

PR0651-MINI

Intuitive Transcritical CO2 Mini Plant Controller Installation & User Guide



Resource Data Management
 UK OFFICE
 Resource Data Management Ltd.
 80 Johnstone Avenue,
 Hillington Industrial Estate,
 Glasgow, Scotland, G52 4NZ, UK
 ☎ +44(0)141 810 2828
 ✉ sales@resourcedm.com

Resource Data Management
 US OFFICE
 Resource Data Management USA Inc.
 100 North 6th Street,
 Suite 630B,
 Minneapolis, MN 55401, USA
 ☎ +1 612 354 3923
 ✉ usasales@resourcedm.com



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The Intuitive Range

From Resource Data Management

This documentation refers to the Intuitive Transcritical Mini CO2 Plant Controller

Description

The Intuitive Transcritical Mini CO2 Plant Controller is a versatile controller intended for HT/LT CO2 Pack and Gas Cooler control. There are 12 relay outputs that are configurable for compressors, loaders, trim compressors or gas dump relays, gas fan output VSD enable, a receiver valve output VSD enable, superheat control relays, transcritical relay and Alarm relay. 12 status inputs can be assigned for Pack section inputs or general alarms and to select extra capacity. There are three (4-20mA or 0-10Vdc) inputs for pressure transducers; 2 for HT and LT control purposes 1 for Gas Cooler Pressure and 1 additional plug in daughter board for Receiver Pressure. Note: If the span of a pressure transducer is set to 0 then that input is effectively switched off and all the subsequent pressure transducer inputs will move up one. For example, if LT Suctions span is set to 0 then input 2 becomes Gas Cooler Pressure and input 3 becomes Receiver Pressure and the additional daughter card is not required.

There are 5 analogue outputs (these can be set to either 0-10V dc or 4-20mA or 0-20mA) 2 to control variable speed drives on HT and LT compressors, 1 each to control variable speed devices on a Gas Cooler Valve, a Gas Cooler Fan output, and a Receiver/Separator Bypass Valve.

There are 5 probe inputs to measure gas cooler temperature and cooler air on and air off temperatures, cooler ambient, suction temperature and 2 temperature probe inputs for temperature monitoring and 1 temperature probe input (Using add on Transducer Interface Daughter Board) for receiver pressure

Note: The HT, LT and Gas Cooler Pressure are also available to be broadcast over the DM network for use by RDM Mercury Switch (PR0018-PHI).

The "Fuzzy" based algorithm, will give enhanced control whilst maintaining the starts/hr requirement. The algorithm also reduces the number of input parameters required for control; only a target pressure is needed.

The "staged" type allows the user to fully program the output stages to the desired elements.

The Intuitive Plant controller has an embedded Ethernet port to allow for connection to a Data Manager system without the need for a communications module. A USB port allows for a direct PC connection.

PR0651-MINI For HT/LT Pack and Cooler Operation

Configuration

The controller has two configuration options: -

Display value	Type	Control Type
1	Dual Pack with Gas Cooler	Fuzzy
2	Dual Pack with Gas Cooler	Staged

The controller is delivered pre-configured as a Dual Pack with Gas Cooler Controller Fuzzy (Type 1) See [Type Change](#)

See: [Set-up](#) to change the controller type.

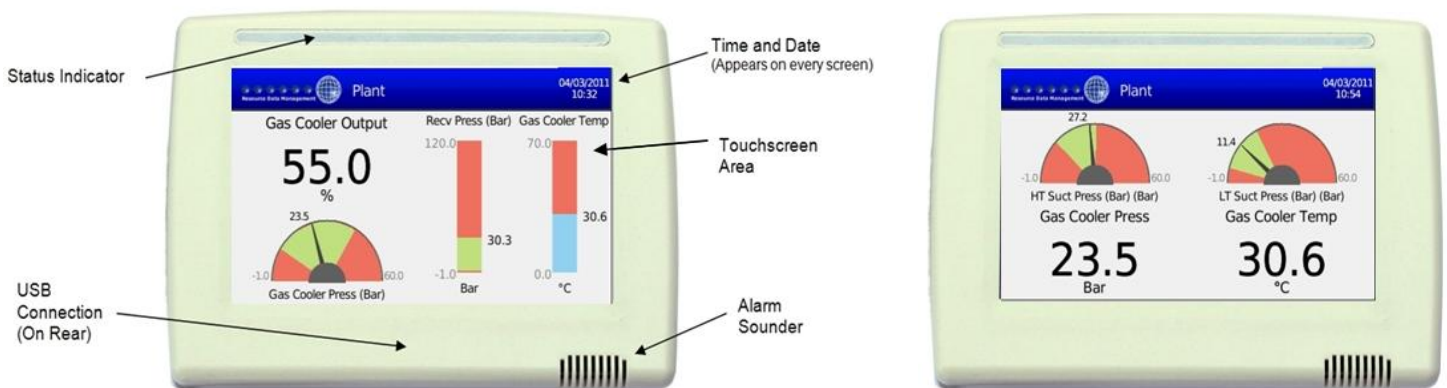


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Plant Controller Colour Touch Display (PR0615)

The Plant Controller Colour Touch Display is the primary interface for viewing inputs, outputs, parameters and alarm information. This display also allows the user to view the current control state and make changes to parameters. Also available is a Plant Controller Panel Mount Display which is a secondary display and can be used as a backup and for the initial installation.

The custom screen, shown below, can be used to show any Input, output or the control state using a selection of graphic interfaces. This allows the user to highlight the key values or processes to quickly and easily view the desired information.



The Display has a built in alarm sounder and a status indicator bar. The status indicator bar is blue with no alarms and changes to red when in an alarm condition.

When an alarm condition occurs the alarm description is listed on the display, the status bar changes to flashing red and the sounder will be activated. When the accept button is pressed on the display the sounder will be muted and the status indicator bar at the top of the display will become static red. When the alarm condition clears the status indicator bar will return to static blue

Individual alarms can also be disabled at the touch screen display so that specific alarms will not sound or be displayed on the display, in this situation alarms will still be sent to the Data Manager.

See RDM web site "Plant Controller Touch Screen Display" for more information.



Opposite is a typical screen showing a list of Inputs, the touch display allows you to scroll up and down the list by placing your finger on the display and sliding it upward or downward motion.

You can view outputs by touching the "Outputs" box. Likewise you can view "States", "Params" and "Alarms" by touching the required box.

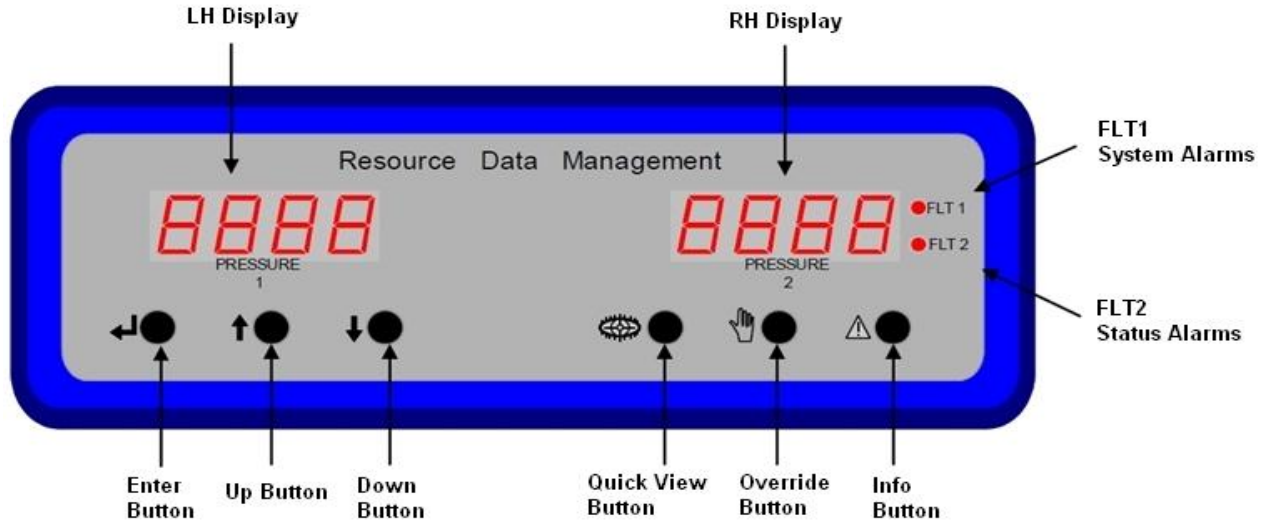
Touching on the "Setup" box allows you to go to setting up of display i.e. Parameters, Alarms and what is displayed on Custom page for example Bar Graphs, Gauges and Values.



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Plant Controller Panel Mount Display (PR0620)

The display can be used for setting up and viewing inputs, outputs and parameters. See: [Set Up Menu](#)



LH Display

4 character display, scrolls between the HT Suction Pressure, LT Suction Pressure, Discharge Pressure and Receiver Pressure
 In set-up mode, displays the set-up menu items
 In quick view mode, indicates the target pressure
 In Override mode, indicates and allows the relays to be forced on

RH Display

4 character display scrolls between what is being displayed in the left hand display i.e. HT Suction Pressure (Suc1), LT Suction Pressure (Suc 2) Discharge Pressure (diSC) and Receiver Pressure (rEcP)
 In set-up mode, display is blank
 In Override mode, display is blank

Front Panel Buttons

- Enter Button:** - Used along with down button to enter menu items.
- Up Button:** - Used to scroll up
- Down Button:** - Used to scroll down
- Quick View Button:** - Used to view the target pressure (See: [Quickview](#) section)
- Override Button:** - Used with the "Enter" button, to go into the override mode. (See [Override](#) section)
- Info Button:** - Used to view the analogue outputs values. (See [Info](#) section)

