

Resource
Data Management

ML Controller Case Controller

Commissioning/User Guide
Document Revision 3.4a



PR0123

Contents

| | |
|--|----|
| ML Controller | 4 |
| Description | 4 |
| Display | 5 |
| Relay Modules | 6 |
| Connections | 6 |
| Connections | 7 |
| Setting-up | 8 |
| Viewing/ Changing Menu Items | 8 |
| Menu Items | 8 |
| Rtc – Real Time Clock | 8 |
| Type | 9 |
| Units | 9 |
| Display | 9 |
| Id | 9 |
| Hub/Switch Type | 9 |
| OFSt | 9 |
| rLY1 | 9 |
| Parameter Tables | 10 |
| Parameter Description | 12 |
| Network Configuration | 14 |
| Network Compatibility | 14 |
| Network Settings | 15 |
| 485 Networks | 15 |
| MODBUS | 16 |
| IP Communications | 16 |
| Bluetooth Network module | 17 |
| Operation | 18 |
| Case Off / Sec | 18 |
| Monitor Probe | 18 |
| Div Value | 18 |
| Mop | 18 |
| Trim Heater | 19 |
| Maximum and Minimum Control Temperature | 19 |
| Fan Delay | 19 |
| Manual Defrost | 19 |
| Defrost Cycles | 19 |
| Electric Defrost Cycle | 20 |
| Gas Defrost Cycle | 20 |
| Relay Assignment | 20 |
| Integral type (Type 1) relay assignment | 21 |
| LLV/EEV Type (Type 2/1) relay assignment | 21 |
| User Selectable Fan Relay | 22 |
| Network Alarms | 22 |
| Network Commands | 22 |
| Front Panel messages | 23 |
| View I/O | 23 |
| Specification | 24 |
| General | 24 |
| Relays | 25 |
| Compressor/LLV (Type 1 Selected) | 25 |
| Compressor/LLV (Type 2 selected) | 25 |
| EEV (Type 1) | 26 |
| Part Numbers | 27 |
| Alarm Sounder | 27 |
| Appendix 1 – Modbus® ML register address table | 28 |



Please ensure all power is switched off before installing or maintaining this product.

| | |
|------------------------|----|
| Type 1 | 28 |
| Type 2 | 32 |
| Revision History | 37 |



Please ensure all power is switched off before installing or maintaining this product.

ML Controller

Description

The ML controller is a refrigerated cabinet / coldroom controller with adjustable parameters, incorporating a defrost scheduling timer, lights control, fan control and an alarm handler. The controller can be networked to an RDM Data Manager.

The ML controller has a solid state relay option for switching an electronic expansion valve or an electro-mechanical relay for switching compressors or a mechanical valve, see [Part Numbers](#) for controller options. Note: Hardware versions of ML Controller with a mechanical Relay are supplied with two PR0240 NTC2K Probes.

The main features are:

- Display with decimal or whole numbers
- Single stage thermostat using on/off relay or EEV mode (Using a different relay Module)
- EEV mode with Pressure input mode (Using an EEV type controller and Hub / Switch)
- Probe 1: Air On Probe
- Probe 2: Air Off Probe
- Probe 3: Evaporator Probe or Logging Probe or Defrost Probe or Plant Fault*
- Probe 4: Suction Probe or Logging Probe or Defrost Probe or Plant Fault*
- Programmable parameters
- Defrost scheduler (up to 8 per day) with 12/15A defrost relay
- Manual defrost (from the display buttons)
- Network Defrost schedule option
- Fan control relay
- High volume Alarm buzzer Installation (Can be switched off). Please see note [Alarm Sounder](#)
- RS232 output for Network connection
- RS485 network version (Genus or Modbus compatible)
- Network Lights timer function
- Trim Heater control relay
- Remote Trim Heater control
- Remote network commands
- PT1000, NTC2K, NTC2k25, NTC5K or 10K probes supported
- Degrees C and Degrees F incorporated in one controller
- Built-in energy saving features such as Case off or Secondary set point option linked to the lights schedule.

***Note:** for the EEV variant of the ML controller Probe 3 & 4 are pre-set as Evaporator & Suction line probe and cannot be changed.



Please ensure all power is switched off before installing or maintaining this product.

Display

LED's:

Cooling



Fans



Lights



Network



- Off: No network attached
- Flashing: Attempting to Log on to network
- Steady: On-line

Service



Defrost



HACCP



Alarm



Keys



Enter



Up



Down



Defrost

Note: Function keys illuminate when pressed, illumination is turned off 20 seconds after the key is used. Press and hold the defrost button to force a manual defrost.



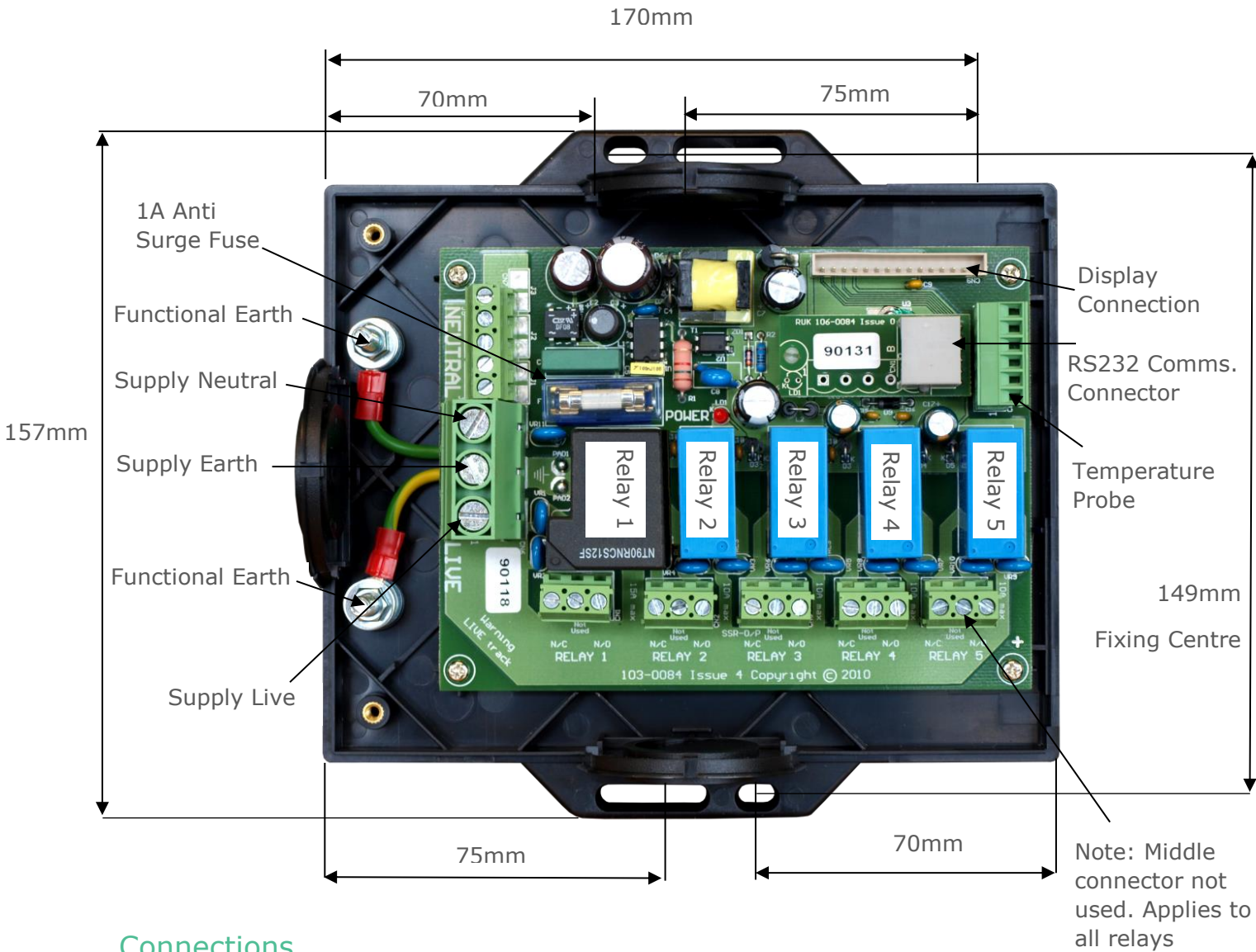
Please ensure all power is switched off before installing or maintaining this product.

Relay Modules

The ML controller is supplied in two parts, a panel mount display / control unit and a relay / power supply module in a black ABS enclosure. The two units are interconnected using the 5m lead supplied, the control unit derives its power from the relay module. All the terminals for power, control relays, networking and temperature probes are contained within the relay module as shown below.

The ML controller can be used with a 230 Vac 50Hz or 110V 60Hz mains supply, the switched mains outputs for the relays are fed by the relay module so only one mains supply needs to be connected.

5 Relay module with RS232 connector (for connection to an IP Network)



Connections

- NEUTRALS: Supply Neutral connections
- LIVE: Supply Live connections
- N/C: Relay normally closed contact
- N/O: Relay normally open contact

Probe Connection Detail



- Probe Common
- Probe 4 / Plant 2
- Probe 3 / Plant 1
- Air Off
- Air On
- Probe Common



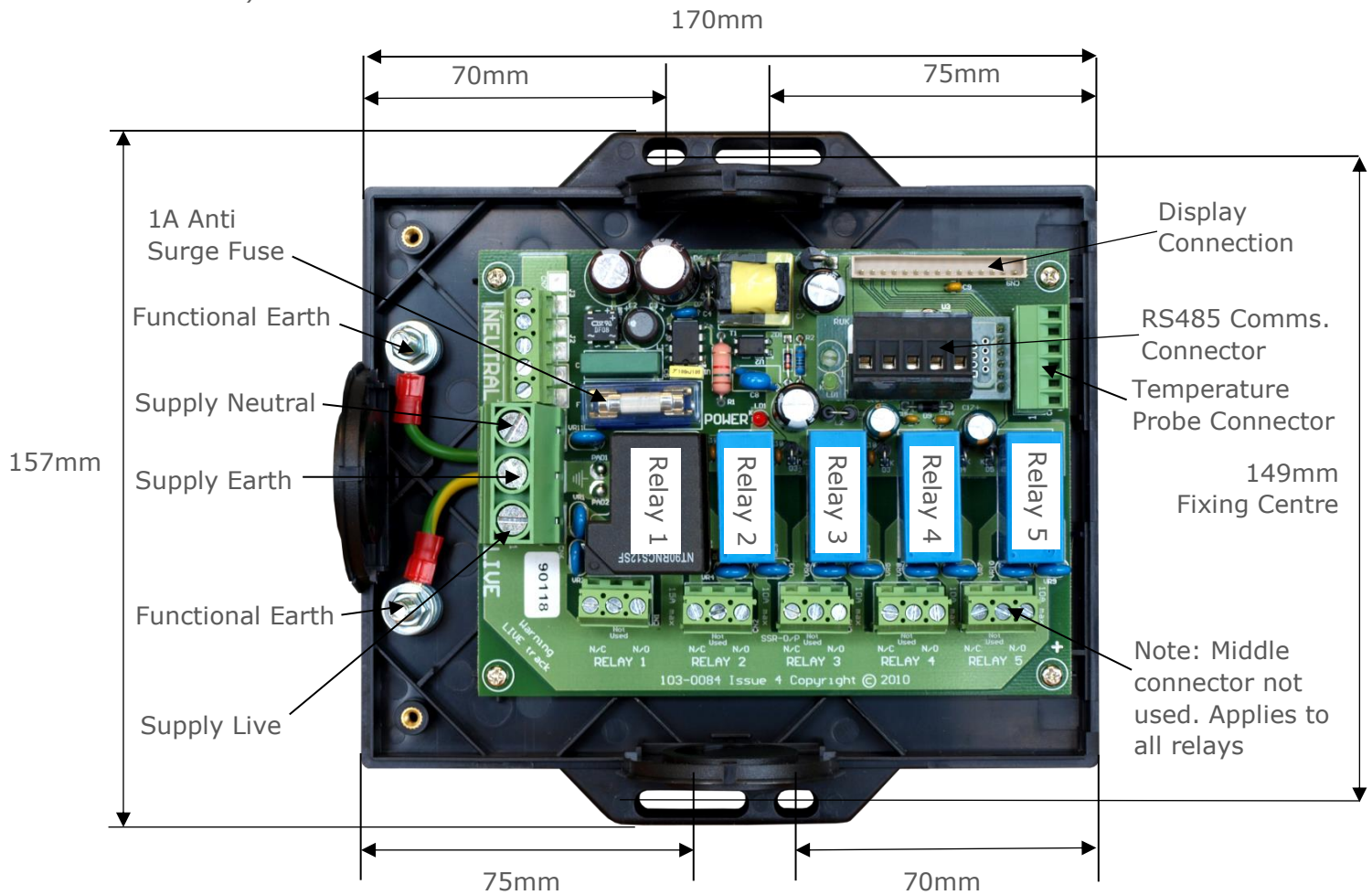
All relays will output the supply voltage

Note. Earth is a functional earth, not a safety earth



Please ensure all power is switched off before installing or maintaining this product.

