



Controller Model

EVCB14NIT4X (4 TRIACS / independent / external motor)

*For use with external floating or modulating actuators

TRL Series Thermostat

TRL24 (Thermostat 2x4)

TRLH24 (Thermostat 2x4 with Humidity)

TRLG24 (Thermostat 2x4 with CO₂)

TRLGH24 (Thermostat 2x4 with CO₂ and Humidity)

TDU Series Thermostat

TDU10 (Grey LCD, white enclosure)

TDU40 (Black LCD, black enclosure)

TDU70 (Black LCD, white enclosure)

Description

The EVCB Series is a combination controller and thermostat with support for networked communications via the BACnet MS/TP or Modbus protocol. The EVCB Series controller is compatible with both TRL24 and TDU series thermostats. The Networkable VAV Controller is designed for simple and accurate control of any variable air volume box in a number of zone control configurations. Its field configurable algorithms enable versatile implementation of required control sequences.

Features

- Field configured VAV algorithms, inputs and outputs
- Control external actuators using analog (0-10Vdc, adjustable) or floating signals with feedback
- On-board differential pressure sensor
- Select direction on analog outputs
- Simple air balancing and commissioning via thermostat
- Configurable PI (Proportional-Integral) function
- Independent, configurable proportional control band and dead band per ramp
- Activate output with CO₂ sensor from TRL/TDU or external input
- Selectable internal or external temperature sensor (10KΩ)
- Changeover by contact or external temperature sensor
- Internal and external temperature sensor calibration
- Freeze protection
- Removable, raising clamp, non-strip terminals

Operational Features

- Backlit LCD with simple icon and text driven menus
- Select thermostat's default display
- Network service port via on-board mini USB connector
- Manual night setback or no occupancy override
- Multi level lockable access menu and setpoint
- Selectable Fahrenheit or Celsius scale
- 3-wire connection to controller and 4 push keys



EVCB Series



TRL24 Series



TDU10 / TDU40 / TDU70 Series

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®

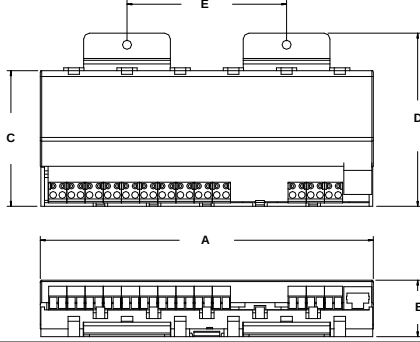
- Automatic device instance configuration
- Copy & broadcast configuration via thermostat menu or via BACnet to other controllers
- BACnet scheduler
- Firmware upgradeable via BACnet
- Support COV (change of value)

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	EVCB14NIT4X
Power consumption	10 VA max
Power supply	22 to 26 Vac 50/60 Hz
Inputs	2 Universal inputs (Thermistor 10K Ω Type 3, digital 24Vac/dry contact, or 0-10Vdc) 2 digital inputs
Outputs	2 analog outputs (0-10 Vdc or 2-10Vdc; selectable) 4 TRIAC outputs 24 Vac, 500mA max thermal fuse in series with each TRIAC output (on/off, pulse, or 2 floating outputs)
Real Time Clock	Real-time clock (RTC) with super capacitor backup (approximately 3 days)
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 connection	24 AWG twisted-shield cable (Belden 9841 or equivalent). Max 0ft (15m) between controller and thermostat
Electrical connection	0.8 mm ² [18 AWG] minimum
Operating temperature	0°C to 50°C [32°F to 122°F]
Storage temperature	-30°C to 50°C [-22°F to 122°F]
Relative Humidity	5 to 95% non condensing
Weight	1.8 kg. [4 lb]
Dimensions	 A = 7.20" 182.9mm B = 1.22" 31.0mm C = 2.93" 74.3mm D = 3.74" 94.9mm E = 3.45" 87.6mm

Thermostat Specifications

Description	TRL24 and TDU Series
Temperature Sensor (TRL24 and TDU)	
Setpoint range	10°C to 40°C [50°F to 104°F]
Control accuracy	Temperature: $\pm 0.4^\circ\text{C}$ [0.8°F]
Display resolution	$\pm 0.1^\circ\text{C}$ [0.2°F]
Humidity Sensor (TRLH24, TRLGH24 and TDU models with Humidity Sensors)	
Sensor range	5 to 95%RH
Display resolution	0.1%
CO₂ Sensor (TRLG24, TRLGH24 and TDU models with CO₂ Sensors)	
Operating principle	Self-calibrating, Non-Dispersive Infrared (NDIR)
Sensor Range	0 to 2000 ppm
Setpoint range	100 to 2000 ppm
Accuracy	± 30 ppm $\pm 3\%$ of reading
Response time	2 minutes by 90%
Display resolution	1 ppm
Other	
Electrical connection	3 wires to VAV controller and 2 wires to BACnet/Modbus network 0.8 mm ² [18 AWG] minimum
Network service port	Mini USB connector
Power supply	24Vac
Power consumption	1VA
Operating temperature	0°C to 50°C [32°F to 122°F]
Storage temperature	-30°C to 50°C [-22°F to 122°F]
Relative humidity	5 to 95 % non condensing
Enclosure protection	IP 30 (EN 60529)
Weight	120 g. [0.25 lb]



Dimensions

A = 2.85" 73mm B = 4.85" 123mm C = 1.00" 24mm D = 2.36" 60mm E = 3.27" 83mm	TRL24	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
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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	•		•	

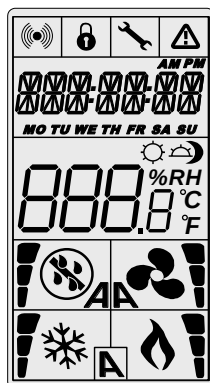


TDU70 Series



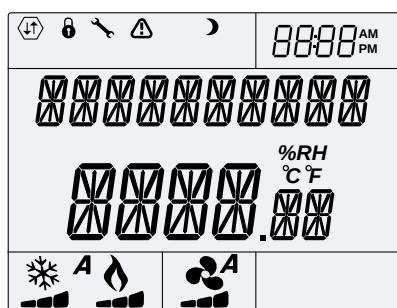
Interface

TRL24



	Cooling ON A: Automatic		Communication Status		Alarm status
	Heating ON A: Automatic		Menu Locked		Energy saving mode (NSB or Occupancy)
	Fan ON A: Automatic		Programming mode (Technician setting)		Percentage of humidity
					°C: Celsius scale °F: Fahrenheit scale

TDU

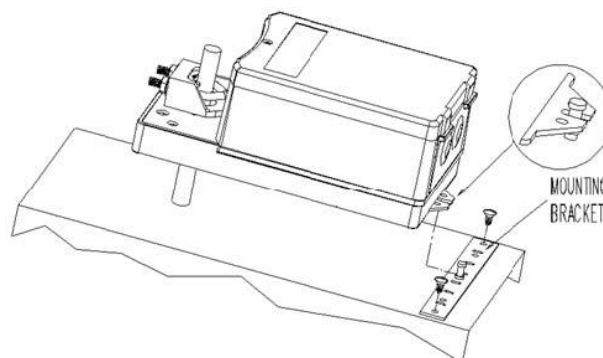


	Network Communication		User Lock		Programming Mode (Technician Setting)
	Alarm Status		Energy Saving Mode (NSB/OCC)		Schedule
	Time		ppm Parts Per Million		°C: Celsius Scale °F: Fahrenheit Scale %RH: Humidity
	Automatic Mode		Cooling		Heating
			Fan		

Mechanical Installation- Actuator

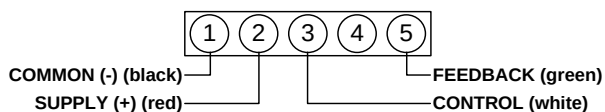
1. Manually close the damper blades and position the actuator to 0° or 90°.
2. Slide the actuator onto the shaft.
3. Tighten the nuts on the "U" bolt to the shaft with an 8mm wrench to a torque of 150 in.lb. [17 Nm].
4. Slide the mounting bracket under the actuator. Ensure free movement of the slot at the base of the actuator. Place the bracket pin at mid distance of the slot.
5. Affix the bracket to the ductwork with #8 self-tapping screws.
6. Connect the cable from the EVC to the terminal in the actuator as shown.

