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53A-128 IEEE-488 COMMUNICATIONS CARD

OPERATING MANUAL

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53A-128 IEEE-488 COMMUNICATIONS CARD

OPERATING MANUAL

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53A-128 IEEE-488 COMMUNICATIONS CARD

DESCRIPTION

INTRODUCTION

The 53A-128 IEEE-488 Communications Card is a printed circuit board assembly for use in a CDS 53/63 Series System. The Communications Card accepts commands and data information from the system controller and buffers it for use in the 53/63 mainframe. The signal levels, input terminations, and protocol of the 53A-128 conform to the IEEE-488 Standard.

CONTROLS AND INDICATORS

The following controls and indicators are provided to select and display the functions of the 53A-128 Card's operating environment. See Figure 128-1 for their physical location.

Fuse

The +5V dc power bus has a fuse that protects the system from overloads. If the fuse has blown, the POWER LED will not light.

LEDs

Power LED

The Power LED provides a valuable diagnostic tool. The LED gives the system programmer a visual indication of activity on the IEEE-488 bus. Whenever the system controller is communicating on the bus, the LED will flash on and off. The LED will continue to flash as long as the communication continues.

The Power LED being lit not only indicates that the system is not communicating at the moment, but also that all required dc power is being supplied.

Talk/Listen LEDs

As a matter of convention, input and output are referenced to the system controller; that is, when the Communications Card is acting as a "talker" (sending information to the system controller) the card is in "input". The TALK/LISTEN LEDs have the following meanings:

TALK LED	LISTEN LED	MEANING
out	out	System unaddressed.
out	lit	System addressed to listen.
lit	out	System addressed to talk.

Bus Command LEDs

The Bus Command LEDs display the state of each of the IEEE-488 bus command, data and handshake signal lines and are used for analyzing the operation of bus devices. An understanding of these LEDs will not be required for most applications. From top to bottom, these LEDs are: REN, ATN, SRQ, EOI, IFC, DAV, NRFD, and NDAC. Each LED will light when its respective signal is true. Explanations of each of these signals are contained in the IEEE-488 Standard.

Data Input/Output (DIO) LEDs

The DIO LEDs display the last data word on the bus (either input or output), even though the Communications Card may not be an active talker or listener.

Switches

Talk/Listen Address Switch

Each device connected to the IEEE-488 bus must have a unique address to distinguish it from other devices on the bus. The 53A-128 Communications Card is capable of receiving and transmitting data over the bus, and must therefore, have both a "TALK" and "LISTEN" address.

The card has a five-position rocker switch labeled "TALK/LISTEN ADDRESS" which is used to select the IEEE-488 bus talk and listen addresses of the Communications Card.

Follow this procedure to set the "TALK" and "LISTEN" addresses:

1. Refer to Table I, and select a LISTEN address from the first column of the table.

2. Once you have picked a LISTEN address, the TALK address is defined, as they come in pairs.

3. The address switch has five rockers labeled 1 through 5. The rocker settings are listed under the "BINARY CODE" of Table I.

4. A "0" under the rocker means it must be closed. A "1" under the rocker means it must be open.

   Example - If you picked a LISTEN address of 8, you will find a corresponding TALK address of "X". Make the following setting on the address switch:

Rocker #	Position
1	Closed
2	Closed
3	Closed
4	Open
5	Open

Polling Response Switch

The Polling Response Switch is an eight-position rocker switch used to set the ASCII character that will be returned to the bus controller when the controller does a serial poll of the 53/63 System and the 53/63 System has generated a service request (SRQ). (See "Serial Poll Enable" in Operations.)

Using the ASCII table in the Appendix of the 53/63 Series System Operating Manual, select the desired ASCII character and set the rockers of the Polling Response Switch accordingly. Opened rockers will cause the corresponding ASCII bits to be true.

