BLACK BOX®
NETWORK SERVICES

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MARCH 2000
IC603C
IC179C

Single Channel Async MIL-188 Interface

FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

TRADEMARKS USED IN THIS MANUAL

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UL is a registered trademark of Underwriters Laboratories Incorporated.

Any other trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

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1. Specifications

Number of Ports	Single MIL-188
Maximum Data Distance	Up to 5000 feet (1524 m)
Speed	IC603C: 115.2 kbps; IC179C: 460.8 kbps and above; Maximum data rate is dependent on software, CPU, and cable length.
Protocol	Asynchronous only
Connectors	(1) DB25P male
Communications Chip	IC603C: 16550 UART; IC179C: 16950 UART
System Requirements	ISA Bus
Operating Temperature	32 to 122°F (0 to 50°C)
Storage Temperature	-4 to +158°F (-20 to +70°C)
Relative Humidity	90%, noncondensing
MTBF	> 150,000 hours
MTTR	< 0.25 hour
Manufacturing	IPC 610-A CLASS-III standards adhered to with a 0.1 visual A.Q.L. and 100% Functional Testing; Boards are built to UL® 94V0 rating and are 100% electrically tested. Boards are solder mask over bare copper or solder mask over tin nickel.
Size	Half card

Shipping Weight   2 lb. (0.9 kg)

Power

Supply Line	+5 VDC	-5 VDC
Rating (mA)	750 mA	85 mA

2. Introduction

2.1 Description

The Single Channel Async MIL-188 Interface provides one asynchronous serial port with the MIL-188-C (single-ended) or MIL-188-114 (differential) communications standard interface. These interfaces are commonly used by military equipment for highly reliable data communications. This board provides jumper-selectable options for the MIL-188-C or MIL-188-114 interface.

The Single Channel Async MIL-188 Interface (part number IC603C) utilizes the same 16550 UART Chip found in the IBM® asynchronous adapter. This chip features programmable baud rate, data format, and interrupt control. Refer to the *IBM Technical Reference* for details on programming this chip. The IC179C uses the 16950 UART chip, which has a 128-byte FIFO buffer for even better performance.

The serial port can be set as COM1: or as COM2:, or as any other I/O address, providing total compatibility with most communications software and languages. MIL-188 compatible drivers and receivers are provided on the serial port.

2.2 Features

- The serial port can be addresses as COM1: through COM4: or any other I/O address up to 3FF Hex.

- IRQ lines are jumper selectable for IRQ 2-7, 10-12, and 15.

- Interrupts can be shared with other sharable IRQs.

- Interface supports the following signals: TD, RD, RTS, CTS, DSR, DCD, DTR.

- RS-530 DTE pinout implemented.

- DB25P (male) connector mounted on board bracket.

- MIL-188-C or MIL-188-114 is determined by jumper selection.

- Includes self-explaining utility software for diagnostics.

2.3 MIL-188 Specifications

2.3.1 VOLTAGE LEVELS

MIL-188-C single-ended input uses positive true logic. The normally idle, or marking, line is represented as +5 volts output. The start bit, or space condition, causes the output to switch to -5 volts.

MIL-188-114 differential transmission utilizes two wires per signal. Signal voltage is at +5, while the other signal voltage is at -5 volts.

2.3.2 LINE TERMINATION

Each receiver is terminated in a 180-ohm resistor. The drivers have 10-ohm current-limiting resistors in series with the output signal for protection.

Table 2-1. MIL-188-114 Pinout

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

Table 2-2. MIL-188-C Pinout

Signal		Name	Pin #	Mode
GND		Ground	7	
RDB	RX+	Receive Positive	16	Input
CTSB	CTS+	Clear To Send Positive	13	Input
DSRB	DSR+	Data Set Ready Positive	22	Input
DCDB	DCD+	Data Carrier Detect Positive	10	Input
TDB	TX+	Transmit Positive	14	Output
RTSB	RTS+	Request To Send Positive	19	Output
DTRB	DTR+	Data Term. Ready Positive	23	Output

3. Address Selection

The serial port on the Single Channel Async MIL-188 Interface occupies 8 consecutive I/O locations. DIP-switch SW1 sets the base address for the serial port. Be careful when selecting the base address as some selections conflict with existing PC ports. The following table shows several examples that usually do not cause a conflict.

