

Controlling Multiport Test Set

Controlling Multiport Test Set Overview

This section provides information about controlling multiport test set (E5092A/E5091A) with E5071C.



- Connecting E5071C and Multiport Test Set
- Setting Multiport Test Set
- Performing Measurement
- Controlling Multiport Test Set by Programming

Connecting E5071C and Multiport Test Set

- Connecting E5071C (Option 440/445/460/465/480/485) and E5092A
- Connecting E5071C (Option 4D5/4K5) and E5092A
- Connecting E5071C (Option 440/445/460/465/480/485) and E5091A
- Connecting Two Multiport Test Sets
- Recommended Wrench

Other topics about Controlling Multiport Test Set

Connecting E5071C (Option 440/445/460/465/480/485) and E5092A

Required Devices

The devices required to connect the E5071C (option 440/445/460/465/480/485) to the E5092A configurable multiport test set are listed below:

- E5071C (option 440/445/460/465/480/485)
- E5092A (option 020)
- Type-N to SMA coaxial adapter (included in the E5092A-08C for connection with the E5071C, Agilent part number: 1250-2879)
- SMA semi-rigid cable (included in the E5092A-08C for connection with the E5071C, Agilent part number: E5092-61652)
- USB cable (supplied with the E5092A, Agilent part number: 8121-1695)
 - For the rackmount usage, it is recommended to use semi-rigid cable (Agilent part number: E5092-61654, included in the E5092A-08C) for connection with the E5071C.

USB Cable Connections and Driver Installation

1. Connect the USB cable between one of USB ports on the E5071C rear panel and that of the E5092A.
2. Turn on the E5071C and the E5092A.
3. The **Found New Hardware Wizard** appears. Select install the software automatically, then click **Next**.



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4. Click **Finish**.

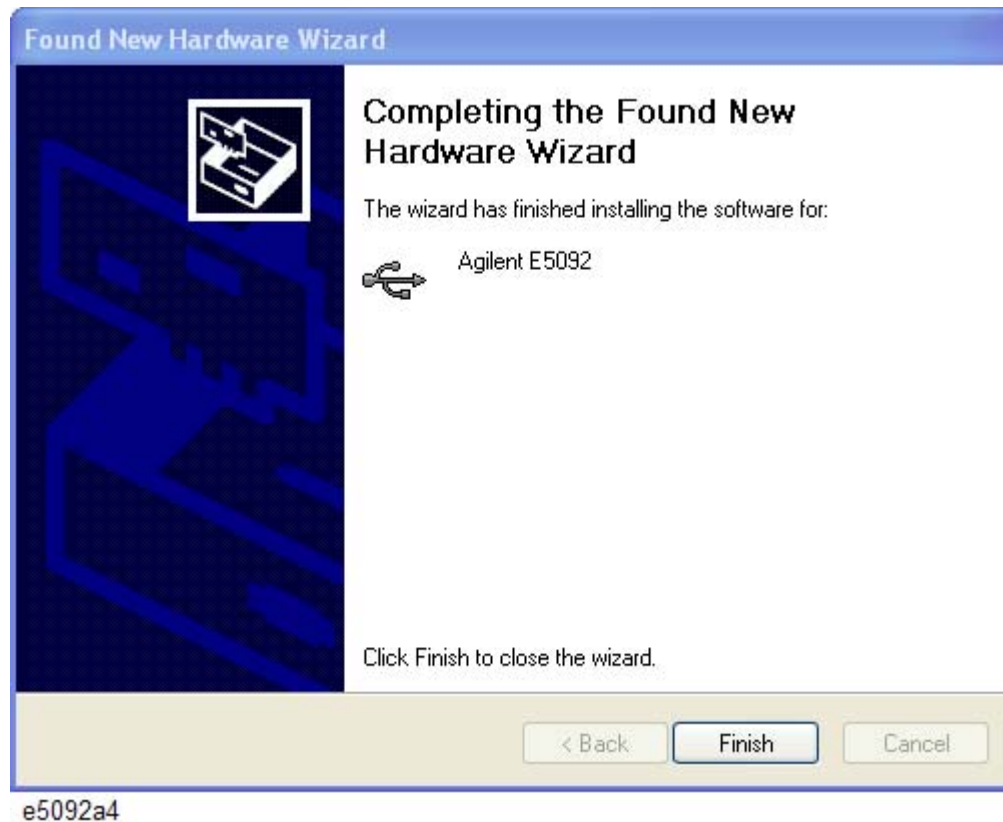
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5. The **Found New Hardware Wizard** appears again. Select install the software automatically, then click **Next**.



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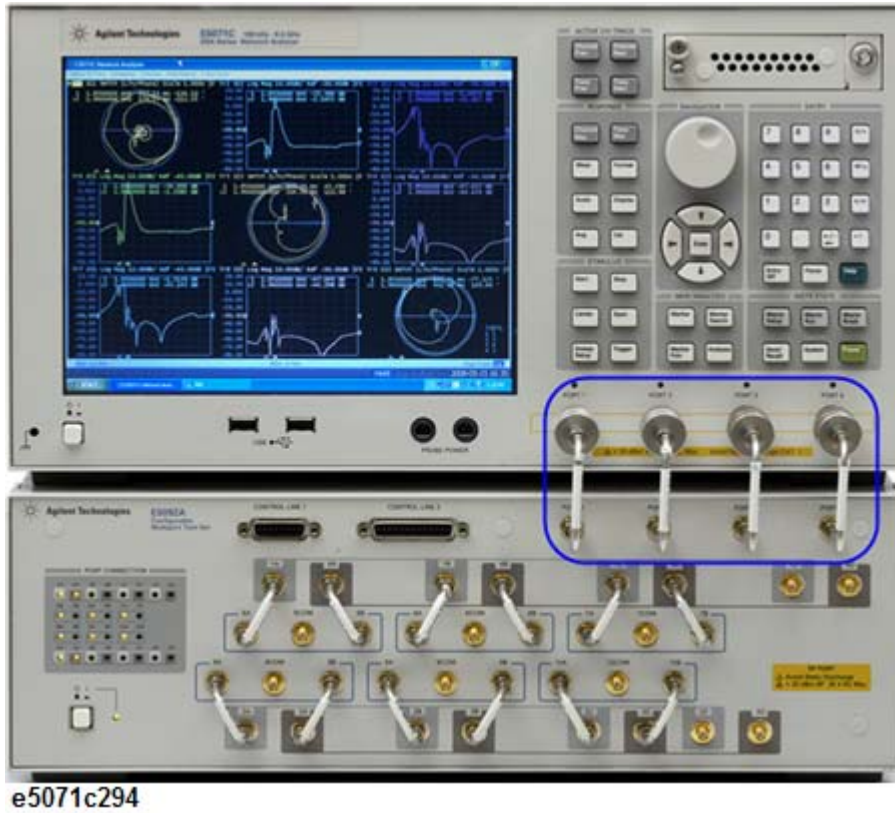
6. Click **Finish**.



7. After the E5071C detects the E5092A, the LEDs that indicate the connected test ports remain on.
8. E5071C should be reset once the multiport test set driver is updated.

RF Cable Connection

1. Connect the type-N to SMA adapter on the test ports (PORT 1 to 4) of the E5071C.
2. Connect the SMA semi-rigid cables between the adapters on the E5071C and the test ports (PORT 1 to 4) of the multiport test set. Make the connection so that the numbers of the ENA ports and the test set ports match.



