DIN-TSTAT-FCU

DIN-Rail Heating and Cooling Fan-Coil Thermostat

Setup and Commissioning Guide

Crestron Electronics, Inc.

This document was written by the Technical Publications department at Crestron.

Contents

DIN-TSTAT-FCU: DIN-Rail Fan-Coil Thermostat

Introduction

The Crestron® fan-coil controller DIN-TSTAT-FCU is a universal 2-pipe, 3-speed fan-coil unit (FCU) controller designed for use in two-pipe applications. A wide range of I/O resources and various FCU types are supported.

Supported FCUs

The DIN-TSTAT-FCU supports the following FCU types:

Type 1 - Modulated 0-10 Vac Valve

Type 2 - Modulated OP-CL 24 Vac Valve

Type 3 - Spring-loaded 24 Vac Valve

Type 4 - Modulated OP-CL 230 Vac Valve

Type 5 - Spring-loaded 230 Vac Valve

Type 6 - 1-2 Stage Direct-expansion System

Specifications

The specifications for the DIN-TSTAT-FCU are listed below.

DIN-TSTAT-FCU Specifications

SPECIFICATION	DETAILS
Electrical specifications	
Power supply	Main: 230 Vac ±10%, 50 Hz, 15 W max Cresnet: 24 Vdc ±10%, 0.5 W max
Binary outputs	3 relays 16 A for fan control* 2 relays 16 A for valve or compressor control**
Valve outputs	0–10 Vdc Modulated OP-CL triac; 24 Vac, 6 W valves
Binary inputs	4 potential free inputs
Analog inputs	2x NTC temperature probe: 10 K, 12 K, 15 K, and 20 K supported

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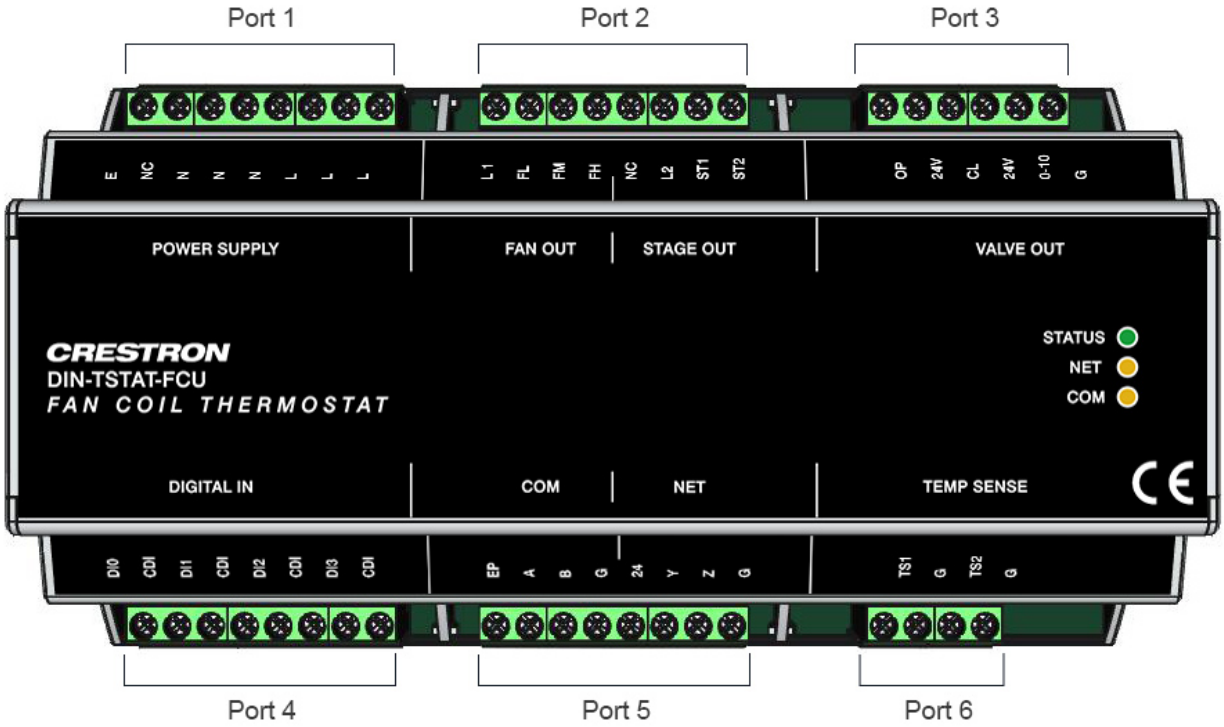
DIN-TSTAT-FCU Specifications (continued)

SPECIFICATION	DETAILS
Communication channels	
Primary port	Cresnet
Auxiliary port	RS-485, Modbus® protocol master
USB mini	Service port for programming
Operating temperature	-10–55 °C
Storage temperature	-40–85 °C
Operating humidity	95% max RH noncondensing
Protection degree	IP20
Mounting	DIN rail, for indoor use only
Dimensions	161.6 x 90 x 62.2 mm
Weight	600 g

* Only one fan speed relay can be active at the time.
** If one stage relay is active at one time, the maximum current is 16 A; if two stage relays are active at one time, the sum of both currents must not exceed 20 A and the current through one relay must not be greater than 16 A.

Port Descriptions

The illustration below depicts the port arrangements of the DIN-TSTAT-FCU. The following table lists a description of the ports.



DIN-TSTAT-FCU Port Descriptions

PORT	NAME	DESCRIPTION
1	E	External protective earth
	NC	No connection
	N	Main power supply - Neutral
	N	Main power supply - Neutral
	N	Main power supply - Neutral
	L	Main power supply - Live
	L	Main power supply - Live
	L	Main power supply - Live
2	L1	Common for fan supply
	FL	Fan speed low
	FM	Fan speed medium
	FH	Fan speed high
	NC	No connection
	L2	Common for stage supply
	ST1	Stage 1 relay output
	ST2	Stage 2 relay output
3	OP	Valve open triac output
	24V	24Vac power supply output
	CL	Valve close triac output
	24V	24Vac power supply output
	0-10	Analog 0-10V output
	G	Ground

PORT	NAME	DESCRIPTION
4	DI0	Digital input 1
	CDI	Digital inputs common terminal
	DI1	Digital input 2
	CDI	Digital inputs common terminal
	DI2	Digital input 3
	CDI	Digital inputs common terminal
	DI3	Digital input 4
	CDI	Digital inputs common terminal
5	EP	AUX port power supply output
	A	AUX port + communication line
	B	AUX port – communication line
	G	AUX port ground
	24	Cresnet power supply input
	Y	Cresnet + communication line
	Z	Cresnet – communication line
	G	Cresnet ground
6	TS1	NTC probe 1 input
	G	Ground
	TS2	NTC probe 2 input
	G	Ground
	N/A	N/A
	N/A	N/A

Safety Notes

- Do not use the device outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Properly trained personnel must install the device.
- Observe any and all legal regulations or regulations issued by authorities.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Device Parameters

Using the DIN-TSTAT-FCU Commissioning Tool, configure the DIN-TSTAT-FCU according to the FCU type, valve parameters, and other requirements. Parameters are divided into common and specific to each FCU type.

The common parameter to all FCUs that are subdivided by regulation, communication, and alarm parameters. The first common parameter determines the FCU type.

Parameters specific to FCU type are presented in respective tables:

- Modulated 0-10 Vac Valve
- Modulated OP-CL 24 Vac valve
- Spring-loaded 24 Vac Valve
- Modulated OP-CL 230 Vac Valve
- Spring-loaded 230 Vac Valve
- 1-2 Stage Direct-expansion System

Common Parameters

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
FCU type	1	1-6		Type 1: Modulated 0-10 Vac Valve Type 2: Modulated OP-CL 24 Vac valve Type 3: Spring-loaded 24 Vac Valve Type 4: Modulated OP-CL 230 Vac Valve Type 5: Spring-loaded 230 Vac Valve Type 6: 1-2 Stage Direct-expansion System

Regulation Parameters

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Regulation step	4	1-10		Regulation step (the width of the zone around set point where the valve is regulated) in multiples of 0.5 °C
Valve minimum position	0	0-100		Minimum valve position when set point is reached (1000 = 100%)
Fan speed OFF enable	1	0-1		If 0, fan will stay in speed 1 when the set point is reached; otherwise the fan is turned OFF
Fan speed change delay	1	1-10	[min]	Minimum time between two fan speed changes
PI regulaton: Kp	20	1-500		PI regulator proportional parameter
PI regulaton: Ti	300100	0-600		PI regulator integration parameter
Temperature probe 1 type	NTC 20K	NTC 20K, NTC 10K, NTC 12K, NTC 15K		Type of the temperature probe on analog input 1 (1 - 20K NTC, 2 - 10K NTC, 3 - 12K NTC, 4 - 15K NTC)
Temperature probe 2 enable	0	0-1		Enable usage of temperature probe on analog input 2

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Regulation Parameters (continued)

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Temperature probe 2 type	NTC 20K	NTC 20K, NTC 10K, NTC 12K, NTC 15K		Type of the temperature probe on analog input 2 (1 - 20K NTC, 2 - 10K NTC, 3 - 12K NTC, 4 - 15K NTC)
Minimum T diff for cooling	10	0-20	°C	Minimum difference between ambient temperature and fluid temperature for cooling to work (fluid must be colder)
Minimum T diff for heating	10	0-20	°C	Minimum difference between ambient temperature and fluid temperature for cooling to work (fluid must be hotter)
Minimum set point for heating	16	16-30	°C	Minimum set point value when heating is active
Maximum set point for heating	30	16-30	°C	Maximum set point value when heating is active
Minimum set point for cooling	16	16-30	°C	Minimum set point value when cooling is active
Maximum set point for cooling	30	16-30	°C	Maximum set point value when cooling is active

Communication Parameters

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Modbus baud	0	0–8		Modbus baud rate 0-0, 1-1200, 2-2400, 3-4800, 4-9600, 5-19200, 6-38400, 7-57600, 8-115200
Modbus parity	0	0–2		Modbus parity 0-no, 1-odd, 2-even
Modbus stop	2	1–2		Modbus number of stop bits
Modbus slave address	1	1–247		Modbus slave address of remote display unit
Set point address	45001	0–65535		Address of temperature set point register on remote display unit
Fan speed address	45002	0–65535		Address of fan speed register on remote display unit
Mode address	45003	0–65535		Address of mode register on remote display unit
Air temperature address	45011	0–65535		Address of register for ambient temperature on remote display unit
Set point min address	45012	0–65535		Address of register for minimum set point on remote display unit
Set point max address	45013	0–65535		Address of register for maximum set point on remote display unit

Alarms Parameters

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Alarm 1 enable	0	0–1		Alarm 1 enable
Alarm 1 polarity	1	0–1		Alarm 1 active level
Alarm 1 delay	5	0–2000	[s]	Alarm 1 delay
Alarm 2 enable	0	0–1		Alarm 2 enable
Alarm 2 polarity	1	0–1		Alarm 2 active level
Alarm 2 delay	5	0–2000	[s]	Alarm 2 delay
Alarm 3 enable	0	0–1		Alarm 3 enable
Alarm 3 polarity	1	0–1		Alarm 3 active level

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Alarms Parameters (continued)

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Alarm 3 delay	5	0–2000	[s]	Alarm 3 delay
Alarm 4 enable	0	0–1		Alarm 4 enable
Alarm 4 polarity	1	0–1		Alarm 4 active level
Alarm 4 delay	5	0–2000	[s]	Alarm 4 delay

Parameters for Type 1 - Modulated 0-10 Vac Valve

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Valve opening time	120	20–300	[s]	Time required for valve to open

Parameters for Type 2 - Modulated OP-CL 24 Vac Valve

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Valve opening time	120	60–300	[s]	Time required for valve to open
Valve closing time	120	60–300	[s]	Time required for valve to close
Reset valve error interval	8	4–24	[h]	Interval between two position error annulations

Parameters for Type 3 - Spring-loaded 24 Vac Valve

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Valve opening time	120	10–300	[s]	Time required for valve to open
Valve closing time	120	10–300	[s]	Time required for valve to close

Parameters for Type 4 - Modulated OP-CL 230 Vac Valve

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Valve opening time	120	20–300	[s]	Time required for valve to open
Valve closing time	120	20–300	[s]	Time required for valve to close
Reset valve error interval	8	4–24	[h]	Interval between two position error annulations

Parameters for Type 5 - Spring-loaded 230 Vac Valve

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Valve opening time	120	10–300	[s]	Time required for valve to open
Valve closing time	120	10–300	[s]	Time required for valve to close

Parameters for Type 6 - 1-2 Stage Direct-expansion System

SPECIFICATION	DEFAULT	RANGE	UNITS	COMMENTS
Stage 1 minimum ON time	300	60–1200	[s]	Minimum operating time for compressor first stage
Stage 2 minimum ON time	300	60–1200	[s]	Minimum operating time for compressor second stage

Regulation Algorithms

The DIN-TSTAT-FCU is a universal fan-coil controller designed for two-pipe HVAC systems. The device controls the fan used for forcing air flow over the water coil and controls the valve used to adjust the water flow rate through the coil. The fan speed of the fan-coil unit is regulated with three speeds: low, medium, and high. The valve is regulated differently depending on the fan-coil type used. The fan speed and valve position are set by the regulation algorithm using the difference in the room temperature and the set point

temperature. The device supports cooling and heating modes, except when configured as Type 6 where only cooling is supported.

On power up, the device has an initialization period where the system is stabilized before temperature regulation can take place.

The DIN-TSTAT-FCU's normal operation can be interrupted if it receives an alarm signal or if the water temperature is inappropriate.