5 Relay module with RS485 connector (for connection to Genus compatible or Modbus Network).



There are two variants of the mechanical relay board, one configuration has 3 relays fitted and the second has 5 relays fitted. The solid state relay board has a 5 relay option only. Please see the [Part Numbers](#) section for the different relay board variants.

On the 3 relay version, relays 4 & 5 are not fitted.

Connections

| | | |
|-----------|-------------------------------|-------------------------|
| NEUTRALS: | Supply Neutral connections | RS485 Connection Detail |
| LIVE: | Supply Live connections | |
| N/C: | Relay normally closed contact | |
| N/O: | Relay normally open contact | |



Common
Data B -
Common
Data A +
Screen

All relays will output the supply voltage



Note. Earth is a functional earth, not a safety earth



Please ensure all power is switched off before installing or maintaining this product.

Setting-up

Access to the controller settings can be achieved several ways,

- Through the display mounted buttons
- Direct access by PC into the rear comms port. This requires a software package available on the RDM website
- Through legacy front end panels on 485 networks
- Through the RDM Data Manager.
- Across an IP network. (Current controller IP address required)

Viewing/ Changing Menu Items

1. Press and hold **"ENT"** and **"DOWN"** for approximately 3 seconds the display will read **"EnT"**
2. Press and release **"ENT"**, the display will indicate **"IO"** *This is the inputs and outputs viewing option*
3. Use the **"UP"** or **"DOWN"** keys to cycle round the menu items, press enter at the desired item.

Example: pressing enter at "PARA" will allow you to view or change parameters

*Note. If menu item "ESC" is entered the controller will **escape** the set up and revert to normal operation*

Menu Items

| Display | Option | Explained in Paragraph | Display | Option | Explained in Paragraph |
|---------|--|------------------------------------|---------|--------------------------------|---------------------------------------|
| IO | View Inputs/Outputs and States | Input/Output table | Rtc | Set/View Real Time Clock | Real Time Clock |
| PArA | Set/View Parameters | Parameter Tables | nEt | Set/View network configuration | Network Configuration |
| Unit | Probe type and Celsius/Fahrenheit option | Units | Hub | Set/View Hub/Switch settings | Hub |
| diSP | Display whole units or decimal | Display | Soft | View Software version | |
| tyPE | Set/View the Controller Type | Type | OFSt | Probe Offset | Probe Offset |
| Id | Enter an ID (For IP-L use) | ID | rLY1 | Relay 1 Invert option | Relay 1 |
| bt | Enables Bluetooth network settings | Bluetooth | ESC | Exit Setup mode | |

Rtc – Real Time Clock

Real time clock (This will automatically synchronise on network systems)

- a. Use the up or down buttons to scroll through the display until the display reads "rtc"
- b. Press enter. The display will show "t-1". press enter again
- c. Scroll hours up or down (0 – 23) press enter
- d. Use up button to select "t-2", press enter
- e. Scroll minutes up or down (0 – 59) press enter
- f. Repeat for t-3 (seconds 0 – 59)
- g. Repeat for t -4 (Days up to 31)
- h. Repeat for t -5 (months up to 12)
- i. Repeat for t -6 (Year up to 99)
- j. Use up button to display "ESC", press enter to display "rtc".

Time clock is now set



Please ensure all power is switched off before installing or maintaining this product.

Type

For non-electronic expansion valve versions:

- Type 1** is Integral (Compressor control) HT
- Type 2** is LLV Controller HT
- Type 3** is Integral (Compressor control) LT
- Type 4** is LLV Controller LT

For electronic expansion valve versions:

- Type 1** is EEV Controller HT
- Type 2** is EEV Controller LT

Units

Use this to select the temperature probe type.

| | |
|-------------------------|--|
| 0 for PT1000 Celsius | 10 for NTC2K25 Celsius |
| 1 for PT1000 Fahrenheit | 11 for NTC2K25 Fahrenheit |
| 2 for NTC2K Celsius | 12 for 5K Celsius |
| 3 for NTC2K Fahrenheit | 13 for 5K Fahrenheit |
| 4 for 470R Celsius | 14 for 6K Celsius |
| 5 for 470R Fahrenheit | 15 for 6K Fahrenheit |
| 6 for 700R Celsius | 16 for NTC10K Celsius |
| 7 for 700R Fahrenheit | 17 for NTC10K Fahrenheit |
| 8 for 3K Celsius | 18 for NTC10K(2) Celsius (USA NTC10K) |
| 9 for 3K Fahrenheit | 19 for NTC10K(2) Fahrenheit (USA NTC10K) |

Display

Display setting:

- 0 = Decimal display (1 place)
- 1 = Integer Display

To view the current temperature range (HI/LO) of the controller, hold all four buttons on the display for two seconds. To change the temperature range of the controller all four buttons down for 5 seconds, when the operating temperature change is displayed press the enter button for the controller to accept the change and the controller will restart.

Note 1: The controller will keep the control (i.e. Integral or Compressor) but will toggle between the High / Low type. So, for example, if the controller is set for Type 1, changing to LO, will change the controller to Type 3.

Note 2: When changing between HI/LO set points, the controller will load up the settings that have been previously set for that type. If it the type has not been previously used or altered it will load the defaults.

Id

Sets the controller ID, (normally used in conjunction with the IP-L network mode). Set a number in the range of 1 - 999

Hub/Switch Type

Select the desired value for the type of communication module in use.

- 0 = Mercury Hub/Switch**
- 1 = ML Hub/Switch**

OFSt

Probe offsets: - select a channel (1 - 4) and select an offset +/- 20 °C (68 °F)

rLY1

Inverts the operation of relay 1 so that the N/O contact can be used.



Please ensure all power is switched off before installing or maintaining this product.

Parameter Tables

| No. | Parameter | Min | Max | Unit | Default Integral (HT) Type 1 | Default LLV (HT) Type 2 | Default Integral (LT) Type 3 | Default LLV (LT) Type 4 | Default EEV Type 1 |
|--------------|--|--------------|--------------|------------|------------------------------------|-------------------------------|------------------------------------|-------------------------------|--------------------------|
| P-01 | Temperature set point | -60 (-76) | 60 (140) | °C (°F) | 0 (32) | 0 (32) | -20 (-4) | -20 (-4) | 0 (32) |
| P-02 | Temperature differential | -60 (-76) | 60 (140) | °C (°F) | 3 (5.4) | 3 (5.4) | 3 (5.4) | 3 (5.4) | 1.5 (2.7) |
| P-03 | Control Weight | 0 | 100 | % | 50 | 50 | 50 | 50 | 50 |
| P-09 | Alarm Weight | 0 | 100 | % | 0 | 0 | 0 | 0 | 0 |
| P-04 | Probe 3 Type 0 = Off 1 = Monitor 2 = Monitor with Fault 3 = Monitor with Alarm 4 = Defrost term 5 = Plant N/O 6 = Plant N/C 7 = Defrost N/O 8 = Defrost N/C | 0 | 8 | | 0 | 0 | 0 | | |
| P-05 | Probe 4 Type 0 = Off 1 = Monitor 2 = Monitor with Fault 3 = Monitor with Alarm 4 = Defrost term 5 = Plant N/O 6 = Plant N/C 7 = Defrost N/O 8 = Defrost N/C | 0 | 8 | | | | | | |
| | Response On | 1 | 30 | | | | | | 10 |
| P-06 | Relay 2 Function 0 = Fans 1 = Lights 2 = Trims 3 = Alarm 4 = SLV 5 = Trim Hub | 0 | 5 | | 0 | 0 | 0 | 0 | 0 |
| | Response Off | 1 | 30 | | | | | | 10 |
| P-07 | Relay 4 Function 0 = Fans 1 = Lights 2 = Trims 3 = Alarm 4 = SLV 5 = Trim Hub | 0 | 5 | | 1 | 1 | 1 | 1 | 1 |
| P-08 | Relay 5 Function 0 = Fans 1 = Lights 2 = Trims 3 = Alarm 4 = SLV 5 = Trim Hub | 0 | 5 | | 2 | 2 | 2 | 2 | 2 |
| P-09 | Superheat Reference | 0 (32) | 12 (53.6) | °C (°F) | | | | | 6 (10.8) |
| P-10 | Control Type 0 = EEV 1 = EET | 0 | 1 | | | | | | 0 |
| P-11 | Trim level | 0 | 100 | % | 100 | 100 | 100 | 100 | 100 |
| P-12 | Anti-Short Cycle Time | 00:00 | 99:00 | mm:ss | 01:00 | | 01:00 | | |
| P-13 | Max Run Time | 00:00 | 99:00 | mm:ss | 00:00 | | 00:00 | | |
| P-14 | Service Interval | 0 | 128 | x1000 hrs | 60 | 60 | 60 | 60 | |
| P-14 P-15 | Evaporator Select 0 = Local 1 = Remote | 0 | 1 | | | | | | 0 |
| | EEV Minimum | 0 | 100 | % | | | | | 10 |
| P-16 | Superheat Problem | 0 | 12 | °C | | | | | 0 |



Please ensure all power is switched off before installing or maintaining this product.

