

Calibration Data Problems

Certain analyzer problems are caused if the analyzer calibration constants are lost. Calibration constants include correction factors for frequency response flatness and the 20 dB pad. These constants are stored in the EEPROM and are not changed in normal operation. Some of the symptoms of this condition are listed below:

- There is only a flat line at the top of the display instead of the normal trace when signals are present
- One or more spurious signals or random noise spikes appear (they may be only a few dB, up to 30 dB, in amplitude)
- The error message LIN DET FAIL may appear in the active region of the CRT display
- Other numerical messages may appear, such as:

```
SRQ 110
1330 0000000000
5300 0000000000
```

If any of these symptoms appears, turn off the correction feature for a quick test to verify whether the calibration constants have been altered.

1. Connect CAL OUTPUT to RF INPUT.
2. Press CAL [CORRECT/on OFF].
3. The mnemonic CORR at the lower left side of the CRT should disappear and you should see a normal trace with CAL signal harmonics present. If you do not see a normal trace, the problem is usually a gain loss along the signal path. Check the local oscillators' power levels. Connect an external signal source set to 299.9 MHz and -20 dBm to the analyzer INPUT 50 Ω . Verify that the analyzer correctly reads the level as -20 dBm.

If the level is wrong and the first LO level is correct, the first mixer diodes have likely been degraded. The A3A6 First Converter should be replaced.

Check the [CAL DATA DISPLAY] and see if the DAC settings are within the correct ranges; i.e., RL-VENR column should read about 230-240 at the top and decrease to 3-20 at the bottom (these are nominal ranges; the important thing is that the DAC should not be 255 at the top nor 0 at the bottom).

The message 1330 0000000000 can occur when the processor is interrupted by *PRESET* while performing a task. (This can be done inadvertently by the operator.) To restore the analyzer to normal operation, press *SAVE I*, then *PRESET*.

A3A6 First Converter

The A3A6 First Converter requires that the bias on the mixer be changed as the tuning ranges (bands 0 to 4) are changed. Changing the mixer bias optimizes performance in each band.

The short programs included here allow the mixer bias DAC numbers to be entered into the EEPROM (SET_NUMBER) or to be interrogated from the EEPROM (READ_NUMBER)

```

10      |          SET_NUMBER
20      |
30      | THIS PROGRAM ALLOWS YOU TO ENTER THE NECESSARY BIAS NUMBERS
40      | INTO EEPROM AFTER REPLACING THE DUAL MIXER ON A REPAIR
50      |
60      | THE PROGRAM ASKS YOU TO ENTER THE FIVE BIAS NUMBERS FOR THE
70      | NEW MIXER IN SEQUENCE, STARTING WITH BAND 0 THROUGH BAND 4.
80      | THE PROGRAM PUTS EACH NUMBER INTO EEPROM AFTER YOU ENTER IT
90      | AND THEN ASKS YOU FOR THE NEXT NUMBER.
100     |
110     FOR Band=1 TO 5
120         INPUT "ENTER MIXER BIAS DAC NUMBERS ",Bias
130         PRINT "FOR BAND ";Band-1;"MIXER BIAS DAC NUMBER ENTERED IS ";Bias
140         Mxr_eeeprom_adrs=329290
150         OUTPUT 718;"MWR ";329290+(Band-1)*8;Bias
160     NEXT Band
170     END

```

```

10      |          READ_NUMBR
20      |
30      | THIS PROGRAM ALLOWS YOU TO READ OUT THE MIXER BIAS DAC SETTINGS.
40      | IT STARTS WITH THE BIAS NUMBER FOR BAND 0 AND CONTINUES THROUGH
50      | TO THE MIXER BIAS SETTING FOR BAND 4.
60      |
70      | Mxr_eeeprom_adrs=329290
80      | FOR Band=1 TO 5
90      |     OUTPUT 718;"MRD ";329290+(Band-1)*8
100     |     ENTER 718;Bias
110     |     PRINT "FOR BAND: ";Band-1;"THE MIXER BIAS DAC SETTING IS: ";Bias
120     | NEXT Band
130     | END

```

This is a sample printout of mixer bias DAC numbers from the program
READ_NUMBER:

```
FOR BAND:  0 THE MIXER BIAS DAC SETTING IS:  0
FOR BAND:  1 THE MIXER BIAS DAC SETTING IS: 1146
FOR BAND:  2 THE MIXER BIAS DAC SETTING IS:  102
FOR BAND:  3 THE MIXER BIAS DAC SETTING IS: 1077
FOR BAND:  4 THE MIXER BIAS DAC SETTING IS: 368
```

These mixer bias DAC numbers for bands 1 through 4 (i.e., 1146, 102, 1077, and 368) must be entered after the flatness data is entered. After the flatness data for each band (0 to 4) is entered, the processor asks for the mixer bias DAC numbers starting with band 1.

