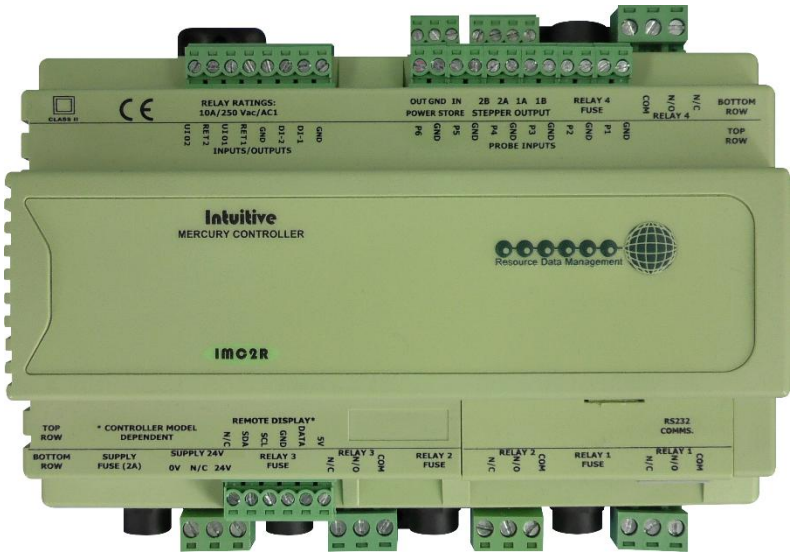
Resource
Data Management

Intuitive Mercury 3 & Mercury 3 Stepper Plate Heat Exchanger

Commissioning/User Guide
Revision 3.8



PR07XX-PHX-XX

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

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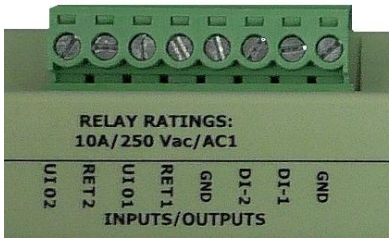
The Mercury 3 & Intuitive Range

Stepper Plate Heat Exchanger Controller

From Resource Data Management

This user guide relates to the current Mercury 3 and Intuitive hardware platforms, for Mercury 2 and earlier Intuitive hardware platforms please refer to the Intuitive Mercury & Mercury 2 PHX user guide. A Mercury 3 controller can be identified by it's part number label and description (PR0740 and Mercury Mk3) however all variants of Intuitive controller use the same part numbering system and descriptions. The current Intuitive controller, to which this user guide refers, can be identified by the inclusion of an 8-way analogue and digital input connector as shown below. If the controller does not have this connector fitted then refer to the Mercury 2 and Intuitive user guide.



This controller is primarily intended for use in Plate Heat Exchanger (PHX) applications. The controller will operate the PHX stepper valve to maintain superheat. The superheat can be obtained in several different ways which are user selectable:

1. Based on the value of the Evaporator and Suction line temperature probe inputs connected directly to the controller.
2. The local Suction line temperature probe and a remote suction pressure value broadcast by a Plant/Intuitive Pack controller on the same IP network. The pressure received from the Plant/Intuitive Pack controller is converted to a temperature based on the gas type being used by the system.
3. The local suction line temperature probe and a local suction pressure measured by a transducer connected directly to the controller and converted to evaporator temperature.
4. The local suction line temperature probe and a local suction pressure measured by a transducer connected to a Mercury Hub. The pressure read from the Mercury Hub pressure transducer is converted to a temperature based on the gas type being used by the system. This temperature is transmitted to all controllers connected to the Mercury Hub.

The controller has relay outputs to indicate 'run', 'fail' and 'alarm' and can operate a variety of stepper motors.

The controller supports PT1000, NTC2K, 470R, 700R, 3K, 5K, 6K, NTC2K25, NTC10K or NTC10K (2) temperature probes. **Note**: probe types cannot be mixed.

Hardware Variants

Description	Part Number
Mercury Stepper plate heat exchanger controller, integral display, RS232 Comms, 24v supply.	PR0740-SD-232-PHX
Mercury Stepper plate heat exchanger controller, integral display, IP Comms, 24v supply.	PR0740-SD-IP-PHX
Mercury Stepper plate heat exchanger controller, remote display, RS232 Comms, 24v supply.	PR0740-SR-232-PHX
Mercury Stepper plate heat exchanger controller, remote display, IP Comms, 24v supply.	PR0740-SR-IP-PHX
Intuitive Mercury Stepper plate heat exchanger controller, remote display, RS232 Comms, 24v supply.	PR0762-NF-PHX
Intuitive Mercury Stepper plate heat exchanger controller, integral display, IP Comms AC Mains supply.	PR0952-IP-PHX

Other part variants are available on request with options such as inbuilt fusing and IP communications.

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Configuration

The controller has only one type, this is fixed as type 3.

Intuitive Power Store

The Intuitive power store (IPS), part number PR0627, is designed for use with both the Mercury and Intuitive Mercury stepper controller platforms. In the event of a power failure to the stepper controller the IPS provides a backup power supply to enable the controller to fully close the stepper valve. Utilising the latest in capacitor technology the IPS provides a reliable and maintenance free solution.

Compatible Network Interfaces

Mercury and Intuitive Mercury controllers are capable of connecting to a TCP/IP local area network, an RS485 Genus compatible network or they can be used in standalone mode with no network output. To connect to a network you must add the correct communications module. Connecting to any of these communication modules will automatically be detected on power up and will affect the setup screens available to you.

Description	Part Number
IP Futura (Single Mercury to IP Interface)	PR0016
RS485 Interface (Single Mercury to RS485 Interface)	PR0026
Intuitive Switch (IP support for 6, 12 or 16 controllers)	PR0757/758
Intuitive Switch with Pressure/Humidity Inputs	PR0757/758-PHI

The Intuitive Mercury Controller is supplied as standard with an internal RS232 network card, this allows connection to any of the above external network interfaces. Three alternative internal network cards are also available, these can be supplied factory fitted as an option or purchased separately as an interface kit.

Description	Part Number
Intuitive Internal IP Network Card Interface Kit	PR0770
Intuitive Internal RS485 Network Card Interface Kit	PR0771

Front Display Features

LEDs:

Valve (Stepper O/P) 

Fans (Not Used) 

Lights (Not Used) 

Defrost (Not Used) 

Network 

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

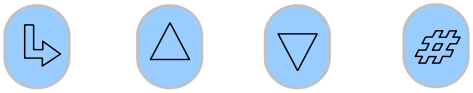
Service 

(See Parameter 33 for setup)

Alarm 

HACCP 

Keys



Enter Up Down Not Used

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.

Main Display 

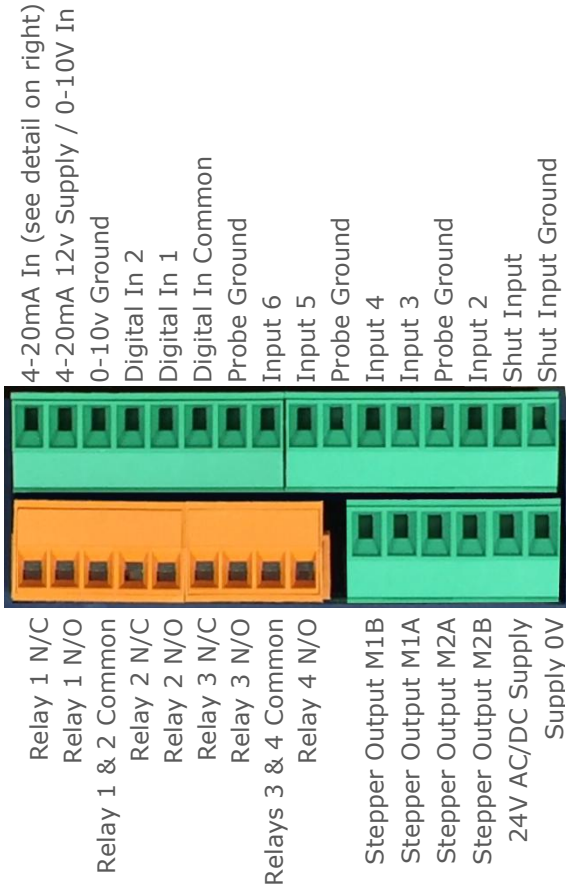
4 character LED display, used to display superheat and status messages.

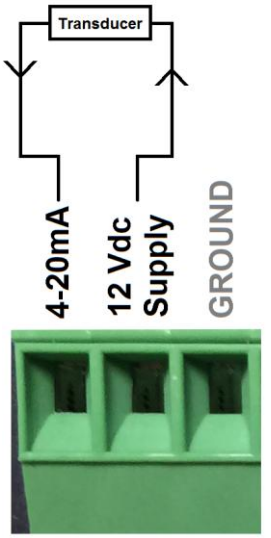
Please ensure all power is switched off before installing or maintaining this product.

Connections

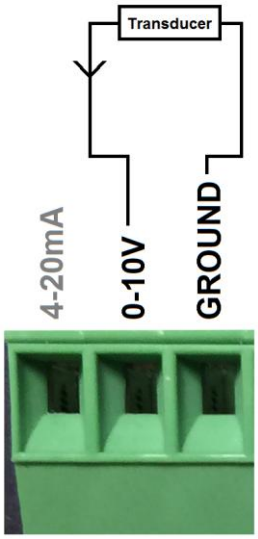
Mercury PHX I/O Connections

Input and Output connections are made to the back of the controller, the RS232/ Ethernet communication port is on the side. The diagram below shows the connection detail. Inputs and outputs are assigned according to the chosen configuration. See Input/ Output tables for further details on connections. Below also shows you the transducer connections available.





4-20mA Transducer Type



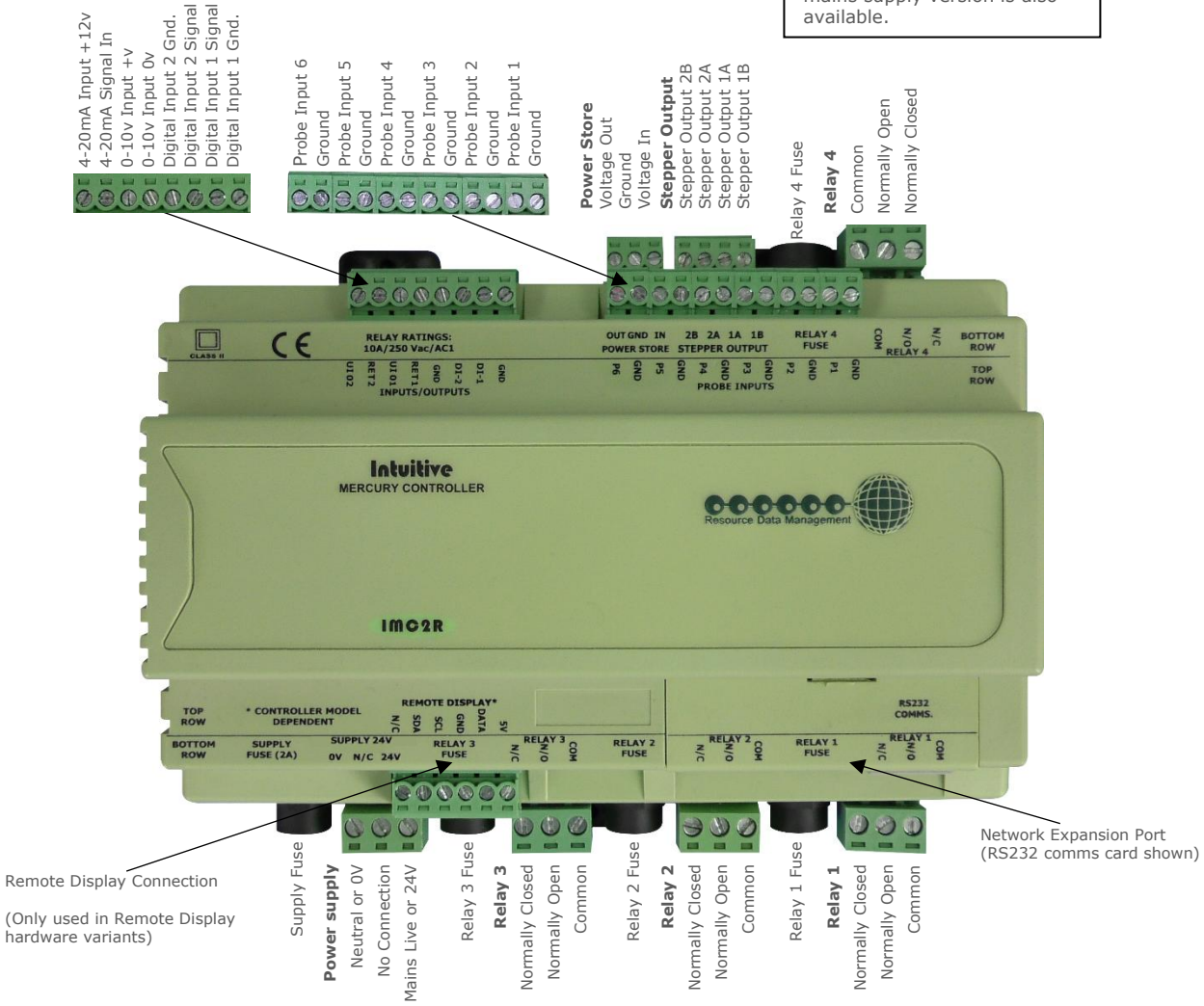
0-10V Transducer Type

For Input Output allocation please see Input and Output allocation tables.