| No. | Parameter | Min | Max | Unit | Default Integral (HT) Type 1 | Default LLV (HT) Type 2 | Default Integral (LT) Type 3 | Default LLV (LT) Type 4 | Default EEV Type 1 |
|------|---|--------------|-------------|------------|------------------------------|-------------------------|------------------------------|-------------------------|--------------------|
| | | (32) | (53.6) | (°F) | | | | | (32) |
| P-17 | EEV Problem Opening | 0 | 100 | % | | | | | 10 |
| P-18 | EEV Problem Time | 00:00 | 99:00 | mm:ss | | | | | 03:00 |
| P-19 | EEV Start Opening | 0 | 100 | % | | | | | 10 |
| P-57 | Div Value | 0 | 100 | % | | | | | 50 |
| P-20 | Alarm delay | 00:00 | 99:00 | mm:ss | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-21 | Under Temp Alarm | -60 (-76) | 60 (140) | °C (°F) | -8 (17.6) | -8 (17.6) | -25 (-13) | -25.0 (-13) | -2 (28.4) |
| P-22 | Over Temp Alarm | -60 (-76) | 60 (140) | °C (°F) | 4 (39.2) | 4 (39.2) | -13 (8.6) | -13 (8.6) | 5 (41) |
| P-23 | Log Alarm Delay | 00:00 | 99:00 | mm:ss | 20:00 | 20:00 | 20:00 | 20:00 | |
| P-24 | Log probe Under Temp | -60 (-76) | 60 (140) | °C (°F) | -8 (17.6) | -8 (17.6) | -25 (-13) | -25 (-13) | |
| P-25 | Log probe Over Temp | -60 (-76) | 60 (140) | °C (°F) | 4 (39.2) | 4 (39.2) | -13 (8.6) | -13 (8.6) | |
| P-26 | Alarm buzzer duration | 00:00 | 61:00 | mm:ss | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 |
| P-40 | Defrost Mode 0 = Local 1 = Remote 2 = External | 0 | 1 | | 0 | 0 | 0 | 0 | 0 |
| P-41 | Defrost Start Time (Local mode) | 00:00 | 23:59 | hh:mm | 01:00 | 01:00 | 01:00 | 01:00 | 01:00 |
| P-42 | Defrost number (Local mode) | 0 | 8 | | 4 | 4 | 4 | 4 | 6 |
| P-43 | No Defrost Time | 0 | 180 | hours | 12 | 12 | 12 | 12 | 12 |
| P-44 | Defrost Termination Temperature | -60 (-76) | 60 (140) | °C (°F) | 10 (50) | 10 (50) | 10.0 | 10.0 | 10 (50) |
| P-45 | Defrost Time | 00:00 | 99:00 | mm:ss | 30:00 | 30:00 | 30:00 | 30:00 | 20:00 |
| P-46 | Defrost Type 0 = Electric 1 = Gas 2 = Off Cycle | 0 | 2 | | 0 | 0 | 0 | 0 | 0 |
| P-53 | Defrost Hold 0=Off 1=On | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| P-47 | Drain Down Time | 00:00 | 24:00 | mm:ss | 02:30 | 02:30 | 02:30 | 02:30 | 02:30 |
| P-48 | Recovery Time | 00:00 | 99:00 | mm:ss | 30:00 | 30:00 | 30:00 | 30:00 | 30:00 |
| P-49 | Fan Delay Time | 00:00 | 99:00 | mm:ss | 15:00 | 15:00 | 15:00 | 15:00 | 15:00 |
| P-50 | Fans in Defrost 0 = Off 1 = On | 0 | 1 | | 0 | 0 | 0 | 0 | 0 |
| P-51 | Fan Delay Temperature | -60 (-76) | 60 (140) | °C (°F) | 0 (32) | 0 (32) | 0 (32) | 0 (32) | 0 (32) |
| P-52 | Display Def Button | 0 | 1 | | 1 | 1 | 1 | 1 | 1 |
| P-98 | Lights Control 0 = Off 1 = Case Off 2 = Sec | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| P-81 | Sec Cut-In | -60 (-76) | 60 (140) | °C (°F) | 10 (050) | 10 (50) | 10 (50) | 10 (50) | 10 (50) |
| P-60 | Lights Mode 0 = Local 1 = Remote 2 = Manual Off 3 = Manual On | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| P-61 | Sunday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |
| P-62 | Sunday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-63 | Monday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |
| P-64 | Monday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-65 | Tuesday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |
| P-66 | Tuesday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-67 | Wednesday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |
| P-68 | Wednesday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-69 | Thursday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |
| P-70 | Thursday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-71 | Friday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |



Please ensure all power is switched off before installing or maintaining this product.

| No. | Parameter | Min | Max | Unit | Default Integral (HT) Type 1 | Default LLV (HT) Type 2 | Default Integral (LT) Type 3 | Default LLV (LT) Type 4 | Default EEV Type 1 |
|------|----------------------------|-------|-------|-------|------------------------------|-------------------------|------------------------------|-------------------------|--------------------|
| P-72 | Friday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| P-73 | Saturday On Time | 00:00 | 23:59 | hh:mm | 08:00 | 08:00 | 08:00 | 08:00 | 08:00 |
| P-74 | Saturday Off Time | 00:00 | 23:59 | hh:mm | 20:00 | 20:00 | 20:00 | 20:00 | 20:00 |
| Dflt | Sets parameters to default | | | | | | | | |

Parameter Description

| No. | Parameter | Description |
|------|-------------------------------------|--|
| P-01 | Temperature set point | The value above which the controller switches on the Valve |
| P-02 | Temperature differential | The value below the set point at which the controller closes the valve. |
| P-03 | Control Weight | Control & Display Weight |
| P-09 | Alarm Weight | Percentage of the Air-On temperature that is used to calculate the temperature that triggers the over temperature alarm. |
| P-04 | Probe 3 Type | This parameter allows the user to change the function of input 3. See Monitor Probe . |
| P-04 | Response On (EEV only) | Speed up the valve on response (0 is the slowest, 30 the fastest) |
| P-05 | Probe 4 Type | This parameter allows the user to change the function of input 4. See Monitor Probe . |
| P-05 | Response Off (EEV only) | Speed up the valve off response (0 is the slowest, 30 the fastest) |
| P-06 | Relay 2 Function | Sets the function of relay 2, default to fans |
| P-07 | Relay 4 Function | Sets the function of relay 4, default to lights |
| P-08 | Relay 5 Function | Sets the function of relay 5, default to trims |
| P-09 | Superheat Reference | Sets the superheat control value. The control will turn the valve on above this setting and off when below. |
| P-10 | Control Type | EEV control prioritises on superheat reference, EET prioritises on Control temp. |
| P-11 | Trim level | Sets the trim relay to a percentage On level (5 minute pulse period) |
| P-12 | Anti Short Cycle Time | Time between compressor stop and re-start |
| P-13 | Max Run Time (Type 1 Integral Only) | Turns the compressor off after this time, unless the control temp is above setpoint. 00:00 switches this feature off. |
| P-13 | Service Interval (Type 1 EEV Only) | Service interval time, set to 0 then back to reset. Brings on the service (Spanner) icon when active. |
| P-14 | Service Interval (Non EEV only) | Service interval time, set to 0 then back to reset. Brings on the service (Spanner) icon when active. |
| P-14 | Evaporator Select (EEV Only) | Used in conjunction with a ML Pressure Hub, for pressure related EEV control. Local uses controller Evap probe. Remote uses value sent from ML Switch. |
| P-15 | EEV Minimum | Sets the minimum EEV opening percentage for the normal state. |
| P-16 | Superheat Problem | Sets the point at which the controller enters the EEV problem state. |
| P-17 | EEV Problem Opening | Sets the valve opening percentage for the EEV problem state |
| P-18 | EEV Problem Time | Time the controller stays in the EEV problem state before entering the EEV start state |
| P-19 | EEV Start Opening | Sets the valve opening percentage for the EEV start state |
| P-57 | Div Value | See Div Value |
| P-20 | Alarm delay | Sets the OT/UT alarm delay |
| P-21 | Under Temp Alarm | Under temperature Alarm setpoint |
| P-22 | Over Temp Alarm | Over temperature Alarm setpoint |
| P-23 | Monitor probe Alarm delay | Sets the monitor probe OT/UT alarm delay |
| P-24 | Monitor probe Under Temp | Monitor probe Under temperature Alarm setpoint |
| P-25 | Monitor probe Over Temp | Monitor probe Over temperature Alarm setpoint |
| P-26 | Alarm buzzer duration | Sets the buzzer on duration when an alarm occurs. Set to 00:00 to disable the buzzer. *Please see note Alarm Sounder |
| P-40 | Defrost Mode | Defrost mode: local mode (controller schedules), Remote: front-end schedules. Externa: Signal in input Probe 3 or 4. |
| P-41 | Defrost Start Time (Local mode) | Start defrost time for local schedule |
| P-42 | Defrost number (Local mode) | Number of defrosts per day (local mode) |
| P-43 | No Defrost Time | Starts a defrost if no defrost command has been sent for this duration (remote mode) |



Please ensure all power is switched off before installing or maintaining this product.

| No. | Parameter | Description |
|------|---------------------------------|--|
| P-44 | Defrost Termination Temperature | Defrosts terminate when the Alarm temp / Defrost Probe temp reaches this value (See P-04 & P-05). |
| P-45 | Defrost Time | Defrost duration, unless terminated by P-44 |
| P-46 | Defrost Type | Defrost type, Gas type keeps the Compressor relay active during defrost |
| P-53 | Defrost Hold | Turns the defrost hold feature on and off. When switched on, the controller can be held off refrigeration until all other controllers on the same defrost channel have completed their defrost cycles. |
| P-47 | Drain Down Time | Drain down time |
| P-48 | Recovery Time | Recovery time, OT alarms are inhibited for this period |
| P-49 | Fan Delay Time | Fans remain off until this time has elapsed or fan delay temperature is reached. *Please see Fan Delay note |
| P-50 | Fans in Defrost | Fans on or off during defrost; if set to on, they go off at the drain down state and come on after the fans delay |
| P-51 | Fan Delay Temperature | Fans stay off until the Alarm temp is reached or the fan delay time expires. |
| P-52 | Display Def Button | This parameter is used to turn on and off the function to allow the '#' button on the display to initiate a local defrost. |
| P-98 | Lights Control | Off – Feature not used. Case Off – Places controller in to Case Off Mode when Lights timer is in the off state. Sec – Controller operates from a second setpoint when the lights timer is in off period. See Case Off / sec |
| P-81 | Sec Cut-In | Secondary setpoint associated to P-98. See : Case Off / sec |
| P-60 | Lights Mode | Lights Mode; local use the local schedule below, Remote uses a front-end GP timer. |
| P-61 | Sunday On Time | Sunday On Time |
| P-62 | Sunday Off Time | Sunday Off Time |
| P-63 | Monday On Time | Monday On Time |
| P-64 | Monday Off Time | Monday Off Time |
| P-65 | Tuesday On Time | Tuesday On Time |
| P-66 | Tuesday Off Time | Tuesday Off Time |
| P-67 | Wednesday On Time | Wednesday On Time |
| P-68 | Wednesday Off Time | Wednesday Off Time |
| P-69 | Thursday On Time | Thursday On Time |
| P-70 | Thursday Off Time | Thursday Off Time |
| P-71 | Friday On Time | Friday On Time |
| P-72 | Friday Off Time | Friday Off Time |
| P-73 | Saturday On Time | Saturday On Time |
| P-74 | Saturday Off Time | Saturday Off Time |
| Dflt | Sets parameters to default | Sets all parameters to factory defaults |



Please ensure all power is switched off before installing or maintaining this product.

Network Configuration

Network Compatibility

To log the controller onto a network you must first connect the controller to a suitable IP comms module or use the ML RS485 variant.

| Description | Part Number |
|---|-------------|
| IP Futura (Single Mercury to IP Interface) | PR0016 |
| Mercury IP Switch (IP support for 10 controllers) | PR0018 |
| Mercury IP Switch with Pressure/Humidity Inputs | PR0018-PHI |
| ML IP Comms module (Single ML to IP Interface) | PR0108* |
| ML IP Switch (IP support for 10 controllers) | PR0109* |
| Mercury IP Switch with Pressure/Humidity Inputs | PR0109-PHI* |

When logging the ML controller on to a Data Manager then one of the above communication modules should be used. The ML range of IP communication modules will soon be obsolete with only spares being made available for replacement purposes. For a limited number of software versions the ability to communicate with both the Mercury and ML communication modules has been included in the ML controller software. This revised software will provide compatibility for both ranges for a short time only. Later versions of software will communicate with Mercury communication modules only. The version of ML controller software which communicates with both Mercury and ML communication modules is shown below:

| Part Number | Description | Controller Software Version and IP Communication Compatibility | | | | | | | |
|-------------|-----------------|--|-----------------------------|-----------------------------|-----------------------------|------------------------|--------------------------------|--------------------------------|--------------------------------|
| | | PR0123 V2.0-V2.3 | PR0123- TWI V2.0-V2.1 | PR0120- HOT V2.0-V2.1 | PR0123- STA V2.0-V2.1 | PR0123 V2.4 & Above | PR0123- TWI V2.2 & Above | PR0120- HOT V2.2 & Above | PR0123- STA V2.2 & Above |
| PR0108 | ML IP Module* | ✓ | ✓ | ✓ | ✓ | x | x | x | x |
| PR0109 | ML Hub* | ✓ | ✓ | ✓ | ✓ | x | x | x | x |
| PR0109-PHI | ML Hub PHI* | ✓ | ✓ | ✓ | ✓ | x | x | x | x |
| PR0016 | IP Futura | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PR0018 | Mercury Hub | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PR0018-PHI | Mercury Hub PHI | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

* Note software version of the ML IP Module has to be V1.4 or higher. Software versions older than V1.4 are not supported with the revised ML hardware platform.

