

CIO-COM485™

User's Manual



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MEGA-FIFO, the CIO prefix to data acquisition board model numbers, the PCM prefix to data acquisition board model numbers, PCM-DAS08, PCM-D24C3, PCM-DAC02, PCM-COM422, PCM-COM485, PCM-DMM, PCM-DAS16D/12, PCM-DAS16S/12, PCM-DAS16D/16, PCM-DAS16S/16, PCI-DAS6402/16, Universal Library, *InstaCal*, *Harsh Environment Warranty* and Measurement Computing Corporation are registered trademarks of Measurement Computing Corporation.

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1 INTRODUCTION

The CIO-COM485 is a serial interface for the IBM PC and compatibles. The UART (serial communications chip) is a 16550. The physical interface conforms to the RS485 standard.

The 16550 UART is the standard UART of the personal computer. Any software which is designed to control IBM PC serial COM ports will work with the CIO-COM485. A base address switch and interrupt jumper allow you to select one of four COM ports; COM1, COM2, COM3, or COM4.

The RS485 interface allows multiple transmitters as well as multiple receivers to communicate on a two-wire serial link thereby making possible serial networks. Many instruments are equipped with RS485 interfaces as are the remote data acquisition and control modules from Measurement Computing Corporation.

Because the RS485 interface calls for each node to be either a transmitter or receiver, the CIO-COM485 can swap the transmit and receive lines. A register on the board allows you to set the CIO-COM485 as a transmitter or receiver. Once written to, this register is not overwritten by standard COM software. The power on default is to configure the CIO-COM485 with neither the transmitter or receiver enabled. One or the other must be enabled via program control.

RS485 is a step up from RS422. RS422 allows multiple receivers but only one transmitter.

2 INSTALLATION

Before you open your computer and install the board, install and run *InstaCal*[™], the installation, calibration and test utility included with your board. *InstaCal* will guide you through switch and jumper settings for your board. Detailed information regarding these settings can be found below. Refer to the *Extended Software Installation* manual for *InstaCal* installation instructions.

The CIO-COM485 is easy to install. You must set the COM port number then open your computer and install the board. From that point on simply use any PC compatible communication software to communicate with devices connected to the CIO-COM485.

Before installing the board in your computer you must:

- 1) Select a COM port number for your CIO-COM485.
- 2) Disable or remove any COM port currently using that port number.

To select the COM port number you must set the base address and interrupt jumper to one of the choices corresponding to COM1, COM2, COM3 or COM4.

2.1 Base Address

Set the base address via the 7 position dip switch labeled Base Address. Figure 2-1 shows the base address switch set for COM1 and COM2 address. The addresses for the COM ports are:

- COM1 = 3F8h (All switches down)
- COM2 = 2F8h (Switch 8 UP)
- COM3 = 3E8h (Switch 4 UP)
- COM4 = 2E8h (Switch 8 and 4 UP)

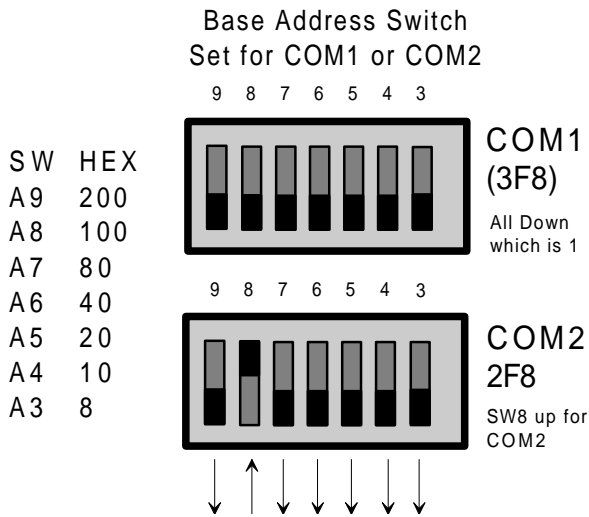


Figure 2-1. Base Address Select Switches - COM1 & COM2

2.2 Interrupts

Set the interrupt with the interrupt level jumper (Figure 2-2) according to the following:

- COM1 = IRQ 4
- COM2 = IRQ 3
- COM3 = IRQ 4 (or a unique IRQ if your PC's)
- COM4 = IRQ 3 (BIOS requires one)

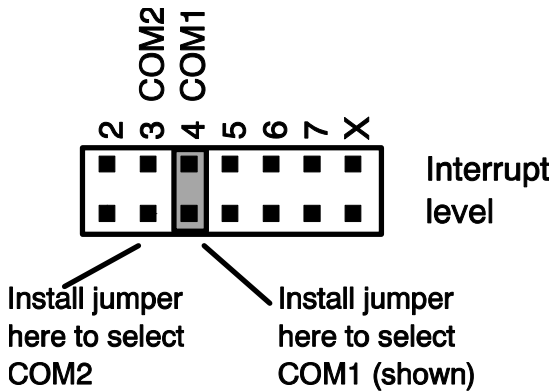


Figure 2-2. Jumper - Interrupt Levels for COM1/COM2

2.3 COM3 and COM4

In order to use COM3 or COM4 you will have to read your computer owner's manual and determine the method of setting the interrupts for COM3 and COM4. There are different methods and the one employed by your computer is dependent on the ROM BIOS installed in the computer.

For example, ZEOS computers require that you assign a unique IRQ number, such as IRQ5, to the COM3 or COM4 port if you install one. The assignment is done in the BIOS setup.

With other computers, you use IRQ4 for COMs 1 and 3 and IRQ3 for COMs 2 and 4. The BIOS determines which COM port to service even though the interrupt may have been generated by one of two COM ports.

The information for using COM3 and COM4 is in your computer's owner's manual. It is not something we can provide you with, nor guide you through.

2.4 Disabling Existing COM Ports

Your computer may have been supplied with a COM1 or COM2 port, or both. To use the CIO-COM485 at either COM1 or COM2, you must disable or remove the COM hardware currently installed for that port number.

Some computers, especially older computers, have a board with one or more COM ports installed. Some computers come with COM ports designed into the motherboard. Refer to your computer's owner's manual to determine which type you have.

If the COM ports in your computer are on a separate board you may be able to disable only that COM port (COM1 or COM2) which would conflict with your choice for the CIO-COM485. If you cannot disable the COM port on the board, you could remove the board from the computer.

If the COM ports in your computer are built into the motherboard you will be able to disable one or both either by switches and jumpers on the motherboard, or through ROM BIOS setup.

For example, the ZEOS Ambra computer comes equipped with two serial ports set for COM1 and COM2. These can be disabled individually by jumper settings on the motherboard. Another of our computers allows you to enable or disable the COM ports via the BIOS setup options which are available by pressing F2 while the computer is booting up.

However your computer works, you must have only one COM device per COM address/interrupt. If you have two, neither will work.

2.5 Cabling

Cabling to the CIO-COM485 is via a 9-pin, D-type female connector. The C9FM-# or C9MM-# cables are compatible with these connectors.

Figure 2-3 is a sample RS485 cable with power to a remote module. Multiple modules may be added to the RS485 link.

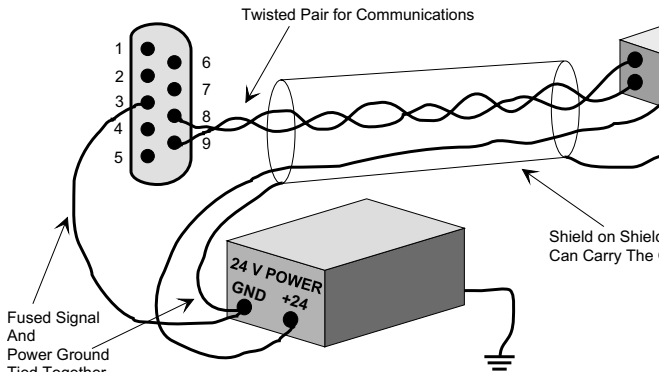
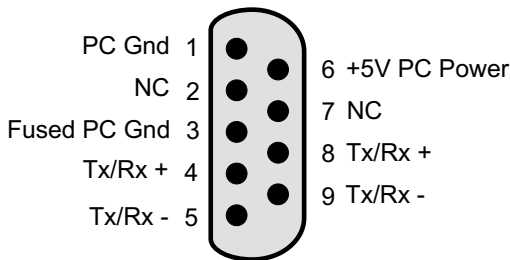


