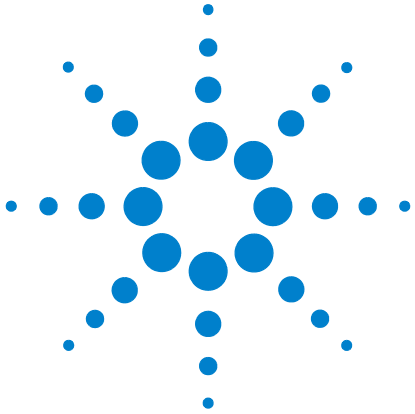

Agilent 89600S Series

VXI Service Guide

Agilent Technologies

Notices

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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.

Contents

Contents

In this book

This book documents the Agilent 89600S Series service procedures. It provides diagnostics, troubleshooting, and replaceable parts information for VXI hardware.

Safety Summary

IMPORTANT

Note that this manual contains only the safety information pertaining to installing VXI modules in the VXI mainframe and for installing the IEEE 1394 PCI interface card in your computer. For information on operating your VXI hardware and your computer safely, please refer to the user or service manuals for your VXI mainframe and computer.

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 elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

GENERAL

This product is a Safety Class 1 instrument (provided with a protective earth terminal). 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 the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under Safety Symbols.

GROUND THE PRODUCT

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. 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.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

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

DO NOT REMOVE THE PRODUCT COVER

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

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

	Caution, refer to accompanying documents		Alternating current
	Earth (ground) terminal		Direct current
	Frame or chassis terminal		Warning, risk of electric shock
	Terminal is at earth potential. Used for measurement and control circuits designed to be operated with one terminal at earth potential.		

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The CE mark is a registered trademark of the European Community.

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This is a marking of an Industrial Scientific and Medical Group 1 Class A product, and to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).

The CSA mark is a registered trademark of the Canadian Standards Association.

This is a marking of the WEEE Directive (2002/96/EC) requirements. The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office or for more information, see http://www.agilent.com/environment/product/.

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Agilent Technologies warrants its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

1 Setting Up VXI Hardware

Introduction

This chapter includes instructions on configuring your VXI measurement hardware, installing the VXI hardware modules into the VXI mainframe, connecting front-panel cables, and connecting the EMC grounding cable to the VXI chassis and laptop PC. See: Chapter 1 , “Installation Overview,” on page 13 to learn which procedures you must perform to install your Agilent 89600S series product.

NOTE

If you purchased an Agilent 89610, 89611, 89640, or 89641, everything in this chapter was done at the factory except connecting the cables for an external down converter or EMC grounding cable. If your analyzer uses an external down converter, see the appropriate illustration at the end of the chapter. If your system includes a laptop PC, see “Connecting EMC grounding cable” on page 52. Otherwise, continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

For information on configuring other measurement hardware, see 89600 online help under **Installation and Licensing > Hardware Setup**.

Inspecting Agilent 89600S series VXI modules

The Agilent 89600S series VXI modules were carefully inspected both mechanically and electrically before shipment. They should be free of marks or scratches upon receipt.

If a module was damaged in transit, do the following:

- Save all packing materials.
- File a claim with the carrier
- Call your Agilent Technologies sales and service office (phone numbers available at www.agilent.com/find/89600).

NOTE If you ordered a 2-channel analyzer, the two E1438 or E1439 modules must have the same amount of memory.

Setting up Agilent 89600S series VXI mainframe and modules

CAUTION To protect circuits from static discharge, observe anti-static techniques whenever handling the Agilent 89600S series VXI modules.

IMPORTANT For safety, environment, regulatory, and mains power specifications, see the user or service manual for your VXI mainframe.

Set logical addresses

This section includes information on setting logical addresses.

To set logical addresses:

1. Check the logical address switches for each VXI module. (See Figure 1-1 through Figure 1-5 on the following pages.) Except for the E2730 and E2731 modules, each module in the system must have a unique logical address. The following table lists the factory default settings (the addresses for second-channel 89605, E1438, and E1439 modules must be different).

   For 2-channel systems, the addresses must be different for the two modules

VXI module	Default address	Figure showing address switch location
Agilent 89605	14 (0000 1110)	Figure 1-1 on page 13
Agilent E2730 or E2731	255 (1111 1111)	Figure 1-2 on page 13
Agilent E1439	194 (1100 0010)	Figure 1-3 on page 14
Agilent 89606	15 (0000 1111)	Figure 1-4 on page 15
Agilent E1438	192 (1100 0000)	Figure 1-5 on page 16

2. If you need to change the address setting for a module, use a small screwdriver or similar tool to move the switches to the correct position. The figures on the following pages show the location and default setting of the logical address switches for each module.

Figure 1-1 **89605 Input module -- address 14 (000 1110)**

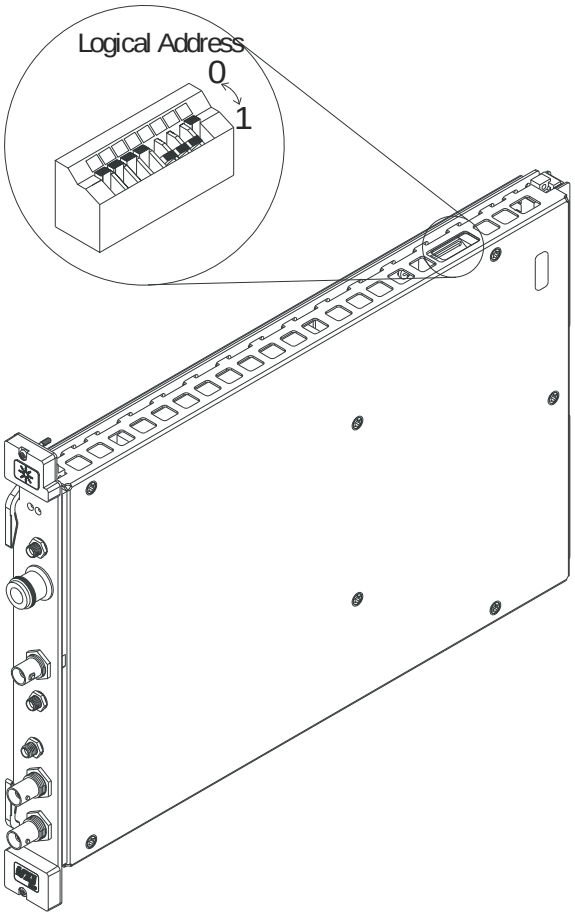
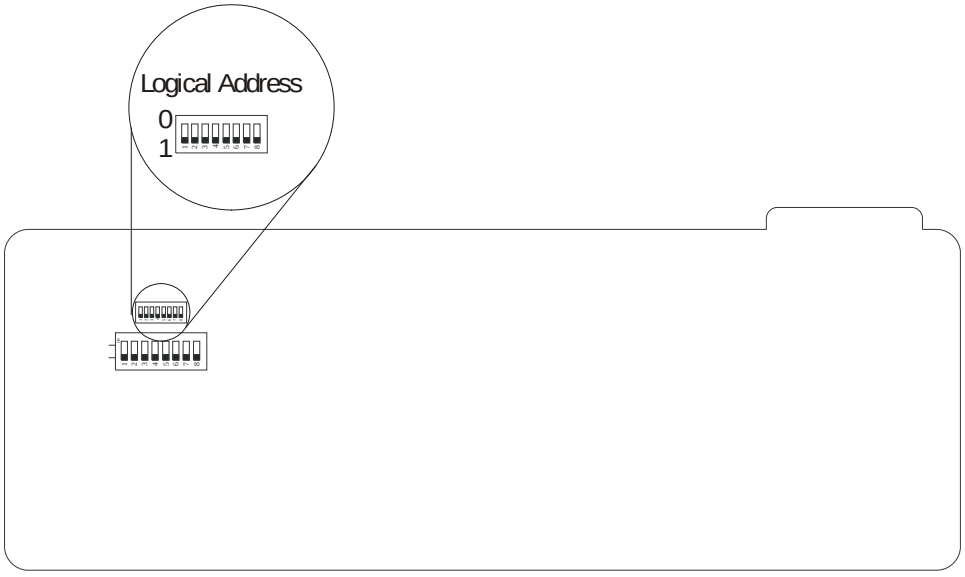


Figure 1-2 **E2730 or E2731 RF Tuner module -- address 255 (1111 1111) (This setting enables dynamic addressing, so that the address is automatically assigned.)**



For 2-channel systems, the addresses must be different for the two E1439 modules.

Figure 1-3 E1439 ADC module -- address 194 (1100 0010)

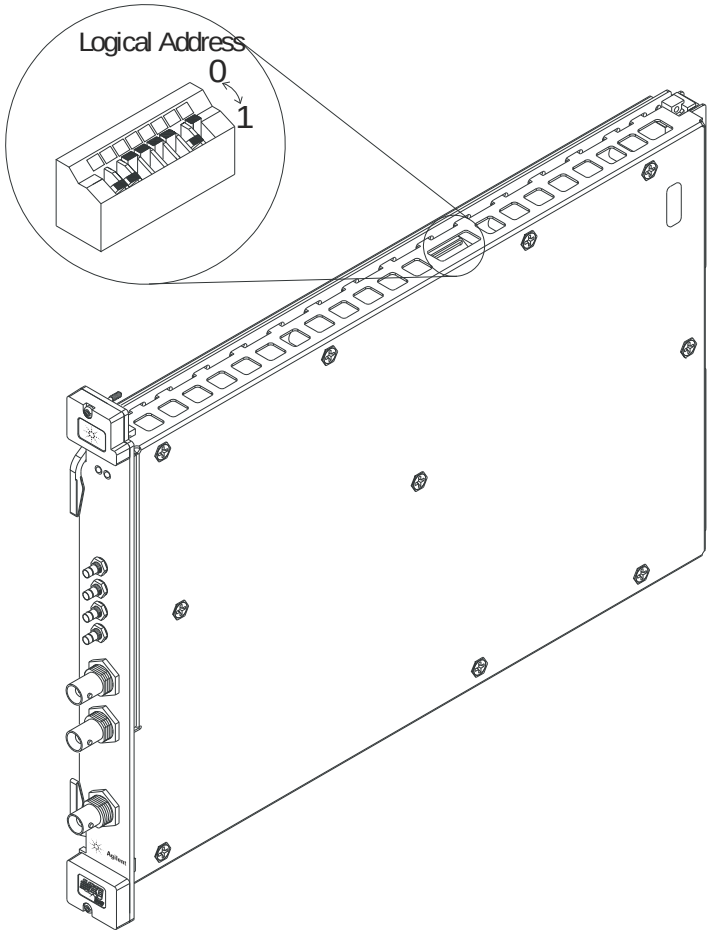
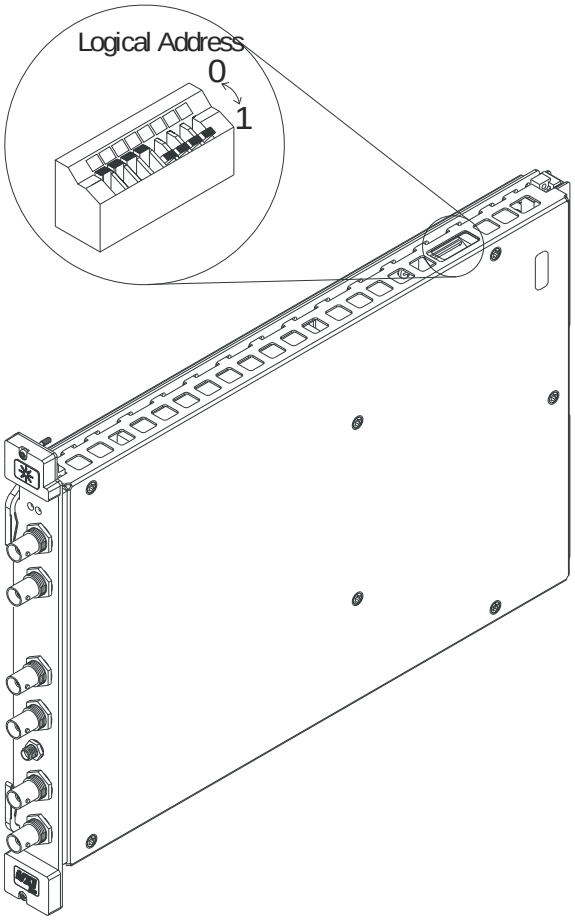
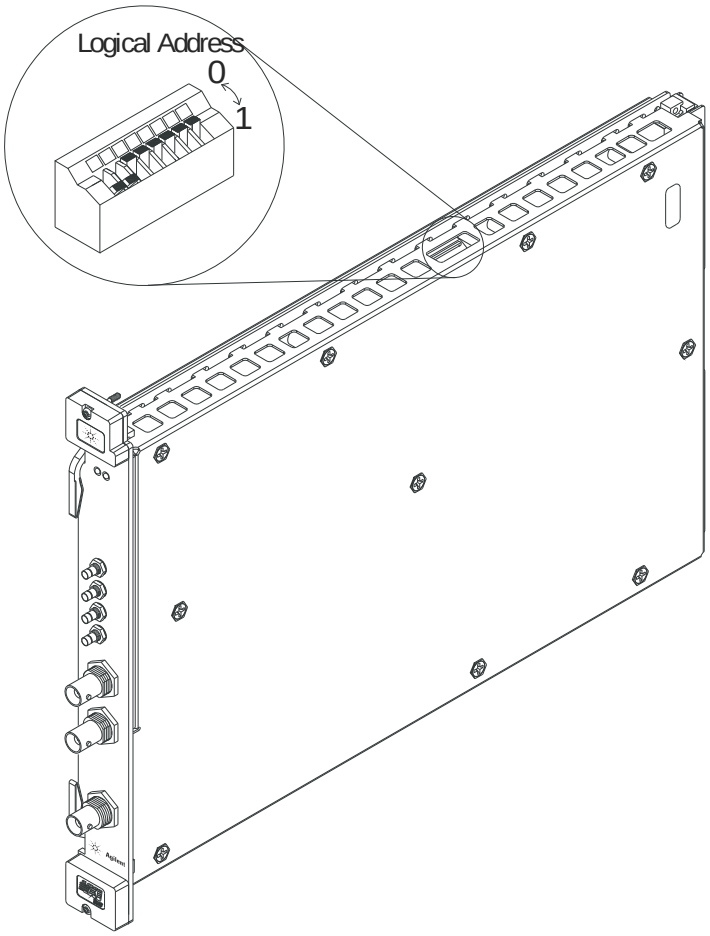


Figure 1-4 **89606 module -- address 15 (0000 1111)**



For 2-channel systems, the addresses must be different for the two E1438 modules.

Figure 1-5 **E1438 ADC module -- address 192 (1100 0000)**



Installing modules in the mainframe

Refer to Figure 1-6 for installing modules in the mainframe.

To install modules in the mainframe:

1. Unpack your VXI mainframe.

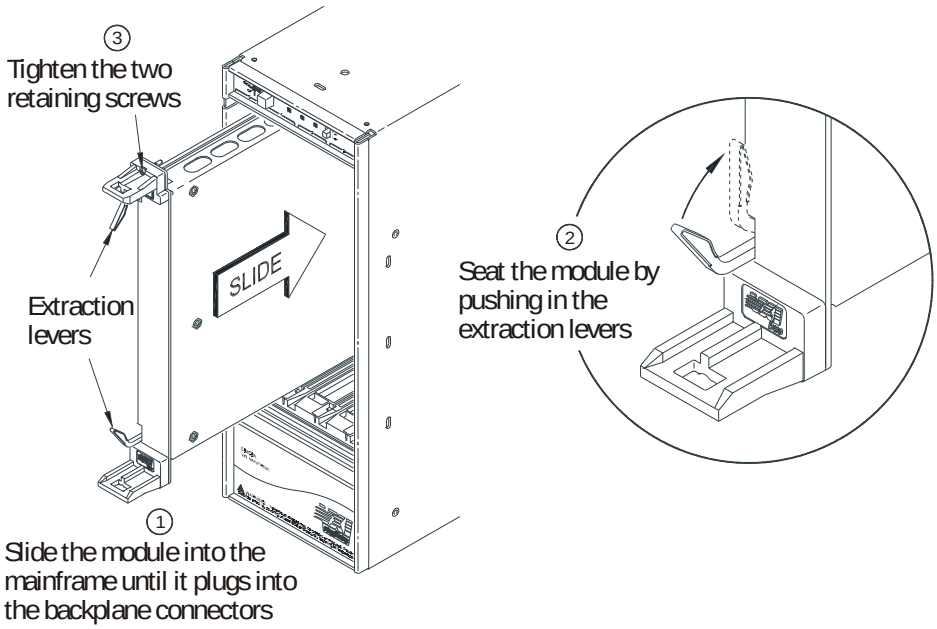
IMPORTANT For safety, environment, regulatory, and mains power specifications, see the user or service manual for your VXI mainframe.