Table 3-1. Address-Selection Table

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
2A0-2A7	1010100XXX		OFF	ON	OFF	ON	OFF	ON	ON
2E8-2EF	1011101XXX		OFF	ON	OFF	OFF	OFF	ON	OFF
2F8-2FF	1011111XXX		OFF	ON	OFF	OFF	OFF	OFF	OFF
3E8-3EF	1111101XXX		OFF	OFF	OFF	OFF	OFF	ON	OFF
300-307	1100000XXX		OFF	OFF	ON	ON	ON	ON	ON
328-32F	1100101XXX		OFF	OFF	ON	ON	OFF	ON	OFF
3F8-3FF	1111111XXX		OFF	OFF	OFF	OFF	OFF	OFF	OFF

Typically COM1: = 3F8h; COM2: = 2F8h; COM3: = 3E8h; COM4: = 2E8h.

SINGLE CHANNEL ASYNC MIL-188 INTERFACE

The following illustration shows the correlation between the DIP-switch
setting and the address bits used to determine the base address.

A9 - - - - - - - - - - - - - A3   EN

ON

1   2   3   4   5   6   7   8
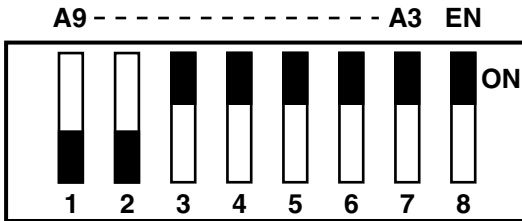
In this example, the address 300 Hex through 307 Hex is selected. 300 Hex
equals 11 0000 0XXX in binary representation.

Note that setting the switch "On" or "Closed" corresponds to a "0" in the
address, while leaving it "Off" or "Open" corresponds to a "1."

4. Option Selections

The board contains several jumper straps for each port. These jumper straps must be set for proper operation.

4.1 Port Enable/Disable

Only one port on the Single Channel Async MIL-188 Interface 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 with it "Off" or "Open." If any port is disabled, be sure to also disable the interrupt request for that port by removing the IRQ jumper (see Figure 4-1).

4.2 Interface Selection

4.2.1 E1

Determines whether the receiver interface is MIL-188-C single-ended unbalanced, or MIL-188-114 balanced differential. With the jumpers at E1 installed, MIL-188-C is selected, and the inverting receiver input is grounded. With the jumpers removed, or floating on one pin, the MIL-188-114 differential interface is selected.

NOTE

You must either install or remove all four jumpers. Any other combination of jumpers (for example, one on, three off) is not a valid combination and can cause erratic data.

4.2.2 E2

These headers select the interrupt request for the serial port. If COM1: is selected, this jumper must be on the IRQ4 setting. If COM2: is selected, this 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 best setting. Check your software's configuration instructions to determine the most appropriate IRQ selection.
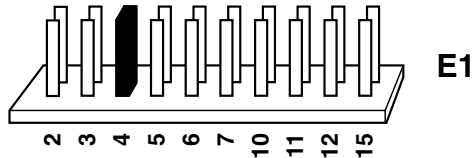

Figure 4-1. Header E2 (IRQ4 selected).

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 E4. Consult your particular software for IRQ selection. If no interrupt is desired, remove the jumper.

NOTE

IRQ2 on AT class machines is not available. IRQ9 is substituted in place of IRQ2. To select IRQ9, place the jumper on the IRQ2 position.

4.2.3 E4

"N" indicates the normal, single-interrupt-per-port mode. The "S" indicates the shared interrupt mode, which allows more than one port to access a single IRQ. The "M" indicates the inclusion of a 1-Kohm pull-down resistor required on one port when sharing interrupts.
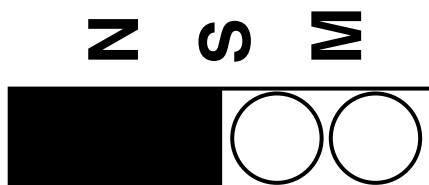
Figure 4-2. Header E4 (shown in normal mode).

