Integra Series integrated switching, measurement, and datalogging solutions

DIGITAL MULTIMETERS & SYSTEMS

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems



- **Combines functions of DMM, switch system, and datalogger**
- **True 6½-digit (22-bit) resolution**
- **Choice of 12 switch/control plug-in modules**
- **Up to 200 differential input channels (with 300V isolation) for measurement and control**
- **Convenient front panel inputs**
- **Free LabVIEW®, LabWindows/ CVI, Visual Basic, and C/C++ drivers (IVI style)**
- **Ethernet, GPIB, RS-232 communications capabilities**
- **Free ExceLINX™-1A datalogging software**

Integra Series systems (2700, 2701, 2750) combine precision measurement, switching, and control in a single, tightly integrated enclosure for either rack-mounted or benchtop applications. These cost-effective, high performance test platforms offer affordable alternatives to separate DMMs and switch systems, dataloggers/ recorders, plug-in card data acquisition equipment, and VXI/PXI systems. The Integra Series plug-in switching and control modules offer unmatched flexibility and testing efficiency for a wide range of industries and applications. System builders can create test solutions with a combination of channel count, cost per channel, and system performance unmatched by any other single-box measurement system. The input modules provide the flexibility to vary the channel count from 20 to 200 (2-pole), apply a stimulus to the device under test, route signals, control system components, and make precision measurements with up to 14 functions. Robust digital I/O capabilities can be used for triggering, handshaking with other automation equipment, and alarm limit outputs. Scan rates of up to 500 channels/second (up to 3500 readings/second on a single channel) will increase test productivity.

Fast Setup and Operation

The Integra systems are fully integrated, off-the-shelf measurement and control systems. Their DMM-like interfaces make it easy for users to collect data and/or perform troubleshooting within minutes of installation and startup. Once sensor or DUT leads are hooked to the instrument's input, use the front panel controls to select the measurement function, range, filtering, scaling, trigger source, scanning sequence, alarms, and more. The free ExceLINX-1A software makes it easy to configure and use the system in a graphical "point-and-click" environment. This gives developers the basic tools needed to create a simple application without writing program code.

The Advantage of Integrated Design

The Integra systems offer a variety of advantages over existing solutions for ATE and data acquisition applications. For example, their flexible modular architecture and integrated measurement, switching, and control capabilities save rack space by reducing the number of separate instruments needed. This design also simplifies expanding the system as the number of channels grows or re-purposing it as new test requirements evolve. Integrated signal conditioning, scaling, stimulus, filtering and I/O capabilities eliminate the need for external circuitry when designing and building data acquisition systems. The Integra systems offer accuracy and repeatability superior to plug-in data acquisition boards, while providing faster test times than typical DMM/switch systems. This makes it possible to combine higher test yields with higher test throughput.

Ethernet

The Model 2701 offers a 10/100 BaseT Ethernet connection for high speed and long distance communication between a computer and a virtually infinite number of instruments. Any PC with an Ethernet port can connect to a single Model

Built-in measurement functions include:

- **DCV • ACV • DCI • ACI**
- **Resistance (2- or 4-wire, offset compensation selectable)**
- **Dry circuit ohms (20mV clamp) 2750 only**
- **Temperature (with thermocouples, RTDs, or thermistors)**
- **Frequency/Period**
- **Continuity**

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems

Ordering Information

2700	**DMM, Data Acquisition, Datalogging System w/2 Slots**
2701	**DMM, Data Acquisition, Datalogging System w/2 Slots and Ethernet Support**
2750	**DMM, Data Acquisition, Switching, Datalogging System w/5 Slots**

Accessories Supplied

LabVIEW, LabWindows/ CVI, Visual Basic, and C/C++ drivers; manual; and Model 1751 Safety Test Leads.

ACCESSORIES AVAILABLE

2750-321A	Extra slot cover
7007-1	Shielded IEEE-488 Cable, 1m (3.3 ft.) (Models 2700, 2750 only)
7007-2	Shielded IEEE-488 Cable, 2m (6.6 ft.) (Models 2700, 2750 only)
7788	50-Pin D-Shell Connector Kit (2 each)(for Models 7703, 7705 Modules w/D-sub Connectors)
7789	50-Pin/25-Pin D-Shell Kit (1 each)
7790	50-Pin Male, 50-Pin Female, and 25-Pin Male IDC D-Shell Connector Kit (1 each) (Ribbon Cable not Included)
7797	Calibration Extender Board (for Model 2750)
7705-MTC-2	50-Pin Male to Female D-Sub Cable, 2m
7707-MTC-2	25-Pin Male to Female D-Sub Cable, 2m
KPCI-488LPA	IEEE-488 Interface/Controller for the PCI Bus (Models 2700, 2750 only)
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter (Models 2700, 2750 only)

SERVICES AVAILABLE

2700-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2701-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2750-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
C/2700-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase*
C/2701-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase*
C/2750-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase*

*Not available in all countries

2701 in a point-to-point configuration, to multiple Model 2701s through a hub, or to multiple Model 2701s distributed on a network.

The Model 2701 Ethernet port uses the industry-standard TCP/IP socket interface. This provides data rates up 100Mbits/sec. and allows the instrument to be located up to 100 meters from the nearest computer or network hub in hardwired systems and miles in wireless Ethernet systems. The maximum distances between a control PC and the instruments are limited only by the size of the network. The instrument also provides a built-in diagnostic Web page for easy remote access to the Model 2701. Entering the instrument's IP address in the URL line of Microsoft Internet Explorer will allow communication with and control of the Model 2701. This Web page allows users to read and set network parameters, such as IP address, subnet mask, gateway, MAC address, and calibration dates, and to send commands to and query data from the Model 2701.

