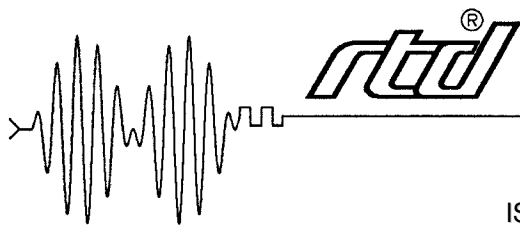


OR16 User's Manual

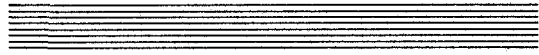
Optoisolated/Mechanical Relay Digital I/O Board



Real Time Devices, Inc.

"Accessing the Analog World"™

ISO9001 and AS9100 Certified



OR16



User's Manual



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INTRODUCTION

The OR16 optoisolated/mechanical relay digital I/O board provides 8 optoisolated input channels for digital signal sensing and switch monitoring, and 8 electromechanical single-pole, double throw relays for general purpose switching applications. Using 16 digital I/O lines available on many Real Time Devices' PC data acquisition and control boards, the OR16 features:

- 8 optoisolated digital input channels,
- On-board signal conditioning circuits,
- LED indicators to monitor input logic status,
- Input buffered with voltage comparators,
- Jumpers to allow individual optoisolation circuits to be selectively bypassed and their digital I/O lines to be brought directly to the connector,
- Adjustable threshold level,
- 8 SPDT relays with 120-volt/1A rating,
- On-board relay driver circuits,
- LED indicators to monitor relay activity,
- Jumpers to allow individual relays to be selectively bypassed and their digital output lines to be brought directly to the connector,
- On-board screw terminals for easy wiring.

What Comes With Your Board

You receive the following items in your OR16 package:

- OR16 optoisolated/mechanical relay digital I/O board
- User's manual

If any item is missing or damaged, please call Real Time Devices' Customer Service Department at (814) 234-8087. If you require service outside the U.S., contact your local distributor.

Using This Manual

This manual is intended to help you get your new board running quickly, while also providing enough detail about the board and its functions so that you can enjoy maximum use of its features even in the most complex applications. We assume that you already have an understanding of data acquisition principles and that you can provide the software necessary to control the OR16 board.

When You Need Help

This documentation package should provide enough information for you to achieve your desired results. If you have any problems using this board, contact our Technical Support Department, (814) 234-8087, during regular business hours, eastern standard time or eastern daylight time, or send a FAX requesting assistance to (814) 234 5218. When sending a FAX request, please include your company's name and address, your name, your telephone number, and a brief description of the problem.

OR16 DESCRIPTION

Board Settings

The OR16 board has jumper settings you can change if necessary for your application. The factory settings are listed in this section. Should you need to change these settings, use these easy-to-follow instructions. Figure 1 shows the board layout with the jumpers set at the factory settings.

