°F or °C)
- Both Automatic and Manual modes
- Adjustable heaters cycle and splitting times
- Adjustable heaters hold on off delay
- Adjustable Lower ambient temperature limit to stop heaters (lockout)
- Energy saving temperature limit
- Commissioning/Test environment

PYROTRACE General system layout with PYROBOX3/5



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PLEASE READ THIS MANUAL AND THE SAFETY WARNINGS CAREFULLY BEFORE INSTALLING AND USING THE CONTROLLER AND SAVE IT FOR FUTURE USE

Installation notes

- Familiarize yourself with the markings, warnings, components and terminology.
- The PYROBOX power boxes and its accessories must be installed by a qualified electrician in accordance with local regulations and the requirements of the NEC (NFPA 72) and the CEC part 1.
- WARNING: Ensure the power is disconnect from all circuits before mounting the power box and making any connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.
- **Installer must ensure the installation of approved disconnect means, for all power supply circuits feeding this unit.**
- The power boxes are suitable for indoor wall mount installation only.
- Ensure wiring according to the provided schematics using copper conductors only.
- Make sure the wire gauge (AWG) is suitable for the circuit amperage draw, as specified in the NEC/CEC table 1.
- Ensure that the main breakers (fuses) are suitable for the heating systems rating (80% load).
- Grounding means must comply with local regulations and CEC/NEC.
- Ensure that the heating system/de-icing system connected to this unit complies with the UL 499 or UL 515 & CSA 22.2 # 130.3 standard and is certified / listed by an NRTL.
- Ensure that all wiring is rated for the application at 60°C (140°F as per UL 515 CSA 22.2 #130 clause 12 table 12.1.
- Ensure that any holes punched for conduit are to compromise the integrity of the enclosure ratings.

Ground fault circuit interrupter (GFCI)

- The ground fault interrupter/residual current detector installed in this system is a Non class A GFCI, intended for equipment protection.
- Familiar yourself with its operation and required setting.
- At installation and commissioning stage use a calibrated milliamp meter to read and record the heating systems natural leakage.

  Set the GFI/RCD to no more than 30 milliamps higher than that reading.
- This step might have to be repeated a few times, to avoid nuisance tripping.
- The GFCI should be tested monthly. Please refer to the calibration and testing instructions in appendix 1 of this manual.

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Wiring the PYROBOX5-TRACE

Heater load connection

Provide 3-Phase contactors C1, C2, C3 and C4 with up to 600 VAC, 50 AMP Maximum per pole.
Provide contactor C5 with with up to 300 VAC, 30 AMP.
Make sure the wire gauge (AWG) is suitable for the circuit Amperage draw, as specified in the NEC/ CEC table 1.

