# 53A-516 DIGITAL INPUT/ANALOG COMPARATOR CARD

# OPERATING MANUAL



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# 53A-516 DIGITAL INPUT/ANALOG COMPARATOR CARD

## DESCRIPTION

The 53A-516 Digital Input/Analog Comparator Card (DI/AC Card) is a printed circuit board assembly for use in the 53/63 Series System. The sixteen inputs of the DI/AC Card can be configured under program control to function either as sixteen digital inputs, or as sixteen comparator inputs. In either mode, the sixteen input channels have individually programmable logic threshold voltages and can be programmed for high true or low true logic. Two logic threshold ranges are provided; ±6.35V in 50 mV steps or ±31.75V in 250 mV steps. The card may be programmed using either range or it may be instructed to autorange, selecting the most sensitive range suitable for a specified threshold voltage.

When used in the analog comparator mode, the DI/AC Card continuously monitors each analog input line for an input voltage level which is greater than, or less than, the programmed threshold voltage. When a voltage of the proper value is detected, the condition is captured in a latch on the DI/AC Card and a "vectored priority interrupt" is initiated to the system controller. The system controller can then interrogate the DI/AC Card to determine the interrupting channel. The system controller may request the status of an individual latch, or of all latches as a group. When the status of all latches is requested, the channel numbers (1 through 16) of those channels whose latches have been set are returned to the system controller in a priority sequence.

When the DI/AC Card is used as a digital input card, the user can select to sample input data at the time an input request is made by the system controller or when an external strobe pulse is received.

In either case, when input data is read by the system controller, a data accepted pulse is output by the card. There are provisions on the card to install pull-up resistors so that open collector, as well as contact closure, inputs can be read by the DI/AC Card.

Sixteen TTL output lines are provided on the DI/AC Card to reflect the state of the status latch of each input comparator when the card is used in the analog comparator mode. When the card is used in the digital input mode, the output lines function as hardware "level shifters", converting the programmed input logic levels to TTL-output logic levels on a continuous basis.

## CONTROLS AND INDICATORS

The following controls and indicators are provided to select and display the functions of the 53A-516 Card's operating environment.

Address Select Switch

The DI/AC Card has a miniature ten-position switch which selects the 53A-516 Card's address (0-9) in the 53/63 Series System. Open the switch's cover and use a screwdriver with a narrow, flat blade to turn the cam-action wiper to the desired position.

Power LED

The Power LED provides a valuable diagnostic tool by giving the system programmer a visual indication of the action which the system is currently taking. Whenever the 53A-516 Card is addressed by the system controller, the Power LED goes out. The LED remains out until another function card is addressed. Since only one function card can be addressed at a time, an unlit Power LED indicates the function card with which the system controller is currently communicating. The Power LED being lit not only indicates that the 53A-516 Card is unaddressed, but that all required dc power (5V dc, ±15V dc) is being supplied.

Function LEDS and Switches

Mode LEDs

The two LEDs labeled DI and AC indicate the mode in which the DI/AC Card is being used. The DI LED is lit when the card is programmed to function as a Digital Input Card, and the AC LED is lit when the card is programmed to function as an Analog Comparator.

DS LED

The Digital Strobe LED will be lit when the card is in the digital input mode and an external strobe input pulse has been received. The DS LED is cleared when input is requested by the system controller from the DI/AC Card.

CS LED

The Comparator Status LED is lit when the card is in the Analog Comparator mode, and the voltage on any input channel has exceeded the programmed voltage threshold level. The CS LED will be extinguished when all interrupting channels have been reported to the system controller.

E LED

The Error LED will light when a command string containing a syntax error is received by the DI/AC Card. The E LED, once lit, will remain lit until a K command is received by the card, or until a Halt command or STOP resets the card to its power-up conditions.

Halt Switch

This two-position slide switch is located near the card's backplane edge connector. It selects the state of the 53A-516 Card after an @XH (Halt) or STOP command is received by the 53/63 Series System.

a. If the Halt switch is in the ON position, then the 53A-516 Card is reset to its power-up state, all parameters are reset to their default values, and the Power LED is lit.

b. If the Halt switch is in the OFF position, then the 53A-516 Card becomes unaddressed, the Power LED is lit, and any programmed parameters of the card remain unchanged.

