



PR0265



PR0264

Mercury 11-CO₂ CO₂ Pack Controller Installation & User Guide

Resource Data Management Ltd

80 Johnstone Avenue, Hillington Industrial Estate,
Glasgow, Scotland G52 4NZ UK

+44(0)141 810 2828

support@resourcedm.com

sales@resourcedm.com

Switchboard

Technical Support

Sales Enquiries



Contents:

THE MERCURY RANGE	3
Description	3
Configuration	3
Input/Output Allocation Tables	3
Front Panel: -	4
Section Display	4
Front Panel Buttons	4
Connections:	5
Parameter Table	6
Section Stages:	8
Stage Sizes	8
Stage Inputs	8
Operation	9
Standby Mode	9
CO2 full system block diagram	10
Example parameter table	11
Wiring for the above example:	13
Warning/Fault Input Example	14
Fault Input Example	14
Specification	15
Power requirements for 24 Volt Controller:	15
General	15
Inputs:	15
Analogue Output	15
Relay Ratings	16
Disclaimer	16
REVISION HISTORY	16



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The Mercury Range

From Resource Data Management

This documentation refers to the controller Mercury 11-10CO₂

Description

The Mercury 11-10CO₂ controller is intended for control of compressors and pump in a CO₂ refrigeration system. It has outputs that can be configured for Pump, vent valve, compressors or loaders. A variable analogue output is available to drive a trim compressor.