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

Intuitive Mercury PHX I/O Connections

Variant shown is 24v version, mains supply version is also available.



For Input Output allocation please see Input and Output allocation tables.

Optional Intuitive Power Store Connections 24v Variant

Power Store Terminal		
GND	Connects to	24vdc Power Supply - V
V in	Connects to	24vdv Power Supply +V
GND	Connects to	Controller Terminal Supply 0v
V Out	Connects to	Controller Terminal Supply 24v
GND	Connects to	Controller Terminal Probe 1 GND
Fail Signal	Connects to	Controller Terminal Probe 1

Optional Intuitive Power Store Connections Mains Variant

Power Store Terminal		Controller Power Store Terminal
GND	Connects to	GND
V in	Connects to	V Out
GND	Connects to	GND
V Out	Connects to	V In
GND	Connects to	Probe 1 GND
Fail Signal	Connects to	Probe 1

The optional Intuitive Power Store provides a short-term backup power supply which enables the controller to shut the stepper valve in the event of a power supply failure.

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With the 24v variant of the controller the 24v power supply connects directly to the power store which then provides a maintained 24v supply to the controller.

With the Mains variant of the controller there is an additional set of power store connections, these provide a 24v supply to the power store and a 24v return supply from the power store. These terminals are marked "In", "Out" and "GND".

The power store has a power fail signal which connects to probe 1 input on the controller, if the power store detects a loss of power then the fail signal tells the controller to shut the stepper valve and a valve shut alarm is generated.

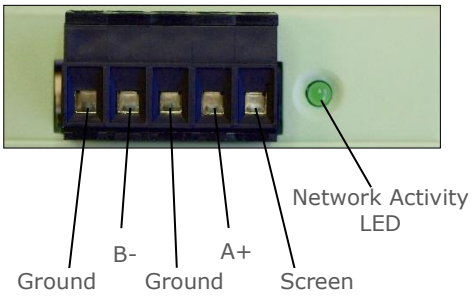
To enable use of the power store the parameter "Shut Enable" has to be set to "N/C", and parameter "Valve Type" set to "Other".

Intuitive Mercury Network Expansion Options

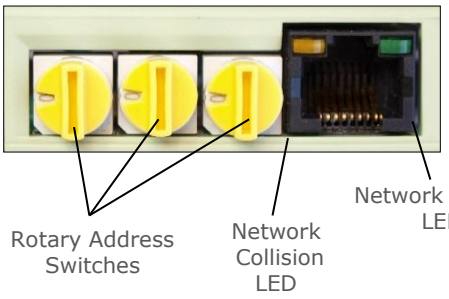
RS232 Network Card (Default)

The Intuitive Mercury is supplied with an RS232 Network Card fitted as standard.

RS485 Network Card (PR0771)



IP Network Card (PR0770)



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Ordering Information

Mercury PHX Controller Hardware

When ordering a Mercury controller the following ordering scheme can be used to purchase the desired hardware configuration.

PR0740 S Y Z PHX

Y	Description	Z	Description
D	Local/ Integral Display	IP	Ethernet Comms
R	Remote Display	232	RS232 Comms

Example: To order a Mercury controller with Stepper Valve, Remote display and IP comms;

PR0740 S R IP PHX

Intuitive Mercury 24v PHX Controller Hardware

When ordering a Mercury Intuitive controller the following ordering scheme can be used to purchase the desired hardware configuration. This ensures the controller ships with the optional hardware pre-fitted.

PR07X2- PHX-Y Where **X** and **Y** are selections from the tables below.

X	Description
5	Internal Display
6	Remote Display

Y	Description
	RS232*
IP	IP Interface
RS485	RS485 Interface

* Fitted by default.
** If no daughter card required leave field blank

Example: To order an internal display variant and a built in IP module use the following part number:

PR0752-PHX-IP

Intuitive Mercury Mains PHX Controller Hardware

PR095X- PHX-Y Where **X** and **Y** are selections from the tables below.

X	Description
2	Internal Display
4	Remote Display

Y	Description
	RS232*
IP	IP Interface
RS485	RS485 Interface

* Fitted by default.
** If no daughter card required leave field blank

Input/Output allocation table

I/O	Description	Alarm Action	Comments
Input 1	Shut Input	Yes	0v Return, no resistor required.
Input 2	Temperature Monitor Probe	Configurable	
Input 3	Evaporator Temperature	Yes	
Input 4	Suction Line Temperature	Yes	
Input 5	Leaving Liquid Temp	Yes	
Input 6	Not Used	No	
Digital Input 1	Run Input	No	0V Return
Digital Input 2	Not Used	Yes	0V Return
UI01 0-10V In	Pressure transducer	Yes	
UI02 4-20mA In	Pressure transducer	Yes	
Stepper Output	Stepper Motor Valve	N/A	
Relay 1	Run	N/A	
Relay 2	Fail	N/A	
Relay 3	Alarm	N/A	
Relay 4	Remote / LLSV	N/A	For LLSV operation, see P-80

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Temperature range for all probe types is -49°C to +60°C

Setting up the controller

Access to the controller can be achieved several ways

- Through the front mounted buttons
- Direct access by PC or palm top into the rear comm 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)

Setup through front buttons

ENTER

UP

DOWN

To enter setup mode, hold the Enter and Down buttons together for approximately 3 seconds until the message 'Ent' appears on the display. Now press the Enter button again to enter the function menu. IO will be displayed. Scroll up or down to go through the list.

Setup Function Menu

Display	Option	Explained in Paragraph
IO	View Inputs / Outputs and States	Input / output table
PArA	Set/View Parameters	Set view parameters
Unit	Probe type and Celsius/Fahrenheit option	Set View Unit
diSP	Display whole units or decimal	Display
tyPE	Set/View Controller Type	Set/view controller type
rtc	Set/view Clock (rtc = Real Time Clock)	Real Time Clock

Display	Option	Explained in Paragraph
nEt	Set/view network configuration	Network Configuration
SoFt	View software version	
FanS	Not used in this controller	
CASE	Not used in this controller	
Ligt	Not used in this controller	
OFSt	Probe Offset	Probe Offset
ESC	Exit Setup mode	

Recommended set-up method

If you are not connecting to a network and want to set up the controller through the buttons we recommend you use the following order from the function menu.

Rtc. 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

type. Set/view controller type

This controller has only one type, this value is set to 3 and cannot be changed.

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ParA. Set/view parameters (This can be achieved at the network front end)

a. From the function menu, scroll to select 'PArA'
b. Pressing Enter while PArA is displayed will enter the parameter menu.
c. The first parameter option will be displayed as P-01. Pressing the Up or Down button will present the other parameter options P-02, P-03 etc. See the parameter list below to find what parameter number corresponds to which actual parameter.
d. Pressing the Enter button will show the current value of the selected parameter.
e. Press Up or Down to modify the value and press Enter again to save the value.
f. The parameter list number will be displayed again.
g. Two other options are present in the parameter menu – dFLt and ESC. Selecting ESC will exit the setup mode and save all changes.
h. Selecting dFLt will reset all parameters back to the default values for the current type of controller

Unit. Set/view temperature unit and Probe type

From the function menu scroll to, and select Unit. Press enter and the value will be displayed;

Probe Types

Use the up or down keys to select the units and press enter.

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

This function is now complete

diSP. Display

From the function menu scroll to and select 'diSP'. Press enter and one of the following values will be shown:

0: Controller display will show the whole number and tenths value of a temperature reading. (Default)
1: Controller display will show temperatures as a whole number.

Parameter Tables

Note: In this application EEV refers to a stepper valve.

Number	Parameter	Range °C (°F)	Step	Units	Default °C (°F)
P-01	Superheat Ref	0 to 12 (7.2 to 21.6)	0.1	Deg	6 (10.8)
P-02	Response on	1 to 60	1	---	10
P-03	Response off	1 to 60	1	---	10
P-20	EEV Minimum Opening	0 to 100	1	%	10
P-21	Superheat Problem	0 to 12 (0 to 21.6)	0.1	Deg	0
P-22	EEV Problem Opening	0 to 100	1	%	10
P-23	EEV Problem Time	00:00 to 99:00	01:00	mm:ss	03:00
P-25	EEV Start Opening	0 to 100	1	%	60
P-27	EEV Start Time	00:00 to 03:00	00:01	mm:ss	00:20
P-26	EEV Divide Value	0 to 100	1	%	50
P-28	Valve Scale	0 to 100	1	%	100
P-80	Do Liquid Temp	0: Off 1: On	1	---	0
P-81	Liquid Target Temp	-49 to 60 (-56.2 to 140)	0.1	Deg	20.0
P-82	Liquid Target Diff	0 to 12 (0 to 21.6)	0.1	Deg	2
P-30	Evap Select	0: Local temp 1: Rem1 2: Rem2 3: Rem3 4: Trans V 5: Trans mA 6: Cust V 7: Cust mA	1	---	0
P-31	Run Input	0: Disabled 1: N/O 2: N/C	1	---	0
P-32	Overdrive Time	1 to 48	1	Hrs	24
P-33	Service Time	0 to 128	1	K Hrs	60
P-50	Control Fail	0 to 100	1	%	0
P-51	Alarm Delay	00:00 to 99:00	01:00	mm:ss	05:00
P-52	Low Superheat	-49 to 60 (-56.2 to 140)	0.1	Deg	2.0
P-53	Probe 1 type	Do not set, used as shut input.	1	---	0
P-54	Probe 2 type	0: Monitor 1: Monitor + Fault 2: Monitor + Fault + Alarm	1	---	0
P-55	Probe Alarm delay	00:00 to 99:00	01:00	mm:ss	20:00
P-56	Probe OT	-49 to 60	0.1	Deg	20.0
P-60	Broadcast ID	0 to 999	1	-	0
P-61	Refrigerant	See: Refrigerant Table below		---	0
P-62	Pressure Type	0: Absolute 1: Gauge	1	---	1
P-63	Evap Offset	0.0 to 5.0	0.1	-	0.0
P-64	Glide	-15.0 to 15.0	0.1	Deg	0.0
P-65	Transducer Span	-3.4 to 180	0.1	Bar	13.8
P-66	Transducer Offset	-3.4 to 180	0.1	Bar	0.0
P-67	Tconst	1 to 30	1	-	1
P-34	Refrigerant Weight	0 to 100	1	%	0
P-35	MOP Cut-in	-3.4 to 180	0.1	Bar	3.4
P-36	MOP Diff	-3.4 to 180	0.1	Bar	0.3
P-37	MOP Delay	00:00 to 02:00	01:00	mm:ss	00:05
P-40	Valve Type	0: Carel 1: Sporlan1 2: Sporlan2 3: Alco 4: Other*	1	---	1
P-41	Step Max	0 to 6800 See: Valve Type	1	---	2500
P-42	Step Close	0 to 6800 See: Valve Type	1	---	3500
P-43	Step Speed	0 to 6800 See: Valve Type	1	Hz	200
P-44	mA Peak	0 to 500 See: Valve Type	1	mA	80
P-45	Half Step	0 (Off), 1(On) See: Valve Type	1	---	0
P-46	mA Hold Current	0 to 500	1	mA	0
P-47	Shut Speed	0 to 6800	1	Hz	200
P-70	Shut Enable	0: Not Used	1	---	0

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

		1: Normally Open 2: Normally Closed			
P-71	Shut Time	00:00 to 99:00	01:00	mm:ss	04:00
P-A3	Evap Cust Off	0.0 to 20.0	1		0
P-A4	Evap Cust High	0.0 to 20.0	1		0
P-F0	Custom A1	-999 to 999	1		0
P-F1	Custom B1 Hi	-999 to 999	1		-220
P-F2	Custom B1 Lo	0 to 999	1		384
P-F3	Custom C1	-999 to 999	0.1		262.5
P-F4	Custom A2	-999 to 999	1		0
P-F5	Custom B2 Hi	-999 to 999	1		-220
P-F6	Custom B2 Lo	0 to 999	1		384
P-F7	Custom C2	-999 to 999	0.1		262.5
dFLt	Default Parameters				
ESC	Exits Menu				

* For most applications Valve Type should be set to "Other" and the parameters P-41, P-42, P-43, P-44, P-45 P-46 and P-47 set relevant to the valve being used. These parameters only have an effect if 'Other' is selected when configuring parameter P-40.

