

# Series 3700

## System Switch/Multimeter and Plug-In Cards



- Six slot system switch mainframe with optional high performance multimeter
- Multi-processor architecture optimized for high throughput scanning and pattern switching applications
- Remote PC control via Ethernet, USB, and GPIB interfaces
- Up to 576 two-wire multiplexer channels in one mainframe
- LXI Class B compliance with IEEE 1588 time synchronization
- Embedded Test Script Processor (TSP™) offering unparalleled system automation, throughput, and flexibility
- TSP-Link™ master/slave connection provides easy system expansion and seamless connection to Series 2600 SourceMeter® instruments
- Capable of over 14,000 readings per second to memory with optional high performance multimeter
- Embedded Web browser interface for test setup, maintenance, and basic application control
- Variety of instrument grade switch and control cards

The Series 3700 offers scalable, instrument grade switching and multi-channel measurement solutions that are optimized for automated testing of electronic products and components. The Series 3700 includes four versions of the Model 3706 system switch mainframe along with a growing family of plug-in switch and control cards. When the Model 3706 mainframe is ordered with the high performance multimeter, you receive a tightly integrated switch and measurement system that can meet the demanding application requirements in a functional test system or provide the flexibility needed in stand-alone data acquisition and measurement applications.

### Maximizes system control and flexibility

To provide users with greater versatility when designing test systems, the Series 3700 mainframes are equipped with many standard features. For example, easy connectivity is supported with three remote interfaces: LXI/Ethernet, General Purpose Interface Bus (GPIB), and Universal Serial Bus (USB). Fourteen digital I/O lines are also included, which are programmable and can be

used to control external devices such as component handlers or other instruments. Additionally, system control can be greatly enhanced by using our Test Script Processor (TSP) technology. This technology provides “smart” instruments with the ability to perform distributed processing and control at the instrument level versus a central PC.

### High quality switching at a value price

The Series 3700 builds upon Keithley's tradition of producing innovative, high quality, precise signal switching. This series offers a growing family of high density and general purpose plug-in cards that accommodates a broad range of signals at very competitive pricing. The Series 3700 supports applications as diverse as design validation, accelerated stress testing, data acquisition, and functional testing.

### Model 3706 mainframe

The Series 3700 includes the base Model 3706 system switch/multimeter mainframe with three options for added flexibility. This mainframe contains six slots for plug-in cards in a compact 2U high (3.5 inches/89mm) enclosure that easily accommodates the needs of medium to high channel count applications. When fully loaded, a mainframe can support up to 576 two-wire multiplexer channels for unrivaled density and economical per channel costs.

### High performance, 7½-digit multimeter (DMM)

The high performance multimeter option provides up to 7½-digit measurements, offering 26-bit resolution to support your ever-increasing test accuracy requirements. This flexible resolution supplies a DC reading rate from >14,000 readings/second at 3½ digits to 60 readings/second at 7½ digits to accommodate a greater span of applications.

The multimeter does not use a card slot, so you maintain all six slots in your mainframe. In addition, the multimeter is wired to the mainframe's analog backplane, ensuring a high quality signal path from each card channel to the multimeter.

The multimeter supports 13 built-in measurement functions, including: DCV, ACV, DCI, ACI, frequency, period, two-wire ohms, four-wire ohms, three-wire RTD temperature, four-wire RTD temperature, thermocouple temperature, thermistor temperature, and continuity. In addition, the multimeter offers extended low ohms (1Ω) and low current (10μA) ranges. In-rack calibration is supported, which reduces both maintenance and calibration time.

#### Single Channel Reading Rates

Resolution	DCV/ 2 Wire Ohms	4 Wire Ohms
7½ Digits (1 NPLC)	60	29
6½ Digits (0.2 NPLC)	295	120
5½ Digits (0.06 NPLC)	935	285
4½ Digits (0.006 NPLC)	6,300	580
3½ Digits (0.0005 NPLC)	14,000	650

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## Ordering Information

- 3706** Six-slot system switch with high performance DMM
- 3706-NFP** Six-slot system switch with high performance DMM, without front panel display and keypad
- 3706-S** Six-slot system switch
- 3706-SNFP** Six-slot system switch, without front panel display and keypad
- 3720** Dual 1×30 multiplexer card (auto CJC with 3720-ST)
- 3721** Dual 1×20 multiplexer card (auto CJC with 3721-ST)
- 3722** Dual 1×48, high density, multiplexer card
- 3723** Dual 1×30, high speed, reed relay multiplexer card
- 3730** 6×16, high density, matrix card
- 3740** 32 channel isolated switch card

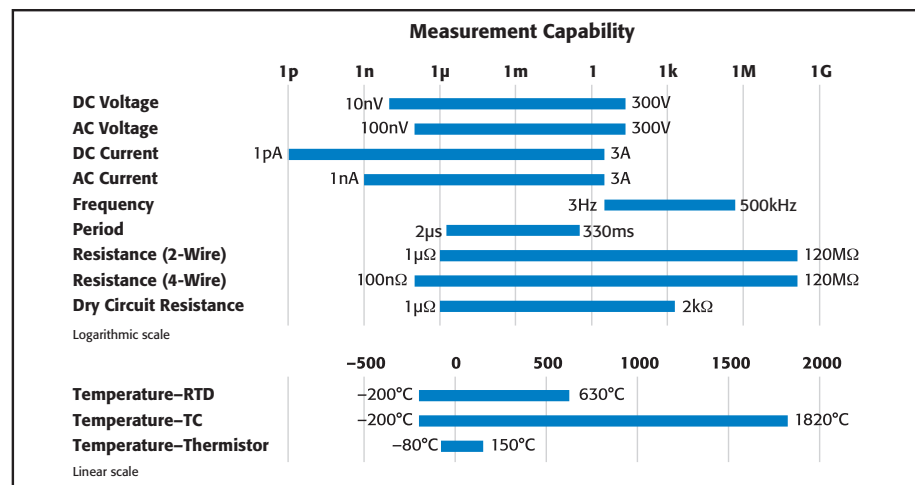
## Accessories Supplied

Test Script Builder  
Software Suite CD

Ethernet Crossover  
Cable (CA-180-3A)

Series 3700 Product CD  
(includes LabVIEW™, IVI C,  
and IVI.COM drivers)

# System Switch/Multimeter and Plug-In Cards



Measurement capabilities of the high performance multimeter

## TSP distributed control increases test speed and lowers test cost

TSP technology enhances instrument control by allowing users the choice of using standard PC control or of creating embedded test scripts that are executed on microprocessors within the instrument. By using TSP test scripts instead of a PC for instrument control, you avoid communication delays between the PC controller and instrument, which results in improved test throughput. Test scripts can contain math and decision-making rules that further reduce the interaction between a host PC and the instrument.

This form of distributed control supports the autonomous operation of individual instruments or groups of instruments and can possibly remove the need for a high level PC controller, which lowers test and ownership costs. This is the same proven TSP technology found in our innovative Series 2600 System SourceMeter instruments.

## TSP-Link for easy and seamless system coordination and expansion

If your channel density requirements grow or if you need to process more signal types, use TSP-Link to expand your system. The TSP-Link master/slave connection offers easy system expansion between Series 3700 mainframes. You can also use TSP-Link to connect to other TSP-Link enabled instruments such as Series 2600 SourceMeter instruments. Everything connected with TSP-Link can be controlled by the master unit, just as if they were all housed in the same chassis.

## ACCESSORIES AVAILABLE

### GPIB INTERFACES AND CABLES

7007-1	Shielded GPIB Cable, 1m (3.5ft)
7007-2	Shielded GPIB Cable, 2m (6.6ft)
KPCI-488LP	IEEE-488 Interface/Controller for the PCI Bus
KPXI-488	IEEE-488 Interface Board for the PXI Bus
KUSB-488A	IEEE-488 USB-to-GPIB Interface Adapter

### DIGITAL I/O, TRIGGER LINK, AND TSP-LINK

2600-TLINK	Trigger I/O to Trigger Link Interface Cable, 1m (3.3 ft)
CA-126-1	Digital I/O and Trigger Cable, 1.5m (4.9 ft)
CA-180-3A	CAT5 Crossover Cable for TSP-Link

### ANALOG BACKPLANE CONNECTOR

3706-BKPL	Analog Backplane Extender Board, 15-pin D-sub to terminal block
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### RACK MOUNT KIT

4288-10	Fixed Rear Rack Mount Kit
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### EXTENDED WARRANTIES AND SERVICES

#### Mainframe Models 3706 and 3706-NFP

3706-3Y-EW	1 Year Factory Warranty Extended to 3 Years
3706-5Y-EW	1 Year Factory Warranty Extended to 5 Years
C/3706-3Y-STD	Calibration Contract, 3 Years, Standard Calibration
C/3706-3Y-DATA	Calibration Contract, 3 Years, Z540 Calibration with Data
C/3706-3Y-ISO	Calibration Contract, 3 Years, ISO 17025 Calibration

#### Mainframe Models 3706-S and 3706-SNFP

3706-S-3Y-EW	1 Year Factory Warranty Extended to 3 Years
3706-S-5Y-EW	1 Year Factory Warranty Extended to 5 Years

### SOFTWARE SERVICES

#### SYSTEM DEVELOPMENT OR IMPLEMENTATION

Other service contracts are available; please contact us for details.

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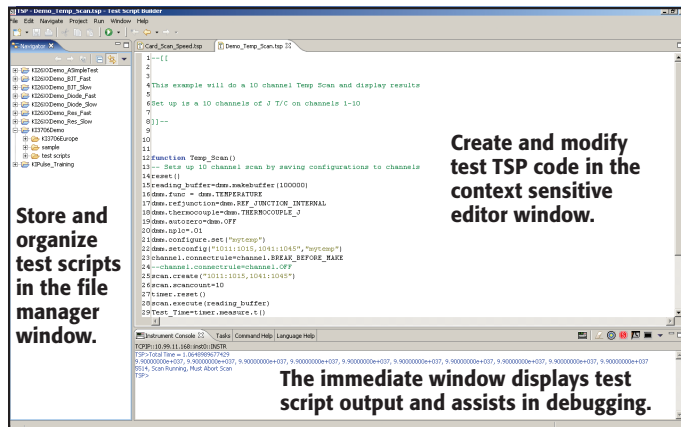
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## Test Script Builder Software Suite

TSP-Link is a high speed system expansion interface that lets users avoid the complex and time consuming task of expanding their remote interfaces to another mainframe. There is no need to add external triggers and remote communication cables to individual instruments, since all TSP-Link connected devices can be controlled from a single master unit.

## Test Script Builder software suite

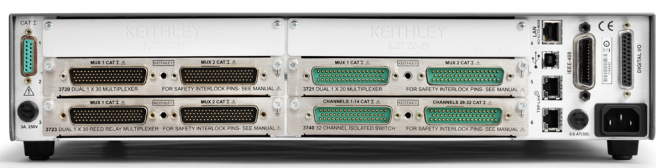
Test Script Builder is a software tool that is provided with all Series 3700 instruments to help users easily create, modify, debug, and store TSP test scripts. It supplies a project/file manager window to store and organize test



Model 3706 front panel



Model 3706-S front panel



Model 3706 rear panel

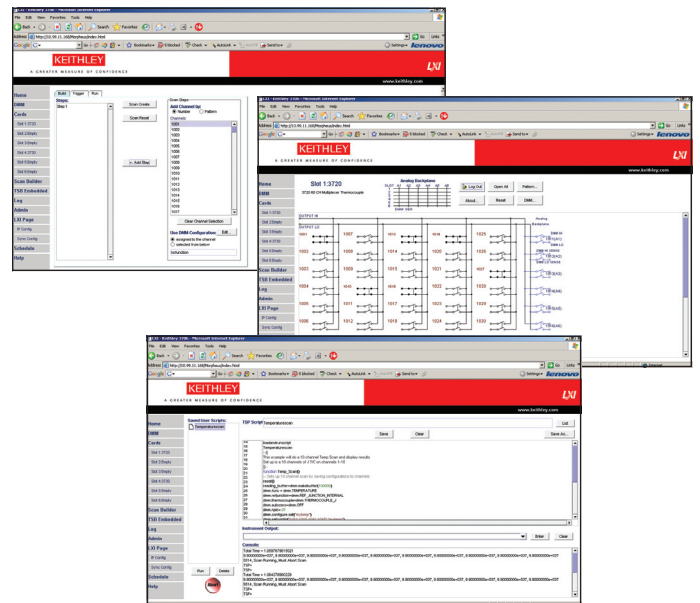
scripts, a text-sensitive program editor to create and modify test TSP code, and an immediate instrument control window to send Ethernet, GPIB, and USB commands and to receive data from the instrument. The immediate window also allows users to see the output of a given test script and simplifies debugging.

## LXI Class B

Series 3700 mainframes are LXI class B compliant instruments. The features include a 10/100M Base-T Ethernet connection, graphical Web server, LAN based instrument triggering, and IEEE 1588 precision time protocol (PTP) synchronization. PTP time synchronization provides a standard method to synchronize devices on an Ethernet network with microsecond precision for time/event based programming.

## Embedded Web server

The built-in Web interface offers a quick and easy method to control the instrument remotely. Interactive schematics of each card in the mainframe support point-and-click control for opening and closing switches. A scan list builder is provided to guide users through the requirements of a scan list (such as trigger and looping definitions) for more advanced applications. When the mainframe is ordered with the multimeter, additional Web pages are included for measurement configuration and viewing.



## Built-in Web interface

## Transportable memory, USB 2.0 device port

All Model 3706 mainframes contain a USB device port for easy transfer of readings, configurations, and test scripts to memory sticks. This port, which is located on the front panel, provides you with easy access to and portability of measurement results. Simply plug in a memory stick and, with a few simple keystrokes, gain access to virtually unlimited memory storage. Additional capabilities include: saving and recalling system configurations and storage for TSP scripts.