Connecting E5071C (Option 4D5/4K5) and E5092A Required Devices

The devices required to connect the E5071C (option 4D5/4K5) to the E5092A configurable multiport test set are listed below:

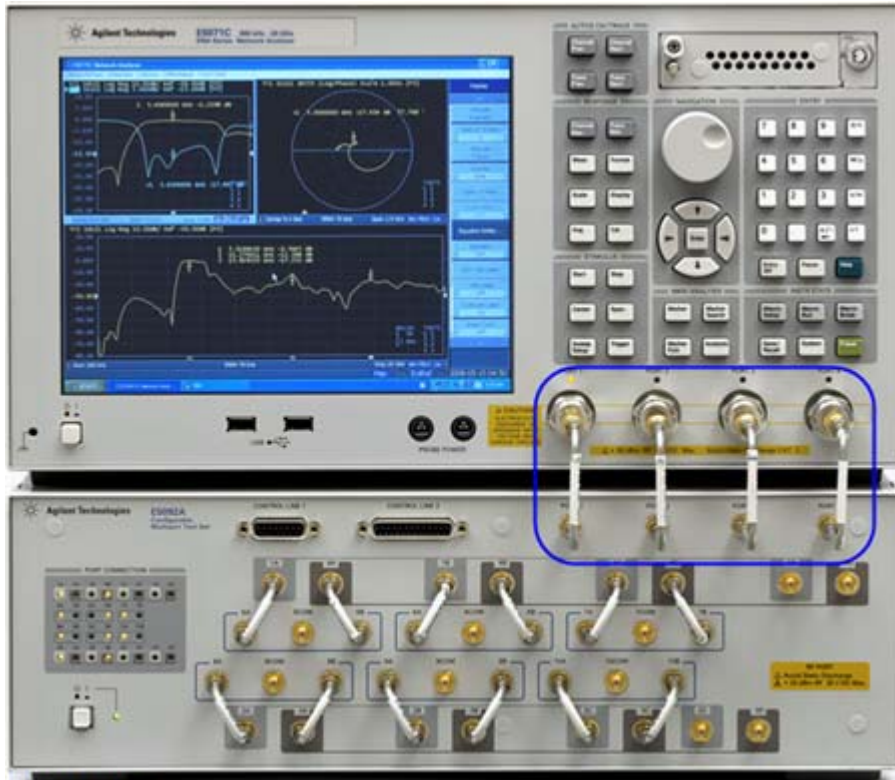
- E5071C (option 4K5)
- E5092A (option 020)
- 3.5mm (female) to 3.5mm (female) coaxial adapter (included in the E5092A-20C for connection with the E5071C, Agilent part number: 85027-60005)
- Semi-rigid cable (included in the E5092A-20C for connection with the E5071C, Agilent part number: E5092-61653)
- USB cable (supplied with the E5092A, Agilent part number: 8121-1695)
 - For the rackmount usage, it is recommended to use semi-rigid cable (Agilent part number: E5092-61655, included in the E5092A-20C) for connection with the E5071C.

USB Cable Connections and Driver Installation

RF Cable Connection

E5071C

1. Connect the coaxial adapter on the test ports (PORT 1 to 4) of the E5071C.
2. Connect the SMA semi-rigid cables between the adapters on the E5071C and the test ports (PORT 1 to 4) of the multiport test set. Make the connection so that the numbers of the ENA ports and the test set ports match.



Connecting E5071C (Option 440/445/460/465/480/485) and E5091A

Required Devices

The devices required to connect the E5071C (option 440/445/460/465/480/485) to the E5091A multiport test set are listed below:

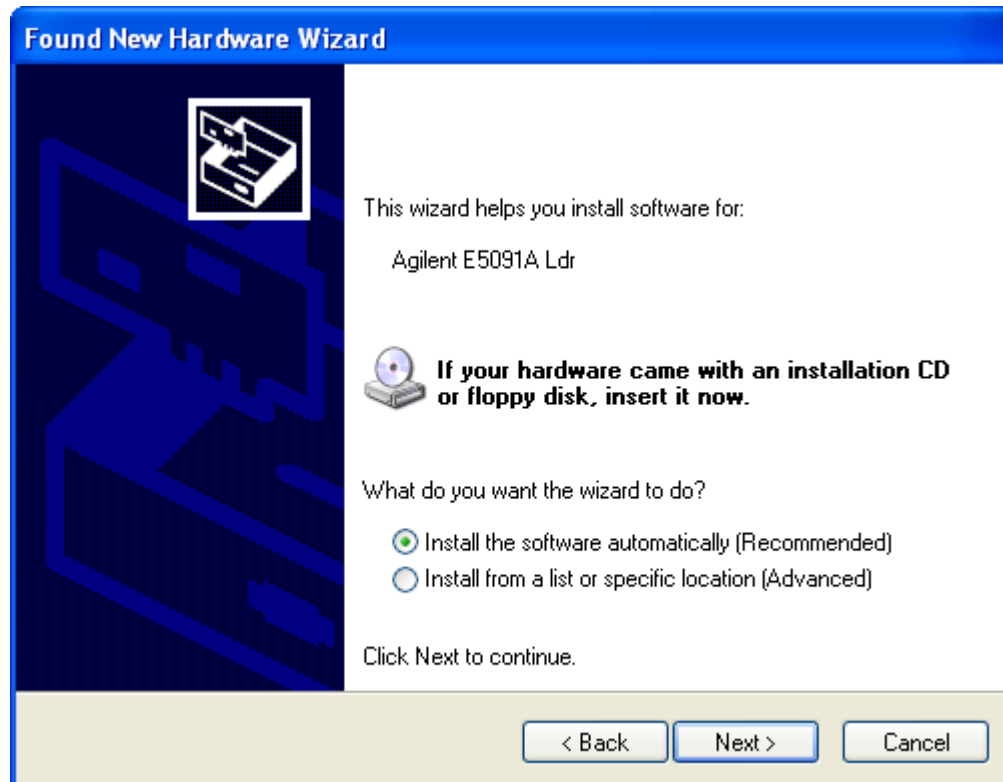
- E5071C (option 440/445/460/465/480/485)
- E5091A (option 009/016)
- Type-N to Type-N cable (supplied with the E5091A option 009 or 016 for connection with the E5071C, Agilent part number: 8120-4782)
- USB cable (supplied with the E5091A, Agilent part number: 8121-0770)

USB Cable connections and Driver Installation

1. Connect the USB cable between one of USB ports on the E5071C rear panel and that of the E5091A.
2. Turn on the E5071C and the E5091A.
3. The **Found New Hardware Wizard** appears. Select **No, not this time**, then click **Next**.