Refrigerant Table for P-61

No.	Gas	No.	Gas	No.	Gas	No.	Gas	No.	Gas
0	None	8	R401C	16	R502	24	R449A	32	R454A
1	Custom*	9	R402A	17	R503	25	R513A	33	R471A
2	R32	10	R402B	18	R507	26	R454C	34	R515B
3	R134a	11	R404A	19	R717	27	R455A	35	R600A
4	R142B	12	R407A	20	R290	28	R448A	36	R1234YF
5	R227	13	R407B	21	R744	29	R449B	37	R1234ZE
6	R401A	14	R407C	22	R407F	30	R450A	38	R1270
7	R401B	15	R500	23	R410A	31	R452B		

***Note:** When P-61 is set to Custom, the controller will use the settings in P-F0 to P-F7.

Transducer Span and Offset allows for the full range of the transducer to be used.
Span is the full range of the transducer
Offset is the value below zero

Example: RDM PR0160 with range: -1 bar to 20 bar (-14.5 to 290 psi)
Span would be 21 bar (305 psi)
Offset would be -1 bar (-14.5 psi)

Parameter Descriptions

Number	Parameter	Description
P-01	Superheat Ref	The controller will attempt to maintain this superheat value
P-02	Response on	Allows the user to speed up the EEV on time. With 60 providing the quickest response and 1 providing the slowest response.
P-03	Response off	Allows the user to speed up the EEV off time. With 60 providing the quickest response and 1 providing the slowest response.
P-20	EEV Minimum Opening	Sets the minimum valve opening level, during normal operation the valve will not go below this level. (Default 10%) If used in conjunction with an Intuitive Pressure Switch, remote pressure from Plant Pack or local pressure daughter card, then the Minimum value should be set at 0% When parameter "Do Liquid Temp" P-80 is set to 1 or ON, if the Leaving Liquid Temp (Probe 5) is below Liquid Target Temp (P-81) then the stepper valve will be held at the EEV Minimum Opening position. Probe 5 temperature is listed as I-10 under the IO list on the controller temperature display.
P-21	Superheat Problem	Sets the point at which the algorithm will go into the 'EEV Problem' state due to low superheat. For example if this parameter is set to 0 Degrees and the Superheat value falls to 0 Degrees or below, for the duration of P-23, then the controller will enter the superheat problem state.
P-22	Superheat EEV Problem Opening	Sets the valve open position when entering the 'Superheat EEV Problem' state. Note: the minimum time the controller will remain in problem state is 60 seconds even if the time is set to 00:00.
P-23	Superheat EEV Problem Time	Sets the time the controller stays in the 'Superheat EEV Problem' state.
P-25	EEV Start Opening	Sets the valve opening % which is used when the controller first powers up. It is also used when the controller exits a problem state for example Superheat EEV Problem state.
P-27	EEV Start Time	Sets the start opening value (P-25) for this length of time when the controller is first started up.
P-26	Div Value	This parameter only takes effect when the controller is used in conjunction with a Mercury Switch pressure application. When the Mercury Switch generates the MOP (maximum operating pressure) alarm the controller reduces the maximum valve opening to this percentage. For example if this parameter is set to 40% and the MOP alarm is generated then the maximum valve opening will be limited by the controller to 40%. Note P-20 EEV Minimum opening overrides the valve output operation and the valve will not close below this setting. Please see Maximum Operating Pressure (MOP) note. **Please note** parameters P-20 through to P-26 should not be altered without first understanding the effects they may have on the case operation. If incorrectly set they may have undesired affects.
P-28	Valve Scale	Limits the valve opening steps by applying this scaling percentage to Step Max P-41. E.g. If Valve Scale is set to 80%, and Step Max is set to 2500, the valve will open to a maximum of 2000 steps.
P-80	Do Liquid Temp	When this parameter is set to OFF (default) then the stepper valve is controlled by the superheat value in relation to superheat reference P-01. Relay 4 will operate as a Remote Relay. When this parameter is set to ON the stepper valve is controlled by the superheat as normal however if the leaving Liquid Temp (Probe 5) drops below the target temperature setpoint P-81 then the stepper valve opening will be limited to the EEV Minimum Opening value (P-20). Relay 4 will operate as an LLSV based on Leaving Liquid Temp (Probe 5), target setpoint P-81, and diff P-82.
P-81	Liquid Target Temp	Defines the cut-in for Relay 4 when P-80 is set to 1 or ON. If Leaving Liquid Temp (Probe 5, I-10) is above Liquid Target Temp, then the LLSV will be open.
P-82	Liquid Target Diff	Defines the cut-out for Relay 4 when P-80 is set to 1 or ON. Acts as a differential below on Liquid Target Temp. If Leaving Liquid Temp (Probe 5, I-10) is below Liquid Target Temp – Liquid Target Diff, then the LLSV will be closed.
P-30	Evap Select	Local Temp: - The local Evaporator and Suction Line temperature probes are used to calculate the Superheat.

Number	Parameter	Description
		Rem1, 2, 3: – The local Suction Line temperature probe and a Remote Suction Pressure value, broadcast from a Plant/Intuitive Pack controller, are used to calculate the Superheat. Trans mA: - The local Suction Line temperature probe and Local Evaporator Temperature, calculated from a 4-20mA pressure transducer connected to the Uni IO2 connection (4-20mA Input) are used to calculate the Superheat. Custom mA: - The local Suction Line temperature probe and Local Evaporator Temperature, calculated from a mA pressure transducer connected to the Uni IO2 connection using custom settings (such as 8 -14mA) are used to calculate the Superheat. Trans V: - The local Suction Line temperature probe and Local Evaporator Temperature, calculated from a 0-10 V pressure transducer connected to the Uni IO1 connection (0-10Vdc Input) are used to calculate the Superheat. Custom V: - The local Suction Line temperature probe and Local Evaporator Temperature, calculated from a voltage pressure transducer connected to the Uni IO1 connection using custom settings (such as 0.5 – 4.5Vdc) are used to calculate the Superheat. In the event of no remote value being received, the control algorithm will revert to using the evaporator in probe value until the remote value is restored. Please See : Valve Control Using Pressure
P-31	Run Input	This input allows the controller to run on the application of a digital input signal (DI 1). If the feature is enabled the control strategy will not operate unless the Run Input is present. This input can be set to N/O or N/C.
P-32	Overdrive Time	The time interval, in hours, at which the attached stepper motor will be overdriven. Please see Valve State – Overdriving section for further details.
P-33	Service Interval Time	Time (in 1000 x hours) before the service icon (Spanner icon) comes on. Reset the spanner icon to off by changing this parameter to 0 and then back to the desired value.
P-50	Control Fail	This value determines the fixed valve opening percentage when a control fail occurs.
P-51	Alarm Delay	Delay for the Low Superheat alarms.
P-52	Low Superheat	This value determines the 'Low Superheat' alarm threshold. Note this alarm will not be generated when the valve is closed i.e. 0%.
P-53	Probe 1 Type	From Mercury3a V3.4 software and newer the probe 1 input is used as the shut input. This setting has no effect.
P-54	Probe 2 Type	Set probe 2 to a monitor probe, monitor with probe fault alarms or monitor with probe fault alarms and OT alarm levels.
P-55	Probe Alarm delay	Sets the delay period for OT alarms on probe 2
P-56	Probe OT	Sets the over temperature alarm threshold for probe 2
P-60	Broadcast ID	ID of the Plant Controller being used to broadcast Suction Pressure The Broadcast ID is derived from the Rotary Switch positions set on the Plant controller which is providing the remote suction pressure. Note: No two Plant controllers on a local area network can have the same rotary switches positions set. This will have adverse effects on control.
P-61	Refrigerant	Sets the refrigerant type so that a pressure to temperature conversion can be calculated.
P-62	Pressure types	Allow the controller to operate with either gauge or absolute pressure
P-63	Evap Offset	Offset to allow for pressure drop over distance
P-64	Glide	Allows a glide value to be applied for a particular refrigerant mix where the component gases have different boiling points (at the same pressure).
P-65	Transducer span	Sets the range of the pressure transducer
P-66	Transducer offset	Sets the value of the transducer that is below zero.
P-67	TConst	This is a damping factor that can be added to the measured pressure value to compensate for sudden changes in pressure (such as when compressors start and stop), the higher the value then the higher the damping effect.
P-34	Refrigerant Weight	Allows for a weighted average between liquid and vapour pressure to be used in the pressure to temperature calculation. See: Ref weight
P-35	MOP Cut-in	If the pressure exceeds this value, then the controller's valve will close or be reduced to a predetermined percentage. A MOP alarm is also created. (See Maximum Operating Pressure (MOP))
P-36	MOP Diff	When the pressure reduces below this value, the controllers valve will recover to their normal operational

Number	Parameter	Description
P-37	MOP Delay	Delay after the MOP value has been exceeded before the MOP actions and alarm occurs.
P-40	Valve Type	In most applications the valve type should be set to 'Other' and the Stepper characteristics for a valve being used entered in P-41 to P-47. See Note Valve Type
P-41	Step Max	Number of steps the controller will send to open the valve to 100%. Consult the valve manufacturer to obtain the required number of steps. (Has no effect if Valve Type 0, 1 or 2 selected at P-40) See Note Valve Type
P-42	Step Close	Number of steps controller will send to close valve fully to 0% and overdrive the valve. The Steps required when overdriving the valve can vary. Please consult the valve manufacturer to obtain the required number of steps (Has no effect if Valve Type 0, 1 or 2 selected at P-40) See Note Valve Type
P-43	Step Speed	Increases and decreases the rate of step change. Enter a value in Hz. Valve Manufacturers specification must be followed. (Has no effect if Valve Type 0, 1 or 2 selected at P-40) See Note Valve Type and Appendix 1 Step Speed.
P-44	mA Peak	Current requirement of motor. Care should be taken when setting this parameter as too high a setting could damage the valve motor. Valve Manufacturers specification must be followed. (Has no effect if Valve Type 0, 1 or 2 selected at P-40) See Note Valve Type
P-45	Half Step	Allows the stepper valve to move in half step increments. Valve type must be set to 'other'. It has no effect if Valve Type 0, 1 or 2 selected at P-40 **Note:** In firmware versions V3.2 or above when using the half step feature the Step Max and Step Close settings should be set according to the valve manufacturer's data sheet. In firmware versions earlier than V3.2 when using the half step feature the Step Max and Step Close settings should be set to **double** the valve manufacturer's data sheet.
P-46	mA Current Hold	Current supplied to valve when it is stationary, to prevent any drift in valve position. (Has no effect if Valve Type 0, 1 or 2 selected at P-40) See: Holding Current
P-47	Shut Speed	If the Shut Enable Input (P-70) is configured then the valve will close at the Shut Speed frequency, only when Shut Enable input (P1) is active, instead of the normal Step Speed P-43. Most stepper valve manufacturers allow for this and the maximum step close rate can be found on the valves datasheet. (Has no effect if Valve Type 0, 1 or 2 selected at P-40)
P-70	Shut Enable	If set to N/C or N/O the Probe Input 1 becomes a shutdown input, if using an Intuitive Power store (PR0627) this should be set to N/C. When this input is activated, for example in the event of a power failure, then the valve will be closed. **Note:** Valve type must be set to 'Other' for this feature to operate. For further information on the Intuitive Power Store and its use please refer to relevant document on the Support section of the RDM website.
P-71	Shut Time	The time that the valve will remain shut once the shutdown input has been activated, this is to prevent the possibility of the valve being stuck in an open position in the event of an intermittent power supply.
P-A3	Evap Cust Off	
P-A4	Evap Cust High	
P-F0	Custom A1	For more information regarding the setting up of custom refrigeration, please contact RDM Technical Support.
P-F1	Custom B1 Hi	
P-F2	Custom B1 Lo	
P-F3	Custom C1	
P-F4	Custom A2	
P-F5	Custom B2 Hi	
P-F6	Custom B2 Lo	
P-F7	Custom C2	

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

Stepper Valve Type

In most applications the valve type should be set to 'Other' and the Stepper characteristics for a valve being used entered in P-41 to P-47.

