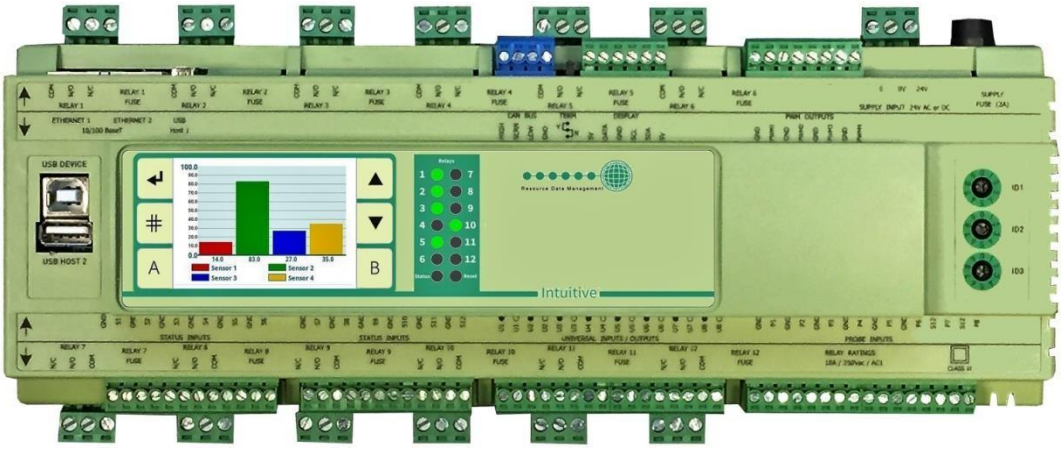
Resource
Data Management

Intuitive V2 & Mini Transcritical Superpack

Commissioning/User Guide

Revision 5.9



PR0650-STCO2

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The Intuitive Range

From Resource Data Management

This documentation refers to the Intuitive V2 & Mini Transcritical Superpack Controller Firmware version V5.9 or above.

Description

The Intuitive Transcritical Superpack Controller is a versatile controller with up to 10 individual control sections, HT Pack, LT Pack, Gas Cooler and Receiver control, HT, LT and Parallel Oil injection, Parallel Compressor control as well as up to 3 General sections which can be used for any additional control requirements. Based on the Superpack platform there are several main controller hardware variants (See table below) and up to 10 expansion boards (IO expansion, Mini IO expansion, 6 stepper expansion and single stepper expansion with autoclose) can be added depending on how many inputs and outputs are required.

Each pack section has 16 digital outputs that are configurable for compressors, loaders, trim compressors, a digital scroll compressor, gas dump, inverter bypass, superheat high & low, standby, offline, run and alarm. Sixteen status inputs can be assigned for pack section inputs or general alarms. There are four analogue inputs (4-20mA, 0-5Vdc, 0.5-4.5Vdc, 0.5-9.5Vdc, 1-2Vdc, 1-6Vdc, 0-10Vdc or custom value) for pressure transducers, one for suction pressure, one for discharge pressure and two for general monitoring (if required). Eight temperature probe inputs are available for suction temperature, discharge temperature and general monitoring (if required). One analogue output is available to control a variable speed drive (0-20mA, 4-20mA, 0-5Vdc, 0-10Vdc or custom value).

The Gas Cooler and Receiver control section has six selectable analogue inputs (4-20mA, 0-5Vdc, 0.5-4.5Vdc, 0.5-9.5Vdc,1-2Vdc, 1-6Vdc, 0-10Vdc or custom) one for gas cooler pressure, one for receiver pressure, two for general pressure monitoring (if required) one for liquid level and one voltage input for a heat reclaim sensor. There are eight probe inputs to measure gas cooler temperature, gas cooler ambient, gas cooler air on and gas cooler air off temperatures, one probe to control liquid injection, one probe for heat recovery, one for heat exchanger and one temperature probe input for general temperature monitoring. There are 11 digital outputs that can be used as gas cooler inverter enable, gas fan inverter enable, receiver inverter enable, auxiliary inverter output enable, transcritical relay, liquid injection, heat recovery bypass relay, heat recovery valve, offline relay, run relay and alarm relay. There are five analogue outputs (these can be set to either 0-5Vdc, 0-10Vdc, 4-20mA, 1-2Vdc, 1-6Vdc or 0-20mA) to control the gas cooler valve, a gas cooler fan inverter drive, a receiver valve, a heat recovery valve and an auxiliary compressor inverter drive. There are also three stepper valve outputs available which can be used control the receiver valve, gas cooler valve and heat recovery valve. There are 8 status inputs that can be used for extra capacity enable, standby input and receiver high and low alarm inputs.

Each oil injection control section has twenty status inputs available, sixteen for oil enable inputs, one oil separator input, one oil low input, one oil high input and one reset input.

Note: The HT, LT and one of the monitor pressures (input 3 on the main plant controller board) are also available to be broadcast over the Data Manager network for use by an RDM Mercury Switch (PR0018-PHI) or Mercury Controller (PR0740).

The “Fuzzy” based control algorithm will give enhanced control whilst maintaining the starts per hour 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 manually program the output stages to the desired switching sequence.

The Intuitive Plant controller has two embedded ethernet ports to allow connection to a Data Manager system without the need for a communications module. A USB port allows for a direct PC connection, due to the number of parameters available it is recommended to use PC for commissioning the controller.

All relays have volt-free contacts and can be mixed between low and high voltage sources. Each controller or expansion requires a 24Vac or 24Vdc supply (a 2A PSU is available from RDM: - PR0625)

Part Numbering System

Transcritical Superpack – PR06W X Y STCO2 Z

W	Hardware	X	Display	Y	Fusing	Z	Solid State Relays
50	Intuitive	CD	Integral Display	NF	Non-Fused	E1	Relay 1 SSR
52	Intuitive Stepper	Blank	No Display	Blank	Fused Relays	E2	Relays 1&2 SSR
80	Intuitive Mini						

For example: Intuitive Transcritical Superpack Controller with Internal Display and no fusing and one solid state relay (for digital scroll) would be PR0650-CD-NF-STCO2.

A large number of variants are available depending on options selected, the most commonly used parts are listed below.

Intuitive / Plant Controller Descriptions	Part Number
Intuitive Transcritical Superpack Controller (No Internal Display)	PR0650-STCO2
Intuitive Transcritical Superpack Controller (No Internal Display) two stepper outputs	PR0652-STCO2
Intuitive Transcritical Superpack Controller (With Internal Display)	PR0650CD-STCO2
Intuitive Transcritical Superpack Controller (With Internal Display) no fuses.	PR0650CD-NF-STCO2
Intuitive Transcritical Superpack Controller (With Internal Display) and one solid state relay (for digital scroll)	PR0650CD-STCO2-E1
Intuitive Transcritical Superpack Controller (With Internal Display) and two solid state relays (for digital scrolls)	PR0650CD-STCO2-E2
Intuitive Transcritical Superpack Controller (With Internal Display) two stepper outputs	PR0652CD-STCO2
Intuitive Transcritical Superpack Controller (With Internal Display) two stepper outputs and one solid state relay (for digital scroll)	PR0652CD-STCO2-E1
Intuitive Transcritical Superpack Controller (With Internal Display) two stepper outputs and two solid state relays (for digital scrolls)	PR0652CD-STCO2-E2
Intuitive Mini Transcritical Superpack Controller (With Internal Display) no fuses	PR0680-CD-NF-STCO2
Intuitive Expansion Board Descriptions	**Part Number**
Intuitive Stepper expansion board with 8 probe inputs, 8 status inputs, 8 universal IOs, 4 relays and 6 stepper motor outputs.	PR0660
Intuitive IO expansion board with 8 status inputs, 8 universal IOs and 12 relays	PR0661
Intuitive Mini IO expansion with 4 Universal Inputs and 5 relays.	PR0663
Intuitive Mini IO expansion with 4 Universal IOs and 4 relays.	PR0663 4-4
Intuitive Stepper Module with Auto Close, 1 Stepper Motor Output, 1 Analogue Input (mA / Volts), 2 Probe Inputs, 1 Digital Input and 1 Relay Output.	PR0653*
Intuitive Stepper Module with Auto Close, 1 Stepper Motor Output, 1 Analogue Input (mA / Volts), 2 Probe Inputs, 1 Digital Input and 1 Relay Output (valve closes on CANbus fail)	PR0653-C*
Intuitive Mini IO expansion with 4 Universal IOs, 5Relay Outputs, 6 Probe Inputs, and 4 Status Inputs.	PR0681
Optional Network Enabler	**Part Number**
BACnet Enabler	PR0655-BAC

*In the event of CANbus communication being lost with the main controller, after 1 minute the PR0653 will set the valve position to the last hour average opening value while the PR0653-C will shut the valve fully until communications are re-established.

Configuration

The controller has 2 configuration options:

Display value	Type	Control Type
1	Dual Pack	Fuzzy
2	Dual Pack	Staged

The controller is delivered pre-configured as a Dual Pack Fuzzy (Type 1) See Type Change

Default Username & Password

From Software version V4.6 the default username and password are unique to every individual panel. The specific credentials will be detailed in the documentation that ships with the unit.

The user name will be '**install**'.
The password will be '**PleaseChange**' followed by the panel ID which is found within the log in page (ignore the small letter at the end, "d" in the example below).

For example, if the panel ID is BC123456 d:
User name is: **install**
Password is**: PleaseChangeBC123456**

The end user MUST add their own install level user.

After entering and saving the install level user details the controller must remain powered for a minimum period of 30 seconds to allow the controller to save these details permanently to its non-volatile memory.

These default credentials will only be enabled when accessing the system locally from a device connected within the systems local subnet. User names and passwords require a minimum of 6 characters so "Install" and "1234" cannot be used.

Note: In the unlikely event username and/or password is unknown, for example a new service contract is undertaken and the previous contractor has not passed across the login credentials, it is possible for RDM Technical Support to generate a panel specific, time limited, 'ONCE' code which allows temporary access to only the device in question at install level allowing an engineer to add a new 'Install' level user.

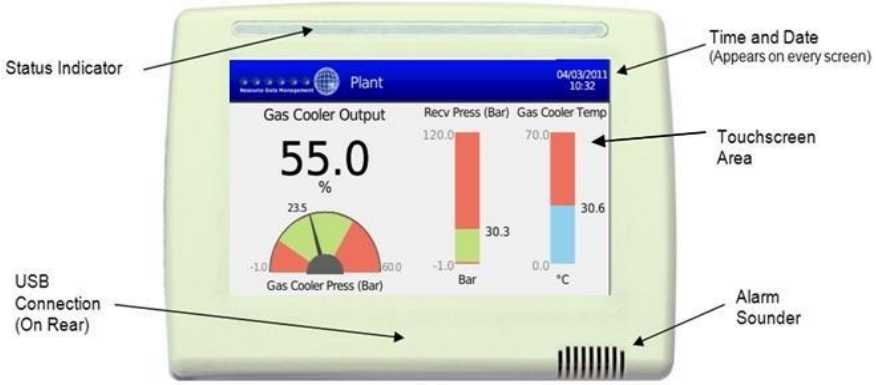
To do this RDM requires in writing, from the end-user/owner of the device, permission to provide access to the system. There will also be an administration charge for this request.

For further information please contact Technical Support.

Plant Controller Colour Touch Display (PR0615)

The Plant Controller Colour Touch Display can be used as an 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.

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.

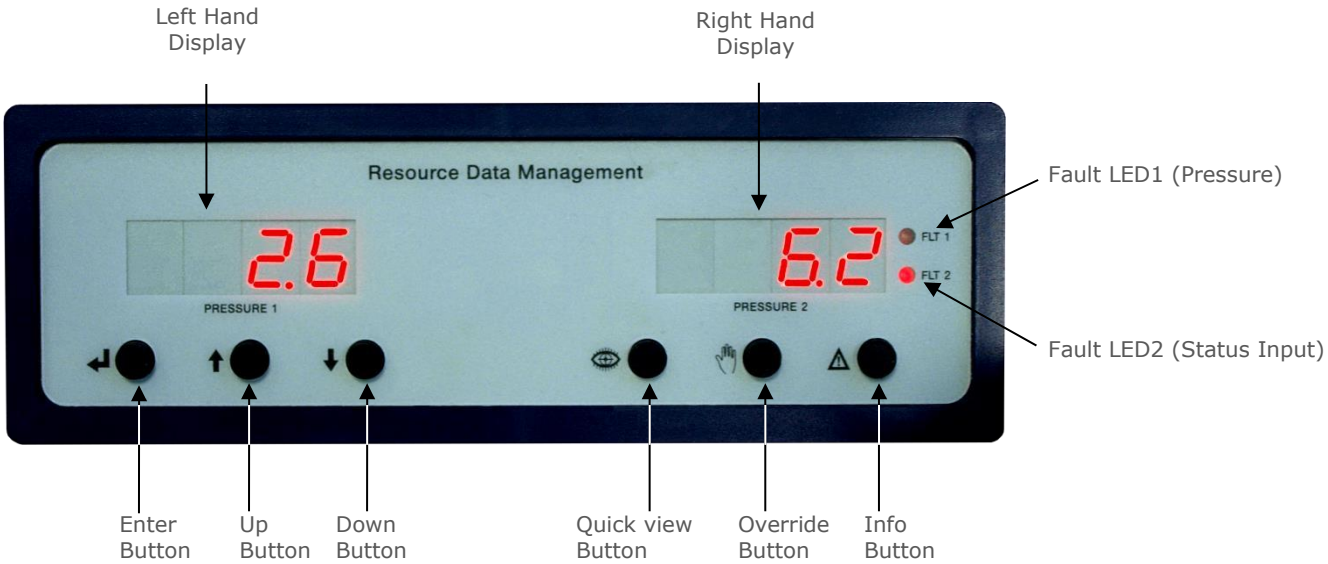
Opposite is a typical screen showing a list of Inputs, the touch display allows you to scroll up and down the list by placing your finger on the display and sliding it upward or downward motion.

You can view outputs by touching the "Outputs" box.

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

Remote Display (PR0620)

The remote display PR0620 is a simpler user interface which can be used in conjunction with the Touchscreen display.



Left Hand Display

The 4-character display shows the pressure or temperature and scrolls round however many sections are used
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

Right Hand Display

The 4-character display shows which section pressure or temperature being displayed in left hand display "PgAS" (gas cooler pressure), "Sec 1" etc
In set-up mode, display is blank
In Override mode, display is blank

Front Panel Remote Display Buttons

Enter Button: - Used along with down button to enter menu items.

Up Button: - Used to scroll up.

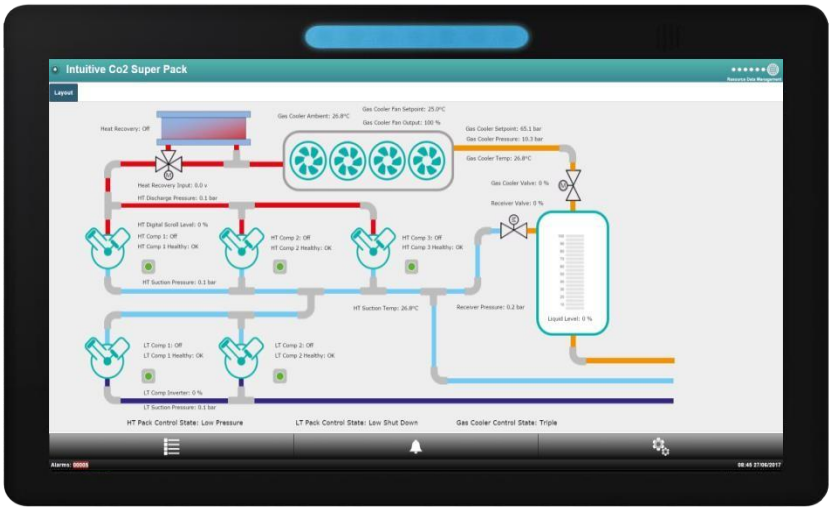
Down Button: - Used to scroll down.

Quick View Button: - Used to view the target pressures and temperatures (See Quick view section).

Override Button: -Used with the "Enter" button, to go into the override mode or to view current variable output values (See Override section).

Info Button: - Used to view the current alarms. (See Info section).

Touch XL



The TouchXL when connected to the Transcritical Superpack, is used as a display, mimicking the view of the standard web interface to the controller. It is used to interact with the application software and alarm indication.

As default, the TouchXL will show an overview list of current values such as pressures, temperatures and fault inputs. An optional graphical layout can be loaded onto the Transcritical Superpack controller which will appear on the TouchXL. Layouts can be generated using the RDM Layout Editor software which is available separately.

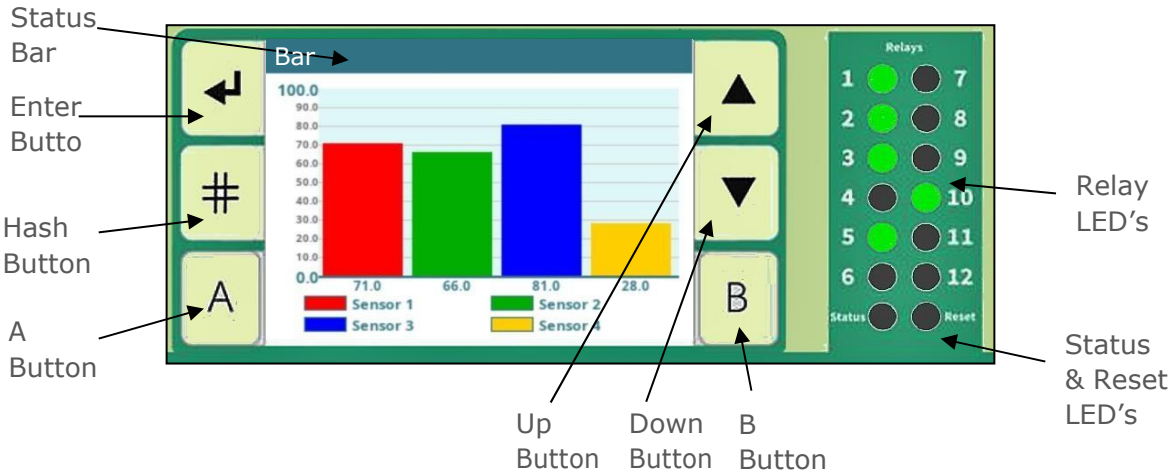
The TouchXL has the benefit of being able to connect to the Intuitive device via USB (USB host 1 or 2) to micro-USB or standard Ethernet connections over IP.

When connecting using the USB method, the communication of the two devices is automatic and the Touch XL will automatically configure itself for use.

Connecting over Ethernet comms requires the configuration of the TouchXL to be setup to 'look at' the Intuitive Transcritical Superpack device. This can be carried out in the 'Network Configuration' page within the TouchXL service menus (only accessible directly on the touch screen). Please consult the specific documentation for more details.

Note: The TouchXL display is only compatible with Intuitive Transcritical Superpack software V3.5 and above.

Integral Graphical Display (optional)



The internal graphical display, if fitted, can be used to display user customisable graphical information such as line graphs, bar graphs gauges and values. For custom display set up see: Internal Screen Setup section.

The screen can also be used to view values and set parameters however it is not intended as a commissioning tool.

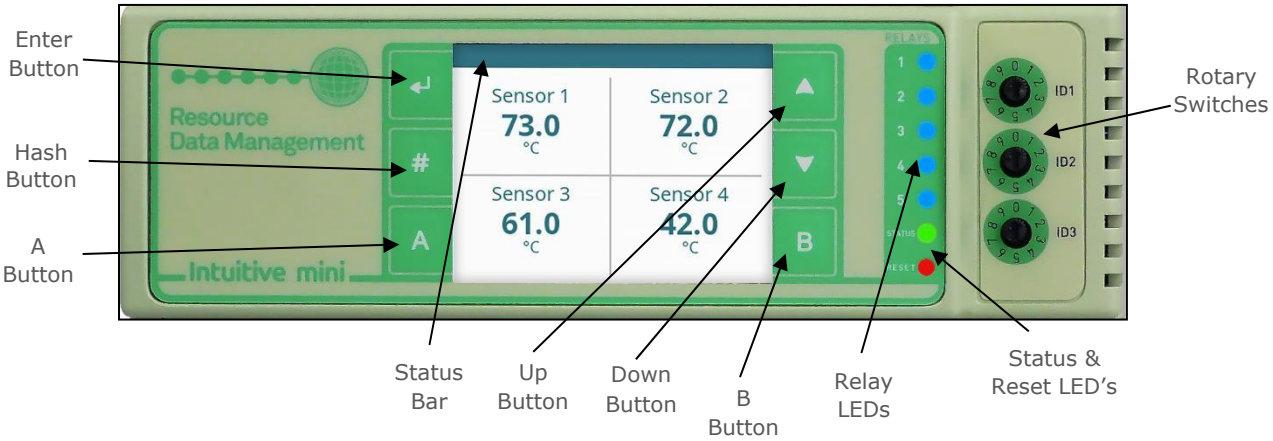
Enter Button	Used along with down button to enter menu items.
Up Button	Used to scroll up.
Down Button	Used to scroll down.
"B" Button	Used to scroll to the next page
"A" Button	Used to scroll back a page
"#" Button	Used to escape from the current page

If a custom graphical display is set up then this will be shown as default, if multiple graphical displays are set up use the "A" and "B" buttons to scroll between pages.

To enter the setup menu, hold the "Enter" and "Down" buttons together then use the "Up" and "Down" keys to scroll through the options and "Enter" to select. Press the "#" button to go back.

Relay LEDs	These will illuminate when the associated relay is energised.
Status LED	This will flash twice at one second intervals when the controller is functioning normally.
Reset LED	This will flash if the controller is in a fault condition and is resetting.
Status Bar	Will be blue in colour during normal operation and will turn red if any alarm condition is present.

Intuitive Mini Integral Display (optional)



The internal graphical display, if fitted, can be used to display user customisable graphical information such as line graphs, bar graphs gauges and values. For custom display set up see : Internal Screen Setup section.

The screen can also be used to view values and set parameters however it is not intended as a commissioning tool.

Enter Button	Used along with down button to enter menu items.
Up Button	Used to scroll up.
Down Button	Used to scroll down.
"B" Button	Used to scroll to the next page
"A" Button	Used to scroll back a page
"#" Button	Used to escape from the current page

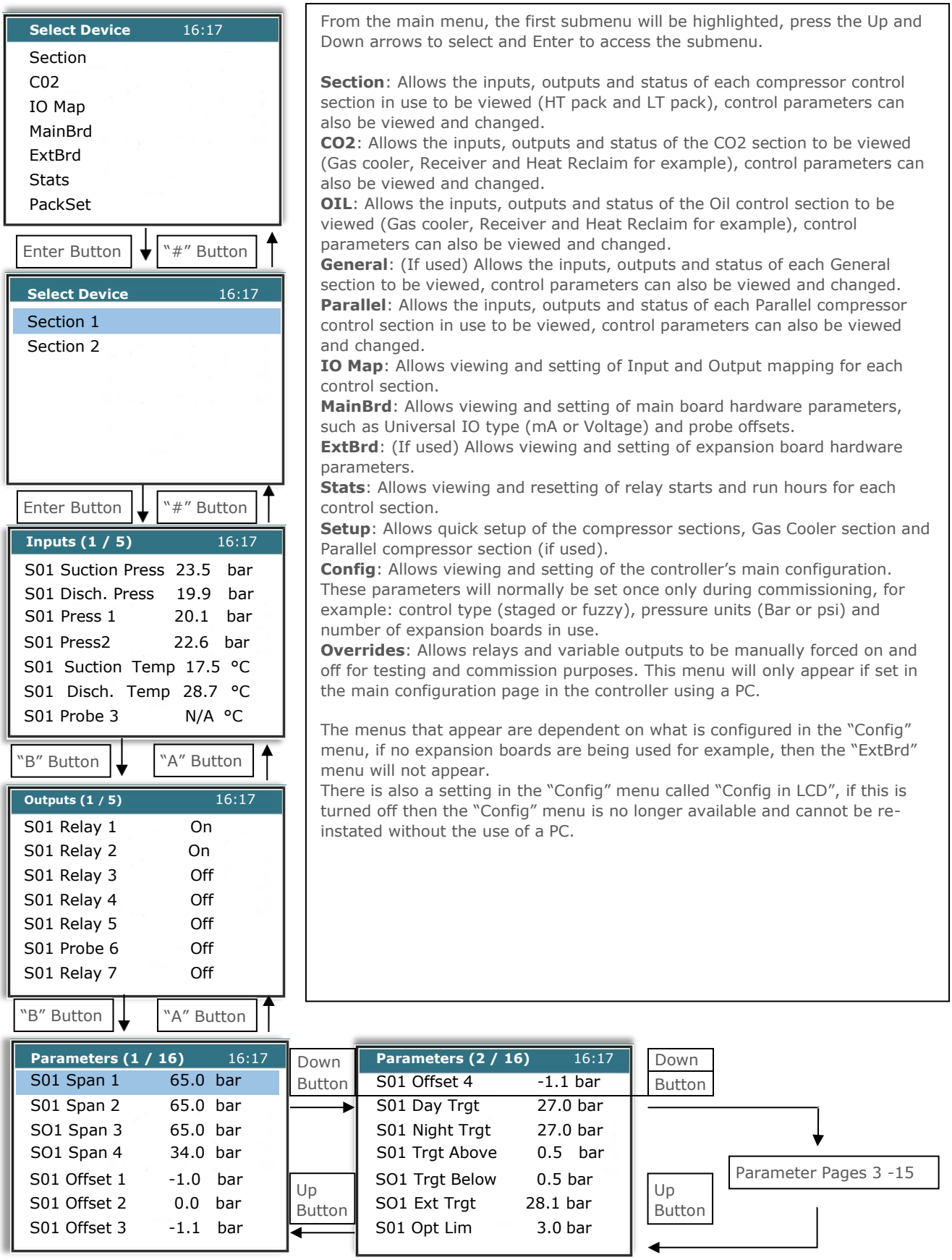
If a custom graphical display is set up then this will be shown as default, if multiple graphical displays are set up use the "A" and "B" buttons to scroll between pages.

If a custom graphical display is in use, hold the "Enter" and "Down" buttons together to enter the setup menu then use the "Up" and "Down" keys to scroll through the options and "Enter" to select. Press the "#" button to go back.

Relay LEDs	These will illuminate when the associated relay is energised.
Status LED	This will flash twice at one second intervals when the controller is functioning normally.
Reset LED	This will flash if the controller is in a fault condition and is resetting.
Status Bar	Will be blue in colour during normal operation and will turn red if any alarm condition is present.

Integral Graphical Display Menu Navigation

(Optional on software version V4.1 onwards)

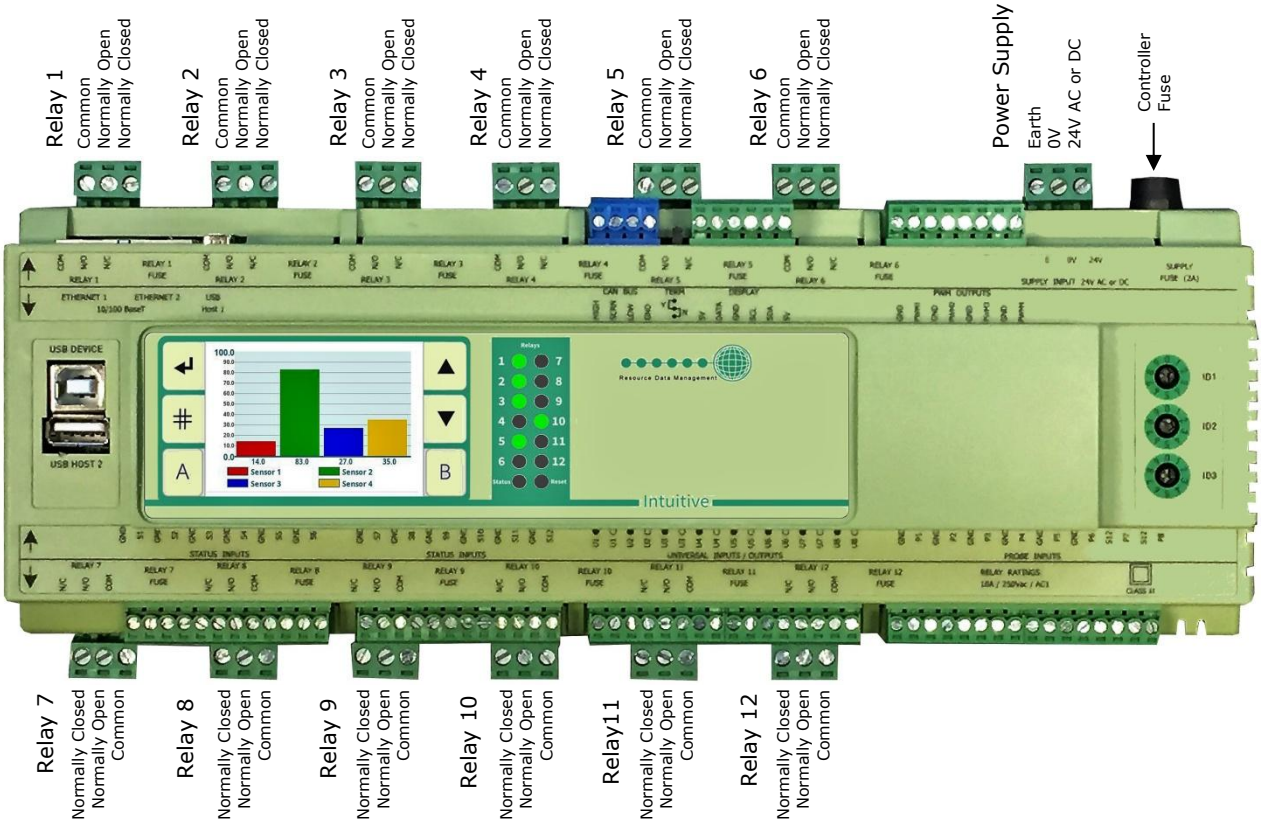


From the main menu, the first submenu will be highlighted, press the Up and Down arrows to select and Enter to access the submenu.

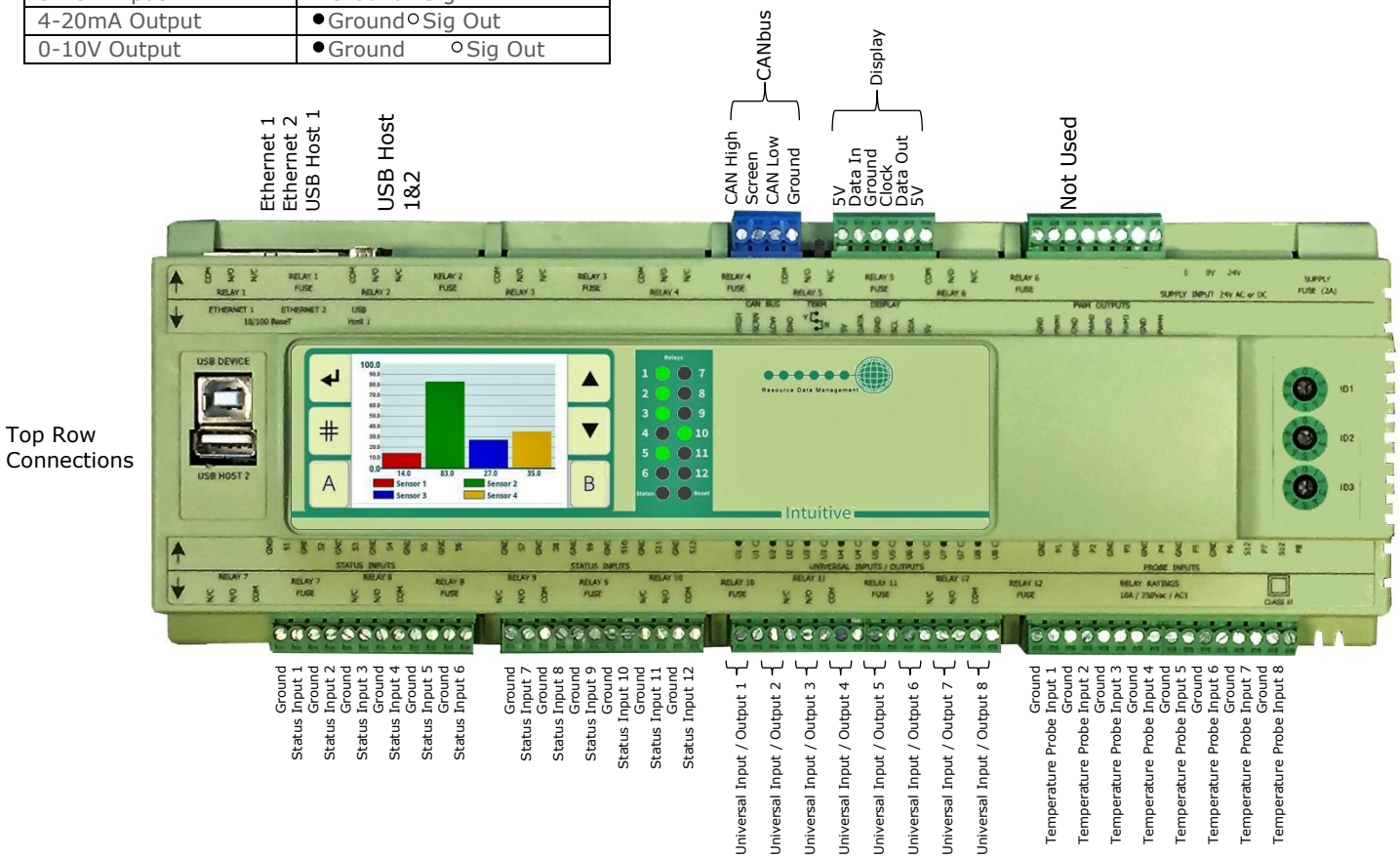
Section: Allows the inputs, outputs and status of each compressor control section in use to be viewed (HT pack and LT pack), control parameters can also be viewed and changed.
CO2: Allows the inputs, outputs and status of the CO2 section to be viewed (Gas cooler, Receiver and Heat Reclaim for example), control parameters can also be viewed and changed.
OIL: Allows the inputs, outputs and status of the Oil control section to be viewed (Gas cooler, Receiver and Heat Reclaim for example), control parameters can also be viewed and changed.
General: (If used) Allows the inputs, outputs and status of each General section to be viewed, control parameters can also be viewed and changed.
Parallel: Allows the inputs, outputs and status of each Parallel compressor control section in use to be viewed, control parameters can also be viewed and changed.
IO Map: Allows viewing and setting of Input and Output mapping for each control section.
MainBrd: Allows viewing and setting of main board hardware parameters, such as Universal IO type (mA or Voltage) and probe offsets.
ExtBrd: (If used) Allows viewing and setting of expansion board hardware parameters.
Stats: Allows viewing and resetting of relay starts and run hours for each control section.
Setup: Allows quick setup of the compressor sections, Gas Cooler section and Parallel compressor section (if used).
Config: Allows viewing and setting of the controller's main configuration. These parameters will normally be set once only during commissioning, for example: control type (staged or fuzzy), pressure units (Bar or psi) and number of expansion boards in use.
Overrides: Allows relays and variable outputs to be manually forced on and off for testing and commission purposes. This menu will only appear if set in the main configuration page in the controller using a PC.

The menus that appear are dependent on what is configured in the "Config" menu, if no expansion boards are being used for example, then the "ExtBrd" menu will not appear.
There is also a setting in the "Config" menu called "Config in LCD", if this is turned off then the "Config" menu is no longer available and cannot be re-instated without the use of a PC.