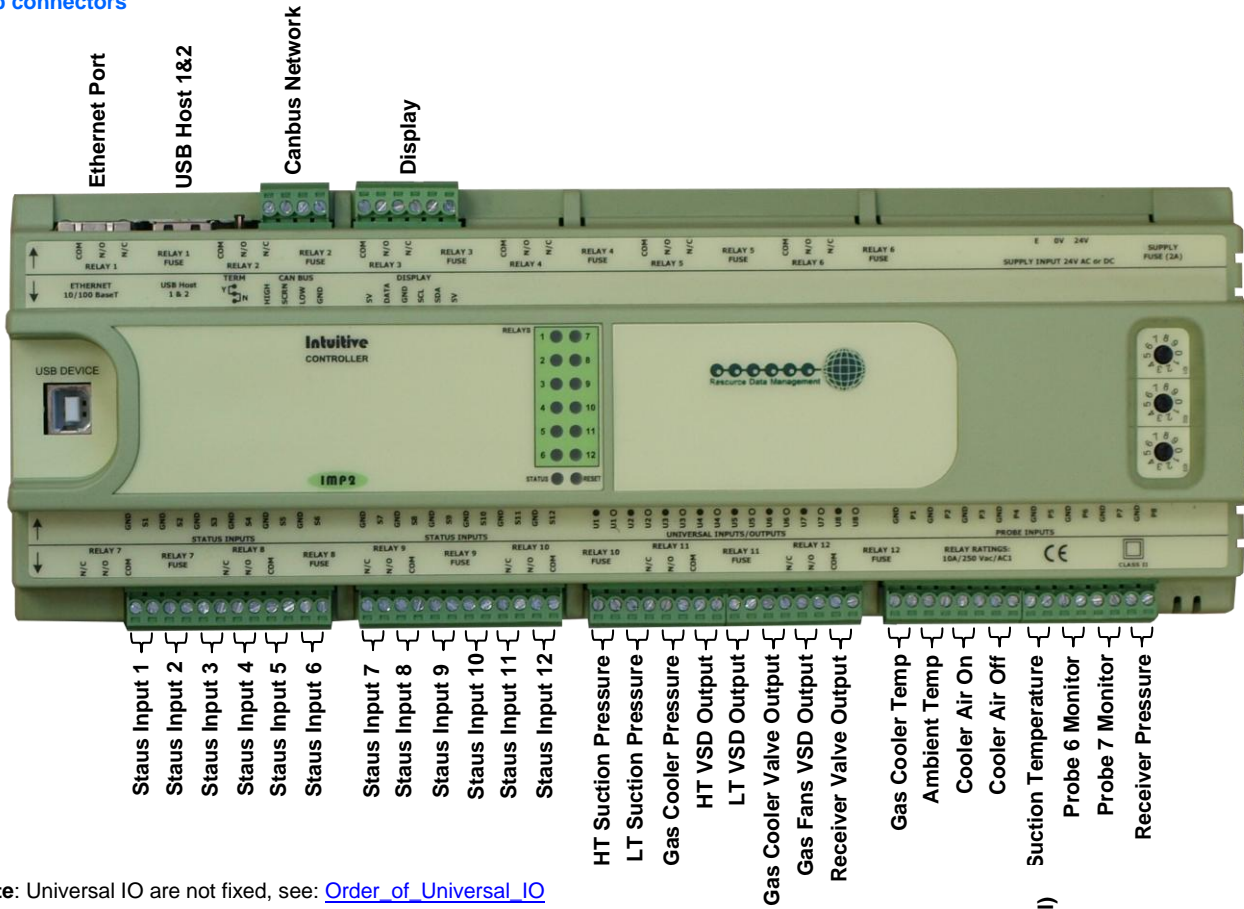


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Controller I/O Connections

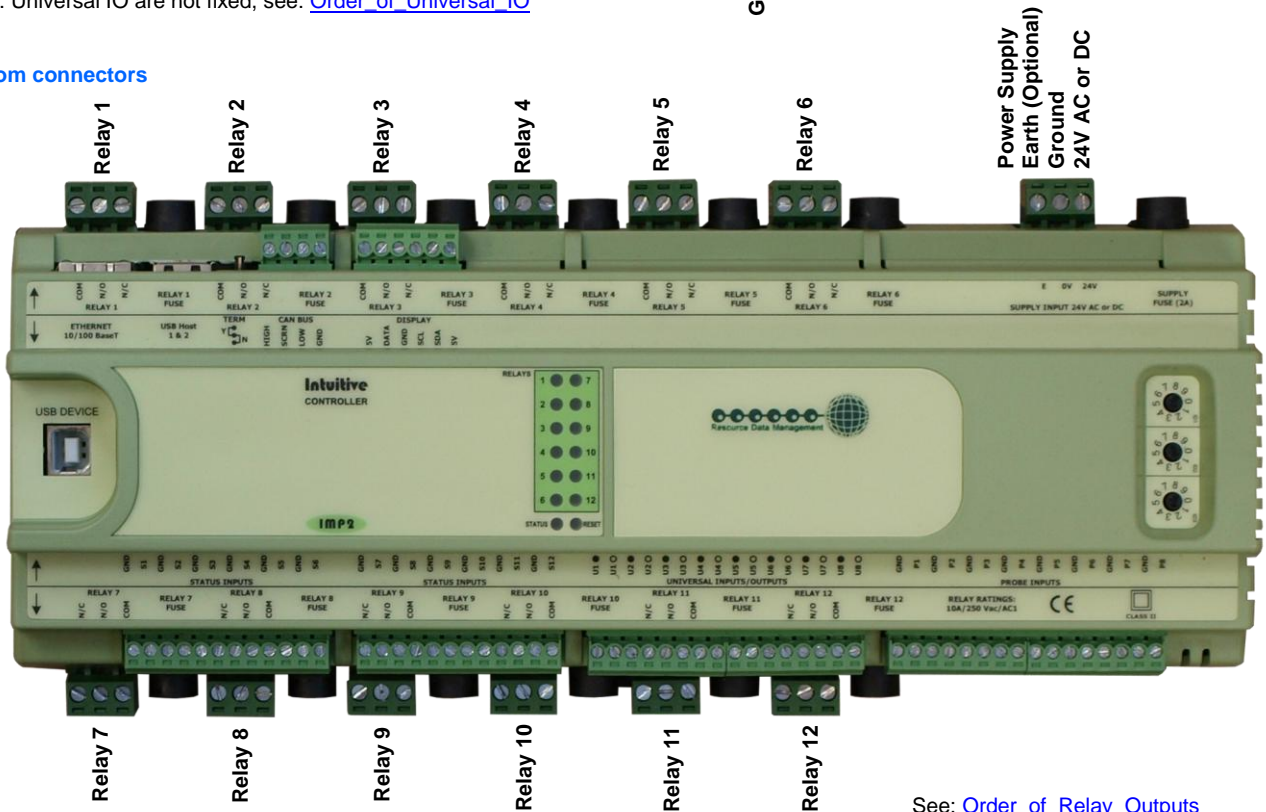
These show the controller without the integral display

Top connectors



Note: Universal IO are not fixed, see: [Order of Universal IO](#)

Bottom connectors



See: [Order of Relay Outputs](#)

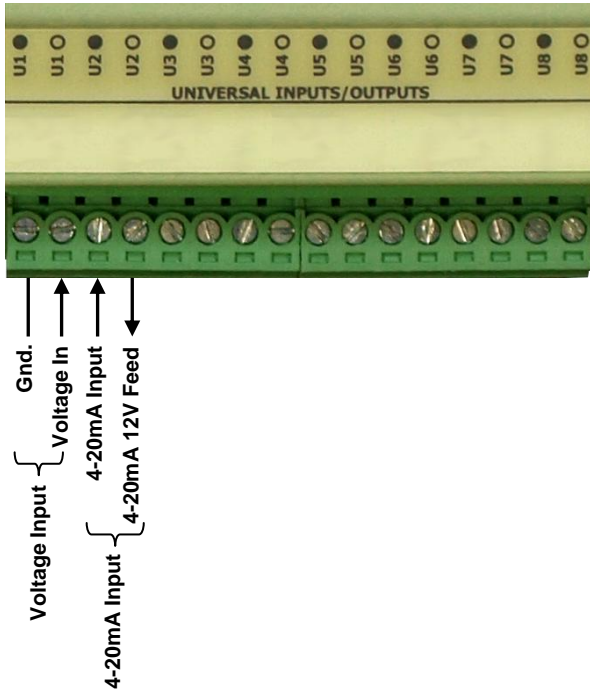


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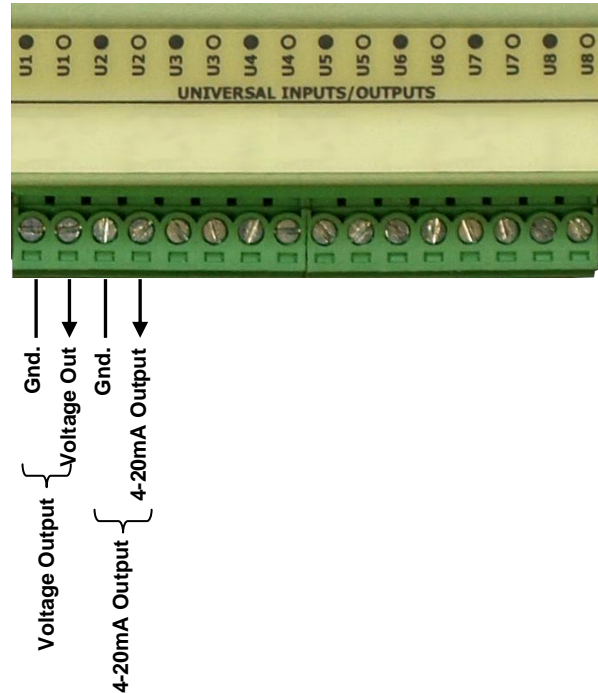
Universal I/O Inputs and outputs

Section of controller showing Universal IO (Inputs and Outputs), these can be selected in software as inputs or outputs and voltage or milliamps.

Universal I/O (Inputs)



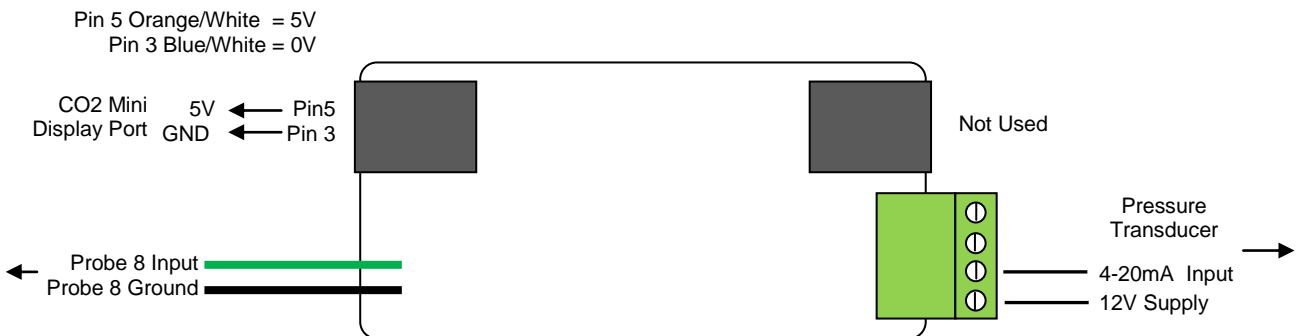
Universal I/O (Outputs)



Pressure Transducer Interface Board for Intuitive Transcritical CO2 Mini Plant Controller

The CO2 Mini controller uses an external 4-20ma interface board (PR0XXX) which allows a pressure transducer to be connected to the Temperature Probe 8 input. Pressure Transducers must be of the current loop 4-20mA type. Excitation voltage (12Vdc) is provided for the transducer. The range of the transducer will vary according to the application, the Span and Offset parameters (P-07, P-08) allow for this.

Note: The PR0XXX works with PT1000 probes only (units selected as 0 or 1) and is only available if all the universal IO are already in use.



The RJ45 socket labelled as "Mercury Controller" with 2 flying leads connects to the main controller display port 5V (terminal 5 on the display connector) and GND (terminal 3 on the display connector).

The Connector labelled "Probe INP" connects to Probe Input 8 on the Transcritical CO2 Mini Pack.

The RJ45 socket labelled as "Network/Communicator" is not used



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Inputs and Outputs:

All Types	Description	Comments
Status Input 1 - 12	0V return or 24 Vac	Note 1
Probe Inputs 1 – 7	Probe inputs	Note 2
Probe Input 8	Receiver pressure Input (Transducer 4)	See: Pressure Transducer Interface Board
Universal IO 1 - 8	Analogue input/output	See: Universal IO
Relay 1 - 12	N/O, N/C and Common	Volt Free
Status LED	Healthy LED	When powered up the LED will flash off/on every 0.5 seconds.

Note 1: 24 Vac must have the same 24 Vac return as the supply Voltage. If using the Plant controller 24V power supply only the 24Vac signal from the supply is required for the status input.

If using an external 24V power supply to signal a status change then both a common (0V) and status input signal (24V) is required for the appropriate status input.

Note 2: Several probe types are available, See: [Probe Type](#)

Setting up the controller

Set-up access to the controller can be achieved several ways

- Through the front mounted buttons on the remote display
- Direct access by PC via a USB connection
- Direct access by a PC via an Ethernet Connection
- Through the RDM Data Manager.

Set-up Mode

Set-up through front panel mount display buttons

To enter set-up 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. Alternatively use either a PC connection for configurations or load a configuration from a memory-stick

Set-up Menu

LH Display	LH Display	Option	Menu Item seen in type:	Explained in Paragraph
IO		View Input/Output States	All types	View Input/Output States
PArA		Set/view Parameters	All types	Set/view parameters
Unit		Set/View Probe Type & Units	All types	Set/View Units
Uni		Set Universal IO	All types	Universal IO
StA		Set Status Input Type	All types	Status Input Type
rLy		Inverts the relay function	All types	Set Relay Output
TyPE		Set/View Controller Type	All types	Set/view controller type
rtc		Set/view Clock (rtc = Real Time Clock)	All types	Real Time Clock
nEt		Set/view network configuration	All types	Network Configuration
bCSt		Broadcast (Pressures)	All types	Broadcast
SoFt		View software version	All types	
USb		Save/Load onto USB device	All types	USB Operation
OFSt		Temperature probe offsets	All types	Set Probe Offsets
ESC		Exit set-up mode		



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Recommended set-up method

It is recommended that this controller is set-up using a direct connection to a PC See [Setup via a PC](#)

If you are not connecting to a network and want to set up the controller through the buttons we recommend you use the Plant controller panel mount display (PR0620) and the following order from the function menu.

Universal IO

Selects whether IO (U-01 to U-08) are to be Inputs or Outputs and what type of input or output.

Setting up from Plant Controller LED Panel Mount Display, navigate to the screen "Uni" and select from the following table for U-01 to U-08

- | | |
|----|-----------------------|
| 0. | 4-20mA Input |
| 1. | 0-10V Input (Default) |
| 2. | 0-5V Input |
| 3. | 4-20mA Output |
| 4. | 0-20mA Output |
| 5. | 0-10V Output |
| 6. | 0-5V Output |

Note: All Universal I/O come defaulted as 0-10V. Please set as required, before connecting external devices such as pressure transducers or inverter drives.

Status Input Type

Selects whether the status inputs require a 0V return or 24Vac return See: [Note 1](#)

Select 1 for Input type 0V return
Select 2 for Input type 24Vac return

NOTE: The first Unused Status Input automatically becomes the Extra Capacity Input

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

1. Use the up or down buttons to scroll through the display until the display reads "rtc"
2. Press enter. The display will show "t-1". Press enter again
3. Scroll hours up or down (0 – 23) press enter
4. Use up button to select "t-2", press enter
5. Scroll minutes up or down (0 – 59) press enter
6. Repeat for t-3 (seconds 0 – 59)
7. Repeat for t-4 (Days up to 31)
8. Repeat for t-5 (months up to 12)
9. Repeat for t-6 (Year up to 99)
10. Use up button to display "ESC", press enter to display "rtc"

Time clock is now set

type. Set/view controller type

1. From the function menu scroll to "type", press enter
2. Use the up/down buttons to scroll through the type values. (See [configuration](#) on page 4)
3. Press enter.

The controller will reset with the selected type now programmed.

Type Change

NOTE : When changing controller types from one type to another always check the parameters and the controller configuration to ensure they are appropriate for the application selected.

Broadcast

Allows pressure readings on Variable Inputs on the plant controller to be broadcast over the DM network to be used up by a Mercury Switch to calculate evaporator temperature which is in turn broadcast over the network to be used by any EEV Case Controllers logged on through that Switch to calculate Superheat

0 = Feature Disabled
1 = Feature Enabled

See RDM Mercury Switch User Guide (PR0018-PHI) for further information.



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Set/View Probe Types & Units

This operation is only available at the controller display or via a PC connection to the plant controller. It cannot be set remotely via the Data manager front end system. Probe type changes affect all probes. They cannot be set individually to different types.

This option allows the user to set the probe types and units.

Note: If the units are set to °C, pressure will be displayed in Bar, if units are set to °F, pressure will be displayed in psi.

Unit Number	Probe Type	Units
0	Probes not used	
1	PT1000	°C
2	PT1000	°F
3	NTC2K	°C
4	NTC2K	°F
5	NTC470R	°C
6	NTC470R	°F
7	NTC700R	°C
8	NTC700R	°F
9	NTC3K	°C
10	NTC3K	°F
11	NTC2K25	°C
12	NTC2K25	°F
13	NTC100K	°C
14	NTC100K	°F
15	NTC5K	°C
16	NTC5K	°F
17	NTC6K	°C
18	NTC6K	°F
19	NTC10K	°C
20	NTC10K	°F
21	NTC10K (2)	°C
22	NTC10K (2)	°F

Temperature Probe Range -80 Degree Celsius to +128 Degree Celsius.

Set/View Offset

This feature allows the probe display temperature to be offset by the value selected: Each of the 8 probes has an individual offset, see the table below: - C-01 = Probe 1 etc.

Note: This can only be set at the plant controller panel mount display and cannot be set remotely by a Data Manager front-end or touch display.

OFSt (Display)	Range	Step	Default
C-01 to C-08	±20°	0.1	0

Network Configuration

There are two network connection options

- IP-L (Rotary switches set to "000")
- IP-r (Rotary switches set to "****" where * is a number between 0 and 9)

IP-L allows you to fix an IP address into the controller, which you would use when you are connecting the controllers onto a customer's local area network. This would allow the customer to view each controller using Internet Explorer

IP-r (normally used mode) allows you to give each controller on the system a unique network ID. This ID is then allocated a dynamic IP address by the system DHCP server (such as the RDM Data Director)



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IP-L

To configure the Plant Controller for IP-L, set all three rotary switches to zero. The unit should then be connected to the network.