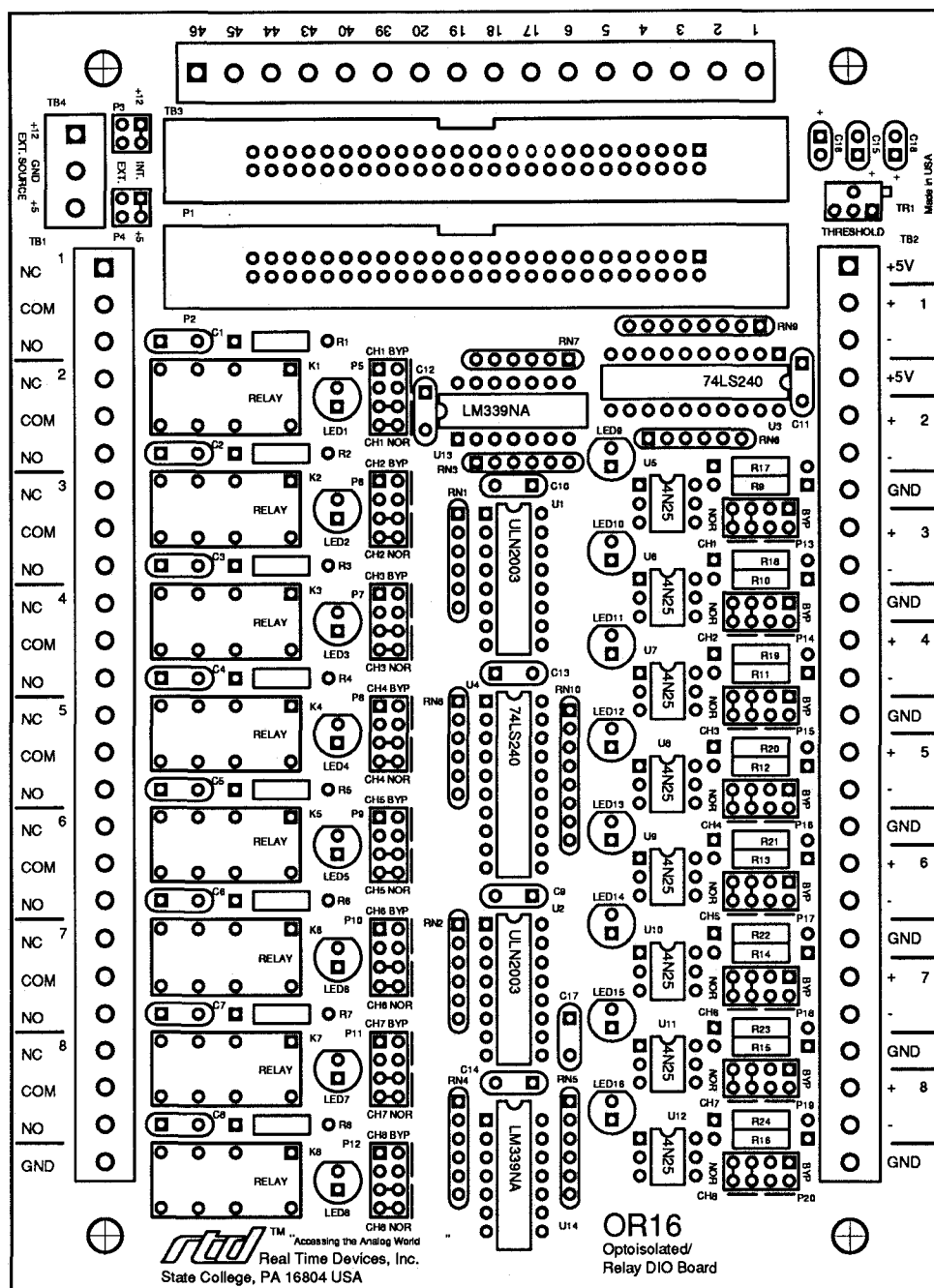


Fig. 1 — OR16 Board Layout

P3 and P4 — Internal/External Power Source, +12 and +5 Volts (Factory Setting: +12/+5V INT)

Header connectors P3 and P4, shown in Figure 2, let you select the power source for the OR16. Each electro-mechanical relay consumes about 33 mA when energized, so the maximum current requirement for all relays energized simultaneously is about 264 mA. Taking this much current from the computer's +12 volt power bus could overload the PC's +12 volt supply if you have other circuitry drawing high current (such as two or three OR16 boards daisy chained). The +5 volts circuitry draws about 140 mA. P3 and P4 let you jumper to an external +12 and/or +5 volt power supply. The external power sources are connected to the OR16 board at TB4, located to the left of P3 and P4.