Example - The ASCII character "F" sent to the system controller for the following rocker positions:

ASCII Bit		Rocker #	Position
0	0	1	Closed
1	1	2	Closed
2	1	3	Closed
3	0	4	Closed
4	0	5	Closed
5	0	6	Closed
6	1	7	Open
7	0	8	Closed

When selecting a serial poll response character, it is recommended that you consult the manual for the controller being used. Most controllers require bit 6 of the response character to be set true to indicate an IEEE-488 Service Request.

EOI Enable Switch

The EOI Enable Switch is a two-position slide switch on the 53A-128 Communications Card. The switch controls whether or not the 53A-128 Card will assert the bus EOI (End Or Identify) line when a Line-Feed <LF> character is returned to the bus controller. A line-feed <LF> character is normally the last character returned to the bus controller when the communications card is addressed to talk.

Switch	Action
ON	EOI line is asserted while a line-feed <LF> character is returned to the bus controller.*
OFF	EOI line is not asserted by the communications card.

* When transferring binary data which may contain a line-feed <LF> character as a data byte, the EOI line will not be asserted while the 53/63 System backplane BINARY line is true (see Binary Data Transfer).

SRQ Clear Switch

The SRQ Clear Switch is a two-position slide switch on the 53A-128 Communications Card. The IEEE-488 Bus Service Request (SRQ) Line is asserted by the 53/63 System whenever a 53/63 backplane interrupt occurs. The SRQ Switch determines when the IEEE-488 Bus SRQ Line will be un-asserted by the 53/63 System.

Switch	Action
ON	The IEEE-488 Bus SRQ Line, if asserted by the 53/63 System, will become unasserted whenever the system controller does a serial poll of the 53/63 System. The SRQ line will not be asserted again by the 53/63 System until a serial poll disable is received and all backplane interrupts have been cleared. A subsequent backplane interrupt occurring following the serial poll disable will again set SRQ.*

OFF — The IEEE-488 Bus SRQ Line, if asserted by the 53/63 System, will become unasserted only when all 53/63 backplane interrupts have been cleared.*

* The generating and clearing of backplane interrupts is described in the Operating Manual of each individual function card which has this capability. See also the Service Request Line section of this manual which describes the 53A-171 Control Card interrupt capability.

Interface Clear Switch

The function of the IEEE-488 Interface Clear (IFC) signal in a 53/63 System may be defined in one of two ways. Depending on the setting of the Interface Clear Switch, an IFC will either clear both the IEEE-488 interface on the 53A-128 Card and activate the 53/63 STOP function in a 53/63 System, or clear only the IEEE-488 interface.

The resulting operation for a 53A function card when the STOP line is activated is defined in the Operating Manual for the card, and is typically dependant on the setting of a Halt Switch on each card.

The Interface Clear Switch setting is defined as follows:

Switch Position	Action
⇒ OFF	Clears IEEE-488 interface and sets STOP line
ON	Clears IEEE-488 interface but does not set STOP line

The Selective Device Clear command to the 53/63 IEEE-488 address will activate the STOP line independent of this switch setting.

For compatibility with earlier revision levels of the 53A-128 Card, this switch should be set to the OFF position.

Talk Transfer Rate Switch

For Talk data transfers, the IEEE-488 Specification requires NRFD to be stable in the Ready For Data state for 2 microseconds before initiating a Talk transfer. This requirement is to allow time for the bus to stabilize. It also protects against a false transfer request at the end of a block transfer. Many system controllers will momentarily set Ready For Data while they are determining that a byte is the final data byte.

However, the length of false Ready For Data signals is usually less than 0.5 microseconds. The Talk Transfer Rate Switch allows selection of a 2 microsecond, 1.5 microsecond, 1 microsecond or 0.5 microsecond test of the NRFD signal. The switch settings and maximum talk transfer rates are shown below.

