KEYSIGHT

M980xA/M983xA PXIe VNA Multi-Module Installation Guide

Keysight Technologies
7-Dec-2023

About This Guide

M980XA/M983XA PXI VNA MULTI-MODULE

- This guide shows you the instruction to configure the multi-module setup for M980xA and M983xA.
- Contents
  - M980xA multi-module configuration
  - M980xA and M983xA multi-module configuration
  - M983xA and VXT modulation measurement configuration
- 3D drawings are also available to understand the connection more easily. See the end of slide.

M980xA

M9800A TO M9808A

Required Models for Interconnections

Y1730A

- Y1730A-001
  - Interconnect cables for multiport configuration of 1-slot M980xA (2-port)
- Y1730A-002
  - Interconnect cables for multiport configuration of 2-slot M980xA (4/6-port)
- Y1730A-003
  - Interconnect cables for multiport configuration of M980xA with multiple PXI chassis
- Y1730A-004
  - Interconnect cables for multiport configuration of M980xA with greater-than 7 modules
    - Greater than 10 modules for M980xA over 20 GHz
- 11636B Power Divider, DC to 26.5 GHz
  - One or two divider(s) is/are required when Y1730A-003/004 is required.
- Y1214B Air Inlet Kit
  - For the empty slots
- For two chassis configuration
  - M9022A/23A/24A PXIe System Module
  - Y1202A/03A PCIe Cable

Required Tools for Installation

Y1730A

- Torque Wrench for 3.5 mm connectors
  - 0.9 Nm
  - Keysight P/N 8710-1765
- Driver for Hex 3-2.5 mm
- Driver for Torx T20 (Two chassis configuration only)

Y1730A-001

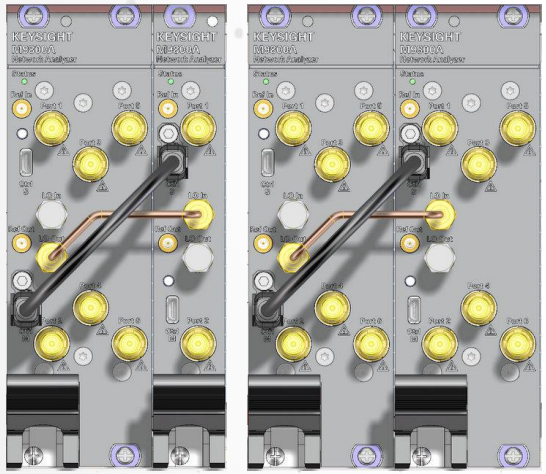
INTERCONNECT CABLES FOR MULTIPORT CONFIG. OF 2-PORT M980XA

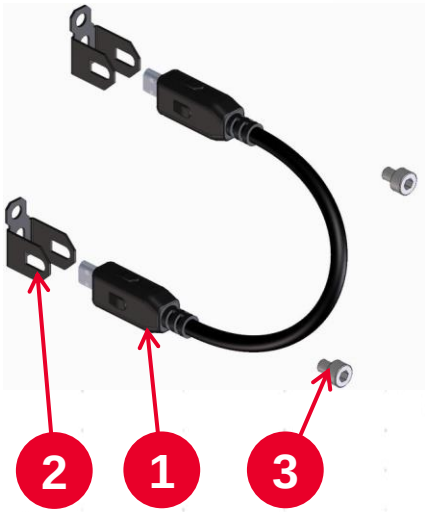
	Part Number	Description	Qty
1	M9800-61601	Cable Assembly, Control 150mm-LG	1
2	M9800-01201	Angle, Control Cable Assembly	2
3	0515-4351	Screw-SKT-HD-Cap HEX-SKT M3X0.5 4mm-LG	2
4	M9800-61602	Semi-Rigid Cable Assembly 1slot	1

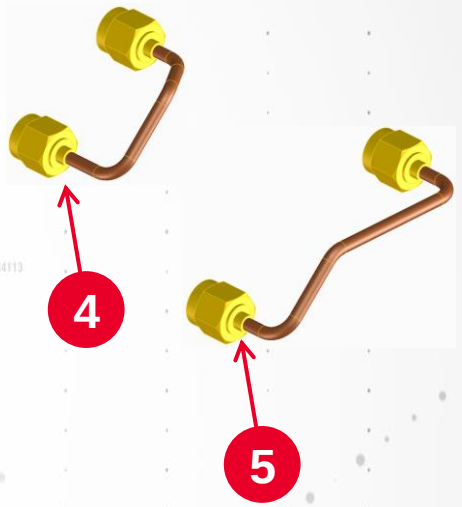
KEYSIGHT TECHNOLOGIES

Y1730A-002

INTERCONNECT CABLES FOR MULTIPORT CONFIG. OF 2/4/6-PORT M980XA





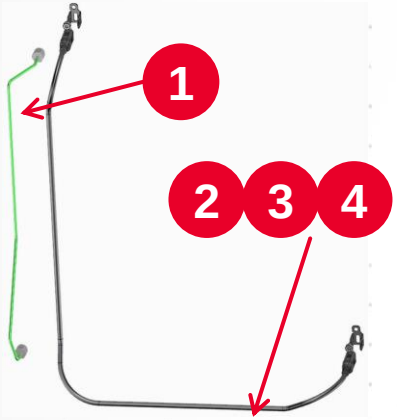


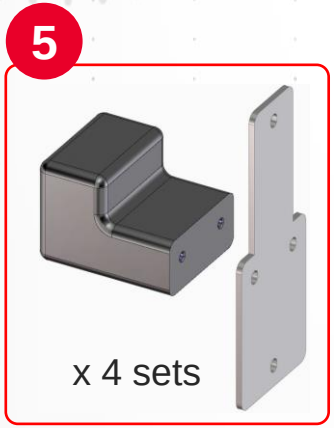
	Part Number	Description	Qty
1	M9800-61601	Cable Assembly, Control 150mm-LG	1
2	M9800-01201	Angle, Control Cable Assembly	2
3	0515-4351	Screw-SKT-HD-Cap HEX-SKT M3X0.5 4mm-LG	2
4	M9800-61602	Semi-Rigid Cable Assembly 1 slot	1
5	M9800-61603	Semi-Rigid Cable Assembly 2 slot	1

KEYSIGHT TECHNOLOGIES

Y1730A-003

INTERCONNECT CABLES FOR MULTIPORT CONFIGURATION FOR TWO CHASSIS

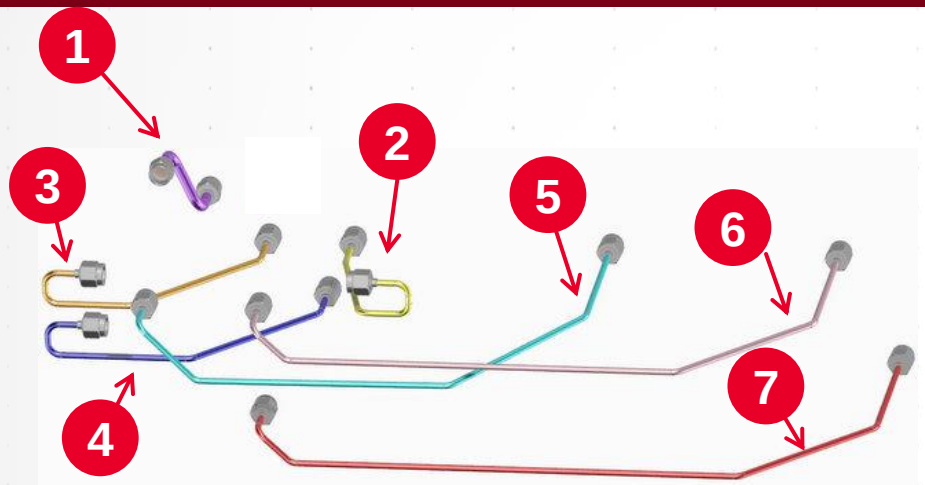




	Part Number	Description	Qty
1	M9800-61613	Cable Assy-RF, LO jumper 2-ch	1
2	M9800-61615	Cable Assembly, Control 700mm-LG	1
3	M9800-01201	Angle, Control Cable Assembly	2
4	0515-4351	Screw-SKT-HD-Cap HEX-SKT M3X0.5 4mm-LG	2
5	M9485-60003	1U Spacer for Two Chassis	1

Y1730A-004

INTERCONNECT CABLES FOR MULTIPORT CONFIGURATION WITH > 7 MODULES

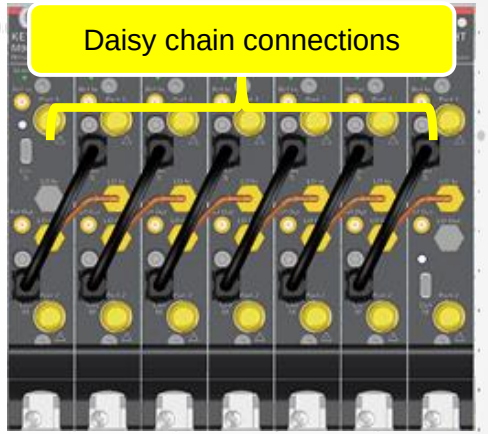


	Part Number	Description	Qty
1	M9800-61606	Cable Assy-RF, LO jumper	2
2	M9800-61607	Cable Assy-RF, LO jumper 0.5-slot	1
3	M9800-61608	Cable Assy-RF, LO jumper 1.5-slot	1
4	M9800-61609	Cable Assy-RF, LO jumper 2.5-slot	1
5	M9800-61010	Cable Assy-RF, LO jumper 7.5-slot	1
6	M9800-61611	Cable Assy-RF, LO jumper 9.5-slot	1
7	M9800-61612	Cable Assy-RF, LO jumper 10.5-slot	1

Rule

M980XA

- ✓ (# of total port should be =<66) and (# of total module should be =<17)
- ✓ The total number of LO signal daisy chains connection from the origin module should be less than or equal to 6 (for models 20 GHz and below) and 8 (for models over 20 GHz)
  - ✓ When the number of total modules is more than 6 (=<20 GHz) or 8 (>20GHz), the Y1730A-004 is necessary in order to distribute LO signal through a divider.
- ✓ The control cables should be connected with each modules in daisy chains.
- ✓ 1 slot module should be placed first from left side in chassis, then 2 slot modules are placed.



Limitation

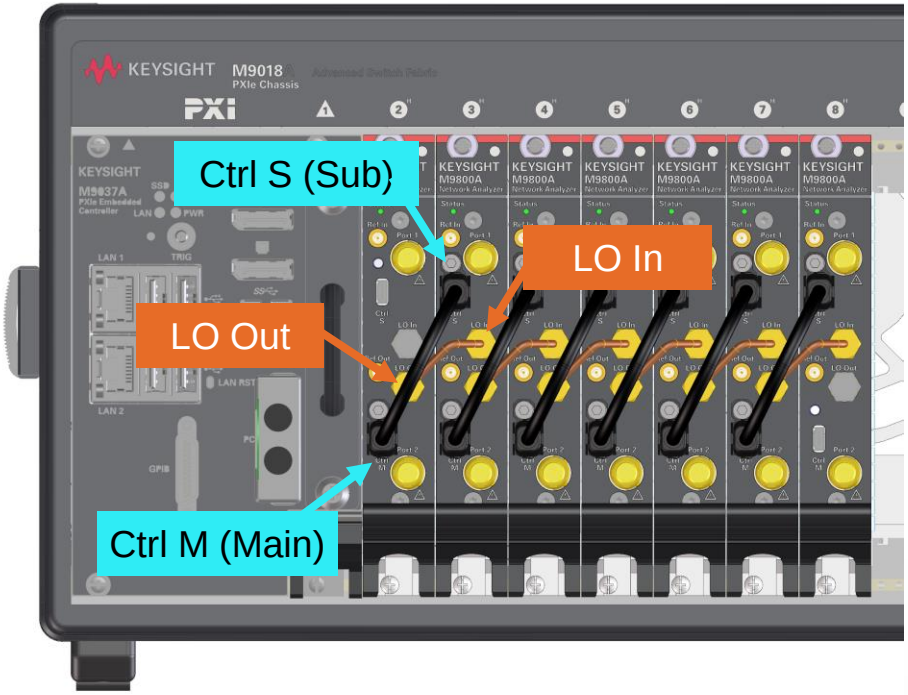
M980XA

- ✓ When the different models are installed, the frequency range is limited with the lowest model.
  - ✓ For example, M9804A (20 GHz) and M9800A (4.5 GHz) are used in multi-module configuration, the maximum frequency range of VNA application is set at 4.5 GHz.