External 180 in. lb. Actuator



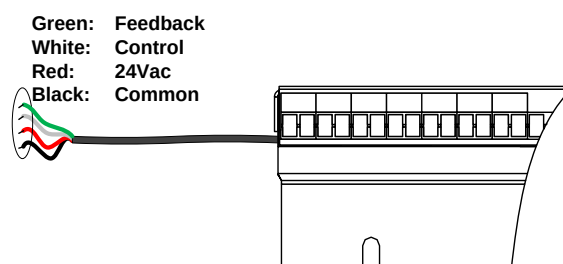
Do not press the clutch when the actuator is powered.

Terminals on the Actuator



Signal cable from EVC controller

Use to connect the external motor on EVCB14NIT4X.





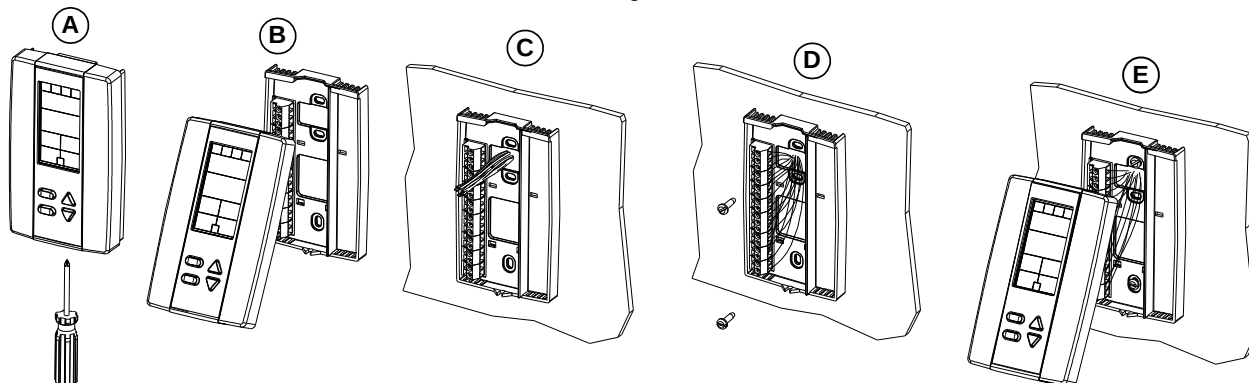
Mounting Instructions

TRL24



CAUTION: Remove power to avoid a risk of malfunction.

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

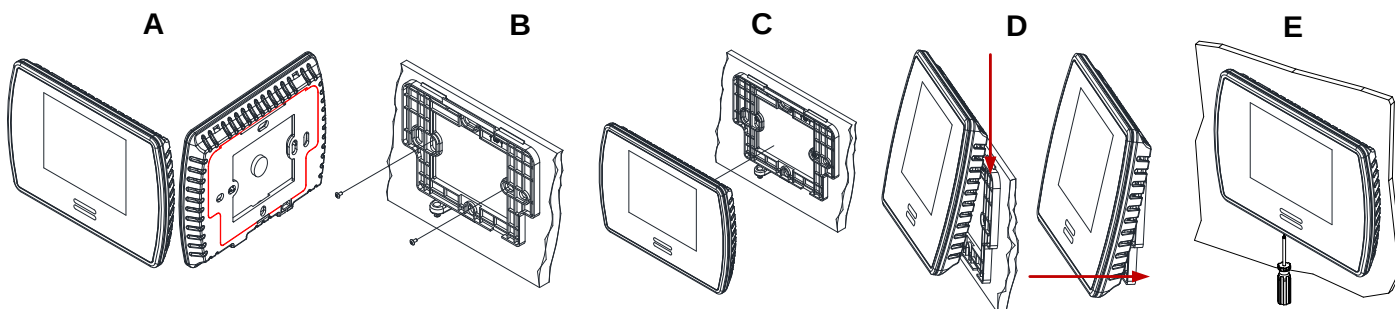


TDU



CAUTION: Remove power to avoid a risk of malfunction.

- Remove the wall mounting plate (highlighted) from the back of the thermostat.
- Install the mounting plate on the gang box.
- Pull the wires through the base hole and make the appropriate connections.
- 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.
- Secure the thermostat using the screw (supplied).



BACnet or Modbus Address DIP Switch (DS1)

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.

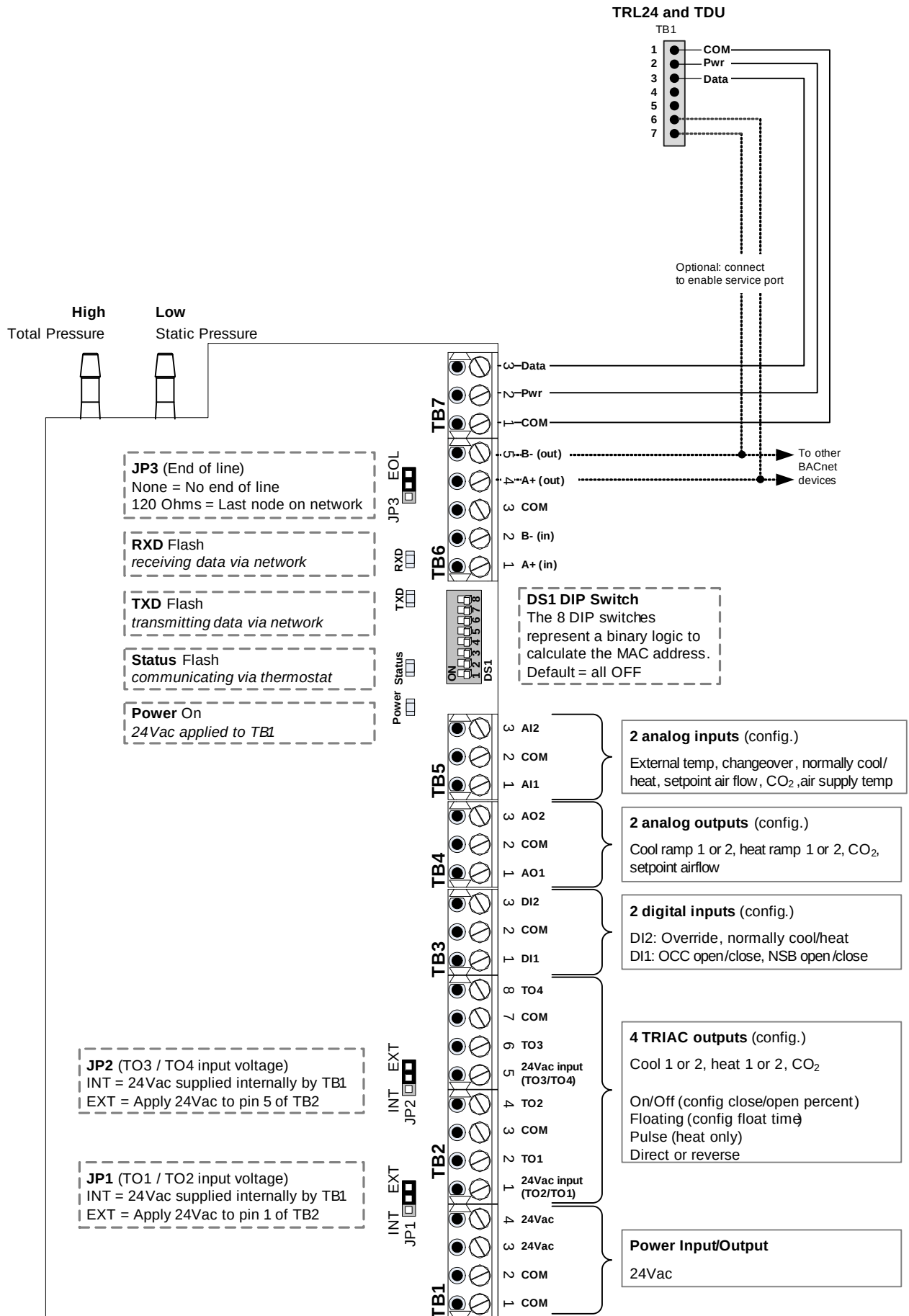
MAC Address	DS.1 = 1	DS.2 = 2	DS.3 = 4	DS.4 = 8	DS.5 = 16	DS.6 = 32	DS.7 = 64	DS.8 = 128	Default Device Instance
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153000
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153001
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	153002
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	153003
4	OFF	OFF	ON	OFF	OFF	OFF	OFF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



