



INDUSTRIAL COMPUTER SOURCE[®]

Model SPRT2A/AT Product Manual

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INDUSTRIAL COMPUTER SOURCE[®]



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FOREWORD

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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The limited warranty is void if the product has been subjected to alteration, neglect, misuse, or abuse; if any repairs have been attempted by anyone other than Industrial Computer Source or its authorized agent; or if the failure is caused by accident, acts of God, or other causes beyond the control of Industrial Computer Source or the manufacturer. Neglect, misuse, and abuse shall include any installation, operation, or maintenance of the product other than in accordance with the owners' manual.

No agent, dealer, distributor, service company, or other party is authorized to change, modify, or extend the terms of this Limited Warranty in any manner whatsoever. Industrial Computer Source reserves the right to make changes or improvements in any product without incurring any obligation to similarly alter products previously purchased.



Shipments not in compliance with this Guarantee and Limited Warranty Return Policy will not be accepted by Industrial Computer Source.

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For any Limited Warranty or Guarantee return, please contact Industrial Computer Source's Customer Service at **1-800-480-0044** and obtain a Return Material Authorization (RMA) Number. All product(s) returned to Industrial Computer Source for service or credit **must** be accompanied by a Return Material Authorization (RMA) Number. Freight on all returned items **must** be prepaid by the customer who is responsible for any loss or damage caused by common carrier in transit. Returns for Warranty **must** include a Failure Report for each unit, by serial number(s), as well as a copy of the original invoice showing date of purchase.

To reduce risk of damage, returns of product must be in an Industrial Computer Source shipping container. If the original container has been lost or damaged, new shipping containers may be obtained from Industrial Computer Source Customer Service at a nominal cost.

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In no event shall Industrial Computer Source be liable for any defect in hardware or software or loss or inadequacy of data of any kind, or for any direct, indirect, incidental, or consequential damages in connection with or arising out of the performance or use of any product furnished hereunder. Industrial Computer Source liability shall in no event exceed the purchase price of the product purchased hereunder. The foregoing limitation of liability shall be equally applicable to any service provided by Industrial Computer Source or its authorized agent.

Some *Sales Items* and *Customized Systems* are **not** subject to the guarantee and limited warranty. However, in these instances any deviations will be disclosed prior to sales and noted in the original invoice. ***Industrial Computer Source reserves the right to refuse returns or credits on software or special order items.***

Advisories

Three types of advisories are used throughout the manual to stress important points or warn of potential hazards to the user or the system. They are the Note, the Caution, and the Warning. Following is an example of each type of advisory:

Note: The note is used to present special instruction, or to provide extra information which may help to simplify the use of the product.



CAUTION!



A Caution is used to alert you to a situation which if ignored may cause injury or damage equipment.



WARNING!



A Warning is used to alert you of a situation which if ignored will cause serious injury.

Cautions and Warnings are accented with triangular symbols. The exclamation symbol is used in all cautions and warnings to help alert you to the important instructions. The lightning flash symbol is used on the left hand side of a caution or a warning if the advisory relates to the presence of voltage which may be of sufficient magnitude to cause electrical shock.

Use caution when servicing any electrical component. We have tried to identify the areas which may pose a Caution or Warning condition in this manual; however, Industrial Computer Source does not claim to have covered all situations which might require the use of a Caution or Warning.

You must refer to the documentation for any component you install into a computer system to insure proper precautions and procedures are followed.

Table of Contents

FOREWORD	iii
Guarantee	iv
Limited Warranty	iv
Return Procedure	v
Limitation of Liability	v
Advisories	vi
Chapter 1: Introduction	1
Overview	1
What's Included	1
Factory Default Settings	1
Chapter 2: Card Setup	3
Address Selection	3
Port Enable / Disable	4
IRQ Selection	4
Interrupt Modes	4
Headers E2 & E4	5
Headers E1 & E3	5
Chapter 3: Installation	7
Chapter 4: Technical Description	9
Features	9
Modem Control Signal Considerations	9
Line Termination	9
Connector Pin Assignments	9
Chapter 5: Specifications	11
Environmental Specifications	11
Temperature Range	11
Humidity Range	11
Appendix A: Troubleshooting	13
Appendix B: Electrical Interface	15
RS-232	15
RS-422	15
RS-485	16
Appendix C: Asynchronous Communications	17
Appendix D: Silk-Screen	19

