

53A-414 BCD OUTPUT CARD

OPERATING MANUAL

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53A-414 BCD OUTPUT CARD

DESCRIPTION

The 53A-414 BCD Output Card is a printed circuit board assembly for use in a CDS 53/63 Series System. The card enables the 53/63 System to output digital data to a variety of peripherals such as printers, or output control signals to instruments such as voltmeters and counters.

The card receives up to ten ASCII decimal digits as data from the system controller and transfers the data to the card's output lines via an ASCII to BCD translator located on the BCD Output Card. The output is ten parallel BCD digits (40-bits) of TTL data, either high or low true, 8421 code.

The card indicates to the external instrument (data receptor) that data is valid by setting the data ready line to the true state (switch selectable).

The BCD output lines are latched and will remain at the last state set by the system controller even though the system controller may be performing other tasks and the BCD Output Card is unaddressed.

The 53A-414 Card can be used as a 40-bit binary output card by setting all sysmol select switches to the binary position and observing the following table.

<u>ASCII Input</u> (from system controller)	<u>BCD Card Output</u> (to data receptor)				
	BCD Character	8	4	2	1
0	0	0	0	0	0
1	1	0	0	0	1
2	2	0	0	1	0
3	3	0	0	1	1
4	4	0	1	0	0
5	5	0	1	0	1
6	6	0	1	1	0
7	7	0	1	1	1
8	8	1	0	0	0
9	9	1	0	0	1
:	A	1	0	1	0
:	B	1	0	1	1
:	C	1	1	0	0
<	D	1	1	0	1
■	E	1	1	1	0
>	F	1	1	1	1
?					

NOTE: BCD A through F is also known as BCD 10 through 15.

CONTROLS AND INDICATORS

The following controls and indicators are provided to select and display the functions of the 53A-414 Card's operating environment.

Address Select Switch

The BCD Output Card has a miniature ten-position switch which selects the 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-414 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-414 Card is unaddressed, but that all required dc power (5V dc, $\pm 15V$ dc) is being supplied.

Fuses

The fuse is on the 5 volt power bus and protects the system from overload conditions. If the fuse has blown, the Power LED will not light.

Function Switches

Bit Jumpers

There are four 2-position jumpers used to select either high true or low true logic for the BCD output data. The four Bit jumpers: bit 4, bit 3, bit 2, bit 1 correspond to the 8, 4, 2, 1 lines of the BCD character respectively. The position labeled 1 is low true for the corresponding BCD line and position 2 is high true.

Data Accept Jumper

On the front edge of the BCD Output Card is a Data Accept line (Pin #Z) which provides a signal from the data receptor to the BCD Output Card. If the Wait switch (see below) is in position 2 the BCD Output Card is inhibited from changing the output data until the Data Accept line is set by the data receptor.

The Data Accept jumper is used to select one of two data accept conditions:

Position 1 - The BCD Output Card waits for a high to low transition.

Position 2 - The BCD Output Card waits for a low to high transition.

Data Ready Jumper

On the front edge of the BCD Output Card is a Data Ready line (Pin #AA) which provides a signal from the BCD Output Card to the data receptor. The Data Ready line indicates to the data receptor when data is valid from the BCD Output Card.

The Data Ready jumper is used to select one of two data ready conditions:

Position 1 - A positive-going TTL pulse will occur on the data ready line when the data is valid.

Position 2 - A negative-going TTL pulse will occur on the data ready line when the data is valid.

Symbol Select Switches

Devices which accept BCD data (data receptors) will usually expect the BCD characters A through F (10 through 15) to represent plus, minus and decimal point. However, there is not an industry standard.

The three Symbol Select switches are used to select a correspondence among the three ASCII characters + - . (output from the system controller to the BCD Output Card), and the six BCD characters A through F (output from the BCD Output Card to the data receptor).

Example: BCD F will be output from the card after the card receives an ASCII + from the system controller, if the + Symbol Select Switch is set to the F position.

The switches in the following figure are set such that BCD B, D, and E will be output for ASCII inputs of + - . respectively.

