

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

53A-336 HIGH VOLTAGE SCANNER CARD

OPERATION MANUAL

BFGoodrich
Aerospace

JcAIR Test Systems

WARRANTY

BFGoodrich Aerospace JcAir Test Systems (TSD) warrants its CDSbus products (hardware and firmware) against defects in materials and workmanship, and are warranted to meet the performance specifications as listed in the current catalog and/or data sheet for the specific product being warranted. This warranty applies for three (3) years following the date of shipment. TSD will, at its option, repair or replace, at no cost to the customer, products which prove to be defective during the warranty period, provided the defect or failure is not due to misuse or abuse of the product. The customer is responsible for shipment of the defective product to the TSD factory. Software products are supplied on a site license basis subject to the same performance warranty provisions; the materials and distribution provision applies to the distribution media only. NOOTHER WARRANTY IS EXPRESSED OR IMPLIED, INCLUDING WARRANTY FOR FITNESS OF PURPOSE. TSD SHALL, IN NO CASE, BE LIABLE FOR CONSEQUENTIAL DAMAGES.

This document is proprietary to BFGoodrich Aerospace, JcAir Test Systems, and is not to be reproduced or otherwise disseminated without the written consent of BFGoodrich Aerospace, JcAir Test Systems.

400 New Century Parkway – New Century, Kansas – 66031
Telephone: (800) 237-2831 / (913) 764-2452 Fax: (913) 782-5104
http:\\www.jcair.com

1/28/00 8507-02-A
through
8607-02-F

53A-336 HIGH VOLTAGE SCANNER CARD

OPERATING MANUAL

DESCRIPTION 1

CONTROLS AND INDICATORS
- Address Select Switch 2
- Power LED 2
- Fuse 2
- Function LEDS and Switches 2

SPECIFICATIONS 5

OPERATION
- Overview 8
- Card Commands 8

INSTALLATION 10

53A-336 WIRE LIST 12

APPENDIX A
- 53/63 SERIES SYSTEM COMMANDS 14

APPENDIX B
- USING THE 53A-336 WITH DC VOLTAGES GREATER THAN 130V RMS 15

53A-336 HIGH VOLTAGE SCANNER CARD

DESCRIPTION

The 53A-336 High Voltage Scanner Card is a printed circuit board assembly used in the 53/63 Series Card Cage. The Scanner Card provides 16 two-wire channels of analog signal acquisition switching at a maximum rate of 40 channels per second. Up to 10 53A-336 High Voltage Scanner Cards can be plugged into a single Card Cage to provide scanning of up to 160 channels. As many as 10 Card Cages can be chained together to provide a system with up to 1,600 high voltage channels. If the user desires, 53A-331 (10 four-wire channels per card), 53A-332 Reed Relay Scanners (20 two-wire channels per card), and 53A-336 High Voltage Scanners can be mixed in the same card cage.

A 53A-336 channel can be randomly selected (closed) by transmitting ASCII characters from the system controller (calculator or computer), to the 53/63 Series system. The card contains built-in logic to insure that any previously closed channel on any card (53A-331, 53A-332, or 53A-336) is first opened before a new channel is closed.

