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53A-854 VXI ADAPTER MODULE

OPERATION MANUAL

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Telephone: (800) 237-2831 / (913) 764-2452 Fax: (913) 782-5104
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53A-854 ADAPTER MODULE

DESCRIPTION

INTRODUCTION

The 53A-854 Adapter Module is a printed circuit board assembly for use in a card cage conforming to the VXIbus Specification. It is used to physically, electrically, and functionally interface BFGoodrich 53A function cards to the VMEbus (IEEE-1014) or the VXIbus (V1.4). This allows any Modular Test Product (MTP) instrument card (53A-2XX through 53A-5XX) to function with any slot 0 module or message based commander from any manufacturer.

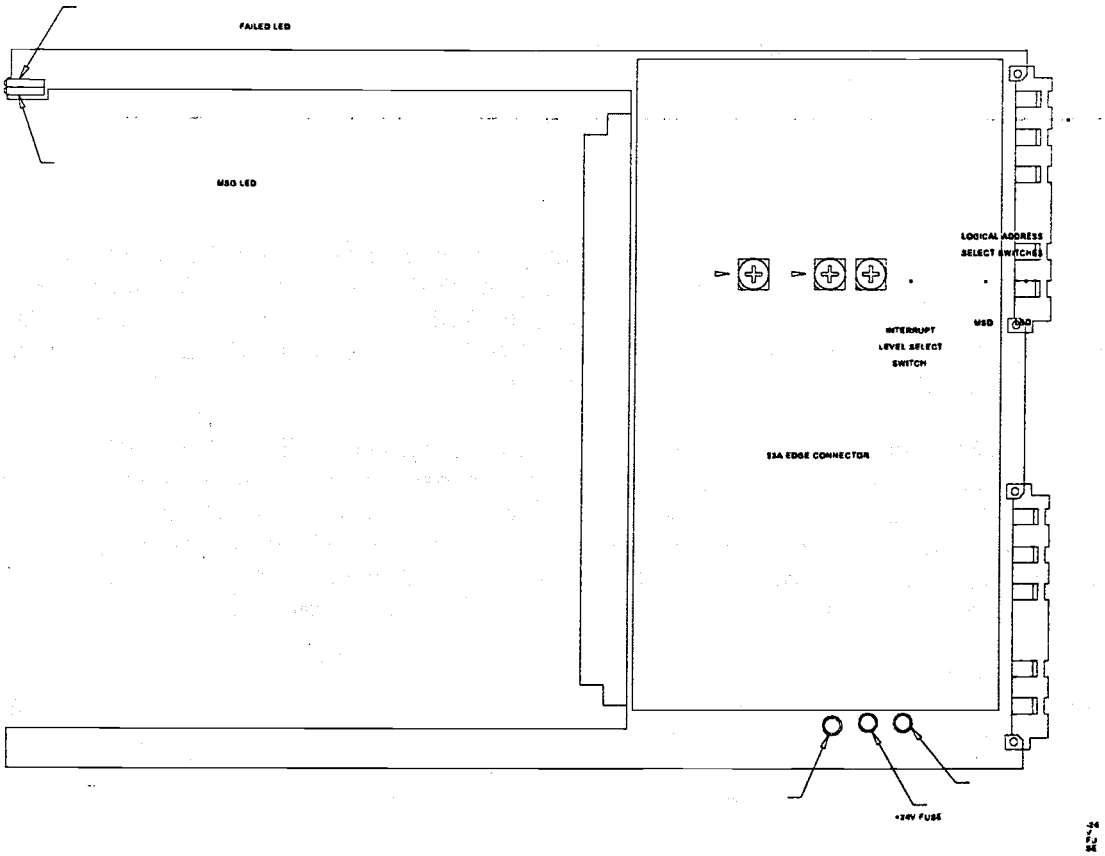
The 53A-854 Module is a VXIbus C size module which plugs into VME connectors P1 and P2. The 53A-854 Module may be used in standard VME card cages if the 53A card does not require "15V power. If the 53A card plugged into the 53A-854 requires "15V dc, the 53A-854 must be used in either a card cage that meets the VXIbus Specification, or a specially modified VME card cage. The 53A-854 Module has on-board voltage regulators to supply "15V dc to the installed 53A card. The voltage regulators receive power from the 24V dc supplied by the VXIbus card cage.

The 53A card to be interfaced to the VMEbus plugs into a framework of card guides and an 86-pin edge connector on the 53A-854 Module. Commands in the form of ASCII strings are sent from a VMEbus master to the 53A-854 Module, which in turn passes them to the 53A card. Requests for data directed to the 53A-854 from a VMEbus master are also passed to the 53A card. The 53A card response to these requests is returned to the VMEbus master via the 53A-854 Module.

Individual 53A card commands and responses are defined in the 53A card's operating manual.

The user may communicate with the 53A-854 Module as if it were a standard VXIbus message based instrument.