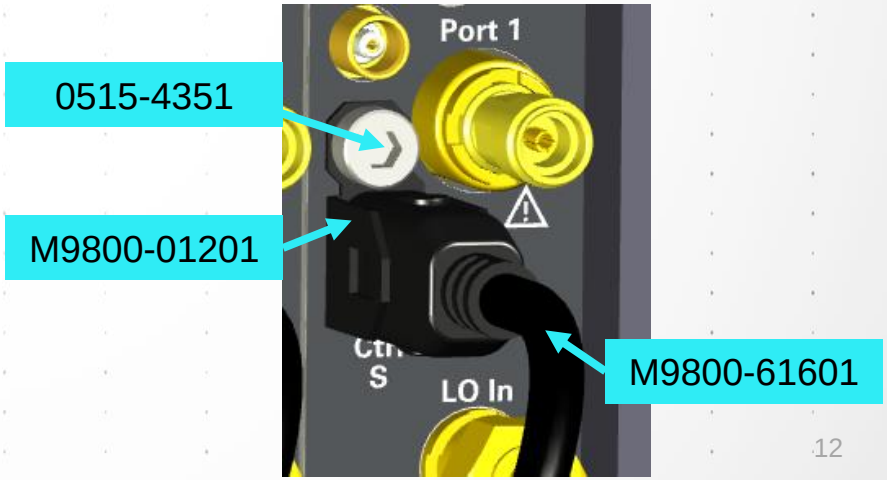
Case 1: No. of modules =< 7 (=<20 GHz) or 9 (> 20GHz)

Y1730A-001, 002

- When the total number of modules is less than or equal to 7 (20 GHz and below), 9 (over 20 GHz), Y1730A-001 and/or 002 are required depending on the module type (2 port or 4/6 port)



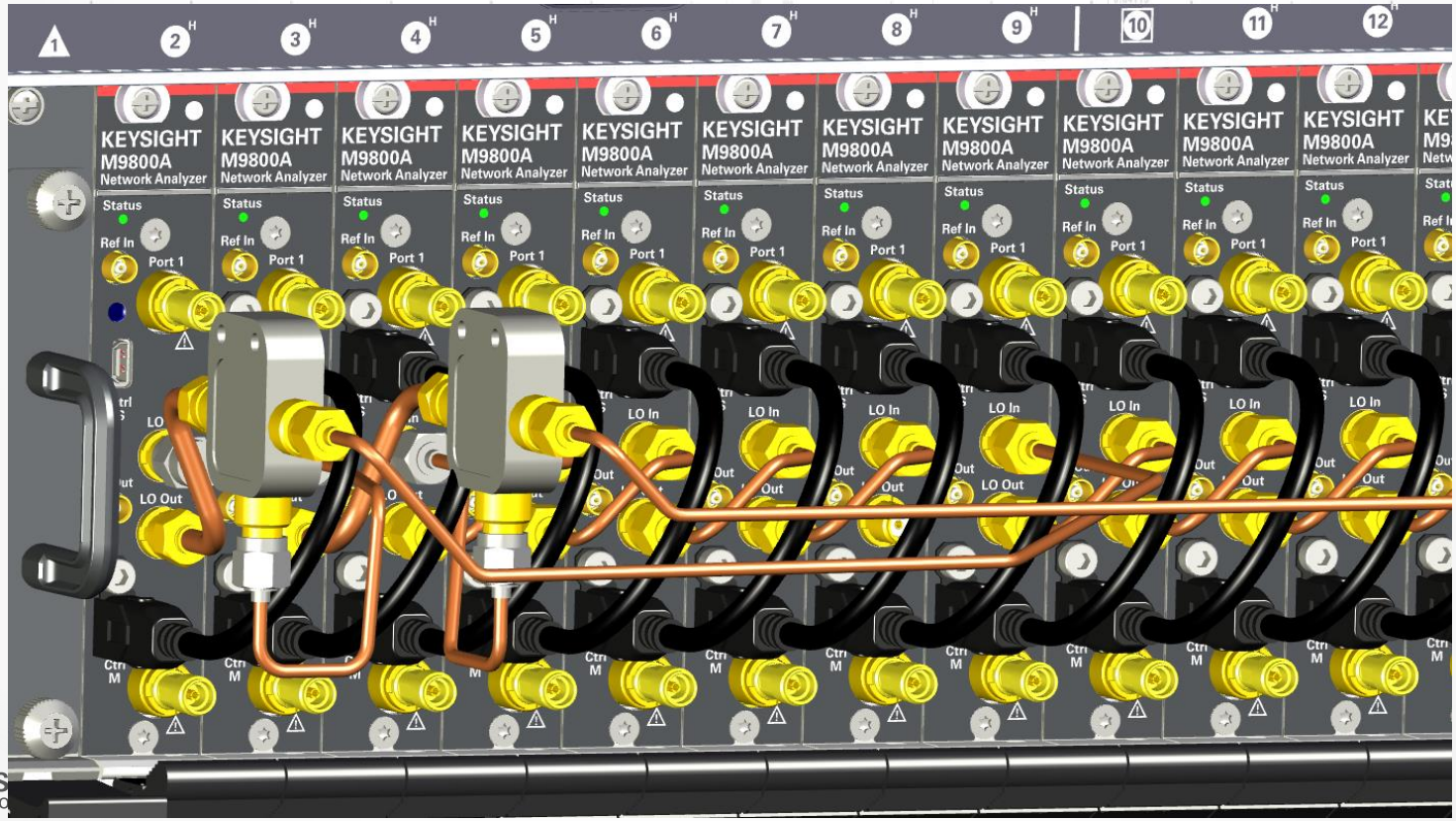
- Connect LO Out and LO In in daisy chain from left to right
  - Torque: 0.90 Nm
- Connect Ctrl M and Ctrl S in daisy chain from left to right.



Case 2: No. of modules >= 8 (=<20 GHz) or 10 (> 20GHz)

Y1730A-001, 002, 004

- When the total number of modules is more than 7 (=<20 GHz) or 9 (> 20GHz), in addition to Y1730A-001/002, Y1730A-004 and dividers are required.



Case 2: Connection Setup for One Chassis

CONNECTION MATRIX FOR 20 GHZ AND BELOW

M9800A, M9801A, M9802A, M9803A and M9804A

		4/6 port								
	# of Modules	0	1	2	3	4	5	6	7	8
2 port	0									1-e
	1								1-a	1-a
	2							1-c	1-c	
	3						1-d	1-d	1-d	
	4					1-c	1-c	1-c		
	5				1-a	1-a	1-a	1-a		
	6			1-b	1-b	1-b	1-b			
	7		1-a	1-a	1-a	1-a	1-a			
	8	1-a	1-a	1-a	1-a	1-a				
	9	1-a	1-a	1-a	1-a	1-a				
	10	1-a	1-a	1-a	1-a					
	11	1-a	1-a	1-a	2-a					
	12	1-a	1-a	2-b						
	13	1-a	2-b	2-b						
	14	2-b	2-b							
	15	2-b	2-b							
	16	2-b								
	17	2-b								

Case 1: Y1730A-003/004 are not required.

Each cell shows the configuration type.
See the corresponding figure in the following pages.
The first digit shows the number of required dividers.
1-x requires one divider. 2-x requires two dividers.

Case 2: Connection Setup for One Chassis

CONNECTION MATRIX FOR OVER 20 GHZ

M9805A, M9806A, M9807A and M9808A

	# of Modules	
2 port	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	1-f
	11	1-f
	12	1-f
	13	1-f
	14	1-f
	15	1-f
	16	1-f
	17	1-f

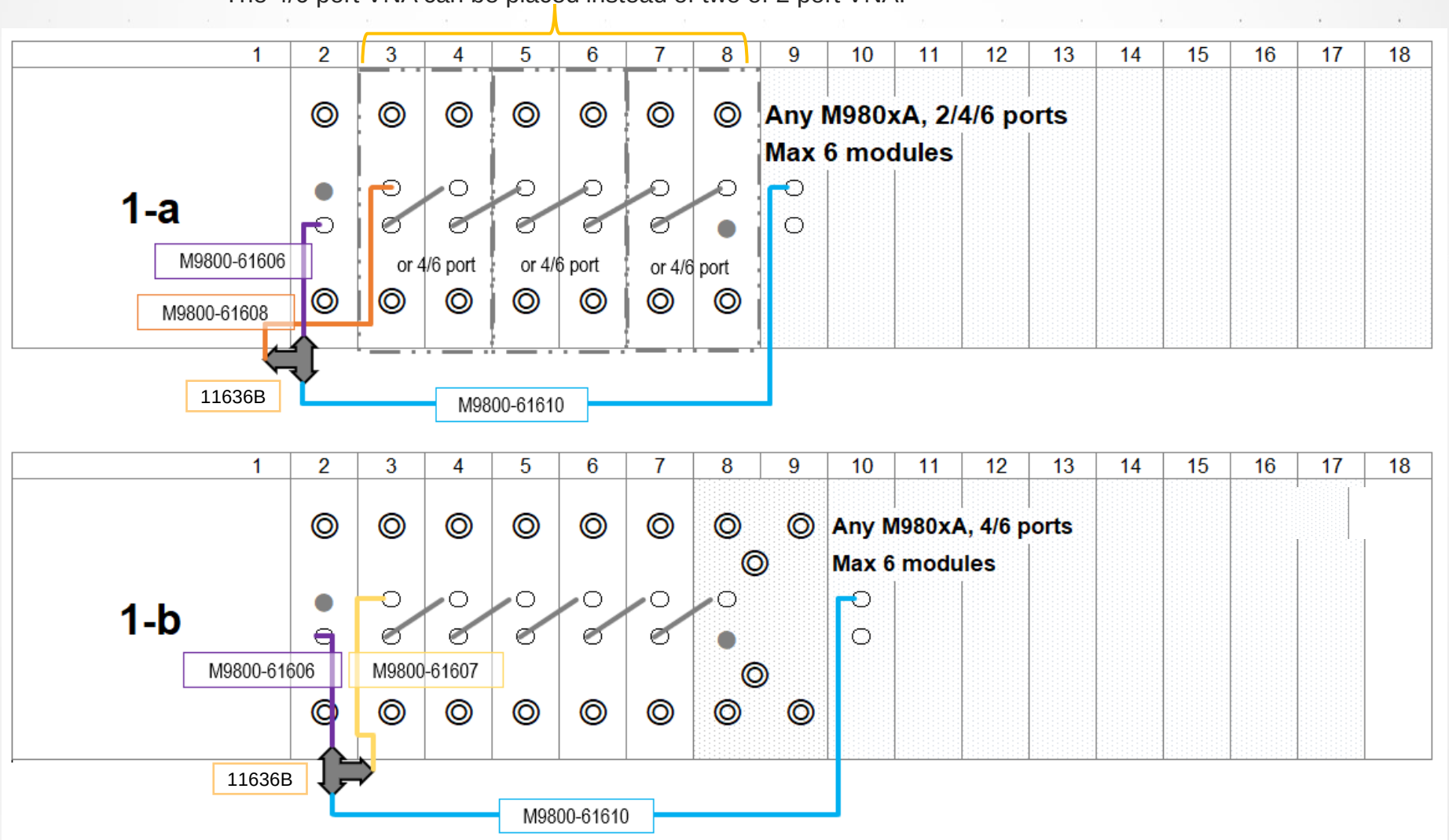
Case 1: Y1730A-003/004 are not required.

The cell shows the configuration type.
See the corresponding figure in the following pages.
The first digit shows the number of required dividers.
1-x requires one divider. 2-x requires two dividers.

Case 2: LO Signal Connection Diagram

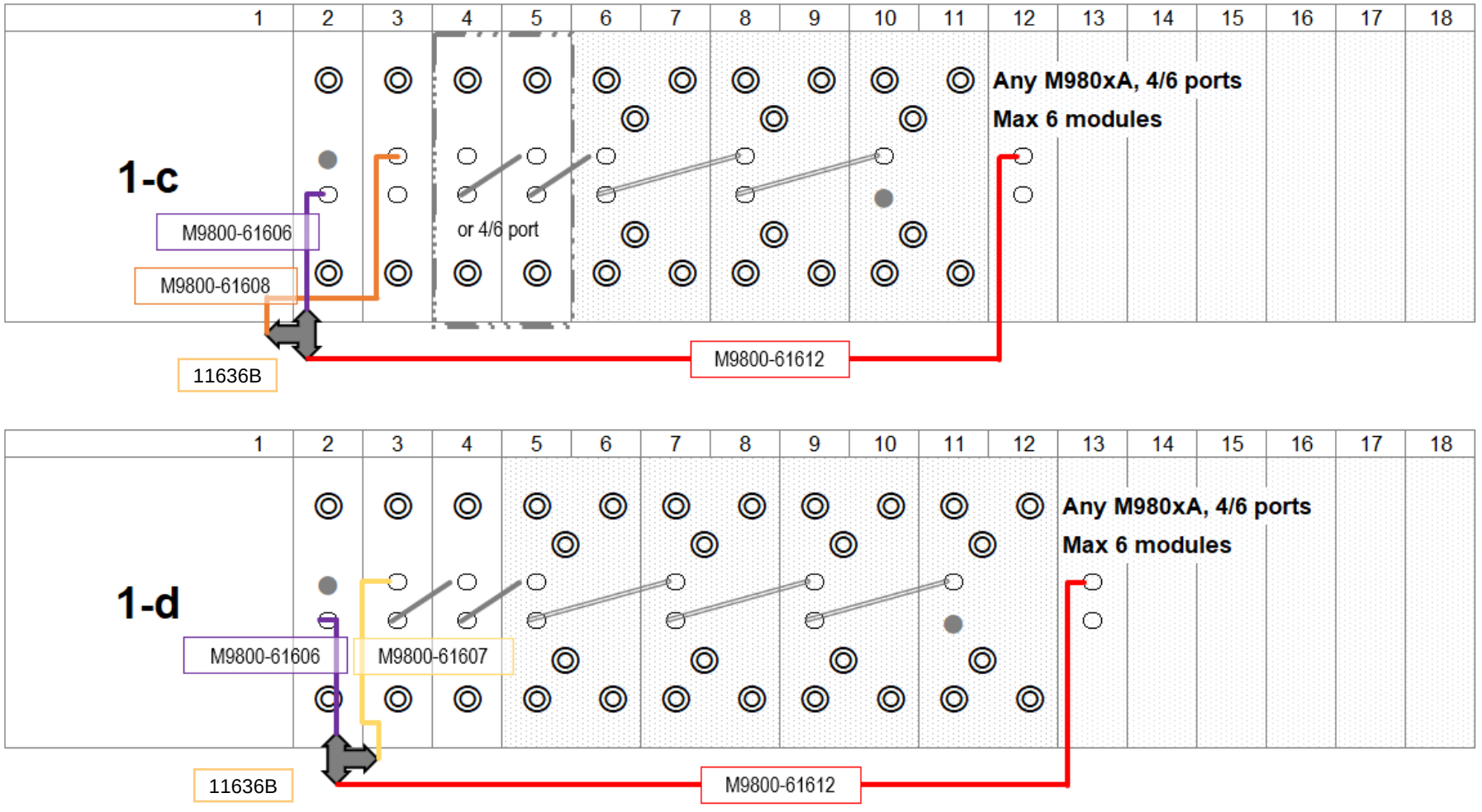
ONE DIVIDER, 1-A/1-B

The 4/6 port VNA can be placed instead of two of 2 port VNA.



