



INDUSTRIAL COMPUTER SOURCE[®]

Model SP104 Series Product Manual

MANUAL NUMBER : 00750-007-1A



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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Guarantee

A thirty day money-back guarantee is provided on all **standard** products sold. **Special order products** are covered by our Limited Warranty, *however they may not be returned for refund or credit.*

Refunds

In order to receive a full 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 **Return Procedure** must be followed to assure repair or replacement. Industrial Computer Source will normally return your replacement or repaired item via UPS Blue. *Overnight delivery or delivery via other carriers is available at additional charge.*

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.

Return Procedure

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.

Limitation of Liability

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.***

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Current Revision 1A

October 1995

Chapter 1: Introduction

Overview

The SP104 series provides the ultimate serial connection for your PC/104 application. The SP104 is available in two different interfaces, RS-232 and RS-422/485.

The RS-422/485 model SP104/422 provides an interface capable of long length, high speed communications.

The RS-232 model SP104/232 provides a standard RS-232C interface that is fully compatible with all popular modem software, network operating systems software, and mouse drivers.

What's Included

The SP104 is shipped with the following items. If any of these items are missing or damaged, contact the supplier.

- (1) SP104 Serial Interface Adapter
- (1) DB-9 cable assembly
- (1) Nylon Mounting Hardware Kit
- (1) 3.5" Serial Utility Diskette
- User Manual
- Warranty Extension Card

Factory Default Settings

The SP104 factory default settings are as follows:

	Base Address	IRQ
Port 1	3F8	4

To install the SP104 using factory default settings, refer to Installation on page 6.

For your reference, record installed SP104 settings below:

	Base Address	IRQ
Port 1		

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Chapter 2: Card Setup

The SP104 contains several jumper straps for each port which must be set for proper operation.

Address Selection

The SP104 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 the SP104.

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

Figure 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 is selected as a base. Address 300 in binary is XX11 0000 0XXX where X = a non-selectable address bit.

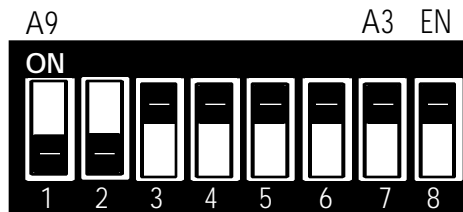


Figure 2: DIP-Switch Illustration

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

Port Enable / Disable

The port on the SP104 can be enabled or disabled with switch position 8 on the DIP-switch. The port is enabled with the switch “on” and disabled when “off” or “open” (refer to Figure 2). If the port is disabled, be sure to also disable the interrupt request for that port by removing the IRQ jumper at header J2.

IRQ Selection

The SP104 has an interrupt selection jumper which should be set prior to use, if an interrupt is required by your application software. Consult the user manual for the application software being used to determine the proper setting. Position “R” is provided so that a jumper can be installed that connects a 1K Ohm pull-down resistor to the output of a high-impedance tri-state driver which carries the IRQ signal. Because the IRQ line is driven low only by the pull-down resistor, it is possible for two or more boards to share the same IRQ signal. Position “R” installed is the default setting and should be left as is unless multiple cards are sharing a single IRQ. If multiple adapters are sharing a single IRQ, then only one adapter should have the pull-down resistor (position “R” selected) in the circuit.

The IRQ can be set at jumper J2 for IRQ 2/9, 3-5, 7, 10, 11, 12, or 15. In the following example, the IRQ is set as IRQ4.

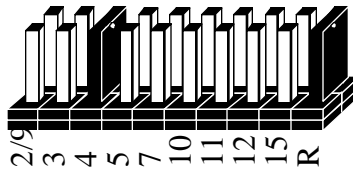


Figure 3: Header J2, IRQ Selection (Factory Default)

Note: The actual silk-screen for the SP104 may have a “2” in place of the IRQ “2/9” selection.

RS-485 Mode (RTS Enable)

J4 selects whether the RS-485 driver is enabled by the UART signal request to send (RTS) or always enabled. With the jumper installed, RTS enables the RS-485 driver. Removing the jumper enables the driver regardless of RTS. The jumper should be installed for a 2/4 wire RS-485 application where the SP104 is acting as a polled node on a multi-drop network. Remove the jumper if you are using a point to point RS-422 application such as programmable logic controllers (PLC’s), etc.

Chapter 3: Installation

Extreme care should be taken when installing this board so as not to cause damage to the connectors. After the board is installed, connect your I/O cable to J3. Please note that J3 is keyed so that pin 1 of the cable matches with pin 1 of the connector (pin 1 is labeled on the Silk-screen and the cable will have a colored stripe). Refer to Card Setup for information on setting the address and jumper options before connecting J1.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover (if applicable).
3. Gently insert the SP104 connector J1 so that it lines up pin 1 to pin of the expansion connector on a PC/104 compatible card. The SP104 adapter is keyed per the PC/104 Revision 2.1 Specification, which aids in preventing the adapter from being inserted incorrectly.
4. Mounting hardware (nylon stand-off and screws) is provided to insure a good mechanical connection. Retain any mounting hardware not used to allow for future expansion.
5. Cabling:

The cable provided is keyed and can be installed before or after the adapter is inserted in the stack.

