Networkable Fan Coil Controller

Specification and Installation Instructions

Controller Models

EFCB10T-OE1 *(24Vac / 0 relays)*
EFCB12T-OE1 *(240Vac / 0 relays)*
EFCB10TU4-OE1 *(24Vac / 4 relays)*
EFCB12TU2-OE1 *(240Vac / 2 relays)*
EFCB12TU4-OE1 *(240Vac / 4 relays)*

TFL Series Thermostat

TFL24 *(Thermostat)*
TFLH24 *(Thermostat with humidity sensor)*
TFLG24 *(Thermostat with CO_2)*
TFLGH24 *(Thermostat with CO_2 and Humidity)*

TDU Series Thermostat

TDU10 *(Grey LCD, white enclosure)*
TDU40 *(Black LCD, black enclosure)*
TDU70 *(Black LCD, white enclosure)*

EFCB-OE1 Series

TFL24 Series

TDU10 / TDU40 / TDU70 Series

Description

The EFCB-OE1 Series Networkable Fan Coil Controller, and TFL24 and TDU Series LCD Thermostats are designed for simple and accurate control of any fan coil application. The Networkable Fan Coil Controller is mounted inside the fan coil cabinet and incorporates a configurable fan coil algorithm, variable three speed fan control and either modulating or digital heating and cooling outputs. All inputs and high/low voltage outputs are centralized at the control module in the fan coil cabinet.

Features

- Built-in configurable fan coil algorithms
- Up to 10 inputs and 15 outputs (configurable)
- Select direction on digital inputs and all outputs
- Selectable proportional control band and dead band
- Selectable fan speed contacts
- No occupancy and NSB override
- Independent cool/heat setpoint for NSB/OCC mode
- Independent fan speed for NSB or OCC mode
- Selectable internal or external temperature sensor (10KΩ)
- Change over by contact or 10KΩ temperature sensor
- Internal and external temperature sensor calibration
- Freeze protection
- Multi level lockable access menu and setpoint
- Removable, raising clamp, non-strip terminals

Thermostat Features

- Backlit LCD with simple icon and text driven menus
- Select thermostat's default display
- BACnet service port via on-board mini USB connector
- Selectable Fahrenheit or Celsius scale
- 3-wire connection to controller and 4 push buttons

Applications

- Compatible with 2 or 4 pipe systems
- Fan coil unit (up to 3 speeds and/or analog 0-10 Vdc)
- Cooling signal (on/off, floating or modulating 0-10 Vdc)
- Heating signal (on/off, floating, pulse or modulating 0-10 Vdc)
- Cool, Heat, Reheat, Reheat with fan, Changeover, Fan, Humidify and Dehumidify by cooling

Network Communication

- BACnet® MS/TP or Modbus communication port
- Select MAC address via DIP switch or via network
- Automatic baud rate detection

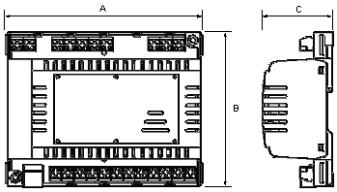
BACnet MS/TP®

- Automatic device instance configuration
- Copy & broadcast configuration via thermostat menu or via BACnet to other controllers
- BACnet scheduler
- Firmware upgradeable via BACnet
- Support COV (change of value)

Modbus

- Modbus @ 9600, 19200, 38400 or 57600 bps
- RTU Slave, 8 bits (configurable parity and stop bits)
- Connects to any Modbus master

Controller Specifications

Description	EFCB10T-OE1	EFCB12T-OE1	EFCB10TU4-OE1	EFCB12TU2-OE1	EFCB12TU4-OE1
Inputs	2 fixed analog inputs (external temp. and changeover sensors); 10KΩ or contact 4 analog inputs (0-10 Vdc or 10 KΩ via DIP switches) 3 configurable digital inputs 1 night setback or occupancy sensor input				
Outputs	4 analog, 0-10 Vdc configurable outputs (changeover/cooling/heating, fan, humidity) 4 configurable TRIAC outputs (changeover/cooling/heating) 3 speed fan (Motor and/or compressor inductive ratings: ¼ Hp/10 LRA/2.5 FLA 240 Vac Maximum Resistive ratings: 7 Amp/1680 W at 240 Vac Maximum); configurable up to 3 speeds 0, 2 or 4 configurable digital outputs (changeover/cooling/heating, humidity, 3A dry contact)				
Power supply	24 Vac	240 Vac	24 Vac	240 Vac	
Power consumption	8 VA max. 24 Vac thermal fused.				
BACnet	BACnet® MS/TP @ 9600, 19200, 38400 or 76800 bps (BAS-C)				
Modbus	Modbus RTU slave @ 9600, 19200, 38400 or 57600. Selectable parity and stop bit configuration: No parity, 2 stop bit Even parity, 1 stop bit Odd parity, 1 stop bit				
Communication Connections	24 AWG twisted-shield cable (Belden 9841 or equivalent)				
Electrical Connections	0.8 mm^2 [18 AWG] minimum				
Operating temperature	0ºC to 50ºC [32ºF to 122ºF]				
Storage temperature	-30ºC to 50ºC [-22ºF to 122ºF]				
Relative Humidity	5 to 95% non condensing				
Enclosure protection	IP 30 (EN 60529)				
Weight	635 g. [1.4 lb]				
Dimensions: A = 6.30” | 160mm B = 5.00” | 126mm C = 2.25” | 57mm					

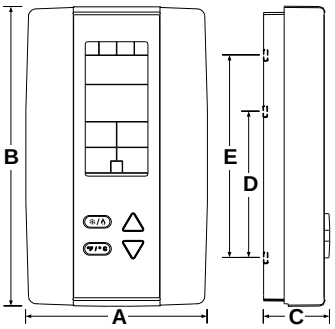
Thermostat Specifications

Description	TFL24 and TDU Series
Temperature Sensor (TFL24 and TDU)	
Setpoint Range	10ºC to 40ºC [50ºF to 104ºF]
Control Accuracy	±0.5ºC [0.9ºF] @ 22ºC [71.6ºF] typical calibrated
Display Resolution	±0.1ºC [0.2ºF]
Humidity Sensor (TFLH24, TFLGH24 and TDU models with Humidity Sensors)	
Setpoint Range	10 to 65%RH
Control Accuracy	±3.5% RH
Display Resolution	0.1%
CO_2 Sensor (TFLG24, TFLGH24 and TDU models with CO_2 Sensors)	
Operating Principle	Self-calibrating, Non-Dispersive Infrared (NDIR)
Sensor Range	400 to 2000 ppm
Accuracy	±30 ppm ±3% of reading (Accuracy is defined after minimum 3 weeks of continuous operation)
Response Time	2 minutes by 90%
Other	
Electrical connection	3 wires to EFCB controller and 2 wires (optional) to BACnet network service port 0.8 mm^2 [18 AWG] minimum
BACnet service port	Mini USB connector
Power supply	24Vac or 24Vdc
Power consumption	1VA
Operating temperature	0ºC to 50ºC [32ºF to 122ºF]
Storage temperature	-30ºC to 50ºC [-22ºF to 122ºF]
Relative humidity	5 to 95 % non condensing
Enclosure protection	IP 30 (EN 60529)
Weight	120 g. [0.25 lb]
Note: The TFL/TDU thermostat functions only with the EFCB controller. All the inputs/outputs are located on the EFCB except for the temperature/humidity sensor built-in the TFL/TDU.	

Dimensions

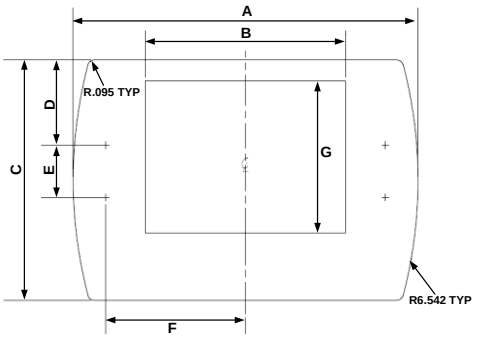
TFL

A = 2.85” | 73mm
B = 4.85” | 123mm
C = 1.00” | 24mm
D = 2.36” | 60mm
E = 3.27” | 83mm



TDU

A = 4.94” | 125mm
B = 2.87” | 72.8mm
C = 3.44” | 87mm
D = 1.22” | 31mm
E = 0.75” | 19mm
F = 2.00” | 51mm
G = 2.18” | 55mm



TDU Models

Model #	Temp	RH	CO_2	Color
TDU10-100	●			grey LCD white enclosure
TDU10-101	●	●		
TDU10-102	●	●	●	
TDU10-103	●		●	

TDU10 Series

Model #	Temp	RH	CO_2	Color
TDU40-100	●			black LCD black enclosure
TDU40-101	●	●		
TDU40-102	●	●	●	
TDU40-103	●		●	