Parameters P-41 to P-47 only have an effect if 'Other' is selected when configuring parameter P-40.

Selecting option 1, 2 or 3 at parameter P-40 sets the controller for use with the factory set values for the type of valve selected. The controller will override any values set in parameters P-41, P-42, P-43 and P-45.

Note the parameters relating to the Stepper Valve type should be configured prior to wiring the Stepper Valve to the Mercury 2 PHX controller. If one of the three default valve types is selected then changing P-41, P-42, P-43, P-44 and P-45 will have no effect.

Manufacturer	Model	Step Max	Step Close	Step Speed (Hz)*	mA Peak	mA Hold	Half Step	Overdrive (Hours)
Carel	E^{3}V	480	500	50	450	0	Off	8
Sporlan 1	SER A/B/C/D	2500	3500	200	80	0	Off	24
Sporlan 2	SER 1.5 to 20 / SEI 6	1596	1756	200	80	0	Off	24
Alco	EX4/5/6	750	825	500	500	0	Off	8
Other	Various	2500	3500	200	80	0	Off	24

See Appendix 1 Step Speed also.

Valve Wiring

Manufacturer	Model	Wiring (Colours)	Connection Description (See Stepper Output)
Carel	E^{3}V	Yellow	M1B
		White	M1A
		Green	M2A
		Brown	M2B
Sporlan	SER 1.5 - 20 SER A/B/C/D SEI 6	Green	M1B
		Red	M1A
		White	M2A
		Black	M2B
Alco	EX4/EX5/EX6	White (A)	M1B
		Black (B)	M1A
		Blue (C)	M2A
		Brown (D)	M2B

Important – Our information is taken from 3rd party data sheets at the time our document is created, any changes since will not be incorporated in our document.

Review the manufacturer's datasheet for the selected valve before installation. If you are unsure regarding any of the above steps please contact RDM Technical Support for further assistance.

Valve State – Overdriving

Each time the controller is powered on the control valve state has to initialise as the controller will have no knowledge of the current valve opening position for the stepper motor attached. During this process the controller will close the valve by a number of steps greater than the total number of steps for the valve configured. This is achieved using the Step Close parameter and is referred to as 'overdriving' the valve. This process will synchronize the controller with the stepper valve output. This ensures the stepper valve is at the 0 steps position, fully closed and the control algorithm will use this for future control operations.

The overdrive parameter (P-32) will overdrive the Stepper motor output by 10% of the step max value within the pre-set period (24 hours for example).

Please consult the stepper valve manufacturer's data sheet to obtain the number of steps required to overdrive the valve.

Holding Current

If using a type of valve that requires a holding current you must select 'Other' at P-40 and make sure parameters P-41, P-42, P-43, P-44, P45, P-46 & P-47 are all set to the correct values. An example of this is a Carel E^2V which requires a holding current, although it is a Carel valve and has the same settings for 'Step Max', 'Step Close', 'Step speed' and 'mA Peak' it must be set to 'Other' at P-40 for the holding current to operate correctly.

Warning: Not all valves require a holding current and applying a holding current to valves that do not require one could result in damage to the valve and/or controller.
Refer to Manufacturers Data Sheet for information on holding current.

Stepper Valve Control Using Pressure

There are several ways to use the suction pressure to calculate the evaporator in temperature.

Local mA or 0-10V Connection

(P30 set Trans mA, Trans V, Cust mA or Cust V) A suction transducer can be connected directly to one of the universal inputs on the controller. The controller will calculate the evaporator temperature from the suction pressure, and along with the suction temperature probe local to the controller, the superheat is calculated. Please note that RDM recommend that the evaporator in temperature probe is fitted as the controller will use this to calculate the superheat in the event of a transducer fault
(Parameters P60/61/62/63/64/65/66) will need to be set accordingly

Intuitive Switch (PR0757/758)

(P-30 set to Rem1) The Mercury Switch can be used for EEV control on an Island by island basis. In an EEV application the evaporator in temperature probe reading for a case controller can be obtained from the Mercury switch on which the controller is connected. A suction pressure transducer is connected from the case Island to the 4-20mA input of the Mercury Switch and the pressure read from this transducer is converted to a temperature based on the gas type being used by the system. This temperature is transmitted to each controller connected to the switch, and along with the suction temperature probe local to the controller, the superheat is calculated. Please note that RDM recommend that the evaporator in temperature probe is fitted as the controller will use this to calculate the superheat in the event of a communication loss with the Mercury Switch. (P-30) allows for the use of this remote temperature provided by the Mercury Switch. Please see the Mercury Switch user document (PR0757/758) for further details.

Remote pressure Direct from a Plant Pack Controller

Using IP Module
(P-30 set to Rem1, Rem2 or Rem3 depending on which input the suction transducer is connected to on the plant controller, transducer input 1, 2 or 3). Set the broadcast ID (P-58) to the ID of Plant Pack Controller (Rotary Switch Setting), (P-59) set to refrigerant type, (P-75) set to pressure units absolute or gauge. The plant controller also needs to be set to broadcast pressure.

Maximum Operating Pressure (MOP)

If the controller is set to use a local or remote pressure transducer to calculate the suction temperature, then a MOP alarm can be generated (using parameters (P-37/P-38/P-39). When a MOP alarm is generated on the controller, it will either close or reduce the Stepper valve opening when a predetermined pressure is reached. This MOP value is configured in the Mercury controller. When the MOP alarm is generated, the controller reduces the maximum valve opening to this percentage. For example if the 'Divide Value' parameter is set to 50% and the MOP alarm is generated then the maximum valve opening will be limited to 50%.

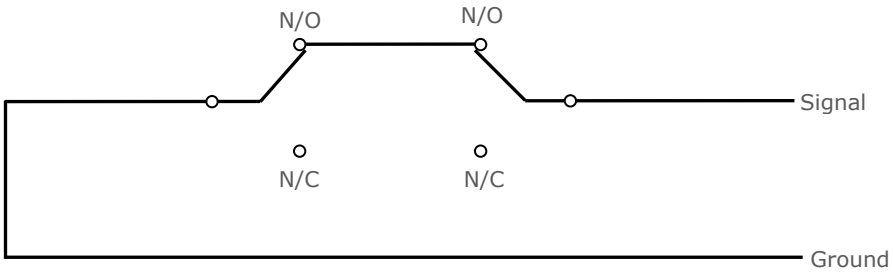
Ref Weighting

When using a local pressure transducer to calculate superheat, the Mercury controller can use a weighted average of liquid pressure and vapour pressure to calculate the temperature. For example, when the Ref Weight parameter is set to 50%, then the controller will use a weighted average of 50% liquid pressure and 50% vapour pressure. Any percentage from 1 to 99% will give an appropriate weighted average between the two pressures.

Relay State and functional operation

Relay 1-3 State	Function State	Wired contact
Relay 1 off	Not running	N/O
Relay 1 on	Running	N/O
Relay 2 off	Fail	N/O
Relay 2 on	Normal	N/O
Relay 3 off	Alarm Relay = Alarm	N/C
Relay 3 on	Alarm Relay = OK	N/C

Relay 4 & Stepper State	Function State	Wired contact
Relay 4 off	Remote off	N/O
Relay 4 on	Remote on	N/O
Relay 4 off	LLV open	N/C
Relay 4 on	LLV closed	N/C
Stepper Valve Off	Stepper Valve Closing	As per I/O Diagram
Stepper Valve On	Stepper Valve Operating	As per I/O Diagram



Example of relay 1 and 2 wired for operation with the CO2 Pump Station Controller

Relay 1 (Run Output) will energise as stepper valve starts to open.
Relay 2 (Run Fail) will be energised during normal operation and will de-energise for superheat low alarms and controller failure.

Network Configuration

The final section to setup is the network address. In all instances, this must be done before the controller is plugged into the site network.

For the Mercury there are two standard hardware variants; RS232 interface or built in IP (See Ordering details for more information).

When using an Intuitive Mercury controller, the controller has to have the correct network card fitted (see compatible network interfaces). For connection to a Mercury Switch (Hub) or an IP Futura network interface, the standard fitment RS232 network card is utilised.

Mercury RS232 Variant & Intuitive Mercury

When logging a Mercury with an RS232 interface onto a network you must first connect the controller to a communications module, this is either a 485 Legacy, IP Futura or Mercury Switch.

IP Futura module & Intuitive Internal IP Network card

In an IP system there are two options;

- IP-L – setting rotary address of module to 000
- IP-r – setting rotary address of module to a unique number that is not 000

IP-L allows the user to statically assign an IP address in the controller which could be used, for example, when connecting the controllers onto a customer's local area network that does not use DHCP.
IP-r allows the network ID (rotary switch address) to be used by a system running a DHCP server (for example the RDM Data Manager) to issue out an IP address automatically.

IP-L

To configure the communication module or network card for IP-L, set all three rotary switches to zero. The module should then be connected to the controller. In the case of an Intuitive Mercury controller where the network card is already fitted, the controller should be powered off, all three rotary switches set to zero and the controller powered on.

- From within the device's display navigate to the 'nEt' menu and press the 'enter' key.
- 'IP-L' will be displayed, press enter again.
- The user can now set the address using the table below

Display	Option
IP-1	IP Address byte 1
IP-2	IP Address byte 2
IP-3	IP Address byte 3
IP-4	IP Address byte 4
nL	Network Mask Length (see the network mask length table below)
gt-1	Gateway Address byte 1
gt-2	Gateway Address byte 2
gt-3	Gateway Address byte 3
gt-4	Gateway Address byte 4
ESC	Exit network menu. **Note:** This option **must** be selected to save any changes made in this menu.

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

IP-r

To configure the communication module for IP-r, set the three rotary switches to give each controller a unique identifier. The module should then be connected to the controller and the network. In the case of an Intuitive Mercury controller where the network card is already fitted, the three rotary switches must be set when the controller is powered off, then power up before connecting to the network. To view the issued IP address from the DHCP server;

- Select 'nEt' from the function menu and press the 'Enter' key.
- 'IP-r' will be shown, press enter again
- Similar to the tables above, the network details can be viewed.

Intuitive Switch

A similar process to that of the IP Futura can be used with the Intuitive Switch. Please refer to the Intuitive Switch user guide, which can be obtained from the RDM website, for information regarding connecting a controller to a network.

RS485 module/ Intuitive Internal RS485 Network card

Connecting an RS485 legacy Module or an Intuitive Internal RS485 network card to the controller will govern which set up screens available under the 'Net' menu. Both modules support the Genus protocol only. They are detailed below;

Display	Option
485t	1: 485 Genus Network
485A	RS485 device name. As it will appear on DMTouch's device list (RC00-0 – RC99-9)
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 485t is set to '1' (Genus RS485)
- Provide a unique device alias under the 485A menu (e.g. 01-5)
- Press the 'ESC' to save

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

Mercury IP Variant

When logging a Mercury with an in-built IP interface it be connected directly into an IP network without the need of a communications module.
When networking the Ethernet variant, the 'Net' menu will have the following menus:

Display	Option
IP-L / IP-r	Read/ Write Static IP address / Read Only DHCP IP address
Id	The 3 digit network address
AtyP	IP-r / IP-L selection
ESC	Exit Menu

Similar to the IP Futura setup, IP-L allows you to fix a static IP address into the controller and IP-r allows you to give each controller on the system a unique network number (using the Id).

- To firstly select between IP-L and IP-r navigate to 'AtyP'.

IP-r

Once IP-r is selected the controller must be given a unique 3 digit 'network address' that no other device on the network has (**note** if logging on to a Data Manager, this will be the device ID). Once the ID has been set connect the controller to the IP network for it then to be given an IP address by the DHCP server. To view the IP address given, within the Net menu, navigate to 'IP-r'.

IP-L

If IP-L has been selected from the 'AtyP' menu the IP address must be set in the controller by navigating to 'IP-L' within the 'Net' menu. The following menus will be available:

Display	Option
IP-1	IP Address byte 1
IP-2	IP Address byte 2
IP-3	IP Address byte 3
IP-4	IP Address byte 4
nL	Network Mask Length (see the network mask length table above)
gt-1	Gateway Address byte 1
gt-2	Gateway Address byte 2
gt-3	Gateway Address byte 3
gt-4	Gateway Address byte 4
ESC	Exit network menu. **Note:** this option **must** be selected to save any changes made in this menu

Once the IP address has been entered, the controller can be connected to the IP network.