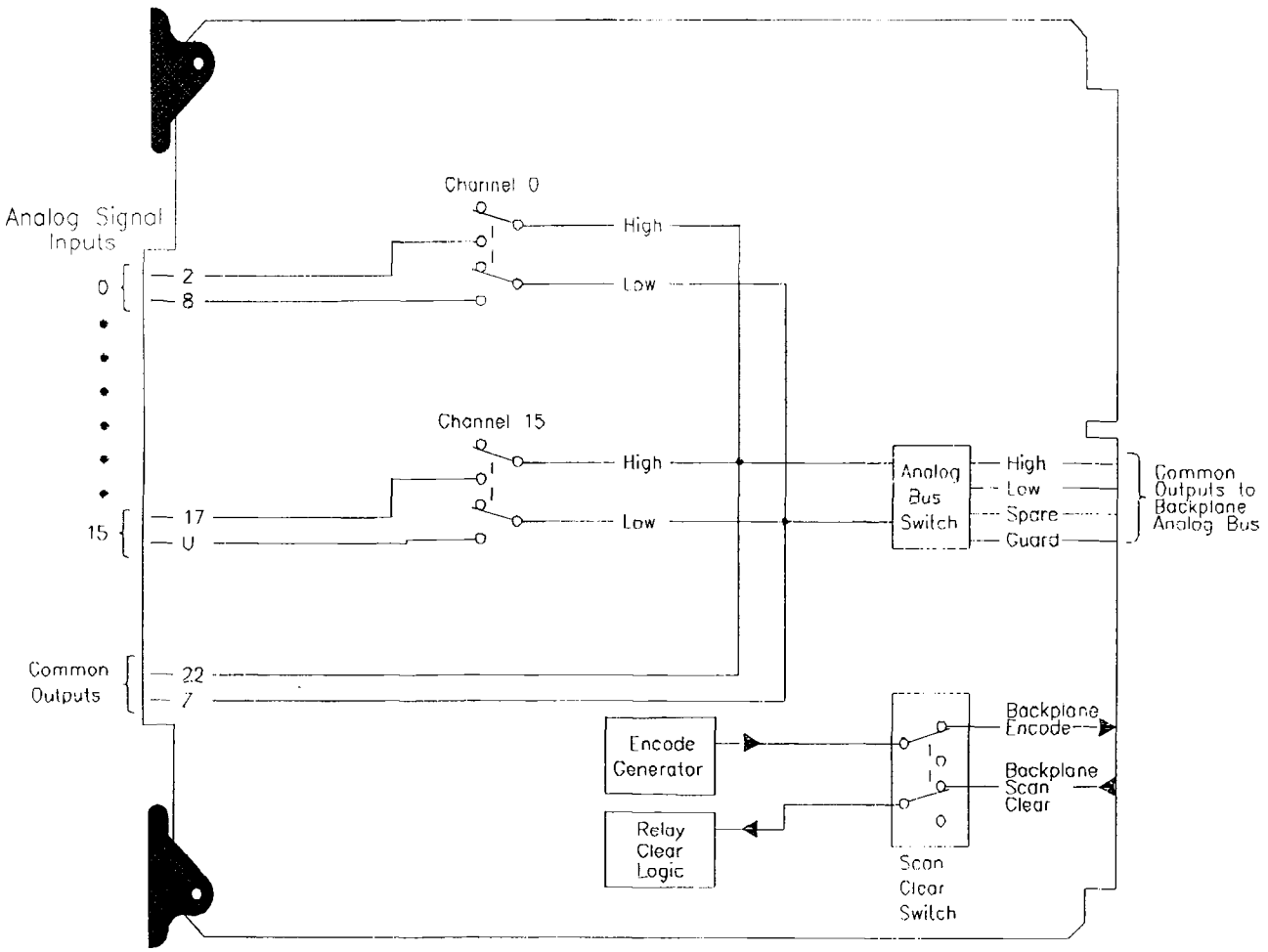


Figure 336-1: 53a-336 Block Diagram

The 53A-336 Card is manufactured using relays specifically designed to handle the high instantaneous inrush currents that can occur when switching a mixture of high and low voltage AC or DC signals. Due to the capacitance of the cable wiring between the unit under test (UUT) and the scanner card input, instantaneous currents in excess of 10 amperes can easily occur when switching from a low voltage channel (less than 10 to 15V) to a high voltage channel (over 100V). For example, a distributed cable capacitance of 300 pF can cause an instantaneous inrush current in excess of 2A, and an instantaneous power dissipation of over 60W across a relay contact when switching from a channel at 0V DC to a channel at 60V DC. Repeated inrush currents of these values may damage the typical 10-W contacts associated with reed relays. To overcome this problem, the 53A-336 Card uses relays with an inrush current capability of 35A.

CONTROLS AND INDICATORS

The following controls and indicators are provided to select and display the functions of the 53A-336 Card's operating environment.

Address-Select Switch

The 53A-336 Card has a miniature 10-position switch labeled "ADDRESS" that selects the 53A-336 Card's address (0-9) in the 53/63 Series System. The switch's cover opens to allow the address to be reselected. A screwdriver with a narrow, flat blade should be used to turn the cam-action wiper to the desired address 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-336 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-336 Card is unaddressed, but that all required dc power (5V dc) is being supplied.