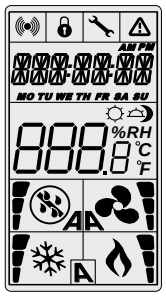
TDU40 Series

Model #	Temp	RH	CO_2	Color
TDU70-100	●			black LCD white enclosure
TDU70-101	●	●		
TDU70-102	●	●	●	
TDU70-103	●		●	

TDU70 Series

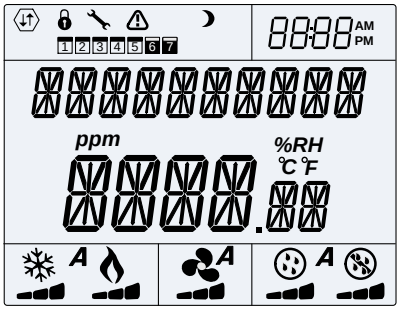
Interface

TFL24



	Cooling ON *A: Automatic*		*Communication Status*		*Alarm status*
	Heating ON *A: Automatic*		*Menu set-up Lock*		*Energy saving mode*
	Fan ON *A: Automatic*		*Programming mode (Technician setting)*	**%RH**	*Percentage of humidity*
	Humidity ON *33, 66 or 100% output*		*Dehumidification ON* *33, 66 or 100% output*	**°C or °F**	*ºC: Celsius Scale* *ºF: Fahrenheit Scale*

TDU



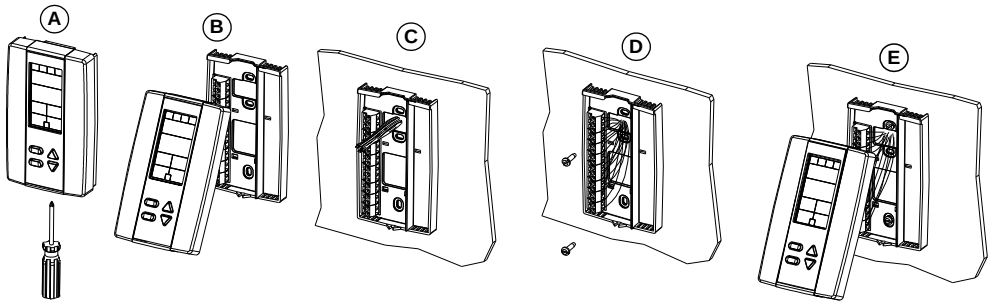
	Network Communication		*User Lock*		*Programming Mode (Technician Setting)*
	Alarm Status		*Energy Saving Mode (NSB/OCC)*	1 2 3 4 5 6 7	*Schedule*
88:88 AM PM	*Time*	*ppm*	*Parts Per Million*	*°C* *°F* *%RH*	*ºC: Celsius Scale* *ºF: Fahrenheit Scale* *%RH :Humidity*
A	*Automatic Mode*		*Cooling*		*Heating*
	Fan		*Humidify*		*De-humidify*

Mounting Instructions

TFL24

CAUTION: Remove power to avoid a risk of malfunction.

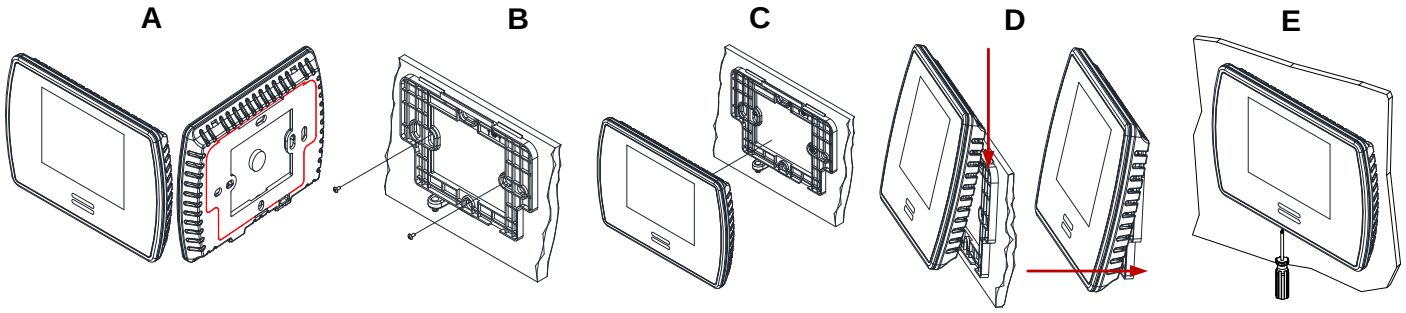
A. Remove the captive screw that's holding the base and the front cover of the unit together.
B. Lift the front cover of the unit to separate it from the base.
C. Pull all wires through the holes in the base.
D. Secure the base to the wall using wall anchors and screws (supplied). Make the appropriate connections.
E. Mount the control module on the base and secure using the screw.



TDU

CAUTION: Remove power to avoid a risk of malfunction.

A. Remove the wall mounting plate (highlighted) from the back of the thermostat.
B. Install the mounting plate on the gang box.
C. Pull the wires through the base hole and make the appropriate connections.
D. Mount the thermostat onto the wall plate. To mount the thermostat correctly, place the top of the thermostat on the mounting plate first and push it into the grooves to snap it into place.
E. Secure the thermostat using the screw (supplied).



BACnet or Modbus Address DIP Switch (DS2)

MAC address for communication, are selectable by DIP switch using binary logic. If you do not change device instance in program mode, it will be automatically modified according to the MAC address.

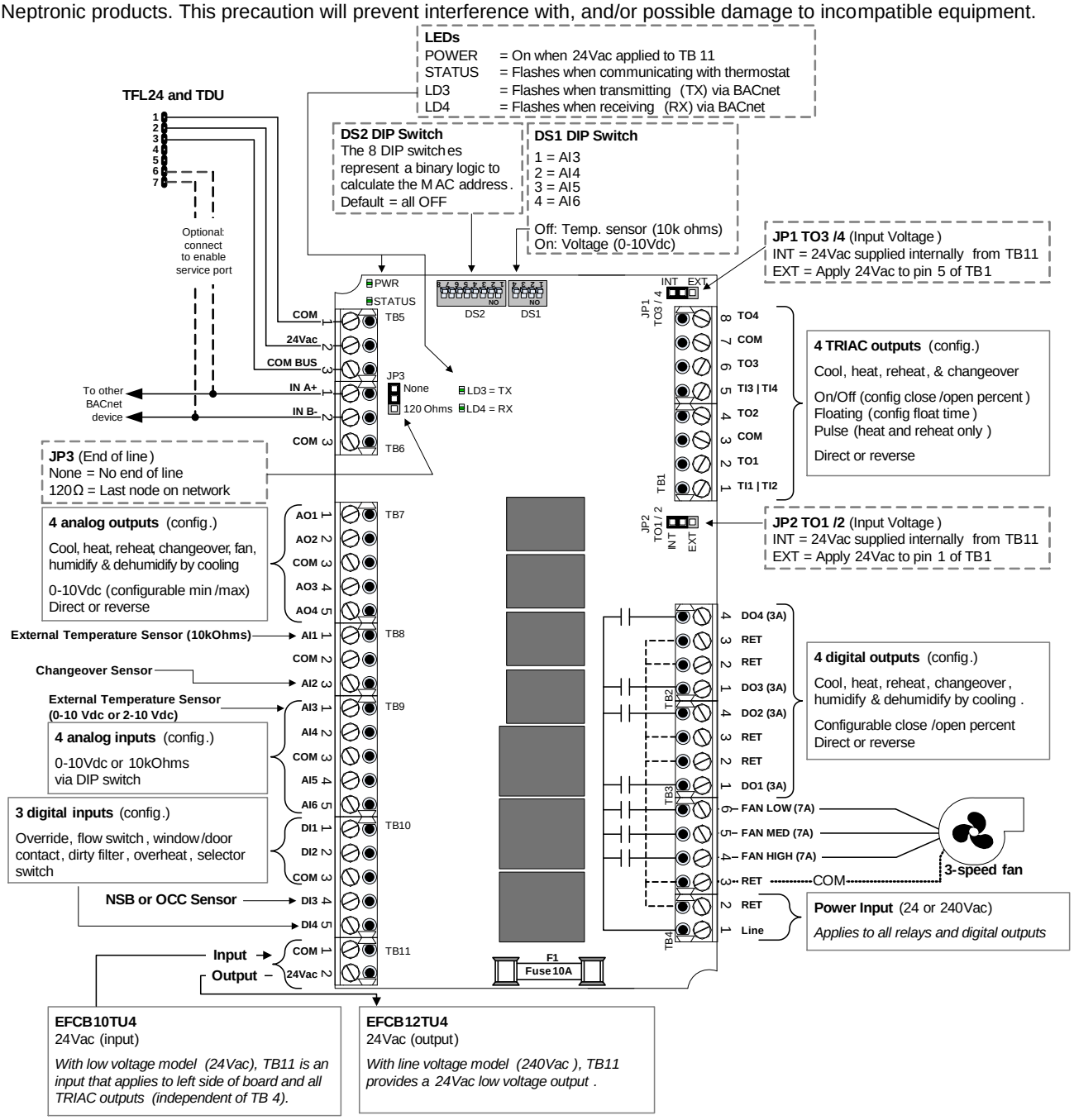
Note: Avoid using addresses above 246 when selecting Modbus MAC address.

