

# COMMTECH

## ***FASTCOM™ ADAPTERS***



### ***FASTCOM™: 232/4-104***

**Advanced Four Channel RS-232 Interface  
for PC/104 Bus**

**Hardware Reference Manual**

**Commtech, Inc.  
9011 E 37th St N  
Wichita KS 67226-2006**





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## REVISION NOTES

<u>REVISION</u>	<u>PAGE NUMBER</u>	<u>CHANGES MADE</u>
2.1	5	Swapped DSR and DCD on loop back plug description
2.2	14	Changed warranty to 2 years
2.3	14	Updated contact information
2.4	1,2	Changed 1.5 Mbaud to 725 Kbps
2.5	14	Changed warranty period to lifetime



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## INTRODUCTION

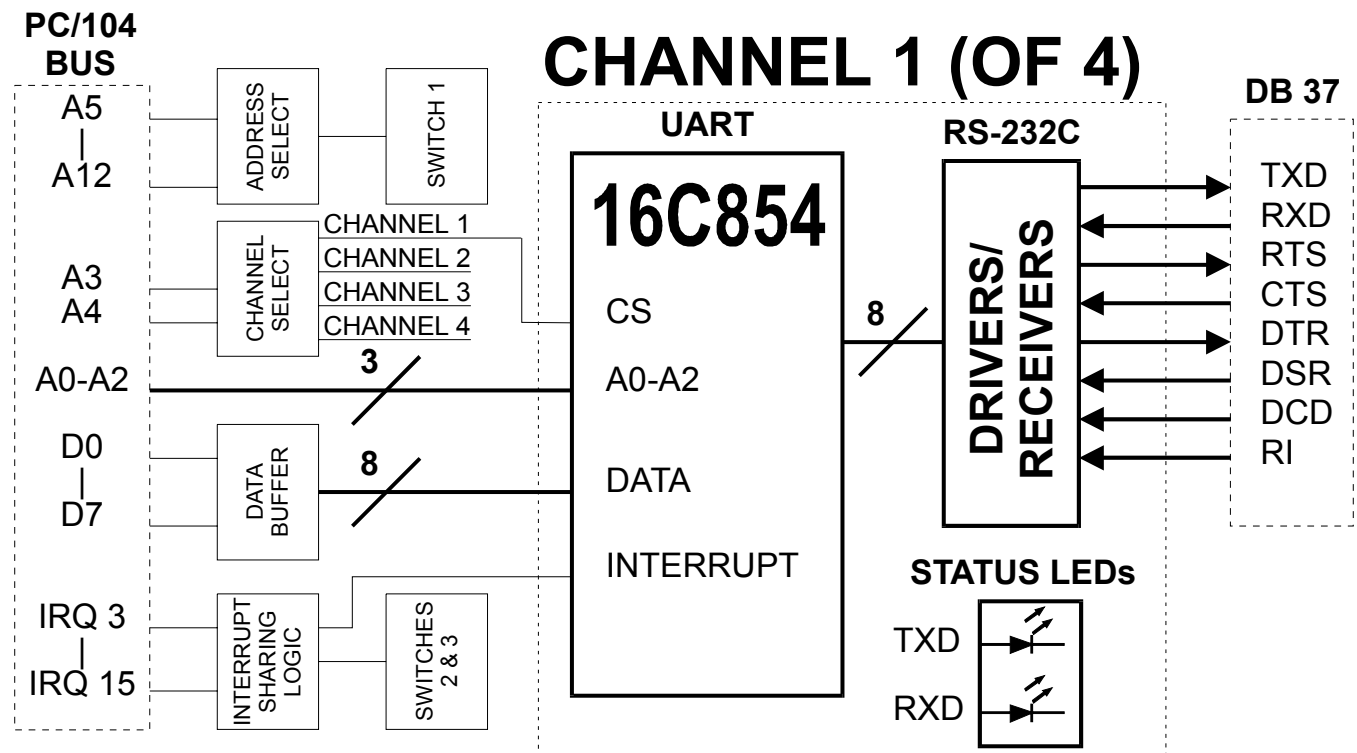
The new FASTCOM: 232/4-104 adapter is one of the fastest (725 Kbps), most advanced four-port RS-232 asynchronous serial adapter in the industry. Primarily designed for commercial, industrial, and OEM applications, the FASTCOM: 232/4-104 features four discrete RS-232 channels, complete with all standard hand-shaking signals for each channel.

The advanced UART on the FASTCOM: 232/4-104 features full compatibility with standard 16C550 UARTs, but provides **extraordinary 128 byte receive and transmit FIFOs for buffering**. This buffering is extremely important when working with RS-232 communications within high-overhead operating systems such as Windows NT and Windows 95/98. The extra-deep FIFOs prevent data loss due to overrun and dramatically improve data throughput in all applications. **The advanced UART on the Fastcom: 232/4-104 is capable of all standard baud rates, plus a high speed mode capable of up to an amazing 725 Kbps.** Note that RS-232 data rates are limited by cable length, noise, and driver/receiver characteristics.

