

Digital controller with off cycle defrost

FTC002-A7B(RTC)

1. GENERAL WARNING

1.1 PLEASE READ BEFORE USING THIS MANUAL

- This manual is part of the product and should be kept near the instrument for easy and quick reference.
- The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device.
- Check the application limits before proceeding.
- Furison Electronics Co., Ltd. reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.

1.2 SAFETY PRECAUTIONS

- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation.
- Warning: disconnect all electrical connections before any kind of maintenance.
- Fit the probe where it is not accessible by the End User. The instrument must not be opened.
- In case of failure or faulty operation send the instrument back to the distributor or to Furison Electronics Co., Ltd. (see address) with a detailed description of the fault.
- Consider the maximum current which can be applied to each relay (see Technical Data).
- Ensure that the wires for probes, loads and the power supply are separated and far enough from each other, without crossing or intertwining.
- In case of applications in industrial environments, the use of mains filters in parallel with inductive loads could be useful.

2. GENERAL DESCRIPTION

Model FTC002-A7B(RTC), format 38 x 185 x 85 mm, is a digital thermostat with off cycle defrost designed for refrigeration applications at normal temperature. It has 2 relay outputs to control thermostat and light (configurable). It could be provided with a Real Time Clock which allows programming of up to 6 daily defrost cycles, divided into holidays and workdays. A "Day and Night" function with two different set points is fitted for energy saving. It is also provided with up to four NTC or PT1000 probe inputs, the first one for temperature control, the second one, to be located onto the evaporator, to control the defrost termination temperature. The third and fourth probes are used to signal the condenser temperature alarm or to display a temperature. There are two digital inputs (free contact) for the door switch and configurable by parameter. Two RS485 outputs allows the user to connect a ModBUS-RTU compatible monitoring system and use for remote display. The USB port allows the user to connect the "Hot Key" to programme the parameter list. The instrument is fully configurable through special parameters that can be easily programmed through the keyboard.

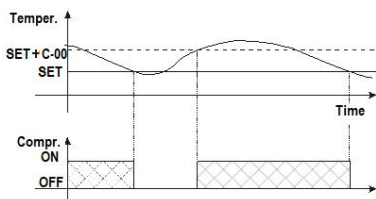
3. CONTROLLING LOADS

3.1 THE REGULATION OUTPUT

The regulation is performed according to the temperature measured by the probe. The instruments are provided with the C-10 programmable parameter which enables the user to set the regulation both for heating or cooling applications: C-10 = 0: cooling applications; C-10 = 1: heating applications.

3.2 C-10 = 0: COOLING APPLICATIONS

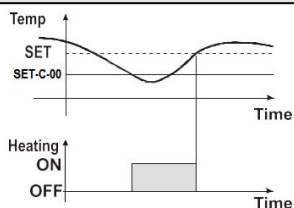
The regulation is performed according to the temperature measured by the thermostat probe with a positive differential from the set point: if the temperature increases and reaches set point plus differential the compressor is started and then turned off when the temperature reaches the set point value again.



In case of fault in the thermostat probe the start and stop of the compressor are timed through parameters C-01 and C-02.

3.3 C-10 = 1: HEATING APPLICATIONS

The C-00 value is automatically set under the Set Point. If the temperature decreases and reaches set point minus differential the regulation output is activated and then turned off when the temperature reaches the set point value again.



3.4 DEFROST

Defrost is performed through a simple stop of the compressor. The defrost interval depends on the presence of the RTC (optional). If the RTC is present is controlled by means of parameter H-00:

- with H-00 = 0, when the defrost is complete, the next defrost is made after the H-01 delay time.
- with H-00 = 1, the defrost is made in real time depending on the hours set in the parameters. L14...L19 on workdays and in L-20...L-25 in holidays.

 Other parameters are used to control defrost cycles: its maximum length (H-02) and two defrost modes: timed or controlled by the evaporator's probe.

At the end of defrost dripping time is started, its length is set in the H-04 parameter. With H-04 = 0 the dripping time is disabled.

3.5 AUXILIARY OUTPUT CONFIGURATION

The functioning of the auxiliary relays can be set by the H-07(AUX1) parameter, according to the kind of application. In the following paragraph the possible setting:

3.5.1 Auxiliary thermostat (I.E., anti condensing heater)

- Parameters involved:
- H-16 Kind of regulation for the auxiliary relay: 1: heating; 0: cooling;
 - H-19 Set point for auxiliary relay
 - H-20 Differential for auxiliary relay
 - H-14 Probe for auxiliary relay
 - H-15 Auxiliary output off during defrost

By means of these 5 parameters the functioning of the auxiliary relay can be set. The differential is given by the H-20 parameter.

3.5.2 On/off relay

In this case the auxiliary relay is activated when the controller is turned on and de-activated when the controller is turned off.

3.5.3 Neutral zone regulation

In this case the auxiliary relay can control a heater element to perform a neutral zone action. The auxiliary relay cut in: room temperature decrease to SET-C-00. The auxiliary relay cut out: room temperature reaches SET.

3.5.4 Second compressor(Only AUX1)

With H-07 = 3, the AUX1 operates as second compressor: it is activated in parallel with the relay of the first compressor, with a possible delay set in the H-09 parameter. Both the compressors are switched off at the same time.

3.5.5 Alarm relay

In this case the auxiliary relay operates as alarm relay. It is activated every time an alarm happens. Its status depends on the F-12 parameter: if F-12 = 1, the relay is switched OFF by pressing the key; if F-12 = 0, the alarm relay remains on until the alarm condition recovers even though the key is pressed.

3.5.6 Night blind management during energy saving cycles

In this case the auxiliary relay operates to manage the night blind: the relay is energised when the energy saving cycle is activated, by digital input or RTC (optional).

3.5.7 Timer mode

In this case the auxiliary relay can be activated by pushing the AUX button of the keyboard, the running time is determined by the H-13 parameter. The auxiliary relay remains on till it's manually switched off with H-13 = 0.