Temperature Capabilities

Integra Series mainframes support three major types of temperature sensors with built-in signal conditioning and 300V isolation: thermocouples, RTDs, and thermistors. To begin using a sensor, simply hook it up and the instrument does the rest. If a thermocouple is broken or disconnected, the instrument will alert the operator. The mainframes also support three methods for cold-junction compensation (CJC): automatic (built-in), external (built-in), and simulated.



Install up to five input modules in the 2750 mainframe (or up to two in the 2700 and 2701 mainframes). All switch/control modules are fully enclosed in impact-resistant plastic for exceptional ruggedness. Three connector alternatives simplify connecting the modules to DUTs. Rugged D-sub connectors allow quick, secure connections and are especially convenient when performing routine maintenance or when the system is installed in a rack. IDC ribbon cable adapters are supplied with the Model 7701, 7707, and 7709 modules for fast, uncomplicated hookups in production test and process monitoring applications. Oversize screw-terminal connectors simplify setup in applications that require the greatest connection flexibility. Additional D-sub and IDC ribbon cable connector kits and pre-wired cable assemblies are sold separately.

TYPICAL APPLICATIONS

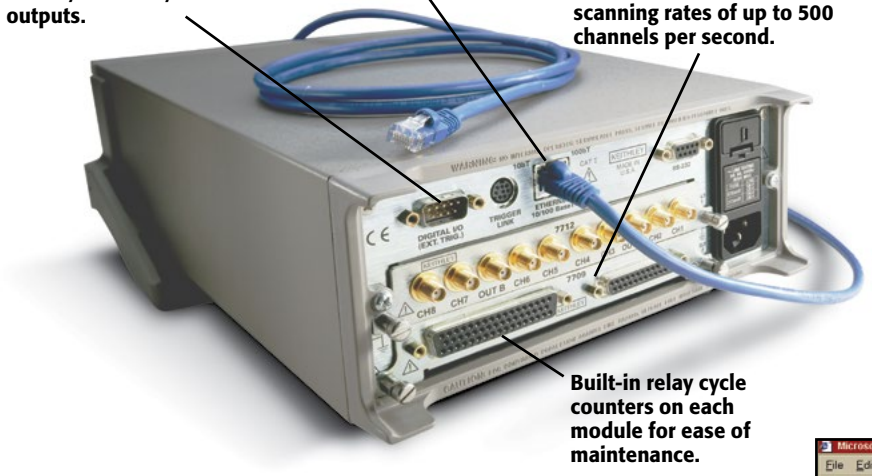
- **Production test of electronic products and devices**
- **Accelerated stress testing (AST)**
- **Process monitor and control**
- **Device characterization/R&D**
- **Low ohms, multichannel measurements**

Integra Series integrated switching, measurement, and datalogging solutions

DIGITAL MULTIMETERS & SYSTEMS

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems



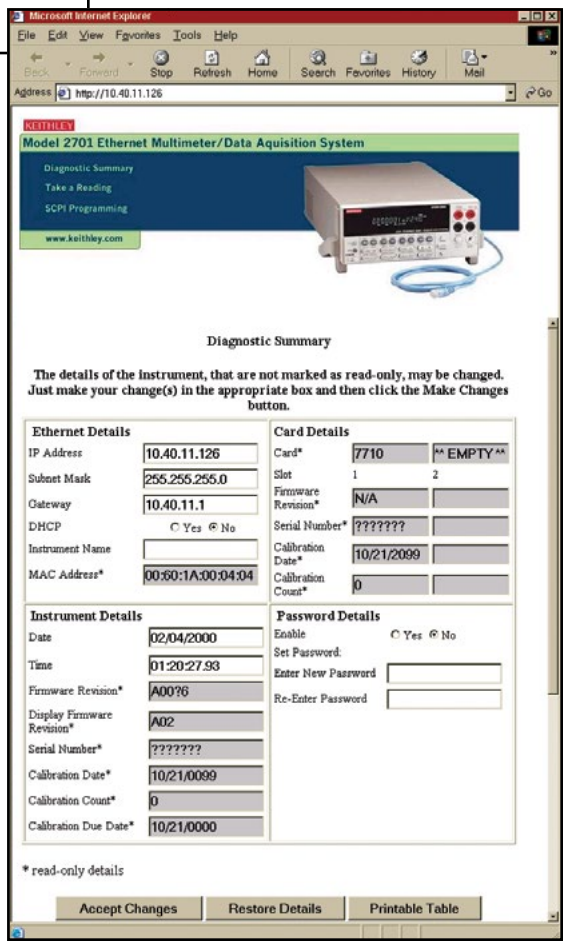
Web-Enabled Data Acquisition and Control via Standard Ethernet

A built-in 10/100BaseTX Ethernet interface makes the Model 2701 the best choice for distributed data acquisition applications that demand stable, high precision measurements. Just connect it directly to an Ethernet port—there's no need for additional interface cards, proprietary cables, or software. The Model 2701 is a cost-effective solution for industrial monitoring and control applications. It combines remote communications with high measurement precision for research and development tasks, such as remote equipment diagnostics and economical monitoring of lab environments.

Free built-In Web diagnostic tool (2701 only)

- **Read and set network parameters**
- **Send command strings and receive data**
- **Debug**

To start communicating with the Integra Series instrument, simply connect the 2701 to a PC Ethernet port using the supplied RJ-45 crossover cable, start Microsoft® Internet Explorer version 5.0 or later, and type the instrument's IP address into the URL line. The built-in web diagnostic interface allows for easy communication and debugging, without the need to install external software. This interface makes it easy to read and set network parameters such as IP address, subnet mask, gateway, MAC address, calibration dates, and other data stored in the Integra Series instrument. It also takes readings from the instrument and allows the user to send command strings and receive data.