Refer to the section "Entering Calibration Data."

The following CAL_FETCH program will print the mixer bias DAC settings and all of the flatness data for bands 0 through 4:

```
11  RE-STORE "CAL_FETCH:HP9121,700,0"
12  Get_flat_data
13  END
14  SUB Get_flat_data
15  Get_cal_data: 1
16  REAL Start_freq,Stop_freq,Step_freq,Data_addrs,Flat_data(1:5,1:75)
17  INTEGER Band,Num_readings
18  Mxr_eeeprom_adrs=329290
19  FOR Band=1 TO 5
20  OUTPUT 718,"MRD ";329290+(Band-1)*8
21  ENTER 718,Bias
22  PRINT "For Band: ";Band-1;" The mixer bias DAC setting is: ";Bias
23  NEXT Band
```

(Continued on next page)

```

14 High_band_addr=329284
15 Data_addr=329374
16 ASSIGN @Sa TO 718
17 OUTPUT @Sa;"MRD ";High_band_addr
18 ENTER @Sa;High_band
19 |
20 DISP "Getting the measured flatness in the 8592A EEPROM..."
21 |
22 FOR Band=1 TO High_band
23 |
24 |   PRINT
25 |   PRINT
26 |   PRINT "FOR BAND ";Band-1
27 |   PRINT "START FREQ:";
28 |   OUTPUT @Sa;"R0BCDL";Data_addr
29 |   ENTER @Sa;Start_freq
30 |   PRINT Start_freq/1.E+6;"      STOP FREQ:";
31 |   Data_addr=Data_addr+8
32 |   OUTPUT @Sa;"R0BCDL";Data_addr
33 |   ENTER @Sa;Stop_freq
34 |   PRINT Stop_freq/1.E+6;"      STEP FREQ:";
35 |   Data_addr=Data_addr+8
36 |   OUTPUT @Sa;"R0BCDL";Data_addr
37 |   ENTER @Sa;Step_freq
38 |   PRINT Step_freq/1.E+6;"      MHz"
39 |   Data_addr=Data_addr+8
40 |   |
41 |   Num_readings=(Stop_freq-Start_freq)/Step_freq+1
42 |   PRINT "      RELATIVE FLATNESS"
43 |   PRINT "===== "
44 |   FOR Data_ptr=1 TO Num_readings
45 |   |
46 |   |   ! The -100 scales the amplitude to accomodate firmware
47 |   |   |
48 |   |   OUTPUT @Sa;"MRD";Data_addr
49 |   |   ENTER @Sa;Flat_data(Band,Data_ptr)
50 |   |   Flat_data(Band,Data_ptr)=Flat_data(Band,Data_ptr)/(-100)
51 |   |   PRINT USING "S00.00,K,0";PROUND(Flat_data(Band,Data_ptr),-2)," dB"
52 |   |   IF Data_ptr MOD 8=0 OR Data_ptr=Num_readings THEN PRINT
53 |   |   Data_addr=Data_addr+2
54 |   NEXT Data_ptr
55 |   |
56 |   NEXT Band
57 |   |
58 |   ! Reinitialize the check sum...
59 |   |
60 |   |-----
61 SUBEND

```

This is a sample output from the program CAL_FETCH:

For Band: 0 The mixer bias DAC setting is: 2080
 For Band: 1 The mixer bias DAC setting is: 1480
 For Band: 2 The mixer bias DAC setting is: 0
 For Band: 3 The mixer bias DAC setting is: 1350
 For Band: 4 The mixer bias DAC setting is: 580

FOR BAND 0

START FREQ: 12 STOP FREQ: 2092 STEP FREQ: 72 MHz
 RELATIVE FLATNESS

```
*****
+1.02 dB +0.00 dB +.29 dB +.23 dB +0.00 dB -.24 dB -.22 dB -.23 dB
+.10 dB +.04 dB -.06 dB +.05 dB -.18 dB -.21 dB -.23 dB -.42 dB
-.62 dB -.70 dB -.77 dB -.97 dB -.82 dB -1.01 dB -1.31 dB -1.51 dB
-1.25 dB -1.39 dB -1.59 dB -1.24 dB -1.30 dB -1.48 dB -1.31 dB -1.58 dB
-1.83 dB -1.51 dB -1.70 dB -1.82 dB -1.84 dB -1.85 dB -1.97 dB -2.24 dB
-2.91 dB
```

