Noise Test Extension (NTX) Modules for R&S FSWP Operational Manual

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General Guidelines

- Read all instructions and information in this manual before connecting an Extension Module to its power supply or to the compatible Phase Noise Analyzer. Operational procedures must be followed for proper function. If you have questions, contact VDI before supplying power to or otherwise operate any VDI Extension Module.
- VDI assumes the customer is familiar with microwave, millimeter wave and VDI products in general. The user is expected to understand all safety guidelines, health hazards and general advisories that may exist and are associated with the use of this product. VDI is not responsible for any human hazards that may exist or may occur while using this device.

Safety Guidelines

- VDI accepts no liability for damage or injury resulting from or caused by
    - Improper use, disassembly or use for other purposes than for which the product was designed.
    - Use outside common safety, health or general advisories pertaining to microwave, millimeter-wave and VDI products.
    - Repairs carried out by individuals other than VDI or its assigned agents.
    - Tampering with or altering power cords or other cabling
- Use of any attachments and accessories not authorized by VDI or that do not meet VDI's specifications may void a NTX Module's limited warranty and could pose a hazard to the operator or cause lasting damage to the device.
- DC bias cables provided by VDI must be used. Alternative or replacement cables cannot be used unless the DC cables are adequately rated, properly grounded and authorized for use by VDI.
- Disassembling an NTX Module can cause lasting damage to components and pose a hazard to the operator.
- An NTX Module is intended for use only with a power supply module or AC/DC converter supplied with the device by VDI. Use of other power supplies or converters could damage the device or injure the operator.
- Applying liquids (other than the TexWipe wipes / cloths used for cleaning) can cause lasting damage to the module.
- Power inputs to the RF Input and LO Input ports of Extension Modules are noted on labels on every Extension Module These values provide optimal performance. Irreversible damage can result if input power exceeds stated damage threshold.

Waveguide Test Port and RF Cable Care

- Do not remove the test ports; test ports must be connected with care for optimal RF calibration results.
- Replace dust caps when the system is idle.
- Use a torque of 90 cNm when making coaxial connections. Avoid sharp bends in cables (RF, IF, LO, etc).
- Inspect waveguide flanges prior to making connections.
- Extension module waveguide screws should be torqued in the range 20-50 cNm, greater torque can damage the interface.
- Making a connection with metal debris between the waveguide flanges can damage the waveguide interface and prevent repeatable connections.
- If debris is present, clean the flange with pre-dampened TexWipe wipes or swabs (e.g. Part Number TX1065).
- If these are not available, TexWipe cloths lightly dampened with ethanol may be used (e.g. Part Number TX604).
- Cover test ports with dust caps when the system is idle.

General Operating Practices and Recommendations

- VDI NTX Modules are intended to be used in typical laboratory conditions.
    - Check with VDI before any measurement connection is attempted beyond those described in this manual or if it may exceed commonly accepted standards of practice.
    - Do not connect or disconnect power cables while the Extender Module is switched on.

Noise Test Extension Modules

VDI NTX Modules from Virginia Diodes are used to extend the performance of modern absolute phase noise test solutions in the frequency range of 50 GHz up to 330 GHz, in the frequency bands from WR-15 (50-75 GHz) to WR-3.4 (220-330 GHz) with additional bands under development. VDI NTX Modules include a waveguide splitter with two down-converter mixer chains that can be used for cross-correlation test setups. These modules use VDI's proprietary mixer technology, which achieves low-conversion loss and exceptional sensitivity.

Setup Procedure: Cross Correlation, External Mixer Setup

The following procedure will set up the R&S Phase Noise Analyzer (FSWP) to work with VDI NTX Modules in using the External Mixer Mode. Input power limitations, safety guidelines, general operating practices and recommendations for the NTX Module are provided in the NTX Datasheet. Please review the datasheet before reading this document.