Switch	Position	NRFD Delay Time	Talk Transfer Rate*
Pos 1	Closed	2 μsec	125,000 bytes/sec
Pos 2	Closed	1.5 μsec	133,300 bytes/sec
Pos 3	Closed	1 μsec	142,900 bytes/sec
Pos 4	Closed	0.5 μsec	153,800 bytes/sec

* Transfer rates assume the delay time of the 53A-171 Control Card but assume no delay time for the system controller or the 53A function card.

CAUTION: To avoid degradation of the board and to insure proper operation, only <u>one</u> of the four switch rockers should be closed at any one time.

This switch is set with position 1 closed when shipped from the factory for compatibility with earlier revision level 53A-128 cards.

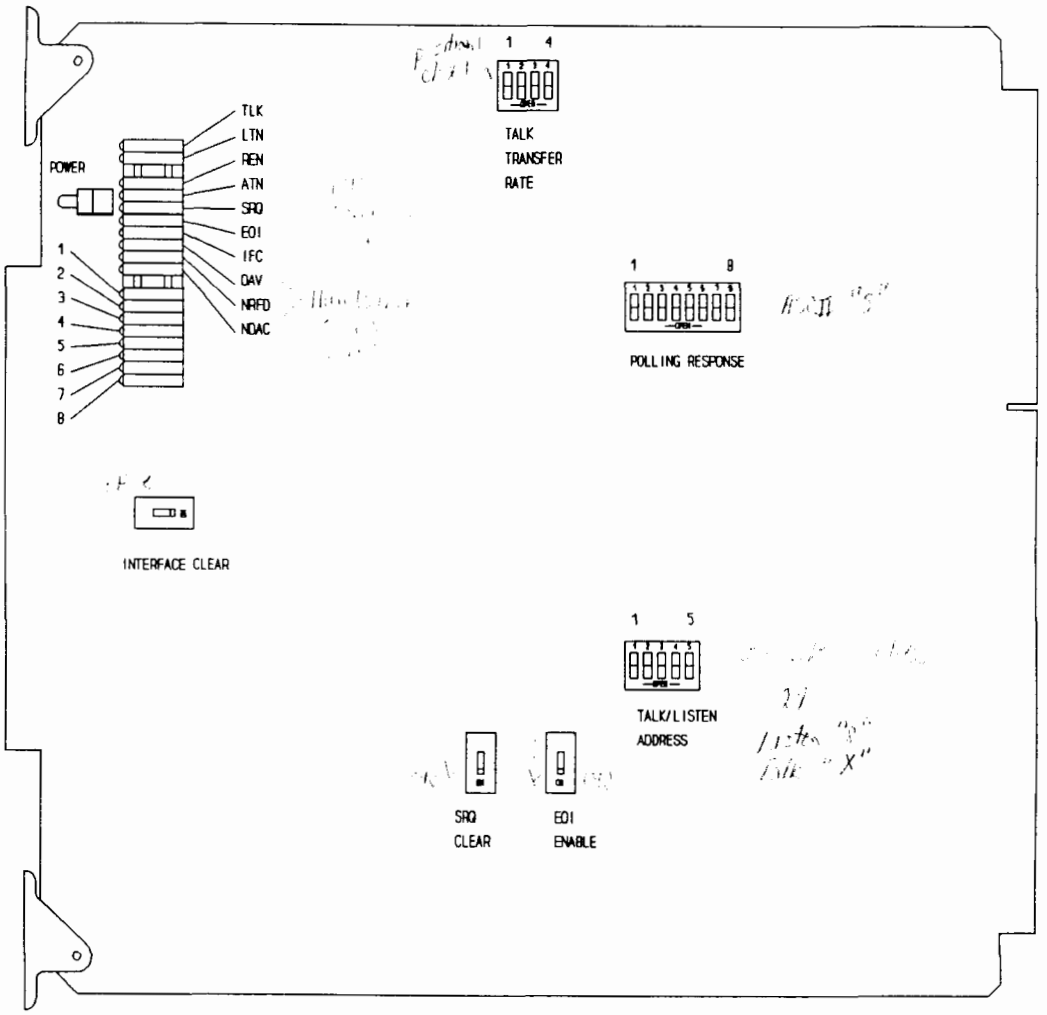


Figure 128-1: 53A-128 Card Block Diagram

SPECIFICATIONS

Function:	Allows the 53/63 System to be controlled on a bus which conforms to IEEE Standard 488-1978. The following set of interface functions contained in the IEEE Standard describe the 53A-128 Card's IEEE-488 interface. SH1 Source Handshake AH1 Acceptor Handshake T6 Talker L4 Listener SR1 Service Request RL0 Remote Local PP0 Parallel Poll DC1 Device Clear DT1 Device Trigger In addition, the 53/63 System provides "Vectored Priority Interrupts." For details see the 53A-171 Control Card Operating Manual.
Logic Levels:	TTL compatible.
Line Termination:	Each of the 16 bus signal lines is terminated with 3K ohms to Vcc and 6.2K ohms to logic common.
Line Drivers:	Open Collector, Tri-State.
Line Receivers:	Schmitt Trigger.
Data Transfer Mode:	Byte-serial, bit parallel asynchronous data transfer using interlocked 3-wire handshake technique.
IEEE-488 Bus Data Rate Listen Data Transfer Rate:	Up to 153,800 characters per second.
Talk Data Transfer Rate:	Up to 153,800 characters per second. The above two rates are true transfer rates for first through ninth characters and will typically be limited by the system controller, particularly on the first character and possibly by the function card addressed in the 53/63 System.
