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Keysight 34952A Multifunction Module

KEYSIGHT TECHNOLOGIES

User's Guide

Notices

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

	Alternating current (AC)		Frame or chassis (ground) terminal
	Standby supply. Unit is not completely disconnected from ac mains when switch is off		Caution, risk of electric shock
	Caution, risk of danger (refer to this manual for specific Warning or Caution information)		

Additional Safety Notices

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or instructions elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability of the customer's failure to comply with the requirements.

General

Do not use this products in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power.

Ground the Instrument

This product is provided with protective earth terminals. To minimize shock hazard, the instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Only qualified, service-trained personal who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Keysight Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit http://about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/34980a
  (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
  (worldwide contact information for repair and service)

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34952A Multifunction Module

The 34952A Multifunction Module with DIO, D/A, and Totalizer combines four 8-bit ports of digital input/output, a 100 kHz totalizer, and two ±12 volt earth-referenced analog outputs. You can include digital inputs and totalizer input in a scan list. You can make connections via standard 50-pin D-sub cables or the optional 34952T terminal block.

Digital Input/Output

The Digital Input/Output (DIO) consists of four 8-bit ports with TTL-compatible inputs and output. The open-drain outputs can sink up to 400 mA. From the front panel, you can read data from only one 8-bit input port at a time. You can configure the DIO ports for 8, 16, or 32-bit operations. The DIO channels are connected by internal 5 V pull-up resistors when configured as inputs.

Totalizer Input

The 32-bit totalizer can count pulses at a 100 kHz rate. You can configure the totalizer to count on the rising edge or falling edge of the input signal. A TTL high signal applied to the Gate terminal enables counting and a low signal disables counting. A TTL low signal applied to the Not-Gate terminal enables counting and a high signal disables counting. The totalizer counts only when both terminals are enabled.

NOTE **When a gate is not connected, the gate terminal is pulled to the enabled state, effectively creating a “gate always” condition.**

Analog Output (DAC)

The two analog outputs are capable of outputting voltages between ±12 volts with 16 bits of resolution. Each DAC channel is capable of 10 mA maximum current. Use the two analog outputs to source bias voltages to your DUT, to control your analog programmable power supplies, or as set points for your control systems. The outputs are programmed directly in volts.

34952A SCPI Programming Examples

The programming examples below provide you with SCPI command examples to use for actions specific to the general purpose switch modules.

The slot and channel addressing scheme used in these examples follow the form sccc where s is the mainframe slot number (1 through 8) and ccc is the channel number. For information on specific configurations, refer to the simplified schematic on page 12.

For complete information on the SCPI commands used to program the 34980A, refer to the *Keysight 34980A Programmer's Reference* which can be downloaded from www.keysight.com/find/34980A.

Digital Input/Output

Example: Configuring a DIO channel The following program segment configures channel 1 on the DAC module in slot 3 as an output and then reads the output value (the channel is not reconfigured as an input). Then, the channel is reconfigured as an input and the value is read again.

The second command below returns 64 as it is physically reading the output data.

```
SOURce:DIGital:DATA:BYTE 64,(@3001)
SENSe:DIGital:DATA:BIT? 0,(@3001)
```

The second command below returns whatever is being input externally.

```
CONFigure:DIGital:STATe INPut,(@3001)
SENSe:DIGital:DATA:BIT? 0,(@3001)
```

Totalizer

Example: Reading totalizer channel count The following command reads the count on totalizer channel 5 on the Multifunction module in slot 3.

```
SENSe:TOTalize:DATA? (@3005)
```

Example: Configuring the totalizer reset mode To configure the totalizer reset mode, send either of the following commands.