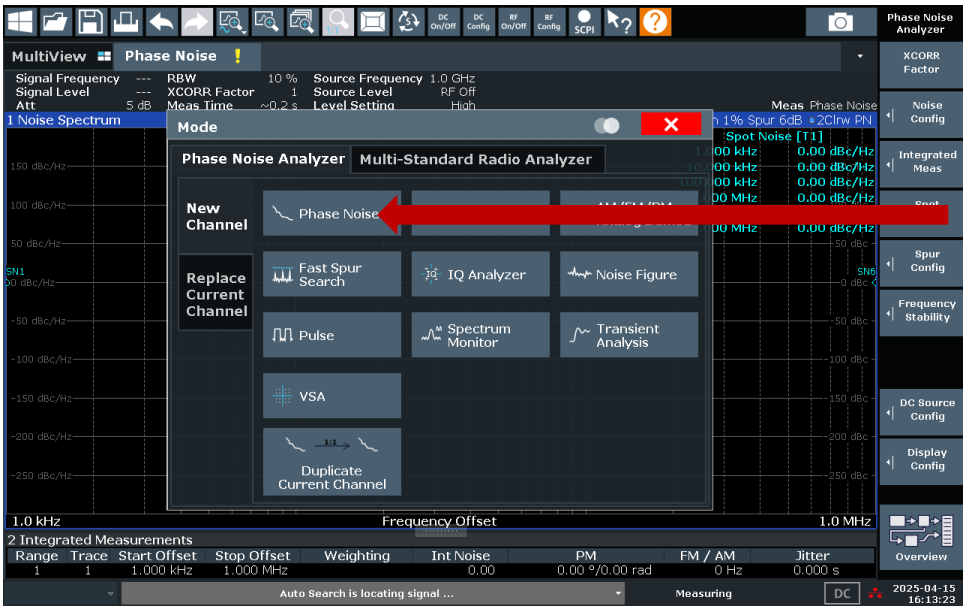
Phase Noise Analyzer Compatibility

For compatibility, verify that the NTX Module is configured with an LO harmonic factor such that the LO input frequency requirement falls within the 7.65-16 GHz of the R&S FSWP External Mixer LO Output Port. Please review the R&S FSWP datasheet for more information on the External Mixer specifications.

The B21 (External Mixer) Option is required for compatible analyzers. Additional options may be required depending on your measurement requirements. For example, for correlation measurements with two external mixers, B61 (Cross Correlation Measurements) and B64 (Additive Noise Measurements) are required. The screenshots were taken on an R&S FSWP50. Other Phase Noise Analyzers may have slightly different menu layout and options, but setup instructions may be similar.

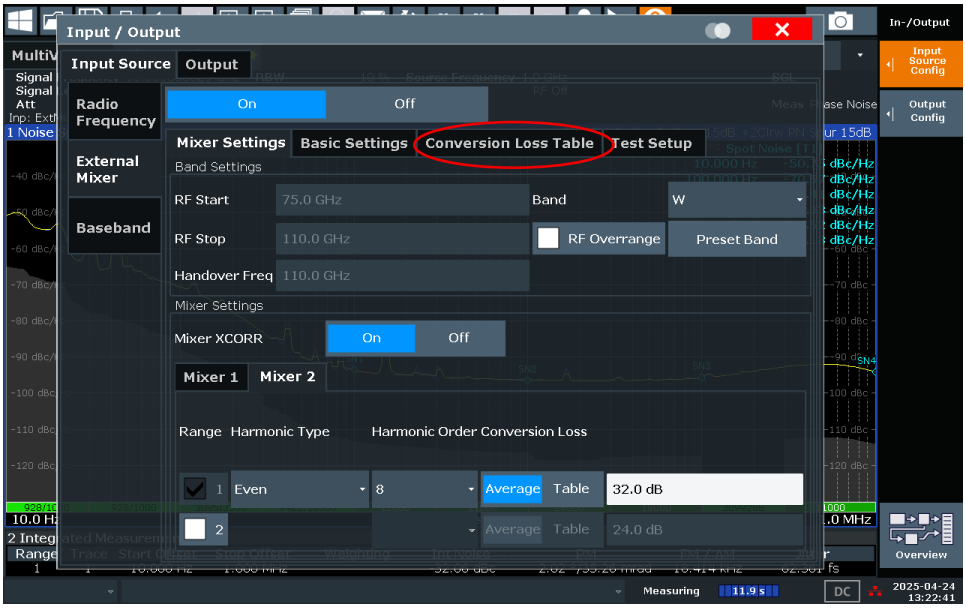
Switch to Phase Noise Measurement Mode

The R&S FSWP defaults to the Phase Noise Measurement Mode. If the instrument does not default to Phase Noise Measurement Mode, you may need to press [Mode] and select [Phase Noise] from the list of menu options.



