

TLC3-FCR-M-U-24, Programmable PI Fan Coil Controller

Features

- Proven PI controls algorithm reduces room temperature fluctuations and energy consumption
- Low power energy consumption: < 1W per unit
- Relays switching for outputs each up to 300W
- Temperature control for 2 or 4-pipe fan coil systems.
- Automatic fan control for three stage fans.
- Cost saving option with Economy functionality and set point limitations
- Control for modulating heating, cooling and fan only operation modes
- Deluxe Version:
 - Clock and time schedule functions with power failure clock protection
 - Blue backlight for LCD
 - Infrared remote controller option:
- With special features for Boost and delayed switching on or off

Ordering

Item Name	Item code	Variant	Power	Features
TLC3-FCR-M2-U-24	40-10 0141	Standard	24VAC/DC	Fan coil controller with: 1 TI int, 1 external input 3 DO (Relay) Fan control 1 AO (0-10VDC) PI valve control
TLC3-FCR-M2-U-120	40-10 0151		120VAC	
TLC3-FCR-M2-U-230	40-10 0102		230VAC	
TLC3-FCR-M2-U-D-24	40-10 0146	Deluxe	24VAC/DC	1 AO (0-10VDC) PI valve control
TLC3-FCR-M2-U-D-120	40-10 0156		120VAC	
TLC3-FCR-M2-U-D-230	40-10 0103		230VAC	
TLC3-FCR-M4-U-24	40-10 0142	Standard	24VAC/DC	1 TI int 3 DO (Relay) Fan control 2 AO (0-10VDC) PI valve control
TLC3-FCR-M4-U-120	40-10 0152		120VAC	
TLC3-FCR-M4-U-230	40-10 0106		230VAC	
TLC3-FCR-M4-U-D-24	40-10 0147	Deluxe	24VAC/DC	
TLC3-FCR-M4-U-D-120	40-10 0157		120VAC	
TLC3-FCR-M4-U-D-230	40-10 0107		230VAC	
-W01	-1	Cooling only		Add to name or code for special settings

Selection of fans

Do not directly connect devices that exceed 2A. Observe startup current on inductive loads! Do not connect more than one fan coil unit to one controller.

Modulating Actuators:

Choose actuators with an input signal type of 0-10V DC or 2-10V DC. Observe maximal signal current of 1mA!

Mounting location

- Install the controller on an easy accessible interior wall, approx. 1.5 m above the floor in an area of average temperature.
- Avoid direct sunlight or other heat sources, e.g. the area above radiators and heat emitting equipment.
- Avoid locations behind doors, outside walls and below or above air discharge grills and diffusers.
- Location of mounting is less critical if external temperature sensors are used.

Installation

1. Connect the wires to be connected to the terminals of the power case according to wiring diagram
2. Install the mounting plate to the flush mounting box. Make sure that the nipple with the front holding screw is facing to the ground. Make sure the mounting screw heads do not stand out more than 5 mm (0.2") off the surface of the mounting plate.
3. Slide the two latches located on the top of the front part into the hooks at the upper side of the mounting plate.
4. Carefully lower the front part until the interconnector reaches the mounting-plate. Continue pressing in a gentle way until the front part is fully connected. While inserting the connectors, a slight resistance can be felt. This is normal. Do not use excessive force!
5. With a Philips-type screw driver of size #2, carefully tighten the front holding screw to secure the front part to the mounting plate. This screw is located on the front lower side of the unit. There is no need to tighten the screw too much.

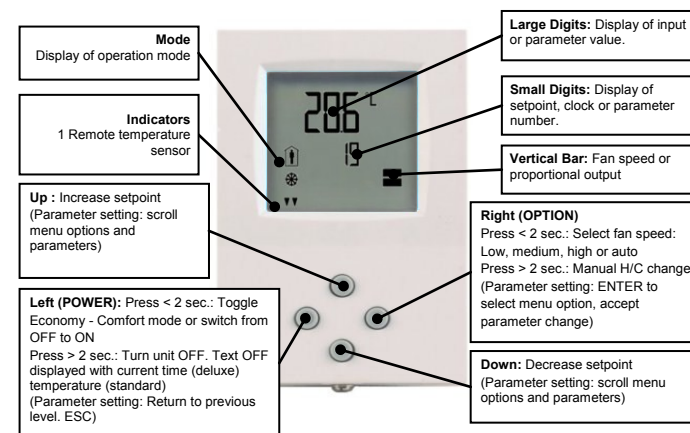
Power Failure

Upon power-interruption, all parameters and setpoints are memorized in non-volatile memory and therefore do not have to be re-entered again.