PR0026 RS485 Legacy network modules are not compatible with ML controllers.

The ML controller has to be set depending on the type of communication module in use. See [Hub/Switch Type](#) for further details.



Please ensure all power is switched off before installing or maintaining this product.

Network Settings

485 Networks

RS485 Relay Board will support the following protocol:

- Genus
- Third Party Modbus)

Use the controller menu options to set-up the network; press enter at the "net" screen, then choose from the following network set-up screens:

| Display | Option |
|---------|--|
| 485t | 485 Network Type |
| 485A | 485 Address/Name |
| gAdd | Show underlying network address assigned to controller |
| rLog | Re-log the controller back onto the network |
| ClrA | Clear the address/name from the controller |
| ESC | Exit network menu. N.B. this option must be selected to save any changes made in this menu |

485T Genus Compatible / Modbus

The 485t option shows a value representing the network type. The possible values are:

| Value | Network Type |
|-------|--|
| 1 | Genus compatible (all versions) |
| 2 | Modbus (9600 Baud Rate, 8 Bit, No Parity, 1 Stop Bit) |
| 3 | Modbus (9600 Baud Rate, 8 Bit, No Parity, 2 Stop Bits) |

Genus Compatible

485A Genus

The 485A option shows a value representing either the name of the controller in a Genus compatible network.

The value shown is of the form 05-6. This means the controller would try to log onto a Genus compatible network using the name 'RC05-6'.

Once the address has been entered, use the net menu items to go to the "Esc" screen and press enter. This registers the network address into the controller and the controller will log on at this point.

Gadd

The gAdd option displays (in hexadecimal format) the underlying network address assigned to the controller when it is logged onto the network.

Rlog

The rLog option allows the controller to be logged back onto the network with its current name. The 'rLog' message will flash for confirmation. Press the Enter button to execute the command, Up or Down buttons to cancel.

ClrA

The ClrA option will clear out the network address and name in the controller. The 'ClrA' message will flash for confirmation. Press the Enter button to execute the command, Up or Down buttons to cancel.

To enter this mode, hold the Enter, Up and Down buttons together for approximately 3 seconds until the message ClrA appears on the display. ClrA is the first option in the menu consisting of the following options:

| Display | Option |
|---------|--|
| ClrA | Clear the address/name from the controller |
| ESC | Exit Setup mode |

Pressing the Enter button to select the ClrA option will cause the 'ClrA' message to flash for confirmation, if the network type is set to Genus compatible. Press the Enter button to execute the command, Up or Down buttons to cancel. If the network type is not set to Genus compatible then the ClrA message will not flash and the ESC option can be used to exit the menu.



Please ensure all power is switched off before installing or maintaining this product.

MODBUS

From 485t the user can select either 2 or 3 for Modbus communications.

- 2) Third Party Modbus 9600 Baud Rate, 8 Bit, No Parity, 1 Stop Bit.
- 3) Third Party Modbus 9600 Baud Rate, 8 Bit, No Parity, 2 Stop Bits.

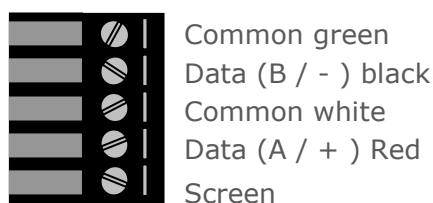
The 485A option shows a value representing the Modbus address that has to be entered in the Data Manager

The value shown is in the range 0 to 247

Note: For Modbus table information, please see [Appendix 1](#)

RS485 Connection

Using a suitable network cable* connect the RS485 Relay module to a network manager (such as RDM Data Manager) with the following connections: -



Network Cable part number: *Belden 8723 or equivalent

IP Communications

There are 2 ways the ML controller can be used with an IP Ethernet network: -

1. IP-R Remote IP address given by the Data Manager (DHCP Server)
2. IP-L Local IP address and gateway is set up in the controller.

IP-R

To use the ML controller in IP-R mode, you will require either a PR0016 Mercury IP Module or PR0018 Mercury Hub. When either of these two devices are used, the rotary switches be given a unique setting. Setting 000 must be avoided for IP-R mode.

Once the comms module has been set up and connected to the controller and Data Manager, it will automatically log-on. Once it is online, the IP address given to the controller can be viewed by pressing enter at the "NET" display. Press enter at any one of the sub-menu option to read the value

IP1 = IP address field 1
 IP2 = IP address field 2
 IP3 = IP address field 3
 IP4 = IP address field 4

IP-L

To use the ML controller in IP-L mode, you will require either a PR0016 Mercury IP Module or PR0018 Mercury Hub.

The rotary switches must be set to 000 on the comms module or 00 on the Hub

In this mode the IP address and gateway address must be set up manually in the controller.



Please ensure all power is switched off before installing or maintaining this product.

Use the following table as a guide:

| Display | Option |
|---------|--|
| IP1 | IP Address byte 1 |
| IP2 | IP Address byte 2 |
| IP3 | IP Address byte 3 |
| IP4 | IP Address byte 4 |
| nL | Network Mask Length (see table below) |
| GT1 | Gateway Address byte 1 |
| GT2 | Gateway Address byte 2 |
| GT3 | Gateway Address byte 3 |
| GT4 | Gateway Address byte 4 |
| ESC | Exit network menu. N.B. this option must be selected to save any changes made in this menu |

Setting nL

To ease setup, a single network mask length value is used. If the address has been specified with a network mask value in dotted IP format e.g. 255.255.255.0 then the table below gives the conversion:

| Mask | Length | Mask | Length | Mask | Length |
|-----------------|--------|---------------|--------|-------------|--------|
| | | 255.255.254.0 | 23 | 255.254.0.0 | 15 |
| 255.255.255.252 | 30 | 255.255.252.0 | 22 | 255.252.0.0 | 14 |
| 255.255.255.248 | 29 | 255.255.248.0 | 21 | 255.248.0.0 | 13 |
| 255.255.255.240 | 28 | 255.255.240.0 | 20 | 255.240.0.0 | 12 |
| 255.255.255.224 | 27 | 255.255.224.0 | 19 | 255.224.0.0 | 11 |
| 255.255.255.192 | 26 | 255.255.192.0 | 18 | 255.192.0.0 | 10 |
| 255.255.255.128 | 25 | 255.255.128.0 | 17 | 255.128.0.0 | 09 |
| 255.255.255.0 | 24 | 255.255.0.0 | 16 | 255.0.0.0 | 08 |

The network led will start flashing as the controller is logging on to the network; once logged on, the LED stays on.

Bluetooth Network module

Connecting a Bluetooth Network Module to the controller will update the screens available under the 'Net' menu. They are detailed below;

| Display | Option |
|---------|---|
| 485A | Bluetooth device name. As it will appear on DMTouch's device list (RC00-0 – RC99-9) |
| nI d | Select Bluetooth Network ID (0 – 4) |
| gAdd | Shows underlying network address assigned to controller |
| rLog | Re-log the controller back onto the network |
| ClrA | Clear the address/ name from the controller |
| ESC | Exit network menu. Note: this option must be selected to save any changes made in this menu. |

- Ensure the bt is set to '1' (Bluetooth)
- Provide a unique device alias under the 485A menu (e.g. 01-5)
- Select the Network ID. Please see the Bluetooth wireless mesh setup guide for more details.
- Press the 'ESC' to save

The green network LED will flash to show it is attempting to log on and go solid when connected.



Please ensure all power is switched off before installing or maintaining this product.

Operation

Normal operation is achieved by setting the appropriate parameters and menu item values.

Case Off / Sec

If "Case Off" is selected the controller will enter "Case Off Mode" when the case lights schedule is in the off period. When case lights schedule is in the on period the controller will follow its normal control operation. This feature is disabled if Temp Cut-In parameter P-01 is set to 4.0 Degrees or lower.

Warning use with caution: - Case Off places the controller into a state whereby all outputs are **off** and alarms are **inhibited** e.g. no temperature control will occur and no over temperature alarms will be created etc.

If "Sec" is selected the controller will operate to a secondary setpoint, using P-81 (Sec Cut-In), when the case lights schedule is in the off period. When case lights schedule is in the on period the controller will operate to its normal Temperature set point (P-01).

This feature is disabled if Sec Cut-In parameter (P-81) is set to 4.0 Degrees or lower.

Note: The temperature alarm limits do not change so should be set accordingly.

Monitor Probe

| | |
|---------------------------|--|
| Off | If selected probe is not used. |
| Monitor | If selected, controller will monitor temperature but will not alarm out. |
| Monitor with Fault | If selected, controller will monitor temperature and alarm out for probe fault but not over or under temperature. |
| Monitor with Alarm | If selected, controller will monitor temperature and alarm out for probe faults and over and under temperature alarms. |
| Defrost | The selected probe will be used as a defrost termination probe (instead of Air Off probe). |
| Plant N/O | If selected, controller will generate a Plant fault alarm when the probe input sees a short circuit. |
| Plant N/C | If selected, controller will generate a Plant fault alarm when the probe input sees an open circuit |

Div Value

This parameter only takes effect when the controller is used in conjunction with an ML Switch pressure application. When the ML Switch generates an MOP (Maximum operating pressure) alarm the controller reduces the maximum valve opening to this percentage. For example, if this parameter is set to 50% and the MOP alarm is generated then the maximum valve opening will be limited to 50%. Therefore as the controller pulses the valve the maximum the valve will open is 50%.

Mop

Maximum Operating Pressure (MOP) is a remote command sent from the ML/Mercury switch (PR0109-PHI/PR0018-PHI) to the controller to either close or reduce the EEV valve opening when a predetermined pressure is reached. This MOP value is configured in the ML/Mercury Switch setup. When the ML/Mercury Switch generates an MOP alarm the controller reduces the maximum valve opening to this percentage. For example if the "Div Value" parameter is (P-57) set to 50% and the MOP alarm is generated then the maximum valve opening will be limited to 50%. For Mechanical valve type controllers the LLV is closed for the MOP alarm duration.



Please ensure all power is switched off before installing or maintaining this product.

Trim Heater

Trims: If a relay is configured as Trims then the relay will pulse in accordance with P-11 or will be switched remotely by the Data Manager Trim Control energy feature.
P-11 is used if Trim control is not configured in the Data Manager.

Trim Hub: If the relay is configured as Trim Hub then the relay is pulsed remotely by the ML/Mercury Switch (PR0109-PHI/PR0018-PHI) Please see the ML/Mercury Switch user documents for further details.

Maximum and Minimum Control Temperature

To view the maximum or minimum Control Temperature the controller has reached since last power on, Press and hold the Up and Down Buttons together for 3 seconds. The display will show "diSP", Press the Up Button to view the maximum Control Temperature the controller has reached and the Down Button to view the minimum Control Temperature the controller has reached.