The device has various configurable parameters for adjusting the working state corresponding to user application.

FCU Wiring and Control

For regulating different 2-pipe, 3-speed valve and fan-coil types the DIN-TSTAT-FCU has six different software configuration types each for controlling different type of fan-coil unit. The DIN-TSTAT-FCU configuration types are:

- Type 1 - Modulated 0-10 Vac Valve
- Type 2 - Modulated OP-CL 24 Vac Valve
- Type 3 - Spring-loaded 24 Vac Valve
- Type 4 - Modulated OP-CL 230 Vac Valve
- Type 5 - Spring-loaded 230 Vac Valve
- Type 6 - 1-2 Stage Direct-expansion System

Initialization

NOTE: Every configuration type has the same initialization procedure.

The device enters initialization period when it is turned on. During the initialization period the fan is forced to off (fan outputs are inactive), and the valve output is forced to fully open in order to run water through the heat exchanger and stabilize its temperature. The duration of the initialization period depends on the type of device configuration, and it is 120% of the *Valve opening time* parameter. In case of DX systems, the fan is also put to off state, and stage relays are inactive for initialization time, which is calculated as 120% of the longer time written in parameters *Stage 1/2 minimum ON time*. The means for valve control depends on device configuration type.

Water temperature

A second NTC probe input can be wired to the TEMP SENSE – TS2 and G port for water temperature measurement. The minimum temperature difference between ambient temperature and water temperature for FCU to effectively perform its function is *Minimal T diff for cooling* parameter in case of cooling and *Minimal T diff for heating* in case of heating. When cooling is performed, the device checks that the water temperature is cooler than the ambient temperature. When heating the device checks that the water temperature is hotter than the ambient temperature. If water temperature is not adequate, the fan speed is set to OFF and valve is fully open.

The water temperature measurement is enabled when the *Temperature probe 2 enable* parameter is set.

Initial Operating Parameters

While operating, the device checks every 5 minutes for changes in operating parameters. Operating parameters are the following:

- Temperature set point
- Selected fan speed
- Selected operating mode (off, cooling, heating)

If a change is detected, new parameters are stored in flash memory. On power up, these parameters are read from flash memory and used as operating parameters.

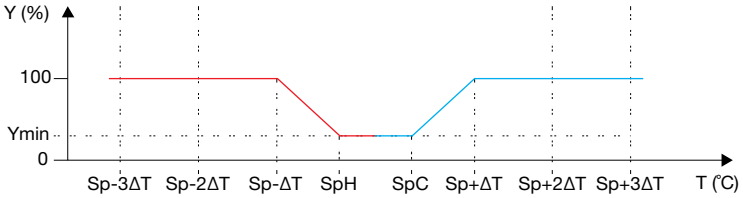
Modulated 0-10 Vac Valve

This device is designed for use with 2-pipe, 3-speed FCU with a 0-10 Vac modulated valve.

In this case, the valve performs regulation in the ΔT vicinity of set point. The valve opens and closes according to the graph below. The valve is controlled using 0-10 Vac analog output.

For details on controlling the fan speed, refer to the “Fan Speed Control” section.

Valve Position according to Room Temperature



SpH – Set point for heating

SpC – Set point for cooling

Y – Valve position (0 close, 100 fully open)

Y_{min} – Minimum position of valve when set point is reached

T – Room temperature

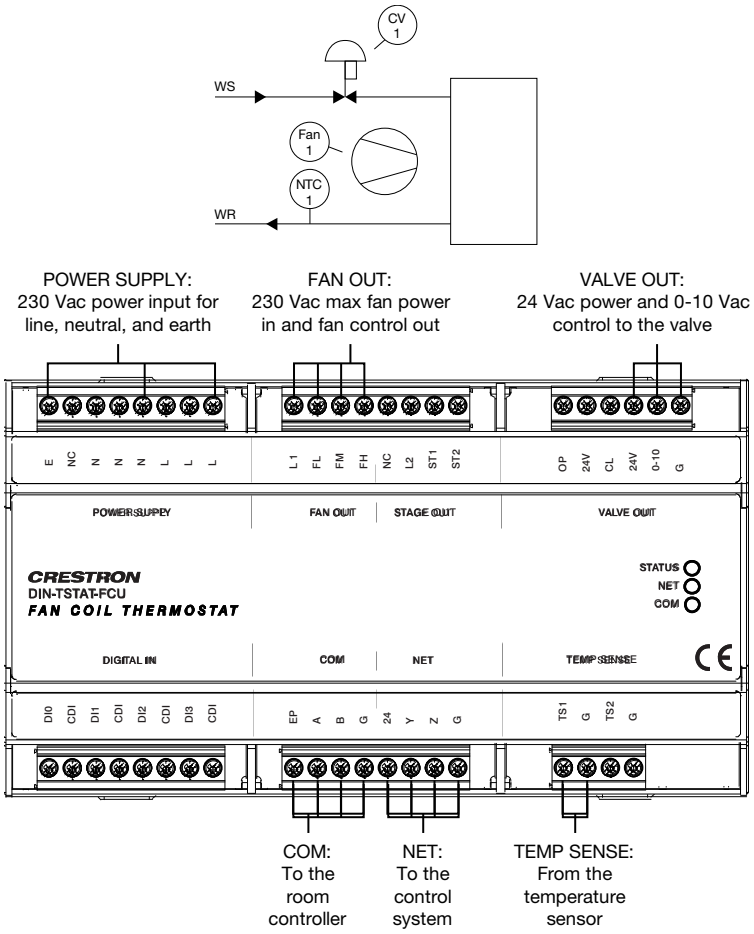
ΔT – Step of temperature difference

The following table explains the connection between regulation parameters from the diagram and user-settable parameters.

Regulation Parameters for Type 1 FCU

PARAMETER	EXPLANATION
ΔT	$\Delta T = Regulation\ step \times 0.5\ °C$
Y_{min}	$Y_{min} = \frac{Valve\ minimum\ position}{1000} \times 100\%$

Wiring Diagram



Modulated OP-CL 24 Vac Valve

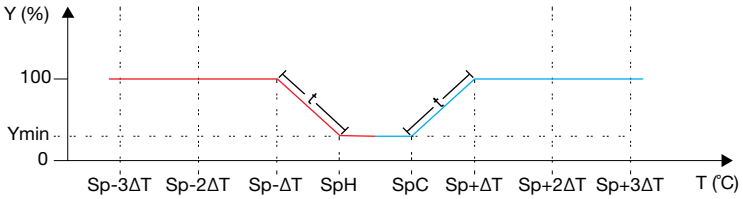
This device is designed for use with a 2-pipe, 3-speed FCU with 24 Vac common open or close valve.

In this case, the valve performs regulation in the ΔT vicinity of set point; the valve opens and closes at the rate of its defined time, according to the graph below.

Periodically, the valve is forced to the fully open position to eliminate accumulated error. The error correction period is defined by *Reset valve error interval* parameter.

For details on controlling the fan speed, refer to the "Fan Speed Control" section.

Valve Position according to Room Temperature



SpH – Set point for heating

SpC – Set point for cooling

Y – Valve position (0 close, 100 fully open)

Y_{min} – Minimum position of valve when set point is reached

T – Room temperature

ΔT – Step of temperature difference

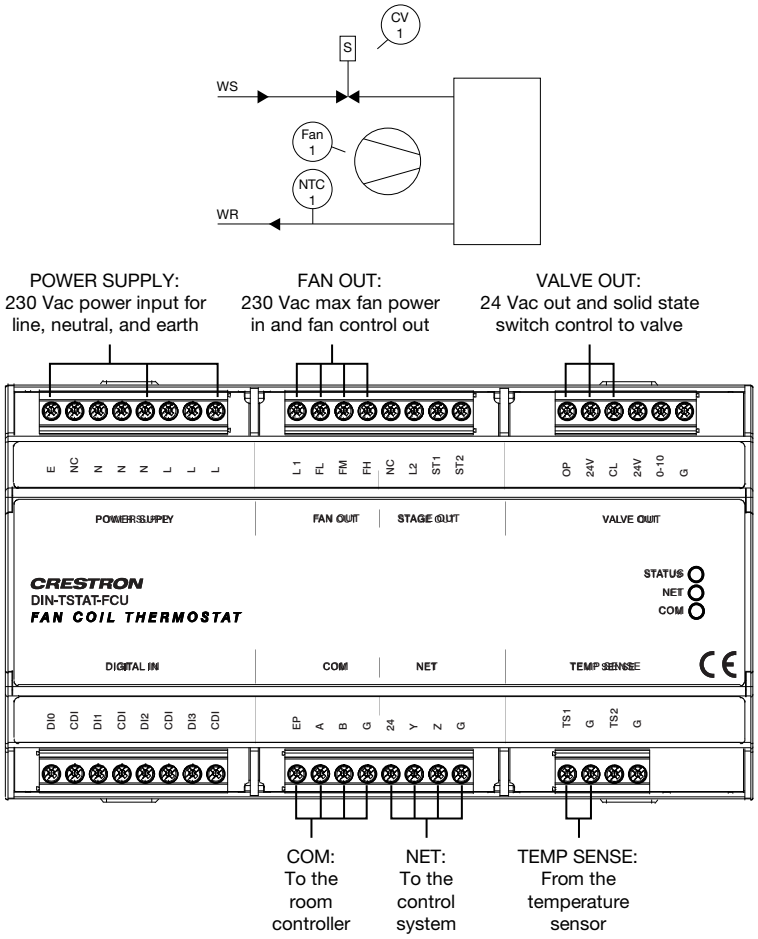
t - Time for valve to reach open/close position

The following table explains the connection between regulation parameters from the diagram and user-settable parameters.

Regulation Parameters for Type 2 FCU

PARAMETER	EXPLANATION
ΔT	$\Delta T = Regulation\ step \times 0.5\ °C$
Y_{min}	$Y_{min} = \frac{Valve\ minimum\ position}{1000} \times 100\%$
t when valve is opening	$t = Valve\ opening\ time \times \frac{1000 - Valve\ minimum\ position}{1000}$
t when valve is closing	$t = Valve\ closing\ time \times \frac{1000 - Valve\ minimum\ position}{1000}$

Wiring Diagram



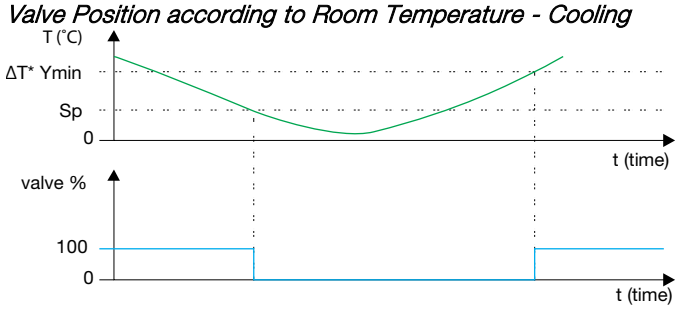
Spring-loaded 24 Vac Valve

This device is designed for use with a 2-pipe, 3-speed FCU with spring-loaded 24 Vac valve.

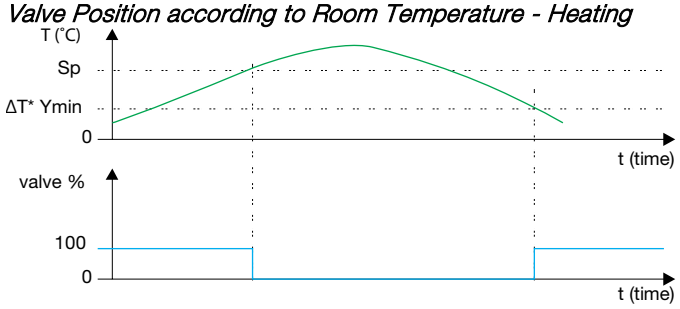
In this case, the valve operates as an on and off valve. The valve value is calculated according to room temperature, as shown in the graphs below. The valve is controlled using one triac (Valve open).

For details on controlling the fan speed, refer to the “Fan Speed Control” section.

Valve Position according to Room Temperature - Cooling



Valve Position according to Room Temperature - Heating



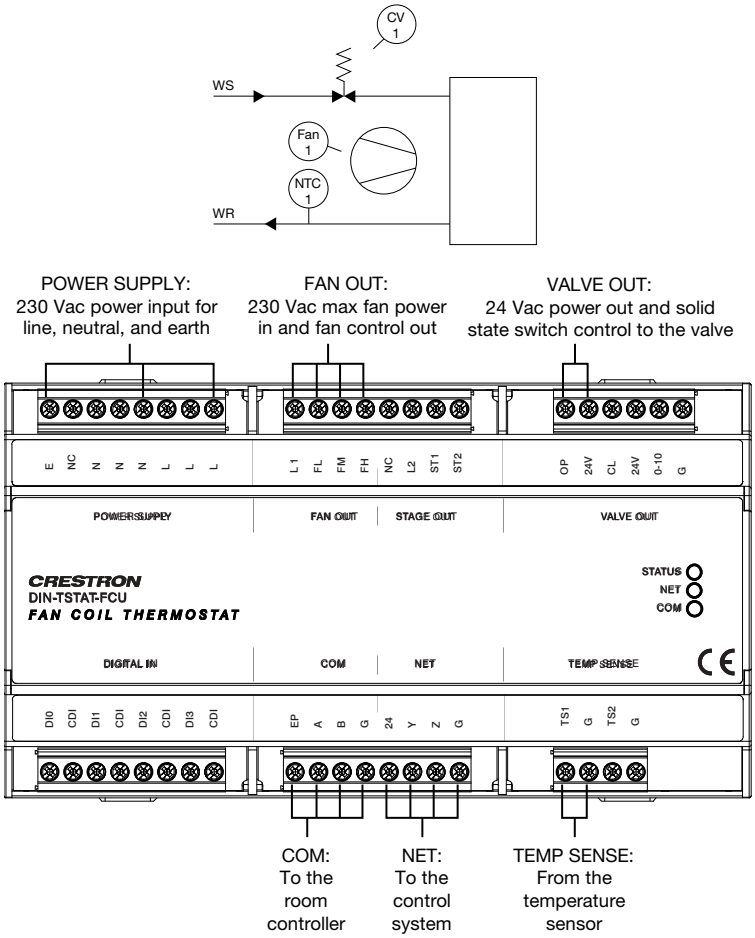
$\Delta T^* Y_{min}$ – temperature when valve open

The following table explains the connection between regulation parameters from the diagram and user-settable parameters.