Error messages

Err1: Error temperature sensor. The internal temperature sensor may be damaged or not present.
FP: Steady: Frost protection is active.
 Blinking: Frost protection activated in the past and is now inactive. Confirm with OPTION key.

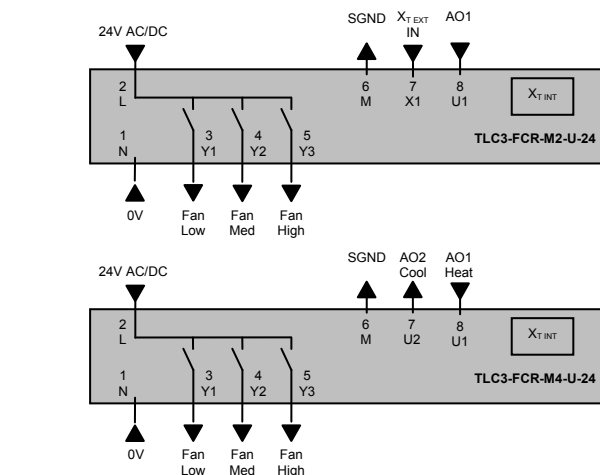
Display and Operation



Technical Specification

Power Supply	Operating Voltage	24 VAC ±10%; 50/60 Hz, 24VDC ±10%, SELV to HD 384, Class II, 48VA max
	Transformer	
	Power Consumption	Max 1W, 1.5VA
	Electrical Connection	Terminal Connectors
Signal Inputs	Deluxe type only: Power backup for real time clock	Min 48h if charged for 24h
	Temperature Inputs	RT Int., Ext. (Sxx-Tn10 sensor)
	Range	0...50 °C (32...122 °F)
	Accuracy	0.5°C (1°F)
Signal Outputs	Digital Switching Outputs	DO1 to DO3
	Switching Type	Relays
	Switching power	2A max. each output
	Analog Outputs	AO1, For TLC3-FCR-M4 AO2
Environment	Output Signal	DC 0...10 V
	Minimum impedance / maximum load	10kOhm, 1mA
	Operation	To IEC 721-3-3
	Climatic Conditions	class 3 K5
Standards	Temperature	0°C ... 50°C (32°F ... 122°F)
	Humidity	<95% R.H. non-condensing
	Transport & Storage	To IEC 721-3-2 and IEC 721-3-1
	Climatic Conditions	class 3 K3 and class 1 K3
General	Temperature	-25°C...70°C (-13°F...158°F)
	Humidity	<95% R.H. non-condensing
	Mechanical Conditions	class 2M2
	CE conformity	2004/108/EC
Standards	Product standards	2006/95/EC
	Automatic electrical controls for household and similar use	EN 60 730 -1
	Special requirement on temperature dependent controls	EN 60 730 -2 - 9
	Electromagnetic compatibility for domestic sector	Emissions: EN 60 730-1
General	Degree of Protection	Immunity: EN 60 730-1
	Pollution Class	IP30 to EN 60 529
	Safety Class:	II (EN 60 730-1)
	Overvoltage Category:	III (IEC 60 536)
General	Material:	I (EN 60 730-1)
	Weight (including package)	Compliant
	Dimensions (H x W x D)	Standard: 270g (9.5oz)
	Weight (including package)	Deluxe (-D): 275g (9.7oz)