Component Mounting Platforms

Located near the front-edge connector of the DI/AC Card and shown in Table 1 are two 16-pin component-mounting platforms which allow the user to install pull-up resistors or filter capacitors across each of the sixteen digital/analog input lines. The pins of each component platform are numbered 1 through 16 in a counter clockwise direction. Pins 1 through 8 of the top platform (nearest the LEDs) are connected to input lines 1 through 8, respectively. Pins 9 through 16 of the bottom platform are connected to input lines 9 through 16, respectively. All remaining pins of both platforms are bused together and brought out to pin 20 on the front-edge connector, where an external voltage or ground may be applied. Front-edge connector pin 21 is connected to the ±5V DC supply of the DI/AC Card and pins 24 and BB are connected to ground. Any of these pins may easily be connected to pin 20 inside a 53A-780 Hooded Connector.

The table below describes how to use the component mounting platforms to install either pull-up resistors or filter capacitors across the desired input channels:

*TABLE 1*

| Input Channel | Install Component Between Pin No. | Component Platform No. |
|---|---|---|
| 1 | 1 and 16 | 1 |
| 2 | 2 and 15 | 1 |
| 3 | 3 and 14 | 1 |
| 4 | 4 and 13 | 1 |
| 5 | 5 and 12 | 1 |
| 6 | 6 and 11 | 1 |
| 7 | 7 and 10 | 1 |
| 8 | 8 and 9 | 1 |
| 9 | 9 and 8 | 2 |
| 10 | 10 and 7 | 2 |
| 11 | 11 and 6 | 2 |
| 12 | 12 and 5 | 2 |
| 13 | 13 and 4 | 2 |
| 14 | 14 and 3 | 2 |
| 15 | 15 and 2 | 2 |
| 16 | 16 and 1 | 2 |

If pull-up resistors are being installed, tie front-edge connector Pin 20 to the required pull-up voltage level. If filter capacitors are being installed, tie front-edge Pin 20 to the DI/AC Card ground, front-edge Pin 24 or BB.

## SPECIFICATIONS

### Digital Input Card

**Inputs:** 16 bits.

**Logic Threshold:** Programmable by bit ±31.75V in 250-mV steps or ±6.35V in 50-mV steps.

**Logic Sense:** Programmable - high true or low true.

**Data Strobe (Input from Data Source):**
Logic Sense - programmable, positive/negative going transition or ignored.
Logic Threshold - same as input bit 16.
Maximum Input - ±200V.

**Data Strobe (Output from data source):**
Logic Sense - programmable, high true or low true pulse. Nominal 5-µs wide pulse occurs when input data is returned to the system controller.
Logic Levels
Data Accept Output 1, TTL (0.4V to 5V), fan out to 10 TTL loads.
Data Accept Output 2, 0.4 to 10V pulse, 3.5 mA output current.
Data Accept Output 3, 10V peak-to-peak output pulse centered about ground, 0.6 mA maximum output current.

**Format of Data Returned to System Controller:** Four hexadecimal characters followed by Carriage-Return and Line-Feed characters.

**Data Throughput:** Rate at which data can be input continuously by the system controller. 2000 four-digit hexadecimal numbers plus Carriage-Return/Line-Feed characters per second.

### Analog Comparator Card

**Inputs:** 16 bipolar analog input channels.

**Voltage Threshold:** Programmable by channel ±31.75V in 250-mV steps or ±6.35V in 50-mV steps.

**Trigger Condition:** Programmable by channel: > or < voltage threshold.

**Minimum Pulse Width:**

| Overdrive | ±6.35V Range | ±31.75 Range |
|---|---|---|
| 50 mV | 17 µs | 8 µs |
| 100 mV | 14 µs | 6 µs |
| 500 mV | 8 µs | 3 µs |
| 1.0 V | 6 µs | 2 µs |
| 5.0 V | 2.5 µs | 1 µs |

Format of Data Returned to System Controller:

Single channel status: ASCII 1 or 0 followed by a "1" is returned if channel's threshold voltage has been crossed.

All channel status: channel numbers (01 through 16) of channels whose threshold voltage have been crossed. Channel numbers are returned in a priority sequence, each number followed by Carriage-Return and Line-Feed characters.

Common Specifications

Overall Accuracy: ±1.8% of full scale excursion of either range at 25°C.

Temperature Stability: 100 ppm/°C.

Calibration Cycle: 12 months.

Monotonicity: Guaranteed within either range. Overall accuracy specification applies when switching between ranges.