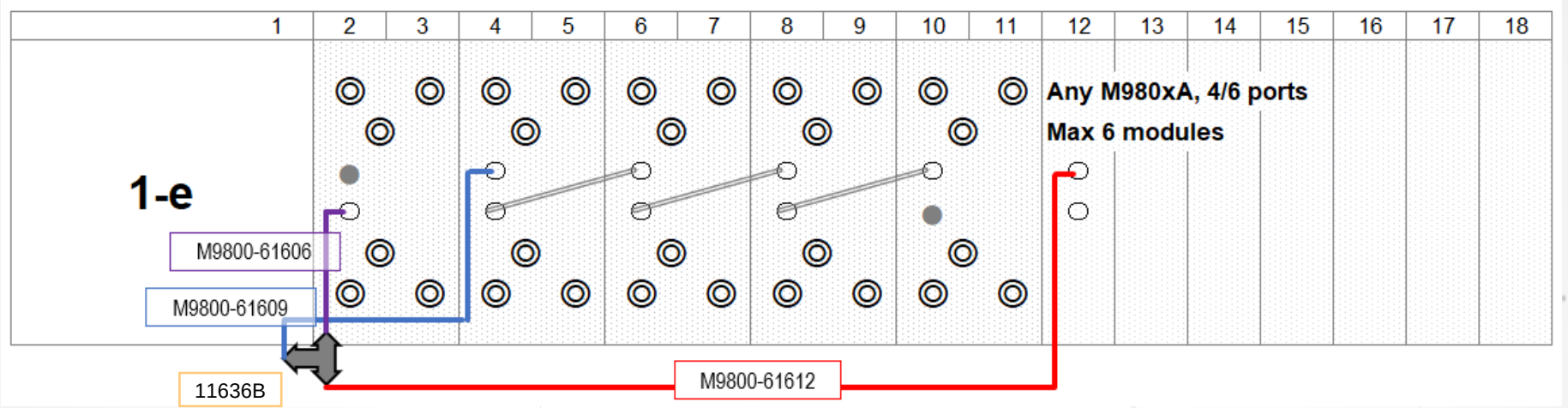
Case 2: Local Signal Connection Diagram

ONE DIVIDER, 1-C/1-D



Case 2: Local Signal Connection Diagram

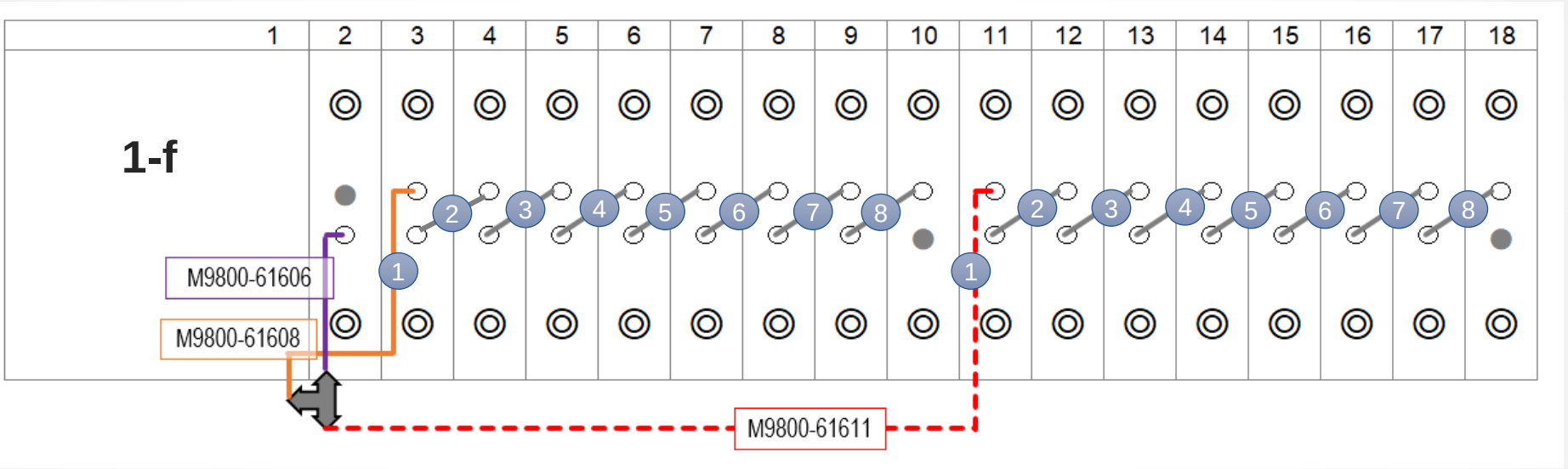
ONE DIVIDER, 1-E



Case 2: Local Signal Connection Diagram

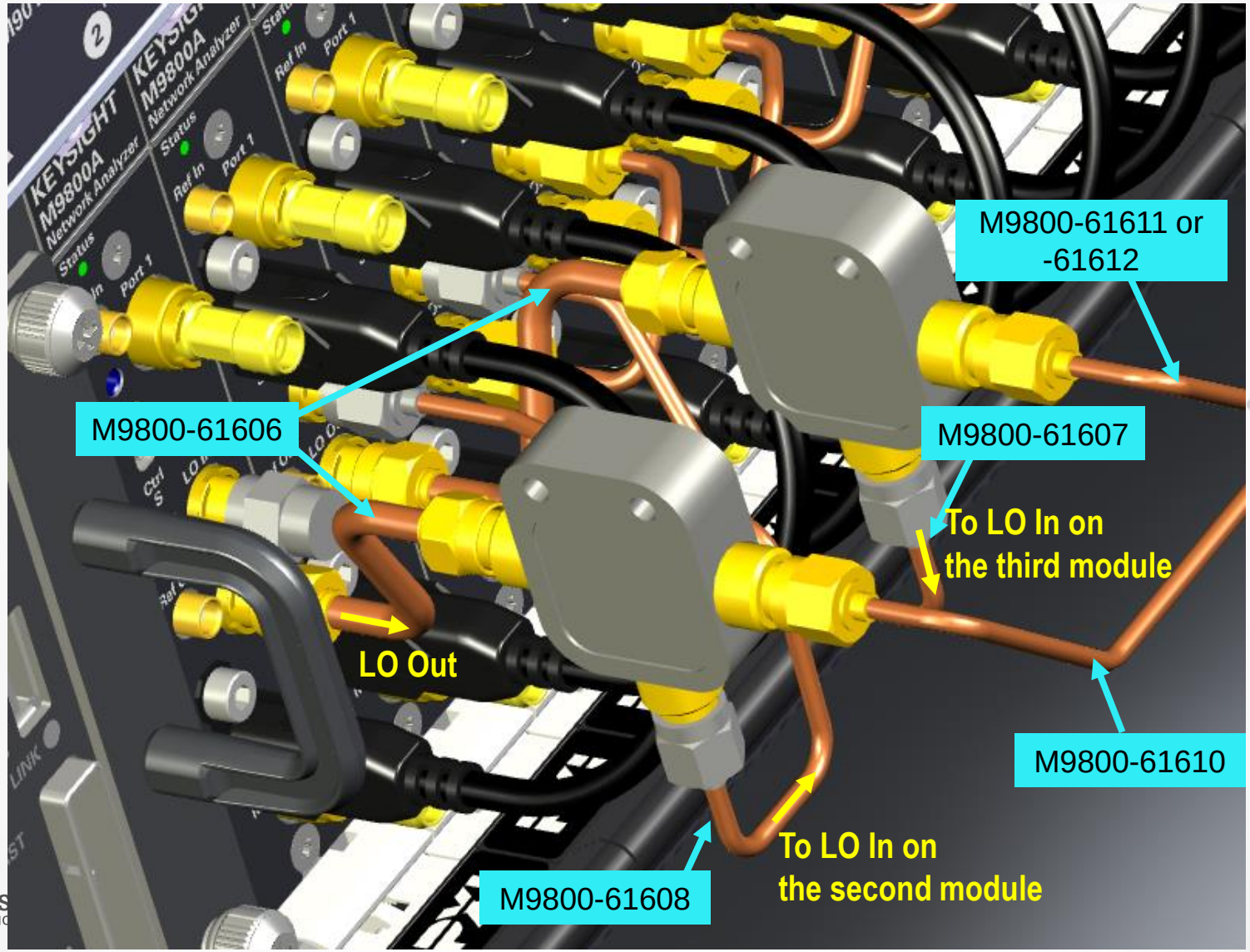
ONE DIVIDER FOR M980XA OVER 20 GHZ

The models from M9805A to M9808A can extend up to eight LO signal daisy chains.