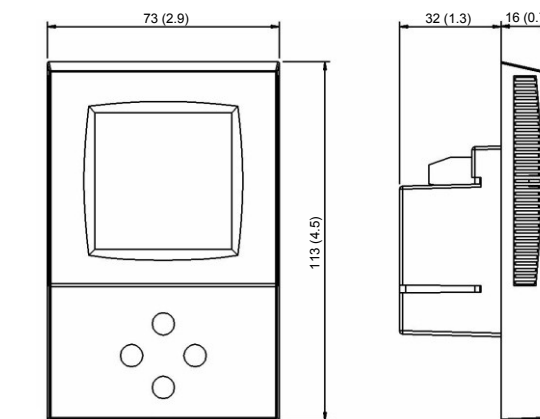
Wiring Diagram



Description:

N	Power supply:	0V Neutral
L	Power supply:	24V AC/DC
Y1	Binary output:	Fan speed low
Y2	Binary output:	Fan speed medium
Y3	Binary output:	Fan speed high
TLC3-FCR-M2-U:		
M	Signal common:	Common 0 potential for inputs and analog outputs.
X1	External input:	NTC 10kΩ @ 25°C (77°F) or open contact to SGND
U1	Analog output:	0...10 V DC
TLC3-FCR-M4-U:		
M	Signal common:	Common 0 potential for inputs and analog outputs.
U2	Analog cooling output:	0...10 V DC
U1	Analog heating output:	0...10 V DC

Dimensions



Space required in flush mounting box: (H x W x D) 60 x 50 x 32mm (2.4 x 2.0 x 1.3 in.)
 Distance for mounting screws: Horizontal and vertical: 45 to 63mm (1.8 to 2.5 in.)

Configuration parameters for firmware version 3.0

The TLC3-FCR-M-U can be adapted to wide variety of fan coil applications. The adaptation is done with parameters. The parameters can be changed on the unit without the need of additional equipment.

Identifying the firmware version

The parameters and functionality of controller depend on its firmware revision. It is therefore important to use a matching product version and parameter set. The firmware version is shown on the large LCD digits when pressing UP and DOWN buttons for more than 3 seconds simultaneously.

Changing parameters

The parameters may only be accessed by entering a code. There are two levels of parameters: User operation parameters for access control settings and Expert parameters for control functions and unit setup. The codes for user levels and expert levels are different. Only control experts should be given the control parameter code.

The parameters can be changed as follows:

- Press UP and DOWN button simultaneously for three seconds. The display shows the software version in the large digits and the software revision in the small digits.
- Pressing the OPTION button will indicate CODE on the small digits and 000 on the large digits.
- The code for accessing the user parameters is 009, for controls settings it is 241 (scroll backwards by pressing the DOWN button)
- Select this using UP or DOWN buttons.
- Press OPTION button after selecting the correct code.
- Once logged in, the parameter is displayed immediately.
- Select the parameters with the UP/DOWN buttons. Change a parameter by pressing the OPTION button. The MIN and MAX symbols show up and indicate that the parameter may be modified now. Use UP or DOWN buttons to adjust the value.
- After you are done, press OPTION or POWER in order to return to the parameter selection level.
- Press the POWER button again so as to leave the menu. The unit will return to normal operation if no button is pressed for more than 5 minutes.

User Parameters (Access Code: 09)