1. nEt. From the function menu you can now select nEt
 - Press enter and the display will show "IP-L", press enter
 - You 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
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. N.B. this option must be selected to save any changes made in this menu

IP-r

To configure the communication module for IP-r, set the three rotary switches to give each controller a unique identifier (other than 000). The module should then be connected to the controller and the network via the Ethernet port. The Data Manager will use DHCP to allocate the controller an IP address.

- From the function menu select nEt
- Press enter and the display will show "IP-r", press enter
- You can now view the address given by the DHCP server

IP1: Shows the first IP address value (10 in the example below)
 IP2: Shows the second IP address value (1 in the example below)
 IP3: Shows the third IP address value (2 in the example below)
 IP4: Shows the forth IP address value (86 in the example below)

Example: 10.1.2.86

PArA. Set/view parameters

1. From the function menu scroll to PArA
2. Pressing Enter while PArA is displayed will enter the parameter menu.

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. Pressing the Enter button will show the current value of the selected parameter. Press Up or Down to modify the value and press Enter again to save the value. The parameter list number will be displayed again. Two other options are present in the parameter menu – dFLt and ESC. Selecting ESC will exit the parameter set-up mode. Selecting dFLt will reset all parameters back to the default values for the current controller type.



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Parameter Tables

No.	Parameter	Range	Step	Units	Default	
					Dual Pack + Gas Cooler (Fuzzy Type 1)	Dual Pack + Gas Cooler (Staged Type 2)
P-01	Transducer 1 Span *	-3.4 - 180	0.1	Bar	60.0	60.0
P-02	Transducer 1 Offset	-3.4 - 180	0.1	Bar	-1.0	-1.0
P-03	Transducer 2 Span *	-3.4 - 180	0.1	Bar	60.0	60.0
P-04	Transducer 2 Offset	-3.4 - 180	0.1	Bar	-1.0	-1.0
P-05	Transducer 3 Span *	-3.4 - 180	0.1	Bar	160.0	160.0
P-06	Transducer 3 Offset	-3.4 - 180	0.1	Bar	-1.0	-1.0
P-07	Transducer 4 Span *	-3.4 - 180	0.1	Bar	60.0	60.0
P-08	Transducer 4 Offset	-3.4 - 180	0.1	Bar	-1.0	-1.0
P-20	HT Target Pressure	-3.4 - 180	0.1	Bar	27.0	27.0
P473	HT External Target Pressure	-3.4 - 180	0.1	Bar	31.0	31.0
P-21	HT Target Pressure Above P-20	-3.4 - 180	0.1	Bar	0.5	0.5
P-22	HT Target Pressure Below P-20	-3.4 - 180	0.1	Bar	0.5	0.5
P-23 Fuzzy	HT Starts/Hour	0 - 60	1	-	10	
P-23 Staged	HT Number of Stages	0 - 12	1	-		0
P-24 Fuzzy	HT Run Smallest **	0 = Off, 1 = On	1	-	0	
P-24 Staged	HT Stage-on Delay	00:00 – 60:00	00:01	mins/sec		00:10
P-25	HT Stage-off Delay	00:00 – 99:00	00:01	mins/sec		00:10
P-26	HT Inverter	0 = Off, 1 = On	1	-	0	0
P444	HT INV Minimum	0 - 100	1	%	0	0
P446	HT INV Maximum	0 - 100	1	%	100	100
P490	HT Gas Dump	0 = Off, 1 = On	1	-	0	0
P492	HT Gas Diff	-3.4 - 180	0.1	Bar	0.5	0.5
P470	HT Always Run last	0 = Off, 1 = On	1	-	0	0
P495	HT Comp Unload	0 = Off, 1 = On	1	-	0	0
P497	HT Equal	0 = Off, 1 = On	1	-	0	0
P-27	HT Response On Speed	1 - 60	1	-	5	5
P-28	HT Response Off Speed	1 - 60	1	-	5	5
P-29	HT Optimise Limit	-3.4 - 180	0.1	Bar	2.0	2.0
P-30	HT Alarm Delay	00:00 – 99:00	01:00	mins/sec	05:00	05:00
P-31	HT HP Alarm	-3.4 - 180	0.1	Bar	38.0	38.0
P-32	HT LP Alarm	-3.4 - 180	0.1	Bar	24.0	24.0
P-33	HT LP Shut-down	-3.4 - 180	0.1	Bar	21.0	21.0
P-34	HT Low Alarm	00:00 – 99:00	01:00	mins/sec	00:00	00:00
P448	HT Fail	0 = Off, 1 = On	1	-	0	0
P-40	LT Target Pressure	-3.4 - 180	0.1	Bar	11.0	11.0
P474	LT External Target Pressure	-3.4 - 180	0.1	Bar	14.0	14.0
P-41	LT Target Pressure Above P-40	-3.4 - 180	0.1	Bar	0.5	0.5
P-42	LT Target Pressure Below P-40	-3.4 - 180	0.1	Bar	0.5	0.5
P-43	LT Starts/Hour	0 - 60	1	-	10	0
P-44	LT Run Smallest **	0 = Off, 1 = On	1	-	0	00:10
P-46	LT Inverter	0 = Off, 1 = On	1	-	0	00:10
P445	LT INV Minimum	0 - 100	1	%	0	0
P447	LT INV Maximum	0 - 100	1	%	100	0
P491	LT Gas Dump	0 = Off, 1 = On	1	-	0	100
P493	LT Gas diff	-3.4 - 180	0.1	Bar	2.0	0.5
P471	LT Always Run last	0 = Off, 1 = On	1	-	0	0
P496	LT Comp Unload	0 = Off, 1 = On	1	-	0	0



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P498	LT Equal	0 = Off, 1 = On	1	-	0	0
P-47	LT Response On Speed	1 – 60	1	-	5	5
P-48	LT Response Off Speed	1 – 60	1	-	5	5
P-49	LT Optimise Limit	-3.4 – 180	0.1	Bar	2.0	2.0
P-50	LT Alarm Delay	00:00 – 99:00	01:00	mins/sec	05:00	05:00
P-51	LT HP Alarm	-3.4 – 180	0.1	Bar	18.0	18.0
P-52	LT LP Alarm	-3.4 – 180	0.1	Bar	8.0	8.0
P-53	LT LP Shut-down	-3.4 – 180	0.1	Bar	6.0	6.0
P-35	LT Low Alarm	00:00 – 99:00	01:00	mins/sec	00:00	00:00
P449	LT Fail	0 = Off, 1 = On	1	-	0	0
P472	Run Proof	0 = Off, 1 = On	1	-	0	0
P-60	Status fault Delay	00:00 – 60:00	00:01	mins/sec	00:10	00:10
P-61	General Alarm Delay	00:00 – 60:00	00:01	mins/sec	00:10	00:10
P494	Dual Standby See: Standby Mode	0 = Off, 1 = On	1	-	1	1
P-55	HT/LT Interlock	0 = Off, 1 = On	1	-	1	1
P508	Gas Alarm Delay	00:00 – 60:00	00:01	mins/sec	01:00	01:00
P509	Gas Shut Delay	00:00 – 60:00	00:01	mins/sec	00:30	00:30
P511	Max Gas Temperature	-80.0 - 128.0	0.1	°C	38.0	38.0
P510	Gas Alarm Offset	-3.4 - 180	0.1	Bar	2.0	2.0
P500	Max Gas Pressure	-3.4 - 180	0.1	Bar	90.0	90.0
P501	Min Gas Pressure	-3.4 - 180	0.1	Bar	10.0	10.0
P502	Max Gas Setpoint	-3.4 - 180	0.1	Bar	85.0	85.0
P503	Min Gas Setpoint	-3.4 - 180	0.1	Bar	10.0	10.0
P506	Min Gas Inverter	0 – 100	1	%	0	0
P507	Max Gas Inverter	0 – 100	1	%	100	100
P505	Extra Capacity	0 = Off, 1 = N/O 2 = N/C	1	-	0	0
P504	Extra Gas Setpoint	-3.4 - 180	0.1	Bar	2.0	2.0
P515	Sub Cooling	-80.0 - 128.0	0.1	°C	2.0	2.0
P516	Gas Response On	1 – 60	1	-	5	5
P517	Gas Response Off	1 – 60	1	-	5	5
P518	Cooler Interlock	0 = Off, 1 = On	1	-	0	0
P520	Gas Fan Control	0 = Fixed, 1 = Ambient 2 = Ambient/Humidity	1	-	0	0
P521	Gas Fan Target	-3.4 - 180	0.1	Bar	50.0	50.0
P522	Gas Fan Offset	0.0 - 20.0	0.1	-	0.0	0.0
P523	Fan Response On	1 – 60	1	-	5	5
P524	Fan Response Off	1 – 60	1	-	5	5
P525	Max Fan Target	-80.0 - 128.0	0.1	°C	31	31
P526	Min Fan Target	-80.0 - 128.0	0.1	°C	21	21
P527	Fan Night Setback	0 = Off, 1 = On 2 = Local, 3 = Remote	1	-	0	0
P528	Fan Night Reduction	0 - 100	1	%	30	30
P529	Fan Night Setback On	00:00 – 23:59	00:01	hrs/min	20:00	20:00
P530	Fan Night Setback Off	00:00 – 23:59	00:01	hrs/min	08:00	08:00
P531	Fan Night Temperatur Limit	-80.0 - 128.0	0.1	°C	28.0	28.0
P532	Fan Day Reduction	0 - 100	1	%	0	0
P533	Fan Day Temperature Limit	-80.0 - 128.0	0.1	°C	28	28
P580	Receiver Control	0 = Off, 1 = On	1	-	1	1
P581	Receiver Target	-3.4 - 180	0.1	Bar	38.0	38.0
P582	Receiver Alarm Delay	00:00 – 60:00	00:01	mins/sec	01:00	01:00
P583	Receiver minPressure	-3.4 - 180	0.1	Bar	28.0	28.0
P584	Receiver Max Pressure	-3.4 - 180	0.1	Bar	42.0	42.0
P585	Receiver Interlock	0 = Off, 1 = On	1	-	1	1
P586	Receiver Response On	1 - 60	1	-	5	5
P587	Receiver Response Off	1 - 60	1	-	5	5
P588	Receiver Fail	0 - 100	1	-	10	10
P594	Superheat Low enable	0 = Off, 1 = On	0	-	0	0
P590	Superheat Low Target	-80.0 to 128.0	1	°C	4.0	4.0
P591	Superheat Low Diff	-80.0 to 128.0	1	°C	2.0	2.0
P595	Superheat High enable	0 = Off, 1 = On	0	-	0	0
P592	Superheat High Target	-80.0 to 128.0	1	°C	4.0	10.0
P593	Superheat High Diff	-80.0 to 128.0	1	°C	2.0	2.0



Ensure that all power is switched off before installing or maintaining this product

P-80	Status Fault 1	(0) Unused (1) Comp N/O. (2) Comp N/C (3) Gen N/O. (4) Gen N/C (5) Standby 1 N/O (6) Standby 1 N/C (7) Standby 2 N/O (8) Standby 2 N/C (9) Run 1 N/O. (10) Run 1 N/C (11) Run 2 N/O. (12) Run 2 N/C	1	-	0	0
↓	↓					
P-91	Status Fault 12					
P100 Fuzzy	HT Stage 1	(0) None, (1) Unused, (2) Compressor, (3) Loader, (5) Inverter (6) Trim (7) Comp Run	1	-	0	
↓	↓					
P111	HT Stage 12					
P120 Fuzzy	HT Stage 1 Size	0.0 – 60.0	0.1	-	0.0	
↓	↓					
P131	HT Stage 12 Size					
P140 Fuzzy	LT Stage 1	(0) None, (1) Unused, (2) Compressor, (3) Loader, (5) Inverter (6) Trim (7) Comp Run	1	-	0	
↓	↓					
P151	LT Stage 12					
P160 Fuzzy	LT Stage 1 Size	0.0 – 60.0	0.1	-	0.0	
↓	↓					
P171	LT Stage 12 Size					
P100 Staged	HT Stage 1 Relay 1	0 = Off 1 = On	1	-		0
↓	↓					
P111	HT Stage 1 Relay 12					
P112 Staged	HT Stage 2 Relay 1	0 = Off 1 = On	1			0
↓	↓					
P123	HT Stage 2 Relay 12					
P124 Staged	HT Stage 3 Relay 1	0 = Off 1 = On	1			0
↓	↓					
P135	HT Stage 3 Relay 12					
P136 Staged	HT Stage 4 Relay 1	0 = Off 1 = On	1			0
↓	↓					
P147	HT Stage 4 Relay 12					
P148 Staged	HT Stage 5 Relay 1	0 = Off 1 = On	1			0
↓	↓					
P159	HT Stage 5 Relay 12					
P160 Staged	HT Stage 6 Relay 1	0 = Off 1 = On	1			0
↓	↓					
P171	HT Stage 6 Relay 12					



Ensure that all power is switched off before installing or maintaining this product

P172 Staged ↓	HT Stage 7 Relay 1 ↓	0 = Off 1 = On	1	-		0
P183	HT Stage 7 Relay 12					
P184 Staged ↓	HT Stage 8 Relay 1 ↓	0 = Off 1 = On	1	-		0
P195	HT Stage 8 Relay 12					
P196 Staged ↓	HT Stage 9 Relay 1 ↓	0 = Off 1 = On	1	-		0
P207	HT Stage 9 Relay 12					
P208 Staged ↓	HT Stage 10 Relay 1 ↓	0 = Off 1 = On	1	-		0
P219	HT Stage 10 Relay 12					
P220 Staged ↓	HT Stage 11 Relay 1 ↓	0 = Off 1 = On	1	-		0
P231	HT Stage 11 Relay 12					
P232 Staged ↓	HT Stage 12 Relay 1 ↓	0 = Off 1 = On	1	-		0
P243	HT Stage 12 Relay 12					
P244 Staged ↓	LT Stage 1 Relay 1 ↓	0 = Off 1 = On	1	-		0
P255	LT Stage 1 Relay 12					
P256 Staged ↓	LT Stage 2 Relay 1 ↓	0 = Off 1 = On	1	-		0
P267	LT Stage 2 Relay 12					
P268 Staged ↓	LT Stage 3 Relay 1 ↓	0 = Off 1 = On	1	-		0
P279	LT Stage 3 Relay 12					
P280 Staged ↓	LT Stage 4 Relay 1 ↓	0 = Off 1 = On	1	-		0
P291	LT Stage 4 Relay 12					
P292 Staged ↓	LT Stage 5 Relay 1 ↓	0 = Off 1 = On	1	-		0
P303	LT Stage 5 Relay 12					



Ensure that all power is switched off before installing or maintaining this product

P-304 Staged ↓	LT Stage 6 Relay 1 ↓	0 = Off 1 = On	1	-		0
P315 ↓	LT Stage 6 Relay 12 ↓					
P316 Staged ↓	LT Stage 7 Relay 1 ↓	0 = Off 1 = On	1	-		0
P327 ↓	LT Stage 7 Relay 12 ↓					
P328 Staged ↓	LT Stage 8 Relay 1 ↓	0 = Off 1 = On	1	-		0
P339 ↓	LT Stage 8 Relay 12 ↓					
P340 Staged ↓	LT Stage 9 Relay 1 ↓	0 = Off 1 = On	1	-		0
P351 ↓	LT Stage 9 Relay 12 ↓					
P352 Staged ↓	LT Stage 10 Relay 1 ↓	0 = Off 1 = On	1	-		0
P363 ↓	LT Stage 10 Relay 12 ↓					
P364 Staged ↓	LT Stage 11 Relay 1 ↓	0 = Off 1 = On	1	-		0
P375 ↓	LT Stage 11 Relay 12 ↓					
P376 Staged ↓	LT Stage 12 Relay 1 ↓	0 = Off 1 = On	1	-		0
P387 ↓	LT Stage 12 Relay 12 ↓					
dFLt	Restore Default Settings (Front panel Only)					

* Span and Offset allows for the full range of the transducer to be used by the controller.
 Span is the full range of the transducer
 Offset is the value below zero.
 Note. The controller uses absolute pressure; if gauge pressure is required, add +1 Bar to the offset value.

