Setup of the Anritsu Lightning VNA System for use with OML Millimeter Wave VNA Modules above 140 GHz

The Anritsu Lightning Millimeter Wave (MMW) VNA System has internal menu selections for waveguide bands up through WR-08 (90 to 140 GHz). Operation in the waveguide bands WR-06 and higher requires that the user enter various data into the setup menus. The information below is in addendum to the procedures contained in the copy of Anritsu 37xxx Operating Manual, Chapter 14 "Millimeter Wave System" that follows (presented in this manual with the gracious permission of Anritsu).

Millimeter Band Definition: The following steps enter the frequency commands needed to edit the program for the synthesizers for the desired band of operation. It is recommended that each band be saved as a specific setup. The methodology used is to enter the "Source" (synthesizer) commands as a fraction of the desired operating frequency. The "values" shown in the following steps apply for the example given in the next paragraph. Those values will need to be amended to reflect the desired band of operation using the data supplied with the millimeter wave test Module.

Example: If the desired band is WR-05 (140 to 220 GHz), "Source 1" (LO) will be set to operate at 1/12, and "Source 2" (RF) will operate at 1/12 of 140 to 220 GHz. "Source 1" will also be offset +/-270 MHz. After the system is functioning choose "+" or "-" offset" for best test results in the response shown on the Lightning display. The "Receiver" is set to a constant frequency of 270 MHz. The entries would appear as follows:

SOURCE 1 = (1/12) * (F-0.270000 GHz)
SOURCE 2 = (1/12) * (F+0.000000 GHz)
RECEIVER = (1/1) * (0.270000 GHz)

BAND START FREQ 140 GHz
BAND STOP FREQ 220 GHz

EXT SOURCE 1 PWR +17 dBm
EXT SOURCE 2 PWR +13 dBm

Band	RF	RF	LO	LO
	input	denom	input	denom
WR-15	12.5-18.8	4	10.0-15.0	5
WR-12	10.0-15.0	6	12.0-18.0	5
WR-10	12.5-18.4	6	9.3-13.8	8
WR-08	7.5-11.7	12	11.2-17.5	8
WR-06	9.1-14.2	12	11.0-17.0	10
WR-05	11.6-18.4	12	11.6-18.4	12
WR-03	12.2-18.1	18	12.2-18.1	18

After the system is setup and functioning satisfactorily save this setup as "WR-05". Be sure and enter the correct data into the calibration program and save it into "WR-05C"

OML is always available to help with any problems that might be experienced. The Tech Support personnel at Anritsu have worked very close with OML and are a good resource for Lightning setup and operational questions.

Rev. 3-18-06

INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

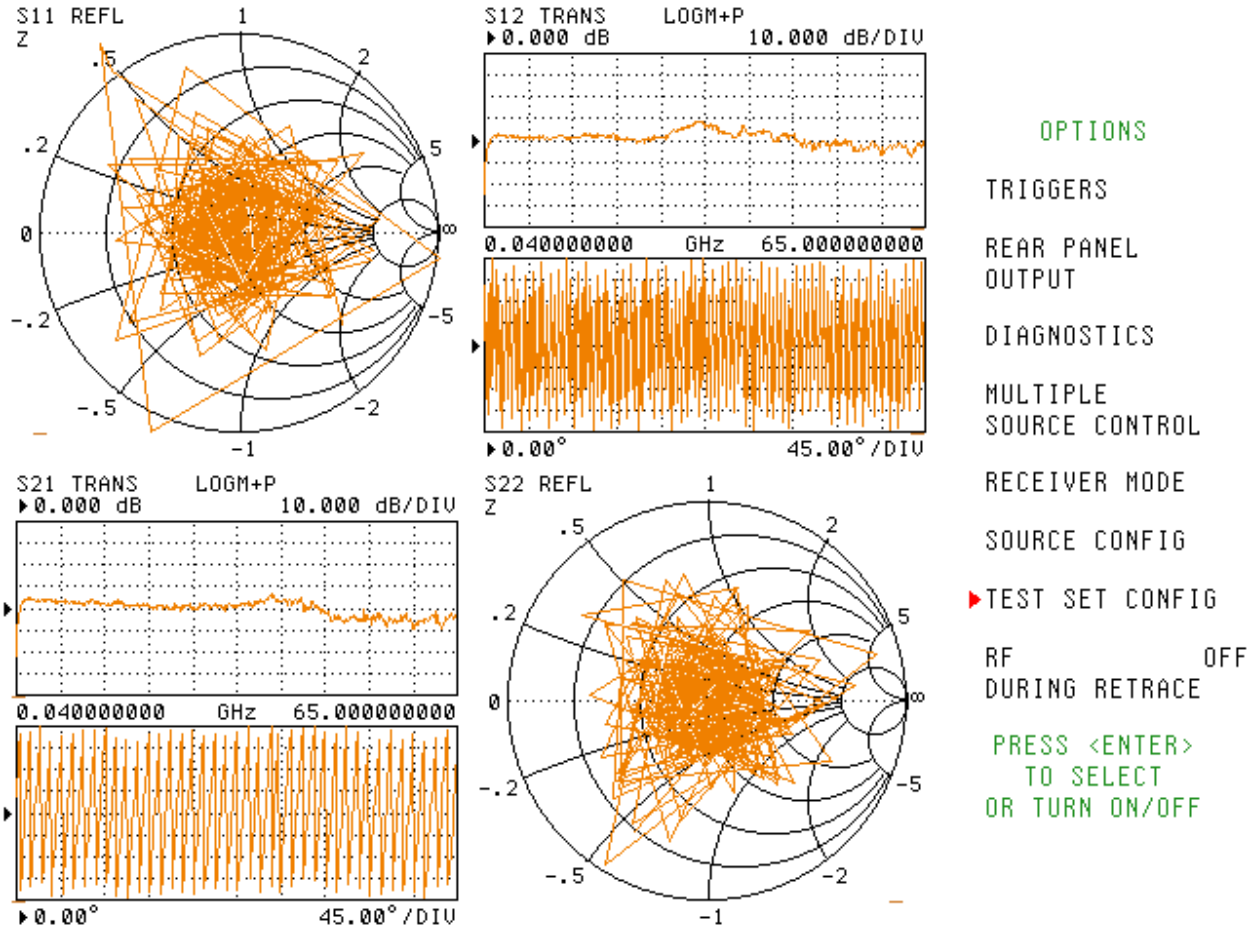
These instructions should be followed for one or more of the following circumstances:

- Standard set-up operation of Anritsu 374x-X mm modules
- Set-up operation of third-party mm modules which support the frequency plan (RF, LO and IF) of Anritsu 374x-X mm modules
- Extended frequency range operation of Anritsu 374x-X or third-party mm modules NOTE: operation beyond specified frequencies is not warranted by Anritsu
- Operation of third party mm modules with different RF and/or LO multiplier factors than the default values in the VNA menu-defined waveguide bands (WR-22, WR-15, WR-12, WR-10 and WR-8)
- Operation of third-party mm modules (such as those from OML, Inc.) in waveguide bands above WR-8 frequency

INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

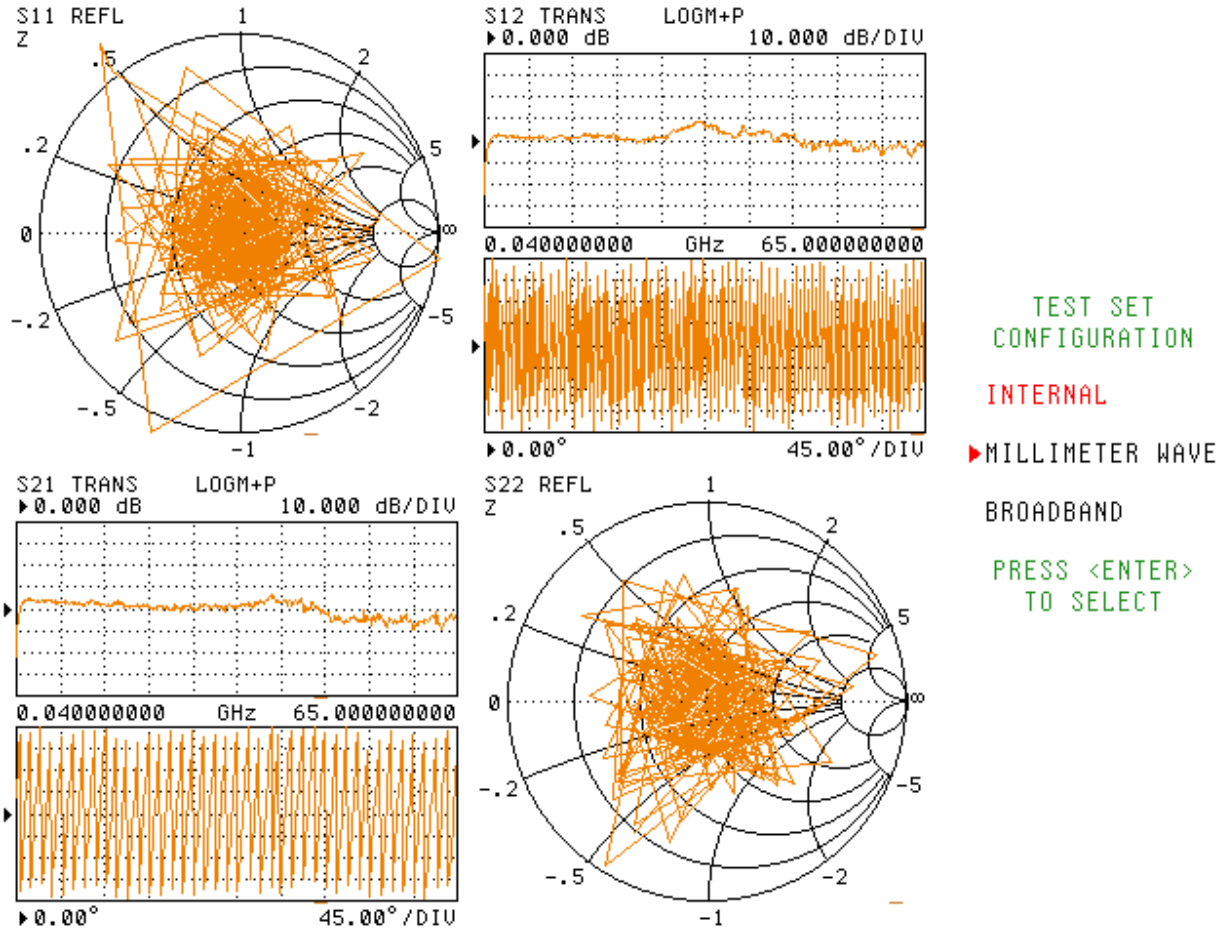
On the 37xxxX VNA Front Panel, select OPTION MENU.

Under the OPTIONS Menu, select TEST SET CONFIG and then ENTER.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

Under the TEST SET CONFIGURATION Menu, select MILLIMETER WAVE and then ENTER.



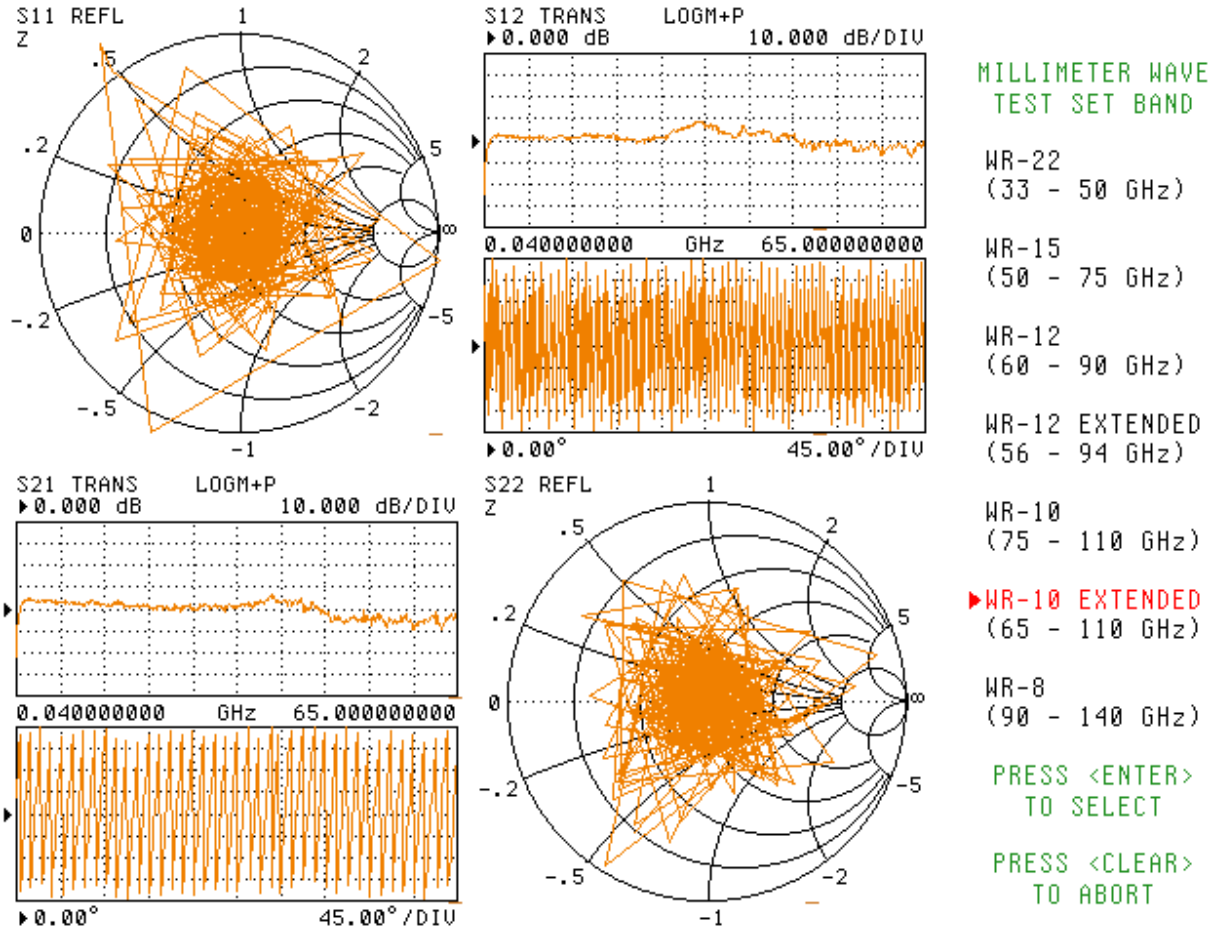
INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