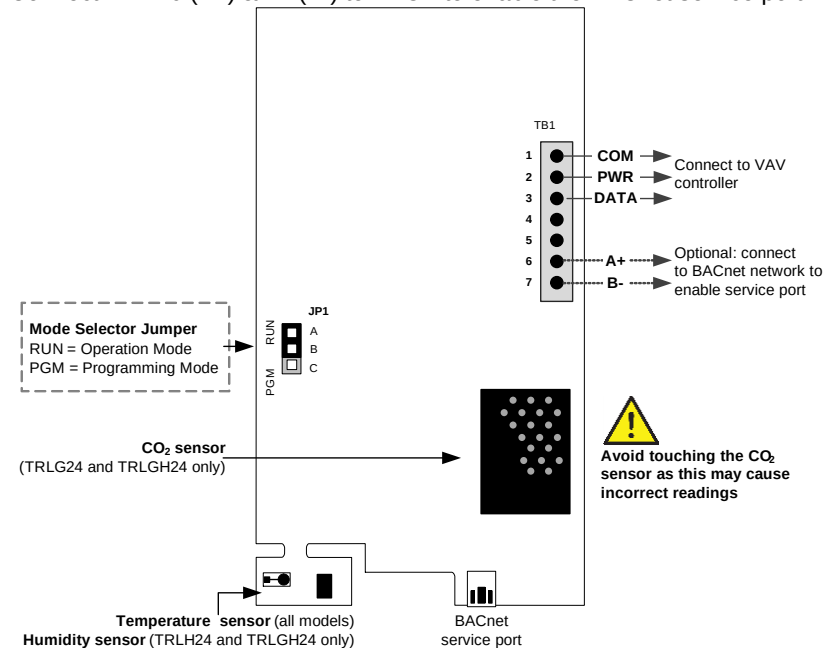


PCB Drawings

TRL24 Thermostat

3 wire cable (TB1 #1, 2 & 3)

Connect TB1 #6 (A+) & #7 (B-) to EVCB to enable the BACnet service port.



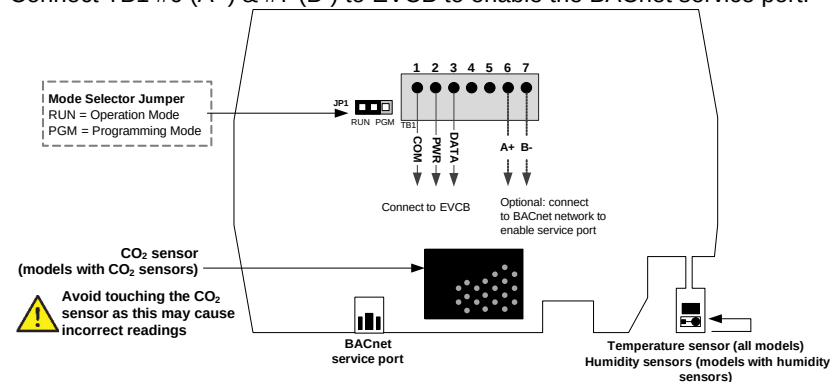
Mode Selection (JP1)

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 EVCB 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.

Access to Menus

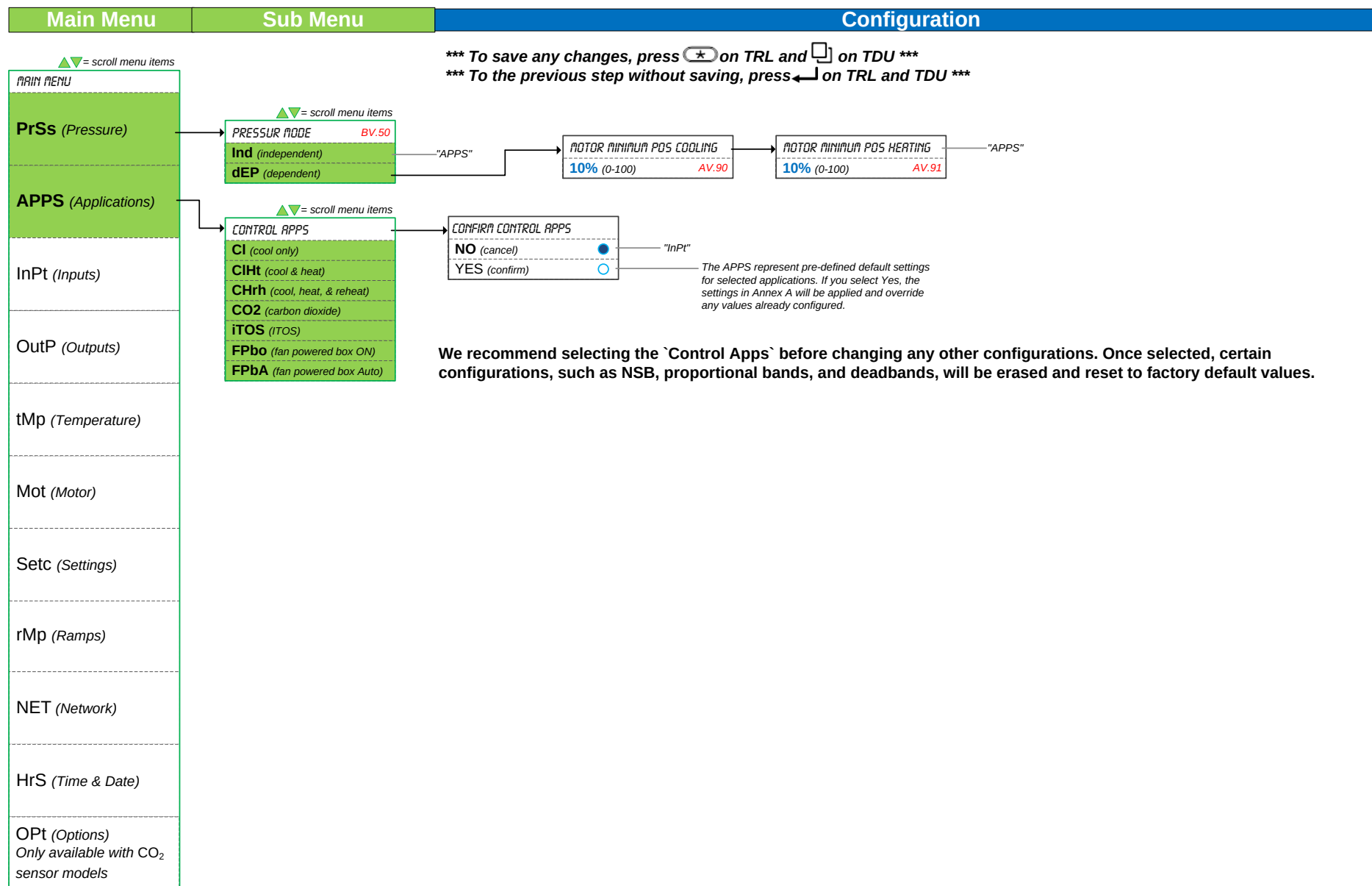
The menu overviews and options are the same for both TRL24 and TDU thermostats. However, the action key or the key used to access the menus and save changes is different in the thermostats. Use the following menu overviews with the appropriate action key as per your thermostat.

Action Keys on Thermostat

Action Key		Task
TRL24	TDU	
		Press to access the programming menus and save any changes.
		Press to return to the previous step without saving.

Pressure & Applications – Menu (1 of 7)

For a description of the default settings for each application refer to Annex A: Control Apps on page 19.