The Fastcom CD contains software drivers for DOS. The FASTCOM: 232/4-104 is designed with a compatible mode for operation in the Windows environment. The "shared interrupt" design and user selectable address allow the installation of multiple FASTCOM: 232/4-104 cards in the same system.

The Fastcom: 232 family of adapters includes the eight channel Fastcom: 232/8-ISA, the four channel Fastcom: 232/4-ISA, the single channel Fastcom: 232/1-ISA, and the fully isolated Fastcom: IG232/2-ISA. PCI bus versions are also available.

The following is the basic structure of the FASTCOM: 232/4-104:



## SPECIFICATIONS:

UART	16C854
BAUD RANGE	All standard PC baud rates, plus up to 725 Kbps*
BUFFERING	Transmit - 128 bytes Receive - 128 bytes
INTERFACE	RS-232C TXD, RXD, DTR, DSR, DCD, RTS, CTS, RI
BUS	16 bit PC/104
POWER REQUIREMENTS:	+5 400mA (Typical) +12 50mA - 12 50mA

## FEATURES:

### **FASTCOM: 232/4-104 modes:**

WINDOWS MODE: True COM1, COM2, COM3, and COM4 compatibility.  
FASTCOM MODE: User configurable RS-232 serial ports.

### **New high performance 16C854 Quad UART**

Standard on the FASTCOM: 232/4-104, *no extra charge*  
All standard baud rates and higher speeds *up to 725 Kbps*  
128 byte FIFOs for *improved through-put*

**Send and Receive Status LED indicators**

**Durable Cables and RFI shielding**

**Interrupt sharing**

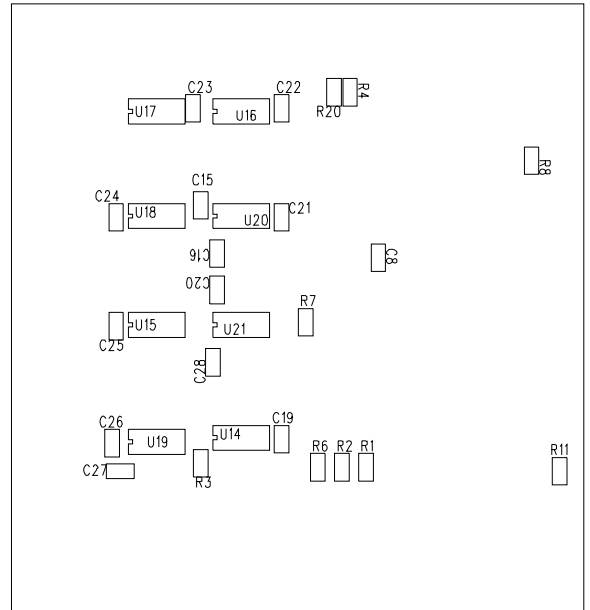
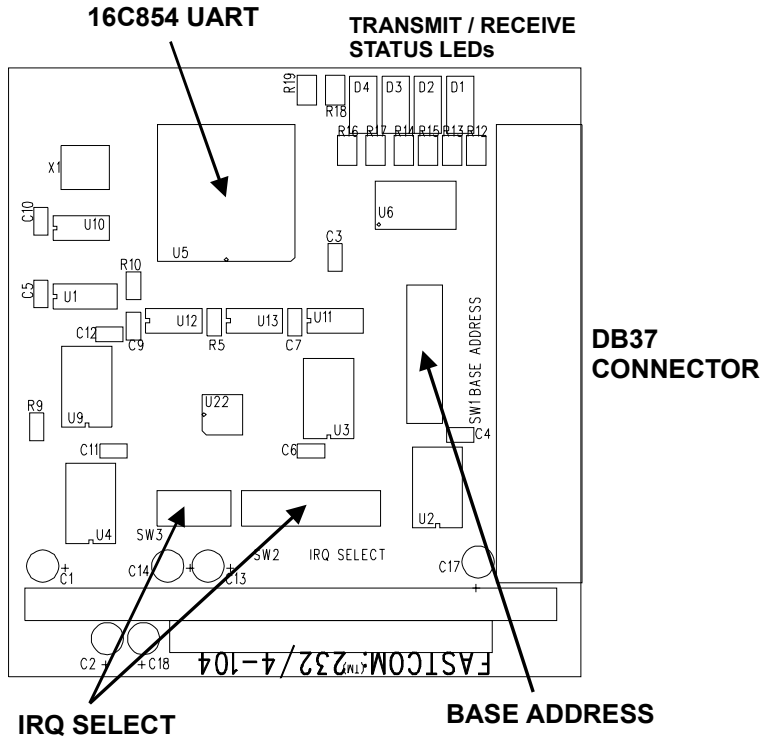
**Comprehensive Hardware and Software Documentation**

\* RS-232 data rates are realistically limited by cable length and driver/receiver characteristics to less than 725 Kbps. A clock change is required to achieve baud rates higher than 115.2 Kbps.



# FASTCOM: 232/4-104

## BOARD LAYOUT



## PACKING LIST

- FASTCOM: 232/4-104 CARD
- CABLE ASSEMBLY
- FASTCOM CD

If an omission has been made, please call technical support for a replacement.