Intuitive Plant Controller I/O Connections (PR0650)

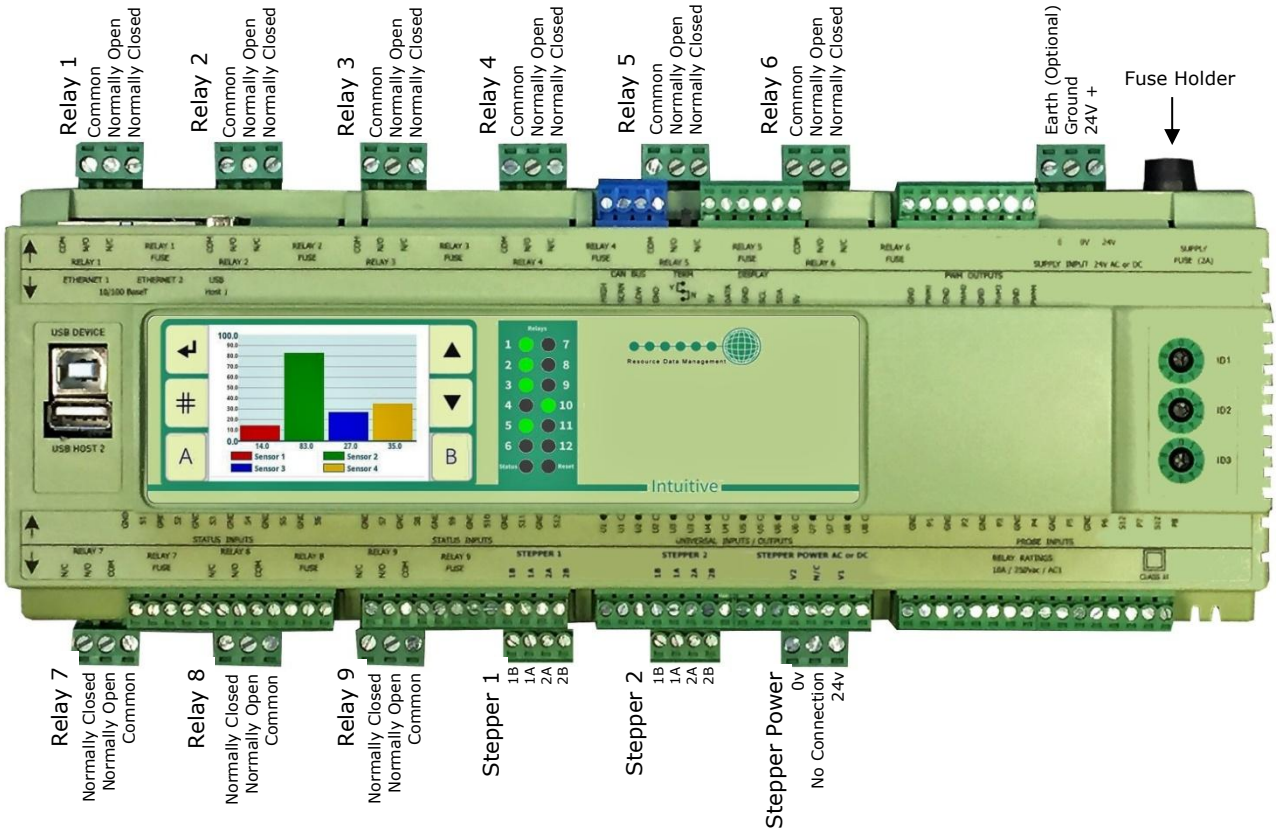


Universal IO Type	Terminal Markings
4-20mA Input	● Sig In ○ 12V dc Out
0-10V Input	● Ground ○ Sig In
4-20mA Output	● Ground ○ Sig Out
0-10V Output	● Ground ○ Sig Out

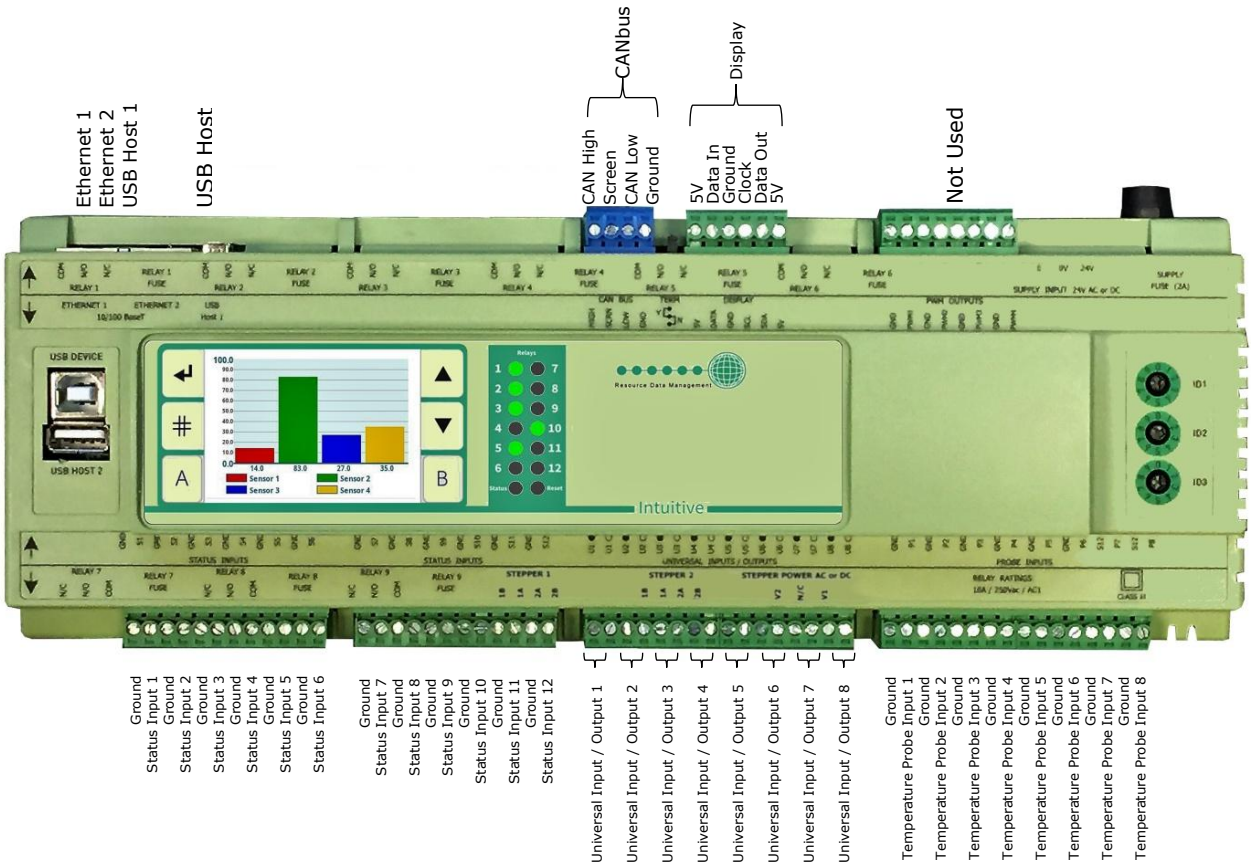


Intuitive Plant Controller with Two Stepper Outputs I/O Connections (PR0652)

Bottom Row Connections

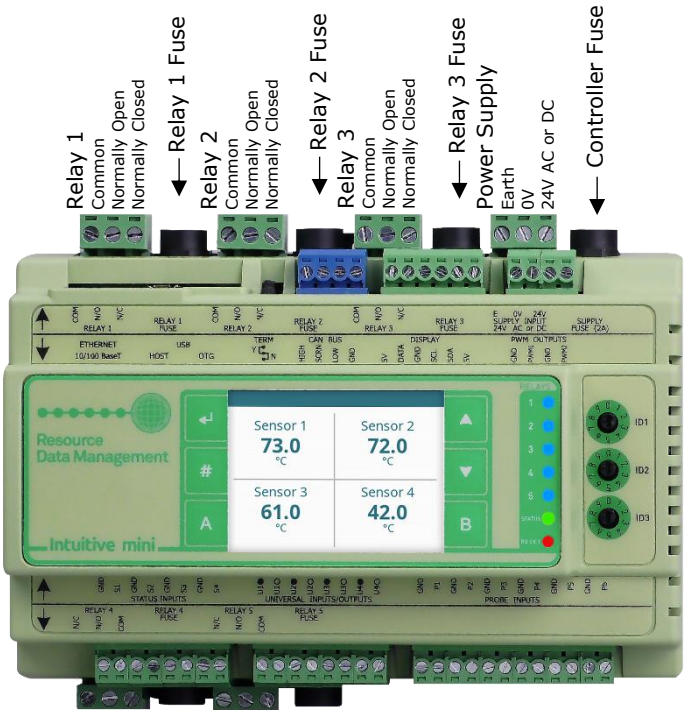


Top Row Connections

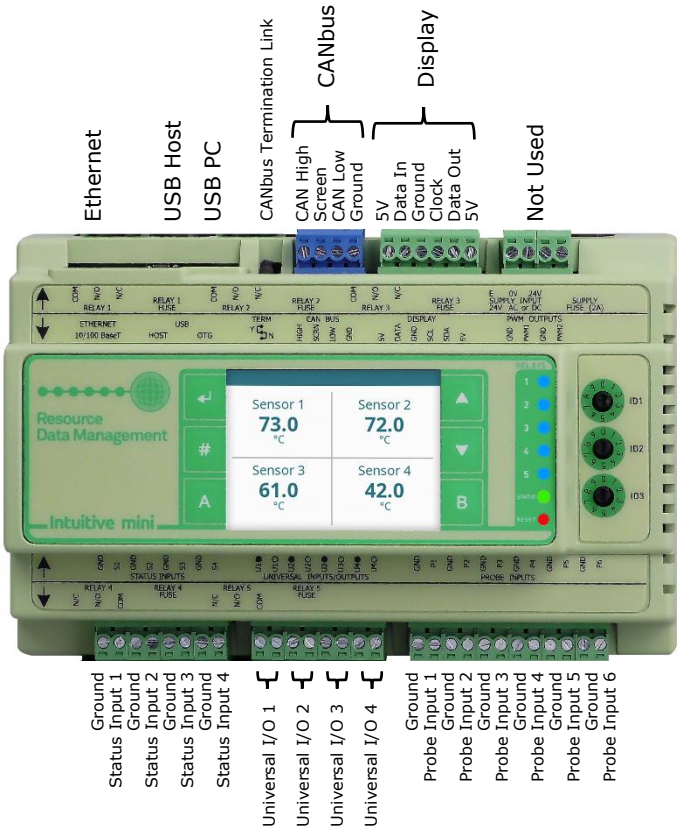


I/O Connections - Mini Intuitive Controller – PR0680

Bottom row connections

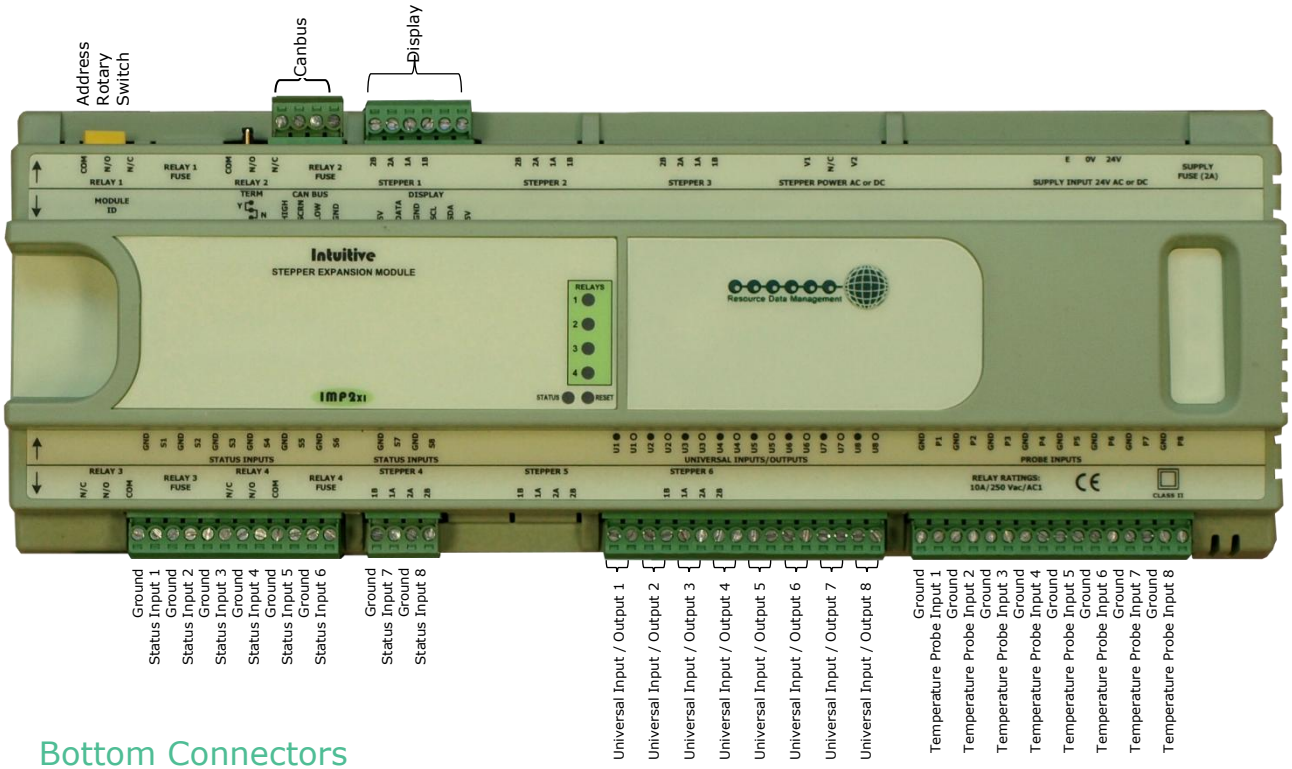


Universal IO Type	Terminal Markings
4-20mA Input	●Sig In ○12V dc Out
0-10V Input	●Ground○Sig In
4-20mA Output	●Ground○Sig Out
0-10V Output	●Ground○Sig Out

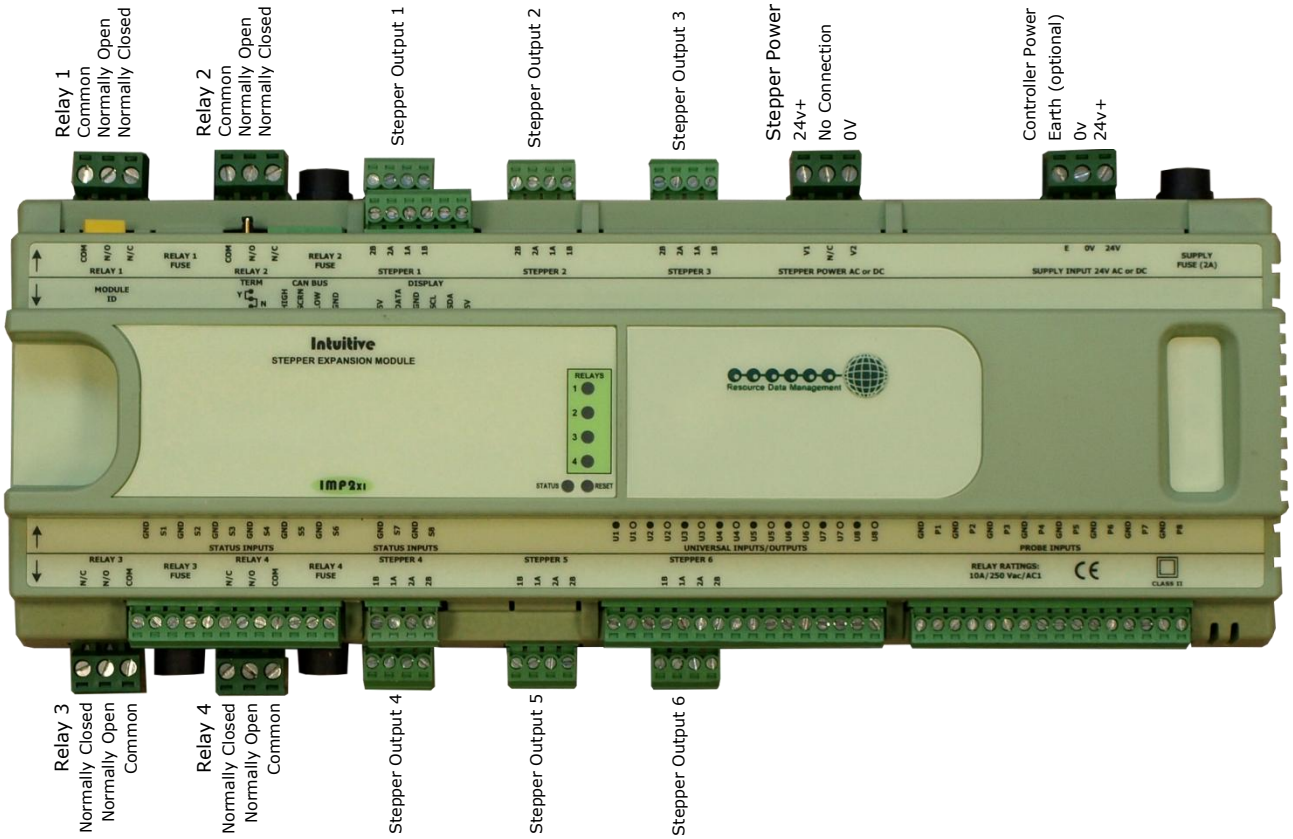


Intuitive Stepper Expansion Module (PR0660)

Top connectors

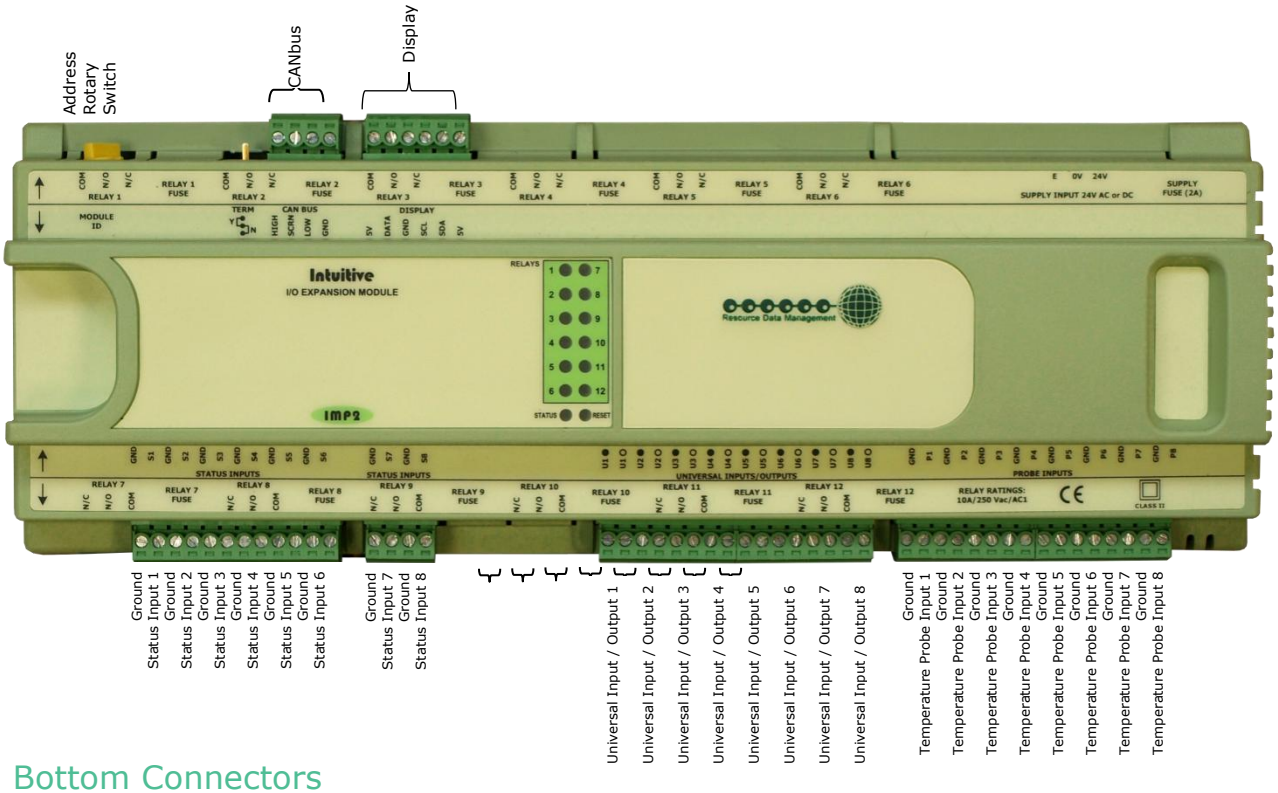


Bottom Connectors

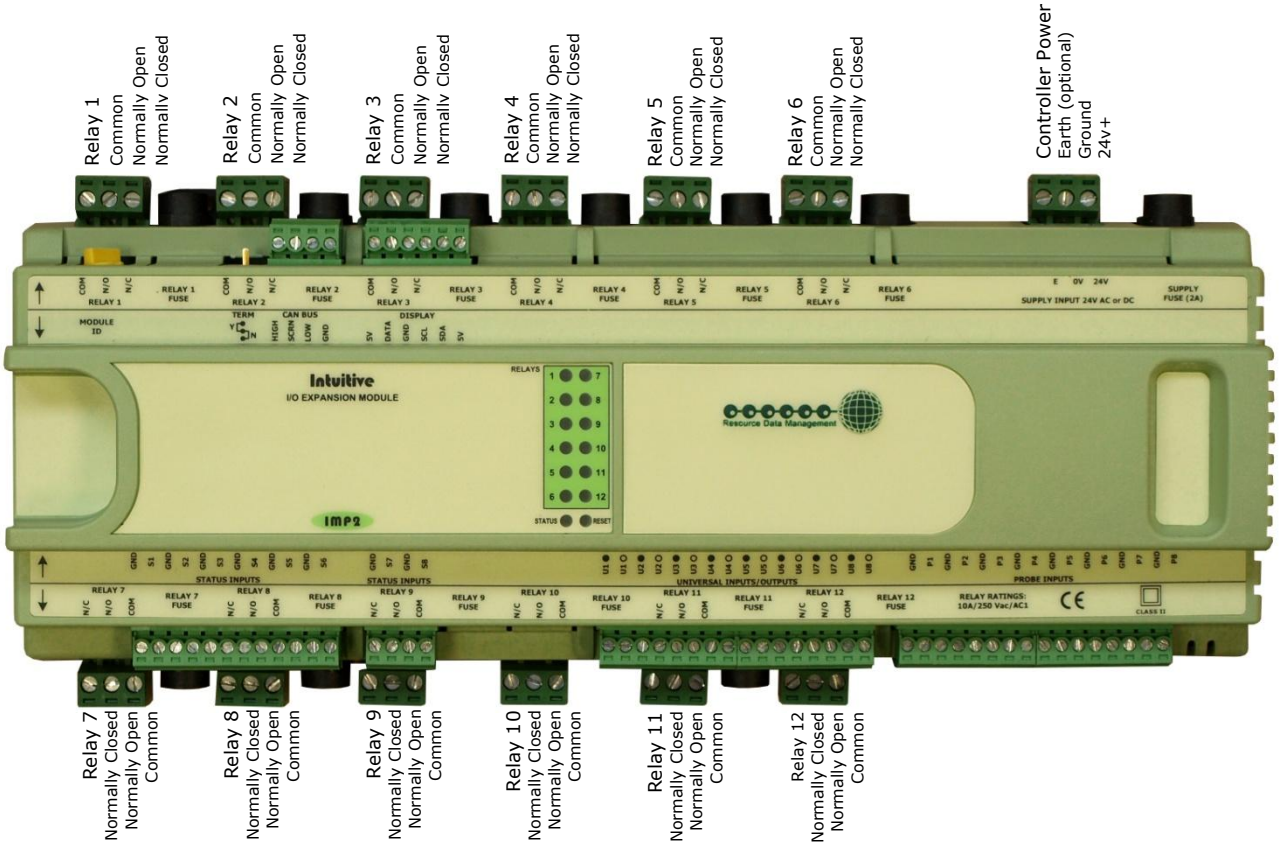


Intuitive Plant IO Expansion Module (PR0661)

Top connectors



Bottom Connectors



Note: If an AC supply is used to power the main control board or expansion board, the same AC supply cannot be used to power the Stepper valve(s), however a DC supply can be used to power both the control board(s) and the Stepper valve(s).

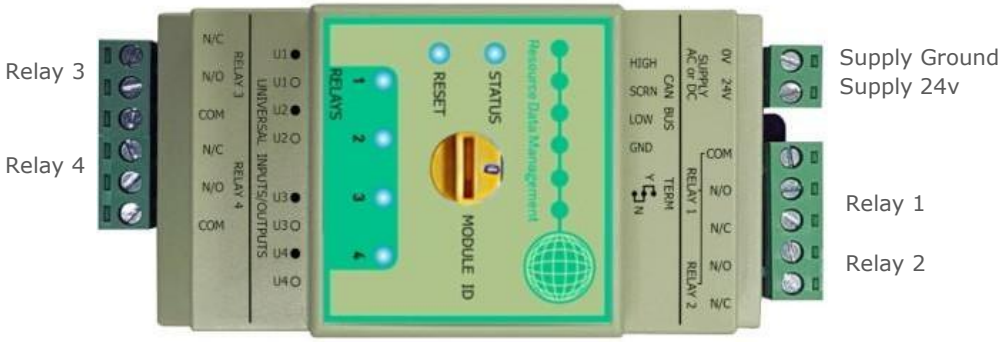
Intuitive Mini IO Expansion Module (PR0663)

Top connectors

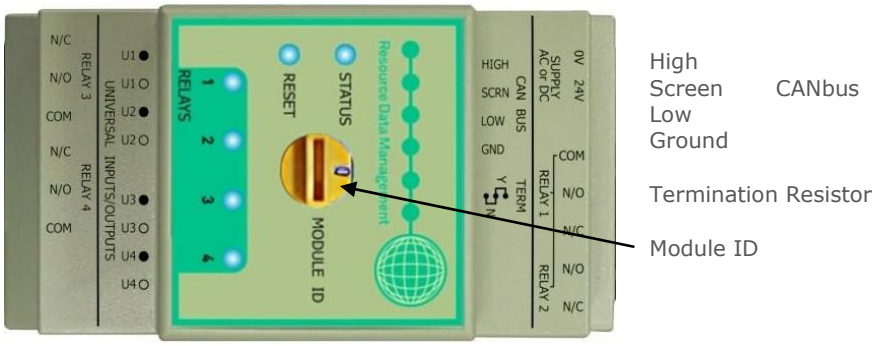
Bottom connectors

Mini I/O Connections (PR0663 4-4)

Bottom Row

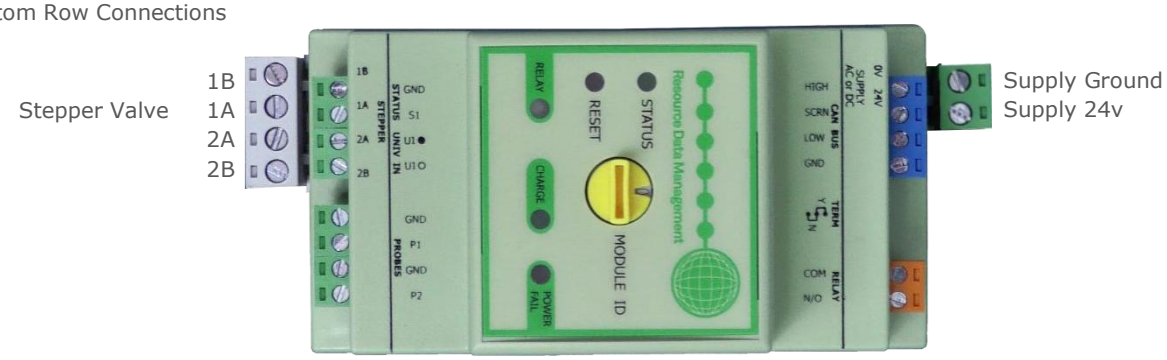


Top Row Connections

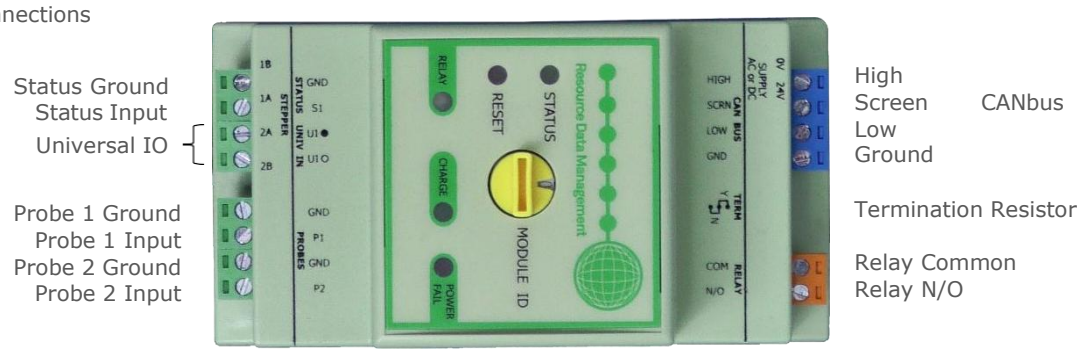


PR0653 Intuitive Stepper Module with Auto Close

Bottom Row Connections



Top Row Connections



Universal Analogue Input / Output Connections

	0 or 4 -20mA or 0 – 10V Input
U1-U8 ●	0 or 4-20mA loop input or variable dc voltage ground.
U1-U8 ○	12v transducer feed or variable dc voltage input.

Input/s & Outputs

All Types	Description	Comments
Status Inputs	0V return or 24 Vac	Note 1
Analogue Inputs	Probe input	Note 2
Universal IO Universal Input Only on Mini IO Expansion	Analogue Input/Output	4-20mA, 0-5Vdc, 0.5-4.5Vdc, 0.5-9.5Vdc , 1-2Vdc, 1-6Vdc, 0-10Vdc or Custom Inputs. 4-20mA, 0-10V / 5V output or Custom. (Mini IO expansion only has Inputs, outputs not available).
Stepper Valve (Stepper expansion) or 1-2 (On Main PR0652 or PR0653)	Bi Polar Stepper Valve Driver	12-24vdc, 825mA / 8W maximum.
Relays	N/O, N/C and Common	Volt Free. If SSR is fitted then only the Common and N/C are connected
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.
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 buttons on the remote display (PR0620)
- Direct access by PC via a USB connection
- TouchXL via a USB connection
- Direct access by a PC via an Ethernet Connection
- Through the RDM Data Manager (Not all commissioning settings are accessible)
- Through the USB Touch display (PR0615)

*Note: Due to the high number of data points within the Transcritical Superpack controller it is not advisable to network the controller to a Data Manager with firmware V2.0.8 or earlier. Doing so will not affect the operation of the Superpack controller but it will have an adverse effect on the Data Managers operation and therefore a Data Manager firmware update is required.

Set-up Mode

Set-up through front buttons

The following tables only apply if using a remote pressure display (PR0620) which has 6 pushbuttons on the front, this enables settings to be changed without the use of a PC however this method is not advisable for full commissioning.

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, dEty 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

Display (PR0620) Menu Structure

Text, as it appears on the display, is shown in red, Parameter description is shown in blue.

START: Hold Enter & Down keys for 3 seconds then press Enter							
dEty	Enter Key		d01	Enter Key	Pack Sections	Up & Down Keys	ds01 → HT Pack Section ds02 → LT Pack Section
Up & Down Keys			Up & Down Keys				
Unit	Enter Key	Set Probe Type and Temp Units	d02	Enter Key	CO2 Gas Cooler Section		ds01 → CO2 Gas Cooler Section
PrES	Enter Key	Set Pressure Units	d03	Enter Key	Oil Section (if used)	Up & Down Keys	ds01 → Oil Section 1 ds02 → Oil Section 2 ds03 → Oil Section 3
tYPE	Enter Key	Set Control Type	d04	Enter Key	General Sections (if used)	Up & Down Keys	ds01 → General Section 1 ds02 → General Section 2 ds03 → General Section 3
Oil	Enter Key	Enable Oil Control	d05	Enter Key	Parallel Section (if used)		ds01 → Parallel Compressor Section
nGen	Enter Key	Set Number of General Sections	d06	Enter Key	IO Mapping	Up & Down Keys	ds01 → HT Pack Mapping ds02 → LT Pack Mapping ds03 → CO2 Mapping ds04 → HT Oil Mapping ds05 → LT Oil Mapping ds06 → Parallel Oil Mapping ds07 → General Sect. 1 Mapping ds08 → General Sect. 2 Mapping ds09 → General Sect. 3 Mapping ds10 → Parallel Section Mapping
nebd	Enter Key	Set Number of Expansion Boards	d07	Enter Key	Main Board Hardware		ds01 → Main Board Hardware
rtc	Enter Key	Set Time	d08	Enter Key	Expansion Boards Hardware	Up & Down Keys	ds01 → Expansion Board 1 ds10 → Expansion Board 10
net	Enter Key	Network Setup	d09	Enter Key	Stats	Up & Down Keys	ds01 → ds02 →
bCSt	Enter Key	Broadcast Pressure Setup	d10	Enter Key	Pack Setup	Up & Down Keys	ds01 → Number of HT stages used ds02 → Number of LT stages used
SoFt	Enter Key	Software Version	d11	Enter Key	Gas Cooler Setup		ds01 → Gas Cooler Setup Information
Usb	Enter Key	USB Options					
Scrn	Enter Key	PR0615 Touch screen Setup					

Device Number

There are 8 sections that can be viewed / set up in dEty

d-01 (Pack Sections) Pack Sections 1 & 2: I/O and set parameters (dS01 to dS02)

d-02 (CO2 Section) CO2 Section: I/O and set parameters (dS01)

d-03 (Oil Sections) Oil Sections 1, 2 & 3: I/O and set parameters (dS01 to dS03)

d-04 (General Sections) General Sections 1, 2 & 3: I/O and set parameters (dS01 to dS03)

d-05 (Parallel section) Parallel Compressor Section I/O and set parameters (dS01)

d-06 (IO Mapping) I/O Mapping of all of the above sections (dS01 to ds08)

d-07 (Main Board) Main Board I/O and set parameters (dS01)

d-08 (Expansion Boards) Expansion Boards I/ O and set parameters (dS01 to dS10)

d-09 (Stats) Pack sections 1 & 2 compressor run times (ds01 to ds02)

d-10 (Setup) Pack sections 1 & 2 stages used (ds01 to ds02) Information only

d-11 (CO2 Setup) Gas Cooler section Setup, information only

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 apply to all probes on a controller and cannot be set individually to different types.

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

Unit Number	Probe Type	Units
0	Probes not used	°C
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

Unit Number	Probe Type	Units
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 -60 degrees Celsius to +128 degrees Celsius.

Set/View Pressure 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. This allows the pressure units to be set to Bar or Psi.

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.

Enable Oil Control Section

1. From the function menu scroll to "Oil", press enter
2. Set to value 1 to enable Oil Control or 0 to disable it.

Set/view number of expansion boards to be used (optional).

1. From the function menu scroll to "nebd", press enter
2. Select the number of expansion boards required (0 to 10), this will need to be set to a minimum of 1 if using a stepper expansion board (PR0660)

Set/view number of general sections to be used (optional).

1. From the function menu scroll to "nGen", press enter.
2. Select the number of general sections required (0 to 3)

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"

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 Manager)

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		Display	Option
IP-1	IP Address byte 1		gt-1	Gateway Address byte 1
IP-2	IP Address byte 2		gt-2	Gateway Address byte 2
IP-3	IP Address byte 3		gt-3	Gateway Address byte 3
IP-4	IP Address byte 4		gt-4	Gateway Address byte 4
nL	Network Mask Length		ESC	Exit network menu. **Note:** this option **must** be selected to save any changes.

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 fourth IP address value (86 in the example below)
Example: 10.1.2.86

The default static IP address within a new controller when first powered on is 100.100.100.100. Power up the controller, leaving the rotary switches at 000 and set the PC/Laptop to be in the same IP range as the controller (i.e. IP: 100.100.100.102 / Subnet mask: 255.255.255.0), link the PC and the device using a Cat5 cable. The controller can then be accessed using a standard internet browser (such as Chrome, Edge or Firefox) and browsing to the address http://**100.100.100.100.**

Note: When power cycling the controller please ensure that the USB connection is removed as this will keep the controller powered and may stop changes taking affect.

Broadcast

0 = No broadcast. 1 = Broadcast Pressures. 2 = Broadcast CO2 Load Cycling (Receiver). 3 = Broadcast CO2 Load Cycling (Gas Cooler)

Set for 1. Broadcasts Pressure.

This allows pressure readings on the variable analogue Inputs to be broadcast over a Data Manager IP network for use with a Mercury Switch or Mercury IP Module. This remote pressure is used by the Mercury Switch or IP Module to calculate the Evaporator temperature. At the device receiving the pressure there will be an option to select Press1, Press2 and Press3, these would normally be Suction section 1, Suction Section 2 and Discharge respectively.

Set for 2. Broadcasts CO2 commands

Allows the pack controller to send commands to the Data Manager which in turns sends "CO2 Case Off" commands to any cases set up on system to do CO2 load shedding. At the device receiving the pressure or in the Data Manager Load Cycling page there will be an option to select Press1, Press2 and Press3, these will normally be Suction section 1, Suction Section 2 and **Receiver** respectively.

Set for 3. Broadcasts CO2 commands

Allows the pack controller to send commands to the Data Manager which in turns sends "CO2 Case Off" commands to any cases set up on system to do CO2 load shedding. At the device receiving the pressure or in the Data Manager Load Cycling page there will be an option to select Press1, Press2 and Press3, these will normally be Suction section 1, Suction Section 2 and **Gas Cooler** respectively.

Note: See CO2 Load shedding documentation and RDM Data Manager user guide for further information on CO2 Load Shedding

USB Operation

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

1. Export system log U-01
2. Export log data U-02
3. Save configuration U-03
4. Load configuration U-04
5. Upgrade the software U-05
6. Export Parameter list U-06
7. Export mapping list U-07
8. Export alarm log U-08
9. Export alarm settings U-09

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.

If using the inbuilt LCD display, the USB menus will appear automatically after the USB memory stick is detected, pressing the UP and DOWN keys allows the different USB menus to be selected and pressing the Enter button will select that process.
The file is transferred to the memory-stick in .zip format. The USB memory stick must be formatted as FAT32.

Touch Display Screen

Determines what information appears on Touch Display Screen

Set to option 0 Allows display items to be manually selected (see: Index Page Display)
Set to option 1 Displays Pack Sections 1& 2 info.
Set to option 2 Displays CO2 Section Info.
Set to option 3 Displays Oil Sections 1&2 info.
Set to option 4 Displays I/O Mapping info.
Set to option 5 Displays Main Board info.
Set to option 6 Displays Expansion Boards 1 to 10 info.
Set to option 7 Displays Section 1, 2, 3 Stats

ParA. Set/view parameters

1. From the function menu scroll to dEty
2. Pressing Enter while dEty is displayed will enter the parameter menu. See: Set up Menus

Setting up a PC connection

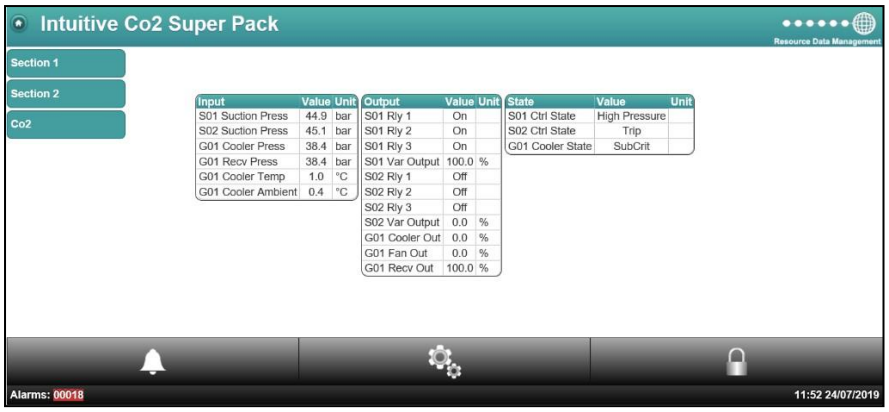
Due to the number of parameters available, it is recommended that this controller is set-up using a direct connection to a PC.