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## High Performance Multimeter

### DC Specifications

CONDITIONS: MED (1 PLC) or SLOW (5 PLC).

For <1PLC, add appropriate "ppm of range" adder from "RMS Noise" table.

Includes rear panel Analog Backplane connector and transducer conversation. Refer to DC Notes for additional card uncertainties.

Function	Range <sup>1</sup>	Resolution	Test Current or Burden Voltage	Input Resistance or Open Circuit Voltage <sup>2</sup>	Accuracy: ±(ppm of reading + ppm of range) (ppm = parts per million) (e.g., 10ppm = 0.001%)			Temperature Coefficient 0°–18°C and 28°–50°C
					24 Hour <sup>3</sup> 23°C ± 1°C	90 Day 23°C ± 5°C	1 Year 23°C ± 5°C	
Voltage <sup>4</sup>	100.00000 mV <sup>19</sup>	0.01 μV		>10 GΩ or 10 MΩ ±1%	10 + 9	25 + 9	30 + 9	(1 + 5)/°C
	1.0000000 V <sup>19</sup>	0.1 μV		>10 GΩ or 10 MΩ ±1%	7 + 2	25 + 2	30 + 2	(1 + 1)/°C
	10.000000 V	1 μV		>10 GΩ or 10 MΩ ±1%	7 + 2	20 + 2	25 + 2	(1 + 1)/°C
	100.00000 V	10 μV		10 MΩ ±1%	15 + 6	35 + 6	40 + 6	(5 + 1)/°C
	300.00000 V	100 μV		10 MΩ ±1%	20 + 6	35 + 6	40 + 6	(5 + 1)/°C
Resistance <sup>5, 6, 7</sup>	1.0000000 Ω	0.1 μΩ	10 mA	8.2 V	15 + 80	40 + 80	60 + 80	(8 + 1)/°C
	10.000000 Ω	1 μΩ	10 mA	8.2 V	15 + 9	40 + 9	60 + 9	(8 + 1)/°C
	100.00000 Ω	10 μΩ	1 mA	13.9 V	15 + 9	40 + 9	60 + 9	(8 + 1)/°C
	1.0000000 kΩ	100 μΩ	1 mA	13.9 V	20 + 4	45 + 4	65 + 4	(8 + 1)/°C
	10.000000 kΩ	1 mΩ	100 μA	9.1 V	15 + 4	40 + 4	60 + 4	(8 + 1)/°C
	100.00000 kΩ <sup>4</sup>	10 mΩ	10 μA	14.7 V	20 + 4	45 + 4	65 + 4	(8 + 1)/°C
	1.0000000 MΩ <sup>4</sup>	100 mΩ	10 μA	14.7 V	25 + 4	50 + 4	70 + 4	(8 + 1)/°C
	10.000000 MΩ	1 Ω	0.64 μA//10 MΩ	6.4 V	150 + 6	200 + 10	400 + 10	(70 + 1)/°C
Dry Circuit Resistance <sup>6, 8</sup>	100.00000 MΩ	10 Ω	0.64 μA//10 MΩ	6.4 V	800 + 30	2000 + 30	2000 + 30	(385 + 1)/°C
	1.0000000 Ω	1 μΩ	10 mA	27 mV	25 + 80	50 + 80	70 + 80	(8 + 1)/°C
	10.000000 Ω	10 μΩ	1 mA	20 mV	25 + 80	50 + 80	70 + 80	(8 + 1)/°C
	100.00000 Ω	100 μΩ	100 μA	20 mV	25 + 80	90 + 80	140 + 80	(8 + 1)/°C
	1.0000000 kΩ	1 mΩ	10 μA	20 mV	25 + 80	180 + 80	400 + 80	(8 + 1)/°C
Continuity (2W)	2.0000000 kΩ	10 mΩ	5 μA	20 mV	25 + 80	320 + 80	800 + 80	(8 + 1)/°C
	1.000 kΩ	100 mΩ	1 mA	13.9 V	40 + 100	100 + 100	100 + 100	(8 + 1)/°C
Current <sup>9</sup>	10.000000 μA	1 pA	<61 mV		40 + 30	300 + 30	500 + 30	(35 + 5)/°C
	100.00000 μA	10 pA	<105 mV		50 + 9	300 + 9	500 + 9	(50 + 5)/°C
	1.0000000 mA	100 pA	<130 mV		50 + 9	300 + 9	500 + 9	(50 + 5)/°C
	10.000000 mA	1 nA	<150 mV		50 + 9	300 + 9	500 + 9	(50 + 5)/°C
	100.00000 mA	10 nA	<0.4 V		50 + 9	300 + 9	500 + 9	(50 + 5)/°C
	1.0000000 A	100 nA	<0.6 V		200 + 10	500 + 10	800 + 10	(50 + 5)/°C
	3.0000000 A	1 μA	<1.8 V		1000 + 15	1200 + 15	1200 + 15	(50 + 5)/°C

### TEMPERATURE

(Displayed in °C, °F, or K. Exclusive of probes errors.)

THERMOCOUPLES (Accuracy based on ITS-90):

Type	Range	Resolution	90 Day/1 Year, 23°C $\pm$ 5°C Relative to simulated reference junction	Using 3720 or 3721 Cards	Range	Using 3720 or 3721 Cards	Temperature Coefficient 0°–18°C and 28°–50°C
J	–150 to + 760°C	0.001°C	0.2°C	1.0°C	–200 to –150°C	1.5°C	0.03°C/°C
K	–150 to +1372°C	0.001°C	0.2°C	1.0°C	–200 to –150°C	1.5°C	0.03°C/°C
N	–100 to +1300°C	0.001°C	0.2°C	1.0°C	–200 to –100°C	1.5°C	0.03°C/°C
T	–100 to +400°C	0.001°C	0.2°C	1.0°C	–200 to –100°C	1.5°C	0.03°C/°C
E	–150 to +1000°C	0.001°C	0.2°C	1.0°C	–200 to –150°C	1.5°C	0.03°C/°C
R	+400 to +1768°C	0.1°C	0.6°C	1.8°C	0 to +400°C	2.3°C	0.03°C/°C
S	+400 to +1768°C	0.1°C	0.6°C	1.8°C	0 to +400°C	2.3°C	0.03°C/°C
B	+1100 to +1820°C	0.1°C	0.6°C	1.8°C	+350 to +1100°C	2.8°C	0.03°C/°C

4-WIRE RTD OR 3-WIRE RTD (100 $\Omega$  platinum [PT100], D100, F100, PT385, PT3916, or user 0 $\Omega$  to 10k $\Omega$ ) (Selectable Offset compensation On or Off):

For 3-wire RTD, dmm.connect=dmm.CONNECT\_FOUR\_WIRE,  $\leq$ 0.1 $\Omega$  lead resistance mismatching in Input HI and LO. Add 0.25°C/0.1 $\Omega$  of lead resistance mismatch.

4-Wire RTD	–200 to +630°C	0.01°C	0.06°C	0.003°C/°C
3-Wire RTD	–200 to +630°C	0.01°C	0.75°C	0.003°C/°C

THERMISTOR: 2.2k $\Omega$ , 5k $\Omega$ , and 10k $\Omega$ .

	–80 to +150°C	0.01°C	0.08°C	0.002°C/°C
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### DC SPEEDS VS. RMS NOISE <sup>10, 11</sup>

Single Channel, 60Hz (50Hz) Operation

### RMS Noise<sup>16</sup>, PPM of Range

RMS Noise Calculator:

Add  $2.5 \times$  "RMS Noise" to "ppm of range"  
(e.g., 10V @ 0.006 PLC)

"ppm of range" =  $2.5 \times 7.0 \text{ ppm} + 2 \text{ ppm}$

### Measurements into Buffer (rdgs/s)<sup>13</sup>

### Measurement to PC (ms/rdg) Azero Off<sup>13</sup>

Function	NPLC	Aperture (ms)	Digits	100 mV	1 V	10 V	100 V	300 V	Azero On	Azero Off	Ethernet	GPIB	USB
DCV	5 <sup>14</sup>	83.3 (100)	7½	1.0	0.07	0.05	0.7	0.2	9.5 (8)	12 (10)	86.3 (104)	86.1 (102.8)	86.3 (103.1)
	1 <sup>14</sup>	16.7 (20)	7½	0.9	0.12	0.1	0.8	0.35	42 (33)	60 (50)	19.4 (22.7)	19.5 (22.8)	19.9 (23.2)
	0.2 <sup>12, 14</sup>	3.33 (4.0)	6½	2.5	0.32	0.3	2.5	1.0	50 (40)	60 (50)	19.4 (22.7)	19.5 (22.8)	19.9 (23.2)
	0.2 <sup>14</sup>	3.33 (4.0)	6½	3.5	6.0	0.7	3.5	1.5	120 (100)	295 (235)	6.03 (6.7)	6.13 (6.8)	6.33 (7.0)
	0.06 <sup>15</sup>	1.0 (1.2)	5½	12	10	1.5	4.0	3.5	205 (165)	935 (750)	1.40 (1.80)	1.50 (1.80)	1.60 (2.30)
	0.006 <sup>15</sup>	0.100 (0.120)	4½	50	15	7.0	45	25	218 (215)	6,300 (5,600)	0.55 (0.57)	0.65 (0.67)	0.75 (0.77)
	0.0005 <sup>15</sup>	0.0083 (0.001)	3½	280	85	80	600	270	270 (270)	15,500 (14,500)	0.50 (0.5)	0.60 (0.60)	0.70 (0.70)
				10–100 Ω	1 kΩ	10 kΩ							
2WΩ (≤10kΩ)	5 <sup>14</sup>	83.3 (100)	7½	2.0	0.5	0.4	—	—	9.5 (8)	12 (10)	87.8 (105)	86.1 (103)	86.4 (104)
	1 <sup>14</sup>	16.7 (20)	7½	3.5	0.8	0.6	—	—	42 (33)	60 (50)	21.0 (24.3)	19.5 (22.8)	19.9 (23.2)
	0.2 <sup>12, 14</sup>	3.33 (4.0)	6½	6.5	1.7	1.5	—	—	50 (40)	60 (50)	21.0 (24.3)	19.5 (22.8)	19.9 (23.2)
	0.2 <sup>14</sup>	3.33 (4.0)	6½	8.0	4.5	5.5	—	—	120 (100)	295 (235)	7.6 (6.7)	6.13 (6.8)	6.33 (7.0)
	0.06 <sup>15</sup>	1.0 (1.2)	5½	15	6	6.5	—	—	205 (165)	935 (750)	1.40 (1.80)	1.50 (1.80)	1.60 (2.30)
	0.006 <sup>15</sup>	0.100 (0.120)	4½	60	115	14	—	—	218 (215)	6,300 (5,600)	0.55 (0.57)	0.65 (0.67)	0.75 (0.77)
	0.0005 <sup>15</sup>	0.0083 (0.001)	3½	190	190	190	—	—	270 (270)	14,100 (13,700)	0.50 (0.5)	0.60 (0.60)	0.70 (0.70)
				10 μA	100 μA	1 mA–1 A	3A						
DCI	5 <sup>14</sup>	83.3 (100)	7½	3.5	1.3	1.2	0.4	—	9.5 (8)	12 (10)	86 (103)	86.1 (102.8)	86.3 (103.1)
	1 <sup>14</sup>	16.7 (20)	6½	3.5	0.9	1.4	0.9	—	42 (33)	60 (50)	19.4 (22.7)	19.5 (22.8)	19.8 (23.1)
	0.2 <sup>12, 14</sup>	3.33 (4.0)	5½	300	10	10	4.0	—	50 (40)	60 (50)	19.4 (22.7)	19.5 (22.8)	19.8 (23.1)
	0.2 <sup>14</sup>	3.33 (4.0)	4½	300	35	20	4.0	—	120 (100)	295 (235)	6.03 (6.7)	6.13 (6.8)	6.33 (7.0)
	0.06 <sup>15</sup>	1.0 (1.2)	4½	350	35	20	4.0	—	205 (165)	935 (750)	1.40 (1.80)	1.50 (1.80)	1.60 (2.30)
	0.006 <sup>15</sup>	0.100 (0.120)	4½	400	45	25	110	—	218 (215)	6,300 (5,600)	0.55 (0.57)	0.65 (0.67)	0.75 (0.77)
	0.0005 <sup>15</sup>	0.0083 (0.001)	3½	2500	450	250	375	—	270 (270)	14,100 (13,700)	0.50 (0.5)	0.60 (0.60)	0.70 (0.70)
				1 Ω	10–100Ω	1 kΩ	10 kΩ						
4WΩ	5 <sup>14</sup>	83.3 (100)	7½	3.5	3.0	0.5	0.5	—	5 (4)	6.0 (4.8)	173 (206)	173 (206)	173 (206)
	1 <sup>14</sup>	16.7 (20)	7½	5.0	0.5	0.5	0.7	—	23.5 (18.5)	29 (23)	39 (46)	39 (46)	39 (46)
	0.2 <sup>12, 14</sup>	3.33 (4.0)	5½	10	30	10	50	—	26.5 (21)	30 (24)	39 (46)	39 (46)	39 (46)
	0.2 <sup>14</sup>	3.33 (4.0)	5½	300	50	10	63	—	80 (60)	120 (95)	12.3 (14.5)	11.3 (13.3)	11.7 (13.7)
	0.06 <sup>15</sup>	1.0 (1.2)	4½	500	50	15	70	—	140 (110)	285 (225)	6.2 (7.2)	6.3 (7.3)	6.5 (7.6)
	0.006 <sup>15</sup>	0.100 (0.120)	4½	750	75	30	100	—	200 (195)	580 (565)	4.2 (4.4)	4.3 (4.5)	4.6 (4.8)
	0.0005 <sup>15</sup>	0.0083 (0.001)	3½	3500	350	250	250	—	210 (205)	650 (645)	4.2 (4.4)	4.3 (4.5)	4.6 (4.8)
				1 Ω	10–100 Ω	1 kΩ	10 kΩ						
4WΩ OCOMP	5 <sup>14</sup>	83.3 (100)	7½	4.0	3.0	0.5	0.5	—	2.5 (2.0)	3.0 (2.4)	343 (427)	341 (425)	342 (426)
	1 <sup>14</sup>	16.7 (20)	7½	11	1.5	0.7	1.5	—	13 (10.2)	14 (11.2)	74 (92)	74 (92)	74.2 (92)
	0.2 <sup>12, 14</sup>	3.33 (4.0)	6½	30	3.5	2.1	3.5	—	14 (11.2)	15 (12)	70 (86.5)	70 (86.5)	70 (86.5)
	0.2 <sup>14</sup>	3.33 (4.0)	5½	500	50	13	30	—	46.5 (37)	58 (46.5)	22.7 (25)	20.5 (23)	21.1 (24)
	0.0005 <sup>15</sup>	0.0083 (0.001)	3½	4500	450	400	400	—	145 (140)	250 (245)	6.7 (6.7)	6.8 (6.8)	7 (7)
				1–10 Ω	100 Ω	1 kΩ	2 kΩ						
Dry-CktΩ OCOMP	5 <sup>14</sup>	83.3 (100)	6½	4.0	4.0	4.0	4.0	—	2.5 (2.0)	3.0 (2.4)	343 (427)	341 (425)	342 (426)
	1 <sup>14</sup>	16.7 (20)	5½	12.5	12.5	12.5	12.5	—	13 (10.2)	14 (11.2)	74 (92)	74 (92)	74.2 (92)
	0.2 <sup>12, 14</sup>	3.33 (4.0)	4½	30	45	35	40	—	14 (11.2)	15 (12)	70 (86.5)	70 (86.5)	70 (86.5)
	0.2 <sup>14</sup>	3.33 (4.0)	3½	500	1000	1000	1500	—	35 (30)	45 (36)	25 (30.5)	25 (30.5)	25 (30.5)
	0.0005 <sup>15</sup>	0.0083 (0.001)	2½	6000	3000	6000	4500	—	90 (90)	125 (125)	10.7 (10.7)	10.7 (10.7)	11 (11)