## INSTALLATION

### SELECTING AN OPERATING MODE

**Important:** Observe Electrostatic Discharge (ESD) precautions when handling the FASTCOM: 232/4-104 board.

The FASTCOM: 232/4-104 has two modes of operation: the **FASTCOM MODE** and the **WINDOWS MODE**. Decide which mode you want to use before you install the FASTCOM: 232/4-104 in your computer.

In the FASTCOM MODE (factory default setting), the FASTCOM: 232/4-104 is hardware/software compatible with our original FASTCOM4: adapter. The address/IRQ for each channel is determined by setting Switch 1 (Address) and Switch 2 (IRQ Level). The FASTCOM MODE is typically used for systems that require multiple serial ports and already have COM1 and/or COM2 installed. This mode would most likely be used by OEMs and system designers who are writing their own software. The FASTCOM MODE also allows you to install multiple FASTCOM: 232/4-104 adapters in your computer.

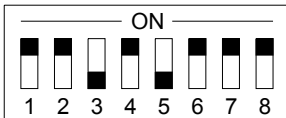
In the WINDOWS MODE, each channel of the FASTCOM: 232/4-104 is assigned an address/IRQ level that provides true COM1, COM2, COM3, and COM4 ports and full compatibility with off-the-shelf DOS/WINDOWS software packages.

The operating mode is selected by the setting of Switch 2, Position 6. In the ON position, the WINDOWS MODE is selected; in the OFF position, the FASTCOM MODE is selected.

The FASTCOM: 232/4-104 is shipped from the factory in the FASTCOM MODE. The following are the factory switch settings:

#### FASTCOM MODE

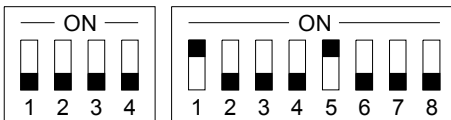
##### ADDRESS



SW1

BASE ADDRESS = 280H

##### IRQ SELECT



SW3

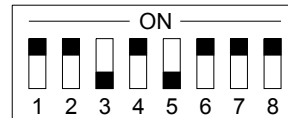
SW2

IRQ LEVEL = 5

MODE SWITCH = FASTCOM

#### WINDOWS MODE

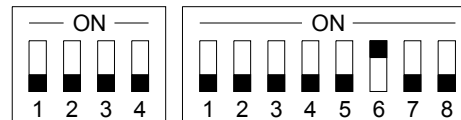
##### ADDRESS



SW1

BASE ADDRESS = OVERRIDDEN

##### IRQ SELECT



SW3

SW2

IRQ LEVEL = OFF

MODE SWITCH = WINDOWS

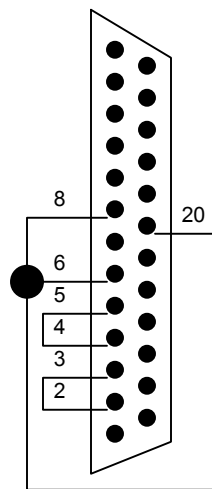
## INSTALLATION TIPS FOR THE FASTCOM: 232/4-104

- Unpack the FASTCOM: 232/4-104. Keep the box and static bag for warranty repair returns.
- Check the switches to be sure that they are set for the mode you want.

## TESTING THE INSTALLATION

To fully test the installation of your FASTCOM: 232/4-104, you will need to build a "loop back plug". Materials needed are a DB25 female receptacle, solder cup style, and a few short pieces of 20 or 24 AWG stranded wire. This loop back plug can be used to test any RS-232 port. Jumper the pins together on the DB25 as illustrated below:

2	TRANSMIT
3	RECEIVE
4	RTS
5	CTS
6	DSR
8	DCD
20	DTR



## TESTING YOUR FASTCOM ASYNC ISA PORT IN WINDOWS

These instructions assume that you have already installed the card and have followed the installation instructions. In NT, the ports should be visible in the Control Panel ->Ports applet. In Windows 95/98, the ports should show up in Control Panel in the System icon's Device Manager. The port installation instructions can be found on the disk in:

For Windows95/98	D:\Fastcom_Disks\Smart14\Windows\W95\howto.txt
For Windows NT	D:\Fastcom_Disks\Smart14\Windows\NT\howto.txt

1. Install the loopback plug on the port to test.
2. Find and run the TTY.EXE program.  
From the Start menu, choose Run, browse to and select  
D:\Fastcom\_Disks\Smart14\windows\win32\tty\tty.exe.  
Select TTY.EXE and click open.  
Click OK to run the TTY program.
3. From the menu bar on the TTY program, select Settings.  
Select the port to test (e.g., COM5)  
Uncheck all of the flow checkboxes (DTR/DSR, RTS/CTS, XON/XOFF).  
Click OK.

4. From the TTY main menu bar select Action, then Connect.
5. At this point you should see a blinking cursor in the upper left corner of the TTY window. Try to type on the keyboard; you should see the characters that you are typing in the TTY window. If you see what you type, the port is passing the loopback, and is installed and functioning correctly.