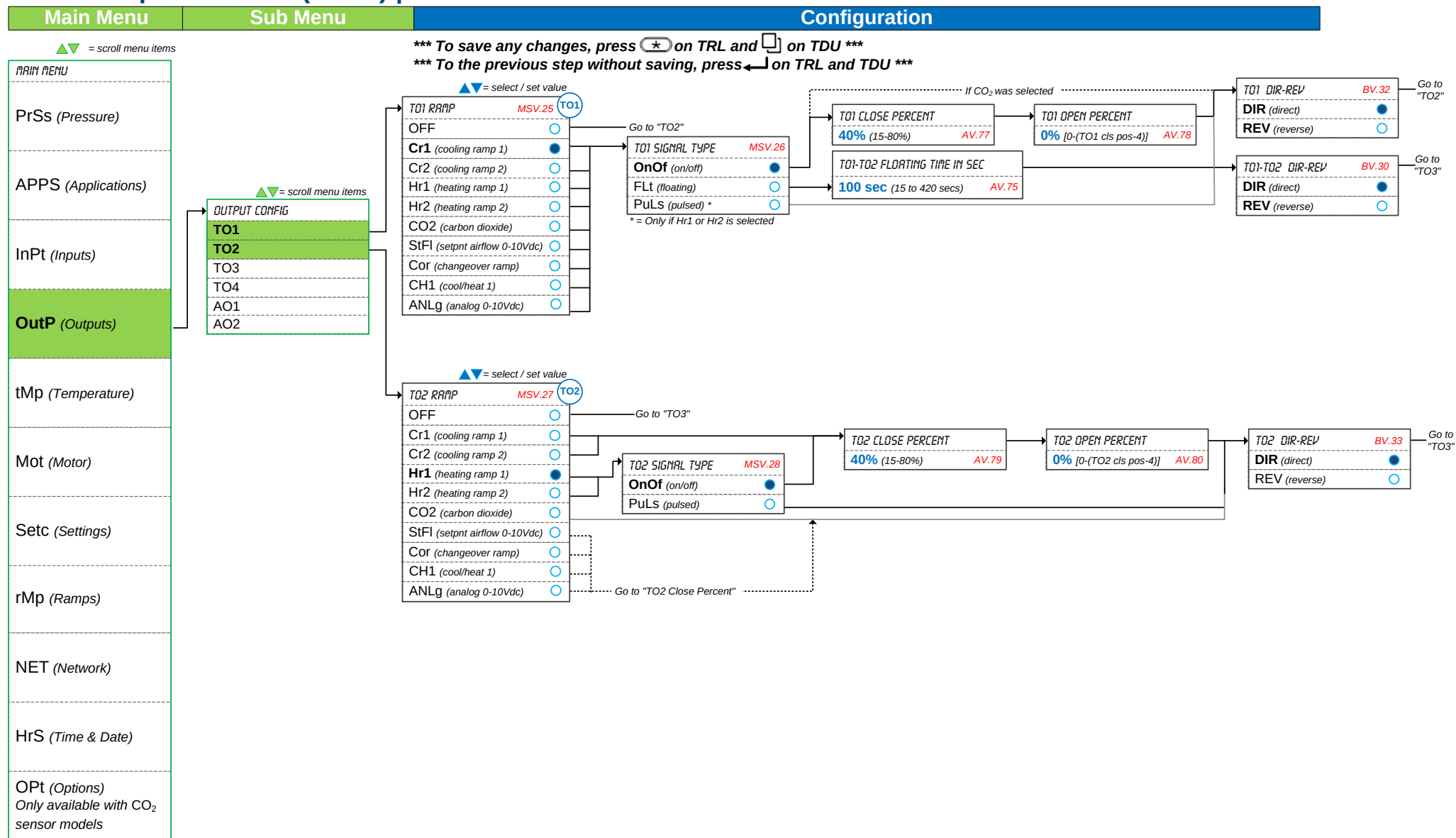




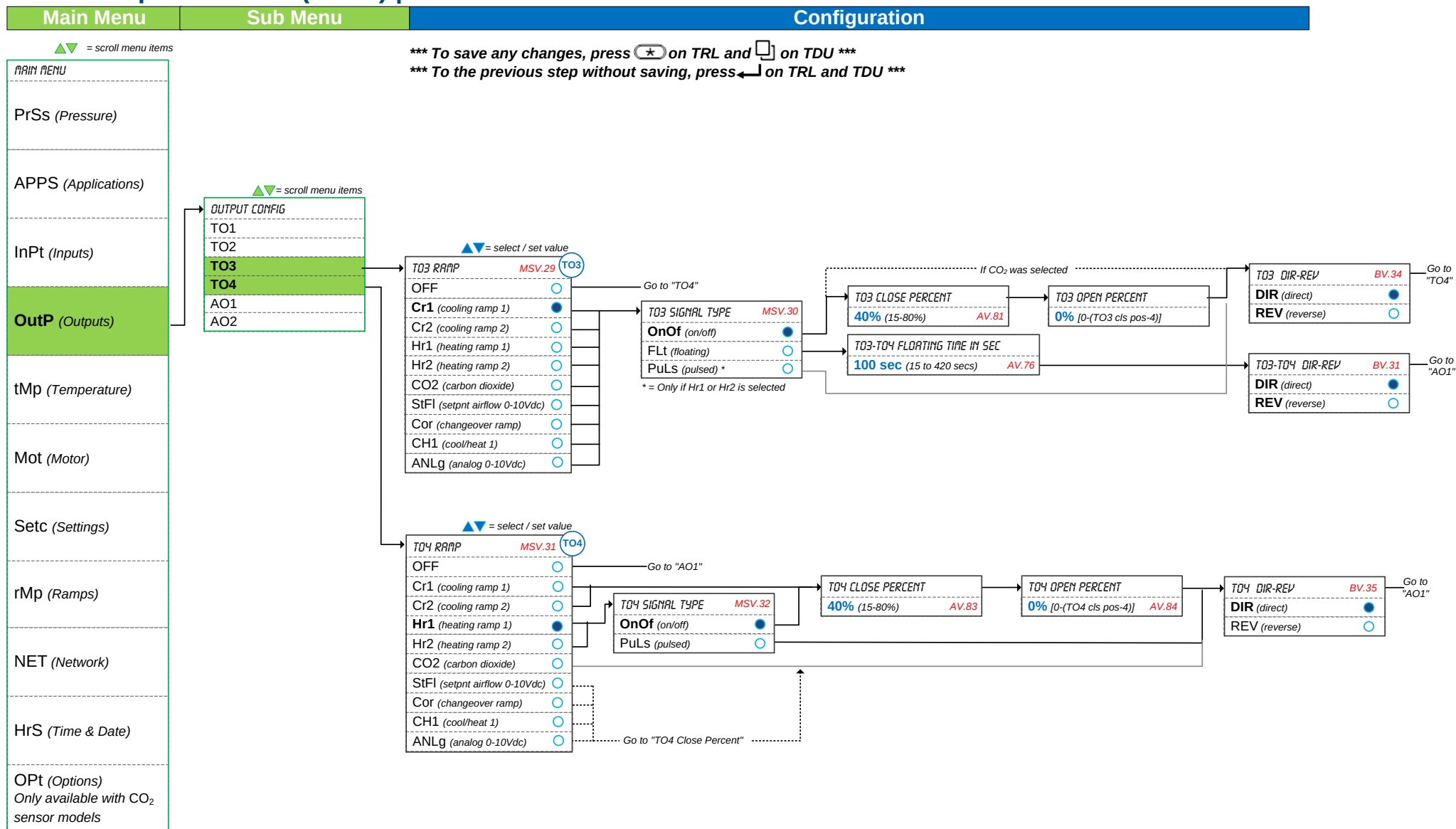
Inputs – Menu (2 of 7) | *AI1, AI2, DI1 and DI2*