Example Transducer: -1 bar to 59 bar
 Span would be 60 bar
 Offset would be -1 bar
 Transducer would read -1 Bar to 59 Bar

Run smallest = on: - When all compressors are off (because the target pressure has been satisfied) the controller, when the pressure rises, will always turn on the smallest compressor after the variable output has reached 100%. If the ASC timer is running for the smallest compressor, the controller will **NOT bring on any other available compressors, the variable output will remain at 100% and the controller will wait until the ASC Timer has elapsed and then turn on the smallest. Please note that this is true for **any** pressure condition.



Ensure that all power is switched off before installing or maintaining this product

Parameter Description:

Number	Parameter	Description
P-01/03/05/07	Transducer 1/2/3/4 Span	Range of the transducers
P-02/04/06/08	Transducer 1/2/3/4 Offset	Transducer value below zero.
P-20/40	Target Pressure	Pressure target, control will try to maintain this pressure P-20 = HT Target : P-40 = LT Target See : HT/LT Interlock
P473/474	External Target Pressure	Pressure target when Sect1 Run/Sect2 Run is off. Control will try to maintain this pressure until Sect1 Run/Sect2 Run is on. At this point P-20/40 used. Please see Status Inputs
P-21/41	Target Pressure Above P-20/40	Set-point above the target, used to obtain a "dead-band"
P-22/42	Target Pressure Below P-20/40	Set-point below the target, used to obtain a "dead-band"
P-23/43Stg	Number of Stages	Number of stages in the system
P-23/43Fzy	Starts per hour	Limits a compressor to this many starts per hour
P-24/44Fzy	Run smallest	See explanation under the parameter tables for this parameter Run Smallest
P-24/44Stg	Stage-on Delay	Delay time between stages on (Staged types only)
P-25/45Stg	Stage-off Delay	Delay time between stages off (Staged types only)
P-26/46	Inverter	Enables the inverter analogue output and associated relay.
P444/445	Inverter Min	The minimum percentage the inverter will operate to
P446/447	Inverter Max	The maximum percentage the inverter will operate to
P490/491	HT/LT Gas Dump	Enables Gas Dump feature.
P492/493	HT/LT Gas Diff	Diff below the set point that the Gas Dump valve is opened. See Gas Dump
P470/471	Always run last	Keeps the last stage running except for a Low Shutdown condition. If the last stage is an inverter, the inverter enable will stay energised, and the inverter analogue output will ramp down to Inverter Min % (P444/445)
P495/496	HT/LT Compressor Unload	Selects the order the compressor loaders are switched off See: Compressor Loaders
P497/498	HT/LT Equal	Equalises compressor run times. See: Equal Run Times
P-27/47	Response On Speed	Allows the user to speed up/slow down the stage on speed (Option: - 1 to 60 with 60 being fastest response) Note: This parameter applies to the inverter output only when using any of the Staged types.
P-28/48	Response Off Speed	Allows the user to speed up/slow down the stage off speed (Option: - 1 to 60 with 60 being fastest response) Note: This parameter applies to the inverter output only when using any of the Staged types.
P-29/49	Optimise Limit	This is an offset that is added to the target pressure when using the Data Manager Energy feature Pack Optimisation. For example if target pressure is 2.1 Bar and Optimise Limit set to 0.5 Bar. The remote optimise command will only be able to optimise the current suction setpoint up to a maximum of 2.6 Bar
P-30/50	Alarm Delay	Delay before HP and LP alarms are signalled
P-31/51	HP Alarm	HP alarm set-point
P-32/52	LP Alarm	LP alarm set-point, stage off when reached
P-33/53	LP Shut-down	LP shut-down set-point, all stages go off when this is reached
P-34/35	Low Alarm	Delay applied before LP Shutdown alarm is generated. Note as soon as the LP Shutdown setpoint is reached any Compressor stages, for the associated section, still operating will go off immediately and does not wait for the LP Shutdown alarm to be generated.
P448/449	HT / LT Fail	The following will occur in the event of pressure transducer fault on HT or LT : If set to On then all Compressors will turn On in the event of a transducer failure. If set to Off then all Compressors will turn Off in the event of a transducer failure.
P472	Run Proof	See section Run-Proof
P-60	Status fault Delay	Time delay before status faults are activated
P-61	General Alarm Delay	Time delay before general faults are activated
P494	Dual Standby	Used to place two sections into Standby from one Standby status input. (Note "Std 1 N/O or Std 1 N/C must be utilised when using this feature) See Note Standby Mode
P-55	HT/LT Interlock	Turns on the interlock between HT and LT Packs. See: HT/LT Interlock
P508	Gas Alarm Delay	Delay applied before Gas Cooler OT/Gas Cooler LP Open/Gas Cooler HP Open alarms are generated



Ensure that all power is switched off before installing or maintaining this product

P509	Gas Shut Delay	Delay applied before Gas Cooler LP Shutdown/Gas Cooler HP Shutdown alarms are generated
P511	Max Gas Temperature	Set point at which Gas Cooler OT alarm is generated, after delay P508
P510	Gas Alarm Offset	Offset below Min Gas Pressure P501 that Gas Cooler LP Shutdown alarm is generated
P500	Max Gas Pressure	Set point at which Gas Cooler HP Open alarm is generated after delay P508
P501	Min Gas Pressure	Set point at which Gas Cooler LP Open alarm is generated after delay P508
P502	Max Gas Setpoint	Upper limit of the calculated Gas cooler Set point
P503	Min Gas Setpoint	Lower limit of the calculated Gas cooler Set point
P506	Min Gas Inverter	Minimum value that the Gas Cooler Output will go to
P507	Max Gas Inverter	Maximum value that the Gas Cooler Output will go to
P505	Extra Capacity	Enables the Cooler Set Point to be raised by amount P504 See : Extra Refrigeration Capacity
P504	Extra Gas Setpoint	Amount Gas Cooler Set Point is raised by if P505 is enabled
P515	Subcooling	The amount of sub cooling trying to be maintained
P516	Gas Response On	Allows the user to speed up/slow down the Gas Cooler output (Option: - 1 to 60 with 60 being fastest response)
P517	Gas Response Off	Allows the user to speed up/slow down the Gas Cooler output (Option: - 1 to 60 with 60 being fastest response)
P518	Cooler Interlock	Enables interlock between Pack and Gas Cooler Output See : Cooler Interlock
P520	Gas Fan Control	Selects between Fixed, Ambient or Ambient/Humidity for Fan Temp SP Fixed uses the set point parameter P521 as its target Ambient uses the Cooler Ambient Temperature Probe + P522 Value Ambient/Humidity uses Apparent Ambient Temperature + P522 Value See: Gas Fan Control
P521	Gas Fan Target (Bar)	Set Point used for Gas Fan Output if "Fixed" selected at P520
P522	Gas Fan Offset	Used to set a Gas Cooler differential, which is added to the value of Gas Cooler Temperature to produce a floating Gas Fan Set Point If "Ambient or Ambient/Humidity" selected at P520 See: Gas Fan Control
P523	Fan Response On	Allows the user to speed up/slow down the Gas Fans (Option: - 1 to 60 with 60 being fastest response)
P524	Fan Response Off	Allows the user to speed up/slow down the Gas Fans (Option: - 1 to 60 with 60 being fastest response)
P525	Max Fan Target	Stops the floating Gas Fan Set Point going above this level
P526	Min Fan Target	Stops the floating Gas Fan Set Point going below this level
P527	Fan Night Setback	Turns on the night set back level. There are 4 options: - Off: Night Feature is not used. Controller uses what is set in Day Reduction. (P532) On: Night Reduction (Parameter P528) is always used Local: Uses times in Fan Night Setback On and Fan Night Setback Off parameters (P529/P530) to determine Day / Night Remote: Uses GP Timer to determine Day / Night Set up a Gp Timer channel with Output Type set to General. Output mask is the controller name as it appears in the device list. For Output channel number you would count down from 1 st output (Relay 1) starting at 0, 1, 2 etc till you get to output for Fan Night Setback. Tick the Invert box so the night setback is on when channel is off.
P528	Fan Night Reduction	Reduces inverter output by this amount during night settings.
P529	Fan Night Setback On	Time for the night set back feature to operate
P530	Fan Night Setback Off	Time for the night set back feature to go off
P531	Fan Night Temperature Limit	Temperature set-point to disable the night set back feature. Night set back is disabled above this level and enabled below it.
P532	Fan Day Reduction	Reduces the inverter output by this amount when the timer is not in its night zone.
P533	Fan Day Temperature Limit	Temperature set-point to disable the day reduction feature. Day reduction is disabled above this level and enabled below it.
P580	Receiver Control	Enables/Disables the Receiver Bypass Valve operation
P581	Receiver Target	Set Point at which the Receiver Bypass Valve will open and close (Fixed 0.5 Bar diff above and below with dead band)
P582	Receiver Alarm Delay	Delay applied before the Receiver Low or High Pressure alarm is generated.



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P583	Receiver minPressure	Setting at which Receiver Low Pressure alarm is generated
P584	Receiver Max Pressure	Setting at which Receiver High Pressure alarm is generated
P585	Receiver Interlock	If enabled : If Receiver Pressure drops below Receiver Minimum Pressure set point Gas Cooler Output Valve opens to 100%
P586	Receiver Response On	Allows the user to speed up/slow down the Receiver Bypass (Option: - 1 to 60 with 60 being fastest response)
P587	Receiver Response Off	Allows the user to speed up/slow down the Receiver Bypass Valve (Option: - 1 to 60 with 60 being fastest response)
P588	Receiver Fail	Value the receiver VSD output will go to if receiver transducer fails
P594	Superheat Low enable	Enables Superheat Low and allocates a relay to come on if superheat goes below the set point and go off if above set point + diff. See: Superheat
P590	Superheat Low Target	If the superheat falls below this value the "Superheat Low Relay " will come On See: Superheat
P591	Superheat Low Diff	The diff above P590 that the "Superheat Low Relay" will go Off
P595	Superheat High enable	Enables Superheat High and allocates a relay to come on if superheat goes above the set point and go off if below set point – diff. See: Superheat
P592	Superheat High Target	If the superheat falls below this value the "Superheat High Relay " will come On See: Superheat
P593	Superheat High Diff	The diff above P590 that the "Superheat High Relay" will go Off
P-80	Status Fault 1	Used to select the type of input required See : Status Inputs
↓	↓	
P-91	Status Fault 12	
P100/140 Fuzzy	Stage 1	Select the output device for this stage See : Section Stages
↓	↓	
111/151	Stage 12	
P120/160 Fuzzy	Stage 1 Size	Sets the relative size for each compressor
↓	↓	
P131/171	Stage 12 Size	
P100	Stage 1 Relay 1 to 12	Maps compressor relays to stages
Parameters for Staged type	↓	
P387	Stage 12 Relay 1 to 12	

HT/LT Interlock

The LT Pack cannot run unless there is an HT Compressor running or HT Variable Speed Drive enabled and at some percentage open. Therefore if the last HT compressor goes off due to HT pressure being maintained, then any LT compressors running at that time will go off with the last HT compressor or when the HT Variable speed drive goes to 0%

HT Pack Fail

If the HT Pack Transducer fails. Both HT and LT compressors will go off. The Gas Cooler State will go to "Pack Fault" and everything will shut down.

Gas Dump

HT/LT Gas Dump Enable (P-490/491). In Fuzzy pack control the Gas dump relay will come on when the HT/LT Suction Pressure drops below the Set Point (P-20/40) minus the Gas Diff (P-492/493) and all but the last compressor has turned off.

When an Inverter output is configured using Fuzzy pack control the Gas dump relay will come on only when the Inverter is active, i.e. above 0% and all other Compressors configured in that section are off.

With Staged pack control the Gas Dump relay will come on only when last compressor is running.

The Gas dump relay will go off again when: -

The pressure rises above the Set Point (P-20/40)

Or

When the last stage compressor goes off, or Inverter Enable is turned off.



Ensure that all power is switched off before installing or maintaining this product

Compressor Loaders

Parameters P495/496 determine the order the compressor loaders are switched off, giving the option to turn off one compressor and its loaders before turning off the next or to switch off all the loaders first leaving compressors running unloaded.

If P495/496 set for 0 (Off) then a compressor loaders and compressor body will be switched off before another loader is switched off.