The Transcritical Superpack controller can communicate directly to a PC using a USB lead (Type A to Type B). Depending on the PC's operating system, it may require the necessary USB drivers to be installed and configured. On Windows 10 machines, no drivers are required to be installed. For older versions, the necessary drivers can be obtained from the 'Download Software' section of the RDM website which is found under 'Support'. Along with the driver, there will be a walk-through guide of how to set it up. The Intuitive V2 Transcritical Superpack controller hardware platform (firmware version 3.8 or higher) does not require the user's PC network card settings to be altered to connect to the controller, it will self-configure. Power up the controller allowing at least 30 seconds to complete booting. Then, connect from the 'USB Device' port on the controller to a USB connection on the PC and using a standard internet browser (such as Internet explorer, Firefox or Chrome) browse to the address 10.255.255.254. The controller's processor can be powered via the USB lead (V2 hardware only) which enables controller set up and programming to be accomplished without the need to connect a power supply. It should be noted however that the controller's inputs and outputs, such as relays and temperature probes, will not operate unless the 24v power supply is connected.

Home page

Log in using an appropriate username and password, setup operations can then be used via the PC by clicking on the appropriate link. The alarm tab will show all current active alarms for all sections listed in order of section followed by alarm type.

By default, the Oil control sections will be set to unused and the number of expansion boards set to 0, selecting the Configuration menu will allow the oil sections to be enabled and the number of expansion boards specified.



Main Menu Overview (PC Connection)

This example shows the oil sections enabled and 10 expansion boards in use and all devices un-hidden.

- Service
  - Control
    - Section 1
    - Section 2
    - Co2
    - Oil 1
    - Oil 2
    - Oil 3
    - General 1
    - Parallel
  - Alarms
  - Mapping
    - Section 1
    - Section 2
    - Co2
    - Oil 1
    - Oil 2
    - Oil 3
    - General 1
    - Parallel
  - Stats
    - Stats 1
    - Stats 2
  - Visibility
    - Device Name Aliases
    - Device Item Aliases
    - Device Alarm Aliases
    - Device Display Aliases
    - Index Page Display
    - Active Alarms
    - Hidden Alarms

Sub Menus

Values	Shows the current values for that section.
Settings	Shows the current settings for that section.
Alarm Log	Shows all alarms that have occurred for that section, these are listed in chronological order.
Set Parameters	Allows settings to be changed for that section, password protected.
Graph	Shows a graph of logged data for that particular section.
Alarm Summary	Gives an overview of all alarms that can be produced for that section and which display they are mapped to.
Proof Status	If run proofs are used then this show an overview of compressor status such as "Off", "Run" and "Pending".

Oil, General and Parallel sections will only be shown if they are being used.

View current and old alarms.

Values	Shows the current input/output mapping for that section.
Settings	Shows the current input/output mapping settings for that section.
Alarm Log	Shows all alarms that have occurred for the mapping of that section.
Set Parameters	Allows input/output mapping for that section, password protected.

Values	Shows the current number of relay starts and relay run hours.
Settings	Not used.
Alarm Log	Not used.
Set Parameters	Allows relay starts and run hours to be reset, password protected.

Device Name Aliases	Allows devices to be hidden or renamed.
Device Item Aliases	Allows items within a device to be renamed or hidden. Outputs, States and Parameters.
Device Alarm Aliases	Allows the description of any alarm to be changed.
Device Display Aliases	Allows the text which appears on the remote display (PR0620) to be aliased.
Index Page Display	Allows the user to configure what Inputs, Outputs and States that are displayed on the Home Page (PC, TouchXL or PR0615 Touch display when set to Dev0).
Active Alarms	View list of alarms that can be generated.
Hidden Alarms	View list of alarms that have been hidden

- Hardware
  - MainBrd 1
  - ExtBrd 1
  - ↓
  - ExtBrd 9
  - ExtBrd 10

Values	Shows the current hardware input/output values for the main control board and expansion boards 1 to 10
Settings	Shows the current hardware settings for the main control board and expansion boards 1 to 10.
Alarm Log	Shows all hardware alarms that have occurred for the main control board and expansion boards 1 to 10.
Set Parameters	Allows hardware settings to be changed for the main control board and expansion boards 1 to 10, password protected

In default (factory) settings, these sections are turned off, they can be enabled in the configuration section.

- Setup

Allows quick set up of the compressor sections during initial commissioning. This menu can be used as a quick alternative to the Control, Mapping and Visibility menus which can also be used for setting up.

- Override Status
  - MainBrd
  - ExtBrd 1

Overview of any inputs and outputs, such as relays, stepper valves and 0-10v outputs that are currently overridden on the main controller and any expansion boards.

- Mapping Summary
  - Section 1
  - Section 2
  - Co2 1
  - Oil 1
  - Oil 2
  - General 1
  - General 2
  - General 3

View a summary of input/output mapping for all sections

- System
  - System Log
  - Mute All Alarms
  - Clear Alarm Logs
  - Clear Aliases
  - Features
  - Network
  - Time
  - Version
  - TouchXL Status
  - LCD Display Setup
  - LCD Display Layout

System Log	View system log
Mute All Alarms	Silences all alarms
Clear Alarm Logs	Removes the alarm log
Clear Aliases	Clears all aliases that have been assigned IO. Additionally, clears the visibility of sections and IO's and will reset the visibility on the display to default.
Features	Shows current features enabled (Bacnet for example)
Network	Shows current set up: - Rotary switches, IP address, Netmask, Default gateway & Name Servers.
Time	Set the Time or synchronise with the PC
Version	Shows the controller and expansion board's software version
TouchXL Status	Shows IP Address, MAC address, name, connection status details.
LCD Display Setup	Allows setting of screen timers and set parameter permission.
LCD Display Layout	Allows configuration of internal LCD display mimics.

- Network

Bacnet Setup — Allows Bacnet network setup if enabled on the controller.

- Layout

Manage Layouts — Allows the user to upload, configure, download, remove and preview a layout on the controller.

- Users

List	View a list of all users currently setup on the controller
Add	Allows an Install level user can add new users

- Maintenance
  - Main Config
  - Save Config
  - Load Config
  - View Config Info
  - Add Feature
  - Upgrade
  - Reset

Main Config	View and set the current configuration of the controller.
Save Config	Saves the current Configuration
Load Config	Allows the user to upload a previously saved configuration, NOTE: file needs to be named "Setup.xml"
View Config Info	Shows details on the last loaded config including any unmatched settings due to differences in firmware, also allows a Config Error alarm to be reset.
Add Feature	Shows the system key to allow features to be enabled remotely.
Upgrade	Allows controller firmware to be updated.
Reset	Allows the user to reset the controller.

- Export
  - Log
  - Settings
  - Mapping
  - System Log
  - Alarm Log
  - Alarm Settings

Log	Allows the controller's logged data, pressures and temperatures for example, to be extracted in the form of an Excel spreadsheet.
Setting	Allows all the controller's control settings to be extracted.
Mapping	Allows all the controller's mapping settings to be extracted.
System Log	Allows all the controller's system log to be extracted.
Alarm Log	Allows all the controller's alarm log to be extracted.
Alarm Settings	Allows all the controller's alarm settings to be extracted.

All of the above data will be in the form of an XML document with the exception of the logged data which will be an Excel spreadsheet

- Overrides
  - MainBrd
  - ExtBrd 1

Allows inputs and outputs, such as relays, stepper valves and 0-10v outputs to be overridden on main controller and any expansion boards. This option is only available when the Override Display setting in the Main Config menu must be set to Web/Touch

- Mail

Sender Setup

Name	The sender name that appears on the received alarm email
Address	The sender email address that appears on the received alarm email.
Force TLS	If set to 'No', then if TLS Authentication fails it will try Plain Authentication. If Force TLS is set to 'Yes', it will only try TLS Authentication

Send email Directly
Sends the e-mails directly to the destination server, please note this may or may not work depending on the setting of firewalls and e-mail servers between the controller and the remote system.

Send email Through Server
Sends the e-mails through an intermediate server. If enabled complete the fields required for Server Setup.

Server Setup

Address	Address of mail server used to send alarms e.g., office mail server.
Port	Set email server port number.
Authenticate	This option should be set to 'Yes' if you need to authenticate when sending a mail.
Username	If authentication required enter a valid username for the mail server account.
Password	If authentication required enter a valid password.
Test	Allows a test email to be sent.

Sections 1 & 2 Pack (d-01)

Not all parameters apply to all controller types, for example P-140 is stage 1 size so will not appear on a controller if it is set up as a staged pack controller. In the right-hand columns, the controller type will be shown, if that parameter applies to that type, if it does not apply it will be greyed out.

Note:
Pack sections 1& 2 have the same parameter numbers

No.	Section Parameters	Range	Step	Units	Default HT/LT	
					All Pack Fuzzy Default Settings	All Pack Staged Default Settings
P-01	Span 1 *	-3.4 – 180	0.1	Bar	60.0	60.0
P-02	Span 2 *	-3.4 – 180	0.1	Bar	160.0	160.0
P-03	Span 3 *	-3.4 – 180	0.1	Bar	60.0	60.0
P-04	Span 4	-3.4 – 180	0.1	Bar	60.0	60.0
P-05	Offset 1	-3.4 – 180	0.1	Bar	0.0	0.0
P-06	Offset 2	-3.4 – 180	0.1	Bar	0.0	0.0
P-07	Offset 3	-3.4 – 180	0.1	Bar	0.0	0.0
P-08	Offset 4	-3.4 – 180	0.1	Bar	0.0	0.0
P-09	Day Target Pressure	-3.4 – 180	0.1	Bar	28/12	28/12
P-10	Night Target Pressure	-3.4 – 180	0.1	Bar	29/13	29/13
P-11	Target Pressure Diff Above P-9/10	-3.4 – 180	0.1	Bar	0.5	0.5
P-12	Target Pressure Diff Below P-9/10	-3.4 – 180	0.1	Bar	0.5	0.5
P-13	Ext. Target Pressure	-3.4 – 180	0.1	Bar	28/12	28/12
P-15	Optimise Limit	-3.4 – 150	0.1	Bar	2.0	2.0
P-16	Response On Speed	1 – 60	1	---	5	5
P-17	Response Off Speed	1 – 60	1	---	5	5
P-22	Inverter Starts Per Hour	0 – 60	1	---	0	
P-23	Compressor Starts per Hour	0 – 60	1	---	10	
P-24	Run Smallest	0 = Off, 1 = On	1	-	0	0
P-25	Always Run Last	0 = Off, 1 = On	1	-	0	0
P-26	Comp Unload	0 = Off, 1 = On	1	-	0	
P-27	Equal Run	0 = Off, 1 = On	1	-	0	
P-28	Run Proof	0 = Off, 1 = On, 2 = On/Mon	1	-	0	0
P-60	Comp Try	1 - 8	1	-	1	1
P-61	Comp Try Wait	00:00 – 60:00	00:01	min:sec	00:05	00:05
P-62	Comp Try Dly	00:00 – 60:00	00:01	min:sec	00:10	00:10
P-63	Comp Open Alm Dly	00:00 – 60:00	00:01	min:sec	00:15	00:15
P-64	Comp Open Clear Dly	00:00 – 60:00	00:01	min:sec	00:15	00:15
P-65	Comp Reset In Fault	0 = Off, 1 = On	1	-	0	0
P-20	Proof Auto Reset	00:00 – 99:00	00:01	min:sec	01:00	01:00
P-29	Gas Dump	0 = Off, 1 = On	1	-	0	0
P-30	Gas Diff	-3.4 – 180	0.1	Bar	0.5	0.5
P-31	Inverter	0 = Off, 1 = On	1	-	0	0
P-32	INV Bypass	0 = Disabled 1 = 1 + no retry 2 = 1 + 1 retry 3 = 1 + 2 retries 4 = 1 + 3 retries 5 = 1 + 4 retries	1	-	0	0
P-38	Inv Mon	0 = Proof, 1 = Fault	1	-	0	0
P-33	INV Minimum	0 – 100	1	%	0	0

No.	Section Parameters	Range	Step	Units	Default	No.
P-34	INV Maximum	0 – 100	1	%	100	100
P-43	INV Hold	0 – 5	0	-	0	0
P-44	Max Ramp On	0 – 10	1	%/second	0	0
P-45	Max Ramp Off	0 – 10	1	%/second	0	0
P-46	In Band Control	0 = Off, 1 = On	1	-	0	0
P-35	PWM Control	0 = Off, 1 = On	1	-	0	0
P-36	PWM Cycle Time	00:10 – 00:30	00:01	min:sec	00:20	00:20
P-37	Inverter Fail	0 – 100	1	%	25	25
P-41	Stage On Delay	00:00 – 01:00	00:01	min:sec	00:10	00:10
P-42	Stage Off Delay	00:00 – 01:00	00:01	min:sec	00:10	00:10
P-50	Alarm Delay	00:00 – 99:00	01:00	min:sec	01:00	01:00
P-51	HP Alarm (suction)	-3.4 – 180	0.1	Bar	38/16	38/16
P-52	LP Alarm (suction)	-3.4 – 180	0.1	Bar	22/9	22/9
P-53	LP Shut-down (suction)	-3.4 – 180	0.1	Bar	19/7	19/7
P-54	Low Pressure Alarm Delay	00:00 – 99:00	01:00	min:sec	00:00	00:00
P-55	Pressure Fail	0 = Off, 1 = On, 2 = Variable	1	-	2	2
P-56	Probe Alarms	0 = Off, 1 = On	1	-	0	0
P-73	Night Set On Time	00:00 – 23:59	00:01	min:sec	20:00	20:00
P-74	Night Set Off Time	00:00 – 23:59	00:01	min:sec	08:00	08:00
P-80	Discharge Trip Pressure	-3.4 – 150	0.1	Bar	103/32	103/32
P-81	Discharge Stop Pressure	-3.4 – 150	0.1	Bar	107/34	107/34
P-82	Discharge Offset	-3.4 – 150	0.1	Bar	2.0	2.0
P-83	Discharge Trip Temperature	-60 – 256	0.1	^{o}C	90.0	90.0
P-84	Discharge Stop Temperature	-60 – 256	0.1	^{o}C	95.0	95.0
P-85	Discharge Temperature Differential	-60 – 256	0.1	^{o}C	10.0	10.0
P-86	Do Discharge Trip	0 = Off, 1 = Pressure, 2 = Temperature, 3 = Pressure & Temperature	1		1	1
On firmware version V4.0 or lower the superheat parameters P-87 to P-94 are located in the Gas Cooler section (G01)						
P-87	Do SH	0 = Off, 1 = On	1	---	Off	Off
P-88	SH Low Target	-60 – 256	0.1	^{o}C	8.0	8.0
P-89	SH Low Diff	-60 – 256	0.1	^{o}C	2.0	2.0
P-90	SH Low Alarm	-60 – 256	0.1	^{o}C	5.0	5.0
P-91	SH High Target	-60 – 256	0.1	^{o}C	30.0	30.0
P-92	SH High Diff	-60 – 256	0.1	^{o}C	3.0	3.0
P-93	SH High Alarm	-60 – 256	0.1	^{o}C	50.0	50.0
P-94	SH Delay	00:00 – 99:00	00:01	min:sec	02:00	02:00
P.100	Status Fault Delay	00:00 – 60:00	00:01	min:sec	00:10	00:10
P.101	General Fault Delay	00:00 – 60:00	00:01	min:sec	00:10	00:10
P.102	Standby Delay	00:00 – 60:00	00:01	min:sec	00:10	00:10
P.103 ↓ P.118	Status Fault 1 ↓ Status Fault 16	0 = Unused 1 = Comp N/O 2 = Comp N/C 3 = Gen N/O 4 = Gen N/C 5 = Standby N/O 6 = Standby N/C 7 = Run N/O 8 = Run N/C 9 = INV N/O 10 = INV N/C 11=Proof N/O 12=Proof N/C 13= INV Proof N/O 14 = INV Proof N/C	1	---	0	0

No.	Section Parameters	Range	Step	Units	Default	No.
P.120 ↓ P.135	Stage 1 ↓ Stage 16	0 = None 1 = Unused 2 = Inv 3 = Comp 4 = Loader 5 = Trim 6 = SSR	1		0	
P.140 ↓ P.155	Stage 1 size ↓ Stage 16 Size	0.0 – 60.0	0.1		0	
P.160 ↓ P.175	Stage 1 Relay 1 ↓ Stage 1 Relay 16	0 = Off 1 = On	1			0
P.180 ↓ P.195	Stage 2 Relay 1 ↓ Stage 2 Relay 16	0 = Off 1 = On	1			0
P.200 ↓ P.215	Stage 3 Relay 1 ↓ Stage 3 Relay 16	0 = Off 1 = On	1			0
P.220 ↓ P.235	Stage 4 Relay 1 ↓ Stage 4 Relay 16	0 = Off 1 = On	1			0
P.240 ↓ P.255	Stage 5 Relay 1 ↓ Stage 5 Relay 16	0 = Off 1 = On	1			0
P.260 ↓ P.275	Stage 6 Relay 1 ↓ Stage 6 Relay 16	0 = Off 1 = On	1			0
P.280 ↓ P.295	Stage 7 Relay 1 ↓ Stage 7 Relay 16	0 = Off 1 = On	1			0
P.300 ↓ P.315	Stage 8 Relay 1 ↓ Stage 8 Relay 16	0 = Off 1 = On	1			0
P.320 ↓ P.335	Stage 9 Relay 1 ↓ Stage 9 Relay 16	0 = Off 1 = On	1			0
P.340 ↓ P.355	Stage 10 Relay 1 ↓ Stage 10 Relay 16	0 = Off 1 = On	1			0
P.360 ↓ P.375	Stage 11 Relay 1 ↓ Stage 11 Relay 16	0 = Off 1 = On	1			0
P.380 ↓ P.395	Stage 12 Relay 1 ↓ Stage 12 Relay 16	0 = Off 1 = On	1			0
P.400 ↓ P.415	Stage 13 Relay 1 ↓ Stage 13 Relay 16	0 = Off 1 = On	1			0

No.	Section Parameters	Range	Step	Units	Default	No.
P.420 ↓ P.435	Stage 14 Relay 1 ↓ Stage 14 Relay 16	0 = Off 1 = On	1			0
P.440 ↓ P.455	Stage 15 Relay 1 ↓ Stage 15 Relay 16	0 = Off 1 = On	1			0
P.460 ↓ P.475	Stage 16 Relay 1 ↓ Stage 16 Relay 16	0 = Off 1 = On	1			0
dFLt	Restore Default Settings (Panel Mount Display 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.

Example: PR0162 transducer with range: -1 bar to 65bar
Span would be 66bar (957 psi)
Offset would be -1 bar (14.5 psi)

The controller expects the pressure transducer used to read zero bar when open to air at sea level (1 bar atmospheric pressure disregarded), if the transducer does not read zero then the offset parameter can be adjusted accordingly.

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.

Section 3 CO2 (d-02)

No.	Section Parameters	Range	Step	Units	Default
P-01	G01 Span 1	-3.4 – 180	0.1	Bar	160.0
P-02	G01 Span 2	-3.4 – 180	0.1	Bar	60.0
P-03	G01 Span 3	-3.4 – 180	0.1	Bar	60.0
P-04	G01 Span 4	-3.4 – 180	0.1	Bar	60.0
P-05	G01 Offset 1	-3.4 – 180	0.1	Bar	0.0
P-06	G01 Offset 2	-3.4 – 180	0.1	Bar	0.0
P-07	G01 Offset 3	-3.4 – 180	0.1	Bar	0.0
P-08	G01 Offset 4	-3.4 – 180	0.1	Bar	0.0
P-15	G01 Gas Temp Select	0=Cool Out, 1=HX Out	1	---	0
P-16	G01 Gas HX Min Temp	-60 – 180	0.1	^{o}C	-10.0
P-20	G01 Max Gas Press	-3.4 – 180	0.1	Bar	90.0
P-21	G01 Min Gas Press	-3.4 – 180	0.1	Bar	15.0
P-22	G01 Max Gas SP	-3.4 – 180	0.1	Bar	85.0
P-23	G01 Min Gas SP	-3.4 – 180	0.1	Bar	40.0
P-29	G01 Temp Fail Gas Setpoint	-60 - 256	1	^{o}C	20.0
P-24	G01 Extra Gas SP	-3.4 – 180	0.1	Bar	2.0
P-25	G01 Gas Trgt Above	-3.4 – 180	0.1	Bar	0.5
P-26	G01 Gas Trgt Below	-3.4 – 180	0.1	Bar	0.5
P-27	G01 Gas Resp On	1 – 60	1	---	5
P-28	G01 Gas Resp Off	1 – 60	1	---	5
P-40	G01 Min Gas Inv	0 – 100	1	%	0
P-41	G01 Max Gas Inv	0 – 100	1	%	100
P-44	G01 Gas Inv Hold	0 – 5	1	sec	0
P-45	G01 Gas Ramp On	0 -10	1	%/sec	0

No.	Section Parameters	Range	Step	Units	Default
P-46	G01 Gas Ramp Off	0 -10	5	%/sec	0
P-42	G01 Gas Temp Fail Cooler	0 – 100	5	%	55
P-43	G01 Gas Temp Fail Fan	0 – 100	1	%	60
P-50	G01 Gas HP Reset	00:00 – 05:00	00:01	min:sec	01:00
P-51	G01 Gas Trans.Ref	0 = Auto, 1 = Manual	1	---	Auto
P-52	G01 Gas Gradient	0 – 100	0.1	---	2.4
P-53	G01 Gas Offset	0 – 100	0.1	---	6.4
P-54	G01 Gas SubTrs Offset	-10 – 10	0.1	°C	0.0
P-60	G01 Sub Cooling	-10 – 10	0.1	°C	3.0
P-70	G01 Cooler InterLock	0 = Off, 1 = On, 2= On/Zero	1	---	Off
P-71	G01 Cooler Valve in Standby	0 = Off, 1 = On	1	---	On
P-72	G01 Max Gas Fan/Step Reset	-3.4 – 180	1	Bar	65
P-80	G01 Gas AlmDly	00:00 – 60:00	00:01	min:sec	01:00
P-81	G01 Gas Shut Dly	00:00 – 60:00	00:01	min:sec	00:30
P-82	G01 Gas Alm Offset	-3.4 – 180	0.1	Bar	5.0
P-83	G01 Gas Temp OT	-60 – 256	0.1	°C	40.0
P-84	G01 HPV Prime	0 = Off, 1 = On	1	---	Off
P-85	G01 HPV Prime Press	-3.4 – 180	0.1	Bar	95.0
P-86	G01 HPV Prime End	-3.4 – 180	0.1	Bar	80.0
P-87	G01 HPV Prime Time	00:00 – 60:00	00:01	min:sec	01:00
P-100	G01 Fan Ctrl	0 = Fixed, 1 = Ambient 2 = Ambient / Pressure 1 3 = Fixed Pressure 1 4 = Ambient / Pressure 2 5 = Fixed Pressure 2	1	---	Ambient
P-101	G01 Fan Trgt	-60 – 256	0.1	°C	15.0
P-102	G01 Fan Offset Tz	-10 – 10	0.1	°C	3.0
P-103	G01 Fan Offset Tc	-10 – 10	0.1	°C	3.0
P-104	G01 Fan Resp On	1 – 60	1	---	5
P-105	G01 Fan Resp Off	1 – 60	1	---	5
P-116	G01 Min Fan Inv	0 – 100	1	%	0
P-117	G01 Max Fan Inv	0 - 100	1	%	100
P-118	G01 Fan Amb Stop	-60 – 256	0.1	°C	5
P-119	G01 Fan Inv Hold	0 – 5	1	sec	0
P-120	G01 Fan Ramp On	0 -10	1	%/sec	0
P-121	G01 Fan Ramp Off	0 -10	1	%/sec	0
P-106	G01 Fan Max Trgt	-60 – 256	0.1	°C	25.0
P-107	G01 Fan Min Trgt	-60 – 256	0.1	°C	5.0
P-108	G01 Fan NgtSetBack	0 = Off, 1 = On, 2 = Local, 3 = Remote	1	---	Off
P-109	G01 Fan Ngt Reduction	0 – 100	1	%	30
P-110	G01 Fan NgtSetOn	00:01 – 23:59	00:01	hr:min	20:00
P-111	G01 Fan NgtSetOff	00:01 – 23:59	00:01	hr:min	08:00
P-112	G01 Fan Ngt Temp Limit	-60 – 256	0.1	°C	28.0
P-113	G01 Fan Day Reduction	0 – 100	1	%	0
P-114	G01 Fan Day Temp Limit	-60 – 256	0.1	°C	28.0
P-115	G01 Fan Trans Ctrl	0= Run, 1 =100%	1	---	1
P-122	G01 Fans Trans Max	-3.4 – 180	0.1	Bar	90.0
P-201	G01 Recv Target	-3.4 – 180	0.1	Bar	38.0
P-202	G01 RecvTrgt Above	-3.4 – 180	0.1	Bar	0.5
P-203	G01 RecvTrgt Below	-3.4 – 180	0.1	Bar	0.5
P-204	G01 RecvResp On	1 – 60	1	---	5
P-205	G01 RecvResp Off	1 – 60	1	---	5
P-207	G01 RecvInterLock	0 = Off, 1 = On, 2 = GC, 3 = GCFan	1	---	On
P-220	G01 RecvAlmDly	00:00 – 60:00	00:01	min:sec	02:00
P-221	G01 Recv Min Press	-3.4 – 180	0.1	Bar	33.0
P-222	G01 Recv Max Press	-3.4 – 180	0.1	Bar	47.0
P-223	G01 Recv Fail	0 – 100	1	%	30
P-226	G01 RecvInv Hold	0 – 5	1	sec	0
P-227	G01 Recv Ramp On	0 -10	5	%/sec	0
P-228	G01 Recv Ramp Off	0 -10	5	%/sec	0
P-250	G01 Liq Level	0 = Off, 1 = On	1	---	Off
P-251	G01 High LiqLevel	0 – 100	1	%	80

P-252	G01 Low LiqLevel	0 – 100	1	%	20
P-253	G01 LiqLevelDly	00:00 – 99:00	00:01	min:sec	05:00
P-300	G01 Aux Comp Trgt	-3.4 – 180	0.1	Bar	34.0
P-301	G01 Aux Resp On	1 – 60	1	---	5
P-302	G01 Aux Resp Off	1 – 60	1	---	5
P-303	G01 Aux Trgt Above	-3.4 – 180	0.1	Bar	0.5
P-304	G01 Aux Trgt Below	-3.4 – 180	0.1	Bar	0.5
P-307	G01 Aux Inv Hold	0 – 5	1	sec	0
P-308	G01 Aux Ramp On	0 -10	1	%/sec	0
P-309	G01 Aux Ramp Off	0 -10	1	%/sec	0
P-350	G01 Do LiqInj	0 = Off, 1 = Section 1, 2 = Section 2, 3 = Parallel	1	---	Off
P-351	G01 LiqInj SP	-60 – 256	0.1	°C	115.0
P-352	G01 LiqInj Diff	-10 – 10	0.1	°C	5.0
P-353	G01 LiqInj OT	-60 – 256	0.1	°C	128.0
On firmware version V4.1 or higher the superheat parameters P-400 to P-420 have been moved from the Gas section (G01) to the compressor sections (S01 & S02)					
P-400	G01 Do SH	0 = Off, 1 = On	1	---	Off
P-401	G01 SH Lo Trgt	-60 – 256	0.1	°C	8.0
P-402	G01 SH Lo Diff	-60 – 256	0.1	°C	2.0
P-403	G01 SH Lo Alm	-60 – 256	0.1	°C	5.0
P-411	G01 SH Hi Trgt	-60 – 256	0.1	°C	30.0
P-412	G01 SH Hi Diff	-60 – 256	0.1	°C	3.0
P-413	G01 SH Hi Alm	-60 – 256	0.1	°C	50.0
P-420	G01 SH Dly	00:00 – 99:00	00:01	min:sec	02:00
P-500	G01 Co2 Status Dly	00:00 – 60:00	00:01	min:sec	00:10
P-501	G01 General Fault Delay	00:00 – 60:00	00:01	min:sec	00:10
P-502	G01 Standby Delay	00:00 – 60:00	00:01	min:sec	00:10
P-520 ↓ P-535	G01 Co2 Status 1 ↓ G01 Co2 Status 16	0 = Unused, 1 = ExCap N/O 2 = ExCap N/C,3 = RcvLon N/O, 4 = RcvLon N/C, 5 = RcvHi N/O, 6 = RcvHi N/C, 7 = Heat Rec. N/O 8 = Heat Rec. N/C, 9 = General N/O, 10 = General N/C, 11 = Standby N/O, 12 = Standby N/C, 13 = Run N/O, 14 = Run N/C	1	---	Unused
P-540	G01 Sect Interlock	0 = Off, 1 = On	1	---	Off
P-600	G01 Heat Recovery	0 = Off, 1 = Type 1, 2 = Type 2, 3 = Type 3	1	---	Off
P-601	G01 Heat Rec. Start	1.0 – 3.0	0.1	V	2.0
P-602	G01 Heat Rec. End	4.0 – 8.0	0.1	V	8.0
P-603	G01 Hrec GasRef at Start	-3.4 – 180	0.1	Bar	50.0
P-604	G01 Hrec GasRef at End	-3.4 – 180	0.1	Bar	80.0
P-605	G01 Hrec GasRef above End	-3.4 – 180	0.1	Bar	83.0
P-606	G01 Hrec FanRef at End	-60 – 256	0.1	°C	8.0
P-607	G01 Hrec FanRef at Bypass	-60 – 256	0.1	°C	5.0
P-608	G01 Hrec Bypass	8.5 – 9.9	0.1	V	9.6
P-609	G01 Hrec Bypass Ref.	-60 – 256	0.1	°C	28.0
P-610	G01 Hrec Bypass Diff	-60 – 256	0.1	°C	2.0
P-611	G01 Hrec Bypass Resp On	1 – 60	1	---	5
P-612	G01 Hrec Bypass Resp Off	1 – 60	1	---	5
P-615	G01 Bypass Inv Hold	0 – 5	1	sec	0
P-616	G01 Bypass Ramp On	0 -10	1	%/sec	0
P-617	G01 Bypass Ramp Off	0 -10	1	%/sec	0
P-620	G01 Fan Rev	0 = Off, 1 = On, 2 = Local, 3 = Remote	1	---	Off
P-621	G01 Fan Rev Start	00:01 – 23:59	00:01	hrs:min	00:00
P-622	G01 Fan Rev Length	00:00 – 99:00	01:00	min:sec	10:00
P-623	G01 Fan Rev Delay	00:00 – 00:99	01:00	min:sec	01:00
P-624	G01 Fan Rev Fix	0 = Off, 1 = On	1	---	Off
P-625	G01 Fan Rev Variable	0 – 100	1	%	100
P-626	G01 Fan Rev Level	-3.4 – 180	0.1	Bar	45
dFLt	Restore Default Settings	Panel Mount Display Only			

Oil Sections 1, 2 & 3 (d-03)

Oil sections 1, 2 & 3 (HT, LT and Parallel) have the same parameter numbers (ds01, ds02 & ds03)

No.	Section Parameters	Range	Step	Units	Default
P-01	Oil Enable 1	0 = Off	1	---	Off
P-02	Oil Enable 2	0 = Off	1	---	Off
P-03	Oil Enable 3	0 = Off	1	---	Off
P-04	Oil Enable 4	0 = Off	1	---	Off
P-05	Oil Enable 5	0 = Off	1	---	Off
P-06	Oil Enable 6	0 = Off	1	---	Off
P-07	Oil Enable 7	0 = Off	1	---	Off
P-08	Oil Enable 8	0 = Off	1	---	Off
P-09	Oil Enable 9	0 = Off	1	---	Off
P-10	Oil Enable 10	0 = Off	1	---	Off
P-11	Oil Enable 11	0 = Off	1	---	Off
P-12	Oil Enable 12	0 = Off	1	---	Off
P-13	Oil Enable 13	0 = Off	1	---	Off
P-14	Oil Enable 14	0 = Off	1	---	Off
P-15	Oil Enable 15	0 = Off	1	---	Off
P-16	Oil Enable 16	0 = Off	1	---	Off
P-40	Pre Dly	00:00 – 01:00	00:01	min:sec	00:05
P-41	Pulses	0 – 30	1	---	30
P-42	Pulse Off	00:00 – 01:00	00:01	min:sec	00:30
P-43	Pulse On	00:00 – 01:00	00:01	min:sec	00:30
P-44	LockOut	0 – 6	1	1	3
P-45	Retry	00:00 – 60:00	00:01	min:sec	00:10
P-46	Post Dly	00:00 – 00:10	00:01	min:sec	00:10
P-60	Oil Sep Enable	0 = Off, 1 = N/O, 2 = N/C	1	---	Off
P-61	Sep Pulse Off	00:00 – 01:00	00:01	min:sec	00:10
P-62	Sep Pulse On	00:00 – 01:00	00:01	min:sec	00:05
P-63	Oil Lo Enable	0 = Off, 1 = N/O, 2 = N/C	1	---	Off
P-64	Oil Hi Enable	0 = Off, 1 = N/O, 2 = N/C	1	---	Off
P-65	LoHi Dly	00:00 – 01:00	00:01	min:sec	00:15
P-66	Oil Reset Enable	0 = Off, 1 = N/O, 2 = N/C	1	---	Off

General Section Parameters (d-04 General)

Note: All General Sections 1 to 3 have the same parameter numbers

No.	Section Parameters	Range	Step	Units	Default
P-01	Stat1	0 = Off, 1 = On, 2 = Run N/O, 3 = Run N/C 4 = On/Tm, 5 = RunNO/Tm, 6 = RunNC/Tm	1	-	0
P-02	Stat1 Cut-In	-60.0 – 256.0	0.1	^{o}C	15.0
P-03	Stat1 Diff	0.0 – 20.0	0.1	^{o}C	1.0
P-04	Stat1 Type	0 = Direct, 0 = Indirect	1	-	0
P-10	Stat1 High Temp	-60.0 – 256.0	0.1	^{o}C	25.0
P-11	Stat1 Low Temp	-60.0 – 256.0	0.1	^{o}C	0.0
P-12	Stat1 Alm Delay	00:00 – 99:00	00:01	hr:min	01:00
P-13	Stat1 On Time	00:00 – 23:59	00:01	hr:min	08:00
P-14	Stat1 Off Time	00:00 – 23:59	00:01	hr:min	20:00
P-21	Stat2	0 = Off, 1 = On, 2 = Run N/O, 3 = Run N/C 4 = On/Tm, 5 = RunNO/Tm, 6 = RunNC/Tm	1	-	0
P-22	Stat2 Cut-In	-60.0 – 256.0	0.1	^{o}C	15.0
P-23	Stat2 Diff	0.0 – 20.0	0.1	^{o}C	1.0
P-24	Stat2 Type	0 = Direct, 0 = Indirect	1	-	0
P-30	Stat2 High Temp	-60.0 – 256.0	0.1	^{o}C	25.0
P-31	Stat2 Low Temp	-60.0 – 256.0	0.1	^{o}C	0.0
P-32	Stat2 Alm Delay	00:00 – 99:00	00:01	min:sec	01:00
P-33	Stat2 On Time	00:00 – 23:59	00:01	hr:min	08:00
P-34	Stat2 Off Time	00:00 – 23:59	00:01	hr:min	20:00

P-41	Stat3	0 = Off, 1 = On, 2 = Run N/O, 3 = Run N/C 4 = On/Tm, 5 = RunNO/Tm, 6 = RunNC/Tm	1	-	0
P-42	Stat3 Cut-In	-60.0 – 256.0	0.1	°C	15.0
P-43	Stat3 Diff	0.0 – 20.0	0.1	°C	1.0
P-44	Stat3 Type	0 = Direct, 0 = Indirect	1	-	0
P-50	Stat3 High Temp	-60.0 – 256.0	0.1	°C	25.0
P-51	Stat3 Low Temp	-60.0 – 256.0	0.1	°C	0.0
P-52	Stat3 Alm Delay	00:00 – 99:00	00:01	min:sec	01:00
P-53	Stat3 On Time	00:00 – 23:59	00:01	hr:min	08:00
P-54	Stat3 Off Time	00:00 – 23:59	00:01	hr:min	20:00
P-61	PStat	0 = Off, 1 = On, 2 = Run N/O, 3 = Run N/C 4 = On/Tm, 5 = RunNO/Tm, 6 = RunNC/Tm	1	-	0
P-62	PStat Cut-In	-3.4 – 180	0.1	Bar	15
P-63	PStat Diff	-3.4 – 180	0.1	Bar	1.0
P-64	PStat Type	0 = Direct, 0 = Indirect	1	-	0
P-70	PStat High Press	-3.4 – 180	0.1	Bar	30
P-71	PStat Low Press	-3.4 – 180	0.1	Bar	6.8
P-72	PStat Alm Delay	00:00 – 99:00	00:01	min:sec	01:00
P-73	PStat On Time	00:00 – 23:59	00:01	hr:min	08:00
P-74	PStat Off Time	00:00 – 23:59	00:01	hr:min	20:00
P-81	PStat Span	-3.4 – 180	0.1	Bar	34.0
P-82	PStat Offset	-3.4 – 180	0.1	Bar	0.0