Configuration

The controller has one configuration option: -

Display value	Type
1	CO ₂ Controller

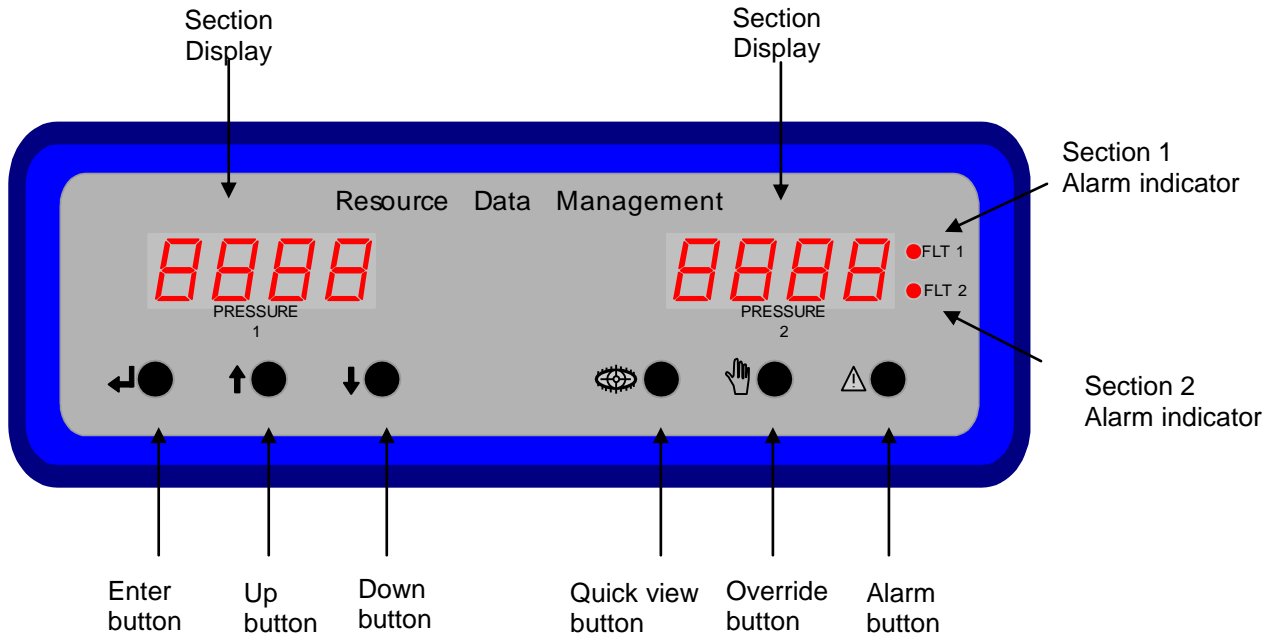
Input/Output Allocation Tables

All Types	Description	Alarm Action	Comments
Input 1	Configurable	Yes	See parameter table
Input 2	Configurable	Yes	See parameter table
Input 3	Configurable	Yes	See parameter table
Input 4	Configurable	Yes	See parameter table
Input 5	Configurable	Yes	See parameter table
Input 6	Configurable	Yes	See parameter table
Input 7	Configurable	Yes	See parameter table
Input 8	Configurable	Yes	See parameter table
Input 9	Configurable	Yes	See parameter table
Input 10	Configurable	Yes	See parameter table
Input 11 analogue	Monitor probe	No	Monitor probe only
Input 11 digital (Standby Input)	Removing the resistor puts the controller into standby	Yes	590 Ohm resistor on Probe I/P See Standby Mode
4-20mA Input 1	Return Pressure transducer	Yes	
4-20mA Input 2	Flow Pressure transducer	Yes	
Relay 1	Configurable	N/A	See parameter table
Relay 2	Configurable	N/A	See parameter table
Relay 3	Configurable	N/A	See parameter table
Relay 4	Configurable	N/A	See parameter table
Relay 5	Configurable	N/A	See parameter table
Relay 6	Configurable	N/A	See parameter table
Relay 7	Configurable	N/A	See parameter table
Relay 8	Configurable	N/A	See parameter table
Relay 9	Configurable	N/A	See parameter table
Relay 10	Configurable	N/A	See parameter table



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Front Panel: -



Section Display

4 character display shows the Control pressure (left) and the % of the variable output (right).
 In set-up mode, displays the set-up menu items
 In quick view mode, indicates the target pressure
 In alarm view mode, indicates the alarm number
 Suction and discharge pressures can be displayed momentarily by pressing the override button

Front Panel Buttons

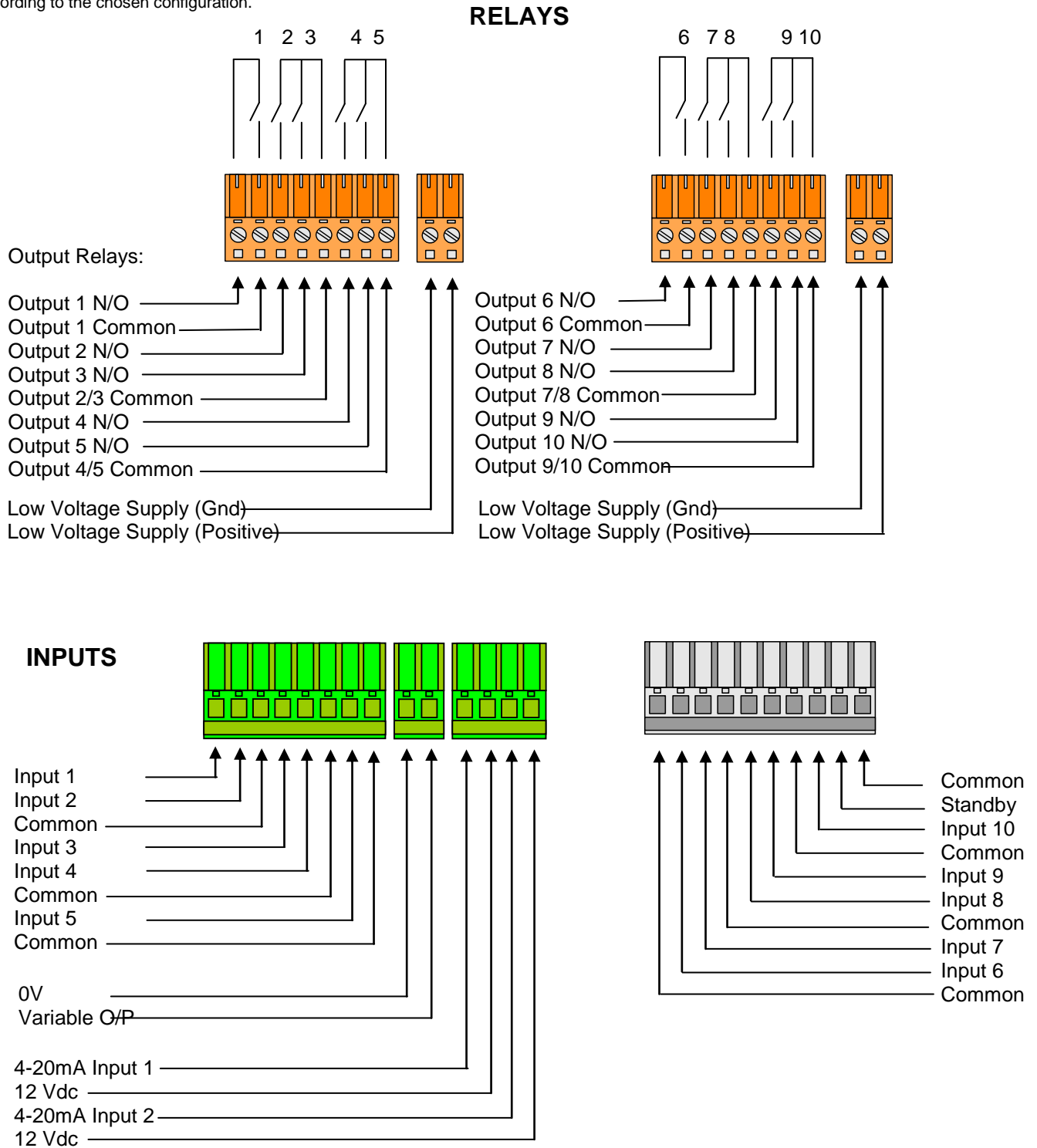
- Enter Button: -** Used to enter menu items.
- Up Button: -** Used to scroll up
- Down Button: -** Used to scroll down
- Quick View Button: -** Used to view the target pressure (See [Quickview](#) section)
In "alarm view" mode, used to view the alarm occurred
- Override Button: -** Used with the "Enter" button, to go into the override mode. (See [Override](#) section)
- Alarm Button: -** Used to enter the "alarm view" mode. (See [View Alarms](#) section)



