Keysight Technologies N5182BX07 Frequency Extender

KEYSIGHT TECHNOLOGIES

User's Guide

Notices

Trademark Acknowledgments

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CAUTION

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WARNING

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N5182BX07
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N5182BX07 Frequency Extender

9 kHz to 7.2 GHz

Description

The Keysight N5182BX07 Frequency Extender is an accessory for the MXG (N5182B) or EXG (N5172B) that extends the frequency range of vector signals to cover 9 kHz to 7.2 GHz. The N5182BX07 is especially well suited for 802.11ax measurements, due to its excellent phase noise and EVM.

The Keysight N5182BX07 has the following key features:

- Frequency range of operation: 9 kHz to 7.2 GHz.
- Bandwidth: 160 MHz.
- 802.11ax EVM at 7.2 GHz, 160 MHz BW: <-47 dB (0.45%) for output up to +5 dBm.
- Max output power: +18 dBm (EVM will degrade as power increases above +5 dBm).
- Total height: 3U (MXG is 2U and frequency extender is 1U).
- Seamless integration with MXG/EXG, including control from the front panel or automation using SCPI via LAN, GPIB, or USB.
- Single RF output for full frequency coverage, with bypass mode for frequencies < 5.9 GHz.
- Available as an upgrade for an existing N5182B or N5172B with power sensor calibration at the customer site.

Figure 1 N5182BX07 Frequency Extender with MXG Vector Signal Generator

Verifying the Shipment

To verify the contents shipped with your product, refer to the “Box Content List” included with the shipment.

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to “Contacting Keysight” on page 44. Keep the damaged shipping materials (if any) for inspection by the carrier and an Keysight Technologies representative.

Equipment

N5182BX07 Frequency Extender, with

- USB cable (Type A to Type C)
- 10 MHz cable (BNC)
- RF cable, (N-type)
- Power cord

Other Required Equipment, Sold Separately

N5182B MXG-B or N5172B EXG-B, with

- Option 506: Frequency range from 9 kHz to 6 GHz
- Option FRQ: Frequency Extender Connectivity
- Licenses for playing 802.11ax waveforms
- Firmware B.01.90 or later
- Power cord

NOTE **Only Keysight approved accessories shall be used.**

General Performance

CAUTION **This instrument has an auto-ranging line voltage input. Be sure the supply voltage is within the specified range and voltage fluctuations do not exceed 10% of the nominal supply voltage.**

Power Requirements

- 100/120V VAC, 220/240 VAC (50/60 Hz)
- N5182BX07 maximum power is 160 W

Environmental Tests

The N5182BX07 complies with all applicable safety and regulatory requirements for the intended location of use.

- Operating Environment (for indoor use only)
- Operating Temperature 0 to 55 °C
- Storage Temperature : –40 to +70 °C
- Operating and Storage Altitude: 0 to 3,000 meters (~ 9,842 feet)
- Maximum Relative Humidity (non-condensing): 95% RH up to 40 °C, decreasing linearly to 50% RH at 55 °C. From 40 °C to 55 °C, the maximum % Relative Humidity follows the line of constant dew point.

Dimensions and Space Requirements

Standard installation of the N5182BX07 includes configuration and installation on a customer-provided lab bench or table top of adequate size and strength.

Table 1 Dimensions

Size, including RF connectors and feet	
Width	426 mm (16.8")
Length	485 mm (19.1")
Height	59 mm (2.3")
Size, excluding RF connectors and feet	
Width	426 mm (16.8")
Length	465 mm (18.3")
Height	44 mm (1.75")
Weight	
	≤ 6.2 kg (13.7 lb)

Specifications

The N5182BX07 Frequency Extender extends any N5182B MXG or N5172B EXG with Option 506 to cover the 802.11ax bands from 2.4 to 7.2 GHz with exceptional error vector magnitude (EVM) accuracy.

For frequencies of 5.9 – 7.2 GHz, the N5182BX07 optimizes EVM by holding the MXG or EXG within a narrow frequency and amplitude range, and then adjusting output amplitude with a mechanical attenuator with 1 dB steps. This provides excellent EVM over a wide range of amplitude levels. The attenuator is rated for 2 million cycles. A mechanical switch rated at 5 million cycles is used to switch between the 9 kHz to <5.9 GHz band and the 5.9 - 7.2 GHz band. To maximize the life of the attenuator and the switch in automated tests across both frequency and amplitude, the optimal test order is as follows:

- First measure all frequency and amplitudes below 5.9 GHz
- Next measure all frequency and amplitudes of 5.9 – 7.2 GHz with amplitude as the outer loop and frequency as the inner loop. In other words, measure all frequencies for a given power level, then switch power level.

NOTE List and sweep features are not supported when using the N5182BX07.

General Specifications

Remote Programming Interfaces

MXG or EXG can be controlled through GPIB, LAN, or USB. N5182BX07 is controlled by MXG or EXG using one USB port.

Recommended Calibration Cycle

12 months.

ISO Compliant

This instrument is manufactured in an ISO9001 registered facility in concurrence with Keysight Technologies' commitment to quality.

Definitions and Conditions

Specifications represent warranted performance of a calibrated instrument with Extender Input Power Offset set to 0 db that has been stored for a minimum of two hours within the operating temperature range of 0 to 55 °C, unless otherwise stated, and after a 45-minute warm-up period. The specifications include measurement uncertainty. Data represented in this document are specifications unless otherwise noted.

Typical (typ) describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 90 percent confidence level at room temperature (approximately 25 °C). Typical performance does not include measurement uncertainty.

Nominal (nom) values indicate the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

Measured (meas) describes an attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

Frequency Specifications

Table 2 Frequency Specifications

Frequency Range	
	9 kHz to 7.2 GHz[1]
Frequency Bands	
Passthrough Band	9 kHz to < 5.900001 GHz
Upconverter Band	5.900001 GHz to 7.2 GHz
Frequency Switching Speed	
Crossing 5.9 GHz	≤ 30 ms (nominal)
Elsewhere	Same as MXG or EXG
External Frequency Reference Input	
Input Frequency	10 MHz
Lock Range	± 1 ppm, nominal
Amplitude	0 dBm, nominal

1. The band edge of a modulated signal can extend up to 7.26 GHz.

Amplitude Specifications

Table 3 Output Parameters

Settable Range with MXG/EXG Option 1EA	
Passthrough Band	+30 to -144 dBm
Upconverter Band	+28 to -144 dBm
Settable Range without MXG/EXG Option 1EA	
Passthrough Band	+19 to -144 dBm
Upconverter Band	+19 to -144 dBm
Step Attenuator in Upconverter Band	0 to 121 dB in 1 dB steps, mechanical
RF Input Connector	Type N, 50 Ω, nominal
RF Output Connector	Type N, 50 Ω, nominal

Table 4 Maximum Output Power[1]

Frequency	Standard	With MXG or EXG Option 1EA
200 kHz to 10 MHz	+12 dBm (typ)	+16 dBm (typ)
> 10 MHz to 3 GHz	+17 dBm (typ)	+23 dBm (typ)
> 3 GHz to 5 GHz	+14 dBm (typ)	+17 dBm (typ)
> 5 GHz to < 5.900001 GHz	+14 dBm (typ)	+15 dBm (typ)
5.900001 GHz to 7.2 GHz	+16 dBm (+18 dBm typ)	+25 dBm (+27 dBm typ)

1. Temperature <= 35 °C and Extender Input Power Offset set to 0 dB. Max power degrades .06 dB / °C for temperatures above 35 °C.

Figure 2 Measured Maximum Power with Option 1EA

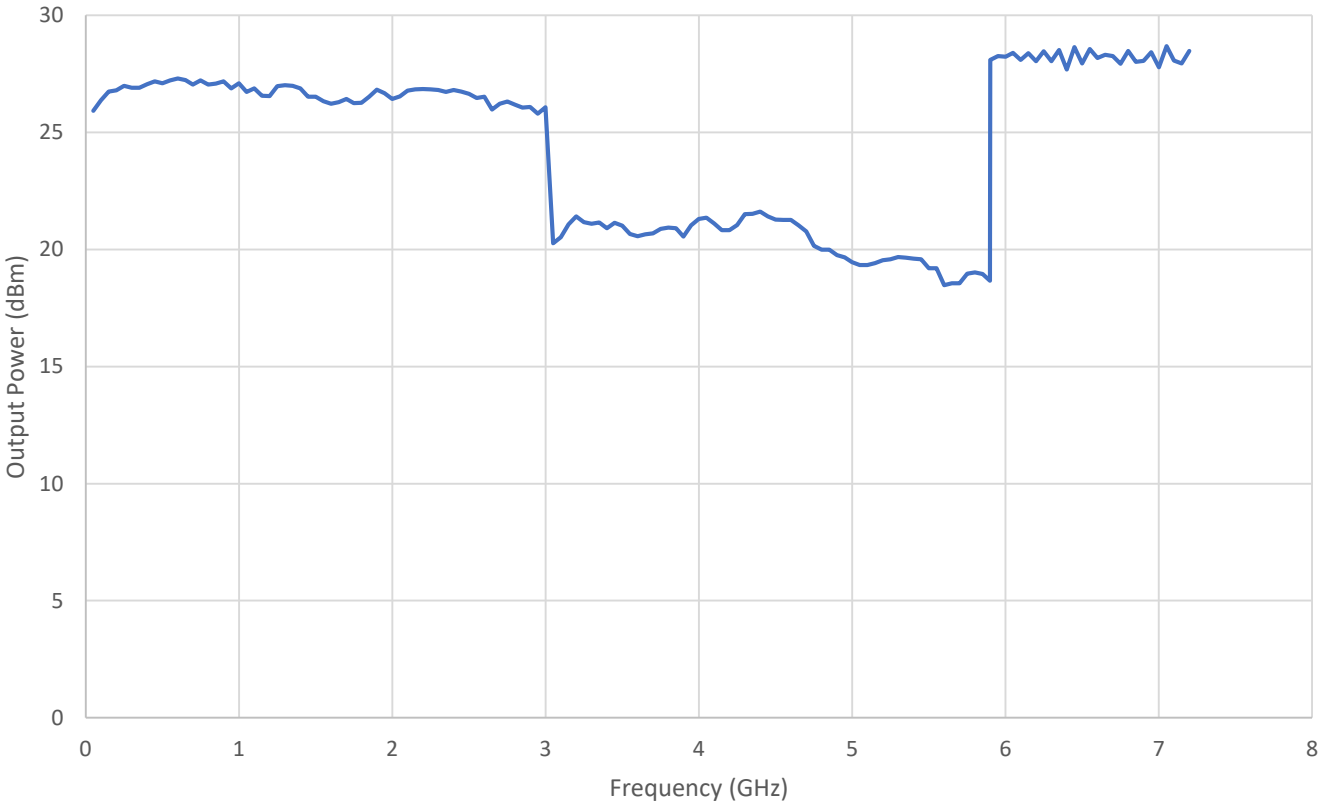


Table 5 Absolute Level Accuracy in CW Mode (ALC On)[1]

Frequency	+15 to -60 dBm	< -60 to -110 dBm
9 kHz to 100 kHz	± .6 dB (typ)	± 1 dB (typ)
100 kHz to 5 MHz	± .6 dB (typ)	± 1 dB (typ)
> 5 MHz to 3 GHz	± .6 dB (typ)	± 1 dB (typ)
> 3 GHz to < 5.9 GHz	± .6 dB (typ)	± 1 dB (typ)
5.9 GHz to 7.2 GHz	± .6 dB (typ)	± 1 dB (nom)

