INDUSTRIAL COMPUTER SOURCE®

Model ULTRA-485
Product Manual

MANUAL NUMBER : 00750-006-4B

INDUSTRIAL COMPUTER SOURCE®

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FORWARD

This product manual provides information to install, operate and or program the referenced product(s) manufactured or distributed by Industrial Computer Source. The following pages contain information regarding the warranty and repair policies.

Technical assistance is available at: **1-800-480-0044**.

Manual Errors, Omissions and Bugs: A "Bug Sheet" is included as the last page of this manual. Please use the "Bug Sheet" if you experience any problems with the manual that requires correction.

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In order to receive refund on a product purchase price, the product must not have been damaged by the customer or by the common carrier chosen by the customer to return the goods, and the product must be returned complete (meaning all manuals, software, cables, etc.) within 30 days of receipt and in as-new and resalable condition. The **Return Procedure** must be followed to assure prompt refund.

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One year limited warranty on all products sold with the exception of the "Performance Series" I/O products, which are warranted to the original purchaser, for as long as they own the product, subject to all other conditions below, including those regarding neglect, misuse and acts of God. Within one year of purchase, Industrial Computer Source will repair or replace, at our option, any defective product. At any time after one year, we will repair or replace, at our option, any defective "Performance Series" I/O product sold. This does not include products damaged in shipment, or damaged through customer neglect or misuse. Industrial Computer Source will service the warranty for all standard catalog products for the first year from the date of shipment. After the first year, for products not manufactured by Industrial Computer Source, the remainder of the manufacturer's warranty, if any, will be serviced by the manufacturer directly.

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September 1997

Chapter 1: Installation

Introduction

The ULTRA-485 is the result of responding to customer requests for an easy to use RS-485 interface. The ULTRA-485 incorporates unique hardware circuitry that enables the RS-485 interface to appear to be an RS-232 interface, requiring no additional software drivers. Previous RS-485 interfaces required the software to "turn on" RTS to transmit and the "turn off" RTS at the end of the character. This required overhead and special interrupt processing. New operating systems such as Windows™, Windows-NT™, OS/2™ and other multi-tasking operating systems typically will not allow the user access to the low level registers of the UART chip without writing a specialized driver. Since ULTRA-485 emulates an RS-232 port, installation is as easy as picking an address and interrupt level.

The ULTRA-485 can be installed in any of the PC expansion slots, except J8 on the original IBM “XT” and Portable. Remove the PC case, remove the blank metal slot cover, and insert the board. Replace the screw, replace the case, and the installation is complete.

Note: Be sure to set the address and jumper options before installation.

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Chapter 2: Address Selection

The ULTRA-485 occupies 8 consecutive I/O locations, and looks to the PC as a standard serial port. A dip-switch (SW1) is used to set the port address options for the ULTRA-485. Be careful when selecting the port addresses as some selections may conflict with existing ports. The following table shows the addressing options available with the standard PAL. If you do not see an address option that suits your needs, please contact Inductrial Computer Source Technical Support about a custom PAL option.

Port 1 J2	**SW1** 1	**SW1** 2	**SW1** 3	**SW1** 4
Disabled	On	On	On	On
3F8	On	On	On	Off
2F8	On	On	Off	On
3E8	On	On	Off	Off
2E8	On	Off	On	On
3220	On	Off	On	Off
3228	On	Off	Off	On
4220	On	Off	Off	Off
4228	Off	On	On	On
238	Off	On	On	Off
300	Off	On	Off	On
308	Off	On	Off	Off
280	Off	Off	On	On
288	Off	Off	On	Off
290	Off	Off	Off	On
298	Off	Off	Off	Off

NOTE: Each COM: port in your system should have a unique address. Typically COM1: - COM4: addresses are 3F8, 2F8, 3E8 & 2E8 Hex

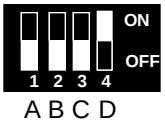

Figure 2-1: Dip-switch SW-1 (Set for address 3F8 Hex)

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Chapter 3: Option Selection

The ***ULTRA-485*** contains several jumper which must be set for proper operation.

