1 - Equipment Calibration – Quick Card

The following steps are almost universal with any sweep test equipment. This card is used to calibrate the test port, prior to making cable connections. DO THIS FIRST!

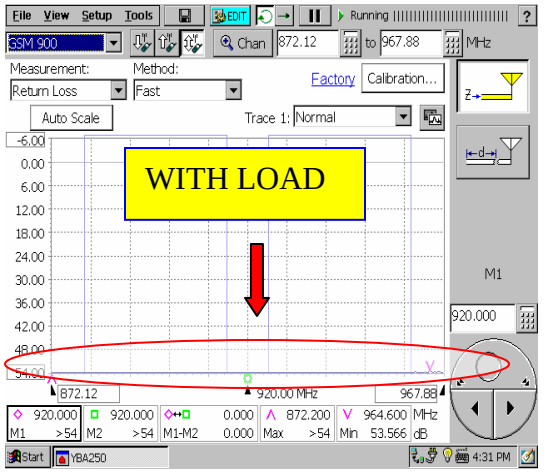
1. Turn ON test equipment, ensure software properly loads.
2. If operating on Battery, ensure there is sufficient battery to conduct the test.
3. Select **"Cal"** or **"Calibration"** from the main menu.

At this point each machine will direct you through the specific process; however, here are good rules to follow.

4. Connect the **phase stable cable** to the equipment.
5. Connect an **OPEN** to the end of the phase stable cable.
6. Run the **CAL** for the **OPEN.**
7. Remove the **OPEN**.
8. Connect the **SHORT** to the end of the phase stable cable.
9. Run the **CAL** for the **SHORT**.
10. Remove the **SHORT** from the cable.

Calibration – Quick Card

11. Connect a Precision **LOAD** to the end of the cable.
12. Run the **CAL** for the **LOAD.**
13. The Test set is now calibrated to **THE END OF THE PHASE STABLE CABLE.**



Note: Proper calibration will have a fairly straight line across the bottom of the scale. Different manufacturers use different scales. The number should be greater than 45dB (-45dB). A higher number is better.

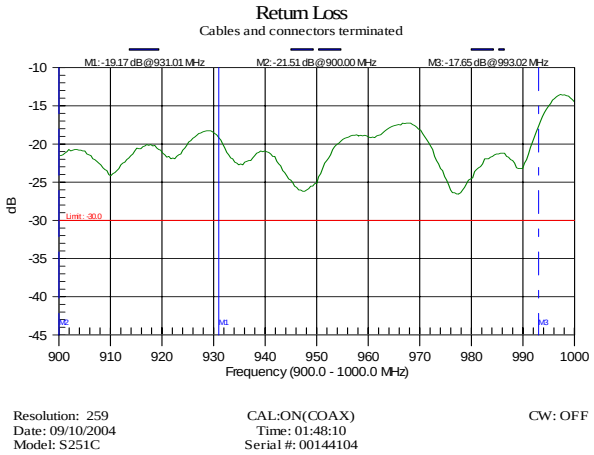
2 - Return Loss Testing – Quick Card

After successful completion of test equipment calibration and ***with the phase stable cable still connected***, complete the following steps for a Return Loss Test.

1. Using the **MODE** button, soft key or pull-down menu select **RETURN LOSS** or **MEASURE/ MATCH** as the test type. ***This is test set specific and will vary slightly between units.***

2. When prompted **SELECT COAXIAL CABLE** as the cable type. (This may not be an option).

3. Follow the specific instructions for making connections. This will vary between vendors.



Return Loss – Quick Card

4. When prompted, connect the phase stable cable to the Device Under Test (DUT), this means the antenna network, cable or antenna.

5. Activate the test! There might be a **single sweep** or **continuous** run modes O**ptions Menu** or S**weep Button** if so select the **"continuous**" mode.

6. You should get a plot ***similar*** to the example shown. This will vary depending on the number of points being plotted and the bandwidth resolution. Success means a Return Loss of around 16-22 dB fairly flat across the band selected.

7. **SAVE** or **PRINT** the plot for future reference.

Return Loss

Goal: Looking for 16-22 dB with points plotted fairly flat across the band.

3 - Insertion Loss – Quick Card

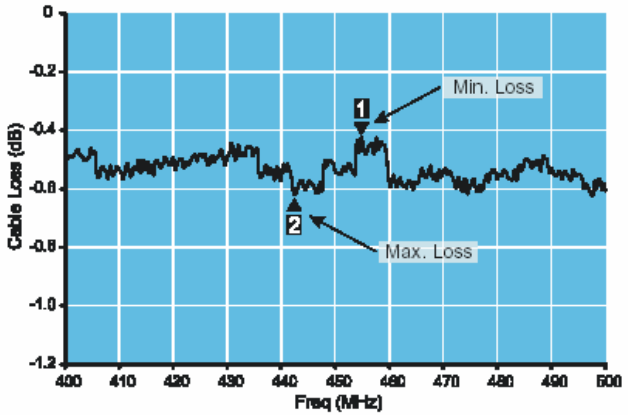
This procedure will find the **Insertion** or **Cable Loss** in the network. There are two possible methods, they are:

- **Direct measurement**
- **Calculated**

Direct Measurement

1. Set-up the test equipment, calibrating if necessary to conduct a **"Cable Loss"** or **"Insertion Loss"** test.
2. Remove the antenna and connect the precision **SHORT** to the cable end. (***True insertion loss measurements exclude amplifiers and antennas***)
3. Run the **Insertion Loss** test.
4. Set Marker "**M1" to Peak** & **Marker M2 to Valley.**
5. Add the markers together and divide by 2 (M1 + M2) ÷ 2
6. Record the results and save the plot.