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A Greater Measure of Confidence
KEITHLEY
A Tektronix Company

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems

Ordering Information

7700 20-channel Differential Multiplexer Module with up to 50MHz Bandwidth, Automatic CJC, and Screw Terminals

7701 32-channel Differential Multiplexer Module with a 25- and 50-Pin Female D-Sub Connector. Supplied with Male IDC Ribbon Cable Connectors

7702 40-channel Differential Multiplexer Module w/ Screw Terminals

7703 32-channel, High Speed, Differential Multiplexer Module with 2 50-Pin Female D-Sub Connectors. Includes 2 Mating Connectors

7705 40-channel, Single-pole Control Module with 2 50-Pin Female D-Sub Connectors. Includes 2 Mating Connectors

7706 All-in-One I/O Module: 20-channel Differential Multiplexer w/Automatic CJC, 16 Digital Outputs, 2 Analog Outputs, a Counter/Totalizer, and Screw Terminals

7707 32-channel Digital I/O w/10-channel Differential Multiplexer Module with a 25-Pin Female and 50-Pin Male D-Sub Connectors. Supplied with Mating IDC Ribbon Cable Connectors

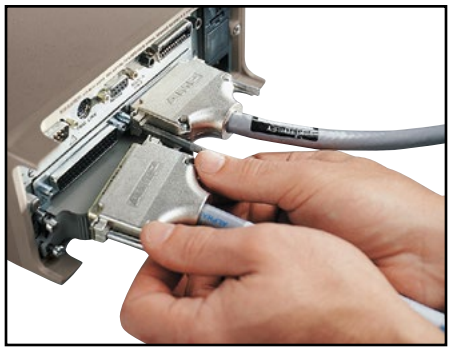
7708 40-channel Differential Multiplexer Module w/Automatic CJC and Screw Terminals

7709 6×8 Matrix Module with 25- and 50-Pin Female D-Sub Connectors. Supplied with Male IDC Ribbon Cable Connectors

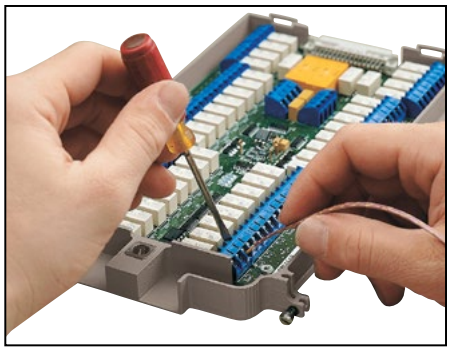
7710 20-channel Solid-state/ Long Life Differential Multiplexer w/Automatic CJC and Screw Terminals

7711 2GHz 50Ω RF Module with Dual 1×4 Configuration and SMA Connections

7712 3.5GHz 50Ω RF Module with Dual 1×4 Configuration and SMA Connections



Rugged 50-pin D-sub connectors ensure dependability and quick setup/teardown in production test racks.

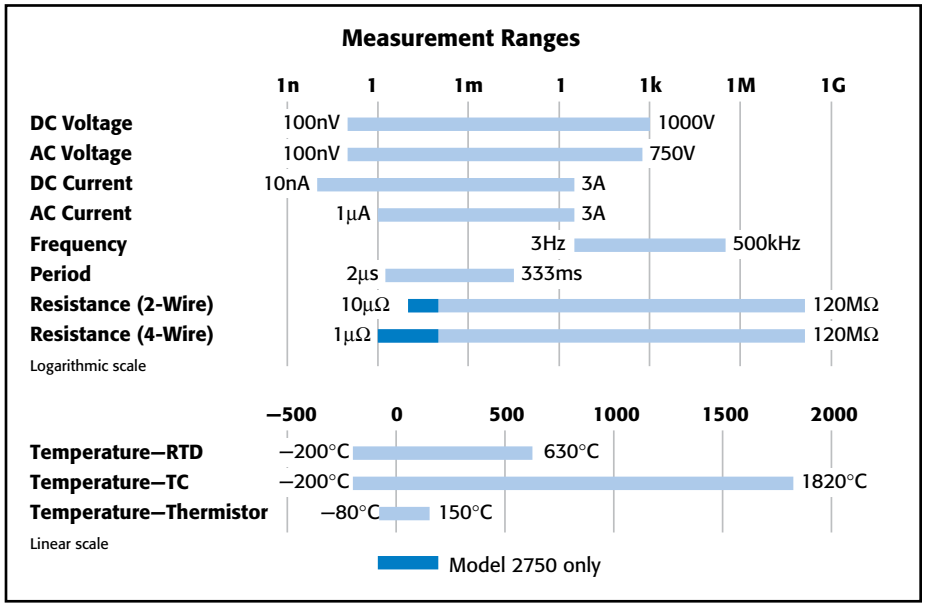


Screw terminals use oversize connectors for easier, mistake-free wiring. Easy-to-use removable terminals are available on some models.

Software Solutions

Whether the task calls for a simple start-up package to acquire several channels of data or the tools to create a fully custom acquisition and analysis solution, Keithley has the software needed to get the most performance from a Model 2700, 2701, or 2750 Multimeter/Switch System. Our broad range of software solutions makes it easy to get applications "Up & Running" quickly and economically.