If you get a "Connection Failed" message box when you try the Action ->Connect sequence, some possible causes are:

1. Incorrect or mismatched address or IRQ settings between what the switches on the board are set to and what is set up in the driver. You can check the driver settings in NT using Control Panel ->Ports ->COMx ->Advanced. In Windows 95/98, you need to look in Control Panel ->System, Device Manager tab, Ports (COM & LPT), select the COM#, click the Properties button, then the Resources tab. Check the address switch settings using the table in the back of the manual. Realize that multiport cards addresses are sequential (if set to base address of 0x280, then the addresses for the four ports will be 0x280, 0x288, 0x290, and 0x298).

If you are using NT, you can run NT Diagnostics (from the Start button, choose Programs ->Administrative Tools ->Windows NT Diagnostics) to verify that there is not another device trying to use the address range or IRQ. The Resources tab in Windows 95 (location listed above) should indicate a resource conflict if another device is using the same I/O range or IRQ. Even if you don't see a listed conflict, try a different address/IRQ combination if all of the settings are matched and it still doesn't work.

If you have tried a couple of different address/IRQ combinations without success, you might try using an Ohm meter or continuity tester to verify that the switch positions are actually what they are set to. The switch positions that are ON should be closed (about 0 ohms); the ones that are OFF should be open (not 0 Ohms). Sometimes the dip switches will get stuck in either the on or off position irrespective of the position of the slide. If this happens, try toggling the stuck position on and off a few times and re-check it.

2. In NT, if multiple ports are opened (running more than one instance of TTY), the ports are using the same IRQ, and the PermitShare registry entry is 0, the second port to be opened will fail. Use the registry editor and expand HKEY\_LOCAL\_MACHINE ->SYSTEM ->CurrentControlSet ->Services ->Serial, change the PermitShare value from 0 to 1, reboot, and run the test again.

If you get to the blinking cursor stage, but do not see what you type with the loopback plug installed, some possible reasons are:

1. Incorrect/faulty loopback plug construction or a bad connection.
2. If you have a RS-422/485 board, check to make sure that the 485 mode is disabled. The loopback test should be run in RS-422 mode (the RS-485 driver control switches should be in the OFF position).
3. The RTS/CTS flow control is checked and there is not a RTS->CTS loopback, or the CTS disabled switch is OFF. If you enable flow control, you must allow CTS to be active in order for the driver to transmit data. Either disable flow control, or wire the RTS->CTS (and possibly DTR->DSR) loop and try the test again.
4. Check to make sure that the loopback plug is on the correct port/cable (or that the correct port is selected in the settings dialog).
5. If you type a character and the cursor stops blinking for a long time and the PC/TTY window stops responding (appears locked up) but returns to a blinking cursor state after a few minutes, this is a good indication that the interrupt setting on the card is not the same as the interrupt setting of the port in Windows. Re-verify that the IRQ setting on the board switches and in Control Panel are the same.

## FASTCOM: 232/4-104 OPERATING MODES

The FASTCOM: 232/4-104 has two modes of operation: the FASTCOM MODE and the WINDOWS MODE. The operating mode is selected by the setting of Switch 2, Position 6. In the ON position, the WINDOWS MODE is selected. In the OFF position, the FASTCOM MODE is selected. In the FASTCOM MODE, the board address/IRQ configuration is determined by setting Switch 1 and Switch 2. In the WINDOWS MODE, each channel is assigned an address/IRQ level that provides "drop-in" compatibility with WINDOWS/DOS applications.

### WINDOWS MODE

If the WINDOWS MODE is selected, the base address switch (Switch 1) is overridden. Switch 2, Position 6 should be set to ON, and all other positions should be set to OFF. The Address/IRQ for each channel is as follows in WINDOWS MODE:

<u>CHANNEL</u>	<u>ADDRESS</u>	<u>IRQ</u>	<u>NAME</u>
CHANNEL 1	3F8H	4	COM1:
CHANNEL 2	2F8H	3	COM2:
CHANNEL 3	3E8H	4	COM3:
CHANNEL 4	2E8H	3	COM4:

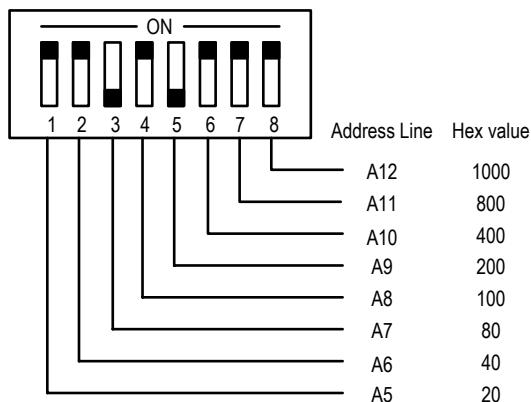
**IMPORTANT:** Be sure that Switch 2, Position 6 is ON and all other positions on Switch 2 are OFF.

### FASTCOM MODE SWITCH DESCRIPTIONS

There are three dip switches on the FASTCOM: 232/4-104, labeled SW1, SW2, and SW3 (See [Board Layout Illustration](#) for location). Switch 1 (labeled Base Address) is used to set the I/O address of the FASTCOM: 232/4-104 board. Switch 2 (labeled IRQ) serves three functions: it selects the IRQ level for the board, is used to enable/disable interrupt sharing, and selects the operating mode for the board. Switch 3 is used to select upper level IRQ settings.

