KEITHLEY

TECHNICAL DATA

MODEL 2700

MULTIMETER/
DATA ACQUISITION SYSTEM

up & running software

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Introduction

The Model 2700 6½-digit Multimeter/Data Acquisition system blends Keithley's high performance DMM technology, our switching expertise, and our data acquisition knowledge into a compact, affordable, easy-to-use package. This technical data sheet provides a comprehensive overview of the system and includes complete detailed specifications.

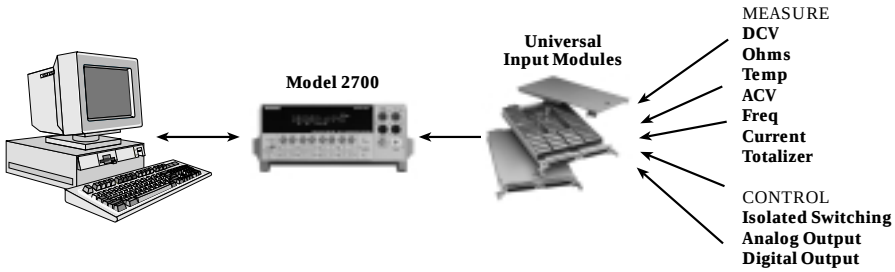
The Model 2700 Multimeter/Data Acquisition System consists of the 2700 mainframe and a choice of five switch/control modules. The two-slot mainframe allows two different types of multiplexer or control modules to operate simultaneously. Input modules can be mixed or matched to provide a broad range of measurement, acquisition, and control capabilities.

The Model 2700 provides up to 80 channels of multiplexed measurement and control. Each channel can be configured independently. Settings can be configured via the computer controller (over GPIB or RS-232) or the front panel of the Model 2700 mainframe.

The Model 2700's ActiveX-based start-up software, Xlinx, enables users to configure the system, log multiple channels of data in real-time, troubleshoot any given channel, and send data directly to Excel or disk. Configuration is done in the familiar Windows "point-and-click" environment; therefore, there's no need to program or write lines of code.

If you have any questions after reviewing this information, please contact your local Keithley representative or call one of our Applications Engineers at 1-800-552-1115 (U.S. only). Check Keithley's website (www.keithley.com) for the names and numbers of representatives around the world.

Model 2700 System Diagram



Overview

Use mX+b or % scaling to convert sensor/transducer outputs directly into engineering units.

Measure the ratio or average of two input channels.

View a channel of interest without interrupting a scan by using the Channel Monitor feature.

Built-in linearization for thermocouples, RTDs, and thermistors.

Front panel input jacks simplify manual probing, troubleshooting, and calibration. Built-in signal conditioning with 1000V isolation simplifies system configuration and ensures good measurements.

Initialize the system with one of four fully programmable set-up conditions. System configuration is stored in non-volatile memory.

Non-volatile memory allows time-stamped storage of 55k readings.

Manually step through channels or scan automatically. Configure each channel independently.

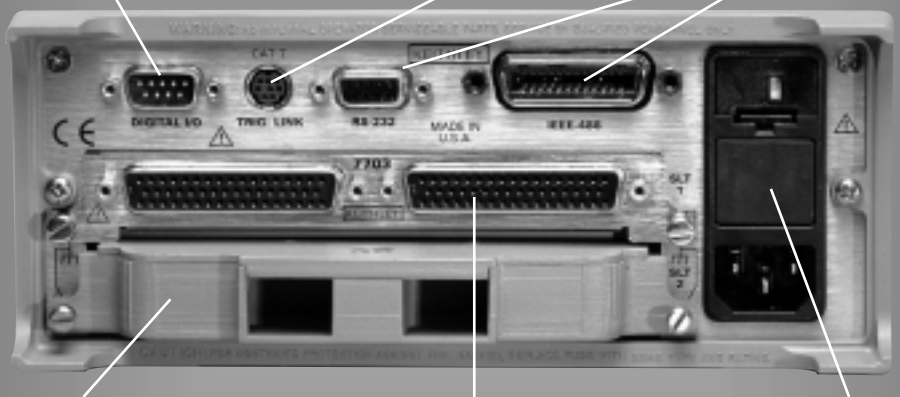
Set the number of digits to be displayed as well as the reading rate.

Familiar DMM-like front panel scheme makes it easier to use on bench or rack. Select or change functions with the simple push of a button.

Built-in digital I/O lines provide for control, external triggering, and HI/LO alarm/limit outputs.

Trigger Link enables tightly synchronized triggering with other instruments in large ATE systems

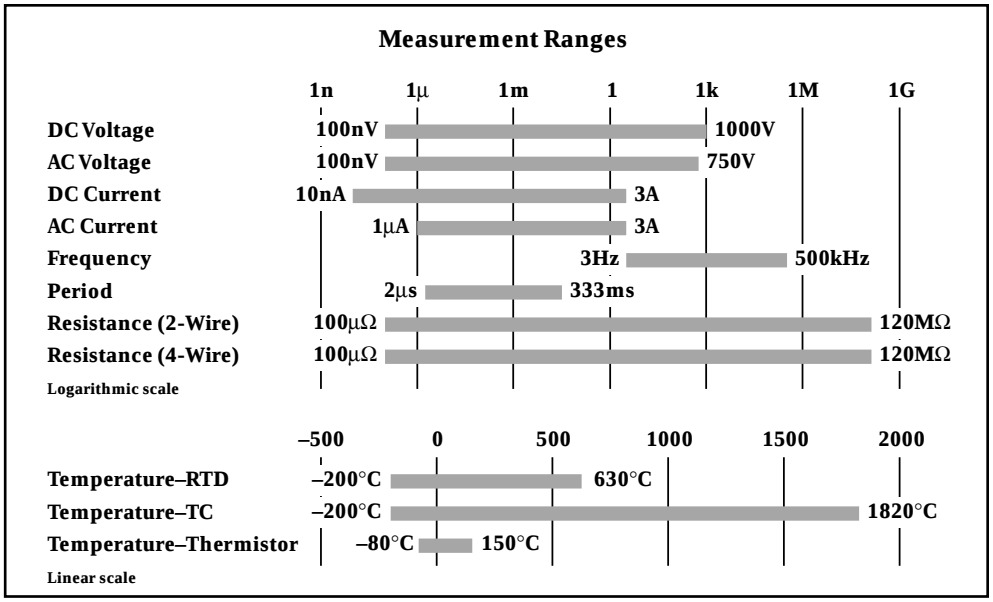
GPIB and RS-232 interfaces are standard.



A variety of measurement and control modules let you mix, match, and change input signals or control lines any time you like. Install up to two modules at a time to create up to an 80-channel "mini-ATE" system.

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

Build-in noise rejection circuitry ensures stable, predictable measurements.



Measurement/Control Module Capabilities

The flexibility to mix and match measurement/control modules in a single half-rack mainframe simplifies configuring Model 2700-based systems for a wide range of applications. Each module offers a different combination of capabilities, such as number of channels, speed, etc. Before selecting a module, it's critical to analyze the needs of the application carefully and consider future requirements for expansion.

Module Capabilities Overview

	7700	7702	7703	7705	7706
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				✓	
Digital Output					✓
Analog Output					✓

- The 7700, 7702, 7703, and 7706 modules can be used to measure a variety of electrical and physical parameters.
- The 7703 module is designed for making high-speed, multi-point measurements.
- The 7705 is designed for signal routing and control within the test system.
- The 7706 combines capabilities for multi-function, multi-point testing with I/O control functions.

Module Combination Selector Guide

This selector guide may prove helpful in identifying the best combination of modules for a specific application. Install up to two modules at a time in the 2700 mainframe or use the 2700 as a stand-alone instrument or as part of a larger ATE system.

	Analog Input	Analog Output	Digital Input	Digital Output	Isolated Switch	Event Counter/ Totalizer
2700	1	-	2	5	-	-
2700 + 7700	22	-	2	5	-	-
2700 + 7700 + 7700	44	-	2	5	-	-
2700 + 7700 + 7702	64	-	2	5	-	-
2700 + 7700 + 7705	22	-	2	5	40	-
2700 + 7700 + 7706	42	2	2	21	-	1
2700 + 7702	42	-	2	5	-	-
2700 + 7702 + 7702	84	-	2	5	-	-
2700 + 7702 + 7705	42	-	2	5	40	-
2700 + 7702 + 7706	60	2	2	21	-	1
2700 + 7703	32	-	2	5	-	-
2700 + 7703 + 7703	64	-	2	5	-	-
2700 + 7703 + 7705	32	-	2	5	40	-
2700 + 7703 + 7706	52	2	2	21	-	1
2700 + 7706	20	2	2	21	-	1
2700 + 7706 + 7706	40	4	2	37	-	2
2700 + 7706 + 7705	20	2	2	21	40	1

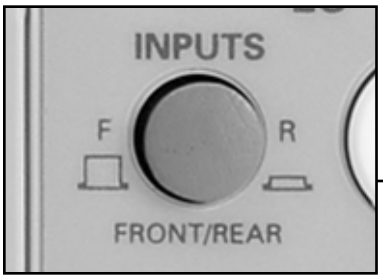
Refer to pages 17–22 for detailed specifications on all switch/control modules.

