

# Optically Isolated Serial Data Acquisition Module

## Model 232OPSDA

### Description

The 232OPSDA is an optically isolated RS-232 serial port data acquisition module with a variety of I/O inputs. The six A/D input channels provide 12-bit resolution and have the following configuration: one 4-20mA current loop input, two 0 to 5V buffered inputs, one 0 to 10V input, and two 0 to 5V non-buffered inputs. These A/D channel configurations can be modified, if required. In addition, the 232OPSDA contains one digital input and one digital output. Demonstration software and a data logging utility are included with the 232OPSDA module.

### Features

- 2500V Optical Isolation protection between RS-232 and I/O side of module
- one 4-20mA input channel (input resistance = 10 $\Omega$ )
- two 0 to 5V buffered A/D input channels (input resistance = 1T $\Omega$ )
- one 0 to 10V A/D input channel (input resistance = 200K $\Omega$ )
- two 0 to 5V non-buffered A/D input channels
- one digital input and one digital output line
- Automatic baud rate detection (1,200 to 9,600 baud)



### Commands

Only three commands are needed to control the 232OPSDA: the read A/D command, the read digital I/O command, and the set digital output command. The command string consists of four or five bytes: the "!" character, the address byte "0" character, two command characters, and a data byte (if required).

#### 232OPSDA Commands

Function	Command	Response
Read A/D Channels	!0RA{#}	{ch#msb}{ch#lsb}{ch(#-1)msb}...{ch0msb}{ch0lsb}
Read Digital I/O	!0RD	{I/O states}
Set Digital Output	!0SO{#}	no response

**NOTE:**{...} represents one byte

In addition to the commands mentioned above, an extended set of commands can be used to provide bit-error identification. With these extended commands, the "#" character is used in place of the "!" character, and the compliment of the data byte must be sent after the data byte. The extended commands are shown below.

#### 232OPSDA Extended Commands

Function	Command	Response
Read A/D Channels	#0RA{#}~{#}	{ch#msb}~{ch#msb}{ch#lsb}~{ch#lsb}{ch(#-1)msb} ~{ch(#-1)msb}{ch0msb}~{ch0msb}{ch0lsb}~{ch0lsb}
Read Digital I/O	#0RD	{I/O states}~{I/O states}
Set Digital Output	#0SO{#}~{#}	no response

**NOTE:** Each ~{...} represents the complement of one byte.

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## A/D Converter

The 232OPSDA has six channels of 12-bit A/D. These channels have several different input configurations to handle a variety of applications. One channel converts a 4-20mA analog input current to a voltage. Two channels can read voltages between 0 to 5V and are buffered to provide a high input impedance. One channel can read voltages between 0 and 10V, and two non-buffered channels can read voltages between 0 and 5V.

## Digital I/O Lines

The 232OPSDA has one digital input that is CMOS/TTL compatible and can handle voltages from -30VDC to +30VDC. One CMOS/TTL compatible digital output is also available on the 232OPSDA. These two digital lines are available on terminal blocks.

### Terminal Block Assignments

Terminal Block	Function	Description
TB 0	A/D 0	Current Loop A/D Input*
TB 1	A/D 1	0 to 5V Buffered A/D Input**
TB 2	A/D 2	0 to 5V Buffered A/D Input
TB 3	A/D 3	0 to 10V A/D Input
TB 4	A/D 4	0 to 5V Non-buffered A/D Input
TB 5	A/D 5	0 to 5V Non-buffered A/D Input
TB 6	DOOUT	Digital Output
TB 7	DIN	Digital Input
GND	GND	Isolated Ground
+12VDC	+12VDC	Power Supply Connection

\*The current loop input uses a non-inverting amplifier with a gain of 23.064. Spaces for through-hole resistors are provided to change the gain of this non-inverting amplifier (Gain must be  $\geq 1$ ). By decreasing the gain, currents up to 100mA can be read using A/D 0.

\*\*This 0-5V input uses a voltage follower circuit. Space is provided for through-hole resistors to change the voltage follower into a non-inverting amplifier with a gain  $> 1$ . This allows you to read small voltages with greater accuracy.

## Power Supply

The 232OPSDA is port powered on the RS-232 side of the device, and an external isolated power supply (232PS2 or equivalent) is needed to power the I/O side of the device. The GND wire is connected to the terminal block labeled GND, and the positive voltage wire is connected to the terminal block labeled +12VDC.

## Communications

The 232OPSDA connects to the host computer's RS-232 serial port using a DB-25 (female) connector. The module automatically detects baud rates from 1,200 to 9,600. A data format of 8 data bits, 1 stop bit, and no parity is used. The RS-232 side of the device is port powered. Power is drawn from RTS and DTR regardless of the state of each. If none of these lines are available, a +12VDC supply can be connected to pin 25 of the DB-25 connector.

### RS-232 Connector Pinout

DB-25 Pin #	Function
2	TD
3	RD
4	RTS
5	CTS
6	DSR
7	GND
8	CD
12	GND
20	DTR
25	Optional Power Connection

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## Specifications

### Analog to Digital Converter

Resolution:	12 bit
Channels:	6
A/D Connections:	Terminal Blocks
4-20mA Input Channel:	1
Input Resistance:	10 $\Omega$
Input Offset Voltage:	1500 $\mu$ V
Input Offset Drift Voltage:	0.5 $\mu$ V/ $^{\circ}$ C
Maximum Signal Conditioning Error:	$\pm$ 3% of output
0 to 5V buffered Input Channels:	2
Input Resistance:	1T $\Omega$
Input Offset Voltage:	1500 $\mu$ V
Input Offset Drift Voltage:	0.5 $\mu$ V/ $^{\circ}$ C
Maximum Signal Conditioning Error:	$\pm$ 1% of output
0 to 10V Input Channel:	1
Input Resistance:	200K $\Omega$
Input Offset Voltage:	1500 $\mu$ V
Input Offset Drift Voltage:	0.5 $\mu$ V/ $^{\circ}$ C
Maximum Signal Conditioning Error:	$\pm$ 1% of output
0 to 5V Non-buffered Channels:	2
Input Offset Voltage:	1500 $\mu$ V
Input Offset Drift Voltage:	0.5 $\mu$ V/ $^{\circ}$ C
Total Unadjusted Error:	$\pm$ 1.75LSB

Non-buffered A/D input channels must be driven from a source impedance less than 1K $\Omega$ .

### Digital Input

Voltage Range:	-30VDC to 30VDC
Low Voltage:	-30VDC to 1.0VDC
High Voltage:	2.0VDC to 30VDC
Leakage Current:	1 microamp max.
Connection:	Terminal Block

### Digital Output

Low Voltage:	0.6VDC @ 8.7mA
High Voltage:	4.3V @ -5.4mA
Connection:	Terminal Block

### Power Supply

Input Voltage:	9VDC to 16VDC @10mA (Doesn't include the power consumption of external devices.)
Connection:	Terminal Blocks

### Communications

Standard:	RS-232
Baud Rate:	1,200 to 9,600 (automatic detection)
Format:	8 data bits, 1 stop bit, no parity
Port Power:	RTS and DTR
Isolation Protection:	2500V
Connector:	DB-25S (female)

**NOTE: Both port power and an isolated external power supply are needed to power the 232OPSDA!**

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