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 one. Set that port block for "M." This provides the pull-down resistor circuit that makes sharing of IRQs possible. *If you are using more than one MIL-188-C/MIL-188-114 adapter or a compatible card in a bus, you should only have one port set to "M."*

Set jumper to "S" if you are using more than one Single Channel Async MIL-188 Interface in a bus or you wish to completely remove the pull-down resistor for hardware compatibility. *Setting the board in this configuration when it is not accompanied by a pull-down resistor will prevent the ports from triggering an interrupt.*

5. Installation

IMPORTANT

You MUST set up the operating system BEFORE you physically install the Card.

5.1 Software Installation

If you are installing an ISA adapter in DOS, OS/2®, or QNX, please refer to the appropriate directory on one of the Serial Utilities Disks for instructions.

5.1.1 WINDOWS 3.1X

Please refer to the /WINDOWS sub-directory on the Serial Utilities Diskette for help files and current information on the installation of the Card in this operating environment.

5.1.2 WINDOWS 95/98 USERS

For the ISA card, run setup on disk two of the Serial Utilities Diskettes before installing the card. Make note of the resources that Windows assigns the adapter, and set the adapter to match those resources. Power down the computer and install the adapter as described in **Section 5.2**. If you wish to change any resources assigned to the adapter, refer to the help file installed in the Black Box folder in the **Start, Programs** menu.

5.1.3 WINDOWS NT

For the ISA card, run setup on disk two of the Serial Utilities Diskettes before installing the card. After installing the software, refer to the help file that automatically comes up for installation instructions.

5.2 Hardware Installation

The Single Channel Async MIL-188 Interface can be installed in any of the PC expansion slots except J8 on the original IBM XT™ and Portable.

To install the card:

- Remove the PC case.

- Remove the screw holding the blank metal slot cover.

- Remove the blank metal slot cover.

- Gently insert the board.

- Replace the blank metal slot cover.

- Replace the screw.

- Replace the PC case.

Installation is complete.

Appendix. Block Diagram
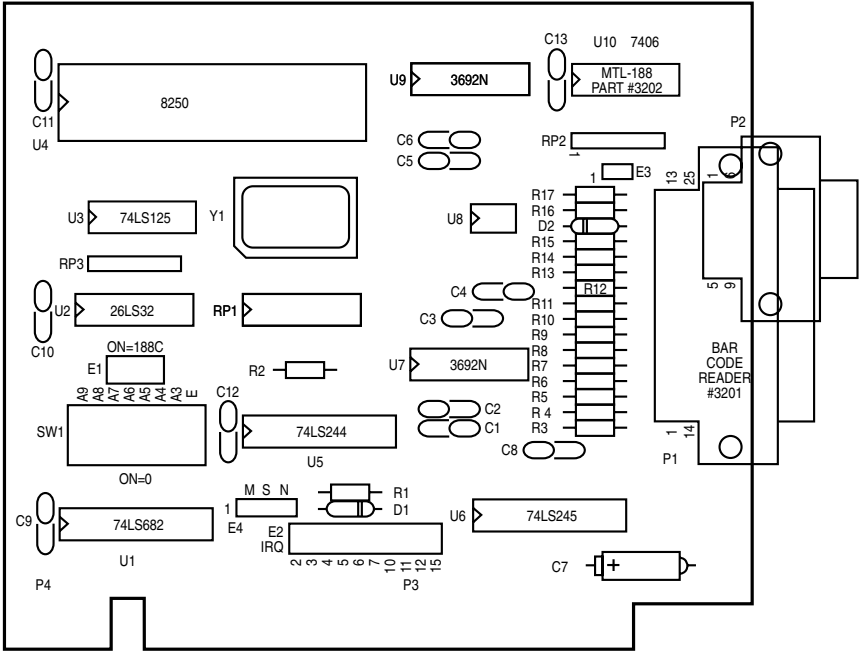
For in-depth schematic detail, call for technical support.

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