Parallel Section Parameters (d-05 Parallel)

No.	Section Parameters	Range	Step	Units	Default
P-01	PA01 Span 1	-3.4 – 180	0.1	Bar	60.0
P-02	PA01 Span 2	-3.4 – 180	0.1	Bar	60.0
P-03	PA01 Span 3	-3.4 – 180	0.1	Bar	60.0
P-04	PA01 Span 4	-3.4 – 180	0.1	Bar	60.0
P-05	PA01 Offset 1	-3.4 – 180	0.1	Bar	0.0
P-06	PA01 Offset 2	-3.4 – 180	0.1	Bar	0.0
P-07	PA01 Offset 3	-3.4 – 180	0.1	Bar	0.0
P-08	PA01 Offset 4	-3.4 – 180	0.1	Bar	0.0
P-150	PA01 Enable GC Switch	0 = Off, 1 = Cool Out, 2 = HX Out	1	-	0.0
P-151	PA01 GC Switch Type	0 = Stage Off, 1 = Shut	1	-	0
P-152	PA01 GC Switch Temperature	-60.0 – 256.0	0.1	°C	25.0
P-153	PA01 GC Switch Diff	-10.0 – 10.0	0.1	°C	2.0
P-154	PA01 Enable on Receiver Minimum	0 = Off, 1 = On	1	-	0
P-155	PA01 Receiver Minimum	0-100	1	%	30
P-09	PA01 Trgt	-3.4 – 180	0.1	Bar	34.0
P-10	PA01 Night Trgt	-3.4 – 180	0.1	Bar	34.0
P-11	PA01 Trgt Above	-3.4 – 180	0.1	Bar	0.5
P-12	PA01 Trgt Below	-3.4 – 180	0.1	Bar	0.5
P-13	PA01 External Trgt	-3.4 – 180	0.1	Bar	34.0
P-16	PA01 Resp On	1 - 60	1	-	5
P-17	PA01 Resp Off	1 - 60	1	-	5
P-18	PA01 Low Amb Stop	-60 - 256	0.1	°C	5
P-19	PA01 Float Recv Setpoint	0.0 – 3.0	0.1	Bar	0.0
P-20	PA01 Float Recv On	0 – 120	1	Sec	10
P-21	PA01 Float Recv Off	0 – 120	1	Sec	10
P-22	PA01 Inv Sts/Hr	0 - 60	1	-	0
P-23	PA01 Sts/Hr	0 - 60	1	-	10
P-24	PA01 Run Small	0 = Off, 1 = On	1	-	0
P-25	PA01 Always Run Last	0 = Off, 1 = On	1	-	0
P-26	PA01 Comp Unload	0 = Off, 1 = On	1	-	0
P-27	PA01 Equal Run	0 = Off, 1 = On	1	-	0
P-28	PA01 Run Proof	0 = Off, 1 = On	1	-	0

No.	Section Parameters	Range	Step	Units	Default
P-60	PA01 Comp Try	1 – 8	1	-	1
P-61	PA01 Comp Try Wait	00:00 – 60:00	00:01	mm:ss	00:05
P-62	PA01 Comp Try Delay	00:00 – 60:00	00:01	mm:ss	00:10
P-63	PA01 Comp Open Alarm Delay	00:00 – 60:00	00:01	mm:ss	00:15
P-64	PA01 Comp Open clear	00:00 – 60:00	00:01	mm:ss	00:15
P-20	PA01 Proof Auto Reset	00:00 – 99:00	00:01	mm:ss	00:00
P-29	PA01 Gas Dump	0 = Off, 1 = On	1	-	0
P-30	PA01 Gas Diff	-3.4 – 180.0	0.1	Bar	0.5
P-31	PA01 Inv	0 = Off, 1 = On	1	-	0
P-32	PA01 Inv Bypass	0 – 5	1	-	0
P-38	PA01 Inv Mon	0 = Proof, 1 = Fault	1	-	0
P-33	PA01 Inv Min	0 -100	1	%	0
P-34	PA01 Inv Max	0-100	1	%	0
P-43	PA01 Inv hold	0 – 5	1	Sec	0
P-44	PA01 Max Ramp On	0 - 10	1	%/s	0
P-45	PA01 Max Ramp Off	0 - 10	1	%/s	0
P-46	PA01 In Band Control	0 = Off, 1 = On	1	-	0
P-35	PA01 Pwm	0 = Off, 1 = On	1	-	0
P-36	PA01 Pwm Cycle	00:10 – 00:30	00:01	mm:ss	00:20
P-37	PA01 Inv Fail	0 – 100	1	%	25
P-41	PA01 Stg On Dly	00:00 – 00:60	00:01	mm:ss	00:10
P-42	PA01 Stg Off Dly	00:00 – 00:60	00:01	mm:ss	00:10
P-50	PA01 Alm Dly	00:00 – 99:00	mm:ss	mm:ss	01:00
P-51	PA01 HP Alm	-3.4 – 180.0	0.1	bar	44.0
P-52	PA01 LP Alm	-3.4 – 180.0	0.1	bar	28.0
P-53	PA01 LP ShutDn	-3.4 – 180.0	0.1	bar	22.0
P-54	PA01 Low Alm Dly	00:00 – 99:00	00:01	mm:ss	00:00
P-55	PA01 Press Fail	0 = Off, 1 = On, 2 = Variable	1	-	08:00
P-56	PA01 Probe Alarms	0 = Off, 1 = On	1	-	0
P-73	PA01 Night Set On	00:01 – 23:59	00:01	hh:mm	20:00
P-74	PA01 Night Set Off	00:01 – 23:59	00:01	hh:mm	08:00
P-80	PA01 Discharge Trip	-3.4 - 180	0.1	Bar	103.0
P-81	PA01 Discharge Stop	-3.4 - 180	0.1	Bar	103.0
P-82	PA01 Discharge Offset	-3.4 - 180	0.1	Bar	103.0
P-83	PA01 Discharge Temp Trip	-60.0 -256.0	0.1	°C	90.0
P-84	PA01 Discharge Temp Stop	-60.0 -256.0	0.1	°C	95.0
P-85	PA01 Discharge Temp Diff	-60.0 -256.0	0.1	°C	10.0
P-86	PA01 Do Discharge Trip	0 = Off, 1 = Press, 2 = Temp, 3 = P/T	1	-	0
P-87	PA01 Do Superheat	0 = Off, 1 = On	1	-	0
P-88	PA01 Superheat Low Target	-60.0 -256.0	0.1	°C	95.0
P-89	PA01 Superheat Low Diff	-10.0 – 10.0	0.1	°C	2.0
P-90	PA01 Superheat Low Alarm	-60.0 -256.0	0.1	°C	95.0
P-91	PA01 Superheat High Target	-60.0 -256.0	0.1	°C	95.0
P-92	PA01 Superheat High Diff	-10.0 – 10.0	0.1	°C	3.0
P-93	PA01 Superheat High Alarm	-60.0 -256.0	0.1	°C	95.0
P-94	PA01 Superheat Delay	00:00 – 99:00	00:01	mm:ss	02:00
P-100	PA01 Sta Flt Dly	00:00 – 99:00	00:01	mm:ss	00:10
P-101	PA01 Gen Flt Dly	00:00 – 99:00	00:01	mm:ss	00:10
P-102	PA01 Standby Dly	00:00 – 99:00	00:01	mm:ss	00:10

No.	Section Parameters	Range	Step	Units	Default
P-650 ↓ P-657	PA01 PrbSel Type 1 ↓ PA01 PrbSel Type 8	0 = Off 1 = Probe 2 = Plant N/O 3 = Plant N/C	1	-	0
P.103 ↓ P.118	Status Fault 1 ↓ Status Fault 16	0 = Unused 1 = Comp N/O 2 = Comp N/C 3 = Gen N/O 4 = Gen N/C 5 = Standby N/O 6 = Standby N/C 7 = Run N/O 8 = Run N/C 9 = INV N/O 10 = INV N/C 11=Proof N/O 12=Proof N/C 13=Inv Proof N/O 14= Inv Proof N/C	1	---	0
P.120 ↓ P.135	Stage 1 ↓ Stage 16	0 = None 1 = Unused 2 = Inv 3 = Comp 4 = Loader 5 = Trim 6 = SSR	1		0
P.140 ↓ P.155	Stage 1 size ↓ Stage 16 Size	0.0 – 60.0	0.1		0
dFLt	Restore Default Settings (Panel Mount Display Only)				

Pressure, Probe, Status, Inverter, Stepper and Relay Position Parameters (d-06 IO Map)

Controller inputs and outputs are not automatically allocated by the controller, these are manually allocated by the user and provides greater flexibility as to where the expansion modules (if used) are located. For example, if section 2 is set to use 4 compressors, then these can be mapped to any relay position on any expansion board. Relays can also be mapped to the main controller if there are relays available which have not been mapped to section 1. The same applies to all other inputs and outputs such as pressure transducers and fault inputs.

All sections 1, 2, 3, 4 & 5 have the same parameter numbers however not all IO may not be applicable to that section, for example the Oil sections do not use a stepper valve although StepPos1 is listed in the mapping table.

The Range covers all possible positions including the maximum amount of expansion modules.

No.	Section Parameters	Range	Step	Units	Default
P-01 ↓ P-04	Pressure Position 1 ↓ Pressure Position 4	0 – 88	1	---	0
P10 ↓ P-17	Probe Position 1 ↓ Probe Position 8	0 – 88	1	---	0
P-20 ↓ P-35	Status Position 1 ↓ Status Position 16	0 – 92	1	---	0
P-40 ↓ P-47	Extra Status Position 1 ↓ Extra Status Position 8	0 – 92			
P-50 ↓ P-53	Inverter Position 1 ↓ Inverter Position 4	0 – 88	1	---	0
P-60 ↓ P-83	Relay Position 1 ↓ Relay Position 24	0 – 132	1	---	0
P-100	Stepper Position 1 (Receiver)	0 – 62	1	---	0
P-101	Stepper Position 2 (Gas Cooler)	0 – 62	1	---	0
P-102	Stepper Position 3 (Heat Recovery)	0 – 62	1	---	0

Clash Alarms

If two different outputs are mistakenly mapped to the same physical relay, for example a compressor relay and alarm relay mapped to Main Board Position 12, then an "M01 Relay Clash" alarm will be generated to indicate a relay clash on the main board. If the relay clash is on expansion board such as board 01 then a "B01 Relay Clash" alarm will be generated.
Similarly, if a variable output like a fan speed signal or a stepper valve output signal is mapped to an output that is already in use then a "Var Out" or "Stepper Out" clash alarm will be generated.

Note on mapping relays on expansion modules using a local display (PR0615 or PR0620) or a Data Manager

To maintain a standard mapping template for relays, each expansion board can be allocated 12 relay positions, (13 to 24 for example). As the Mini IO expansion module only has 5 physical relays then the next 8 relay positions should be skipped ***if*** there is another expansion module fitted after the Mini IO. If an Intuitive expansion module (12 relays) is being used as well as a Mini IO expansion module (4 relays) then by having

the Mini IO as the last expansion module (highest canbus rotary address switch position) then any confusion over relay positioning is avoided.

If two Mini IO expansion modules are in use then the relays on the first module would be allocated positions 13 to 17 (relays 1 to 12 are on the main controller), and the relays on the second module would be allocated positions 25 to 29 (13 to 24 are skipped).
This setup only applies when setting the relay mapping using a local display or a Data Manager panel where relay positions are allocated numbers (as shown in the table above).
When using a PC or Touch XL to set up the controller directly then the dropdown menus automatically limit the relays available to the relevant expansion module so the above note can be disregarded.

Universal I/O, Status Inputs, Invert Relays, Probe Offsets Configuration (d-07 Main Board)

No.	Section Parameters	Range	Step	Units	Default
P-01 ↓ P-08	M01 Universal I/O 1 ↓ M01 Universal I/O 8	0 = 4-20mA Input 1 = 0-10V Input 2 = 0-5V Input 3 = 0.5-4.5V Input 4 = 0.5-9.5V Input 5 = 1-2V Input 6 = 1-6V Input 7 = 4-20mA Out 8 = 0-20mA Output 9 = 0-10V Output 10 = 0-5V Output 11 = 1-5V Output 12 = Custom mA Input 13 = Custom V Input 14 = Custom mA Output 15 = Custom V Output	1	---	1
P-50	Uni Custom In Low	-100 to 100	0.1	V/mA	0
P-51	Uni Custom In High	-100 to 100	0.1	V/mA	0
P-52	Uni Custom Out Low	-100 to 100	0.1	V/mA	0
P-53	Uni Custom Out High	-100 to 100	0.1	V/mA	0
P-10	M01 Status Inputs	0V / 24V ac	1	---	0
P-20 ↓ P-31	M01 Invert Relay or SSR select 1 ↓ M01 Invert Relay 12	0 = Off 1 = On 2 = SSR	1	---	0
P-40 ↓ P-47	M01 Offset 1 ↓ M08 Offset 8	-20 to +20	0.1	^{O}C	0.0
P-59	M01 Step Reset	1 – 25	1	Hours	6
P-60	M01 Stepper Type 1	0 = Carel 1 = Sporlan 1 2 = Sporlan 2 3 = Alco 4 = Other	1	---	1
P-61	M01 Stepper Type 2	0 = Carel 1 = Sporlan 1 2 = Sporlan 2 3 = Alco 4 = Other	1	---	1
P-70	M01 Step Max 1	0 – 6400	1	---	2500
P-71	M01 Step Max 2	0 – 6400	1	---	2500
P-80	M01 Step Close 1	0 – 6400	1	---	3500
P-81	M01 Step Close 2	0 – 6400	1	---	3500
P-90	M01 Step Speed 1	0 – 6400	1	Hz	200
P-91	M01 Step Speed 2	0 – 6400	1	Hz	200
P-100	M01 mA Peak 1	0 – 825	1	mA	120
P-101	M01 mA Peak 2	0 – 825	1	mA	120

P-110	M01 Step Half 1	0 = Off, 1 = On	1	---	0
P-111	M01 Step Half 2	0 = Off, 1 = On	1	---	0
P-120	M01 Step mA Hold 1	0 – 825	1	mA	0
P-121	M01 Step mA Hold 2	0 – 825	1	mA	0

Note: Parameters P-50 to P-121 apply only to the PR0652 hardware variant which has two stepper outputs.

When using the PR0650 hardware variant these parameters do not apply, stepper setup is the stepper expansion board PR0660 or PR0653 (See the following page).

Universal I/O, Status Inputs, Invert Relays, Probe Offsets Configuration (d-08 Ext Board)

All expansion boards (ds01 – ds10) have the same parameter numbers

No.	Section Parameters	Range	Step	Units	Default
P-01	Board Type	0 =Unused, 1 = IO 2 = Stepper, 3 = Mini IO	1	---	0
P-02 ↓ P-09	Universal I/O 1 ↓ Universal I/O 8	0 = 4-20mA Input 1 = 0-10V Input 2 = 0-5V Input 3 = 0.5-4.5V Input 4 = 0.5-9.5V Input 5 = 1-2V Input 6 = 1-6V Input 5 = 4-20mA Out 6 = 0-20mA Output 7 = 0-10V Output 8 = 0-5V Output 9 = 1-5V Output 10 = Custom mA Input 11 = Custom V Input 12 = Custom mA Output 13 = Custom V Output	1	---	0
P-10	Status Inputs	0 = 0V Return 1 = 24V ac	1	---	0
P-20 ↓ P-31	Invert Relay 1 ↓ Invert Relay 12	0 = Off 1 = On 2 = SSR	1	---	0
P-40 ↓ P-47	Offset 1 ↓ Offset 8	-20 to +20	0.1	^{O}C	0.0
P-50	Step Reset	0 – 25	1	Hours	6
P-60 ↓ P-65	Step Type 1 ↓ Step Type 6	0 = Carel 1 = Sporlan 1 2 = Sporlan 2 3 = Alco 4 = Other			
P-70 ↓ P-75	Step Max 1 ↓ Step Max 6	0 – 6400	1	---	2500
P-80 ↓ P-85	Step Close 1 ↓ Step Close 6	0 – 6400	1	---	3500
P-90 ↓ P-95	Step Speed 1 ↓ Step Speed 6	0 – 6400	1	Hz	200
P-100 ↓ P-105	Step mA Peak 1 ↓ Step mA Peak 6	0 – 825	1	mA	120
P-110 ↓ P-115	Step Half 1 ↓ Step Half 6	0 = Off, 1 = On	1	---	0
P-120 ↓ P-125	Step mA Hold 1 ↓ Step mA Hold 6	0 – 825	1	mA	0

Compressor Run Hours and Compressor Starts (d-09 Stats)

Note: sections 1 & 2 have the same parameter numbers

No.	Section Parameters	Range	Step	Units	Default
P-01	Reset Stats	0 – 1	1	---	0

Setup (d-10 Compressor Stages Quick Setup menu, Not Available in the PR0620 Display)

No.	Section Parameters	Range	Step	Units	Default
N/A	Number of Stages	0 – 16	1	---	0
N/A	Number of Status Inputs	0 – 16	1	---	0
N/A	Number of Pressure Inputs	1 – 4	1	---	0
N/A	Inverter (variable output)	0 = Unused, 1 = Used	1	---	0
N/A	Number of Probe Inputs	0 – 8	1	---	0
N/A	Superheat	0 = Unused, 1 = Used	1	---	0

Setup (d-11 CO2 Section Quick Setup menu, Not Available in the PR0620 Display)

No.	Section Parameters	Range	Step	Units	Default
N/A	Number of Status Inputs	0 – 16	1	---	0
N/A	Number of Pressure Inputs	1 – 4	1	---	0

Parameter Description

Section Parameters Description (d-01)

Note: sections 1 & 2 have the same parameter numbers

No.	Parameter	Description
P-01 ↓ P-04	Transducer 1 Span ↓ Transducer 4 Span	Range of the transducers
P-05 ↓ P-08	Transducer 1 Offset ↓ Transducer 4 Offset	Transducer value above or below zero.
P-09	Day Target Pressure	Pressure target, control will try to maintain this pressure during day time. See P-74
P-10	Night Target Pressure	Pressure target, control will try to maintain this pressure during night time. See P-73
P-11	Target Pressure Above P-09/10	Set-point above the target, used to obtain a "dead-band"
P-12	Target Pressure Below P-09/10	Set-point below the target, used to obtain a "dead-band"
P-13	External Target Pressure	Pressure target when Sect1/2/3 Run is off. Control will try to maintain this pressure until Sect1/2/3 Run is on. At this point P-09/10 used. Please see: Status Inputs
P-15	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 set point up to a maximum of 2.6 Bar

No.	Parameter	Description
P-16	Response On Speed	Allows the user to speed up/slow down the stage on speed (Option: - 1 to 60 with 60 being fastest response)
P-17	Response Off Speed	Allows the user to speed up/slow down the stage off speed (Option: - 1 to 60 with 60 being fastest response)
P-22	Inverter Starts Per Hour	Limits the inverter starts to this many starts per hour, set to 0 if not required.
P-23	Starts per hour	Limits a compressor to this many starts per hour, set to 0 if not required.
P-24	Run smallest	See explanation under the parameter tables for this parameter Run Smallest
P-25	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, but the inverter analogue output may well decrease to 0% if pressure is below the set-point.
P-26	Comp Unload	Selects the order the compressor loaders are switched off See: Compressor Loaders
P-27	Equal run Times	Equalises compressor run times. See: Equal run Times
P-28	Run Proof	Enable the compressor run proof feature. See section Run-Proof
P-60	Comp Try	If Run Proof parameter (P-28) is set to On/Mon this is the number of start attempts a compressor will have before being locked out.
P-61	Comp Try Wait	If Run Proof parameter (P-28) is set to On/Mon this is the time allowed between a compressor starting and the run confirm input being returned.
P-62	Comp Try Delay	If Run Proof parameter (P-28) is set to On/Mon this is the time delay period after a run proof fail before the compressor will try to start again.
P-63	Comp Open Alarm Delay	If Run Proof parameter (P-28) is set to On/Mon this is the time delay period between the run confirm signal being lost when a compressor is running and the compressor being stopped.
P-64	Comp Open Clear Delay	If Run Proof parameter (P-28) is set to On/Mon this is the time delay period after a running compressor is stopped due to run signal being lost and the next re start attempt.
P-65	Comp Reset In Fault	If Run Proof Parameter (P-28) is set to On or On/Mon and a compressor lockout is reset by activating the proof reset status input, the compressors will not attempt a restart until the fault input is cleared. If this parameter is set to On then compressors will attempt to restart, after a proof reset, even if the fault input is not cleared. This parameter does not apply to Inverter stages. NOTE - Where any faults have resulted in a compressor being locked out, resetting of the locked-out status in the controller should only be carried out when an engineer has verified that the fault is fully rectified on site.
P-20	Run Proof Auto Reset	If a compressor is locked out due to a run proof fail signal the lock out will be reset after this time period. If set to 00:00 then the auto reset feature is disabled and a manual reset is required.
P-29	Gas Dump	Enables Gas Dump feature. See: Gas Dump
P-30	Gas Diff	Diff below the set point that the Gas Dump valve is opened. See Gas Dump
P-31	Inverter	Enables the inverter analogue output and associated relay.
P-32	Inv Bypass	Enable for Inverter Bypass feature.
P-38	Inv Mon	If Inverter Bypass function is being used (P-32) and Inv Monitor is set to Proof then the inverter output will be locked out and bypass relay activated after the specified number of re try attempts. This can be reset by activating the InvProof status input. If Inv Monitor is set to Fault then the Inverter can be re started if the fault input clears.
P-33	Inverter Min	The minimum percentage the inverter will operate to e.g., if set to 25% the inverter output will never go below this value. This should be set to 10% when using a digital scroll compressor.
P-34	Inverter Max	The maximum percentage the inverter will operate to e.g., if set to 80% the inverter output will never go above this value

P-43	Inverter Hold	When using a variable output, like an inverter drive or digital compressor, the control algorithm will constantly monitor the changing pressure value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sample and hold" time in seconds to be set from 1 to 5 seconds. If set to a value of 3 for example, then every 3 seconds the pressure will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until the next sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in pressure.
P-44	Max Ramp On	When using a variable output, this limits how quickly the output percentage can change when responding to rising pressure. For example, if set to 5%/s then the output cannot increase more quickly than 5% in one second.
P-45	Max Ramp Off	When using a variable output, this limits how quickly the output percentage can change when responding to falling pressure. For example, if set to 5%/s then the output cannot decrease more quickly than 5% in one second.
P-46	In Band Control	When using a variable output, when the pressure is within the control dead band (within set point and target above and target below differentials.) the variable output will not change. With this parameter set to On the variable output will be allowed to change continually when inside the dead band. If, however the variable output reaches 0% or 100% (or Inverter Min and Max settings) the next stage will not switch on or off until the pressure is outside the dead band.
P-35	PWM Control	Pulse width modulation control, used to control a digital scroll compressor.
P-36	PWM Cycle Time	The total time for one on/off cycle.
P-37	Inverter Fail	In the event of a pressure transducer failure the inverter output will remain at this value. (if P-55 set to variable)
P-41	Stage On Delay	Time delay between stages switching on. If set to fuzzy control then this is not usually required and should be set to 00:00 or a low value.
P-42	Stage Off Delay	Time delay between stages switching off. If set to fuzzy control then this is not usually required and should be set to 00:00 or a low value.
P-50	Alarm Delay	Delay before HP and LP alarms are signalled
P-51	HP Alarm	Suction Pressure HP alarm set-point
P-52	LP Alarm	Suction Pressure LP alarm set-point
P-53	LP Shut-down	Suction LP shut-down set-point, all stages go off when this is reached
P-54	Low Alarm Delay	Delay applied before LP Shutdown alarm is generated. Note as soon as the LP Shutdown set point is reached any Compressor/Condenser stages, for the associated section, still operating will go off immediately and does not wait for the LP Shutdown alarm to be created.
P-55	Pressure Fail	The following will occur in the event of pressure transducer fault: – If set to On then all Compressors or Fans will turn On in the event of a transducer failure. If set to Off then all Compressors or Fans will turn Off in the event of a transducer failure. If set to variable:- during the night period all stages will turn off and inverter output will be set to the inverter fail value (P-37), during the day one stage will be switched on.
P-56	Probe Alarms	If any temperature probes are being used for general monitoring then this parameter selects whether or not to create a probe fail alarm if the probe goes faulty or is disconnected. The exception is the suction temperature probe which will always alarm on probe failure if the Superheat calculation feature is being used.
P-73	Night Set Back On Time	Time for the night set back feature to operate
P-74	Night Set Back Off Time	Time for the night set back feature to go off
P-80	Discharge Trip Pressure	If Discharge Pressure exceeds this setting, compressors will turn off gradually or Inverter will ramp down to try to reduce the discharge pressure before it reaches discharge stop parameter P-81
P-81	Discharge Stop Pressure	If Discharge Pressure exceeds this setting **All** compressors on the assigned pack go off immediately and all fans come on immediately. A Discharge Trip Alarm is generated. **Note:** If using an Inverter on the Compressors the output to the Inverter will go to 0% immediately as well as all compressors going off. The controller will remain in the stop state for a minimum of 1 minute regardless of pressure

P-82	Discharge Offset	The pressure differential below the Discharge Stop Pressure that has to be reached before the discharge trip will reset, this is also subject to a 1-minute delay period.
P-83	Discharge Trip Temperature	If Discharge Temperature exceeds this setting, compressors will turn off gradually or Inverter will ramp down to try to reduce the discharge temperature before it reaches discharge stop parameter P-84
P-84	Discharge Stop Temperature	If Discharge Temperature exceeds this setting **All** compressors on the assigned pack go off immediately and a Discharge Trip Alarm is generated. **Note:** If using an Inverter on the Compressors the output to the Inverter will go to 0% immediately as well as all compressors going off. The controller will remain in the stop state for a minimum of 1 minute regardless of temperature.
P-85	Discharge Temperature Differential	The temperature differential below the Discharge Stop Temperature that has to be reached before the discharge trip will reset, this is also subject to a 1-minute delay period.
P-86	Do Discharge Trip	Off: - Feature is not used Pressure: - Compressors will start switching off when trip pressure level is reached. Pressure & Temperature: - Compressors will start switching off when trip pressure or temperature levels are reached.
On firmware version V4.0 or lower the superheat parameters P-87 to P-94 below are located in the Gas Cooler section (G01)		
P-87	Do SH	Enables the Superheat feature which switches Superheat High and Superheat Low relays when high or low conditions are met.
P-88	SH Low Temp	If the superheat falls below this value the Superheat Low Relay will come On
P-89	SH Low Diff	The diff above P88 that the Superheat Low Relay will go Off
P-90	SH Low Alarm	Superheat Low Alarm Set Point
P-91	SH High Temp	If the superheat rises above this value the Superheat High Relay will come On
P-92	SH High Diff	The diff below P91 that the Superheat High Relay will go Off
P-93	SH High Alarm	Superheat High Alarm Set Point
P-94	SH Delay	Delay for Superheat High and Low alarms
P-100	Status fault Delay	Time delay before status faults are activated
P-101	General Alarm Delay	Time delay before general faults are activated
P-102	Standby Delay	Time delay between the standby input being activated and the controller going into standby.
P103 ↓ P118	Status Fault 1 ↓ Status Fault 16	Used to select the type of input required See: Status Inputs
P120 ↓ P135	Stage 1 ↓ Stage 16	Select the output device for this stage
P140 ↓ P155	Stage 1 Size ↓ Stage 16 Size	Sets the relative size for each compressor

CO2 Section Parameters Description (d-02)

No.	Section Parameters	Description
P-01 to P-04	Transducers 1-4 Span	Range of the pressure transducer
P-05 to P-08	Transducers 1-4 Offset	Transducer value below or above zero.
P-15	G01 Gas Temp Select	If set to Cool Out (default) then fan and gas cooler valve controls are both functions of the Gas Cooler Temperature/Pressure. If set to HX Out then fan control remains a function of Gas Cooler Temperature but gas cooler control is a function of the HX Out (heat exchanger out) temperature probe.

P-16	G01 Gas HX Min Temp.	If P-15 is set to HX Out and the ambient temperature drops below this value (default -10°C) then gas cooler valve control will revert to using the gas cooler temperature probe.
P-20	G01 Max Gas Press	Set point at which Gas Cooler HP Open alarm is generated after delay P80
P-21	G01 Min Gas Press	Set point at which Gas Cooler LP Open alarm is generated after delay P80
P-22	G01 Max Gas SP	Upper limit of the calculated Gas cooler Set point
P-23	G01 Min Gas SP	Lower limit of the calculated Gas cooler Set point
P-29	G01 Temp Fail Gas SP	If the Gas Cooler temperature probe fails then the ambient temperature probe isused instead, if the ambient probe fails then discharge pressure converted to temperature is used, if there is no discharge pressure reading then parameter "G01 Temp Fail Gas SP" is used as a setpoint.
P-24	G01 Extra Gas SP	Amount Gas Cooler Set Point is raised by if a status input set to "ExCap" is switched on.
P-25	G01 Gas Trgt Above	Differential above the gas setpoint
P-26	G01 Gas Trgt Below	Differential below the gas setpoint
P-27	G01 Gas Resp On	Adjusts the rate at which the Gas Cooler output increases when above setpoint (Option: - 1 to 60 with 60 being fastest response)
P-28	G01 Gas Resp Off	Adjusts the rate at which the Gas Cooler output decreases when below setpoint (Option: - 1 to 60 with 60 being fastest response)
P-40	G01 Min Gas Inv	Minimum value that the Gas Cooler Output will go to
P-41	G01 Max Gas Inv	Maximum value that the Gas Cooler Output will go to
P-44	G01 Gas Inv Hold	When using a variable output, like an inverter drive or stepper valve, the control algorithm will constantly monitor the changing pressure value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sample and hold" time in seconds to be set from 1 to 5 seconds. If set to a value of 3 for example, then every 3 seconds the pressure will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until the next sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in pressure or temperature.
P-45	G01 Gas Ramp On	When using a variable output, this limits how quickly the output percentage can change when responding to rising pressure or temperature. For example, if set to 5%/s then the output cannot increase more quickly than 5% in one second.
P-46	G01 Gas Ramp Off	When using a variable output, this limits how quickly the output percentage can change when responding to falling pressure or temperature. For example, if set to 5%/s then the output cannot decrease more quickly than 5% in one second.
P-42	G01 Gas Temp Fail Cooler	If gas cooler outlet temperature probe fails then the gas cooler output will go to this value.
P-43	G01 Gas Temp Fail Fan	If gas cooler outlet temperature probe fails then the fan output will go to this value.
P-50	G01 Gas HP Reset	Length of time controller stays in HP shutdown if the pressure is exceeded. This time period also applies to LP shutdown.
P-51 P-52 P-53	G01 Gas Trans.Ref G01 Gas Gradient G01 Gas Offset	During "Transcritical Operation", the Gas Cooler set point is calculated as a linear function of the "Gas Cooler Outlet" temperature. If Parameter P-51 is set to "Auto", then a pre-defined function is used. If Parameter P-51 is set to "Man", then Parameters P-52 and P-53 are used to generate the linear function. (Set Point = Gas Gradient x Gas Temp + Gas Offset)
P-54	G01 Gas SubTrs Offset	Offset to the CO2 critical point (31.1°C)
P-60	G01 Sub Cooling	Offset to the calculated gas cooler setpoint (in subcritical operation)
P-70	G01 Cooler InterLock	If "Cooler Interlock" is set to "On" then if no Section 1 compressors are running then the Gas Cooler Output is set to its minimum value, as defined by P-40 (default 0%). If set to On/Zero then the valve will close fully when all Section 1 compressors are off.
P-71	G01 Cooler Valve Standby	If the controller goes into standby mode then the gas cooler valve can be set to turn on or off, default is on.
P-72	G01 Max Gas Fan/Step Reset	Prevents the gas cooler stepper valve from automatically overdriving to 0 (re synching) if the gas cooler pressure is above this value. This setting is also used to prevent fan reversal operation if gas cooler pressure is above this value.
P-80	G01 Gas AlmDly	Gas cooler HP and LP alarm Delay
P-81	G01 Gas Shut Dly	Gas cooler Shut delay. **Note: This should be set to a minimum of 1 minute.**
P-82	G01 Gas Alm Offset	Offset to Parameters P-20 and P-21, Max and Min Gas Press, used as a trigger for "Gas Cooler Shutdown" i.e. If Gas Pressure < (Min – Offset) Shutdown after Delay set by Parameter P-81 If Gas Pressure > (Max + Offset) Shutdown after Delay set by Parameter P-81

P-83	G01 Gas Temp OT	Gas cooler outlet high temperate alarm setting, generates "G01 Gas Cooler OT" alarm after Delay set by P-80
P-84	G01 HPV Prime	When switched ON and the gas cooler pressure is above the HPV Prime Pressure value (P-85) any new HT compressor starts will be held off and the gas cooler setpoint reduced to a fixed value (P-86). Once the gas cooler pressure has dropped below the HPV Prime End setting (P-86) or if the HPV Prime Time period (P-87) has expired then the next compressor stage will be allowed to start. This feature can only be used when control type is set to fuzzy.
P-85	G01 HPV Prime Pressure	The gas cooler pressure threshold above which the HPV Prime feature is activated.
P-86	G01 HPV Prime End	The gas cooler setpoint used when the HPV Prime function is active and also the pressure below which the HPV Prime function is switched off.
P-87	G01 HPV Prime Time	The time period which, when HPV Prime function is active, will hold off the next compressor stage if the gas cooler pressure does not drop below the HPV Prime End value (P-85).
P-100	G01 Fan Ctrl	Selects how the Gas fan target and Gas Cooler target set points are derived. See: Gas Fan Control
P-101	G01 Fan Trgt	Setpoint used if fan control set to fixed or in the event of ambient temperature probe failure.
P-102	G01 Fan Offset Tz	Offset applied to the fan setpoint (only when P-100 set to ambient) when ambient temperature is $0^{O}C$
P-103	G01 Fan Offset Tc	Offset applied to the fan setpoint (only when P-100 set to ambient) when ambient temperature is at critical temperature ($31.1^{O}C$ default)
P-104	G01 Fan Resp On	Adjusts the rate at which the Gas Fan output increases when above setpoint (1 to 60 with 60 being fastest response)
P-105	G01 Fan Resp Off	Adjusts the rate at which the Gas Fan output decreases when below setpoint (1 to 60 with 60 being fastest response)
P-116	G01 Min Fan Inv	Sets the minimum gas cooler fan speed under normal running conditions. If the ambient temperature drops below the ambient stop value (P-118) then the Min Fan Inv setting will be ignored and the fans will be allowed to ramp down to 0% if required
P-117	G01 Max Fan Inv	Set the maximum gas cooler fan speed allowed during normal operation
P-118	G01 Fan Amb Stop	If the ambient temperature probe drops below this value, then the gas cooler Min Fan Inv parameter (P-116) will be ignored and the fans will be allowed to ramp down to 0% if required. Note: If the gas cooler temperature is above the fan setpoint then the fans will run normally even if the ambient temperature is below the Fan Ambient Stop value.
P-119	G01 Fan Inv Hold	When using a variable output, such as an inverter drive, to control gas cooler fan speed the control algorithm will constantly monitor the changing temperature or pressure value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sample and hold" time in seconds to be set from 1 to 5seconds. If set to a value of 3 for example, then every 3 seconds the value will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until the next sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in temperature or pressure.
P-120	G01 Fan Ramp On	When using a variable output, this limits how quickly the output percentage can change when responding to rising temperature or pressure. For example, if set to 5%/s then the output cannot increase more quickly than 5% in one second.
P-121	G01 Fan Ramp Off	When using a variable output, this limits how quickly the output percentage can change when responding to falling temperature or pressure. For example, if set to 5%/s then the output cannot decrease more quickly than 5% in one second.
P-106	G01 Fan Max Trgt	Stops the floating Gas Fan Set Point going above this level
P-107	G01 Fan Min Trgt	Stops the floating Gas Fan Set Point going below this level