Binary Output: With the three Symbol Select switches set in the Bi position the card can be used as a 40-bit binary output card.

Wait Switch

The Wait switch will, when used, cause the BCD Output Card to wait until the data receptor acknowledges via the Data Accept Line (Pin #Z) that it is finished with the data and it is ready for new data.

The two switch positions are:

Position 1 - The Data Accepted signal from the data receptor is not required and the Data Accept Switch is disabled.

Position 2 - The data accepted signal from the data receptor is required and the Data Accept Switch is enabled.

SPECIFICATIONS

<u>Parallel Data Output:</u>	Capacity, BCD: 10 digits, High or Low true, 8421 code. Capacity, Binary: 40 bits. Logic levels: TTL Fan out: Ten TTL loads. Transfer Time: Less than a microsecond for all 40 bits from the BCD Output Card to the data receptor.
<u>Programmed By:</u>	ASCII characters.
<u>Data Throughput:</u>	This is the rate which data can be <u>continuously</u> output by the system controller through the BCD Output Card to the data receptor. The BCD output card is capable of a data rate of 12000 ten-digit transfers per second. In a typical system, throughput will be limited by the system controller, the 53/63 System Communications Card and the data receptor.
<u>Data Ready</u> <u>(output to data receptor):</u>	High or low true pulse (switch selectable). Pulse occurs approximately 3 μ s after output data has settled. Fan out: 10 TTL loads. Pulse width: 0.5 μ s nominal. Rise and fall time: 20 nanoseconds maximum.
<u>Data Accept</u> <u>(input from data receptor):</u>	High to low or low to high transition (switch selectable). Minimum pulse width: 30 nanoseconds. Maximum rise time: 5 microseconds.
<u>Power Up:</u>	When power is turned on, the card will go to the following known state: All BCD outputs will be low.
<u>Power Requirements:</u>	Power is provided by a 53A-060 power supply located in the 53A-002 Card Cage. Voltage: 4.75V to 5.25V DC. Current: 0.7 amperes maximum, quiescent. 1.0 amperes, peak.
<u>Cooling:</u>	Provided by the fan in the 53/63 Card Cage.
<u>Temperature:</u>	-10 °C to +65 °C, operating (assumes ambient temperature of 55 °C and airflow to assure less than 10 °C temperature rise). -40 °C to +85 °C, storage.
<u>Humidity:</u>	Less than 95% R.H. noncondensing, -10 °C to +30 °C. Less than 75% R.H. non-condensing, +31 °C to +40 °C. Less than 45% R.H. non-condensing, +41 °C to +55 °C.

<u>Dimensions:</u>	197 mm High, 220 mm Deep, 13 mm Wide. (7.75" x 8.66" x 0.5")
<u>Dimensions, Shipping:</u>	When ordered with a 53/63 Card Cage, the card is installed in one of the card cage's function-card slots. When ordered alone the shipping dimensions are: 254 mm x 254 mm x 127 mm (10" x 10" x 5")
<u>Weight:</u>	0.23 Kg. (0.5 lbs.)
<u>Weight, Shipping:</u>	When ordered with a 53/63 Card Cage, the card is installed in one of the card cage's function-card slots. When ordered alone the shipping weight is: 0.64 Kg. (1.4 lbs.)
<u>Mounting Position:</u>	Any orientation.
<u>Mounting Location:</u>	Installs in any function card slot of the 53/63 Card Cage.
<u>Required Equipment:</u>	A 53A-780 Hooded Connector or 53A-742 Data Cable is required with this card.
<u>Equipment Supplied:</u>	53A-414 BCD Output Card. Spare Fuse (Part #42202-52001). Operating Manual (Part #00000-14140). Service Manual (Part #00000-24140).

OPERATION

The BCD Output Card is programmed by ASCII characters issued from the system controller to the 53/63 System's communications card. The BCD Output 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-414 Card's address (0-9) within the addressed card cage. The 53A-414 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-414 Card is addressed, the commands listed below may be issued until another function card is addressed.