Under the MILLIMETER WAVE TEST SET BAND Menu, select the appropriate WR waveguide band for the modules in use, and then ENTER.

If the frequency limits in a particular waveguide band will be extended beyond what is shown, it doesn't matter if the standard or extended band is selected, as the frequency limits will be defined later.

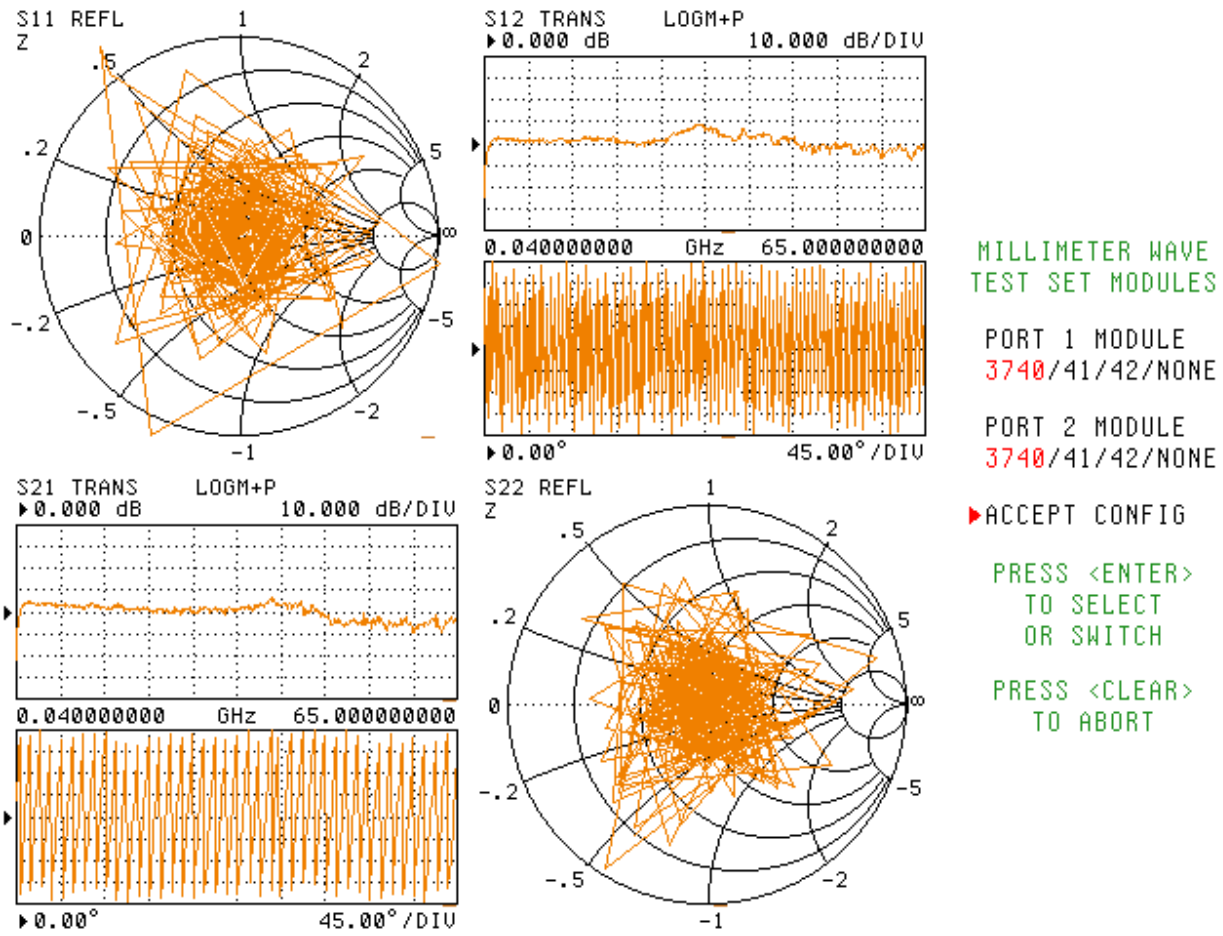
If the module uses different multiplication factors for the RF and/or LO sources than the default, select the appropriate WR band and the multiplier factors will be edited later.

If the WR band is not shown, select any WR band from the menu, as all the band definitions will be edited. Note which WR band was selected for future reference (see page 14.)



