Installation Guide

Agilent E5255A 24 (8×3) Channel Multiplexer

Agilent Technologies

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    Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

    Indicates dangerous voltage and potential for electrical shock. Do not touch terminals that have this symbol when instrument is on.

    Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

    Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

    Indicates earth (ground) terminal.

    Alternating current.

    Direct current.

    ON (Supply).

    OFF (Supply).

    STANDBY (Supply).

    CAT 1   Means INSTALLATION CATEGORY I. Measurement terminals on the rear panel comply with INSTALLATION CATEGORY I.

WARNING   **The warning sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personal.**

CAUTION   The caution sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

Printing History

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Product Description

Agilent E5255A 24 (8×3) Channel Multiplexer is a 2-input to 24-output multiplexer card for Agilent E5250A Low Leakage Switch Mainframe. The E5255A consists of 3 blocks (three 2×8 multiplexers). So, one E5255A can be configured as three 2×8 multiplexers, a 2×16 multiplexer and a 2×8 multiplexer, or a 2×24 multiplexer. "2-input" means one BIAS input and one IV input.

The E5255A is designed for semiconductor device reliability testing which needs to automatically scan instrument input/output for many DUTs.

A maximum of four E5255As can be installed in the E5250A, which can use the multiplexers in several configurations. For example, the E5250A can configure twelve 8-output multiplexers, six 16-output multiplexers, four 24-output multiplexers, three 32-output multiplexers, two 48-output multiplexers, or one 96-output multiplexer.

The input/output connectors and block diagram of the E5255A are shown below.

Input/Output Connectors
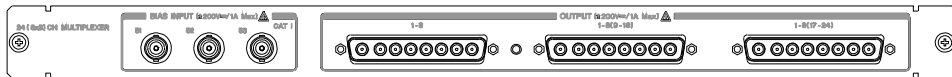
2×8 multiplexer Block No.	BIAS INPUT (Port No.)	Output Port No.	OUTPUT Connector (Location)
Block1	BIAS1 (51)	Output 1 to 8	Left
Block2	BIAS2 (52)	Output 9 to 16	Center
Block3	BIAS3 (53)	Output 17 to 24	Right

WARNING **Do not touch the force and guard terminals of the OUTPUT connectors while the E5250A is turned on. Dangerous voltages up to the maximum input voltage may be present at the OUTPUT connectors.**
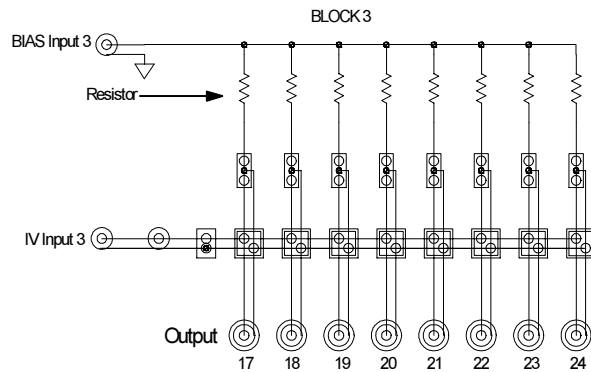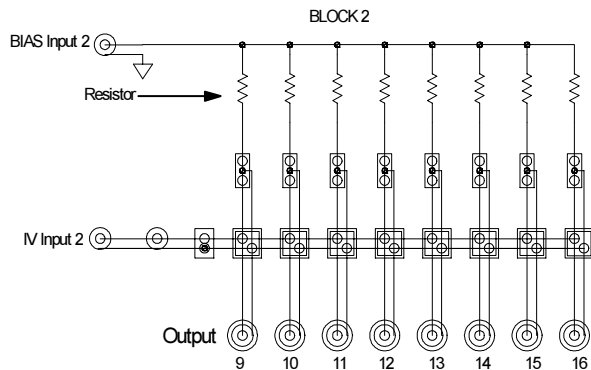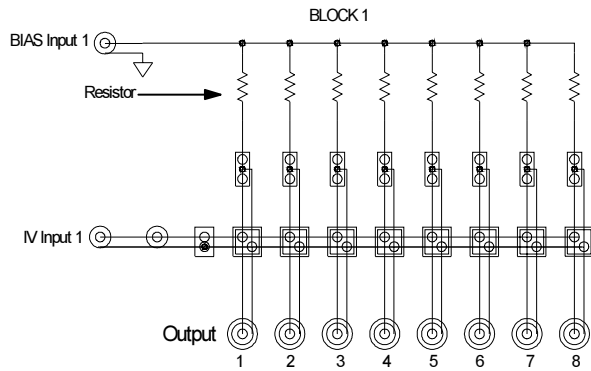
CAUTION The maximum voltage that can be applied to any input terminal is ±200 Vdc. The maximum current is 1 Adc at ±200 Vdc. The maximum voltage that can be applied between input terminals is 300 Vdc. Do not apply an input signal over these limits to the E5255A inputs. If you do, the E5255A will be damaged.