Fuse

There is a fuse on the 5V DC power bus that protects the system from overload conditions. If the fuse blows, the power LED does not light.

Function LEDS and Switches

See the Switch Location Diagram for the physical location of the switches.

Channel LEDs

A column of 12 LEDs above the front-edge connector indicate the specific scanner channel closed. If the scanner channel closed is between 0 and 9, the 0X LED and one of the 0 through 9 LEDs is lit. If the closed canner channel is between 10 and 15, the 1X LED and one of the 0 through 5 LEDs is lit.

Analog Bus Switch

The 2-section rocker switch at the rear of the 53A-336 Card connects the scanner common output lines to the analog backplane bus of the 53/63 Series Card Cage.

CAUTION:

If the backplane analog bus is to be used, relay carry current should be limited to 3A or less. For carry currents up to 5A, the common output lines on the front-edge connector should be used to route signals from scanner card to scanner card and from the scanner card(s) to the user's external equipment.

Rocker Position	Action
C1, C3	Scanner Common High and Low connected to Backplane High and Low respectively.
C2, C4	Scanner Common High and Low connected to Backplane Guard and Spare respectively.
C2, C3	Scanner Common High and Low disconnected from Backplane Analog Bus.
C1, C4	Normally not used. Connects Scanner Common High to Backplane High and Guard, connects Scanner Common Low to Backplane Low and Spare.

Scan Clear Switch

Located at the rear of the 53A-336 Card is a 1-section rocker switch that determines if the card will automatically open all channels whenever a channel is closed on another scanner card.

Rocker Position	Action
C1	A closed channel on this card is opened when a channel is closed on any other scanner card (53A-331, 53A-332, or 53A-336). Closing a channel on this card sends a clear pulse to all other scanner cards.
C2	Closing channels on other scanner cards has no effect on this scanner card. When a channel is closed on this card, a clear pulse is not sent to other scanner cards.

System Bus Resistance Switch

Located at the rear of the 53A-336 Card is a 1-section rocker switch which may be used to connect two 1 megohm resistors to ground, one from the high side and one from the low side of the 53/63 Series backplane analog bus. This switch is used to discharge parasitic capacitance on the backplane analog bus when the Analog Bus switches
are in a position other than C2, C3. See Appendix B for application information on using this switch.

Rocker Position	Action
C1	Disconnect 1-megohm resistors from the Scanner Common bus.
C2	Connect a 1-megohm resistor between Scanner Common High and Ground, and a 1-megohm resistor between Scanner Common Low and Ground.

Card Bus Resistance Switch

Located at the front of the 53A-336 Card is a 1-section rocker switch , page 336-12) which may be used to connect two 1 megohm resistors to ground, on the Scanner Common Bus internal to the 53A-336. One resistor is from the High side to ground and the other is from the Low side to ground. These resistors are used to discharge internal parasitic capacitance on the 53A-336 Card. It should be set to the C2 position whenever the 53A-336 Card is used to switch voltages greater than 130V DC or AC RMS.

Rocker Position	Action
C1	Disconnect 1-megohm resistors from the analog bus.
C2	Connect a 1-megohm resistor between Analog Bus High and Ground, and a 1-megohm resistor between Analog Bus Low and Ground.

SPECIFICATIONS

Configuration: 16 relays, 2-pose, form A.
Common output bus, 2 lines.

Relay Manufacturer: Aromat. Model: ST2E-DC5V or equivalent.

Contacts: Maximum Switching Power (resistive): 2000 VA AC or 150W DC.
Maximum Switching Voltage: 230V DC or AC RMS, shielded.
(Shield tied to pins 24 or BB on front-edge connector of 53A-336 Card and to source chassis ground.)

Maximum Switching Current: 5A AC or 5A DC up to 35V DC, 1A DC up to 60V DC, 0.5A DC up to 150V DC, 0.4A DC up to 230V DC.
Inrush current: 35A AC or DC.

Relay Life: At least 10^5 operations per channel at rated resistive loads.