1. Power degrades .06 dB / °C from last calibration.

Figure 3 Measured Level Accuracy in Passthrough Band

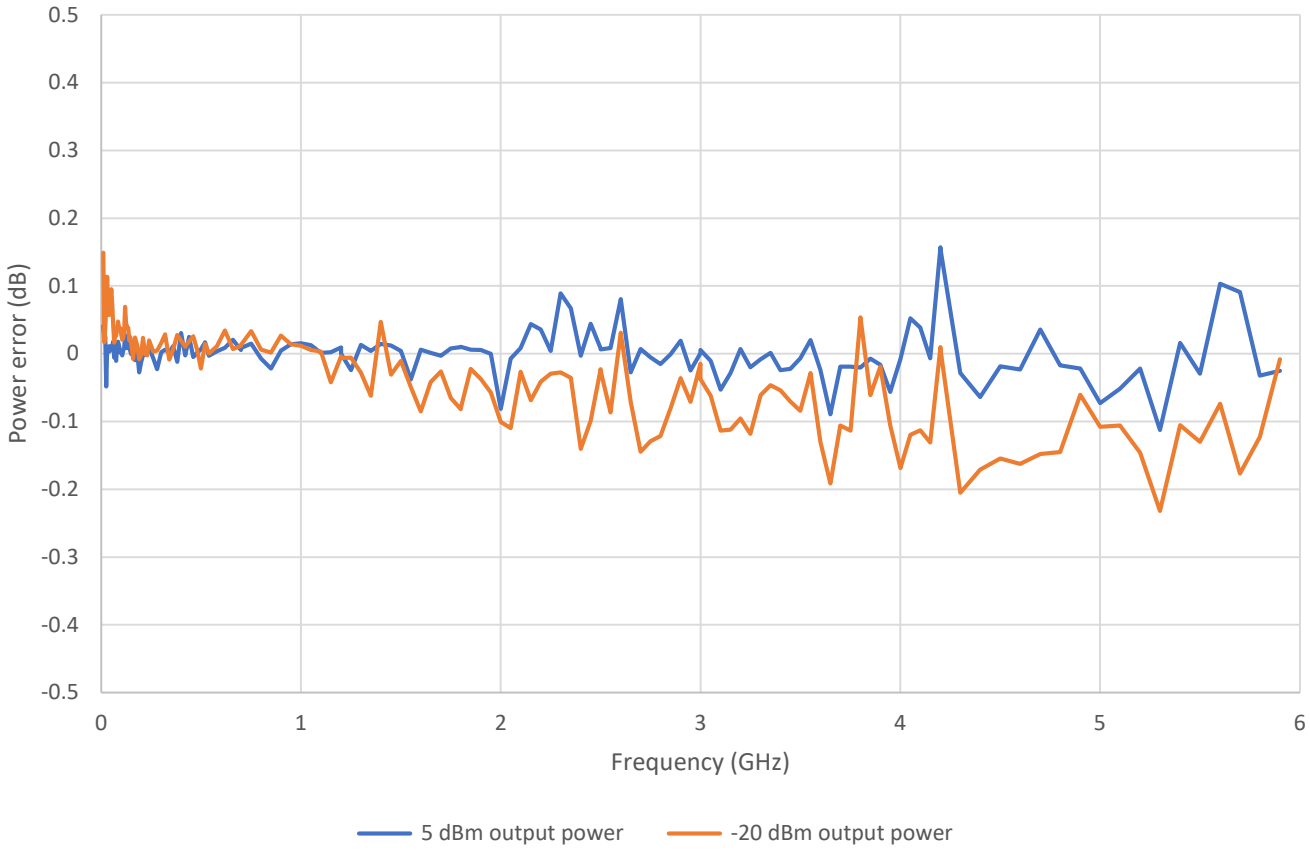


Figure 4 Measured Level Accuracy in Upconverter Band

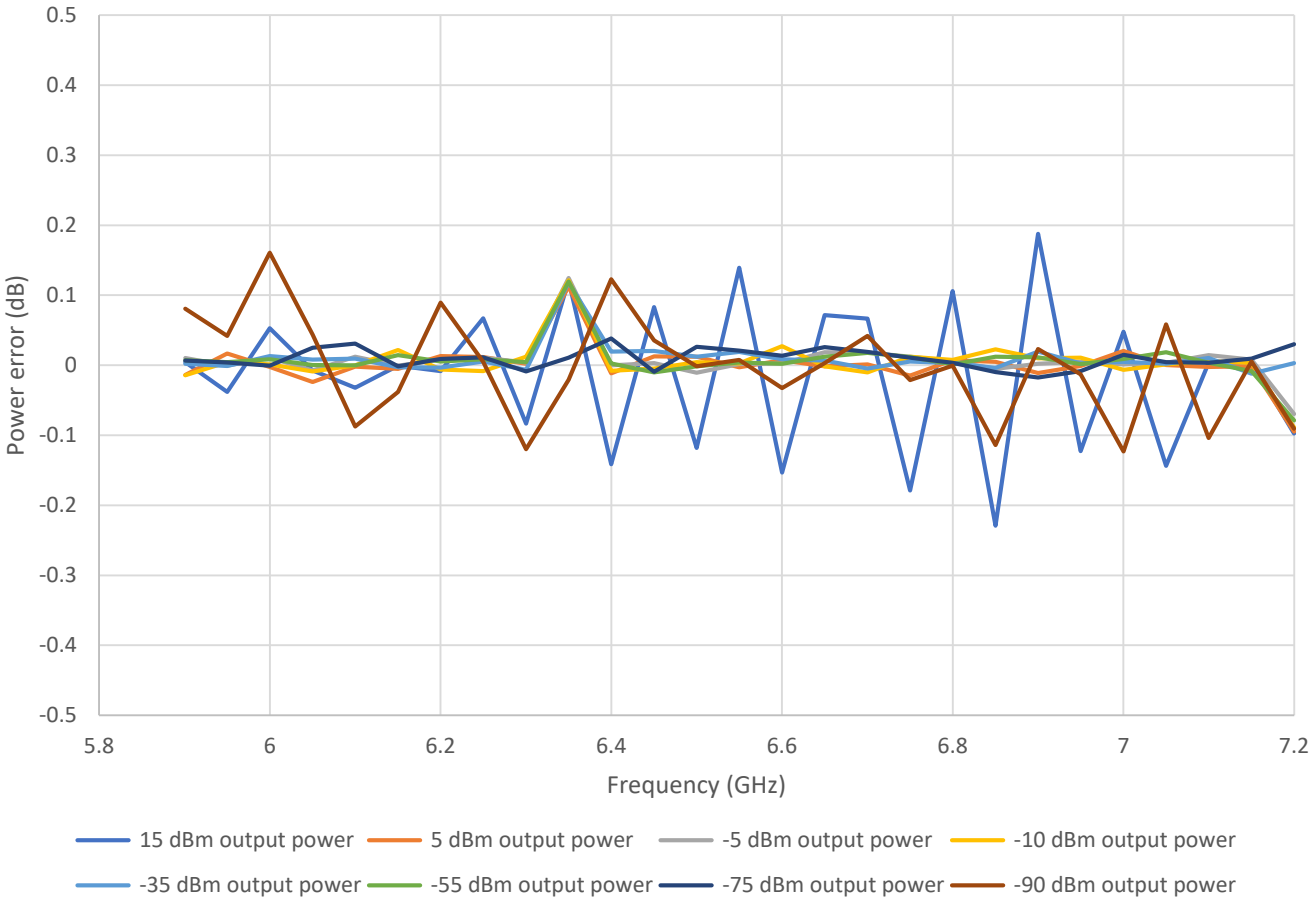


Table 6 Amplitude Switching Speed

Below 5.9 GHz	Same as MXG or EXG
5.9 GHz and above	≤ 30 ms (nominal)

Table 7 RF Input Limits

The N5182BX07 Frequency Extender is designed to be used and controlled by an MXG/EXG instrument with Option FRQ. The MXG/EXG instrument will keep the power levels below the maximum limits. Table 7 is intended for informational purposes only.

Maximum Input Power	
Passthrough Mode	28 dBm, nominal
Upconverter Mode	8 dBm, nominal
Maximum DC Voltage	0 VDC, nominal

Table 8 RF Output Limits

Maximum Reverse Power	0.5 W, nominal
Maximum DC Voltage	0 VDC, nominal

Spectral Purity Specifications

Table 9 Harmonics (CW Mode)

9 kHz to < 5.900001 GHz	Same as MXG or EXG, typical
5.900001 GHz to 7.2 GHz[1]	< -78 dBc (-84 dBc typical)

1. Measured at 10 dBm with Extender Input Power Offset set to 0 dB.

Table 10 Non-Harmonics (CW Mode) > 10 kHz Offset

5.120 GHz	< -90 dBm, typical
9 kHz to < 5.900001 GHz, excluding 5.120 GHz	1 dB higher than MXG or EXG, typical
5.900001 GHz to 7.2 GHz with power ≤ 10 dBm[2]	
At 20.48 GHz - 2 * RF Output Frequency	< -40 dBc (-46 dBc typical)
At 2 * RF Output Frequency - 5.12 GHz	< -41 dBc (-47 dBc typical)
Other Frequencies	< -58 dBc (-64 dBc typical)

2. Measured with Extender Input Power Offset set to 0 dB.

Modulation

Figure 5 EVM - 802.11ax, 80 MHz Bandwidth (Measured)