CE Declaration of Conformity

List of Figures

Figure 1: DIP-Switch Illustration	3
Figure 2: Header E6, IRQ Selection (Factory Default)	4
Figure 3: Header E5, IRQ Mode Selection	5
Figure 4: Header E1 and E3, Interface Selection Options	5
Figure 5: Interface Option Examples	6
Figure 6: Asynchronous Communications Bit Diagram	17

List of Tables

Table 1: Address Selection Table	3
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Chapter 1: Introduction

Overview

The **SPRT2A/AT** provides the PC with two async serial ports which can interface to RS-232, RS-422, or RS-485.

What's Included

The **SPRT2A/AT** is shipped with the following items. If any of these items are missing or damaged, contact the supplier.

- **SPRT2A/AT** Serial I/O Adapter
- 3.5" Serial Utility Diskette
- User Manual

Factory Default Settings

The **SPRT2A/AT** factory default settings are as follows:

Port #	Base Address	IRQ	Electrical Specification
Port 1	3F8	4	RS-422
Port 2	2F8	3	RS-422

To install the **SPRT2A/AT** using factory default settings, refer to Installation on page 1.

For your reference, record installed **SPRT2A/AT** settings below:

Port #	Base Address	IRQ	Electrical Specification
---------------	---------------------	------------	---------------------------------

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Chapter 2: Card Setup

The **SPRT2A/AT** contains several jumper straps which must be set for proper operation.

Address Selection

Each port on the **SPRT2A/AT** occupies 8 consecutive I/O locations. A DIP-switch is used to set the base address for these locations. Be careful when selecting the base address as some selections conflict with existing ports. The following table shows several examples that typically do not cause a conflict. SW1 sets the I/O address for port 1 of the **SPRT2A/AT** and SW2 sets the address for port 2.

Address	Binary		Switch Position Setting							
	Hex	A9	A0	1	2	3	4	5	6	7
280-287	1010000XXX	Off	On	Off	On	On	On	On	On	On
2A0-2A7	1010100XXX	Off	On	Off	On	Off	On	On	On	On
2E8-2EF	1011101XXX	Off	On	Off	Off	Off	Off	On	Off	Off
2F8-2FF	1011111XXX	Off	On	Off	Off	Off	Off	Off	Off	Off
3E8-3EF	1111101XXX	Off	Off	Off	Off	Off	Off	On	Off	Off
300-307	1100000XXX	Off	Off	On	On	On	On	On	On	On
328-32F	1100101XXX	Off	Off	On	On	Off	On	On	Off	Off
3F8-3FF	1111111XXX	Off	Off	Off	Off	Off	Off	Off	Off	Off

Table 1: Address Selection Table

The following illustration shows the correlation between the DIP-switch setting and the address bits used to determine the base address. In the example below, address 300 Hex is selected as a base. Address 300 in binary is XX11 0000 0XXX where X = a non-selectable address bit.

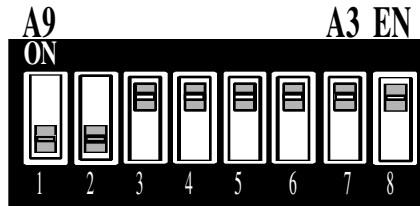


Figure 1: DIP-Switch Illustration

Note: Setting the switch “On” or “Closed” corresponds to a “0” in the address, while leaving it “Off” or “Open” corresponds to a “1”.

Refer to Appendix A for common address contentions.

Port Enable / Disable

Each port on the **SPRT2A/AT** can be enabled or disabled with switch position 8 on the DIP-switch. The port is enabled with the switch “On” or “Closed” and disabled when “Off” or “Open”. If any port is disabled, be sure to disable the interrupt request for that port by removing the IRQ jumper.