- Press [Input/Output]

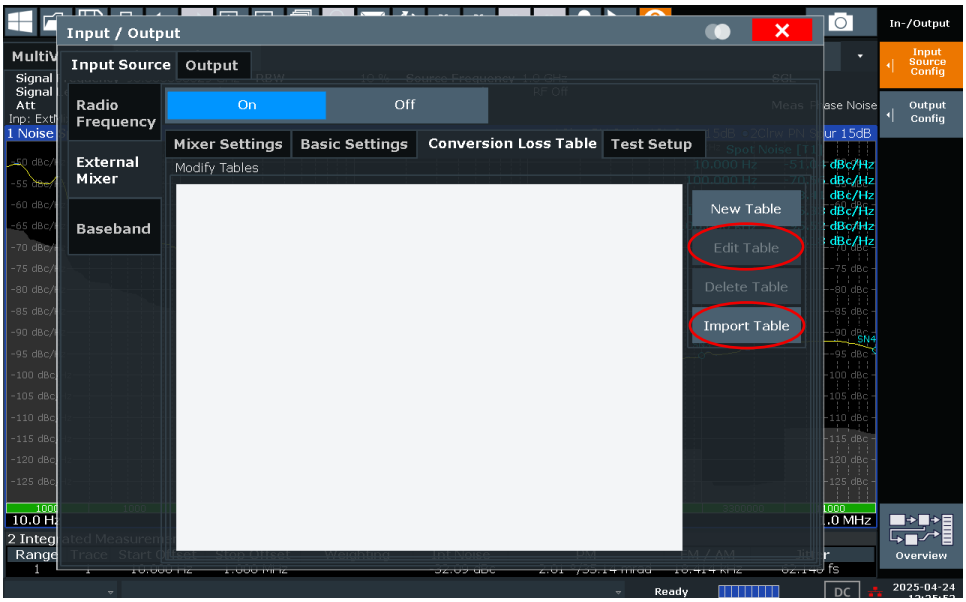
- Select [Input Source Config]



- Select [Conversion Loss Table]

Upload Conversion Loss Table

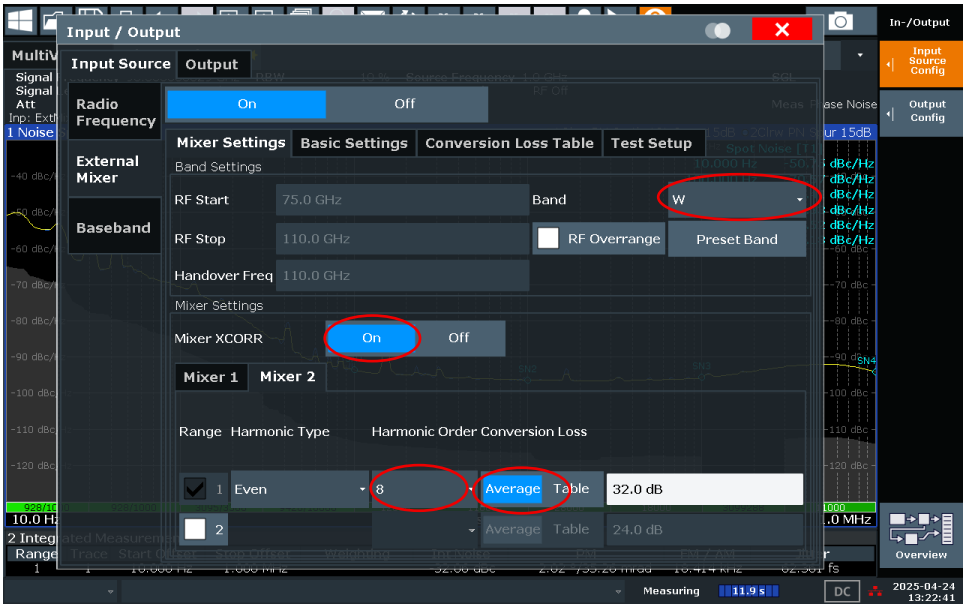
An average Conversion Loss value can be applied if desired. If a frequency dependent Conversion Loss table is desired, navigate to the 'Conversion Loss Table' tab. Click 'Import Table' and navigate to the appropriate Conversion Loss table file. Please note: for cross-correlation measurements and both down-converter chains from the NTX are used, uploading two unique files may be desired.