2. Set the mainframe's power switch to off (0).

CAUTION Be sure the power is off before installing modules in the mainframe. Installing or removing a module with power on may damage components in the module.

3. Be sure to put each module in the correct slot, see "Configuring your VXI hardware" (page 18).
4. Place the module's card edges (top and bottom) into the module guides in the slot.
5. Install the module into the mainframe. (Note: the E2730 module does not have insertion/extraction levers.)

Figure 1-6 Installing a VXI module in the mainframe



Configuring your VXI hardware

Your Agilent 89600S series VXI modules must be installed in a specified order in the VXI mainframe. There are eight possible configurations:

- Agilent 89610 Single-channel DC-40 MHz analyzer (page 19)
- Agilent 89610 Two-channel DC-40 MHz analyzer (page 20)
- Agilent 89611 70 MHz IF analyzer (page 21)
- Agilent 89611 Two-channel 70 MHz IF analyzer (page 22)
- Agilent 89640 DC-2.7 GHz analyzer (page 23)
- Agilent 89640 DC-2.7 GHz analyzer with second IF/baseband channel (page 24)
- Agilent 89640 DC-2.7 GHz analyzer with second RF channel (page 25)
- Agilent 89641 DC-6 GHz analyzer (page 26)
- Agilent 89641 DC-6 GHz analyzer with second IF/baseband channel (page 27)
- Agilent 89641 DC-6 GHz analyzer with second RF channel (page 28)

NOTE If you are using a VXI mainframe with more than 4 slots, the Agilent E8491 module or VXI imbedded PC must be installed in slot 0. The other 89600S series modules are not required to be installed in slots 1 through 3. However, the modules must be installed relative to each other in the order described in Figure 1-7 through Figure 1-16.

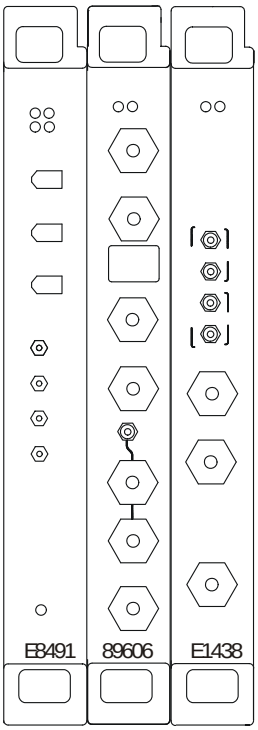
89610 Single-channel DC-40 MHz analyzer

This configuration includes 3 modules (Figure 1-7), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89606 Baseband Input
2	Agilent E1438 ADC

Note that this illustration shows an 89606B input module. Your analyzer might include an 89606A input; the configuration is the same for both modules.

Figure 1-7 **89610 DC-40 MHz analyzer**



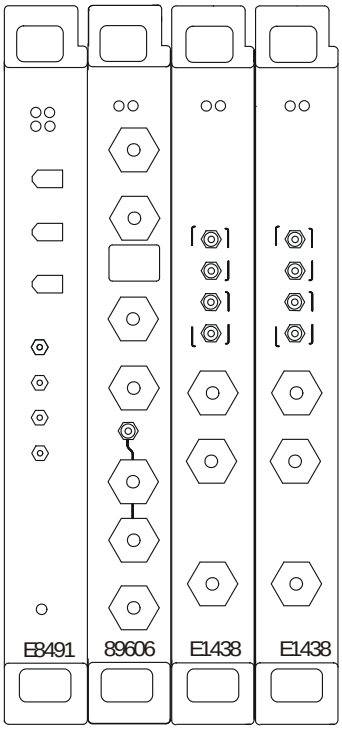
89610 Two-channel DC-40 MHz analyzer

This configuration includes 4 modules (Figure 1-8), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89606 Baseband Input
2	Agilent E1438 ADC
3	Agilent E1438 ADC

Note that this illustration shows an 89606B input module. Your analyzer might include an 89606A input module. The configuration is the same for both modules.

Figure 1-8 **89610 Two-channel DC-40 MHz analyzer**



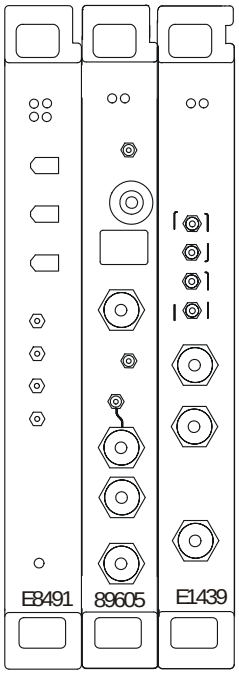
89611 70 MHz IF analyzer

This configuration includes 3 modules (Figure 1-9), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E1439 RF ADC

Note that this illustration shows an 89605B input module. Your analyzer might include an 89605A input. The configuration is the same for both modules.

Figure 1-9 **89611 analyzer**



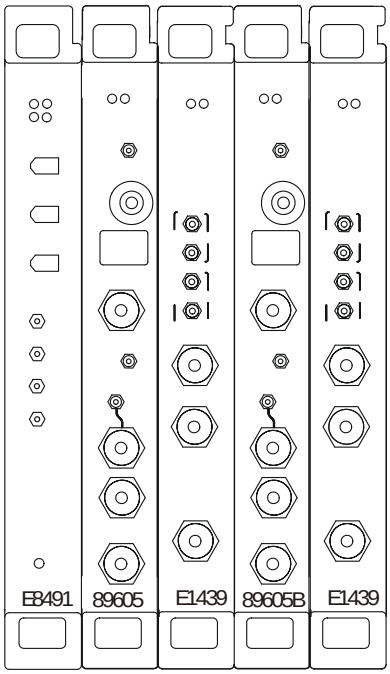
89611 Two-channel 70 MHz IF analyzer

This configuration includes 5 modules (Figure 1-10), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E1439 RF ADC
3	Agilent 89605B RF Input
4	Agilent E1439 RF ADC

NOTE The 2-channel 89611 requires an 89605B module for the second channel (slot 3 in Figure 1-10). The module for channel 1 can be either an 89605B or A.

Figure 1-10 2-channel 89611 analyzer

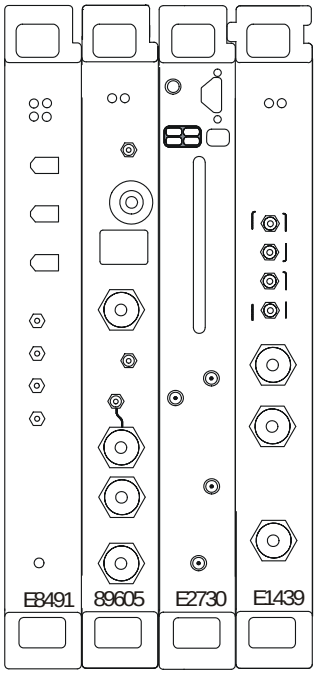


89640 DC-2.7 GHz analyzer

This configuration includes 4 modules (Figure 1-11), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E2730 RF Tuner
3	Agilent E1439 RF ADC

Figure 1-11 **89640 DC-2.7 GHz analyzer**



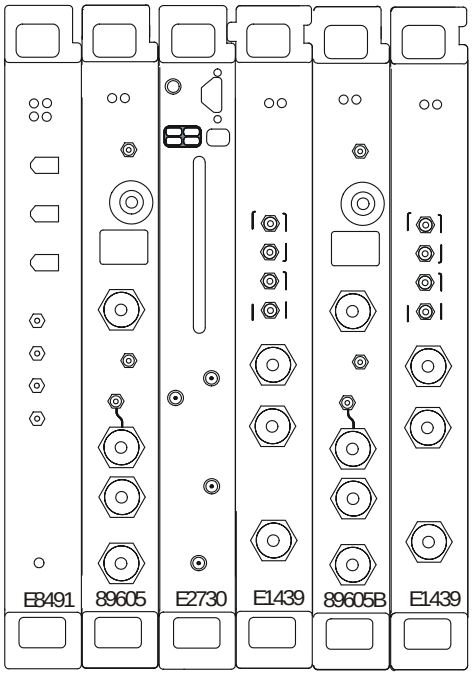
89640 DC-2.7 GHz analyzer with second IF/baseband channel

This configuration includes 6 modules (Figure 1-12), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E2730 RF Tuner
3	Agilent E1439 RF ADC
4	Agilent 89605B RF Input
5	Agilent E1439 RF ADC

NOTE The 2-channel 89640 requires an 89605B module for the second channel (slot 4 in Figure 1-12). The module for channel 1 can be either an 89605B or A.

Figure 1-12 **89640 DC-2.7 GHz analyzer with second IF/baseband channel**



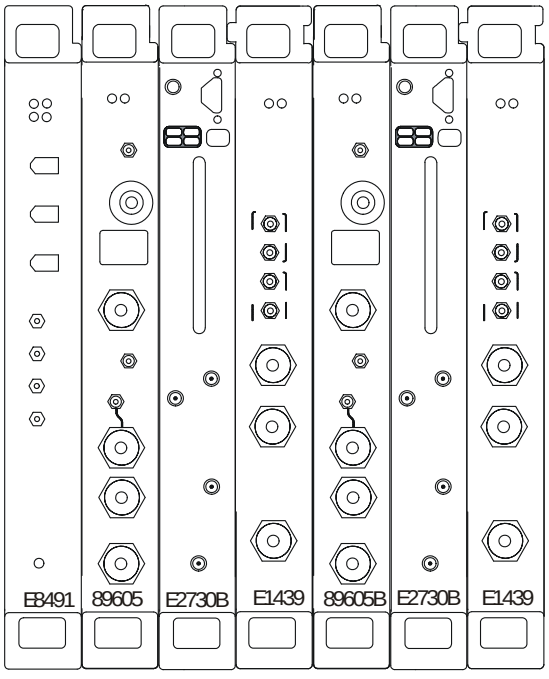
89640 DC-2.7 GHz analyzer with second RF channel

This configuration includes 7 modules (Figure 1-13), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E2730 RF Tuner
3	Agilent E1439 RF ADC
4	Agilent 89605B RF Input
5	Agilent E2730 RF Tuner
6	Agilent E1439 RF ADC

NOTE The 2-channel 89640 requires E2730B modules for both channels and an 89605B module for the second channel (slot 4 in Figure 1-13). The module for channel 1 can be either an 89605B or A.

Figure 1-13 **89640 DC-2.7 GHz analyzer with second RF channel**

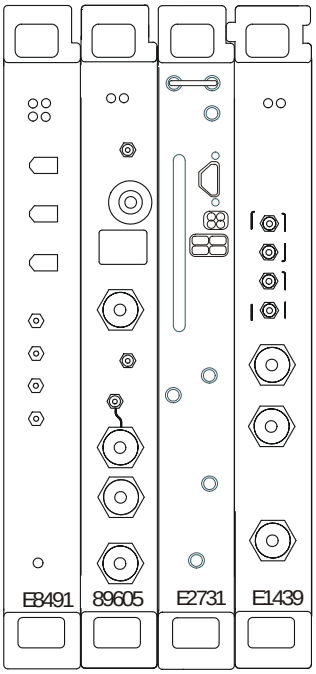


89641 DC-6 GHz analyzer

This configuration includes 4 modules (Figure 1-14), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E2731 RF Tuner
3	Agilent E1439 RF ADC

Figure 1-14 **89641 DC-6 GHz analyzer**



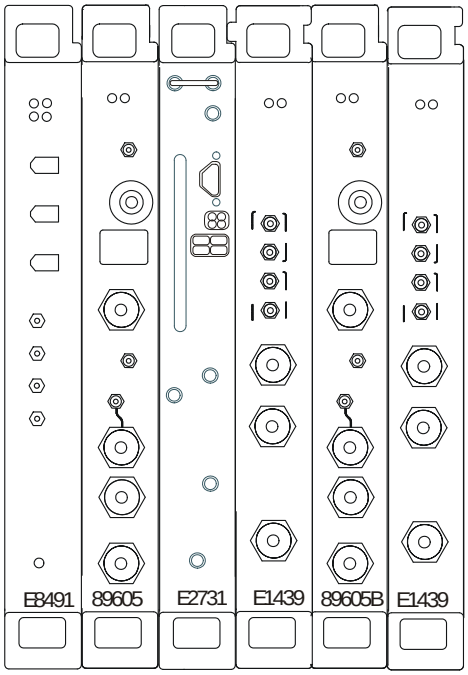
89641 DC-6 GHz analyzer with second IF/baseband channel

This configuration includes 6 modules (Figure 1-15), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E2731 RF Tuner
3	Agilent E1439 RF ADC
4	Agilent 89605B RF Input
5	Agilent E1439 RF ADC

NOTE The 2-channel 89641 requires an 89605B module for the second channel (slot 4 in Figure 1-15). The module for channel 1 can be either an 89605 B or A.

Figure 1-15 **89641 DC-6 GHz analyzer with second IF/baseband channel**



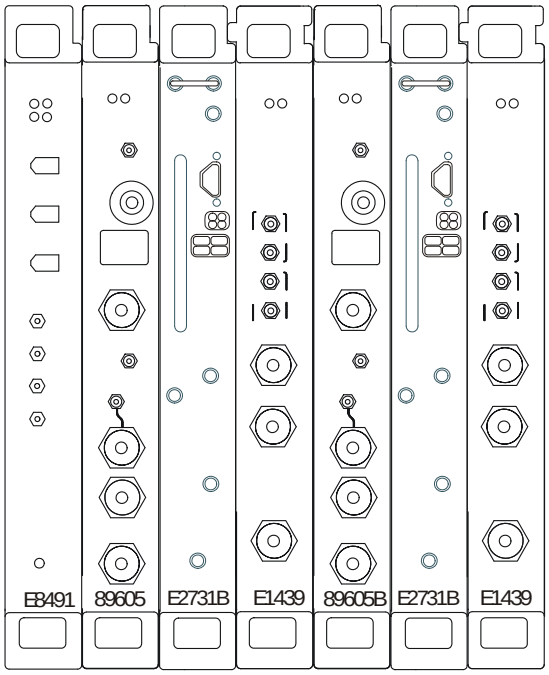
89641 DC-6 GHz analyzer with second RF channel

This configuration includes 7 modules (Figure 1-16), which must be installed in this order:

Mainframe slot	VXI module
0	Agilent E8491 Interconnect
1	Agilent 89605 RF Input
2	Agilent E2731 RF Tuner
3	Agilent E1439 RF ADC
4	Agilent 89605B RF Input
5	Agilent E2731 RF Tuner
6	Agilent E1439 RF ADC

NOTE The 2-channel 89641 requires E2731B modules for both channels and an 89605B module for the second channel (slot 4 in Figure 1-16). The module for channel 1 can be either an 89605B or A.

Figure 1-16 **89641 DC-6 GHz analyzer with second RF channel**



Connecting front panel cables

The illustrations on the following pages show the cable connections for 11 configurations of Agilent 89600S series analyzers. Below each illustration is a table listing each cable, termination, and adapter with a description and part number.

For a single-channel 89610A, see page 30.

For a two-channel 89610A, see page 31.

For an 89610A with external down converter, see page 32.

For a single-channel 89611A, see page 33.

For an 89611A with PSA option H70, see page 34

For a two-channel 89611A, see page 37.

For a single-channel 89640A, see page 39.

For an 89640A with second IF/baseband channel, see page 40.

For an 89640A with second RF channel, see page 42.

For an 89640A with external down converter, see page 44.

For a single-channel 89641A, see page 45.

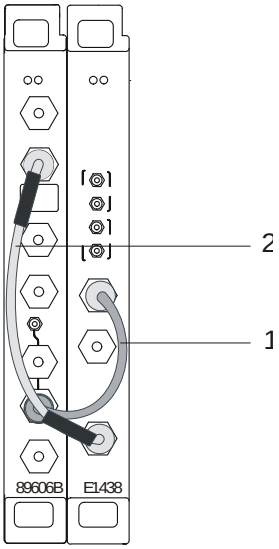
For an 89641A with second IF/baseband channel, see page 46.

For an 89641A with second RF channel, see page 48.

For an 89641A with external down converter, see page 50.

NOTE If you change or replace any cables, be sure to do a calibration to compensate for variance in cable characteristics before you make measurements.