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Connections:

All connections are made to the back of the controller. The diagram below shows the connection detail. Inputs and outputs are assigned according to the chosen configuration.



Probe input is PT1000 only.

Both Supplies must be connected.

Low Voltage Supply (Gnd) can be Earthed if required



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Parameter Table

Number	Parameter	Range	Step	Units	Dft	Comments
P1	Target Pressure	-3.4 – 90.0	1	Bar	31.1	
P2	Target Above	-3.4 – 90.0	1	Bar	0.0	Creates a dead zone
P3	Target Below	-3.4 – 90.0	1	Bar	0.0	Creates a dead zone
P4	Response On speed	1 - 30	1	-	5	1 = slowest 30 = fastest
P5	Response Off speed	1 - 30	1	-	5	1 = slowest 30 = fastest
P6	Starts per Hour	0 to 60	1	-	6	0 = start on demand
P7	Compressors stop	0 = allow all off 1 = 1 must run	1	-	0	Allow all compressor to stop, or keeps 1 running
P8	Pump stop	0 = pump off, 1 = always run	1	-	1	Pump off when compressors are off. Or always runs
P9	Pump Start Delay	0 - 60	1	mins	5	Delay after 1 st compressor on.
P10	Run, if off time	0-30	1	mins	15	starts if off for this time period
P11	Run time after off	0-30	1	mins	15	Runs for this period after the off time
P12	Pump Start to Start time	0 to 60	1	Mins	15	
P13	Pump Stop to Start time	0 to 60	1	Mins	10	
P14	Vent Valve on pressure setpoint	-3.4 – 90.0	1	Bar	38	Send a warning when this is reached
P15	Vent Valve diff (below)	-3.4 – 90.0	1	Bar	0.2	
P16	Group A On Pressure	-3.4 – 90.0	1	Bar	34.5	
P17	Group A Diff	-3.4 – 90.0	1	Bar	0.2	
P18	Group B On Pressure	-3.4 – 90.0	1	Bar	35	
P19	Group B Diff	-3.4 – 90.0	1	Bar	0.2	
P20	Control transducer Span*	-3.4 – 90.0	1	Bar	60	Set up transducer range
P21	Control transducer Offset*	-3.4 – 90.0	1	Bar	0	Setup value below 0
P22	Flow transducer Span*	-3.4 – 90.0	1	Bar	60	Set up transducer range
P23	Flow transducer Offset*	-3.4 – 90.0	1	Bar	0	Setup value below 0
P30	Control Pressure HP Alarm	-3.4 – 90.0	1	Bar	45	
P31	Control Pressure LP Alarm	-3.4 – 90.0	1	Bar	20	Stage compressors off
P32	Control Pressure LP Shutdown	-5.0 – 70.0	1	Bar	15	Shuts all compressor off
P33	Temperature Differential Alarm	-50 – 70.0	0.5	°C	0.5	Return > Flow
P34	Pressure differential warning	0 - 5	0.1	Bar	1.8	Flow > Return
P35	Pressure differential alarm	0 - 5	0.1	Bar	1.4	Flow > Return Stops the pump
P36	Fault Delay	00:00 to 60:00	1	mins/sec	00:30	
P37	General Fault Delay	00:00 to 60:00	1	mins/sec	00:10	
P38	Temperature Alarm delay	00:00 to 99:00	1	mins/sec	05:00	
P39	Pressure Diff Alarm delay	00:00 to 99:00	1	mins/sec	01:00	
P40	Pressure Alarm delay	00:00 to 99:00	1	mins/sec	05:00	
P50	Stage 1 Output Type	Select from: - (0) None, (1) Unused, (2) Compressor, (3) Loader, (4) Inv enable (5) Pump (6) Vent Valve (7) Compressor on (8) Group A (9) Group	1		0	
P59	Stage 10 Output Type					
P70	Stage 1 Size	0-60	1		0	Only required for compressor or loader stages
P79	Stage 10 size					