P-108	G01 Fan Ngt 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. Offparameters (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 1st output (Relay 1) starting at 0, 1, 2 etc. untill you get to output for Fan Night Setback. Tick the Invert box so the night setback is on when channel is off.
P-109	G01 Fan Ngt Reduct	Reduces the fan output by this amount when the timer is not in it's night zone.
P-110	G01 Fan Ngt SetOn	The time when night setback feature will start operating
P-111	G01 Fan Ngt SetOff	The time when night setback feature will stop operating
P-112	G01 Fan Ngt Temp Limit	Temperature set-point to disable the night set back feature. Night set back is disabled when the fan target is above this level and enabled below it.
P-113	G01 Fan Day Reduct	Reduces the fan output by this amount when the timer is not in its night zone.
P-114	G01 Fan Day Temp Limit	Temperature set-point to disable the day set back feature. Day set back is disabled when the fan target is above this level and enabled below it.
P-115	G01 Fan Trans Ctrl	When set to 100% (default) gas cooler fans will run at full speed when transcritical (and the heat reclaim feature is not in use), day and night fan speed setback limits will **not** be applied. When set to "Run" the fan speed will be controlled by the normal fan setpoint strategy when transcritical, day and night fan speed setback limits will apply (if set).
P-122	G01 Fans Trans Run Max	If the gas cooler pressure reaches this value then the gas cooler fans will immediately run at 100% capacity with no delay. The parameter G01 Fan Trans Ctrl (P-115) needs to be set to "Run" for correct operation.
P-201	G01 Recv Target	Set Point at which the Receiver Bypass Valve will open and close.
P-202	G01 RecvTrgt Above	Control differential above receiver target setpoint (P-201)
P-203	G01 RecvTrgt Below	Control differential below receiver target setpoint (P-201)
P-204	G01 RecvRespOn	Adjusts the rate at which the receiver output increases when above target setpoint (Option: - 1 to 60 with 60 being fastest response)
P-205	G01 RecvResp Off	Adjusts the rate at which the receiver output decreases when below target setpoint (Option: - 1 to 60 with 60 being fastest response)
P-207	G01 RecvInterLock	If set to ON, when receiver pressure generates a receiver high pressure alarm, gas cooler output is set to the "Min Gas Inv" parameter value P-40 (default 0%)When receiver pressure generates a receiver low pressure alarm, gas cooler output is set to "Max Gas Inv" Parameter value P-41 (default 100%) If Set to GC, operation is the same as described above but the receiver alarm delay period is ignored. If Set to GC Fans, do not use, for future development.
P-220	G01 Recv Alm Dly	Delay applied before the Receiver Low or High Pressure alarm is generated.
P-221	G01 Recv Min Press	Setting at which Receiver Low Pressure alarm is generated
P-222	G01 Recv Max Press	Setting at which Receiver High Pressure alarm is generated
P-223	G01 Recv Fail	Value the Receiver Bypass Valve will go to it the Receiver Transducer fails
P-226	G01 Recv Inv Hold	When using a variable output, like an inverter drive or stepper valve, the controlalgorithm will constantly monitor the changing pressure value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sampleand hold" time in seconds to be set from 1 to 5 seconds. If set to a value of 3 forexample, then every 3 seconds the pressure will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until thenext sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in pressure.
P-227	G01 Recv Ramp On	When using a variable output, this limits how quickly the output percentage canchange when responding to rising pressure. For example, if set to 5%/s then the output cannot increase more quickly than 5% in one second.
P-228	G01 Recv Ramp Off	When using a variable output, this limits how quickly the output percentage can change when responding to falling pressure. For example, if set to 5 %/s then the output cannot decrease more quickly than 5% in one second.
P-250	G01 Liq Level	Enables Liquid Level feature
P-251	G01 High Liq Level	Settings at which High Low Liquid Level alarms are generated
P-252	G01 Low Liq Level	Settings at which Low Liquid Level alarms are generated
P-253	G01 Liq Level Dly	Liquid level alarm delay period
P-300	G01 Aux Comp Trgt	Pressure at which the Auxiliary Compressor will turn on

P-301	G01 Aux Resp On	Adjusts the rate at which the auxiliary compressor output increases when above target setpoint (Option: - 1 to 60 with 60 being fastest response)
P-302	G01 Aux Resp Off	Adjusts the rate at which the auxiliary compressor output decreases when below target setpoint (Option: - 1 to 60 with 60 being fastest response)
P-303	G01 Aux Trgt Above	Differential Above the Aux Compressor Target set point (P-300)
P-304	G01 Aux Trgt Below	Differential Below the Aux Compressor Target set point (P-300)
P-307	G01 Aux Inv Hold	When using a variable output, like an inverter drive, the control algorithm will constantly monitor the changing pressure value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sample and hold" time in seconds to be set from 1 to 5 seconds. If set to a value of 3 for example then every 3 seconds the pressure will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until the next sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in pressure.
P-308	G01 Aux Ramp On	When using a variable output, this limits how quickly the output percentage can change when responding to rising pressure. For example, if set to 5 %/s then the output cannot increase more quickly than 5% in one second.
P-309	G01 Aux Ramp Off	When using a variable output this limits how quickly the output percentage can change when responding to falling pressure. For example, if set to 5 %/s then the output cannot decrease more quickly than 5% in one second.
P-350	G01 Do Liq Inj	Enables the liquid injection feature, this can be set to Section 1, Section 2 or Parallel.
P-351	G01 Liq Inj SP	Temperature at which Liquid Injection relay comes On. (Superheat high must be on for this to operate, see P-400)
P-352	G01 Liq Inj Diff	Temperature diff below the liquid injection setpoint that the Liquid Injection Relay goes Off
P-353	G01 Liq Inj OT	Temperature at which a Liquid Injection Over Temperature Alarm is generated. This has a fixed 1-minute delay.
On firmware version V4.1 or higher the superheat parameters P-400 to P-420 have been moved from the Gas section (G01) to the compressor sections (S01 & S02)		
P-400	G01 Do SH	Enables the Superheat feature which switches Superheat High and Superheat Low relays when high or low conditions are met.
P-401	G01 SH Lo Trgt	If the superheat falls below this value the Superheat Low Relay will come On
P-402	G01 SH Lo Diff	The diff above P401 that the "Superheat Low Relay" will go Off
P-403	G01 SH Lo Alm	Superheat Low Alarm Set Point
P-411	G01 SH Hi Trgt	If the superheat rises above this value the Superheat High Relay will come On
P-412	G01 SH Hi Diff	The diff below P411 that the Superheat High Relay will go Off
P-413	G01 SH Hi Alm	Superheat High Alarm Set Point
P-420	G01 SH Dly	Delay for Superheat High and Low alarms
P-500	G01 Co2 Status Dly	Time delay applied to the status inputs
P-501	G01 Co2 General Dly	Time delay applied to the general fault inputs.
P-520 ↓ P-535	G01 Co2 Status 1 – 16	Defines the use of each status input, 0 = Unused 1 = Extra Capacity N/O 2 = Extra Capacity N/C 3 = Receiver Low N/O 4 = Receiver Low N/C 5 = Receiver High N/O 6 = Receiver High N/C 7 = Heat Recovery N/O 8 = Heat Recovery N/C 9 = General N/O 10 = General N/C 11 = Standby N/O 12 – Standby N/C 13 & 14 = Do not use, for future use.
P-540	G01 Sect Interlock	Interlock between Section 1 and Section 2, when enabled if no Section 1 stages are running then no Section 2 stages will be allowed to run.
P-600	G01 Heat Recovery	Mode 1: Uses 0-10v Heat Recovery Sensor to vary the Gas Cooler Setpoint Mode 2: Uses status input to enable and varies analogue valve output around the setpoint. Mode 3: Uses status input to enable and cycles relay output around the setpoint and diff.
P-601	G01 Heat Rec. Start	Selects the voltage input level from the heat recovery sensor (0-10v) that heat recovery will start. (Mode 1 only)
P-602	G01 Heat Rec. End	Selects the voltage input level from the heat recovery sensor (0-10v) that heat recovery will end. (Mode 1 only)
P-603	G01 Hrec Gas Ref at Start	The gas cooler setpoint at the start of heat recovery (Mode 1 only)
P-604	G01 Hrec Gas Ref at End	The gas cooler setpoint at the end of heat recovery (Mode 1 only), in modes 2 & 3 this is the gas cooler target when in heat recovery.
P-605	G01 Hrec Gas Ref above End	The gas cooler setpoint that is used when the input voltage is above the end voltage level (Mode 1 only), in modes 2 & 3 this is the gas cooler high pressure alarm limit.
P-606	G01 Hrec Fan Ref at End	The fan temperature setpoint used at the end of heat recovery (Mode 1 only)

P-607	G01 Hrec Fan Ref at Bypass	The fan temperature setpoint used at the bypass level (Mode 1 only)
P-608	G01 Hrec Bypass	Selects the voltage input level from the heat recovery sensor (0-10v) that heat recovery will go into bypass mode. (Mode 1 only)
P-609	G01 Hrec Bypass Ref.	Heat recovery target setpoint temperature
P-610	G01 Hrec Bypass Diff.	Differential above setpoint (Mode 3 only)
P-611	G01 Hrec Resp. On	Sets the speed of heat recovery valve opening (Mode 2 only)
P-612	G01 Hrec Resp. Off	Sets the speed of heat recovery valve closing (Mode 2 only)
P-615	G01 Bypass Inv Hold	When using a variable output, like a motorised valve, the control algorithm will constantly monitor the changing temperature value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sample and hold" time in seconds to be set from 1 to 5 seconds. If set to a value of 3 for example then every 3 seconds the pressure will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until the next sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in temperature.
P-616	G01 Bypass Ramp On	When using a variable output this limits how quickly the output percentage can change when responding to rising pressure. For example, if set to 5 %/s then the output cannot increase more quickly than 5% in one second.
P-617	G01 Bypass Ramp Off	When using a variable output this limits how quickly the output percentage can change when responding to falling pressure. For example, if set to 5 %/s then the output cannot decrease more quickly than 5% in one second.
P-620	G01 Fan Rev	This feature allows a relay to be allocated as a fan reverse signal, this will reverse the gas cooler fans at a pre-set time for a pre-set period to assist clearing debris that may have accumulated in the fans. (Gas cooler pressure must be below P-72 value.) 0 = Off, feature not used. 1 = On, allows fans to be forced manually into reverse. 2 = Local, uses the controller's internal GP timer to switch the fans into reverse. 3 = Remote, uses the Data Manager's GP timer to switch the fans into reverse.
P-621	G01 Fan Rev Start	Set the local time of day when fans are switched into reverse (only applies if P-620 set to local)
P-622	G01 Fan Rev Length	Sets the length of time fans will run in reverse
P-623	G01 Fan Rev Delay	Sets a delay period between fans stopping and being switched into reverse.
P-624	G01 Fan Rev Fix	If set to On then the fans will run in reverse at a fixed speed (set in P-625), if set to Off then the fans will run at their normal control speed.
P-625	G01 Fan Rev Variable	Sets the fixed reverse fan speed if P-624 set to On.
P-626	G01 Fen Rev Level	Fan reverse will not operate if the pressure is below this value, this is to prevent over condensing. If the pressure drops below this value during a fan reverse cycle, then normal forward operation will be resumed, another reverse fan cycle cannot be activated for a minimum of one hour.
dFLt	Restore Default Settings	Only available when using plant display PR0620

Oil Section Parameters Description (d-03)

Parameter numbers are the same for both sections (ds01, ds02 & ds03)

No.	Section Parameters	Description
P-01 ↓ P-16	Oil Enable 1 ↓ Oil Enable 16	Used to enable oil fault input on compressor 1 ↓ Used to enable oil fault input on compressor 16
P-40	Pre Dly	Delay before pulsing Oil relay
P-41	Oil Pulses	Number of times Oil Injection Relays will pulse on and off
P-42	Pulse Off Time	Length of time Oil Injection Relay is pulsed off
P-43	Pulse On Time	Length of time Oil Injection Relay is pulsed on
P-44	Lock Out	Number of times Oil Injection will retry before disabling compressor
P-45	Retry	Length of time compressor will go off between retries
P-46	Post Dly	Delay after pulsing oil relay
P-60	Oil Sep Enable	Used to enable an oil separator input to allow it to be pulsed on and off.
P-61	Sep Pulse Off	Length of time Oil Separator Relay is pulsed off
P-62	Sep Pulse On	Length of time Oil Separator Relay is pulsed on

P-63	Oil Lo Enable	Allocates a status input as a low oil level alarm input, typically the oil separator, for monitoring only.
P-64	Oil Hi Enable	Allocates a status input as a high oil level alarm input, typically the oil separator, for monitoring only.
P-65	Lo Hi Dly	Oil level alarm delay period
P-66	Oil Reset Enable	Allocates a status input as a reset input to reset oil lockouts

NOTE: The status inputs, such as oil enable and oil separator enable will display as being "Alarm" when active and "OK" when not active even though the input is not necessarily an alarm input.
This is providing status information only and in the case of the oil separator input no alarms will be generated.

General Section Parameters Description (d-04)

	Parameters	Description
P-01	Stat1	Off - Thermostat is not used. On - Thermostat is active and does not require a run signal to operate. Run N/O - Thermostat requires a status input to be closed before operating. Run N/C – Thermostat requires a status input to be opened before operating. On/Tm – Thermostat is active when the channel timer is on and does not require a run signal to operate. Run NO/Tm - Thermostat is active when the channel timer is on and requires a status input to be closed before operating. Run NC/Tm - Thermostat is active when the channel timer is on and requires a status input to be opened before operating.
P-02	Stat1 Cut-In	Thermostat cut in set point.
P-03	Stat1 Diff	Set point differential. If Stat Type is set to Direct then Diff operates below the setpoint, if Stat Type is set to Indirect then Diff operates above setpoint.
P-04	Stat1 Type	Direct: Output switches ON above setpoint, normally used for cooling. Indirect: Output switches OFF above setpoint, normally used for heating.
P-10	Stat1 High Temp	High temperature alarm threshold.
P-11	Stat1 Low Temp	Low temperature alarm threshold.
P-12	Stat1 Alm Delay	Temperature alarm delay period.
P-13	Stat1 On Time	The start time for the operational period if Stat 1 Parameter is set to a timed mode.
P-14	Stat1 Off Time	The end time for the operational period if Stat 1 Parameter is set to a timed mode.
P-21	Stat2	Off - Thermostat is not used. On - Thermostat is active and does not require a run signal to operate. Run N/O - Thermostat requires a status input to be closed before operating. Run N/C – Thermostat requires a status input to be opened before operating. On/Tm – Thermostat is active when the channel timer is on and does not require arun signal to operate. Run NO/Tm - Thermostat is active when the channel timer is on and requires a statusinput to be closed before operating. Run NC/Tm - Thermostat is active when the channel timer is on and requires a status input to be opened before operating.
P-22	Stat2 Cut-In	Thermostat cut in set point.
P-23	Stat2 Diff	Set point differential. If Stat Type is set to Direct then Diff operates below the setpoint, if Stat Type is set to Indirect then Diff operates above setpoint.
P-24	Stat2 Type	Direct: Output switches ON above setpoint, normally used for cooling. Indirect: Output switches OFF above setpoint, normally used for heating.
P-30	Stat2 High Temp	High temperature alarm threshold.
P-31	Stat2 Low Temp	Low temperature alarm threshold.
P-32	Stat2 Alm Delay	Temperature alarm delay period.
P-33	Stat2 On Time	The start time for the operational period if set to a timed mode.
P-34	Stat2 Off Time	The end time for the operational period if set to a timed mode.
P-41	Stat3	Off - Thermostat is not used. On - Thermostat is active and does not require a run signal to operate. Run N/O - Thermostat requires a status input to be closed before operating. Run N/C – Thermostat requires a status input to be opened before operating. On/Tm – Thermostat is active when the channel timer is on and does not require arun signal to operate. Run NO/Tm - Thermostat is active when the channel timer is on and requires a statusinput to be closed before operating. Run NC/Tm - Thermostat is active when the channel timer is on and requires a status input to be opened before operating.

P-42	Stat3 Cut-In	Thermostat cut in set point.
P-43	Stat3 Diff	Set point differential. If Stat Type is set to Direct then Diff operates below the setpoint, if Stat Type is set to Indirect then Diff operates above setpoint.
P-44	Stat3 Type	Direct: Output switches ON above setpoint, normally used for cooling. Indirect: Output switches OFF above setpoint, normally used for heating.
P-50	Stat3 High Temp	High temperature alarm threshold.
P-51	Stat3 Low Temp	Low temperature alarm threshold.
P-52	Stat3 Alm Delay	Temperature alarm delay period.
P-53	Stat3 On Time	The start time for the operational period if set to a timed mode.
P-54	Stat3 Off Time	The end time for the operational period if set to a timed mode.
P-61	PStat	Off – Pressure stat is not used. On – Pressure stat is on and does not require a run signal to operate. Run N/O – Pressure stat requires a status input to be closed before running.Run N/C – Pressure requires a status input to be opened before running. On/Tm – Pressure stat is active when the channel timer is on and does not require arun signal to operate. RunNO/Tm – Pressure stat is active when the channel timer is on and requires astatus input to be closed before operating. RunNC/Tm – Pressure stat is active when the channel timer is on and requires a status input to be opened before operating.
P-62	PStat Cut-In	Pressure stat cut in set point.
P-63	PStat Diff	Set point differential. If Stat Type is set to Direct then Diff operates below the setpoint, if Stat Type is set to Indirect then Diff operates above setpoint.
P-64	PStat Type	Direct: Output switches ON above setpoint. Indirect: Output switches OFF above setpoint.
P-70	PStat High Press	High pressure alarm threshold.
P-71	PStat Low Press	Low pressure alarm threshold.
P-72	PStat Alm Delay	Pressure alarm delay period.
P-73	Stat4 On Time	The start time for the operational period if set to a timed mode.
P-74	Stat4 Off Time	The end time for the operational period if set to a timed mode.
P-81	PStat Span	The total range of the pressure transducer (21 Bar for example)
P-82	PStat Offset	The offset of the pressure transducer below 0 (-1 Bar for example)

Parallel Section Parameter Descriptions (d-05)

No.	Parameter	Description
P-01 ↓ P-04	Transducer 1 Span ↓ Transducer 4 Span	Range of the transducers
P-05 ↓ P-08	Transducer 1 Offset ↓ Transducer 4 Offset	Transducer value above or below zero.
P-150	Enable Gas Cooler Switch	Enables a temperature interlock between the parallel section and the gas cooler out temperature or heat exchanger out temperature. If the temperature drops below the Gas Cooler Switch Temperature (P-152) then the parallel compressor stages will stage off.
P-151	Gas Cooler Switch Type	If using Gas Cooler Switch Enable function (P-150) the parallel compressor stages can be set to switch off immediately or stage off ina controlled manner.
P-152	Gas Cooler Switch Temperature	The temperature below which the parallel stages will switch off. This is selected as Gas Cooler Out or Heat Exchanger Out temperature by parameter P-150.
P-153	Gas Cooler Switch Diff	The control differential above the Gas Cooler Switch Temperature.
P-154	Enable On Receiver Minimum	Enables an interlock between the receiver valve output level and the parallel section which prevents parallel compressor stages starting below a pre-set receiver output (P-155, default 30%).
P-155	Receiver Minimum	The minimum receiver output value used to prevent parallel compressor stages from starting if P-154 is set to On.

P-09	Day Target Pressure	Pressure target, control will try to maintain this pressure during daytime.
P-10	Night Target Pressure	Pressure target, control will try to maintain this pressure during nighttime.
P-11	Target Pressure Above P-09/10	Set-point above the target, used to obtain a "dead-band"
P-12	Target Pressure Below P-09/10	Set-point below the target, used to obtain a "dead-band"
P-16	Response On Speed	Allows the user to speed up/slow down the stage on speed (Option: - 1 to 60 with 60 being fastest response)
P-17	Response Off Speed	Allows the user to speed up/slow down the stage off speed (Option: - 1 to 60 with 60 being fastest response)
P-18	Low Ambient Stop	If the ambient temperature drops below this value, then the compressor(s) will start to stage off.
P-19	Float Receiver Setpoint	If set to a non-zero value, for example 2 bar, when the parallel compressor section starts to run the receiver setpoint will be increased by this value after the Float Receiver On time (P-20) has expired.
P-20	Float Receiver On	The time period between the parallel compressor section starting up and the receiver set point being increased.
P-21	Float Receiver Off	If the parallel compressor section is running at full capacity then after this delay period the receiver set point will return to it's normal setting.
P-22	Inverter Starts Per Hour	Limits the inverter starts to this many starts per hour, set to 0 if not required.
P-23	Starts per hour	Limits a compressor to this many starts per hour, set to 0 if not required.
P-24	Run smallest	If set to On the smallest compressor will always start first. See: Run Smallest
P-25	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, but the inverter analogue output may well decrease to 0% if pressure is below the set-point.
P-26	Comp Unload	Selects the order the compressor loaders are switched off. See: Compressor Loaders
P-27	Equal run Times	Equalises compressor run times. See: Equal run Times
P-28	Run Proof	See section Run-Proof
P-29	Gas Dump	Enables Gas Dump feature. See: Gas Dump
P-30	Gas Diff	Diff below the set point that the Gas Dump valve is opened.
P-60	Comp Try	If Run Proof parameter (P-28) is set to On/Mon this is the number of start attempts a compressor will have before being locked out.
P-61	Comp Try Wait	If Run Proof parameter (P-28) is set to On/Mon this is the time allowed between a compressor starting and the run confirm input being returned.
P-62	Comp Try Delay	If Run Proof parameter (P-28) is set to On/Mon this is the time delay period after a run proof fail before the compressor will try to start again.
P-63	Comp Open Alarm Delay	If Run Proof parameter (P-28) is set to On/Mon this is the time delay period between the run confirm signal being lost when a compressor is running and the compressor being stopped.
P-64	Comp Open Clear	If Run Proof parameter (P-28) is set to On/Mon this is the time delay period after a running compressor is stopped due to run signal being lost and the next re start attempt.
P-20	Proof Auto Reset	If the run proof feature is being used then the compressor lockout willreset after this period of time. If set to 00:00 (default) then timed auto reset is not used and a manual reset is required.
P-31	Inverter	Enables the inverter analogue output and associated relay.
P-32	Inv Bypass	Enable for Inverter Bypass feature.
P-38	Inverter Monitor	If Inverter Bypass function is being used (P-32) and Inv Monitor is set to Proof then the inverter output will be locked out and bypass relay activated after the specified number of re try attempts. This can be reset by activating the Inv Proof status input. If Inv Monitor is set to Fault then the Inverter can be re started if the fault input clears.

P-33	Inverter Min	The minimum percentage the inverter will operate to e.g., if set to 25% the inverter output will never go below this value. This should be set to 10% when using a digital scroll compressor.
P-34	Inverter Max	The maximum percentage the inverter will operate to e.g., if set to 80% the inverter output will never go above this value.
P-43	Inverter Hold	When using a variable output, like an inverter drive or digital compressor, the control algorithm will constantly monitor the changing pressure value and continually adjust the variable output accordingly. The INV Hold parameter allows a "sample and hold" time in seconds to be set from 1 to 5 seconds. If set to a value of 3 for example, then every 3 seconds the pressure will be sampled and the variable output calculated. This output value will be fixed for the next 3 seconds until the next sample and so on. This parameter can be used to eliminate sudden changes of variable output which may result from a momentary spike in pressure.
P-44	Max Ramp On	When using a variable output, this limits how quickly the output percentage can change when responding to rising pressure. For example, if set to 5%/s then the output cannot increase more quickly than 5% in one second.
P-45	Max Ramp Off	When using a variable output, this limits how quickly the output percentage can change when responding to falling pressure. For example, if set to 5%/s then the output cannot decrease more quickly than 5% in one second.
P-46	In Band Control	When using a variable output, when the pressure is within the control dead band (within set point and target above and target below differentials.) the variable output will not change. With this parameter set to On the variable output will be allowed to change continually when inside the dead band. If however the variable output reaches 0% or 100% (or Inverter Min and Max settings) the next stage will not switch on or off until the pressure is outside the dead band.
P-37	Inverter Fail	In the event of a pressure transducer failure the inverter output will remain at this value. (if P-55 set to variable)
P-41	Stage On Delay	Time delay between stages switching on. If set to fuzzy control then this is not usually required and should be set to 00:00 or a low value.
P-42	Stage Off Delay	Time delay between stages switching off. If set to fuzzy control then this is not usually required and should be set to 00:00 or a low value.
P-50	Alarm Delay	Delay before HP and LP alarms are signalled
P-51	HP Alarm	Suction Pressure HP alarm set-point
P-52	LP Alarm	Suction Pressure LP alarm set-point
P-53	LP Shut-down	Suction LP shut-down set-point, all stages go off when this is reached
P-54	Low Alarm Delay	Delay applied before LP Shutdown alarm is generated. Note: as soon as the LP Shutdown set point is reached any Compressor/Condenser stages for the associated section still operating will go off immediately and does not wait for the LP Shutdown alarm to be created.
P-55	Pressure Fail	The following will occur in the event of pressure transducer fault: If set to On then all Compressors or Fans will turn On in the event of a transducer failure. If set to Off then all Compressors or Fans will turn Off in the event of a transducer failure. If set to variable then during the night period all stages will turn off and inverter output will be set to the inverter fail value (P-37), during the day one stage will be switched on.
P-56	Probe Alarms	If any of the temperature probes are used for general monitoring and this parameter is set to On then a probe failure or disconnection will generate a probe fail alarm.
P-73	Night Set Back On Time	Time for the night set back feature to operate
P-74	Night Set Back Off Time	Time for the night set back feature to go off
P-80	Discharge Trip	If Discharge Pressure exceeds this setting, compressors will turn off gradually or Inverter will ramp down to try to reduce the discharge pressure before it reaches discharge stop parameter P-81.

P-81	Discharge Stop	If Discharge Pressure exceeds this setting All compressors on the assigned pack go off immediately and all fans come on immediately. A Discharge Trip Alarm is generated. Note: If using an Inverter on the Compressors the output to the Inverter will go to 0% immediately as well as all compressors going off, the controller will remain in the stop state for a minimum of 1 minute regardless of pressure.
P-82	Discharge Offset	This is the pressure diff below P-80 & P-81 below which comps start staging in again.
P-83	Discharge Temp Trip	If this temperature is reached, the controller will start staging off compressors. Compressors will start staging back on once the temperature drops below the set point minus the differential (P-85) and a one minute delay has expired.
P-84	Discharge Temp Stop	If this temperature is reached, the controller will stop any digital scroll compressor(s) on the parallel section. The compressor(s) will start staging back on once the temperature drops below the set point minus the differential (P-85) and a one minute delay has expired.
P-85	Discharge Temp Diff	The value below the discharge trip (P-83) and discharge stop temperature (P-84) before the compressor(s) will restart, this is subject to a one minute delay.
P-86	Do Discharge Trip	Enables the Discharge Trip/Stop features on high pressure, high temperature or both.
P-87	Do Superheat	Enables the superheat functionality. This can be set to switch the Superheat High and Superheat Low relays and also generate Superheat high and low alarms if required. The superheat value is calculated as the suction temperature measured by the suction temperature probe minus the suction pressure converted to temperature.
P-88	Superheat Low Target	If the superheat falls below this value the superheat low relay will switch on.
P-89	Superheat Low Diff	The diff above Superheat Target that the superheat low relay will switch off.
P-90	Superheat Low Alarm	High superheat alarm setpoint.
P-92	Superheat High Target	If the superheat rises above this value the superheat high relay willcome on
P-93	Superheat High Diff	The differential below Superheat Target that the superheat relay will switch off.
P-94	Superheat High Alarm	High superheat alarm setpoint.
P-100	Status fault Delay	Time delay before status faults are activated
P-101	General Alarm Delay	Time delay before general faults are activated
P-102	Standby Delay	Time delay between the standby input being activated and the controller going into standby.
P-650 ↓ P-657	Probe Select Type 1 ↓ Probe Select Type 8	If all the status inputs (digital inputs) are used up then any available temperature probe can be set to be used as a status input instead.
P103 ↓ P118	Status Fault 1 ↓ Status Fault 16	Used to select the type of input required See: Status Inputs
P120 ↓ P135	Stage 1 ↓ Stage 16	Select the output device for this stage
P140 ↓ P155	Stage 1 Size ↓ Stage 16 Size	Sets the relative size for each compressor

General Section Mapping (d-06)

Parameter numbers are the same for all 3General Sections (ds06 to ds08).

No.	Section Parameters	Range	Step	Units	Default
P-01	Pressure Transducer Position	0 – 88	1	---	0
P-10 P-11 P-12	Stat 1 Probe Position Stat 2 Probe Position Stat 3 Probe Position	0 – 88	1	---	0
P-20 P-21 P-22 P-23	Stat 1 Status Input Position Stat 2 Status Input Position Stat 3 Status Input Position Pressure Stat Status Input Position	0 – 92	1	---	0
P-60 P-61 P-62 P-63 P-64 P-65 P-66 P-67	Stat 1 Relay Position Stat 2 Relay Position Stat 3 Relay Position Pressure Stat Relay Position Stat 1 Timer Relay Position Stat 2 Timer Relay Position Stat 3 Timer Relay Position Pressure Stat Timer Relay Position	0 – 132	1	---	0

I/O Mapping of Pressure Transducers, Temperature Probes, Inverters, Steppers and Relay Positions (d-06 IO Map)

Parameter numbers are the same for all 8 sections (ds01 to ds08) although some parameters are not used for a particular section, for example the Oil control sections do not require a stepper valve allocation.

Number	Parameter	Description
P-01 ↓ P-04	Pressure Position 1 ↓ Pressure Position 4	Position of pressure transducer inputs (not used in the oil sections)
P-10 ↓ P-17	Probe Position 1 ↓ Probe Position 8	Position of temperature probe inputs (not used in the oil sections)
P-20 ↓ P-35	Status Position 1 ↓ Status Position 16	Position of oil status inputs, these should match the compressor numbers in pack sections 1 & 2.
P-40 ↓ P-47	Extra Status Position 1 ↓ Extra Status Position 8	Position of additional oil status inputs (if used), these are as follows: Oil Separator Input Oil Low Input Oil High Input Oil Reset Input (this should be a momentary switched input)
P-50 ↓ P-53	Inverter or Valve Variable Output Position 1 ↓ Inverter or Valve Variable Output Position 4	Position of variable mA or dc voltage outputs to drive inverters or valves (not used in the oil sections)
P-60 ↓ P-83	Relay Position 1 ↓ Relay Position 24	Position of oil injection relay outputs These correspond to the status inputs 1 -16, the relay will pulse when the relevant status input is activated.
P-100	Stepper Position 1	Position of stepper valve output 1 on main board (not used in the oil sections)
P-101	Stepper Position 2	Position of stepper valve output 2 on main board (not used in the oil sections)

Main Board Setup Configuration Description

Universal I/O Type, Status Input Type, Invert Relays, SSR Select, Stepper Valve Settings and Probe Offsets (d-07 Main Board)

Number	Parameter	Description
P-01 – P-08	M01 Universal I/O 1-8	Select the type of universal input or output, such as 4-20mA in or 0-10vdc out.
P-10	M01 Status Inputs	Select whether 0V return or 24V ac
P-20– P-31	M01 Invert Relay 1 or SSR Select	Used to invert relay operation or set relay to solid state relay (SSR) if fitted
P-40 – P-47	M01 Offset 1	Offset probe readings by this amount, this allows calibration due to resistance drop over long cable lengths.
P-50	M01 Step Reset Time	After a set amount of stepper valve operation hours (default 6) the valve will automatically close fully to recalibrate it's position.
P-60	M01 Stepper Type 1	Selects the type of stepper valve to be driven
P-61	M01 Stepper Type 2	Selects the type of stepper valve to be driven
P-70	M01 Step Max 1	The number of steps to open the valve fully if valve type is set to "other"
P-71	M01 Step Max 2	The number of steps to open the valve fully if valve type is set to "other"
P-80	M01 Step Close 1	The number of steps to close the valve fully if valve type is set to "other", this is normally higher than the maximum open steps to ensure the valve is fully shut.
P-81	M01 Step Close 2	The number of steps to close the valve fully if valve type is set to "other", this is normally higher than the maximum open steps to ensure the valve is fully shut.
P-90	M01 Step Speed 1	The step speed in Hz if the valve type is set to "other"
P-91	M01 Step Speed 2	The step speed in Hz if the valve type is set to "other"
P-100	M01 mA Peak 1	The maximum current that can be delivered to the valve if the valve type is set to "other"
P-101	M01 mA Peak 2	The maximum current that can be delivered to the valve if the valve type is set to "other"
P-110	M01 Half Step 1	Allows the valve to be opened or closed in half step increments if valve type is set to "other"
P-111	M01 Half Step 2	Allows the valve to be opened or closed in half step increments if valve type is set to "other"
P-120	M01 Step mA Hold 1	The holding current that will be applied to the valve to stop it drifting if valve type is set to "other"
P-121	M01 Step mA Hold 2	The holding current that will be applied to the valve to stop it drifting if valve type is set to "other"

Note: Parameters P-50 to P-121 apply only to the PR0652 hardware variant which has two stepper outputs.

When using the PR0650 hardware variant these parameters do not apply, stepper setup is the stepper expansion board PR0660 (See the following page).

Expansion Board Setup Configuration Description

Universal I/O Type, Status Input Type, Invert Relays, Probe Offsets and Stepper Valve Settings (d-08 Expansion Boards)

Parameter numbers are the same for all 10 expansion boards (ds01 to ds10)

Number	Parameter	Description
P-01	Board Type	Selects the type of expansion board being used, IO board, Mini IO board or Stepper board.
P-02 – P-09	Universal I/O 1-8	Select the type of universal input or output, for example 4-20mA in for a pressure transducer or 0-10vdc out for an inverter drive.
P-10	Status Inputs	Select whether 0V return or 24V ac

P-20 – P-31	Invert Relay 1–12	Used to invert relay operation
P-40 – P-47	Offset 1-8	Offset probe readings by this amount, this allows calibration due to resistance drop over long cable lengths.
P-50	Uni Custom In Low	If the Universal IO type is set to "Custom mA Input" or "Custom V Input" then the range of the mA or voltage input can be set by the user. As an example, if a pressure transducer with a 1v to 5v signal is being used then the Universal IO parameter (P-01 to P-08) would be set to "Custom V Input" and the "Universal Custom In Low" parameter (P-50) would be set to 1 (for 1volt dc).
P-51	Uni Custom In High	If the Universal IO type is set to "Custom mA Input" or "Custom V Input" then the range of the mA or voltage input can be set by the user. As an example, if a pressure transducer with a 1v to 5v signal is being used then the Universal IO parameter (P-01 to P-08) would be set to "Custom V Input" and the "Universal Custom In High" parameter (P-51) would be set to 5 (for 5volt dc).
P-52	Uni Custom Out Low	If the Universal IO type is set to "Custom mA Output" or "Custom V Output" then the range of the mA or voltage output can be set by the user. As an example, if an inverter drive requires a 1v to 9v speed control signal then the Universal IO parameter (P-01 to P-08) would be set to "Custom V Output" and the "Universal Custom Out Low" parameter (P-52) would be set to 1 (for 1volt dc).
P-53	Uni Custom Out High	If the Universal IO type is set to "Custom mA Output" or "Custom V Output" then the range of the mA or voltage output can be set by the user. As an example, if an inverter drive requires a 1v to 9v speed control signal then the Universal IO parameter (P-01 to P-08) would be set to "Custom V Output" and the "Universal Custom Out High" parameter (P-53) would be set to 9 (for 9 volts dc).
P-59	Step Reset	After a set amount of stepper valve operation hours (default 6) the valve will automatically close fully to recalibrate it's position.
P-60 – P-65	Step Type 1–6	Selects the type of stepper valve to be driven.
P-70 – P-75	Step Max 1–6	The number of steps to open the valve fully if valve type is set to "other"
P-80 – P-85	Step Close 1–6	The number of steps to close the valve fully if valve type is set to "other", this is normally higher than the maximum open steps to ensure the valve is fully shut.
P-90 – P-95	Step Speed 1-6	The step speed in Hz if the valve type is set to "other"
P-100 – P-105	Step mA Peak	The maximum current that can be delivered to the valve if the valve type is set to "other"
P-110 – P-115	Step Half 1-6	Allows the valve to be opened or closed in half step increments if valve type is set to "other"
P-120 – P-125	Step mA Hold 1-6	The holding current that will be applied to the valve to stop it drifting if valve type is set to "other"
P-130 – P-135	Shut Close 1-6	If using an expansion board which has the valve auto close feature this is the number of steps used to close the valve in the event of power failure or CANbus communications failure. Valve type needs to be set to "other"
P-140 – P-145	Shut Speed 1-6	If using an expansion board which has the valve auto close feature this is the step speed used to close the valve in the event of power failure or CANbus communications failure. Valve type needs to be set to "other"

Compressor Run Hours and Compressor Starts Description (d-09 Stats)

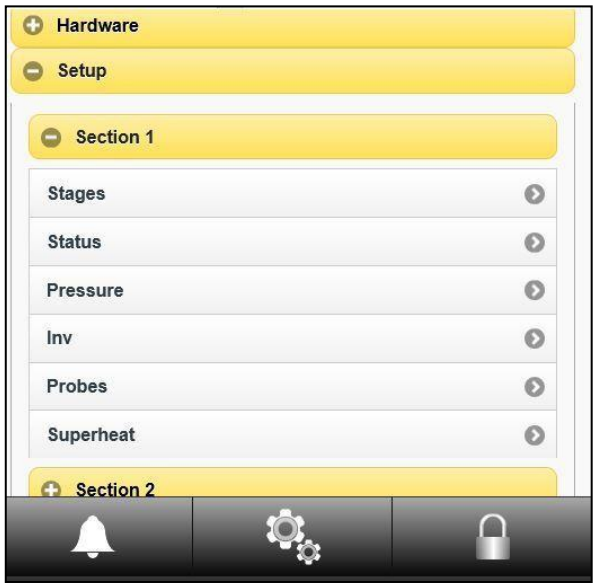
Parameter numbers are the same for both pack sections (ds01 &ds02)

Number	Parameter	Description
P-01	Reset Stats	Reset stats by changing from Reset 1 to Reset 2 or vice versa

Getting Started

There are up to 8 separate sections, sections 1 & 2 are pack control sections, section 3 is the CO2 control section, sections 4 & 5 are the optional oil control sections for packs 1 & 2, and sections 6, 7 & 8 are the optional General sections. Each section is set up by clicking on the appropriate tab to expand it and selecting "set parameters" to set all the values required.

Pack Sections (Section 1 & Section 2)



Software version V4.8 or higher has a "quick" setup section for the compressor sections, this is accessed using the service menu (cogwheels icon).

Each of the submenus allow quick setup of the compressor stages, status inputs, pressure inputs, inverter (variable) outputs, temperature probes and superheat calculation.

Software version V5.0 or higher has in addition to the compressor sections a "quick" setup section for the CO2 and Parallel compressor sections.

Selecting the section 1 stages submenu will show the compressor setup parameters for section 1.