E1: This header selects the interrupt request for the ***ULTRA-485***. If COM1: is selected, this jumper must be on the IRQ4 setting. If COM2: is selected, this jumper must be on IRQ3. Any two or more ports can share a common IRQ by placing the jumpers on the same IRQ setting, and setting the appropriate selections at E3. Consult your particular software for IRQ selection. If no interrupt is desired, remove the jumper.

NOTE: Most communications software applications default COM3: to IRQ4 and COM4: to IRQ3. This requires the sharing of interrupts between COM1: and COM3:, and between COM2: and COM4:. While this is the default, it is not always the preferred setting. Windows 3.1, OS/2 and UNIX applications typically require a separate IRQ setting for each address. Check your software configuration instructions to determine the most appropriate .

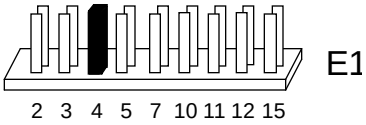


Figure 3-1: Header E1 (Factory Default) (IRQ4 Selected)

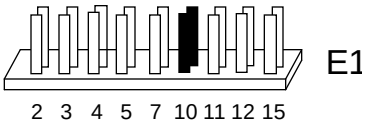


Figure 3-2: Header E1 Optional Windows 3.1 Configuration (IRQ10 Selected)

NOTE: Refer to Chapter 5 for Windows Configuration Information.

NOTE: IRQ 2 on "AT" class machines is not available. IRQ 9S is substituted in place of IRQ 2. To select IRQ 9 place the jumper on the IRQ 2 position.

E2: "**N**" indicates the (**N**)ormal, single interrupt per port mode. The "**S**" indicates the (**S**)hared interrupt mode, which allows more than one port to access a single IRQ. This is the preferred Windows and OS/2 setting.

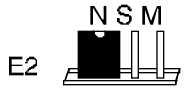


Figure 3-3: Header E2 Normal Mode

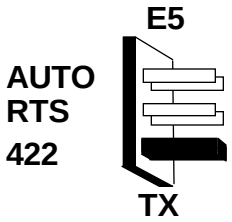
Set jumpers to "**N**" for single interrupt mode. This setting is the normal setting for most applications.

Set jumpers to "**S**" for shared interrupt mode for all ports sharing an IRQ except for one . Set one of the ports sharing an IRQ to "M". This provides the pull-down resistor circuit that makes sharing of IRQ's possible.

Figure 3-4: Header E2 "Shared Mode"

NOTE: If you are using more than one ULTRA-485 or a compatible card in a bus sharing a single interrupt, you should only have on port set to "M".

Header E5 is used to control the RS-485 enable/disable functions for the driver circuit. One of the unique features of the ***ULTRA-485*** is its ability to be RS-485 compatible without the need for special software or drivers. This is especially useful in Windows, Windows NT and OS/2 environments where the lower level I/O control is abstracted from the application program. This means that the user can effectively use the ***ULTRA-485*** in a RS-485 application with existing software drivers.



NOTE: This jumper is in the "422" position. Note that the modem control outputs are only valid when Header E5 is in the 422 mode.

Auto	Driver automatically Enabled/Disabled
RTS	Driver Enabled by UART RTS signal
422	Driver always Enabled

Figure 3-5: Header E5

Header E3 is used to control the RS-485 enable/disable functions for the receiver circuit. The RS-485 "Echo" is the result of connecting the boards receiver inputs to the transmitter outputs. Every time a character is transmitted it is also received by the board. This can be beneficial if your software can handle it (i.e. using received characters to throttle the transmitter) or it can confuse your system if it does not. The ***ULTRA-485*** provides a jumper block (E3) to enable or disable this function.

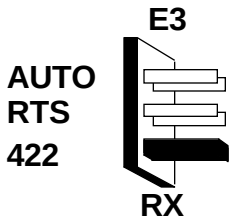


Figure 3-6: Jumper Block

NOTE: This should follow the selection made at E5 if "No Echo" is desired. If Echo suppression is not desired, then leave the jumper in the "422" position. Also note that the modem control inputs are only valid when Header E3 is in the 422 mode.

