UNIVERSITY OF TORONTO
Department of Electrical and Computer Engineering
Fields and Waves Laboratory
Courses ECE 320F and ECE 357S
III Year

RESONANT CAVITY

Network Analyzer

A. Introduction

The Vector Network Analyzer (VNA) is a combination of a sweep generator and receiver which can measure either reflected or transmitted signals. The received signals can be displayed in various formats such as SWR and impedance magnitude.

The user can control the source parameters such as frequency and sweep width. The operation of the receiver can be controlled as to the format of display and scaling.

B. Operation of The Vector Network Analyzer

The VNA is controlled by:

1. Function selection is controlled by the ***Measure***, ***Source***, ***Configure*** and ***System*** buttons on the VNA front panel (see Figure 1).
2. The Softkeys (mode selection keys) are prompted by the CRT display.

C. Operating Procedure

The receiver control setup and sweep generator setup is described below.

(Refer to Figure 1 for the numbering)

Section 6.1 – SWR measurement

1. Attach the **GR874-WN** or **GR874-WN3** short circuit termination to the air line. Press the **Preset** button (no. 4 under the System section). This sets the VNA to the factory presets.
2. Press the **Meas 1** button then the softkey for *Reflection*. This sets up the receiver control.
3. Press the **Freq.** button (no. 1 under the Source section), then the softkey *Centre Frequency*. Using the numeric key pad set the center frequency to **550 MHz** for the **GR874-WN** termination or to **450 MHz** for the **GR874-WN3** termination.

4. Press the softkey *Span* and set the span for **200 MHz** using the numeric key pad.
5. Setup the Smith chart display by pressing the **Format** button (no. 5 in the Configure section), then the softkey for *Smith chart*.
6. Display a marker by pressing the **Marker** button (no. 4 in the Configure section)
7. Move the marker using the dial to real positive reflection point on the Smith chart. Record the marker frequency.
8. Press the **Freq.** button
9. Press the *Centre Frequency* softkey.
10. Enter the frequency recorded in step 7 above.
11. Press the *Span* softkey.
12. Enter **50 MHz** using the numeric keys.
13. Press the **Format** button.
14. Press the *SWR* softkey.
15. Press the **Scale** button.
16. Press the *Scale/Div* softkey and enter **5**.
17. Press the **Marker** button.
18. Press the *Marker Search* softkey.
19. Press the *Min Search* softkey.
20. Record the minimum SWR value and the frequency. Print this plot.

Section 6.2 – Input impedance measurement

1. Press the **Freq.** button
2. Press the *Centre Frequency* softkey.
3. Enter the frequency recorded in step 20 above.
4. Press the *Span* softkey.
5. Enter **10 MHz** using the numeric keys.
6. Press the **Format** button.
7. Press the *More Format* softkey.
8. Press the *Impedance Magnitude* softkey.
9. Press the **Scale** button.
10. Press the *Autoscale* softkey.
11. Press the *Phase offset* softkey.

12. Adjust phase offset until the peak of the impedance plot coincides with the marker of step 20 above. NOTE: This phase offset does not correspond to θ!
13. Record the value of the input impedance and print this plot.

Section 6.3 – Q measurement

1. Press the **Marker** button.
2. Press the *Marker Search* softkey.
3. Press the *Bandwidth* softkey.
4. Enter the impedance bandwidth level that corresponds to –(Zin(max)–Zin(max)/√2).
5. Record the bandwidth and the Q (top RHS of the display).

Section 6.4

1. Repeat the steps in Sections 6.1–6.3, using the alternate short-circuit termination.

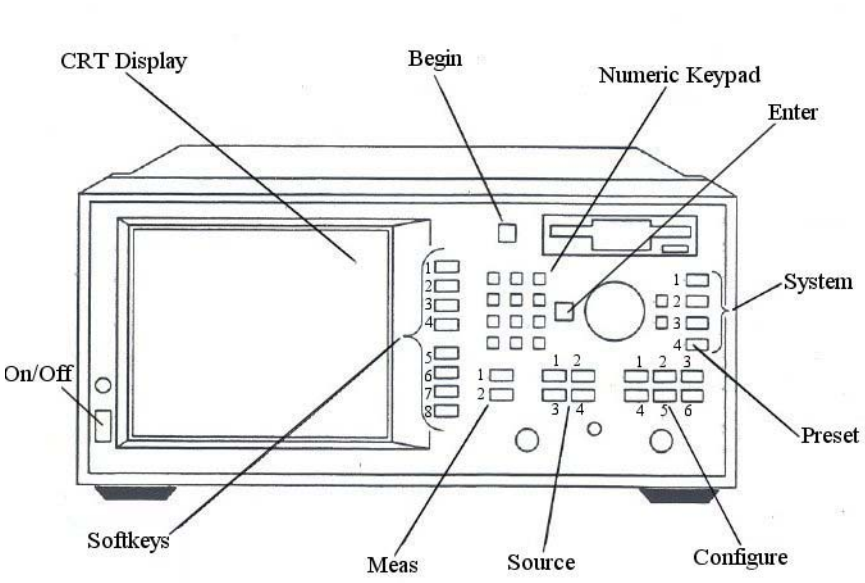

Figure 1.

Meas
1. Meas 1
2. Meas 2

Source
1. Freq.
2. Sweep
3. Power
4. Menu

Configure
1. Scale
2. Display
3. Cal
4. Marker
5. Format
6. Ave

System
1. Save/Recall
2. Hard Copy
3. System Options
4. Preset