6. Replace the cover.
7. Connect the power cord.

Installation is complete.

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Chapter 4: Technical Description

The SP104 series provides the ultimate serial connection for your PC/104 application. The SP104 utilizes the 16550 UART. This chip features programmable baud rate, data format, interrupt control and a 16 Byte input and output FIFO.

The SP104-422 is equipped with the RS-422/485 interface allowing long length, high speed communications suitable for data collection and shop floor control .

The SP104-232 provides a standard RS-232C interface that is fully compatible with the DOS operating system, all popular modem software, network operating systems software, and mouse drivers.

Features

- Selectable interrupts (IRQs) 2/9, 3, 4, 5, 7, 10, 11, 12, 15
- Multiple adapters can share the same IRQ
- 16550 UART standard
- Uses PC/104 compatible stack through connector for universal mounting
- 5 volt DC operation

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.

Connector Pin Assignments

RS-232

Signal	Name	DB-9	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.

RS-422/485

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

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

10 to 90% R.H. Non-Condensing 10 to 90% R.H. Non-Condensing

Power Consumption

Supply Line	Product	Rating (mA)
+5	SP104/422	60mA
+5	SP104/232	125mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

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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. Refer to the section on Card Setup for help in choosing an I/O address.
3. Make sure the adapter is using a unique IRQ. While the adapter does allow the sharing of IRQ's, many other adapters (i.e. SCSI adapters & on-board serial ports) may not. The ability to share IRQ's in a PC/104 system is an optional feature and does not need to be implemented to claim PC/104 compatibility/compliance. The IRQ is typically selected via an on-board header block. Refer to the section on Card Setup for help in choosing an IRQ.
4. Make sure the adapter is securely installed in a PC/104 stack .
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.txt" file on the supplied diskette for detailed instructions on using "SSD".
6. 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: This is a valid setup option for the SP104. However, since only 10 address lines are actually decoded, a possible conflict with an advanced video card emulating the IBM XGA adapter (8514 register set) may occur.

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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 -12 volts (-3 to -10 volts) denotes a binary 1 (mark). The RS-232 and the EIA/TIA-574 specification defines two type of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The adapter is a DTE interface.

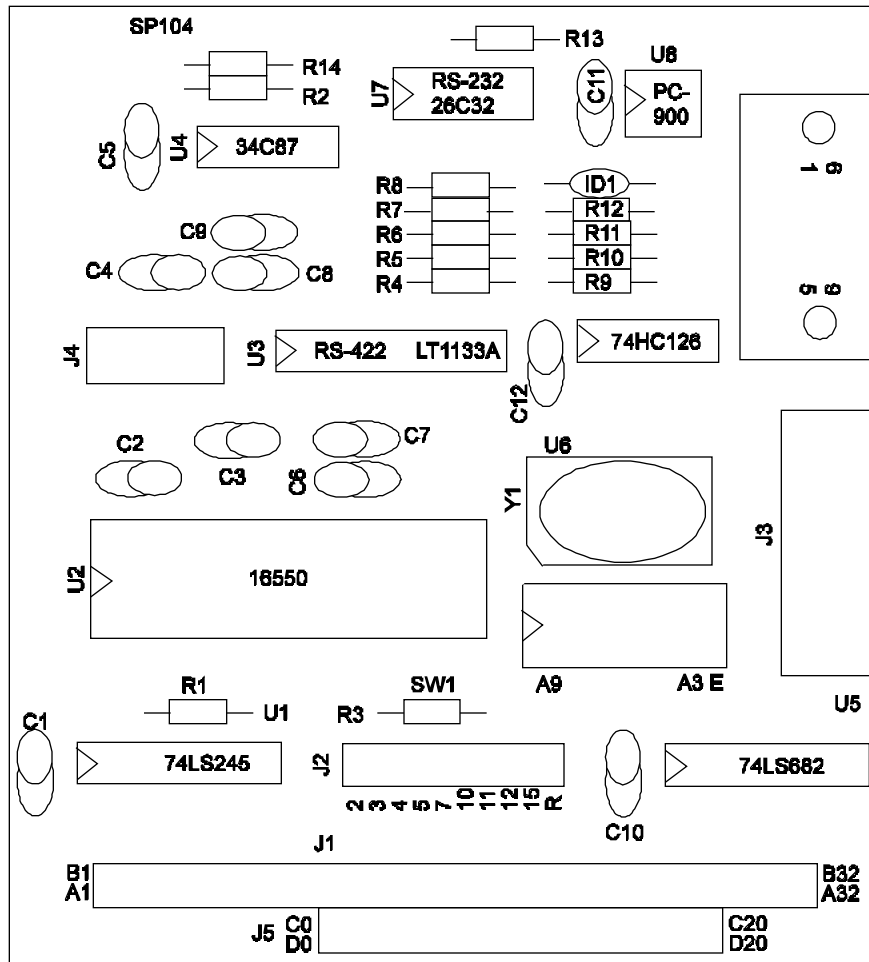
RS-422

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 Request to Send (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 - Silk-Screen



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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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