3.5.8 Light relay

In this case the auxiliary relay operates as light relay. Switch ON and OFF the relay by pushing the key.

4. FRONT PANEL COMMANDS

4.1 STANDARD FRONTAL PANEL



| | |
|--|--|
| | Start a continuous cycle; in programming mode it browses the parameter codes or increases the displayed value. |
| | Silence the buzzer; in programming mode it browses the parameter codes or decreases the displayed value. |
| | Start a manual defrost. |
| | To display and modify target set point; in programming mode it selects a parameter or confirm an operation. |
| | Switch ON and OFF the light. (When auxiliary relay operates as light relay) |
| | Switch ON and OFF the instrument. (Push it for more than 3s) |
| | To see the max and min temperature recorded; in programming it save a value and return to the previous menu. |
| | To switch the auxiliary relay. |

KEY COMBINATIONS:

- + To lock & unlock the keyboard.

4.2 USE OF LCDS

Each LCD function is described in the following table.

| LCD | MODE | FUNCTION |
|------|------|--|
| 8888 | ON | Temperature |
| 8888 | ON | Set point; continuous cycle set point (while continuous cycle is running); alarm message (while an alarm is occurring) |
| °E | ON | Temperature measurement unit |

| | | |
|-----------|----------|--|
| | ON | Compressor enabled |
| | Flashing | Anti short cycle delay enabled; outputs activation delay at start up; the defrost is enabled |
| | ON | Defrost enabled |
| | Flashing | Defrost delay after start up; continuous cycle is running |
| Int1-Int4 | ON | Probe inputs enabled |
| Aux1-Aux3 | ON | Auxiliary relays on (AUX2,AUX3 not used in this model) |
| | ON | Fans output enabled (Not used in this model) |
| | ON | Light on |
| | ON | Energy Saving enabled |
| | ON | Door is open |
| | ON | Digital input is activated |
| | ON | Continuous cycle is running |
| | ON | An alarm is occurring |
| | ON | Holiday defrost enabled (Only for models with RTC) |

5. MAX & MIN TEMPERATURE MEMORIZATION

5.1 HOW TO SEE THE MIN TEMPERATURE

1. Press and release the key.
2. The "LO" message will be displayed followed by the min temperature recorded.
3. By pressing the key or by waiting 5s the normal display will be restored.

5.2 HOW TO SEE THE MAX TEMPERATURE

1. Press and release the key, the LCD will display the min temperature recorded.
2. Press the key, the "HO" message will be displayed followed by the max temperature recorded.
3. By pressing the key or by waiting 5s the normal display will be restored.

5.3 HOW TO RESET THE MAX AND MIN TEMPERATURE RECORDED

1. Press the key, while the min or max temperature is displayed.
2. By pressing the key or by waiting 5s the normal display will be restored.

6. MAIN FUNCTIONS

6.1 TO SET THE CURRENT TIME AND DAY (ONLY FOR INSTRUMENTS WITH RTC)

When the instrument is switched on, it's necessary to program the time and day.

1. Push the key for 3s, then press the key. Enter the "L" series programming menu.
2. Select L-00 (minutes) parameter with or .
3. Press the key, the L-00 parameter starts blinking.
4. Use or to change its value, then push key to confirm the value.
5. Repeat the same operations on the other parameters (L-01 + L-05).

To exit: Push keys or wait for 15 sec without pushing any keys.

6.2 HOW TO SEE AND MODIFY THE SET POINT

How to see the set point:

At normal visualisation. The set point will be showed in the top right of the LCD.

How to modify the set point:

1. Push and immediately release the key: the LCD will show the set point value and "HDS" flashing message.
 2. To change the Set value push the or arrows within 15s.
 3. To memorise the new set point value push the key or wait 15s.
- In addition, user can modify the set point by parameter C-19.

6.3 HOW TO START A MANUAL DEFROST

At normal visualisation, push the key a manual defrost will start. (ON and start blinking)

6.4 HOW TO ACCESS THE PARAMETER MENU

How to access the parameter menu:

1. Enter the programming mode by pressing the key for few seconds: the LCD will show SET.
2. To access the corresponding parameter menu refer to the following table:

| | |
|--|--|
| | Enter the "F" series parameter menu by pressing this key (F-00 + F-26) |
| | Enter the "L" series parameter menu by pressing this key (L-00 + L-25) |
| | Enter the "H" series parameter menu by pressing this key (H-00 + H-20) |
| | Enter the "C" series parameter menu by pressing this key (C-00 + C-24) |

6.5 HOW TO CHANGE A PARAMETER VALUE

1. Enter the corresponding parameter menu.
2. Select the required parameter with or .
3. Press the key. (parameter starts blinking)

4. Use or to change its value.

5. Press to store the new value.

To exit: Press or wait 15s without pressing a key.

NOTE: the new programming is stored even when the procedure is exited by waiting the time-out.

6.6 HOW TO LOCK THE KEYBOARD

1. Keep pressed for more than 3 s the + keys.
2. The "POF" flashing message will be displayed and the keyboard will be locked. At this point it will be possible only to switch ON and OFF the instrument by pressing the .
3. If a key is pressed the "POF" message will be displayed.

6.7 HOW TO UNLOCK THE KEYBOARD

Keep pressed together for more than 3s the and keys, till the "PON" flashing message will be display.

6.8 HOW TO RESTORE THE FACTORY DEFAULT SETTINGS

Push the key for more than 3s, the LCD will show "YES" and "RST" flashing message. Push the key the factory default settings will be restored.

6.9 THE CONTINUOUS CYCLE

When defrost is not in progress, it can be activated by pressing the key. The compressor operates to maintain the "C-20" set point for the time set through the "C-05" parameter (ON). The cycle can be terminated before the end of the set time using the same activation key .

6.10 THE ON/OFF FUNCTION

By pushing the key for more than 3s, switch ON and OFF the instrument. In this configuration, the regulation is disabled.

During the OFF status, all the relays are switched OFF and the regulations are stopped.