Enter the number of compressor stages required, click on "Set" at the bottom of the page then refresh the page or navigate away from the menu and then back in.

The menu will now settings for the number of stages selected. If the Autohide parameter is enabled under the main config page then any unused stages will be hidden. In the example on the left 4 stages have been selected.

The stage type can be set (compressor, loader or inverter for example) and the stage size in kW. The stage's hardware position or mapping can be set and if required the stage name or alias can be changed from the default "S01 Stage 1".

Note: If controller type is set to Staged then the switching sequence of each stage will still need to be setup under the section control menu.

Parameter	Value	Unit
S01 Span 1	60.0	bar
S01 Span 2	160.0	bar
S01 Span 3	60.0	bar
S01 Span 4	60.0	bar
S01 Offset 1	0.0	bar
S01 Offset 2	0.0	bar
S01 Offset 3	0.0	bar
S01 Offset 4	0.0	bar
S01 Day Trgt	20.0	bar
S01 Night Trgt	29.0	bar
S01 Trgt Above	0.5	bar
S01 Trgt Below	0.5	bar
S01 Ext Trgt	28.0	bar
S01 Opt Lim	2.0	bar
S01 Resp On	5	
S01 Resp Off	5	
S01 Fuzzy Weight	1	
S01 Inv Sts/Hr	0	
S01 Sts/Hr	10	

Each of the two pack sections has 4 transducer inputs available, 16 status inputs and 16 stage outputs although it should be noted that these are "virtual" inputs and outputs and at this stage are not mapped to physical relays or pressure or fault inputs.

Mapping these settings to the controller's hardware will be done at a later stage.

The minimum requirement is that one transducer span and offset is set to match the suction control pressure transducer. (S01 Span 1 and S01 Offset 1), the other transducers can be used for discharge pressure (recommended) or general monitoring if required.

If an inverter drive is being used then S01 Inv parameter should be set to On and S01 stage 1 set to Inv, this will make the first stage output an inverter enable signal. If no inverter is being used then S01 stage 1 will be set to Comp for compressor and the S01 Inv parameter must be set to off. All other stages are then set up accordingly, compressor, loader and so on.

Compressor sizes then need to be entered to enable the controller to calculate the best combination of stages to use. If all compressors are the same size, then the sizes can all be set to 1 for simplicity.

If a compressor size is left at 0 then the compressor will not run.

This is the minimum set up requirement for this section to operate, other settings such as status inputs (compressor faults for example), night setback, and alarm settings will need entered as and if required.

All these settings are the same for pack section 2.

Compressor Capacity Overview

Once compressor sizes have been entered an overview of total capacity, available capacity and running capacity is available.

Total Capacity:	Total electrical capacity of all compressors in kW.
Available Capacity:	Total capacity available to run, compressors that are inhibited due to starts per hour limitation are excluded.
Running Capacity:	Current capacity of all running compressors including percentage of inverter driven compressor.

S01 Target	27.0	bar
S01 Total Cap	10.0	kW
S01 Available Cap	7.2	kW
S01 Running Cap	2.8	kW

CO2 Section (Section 3)

Parameter	Value	Unit
G01 Span 1	140.0	bar
G01 Span 2	80.0	bar
G01 Span 3	60.0	bar
G01 Span 4	60.0	bar
G01 Offset 1	10.0	bar
G01 Offset 2	0.0	bar
G01 Offset 3	0.0	bar
G01 Offset 4	0.0	bar
G01 Max Gas Press	90.0	bar
G01 Min Gas Press	15.0	bar
G01 Max Gas SP	85.0	bar
G01 Min Gas SP	40.0	bar
G01 Extra Gas SP	2.0	bar
G01 Gas Trgt Above	0.5	bar
G01 Gas Trgt Below	0.5	bar
G01 Gas Resp On	5	
G01 Gas Resp Off	5	
G01 Gas Fuzzy Weight	1	
G01 Min Gas Inv	0	%

This section contains all the settings relating to gas cooler control, gas fan control, receiver control, liquid injection control (optional), auxiliary compressor control (optional) and heat reclaim control (optional).

The minimum requirements are a gas cooler pressure transducer is set up (G01 Span 1 and G01 Offset 1), a receiver pressure transducer (G01 Span 2 and G01 Offset 2), and a gas cooler outlet temperature probe (G01 Probe 1) and gas cooler ambient temperature probe (G01 Probe 2) are connected.

Oil Control Sections

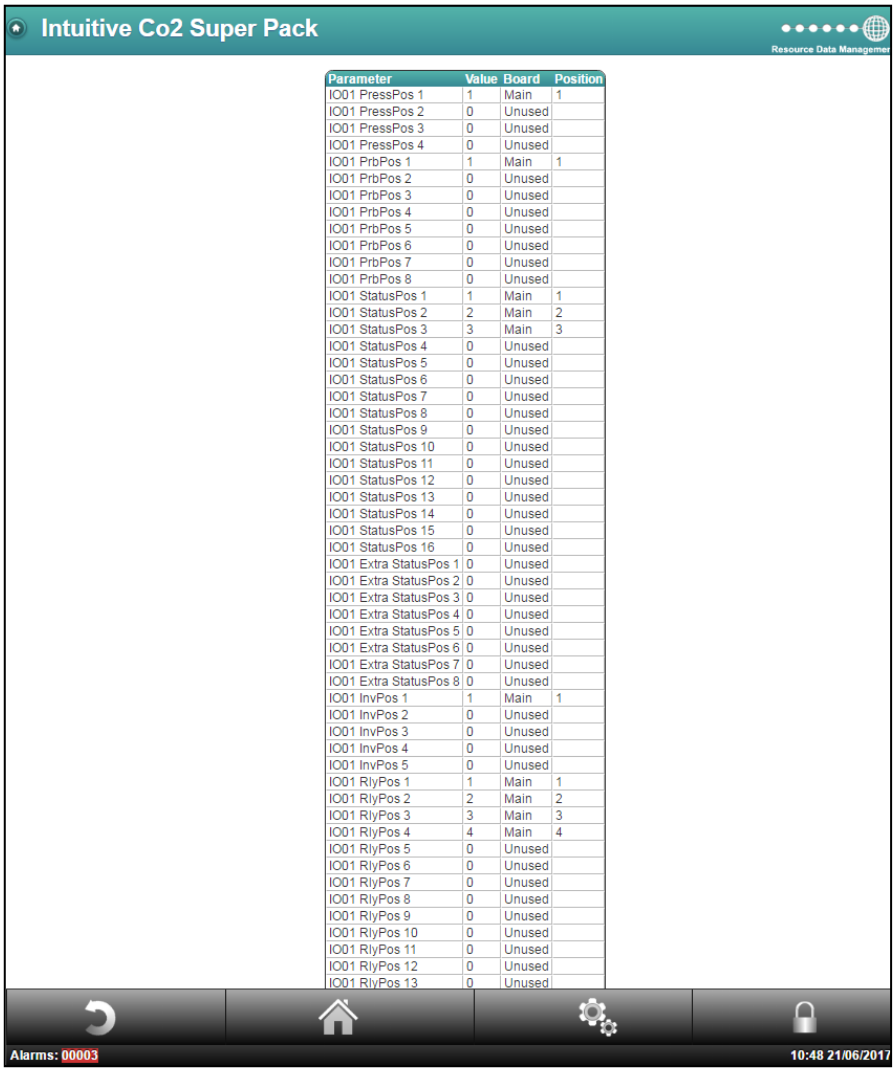
Oil control for each of the pack sections and the parallel section is optional and is switched off as default, set up procedure is the same method as sections 1 to 3.

Once all the sections that are required are setup then all the inputs and outputs can be mapped to physical connections on the main control board or on any of the 10 expansion boards, the controller will not operate until this is done.

IoMap 1 to 8

In the Superpack range of controllers, inputs and outputs, such as relays and probe inputs, are not allocated automatically. These are allocated manually by the user using the IO map sections, although this requires more setting up it does mean greater flexibility. IO map sections 1 & 2 are for pack sections 1 & 2, IO map section 3 is for the CO2 section and IO map sections 4 & 5 are for the oil sections.

In the example below:



Parameter	Value	Board	Position
IO01 PressPos 1	1	Main	1
IO01 PressPos 2	0	Unused	
IO01 PressPos 3	0	Unused	
IO01 PressPos 4	0	Unused	
IO01 PrbPos 1	1	Main	1
IO01 PrbPos 2	0	Unused	
IO01 PrbPos 3	0	Unused	
IO01 PrbPos 4	0	Unused	
IO01 PrbPos 5	0	Unused	
IO01 PrbPos 6	0	Unused	
IO01 PrbPos 7	0	Unused	
IO01 PrbPos 8	0	Unused	
IO01 StatusPos 1	1	Main	1
IO01 StatusPos 2	2	Main	2
IO01 StatusPos 3	3	Main	3
IO01 StatusPos 4	0	Unused	
IO01 StatusPos 5	0	Unused	
IO01 StatusPos 6	0	Unused	
IO01 StatusPos 7	0	Unused	
IO01 StatusPos 8	0	Unused	
IO01 StatusPos 9	0	Unused	
IO01 StatusPos 10	0	Unused	
IO01 StatusPos 11	0	Unused	
IO01 StatusPos 12	0	Unused	
IO01 StatusPos 13	0	Unused	
IO01 StatusPos 14	0	Unused	
IO01 StatusPos 15	0	Unused	
IO01 StatusPos 16	0	Unused	
IO01 Extra StatusPos 1	0	Unused	
IO01 Extra StatusPos 2	0	Unused	
IO01 Extra StatusPos 3	0	Unused	
IO01 Extra StatusPos 4	0	Unused	
IO01 Extra StatusPos 5	0	Unused	
IO01 Extra StatusPos 6	0	Unused	
IO01 Extra StatusPos 7	0	Unused	
IO01 Extra StatusPos 8	0	Unused	
IO01 InvPos 1	1	Main	1
IO01 InvPos 2	0	Unused	
IO01 InvPos 3	0	Unused	
IO01 InvPos 4	0	Unused	
IO01 InvPos 5	0	Unused	
IO01 RlyPos 1	1	Main	1
IO01 RlyPos 2	2	Main	2
IO01 RlyPos 3	3	Main	3
IO01 RlyPos 4	4	Main	4
IO01 RlyPos 5	0	Unused	
IO01 RlyPos 6	0	Unused	
IO01 RlyPos 7	0	Unused	
IO01 RlyPos 8	0	Unused	
IO01 RlyPos 9	0	Unused	
IO01 RlyPos 10	0	Unused	
IO01 RlyPos 11	0	Unused	
IO01 RlyPos 12	0	Unused	
IO01 RlyPos 13	0	Unused	

Section 1 Pressure Position 1 (suction transducer) is mapped to main board 1 Universal Input 1

Section 1 Probe Position 1 is mapped to Main board probe input 1

Section 1 Status Positions 1, 2 & 3 are mapped to Main board status inputs 1, 2 & 3

Section 1 Inverter Position 1 is mapped to Main board Universal IO 1

Section 1 Relay Positions 1 to 4 are mapped to Main board relays 1 to 4

The values listed under the Board and Position columns to the right of the parameter column are the physical locations that the "virtual" locations are mapped to.

The values listed under the parameter column are "virtual" values, for example IO01 RlyPos1 is not one of the physical relays on the main board or one of the expansion boards but is simply stage 1 as set up under Section 1 Parameters (S01 Stage 1 set to "Comp" for example). These "virtual" relays are allocated as follows:

Sections 1&2 (Pack) IO Positioning

Virtual Position	Description
Analogue Input 1	Suction Pressure
Analogue Input 2	Discharge Pressure
Analogue Input 3	Pressure 1
Analogue Input 4	Pressure 2
Temperature Input 1	Suction Temperature
Temperature Input 2	Discharge Temperature
Temperature Input 3-8	Temperature 3-8
Status Inputs 1-16	Status Inputs 1-16 (Input functions are selected in the section parameters menu)
Analogue Output 1	Inverter Output
Digital Output 1-16	Compressor stages 1-16
Digital Output 17	Inverter Bypass
Digital Output 18	Gas dump
Digital Output 19	Superheat High (will move into position 17 or 18 if Inverter Bypass or Gas Dump are not in use)
↑	Superheat Low (will move into position 18 or 19 if Inverter Bypass or Gas Dump are not in use)
Digital Output 20	Standby (de energises when section in standby, energised when running)
Digital Output 22	Offline
Digital Output 23	Run
Digital Output 24	Alarm

Section 3 (CO2) IO Positioning

Virtual Position	Description
Analogue Input 1	Cooler Pressure
Analogue Input 2	Receiver Pressure
Analogue Input 3	Liquid Level
Analogue Input 4	Heat Recovery Sensor
Temperature Input 1	Cooler Temperature
Temperature Input 2	Ambient Temperature
Temperature Input 3	Cooler Air On Temperature
Temperature Input 4	Cooler Air Off Temperature
Temperature Input 5	Liquid Injection Temperature
Temperature Input 6	Bypass Temperature
Temperature Input 7	HX (heat exchanger) Temperature
Temperature Input 8	Spare, can be used for general temperature monitoring.
Status Inputs 1-16	Status Inputs 1-16 (Input functions are selected in the section parameters menu)
Analogue Output 1	Cooler Inverter Output
Analogue Output 2	Fan Inverter Output
Analogue Output 3	Receiver Inverter Output
Analogue Output 4	Auxiliary Compressor Inverter Output
Analogue Output 5	Heat Recovery Output
Stepper Output 1	Receiver/Bypass valve (only available on Main Board hardware variant PR0652 or stepper expansion board)
Stepper Output 2	Gas cooler valve (only available on Main Board hardware variant PR0652 or stepper expansion board)
Stepper Output 3	Heat Recovery valve (only available on Main Board hardware variant PR0652 or stepper expansion board)

Virtual Position	Description
Digital Output 1	Cooler Inverter Enable
Digital Output 2	Fan Inverter Enable
Digital Output 3	Receiver Inverter Enable
Digital Output 4	Auxilliary Inverter Enable
Digital Output 5	Transcritical Relay
Digital Output 6	Liquid Injection Relay
Digital Output 7	Superheat Low Relay Note: On software version V4.1 and above Superheat Low Relay has been moved to the compressor sections (S01 & S02) Virtual Relay 18
Digital Output 8	Superheat High Relay Note: On software version V4.1 and above Superheat High Relay has been moved to the compressor sections (S01 & S02) Virtual Relay 17
Digital Output 9	Heat Recovery Valve
Digital Output 10	Heat Recovery Bypass Valve
Digital Output 11	Fan Reverse Relay
Digital Output 12	Heat Recovery Inverter Enable
Digital Output 22	Offline
Digital Output 23	Run
Digital Output 24	Alarm

Sections 4&5 (Oil) IO Positioning

Virtual Position	Description
Status Inputs 1-16	Status Inputs 1-16
Status Inputs 17 (Extra Status 1)	Oil Separator
Status Inputs 18 (Extra Status 2)	Oil Low
Status Inputs 19 (Extra Status 3)	Oil High
Status Inputs 20 (Extra Status 4)	Oil Reset
Status Output 1-16	Oil Injection Relays 1-16
Status Output 17	Oil Separator Relay

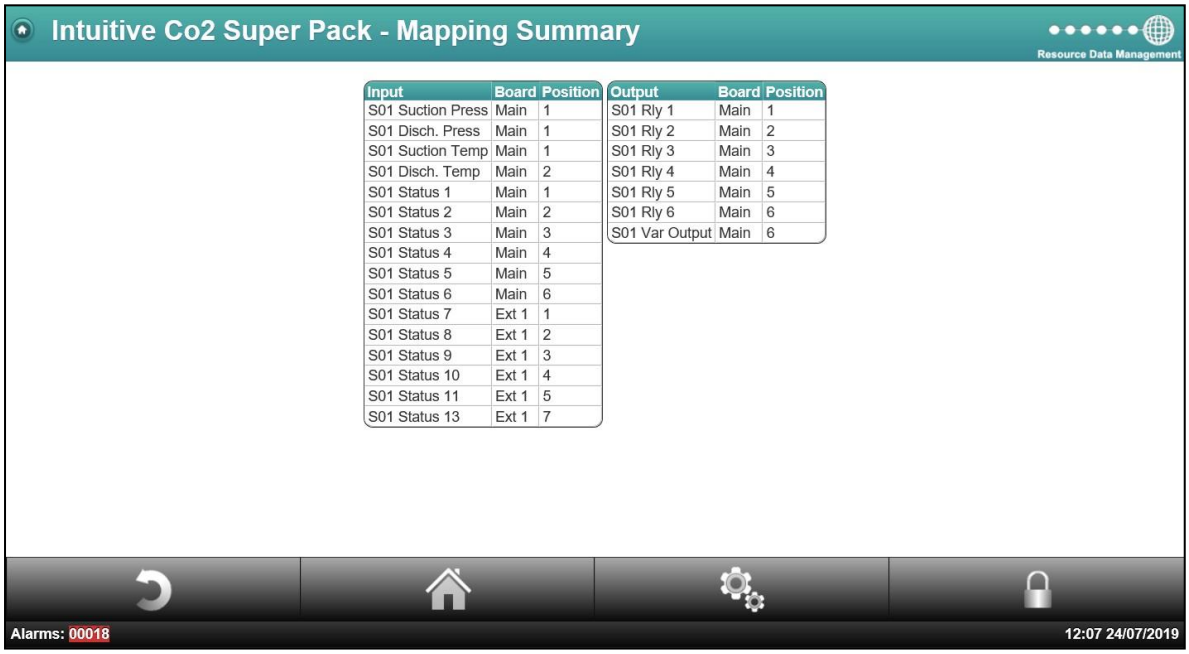
Sections 6,7 & 8 (General) IO Positioning

Virtual Position	Section Parameters
Analogue Input 1	Pressure Transducer
Temperature Input 1	Stat 1 Probe
Temperature Input 2	Stat 2 Probe
Temperature Input 3	Stat 3 Probe
Status Input 1	Stat 1 Run
Status Input 2	Stat 2 Run
Status Input 3	Stat 3 Run
Status Input 4	Pressure Stat Run
Digital Output 1	Stat 1 Relay Position
Digital Output 2	Stat 2 Relay Position
Digital Output 3	Stat 3 Relay Position
Digital Output 4	Pressure Stat Relay Position
Digital Output 5	Stat 1 Timer Relay Position
Digital Output 6	Stat 2 Timer Relay Position
Digital Output 7	Stat 3 Timer Relay Position
Digital Output 8	Pressure Stat Timer Relay Position

Section 10 (Parallel) IO Positioning

Virtual Position	Description
Analogue Input 1	Control Pressure
Analogue Input 2	Discharge Pressure (optional)
Analogue Input 3	Pressure 2 (optional monitoring)
Analogue Input 4	Pressure 3 (optional monitoring)
Temperature Input 1	Suction Temperature
Temperature Input 2	Discharge Temperature
Temperature Input 3-8	Temperature 3-8 (optional monitoring)
Status Inputs 1-16	Status Inputs 1-16 (Input functions are selected in the section parameters menu)
Analogue Output 1	Inverter Output
Digital Output 1-16	Compressor stages 1-16
Digital Output 17	Inverter Bypass
Digital Output 18	Gas Dump
Digital Output 19 ↑	Superheat High (Will move to position 17 or 18 if Inverter Bypass or Gas Dump are not in use)
	Superheat Low (Will use position 18 or 19 if Inverter Bypass or Gas Dump are not in use)
Digital Output 20	Standby (de energises when section in standby, energised when running)
Digital Output 22	Offline
Digital Output 23	Run
Digital Output 24	Alarm

Mapping Overview



Input	Board	Position
S01 Suction Press	Main	1
S01 Disch. Press	Main	1
S01 Suction Temp	Main	1
S01 Disch. Temp	Main	2
S01 Status 1	Main	1
S01 Status 2	Main	2
S01 Status 3	Main	3
S01 Status 4	Main	4
S01 Status 5	Main	5
S01 Status 6	Main	6
S01 Status 7	Ext 1	1
S01 Status 8	Ext 1	2
S01 Status 9	Ext 1	3
S01 Status 10	Ext 1	4
S01 Status 11	Ext 1	5
S01 Status 13	Ext 1	7

Output	Board	Position
S01 Rly 1	Main	1
S01 Rly 2	Main	2
S01 Rly 3	Main	3
S01 Rly 4	Main	4
S01 Rly 5	Main	5
S01 Rly 6	Main	6
S01 Var Output	Main	6

Clicking on the Mapping tab allows an overview of the mapping of each section to be displayed, this is a useful confirmation that mapping is set up correctly and can help with fault finding at a later date.

In this example the suction control transducer for section 1 is mapped to Main board, universal IO connection 1.

Virtual relay positions 1&2 (compressors) are mapped to physical relays 1&2 on the main controller.

Section 1 variable output is mapped to Main Board Universal IO connection 6.

Once the mapping has been completed then the hardware can be set up for the main board and any expansion boards fitted.

Hardware Setup

Main Board

Parameter	Value	Unit
M01 Uni 1	4-20mA-I	
M01 Uni 2	4-20mA-I	
M01 Uni 3	4-20mA-I	
M01 Uni 4	0-10v-O	
M01 Uni 5	0-10v-O	
M01 Uni 6	0-10v-O	
M01 Uni 7	0-10v-O	
M01 Uni 8	0-10v-O	
M01 Status Inp	0v	
M01 Inv/Ssr Rly 1	On	
M01 Inv/Ssr Rly 2	SSR	
M01 Inv/Ssr Rly 3	Off	
M01 Inv/Ssr Rly 4	Off	
M01 Inv/Ssr Rly 5	Off	
M01 Inv/Ssr Rly 6	Off	
M01 Inv/Ssr Rly 7	Off	
M01 Inv/Ssr Rly 8	Off	
M01 Inv/Ssr Rly 9	Off	
M01 Inv/Ssr Rly 9	Off	
M01 Inv/Ssr Rly 10	Off	
M01 Inv/Ssr Rly 11	Off	
M01 Inv/Ssr Rly 12	Off	
M01 Offset 1	0.8	
M01 Offset 2	-0.2	
M01 Offset 3	0.0	
M01 Offset 4	0.0	
M01 Offset 5	0.0	
M01 Offset 6	0.0	
M01 Offset 7	0.0	
M01 Offset 8	0.0	
M01 Step Reset	6	
M01 Step Max 1	2500	

The main board hardware settings have to be set to match the devices connected to it.

M01 Uni 1 to 8 are universal inputs & outputs, in the example on the left Uni1-Uni3 are set to 4-20mA In to read 4-20mA pressure transducers.

Uni 4 to Uni 8 are set to 0-10v Out to provide a signal to control the speed of an inverter drive or variable position valve.

Status Inputs are set to 0v, this applies to all status inputs on that board and requires a volt free contact to activate an input (as opposed to a 24vac signal).

Relay 1 Inv/SSR is set to On which means that the relay function is inverted (energise to switch off).

Relay 2 is set to SSR which means that a solid-state relay is fitted in relay position 2 to drive a digital scroll compressor solenoid valve.

Temperature probe 1 has an offset of 0.8 degrees applied to account for an increased resistance due to a long cable run for example.

The two sets of stepper settings after these settings on the main board are only available with hardware option PR0652 which has two stepper driver outputs built in. If the main board is the PR0650 hardware option then a stepper expansion board needs to be used to drive stepper valves.

Extension Board

Extension board hardware set up is the same as the main board except that the first option is "Board" which selects between a stepper expansion board, a Mini IO board or an IO expansion board. There are also settings for 6 stepper valves instead of the two on the main board.

System

Link	Operation
System Log	Displays all the changes made to the controller in chronological order.
Mute All Alarms	Allows all active alarms to be muted (Alarm sounder in PR0615 Display and TouchXL)
Clear Alarm Log	Clears the controller alarm log completely (Yes/No choice)
Clear Aliases	Clears any item aliases set up and reverts them back to default
Features	Shows any optional features that are activated on the controller, such as Bacnet (PR0655-BAC)
Network	Setup: - IP Address, Netmask and Default Gateway Shows current network address rotary switch positions
Time	Set the Time or synchronise with the PC
Version	Shows the controller and expansion boards software version
TouchXL Status	Shows details on any connected TouchXL displays, such as IP address
LCD Display Setup	If the controller has a built-in graphical LCD display, set parameters permission, home screen timeout and screen off time can be set here.
LCD Display Layout	Allows customised graphical displays to be set up such as real time graphs and value gauges. Applies only to the optional built in LCD display

Visibility

To simplify the appearance of the controller, devices, items, alarms and display values can be hidden or renamed using the visibility section.

Link	Operation
Device Name Aliases	Allows each control section to be renamed, for example "Section 1" can be renamed to "HT Suction Control"
Device Item Aliases	Allows individual device items to be hidden or renamed. Select the device, "Section 1" for example, and select the class from either: Inputs, Outputs, States or Parameters.
Device Alarm Aliases	Allows the description of any alarm to be changed, for example S01 High Pressure can be renamed to "HT Suction High Pressure" or hidden if not used.
Device Display Aliases	Allows the text which appears on the remote display (PR0620) to be aliased, for example "HP SEC1" can be changed to "HP SUCt". Characters that can be used are limited by the 8 segment LED display, for example S, A and L can be used but X, Y and Z cannot.
Index Page Display	Allows all items to be renamed or hidden on the Index or Home page. If a layout is being used on the controller, then any items in the layout need to be unhidden and match the names on the Index page.
Active Alarms	Gives an overview of which alarms are available, i.e., not hidden.
Hidden Alarms	Gives an overview of which alarms are not available, i.e., hidden.

To set an alias back to factory setting leave the required filed blank and then set aliases.

Configuration

Link	Operation
Configuration	Set the controller configuration (see next page)
Save Configuration	Saves the current Configuration
Load Configuration	Allows the user to upload a previously saved configuration, NOTE: file needs to be named "Setup.xml"
Add Feature	Enables additional Features such as Bacnet (PR0655-BAC)

Important Note:

If transferring a saved configuration from a controller with firmware version V2.9 or earlier to a controller with firmware version V3.0 or higher, the universal IO settings (such as 4-20mA in) will revert to default settings (0-10v in), these will need to be changed and saved manually. Once this configuration has been saved it can be transferred between any controllers with V3.0 or higher firmware installed without any further manual intervention.

As new features and settings are added to the controller in subsequent firmware versions (such as the "Ext Devices" parameter), if a configuration from a controller that does not have the feature is transferred onto a

controller that does, then as the saved value is not known then it will be set to a default value on the newer controller.

Under the maintenance menu there is a "View Config Info" menu. After loading a configuration file, the "View Config Info" page should be inspected, this will highlight any settings that have not been transferred across, this is usually due to different controller revisions having different parameters available.

Configuration	Value	Unit
Control Type	FuzzPP	
Probe Type	PT1000C	
Press Type	bar	
Broadcast	Off	
Enable Oil	On	
Num General	1	
Ext Devices	1	
Parallel Comp	Off	
IP Address	10.1.2.165	
Netmask	22	
Gateway	10.1.2.1	
Static Id	0	
Screen Dev	1	
Select Tabs	WebInterface	
Override Display	Lcd	
Override in HP/LP	Yes	
Override Period	00:30	mm:ss
Config in Lcd	Off	
Auto Split	Off	
Force CGI Login	Off	
Param AutoHide	Off	
Log Frequency	15 Secs	
Enable Alerts	Off	
Xml Encode	Off	

If loading a configuration from a controller that is set to staged control into a controller that is set for fuzzy control (default) it is advisable to load the configuration twice, the first time to change the control type and thesecond time to ensure all parameters are transferred across. If a system user has locked the control type and aservice or install user attempts to load a config. with a different control type then a "Control Type Locked" message will be generated and the config. file will not be loaded.

Control Type:
FuzzyPP: compressor staging on and off times are adjusted automatically depending on pressure compared to target setpoint and rate of change (PID control). PP indicates dual temperature pack control.
StagePP: compressor staging is configured manually by setting fixed stage on and off delays and differential above and below target setpoint.

Probe Type:
Selects thermistor temperature probe type and temperature units degrees C or F, defaults to PT1000 Centigrade**.**

Press Type:
Selects between bar and psi

Broadcast:
Press: allows pressure to be transmitted over the network for use in evaporator superheat control.
Load: allows evaporator shutdown signals to be sent over the network.
See: Broadcast

Enable Oil:
Enables compressor oil control feature.

Number General:
Sets the number of General Sections in use.

Ext Devices:
Sets the number of Canbus expansion devices being used.

Parallel Comp:
Enables the parallel compressor section.

IP Address:
Shows the current IP address details of the controller or allows a static IP address to be entered if rotary address switches are set to 000.
See: Network Configuration.

Netmask:
Shows the current Netmask details of the controller or allows a Netmask to be entered if rotary address switches are set to 000.

Gateway:
Shows the current Gateway address details of the controller or allows a static Gateway address to be entered if rotary address switches are set to 000.
See: Network Configuration.

Static Id:
When using a static IP address, a static 3-digit id number can be entered. This is used by a Mercury evaporator controller to identify which pack controller is transmitting suction pressure.

Screen Dev:
Select which type of information is shown on the PR0615 Touchscreen Display.
See: Touch Display Screen

Network:
Selects the network type: XML (IP), Bacnet IP, RDM-485, XML RDM-485 or both types.

Select Tabs.

Off:	Section information tabs not displayed.
Web Interface:	Display section information tabs on webpage.
Touch:	Displays section information tabs on TouchXL.
Web/Touch:	Displays section information tabs on Webpage and TouchXL.

Override Display:

Off:	Overrides are not available.
Web Interface:	Overrides are available in the Touch XL display or PC interface.
Plant:	Overrides are available in the Plant Display (PR0620).
LCD:	Overrides are available in the optional in-built LCD display.

Override HP/LP: If set to "No" then overrides will have no effect if the controller is in a high pressure or low-pressure alarm condition.

Override Period: If an override is left active then it will revert back to normal operation automatically after this time period.

Config in LCD: If set to "On" then the configuration menu is available in the optional inbuilt LCD display (software version V4.1 or higher).

Auto Split: Determines whether, when the controller logs onto a DMTouch, if the controller will split (i.e., Section 1, 2 & 3, IO Map 1, 2, & 3, Main Board & Stats 1, 2 &3) automatically or not.

Note 1: The Auto Split parameter MUST be the same, if connecting more than one CO2 Superpack to a DMTouch and they are set to the same Control Type.

Note 2: If the controller has logged on to a DMTouch and the Auto Split parameter is changed, the Type file must be deleted from the DMTouch

Force CGI Login: **Off:** When connecting to the controller using a PC or a TouchXL display the home page with all current values will be displayed without having to enter a user name and passcode.
Remote: When viewing from a remote location, user name and passcode must be entered.
Local/Remote: When viewing from any location, user name and passcode must be entered.

Param Autohide: When using the quick "Setup" menu, any IO that are not used such as probe inputs, status inputs and relay outputs are automatically hidden. If autohide is switched off the all IO will appear even if they are not in use.

Log Frequency: The logging frequency can be set from 15 second log intervals up to 60-minute intervals. Setting a fast-logging frequency will give more detailed graphs and logs but will use up the memory more quickly reducing the long-term logging capacity, export log files will also be much larger in size and take longer to download. It is advisable only to use 15 second logging for short term diagnostic/testing purposes and not during normal operation.
Caution: Changing the logging frequency after initial setup will cause any previously logged data to be removed. After changing the logging frequency the controller should be powered on and off to enable logging at the new rate.
If changing the logging frequency all logged data should be exported first.

Enable Alerts: When enable alerts is set to ON the controller has the ability to send out alarms via e mail, an additional "Mail" menu will appear at the bottom of the service menu.

XML Encode: When requesting XML files from the controller using a web browser the XML file can be encoded, this reduces the size of the file but increases the time to extract the data. If the browser does not accept encoded data then this should be switched off, if the file size needs to be small then encoding can be switched on.

Pack and Parallel Sections 1, 2 & 5 Additional Information.

Status Inputs

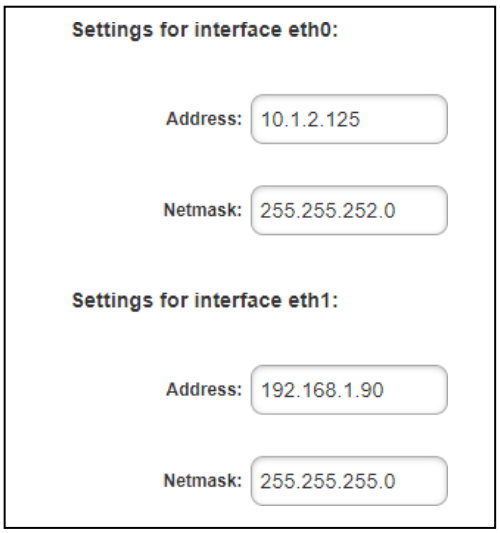
Section Inputs can be set up as: -

0	Unused	Input is not used
1	Compressor or Condenser Normally Open	When selected "Make" to generate Compressor or Condenser Fault
2	Compressor or Condenser Normally Closed	When selected "Break" to generate Compressor or Condenser Fault
3	General Normally Open	When selected "Make" to generate General Fault
4	General Normally Closed	When selected "Break" to generate General Fault
5	Standby Normally Open	When selected "Make" to place Section 1 into standby and generate Standby alarm.
6	Standby Normally Closed	When selected "Break" to place Section 1 into standby and generate Standby alarm.
7	Run Normally Open	When selected "Break" to use Sect 1 Ext Target (P-13) OR "Rem Ext 1 or 2" See Note: Ext Target
8	Run Normally Closed	When selected "Make" input to use Sect 1 Ext Target (P-13) OR "Rem Ext 1 or 2" See Note: Ext Target
9	INV N/O	When selected "Break" to signal Inverter Run. Used when using Inverter Bypass relay. See Note: INV Bypass
10	INV N/C	When selected "Make" to signal Inverter Run. Used when using Inverter Bypass relay. See Note: INV Bypass
11	Proof N/O	When the global Run Proof option is being used, this input is closed to reset a compressor trip caused by fault input (options 1 or 2 above)
12	Proof N/C	When the global Run Proof option is being used, this input is opened to reset a compressor trip caused by fault input (options 1 or 2 above)
13	Inv Proof N/O	When the Inverter Proof option is being used, this input is closed to reset an inverter trip caused by a fault input (options 1 or 2 above)
14	Inv Proof N/C	When the Inverter Proof option is being used, this input is opened to reset an inverter trip caused by a fault input (options 1 or 2 above)

For the above any alarms will be generated after the Status Fault Delay (P.100) has timed out.

NOTE: These are "Virtual" status inputs so the order in which they are allocated is not important as they will be mapped to actual physical inputs later in the setup. Stages should only be set to unused and the end of allocating, for example Input 1=Comp N/O, Input 2=Comp N/O, Input 3=Comp N/O, Input 4=Standby N/C, Inputs 5 onwards=Unused. Do not set a stage input to Unused followed by used input (such as Comp N/O).

Fibre Network Adapter



A USB to Fibre Network Adapter (PR0459-FIB) can be used with the controller to provide connection to an RDM Fibre Network.

When the adapter is plugged into one of the controller's USB Type A ports an additional Eth1 network menu will appear under the network setup page (Service – System – Network).

Eth1 Address and Netmask can be entered as required.

This network is separate from the Eth0 network which uses the two CAT5 ports on the controller.

External Target

Pack Controller

To use Sect 1 or 2 Ext Target (P-13) instead of Section 1 or 2 Target Pressure (P-09) a status Input must be set to "Run N/O or N/C".

- When the input is activated the Target Pressure will change from (P-09/10) to (P-13)
- When the input is de-activated the Target Pressure will revert back to (P-09/10)

Section Stages

Pack

	Stage	Description	
0	None	Use this option to end the number of stages in the compressor section.	
1	Unused	Use this option to skip a relay output within a stage.	
2	Inverter	Use this option to assign a relay to an Inverter.	
3	Comp	Use this option to assign a relay output to a compressor.	See note 5
4	Loader	Use this option to assign a relay output to a compressor loader.	See note 9
5	Trim	Use this option to set a relay to a trim compressor.	See note 6
6	SSR	Use this option to set a relay to a digital scroll solenoid valve.	See Using a DigitalScroll

Note 5: 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 to which it is attached.

Note 6: This option can be used to provide additional capacity if the inverter capacity is too small. The "Trim" relay will always come on first before the Inverter enable relay and will use the starts per hour parameter. Once the trim stage is on the inverter enable relay would be energised and the inverter analogue output would begin to ramp up. The trim relay would remain on until all other stages are off and the inverter enable relay has been turned off.

Note 9: Relays can be configured as loaders, selected after a compressor stage or a compressor running on an Inverter

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 or kW)

The default stage size is 0; stage sizes must be entered for correct operation.

Using a Digital Scroll Compressor

A digital scroll compressor requires an Inverter relay allocated to it to switch on the compressor and a solid-state relay (SSR) to energise the capacity solenoid, the SSR output is switched **off** to fully load the compressor and **on** to fully unload the compressor**.** The compressor is loaded and unloaded in 20 second cycles as default (P-36 cycle time) so if the compressor is required to run at 50% capacity, then the SSR output will be on for 10 seconds and off for 10 seconds. Similarly, if the compressor is required to run at 75% capacity the SSR will be off for 15 seconds and on for 5 seconds.