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

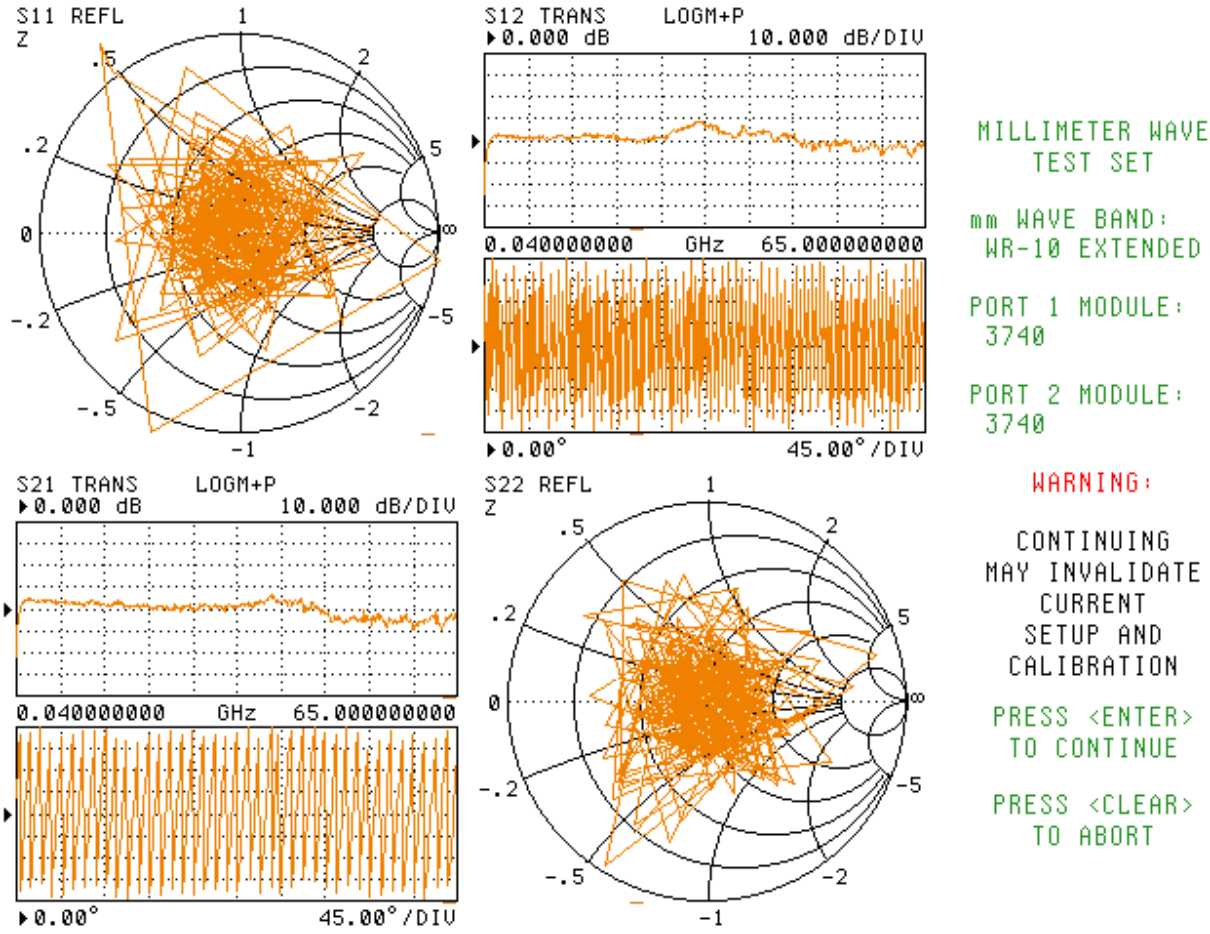
On the MILLIMETER WAVE TEST SET MODULES Menu, toggle to PORT 1 MODULE 3740 and PORT 2 MODULE either 3740 (Transmission/Reflection module) or 3741 (Transmission only module.) Then select ACCEPT CONFIG and then ENTER.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

A Confirmation/Warning Menu will appear.

Review the WR Band and Module types at each Port and then ENTER.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

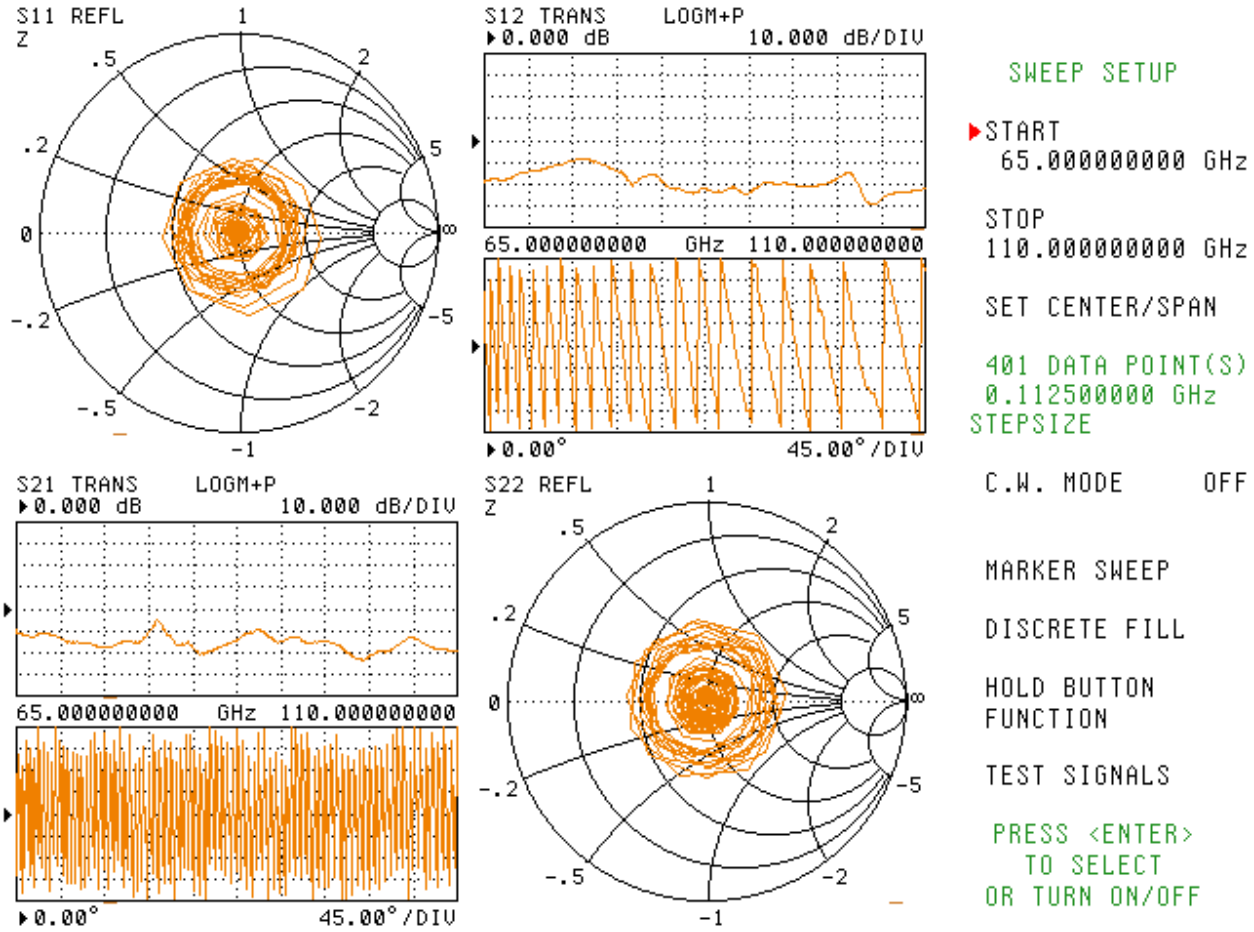
The VNA is now in Millimeterwave Mode.