If P495/496 set for 1 (On) then all loaders will be switched off before a compressor body will be switched off leaving any compressors running unloaded before switching a compressor body off.

Example 1 (Type 1 Fuzzy)

Pack set up: 2 compressors with 2 Loaders each

Sect 1 stage 1 = Comp.	Sect 1 stage 2 = Loader.	Sect 1 stage 3 = Loader.
Sect 1 stage 4 = Comp.	Sect 1 stage 5 = Loader.	Sect 1 stage 6 = Loader.

Parameter P495 = 0 (Off)

Switching On sequence: Pressure above set point + diff

First compressor comes on. Compressor loader 1 comes on. Compressor loader 2 comes on.
Second compressor comes on. Compressor loader 1 comes on. Compressor loader 2 comes on.

Switching Off sequence: Pressure below set point – diff

One compressor loader 2 goes off. Compressor loader 1 goes off. Compressor body goes off.
Next compressor loader 2 goes off. Compressor loader 1 goes off. Compressor body goes off.

This configuration switches off one compressor and its loaders before switching off the next compressor loader. Thus leaving one compressor fully loaded till first one is completely off.

Example 2 (Type 1 Fuzzy)

Pack set up: 2 compressors with 2 Loaders each

Sect 1 stage 1 = Comp.	Sect 1 stage 2 = Loader.	Sect 1 stage 3 = Loader.
Sect 1 stage 4 = Comp.	Sect 1 stage 5 = Loader.	Sect 1 stage 6 = Loader.

Parameter P495 = 1 (On)

Switching On sequence: Pressure above set point + diff

First compressor comes on. First compressor loader 1 comes on. First compressor loader 2 comes on.
Second compressor comes on. Second compressor loader 1 comes on. Second compressor loader 2 comes on.

Switching Off sequence: Pressure below set point – diff

One compressor loader 2 goes off. Compressor loader 1 goes off.
Next compressor loader 2 goes off. Compressor loader 1 goes off.
One compressor body goes off. Next compressor goes off.

This configuration switches off all loaders before switching off a compressor. Thus leaving both compressors running unloaded before switching one completely off.

NOTE: If using an Inverter with loaders

The Inverter and its loader/s will always be the last to go off.

Equal Run Times

With parameters P496/498 Set to 1 (On) the controller will bring on the compressors in a way that the running times are as near equal as possible.

If the pressure is above set point the next compressor that comes on will be the compressor that has been running for the least amount of time.

If the pressure is below set point the next compressor to go off will be the one that has been running the longest.

This configuration will try to make each compressors run hours equal.

Run-Proof

This is a “global” parameter if set to on the Status fault inputs are used to prove that compressors are running. Configure the status inputs, using either Compressor Normally Closed or Compressor Normally Open, that correspond with each relay output. When the relay output is energised and the run proof signal isn't returned within the specified time period, then the compressor relay will go off and be taken out of the control strategy until the run proof has been reset. The run-proof feature uses the status fault delay (P-60) and all run proof signals must be returned within this delay period. Run proofs are used with compressor (Comp) stages only. This feature can be used in both Fuzzy and Staged applications.



Ensure that all power is switched off before installing or maintaining this product

To reset the run proof for any stage, after maintenance, and return a compressor back into the control strategy use the menu item [Override](#). The override option is used to manually turn on the compressor output. If the proof signal is returned within the allotted time delay the compressor is allocated back into the control strategy; if the proof isn't returned the compressor relay will go off and remain out of the control strategy.

Alternatively the alarm can be cleared remotely by changing parameter P472 from 1 to 0 (On to Off). This clears **all** run proof alarms on **all** compressors which are currently out of the control logic due to run proof feature. Now change P472 from 0 to 1 (Off to On). The compressor(s) will then be available for selection by the control logic. If the compressor is selected by the control strategy and the run proof signal is then not returned within the allotted time delay then it will fail and will be removed from the control logic again.

Standby Mode

Once in standby all configured stages are turned off and a standby alarm is generated for the given section. The delay applied before a section enters standby is determined by the General Alarm Delay (P-61). Once this delay expires the controller enters standby and a standby alarm is also generated for the relevant section.

HT and LT can be placed into standby independently from two separate status inputs or both sections can be placed into standby at the same time from a single status input. P494 determines the Standby configuration.

P494 set to 1 = On

Controller uses one status input to place both HT and LT into standby. Parameters P-80 to P-91 (Option 7 Std 1 N/O or Option 8 Std 1 N/C) are used to place both Ht and LT into standby from a single status input

P494 set 0 = Off

Controller uses two independent status inputs to place HT and LT into standby independently. Controller uses P-80 to P-91 (Option 7 Std 1 N/O or 8 Std 1 N/C) to put HT into standby. Controller uses P-80 to P-91 (Option 9 Std 2 N/O or 10 Std 2 N/C) to put LT into standby

Gas Cooler states

Gas Cooler Pressure	High	HP Shutdown	:	Gas cooler Pressure above P500 (Max Gas Pressure) + P510 (Gas Alarm Offset) for P509 (Gas Shut Delay)
	↑	Supercritical	:	Gas Cooler Pressure above P500 (Maximum Gas Pressure) (110 Bar)
		Transcritical	:	Gas Cooler Temperature above 31.1 Degrees (Fixed setting)
		Subcritical	:	Gas Cooler Pressure Normal (Uses P521 or floating to control fans)
		Triple	:	Gas Cooler Pressure below P501 (Minimum Gas Pressure)
	↓	LP Shutdown	:	Gas Cooler Pressure below P501 (Min Gas Pressure) – P510 (Gas Alarm Offset) for P509 Gas Shut Delay)
Low				

Shutdown (HP)

As the Gas Cooler Pressure rises by the "Gas Alarm Offset" P510 above "Max Gas Press" P500 for "Gas Shut Delay" P509 The Control State will go to "Shutdown"

HT and LT Packs will go off immediately and Pack Control States will go to "Cooler Flt"

Gas Cooler Output Valve will close.

Gas Cooler Fans will go Off.

Transcritical Relay will be Off

A "Gas Cooler HP Shutdown" Alarm will be generated.

Note: Once normal pressure has been maintained the controller needs a power reset to regain control.

Supercritical

As the Gas Cooler Pressure rises above Max Gas Press (P500) for Gas Alarm Delay (P508)

The Control State will go to "Supercritical"

HT and LT Packs will operate as normal.

Gas Cooler output will be Open.

Gas Cooler Fan will be On.

Transcritical Relay will be On

A "Gas Cooler HP Open" alarm will be generated.

Receiver Output will operate as normal



Ensure that all power is switched off before installing or maintaining this product

Transcritical

If the Gas Cooler Temperature goes above 31.1 Degrees C
The Transcritical Relay will come on.
The Gas Cooler Control State will go to "Transcritical"
HT and LT Packs operate as normal
Gas Cooler output will operate to maximum Gas Cooler Set Point
Gas Cooler Fan will ramp up to 100% regardless of pressure
Receiver Output and Aux Comp operate as normal

Subcritical

As the Gas Cooler pressure (Which gives the Gas cooler Calculated Temperature) is between the parameter Min Gas Press setting P501 and Max Gas Press Setting P500
The Transcritical Relay will be Off
The control state will be "Subcritical"
HT and LT Packs and Gas Cooler Fans operate as normal Packs, with compressors going on and off with suction pressures and Gas Cooler Fan going On and Off with Gas Cooler pressure going above and below Gas Fan SP (P521 Fixed) or (Calculated from Gas Cooler Temp. Floating). Gas Cooler Output Valve goes on and off as Gas Cooler pressure rises above Gas Cooler SP
Receiver Output and

Triple

As the Gas Cooler Pressure falls below "Min Gas Press" setting (P501) for "Gas Alarm Delay" (P508)
The Gas Cooler State will go to "Triple" A "Gas Cooler LP Open" alarm will be generated.
HT and LT Packs will operate as normal.
The Gas Cooler Fan will be Off
The Transcritical relay will be Off
Note : The Gas Cooler Output will Open.

Shutdown (LP)

As the Gas Cooler Pressure falls below the "Gas Alarm Offset" setting P510 below "Min Gas Press" setting P501 for "Gas Shut Delay" P509. The Control State will go to "Shutdown" A "Gas Cooler LP Shutdown" Alarm will be generated.
HT and LT Packs will go off immediately and Pack Control States will go to "Cooler Flt"
The Gas Cooler Fan will be Off
Gas Cooler will close.
Receiver Output goes off
Note : The Transcritical relay will be Off
Note : Once normal pressure has been maintained the controller needs a power reset to regain control

Pack Fault

If the HT Pack Transducer fails the following occurs:

All compressors will go off
All Gas Cooler Outputs that are on will go off and any that are off will stay off

Gas Cooler Valve

The Gas Cooler Valve is used to feed liquid into the Liquid Receiver. The temperature of the gas cooler output is used to determine whether the system is in subcritical or transcritical state.

Gas Cooler Pressure Set Point

The Gas Cooler Temperature is measured in the Liquid Line and converted to a pressure. A combination of this pressure along with the Gas Cooler Pressure (Measured in the Liquid Line) is used to calculate the set point for the Gas Cooler Output Valve
If the Gas Cooler Pressure rises above this set point the Gas Cooler Valve will open

Gas Cooler Calculated Temperature

The Gas Cooler Pressure is measured in the liquid line and converted to a temperature.

Extra Refrigeration Capacity

This function improves the system's refrigeration capacity by increasing the pressure in the gas cooler
The function is activated by setting parameter (P505) to "1" (N/O) or "2" (N/C) and activating status input.
The Gas Cooler Pressure Setpoint is increased by the amount set in parameter (P504)



Ensure that all power is switched off before installing or maintaining this product

NOTE: The first Unused Status Input automatically becomes the Extra Capacity Input
See : [Gas Cooler Pressure Setpoint](#)

Cooler Interlock

With Cooler Interlock (P518) set to On
If all HT compressors go off the Gas Cooler Valve goes off with the last compressor.

Note: If the Cooler Interlock and Receiver Interlock are both set to On the Cooler Interlock takes priority and will override the Receiver Interlock

Receiver Interlock

With "Receiver Interlock" (P535) set to on
To prevent the Receiver Pressure from getting too low, a minimum value is set "Receiver Minimum Pressure" (P-533)
If Receiver Pressure drops below this set point the Gas Cooler Output Valve will open.

Note: If the Cooler Interlock and Receiver Interlock are both set to On the Cooler Interlock takes priority and will override the Receiver Interlock

Receiver/Separator Bypass Valve

Receiver/Separator Bypass Valve

Receiver Control (P530): To enable or disable Receiver Control.

With "Receiver Control" (P530) set to "Off"
Receiver Pressure Input is disabled and the Receiver Output and Auxiliary Outputs are disabled and will not come on

With "Receiver Control" (P530) set to "on".
As the Receiver Pressure rises above the "Receiver Target" setting (P531) the "Receiver Bypass Valve " will open.

Gas Fan Control

Fixed

If P520 is set for Fixed (0), the Gas Fans will come on when the Gas Cooler pressure rises above the target P521 and go off when the Gas Cooler Pressure falls below the target P521 (Using fuzzy logic and response on and off speed using parameters P523/524)
Note : Parameter P522 (Gas Fan Offset) has no effect when Fixed is selected

Ambient

With P520 is set for Ambient (1).
The Target for the Gas Fan SP is calculated using the Gas Cooler Temperature Probe plus any offset set in parameter P522 (Gas Fan Offset) converted to a pressure. This converted pressure replaces the "Gas Fan Target" set point (P521)

Note : If the Gas calculated Temperature (Calculated from the Gas Cooler Pressure) rises above 33 degrees the Gas Cooler Fans will come on regardless of the Gas Cooler Pressure. Note that the calculation for 33 degrees is using pressure measured in gauge. If using absolute the temperature at which the fans would come on would be 31 degrees.

Ambient/Humidity

With P520 is set for Ambient/Humidity (2).
The Target for the Gas Fan SP is calculated using the Apparent Ambient Temperature (Calculated from the Humidity and the Cooler Ambient Temperature) plus any offset set in parameter P522 (Gas Fan Offset) converted to a pressure. This converted pressure replaces the "Gas Fan Target" set point (P521) Humidity is sent from TDB Program

Apparent Temperature

Apparent Temperature (AT) is an adjustment to the ambient temperature based on the level of humidity (Heat Index)
See table: [Apparent Temperature Heat Index](#)

Superheat

Parameters 594 and 595 enable superheat and allocates relays for superheat low and superheat high monitoring

The Superheat is calculated from the Evaporator Temperature (Calculated from the HT Suction Pressure) and the Suction Line Probe Temperature.

If the Superheat falls below Superheat Low Target Parameter (P590) then the Superheat Low Relay will come on.
When the Superheat rises above the Superheat Low Target (P590) by the diff parameter (P591) the Superheat Low Relay goes off.
If the Superheat rises above Superheat High Target Parameter (P592) then the Superheat High Relay will come on.
When the Superheat falls below the Superheat Low Target (P592) by the diff parameter (P593) the Superheat Low Relay goes off.



Ensure that all power is switched off before installing or maintaining this product

Setup via a PC

Log on to the RDM web site and go to Support -> Software.

Download the following folder: - Plant Controller USB drivers for Windows XP/2000. Contained within this folder are installation instructions and the drivers required to connect to the Intuitive Plant controller. A USB cable is required which connects to a Type A USB connector (PC) at one end and a Type B USB connector at the other end (Plant USB Device port).

Plant Controller home page



The screenshot shows the 'Intuitive Controller' web interface. On the left is a login panel with fields for 'Name' and 'Pass', a 'Login' button, and a timestamp '12:05 17/08/2011'. The main area contains a data table with three columns: 'Input', 'Output', and 'State'. Each column has sub-columns for 'Value' and 'Unit'.