The top left hand segment will be lit when the maximum temperature is being displayed.
The bottom left hand segment will be lit when the minimum temperature is being displayed.

Resetting the controller will clear out these values.

The Min and Max values can also be reset by pressing the hash (#) button while in display mode.
When the hash (#) button is pressed in display mode, the display will show "rSEt" and the values will reset.
Once reset, the display will show current control temperature.

The display will revert back to normal operation if the Enter Button is pressed or after 1 minute if no button has been pressed.

Fan Delay

Note: in software versions M 1.2 and E 1.1: - Please multiply the desired fan delay (in minutes) by four and enter this for P-49 to achieve the required fan delay.
Example: if a 5 minute delay is required, enter the value 20 for P-49.

Software versions M 1.3 and E 1.2 should have the fan delay, parameter P-49, entered in minutes.
Therefore if an 8 minute fan delay is required enter 8 for P-49.

Manual Defrost

Press and hold the "#" key for 3 seconds. A manual defrost in accordance with the defrost parameters will be performed. (see defrost page)

Defrost Cycles

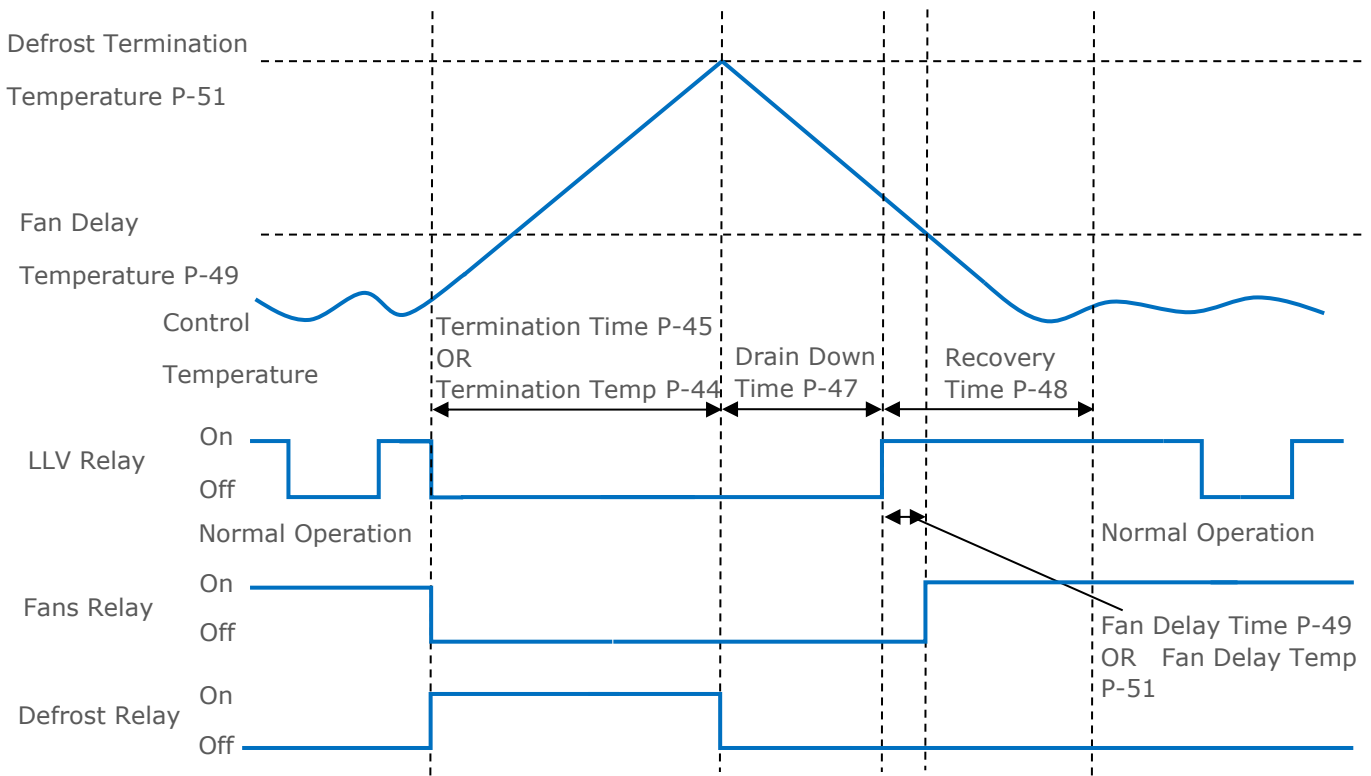
From normal operation, when the defrost sequence starts, the fans are switched off (if fans are set to off in defrost, P-50) and the LLV closes. The controller stays in this state until either the termination time (P-45) expires or the termination temperature (P-44) is reached on the defrost termination or Alarm temp. The controller then enters the drain down period and the fans are switched off. After the drain down period, the LLV is switched on and the recovery period starts. After the fan delay period or when the fans termination temperature drops below the fans set point (P-51), the fans are switched on. Over temperature alarms are inhibited from the start of the sequence to the end of the recovery time. Recovery ends either when the Alarm temp drops below the over temperature alarm level or when the recovery time expires.

See below diagrams for a graphical representation.

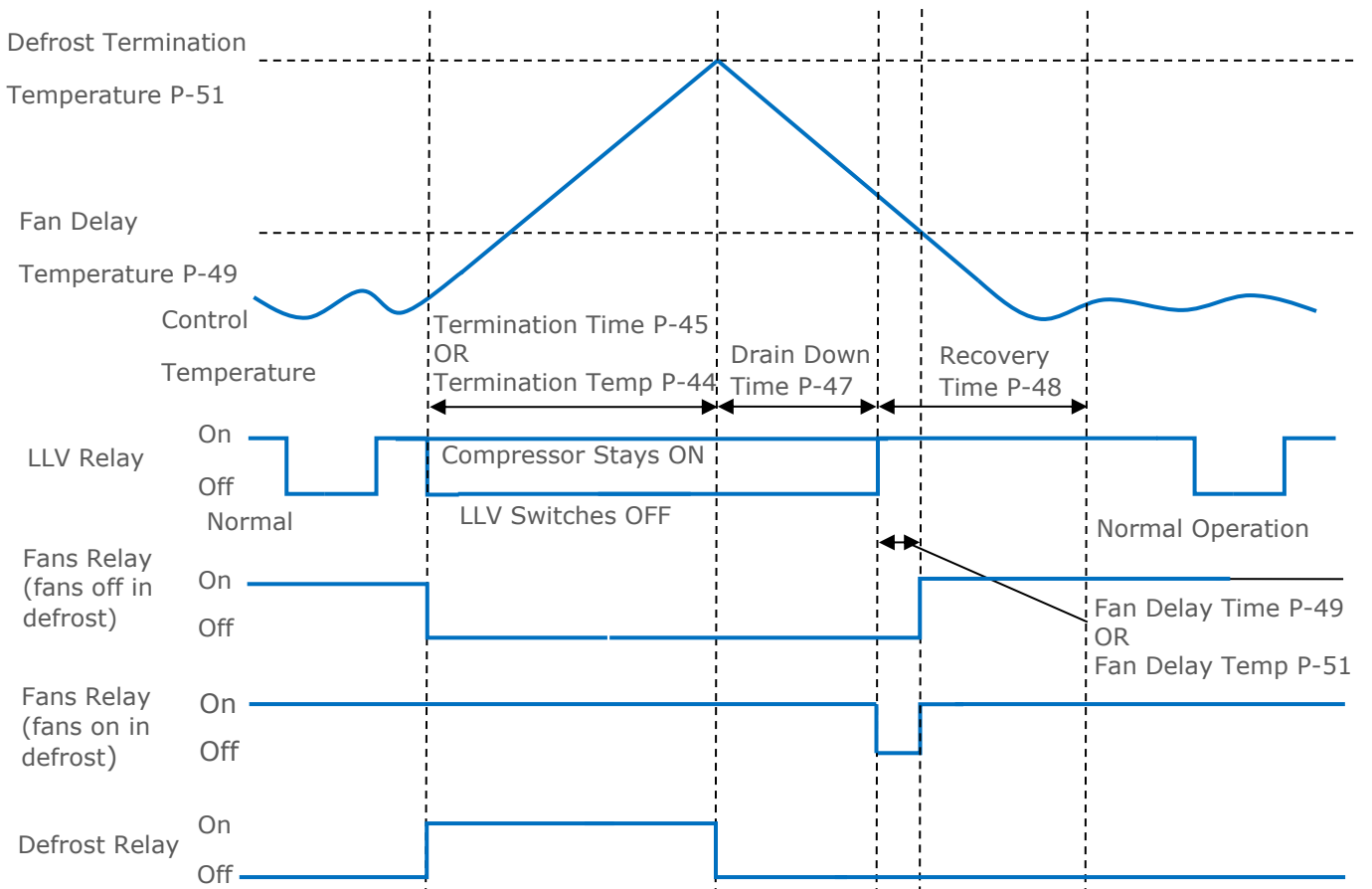


Please ensure all power is switched off before installing or maintaining this product.

Electric Defrost Cycle



Gas Defrost Cycle



Please ensure all power is switched off before installing or maintaining this product.

Relay Assignment

Integral type (Type 1) relay assignment

In this mode, the relays are assigned as follows: -

| | |
|---------|--|
| Relay 1 | Compressor ^{Note 1} |
| Relay 2 | Fans, Lights, Trims, SLV or Alarm |
| Relay 3 | Defrost (use the N/O for correct operation) |
| Relay 4 | Fans, Lights, Trims, SLV or Alarm (This relay is not available on the 3 Relay version) |
| Relay 5 | Fans, Lights, Trims, SLV or Alarm (This relay is not available on the 3 Relay version) |

Note 1: Normally relay 1 operation is from the lower HP switch N/C contact, if the higher HP switch N/O contact is required for normal operation, then rLy1 option in the menu must be set from it's default value 0 to 1.

LLV/EEV Type (Type 2/1) relay assignment

In this mode, the relays are assigned as follows: -

| | |
|---------|--|
| Relay 1 | Defrost (use the N/O for correct operation) |
| Relay 2 | Fans, Lights, Trims, SLV or Alarm *see note |
| Relay 3 | LLV or EEV (use the N/C for correct operation) |
| Relay 4 | Fans, Lights, Trims, SLV or Alarm (This relay is not available on the 3 Relay version) |
| Relay 5 | Fans, Lights, Trims, SLV or Alarm (This relay is not available on the 3 Relay version) |

SLV relay switches on at the start of the defrost cycle, and goes off at termination before the drain-down period.

Note: The Relay's logic has been assigned to function correctly when the following connections are used: -

| | |
|-------------------|--|
| Defrost | Use N/O contact |
| Fans | Use N/C contact |
| LLV or Compressor | Use N/C contact (N/O when the "Invert Relay" option is used) |
| Lights | Use N/C contact |
| Trims | Use N/O contact |
| SLV | Use N/O contact |

Note: The relay assigned to Trim and/or SLV will indicate the inverse action on the Data Manager's value page.