Auto	Receiver automatically Enabled/Disabled
RTS	Receiver Enabled by UART RTS signal
422	Receiver always Enabled

Figure 3-7: Header E3

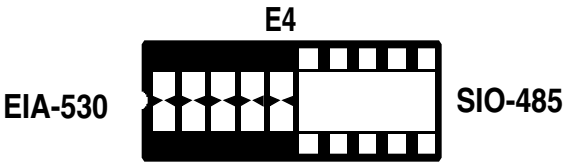


Figure 3-8: Dip-Shunt E4 (EIA-530 Mode)

Dip-shunt E4 selects the pin out for the DB-25 connector P3. With the 5 position shunt in the EIA-530 mode the ***ULTRA-485*** complies with the EIA-530 pin out with the following signals supported:

Signal		Name	Pin#	Mode
GND		Ground	7	
RDB	RX+	Receive positive	16	Input RS-422
RDA	RX-	Receive Negative	3	Input RS-422
CTSB	CTS+	Clear to Send Positive	13	Input RS-422
CTSA	CTS-	Clear to Send Negative	5	Input RS-422
DSRB	DSR+	Data Set Ready Positive	22	Input RS-422
DSRA	DSR-	Data Set Ready Negative	6	Input RS-422
DCDB	DCD+	Data Carrier Detect Positive	10	Input RS-422
DCDA	DCD-	Data Carrier Detect Negative	8	Input RS-422
TDB	TX+	Transmit Positive	14	Output RS-422
TDA	TX-	Transmit Negative	2	Output RS-422
RTSB	RTS+	Request to Send Positive	19	Output RS-422
RTSA	RTS-	Request to Send Negative	4	Output RS-422
DTRB	DTR+	Data Terminal Ready positive	23	Output RS-422
DTRA	DTR-	Data Terminal Ready Negative	20	Output RS-422

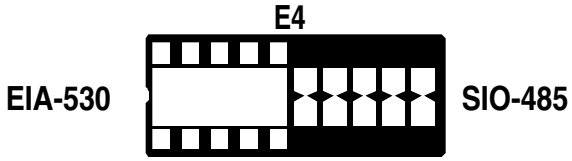


Figure 3-9: Dip-Shunt E4 (SIO-485 Mode)

With the 5 position shunt in the SIO-485 mode the ***ULTRA-485*** supports the following pin out list.

Signal		Name	Pin#	Mode
GND		Ground	7	
TDB	TX+	Transmit Positive	24	Output RS-422
TDA	TX-	Transmit Negative	25	Output RS-422
RDB	RX+	Receive positive	12	Input RS-422
RDA	RX-	Receive Negative	13	Input RS-422

RS-530 / 422 / 485 Line Termination

Typically, each end of the RS-530/422/485 bus must have line terminating resistors. A 100 ohm resistor is across each RS-530/422/485 input in addition to a 1K ohm pull-up/pull-down combination that bias the receiver inputs. Dip-switch SW2 allows the user to customize this interface to their specific requirements. Each switch corresponds to a specific portion of the interface. If multiple ***ULTRA-485*** adapters are configured in a network, only the boards on each end should have switches 1, 2 & 3 **ON.** Refer to the following table for each switch's operation:

Name	Function
T	Adds or removes the 100 ohm termination. Switch 1 ON adds the termination and OFF removes the terminations
P	Adds or removes the 1K ohm pull-up resistor in the RS-422/RS-485 receiver circuit (Receive data only). Switch 2 ON adds the 1K pull-up resistor and OFF removes the pull-up resistor.
P	Adds or removes the 1K pull-down resistor in the RS-422/RS-485 receiver circuit (Receive data only). Switch 3 ON adds the 1K pull-down resistor and OFF removes the pull-down resistor.
L	Connects the TX+ to RX+ for RS-485 two wire operation.
L	Connects the TX- to RX- for RS-485 two wire operation.

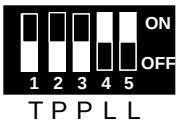


Figure 3-10: Dip-Switch SW-2

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Chapter 4: Technical Description

The ***ULTRA-485*** provides one RS-422 /485 serial port utilizing the 16550 UART. This chip features programmable baud rate, data format, interrupt control and a 16 Byte input and output FIFO.