Command Transfer Rate:	Up to 666,600 characters per second. Includes talk and listen address, universal unlisten and untalk, serial poll, and selective clear commands.
Bus Loading:	One standard bus load.

Power-Up:	When power is turned on, the Communications Card will go to the following known state: Power LED - Lit. TLK LED - Lit. LSTN LED - Lit. The state of all other LEDs will depend on the system controller and the other instruments connected to the IEEE-488 bus.
Power Requirements:	5-volt dc power is provided by the internal Power Supply in the 53/63 Series Card Cage.
Voltage (5-volt Supply):	4.75 V dc to 5.25 V dc.
Current (5-volt Supply):	0.72 A, maximum quiescent. 0.75 A, peak.
Cooling:	Provided by the fan in the 53/63 Card Cage.
Temperature, Ambient:	0 °C to +50 °C operating. -40 °C to +85 °C storage.
Humidity:	Less than 95% R.H., noncondensing.
Dimensions:	197mm High, 220mm Deep, 13mm Wide (7.75" x 8.66" x 0.5")
Dimensions, Shipping:	When ordered with a 53/63 Card Cage, this card will be plugged into the Card Cage communications slot. When ordered alone, the shipping dimensions are: 254mm X 254mm X 127mm (10" X 10" X 5")
Weight:	0.23Kg. (0.5 lbs.)
Weight, Shipping:	When ordered with a 53/63 Card Cage, this card will be plugged into the Card Cage communications slot. When ordered alone, the shipping weight is: 0.64 Kg. (1.4 lbs.)
Mounting Position:	Any orientation.
Mounting Location:	Plugs into the communications slot of the 53/63 Card Cage.

Required Equipment:

One of the following cables will be required with the 53A-128 IEEE-488 Communications Card:

53A-713 IEEE-488 Cable, 4 meters long.
53A-716 IEEE-488 Cable, 2 meters long.
53A-717 IEEE-488 Cable, 1 meter long.

When ordered as part of a configured system, a 53A-716 Cable is supplied.