Many newer test sets give a direct read by doing the math internally, NOT ALL.



Calculated Measurement

7. Repeat Step #2
8. Place the test set in the **Return Loss** mode.
9. Run a **Return Loss** test.
10. Place markers as follows; **M1 = PEAK & M2 = Valley**.
11. Read the values of the markers, **add** them, and **divide (÷) by 4**.
12. The display should look similar to the example shown.

The direct measured and calculated results should be the same.

4 - Distance-to-Fault – Quick Card

This test is used to detect the location of faults within the antenna network. This card is a general test set-up. Instructions provided by the test equipment manufacturer, vary and should be followed to ensure reliable results.

1. Turn-on the Test Equipment, ensure the firmware is operating properly and the equipment is calibrated to the Phase Stable Cable. (See QC #1)

2. Make sure the test equipment is set for the band of operation being tested.

3. From the equipment **MAIN MENU** select the **Distance–to-Fault** (DTF) test. Set up the cable parameters as follow:

    a. Distance at the **beginning (D1)** and the **end (D2)** of the cable

    b. Cable type*

    c. Cable Loss/ft*

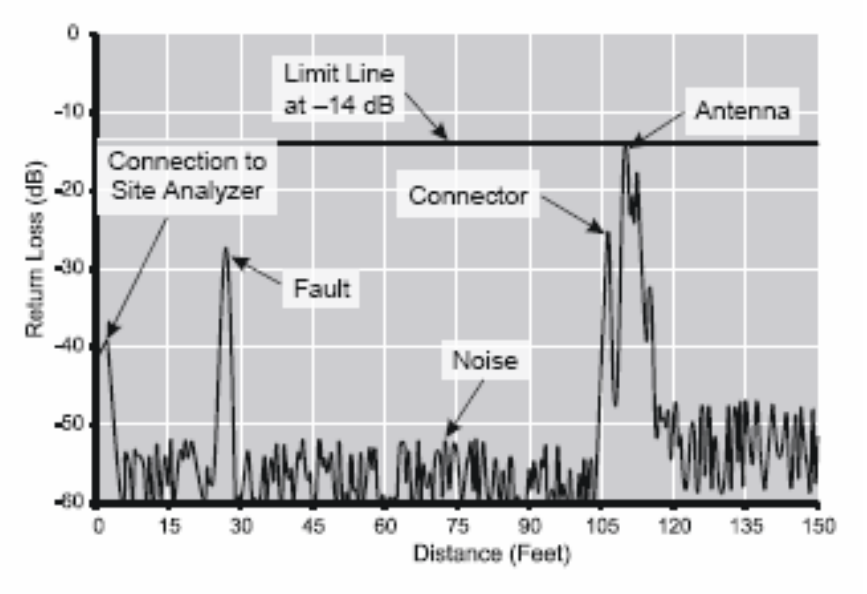
    d. Cable velocity of propagation*

    e. Frequency band – if applicable

    **** look-up table may populate all fields upon selection of cable type .***

Distance-to-Fault Quick Card

4. After calibration and set-up of the test set, the technician can now conduct Distance-to-Fault tests.



5. Connect the antenna transmission network or transmission line to the end of the calibrated phase stable cable.

6. Start or Run the **Distance-to-Fault** test.

7. The results will typically appear as shown

Note: The measurement is RETUN LOSS! This means that you are now measuring a cable along the entire length and reporting RL at distant points.

5 - Antenna Testing – Quick Card

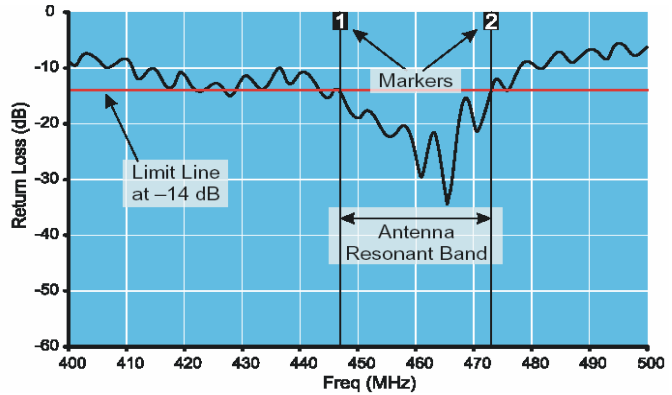
This test is designed to measure the bandwidth and Return Loss (quality) of an antenna. This test is conducted in the following situations:

- **At Antenna Installation**
- **When trouble is present or coverage is reduced**

This test is designed to measure **JUST the ANTENNA**, thus disconnection from the network is required.

1. Set the bandwidth of the test equipment (F1 & F2) to a range beyond the expected range of the antenna. ***Changing the range may change the calibration. Some test equipment requires a re-calibration if the frequency range is changed.***
2. Set the **LIMIT LINE** to -15dB (*see antenna specifications for accurate RL number)*
3. Having calibrated the equipment and successfully conducted a baseline Return Loss test **remove** all of the cabling and connect **JUST** the antenna to the end of the phase stable cable.

Antenna Testing – Quick Card



4. Rerun the **Return Loss** test.
5. Set the markers M1 & M2 to where they **intercept the Limit Line,** on each side, see example.
6. Set Marker M3 to “Marker toValley.”
7. Save the plot for future reference.

NOTE: A good antenna is noted when there is specific resonance (better Return Loss) within the band of the antenna. The resonance must meet the manufacturer specification.