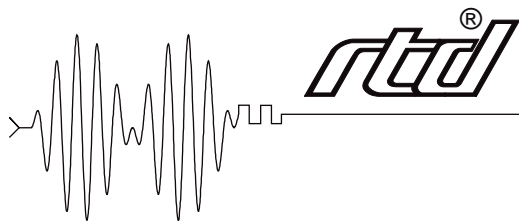


# OP8/16

## Optoisolated Digital Input Board

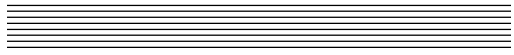
### User's Manual



**Real Time Devices USA, Inc.**

*"Accessing the Analog World"™*





**OP8/16**



# **User's Manual**



**REAL TIME DEVICES USA**

820 North University Drive  
Post Office Box 906  
State College, Pennsylvania 16804  
Phone: (814) 234-8087  
FAX: (814) 234-5218

Published by  
Real Time Devices USA, Inc.  
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# INTRODUCTION

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The OP8 and OP16 optoisolated digital input boards provide 8 or 16 optoisolated input channels for digital signal sensing and switch monitoring applications. Both boards are identical except that the OP8 has circuitry for 8 optoisolated channels and the OP16 has circuitry for 16 channels. Able to drive up to 8 or 16 digital input lines available on many Real Time Devices' PC data acquisition and control boards, these boards feature:

- 8 or 16 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,
- On-board screw terminals for easy wiring.

## What Comes With Your Board

You receive the following items in your OP8/16 package:

- OP8 or OP16 mechanical relay output 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.

In addition to the items included in your OP8/16 package, Real Time Devices offers a full line of board accessories. Key accessories for the OP8/16 include the TB50 terminal board and XB50 prototype/terminal board which can be connected to the daisy chain connector for prototype development and easy signal access, and the DWK-1 and DWK-2 discrete wire kits for connecting 40-pin interface boards to the 50-pin OP16 board.

## 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 OP16 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.



# OP16 DESCRIPTION

## Board Settings

The OP8/16 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.