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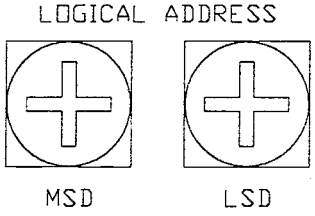
CONTROLS AND INDICATORS

The following controls and indicators are provided to select and display the functions of the 53A-854 Module's operating environment. See Figure 854-1 for their physical locations.

Switches

Logical Address Switches

Each function module in a VXIbus System must be assigned a unique logical address, from 1 to 255 decimal. The base VMEbus address of the 53A-854 is set to a value between 1 and FFh (255d) by two hexadecimal rotary switches. Align the desired switch position with the arrow on the module shield.



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The actual physical address of the 53A-854 Module is on a 64 byte boundary. If the switch representing the most significant digit (MSD) of the logical address is set to position X and the switch representing the least significant digit (LSD) of the logical address is set to position Y, then the base physical address of the 53A-854 will be [(64d * Xyh) + 49152d]. For example:

L.A.	MSD	LSD	Base Physical Addr. (d)
Ah	Y	A	(64*10)+49152 = 49792d
15h	1	5	(64*21)+49152 = 50496d

where: L.A. = Logical Address
MSD = Most Significant Digit
LSD = Least Significant Digit

NOTE: The Address switch on the 53A card does not determine the module's address. The 53A card will be addressed via the 53A-854 logical address, regardless of the position of the 53A card's switch.

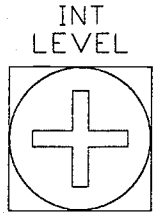
IEEE-488 Address

Using the 53A-854 Module in an IEEE-488 environment requires knowing the module's IEEE-488 address in order to program it. Different manufacturers of IEEE-488 interface devices may have different algorithms for equating a logical address with an IEEE-488 address.

If the 53A-854 is being used in a MATE system, VXIbus logical addresses are converted to IEEE-488 addresses using the algorithm specified in the MATE IAC standard (MATE-STD-IAC).

Consult the operating manual of the IEEE-488 interface device being used for recommendations on setting the logical address.

VMEbus Interrupt Level Select Switch



Each function module in a VXIbus System can generate an interrupt on the VMEbus to request service from the interrupt handler located on its commander. The VMEbus interrupt level on which the 53A-854 Module generates interrupts is set by a BCD rotary switch. Align the desired switch position with the arrow on the module shield.

Valid Interrupt Level Select switch settings are 1 through 7, with setting 1 equivalent to level 1, etc. The level chosen should be the same as the level set on the 53A-854's interrupt handler, typically the module's commander. Setting the switch to an invalid interrupt level (0, 8, or 9) will disable the module's interrupts.

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Interrupts are used by the module to return VXIbus Protocol Events to the module's commander. Refer to the Operation section for information on interrupts. The VXIbus Protocol Events supported by the module are listed in the Specifications section.

Voltage Regulators

The 53A-854 has two voltage regulators to convert the VXIbus "24 volt power to the "15 volt power needed by the 53A card. If the 53A card plugged into the 53A-854 requires "15V dc, then the 53A-854 must be used in either a card cage that meets the VXIbus Specification, or a specially modified VME card cage.

Fuses

The 53A-854 Module has three fuses: a 4 amp fuse for the +5V, a 1 amp fuse for the +24V, and a 1 amp fuse for the -24V. The fuses protect the module in case of an accidental shorting of the power bus or any other situation where excessive current might be drawn.

If the +5V fuse opens, the VXIbus Resource Manager will be unable to assert SYSFAIL INHIBIT on this module to disable SYSFAIL*.

If the +5V fuse opens, remove the fault before replacing the fuse. Replacement fuse information is given in the Specifications section of this manual.

LEDs

The following LEDs are visible at the top of the 53A-854 Module's front panel to indicate the status of the module's operation:

Failed LED

This normally off red LED is lit whenever SYSFAIL* is asserted, indicating a module failure. Module failures include failure to correctly complete a self test, loss of a power rail, or failure of the module's central processor.

NOTE: If the module loses any of its power voltages, the Failed LED will be lit and SYSFAIL* asserted. A module power failure is indicated when the module's Power LED is extinguished.

MSG LED

This green LED is normally off. When lit, it indicates that the module is processing a VMEbus cycle. The LED is controlled by circuitry that appears to stretch the length of the VMEbus cycle. For example, a five microsecond cycle will light the LED for approximately 0.2 seconds. The LED will remain lit if the module is being constantly addressed.