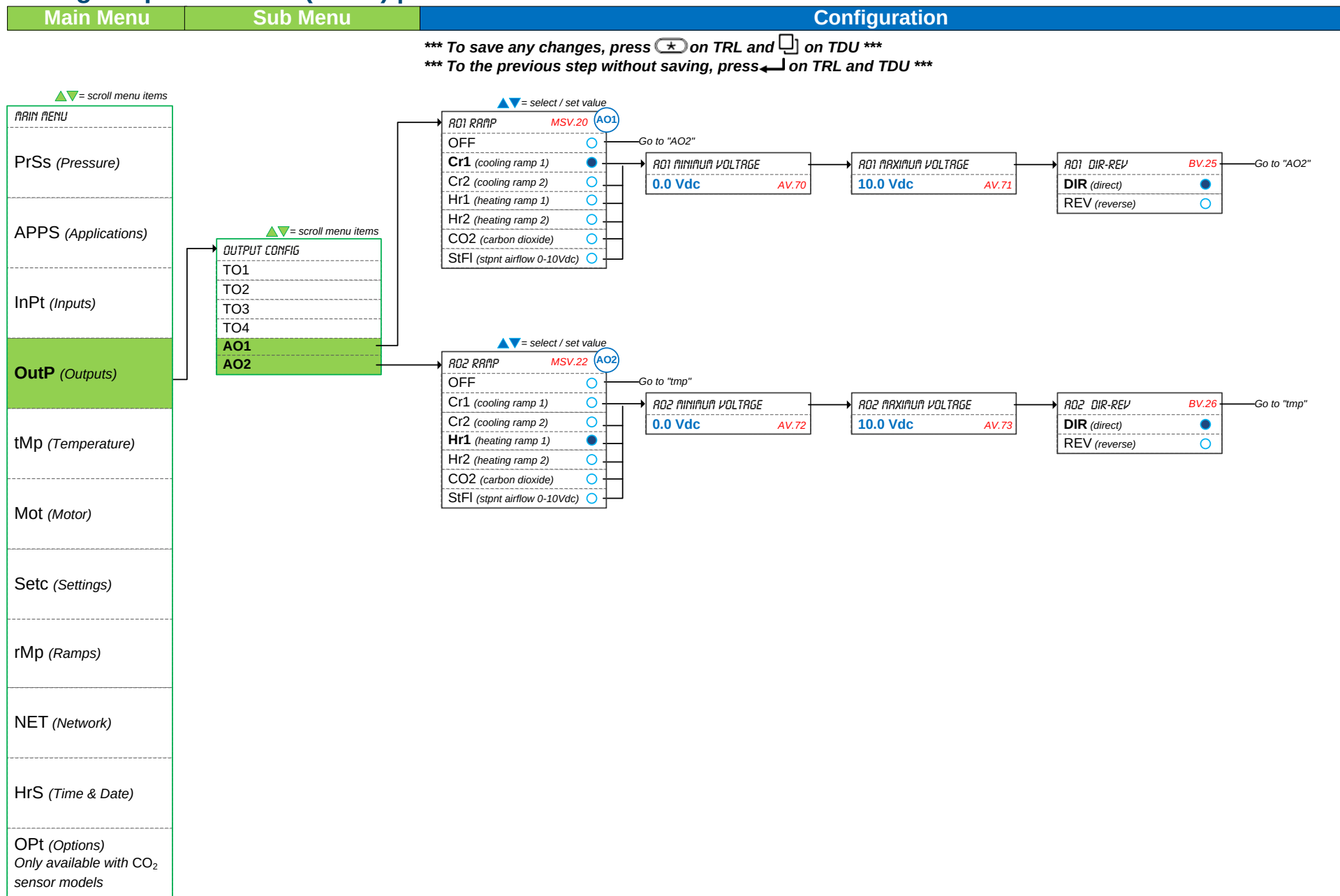
TRIAC Outputs – Menu (3 of 7) | TO1 and TO2