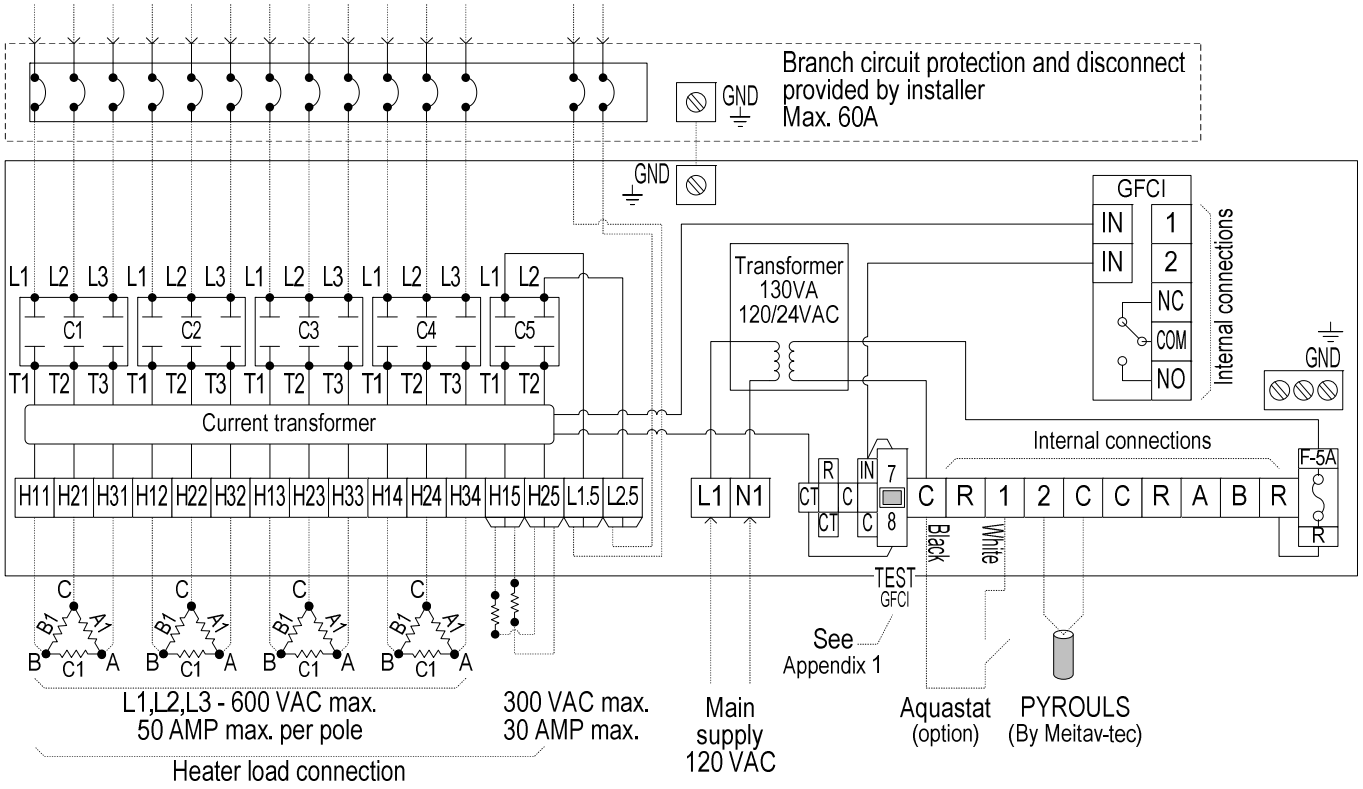
Main supply for the power box

Provide terminals L1, N1 with 120 VAC supply.

Caution: Incorrect voltage may cause fire or seriously damage the unit.

Connection to 3rd party ice/snow sensor (GIT-1 / CIT-1 / SIT/6E) - option

3-wire shielded cable
Up to 2,000 ft (609 m) using 12 AWG 3-wire shielded cable.
Up to 500 ft (152 m) using 18 AWG 3-wire shielded cable.



Important!
If the heaters are connected in star, the neutral must pass through the internal current transformer ring and the external branch circuit protection.

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Wiring the PYROBOX3C-TRACE

Heater load connection

Provide 3-Phase contactors C1 and C2 with up to 600 VAC, 50 AMP Maximum per pole.

Provide contactor C5 with with up to 300 VAC, 30 AMP.

Make sure the wire Gauge (AWG) is suitable for the circuit Amperage draw, as specified in the NEC/ CEC table 1.

Main supply for the power box

Provide terminals L1, N1 with 120 VAC supply.

Caution: Incorrect voltage may cause fire or seriously damage the unit.

Connection to 3rd party ice/snow sensor (GIT-1 / CIT-1 / SIT/6E) - option

3-wire shielded cable

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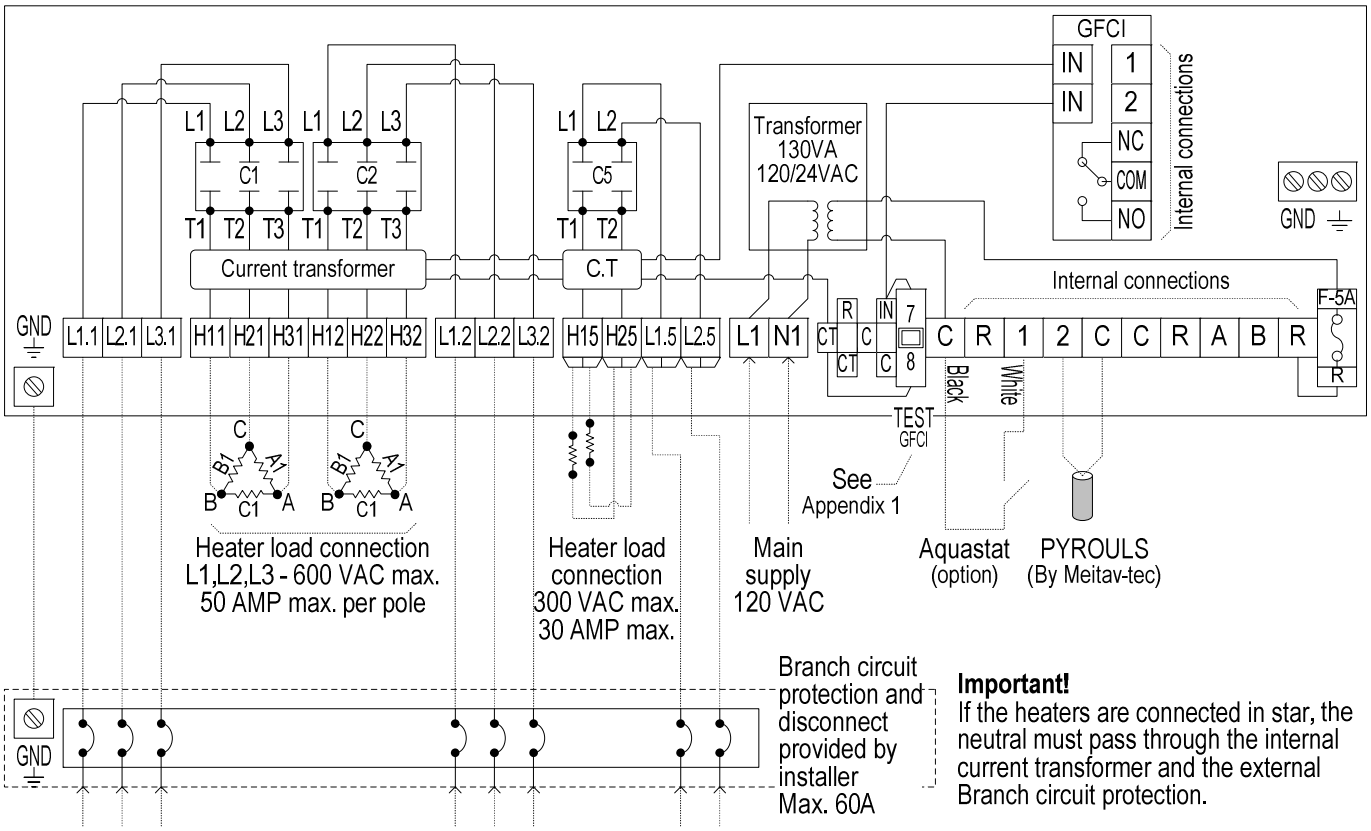