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# Series 3700

## System Switch/Multimeter and Plug-In Cards

### SYSTEM PERFORMANCE <sup>13, 14</sup>

$\frac{4}{5}$ -Digit Mode, Azero off, nPLC = 0.0005

Function	Function Change (ms)	Range Change (ms)	Auto-range (ms)
DCV or 2W $\Omega$ (<10k $\Omega$ )	10	10	10
4W $\Omega$ (<10k $\Omega$ )	20	20	20
DCI	10	10	10
Frequency or Period	22	10	100
ACV or ACI <sup>17</sup>	85	85	300

Buffer Transfer Speed	Ethernet	GPIO	USB
Average for 1000 readings	2450/s	2000/s	1800/s
Average for 1000 readings with timestamp	2300/s	1800/s	1600/s

Card	Command	Single Command Execution Time (ms) <sup>13, 17</sup>		
		Ethernet	GPIO	USB
3720, 3721, 3722, 3730	channel.close (ch_list) or channel.open (ch_list)	5.7	5.8	6.1
3723 <sup>18</sup>	channel.close (ch_list) or channel.open (ch_list)	2.3	2.4	2.7
3740	channel.close (ch_list 1-28) or channel.open (ch_list 1-28)	10.7	10.8	11.1
	channel.close (ch_list 29-32) or channel.open (ch_list 29-32)	22.7	22.8	23.1

### DC MEASUREMENT CHARACTERISTICS

#### DC VOLTS

A-D LINEARITY: 1.0ppm of reading + 2.0 of range.

INPUT IMPEDANCE: 100mV–10V Ranges: Selectable >10G $\Omega$  // <400pF or 10M $\Omega$   $\pm$ 1%.  
100V–300V Ranges: 10M $\Omega$   $\pm$ 1%.

INPUT BIAS CURRENT: <50pA at 23°C with dmm.autozero=dmm.OFF or dmm.inputdivider=dmm.ON.

COMMON MODE CURRENT: <500nA p-p for  $\leq$ 1MHz.

AUTOZERO OFF ERROR: For DCV  $\pm$ 1°C and <10 minutes, add  $\pm$ (8ppm of reading + 5 $\mu$ V).

INPUT PROTECTION: 300V all ranges.

COMMON MODE VOLTAGE: 300V DC or 300Vrms (425V peak for AC waveforms) between any terminal and chassis.

#### RESISTANCE

MAX. 4W $\Omega$  LEAD RESISTANCE: 5 $\Omega$  per lead for 1 $\Omega$  range; 10% of range for 10 $\Omega$   $\rightarrow$  1k $\Omega$  ranges; 1k $\Omega$  per lead for all other ranges.

MAX. 4W $\Omega$  LEAD RESISTANCE (DRY CKT): 0.5 $\Omega$  per lead for 1 $\Omega$  range; 10% of range per lead for 10 $\Omega$   $\rightarrow$  100 $\Omega$  ranges; 50 $\Omega$  per lead for 1k $\Omega$   $\rightarrow$  2k $\Omega$  ranges.

INPUT IMPEDANCE: 1 $\Omega$ –100 $\Omega$  Ranges: 99k $\Omega$   $\pm$ 1% // <1 $\mu$ F.  
1k $\Omega$ –2k $\Omega$  Ranges: 10M $\Omega$   $\pm$ 1% // <0.015 $\mu$ F.

OFFSET COMPENSATION: Selectable on 4W $\Omega$  1 $\Omega$   $\rightarrow$  10k $\Omega$  ranges.

OPEN LEAD DETECTOR: Selectable per channel. 1.5 $\mu$ A,  $\pm$ 20% sink current per DMM SHI and SLO lead. Default on.

CONTINUITY THRESHOLD: Adjustable 1 to 1000 $\Omega$ .

AUTOZERO OFF ERROR: For 2W $\Omega$   $\pm$ 1°C and <10 minutes, add  $\pm$ (8ppm of reading + 0.5m $\Omega$ ) for 10 $\Omega$  and 5m $\Omega$  for all other ranges.

INPUT PROTECTION: 300V all ranges.

#### DC CURRENT

AUTOZERO OFF ERROR: For  $\pm$ 1°C and <10 minutes, add  $\pm$ (8ppm of reading + range error). Refer to table below.

Range	3 A	1 A	100 mA	10 mA	1 mA	100 $\mu$ A	10 $\mu$ A
Shunt Resistance guarantee by design	0.1 $\Omega$	0.1 $\Omega$	1 $\Omega$	10 $\Omega$	100 $\Omega$	1 k $\Omega$	6 k $\Omega$
Burden Voltage	<1.8 V	<0.6 V	<0.4 V	<150 mV	<130 mV	<105 mV	<61 mV
Burden Voltage with 3721 card	<2.4 V	<1.2 V	<0.4 V	<150 mV	<130 mV	<105 mV	<61 mV
Autozero OFF "of range" Error	50 $\mu$ A	50 $\mu$ A	5 $\mu$ A	0.5 $\mu$ A	50 nA	5 nA	0.85 nA

INPUT PROTECTION: 3A, 250V fuse.

#### THERMOCOUPLES

CONVERSION: ITS-90.

REFERENCE JUNCTION: Internal, External, or Simulated (Fixed).

OPEN LEAD DETECTOR: Selectable per channel. Open >1.15k $\Omega$   $\pm$ 50 $\Omega$ . Default on.

COMMON MODE ISOLATION: 300V DC or 300Vrms (425V peak for AC waveforms), >10G $\Omega$  and <330pF any terminal to chassis.

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# Series 3700

# System Switch/Multimeter and Plug-In Cards

## DC NOTES

1. 20% overrange except 1% on 300V range and 3.33% on 3A range.
2.  $\pm 5\%$  (measured with 10M $\Omega$  input resistance DMM, >10G $\Omega$  DMM on 10M $\Omega$  and 100M $\Omega$  ranges). Refer to table for other 2W/4W configurations. For Dry Circuit, +20%, <1mV with dmm.offsetcompensation=ON for 100 $\Omega$   $\rightarrow$  2k $\Omega$  ranges.

Range	2W	4W	4W-Kelvin	Ocomp 4W	Ocomp 4W-Kelvin
1, 10 $\Omega$	8.2 V	8.2 V	8.2 V	12.1 V	12.1 V
100, 1k $\Omega$	13.9 V	14.1 V	13.9 V	15.0 V	12.7 V
10k $\Omega$	9.1 V	9.1 V	9.1 V	0.0 V	0.0 V
100k, 1M $\Omega$	12.7 V	14.7 V	12.7 V	—	—
10M, 100M $\Omega$	6.4 V	6.4 V	6.4 V	—	—

3. Relative to calibration accuracy.
4. Add the following additional uncertainty:

Card	DCV "of range"	100 k $\Omega$ "of reading + of range"	1 M $\Omega$ "of reading"
3720, 3721, 3730	3.0 $\mu$ V	8 ppm + 3 ppm	8 ppm
3722	2.0 $\mu$ V	8 ppm + 2 ppm	8 ppm
3723	6 $\mu$ V	8 ppm + 6 ppm	8 ppm

5. Specifications are for 4-wire  $\Omega$ , 1  $\rightarrow$  100 $\Omega$  with offset compensation on. Series 3700 plug-in cards with LSYNC and offset compensation on. 2-wire  $\Omega$  specifications are for dmm.connect=dmm.CONNECT\_ALL.

For 2-wire  $\Omega$ , add the following to "ppm of range" uncertainty:  
700m $\Omega$  with dmm.connect=dmm.CONNECT\_TWO\_WIRE, 100m $\Omega$  with REL, and 1.5 $\Omega$  without REL.  
1 $\Omega$  range is 4-wire only.

6. Test current with dmm.offsetcompensation=OFF,  $\pm 5\%$ .
7. Add the following to "ppm of reading" uncertainty when using Series 3700 Plug-in Cards in Operating Environment  $\geq 50\%$  RH.

Card	10 k $\Omega$	100 k $\Omega$	1 M $\Omega$	10 M $\Omega$	100 M $\Omega$
3720, 3721, 3730 with MTC D-Shell connector	1 ppm	10 ppm	0.01%	0.1%	1%
3722, 3723 and 3720, 3721, 3730 with -ST screw terminal module	10 ppm	100 ppm	0.1%	1%	10%

Series 3700 Plug-in Cards Operating Environment: Specified for 0°C to 50°C,  $\leq 70\%$  RH at 35°C.

8. For 4-wire  $\Omega$  only, offset compensation and L<sub>SYNC</sub> on. For Models 3722 and 3723, 10 $\Omega$   $\rightarrow$  2k $\Omega$  ranges only.
9. Includes Analog Backplane 15-pin rear panel connector. For 3721, refer to DC Current table for additional uncertainties.

10. For L<sub>SYNC</sub> On, line frequency  $\pm 0.1\%$ .

	nPLC	5	1	0.2	<0.2
L <sub>SYNC</sub> On	NMRR	110 dB	90 dB	70 dB	—
L <sub>SYNC</sub> Off	NMRR	60 dB, $\pm 2$ dB	60 dB, $\pm 2$ dB	—	—

11. For 1k $\Omega$  unbalance in LO lead. AC CMRR is 70dB.

nPLC	5	1	0.2 <sup>12</sup>	$\leq 0.2$
CMRR	140 dB	140 dB	120 dB	80 dB

12. For L<sub>SYNC</sub> On.

13. Reading rates are for 60Hz (50Hz) operation using factory defaults operating conditions dmm.reset("all"), Autorange off, Limits off, dmm.autodelay=0, dmm.opendetector=dmm.OFF, format.data=format.SREAL, DCV = 10V, 2W/4W = 1k $\Omega$ , DCI = 1mA, Dry-Ckt = 10 $\Omega$ , ACI = 1mA, and ACV = 1V. For Dry-Ckt 100 $\Omega$  and 2k $\Omega$ , 60 rdg/s max. with offset compensation OFF and 29.5 rdg/s max. with offset compensation ON. For temperature reading rates use DCV for T/C, 2W $\Omega$  for Thermistor, and 4W $\Omega$  for RTD. Speeds include measurements and binary data transfer out the Ethernet, GPIB, or USB.

14. DMM configured for single reading, dmm.measurecount=1, and print(dmm.measure()).

15. DMM configured for multisample readings and single buffer transfer, dmm.measurecount=1000, dmm.makebuffer(1000), dmm.measure(buf), and printbuffer(x,x,buf).

16. dmm.autozero=dmm.ON. Includes Model 3721 card accuracies.

17. For DC, dmm.nplc=0.0005. For AC, dmm.detectorbandwidth=300, dmm.nplc=0.0005. For ACI, dmm.autodelay=dmm.ON (0.40s), max rate is 400ms and ACV dmm.autodelay=dmm.ON (1.0s), max rate is 1.0s.