TRIAC Outputs – Menu (4 of 7) | TO3 and TO4

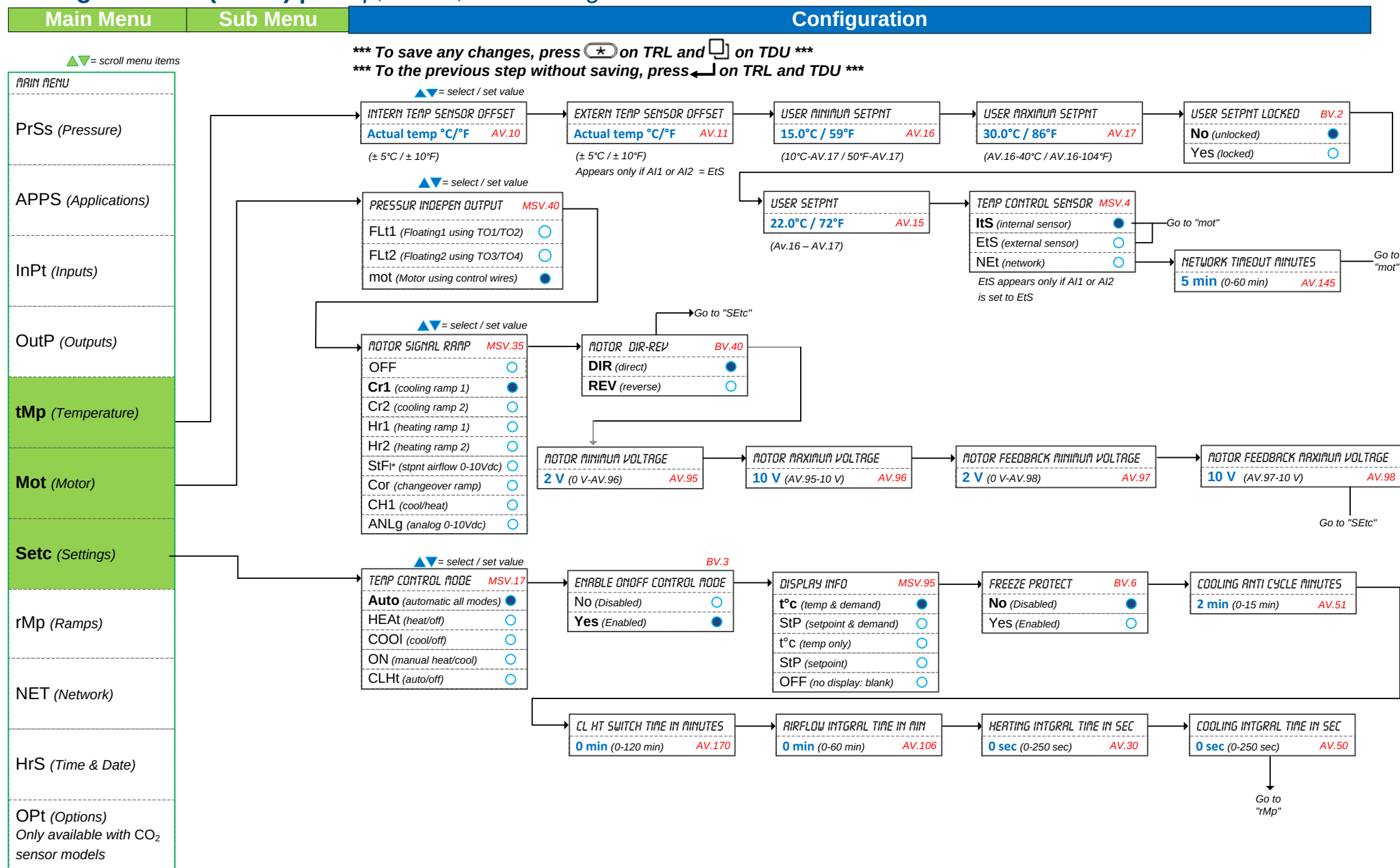


Analog Outputs – Menu (5 of 7) | AO1 and AO2



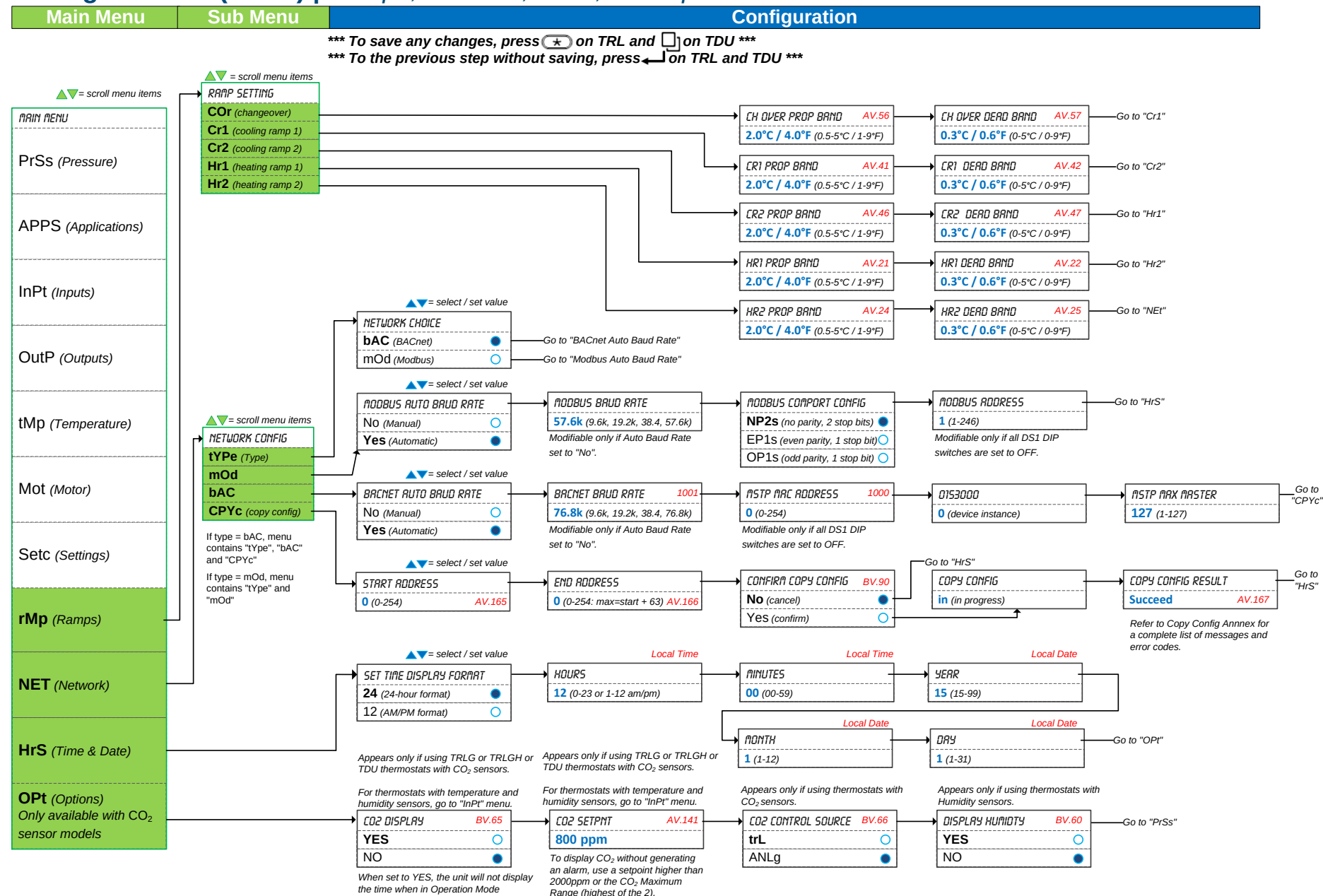


Settings – Menu (6 of 7) | Temp, Motor, and Settings





Settings – Menu (7 of 7) | Ramps, Network, Time, and Options





Operation Menus

This menu is accessible through normal operation mode. The Mode Selector jumper (JP1) of the thermostat must be set to the "RUN" position (Operation Mode). Refer to Wiring on page 6.

Note: Since the action keys are different on TRL and TDU thermostat series, both keys have been included in the instructions. Refer to the Action Keys on Thermostat section to know and use the key as available on your thermostat.

- Press the [] and keys simultaneously for 5 seconds. The "ENTER PASSWORD" screen appears.
- Enter the password within 1 minute by using the arrow keys to increase or decrease the value and the [] and keys to toggle between the digits.
 - Password **372** = Temperature Offset Menu
 - Password **637** = Network Settings Menu
 - Password **757** = Airflow Balance Mode
- If you enter the wrong password, the thermostat displays "Error" 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 – Temperature Offset

1. "INTERN TEMP SENSOR OFFSET"



Range: 10 to 40°C [50 to 104°F]
Offset: Max ± 5°C
Increment: 0.1°C [0.2°F]

Compare the displayed temperature reading with a known value from a thermometer. To offset or calibrate the sensor, use the arrows key to set the desired temperature reading. This is useful for thermostats installed in areas where the temperature read is slightly different than the room's actual temperature. For example, a thermostat placed right under the air diffuser. If the thermostat is set to use an external temperature sensor (EtS), the thermostat displays "OFF".

2. "EXTERN TEMPER SENSOR OFFSET"



Range: 0 to 50°C [41 to 122°F]
Offset: Max ± 5°C
Increment: 0.1°C [0.2°F]

This option appears if you've set one of the analog inputs to EtS (External temperature sensor). When the thermostat is connected to the appropriate analog input, the display shows the temperature read by the external temperature sensor. Adjust the offset by comparing it with a known value (e.g. thermometer). If the sensor is not connected or short circuited, then the unit displays the sensor's limit.

3. "INPUT3 READING"



Range: 250mV (0") to 4000mV (1")

Displays the voltage output value in mV of the pressure sensor.

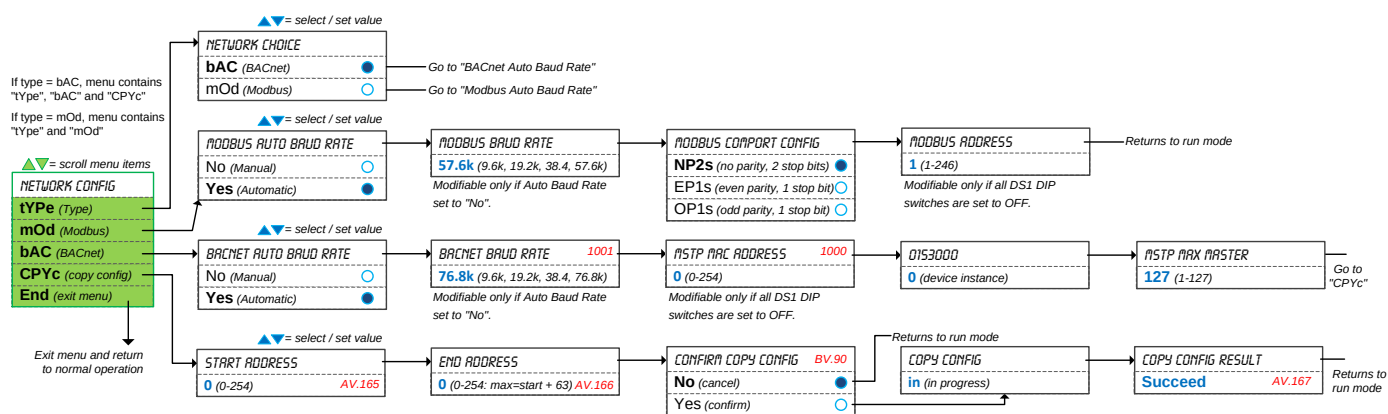
4. "INPUT3 MINIMUM READING"