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Wiring the PYROBOX3-TRACE

Heater load connection

Provide contactors C1, C2, C3 and C4 with up to 300 VAC, 30 AMP.

Make sure the wire Gauge (AWG) is suitable for the circuit Amperage draw, as specified in the NEC/ CEC table 1.

Main supply for the power box

Provide terminals L1, N1 with 120 VAC supply.

Caution: Incorrect voltage may cause fire or seriously damage the unit.

Connection to 3rd party ice/snow sensor (GIT-1 / CIT-1 / SIT/6E) - option

3-wire shielded cable

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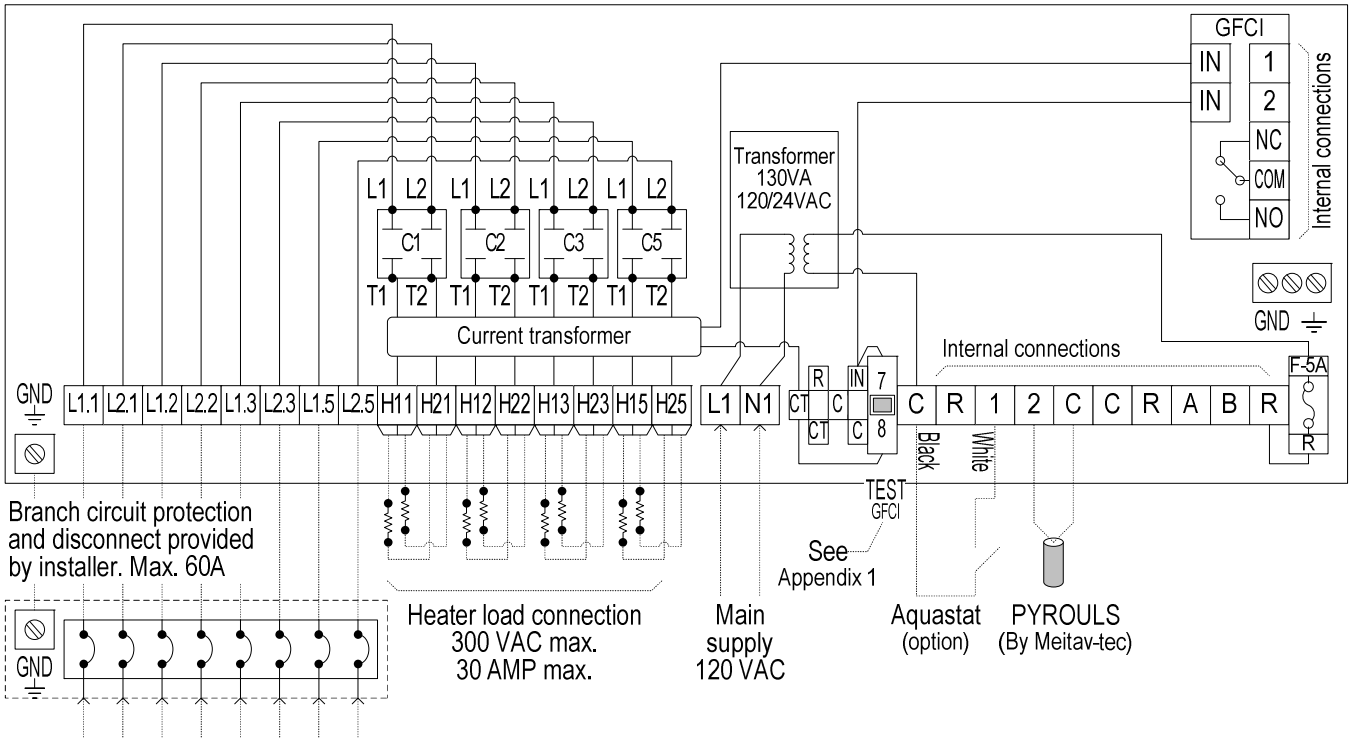

Important!
If the heaters are connected in star, the neutral must pass through the internal current transformer and the external Branch circuit protection.