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P60 ↓	Stage 1 Input Type ↓	Select from: - (0) Unused (1) Compressor fault (2) Flow Probe (3) Return Probe (4) Pump Fault (5) Bearing Warning/Alarm (6) Low Liquid Warning/Alarm (7) General N/O (8) General N/C	1		0	No action 0 V return activates PT1000 PT1000 Open = alarm See Note Open = alarm Open = alarm*
P69	Stage 10 Input Type					
dFLt	Restore Default Settings					
Esc						

* 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.

Eg Danfoss AKS 33 with range: -1 bar to 12 bar

Span would be 190 (13 bar)

Offset would be -15 (-1 bar)

Note. This input uses 2 x 330 Ohm resistors and a 590 Ohm resistor to detect the 2 functions. If the input is 330 Ohms, the controller input is good. If the input is at 660 Ohms, a bearing warning is issued. If the input is at 1250 Ohms, the controller issues a bearing alarm and stops the pump. See example later in this document.

The low liquid warning/alarm input works in a similar manner to the bearing input.

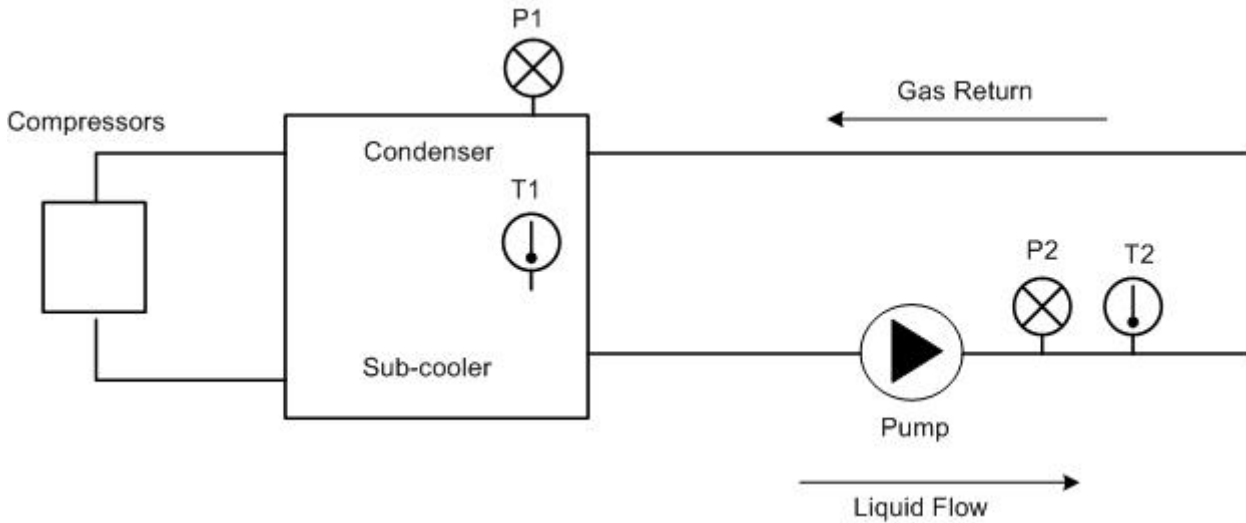
* The low liquid alarm switches the pump off.