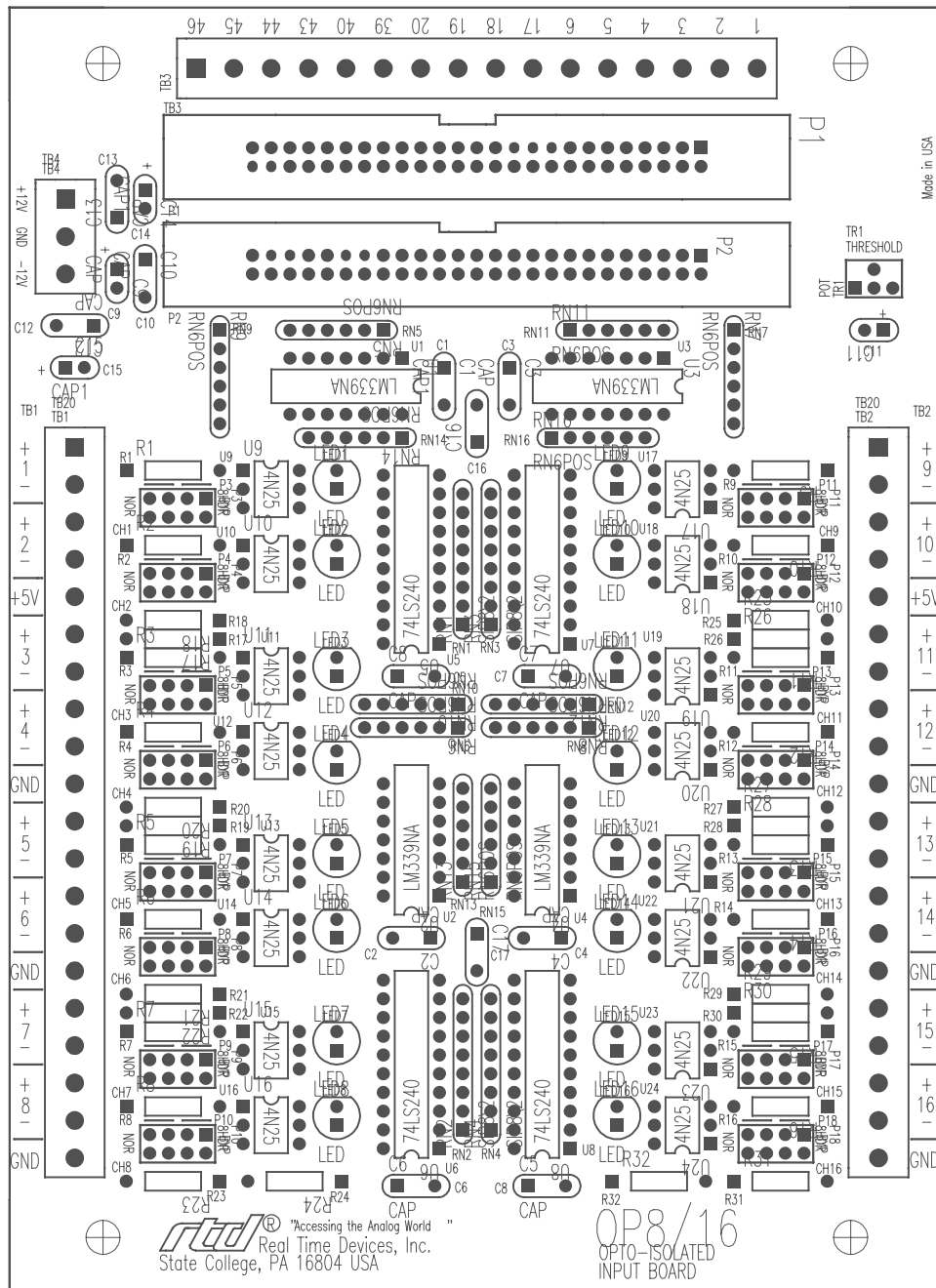


Fig. 1 — OP8/16 Board Layout

### P3 Through P18 — Bypass/Normal Operation (Factory Setting: NOR (Normal))

Header connectors P3 through P18 (P3 is shown in Figure 2) 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 OP8/16 on-board circuitry. Note that two jumpers must be installed on either the NOR pins or the BYP pins for proper operation.

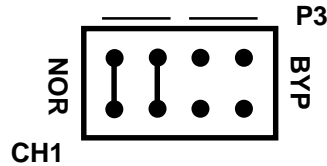


Fig. 2a: Factory Setting, Normal Operation (optoisolation circuitry activated)

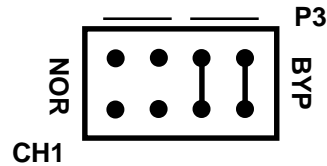


Fig. 2b: Bypass Operation (optoisolation circuitry bypassed)

Fig. 2 — Bypass/Normal Relay Jumpers, P3

## Connecting to the PC Interface Board

### Connecting to a 50-pin Interface Board

Figure 3 shows the OP16's P1 I/O connector pinout, with all of the pins used by the OP16 board labeled. The OP8 board pinout is identical, except that DOUT8 through DOUT15 (channels 9 through 16) are not available. The OP8/16 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 OP8/16 carry the same signal found at the I/O connector of the interface board you are using.

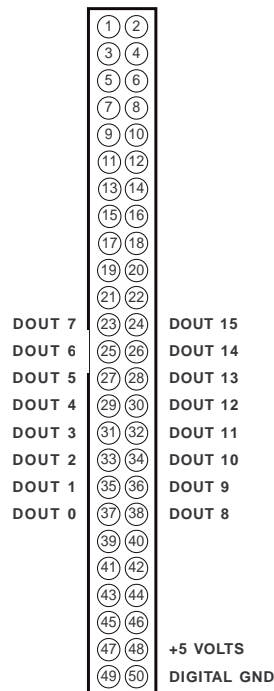


Fig. 3 — P1 I/O Connector Pin Assignments

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 OP8/16 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. The pinouts for some RTD boards are included in Appendix B.

### **Connecting to a 40-pin A/D Converter Board**

The OP8/16 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 3 and the pinout diagram for your interface board, you can make the appropriate connections.

### **Connecting to the Signal Sources**

The OP8/16 is connected to a signal source as shown in Figure 4. 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 the OP8/16 board and the negative, or ground, 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 OP8/16 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 OP8/16 as mode 0 inputs. The interface board manual tells you how to set up the PPI. If you bypass any channel's optoisolation circuitry on the OP8/16, the associated digital line can be set up as either an input or an output.

TB1 and TB2 are 20-terminal miniature screw terminal strips which let you easily connect and disconnect the relay outputs to external devices. TB1 and TB2 also provide +5 volts and ground terminals for your convenience.