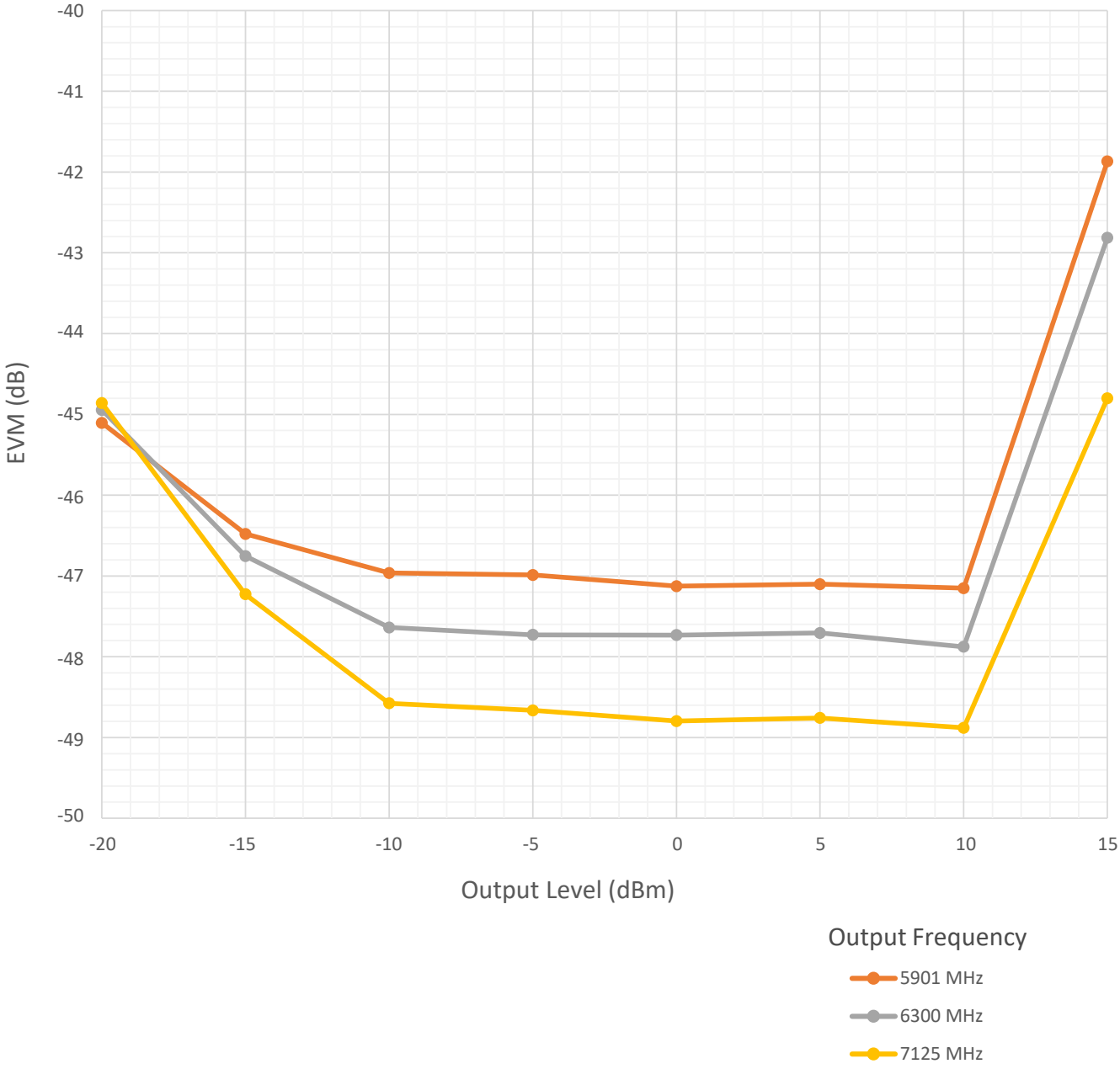
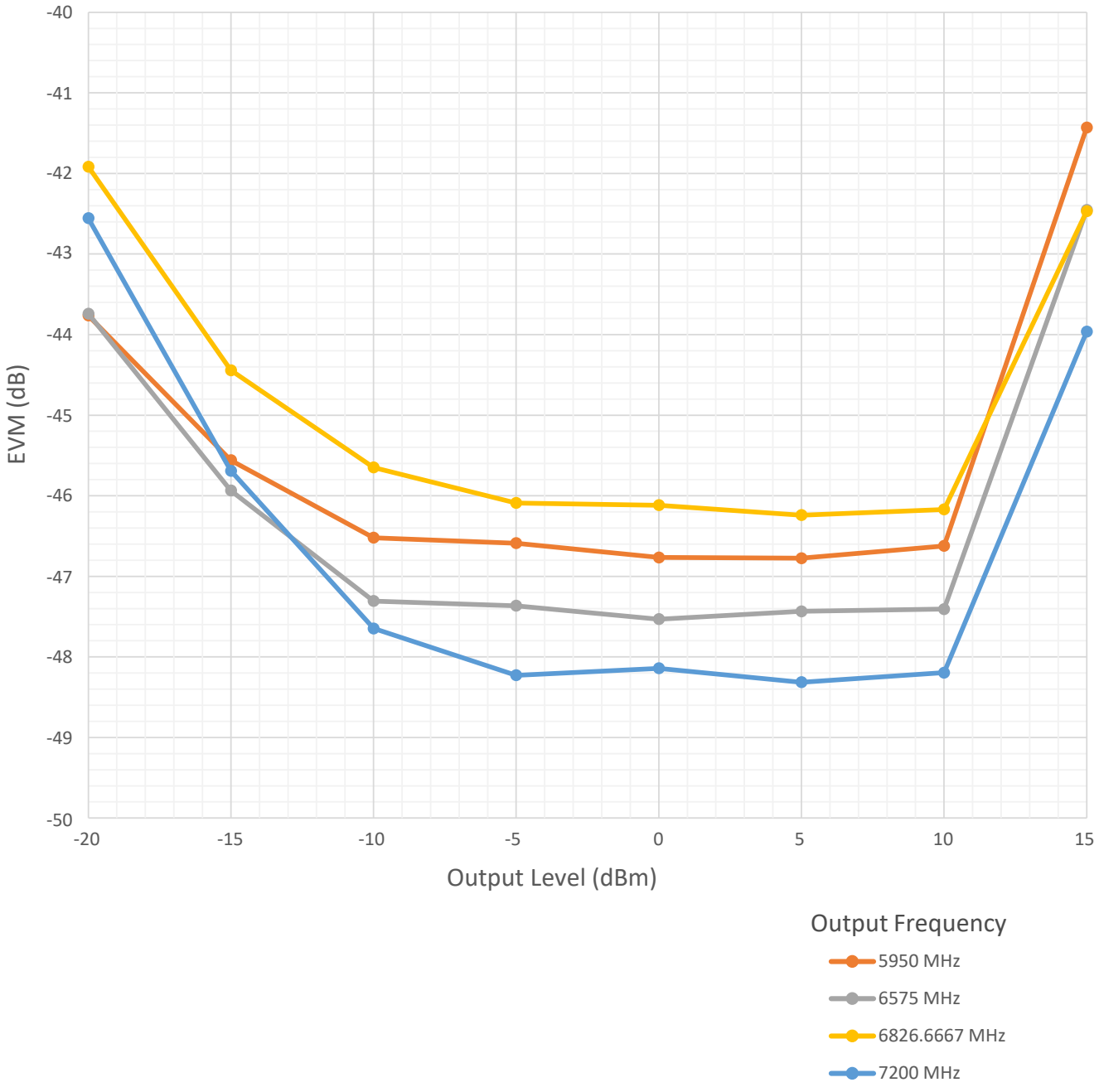


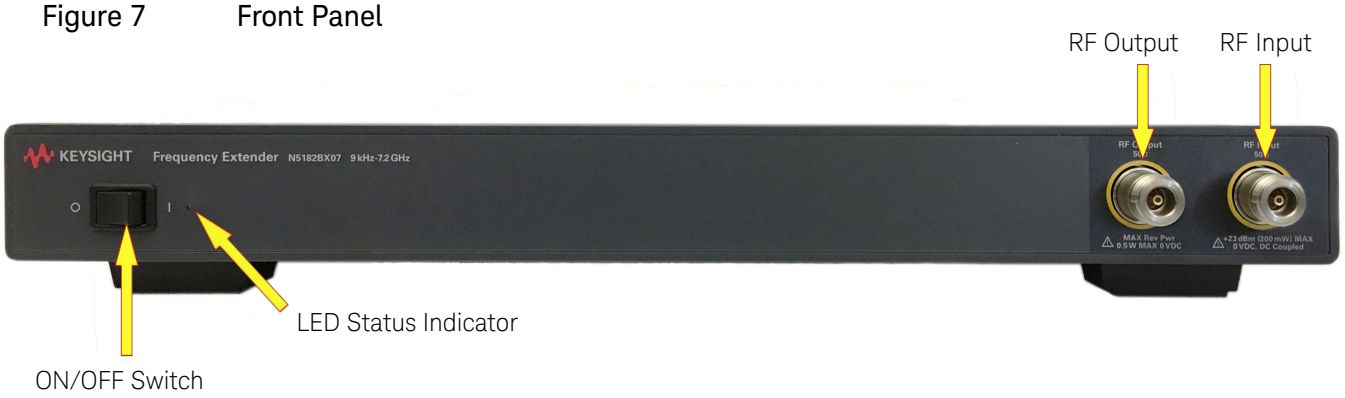
Figure 6 EVM - 802.11ax, 160 MHz Bandwidth (Measured)



Front and Rear Panel Features

CAUTION Refer to the preceding tables and the MXG/EXG documentation for damage limits to the ports. Verify that your test setup will not cause those limits to be exceeded.

Figure 7 Front Panel



ON/OFF Switch

Install the instrument so that the ON/OFF switch is readily identifiable and is easily reached by the operator. The ON/OFF switch is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. Or, the detachable power cord can be removed from the electrical supply. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

LED Status Indicator

The light will turn yellow when the instrument is turned on.

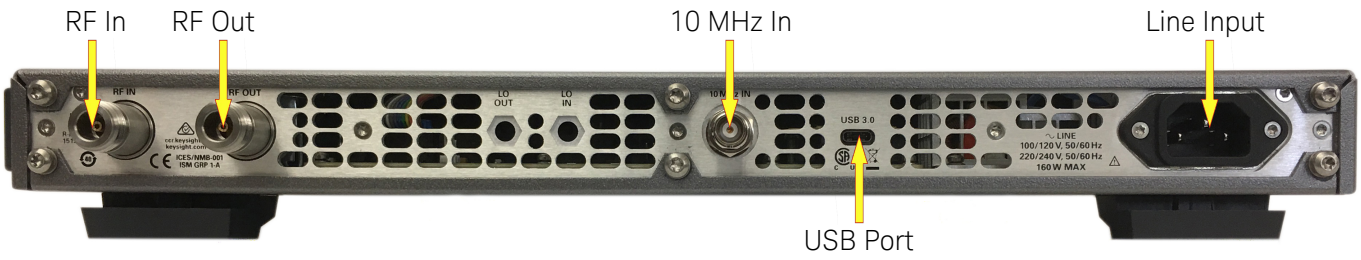
RF Input (without Option 1EM)

Type-N, 50 ohm, nominal.

RF Output (without Option 1EM)

Type-N, 50 ohm, nominal.

Figure 8 Rear Panel



RF In (Option 1EM)

Type-N, 50 ohm, nominal.

RF Out (Option 1EM)

Type-N, 50 ohm, nominal.

10 MHz In

10 MHz reference input, BNC.

USB Port

USB, Type C.

Line Input

Power cord connection.

CAUTION Use the Keysight supplied power cord or one with the same or better electrical rating.

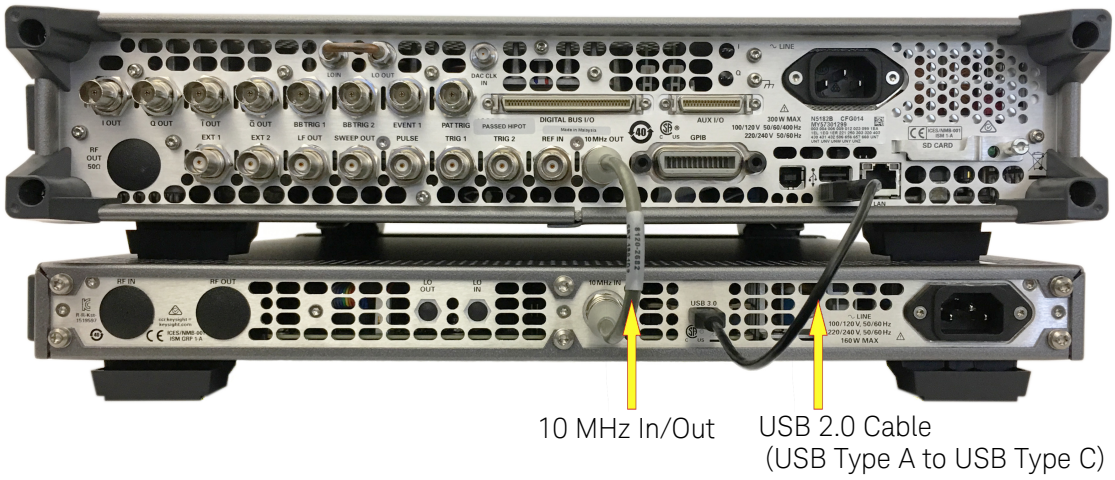
Front and Rear Panel Connections

In the example shown in Figure 9, the N5182BX07 is connected to the MXG from the RF output of the MXG (or EXG) to the RF input of the N5182BX07, using an RF cable with N-Type connectors.

Figure 9 Front Panel Connections

Figure 10 shows the rear panel connections of the N5182BX07 to the MXG. The 10 MHz BNC cable connects the MXG (or EXG) 10 MHz Output to the N5182BX07 10 MHz Input. Also shown is the USB cable connection from the MXG (or EXG) to the N5182BX07.