#### SWITCH 1, ADDRESS

Switch 1 decodes the PC address lines as follows:



Address lines A5 through A12 are decoded by the setting of SW1 and set the base address of the FASTCOM: 232/4-104. Address lines A3 and A4 are used on the board to select which port (1, 2, 3, or 4) you want to use. Address lines A0, A1, and A2 are used to select the registers within the UARTS.

The above diagram illustrates a base address of 280 Hex (factory default). Note that when a switch is ON, that it represents a "0" in the corresponding bit position (not a "1" as you might expect). Also, a switch that is OFF represents a "1" in the corresponding bit position. (If you would like to know why this is reversed, read a technical data sheet for the address decoder chip, a 74LS682).

So, the SW1 diagram can be decoded as follows:

A12	A11	A10	A9	A8	A7	A6	A5
0	0	0	1	0	1	0	0

You can determine the I/O address of the board by adding the Hex values for each address line that is set to a "1". In the illustration, only address lines A7 and A9 are set to "1". So, add the Hex value of A9 (200H) and A7 (80H), and the result is the I/O base address (200H + 80H = 280H).

Switch 1 is referred to as the Base Address switch because it marks the beginning address of the first channel on the FASTCOM: 232/4-104 board. The other channels are addressed as an offset to the first channel. For example, if we set the Base Address to 280H, note the address of each channel:

<u>CHANNEL</u>		<u>BASE</u>		<u>OFFSET</u>		<u>ADDRESS</u>
CHANNEL 1 =	280H	+	0	=		280H
CHANNEL 2 =	280H	+	8	=		288H
CHANNEL 3 =	280H	+	10H	=		290H
CHANNEL 4 =	280H	+	18H	=		298H

## We have provided a comprehensive guide to setting the address switch in Appendix A.

Please note that not all of the I/O address space in a PC is available for your use. We have selected 280H as a default because it does not conflict with devices normally installed in a PC. However, if you wish to select another address, select an address that does not conflict with devices installed in your PC. Keep in mind that the FASTCOM: 232/4-104 requires 32 contiguous bytes of address space.

If you want to install more than one FASTCOM: 232/4-104 board in your computer, be sure to set each to a unique I/O address. We recommend the following addresses for a multi-board system:

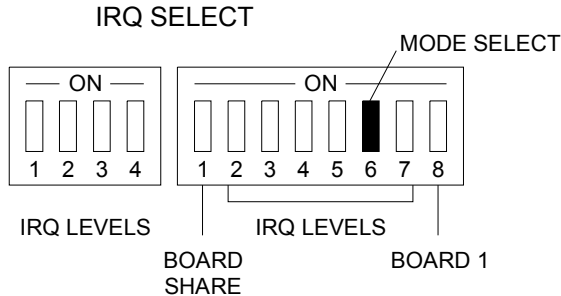
FASTCOM: 232/4-104 BOARD 1	280H
FASTCOM: 232/4-104 BOARD 2	2A0H
FASTCOM: 232/4-104 BOARD 3	2C0H
FASTCOM: 232/4-104 BOARD 4	300H

Remember that a single IRQ level can be shared between multiple FASTCOM: 232/4-104 boards in a PC.

## SWITCH 2 and SWITCH 3, INTERRUPTS

Switch 2 serves three functions: it selects the IRQ level for the FASTCOM: 232/4-104, enables/disables interrupt sharing, and selects the operating mode for the board. Switch 3 selects upper level IRQ settings.

The following illustrates the IRQ select switch on the FASTCOM: 232/4-104:



Positions 2 through 5 and 7 select the IRQ level for the FASTCOM: 232/4-104. Select only 1 IRQ level at a time. Position 6 selects either WINDOWS or FASTCOM mode.

### SWITCH 2

SWITCH POSITION	PC/AT/386 IRQ	Assigned
2	9	UNUSED
3	3	COM2
4	4	COM1
5	5	UNUSED (LPT2)
6	USED FOR DOS / WINDOWS MODE SELECT	
7	7	LPT1

### SWITCH 3

SWITCH POSITION	IRQ LEVEL	Assigned
1	10	UNUSED
2	11	UNUSED
3	12	UNUSED
4	15	UNUSED

You can use any IRQ that is not assigned to a device installed in your PC.

## INTERRUPT SHARING

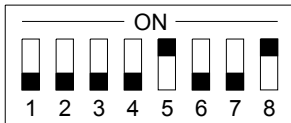
An important feature of the FASTCOM: 232/4-104 is its ability to share one IRQ level with several FASTCOM: 232/4-104 boards in the same computer. This is important because there are very few unassigned IRQs in the PC.

Switch 2 positions 1 and 8 control the interrupt sharing circuit on the FASTCOM: 232/4-104. Position 1 Enables interrupt sharing in the OFF position and Disables sharing in the ON position. Position 8 is called the "Board 1" switch. In the interrupt sharing mode, this switch must be ON for the first FASTCOM: 232/4-104 board in your system, and OFF on all other FASTCOM: 232/4-104 boards.