Input RC: 100k ohm shunted by < 20pF on ±31.75V input range.
200k ohm shunted by < 20pF on ±6.35V input range.

Maximum Input: ±200V.

Interrupt Response Time: Less than 1 µs.

Programmed By: ASCII characters.

Power Up Conditions: When power is applied, the card goes to the following known states:

Mode - Analog Comparator
Range - ±6.35V.
Threshold Level - 1.4 V.
Trigger Condition - Greater than threshold level.
External Strobe - Disabled.
Data Accept Output Sense - Low true.
Interrupts - Off.
Comparator Latches - Cleared.
Power LED - Lit.

TTL Output Lines:

Fan Out: 10 TTL loads.
Logic Sense: High true.
Number of Outputs: 16.
Function:
Analog Comparator Mode - True if corresponding comparator latch is set.
Digital Input Mode - True if corresponding input bit is true.

| | |
|---|---|
| Power Requirements: | 5V and ±15V 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): | 1.30 A, maximum quiescent.<br>1.36 A, peak. |
| Voltage (±15-volt Supplies): | +14.5 V dc to +15.5 V dc.<br>-14.5 V dc to -15.5 V dc. |
| Current (+15-volt Supplies): | 127 milliamperes, maximum quiescent.<br>141 milliamperes, peak. |
| Current (-15-volt Supplies): | 80 milliamperes, maximum quiescent.<br>83 milliamperes, peak. |
| Cooling: | Provided by the fan in the 53/63 card cage. |
| Temperature: | -10°C to +65°C, operating (assumes ambient temperature of 55° and airflow to assure less than 10°C temperature rise).<br>-40°C to +85°C, storage. |
| Humidity: | Less than 95% R.H. noncondensing, -10°C to +30°C.<br>Less than 75% R.H. non-condensing, +31°C to +40°C.<br>Less than 45% R.H. non-condensing, +41°C to +55°C. |
| Dimensions: | 197 mm high, 220 mm deep, 13 mm wide.<br>(7.75" x 8.66" x 0.5"). |
| Dimensions, Shipping: | When ordered with a 53/63 Card Cage, the card is installed in one of the card cage's function-card slots.<br><br>When ordered alone the shipping dimensions are:<br><br>254 mm x 254 mm x 127 mm. (10" x 10" x 6"). |
| Weight: | 0.23 kg. (0.5 lbs). |
| Weight, Shipping: | When ordered with a 53/63 Card Cage, the card is installed in one of the card cage's function-card slots.<br><br>When ordered alone the shipping is:<br>0.64 kg. (1.4 lbs). |
| Mounting Position: | Any orientation. |
| Mounting Location: | Installs in any function-card slot of the 53/63 Series Card Cage. |

| | |
|---|---|
| Input Connections: | A 48-pin printed circuit type hooded connector (53A-780) provides a connection for all front edge input and output signals. |
| Required Equipment (not supplied): | 53A-780 Hooded Connector. |
| Equipment Supplied: | 53A-516 Digital Input/Analog Comparator Card.<br>Spare fuse, (Part #42202-52001).<br>Operating Manual, (Part #00000-15160).<br>Service Manual, (Part #00000-25160). |

# OPERATION

## Overview

The DI/AC Card is programmed by ASCII characters issued from the system controller to the 53/63 System's communications card. The 53A-516 Card is interfaced to the communications card through the 53 Series or 63 Series Card Cage's backplane.

To address a function card for the first time, the system command @XY must be issued. X is the card cage address (0-9) selected on the 53A-171 Control Card in the addressed card cage; Y is the 53A-516 Card's address (0-9) within the addressed card cage. The 53A-516 Card's address is selected using the card's Address Select switch. Once a function card is addressed, it remains addressed until the system receives another @ character. After the 53A-516 Card is addressed, the commands listed below may be issued until another function card is addressed. More than one command may be entered on a single line by simply stringing them together; they are scanned and acted upon in left to right order.

The Common Commands section details commands which apply when the DI/AC Card is functioning as either an Analog Comparator or Digital Input Card. The Digital INput section details commands used when the DI/AC Card is functioning as a Digital INput Card, while the Analog comparator section describes commands used when the card is functioning as a Analog Comparator.