IRQ Selection

Header E6 selects the interrupt request for each serial port. If COM1: is selected, the corresponding jumper must be on the IRQ4 setting. If COM2: is selected, the corresponding jumper must be on IRQ3.

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. Check your software configuration instructions to determine the most appropriate IRQ selection.

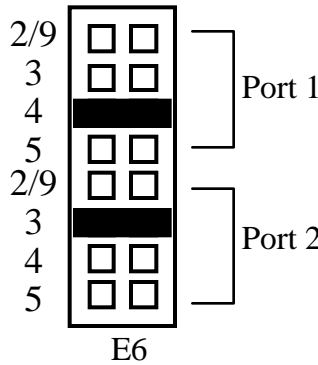


Figure 2: Header E6, IRQ Selection (Factory Default)

Note: The actual Silk-Screen for the **SPRT2A/AT** may have a “2” in place of the IRQ “2/9” selection.

Any two or more ports can share a common IRQ by placing the jumpers on the same IRQ setting at header E6, and setting the appropriate selections at E5. Consult your particular software for IRQ selection. If no interrupt is desired, remove the jumper.

Interrupt Modes

Jumper block E5 allows you to select a single interrupt per port mode or a shared interrupt mode. The single interrupt per port mode is the typical DOS, O/S 2 and Windows 3.X mode of operation.

The shared interrupt mode, which allows more than one port to access a single IRQ, indicates the inclusion of a 1K ohm pull-down resistor required on one port when sharing interrupts. This mode is used by software that requires COM3: and COM4: to share interrupts with COM1: and COM2: (see note on E6) or in an OEM configuration to support a specific software application.

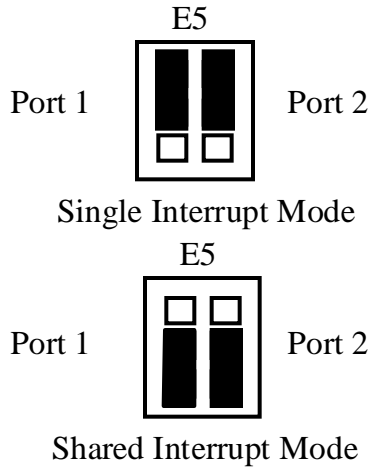


Figure 3: Header E5, IRQ Mode Selection

Headers E2 & E4

These jumper blocks make the connection between the UART pins and the actual driver/receiver pair that are used. If you are using the RS-232 driver/receiver pair, all eight of these jumpers will be in the “A” position. If you are using the RS-422 driver/receiver pair all eight of these jumpers will be in the “B” position.

Headers E1 & E3

These jumper blocks allow you to customize your interface in the following ways:

- Select if Modem control signals are used or tied “True”.
- Select the RS-485 enable option.
- Select whether the Ground connection is a *Direct Ground* or a *High Impedance Ground* through a 100-ohm resistor.

E1 & E3			
	A	B	
1	<input type="checkbox"/>	<input type="checkbox"/>	"A" Selects RS-232 Receive Data; "B" Selects RS-422 Receive Data
2	<input type="checkbox"/>	<input type="checkbox"/>	"A" Enables CTS; Remove to set Active
3	<input type="checkbox"/>	<input type="checkbox"/>	"A" Enables DSR; "B" sets DSR Active
4	<input type="checkbox"/>	<input type="checkbox"/>	"A" Enables DCD; "B" sets DCD Active
5	<input type="checkbox"/>	<input type="checkbox"/>	"A" Enables RI; "B" Sets RI Active
6	<input type="checkbox"/>	<input type="checkbox"/>	"A" Also required to Enable CTS; "B" Sets CTS Active
7	<input type="checkbox"/>	<input type="checkbox"/>	"B" sets RS-485 Driver Enabled by RTS; "A" RS-485 Driver always Enabled
8	<input type="checkbox"/>	<input type="checkbox"/>	"B" Selects Direct Ground; "A" Selects 100 ohm High Impedance Ground