Parameter	Description	Range	Standard
UP 00	Enable change of operation modes,	ON, OFF	ON (Enabled)
UP 01	Enable change of set points	ON, OFF	ON (Enabled)
UP 02	Enable manual control fan speeds	ON, OFF	ON (Enabled)
UP 03	Enable manual change of Heating/Cooling Mode. Applies only for 2-pipe or 4-pipe systems.	ON, OFF	ON
UP 04	Enable Access to time programs	ON, OFF	ON (Enabled)
UP 05	State after power failure: 0 = OFF, 1 = ON, 2 = Last State	0, 1, 2	2
UP 06	Enable Economy (unoccupied) Mode. Shift the setpoint to a lower temperature in winter or higher temperature in summer in order to save energy. May be activated through the POWER button, or with the external input (typically for key card switches in hotel rooms or motion detectors for meeting rooms.)	ON, OFF	OFF
UP 07	Celsius or Fahrenheit, OFF for Celsius, ON for Fahrenheit	ON, OFF	OFF (Celsius)
UP 08	Calibrate internal temperature sensor -10° to +10° in 0.1° steps. (Sensor is factory calibrated, use this feature for field adjustment only as required.)	-10...10	0
UP 09	Enable Frost Protection. Activates the output independent of operation mode when the control temperature drops below 5°C or 41°F. The controller returns to normal operation when the temperature increases above 10°C or 50°F.	ON, OFF	ON
UP 10	Select contents of Large LCD display in standard mode: 00 = OFF 01 = Setpoint 02 = Temperature Sensor	0...4	02 Temperature
UP 11	Select contents of small LCD display in standard mode (use table of UP 10)	0...4	Standard: 01 Setpoint Deluxe: 04 Clock
UP 12	Contents of vertical bar in standard mode OFF = Fan Speed: 0 – 3 levels ON = Control output 0 – 10 levels	ON, OFF	ON (Control)
UP 13	Clock display type: Only available for deluxe version OFF = Show 24hour clock ON = Show 12hour clock (AM, PM)	ON, OFF	OFF (24h)
UP 14	Reset timer for override mode: Only available for deluxe version 0 = Reset of override mode is not active. 1...255 = delay in minutes to switch off device if ON/Economy mode is activated while the unit is scheduled to be in OFF mode	0...255	60 (Min)

Control Parameters (Access Code: 241)

Warning! Only experts should change these settings!

Set point limits

Parameter	Description	Range	Standard
FC 00	Minimum setpoint limit in Heating mode	-40-60°C (160°F)	16°C (61°F)
FC 01	Maximum setpoint limit in Heating mode	-40-60°C (160°F)	24°C (75°F)
FC 02	Minimum setpoint limit in Cooling mode	-40-60°C (160°F)	18°C (64°F)
FC 03	Maximum setpoint limit in Cooling mode	-40-60°C (160°F)	30°C (86°F)

Fan control sequence

FC 04	Economy (unoccupied) Mode temperature shift: The comfort (occupied) setpoint is shifted by the value set with parameter. If heating is active the comfort setpoint will be decreased, if cooling is active, the setpoint will be increased. (Enable with UP06.)	0...10.0K (20°F)	4.0°C (8°F)
FC 05	Switching Span Heating. Setting this value to 0 limits fan to single fan speed in heating mode	0...10.0K (20°F)	0°C (0.0°F) Single fan speed
FC 06	Switching Span Cooling Setting this value to 0 limits fan to single fan speed in cooling mode	0...10.0K (20°F)	0.0°C (0.0°F) Single fan speed
FC 07	Switching Hysteresis is the difference between switching on and switching off. A small hysteresis will increase the number of switching cycles and thus the wear on fan and relays contacts.	0...10.0K (20°F)	0.5°C (1°F)
FC 08	Mold Protection: In mold protection, the fan keeps running independent of temperature as long as the unit is switched on.	ON, OFF	ON Mold protection
FC 09	Switching delay min running time of fan speed. Prevents the fan from switching in too short intervals.	0...255 s	10s
FC 10	Switching delay min stopping time of fan speed. Prevents too short restart times, once a fan speed has been switched off.	0...255 s	10s
FC 11	Control option: 0 = Cooling only 1 = Heating only 2 = 2-pipe system 3 = 4-pipe system	-M2: 0...2 -M4: 0...3	-M2: 2 -M4: 3
FC 12	Dead Zone Span: The Dead Zone Span lies between the heating and the cooling setpoint. The output is off while the temperature is within the dead zone span. A negative dead zone is not possible.	0...100°C (200°F)	1.0°C (2°F)
FC 13	Heat/Cool Changeover Delay (if set to FC11 = 3): A demand to switch between heating and cooling must persist for the length of time set with this parameter before the controller switches. Prevents activation of a sequence during a short-term change in temperature in order to protect equipment (with control overshoot for example)	0...255 min	5 min