## Common Commands

| Command | Description |
|---|---|
| @XY | The @XY (Address) command addresses a function card in the 53/63 Series System.<br><br>@ is a delimiter used by the 53/63 Series System.<br><br>X is a card cage address (0-9) defined by the Address Select switch on the 53A-171 Control Card in the addressed card cage.<br><br>Y is a function-card address (0-9) defined by the Address Select switch on the function card. Once a card cage/function-card combination is addressed, it remains addressed until the 53/63 Series System detects a new @ character. |
| T | The T command programs the input logic or voltage level threshold of each channel and the logic sense or trigger condition of each channel. This command automatically selects the most sensitive range consistent with the programmed threshold voltage level.<br><br>Syntax: @XYT$Z_1Z_2$<br><br>$Z_1$ $Z_1$ is a one or two digit number which specifies the channel (1 through 16) to which the T command applies. If $Z_1$ is the ASCII character * (Octal 52), the T command is applied to all 16 input channels. |

$Z_2$ $Z_2$ represents the input logic or voltage level threshold to be programmed for the channel specified by $Z_1$, and must fall within the range, ±31.75 V. When the programmed threshold falls within the range ±6.35 V, the most sensitive range is selected. When the DI/AC Card is used in Digital Input mode, the required logic threshold voltage is preceded with a > or < sign to indicated positive true or negative true logic respectively. When the DI/AC Card is used in Analog Comparator mode, the > sign indicates that the input voltage must exceed (be greater than) the programmed threshold voltage, while the < sign indicates that the input voltage must go below (be less than) the programmed threshold voltage to set an individual comparator's status latch.

*NOTE:* The channel number and threshold voltage values may be preceded by leading spaces or zero characters. In the case of a positive threshold, the plus sign in front of the value may be omitted. The decimal point is required and must be followed by at least two decimal digits.

Example:
Digital Input - To program all 16 inputs for TTL level logic with a 1.5V logic threshold and positive true logic sense, the following command would be used: @01T*>1.5. To change bit 5 to a 1.5V logic threshold with negative true logic sense, issue the command @01T5<1.5.

Example:
Analog Comparator - To set the voltage threshold of channel 8 to greater than 15.250V and the channel 6 to less than -6.15V, the following command is used: @01T8>15.25T6<-6.15.

H

The H command programs the input logic or voltage level threshold of each channel and the logic sense or trigger condition of each channel. This command functions like the T command, except that it forces the use of the high (less sensitive) range.

Syntax: @XYH$Z_1Z_2$

$Z_1$ $Z_1$ is the same as the $Z_1$ parameter of the T command.

$Z_2$ $Z_2$ is the same as the $Z_2$ parameter of the T command except that the ±31.75V range is selected even when the specified threshold level is within ±6.35V.

Example:
To set all channels to a TTL threshold level of 1.5V using low true logic on the ±31.75V range with a resolution of 0.25V, issue the following command @01H*<1.5.

L

The L command programs the input logic or voltage level threshold of each channel and the logic sense or trigger condition of each channel. This command functions like the T command except that it forces the use of the low (most sensitive) range.

Syntax: @XYL$Z_1Z_2$

$Z_1$ $Z_1$ is the same as the $Z_1$ parameter of the T command.

$Z_2$ $Z_2$ is the same as the $Z_2$ parameter of the T command except that the specified threshold level must be within the range of ±6.35V.

Example:
To set channel 4 to a threshold voltage of -2.35 volts using high true logic on the ±6.35V range with a resolution of 0.05V, issue the following command: @01L4>-2.35.

I

The Interrupt Command is used to enable or disable interrupts from DI/AC Card. Detection and handling of vectored priority interrupts are described in the 53A-171 Control Card Manual.

When in the Analog Comparator mode, if interrupts are enabled, the DI/AC Card will generate an interrupt to the system controller whenever an individual input channel's voltage threshold is crossed. The card will continue to generate an interrupt until the status of all interrupting input channels has been reported to the system controller.

In the Digital Input mode, if interrupts are enabled, the DI/AC Card generates an interrupt whenever a strobe input is received by the card. The card will continue to generate an interrupt until the input data latched by the card has been returned to the system controller.

Syntax: @XYI$Z_1$

$Z_1$ If $Z_1$ is a 1, interrupts will be enabled.
If $Z_1$ is a 0, interrupts will be disabled.

Example:
The command sequence @01I1 would enable interrupts.

R

The Reset command is used to simultaneously clear all sixteen comparator status latches in the Analog Comparator mode and to clear the strobe latch in the Digital Input mode. Individual comparator status latches are also cleared whenever the status of a comparator is returned to the system controller.