Regulation Parameters for Type 3 FCU

PARAMETER	EXPLANATION
ΔT	$\Delta T = Regulation\ step \times 0.5\ °C$
Y_{min}	$Y_{min} = \frac{Valve\ minimum\ position}{1000} \times 100\%$

Wiring diagram



Modulated OP-CL 230 Vac Valve

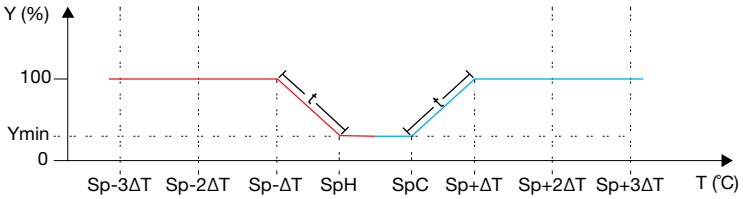
This device is designed for use with a 2-pipe, 3-speed FCU with 230 Vac common open or close valve.

In this case, the valve performs regulation in the ΔT vicinity of set point; the valve opens and closes at the rate of its defined time, according to the graph below.

Periodically, the valve is forced to the fully open position to eliminate accumulated error. Error annulation period is defined by *Reset valve error interval* parameter.

For details on controlling the fan speed, refer to the "Fan Speed Control" section.

Valve Position according to Room Temperature



SpH – Set point for heating

SpC – Set point for cooling

Y – Valve position (0 close, 100 fully open)

Y_{min} – Minimum position of valve when set point is reached

T – Room temperature

ΔT – Step of temperature difference (ΔT=N*0.5 °C, N is settable parameter)

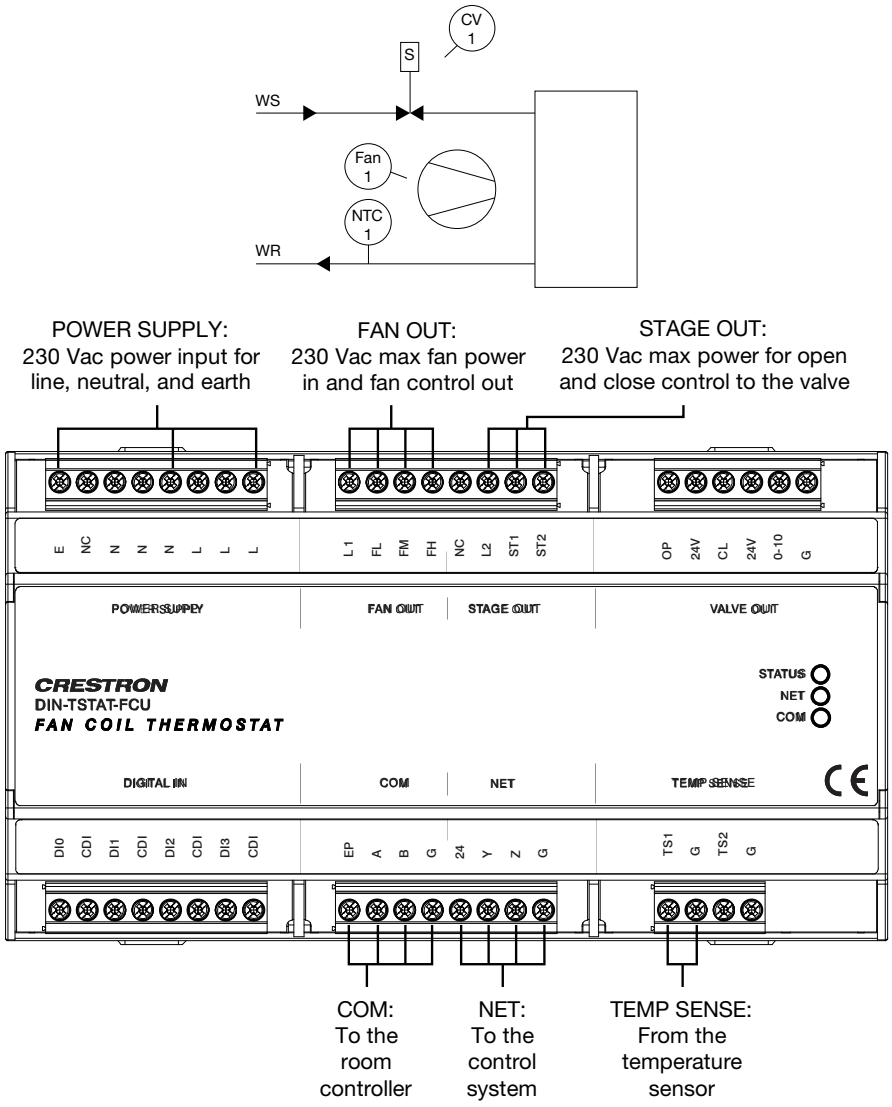
t - Time for the valve to reach full open/close position

This table explains the connection between regulation parameters from the diagram and user-settable parameters.

Regulation Parameters for Type 4 FCU

PARAMETER	EXPLANATION
ΔT	$\Delta T = Regulation\ step \times 0.5\ °C$
Ymin	$Ymin = \frac{Valve\ minimum\ position}{1000} \times 100\%$
t when valve is opening	$t = Valve\ opening\ time \times \frac{1000 - Valve\ minimum\ position}{1000}$
t when valve is closing	$t = Valve\ closing\ time \times \frac{1000 - Valve\ minimum\ position}{1000}$

Wiring Diagram



Spring-loaded 230 Vac Valve

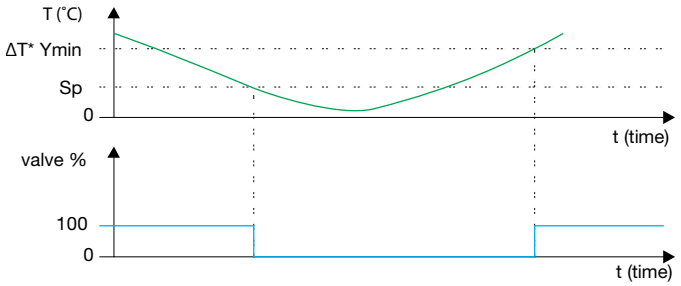
This device is designed for use with a 2-pipe, 3-speed FCU with spring-loaded 230 Vac valve.

In this case, the valve operates as an on and off valve. The valve value is calculated according to room temperature, as shown in the graphs below.

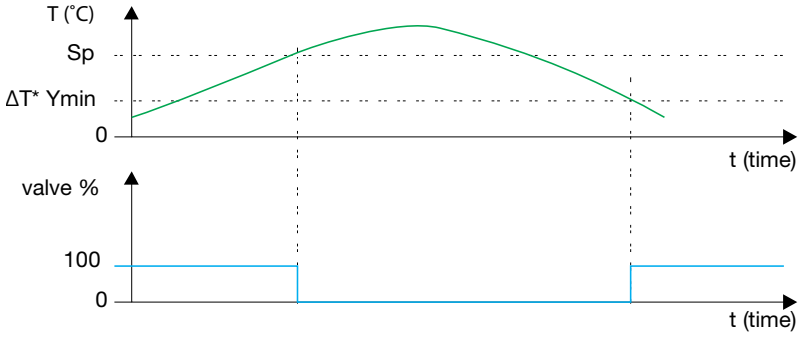
The valve is controlled using one relay (Valve open).

For details on controlling the fan speed, refer to the “Fan Speed Control” section.

Valve Position according to Room Temperature - Cooling



Valve Position according to Room Temperature - Heating



Sp – set point

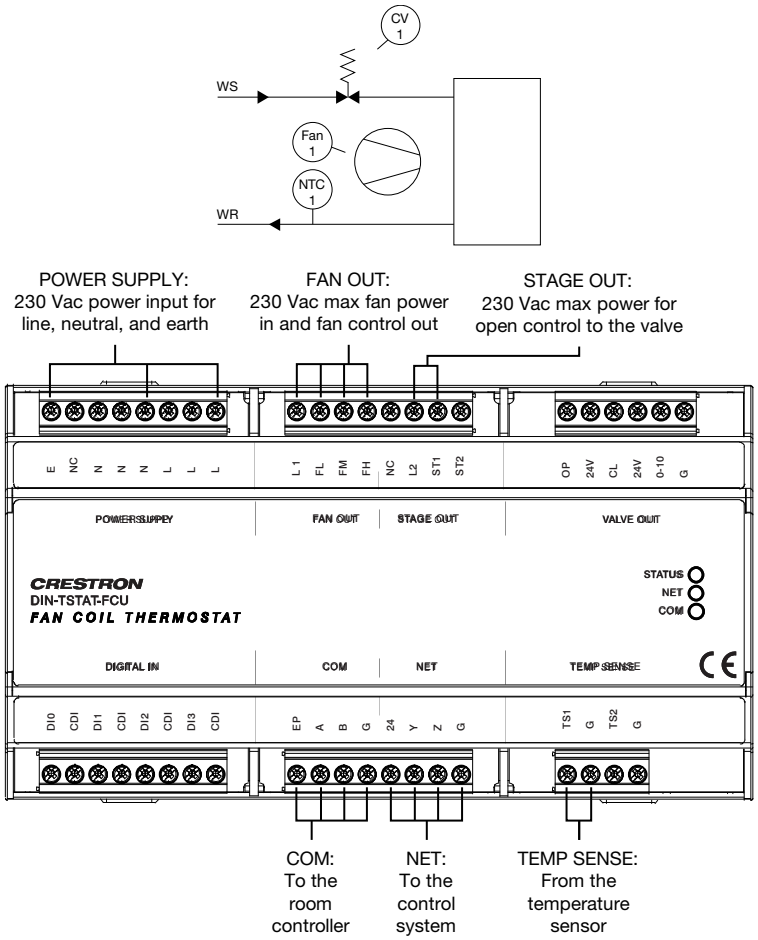
ΔT* Y_{min} – temperature when valve is open

The following table explains the connection between regulation parameters from the diagram and user-settable parameters.

Regulation Parameters for Type 5 FCU

PARAMETER	EXPLANATION
ΔT	$\Delta T = Regulation\ step \times 0.5\ °C$
Ymin	$Ymin = \frac{Valve\ minimum\ position}{1000} \times 100\%$

Wiring Diagram



1-2 Stage Direct-expansion System

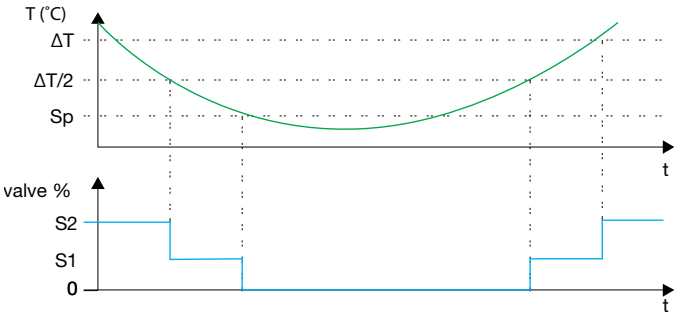
This device is designed for use with a 3-speed, direct-expansion system with compressor control - cooling only.

In this case, a compressor is controlled instead of a valve. The compressor state for stage one and stage two is determined by the room temperature. The compressor is controlled using two relays (Stg 1 – stage 1, Stg 2 – stage 2).

The diagram of working compressor according to room temperature is shown in the graph below.

For details on controlling the fan speed, refer to the “Fan Speed Control” section.