Channel Configuration Capabilities

- ***Measurement functions:*** The 2700 can measure many different parameters: DC voltage, DC current, AC voltage, AC current, 2-wire Ω, 4-wire Ω, temperature (using thermocouples, RTDs, and thermistors), frequency, period, and continuity.
- ***Math functions:*** A variety of math functions are available at the push of a button, including channel average and ratio, mX+b scaling, min, max, average and standard deviation.
- ***Measurement setup:*** Each channel can be configured independently for making measurements. Selectable channel parameters include:

- Speed
- Range
- Resolution
- Number of power line cycles (NPLC)
- Math functions to be displayed
- Ratio calculation
- Individual 'm' and 'b' values in mX+b format
- Channel Averaging
- Hi-Low limits
- Resistance measurement method (2- or 4-wire)
- Offset compensation
- CJC type
- Thermistor type
- Thermocouple type
- RTD type

Channel Configuration Capabilities (cont.)



- ***DUT- to-modules connections:*** The 2700 makes it easy to connect the device under test to the measurement/control modules. The 7703 and 7705 modules use 50-pin "D-sub" input connectors for secure, quick connections. These connectors are especially convenient for connecting/disconnecting for calibration or rack installation. When greater connection flexibility is required, the oversize screw-terminal connectors simplify setup by eliminating the need to handle small connectors. The standard wires used are 20AWG.
- ***Mainframe-to-modules connection:*** Secure screws connect the mainframe to the modules. At power-up, the mainframe detects any attached modules automatically, which minimizes set-up time. All signals are routed internally from module to mainframe.
- ***Front/rear switch:*** The Model 2700's front inputs are used for manual probing and troubleshooting. A switch on the front panel makes it easy to shift between the front and rear inputs. This eases setting up the equipment and speeds verifying proper setup and connections prior to automating the measurement.

Scanning Capabilities

- ***Scan count:*** The Model 2700 can be programmed to run a given number of scans (n) on all the available channels and to record readings for each channel. The instrument also allows programming the type of trigger used to initiate each scan. (Refer to page 7 for more information on triggering.)
- ***Scan interval:*** The user can set the interval after which each succeeding scan will begin. Scan intervals can be set anywhere from 0 to 99 hours in increments of 10ms.
- ***Scan sequence/omitting channels:*** In addition to scanning in numerical sequence, the Model 2700 can be programmed to skip any channels that are not required for a particular test. This avoids recording irrelevant data and speeds the data acquisition process. This makes scanning both faster and more flexible.
- ***Ratio (DCV only):*** The instrument can calculate and display the ratio of measurements of paired channels. Ratios can only be determined for specific channel pairs, depending upon the input module used. For example, channel pairs on the Model 7702 include Channels 1 and 21, Channels 2 and 22, etc. Hi/Lo limits are fully supported.
- ***Channel Average (DCV and thermocouple only):*** The instrument can calculate and display the average of two channel measurements. As with ratio calculations, only paired channels can be averaged. Hi/Lo limits are fully supported.
- ***Open Sense Line Indication.*** The Model 2700 can alert the user if there is a disconnection on any channel or the relay on the scanner card fails. In this case, the front panel display will show "OVERFLOW." Therefore, the Model 2700 does not need other equipment or calibration to inspect the broken connection or failed relay on the scanner card. In addition, the Model 2700 will not erroneously pass a failed test.

Triggering & I/O Capabilities

Trigger sources

Any of the following sources can be used for triggering a reading or scan sequence:

1. Immediate: The 2700 self-triggers automatically. This default method is the simplest way to take a measurement on a single channel.
2. An external trigger is received via the Trigger Link connector. Triggering through Trigger Link is very precise (0.5msc trigger latency) and provides tight timing control for synchronization in larger systems. Therefore, measurements can be taken at a precise time with very little uncertainty. This capability can be valuable when optimizing coordination with other system instruments, such as the Model 7002 switch mainframe or Model 2400 SourceMeter® instrument in larger ATE applications.
3. A bus trigger is received (GET or *TRG) on GPIB or *TRG on RS-232.
4. Manual: Use of front panel TRIG key.
5. Analog trigger: A display reading on a particular channel can be programmed as an analog trigger. A scan sequence is started whenever such a reading is reached [programmed for either a greater than (>) or less than (<) condition as a trigger]. In other words, this feature can be used to initiate a scan sequence based on some external factor, such as a temperature, rising above a pre-set limit. After scanning all the configured channels on the instrument, the instrument then returns to the channel that acted as the analog trigger, and checks for the reading to be in conditional limits. Depending on the limits and current reading, the instrument decides whether to start the next scan. Only the data of interest are acquired, eliminating the need to spend hours searching through reams of normal readings to find anomalous data.
6. Digital trigger: Two digital inputs (TTL-level) are standard on the 2700 mainframe—one to serve as a trigger input and one to serve as a hardware interlock. The digital trigger is logical "and"-ed with the interlock. The interlock is default true. Therefore, the digital trigger input would be recognized for triggering only when the digital trigger and the interlock are both true. Thus, the interlock provides the user with a controlling mechanism for recognizing the digital trigger if necessary.

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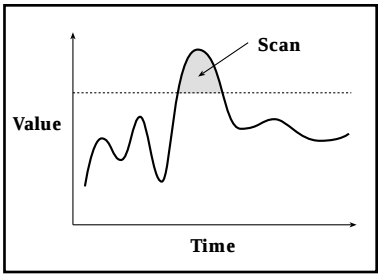

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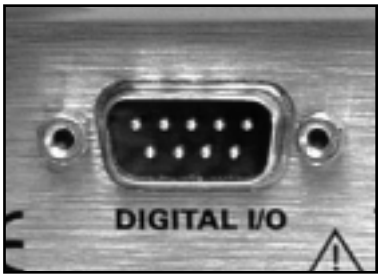


Alarm Limits

The Model 2700's digital output lines can trigger external alarms without the need for a PC connection. The instrument can be programmed to provide alarms when any pre-set limits are breached. Limits can be applied to all measurement functions except continuity, which has its own alarm beeper. The limit test is performed after "mX + b" and math operations.

- ***Limit types:*** Each channel has four independently programmable limits, each of which can be assigned a value. These are:

  1. Limit1 High (for example, 1% higher than the expected reading)
  2. Limit1 Low (for example, 1% less than the expected reading)
  3. Limit2 High (for example, 5% higher than the expected reading)
  4. Limit2 Low (for example, 5% less than the expected reading)

The outputs can be positive or negative true, pulse, or fixed level. Pulse widths are programmable.

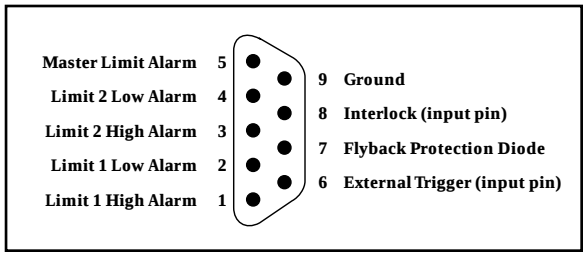
Master Limit: In addition to these limit alarms, a master limit is provided. It is logically "or"-ed with the four limits and is active every time any of the other limits are breached.

Each of the alarm limits and the master alarm is mapped to a specific output pin on the 9-pin male connector that handles the output of that alarm limit.

Capabilities

- 100mA sink (output).
- TTL level outputs (no external supply is needed).
- Open collector output up to 24V with external supply.
- Ability to trigger or start a scan by connecting to one of the digital input lines.

Structure of the 9-Pin Male Connector



Additional digital output capabilities of the 7706. The All-in-One I/O Module adds 16 channels of digital output for control and actuation purposes. Refer to page 19 for more information.

On-board Data Storage

- ***Buffer size and type:*** The 2700 has a 55,000-point non-volatile "read and transmit" memory (in other words, the buffer can be emptied while it is being filled.) The buffer can be configured in "wrap around" mode for recording readings continuously for long periods. There is no need to stop taking data, reset the instrument, or change memory cards. The wrap around memory can be configured to issue a Service Request. Typically, an SRQ is issued after every 27,500 readings, when the buffer is half full. (Or, if desired, the memory can be configured to issue an SRQ when the buffer is one-quarter-full, three-quarters-full, or full). At this time, the instrument can be requested to download the readings acquired prior to the SRQ (first reading in is first reading out), while it continues to record further readings in the buffer. Therefore, recording and retrieving readings take place simultaneously. When the readings fill up the last memory locations of the buffer, the instrument returns to the beginning of the buffer and starts writing in the locations emptied by the previous download.
- ***Timestamp:*** The readings in the memory can be timestamped to trace the progress of a test. The time can be configured as either:
  - Real time: The actual calendar day and time.
  - Relative Time: Time is relative to the first reading stored in the buffer.

Saving/Recalling a Setup

All current set-up information for individual channels and the mainframe is battery backed and the measurement data is stored in the non-volatile memory. Therefore, while the instrument is switched off, the configuration for each channel is saved in the memory, then automatically recalled when the product is switched on again. Up to four different sets of setups can be recorded for each channel, so it's unnecessary to set up each channel before a different test.

Power Failure Recovery

All set-up information is battery backed and data is stored in non-volatile RAM, so the Model 2700 is immune to power failures and can resume scanning where it stopped once power is restored. There is no need to restart interrupted tests from the beginning. The scan resumption feature is user-selectable.