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Operation

Once the controller has been set-up and configured, normal operation will resume. The controller operates a "fuzzy logic" based control algorithm. The controller will determine the stages to bring on and off (based on the CO₂ return pressure) using the fuzzy logic rules and adhering to the starts/hr criteria. Note that on and off delays will vary according the current conditions. Once a compressor starts running, the pump will start after a short delay (P9) The response time for compressors switching on and off can be varied by adjusting parameters P4 and P5 (1 is the slowest response, 30 is the quickest). The fuzzy logic will attempt to optimise the compressor starts and keep them at a minimum. Capacity control is achieved by using the value from pressure transducer 1 (P1 on the diagram). There is a parameter (P7) to choose whether to keep the system always running, if this option is used, the smallest compressor will run even if there is no demand. A similar option (P8) keeps the pump running all of the time, or off when there is no demand. If the pressure exceeds the value in P14 the vent valve relay will energise (a warning will be sent), the relay will de-energise when the pressure falls below the vent valve diff.



Standby Mode

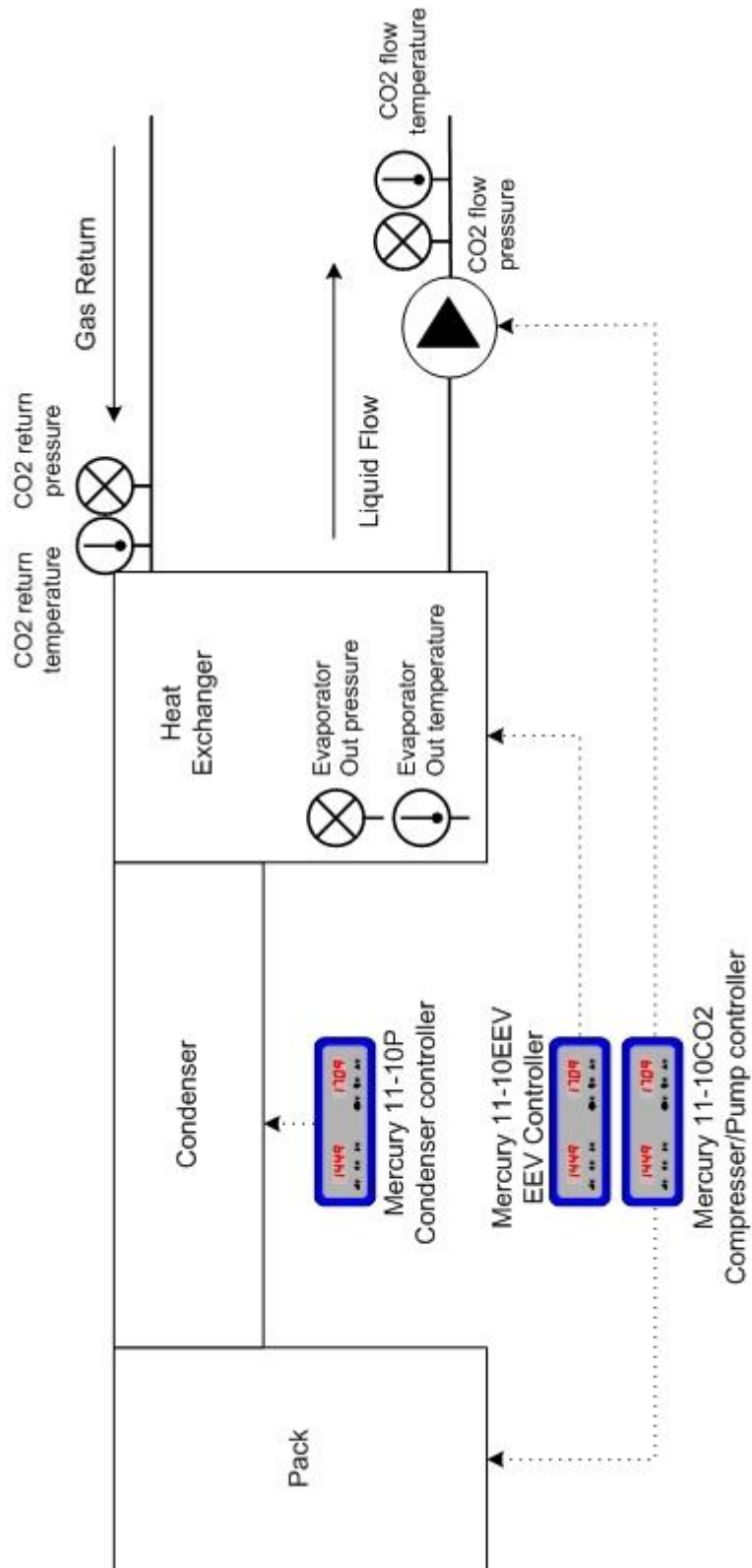
The controller requires a 590 Ohm resistor present on input 11 for normal operation. If the resistor is not detected; such as in a fault condition or remote off switch, the controller will go into standby mode. All compressors and/or fans will be turned off and an alarm (controller in standby) generated.