Figure 2-3. RS485 Cable CIO-COM485 to Remote Module

The pin assignments of this connector are shown in Figure 4. Note: Pins 4 and 8 and pins 5 and 9 are tied together on the board. Only three wires are needed for RS-485 communication. One must be connected to pins 4/8 and the other to pins 5 or 9 to provide the differential communication line. The third wire is for a ground reference.

We strongly recommend that you use the fused ground for the signal ground line. This fuse will protect the CIO-COM485 and the computer from earth ground differences, voltage spikes and transients which could subject the CIO-COM485 to potentially hundreds of volts!

If remote data acquisition modules are being used with the CIO-COM485, those should be powered through a separate power supply. The power supplies for all devices connected to a CIO-COM485 should share the same earth ground.



NOTES:

- Pins 4 & 8 and pins 5 & 9 are hardwired together on the board.
- Pin 1 is directly connected to PC ground
- Pin 6 is directly connected to PC +5 power. No more than 1 Amp should be drawn from this pin.
- Pin 3 is connected to PC ground through a fuse on the board.

Caution:

Use fused ground as signal ground.

Figure 2-4. 9-Pin Board Connector w/Notes

Note that there are two 9-pin connectors on the board (Figure 5). These two connectors are wired in parallel. (A connection to pin 9 on one connector is the same as a connection to pin 9 on the other.)

There is only one communications chip on the CIO-COM485. There are two connectors to ease cabling from one PC to multiple drops on the RS-485 serial line.

If your application requires more than 31 remote devices, you will need to install a second CIO-COM485. The RS485 standard supports up to 32 separate devices on a single transmission wire pair.

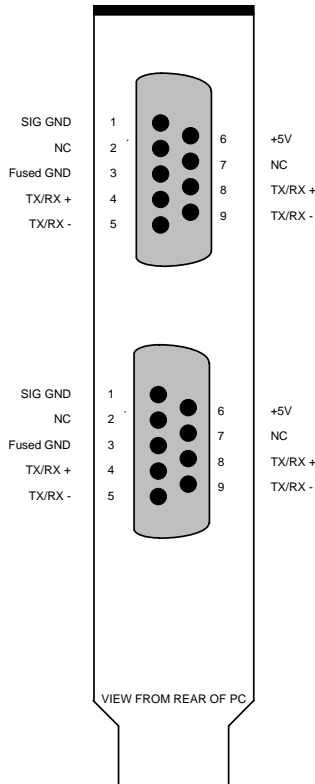


Figure 2-5. CIO-COM485 Board Connectors

3.1 Introduction and Programming Example

After installation, the CIO-COM485 operates just like any other COM port. Using the serial drivers supplied with DOS, Windows, Languages or applications programs, the CIO-COM485 handles communications with other RS422 or RS485 devices.

Here is a simple example in QuickBasic 4.5 showing how to use the CIO-COM485 board.

Program to communicate with a remote temperature module.