Syntax: @XYR

The R character instructs the DI/AC Card to clear all latches.

Example:
The command sequence @01R would clear all latches of the DI/AC Card with address 1 located in the mainframe with address 0.

K

The Kill command returns the DI/AC Card to its initial power up conditions.

Syntax: @XYK

@XH

The Halt command halts all function cards within the card cage defined by X. This command does not affect function cards in other card cages. How a function card reacts to the @XH command depends on the particular card. In all cases, an addressed function card (Power LED out) becomes unaddressed (Power LED lit).

The effect of the Halt command on the DI/AC Card is determined by the Halt switch located on the card. (See Halt switch description.)

Example:
Assume the Halt switch is in the OFF position. The command @0H would unaddress all function cards in the card cage with address 0 and would have no other effect on the DI/AC.

If the Halt switch was in the ON position, the effect of the Halt command would have been the same as turning the power off and back on - i.e., the power-up conditions.

STOP

The STOP Command is not a string of ASCII characters but is a hard-wired command from the system controller to the 53/63 SEries System's communications card in each card cage.

Consult individual Communications Card manuals for an explanation of how the system controller initiates a STOP Command. In the case of a 53A-127 IEEE-488 Communications Card, for example, a STOP Command is initiated when the system controller asserts the IEEE-488 Bus Line IFC (Interface Clear).

When a STOP Command is initiated by the system controller, individual system cards will react as though they had received a Halt Command, as described above. When the system controller issues a STOP command, each function card (including the 53A-516 Card) reacts as if it had received the @XH command described above.

How the system controller executes a STOP command depends on the communications card used. For example, when using the 53A-128 IEEE-488 Communications Card, a STOP command is executed whenever the system controller asserts the IEEE-488 bus line IFC (Interface Clear) true.

Analog Comparator Commands

In the Analog Comparator mode, the status latch associated with each individual comparator is set when an input voltage is detected that crosses the channel's programmed voltage threshold level in the proper direction.

| Command | Description |
|---|---|
| A | The AC Mode Command selects the Analog Comparator mode. |

Syntax: @XYA

F — The Flip Command reverses an individual comparator channel's trigger sense ( > or <, as defined by the T command), each time that comparator's status latch is reported as set to the system controller.

Syntax: @XYF$Z_1$

$Z_1$ — $Z_1$ is a one or two digit number which specifies the channel (1 through 16) to which the F command applies. If $Z_1$ is the ASCII character * (Octal 52), the F command is to be applied to all 16 input channels. Notice that the inversion of the logic sense does not occur immediately when a transition is detected by the DI/AC card, but is deferred until the transition has been reported to the system controller.

Example:
To program comparator input 6 so that an interrupt to the system controller would be generated each time the input signal crossed 2 volts (in a positive going or negative going direction), use the commands

@01I1T6>2.00F6

The commands @01I1T6>2.00 enables card interrupts and sets up channel 6 to generate an interrupt when a positive going voltage greater than 2.00 volts is detected. The command F6 instructs the card to automatically execute a T6<2.00 command after an interrupt is reported for a positive going transition and at T6>2.00 command after an interrupt is reported for a negative going transition.

C — The Channel command is issued to the DI/AC Card prior to the system controller requesting input from the card. The C command instructs the card as to which channel(s) status is to be returned to the system controller on its next input request.

Syntax: @XYC$Z_1$

$Z_1$ — $Z_1$ is a one or two digit number specifying the input channel whose status is to be returned to the system controller. A 1

followed by Carriage-Return and Line-Feed characters will be returned if the input channel has detected a voltage which has crossed its programmed threshold level in the proper direction, i.e., the channels status latch is set. A 0 followed by Carriage-Return and Line-Feed characters will be returned if the channel's status latch is not set. After returning the state (0 or 1) of a channel's status latch, the latch is cleared.

If the $Z_1$ character is an "*" (Octal 52), the channel number of each input channel whose status latch is set is returned in a priority sequence. The priority sequence is highest numbered status latches are reported first. The value returned to the system controller on each input request is a two digit number, 16 through 01 and 00, each followed by Carriage-Return and Line-Feed. The number 00 is the last returned value, indicating that all set status latches have been reported to the system controller. As each set status latch is reported to the system controller, the latch is automatically cleared.

Example:
See the example following the @XY command.

@XY

Whenever the ID/AC Card is addressed, the system controller can request input from the card and receive the status information as defined by the last issued C command.