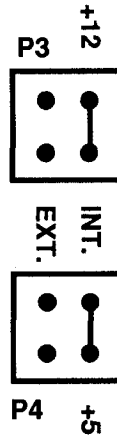


Fig. 2 — Internal/External Power Source Jumpers, P3 and P4

P5 Through P12 — Bypass/Normal Relay Operation (Factory Setting: NOR (Normal))

Header connectors P5 through P12 (P5 is shown in Figure 3) let you bypass an individual relay so that the digital output line can be brought out to the external I/O connector where it can be used for digital control functions. Two jumpers are installed on each header connector. Installing the jumpers across the top two pairs of pins bypasses the relay. Installing the jumpers across the bottom two pairs of pins lets the digital output line be used to control the relay.

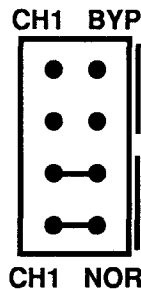


Fig. 3 — Bypass/Normal Relay Jumpers, P5

P13 Through P20 — Bypass/Normal Operation (Factory Setting: NOR (Normal))

Header connectors P13 through P20 (P13 is shown in Figure 4) let you bypass the optoisolation circuitry so that digital input or output lines can be routed to the external I/O connector where they are available as non-optoisolated signals for external use. This feature lets you make full use of digital outputs as well as inputs on your data acquisition and control board. Two jumpers are installed on each header connector. Installing the jumpers across the left two pairs of pins (NOR) connects the digital input to the optoisolated circuitry for that channel. Installing the jumpers across the right two pairs of pins (BYP) bypasses the OR16 on-board circuitry. Note that two jumpers must be installed on either the NOR pins or the BYP pins for proper operation.

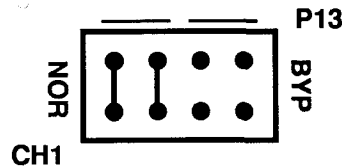


Fig. 4a: Factory Setting, Normal Operation (optoisolation circuitry activated)

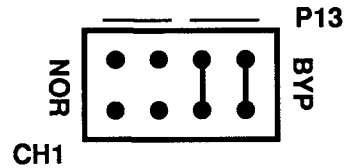


Fig. 4b: Bypass Operation (optoisolation circuitry bypassed)

Fig. 4 — Bypass/Normal Relay Jumpers, P13

Connecting to the PC Interface Board

Connecting to a 50-pin Interface Board

Figure 5 shows the OR16's P1 I/O connector pinout, with all of the pins used by the OR16 board labeled. The OR16 is pin-for-pin compatible with all Real Time Devices' 50-pin I/O connector boards. For these boards, all of the unlabeled pins on the OR16 carry the same signal found at the I/O connector of the interface board you are using. The DOUT lines on the left side of the connector are the digital lines for the optoisolated circuitry, and the DIN lines on the right side are the digital lines for the mechanical relay circuitry.

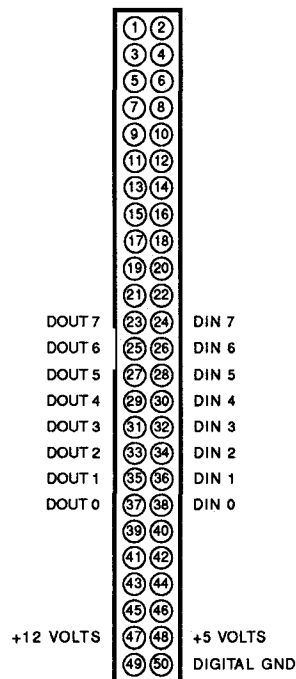


Fig. 5 — P1 I/O Connector Pin Assignments

If you want to access other signals on your interface board, such as analog inputs and timer/counters, you can connect to the 16 signals available on TB3 at the top of the OR16 board. This terminal strip is labeled with the pin numbers brought out to it from the 50-pin connector. To find the signals available on these pins, refer to the interface board's pinout.

To further expand the number of relays you can control using your digital I/O lines and the number of optoisolated channels, you can use the daisy chain connector on the OR16 board, P2. The signals at this connector are identical to the pinout of your 50-pin interface board. You can connect to another OR16 (each digital I/O line will now control two relays or two optoisolated channels, one on each OR16 board), or to a TB50 or XB50 breakout board to easily access all of the interface board signals. Our technical staff will gladly help you select the accessories you need for your application.