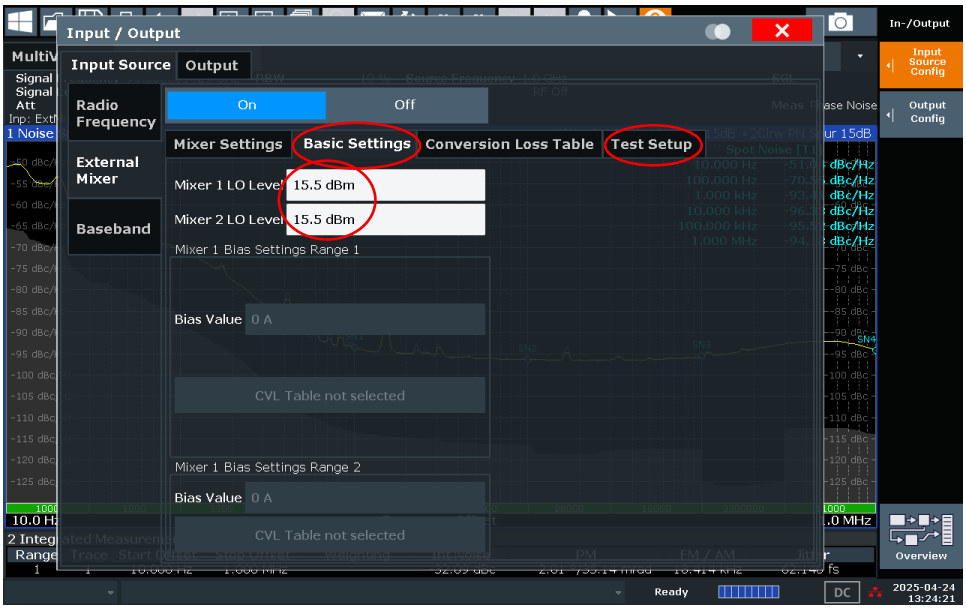
- Insert USB Drive provided by VDI into the R&S Spectrum Analyzer
- Select [Import Table]
- Navigate to the .acl Conversion Loss file located on the USB Drive.
    - Each NTX Module has a unique conversion loss file for each down-converter chain. Verify that the serial number in the .acl file name matches the serial number on top of the NTX module.
- Press [Select]

- Select the appropriate Conversion Loss file and press [Edit Table]. Verify the parameters and data are correct and properly loaded. Close the window.
- Navigate back to the ‘Mixer Settings’ tab

Set NTX-F Parameters



- Select the appropriate Band designation from the drop-down menu. USER band can be selected.
- For cross-correlation measurements, turn Mixer XCORR ON.
- Set Harmonic Order to appropriate value. See label on top of NTX-F module for the correct LO harmonic factor. For cross-correlation, set LO harmonic factor to both Mixer 1 and Mixer 2.
- Set Conversion Loss to ‘Average’ or ‘Table’. If ‘Table’ is selected, select the appropriate conversion loss file from the drop-down menu. For cross-correlation measurements, set Conversion Loss for both Mixer 1 and Mixer 2.

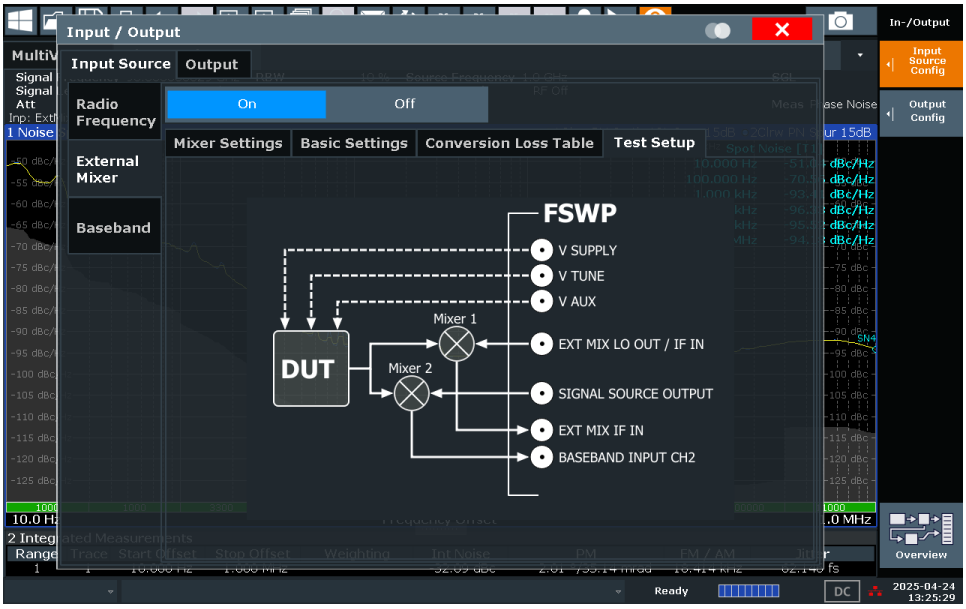


- Navigate to the ‘Basic Settings’ tab.

- Set Mixer 1 and Mixer 2 LO power levels. Cable loss must be calculated or approximated to avoid damaging the LO input ports of the NTX-F modules.
- Navigate to the ‘Test Setup’ tab.