Input / Output Table

Number	IO	Range* °C (°F)	Step	Units
I-01	Probe 1	-49 to 60 (-43.6 to 140)	0.1	Deg
I-02	Probe 2	-49 to 60 (-43.6 to 140)	0.1	Deg
I-03	Evaporator Probe	-49 to 60 (-56.2 to 140)	0.1	Deg
I-04	Suction Line Probe	-49 to 60 (-56.2 to 140)	0.1	Deg
I-05	PHX Superheat	-49 to 60 (-56.2 to 140)	0.1	Deg
I-06	Run Input	0 = Off, 1 = Run, 2 = Unused	1	
I-07	Remote Evaporator temp	-49 to 60 (-56.2 to 140)	0.1	Deg
I-08	MOP	0 = Off, 1 = On	1	
I-09	Div Input	0 to 100	1.0	%
I-10	Leaving Liquid Temp	-49 to 60 (-56.2 to 140)	0.1	Deg
I-20	Remote Pressure	-3.4 to 180.0	0.1	Bar
I-21	Local Pressure	-3.4 to 180.0	0.1	Bar
I-22	Local Calc Temp	-49 to 60 (-56.2 to 140)	0.1	Deg
I-30	Shut Enable	0 = Off, 1 = On	1	
O-01	Valve Opening	0 to 100	0.1	%
O-02	Run Output	0 = Off, 1 = On	1	
O-03	Run Fail	0 = Off, 1 = On	1	
O-04	Alarm Relay	0 = Off, 1 = On	1	
O-05	Remote Relay	0 = Off, 1 = On	1	
O-18	Run Time	0 – 128 K Hours	1	
O-19	Valve Step	0 - 6800	1	
O-20	LLV Relay	0 = Off, 1 = On	1	
S-01	Control State	0 = Stabilise, 1 = Normal, 2 = Alarm, 3 = Control Off , 4 = Shut	1	
S-02	Valve State	0 = Off, 1 = Start, 2 = Run, 3 = Problem, 4 = Fail, 5 = Initial	1	

* Range is dependent on probe type

Alarm Messages

The following alarms and messages can appear on the Mercury display.

Display Message	System status
Ft	Control Fault
Prb1	Probe 1 Fault
Prb2	Probe 2 Fault
Prb3	Probe 3 Fault
Prb4	Probe 4 Fault
AL	Control State in Alarm

Network Alarms

The table below shows the text and associated type number that is sent to the system 'front end'. The type number is normally used to provide different alarm actions.

Alarm text	Type # (index)
Superheat Low	5
Superheat problem	6
Probe 1 fault	6
Probe 2 fault	6
Probe 3 fault	6
Probe 4 fault	6
Probe 5 fault	6

Alarm text	Type # (index)
Transducer fault	6
Monitor Probe 1 OT	4
Monitor Probe 2 OT	4
Controller Off	29
Remote evap temperature	6
Valve Shut	2
MOP Alarm	2
Stepper Fault	3

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

Probe Offset

This feature allows each probe value to be modified by an 'offset'. Offset values are from -10^{O}C (-18^{O}F) to +10^{O}C (+18^{O}F) and on a channel basis. Example C1 = Probe 1.

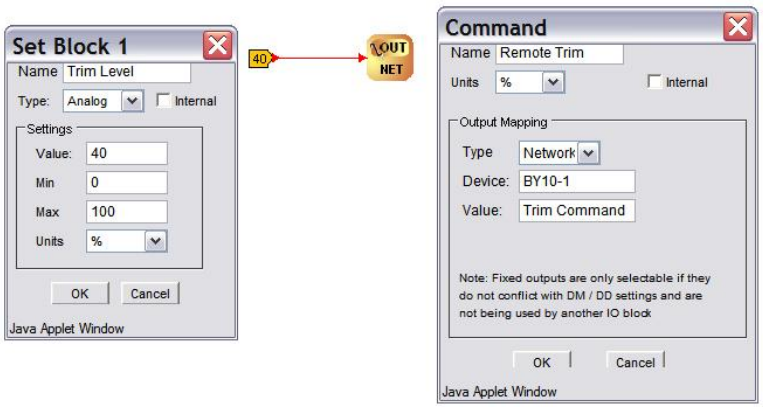
Remote Commands

The following commands can be used by a Data Builder program:

Command	Value to send	Description	Conditions
Defrost Command	1	Initiates a defrost cycle	Defrost mode: remote
Defrost Command	3	Terminates the defrost	Defrost mode: remote Defrost hold: On Defrost min state complete
Case Off Command	5 6 8 0	Sets the controller to Case Off Sets the controller to Fans Only Sets the controller to Lights Only Restores the controller from Case Off to Normal	
Haccp Command	0 1 2	HACCP LED OFF HACCP LED On HACCP LED Flashes	
Button Command	0 1	Buttons backlights Off Buttons backlights On	
EEV Command	2 1	Shuts the valve off Restores the valve to normal operation	
Divider Command	0 to 100%	Sets the maximum valve opening to this percentage.	MOP input from Merc PHI hub must be 'Off'.

Use an 'Analogue Out' block configured to the controller name and in the value field type in the command you require. Use a 'Setting block' as the input to the 'Analogue Out' block to send the Value.

See Example on the right, which sets the Trim Heater on BY10-1 at 40%.



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

Specification

	Mercury PHX Controller PR0740	Intuitive Mercury PHX controller PR07X2
Power Requirements		
Supply Voltage Range	24 Vac ±10% or 24Vdc ±10%	24 Vac ±10% or 24Vdc ±10%
Supply Frequency	50 – 60 Hz ±10% or dc	50 – 60 Hz ±10% or dc
Maximum supply current	0.5 Amps (Total max. Current dependant on stepper motor used)	0.5 Amps (Total max. Current dependant on stepper motor used)
Typical supply current	<1 Amp	<1 Amp
General		
Operating temperature range	+5^{0}C to +50^{0}C	-10^{0}C to +60^{0}C
Storage temperature range	-20^{0}C to +65^{0}C	-20^{0}C to +65^{0}C
Environmental	Indoor use at altitudes up to 2000m, pollution degree 1, installation category II. Voltage fluctuations not to exceed ±10% of nominal voltage.	Indoor use at altitudes up to 2000m, pollution degree 1, installation category II. Voltage fluctuations not to exceed ±10% of nominal voltage.
Size	78mm (W) x 36mm (H) x 110mm (D)	157mm (W) x 67mm (H) x 120 (D)
Approx. Weight	170 grams	500 grams
Safety	EN61010	EN61010
EMC	EN61326; 1997 +Amdt. A1; 1998	EN61326; 1997 +Amdt. A1; 1998
Ventilation	There is no requirement for forced cooling ventilation	There is no requirement for forced cooling ventilation
Class 2 Insulation	**No** protective Earth is required and **none** should be fitted	**No** protective Earth is required and **none** should be fitted
Supply Fuse	The host equipment must provide a suitable external over-current protection device such as: - Fuse: 6.3A 240 Vac Anti-surge (T) HRC conforming to IEC 60127	Built in fuse holder, fuse 2A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm
Or MCB	6A, 240 VAC Type C conforming to BS EN 60898	2A, 240 VAC Type C conforming to BS EN 60898 (Note: controller has integral 2A fuse)
Relay Fuse	Not Fitted	10A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm
Valve Output		
Max current valve output	Total Max current dependant on Stepper Motor used.	Total Max current dependant on Stepper Motor used.
Stepper Output	Bipolar Stepper Motor 24V 8W Max. Maximum current cannot exceed 825mA Chopper Drive	Bipolar Stepper Motor 24V 8W Max. Maximum current cannot exceed 825mA Chopper Drive
Relay Specification		
Relays 1-3 Exclusive common		
Max current	6A Resistive (CosØ = 1) 2A Inductive (CosØ = 0.4)	10A Resistive (CosØ = 1) 3A Inductive (CosØ = 0.4)
Max voltage	250Vac, 30V dc	250Vac. 30V dc
Relay Fuse	N/A	10A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm
Relay 4 Exclusive common		
Max current	3A Resistive (CosØ = 1) 1A Inductive (CosØ = 0.4)	10A Resistive (CosØ = 1) 3A Inductive (CosØ = 0.4)
Max voltage	250Vac	250Vac
Relay Fuse	N/A	10A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm

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

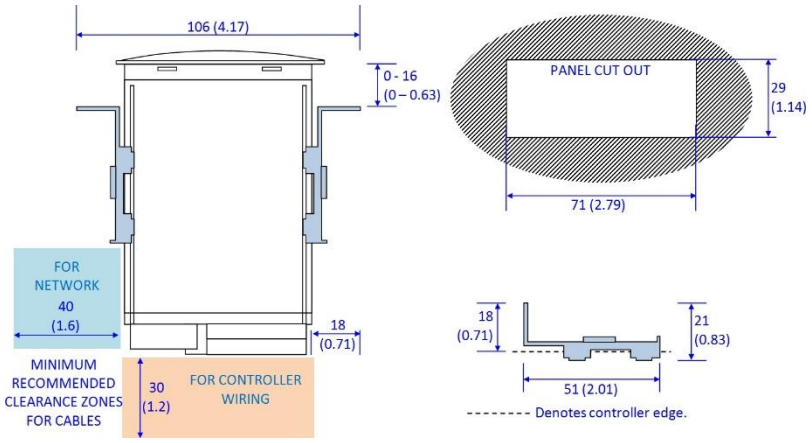
Inputs		
Input resistance	3.01K Ohms (for PTC or NTC type probes)	3.01K Ohms (for PTC or NTC type probes)
Input type	Selectable. See: Units	Selectable. See: Units
Uni IO 1	0-10Vdc input	For pressure transducer (optional)
Uni IO 2	4-20mA input	For pressure transducer (optional)
Comms		
Serial Variant	RS232 with flow control	RS232 with flow control
Ethernet Variant	IP comms	IP comms

Intuitive Mercury Mains Controller PR0952/954	
Power requirements	
Supply Voltage Range	100 – 240 Vac ±10%
Supply Frequency	50 – 60 Hz
Maximum supply current	2 Amps (Total maximum supply current is dependent on type of valve used)
Typical supply current	<1 Amp
General	
Operating temperature range	-10^{0}C to +60^{0}C (14°F to 140°F)
Storage temperature range	-20^{0}C to +65^{0}C (-4°F to 149°F)
Environmental	Indoor use at altitudes up to 2000m, pollution degree 1, installation category II. Voltage fluctuations not to exceed ±10% of nominal voltage.
Size	157mm (W) x 67mm (H) x 120 (D)
Approx. Weight	500 grams
Safety	EN61010
EMC	EN61326; 1997 +Amdt. A1; 1998
Ventilation	There is no requirement for forced cooling ventilation
Class 2 Insulation	**No** protective Earth is required and **none** should be fitted
Supply Fuse	Built in fuse holder, fuse 2A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm
Or MCB	2A, 240 VAC Type C conforming to BS EN 60898. Note: device has integral 2A fuse
Connections	All relay and power connections are plug in with screw terminals, maximum 1.5mm² CSA wire size (16 AWG 25pprox.).
Relay Fuse	10A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm
Relay Specification	
	Relays 1 – 5
Max current	10A Resistive (CosØ = 1) 3A Inductive (CosØ = 0.4)
Max voltage	250Vac. 30V dc
Relay Fuse	10A 240Vac Anti-surge (T) HRC conforming to IEC60127, 32 x 6.3mm
For compliance with the LVD, All relay commons must be at the same potential as the supply voltage	
Safety	Conforms to EN60730-1 based on UL 60950-1; UL 62368-1 as referenced to IEC60730-1
Valve Output	
	Bipolar Stepper Motor 24V 8W, Maximum current cannot exceed 825mA, Chopper Drive. Maximum settable peak current per motor coil 500mA.
Inputs	
Probe Input resistance	3.01K Ohms (for PTC or NTC type probes)
Probe Input type	Selectable. See: Units
Transducer 0-10V	Connect a 0-10v signal
Transducer 4-20mA	4-20mA current loop, provides a 12 Vdc output to power the pressure transducer. See wiring
Digital Inputs	Volt Free
Comms	
Serial Variant	RS232 with flow control
Ethernet Variant	IP comms