Measurement Ranges for the Integra Series Systems



Integra Series integrated switching, measurement, and datalogging solutions

DIGITAL MULTIMETERS & SYSTEMS

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Important Features and Benefits

- **Full per-channel configurability**—Each channel can be independently configured for making measurements. The parameters that can be chosen for each channel include speed, range, resolution, number of power line cycles (NPLC), filtering type, offset compensation, math functions to be displayed, CJC type, RTD type, frequency gate time, "m" and "b" values in mX + b format, HI/LO limits, low Ω (Model 2750 only), ratio calculation, and thermistor type.
- **Channel monitor feature**—Monitor any specific input channel on the front panel display during a scan. This feature can also serve as an analog trigger to initiate a scan sequence based on some external factor, such as a temperature rising above a pre-set limit. Only the data of interest is acquired, so there's no need to spend hours searching through reams of normal readings to find anomalous data.
- **Front/rear switch**—Switching between the front and rear panel measurement inputs is as easy as pressing a button. Users can select the front panel inputs for tasks such as system setup and verification, manual probing, troubleshooting, and calibration, while the rear panel inputs through the modules allow fast, automated multiplexing and control.
- **Battery-backed setup memory**—Up to four different setup configurations can be stored in onboard memory. If the line power fails during a scan, the system will resume scanning where it stopped once power is restored.
- **Relay counting**—Provides preventive maintenance of the system and switches.
- **Memory buffer**—The mainframe's non-volatile wrap-around reading memory allows continuous, unattended datalogging over long periods. Data in the buffer can be transferred to a PC controller automatically as new data is acquired. The real-time clock can be used to time- and date-stamp readings for later review and interpretation.
- **2 TTL-level digital inputs**—Use to implement external triggers to initiate a scan sequence.
- **5 "per-channel" HI/LO alarm limit TTL outputs**—Trigger external alarms or perform other control functions without a PC controller.
- **Dry circuit ohms (20mV clamp)**—Protects sensitive devices from damage and prevents self-heating errors during testing (Model 2750 only).
- **Virtual channel**—Stores the results of channel-to channel ratio and average math operations.
- **Onboard statistical analysis**—Mathematical functions available at the push of a button are channel average, mX+b scaling, minimum, maximum, average, and standard deviation.
- **GPIB and RS-232 interfaces** (Models 2700 and 2750)
- **Ethernet and RS-232 interface** (Model 2701 only)

Which Integra Mainframe is the Best Choice for the Application?

Use this selector guide to decide which Integra Series mainframe offers the combination of features and capacity that's right for a specific application. If testing requirements change in the future, switch/control modules and test code can be easily re-used.

	2700	2701	2750
No. of differential input channels	80	80	200
Matrix crosspoints	96	96	240
Ohms resolution	100 μΩ	100 μΩ	1 μΩ
Dry circuit ohms (20mV clamp)	No	No	Yes
No. of slots	2	2	5
Memory buffer	55,000 rdgs	450,000 rdgs	110,000 rdgs
Size (2U height)	Half-rack width	Half-rack width	Full-rack width (19″)
Communications	GPIB, RS-232	Ethernet, RS-232	GPIB, RS-232
Scan-Rate (memory)	180/s	500/s	230/s
Scan-Rate (bus)	145/s	440/s	210/s
Max. Internal Trigger Rate	2000/s	2800/s	2000/s
Max. External Trigger Rate	375/s	2000/s	375/s

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems

DC CHARACTERISTICS[1]

Conditions: MED (1 PLC)[2] or 10 PLC or MED (1 PLC) with Digital Filter of 10

Function	Range	Resolution	Test Current ±5% or Burden Voltage	Input Resistance or Open Circuit Voltage[3] 2700/2701	Input Resistance or Open Circuit Voltage[3] 2750	Accuracy: ±(ppm of reading + ppm of range) (ppm = parts per million) (e.g., 10ppm = 0.001%) 24 Hour[4] 23°C ±1°	90 Day 23°C ±5°	1 Year 23°C ±5°	Temperature Coefficient 0°–18°C & 28°–50°C
Voltage[11]	100.0000 mV	0.1 µV		>10 GΩ	>10 GΩ	15 + 30	25 + 35	30 + 35	(1 + 5)/°C
	1.000000 V	1.0 µV		>10 GΩ	>10 GΩ	15 + 6	25 + 7	30 + 7	(1 + 1)/°C
	10.00000 V	10 µV		>10 GΩ	>10 GΩ	10 + 4	20 + 5	30 + 5	(1 + 1)/°C
	100.0000 V	100 µV		10 MΩ ±1%	10 MΩ ±1%	15 + 6	35 + 9	45 + 9	(5 + 1)/°C
	1000.000 V[5]	1 mV		10 MΩ ±1%	10 MΩ ±1%	20 + 6	35 + 9	50 + 9	(5 + 1)/°C
Resistance[6, 8]	1.000000Ω[24]	1 µΩ	10 mA		5.9 V	80 + 40	80 + 40	100 + 40	(8 + 1)/°C
	10.00000Ω[24]	10 µΩ	10 mA		5.9 V	20 + 20	80 + 20	100 + 20	(8 + 1)/°C
	100.0000 Ω	100 µΩ	1 mA	6.9 V	12.2 V	20 + 20	80 + 20	100 + 20	(8 + 1)/°C
	1.000000kΩ	1 mΩ	1 mA	6.9 V	12.2 V	20 + 6	80 + 6	100 + 6	(8 + 1)/°C
	10.00000kΩ	10 mΩ	100 µA	6.9 V	6.8 V	20 + 6	80 + 6	100 + 6	(8 + 1)/°C
	100.0000kΩ	100 mΩ	10 µA	12.8 V	12.8 V	20 + 6	80 + 10	100 + 10	(8 + 1)/°C
	1.000000MΩ[23]	1.0 Ω	10 µA	12.8 V	12.8 V	20 + 6	80 + 10	100 + 10	(8 + 1)/°C
	10.00000MΩ[7, 23]	10 Ω	0.7 µA//10 MΩ	7.0 V	7.0 V	150 + 6	200 + 10	400 + 10	(70 + 1)/°C
	100.0000MΩ[7, 23]	100 Ω	0.7 µA//10 MΩ	7.0 V	7.0 V	800 + 30	2000 + 30	2000 + 30	(385 + 1)/°C
Dry Circuit Resistance[21, 24]	1.000000 Ω	1 µΩ	10 mA		20 mV	80 + 40	80 + 40	100 + 40	(8 + 1)/°C
	10.00000 Ω	10 µΩ	1 mA		20 mV	25 + 40	80 + 40	100 + 40	(8 + 1)/°C
	100.0000 Ω	100 µΩ	100 µA		20 mV	25 + 40	90 + 40	140 + 40	(8 + 1)/°C
	1.000000kΩ	1 mΩ	10 µA		20 mV	25 + 90	180 + 90	400 + 90	(8 + 1)/°C
Continuity (2W)	1.000kΩ	100 mΩ	1 mA	6.9 V	12.2 V	40 + 100	100 + 100	100 + 100	(8 + 1)/°C
Current	20.00000 mA	10 nA	< 0.2 V			60 + 30	300 + 80	500 + 80	(50 + 5)/°C
	100.0000 mA	100 nA	< 0.1 V			100 + 300	300 + 800	500 + 800	(50 + 50)/°C
	1.000000 A	1.0 µA	< 0.5 V[9]			200 + 30	500 + 80	800 + 80	(50 + 5)/°C
	3.000000 A	10 µA	< 1.5 V[9]			1000 + 15	1200 + 40	1200 + 40	(50 + 5)/°C
Channel (Ratio)[10]	Ratio Accuracy = Accuracy of selected Channel Range + Accuracy of Paired Channel Range								
Channel (Average)[10]	Average Accuracy = Accuracy of selected Channel Range + Accuracy of Paired Channel Range								

