



### Features & Benefits

- Link selectable modes binary, heat/cool, staged or sequenced
- On/Off/Auto links for ease of commissioning
- DIN Rail mounting
- Fault finding LED indication
- Relay status LED indication

### Technical Overview

The IO-RM-3 is intended for use with BMS controllers to convert an analogue control output to a binary, heat/cool, staged or sequenced relay modes.

LEDs indicate correct operation and Hand/Off/Auto jumpers ease commissioning. Low current draw from 0-10Vdc controller output means that the IO-RM-3 can work successfully with most BEMS controllers.

### Product Codes

**IO-RM-3**      **3-Stage relay module**

### Specification

Input signal	0-10Vdc 1mA min. into 22kΩ impedance
Output contacts	8A at 230Vac (resistive load)
Power supply:	24Vac ±15% @ 50Hz or 24Vdc +15% -6%, 65mA max.
Hysteresis	±0.2Vdc about switching points
Operating modes:	Heat/cool 3 Stage 1 of 3 Sequenced Binary
LED indication:	Supply OK Supply voltage low Supply voltage high Relay Status Hi input voltage Incorrect input mode jumper selection Low input voltage (only in 2-10Vdc mode)
Manual override	On/Off/Auto jumper selectable
Electrical terminals	Rising cage connectors for 0.5-2.5mm² cables
Ambient range:	
Temperature	-10 to +40°C
RH	0-80% non-condensing
Dimensions (H x W x H)	72 x 64 x 55
Country of origin	UK



#### Warning!

When installed, the output relay contacts may carry 240Vac. Special care must be taken to isolate the switched voltages prior to any work being undertaken.

#### WEEE Directive:



At the end of the products useful life please dispose as per the local regulations.  
Do not dispose of with normal household waste.  
Do not burn.



The products referred to in this data sheet meet the requirements of EU 2014/30/EU and 2014/35/EU

## Installation



Antistatic precautions must be observed when handling these sensors. The PCB contains circuitry that can be damaged by static discharge.

1. The IO-RM-3 should only be installed by a competent, suitably trained technician, experienced in installation with hazardous voltages. (>50Vac & <1000Vac or >75Vdc & 1500Vdc)
2. Ensure that all power is disconnected before carrying out any work on the IO-RM-3.
3. Maximum cable is 2.5mm<sup>2</sup>, care must be taken not to over tighten terminals.
4. When mounting the IO-RM-3 care should be taken not to stress the PCB when fitting to the DIN rail. If it is necessary remove the module from the DIN rail, be sure to use a flat bladed screwdriver to release the DIN clips.
5. The IO-RM-3 is designed to operate from a 24Vac/dc supply (so that power can be drawn from a 24Vac transformer used for other purposes if a 24Vdc supply is not available). In either case one side of the supply is common to the signal ground from the BEMS controller.
6. The relay outputs are single Pole Change Over (SPCO) so they can be wired as Normally Open (N/O) or Normally Closed (N/C).
7. The 0-10Vdc signal input requires a minimum of 1mA to operate.

## LED Status

## Power supply

**Normal:**

The green LED indicates the supply power condition. If power supply is normal (between 22V and 40V  $\pm 0.2V$  hysteresis) the green LED is ON continuously, showing that the IO-RM-3 is powered correctly.

**Low Supply Voltage:**

If power supply falls below about 21.8V the green LED double flashes twice a second;

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The low power condition clears at about 22.0V. The relays behave as normal.

**High Supply Voltage:**

If the power supply is above 40V the green LED flashes 6 times a second:

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All the relays are switched off (except when forced ON by jumper settings) as excessive voltage might overload the voltage regulator.

The relays are switched off:

- For 2 seconds after power-up
- When the supply is greater than 40V
- For 2 seconds after any over 40V condition clears

This prevents the relays from switching on and off during power-up or power failure with an over voltage power supply.

### Control Input Voltage

The red LED indicates input voltage condition, normally the red LED is off

**High Input:**

If the input voltage exceeds 11V,  $\pm 0.2V$  hysteresis, the red LED goes on continuously. The relays behave as if 10Vdc were applied. The input voltage should settle on one 'voltage band'. Voltage is deemed to have settled after it has been within one band for 250ms. If it has not settled for 500ms it is deemed to be unstable. If it is unstable the red LED flashes 6 times a second:

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The relay outputs remain at their last settled value.



## Switching Sequences

Binary:

Input Voltage	Nominal	Relay 1	Relay 2	Relay 3
0Vdc - 1.25Vdc	0.0Vdc	OFF	OFF	OFF
1.25Vdc - 2.5Vdc	1.87Vdc	<b>ON</b>	OFF	OFF
2.5Vdc - 3.75Vdc	3.12Vdc	OFF	<b>ON</b>	OFF
3.75Vdc - 5Vdc	4.37Vdc	<b>ON</b>	<b>ON</b>	OFF
5Vdc - 6.25Vdc	5.62Vdc	OFF	OFF	<b>ON</b>
6.25Vdc - 7.5Vdc	6.87Vdc	<b>ON</b>	OFF	<b>ON</b>
7.5Vdc - 8.75Vdc	8.12Vdc	OFF	<b>ON</b>	<b>ON</b>
8.75Vdc - 10Vdc	9.37Vdc	<b>ON</b>	<b>ON</b>	<b>ON</b>

Heat/Cool:

Input Voltage	Nominal	Relay 1	Relay 2	Relay 3
0Vdc - 3Vdc	0.0Vdc	OFF	OFF	OFF
3Vdc - 5.5Vdc	4Vdc	<b>ON</b>	<b>ON</b>	OFF
5.5Vdc - 8Vdc	7Vdc	<b>ON</b>	OFF	OFF
8Vdc - 10Vdc	10Vdc	<b>ON</b>	OFF	<b>ON</b>

Staged:

Input Voltage	Nominal	Relay 1	Relay 2	Relay 3
0Vdc - 3Vdc	0.0Vdc	OFF	OFF	OFF
3Vdc - 5.5Vdc	4Vdc	<b>ON</b>	OFF	OFF
5.5Vdc - 8Vdc	7Vdc	<b>ON</b>	<b>ON</b>	OFF
8Vdc - 10Vdc	10Vdc	<b>ON</b>	<b>ON</b>	<b>ON</b>

Sequenced:

Input Voltage	Nominal	Relay 1	Relay 2	Relay 3
0Vdc - 3Vdc	0.0Vdc	OFF	OFF	OFF
3Vdc - 5.5Vdc	4Vdc	<b>ON</b>	OFF	OFF
5.5Vdc - 8Vdc	7Vdc	OFF	<b>ON</b>	OFF
8Vdc - 10Vdc	10Vdc	OFF	OFF	<b>ON</b>

## Tech Tip

### Electrical Noise

By far the most common cause of electrical noise on a typical HVAC site is the contactor. Little, if any, electrical noise is produced when the contactor coil is energized, but significant noise is produced when the coil de-energizes, and may exceed 700Vac P-P. Typically, the contactor coil is switched by the C & N/O contacts of an IO-RM module relay.

Fitting an "RF snubber" across the contactor coil is a good way of greatly reducing the electrical noise pulse produced when the coil de-energizes. The ROXBURGH flying lead RC network type XEB1201 (Farnell part code 1187659) is a tried and trusted component for this purpose. Alternatively, a suitable MOV (metal oxide varistor) across the IO-RM C & N/O relay contacts will also help to prevent electrical noise being induced."