Figure 10 Rear Panel Connections

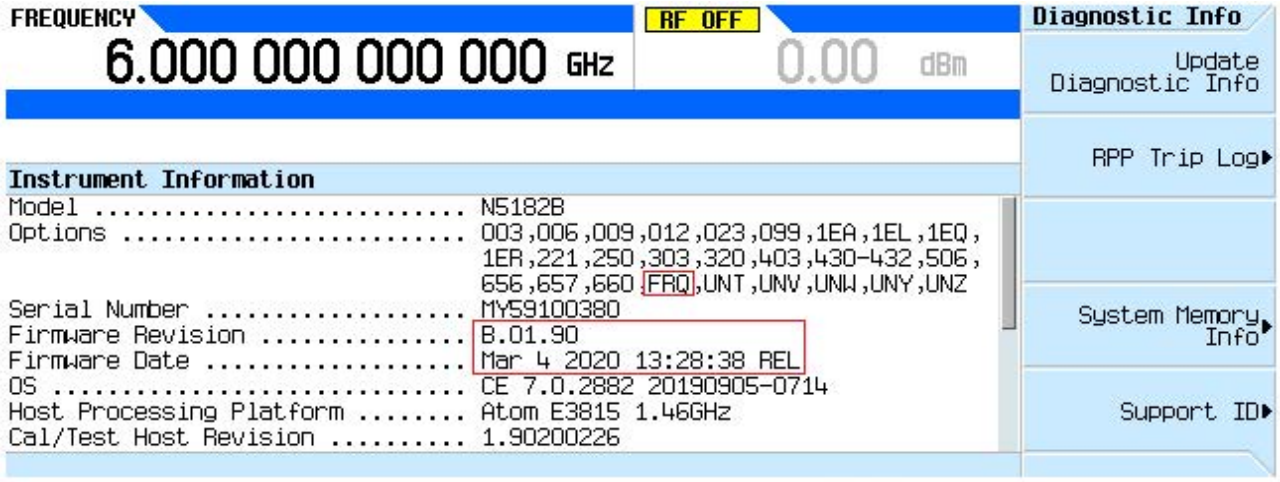


Firmware Initialization

To initialize the firmware in the N5182BX07, perform the following steps:

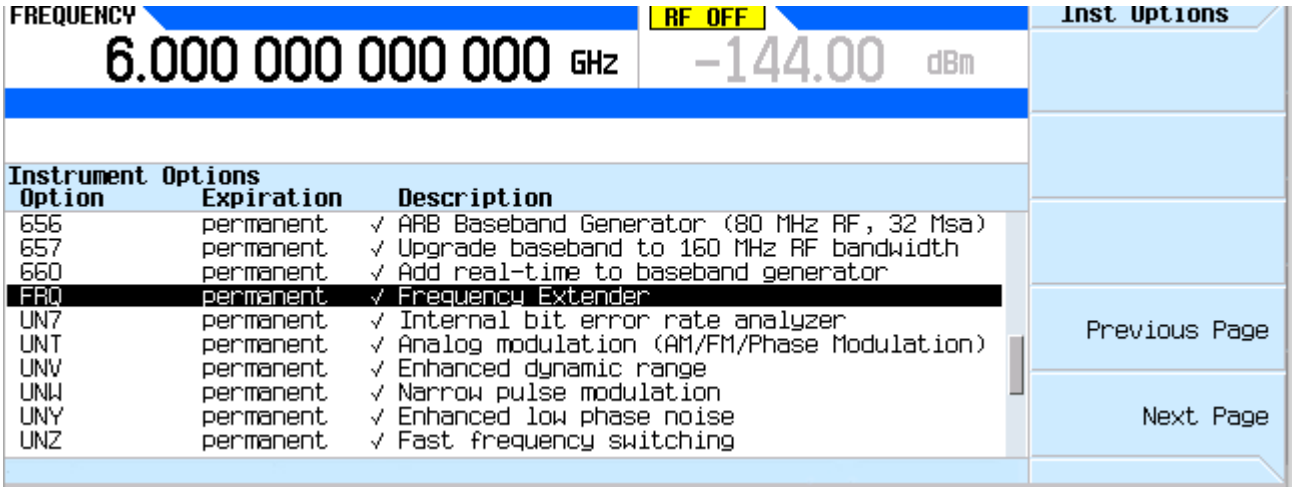
1. Check that there is no USB cable connected between the N5182BX07 and the MXG (or EXG). This cable will be connected in Step 6.
2. Turn on the MXG or EXG.
3. Press softkeys **Utility** > **Instrument Info** > **Diagnostic Info** and confirm the installed firmware is **B.01.90** or later. See Figure 11. If older firmware is installed, download and install firmware **B.01.90** (or later) from http://www.keysight.com/find/upgradeassistant.

Figure 11 Install Firmware



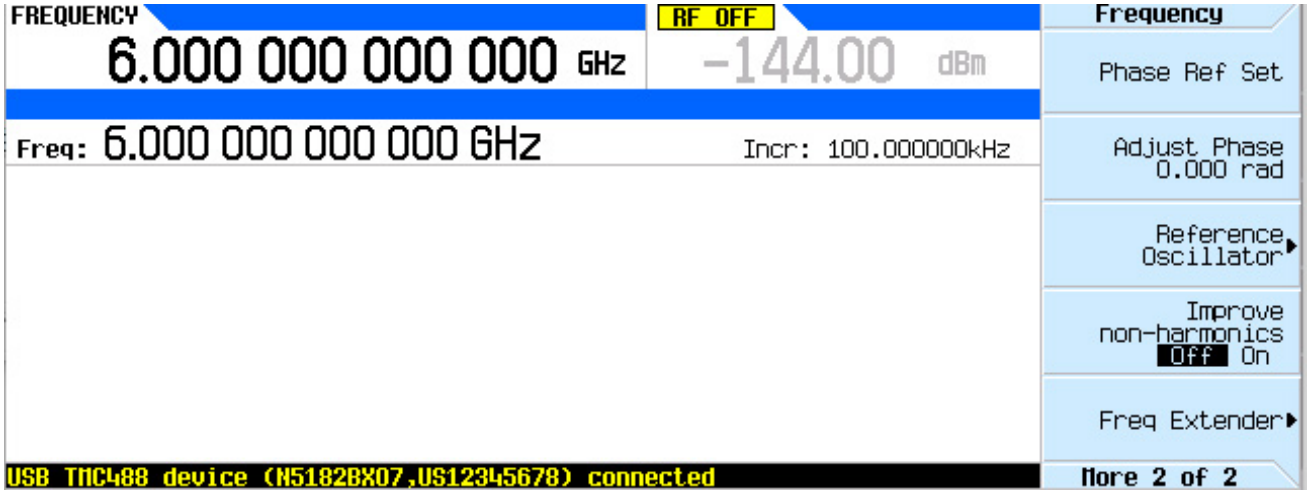
4. Press softkeys **Utility** > **Instrument Info** > **Options Info** > **Instrument Options** and verify a check mark appears next to **Frequency Extender (FRQ)**. See Figure 12. If this option is missing, purchase an upgrade license and install it.

Figure 12 Install Option FRQ



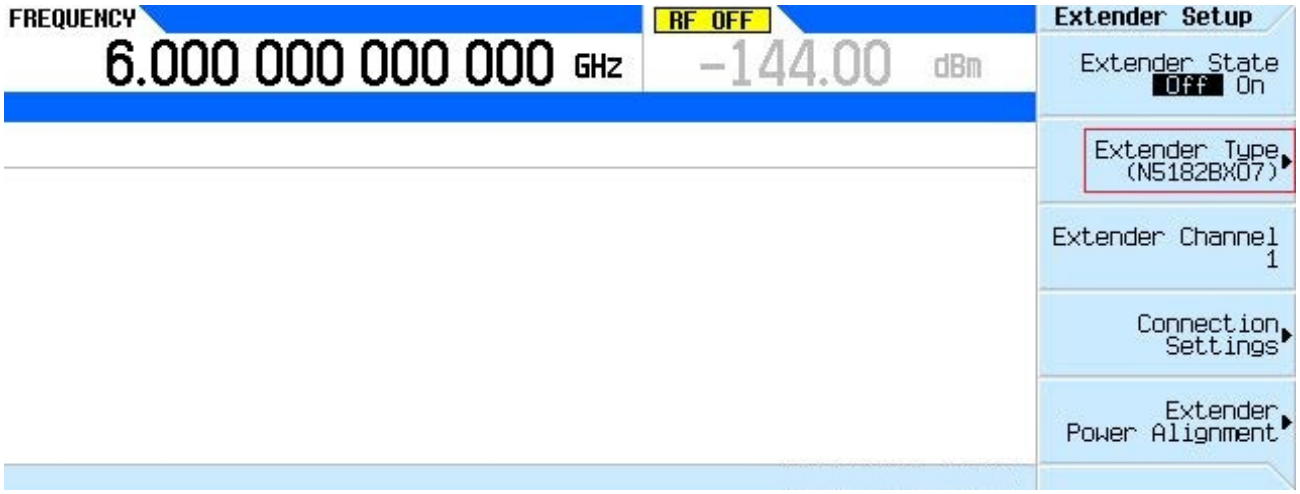
5. Turn on the N5182BX07.
6. Connect the USB cable between the N5182BX07 and the MXG (or EXG). After about 5 seconds, there should be a notification at the bottom of the screen of the MXG (or EXG) showing that it has successfully detected the N5182BX07. See Figure 13.

Figure 13 Detection of N5182BX07 by MXG (or EXG)



7. Configure the MXG (or EXG) for operation with the N5182BX07.
   a. Press **Frequency** > **More** > **Frequency Extender**.
   b. Set **Extender State** = **Off** before making changes.
   c. Select "N5182BX07" as the **Extender Type**. See Figure 14.

Figure 14 Configuring MXG (or EXG) to N5182BX07



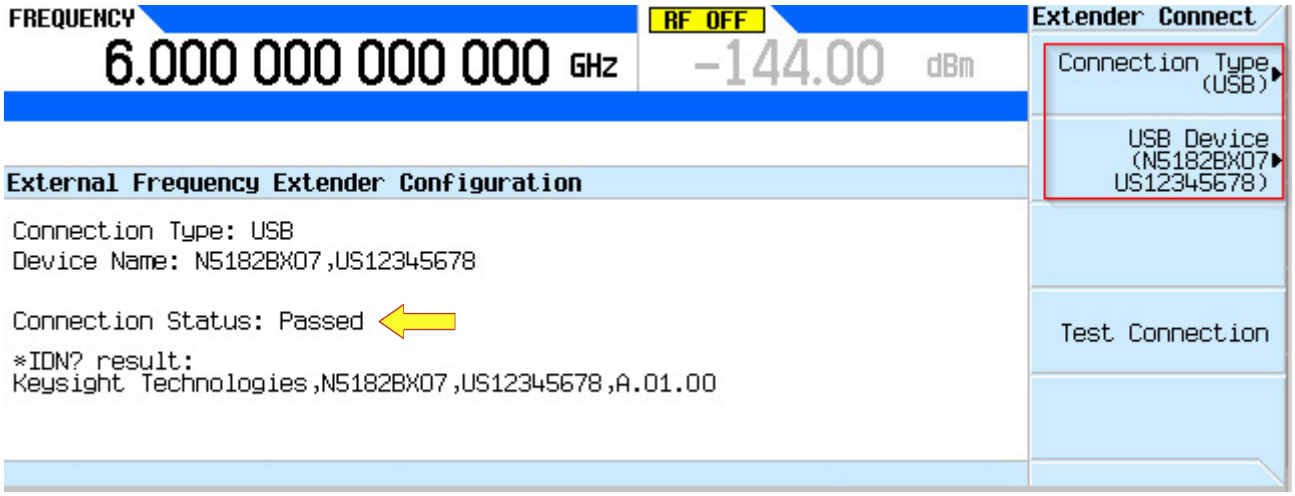
d. Under Connection Settings:

i. Select "USB" for the **Connection Type**

ii. Select "N5182BX07,USXXXXXXXX" (or MYXXXXXXXX) as the **USB Device** ("US12345678" shown as an example in Figure 15)

iii. Press **Test Connection** to verify the connection. Verify the text **Connection Status: Passed** appears. See Figure 15.

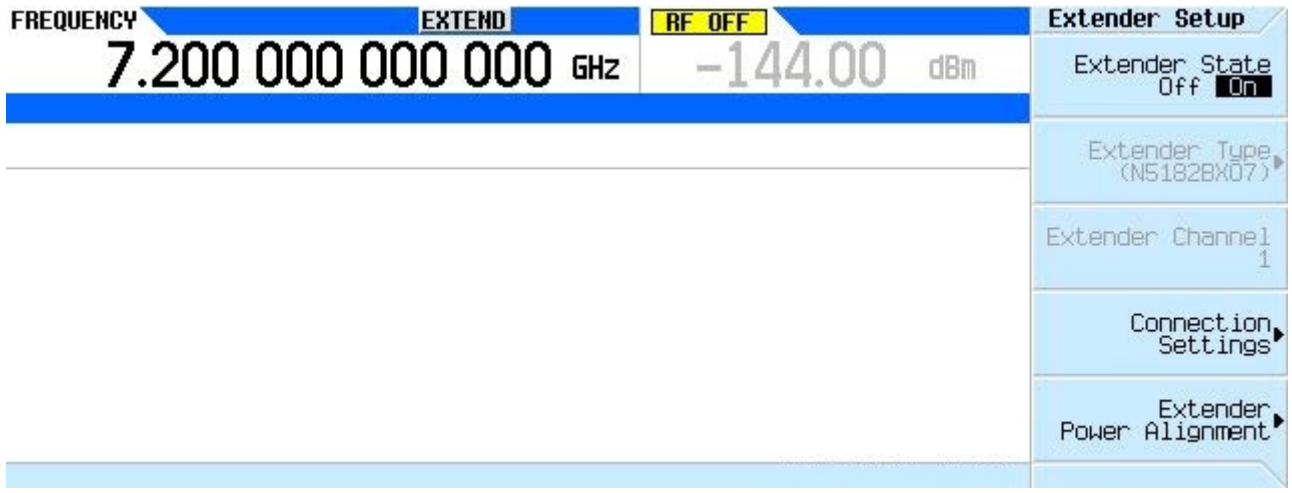
Figure 15 Test Connection of the N5182BX07



NOTE If you can't make a connection, check the serial number displayed on your MXG (or EXG) and the serial number of the N5182BX07 to confirm that they match. If they don't match, reselect the USB device.