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SPECIFICATIONS

VXIbus Compatibility:	Fully compatible with the VXIbus Specification for message-based instruments.
VXI Device Type:	VXI message based instrument, Revision 1.4.
VXI Protocol:	Word serial.
VXI Card Size:	C size, one slot wide.
Module-Specific Commands:	All module-specific commands and data are sent via the VXIbus Byte Available command. All module-specific commands are made up of ASCII characters. Module-specific data may be in either ASCII or binary format.
VMEbus Interface:	Data transfer bus (DTB) slave - A16, D16 only.
Interrupt Level:	Switch selectable, levels 1 (highest priority) through 7 (lowest).
Interrupt Acknowledge:	D16; lower 8 bits returned are the logical address of the module.
VXIbus Commands Supported:	All VXIbus commands are accepted (e.g. DTACK* will be returned). The following commands have effect on this module; all other commands will cause an Unrecognized Command event: ABORT NORMAL OPERATION ASYNCHRONOUS MODE CONTROL BEGIN NORMAL OPERATION BYTE AVAILABLE (with or without END bit set) BYTE REQUEST CLEAR CLEAR LOCK CONTROL EVENT END NORMAL OPERATION ERROR QUERY IDENTIFY COMMANDER READ INTERRUPTER LINE READ INTERRUPTERS READ PROTOCOL READ STATUS RESPONSE ENABLE SET LOCK TRIGGER
VXIbus Protocol	

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Events Supported:	VXIbus events are returned via VME interrupts. The following events are supported and returned to the 53A-854 Module's commander: REQUEST TRUE (In IEEE-488 systems, this interrupt will cause a Service Request (SRQ) to be generated on the IEEE-488 bus.)
VXIbus Registers:	ID Device Type Status Control Protocol Response Data Low See Appendix A for definition of register contents.
Device Type Register Contents:	1111 1100 1010 1010 (1s complement of binary value of model number).
Power Requirements:	All required dc power is provided by the Power Supply in the VXIbus card cage.
Voltage:	+5 Volt Supply: 4.75 V dc to 5.25 V dc. +24 Volt Supply: +23.5 V dc to +24.5 V dc. -24 Volt Supply: -23.5 V dc to -24.5 V dc.
Current (Peak Module, I_{PM}):	+5 volt supply: 1.2 A + 53A card 5V current. +24 volt supply: 10 mA + 53A card +15V current. -24 volt supply: 10 mA + 53A card -15V current.
Current (Dynamic Module, I_{DM}):	Dynamic current is a function of the 53A card being used. Consult the factory for dynamic current specifications.
Replacement Fuses:	+5V: Littlefuse P/N 273004; BFG P/N 42202-73040. +24V: Littlefuse P/N 273001; BFG P/N 42202-73010. -24V: Littlefuse P/N 273001; BFG P/N 42202-73010.
Cooling:	The airflow required for the 53A-854 is a function of the 53A card installed. The formula used to determine the airflow required for <10EC temperature rise is 0.08 x Power Consumption.

The 53A-854 uses 6.5 Watts of power, so the minimum airflow requirement (without a 53A card installed) is

0.8 x 6.5 = 0.52 liters/second

The airflow required with a 53A card installed is therefore
0.52 + (0.08 x 53A card Power Consumption)

The worst case pressure drop with a 53A card installed is 0.02 mm of H_2O.

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Temperature:	0EC to 50EC, operating. -40EC to +85EC, storage.
Humidity:	Less than 95% R.H. non-condensing, -10EC to +30EC. Less than 75% R.H. non-condensing, +31EC to +40EC. Less than 45% R.H. non-condensing, +41EC to +55EC.
Radiated Emissions:	Complies with VXIbus Specification.
Conducted Emissions:	Complies with VXIbus Specification.
Module Envelope Dimensions:	VXI C size. 262 mm x 353 mm x 30.5 mm (10.3 in x 13.9 in x 1.2 in)
Dimensions, Shipping:	The module's shipping dimensions are: 406 mm x 305 mm x 102 mm. (16 in x 12 in x 4 in).
Weight:	1.1 kg. (2.5 lb).
Weight, Shipping:	The module's shipping weight is: 1.6 kg. (3.5 lb).
Mounting Position:	Any orientation.
Mounting Location:	Installs in an instrument module slot (slots 1-12) of a C or D size VXIbus card cage. (Refer to D size card cage manual for information on required adapters.)
Equipment Supplied:	1 - 53A-854 Module. 1 - Operating Manual (Part # 00000-18540). 1 - Service Manual (Part # 00000-78540).
Software Revision:	V2.0

INSTALLATION

INSTALLATION REQUIREMENTS AND CAUATIONS

The 53A-854 Module may be installed in either a VXIbus card cage or a standard VME card cage. If it is installed in a VXIbus card cage it must be installed in any slot other than the left-most slot (Slot 0).

Setting the module's Logical Address switch defines the module's programming address. Refer to the Controls and Indicators subsection for information on selecting and setting the 53A-854 Module's logical address.

CAUTION:
Note that there are two ejector handles on the card. To avoid installing the card incorrectly, make sure the ejector labeled "53A-854" is at the top. Use the two captive screws located at the top and bottom of the front panel to secure the module in the card cage.

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Tools Required

The following tools are required for proper installation:

Slotted screwdriver set.