7. PARAMETERS

REGULATION

C-00 Differential: (0 + 200) Intervention differential for set point. Compressor Cut IN is Set Point + differential (C-00). Compressor Cut OUT is when the temperature reaches the set point.

(Optional) **Minimum set point:** (-50°C + SET / -58°F + SET) Sets the minimum value for the set point.

(Optional) **Maximum set point:** (SET + 110°C / SET + 230°F) Sets the maximum value for set point.

C-21 Thermostat probe calibration: (-12.0 + 12.0°C; -60 + 60°F) Allows to adjust possible offset of the thermostat probe.

C-22 Evaporator probe calibration: (-12.0 + 12.0°C; -60 + 60°F) Allows to adjust possible offset of the evaporator probe.

C-16 Third probe presence: 0 = not present; 1 = present.

C-23 Third probe calibration: (-12.0 + 12.0°C; -60 + 60°F) Allows to adjust possible offset of the third probe.

C-17 Fourth probe presence: 0 = not present; 1 = present.

C-24 Fourth probe calibration: (-12.0 + 12.0°C; -60 + 60°F) Allows to adjust possible offset of the fourth probe.

C-06 Outputs activation delay at start up: (0 + 60 min) This function is enabled at the initial start up of the instrument and inhibits any output activation for the period of time set in the parameter.

C-03 Anti-short cycle delay: (5 + 100 min) Minimum interval between the compressor stop and the following restart.

(Optional) **Percentage of the second and first probe for regulation:** (0 + 100; 100 = P1, 0 = P2) It allows to set the regulation according to the percentage of the first and second probe, as for the following formula (C-XX(P1-P2)/100 + P2).

C-05 Compressor ON time during continuous cycle: (0 + 240 min) Allows to set the length of the continuous cycle: compressor stays on without interruption for the C-05 time. Can be used, for instance, when the room is filled with new products.

C-20 Set point for continuous cycle: (-40 + 80°C; -40 + 176°F) It sets the set point used during the continuous cycle.

C-01 Compressor ON time with faulty probe: (10 + 240 min) Time during which the compressor is active in case of faulty thermostat probe.

C-02 Compressor OFF time with faulty probe: (10 + 240 min) Time during which the compressor is OFF in case of faulty thermostat probe.

C-10 Type of action: 0 = cooling; 1 = heating.

L-08 Energy Saving enabled: 0 = No; 1 = Yes.

L-09 Temperature increase during the Energy Saving cycle: (0 + 100) It sets the increasing value of the set point during the Energy Saving cycle.

DISPLAY

C-11 Temperature measurement unit: 0 = Celsius; 1 = Fahrenheit. **WARNING:** When the measurement unit is changed the values of the parameters C-21, C-22, C-23 and C-24 have to be checked and modified if necessary.

C-12 Resolution (for °C): (0 = 1°C; 1 = 0.1°C) Allows decimal point display.

C-13 Instrument display: (0 + 4) It selects which probe is displayed by the instrument: 0 = Thermostat probe; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe; 4 = Percentage of visualization.

C-14 RTC display: (0, 1) It determines whether show the real time in the top right of the LCD. 0 = No, show the set point; 1 = Yes, show the real time instead of the set point.

C-15 Remote display: (0 + 4) It selects which probe is displayed by the remote display. 0 = Thermostat probe; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe; 4 = Percentage of visualization.

(Optional) **Display delay:** (0 + 20.0m; resul. 10s) When the temperature increases, the display is updated of 1°C/1°F after this time.

C-18 Percentage of the second and first probe for visualization when C-13=4, C-15=4: (0 + 100; 100 = P1, 0 = P2) It allows to set the visualization according to the percentage of the first and second probe, as for the following formula (C-18(P1-P2)/100 + P2).

DEFROST

- H-00 Defrost mode (only for controller with RTC): 0 = interval mode.** The defrost starts after the H-01 delay time. 1 = Real Time Clock mode. Defrost time follows L-14+L-19 parameters on workdays and L-20+L-25 on holidays.
- H-01 Interval between defrosts:(1÷240 h)** Time interval between the end of defrost and the beginning of the next defrost.
- H-02 (Maximum) length for defrost:(0÷240 min, with 0 no defrost)** When the evaporator probe is not present it sets the defrost duration, when the evaporator is present it sets the maximum length for defrost.
- H-03 Defrost delay at start-up:(0÷240 min)** When the instrument power on, the first defrost will be delayed for this time.
- H-04 Drip time:(0÷240 min)** Time interval between reaching defrost termination temperature and the restoring of the control's normal operation. This time allows the evaporator to eliminate water drops that might have formed due to defrost.
- H-05 Defrost delay after continuous cycle:(0÷240 min)** Time interval between the end of the fast freezing cycle and the following defrost related to it.
- H-06 Temperature displayed during defrost:(0÷3) 0 = Thermostat temperature; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe.**
- H-18 Defrost termination temperature:(-40÷80 °C/-40÷176°F)** Sets the temperature measured by the evaporator probe, which causes the end of defrost.
- (Optional) MAX display delay after defrost:(0÷255min).** Sets the maximum time between the end of defrost and the restarting of the real room temperature display.