8. Set **Extender State** = **On**. The **EXTEND** indicator should now be visible in the top blue bar. See Figure 16.

Figure 16 Turn On Frequency Extender Feature on MXG (or EXG)



9. You may see the following error message: "Error 518: calibration must be run. Frequency extender calibration data for I/Q internal channel correction was not found."
    a. When this error occurs, press **Utility** > **More** > **Service** > **IQ Int Channel Correction Calibration** > **Freq Extender Calibration**. This will take about one minute to run. No equipment is required. This error will occur only once.
10. Set the MXG (or EXG) to the desired frequency, in the range of 9 kHz to 7.2 GHz.
11. On the MXG (or EXG), press **IQ** > **IQ Calibration** > **Calibration Type** = **DC** > **Run Calibration**.
12. Load a waveform onto the MXG (or EXG) and play the waveform.
13. Confirm **Internal Channel Corrections** are turned on by pressing **IQ** > **More** > **Int Channel Correction ON**. Signal Studio waveforms should do this automatically, but your own waveform may not.

Extender Power Alignment

NOTE The power sensor used for the Extender Power Alignment must cover the range of 50 MHz to 7.2 GHz. Recommended power sensor models are **U8481A**, **U8485A**, and **E9304A**.

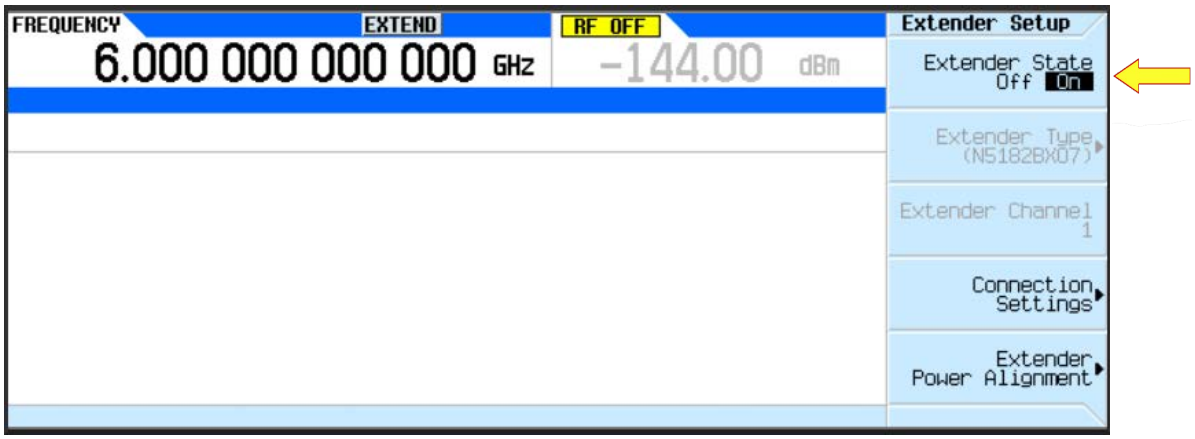
1. Ensure Frequency Extender is connected to the MXG.
2. Ensure Frequency Extender option is installed on MXG.
3. On MXG front panel, select "Freq" then the "More" hard key. See Figure 17.

Figure 17 MXG Front Panel

4. Select the "Freq Extender" softkey and ensure the "Extender State" is set to "On." See Figures 18 and 19.

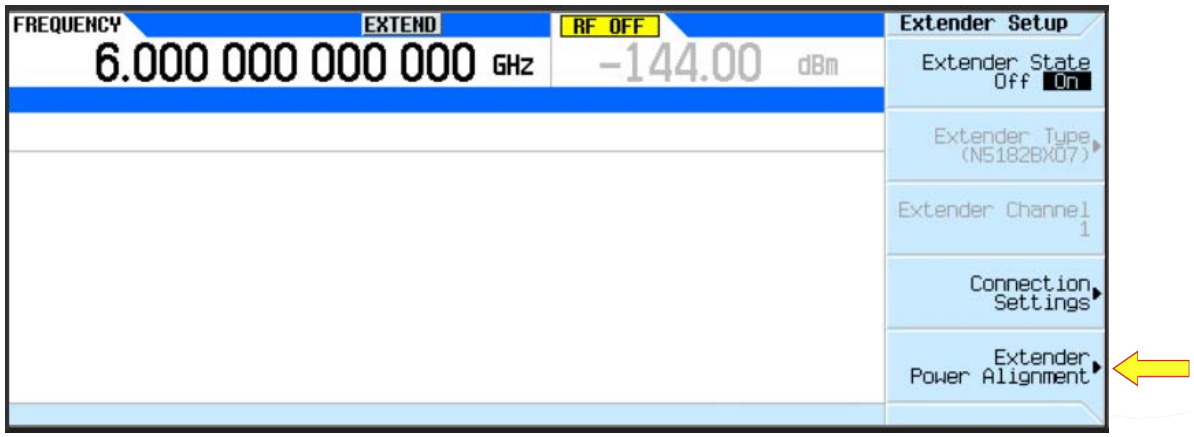
Figure 18 Select Frequency Extender

Figure 19 Extender State ON



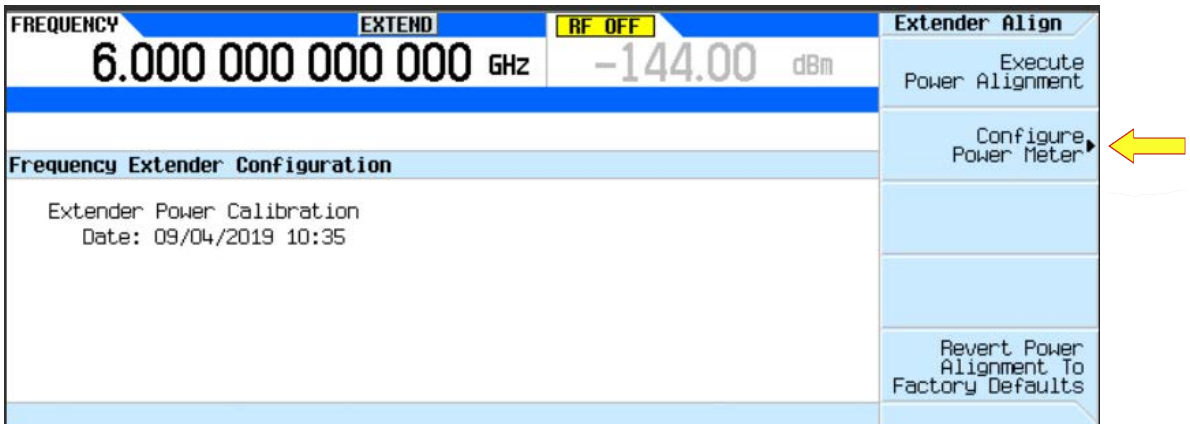
5. Select the "Extender Power Alignment" softkey. See Figure 20.

Figure 20 Extender Power Alignment



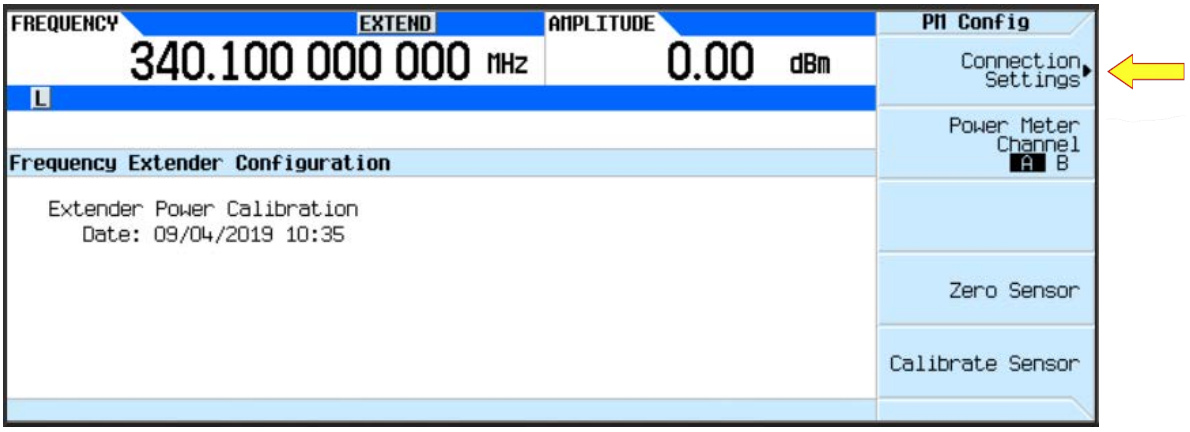
6. Select the "Configure Power Meter" softkey. See Figure 21.

Figure 21 Configure Power Meter



7. In "Connection Settings," set the connection settings based on the power meter/sensor used. See Figure 22.

Figure 22 Connection Settings



- When using a **Power Meter with GPIB or LAN**, follow the steps in **Section a.**
- When using a **USB Power Sensor**, follow the steps in **Section b**.

a. **Power Meter Setup** (a GPIB to LAN gateway must be used).

   i. Set connection Type to **VXI-11**. See Figures 23 and 24.