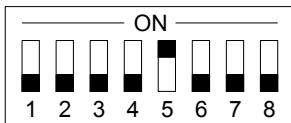
SWITCH 2  
POSITION

<u>1</u>	<u>8</u>	
ON	OFF	Disables IRQ sharing
OFF	ON	Enables IRQ sharing, first board
OFF	OFF	Enables IRQ sharing, second board

For example, let's assume that you have two FASTCOM: 232/4-104 boards in your PC and want to share IRQ 5. Set Switch 2 as follows for the first board:



For the second board, set Switch 2 as follows:



Any additional FASTCOM: 232/4-104 board that shares IRQ5 would be set the same as the second board.



## **IMPORTANT NOTES**

### **WINDOWS MODE**

1. In the WINDOWS MODE, make sure that all switch positions on Switch 2 (IRQ) are off, except for Position 6. This will prevent any IRQ conflicts.
2. Disable or remove COM1 and COM2 from your PC before installing the FASTCOM: 232/4-104 in WINDOWS MODE. The COM ports will not function properly if they have conflicting addresses or IRQ levels.

### **FASTCOM MODE**

1. Install and load SMART14™ before testing or using the FASTCOM: 232/4-104 in the FASTCOM MODE in DOS.

## PROGRAMMING

We have included the technical data sheets for the 16C854 as Appendix B of the manual. This appendix covers programming and electrical characteristics of this advanced UART.

### FASTCOM: 232/4-104 I-STAT REGISTER

The FASTCOM: 232/4-104 board features an Interrupt Status Register ("I-STAT Register") that improves the efficiency of interrupt service routines and reduces polling time. The I-STAT register is an 8 bit register on the FASTCOM: 232/4-104 board that will quickly tell a programmer which channel or channels has generated an interrupt. The I-STAT register is an 8 bit read-only register. The high order 4 bits can be ignored and are set to '0'. If a '1' appears in any of the lower 4 bit positions, the channel corresponding to that bit position is generating an interrupt. Frequently, more than one channel will generate an interrupt at a given time. In that case, the I-STAT register will have a bit set to '1' for each channel that is issuing an interrupt.

For example, let's assume that an interrupt has been issued by the FASTCOM: 232/4-104 board, indicating that one of the ports has received data. Rather than reading the Line Status register of each of the four UARTs, we only need to read the I-STAT register. The I-STAT register is located at Base Address plus 7. So, if your FASTCOM: 232/4-104 board is set to Base Address 280H, reading address 287H will give you the contents of the I-STAT register. The following Assembler code illustrates how to read the I-STAT Register:

```
MOV DX,BASE_ADDRESS+7    ;LOCATION OF I-STAT REGISTER
IN AL,DX                 ;READ I-STAT DATA
```

The contents of register AL may look like this:

Bit Number	8	7	6	5	4	3	2	1
	X	X	X	X	0	1	0	0

X - indicates a "don't care" condition

This bit pattern tells you that channel 3 of the FASTCOM: 232/4-104 board has generated an interrupt.

When you service the interrupt from channel 3, the I-STAT register will automatically set bit position 3 to a '0'. You do not have to reset, clear, or initialize the I-STAT register. If you want to, you may completely ignore it. It does not mask or affect normal interrupt functions of the UARTs. The I-STAT register reports only which channel (or channels) is currently issuing an interrupt.

If you have more than one FASTCOM: 232/4-104 board in your machine, reading the I-STAT register from each board during your interrupt service routine can save you a great deal of time compared to polling each channel for status.

In the WINDOWS MODE, the I-STAT register is not used. This is to provide full compatibility with off-the-shelf software.

## FASTCOM: 232/4-104 ADAPTER CABLE

We provide access to the four channels on the FASTCOM: 232/4-104 adapter through a shielded DB37 connector and an adapter cable (supplied with the board). The adapter cable consists of a DB37 male plug fanning out to four standard DB25 male plugs.

### DB37 PIN DESCRIPTION

N.C.	1	20	RI3
DCD3	2	21	DTR3
GND	3	22	DSR3
CTS3	4	23	RTS3
RXD3	5	24	TXD3
RI4	6	25	DCD4
DTR4	7	26	GND
DSR4	8	27	CTS4
RTS4	9	28	RXD4
TXD4	10	29	RI2
DCD2	11	30	DTR2
GND	12	31	DSR2
CTS2	13	32	RTS2
RXD2	14	33	TXD2
RI1	15	34	DCD1
DTR1	16	35	GND
DSR1	17	36	CTS1
RTS1	18	37	RXD1
TXD1	19		

### DB25 PIN DESCRIPTION (Four Plugs)

	13	25	
	12	24	
	11	23	
	10	22	RI
	9	21	
DCD	8	20	DTR
GND	7	19	
DSR	6	18	
CTS	5	17	
RTS	4	16	
RXD	3	15	
TXD	2	14	
	1		

## TECHNICAL SUPPORT

All products manufactured by Commtech are warranted against defective materials and workmanship for the lifetime of the product. This warranty is available only to the original purchaser. Any product found to be defective will, at the option of Commtech, be repaired or replaced with no charge for labor or parts not excluded by the warranty. This warranty does not apply to any products that have been subjected to misuse, abuse, or accident or as a result of service or modification by anyone other than Commtech. In no case shall Commtech liability exceed the original product purchase price.