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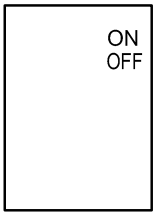
Operating instructions

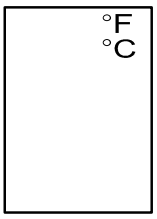
Turning the system ON and OFF

- Press and hold the [ON] button for 0.5 seconds to turn the system ON or OFF.
- The words “ON” or “OFF” will appear on display.



Selecting temperature scale

- Press the [+] button for Celsius.
- Press the [-] button for Fahrenheit.

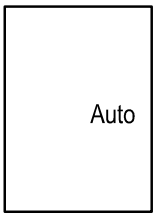


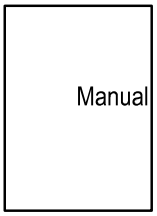
Selecting Automatic or Manual mode

- Press the [SELECT] button to switch between modes:

“Automatic” Heating will start and stop automatically depending on the set point and ambient temperatures.

“Manual ON” Heating will start regardless of the set point and ambient temperatures and will stop after a preset time (pls. refer to the “Manual ON” section in the tech. settings).





Note: Mode will always return to “Automatic” after switching the unit OFF and ON.

Heaters indication

The number beneath the heater icon indicate the heater stage (1 to 5).

Stg. 1 Stg. 2 Stg. 3 Stg. 4 Stg. 5

Black icon – Heater ON

White icon – Heater OFF

Heater ON

Heater OFF

Snow flake icon and digital time indication

A solid snow flake icon will appear on display during normal heaters operation.

A blinking snow flake icon will appear on display during heaters off delay or when manual mode is activated. The digital clock will count down the remaining time until the heaters are turned off.

The snow flake icon will disappear from display as long as the heaters are turned off.

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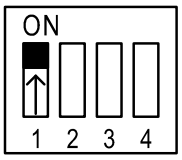
Technician settings

Use the technician settings mode to view and adjust the following parameters:

P01	Temperature set point
P02	Lower ambient temperature limit to stop heaters
P03	Time delay before stopping the heaters
P04	ON time for manual mode
P05	Heaters cycle time / Splitting time
P06	Enable/Disable 2nd temperature sensor logic (Aquastat)
P07	Heaters outputs logic
P08	MODBUS MAC Address for home automation system (option)
P09	Commissioning / Test mode
	Restore defaults

Enter technician settings mode

- **Move DIP switch S1 located on the side of thermostat to ON position.**
- Press the [SELECT] and [+] buttons simultaneously to move forward to the next technician parameter.
- Press the [SELECT] and [-] buttons simultaneously to return to the previous technician parameter.

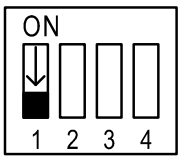


Enter technician settings mode

Save changes and exit technician settings mode

- **Move DIP switch S1 located on the side of thermostat to OFF position.**

Important: Changes made to technician parameters will not take effect as long as DIP switch S1 is in ON position.



Save changes and exit technician settings mode

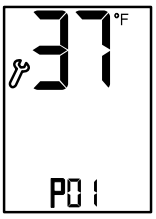
Parameters:

P01 - Temperature set point

- Move DIP switch S1 located on the side of thermostat to ON position.
- "P01" and the temperature set point will appear on display.
- Use the [+] and [-] buttons to adjust the temperature set point.

  Range: 5…60°F / -15…+15°C, Default: 37°F / 3°C

As long as the ambient temperature is lower than the temperature set point P01, the PYROTRACE will turn ON.



Temperature set point

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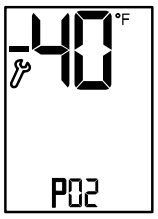
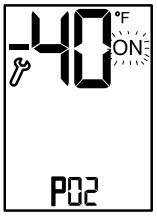
P02 - Lower limit temperature for heating

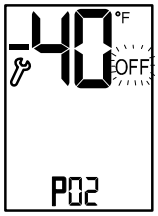
- Press the [SELECT] and [+] buttons simultaneously.
- "P02" and the low limit temperature will appear on display.
  When the temperature on the temperature sensor drops below the low temperature limit, the heating system will stop.
- Use the [+] and [-] buttons to adjust the temperature set point.
  Range: -40…+23°F / -40…-5°C Default: -40°F / -40°C
- Press the [SELECT] and [+] buttons simultaneously again.
- The word "ON" or "OFF" will appear on display.
- Use the [+] and [-] buttons enable (ON) or disable (OFF) the P02 parameter.
  If disabled, the heating system will operate without low temperature limitations.