AUXILIARY THERMOSTAT CONFIGURATION (with H-07=2)

- H-16 Kind of regulation for auxiliary relay: 1 = heating; 0 = cooling.**
- H-19 Set point for auxiliary relay:(-40÷80 °C/-40÷176°F)** It defines the room temperature set point to switch auxiliary relay.
- H-20 Differential for auxiliary output:(1 ÷ 100)** Intervention differential for auxiliary output set point. With H-16 = 0 auxiliary relay Cut in is H-19 + H-20, auxiliary relay Cut out is H-19; With H-16 = 1 auxiliary relay Cut in is H-19 - H-20, auxiliary relay Cut out is H-19.
- H-14 Probe selection for auxiliary: 0 = Thermostat temperature; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe.**
- H-15 Auxiliary relay off during defrost: 0 = the auxiliary relay operates during defrost; 1 = the auxiliary relay is switched off during defrost.**

SECOND COMPRESSOR (with H-07=3)

- H-08 Compressor operating mode: 0: first compressor work; 1: second compressor work; 2: both the first and second compressor work.**
- H-09 2nd compressor delay at start up:(0÷240min)** Time interval between the switching on of the first compressor and the second one.
- H-10 Set point for second compressor:(0÷100)** The second compressor ON when the temperature increases and reaches H-10+SET+H-11 and then turned off when the temperature reaches H-10+SET.
- H-11 Differential for second compressor:(0÷100)** Intervention differential for the second compressor set point.
- H-12 Probe selection for second compressor: 0 = Thermostat probe; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe.**


ALARM RELAY (with H-07=0)

- F-12 Alarm relay silencing: 0 = silencing disabled: alarm relay stays on till alarm condition lasts; 1 = silencing enabled: alarm relay is switched OFF by pressing the  key during an alarm.**
- H-17 Alarm relay polarity:** Alarm relay is activated every time an alarm happens. 0 = the alarm relay is activated by closing the relay; 1 = the alarm relay is activated by opening the relay.

TIMER (with H-07=4)

- H-13 Auxiliary relays output time:(0÷100 min)** Set the running time of the auxiliary relay. The auxiliary relay remains on till it's manually switched off with H-13 = 0.

ALARMS

- F-17 Temperature alarms configuration: 0 = absolute temperature: alarm temperature is given by the F-25 or F-26 values. 1 = temperature alarms are referred to the set point. Temperature alarm is enabled when the temperature exceeds the "SET+F-25" or "SET-F-26" values.**
- F-18 Probe selection for alarm: 0 = Thermostat temperature; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe.**
- F-19 Temperature alarm delay:(0÷120 min)** Time interval between the detection of an alarm condition and alarm signalling.
- F-20 Exclusion of temperature alarm at start-up:(0÷240 min)** Time interval between the detection of the temperature alarm condition after instrument power on and alarm signalling.
- F-21 Differential for temperature alarm recovery:(0÷60)** Intervention differential for recovery of temperature alarm.
- F-25 MAXIMUM temperature alarm:(-40÷80°C; -40÷176°F)** When this temperature is reached the HA alarm is enabled, after the "F-19" delay time.
- F-26 Minimum temperature alarm:(-40÷80°C; -40÷176°F)** When this temperature is reached the LA alarm is enabled, after the "F-19" delay time.
- F-10 Alarm delay at the end of defrost:(0÷60 min)** Time interval between the detection of the temperature alarm condition at the end of defrost and the alarm signalling.
- F-07 Buzzer mode(only for door switch alarm):** Once the door switch alarm signalling the buzzer is silenced by pressing the  key. 0 = Silence the buzzer during the alarm; 1 = Silence the buzzer, but it sounded again after the door switch alarm delay time.

CONDENSER TEMPERATURE ALARM

- F-11 Condenser temperature alarm delay:(0÷120 min)** Time interval between the detection of the condenser alarm condition and alarm signalling.
- F-13 Differential for temperature condenser alarm recovery:(0÷60).**
- F-14 Condenser temperature alarm exclusion at start up:(0÷240 min).**
- F-15 Compressor off with low temperature alarm of condenser: 0 = no, compressor keeps on working; 1 = yes, compressor is switched off till the alarm is present, in any case regulation restarts after C-03 time at minimum.**
- F-16 Compressor off with high temperature alarm of condenser: 0 = no, compressor keeps on working; 1 = yes, compressor is switched off till the alarm is present, in any case regulation restarts after C-03 time at minimum.**
- F-22 Probe selection for temperature alarm of condenser: 0 = Thermostat temperature; 1 = Evaporator probe; 2 = Third probe; 3 = Fourth probe.**

- F-23 High temperature alarm of condenser:(-40÷80°C; -40÷176°F)** When this temperature is reached the HAZ2 alarm is signalled, possibly after the F-11 delay.
- F-24 Low temperature alarm of condenser:(-40÷80°C; -40÷176°F)** When this temperature is reached the LA2 alarm is signalled, possibly after the F-11 delay.

AUXILIARY RELAY CONFIGURATION

- H-07 Auxiliary relay configuration(AUX1): 0: alarm; 1: light; 2: auxiliary thermostat; 3 : second compressor; 4: timer mode; 5: neutral zone; 6: on/off relay; 7: night blind.**

DIGITAL INPUTS

- F-00 First digital input polarity(23-24): 0:** the digital input is activated by closing the contact; 1: the digital input is activated by opening the contact.
- F-01 First digital input configuration(23-24): 0 = door switch; 1 = generic alarm: "EA" message is displayed; 2 = Energy saving; 3 = activation of a defrost cycle; 4 = pressure switch alarm: "PA" message is displayed; 5 = serious alarm: "CA" message is displayed; 6 = switch on and off the controller; 7 = kind of action inversion (cooling - heating); 8 = holiday defrost.**
- F-02 With F-01 = 1 or F-01 = 5 digital input alarm delay(23-24):(0÷240 min)** Delay between the detection of the external alarm condition and its signalling. With F-01 = 0: door open signalling delay, with F-01 = 4: time for pressure switch function: time interval to calculate the number of the pressure switch activation.
- F-03 Second digital input configuration(24-25): 0 = door switch; 1 = generic alarm: "EA" message is displayed; 2 = Energy saving; 3 = activation of a defrost cycle; 4 = pressure switch alarm: "PA" message is displayed; 5 = serious alarm: "CA" message is displayed; 6 = switch on and off the controller; 7 = kind of action inversion (cooling - heating); 8 = holiday defrost.**
- F-04 Second digital input polarity(24-25): 0:** the digital input is activated by closing the contact; 1: the digital input is activated by opening the contact.
- F-05 With F-03 = 1 or F-03 = 5 digital input alarm delay(24-25):(0÷240 min)** Delay between the detection of the external alarm condition and its signalling. With F-03 = 0: door open signalling delay, with F-03 = 4: time for pressure switch function: time interval to calculate the number of the pressure switch activation.
- F-06 Pressure switch number:(0 ÷ 240)** Number of activation of the pressure switch, during the F-02(F-01=4) or F-05(F-03=4) interval, before signalling the alarm event. If the F-06 activation in the F-02 or F-05 time is reached, switch off and on the instrument to restart normal regulation.
- F-08 Compressor status when open door: 0: Normal; 1: Compressor OFF.**
- F-09 Outputs restart after door alarm: 0 = outputs not affected by the door alarm; 1 = outputs restart with the door alarm.**