If you use a bias source that has current limit capability, set the bias source current limit to less than 1 Adc.

Block Diagram

The following figure shows the block diagram of the E5255A.

BLOCK 1

BLOCK 2

BLOCK 3

BIAS Input	The BIAS INPUT ports are used to apply ac or dc bias to DUT. BIAS INPUT ports are BNC connectors. Each BIAS INPUT port is assigned to a 2×8 multiplexer block as shown in the table on page 6. And you can make internal connections to connect a BIAS INPUT port to multiple blocks. Refer to "Internal Connections".
IV Input	IV input is used for measuring/forcing dc current/voltage. You can connect the IV input to desired the E5250A SMU INPUT connector (SMU1 to SMU6) by making an internal connection. Refer to "Internal Connections". The E5250A AUX INPUT connectors are not used with the E5255A.
OUTPUT Connectors	The E5255A has three 8-channel coaxial output connectors. Each output connector is assigned to a 2×8 multiplexer as shown in the table on page 6.
Resistors	Resistors connected between BIAS path and IV path are for protecting DUT from electrical damage. When shipped from factory, 0 Ω resistance is used in the E5255A. You can easily replace with desired resistors. Refer to "Internal Connections". The following resistors are furnished with the E5255A:

- 0 Ω resistors (3 sets with 10 resistors in each set)

- 1.2 kΩ resistors (3 sets with 10 resistors in each set)

- 22 kΩ resistors (3 sets with 10 resistors in each set)

If you replace initial 0 Ω resistors with other resistors, you must cut the initial resistors. Then, if you need 0 Ω resistors again, use the ones listed above.

Internal Connections

The E5255A multiplexer card has three 2×8 multiplexers. And you can configure several multiplexers by modifying some internal connections.

This section covers:

- "To Modify IV Input Connection"
- "To Modify BIAS Input Connection"
- "Mounting Protective Resistors"
- "Setting up Several Example Configurations"

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WARNING   **Only qualified service personnel should install or configure the E5255A. Before removing or installing the plug-in cards, disconnect the following from the rear side of the E5250A:**

1. Disconnect the power cable.

2. Disconnect all cables from input/output terminals.

CAUTION   When the E5255A is shipped from factory, it has been confirmed that the E5255A satisfies its specifications.

But after you install the E5255A into your E5250A, the specifications of your E5250A with the card are not guaranteed.

For verifying the specifications, contact your nearest Agilent Technologies Service Center.

CAUTION   Use clean handling and anti-static procedures when removing, configuring, and installing the plug-in cards. The cards contain components that can be damaged by static electricity.

CAUTION   Be careful about the module pins used for internal connection to the E5250A. The pins can be damaged easily.

Table below shows the initial setting of the E5255A internal connections. The setting does not depend on the card slot in which the card is installed. For changing the multiplexer configurations, you need to change the internal connections.