Figure 23 Connection Type

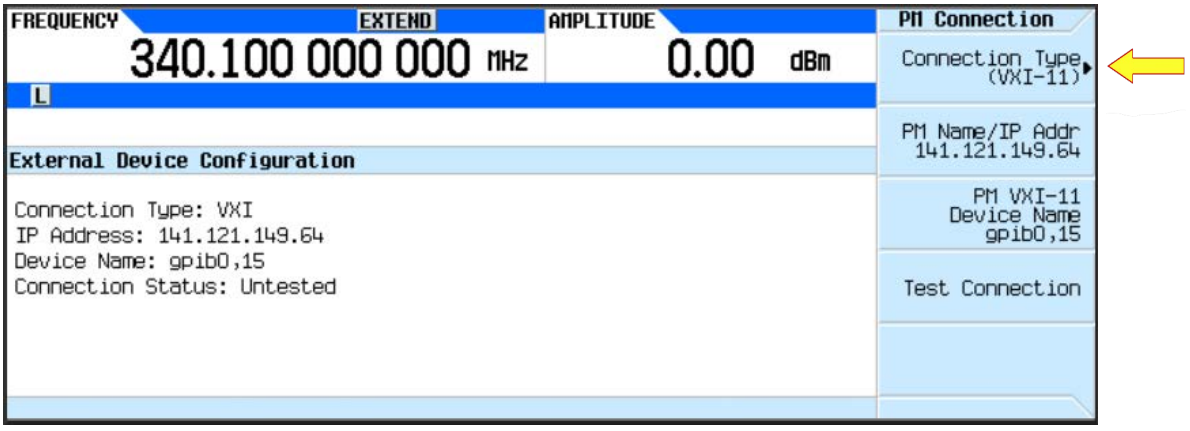
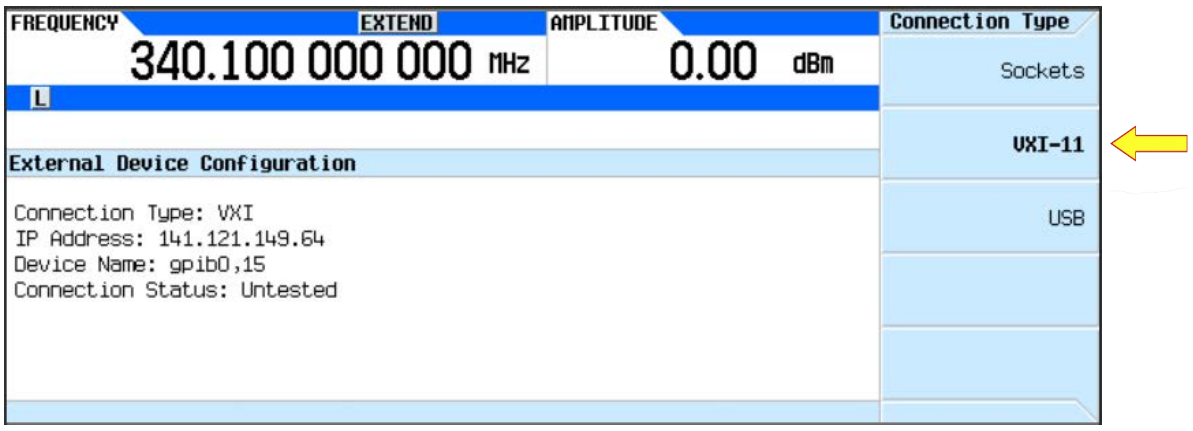
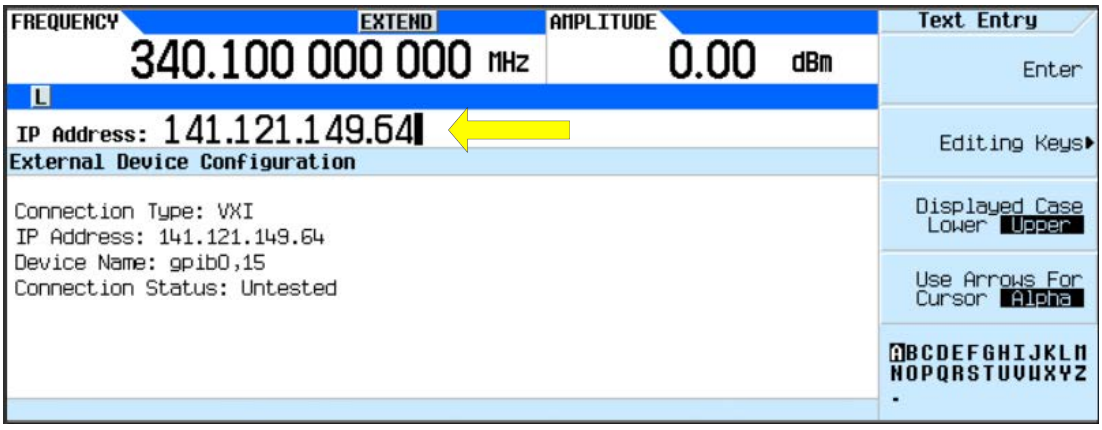


Figure 24 Set to VXI-11



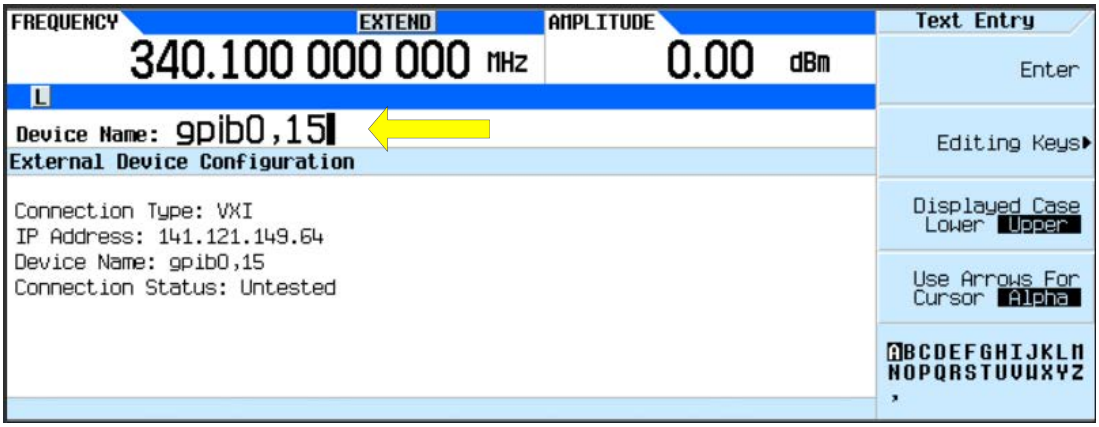
ii. Enter the IP address supplied by the LAN gateway. See Figure 25.

Figure 25 Enter IP Address



iii. Enter the Device Name. (Typically, "gpib0,15" is the default.) See Figure 26.

Figure 26 Enter the Device Name



iv. Test the connection and verify it passes. If it fails, re-check the previous steps.

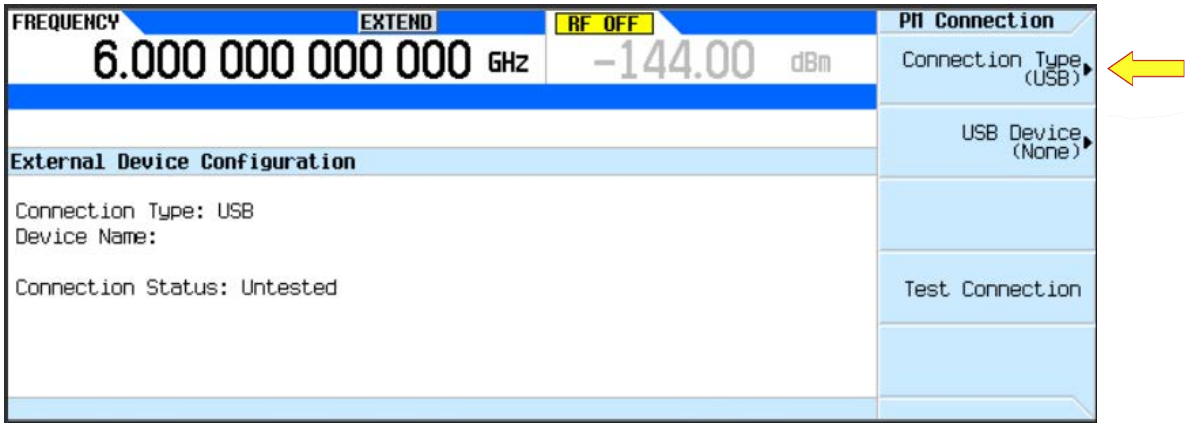
b. USB Sensor Setup

i. Plug the USB sensor into the MXG USB port (typically, the top port). See Figure 27.

Figure 27 USB Port on MXG

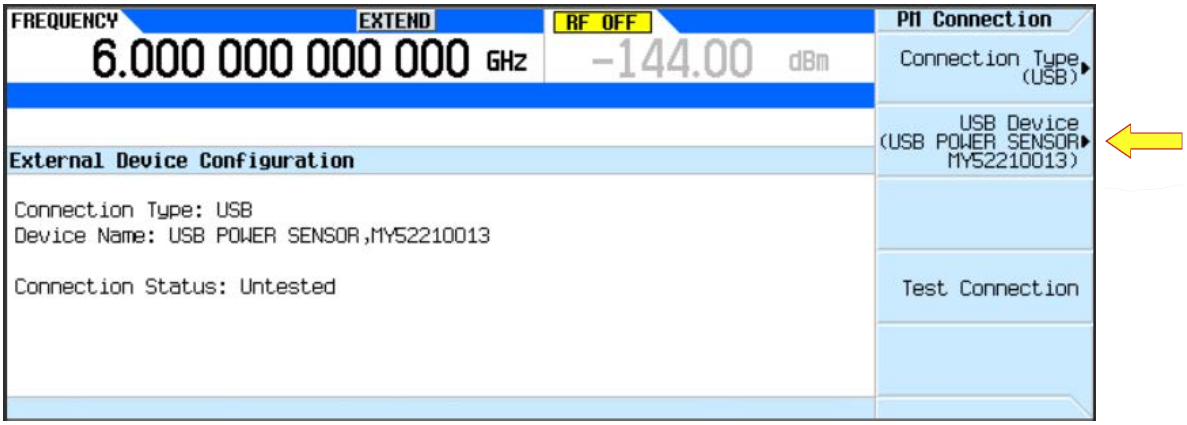
ii. Set connection type to "USB." See Figure 28.

Figure 28 Set Connection Type to USB



iii. Set the USB device to the sensor being used (will be displayed in the softkey). See Figure 29.

Figure 29 Set USB Device to Power Sensor Used



iv. Test the connection and verify it passes. If it fails, re-check the previous steps.

8. Once the power meter/sensor is connected and passes the connection test, select the "Return" hard key.

9. Select the "Execute Power Alignment" softkey to run the calibration. Figures 30, 31, and 32.

10. Verify the calibration runs and completes successfully.

Figure 30 Execute Power Alignment

Figure 31 Performing Power Alignment

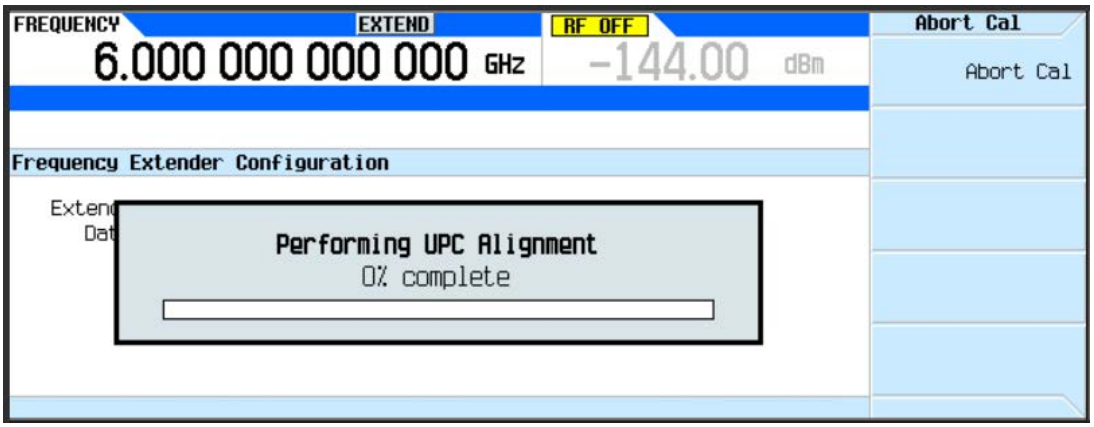
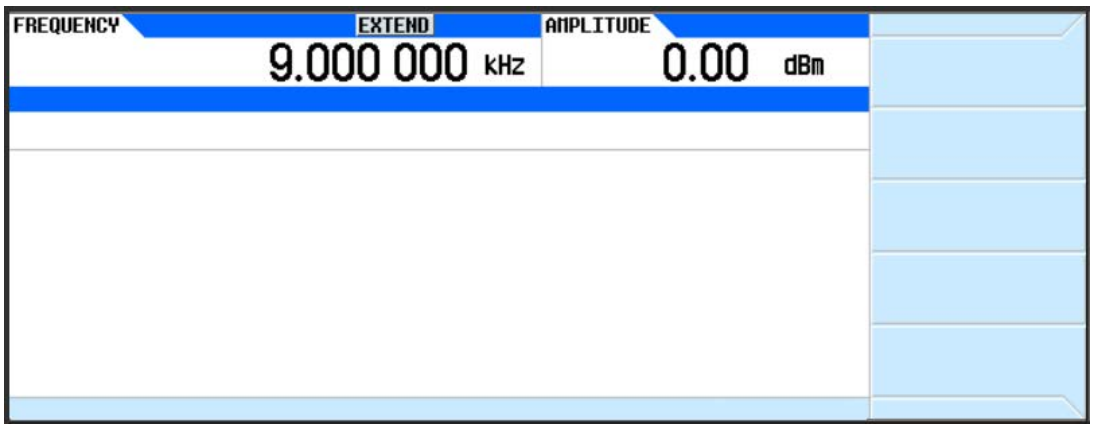


Figure 32 Power Alignment Completed



SCPI Commands

NOTE To maximize the life of the N5182BX07 attenuator, see the automated test recommendations on page 10.