Equipment Supplied:

53A-128 IEEE-488 Communications Card
Spare Fuse (Part #42202-52001)
Operating Manual (Part #00000-11280)
Service Manual (Part #00000-21280)

OPERATION

OVERVIEW

The 53A-128 IEEE-488 Communications Card provides a communications translator and buffer between the IEEE-488 bus and the 53/63 System. With the Communications Card connected to the IEEE-488 bus, the entire 53/63 System, with up to ten chained Card Cages, will appear as one IEEE-488 bus instrument.

With the exception of the universal commands (described below), once the Communications Card has been addressed to TALK or LISTEN by the bus controller, it becomes transparent in terms of 53/63 System operation and the user's application program. The manner in which the Communications Card is addressed to LISTEN (the controller sends data to the 53/63 System) or TALK (the controller receives data from the 53/63 System) depends on the bus controller being used and will be described in the controller manual. At the end of this section is an example program showing how the Communications Card would be addressed using a Hewlett Packard 9825A calculator or Fluke 1720 Instrumentation Controller.

UNIVERSAL COMMANDS

The IEEE-488 Specification refers to "multiline messages" which can be used to obtain pre-defined uniform actions from bus instruments. These multiline messages are commonly referred to by instrument manufacturers as universal commands. The universal commands may be sent to instruments by the bus controller when the attention line on the bus is true (ATN LED - LIT).

The universal commands which the 53A-128 IEEE-488 Communications Card responds to are listed here and described in the following pages.

Mnemonic	Message Name	Octal Code	Decimal Code	ASCII Character
SDC	Selected Device Clear	004	4	EOT
GET	Group Execute Trigger	010	8	BS
SPE	Serial Poll Enable	030	24	CAN
SPD	Serial Poll Disable	031	25	EM
UNL	Unlisten	077	63	?
UNT	Untalk	137	95	_

The method of sending these universal commands will be controller dependent.

SELECTED DEVICE CLEAR (SDC)

When the 53A-128 Card is addressed to LISTEN and it receives an "SDC" command, it will initialize itself exactly as described for power-up. In addition, the Communications Card will issue a STOP command to the 53/63 System. The action taken by the 53/63 System Function Cards upon the occurrence of a STOP command is described in their respective manuals.

GROUP EXECUTE TRIGGER (GET)

When the 53A-128 Card is addressed to LISTEN and it receives a "GET" command, the 53A-128 will issue an "ENCODE" pulse down the backplane of the Card Cage that contains the 53A-128.

If it is desired that the encode pulse should continue to another backplane in a chained system, then the 53A-715 Analog Chaining Cable should be connected between card cages to provide a signal path for the encode pulse from card cage to card cage.

SERIAL POLL ENABLE (SPE)

Polling is a method whereby the bus controller determines which instrument on the bus has requested service. Bus instruments, including the 53/63 System, will request service by setting the IEEE-488 bus "SRQ" (Service Request) line true (SRQ LED - lit). The 53A-128 Card will request service whenever a function card has set an INTERRUPT. The conditions under which INTERRUPTs are set are described in the function card Operating Manuals.

When the 53A-128 Card receives a "SPE" command, it places itself in a polling response mode. In this mode, the 53A-128 card when addressed to TALK, will respond with a single, eight-bit byte. If the SRQ Clear Switch is ON, SRQ will clear as soon as the serial poll byte has been read. The response depends on whether or not the 53/63 System requested service:

1. The 53/63 System didn't request service. A NULL (octal 0) character will be returned to the bus controller.

2. The 53/63 System did request service. A character determined by the setting of the Polling Response Switch will be returned.

If the 53/63 System requested service, the user can immediately determine which card(s) in the System caused the Service Request by issuing an S command to the 53A-171 Control Card. (See the 53A-171 Control Card Operating Manual).

SERIAL POLL DISABLE (SPD)

When the 53A-128 receives a "SPD" command, it clears the "SPE" command and leaves the polling response mode. If the SRQ Clear Switch is ON, the 53A-128 will enable SRQ again and set it if a function card requests a new interrupt.

