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KEITHLEY

Model 3750 Multifunction I/O Card

Connection Instructions and Specifications

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1-888-KEITHLEY
www.keithley.com

Introduction

This instruction sheet contains information about the Keithley Instruments Model Series 3700 Multifunction I/O Card connector pins, safety precautions, and product specifications.

WARNING ***The following information is intended for qualified service personnel. Do not make module connections unless qualified to do so.***

To prevent electric shock that could result in serious injury or death, adhere to the following safety precautions:

Before removing or installing a switch module in the mainframe, make sure the mainframe is turned off and disconnected from line power.

Before making or breaking connections, make sure the power is removed from all external circuitry.

Do not connect signals that may exceed the maximum specifications of the model or external wiring. Specifications for each circuit board are provided in the Series 3700 User's Manual.

WARNING ***All wiring must be rated for the maximum voltage in the system. For example, if 300V is applied to the backplane connector, all module wiring must be rated for 300V.***

Information related to reading, writing, and controlling channels, as well as scanning, can be found in the Series 3700 System Switch/Multimeter User's Manual. Detailed information about controlling the Series 3700 from a remote interface can be found in the Series 3700 System Switch/Multimeter Reference Manual.

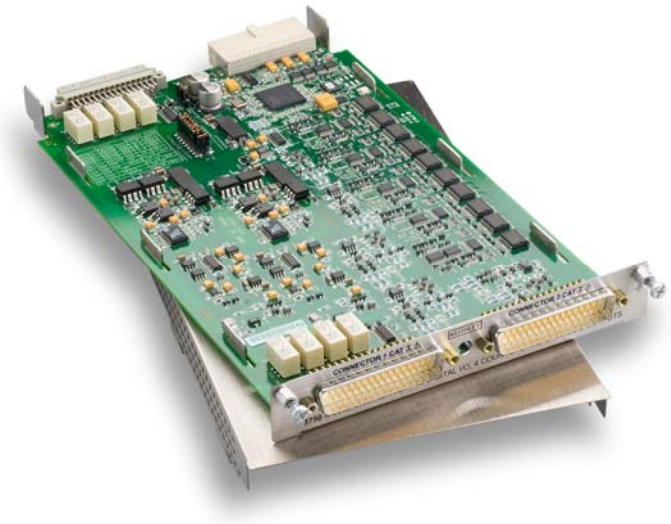
Model 3750 Multifunction I/O Card

The Model 3750 Multifunction I/O Card has 40 bidirectional digital I/O bits arranged in five banks of eight bits each. Each bank can be configured as either inputs or outputs. One bank of I/O is equivalent to one system channel.

The two analog outputs of the Model 3750 can be individually configured as either voltage outputs (+/- 12 V) or as current outputs (0 mA to 20 mA or 4 mA to 20 mA).

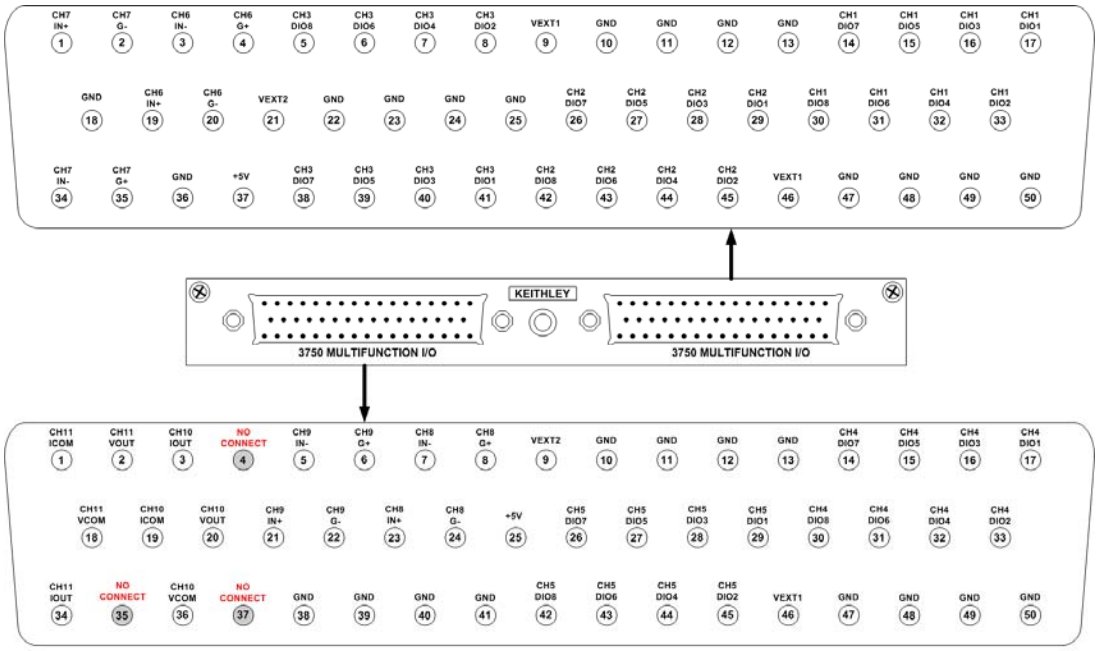
Four 32-bit counters are provided with a maximum input range of 1 MHz. Each counter has a gate input for control of event counting.