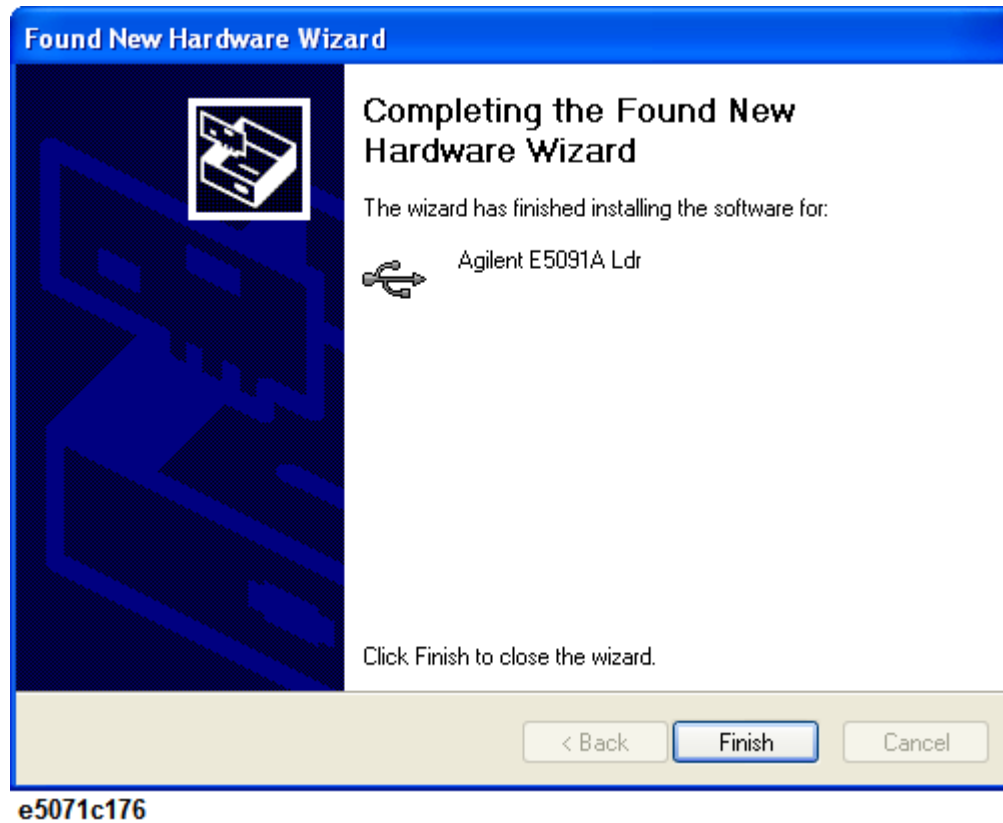


4. Select Install the software automatically, then click **Next**.

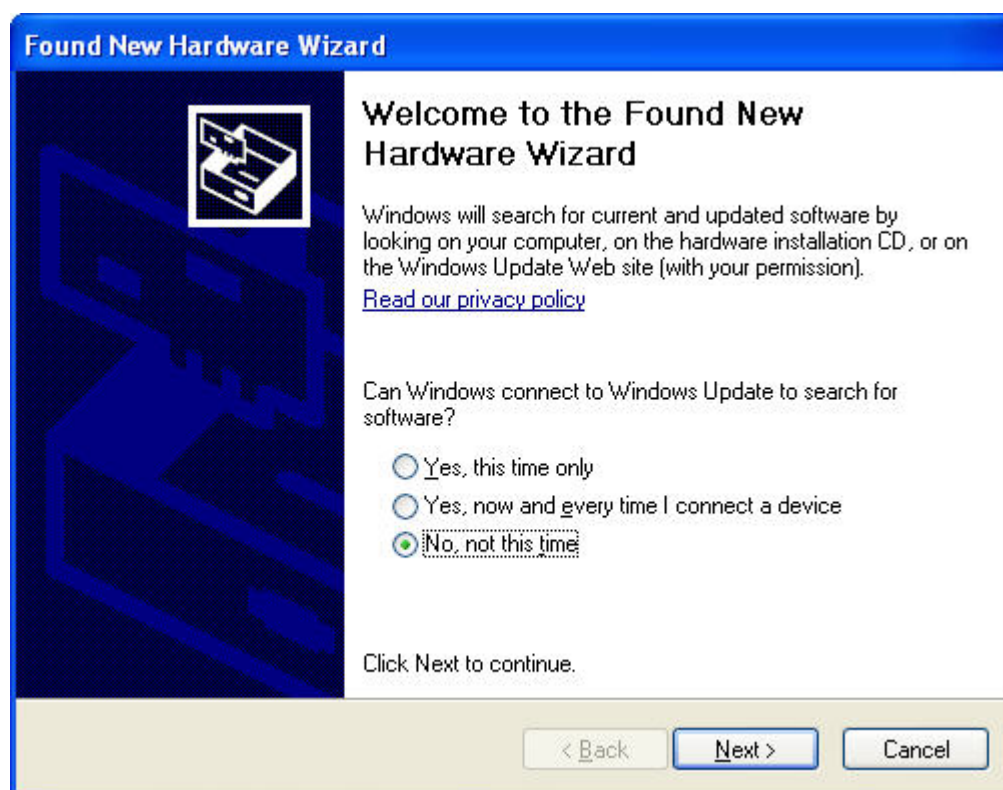


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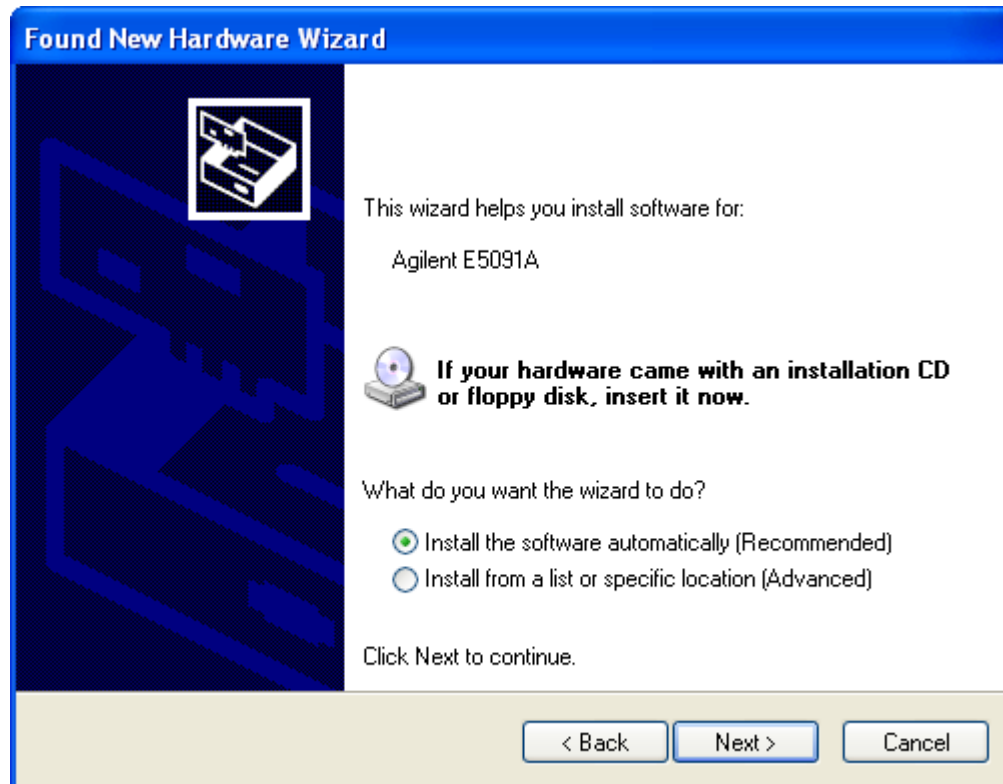
5. Click **Finish**.