CAUTION:
If an empty slot appears to the left of an IAC module in the chassis, the daisy-chained signals must be jumpered across the empty slot in order to allow the signals to propagate down the backplane. The following method is suggested for jumpering the daisy-chained signals in a Tek VX1401 Mainframe:

Individual jumpers can be placed on the backplane's jumper pins from each BGIN to BGOUT signal (4 jumpers), and from the IACKIN to IACKOUT signal (1 jumper).

To access the backplane's jumper pins in a Tek VX1401 Mainframe, remove the blank filler panel of the slot by loosening the two captive screws located at the top and bottom of the panel. The P1 connectors are the row of connectors across the top of the backplane. The pins to be jumpered are to the left of the P1 connector. Jumper the following pins together: (top to bottom)

Signal	Jumper	Signal
BG0IN (B4)	to	BG0OUT (B5)
BG1IN (B6)	to	BG1OUT (B7)
BG2IN (B8)	to	BG2OUT (B9)
BG3IN (B10)	to	BG3OUT (B11)
IACKIN (A21)	to	IACKOUT (A22)

CAUTION:
In order to maintain proper card cage cooling, unused card cage slots must be covered with blank front panels supplied by the card cage manufacturer.

CAUTION:
Verify that the card cage is able to provide adequate cooling and power for the 53A-854 Module. Refer to the card cage Operating Manual for instructions on determining cooling and power compatibility. See also the information on cooling in the Specifications.

INSTALLATION PROCEDURE

CAUTION:
The 53A-854 Module is a piece of electronic equipment and therefore has some susceptibility to electrostatic damage (ESD). ESD precautions must be taken whenever the module is handled.

1) Record the module's Revision Level, Serial Number (located on the BFG label on the top shield of the 53A-854), and switch settings on the Installation Checklist. Only qualified personnel should install the 53A-854 Module.

2) Verify that all switches on both modules are switched to the correct values.

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3) After the 53A-854 Module has been installed in the card cage, the 53A card to be used is plugged into the 86-pin connector on the 53A-854 Module.

NOTE: Some 53A cards may be too wide to fit the slot. If this is the case, remove the shield piece that covers the 53A card (see Figure 854-3).

Before installing the 53A card in the 53A-854, set the Halt switch (if provided) on the 53A card to the ON position. This ensures that the 53A card will receive a valid Reset signal. Card guides on the 53A-854 Module guide the 53A card into this connector. Refer to Figure 854-2.

The 53A card must be installed so that the card ejector marked with the card model number is at the top. The card ejectors on the 53A card are used to remove the card from the 53A-854 Module.

4) If the 53A card has a cable, it should be mounted on the front edge connector of the 53A card after the card is installed on the 53A-854 Module.

If there is a non-854 module to the left of the 53A-854 Module, then the blue hood on the 53A cable may interfere with cabling on the adjacent module. Repositioning the 53A-854 within the card cage will solve this problem.

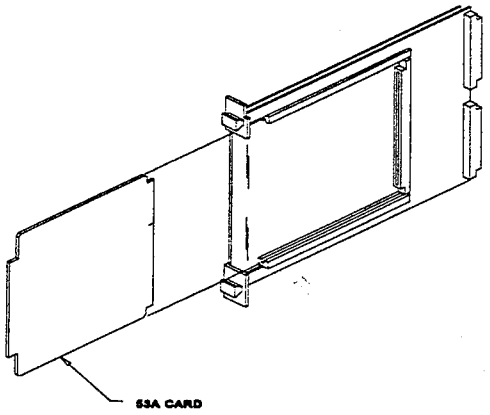


FIGURE 854-2 INSTALLATION OF A 53A CARD

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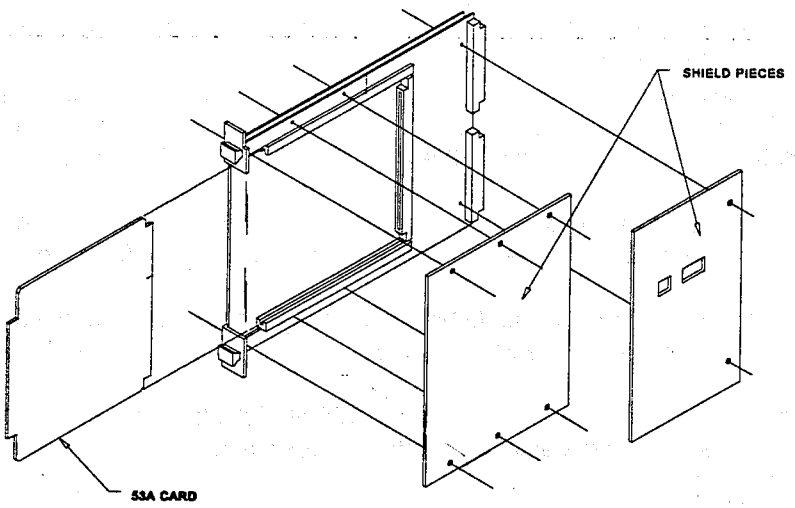


FIGURE 854-3 SHIELD PLACEMENT

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INSTALLATION CHECKLIST

Installation parameters may vary depending on the card cage being used. Be sure to consult the card cage Operating Manual before installing and operating the 53A-854 Module.