Example:
In the following two examples, assume that channels 6 and 13 have detected the necessary input voltage transition to set their status latches and that the DI/AC Card is addressed (Power LED out).

If the last issued channel command was: C6, and the system controller requests input from the DI/AC Card, it would receive a 1 followed by Carriage-Return and Line-Feed. If input was immediately requested again, the system controller would receive a 0 followed by Carriage-Return and Line-Feed since the prior input will have cleared channel six status latch.

If the last issued channel command was C*, and the system controller requested input three times from the DI/AC Card, the following would be returned:

| Data Returned | Input Request |
|---|---|
| 13 CR LF | 1st |
| 06 CR LF | 2nd |
| 00 CR LF | 3rd |

If a fourth input request is immediately made, 00 CR LF would again be returned, indicating that no channels have a set status latch condition to be reported.

Digital Input Commands

When the DI/AC Card is in the Digital Input mode, the card functions as a sixteen bit binary input card.

| Command | Description |
|---|---|
| D | The DI Mode command selects the Digital Input mode.<br><br>Syntax: @XYD |
| O | The Output command programs the logic sense of the three Data Accept Output handshake lines.<br><br>Syntax: @XYOZ<br><br>Z — Z is a single character (+ or -) which instructs the card as to the logic sense to the Data Accept lines. If Z is a "+", high true logic is selected; if Z is a "-", low true logic is selected.<br><br>Example:<br>To program the handshake lines for low true logic the following command is issued:<br><br>@O1O- |
| S | The Strobe command is used to instruct the DI/AC Card as to when to latch into memory the data present on the sixteen digital input lines.<br><br>Syntax: @XYSZ<br><br>Z — Z is a single character (0, + or -) that instructs the card as to when to latch input data. If Z is a "0", data will be latched each time input is requested by the system controller from the card. If Z is a "+", data is latched each time a positive going external strobe pulse is received by the card. If Z is a "-", data will be latched each time a negative going external strobe pulse is received. When Z is a "+" or "-", the logic threshold level of the strobe input is the same as that programmed for digital input 16.<br><br>Example:<br>See the example following the @XY command. |
| @XY | Whenever the DI/AC Card is addressed, the system controller can request input from the card. The data returned will be from the card. The data returned will be formatted into four hex characters followed by Carriage-Return and Line-Feed. If the Strobe mode was previously |

programmed to SO, the hex equivalent of the input data (see Table 1) at the time the input request is received, will be returned to the system controller. If the last Strobe mode programmed S+ or S-, the data latched from the most recently received strobe pulse will be returned to the system controller. If a strobe pulse has not been received since the last time an input request was made or since the last S+ or S- command was issued to the card, four ASCII N's followed be Carriage-Return and Line-Feed will be returned to the system controller. The N's are a method of indicating to the system controller that a strobe pulse has not been received. If N's are returned to the system controller, a Data Accept Output pulse will not be generated when the system controller requests input from the card.

Example:
If the last issued Strobe command was S0, the system controller would receive four hex characters followed by Carriage-Return and Line-Feed each time input is requested from the card.

If the last issued Strobe command was S+ or S-, and three successive strobe pulses were received by the card, the data returned would be the hex equivalent of the input data at the time the third strobe pulse was received. If an additional input request was received by the card before another strobe pulse was received, then four N's would be returned to the system controller.

*TABLE 2: Binary To Hex Conversions*

| Data On Input Lines* | | | | Equivalent Hex Input Character (one of four) |
|---|---|---|---|---|
| 4 | 3 | 2 | 1 | |
| 8 | 7 | 6 | 5 | |
| 12 | 11 | 10 | 9 | |
| 16 | 15 | 14 | 13 | |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 2 |
| 0 | 0 | 1 | 1 | 3 |
| 0 | 1 | 0 | 0 | 4 |
| 0 | 1 | 0 | 1 | 5 |
| 0 | 1 | 1 | 0 | 6 |
| 0 | 1 | 1 | 1 | 7 |
| 1 | 0 | 0 | 0 | 8 |
| 1 | 0 | 0 | 0 | 9 |
| 1 | 0 | 1 | 0 | A |
| 1 | 0 | 1 | 1 | B |
| 1 | 1 | 0 | 0 | C |
| 1 | 1 | 0 | 1 | D |
| 1 | 1 | 1 | 0 | E |
| 1 | 1 | 1 | 1 | F |

* A one (1) represents the true state of an input line.