6. The **Found New Hardware Wizard** appears again. Select **No, not this time**, then click **Next**.

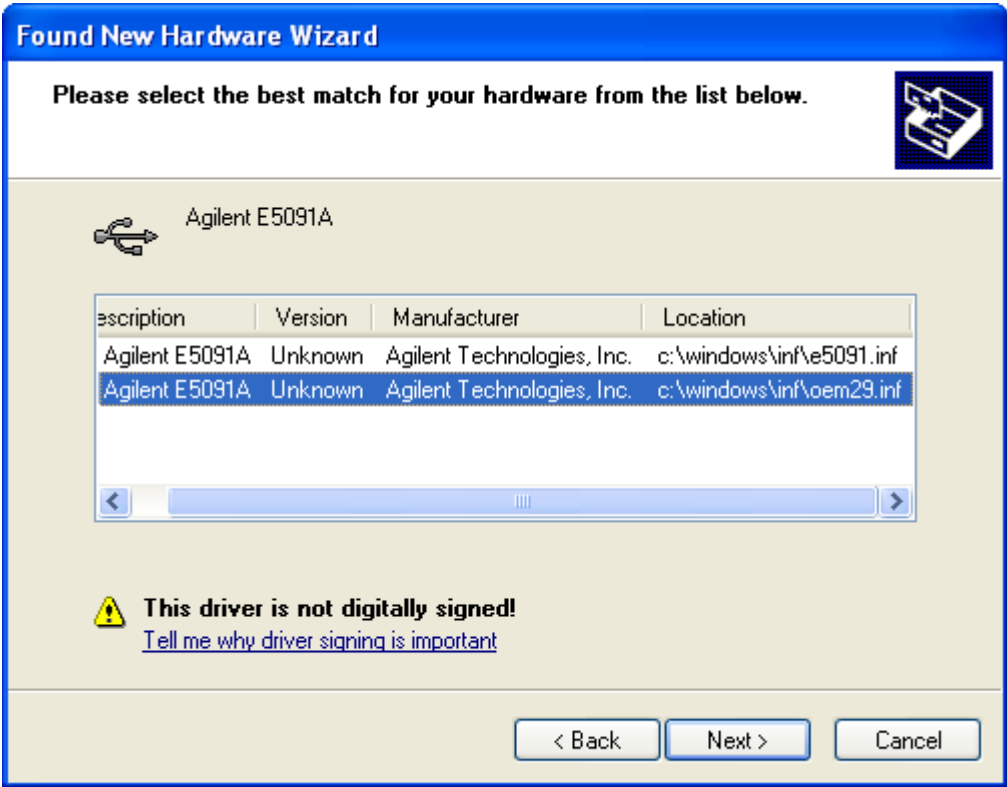


7. Select Install the software automatically, then click **Next**.



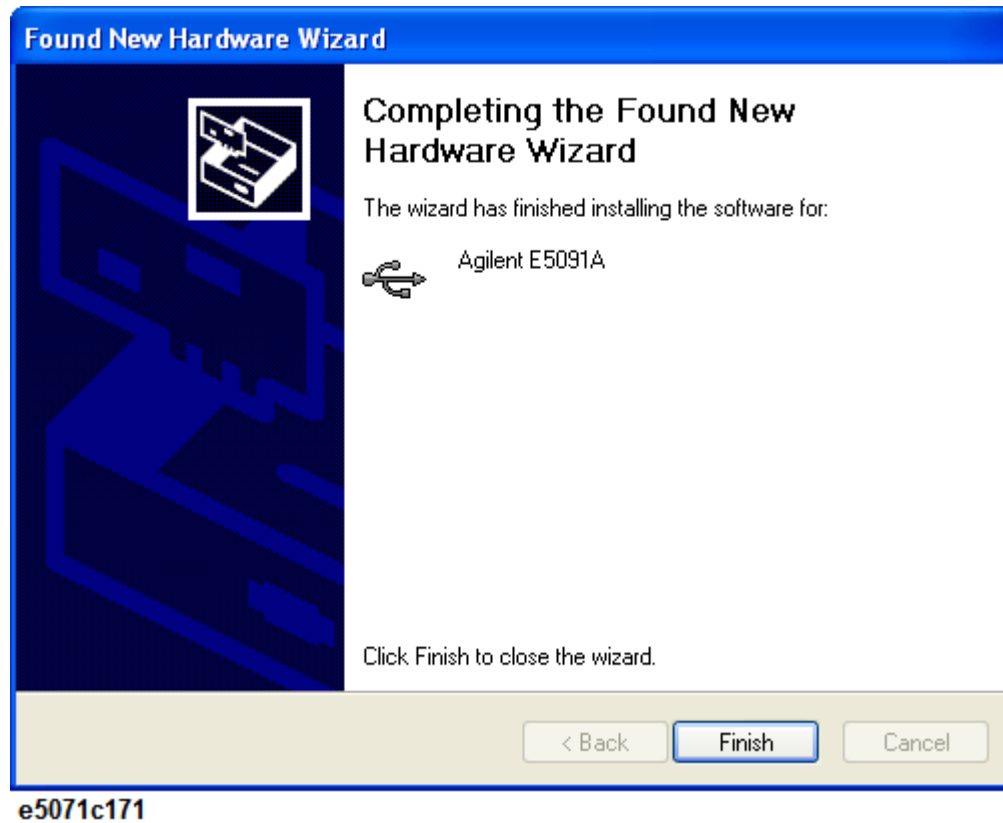
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8. Select **Agilent E5091A** of Location **C:\windows\infoemxx.inf** (xx is numeric number e.g.: **oem29.inf**), then click **Next**.



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9. Click **Finish**.



10. After the E5071C detects the E5091A, the LEDs that indicate the connected test ports remain on.

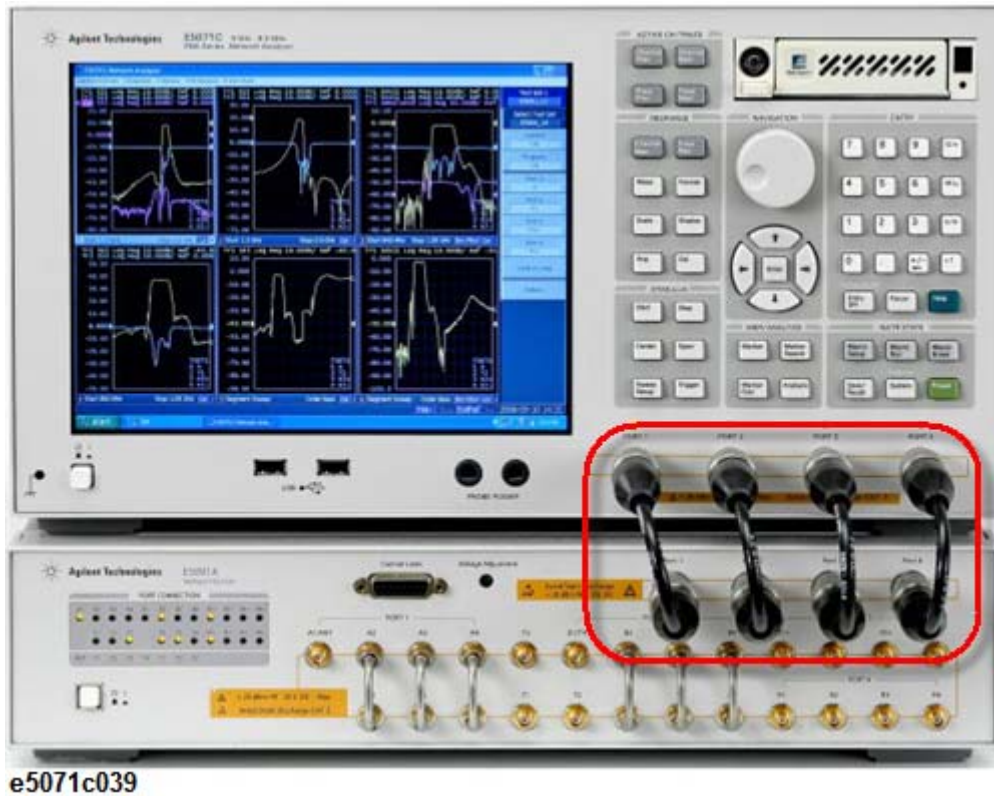
NOTE Do not switch on/off devices connected via the USB ports (front or rear panel) or connect/disconnect devices to the USB ports while the E5071C is measuring with the E5091A.

NOTE Even if you install the driver on a USB port, you will be asked to install driver again if you connect E5091A with a different USB port.