Low limit Temperature



P02 enabled



P02 disabled

P03 -Time delay before stopping the heaters

- Press the [SELECT] and [+] buttons simultaneously.
- "P03", "dL" and the time delay before stopping the heaters (Hold ON) will appear on display.
- Use the [+] and [-] buttons to adjust the the time delay.
  Range: 0000...9999 minutes Default: 120 minutes

Time delay (minutes)

Note 1. The time delay countdown will start when the ambient temperatures rises above the set point temperature.

Note 2. The staggering sequence will continue during the time delay period.

↳ Cont'

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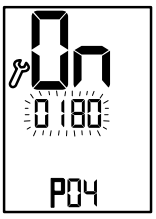
Technician settings (Cont')

P04 - Manual mode ON time

- Press the [SELECT] and [+] buttons simultaneously.
- "P04", "On" and the "Manual ON" mode time period will appear on display.
  The time frame in which the heaters remain ON after receiving an "Manual ON" command.
- Use the [+] and [-] buttons to adjust the "Manual ON" time.
  Range: 0000...9999 minutes Default: 180 minutes



Manual ON (minutes)

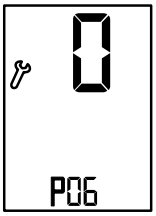
P05 – Heaters cycle and splitting time

- Press the [SELECT] and [+] buttons simultaneously.
- "P05", "SP" and the splitting time will appear on display.
  The minutes will blink.
  The heaters cycle / splitting time parameter defines the working time of the heaters when working in sequence.
  Example: the splitting time is set to 10 minutes and 4 heaters work in sequence, each heater will be ON for 2.5 minutes (10/4=2.5).
- Use the [+] and [-] buttons to adjust the splitting time.
  Range: 10...1999 minutes Default: 60 minutes.

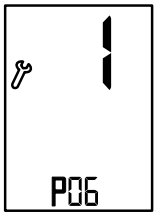
Splitting time

P06 – Enable/Disable Temperature sensor / Aquastat logic

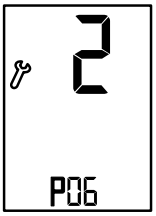
- Press the [SELECT] and [+] buttons simultaneously.
- "P06" and the number "0" or "1" will appear on display.
- Use the [+] and [-] buttons to select between:
  "0" - Logic set by both TEMPERATURE SENSOR and AQUASTAT (default).
  "1" - Logic set by TEMPERATURE sensor only.
  "2" - Logic set by AQUASTAT sensor only



Logic by temperature sensor and aquastat



Logic by temperature sensor only



Logic by aquastat sensor only

↳ Cont'

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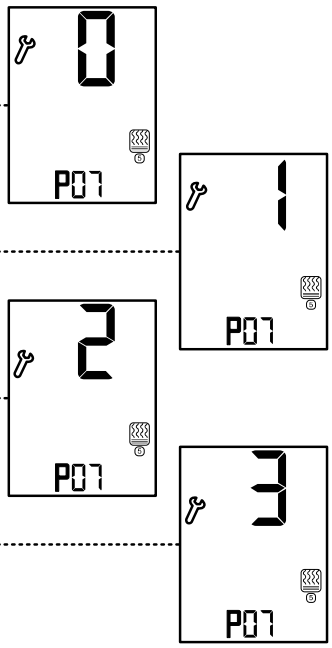
P07 - Heaters outputs logic (by TEMPERATURE SENSOR or by AQUASTAT SENSOR)

- Press the [SELECT] and [+] buttons simultaneously.
- "P07" and the figures "0", "1", "2" or "3" will appear on display.
- Use the [+] and [-] buttons to define the logic of output 1-5 as follows:

Option	Temperature Sensor	Aquastat Sensor
0	1 2 3 4 5 (4-5 linked)	
1	1 2 3 4	5
2		1 2 3 4 5
3	1 2 3	4 5 (linked)



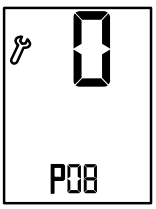
Linked heaters

Notes:

1. If option 2 is selected, the temperature display will remain blank.
2. If P06=1, only option "0" is available.
2. If P06=2, only option "2" is available.

P08 – MODBUS MAC Address

- Press the [SELECT] and [+] buttons simultaneously.
- "P08" and the MODBUS MAC Address will appear on display.
- Use the [+] and [-] buttons to set the MAC Address of the unit.
  Setting the MAC address for the unit will make it available through the home automation system.
  Range: 0 – 60.
  Select "0" for NO COMMUNICATION system (default).