The following command configures totalizer channel 5 on the Multifunction module in slot 3 to be read without resetting its count.

```
SENSe:TOTalize:TYPE READ,(@3005)
```

The following command configures totalizer channel 5 on the Multifunction module in slot 2 to be reset to "0" after it is read (**RRESet** means “read and reset”).

```
CONFigure:TOTalize RRES,(@2005)
```

Example: Configuring the totalizer for count This command configures the totalizer to count on the rising edge (positive) or falling edge (negative) of the input signal. The following command configures the totalizer (channel 5) on a Multifunction module in slot 3 to count on the negative edge (falling) of the input signal.

```
TOTalize:SLOPe NEGative,(@3005)
```

Example: Clearing count on the totalizer channel This command immediately clears the count on the specified totalizer channels. The following command clears the count on the totalizer (channel 5) on a Multifunction module in slot 3.

```
TOTalize:CLEAR:IMMediate (@3005)
```

DAC Output

Example: Setting output voltage This command sets the output voltage level for the specified DAC channels. The following command outputs +2.5 V DC on DAC channels (6 and 7) of a Multifunction module in slot 4.

```
SOURce:VOLTage 2.5,(@4006,4007)
```

Configuring a Multifunction Module

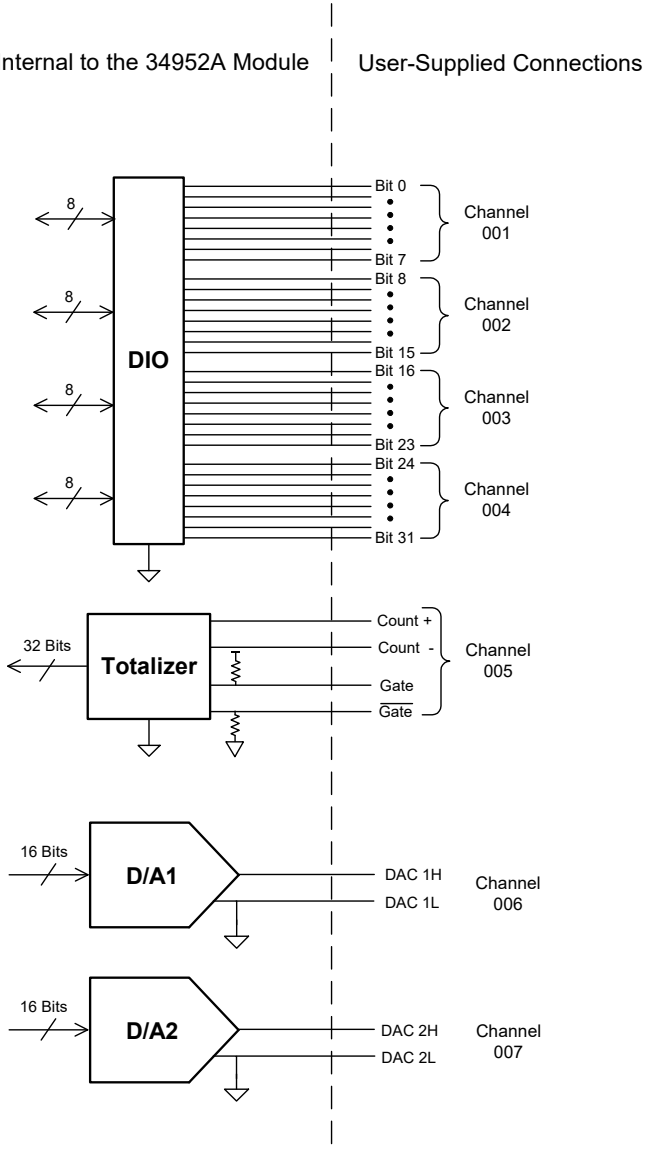
Example: Querying the system for module identify The following command returns the identify of the module installed in slot 7.

```
SYSTem:CTYPe? 7
```

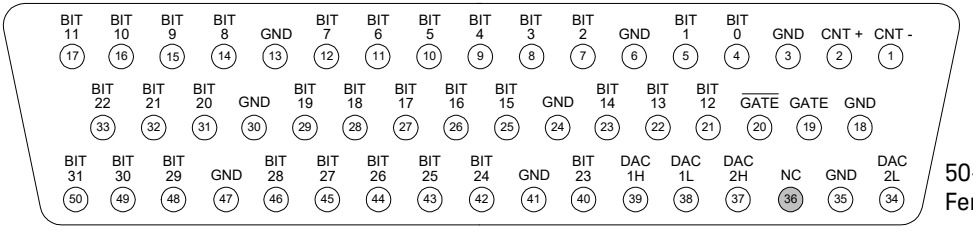
Example: Resetting module(s) to power-on state The following command resets a module in slot 4 to its power-on state.

```
SYSTem:CPON 4
```