ML45-4 - MLM Case Controller
Online since 15:55 05/05/08

| Name | Value | Units | Name | Value | Units |
|-----------------|-----------|-------|----------------------|----------|-------|
| Control temp. | -0.4 | °C | Air on Probe | -1.0 | °C |
| Air off Probe | 0.1 | °C | Probe 3 | ???????? | °C |
| Probe 4 | ???????? | °C | Plant Fault 1 | OK | |
| Plant Fault 2 | OK | | | | |
| Defrost Control | Off | | Fan Control | Off | |
| Liq. Line Valve | Closed | | Lights | On | |
| Lights Control | On | | Inverse Trim Control | Off | |
| Trims | On | | Run Time | 0 | K Hrs |
| Setpoint Offset | 0.0 | °C | | | |
| Control State | Fan Delay | | | | |

Relay 4 aliased to Lights Control

Relay 2 aliased to Fan Control

Relay 4 aliased to Inverse trim Control

Sample Data manager Screen Shot (Fan Delay state after a defrost)

Note: Lights and trims have an extra value to indicate the state (This is the control state, not the relay state)



Please ensure all power is switched off before installing or maintaining this product.

User Selectable Fan Relay

Relays 2, 4 & 5 can be selected to operate the evaporator fans which should be connected to the normally closed (N/C) terminal. When the fans are running the relay is de energised and will energise to turn the fans off, this means that the fans will run in the event of the controller losing power. On ML controller software versions V3.0 or newer the Data Manager will display the relay as being on when the fans are running and off when the fans are not running. On earlier software versions the Data Manager will display the actual status of the relay i.e. off or de energised when the fans are running and on or energised when the fans are not running.

Network Alarms

| Alarm text | Type # (index) |
|-----------------------|----------------|
| Missed Defrost | 15 |
| Over Temperature | 4 |
| Under Temperature | 5 |
| Log Over Temperature | 8 |
| Log Under Temperature | 9 |
| Probe 1 Fault | 6 |
| Probe 2 Fault | 6 |
| Probe 3 Fault | 6 |
| Probe 4 Fault | 6 |
| Plant Fault 1 | 3 |
| Plant Fault 2 | 3 |

Network Commands

| Command | Value to send | Description | Conditions |
|------------------|---------------|--|---|
| Defrost Command | 1 | Initiates a defrost cycle | Defrost mode: remote Once started defrost terminates on temperature or time |
| Trim Command | 0 to 100% | Sets the trim level to this value (Trim period is 5 minutes) | Selectable Relay 2/4/5 mode: Trim Heater |
| Setpoint Command | ±20°C / 68°F | Is added to or subtracted from the setpoint | See note * |
| Case Off Command | 5 0 | Sets the controller to Case Off Restores the controller form Case Off to Normal | This command only works when parameter P-98 (Lights Control) Is set to 0 (Off) or 2 (sec) See Note **. Also see not |
| EEV Command | 1 2 | Normal Valve Off (any type, EEV or LLV) | |
| Haccp Command | 0 1 2 | HACCP LED OFF HACCP LED On HACCP LED Flashes | |

Note **

When parameter P-98 is set to 1 (Case Off) the lights timer will put the controller into Case Off Mode when the case lights go Off

If the ML controller is logged onto a Genus network the network command for Case Off is 'Case Off Comman and the Setpoint Command is 'Setpoint Comman'



Please ensure all power is switched off before installing or maintaining this product.

Front Panel messages

Typical Front Panel messages:

| Display Message | System status |
|-----------------|--|
| Ft | Control Fault |
| Prb1 | Probe 1 Fault |
| Prb2 | Probe 2 Fault |
| Prb3 | Probe 3 Fault |
| Prb4 | Probe 4 Fault |
| rec | Control State in Recovery |
| dEF | Control Sate in Defrost |
| AL | Control State in Alarm (Over or Under Temperature) |
| OFF | Controller in Case Off |
| PrAL | Log Probe Over or Under Temperature |

View I/O

Selecting this menu option allows the user to view the inputs and outputs. Use the up/down button to select the desired input or output and then press "Enter". The value will be shown on the display.

Press "Enter" in the menu at "IO" to view the inputs and outputs.

| Number | I/O M Type 2 (LLV) | I/O M Type 1 (Integral) | I/O E Type 1 (EEV) | Range (dependant on probe type) | Step | Units |
|--------|--------------------------|-------------------------------|-----------------------|---|------|----------|
| I-01 | Control Temp. | Control Temp. | Control Temp. | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-02 | Probe 1 (Air On) | Probe 1 (Air On) | Probe 1 (Air On) | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-03 | Probe 2 (Air Off) | Probe 2 (Air Off) | Probe 2 (Air Off) | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-04 | Probe 3 | Probe 3 | Probe 3 (Evap) | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-05 | Probe 4 | Probe 4 | Probe 4 (Suct line) | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-06 | | | Superheat | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-07 | | | Remote Evap Temp. | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| I-11 | Plant 1 Input | Plant 1 Input | | 0 = off, 1= on | 1 | |
| I-12 | Plant 2 Input | Plant 2 Input | | 0 = off, 1= on | 1 | |
| I-13 | MOP | | MOP | 0 = off, 1 = on | 1 | |
| I-14 | Hub Trim Level | Hub Trim Level | Hub Trim Level | 0 to 100 | 1 | % |
| I-15 | External Defrost | External Defrost | | 0 = off, 1 = on | 1 | |
| I-16 | Alarm temp | Alarm temp | Alarm temp | 0 - 100 | 1 | % |
| O-01 | Defrost Control | Compressor | Defrost Control | 0 = off, 1= on | 1 | |
| O-02 | Relay 2 | Relay 2 | Relay 2 | 0 = off, 1= on | 1 | |
| O-03 | LLV Control | Defrost Control | Valve opening | 0 = off, 1= on | 1 | |
| O-06 | Lights | Lights | Lights | 0 = off, 1= on | 1 | |
| O-04 | Relay 4 | Relay 4 | Relay 4 | 0 = off, 1= on | 1 | |
| O-05 | Relay 5 | Relay 5 | Relay 5 | 0 = off, 1= on | 1 | |
| O-07 | Trims | Trims | Trims | 0 = off, 1 = on | 1 | |
| O-10 | Run Time | Run Time | Run Time | 0 -128 | 1 | K Hrs |
| O-30 | Setpoint Offset | Setpoint Offset | Setpoint Offset | -60 ° to 60° (-76 ° to 140°) | 0.1 | °C (°F) |
| S-01 | Control State | Control State | Control State | 0 = Stabilise, 1 = Normal, 2 = Defrost, 3 = Drain Down, 4 = Fan Delay 5 = Recovery, 6 = Alarm 7 = Case Off, 8 = Df Hold | | |



Please ensure all power is switched off before installing or maintaining this product.

| Number | M Type 2 (LLV) | M Type 1 (Integral) | E Type 1 (EEV) | Range | Step | Units |
|--------|----------------|---------------------|----------------|--|------|-------|
| S-02 | | | Valve State | 0 = Off 1 = Start 2 = Run 3 = Problem 4 = Fail | 1 | |

Specification

General

| | | |
|------------------------------|--|---|
| Supply Voltage Range: | 90 - 270 Vac \pm 10% | |
| Supply Frequency | 50 - 60 Hz \pm 10% | |
| Maximum Supply Current | 55A | With relays 1 to 5 fully loaded |
| Typical Supply Current | <1A | With relays 1 to 5 off load |
| Supply Fuse | 1Amp anti-surge 20 x 5mm | |
| Operating temperature range | +5°C to 50 °C | |
| Storage temperature | -20°C to 65°C | |
| Operating Humidity | 80% maximum | |
| Environmental | Indoor use at altitudes up to 2000m, Pollution Degree 1 Installation Category II. Voltage fluctuations not to exceed \pm 10% of nominal voltage | |
| Controller Size | 79mm x 37mm x 73mm WxHxD | |
| Panel Cut-out for Controller | 72mm x 29mm | |
| Relay Board Size | 170mm x 157mm x 52mm LxWxH | NB – width includes mounting feet |
| Maximum Weight (combined) | 1.25kg | |
| Safety (Relay Board) | Class II LVD | This product is double insulated when used with the original enclosure |
| Safety (Controller) | Class II LVD | Only use the cable provided to connect the controller to the relay board. |
| Safety | Conforms to EN60730-1 based on UL 60950-1; UL 62368-1 as referenced to IEC60730-1 | |
| EMC | EN61326-1 : 2013 | |
| Ventilation | No requirement for forced ventilation | |
| Insulation | Class I for Relay board Class II for controller | |



Please ensure all power is switched off before installing or maintaining this product.

Relays

Compressor/LLV (Type 1 Selected)

IMPORTANT: Some early versions of Relay modules had relays fitted in position 1 that had a lower N/O contact rating (0.5 HP) Look at the label on the enclosure lid for the correct Relay rating.

| | | |
|--|---|--|
| Relay 1 Compressor Relay ^{Note 1} | N/O contact 250 Vac/16A N/O contact 250 Vac/ 2HP N/C contact 250 Vac/16A N/C contact 250 Vac/1.5HP | Resistive Load Motor Load Resistive Load Motor Load |
| Relay 2 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |
| Relay 3 Defrost | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |
| Relay 4 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |
| Relay 5 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |

Note 1 Normally relay 1 operation is from the lower HP NC contact, if the higher HP NO contact is required for normal operation, the relay 1 option in the menu must be set from its default value (0) to 1.

Compressor/LLV (Type 2 selected)

| | | |
|-------------------------------|--|--|
| Relay 1 Defrost Relay | N/O contact 250 Vac/15A N/O contact 250 Vac/2HP N/C contact 250 Vac/10A N/C contact 250 Vac/1.5HP | Resistive Load Motor Load Resistive Load Motor Load |
| Relay 2 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |
| Relay 3 (Valve or Compressor) | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |
| Relay 4 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |
| Relay 5 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load Cos Φ =0.4 Resistive Load Inductive Load Cos Φ =0.4 |



Please ensure all power is switched off before installing or maintaining this product.

EEV (Type 1)

| | | |
|-----------------------|--|--|
| Relay 1 Defrost Relay | N/O contact 250 Vac/15A N/O contact 250 Vac/2HP N/C contact 250 Vac/10A N/C contact 250 Vac/1.5HP | Resistive Load Motor Load Resistive Load Motor Load |
| Relay 2 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$ Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$ |
| Relay 3 EEV | 1.5 A 280Vac | |
| Relay 4 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$ Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$ |
| Relay 5 Selectable | N/C contact 240 Vac/10A N/C contact 240 Vac/3A N/O contact 240 Vac/10A N/O contact 240 Vac/3A | Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$ Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$ |

Please Note:

Damage to relays through out of specification usage will invalidate the warranty.



Please ensure all power is switched off before installing or maintaining this product.