Case 2: Divider Connection for Local Signal

TWO DIVIDER CASE / CASES 2-A,2-B



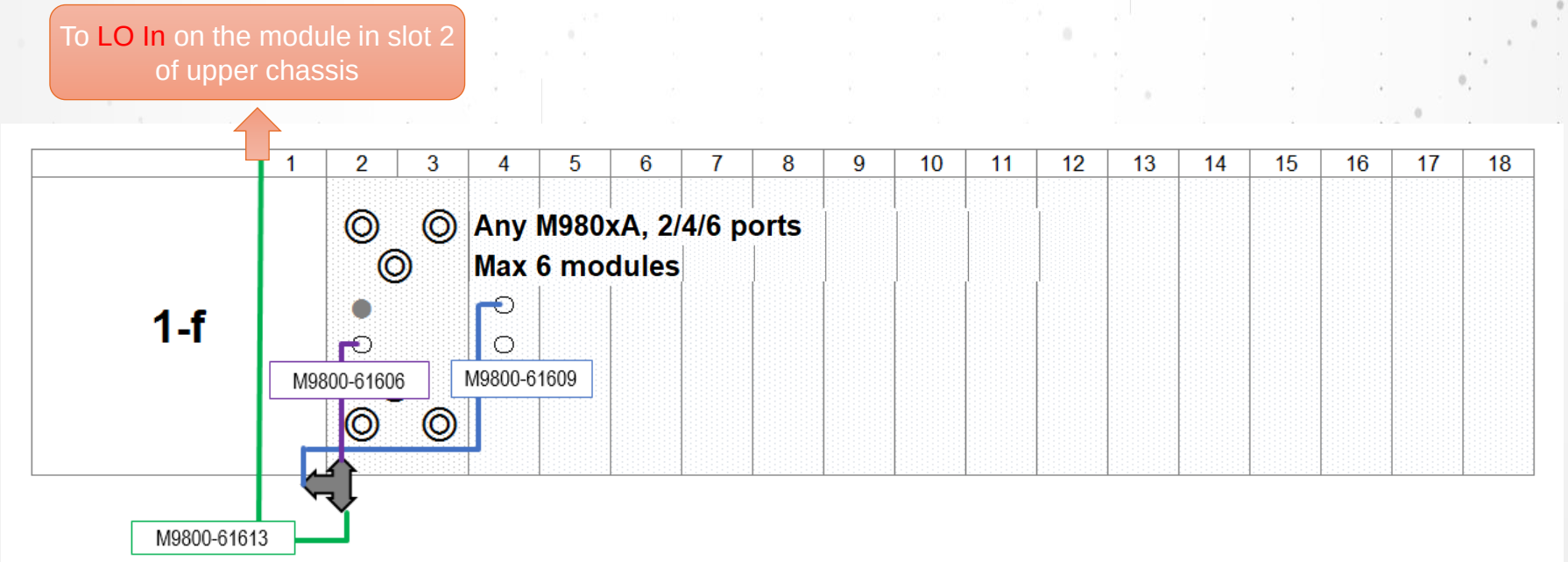
Case 2: Cable Connection

TWO DIVIDER CASE / 2-B

Case 3: Two Chassis Configuration

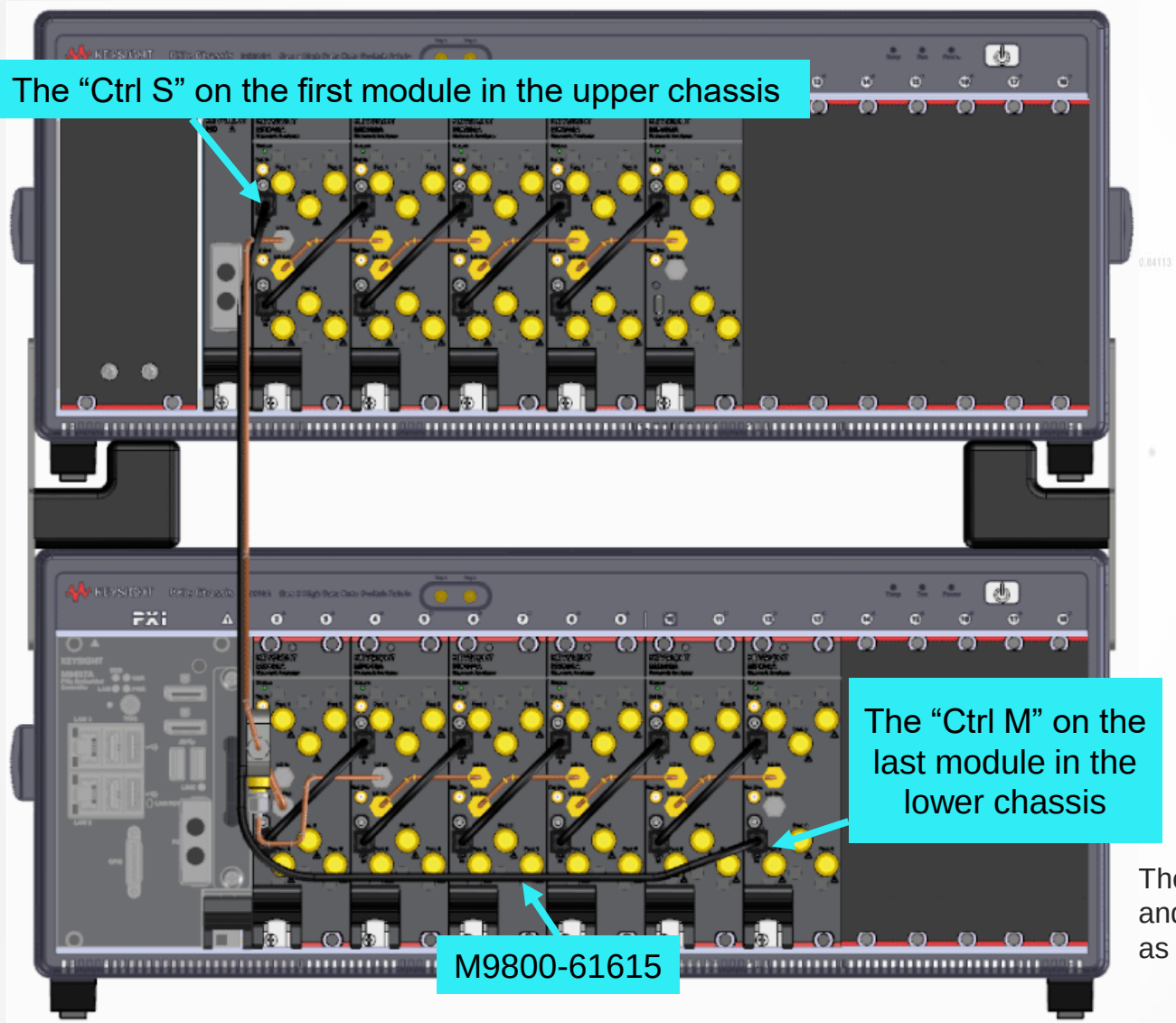
Y1730A-001,002,003,004

- Two chassis configuration is available under the following conditions.
  - (# of total port =<66) and (# of total module =<17)
  - The total number of LO signal daisy chain connection from the origin module should be less than or equal to 6.



Case 3: Two Chassis Configuration Example

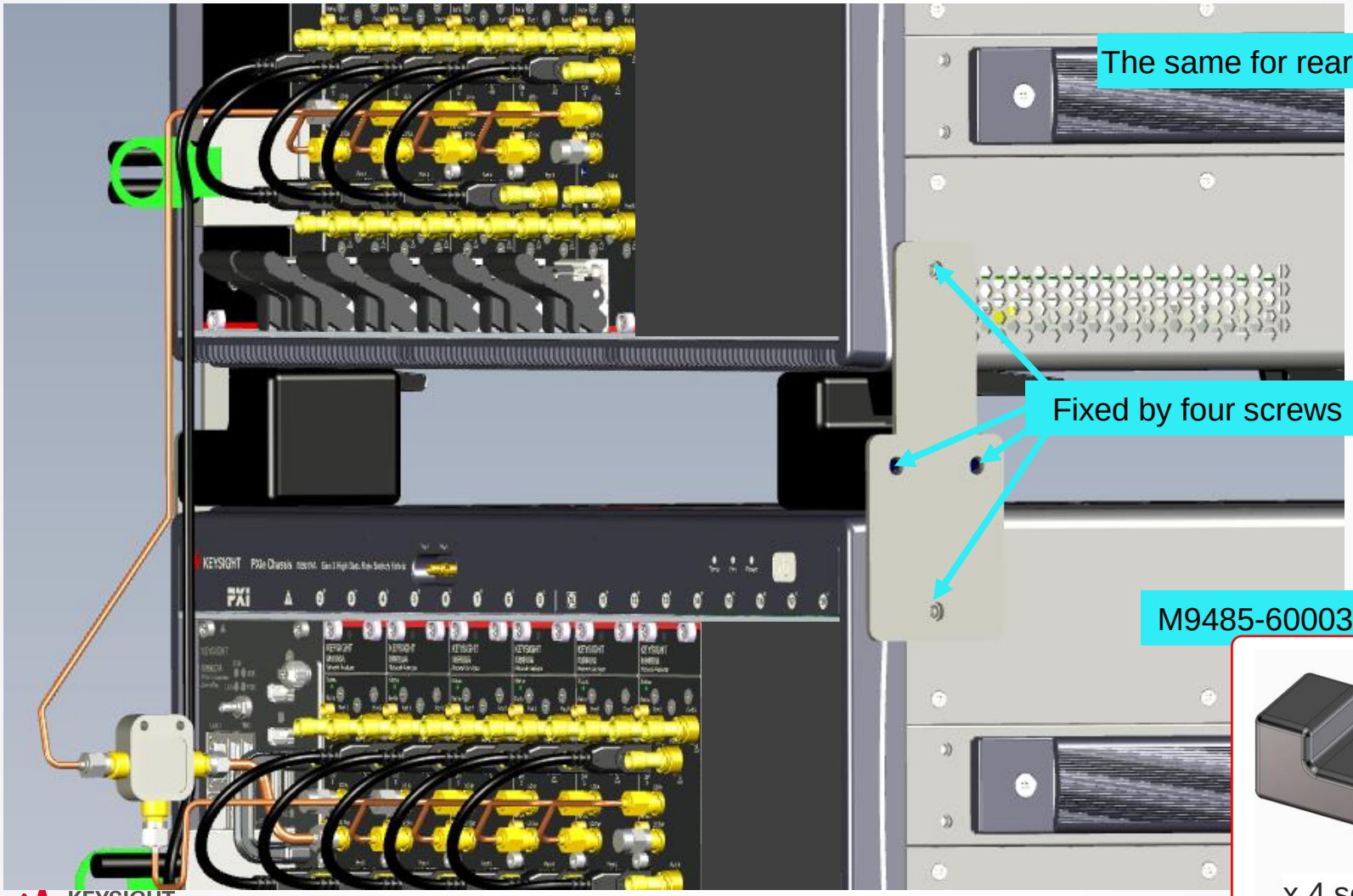
66 PORTS / 11 MODULES 6 PORT VNA



The other module allocations in lower and upper chassis are also available as far as it meets the conditions.

Case 3: Two Chassis Configuration Example

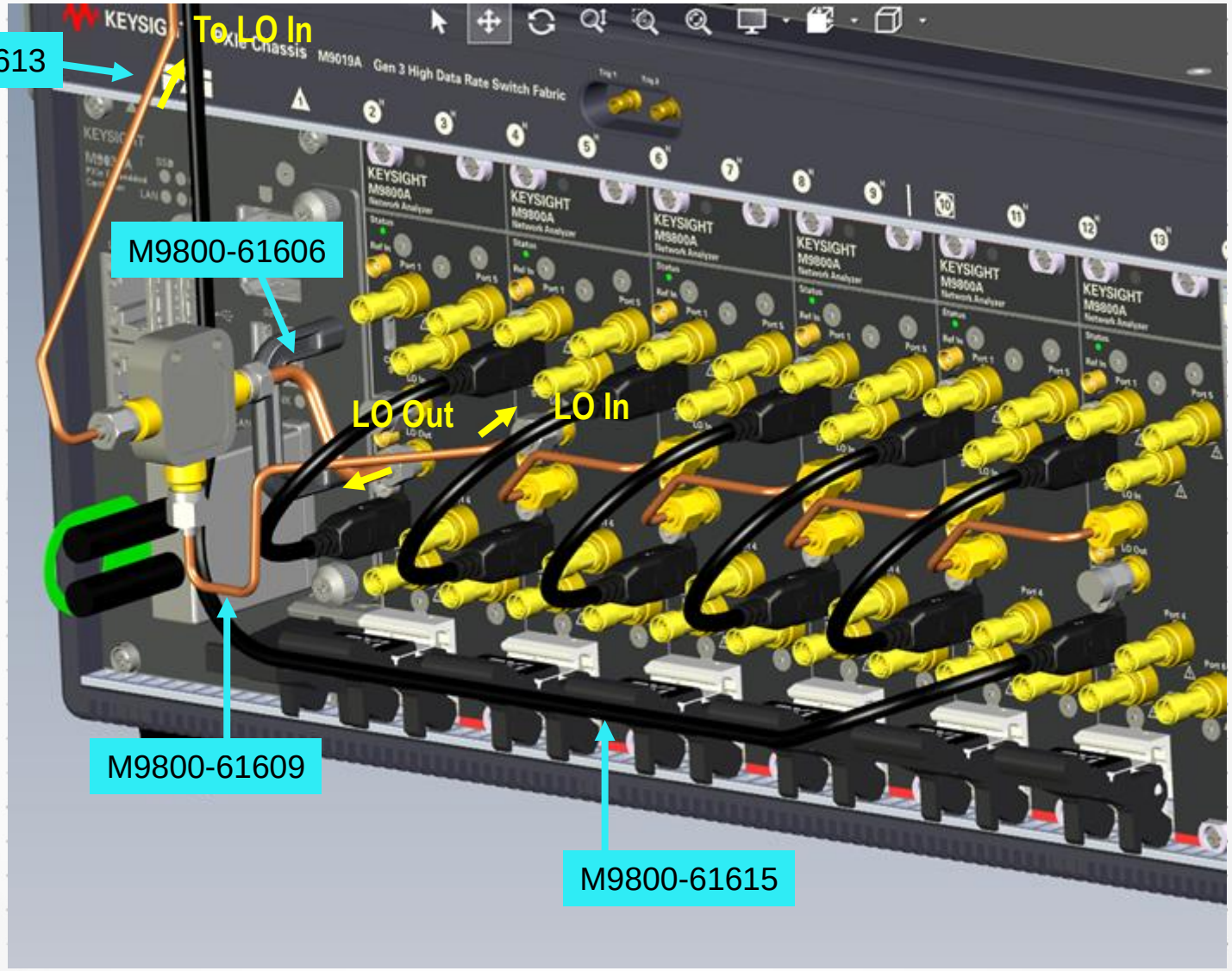
SPACERS AND ANGLES



KEYSIGHT TECHNOLOGIES

Case 3: Two Chassis Configuration Example

LOWER CHASSIS



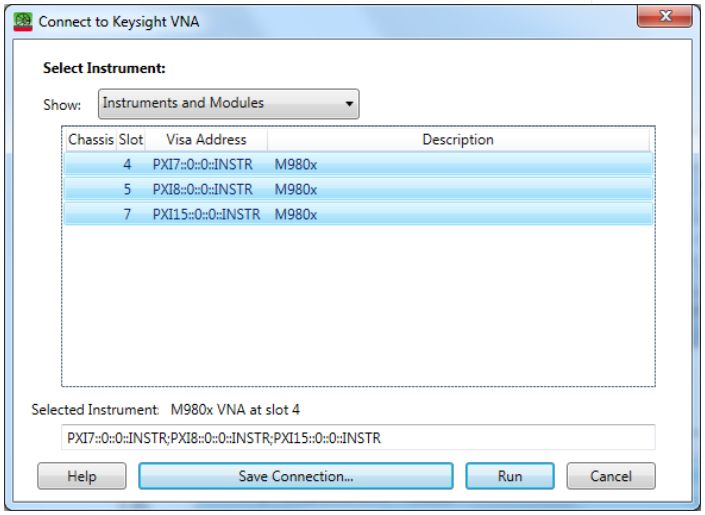
Case 3: Two Chassis Configuration Example