FOR BAND 1

START FREQ: 2750 STOP FREQ: 5900 STEP FREQ: 450 MHz
 RELATIVE FLATNESS

```
*****
-2.84 dB -2.15 dB -2.14 dB -2.18 dB -1.97 dB -2.39 dB -2.03 dB -2.52 dB
```

FOR BAND 2

START FREQ: 6100 STOP FREQ: 12540 STEP FREQ: 460 MHz
 RELATIVE FLATNESS

```
*****
-8.40 dB -8.93 dB -8.36 dB -9.99 dB -10.45 dB -10.03 dB -9.58 dB -8.36 dB
-9.48 dB -9.74 dB -11.06 dB -10.92 dB -10.44 dB -9.52 dB -9.63 dB
```

FOR BAND 3

START FREQ: 12450 STOP FREQ: 19350 STEP FREQ: 230 MHz
 RELATIVE FLATNESS

```
*****
-3.76 dB -3.40 dB -3.38 dB -3.70 dB -4.24 dB -4.72 dB -4.73 dB -5.23 dB
-6.01 dB -5.60 dB -4.90 dB -4.94 dB -5.12 dB -5.22 dB -5.25 dB -5.21 dB
-4.99 dB -5.15 dB -5.97 dB -6.22 dB -6.13 dB -5.88 dB -5.49 dB -5.00 dB
-5.34 dB -6.00 dB -6.20 dB -6.70 dB -6.85 dB -6.56 dB -6.91 dB
```

FOR BAND 4

START FREQ: 19150 STOP FREQ: 22000 STEP FREQ: 150 MHz
 RELATIVE FLATNESS

```
*****
-10.76 dB -10.83 dB -10.89 dB -10.46 dB -10.06 dB -9.97 dB -10.33 dB -10.74 dB
-10.87 dB -10.93 dB -11.18 dB -12.19 dB -12.28 dB -12.73 dB -12.90 dB -12.75 dB
-12.79 dB -12.16 dB -12.25 dB -11.84 dB
```

Checking the Calibration Data

Currently stored calibration data for the analyzer can be displayed using the CAL data display function. To access the data, press the following keys:

CAL [MORE]
[DISPLAY CAL DATA]

Figure 4-3 shows a sample CAL data display and a "map" of the data.

The processor uses the "boxed" values as calibration correction factors. The "dotted" values are calibration constants (i.e., they are the same value in each analyzer).

NOTE for LC-XTAL DACs:

LC COLUMN:

BW's 1 Hz to 30 kHz - 0
BW's 100 kHz to 3 MHz - some setting between 0 and 255
(100 kHz ~ 0, 300 kHz ~ 100, 1 MHz ~ 160, 3 MHz ~ 220)
BW's 10 and 30 MHz - 255

XTAL COLUMN:

BW's 1 Hz to 300 Hz - 255
BW's 1 kHz ~ 220, 3 kHz ~ 160, 10 kHz ~ 100, 300 kHz ~ 10
BW's 100 kHz to 50 MHz - 255

RL_VENR:

This column is the REF_CAL DAC that controls the CAL AMP in the A9 Third Converter.

If the instrument has proper gain steps along the signal path, this DAC (RL_VENR column) should display the nominal range shown in the example in Figure 4-3.

If the RL_VENR column has one or more 255 numbers at the top, suspect a loss of gain in the signal path. To do this, check the power levels of 1st and 2nd Local Oscillators, check the mixer for loss of sensitivity, or the IF section for a gain problem due to excess power or a degraded mixer damaged by electrostatic discharge. The attenuator may cause this apparent gain problem as well.