Connecting to a 40-pin A/D Converter Board

The OR16 can be adapted for use with all Real Time Devices' 40-pin interface boards by making I/O connections using an RTD Discrete Wire Kit. Available with single or twisted pair wiring, this kit is designed so that you can mate connectors with otherwise incompatible pinouts. Using Figure 5 and the pinout diagram for your interface board, you can make the appropriate connections.

Connecting to the Signal Sources

Mechanical Relay Digital Outputs

One digital output line from your interface board is required to control each relay on the OR16. These lines are labeled DIN0 through DIN7 on the OR16 P1 connector pinout because they are inputs to the OR16 board. These lines are programmed through your interface board. For normally open operation of your relay, the relay is open when the control line is low and closed when the control line is high. For normally closed operation, the relay is closed when the control line is low and open when the control line is high. When the relay is energized, its LED status indicator lights. The OR16 cannot be controlled by analog lines! If your interface board's digital I/O is provided by an 8255 programmable peripheral interface (PPI), then you must set up the lines that you use for the mechanical relays as mode 0 outputs. The interface board manual tells you how to set up the PPI.

TB1 is a 25-terminal miniature screw terminal strip which lets you easily connect and disconnect the relay outputs to external devices. When operating the relay as a normally open switch (open = low and closed = high), connect the external device the relay is controlling to the NO terminal screw and the ground to the COM terminal screw for the selected channel. When operating the relay as a normally closed switch (closed = low and open = high), connect the external device to the NC terminal screw and the ground to the COM screw terminal. An additional ground terminal is provided on the strip for your convenience when making these connections. Figure 6 shows a diagram of the channel 1 (DIN0) relay circuit.