MAC Address	DS.1 = 1	DS.2 = 2	DS.3 = 4	DS.4 = 8	DS.5 = 16	DS.6 = 32	DS.7 = 64	DS.8 = 128	Default Device Instance
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153000
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153001
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	153002
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	153003
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	153004
…	…	…	…	…	…	…	…	…	…
126	OFF	ON	ON	ON	ON	ON	ON	OFF	153126
127	ON	ON	ON	ON	ON	ON	ON	OFF	153127

** Slave addresses available by setting DS.8 to ON*

Wiring

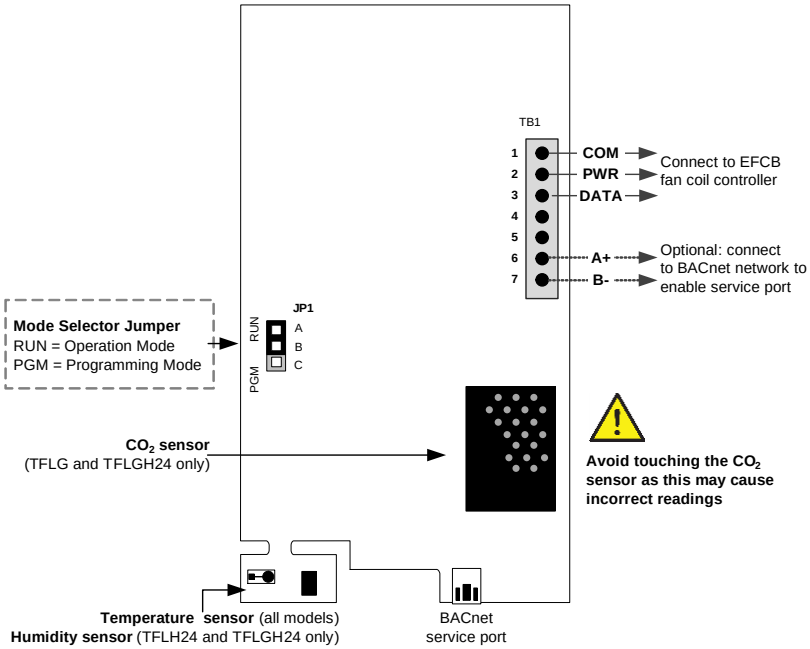
We strongly recommend that all Neptronic products be wired to a separate grounded transformer and that transformer shall service only Neptronic products. This precaution will prevent interference with, and/or possible damage to incompatible equipment.



PCB Drawings

TFL24 Thermostat

3 wire cable (TB1 #1, 2 & 3)
Connect TB1 #6 (A+) & #7 (B-) to EFCB to enable the BACnet service port.

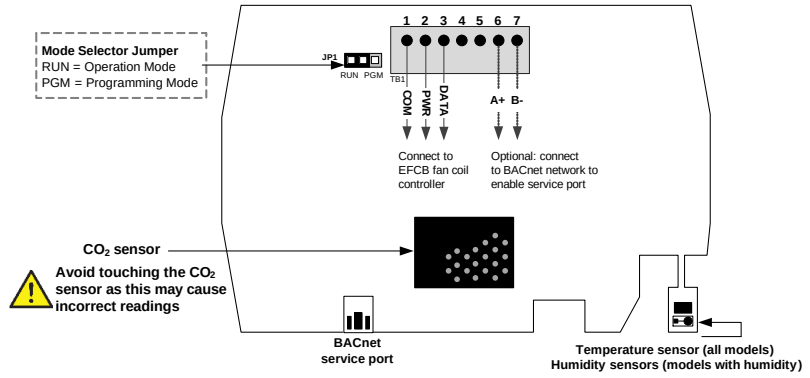


Mode Selection (JP1)

JP1 RUN PGM	**RUN:** Thermostat is in **Operation Mode**. Thermostat must be set in this mode for normal system operation. If not locked, setpoint and control mode can be changed by the end user.
JP1 RUN PGM	**PGM:** Thermostat is set in **Programming Mode**. Refer to the following sections for more details.

TDU Thermostat

3 wire cable (TB1 #1, 2 & 3)
Connect TB1 #6 (A+) & #7 (B-) to EFCB to enable the BACnet service port.



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JP1 RUN PGM	**PGM:** Thermostat is set in **Programming Mode**. Refer to the following sections for more details.

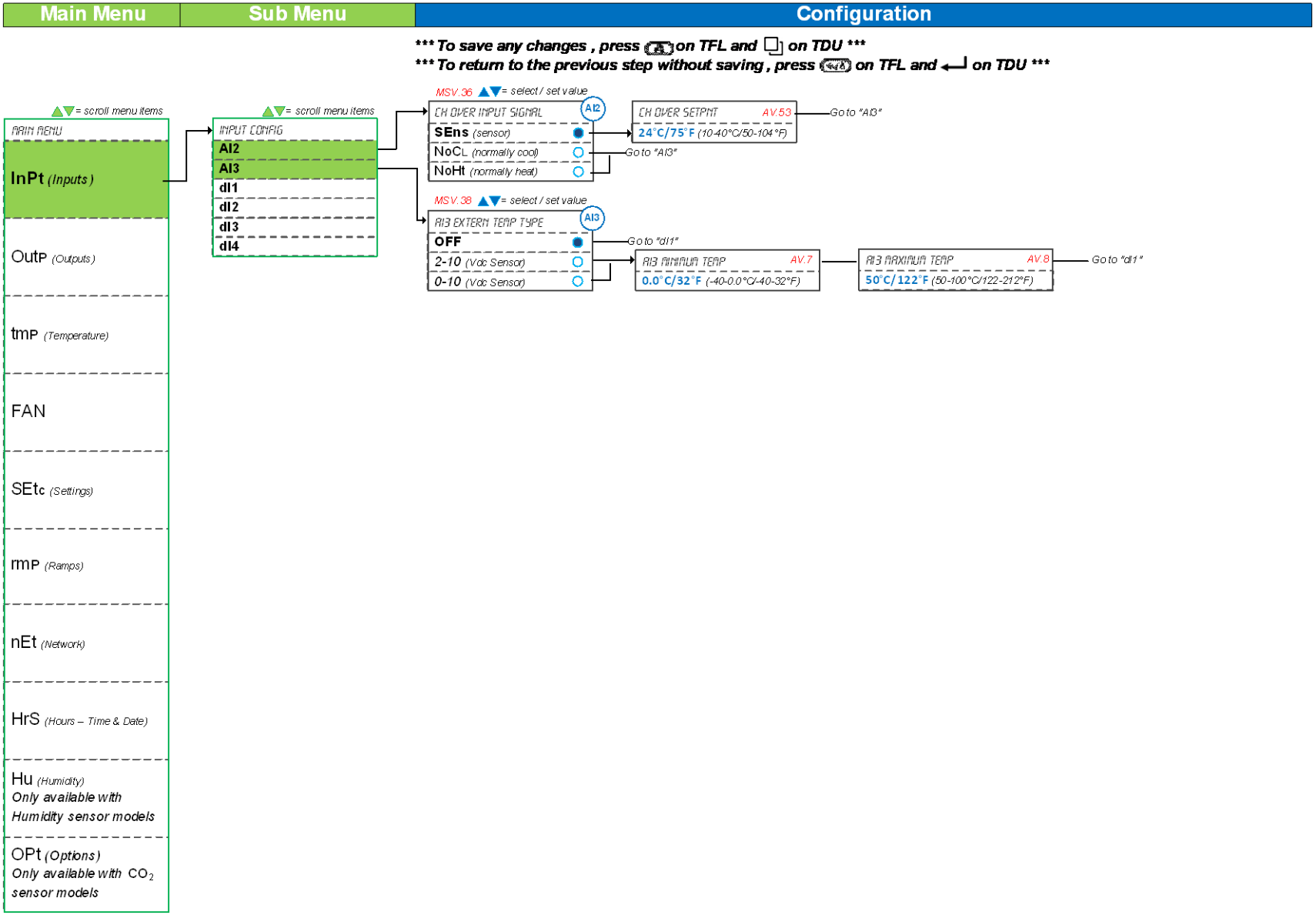
Access to Menus

The menu overviews and options are the same for both TFL24 and TDU thermostats. However, the action button or the button used to access the menus and save changes is different in the thermostats. Use the following menu overviews with the appropriate action button as per your thermostat.