Figure 1: Model 3750 Multifunction I/O Card



Connection information: Model 3750

Figure 2: Model 3750 connection information



3750 MALE D-SUB PIN ASSIGNMENTS

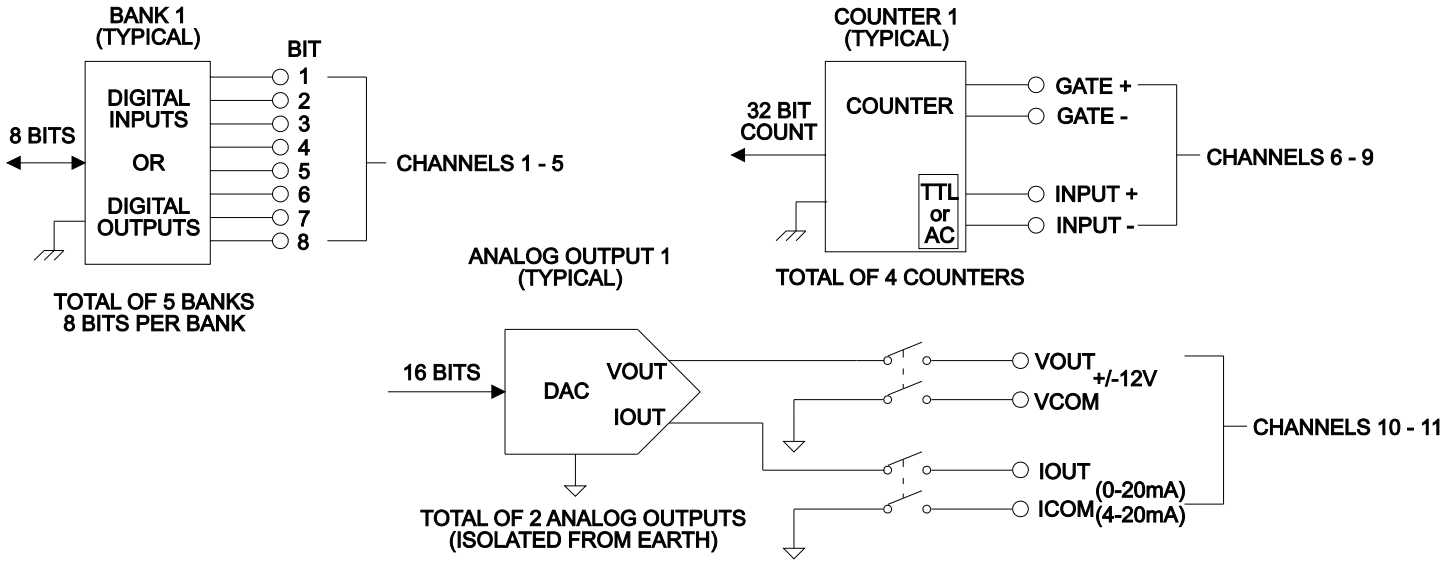
Specifications

GENERAL

Channels 1 - 5: Bidirectional, high current digital I/O (40 bits)

Channels 6 - 9: 32-bit counter (4 counters)

Channels 10 - 11: Isolated voltage and current analog outputs (2 each)



DIGITAL I/O[1]

Configuration: 40 bidirectional digital I/O bits arranged in 5 banks of 8 bits each. Each bank can be configured for either input or output capability. 1 bank of I/O is equivalent to 1 system channel.

Digital Input specifications:

An internal weak pull-up resistor of approximately 68 kΩ is provided on the card for each I/O. This pull-up resistor can be removed via onboard jumper on a channel (8 bit) basis. The pull-up voltage can either connect to the internally supplied 5V or an externally supplied voltage of up to 30V via onboard jumper. An internal 5V supply connection is separately available to run external logic circuits.