Cable connections, 89610



	Description	Connection	Part number
1	black BNC-BNC cable (172 mm)	89606 *10 MHz Ref Out* to E1438A *Ext Clock/Ref*	8120-6237
2	black BNC-BNC cable (267mm)	89606 *To ADC Analog In* to E1438 *Analog In*	8121-0133

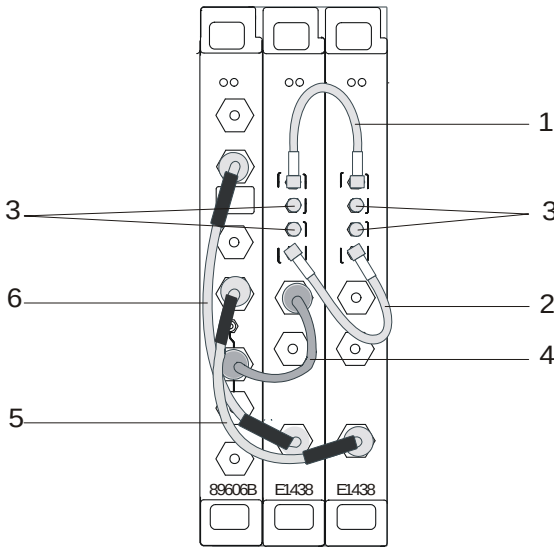
After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, two-channel 89610

The following cable connections for the 2-channel 89610 are especially important:

- You must connect one set of Clock connectors and one set of Sync connectors between the two E1438 modules. The two cables used for these connections must be exactly the same length to avoid timing and synchronization problems.
- You must connect the 10 MHz Ref Out from the 89606 module to the Ext Clock/Ref connector on the E1438 module adjacent to the 89606 module.



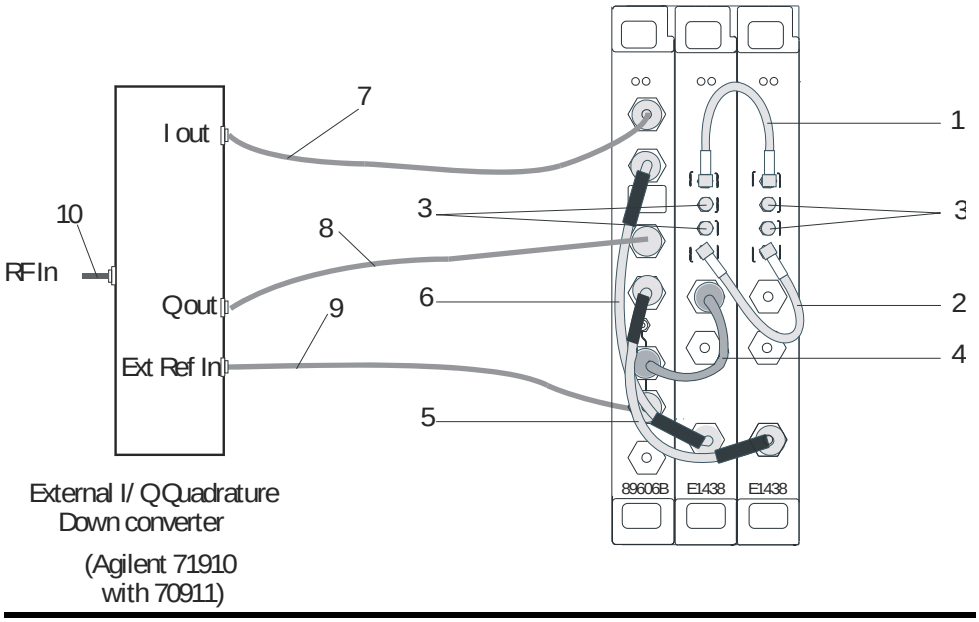
- If you use external trigger, you must connect the trigger signal to the channel 1 ADC (E1438) trigger input.

	Description	Connection	Part number
1	orange SMB-SMB cable (100 mm)	E1438 #1 *Clock* to E1438 #2 *Clock*	03585-61603
2	orange SMB-SMB cable (100 mm)	E1438 #1 *Sync* to E1438 #2 *Sync*	03585-61603
3	50 ohm SMB term (Qty 4)	Unused E1438 *Clock* & *Sync* connectors	1250-0676
4	black BNC-BNC cable (172 mm)	89606 *10 MHz Ref Out* to E1438A #1 *Ext Clock/Ref*	8120-6237
5	black BNC-BNC cable (215 mm)	89606 *To ADC 2 Analog In* to E1438A #2 *Analog In*	8121-0132
6	black BNC-BNC cable (267 mm)	89606 *To ADC 1 Analog In* to E1438A #1 *Analog In*	8121-0133

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89610 with external down converter

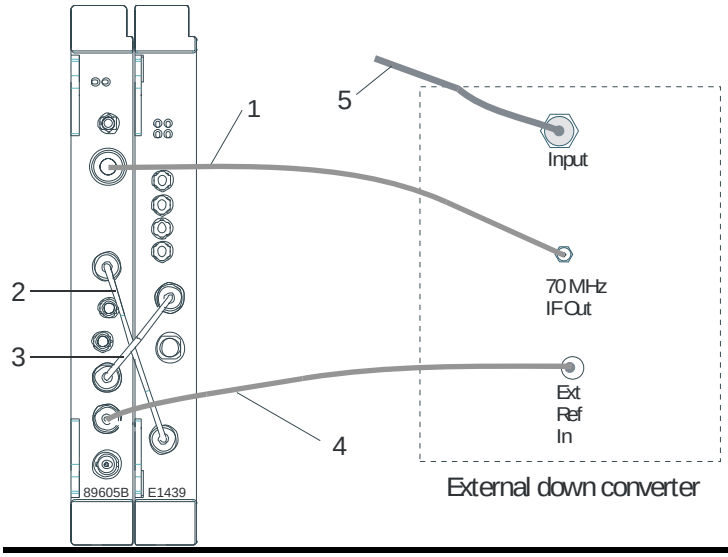


	Description	Connection	Part number
1	orange SMB-SMB cable (100 mm)	1438 #1 to E1438 #2 Clock	03585-61603
2	orange SMB-SMB cable (100 mm)	E1438 #1 to E1438 #2 Sync	03585-61603
3	50 ohm SMB term (Qty 4)	Unused E1438 Clock & Sync connectors	1250-0676
4	black BNC-BNC cable (172 mm)	89606 to E1438 Ext Clock/Ref	8120-6237
5	black BNC-BNC cable (215 mm)	89606 to E1438 #2 Analog In	8121-0132
6	black BNC-BNC cable (267mm)	89606 to E1438 #1 Analog In	8121-0133
7	varies	down converter I Out to 89606 Ch1 In	user supplied
8	varies	down converter Q Out to 89606 Ch2 In	user supplied
9	BNC	89606 10 MHz Ref Out to down converter Ext Ref In	user supplied
10	varies	down converter RF input	user supplied

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89611



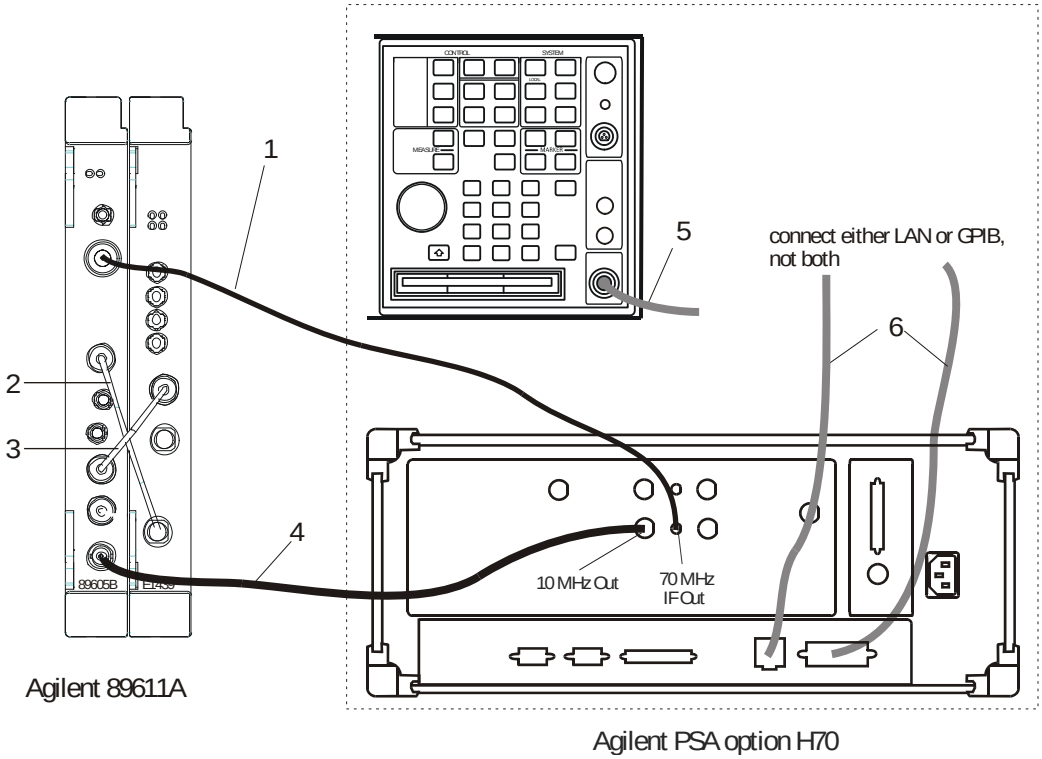
	Description	Connection	Part number
1	SMA-SMA cable (requires a type N-SMA adapter)	from external tuner IF output to 89605 *Ch 1 Input*	8121-0790 (cable) 1250-1250 (adapter)
2	black BNC-BNC cable (215 mm)	from 89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
3	black BNC-BNC cable (215 mm)	from 89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
4	BNC-BNC cable	from 89605 *10 MHz Ref Out* to external tuner *Ext Ref In* (or from external tuner*10 MHz Ref Out* to 89605 *Ext Ref In*)	user supplied
5	varied	input to down converter	user supplied

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89611 with PSA Option H70

This configuration replaces the VXI tuner module with an Agilent PSA option H70.



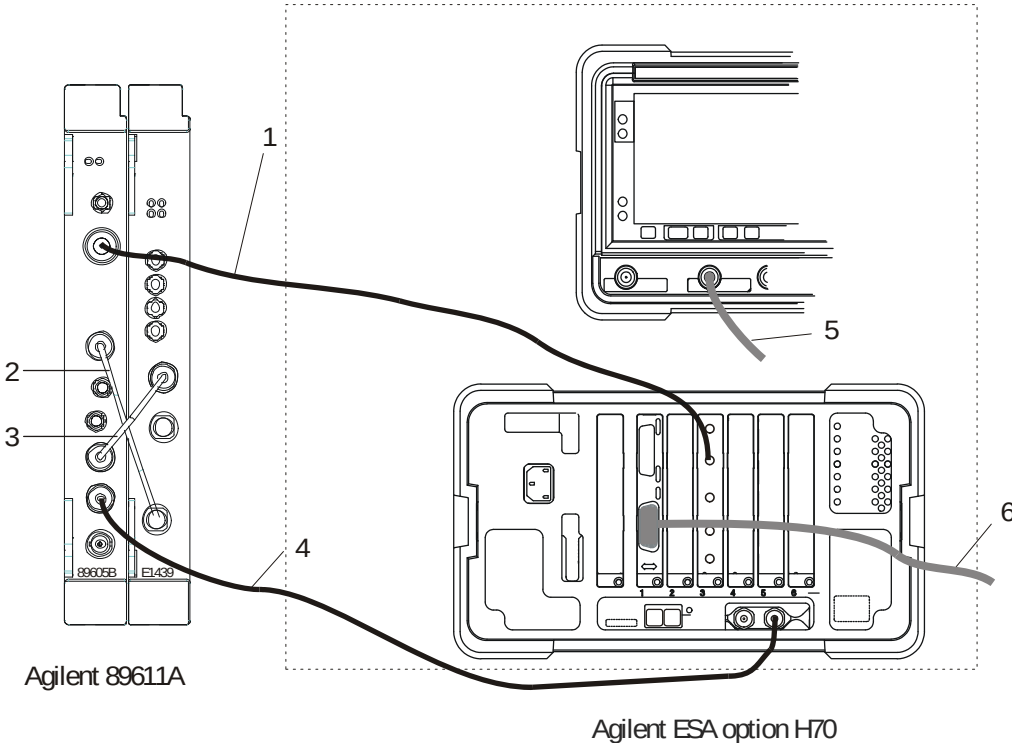
	Description	Connection	Part number
1	SMA-SMA cable with a type N-SMA adapter	from PSA 70 MHz IF output to 89605 *Ch 1 Input*	8121-0790 (cable) 1250-1250 (adapter)
2	black BNC-BNC cable (215 mm)	from 89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
3	black BNC-BNC cable (215 mm)	from 89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
4	BNC-BNC cable	from 89605 *10 MHz Ref Out* to PSA *Ext Ref In* (or from PSA *10 MHz Ref Out* to 89605 *Ext Ref In*)	user supplied
5	varies	PSA RF input	user supplied
6	LAN or GPIB cable	LAN or GPIB connector to PC (not both)	varies

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89611 with ESA Option H70

This configuration replaces the VXI tuner module with an Agilent ESA option H70.



Note that the cards may be installed in a different order in the slots, so the GPIB connector and the 70 MHz Out connector may be in different locations on the rear panel.

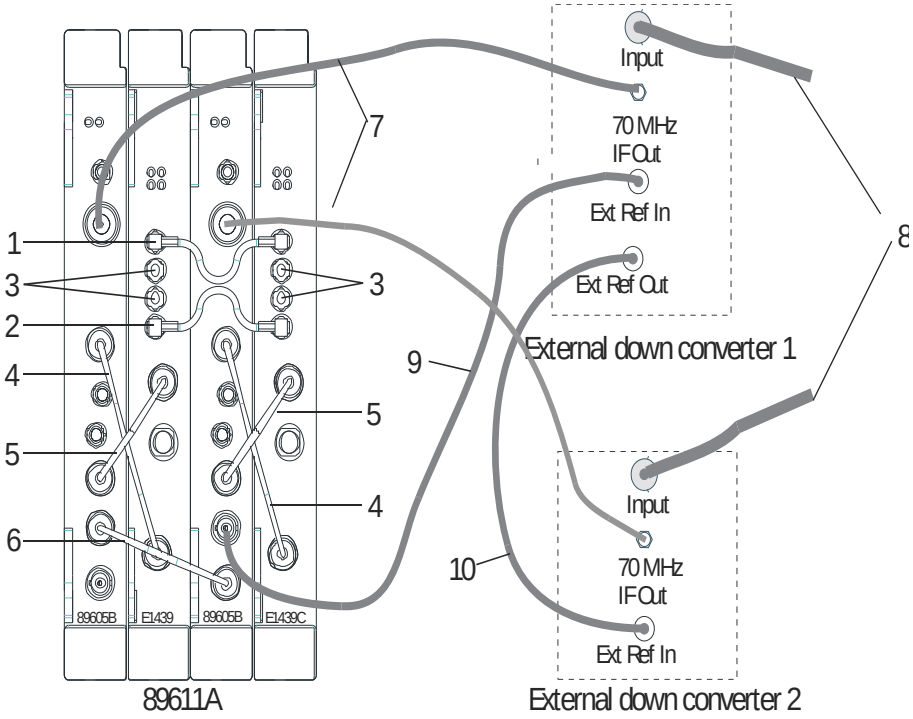
	Description	Connection	Part number
1	SMA-SMA cable with a type N-SMA adapter	from ESA 70 MHz IF output to 89605 *Ch 1 Input*	8121-0790 (cable) 1250-1250 (adapter)
2	black BNC-BNC cable (215 mm)	from 89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
3	black BNC-BNC cable (215 mm)	from 89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
4	BNC-BNC cable	from 89605 *10 MHz Ref Out* to ESA *Ext Ref In* (or from ESA *10 MHz Ref Out* to 89605 *Ext Ref In*)	user supplied
5	varies	ESA RF input	user supplied
6	GPIB cable	ESA GPIB connector to PC	varies

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC

grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, two-channel 89611



NOTE

If you use external trigger, you must connect the trigger signal to the channel 1 ADC (E1439) trigger input.

The interconnections for the 10 MHz reference signals can be different, but you must ensure that all the hardware is referenced to one signal.