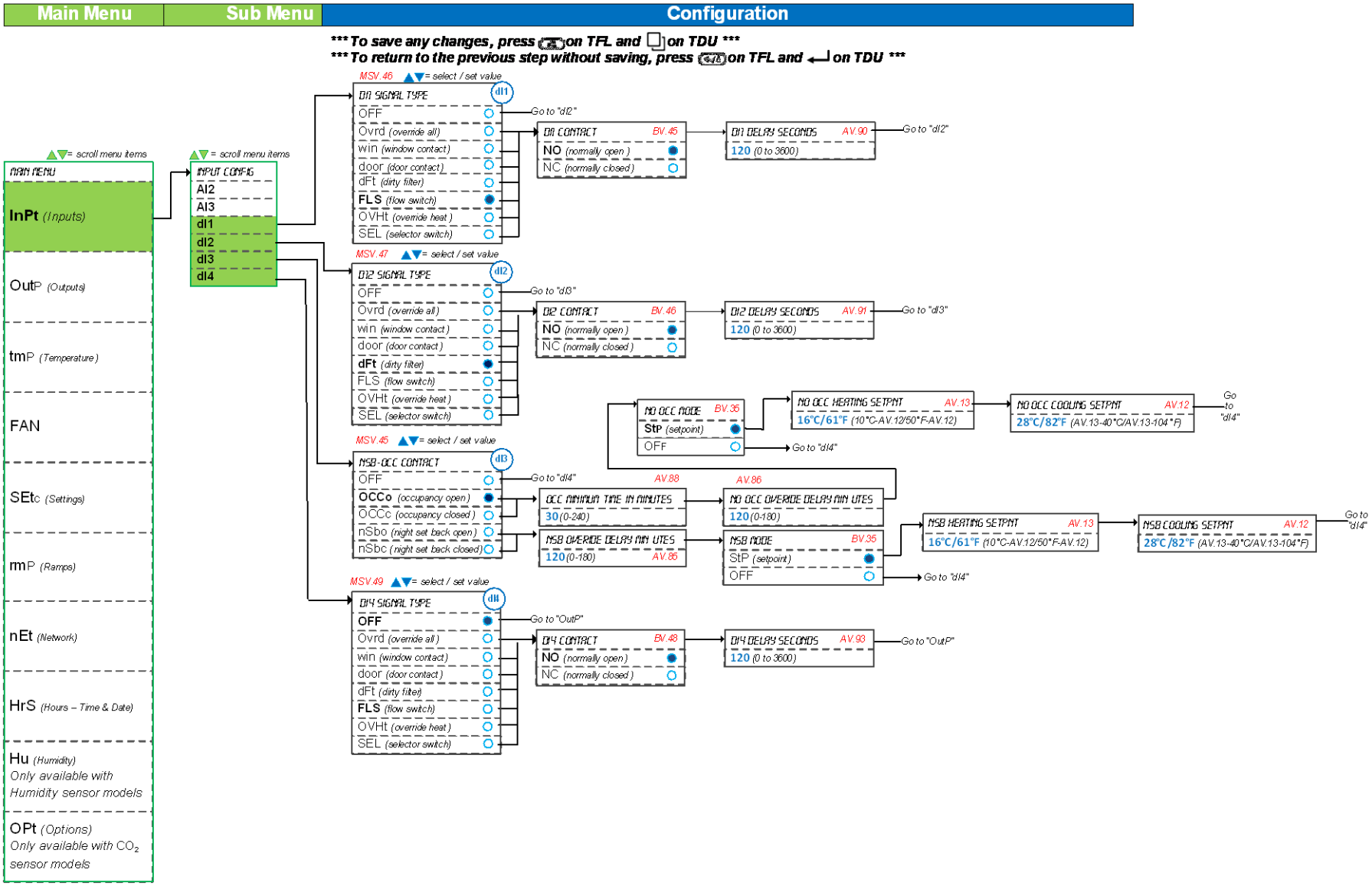
Action Buttons on Thermostat

Action Button		Task
TFL24	TDU	
		Press to access the programming menus and save any changes.
		Press to return to the previous step without saving.

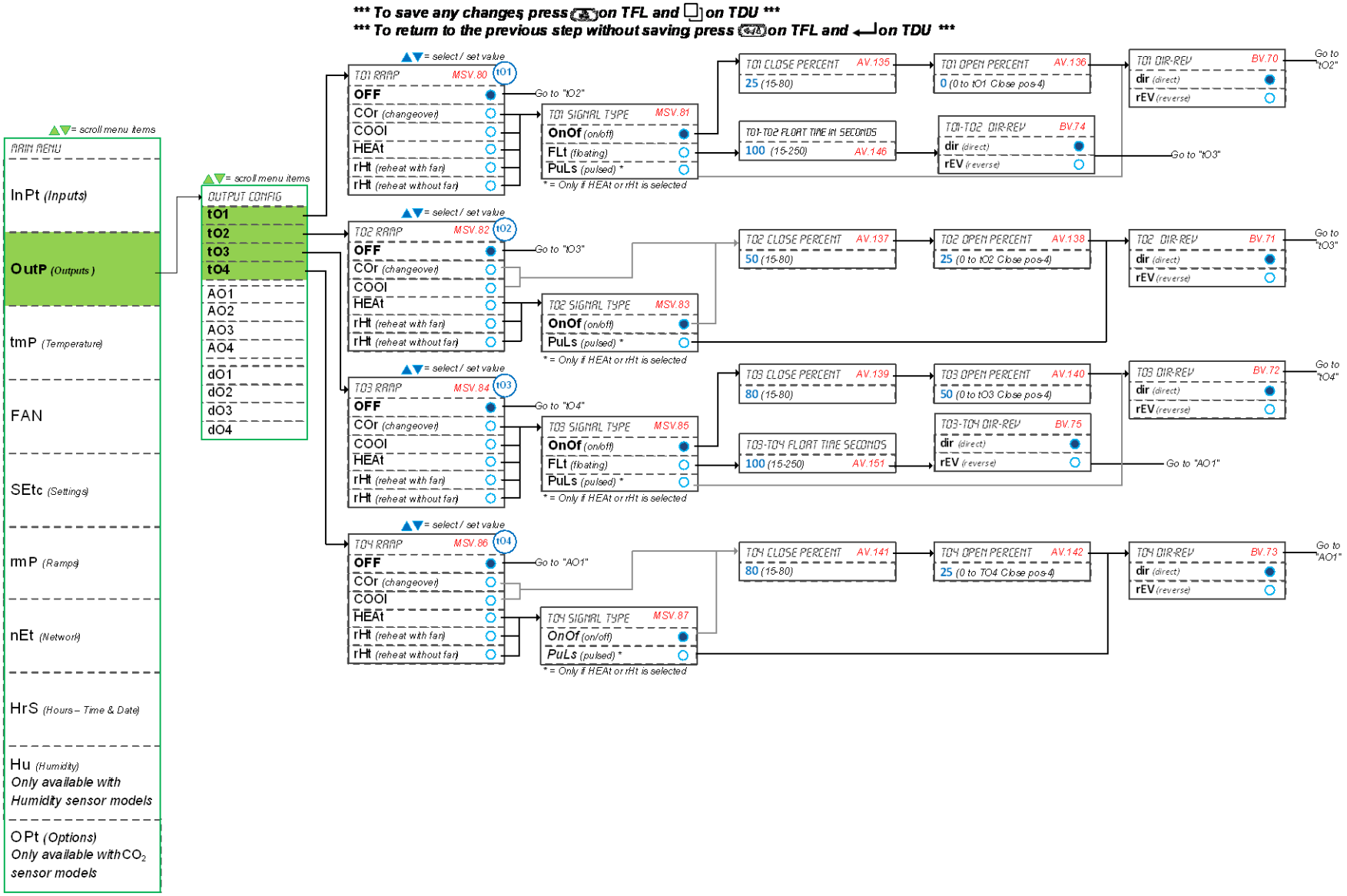
Analog Inputs – Menu Overview (1 of 8) | *AI1 and AI3*