Table 11 SCPI Commands to Turn On the Frequency Extender

Turn off the frequency extender in order to change its settings
FREQ : EXT : STAT **OFF**
Select the type of frequency extender and set connection type to USB
FREQ : EXT : TYPE **N5182BX07** FREQ : EXT : COMM : TYPE **USB**
Query for list of connected USB devices and select device[1]
FREQ : EXT: COMM : USB : LIST? "N5182BX07,US12345678"  Response example FREQ : EXT : COMM : USB : DEV "**N5182BX07,US12345678**"
Turn on the frequency extender
FREQ : EXT : STAT **ON**

1. Serial number US12345678 is used as an example.

Table 12 SCPI Control Commands for the Frequency Extender Power Alignment

Executes the frequency extender power alignment[1]
FREQ : EXT : CAL : POW : ALL
Reverts the frequency extender power alignment to factory default settings
FREQ : EXT : CAL : POW : ALL : DEF

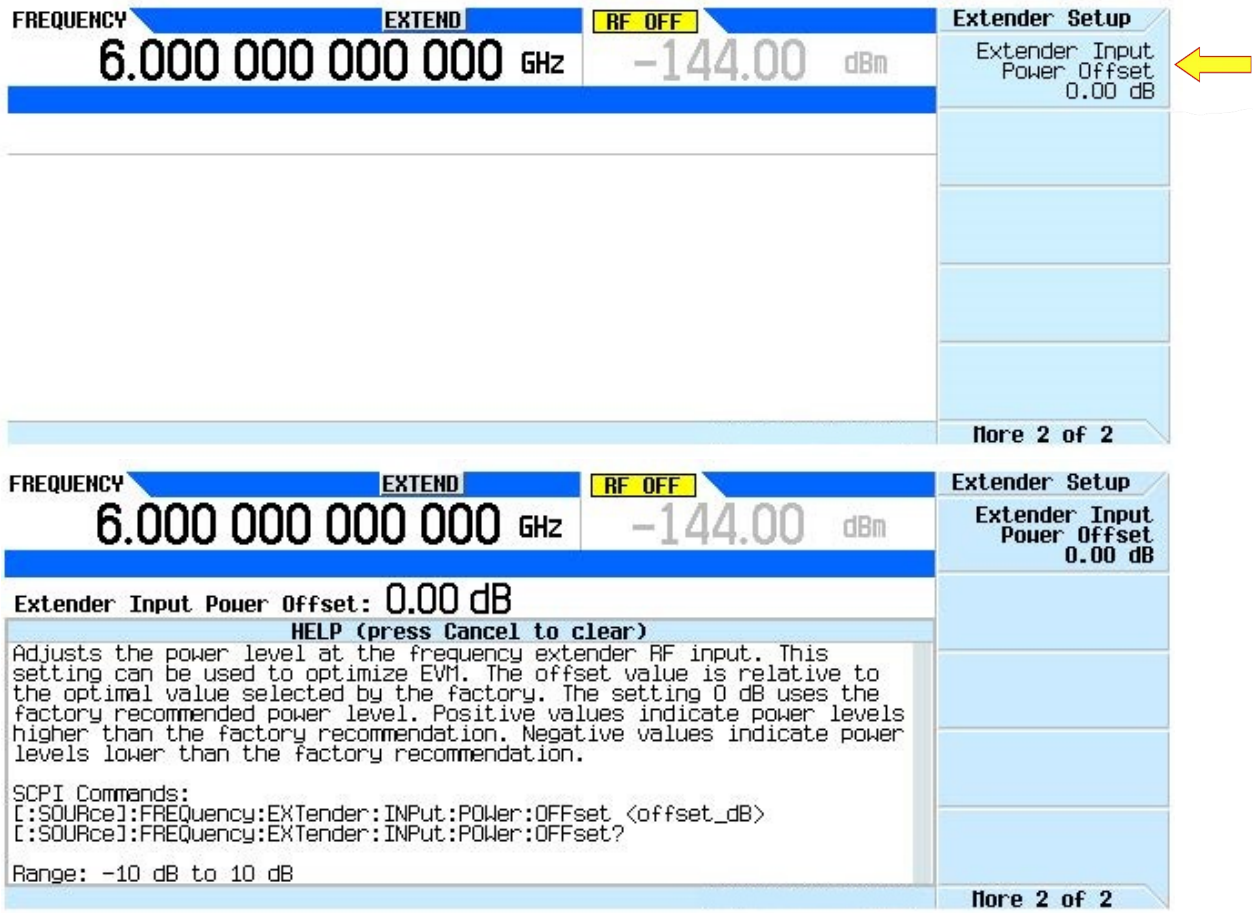
1. Requires a power meter.

NOTE The power sensor/power meter used by the power alignment is shared with the user flatness calibration. The SCPI commands to configure this shared power sensor/power meter are described on pages 53-55 of the MXG/EXG SCPI Command Reference document.

EVM Optimization

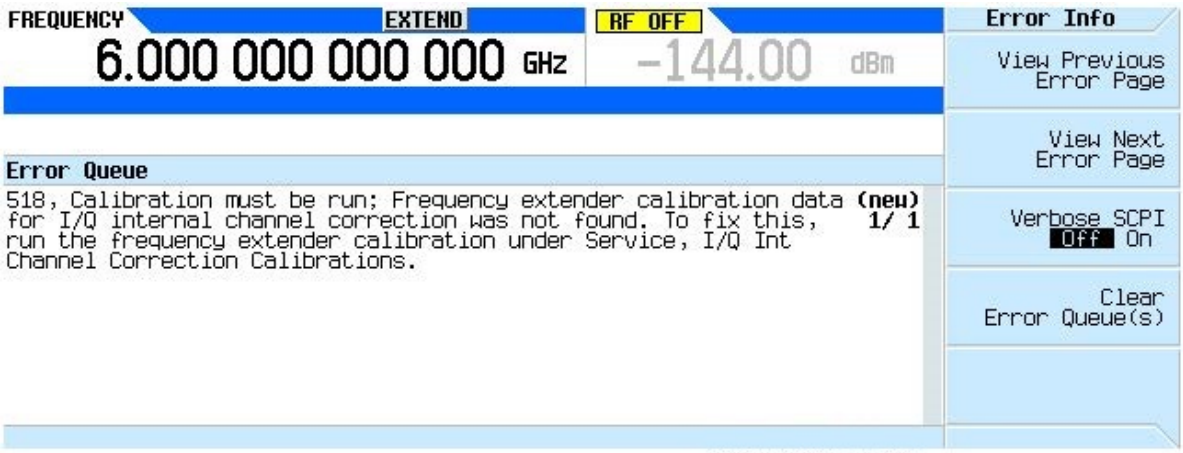
To optimize EVM, the N5182BX07 input power level can be adjusted using the "Extender Input Power Offset" softkey found on the second page of the Frequency Extender menu (**Frequency** > **More** > **Frequency Extender** > **More**). See the Help text below for a description of the offset value.

Figure 33 Extender Input Power Offset



When upgrading from B.01.90 to any later firmware, you may see the following error message (Figure 34) when turning on the Frequency Extender feature. This is reported if the N5182BX07 does not have calibration data for use with the I/Q Internal Channel Correction feature.

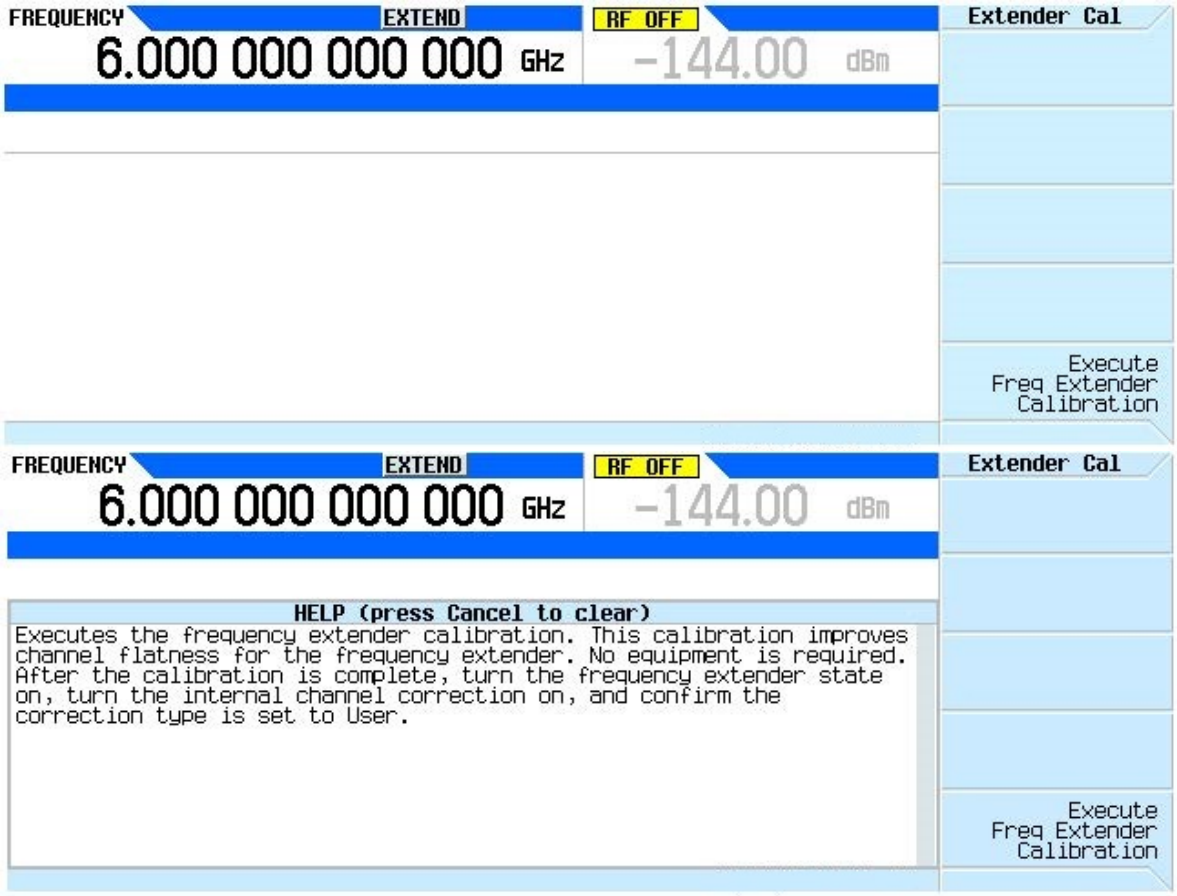
Figure 34 Frequency Extender Calibration Data Error Message



To fix this, you can run the "Freq Extender Calibration" found under **Utility > More 1 of 2 > Service > I/Q Int Channel Correction Calibrations > Freq Extender Calibration** (Figure 35). There is no associated SCPI command for this calibration. The calibration takes about one minute and requires no external equipment. The error only appears once.

Figure 35 Frequency Extender Calibration

Figure 35 Frequency Extender Calibration (Continued)



After running the calibration, you can turn on the I/Q Channel Correction feature under **I/Q** > **More 1 of 3** > **Int Channel Correction** (Figure 36). The correction type will automatically be changed to User to enable corrections for the frequency extender.

NOTE Remember to turn on the I/Q Channel Correction whenever you need flat amplitude across the modulation channel. Most Signal Studio applications will turn this on automatically, but if you are not using Signal Studio, you must turn this on manually.