<u>Command</u>	<u>Description</u>
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S	This command is used to output up to a 10-digit (40-bit) BCD number.
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Syntax: @XYZ₁...Z_nS

Once this command is issued, the system controller is free to address other function cards even though the data receptor may not have finished taking the data. The smart hardware on the BCD Output Card provides a data output buffer.

The Z₁...Z_n characters represent one to ten decimal digits which are converted to BCD format for output. If fewer than ten decimal digits are given before an S, the leading BCD digit's output data lines will be low.

The S in the sequence strobes the decimal data to the output lines and sets the Data Ready line.

Example:

The command "@049876543210S" would cause the BCD Output Card to output the BCD equivalent of the ASCII characters 9876543210.

In this example, it was assumed that the BCD Output Card had address 4 and was located in the card cage with address 0.

Status:

Power LED - out.

H	The @XH (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 BCD Output Card is to unaddress the card and set all of the output lines low.
---	---

Example:

Assume the BCD Output Card is addressed and has received data followed by an S command. The command @XH will HALT all function cards in the card cage with address 0.

The BCD Output Card will be unaddressed and the data on its output lines will be low.

Status:

Power LED - lit.

STOP

The STOP command is not a string of ASCII characters. This command is hard-wired from the system controller to the 53/63 System's communications card in each card cage. When the system controller issues a STOP command, each function card (including the 53A-414 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.

Examples

In the following examples, the Symbol Select switches are assumed to be set as shown in the switch description, and leading zeroes represent a low TTL state.

Example 1: If the system controller outputs -3.14, the BCD Output Card will output the following characters: 0000D3E14

Example 2: If the system controller outputs -3.14159, the BCD Output Card will output the following characters: 00D3E14159

INSTALLATION

The 53A-414 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-414" is at the top for a 53 Series Chassis and to the left for a 63 Series Chassis.

CAUTION:

The 53A-414 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.

WIRE LIST

In this wire list, digit 10 is the most significant digit. Digits are loaded from the right and shifted to the left.

Digit	BCD	Pin #	Wire Color		Pin #
			53A-742 Cable	User's Cable	
1	1	2	Brown of Brown/White		
	2	B	White of Brown/White		
	4	3	Red of Red/White		
	8	C	White of Red/White		
2	1	4	Orange of Orange/White		
	2	D	White of Orange/White		
	4	5	Yellow of Yellow/White		
	8	E	White of Yellow/White		
3	1	6	Green of Green/White		
	2	F	White of Green/White		
	4	7	Blue of Blue/White		
	8	H	White of Blue/White		
4	1	8	Violet of Violet/White		
	2	J	White of Violet/White		
	4	9	Gray of Gray/White		
	8	K	White of Gray/White		
5	1	10	Brown of Brown/Black		
	2	L	Black of Brown/Black		
	4	11	Red of Red/Black		
	8	M	Black of Red/Black		
6	1	12	Orange of Orange/Black		
	2	N	Black of Orange/Black		
	4	13	Yellow of Yellow/Black		
	8	P	Black of Yellow/Black		
7	1	14	Green of Green/Black		
	2	R	Black of Green/Black		
	4	15	Blue of Blue/Black		
	8	S	Black of Blue/Black		

Digit	BCD	Pin #	Wire Color		Pin #
			53A-742 Cable	User's Cable	
8	1	16	Violet of Violet/Black		
	2	T	Black of Violet/Black		
	4	17	Gray of Gray/Black		
	8	U	Black of Gray/Black		
9	1	18	Red of Red/Brown		
	2	V	Brown of Red/Brown		
	4	19	Orange of Orange/Brown		
	8	W	Brown of Orange/Brown		
10	1	20	Yellow of Yellow/Brown		
	2	X	Brown of Yellow/Brown		
	4	21	Green of Green/Brown		
	8	Y	Brown of Green/Brown		
Data Accept	Z	Brown of Blue/Brown			
Data Ready	AA	Brown of Violet/Brown			
Ground	24	Shield			