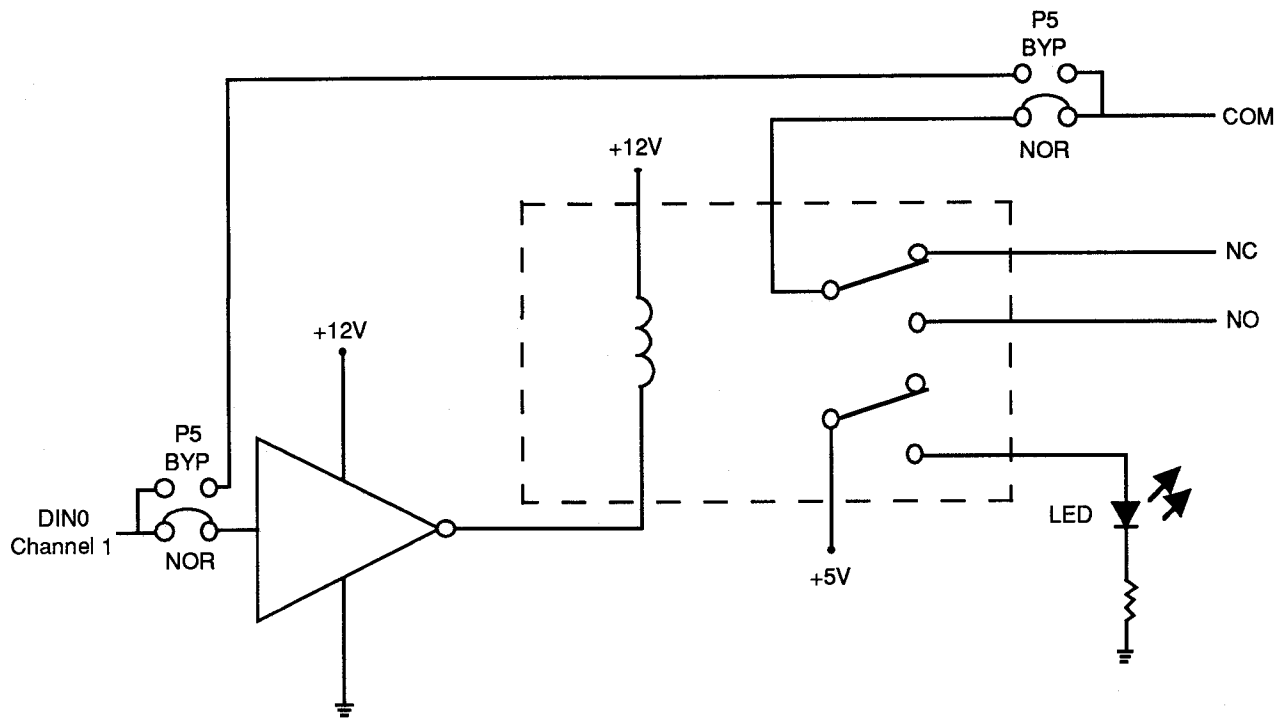


Fig. 6 — Mechanical Relay Circuit Diagram

Optoisolated Digital Inputs

An optoisolated digital input is connected to a signal source as shown in Figure 7. All connections are made on terminal strip TB2. For example, the circuit may be used to detect closure of a switch. The positive (+) side of the switch would be connected to the positive (+) terminal on TB2 and the negative (-) side would be connected to the negative (-) terminal. The channel output is connected to a digital input line on your data acquisition and control board through OR16 connector P1.

If your interface board's digital I/O is provided by an 8255 programmable peripheral interface (PPI), then you must set up the lines that routed through the optoisolation circuitry on the OR16 as mode 0 inputs. The interface

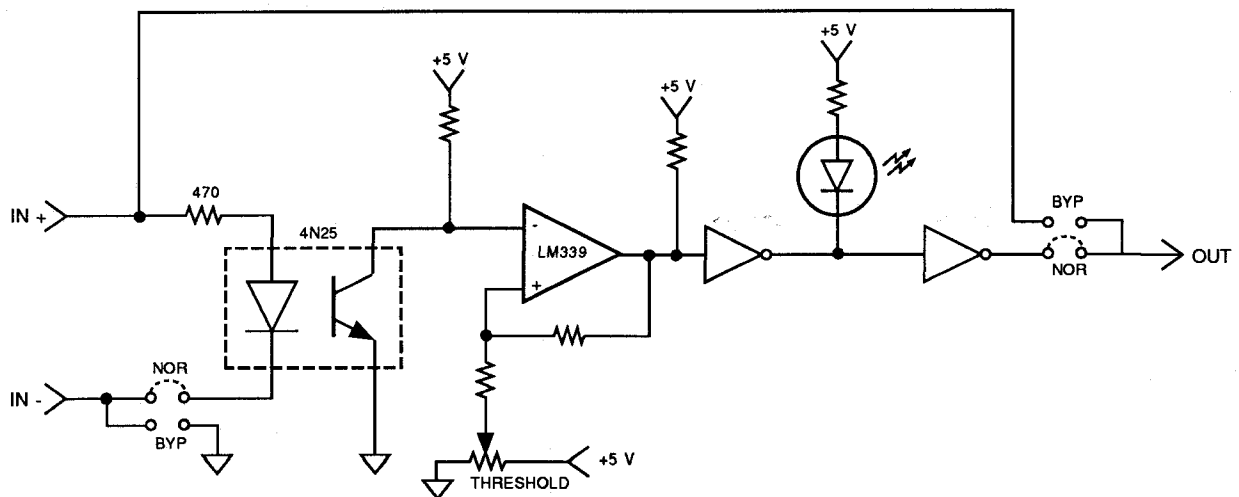


Fig. 7 — Optoisolated Digital Input Channel Circuit Diagram

board manual tells you how to set up the PPI. If you bypass any channel's optoisolation circuitry on the OR16, the associated digital line can be set up as either an input or an output.

TB2 is a 25-terminal miniature screw terminal strip which lets you easily connect and disconnect the optoisolated outputs to external devices. TB2 also provides +5 volts and ground terminals for your convenience.