18. Speeds are within same multiplexer bank. Add an additional 8ms when changing banks or slots.

19. When properly zeroed using REL function.

## AC Specifications

			Accuracy: ± (% of reading + % of range) 23°C ± 5°C						
Function	Range <sup>1</sup>	Resolution	Calibration Cycle	3 Hz–5 Hz	5 Hz–10 Hz	10 Hz –20 kHz	20 kHz–50 kHz	50 kHz–100 kHz	100 kHz–300 kHz
Voltage <sup>2</sup>	100.0000 mV	0.1 μV	90 Day (all ranges)	1.0 + 0.03	0.30 + 0.03	0.05 + 0.03	0.11 + 0.05	0.6 + 0.08	4.0 + 0.5
	1.000000 V	1 μV		1.0 + 0.03	0.30 + 0.03	0.06 + 0.03	0.12 + 0.05	0.6 + 0.08	4.0 + 0.5
	10.00000 V	10 μV	1 Year (all ranges)	1.0 + 0.03	0.30 + 0.03	0.06 + 0.03	0.12 + 0.05	0.6 + 0.08	4.0 + 0.5
	100.0000 V	100 μV		1.0 + 0.03	0.30 + 0.03	0.06 + 0.03	0.12 + 0.05	0.6 + 0.08	4.0 + 0.5
	300.0000 V	1 mV		1.0 + 0.03	0.30 + 0.03	0.06 + 0.03	0.12 + 0.05	0.6 + 0.08	4.0 + 0.5
Temp. Coeff. /°C <sup>3</sup>				0.010 + 0.003	0.030 + 0.003	0.005 + 0.003	0.006 + 0.005	0.01 + 0.006	0.03 + 0.01
			Accuracy: ± (ppm of reading + offset ppm)						
Current <sup>2</sup>	1.000000 mA <sup>8</sup>	1 nA	90 Day/1 Year (all ranges)	1.0 + 0.04	0.30 + 0.04	0.08 + 0.03	0.09 + 0.03	0.09 + 0.03	0.09 + 0.03
	10.00000 mA	10 nA		1.0 + 0.04	0.30 + 0.04	0.08 + 0.03	0.09 + 0.03	0.09 + 0.03	0.09 + 0.03
	100.0000 mA	100 nA		1.0 + 0.04	0.30 + 0.04	0.08 + 0.03	0.09 + 0.03	0.09 + 0.03	0.09 + 0.03
	1.000000 A	1 μA		1.0 + 0.04	0.30 + 0.04	0.20 + 0.03	0.88 + 0.04	2.0 + 0.04	2.0 + 0.04
	3.000000 A	10 μA		1.0 + 0.04	0.30 + 0.04	0.20 + 0.03	0.88 + 0.04	2.0 + 0.04	2.0 + 0.04
Temp. Coeff./°C <sup>3</sup>				0.10 + 0.004	0.030 + 0.004	0.005 + 0.003	0.006 + 0.005	0.006 + 0.005	0.006 + 0.005
			Accuracy: ±(ppm of reading + offset ppm)						
Frequency <sup>4</sup> and Period			90 Day/1 Year (all ranges)	3 Hz–500 kHz	3 Hz–500 kHz	333 ms–2 μs			
	100.0000 mV to 300.0000 V	0.333 ppm to 33.3 ppm		80 + 0.333	80 + 0.333	(SLOW, 0.25s gate)			
				80 + 3.33	80 + 3.33	(MED, 100ms gate)			
				80 + 33.3	80 + 33.3	(FAST, 10ms gate)			

## ADDITIONAL UNCERTAINTY $\pm$ (% of reading)

Low Frequency Uncertainty	Detectorbandwidth		
	3 (SLOW) 3 Hz–300 kHz	30 (MED) 30 Hz–300 kHz	300 (FAST) 300 Hz–300 kHz
20 Hz–30 Hz	0	0.3	—
30 Hz–50 Hz	0	0	—
50 Hz–100 Hz	0	0	4.0
100 Hz–200 Hz	0	0	0.72
200 Hz–300 Hz	0	0	0.18
300 Hz–500 Hz	0	0	0.07
>500 Hz	0	0	0

Additional Uncertainty $\pm$ (% of reading)	Detectorbandwidth	Crest Factor <sup>5</sup> Maximum Crest Factor: 5 at full-scale			
		1–2	2–3	3–4	4–5
5 Hz–10 Hz	3	0.50	1.10	1.30	1.40
10 Hz–30 Hz	3	0.20	0.30	0.50	0.90
30 Hz–100 Hz	3 or 30	0.20	0.30	0.50	0.90
>100 Hz	3 or 30	0.05	0.15	0.30	0.40
300 Hz–500 Hz	300 only	0.50	1.10	1.30	1.40
$\geq 500$ Hz	300 only	0.05	0.15	0.30	0.40

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## System Switch/Multimeter and Plug-In Cards

### AC SPEEDS

Single Channel, 60Hz (50Hz) Operation

Function	NPLC	Aperture (ms)	Measurements into Buffer <sup>13</sup> (rdg/s)			Measurement to PC <sup>13</sup> (ms/rdg)		
			Digits	Azero On	Azero Off	Ethernet	GPIB	USB
ACI / ACV	SLOW	N/A	6½	0.5 (0.5)	N/A	2000 (2000)	2000 (2000)	2000 (2000)
	MED	N/A	6½	2.5 (2.5)	N/A	400 (400)	400 (400)	400 (400)
	1.0 <sup>14</sup>	16.67 (20)	6½	42 (33)	60 (50)	19.4 (22.7)	19.5 (22.8)	19.8 (23.1)
	0.2 <sup>14</sup>	3.33 (4.0)	6½	120 (100)	295 (235)	6.03 (6.7)	6.13 (6.8)	6.33 (7.0)
	0.06 <sup>15</sup>	1.0 (1.2)	5½	205 (165)	935 (750)	1.40 (1.80)	1.50 (1.80)	1.60 (2.30)
	0.006 <sup>15</sup>	0.100 (0.120)	4½	218 (215)	6,300 (5,600)	0.55 (0.57)	0.65 (0.67)	0.75 (0.77)
	0.0005 <sup>15</sup>	0.0083 (0.001)	3½	270 (270)	15,000 (14,500)	0.50 (0.5)	0.60 (0.60)	0.70 (0.70)
Frequency/ Period	N/A	SLOW, MED, FAST	N/A	2× input period + gate time	N/A	2× input period + gate time + 2.7ms	2× input period + gate time + 2.8ms	2× input period + gate time + 3.1ms

### AC MEASUREMENT CHARACTERISTICS

#### AC VOLTS

MEASUREMENT METHOD: AC-coupled, True RMS.

INPUT IMPEDANCE: 1MΩ ±2% // by <150pF.

INPUT PROTECTION: 300VDC or 300Vrms rear inputs or 37xx cards.

#### AC CURRENT

MEASUREMENT METHOD: AC-coupled, True RMS.

Range	3 A	1 A	100 mA	10 mA	1 mA
Shunt Resistance <sup>7</sup>	0.1 Ω	0.1 Ω	1.0 Ω	10 Ω	100 Ω
Burden Voltage Rear Panel	<1.8 V rms	<0.6 V rms	<0.4 V rms	<150 mV rms	<125 mV rms
Burden Voltage 3721 Card	<2.4 V rms	<1.0 V rms	<0.6 V rms	<200 mV rms	<130 mV rms

INPUT PROTECTION: 3A, 250V fuse.

#### FREQUENCY AND PERIOD

MEASUREMENT METHOD: Reciprocal Counting technique.

GATE TIME: SLOW 0.25s, MED 100ms, and FAST 10ms (dmm.aperture=0.25, 0.1, or 0.01).

#### AC GENERAL

AC CMRR<sup>6</sup>: 70dB.

VOLT HERTZ PRODUCT: ≤8×10<sup>7</sup> Volt·Hz (guaranteed by design), ≤2.1×10<sup>7</sup> Volt·Hz verified. Input frequency verified for ≤3×10<sup>5</sup> Hz.

### AC NOTES

- 20% overrange except 1% on 300V and 3.33% on 3A. Default resolution is 5½ digits, maximum useable resolution is 6½ with 7½ digits programmable.
- Specification are for SLOW mode and sinewave inputs >5% of range. SLOW and MED are multi-sample A/D conversions. FAST is dmm.detectorbandwidth=300 with dmm.nplc=1.0.
- Applies to 0°–18°C and 28°–50°C.
- Specified for square wave inputs. Input signal must be >10% of ACV range. If input is <20mV on the 100mV range then the frequency must be >10Hz. For sinewave inputs, frequency must be >100Hz.
- Applies to non-sinewave inputs ≥5Hz.
- For 1kΩ unbalance in LO lead.
- Shunt resistance guaranteed by design.
- For Model 3721, 1mA ACI, add 0.05% to "of reading" uncertainty from 250Hz → 10kHz.



## GENERAL SPECIFICATIONS

**EXPANSION SLOTS:** 6.

**POWER LINE:** Universal, 100V to 240V,  $\pm 10\%$ .

**LINE FREQUENCY:** 50Hz and 60Hz, automatically sensed at power-up.

**POWER CONSUMPTION:** 28VA with DMM and display, up to 140VA with six 37xx cards.

**REAL TIME CLOCK:** Battery backed, 10 years typical life.

**WARRANTY:** 1 year.

**EMC:** Conforms to European Union Directive 2004/108/EC EN61326-1.

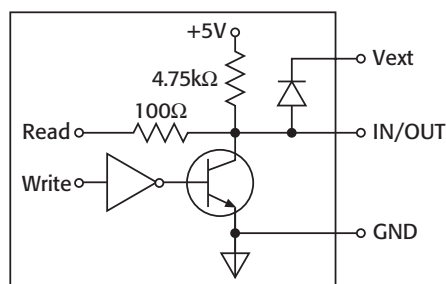
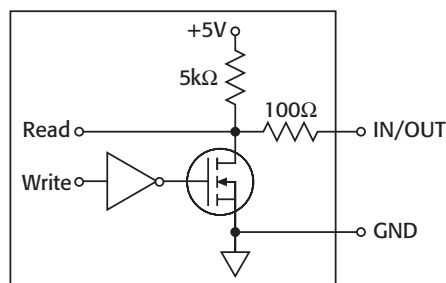
**SAFETY:** Conforms to European Union Directive 73/23/EEC EN61010-1.

**VIBRATION:** MIL-PRF-28800F Class 3, Random.

**WARM-UP:** 2 hours to rated accuracy.

**DIGITAL I/O:** 25-pin female D-shell.

	I/O 1-9	I/O 10-14	Vext
$I_{\text{SINK, max.}}$	5 mA	250 mA	—
Absolute $V_{\text{IN}}$	5.25 V to $-0.25$ V	5.25 V to $-0.25$ V	5 V to 33 V
$V_{\text{IH min}}$	2.2 V	2.2 V	—
$V_{\text{IL max}}$	0.7 V	0.7 V	—
$V_{\text{OL max at } I_{\text{sink max}}}$	0.7 V	0.7 V	—
$V_{\text{OH min, 0.4mA sour}}$	2.7 V	2.4 V	—
Min $V_{\text{IN pulse}}$	2 $\mu\text{s}$	10 $\mu\text{s}$	—
Min $V_{\text{O pulse}}$	1 $\mu\text{s}$	50 $\mu\text{s}$	—



### TRIGGERING AND MEMORY:

**Window Filter Sensitivity:** 0.01%, 0.1%, 1%, 10%, or full-scale of range (none).

**Trigger Delay:** 0 to 99 hrs. (10 $\mu\text{s}$  step size).

**External Trigger Delay:**  $< 10\mu\text{s}$ .

**Memory:** Up to 650,000 time-stamped readings and  $\geq 600$  channel patterns (dependent on name length and pattern image size). Additional memory available with external "thumb drive."

**Non-volatile Memory:** Single user save setup, with up to 75 DMM configurations (dependent on name length and DMM, function, and configuration). Additional memory available with external "thumb drive."

**MATH FUNCTIONS:** Rel, dB, Limit Test, %, 1/x, and mX+b with user defined displayed.

### REMOTE INTERFACE:

**Ethernet:** RJ-45 connector, LXI Class C, 10/100BT, no auto MDIX.

**GPIO:** IEEE-488.1 compliant. Supports IEEE-488.2 common commands and status model topology.

**USB Device (rear panel, type B):** Full speed, USBTMC compliant.

**USB Host (front panel, type A):** USB 2.0, support for thumb drives.

**LXI COMPLIANCE:** LXI Class B with IEEE 1588 precision time protocol.

### LXI TIMING (applies to scanning) and SPECIFICATION:

**Receive LAN[0-7] Event Delay:** 600 $\mu\text{s}$  min, 800 $\mu\text{s}$  typ., n/s max.

**Alarm to Trigger Delay:** 25 $\mu\text{s}$  min., 50 $\mu\text{s}$  typ., n/s max.

**Generate LAN[0-7] Event:** 750 $\mu\text{s}$  min., 1000 $\mu\text{s}$  typ., n/s max. (minimums are probabilistic and represent a 95% confidence factor).

**Clock Accuracy:** 25ppm.

**Synchronization Accuracy:**  $< 150\text{ns}$  (probabilistic and represents a 95% confidence factor).

**Timestamp Accuracy:** 100 $\mu\text{s}$ .

**Timestamp Resolution:** 20ns.

**LANGUAGE:** Embedded Test Script Processor (TSP) accessible from any host interface. Responds to individual Instrument Control Library (ICL) commands. Responds to high-speed test scripts comprised of ICL commands and Test Script Language (TSL) statements (e.g., branching, looping, math, etc.). Able to execute high-speed test scripts stored in memory without host intervention.

**ACCESSORIES SUPPLIED:** Product Information CD-ROM and 3m Ethernet cable.

**ACCESSORIES AVAILABLE:** 3700 Cards, 3700-MTC cables, 3706-BKPL (analog backplane extender), 3706-3Y/5Y-EW (extended warranty), C/3706-3Y (Calibration / Data / ISO 17025), Software IVI/VISA drivers for VB, VC/C++, LabView, TSP Script, Script Builder, and LabWindows/CVI.