Revision Level:

Serial No.: _____

Card Cage Slot Number: _____

Switch Settings:

Address Select Switch: _____

Interrupt Level Select Switch: _____

Cable Installed: (if any) _____

Performed by: _____ Date: _____

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OPERATION

OVERVIEW

53A Card Command/Response Format

The format of the commands and responses sent to and from the 53A-854 to control a 53A card are identical to those described in the Operating Manual of the 53A card that is plugged into the 53A-854. Exceptions are the "@XY" and "@XH" commands. In the 53A System these commands are interpreted by the 53A-171 Control Card. They are not passed to function cards.

The "@XY" command is used to select a function card in the 53A System. In a VXIbus System, a function card is selected by the 53A-854 Module's commander using the proper logical address to select the 53A-854. In the 53A System the "@XH" command deselects all cards in 53A chassis number "X". A VXIbus System has no direct equivalent to the "@XH" command, although the Reset bit in the 53A-854 Control register can be used to reset an individual 53A card.

53A Card Interrupts (RFI

The Operating Manual of the installed 53A card describes what conditions cause the 53A RFI line to be set.

When the RFI line is set true, the 53A-854 will generate a VXIbus interrupt. When an Interrupt Acknowledge cycle occurs on the VXIbus for the interrupt level the 53A-854 is set for, the 53A-854 will return a 16 bit Status/ID value. The upper 8 bits (Status) will be the VXIbus Request True event (hex FD). The lower 8 bits (ID) will be the logical address of the 53A-854.

The Interrupt Acknowledge cycle will also generate the INT CHK (Interrupt Check) signal, which, on most 53A cards, causes the 53A card to remove RFI.

PROGRAM EXAMPLES

This section contains an example program which demonstrates how the various programmable features of the 53A-854 are used. The example is written in BASIC using an IBM PC or equivalent computer as the system controller.

Definition of BASIC Commands

The programming example in this manual is written in Microsoft GW BASIC, using the GW BASIC commands described below. If the programming language you are using does not conform exactly to these definitions, use the command in that language that will give the same result.

Command	Result
END	Terminates the program.
FOR/NEXT	Repeats the instructions between the FOR and NEXT statements for a defined number of iterations.

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GOSUB n	Runs the subroutine beginning with line n. EX: GOSUB 750 - runs the subroutine beginning on line 750. The end of the subroutine is delineated with a RETURN statement. When the subroutine reaches the RETURN statement, execution will resume on the line following the GOSUB command.
GOTO n	Program branches to line n. EX: GOTO 320 - directs execution to continue at line 320.
IF/THEN	Sets up a conditional (IF/THEN) statement. Used with other commands, such as PRINT or GOTO, so that IF the stated condition is met, THEN the command following is effective. EX: IF I = 3 THEN GOTO 450 - will continue operation at line 450 when the value of variable I is 3.
REM	All characters following the REM command are not executed. REM statements are used for documentation and user instructions. EX: REM **CLOSE ISOLATION RELAYS**
RETURN	Ends a subroutine and returns operation to the line after the last executed GOSUB command.
<CR>	Carriage Return character, decimal 13.
<LF>	Line Feed character, decimal 10.

Definition of Capital Equipment IEEE-488 Interface Commands

CALL ENTER (R$, LENGTH%, ADDRESS%, STATUS%)
The CALL ENTER statement inputs data into the string R$ from the IEEE-488 instrument whose decimal primary address is contained in the variable ADDRESS%. Following the input, the variable LENGTH% contains the number of bytes read from the instrument. The variable STATUS% contains the number '0' if the transfer was successful or an '8' if an operating system timeout occurred in the PC. Prior to using the CALL ENTER statement, the string R$ must be set to a string of spaces whose length is greater than or equal to the maximum number of bytes expected from the 53A-854.

CALL SEND (ADDRESS%, OUT$, STATUS%)
The CALL SEND statement outputs the contents of the string variable OUT$ to the IEEE-488 instrument whose decimal primary address is contained in the variable ADDRESS%. Following the output of data, the variable STATUS% contains a '0' if the transfer was successful and an '8' if an operating timeout occurred in the PC.

Programming Example In BASIC

The following sample BASIC program shows how commands for the 53A-854 might be used. This example assumes that the 53A-854 has logical address 24, has a 53A-522 Card plugged into it, and is installed in a VXIbus card cage that is controlled via an IEEE-488 interface from an external system controller, such as an IBM PC or equivalent, using a Capital Equipment Corporation IEEE-488 interface.