Figure 4: Header E1 and E3, Interface Selection Options

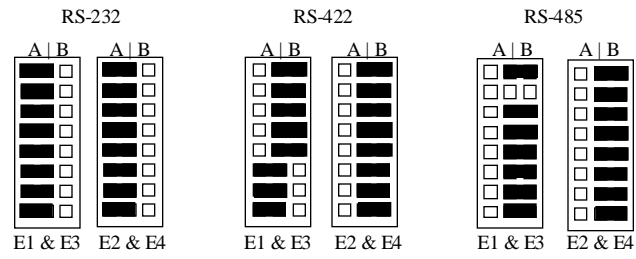


Figure 5: Interface Option Examples

Chapter 3: Installation

The **SPRT2A/AT** can be installed in any of the PC expansion slots. The **SPRT2A/AT** contains several jumper straps for each port which must be set for proper operation.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover.
3. Locate an available slot and remove the blank metal slot cover.
4. Gently insert the **SPRT2A/AT** into the slot. Make sure that the adapter is seated properly.
5. Replace the screw.
6. Replace the cover.
7. Connect the power cord.

Installation is complete.

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Chapter 4: Technical Description

The **SPRT2A/AT** adapter utilizes the 16550 UART chip. This chip features programmable baud rate, data format, interrupt control and has a 16 byte transmit and receive FIFO.

Features

- Full independent operation of ports allowing two ports RS-232, two ports RS-422/485 or one port of each.
- Addressable as COM1: - COM4: or any other I/O address up to 3FF Hex.
- “Shareable” IRQs allow more than one port to share a single IRQ.
- IRQs 2/9, 3, 4, 5 supported.
- Support for non-standard baud rates available. These baud rates (such as 31.25K or 76.8K baud) are supported by installing a different oscillator.

Modem Control Signal Considerations

Some software packages require the use of the modem handshake signals such as CTS or DCD. Refer to your application software manual to determine the requirements for modem control signals. If no requirements are mentioned, a safe configuration is to tie DTR to DSR and DCD, and tie RTS to CTS. This configuration will typically satisfy the modem control signal requirements for most communications software.

Line Termination

Typically, each end of the RS-422/485 bus must have line-terminating resistors. A 100 ohm resistor is across each RS-422/485 input and a 1K ohm pull-up/pull-down combination bias the receiver inputs. If more than two RS-485 nodes are configured in a multi-drop network, only the nodes at each end of the bus should have the 100-ohm resistors installed.

Connector Pin Assignments

RS-422

Signal	Name	Pin #	Mode
GND	Ground	5	
TX +	Transmit Data Positive	4	Output
TX-	Transmit Data Negative	3	Output
RTS+	Request To Send Positive	6	Output
RTS-	Request To Send Negative	7	Output
RX+	Receive Data Positive	1	Input
RX-	Receive Data Negative	2	Input
CTS+	Clear To Send Positive	9	Input
CTS-	Clear To Send Negative	8	Input

RS-232

Signal	Name	Pin #	Mode
GND	Ground	5	
TD	Transmit Data	3	Output
RTS	Request To Send	7	Output
DTR	Data Terminal Ready	4	Output
RD	Receive Data	2	Input
CTS	Clear To Send	8	Input
DSR	Data Set Ready	6	Input
CD	Carrier Detect	1	Input
RI	Ring Indicator	9	Input

Note: These assignments meet EIA/TIA/ANSI-574 DTE for DB-9 type connectors.

Chapter 5: Specifications

Environmental Specifications

Temperature Range

Operating

0° to 50° C
(32° to 122° F)

Storage

-20° to 70° C
(-4° to 158° F)

Humidity Range

Operating

10 to 90% R.H. Non-Condensing

Storage

10 to 90% R.H. Non-Condensing

Manufacturing

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

Power Consumption

Supply line	+12 VDC	-12 VDC	+5 VDC
Rating	50 mA	50 mA	195 mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

Physical Dimensions

Board length	4.6 inches	(11.684 cm)
Board Height including Goldfingers	4.2 inches	(10.66 cm)
Board Height excluding Goldfingers	3.9 inches	(9.91 cm)

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Appendix A: Troubleshooting

A Serial Utility Diskette is supplied with the adapter and will be used in the troubleshooting procedures. By using this diskette and following these simple steps, most common problems can be eliminated without the need to call Technical Support.