First configure CIO-COM485 then configure and communicate with the module.

```
BASE = &H3F8           'Base address for COM1.
TXRX = 7 + BASE       'Address of the transmit/receive register.
TX = 2                'Bit to turn on transmitter.
RX = 1                'Bit to turn on receiver.
OPEN "COM1:9600" AS #1 'Set up CIO-COM485 as standard
                       'COM1.
OUT TXRX, TX          'Enable COM1 at a transmitter.
CMD$ = "%01020E0600" 'Configure module.
PRINT #1, CMD$        'Send the configuration data.
OUT TXRX, RX          'Set CIO-COM485 to receive.
GOSUB DELAY           'Wait for module to configure.
RESULT$ = INPUT$(4, #1) 'Read back configuration result.
OUT TXRX, TX
CMD$ = "@02LO+090.00" 'Configure low alarm limit to 90oC.
PRINT #1, CMD$
GOSUB DELAY
```

The remote module is also an RS485 device. While idle, it is configured as a receiver. After it receives a command (and if that command entails a response) the module becomes a transmitter, transmits status or data, then switches back to the receiver mode.

You can see from the program flow that the CIO-COM485 has to switch back and forth from transmitter to receiver. Also, you must be aware of the constraints of the remote device(s) you are working with. In this case, a subroutine called DELAY provides an adequate delay to allow the remote module to settle back into receiver state.

RS485 communications require that you understand the devices you are working with and program accordingly.

3.2 Transmitter/Receiver Enable Register

The BASE + 7 Transmitter/Receiver Enable Register controls the transceivers on the CIO-COM485. There are only two bits in this 8-bit register which control the orientation of the CIO-COM485 transceivers.

Setting the first bit to one turns on the receivers. Setting the second bit to one turns on the transmitters. Turning both on (writing a “3” to the register) turns on both the receiver and transmitter. This mode will echo back everything written even when no cable is in place.

Note: the default value for this register is 0.

You must write to BASE + 7 and enable one of the transceivers before the CIO-COM485 can communicate with other RS485 devices.

BASE + 7 - Control Register (Byte, Write Only)

7	6	5	4	3	2	1	0
X	X	X	X	X	X	XMTR	RCVR

<u>XMTR</u>	<u>RCVR</u>	<u>Transmitter</u>	<u>Receiver</u>
0	0	Disabled	Disabled
1	0	Enabled	Disabled
0	1	Disabled	Enabled
1	1	Enabled	Enabled

Figure 3-1 is a functional block diagram of the CIO-COM485 card.

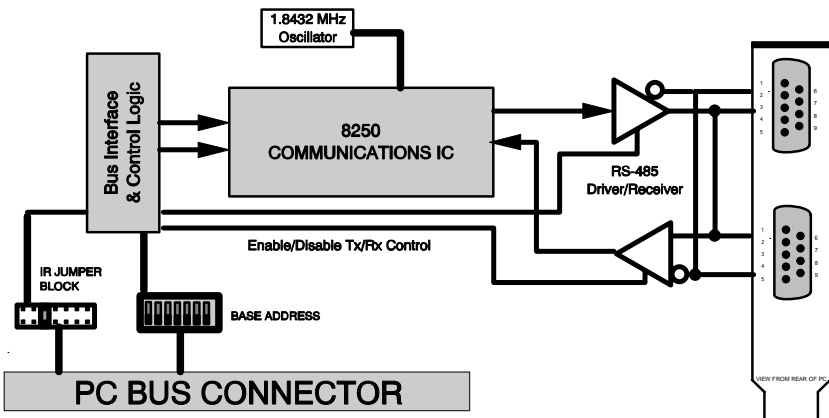


Figure 3-1. CIO-COM485 Functional Block Diagram

For Your Notes

For your notes.

EC Declaration of Conformity

We, Measurement Computing Corporation, declare under sole responsibility that the product:

<u>CIO-COM485</u>	<u>RS485 Serial Interface</u>
Part Number	Description

to which this declaration relates, meets the essential requirements, is in conformity with, and CE marking has been applied according to the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents:

EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.

EU 55022 Class B: Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1: EC generic immunity requirements.

IEC 801-2: Electrostatic discharge requirements for industrial process measurement and control equipment.

IEC 801-3: Radiated electromagnetic field requirements for industrial process measurements and control equipment.

IEC 801-4: Electrically fast transients for industrial process measurement and control equipment.

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