UPPER CHASSIS

Launch VNA Application

VNA APPLICATION

1. Click the Network Analyzer icon to execute the launcher.
2. Select all required modules, then click RUN.



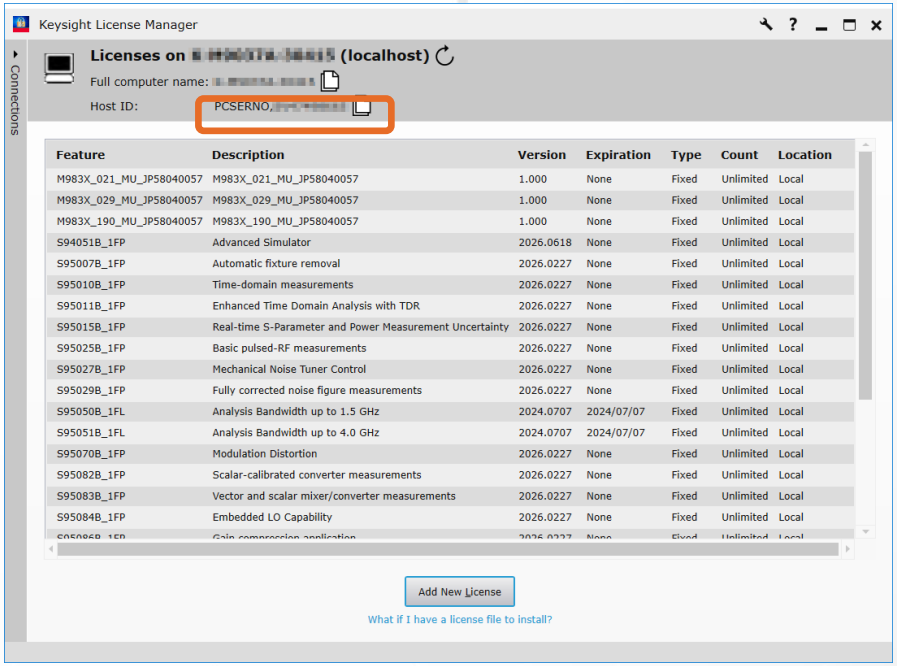
3. VNA application will check if the control and LO cables are connected correctly during boot up. If there is something wrong, the selftest error message is displayed at the message area on the bottom of the VNA application.

Install S95551B N-Port calibrated measurement

KEYSIGHT LICENSE MANAGER

Procedure for Node Locked or Transportable License.
Note: Use Keysight License Manager 6 for Floating and USB Portable licenses.

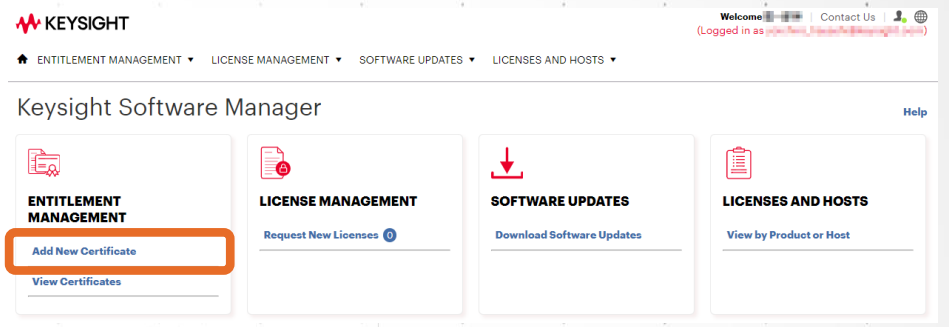
- Get HOST ID
  1. Execute the Keysight License Manager from Windows Start Menu.
  2. Get the Host ID information

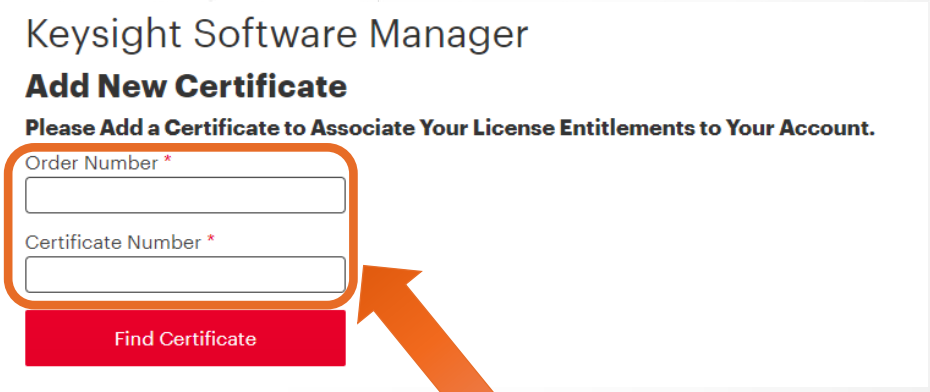


Install S95551B N-Port calibrated measurement

KEYSIGHT SOFTWARE MANAGER

- Visit http://www.keysight.com/find/softwaremanager
- Log in or register your name if first time log-in.
- Click “Add New Certificate”
- Enter your “Order Number” and “Certificate Number” on Software Entitlement Certificate.

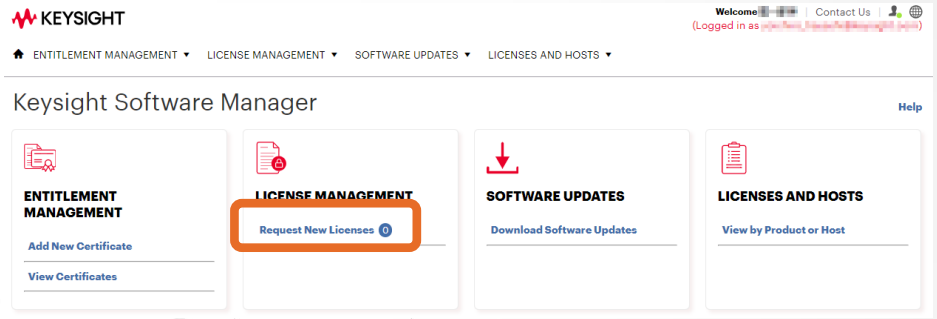


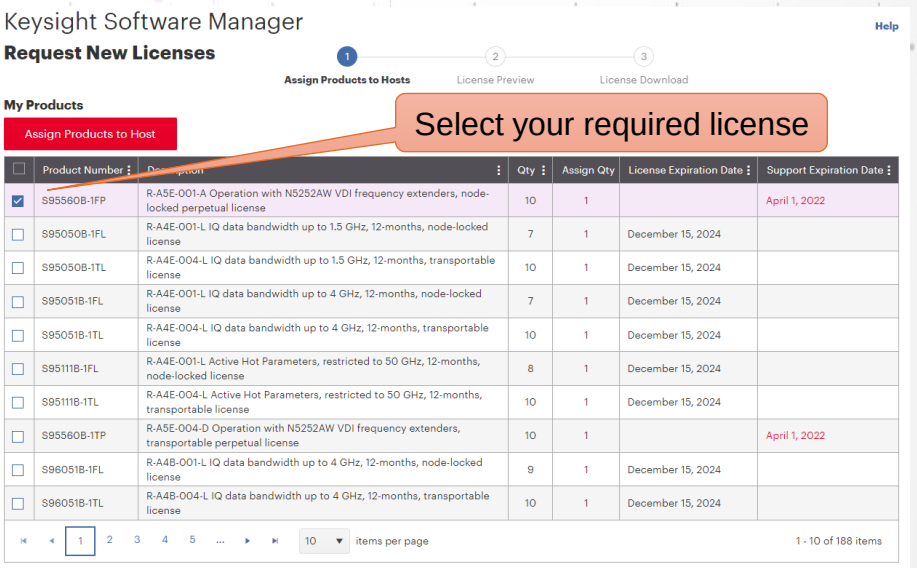


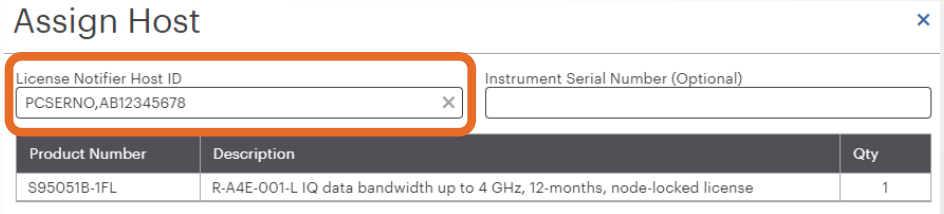
Install S95551B N-Port calibrated measurement

KEYSIGHT SOFTWARE MANAGER

- Click “Request New License”
- Select your required license (ex. S95551B) and click “Assign Products to Host”
- Assign your HOST ID
  - PCSERNO,{10 digits number}
- Click “Save HOST ID” at the bottom.
- Follow the instructions.
- The license file is sent to your email address or downloaded into your PC.







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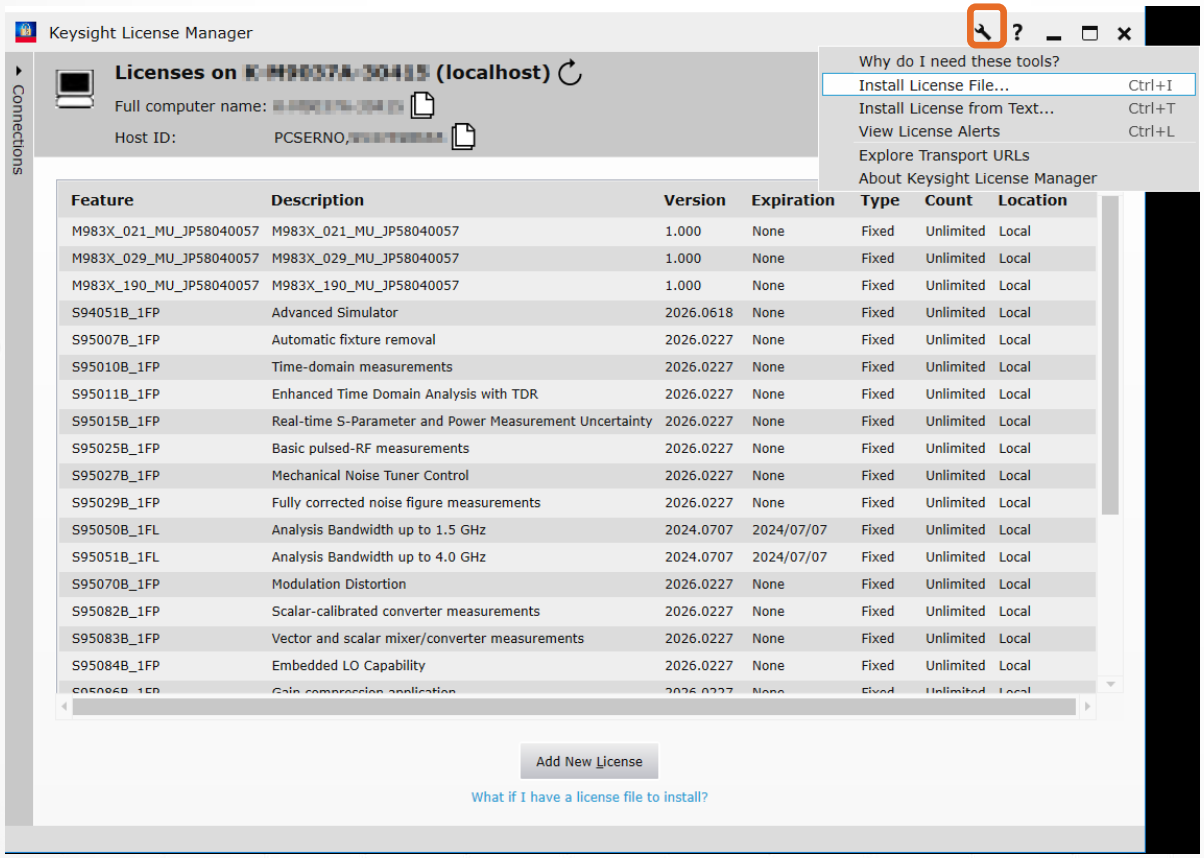
Install S95551B N-Port calibrated measurement

KEYSIGHT LICENSE MANAGER

- Click the Wrench (Tool) icon to install the license file.



FAQ

FOR MULTIMODULE CONFIGURATION

- When you want to use the single module in the multi module configuration, just execute one module in the launcher. Disconnection for LO/control cables is not necessary.
- When you want to use modules for multi-site (multi VNA application boot up), disconnection for LO/control cables is necessary.

M983xA and M98xA

M983XA ONLY OR BOTH M983XA AND M980XA

Rule

MULTI MODULE WITH M983XA AND M980XA

- ✓ The number of M9834A/M9837A units is one or two.
  - ✓See the appendix for a configuration with three M9834A/M9837A modules
- ✓ One Chassis
  - ✓ See the appendix for two chassis configuration
- ✓ M9834A/M9837A must be installed from the most left slot.
- ✓ The M980xA can be installed in the other empty slots.
  - ✓See the example configuration in the end of this section.
- ✓ When M980xA is installed, 1 slot module should be placed first from left side in chassis, then 2 slot modules are placed.
- ✓ S95551B with the valid support subscription is required.