Input	Value	Unit	Output	Value	Unit	State	Value	Unit
HT Suction Press	31.1	bar	Relay 1	On		HT State	Normal	
LT Suction Press	9.1	bar	Relay 2	On		LT State	Normal	
Gas Cooler Press	39.2	bar	Relay 3	Off		Gas Cooler State	SubCrit	
Gas Calc Temp	5.2	°C	Relay 4	Off				
Gas Cooler Temp	9.3	°C	Relay 5	Off				
Cooler Ambient	8.7	°C	Relay 6	On				
Cooler Air On	24.8	°C	Relay 7	Off				
Cooler Air Off	8.8	°C	Relay 8	On				
Recv Press	33.0	bar	Relay 9	Off				
Suction Temp	9.6	°C	Relay 10	Off				
Probe 6	14.0	°C	Relay 11	Off				
Probe 7	26.6	°C	Relay 12	Off				
Probe 8	-1.3	°C	HT Var Output	100	%			
Status 1	Unused		LT Var Output	7	%			
Status 2	Unused		HT Gas Dump	Off				
Status 3	Unused		LT Gas Dump	Off				
Status 4	Unused		Optimise 1	0.0	bar			
Status 5	Unused		Optimise 2	0.0	bar			
Status 6	Unused		Gas Cooler SP	46.8	bar			
Status 7	Unused		Gas Cooler Out	0	%			
Status 8	Unused		Transcritical	Off				
Status 9	Unused		Fan Press SP	57.5	bar			
			Fan Temp SP	21.0	°C			
			Fan Out	0	%			
			Fan Inv	Off				
			Recv Out	0	%			
			Recv Inv	Off				

Setup

Log in using an appropriate username and password; setup operations can then be used via the PC by clicking on the appropriate link: -

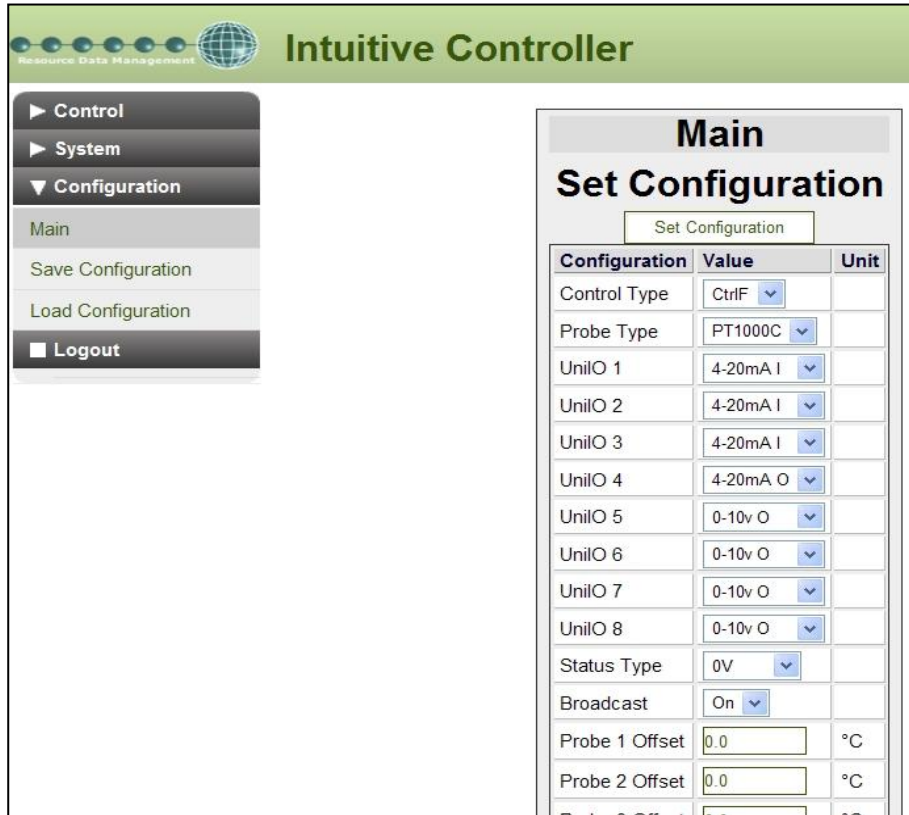
Link	Operation
Control	
Values	Shows the values being returned on the controllers inputs and outputs
Settings	Shows the controllers parameter settings
Alarm Log	Shows the controllers alarm history; up to 1000 alarms are stored
Graph	Shows the controller values in graphical format
Set Parameters	Allows the user to change parameter values; see Set Parameters
System	
System Log	Shows the changes made to the controller in chronological order
Network	Allows the user to setup: - IP Address Netmask Gateway
Time	Allows the user to set the Time or synchronise with the PC
Reset	Allows the user to reset the controller
Export Log	Creates a log file of the controllers data for downloading onto a PC
Clear Alarm Log	Clears the controller alarm log completely (Yes/No choice)
Version	Shows the controllers software version
Upgrade	Allows software to be upgraded
Configuration	
Main	Allows the user to change the controller configuration on the main controller ; See : changing configuration
Save Configuration	Saves the current Configuration
Load Configuration	Allows the user to upload a pre-configuration (a stand-alone PC program is available to create Plant controller configuration files. Contact RDM for details)



Ensure that all power is switched off before installing or maintaining this product

Change Configuration (PC)

This page allows the user to change the configuration of the Main Pack Controller: - 1 example as follows :-



Configuration	Value	Unit
Control Type	CtrlF	
Probe Type	PT1000C	
UnilO 1	4-20mA I	
UnilO 2	4-20mA I	
UnilO 3	4-20mA I	
UnilO 4	4-20mA O	
UnilO 5	0-10v O	
UnilO 6	0-10v O	
UnilO 7	0-10v O	
UnilO 8	0-10v O	
Status Type	0V	
Broadcast	On	
Probe 1 Offset	0.0	°C
Probe 2 Offset	0.0	°C

Change Parameters (PC)



Parameter	Value	Unit
Trans1 Span	60.0	bar
Trans1 Offset	-1.0	bar
Trans2 Span	60.0	bar
Trans2 Offset	-1.0	bar
Trans3 Span	160.0	bar
Trans3 Offset	-1.0	bar
Trans4 Span	60.0	bar
Trans4 Offset	-1.0	bar
HT Trgt	27.0	bar
HT Ext Trgt	31.0	bar
HT Trgt Above	0.5	bar
HT Trgt Below	0.5	bar
HT Sts/Hr	10	
HT Run Small	Off	
HT Inv	On	



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Configuration of inputs and outputs:

Status Inputs:

Section Inputs can be set up as: -

No.	Input	Description
0	Unused	Input is not used
1	Compressor Normally Open	When selected "Make" to generate a Compressor Fault
2	Compressor Normally Closed	When selected "Break" to generate a Compressor Fault
3	General Normally Open	When selected "Make" to generate a General Fault
4	General Normally Closed	When selected "Break" to generate a General Fault
5	Standby 1 Normally Open	When selected "Make" to place HT into standby and generate Standby alarm.
6	Standby 1 Normally Closed	When selected "Break" to place HT into standby and generate Standby alarm.
7	Standby 2 Normally Open	When selected "Make" to place LT into standby and generate Standby alarm.
8	Standby 2 Normally Closed	When selected "Break" to place LT into standby and generate Standby alarm.
9	Run 1 Normally Open	When selected "Break" to use HT Ext Target (P473) OR "Rem Ext 1" See note : Ext Target
10	Run 1 Normally Closed	When selected "Make" input to use HT Ext Target (P473) OR "Rem Ext 1" See note : Ext Target
11	Run 2 Normally Open	When selected "Break" input to use LT Ext Target (P474) OR "Rem Ext 2" See Note : Ext Target
12	Run 2 Normally Closed	When selected "Make" input to use LT Ext Target (P474) OR "Rem Ext 2" See note : Ext Target

For the above any alarms will be generated after the Status Fault Delay (P-60) has timed out. Note Standby Alarm follows the General Fault Delay (P-60)

NOTE: The first Unused Status Input automatically becomes the Extra Capacity Input

Ext Target

HT/LT Pack Controller

To use HT/LT Ext Target (P473/474) instead of HT/LT Target Pressure (P-20/40)

A Status Input must be set to "Run 1 N/O or N/C" for HT Pack Ext Target.

A Status Input must be set to "Run 2 N/O or N/C" for LT Pack Ext Target.

When input is activated the Target Pressure will change from (P-20/40) to (P473/474)

When input is de-activated the Target Pressure will revert back to (P-20/40)

Section Stages

Stage	Description	Notes
None	Use this option to end the number of stages in the controller	See note 7
Unused	Use this option to skip a relay output within a stage	
Comp	Use this option to assign a relay output to a compressor	See note 5
Loader	Use this option to assign a relay output to a compressor loader	
Inverter	Use this option to assign a relay to an Inverter	
Trim	Use this option to set a relay to a trim compressor	See note 6
Comp Run	Use this option to set a relay as a separate compressor used only when other compressors are running	See note 8

Note 5: In the configuration, at least 1 output must be assigned to a compressor. Loader outputs will not energise without a compressor being on. When assigning stages a Loader should follow the Compressor on which it is mounted.

Note 6: This option can be used to delay the onset of the inverter output, all outputs selected as "Trim" will come on before the Inverter output energises. Once all the trim stages are on the inverter enable relay would be energised and the inverter analogue output would begin to ramp up. The trim stages would remain on until all other stages and the inverter are turned off.

Note 8: This option is used to bring on a separate compressor. This output is active when any of the other defined compressors (Comp stages) are running. This output is off when the last compressor in its section is turned off. Note if only the inverter output is configured and no other Comp stages then the Comp Run is active when the inverter output is active.

Alarm Relay

Note 7: The alarm relay is assigned automatically to the first free relay that has been assigned "None" in the stage programming. At first power on this is likely to be relay 1, until programming of the output stage is complete. The relay is energised with no alarm and de-energised when in alarm.



Ensure that all power is switched off before installing or maintaining this product

Stage Sizes

Stage sizes will determine the order in which compressors or loaders are switched on and off. This is a relative number between 0 and 60, reflecting the size of the compressor (usually horse power)
The default stage size is 0; stage sizes must be entered for correct operation.

Operation (Fuzzy)

Once the controller has been set-up and configured, normal operation will resume. If the appropriate Type has been selected the controller will operate using a "fuzzy logic" based control algorithm. The controller will determine the stages to bring on and off using the fuzzy logic rules and adhering to the starts/hr criteria. The response time for devices switching on and off can be varied by adjusting the response on and response off parameters (1 is the slowest response, 60 is the quickest). The fuzzy logic will attempt to optimise the compressor starts and keep them at a minimum. Before a compressor is switched on, Relay 1 will energise and the variable output will ramp to 100%, when it reaches this point, the fixed device (compressor or loader) ; will switch on and the variable output will begin its cycle again starting from 0%. When demand is satisfied, and all compressor relays are off, the variable output ramps down 0%, if demand is still satisfied, the enable relay de-energises.

Operation (Staged)

Staged operation requires the output relays to be "mapped" to a particular stage. Each stage (there are 12 stages) has to have at least 1 relay assigned for the controller to operate correctly. More than one relay can be assigned to stages in a given section and the same relay can be used in multiple stages. Note a relay cannot be assigned in both HT and LT. As the pressure rises above the target setpoint, plus the target above value, the controller will enter Stage 1 after the stage on delay has expired. At this point any relay assigned in Stage 1 will come on and the stage on delay timer will be reset. If the pressure remains above the setpoint, plus the target above value, and the stage on delay has expired for a second time the controller will enter stage 2. At this point any relay assigned in Stage 2 will come on. Note if a relay has been assigned in Stage 1 but not used in Stage 2 then it will go off at this point. The reverse occurs when the pressure falls below the setpoint plus the target below value. The controller will step down the stages using the stage off delay (P-08) until all stages are off.

When using a variable output as the pressure rises above target setpoint, plus target above, the variable speed output will ramp up from 0% to 100% without following the stage on delay. If the pressure stays above the target setpoint and the variable output is at 100% and the stage on delay has timed out then the controller will enter Stage 1. At this point the variable output will reset to 0% and start ramping up again towards 100%. If the pressure stays above the target setpoint and the variable output is at 100% and the stage on delay has timed out then the controller will enter Stage 2. As the pressure drops below the setpoint, minus the target below, the variable output will ramp from 100% down to 0%, once the stage off delay expires the controller will stage down. Note if the variable output reaches 100% and the stage on delay has not expired the output will remain at 100% until the stage on delay has expired.

For example : HT Pack has 4 Compressors the following could be set: -

HT Stg1 : Rly 1 =On, **HT Stg2** : Rly 1 and Rly 2 = On, **HT Stg 3** : Rly 1 ,Rly 2 and Rly 3 = On. **HT Stg 4** : Rly 1, Rly 2, Rly 3 and Rly 4 = On. This would stage relay 1 through to four on after the appropriate stage delay if the pressure is above the target setpoint and differentials.

LT Pack would start as follows:-

LT stg1: Rly 5 = On (**Note**: Starting at Relay 5 as the first 4 relays have already been allocated to Pack 1)

Other operational features

Invert Relays

The operation of the relays can be inverted so that N/C contacts can be used for energisation. This can be done from the configure screen on web page. Choose the relay(s) you wish to invert and set them to on. This process can also be completed from the controller display. Navigate to the menu option **rly** and select the relay output you wish to invert for example **r-05** is relay output 5. Change from "0" to "1" to invert the relay so that the N/C contact is in use.

Please note: This operation does not invert the Alarm relay. The alarm relay is energised when there are no alarms present.

USB Operation

The following operations can be performed using a memory-stick plugged into the USB port: -

- | | |
|-------------------------|------|
| 1. Export event log | U-01 |
| 2. Export logged data | U-02 |
| 3. Save configuration | U-03 |
| 4. Load configuration | U-04 |
| 5. Upgrade the software | U-05 |

The above requires the user to enter the USB menu via the display and press enter at the appropriate display option.

For example to save the current configuration insert a USB Memory stick into one of the USB Host ports, go to the USB software menu option, press enter, then the use the up key to scroll to U-03. Now press enter, the screen will flash "USB" until the operation has completed.

The file is transferred to the memory-stick in .zip format. The USB memory stick must be formatted as FAT32.



Ensure that all power is switched off before installing or maintaining this product

Viewing

Inputs and Outputs

Apart from setting up the controller, you can also view the status of the inputs and outputs.

1. From the function menu, select "IO", press enter
2. You can now scroll through the IO tables as set out below. The tables you view will depend on the controller type configuration.