Features Include

- Addressable as COM1: thru COM4: or twelve other pre-selected address options
- Automatic RS-485 protocol control allows card to appear to be RS-232 requiring no additional drivers
- "PAL" option allows for unique OEM address selection
- "Shareable" IRQs allow more than one port to share a single IRQ
- IRQ's 2-5, 7, 10-12, 15 supported
- 16550 buffered UARTs Standard
- 16 Bit address decode allows for easier integration

RS-422

RS-422, unlike RS-232, is a differential interface that defines voltage levels, and driver / receiver electrical specifications. On a differential interface, logic levels are defined by the difference in voltage between a pair of outputs or inputs. In contrast, a single ended interface, for example RS-232, defines the logic levels as the difference in voltage between a single signal and a common ground connection. Differential interfaces are typically more immune to noise or voltage spikes that may occur on the communication lines. Differential interfaces also have greater drive capabilities that allow for longer cable lengths. RS-422 is rated up to 10 Megabits per second and can have cabling 4000 feet long. RS-422 also defines driver and receiver electrical characteristics that will allow 1 driver and up to 32 receivers on the line at once. RS-422 signal levels range from 0 to +5 volts. RS-422 does not define a physical connector.

RS-530 and RS-449

RS-530 and RS-449 (a.k.a. EIA-530 and EIA-449) are similar to RS-422 and RS-485 in the fact that they are differential interfaces, but these two standards provide a specified pin-out that defines a full set of modem control signals that can be used for regulating flow control and line status. RS-449 is defined on a standard 37 pin D sub connector while RS-530 is backwardly compatible and is replacing RS-449. RS-530 is defined on a 25 pin D sub connector.

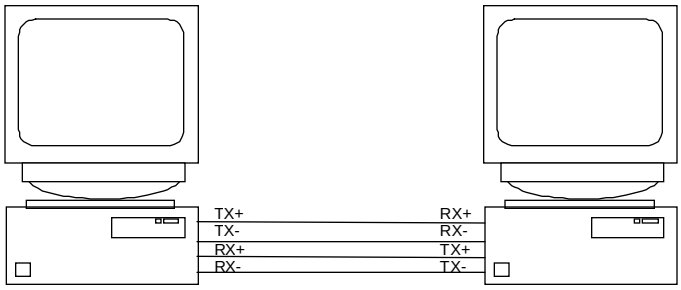

Figure 4-1: RS-422/530 Example

RS-485

This interface is very similar to RS-422 is several ways. RS-485 is a differential interface that allows cable lengths up to 4000 feet and data rates up to 10 Megabits per second. The signal levels for RS-485 are the same as those defined by RS-422. RS-485 has electrical characteristics that allow for 32 drivers and 32 receivers to be connected to one line. This interface is ideal for multi-drop or network environments. The RS-485 tri-state driver (not dual-state) will allow the electrical presence of the driver to be removed from the line. The driver is in a tri-state or high impedance condition when not active. Only one driver may be active at a time and the other driver(s) must be tri-stated. Some communication software packages refer to RS-485 as RTS enable or RTS block mode transfer. RS-485 can be cabled in two ways, two wire and four wire mode. Two wire mode does not allow for full duplex communication. Two wire mode requires that data be transferred in only one direction at a time and the two transmit pins should be connected to the two receive pins (Tx+ to Rx+ and Tx- to Rx-). Four wire mode will allow full duplex data transfers. RS-485 does not define a connector pin-out , modem control signals, or a physical connector.