PI control sequence

FC 14	P – band heating X _{PH}	0...10.0K (20°F)	2.0°C (4.0°F)
FC 15	P – band cooling X _{PC}	0...10.0K (20°F)	2.0° (4.0°F)
FC 16	K _{PH} , Integral gain heating, in 0.1 steps, 0 disables ID part low value = slow reaction high value = fast reaction	0...25.5	0.0
FC 17	K _{PC} , Integral gain cooling, in 0.1 steps	0...25.5	0.0



Proportional control (P-band)

The proportional control function calculates the output based on the difference between setpoint and measured value. The proportional band (P-band) defines the difference between setpoint and measured value which will result in a 100% output. Setting the proportional band to 0 disables proportional control.



Integral gain KI

The integral gain defines how fast the output increases in case the setpoint is not met by the room temperature. A low value indicates a slow reaction, a high value a fast one. If the value is chosen too high, the controller will start to swing. Depending on the room size and heating / cooling equipment used a value between 0.1 and 1.5 should be sufficient. Below are suggested values:
Heating: K_{PH}: 0.1-0.5
Cooling: K_{PC}: 0.3-0.8

Configuration of outputs

FC 18	Configuration of analog output signal 0 = 0-10V 1 = 2-10V 2 = Manual override (useful for commissioning) When low fan speed: 25% output When medium fan speed 50% output When high fan speed 100% output	0-2	0 (0-10V)
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Configuration of inputs

FC 19	External input: 0 = No external input 1 = External temperature sensor 2 = Occupation sensor – Comfort / Economy 3 = Occupation sensor – Comfort / Off 4 = Heat / Cool changeover 5 = Key card with alternative setpoint	0...8	0
FC 20	Activation delay (Minutes) = the time the binary input needs to be open before economy/off mode is activated.	0...255 min	5
FC 21	Auto-changeover limit heating FC20 = 4 or economy setpoint in heating mode if FC20 = 5	-40...60°C (160°F)	16°C (61°F)
FC 22	Auto-changeover limit cooling FC20 = 4 or economy setpoint in cooling mode if FC20 = 5	-40...60°C (160°F)	28°C (82°F)



Configuring the function of the external input

FC19 = 0	Input not used	
FC19 = 1	External control input	The external sensor is the control input. The internal sensor will be disabled.
FC19 = 2	Switching Economy and Comfort modes	Economy (unoccupied) and Comfort (occupied) modes are controlled through an external contact by connecting the input through a dry contact to signal common. This function may be used together with key card switches for hotels or motion detectors for offices.
FC19 = 3	Switching Energy Hold OFF and Comfort modes	Opening the input will force the unit into the OFF operation mode. The operation mode cannot be overridden by using the terminal. Connecting the input to signal common returns control of the operation mode to the terminal. This function may be used as window contact to prevent loss of energy.
FC19 = 4	Heat – Cool changeover	Switch heating and cooling mode based on supply media or outside temperature or binary contact. See below for further details.
FC19 = 5	Key card with alternative setpoint	As with FC19 = 2, the key card function switches economy (unoccupied) and comfort (occupied) modes. Instead of using the setpoint shift, the setpoints in unoccupied mode are defined by parameter FC21 and FC22.



Configuring auto changeover input if FC19 = 4:

The auto changeover function automatically changes heating and cooling mode based on supply media temperature or outdoor temperature. The difference between the two is in the values of the changeover limits FC21 and FC22. See table below for recommended settings.

Heating and cooling may be as well changed by an open contact switched to signal ground. Note: all signal ground levels of involved controllers must be the same in case more than one controller is switched.



Recommended settings for FC21 and FC22:

Change over mode FC19=4	Relation FC21 to FC22	Example FC21	Example: FC22
Supply media	FC21 > FC22	25°C (77°F)	18°C (64°F)
Outside temperature	FC21 < FC22	15°C (59°F)	25°C (77°F)
Dry contact: Heating if contact closed	FC21 > FC22	25°C (77°F)	15°C (59°F)
Dry contact: Cooling if contact closed	FC21 < FC22	15°C (59°F)	25°C (77°F)