The following procedure is an example of how the controller should be set up to run a digital scroll compressor:

- When ordering, the controller must be specified with a solid-state relay fitted in relay position 1 (PR0650-SUPCO2-E1 for example) or if two digital scrolls are being controlled then a solid-state relay is required in relay positions 1&2 (PR0650-SUPCO2-E2 for example). Only one digital scroll compressor can be controlled on each compressor section.
- Under the Main Board set up page set relay 1 to SSR and relay 2 to SSR if fitted.
- Under the section parameters set Inverter to on (P-31) and set inverter minimum to 10% (P-33) or refer to compressor manufacturer's specification for a minimum capacity (to provide compressor cooling).
- Set PWM Control to on (P-35) and set PWM Cycle time to 20 seconds (P-36) or refer to compressor manufacturer's specification.
- Set stage 1 to SSR and stage 2 to Inverter (P-120 & P-121)

Under the stage IO map, map the SSR to the position the SSR is fitted on the controller (relay position 1 or 2) and the inverter relay to any other relay which is being used to switch the compressor on.

- The Discharge Stop and Trip parameters need to be set according to manufacturer's specification (P-83, P-84, P-85 & P-86).

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, so that correspond with each relay output.
- When the relay output is energized and the run proof signal isn't returned within the specified time period, 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.100) 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.
- Example, when the status input is set to Compressor Normally Closed then the input must become open circuit for the compressor run to be confirmed and vice versa.

Note: If using "Run Proofs" and Compressor Loaders.
If you have a compressor with loaders you need to set up status inputs for the compressor body and the loaders and map the inputs accordingly. For example, if relay 1 is a compressor and relays 2 & 3 are the associated loaders then status inputs 1, 2 & 3 would be set as compressors, if inputs 1, 2 & 3 are then mapped to physical input 1 on the controller then when the compressor fault input is activated the associated loaders will be switched off as well as the compressor body.

Run proof inputs must not be used on Inverter (variable speed) stages. If an Inverter is being used that is required to be stopped in the event of a run proof signal not being returned then the stage should be set to "Inv" the fault input set to "Inv N/O" or "Inv N/C" and the Inverter bypass parameters set up as required. See "Inverter Bypass" section

Resetting a Run Proof
To reset the run proof for any stage, after maintenance, and return a compressor back into the control strategy, the proof status input should be activated momentarily. If a proof status input is not set up then resetting the controller will have the same effect.

From firmware version V5.0 or newer the proof auto reset parameter has been added, this will attempt to restart the compressor automatically after the auto reset period has expired. If the compressor run signal is not confirmed then the compressor will switch off again and will be locked out until the next auto or manual reset.

If the run proof parameter is set to "On/Mon" then additional parameters are available which allow a compressor to attempt a restart without the proof signal being cleared, the compressor is run for a pre set time period (Comp Try Wait parameter) to allow time for the proof signal to clear. If the proof signal does not clear during this time period then the compressor relay will switch off and wait for the Comp Try Delay period to expire before attempting another restart. The number of compressor start attempts is specified by the "Comp Try" parameter, once this number of tries has been exceeded then the compressor will be locked out.

The auto reset parameters should be used with caution as it allows repeated compressor starts without the compressor fault signal being cleared.

Gas Dump

Gas Dump Enable (P-29). The Gas dump relay will come on when the Suction Pressure drops below the Set Point (P-09/10) plus the Gas Diff (P-30) and all but the last compressor has turned off.

When an Inverter output is configured 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.

The Gas dump relay will go off again when: -

The pressure rises above the Set Point (P-09/10)
Or

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

Compressor Loaders

Parameter (P-26) determines the order the compressor loaders are switched off providing 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 (P-26) set for 0 (Off) then a compressor loaders and compressor body will be switched off before another loader is switched off.

If (P-26) 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

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 (P-26) = 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

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 (P-26) = 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 (P-27) 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 compressor's run hours equal.

Inverter Bypass

Inverter Bypass Parameter (P-32) is used to set however many retries are required if the Inverter run signal is not returned in the allocated time after the inverter enable has been turned on.

(P-32) set for 1 to 5 is the number of times enable comes on including initial inverter enable turned on.
0 = Feature disabled.
1 = Inverter enable will come on once with no retries
2 = Initial turn on and 1 retry
3 = Initial turn on and 2 retries
4 = Initial turn on and 3 retries
5 = Initial turn on and 4 retries

Firstly, assign the desired inverter run input using the Status Fault inputs. This input can be set as either normally closed (INV N/C) or normally open (INV N/O). When the inverter enable relay is called for by the control strategy then the inverter run signal has to be returned to the appropriate input within 2 seconds.

If the run signal is received then the control strategy will continue as normally and the variable output will begin to ramp up.

If the signal is not returned within the allotted time, then the following will occur.

(P-32) set for 1 the inverter enable will stay off and bypass relay will come on.

(P-32) set for 2 to 5 the inverter enable relay will be turned off for a further 15 seconds.

This process will occur a further 1 to 4 retries depending on (P-32) if the inverter run signal is not received in any test instance. After the retries the inverter will be taken out of the control logic, until the fault is cleared using the reset process, and the pack will operate as a standard digital pack without the use of the inverter output. At this point the Bypass relay will become like another staged relay and will cycle on and off when called for.

An “INV Bypass” alarm will be generated.

Note if the inverter run signal is not returned within the allotted time in the first instance but is successful in the second, third or fourth attempt (Depending on (P-32) then any future inverter run tests must still complete all tests.

To reset the Inverter Bypass after maintenance, and return the inverter back into the control strategy, the proof status input should be activated momentarily. If a proof status input is not set up then resetting the controller will have the same effect.

The status inputs should be mapped to the relay used as the Inverter Enable relay for a given section i.e., if relay 1 is the first Inverter relay, then status Input 1 would become the inverter run input for Section 1. If the second Inverter relay is 5 then status Input 5 would become the inverter run input for Section 2.

Relay Run Hours and Relay Starts

The total run hours and the total number of starts for each relay can be viewed via a Laptop/PC (See Stats) or from the Data Manager front end outputs. This feature informs the user of the total number of hours a given relay has been on. If a compressor is assigned to a relay, the total run hours for that compressor can be viewed. It also gives the total number of starts for a given relay and therefore gives the total number of starts for that compressor.

To reset the run hours and relay starts connect to the controller using PC/Laptop, log in and select “Stats” and “Set Parameters” Change the value from “Reset 1” to “Reset 2” or if value is at “Reset 2” change it to “Reset 1” It makes no difference which value is shown, just the operation of changing it from one to the other will reset the run hours and relay starts.

This can also be done from the front end by selecting “Set Parameters” and carrying out the same operation

This applies to all relays including the Alarm relay.

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 or fan is switched on, Relay 1 will energise and the variable output will ramp to 100%, when it reaches this point, the fixed device (compressor, loader or fan) 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 16 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 Section 1 and Section 2 or 3. 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-42) 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, if set to Pack and pack has 4 Compressors the following could be set: -

Sect1 Stg1: Rly 1 =On, **Sect1 Stg2**: Rly 1 and Rly 2 = On, **Sect1 Stg 3:** Rly 1, Rly 2 and Rly 3 = On. **Sect1 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.

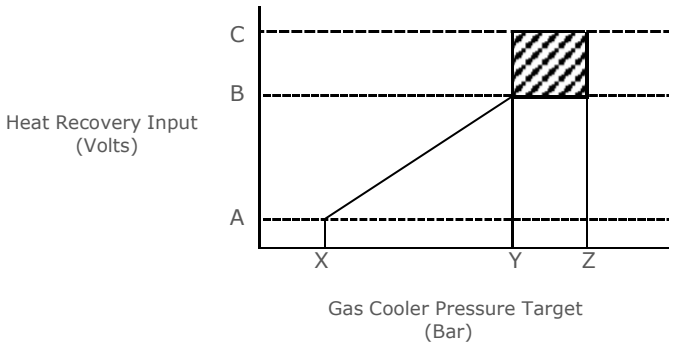
There is a High-pressure limit, over which the night set-back feature will be turned off. As the pressure reduces under this limit the night set-back feature is switched on again.

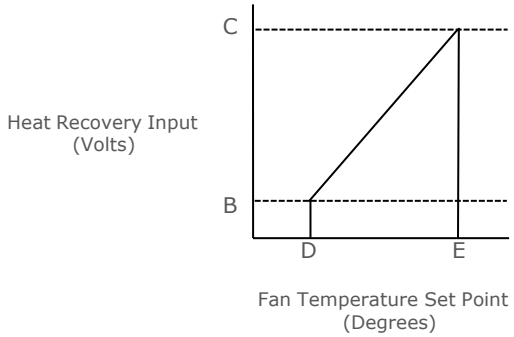
Heat Recovery

Heat recovery (P600) can be set to Off, Mode 1, Mode 2 or Mode 3

Mode 1

In mode 1, a variable 0-10v input signal is used to determine the change in gas cooler setpoint and fan temperature setpoint and switches heat recovery and bypass relays accordingly.





Where:
A = P601 (Heat Recovery Start)

B = P602 (Heat Recovery End)
C = P608 (Heat Recovery Bypass)

X = P603 (Heat Recovery Ref at Start)
Y = P604 (Heat Recovery Ref at End)
Z = P605 (Heat Recovery above End)

B = P602 (Heat Recovery End)
C = P608 (Heat Recovery Bypass)

D = P606 (Heat Recovery Ref at End)
E = P607 (Heat Recovery Ref at Bypass)

If the voltage on (Heat Recovery Sensor) rises above P601 setting then the Gas Cooler Target will go to P603 setting or calculated (Gas Cooler SP) whichever is highest and the heat reclaim relay will switch on.
As the voltage on the input rises between P601 setting and P602 setting the Gas Cooler Target will rise linearly to P604 setting or calculated (Gas Cooler SP) whichever is highest
When the voltage on the input is between P602 and P608 the Gas Cooler Target will go to P605 setting or calculated (Gas Cooler SP) whichever is highest, at the same time the Fan Temperature Set Point will rise between P606 setting and P607 setting in place of the calculated Fan Temperature Set Point,
Once the Heat Recovery Input reaches the P608 Heat Recovery at Bypass setting and is still rising, Bypass comes on and bypasses cooler

Mode 2

In mode 2, a status input signal is used to enable heat recovery, gas cooler setpoint is changed and an analogue 3-way heat recovery valve output (voltage, milliamps or stepper) is varied in relation to the heat recovery temperature probe measured against the Heat Recovery Bypass setpoint.
When heat recovery is enabled (status input Hrec N/O or N/C), heat recovery valve will be switched on (relay) and Gas cooler target will be set to Hrec Gas Ref at End (P604, default 80 bar)
If Bypass Temp is less than Hrec Bypass Ref Value (P609), 3-way valve will start opening.
If Bypass Temp is greater than Hrec Bypass Ref Value (P609) 3-way valve will start closing.
If Gas Cooler Pressure is greater than Gas Bypass HP setting for longer than Gas AlmDly:
1. Heat Recovery Valve will stay ON
2. Gas cooler target will return to Normal
3. Heat Reclaim 3-way Valve will close to 0%.
4. Gas Bypass HP Alarm Generated.

If Gas Cooler Pressure drops below Gas cooler target, Heat Recovery will resume.

Mode 3

In mode 3, a status input signal is used to enable heat recovery, gas cooler setpoint is changed and the heat recovery bypass valve relay is cycled on and off in relation to the heat recovery temperature probe measured against the Heat Recovery Bypass setpoint.
When heat recovery is enabled (status input Hrec N/O or N/C), heat recovery valve will be switched on and Gas cooler target will be set to Hrec Gas Ref at End (P604, default 80 bar)
If Bypass Temp is less than Hrec Bypass Ref Value (P609), valve will switch on.
If Bypass Temp is greater than Hrec Bypass Ref Value (P609) plus diff value (P610), valve will switch off

If Gas Cooler Pressure is greater than Gas Bypass HP setting for longer than Gas AlmDly:
1. Heat Recovery Valve will stay ON
2. Gas cooler target will return to Normal
3. Heat recovery bypass valve will be switched ON
4. Gas Bypass HP Alarm Generated.

If Gas Cooler Pressure drops below Gas cooler target, Heat Recovery will resume.

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.

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.

Expansion Board off line

A relay can be selected to act as watchdog for expansion boards going off line.

If one or more expansion boards go off line the outputs on the expansion board(s) will remain in whatever state they are in when board stops communicating. A relay can be used to act as a switch to switch power off if required so the outputs will go to a known state.

The relay will be energised during normal running and will de-energise when expansion board is off line.

The relay will remain in the off position until communication is restored, it will not automatically reset so care should be taken if using the relay to interrupt a power supply.

Note: There is a fixed one-minute delay before the Off Line Alarm occurs.

Superheat

Parameter P400 enables superheat and allocates outputs for superheat low and superheat high monitoring

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

If the Superheat falls below Superheat Low Target Parameter (P401) then the Superheat Low Relay will come on.

When the Superheat rises above the Superheat Low Target (P401) by the diff parameter (P401) the Superheat Low Relay goes off.

If the Superheat rises above Superheat High Target Parameter (P411) then the Superheat High Relay will come on.

When the Superheat falls below the Superheat High Target (P411) by the diff parameter (P412) the Superheat Low Relay goes off.

If the Suction Pressure Transducer or the Suction Temperature Probe fails, any of the superheat high or low relays that are on will go off and a superheat fault alarm will be generated.

Oil Faults

When an Oil Fault Input comes on the Oil state will go to a “Pre-Delay” State and wait for period of time in parameter (P40).

Then the corresponding Oil Fault Relay will pulse on and off or the length of time in parameters (P42 and P43) The Oil State will show Pulse On and Pulse Off

This will be repeated for the number of pulses set in parameter (P41)

Then the Oil State will go to an “Oil Lock-Out” state for the time in parameter Oil Retry (P45) and the corresponding compressor will be turned off for this period.

The Oil State will then go to the “Pre-Delay” state again the above will be repeated for the number of times in parameter Oil Lock Out (P44)

After the above sequence if the fault has not cleared the corresponding compressor will be taken out of commission and an Oil Fault alarm will be generated. The Oil State for that input will show Lock Out

Note: The oil reset input needs to be activated (momentarily) to re-instate the compressor once the fault has been rectified.

If at any time during the above sequence the Oil Fault Input goes off the sequence will stop and the Oil State will return to Off

Gas Cooler states with pressure rising and falling

Gas Cooler Pressure

High	HP Shutdown:	Gas cooler Pressure above Max Gas Pressure (P-20) plus Gas Alarm Offset (P-82)
	Supercritical:	Gas Cooler Pressure above Maximum Gas Pressure (P-20) but less than offset (P-82)
	Transcritical:	Gas Cooler Temperature above 31.1 Degrees (offset may be applied (P-53))
	Subcritical :	Gas Cooler Pressure Normal (Between min and max gas setpoints (P22 & P23)
	Triple :	Gas Cooler Pressure below Minimum Gas Pressure (P21)
Low	LP Shutdown :	Gas Cooler Pressure below Minimum Gas Pressure minus Gas Alarm Diff (P-82) for Gas Alarm Shut Delay.

Shutdown (HP)

As the Gas Cooler Pressure rises above Max Gas Pressure (P-20) plus the Gas Alarm Offset (P-82) for a period longer than the Gas Shut Delay (P-81) 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.

Supercritical

As the Gas Cooler Pressure rises above Max Gas Press (P-20) but stays below the Max Gas Press plus the Gas Alarm Offset (P-82)
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 and at maximum output.
Transcritical Relay will be On
A "Gas Cooler HP Open" alarm will be generated.
Receiver Output and Aux Comp operate as normal

Transcritical

If the Gas Cooler Temperature goes above 31.1 Degrees C (offset may be applied (P-53)) or the gas cooler pressure goes above 74 Bar
The Transcritical Relay will come on.
The Gas Cooler Control State will go to "Transcritical"
HT and LT Packs and Gas Cooler Fans operate as normal
Gas Cooler output will be Open.
Gas Cooler Fan will be On.
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 P21 and 73 Bar.
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 Target (P101 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 Aux Comp operate as normal

Triple

As the Gas Cooler Pressure falls below "Min Gas Press" setting (P21) for Gas Alarm Delay (P80)
HT and LT Packs will operate as normal.
The Gas Cooler Fan will be Off
The Transcritical relay will be Off
A "Gas Cooler LP Open" alarm will be generated.
Note: The Gas Cooler Output will Close.
Receiver Output and Aux Comp operate as normal

Shutdown (LP)

As the Gas Cooler Pressure falls below the "Gas Alarm Offset" setting P82 below "Min Gas Press" setting P21 for Gas Shut Delay P81. The Control State will go to "Shutdown"
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.
A "Gas Cooler LP Shutdown" Alarm will be generated.
Receiver Output and Aux Comp go off
Note: The Transcritical relay will come On

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 Setpoint

The Gas Cooler Temperature is measured in the Gas Cooler Return Line and added to the Sub Cooling value (Default 3 ^{O}C) and then converted to a pressure. During subcritical operation this value is used as the Gas Cooler setpoint, if the Gas Cooler Pressure rises above this setpoint the Gas Cooler Valve will open.

During transcritical operation, the Gas Cooler set point is calculated as a linear function of the Gas Cooler Outlet temperature.

If Parameter P-51 is set to "Auto", then a pre-defined function is used.
If Parameter P-51 is set to "Man", then Parameters P-52 and P-53 are used to generate the linear function, (Set Point = Gas Gradient x Gas Temp + Gas Offset).
If P-100 (Gas Fan Control Type) is set to Ambient / Pressure then the Ambient temperature probe is used instead of the Gas Cooler Return Line probe.

Gas Cooler Calculated Temperature

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

Extra Refrigeration Capacity

This function provides the ability increase the system's refrigeration capacity by increasing the pressure in the gas cooler
The function is activated by setting one of the status input parameters (P520-P535) to Extra Capacity N/O or Extra Capacity N/C.
When that input is activated, the Gas Cooler Pressure Setpoint is increased by the amount set in parameter (P24)
See: Gas Cooler Pressure Setpoint

Cooler Interlock

With Cooler Interlock (P70) set to on, if all compressors go off then the gas cooler output valve goes off with the last compressor.

Receiver/Separator Bypass Valve

Receiver/Separator Bypass Valve can be either a Stepper Valve or a Variable Speed Drive

As the Receiver Pressure rises above the "Receiver Target" setting (P201) the "Receiver Bypass Valve" will open.

Receiver Interlock

With "Receiver Interlock" (P207) set to on

To prevent the Receiver Pressure from getting too low, a minimum value is set "Min Gas Pressure" (P21)

If Receiver Pressure drops below this set point, after the alarm delay period (P220), the Gas Cooler Output Valve will open to "Min Gas Inverter" value (P40)

To prevent the Receiver Pressure from getting too high a maximum value is set "Max Gas Pressure" (P20)

If Receiver Pressure rises above this set point, after the alarm delay period (P220), the Gas Cooler Output Valve will close to "Max Gas Inverter" value (P41)

With "Receiver Interlock" (P207) set to GC, operation is the same as above but the gas cooler valve is set to min. and max. settings without using the alarm delay.

Gas Fan Control

Fixed

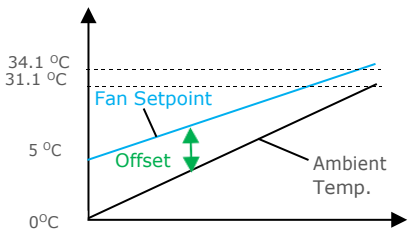
If P100 is set for Fixed (0), the Gas Fans will come on when the Gas Cooler temperature probe rises above the temperature target derived from P101 and go off when the Gas Cooler temperature falls below the target (Using fuzzy logic and response on and off speed using parameters P104 & P105)

Note: Parameters P102 & P103 (Gas Fan Offsets) have no effect when Fixed is selected

If the gas cooler temperature probe fails then the fan output will default to 50%.

Ambient

If P100 is set for Ambient then an offset is added to the Gas FanSP as the ambient temperature changes. The offset is calculated using the Ambient Probe temperature and the Fan Offset Tz and Tc parameters P102 & P103 (Zero offset and Critical offset).
In the example on the right, Tz is set to 5 ^{O}C and Tc is set to 3 ^{O}C, when the ambient temperature is 0 ^{O}C the fan target offset is5^{O}C, when the ambient reaches31.1 ^{O}C the fan target offset is 3 ^{O}C. The fan target offset varies on a linear scalebetween5^{O}C and 3 ^{O}C as the ambient temperature changes between 0 ^{O}C and 31.1 ^{O}C.
The calculation used is: Fan Setpoint = Ambient+(Tz-((Ambient x ((Tz-Tc)/31.1))



Ambient/Pressure 1

If P100 is set for Ambient/Pressure 1 then the fixed Gas Fan SP parameter is used but the offset will vary depending on the ambient temperature. The Gas Fan SP is converted to pressure and an additional Gas Fan Setpoint in Bar/Psi will be shown.
Gas cooler pressure is used for control against the Gas Fan SP.

Fixed Pressure 1

If P-100 is set for Fixed Pressure then the Target for the Gas Fan setpoint is calculated from the Gas Fan Setpoint (P-101) in ^{O}C converted to pressure. For example, if target is set to 10°C then the fixed pressure target is 45.0 Bar.
Gas cooler pressure is used for control against the Gas Fan SP.

Ambient/Pressure 2

If P100 is set for Ambient/Pressure 2 then the Gas Fan SP is calculated using the same method as Ambient/Pressure 1 (above) however the Gas Fan SP is converted to pressure and an additional Gas Fan Setpoint in Bar/Psi will be shown.
Discharge pressure is used for control against the Gas Fan SP.

Fixed Pressure 2

If P-100 is set for Fixed Pressure 2 then the Target for the Gas Fan setpoint is calculated from the Gas Fan Setpoint (P-101) in ^{O}C converted to pressure. For example, if target is set to 10°C then the fixed pressure target is 45.0 Bar.
Discharge pressure is used for control against the Gas Fan SP.

Note If the control state goes to Transcritical the Gas Cooler Fans will run at 100% unless the "Fan Trans Ctrl" parameter (P-115) is set to run in which case the fans will operate as described above.

Auxiliary Compressor

The Auxiliary Compressor is used to try to reduce the pressure in the Liquid Receiver before it reaches a point where it will open the Receiver Bypass Valve

As the receiver pressure rises above "Aux Comp Target" (P300) The Auxiliary Compressor Inverter Enable Relay will come on and the Aux Compressor Variable Output will ramp up

The auxiliary Compressor does this by removing any vapour in the top of the Receiver and discharging it into the HT Discharge line.

Liquid Injection

With the parameter "Do SH" (P400) set to "On", the superheat value is calculated as suction temperature measured from the temperature probe minus suction temperature calculated from the suction pressure (Using a CO2 pressure to temperature conversion table).

If the superheat value is greater than SH Lo Trgt (P401) + SH Lo Diff (P402) then the superheat low output is off.

If the superheat value falls below the SH Lo Trgt (P401) then the superheat low output is on and a superheat low alarm is generated.

If the superheat value is below SH Hi Trgt (P411) – SH Hi Diff (P412) then the superheat high output is off.

If the superheat value is greater than SH Hi Trgt (P411) then the superheat high output is on and a superheat high alarm is generated.

If the superheat value cannot be calculated (due to a probe failure for example) then a superheat fault alarm is generated.

Superheat alarms are subject to the superheat alarm delay period (P420)

With the parameter Do LiqInj (P350) set to on, if the superheat high output is on and the liquid temperature probe is greater than the LiqInj SP (P351) then the liquid Injection relay switches on.

If the liquid temperature is below LiqInj SP (P351) – LiqInj Diff (P351) or the superheat high output switches off then the liquid Injection relay switches off.

If the liquid temperature probe fails then a liquid Injection fault alarm will be generated.

If the liquid temperature rises above the LiqInj OT setting (P353) then a liquid injection over temperature alarm will be generated.

Parallel Compressor Section

The parallel compressor section (optional) is intended to control receiver pressure in parallel with or in place of the receiver valve (flash gas valve). Operation is very similar to the HT/LT compressor sections with an optional variable output (inverter) compressor, digital scroll compressor and up to 16 compressor stages. From firmware version V5.4 superheat control, gas dump control and high discharge temperature and pressure shutdown functionality are also available. Firmware version V5.4 also has additional features which provides interaction with the gas cooler section, these are:

Low Ambient Stop: This will prevent the parallel compressor(s) running if the ambient temperature is below the Low Ambient Stop Setpoint. The ambient temperature probe from the gas cooler section is used for this.

Gas Cooler Low Temperature Stop: This will prevent the parallel compressor(s) running if the gas cooler outlet temperature is below the Gas Cooler Switch Temperature Setpoint. The gas cooler outlet probe is used for this although there is an option to use the heat exchanger outlet temperature probe instead (HX Out temperature)

Enable on Receiver Minimum: This will prevent the parallel compressor(s) running if the receiver valve output is below the Receiver Minimum setting (default 30%).

Receiver Float: This parameter, if used, will increase the receiver target setpoint by the parameter setting "Float Receiver Setpoint" when the parallel section starts running. Once the Parallel section is running at maximum capacity the receiver setpoint will return to it's normal value. These setpoint changes are subject to settable time delays.

The pressure control input would normally be mapped to the receiver pressure transducer but can be mapped to any of the transducers connected to the controller, 3 additional pressure inputs are available for monitoring purposes. 16 status inputs and 8 temperature inputs are also available similar to the HT/LT compressor sections. Two temperature probes are used for suction temperature (superheat calculation) and discharge temperature (high discharge temperature stop).

Viewing Inputs and Outputs via the pressure display (PR0620)

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/Output table d01 (Applies ds01 & ds02 Pack Sections)

Parameter numbers are the same for both sections

Number	IO	Range	Units
I-01	Suction Pressure	-3.4 to 180	Bar
I-02	Discharge Pressure	-3.4 to 180	Bar
I-03	Pressure Input 3	-3.4 to 180	Bar
I-10	Suction Temperature	-60 to +256	^{o}C
I-11	Discharge Temperature	-60 to +256	^{o}C
I-12 ↓ I-17	Probe Input 3 ↓ Probe Input 8	-60 to +256	^{o}C
I-30 ↓ I-45	Status Input 1 ↓ Status Input 16	0 = OK 1 = Alarm 2 = Unused	---
I-50	Run	0 = Off, 1 = On 2 = Unused	---
I-51	Proof Reset	0 = Off, 1 = On	---
I-22	Heat	-0 = Off, 1 = On 2 = Unused	---
O-01 ↓ O-24	Relay 1 ↓ Relay 24	0 = Off, 1 = On	---
O-30	Variable Output	0 – 100	%
O-41	Optimisation Level	-3.4 to 180	Bar
O-70	Bypass	0 = Off, 1 = On	---

O-80	Gas Dump	0 = Off, 1 = On	---
S-01 ↓ S-03	Control States	0 = Off 1 = Stabilise 2 = Initial 3 = Cooler Fault 4 = Normal 5 = High Pressure 6 = Low Pressure 7 = Low Shut-down 8 = Transducer Fail 9 = Standby 10 = Trip 11 = Stop 12 = Transducer Fail	

Input/Output table d-02 CO2 Section

Number	IO	Range	Units
I-01	Cooler Pressure	-3.4 to 180	Bar
I-02	Receiver Pressure	-3.4 to 180	Bar
I-10	Cooler Temperature	-60 to +256	^{o}C
I-11	Cooler Ambient Temperature	-60 to +256	^{o}C
I-12	Cooler Air On Temperature	-60 to +256	^{o}C
I-13	Cooler Air Off Temperature	-60 to +256	^{o}C
I-14	Liquid Injection Temperature	-60 to +256	^{o}C
I-15	Heat Recovery Temperature	-60 to +256	^{o}C
I-16	Probe Input 7	-60 to +256	^{o}C
I-17	Probe Input 8	-60 to +256	^{o}C
I-30	Liquid Level Input	0 -100	%
I-60 ↓ I-75	Status Input 1 ↓ Status Input 16	0 = OK 1 = Alarm 2 = Unused	---
I-90	Heat Recovery Sensor	0 – 10	V
O-01	Gas Cooler Setpoint	-3.4 to 180	Bar
O-05	Gas Cooler Calculated Temperature	-60 to +256	^{o}C
O-20	Cooler Inverter	0 = Off, 1 = On	---
O-21	Cooler Output	0 -100	%
O-22	Capacity Input	0 = Off, 1 = On, 2 = Unused	---
O-40	Fan Setpoint (temperature)	-60 to +256	^{o}C
O-41	Fan Setpoint (pressure)	-3.4 to 180	Bar
O-60	Fan Inverter	0 = Off, 1 = On	---
O-61	Fan Inverter Output	0 -100	%
O-70	Fan Night Setback	0 = Off, 1 = On	---
O-71	Fan Day Setback	0 = Off, 1 = On	---
O-90	Receiver Inverter	0 = Off, 1 = On	---
O-91	Receiver Output	0 -100	%
O-110	Auxiliary Compressor Inverter	0 = Off, 1 = On	---
O-111	Auxiliary Compressor Output	0 -100	%
O-120	Transcritical Relay	0 = Off, 1 = On	---
O-121	Liquid Injection	0 = Off, 1 = On	---
O-122	Superheat	-60 to +256	^{o}C
O-123	Superheat Low	0 = Off, 1 = On	---
O-124	Superheat High	0 = Off, 1 = On	---
O-130	Heat Recovery Valve	0 = Off, 1 = On	---
O-131	Heat Recovery Bypass	0 = Off, 1 = On	---
O-140	Stepper 1	0 -100	%
O-141	Stepper 2	0 -100	%
O-142	Stepper 3	0 -100	%

O-150	Offline Relay	0 = Off, 1 = On	---
O-151	Run Relay	0 = Off, 1 = On	---
O-152	Alarm Relay	0 = Off, 1 = On	---
S-01 ↓ S-10	Control States	0=Off 1=Stabilise 2=Initial 3=Pack Fault 4=Triple 5=Sub Critical 6=Trans Critical 7=Super Critical 8=Transducer Fail	9=Temp Probe Fail 10=Shutdown

Overrides

For testing and commissioning purposes, all relays can be manually switched on and off and analogue outputs and stepper outputs can be set to specific values. Overrides can be activated using one of three interfaces: -
The web interface which is a PC or Touch XL display,
The optional built in LCD display or
The optional remote plant display (PR0620).
The method of override is set in the controller configuration page, if this is set to "Plant" for example then the override menu will not appear on the inbuilt LCD display or PC interface.
Initially the override value of an analogue output will show as 101%, this means the override is not in use. Setting this to 100% will force the output to it's maximum value (10v for example), setting it to 0% will force the output to it's minimum value (0v for example) and setting it to 50% will force it to 50% of it's maximum value (5v for example).

If the override is not manually switched off then it will revert back to it's normal operating value after the Override Period has expired, this time period is set in the controller's configuration page.

Overrides Using PR0620 Plant Display

Pressing the "override" button during normal operation displays the variable output value. Repeated presses will scroll through section 1 then section 2 and section 3 variable output values

The override function also allows the user to switch output stages on or off. Press the override and enter button together for approx. 3 seconds until "t-01" is displayed. ("t-01" = main board) ("t-02" = ext board 1) ("t-03" = ext board 2) to ("t-11" = ext board 10)

Press enter to go to "Main Board" "t-01" overrides

"r-01" will be displayed Use the "up" or "down" button to display the relays (r-01 to r-12), analogue outputs (A-01 to A-08) and stepper outputs (S-01 to S-06)

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 and S-01 to S-06 Press "Enter" and use up and down buttons to select the desired output for A-01 to A-08 or S-01 to S-06, Press the "Enter" button when the desired output percentage is reached. Each output can be set between 0% to 100%

Note: A-01 to A-08 must be set for variable outputs and S-01 to S-06 set up as stepper outputs.

Info Button

Pressing the "info" button during normal operation displays the number of current alarms. Repeated presses will scroll through section 1 then section 2 and section 3 number of current alarms

Standby Mode

Once in standby all configured stages are turned off and a standby alarm is generated for the given section. There is a settable delay before a section enters standby. Once this delay expires the controller enters standby and a standby alarm is also generated for the relevant section.

Section 1 & 2 can be placed into standby independently using two separate status inputs both sections can be placed into standby at the same time from a single status input by mapping the same status input to each section. From software version V5.0 onwards the Gas Cooler section also has a standby input available.

Display Messages

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

Display	System status
HP	High Pressure alarm (Pack or Condenser)
LP	Low Pressure alarm (Pack or Condenser)
Sd	Low Pressure Shut-down (Pack or Condenser)
Lh 1 to Lh 3	Liquid Level High Level alarm
LL 1 to LL 3	Liquid Level Low Alarm
LF 1 to LF 3	Liquid Level Fault
Inv 1 to Inv 3	Inverter Fault
trAn Ft	Pressure Transducer Fault
St 1 to St 16	Stage 1 to 16 Fault (Comp or Cond)
gn 1 to gn 16	General Fault
Stby	Controller in Standby
triP	Discharge Pressure Trip / Stop
br 1 to br 10	Board Offline Alarm
rCL1 to rCL3	Relay Mapping Clash
gSFtPgAS	Gas Sensor Fault
gPFttgAS	Gas Probe Fault
gOt	Gas Cooler OT
gHPS	Gas Cooler HP Shutdown
gLPS	Gas Cooler Low Pressure Shutdown
AbFttAbE	Ambient Probe Fault
rSFtPrEC	Receiver Sensor Fault
rcHP	Receiver High Pressure
rcLP	Receiver Low Pressure
rLOL	Receiver Low Level
rHIL	Receiver High Level
LLFt	Liquid Level Fault
LLHi	Liquid Level High
LLLo	Liquid Level Low
ShFt	Superheat Fault
ShOt	Superheat High
ShUt	Superheat Low
LiFt	Liquid Injection Fault
LiOt	Liquid Injection OT
HrFt	Heat Reclaim Sensor Fault
SCPU	Stepper CPU Fault
Oil1 to Oil9	Oil Fault
OilO	Oil Low Level
Oili	Oil High Level
gbHP	Gas Bypass HP
Err	Configuration error (check alarm indexes not set to 0)

Network Alarms

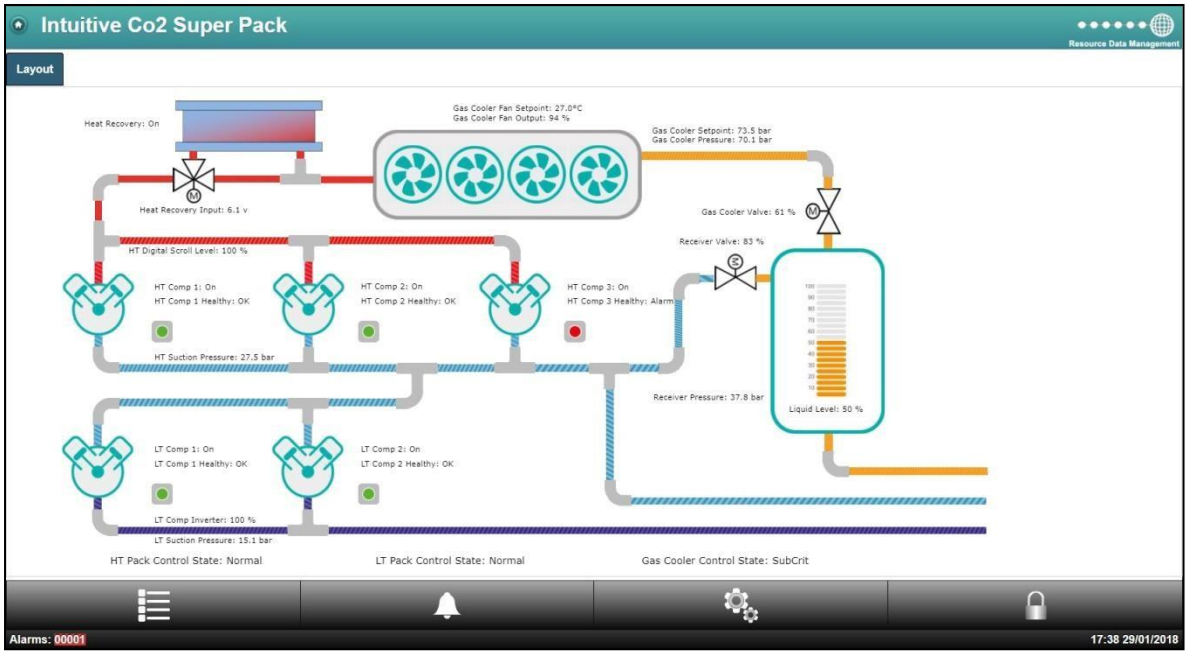
The table below shows the text and associated type number that is sent to the system "front end". The type number is normally used to provide different alarm actions.