Input and Output Configuration

Plant Controller Board

Inputs	HT/LT Pack Controller
Universal I/O 1	HT Suction Pressure Input
Universal I/O 2	LT Suction Pressure Input
Universal I/O 3	Gas Cooler Pressure Input
Probes 1	Gas Cooler Temperature
Probes 2	Gas Cooler Ambient Temperature
Probes 3	Gas Cooler Air On
Probes 4	Gas Cooler Air Off
Probes 5	Suction Temperature
Probes 6	Monitor Only
Probes 7	Monitor Only
Probes 8	Receiver Pressure. See: Pressure Transducer Interface Board
Status Inputs 1 to 12	Compressor Faults, General Faults, Standby, Ext Target and Extra Capacity
Outputs	HT/LT Pack Controller
Relays 1 to 12	HT and LT Compressor Stages, Gas Fan Enable, Receiver Enable, Superheat Low and High Relays, Transcritical Relay, Gas Dump Relays and Alarm Relay
Universal I/O 4	HT VSD Output
Universal I/O 5	LT VSD Output
Universal I/O 6	Gas Cooler Valve Output
Universal I/O 7	Gas Fan VSD Output
Universal I/O 8	Receiver Valve Output

Order of Relay Outputs

The order of the relays is as follows: -

HT Pack Compressor Stage Relays
 LT Pack Compressor Stage Relays
 Gas Fan Enable
 Receiver Enable
 Superheat Low Relay
 Superheat High Relay
 Transcritical Relay
 HT Gas Dump Relay (If used)
 LT Gas Dump Relay (If used)
 Alarm Relay

Note: Any features that are not being used will mean all others move up i.e. With 4 HT and 4 LT compressors, Gas Fan Enable, Receiver Enable, Transcritical, but no Superheat Relays or Gas Dump Relays would mean Relays 1 to 4 would be HT Compressors, 5 to 8 would be LT Compressors, Gas Fan Enable would be 9, Receiver Enable would be 10, Transcritical would be 11 and Alarm Relay would be 12.

Order of Universal IO

The order of the universal IO is as follows

HT Suction Input
 LT Suction Input
 Gas Cooler Pressure Input
 HT VSD Output
 LT VSD Output
 Gas Cooler Valve Output
 Gas Fan VSD Output
 Receiver Valve Output
 Probe Input 8 Receiver Pressure Input

Note: Any features not being used will mean all others move up. i.e. With HT Suction Input, LT Suction Input, Gas Cooler Pressure Input, Gas Cooler Valve Output, Gas Fan VSD Output, Receiver Valve Output, Receiver Pressure Input, but no HT or LT VSD Outputs would give HT Suction Input would be I/O 1, LT Suction I/O 2, Gas Cooler Input I/O 3, Gas Cooler Valve Output I/O 4, Gas Fan VSD I/O 5, Receiver Valve Output I/O 6, Receiver Pressure Input Probe 8.
 Note: If no LT Suction Input required (Setting the Span and Offset to 0 disables it) this would move the Receiver Pressure Input to I/O 3
 With Probe 8 used as a temperature monitor probe



Ensure that all power is switched off before installing or maintaining this product

Input/Output Tables

No.	IO	Range	Units	Comments	Dual Pack + Gas Cooler (Fuzzy Type 1)	Dual Pack + Gas Cooler (Staged Type 2)
I-01	HT Suction Pressure	-3.4 to 180	Bar		✓	✓
I-02	LT Suction Pressure	-3.4 to 180	Bar		✓	✓
I-04	Gas Cooler Pressure	-3.4 to 180	Bar	Used to calculate "Gas Calc Temp" See : Gas Calculated Temperature	✓	✓
I-05	Receiver Pressure	-3.4 to 180	Bar		✓	✓
I-14	Suction Temperature	-80 to +128	°C		✓	✓
I-15	Probe 6	-80 to +128	°C		✓	✓
I-16	Probe 7	-80 to +128	°C		✓	✓
I-17	Probe Input 8	-80 to +128	°C	Not Used (See I-05 Receiver Pressure)	✓	✓
I-18	Gas Cooler Temperature	-80 to +128	°C	Used to calculate "Gas Cooler SP" See : Gas Cooler Set Point	✓	✓
I-19	Gas Calculated Temperature	-80 to +128	°C	Calculated from "Gas Cooler Pressure" See : Gas Calculated Temperature	✓	✓
I-30	Status Input 1	0 = OK 1 = Alarm 2 = Unused			✓	✓
I-41	Status Input 12					
I-50	HT Run	0 = Off, 1 = On 2 = Unused			✓	✓
I-51	LT Run	0 = Off, 1 = On 2 = Unused			✓	✓
I-60	Capacity Input	0 = Off, 1 = On 2 = Unused			✓	✓
I-63	Cooler Air On	-80 to +128	°C		✓	✓
I-64	Cooler Air Off	-80 to +128	°C		✓	✓
I-65	Cooler Ambient Temperature	-80 to +128	°C		✓	✓
O-01	Relay 1	0 = Off 1 = On			✓	✓
O-12	Relay 12					
O-15	Transcritical	0 = Off, 1 = On			✓	✓
O-20	HT Stage	0 - 12				✓
O-21	LT Stage	0 - 12				✓
O-31	HT Variable Output	0 – 100	%		✓	✓
O-32	LT Variable Output	0 – 100	%		✓	✓
O-41	Optimisation Level Pack 1	-3.4 to 180	Bar		✓	✓
O-42	Optimisation Level Pack 2	-3.4 to 180	Bar		✓	✓
O-61	Fan Night Setback	0 = Off, 1 = On			✓	✓
O-62	Fan Day setback	0 = Off, 1 = On			✓	✓
O-64	Humidity	0 – 100	%		✓	✓
O-65	Apparent Ambient Temperature	-80 to +128	°C		✓	✓
O-72	HT Gas Dump	0 = Off, 1 = On			✓	✓
O-73	LT Gas Dump	0 = Off, 1 = On			✓	✓
O-80	Gas Cooler Setpoint	-3.4 to 180	Bar	Calculated from "Gas Cooler Temp" See : Gas Cooler Set Point	✓	✓



Ensure that all power is switched off before installing or maintaining this product

O-81	Gas Cooler Output	0 – 100	%		✓	✓
O-82	Gas Fan Pressure Setpoint	-3.4 to 180	Bar		✓	✓
O-83	Gas Fan temperature Set Point					
O-84	Gas Fan Output	0 – 100	%		✓	✓
O-85	Receiver Output	0 – 100	%		✓	✓
O-86	Gas Fan Output Enable	0 = Off, 1 = On			✓	✓
O-87	Receiver Output Enable	0 = Off, 1 = On			✓	✓
O-91	Superheat	-80 to +128	°C		✓	✓
O-92	Superheat Lo	0 = Off, 1 = On			✓	✓
O-93	Superheat Hi	0 = Off, 1 = On			✓	✓
S-01	HT Control States	0 = Stabilise 1 = Off 2 = Initial 3 = Cooler Fault 4 = Normal 5 = High Pressure 6 = Low Pressure 7 = Low Shut-down 8 = Transducer Fail 9 = Stand-by			✓	✓
S-02	LT Control States					
S-03	Gas Cooler State	0 = Stabilise 1 = Initial 2 = Pack Fault 3 = Triple 4 = SubCrit 5 = TransCri 6 = SuperCrit 7 = Transducer Fail 8 = Shutdown			✓	✓

Quickview

Pressing the “quickview” button during normal operation displays the HT and LT Packs target pressures. Press the “quickview” button again to go back to the normal display or wait for the time-out period to elapse.

Override

The override function allows the user to switch output stages on or off. Press the override and enter button together for approx 3 seconds until “r-01” is displayed.

Use the “up” or “down” button to display the relays (r-01 to r-12) and 4 – 20mA outputs (A-01 to A-08)

For (r-01 to r-12) Press “Enter” and select “1” to turn the relay on and “0” to turn the relay off.

For (A-01 to A-08) Press “Enter” and use up and down buttons to select the output on 4-20mA outputs 1 to 8 0% to 100%

Override will last for 30 seconds then the output will return to normal operation.

Info Button

When this button is used, HT and LT analogue output values can be displayed.

Probe Offsets

Each probe input, displayed as C-01 to C-08 from the controller display menu, can have an offset applied;

Up to ± 20°C in increments of 0.1°C.



Ensure that all power is switched off before installing or maintaining this product

Display Messages

The following messages can appear on the display during normal operation.

Display	System status
HP	High Pressure alarm
LP	Low Pressure alarm
Ft TrAn	Pressure Transducer Fault
Ft	Fault
Sd	Low Pressure Shut-down
CP (1 to 12)	Compressor Fault Compressor Run Fault
Gn (1 to 12)	General Fault
Stby	Controller in Standby
Conf	Configuration / Set up error

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 #
High Pressure Alarms	8
Low Pressure Alarms	9
Low Pressure Shutdown	10
Transducer Faults	6
General Faults	20
Compressor faults	3
Configuration Error	20
Controller in standby	20
Gas Probe Fault	6
Gas Sensor Fault	6
Gas Cooler HP Shut Down	8
Gas Cooler LP Shut Down	9
Gas Cooler HP Open	8
Gas Cooler LP Open	9
Gas Cooler OT	4
Receiver Sensor Fault	6
Receiver High Pressure	8
Receiver Low Pressure	9
Ambient Probe Fault	6
Superheat Fault	2



Ensure that all power is switched off before installing or maintaining this product

Specification

Power requirements:

Supply Voltage Range:	24 Vac $\pm 10\%$ or 24 Vdc $\pm 10\%$
Supply Frequency:	50 – 60 Hz $\pm 10\%$
Maximum supply current:	<1 Amp Typical supply current: <1.0 Amp
Class 2 Insulation:	No protective Earth is required. A functional earth can be connected if the equipment is located in an electrically noisy environment.

Note : The use of centre tapped to earth transformers is not allowed. This is to prevent damage to the transformer and/or controller.

The host equipment must provide adequate protection against contact to hazardous live parts.

RDM advise the use of a suitable external over-current protection device.

Warranty may be invalidated due to excess current being unlimited if there are no fuses/circuit breakers installed

General

Operating temperature range:	+5°C to +50°C
Operating Humidity:	80% maximum
Storage temperature range:	-20°C to +65°C
Environmental:	Indoor use at altitudes up to 2000m, Pollution Degree 1, Installation Category II. Voltage fluctuations not to exceed $\pm 10\%$ of nominal Voltage
Size:	280mm (L) x 122mm (W) x 67mm (H)
Weight:	750 Grams
Safety:	EN61010
EMC:	EN61326; 1997 +Amdt. A1; 1998
Ventilation:	There is no requirement for forced cooling ventilation

Inputs

Probe Input type See [Set/change Units](#) for probe types

Status Input type The preferred option is a 0 Volt return through a Volt free relay or 24 Vac referenced to the supply Voltage. If a 24Vac signal is being sourced from the Plant controller power supply then **do not** ground the Status Input common rail, this is grounded internally.

Comms: Ethernet

4-20mA 4-20mA current loop, use the 12 Vdc output to feed the device.

Analogue Outputs 0 to 10 Volts DC or 0/4-20mA, Selected in the Front Panel Menu.
A 50mA fuse is recommended for each Analogue output.

The 4-20mA output will not operate correctly if the target device input impedance is $> 75\Omega$

The 0-10V output will not operate correctly if the target device input impedance is $< 10K\Omega$

Relay Ratings

All Relays 5A/250 Vac/AC1 (Resistive load)
5A/30 Vdc (Resistive)
2A/250 Vac $\cos\phi=0.3$ on N/O contact (Inductive Load)

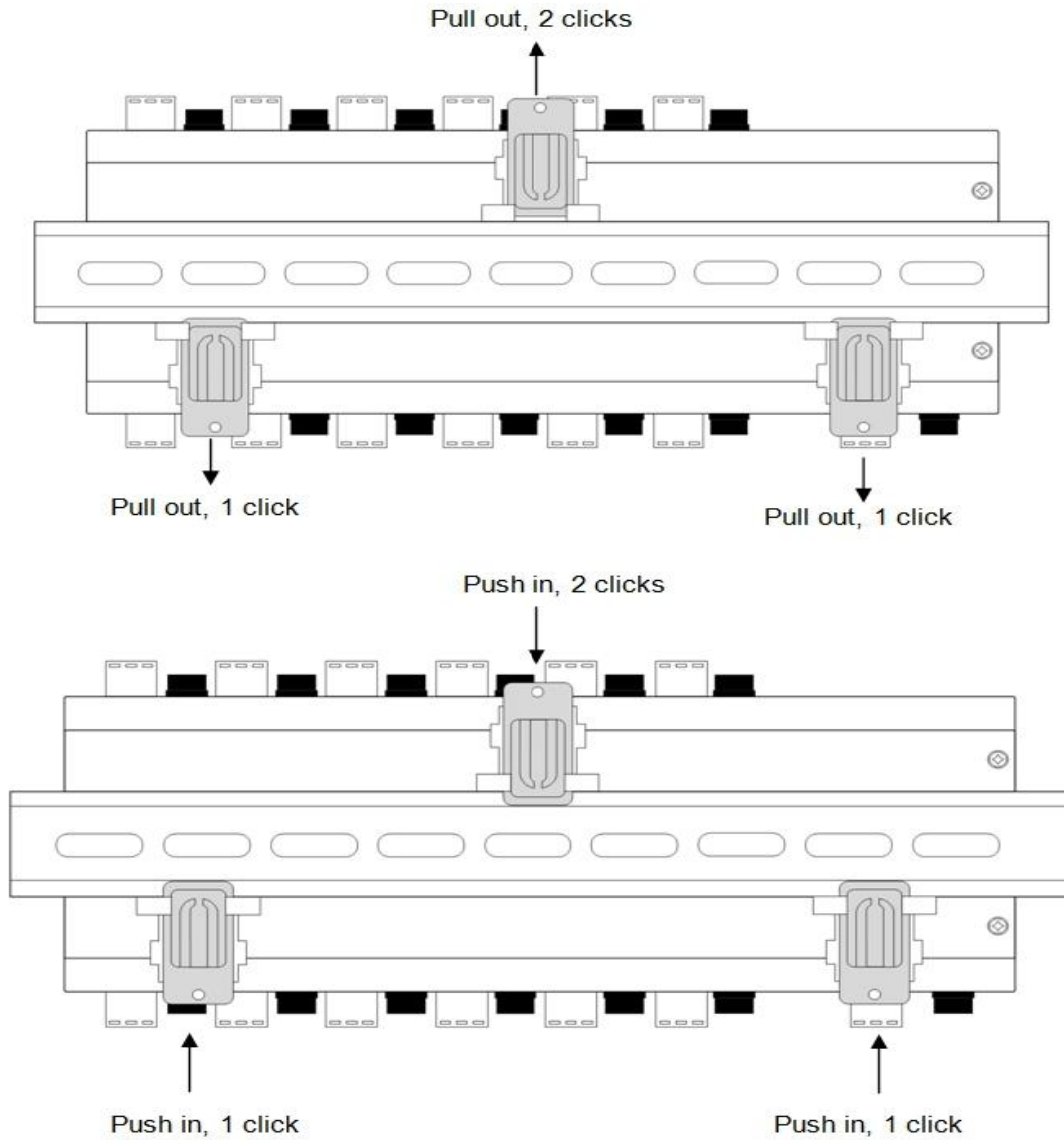


Ensure that all power is switched off before installing or maintaining this product

Installation:

Mounting on to a DIN rail

Rear view.