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

Installation & Dimensions

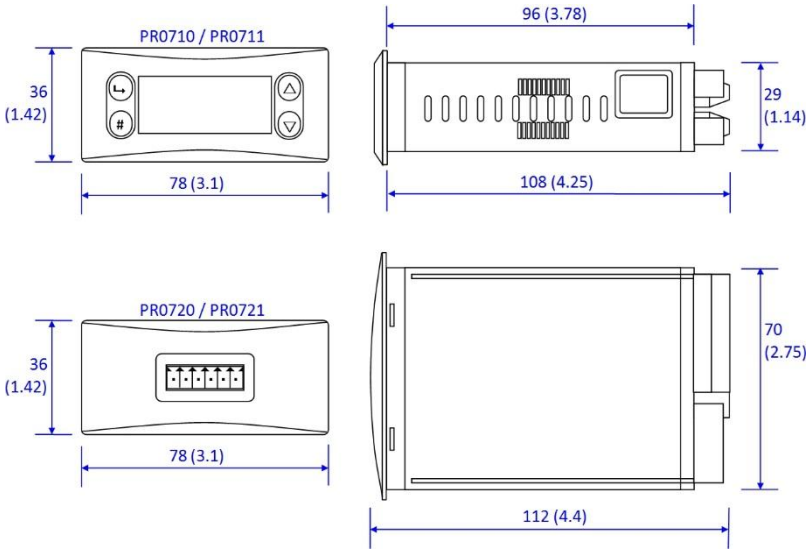
Panel Cut-out and Clearances – Mercury



Fixing

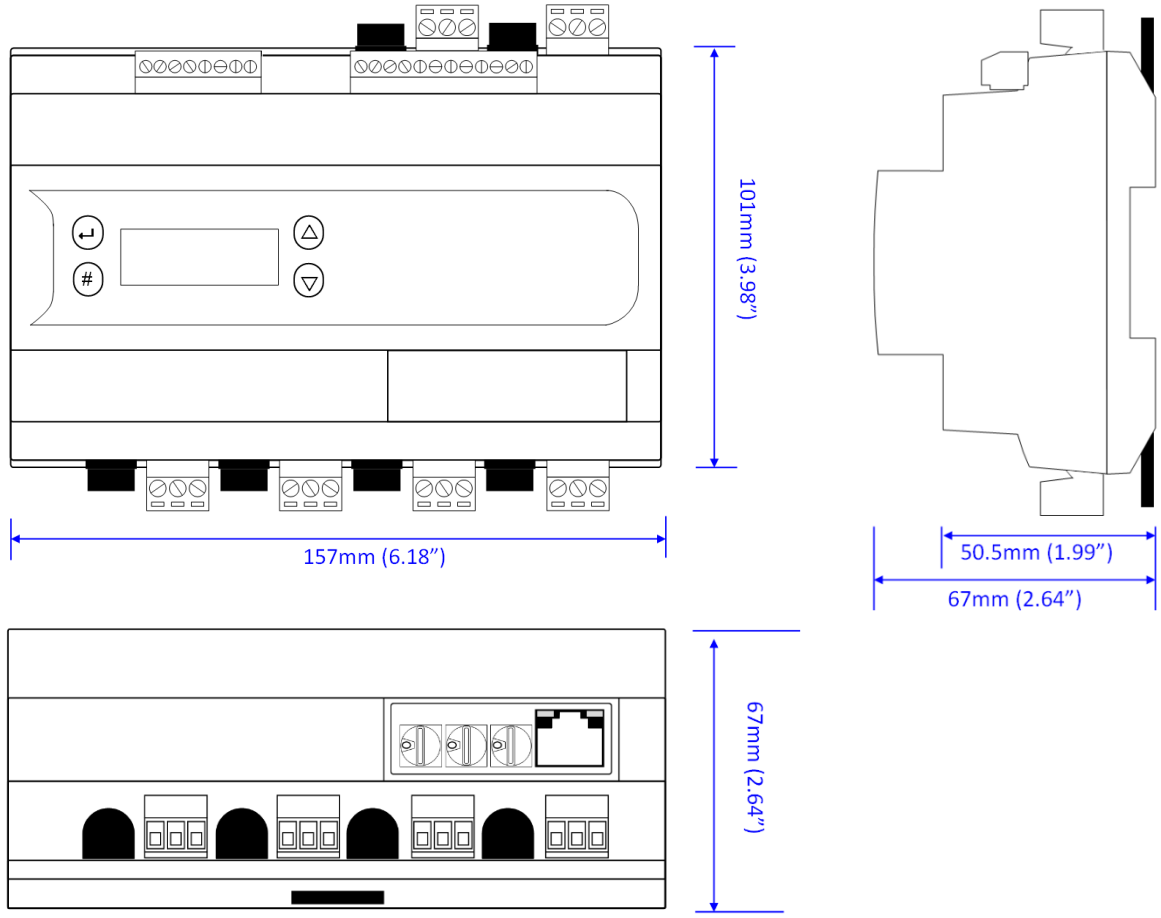
The controller is fixed by sliding the 2 plastic retaining clips up to rear of the panel. These clips have a ratchet action and can be removed by holding in the clip sides and sliding back.

Dimensions – Mercury

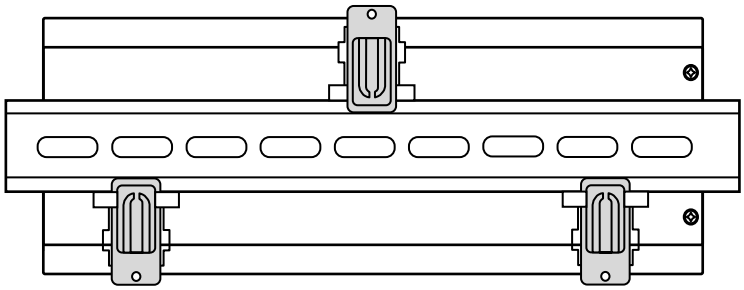


Please ensure all power is switched off before installing or maintaining this product.

Dimensions – Intuitive Mercury



Mounting Instructions – Intuitive Mercury



Three clips fix the Intuitive Mercury securely to DIN rail. Pull each clip until it “clicks” to remove the controller. Each clip has a mounting hole to provide an alternative fixing mechanism to DIN mounting.

Cleaning

Do not wet the controller when cleaning. Clean the front by wiping with slightly damped lint free cloth.

Ventilation

There is no requirement for forced cooling ventilation

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

Disclaimer

The specifications of the product detailed in this document may change without notice. RDM 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.

Appendix 1 Step Speed (Frequency Hz)

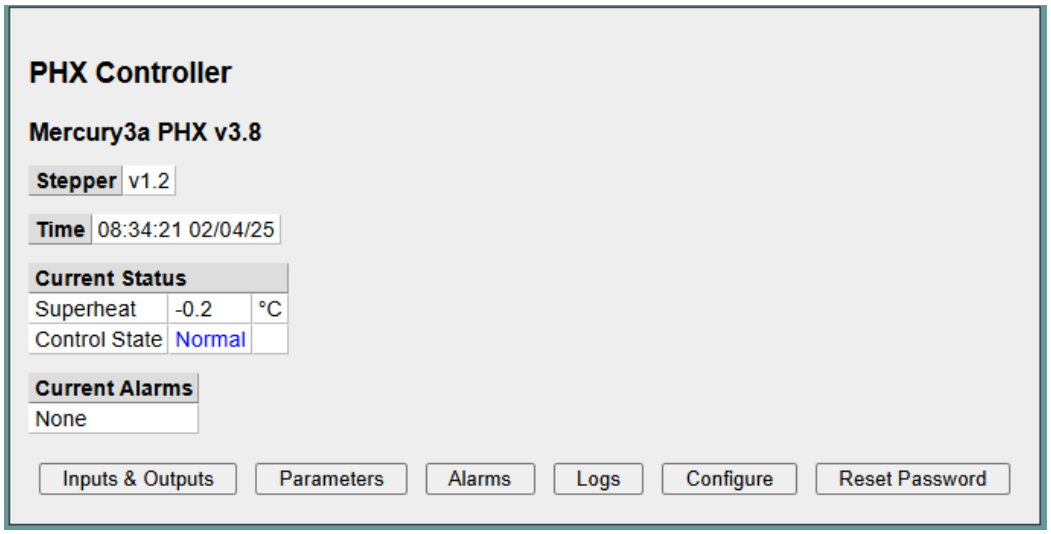
When setting the Step Speed, P-43, the following table applies.

Step Speed Entered	Actual Speed Set (Hz)		Step Speed Entered	Actual Speed Set (Hz)
500 and above	500		86 to 90	90
251 to 333	333		81 to 85	85
201 to 250	250		76 to 80	80
167 to 200	200		71 to 75	75
144 to 166	166		66 to 70	70
126 to 143	143		61 to 65	65
112 to 125	125		56 to 60	60
101 to 111	111		51 to 55	55
96 to 100	100		50 and below	50
91 to 95	95			

Please confirm with the Stepper valve manufacturer datasheets to select the correct step frequency.

Appendix 2: Webpage Appearance

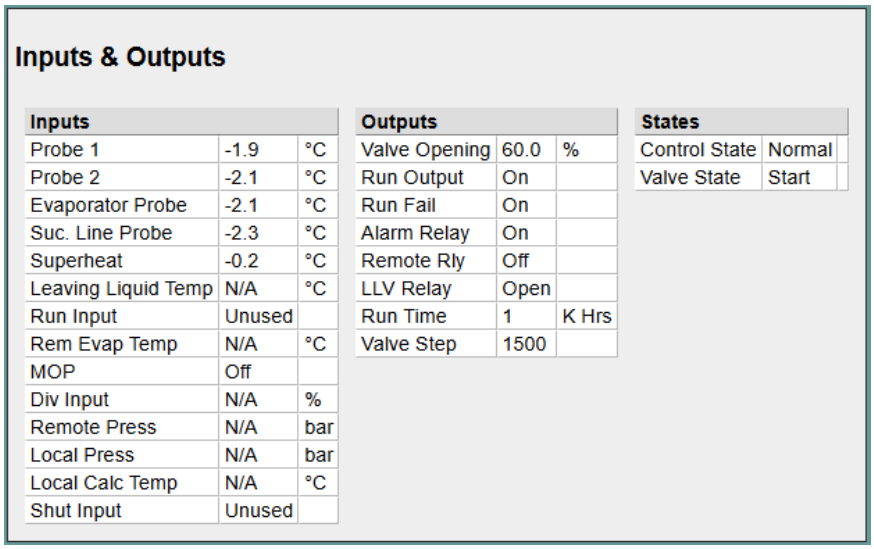
It is possible to view the controller across an IP connection using one of the methods outlined in the Network Configuration section.



The following screens are samples of how values and settings appear when viewed through a PC/Laptop connection.
The user has a choice of entering the following pages: - **Inputs & Outputs, Parameters, Alarms, Logs, Configure and Reset Password.**

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

Inputs & Outputs



Inputs & Outputs

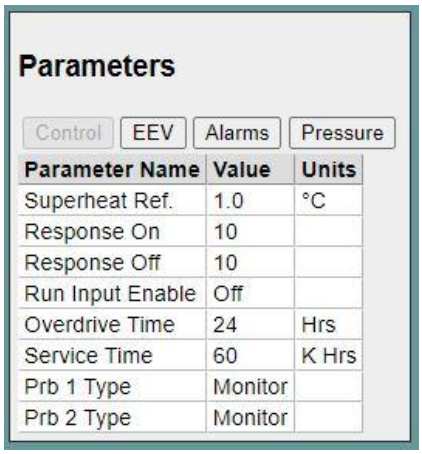
Inputs		
Probe 1	-1.9	°C
Probe 2	-2.1	°C
Evaporator Probe	-2.1	°C
Suc. Line Probe	-2.3	°C
Superheat	-0.2	°C
Leaving Liquid Temp	N/A	°C
Run Input	Unused	
Rem Evap Temp	N/A	°C
MOP	Off	
Div Input	N/A	%
Remote Press	N/A	bar
Local Press	N/A	bar
Local Calc Temp	N/A	°C
Shut Input	Unused	

Outputs		
Valve Opening	60.0	%
Run Output	On	
Run Fail	On	
Alarm Relay	On	
Remote Rly	Off	
LLV Relay	Open	
Run Time	1	K Hrs
Valve Step	1500	

States	
Control State	Normal
Valve State	Start

This is view only screen and shows the states of the inputs and outputs.

Parameters



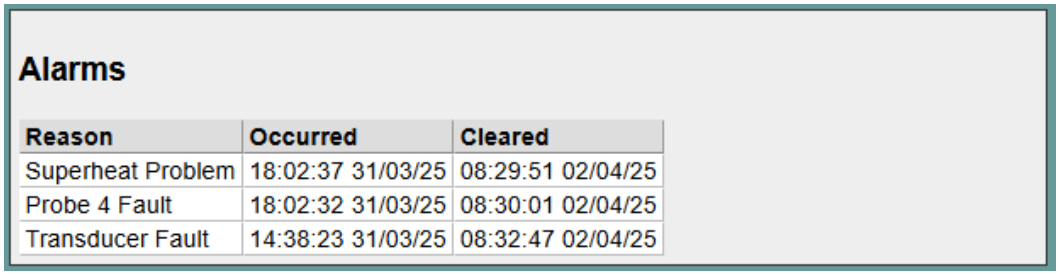
Parameters

Control | EEV | Alarms | Pressure

Parameter Name	Value	Units
Superheat Ref.	1.0	°C
Response On	10	
Response Off	10	
Run Input Enable	Off	
Overdrive Time	24	Hrs
Service Time	60	K Hrs
Prb 1 Type	Monitor	
Prb 2 Type	Monitor	

This is a view only screen and shows the parameter settings.