Duty: Continuous.

Scanning Rate: Random channel selection at greater than 40 channels per second.

Signal Path Specifications: These specifications include the effects of the card cage backplane and are valid at the backplane analog output connector.

Differential thermal offset:	Less than 10 microvolts
Single-line thermal offset:	Less than 20 microvolts.
Initial signal path resistance:	Less than 900 milliohms.
Signal path resistance at end of contact life:	Less than 1.4 ohms.

Isolation Impedance:
System and Card Bus Resistance
Switches Both Open (C1 Position):
Closed Channel:
>20 gigohms high side analog bus to ground
>20 gigohms low side analog bus to ground.
Open Channel:
>20 gigohms any open input to ground.

System or Card Bus Resistance
Switch Closed:
Closed Channel:
1 megohm high side analog bus to ground,
1 megohm low side analog bus to ground.
Open Channel:
>20 gigohm any open input to ground.

System and Card Bus Resistance

Switches Both Closed: (Position C2)

Closed Channel:
500 k ohms high side analog bus to ground,
500 k ohms low side analog bus to ground.

Open Channel:
>20 gigohm any open input to ground.

Cross Talk Between Channels:

1 kHz	Less than -90 dB
10 kHz	Less than -76 dB
100 kHz	Less than -57 dB
1 MHz	Less than -45 dB

Cross talk measurements made at Scanner common output with closed channel terminated in 600 ohms and signal applied to unselected channels.

Power Up:

When power is turned on, the 53A-336 Card goes to the following known states:
Card unaddressed (Power LED - lit).
All channels open (Channel LEDs - out).

Power Down:

When power is turned off, the 53A-336 Card goes to the following known states:
All channels open.

Encode Pulse:

Issued 24 ms after card is instructed to close a channel; this allows time for the relays to settle. The encode pulse is typically used to trigger an external instrument such as a digital voltmeter.

Type Output: TTL level, negative-going pulse, 500 mA sink capability.
Pulse Width: 0.5 ms nominal.

Power Requirements:

5V dc power is provided by the internal Power Supply in the 53/63 Series Card Cage.

Voltage: 4.75V to 5.25V DC.
Current: 0.4 amperes, quiescent.
0.45 amperes, 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).
-40°C to +85°C, storage.

Humidity:

Less than 95% R.H. non-condensing, -10C 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.

Dimensions:

197 mm high, 220 mm deep, 13 mm wide
(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. When ordered alone, the shipping dimensions are: 254 mm x 254 mm x 127 mm (10" x 10" x 5").
Weight:	0.45 Kg. (1.0 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. When ordered alone, the shipping weight is: 0.91 Kg. (2.0 lbs).
Mounting Position:	Any orientation.
Mounting Location:	Installs in any function-card slot of the 53/63 Series Card Cage.
Input Connection:	A 48-pin printed-circuit type hooded connector (53A-780) or 53A-736 Analog Cable provides a connection for all analog signal inputs.
Output Connection:	The analog output connection is through either the 48-pin front edge connector of the 53A-336 Card or the analog output connector on the 53A-002 or 63A-012 Card Cage backplane.
Required Equipment: (Not Supplied)	A 53A-736 Analog Cable or 53A-780 Hooded Connector is required with this card.
Equipment Supplied:	53A-336 High Voltage Scanner Card.

Overview

The 53A-336 Card is programmed by ASCII characters issued from the system controller to the 53/63 Series system communications card. The 53A-336 Card is connected to the communications card through the 53 Series or 63 Series Card Cage's backplane.

When a command is issued to close a channel on a 53A-336 Card, first all channels on all scanner cards in the system (53A-331, 53A-332, or 53A-336) are automatically opened. This feature prevents the accidental connection of more than one set of scanner input lines to the common output lines at the same time. A scanner channel, once closed, remains closed until another scanner channel is closed. Only one channel on a card may be closed at a time. If the user does not want to have all channels automatically open whenever a channel on another scanner card is closed, then the Scan Clear switch described in the Description Section should be set to position C2.