Clearances:

The controller must have 10mm clearance above the top and 15mm clearance from the sides. Clearance at the front and rear is dependent on the site wiring.

There is no requirement for forced cooling ventilation

Cleaning:

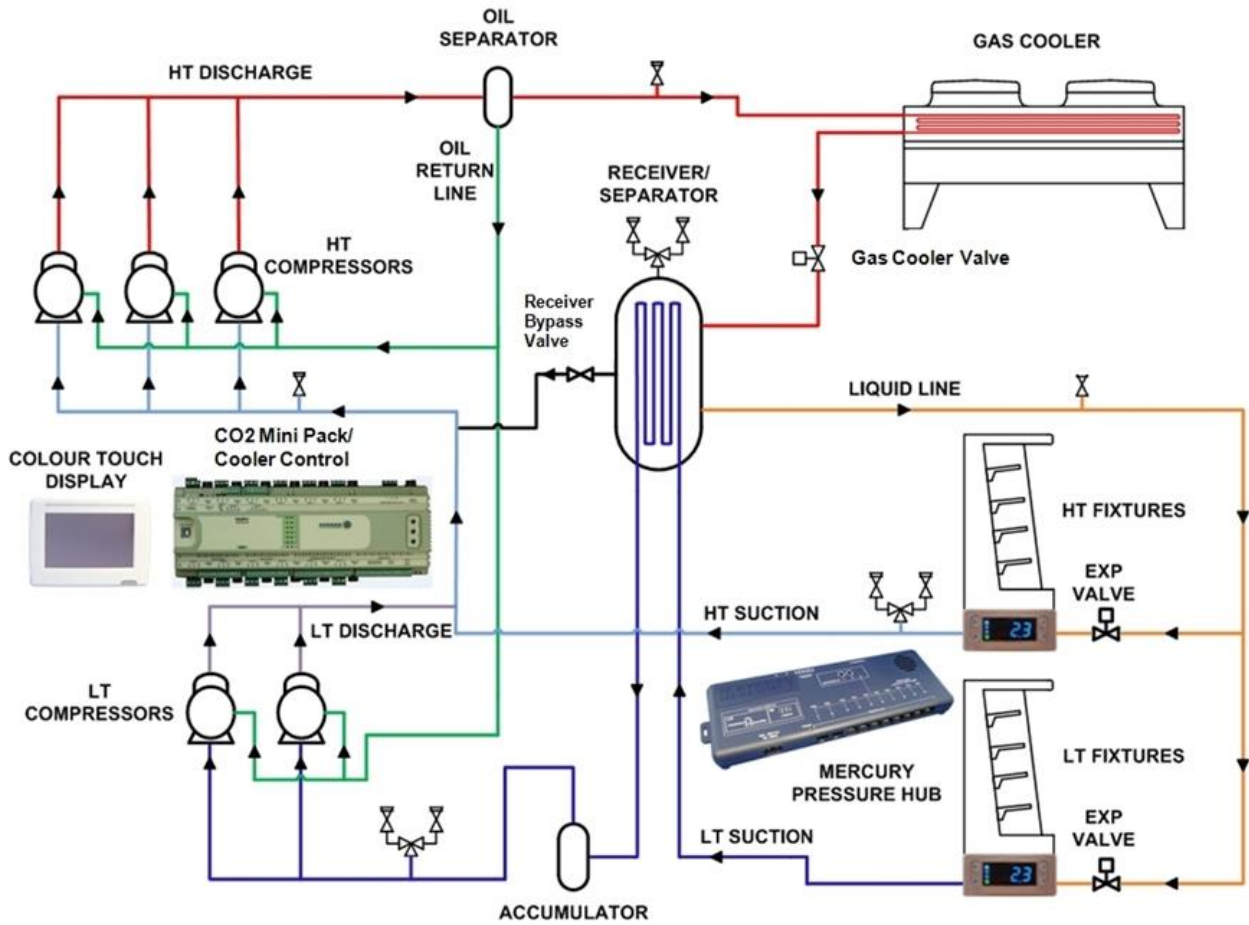
Do not wet the controller when cleaning. Clean the front by wiping with a slightly dampened lint free cloth.

Please note: The specifications of the product detailed on this set up guide may change without notice. RDM Ltd shall not be liable for errors or for incidental or consequential damages, directly or indirectly, in connection with the furnishing, performance or misuse of this product or document.



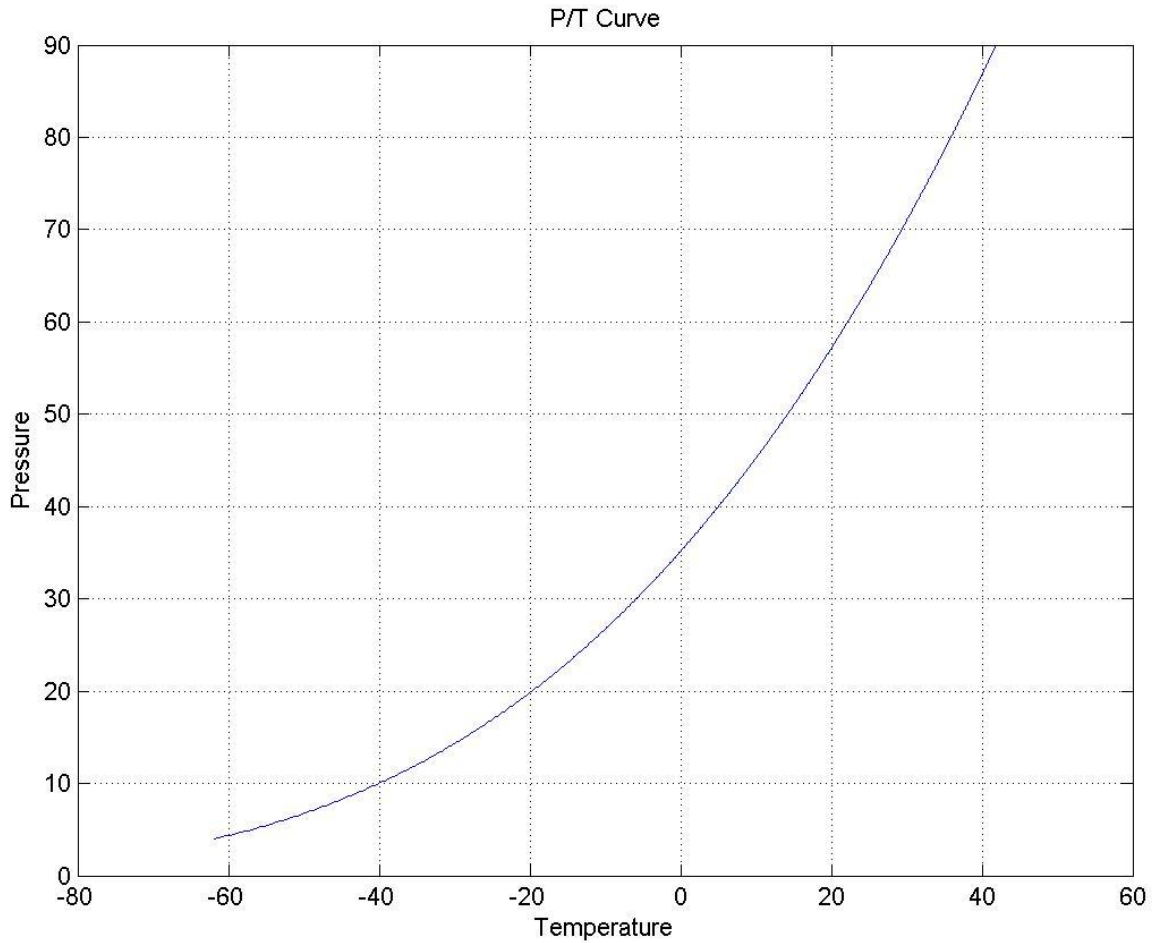
Ensure that all power is switched off before installing or maintaining this product

Typical CO2 Circuit Diagram



Ensure that all power is switched off before installing or maintaining this product

CO2 Pressure to Temperature Curve



Apparent Temperature (Heat Index)

Relative Atmospheric Temperature

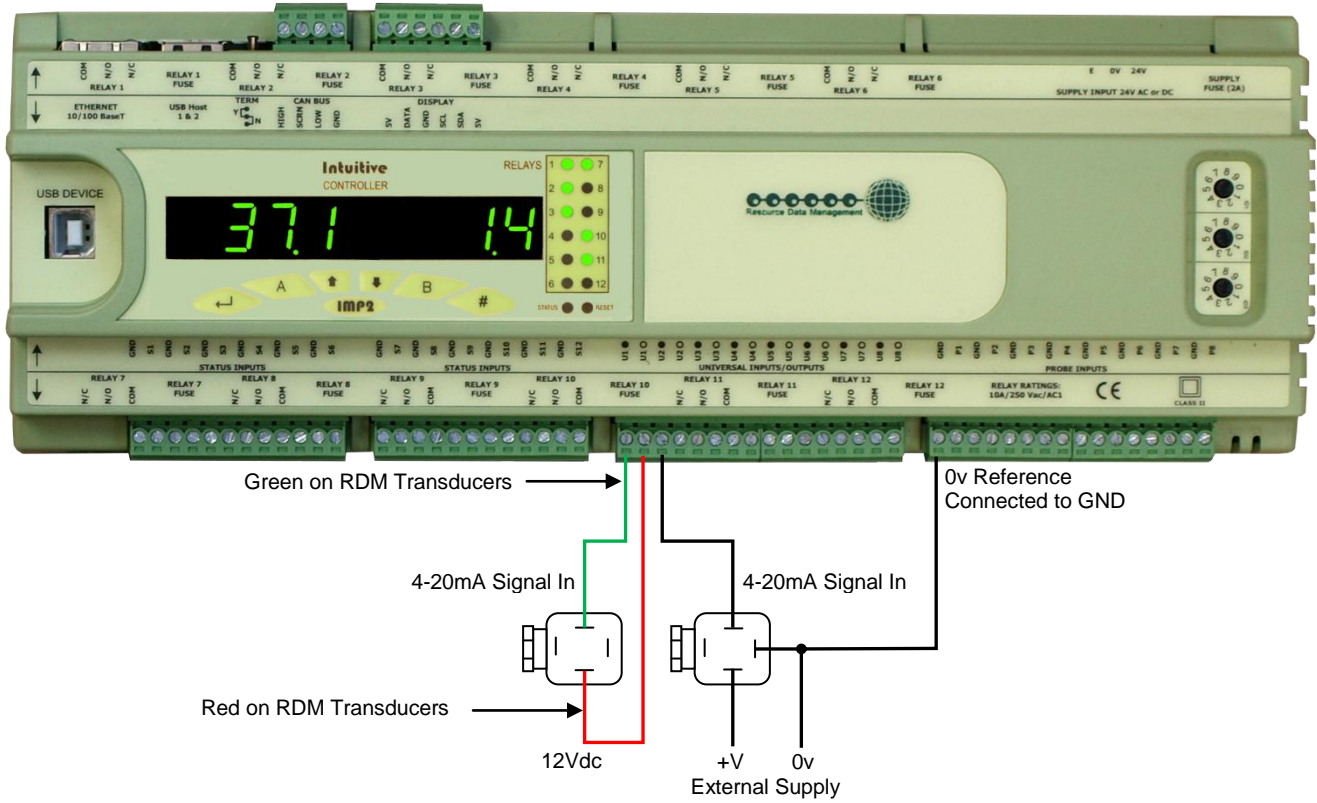
	26 °C	28 °C	30 °C	32 °C	34 °C	36 °C	38 °C	40 °C	42 °C	44 °C
Humidity										
0%	24.7	26.7	28.3	30.3	31.7	33.3	34.7	35.9	37.2	38.2
10%	25.1	26.6	28.2	29.8	31.3	33.2	35.2	36.9	39.0	40.8
20%	25.5	26.7	28.1	30.1	31.8	34.2	36.8	39.2	42.3	45.2
30%	25.8	27.1	28.8	31.0	33.1	36.2	39.6	42.9	47.2	51.2
40%	26.1	27.7	29.4	32.4	35.2	39.1	43.7	48.0	53.7	59.0
50%	26.5	28.5	31.2	34.6	38.1	43.1	48.9	54.4	61.6	
60%	26.8	29.5	32.4	37.3	41.8	48.1	55.3	62.2		
70%	27.1	30.6	34.5	40.7	46.3	54.1	63.0			
80%	27.4	32.1	38.0	44.7	51.7	61.1				
90%	27.7	33.7	41.1	49.4	57.8					
100%	28.0	35.6	44.7	54.7						



Ensure that all power is switched off before installing or maintaining this product

Appendix 1 Typical Transducer Connection

For 4-20mA type transducers the diagram below shows the connections to the Intuitive Controller: -



Note: The Earth connection on transducer is not necessary unless in an electrically noisy environment.

Part numbers

PR0651-MINI
PR0XXX

Intuitive Transcritical CO2 Mini Plant Controller
Transducer Interface Board

Revision

Revision	Date	Changes
1.5	29/09/2015	First Release
1.6	26/11/2015	All Universal I/O come defaulted as 0-10V
1.6a	26/01/2016	Description of Status/Digital inputs standardised to Status Inputs



Ensure that all power is switched off before installing or maintaining this product