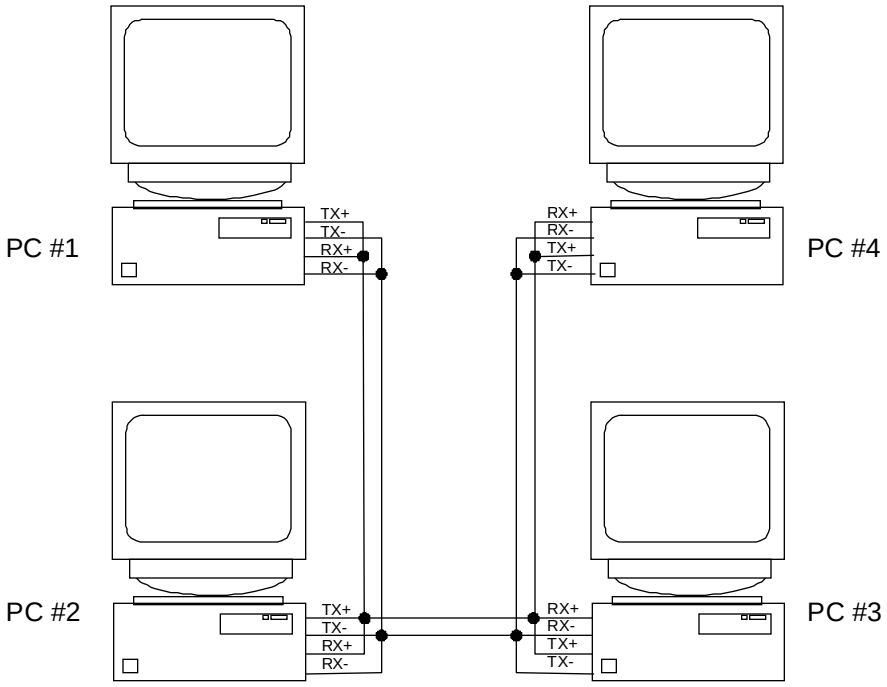

Figure 4-2: RS-485 Two wire Example

How to remain CE Compliant

In order for machines to remain CE compliant, only CE compliant parts may be used. To keep a chassis compliant it must contain only compliant cards, and for cards to remain compliant they must be used in compliant chassis. Any modifications made to the equipment may affect the CE compliance standards and should not be done unless approved in writing by Industrial Computer Source.

The Model ULTRA-485 is designed to be CE Compliant when used in an CE compliant chassis. Maintaining CE Compliance also requires proper cabling and termination techniques. The user is advised to follow proper cabling techniques from sensor to interface to ensure a complete CE Compliant system. Industrial Computer Source does not offer engineering services for designing cabling or termination systems. Although Industrial Computer Source offers accessory cables and termination panels, it is the user's responsibility to ensure they are installed with proper shielding to maintain CE Compliance.

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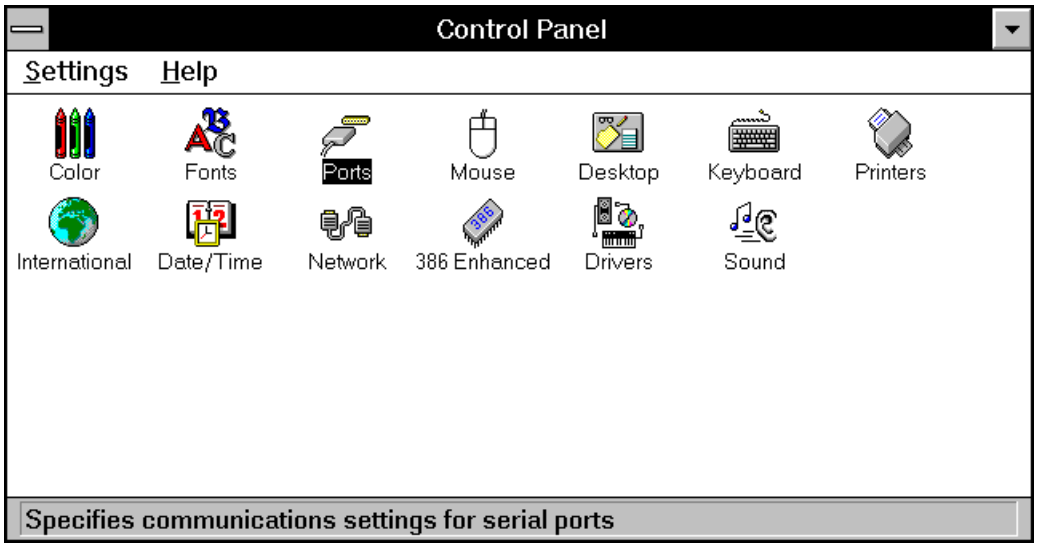
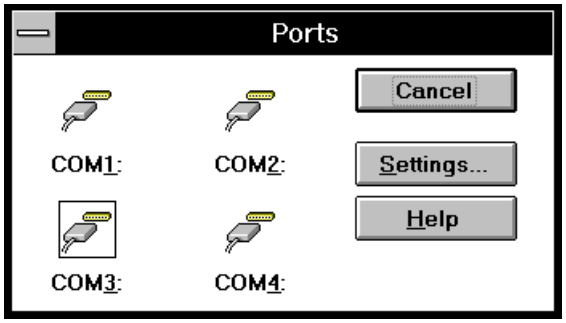
Chapter 5: Windows 3.1 Setup