Range: 10mV to 180mV
Default: 60mV

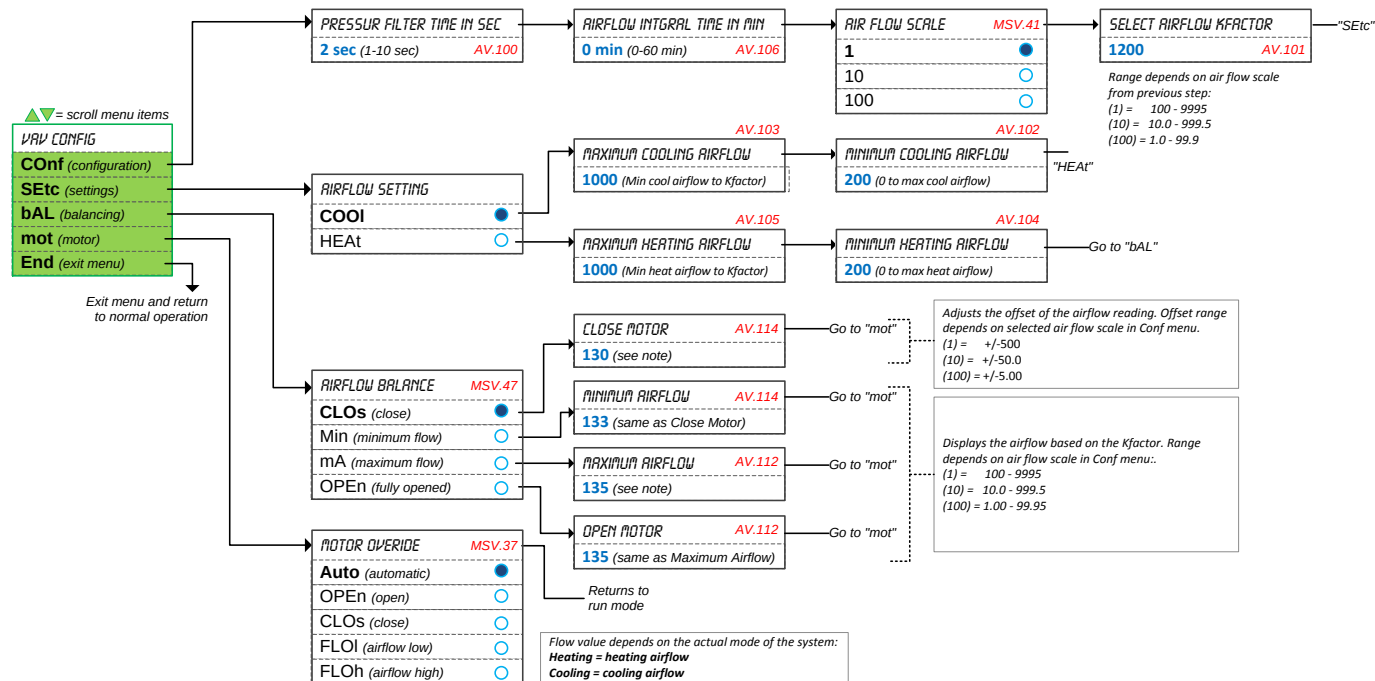
This setting represents the deadband of the pressure sensor in mV. For advanced users or special applications only. We recommend that you use the default setting of 60mV.

Menu 637 – Network Settings





Menu 757 – Airflow Balance Mode



*** To save any changes, press on TRL and on TDU ***

*** To the previous step without saving, press on TRL and TDU ***



Note: Refer to **EVCB-Airflow Balance Instructions** on Neptronic website for further information on airflow balancing function.

Reset to Factory Default Settings



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

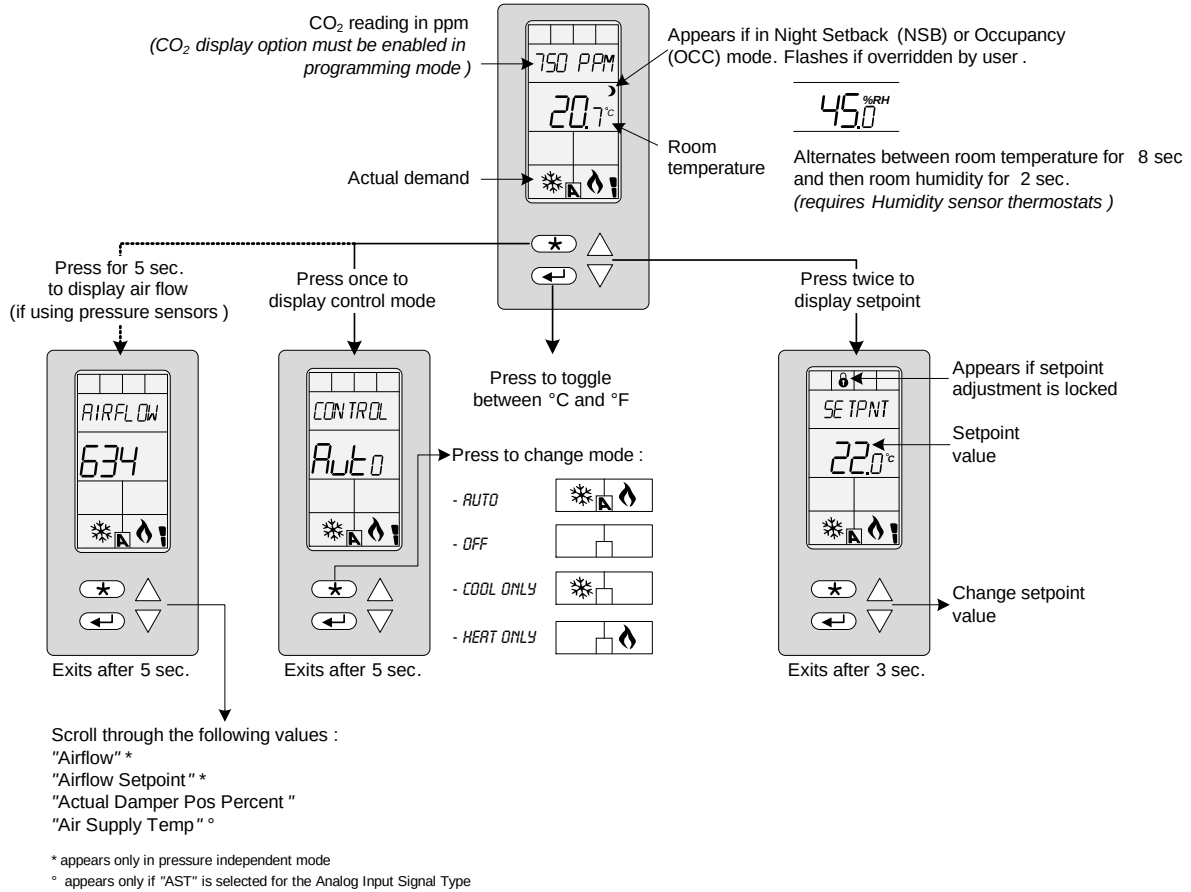
1. The Mode Selector jumper (JP1) of the thermostat must be set to the "RUN" position (Operation Mode). Refer to Wiring on page 6.
2. During the power up sequence of the controller and thermostat (when the firmware versions are displayed), press and hold both the and keys.
3. The "ENTER PASSWORD" screen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



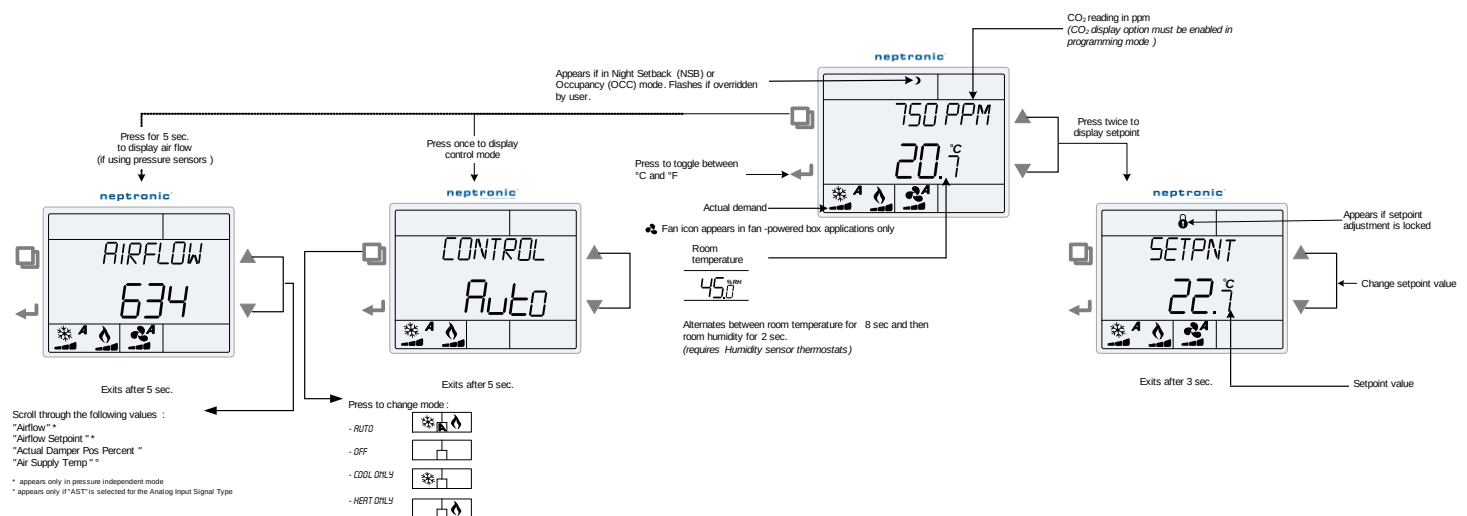
Operation Mode

The Mode Selector Jumper (JP1) of the thermostat must be set to the “RUN” position (Operation Mode). Refer to Wiring on page 6.