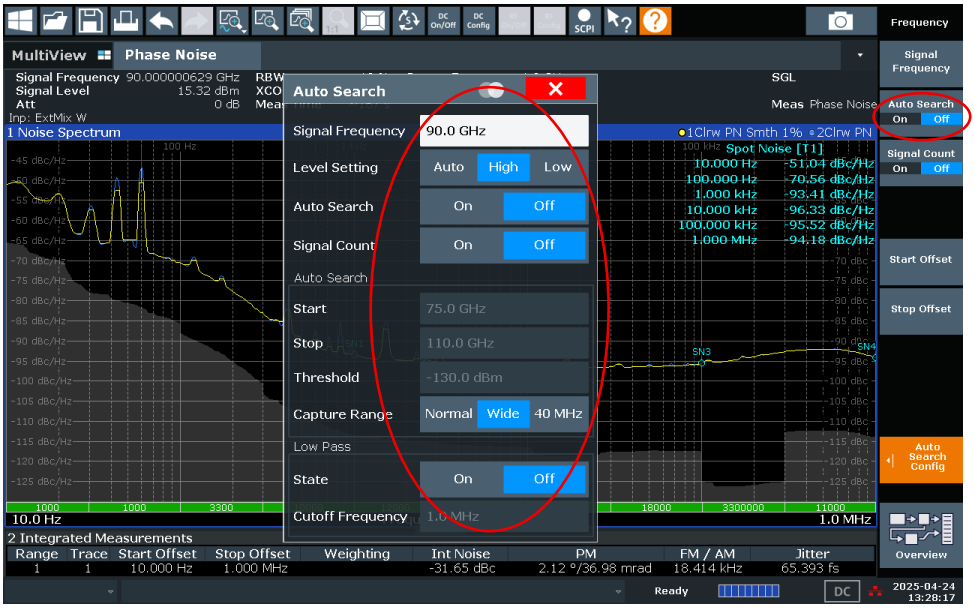
Hardware Connections

The ‘Test Setup’ tab shows the block diagram and hardware connections for the cross-correlation setup. Using appropriate cables, make the appropriate hardware connections as shown. The NTX Module is configured with two IF output channels for each downconverter (Low IF and High IF). For use with the FSWP, the Low IF path must be used.



Frequency Configuration

- Press [Freq]



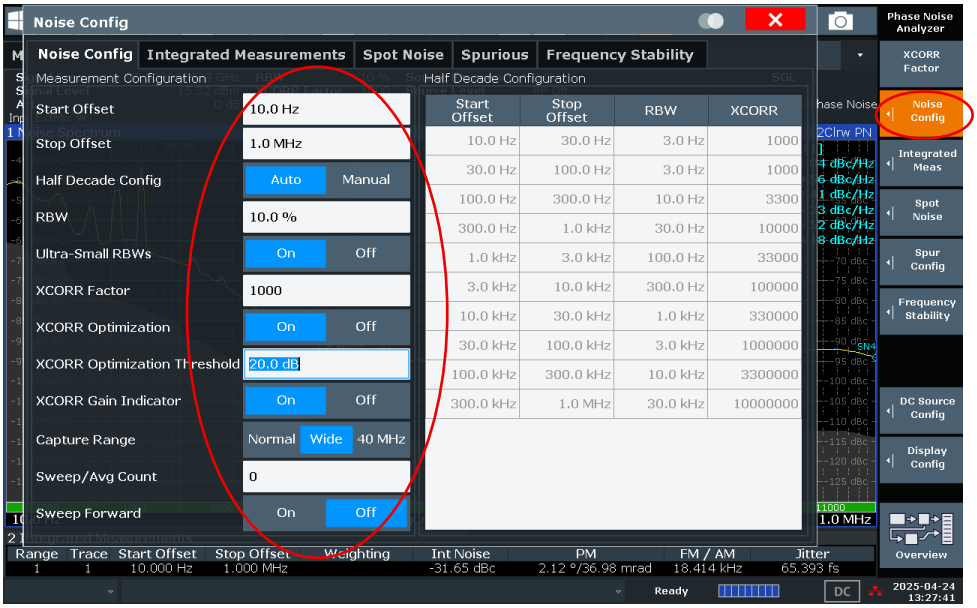
- Select [Auto Search Config]

- Adjust parameters in the Auto Search window to enable the Phase Noise Analyzer to detect the RF signal.
- Review the FSWP User Manual for more details.

Measurement Configuration

Additional measurement parameter adjustments may be required to improve the phase noise measurement quality.

- Press [Meas Config]



- Select [Noise Config]
- Adjust parameters in the Noise Config window as needed.
- Review the FSWP User Manual for more details.