Figure 36 I/Q Internal Channel Corrections

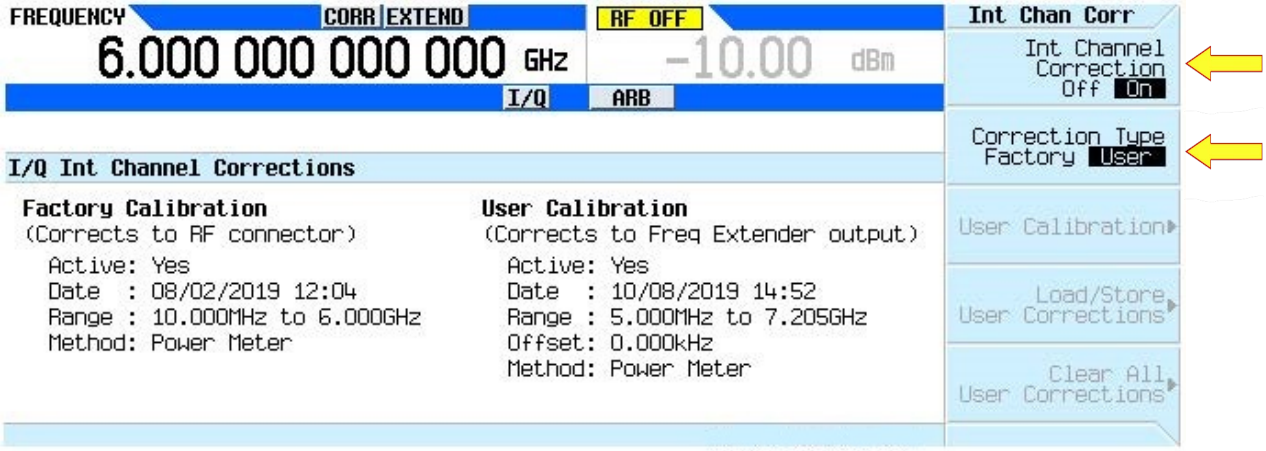
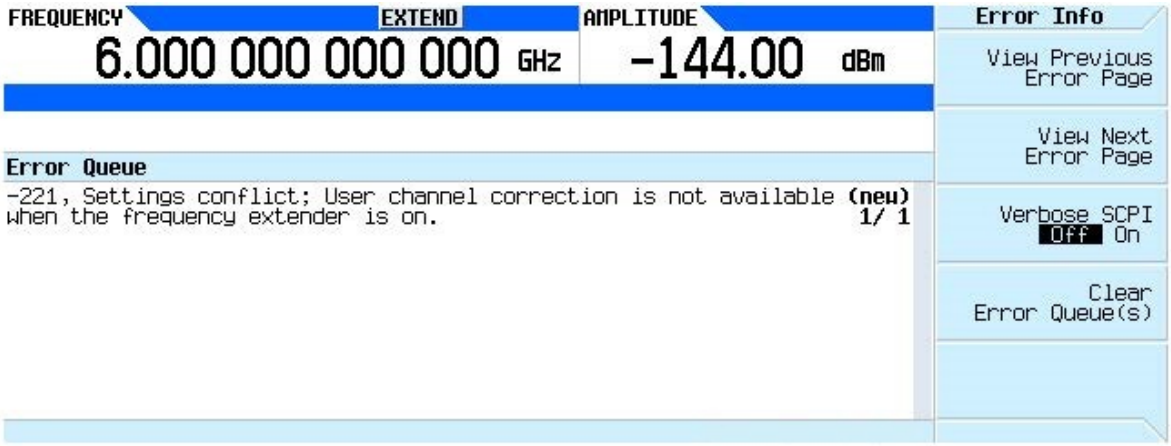


Table 13 User Channel Correction SCPI Commands

SCPI Commands
: MEMory : LOAD : CHANnel <"filename"> : MMEMory : LOAD : CHANnel <"filename"> : MEMory : STORe : CHANnel <"filename"> : MMEMory : STORe : CHANnel <"filename"> [: SOURce] : DM : INTernal : CHANnel : CORRection : USER : CLEar : CALibration : BBG : CHANnel : USER

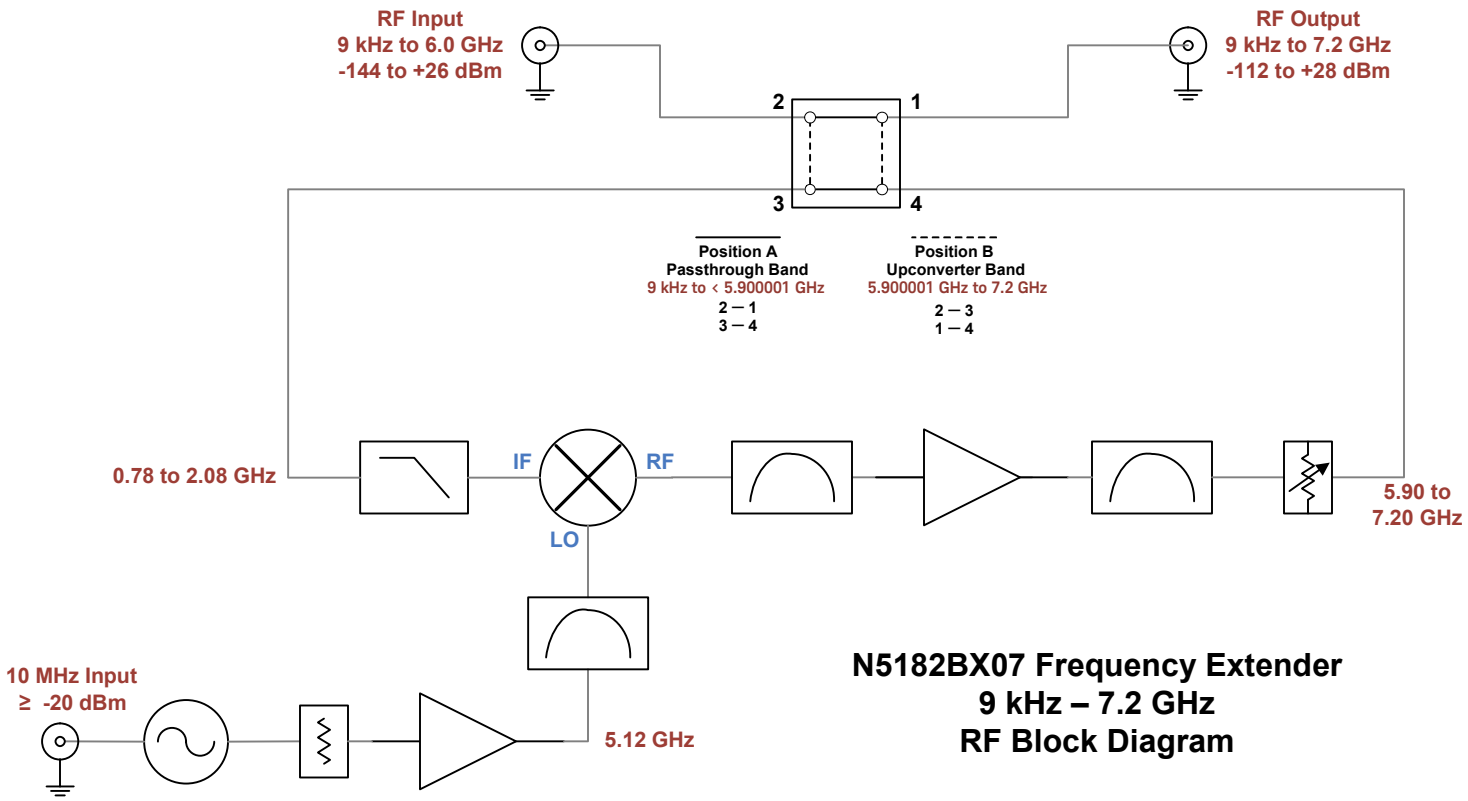
NOTE Attempting to use the User Channel Correction SCPI commands when the frequency extender is on will result in the error message shown in Figure 37.

Figure 37 User Channel Correction Error Message



RF Block Diagram

Figure 38 RF Block Diagram of N5182BX07 Frequency Extender



Safety and Regulatory Information

Introduction

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Safe Installation

Safety of any system incorporating the equipment is the responsibility of the assembler of the system.

Safety Earth Ground

WARNING This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the product is likely to make the product dangerous. Intentional interruption is prohibited.

CAUTION Always use the three prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage and the risk of electrical shock.

Declaration of Conformity

A copy of the Declaration of Conformity is available upon request, or a copy is available on the Keysight Technologies web site at:
https://regulations.about.keysight.com/DoC/search.htm

Safety (European Low Voltage Directive)

This instrument complies with the essential requirements of the European Low Voltage Directive as well as current editions of the following standards:

- IEC/EN 61010-1
- Canada: CSA C22.2 No. 61010-1
- USA: UL std no. 61010-1

EMC Information

Complies with European EMC Directive 2014/30/EU

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, Class A
- AS/NZS CISPR 11
- ICES/NMB-001
  This ISM device complies with Canadian ICES-001.
  Cet appareil ISM est conforme a la norme NMB-001 du Canada.

Acoustic Statement (European Machinery Directive)

- Acoustic noise emission
  LpA<70 dB
  Operator position
  Normal operation mode per ISO 7779

Before Applying Power

Verify that the premises electrical supply is within the range of the instrument. The instrument has an autoranging power supply.

WARNING If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

CAUTION The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure, to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

CAUTION Always use the three prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage and the risk of electrical shock.

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2.

CAUTION Before switching on this instrument, make sure the supply voltage is in the specified range.

CAUTION Verify that the premise electrical voltage supply is within the range specified on the instrument.

CAUTION When installing the instrument(s) into a cabinet, consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument now becoming the cooling intake air for another instrument. Another area of concern is verification that the maximum ambient operating temperature of the instrument(s) is not exceeded by cabinet installation. Keysight recommends forced air convection whenever an instrument(s) are installed in a cabinet and further recommends that the maximum operating temperature of the cabinet be reduced 10°C from the lowest of the maximum operating temperature of a single instrument.

If there are any concerns or special requirements, a Keysight Field Engineer should be consulted to assure instrument(s) temperature compliance and performance."

WARNING These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

WARNING The opening of covers or removal of parts is likely to expose the user to dangerous voltages. Disconnect the instrument from all voltage sources before opening.

WARNING No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

WARNING Install the instrument so that the ON/OFF switch is readily identifiable and is easily reached by the operator. The ON/OFF switch is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. Or, the detachable power cord can be removed from the electrical supply. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

Connector Care and Cleaning Precautions

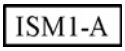
Remove the power cord to the instrument. To clean the connectors use alcohol in a well ventilated area. Allow all residual alcohol moisture to evaporate, and fumes to dissipate prior to energizing the instrument.

WARNING To prevent electrical shock, disconnect the Keysight N5182BX07 from mains electrical supply before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

WARNING If flammable cleaning materials are used, the material shall not be stored, or left open in the area of the equipment. Adequate ventilation shall be assured to prevent the combustion of fumes, or vapors.

Instrument Markings

This section contains markings which may be included on the instrument.

	The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.
	The AC symbol indicates the required nature of the line module input power.
	This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is in the STANDBY position.
	This symbol indicates that the power line switch is in the OFF position.
	This symbol is used to identify a terminal which is internally connected to the product frame or chassis.
	The CE mark is a registered trademark of the European Community.
ccr.keysight@keysight.com	The Keysight email address is required by EU directives applicable to our product.
	The CSA mark is a registered trademark of the CSA International.
	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 5).
	This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). Cet appareil ISM est conforme à la norme NMB du Canada.
	Direct Current.
IP 2 0	The instrument has been designed to meet the requirements of IP 2 0 for egress and operational environment.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
	Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.
	This symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.
	South Korean Certification (KC) mark; includes the marking's identifier code which follows the format: MSIP-REM-YYY-ZZZZZZZZZZZZZZ.

Keysight Support, Services, and Assistance

Service and Support Options

There are many other repair and calibration options available from the Keysight Technologies support organization. These options cover a range of service agreements with varying response times. Contact Keysight for additional information on available service agreements for this product.

Contacting Keysight

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

http://www.keysight.com/find/assist
(Worldwide contact information for repair and service)

http://www.keysight.com/find
(Product specific information and support, software, and documentation updates)

If you do not have access to the Internet, contact your field engineer.

NOTE **In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine the warranty status of your unit.**

Shipping Your Product to Keysight for Service or Repair

If you wish to send your instrument to Keysight Technologies for service or repair, please use the original or comparable packaging.

- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- The instrument should be sent to Keysight in the same configuration that it was originally shipped.
- Contact Keysight for instructions on where to ship your instrument.

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KEYSIGHT TECHNOLOGIES

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