Diagram of Working Compressor according to Room Temperature



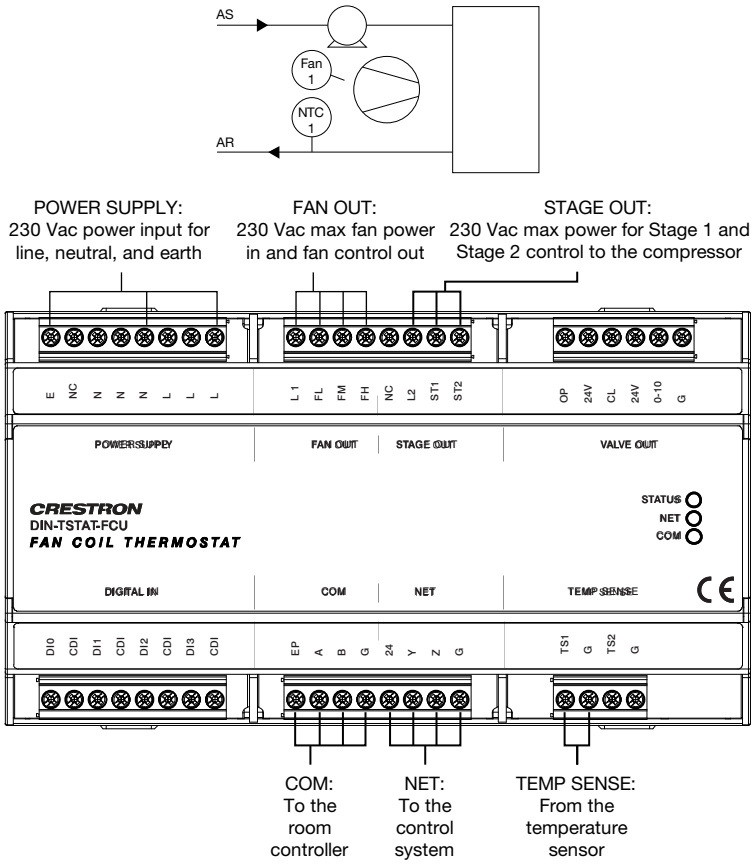
Sp- set point

ΔT – Step of temperature difference (ΔT=N*0.5 °C, N is settable parameter)

S2 – Stage 2 ON

S1 – Stage 1 ON

Wiring Diagram



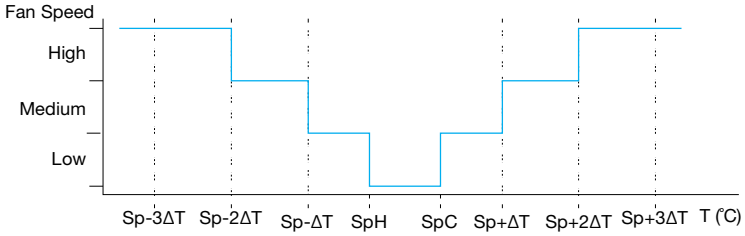
Fan Speed Control

This device is designed for all configuration, the fan shifts to low, medium, and high speed based on room temperature. When room temperature reaches its set point, if parameter *Fan speed OFF enable* is set to 1, the fan turns down; otherwise it remains in low.

If fan speed is forced, it constantly runs at the selected speed.

The diagram below shows the fan speed according to room temperature and operating mode.

Fan Speed according to Room Temperature



SpH – Set point for heating

SpC – Set point for cooling

T – Room temperature

ΔT – Step of temperature difference ($\Delta T = Regulation\ step \times 0.5\ °C$)

Alarms

The device has four digital inputs reserved for external alarm signals. Their usage is optional and adjustable by device configuration parameters. Each of the four alarm inputs has three adjustable parameters available:

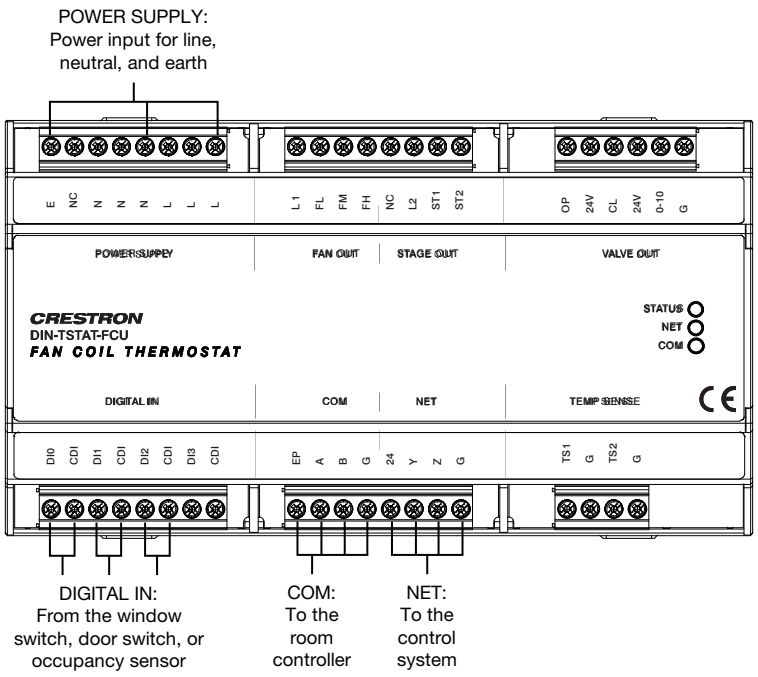
- *Alarm X enable* – Determines if the alarm input is used
- *Alarm X polarity* – Alarm is active if the incoming input signal corresponds to the set polarity
- *Alarm 1 delay* – Time interval from the alarm input signal activation to the activation of the alarm state

Alarm inputs are used for accepting signals from window/door sensors, condensation canister sensor, PIR sensors, etc.

If enabled and activated, the alarm blocks the device outputs for fan speed (fan speed will be set to 0) and closes the valve by forcing valve outputs (different outputs depending on device configuration type). If the delay time is set, alarm activation or deactivation is postponed by alarm delay time.

The wiring diagram below shows an example where three alarm inputs are used.

Alarms Wiring Example



Temperature Probes

DIN-TSTAT-FCU device has two resistance measuring inputs for NTC probes. First input is used for room temperature measurement. The second input can be used for water temperature monitoring.

For the best results, use 20K NTC probes.

Supported NTC Probes

PROBE TYPE	RANGE [OC]	TEMPERATURE PROBE 1/2 TYPE PARAMETER VALUE
NTC 20K	0 – 100	1
NTC 10K	0 – 100	2
NTC 12K	0 – 100	3
NTC 15K	0 – 100	4

Cresnet® Communications

The DIN-TSTAT-FCU primarily communicates using the NET port. The NET port has four pins marked as 24, Y, Z, G, where 24 is 24 V input, Y and Z are + and – signal lines, and G is ground.

Through the Cresnet network, a user can do the following:

- Change the temperature set point either by sending a new value or by sending raise and lower commands
- Set the desired fan speed mode (low, medium, high, or auto)
- Set the operating mode (cooling, heating, or off)
- Monitor the current temperature set point
- Monitor the currently active operating mode
- Monitor the currently active fan speed
- Monitor the status of binary inputs
- Monitor the measured temperatures

Commands issued using the Cresnet port are also reported back through the Modbus port. The last received command is considered valid. The Cresnet network and local room display unit are both informed about the last change.

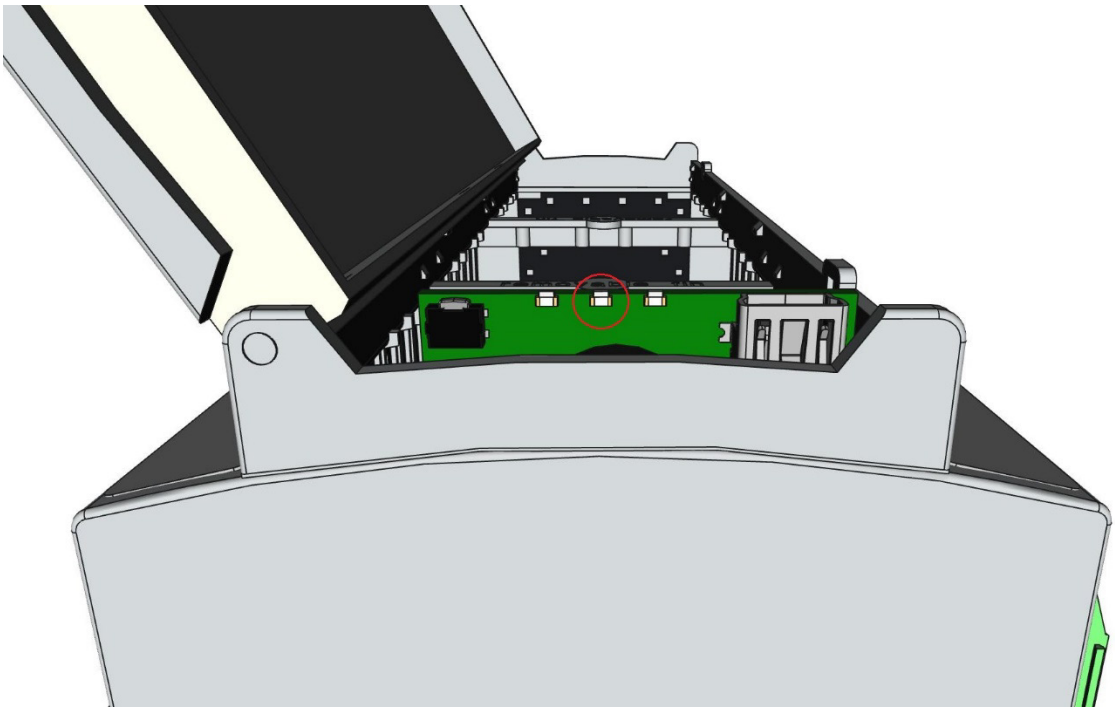
Port

The device can operate using only power supplied from the Cresnet network, but in that case, I/O resources are not operational and a main power supply error is reported. When operating from network power supply, the device consumes 0.5 W.

Communication

The device is reported as a DIN-TSTAT-FCU on the Cresnet network. The serial number is the same as serial number on the device label.

While Cresnet communication is active, the NET LED is ON.



Joins

The device input and output joins are listed in the tables below.

Input Joins

JOIN TYPE	JOIN NAME	JOIN NUMBER
Digital	Raise_Setpoint	1
Digital	Lower_Set point	2
Digital	Mode_Heat	3
Digital	Mode_Cool	4
Digital	Mode_Off	6
Digital	Fan_High	9
Digital	Fan_Med	10
Digital	Fan_Low	11
Digital	Fan_Auto	12
Analog	Setpoint	1

Output Joins

JOIN TYPE	JOIN NAME	JOIN NUMBER
Digital	Mode_Heat_FB	3
Digital	Mode_Cool_FB	4
Digital	Mode_Off_FB	6
Digital	Is_Cooling_FB	7
Digital	Is_Heating_FB	8
Digital	Fan_High_FB	9

(continued on the following page)

Output Joins (continued)

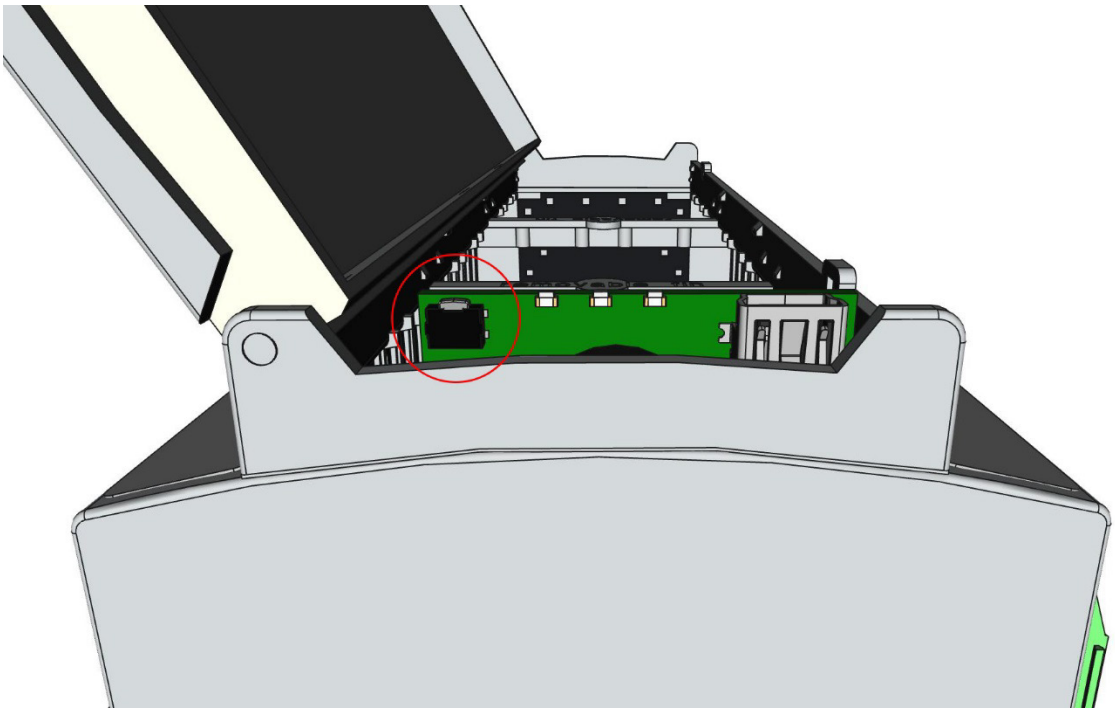
JOIN TYPE	JOIN NAME	JOIN NUMBER
Digital	Fan_Med_FB	10
Digital	Fan_Low_FB	11
Digital	Fan_Auto_FB	12
Digital	Input_1_FB	13
Digital	Input_2_FB	14
Digital	Input_3_FB	15
Digital	Input_4_FB	16
Analog	Setpoint_FB	1
Analog	Temperature_1_FB	2
Analog	Temperature_2_FB	3
Analog	MinHeatSetpoint_FB	4
Analog	MaxHeatSetpoint_FB	5
Analog	MinCoolSetpoint_FB	6
Analog	MaxCoolSetpoint_FB	7
Analog	FCU_Type	11

Light and Poll

Light and Poll (LP) is a mechanism that allows a device to identify itself through physical input from a user. This helps identify devices in their physical location, as well as reduce the chance of communicating with the wrong device. LP works in the following manner:

1. A Start Light and Poll (SLP) command is sent from the control system to DIN-TSTAT-FCU.
2. The device blinks its NET LED to indicate that it is in Light and Poll mode.
3. Press the NET button to acknowledge the SLP command. This ends the Light and Poll procedure by sending an End Light and Poll (ELP) command.

Press the Pushbutton to Acknowledge SLP



AUX Port

An auxiliary RS-485 port supports the Modbus RTU protocol. The device is master on Modbus network. This port is used for connecting to a local room display unit. The local room display unit enables user to do the following:

- Set the temperature set point
- Set the desired fan speed mode (low, medium, high, or auto)
- Set the operating mode (cooling, heating, or off)
- Monitor the current temperature set point
- Monitor the currently active operating mode
- Monitor the currently active fan speed
- Monitor the measured room temperature

Commands from the auxiliary port can be received concurrently with commands from the NET port. The last received command is considered valid. The control system and local room display unit are both informed about the last change.