There is a 10 second delay for the detection of the resistor, both in and out.



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CO₂ full system block diagram



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Example parameter table

The parameter table below shows typically how this controller can be set-up for a pack with 3 compressors and an inverter, a pump and associated fault inputs. (White City can be set-up similar to this)

Number	Parameter	Range	Step	Units	Dft	Comments
P1	Target Pressure	-3.4 – 90.0	1	Bar	31.1	
P2	Target Above	-3.4 – 90.0	1	Bar	0.0	Creates a dead zone
P3	Target Below	-3.4 – 90.0	1	Bar	0.0	Creates a dead zone
P4	Response On speed	1 - 30	1	-	10	1 = slowest 30 = fastest
P5	Response Off speed	1 - 30	1	-	10	1 = slowest 30 = fastest
P6	Compressors Starts per Hour	0 to 60	1	-	6	0 = start on demand
P7	Compressors stop	0 = allow all off 1 = 1 must run	1	-	0	Allow all compressor to stop, or keeps 1 running
P8	Pump stop	0 = pump off, 1 = always run	1	-	0	Pump off when compressors are off. Or always runs
P9	Pump Start Delay (after Compressors on)	0 - 15	1	mins	1	Delay after 1 st compressor on.
P10	Run if compressors are off time	0-30	1	mins	15	starts if off for this time period
P11	Run for this time if compressors are off	0-30	1	mins	15	Runs for this period after the off time
P12	Pump Start to Start time	0 to 60	1	Mins	15	
P13	Pump Stop to Start time	0 to 60	1	Mins	10	
P14	Vent Valve on pressure setpoint	-5.0 – 70.0	1	Bar	38	Send a warning when this is reached
P15	Vent Valve diff (below)	-3.4 – 90.0	1	Bar	0.2	
P16	Group A On Pressure	-3.4 – 90.0	1	Bar	34.5	
P17	Group A Diff	-3.4 – 90.0	1	Bar	0.2	
P18	Group B On Pressure	-3.4 – 90.0	1	Bar	35	
P19	Group B Diff	-3.4 – 90.0	1	Bar	0.2	
P20	Control transducer Span*	-3.4 – 90.0	1	Bar	60	Set up transducer range
P21	Control transducer Offset*	-3.4 – 90.0	1	Bar	0	Setup value below 0
P22	Flow transducer Span*	-3.4 – 90.0	1	Bar	60	Set up transducer range
P23	Flow transducer Offset*	-3.4 – 90.0	1	Bar	0	Setup value below 0
P30	Control Pressure HP Alarm	-3.4 – 90.0	1	Bar	34	
P31	Control Pressure LP Alarm	-3.4 – 90.0	1	Bar	26	Stages compressors off
P32	Control Pressure LP Shutdown	-3.4 – 90.0	1	Bar	24	Stops all compressors
P33	Temperature Differential Alarm	-50 - 70	0.5	°C	0.5	Flow > Return
P34	Pressure differential warning	0 - 5	0.1	Bar	1.8	Return > Flow Send an alarm
P35	Pressure differential alarm	0 - 5	0.1	Bar	1.4	Return > Flow Stop the pump
P36	Fault Delay	00:00 to 60:00	1	mins/sec	00:30	
P37	General Fault Delay	00:00 to 60:00	1	mins/sec	00:10	
P38	Temperature Alarm delay	00:00 to 99:00	1	mins/sec	05:00	
P39	Pressure Diff Alarm delay	00:00 to 99:00	1	mins/sec	01:00	
P40	Pressure Alarm delay	00:00 to 99:00	1	mins/sec	05:00	
P50	Stage 1	Inverter Enable	1		4	
	Stage 2	Compressor			2	
	Stage 3	Compressor			2	
	Stage 4	Compressor			2	
	Stage 5	Pump			5	
	Stage 6	Vent Valve			6	
	Stage 7	Compressor on			7	
	Stage 8	Group A			8	
	Stage 9	Group B			9	
P59	Stage 10	Not Used			0	