TEMPERATURE[19]

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

Thermocouples (Accuracy based on ITS-90)

Type	Range	Resolution	90 Day/1 Year (23°C ± 5°C) Relative to Simulated Reference Junction	Using 77XX Module*	Temperature Coefficient 0°–18°C & 28°–50°C
J	–200 to + 760°C	0.001 °C	0.2°C	1.0°C	0.03°C/°C
K	–200 to +1372°C	0.001 °C	0.2°C	1.0°C	0.03°C/°C
N	–200 to +1300°C	0.001 °C	0.2°C	1.0°C	0.03°C/°C
T	–200 to + 400°C	0.001 °C	0.2°C	1.0°C	0.03°C/°C
E	–200 to +1000°C	0.001 °C	0.2°C	1.0°C	0.03°C/°C
R	0 to +1768°C	0.1 °C	0.6°C	1.8°C	0.03°C/°C
S	0 to +1768°C	0.1 °C	0.6°C	1.8°C	0.03°C/°C
B	+350 to +1820°C	0.1 °C	0.6°C	1.8°C	0.03°C/°C

* Using 7710 Module: J: 2.5°C; K: 1°C. N, T, E Types: 1.5°C. R, S, B Types: 2.7°C.

4-Wire RTD:

(100Ω platinum [PT100], D100, F100, PT385, PT3916, or user type. Offset compensation On.)

–200° to +630°C	0.01°C	0.06°C	0.003°C/°C

Thermistor: (2.2kΩ, 5kΩ, and 10kΩ)[20]

–80° to +150°C	0.01°C	0.08°C	0.002°C/°C

DC SYSTEM SPEEDS[15,18]

	2700/2750	2701
RANGE CHANGES (excludes 4WΩ)[16]:	50/s (42/s)	50/s (42/s)
FUNCTION CHANGES[16]:	50/s (42/s)	50/s (42/s)
AUTORANGE TIME[16]:	<30 ms	<30 ms
ASCII READINGS TO RS-232 (19.2k baud):	55/s	300/s
MAX. EXTERNAL TRIGGER RATE:	375/s	2000/s

DC MEASUREMENT SPEEDS[15]

Single Channel, 60Hz (50Hz) Operation

Function	Digits	Readings/s		PLCs
DCV, DCI, Ω (<10M), Thermocouple, Thermistor	6.5[12,16]	5	(4)	10
	6.5[16]	35	(28)	1
	6.5[12,16]	45	(36)	1
	5.5[12,16]	150	(120)	0.1
	5.5[16, 17]	300	(240)	0.1
	5.5[17]	500	(400)	0.1
2700 and 2750 only	4.5[17]	2500	(2000)	0.01
2701 only	3.5	3500	(3500)	0.002
4WΩ (<10M)	6.5[16]	1.4	(1.1)	10
	6.5[16]	15	(12)	1
	5.5[17]	33	(25)	0.1
4WΩ OComp, RTD[22]	6.5[16]	0.9	(0.7)	10
	6.5[16]	8	(6.4)	1
	5.5[16, 17]	18	(14.4)	0.1
Channel (Ratio), Channel (AVG)	6.5[16]	2.5	(2)	10
	6.5[16]	15	(12)	1
	5.5[17]	25	(20)	0.1

Multiple Channels, Into Memory[18]

	Channels/s 2700	2701	2750
7710 Scanning DCV	180/s	500/s	230/s
7710 Scanning DCV with Limits or Time Stamp On	170/s	500/s	230/s
7710 Scanning DCV alternating 2WΩ	45/s	115/s	60/s

Multiple Channels, Into and Out of Memory to GPIB[16, 18] or Ethernet

	Channels/s 2700	2701	2750
7702 Scanning DCV	65/s	75/s	65/s
7700 and 7708 Scanning Temperature (T/C)	50/s	50/s	50/s
7710 Scanning DCV	145/s	440/s	210/s
7710 Scanning DCV with Limits or Time Stamp On	145/s	440/s	210/s
7710 Scanning DCV alternating 2WΩ	40/s	115/s	55/s

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems

DC SPEED vs. NOISE REJECTION

Rate	Filter	Readings/s[12]	Digits	RMS Noise 10V Range 2700,2750	RMS Noise 10V Range 2701	NMRR	CMRR[14]
10	50	0.1 (0.08)	6.5	<1.2 μV	<2.5 μV	110 dB[13]	140 dB
1	Off	15 (12)	6.5	<4 μV	<6 μV	90 dB[13]	140 dB
0.1	Off	500 (400)	5.5	<22 μV	<40 μV	—	80 dB
0.01	Off	2500 (2000)	4.5	<150 μV	<300 μV	—	80 dB
0.002	Off	3500 (2800)	3.5	—	<1 mV	—	60 dB

DC MEASUREMENT CHARACTERISTICS

DC VOLTS

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

INPUT IMPEDANCE:
100mV–10V Ranges: Selectable >10GΩ // with <400pF or 10MΩ ±1%.
100V, 1000V Ranges: 10MΩ ±1%.
Dry Circuit: 100kΩ ± 1% // <1μF.