UNLISTEN (UNL)

When the 53A-128 Card is addressed to LISTEN and receives an "ULN" command, the card will become unaddressed and no longer respond to data on the bus until it is again addressed to LISTEN. The 53A-128 card will automatically UNLISTEN whenever it receives a "TALK" command.

UNTALK (UNT)

The 53A-128 card operates in an addressed input mode. In other words, when a 53/63 Function card has been programmed in such a manner as to produce an input to the bus controller, the 53A-128 will wait to be addressed to talk before providing the input data. The input data returned from the function card to the bus controller will typically be terminated by carriage-return and line-feed <CR><LF> characters. After the 53A-128 Card detects the line-feed <LF> character and transmits it to the bus controller, the 53A-128 card will automatically leave the talk mode. If additional input is desired, the 53A-128 must be re-addressed to TALK.

The Communications Card will automatically become unaddressed to talk whenever the bus controller issues an "UNT" command.

INTERFACE CLEAR (IFC)

The bus controller will issue an "IFC" by pulling the bus "IFC" line to the true state. When this line is true the IFC LED will be lit.

When the IFC line is true, the Communications Card will initialize exactly as described for power-up. In addition, if the Interface Clear Switch is set to OFF, the Communications Card will issue a STOP command to the 53/63 System. The action taken by the 53/63 Function cards upon the occurrence of a STOP command is described in their respective manuals.

SERVICE REQUEST LINE (SRQ)

The SRQ line on the IEEE-488 bus is set by bus instruments whenever they require service from the system controller. The 53A-128 Card will set the bus SRQ line true when it detects an INTERRUPT generated by a 53/63 function card. The conditions under which function cards generate INTERRUPTs are described in individual function card Operating Manuals. It should be noted that the 53A-171 Control Card contained in each system will automatically generate an INTERRUPT on power-up to alert the user that an interruption of power to the 53/63 System has occurred. The power-up INTERRUPT generated by the 53A-171 Control Card will cause the 53A-128 Communications Card to set the IEEE-488 bus SRQ line true. To clear the 53A-171 Control Card power-up INTERRUPT, see the description of the "@XS" command in the 53A-171 Control Card Operating Manual.

POWER-UP

When power is applied to the 53/63 System, the 53A-128 Card initializes all internal logic. The Communications Card will not be addressed as an active talker or listener.

BUS MONITOR

The lower 16 LEDs on the front edge of the 53A-128 IEEE-488 Communications Card provide the 53/63 System with a bus monitor that continuously displays all data and control lines of the IEEE-488 Bus. When the 53/63 System is addressed to TALK or LISTEN, the single step feature of the 53A-171 Control Card allows you to single step individual characters sent to, or received from, the 53/63 System over the IEEE-488 bus.

BINARY DATA TRANSFER

The 53A-128 IEEE-488 Communications Card is designed to transfer either ASCII characters or binary data between the IEEE-488 bus controller and the 53/63 System. When binary data is being transferred to the bus controller by the 53/63 System, line-feed <LF> characters may appear as valid data in the binary data stream. To prevent the communications card from automatically exiting the addressed to Talk Mode (see UNTALK command) when a line-feed <LF> character is detected in the binary data stream, the function card returning the binary data disables the automatic UNTALK function of the communications card until the binary transfer is completed.

When the bus controller is transferring binary data to the 53/63 System, no special action is required on the part of the 53A-128 Communications Card.

Some bus controllers have the ability to terminate the input of binary data streams when the IEEE-488 Bus EOI line is set to the true state. This capability is supported by the 53A-128

Communications Card. When the Communications Card EOI Switch is enabled, the card will set the bus EOI line during the time the terminating line-feed <LF> character is returned to the bus controller (see EOI Enable Switch).