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P70 ↓ P79	Stage 1 size Stage 2 size Stage 3 size Stage 4 size Stage 5 size Stage 6 size Stage 7 size Stage 8 size Stage 9 size Stage 10 size	0-60	1		0 1 2 3 0 0 0 0 0 0	21% 25.6% 53.4%
P60 ↓ P69	Stage 1 Input Stage 2 Input Stage 3 Input Stage 4 Input Stage 5 Input Stage 6 Input Stage 7 Input Stage 8 Input Stage 9 Input Stage 10 Input	Compressor fault Compressor fault Compressor fault Compressor fault Pump Fault Bearing Warning/Alarm Low liquid Warning/Alarm Flow Probe Return Probe General Fault 1 N/O	1		1 1 1 4 5 6 2 3 7	Open = alarm Open = alarm Open = alarm Open = alarm Open = alarm See Note 2 See Note 2 PT1000 PT1000 Closed = alarm
dFLt	Restore Default Settings					
Esc						

Note the association between outputs and inputs, this association must be kept for the controller to function correctly

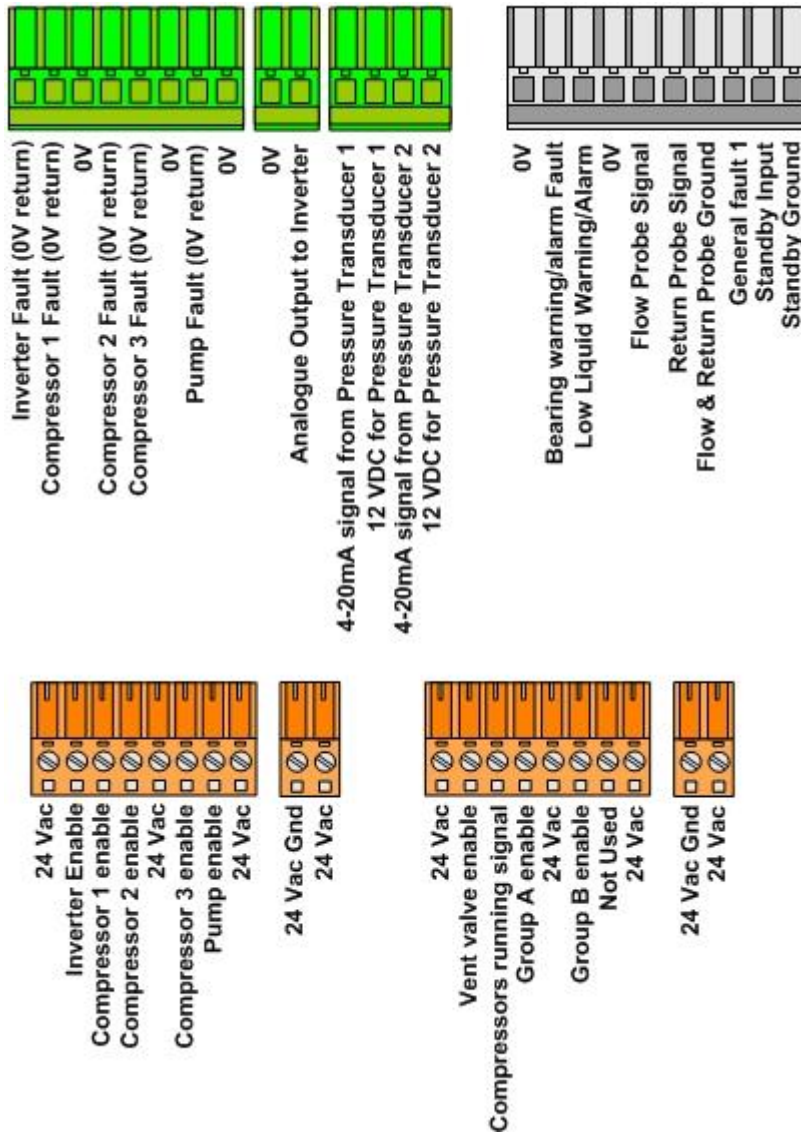
Note 2.

This input uses 2 x 330 Ohm resistor and a 590 Ohm resistor to detect the 2 functions. If the input is at 330 Ohms, the controller input is good. If the input is at 660 Ohms, a warning is issued. If the input is at 1250 Ohms, the controller issues an alarm and stops the pump. See example below: -