How the Optoisolated Digital Input Circuit Works

Figure 7 shows a single optoisolated digital input channel on the OR16 board. All 8 channels are identical. To show how the circuit operates, let's use our example of detecting switch closure. When the switch is open, there is no current flow through the input circuit, the LED is off, and the digital output is low, or 0. When the switch is closed, a current is generated in the input circuit, the LED lights, and the digital output goes high, or to 1. The input signal is buffered with a voltage comparator to allow flexible signal conditioning.

A threshold trimpot, TR1, is included on the board above TB2 to adjust the threshold level for all optoisolated channels. The level is factory set at about 1 milliampere. In a noisy environment, you may want to adjust the threshold level to a higher setting to achieve the required noise immunity and prevent false readings. This is done by connecting an input circuit, such as one using a 5-volt supply and appropriate series resistance, and adjusting TR1 until the LED for channel 1 turns on at a higher input current level, such as 5 or 10 milliamperes.

Terminal Strip TB4

TB4, located in the upper left area of the board, provides +12 and +5 volts from the PC bus for external use. Be careful not to draw excessive current if using these connections.

APPENDIX A

OR16 SPECIFICATIONS

OR16 Characteristics Typical @ 25° C

Relay

| | |
|-----------------------------|--|
| Number of channels | 8 |
| Type | SPDT (Form C) |
| Contact rating | 120 Vac/Vdc, 1 A |
| Breakdown voltage | 500 Vac/Vdc, min |
| 'ON' time | 3 msec, typ |
| 'OFF' time | 2 msec, typ |
| Switching time | 10 msec, typ |
| Insulation resistance | >100 M Ω |
| Life expectancy | over 5 million operations at full load |

Input Circuitry

| | |
|----------------------------------|--|
| Number of channels | 8 |
| Type of optoisolator | 4N25 |
| Input current, per channel | 80 mA, max |
| Buffering | voltage comparator |
| Threshold voltage/current | 1.5 volts/1 mA, adjustable |
| Input modes | NOR (normal) or BYP (bypassed) (optoisolated or non-optoisolated) |
| Maximum input voltage | 1500 Vdc |

Current Requirements

| | |
|-----------------------------|---|
| +12 volts | 33 mA per relay; 264 mA with all relays energized |
| +5 volts (inputs = 0) | 140 mA |

Power Requirements

| | |
|----------------|-------------------|
| +5 volts | From computer bus |
|----------------|-------------------|

Connectors

Two 50-pin shrouded headers with ejector tabs

Screw Terminals

TB1 and TB2 - 25-terminal; TB3 - 16-terminal; TB4 - 3-terminal
22-12 AWG wire

Size

6.875"L x 5.0"W (175mm x 127mm)

APPENDIX B

WARRANTY

LIMITED WARRANTY

Real Time Devices, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from REAL TIME DEVICES. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, REAL TIME DEVICES will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to REAL TIME DEVICES. All replaced parts and products become the property of REAL TIME DEVICES. **Before returning any product for repair, customers are required to contact the factory for an RMA number.**

THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCTS WHICH HAVE BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by REAL TIME DEVICES, "acts of God" or other contingencies beyond the control of REAL TIME DEVICES), OR AS A RESULT OF SERVICE OR MODIFICATION BY ANYONE OTHER THAN REAL TIME DEVICES. EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND REAL TIME DEVICES EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED HEREIN. ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES FOR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THIS WARRANTY. IN THE EVENT THE PRODUCT IS NOT FREE FROM DEFECTS AS WARRANTED ABOVE, THE PURCHASER'S SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED ABOVE. UNDER NO CIRCUMSTANCES WILL REAL TIME DEVICES BE LIABLE TO THE PURCHASER OR ANY USER FOR ANY DAMAGES, INCLUDING ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOST PROFITS, LOST SAVINGS, OR OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT.

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THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