TO SET CURRENT TIME AND WEEKLY HOLIDAYS

- L-03 Current year:(0÷99)**
- L-04 Current month:(1÷12)**
- L-05 Current date:(1÷31)**
- L-01 Current hour:(0 ÷ 23 h)**
- L-00 Current minute:(0 ÷ 59 min)**
- L-02 Current day:(1 ÷ 7)**
- L-06 First weekly holiday:(0 ÷ 7)** Set the first day of the week which follows the holiday times.
- L-07 Second weekly holiday:(0 ÷ 7)** Set the second day of the week which follows the holiday times.
- N.B L-06,L-07 can be set also as "0" value (Not Used).**

TO SET ENERGY SAVING TIMES

- L-12 Energy Saving cycle start during workdays:(0÷23h 50min)** During the Energy Saving cycle the set point is increased by the value in L-09 so that the operation set point is SET + L-09.
- L-10 Energy Saving cycle length during workdays:(0÷24h)** Sets the duration of the Energy Saving cycle on workdays.
- L-13 Energy Saving cycle start on holidays:(0÷23h 50min)**
- L-11 Energy Saving cycle length on holidays:(0÷24h)**

TO SET DEFROST TIMES

- L-14+L-19 Workday defrost start:(0÷23h 50min)** These parameters set the beginning of the 6 programmable defrost cycles during workdays. Ex. When L-15 = 12.4 the second defrost starts at 12.40 during workdays.
- L-20+L-25 Holiday defrost start:(0÷23h 50min)** These parameters set the beginning of the 6 programmable defrost cycles on holidays. Ex. When L-21 = 3.4 the second defrost starts at 3.40 on holidays.
- N.B. :To disable a defrost cycle set the same time to the two defrosts. Ex. If L-14=1.5, L-15=1.5 the second defrost cycle is disabled.**

OTHER

- C-07 Test mode: 0 = disabled; 1 = enabled.**
- C-08 RS485 Serial address:(1÷100)** Identifies the instrument address when connected to a ModBUS compatible monitoring system.
- C-09 Type of probe:** It allows to set the kind of probe used by the instrument. 0 = NTC probe; 1 = PT1000 probe.
- C-04 Factory reset:** Whether to restore the factory default settings: 0 = No; 1 = Yes.

8. DIGITAL INPUTS

This product can support up to 2 free contact digital inputs. The free voltage digital inputs are programmable by the F-01 and F-03 parameters.

8.1 GENERIC ALARM (F-01 or F-03 = 1)

As soon as the digital input is activated the unit will wait for F-02 or F-05 time delay before signalling the "EA" alarm message. The outputs status don't change. The alarm stops just after the digital input is de-activated.

8.2 SERIOUS ALARM (F-01 or F-03 = 5)

When the digital input is activated, the unit will wait for F-02 or F-05 delay before signalling the "CA" alarm message. The relay outputs are switched OFF. The alarm will stop as soon as the digital input is de-activated.

8.3 PRESSURE SWITCH (F-01 or F-03 = 4)

If during the interval time set by F-02(F-01=4) or F-05(F-03=4) parameter, the pressure switch has reached the number of activation of the F-06 parameter, the "PA" pressure alarm message will be displayed. The compressor and the regulation are stopped. When the digital input is ON the compressor is always OFF. If the F-06 activation in the F-02 or F-05 time is reached, switch off and on the instrument to restart normal regulation.

8.4 DOOR SWITCH INPUT (F-01 or F-03 = 0)

It signals the door status and the corresponding relay output status through the F-08 parameter: 0 = normal (any change); 1 = Compressor OFF. Since the door is opened, after the delay time set through parameter F-02(F-01=0) or F-05(F-03=0), the door alarm is enabled, the display shows the message "DA" and the regulation restarts is F-09 = 1. The alarm stops as soon as the external digital input is disabled again. With the door open, the high and low temperature alarms are disabled.

8.5 START DEFROST (F-01 or F-03 = 3)

It starts a defrost if there are the right conditions. After the defrost is finished, the normal regulation will restart only if the digital input is disabled otherwise the instrument will wait until the H-02 safety time is expired.

8.6 INVERSION OF THE KIND OF ACTION: HEATING-COOLING (F-01 or F-03=7)

This function allows to invert the regulation of the controller: from cooling to heating and viceversa.

8.7 ENERGY SAVING (F-01 or F-03 = 2)

The Energy Saving function allows to change the set point value as the result of the SET+ L-09 (parameter) sum. This function is enabled until the digital input is activated.

8.8 HOLIDAY DEFROST (F-01 or F-03 = 8)

This function enabled the holiday defrost setting.

8.9 ON OFF FUNCTION (F-01 or F-03 = 6)

To switch the controller on and off.

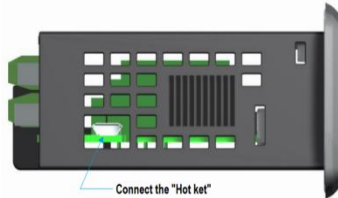
8.10 DIGITAL INPUTS POLARITY

The digital input polarity depends on the F-00 and F-04 parameters.
F-00 or F-04 = 0: the digital input is activated by closing the contact.
F-00 or F-04 = 1: the digital input is activated by opening the contact.

9. RS485 SERIAL

This product has two RS485 outputs allows the user to connect a ModBUS-RTU compatible monitoring system and use for remote display.