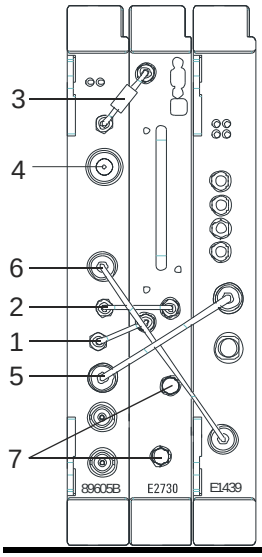
	Description	Connection	Part number
1	orange SMB-SMB cable (100 mm)	E1439 #1 *Clock* to E1439 #2 *Clock*	03585-61603
2	orange SMB-SMB cable (100 mm)	E1439 #1 *Sync* to E1439 #2 *Sync*	03585-61603
3	50 ohm SMB term (Qty 4)	Unused E1438 *Clock* & *Sync* connectors	1250-0676
4	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
5	black BNC-BNC cable (215 mm)	from 89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
6	black BNC-BNC cable (215 mm)	from 89605 1 *10 MHz Ref Out* to89605 2 *Ext Ref In*	8121-0132
7	varies	external down converter *70 MHz IF Out* to *89605 Ch 1 Input*	user supplied
8	varies	input to down converter	user supplied
9	varies	from 89605 #2 *10 MHz Ref Out* to external down converter #1 *Ext Ref In*	user supplied

	Description	Connection	Part number
10	varies	from external down converter #1 *10 MHz Ref Out* to external down converter #2 *Ext Ref In*	user supplied

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89640



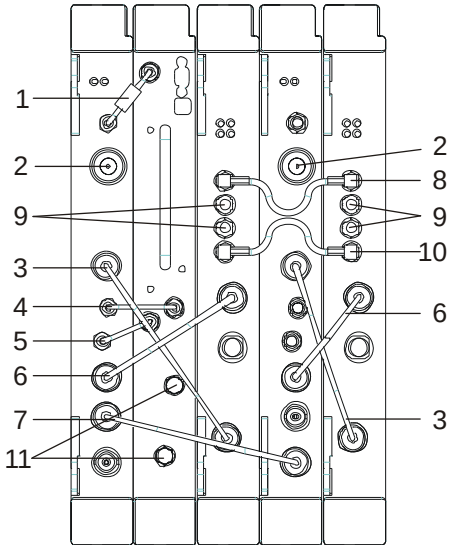
	Description	Connection	Part number
1	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2730 *10 MHz Ext Ref*	for 89605B, 89605-61693 for 89605A, 89605-61691
2	semi-rigid SMA cable	E2730 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
3	semi-rigid SMA cable	89605 *To RF In* to E2730 *RF In*	89605-61692
4	N-to-BNC adapter	89605 *Ch 1 Input* (user signal)	1250-0780
5	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
6	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
7	coax SMA cap	E2730 *1st LO In/Out* and *2nd LO In/Out*	1250-0590

NOTE It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89640 with second IF/baseband channel



NOTE

If you use external trigger, you must connect the trigger signal to the channel 1 ADC (E1439) trigger input.

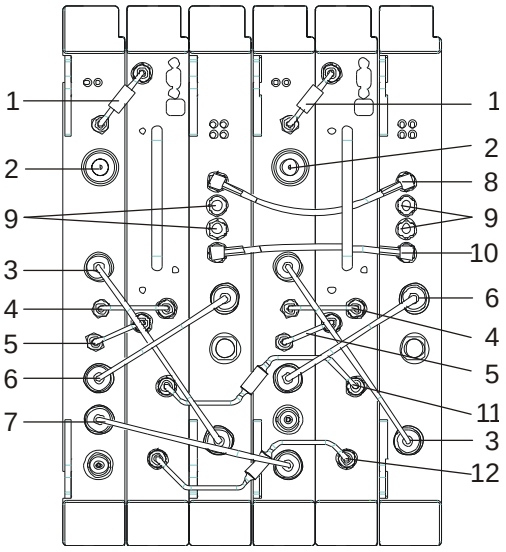
It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

	Description	Connection	Part number
1	semi-rigid SMA cable	89605 *To RF In* to E2730 *RF In*	89605-61692
2	N-to-BNC adapter	89605 *Ch 1 Input* (user signal)	1250-0780
3	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
4	semi-rigid SMA cable	E2730 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
5	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2730 *10 MHz Ext Ref*	for 89605B, 89605-61693 for 89605A, 89605-61691
6	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
7	black BNC-BNC cable (215 mm)	89605-1 *10 MHz Ext Ref Out* to 89605-2 *Ext Ref In*	8121-0132
8	orange SMB-SMB cable (100 mm)	E1439 #1 *Clock* to E1439 #2 *Clock*	03585-61603
9	50 ohm SMB term (Qty 4)	Unused E1438 *Clock* & *Sync* connectors	1250-0676
10	orange SMB-SMB cable (100 mm)	E1439 #1 *Sync* to E1439 #2 *Sync*	03585-61603
11	coax SMA cap	E2730 *1st LO In/Out* and *2nd LO In/Out*	1250-0590

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89640 with second RF channel



NOTE If you use external trigger, you must connect the trigger signal to the channel 1 ADC (E1439) trigger input. It is important that you use the semi-rigid SMA cables shipped with the analyzer; using other cables could degrade measurement accuracy.

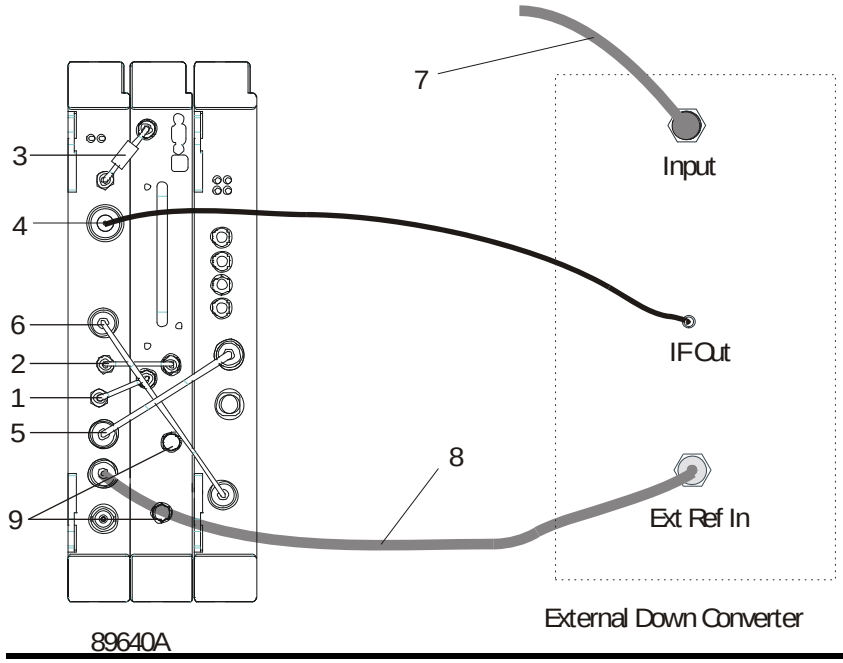
	Description	Connection	Part number
1	semi-rigid SMA cable	89605 *To RF In* to E2730 *RF In*	89605-61692
2	N-to-BNC adapter	89605 *Ch 1 Input* (user signal)	1250-0780
3	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
4	semi-rigid SMA cable	E2730 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
5	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2730 *10 MHz Ext Ref*	for 89605B, 89605-61693 for 89605A, 89605-61691
6	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
7	black BNC-BNC cable (215 mm)	89605-1 *10 MHz Ext Ref Out* to 89605-2 *Ext Ref In*	8121-0132
8	orange SMB-SMB cable (100 mm)	E1439 #1 *Clock* to E1439 #2 *Clock*	03585-61603
9	50 ohm SMB term (Qty 4)	Unused E1438 *Clock* & *Sync* connectors	1250-0676
10	orange SMB-SMB cable (100 mm)	E1439 #1 *Sync* to E1439 #2 *Sync*	03585-61603
11	semi-rigid SMA cable	E2730 #1 2nd LO In/Out to E2730 #2 2nd LO In/Out	89605-61696
12	semi-rigid SMA cable	E2730 #1 1st LO In/Out to E2730 #2 1st LO In/Out	89605-61696

After you install and configure the IEEE-1394 interface in your PC, you must connect an IEEE 1394 cable between the PC and an E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See "Connecting EMC grounding cable" on page 52.

CAUTION If you reconfigure a 2-RF-channel 89640 to a single-channel, you must connect coax SMA caps (Agilent part number 1250-0590) to the LO connectors on the E7230 module.

Continue with Step 2., part b, in "Set up your measurement hardware" on page 19.

Cable connections, 89640 with external down converter



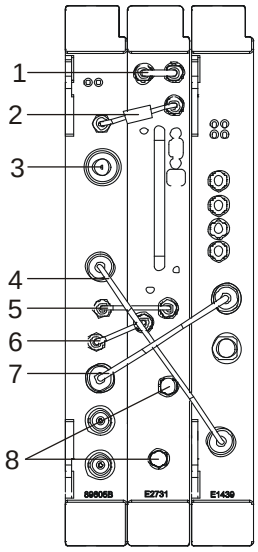
	Description	Connection	Part number
1	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2730 *10 MHz Ext Ref*	for 89605A, 89605-61691 for 89605B, 89605-61693
2	semi-rigid SMA cable	E2730 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
3	semi-rigid SMA cable	89605 *To RF In* to E2730 *RF In*	89605-61692
4	varies	external down converter *IF Out* to 89605 *Ch1 Input*	varies
5	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
6	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
7	varies	input to external down converter	varies
8	BNC-BNC cable	89605 *10 MHz Ext Ref Out* to external down converter *Ext Ref In*	varies
9	coax SMA cap	E2730 *1st LO In/Out* and *2nd LO In/Out*	1250-0590

NOTE It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89641



NOTE

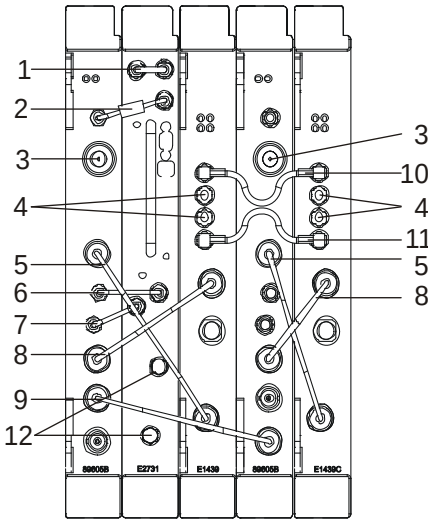
It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

	Description	Connection	Part number
1	semi-rigid SMA cable	E2731 *FE RF Out* to E2731 *2.7GHz RF In*	E2731-61601
2	semi-rigid SMA cable	89605 *To RF In* to E2731 *6 GHz In*	89605-61694
3	N-to-BNC adapter	89605 *Ch 1 Input* (user signal)	1250-0780
4	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
5	semi-rigid SMA cable	E2731 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
6	semi-rigid SMA cable	89605B *10 MHz Ext Ref Out* to E2731 *10 MHz Ext Ref*	for 89605B, 89605-61693 for 89605A, 89605-61691
7	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
8	coax SMA cap	E2731 *1st LO In/Out* and *2nd LO In/Out*	1250-0590

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89641 with second IF/baseband channel



NOTE

If you use external trigger, you must connect the trigger signal to the channel 1 ADC (E1439) trigger input.

It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

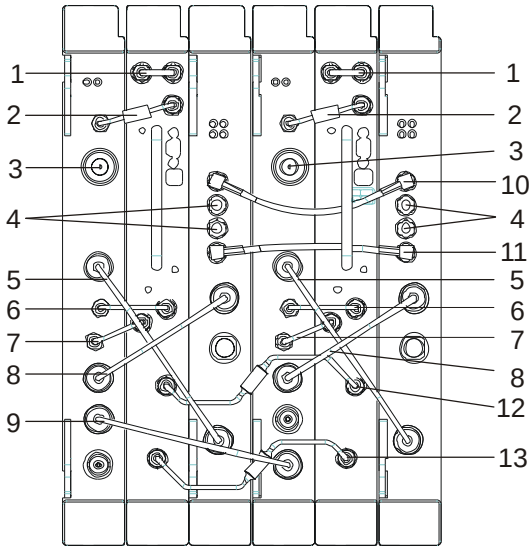
	Description	Connection	Part number
1	semi-rigid SMA cable	E2731 *FE RF Out* to E2731 *2.7GHz RF In*	E2731-61601
2	semi-rigid SMA cable	89605 *To RF In* to E2731 *6 GHz In*	89605-61694
3	N-to-BNC adapter	89605 *Ch 1 Input* (user signal)	1250-0780
4	50 ohm SMB term (Qty 4)	Unused E1439 *Clock* & *Sync* connectors	1250-0676
5	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
6	semi-rigid SMA cable	E2731 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
7	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2731 *10 MHz Ext Ref*	for 89605B, 89605-61693 for 89605A, 89605-61691
8	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
9	black BNC-BNC cable (215 mm)	89605 #1 *10 MHz Ref Out* to 89605 #2 *Ext Ref In*	8121-0132
10	orange SMB-SMB cable (100 mm)	E1438 #1 *Clock* to E1438 #2 *Clock*	03585-61603
11	orange SMB-SMB cable (100 mm)	E1438 #1 *Sync* to E1438 #2 *Sync*	03585-61603
12	coax SMA cap	E2731 *1st LO In/Out* and *2nd LO In/Out*	1250-0590

After you have installed and configured the IEEE-1394 interface in your PC, you

must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Cable connections, 89641 with second RF channel



NOTE

If you use external trigger, you must connect the trigger signal to the channel 1 ADC (E1439) trigger input.

It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

	Description	Connection	Part number
1	semi-rigid SMA cable	E2731 *FE RF Out* to E2731 *2.7GHz RF In*	E2731-61601
2	semi-rigid SMA cable	89605 *To RF In* to E2731 *6 GHz In*	89605-61694
3	N-to-BNC adapter	89605 *Ch 1 Input* (user signal)	1250-0780
4	50 ohm SMB term (Qty 4)	Unused E1439 *Clock* & *Sync* connectors	1250-0676
5	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
6	semi-rigid SMA cable	E2731 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
7	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2731 *10 MHz Ext Ref*	for 89605B, 89605-61693 for 89605A, 89605-61691
8	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
9	black BNC-BNC cable (215 mm)	89605 #1 *10 MHz Ref Out* to 89605 #2 *Ext Ref In*	8121-0132
10	orange SMB-SMB cable (100 mm)	E1438 #1 *Clock* to E1438 #2 *Clock*	03585-61603
11	orange SMB-SMB cable (100 mm)	E1438 #1 *Sync* to E1438 #2 *Sync*	03585-61603
12	semi-rigid SMA cable	E2731 #1 2nd LO In/Out to E2731 #2 2nd LO In/Out	89605-61696

	Description	Connection	Part number
13	semi-rigid SMA cable	E2731 #1 1st LO In/Out to E2731 #2 1st LO In/Out	89605-61696

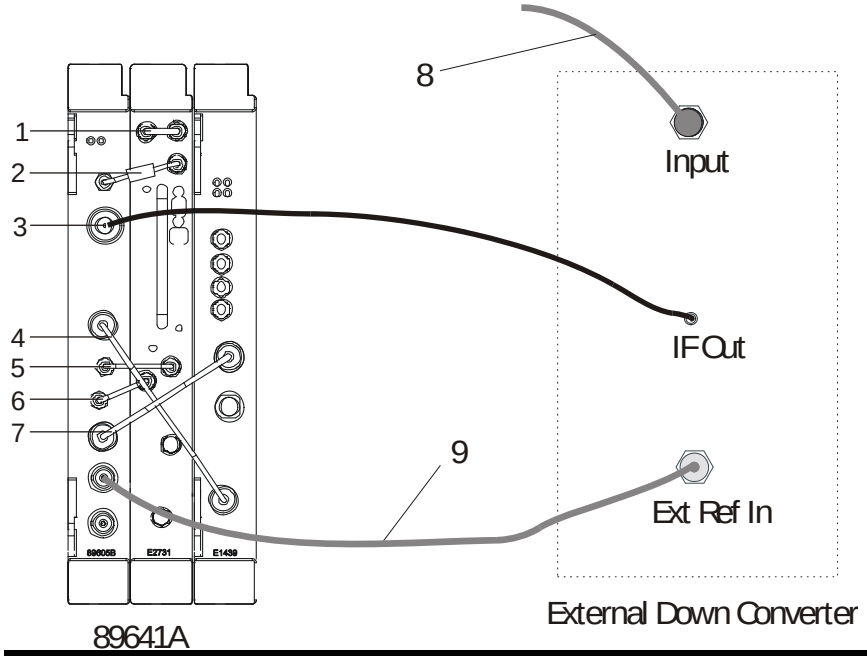
After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See "Connecting EMC grounding cable" on page 52.

CAUTION

If you reconfigure a 2-RF-channel 89641 to a single-channel configuration, you must connect coax SMA caps (Agilent part number 1250-0590) to the LO connectors on the E7231 module.

Continue with Step 2., part b, in "Set up your measurement hardware" on page 19.

Cable connections, 89641 with external down converter



	Description	Connection	Part number
1	semi-rigid SMA cable	E2731 *FE RF Out* to E2731 *2.7 GHz In*	E2731-61601
2	semi-rigid SMA cable	89605 *To RF In* to E2731 *RF In*	89605-61692
3	varies	external down converter *IF Out* to 89605 *Ch1 Input*	varies
4	black BNC-BNC cable (215 mm)	89605 *To ADC Analog In* to E1439 *Analog In*	8121-0132
5	semi-rigid SMA cable	E2731 *70 MHz IF Out* to 89605 *From 70 MHz IF Out*	89605-61691
6	semi-rigid SMA cable	89605 *10 MHz Ext Ref Out* to E2731 *10 MHz Ext Ref*	for 89605A, 89605-61691 for 89605B, 89605-61693
7	black BNC-BNC cable (215 mm)	89605 *10 MHz Ref Out* to E1439 *Ext Clock/Ref*	8121-0132
8	varies	input to external down converter	varies
9	BNC-BNC cable	89605 *10 MHz Ext Ref Out* to external down converter *Ext Ref In*	varies
9	coax SMA cap	E2731 *1st LO In/Out* and *2nd LO In/Out*	1250-0590

NOTE It is important that you use the semi-rigid SMA cables shipped with the analyzer. Using other cables could degrade measurement accuracy.