Limitation

M983XA AND M980XA

- ✓ When the different models are installed, the frequency range is limited with the lowest model.
  - ✓ For example, M9834A (20 GHz) and M9800A (4.5 GHz) are used in multi-module configuration, the maximum frequency range of VNA application is set at 4.5 GHz.

Required Models for Interconnections

Y1730A

- Y1730A-001
  - Interconnect cables for multiport configuration of 1-slot M980xA (2-port)
- Y1730A-002
  - Interconnect cables for multiport configuration of 2-slot M980xA (4/6-port)
- Y1730A-200
  - Interconnect cables for multiport configuration of 2-slot M983xA with M980xA
- Y1730A-201
  - Interconnect cables for multiport configuration of 3-slot M983xA with M980xA
- Y1730A-301
  - Interconnect cables for multiport configuration of Two 3-slot M983xAs
- Y1730A-302
  - Interconnect cables for multiport configuration of 3-slot M983xA with M9410A VXT
- Y1241B Air Inlet Kit
  - For the empty slots

Required Models for Interconnections

Y1730A

		Right module				
		2-port M980xA (opt.200)	4-port M980xA (opt.400)	6-port M980xA (opt.600)	M9834-205 (*2)	M9834A-270 M9837A (*2)
Left module	2-port M980xA (opt.200)	Y1730A-001	Y1730A-002	Y1730A-002	Not Supported	Not Supported
	4-port M980xA (opt.400)	Y1730A-002	Y1730A-002	Y1730A-002	Not Supported	Not Supported
	6-port M980xA (opt.600)	Y1730A-002	Y1730A-002	Y1730A-002	Not Supported	Not Supported
	M9834-205 (*2)	Y1730A-200	Y1730A-200	Y1730A-200	Y1730A-300	*1
	M9834A-270 M9837A (*2)	Y1730A-201	Y1730A-201	Y1730A-201	*1	Y1730A-301
	M9300A + 2-slot VXT	*1	*1	*1	*1	Y1730A-302
	M9300A + 3-slot VXT	*1	*1	*1	*1	*1

Note:

1. Keysight does not provide interconnect for the configuration. Users must develop cables for the connection between modules.
2. 2-slot M983xA includes M9834A-205. 3-slot M983xA includes M9834A-270, M9837A-205, and M9837A-270

Required Tools for Installation

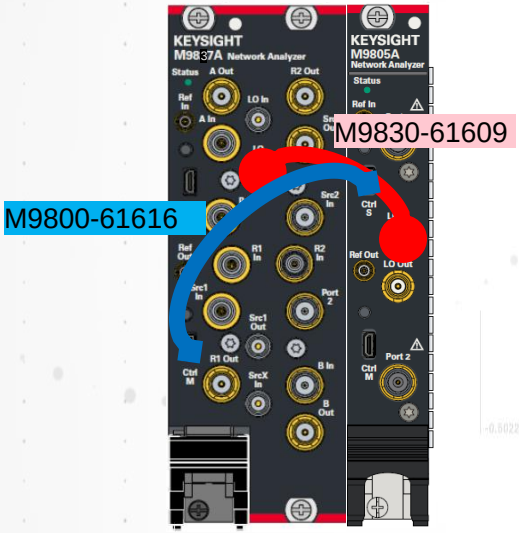
Y1730A

- Torque Wrench for 3.5 mm connectors
  - 0.9 Nm
  - Keysight P/N 8710-1765
- Driver for Hex 3-2.5 mm

Interconnect Cable for M9834A-205

2-SLOT M9834A

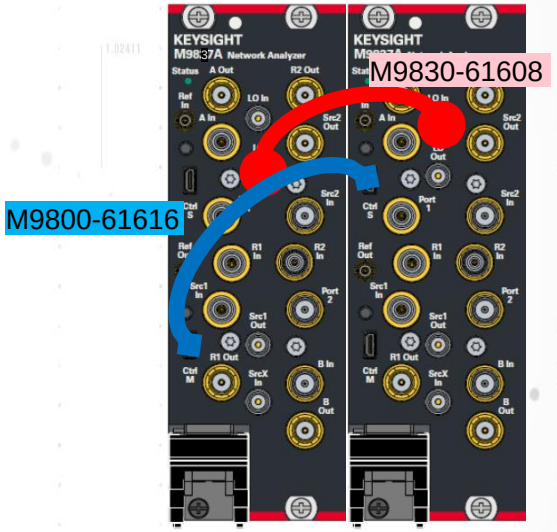
M9834A-205 (left) => M980xA (right)



Required instruments/accessories:

Model/opt. number	Description	Qty
M9834A-205	2-slot M983xA	1
M980xA-200/400/600	PXI VNA (either of 2-, 4-, or 6-port options)	1
Y1730A-200	TBD - Interconnect cables for multiport configuration of 2-slot M983xA with M980xA	1

M9834A-205 (left) => **M9834A-205** (right)



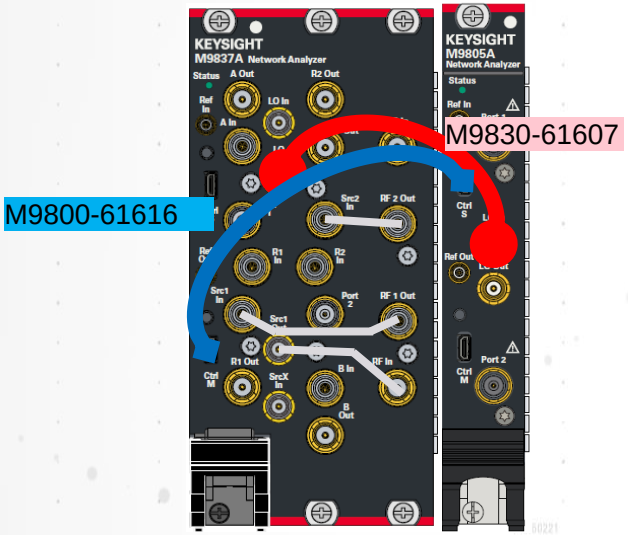
Required instruments/accessories:

Model/opt. number	Description	Qty
M9834A-205	2-slot M983xA	2
Y1730A-300	TBD - Interconnect cables for multiport configuration of Two 2-slot M983xAs	1

Interconnect Cable for M9834A-270, M9837A-205/270

3 SLOT

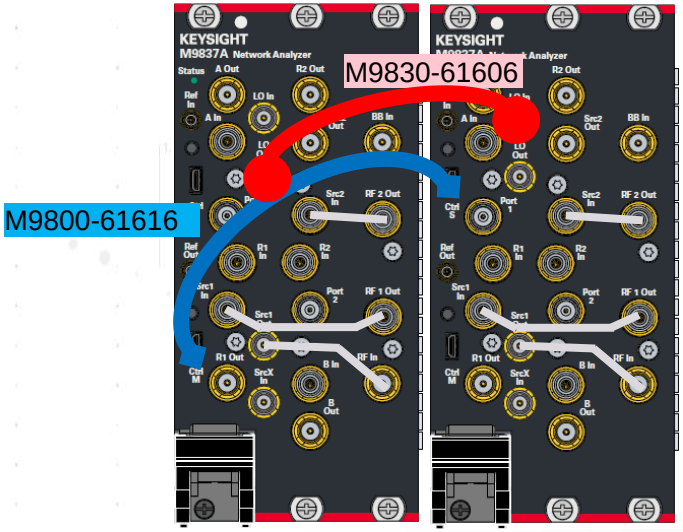
3-slot M983xA (left) => M980xA (right)



Required instruments/accessories:

Model/opt. number	Description	Qty
M983xA	3-slot M983xA (either of M9834A-270, M9837A-205, or M9837A-270)	1
M980xA-200/400/600	PXI VNA (either of 2-, 4-, or 6-port options)	1
Y1730A-201	TBD - Interconnect cables for multiport configuration of 3-slot M983xA with M980xA	1

3-slot M983xA (left) => **3-slot M983xA** (right)



Required instruments/accessories:

Model/opt. number	Description	Qty
M983xA	3-slot M983xA (either of M9834A-270, M9837A-205, or M9837A-270)	2
Y1730A-301	TBD - Interconnect cables for multiport configuration of Two 3-slot M983xAs	1

Required Accessory for M980xA/M983xA

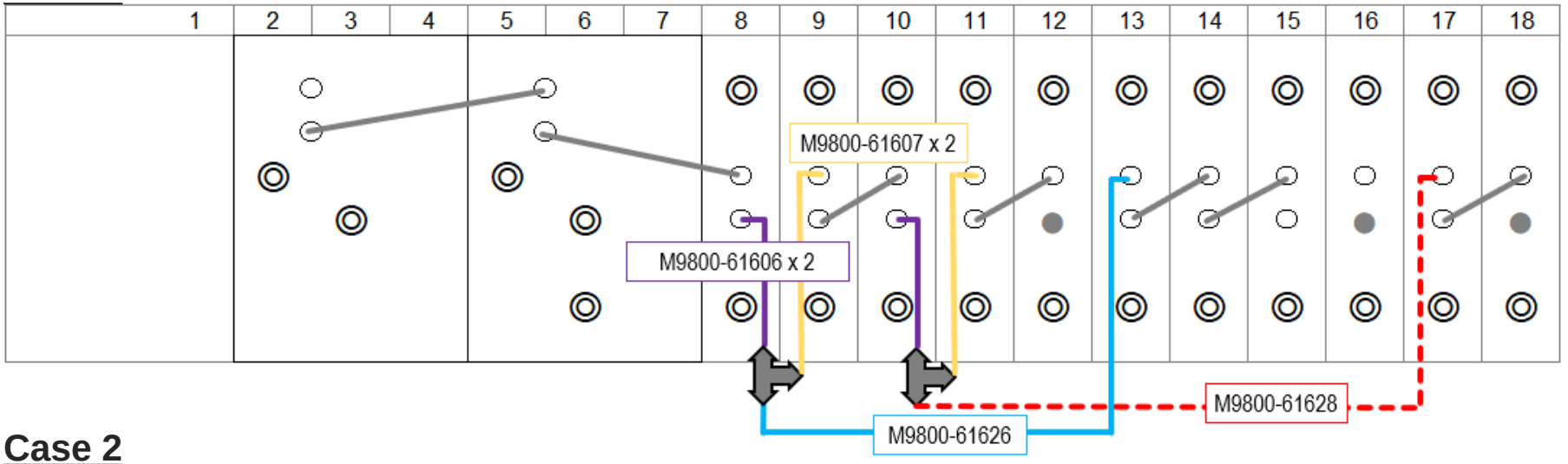
MORE THAN TWO M980XA

Case	M983xA		M980xA			Divider	Y1730A								
	M9834A-205 (2-slot)	M983xA-270 (3-slot)	M980xA-200 (<= 20 GHz)	M980xA-400/600 (<=20 GHz)	M980xA-200 (> 20 GHz)	11636B	001	002	003	004	005	200	201	300	301
1	0	2	0 to 5	0	0	0	0 to 4	0	0	0	0	0	0	0	1
1	0	2	6 to 9	0	0	1	5 to 8	0	0	1	1	0	0	0	1
1	0	2	10 to 11	0	0	2	9 to 10	0	0	2	1	0	0	0	1
2	2	0	0 to 5	0	0	0	0 to 4	0	0	0	0	1	0	1	0
2	2	0	6 to 9	0	0	1	5 to 8	0	0	1	1	1	0	1	0
2	2	0	10 to 12	0	0	2	9 to 11	0	0	2	1	1	0	1	0
3	2	0	0	0 to 5	0	0	0	0 to 4	0	0	0	1	0	1	0
3	2	0	0	6	0	1	0	5	0	1	1	1	0	1	0
4	2	0	1	0 to 4	0	0	0 to 1	0 to 3	0	0	0	1	0	1	0
4	2	0	1	5 to 6	0	1	1	4 to 5	0	1	1	1	0	1	0
5	0	2	0	0	0 to 7	0	0 to 6	0	0	0	0	0	1	0	1
5	0	2	0	0	8 to 11	1	7 to 10	0	0	1	1	0	1	0	1