MODBUS
MAC Address

↳ Cont'

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Technician settings (Cont')

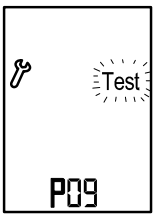
P09 - Test conditions mode / Technician commissioning mode

Turn ON test conditions to check the functionality of the system regardless of temperature sensors parameters (i.e. during the summer).

In test conditions, the Ambient temperature is always -7°C/19°F.

- Press the [SELECT] and [+] buttons simultaneously.
- "P09" will appear on display.
- Use the [+] button to enter test/commissioning mode – the word "Test" will appear on display.
- Use the [-] button to manually exit test/commissioning mode – the word "Test" will disappear from display.

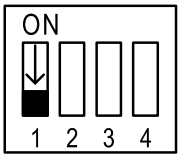
Note: If the technician did not manually exit test/commissioning mode, the unit will automatically return to normal mode after 5 hours.



Test conditions mode

Save changes and return to normal display

- In order to save changes and return to normal display, move DIP switch S1 back to OFF position.



Important: Changes made to technician parameters will not take effect as long as DIP switch S1 is in ON position.

Restore default values

- Move DIP switch S1 to ON position.
- Press and hold the [ON] button for 10 seconds. The thermostat will beep.
- Move DIP switch S1 back to OFF position.

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Technician settings (Cont')

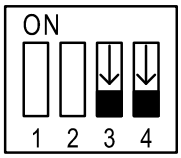
DIP switch S2 - Short measuring times (test only)

- Use DIP switch S2 to short the
  - "ON" - Short measuring times – for test/commissioning only (measuring times will be divided by 60).
  - "OFF" - Normal operation.

Short measuring times: A real 1 hour will take 1 minute and a real 1 minute will take 1 second.

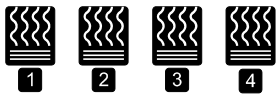
DIP switches S3 and S4 – heaters sequencing logic

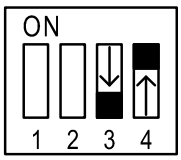
- Use DIP switches S3 and S4 to define the sequencing logic of the heater (zones) as follows:



S3 OFF, S4 OFF

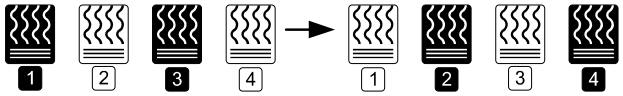
All 4 outputs work per request from the temperature sensor

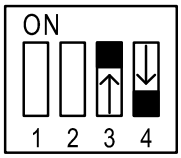




S3 OFF, S4 ON

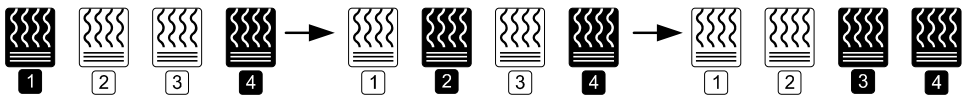
Outputs 1+3 and outputs 2+4 work together (according to splitting time)

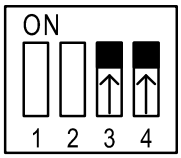




S3 ON, S4 OFF

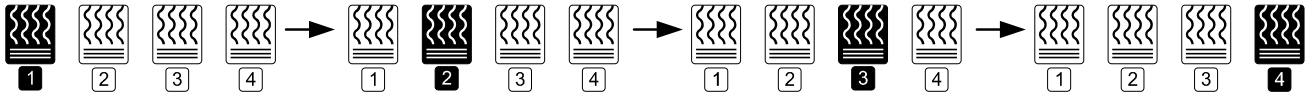
Outputs 1,2 and 3 work in sequence (according to splitting time) and output 4 works continuously.





S3 ON, S4 ON

All 4 outputs work in sequence (according to splitting time)



Note: if output 5 is set to work together with outputs 1-4, (see "Heater output no. 5 logic" in the technician settings), it will operate the same as output 4.

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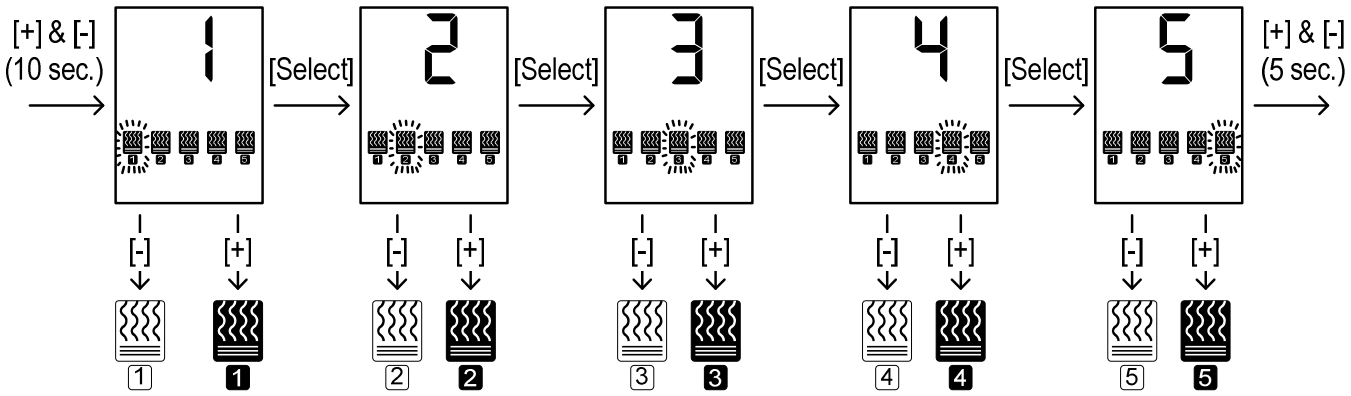
Enable/Disable zones

Follow the steps below to enable or disable each of the 5 zones.

By default, all zones are enabled.

1. Turn the thermostat OFF.
2. Press and hold both the [+] and the [-] buttons simultaneously for 10 seconds.
3. Choose the required zone using the [Select] button. Selected zone number will appear on display and the heater icon will flash.
4. Use the [+] button to enable the selected zone (black heater icon).
5. Use the [-] button to disable the selected zone (white heater icon).
6. Repeat steps above 3 to 5 for any required zone.
7. Press and hold both the [+] and the [-] buttons simultaneously again for 5 seconds to return to normal display.



Black icon – Zone enabled

White icon – Zone disabled

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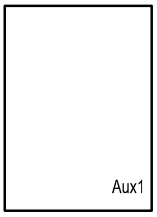
System Errors

Error 1 – MODBUS Communication error

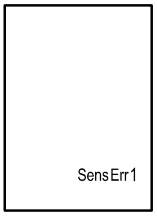
"Aux1" Will appear on display.



Communication error

Error 2 – Temperature sensor is not connected or short circuit

"SensErr 1" Will appear on display.



Temperature Sensor error

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Appendix 1
Calibrating and testing the internal GFCI

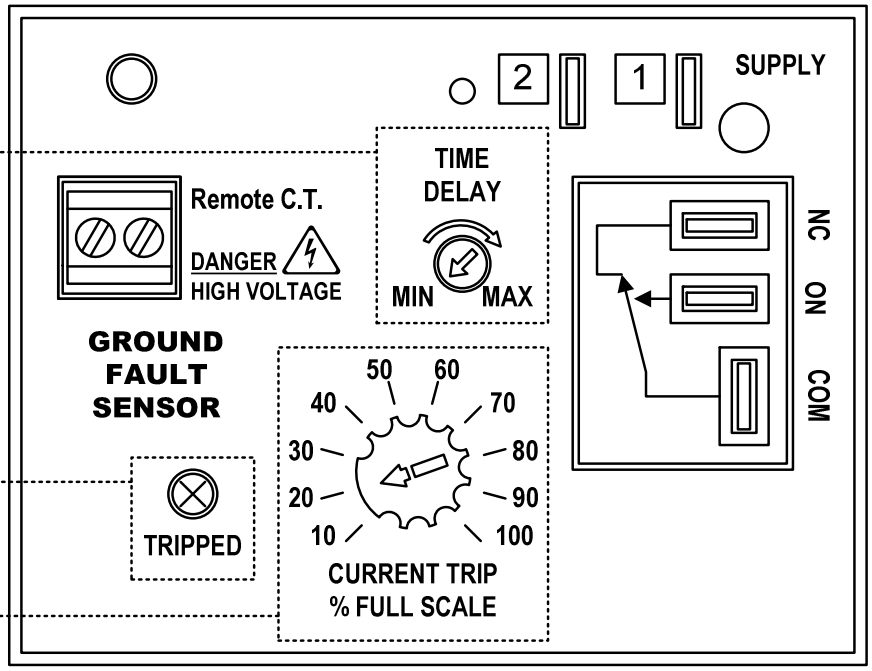
The GFCI (ground fault circuit interrupter) is designed to provide protection for electrical equipment. The "ON" Time Delay and Current Trip should be configured to match application requirements.

"ON" Time delay

Turn clockwise to increase
Counter-clockwise to decrease
(Default: Minimal time delay)

Tripped relay LED indicator

Current Trip - % full scale
(model dependent – see table)
(Default: 20%)



Indicator (%)	Current trip (Amps)	
	PYROBOX5	*PYROBOX3/3C*
10	0.1	0.01
20	0.2	0.02
30	0.3	0.03
40	0.4	0.04
50	0.5	0.05
60	0.6	0.06
70	0.7	0.07
80	0.8	0.08
90	0.9	0.09
100	1.0	0.10

GFCI TEST

The GFCI should be tested monthly. Press the red GFCI TEST button located next to the R,C terminals inside the box for 3 seconds to trip the outlet and break the circuit. The RED internal LED on the GFCI and the RED external lamp on the box door should lit. Press the RESET GFCI button on the box door for 5 seconds to return to normal operation and reestablish power and protection.

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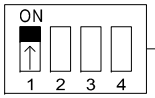
Enter technician settings



Move DIP switch S1 located on the side of thermostat to ON position.

P01 Temperature set point

Adjust

Adjust the temperature set point.
Above this temperature the outputs to the heaters will not be activated.
Range: -15ºC - +15ºC. Default +3ºC (5ºF - +59ºF. Default +37ºF)
Note: the temperature is measured by the PYROULS

P02 Low limit Temperature

Adjust
-40…+23°F
-40…-5C°C
Def: -40°C/-40°F

Enable/Disable
ON – Enable
OFF - Disable

Adjust and enable/disable the low limit temperature.
When temperature on snow sensor drops below the low temperature limit, the heating system will stop.

P03 Time delay

Adjust minutes
00…9999
Def: 120

Adjust the time delay before stopping the heaters.
Note 1. The time delay countdown will start when the temperature value from the temp. sensor will rise above the Temp. Set-Point.
Note 2. The staggering sequence will continue during the time delay period.

P04 Manual ON

Adjust minutes
00…9999
Def: 180

Adjust the "Manual ON" mode time period.
The delay time parameter defines a time frame in which the heaters remain ON after receiving a "Manual ON" command.

P05 Splitting time

Adjust minutes
10…1999
Def: 60

Adjust the splitting time. The heaters cycle / splitting time parameter defines the full cycle working time of all the heaters when working in sequence.

P06 Temp.sensor/ Aquastat logic

Select
0...3
Def: 0

Select temperature sensor/Aquastat logic

"0" - Logic by temperature sensor and aquastat.
"1" - Logic by temperature sensor only.
"2" - Logic by aquastat sensor only.

P07 Logic of sensors And outputs

Select
0...3
Def. 0

Define heaters control by the temperature sensors

"0" - 1-5 by PYROULS. 4 & 5 operate together.
"1" - 1-4 by PYROULS. 5 by aquastat party.
"2" - 1-5 by aquastat . Temperature display blank.
"3" - 1-3 by PYROULS. 4 & 5 by aquastat.

P08 MODBUS MAC address

Set
0 – 60
default = 0

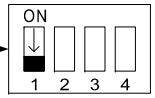
Set the MODBUS MAC address of the PYROCON12_TRACE, make it available for the home automation system. The MODBUS Object List is available in the user manual.
0 value = no communication for the PYROCON12_TRACE

P09 Test mode (commisioning)

Enable/Disable

Turn ON test conditions to check the functionality of the system regardless of sensors parameters. Note: If the technician did not manually exit test/ commissioning mode, the unit will automatically return to normal mode after 5 hours.

Save changes and Exit technician settings



Move DIP switch S1 located on the side of thermostat to OFF position.

Important: Changes made to technician parameters will not take effect as long as DIP switch S1 is in ON position.

Rev 1.2

Restore default values

Move DIP switch S1 to ON position.
Press and hold the [ON] button for 10 seconds.
Move DIP switch S1 back to OFF position.

DIP switch S2 - Short measuring times (test only)

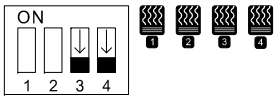
- "ON" - Short measuring times – for test/commissioning only (measuring times will be divided to 60).
- "OFF" - Normal operation.

Short measuring times: A real 1 hour will take 1 minute and a real 1 minute will take 1 second.

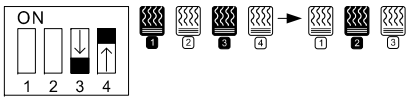
DIP switches S3 and S4 – heaters sequencing logic

Use DIP switches S3 and S4 to define the sequencing logic of the heater (zones) as follows:

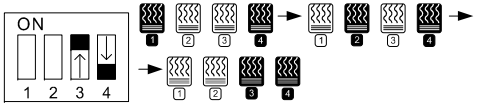
All 4 outputs work per request from the PYROULS or aquastat



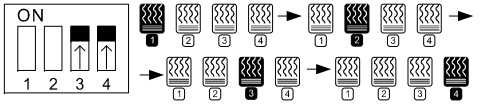
Outputs 1+3 and outputs 2+4 work together (by splitting time)



Outputs 1,2 and 3 work in sequence (by splitting time) and output 4 works continuously.



All 4 outputs work in sequence (by splitting time)



Note: if output 5 is set to work together with outputs 1-4, (see "Heater output no. 5 logic" in the technician settings), it will operate the same as output 4.

Enable/Disable zones

Turn Unit OFF.
While OFF, press both the [+] and [-] buttons for 10 sec.
Press the [Select] button to select zone.
Press the [+] and [-] buttons enable/disable the selected zone.
Black - Enabled zone. White – Disable zone.
Press both the [+] and [-] buttons for 5 seconds to exit.

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