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The VXIbus IEEE-488 interface is assumed to have an IEEE-488 primary address of decimal 30 and to have converted the 53A-854 Module's logical address to an IEEE-488 primary address of decimal 24.
The command sequence terminator character <TM> used in the example programs is a line feed character, which is appended to output data strings using the BASIC command CHR$(13). That is, DATA$ = "....."+CHR$(13).

The following program causes a 53A-522 DMM Card installed in the 53A-854 to be programmed to DC volts, 20 volt range. A single voltage measurement is then taken and placed in the variable RESULT$.

```
10      DEF SEG &HC400
20      SEND = 9 : INIT = 0 : ENTER = 21
30      PC.ADDRESS% = 21 : CONTROL% = 0
40      CALL INIT (PC.ADDRESS%, CONTROL%)
              Lines 10 through 40 initialize the PC'S IEEE-488 Interface Card as a system controller
              with an IEEE-488 address of decimal 21.
50      ADDRESS% = 24
              Line 50 assigns the decimal IEEE-488 address of the 53A-854 to the variable
              ADDRESS%.
60      OUT$="F1R4"+CHR$(10)
70      CALL SEND(ADDRESS%,OUT$,STATUS%)
              Lines 60 through 70 program the DMM for dc volts, 20 volt range.
80      LET RESULT$=SPACE$(10)
90      CALL ENTER(RESULT$,LENGTH%,ADDRESS%,STATUS%)
              Lines 80 through 90 input a single DMM reading into the variable RESULT$.
100     END
```

Shown below are the commands and data sent to the 53A-854 Module and the response data returned. Response data is underlined.

F1R4<LF>
<u>+9.134<CR><LF></u>

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APPENDIX A - VME and VXIbus OPERATION

VME Operation

A VME read or write cycle using Word Serial Protocol (Byte Request or Byte Available) initiates a 53A backplane I/O cycle. If a write cycle (Byte Available) is executed, the following signals are generated at the 53A card edge connector on the 53A-854:

1. The byte of data on VME data lines D00-D07 is inverted and latched on the 53A card data lines OB0-OB7.

2. A low level is latched on the 53A I/O line.

3. The 53A-854 Module terminates the VME write cycle by driving DTACK*.

4. If the 53A card is not driving its BINARY* line low, then the byte of data on VME data lines D00 - D07 is compared to the ASCII code for the characters: A, B, C, I, J, K, P, Q, R, and S. If the data matches the ASCII code for one of these characters, then the corresponding character decode input to the 53A card (A*, B*, C*, I*, J*, K*, P*, Q*, R*, S*, respectively) is latched low.

5. Non-overlapping, active low timing signals T3* through T15* are generated in sequential order at 500 ns intervals. Each timing pulse is low for 250 ns. Timing signal T15* is not an input to the 53A card. It is used only by 53A-854 circuitry.

6. The 53A card uses the timing signals described above to sequence its state machine circuitry to process the byte of data latched on data lines OB0* - OB7*. The 53A card drives its FLAG* output low some time after the T3* timing signal goes active. The 53A card releases FLAG* when its state machine circuitry has finished processing the byte of data latched on data lines OB0* - OB7*.

If FLAG* is released after timing signal Tn* is active, then timing signals Tn+1* through T15* will not be generated.

When the 53A card is ready to receive another byte of data, it releases FLAG*. The DIR bit in the Response register is then set true high. After the DIR bit is set true the 53A card is ready to receive another byte of data.

If a read cycle (Byte Request) is executed, the following signals are generated at the 53A card edge connector:

1. A high level is latched on the 53A I/O line.

2. Non-overlapping, active low timing signals T3* through T15* are generated in sequential order at 500 ns intervals. Each timing pulse is low for 250 ns. Timing signal T15* is not an input to the 53A card. It is used only by 53A-854 circuitry.

3. The 53A card uses the timing signals described above to sequence its state machine circuitry to retrieve a byte of data to return to the VME bus master that initiated the VME read cycle. The 53A card drives its FLAG* output low sometime after timing signal T3* goes active. The 53A card releases FLAG* when its state machine has placed a valid byte of data on data lines IB0* - IB7*. This byte of data is inverted and latched on the 53A-854 Module on the rising edge of FLAG*. The 53A-854 DOR bit in the Response register is also set at this time.

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If FLAG* is released after timing signal Tn* is active, then timing signals Tn+1* through T15* will not be generated.

4. After the DOR bit is set, the byte of data latched from the 53A card can be read from the Data Low Register.

VXIbus Operation

The 53A-854 Module is a C size single slot VXIbus Message-Based Word Serial instrument. It uses the A16, D16 VME interface available on the backplane P1 connector and does not require any A24 or A32 address space. The module is a D16 interrupter.

The 53A-854 Module is neither a VXIbus commander or VMEbus master, and therefore it does not have a VXIbus Signal register. The 53A-854 is a VXIbus message based servant.

The module supports the Normal Transfer Mode of the VXIbus, using the Write Ready, Read Ready, Data In Ready (DIR), and Data Out Ready (DOR) bits of the module's Response register.