### **OP8/16 Circuitry**

Figure 4 shows a single channel on the OP8/16 board. All 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 OP8/16 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 to adjust the threshold level for all channels. The level is factory set at about 1 milliamperes. 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 -12 volts from the PC bus for external use. Be careful not to draw excessive current if using these connections.



Fig. 4 — OP8/16 Channel Circuit Diagram

# APPENDIX A

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## OP8/16 SPECIFICATIONS



## OP8/16 Characteristics Typical @ 25° C

### Input Circuitry

Number of channels .....	8 or 16
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

+5 volts (inputs = 0) .....	85 mA
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### Power Requirements

+5 volts .....	From computer bus
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### Connectors

Two 50-pin shrouded headers with ejector tabs

### Screw Terminals

TB1 and TB2 - 20-terminal; TB3 - 16-terminal; TB4 - 3-terminal  
22-12 AWG wire

### Size

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



# **APPENDIX B**

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## **RTD INTERFACE BOARD PINOUTS**



## ADA3100 Pinout:

DIFF.	S.E.		DIFF.	S.E.
AIN1+	AIN1	① ②	AIN1-	ANALOG GND
AIN2+	AIN2	③ ④	AIN2-	ANALOG GND
AIN3+	AIN3	⑤ ⑥	AIN3-	ANALOG GND
AIN4+	AIN4	⑦ ⑧	AIN4-	ANALOG GND
AIN5+	AIN5	⑨ ⑩	AIN5-	ANALOG GND
AIN6+	AIN6	⑪ ⑫	AIN6-	ANALOG GND
AIN7+	AIN7	⑬ ⑭	AIN7-	ANALOG GND
AIN8+	AIN8	⑮ ⑯	AIN8-	ANALOG GND
	AOUT1	⑰ ⑱		ANALOG GND
	AOUT2	⑲ ⑳		ANALOG GND
	ANALOG GND	㉑ ㉒		ANALOG GND
	DIN7	㉓ ㉔		DOUT7
	DIN6	㉕ ㉖		DOUT6
	DIN5	㉗ ㉘		DOUT5
	DIN4	㉙ ㉚		DOUT4
	DIN3	㉛ ㉜		DOUT3
	DIN2	㉝ ㉞		DOUT2
	DIN1	㉟ ㊱		DOUT1
	DIN0	㊲ ㊳		DOUT0
	TRIGGER IN	㊴ ㊵		DIGITAL GND
	EXT PACER CLK	㊶ ㊷		TIMER OUT
	TRIGGER OUT	㊸ ㊹		COUNTER OUT
	EXT CLK	㊺ ㊻		EXT GATE
	+12 VOLTS	㊼ ㊽		+5 VOLTS
	-12 VOLTS	㊾ ㊿		DIGITAL GND

## AD3700 Pinout:

AIN1	① ②	ANALOG GND
AIN2	③ ④	ANALOG GND
AIN3	⑤ ⑥	ANALOG GND
AIN4	⑦ ⑧	ANALOG GND
AIN5	⑨ ⑩	ANALOG GND
AIN6	⑪ ⑫	ANALOG GND
AIN7	⑬ ⑭	ANALOG GND
AIN8	⑮ ⑯	ANALOG GND
ANALOG GND	⑰ ⑱	ANALOG GND
ANALOG GND	⑲ ⑳	ANALOG GND
ANALOG GND	㉑ ㉒	ANALOG GND
	DIN7	㉓ ㉔
	DIN6	㉕ ㉖
	DIN5	㉗ ㉘
	DIN4	㉙ ㉚
	DIN3	㉛ ㉜
	DIN2	㉝ ㉞
	DIN1	㉟ ㊱
	DIN0	㊲ ㊳
	TRIGGER IN	㊴ ㊵
	EXT PACER CLK	㊶ ㊷
	TRIGGER OUT	㊸ ㊹
	EXT CLK	㊺ ㊻
	+12 VOLTS	㊼ ㊽
	-12 VOLTS	㊾ ㊿