Alarms



Alarms

Reason	Occurred	Cleared
Superheat Problem	18:02:37 31/03/25	08:29:51 02/04/25
Probe 4 Fault	18:02:32 31/03/25	08:30:01 02/04/25
Transducer Fault	14:38:23 31/03/25	08:32:47 02/04/25

This is a view only screen.

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

Logs

Logs

<<< << < > >> >>>

	08:38:25 02/04/25	08:38:30 02/04/25	08:38:35 02/04/25	08:38:40 02/04/25	08:38:45 02/04/25	08:38:50 02/04/25	08:38:55 02/04/25	08:39:00 02/04/25
Probe 1	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Probe 2	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
Evaporator Probe	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
Suc. Line Probe	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Superheat	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Leaving Liquid Temp	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Run Input	Unused	Unused	Unused	Unused	Unused	Unused	Unused	Unused
Rem Evap Temp	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOP	Off	Off	Off	Off	Off	Off	Off	Off
Div Input	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Valve Opening	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Run Output	On	On	On	On	On	On	On	On
Run Fail	On	On	On	On	On	On	On	On
Alarm Relay	On	On	On	On	On	On	On	On
Remote Rly	Off	Off	Off	Off	Off	Off	Off	Off

This is a view only screen

Mercury Controller Passcode

The configure menu allows access to all the controller's settable parameters and requires a password to access.

Due to increased cyber security protection, implemented from April 2025 onwards, the Mercury range of controllers have a firmware update which removes the previous shipping default legacy password and replaces it with a unique passcode from the factory. This unique passcode can be changed by the engineer, if required, using a PC connection and the controller display.

Any version of Mercury controller will log onto a Data Manager front end as before, the April 2025 update only affects the Data Manager's ability to change parameters on the Mercury controller. At the controller itself the normal method of accessing the "Para" menu using it's display remains unchanged.

Action Overview

There are three possible actions to take when networking a Mercury, these are fully documented later in this application note, below is a summary table.

Combinations	Action
New Mercury (post-April 2025) and new Data Manager (V4.2.3 or newer)	No action needed. Logon and network as before.
Older Mercury (pre-April 2025) and any Data Manager software version	No action needed. Logon and network as before.
New Mercury (post-April 2025) and older Data Manager (V4.2.2 or earlier)	Navigate to "PASS" via Mercury display and set to "OLD". Logon and network as before.

Using a new Mercury controller with a recent Data Manager

If connecting a new Mercury Controller (Manufactured on April 2025 or later) with a Data Manager with firmware version V4.2.3 or newer (Manufactured on September 2023 or later), then there will be no compatibility issues.

A quick way to determine if a Mercury controller is legacy or not is the "PASS" menu being present,

see: Setting the legacy passcode on a new Mercury controller later on in this document. If the "PASS" menu is **not** present then the controller is classed as a legacy controller (pre April 2025).

If connecting a PC directly to the Mercury controller the previous default legacy password will not work and a new passcode will need to be set up. The Mercury controller requires a built-in display or remote display (PR0725 for example) to enable this.

Using a legacy Mercury controller with a Data Manager

If connecting a legacy Mercury Controller (Manufactured **before** April 2025) with any Data Manager then there will be no compatibility issues.

If connecting a PC directly to the Mercury controller the legacy default password will work as before.

Using a new Mercury controller with a legacy Data Manager

If connecting a new Mercury Controller (Manufactured on April 2025 or later) with a Data Manager with firmware version V4.2.2 or earlier, then the Mercury controller will require the unique factory shipping passcode to be changed to enable the legacy Data Manager to make parameter changes in the controller.

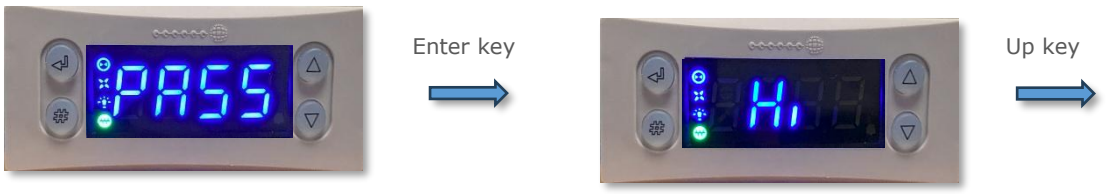
If connecting a PC directly to the new Mercury controller the previous default legacy password will not work and a new passcode will need to be configured. The Mercury controller requires a built-in display or remote display (PR0725 for example) to enable this.

Setting the legacy passcode on a new Mercury controller

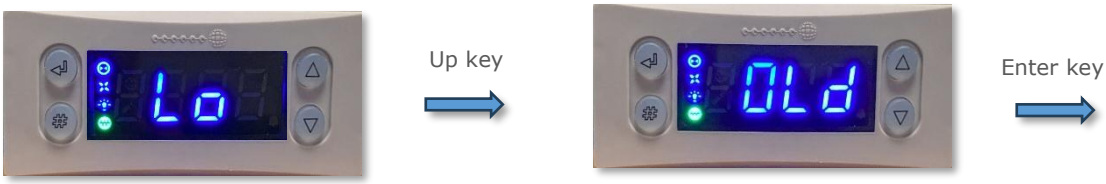
If using a new Mercury controller with a legacy Data Manager (V4.2.2 or earlier) a PC connection is not required and a legacy default passcode can be set using the controller's display.

To enter the setup menu on the Mercury Controller press and hold the Enter and Down keys for 3 seconds, the display will show "Ent", release both keys and press the Enter key and the display will show "IO", this is the Input/Output menu.

Press the Up or Down keys to scroll through the set up menus until the "PASS" menu is shown, press the Enter key to select. The display will show "Hi".



Pressing the Up key again will show "Lo" on the display, pressing the Up key again will show "Old".



Pressing the Enter key on "Old" will show "dFLt", this allows the legacy default passcode to set in the controller, pressing the Enter key again will set the legacy passcode and the display will return to "PASS".

The Legacy passcode is now set. Navigate to "Esc" and press the Enter key to save the setting otherwise the display will timeout after 60 seconds after no user interactions.

The Data Manager will now be able to set parameters in the Mercury controller.

Setting a PC or Laptop passcode.

A PC can be connected by surfing to an IP enabled controller's IP address using a web browser, if the controller is not IP enabled then RDM communicator software can be used to connect directly to the controller's RS232 port.

An external communication module such as an IP Futura (PR0016) or Intuitive Switch can be used to enable IP connectivity on any RS232 Mercury controller.

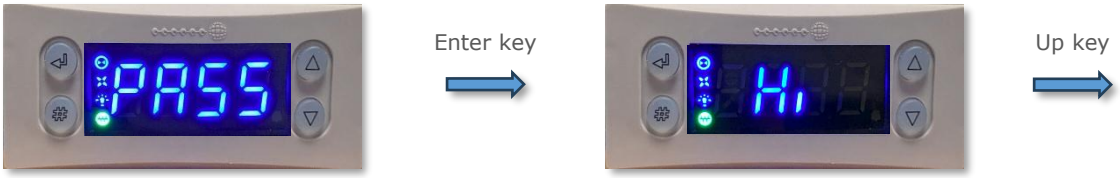
The controller's home page will be shown, similar to the one below.

Select the "Reset Password" option.

An 8 digit passcode is required to be entered in the Response field, this is comprised of the "Hi" an "Lo" values which can be obtained from the controller's display as follows.

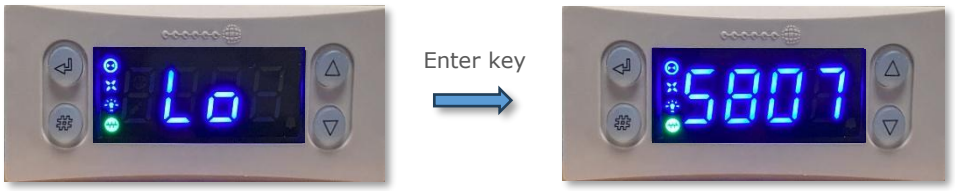
Enter the setup menu on the Mercury Controller by pressing and holding the Enter and Down keys for 3 seconds, the display will show "Ent", release both keys and press the Enter key and the display will show "IO", this is the Input/Output menu.

Press the Up or Down keys to scroll through the set up menus until the "PASS" menu is shown, press the Enter key to select. The display will show "Hi".



Press the Enter key again and the "Hi" code will be shown, 9901 for example, make a note of this code.

Press the Enter key again to return to the "Hi" menu, press the Up key to select the "Lo" menu.



Press the Enter key again and the "Lo" code will be shown, 5807 for example, make a note of this code.

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

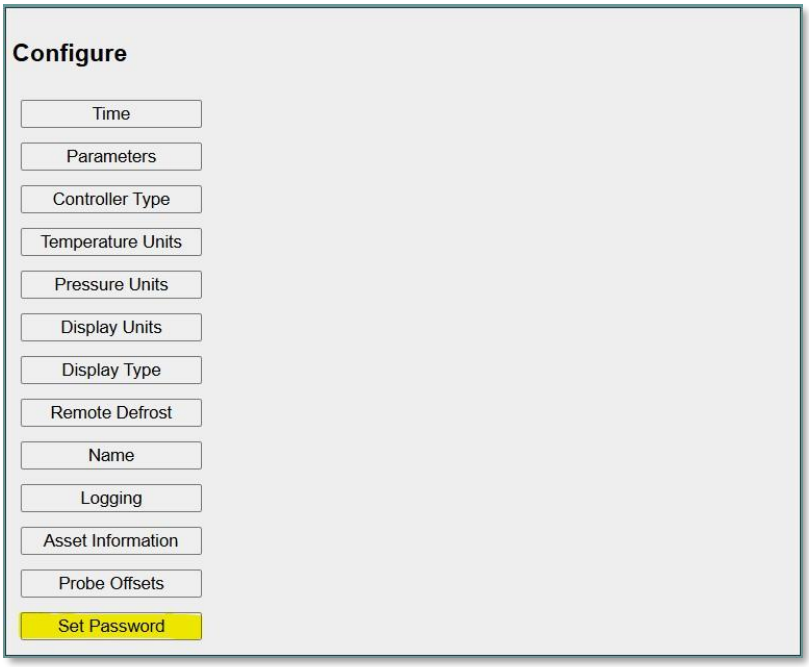
The "Hi" code followed by the "Lo" code, 99015807 for example, can now be entered into the "Response" field in the PC interface.

The controller password is now reset and all the controller's service menu options are now accessible.

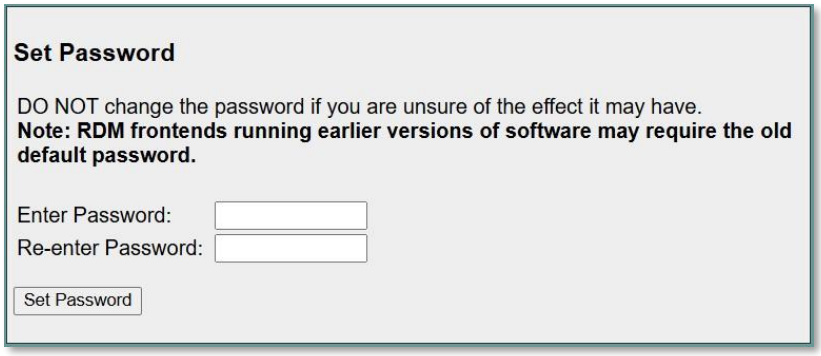
Setting a user defined Passcode

In most cases setting the legacy passcode is all that is required, however there is an option to set a unique user defined passcode in the controller.
Setting a user definable passcode is not essential but it allows the user to have their own unique passcode and does not require access to the controller's display (if fitted) to access the "Hi" and "Lo" values.

In the main "Configure" menu select "Set Password".