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-336 Card's address (0-9) within the addressed card cage. The 53A-336 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. Appendix A fully discusses the @XY command and the other 53/63 Series system commands. After the 53A-336 Card is addressed, the commands listed below may be issued until another function card is addressed.

Carriage-return <CR> or line-feed <LF> characters may optionally follow a card command. ASCII space characters must not follow a command.

Card Commands

Command	Description
Z	This command connects the two input lines of a channel to the two common output lines. Z is a 2-digit decimal integer from 00 to 15 and specifies the channel number to connected to the common scan bus. Leading 0's must not be omitted. A space character may optionally be substituted for a leading 0. Example: The command @0205 would open any closed channel then closed channel 5 of the Scanner Card with address 2 located in the card cage with address 0. Status: Power LED - out. Channel LEDs - 0X,5 lit, all others out.

R

The R command is used to RESET (Open) all channels of a given scanner. If the card's Scan Clear switch is in position C1, a clear signal will be sent to all other Scanner Cards (53A-331, 53A-332, or 53A-336) in the system.

The R in the command sequence instructs the card to open any closed channel.

Example:
The command @02R would open all channels on the Relay Scanner Card with address 2 located in the card cage with address 0. If the card's Scan Clear switch was in position C1, a clear signal would be sent to all other scanner cards (53A-331, 53A-332, and 53A-336).

Status:
Power LED - out.
Channel LEDs - out.

The 53A-336 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-336" is at the top for a 53 Series Chassis and to the left for a 63 Series Chassis.

CAUTION:

The 53A-336 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.