After you have installed and configured the IEEE-1394 interface in your PC, you must connect the IEEE 1394 interface cable between the PC and one of the E8491 module IEEE ports. If you are using a laptop PC, you must also connect the EMC grounding cable. See “Connecting EMC grounding cable” on page 52.

Continue with Step 2., part b, in “Set up your measurement hardware” on page 19.

Connecting EMC grounding cable

When the 89600S is operating and configured with a laptop PC, the EMC grounding cable (Agilent part number 89600-60006) must be installed as described below. This cable is necessary to ensure conformity to European EMC immunity requirements according to IEC 61326-1. The EMC grounding cable is used in addition to the IEEE-1394 (Firewire) cable (Agilent part number 8121-1944).

The EMC grounding cable is provided with the 89600S when option 201 (IEEE-1394 cable and VXI interface for use with user-supplied laptop PC) or option 204 (Laptop PC w/VSA SW, IEEE-1394 I/F; 90 day warranty only) are purchased.

1. Attach the terminal lug of the EMC grounding cable (Agilent part number 89600-60006) to chassis grounding location on rear panel of VXI main frame with a M4 x 10mm screw as shown below.

Figure 1-17 EMC grounding cable attached to VXI main frame chassis

2. Insert the USB connector of the EMC grounding cable into any available USB port on the laptop computer as shown in the following figure.

NOTE The EMC grounding cable establishes an electrical connection to the shield of the laptop computer's USB connector. That is, it makes no connection to the USB signal or voltage terminals.

Figure 1-18 **IEEE-1394 cable connected to laptop PC (left side of image). EMC grounding cable connected to laptop PC (right side of image).**

2 Diagnostics

Introduction to Diagnostics

This chapter includes procedures for troubleshooting and isolating hardware problems.

NOTE For additional troubleshooting information, in the Agilent 89600 window, click **Help > Roadmap > Troubleshooting**.

Before you run diagnostics on VXI analyzers, check the front-panel cable connections described in Chapter 1 (see table below).

Table 2-1 Front-Panel Cable Connections for VXI Analyzers

Analyzer configuration	Cable connections
1-channel 89610A	"Cable connections, 89610" (page 30)
2-channel 89610A	"Cable connections, two-channel 89610" (page 31)
1-channel 89611A	"Cable connections, 89611" (page 33)
2-channel 89611A	"Cable connections, two-channel 89611" (page 37)
1-channel 89640A	"Cable connections, 89640" (page 39)
89640A, second IF/BB channel	"Cable connections, 89640 with second IF/baseband channel" (page 40)
2-RF-channel 89640A	"Cable connections, 89640 with second RF channel" (page 42)
1-channel 89641A	"Cable connections, 89641" (page 45)
89641A second IF/BB channel	"Cable connections, 89641 with second IF/baseband channel" (page 46)
2-RF-channel 89641A	"Cable connections, 89641 with second RF channel" (page 48)

Refer to table below for a summary of diagnostic procedures in this chapter.

Table 2-2 Summary of Diagnostic Issues and Procedures

Issue	Discussion
Your analyzer includes VXI hardware and when you start the 89600 software you get a message saying the hardware wasn't found (or *Simulated Hardware* is displayed on the trace grid)	Troubleshoot Installation problems: "Troubleshooting a VXI installation problem" (page 60).
	Troubleshoot a VXI IO problem: "Troubleshooting a VXI IO configuration problem" (page 61).
	Troubleshoot an IEEE-1394 interface problem: "Troubleshooting an IEEE-1394 interface failure" (page 62).
Problem is VXI hardware and you suspect a defective module	E1438 ADC module: "Troubleshooting an E1438 ADC module" (page 64)
	E1439 ADC module: "Troubleshooting an E1439 ADC module" (page 65)
	E2730 or E2731 RF Tuner module: "Troubleshooting the E2730/E2731 module" (page 66)

Table 2-2 Summary of Diagnostic Issues and Procedures

Issue	Discussion
Problem is in signal path and you suspect a defective module	2.7 GHz RF signal path: "Troubleshooting the 2.7 GHz RF signal path" (page 67)
	6.0 GHz RF signal path: "Troubleshooting the 6.0 GHz RF signal path" (page 70)
	0 to 36 MHz baseband signal path: "Troubleshooting the 0 to 36 MHz baseband signal path" (page 73)
	70 MHz IF signal path: "Troubleshooting the 70 MHz IF signal path" (page 74)
	0 to 40 MHz signal path: "Troubleshooting the 0-to-40 MHz baseband signal path" (page 75)

Recommended Test Equipment

The table below shows you the recommended test equipment.

Table 2-3 Recommended Test Equipment

Instrument	Specifications (50 Ω In/Out Impedance)	Model
Digital Signal Generator	Frequency: 500 kHz to 3 GHz Amplitude range: -40 to +16 dBm Amplitude resolution: 0.1 dB Harmonic level: <-30 dBc Spurious: <-90 dBc, <40 MHz Spurious: <-78 dBc, <2.56 GHz SWR: <1.5 Frequency Reference Out: 10 MHz Amplitude: ~7 dBm SSB Phase Noise: <-140 dBc/Hz at 100,1 k, 10MHz offsets RF: 1 GHz SSB Phase Noise: ≤-109 dBc/Hz at 20 kHz ≤-122 dBc/Hz at 100 kHz offset External Reference Input	E4433B
Spectrum Analyzer	Frequency 3 to 7 GHz Amplitude Range –20 to +15 dBm	E4407B
Power Meter	Dual Channel Absolute Accuracy: ±0.5% Power Reference Accuracy: ±0.9%	E4419B Alternate: E4419A
Power Sensor (2)	Frequency Range: 10 MHz to 6 GHz Amplitude Range: -30 to +20 dBm SWR (varies): ≤1.1 10 MHz to 2 GHz ≤1.15 2GHz to 6 GHz	E9301A

Troubleshooting a VXI mainframe failure

Using the mainframe service guide, verify that all power supplies and fan(s) are operational.

Troubleshooting a VXI installation problem

If you get a message saying that the analyzer cannot find VXI hardware when you start either the Vector Signal Analyzer or the Spectrum Analyzer application, there may have been a problem during the installation of the PCI card in your computer.

To troubleshoot a VXI installation problem:

1. It is very important that you upgrade the PC BIOS to the latest version your PC manufacturer provides whether your PC is new or old. Upgrading to the latest version of BIOS will eliminate those bugs fixed by the new BIOS. A BIOS upgrade and a video driver upgrade may be required to fix PCI-related problems even on a new PC.
2. You may also need to upgrade the drivers for other PCI devices in the PC (video, IDE, LAN, SCSI, sound, modem, etc.).
3. Verify that the power supply splitter cable is connected between the PC power supply and the PCI card.
4. The E8491B requires installation of the PCI-to-IEEE 1394 host adapter in a bus-mastering PCI slot. Consult your PC's user manual to determine which slots are bus-mastering (it is possible that all slots are bus-mastering).
5. In addition to the above, you may need to move the PCI-to-IEEE 1394 host adapter to a separate IRQ line in the PC. PCI enables up to four devices sharing an IRQ line. However, this doesn't always work, and you may need to have one IRQ per card. Moving the IRQ is not easy, and whether it can be done will depend on the details of the BIOS implementation of your PC.
6. Go to Control Panel, Devices and change the Startup mode for the wn1394 to *System*. This starts the 1394 PCI card driver sooner and prevent problems.

   If you suspect such a problem, refer to PDF: *Agilent E8491B IEEE 1394 PC Link to VXI Configuration and User's Guide* located at http://www.home.agilent.com/upload/cmc_upload/All/E8491-90001_users.pdf .

Troubleshooting a VXI IO configuration problem

The information in this section shows you how to troubleshoot a VXI IO configuration problem when the 89600 software cannot find VXI measurement hardware.

If you replace the E8491 card in the mainframe or connect a different VXI mainframe to your computer, the 89600 software will not be able to find the hardware. The PCI interface in the computer looks for the specific E8491 card that was previously connected and cannot find it.

To troubleshoot a VXI IO configuration problem:

1. If you are running Vector Signal Analyzer or Spectrum Analyzer, close the application.
2. Click **Start > (All) Programs > Agilent IO Libraries Suite> Agilent Connection Expert**.
3. In the right column, select **VXI** in list and click **Delete**.
4. Click **Add Interface** and then select **VXI**: **Agilent E8491 IEEE 1394 to VXI Controller**, then click **Add.**
5. If E8491 IEEE to VXI is not listed, you may need to install a driver for the E8491. See instructions on the next page. The 89600 software should find the hardware. If not, you can find E8491 troubleshooting information in *E8491B Configuration and User's Guide* located at http://www.home.agilent.com/upload/cmc_upload/All/EPSG084330.pdf.

You can also find *E8491B Configuration and User's Guide* by searching: Go to http://www.agilent.com. Click on **Technical Support > Manuals** and Search for E8491B.

Troubleshooting an IEEE-1394 interface failure

If you are running Vector Signal Analyzer or Spectrum Analyzer, close the application before troubleshooting this problem.

To troubleshoot an IEEE-1394 interface failure:

1. Verify that Agilent IO Libraries Suite Control is running.

   If this program is running, the icon shown to the right will appear in the task bar. If the icon is there, go to step 2.

   If the icon is not there, reinstall the IO Libraries Suite from the 89600 Installation CD as follows:

   a. Insert the 89600 Installation CD ROM.

   b. If the installation utility does not start automatically, click **Start > Run**, and type:

      drive:\setup.exe

      ...where *drive* represents the drive containing the setup CD-ROM.

   c. When the Installation Manager window opens, select **Install Agilent 89600 VSA**.

   d. Click **Next** in the Welcome window and **Yes** in the Software License and Warranty window.

   e. In the Installation Options window, select **Custom Installation** and click **Next.**

   f. In the Custom Installation window, select **IO Libraries Suite 14.0** from the list. Click **Next**.

   g. In the Installation Settings window, click **Install**.

2. If the Agilent IO Libraries Suite Control is running, verify that the version is 14.0 or greater.

   a. Click the IO Control icon (shown above).

   b. Click **About Agilent IO Control**.

      If the version is lower than 14.0, reinstall the IO Libraries Suite 14.0 as instructed in step 1.

3. Verify that the IEEE-1394 drivers are loaded and running.

   a. Click **Start > Settings > Control Panel > System > Hardware > Device Manager.**

   b. If *IEEE 1394 Bus host controllers* is not present then the IEEE-1394 drivers were not loaded properly. Reload the IO Libraries Suite as instructed in step

1.

If *IEEE 1394 Bus host controllers* is on the list, then the PCI interface card is most likely faulty.

4. Verify the E8491B slot zero VXI controller card.

   a. Click on the Agilent IO Control icon and click **VXI Resource Manager > Edit Resources**, then click the **Run** button.

   b. If an error is reported, click **Start > (All) Programs > Agilent IO Libraries Suite > Agilent Connection Expert.**

      If Connection Expert is unable to find the E8491B, then the E8491B is most likely faulty.

Troubleshooting an E1438 ADC module

This section provides information on troubleshooting an E1438 ADC module.

To verify the E1438 module using the self test:

1. If you have either the Vector Signal Analyzer or Spectrum Analyzer running, close the application.
2. Click **Start > (All) Programs > Vxipnp > Age1438 > E1438 Front Panel**.
3. If the factory default address has been changed you must enter it into the dialog box that will be presented.

   There are two ways to find the E1438 address:

   a. Click on the Agilent IO Libraries Suite Control icon and click **VXI Resource Manager > Edit Resources**, highlight Add/delete symbolic names of VXI devices, and click **RM Output**. The LADD column in the VXI device table lists the logical address for each module.

   b. Open the Vector Signal Analyzer or Spectrum Analyzer, click **Utilities > Hardware** and the ADC tab for the module. The logical address is listed in the first column with the VXI mainframe number.
4. On the menu bar of the front panel program select **Control > Self Test.**

   If errors are reported, then the E1438 module is faulty.
5. Repeat this procedure for a second E1438 if necessary.

   The E1438 front panel test always looks for a module at logical address 192. If it finds one, it automatically opens the soft front panel for that module. To test another E1438 module, power-off the mainframe and pull the module with address 192 out of the mainframe (you don’t have to remove the module completely--just slide it forward an inch or so). Repeat steps 1-4 above.

Troubleshooting an E1439 ADC module

This section provides troubleshooting information for an E1439 ADC module.

To verify the E1439 module using the self test:

1. If you have either the Vector Signal Analyzer or Spectrum Analyzer running, close the application.
2. Click **Start > (All) Programs > Vxipnp > Age1439 > E1439 Front Panel.**
3. If the factory default address has been changed you must enter it into the dialog box that will be presented.

   There are two ways to find the E1439 address:

   a. Click on the Agilent IO Libraries Suite Control icon and click **VXI Resource Manager > Edit Resources**, highlight Add/delete symbolic names of VXI devices, and click **RM Output**. The LADD column in the VXI device table lists the logical address for each module.

   b. Open the Vector Signal Analyzer or Spectrum Analyzer, click **Utilities, Hardware** and the ADC tab for the module. The logical address is listed in the first column with the VXI mainframe number.
4. On the menu bar of the front panel program select **Control > Self Test.**

   If errors are reported, then the E1439 module is faulty.
5. Repeat this procedure for a second E1439 if necessary.

   The E1439 front panel test always looks for a module at logical address 194. If it finds one, it automatically opens the soft front panel for that module. To test another E1439 module, power-off the mainframe and pull the module with address 194 out of the mainframe (you don’t have to remove the module completely--just slide it forward an inch or so). Repeat steps 1-4 above.

Troubleshooting the E2730/E2731 module

You can use VISA Assistant to isolate problems to the E2730/E2731 module.

To troubleshoot the E2730/E2731 module:

1. Start Agilent Connection Expert by clicking **Start > (All) Programs > Agilent IO Libraries Suite > Agilent Connection Expert**.
2. Under VXIO, highlight the E273xA module.
3. Click **Interactive IO**.
   a. If the red LED on the E273xA front panel is lit, type **CDE?** in the command box and click **Send & Read**. (CDE? reads the module's current device Error Register contents.) If the response ends in 32768, the 10 MHz Reference signal is probably not connected properly. Check the semi-rigid cable from the 10 MHz Ref Out connector on the 89605 module to the 10 MHz Ext Ref connector on the E273xA module. Tighten the connectors, and the red LED should turn off. If the query returns any number other than 32768 or 00000, the E273xA module is most likely faulty.
   b. If the red LED on the E273xA front panel flickers or turns on and off, type **DDE?** in the command box and click **Send & Read**. (DDE? reads the module's latched error status. Reading this register clears it until the fault reoccurs.) If the query returns 32768, check the 10 MHz Ref connections as described in the previous paragraph. If the query returns any number other than 32768 or 00000, the E273xA module is most likely faulty.
4. Repeat for a second E2730/E2731 module if necessary.

Troubleshooting the 2.7 GHz RF signal path

The following procedures direct you through inserting a signal at various points in the analyzer's signal path to isolate problems to a specific module. Perform the steps in the order listed.

This test requires a signal generator. See, "Recommended Test Equipment" (page 58).

To troubleshoot the 2.7 GHz RF signal path:

1. Set up the analyzer as follows:
   a. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
   b. Click **File > Preset > Preset Setup.**
   c. Click **Utilities > Calibration,** and clear the **Apply Corrections to Data** checkbox.
   d. Click **MeasSetup > Frequency Bands > 36 MHz – 2.7 GHz**.
   e. Disconnect the BNC cable from the E1439 *Analog In* connector and connect a signal generator to E1439 Analog Input.
   f. Set the signal generator for 70 MHz, –10 dBm output.
   g. Set the analyzer's marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

      The marker reading should be 20 dBm ± 1.5 dB.
   h. Verify the other settings in the following table.

Input Range	Signal Generator Level	Marker Level
+20 dBm	–10 dBm	+20 dBm ± 1.5 dB
–35 dBm	–20 dBm	–40 dBm ± 1.5 dB
–40 dBm	–20 dBm	–40 dBm ± 1.5 dB
–45 dBm	–20 dBm	–40 dBm ± 1.5 dB

   If any of the readings are incorrect, the E1439 module is most likely faulty.

2. Reconnect the BNC cable to the E1439 *Analog In* and disconnect the SMA cable from the 89605 *From 70 MHz IF Out* connector. Connect the signal generator output to 89605 *From 70 MHz IF Out*.
   a. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

b. The marker reading should be –40 dBm ± 1.5 dB. If this reading is incorrect, the 89605 module is most likely faulty.