If an extended WR band was selected and the module is not capable of operating over that range of frequencies, a Phase Lock Error may be displayed.

If a non menu listed WR waveguide type or non-standard RF and/or LO multiplier is required, a Phase Lock Error will be displayed. This will be corrected when the waveguide band definitions are edited.

Proceed further only if the Start and Stop frequency limits will be extended beyond the default definitions, non-listed WR waveguide or non-standard multiplier factors are used.

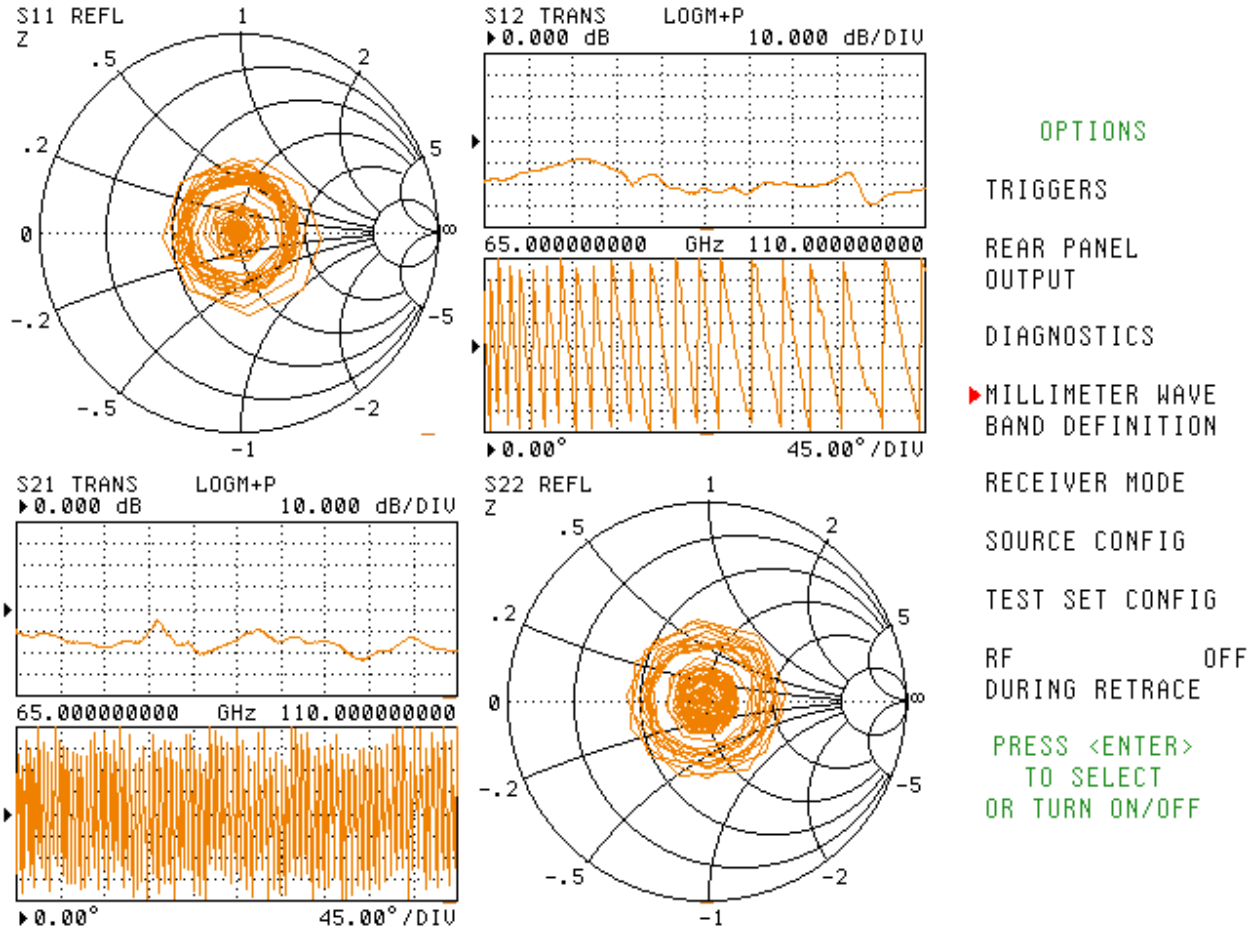
Otherwise, the VNA is now ready for millimeter wave operation.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

On the VNA Front Panel, select OPTION MENU.

Under the OPTIONS Menu, select MILLIMETER WAVE BAND DEFINITION and then ENTER.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

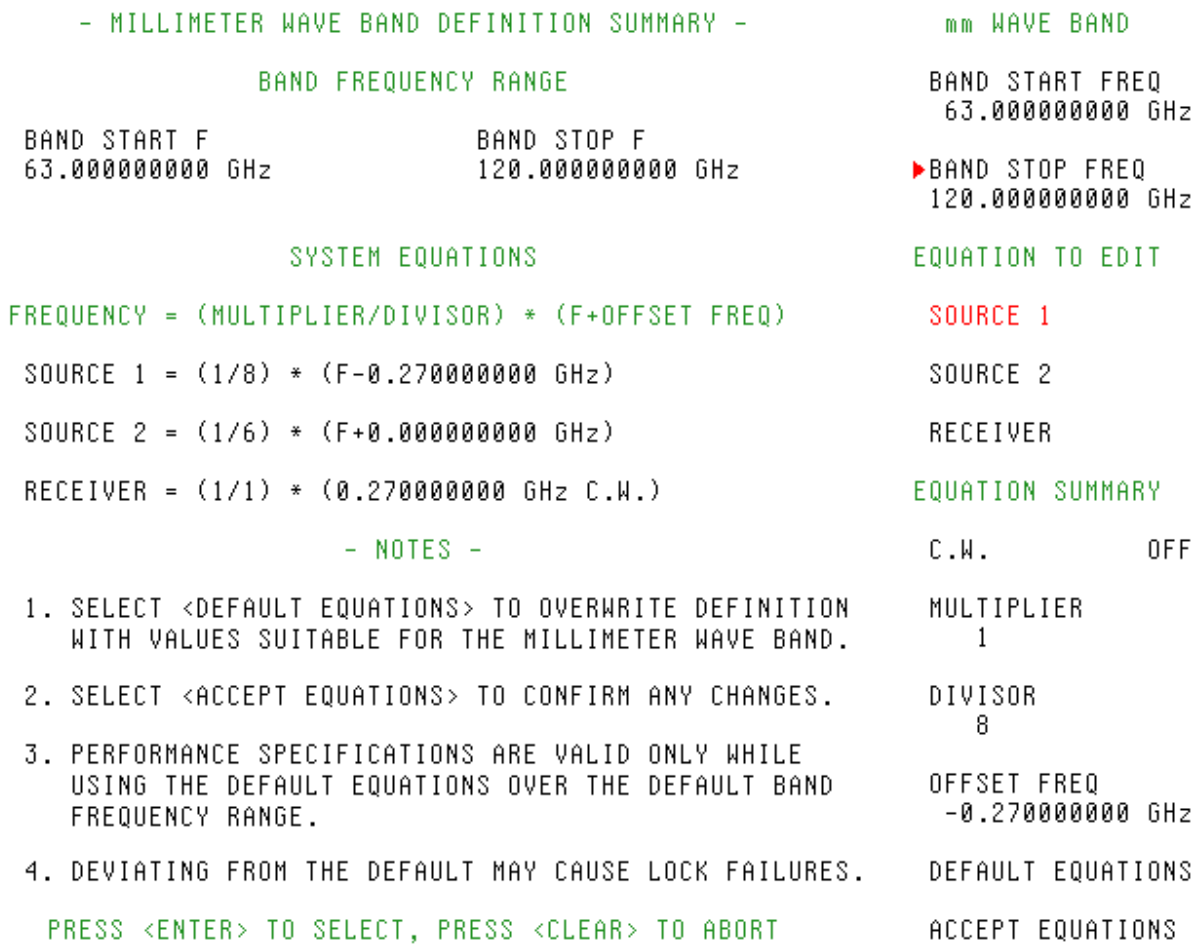
If the WR waveguide band frequency limits are correct, but only RF and/or LO multiplier factors need to be changed, skip to page 10 and/or 11. Otherwise proceed on this page.