10. USB PORT



The USB port allows the user to connect the "Hot Key" to programme the parameter list.

11. TEST MODE

This function is used to detect whether the relays are broken. To enter the test mode, set C-07 = 1, then restart the instrument. The instrument will display as follow:



In test mode, user can switch on and off the relays by pressing the corresponding key:

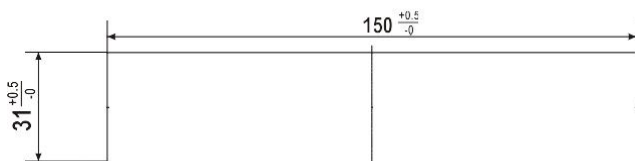
| KEY | RELAY | FUNCTION |
|-----|------------------|-------------------------|
| | Compressor relay | Switch ON/OFF the relay |
| | AUX1 relay | Switch ON/OFF the relay |

To exit the test mode by pressing the key for more than 3s. The C-07 parameter value automatically reset to 0.

12. INSTALLATION AND MOUNTING

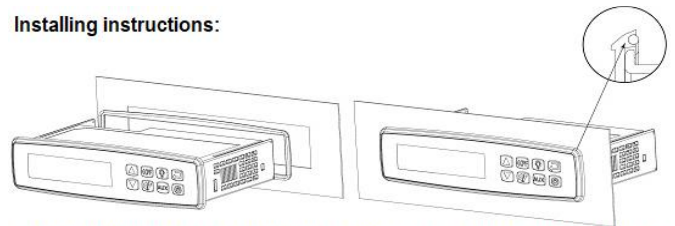
The controller FTC002-A7B(RTC), shall be mounted on vertical panel, in a 150x31 mm hole. To obtain an IP65 protection grade use the front panel rubber gasket (mod. RG-L). The temperature range allowed for correct operation is 0 - 60 °C. Avoid places subject to strong vibrations, corrosive gases, excessive dirt or humidity. The same recommendations apply to probes. Let the air circulate by the cooling holes.

12.1 CUT OUT

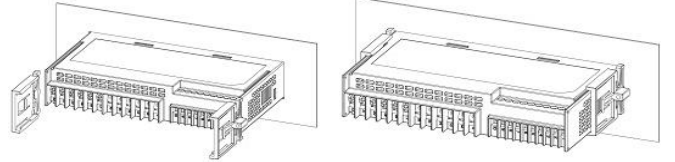


12.2 MOUNTING

Installing instructions:



1. Put the rubber gasket into the instrument
2. The rubber gasket must be put into the groove of the instrument panel



3. Push the brackets forward
4. Compact the brackets and equipment panel

13. ELECTRICAL CONNECTIONS

The instruments are provided with screw terminal block to connect cables with a cross section up to 2,5 mm² for the digital and analogue inputs. Heat-resistant cables have to be used. Before connecting cables make sure the power supply complies with the instrument's requirements. Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay, in case of heavier loads use a suitable external relay.

N.B. Maximum current allowed for all the loads is 20A.

13.1 PROBE CONNECTION

The probes shall be mounted with the bulb upwards to prevent damages due to casual liquid infiltration. It is recommended to place the thermostat probe away from air streams to correctly measure the average room temperature. Place the defrost termination probe among the evaporator fins in the coldest place, where most ice is formed, far from heaters or from the warmest place during defrost, to prevent premature defrost termination.

14. HOW TO USE THE HOT KEY

14.1 HOW TO PROGRAM A HOT KEY FROM THE INSTRUMENT (UPLOAD)

Program the "Hot key" with the "Hot key" button:

1. When the controller is ON, insert the "Hot key", the "UP" message appears followed a by flashing "HOT".
2. Push the upload button on the "Hot key", the "ED" message appears.
3. Remove the "Hot key".

Program the "Hot key" with the front keypad:

1. When the controller is ON, insert the "Hot key", the "UP" message appears followed a by flashing "HOT".
2. Push the key, the "ED" message appears.
3. Remove the "Hot key".

NOTE: the "ER" message is displayed for failed programming. In this case push the upload button or key again if you want to restart the upload again or remove the "Hot key" to abort the operation.

14.2 HOW TO PROGRAM AN INSTRUMENT USING A HOT KEY (DOWNLOAD)

Program the instrument with the "Hot key" button:

1. When the controller is ON, insert the "Hot key", the "UP" message appears followed a by flashing "HOT".
2. Push the download button on the "Hot key". Automatically the parameter list of the "Hot Key" is downloaded into the controller memory, the "ED" message appears.
3. Remove the "Hot Key".

Program the instrument with the front keypad:

1. When the controller is ON, insert the "Hot key", the "UP" message appears followed a by flashing "HOT".
2. Push the key, the "DP" message appears.
3. Push the key. Automatically the parameter list of the "Hot Key" is downloaded into the controller memory, the "ED" message appears.
4. Remove the "Hot Key".


NOTE: the "ER" message is displayed for failed programming. In this case push the download button or key again if you want to restart the download again or remove the "Hot key" to abort the operation.

15. ALARM SIGNALS

| Message | Cause | Outputs |
|---------|----------------------------------|---|
| "P1" | Thermostat probe failure | Compressor output according to parameters "C-01" and "C-02" |
| "P2" | Evaporator probe failure | Defrost end is timed |
| "P3" | Third probe failure | Outputs unchanged |
| "P4" | Fourth probe failure | Outputs unchanged |
| "P5" | The third probe is not present. | Outputs unchanged |
| "P6" | The fourth probe is not present. | Outputs unchanged |

| Message | Cause | Outputs |
|---------|---|------------------------------------|
| "HA" | Maximum temperature alarm | Outputs unchanged. |
| "LA" | Minimum temperature alarm | Outputs unchanged. |
| "HA2" | Condenser high temperature | It depends on the "F-16" parameter |
| "LA2" | Condenser low temperature | It depends on the "F-15" parameter |
| "DA" | Door open | Compressor restarts |
| "EA" | Generic external alarm (F-01 or F-03 = 1) | Output unchanged. |
| "CA" | Serious external alarm (F-01 or F-03 = 5) | All outputs OFF. |
| "PA" | Pressure switch alarm (F-01 or F-03 = 4) | All outputs OFF. |

15.1 SILENCING BUZZER

Once an alarm signalling, the buzzer is silenced by pressing the  key.