Part Numbers

| Controller Variant | Part Number |
|---|-------------|
| ML Controller (Comp/LLV) with 3 Relay, No Comms and Faston connectors | PR0120 |
| ML Controller (Comp/LLV) with 3 Relay, No Comms and Faston connectors (50 Units) | PR0120-50 |
| ML Controller (Comp/LLV) with 3 Relay, No Comms and Faston connectors (20 Units) | PR0120-20 |
| ML Controller (Comp/LLV) with 3 Relay, RS485 Comms and Screw Terminals | PR0121 |
| ML Controller (Comp/LLV) with 3 Relay, RS485 Comms and Screw Terminals (50 Units) | PR0121-50 |
| ML Controller (Comp/LLV) with 3 Relay, RS485 Comms and Screw Terminals (20 Units) | PR0121-20 |
| ML Controller (Comp/LLV) with 5 Relay, RS485 Comms and Screw Terminals | PR0122 |
| ML Controller (Comp/LLV) with 5 Relay, RS485 Comms and Screw Terminals (50 Units) | PR0122-50 |
| ML Controller (Comp/LLV) with 5 Relay, RS485 Comms and Screw Terminals (20 Units) | PR0122-20 |
| ML Controller (Comp/LLV) with 5 Relay, RS232 Comms and Screw Terminals | PR0123 |
| ML Controller (Comp/LLV) with 5 Relay, RS232 Comms and Screw Terminals (50 Units) | PR0123-50 |
| ML Controller (Comp/LLV) with 5 Relay, RS232 Comms and Screw Terminals (20 Units) | PR0123-20 |
| Each of the above units supplied with Controller Display, Display Cable, Relay Board and two PR0240 Probes (NTC2K 7 Metres) | |
| ML PSU Relay module with 3 Relay, RS485 Comms and Screw Terminals | PR0125 |
| ML PSU Relay module with 3 Relay, RS485 Comms and Screw Terminals (50 Units) | PR0125-50 |
| ML PSU Relay module with 3 Relay, RS485 Comms and Screw Terminals (20 Units) | PR0125-20 |
| ML PSU Relay module with 5 Relay, RS485 Comms and Screw Terminals | PR0126 |
| ML PSU Relay module with 5 Relay, RS485 Comms and Screw Terminals (50 Units) | PR0126-50 |
| ML PSU Relay module with 5 Relay, RS485 Comms and Screw Terminals (20 Units) | PR0126-20 |
| ML PSU Relay module with 5 Relay, RS232 Comms and Screw Terminals | PR0127 |
| ML PSU Relay module with 5 Relay, RS232 Comms and Screw Terminals (50 Units) | PR0127-50 |
| ML PSU Relay module with 5 Relay, RS232 Comms and Screw Terminals (20 Units) | PR0127-20 |
| ML Controller (EEV) with 5 Relay (SSR), RS232 Comms and Screw Terminals | PR0123E |
| ML Controller (EEV) with 5 Relay(SSR), RS232 Comms and Screw Terminals (50 Units) | PR0123E-50 |
| ML Controller (EEV) with 5 Relay (SSR), RS232 Comms and Screw Terminals (20 Units) | PR0123E-20 |
| ML PSU Relay module (EEV) with 5 Relay, RS232 Comms and Screw Terminals | PR0127E |
| ML PSU Relay module (EEV) with 5 Relay, RS232 Comms and Screw Terminals (50 Units) | PR0127E-50 |
| ML PSU Relay module (EEV) with 5 Relay, RS232 Comms and Screw Terminals (20 Units) | PR0127E-20 |

Alarm Sounder

The sounder is not included or fitted to the standard build but it is an optional build for quantity orders.



Please ensure all power is switched off before installing or maintaining this product.

Appendix 1 – Modbus® ML register address table

Type 1

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|-----------------|----------------|-------------|-------|---------------|-----------|------|--------|
| 0 | Control temp. | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 1 | Air On Probe | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 2 | Air Off Probe | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 3 | Probe 3 | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 4 | Probe 4 | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 5 | Plant Fault 1 | 0 = Unused | | | 3 - Holding | Word | | |
| | | 1 = OK | | | | | | |
| | | 2 = Alarm | | | | | | |
| 6 | Plant Fault 2 | 0 = Unused | | | 3 - Holding | Word | | |
| | | 1 = OK | | | | | | |
| | | 2 = Alarm | | | | | | |
| 7 | Hub Trim Level | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8 | Ext Defrost | 0= Off 1 = On | | | 3 - Holding | Word | | |
| 9 | Alarm temp | -60 (-76) | 60 (140) | C (F) | | | ÷ 10 | Extend |
| 4096 | Compressor | 0 = Off | | | 3 - Holding | | | |
| | | 1 = On | | | | | | |
| 4097 | Relay 2 | 0 = On | | | 3 - Holding | Word | | |
| | | 1 = Off | | | | | | |
| 4098 | Defrost Control | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |
| 4099 | Lights | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |
| 4100 | Relay 4 | 0 = On | | | 3 - Holding | Word | | |
| | | 1 = Off | | | | | | |
| 4101 | Relay 5 | 0 = On | | | 3 - Holding | Word | | |
| | | 1 = Off | | | | | | |
| 4102 | Trims | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |
| 4103 | Run Time | 0 | 128 | K Hrs | 3 - Holding | Word | × 1 | |
| 4104 | Setpoint Offset | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 12288 | Control State | 0 =Stabilise | | | 3 - Holding | Word | | |
| | | 1 = Normal | | | | | | |
| | | 2 = Defrost | | | | | | |
| | | 3 = Drain Down | | | | | | |
| | | 4 = Fan Delay | | | | | | |
| | | 5 = Recovery | | | | | | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|-----------------------|--------------|-------------|-------|---------------|-----------|------|--------|
| | | 6 = Alarm | | | | | | |
| | | 7 = Case Off | | | | | | |
| 20480 | Defrost Command | 0 = Normal | | | 3 - Holding | Word | | |
| | | 1 = Defrost | | | | | | |
| | | 2 = ElecDf | | | | | | |
| | | 3 = DefTerm | | | | | | |
| | | 4 = Standby | | | | | | |
| | | 5 = CaseOff | | | | | | |
| | | 6 = FansOnly | | | | | | |
| 20481 | Trim Command | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 20482 | Setpoint Command | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 20483 | Case Off Command | 0 = Normal | | | 3 - Holding | Word | | |
| | | 1 = Defrost | | | | | | |
| | | 2 = ElecDf | | | | | | |
| | | 3 = DefTerm | | | | | | |
| | | 4 = Standby | | | | | | |
| | | 5 = CaseOff | | | | | | |
| | | 6 = FansOnly | | | | | | |
| 20484 | Haccp Command | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |
| | | 2 = Flash | | | | | | |
| 20485 | EEV Command | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Normal | | | | | | |
| | | 2 = Close | | | | | | |
| | | 3 = Open | | | | | | |
| 24576 | Unused | | | | 3 - Holding | Word | | |
| 24577 | Missed Defrost | | | | 3 - Holding | Word | | |
| 24578 | Probe 1 Fault | | | | 3 - Holding | Word | | |
| 24579 | Probe 2 Fault | | | | 3 - Holding | Word | | |
| 24580 | Probe 3 Fault | | | | 3 - Holding | Word | | |
| 24581 | Probe 4 Fault | | | | 3 - Holding | Word | | |
| 24582 | Plant 1 Fault | | | | 3 - Holding | Word | | |
| 24583 | Plant 2 Fault | | | | 3 - Holding | Word | | |
| 24584 | Over Temperature | | | | 3 - Holding | Word | | |
| 24585 | Under Temperature | | | | 3 - Holding | Word | | |
| 24586 | Log Over Temperature | | | | 3 - Holding | Word | | |
| 24587 | Log Under Temperature | | | | 3 - Holding | Word | | |
| 8192 | Temp Cut-In | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|------------|----------------|-----------------|----------|-------|---------------|-----------|------|--------|
| 8193 | Temp Diff | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8194 | Control weight | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8195 | Probe 3 Type | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Prb | | | | | | |
| | | 2 = Prb/Flt | | | | | | |
| | | 3 = Prb/Alm | | | | | | |
| | | 4 = Prb/Defrost | | | | | | |
| | | 5 = PltN/O | | | | | | |
| | | 6 = PltN/C | | | | | | |
| | | 7 = Def N/O | | | | | | |
| | | 8 = Def N/C | | | | | | |
| 9 = TempSw | | | | | | | | |
| 8196 | Probe 4 Type | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Prb | | | | | | |
| | | 2 = Prb/Flt | | | | | | |
| | | 3 = Prb/Alm | | | | | | |
| | | 4 = Prb/Defrost | | | | | | |
| | | 5 = PltN/O | | | | | | |
| | | 6 = PltN/C | | | | | | |
| | | 7 = Def N/O | | | | | | |
| | | 8 = Def N/C | | | | | | |
| 9 = TempSw | | | | | | | | |
| 8197 | Relay 2 Type | 0 = Fans | | | 3 - Holding | Word | | |
| | | 1 = Lights | | | | | | |
| | | 2 = Trim | | | | | | |
| | | 3 = Alam | | | | | | |
| | | 4 = SLV | | | | | | |
| | | 5 = Trim Hub | | | | | | |
| 8198 | Relay 4 Type | 0 = Fans | | | 3 - Holding | Word | | |
| | | 1 = Lights | | | | | | |
| | | 2 = Trim | | | | | | |
| | | 3 = Alam | | | | | | |
| | | 4 = SLV | | | | | | |
| | | 5 = Trim Hub | | | | | | |
| 8199 | Relay 5 Type | 0 = Fans | | | 3 - Holding | Word | | |
| | | 1 = Lights | | | | | | |
| | | 2 = Trim | | | | | | |
| | | 3 = Alam | | | | | | |
| | | 4 = SLV | | | | | | |
| | | 5 = Trim Hub | | | | | | |
| 8200 | Trim Level | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8201 | Anti SC Time | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8202 | Max Run Time | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|-----------------|---------------|-------------|-------|---------------|-----------|------|--------|
| 8203 | Service Time | 0 | 128 | K Hrs | 3 - Holding | Word | × 1 | |
| 8204 | OT/UT alarm dly | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8205 | Under Temp Alm | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8206 | Over Temp Alm | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8207 | Log Alarm Delay | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | z |
| 8208 | Log U/T Alarm | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8209 | Log O/T Alarm | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8210 | Alarm Duration | 00:00 | 61:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8211 | Defrost Mode | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Remote | | | | | | |
| 8212 | Defrost Start | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8213 | Defrost Number | 0 | 8 | | 3 - Holding | Word | × 1 | |
| 8214 | No Defrost Time | 0 | 180 | Hours | 3 - Holding | Word | × 1 | |
| 8215 | Def. term. Temp | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8216 | Defrost Time | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8217 | Defrost Type | 0 = Elec | | | 3 - Holding | Word | | |
| | | 1 = Gas | | | | | | |
| | | 2 = Off Cycle | | | | | | |
| 8218 | Drain down Time | 00:00 | 24:00 | mm:ss | 3 - Holding | Word | × 15 | |
| 8219 | Recovery Time | 00:00 | 99:99 | mm:ss | 3 - Holding | Word | × 60 | |
| 8220 | Fan Delay Time | 00:00 | 99:99 | mm:ss | 3 - Holding | Word | × 60 | |
| 8221 | Fans in Def | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |
| 8222 | Fan Delay Temp | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | |
| 8223 | Lights Ctrl | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Case Off | | | | | | |
| | | 2 = Sec | | | | | | |
| 8224 | Sec Cut-In | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8225 | Lights Mode | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Remote | | | | | | |
| | | 2 = ManOff | | | | | | |
| | | 3 = ManOn | | | | | | |
| 8226 | Sun Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8227 | Sun Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8228 | Mon Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8229 | Mon Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8230 | Tue Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8231 | Tue Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8232 | Wed Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8233 | Wed Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8234 | Thu Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|--------------------|-----------|---------|-------|---------------|-----------|------|--------|
| 8235 | Thu Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8236 | Fri Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8237 | Fri Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8238 | Sat Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8239 | Sat Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8240 | Cut-In Offset | -30 (-22) | 30(86) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8241 | Alarm weight | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8242 | Display Def Button | 0 | 1 | | 3 - Holding | Word | × 1 | |