If any Commtech product is damaged such that it cannot be repaired, you can return it to Commtech for replacement under our *Non-Repairable Replacement* policy, regardless of the cause of damage. Commtech will replace the unit at 60% of the then-current list price.

Commtech provides extensive technical support and application suggestions. Most of the problems that occur with the FASTCOM: 232/4-104 can be corrected by double checking the switch positions, your cables and your program. We recommend that you build the loop back plug that is described in the Programming section of this manual. With that plug, you can quickly isolate the problem to the board, cables, or software.

If you still have unresolved questions, use the following procedure to get technical support:

1. Call our Technical Support Staff at (316) 636-1131. They are on duty from 9:00 AM to 5:00 PM Central Time.
2. Ask for technical support for the FASTCOM: 232/4-104. Be ready to describe the problem, your computer system, your application, and your software.

If you purchased your board from Kontron America, please call their 7-24 technical support line at 1-800-480-0044.

3. If necessary, our staff will give you an RMA number (Return Material Authorization). Use this number on the mailing label and in all references to your board. Put the board back in its static bag and in its box. Ship the board back to us as directed.

“ ”

## APPENDIX A

### I/O ADDRESS SETTINGS

Each channel of the Fastcom: 232/4-104 requires 8 contiguous bytes of address space. Since channels 2-4 are addressed as offsets of the base address, you will need 32 contiguous bytes (020 hex) of address space. You may use any I/O address that is not used by a device installed in your system.



Hex (Decimal)	1	2	3	4	5	6	7	8
800h (2048)	1	1	1	1	1	1	0	1
820h (2080)	0	1	1	1	1	1	0	1
840h (2112)	1	0	1	1	1	1	0	1
860h (2144)	0	0	1	1	1	1	0	1
880h (2176)	1	1	0	1	1	1	0	1
8a0h (2208)	0	1	0	1	1	1	0	1
8c0h (2240)	1	0	0	1	1	1	0	1
8e0h (2272)	0	0	0	1	1	1	0	1
900h (2304)	1	1	1	0	1	1	0	1
920h (2336)	0	1	1	0	1	1	0	1
940h (2368)	1	0	1	0	1	1	0	1
960h (2400)	0	0	1	0	1	1	0	1
980h (2432)	1	1	0	0	1	1	0	1
9a0h (2464)	0	1	0	0	1	1	0	1
9c0h (2496)	1	0	0	0	1	1	0	1
9e0h (2528)	0	0	0	0	1	1	0	1
a00h (2560)	1	1	1	1	0	1	0	1
a20h (2592)	0	1	1	1	0	1	0	1
a40h (2624)	1	0	1	1	0	1	0	1
a60h (2656)	0	0	1	1	0	1	0	1
a80h (2688)	1	1	0	1	0	1	0	1
aa0h (2720)	0	1	0	1	0	1	0	1
ac0h (2752)	1	0	0	1	0	1	0	1
ae0h (2784)	0	0	0	1	0	1	0	1
b00h (2816)	1	1	1	0	0	1	0	1
b20h (2848)	0	1	1	0	0	1	0	1
b40h (2880)	1	0	1	0	0	1	0	1
b60h (2912)	0	0	1	0	0	1	0	1
b80h (2944)	1	1	0	0	0	1	0	1
ba0h (2976)	0	1	0	0	0	1	0	1
bc0h (3008)	1	0	0	0	0	1	0	1
be0h (3040)	0	0	0	0	0	1	0	1
c00h (3072)	1	1	1	1	1	0	0	1
c20h (3104)	0	1	1	1	1	0	0	1

Hex (Decimal)	1	2	3	4	5	6	7	8
c40h (3136)	1	0	1	1	1	0	0	1
c60h (3168)	0	0	1	1	1	0	0	1
c80h (3200)	1	1	0	1	1	0	0	1
ca0h (3232)	0	1	0	1	1	0	0	1
cc0h (3264)	1	0	0	1	1	0	0	1
ce0h (3296)	0	0	0	1	1	0	0	1
d00h (3328)	1	1	1	0	1	0	0	1
d20h (3360)	0	1	1	0	1	0	0	1
d40h (3392)	1	0	1	0	1	0	0	1
d60h (3424)	0	0	1	0	1	0	0	1
d80h (3456)	1	1	0	0	1	0	0	1
da0h (3488)	0	1	0	0	1	0	0	1
dc0h (3520)	1	0	0	0	1	0	0	1
de0h (3552)	0	0	0	0	1	0	0	1
e00h (3584)	1	1	1	1	0	0	0	1
e20h (3616)	0	1	1	1	0	0	0	1
e40h (3648)	1	0	1	1	0	0	0	1
e60h (3680)	0	0	1	1	0	0	0	1
e80h (3712)	1	1	0	1	0	0	0	1
ea0h (3744)	0	1	0	1	0	0	0	1
ec0h (3776)	1	0	0	1	0	0	0	1
ee0h (3808)	0	0	0	1	0	0	0	1
f00h (3840)	1	1	1	0	0	0	0	1
f20h (3872)	0	1	1	0	0	0	0	1
f40h (3904)	1	0	1	0	0	0	0	1
f60h (3936)	0	0	1	0	0	0	0	1
f80h (3968)	1	1	0	0	0	0	0	1
fa0h (4000)	0	1	0	0	0	0	0	1
fc0h (4032)	1	0	0	0	0	0	0	1
fe0h (4064)	0	0	0	0	0	0	0	1
1000h (4096)	1	1	1	1	1	1	1	0
1020h (4128)	0	1	1	1	1	1	1	0
1040h (4160)	1	0	1	1	1	1	1	0
1060h (4192)	0	0	1	1	1	1	1	0