Example:

Data Input Lines

| | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input Data | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |

Hex equivalent returned to system controller: AB2D

## INSTALLATION

The 53A-516 Card is a function card; therefore, it may be installed in any blue card slot. Setting the Address Select switch defines the card's programming address. To avoid confusion, it is recommended that the slot number and the programming address be the same.

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-516" is at the top for a 53 Series Chassis and to the left for a 63 Series Chassis.

CAUTION:

The 53A-516 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.

# APPENDIX A - CALIBRATION

The 53A-516 Card must be calibrated every 12 months in order for the card to meet its published accuracy specifications. Calibrate the 53A-516 Card in an environment where the temperature is between 21° and 25°C. If this is not feasible, or the card will be operating under a wide temperature variation, consult the temperature drift specifications. Allow a ten minute warm-up period before performing the calibration.

Required Eqipment

- a small flat-blade screwdriver to adjust potentiometers.
- a high quality DC volt meter with at least 4½ digits resolution and no less than 1 Megohm input impedance.

Procedure

1) Connect the voltmeter to indicate voltage between the ground (edge pin 24) and the +10.000 V reference (edge pin W) of the card.

2) Adjust the potentiometer at the bottom edge of the card until the voltmeter reads +10.000 V ±0.001 V.

3) Connect the voltmeter to indicate the voltage between the ground and the +9.381 V reference (edge pin X) of the card.

4) Adjust the remaining potentiometer until the voltmeter reads +9.381 V ±0.001 V.

## APPENDIX B - INPUT/OUTPUT CONNECTIONS

Input Connector

Signals are input to the DI/AC Card using a 53A-780 Hooded Connector. The signal assignments are listed below:

| Channel | Signal | 53A-780 Pin Number/Letter |
|---|---|---|
| 1 | Input | 1 |
| | TTL Output | A |
| 2 | Input | 2 |
| | TTL Output | B |
| 3 | Input | 3 |
| | TTL Output | C |
| 4 | Input | 4 |
| | TTL Output | D |
| 5 | Input | 5 |
| | TTL Output | E |
| 6 | Input | 6 |
| | TTL Output | F |
| 7 | Input | 7 |
| | TTL Output | H |
| 8 | Input | 8 |
| | TTL Output | J |
| 9 | Input | 9 |
| | TTL Output | K |
| 10 | Input | 10 |
| | TTL Output | L |
| 11 | Input | 11 |
| | TTL Output | M |
| 12 | Input | 12 |
| | TTL Output | N |
| 13 | Input | 13 |
| | TTL Output | P |
| 14 | Input | 14 |
| | TTL Output | R |
| 15 | Input | 15 |
| | TTL Output | S |
| 16 | Input | 16 |
| | TTL Output | T |

| Signal | 53A-780 Pin Number/Letter |
|---|---|
| Strobe Input | 17 |
| Data Accept Output (TTL) | U |
| Data Accept Output (0.4 to 10 V) | 18 |
| Data Accept Output (-8 to +8 V) | V |
| Common Interrupt Output (TTL) | 19 |
| Component Platform Common Input | 20 |
| +5V DC | 21 |
| +10V Calibration Point | W |
| +9.381V Calibration Point | X |
| Ground | 22 through 24 |
| | Y, Z, AA, BB |

*NOTES:*

1) Common Interrupt Output will go low in the Analog Comparator Mode when the status latch of any of the sixteen analog input channels is set. It will remain low until all set status latches have been reported to the system controller.

2) Common Interrupt Output will go low in the Digital Input Mode when a Strobe Input pulse is detected. It will remain low until data latched by the strobe pulse is read by the system controller.

3) The Data Accept Outputs are generated in the Digital Input Mode when input data from the DI/AC Card is read by the system controller.

4) TTL Output lines, in the Digital Input Mode, will be high if the specified threshold condition of the corresponding input line is true. To obtain clean TTL transitions on these outputs, it is necessary to maintain a minimum input signal slew rate of at least 2 V/µs on the ±6.35 V range and 6 V/µs on the ±31.75 V range.

5) TTL Output lines, in the Analog Comparator Mode will be set high when the specified threshold condition of the corresponding input line becomes true; the lines remain high, at least, until the next input request from the 53/63 system controller to the 53A-516 Card. It may remain high after that time, but in any case, will return low by the time the corresponding comparator latch is reported as set to the system controller.