RF Cable Connection

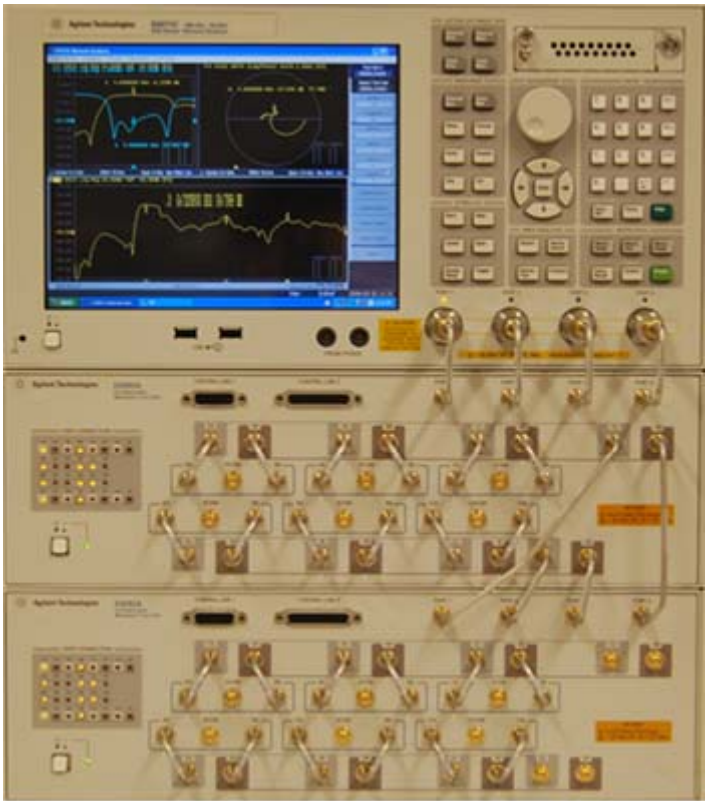
Connect the type-N cables between the test ports (PORT 1 to 4) of the E5071C and the test ports (PORT 1 to 4) of the multiport test set. Make the connection so that the numbers of the ENA ports and the test set ports match.

E5071C



Connecting Two Multiport Test Sets

Up to two multiport test sets can be connected to one ENA for measurements with more multiple test ports.



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- 1. Set IDs of connected multiport test sets to different values. The instruments will not work correctly if their IDs are the same. For more information, see Selecting ID for Multiport test Set.
- 2. Press **System** key > **Multiport Test Set Setup** to display the multiport test set setup menu.
- 3. Select **Test Set 1** for the test set with ID 1 and **Test Set 2** for ID 2.
- 4. The E5091A (option 009 and 016) and the E5092A (option 020) can be used at the same time.

Recommended Wrench

When using a semi-rigid cable, connect the semi-rigid cable to a test port of the multiport test set with a specified torque using a torque wrench.

Specified torque	5.7 kgf-cm/ 56 N-cm / 5 in-lb
Recommended wrench	Wrench (Agilent part number 8710-1582)

Setting the Multiport Test Set

This section describes the settings of the multiport test set. The following table shows the flow used for item setting:

Setting flow for multiport test set

Item	Description
Selecting ID for Multiport Test Set	Selects the ID of the multiport test set you want to set
Selecting the Configuration of the Multiport Test Set	Selects the configuration of the multiport test set you want to set
Assigning Test Ports	Assigns test ports of the E5071C and those of the multiport test set
Displaying the Properties	Displays the multiport test set property to check the port setting
Setting Control Line	Makes the setting of the control line that controls the DUT

Other topics about Controlling Multiport Test Set

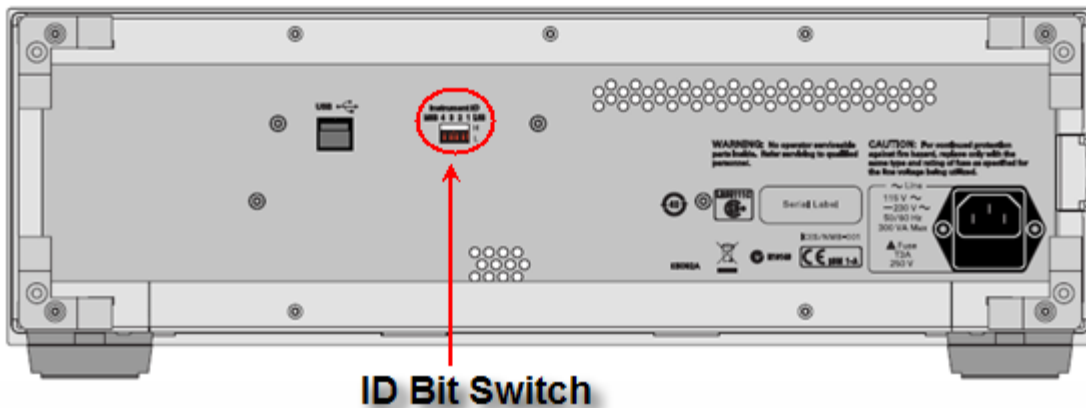
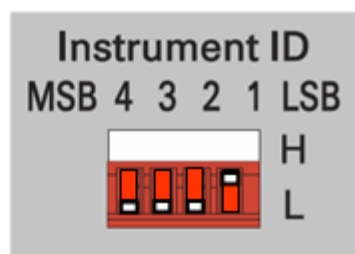
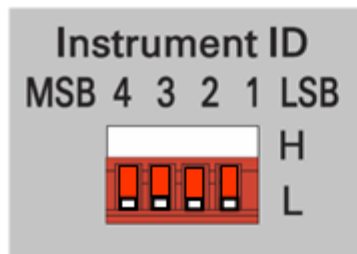
Selecting ID for Multiport Test Set

Operational Procedure

- 1. Set the target ID to the ID of the connected multiport test set.
- 2. Press **System** key > **Multiport Test Set Setup** to display the multiport test set setup menu.
- 3. Select **Test Set 1** for ID 1 and **Test Set 2** for ID 2. The ID is set with the bit switch on the rear panel of the multiport test set.

ID Bit Switch of E5091A



ID Bit Switch of E5092A**ID 1****ID 2****e5071c500**

- Change the ID bit switch setting while the E5071C is turned off.
- Two multiport test set can be controlled from one E5071C by assigning an ID number (ID 1 or ID 2) on each test set.
- The E5091A (option 009 and 016) and the E5092A (option 020) can be used at the same time.

Selecting the Configuration of the Multiport Test Set

Select the configuration of the multiport test set you want to set.

Operational Procedure

1. Press **System** > **Multiport Test Set Setup** > **Test Set 1** or **Test Set 2**.
2. Click **Select Test Set**.
3. Select the configuration of the multiport test set from the following selection:

Test set	Softkey	Configuration
E5092A	E5092_13	Select the 13-port configuration of the E5092A (E5092A-020). Equivalent to E5091_13 of the E5091A-016.

	E5092_16	Select the 16-port configuration of the E5092A (E5092A-020). Equivalent to E5091_16 of the E5091A-016.
	E5092_22	Select the 22-port configuration of the E5092A (E5092A-020).
	E5092_28	Select the switching independently in the E5092A (E5092A-020).
	E5092_X10	Select the 10-port full crossbar configuration of the E5092A (E5092A-020).
E5091A	E5091_9	Select the 9-port option of the E5091A (E5091A-009).
	E5091_13	Select the 13-port configuration of the E5091A-016.
	E5091_16	Select the 16-port configuration of the E5091A-016.

4. Click **Control** to enable (**ON**) control of the multiport test set.
5. The enable (**ON**)/disable (**OFF**) setting of the control function of the multiport test set is executed for all channels.

NOTE

If the model you use and the selected softkey is different, the configuration will not be reflected. Also, no error message will appear. For the correlation between the model and the softkey, refer to the following table:

	E5091_9	E5091_13	E5091_16	E5092_13	E5092_16	E5092_22	E5092_28	E5092_X10
E5091A (Option 009)	Yes	No	No	No	No	No	No	No
E5091A (Option 016)	No	Yes	Yes	No	No	No	No	No
E5092A (Option 020)	No	No	No	Yes	Yes	Yes	Yes	Yes

Assigning Test Ports

Before calibration and measurement, you need to assign the test ports of the multiport test set. You can set the connection ports for each channel and perform measurement while switching the connection for each channel.

Operational Procedure

1. Press **System** key, then click **Multiport Test Set Setup > Test Set 1** or **Test Set 2**.
2. Press **Channel Next** (or **Channel Prev**) to activate the channel for which you want to set the connection ports.
3. Use the corresponding softkey to assign the connected test port of the multiport test set.
4. Execute Step 2 through Step 3 for all channels for which you want to perform sweep.