Channel Monitor

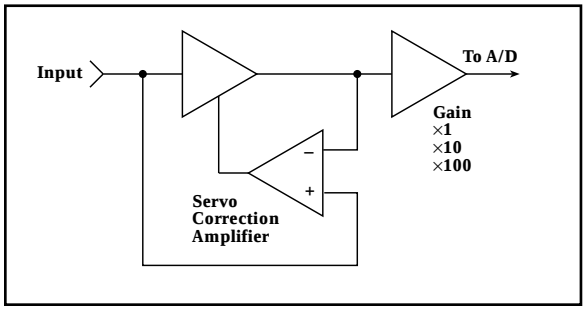
The Channel Monitor feature allows monitoring any specific input channel on the front panel display at any time during a scan. The Model 2700 can scan across channels very rapidly, so the Channel Monitor offers a convenient way to view only the channel of interest without interrupting a scan.

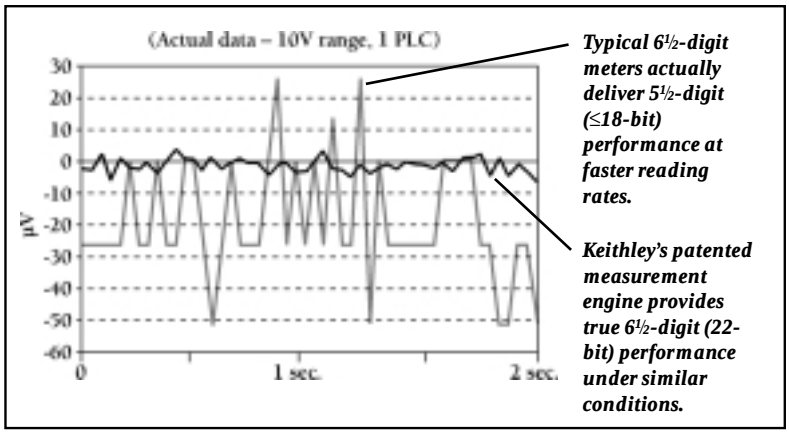
Measurement Performance

The Model 2700 is a true 6½-digit (22-bit) instrument designed for high measurement precision. Its high precision enhances measurement repeatability and stability.

Measurement performance is a key advantage of all Keithley's products. The Model 2700 is based on a number of advanced technologies, which improve its overall performance dramatically, including:

- Patented A/D converter IC circuitry design to increase the resolution, precision, and speed of measurement.
- Advanced signal conditioning hardware to filter out unwanted noise and provide necessary isolation.
- A unique "servo" front end design. While conventional DMMs typically measure and correct for the zero drift of front-end circuitry, the Model 2700's servo front-end eliminates zero drift, which also eliminates the wasted measurement time usually required to check zero, further increasing measurement speed.





When the measurements matter, Keithley provides up to 10× better performance at equivalent reading rates or up to 10x faster speeds at equivalent measurement performance. Our patented A/D converter and high performance signal conditioning circuitry make this possible.

Specification Conversion Factors

Percent	PPM	Digits	Bits	dB	Portion of 10V
10%	100000	1	3.3	–20	1 V
1%	10000	2	6.6	–40	100 mV
0.1%	1000	3	10	–60	10 mV
0.01%	100	4	13.3	–80	1 mV
0.001%	10	5	16.6	–100	100 µV
0.0001%	1	6	19.9	–120	10 µV
0.00001%	0.1	7	23.3	–140	1 µV
0.000001%	0.01	8	26.6	–160	100 nV
0.0000001%	0.001	9	29.9	–180	10 nV

Model 2700 Performance (6½-digit, 22-bit)

Filtering

For each major measurement function, users can employ either averaging or advanced digital filtering to reduce noise and increase the effective resolution.

1. Averaging Filter

   The Average Filter operates over a range of from 2 to 100 readings. All readings included in the filter range are weighted equally. A step input of any size will ramp up linearly to the final value after obtaining the number of readings specified by the user. The averaging filter may be configured as either a moving averaging or as a repeat filter. Operation over the GPIB bus is often done in "repeat" mode to ensure that all readings are fully filtered. Also, taking filtered measurements in repeat mode requires only one trigger, simplifying programming. Only the repeat filter can be used while scanning.

2. Advanced Filter

   When a DMM is used in bench mode, it's often desirable for it to respond immediately upon connection to a test point, without the slow response associated with an averaging filter. The Model 2700's advanced filter addresses this need by providing a filter reset level. If the measured value deviates significantly from previous values, the filter is reset to the new value, and filtering is restarted. In this way, the user can set the filter reset level just above the maximum noise level anticipated and the multimeter will respond to new values immediately.

Line Cycle Synchronization

To attain the highest possible normal mode noise rejection, it is important to trigger the reading at the beginning of a power line cycle. The Model 2700 can be set to start a measurement precisely when the power line signal crosses zero. This function increases the normal mode noise rejection 30dB, providing an additional ×30 reduction in noise.

Autozero

Internal autozeroing is used to maintain the best measurement performance. The Model 2700's advanced firmware design does the required calculation automatically in the background. This enables the 2700 to provide faster reading rates (competitive products spend half their measurement time validating their own zero.) Autozero can be disabled to increase measurement speed, but this may result in greater measurement uncertainty.

NPLC

Selectable power line cycle integration allows the user to specify the number of power line cycles over which to integrate (1, 5, 10, etc.) In general, the longer the integration time chosen, the greater the noise rejection will be.

Offset Compensation

For more accurate low resistance measurements, the Model 2700 provides the offset compensation mode to eliminate errors from the thermoelectric EMF effects (V_{EMF}). During the measurement cycle, the built-in ohms current source is turned off, then turned on again, and the resulting EMF error is automatically subtracted. This technique is typically used when measuring values less than 100Ω using the 4-wire ohms method.

Temperature Measurements

The Model 2700 supports three major types of temperature sensors with built-in signal conditioning and linearization: thermocouples, RTDs, and thermistors.

	Thermocouples	RTDs	Thermistors
Temperature Range	–200 ~ 1820°C	–200 ~ 630°C	–80 ~ 150°C
Advantage	• Self-powered • Wide temperature range	• High stability • High accuracy • No CJC required	• Interchangeability • No CJC required
Cost	Low	High	Medium

The 2700 has built-in algorithms for a variety of thermocouples, RTDs, and thermistors. To begin using a sensor, simply hook it up and the 2700 does the rest.

- Thermocouples: Type J, K, N, T, E, R, S, B
- RTDs: D100, F100, PT100, PT385, PT3916, or user type
- Thermistors: 2.2K, 5K, and 10K

Cold junction compensation methods

Typically, a cold junction is used as a reference point for temperature measurements made using thermocouples. The Model 2700 can support three different methods of cold junction compensation.

Automatic CJC

The CJC sensors are mounted on the multiplexer module's PC board. They sense the actual temperature across the module's connector, then compensate all temperature measurements accordingly. The CJC scaling is done automatically (in the background, like an autozero) so the user does not have to acquire it separately.

External CJC

A thermistor or RTD is attached to Channel 1, which is then used to measure the temperature of an object as a cold junction reference point. The precision of the actual temperature measurement depends on the accuracy of the cold junction reading.

Simulated CJC

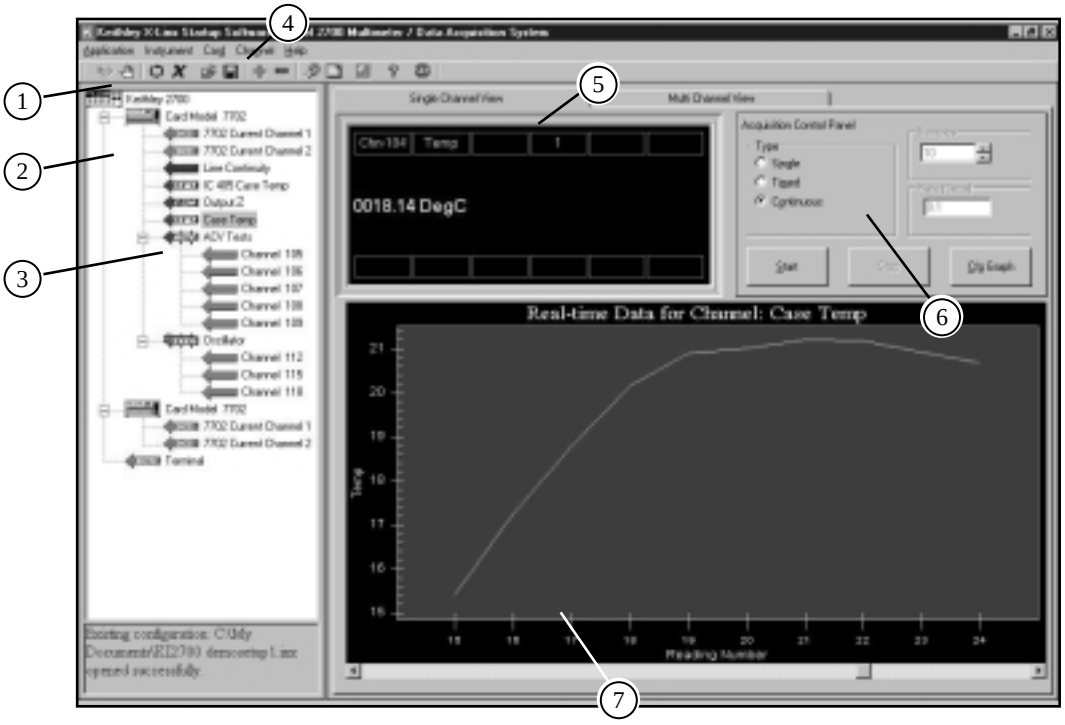
When the "change" in temperature is of interest rather than the absolute temperature value, the user can enter a parameter as a cold junction reference point (for example, 23°C for room temperature). This parameter will be used to adjust the actual temperature measurement for each channel. This simulated temperature must be updated manually if ambient conditions change.