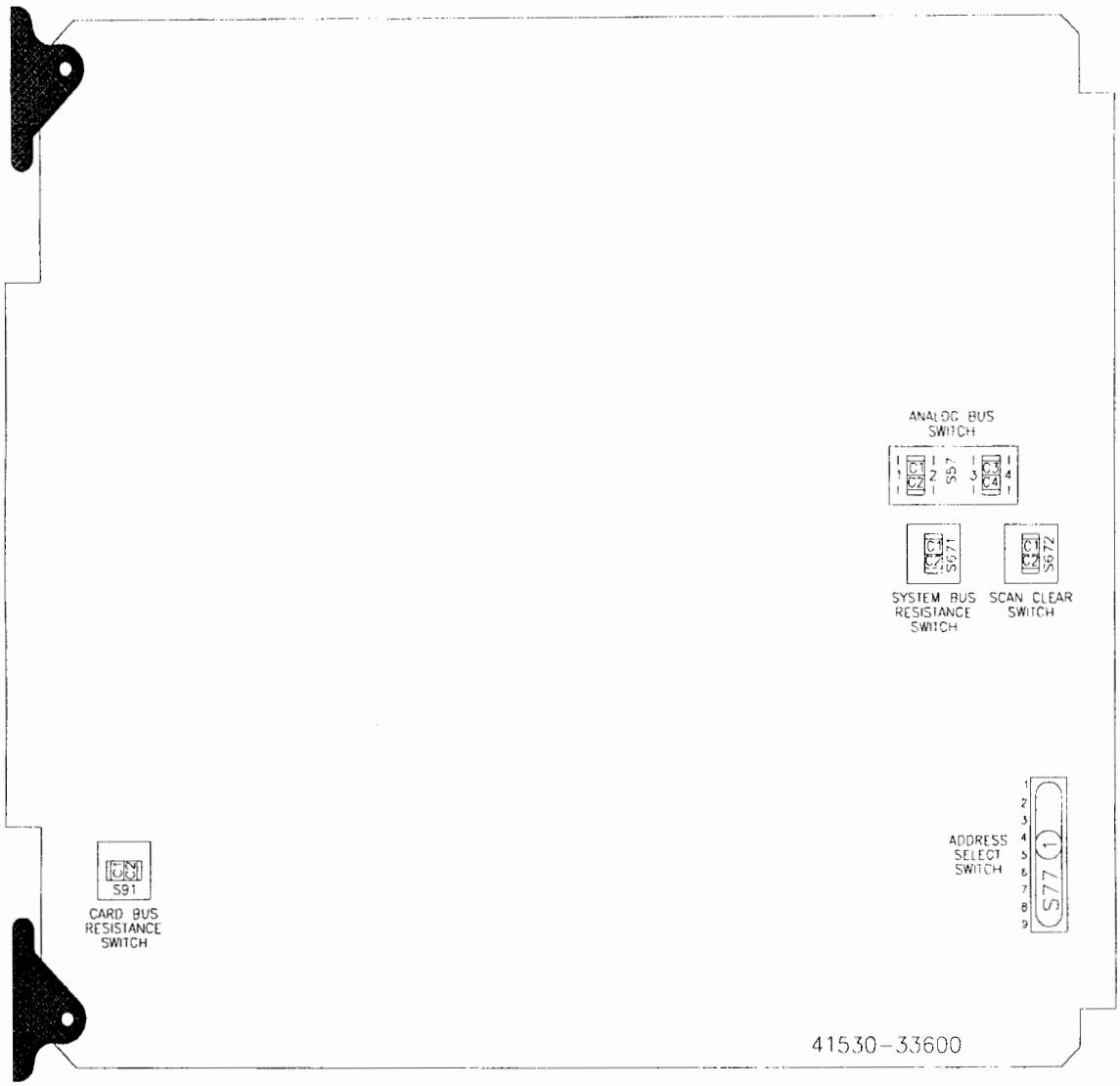


Figure 336-2: 53A-336 Switch Locations

53A-336 WIRE LIST

Chan	H L	Pin #	53A-736 Cable Wire Color	Termination Signal Name	Pin #
0	H	2	Brown of Brown/White		
	L	B	White of Brown/White		
1	H	3	Red of Red/White		
	L	C	White of Red/White		
2	H	4	Orange of Orange/White		
	L	D	White of Orange/White		
3	H	5	Yellow of Yellow/White		
	L	E	White of Yellow/White		
4	H	6	Green of Green/White		
	L	F	White of Green/White		
5	H	7	Blue of Blue/White		
	L	H	White of Blue/White		
6	H	8	Violet of Violet/White		
	L	J	White of Violet/White		
7	H	9	Gray of Gray/White		
	L	K	White of Gray/White		
8	H	10	Brown of /Black		
	L	L	Black of /Black		
9	H	11	Red of Red/Black		
	L	M	Black of Red/Black		
10	H	12	Orange of Orange/Black		
	L	N	Black of Orange/Black		
11	H	13	Yellow of Yellow/Black		
	L	P	Black of Yellow/Black		

Chan.	H L	Pin #	53A-736 Cable Wire Color	Termination Signal Name	Pin #
12	H	14	Green of Green/Black		
	L	R	Black of Green/Black		
13	H	15	Blue of blue/Black		
	L	S	Black of Blue/Black		
14	H	16	Violet of Violet/Black		
	L	T	Black of Violet/Black		
15	H	17	Gray of Gray/Black		
	L	U	Black of Gray/Black		
Com.	H	22	Orange of Orange/Brown		
Com.	L	Z	Brown of Orange/Brown		
Shield		24	Red of Red/Brown		
			Brown of Red/Brown		
		BB	Black of Black/White		
			White of Black/White		
			Shield		

APPENDIX A

53/63 SERIES SYSTEM COMMANDS

Command	Description
@XY	The @XY (Address) command addresses a function card in the 53/63 Series System. @ is a delimiter used by the 53/63 Series System. 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. 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.
@XH	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).
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-336 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.

APPENDIX B

USING THE 53A-336 WITH DC VOLTAGES GREATER THAN 130V RMS

The relays used on the 53A-336 have switch contact ratings of 250V RMS. The peak voltage of a 250V RMS signal is 353.5V. The relay can switch from the peak level to level of 0V DC.

With a scanner system, a special situation exists: more than one relay can switch different voltages to a high impedance common bus. Since this common bus also has stray capacitance or cable capacitance associated with it, a residual voltage is left from the previous signal switched to the common bus. If two different 250V RMS signals are being measured, a residual voltage of -353.5V could be on the bus. Switching a +353.5V input to this bus is the same as switching 707V DC on the relay contact exceeding its rating by 2:1.