Under the mm WAVE BAND Menu, enter the BAND START FREQ and/or BAND STOP FREQ desired. These frequencies may be limited by the capabilities of Sources 1 and 2. An error message will alert the user to this fact, if violated by the equations.

For this example, the extended WR-10 band (65-110 GHz) has been further extended to 63-120 GHz.

If only the WR band frequency limits need changing, proceed to page 12 after completion of action on this page.

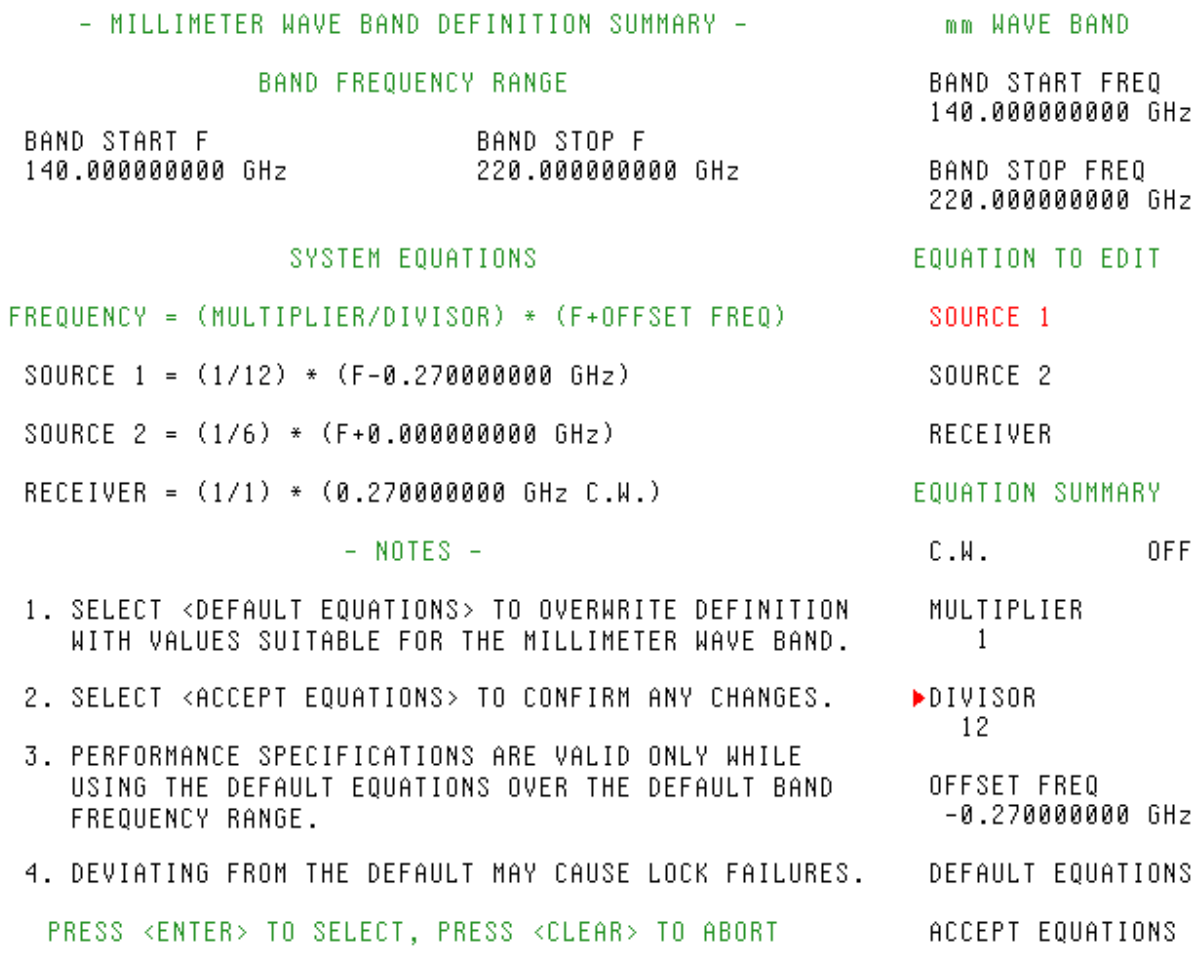
NOTE: Do not edit the System Equations.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

To change the LO multiplier factor, select SOURCE 1 under menu EQUATION TO EDIT, then enter the multiplication factor at DIVISOR under EQUATION SUMMARY.