TRL24



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.

CO₂ (Thermostats with CO₂ Sensors)

If enabled via the configuration menu, the thermostat displays the CO₂ reading on the first line above the temperature reading. If CO₂ display is enabled, the time will not be displayed.

Temperature Display and Setpoint

If enabled in the "Display Info" menu (see Settings – Menu (6 of 7) | *Temp, Motor, and Settings* on page 13), the thermostat displays the temperature reading. If the sensor is disconnected or short circuited, then the unit displays the sensor's limit. To toggle the temperature scale between °C and °F, press the ◀ key. 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 "SETPNT LOCKED", the lock Ⓛ symbol appears.

Humidity

If enabled in the "Options" menu (see Settings – Menu (7 of 7) | *Ramps, Network, Time* on page 14), 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, then the unit displays the sensor's limit.

Airflow and Air Supply Temperature

Press and hold the [Ⓢ / Ⓛ] key for 5 seconds and use the arrow keys to view the "AIRFLOW", "AIRFLOW SETPNT", "ACTUAL DAMPER POS PERCENT" and "AIR SUPPLY TEMP". After 5 seconds without any action, the thermostat returns to operation mode. The air supply temperature appears only if analog input AI1 or AI2 are configured with the AST option.

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 in "Temp Control Mode" and "Enable OnOff Control Mode".

- 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)

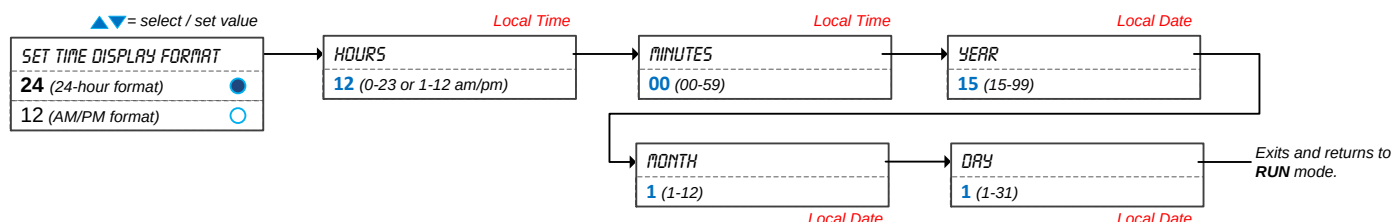
Night Setback (NSB) or Occupancy Mode

This function is only available if you set DI1 to **nSb** (Night setback contact) or **Occ** (occupancy mode). If the DI1 contact is triggered, the thermostat enters NSB or No Occupancy Mode (the ⤵ symbol appears) and uses the NSB or OCC heating and cooling setpoints.

If not locked, you can override the night setback or no occupancy mode for a predetermined period by pressing any of the 4 keys. During the override period the ⤵ symbol will flash. If the ⤵ symbol does not flash, the override period is finished or the night setback or no occupancy override has been locked in programming mode.

Set Time and Date

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



*** To save any changes, press Ⓢ on TRL and Ⓛ on TDU ***

*** To the previous step without saving, press ◀ on TRL and TDU ***



Annex A: Control Apps

Refer to *Pressure & Applications – Menu (1 of 7)* on page 8 for more information. The available **Control Apps** vary according to the model.

Description	CL (cool only)	CLHt (cool/heat)	CHrH (cool/heat/reheat)	CO ₂ (CO ₂)	ITOS (ITOS)	FPbo (fan powered ON)	FPbA (fan powered Auto)
Min. Setpoint	20°C (68°F)	20°C (68°F)	20°C (68°F)	20°C (68°F)	15°C (59°F)	15°C (59°F)	15°C (59°F)
Max. Setpoint	28°C (82°F)	28°C (82°F)	28°C (82°F)	28°C (82°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)
Changeover Setpnt	24°C (75°F)	20°C (68°F)	20°C (68°F)	20°C (68°F)	24°C (75°F)	24°C (75°F)	24°C (75°F)
TO1 Ramp	HR1	CR1	HR1	CR1	OFF	HR1	HR1
TO1 Signal Type	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off
TO1 Close Pos.	40%	40%	40%	40%	40%	35%	35%
TO1 Open Pos.	0%	0%	0%	0%	0%	0%	0%
TO2 Ramp	HR1	HR1	HR1	CO₂	OFF	HR1	HR1
TO2 Signal Type	Pulse	On/Off	Pulse	On/Off	On/Off	On/Off	On/Off
TO2 Close Pos.	40%	40%	40%	40%	40%	70%	70%
TO2 Open Pos.	0%	0%	0%	0%	0%	35%	35%
TO3 Ramp	HR2	CR2	HR2	HR1	OFF	Fan ON	Fan Auto
TO3 Signal Type	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off
TO3 Close Pos.	40%	40%	40%	40%	40%	40%	40%
TO3 Open Pos.	0%	0%	0%	0%	0%	0%	0%
TO4 Ramp	HR2	HR2	HR2	HR1	OFF	HR1	HR1
TO4 Signal Type	Pulse	On/Off	Pulse	On/Off	On/Off	On/Off	On/Off
TO4 Close Pos.	40%	40%	40%	40%	40%	40%	40%
TO4 Open Pos.	0%	0%	0%	0%	0%	0%	0%
Motor Ramp	CR1	CO_r	CO_r	CO_r	CR1	CR1	CO_r
AO1 ramp	HR1	CR1	HR1	CR1	HR1	HR1	HR1
AO2 Ramp	HR2	HR1	HR2	HR1	OFF	HR2	Fan Auto
AI1 Input	OFF	SENS	SENS	SENS	OFF	OFF	SENS
AI2 Input	OFF	OFF	OFF	CO₂	OFF	OFF	OFF
DI1 Input	nSb.o	nSb.o	nSb.o	Occ.o	Occ.o	nSb.o	nSb.o
Heat Prop Band 2	2°C (4°F)	2°C (4°F)	2°C (4°F)	2°C (4°F)	2°C (4°F)	1°C (2°F)	1°C (2°F)
Heat Deadband 2	1.3°C (2.6°F)	1.3°C (2.6°F)	1.3°C (2.6°F)	1.3°C (2.6°F)	0.3°C (0.6°F)	1.3°C (2.6°F)	1.3°C (2.6°F)
Cool Deadband 2	1.3°C (2.6°F)	1.3°C (2.6°F)	1.3°C (2.6°F)	1.3°C (2.6°F)	0.3°C (0.6°F)	0.3°C (0.6°F)	0.3°C (0.6°F)

Legend

Grey Text = Standard default value

Bold Text = Special default value for selected application

HR = Heating ramp
 CR = Cooling ramp
 CO_r = Changeover ramp
 SENS = Changeover temperature sensor
 Fan ON = Fan powered box in continuous mode
 Fan Auto = Fan powered box in automatic mode (follows demand)
 nSb.o = Night Setback (normally open)
 Occ.o = Occupancy mode (normally open)

TO = TRIAC output
 AO = Analog output
 AI = Analog input
 DI = Digital input



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