Digital Input logic low voltage: 0.8V max

Digital Input logic high voltage: 2V min.

Digital Input logic low current: -600uA max @ 0V

Digital Input logic high current: 50uA max @ 5V

Logic: Positive True.

System Input Minimum Read speed[2]: 1000 readings / second.

Maximum externally supplied pull-up voltage: 30V

[1] All channels power up configured as inputs.
[2] All channels configured as inputs.

Maximum externally supplied voltage to any digital I/O line: Pull-up voltage (5V internal or up to 30V external)

Digital Output specifications:

Each output has an internal fly-back diode for driving inductive loads. Each output is protected against continuous short circuits and over temperature. An internal 5V supply connection is separately available to run external logic circuits.

Digital Output logic high voltage: 2.4V minimum @ Iout = 10mA. sourcing only.

Digital Output logic low voltage: 0.5V maximum @ Iout = -300mA sinking only.

Maximum output sink current: 300mA per output, 3.0 A total per card.

Logic: Positive True.

System Output Minimum Write speed[3]: 1000 readings / second.

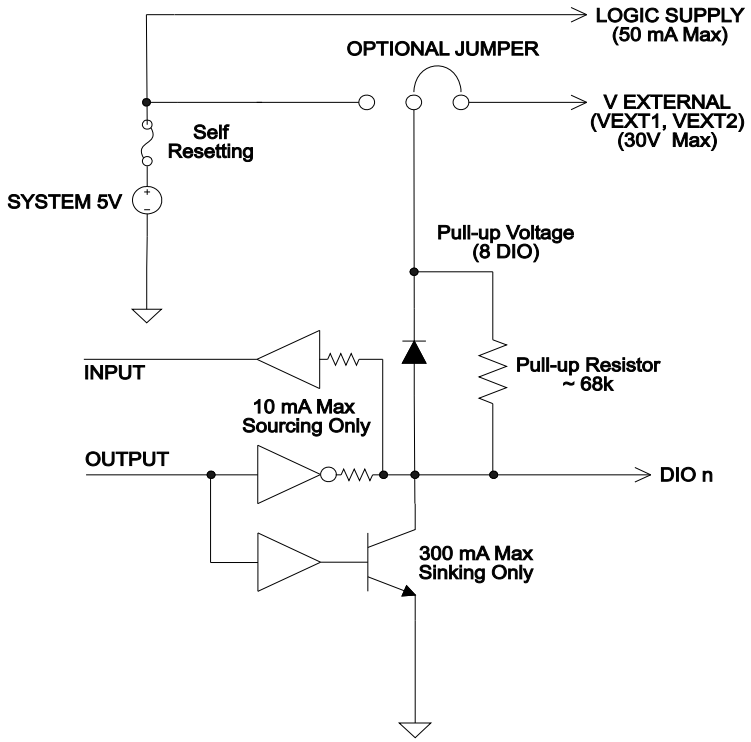
Maximum externally supplied voltage to any digital I/O line: Pull-up voltage (5V internal or up to 30V external)

Alarm: Trigger generation is supported for a maskable pattern match or state change on any of channels 1 through 5.

Protection: Optional disconnect (set to inputs) during output fault conditions.

Internal 5V logic supply: The internal logic supply is designed for powering external logic circuits of up to 50mA maximum. The logic supply is internally protected with a self-resetting fuse. Fuse reset time < 1 hour.

SIMPLIFIED DIGITAL I/O SCHEMATIC



[3] All channels configured as outputs.

COUNTER / TOTALIZER INPUT

Maximum Count: $2^{32} - 1$

Maximum Input Rate: 1 MHz, rising or falling edge, programmable.

Minimum Input pulse width: 500 ns

Input Signal Level: 200 mVp-p (minimum), 42V Peak (maximum)

Threshold: AC (0V) or TTL Logic Level

Gate Input: TTL-HI (Gate+), TTL-LO (Gate-) or NONE.

Minimum Gate input setup time: 1us

Count Reset: Manual or Read + Reset

System Input Minimum Read speed: 1000 readings / second.

Alarm: Trigger generation is supported for a count match or counter overflow on any of channels 6 though 9

ANALOG VOLTAGE OUTPUT

The isolated analog voltage output is designed for general purpose, low power applications.

Output Amplitude[4] ± 12V up to 10mA

Overload Current: 21mA minimum.