Open Thermocouple Detect

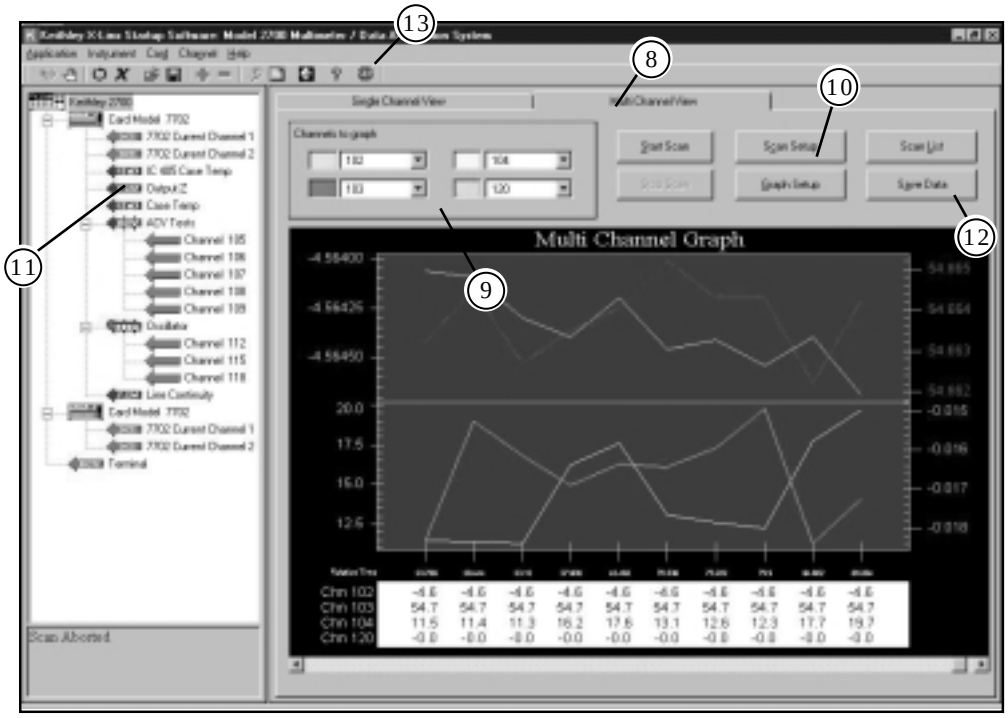
The Model 2700 can alert the user if any thermocouple becomes broken or otherwise disconnected from the input terminal blocks. When the Open T/C Detect feature is enabled, the Model 2700 will perform (in the background) a 2-wire resistance measurement across each thermocouple input channel. If an open connection is detected, the front panel display will show "OVERFLOW" for that channel.

Model 2700 Free Software

The Model 2700's ActiveX-based start-up software, Xlinx, enables users to configure the system, log multiple channels of data in real-time, troubleshoot any given channel, and send data directly to Excel or disk. Configuration is done in the familiar Windows "point-and-click" environment; therefore, there's no need to program or write lines of code. This free software is designed to get basic PC-based data acquisition tasks "Up & Running" as quickly as possible. It directly accommodates GPIB boards from both Keithley and National Instruments. It is designed to run on PCs with Windows 95, 98, or 2000/NT.



1. Choose GPIB card type and address, then initialize the 2700 with the click of a button. The software automatically determines which input modules are installed.
2. The familiar Windows Explorer menu tree is used to view and configure the 2700 system. Use right and left mouse clicks to add/delete, configure, and name the channels to be scanned. Each channel can be programmed to operate independently, allowing tremendous flexibility.
3. For multiple channels that have the same measurement function, configuration is simplified through "group" and "aggregate" channel setups. A "group" list is a series of channels in sequential order, while an "aggregate" list is a series of channels in random order.
4. Set-up configuration information can be saved to disk, then later recalled as a specific start-up condition.
5. The Single Channel View (above) displays the measured data on a selected channel. This is a good way to be sure the channel setups are correct before initiating automated scanning or datalogging. In addition, this functionality greatly simplifies troubleshooting.
6. Configure the acquisition sample size, trigger, and reading rate.
7. View the real-time data graphically. X- and Y-axis scaling can be automatic or user-configurable and trend information is available via the scrolling windows.



8. Use the Multi-Channel View (above) to scan and acquire data from multiple channels. View up to four channels at once on the graph. X- and Y-axis scaling can be automatic or user-configurable.
9. View and select the channels to be included on the display. A scan list can be created to log data automatically from up to 80 independently configured channels. Up to 4 channels can be displayed simultaneously.
10. Configure the number of times to scan through the input channels, as well as any delay times that may be necessary. Select from a variety of trigger sources, including the real-time clock.
11. All channels can be given a custom tag name or simply use the default channel number.
12. Save all data directly to Excel on a per-channel basis or to disk in the file format of your choice, including HTML. Once in Excel, the data can be further analyzed statistically or shared with other applications, such as Microsoft Word® or PowerPoint®.
13. On-line help is just a mouse click away.

Calibration

The design of the Model 2700 and its calibration procedure were developed to address a variety of critical calibration issues. For example, the 2700 has front panel input jacks, so there's no need to disassemble the system for periodic recalibrations. There's also no need to buy, stock, and track spare "cal only" modules. The 2700 is connected to the calibrator through the front panel input jacks. The Model 2700's calibration procedure covers both verification and adjustment and can be performed through either the front panel or GPIB. The calibration interval is user-selectable.

MODEL 2700 SPECIFICATIONS

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 OR BURDEN VOLTAGE	INPUT RESISTANCE OR OPEN CKT. VOLTAGE[3]	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	15 + 30	25 + 35	30 + 35	(1 + 5)/°C
	1.000000 V	1.0 µV		>10 GΩ	15 + 6	25 + 7	30 + 7	(1 + 1)/°C
	10.00000 V	10 µV		>10 GΩ	10 + 4	20 + 5	30 + 5	(1 + 1)/°C
	100.0000 V	100 µV		10 MΩ ± 1%	15 + 6	35 + 9	45 + 9	(5 + 1)/°C
	1000.000 V[5]	1 mV		10 MΩ ± 1%	20 + 6	35 + 9	50 + 9	(5 + 1)/°C
Resistance[6,8]	100.0000 Ω	100 µΩ	1 mA	6.6 V	20 + 20	80 + 20	100 +20	(8 + 1)/°C
	1.000000 kΩ	1 mΩ	1 mA	6.6 V	20 + 6	80 + 6	100 +6	(8 + 1)/°C
	10.00000 kΩ	10 mΩ	100 µA	6.6 V	20 + 6	80 + 6	100 +6	(8 + 1)/°C
	100.0000 kΩ	100 mΩ	10 µA	12.8 V	20 + 6	80 + 10	100 +10	(8 + 1)/°C
	1.000000 MΩ	1.0 Ω	10 µA	12.8 V	20 + 6	80 + 10	100 +10	(8 + 1)/°C
	10.00000 MΩ[7]	10 Ω	0.7 µA // 10MΩ	7.0 V	150 + 6	200 + 10	400 +10	(30 + 1)/°C
	100.0000 MΩ[7]	100 Ω	0.7 µA // 10MΩ	7.0 V	800 + 30	2000 + 30	2000 +30	(150 + 1)/°C
Continuity (2W)	1.000 kΩ	100 mΩ	1 mA	6.6 V	40 + 100	100 + 100	100 +100	(8 + 1)/°C
Current	20.00000 mA	10 nA	< 0.2 V		60 + 15	300 + 40	500 + 40	(50 +5)/°C
	100.0000 mA	100 nA	< 0.05 V		100 + 150	300 + 400	500 + 400	(50 +50)/°C
	1.000000 A	1.0 µA	< 0.3 V[9]		200 + 15	500 + 40	800 + 40	(50 +5)/°C
	3.000000 A	10 µA	< 1.0 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

(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 CJC from Plug-In Module[19]	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

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.)

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

DC SPEED vs. NOISE REJECTION

Rate	Filter	Readings/s[12]	Digits	RMS Noise 10V Range	NMRR	CMRR[14]
10	50	0.1 (0.08)	6.5	< 1.2 µV	110 dB[13]	140 dB
1	Off	15 (12)	6.5	< 4 µV	90 dB[13]	140 dB
0.1	Off	500 (400)	5.5	< 22 µV	—	80 dB
0.01	Off	2000 (1800)	4.5	< 150 µV	—	80 dB

DC OPERATING CHARACTERISTICS[15]

60Hz (50Hz) Operation

FUNCTION	DIGITS	READINGS/s		PLCs
DCV, DCI, Ohms (<10M), Thermocouple, Thermistor	6.5[12,16]	5	(4)	10
	6.5[16]	30	(24)	1
	6.5[12,16]	50	(40)	1
	5.5[12,16]	100	(80)	0.1
	5.5[16,17]	250	(200)	0.1
	5.5[17]	500	(400)	0.1
	4.5[17]	2000	(1800)	0.01
4W Ohms (<10M)	6.5[16]	1.4	(1.1)	10
	6.5[16]	15	(1)	1
	5.5[17]	33	(25)	0.1
RTD	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

DC SYSTEM SPEEDS[15,18]

RANGE CHANGES[16]: 50/s (42/s).
FUNCTION CHANGES[16]: 50/s (42/s).
AUTORANGE TIME[16]: < 30ms.
ASCII READINGS TO RS-232 (19.2k BAUD): 55/s.
MAX. INTERNAL TRIGGER RATE: 2000/s.
MAX. EXTERNAL TRIGGER RATE: 500/s.