**IP CONFIGURATION:** Static or DHCP.

**PASSWORD PROTECTION:** 11 characters

**MINIMUM PC HARDWARE:** Intel Pentium 3, 800MHz, 512Mbyte RAM, 210Mbyte disk space or better.

**OPERATING SYSTEMS/SOFTWARE:** Windows 2000 and XP compatible, supports Web browsers with Java plug-in (requires Java plug-in 1.6 or higher). Web pages served by 3706.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C,  $\leq 80\%$  RH at 35°C, altitude up to 2000 meters.

**STORAGE ENVIRONMENT:**  $-40^\circ$  to 70°C.

### DIMENSIONS:

**Rack Mounted:** 89mm high  $\times$  483mm wide  $\times$  457mm deep (3.5 in.  $\times$  19 in.  $\times$  18 in.).

**Bench Configuration (includes handle and feet):** 104mm high  $\times$  483mm wide  $\times$  457mm deep (4.125 in.  $\times$  19 in.  $\times$  18 in.).

**SHIPPING WEIGHT:** 13kg (28 lbs).

# Series 3700

## System Switch/Multimeter and Plug-In Cards

### Specifications for Plug-In Cards

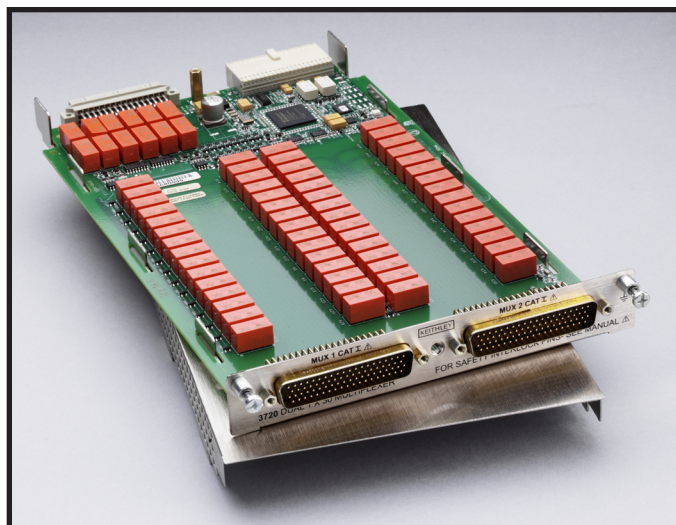
	3720	3721	3722	3723	3730	3740
No. of Channels	60 (Dual 1×30)	40 (dual 1×20)	96 (dual 1×48)	60 (dual 1×30) or 120 single pole (dual 1×60)	6×16	32
Card Config.	Multiplexer	Multiplexer	Multiplexer	Multiplexer	Matrix	Independent
Type of Relay	Latching electromechanical	Latching electromechanical	Latching electromechanical	Dry reed	Latching electromechanical	Latching electromechanical
Contact Configuration	2 Form A	2 Form A	2 Form A	1 Form A	2 Form A	28 Form C, 4 Form A
Max. Voltage	300 V	300 V (ch 1–40), 60 V (ch 41–42)	300 V	200 V	300 V	300 VDC/250 VAC (Form A)
Max. Current Switched	1 A	2 A (ch 1–40), 3 A (ch 41–42)	1 A	1 A	1 A	2 A (Form C), 7 A (Form A)
Comments	2 independent 1×30 multiplexers. Automatic temperature reference with screw terminal accessory (Model 3720-ST)	2 independent 1×20 multiplexers. Automatic temperature reference with screw terminal accessory (Model 3721-ST)	2 independent 1×48 multiplexers	2 independent 1×30 multiplexers	Columns can be expanded through the backplane or isolated by relays	32 general purpose independent channels.

# 3720

## Dual 1×30 Multiplexer Card

60 differential channels, automatic CJC w/3720-ST accessory

- 60 two-pole channels or 30 four-pole channels for general purpose switching
- Automatic CJC for temperature measurements with 3720-ST accessory
- Analog backplane connection relays provide easy bank and card interconnections
- 300V, 1A switched or 2A carry signal capacity; 60W, 125VA
- Screw terminal connections provided with removable 3720-ST accessory
- Relay closures stored in onboard memory
- Latching electromechanical relays



The Model 3720 offers two independent banks of 1×30 two-pole multiplexers. It is ideal for general purpose switching, including temperature measurements. The two banks can automatically be connected to the Series 3700 mainframe backplane and optional DMM through the analog backplane connection relays. This connection allows the mainframe to reconfigure the card to a single 1×60 two-pole multiplexer or to enable card-to-card expansion for even larger configurations.

Other features of the Model 3720 include its ability to be reconfigured to coordinated four-pole operation for additional measurement flexibility. Furthermore, the Model 3720 supports thermocouple-type temperature measurements with the Model 3720-ST (screw terminal) accessory providing automatic cold junction compensation (CJC).

The Model 3720 uses two 78-pin male D-sub connectors for signal connections. For screw terminal or automatic CJC, use the detachable Model 3720-ST accessory.

### ACCESSORIES AVAILABLE

3720-MTC-1.5	78 Pin D-sub Female to Male Cable, 1.5m (5 ft.)
3720-MTC-3	78 Pin D-sub Female to Male Cable, 3m (10 ft.)
3720-ST	Screw Terminal Block (required for auto CJC thermocouple measurements)
3791-CIT	Contact Insertion and Extraction Tool
3791-KIT78-R	78 Pin Female D-sub Connector Kit (contains 2 female D-sub connectors and 156 solder-cup contacts)
7401	Type K Thermocouple Wire (100 ft.)

### Ordering Information

**3720**      **Dual 1×30  
Multiplexer Card**

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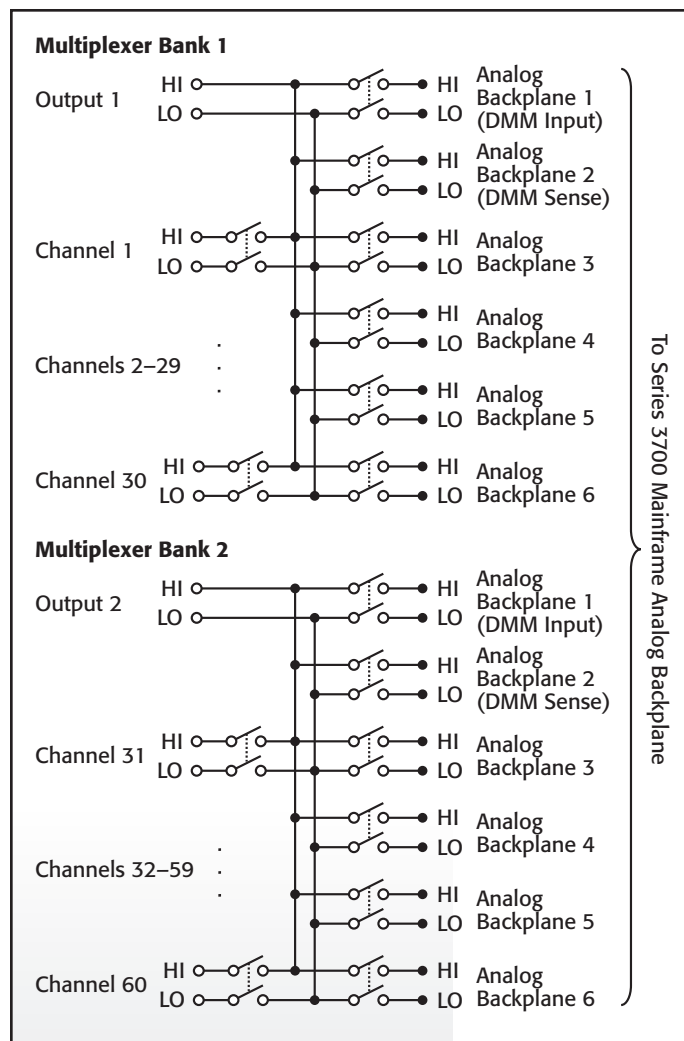
Dual 1×30 multiplexer card

SWITCHING AND CONTROL

**3720**

# Dual 1×30 Multiplexer Card

60 differential channels, automatic CJC w/3720-ST accessory



**MULTIPLEXER CONFIGURATION:** Two independent 1×30 2-pole multiplexers. Banks can be isolated from the backplane by relays. Card can be configured for 2 and 4 wire.

**CONTACT CONFIGURATION:** 2 pole form A.

**CONNECTOR TYPE:** Two 78 pin male D-shells.

**MODEL 3720-ST SCREW TERMINAL OPTION:** #22 AWG typical wire size with 0.062 inch O.D. 124 conductors maximum. #16 AWG maximum wire size with 0.092 inch O.D. 36 conductors per card maximum.

**MAXIMUM SIGNAL LEVEL:** Channels 1–60: 300V DC or RMS, 1A switched (2A carry), 60W, 125VA.

**COMMON MODE VOLTAGE:** 300V DC or RMS between any terminal and chassis.

**VOLT-HERTZ LIMIT:** 8×10<sup>7</sup>.

**CONTACT LIFE:** >10<sup>5</sup> operations at maximum signal level. >10<sup>8</sup> operations no load.<sup>1</sup>

	Dual 1×30 <sup>3</sup>	Single 1×60 <sup>2,3</sup>
Channel Resistance (end of contact life)	<1.0 Ω	<1.5 Ω
Contact Potential (differential)	<±1 μV	<±3 μV
Offset Current	<±250 pA	<±250 pA
<b>Isolation</b>		
Differential	10 <sup>9</sup> Ω, 250 pF	10 <sup>9</sup> Ω, 450 pF
Bank-Bank	10 <sup>10</sup> Ω, 75 pF	—
Channel-Channel	10 <sup>9</sup> Ω, 75 pF	10 <sup>9</sup> Ω, 75 pF
Common Mode	10 <sup>9</sup> Ω, 200 pF	10 <sup>9</sup> Ω, 400 pF
<b>Crosstalk Channel-Channel</b>		
300kHz	<–60 dB	<–55 dB
1MHz	<–50 dB	<–50 dB
20MHz:	<–25 dB	<–20 dB
<b>Bandwidth</b>	30 MHz	10 MHz

**TYPICAL SCANNING SPEEDS:**

**Switch Only<sup>4</sup>:** Sequential scanning, single channel, immediate trigger advance: >120 ch/s.

**With Measurements Into Memory<sup>5</sup>:**

DCV (10V range) or 2W Ohms (1kΩ range): >110 ch/s.

Thermocouple: >110 ch/s.

3- or 4-Wire RTD: >100 ch/s.

4-Wire Ohms (1kΩ range): >100 ch/s.

ACV (10V range): >110 ch/s.

**GENERAL**

**ACTUATION TIME:** 4ms.

**TEMPERATURE ACCURACY using Automatic CJC with 3720-ST accessory:** 1°C for J, K, T and E types (see mainframe specification for details).

**RELAY TYPE:** Latching electromechanical.

**RELAY DRIVE SCHEME:** Matrix.

**INTERLOCK:** Backplane relays disabled when interlock connection is removed.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C. Specified for 70% R.H. at 35°C.

**STORAGE ENVIRONMENT:** –25° to 65°C.

**WEIGHT:** 2.5 lbs.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN61010-1.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN61326-1.

- Open detector enabled during thermocouple measurements. Minimum signal level 10mV, 10μA.
- 3706 mainframe with all DMM backplane relays disconnected. Maximum two card backplane relays closed.
- Connections made using 3720-ST accessory.
- Scanning script local to 3706 mainframe, within same bank, and break before make switching.
- 3706 mainframe with autorange off, limits off, dmm.autozero=0, dmm.autodelay=0, 4½ digits (NPLC=0.006), for ACV dmm.detectorbandwidth=300, for OHMs dmm.offsetcompensation=off, dmm.opendetector=off. Scanning script local to mainframe, sequential scan within same bank (2 pole) or card (4 pole), and break before make switching.

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# 3721

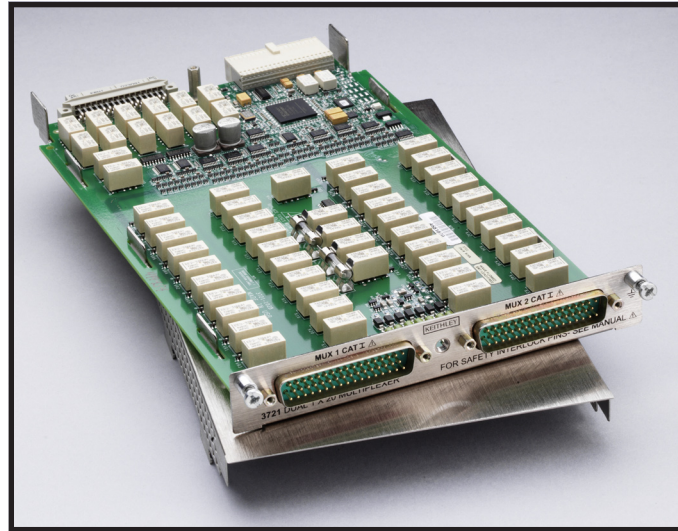
- 40 two-pole or 20 four-pole channels for general purpose switching
- 2 dedicated channels for current measurements, 3A capacity
- Automatic CJC for temperature measurements with 3721-ST accessory
- 4-wire common side ohms input supports 40 channels of 4-wire ohms measurements
- Analog backplane connection relays provide easy bank and card interconnections
- 300V, 2A switched or 3A carry signal capacity; 60W, 125VA
- Latching electromechanical relays

## Ordering Information

**3721**      **Dual 1×20 Multiplexer Card**

## Dual 1×20 Multiplexer Card

40 differential channels, automatic CJC w/3721-ST accessory



The Model 3721 offers two independent banks of 1×20 two-pole multiplexers that are ideal for general purpose switching, including temperature measurements. The two banks can automatically be connected to the Series 3700 mainframe backplane and optional DMM through the analog backplane connection relays. This connection allows the mainframe to reconfigure the Model 3721 as a single 1×40 two-pole multiplexer or to enable card-to-card expansion for even larger configurations.