When the E5091_9 is Selected

Softkey	Function
Port 1	Selects a test port of the multiport test set connected to the port 1. You can select the port from A or T1.
Port 2	Selects a test port of the multiport test set connected to the port 2. You can select the port from T1 or T2.
Port 3	Selects a test port of the multiport test set connected to the port 3. You can select the port from R1+, R2+, or R3+.
Port 4	Selects a test port of the multiport test set connected to the port 4. You can select the port from R1-, R2-, or R3-.

When the E5092_13/E5091_13 is Selected

Softkey	Function
Port 1	Selects a test port of the multiport test set connected to the port 1. You can select the port from A, T1, T2, or T3.
Port 2	Selects a test port of the multiport test set connected to the port 2. You can select the port from T1, T2, T3, or T4.
Port 3	Selects a test port of the multiport test set connected to the port 3. You can select the port from R1+, R2+, R3+, or R4+.
Port 4	Selects a test port of the multiport test set connected to the port 4. You can select the port from R1-, R2-, R3-, or R4-.

When the E5091_16 is Selected

Softkey	Function
Port 1	Selects a test port of the multiport test set connected to the port 1. You can select the port from A1, A2, A3, A4, A, T1, T2, or T3.
Port 2	Selects a test port of the multiport test set connected to the port 2. You can select the port from B1, B2, B3, B4, T1, T2, T3, or T4.

Port 3	Selects a test port of the multiport test set connected to the port 3. You can select the port from R1+, R2+, R3+, or R4+.
Port 4	Selects a test port of the multiport test set connected to the port 4. You can select the port from R1-, R2-, R3-, or R4-.
Port 5	Selects a test port of the switch #13 (SW13). You can select the port from X1 or X2.
Port 6	Selects a test port of the switch #14 (SW14). You can select the port from Y1 or Y2.
Port 7	Selects a test port of the switch #15 (SW15). You can select the port from Z1 or Z2.

NOTE

The same test ports cannot be connected to each port. In such a case, the other test ports settings will be automatically changed.

When the E5092_16 is Selected

Softkey	Function
Port 1	Selects a test port of the multiport test set connected to the port 1. You can select the port from A1, A2, A3, or A4.
Port 2	Selects a test port of the multiport test set connected to the port 2. You can select the port from B1, B2, B3, or B4.
Port 3	Selects a test port of the multiport test set connected to the port 3. You can select the port from R1+, R2+, R3+, or R4+.
Port 4	Selects a test port of the multiport test set connected to the port 4. You can select the port from R1-, R2-, R3-, or R4-.
Port 5	Selects a test port of the switch #8 (SW8). You can select the port from X1 or X2.
Port 6	Selects a test port of the switch #9 (SW9). You can select the port from Y1 or Y2.
Port 7	Selects a test port of the switch #10 (SW10). You can select the port from Z1 or Z2.

When the E5092_22 is Selected

Softkey	Function
Port 1	Selects a test port of the multiport test set connected to the port 1. You can select the port from A1, A2, A3, A4, A5, or A6.
Port 2	Selects a test port of the multiport test set connected to the port 2. You

	can select the port from A7, A8, A9, A10, or A11.
Port 3	Selects a test port of the multiport test set connected to the port 3. You can select the port from B1, B2, B3, B4, B5, or B6.
Port 4	Selects a test port of the multiport test set connected to the port 4. You can select the port from B7, B8, B9, B10, or B11.

When the E5092_28 is Selected

Softkey	Function
Port 1	Selects a test port of the switch #1 (SW1). You can select the port from A, B, C, or D.
Port 2	Selects a test port of the switch #2 (SW2). You can select the port from A, B, C, or D.
Port 3	Selects a test port of the switch #3 (SW3). You can select the port from A, B, C, or D.
Port 4	Selects a test port of the switch #4 (SW4). You can select the port from A, B, C, or D.
Port 5	Selects a test port of the switch #5 (SW5). You can select the port from A or B.
Port 6	Selects a test port of the switch #6 (SW6). You can select the port from A or B.
Port 7	Selects a test port of the switch #7 (SW7). You can select the port from A or B.
Port 8	Selects a test port of the switch #8 (SW8). You can select the port from A or B.
Port 9	Selects a test port of the switch #9 (SW9). You can select the port from A or B.
Port 10	Selects a test port of the switch #10 (SW10). You can select the port from A or B.

When the E5092_X10 is Selected

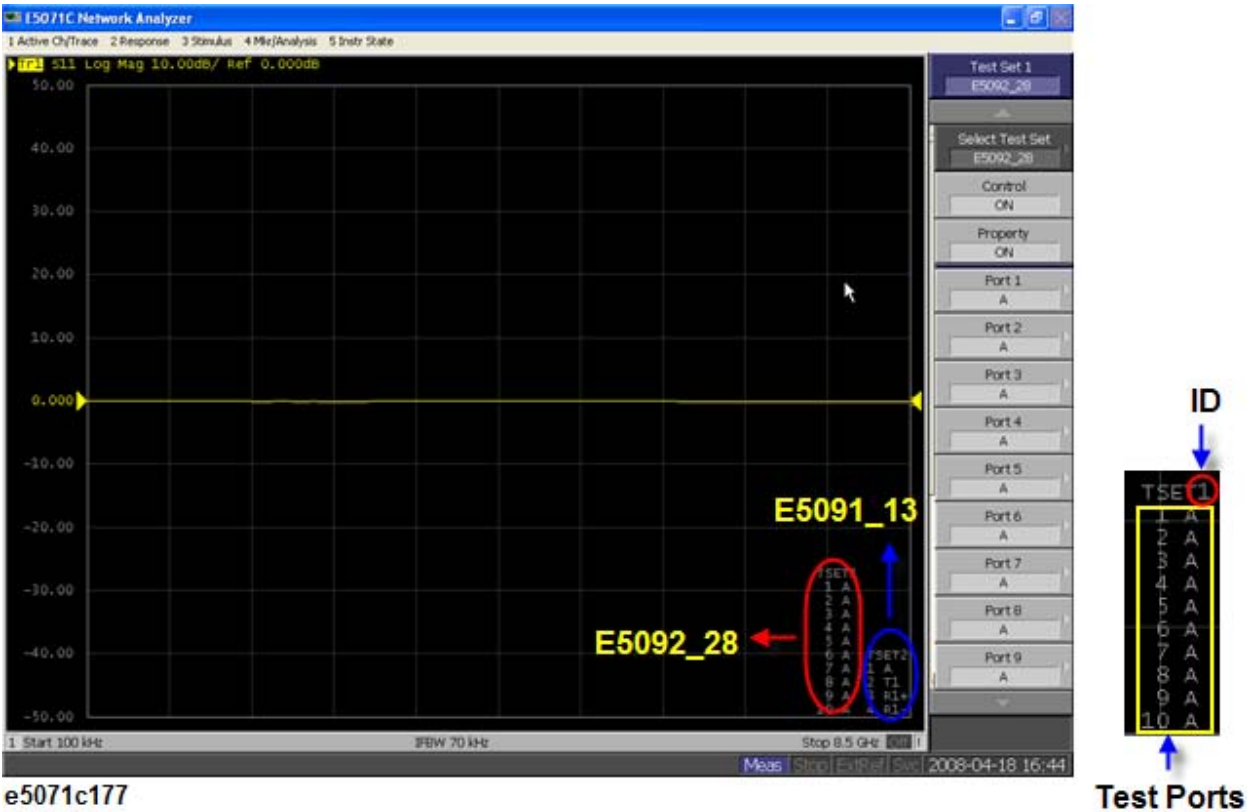
Softkey	Function
Port 1	Selects a test port of the multiport test set connected to the port 1. You can select the port from 1, 3, 5, or 7.
Port 2	Selects a test port of the multiport test set connected to the port 2. You can select the port from 2, 4, 6, or 8.