## ADA900 Pinout:

DIFF.	S.E.		DIFF.	S.E.
AIN1+	AIN1	① ②	AIN1-	ANALOG GND
AIN2+	AIN2	③ ④	AIN2-	ANALOG GND
AIN3+	AIN3	⑤ ⑥	AIN3-	ANALOG GND
AIN4+	AIN4	⑦ ⑧	AIN4-	ANALOG GND
ANALOG GND		⑨ ⑩	ANALOG GND	
ANALOG GND		⑪ ⑫	ANALOG GND	
ANALOG GND		⑬ ⑭	ANALOG GND	
ANALOG GND		⑮ ⑯	ANALOG GND	
AOUT1		⑰ ⑱	ANALOG GND	
ANALOG GND		⑲ ⑳	ANALOG GND	
ANALOG GND		㉑ ㉒	ANALOG GND	
	DIN7	㉓ ㉔	DOUT7	
	DIN6	㉕ ㉖	DOUT6	
	DIN5	㉗ ㉘	DOUT5	
	DIN4	㉙ ㉚	DOUT4	
	DIN3	㉛ ㉜	DOUT3	
	DIN2	㉝ ㉞	DOUT2	
	DIN1	㉟ ㊱	DOUT1	
	DIN0	㊲ ㊳	DOUT0	
TRIGGER IN		㊴ ㊵	DIGITAL GND	
DIGITAL GND		㊶ ㊷	DIGITAL GND	
TRIGGER OUT		㊸ ㊹	COUNTER OUT	
EXT CLK		㊺ ㊻	EXT GATE	
+12 VOLTS		㊼ ㊽	+5 VOLTS	
-12 VOLTS		㊾ ㊿	DIGITAL GND	

## DM402 Pinout:

AIN1	① ②	ANALOG GND
AIN2	③ ④	ANALOG GND
AIN3	⑤ ⑥	ANALOG GND
AIN4	⑦ ⑧	ANALOG GND
AIN5	⑨ ⑩	ANALOG GND
AIN6	⑪ ⑫	ANALOG GND
AIN7	⑬ ⑭	ANALOG GND
AIN8	⑮ ⑯	ANALOG GND
AOUT 1	⑰ ⑱	ANALOG GND
AOUT 2	⑲ ⑳	ANALOG GND
ANALOG GND	㉑ ㉒	ANALOG GND
PA7	㉓ ㉔	PC7
PA6	㉕ ㉖	PC6
PA5	㉗ ㉘	PC5
PA4	㉙ ㉚	PC4
PA3	㉛ ㉜	PC3
PA2	㉝ ㉞	PC2
PA1	㉟ ㊱	PC1
PA0	㊲ ㊳	PC0
TRIGGER IN	㊴ ㊵	DIGITAL GND
EXT GATE 1	㊶ ㊷	T/C OUT 1
TRIGGER OUT	㊸ ㊹	T/C OUT 2
EXT CLK	㊺ ㊻	EXT GATE 2
+12 VOLTS	㊼ ㊽	+5 VOLTS
-12 VOLTS	㊾ ㊿	DIGITAL GND

## DM406 Pinout:

DIFF.	S.E.		DIFF.	S.E.
AIN1+	AIN1	(1) (2)	AIN1-	AIN9
AIN2+	AIN2	(3) (4)	AIN2-	AIN10
AIN3+	AIN3	(5) (6)	AIN3-	AIN11
AIN4+	AIN4	(7) (8)	AIN4-	AIN12
AIN5+	AIN5	(9) (10)	AIN5-	AIN13
AIN6+	AIN6	(11) (12)	AIN6-	AIN14
AIN7+	AIN7	(13) (14)	AIN7-	AIN15
AIN8+	AIN8	(15) (16)	AIN8-	AIN16
	AOUT 1	(17) (18)		ANALOG GND
	AOUT 2	(19) (20)		ANALOG GND
	ANALOG GND	(21) (22)		ANALOG GND
	PA7	(23) (24)		PC7
	PA6	(25) (26)		PC6
	PA5	(27) (28)		PC5
	PA4	(29) (30)		PC4
	PA3	(31) (32)		PC3
	PA2	(33) (34)		PC2
	PA1	(35) (36)		PC1
	PA0	(37) (38)		PC0
	TRIGGER IN	(39) (40)		DIGITAL GND
	EXT GATE 1	(41) (42)		T/C OUT 1
	TRIGGER OUT	(43) (44)		T/C OUT 2
	EXT CLK	(45) (46)		EXT GATE 2
	+12 VOLTS	(47) (48)		+5 VOLTS
	-12 VOLTS	(49) (50)		DIGITAL GND