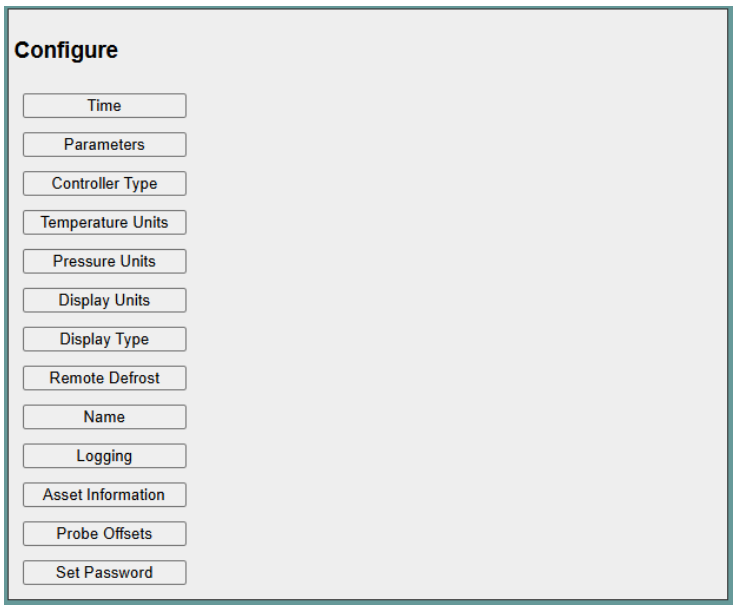
A new passcode can now be set, this should be a number between 4 and 8 digits in length.



Configure

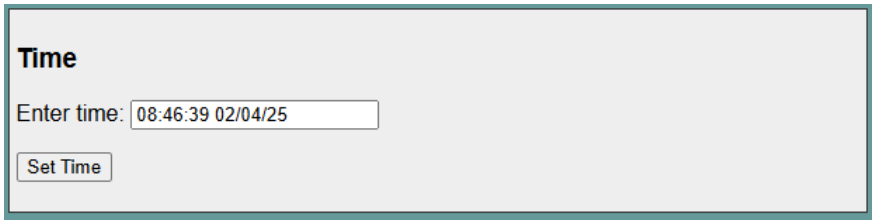
Click on the **Configure** button to access the setup menu.

Note: login credentials required to access Configure menu are as follows;
Username: 'service'
Password: As set in above section.



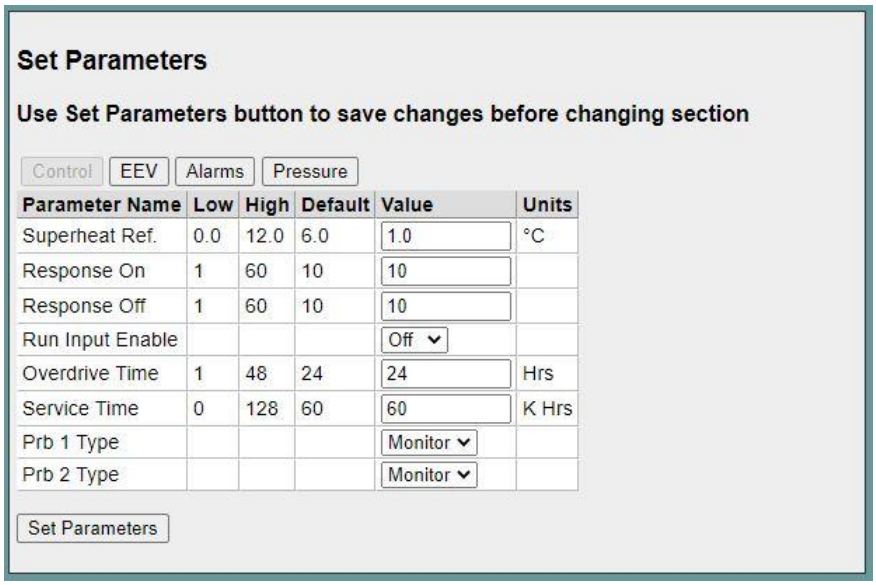
This screen allows the user to configure the controller and set-up the following: - **Time, Parameters, Controller Type, Temperature Units, Pressure Units, Display Units, Name, Logging, Asset Information and Probe Offsets.**

Time



Enter the time and date in the format displayed and press "Set Time" to update the controller. A screen showing the set time will be displayed, and then revert to the initial (Home) screen.

Parameters



This screen allows the parameters to be changed. Once the values are changed, the "Set Parameter" button must be clicked to set the parameters into the controller.
A screen will show the number of parameters and the number changed, then revert back to the Home screen.

Controller Type

This screen allows the controller type to be changed. For this controller, there is 6 for the Mechanical type and 4 for the EEV type.

Temperature Unit

This screen allows the user to set the probe type for the controller and if it's in degrees Centigrade or Fahrenheit.

Pressure Units

This screen allows the user to set the pressure units displayed to Bar or PSI.

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

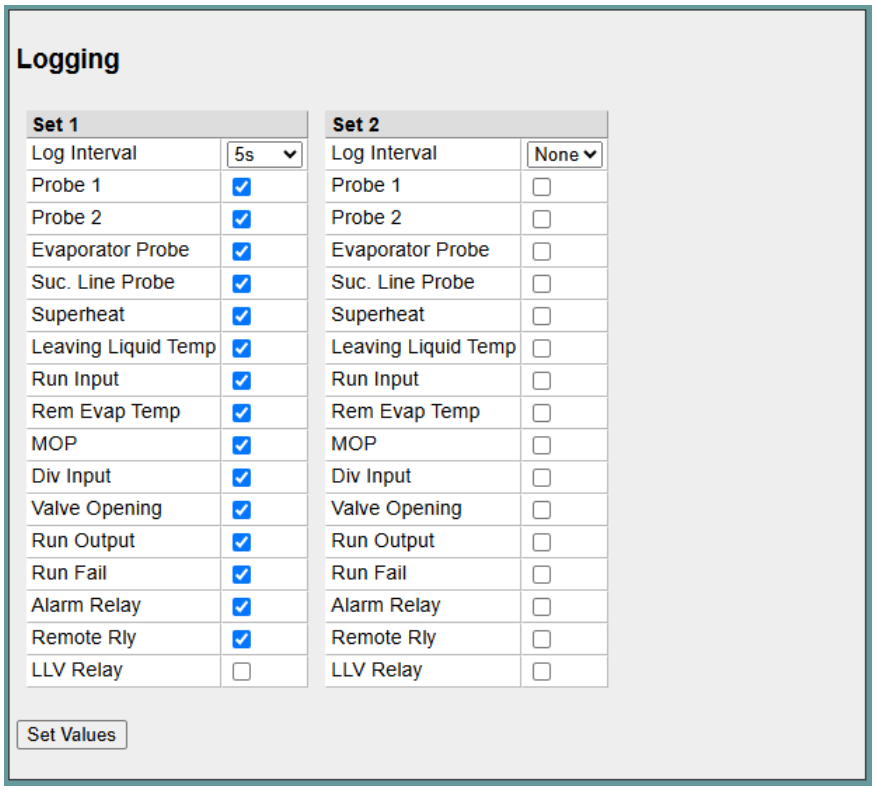
Display Units

This screen allows the user to set if the display on the controller will display only whole numbers (Whole) or whole numbers and tenths (Decimal).

Name

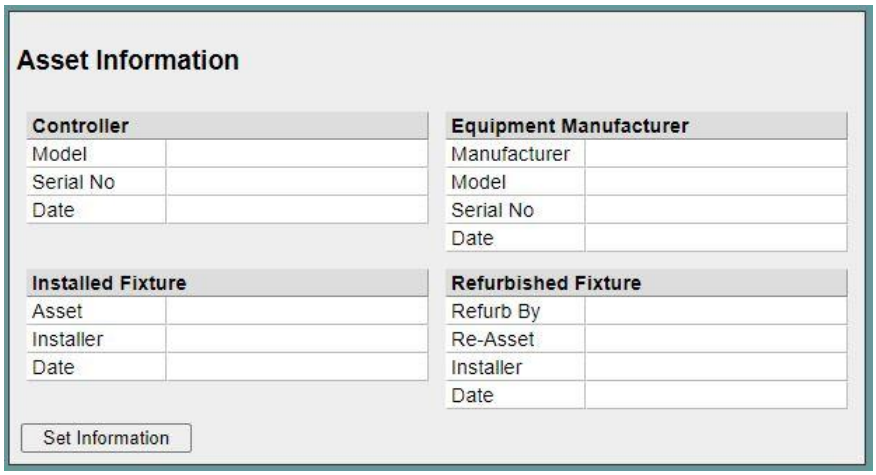
This screen allows the user to give the controller a name. Type in a name of your choice (upper or lower case alpha-numeric) up to 32 characters. Click "Set Name" to load into the controller. A screen will show the name has been set and then revert back to the Home screen. (The Home screen will also now show the controller name.)

Logging



This screen allows the user to set the logging features. There are two sets so that values can have different log intervals.
Set the interval required on set1 and set 2, tick the required values to be logged, then click "Set Values" to load into the controller.
A screen will display "Log configuration set" then revert back to the Home page.

Asset Information

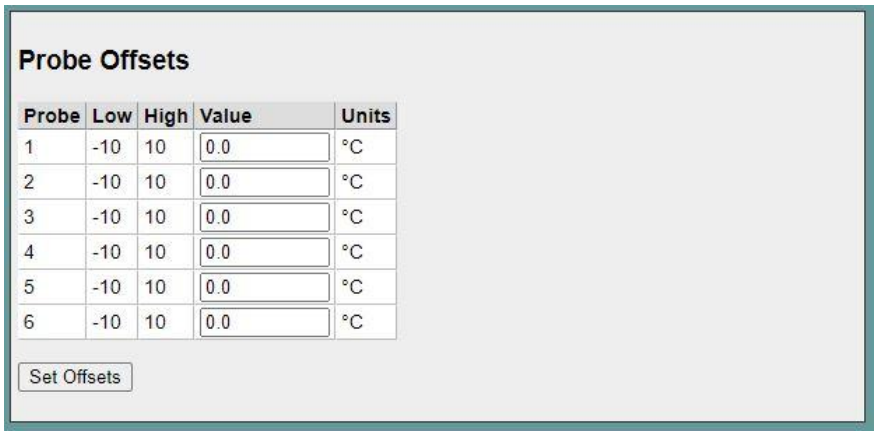


This screen allows the user to set asset information into the controller.

Caution: This is a once only operation.

Click "Set Information" and follow the on screen instructions to set up your asset information.

Probe Offsets



This screen allows the user to set a probe offset between to any of the six probes connected to the controller.

Set Password

Details found here.

Warranty Information

www.resourcedm.com/terms-and-conditions/

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

Revision History

Revision	Date	Changes
1.3b	30/06/2011	Current Issue
1.3c	13/01/2012	Inp. Option removed
1.3d	02/07/2012	Valve types amended
1.5	01/08/2012	Various ways to measure suction pressure using daughter cards on Intuitive type. Holding current added, Issue synchronized with software version
1.5a	12/08/2012	Parameter numbers corrected
1.6	15/08/2012	PR0722 with 0–10V input as well as 4-20mA added.
2.0	17/04/2013	Following parameters added: P-27 EEV Start Time P-47 Shut Speed P-67 Time Constant (Tconst) P-70 Shut Enable P-71 Shut Time Intuitive Power Store support added.
2.1	09/07/2013	Gas type R407F added.
2.1a	30/09/2014	Probes types amended.
2.1b	06/01/2015	Operating temperature updated
2.1c	07/01/2015	Description of problem opening time amended, minimum time in problem state is 60 seconds.
2.1d	17/07/2015	Description of control using local transducer updated
2.2	23/09/2015	Description of Glide parameter updated. Sporlan 2 valve added.
2.3	01/10/2015	Gases R513A and R449A added, glide span increased to 15.
2.3a	11/01/2017	Valve selection information updated.
2.3b	15/08/2017	Update to Sporlan mA peak
2.4	13/09/2017	Amendment to MOP functionality added. Refrigerant gas table updated. Ref weight parameter added. Change to stepper mA settings.
2.4a	26/06/2018	New documentation format.
3.2	07/07/2020	Intuitive hardware added.
3.2a	29/07/2020	Webpage appearance added.
3.3	07/08/2020	Update to IO table and parameter descriptions.
3.3a	24/12/2020	Warranty information added.
3.3b	18/02/2021	Mains variant added, evap. select and custom transducer descriptions added.
3.4	01/08/2021	Shut input moved to probe 1
3.5	09/09/2021	Note added regarding Valve type selection, power store connection details added.
3.6	24/03/2022	LLV control added. Liquid line temperature probe added as probe 5. LLV option added to relay 4.

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

		Valve Scaling option added. New parameters: P-28: Valve Scaling P-80: Do Liquid Temp P-81: Liquid Target Temp P-82: Liquid Target Diff
3.7	27/04/2023	Improvement to IP-I network settings
3.8	14/04/2025	Default password menus added. Override support added New gas tables added: R1234ZE, R227EA, R507A, R448A, R507A, R142B, R449B, R450A, R452B, R454A, R471A, R515B, R600A, R1234YF, R1270. Passcode security update.

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