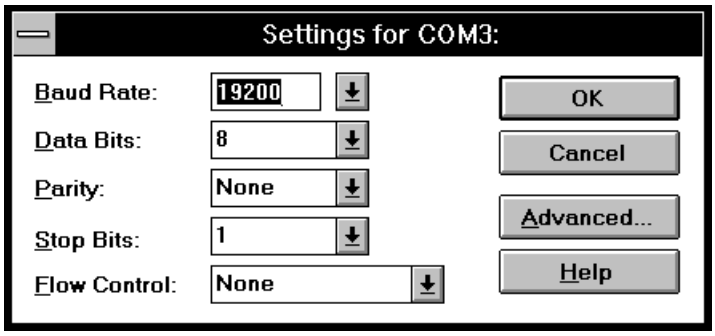
To configure the ***ULTRA-485*** under Windows 3.1 start by opening the "**Control Panel**". The Control Panel is typically found in the "**Main**" Program Group. The next step is to open the "**Ports**" selection under the **Control Panel**.



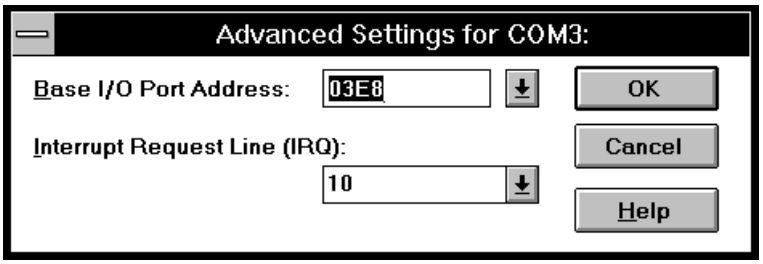
Select the port you wish to configure. Once you have selected the port, click on the "**Settings**" button.



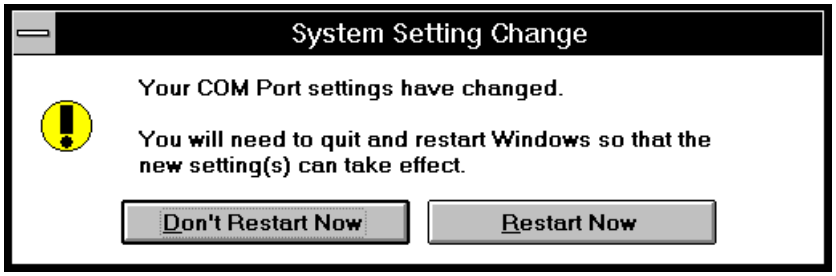
The next step is to select the appropriate Baud Rate, Data Bits, Parity, Stop Bits and Flow Control.



If you wish to select an IRQ or address different than the default click on the "**Advanced**" button.



Select "OK" for all windows after you have made your selection. The following message should appear:



If you wish to configure another COM: Port setting, select the "**Don't Restart Now**" button and repeat this procedure until you have configured all new ports. To make the changes take effect immediately select the "**Restart Now**" button.

Chapter 6: Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0° to 50° C 32° to 122° F	-20° to 70° C -40° to 100° F
Humidity Range	0 to 90% R.H Non-Condensing	0 to 90% R.H Non-Condensing

Performance Specifications

MTBF > 150,000 Hours

MTTR < .25 Hours

Turnaround For Repair - 5 Working Days

Manufacturing Specifications

- IPC 610-A Class-III standards adhered to with a 0.1 visual A.Q.L. and 100% Functional Testing.
- Boards are built to U.L. 94V0 rating and are 100% Electrically tested. Boards are solder mask over bare copper or solder mask over tin nickel.