MODEL 2700 SPECIFICATIONS

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%.

INPUT BIAS CURRENT: <75pA at 23°C.

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

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

MAX 4WΩ LEAD RESISTANCE: 10% of range per lead for 100Ω and 1kΩ ranges; 1kΩ per lead for all other ranges.

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

CONTINUITY THRESHOLD: Adjustable 1 to 1000 Ω

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 >12kΩ.

EARTH ISOLATION: 500V peak, >10GΩ and <150pF any terminal to chassis.

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, 100Ω 30ppm, <1MΩ 2ppm, 10mA and 1A 10ppm, 100mA 40ppm.
3. ± 2% (measured with 10MΩ input resistance DMM, >10GΩ DMM on 10MΩ and 100MΩ ranges).
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, 100Ω with offset compensation on. With offset compensation on, OPEN CKT. VOLTAGE is 12.8V. For 2-wire Ω add 1Ω additional uncertainty.
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: 10MΩ 220ppm, 100MΩ 2200ppm. For Model 7703, add the following: 10kΩ 10ppm; 100kΩ 100ppm; 1MΩ 1000ppm; 10MΩ 1%; 100MΩ 10%.
9. Add 1V 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 Model 7703.
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.
17. Sample count = 1024, auto zero off.
18. Auto zero off, NPLC = 0.01.
19. Add ±0.5°C uncertainty for type J, K, N, T, and E for temperatures <-100°C, for types R and S <+400°C, and for type B <+1100°C. Guaranteed by design, not tested, for types B, E, N, R, and S.

AC SPECIFICATIONS[1]

				Accuracy: ±(% of reading + % of range), 23°C ± 5°C				
Function	Range	Resolution	Calibration Cycle	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	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	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.**[3]	0.035 + .003	0.005 + .003	0.006 + .005	0.01 + .006	0.03 + .01
				3 Hz–10 Hz	**10 Hz–5 kHz**			
Current[2]	1.000000 A	1.0 µA	90 Day/1 Yr.	0.30 + 0.04	0.10 + 0.04			
	3.00000 A	10 µA		0.35 + 0.06	0.15 + 0.06			
			Temp. Coeff.[3]	(0.035 + 0.006)/°C	(0.015 + 0.006)/°C			
				(3 Hz–500 kHz) (333 ms–2 µs)				
Frequency[4]	100 mV	0.333 ppm	90 Day/ 1 Yr.	100 ppm + 0.333 ppm (SLOW, 1s gate)				
and Period	to	3.33 ppm		100 ppm + 3.33 ppm (MED, 100ms gate)				
	750 V	33.3 ppm		100 ppm + 33.3 ppm (FAST, 10ms gate)				

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

MODEL 2700 SPECIFICATIONS

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 <0.3Vrms, 3A <1Vrms. Add 1Vrms 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.
MAXIMUM CREST FACTOR: 5 at full-scale.
VOLT HERTZ PRODUCT: $<= 8 \times 10^7$.

AC OPERATING CHARACTERISTICS[7]

60Hz (50Hz) Operation

Function	Digits	Readings/s	Rate	Bandwidth
ACV, ACI	6.5[8]	2s/Reading	SLOW	3 Hz–300 kHz
	6.5[8]	1.4 (1.1)	MED	30 Hz–300 kHz
	6.5[9]	4.8 (4)	MED	30 Hz–300 kHz
	6.5[9]	35 (28)	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

AC System Speeds[7, 11]

RANGE CHANGES[12]: 4/s (3/s).
FUNCTION CHANGES[12]: 4/s (3/s).
AUTORANGE TIME: < 3s.
ASCII READINGS TO RS-232 (19.2k baud): 50/s.
MAX. INTERNAL TRIGGER RATE: 300/s.
MAX. EXTERNAL TRIGGER RATE: 300/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. Includes measurement and binary data transfer out GPIB.
8. 0.01% of step settling error. Trigger delay = 400ms.
9. Trigger delay = 0.
10. Sample count = 1024.
11. DETector:BANDwidth 300 with nPLC = 0.01.
12. Maximum useful limit with trigger delay = 175ms.

Internal Scanner Speeds:

Into and Out of Memory to GPIB[1]

7703 Scanning DCV	175/s
7703 Scanning DCV with Limits or Time Stamp On	135/s
7703 Scanning ACV[2, 3]	100/s
7703 Scanning DCV alternating 2W	60/s
7702 Scanning DCV	60/s
7700 Scanning Temperature (T/C)	60/s

Internal Scanner Speed Notes:

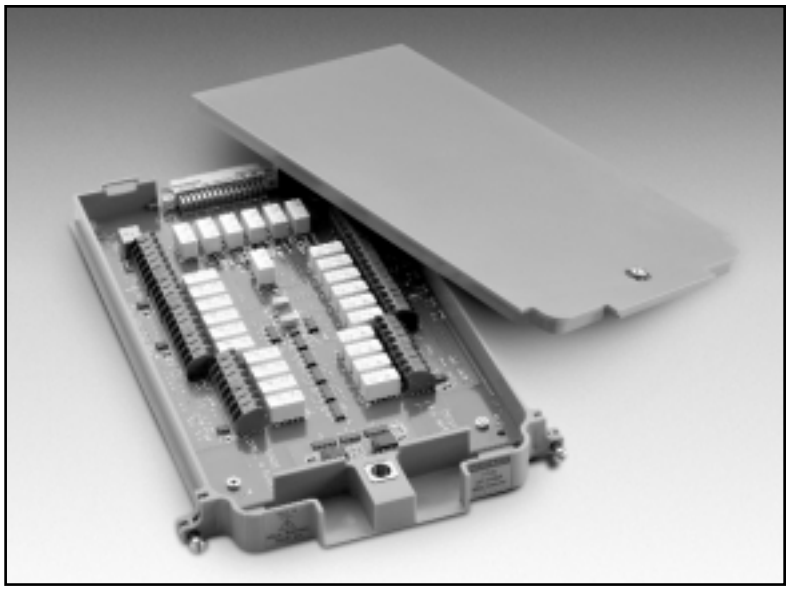
1. Speeds are 60Hz or 50Hz operation using factory default conditions (*RST). NPLC = 0.01. Auto Zero off, Auto Range off, and Display off. Sample count =1024. Includes measurement and binary data transfer out GPIB.
2. Detector Bandwidth = 300.
3. For Auto Delay On = 1.8/s.

GENERAL SPECIFICATIONS:

POWER SUPPLY: 100V / 120V / 220V / 240V ±10%.
LINE FREQUENCY: 45Hz to 66Hz and 360Hz to 440Hz, automatically sensed at power-up.
POWER CONSUMPTION: 28VA.
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.
WARRANTY: 3 years.
SAFETY: Designed to UL-3111-1, IEC-1010-1.
EMC: Complies with European Union Directive 89/336/EEC EN55022, EN50082-1, EN61000-3-2, EN61000-3-3, FCC part 15 class A.
VIBRATION: MIL-T-28800E Type III, Class 5.
WARM-UP: 2 hours to rated accuracy.
DIMENSIONS:
Rack Mounting: 89mm high × 213mm wide × 370mm deep (3.5 in × 8.375 in × 14.563 in).
Bench Configuration (with handle and feet): 104mm high × 238mm wide × 370mm deep (4.125 in × 9.375 in × 14.563 in).
SHIPPING WEIGHT: 6.5kg (14 lbs.).
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 33V.
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: <1ms.
External Trigger Jitter: <500us.
Memory Size: 55,000 readings.
MATH FUNCTIONS: Rel, Min/Max/Average/Std Dev/ Peak-to-Peak (of stored reading), Limit Test, %, and mX + b with user defined units displayed.
REMOTE INTERFACE:
Keithley XLinx Up & Running starter software
GPIB (IEEE-488.2) and RS-232C.
SCPI (Standard Commands for Programmable Instruments)
LabVIEW Drivers
TestPoint Drivers
ACCESSORIES SUPPLIED: Model 1751 Safety Test Leads, User Manual, Service Manual.

SWITCH/CONTROL MODULE SPECIFICATIONS

Model 7700 20-Channel Differential Multiplexer w/Automatic CJC



Features

- 20 channels for general-purpose measurements, plus two channels to measure current.
- 2- or 4-wire measurement.
- Oversize screw terminal connection blocks are standard for easier connections.
- Automatic CJC sensors on the scanner card mean there are no other accessories are required to make thermocouple temperature measurements.
- 300V, 1A capacity for voltage channels; 60W, 125VA.
- 3A capacity for current channels.

GENERAL

20 CHANNELS: 20 channels of 2-pole relay input. All channels configurable to 4-pole.

2 CHANNELS: 2 channels of current only input.

RELAY TYPE: Latching electromechanical.

ACTUATION TIME: <3ms.

CAPABILITIES

CHANNELS 1-20: Multiplex one of 20 2-pole or one of 10 4-pole signals into DMM.

CHANNELS 21-22: Multiplex one of 2 2-pole current signals into DMM.

INPUTS

MAXIMUM SIGNAL LEVEL:

Channels (1-20): 300V DC or rms, 1A switched, 60W, 125VA maximum.

Channels (21-22): 60V DC or 30V rms, 3A switched, 60W, 125VA maximum.

CONTACT LIFE (typ): $>10^5$ operations at max signal level.
$>10^8$ operations cold switching.

CONTACT RESISTANCE: <1Ω at end of contact life.

CONTACT POTENTIAL: <±500nV typical per contact, 1µV max.
<±500nV typical per contact pair, 1µV max.

OFFSET CURRENT: <100pA.

CONNECTOR TYPE: Screw terminal, #20 AWG wire size.

ISOLATION BETWEEN ANY TWO TERMINALS: $>10^{10}\Omega$, <100pF.

ISOLATION BETWEEN ANY TERMINAL AND EARTH: $>10^9\Omega$, <200pF.

CROSS TALK (10MHz, 50Ω Load): <–40dB.

INSERTION LOSS (50Ω Source, 50Ω Load): <0.1dB below 1MHz.
<3dB below 2MHz.

COMMON MODE VOLTAGE: 300V between any terminal and chassis.

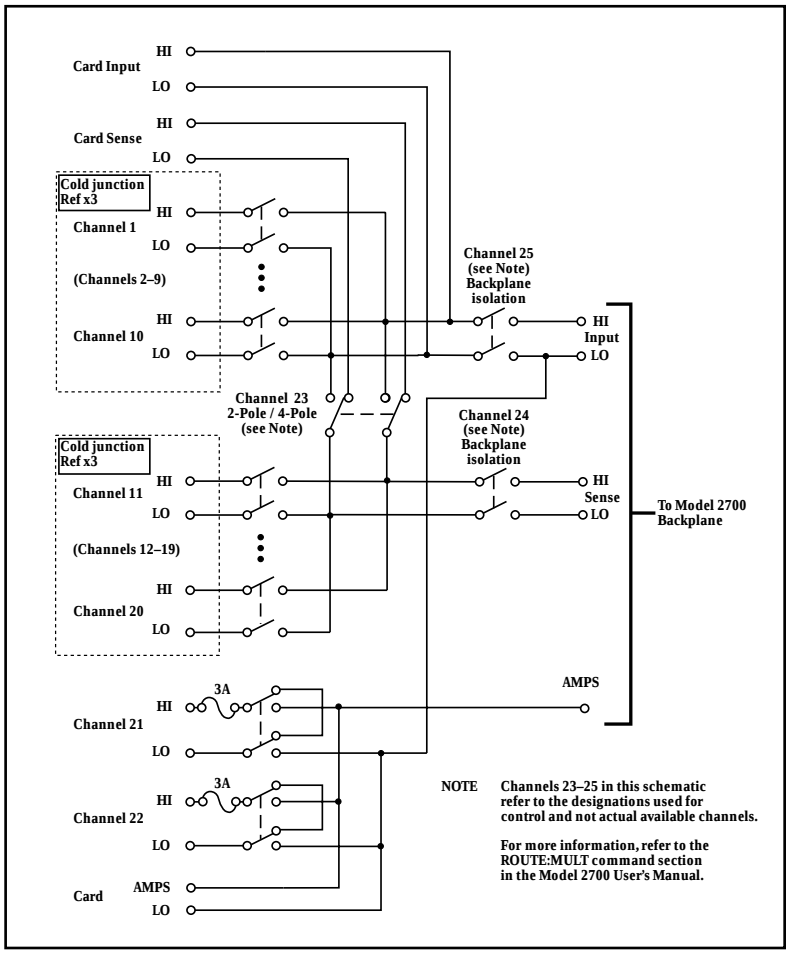
T/C COLD JUNCTION: 1.0°C (18°–28°C Mainframe Temp)
1.5°C (0°–18°C & 28°–50°C Mainframe Temp).

ENVIRONMENTAL:

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

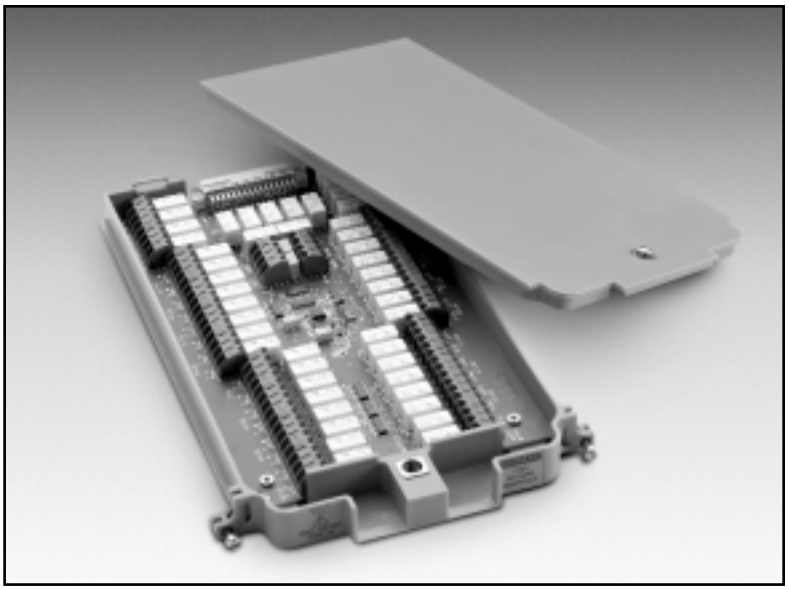
STORAGE ENVIRONMENT: –25°C to 65°C.

WEIGHT: 0.45kg (1 lb).



SWITCH/CONTROL MODULE SPECIFICATIONS

Model 7702 40-Channel Differential Multiplexer



Features

- There are 40 channels for general-purpose measurement, plus 2 channels to measure current.
- 2- or 4-wire measurement.
- Oversize screw terminal connection blocks are standard for easier connection.
- 300V, 1A capacity for voltage channels; 60W, 125VA.
- 3A capacity for current channels.

GENERAL

40 CHANNELS: 40 channels of 2-pole relay input.
All channels configurable to 4-pole.

2 CHANNELS: 2 channels of current only input.

RELAY TYPE: Latching electromechanical.

ACTUATION TIME: <3ms.

CAPABILITIES

CHANNELS 1-40: Multiplex one of 40 2-pole or one of 20 4-pole signals into DMM.

CHANNELS 41-42: Multiplex one of 2 2-pole current signals into DMM.

INPUTS

MAXIMUM SIGNAL LEVEL:

Channels (1-40): 300V DC or rms, 1A switched, 60W, 125VA maximum.

Channels (41-42): 60V DC or 30V rms, 3A switched, 60W, 125VA maximum.

CONTACT LIFE (typ): $>10^5$ operations at max signal level.
$>10^8$ operations cold switching.

CONTACT RESISTANCE: <1Ω at end of contact life.

CONTACT POTENTIAL: <±500nV typical per contact, 1µV max.
<±500nV typical per contact pair, 1µV max.

OFFSET CURRENT: <100pA.

CONNECTOR TYPE: Screw terminal, #20 AWG wire size.

ISOLATION BETWEEN ANY TWO TERMINALS: $>10^{10}\Omega$, <100pF.

ISOLATION BETWEEN ANY TERMINAL AND EARTH: $>10^9\Omega$, <200pF.

CROSS TALK (10MHz, 50Ω Load): <–40dB.

INSERTION LOSS (50Ω Source, 50Ω Load): <0.1dB below 1MHz.
<3dB below 2MHz.

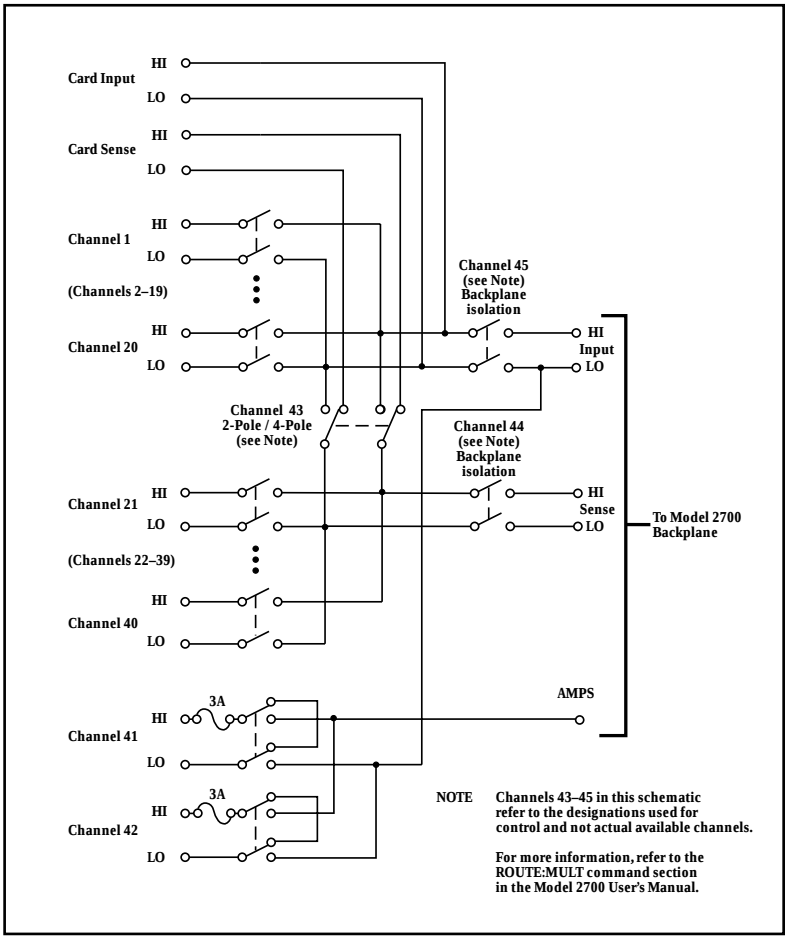
COMMON MODE VOLTAGE: 300V between any terminal and chassis.

ENVIRONMENTAL

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

STORAGE ENVIRONMENT: –25°C to 65°C.

WEIGHT: 0.5kg (1.1 lb).

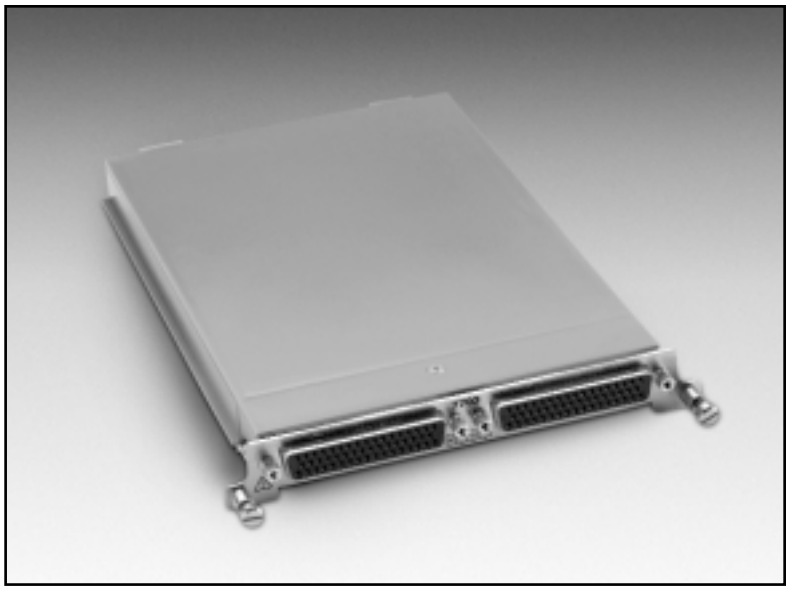


SWITCH/CONTROL MODULE SPECIFICATIONS

Model 7703 32-Channel High Speed Differential Multiplexer

Features

- There are 32 channels for general purpose measurement.
- Relay actuation time of less than 1ms for high-speed scanning.
- 2 or 4 wire measurement.
- Two 50-pin female "D-sub" connectors are standard for secure hook-up and quick teardown.
- Reed relay based design with 300 volt, 500mA; 10VA.
- Two mating connector (Model 7788) supplied.



GENERAL

32 CHANNELS: 32 channels of 2-pole relay input.
All channels configurable to 4-pole.

RELAY TYPE: Reed.

ACTUATION TIME: <1ms.

CAPABILITIES

CHANNELS 1-32: Multiplex one of 32 2-pole or one of 16 4-pole signals into DMM.

INPUTS

MAXIMUM SIGNAL LEVEL:

Channels (1-32): 300V DC or rms, 0.5A switched, 10W maximum.

Contact Life (typ): $>5\times10^4$ operations at max signal level.
$>10^8$ operations cold switching.

CONTACT RESISTANCE: <1Ω at end of contact life.

CONTACT POTENTIAL: <±3µV typical per contact, 6µV max.
<±3µV typical per contact pair, 6µV max.

OFFSET CURRENT: <100pA.

CONNECTOR TYPE: 50 pin D-sub × 2.

RELAY DRIVE CURRENT: 20mA per channel.

ISOLATION BETWEEN ANY TWO TERMINALS: $>10^9\Omega$, <200pF.

ISOLATION BETWEEN ANY TERMINAL AND EARTH: $>10^9\Omega$, <400pF.

CROSS TALK (1 MHz, 50Ω Load): <–40dB.

INSERTION LOSS (50Ω Source, 50Ω Load): <0.35dB below 1MHz.
<3dB below 2MHz.

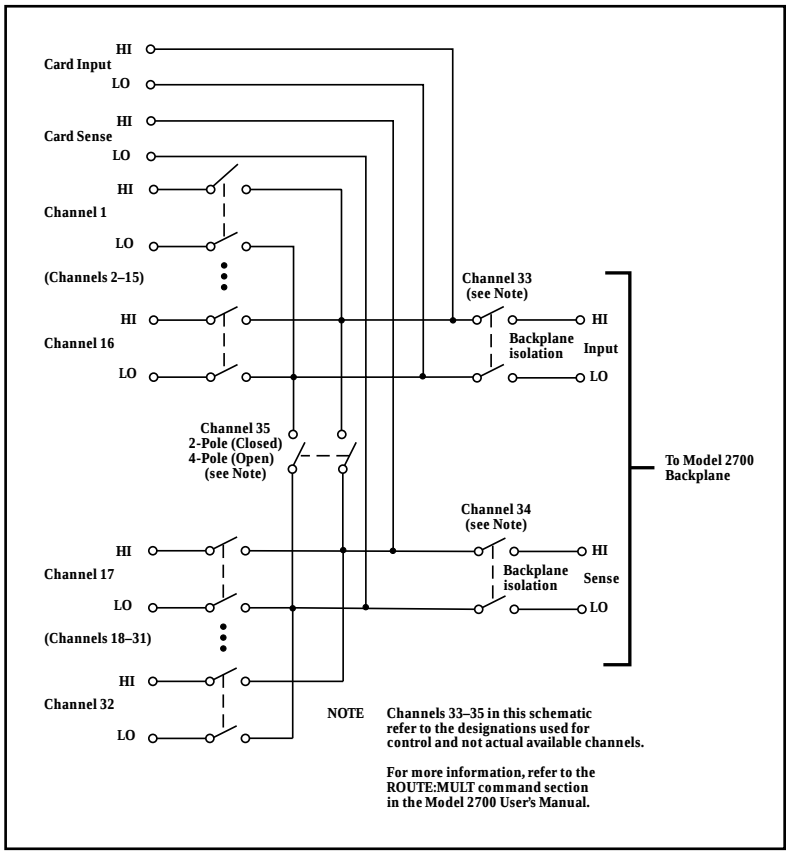
COMMON MODE VOLTAGE: 300V between any terminal and chassis.

ENVIRONMENTAL

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

STORAGE ENVIRONMENT: –25°C to 65°C.

WEIGHT: 0.8kg (1.75 lbs).

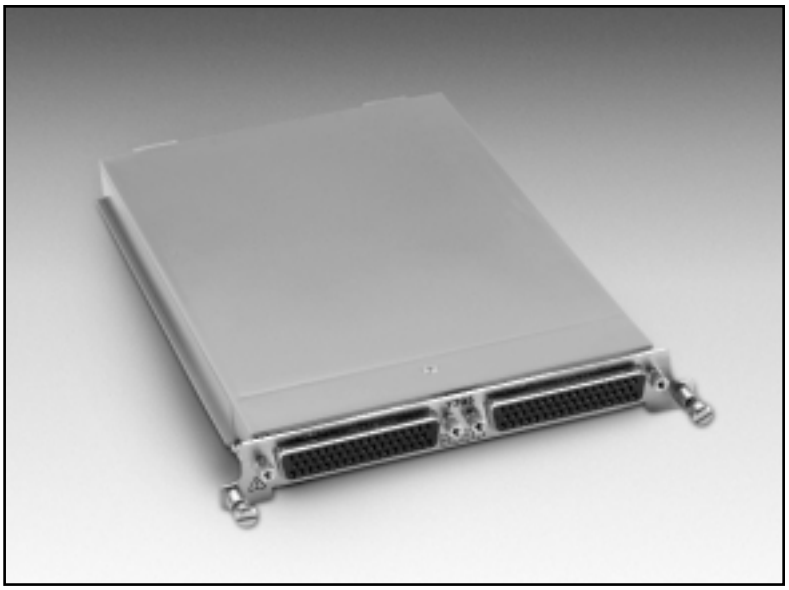


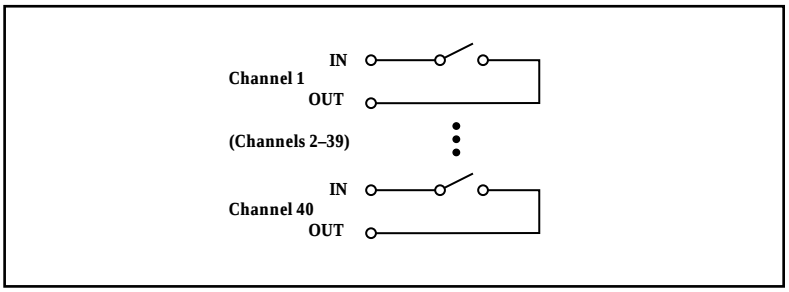
SWITCH/CONTROL MODULE SPECIFICATIONS

Model 7705 40-Channel Control Module

Features

- 40 channels designed for controlling power to the DUT, switching loads, controlling light indicator and relays, etc.
- Two 50-pin female "D-sub" connectors are standard for secure hook-up and quick teardown.
- 300V, 2A capacity.
- Two mating connectors (Model 7788) supplied.





GENERAL

RELAY SWITCH CONFIGURATION: 40 independent channels of 1-pole switching. Isolated from internal DMM.

CONTACT CONFIGURATION: 1 pole Form A.

RELAY TYPE: Latching electromechanical.

CONNECTOR TYPE: Two 50-pin female D-sub connectors.

INPUTS

MAXIMUM SIGNAL LEVEL: 300VDC or rms, 2A switched, 60W (DC, resistive), 125VA (AC, resistive).

CONTACT LIFE: **Cold Switching:** 10^8 closures.
At Maximum Signal Levels: 10^5 closures.

CHANNEL RESISTANCE (per conductor): <1Ω.

CONTACT POTENTIAL: ≤4µV per contact.

OFFSET CURRENT: <100pA.

ACTUATION TIME: 3ms.

ISOLATION: **Channel to Channel:** $>10^9\Omega$, <50pF.
Common Mode: $>10^9\Omega$, <100pF.

CROSSTALK (1MHz, 50Ω load): <–35dB.

INSERTION LOSS (50Ω source, 50Ω load): <0.3dB below 1MHz, <3dB below 10MHz.

COMMON MODE VOLTAGE: 300V between any terminal and chassis.

ENVIRONMENTAL

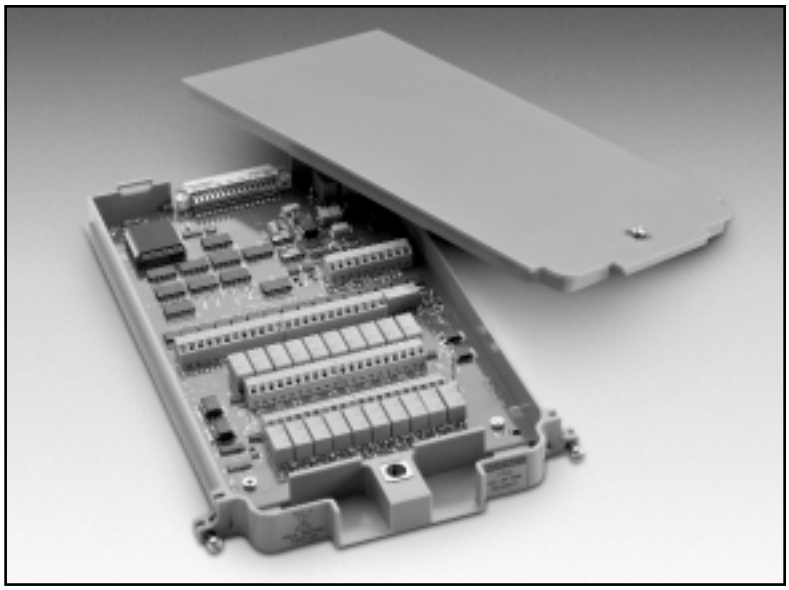
OPERATING ENVIRONMENT: Specified for 0°C to 50°C.
Specified to 80% R.H. at 35°C.

STORAGE ENVIRONMENT: –25°C to 65°C.

WEIGHT: 0.45kg (1 lb).

SWITCH/CONTROL MODULE SPECIFICATIONS

Model 7706 All-in-One I/O Module



Features

- 20 channels of analog input (w/ automatic CJC) for general-purpose measurement.
- 16 channels of digital output for I/O control.
- Event counter/totalizer can monitor and control system components, such as fixturing, limit switches, pass/fail indicators, external voltage sources, loads, door closures, revolutions, etc., while performing mixed signal measurement.
- 300V, 1A capacity; 60W, 125VA maximum.
- Two analog outputs (±12V, 5mA).

GENERAL

20 CHANNELS: 20 channels of 2-pole relay input.
All channels configurable to 4-pole.

RELAY TYPE: Latching electromechanical.

ACTUATION TIME: <3ms.

CAPABILITIES

CHANNELS 1–20: Multiplex one of 20 2-pole or one of 10 4-pole signals into DMM.

Channels 21–25 are referenced to chassis ground.

CHANNELS 21–22: 16 Digital Outputs.

CHANNELS 23–24: Analog Voltage Output (2).

CHANNELS 25: Totalize Input.

INPUTS

MAXIMUM SIGNAL LEVEL (Channels 1–20): 300V DC or rms, 1A switched, 60W, 125VA maximum.

CONTACT LIFE (typ.): $>10^5$ operations at max. signal level: $>10^8$ operations cold switching.

CONTACT RESISTANCE: <1Ω at end of contact life.

CONTACT POTENTIAL: <±500nV typical per contact, 1µV max.
<±500nV typical per contact pair, 1µV max.

OFFSET CURRENT: <100pA.

CONNECTOR TYPE: Screw terminal, #20 AWG wire size.

ISOLATION BETWEEN ANY TWO TERMINALS: $>10^9\Omega$, <100pF.

ISOLATION BETWEEN ANY TERMINAL AND EARTH: $>10^9\Omega$, <200pF.

CROSS TALK (10MHz, 50Ω Load): <–40dB.

INSERTION LOSS (50Ω Source, 50Ω Load): <0.1dB below 1MHz.
<3dB below 2Mhz.

COMMON MODE VOLTAGE: 300V between any terminal and chassis.

T/C COLD JUNCTION: 1.0°C (18°C to 28°C mainframe temp.).
1.5°C (0°–18°C & 28°–50°C mainframe temp.).

TOTALIZE INPUT

MAXIMUM COUNT: $2^{32}–1$.

TOTALIZE INPUT: 100kHz (max), rising or falling edge, programmable.

SIGNAL LEVEL: 1Vp-p (min), 42Vpk (max).

THRESHOLD: 0V or TTL, jumper selectable.

DATE INPUT: TTL-Hi, TTL-Lo, or none.

COUNT RESET: manual or Read+Reset.

READ SPEED: 10/s.

ANALOG VOLTAGE OUTPUT

DAC 1, 2: ±Non-isolated.

RESOLUTION: 1mV.

I_{OUT}: 5mA max.

SETTLING TIME: 1ms to 0.01% of output.

ACCURACY ±(% of output + mV):
1 year ±5°C: 0.15% + 6mV;
90 day ±5°C: 0.1% + 6mV;
24 hour ±1°C: 0.04% + 4mV.

TEMPERATURE COEFFICIENT: ±(0.015% + 1mV)/°C.

DIGITAL OUTPUT

V_{OUT}(L): <0.8V @ Iout = 400mA.

V_{OUT}(H): >2.4V @ Iout = 1mA.

V_{OUT}(H)MAX.: <42V with external open drain pull-up.

WRITE SPEED: 10/s.

ENVIRONMENTAL

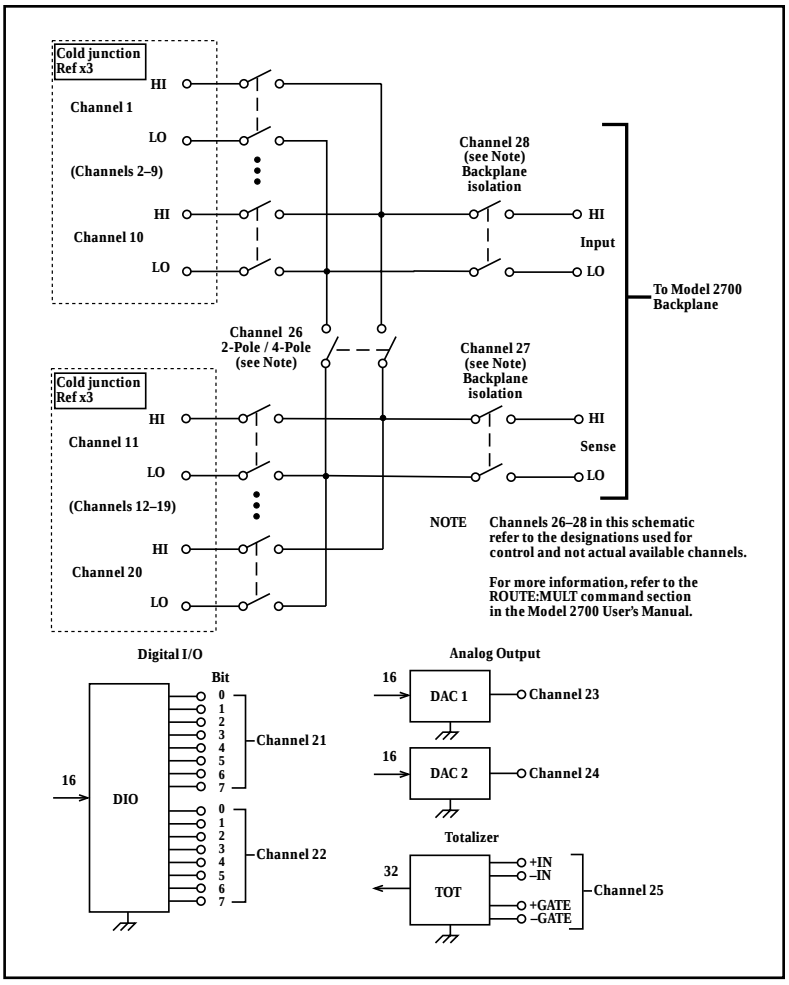
OPERATING ENVIRONMENT: Specified for 0°C to 50°C.
Specified to 80% R.H. at 35°C.

STORAGE ENVIRONMENT: –25°C to 65°C.

WEIGHT: 0.5kg (1.1 lbs).

SWITCH/CONTROL MODULE SPECIFICATIONS

Model 7706 All-in-One I/O Module (cont.)



Specifications are subject to change without notice.

KEITHLEY

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