Type 2

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|--------------------|-------------------|-------------|-------|---------------|-----------|------|--------|
| 0 | Control temp. | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 1 | Air On Probe | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 2 | Air Off Probe | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 3 | Evaporator Probe | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 4 | Suction Line Probe | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 5 | Superheat | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 6 | Rem Evap Temp | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 7 | MOP | 0 = Off 1 = On | | | 3 - Holding | Word | | |
| 8 | Hub Trim Level | 0 | 100 | % | 3 - Holding | Word | | |
| 8 | Ext Defrost | 0= Off 1 = On | | | 3 - Holding | Word | | |
| 9 | Alarm temp | -60 (-76) | 60 (140) | C (F) | | | ÷ 10 | Extend |
| 4096 | Defrost Control | 0 = Off 1 = On | | | 3 - Holding | Word | | |
| 4097 | Relay 2 | 0 = On 1 = Off | | | 3 - Holding | Word | | |
| 4098 | Valve Opening | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 4099 | Lights | 0 = Off 1 = On | | | 3 - Holding | Word | | |
| 4100 | Relay 4 | 0 = On 1 = Off | | | 3 - Holding | Word | | |
| 4101 | Relay 5 | 0 = On 1 = Off | | | 3 - Holding | Word | | |
| 4102 | Trims | 0 = Off 1 = On | | | 3 - Holding | Word | | |
| 4103 | Run Time | 0 | 128 | K Hrs | 3 - Holding | Word | × 1 | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|--------------|------------------|----------------|-------------|-------|---------------|-----------|------|--------|
| 4104 | Setpoint Offset | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 12288 | Control State | 0 = Stabilise | | | 3 - Holding | Word | | |
| | | 1 = Normal | | | | | | |
| | | 2 = Defrost | | | | | | |
| | | 3 = Drain Down | | | | | | |
| | | 4 = Fan Delay | | | | | | |
| | | 5 = Recovery | | | | | | |
| | | 6 = Alarm | | | | | | |
| 7 = Case Off | | | | | | | | |
| 12289 | Valve State | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Start | | | | | | |
| | | 2 = Run | | | | | | |
| | | 3 = Problem | | | | | | |
| | | 4 Fail | | | | | | |
| 20480 | Defrost Command | 0 = Normal | | | 3 - Holding | Word | | |
| | | 1 = Defrost | | | | | | |
| | | 2 = ElecDf | | | | | | |
| | | 3 = DefTerm | | | | | | |
| | | 4 = Standby | | | | | | |
| | | 5 = CaseOff | | | | | | |
| 6 = FansOnly | | | | | | | | |
| 20481 | Trim Command | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 20482 | Setpoint Command | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 20483 | Case Off Command | 0 = Normal | | | 3 - Holding | Word | | |
| | | 1 = Defrost | | | | | | |
| | | 2 = ElecDf | | | | | | |
| | | 3 = DefTerm | | | | | | |
| | | 4 = Standby | | | | | | |
| | | 5 = CaseOff | | | | | | |
| 6 = FansOnly | | | | | | | | |
| 20484 | Haccp Command | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |
| | | 2 = Flash | | | | | | |
| 20485 | EEV Command | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Normal | | | | | | |
| | | 2 = Close | | | | | | |
| | | 3 = Open | | | | | | |
| 24576 | Unused | | | | 3 - Holding | Word | | |
| 24577 | Missed Defrost | | | | 3 - Holding | Word | | |
| 24578 | Probe 1 Fault | | | | 3 - Holding | Word | | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|------------|-------------------|-----------------|----------|-------|---------------|-----------|------|--------|
| 24579 | Probe 2 Fault | | | | 3 - Holding | Word | | |
| 24580 | Probe 3 Fault | | | | 3 - Holding | Word | | |
| 24581 | Probe 4 Fault | | | | 3 - Holding | Word | | |
| 24582 | Over Temperature | | | | 3 - Holding | Word | | |
| 24583 | Under Temperature | | | | 3 - Holding | Word | | |
| 8192 | Temp Cut-In | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8193 | Temp Diff | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8194 | Control weight | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8195 | Response On | 1 | 30 | | 3 - Holding | Word | × 1 | |
| 8196 | Response Off | 1 | 30 | | 3 - Holding | Word | × 1 | |
| 8197 | Probe 3 Type | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Prb | | | | | | |
| | | 2 = Prb/Flt | | | | | | |
| | | 3 = Prb/Alm | | | | | | |
| | | 4 = Prb/Defrost | | | | | | |
| | | 5 = PltN/O | | | | | | |
| | | 6 = PltN/C | | | | | | |
| | | 7 = Def N/O | | | | | | |
| | | 8 = Def N/C | | | | | | |
| 9 = TempSw | | | | | | | | |
| 8198 | Probe 4 Type | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Prb | | | | | | |
| | | 2 = Prb/Flt | | | | | | |
| | | 3 = Prb/Alm | | | | | | |
| | | 4 = Prb/Defrost | | | | | | |
| | | 5 = PltN/O | | | | | | |
| | | 6 = PltN/C | | | | | | |
| | | 7 = Def N/O | | | | | | |
| | | 8 = Def N/C | | | | | | |
| 9 = TempSw | | | | | | | | |
| 8199 | Relay 2 Type | 0 = Fans | | | 3 - Holding | Word | | |
| | | 1 = Lights | | | | | | |
| | | 2 = Trim | | | | | | |
| | | 3 = Alam | | | | | | |
| | | 4 = SLV | | | | | | |
| | | 5 = Trim Hub | | | | | | |
| 8200 | Relay 4 Type | 0 = Fans | | | 3 - Holding | Word | | |
| | | 1 = Lights | | | | | | |
| | | 2 = Trim | | | | | | |
| | | 3 = Alam | | | | | | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|-------------------|---------------|--------------|-------|---------------|-----------|------|--------|
| | | 4 = SLV | | | | | | |
| | | 5 = Trim Hub | | | | | | |
| 8201 | Relay 5 Type | 0 = Fans | | | 3 - Holding | Word | | |
| | | 1 = Lights | | | | | | |
| | | 2 = Trim | | | | | | |
| | | 3 = Alarm | | | | | | |
| | | 4 = SLV | | | | | | |
| | | 5 = Trim Hub | | | | | | |
| 8202 | Superheat Ref | 0 (0) | 12 (21.6) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8203 | Control Type | 0 = EEV | | | 3 - Holding | Word | | |
| | | 1 = EET | | | | | | |
| 8204 | Evap Select | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Remote | | | | | | |
| 8205 | EEV Min Opening | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8206 | Superheat Problem | 0 (0) | 12 (21.6) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8207 | EEV Prob Opening | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8208 | EEV Prob Time | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8209 | EEV Start Opening | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8210 | Div Value | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8211 | Trim Level | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8212 | Service Time | 0 | 128 | K Hrs | 3 - Holding | Word | × 1 | |
| 8213 | OT/UT alarm dly | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8214 | Under Temp Alm | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8215 | Over Temp Alm | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8216 | Log Alarm Delay | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8217 | Alarm Duration | 00:00 | 61:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8218 | Defrost Mode | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Remote | | | | | | |
| 8219 | Defrost Start | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8220 | Defrost Number | 0 | 8 | | 3 - Holding | Word | × 1 | |
| 8221 | No Defrost Time | 0 | 180 | Hours | 3 - Holding | Word | × 1 | |
| 8222 | Def. term. Temp | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8223 | Defrost Time | 00:00 | 99:00 | mm:ss | 3 - Holding | Word | × 60 | |
| 8224 | Defrost Type | 0 = Elec | | | 3 - Holding | Word | | |
| | | 1 = Gas | | | | | | |
| | | 2 = Off Cycle | | | | | | |
| 8225 | Drain down Time | 00:00 | 24:00 | mm:ss | 3 - Holding | Word | × 15 | |
| 8226 | Recovery Time | 00:00 | 99:99 | mm:ss | 3 - Holding | Word | × 60 | |
| 8227 | Fan Delay Time | 00:00 | 99:99 | mm:ss | 3 - Holding | Word | × 60 | |
| 8228 | Fans in Def | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = On | | | | | | |



Please ensure all power is switched off before installing or maintaining this product.

| Register | Name | Min | Max | Unit | Register Type | Item Type | | |
|----------|--------------------|--------------|-------------|-------|---------------|-----------|------|--------|
| 8229 | Fan Delay Temp | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | |
| 8230 | Lights Ctrl | 0 = Off | | | 3 - Holding | Word | | |
| | | 1 = Case Off | | | | | | |
| | | 2 = Sec | | | | | | |
| 8231 | Sec Cut-In | -60 (-76) | 60 (140) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8232 | Lights Mode | 0 = Local | | | 3 - Holding | Word | | |
| | | 1 = Remote | | | | | | |
| | | 2 = ManOff | | | | | | |
| | | 3 = ManOn | | | | | | |
| 8233 | Sun Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8234 | Sun Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8235 | Mon Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8236 | Mon Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8237 | Tue Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8238 | Tue Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8239 | Wed Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8240 | Wed Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8241 | Thu Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8242 | Thu Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8243 | Fri Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8244 | Fri Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8245 | Sat Lights On | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8246 | Sat Lights Off | 00:00 | 23:59 | hh:mm | 3 - Holding | Word | × 1 | |
| 8240 | Cut-In Offset | -30 (-22) | 30(86) | C (F) | 3 - Holding | Word | ÷ 10 | Extend |
| 8241 | Alarm weight | 0 | 100 | % | 3 - Holding | Word | × 1 | |
| 8242 | Display Def Button | 0 | 1 | | 3 - Holding | Word | X 1 | |



Please ensure all power is switched off before installing or maintaining this product.

Revision History

| Soft M | Soft E | Revision | Date | Changes |
|--------|--------|----------|------------|---|
| 2.4 | 2.4 | a | 20/06/2011 | New layout and diagrams |
| 2.5 | 2.5 | a | 29/01/2013 | NTC5K probe type added. |
| | | b | 17/04/2014 | Comment added regarding non compatibility with PR0026 |
| | | c | 04/03/2015 | Updated USA address and dimensions of relay board |
| | | d | 06/03/2015 | Modbus® register address table added |
| 2.6 | 2.5 | a | 11/05/2015 | 470R, 700R, 3K, 5K, 6K and NTC10K(2) probe type added |
| | | b | 01/06/2015 | EMC standard updated. |
| 2.7 | 2.6 | a | 17/06/2015 | External defrost option added in M type only. |
| 2.8 | 2.6 | a | 20/08/2015 | Options added for quick view, change of Type and Application via the display. |
| | | b | 04/09/2015 | Default settings updated on Superheat Reference. |
| | | c | 29/10/2015 | Part list amended. |
| | | d | 01/02/2017 | New Documentation Template. |
| | | e | 29/08/2017 | Part number for 50 units corrected. |
| 3.1 | 2.7 | a | 05/10/2017 | Fan status changed to show as on when the fans are running and not the actual relay state of off on the Mechanical variant. |
| 3.2 | 2.8 | a | 25/10/2017 | Alarm weight parameter added. |
| 3.3 | 2.9 | a | 27/04/2018 | Parameter to turn off the local defrost button (#) on the display |
| | | b | 20/01/2020 | Update to Specification |
| | 3.0 | a | 05/03/2020 | Fan status changed to show as on when the fans are running and not the actual relay state. |
| | | b | 15/04/2020 | Sounder not included in standard build option. |
| 3.4 | 3.1 | a | 26/05/2021 | Bluetooth Support Added. New Defrost Hold Parameter. |



Please ensure all power is switched off before installing or maintaining this product.

Group Offices

RDM Group Head Office

80 Johnstone Avenue
Hillington Industrial Estate
Glasgow
G52 4NZ
United Kingdom

+44 (0)141 810 2828
support@resourcedm.com

RDM USA

9441 Science Center Drive
New Hope
Minneapolis
MN 55428
United States

+1 612 354 3923
usasupport@resourcedm.com

RDM Asia

Sky Park at One City
Jalan USJ 25/1
47650 Subang Jaya
Selangor
Malaysia

+60 3 5022 3188
asiatech@resourcedm.com



Visit www.resourcedm.com/support for more information on RDM solutions, additional product documentation and software downloads.

While every effort is made to ensure the information given within this document is accurate, Resource Data Management Ltd shall not be liable for errors or omissions, for incidental or consequential damages, directly or indirectly, in connection with the furnishing, performance or misuse of this product or document. All specifications are subject to change without notice.

See www.resourcedm.com for terms and conditions of sales.

Copyright © Resource Data Management