Resolution: 1mV.

Full Scale Settling Time[5]: 1ms to 0.1% of output.

DC Accuracy[6]: ± (% of output + mV)

1 year 23 ± 5°C: 0.15% + 16mV
90 day 23 ± 5°C: 0.1% + 16mV
24 hour 23 ± 5°C: 0.04% + 16mV

Temperature Coefficient: ± (0.02% + 1.2mV) / °C

10mV Maximum Update Rate: 350us to 1% accuracy. System limited.

Output Fault Detection: System fault detection is available for short circuit output / current compliance.

Isolation: 300 V Peak Channel to Channel or Channel to Chassis.

Protection: Optional disconnect during output fault conditions.

[4] Programming up to 1% over full scale range is supported
[5] Measured with standard load shown in Figure 1
[6] Measured with > 10MΩ input DMM (DCV, filter, 1 PLC rate). Warm-up time is 1 hour @ 10mA load with 3750-ST

Maximum guaranteed stable capacitive load: 10 nF

ANALOG CURRENT OUTPUT

The isolated analog current output is designed for 0-20 mA or 4-20 mA unipolar modes of operation.

Output Amplitude: 0 to 20mA or 4 to 20mA

Compliance Voltage: 11V minimum.

Maximum Open Circuit Voltage: 16V

Resolution: 1 uA.

Full Scale Settling Time[5]: 1ms to 0.1% of output.

DC Accuracy[7]: ± (% of output + uA)

1 year 23 ± 5°C: 0.15% + 18uA
90 day 23 ± 5°C: 0.1% + 18uA
24 hour 23 ± 5°C: 0.04% + 18uA

Temperature Coefficient: ± (0.02% + 1.6uA) / °C

Output Fault Detection: System fault detection is available for open circuit output / voltage compliance.

Isolation: 300 V Peak Channel to Channel or Channel to Chassis.

Protection: Optional disconnect during output fault conditions.

CONNECTOR TYPE: Two 50 pin male D-shells.

OPERATING ENVIRONMENT:

Specified for 0ºC to 50ºC.
Specified to 70% R.H. at 35ºC

STORAGE ENVIRONMENT: -25ºC to 65ºC

WEIGHT: 1.27 kg (2.80 lb)

FIRMWARE: Requires main revision to be 1.20 or above (Applies to all 3706 series mainframes)

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

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

Power Budget Information:

Quiescent Power: 3300 mW
Digital Outputs each channel (1 through 5): 325 mW
Analog Channel each (10 & 11): 820 mW

[7] Measured with < 2Ω shunt DMM (DCI, filter, 1 PLC rate). Warm-up time is 1 hour with 3750-ST

Totalizer Channel all (6 through 9): 730 mW

Analog channels and counter channels may optionally be turned off to conserve system power.

See Chapter 8 of the series 3700 user's manual for more detailed information.

ACCESSORIES AVAILABLE:

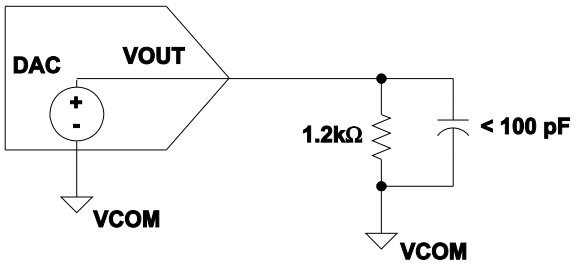
3750-ST screw terminal block

3790-KIT50-R 50 pin female D-sub connector kit (contains 2 female D-sub connectors and 100 solder-cups)

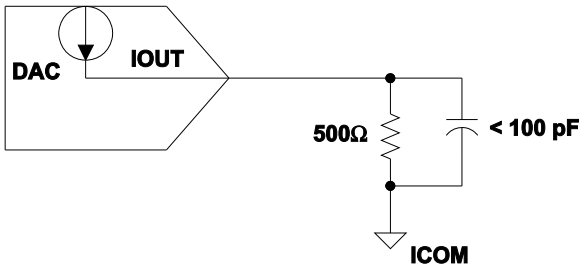
3721-MTC-3 50 pin D-sub female to male cable, 3m

3721-MTC-1.5 50 pin D-sub female to male cable, 1.5m

TEST CIRCUIT FOR VOLTAGE OUTPUT CHANNELS 10 & 11



TEST CIRCUIT FOR CURRENT OUTPUT CHANNELS 10 & 11



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