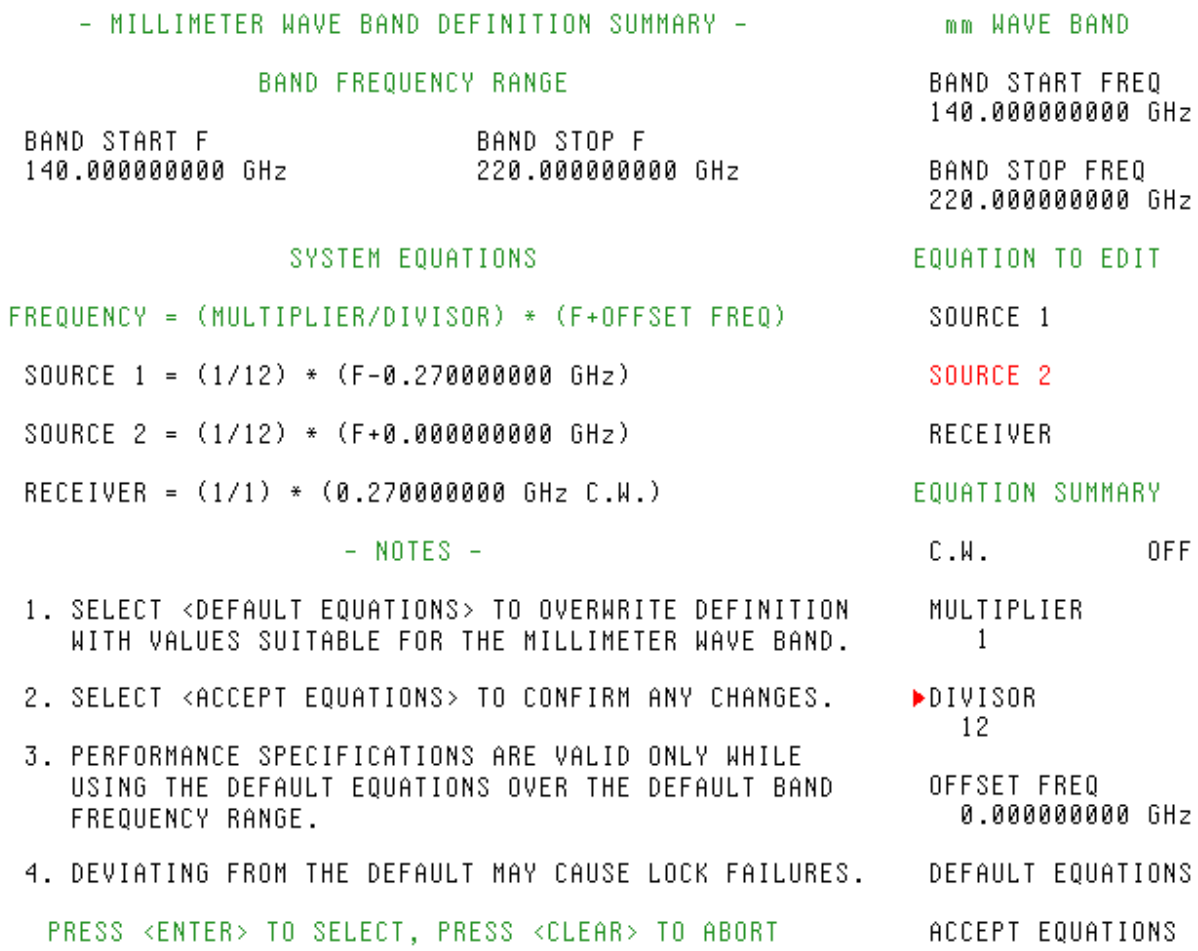
For the example here, a WR-5 mm module operating from 140-220 GHz has a harmonic mixer operating at the 12th harmonic. Source 1 (LO) must output a frequency at 1/12 the system frequency.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

To change the RF multiplier factor, select SOURCE 2 under menu EQUATION TO EDIT, then enter the multiplication factor at DIVISOR under EQUATION SUMMARY.

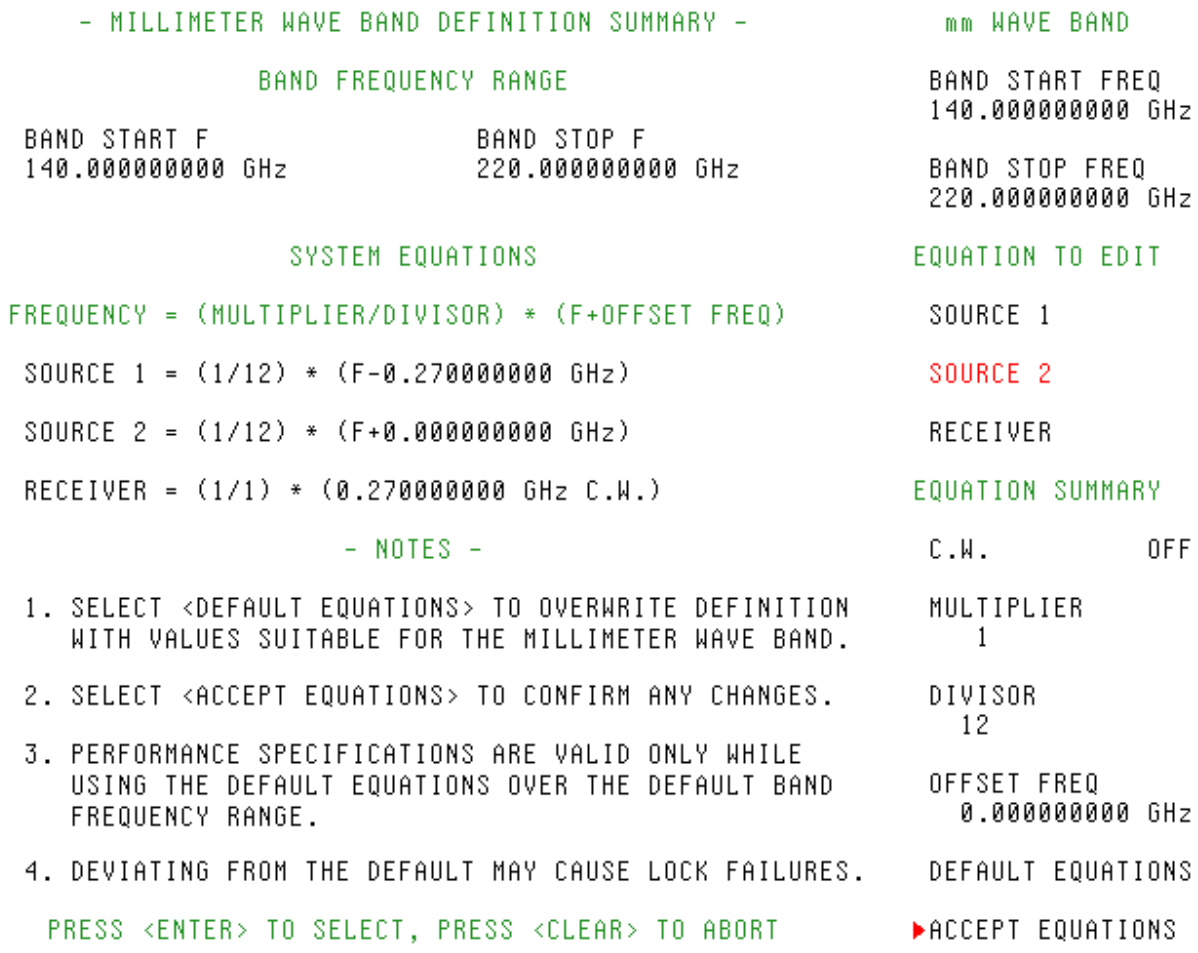
For the example here, a WR-5 mm module operating from 140-220 GHz has a x12 RF multiplier. Source 2 (RF) must output a frequency at 1/12 the system frequency.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

After making the desired changes, under the EQUATION SUMMARY Menu, select ACCEPT EQUATIONS, and then ENTER.