BLOCK DATA TRANSFER

The 53/63-IBX System automatically "Untalks" itself when the terminating <LF> character at the end of each data transmission is returned. This is a normal operating mode for most IEEE-488 instruments. Therefore, when transferring large amounts of data from a single function card (such as the 53A-453 MIL-STD1553A/B Bus Simulator Card), the system controller must re-issue the IEEE-488 Talker/Listener address sequence before each data item is returned to the system controller. On typical controllers, such as the Hewlett-Packard 9825/26/36, the time required to issue the IEEE-488 Talker/Listener address sequence can consume as much as 40 to 50% of the total time required to transfer an 8-10 character long measurement.

The 53A-128 Communications Card supports a block transfer mode wherein the 53/63 System does not become unaddressed when the terminating <LF> character of a measurement is returned to the system controller. To utilize this mode, the system controller must support an input mode whereby an input data transfer is terminated after a specific number of characters have been received by the controller, rather than by a special termination character (i.e. <LF>) or termination signal (i.e. EOI).

To enable the 53A-128 Communications Card block transfer mode, remove the zero ohm resistor R231. (Consult the 53A-128 Service Manual Assembly Drawing for the location of R231). Once R231 is removed, the 53A-128 Card EOI Switch is disabled and the 53/63 System will no longer automatically "Untalk" when a terminating <LF> character is returned to the system controller. The 53/63 System will continue to automatically "Untalk" whenever another instrument is address to Talk or Listen, the 53/63 System is addressed to Listen, the IEEE-488 Bus IFC Line is asserted or a Universal "Untalk" command is issued by the system controller.

EXAMPLE PROGRAM

The following example program uses a Hewlett Packard 9825A calculator (General I/O ROM and HP-IB Interface) as a bus controller. It is assumed that the 53A-128 Communications Card has been set with a LISTEN address of 8 and a TALK address of X. The program outputs to the 53/63 System the character string @01C9 (i.e. close relay 9 of the 53A-351 Relay Switching Card whose address is 1, and is located in a card cage with address 0) and then reads the 53A-522 DMM Card (address 2) located in the same card cage as the Relay Switching Card.

wrt 724,"@01C9"	Addresses Communications Card as active bus listener and sends character string to close relay.
wrt 724,"@02"	Addresses Communications Card as an active bus listener, and sends character string to address DVM Card in the 53/63 System.
red 724,A	Addresses Communications Card as an active bus talker and reads the DVM Card, placing the result in variable A.

The above program rewritten using a Fluke 1720 Instrumentation Controller is shown below:

```
PRINT@24,"@01C9"
PRINT@24,"@02"
INPUT@24,A
```

INSTALLATION

The 53A-128 IEEE-488 Communications Card must be plugged into the green card cage slot marked "Comm".

CAUTION: To avoid plugging the card in backwards, observe the following:

a. Match the keyed slot on the card to the key in the backplane connector. The component side should be to the right for a 53 Series Chassis and to the top for a 63 Series Chassis.

b. There are two ejectors on the card. Make sure the ejector marked "53A-128" is at the top for a 53 Series Chassis and to the left for a 63 Series Chassis.

CAUTION: The 53A-128 Card 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.

Cable Length Restrictions

The interface electronics must maintain proper line voltage levels and timing relationships to achieve design performance. If the system cable length should be too long, the devices on the bus cannot drive the lines, and the system may fail to operate properly. Observe the following when interconnecting an interface bus system:

a. The total cable length for the system must be less than 20 meters (65 feet).

b. The total cable length for the system must be less than 2 meters (6 feet) times the total number of devices on the bus.

Be sure to count the bus controller when counting the number of devices in the system. For example, a IEEE-488 bus system consisting of a bus controller and a chained 53/63 System using a 53A-128 Card contains two devices. Up to 4 meters (12 feet) of bus cable may be used to connect the bus controller to the 53/63 System.

Bus Cable

The 53A-128 IEEE-488 Communications Card is connected to the system controller by a pre-assembled cable with a hooded edge connector on one end and a standard IIB connector on the other end. The hooded end of the cable plugs onto the 53A-128 Communications Card.