3. Set the signal generator to 1 GHz, –40 dBm.

   a. Reconnect the SMA cable to the 89605 *From 70 MHz IF Out* connector. Disconnect the SMA cable from the E2730 *RF IN* connector. Connect the signal generator output to the E2730 *RF In* connector.

   b. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

   c. The marker reading should be –40 dBm ± 3.5 dB

   d. Change the signal generator and 89600 center frequency to 950 MHz.

   e. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

   f. The marker reading should be –40 dBm ± 3.5 dB.

      If either reading is incorrect, the E2730 module is most likely faulty. If this module is channel 2 in a 2-channel analyzer, see "Verifying Channel 1 LO outputs in a 2-channel RF system" on page 77.

4. Set the signal generator to 1 GHz, –30 dBm. Set the 89600 center frequency to 16 Hz.

   a. Reconnect the SMA cable to E2730 *RF In* connector. Connect the signal generator output to the 89605 Ch1 Input connector.

   b. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

c. Change the analyzer input range and the signal generator output level in 5 dB steps, verifying the marker readings in the following table.

Input Range	Signal Generator Level	Marker Level
–30 dBm	–30 dBm	–30 dBm ± 3.5 dB
–25 dBm	–25 dBm	–25 dBm ± 3.5 dB
–20 dBm	–20 dBm	–20 dBm ± 3.5 dB
–15 dBm	–15 dBm	–15 dBm ± 3.5 dB
–10 dBm	–10 dBm	–10 dBm ± 3.5 dB
–5 dBm	–5 dBm	–5 dBm ± 3.5 dB
0 dBm	0 dBm	0 dBm ± 3.5 dB
+5 dBm	+5 dBm	+5 dBm ± 3.5 dB
+10 dBm	+10 dBm	+10 dBm ± 3.5 dB
+15 dBm	+15 dBm	+15 dBm ± 3.5 dB
+20 dBm	+20 dBm	+20 dBm ± 3.5 dB

If any of these readings are incorrect, the 89605 module is most likely faulty.

5. Repeat steps 1 through 4 for a second channel if required.

Troubleshooting the 6.0 GHz RF signal path

The following procedures direct you through inserting a signal at various points in the analyzer's signal path to isolate problems to a specific module. Perform the steps in the order listed. This test requires a signal generator. See "Recommended Test Equipment" (page 58).

To troubleshoot the 6.0 GHz RF signal path:

1. Set up the analyzer as follows:
   a. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
   b. Click **File > Preset > Preset Setup.**
   c. Click **Utilities > Calibration,** and clear the **Apply Corrections to Data** checkbox.
   d. Click **MeasSetup > Frequency Bands > 36 MHz – 6 GHz**.
   e. Disconnect the BNC cable from the E1439 *Analog In* connector and connect a signal generator to E1439 Analog Input.
   f. Set the signal generator for 70 MHz, –10 dBm output.
   g. Set the analyzer's marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**. The marker reading should be 20 dBm ± 1.5 dB
   h. Verify the other settings in the following table.

Input Range	Signal Generator Level	Marker Level
+20 dBm	–10 dBm	+20 dBm ± 1.5 dB
–35 dBm	–20 dBm	–40 dBm ± 1.5 dB
–40 dBm	–20 dBm	–40 dBm ± 1.5 dB
–45 dBm	–20 dBm	–40 dBm ± 1.5 dB

   If any of the readings are incorrect, the E1439 module is most likely faulty.

2. Reconnect the BNC cable to the E1439 *Analog In* and disconnect the SMA cable from the 89605 *From 70 MHz IF Out* connector. Connect the signal generator output to 89605 *From 70 MHz IF Out*.
   a. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.
   b. The marker reading should be –40 dBm ± 1.5 dB.

      If this reading is incorrect, the 89605 module is most likely faulty.

3. Set the signal generator to 1 GHz, –40 dBm.

   a. Reconnect the SMA cable to the 89605 *From 70 MHz IF Out* connector. Disconnect the SMA cable from the E2731 *6 GHz IN* connector. Connect the signal generator output to the E2731 *6 GHz IN* connector.

   b. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

   c. The marker reading should be –40 dBm ± 4.5 dB

   d. Change the signal generator and 89600 center frequency to the frequencies in the table and repeat steps b and c.

Frequency
950 MHz
3.5 GHz
4.0 Ghz
4.5 Ghz
5.5 Ghz

   If any of these readings are incorrect, the E2731 module is most likely faulty. If this module is channel 2 in a 2-channel analyzer, see "Verifying Channel 1 LO outputs in a 2-channel RF system" on page 77.

4. Set the signal generator to 1 GHz, –30 dBm. Set the 89600 center frequency to 16 Hz.

   a. Reconnect the SMA cable to E2731 *6 GHz In* connector. Connect the signal generator output to the 89605 Ch1 Input connector.

   b. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.

   c. Change the analyzer input range and the signal generator output level in 5 dB steps, verifying the marker readings in the following table.

Input Range	Signal Generator Level	Marker Level
–30 dBm	–30 dBm	–30 dBm ± 5 dB
–25 dBm	–25 dBm	–25 dBm ± 5 dB
–20 dBm	–20 dBm	–20 dBm ± 5 dB
–15 dBm	–15 dBm	–15 dBm ± 5 dB
–10 dBm	–10 dBm	–10 dBm ± 5 dB
–5 dBm	–5 dBm	–5 dBm ± 5 dB
0 dBm	0 dBm	0 dBm ± 5 dB
+5 dBm	+5 dBm	+5 dBm ± 5 dB
+10 dBm	+10 dBm	+10 dBm ± 5 dB

Input Range	Signal Generator Level	Marker Level
+15 dBm	+15 dBm	+15 dBm ± 5 dB
+20 dBm	+20 dBm	+20 dBm ± 5 dB

If any of these readings are incorrect, the 89605 module is most likely faulty.

5. Repeat steps 1-4 for channel 2 if required.

Troubleshooting the 0 to 36 MHz baseband signal path

Perform the following procedures in the order listed to troubleshoot the 89640 baseband signal path.

This test requires a signal generator. See "Recommended Test Equipment" (page 58).

1. Set up the 896xxA as follows:
   a. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
   b. Click **File > Preset > Preset Setup.**
   c. Click **Utilities > Calibration,** and clear the *Apply Corrections to Data* checkbox.
   d. Click **MeasSetup > Frequency Bands > 0 - 36 MHz.**
   e. Disconnect the BNC cable from the E1439 *Analog In* connector and connect a signal generator to E1439 *Analog In*.
   f. Set the signal generator for 20 MHz, -30 dBm output.
   g. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.
   h. The marker reading should be 20 dBm ± 1.7 dB.

      If this reading is incorrect, the E1439 module is most likely faulty.
2. Connect the signal generator output to 89605 *Ch 1 Input*.
   a. Reconnect the BNC cable from 89605 *To ADC* to E1439 *Analog In*.
   b. Set the center frequency to 20 MHz and the frequency span to 100 kHz.
   c. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.
   d. The marker reading should be -30 dBm ± 3.5 dB.
   e. Change the 89640A input range in 5 dB steps while verifying that the marker reading at each step is -30 dBm ± 3.5 dB.

      If any of these readings are incorrect, the 89605 module is most likely faulty.
3. Repeat steps 1 and 2 for a second channel if required.

Troubleshooting the 70 MHz IF signal path

The following procedures direct you through inserting a signal at various points in the analyzer's signal path to isolate problems to a specific module. Perform the steps in the order listed. This test requires a signal generator. See "Recommended Test Equipment" (page 58).

1. Set up the analyzer as follows:
   a. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
   b. Click **File > Preset > Preset Setup.**
   c. Click **Utilities > Calibration,** and clear the *Apply Corrections to Data* checkbox.
   d. Click **MeasSetup > Frequency Bands > 52 MHz – 88 MHz**.
   e. Click **MeasSetup > Freq > Span,** and enter `100 kHz`.
   f. Click **Input > Range,** and enter `-45 dBm`.
   g. Click **Control > Restart**.
   h. Disconnect the BNC cable from the E1439 *Analog In* connector and connect a signal generator to E1439 Analog Input.
   i. Set the signal generator for 70 MHz, –45 dBm output.
   j. Set the 89600 marker to peak: right click on the spectrum trace and click ↑**Peak**. The marker reading should be -39 dBm ± 1.5 dB
   k. Click **Markers > Copy Marker to > Move Offset to Mkr**.
   l. Change the Input Range in 5 dB increments from -45 dBm to -25 dBm. The Marker Level for all ranges should read 0 dB ± 0.5 dB.

      If any of the readings are incorrect, the E1439 module is most likely faulty.
2. Reconnect the BNC cable to the E1439 *Analog In*. Connect the signal generator output to 89605 *Ch 1 Input*.
   a. Set the marker to peak: right click on the spectrum trace and click ↑**Peak**.
   b. Click **Input > Range,** and enter `-25 dBm`.
   c. Click **Markers > Copy Marker to > Move Offset to Mkr**.
   d. Change the Input Range in 5 dB increments from -25 dBm to +20 dBm. The Marker Level for all ranges should read 0 dB ± 0.5 dB.

      If any of these readings is incorrect, the 89605 module is most likely faulty.
3. For a two-channel IF analyzer, repeat this procedure for the second channel.

Troubleshooting the 0-to-40 MHz baseband signal path

Perform the following procedures in the order listed to troubleshoot the 89610A signal path. This test requires a signal generator. See "Recommended Test Equipment" (page 58).

To troubleshoot the 0-to-40MHz baseband signal path:

1. Set up the analyzer as follows:
   a. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
   b. Click **File > Preset > Preset Setup.**
   c. Click **Utilities > Calibration,** and clear the *Apply Corrections to Data* checkbox.
   d. Disconnect the BNC cable from the E1438 *Analog In* connector and connect a signal generator to E1438 *Analog In*.
   e. Set the signal generator for 20 MHz, -31 dBm output.
   f. Set the analyzer input range to -31 dBm.
   g. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.
   h. The marker reading should be -31 dBm ± 1.7 dB.

      If this reading is incorrect, the E1438 module is most likely faulty.

i. Change the analyzer input range and the signal generator output level in 3 dB steps, verifying the marker readings in the following table.

Input Range	Signal Generator Level	Marker Level
–31 dBm	–31 dBm	–31 dBm ± 1.7 dB
–28 dBm	–28 dBm	–28 dBm ± 1.7 dB
–25 dBm	–25 dBm	–25 dBm ± 1.7 dB
–22 dBm	–22 dBm	–22 dBm ± 1.7 dB
–19 dBm	–19 dBm	–19 dBm ± 1.7 dB
–16 dBm	–16 dBm	–16 dBm ± 1.7 dB
–13 dBm	–13 dBm	–13 dBm ± 1.7 dB
–10 dBm	–10 dBm	–10 dBm ± 1.7 dB
–7 dBm	–7 dBm	–7 dBm ± 1.7 dB
–4 dBm	–4 dBm	–4 dBm ± 1.7 dB
–1 dBm	–1 dBm	–1 dBm ± 1.7 dB
+ 2 dBm	+ 2 dBm	+ 2 dBm ± 1.7 dB
+5 dBm	+5 dBm	+5 dBm ± 1.7 dB
+8 dBm	+8 dBm	+8 dBm ± 1.7 dB
+11 dBm	+11 dBm	+11 dBm ± 1.7 dB
+14 dBm	+14 dBm	+14 dBm ± 1.7 dB
+17 dBm	+17 dBm	+17 dBm ± 1.7 dB
+20 dBm	+20 dBm	+20 dBm ± 1.7 dB

If any readings are incorrect, the E1438 module is most likely faulty.

2. For a two-channel 89610A, repeat this procedure for the second E1438.
3. Connect the signal generator output to 89606/B *Ch 1 Input*.
   a. Reconnect the BNC cable from 89606/B *To ADC* to E1438 *Analog In*.
   b. Set the signal generator to -31 dBm output level.
   c. Set the analyzer center frequency to 20 MHz, frequency span to 100 kHz, and input range to -31 dBm.
   d. Set the marker to peak by right clicking on the spectrum trace and clicking ↑**Peak**.
   e. The marker reading should be -31 dBm ± 1.7 dB.
   f. Change the analyzer input range and the signal generator output level in 3 dB steps, verifying the marker readings in the table in above.

      If any of these readings are incorrect the 89606/B module is most likely faulty.

Verifying Channel 1 LO outputs in a 2-channel RF system

Perform the following procedures to verify the channel 1 LO output on an E2730 or E2731 module in a 2-channel analyzer. This test requires a spectrum analyzer and a power meter. See "Recommended Test Equipment" (page 58).

To verify Channel 1 LO outputs in a 2-channel RF system, 1st LO:

1. Disconnect the cable connected to E273x 1st LO In/Out.
2. Connect Channel 1 1st LO In/Out to the spectrum analyzer RF Input.
3. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
4. Set up the 89600 Vector Signal Analyzer:
   a. Click **File > Preset > Preset Setup.**
   b. Click **Input > Channels > 2 Channels**.
5. Set up the spectrum analyzer:
   a. Preset.
   b. Set the reference level to 12 dBm.
   c. Set the span to 100 MHz.
6. For each frequency listed below verify that the amplitude is < 6.5 dBm. If the signal level is marginal, verify with a power meter.

89600 center frequency	Spectrum analyzer center frequency
36 MHz	3.8175 GHz
1 GHz	4.7825 GHz
2.7 GHz	6.4825 GHz

If any reading is incorrect then the E273x is most likely faulty.

To verify Channel 1 LO outputs in a 2-channel RF system, 2nd LO

1. Disconnect the cable connected to E273x 2nd LO In/Out.
2. Connect Channel 1 2nd LO In/Out to the spectrum analyzer RF Input.
3. If it is not already running, start the Vector Signal Analyzer by double clicking the icon or clicking **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.
4. Set up the 89600 Vector Signal Analyzer:
   a. Click **File > Preset > Preset Setup.**
   b. Click **Input > Channels > 2 Channels**.
5. Set up the spectrum analyzer:
   a. Preset.
   b. Set the reference level to 15 dBm.
   c. Set the center frequency to 3.711 GHz.
   d. Set the span to 5 MHz.
6. For each frequency listed below verify that the amplitude is < 10.0 dBm. If the signal level is marginal, verify with a power meter.

89600 center frequency	Spectrum analyzer center frequency
252.4 MHz	3710 MHz
252.5 MHz	3712.5 MHz
254 MHz	3711 MHz

If any reading is incorrect then the E273x is most likely faulty.

3 Circuit Descriptions

Introduction

This chapter contains block diagrams and circuit descriptions of the 89600 series VXI measurement hardware. This information is provided to help you understand system operation and identify and isolate problems to a specific module.

These products consist of VXI measurement hardware and Vector Signal Analysis (VSA) software running on a standard Windows XP workstation. The 89600 series includes three analyzer configurations with VXI measurement hardware:

- 89611 70 MHz IF Analyzer, see: "Agilent 89611 70 MHz IF Analyzer circuit description" (page 89)
- 89610 DC - 40 MHz Analyzer (with optional second input channel), see: "Agilent 89610 circuit description" (page 81)
- 89640 DC - 2.7 GHz Analyzer and 89641 DC - 6.0GHz Analyzer, see: "Agilent 89640/89641 circuit description" (page 85)

Agilent 89610 circuit description

The Agilent 89610 Vector Signal Analyzer VXI hardware includes the following VXI modules:

- Agilent E8491 Option 001 IEEE 1394 PC Link to VXI (Firewire)
- Agilent 89606 Input module
- Agilent E1438 ADC module
- Option 002, 102, 145, and 289 include a second E1438 module

For module descriptions in this section, refer to Figure 3-1 on page 82.

E8491 PC Link to VXI

The E8491 module provides the link between the computer and the VXI measurement hardware. No signal acquisition or processing happens in this module. For detailed information on this module and the IEEE 1394 interface, refer to the PDF document *Agilent E8491B IEEE 1394 PC Link to VXI Configuration and User's Guide* located at http://www.home.agilent.com/upload/cmc_upload/All/E8491-90001_users.pdf.