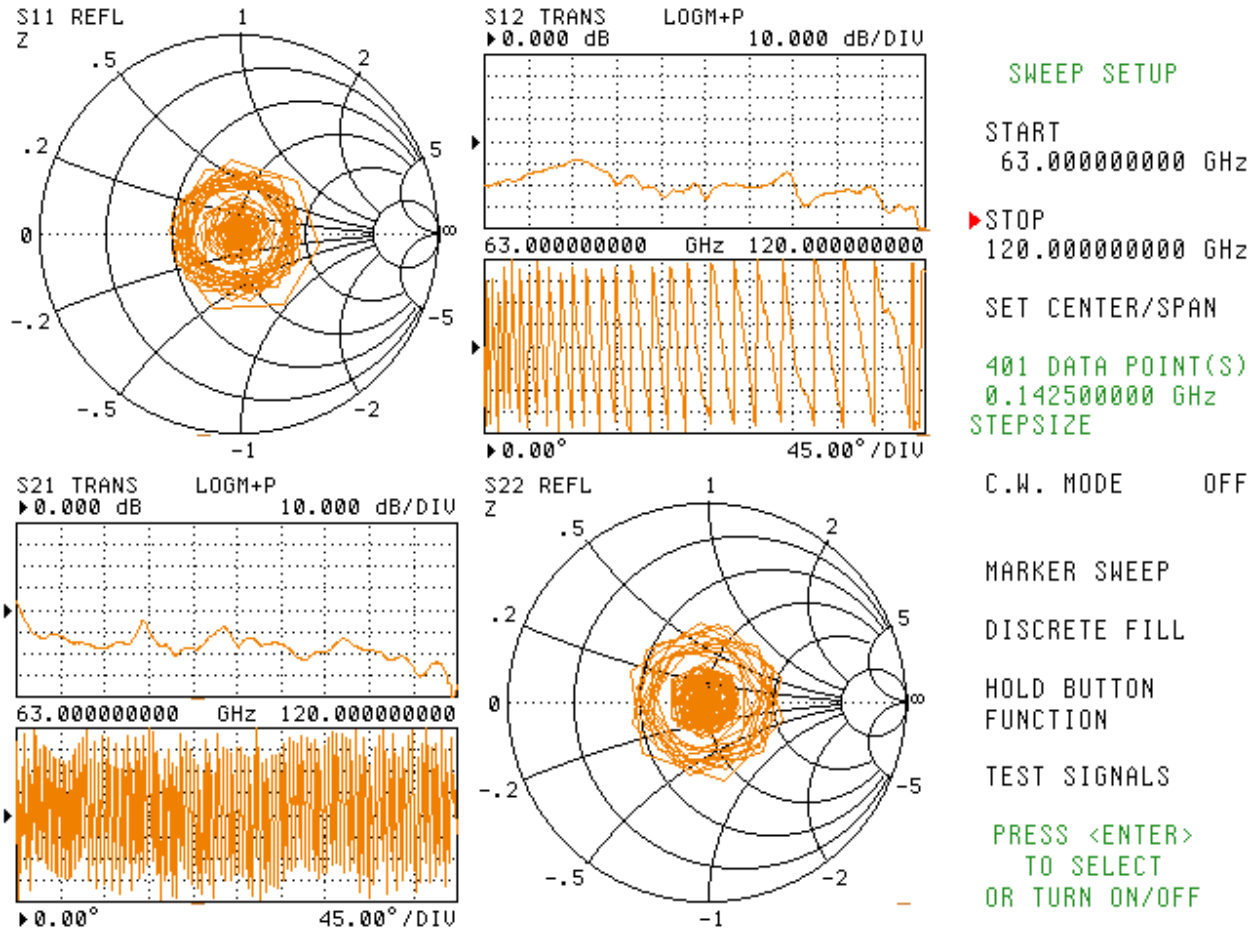
NOTE: Deviating from default conditions may cause Lock Failure.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

If the WR waveguide band frequency range has been extended, (as the example from page 9, from 65-110 GHz to 63-120 GHz) the SWEEP SETUP Menu displays the default non-extended Start and Stop Frequencies. The user can then change the frequencies up to the defined limits.

If a new WR band above WR8 in frequency has been defined, the SWEEP SETUP frequencies will be displayed as defined.



INSTRUCTIONS FOR MILLIMETER WAVE BAND SET-UP AND EXTENDED FREQUENCY RANGE OPERATION

To avoid a repetition of this process, the set-up should be stored for future recall.

On the 37xxxX VNA Front Panel, select SAVE/RECALL MENU.

Select SAVE and ENTER.

On the SAVE MENU, select FRONT PANEL SETUP AND CAL DATA ON HARD DISK and ENTER.

Create a file name for this set-up.

The stored set-up defines a specific “profile” which includes both system instrument hardware and the specific WR waveguide band. This profile must be matched in order for the set-up to be recalled. The hardware includes the specific VNA and two source synthesizers, all of which must not have changed in order to recall the set-up. The system must be in Millimeter Wave mode (see pages 2 and 3), the same module port configuration (see page 5) and the same WR band (see page 4) as stored in order to recall a stored set-up.

Note that a special situation occurs when the WR band is not listed and defined in the VNA menu (frequencies above WR-8.) One WR band was selected as a menu entry selection during the band definition process. This same band must be selected in order to recall a previously stored set-up made (see page 4.)

If two or more waveguide bands above WR-8 are used (example WR-5 and WR-3), it may be easier to simply use the default extended WR-10 menu selection as an entry point for waveguide band definition. When storing the set-ups, use a distinctive frequency band identifier for the file name. When recalling the stored set-ups, simply use the default extended WR-10 menu selection to enter Millimeter Wave mode, then recall any of the stored set-ups.

It should be noted that when redefining one waveguide WR band to another, certain global parameters, such as the waveguide cut-off frequency, are not changed in the VNA. It will be changed, however, to the correct value when a waveguide calibration is performed, as the cut-off frequency is one of the cal kit disk parameters.

To recall a stored set-up, on the Front Panel, select SAVE/RECALL MENU.

Select RECALL and ENTER.

On the RECALL MENU, select FRONT PANEL SETUP AND CAL DATA ON HARD DISK and ENTER.

Select the stored set-up from the file list.