Initial Internal Connections of E5255A

Block No.	IV Input Connection	BIAS Input	Protective Resistor
1	SMU INPUT 1	BIAS INPUT 51	0 Ω
2	SMU INPUT 2	BIAS INPUT 52	0 Ω
3	SMU INPUT 3	BIAS INPUT 53	0 Ω

Component locations on the E5255A card are shown in the following figure, and the relation of the multiplexer blocks and the components is shown in the table below.
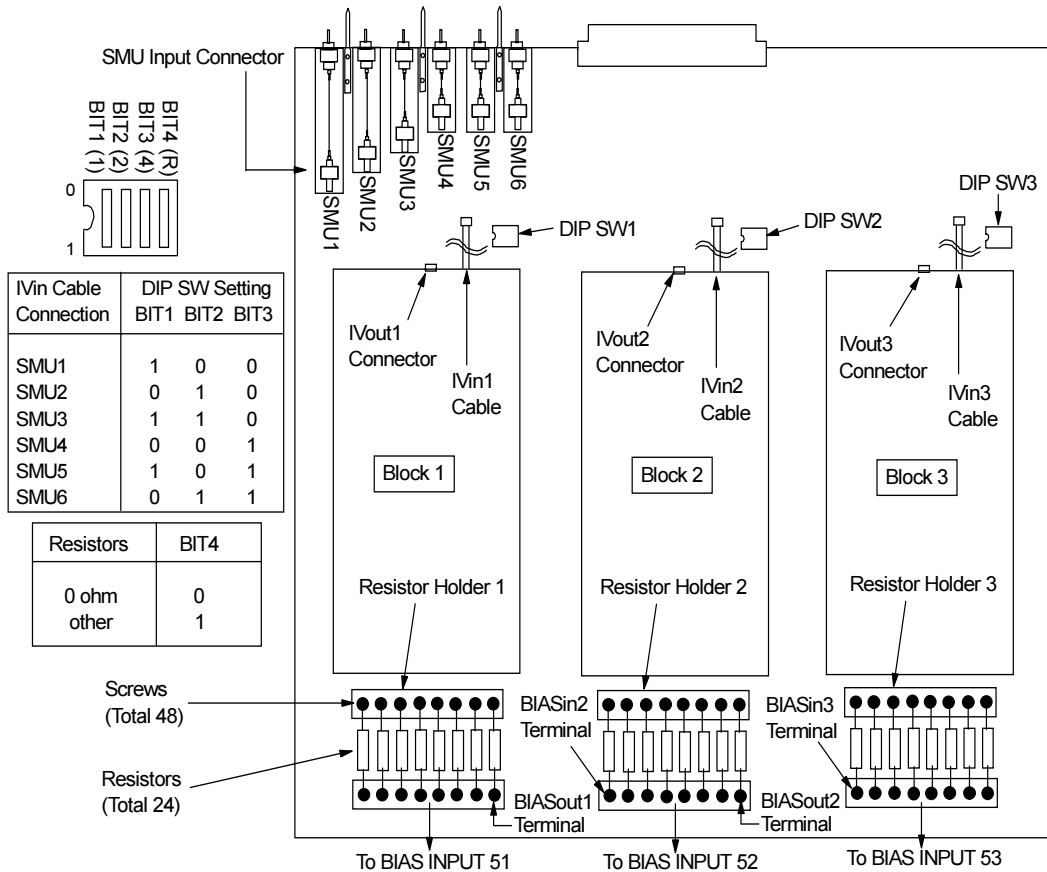
To Modify IV Input Connection

IV input connection is defined by the connection of IVin cable shown in the following figure. For actual examples of modifications, refer to "Setting up Several Example Configurations" later in this section.

To Modify BIAS Input Connection

Each multiplexer block has an independent external BIAS INPUT connector. You can change the BIAS input externally using the BIAS INPUT connectors, or internally using the internal BIASin/BIASout terminals shown in the following figure. For actual examples of modifications, refer to "Setting up Several Example Configurations" later in this section.

E5255A Component Locations

IVin Cable Connection	DIP SW Setting BIT1 BIT2 BIT3		
SMU1	1	0	0
SMU2	0	1	0
SMU3	1	1	0
SMU4	0	0	1
SMU5	1	0	1
SMU6	0	1	1

Resistors	BIT4
0 ohm	0
other	1

E5255A Multiplexer Blocks and Components

Multiplexer Block	Resistor Holder	BIAS Input Terminal	BIAS Output Terminal	IV Input Cable	IV Output Connector	DIP Switch
Block 1	Holder 1	none	BIASout 1	IVin 1	IVout 1	DIP SW1
Block 2	Holder 2	BIASin 2	BIASout 2	IVin 2	IVout 2	DIP SW2
Block 3	Holder 3	BIASin 3	none	IVin 3	IVout 3	DIP SW3

CAUTION   As shown in the table on page 12, each multiplexer block has a DIP switch.

The DIP switches must be set properly after you complete the internal connection. Each DIP switch has four bit switches.

Bits 1 to 3 are used to specify which SMU input connector is connected to the IV input port of the block.

Bit 4 of DIP switch is related to the resistors in the resistor holders. If 0 Ω resistors are installed in the resistor holder for a block, set bit 4 of DIP switch to 0. If other resistors are installed, set bit 4 to 1.

Make sure you set the DIP switches correctly. If not, dangerous voltages may be applied to unexpected output connectors.

NOTE   The SMU input connectors on the card are connected to the E5250A internal bus when the card is installed in the E5250A slot. This allows you to connect desired multiplexer blocks of multiple E5255As.

For example, if you want to make a 32 channel multiplexer by using four "Block1" multiplexers of four E5255As, connect the "IVin1" cable for each E5255A to the same SMU input connector.

⚠ Mounting Protective Resistors

To protect the device (DUT) from electrical damage, you can mount resistors between the IV input and BIAS input of multiplexer. The following procedure shows how to mount the resistors. Refer to the figure on page 12 for the component locations shown in the procedure.

NOTE   When shipped from the factory, 0 Ω resistors are mounted, and bit 4 of all DIP switches is set to 0.

1. Cut the original resistors (0 Ω) off the E5255A.

2. Loosen the screws from both sides of the resistor holder.

3. Put resistors in holder, and tighten screws. And confirm that the resistors are held properly.

   Resistors should be mounted on each multiplexer block that you will use (8 resistors/block).

4. Set bit 4 to 1 for the DIP switch of the related block.

   If you mounted resistors for all multiplexer blocks (block 1 to block 3), set bit 4 to 1 for all DIP switches: "DIP SW1", "DIP SW2", and "DIP SW3".

WARNING   **Be careful about the following when selecting protective resistors:**

- **If only one E5255A is installed in the mainframe, total power consumption by resistors must be less than 16W.**

- **If multiple E5255As are installed in the mainframe, total power consumption by resistors must be less than 32W.**

- **Consider the current flows to resistor when DUT shorts, and make sure the power consumption by resistor will be within specification of resistor.**

   Do not use resistors that have specifications inadequate for your applications, which will result in resistors heating up, burning, or smoking.

Be careful about the heating of the rear panel of mainframe or plug-in card, which may be heated by resistors, even if you follow this warning.

Setting up Several Example Configurations

The following example configurations are described:

- Making 3-BIAS-Input/1-IV-Input $\times$ 24-output multiplexer
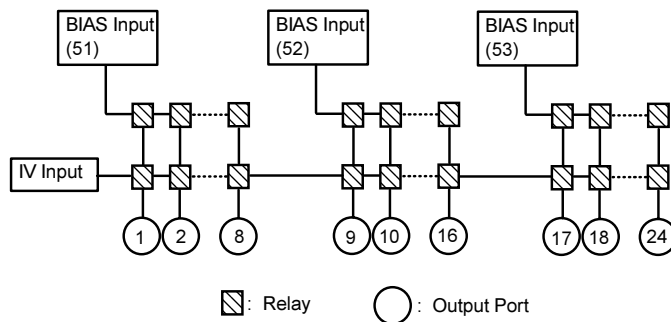- Making 2-input $\times$ 24-output multiplexer

In the above list, "2-input" means "1-BIAS-input/1-IV-input".

For component locations of following procedure, see the figure on page 12:

Making 3-BIAS-Input/1-IV-Input $\times$ 24-output multiplexer

To make this multiplexer, you use three multiplexer blocks of a E5255A as shown in the following figure.

1. Connect the "IVin1" cable of "Block1" to the desired SMU input connector. This will be the IV input for the 24 channel multiplexer.

2. Connect the "IVin2" cable of "Block2" to the "IVout1" connector of "Block1".

3. Connect the "IVin3" cable of "Block3" to the "IVout2" connector of "Block2".

4. Set "DIP SW1", "DIP SW2", and "DIP SW3" according to which SMU input connector is connected to the "IVin1" cable. The bit 1 to 3 settings of these three DIP switches must be the same.

Making 2-input × 24-output multiplexer

1. Connect the "IVin1" cable of "Block1" to the desired SMU input connector. This will be the IV input for the 24 channel multiplexer.

2. Connect the "IVin2" cable of "Block2" to the "IVout1" connector of "Block1".

3. Connect the "IVin3" cable of "Block3" to the "IVout2" connector of "Block2".

4. Connect "BIASout1" terminal to "BIASin2" terminal by using the wire included in the BIAS Input Modification Kit furnished with the E5255A.

5. Connect "BIASout2" terminal to "BIASin3" terminal by using the wire.

6. Set "DIP SW1", "DIP SW2" and "DIP SW3". The bit 1 to 3 settings of these three DIP switches must be the same.

7. Connect BNC open caps included in the BIAS Input Modification Kit furnished with the E5255A to BIAS INPUT 52 and 53 connectors. So, in this case, BIAS INPUT 51 connector will be the bias input port of the 24 channel multiplexer.

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WARNING

Steps 4 and 5 internally connect all BIAS INPUT connectors of the E5255A. So, when bias is applied to a BIAS INPUT connector, the bias will also be applied to all the other BIAS INPUT connectors.

Do not forget to connect the BNC open caps to the unused BIAS Input connectors. Otherwise, you will be shocked if you touch the connectors while bias is applied.

DO NOT connect the BNC short cap to the connectors. If you do, the E5255A and the Bias Source will be destroyed when the bias is applied.

NOTE   Instead of internal BIAS input connection described in the previous procedure, you can also interconnect the three BIAS inputs by using only external connections of BIAS INPUT connectors as follows:
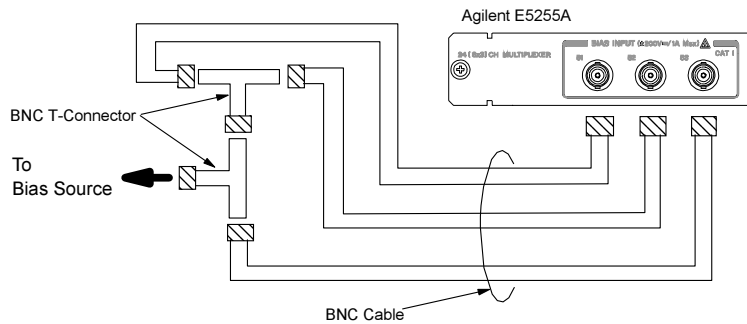
For example above, all 24 channels of the multiplexer will have the same bias input. You connect all BIAS INPUT connectors by using three BNC cables and two BNC-T type (f-m-f) adapters.

Recommended Parts for the BNC-T type adapters:

Agilent part number 1250-0781: female(side)-male(center)-female(side)

Agilent part number 1250-2405: male(side)-female(center)-female(side)

Installation

The E5255As are plug-in cards (modules) for the E5250A Low Leakage Switch Mainframe. You install these cards in card slots 1 to 4 of the E5250A. The following procedure explains the card installation and removal:

Procedure:

1. Turn off the E5250A, then wait at least 10 seconds before you remove or install a card.

2. Remove blank panel or card from the slot where you want to install the new card as follows:

    • To remove blank panel, do as follows:

      Loosen the screws on both the left and right edges of the blank panel by using the wrench furnished with the E5255A, then remove the blank panel.

    • To remove a card, do as follows:

      a. Screw the Module Extractor into the screw hole for the extractor. See the following figure. Module Extractor is furnished with the E5250A.

      b. Loosen the screws on left and right edges of the card by using the wrench furnished with the E5255A.

      c. Gently pull the Module Extractor to extract the card from the card slot.
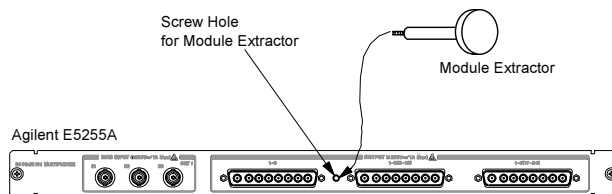
3. Install the card as follows:

    a. Align the card with the left and right slot guide rails. The component side should be facing up.

    b. Push the card into the slot until you feel it seat firmly into the connector at the back of the card slot.

    c. Screw in the screws on the left and right edges of the card by using the wrench furnished with the E5255A.
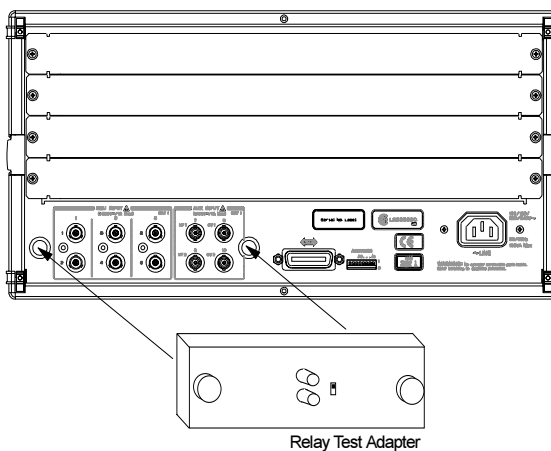
4. Execute the Relay Test as follows:

NOTE   To execute the relay test, you need to prepare the following parts.

Relay Test Adapter (Agilent E5250A Option 301)

BNC Short Caps (3 caps are furnished with each E5255A)

a. Attach the Relay Test Adapter to the E5250A input connectors as shown in the following figure.

b. Set switch on the Relay Test Adapter to Relay Test position.

c. Connect a BNC Short Cap to each E5255A BIAS INPUT connector.

d. Make sure no output cables are connected to any cards in the E5250A mainframe.

e. Turn on the E5250A.

f. Press the **Local/Self Test** key on the E5250A front panel. The Relay Test executes.

g. Wait until the LED in **Local/Self Test** key turns off.

Relay Test Adapter

NOTE   After executing the relay test, if the Fail LED turns on, the cause is one of the following:

- The Relay Test Adapter is not connected.

- You did not properly install the E5255A. See "Internal Connections".

Or, a plug-in card may be defective. Contact your nearest Agilent Technologies Service Center.

NOTE   The Relay Test *cannot* be used to verify the specifications of the E5250A with the E5255A.

To verify the specifications, return the E5250A with the cards installed to your nearest Agilent Technologies Service Center. The performance verification should be done by service personnel who are trained to service the E5250A, and should be performed once a year.