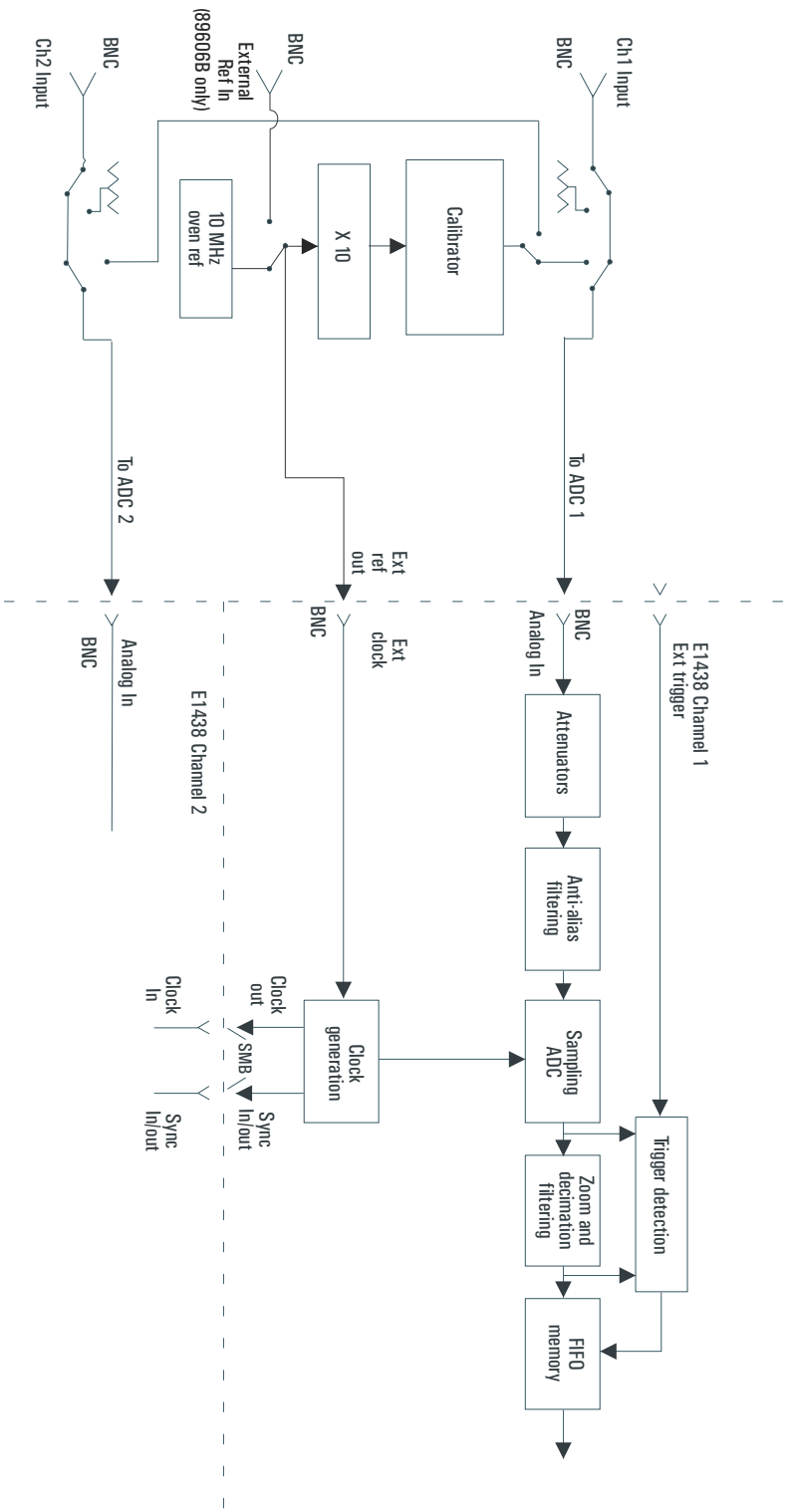
89606/B Input Module

The 89606 Input module accepts the input signal and passes it to the E1438 ADC module. During calibration, the input signal path is interrupted. The calibrator in the 89606 module inserts a calibration signal into the signal path to the E1438 ADC module. The calibration signal is taken from the 10 MHz reference and multiplied by 10 to match the E1438 sampling rate of 100 MSa per second. The E1438 ADC uses the same 10 MHz reference, so the calibration source is phase locked to the sample clock.

The 89606 also provides a 10 MHz reference signal to the Agilent E1438 module. An additional 10 MHz Ref output is available on the module front panel to connect to other instruments in your measurement setup. For the 89606B only, you can connect a 10 MHz or 13 MHz reference signal to the Ext Reference In connector.

Use of this module outside the 89600-series of analyzers is not supported.

Figure 3-1 **89610 block diagram**



E1438 ADC Module

All signal processing happens in the Agilent E1438A 100 MSa/s ADC + Filter + FIFO (attenuation, anti-alias filtering, etc.). Detailed information about this module is available in a PDF file: *Agilent E1438 VXI 100 MSa/s ADC with filters and memory User's Guide*. This guide is installed on your computer, however, you may have to use the Search function to find the exact location. Typical locations include the following:

C:/Vxi/Vxipnp/Winnt/age1438/help/e1438_Users_Guide.pdf

C:/Program Files/Visa/Winnt/age1438\help/e1438_Users_Guide.pdf

Triggering

For external trigger mode, a trigger signal must be supplied at the *Ext Trigger* connector on the front panel. This input is AC coupled with an impedance of 1 K ohm so any signal with a sharp rising or falling transition greater than 100 mV (for example, TTL or ECL logic) can be used as an external trigger source. Minimum pulse width is 300 ns.

If your system includes two E1438 modules, you can use the external trigger connector on either module. The bi-directional Intermodule Sync connectors on the module front panels connect the trigger signal between the modules. This synchronizes the two modules so that they receive the trigger signal simultaneously.

Coupling

The input can be either AC or DC coupled. AC coupling enables the system to measure low level AC signals in the presence of a large DC offset.

Ranging

Attenuation is the first step in the E1438 module. The module provides 0 to 51 dB of attenuation in 3 dB steps, resulting in analyzer input ranges between -31 dBm and 20 dBm in 3 dB steps.

Anti-alias filtering

Since the normal ADC sample rate is 100 MHz, a complete representation of the input signal can be achieved only for bandwidths up to 50 MHz. Frequency components above 50 MHz can cause ambiguous results (aliasing).

The anti-alias filter attenuates these high frequency components to reduce aliasing. The anti-alias filter in the Agilent E1438 is flat to 40 MHz and rejects signals above 60 MHz by at least 90 dB. Thus the 0-40 MHz frequency range of the sampled signal is –90 dB alias free. The filter's transition band from 40 MHz to 60 MHz affects flatness and enable some aliasing in the sampled signal frequency range of 40 MHz to 50 MHz.

Analog-to-digital (ADC) signal conversion

The central part of the E1438 is a precision sampling ADC. The ADC samples the

signal at a rates up to 100 MSa/sec and converts the analog signal to a digital signal.

Zoom and decimation filtering

This section uses digital circuitry to enable programmable changes in the center frequency and signal bandwidth of the 89610 analyzer (zoom). Bandwidth is controlled by a chain of digital low-pass filters. Each of the filters reduces the bandwidth by a factor of 2 (decimation).

Memory

Digitized data is stored in memory in the E1438 module and read out after a block of data has been taken. The digitized data passes through the E8491 interface to the measurement software in the computer.

For information on how the signal is processed by the measurement software, see the 89600 online help for “System Block Diagram” under Tutorial, Theory of Operation. Typically, this help file is in location:

C:/Program Files/Agilent/89600 VSA/Help/tasks.hlp

Agilent 89640/89641 circuit description

The Agilent 89640 Vector Signal Analyzer VXI hardware includes the following VXI modules:

- Agilent E8491 Option 001 IEEE 1394 PC Link to VXI
- Agilent 89605 Input module
- Agilent E1439 ADC module
- Agilent E2730 RF Tuner module
- optional second IF/baseband channel, including an additional E1439 and E2730 modules

The Agilent 89641 Vector Signal Analyzer VXI hardware includes the following VXI modules:

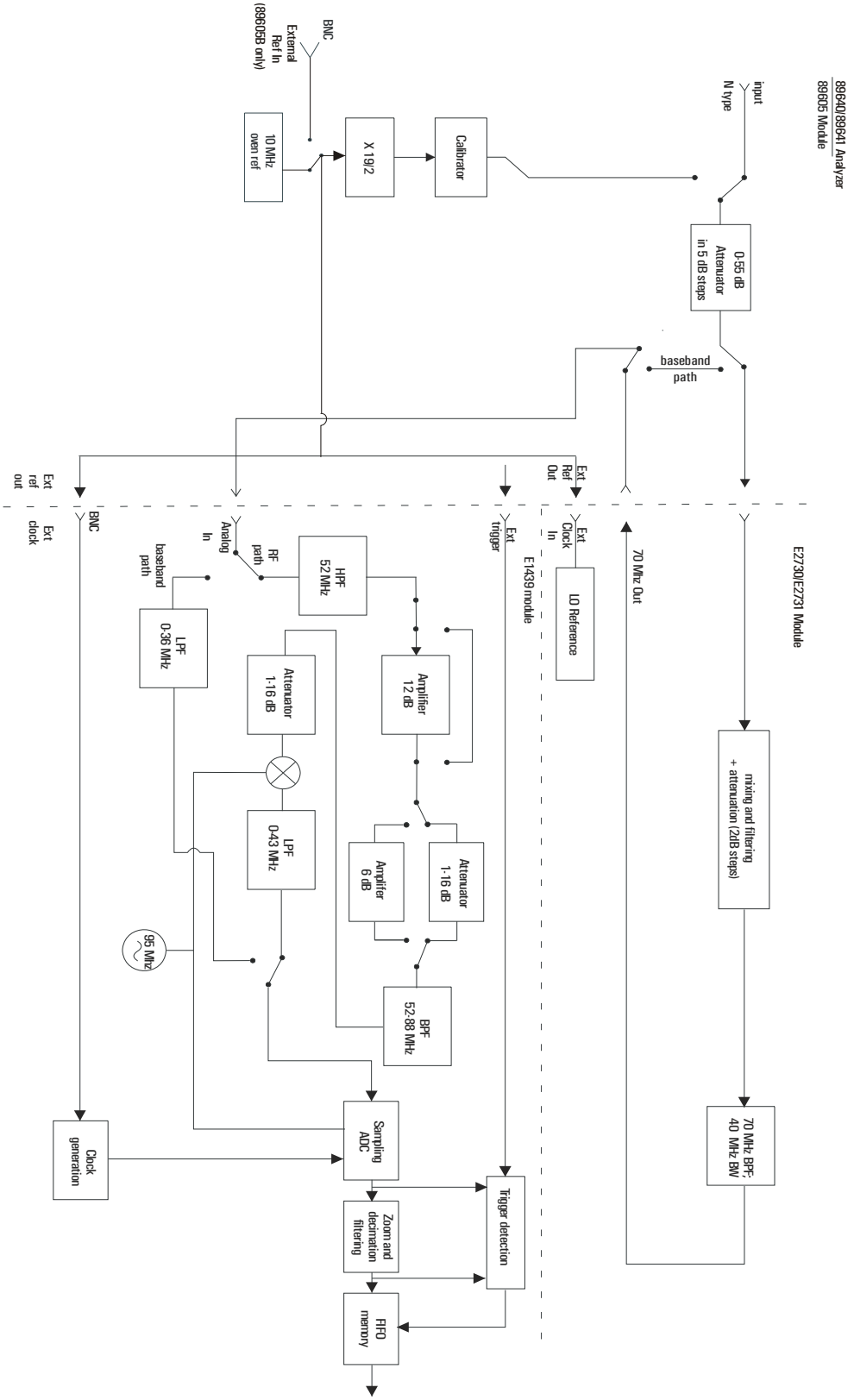
- Agilent E8491 Option 001 IEEE 1394 PC Link to VXI
- Agilent 89605 Input module
- Agilent E1439 ADC module
- Agilent E2731 RF Tuner module
- optional second IF/baseband channel, including an additional E1439 and E2731 modules

The module descriptions in this section apply to the 89640/89641 block diagram: "89640/89641 block diagram" (page 86). Your analyzer may include a second IF/baseband channel, which is not shown in the block diagram.

E8491 PC Link to VXI

The E8491 module provides the link between the computer and the VXI measurement hardware. No signal acquisition or processing happens in this module. For detailed information on this module and the IEEE 1394 interface, refer to the PDF document *Agilent E8491B IEEE 1394 PC Link to VXI Configuration and User's Guide* located at http://www.home.agilent.com/upload/cmc_upload/All/E8491-90001_users.pdf.

Figure 3-2 **89640/89641 block diagram**



89605 Input Module

The 89605 Input module accepts the input signal and passes it through a 0-to-50 dB attenuator (5 dB steps). In baseband mode (0 to 36 MHz), the signal is routed directly to the E1439 module, by-passing the E2730/E2731 module. In RF mode (36 MHz to 2.7 GHz or 6 GHz), the signal is routed to the E2730/E2731 RF Tuner. The down-converted signal from the E2730/E2731 comes back to the 89605 and is routed to the E1439 module.

During calibration, the input signal path is interrupted. The calibrator in the 89605 module inserts a calibration signal into the signal path to the E1439 ADC module. The calibration signal is taken from the 10 MHz reference and multiplied by 19/2 to match the E1439 sampling rate of 95 MSa per second. The E1439 ADC uses the same 10 MHz reference, so the calibration source is phase locked to the sample clock.

The 89605 also provides a 10 MHz reference signal to the E2730/E2731 and E1439 modules. An additional 10 MHz Ref output is available on the module front panel to connect to other instruments in your measurement setup. For the 89605B only, you can connect a 10MHz or 13 MHz reference signal to the Ext Reference In connector.

Use of this module outside the 89600-series of analyzers is not supported.

E2730/E2731 RF Tuner module

The E2730 RF Tuner has a frequency tuning range of 20 to 2700 MHz in 1 kHz steps. The E2731 RF Tuner has a frequency tuning range of 20 to 6000 MHz. Each tuner converts the input signal in multiple stages of local oscillators, amplifiers, attenuators, and filters. The 70 MHz output has a bandwidth of 36 MHz, resulting in an output signal to the ADC between 52 MHz and 88 MHz.

Use of this module outside the 89600-series of analyzers is not supported.

E1439 ADC module

The input signal passes to the E1439 ADC module in one of two ways. If the input frequency band is 0 Hz to 36 MHz, the signal goes directly to the E1439 module. If the input frequency band is 36 MHz to 2.7 GHz or 6 GHz, the signal goes to the RF Tuner module to be down converted. From the RF Tuner module, the signal goes back through the 89605 module to the Agilent E1439 95 MSa/s ADC + Filter + FIFO + 70 MHz IF Input module.

Detailed information about this module is available in a PDF file: *Agilent E1439 VXI 70 MHz IF ADC with filters and memory User's Guide*. This guide is installed on your computer, however, you may have to use the Search function to find the exact location. Typical locations include the following:

C:/Vxi/Vxipnp/Winnt/age1439/help/e1439_Users_Guide.pdf

C:/Program Files/Visa/Winnt/age1439/help/e1439_Users_Guide.pdf

Triggering

For external trigger mode, a trigger signal must be supplied at the *Ext Trigger* connector on the front panel. This input is AC-coupled with an impedance of 1K ohm so any signal with a sharp rising or falling transition greater than 100 mV (for example, TTL or ECL logic) can be used as an external trigger source. Minimum pulse width is 300 ns.

Coupling

The input can be either AC or DC coupled. AC coupling enables the system to measure low level AC signals in the presence of a large DC offset.

Signal conditioning

In 0-36 MHz mode, the input signal goes through the lower path in the block diagram. In this mode, no attenuation occurs in the E1439 module.

In 36 MHz-2.7 GHz (or 6 GHz) mode, the input signal goes through the upper path in the block diagram. This path includes 0 to 32 dB of attenuation in 1 dB steps. The signal is band-pass filtered, mixed with 95 MHz, and low-pass filtered. This inverts and translates the frequency spectrum from 52-88 MHz at the input to 43-7 MHz at the ADC. The ADC samples the signal at a 95 MHz sample rate.

Analog-to-digital (ADC) signal conversion

The central part of the E1439 is a precision sampling ADC. The ADC samples the signal at a rate of up to 95 MSa/sec and converts the analog signal to a digital signal.

Memory

Digitized data is stored in memory in the E1439 module and read out after a block of data has been taken. The digitized data passes through the E8491 interface to the measurement software in the computer.