15.2 ALARM RECOVERY

Probe alarms: "P1", "P2", "P3" and "P4"; they automatically stop some seconds after the probe restarts normal operation. Check connections before replacing the probe. "P5", "P6" automatically stop as soon as the third or fourth probe is present.

Temperature alarms "HA", "LA", "HA2" and "LA2" automatically stop as soon as the thermostat temperature returns to normal values or when the defrost starts.

Door switch alarm "DA" stop as soon as the door is closed.

Alarms "EA" and "CA" recover as soon as the digital input is disabled.

Alarm "PA" recovers only by switching off and on the instrument.

15.3 OTHER MESSAGES

| | |
|-----|--------------------|
| PON | Keyboard unlocked. |
| POF | Keyboard locked |

16. TECHNICAL DATA

Housing: Self extinguishing PC

Case: Facia 38x185 mm; depth 85mm

Mounting: Panel mounting in a 150x31 mm panel cut-out

Protection: IP20; **Frontal protection:** IP65

Connections: Screw terminal block $\leq 2,5 \text{ mm}^2$ heat-resistant wiring

Power supply: 110-240Vac $\pm 10\%$, 50/60Hz

Power absorption: 5VA max

Display: PV: 4 digits, white LCD, 18,4 mm high; SV: 4 digits, yellow LCD, 9,2 mm high

Inputs: Up to 4 NTC or PT1000 probes

Digital inputs: 2 free voltage

Relay outputs: **Total current on loads MAX. 20A**

AUX1: relay SPST 8(5) A, 250Vac Compressor: relay SPST 20(10)A, 250Vac

Other output: Buzzer (optional)

Hot key: USB

Serial output: RS485; **Communication protocol:** Modbus - RTU

Data storing: On the non-volatile memory (EEPROM)

Internal clock back-up: 24 hours (only for model with RTC)

Kind of action: 1B; **Pollution grade:** 2; **Software class:** A

Rated impulsive voltage: 2500V; **Over voltage Category:** II

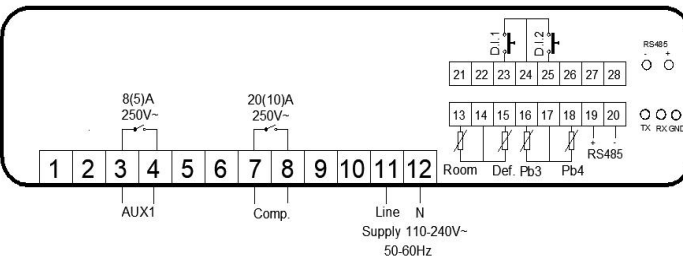
Operating temperature: 0+60 °C; **Storage temperature:** -30+85 °C

Relative humidity: 20+85% (no condensing)

Measuring and regulation range: NTC probe: -40+80°C (-40+176°F) PT1000 probe: -40+80°C (-40+176°F)

Resolution: 0,1 °C or 1°C or 2 °F (selectable); **Accuracy (ambient temp. 25°C):** $\pm 0,7 \text{ °C} \pm 1 \text{ digit}$

17. CONNECTIONS



18. DEFAULT SETTING VALUES

| Label | Name | Range | °C/°F |
|-------|--|----------|-------|
| L-00 | Current minute | 0+59 | 0 |
| L-01 | Current hour | 0+23 | 0 |
| L-02 | Current day | 1+7 | 1 |
| L-03 | Current year | 0+99 | 0 |
| L-04 | Current month | 1+12 | 1 |
| L-05 | Current date | 1+31 | 1 |
| L-06 | First weekly holiday | 0+7 | 6 |
| L-07 | Second weekly holiday | 0+7 | 7 |
| L-08 | Energy Saving enabled | 0,1 | 0 |
| L-09 | Differential for Energy Saving | 0+100 | 2 |
| L-10 | Energy Saving cycle length during workdays | 0+24h | 1h |
| L-11 | Energy Saving cycle length on holidays | 0+24h | 1h |
| L-12 | Energy Saving cycle start during workdays | 0,0+23,5 | 1,0 |