1. Identify all I/O adapters currently installed in your system. This includes your on-board serial ports, controller cards, sound cards etc. The I/O addresses used by these adapters, as well as the IRQ (if any) should be identified.
2. Configure your adapter so that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address.
3. Make sure the adapter is using a unique IRQ. While the adapter does allow the sharing of IRQs, many other adapters (i.e. SCSI adapters & on-board serial ports) do not. The IRQ is typically selected via an on-board header block. Refer to the section on Card Setup for help in choosing an I/O address and IRQ.
4. Make sure the adapter is securely installed in a motherboard slot.
5. Use the supplied diskette and User Manual to verify that the adapter is configured correctly. The supplied diskette contains a diagnostic program "SSD" that will verify if an adapter is configured properly. This diagnostic program is written with the user in mind and is easy to use. Refer to the "README" file on the supplied diskette for detailed instructions on using "SSD".

1. The following are known I/O conflicts:

- The 278 and 378 settings may conflict with your printer I/O adapter.
- 3B0 cannot be used if a Monochrome adapter is installed.
- 3F8-3FF is typically reserved for COM1:
- 2F8-2FF is typically reserved for COM2:
- 3E8-3EF is typically reserved for COM3:
- 2E8-2EF is typically reserved for COM4:

2. Please refer to your included diskette for any post production manual updates and application specific information.
3. Always use the diagnostic software when Troubleshooting a problem. This will eliminate the software issue from the equation.

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Appendix B: Electrical Interface

RS-232

Quite possibly the most widely used communication standard is RS-232. This implementation has been defined and revised several times and is often referred to as RS-232 or EIA/TIA-232. The IBM PC computer defined the RS-232 port on a 9 pin D sub connector and subsequently the EIA/TIA approved this implementation as the EIA/TIA-574 standard. This standard is defined as the *9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*. Both implementations are in wide spread use and will be referred to as RS-232 in this document. RS-232 is capable of operating at data rates up to 20 Kbps at distances less than 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 often operates at 38.4 Kbps over very short distances. The voltage levels defined by RS-232 range from -12 to +12 volts. RS-232 is a single ended or unbalanced interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logic states. A voltage of +12 volts (usually +3 to +10 volts) represents a binary 0 (space) and a -12 volt (-3 to -10 volts) denotes a binary 1 (mark). The RS-232 and the EIA/TIA-574 specification define two type of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The SPRT2A/AT adapter is a DTE interface.

RS-422

The RS-422 specification defines the electrical characteristics of balanced voltage digital interface circuits. RS-422 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-485

RS-485 is backwardly compatible with RS-422; however, it is optimized for partyline or multi-drop applications. The output of the RS-422/485 driver is capable of being **Active** (enabled) or **Tri-State** (disabled). This capability allows multiple ports to be connected in a multi-drop bus and selectively polled. RS-485 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. RS-485 tri-state driver (not dual-state) will allow the electrical presence of the driver to be removed from the line. Only one driver may be active at a time and the other driver(s) must be tri-stated. The output modem control signal RTS controls the state of the driver. 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, and requires that data be transferred in only one direction at a time. For half-duplex operation, the two transmit pins should be connected to the two receive pins (Tx+ to Rx+ and Tx- to Rx-). Four wire mode allows full duplex data transfers. RS-485 does not define a connector pin-out or a set of modem control signals. RS-485 does not define a physical connector.

Appendix C: Asynchronous Communications

Serial data communications implies that individual bits of a character are transmitted consecutively to a receiver that assembles the bits back into a character. Data rate, error checking, handshaking, and character framing (start/stop bits) are pre-defined and must correspond at both the transmitting and receiving ends.

Asynchronous communications is the standard means of serial data communication for PC compatibles and PS/2 computers. The original PC was equipped with a communication or COM: port that was designed around an 8250 Universal Asynchronous Receiver Transmitter (UART). This device allows asynchronous serial data to be transferred through a simple and straightforward programming interface. Character boundaries for asynchronous communications are defined by a starting bit followed by a pre-defined number of data bits (5, 6, 7, or 8). The end of the character is defined by the transmission of a pre-defined number of stop bits (usual 1, 1.5 or 2). An extra bit used for error detection is often appended before the stop bits.