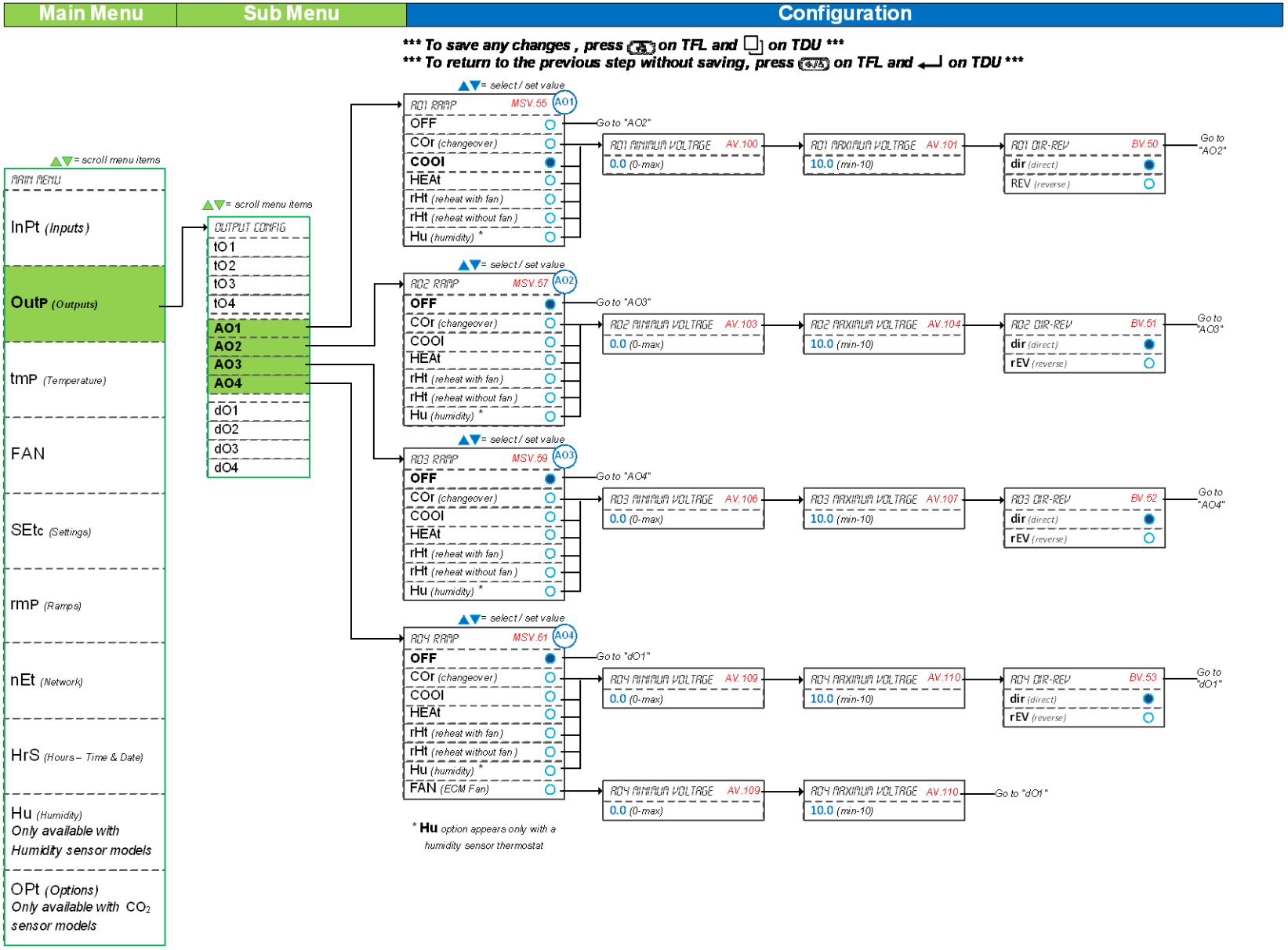
Digital Inputs – Menu Overview (2 of 8) | *DI1 to DI4*



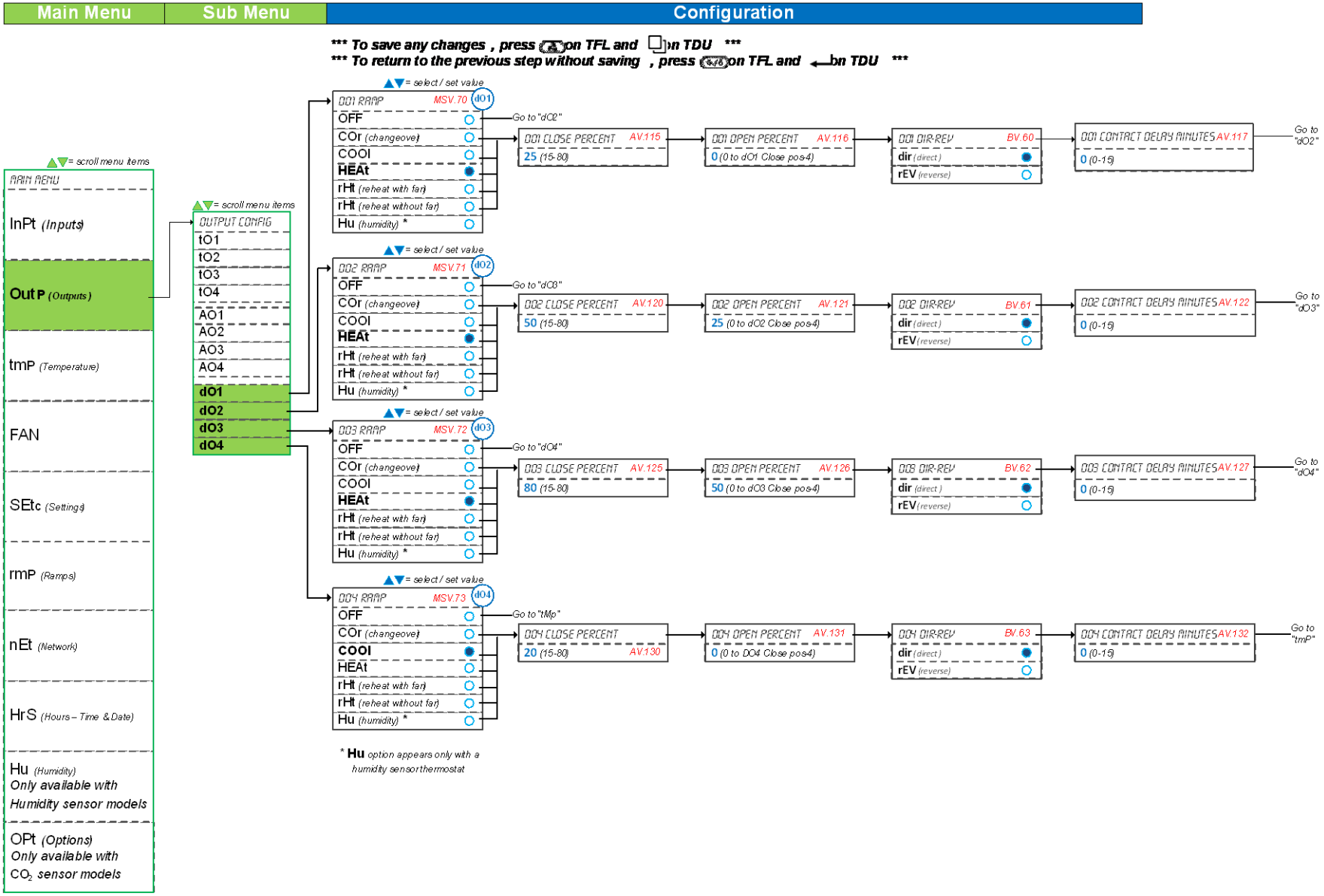
TRIAC Outputs – Menu Overview (3 of 8) | *TO1 to TO4*