EARTH ISOLATION: 500V peak, >10GΩ and <300pF any terminal to chassis.

INPUT BIAS CURRENT: <75pA at 23°C.

COMMON MODE CURRENT: <500nApp at 50Hz or 60Hz.

AUTOZERO ERROR: Add ±(2ppm of range error + 5μV) for <10 minutes and ±1°C.

INPUT PROTECTION: 1000V, all ranges. 300V with plug in modules.

RESISTANCE

MAXIMUM 4WΩ LEAD RESISTANCE: 80% of range per lead (Dry Ckt mode). 5Ω per lead for 1Ω range; 10% of range per lead for 10Ω, 100Ω, and 1kΩ ranges; 1kΩ per lead for all other ranges.

OFFSET COMPENSATION: Selectable on 4WΩ, 1Ω, 10Ω, 100Ω, 1kΩ, and 10kΩ ranges.

CONTINUITY THRESHOLD: Adjustable 1 to 1000Ω.

INPUT PROTECTION: 1000V, all Source Inputs, 350V Sense Inputs. 300V with plug-in modules.

DC CURRENT

SHUNT RESISTORS: 100mA–3A, 0.1Ω. 20mA, 5Ω.

INPUT PROTECTION: 3A, 250V fuse.

THERMOCOUPLES

CONVERSION: ITS-90.

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

OPEN CIRCUIT CHECK: Selectable per channel. Open >11.4kΩ ±200Ω.

DC NOTES

1. 20% overrange except on 1000V and 3A.
2. Add the following to "ppm of range" uncertainty; 100mV 15ppm; 1V and 100V 2ppm; for Model 2750 1Ω and Dry Circuit Ω 40ppm; 10→1MΩ 2ppm, for Models 2700/2701 100Ω 30ppm, 20mA and 1A 10ppm, 100mA 40ppm.
3. ±2% (measured with 10MΩ input resistance DMM, >10GΩ DMM on 10MΩ and 100MΩ ranges). For Dry Circuit Ω, ±25% with Input HI connected to Sense HI; with Sense HI disconnected add 30mV.
4. Relative to calibration accuracy.
5. For signal levels >500V, add 0.02ppm/V uncertainty for portion exceeding 500V.
6. Specifications are for 4-wire Ω, 1Ω, 10Ω, and 100Ω with offset compensation on. With 77XX plug-in modules, LSYNC on. With offset compensation on, OPEN CKT. VOLTAGE is 12.8V. For 2-wire Ω add 1.5Ω to "ppm of range" uncertainty. 1Ω range is 4-wire only.
7. Must have 10% matching of lead resistance in Input HI and LO.
8. Add the following to "ppm of reading" uncertainty when using plug in modules:

	10 kΩ	100 kΩ	1 MΩ	10 MΩ	100 MΩ
All Modules:				220 ppm	2200 ppm
7701, 7703, 7707, 7709 Modules:	10 ppm	100 ppm	1000 ppm	1%	10%
7706, 7708, 7710 Modules:	5 ppm	50 ppm	500 ppm	5000 ppm	5%
7710 Module 23°C ±5°C:	11 ppm	110 ppm	1100 ppm	1.1%	11%

9. Add 1.5V when used with plug in modules.
10. For RATIO, DCV only. For AVERAGE, DCV, and Thermocouples only. Available with plug in modules only.
11. Add 6μV to "of range" uncertainty when using Models 7701, 7703, and 7707, and 3μV for Models 7706 and 7709.
12. Auto zero off.
13. For LSYNC On, line frequency ±0.1 %. For LSYNC Off, use 60dB for ≥ 1PLC.
14. For 1kΩ unbalance in LO lead. AC CMRR is 70dB.
15. Speeds are for 60Hz (50Hz) operation using factory defaults operating conditions (*RST). Autorange off, Display off, Limits off, Trigger delay = 0.
16. Speeds include measurements and binary data transfer out the GPIB or ASCII data transfer for Ethernet and RS-232 (reading element only).
17. Sample count = 1000, auto zero off (into memory buffer).
18. Auto zero off, NPLC = 0.01 (Models 2700 and 2750), NPLC = 0.002 (Model 2701).
19. Additional Uncertainty:

		Plug-In Modules				
Type	Range	Front Terminals Simulated Ref. Junction	7709 Simulated Ref. Junction	7701, 7703, 7707 Simulated Ref. Junction	7700, 7708, 7710 Using CJC	7706 Using CJC
J	–200 to 0°C	0.1	0.1	0.3	0.8	1.6
K	–200 to 0°C	0.2	0.2	0.4	0.8	1.6
N	–200 to 0°C	0.3	0.3	0.6	0.8	1.6
T	–200 to 0°C	0.2	0.1	0.4	0.8	1.6
E	–200 to 0°C	–	0.1	0.3	0.8	1.6
R	0 to +400°C	0.4	0.6	1.2	0.5	1.0
S	0 to +400°C	0.4	0.6	1.2	0.5	1.0
B	+350 to +1100°C	0.8	0.3	1.7	0.5	1.0

20. For lead resistance >0Ω, add the following uncertainty/Ω for measurement temperatures of:

	70°–100°C	100°–150°C
2.2 kΩ (44004)	0.22°C	1.11°C
5.0 kΩ (44007)	0.10°C	0.46°C
10 kΩ (44006)	0.04°C	0.19°C

21. For 4-wire Ω only, offset compensation on, LSYNC on.
22. For Dry Circuit 1kΩ range, 2 readings/s max.
23. For 2750 Front Inputs, add the following to Temperature Coefficient "ppm of reading" uncertainty: 1MΩ 25ppm, 10MΩ 250ppm, 100MΩ 2500ppm. Operating environment specified for 0°C to 50°C and 50% RH at 35°C.
24. Model 2750 only.
25. Front panel resolution is limited to 0.1Ω.