A Normal Transfer Mode read of the 53A-854 Module proceeds as follows:

1. The commander reads the 53A-854's Response register and checks if the Write Ready and DOR bits are true. If they are, the commander proceeds to the next step. If not, the commander continues to poll these bits until they become true.

2. The commander writes the Byte Request command (0DEFFh) to the 53A-854's Data Low register.

3. The commander reads the 53A-854's Response register and checks if the Read Ready and DOR bits are true. If they are, the commander proceeds to the next step. If not, the commander continues to poll these bits until they become true.

4. The commander reads the 53A-854's Data Low register.

A Normal Transfer Mode Write to the 53A-854 Module proceeds as follows:

1. The commander reads the 53A-854's Response register and checks if the Write Ready and DIR bits are true. If they are, the commander proceeds to the next step. If not, the commander continues to poll the Write Ready and DIR bits until they are true.

2. The commander writes the Byte Available command which contains the data (0BCXX or 0BDXX, depending on the state of the End bit) to the 732A-854's Data Low register.

The 53A-854 Module has no registers beyond those defined for VXIbus message based devices. All communications with the module are through the Data Low register, the Response register or the VXIbus interrupt cycle. Any attempt by another module to read or write to any undefined location of the 53A-854's address space may cause incorrect operation of the module.

As with all VXIbus devices, the 53A-854 Module has registers located within a 64 byte block in the A16 address space.

The base address of the 53A-854 device's registers is determined by the device's unique logical address and can be calculated as follows:

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Base Address = V * 40H + C000H

where V is the device's logical address as set by the Logical Address switches.

53A-854 Configuration Registers.

Below is a list of the 53A-854 Configuration registers with a complete description of each. In this list, RO = Read Only, WO = Write Only, R = Read, and W = Write. The offset is relative to the module's base address:

REGISTER DEFINITIONS

Register	Address	Type	Value (Bits 15-0)
ID Register	0000H	RO	1011 1111 1111 1100 (BFFCh)
Device Type	0002H	RO	See Device Type definition below
Status	0004H	R	Defined by state of interface
Control	0004H	W	Defined by state of interface
Offset	0006H	WO	Not used
Protocol	0008H	RO	1111 0111 1111 1111 (F7FFh)
Response	000AH	RO	Defined by state of the interface
Data High	000CH		Not used
Data Low	000EH	W	See Data Low definition below
Data Low	000EH	R	See Data Low definition below

BIT DEFINITIONS

Register	Bit Location	Bit Usage	53A-854 Value	53A-854 Usage
ID	15-14	Device Class	10	Message Based
	13-12	Address Space	11	A16 only
	11-0	Manufact. ID	1111 1111 1100	Colorado Data Systems
Device Type	15-0	Device Type	1111 1100 1010 1010	Ones comp. of 853
Status	15	A24/32 Active	x	Not used
	14	MODID*	1	MODID line not active
			0	MODID line active
	13-4	Device dependent	xx xxxx xxxx	Not used
	3	Ready	0 or 1	Per VXI Spec.
	2	Passed	1	Passed
			0	VXI Interface failure
	1-0	Device dependent	xx	Not used
Control	15	A24/32 Enable	x	No effect
	14-2	Device dependent	xx xxxx xxxx xx	Not used
	1	SYSFAIL Inhibit	1	Disables module from driving Sysfail
			0	Enables module to drive Sysfail
	0	Reset	1	Reset

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			0	Not reset
Protocol	15	CMDR*	1	Servant only
	14	Signal Reg.*	1	No Signal Reg.
	13	Master*	1	Slave only
	12	Interrupter	1	Interrupter
	11	FHS*	0	Fast Handshake capability
	10	Shared Memory*	1	No Shared Memory capability
	9-4	Reserved	11 1111	Not used
	3-0	Device dependent	1111	Not used
Response	15	Defined value of 0	0	Per VXI
	14	Reserved	1	Per VXI
	13	DOR	1 or 0	1 indicates that instrument data may be read at this time.
12	DIR	1 or 0	1 indicates that instrument data may be sent to this module.	
11	ERR*	1	No VXI error has occurred	
			0	VXI error has occurred.
Response	10	Read Ready	1 or 0	Indicates that data may be read from this module at this time. Set by the instrument following a "Byte Request" or any other VXI command requiring readback. Cleared on reset or when no data is left to send.
	9	Write Ready	1 or 0	Indicates that VXI commands or instrument data may be written at this time.
	8	FHS Active*	1	Indicates that this module is capable of supporting fast handshake (not requiring handshake) at this point in time.
	7	Locked*	1 or 0	Follows the state of the Clear Lock and Set Lock VXIbus commands.
	6-0	Device dependant	xxx xxxx	Not used

Data High - not implemented.

Data Low (read/write)

Word Serial Commands

A write to the Data Low register causes this module to execute some action based on the data written. This section describes the device specific Word Serial commands this module responds to and the results of these commands.