Hex (Decimal)	1	2	3	4	5	6	7	8
1080h (4224)	1	1	0	1	1	1	1	0
10a0h (4256)	0	1	0	1	1	1	1	0
10c0h (4288)	1	0	0	1	1	1	1	0
10e0h (4320)	0	0	0	1	1	1	1	0
1100h (4352)	1	1	1	0	1	1	1	0
1120h (4384)	0	1	1	0	1	1	1	0
1140h (4416)	1	0	1	0	1	1	1	0
1160h (4448)	0	0	1	0	1	1	1	0
1180h (4480)	1	1	0	0	1	1	1	0
11a0h (4512)	0	1	0	0	1	1	1	0
11c0h (4544)	1	0	0	0	1	1	1	0
11e0h (4576)	0	0	0	0	1	1	1	0
1200h (4608)	1	1	1	1	0	1	1	0
1220h (4640)	0	1	1	1	0	1	1	0
1240h (4672)	1	0	1	1	0	1	1	0
1260h (4704)	0	0	1	1	0	1	1	0
1280h (4736)	1	1	0	1	0	1	1	0
12a0h (4768)	0	1	0	1	0	1	1	0
12c0h (4800)	1	0	0	1	0	1	1	0
12e0h (4832)	0	0	0	1	0	1	1	0
1300h (4864)	1	1	1	0	0	1	1	0
1320h (4896)	0	1	1	0	0	1	1	0
1340h (4928)	1	0	1	0	0	1	1	0
1360h (4960)	0	0	1	0	0	1	1	0
1380h (4992)	1	1	0	0	0	1	1	0
13a0h (5024)	0	1	0	0	0	1	1	0
13c0h (5056)	1	0	0	0	0	1	1	0
13e0h (5088)	0	0	0	0	0	1	1	0
1400h (5120)	1	1	1	1	1	0	1	0
1420h (5152)	0	1	1	1	1	0	1	0
1440h (5184)	1	0	1	1	1	0	1	0
1460h (5216)	0	0	1	1	1	0	1	0
1480h (5248)	1	1	0	1	1	0	1	0
14a0h (5280)	0	1	0	1	1	0	1	0

Hex (Decimal)	1	2	3	4	5	6	7	8
14c0h (5312)	1	0	0	1	1	0	1	0
14e0h (5344)	0	0	0	1	1	0	1	0
1500h (5376)	1	1	1	0	1	0	1	0
1520h (5408)	0	1	1	0	1	0	1	0
1540h (5440)	1	0	1	0	1	0	1	0
1560h (5472)	0	0	1	0	1	0	1	0
1580h (5504)	1	1	0	0	1	0	1	0
15a0h (5536)	0	1	0	0	1	0	1	0
15c0h (5568)	1	0	0	0	1	0	1	0
15e0h (5600)	0	0	0	0	1	0	1	0
1600h (5632)	1	1	1	1	0	0	1	0
1620h (5664)	0	1	1	1	0	0	1	0
1640h (5696)	1	0	1	1	0	0	1	0
1660h (5728)	0	0	1	1	0	0	1	0
1680h (5760)	1	1	0	1	0	0	1	0
16a0h (5792)	0	1	0	1	0	0	1	0
16c0h (5824)	1	0	0	1	0	0	1	0
16e0h (5856)	0	0	0	1	0	0	1	0
1700h (5888)	1	1	1	0	0	0	1	0
1720h (5920)	0	1	1	0	0	0	1	0
1740h (5952)	1	0	1	0	0	0	1	0
1760h (5984)	0	0	1	0	0	0	1	0
1780h (6016)	1	1	0	0	0	0	1	0
17a0h (6048)	0	1	0	0	0	0	1	0
17c0h (6080)	1	0	0	0	0	0	1	0
17e0h (6112)	0	0	0	0	0	0	1	0
1800h (6144)	1	1	1	1	1	1	0	0
1820h (6176)	0	1	1	1	1	1	0	0
1840h (6208)	1	0	1	1	1	1	0	0
1860h (6240)	0	0	1	1	1	1	0	0
1880h (6272)	1	1	0	1	1	1	0	0
18a0h (6304)	0	1	0	1	1	1	0	0
18c0h (6336)	1	0	0	1	1	1	0	0
18e0h (6368)	0	0	0	1	1	1	0	0





## APPENDIX B

**16C854**

# UART DATA