Available Cables:

CDS 53A-713	4 meters long
CDS 53A-716	2 meters long
CDS 53A-717	1 meter long

TABLE I - Talk/Listen Addresses

ASCII CODE CHARACTER		BINARY CODE					OCTAL CODE		5-BIT
LISTEN ADDRESS	TALK ADDRESS	ROCKERS b7 b6	5 b5	4 b4	3 b3	2 b2	1 b1	LISTEN	TALK	DECIMAL CODE
SP	@		0	0	0	0	0	040	100	00
!	A	See	0	0	0	0	1	041	101	01
"	B	notes	0	0	0	1	0	042	102	02
#	C	below	0	0	0	1	1	043	103	03
$	D		0	0	1	0	0	044	104	04
%	E		0	0	1	0	1	045	105	05
&	F		0	0	1	1	0	046	106	06
'	G		0	0	1	1	1	047	107	07
(	H		0	1	0	0	0	050	110	08
)	I		0	1	0	0	1	051	111	09
*	J		0	1	0	1	0	052	112	10
+	K		0	1	0	1	1	053	113	11
,	L		0	1	1	0	0	054	114	12
-	M		0	1	1	0	1	055	115	13
.	N		0	1	1	1	0	056	116	14
/	O		0	1	1	1	1	057	117	15
0	P		1	0	0	0	0	060	120	16
1	Q		1	0	0	0	1	061	121	17
2	R		1	0	0	1	0	062	122	18
3	S		1	0	0	1	1	063	123	19
4	T		1	0	1	0	0	064	124	20
5	U		1	0	1	0	1	065	125	21
6	V		1	0	1	1	0	066	126	22
7	W		1	0	1	1	1	067	127	23
8	X		1	1	0	0	0	070	130	24
9	Y		1	1	0	0	1	071	131	25
:	Z		1	1	0	1	0	072	132	26
;	[		1	1	0	1	1	073	133	27
<	\		1	1	1	0	0	074	134	28
=	]		1	1	1	0	1	075	135	29
>			1	1	1	1	0	076	136	30

NOTE 1: Only the first five bits of the binary code are given for each address. These first five bits are the same for both the TALK and LISTEN addresses. The sixth and seventh bits are "hard-wired"and determine whether an address is LISTEN (01) or TALK (10).

NOTE 2: A 0 in the bit pattern indicates that the corresponding rocker is CLOSED. A 1 in the bit pattern indicates that the corresponding rocker is OPEN.

LED ASSIGNMENTS

TLK	TaLK . . . . . lit when card is addressed to talk.
LSTN	LiSTeN . . . . . lit when card is addressed to listen.
REN	Remote ENable. . . . . lit when REN line is true.
ATN	ATtentioN. . . . . lit when ATN line is true.
· SRQ	Service ReQuest. . . . . lit when SRQ line is true.
· EOI	End Or Identify. . . . . lit when EOI line is true.
· IFC	InterFace Clear. . . . . lit when IFC line is true.
DAV	Data AVailable . . . . . lit when DAV line is true.
NRFD	Not Ready For Data . . . . . lit when NRFD line is true.
NDAC	Not Data ACcepted. . . . . lit when NDAC line is true.
DIO1	Data Input/Output bit 1. . . lit when bit 1 is true.
DIO2	Data Input/Output bit 2. . . lit when bit 2 is true.
DIO3	Data Input/Output bit 3. . . lit when bit 3 is true.
DIO4	Data Input/Output bit 4. . . lit when bit 4 is true.
DIO5	Data Input/Output bit 5. . . lit when bit 5 is true.
DIO6	Data Input/Output bit 6. . . lit when bit 6 is true.
DIO7	Data Input/Output bit 7. . . lit when bit 7 is true.
DIO8	Data Input/Output bit 8. . . lit when bit 8 is true.

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