| Label | Name | Range | °C/°F |
|-------|---|----------------------------|-------|
| L-13 | Energy Saving cycle start on holidays | 0,0+23,5 | 1,0 |
| L-14 | 1 st workdays defrost start | 0,0+23,5 | 0,0 |
| L-15 | 2 nd workdays defrost start | 0,0+23,5 | 6,0 |
| L-16 | 3 rd workdays defrost start | 0,0+23,5 | 10,0 |
| L-17 | 4 th workdays defrost start | 0,0+23,5 | 16,0 |
| L-18 | 5 th workdays defrost start | 0,0+23,5 | 18,0 |
| L-19 | 6 th workdays defrost start | 0,0+23,5 | 22,0 |
| L-20 | 1 st holiday defrost start | 0,0+23,5 | 0,0 |
| L-21 | 2 nd holiday defrost start | 0,0+23,5 | 6,0 |
| L-22 | 3 rd holiday defrost start | 0,0+23,5 | 10,0 |
| L-23 | 4 th holiday defrost start | 0,0+23,5 | 16,0 |
| L-24 | 5 th holiday defrost start | 0,0+23,5 | 18,0 |
| L-25 | 6 th holiday defrost start | 0,0+23,5 | 22,0 |
| H-00 | Defrost mode | 0,1 | 0 |
| H-01 | Interval between defrosts | 1+240h | 24h |
| H-02 | (Maximum) length for defrost | 0+240min | 10min |
| H-03 | Defrost delay at start-up | 0+240min | 10min |
| H-04 | Draining time | 0+240min | 10min |
| H-05 | Defrost delay after continuous cycle | 0+240min | 10min |
| H-06 | Displaying during defrost | 0+3 | 0 |
| H-07 | Auxiliary relay configuration | 0+7 | 0 |
| H-08 | Compressor operating mode | 0+2 | 0 |
| H-09 | Second compressor start delay | 0+240min | 5min |
| H-10 | Set point for second compressor | 0+100 | 2 |
| H-11 | Differential for second compressor | 0+100 | 3 |
| H-12 | Probe selection for second compressor | 0+3 | 0 |
| H-13 | Auxiliary relays output time | 0+100min | 0min |
| H-14 | Probe selection for auxiliary relay | 0+3 | 0 |
| H-15 | Auxiliary relay operating during defrost | 0,1 | 0 |
| H-16 | Kind of action for auxiliary relay | 0,1 | 0 |
| H-17 | Alarm relay polarity | 0,1 | 0 |
| H-18 | Defrost termination temperature | (-40 + 80°C) (-40 + 176°F) | 8°C |
| H-19 | Set Point for auxiliary relay | (-40 + 80°C) (-40 + 176°F) | 0°C |
| H-20 | Differential for auxiliary relay | 1+100 | 2 |
| F-00 | First digital input polarity | 0,1 | 0 |
| F-01 | First digital input configuration(23-24) | 0+8 | 0 |
| F-02 | First digital input alarm delay | 0+240min | 10min |
| F-03 | Second digital input configuration(24-25) | 0+8 | 1 |
| F-04 | Second digital input polarity | 0,1 | 0 |
| F-05 | Second digital input alarm delay | 0+240min | 10min |
| F-06 | Number of activation of pressure switch | 0+240 | 0 |
| F-07 | Buzzer mode | 0,1 | 0 |
| F-08 | Compress status when open door | 0,1 | 0 |
| F-09 | Regulation restart with door open alarm | 0,1 | 0 |
| F-10 | Alarm delay at the end of defrost | 0+60min | 10min |
| F-11 | Condenser temperature alarm delay | 0+120min | 10min |
| F-12 | Alarm relay disabling | 0,1 | 0 |
| F-13 | Differ. for condenser temp. alar. recovery | 0+60 | 5 |
| F-14 | Delay of cond. temper. alarm at start up | 0+240min | 30min |
| F-15 | Compr. off for condenser low temperature alarm | 0,1 | 0 |
| F-16 | Compr. off for condenser high temperature alarm | 0,1 | 0 |
| F-17 | Temperature alarms configuration | 0,1 | 0 |
| F-18 | Alarm probe selection | 0+3 | 0 |
| F-19 | Temperature alarm delay | 0+120min | 10min |
| F-20 | Delay of temperature alarm at start up | 0+240min | 30min |
| F-21 | Differential for temperat. alarm recovery | 0+60 | 2 |
| F-22 | Probe for temperat. alarm of condenser | 0+3 | 0 |
| F-23 | Condenser for high temperat. alarm | (-40 + 80°C) (-40 + 176°F) | 40°C |
| F-24 | Condenser for low temperat. alarm | (-40 + 80°C) (-40 + 176°F) | -35°C |
| F-25 | Maximum temperature alarm | (-40 + 80°C) (-40 + 176°F) | 40°C |
| F-26 | Minimum temperature alarm | (-40 + 80°C) (-40 + 176°F) | -35°C |
| C-00 | Differential | 0+200 | 3 |
| C-01 | Compressor ON time with faulty probe | 10+240min | 30min |
| C-02 | Compressor OFF time with faulty probe | 10+240min | 30min |
| C-03 | Anti-short cycle delay | 5+100min | 15min |
| C-04 | Factory reset | 0,1 | 0 |
| C-05 | Continuous cycle duration | 0+240min | 30min |
| C-06 | Outputs delay at start up | 0+60min | 0min |
| C-07 | Test mode | 0,1 | 0 |
| C-08 | RS485 address | 1+100 | 1 |
| C-09 | Kind of probe | 0,1 | 0 |
| C-10 | Kind of action | 0,1 | 0 |
| C-11 | Temperature measurement unit | 0,1 | 0 |
| C-12 | Resolution | 0,1 | 0 |
| C-13 | Instrument display | 0+4 | 0 |
| C-14 | RTC display | 0,1 | 0 |
| C-15 | Remote display | 0+4 | 0 |
| C-16 | Third probe presence | 0,1 | 0 |
| C-17 | Fourth probe presence | 0,1 | 0 |
| C-18 | P1-P2 percentage for display | 0+100 | 0 |
| C-19 | Set point | (-40 + 80°C) (-40 + 176°F) | 1°C |

| Label | Name | Range | °C/°F |
|-------|--------------------------------|----------------------------|-------|
| C-20 | Set point for continuous cycle | (-40 ÷ 80°C) (-40 ÷ 176°F) | -1°C |
| C-21 | Thermostat probe calibration | (-12 ÷ 12°C) (-60 ÷ 60°F) | 0°C |
| C-22 | Evaporator probe calibration | (-12 ÷ 12°C) (-60 ÷ 60°F) | 0°C |
| C-23 | Third probe calibration | (-12 ÷ 12°C) (-60 ÷ 60°F) | 0°C |
| C-24 | Fourth probe calibration | (-12 ÷ 12°C) (-60 ÷ 60°F) | 0°C |

19. APPENDIX

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | b | C | d | E | F | G | H | I | J | K | L | M |
| A | B | C | D | E | F | G | H | I | J | K | L | M |
| n | o | P | q | r | S | t | U | u | v | w | x | z |
| N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

Fastron
Electronics

- Power Semiconductors
- Electrical Measurement
- Process Control

32 Shearson Crescent
Mentone VIC 3194 Australia

Web: www.fastron.com.au
Email: sales@fastron.com.au
Telephone: + 61-3 - 97635155
Facsimile: + 61-3 - 97635206