Alarm text	Action	Type #
High Pressure Alarms	Alarm only	8
Low Pressure Alarms	Alarm only	9
Low Pressure Shutdown	All compressors stop	10
Transducer Faults	Settable pressure fail parameter, On, Off or Variable	6
Discharge Trip	Compressors start staging off	8
Discharge Stop	Compressors stop	8
General Faults	Alarm only	20
Compressor faults	Alarm only if run proof parameter set to Off, compressor stops if run proof parameter set to On	3
Inverter Fault	Alarm only if Inverter bypass set to Off, Inverter stops after x retries if Inverter bypass set to x	3
Stage No Run Fault	Alarm only if run proof parameter set to ON	3
Discharge Pressure Fault	Alarm only	6
Discharge Temperature Fault	Alarm only	6
Configuration Error	Alarm only	20
Controller in standby	All compressors stop, Gas Cooler Standby parameter sets gas cooler to On or Off ins standby	20
Gas Probe Fault	Gas cooler will go to output set in parameter Gas Temp Fail Cooler	6
Gas Sensor Fault	Discharge pressure sensor is used instead	6
Gas Cooler HP Shut Down	Compressors switch off Gas cooler output valve will close Gas cooler fans will go Off	8
Gas Cooler LP Shut Down	Compressors switch off The gas cooler fan will switch off Gas cooler valve will close Receiver valve will close and auxiliary compressor will switch off	9
Gas Cooler HP Open	Gas cooler valve will open Gas cooler fans will run	8
Gas Cooler LP Open	Compressors will stop Gas cooler fans will stop Gas cooler valve will close Receiver valve will close Auxiliary compressor will stop	9
Gas Cooler OT	Alarm only	4
Receiver Sensor Fault	Receiver valve will go to settable parameter Receiver Fail value	6
Receiver High Pressure	Alarm only	8
Receiver Low Pressure	Alarm only	9
Receiver Low Level	Alarm only	13
Receiver High Level	Alarm only	13
Liquid Level Fault	Alarm only	6
Liquid Level High	Alarm only	4
Liquid Level Low	Alarm only	5
Liquid Injection Probe	Alarm only	6
Liquid Injection OT	Alarm only	4
Ambient Probe Fault	Settable parameter fixed fan setpoint will be used	6
Superheat Fault	Alarm Only	2
Discharge Sensor Fault	Alarm Only	6
Discharge High Pressure	Alarm only	8
Superheat Low	Superheat low relay will switch	8
Superheat High	Superheat high relay will switch	9
Heat Reclaim Sensor	Heat reclaim will switch off	6
Oil Fault	Oil fault relay will pulse on and off subject to pulse length parameters and number of tries	18
Oil Low Level	Alarm only	6
Oil High Level	Alarm only	6
Board Offline	Offline relay will switch	7
Relay Mapping Clash	Alarm only	7
Stepper Mapping Clash	Alarm Only	7
Variable Out Mapping Clash	Alarm Only	7

Layout

Manage Layouts

The Transcritical Superpack provides the option for users to upload layouts. Utilising RDM's Layout Editor software, users can generate their own layout to represent the control strategy in the device. Please consult RDM Technical Support for more details on the Layout Editor. The below shows an example of such a layout which can be viewed on a PC or Touch XL display;

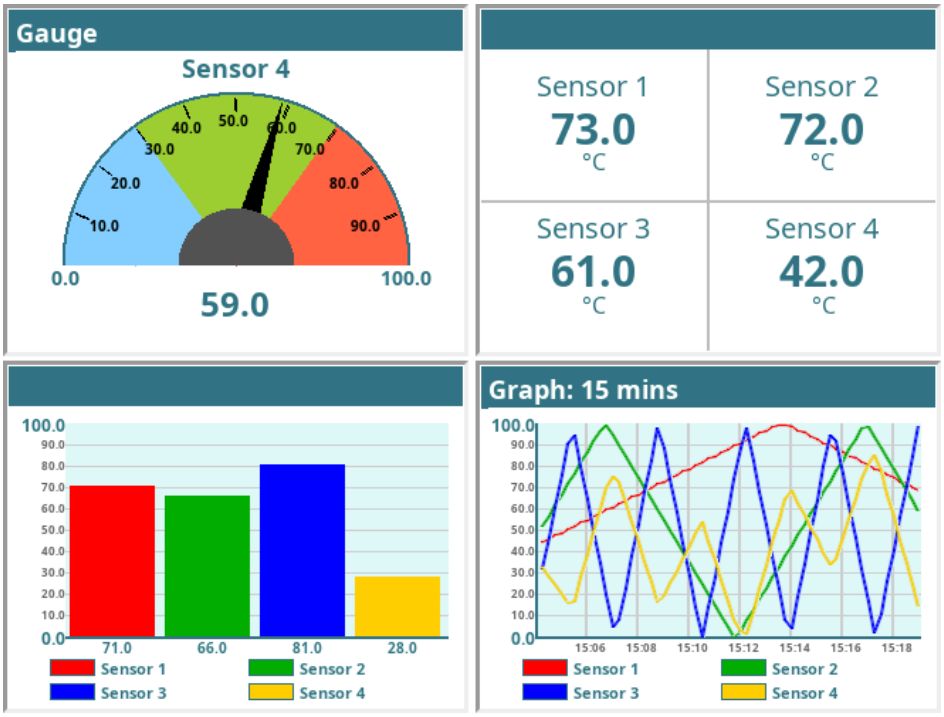


Link	Operation
Configure	Allows the user to provide a description of the Layout
Set Default	Not used in this variant.
Get	This option allows the layout to be download to the user's PC.
Remove	Select this option to permanently remove the layout from the controller. **Note**: Once removed the layout cannot be recovered.
Preview	Use this option for a quick view of the selected layout without leaving the setup page.

Note: The current Transcritical Superpack hardware will support a dynamic image which will only allow one level at a maximum size of 1MB.

Internal Screen Setup

The controller can be specified with a colour LCD display built in; this display allows a maximum of 6 pages of information to be displayed with a maximum of four values on each page. The values displayed can be in the form of a gauge, a line graph, a bar graph or a numerical value, an example of each is shown below.



LCD Display Setup

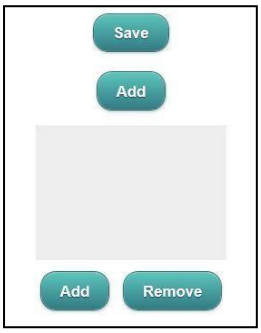
From the service menu select "system" followed by "LCD Display Setup", here there are three set up parameters:

Screen Home (mins): After this time period of inactivity (no button presses) the screen will revert to the home page.

Screen Off (mins): After this time period of inactivity the display will switch off automatically.

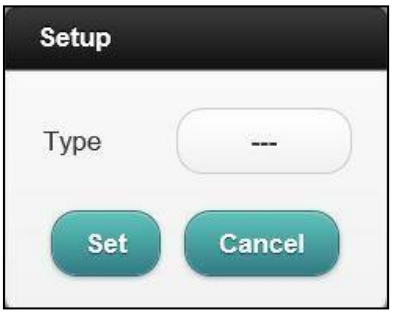
Set Parameters Allowed: If this is selected then controller parameters can be altered using the inbuilt display.

LCD Display Layout

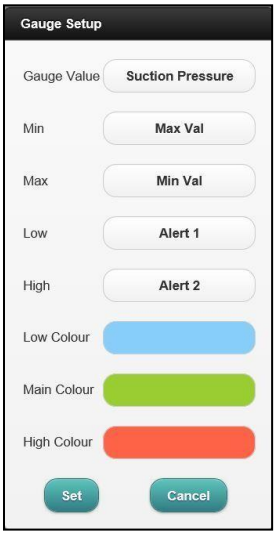


From the service menu select "system" followed by "LCD Display Layout", here the display layout can be customised, a maximum of 6 different screens can be set up.

To add a new screen, click "Add". A blank selection screen will be shown (see left), double clicking on the blank area will produce a drop-down box (see right). From the drop-down box gauge, value, graph or bar can be selected.



Gauge



Gauge Value: Selects an analogue value from the controller that is to be shown in gauge form, "S01 Suction Pressure" for example.

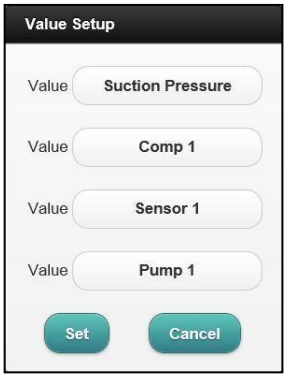
Min: Selects the minimum value that the gauge can display. This needs to be an analogue value within the controller's parameter list, for example if suction pressure is being displayed then "S01 Offset 1" could be selected which is typically -1 Bar and would become the low limit of the scale on the gauge.

Max: Selects the maximum value that the gauge can display. This needs to be an analogue value within the controller's parameter list, for example if suction pressure is being displayed then "S01 Span 1" could be selected which is the maximum pressure value that can be read.

Low: This selects a low region on the gauge where the colour changes, for example a low pressure region. The area between the min value and the low value will then be the colour selected in the "Low Colour" parameter. As an example, if suction pressure is being displayed then "S01 LP Alm" could be selected.

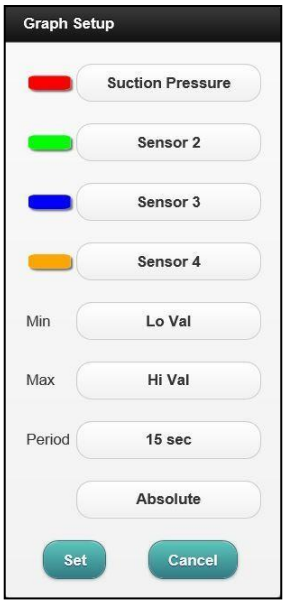
High: This selects a region on the gauge where the colour changes, for example a high pressure region. The area between the max value and the high value will then be the colour selected in the "High Colour" parameter. For example, if displaying suction pressure then "S01 HP Alm" could be used.

Value



Value: Selects up to four analogue values from the controller that can be shown in the form of text.

Graph



Value: Selects up to four analogue values from the controller that can be shown in the form of a real time graph.

Min: Selects the minimum value that the graph can display. This needs to be an analogue value within the controller's parameter list, for example if suction pressure is being displayed then "S01 Offset 1" could be selected which is typically -1 Bar and would become the low limit of the scale on the graph.

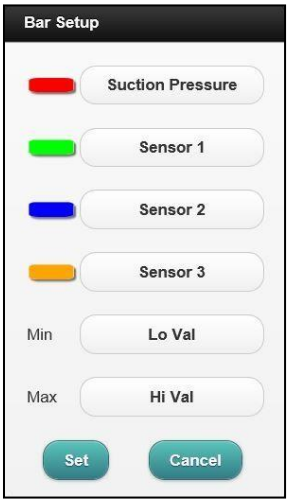
Max: Selects the maximum value that the graph can display. This needs to be an analogue value within the controller's parameter list, for example if suction pressure is being displayed then "S01 Span 1" could be selected which is the maximum pressure value that can be read.

Period: Selects the sample period of the graph, the controller will automatically scale the horizontal axis of the graph to match this sample period. For example,

if the sample period is set to one minute, then the horizontal axis on the graph will show a one hour log.

Absolute: Selects whether the graph will display an absolute value or relative value. Relative will show how much the value has changed and not what the actual value is.

Bar



Value: Selects up to four analogue values from the controller that can be shown in the form of a bar graph.

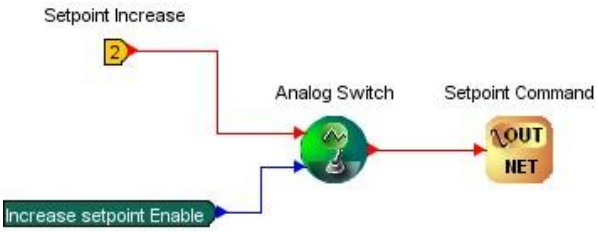
Min: Selects the minimum value that the graph can display. This needs to be an analogue value within the controller's parameter list, for example if suction pressure is being displayed then "S01 Offset 1" could be selected which is typically -1 Bar and would become the low limit of the scale on the bar graph.

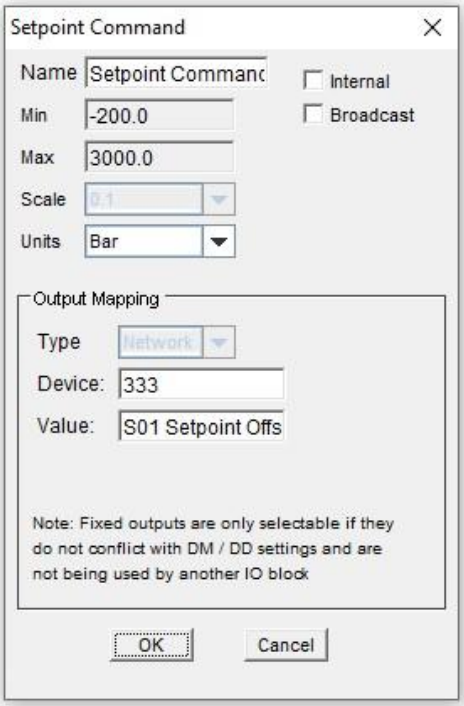
Max: Selects the maximum value that the graph can display. This needs to be an analogue value within the controller's parameter list, for example if suction pressure is being displayed then "S01 Span 1" could be selected which is the maximum pressure value that can be read.

Remote Setpoint Offset Using TDB

If the controller is connected by ethernet to an RDM Data Manager then setpoint offset commands can be sent to the HT and LT compressor sections using a TDB program running in the Data Manager. This allows the pressure setpoint in each section to be increased or decreased remotely by up to 4 Bar.

A typical section of a TDB program is shown below, the values to be sent are "S01 Setpoint Offset" (HT) and "S02 Setpoint Offset" (LT), the Device "333" is the name of the CO2 Superpack controller as it appears on the Data Manager's device list.





Specification

Power requirements (for each Main Controller or expansion module)

Supply Voltage Range	24 Vac ±10% or 24 Vdc ±10%
Supply Frequency	50 – 60 Hz ±10%
Maximum supply current	1.8 Amp
Typical supply current	Intuitive V2: 0.3A, Mini Intuitive: 0.2A

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.

Insulation and Fuse Requirements

Class 2 Insulation	**No** protective Earth is required. A functional Earth may be fitted in noisy environments.
Supply Fuse	Built in fuse holder, fuse 2A 240Vac Ant surge (T) HRC conforming to IEC60127, 32 x 6.3mm
Or MCB	2A, 240 VAC Type D conforming to BS EN 60898 (Note: controller has integral 2A fuse)
Relay Fuse	10A 240Vac Ant surge (T) HRC conforming to IEC60127, 32 x 6.3mm

RDM advise the use of a suitable external over-current protection device on the Mercury Plant Controller.

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

General

Operating temperature range	Without Internal LCD Display: -40°C to +65°C (-40°F to +149°F) With Internal LCD Display or SRR fitted: -20°C to +65°C (-4°F to +149°F)
Operating Humidity	80% maximum
Storage temperature range	Without Internal LCD Display: -40°C to +65°C (-40°F to +149°F) With Internal LCD Display or SSR fitted: -30°C to +65°C (-22°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
Dimensions	Intuitive Plant Controller 280mm (L) x 122mm (W) x 67mm (H) Intuitive Mini Plant Controller 157mm (L) x 122mm (W) x 67mm (H)
Weight	Intuitive Plant Controller 750 Grams Intuitive Mini Plant Controller 500 Grams
Safety	EN 61010-1:2010, UL 62368-1
EMC	EN 61326-1:2013 FCC CFR 47 Parts 15.107 & 15.109 and ICES-003 Issue 6
UL Compliance	UL 60950-1 and CAN/CSA C22.2 No. 60950-1-07 Information Technology Equipment - Safety - Part 1: General Requirements.
Ventilation	There is no requirement for forced cooling ventilation
Disposal	Please observe local legislation with regards to electrical products.
Origins	Product designed in the UK manufactured in Taiwan.
Battery	The controller contains a lithium battery to retain time and date information when the controller is not powered. Caution: this battery is not user replaceable and there is a danger of explosion if the battery is replaced incorrectly.

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. If a 24Vdc supply is being used with 24Vac status inputs then the status ground **must** be connected to the 24Vac power supply ground.
4-20mA	4-20mA current loop, use the 12 Vdc output to feed the device. (28mA Maximum)

Outputs

Analogue Outputs	0-10 Volts DC or 4-20mA. (Selected in hardware settings page)
Note 1	The 4-20mA output will not operate correctly if the target device input impedance is >75Ω
Note 2	The 0-10V output will not operate correctly if the target device input impedance is < 10KΩ A 50mA fuse is recommended for this output.
Note 3	When using the universal 0-10V output to drive an inductive load such as a relay coil, a back e.m.f. protection diode must be fitted if the controller is V1 hardware. (V1 hardware is identifiable by having a single CAT5 socket, V2 hardware has two). The cathode should connect to the output terminal and the Anode to GND/Return terminal. V2 Hardware and the Intuitive Mini Hardware do not require a protection diode. The Mercury Plant Controller (PR0600) cannot be used to drive a relay coil. The maximum load current that can be supplied from these outputs is 38mA.
Relay Ratings	
Mechanical Relay	10A/250 Vac/AC1 (Resistive load)
	10A/30 Vdc (Resistive load)
	5A/250 Vac cosφ=0.4 (Inductive load)
Mechanical Relay Lifespan	300,000 operations @250vac switching 3A resistive load 100,000 operations @250vac switching 8A resistive load
Solid State Relay (SSR)	1A/250 Vac (AC only 12-280Vac, will not switch DC) minimum load 25mA
SSR Lifespan	50,000,000 operations under normal operating conditions
Safety	Conforms to EN60730-1 based on UL 60950-1; UL 62368-1 as referenced to IEC60730-1

Internal Display

Display	2.4" 320 x 240 Full Colour TFT Graphic LCD
Buttons	6 x Pushbuttons

Comms

Comms	Ethernet 10/100baseT
Inter-board Comms	CABbus (see specification below)

Stepper Outputs

Stepper Drive	Bipolar Stepper Motor, 12-24vdc chopper drive, 8W Maximum

CANbus cable specification

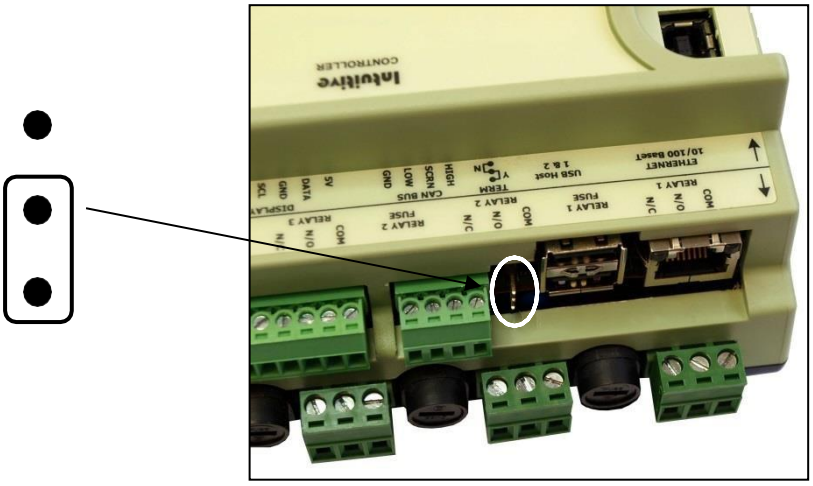
CANbus communication cable **must** be of a standard to meet ISO11898 or equivalent and the screen cable **must** be connected.

Note: end of line termination resistors must be fitted on the CANbus network, on the Intuitive controller and expansion boards this is done by a termination link. The network should be wired in a daisy chain configuration. Only one Intuitive controller should be connected to a single CANbus network. The maximum allowable network cable length is 500M in total from one end of the network to the other providing a CANbus network cable which meets ISO11898 or equivalent is used.

A maximum of 10 expansion boards can be connected to a single Intuitive or Plant controller. When connecting an expansion board to an Intuitive or Plant controller or another Expansion board the following should be observed.

Plant Controller/Expansion Board		**Expansion Board**
CAN High	Connects to	CAN High
Screen	Connects to	Screen
CAN Low	Connects to	CAN Low
Ground	Not Connected	Ground

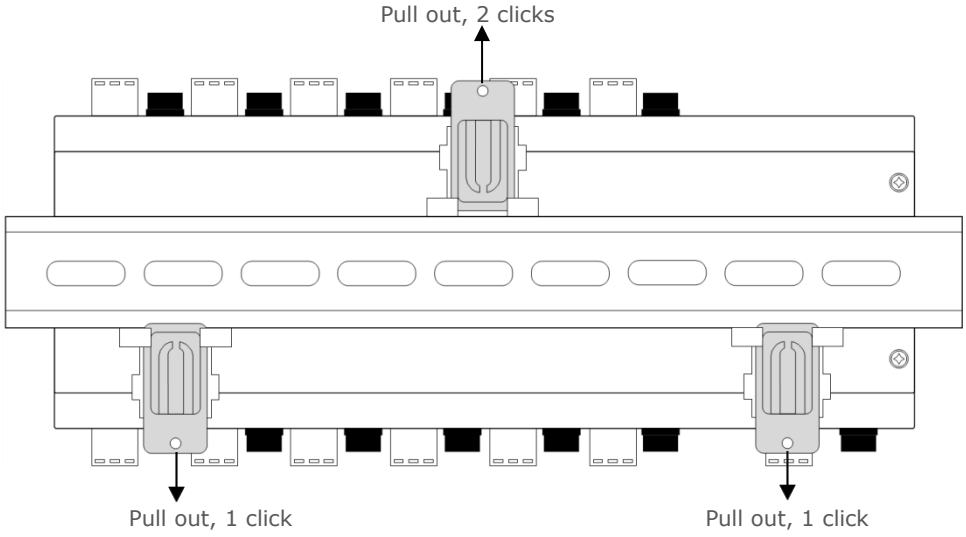
End of line termination resistor



The end of line termination resistor link should be fitted to the middle and bottom pins on the Main control board and on the last expansion board on the CANbus network. All other expansion boards should have the link removed or fitted to the middle and top pins.

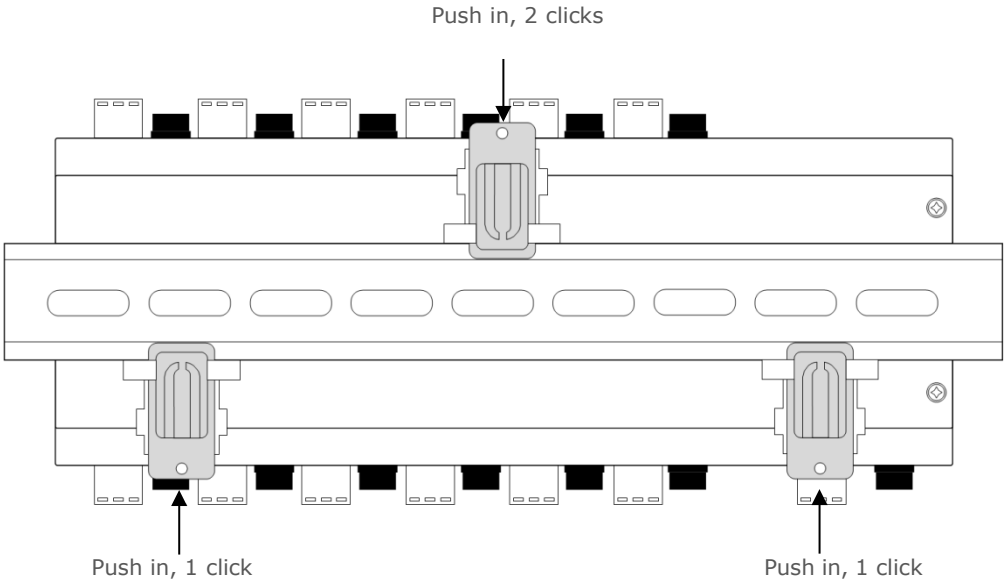
Installation

Mounting on to a DIN rail, Intuitive Plant Controller



The Intuitive plant controller has three DIN rail mounting feet which can slide in and out to three different positions, sliding into each position is accompanied by a "click" which locks the foot into that position.

To install the controller onto a DIN mounting rail, from the fully pushed in position slide the top mounting foot out by 2 clicks so that the foot is clear of the DIN rail channel. Slide the bottom two feet out by one click so that they are protruding slightly into the DIN rail channel. The controller can now be inserted onto the DIN rail by inserting the bottom lip of the DIN rail behind the two bottom mounting feet



The controller can now be pushed flat onto the DIN rail and the top foot pushed in 2 clicks to hold the controller in place. Finally, push the bottom two feet in by one click to secure the controller.

The mounting feet also have M3 holes for direct mounting where DIN rail is not being used.

Clearances:

The controller requires 40mm clearance top and bottom to allow fuse access and removal and USB cable connection, otherwise 10mm is required, side clearance is 15mm. Clearance at the front and rear is dependent on the site wiring.
There is no requirement for forced cooling ventilation

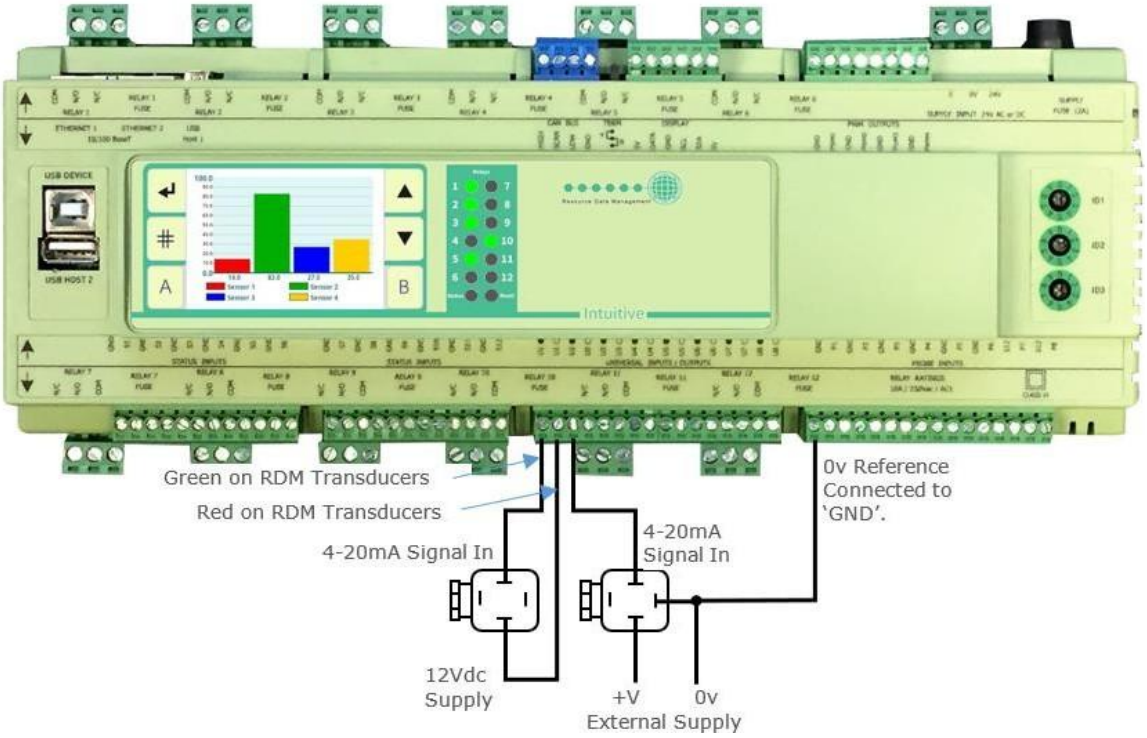
Cleaning:

Do not wet the controller when cleaning. Clean the front by wiping with a slightly damped 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.

Appendix 1: Typical 4-20mA Input Connection

When using a 4-20mA input device (such as a pressure transducer or liquid level sensor), the controller supplies a 12vdc supply to power the device and measures the 4-20mA current level being returned by the device, the connections for this setup are shown below on the below left, connected to universal IO1. If the 4-20mA device utilises its own power supply then the 12vdc supply from the controller is not required and should not be connected, only a 4-20mA signal input and 0v (or GND.) reference should be connected. This setup is shown below on the right, connected to universal IO2:

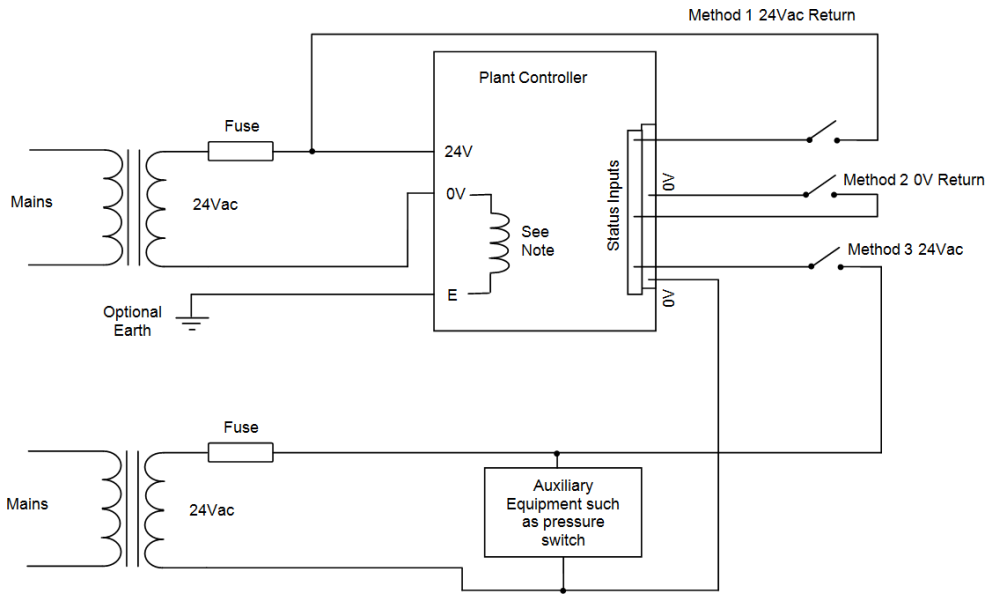


Appendix 2 – Supply & Status Input Wiring

Appendix four applies to the current version of the Plant controller hardware.

- Method 1. Uses the 24Vac of the transformer supplying the input voltage; which is returned via a switch (or relay) to the status input signal line. No 0V is required at the status connector.
- Method 2. Uses a 0V return (from the status connector) to the status signal input.
- Method 3. Uses a 24Vac signal derived from another transformer (supplying an auxiliary piece of kit) to feed the status input signal line. Note the auxiliary transformer must be referenced to the Plant Controller supply transformer.

All transformers that have a connection to the Plant Controller must have their primaries connected to the same phase. Transformer should have fuse fitted in line with 24V input as per diagram.



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

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Revision History

Date	Revision	Update No.	Changes
22/05/2015	2.0	01	First Issue
01/07/2015	2.0a	01	Description of liquid line changed to gas cooler return line, receiver interlock GC setting added.
06/07/2015	2.1	01	Heat Recovery modes 1, 2 & 3 added.
07/07/2015	2.1a	01	Heat recovery description amended
18/08/2015	2.2	01	P-72 Max Gas Fan/Step Reset parameter added and Standby Relay Added
22/09/2015	2.2a	01	V1 and V2 stepper power connections reversed to match other products
26/01/2016	2.2b	01	Naming of Status/Digital Inputs standardised to Status Inputs.
10/03/2016	2.4	01	Uni IO defaulted to 0-10v, Oil section and number of expansions configurable in display, save screen config function added, manual override of stepper and uni IO added, fan reverse low level parameter added. Touchscreen Display visibility menu added.
16/05/2016	2.5	01	Operation of heat reclaim valve in mode 2 changed, valve now closes on HP alarm instead of opening.
19/05/2016	2.6	01	Improvement in item aliasing to make it more compatible with the Data Manager.
20/05/2016	2.7	01	Addition of Mini IO expansion hardware and associated settings.
11/07/2016	2.8	01	Bacnet Support Added
26/07/2016	2.9	01	Fixed 30 second startup delay added.
12/08/2016	2.9a	01	Description of gas cooler HP shutdown and supercritical states clarified on page 48
08/09/2016	2.9b	01	Fan target offsets Tz and Tc added
26/09/2016	3.0	01	P-72 Max Gas Step Reset changed to Max Fan/Step Reset. Description of P-50 Gas HP Reset changed, this delay also applies to LP shutdown.
05/10/2016	3.1	01	Note about pressure transducers amended on page 22.
30/11/2016	3.1a	01	Page 49, description of calculated gas cooler setpoint calculation updated and example of ambient fan setpoint graph updated.
20/12/2016	3.1b	01	Update to specification page
06/02/2017	3.1c	01	Parameter description amended.
14/02/2017	3.1d	01	Added ECA approval
10/02/2017	3.2	01	Gas Fan control options Ambient / Pressure and Pressure Fixed added to P-100. PR0652 stepper connections changed to match current hardware label.
10/03/2017	3.3	01	PR0652 Hardware now zeros gas valves when going in and coming out of standby.
04/05/2017	3.3a	01	Note added about Uni IO settings not being transferred between pre and post V3.0 firmware.
01/07/2017	3.4	01	View Config Info menu added
17/07/2017	3.5	01	New Cgi Interface, 1-2 and 1-6Vdc inputs added, TouchXL support.
14/11/2017	3.6	01	P-55 Gas SP weighting parameter added. Note added regarding using a digital scroll compressor when set to staged.
06/01/2018	3.7	01	Default valve specific stepper settings updated.
29/01/2018	3.8	01	V2 Hardware first issue.
08/03/2018	3.9a	01	Description of heat reclaim parameter P609 updated, applies to all modes 1,2 & 3
01/05/2018	4.0	01	Support added for non-English USB cgi interface.
22/08/2018	4.1	01	Autosplit feature added, superheat high and low relays moved from gas cooler section to compressor sections. Added new parameters G01 Fan Trans Ctrl, Aux Compressor Diff settings and G01 Gas Temp Select, which uses new temperature probe input "HXOut".
19/09/2018	4.1a	01	Description of heat recovery mode 1 updated to include heat recovery relay. Superheat high and low relay positioning corrected (17 & 18 respectively).
13/12/2018	4.4	01	New fan control options added, Ambient Pressure 1 & 2 and Fixed Pressure 1 & 2, new output "Gas Fan SP" in Bar or psi added.
09/04/2019	4.5	01	Default 1234 passcode removed, replaced by "PleaseChange"
31/07/2019	4.7	01	General sections added, autosplit defaults to off, section target values added to output list, cgi local & remote login options added, Web/Touch Override pages added, default home page simplified, percentage resolution increased to one decimal place, section target value added to output list.

			Parameters Added: Min & Max Fan Inverter, Fan Ambient Stop, Max Ramp On, Max Ramp Off, In Band Control & Inverter Hold. Parameters Removed: Fuzzy Weight & Gas SP Weight. Stage On and Off delays now apply in all pressure conditions in Fuzzy and Staged control.
24/01/2020	4.8	01	Quick setup menu added to compressor sections, PR0653 and PR0663 expansion boards added, autohide option added.
04/08/2020	4.9	01	Layout compatibility changes.
28/10/2020	4.9a	01	Note added regarding allowing 30 seconds for new passwords to be saved.
11/05/2021	5.0	01	Parallel section added. See: Parallel Compressor Section
		02	System user added.
		03	Gas cooler temp probe fail options added (ambient, discharge and fixed value).
		04	Low receiver pressure now opens gas cooler valve gradually.
		05	Standby input added to gas cooler section.
		06	Run proof auto reset added.
		07	Custom Uni IO added.
		08	Export options added.
		09	Graphing added.
		10	Alarm modem added.
		11	Monitoring probe fail alarm option added.
		12	General faults added to Gas cooler section.
		13	SSR minimum load now 25mA.
		14	Variable out clash alarm added.
		15	BACnet enhancements, support added for BBMD.
		16	Additional Oil section added for parallel compressor section.
29/07/2021	5.0a	01	Addition of PR0653-C expansion module.
20/08/2021	5.0b	01	Mini Intuitive controller I/O connections updated.
01/03/2022	5.1	01	Improvements to pressure broadcast when using TouchXL Display
04/03/2022	5.2	01	Improvements to display alarm reporting and probe alarms when in standby. Notes added regarding alarm ordering.
27/04/2022	5.2a	01	Modbus reference removed as not valid, replaced with Bacnet.
10/05/2022	5.2b	02	BACnet activation part number added.
12/07/2022	5.3	01	Improvements to parallel LP shutdown when used in conjunction with low temp. shutdown and always run last parameter.
08/11/2022	5.4	01	Run Proof functionality updated to allow multiple compressor start attempts.
		02	Comp Try Wait, Comp Try Open delays added, Comp Open, Comp Open Clear Alarm Delays added.
		03	Inverter Monitor parameter and Inverter Proof Reset status input added.
		04	Device Alarm Summary menus added.
		05	Device Alarm LCD/TouchXL menu added under visibility.
		06	Proof Status menu added under compressor sections.
		07	New Parallel section parameters added, Enable GC Switch, GC Switch Type, GC Switch Temperature, GC Switch Diff, Enable on Receiver Minimum, Receiver Minimum, Float Receiver Setpoint, Float Receiver On Delay, Float Receiver Off Delay.
		08	Parallel section control status added, Enabled and Disabled.
		09	Discharge Trip Pressure, Discharge Stop Pressure, Discharge Offset Pressure, Discharge Temperature Trip, Discharge Temperature Stop, Discharge Temperature Diff and Do Discharge Trip Parameters added to Parallel section.
		10	Superheat Low Target, Superheat Low Diff, Superheat Low Alarm, Superheat High Target, Superheat High Diff, Superheat High Alarm and Superheat Delay parameters added to Parallel section.
		11	Inverter Proof status inputs added to Parallel section.
		12	TDB Setpoint offsets commands added to sections 1 & 2.
		13	New sub-menus menus added to the Setup menus for compressor sections, Run Proof and Trip Stop.
		14	New sub-menus menus added to the Setup menus for parallel section, Run Proof, Trip Stop, Superheat, Enable On Temperature, Enable On Receiver Min and Float Receiver Pressure.
		15	Gas Dump functionality added to Parallel section.
		16	Support added for fibre network adapter.
22/12/2022	5.5	01	Improvements to superheat alarm functionality.
07/03/2023	5.6	01	Heat recovery functionality switches off when the gas cooler section is in standby mode.

29/09/2023	5.7	01	Fix to show correct firmware version on built in LCD display when booting up.
22/02/2024	5.8	01	HPV Prime functionality added, Fans Trans Run Max parameter added, Run Proof Reset in Alarm parameter added.
08/08/2024	5.8a	01	Description of Fan Day and Night Temp. Limit parameters updated.
30/08/2024	5.8b	01	Note added regarding the description of Oil Section status inputs.
01/10/2014	5.9	01	Improvements to compressor run proof alarm handling.
21/05/2025	6.0	01	Improvements made to compressor functionality in “Staged Type” only.

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