Communication parameters are settable through user registers.

Port

The auxiliary port has four pins marked EP, A, B, G, where EP is external power supply, A and B are + and – communication signals lines, and G is ground.

The DIN-TSTAT-FUC can supply power to other devices on the Modbus network. Supply voltage is 20 Vdc and the maximum output current is 100 mA.

Communication

The device is preprogrammed to read and write particular values to and from local room display.

Modbus reads:

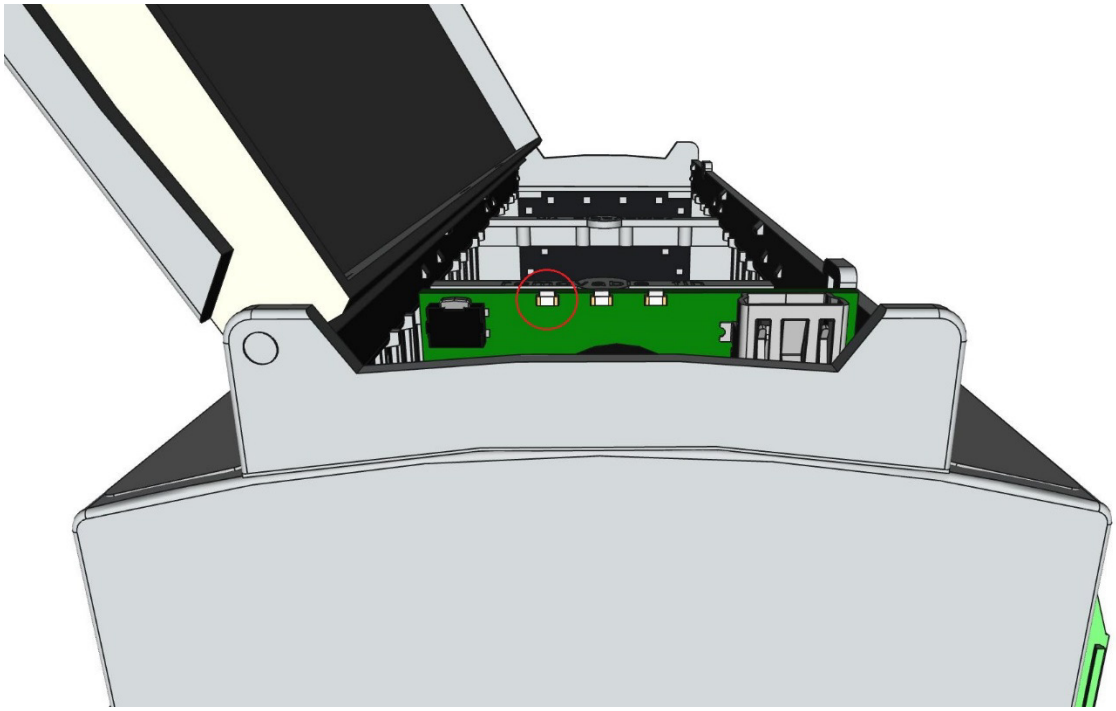
- Temperature set point
- Desired fan speed mode
- Desired operating mode

Modbus writes:

- Active temperature set point
- Active fan speed mode
- Active operating mode
- Current room temperature
- Minimum set point value
- Maximum set point value

Write Multiple Registers command is used for register write and Read Holding Registers command is used for register read. The registers are written on value change while read is performed on best effort.

While communication is active, the COM LED blinks. If communication is error-free COM LED blinks fast, and each error will introduce a delay of 1s between the LED flashes.



Registers

Registers that read and write from the local room display are shown below.

Modbus Read/Write Registers

REGISTER NAME	RANGE	READ/WRITE	NOTE
Set point	Set point min – Set point max	Read/Write	Temperature is in format oC x 10
Fan speed command	1 – 4	Read/Write	1: Lo; 2: Med; 3: Hi; 4: Auto
Mode command	0 – 2	Read/Write	0: OFF; 1: Cooling; 2: Heating
Air temperature	0 – 1000	Write	Temperature is in format oC x 10
Set point min	0 – 1000	Write	Temperature is in format oC x 10
Set point max	0 – 1000	Write	Temperature is in format oC x 10

Parameters

For communication with the local room display unit to be established, correct parameters must be written to communication registers. Refer to “Device Parameters” on page 4 for details. After parameters are set, reboot the device for changes to take effect.

USB Port

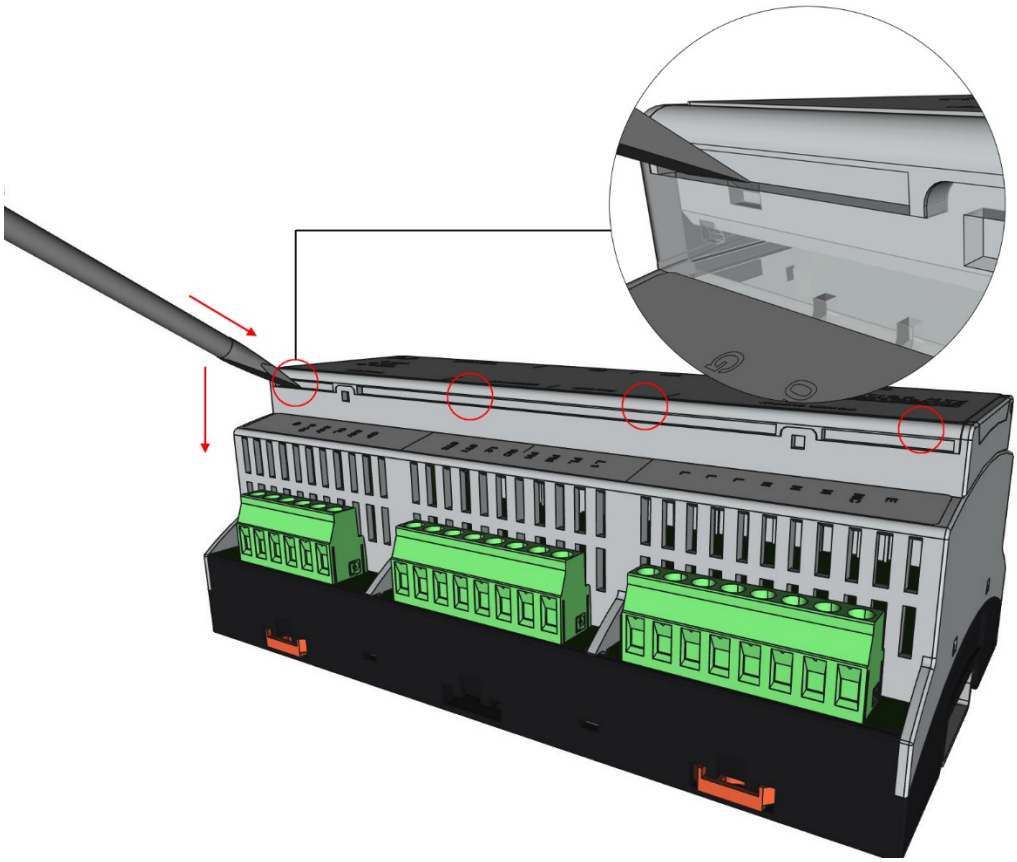
The USB port is used for device commissioning and software updates including operating system and firmware updates. USB connector type on the DIN-TSTAT-FCU is Mini-B.

NOTE: It may be necessary to install a USB driver to be able to communicate with the DIN-TSTAT-FCU over USB.

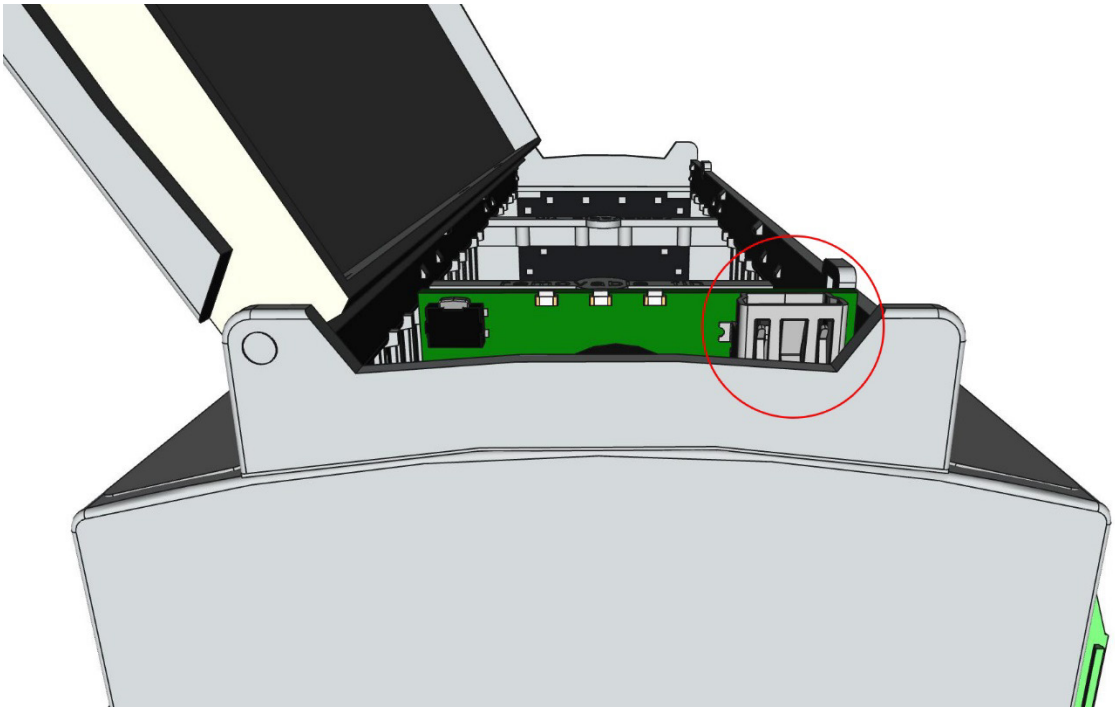
Accessing USB Port

USB port is located under the cover of the DIN-TSTAT-FCU. To open the cover, use a 2 mm wide flat screwdriver to gently pry the cover open using the four slots that are marked below.

Releasing the Lid



Accessing the USB Port



USB Driver Installation Procedure

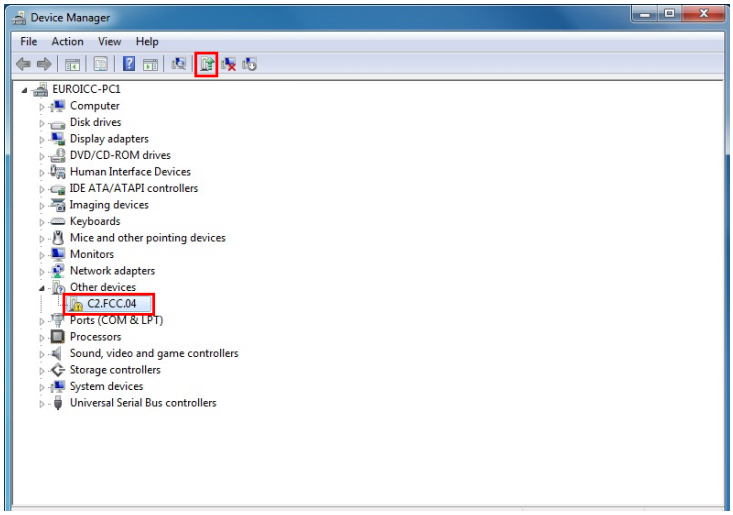
NOTE: USB driver installation procedure is necessary only if the USB driver is not installed automatically after the USB cable is inserted.

Before the USB driver is installed, please install DIN-TSTAT-FCU Configuration Tool.

The USB driver installation procedure explained in this section is for Windows® 7 operating system but is similar to other Windows versions.

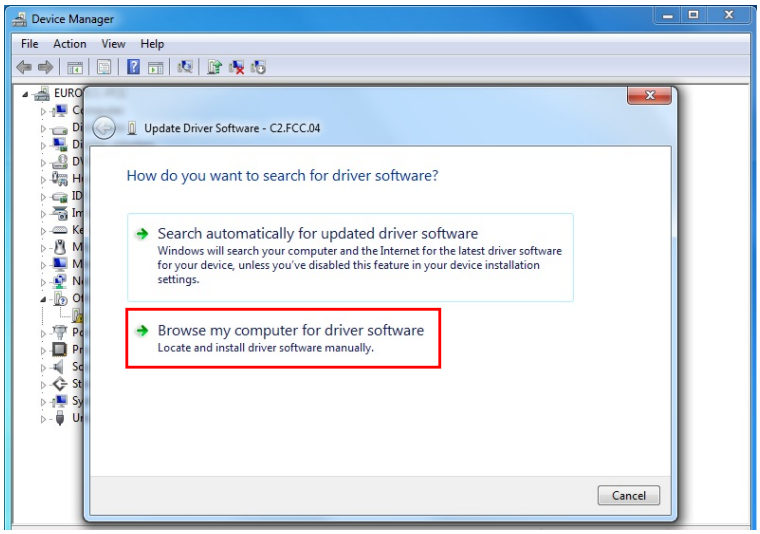
To install the USB driver, follow these steps:

1. Connect the DIN-TSTAT-FCU to the PC using a USB cable.
2. Open the *Device Manager* window.
3. Click the DIN-TSTAT-FCU with the missing driver.
4. Click on the *Update Driver* shortcut icon.