The Model 3721 provides a number of other features. In addition to the 40 channels, two fused channels are supplied for current measurements. Also, the Model 3721 includes dedicated inputs that enable 40 channels of four-wire common side ohms measurements. For thermocouple type measurements, automatic cold junction compensation (CJC) is supported with the Model 3721-ST (screw terminal) accessory.

The Model 3721 uses two 50-pin male D-sub connectors for signal connections. For screw terminal or automatic CJC, use the detachable Model 3721-ST accessory.

### ACCESSORIES AVAILABLE

3721-MTC-1.5	50 Pin D-sub Female to Male Cable, 1.5m (5 ft.)
3721-MTC-3	50 Pin D-sub Female to Male Cable, 3m (10 ft.)
3721-ST	Screw Terminal Block (required for auto CJC thermocouple measurements)
3790-KIT50-R	50 Pin Female D-sub Connector Kit (contains 2 female D-sub connectors and 100 solder-cup contacts)
7401	Type K Thermocouple Wire (100 ft.)

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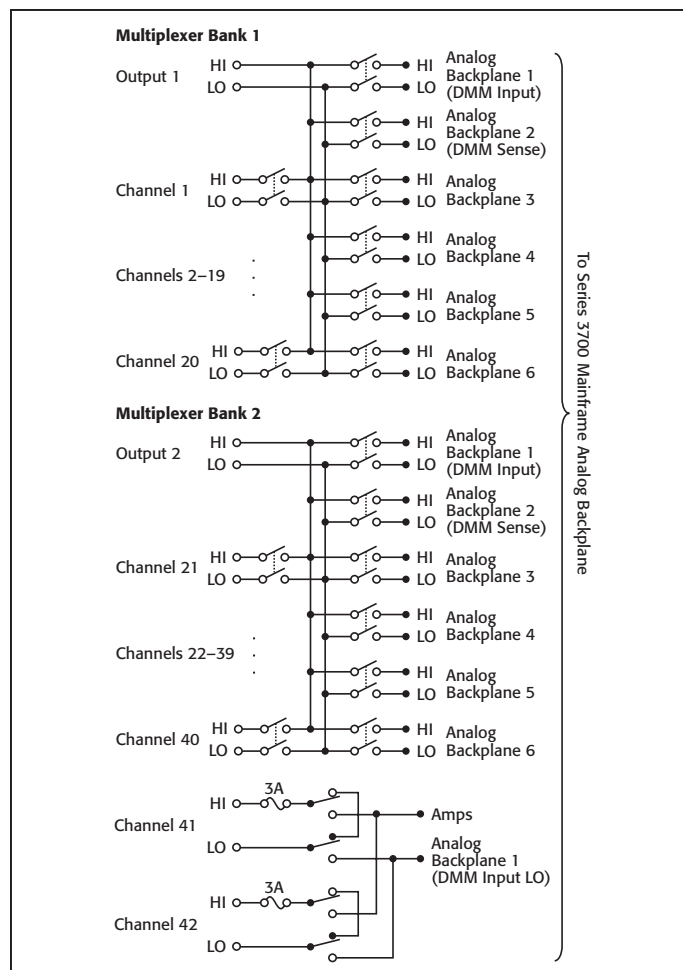
A GREATER MEASURE OF CONFIDENCE



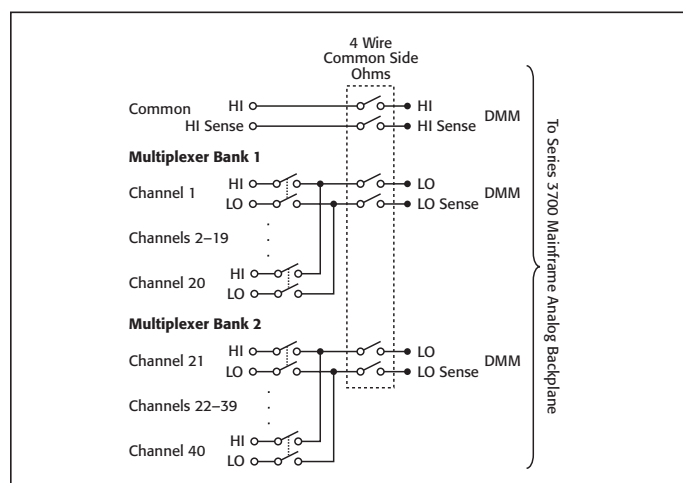
**3721**

# Dual 1×20 Multiplexer Card

40 differential channels, automatic CJC w/3721-ST accessory



## Two pole mode



## Four-wire common side ohm mode

**MULTIPLEXER CONFIGURATION:** Two independent 1×20 2-pole multiplexers. Banks can be connected together via relay creating a single 1×40 multiplexer. Banks can be isolated from the backplane by relays. Card can be configured for common side Ohms measurement via backplane relays. **Channel 41–42:** Multiplex one of two 2-pole current signals into DMM.

**CONTACT CONFIGURATION:** 2 pole form A.

**CONNECTOR TYPE:** Two 50 pin male D-shells. Removable screw terminal option.

**MAXIMUM SIGNAL LEVEL:** **Channels 1–40:** 300V DC or RMS, 2A switched (3A carry), 60W, 125VA maximum. **Channels 41–42:** 60V DC or 30V RMS, 3A switched, 60W, 125VA maximum. Fused 3A, 250V RMS.

**COMMON MODE VOLTAGE:** **Channels 1–40:** 300V DC or RMS between any terminal and chassis.

**VOLT-HERTZ LIMIT:** 8×10<sup>7</sup>.

**CONTACT LIFE:** >10<sup>5</sup> operations at maximum signal level. >10<sup>8</sup> operations no load.<sup>1</sup>

	Dual 1×20 <sup>3</sup>	Single 1×40 <sup>2,3</sup>
Channel Resistance (end of contact life)	<1.0 Ω	<1.5 Ω
Contact Potential (differential)	<±1 μV	<±3 μV
Offset Current	<±250 pA	<±250 pA
Isolation		
Differential	10 <sup>9</sup> Ω, 280 pF	10 <sup>9</sup> Ω, 530 pF
Bank-Bank	10 <sup>11</sup> Ω, 60 pF	—
Channel-Channel	10 <sup>9</sup> Ω, 50 pF	10 <sup>9</sup> Ω, 50 pF
Common Mode	10 <sup>9</sup> Ω, 180 pF	10 <sup>9</sup> Ω, 480 pF
Crosstalk Channel-Channel		
300kHz	<–60 dB	<–60 dB
1MHz	<–50 dB	<–50 dB
20MHz:	<–25 dB	<–15 dB
Bandwidth	28 MHz	9 MHz

## TYPICAL SCANNING SPEEDS:

**Switch Only<sup>4</sup>:** Sequential scanning, single channel, immediate trigger advance: >120 ch/s.

**With Measurements Into Memory<sup>5</sup>:**

DCV (10V range) or 2W Ohms (1kΩ range): >110 ch/s.

Thermocouple: >110 ch/s.

3- or 4-Wire RTD: >100 ch/s.

4-Wire Ohms (1kΩ range): >100 ch/s.

ACV (10V, 400Hz range) or ACI (1A, 400Hz range): >110 ch/s.

## GENERAL

**ACTUATION TIME:** 4ms.

**TEMPERATURE ACCURACY using Automatic CJC with 3721-ST accessory:** 1°C for J, K, T and E types (see mainframe specification for details).

**RELAY TYPE:** Latching electromechanical.

**RELAY DRIVE SCHEME:** Direct.

**INTERLOCK:** Backplane relays disabled when interlock connection is removed.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C. Specified to 70% R.H. at 35°C.

**STORAGE ENVIRONMENT:** –25° to 65°C.

**WEIGHT:** 2.25 lbs.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN61010-1.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN61326-1.

- Open detector enabled during thermocouple measurements. Minimum signal level 10mV, 10μA.
- 3706 mainframe with all DMM backplane relays disconnected. Maximum two card backplane relays closed.
- Connections made using 3721-ST accessory.
- Scanning script local to 3706 mainframe, within same bank, and break before make switching.
- 3706 mainframe with autorange off, limits off, dmm.autozero=0, dmm.autodelay=0, 4½ digits (NPLC=0.006), for ACV dmm.detectorbandwidth=300, for OHMS dmm.offsetcompensation=off, dmm.opendetector=off. Scanning script local to mainframe, sequential scan within same bank (2 pole) or card (4 pole), and break before make switching.

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# 3722

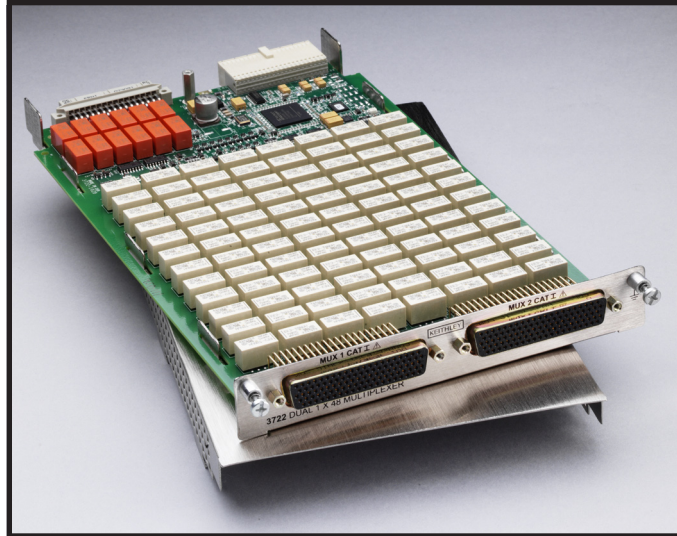
- 96 two-pole or 48 four-pole channels for general purpose measurements
- Analog backplane connection relays provide easy bank and card interconnections
- 300V, 1A switched or 2A carry signal capacity; 60W, 125VA
- 1 $\mu$ V and 100pA offsets
- 25MHz bandwidth
- Relay closures stored in onboard memory
- Latching electromechanical relays
- Scan and measure over 110 channels/second

## Ordering Information

**3722** Dual 1 $\times$ 48, High Density, Multiplexer Card

## Dual 1 $\times$ 48, High Density, Multiplexer Card

96 differential channels, 300 Volts/1 Amp



The Model 3722 offers two independent banks of 1 $\times$ 48 two-pole multiplexers, which is ideal for applications that require a high channel count. The two banks can automatically be connected to the Series 3700 mainframe backplane and optional DMM through the analog backplane connection relays. This connection allows the mainframe to reconfigure the card as a single 1 $\times$ 96 two-pole multiplexer or to enable card-to-card expansion for even larger configurations. Another feature of this card is the latching electromechanical relays. They can accommodate 300V, 1A switched signal levels.

The Model 3722 uses two 104-pin D-sub connectors for signal connections. A solder style connector kit (Model 3791-KIT104-R) and pre-assembled cables (Model 3722-MTC-1.5 and 3722-MTC-3) are available for card connections.

### ACCESSORIES AVAILABLE

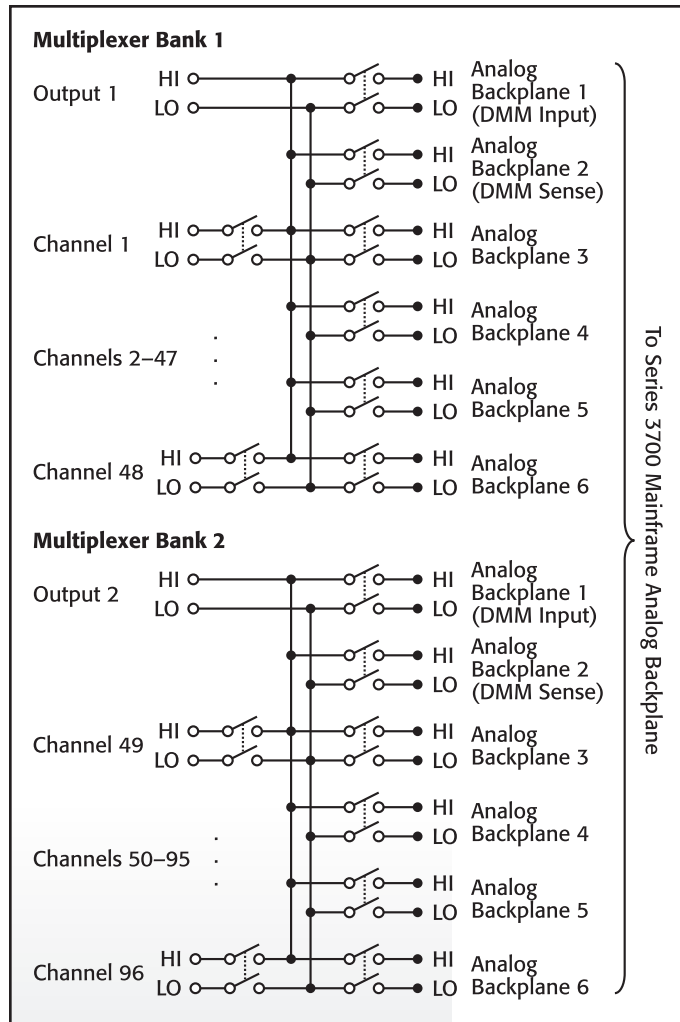
3722-MTC-1.5	104 Pin D-sub Male to Male Cable, 1.5m (5 ft.)
3722-MTC-3	104 Pin D-sub Male to Male Cable, 3m (10 ft.)
3791-CIT	Contact Insertion and Extraction Tool
3791-KIT104-R	104 Pin Male D-sub Connector kit (contains 2 male D-sub connectors with housings and 208 solder-cup contacts)

# 3722

## Dual 1×48, High Density, Multiplexer Card

### 96 differential channels, 300 Volts/1 Amp

Model 3722 specifications



**MULTIPLEXER CONFIGURATION:** Two independent 1×48 2-pole multiplexers. Banks can be connected together via relays creating a single 1×96 multiplexer. Banks can be isolated from the backplane by relays. Card can be configured for 2- and 4-wire mode.