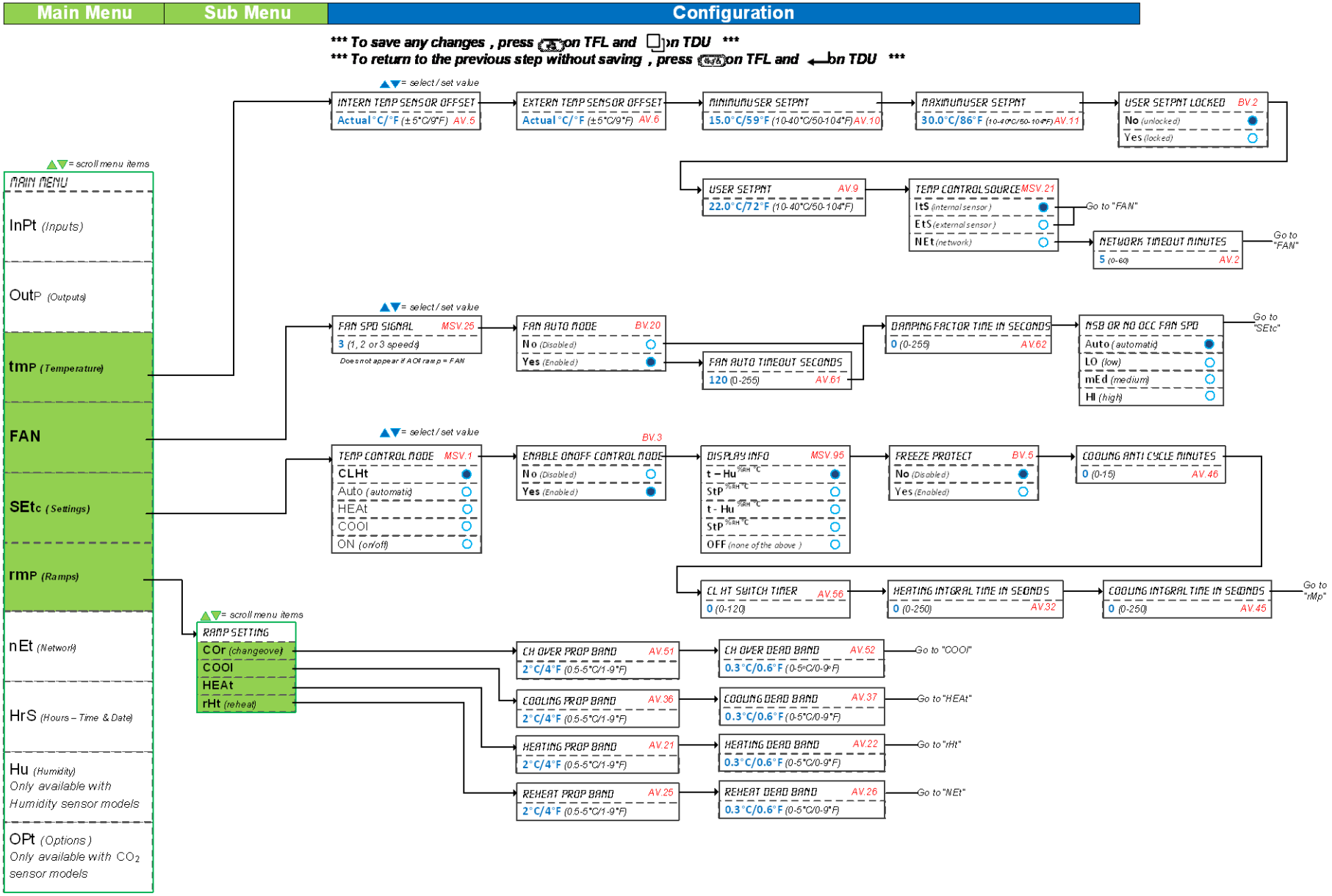
Analog Outputs – Menu Overview (4 of 8) | *AO1 to AO4*



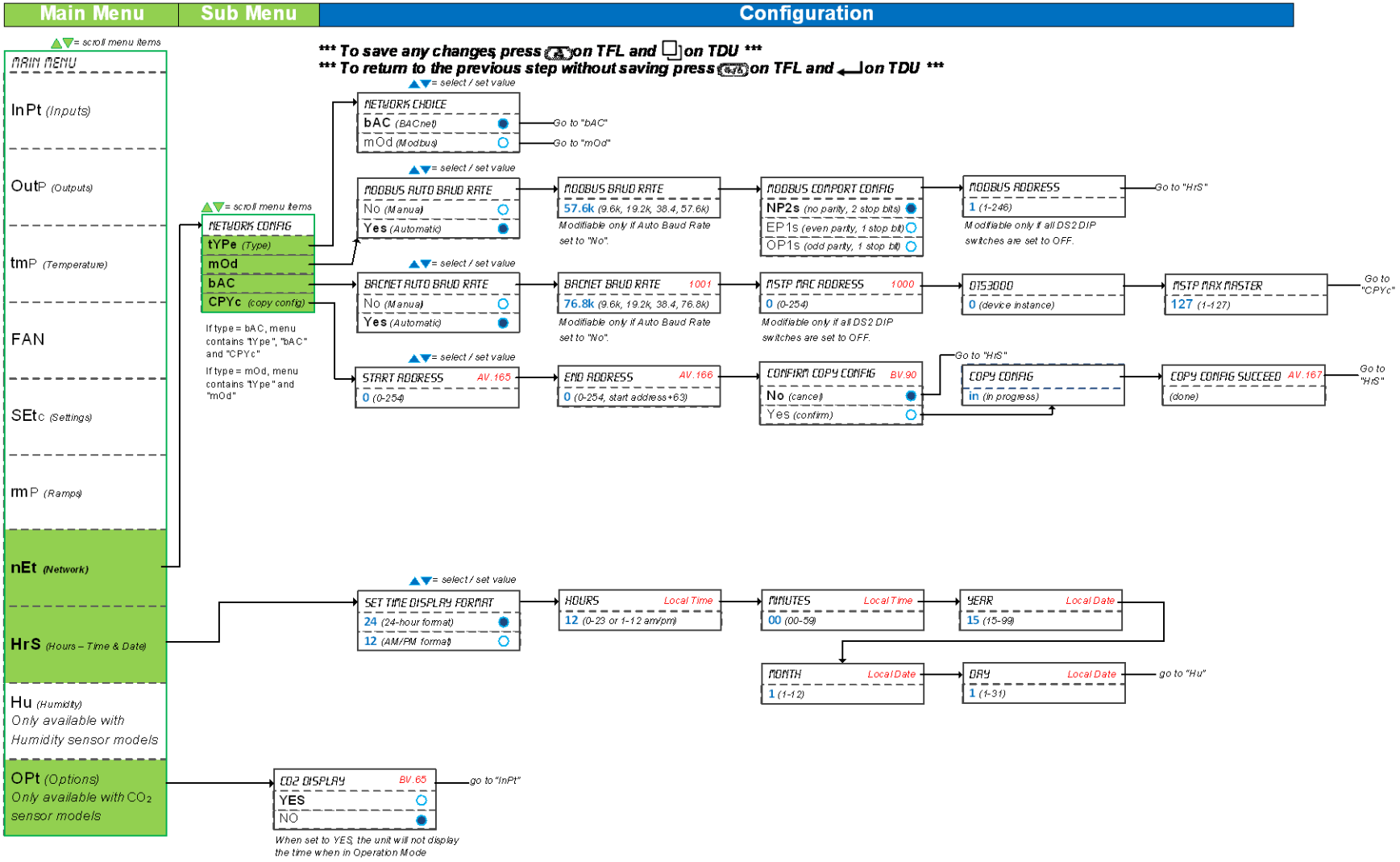
Digital Outputs – Menu Overview (5 of 8) | *DO1 to DO4*