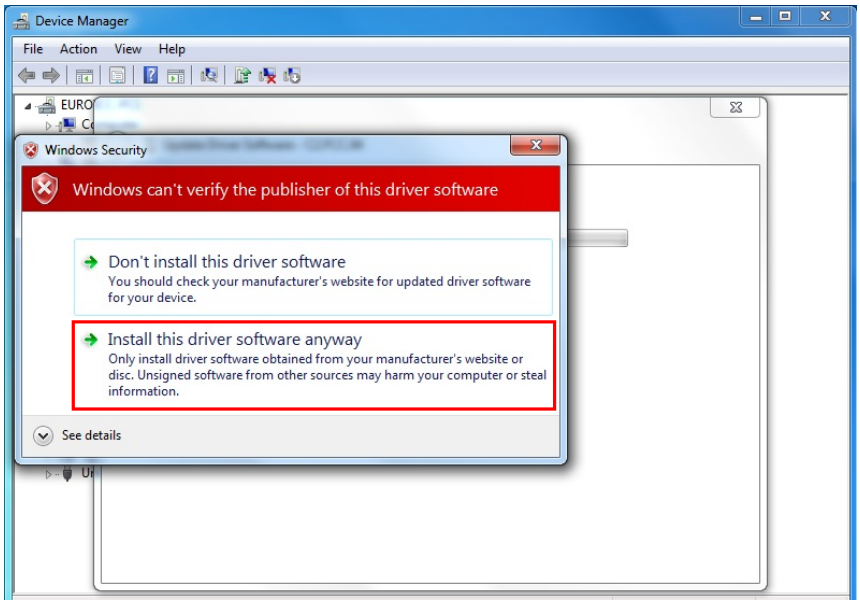


5. Click “Browse my computer for driver software.”

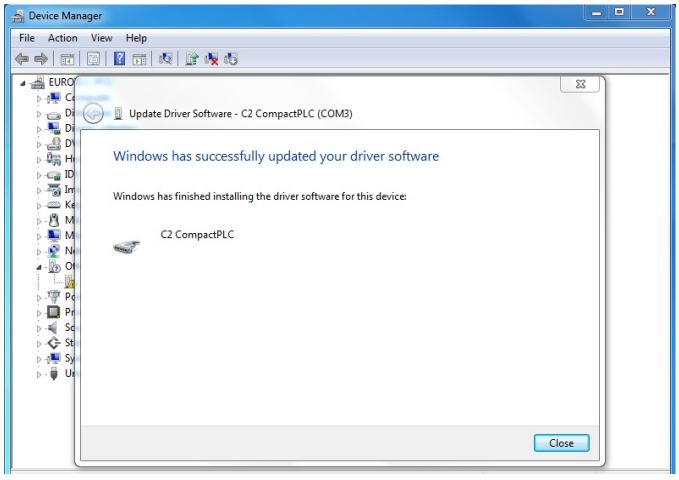
6. Browse to the location that the DIN-TSTAT-FCU Configuration Tool is installed and then click **Next**. The default location is C:\Program Files (x86)\Crestron\DIN-TSTAT-FCU Configuration Tool.



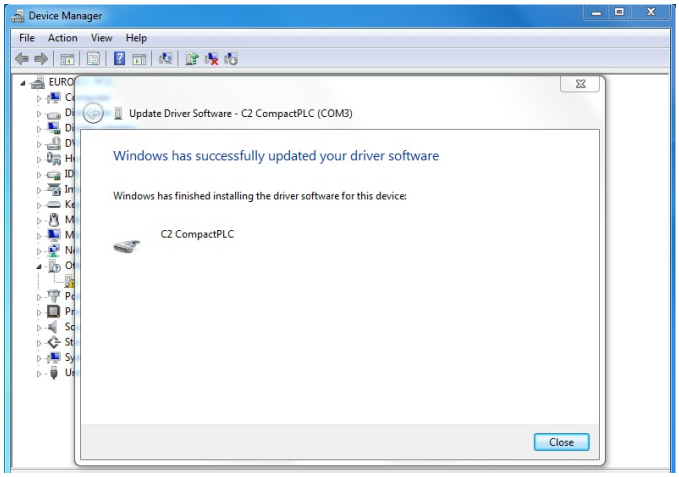
7. If the *Windows Security* window appears, click *Install this driver software anyway*.



8. After installation is complete, a popup window indicating installation success appears.



9. Check that the device has appeared in the *Device Manager* list and note COM number associated with device.

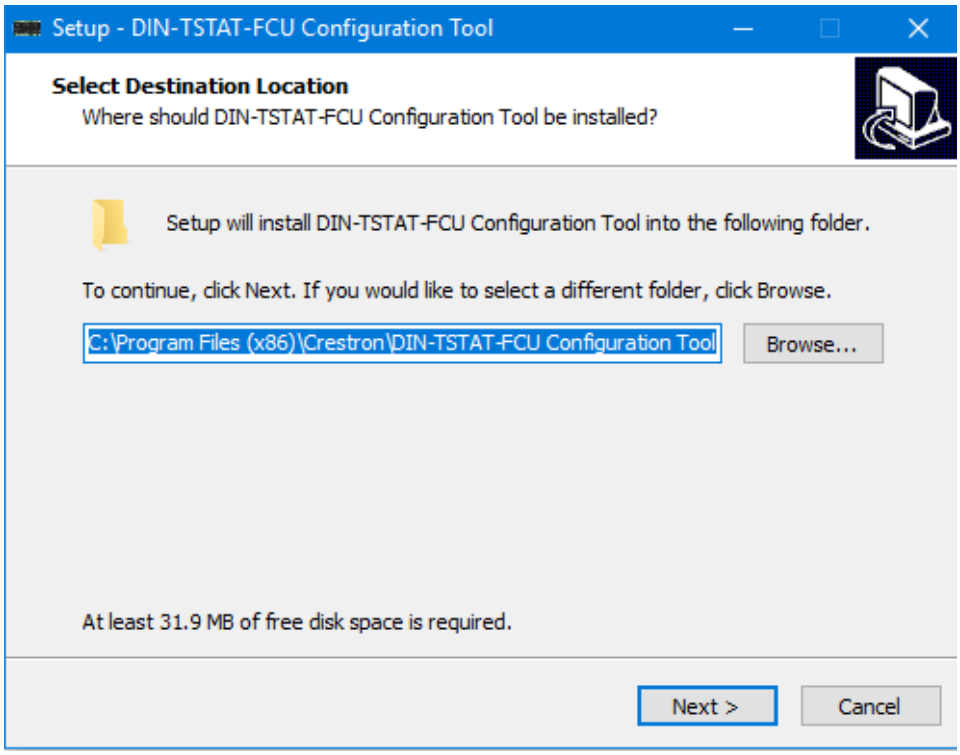


Install the DIN-TSTAT-FCU Configuration Tool

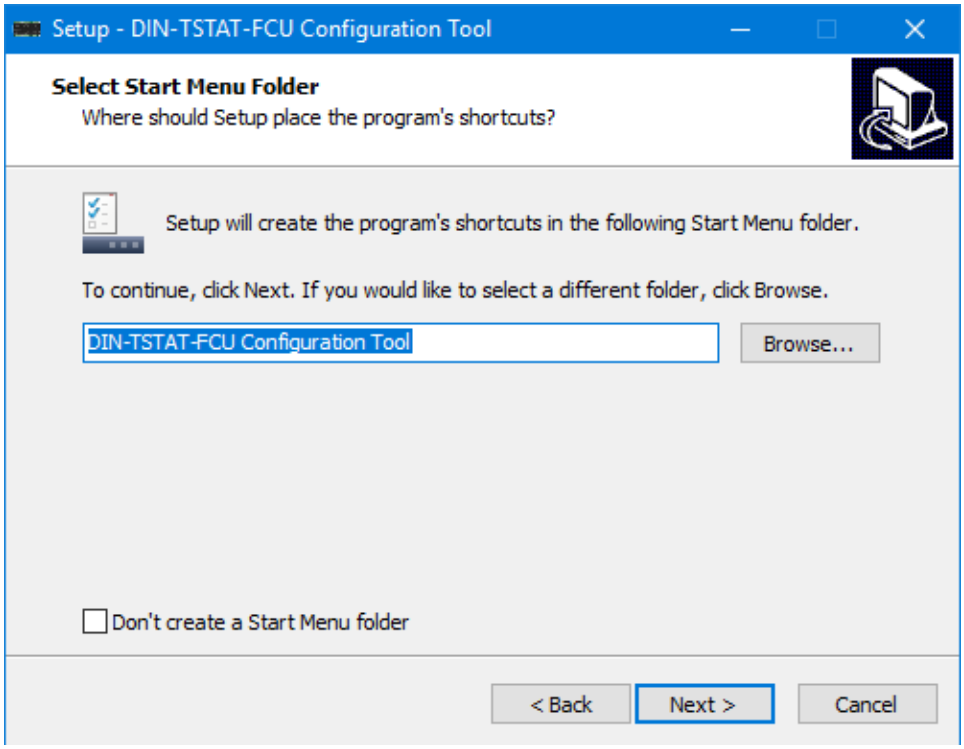
To install the DIN-TSTAT Configuration Tool, do the following:

1. Double-click the DIN-TSTAT-FCU Configuration Tool.exe file to begin installation.

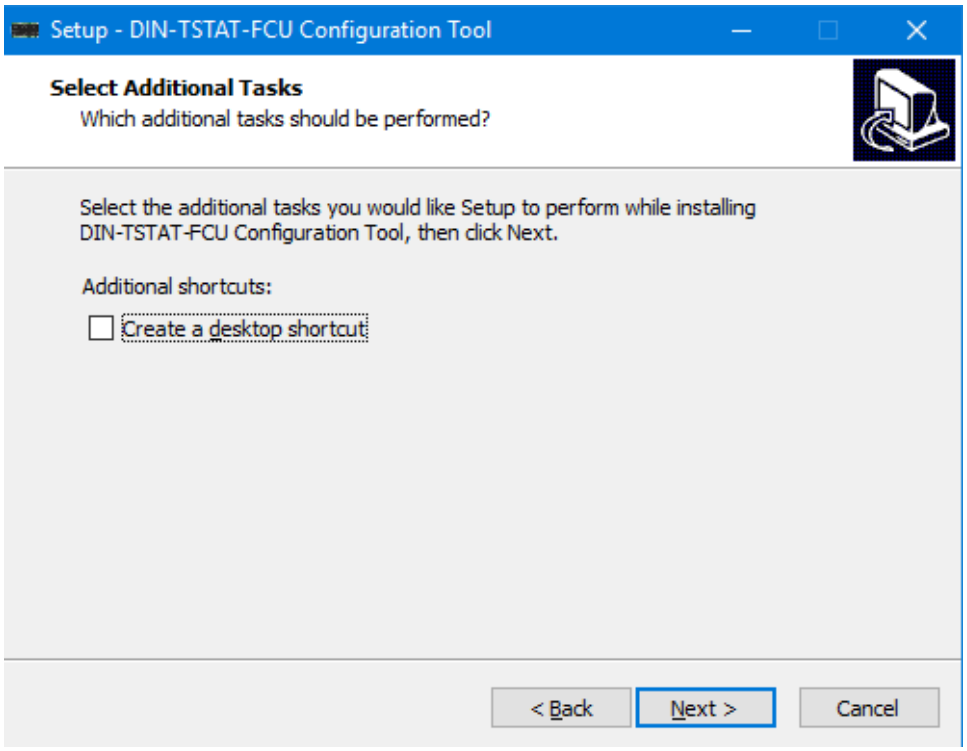
2. Enter the installation destination in the “Setup -Select Destination Location” window. The default installation destination “C:\Program Files (x86)\Crestron\DIN-TSTAT-FCU Configuration Tool”. Click **Next**.



3. In the “Setup – Select Start Menu Folder,” set the installation options for creating a shortcut for the configuration tool in the Start Menu folder. Click **Next**.

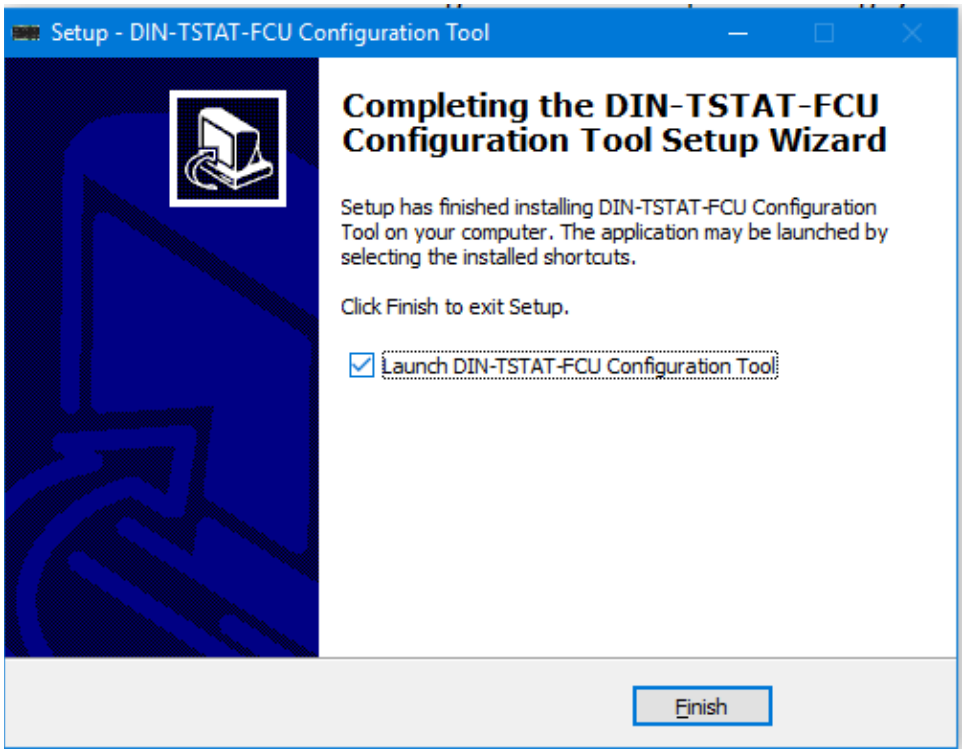


4. In the “Setup – Select Additional Tasks” window, select or clear the **Create a desktop shortcut** check box to create a shortcut to the DIN-TSTAT-FCU Configuration tool on your desktop. Click **Next**.