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Read Protocol Command:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1

If the Data Low register is read after this command, the contents are as follows:

BIT DEFINITIONS

Register	Bit Location	Bit Usage	53A-854 Value	53A-854 Usage
Read Protocol	15	VXI Rev.	1	VXI Revision 1.4
	14-11	Device Dependant	1111	not used
	10	Reserved	1	Reserved
	9	RG*	1	response generation not supported
	8	EG*	0	event generation supported
	7	Zero	0	must be 0, per VXI specification.
	6	PI*	1	programmable interrupts not supported
	5	PH*	1	programmable interrupt handlers not supported
	4	TRG*	0	Word Serial Trigger command supported
	3	I4*	1	488.2 protocol not supported
	2	I*	0	VXIbus Instrument Protocol supported
	1	ELW*	1	Extended Long Word protocol not supported
	0	LW*	1	Long Word protocol not supported
Read STB	15-8	Upper byte	1111 1111	not used
	7	not used	0	not used
	6	RQS	1 or 0	set when a request true interrupt has been generated. Cleared upon the execution of this command.
	5-0	not used	0	not used
Async Mode Control	15-12	Status	1111	command successful
			0111	command unsuccessful. this occurs if bits 0 or 1 of this command are 1 indicating that a request is being made to have responses and/or events sent as signals. This module supports interrupts rather than signals.
	11-4	not used	1111 1111	not used

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	3	Resp En*	0 or 1	if bits 15-12 are 1111, echoes bit 3 of the command
	2	Event En*	0 or 1	if bits 15-12 are 1111, echoes bit 2 of the command
	1	Resp Mode	0	interrupts are supported
	0	Event Mode	0	interrupts are supported
Control Response	15-12		1111	command passed
	11-7	not used	11111	not used
	6-0		1111111	no responses supported

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APPENDIX B - VXIbus GLOSSARY

Certain terms used in this manual have very specific meanings in the context of a VXIbus System. A list of these terms is presented below.

Commander
A VXIbus device that has bus master capability and has VXIbus servants under it in the system hierarchy. A commander may be a servant as well.

Hard Reset
This is the state of the module when the SYSRESET* line is true. While in this state, the module is inactive and its Status and Control registers are cleared. The SYSFAIL* line is driven low, and the Failed LED is lit.

Interrupt Handler
The module in the VXIbus system that generates the hardware interrupt acknowledge for a particular VME interrupt level. The software interrupt handler may or may not be on the same module as the hardware interrupt handler. In the case of MTP instrument modules, both the hardware and software interrupt handlers reside on the commander module of a given servant module.

Logical Address
A unique eight bit number which identifies each VXIbus device in a system. It defines the device's A16 register addresses, and indicates the device's commander/servant relationship.

Reset Bit
Bit 0 in the Control register of the module. When set to a one (1) by the module's commander or resource manager, the 53A-854 interface will be reset and the STOP line on the 53A card will be pulled low.

Resource Manager
A message based commander located at logical address 0, which provides configuration management services, including address map configuration, commander/servant mapping, self test, and diagnostic management.

Servant
A VXIbus device that may or may not have bus master capability, that is under control of a commander in the VXIbus system hierarchy. A servant may also be a commander.

Soft Reset
This state is entered when the Reset bit in the module's Control register is set to one (1) by the module's commander. While in this state, a device is inactive, interrupts which are pending are unasserted, all pending bus requests are unasserted, and the onboard processor is halted. The device's VMEbus slave interface is active in this state; however, the device is incapable of responding to any commands other than RESET and SYSFAIL INHIBIT.

SYSFAIL INHIBIT
Bit 1 in the Control register of the module. When set to a one (1) by the VXIbus Resource Manager, the device is disabled from driving the SYSFAIL* line. MTP modules are designed so that the Sysfail Inhibit bit will work under all conditions except when the +5V power is lost.

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VXI Commands
These are commands passed from a commander to a servant within the VXIbus environment. A command may or may not be prompted by an external event. For example, an IEEE-488 GROUP EXECUTE TRIGGER will generate a trigger command to all addressed devices. However, a BEGIN NORMAL OPERATIONS command is generated by the VXIbus resource manager and has no external source.

VXI Events
Events are passed from a servant to a commander. They may be generated by the servant either in response to a command (for example, Unrecognized Command event) or due to a condition detected in the module (internal error).

VXI Message Based Instrument
An intelligent instrument that implements the defined VXIbus registers and, at a minimum, the Word Serial protocol. All MTP instruments are message based.

VXI Word Serial Protocol
The simplest required communication protocol supported by Message Based devices in a VXIbus system. It utilizes the A16 communications registers to transfer data using a simple polling handshake method. All MTP instruments implement the Word Serial protocol.

488-VXIbus Interface
An IEEE-488 to VXIbus Interface Device is a message based device which provides communication between the IEEE-488 bus and VXIbus instruments.

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