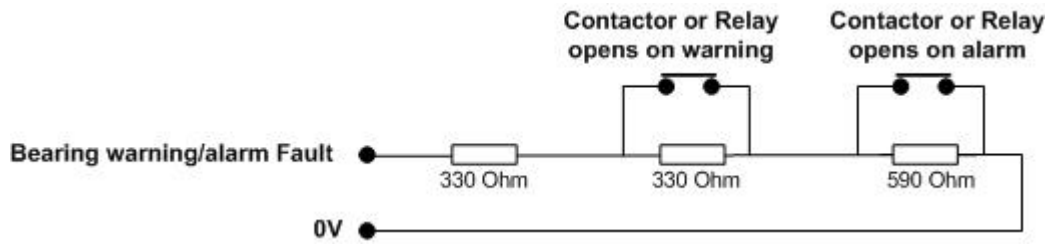
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Wiring for the above example:



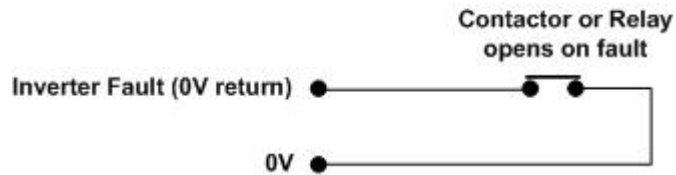
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Warning/Fault Input Example



Fault Input Example

Example of fault input



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Specification

Power requirements for 24 Volt Controller:

Supply Voltage Range: 10 Vdc to 35 Vdc or 15 Vac to 30 Vac
Maximum supply current: 1 Amp (Controller only)
Typical supply current: <1.0 Amp (Controller only)
Class 2 Insulation: The supply ground can be earthed if required.

The host equipment must provide a suitable external over-current protection device such as: -
Fuse: 3A, 240 Vac Antisurge (T) HRC conforming to IEC 60127
Or MCB: 3A, 240 Vac Type C conforming to BS EN 60898

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

General

Operating temperature range: -10⁰C to +60⁰C
Operating Humidity: 80% maximum
Storage temperature range: -20⁰C to +65⁰C
Environmental: Indoor use at altitudes up to 2000m, Pollution Degree 1, Installation Category II.
Voltage fluctuations not to exceed ±10% of nominal voltage
Size: 180mm (W) x 68mm (H) x 110mm (D)
Weight: 260 Grams
Safety: EN61010
EMC: EN61326; 1997 +Amdt. A1; 1998
Ventilation: There is no requirement for forced cooling ventilation

Inputs:

Probe Input type PT1000 for all versions
Digital Input type 0 volt return (internal pull-up resistor give hi state when there is no return)
Comms: RS232 with flow control
4-20mA 4-20mA current loop, use the 12 Vdc output to feed the pressure transducer

Analogue Output

0 to 10 Volts or 4-20mA (Jumper on the back of the controller selects)



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Relay Ratings

Max current relay 1: Max Voltage relay 1:	6A (non inductive) 24Vac (external supply)	Exclusive common
Max current relay 2: Max Voltage relay 2: Shared common with relay 3	4A (non inductive) 24Vac (external supply)	Relays 2 and 3 share a common supply line and the loads can have a combined total of 8A.
Max current relay 3: Max Voltage relay 3: Shared common with relay 2	4A (non inductive) 24Vac (external supply)	Relay 2 or 3 can switch a maximum of 6A provided the other is at 2A or lower.
Max current relay 4: Max Voltage relay 4:	3A (non inductive) 24Vac (external supply)	Relays 4 and 5 share a common supply line and the loads can have a combined load of 6A
Max current relay 5: Max Voltage relay 5:	3A (non inductive) 24Vac (external supply)	
Max current relay 6: Max Voltage relay 6:	6A (non inductive) 24Vac (external supply)	Exclusive common
Max current relay 7: Max Voltage relay 7: Shared common with relay 8	4A (non inductive) 24Vac (external supply)	Relays 7 and 8 share a common supply line and the loads can have a combined total of 8A.
Max current relay 8: Max Voltage relay 8: Shared common with relay 7	4A (non inductive) 24Vac (external supply)	Relay 7 or 8 can switch a maximum of 6A provided the other is at 2A or lower.
Max current relay 9: Max Voltage relay 9:	3A (non inductive) 24Vac (external supply)	Relays 9 and 10 share a common supply line and the loads can have a combined total of 6A.
Max current relay 10: Max Voltage relay 10:	3A (non inductive) 24Vac (external supply)	

590R Resistor Part numbers

Farnell: 323-1914 or 303-2966 or 946-9150	RS Components 487-5836 or 165-545
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330R Resistor Part numbers

Farnell: 946-7327	RS Components
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Disclaimer

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

Revision History

Revision	Date	Changes
1.7		1 st Release
1.7a	30/07/2012	New Look
1.7b	06/01/2015	Operating temperature range updated.



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