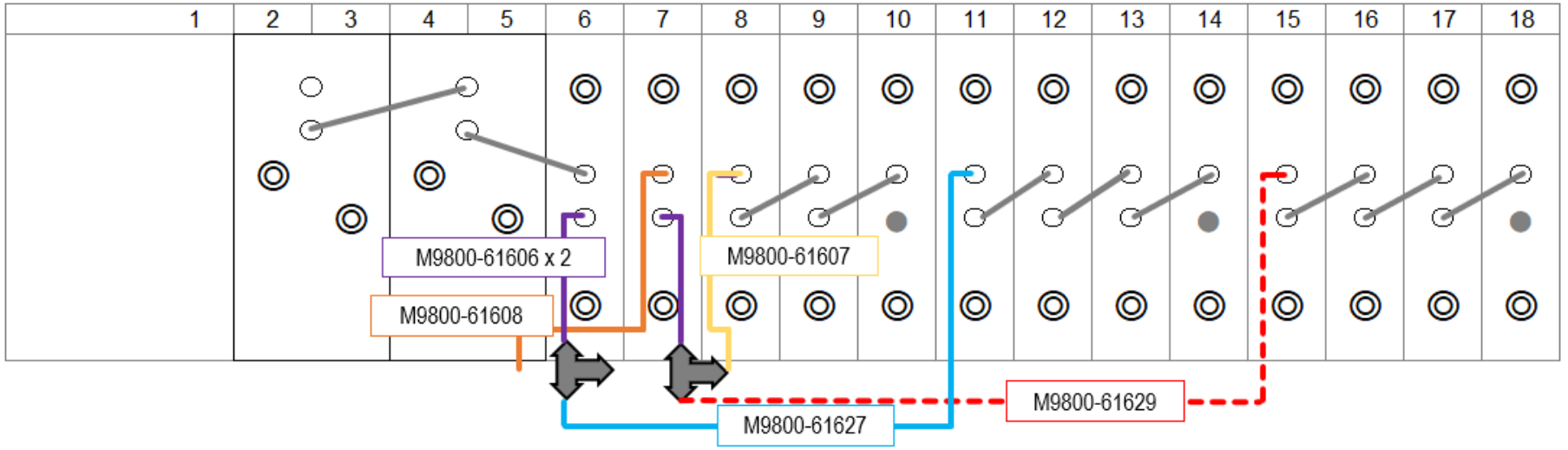
M9834A and M9800A to 04A Configuration

LOCAL SIGNAL CONNECTION DIAGRAM

Case 1



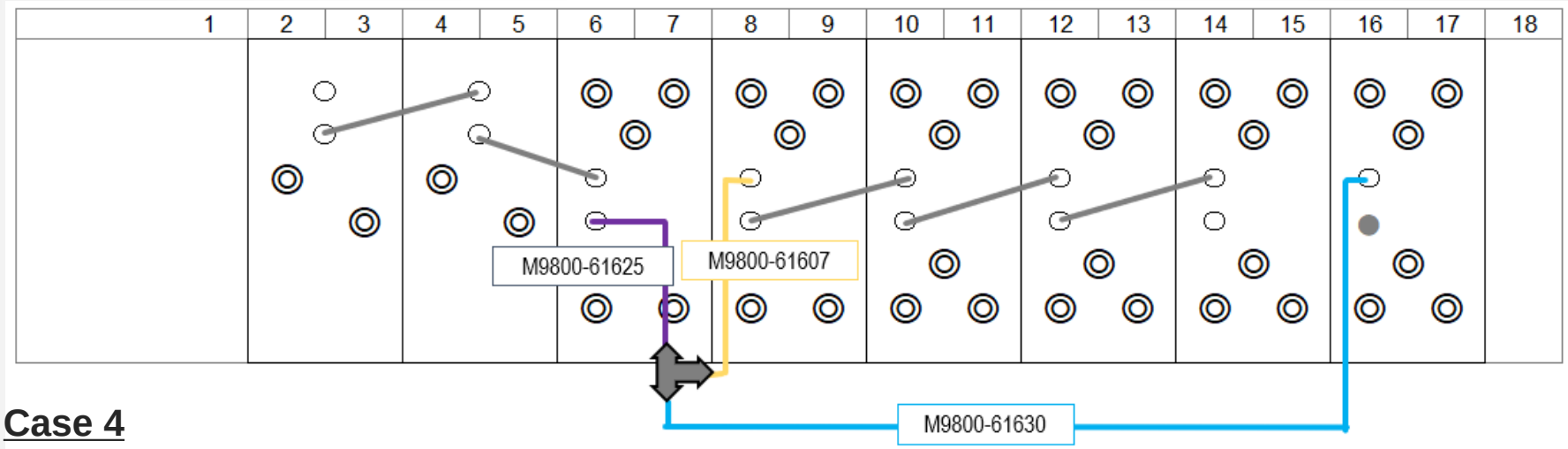
Case 2



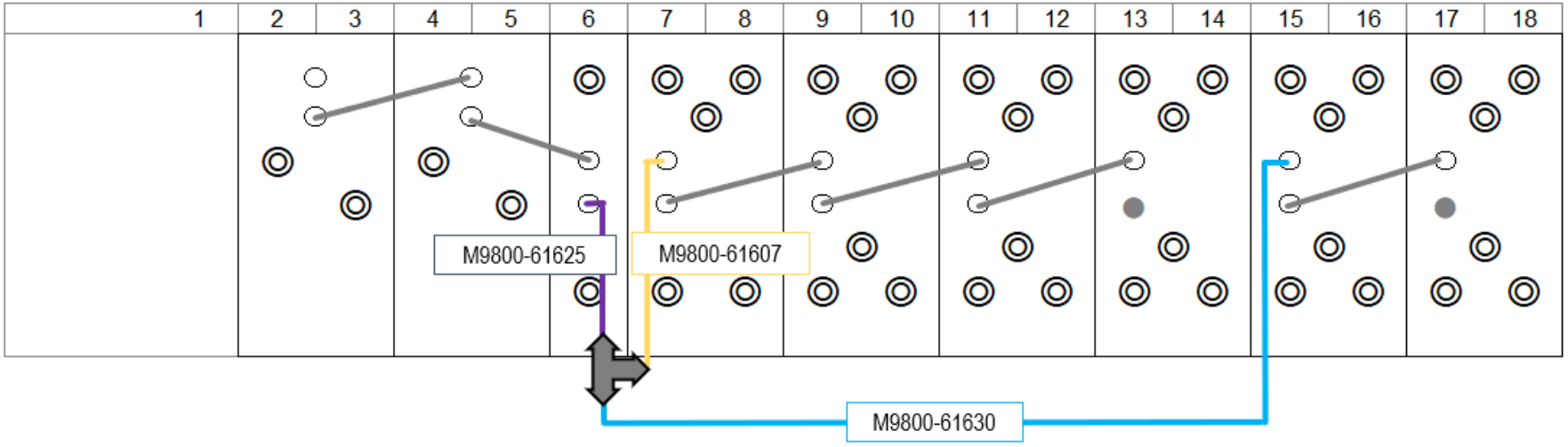
M9834A and M9800A to 04A Configuration

LOCAL SIGNAL CONNECTION DIAGRAM

Case 3



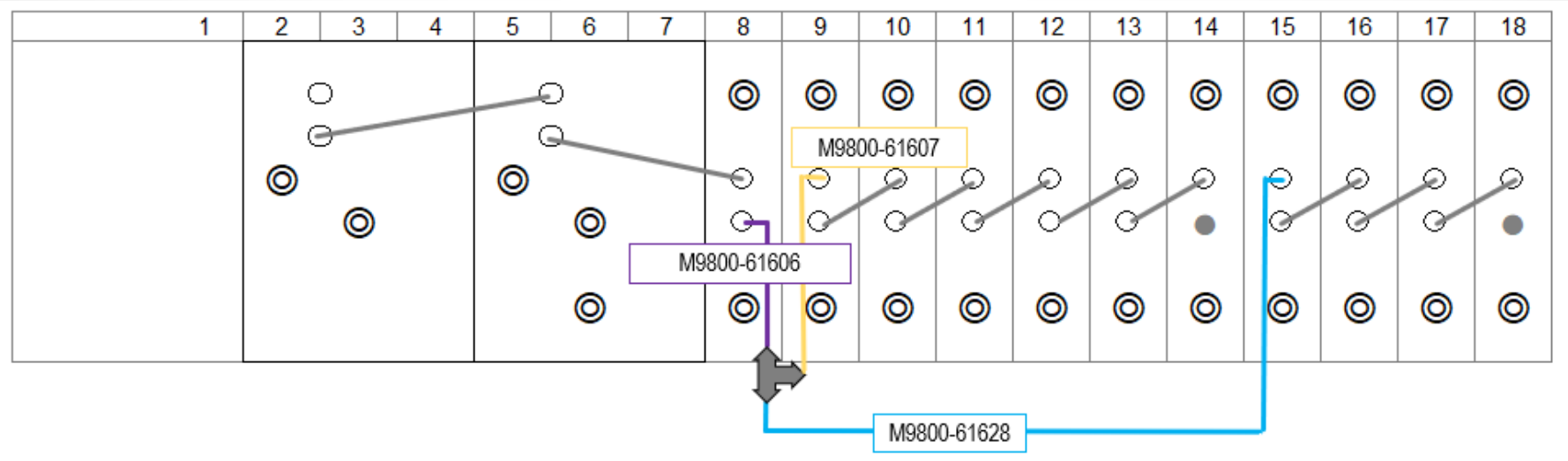
Case 4



M9837A and M9805A to 08A Configuration

LOCAL SIGNAL CONNECTION DIAGRAM

Case 5



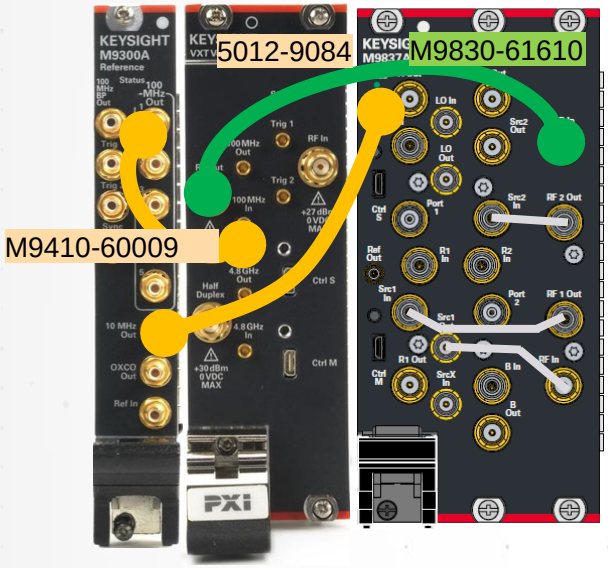
M983xA and VXT

MODULATION

Interconnect Cable for 3-slot M983xA and VXT

VXT AND M983XA

M9300A => M9410A VXT => **3-slot M983xA**



Required instruments/accessories:

Model/opt. number	Description	Qty
M9300A	PXIe Frequency Reference (No option required)	1
M9410A-EP6/M02	VXT PXIe Vector Transceiver, with 256 MSa memory	1
M983xA	3-slot M983xA (either of M9834A-270, M9837A-205, or M9837A-270)	1
Y1730A-302 (*1)	TBD - Interconnect cables for multiport configuration of 3-slot M983xA with VXT	1

Note:
1. Y1730A-302 includes:
   - 1 flexible cable (P/N: M9410-60009. The cable is also included in Y1810A)
   - 1 flexible cable (P/N: 5012-9084)
   - 1 semi-rigid cable (P/N: M9830-61610)

Connections

M9410-60009

M9300A 100 MHz Out 1 → M9410A 100 MHz In

5012-9084

M9300A 10 MHz Out → M9837A Ref In

M9830-61610

M9410A RF Out → M9837A BB In

Must fasten all 6 screws on M9837A.
Otherwise, internal boards will be damaged.

Installing Software

IO LIBRARY / M938X, M983X FIRMWARE

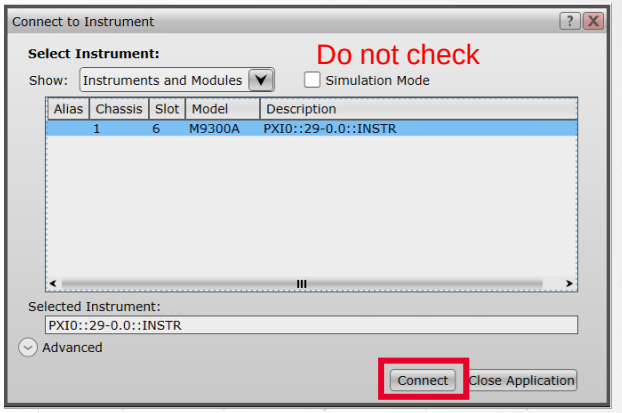
- IO Library
  - Download and install IO Libraries Suite **2022 Update 1** (18.2.28014) or later. https://www.keysight.com/find/iosuiteproductcounter
    - Note: IOLS 2018 does not work.
- M938x Vector Signal Generator / CW Source Instrument Drivers
  - https://www.keysight.com/us/en/lib/software-detail/driver/m938x-vector-signal-generator--cw-source-instrument-drivers-2235963.html
  - It contains M9300A firmware.
- PXI/USB VNA Firmware
  - https://www.keysight.com/find/pxiusbvna-firmware

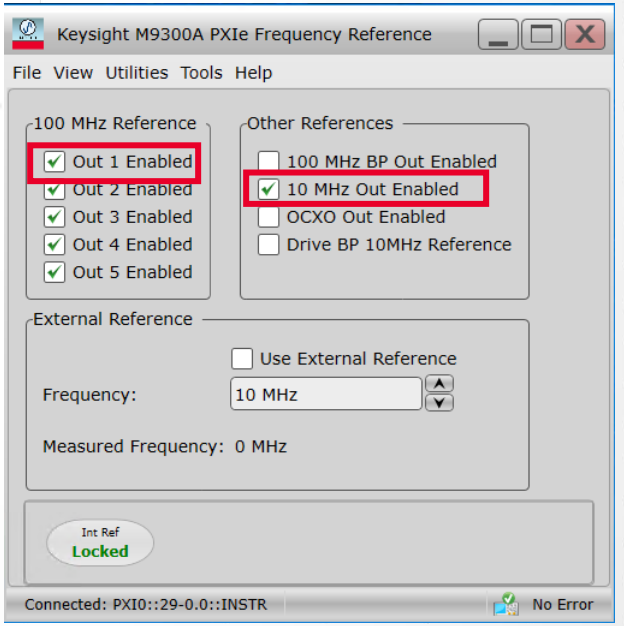
Launch M9300A Soft Front Panel (SFP)

FREQUENCY REFERENCE

- Start menu > Keysight M938x > M9300A SFP
- Connect to Instrument
- Enable the following items
  - 100 MHz Out 1 Enabled
  - **10 MHz Out Enabled**
- Pin to Taskbar (if needed)

Keep always open the M9300A SFP.
The reference output stops if you close the dialog.