5. The DIN-TSTAT-FCU Configuration tool is installed. Upon completion, a summary window is displayed gives the option to start the application. Select or clear the

Launch DIN-TSTAT-FCU Configuration Tool check box to open the program after exiting the installation process. Click Finish to exit the installation process.



Using the DIN-TSTAT-FCU Configuration Tool

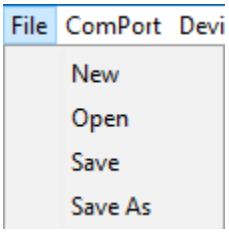
The DIN-TSTAT-FCU Configuration Tool sets the parameters for the DIN-TSTAT-FCU.

Menu Overview

The menu bar contains File, ComPort, Device, and Help menus that provide access to various setup and operation features.

File Menu

The File menu contains New, Open, Save and Save As options.



New – creates new tables with the default parameters for Regulation and Alarms. It populates default values for the the Valve/Compressor table based on the FCU type list.

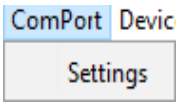
Open – opens a previously saved value configuration from an xml file.

Save – saves the current values from the tables inside an xml file. If the current file is the default-parameters.xml file, which cannot be overwritten, the program prompts a file selection dialog so the user can select a new file to save in.

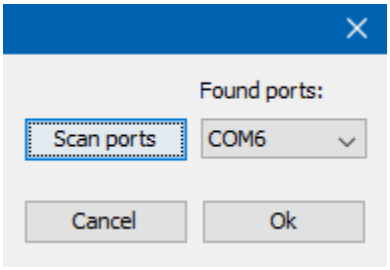
Save As – opens a file save dialog that lets the user choose a save location for the xml table.

ComPort Menu

The ComPort menu contains a Settings option.



Settings Menu

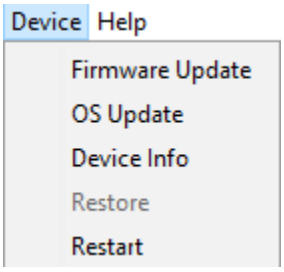


Click the Scan Ports button to identify and list all used ports in the system. Select the port that the DIN-TSTAT-FCU uses to communicate from the drop-down list.

Click OK to save the settings and exit the menu. Click Cancel to discard the settings and exit.

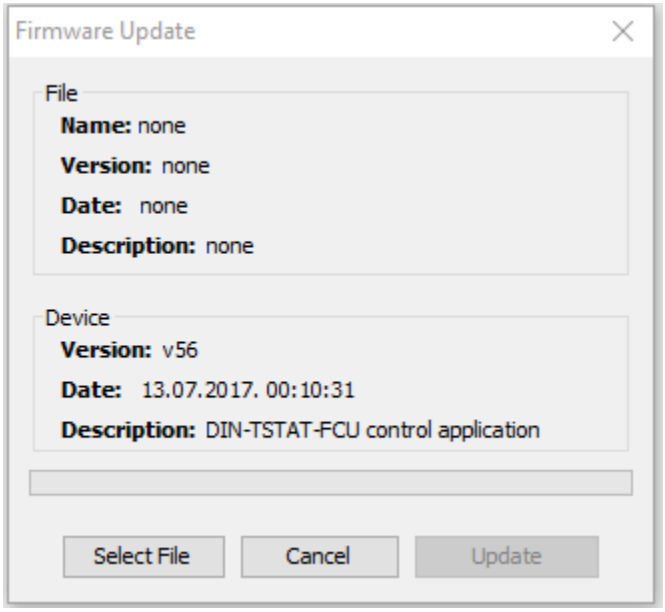
Device Menu

The Device menu contains Firmware Update, OS Update, Device Info, Restore, and Restart options.



Firmware Update

The “Firmware Update” window displays device firmware information and allows new firmware to be loaded to the device.



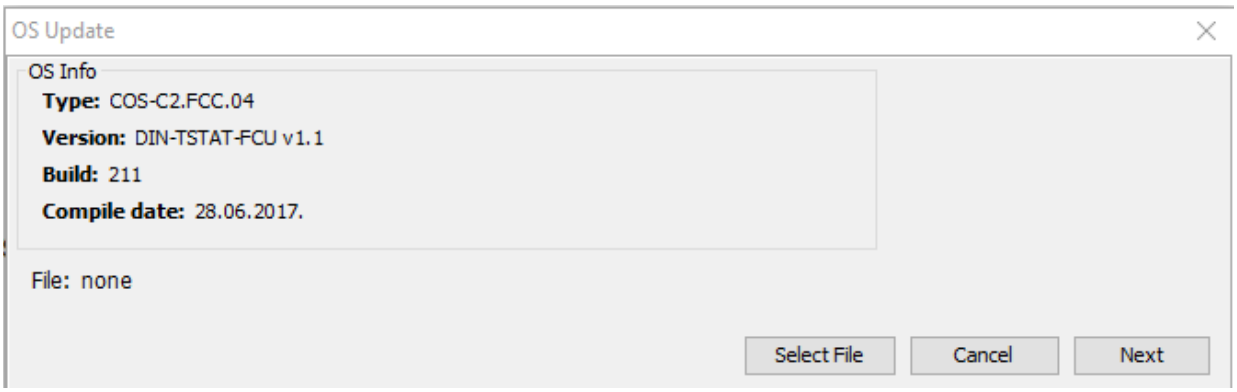
To load firmware to the DIN-TSTAT-FCU, do the following:

1. Click the **Select file** button and select the firmware file to be loaded. The Firmware information is displayed in the “File” section of the “Firmware Update” window.
2. Click the **Update** button to load the firmware onto the DIN-TSTAT-FCU.

OS Update

The “OS Update” window allows an updated OS to be loaded to the DIN-TSTAT-FCU. The information about the current OS in the device is displayed in the “OS Info” section of the window.

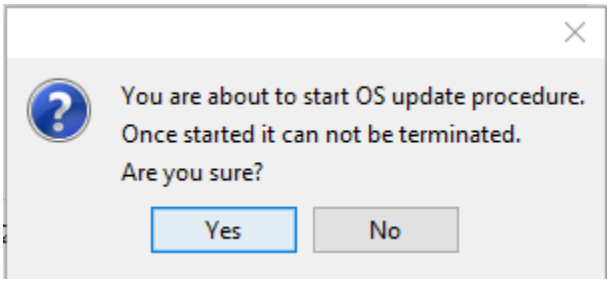
OS Update Window



To update the OS of the DIN-TSTAT-FCU, do the following:

1. Click the **Select file** button to select and load the updated OS.

2. In the pop-up dialog, click **Yes** to accept that the procedure cannot be terminated after proceeding. The device is placed into OS Flash mode and all LEDs on the DIN-TSTAT-FCU turn off.

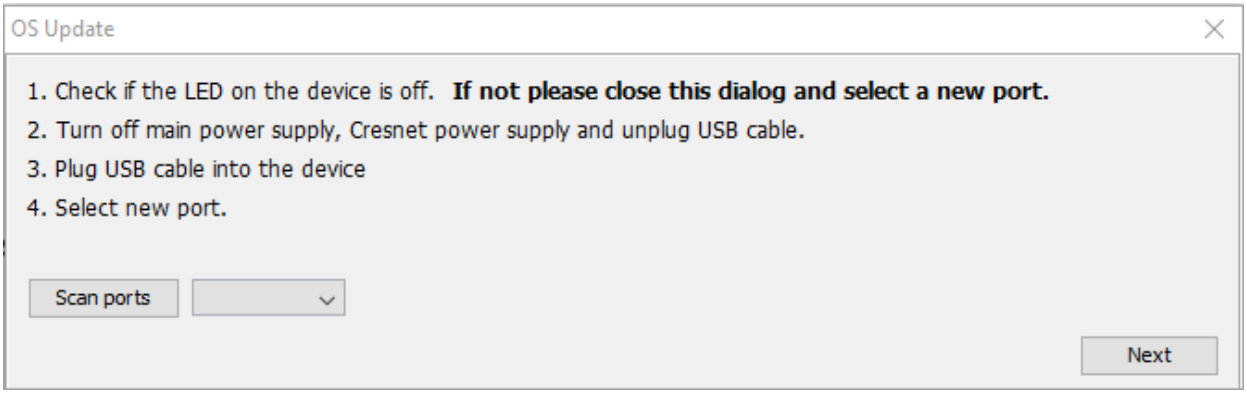


CAUTION: The OS update procedure cannot be aborted after clicking **Yes**. The remaining procedure must be completed and an OS must be flashed to the device.

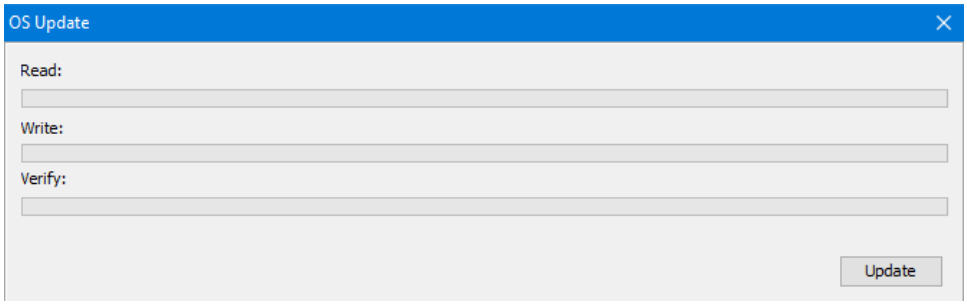
3. Turn off power to the POWER SUPPLY and NET port.
4. Disconnect the USB cable from the DIN-TSTAT-FCU, and then reconnect the USB cable.

NOTE: The USB cable must be removed and then reinserted into the DIN-TSTAT-FCU before continuing.

5. Click **Scan ports**, and then select the port with which the DIN-TSTAT-FCU is associated.
6. Click **Next**.



7. Click **Update** to start the OS update process.



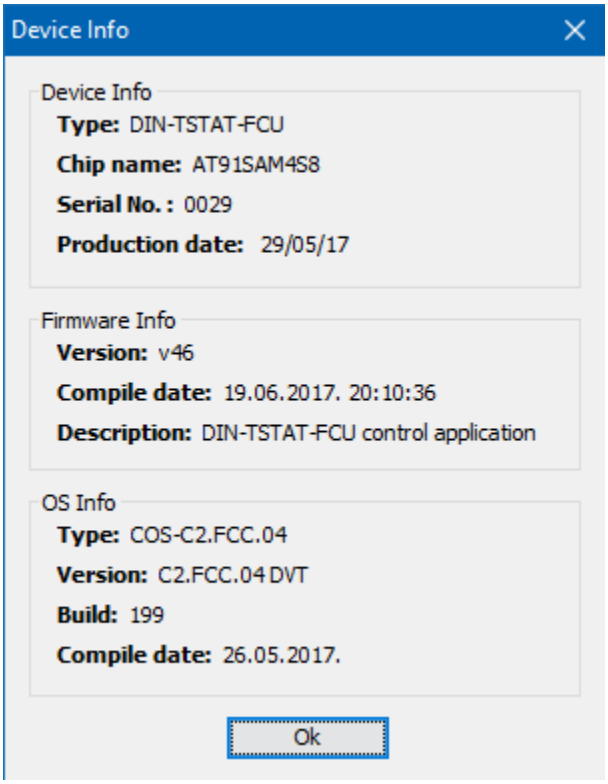
8. When prompted, disconnect the USB cable from the DIN-TSTAT-FCU, and then reconnect the USB cable. The LED lights when the USB cable is reconnected.

NOTE: The USB cable must be removed and then reinserted into the DIN-TSTAT-FCU before continuing.

9. Restore power to the POWER SUPPLY and NET port.

Device Info

The “Device Info” window displays device information such as Device Info, Firmware Info, and OS Info.



Restore

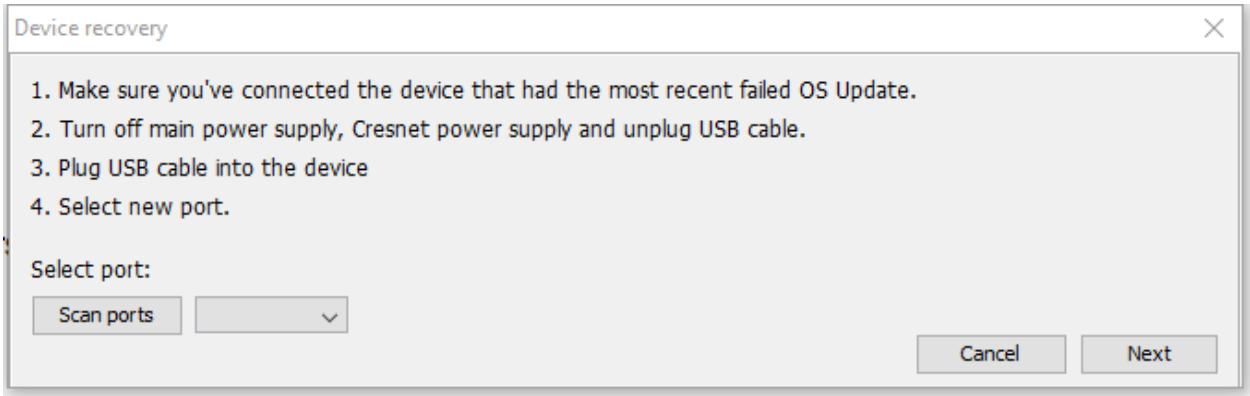
Device recovery is available only when an OS Update fails while a new OS is being written or verified. It allows the DIN-TSTAT-FCU to recover to the last known working OS.

