

# IR104 Relay / Optoisolator PC/104 Board User Manual

Revised 12-02

## 1. I/O ADDRESS SELECTION

IR104 occupies 8 addresses in I/O memory, of which 6 are used. The address is selected with jumpers JP1 and JP2. The pins listed under each jumper block are the pins that must be shorted with a jumper for the In position. On each jumper block, pin 1 is on the left and pin 3 is on the right. Note that on JP1, pins 1 and 2 are used, but pin 3 is never used. On JP2, pins 2 and 3 are used, but pin 1 is never used.

| Address |         | JP1          | JP2          |
|---------|---------|--------------|--------------|
| Hex     | Decimal | pins 1 and 2 | pins 2 and 3 |
| 240     | 576     | Out          | Out          |
| 260     | 608     | Out          | In           |
| 280     | 640     | In           | Out          |
| 300     | 768     | In           | In           |

## 2. I/O MAP

| Base + | Write Function | Read Function     |
|--------|----------------|-------------------|
| 0      | Relays 1-8     | Read back value   |
| 1      | Relays 9-16    | Read back value   |
| 2      | Relays 17-20   | Read back value   |
| 3      | --             | --                |
| 4      | --             | Opto inputs 1-8   |
| 5      | --             | Opto inputs 9-16  |
| 6      | --             | Opto inputs 17-20 |
| 7      | --             | --                |

## 3. REGISTER BIT ASSIGNMENTS

| Addr | Operation  | D7    | D6    | D5    | D4    | D3    | D2    | D1    | D0    |
|------|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0    | Read/Write | RLY8  | RLY7  | RLY6  | RLY5  | RLY4  | RLY3  | RLY2  | RLY1  |
| 1    | Read/Write | RLY16 | RLY15 | RLY14 | RLY13 | RLY12 | RLY11 | RLY10 | RLY9  |
| 2    | Read/Write | 0     | 0     | 0     | 0     | RLY20 | RLY19 | RLY18 | RLY17 |
| 3    | Not Used   |       |       |       |       |       |       |       |       |
| 4    | Read only  | IN8   | IN7   | IN6   | IN5   | IN4   | IN3   | IN2   | IN1   |
| 5    | Read only  | IN16  | IN15  | IN14  | IN13  | IN12  | IN11  | IN10  | IN9   |
| 6    | Read only  | 0     | 0     | 0     | 0     | IN20  | IN19  | IN18  | IN17  |
| 7    | Not Used   |       |       |       |       |       |       |       |       |

### Definitions:

Rly1 – Rly20      Relay outputs; 1 = on, 0 = Off  
 In1 – In20      Optoisolator inputs; 1 = on, 0 = off  
 X                  Bit not used  
 0                  Bit reads back as a 0

## 4. I/O HEADER PINOUTS

### Optocoupler inputs

Optocouplers are accessed through a 2x20 pin header **CN3** at the top of the board. Pin 1 is on the left. There is no difference between the A and B connection, since the inputs are not polarity sensitive.

|         |    |    |         |
|---------|----|----|---------|
| In 1 A  | 1  | 2  | In 1 B  |
| In 2 A  | 3  | 4  | In 2 B  |
| In 3 A  | 5  | 6  | In 3 B  |
| In 4 A  | 7  | 8  | In 4 B  |
| In 5 A  | 9  | 10 | In 5 B  |
| In 6 A  | 11 | 12 | In 6 B  |
| In 7 A  | 13 | 14 | In 7 B  |
| In 8 A  | 15 | 16 | In 8 B  |
| In 9 A  | 17 | 18 | In 9 B  |
| In 10 A | 19 | 20 | In 10 B |
| In 11 A | 21 | 22 | In 11 B |
| In 12 A | 23 | 24 | In 12 B |
| In 13 A | 25 | 26 | In 13 B |
| In 14 A | 27 | 28 | In 14 B |
| In 15 A | 29 | 30 | In 15 B |
| In 16 A | 31 | 32 | In 16 B |
| In 17 A | 33 | 34 | In 17 B |
| In 18 A | 35 | 36 | In 18 B |
| In 19 A | 37 | 38 | In 19 B |
| In 20 A | 39 | 40 | In 20 B |

### Relay outputs

Relays are on 1x20 detachable screw terminal headers. **CN1** on the left side of the board handles relays 1 – 10, while **CN2** on the right side handles relays 11 – 20. The relay numbers are marked next to each relay so you can identify each relay and its associated screw terminals. Pin 1 on both screw terminals is the pin nearest the PC/104 connector, i.e. each terminal pinout is reversed with respect to the other. The drawings below indicate the pinouts according to their actual board orientation. There is no difference between the A and B connection, since the relays are not polarity sensitive. All connections are NO, normally open.

|            |            |           |            |            |
|------------|------------|-----------|------------|------------|
|            | <b>CN1</b> |           | <b>CN2</b> |            |
| Relay 10 B | 20         | CN3 End   | 20         | Relay 20 B |
| Relay 10 A | 19         |           | 19         | Relay 20 A |
| Relay 9 B  | 18         |           | 18         | Relay 19 B |
| Relay 9 A  | 17         |           | 17         | Relay 19 A |
| Relay 8 B  | 16         |           | 16         | Relay 18 B |
| Relay 8 A  | 15         |           | 15         | Relay 18 A |
| Relay 7 B  | 14         |           | 14         | Relay 17 B |
| Relay 7 A  | 13         |           | 13         | Relay 17 A |
| Relay 6 B  | 12         |           | 12         | Relay 16 B |
| Relay 6 A  | 11         |           | 11         | Relay 16 A |
| Relay 5 B  | 10         |           | 10         | Relay 15 B |
| Relay 5 A  | 9          |           | 9          | Relay 15 A |
| Relay 4 B  | 8          |           | 8          | Relay 14 B |
| Relay 4 A  | 7          |           | 7          | Relay 14 A |
| Relay 3 B  | 6          |           | 6          | Relay 13 B |
| Relay 3 A  | 5          |           | 5          | Relay 13 A |
| Relay 2 B  | 4          |           | 4          | Relay 12 B |
| Relay 2 A  | 3          | PC/104    | 3          | Relay 12 A |
| Relay 1 B  | 2          | Connector | 2          | Relay 11 B |
| Relay 1 A  | 1          | End       | 1          | Relay 11 A |

## 5. PROGRAMMING EXAMPLES

### Example 1: Turn on a relay

Current state of relays 1 – 8 is relays 1-4 on, relays 5-8 off.  
Turn relay 8 on:

Current data value at Base + 0 is 00001111 = 15

To turn on relay 8, we need to set bit 7 to 1.

Relay 8 = bit 7 = 10000000 = 128

New data value = 128 OR 15 = 143 (10001111)

Write 143 to Base + 0 to turn on relay 8 and keep relays 1-4 on, 5-7 off.

### Example 2: Turn off a relay

Current state of relays 1 – 8 is relays 1-4 and 8 on, relays 5-7 off.  
Turn relay 3 off:

Current data value at Base + 0 is 10001111 = 143

To turn off relay 3, we need to clear bit 2.

Relay 3 = bit 2 = 00000100 = 4

New data value = 143 AND NOT(4) = 139 (10001011)

Write 139 to Base + 0 to turn off relay 3 and keep relays 1, 2, 4, and 8 on, 5, 6, and 7 off.