AC SPECIFICATIONS[1]

Function	Range	Resolution	Calibration Cycle	Accuracy: ±(% of reading + % of range), 23°C ± 5°C				
				3 Hz–10 Hz	10 Hz–20 kHz	20 kHz–50 kHz	50 kHz–100 kHz	100 kHz–300 kHz
Voltage[2]	100.0000 mV	0.1 μV	90 Days (all ranges)	0.35 + 0.03	0.05 + 0.03	0.11 + 0.05	0.6 + 0.08	4.0 + 0.5
	1.000000 V	1.0 μV						
	10.00000 V	10 μV	1 Year (all ranges)	0.35 + 0.03	0.06 + 0.03	0.12 + 0.05	0.6 + 0.08	4.0 + 0.5
	100.0000 V	100 μV						
	750.000 V	1.0 μV						
			(Temp. Coeff.)/°C[3]	0.035 + 0.003	0.005 + 0.003	0.006 + 0.005	0.01 + 0.006	0.03 + 0.01
				3 Hz–10 Hz	**10 Hz–3 kHz**	**3 kHz–5 kHz**		
Current[2]	1.000000 A	1.0 μA	90 Day/1 Year	0.30 + 0.04	0.10 + 0.04	0.14 + 0.04		
	3.00000 A[14]	10 μA		0.35 + 0.06	0.16 + 0.06	0.18 + 0.06		
			(Temp. Coeff.)/°C[3]	0.035 + 0.006	0.015 + 0.006			
				(3 Hz–500 kHz) (333 ms–2 μs)				
Frequency[4] **and Period**	100 mV to 750 V	0.333 ppm	90 Day/1 Year	100 ppm + 0.333 ppm (SLOW, 1s gate)				
		3.33 ppm		100 ppm + 3.33 ppm (MED, 100ms gate)				
		33.3 ppm		100 ppm + 33.3 ppm (FAST, 10ms gate)				

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2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems

ADDITIONAL UNCERTAINTY ±(% of reading)

Low Frequency Uncertainty	Med	Fast
20 Hz – 30 Hz	0.3	—
30 Hz – 50 Hz	0	—
50 Hz – 100 Hz	0	1.0
100 Hz – 200 Hz	0	0.18
200 Hz – 300 Hz	0	0.10
>300 Hz	0	0

CREST FACTOR: [5]	1–2	2–3	3–4	4–5
Additional Uncertainty:	0.05	0.15	0.30	0.40
Max. Fundamental Freq.:	50kHz	50kHz	3kHz	1kHz

Maximum Crest Factor: 5 at full-scale.

AC MEASUREMENT CHARACTERISTICS

AC VOLTS

MEASUREMENT METHOD: AC-coupled, True RMS.

INPUT IMPEDANCE: 1MΩ ±2% // by <100pF.

INPUT PROTECTION: 1000Vp or 400VDC. 300Vrms with plug in modules.

AC CURRENT

MEASUREMENT METHOD: AC-coupled, True RMS.

SHUNT RESISTANCE: 0.1Ω.

BURDEN VOLTAGE: 1A <0.5Vrms, 3A <1.5Vrms. Add 1.5Vrms when used with plug in modules.

INPUT PROTECTION: 3A, 250V fuse.

FREQUENCY AND PERIOD

MEASUREMENT METHOD: Reciprocal counting technique.

GATE TIME: SLOW 1s, MED 100ms, and FAST 10ms.

AC GENERAL

AC CMRR[6]: 70dB.

VOLT HERTZ PRODUCT: ≤8 × 10[7].

AC MEASUREMENT SPEEDS [7, 13]

Single Channel, 60Hz (50Hz) Operation

Function	Digits	Readings/s	Rate	Bandwidth
ACV, ACI	6.5	2s/Reading	SLOW	3 Hz–300 kHz
	6.5	4.8 (4)	MED	30 Hz–300 kHz
	6.5 [9]	40 (32)	FAST	300 Hz–300 kHz
Frequency, Period	6.5	1 (1)	SLOW	3 Hz–300 kHz
	5.5	9 (9)	MED	30 Hz–300 kHz
	4.5	35 (35)	FAST	300 Hz–300 kHz
	4.5 [10]	65 (65)	FAST	300 Hz–300 kHz

Multiple Channel

7710 SCANNING ACV [10, 11]: 500/s.

7710 SCANNING ACV WITH AUTO DELAY ON: 2s/reading.

AC SYSTEM SPEEDS [7, 9, 11]

	2700/2750	2701
AC System Speed:	(19.2K)	(115.2K)
Range Changes:[12]	4/s (3/s)	4/s (3/s)
Function Changes:[12]	4/s (3/s)	4/s (3/s)
Autorange Time:	< 3s	< 3s
ASCII Readings to RS-232 (19.2k baud):	50/s	300/s
Max. External Trigger Rate:	250/s	2000/s