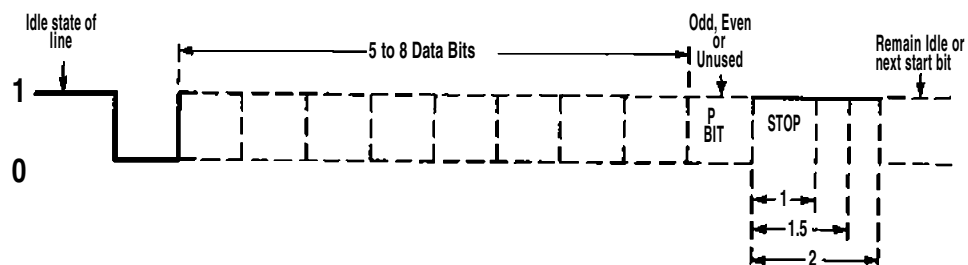
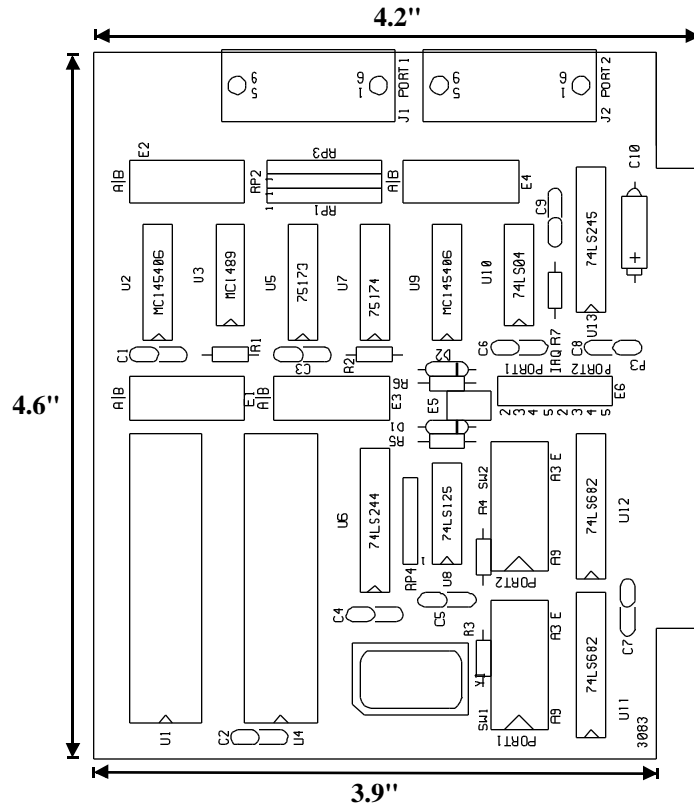


Figure 6: Asynchronous Communications Bit Diagram

This special bit is called the parity bit. Parity is a simple method of determining if a data bit has been lost or corrupted during transmission. There are several methods for implementing a parity check to guard against data corruption. Common methods are called (E)ven Parity or (O)dd Parity. Sometimes parity is not used to detect errors on the data stream. This is referred to as (N)o parity. Because each bit in asynchronous communications is sent consecutively, it is easy to generalize asynchronous communications by stating that each character is wrapped (framed) by pre-defined bits to mark the beginning and end of the serial transmission of the character. The data rate and communication parameters for asynchronous communications have to be the same at both the transmitting and receiving ends. The communication parameters are baud rate, parity, number of data bits per character, and stop bits (i.e. 9600,N,8,1).

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Appendix D: Silk-Screen



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Declaration of Conformity



6260 Sequence Drive
San Diego, CA 92121-4371
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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.

Only specific models listed on this declaration and labeled with the CE logo are CE compliant.

SPRT2A/AT

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

Information supporting this declaration is contained in the applicable Technical Construction file available from:



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Mr. Steven R. Peltier
President & Chief Executive Officer

October 28, 1997
San Diego, CA

BUG REPORT

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