34952A Simplified Block Diagram



34952A D-Sub Connector



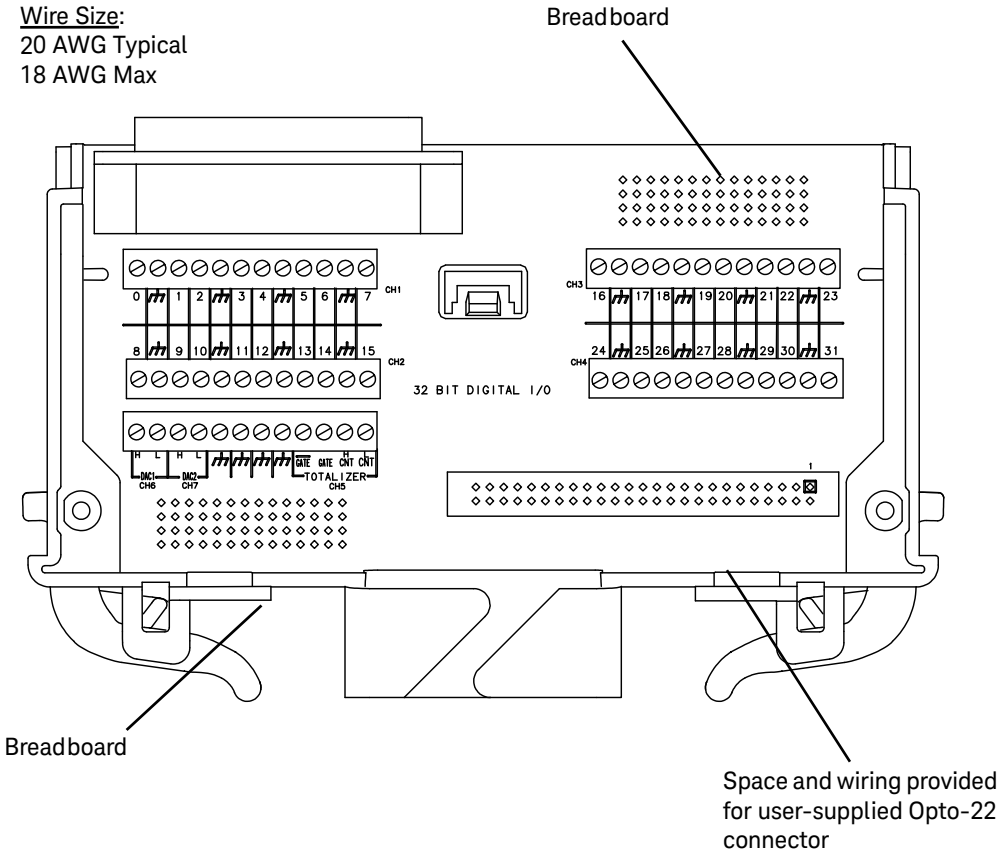
50-Pin D-Sub
Female Connector

Description		Socket	Description		Socket	Description		Socket	Description	Socket
Channel 1	Bit 0	4	Channel 3	Bit 16	26	Channel 5 Totalizer	Count -	1	GND	47
	Bit 1	5		Bit 17	27		Count +	2	No Connect	36
	Bit 2	7		Bit 18	28		Gate	19		
	Bit 3	8		Bit 19	29		Not-Gate	20		
	Bit 4	9		Bit 20	31	Channel 6	DAC 1L	38		
	Bit 5	10		Bit 21	32		DAC 1H	39		
	Bit 6	11		Bit 22	33	Channel 7	DAC 2L	34		
	Bit 7	12		Bit 23	40		DAC 2H	37		
Channel 2	Bit 8	14	Channel 4	Bit 24	42		GND	3		
	Bit 9	15		Bit 25	43		GND	6		
	Bit 10	16		Bit 26	44		GND	13		
	Bit 11	17		Bit 27	45		GND	18		
	Bit 12	21		Bit 28	46		GND	24		
	Bit 13	22		Bit 29	48		GND	30		
	Bit 14	23		Bit 30	49		GND	35		
	Bit 15	25		Bit 31	50		GND	41		

34952T Terminal Block

Each terminal block is labeled with the model number and the abbreviated module name. In addition, space is available on the label for you to write the slot number.

The 34952T provides space for breadboard and for a connector to control an external Opto-22 standard board.



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