AC NOTES

1. 20% overrange except on 750V and 3A.
2. Specification are for SLOW mode and sine wave inputs >5% of range. SLOW and MED are multi-sample A/D conversions. FAST is DETector:BANDwidth 300 with nPLC = 1.0.
3. Applies to 0°–18°C and 28°–50°C.
4. For square wave inputs >10% of ACV range, except 100mV range. 100mV range frequency must be >10Hz if input is <20mV.
5. Applies to non-sine waves >5Hz.
6. For 1kΩ unbalance in LO lead.
7. Speeds are for 60Hz (50Hz) operation using factory defaults operating conditions (*RST). Autorange off, Display off, Limits off, Trigger delay=0.
8. For ACV inputs at frequencies of 50 or 60Hz (±10%), add the following to "% of Range" uncertainty: 100mV 0.25%, 1V 0.05%, 10V 0.13%, 100V 0.03%, 750V 0.015 (Model 2701 only).
9. Auto Zero off.
10. Sample count = 1024.
11. DETector:BANDwidth 300 with nPLC = 0.006 (2701 only).
12. Maximum useful limit with trigger delay = 175ms.
13. Includes measurement and binary data transfer out GPIB or ASCII data transfer for Ethernet and RS-232 (Reading Element only).

GENERAL

EXPANSION SLOTS: 2 (2700, 2701), 5 (2750).

POWER SUPPLY: 100V / 120V / 220V / 240V ±10%.

LINE FREQUENCY: 45Hz to 66Hz and 360Hz to 440Hz, automatically sensed at power-up.

POWER CONSUMPTION: 28VA (2700), 80VA (2701, 2750).

OPERATING ENVIRONMENT: Specified for 0°C to 50°C. Specified to 80% RH at 35°C.

STORAGE ENVIRONMENT: –40°C to 70°C.

BATTERY: Lithium battery-backed memory, 3 years @ 23°C (Models 2700, 2750) Lithium Ion battery-backed memory, 30 days of buffer storage @ 23°C and >4 hours charge time. Battery lifetime: >3 years @ 23°C, >1.5 years @ 50°C (Model 2701)

EMC: Conforms to European Union Directive 89/336/EEC EN61326-1.

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

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

WARM-UP: 2 hours to rated accuracy.

DIMENSIONS:

Rack Mounting: 89mm high × 213mm wide (2700, 2701) or 485mm wide (2750) × 370mm deep (3.5 in × 8.375 in or 19 in × 14.563 in).

Bench Configuration (with handle and feet): 104mm high × 238mm wide (2700, 2701) or 485mm wide (2750) × 370mm deep (4.125 in × 9.375 in (2700, 2701) or 19 in (2750) × 14.563 in).

SHIPPING WEIGHT: 6.5kg (14 lbs.) (2700, 2701) or 13kg (28 lbs.) (2750).

DIGITAL I/O: 2 inputs, 1 for triggering and 1 for hardware interlock.
5 outputs, 4 for Reading Limits and 1 for Master Limit. Outputs are TTL compatible or can sink 250mA, diode clamped to 40V.

TRIGGERING AND MEMORY:

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

Reading Hold Sensitivity: 0.01%, 0.1%, 1%, or 10% of reading.

Trigger Delay: 0 to 99 hrs (1ms step size).

External Trigger Delay: <2ms (2700), <1ms (2701, 2750).

External Trigger Jitter: <1ms (2700), <500μs (2701), <500μs (2750).

Memory Size: 55,000 readings (2700), 450,000 readings (2701), 110,000 readings (2750).

MATH FUNCTIONS: Rel, Min/Max/Average/Std Dev/Peak-to-Peak (of stored reading), Limit Test, %, 1/x, and mX+b with user defined units displayed.

REMOTE INTERFACE:
GPIB (IEEE-488.2) (2700, 2750), RS-232C (2700, 2701, and 2750).
Ethernet TCP/IP (10bT and 100bT) (2701)
SCPI (Standard Commands for Programmable Instruments)
LabVIEW Drivers

FOR MODEL 2701:

Ethernet: RJ-45 connector, TCP/IP, 10bT and 100bTx autosensed.

IP Configuration: Static or DHCP.

Password Protection: 11 Characters.

Software: Windows 98, NT, 2000, ME, and XP compatible. Internet Explorer 5.0 or higher required. Web page server by 2701.

2700, 2701, 2750

Multimeter/Data Acquisition/ Switch Systems

Switch/Control Module Capabilities

All plug-in modules are compatible with the two-slot Model 2700 and Model 2701 Multimeter/Data Acquisition Systems and the five-slot Model 2750 Multimeter/Switch System. When the application's needs change, simply change modules. Integra systems reconfigure themselves automatically.

Module Capabilities Overview

	7700	7701	7702	7703	7705	7706	7707	7708	7709	7710	7711	7712
DC Volts	✓	✓	✓	✓		✓	✓	✓	✓	✓		
DC Current	✓		✓									
Temperature												
T/C w/Automatic CJC	✓					✓		✓		✓		
T/C w/External CJC	✓	✓	✓	✓		✓	✓	✓	✓	✓		
RTD	✓	✓	✓	✓		✓	✓	✓	✓	✓		
Thermistor	✓	✓	✓	✓		✓	✓	✓	✓	✓		
Resistance (2- or 4-wire)	✓	✓	✓	✓		✓	✓	✓	✓	✓		
Continuity	✓	✓	✓	✓		✓	✓	✓	✓	✓		
AC Volts	✓	✓	✓	✓		✓	✓	✓	✓	✓		
AC Current	✓		✓									
Frequency	✓	✓	✓	✓		✓	✓	✓	✓	✓		
Event Counter/Totalizer						✓						
Signal Routing/Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Input							✓					
Digital Output						✓	✓					
Analog Output						✓						
RF Switching											✓	✓



Integra Plug-In Modules