Installing M9410A Software and License

VXT PXI VECTOR TRANSCEIVER

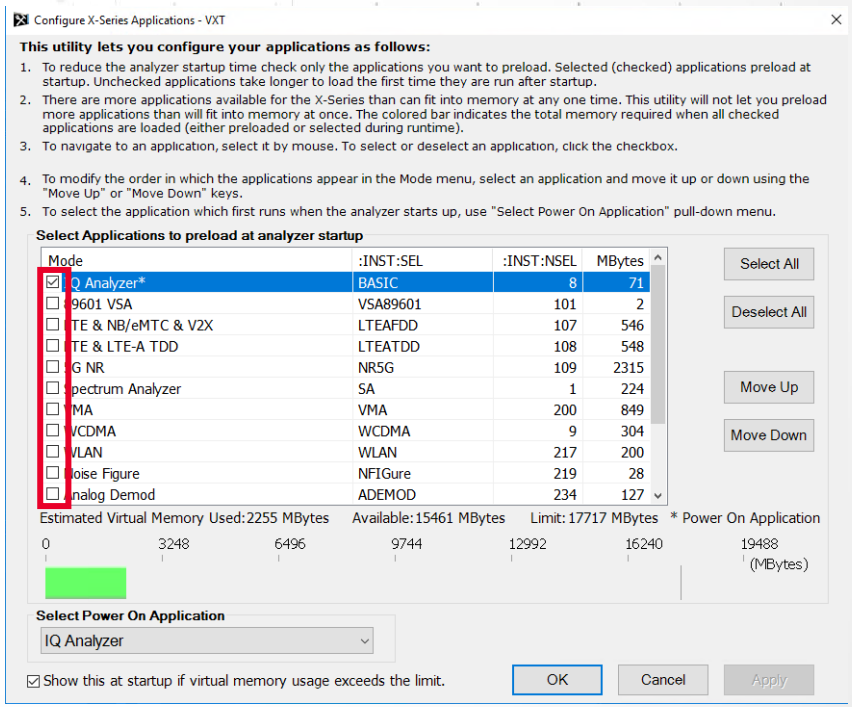
- M9410A VXT PXI Vector Transceiver, 300/600/1200 MHz Bandwidth Software
  - https://www.keysight.com/us/en/lib/software-detail/instrument-firmware-software/m9410a-vxt-pxi-vector-transceiver-3006001200-mhz-bandwidth-software-3016010.html
  - The installation takes 30 to 60 mins. FPGA update requires shutdown or reboot.
  - M9410A always requires the external 100 MHz input. It does not have own internal refence signal. Make sure that the reference is supplied even while the installation.

- Install the required license
  - N7631EMBC Signal Studio Pro for 5G NR, waveform playback must be installed

Configure M9410A Firmware

VXT PXI VECTOR TRANSCEIVER

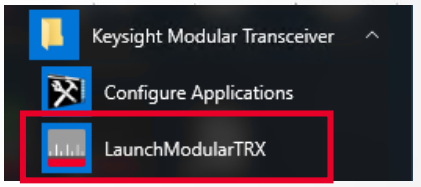
- Start menu > Keysight Modular Transceiver > Configure Applications
- Uncheck preload applications to reduce memory usage.
  - Keep the IQ Analyzer checked.
  - OK to activate other apps if needed.
    But the firmware launch will slow down.
- OK to save.

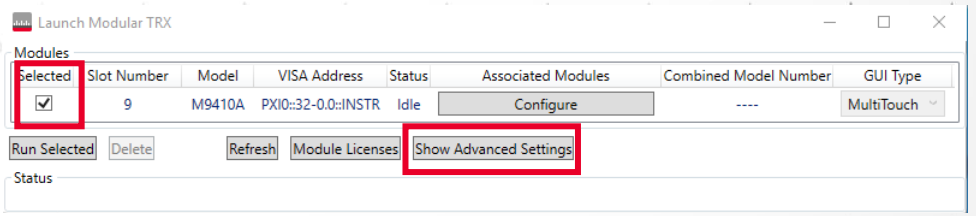


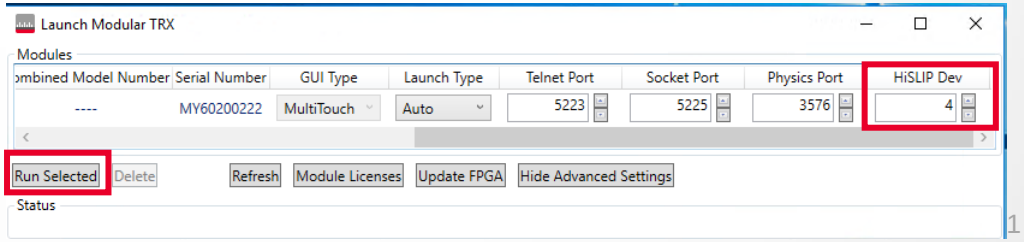
Launch M9410A Firmware

VXT PXI VECTOR TRANSCEIVER

- Start menu > Keysight Modular Transceiver > LaunchModularTRX
- Check “Selected”
- Show Advanced Settings
- Set HiSLIP number (for example 4) to avoid conflict vs. VNA FW.
- Press Run Selected to launch the FW







Lanch VNA Firmware

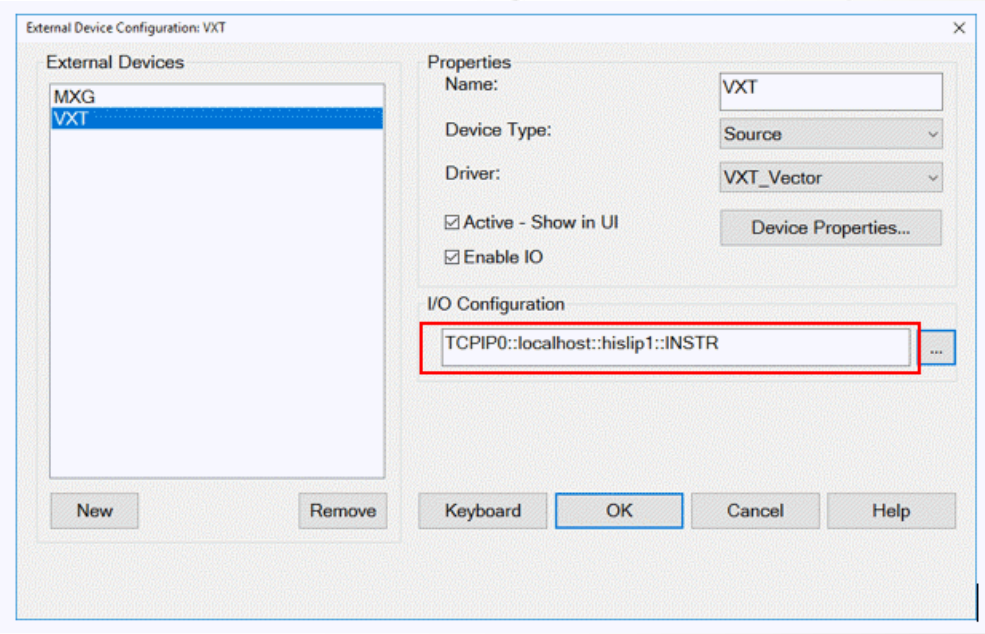
M98XXA

- S95070B Modulation Distortion is required.
- Launch by clicking Network icon on the desktop.
  - Select only VNA(s) in VNA lancher. Do not select M9800A.

Add VXT as an External Device on VNA

VNA FIRMWARE

- Open External Device Configuration dialog on VNA on Firmware (**Setup -> External Hardware -> External Device**...).
- Then, add new External Devices with the properties below.
  - Device Type : Source
  - Driver : VXT_Vector
  - I/O Configuration : TCPIP0::localhost::hislip<address>::INSTR

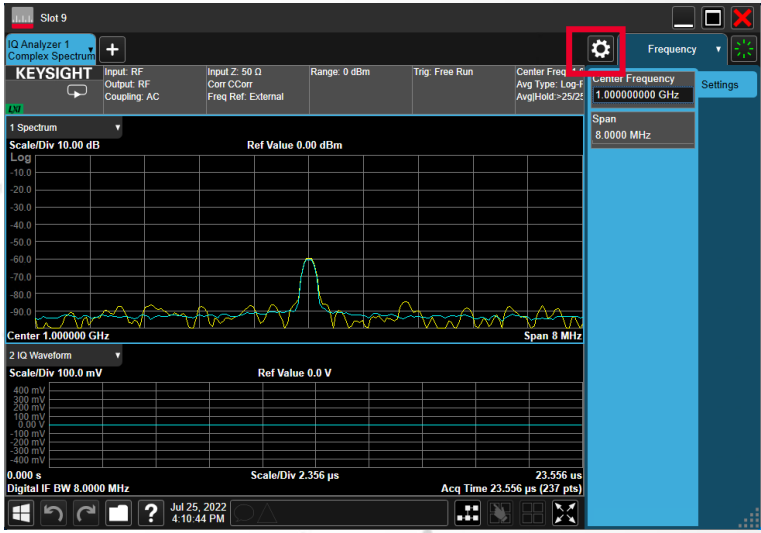


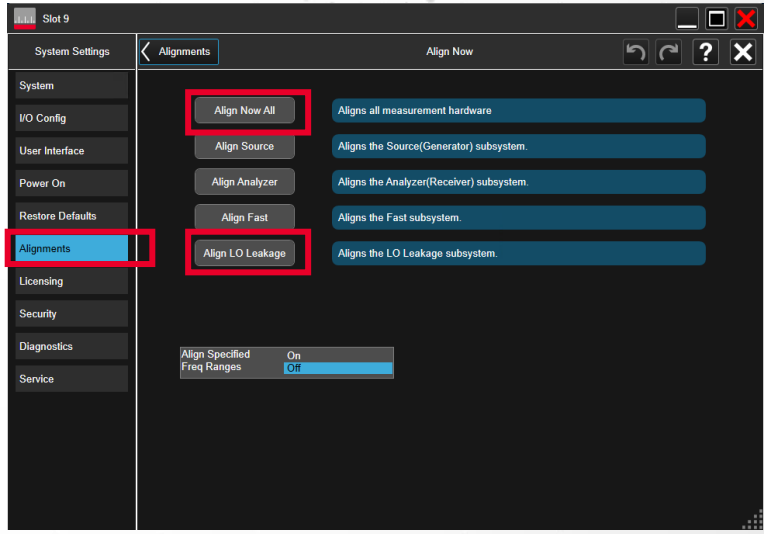
Take M9410A Self Alignment

VXT PXI VECTOR TRANSCEIVER

1. On M9410A GUI, click “Config” button > System Settings > Alignments > Align Now
2. Click “Align Now All” (10 mins)
3. Click “Align LO Leakage” (5 mins)

M9410A periodically requests you to take alignment. Typically, once a few days.





KEYSIGHT TECHNOLOGIES

Configuration Example in 3D

EDRAWINGS VIEWER

- 3D image (.easm) file is available.
- eDrawings Viewer, a free 3D viewing software, is required.
  - http://www.edrawingsviewer.com/ed/edrawings-viewer.htm
- The following five configuration examples are available at http://www.keysight.com/find/m980xa-mm
  - M980xA 34 ports - 17 x 2 Port VNAs in one chassis, Two divider case / 2-b
    - File Name: M980xA_2port17modules.easm
  - M980xA 66 ports – 11 x 6 port VNAs in two chassis
    - File Name: M980xA_6port11modules.easm
  - M9834A-205 x 2 and M9804A x 13
    - File Name: M9834A-205_2modules_M9804A_13modules.easm
  - M9834A-270 x 2 and M9804A x 11
    - File Name: M9834A-270_2modules_M9804A_11modules.easm
  - M9837A-270 x 2 and M9808A x 11
    - File Name: M9837A-270_2modules_M9808A_11modules.easm

Configuration for three or more M983xAs

APPENDIX

Three and more M983xAs

MULTI MODULE WITH M983XA

You can make a configuration with three and more M983xA. Here is the limitation and rule.

- Maximum Number of modules: Eight M983xAs
- Modules order: If VXT is placed, it should be the most left slot.
- The 11636B Power Divider must be placed on the first module.
- The total number of LO signal daisy chains connection from the origin module should be less than or equal to 5.
- Each path of daisy chains connection should be the same or one different.
- Two chassis: The divider must be placed on the first module on the first chassis. Then, the LO provides the second modules in both first and second chassis.
- The performance will be degraded on this configuration. See the data sheet.

M983xAs and M980xA

MULTI MODULE WITH M983XA AND M980XA

You can make a configuration with M983xAs and M980xAs. Here is the additional limitation and rule.

- If two divider is required, the second divider must be placed on the second module.