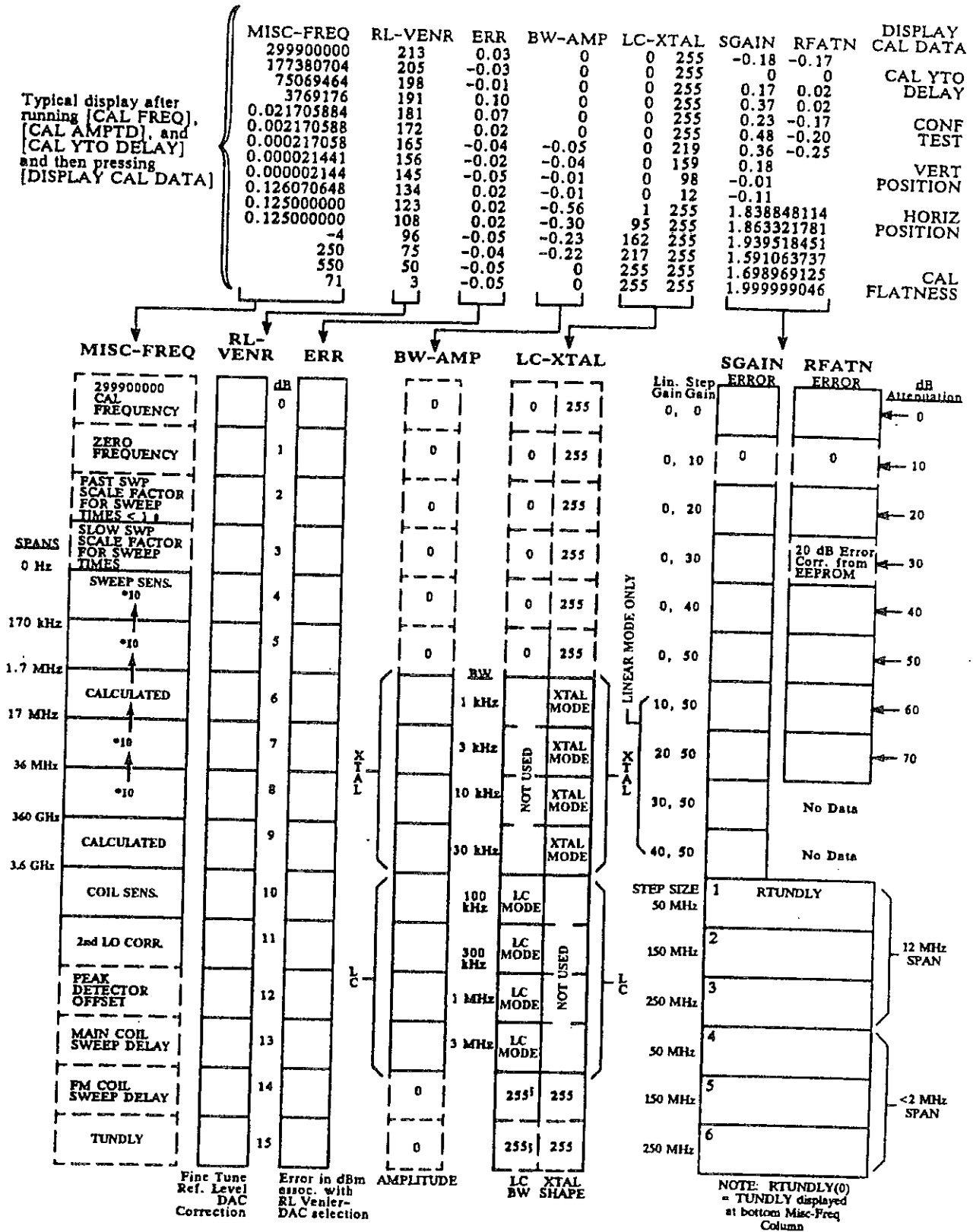


Figure 4-3. Explanation of Calibration Data Display

Entering Calibration Data

If the calibration data is destroyed, the data can be reentered using the procedure given below. This procedure involves two main tasks: setting the attenuator flatness error and entering flatness calibration data.

To set the 20 dB attenuator flatness error:

1. Turn on the analyzer and press the following keys:
PRESET
FREQUENCY ~2001 Hz
CAL [MORE] [CAL FLATNESS]
[SET 20 dB ERR]
2. Enter the 20 dB data entry in dB.

The processor will preset the analyzer.
3. Press:
CAL [CAL FETCH] [MORE] [DISPLAY CAL DATA]
4. Check to see that the 20 dB attenuator flatness error has been correctly entered (refer to Figure 4-3).

To enter the flatness calibration data:

1. Turn on the analyzer and press the following keys:
FREQUENCY ~2001 Hz
CAL [MORE] [CAL FLATNESS]
[ENTER FLT ERR]

The active area of the CRT displays:

START
0 HZ
ENTER START FREQUENCY

2. Enter the start, stop, and CF step size.

NOTE

Enter the information for each band, one band at a time, starting with band 0 through band 4.

3. Sequentially enter the flatness calibration data for each band's frequency limits. End each set of data entry by pressing:
MHz

As you enter the last data for bands 0 to 3, the processor will automatically ask for the start, stop, and step numbers of the next band.

4. After the last data is entered for band 4, the processor will ask for mixer bias DAC numbers to be entered. It asks for each band number, one band at a time. Terminate the number entry by pressing *ENTER*.
5. After the mixer bias DAC number for band 4 is entered and terminated by pressing *ENTER*, the processor presets the spectrum analyzer.

Press:

CAL [*CAL FETCH*] [*MORE*] [*DISPLAY CAL DATA*]

6. Check to see that flatness calibration data has been correctly entered (refer to Figure 4-3).