Port 3	Selects a test port of the multiport test set connected to the port 3. You can select the port from 2, 4, 6, or 10.
Port 4	Selects a test port of the multiport test set connected to the port 4. You can select the port from 1, 3, 5, or 9.

Displaying the Properties

By displaying the multiport test set properties shown below, you can obtain the assignment information of the test ports for each channel. This is useful when you need to check the test port assignment, for example, when you perform calibration.

Multiport Test Set properties



Operational Procedure

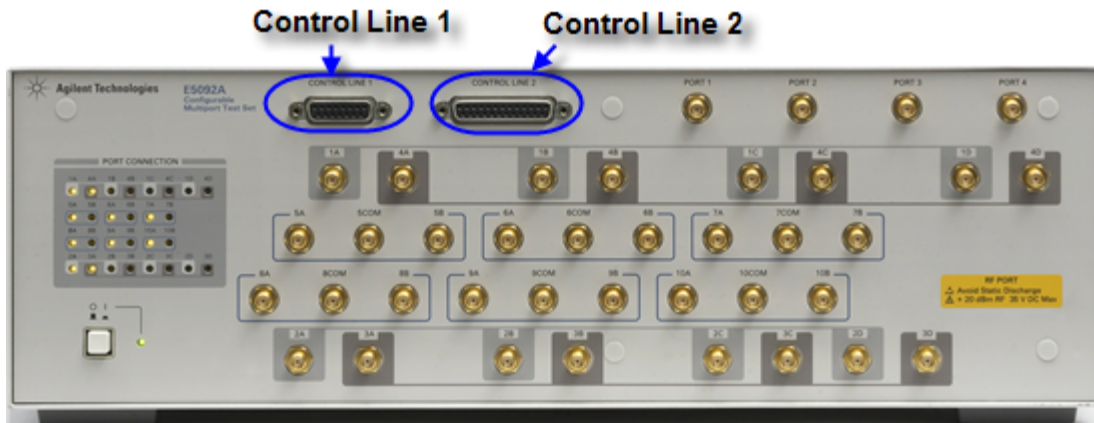
1. Press **System** Key, then click **Multiport Test Set Setup** > **Test Set 1** or **Test Set 2**.
2. Click **Property** to enable it (**ON**) to display the multiport test set's properties.

NOTE The enable (**ON**)/disable (**OFF**) setting of the multiport test set properties display is executed for all channels.

Setting Control Line

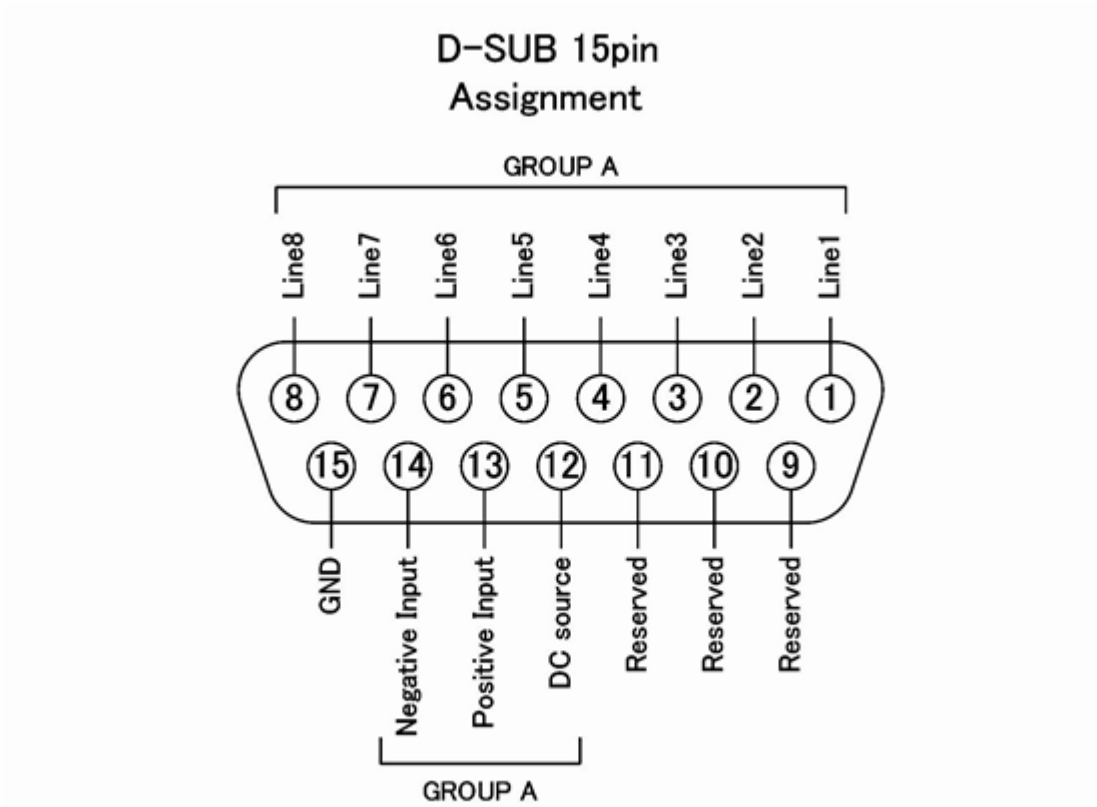
The E5071C can control the output from the control line of the multiport test set and control the DUT (for example, switching the frequency band of the front end module).

E5092A Front Panel

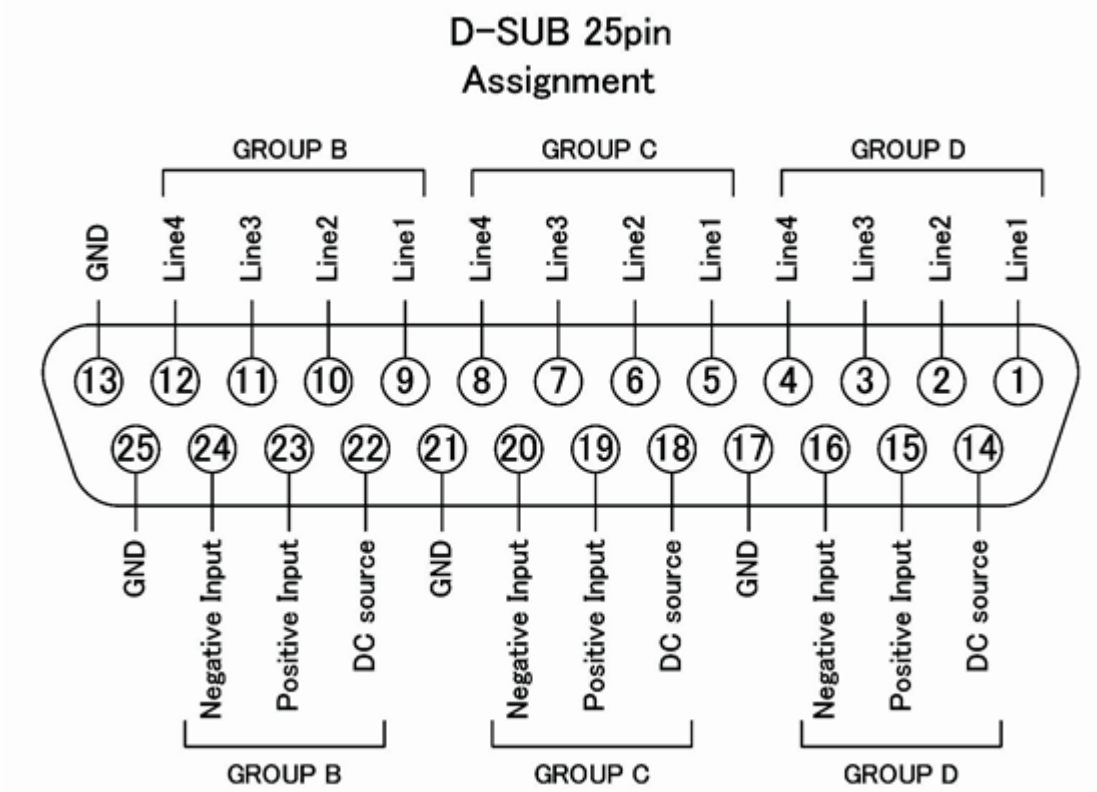


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E5092A Control Line



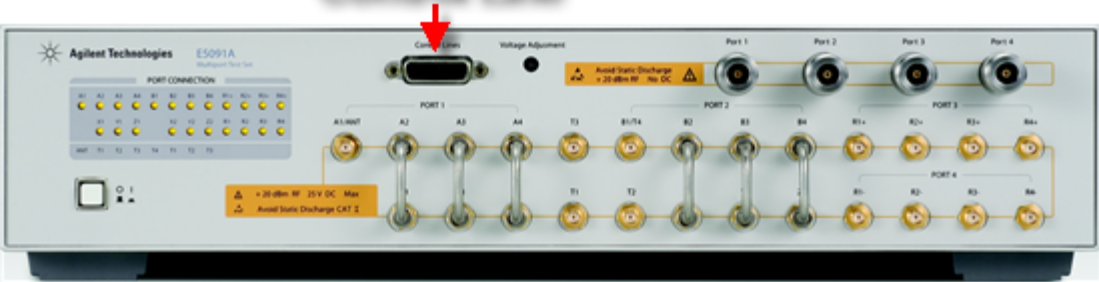
enamwa009



enamwa010

E5091A Front Panel

Control Line



e5071c206

Operational Procedure

1. Press **System** Key, then click **Multiport Test Set Setup > Test Set 1** or **Test Set 2**.
2. Press **Channel Next** (or **Channel Prev**) to activate the channel for which you want to set the control line.
3. Click **Control Lines** for E5091A or **Control Line A/B/C/D** for E5092A to display the settings menu for the DUT control line.
4. Use the corresponding softkey to set the control line of the multiport test set.

Softkey	Function
Line 1 to Line 8	Set High/Low of each line of the control line.
DC source (only for E5092A)	Set DC source voltage.

5. Execute Step 3 through Step 4 for all channels that you want to sweep.

Performing Measurement

- Calibration
- Making Measurements

Other topics about Controlling Multiport Test Set

Calibration

Follow these steps to perform calibration with the multiport test set connected:

1. Press **Channel Next** (or **Channel Prev**) key to set the channel that you want to calibrate to the active channel.
2. Follow Displaying the properties to display the multiport test set properties.
3. Perform the calibration. Check the corresponding multiport test set test ports shown in the calibration properties as the port names of the E5071C are displayed on the calibration menu, connect the calibration standard to the corresponding test ports of the multiport test set, and perform the calibration.

Making Measurements

Making measurements with multiport test set is the same as E5071C standalone measurement. Perform operations by referring to Making Measurements.

Trigger state and switching the setting of the Multiport test set

The following table shows how the setting in the multiport test set is switched from when the trigger state is the stop state.

Trigger state	Switching the setting of multiport test set
Stop	The setting is not switched.
Trigger wait	The setting of the internal switch and the output of the control line are switched according to the setting of the channel swept first. The connections of the test ports and the output of the control line are switched according to the setting of the channel swept first.
Measurement	Measurement is performed following the procedure below. <ol style="list-style-type: none"> 1. Execute a sweep for the first channel. 2. Set the connections of the test ports and the output of the control line according to the settings of the channel swept second.

Controlling Multiport Test Set

	<ol style="list-style-type: none">3. Execute a sweep for the second channel.4. Set the connections of the test ports and the output of the control line according to the setting of the channel swept last.5. Execute a sweep for the last channel.
Stop or trigger wait	The setting is not switched for the stop state; it is switched for the trigger wait state.

Controlling Multiport Test Set by Programming

- Selecting Test Set
- Selecting ports assigned to Port 1 to Port n
- Difference between E5092A and E5091A
- Sample program

Other topics about Controlling Multiport Test Set

Selecting Test Set

The multiport test set provides test set 1 and test set 2. To select the test set, use the following command:

:SENS:MULT{1-2}:NAME

The following models are available for the test set:

Multiport Test Set		Option
E5092A	E5092_13	Option 020 (13-port measurement)
	E5092_16	Option 020 (16-port measurement)
	E5092_22	Option 020 (22-port measurement)
	E5092_28	Option 020 (28-port measurement)
	E5092_X10	Option 020 (X10-port measurement)
E5091A	E5091_9	Option 009
	E5091_13	Option 013 (13-port measurement)
	E5091_16	Option 016 (16-port measurement)

Checking the name of available test set

To check the name of the available multiport test set, use the following command:

:SENS:MULT:CAT?

Turning control ON/OFF

To turn ON/OFF the control of the multiport test set, use the following command:

:SENS:MULT{1-2}:STAT

If you turn OFF the control of the multiport test set, it does not affect the operation of the E5071C, even if it is connected. You can control test set 1 and test set 2 separately.

Selecting ports assigned to Port 1 to Port n

Selecting the connection ports

You can select the ports assigned to Port 1 to Port n for each channel. To select the ports, use the following commands:

:SENS{1-36}:MULT{1-2}:PORT{1-20}

NOTE

The connection between the assigned ports and Port 1 to Port n inside the E5091A is not changed when one of the above commands is executed but it is changed immediately before a sweep for each channel.

Turning ON/OFF state display of connection ports (properties display)

You can display the state of the ports assigned to Port 1 to Port n (multiport test set properties) in the lower right part in the window for each channel. To turn ON/OFF the properties display, use the following command:

:SENS:MULT{1-2}:DISP

Checking number of ports

To check the number of the multiport test set connected ports, use the following command:

:SENS:MULT{1-2}:COUN?

Checking the available port name

To check the name of the multiport test set connected ports, use the following command:

:SENS:MULT{1-2}:PORT{1-20}:CAT?

Checking number of input ports

To check the number of the multiport test set input ports, use the following command:

:SENS:MULT{1-2}:INC?

Setting control line

You can set the HIGH/LOW state of each line of the control line for each channel. To set the HIGH/LOW of each line, use the following command:

:SENS:MULT{1-2}:TSET9:OUTP

NOTE

The HIGH/LOW state of each line of the E5091A is not changed when the above command is executed but it is changed immediately before a sweep for each channel.

Difference between E5092A and E5091A

Difference	E5092A	E5091A
Options	13 port, 16 port, 22 port, 28 port and X10 port	9 port, 13 port and 16 port
Number of control lines	2	1

NOTE

The channel number for E5092A has increased because the number of supported test sets has increased.

Controlling E5092A

NOTE

The following commands are available only in E5092A.

Setting output data/voltage and switch

To set the value of output data/voltage and switch, use the following command:

```
:CONT:MULT[1-2]:OUTP:[A-D][:DATA]
:CONT:MULT[1-2]:OUTP:[A-D]:VOLT[:DATA]
:CONT:MULT[1-2]:PORT[1-20][:SEL]
:SENS[1-160]:MULT[1-2]:OUTP[:DATA]
:SENS[1-160]:MULT[1-2]:OUTP:[A-D][:DATA]
:SENS[1-160]:MULT[1-2]:OUTP:[A-D]:VOLT[:DATA]
:SENS[1-160]:MULT[1-2]:PORT[1-20][:SEL]
```

Selecting test set

To select the test set, use the following command:

```
:SENS[1-160]:MULT[1-2]:NAME
```

For E5091A test set, only the following two commands are available:

```
:CONT:MULT[1-2]:PORT[1-20][:SEL]
:CONT:MULT[1-2]:OUTPut:A[:DATA]
```

Sample program

See Control E5091A.