## DM802 Pinout:

PC0	(1) (2)	EXTINT
PC1	(3) (4)	DIGITAL GND
PC2	(5) (6)	DIGITAL GND
PC3	(7) (8)	DIGITAL GND
PC4	(9) (10)	DIGITAL GND
PC5	(11) (12)	DIGITAL GND
PC6	(13) (14)	DIGITAL GND
PC7	(15) (16)	DIGITAL GND
PB0	(17) (18)	DIGITAL GND
PB1	(19) (20)	DIGITAL GND
PB2	(21) (22)	DIGITAL GND
PB3	(23) (24)	DIGITAL GND
PB4	(25) (26)	DIGITAL GND
PB5	(27) (28)	DIGITAL GND
PB6	(29) (30)	DIGITAL GND
PB7	(31) (32)	DIGITAL GND
PA0	(33) (34)	DIGITAL GND
PA1	(35) (36)	DIGITAL GND
PA2	(37) (38)	DIGITAL GND
PA3	(39) (40)	DIGITAL GND
PA4	(41) (42)	DIGITAL GND
PA5	(43) (44)	DIGITAL GND
PA6	(45) (46)	DIGITAL GND
PA7	(47) (48)	DIGITAL GND
+5 VOLTS	(49) (50)	DIGITAL GND

**2700 Pinout:**

DIFF.	S.E.		DIFF.	S.E.
AIN1+	AIN1	① ②	AIN1-	AIN9
AIN2+	AIN2	③ ④	AIN2-	AIN10
AIN3+	AIN3	⑤ ⑥	AIN3-	AIN11
AIN4+	AIN4	⑦ ⑧	AIN4-	AIN12
AIN5+	AIN5	⑨ ⑩	AIN5-	AIN13
AIN6+	AIN6	⑪ ⑫	AIN6-	AIN14
AIN7+	AIN7	⑬ ⑭	AIN7-	AIN15
AIN8+	AIN8	⑮ ⑯	AIN8-	AIN16
	AOUT 1	⑰ ⑱		ANALOG GND
	AOUT 2	⑲ ⑳		ANALOG GND
	ANALOG GND	㉑ ㉒		ANALOG GND
	PA7	㉓ ㉔		PC7
	PA6	㉕ ㉖		PC6
	PA5	㉗ ㉘		PC5
	PA4	㉙ ㉚		PC4
	PA3	㉛ ㉜		PC3
	PA2	㉝ ㉞		PC2
	PA1	㉟ ㊱		PC1
	PA0	㊲ ㊳		PC0
	TRIGGER IN	㊴ ㊵		DIGITAL GND
	EXT GATE 1	㊶ ㊷		T/C OUT 1
	TRIGGER OUT	㊸ ㊹		T/C OUT 2
	EXT CLK	㊺ ㊻		EXT GATE 2
	+12 VOLTS	㊼ ㊽		+5 VOLTS
	-12 VOLTS	㊾ ㊿		DIGITAL GND

**DIO24 Pinout:**

PC0	① ②	EXTINT
PC1	③ ④	DIGITAL GND
PC2	⑤ ⑥	DIGITAL GND
PC3	⑦ ⑧	DIGITAL GND
PC4	⑨ ⑩	DIGITAL GND
PC5	⑪ ⑫	DIGITAL GND
PC6	⑬ ⑭	DIGITAL GND
PC7	⑮ ⑯	DIGITAL GND
PB0	⑰ ⑱	DIGITAL GND
PB1	⑲ ⑳	DIGITAL GND
PB2	㉑ ㉒	DIGITAL GND
PB3	㉓ ㉔	DIGITAL GND
PB4	㉕ ㉖	DIGITAL GND
PB5	㉗ ㉘	DIGITAL GND
PB6	㉙ ㉚	DIGITAL GND
PB7	㉛ ㉜	DIGITAL GND
PA0	㉝ ㉞	DIGITAL GND
PA1	㉟ ㊱	DIGITAL GND
PA2	㊲ ㊳	DIGITAL GND
PA3	㊴ ㊵	DIGITAL GND
PA4	㊶ ㊷	DIGITAL GND
PA5	㊸ ㊹	DIGITAL GND
PA6	㊺ ㊻	DIGITAL GND
PA7	㊼ ㊽	DIGITAL GND
+5 VOLTS	㊾ ㊿	DIGITAL GND

# APPENDIX C

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## 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.