Settings – Menu Overview (6 of 8) | *Temp, Fan, Settings and Ramps*

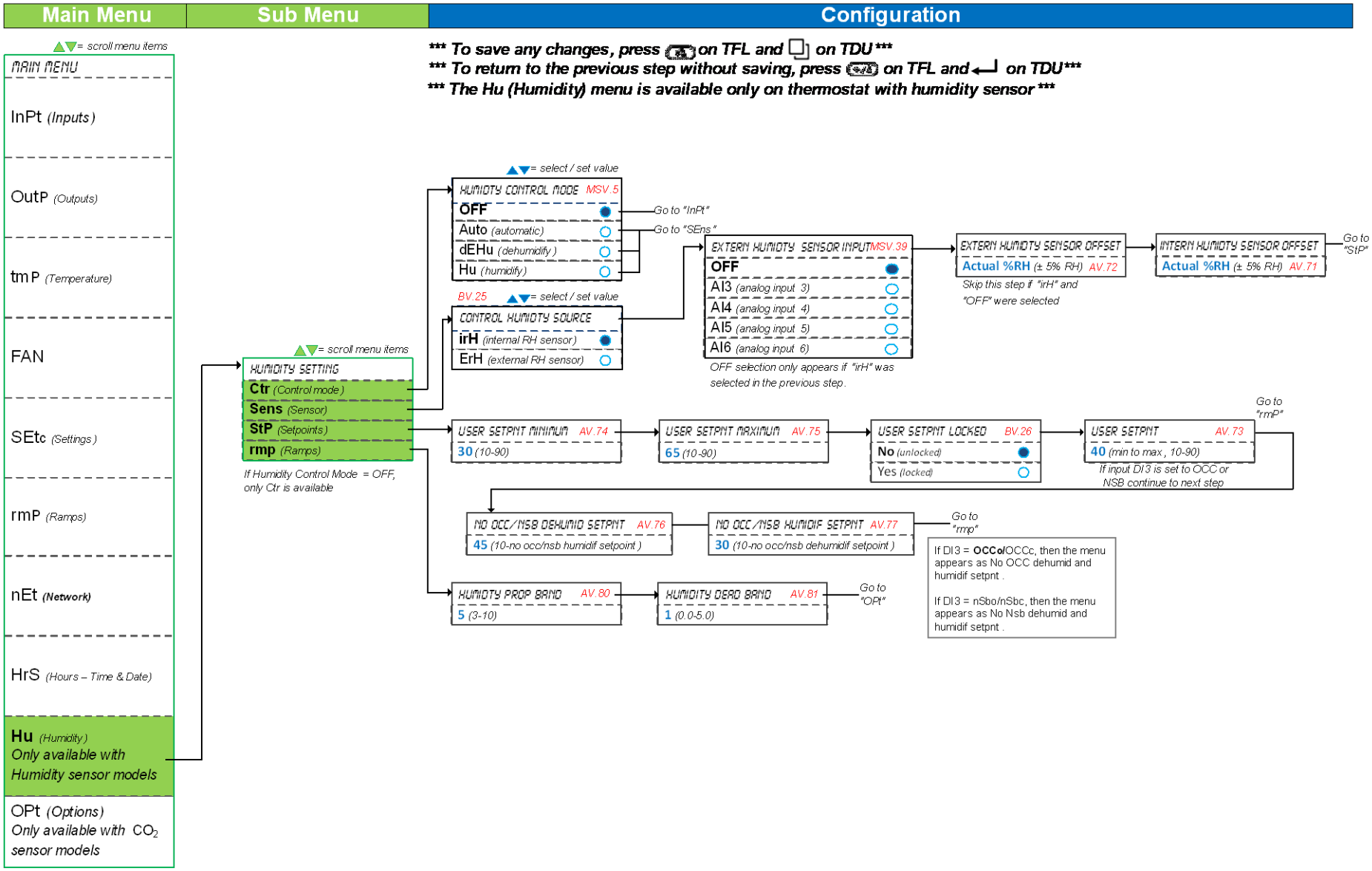


Network and Calendar – Menu Overview (7 of 8) | *Network, Time and Options*



Humidity – Menu Overview (8 of 8) | *Humidity*

Only available when a humidity sensor thermostat is connected to the controller



Auto Fan/Auto Speed Sequence (for analog, 2-speed or 3-speed)

Refer to MainMenu > Fan> for related options.

Auto Fan (*Fan Auto Mode* configuration)	Mode button	Fan button	If control demand > 0	If control demand = 0
Enable	Heat	Auto Speed*	Fan speed = heat demand	Fan = Off
		Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Cool	Auto Speed*	Fan speed = cool demand	Fan = Off
		Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Auto (H/C)	Auto Speed*	Fan speed = heat/cool demand	Fan = Off
		Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Fan	Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Off	Off	Off	Off
Disable	Heat	Auto Speed*	Fan speed = heat demand	Fan speed = Low
		Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Cool	Auto Speed*	Fan speed = cool demand	Fan speed = Low
		Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Auto (H/C)	Auto Speed*	Fan speed = heat/cool demand	Fan speed = Low
		Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Fan	Low	Fan speed = Low	Fan speed = Low
		Medium	Fan speed = Medium	Fan speed = Medium
		High	Fan speed = High	Fan speed = High
	Off	Off	Off	Off

Auto Fan/Auto Speed Sequence (for 1-speed)

Auto Fan (*Fan Auto Mode* configuration)	Mode button	Fan button	If control demand > 0	If control demand = 0
Enable	Heat	Auto Speed*	Fan speed = On on heat demand	Fan = Off
		On	Fan = On	Fan = On
	Cool	Auto Speed*	Fan speed = On on cool demand	Fan = Off
		On	Fan = On	Fan = On
	Auto (H/C)	Auto Speed*	Fan speed = On on heat/cool demand	Fan = Off
		On	Fan = On	Fan = On
	Fan	On	Fan = On	Fan = On
	Off	Off	Off	Off
Disable	Heat	On	Fan = On	Fan = On
	Cool	On	Fan = On	Fan = On
		On	Fan = On	Fan = On
	Fan	On	Fan = On	Fan = On
	Off	Off	Off	Off

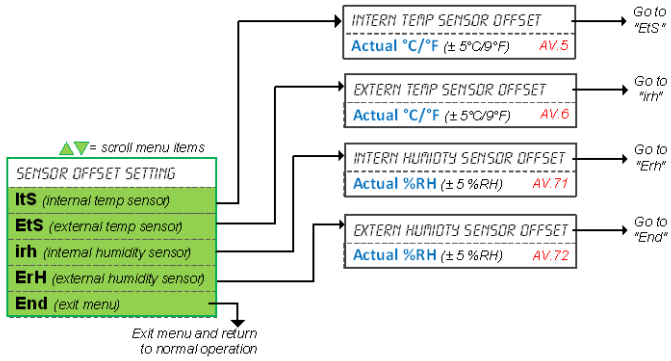
*When fan button is set in **Auto Speed**, the symbol will be apparent.

Operation Menus

This menu is accessible through normal operation mode.
Note: Since the action buttons are different on the TFL24 and TDU thermostat series, both buttons have been included in the instructions. Refer to the Action Buttons on Thermostat section to know and use the button as available on your thermostat.

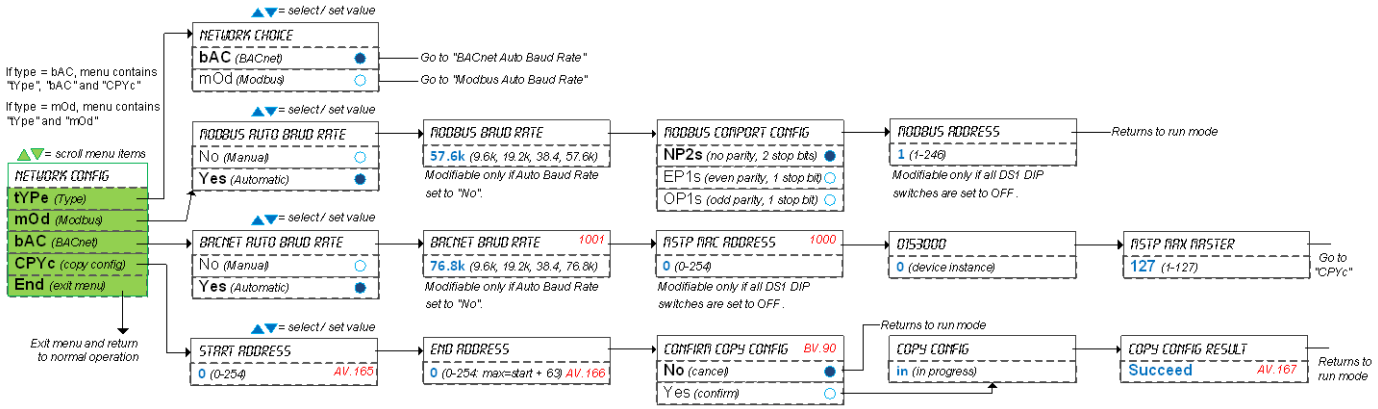
1. The Mode Selector jumper (JP1) of the thermostat must be set to the "RUN" position (Operation Mode). Refer to Wiring on page 6.
2. Press the [/] and [/] buttons simultaneously for 5 seconds. The *"ENTER PASSWORD"* screen appears.
3. Enter the password within 1 minute by using the arrow keys to increase or decrease the value and the [/] and [/] buttons to toggle between the digits.
   a. Password **372** = Sensor Offset Menu
   b. Password **637** = Network Settings Menu
4. If you enter the wrong password, the thermostat displays "**Eror**" and returns to Operation Mode. The thermostat will return to normal mode if you navigate through the entire menu and do not make any selection, or if you do not press any key for 5 minutes. The changed values will be saved automatically.

Menu 372 – Sensor Offset



*** To save any changes, press on TFL and on TDU ***
*** To return to the previous step without saving, press on TFL and on TDU ***

Menu 637 – Network Settings



*** To save any changes, press on TFL and on TDU ***
*** To return to the previous step without saving, press on TFL and on TDU ***

Reset to Factory Default Settings

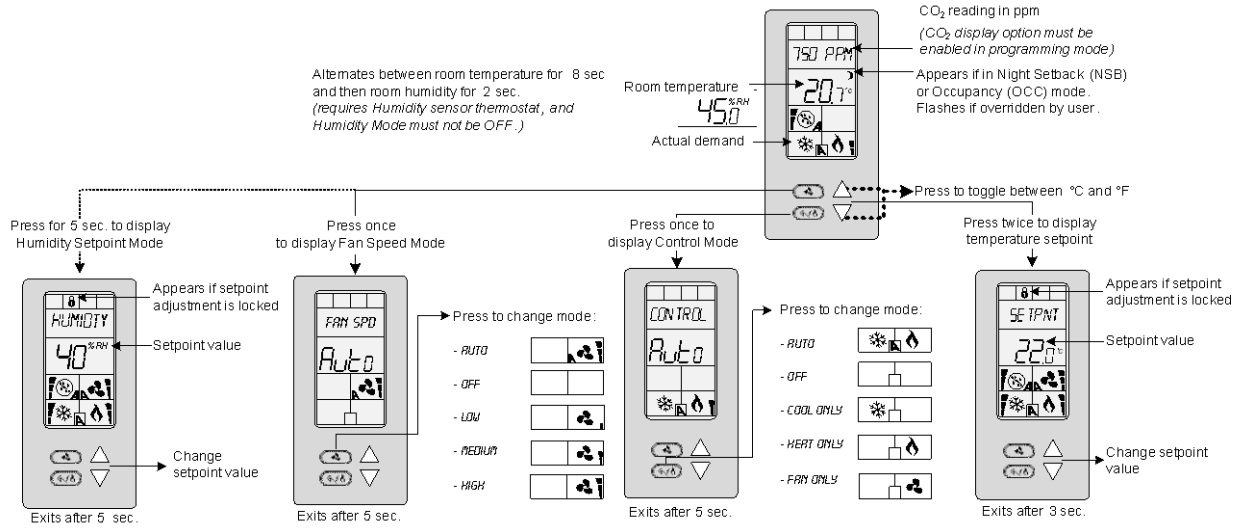
⚠	**This will erase all actual configurations and replace them with the factory default settings.**

1. The Mode Selector jumper (JP1) of the thermostat must be set to the "RUN" position (Operation Mode). Refer to Wiring on page 6.
2. During the power up sequence of the controller and thermostat (when the firmware versions are displayed), press and hold both the [/] and ▼ buttons.
3. The *"ENTER PASSWORD"* screen appears. Enter **372** within 1 minute by using the arrow keys to increase or decrease the value and the [/] and [/] buttons to toggle between the digits.
4. Use the arrow buttons to select YES and then press [/].

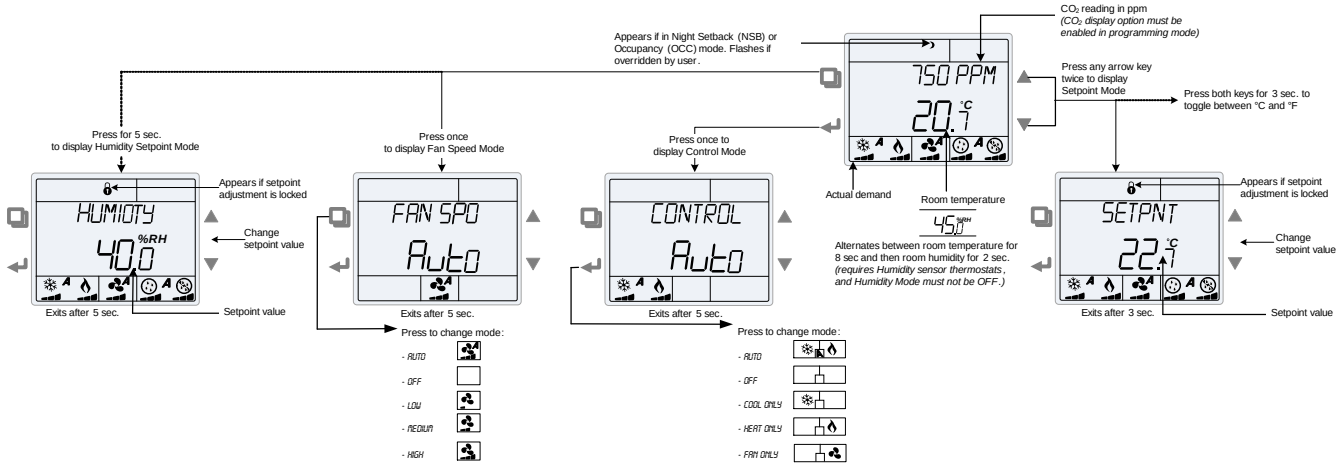
Operation Mode

The Mode Selector Jumper of the thermostat must be set to the “RUN” position (Operation Mode). Refer to Wiring on page 6.

TFL24



TDU



Power Up

Upon power up, the LCD illuminates and all segments appear for 2 seconds. The thermostat then displays its current version of the thermostat for 2 seconds followed by the current version of the controller for 2 seconds. Pressing any key on the thermostat illuminates the LCD for 4 seconds.

CO_2 (Thermostats with CO_2 Sensors)

If enabled via the configuration menu, the thermostat displays the CO_2 reading on the first line above the temperature reading. If CO_2 display is enabled, the time will not be displayed.

Temperature Display and Setpoint

The thermostat displays the temperature reading. If the sensor is disconnected or short circuited, the unit displays the sensor's limits. To toggle the temperature scale between ºC and ºF, press both the ▲ and ▼ keys for 3 seconds. To display the setpoint, press the ▲ or ▼ key twice. The setpoint appears for 5 seconds. To adjust the setpoint, press the arrow keys while the temperature is displayed. If the setpoint adjustment has been locked, the lock 🔒 symbol appears.

Temperature and Humidity (Thermostats with Temperature and Humidity Sensors)

The thermostat displays the temperature reading for 8 seconds and then displays the humidity reading for 2 seconds. If the sensor is disconnected or short circuited, the unit displays the sensor's limits. To toggle the temperature scale between ºC and ºF, press both the ▲ and ▲ keys for 3 seconds.

To access the Humidity setpoint, press the [/] button for 5 seconds. The humidity setpoint will be displayed for 5 seconds. To adjust the setpoint, press the ▲ and ▲ keys while the setpoint is displayed. The unit will return to normal mode if you do not press any key for 3 seconds. The changed values will be saved automatically.

Control Mode

To access the Control Mode, press the [/] key. The Control Mode appears for 5 seconds. Press the [/] key to scroll through the following control modes. These options can vary depending on the options selected.

- Auto (Automatic Cooling or Heating)
- OFF (if it is not disabled in Programming Mode)
- Cooling only (on, with cooling symbol)
- Heating only (on, with heating symbol)
- Fan only (on, with fan symbol)

Fan Speed Selection Mode

To access the Fan Speed selection mode, press the [/] key. The mode appears for 5 seconds. These options can vary depending on the fan speed signal and auto mode settings. If in No Occupancy mode, the [/] button now serves as the override button.

- Automatic speed. Available only if enabled in Programming Mode.
- Low speed
- Medium speed
- High speed
- Off. Off is not selectable by the user, it appears only if the "Control Mode" is "Off" and it indicates that the user can not change the speed of the fan.

Night Setback (NSB)

This function is only available if you've set DI3 to **nSb** (Night setback contact). If the DI3 contact is triggered, the thermostat enters NSB Mode (the ☽ symbol appears) and uses the NSB setpoints defined in Programming Mode. Press any key to override NSB for the delay defined in Programming Mode (default: 120 minutes). The ☽ symbol flashes to indicate that the NSB mode is overridden (during this time the standard setpoints are used).

If the NSB Mode was set to OFF, all outputs will be off for the duration of the period and cannot be overridden.

Occupancy Mode

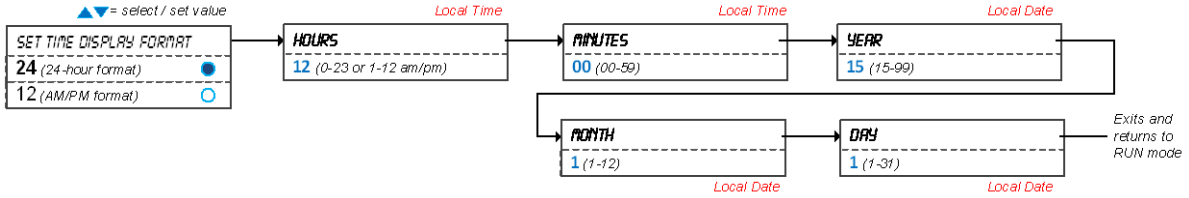
This function is only available if you've set DI3 to **Occ** (occupancy mode). If the DI3 contact is triggered, the thermostat enters Occupancy Mode (the ☽ symbol appears) and uses the NoOcc setpoints defined in Programming Mode.

If not locked, no occupancy mode can be overridden for a period by pressing the [/] button. Each time you press the [/] button, 15 minutes are added to the override (up to a maximum defined in program mode).

Press the fan [/] button until "0" is displayed to disable the override. The ☽ icon will flash and the remaining override time will be displayed in minutes.

Set Time and Date

1. Ensure that JP1 on the thermostat is set to run.
2. Press and hold the [/] button for 5 seconds.
3. Use the arrow keys to set the desired value. Press the [/] button to save and go to the next step. Press the [/] button to go to the previous step without saving.



*** To save any changes, press on TFL and on TDU ***
*** To return to the previous step without saving, press on TFL and on TDU ***

	Recycling at end of life: please return this product to your Neptronic local distributor for recycling. If you need to find the nearest Neptronic authorized distributor, please consult **www.neptronic.com**.

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