Power Specifications

Supply Line	5
Rating (mA)	160mA

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Appendix A: Troubleshooting

Please follow these steps in identifying common installation problems with your card/system:

Problem	How to identify the problem	Solution	Reason
Computer does not recognize any COM: ports or the system is "Dead" or non-responsive	Use the SSD.com Program (found on your utility diskette).	Identify all COM: ports installed in your computer and address the ULTRA-485 at a different address from those already present.	Only one device can occupy an address location. If more than one device tries to share an address space, a conflict will occur preventing either device from working.
The address of the ULTRA-485 is not being recognized by the system.	Use the SSD.com Program (found on your utility diskette).	Verify that the ULTRA-485 addresses are correctly set.	If the board is incorrectly addressed, your application will-not respond.
The ULTRA-485 transmits but does not receive.The other side appears to receive but you do not receive any characters in your application.	Verify that the IRQ is set properly on your ULTRA-485 and is correctly set in your application program.	Change the IRQ's so that they are correct.	Most DOS application programs are "Interupt Driven" on receive. If the IRQ is not set on the card to match those required by your application, it will not receive characters because the interupt for the first character cannot be serviced.
When using Windows 3.1, only 2 ports at any time are functional.	Verify that all ports have a seperate interrupt, or if sharing interrupts, only one device is using the IRQ at a time.	Change the IRq's so that each port has its own unique interrupt (the preferred setting) or close each port before trying to open the next.	The Windows communication driver does not support simultaneuos operation of shared interrupts.
In Windows 3.1, the Mouse hangs or moves erratically.	Verify that the Mouse is not sharing an interrupt with any other port or devices.	Change the IRQ of your Mouse port so that it does not share an interrupt. Most mice only operate on either COM1: or COM2: using IRQ 4and 3 respectively. This is a limitation of a Mouse Driver.	A Mouse is an interrupt "HOG". Any movement or button pressing on the Mouse causes an interrupt.

Problem	How to identify the problem	Solution	Reason
The applications requires that the Modem Control signals be "ON" or "Active" but they are not connected in my cable.	Check the pin out of your cable and the device you are connected to.	The unused modem control signals are baised "ON" on the board	
MSD (Microsoft Diagnostics) does not report the ports on the ULTRA-485	Verify that the ULTRA-485 addresses are correctly set.	Use the program SETCOM (found on your utility diskette to install additional ports)	MSD only reports the serial ports found by the BIOS. Older BIOS install only COM1: or COM2: Newer BIOS's will install up to four ports, but only if the traditionall COM: port addresses are used.
The ULTRA-485 is setup to use the "AT" interrupts but I do not get any interrupt response.	Verify that the interrupt jumpers are correctly set. Verify that the card is inserted into a 16-bit or "AT" slot.	Use the program SLT (found on the utility diskette) to verify that the interrupts are set correctly. (Note that SLT requires that the transmit and receive signals on the connector be "looped back" or connected together. This can be accomplished by setting SW-2, 4 & 5 on)	"AT" IRQs are not found on the 8-bit slots, only on 16-bit slots. The higher level interrupts can never be used in an "XT" compatible system or if the board is installed in an 8-bit slot.

Declaration of Conformity

INDUSTRIAL COMPUTER SOURCE®

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(800) 523-2320

Industrial Computer Source declares under its own and full responsibility that the following products are compliant with the protection requirements of the 89/336/EEC directives.

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ULTRA-485 ULTRA-485/650

Conformity is accomplished by meeting the requirements of the following European harmonized standards:

EN 50082-1:1992	EMC Generic Immunity Standard
EN 55022:1987	Limits & Methods of measurement of interference characteristics of IT Equipment
EN 60 950	Safety of Information Technology Equipment Including Electrical Business Equipment

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September 11, 1997
San Diego, CA

Mr. Steven R. Peltier
President & Chief Executive Officer

BUG REPORT

While we have tried to assure this manual is error free, it is a fact of life that works of man have errors. We request you to detail any errors you find on this BUG REPORT and return it to us. We will correct the errors/problems and send you a new manual as soon as available. Please return to:

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Please list the page numbers and errors found. Thank you!