**CONTACT CONFIGURATION:** 2 pole form A.

**CONNECTOR TYPE:** Two 104 pin female D-shells.

**MAXIMUM SIGNAL LEVEL:** 300V DC or RMS, 1A switched (2A carry), 60W, 125VA.

**COMMON MODE VOLTAGE:** 300V DC or RMS between any terminal and chassis.

**VOLT-HERTZ LIMIT:** 8×10<sup>7</sup>.

**CONTACT LIFE:** >10<sup>5</sup> operations at maximum signal level. >10<sup>8</sup> operations no load.<sup>1</sup>

	Dual 1×48 <sup>2</sup>	Single 1×96
Channel Resistance (end of contact life)	<1.5 Ω	<2.5 Ω
Contact Potential (differential)	<±1 μV	<±2 μV
Offset Current	<100 pA	<100 pA
Isolation		
Differential	5×10 <sup>9</sup> Ω, 200 pF	5×10 <sup>9</sup> Ω, 400 pF
Bank-Bank	10 <sup>9</sup> Ω, 50 pF	—
Channel-Channel	10 <sup>9</sup> Ω, 50 pF	10 <sup>9</sup> Ω, 50 pF
Common Mode	10 <sup>10</sup> Ω, 200 pF	10 <sup>10</sup> Ω, 400 pF
Crosstalk Channel-Channel		
300kHz	<-65 dB	<-65 dB
1MHz	<-55 dB	<-55 dB
20MHz:	<-30 dB	<-30 dB
Bandwidth	25 MHz	15 MHz

#### TYPICAL SCANNING SPEEDS:

**Switch Only<sup>3</sup>:** Sequential scanning, single channel, immediate trigger advance: >120 ch/s.

**With Measurements Into Memory<sup>4</sup>:**

DCV (10V range) or 2W Ohms (1kΩ range): >110 ch/s.

3- or 4-Wire RTD: >100 ch/s.

4-Wire Ohms (1kΩ range): >100 ch/s.

ACV (10V, 400Hz range): >110 ch/s.

#### GENERAL

**ACTUATION TIME:** 4ms.

**RELAY TYPE:** Latching electromechanical.

**RELAY DRIVE SCHEME:** Matrix.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C. Specified to 70% R.H. at 35°C.

**STORAGE ENVIRONMENT:** -25° to 65°C.

**WEIGHT:** 2.5 lbs.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN61010-1.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN61326-1.

1. Minimum signal level 10mV, 10μA.

2. 3706 mainframe with all DMM backplane relays disconnected. Maximum two card backplane relays closed.

3. Scanning script local to 3706 mainframe, within same bank, and break before make switching.

4. 3706 mainframe with autorange off, limits off, dmm.autozero=0, dmm.autodelay=0, 4½ digits (NPLC=006), for ACV dmm.detectorbandwidth=300, for OHMs dmm.offsetcompensation=off. Scanning script local to mainframe, sequential scan within same bank (2 pole) or card (4 pole), and break before make switching.

SWITCHING AND CONTROL

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# 3723

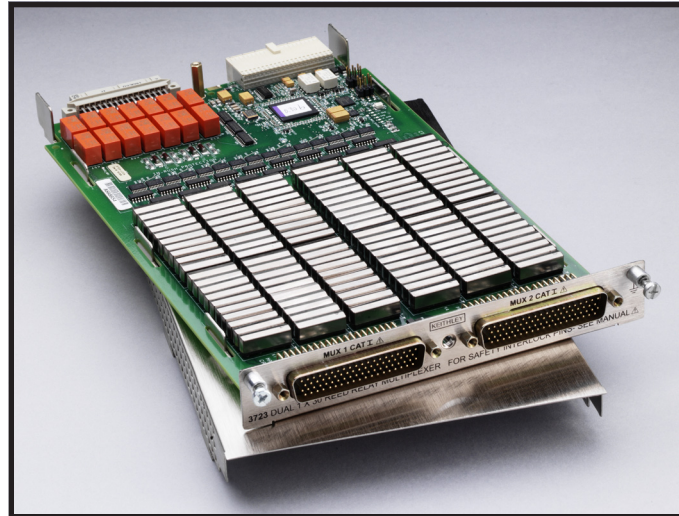
- 60 two-pole or 30 four-pole channels for high speed scanning
- 120 channel single-pole mode for one-wire (common side) measurements
- Analog backplane connection relays provide easy bank and card interconnections
- 200V, 1A switched or 1.25A carry signal capacity; 15W
- Relay actuation time <0.5ms
- 20MHz bandwidth
- Ideal for multi-channel I-V testing with Model 2600 SourceMeter® instruments
- Long life dry reed relays (>10<sup>9</sup> operations)

## Ordering Information

**3723** Dual 1×30, High Speed, Reed Relay, Multiplexer Card

# Dual 1×30, High Speed, Multiplexer Card

60 differential channels, long life reed relays



The Model 3723 offers two independent banks of high speed 1×30 two-pole multiplexers that are ideal for high speed scanning applications. The two banks can automatically be connected to the Series 3700 mainframe backplane and optional DMM through the analog backplane connection relays. This connection allows the mainframe to reconfigure the Model 3723 as a single 1×60 two-pole multiplexer or as a single 1×120 single-pole multiplexer. It also enables card-to-card expansion for even larger configurations.

By using high speed reed relays with actuation times of less than 0.5ms, this card can meet demanding throughput applications. Another feature of the Model 3723 is its single-ended, one-pole mode, which supports up to 120 channels of single-wire measurements.

The Model 3723 uses two 78-pin D-sub connectors for signal connections. For screw terminal connections, use the Model 3723-ST for two- and four-pole configurations or the Model 3723-ST-1 for single-wire applications.

## ACCESSORIES AVAILABLE

3720-MTC-1.5	78 Pin D-sub Female to Male Cable, 1.5m (5 ft.)
3720-MTC-3	78 Pin D-sub Female to Male Cable, 3m (10 ft.)
3723-ST	Screw Terminal Block
3723-ST-1	Screw Terminal Block for single-pole applications
3791-CIT	Contact Insertion and Extraction Tool
3791-KIT78-R	78 Pin Female D-sub Connector Kit (contains 2 female D-sub connectors and 156 solder cups)

High speed, dual 1×30 multiplexer card

SWITCHING AND CONTROL

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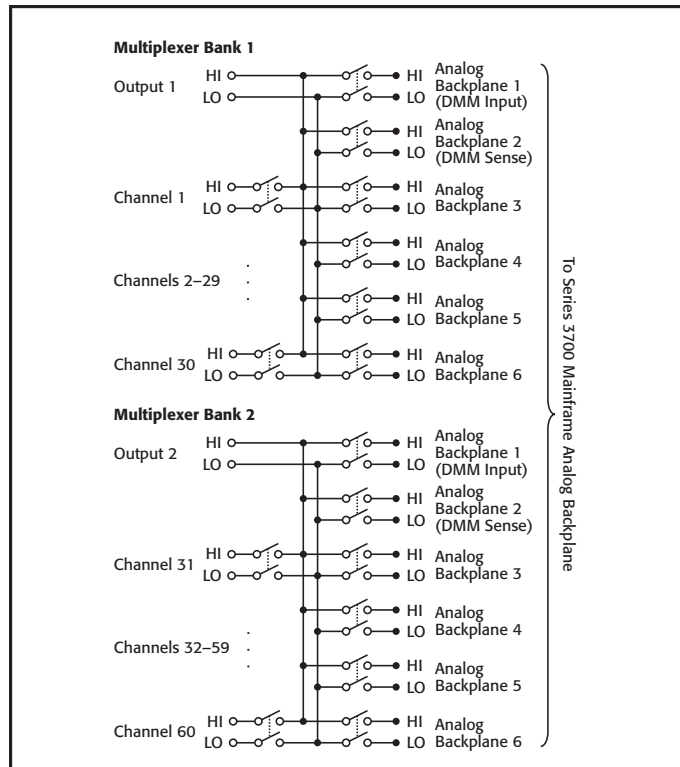
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# 3723

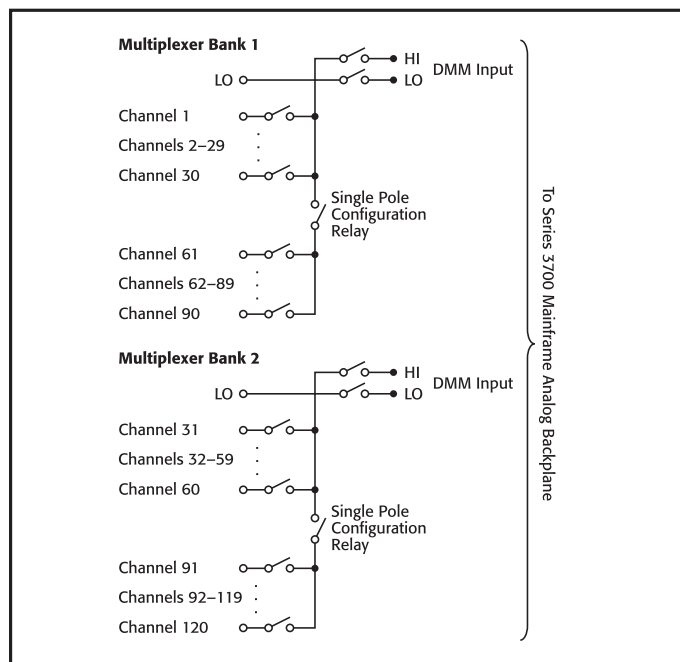
## Dual 1×30, High Speed, Multiplexer Card

### 60 differential channels, long life reed relays

Model 3723 specifications



Two-pole mode



Single-pole mode

**MULTIPLEXER CONFIGURATION:** Two independent 1×30 2-pole multiplexers. Banks can be connected together via relay creating a single 1×60 multiplexer. Banks can be isolated from the backplane by relays. Card can be configured for 1-, 2-, and 4-wire.

**CONTACT CONFIGURATION:** 2 pole form A.

**CONNECTOR TYPE:** Two 78 pin male D-shells.

**MODEL 3723-ST SCREW TERMINAL OPTION:** #22 AWG typical wire size with 0.062 inch O.D. 124 conductors maximum. #16 AWG maximum wire size with 0.092 inch O.D. 36 conductor per card maximum.

**MAXIMUM SIGNAL LEVEL:** 200V DC or RMS, 1A switched (1.25A carry), 15W.

**COMMON MODE VOLTAGE:** 300V DC or RMS between any terminal and chassis.

**VOLT-HERTZ LIMIT:** 8×10<sup>7</sup>.

**CONTACT LIFE:** Reed: >10<sup>9</sup> operations, no load. 10<sup>7</sup> operations @ 100V, 10mA.

EMR: >10<sup>9</sup> operations @ 5V, 10mA. 10<sup>5</sup> operations @ maximum signal level.

	Dual 1×30 <sup>1</sup>	Single 1×60 <sup>1, 2</sup>
Channel Resistance (end of contact life)	<1.5 Ω	<2.0 Ω
Contact Potential: Differential	<±6 μV	<±6 μV
Single-Ended	<±12 μV	<±12 μV
Offset Current	<250 pA	<250 pA
Isolation		
Differential	10 <sup>10</sup> Ω, 260 pF	10 <sup>10</sup> Ω, 500 pF
Bank-Bank	10 <sup>10</sup> Ω, 75 pF	—
Channel-Channel	10 <sup>10</sup> Ω, 75 pF	10 <sup>10</sup> Ω, 75 pF
Common Mode	10 <sup>10</sup> Ω, 280 pF	10 <sup>9</sup> Ω, 625 pF
Crosstalk Channel-Channel		
300kHz	<-55 dB	<-55 dB
1MHz	<-50 dB	<-45 dB
20MHz:	<-20 dB	<-20 dB
Bandwidth	20 MHz	10 MHz

#### TYPICAL SCANNING SPEEDS:

**Switch Only<sup>3</sup>:** Sequential scanning, single channel, immediate trigger advance: >1000 ch/s.

**With Measurements Into Memory<sup>4</sup>:**

DCV (10V range) or 2W Ohms (1kΩ range): >800 ch/s.

3- or 4-Wire RTD: >450 ch/s.

4-Wire Ohms (1kΩ range): >450 ch/s.

ACV (10V, 400Hz range): >800 ch/s.

#### GENERAL

**ACTUATION TIME:** <0.5ms.

**RELAY TYPE:** Dry reed.

**RELAY DRIVE SCHEME:** Direct.

**RELAY DRIVE CURRENT:** 10mA.

**INTERLOCK:** Backplane relays disabled when interlock connection is removed.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C. Specified to 70% R.H. at 35°C.

**STORAGE ENVIRONMENT:** -25° to 65°C.

**WEIGHT:** 3.0 lbs.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN61010-1.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN61326-1.

- Connections made using 3723-ST accessory.
- 3706 mainframe with all DMM backplane relays disconnected. Maximum two card backplane relays closed.
- Scanning script local to 3706 mainframe, within same bank, and break before make switching.
- 3706 mainframe with autorange off, limits off, dmm.autozero=0, dmm.autodelay=0, 4½ digits (NPLC=0.006), for ACV dmm.detectorbandwidth=300, for OHMS dmm.offsetcompensation=off. Scanning script local to mainframe, sequential scan within same bank (2 pole) or card (4 pole), and break before make switching.