1. Turn off power to the POWER SUPPLY and NET ports.
2. Disconnect the USB cable from the DIN-TSTAT-FCU, and then reconnect the USB cable.

   NOTE: The USB cable must be removed and then reinserted into the DIN-TSTAT-FCU before continuing.

3. Press Scan and then select the port with which the DIN-TSTAT-FCU is associated.

4. Click **Next**.



5. Click **Recover**.

6. When prompted, disconnect the USB cable from the DIN-TSTAT-FCU, and then reconnect the USB cable. The LED lights when the USB cable is reconnected.

   NOTE: The USB cable must be removed and then reinserted into the DIN-TSTAT-FCU before continuing.

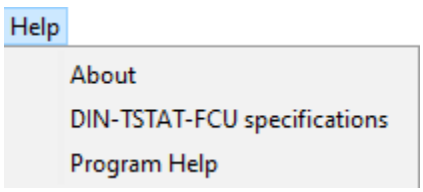
7. Restore power to the POWER SUPPLY and NET port.
8. Click **Finish**.

Restart

The "Restart" window allows the device to be restarted. When restarted, the DIN-TSTAT-FCU is put into idle state, and then put into a normal operating state.

Help Menu

The Help menu contains About, DIN-TSTAT-FCU specifications, and Program Help options.



About - The "About" window displays the version number of the DIN-TSTAT-FCU Configuration Tool and copyright information.

DIN-TSTAT-FCU specifications - The “DIN-TSTAT-FCU specifications” window displays a PDF with the specifications of the device.

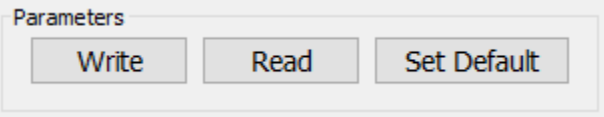
Program Help – The “Program Help” window displays the user manual for the program.

Configure the DIN-TSTAT-FCU

NOTE: When the DIN-TSTAT-FCU Configuration Tool is run for the first time, it searches for available ports. If only one port is discovered, it connects to the DIN-TSTAT-FCU associated with that port. Upon subsequent starts, it loads the port used during the last session.

NOTE: Configuration save is done automatically upon changing the working file or changing the port, as well as upon closing the application.

Toolbar Bar



The toolbar contains **Write**, **Read**, and **Set Default** buttons.

Write – writes the values from the table to the DIN-TSTAT-FCU.

Read – reads the values from the DIN-TSTAT-FCU and populates them into the tables.

Set Default – sets the values in tables to the default values.

Status Bar

The toolbar contains **Device**, **Parameters file**, and **Port** information.

Device – displays the connected device.

Parameters file – displays the name of the active table that is being edited.

Port – displays the port of the connected DIN-TSTAT-FCU.

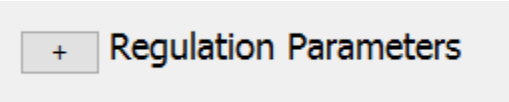
Main Screen

The main screen displays the **FCU Type**, **TABLE Name** and **Expander**, and **Tables** information.

FCU Type List

The FCU type determines the content and the name of the Valve/Compressor parameters table. When an FCU type is selected, the Valve/Compressor parameters table is populated with default values. Existing values are erased.

Table Name and Expander



The Table Name and Expander displays the name of the table. Click the "+" or "-" button to show or hide that table.

Tables

Every configuration file contains three tables: **Regulation parameters, Alarm parameters,** and **Valve/Compressor parameters**. Each table contains the following parameters:

Name – user friendly name of the parameter.

Value – only editable field (shown also by the white column color) that represents the value that parameter will have on the device.

Unit – shows what the parameter represents in the context of the device.

Range – shows the minimum and maximum values the value can have.

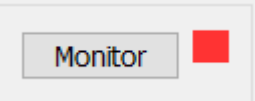
Description – shows a detailed description of what that parameter represents. This is also available as a tooltip for that row.

Configuration Table Example

Name	Value	Unit	Range	Description
Regulation step	4		1-10	Regulation step in multiple of 0.5oC
Valve minimum pos...	200		0-1000	Minimal valve position when setpoint is reached
Fan speed OFF ena...	1		0-1	If value is 0 fan will stay in speed 1 when when setpoint is reached eif >0 fan is turned OFF
Fan speed change ...	10	seconds	0-60	Minimal time between two fan speed changes
PI regulatior Kp	40		?	PID proportional parameter
PI regulatior Ti	100		?	PID integration parameter
Temperature prob...	1		?	Type of the temperature probe on analog input 1
Temperature prob...	0		0-1	Enable usage of temperature probe on analog input 2
Temperature prob...	1		?	Type of the temperature probe on analog input 1
Minimal T dif for co...	50		0-200	Minimal difference between ambient temperature and fluid temperature for cooling to work
Minimal T dif for he...	100		0-200	Maximal difference between ambient temperature and fluid temperature for cooling to work

Monitoring

The monitoring feature allows dynamic monitoring of a set of values from the device.



Monitor – activates the monitoring process for the indicated set of values. Other functions of the program are blocked.

Stop - Stops the monitoring process. All functionalities are enabled.

Monitoring table:

Name – the name of the variable.

Value – the read value from the device.

Unit – the unit of the displayed value.

Description – a short description of the variable.

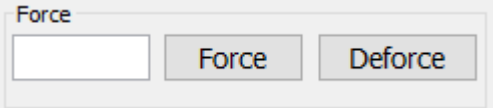
Monitoring Table Example

Binary input 4	0		Binary input 4
Temeprature 1	41.2	oC	Temperature measured on probe input 1
Temeprature 2	41.1	oC	Temperature measured on probe input 2

The values that are displayed are stored in the monitoring.xml file, which is located in the "files" folder where the DIN-TSTAT-FCU Commissioning Tool is installed.

Variable Forcing

For certain fields of the monitoring table, it is possible to force values. Enter the numeric or binary value, and then click **Force** to force the value. To stop forcing the value and return it to the previous state, click **Deforce.**



Troubleshooting

Error Code

Using Cresnet, the DIN-TSTAT-FCU can report certain errors. The errors are bit coded in FCU_type join as presented in the table below.

Error Codes

BIT	ERROR	DESCRIPTION
15	Parameter error	There is an error in parameters stored in flash.
14	Main power supply error	The main power supply is off or voltage is below minimum level.
13	Water temperature error	The water temperature is inadequate or the water temperature probe is not functioning. An error is reported only if water temperature measuring is enabled.
12	Probe 1 error	The air temperature probe is not connected or is shorted.
11	Probe 2 error	The second temperature probe is not connected or is shorted. An error is reported only if second temperature probe is enabled.

Troubleshooting

The following provides corrective actions for possible trouble situations. If further assistance is required, please contact a Crestron customer service representative.

DIN-TSTAT-FCU Troubleshooting

TROUBLE	POSSIBLE CAUSE(S)	ACTION
The LED indicators are off on power up.	Power is not being provided to the device.	Check the ac and Cresnet wiring.
	The device was left in the OS update mode.	Use the DIN-TSTAT-FCU Configuration Tool to perform an OS update procedure.
	The OS update procedure was interrupted.	Perform the restore procedure if the Restore option is enabled in the DIN-TSTAT-FCU Configuration Tool.
The Cresnet communication is not working.	The Cresnet cable is improperly wired.	Ensure that the Cresnet connection is properly made.
	There is an error in the Cresnet network or master device.	Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check the value of Cresnet status variable (0-no connection, 1-activity detected, 2-connected).
		Check the Cresnet wiring.
The local room display unit is off while the device is turned on.	There is a wiring error.	Check the room display unit wiring.
		Check if either main or Cresnet power supplies are present.
		Turn off the device, reconnect the wiring, and power up the device again.
		Using a voltmeter, check if voltage between the EP and G pins is 20 Vdc.
The communication with the local room display unit is not functioning.	The Modbus communication parameters are bad.	If the COM LED indicator blinks once per second, then DIN-TSTAT-FCU is trying to establish communication but no response is received. Use the DIN-TSTAT-FCU Configuration Tool in Monitoring mode to check if Modbus is detected.
		Reconnect the communication cable.
		Check the communication wiring.
		Check if the DIN-TSTAT-FCU and Local room display unit communication parameters match.
	The register addresses are bad.	If the COM LED indicator is Off, check the communication parameters on the DIN-TSTAT-FCU. Use Monitoring mode to check the Modbus parameters error variable.

(Continued on the following page)

DIN-TSTAT-FCU Troubleshooting (continued)

TROUBLE	POSSIBLE CAUSE(S)	ACTION
The local room display unit functions are not working (e.g., fan speed, mode change, set point change, etc.).	Communication with the local room display unit is not functioning properly.	If communication is not functional, refer to the "the communication with the local room display unit is not functioning" error.
	Commands from Cresnet are overriding commands received from AUX port.	Check traffic on Cresnet network.
The fan is off when the fan speed is set to 1, 2, or 3.	The temperature probe has an incorrect reading.	Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check: • Temperature probe error flags. • Water temperature error flag. • FCU initialization flag. • Main power supply error flag. • Alarm statuses.
	There is an error in the fan speed wiring.	Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, force fan speed relay outputs
	There is an error in the main power supply wiring.	Check the fan speed wiring.
	An alarm is active.	Correct the issues that are causing the alarm.
	The water temperature is inappropriate.	Normal fan operation continues once the water reaches the desired temperature.
	The operating mode is set to off.	Turn the DIN-TSTAT-FCU on.
	The FCU initialization function is in progress.	Normal fan operation continues after the initialization process is complete.
The fan is always operating.	The *Fan speed OFF enable* parameter is 0.	Using the DIN-TSTAT-FCU Configuration Tool, read the *Fan speed OFF enable* parameter value.
	Temperature probe 1 is reading the wrong temperature.	Using DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check the measured Ambient temperature.
Fan does not change speed.	The time from the last speed change has not expired yet.	Using the DIN-TSTAT-FCU Configuration Tool, read the fan speed change delay parameter value, and wait for time equal to the set value.
	The wrong operating mode is active.	Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check the Selected mode value.

(continued on the following page)

DIN-TSTAT-FCU Troubleshooting (continued)

TROUBLE	POSSIBLE CAUSE(S)	ACTION
A valve is off or is inactive.	There are temperature probe errors.	Check the main power supply and the valve wiring.
	The valve output wiring is incorrect.	Check if the appropriate FCU type is selected.
	An alarm is active.	Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check: • Temperature probe errors. • The measured temperatures. • The main power supply. • The selected operating mode. • The current alarm states. • If Type 1 is selected, check the analog voltage control output value. Use the forcing option to set the desired voltage on the output regardless of current regulation state. • If Type 2 or 3 is selected, check the OP-CL triac output variables. Use the forcing option to place outputs in the desired state regardless of the current regulation state. • If Type 4, 5, or 6 is selected, check Stage 1 or 2 relay output variables. Use the forcing option to place the outputs in the desired state regardless of the current regulation state.

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DIN-TSTAT-FCU Troubleshooting (continued)

TROUBLE	POSSIBLE CAUSE(S)	ACTION
The valve remains in the open position.	An incorrect operating mode is selected.	Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check: • Measured temperatures. • Selected operating mode. • Alarm states. • If Type 1 is selected check Analog voltage control output value. Use forcing option to set desired voltage on output regardless of regulation state. • If Type 2 or 3 is selected check OP-CL triac output variables. Use forcing option to place outputs in desired state regardless of regulation state. • If Type 4, 5, or 6 is selected, check Stage 1/2 relay output variables. Use forcing option to place outputs in desired state regardless of regulation state.
	The FCU initialization has not finished yet.	If the mode is on and the measured ambient temperature is lower than 5 °C, the valve is fully open to prevent freezing.
	The water temperature is inappropriate.	Check the valve wiring.
	The freeze prevention function is activated.	Verify that the freeze prevention functions are operating correctly.
	There is an error in the valve output wiring.	Check the valve output wiring.
The alarms are inactive when they should be active.	There is an error in the alarm wiring.	Check the alarm wiring.
	There is an error in the alarm parameters.	Using the DIN-TSTAT-FCU Configuration Tool, verify the alarm polarity and the delay.
		Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check the binary input and alarm statuses. Use the force option to place the input in the desired state.

(Continued on the following page)

DIN-TSTAT-FCU Troubleshooting (continued)

TROUBLE	POSSIBLE CAUSE(S)	ACTION
The alarms are triggered too fast or too slow.	There is an error in an alarm parameter.	Using the DIN-TSTAT-FCU Configuration Tool, check the selected alarm delay.
The alarms are always active.	There is an error in the alarm wiring.	Check the alarm wiring.
	There is an error in the alarm parameters.	Using the DIN-TSTAT-FCU Configuration Tool, check the selected alarm polarity and the delay.
		Using the DIN-TSTAT-FCU Configuration Tool in Monitoring mode, check the binary input and the alarm statuses. Use the force option to place the input in the desired state.

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