For information on how the signal is processed by the measurement software, see the 89600 online help for “System Block Diagram” under Tutorial, Theory of Operation. Typically, this help file is in location:

C:/Program Files/Agilent/89600 VSA/Help/tasks.hlp

Agilent 89611 70 MHz IF Analyzer circuit description

The Agilent 89610 Vector Signal Analyzer VXI hardware includes the following VXI modules:

- Agilent E8491 Option 001 IEEE 1394 PC Link to VXI
- Agilent 89605 Input module
- Agilent E1439 ADC module
- an optional second channel, including an additional 89605 and E1439 module

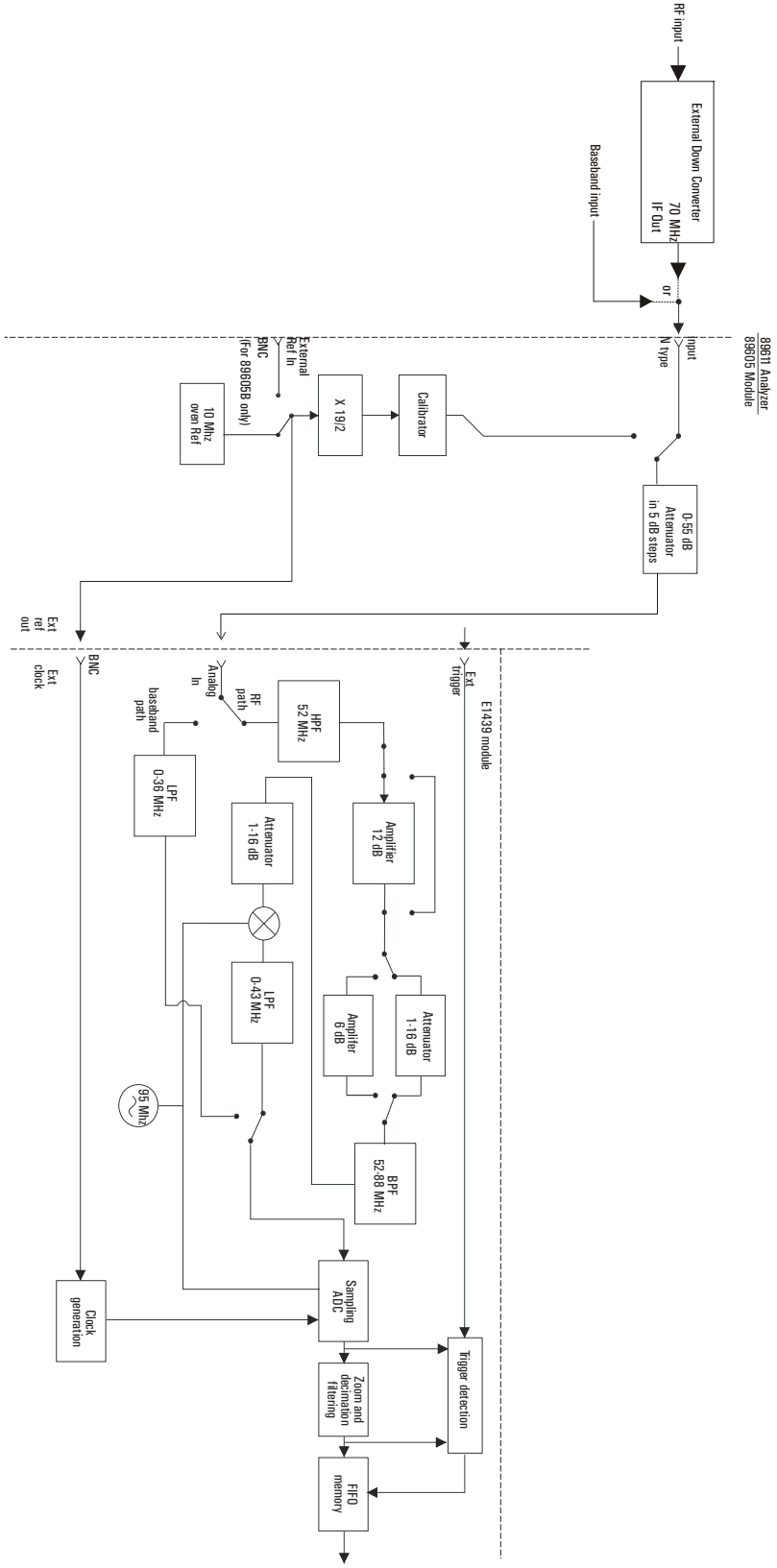
In addition, the 89611 requires an external down converter that provides a 70 MHz IF out signal. If you use an Agilent PSA option H70 as the down converter, the 89600 software controls the down converter. Otherwise, you must control the down converter separately from the 89600 interface.

The module descriptions in this section apply to: "89611 block diagram" (page 90). This block diagram does not include the optional second channel.

E8491 PC Link to VXI

The E8491 module provides the link between the computer and the VXI measurement hardware. No signal acquisition or processing happens in this module. For detailed information on this module and the IEEE 1394 interface, refer to the PDF document *Agilent E8491B IEEE 1394 PC Link to VXI Configuration and User's Guide* located at http://www.home.agilent.com/upload/cmc_upload/All/E8491-90001_users.pdf.

Figure 3-3 **89611 block diagram**



89605 Input Module

The 89605 Input module accepts the baseband input signal and passes it through a 0-to-50 dB attenuator (5 dB steps). In baseband mode (0 to 36 MHz), the signal from the Ch 1 Input connector is routed to the E1439 module. For the upper frequency band (frequencies determined by the down converter used), the signal is routed from the *From 70 MHz IF Out* connector to the E1439 module (via the *To ADC Analog In* connector).

During calibration, the input signal path is interrupted. The calibrator in the 89605 module inserts a calibration signal into the signal path to the E1439 ADC module. The calibration signal is taken from the 10 MHz reference and multiplied by 19/2 to match the E1439 sampling rate of 95 MSa per second. The E1439 ADC uses the same 10 MHz reference, so the calibration source is phase locked to the sample clock.

The 89605 also provides a 10 MHz reference signal to the E1439 module. An additional 10 MHz Ref output is available on the module front panel to connect to other instruments in your measurement setup. For the 89605B only, you can connect a 10 MHz or 13 MHz reference signal to the Ext Reference In connector.

Use of this module outside the 89600 series analyzers is not supported.

E1439 ADC Module

The input signal passes to the E1439 ADC module in one of two ways. If the input frequency band is 0 Hz to 36 MHz, the signal at the 89605 input is passed directly to the E1439 module. If the input frequency band is 20 MHz to 2.7 GHz, the signal comes from the external down converter through the 89605 module to the E1439 95 MSa/s ADC + Filter + FIFO + 70 MHz IF Input module.

Detailed information about this module is available in a PDF file: *Agilent E1439 VXI 70 MHz IF ADC with filters and memory User's Guide*. This guide is installed on your computer, however, you may have to use the Search function to find the exact location. Typical locations include the following:

C:/Vxi/Vxipnp/Winnt/age1439/help/e1439_Users_Guide.pdf

C:/Program Files/Visa/Winnt/age1439/help/e1439_Users_Guide.pdf

Triggering

For external trigger mode, a trigger signal must be supplied at the *Ext Trigger* connector on the front panel. This input is AC coupled with an impedance of 1 K ohm so any signal with a sharp rising or falling transition greater than 100 mV (for example, TTL or ECL logic) can be used as an external trigger source. Minimum pulse width is 300 ns.

Coupling

The input can be either AC or DC coupled. AC coupling enables the system to measure low level AC signals in the presence of a large DC offset.

Signal conditioning

In 0-36 MHz mode, the input signal goes through the lower path in the block diagram. In this mode, no attenuation occurs in the E1439 module.

In 36 MHz-2.7 GHz mode, the input signal goes through the upper path in the block diagram. This path includes 0 to 32 dB of attenuation in 1 dB steps. The signal is band-pass filtered, mixed with 95 MHz, and low-pass filtered. This inverts and translates the frequency spectrum from 52-88 MHz at the input to 43-7 MHz at the ADC. The ADC samples the signal at a 95 MHz sample rate.

Analog-to-digital (ADC) signal conversion

The central part of the E1439 is a precision sampling ADC. The ADC samples the signal at a rate of up to 95 MSa/sec and converts the analog signal to a digital signal.

Memory

Digitized data is stored in memory in the E1439 module and read out after a block of data has been taken. The digitized data passes through the E8491 interface to the measurement software in the computer.

For information on how the signal is processed by the measurement software, see the 89600 online help for “System Block Diagram” under Tutorial, Theory of Operation. Typically, this help file is in location:

C:/Program Files/Agilent/89600 VSA/Help/tasks.hlp

4 Replacing VXI Hardware

This section provides information on obtaining replaceable parts for the Agilent 89600S series VXI modules.

Replaceable parts for VXI hardware

NOTE

This chapter contains information only for VXI measurement hardware modules. If your analyzer uses other measurement hardware, such as an Agilent E4406 or Agilent E4440, refer to the service document shipped with that product.

For VXI mainframes, refer to the mainframe documentation on replaceable parts.

For information on upgrading your analyzer or replacing parts, contact your local Agilent Technologies sales and service office. See the list of office locations and addresses in the back of this manual.

Ordering Information

To order Agilent parts in the U.S., call Agilent Technologies Support Parts at (877) 447-7278. Outside the U.S., please contact your local Agilent Technologies parts center.

See the following pages for replaceable parts lists:

System cables and connectors

- "Agilent 89610A parts" (page 95)
- "Agilent 89611A parts" (page 95)
- "Agilent 89640A parts" (page 96)
- "Agilent 89641A parts" (page 97)

Modules

- "89605 parts" (page 98)
- "89606 parts" (page 98)
- "E1438 parts" (page 98)
- "E1439 parts" (page 98)
- "E2730 parts" (page 99)
- "E2731 parts" (page 99)
- "E8491B parts" (page 99)

Agilent 89610A parts

Cables, connectors, and terminations. References for illustrations showing cable connections:

- "Cable connections, 89610" on page 30
- "Cable connections, two-channel 89610" on page 31

Part Number	Description	Qty
8121-0133	flex BNC (m) to BNC (m) cable 267 mm, black	1
8120-6237	flex BNC (m) to BNC (m) cable 172 mm, black	1

Additional cables and connectors for second input channel

Part Number	Description	Qty
8121-0132	BNC (m) to BNC (m) cable 215 mm, black	1
03585-61603	SMB (f) to SMB (f) cable, 100 mm, orange	2
1250-0676	50 ohm SMB termination	4

Agilent 89611A parts

Cables, connectors, and terminations (double the quantities for 2-channel configurations). References for illustrations showing cable connections:

- "Cable connections, 89611" on page 33
- "Cable connections, 89611 with PSA Option H70" on page 34
- "Cable connections, two-channel 89611" on page 37

Part Number	Description	Qty
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	2
1250-0780	N (m) to BNC (f) Adapter	1
8121-0790	SMA(m) to SMA(m) cable 1,219 mm	1
1250-1250	Type N(m) to SMA(f) adapter	1
1250-1700	BNC(m) to SMA(f) adapter	1
1250-0590	coax SMA cap	2

Additional cables and connectors for second input channel:

Part Number	Description	Qty
03585-61603	SMB (f) to SMB (f) cable, 100 mm, orange	2
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	1
1250-0676	50 ohm SMB termination	4

Part Number	Description	Qty
1250-0590	coax SMA cap	2

Agilent 89640A parts

Cables, connectors, and terminations. (Double the quantities for 2-channel configurations.) References for illustrations showing cable connections:

- “Cable connections, 89640” on page 39
- “Cable connections, 89640 with second IF/baseband channel” on page 40
- “Cable connections, 89640 with second RF channel” on page 42
- “Cable connections, 89640 with external down converter” on page 44

Part Number	Description	Qty
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	2
1250-0780	N (m) to BNC (f) Adapter	1
89605-61691	SMA (m) to SMA (m) Semi-rigid cable	1-2*
89605-61692	SMA (m) to SMA (m) Semi-rigid cable with toroid	1
89605-61693	SMA (m) to SMA (m) Semi-rigid cable	0-1*
1250-0590	coax SMA cap	2

* With an 89605A, you need two 89605-61691 cables. With an 89605B, you need one 89605-61691 cable and one 89605-61693 cable.

Additional cables and connectors for second IF channel:

Part Number	Description	Qty
03585-61603	SMB (f) to SMB (f) cable, 100 mm, orange	2
1250-0676	50 ohm SMB termination	4
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	1

Additional cables and connectors for second RF channel:

Part Number	Description	Qty
03585-61603	SMB (f) to SMB (f) cable, 100 mm, orange	2
1250-0676	50 ohm SMB termination	4
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	1
89605-61696	semi-rigid SMA cable	2
1250-0590	coax SMA cap	2

Agilent 89641A parts

Cables, connectors, and terminations. References for illustrations showing cable connections:

- "Cable connections, 89641" on page 45
- "Cable connections, 89641 with second IF/baseband channel" on page 46
- "Cable connections, 89641 with second RF channel" on page 48
- "Cable connections, 89641 with external down converter" on page 50

Part Number	Description	Qty
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	2
1250-0780	N (m) to BNC (f) Adapter	1
89605-61691	SMA (m) to SMA (m) Semi-rigid cable	1-2*
89605-61694	SMA (m) to SMA (m) Semi-rigid cable with toroid	1
89605-61693	SMA (m) to SMA (m) Semi-rigid cable	0-1*
1250-0590	coax SMA cap	2

* With an 89605A, you need two 89605-61691 cables; with an 89605B, you need one 89605-61691 cable and one 89605-61693 cable.

Additional cables and connectors for second IF channel:

Part Number	Description	Qty
03585-61603	SMB (f) to SMB (f) cable, 100 mm, orange	2
1250-0676	50 ohm SMB termination	4
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	1

Additional cables and connectors for second RF channel:

Part Number	Description	Qty
03585-61603	SMB (f) to SMB (f) cable, 100 mm, orange	2
1250-0676	50 ohm SMB termination	4
8121-0132	flex BNC (m) to BNC (m) cable 215 mm, black	1
89605-61696	semi-rigid SMA cable	2
1250-0590	coax SMA cap	2

89605 parts

The following lists 89605 parts.

Part Number	Description	Qty
89605-69201	Exchange 89605A module	1
89605-69211	Exchange 89605B module	1

89606 parts

The following lists 89606 parts.

Part Number	Description	Qty
89606-69201	Exchange 89606A module	1
89606-69211	Exchange 89606B module	1

E1438 parts

For information in installing SDRAM, see the Replacing Assemblies chapter in the Agilent E1438 VXI 100 MSa/s ADC with filters and memory User's Guide. This guide is installed in your computer, however, you may have to use the Search function to find the exact location. Typical locations include the following:

C:/Vxi/Vxipnp/Winnt/age1438/help/e1438_Users_Guide.pdf

C:/Program Files/Visa/Winnt/age1438/help/e1438_Users_Guide.pdf

Part Number	Description	Qty
E1438-69202	Exchange E1438 module	1-2
1818-7901	ICM SDRAM 128 MB	0-2
1818-7889	ICM SDIMM 16 MB	0-2
1818-8606	IC SDRAM 64MX7	0-2

E1439 parts

For information in installing SDRAM, see the Replacing Assemblies chapter in the Agilent E1439 VXI 70 MHz IF ADC with filters and memory User's Guide. This guide is installed in your computer, however, you may have to use the Search function to find the exact location. Typical locations include the following:

C:/Vxi/Vxipnp/Winnt/age1439/help/e1439_Users_Guide.pdf

C:/Program Files/Visa/Winnt/age1439/help/e1439_Users_Guide.pdf

Part Number	Description	Qty
E1439-69202	Exchange E1439 module	1-2

Part Number	Description	Qty
1818-7901	ICM SDRAM 128 MB	0-2
1818-8606	IC SDRAM 64MX7	0-2
1818-7889	IC SDIMM 16 MB	0-2

E2730 parts

The following lists E2730 parts.

Part Number	Description	Qty
E2730-69201	Exchange E2730A module	1
E2730-69211	Exchange E2730B module	1-2
1250-0590	coax SMA cap	2

E2731 parts

The followings lists E2731 parts.

Part Number	Description	Qty
E2731-69201	Exchange E2731A module	1
E2731-69211	Exchange E2731B module	1
E2731-61601	SMA (m) to SMA (m) Semi-rigid cable	1
1250-0590	coax SMA cap	2

E8491B parts

See E8941B service manual for installation instructions. You can also find this PDF guide using: *http://www.agilent.com*. Click on Technical Support and Search for E8491B. Select E8491B Configuration and User's Guide from the results. You can also view this guide as a PDF using the link:

http://www.home.agilent.com/upload/cmc_upload/All/EPSG084330.pdf

Part Number	Description	Qty
E8491-66202	Module, Service Replaceable E8491B	1
8121-0078	E8491B to IEEE-1394/PCI card cable	1
E8491-61613	IEEE-1394/PCI card power adapter cable	1
E8491-66204	IEEE-1394/PCI Card	1

Transporting VXI modules

CAUTION The VXI modules are static sensitive; use appropriate precautions when removing, handling, and installing to avoid damage.

- Package the module using the original factory packaging or packaging identical to the factory packaging.
- If returning the module to Agilent Technologies for service, attach a tag describing the following:
  - Type of service required
  - Return address
  - Model number
  - Full serial number

In any correspondence, refer to the module by model number and full serial number.

- Mark the container FRAGILE to ensure careful handling.
- If necessary to package the module in a container other than original packaging, observe the following (use of other packaging is not recommended):
  - Wrap the module in heavy paper or anti-static plastic.
  - Protect the front panel with cardboard.
  - Use a double-wall carton made of at least 200-pound test (32 ECT) material.
  - Cushion the module to prevent damage. For example, several layers of plastic bubble wrap is usually sufficient.

CAUTION Do not use pellets in any shape as packing material for the module. The pellets do not adequately cushion the module and do not prevent the module from shifting in the carton. In addition, some pellets create static electricity which can damage electronic components.

Storing VXI modules

Store modules in a clean, dry, and static free environment.

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Contacting Agilent

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