SWITCHING AND CONTROL

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# 3730

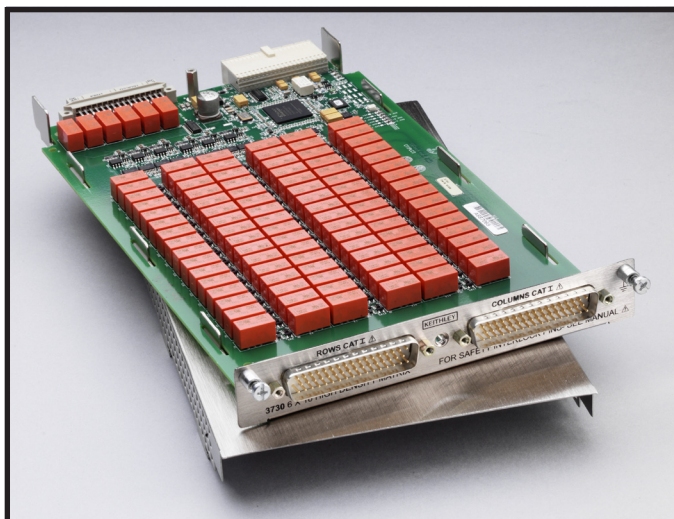
- 6 row by 16 column matrix (2-pole)
- Analog backplane connection relays provide easy column expansion
- 300V, 1A switched or 2A carry signal capacity; 60W, 125VA
- Screw terminal connections provided with removable 3730-ST accessory
- 2 $\mu$ V and 100pA offsets
- Relay closures stored in onboard memory
- Latching electromechanical relays

## Ordering Information

**3730**      **6 $\times$ 16, High Density, Matrix Card**

## 6 $\times$ 16, High Density, Matrix Card

96 two-pole crosspoints with column expansion relays



The Model 3730 is a two-pole, 6 row by 16 column matrix card. It can connect up to six differential instrument channels to any combination of 16 DUTs (devices under test). Any row can be connected to the Series 3700 mainframe backplane by using the analog backplane connection relays. This allows for easy matrix column expansion. A matrix of up to 6 rows by 96 columns can be supported within a single Model 3706 mainframe (with six Model 3730 cards).

The Model 3730 uses two 50-pin male D-sub connectors for signal connections. For screw terminal connections, use the detachable Model 3730-ST accessory.

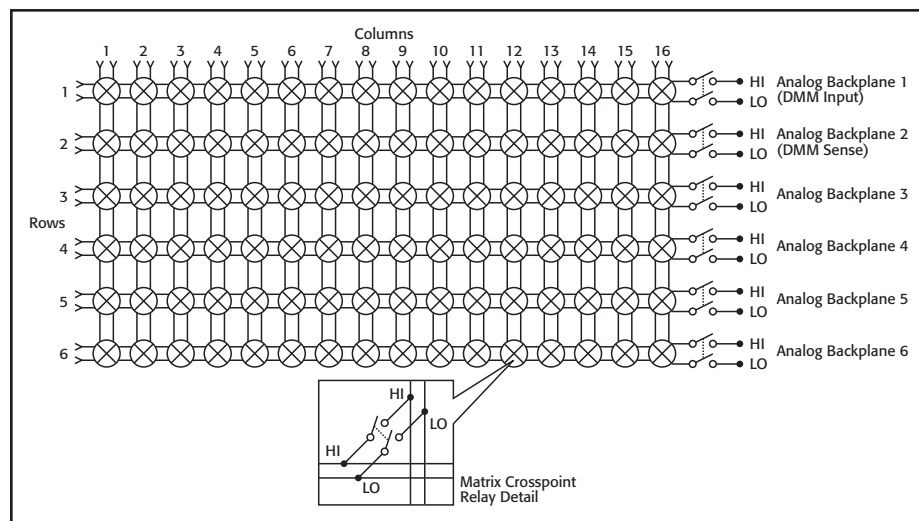
### ACCESSORIES AVAILABLE

3721-MTC-1.5	50 Pin D-sub Female to Male Cable, 1.5m (5 ft.)
3721-MTC-3	50 Pin D-sub Female to Male Cable, 3m (10 ft.)
3730-ST	Screw Terminal Block
3790-KIT-R	50 Pin Female D-sub Connector Kit (contains 2 female D-sub connectors and 100 solder-cup contacts)

**3730**

# 6×16, High Density, Matrix Card

## 96 two-pole crosspoints with column expansion relays



**MULTIPLEXER CONFIGURATION:** 6 row by 16 column matrix. Columns can be expanded using the backplane or isolated by relays.

**CONTACT CONFIGURATION:** 2 pole form A.

**CONNECTOR TYPE:** Two 50 pin male D-shells.

**MODEL 3730-ST SCREW TERMINAL OPTION:** #22 AWG typical wire size with 0.062 inch O.D. 88 conductors maximum. #16 AWG maximum wire size with 0.092 inch O.D. 44 conductor per card maximum.

**MAXIMUM SIGNAL LEVEL:** 300V DC or RMS, 1A switched (2A carry), 60W, 125VA.

**COMMON MODE VOLTAGE:** 300V DC or RMS between any terminal and chassis.

**VOLT-HERTZ LIMIT:**  $8 \times 10^7$ .

**CONTACT LIFE:**  $>10^5$  operations @ maximum signal level.  $>10^8$  operations no load.<sup>1</sup>

<b>6×16<sup>2,3</sup></b>	
Channel Resistance (end of contact life)	<1.0 Ω
Contact Potential (differential)	<±2 μV
Offset Current	<±100 pA
<b>Isolation</b>	
Differential	10 <sup>10</sup> Ω, 250 pF
Channel-Channel	10 <sup>10</sup> Ω, 75 pF
Common Mode	10 <sup>10</sup> Ω, 150 pF
<b>Crosstalk Channel-Channel</b>	
300kHz	<-65 dB
1MHz	<-55 dB
20MHz:	<-30 dB
Bandwidth	27 MHz

### GENERAL

**ACTUATION TIME:** 4ms.

**RELAY TYPE:** Latching electromechanical.

**RELAY DRIVE SCHEME:** Hybrid Matrix.

**INTERLOCK:** Backplane relays disabled when terminal assembly is removed.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C. Specified to 70% R.H. at 35°C.

**STORAGE ENVIRONMENT:** -25° to 65°C.

**WEIGHT:** 2.5 lbs.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN61010-1.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN61326-1.

1. Minimum signal level 10mV, 10μA.
2. Connections made using 3730-ST accessory.
3. 3706 mainframe with all DMM backplane relays disconnected.

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# 3740

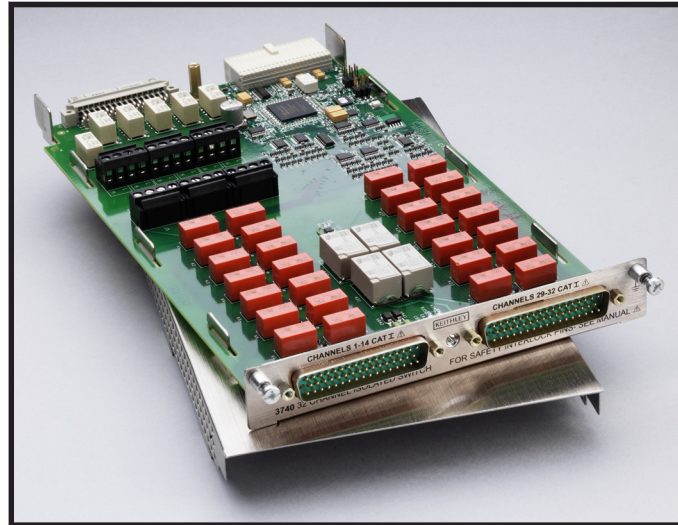
- 28 general purpose Form C relays rated for 300V, 2A switched or 3A carry signal capacity; 60W, 125VA
- 4 high current Form A relays rated for 250VAC, 7A or 30VDC, 7A switched capacity; 210W
- Analog backplane connection relays provided for user interconnections
- Screw terminal connections provided with removable 3740-ST accessory
- Relay closures stored in onboard memory
- Latching electromechanical relays

## Ordering Information

**3740**      **General Purpose Card with 32 Independent Channels**

## 32 Channel Isolated Switch Card

28 Form C relays and 4 high power Form A relays



The Model 3740 offers 28 general-purpose form C channels that are ideal for routing power or other control devices. For higher power applications of up to 7A, four additional high current form A channels are provided.

If any general purpose signal requires routing to the Series 3700 mainframe backplane, terminal blocks are located on the card, which are enabled with jumpers. Custom configurations can be created with the user accessible terminal blocks. For additional protection, an onboard temperature sensor will notify the mainframe when the card's operating temperature exceeds 70°C, compromising system specifications.

The Model 3740 uses two 50-pin male D-sub connectors for signal connections. For screw terminal connections, use the detachable Model 3740-ST accessory.

### ACCESSORIES AVAILABLE

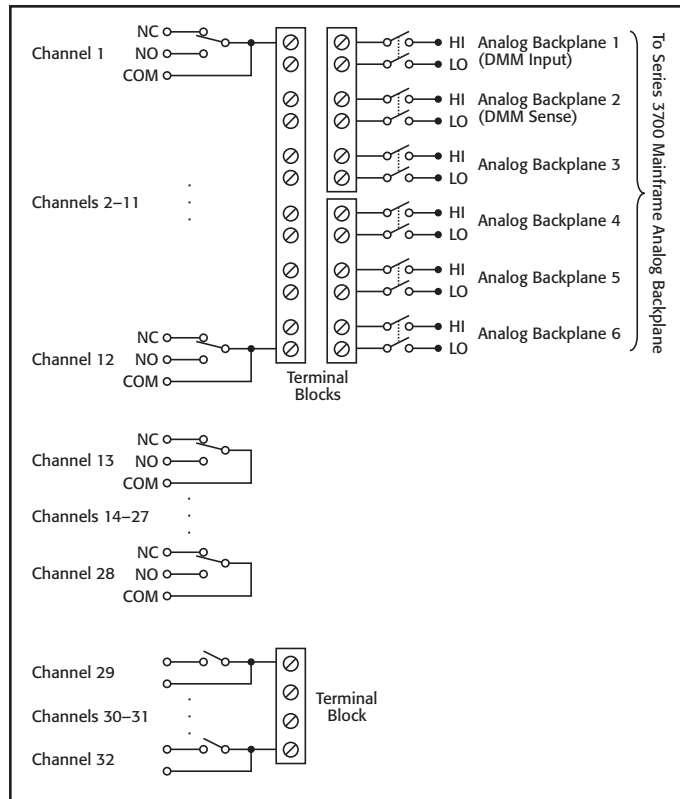
3721-MTC-1.5	50 Pin D-sub Female to Male Cable, 1.5m (5 ft.)
3721-MTC-3	50 Pin D-sub Female to Male Cable, 3m (10 ft.)
3740-ST	Screw Terminal Block
3790-KIT50-R	50 Pin Female D-sub Connector Kit (contains 2 female D-sub connectors and 100 solder cup contacts)

# 3740

## 32 Channel Isolated Switch Card

### 28 Form C relays and 4 high power Form A relays

Model 3740 specifications



**RELAY SWITCH CONFIGURATION:** 32 general purpose independent channels. 28 channels of Form C switching at 2A and 4 channels of Form A switching at 7A. Relays can be connected to each other and backplane via removable terminal blocks.

**CONTACT CONFIGURATION:** **General Purpose:** 1 pole Form C. **High Current:** 1 pole Form A. **CONNECTOR TYPE:** Two 50 pin male D-shells.

**MODEL 3740-ST SCREW TERMINAL OPTION:** #22 AWG typical wire size with 0.062 inch O.D. 84 conductors maximum. #16 AWG maximum wire size with 0.092 inch O.D. 44 conductors per card maximum.

**MAXIMUM SIGNAL LEVEL:** **Form C:** 300V DC or RMS, 2A switched (3A carry), 60W, 125VA. **Form A:** 250VAC 7A, 30VDC 7A, 210W.

**COMMON MODE VOLTAGE:** 300V DC or RMS between any terminal and chassis.

**VOLT-HERTZ LIMIT:**  $8 \times 10^7$ .

**CONTACT LIFE:** **Form C:**  $>10^5$  operations at maximum signal level.  $>10^8$  operations no load.<sup>1</sup> **Form A:**  $>10^5$  operations at maximum signal level,  $>5 \times 10^7$  operations no load.<sup>1</sup>

**CHANNEL RESISTANCE (end of contact life):**  $<0.5 \Omega$ .

**CONTACT POTENTIAL:**  $<\pm 3\mu V$  typical per contact.

**ISOLATION:** **Channel-Channel:**  $10^9 \Omega$ ,  $<200pF$ . **Common Mode:**  $>10^{10} \Omega$ ,  $<150pF$ .

**Crosstalk (Channel-Channel, 50 $\Omega$  load- 50 $\Omega$  source):**

100kHz:  $<-50dB$ .

1MHz:  $<-35dB$ .

10MHz:  $<-15dB$ .

**BANDWIDTH:** 30MHz.

#### GENERAL

**OVER-TEMPERATURE:** Temperature sensor indicates over temperature.

**ACTUATION TIME:** **Form C:** 4ms. **Form A:** 10ms.

**RELAY TYPE:** **Form C:** Latching electromechanical. **Form A:** Nonlatching electromechanical.

**RELAY DRIVE SCHEME:** Direct.

**INTERLOCK:** Backplane relays disabled when interlock connection is removed.

**OPERATING ENVIRONMENT:** Specified for 0° to 50°C. Specified to 70% R.H. at 35°C.

**STORAGE ENVIRONMENT:** -25° to 65°C.

**WEIGHT:** 2.5 lbs.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN61010-1.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN61326-1.

1. Minimum signal level 10mV, 10 $\mu A$ .

SWITCHING AND CONTROL

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# Series 3700

## System Switch/Multimeter and Plug-In Cards

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