Two resistors can be installed on the front connector of any 53A-336 Card that place a 1-megohm load between each side of an active scanner input and ground. The System Bus Resistance switch, S671, places the 1-megohm load directly on the common 53/63 Series analog backplane (assuming the Analog Bus switch is closed). If more than one 53A-336 Card is installed in a scanner system, typically the switches on only one card in the system should be closed.

The Bus Resistance switch may need to be closed based on the following consideration. The 1-megohm impedance S671 places on the analog backplane bus, in parallel with any other impedance on the bus, such as S671 on another 53A-336 card or an AC voltmeter, is a discharge path for any parasitic capacitance on the bus. Using the value of the impedance and capacitance, the backplane discharge time constant can be determined. (For those systems with chained JcAIR Card Cages, the 53A-715 Analog Chaining Cable has a capacitance of approximately 14 pF per foot.) This discharge time is then compared to the minimum time interval between releasing a 53A-336 relay on the next scanner card. The minimum time intervals are:

53A-331	0.2 ms
53A-332	1.7 ms
53A-336 (next channel)	5 ms

If the residual voltage remaining by the time the next channel is closed is greater than 353 volts, another relay channel, not being used on the 53A-336 Card, should be closed in between. This allows another 24 ms for the bus to decay.

Example:

Input voltage on two successive 53A-336 channels	= 180V RMS or 254V P
Backplane Analog Bus Capacitance	= 1000 pF
Backplane Analog Bus Impedance	= 1M Ohm
Residual Voltage after 5 ms	= VR

$V_R = V \times e^{-(t/RC)}$

$= 254 \times e^{-(.005/1x106.1000x10-12)}$

$= 1.71V$

The next channel to be closed may be at -254V, therefore the voltage across the relay contacts could be as high as 1.71-(254), or 255.71V. Since 255.71V is less than 353V (the breakdown

voltage of the 53A-336 Card) successive channels of the 53A-336 can be closed without any additional delay.

The Card Bus Resistance switch, S91, discharges internal capacitance on the 53A-336 Card and should be closed whenever a card switches signals greater than 130V RMS. This impedance is not placed directly on the 53/63 System analog bus but is placed on the bus at a point internal to the 53A-336 Card. This switch should be closed on each card in a system that is scanning signals greater than 130V RMS.

To further improve the performance of the scanning system, a shield pin is provided at front-edge connector pins 24 and BB of the 53A-336 Card. For voltages greater than 130V DC or peak AC it is recommended that a shielded cable be used for scanner input signals. The shield provides a "back-to-ground" path for the switching energy of the contacts, keeping ground noise in the 53/63 Series System down to the minimum level.

Additional considerations exist when using the 53A-336 with a 53A-331 or 53A-332 Scanner Card. If a 53A-331 Card or a 53A-332 Card is the next channel to be switched (following a 53A-336 channel closure), the maximum switching power of the relay contacts on these cards (10W) needs to be considered. A substantial capacitive load can cause inrush currents that will seriously degrade the contacts. It is difficult to determine analytically if the amount of voltage and capacitance present will create an inrush current in excess of 10 watts for a long enough period of time to pit the 53A-331 or 53A-332 relay contacts. JcAIR has found the following rule-of-thumb to apply: if the switching voltage times the capacitance is greater than $1x10^{-8}$ volt-farads, a 53A-336 Card (150-W switching power) should be used instead of a 53A-331 Card or 53A-332 Card. For example, 10 volts may be switched into a 1000 pF capacitive load, or 100V into a 100 pF capacitive load. Above those levels, a 53A-336 Card should be used.

Another constraint on using the 53A-331 Card or the 53A-332 Card on the same scanner bus as a 53A-336 Card is the maximum contact breakdown voltage rating of the 53A-331 Card or the 53A-332 Card. The differential voltage between the scanner bus and any input to a 53A-331 Card or a 53A-332 Card open scanner channel cannot exceed this breakdown rating. The 53A-331 Card and the 53A-332 Card both have a maximum contact breakdown rating of 200V DC or peak AC. For example, if a 53A-336 Card is placing 110V DC on the scanner bus and a 53A-332 scanner card input has -100V DC on it, 210V DC is being placed across the 53A-332 contacts, exceeding the contact rating.

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP