Model 7705 Control Module

User's Guide

PA-696 Rev. D / October 2006

KEITHLEY

Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the manual for complete product specifications.

If the product is used in a manner not specified, the protection provided by the product may be impaired.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating properly, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Keithley products are designed for use with electrical signals that are rated Measurement Category I and Measurement Category II, as described in the International Electrotechnical Commission (IEC) Standard IEC 60664. Most measurement, control, and data I/O signals are Measurement Category I and must not be directly connected to mains voltage or to voltage sources with high transient over-voltages. Measurement Category II connections require protection for high transient over-voltages often associated with local AC mains connections. Assume all measurement, control, and data I/O connections are for connection to Category I sources unless otherwise marked or described in the Manual.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, no conductive part of the circuit may be exposed.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided, in close proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If a  screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

The  symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The  symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The  symbol indicates a connection terminal to the equipment frame.

The WARNING heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The CAUTION heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

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Model 7705 Control Module
Connection and Wiring Information
User's Guide

Introduction

WARNING **The information contained in this packing sheet is intended for use by qualified service personnel only. Do not perform these procedures unless qualified to do so. Failure to recognize and observe normal safety precautions could result in personal injury or death.**

This document contains information specific to the Model 7705 control module. If you have any questions after reviewing this information, please contact your local Keithley representative or our Applications Engineers at 1-888-KEITHLEY (1-888-534-8453, U.S. only) or Telefax: 440-498-2990 (Instrument Products).

The Model 7705 is a 40-channel, single-pole relay module with the following features:

- 40 Independent Form A switches
- Quick-disconnect 50 pin D-shell connector (2 × DB-50)—use with Model 7788.
- Designed specifically for use with Keithley's Model 2700/2750/2701 Systems.

NOTE *The 7705 module can be used with Keithley Models 2700, 2701, and 2750. All references to the Model 27xx apply to the Models 2700, 2701, and 2750.*

WARNING **Before operating the Model 27xx with an accessory card, verify that the card is properly installed and the mounting screws are tightly fastened. If the mounting screws are not properly connected, an electrical shock hazard may be present.**

Connection information

Keep the following in mind when using the Model 7705 module:

- The 7705 module is a non-measurement card. No channels are connected to the internal DMM (the channels cannot be connected to the backplane).
- Multiple channel operation should be used to close channels on the 7705 module. For remote operation, the ROUT:MULT commands are used to close channels.
- For remote operation, system (single) channel operation (ROUT:CLOS <list> command) can be used to close 7705 module channels. However, only the specified channel will be closed. All other channels on the card will be open.

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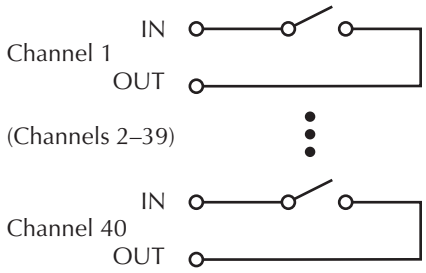
- Front panel system (single) channel operation cannot be used to close channels on this module. For front panel operation, system channel operation will cause message “NO MEAS CARD” to be displayed.
- In order to perform measurements, you must use the front panel inputs of the 27xx mainframe. You can still use the 7705 module to control external circuits.

NOTE *For details on multiple channel operation, refer to Section 2 of the Model 27xx User s Manual.*

- Although the Model 7705 relays are the latching type (relays hold their state even after power has been removed), all relay states are set to open a few seconds after either a power cycle or a *RST command is issued.

Simplified schematic for Model 7705



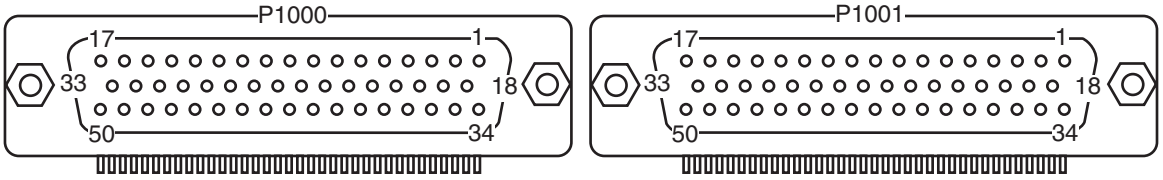
Card configuration—connections

WARNING **The information in this section is intended for qualified service personnel. Do not attempt to perform this procedure unless qualified to do so.**

Do not exceed the maximum specifications for the Model 7705 module.

NOTE *When looking at the rear connectors of the Model 7705 module, the connector on the left is P1000 and the connector on the right is P1001.*

Model 7705 Pinouts



Channels 1–20 Channels 21–40

Table 1
Model 7705 channel designations

P1000						P1001					
CH	**PIN**	**CH**	**PIN**	**CH**	**PIN**	**CH**	**PIN**	**CH**	**PIN**	**CH**	**PIN**
1 IN	6	8 IN	25	15 IN	39	21 IN	6	28 IN	25	35 IN	39
1 OUT	8	8 OUT	26	15 OUT	40	21 OUT	8	28 OUT	26	35 OUT	40
2 IN	10	9 IN	27	16 IN	41	22 IN	10	29 IN	27	36 IN	41
2 OUT	12	9 OUT	28	16 OUT	42	22 OUT	12	29 OUT	28	36 OUT	42
3 IN	14	10 IN	29	17 IN	43	23 IN	14	30 IN	29	37 IN	43
3 OUT	16	10 OUT	30	17 OUT	44	23 OUT	16	30 OUT	30	37 OUT	44
4 IN	17	11 IN	31	18 IN	45	24 IN	17	31 IN	31	38 IN	45
4 OUT	18	11 OUT	32	18 OUT	46	24 OUT	18	31 OUT	32	38 OUT	46
5 IN	19	12 IN	33	19 IN	47	25 IN	19	32 IN	33	39 IN	47
5 OUT	20	12 OUT	34	19 OUT	48	25 OUT	20	32 OUT	34	39 OUT	48
6 IN	21	13 IN	35	20 IN	49	26 IN	21	33 IN	35	40 IN	49
6 OUT	22	13 OUT	36	20 OUT	50	26 OUT	22	33 OUT	36	40 OUT	50
7 IN	23	14 IN	37			27 IN	23	34 IN	37		
7 OUT	24	14 OUT	38			27 OUT	24	34 OUT	38		

Power limits

CAUTION **To prevent damage to the card, do not exceed the maximum signal level specifications of the card. For reactive loads, be sure to use voltage clamping and current limiting as explained in the "Reactive loads" paragraph.**

Maximum signal levels

CAUTION **To prevent overheating or damage to the relays, never exceed the following maximum signal levels: 300V (DC or RMS) between any two inputs or chassis, 60W (DC, resistive), 125VA (AC, resistive), or 2A switched.**

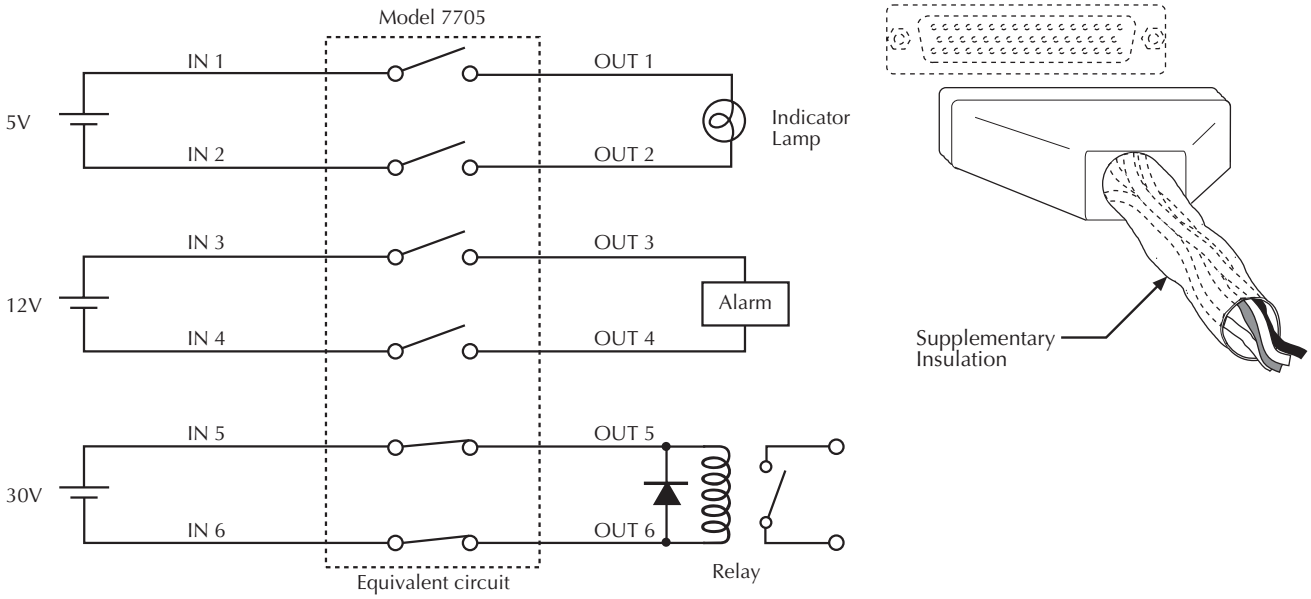
Reactive loads

Model 7705 operation is specified for resistive loads (see "Typical connections—indicator lamp, alarm, and relay" figure). Reactive loads require voltage clamping (for inductive loads) and current surge limiting (for capacitive loads) to prevent damage to the relays and to external circuitry. For additional information, refer to the Model 2700/2750/2701 User's manual.

Wire sizes

Make all connections using correct wire size (up to 20 AWG). Use Model 7788 (DB-50 kit) to provide for a high quality connection to the Model 7705 module. Also, make sure to add supplementary insulation around the harness for voltages above 42V peak (see “Supplementary insulation” figure).

Typical connections—indicator lamp, alarm, and relaySupplementary insulation



Connection log

Make a copy of Table 2 and affix it to the cover of the Model 7705. Use this to record connection information and channel descriptions as needed.

Table 2

Connection Log Model 7705

Channel		Color	Description	Description	Color	Channel	
1	IN					IN	21
	OUT					OUT	
2	IN					IN	22
	OUT					OUT	
3	IN					IN	23
	OUT					OUT	
4	IN					IN	24
	OUT					OUT	
5	IN					IN	25
	OUT					OUT	
6	IN					IN	26
	OUT					OUT	
7	IN					IN	27
	OUT					OUT	
8	IN					IN	28
	OUT					OUT	
9	IN					IN	29
	OUT					OUT	
10	IN					IN	30
	OUT					OUT	
11	IN					IN	31
	OUT					OUT	
12	IN					IN	32
	OUT					OUT	
13	IN					IN	33
	OUT					OUT	
14	IN					IN	34
	OUT					OUT	
15	IN					IN	35
	OUT					OUT	
16	IN					IN	36
	OUT					OUT	
17	IN					IN	37
	OUT					OUT	
18	IN					IN	38
	OUT					OUT	
19	IN					IN	39
	OUT					OUT	
20	IN					IN	40
	OUT					OUT	

7705 40-Channel Control Module

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.

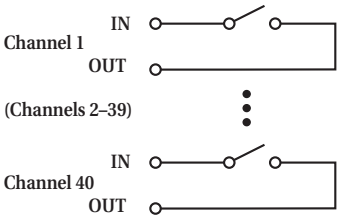
COMMON MODE VOLTAGE: 300V between any terminal and chassis.

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).



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