MODEL 6769A
SWEPT FREQUENCY SYNTHESIZER

MAINTENANCE MANUAL

67xx A

CALIBRATION / ADJUSTMENTS

WILTRON

490 JARVIS DRIVE • MORGAN HILL, CA 95037-2809
TEL. (408) 778-2000 • TELEX 285227 WILTRON MH • FAX 408-778-0239

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SECTION III
CALIBRATION / ADJUSTMENTS

CONTENTS

SECTION III
CALIBRATION/ADJUSTMENTS

3-1 INTRODUCTION

This section contains calibration and adjustment procedures for 67XXA Swept Frequency Synthesizers. These procedures are typically accomplished due to out-of-tolerance conditions having been noted during performance verification testing (see Section II) or as a result of the repair or replacement of subassemblies or microwave components.

NOTE

The calibration procedures herein use hidden-key routines that were implemented with version 6.10 operating firmware. It is recommended that you upgrade your instrument's operating firmware to the latest available version prior to calibration. For assistance in calibrating instruments containing older versions of operating firmware or for firmware upgrade details, contact Wiltron Customer Service at (408) 778-2000.

3-2 RECOMMENDED TEST EQUIPMENT

Table 3-2 lists the test equipment required for these calibration and adjustment procedures.

The procedures refer to specific test equipment front panel control labels when the setup parameters of the procedure are critical to making accurate measurements. In some cases, the user may substitute equipment having the same critical specifications as those of the recommended test equipment listed in Table 3-2.

Contact the WILTRON Custromer Service department at (408) 778-2000 if you need clarification of any equipment or procedural reference.

3-3 CALIBRATION/ADJUSTMENT TEST RECORD

A blank copy of a sample calibration/adjustments test record is provided in Section IV, Test Records. The test record contains model-specific variables called for by the procedures in this section and provides the means for maintaining an accurate and complete record of calibration/adjustments to the instrument. We recommend that you copy these pages and record on them the results from: (1) your initial calibration/adjustment of out-of-tolerance 67XXA circuits, or (2) your initial calibration/adjustment of the 67XXA following repair or replacement of subassemblies or microwave components. These initial readings can later be used as benchmark values for future tests of the same serial-numbered instrument.

3-4 STATIC HANDLING PROCEDURES

The 67XXA contains components that can be damaged by static electricity. Figure 6A-1 (see Section VI) provides a list of precautions that, when followed, will minimize the possibilities of static-shock damage to components.

3-5 CALIBRATION/ADJUSTMENTS FOLLOWING COMPONENT REPAIR OR REPLACEMENT

Table 3-1 lists the calibration/adjustments that should be performed following the repair or replacement of 67XXA subassemblies or microwave components.

3-6 CONNECTOR AND KEY LABEL NOTATION

The calibration and adjustment procedures include many references to equipment interconnections and control settings. For all 67XXA references, specific labels are used to denote the appropriate control key or connector (such as CW OUTPUT SELECT or RF OUTPUT). Most references to supporting test equipment use general labels for commonly used controls and connections (such as Span or RF Input). In some cases, a specific label is used that is a

particular feature of the test equipment listed in Table 3-2.

Many of the 67XXA front panel control keys, when pressed, cause an LED indicator next to the key to light verifying the selection. Observe the lighting of the LED indicator to ensure that the desired function is enabled.

During calibration/adjustment procedures, three additional LED indicators that should be monitored are the ENTRY ACTIVE, RF UNLEVELED, and NOT Ø-LOCKED indicators. The lighting on the ENTRY ACTIVE LED indicates that the Data Entry function is active. When in the step sweep or CW modes of operation, the lighting of the RF UNLEVELED LED or NOT Ø-LOCKED LED may signal a situation that is the result of an instrument failure and may cause errant calibration/adjustment results.

3-7 HIDDEN-KEY ROUTINES

The <Shift> TRIGGER key in conjunction with a 3 digit code inplements the 67XXA's hidden-key routines. These routines are used in calibration and troubleshooting. Table 3-3 provides descriptions of the routines used in calibration. Once a hidden-key routine has been activated, the keys used (except for the DATA ENTRY keypad) have different functions than are indicated by the 67XXA's front panel markings.

Care must be exercised when entering <Shift> TRIGGER codes during calibration or troubleshooting procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

3-8 GENERATING EEPROM CHECKSUMS FOLLOWING CALIBRATION

During calibration procedures, calibration data is stored in the non-volatile memory (EEPROMs) located on the A23 Microprocessor PCB. Upon completion of 67XXA calibration, you should generate new checksums for the EEPROMs. Failure to do so will result in checksum error codes E23-17, E23-18, and E23-19.

EEPROM checksums are generated by (1) placing the CAL/NORM jumper on the A23 Microprocessor PCB in the CAL position and (2) pressing <Shift> TRIGGER 089, then <Shift> TRIGGER 397. The EEPROM checksums have now been generated. Restore the CAL/NORM jumper to the NORM positon.

Table 3-1. Calibration/Adjustments Following 67XXA Component Repair or Replacement

If a Repair or Replacement Action Was Made To:	Perform the Following Adjustment(s) or Calibration(s) in Paragraph(s):
A1 Front Panel PCB	None
A2 Front Panel Control PCB	3-11
A3 Coarse Loop Mixer PCB	None
A4 Coarse Loop Oscillator PCB	See troubleshooting in section 6H for calibration/adjustment procedures.
A5 Reference Oscillator PCB	See troubleshooting in section 6G for calibration/adjustment procedures.
A6 Coarse Loop Divider PCB	None
A7 Reference Divider PCB	None
A8 Serial I/O PCB	None
A9 Fine Loop Oscillator PCB	None
A10 Reference Buffer PCB	None
A11 Fine Loop Divider PCB	None
A12 YIG Phase Detector PCB	3-22
A13 Pulse Generator PCB	None
A15 ALC PCB	3-10, 3-13, 3-17, 3-18, 3-19, 3-20
A16 FM PCB	3-14, 3-15, 3-16, 3-21, 3-22, 3-23
A17 Analog Instruction PCB	3-14, 3-16
A18 thru A21 YIG Driver PCBs	3-15, 3-16, 3-21, 3-22
A22 Regulator Interface PCB	None
A23 Microprocessor PCB	3-13 thru 3-23. None, if firmware EEPROMs are reused.
A24 GPIB PCB	None
A25 Switching Power Supply PCB	3-9
A27 Aux I/O PCB	None
A28 Motherboard PCB	None
A29 Rear Panel Interface PCB	3-13, 3-18
A30 Sampler/IF Amplifier PCB	None
A31 Power Amplifier PCB	None
Any YIG-tuned Oscillator	3-13, 3-15, 3-16, 3-21, 3-22
Any Isolator	3-13
Any Control Modulator	3-13
Any Low Pass Filter	3-13
0.01 to 2 GHz Downconverter	3-13, 3-17, 3-18
Switched Filter	3-13
Frequency Doubler (26.5-to-40 GHz)	3-13
Main Multiplexer (PIN) Switch	3-13
Leveling Detector/Directional Coupler	3-13, 3-17, 3-18
Sampler Multiplexer (PIN) Switch	None
Any RF Amplifier (High Power Option) and/or Optional Step Attenuator	3-13, 3-18 (Step Attenuators Only)

Table 3-2. Recommended Test Equipment Used in the Calibration/Adjustments

INSTRUMENT	CRITICAL SPECIFICATION	RECOMMENDED MANUFACTURER/MODEL	REQUIRED FOR TEST(S)
Spectrum Analyzer with Diplexer and External Mixers	*Frequency:* 0.01 to 40 GHz *Resolution:* 30 Hz	Tektronix, Model 494P Ext. Mixer PNs: WM 490K (18 to 26.5 GHz) WM 490A (26.5 to 40 GHz) Diplexer PN: 015-3085-00	3-19, 3-21, 3-22
Frequency Counter	*Frequency:* 0.01 to 40 GHz *Input Impedance:* 50Ω *Resolution:* 1 Hz *Other:* Ext Time Base Input	EIP Microwave, Inc. Model 578A, Option 91	3-12, 3-16
Digital Voltmeter	*Resolution:* 4-1/2 digits (to 20V) *DC Accuracy:* 0.002% + 2 counts *DC Input Impedance:* 10 MΩ *AC Accuracy:* 0.07% + 100 counts (to 20 kHz) *AC Input Impedance:* 1 MΩ	John Fluke, Inc. Model 8840A With Option 8840A-09 (True RMS AC)	3-10, 3-11, 3-13, 3-19, 3-20, 3-21, 3-22, 3-23
Frequency Standard	*Frequency:* 10 MHz *Accuracy:* 1 x 10^{-10} parts/day	Spectracom Corp. Model 8161	3-12
Function Generator	*Output Voltage:* 300 mV to 10V *Functions:* 200 kHz sine wave, 100 Hz square wave	Hewlett-Packard Model 8116A	3-13, 3-19, 3-20, 3-21, 3-22, 3-23
Oscilloscope	*Bandwidth:* dc to 150 MHz *Sensitivity:* 2 mV *Horiz. Sensitivity:* 50 ns/division	Tektronix, Inc. Model 2445	3-9, 3-13
Scalar Network Analyzer	*Frequency Range:* 0.01 to 40 GHz	Wiltron Model 562, with 560-7K50 Option 2 RF Detector	3-18
Microwave (Pulse) Detector	*Output Polarity:* Negative *Frequency Range:* dc to 40 GHz	Wiltron Company Model 75KC50	3-13
Modulation Analyzer	*Frequency Input:* 10 MHz (or the IF of the spectrum analyzer) *FM Max. Deviation:* 500 kHz *FM Accuracy:* ±1% to 100 kHz rate *AM Depth:* 0% to 90% *AM Mod. Rates:* dc to 100 kHz *AM Accuracy:* ± 3% *Filters:* 50 Hz lowpass, 15 kHz highpass	Hewlett-Packard Model 8901A	3-19
Tee	*Connectors:* 50Ω BNC	Any Common Source	3-13, 3-19, 3-20, 3-21, 3-22, 3-23
Cables	*Connectors:* 50Ω BNC	Any Common Source	All Tests

Table 3-3. Descriptions of Calibration Related Hidden-Key Routines (1 of 2)

<Shift> TRIGGER Code	Function
009	Displays the software version number in the FREQUENCY display. <Shift> exits this function.
050	Calibrates the ALC slope for the heterodyne band (<2 GHz).
051	Calibrates the ALC slope for the ≥2 GHz frequency bands.
089	Enables access to hidden-key routines that have <Shift> TRIGGER codes from 300 to 599. These routines are used in calibration or to check out the DACs to be calibrated.
300	Enables direct control of the A17 PCB Tune DAC. No calibration is performed.
301	Enables direct control of the A17 PCB Linearizer DAC. No calibration is performed.
302	Enables direct control of the A15 PCB ALC Level DAC. No calibration is performed.
303	Enables direct control of the A15 PCB ALC Level Range DAC. No calibration is performed.
305	Enables direct control of the A15 PCB External ALC Gain DAC. No calibration is performed.
306	Enables direct control and calibration of the A15 PCB %AM DAC (AM Sensitivity). (Code must be re-entered prior to calibration of each installed frequency band).
307	Enables direct control of the A16 PCB FM Sensitivity Cal DAC (FM Driver Output). No calibration is performed.
308	Enables direct control and calibration of the A16 PCB FM Attn DAC (FM Input Sensitivity). (Code must be re-entered prior to calibration of each installed frequency band).
309	Enables direct control of the A15 PCB ALC Slope DAC. No calibration is performed.
310	Enables direct control of the A17 PCB Sweep Width DAC. No calibration is performed.
312	Enables direct control of the A17 PCB Sweep Time DAC. No calibration is performed.
313	Enables direct control of the A17 PCB Marker/Switch Point DAC. No calibration is performed.
314	Enables direct control of the A29 PCB CW Horiz DAC. No calibration is performed.
315	Enables direct control of the A29 PCB V/GHz Width DAC. No calibration is performed.
316	Enables direct control of the A29 V/GHz Offset DAC. No calibration is performed.
317	Enables direct control and calibration of the A16 PCB Phase Mod Cal DAC (FM Flatness). (Code must be re-entered prior to calibration of each installed frequency band).
319	Enables direct control of the A17 PCB Linearizer DAC. No calibration is performed.
340	Calibrates the FM meter when there is no input voltage.
341	Calibrates the FM meter when there is a 1V peak (.707 Vrms) input.
342	Calibrates the AM meter when there is no input voltage.
343	Calibrates the AM meter when there is a 1V peak (.707 Vrms) input.
390	Zeros out the A17 PCB Linearizer DAC calibration.
391	Zeros out the frequency calibration for the C/S Band (2 to 8 GHz).
392	Zeros out the frequency calibration for the X Band (8 to 12.4 GHz).
393	Zeros out the frequency calibration for the Ku Band (12.4 to 20 GHz).
394	Zeros out the frequency calibration for the K Band (20 to 26.5 GHz).

Table 3-3. Descriptions of Calibraton Related Hidden-Key Routines (2 of 2)

<Shift> TRIGGER Code	Function
395	Zeros out the A16 PCB FM Attn DAC (FM Input Sensitivity) calibration.
396	Zeros out the A15 PCB %AM DAC (AM Sensitivity) calibration.
397	Generates memory checksum for the A23 PCB EEPROMs. Must be done anytime calibration of the 67XXA instrument is performed to eliminate checksum error codes.
398	Zeros out the AM meter calibration.
399	Zeros out the frequency calibration for the Ka Band (26.5 to 40 GHz).
400	Automatically calibrates the A16 PCB FM Sensitivity Cal DAC (FM Driver Output) for the current frequency band.
402	Calibrates the ALC bandwidth for each frequency band. (Code must be re-entered prior to calibration of each installed frequency band).
403	Automatically calibrates the analog sweep time, both the ≤1second and >1 second ranges.
404	Automatically calibrates the A16 PCB FM Sensitivity Cal DAC (FM Driver Output) for all installed frequency bands.
405	Automatically calibrates the paths used by analog sweeps.
406	Automatically calibrates the path used by narrow band sweeps (analog sweeps of ≤50 MHz).
460	Calibrates the YIG output frequency for each band. Code must be re-entered prior to calibration of each installed frequency band.

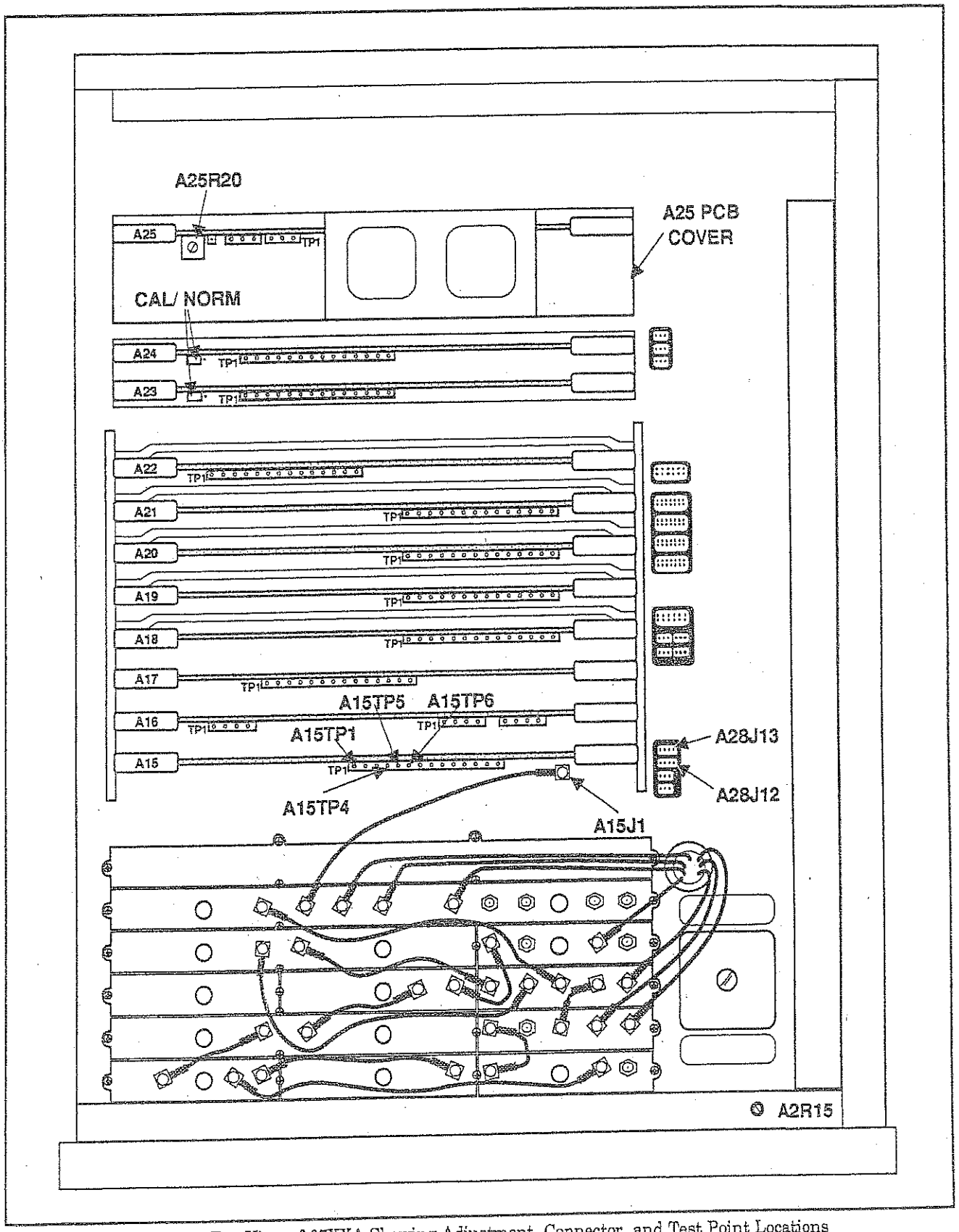

Figure 3-1. Top View of 67XXA Showing Adjustment, Connector, and Test Point Locations

3-9 POWER SUPPLY INJECTION-LOCK ADJUSTMENT

a. Procedure Description

This procedure provides the steps necessary to perform the Power Supply Injection-Lock adjustment. This adjustment is required following replacement of the A25 Switching Power Supply PCB. The adjustment synchronizes the power supply's 50 kHz switching rate to the 10 MHz crystal oscillator reference to eliminate intermodulation products.

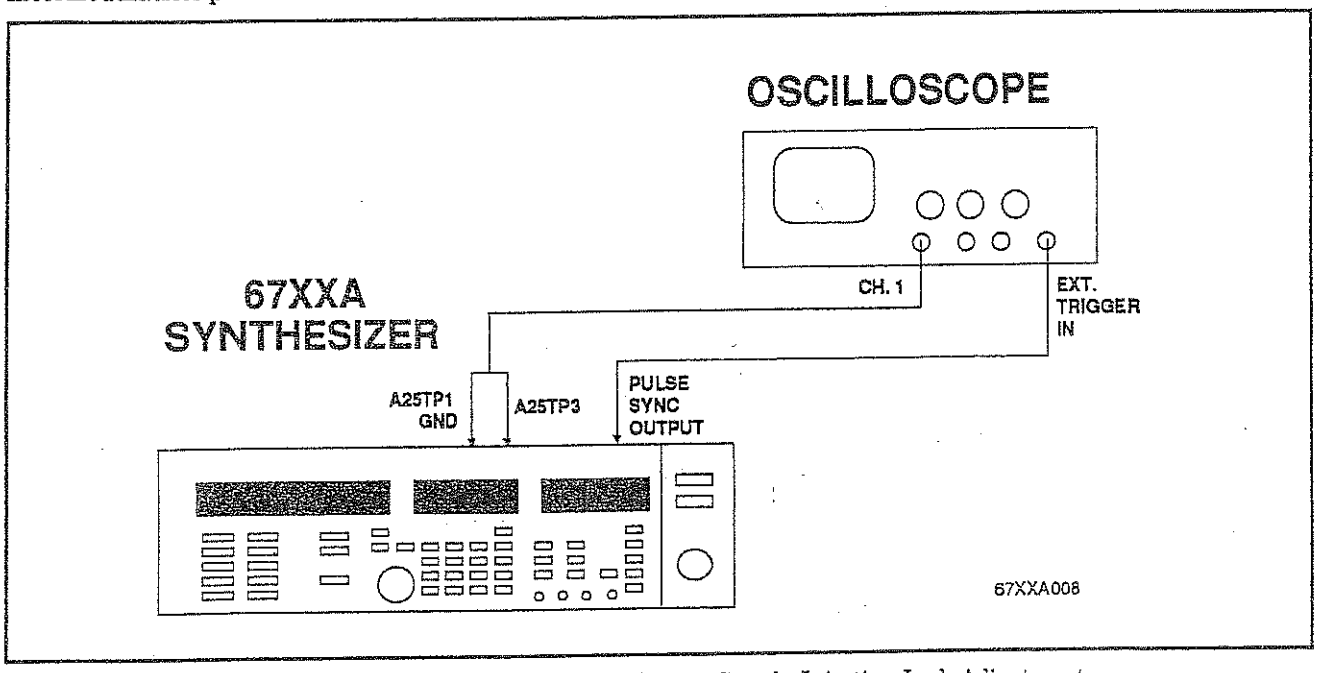

Figure 3-2. Test Equipment Setup for Power Supply Injection-Lock Adjustment

b. Test Equipment Setup

1. On the 67XXA:
   (a) Press LINE key to STDBY (STDBY indicator will light).
   (b) Disconnect the line power cord.
   (c) Remove the cover from the A25 PCB housing (see Figure 3-1).

WARNING

Voltages hazardous to life are present when the cover is removed from the A25 housing. High-voltage connections on both the A25 PCB and the A25 heat sink are exposed.

2. Connect the equipment as shown in Figure 3-2.
   (a) Connect the Oscilloscope Channel 1 to the 67XXA as follows:
      (1) Connect the coax center conductor to test point A25TP3 (see Figure 3-1).
      (2) Connect the coax ground (shield) to test point A25TP1.
   (b) Connect the 67XXA rear panel PULSE SYNC OUTPUT to the Oscilloscope EXT TRIGGER IN.

3. On the 67XXA:
   (a) Reconnect the line power cord.
   (b) Press the LINE key to ON (ON indicator will light).

c. Injection-Lock Adjustment

1. Set up the Oscilloscope as follows:
   (a) Vertical: 5V/div
   (b) Horizontal: 5 µs/div
   (c) Trigger: External

2. Set up the 67XXA as follows:
   (a) Press INT PULSE.
   (b) Press <Shift> INT WIDTH.
   (c) Enter 10 µs.
   (d) Press <Shift> INT RATE.
   (e) Enter 50 kHz.

3. On the 67XXA, adjust A25R20 (see Figure 3-1) to provide a stable squarewave display on the Oscilloscope.

4. Rotate A25R20 slightly to each side of the setting that provides the stable squarewave display, carefully noting the adjustment positions at which the squarewave display becomes unstable.

5. Reset A25R20 exactly half-way between the positions at which the squarewave display becomes unstable.

6. Inscribe a mark on the potentiometer to show the position of this optimum setting.

7. On the 67XXA:
   (a) Press the LINE key to STDBY (STDBY indicator will light).
   (b) Disconnect the line power cord.
   (c) Replace the cover on the A25 PCB housing.

3-10 ALC LEVEL OFFSET ADJUSTMENTS

a. Procedure Description

This procedure provides the steps necessary to perform the ALC Level Offset adjustment. This adjustment is required following replacement of the A15 ALC (Automatic Level Control) PCB. The adjustment sets the offset voltage to balance the ALC Band 0 and Band 1 to 5 Detector Preamplifiers.

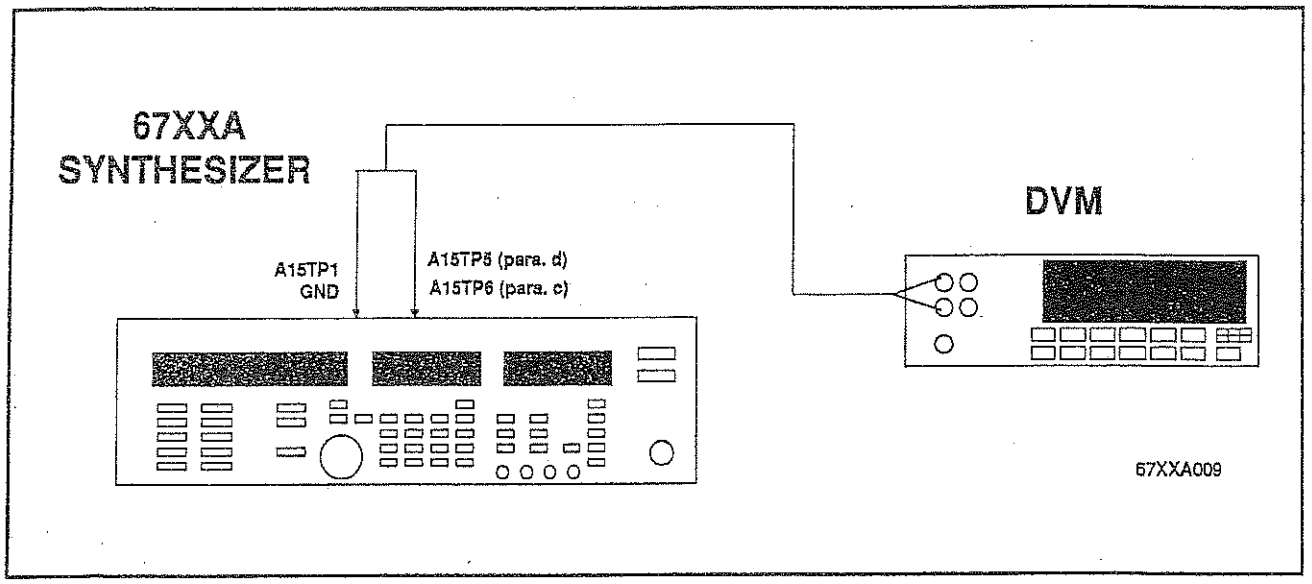

Figure 3-3. Test Equipment Setup for ALC Level Offset Adjustment

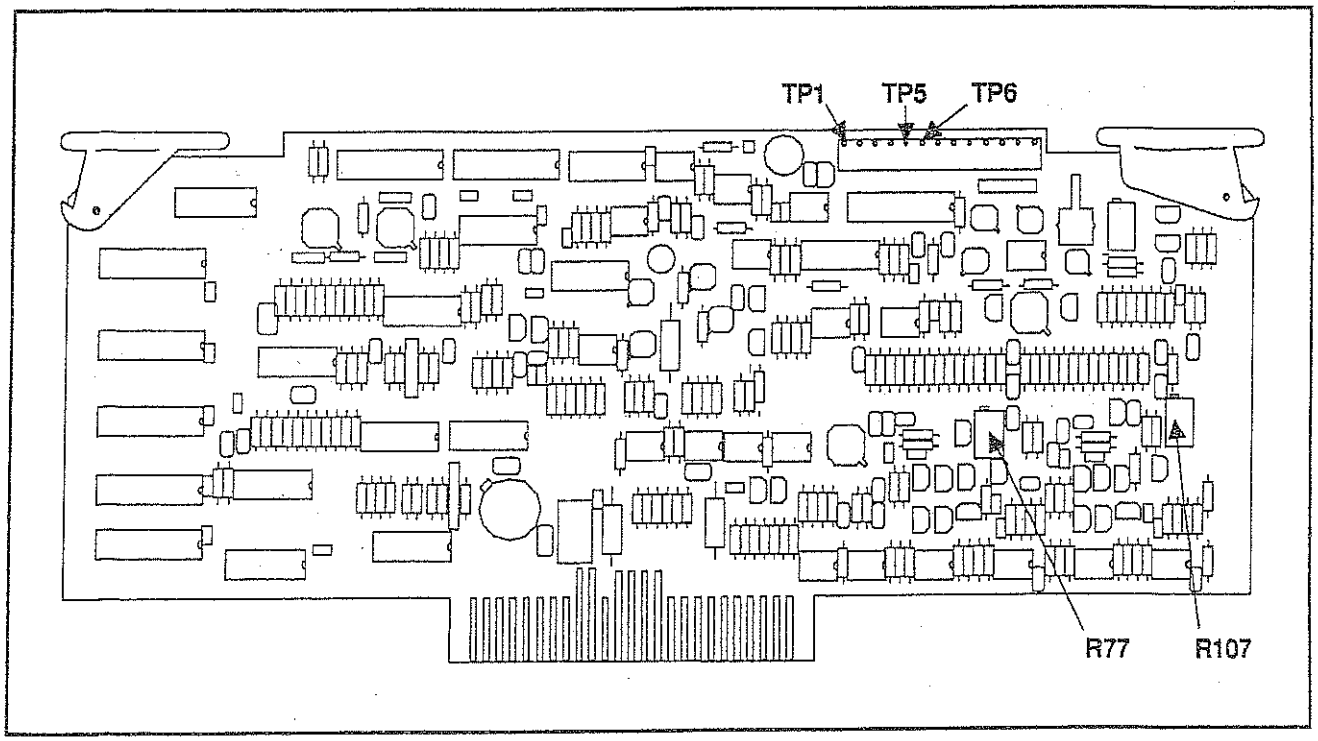

Figure 3-4. A15 ALC PCB Test Point and Adjustment Locations

b. Test Equipment Setup

1. Connect the equipment as shown in Figure 3-3 (see Figure 3-1 for test point locations).

c. Band 0 Level Offset Adjustment

NOTE

For 67XXA models without Band 0 (0.01 to 2 GHz), remove the cable from A28J12 and temporarily connect it to A28J13 (see Figure 3-1).

1. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) Press CW OUTPUT SELECT.
   (c) Enter the frequency indicated on the Test Record.
   (d) Press RF ON/OFF to turn the RF off (RF OFF indicator will light).

2. Set the Digital Voltmeter (DVM) to read dc voltage and connect as follows:
   (a) Connect the DVM (+) lead to the 67XXA test point A15TP6 (see Figure 3-1).
   (b) Connect the DVM (–) lead to the 67XXA test point A15TP1 (see Figure 3-1).

3. On the 67XXA A15 PCB, adjust A15R77 for 0 Vdc ±50 µVdc (see Figure 3-4). Record this voltage on the Test Record.

4. If the cable to A28J12 was connected to A28J13 for this adjustment, restore it to A28J12.

d. Band 1 to 5 Level Offset Adjustment

1. On the 67XXA:
   (a) Press CW OUTPUT SELECT.
   (b) Enter the frequency indicated on the Test Record.

2. Connect the DVM (+) lead to 67XXA test point A15TP5 (see Figure 3-1).

3. On the 67XXA A15PCB, adjust A15R107 for 0 Vdc ±50 µVdc (see Figure 3-4). Record this voltage on the Test Record.

3-11 EXTERNAL LEVELING OFFSET ADJUSTMENT

a. Procedure Description

This procedure provides the steps necessary to perform the External Leveling Offset adjustment. This adjustment is required following replacement of the A2 Front Panel PCB. The adjustment sets the offset voltage to balance the External Level Detector Amplifier.

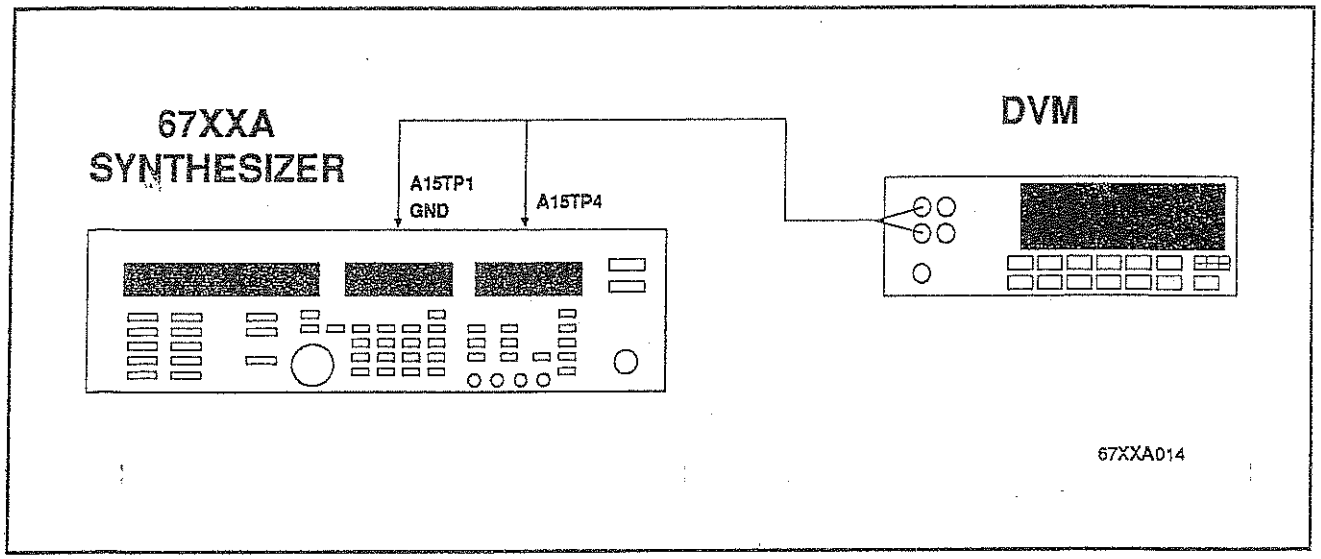

Figure 3-5. Test Equipment Setup for External Leveling Offset Adjustment

b. Test Equipment Setup.

1. Connect the equipment as shown in Figure 3-5 (see Figure 3-1 for test point location).

c. Leveling Offset Adjustment

1. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) Press the LEVELING key to light the EXT DETECTOR indicator.

2. Set the Digital Voltmeter (DVM) to read dc voltage and connect as follows:

3. Connect the DVM (+) lead to the 67XXA test point A15TP4 (see Figure 3-1).

4. Connect the DVM (–) lead to the 67XXA test point A15TP1 (see Figure 3-1).

5. On the 67XXA A2 PCB, adjust A2R15 for 0 Vdc ±1 mVdc (see Figure 3-1 for A2R15 location). Record this voltage on the Test Record.

3-12 10 MHz REFERENCE OSCILLATOR CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform the 10 MHz Reference Oscillator calibration. This calibration may be required at periodic intervals and following replacement of the 10 MHz Reference Oscillator.

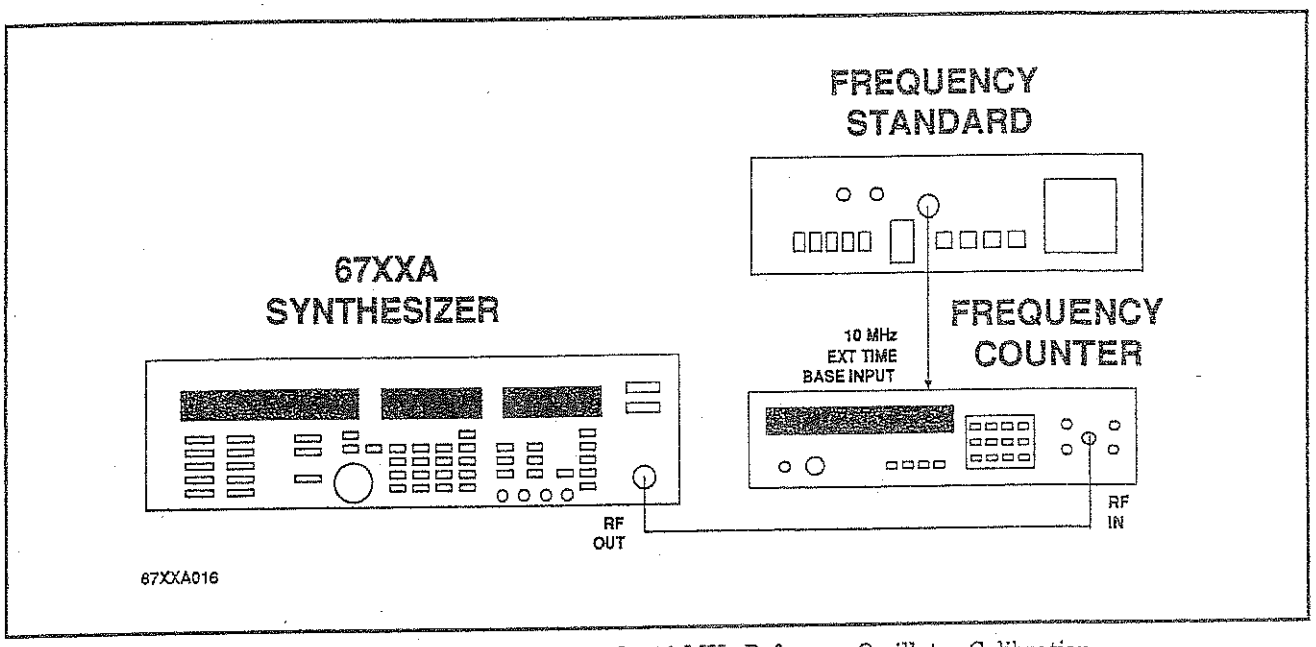

Figure 3-6. Test Equipment Setup for 10 MHz Reference Oscillator Calibration

b. Test Equipment Setup

1. Connect the equipment as shown in Figure 3-6.
   (a) Connect the 67XXA RF OUTPUT to the Frequency Counter RF Input.
   (b) Connect the Frequency Standard 10 MHz Output to the Frequency Counter 10 MHz External Time Base Input.

2. On the 67XXA, press the LINE key to STDBY (STDBY indicator will light). Allow the 67XXA to run in standby mode for 48 continuous hours.

3. Press the LINE key to ON two hours prior to calibration.

c. Reference Oscillator Calibration

1. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) Press CW OUTPUT SELECT.
   (c) Enter the frequency indicated on the Test Record.

2. Remove the adjustment-access screw from the top of the 10 MHz Reference Oscillator oven (see Figure 3-7).

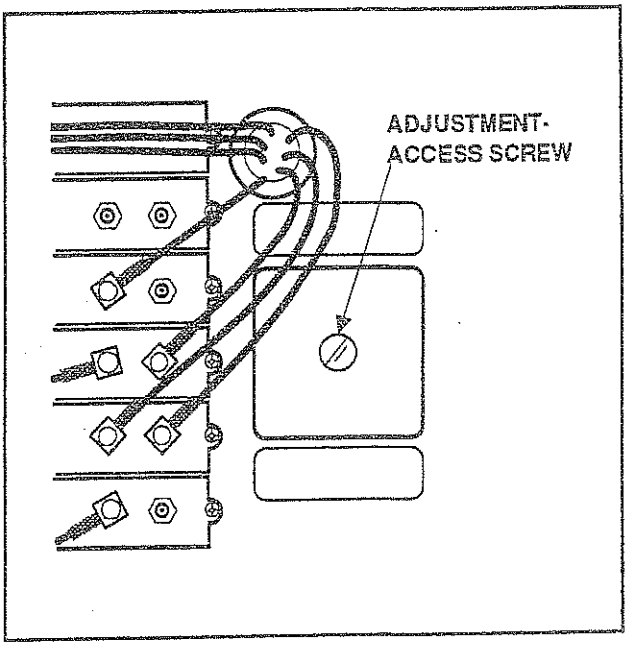

Figure 3-7. 10 MHz Reference Oscillator Oven Tuning Screw Location

3. Using a non-magnetic screwdriver, adjust the potentiometer located inside the oven housing to obtain a Frequency Counter reading equal to the frequency shown on the Test Record (to within ±100 Hz).

4. Using the handle of a screwdriver or similar device, tap the 10 MHz Reference Oscillator oven housing sharply while watching the frequency counter display for any variance. Readjust the potentiometer if necessary.

5. Repeat step c.4 as necessary to ensure frequency stability of the oscillator.

6. Replace the adjustment-access screw. This completes the 10 MHz Reference Oscillator calibration.

3-13 ALC BANDWIDTH CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform ALC Bandwidth calibration. This calibration may be required following replacement of either the A15 ALC PCB, the A29 Rear Panel Interface PCB, a YIG-tuned Oscillator, an Isolator, a Control Modulator, a Low Pass Filter, the 0.01 to 2 GHz Downconverter, the Switched Filter, the Frequency Doubler, a High Power Option RF Amplifier, the Main Multiplexer (PIN) Switch, the Leveling Detector/Directional Coupler, a Step Attenuator, or the A23U27 IC. The calibration determines the correct settings for the ALC Gain DAC and saves the values in EEPROM (A23U27). The ALC Gain DAC adjusts the overall ALC loop gain and bandwidth for each installed frequency band.

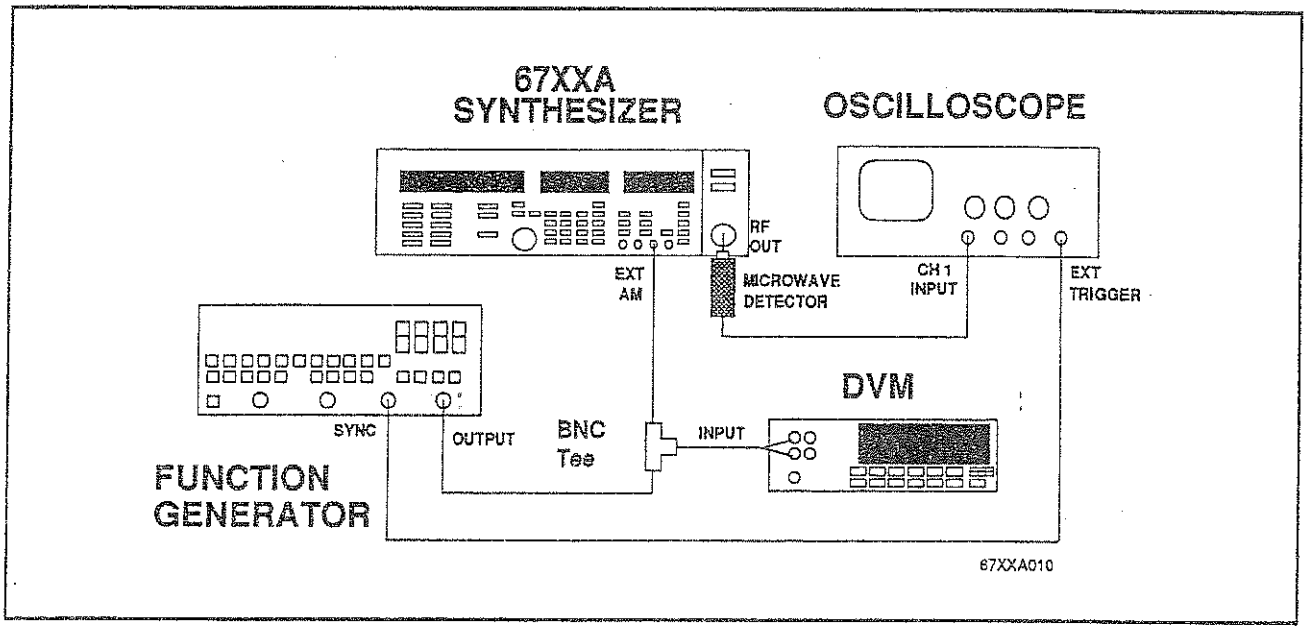

Figure 3-8. Test Equipment Setup for ALC Bandwidth Calibration

b. Test Equipment Setup

1. Connect the equipment as shown in Figure 3-8.
   (a) Connect the Function Generator output to the BNC tee. Connect one leg of the tee to the 67XXA front panel EXT AM input. Connect the other leg of the tee to the DVM input.
   (b) Connect the Function Generator SYNC output to the EXT TRIGGER input of the Oscilloscope.
   (c) Connect the Microwave Detector output to the Vertical input (CH1) of the Oscilloscope.
   (d) Connect the Microwave Detector input to the 67XXA RF OUTPUT.
   (e) On the Oscilloscope, select 50Ω Input Impedance.

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. Bandwidth Calibration

1. Adjust the Function Generator for a sinewave output of 1 kHz, with an amplitude of 0.707 Vrms ± 0.5% and no dc offset. The generator voltage must be set while connected to the 67XXA EXT AM input through the BNC tee.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) Set the output power to +2 dBm.

(c) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
(d) Press CW OUTPUT SELECT.
(e) Enter the frequency indicated on the Test Record.
(f) Press AM.
(g) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 402. This places the instrument in calibration mode.

NOTE

The calibration frequency is shown in the FREQUENCY display and the ALC gain DAC setting is shown in the MODULATION/TIME display.

3. On the Oscilloscope, adjust the vertical gain control for a vertical deflection of 6 major divisions.

4. On the Function Generator, adjust the output frequency to 30 kHz if calibrating bands 0 and 1 (frequencies 0.01 to 8 GHz) or 50 kHz if calibrating Bands 2 through 5 (frequencies 8 to 40 GHz).

5. On the Oscilloscope the vertical deflection should not be less than 4.2 divisions.

6. On the 67XXA, press SET INCR/DECR SIZE then enter 1 kHz.

7. While observing the Oscilloscope display, press the INCR or DECR keys to readjust the DAC for a vertical deflection of 6 major divisions.

8. On the 67XXA, press RECALL. The FREQUENCY display indication advances to the next calibration frequency.

9. Repeat steps c.7 and c.8 until the calibration frequency shown in the FREQUENCY display returns to the bottom frequency of the band.

10. On the 67XXA, press <Shift> to return from the calibration mode.

11. If the 67XXA instrument is a multiband unit, press CW OUTPUT SELECT, then enter the next frequency indicated on the Test Record. If the 67XXA instrument is a single band unit skip to step c.14.

12. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 402 to place the instrument in calibration mode.

13. Repeat steps c.3 through c.12 for each remaining band.

14. When all bands have been calibrated, press <Shift> to exit the calibration mode.

15. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397. This generates new EEPROM checksums.

16. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the ALC Bandwidth calibration.

3-14 ANALOG SWEEP CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform Analog Sweep calibration. This calibration is required following replacement of either the A16 FM PCB, the A17 Analog Instruction PCB, or the A23U27 IC. The procedure calibrates the analog sweep times and analog sweep tuning ramps for all installed frequency bands and saves the calibration data in EEPROM (A23U27). Analog sweep time is controlled by the setting of the A17 Sweep Time DAC. The analog sweep tuning ramps are controlled by the settings of A17 Marker-Switch Point DAC, the A17 Sweep Width DAC, and the A17 Tune DAC.

b. Test Equipment Setup.

1. No test equipment is required for this calibration.

> ***CAUTION***
>
> Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. Sweep Calibration

1. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
   (c) Press CW OUTPUT SELECT.
   (d) Enter the frequency indicated on the Test Record.
   (e) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 403. This automatically calibrates the analog sweep time for the ≤1 second and the >1 second ranges.
   (f) Press <Shift> TRIGGER 405. This automatically calibrates the different paths used by the analog sweep.
   (g) Press <Shift> TRIGGER 406. This automatically calibrates the path used by narrow band sweeps (analog sweeps of ≤50 MHz).
   (h) Press <Shift> TRIGGER 397. This will generate new EEPROM checksums.
2. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the Analog Sweep calibration.

3-15 FM DRIVER CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform FM Driver calibration. This calibration is required following replacement of either the A16 FM PCB, any of the A18 thru A21 YIG Driver PCBs, any of the YIG-tuned Oscillators, or the A23U27 IC. The calibration determines the correct settings for the A16 FM Sensitivity Cal DAC for each installed YIG-tuned Oscillator and saves the values in EEPROM (A23U27). The A16 FM Sensitivity Cal DAC compensates for variations in YIG-tuned Oscillator sensitivities and YIG loop components by setting a YIG driver sensitivity of 5 MHz/V for each installed YIG-tuned Oscillator. This results in a more constant YIG loop gain.

b. Test Equipment Setup

1. No test equipment is required for this calibration.

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. FM Driver Calibration

1. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper in the CAL position (see Figure 3-1).
   (c) Press CW OUTPUT SELECT.
   (d) Enter the frequency indicated on the Test Record.
   (e) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 404. The automatic calibration process takes approximately 15 seconds to complete.
   (f) Press <Shift> TRIGGER 397. This will generate new EEPROM checksums.

2. This completes the FM Driver calibration. Restore the A23 PCB CAL/NORM jumper to the NORM position.

3-16 YIG-TUNED OSCILLATOR FREQUENCY CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform YIG-tuned Oscillator Frequency calibration. This calibration is required following the replacement of either the A16 FM PCB, the A17 Analog Instruction PCB, any of the A18 thru A21 YIG Driver PCBs, any of the YIG-tuned Oscillators, or the A23U27 IC. The procedure determines the correct settings for the A17 Tune DAC and the A17 Linearizer DAC for each installed frequency band and stores the calibration data in EEPROM (A23U27). The A17 Tune DAC and the A17 Linearizer DAC adjust the YIG-tuned Oscillators for an accurate, linear frequency output (to within ±2 MHz) throughout the range of each installed frequency band.

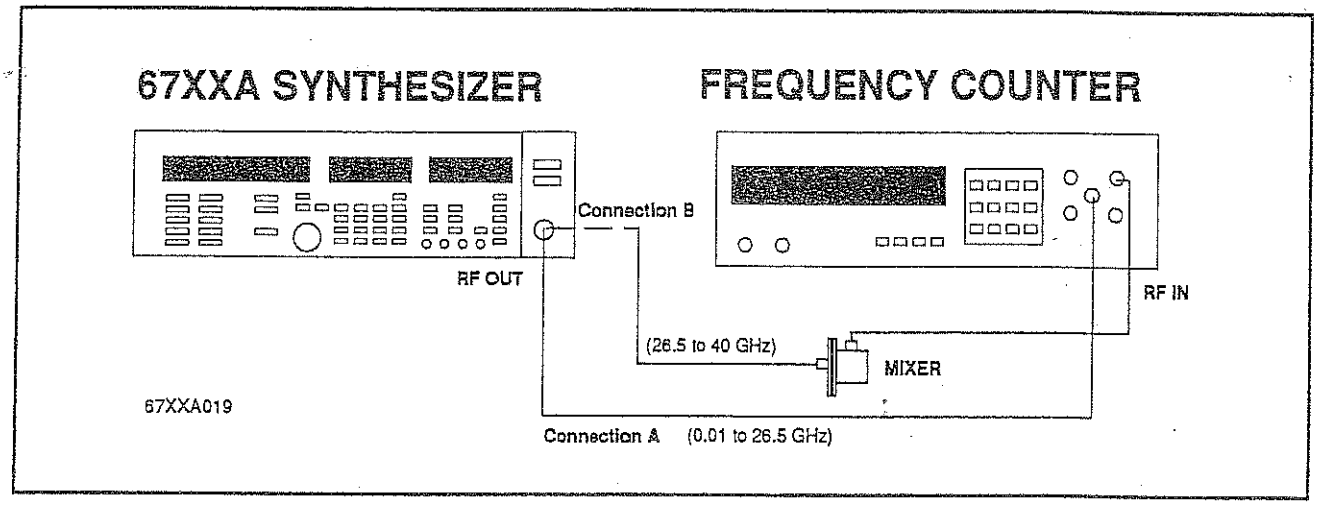

Figure 3-9. Test Equipment Setup for YIG Oscillator Frequency Calibration

b. Test Equipment Setup

1. Connect the equipment as shown in Figure 3-9.
   (a) Connect the 67XXA RF OUTPUT to the Frequency Counter RF Input.

NOTE

For measuring frequencies in the range of 0.01 to 26.5 GHz, connect the 67XXA RF OUT to the Frequency Counter RF IN as shown in Connection A. For measuring frequencies in the range of 26.5 to 40 GHz, connect the 67XXA RF OUT to the Frequency Counter RF IN as shown in Connection B using the Option 91 waveguide mixer.

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. Frequency Calibration

1. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
   (c) If the A23U27 EEPROM was replaced, press <Shift> TRIGGER 089, then <Shift> TRIGGER 390 to erase any previous A17 Linearizer DAC calibration data.
   (d) Press CW OUTPUT SELECT.
   (e) Enter the frequency indicated on the Test Record.
   (f) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 460.

(g) Press SET INCR/DECR SIZE.
(h) Enter 1 MHz.

2. Observe the frequency displayed on the Frequency Counter. Using the 67XXA INCR and DECR keys, adjust the counter frequency to agree with the 67XXA FREQUENCY display to within ±2 MHz.

NOTE

If the counter frequency differs greatly from the 67XXA frequency (or if you have difficulty in making the two frequencies match), you may wish to select a larger incremental MHz value for the SET INCR/DECR SIZE step size. As the counter frequency gets closer to the 67XXA frequency, select a smaller incremental MHz value for the SET INCR/DECR SIZE step size.

3. When the counter frequency agrees with the 67XXA frequency to within ±2 MHz, press RECALL. This saves the calibration data and sets the 67XXA to the next frequency to be calibrated in the band.

4. Repeat steps c.2 and c.3 for the remaining frequencies to be calibrated in the band.

5. When all frequencies in the band have been calibrated, record on the Test Record the maximum difference between the counter frequency and the 67XXA frequency for the band being calibrated (should not exceed ±2 MHz). On the 67XXA, press <Shift>. This gets you out of the band you have been calibrating.

6. If the 67XXA instrument is a multi-band unit, press CW OUTPUT SELECT, then enter the next frequency indicated on the Test Record. If the 67XXA instrument is a single-band unit skip to step c.8.

7. Repeat steps c.1(f) through c.6 for the remaining bands appearing in the Test Record.

8. When all bands have been calibrated, press <Shift> twice, then RESET to exit the calibration mode.

9. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397. This generates new EEPROM checksums.

10. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the YIG-tuned Oscillator Frequency calibration.

3-17 RF LEVEL CALIBRATION

a. Procedure Description

RF level calibration requires the use of an automated test system. A computer-controlled power meter measures 67XXA power output at many frequencies and power levels for each installed frequency band. Correction factors are then calculated and stored in EEPROM (A23U27 or A23U28).

This calibration is required following replacement of either the A15 ALC PCB, the 0.01 to 2 GHz Downconverter, the Leveling Detector/Directional Coupler, a Step Attenuator, or the A23U27 or A23U28 ICs.

For information concerning test equipment requirements and ordering the automated program contact WILTRON Customer Service department at (408) 778-2000.

3-18 ALC SLOPE CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform the ALC Slope calibration. This calibration is required following replacement of either the A15 ALC PCB, the A29 Rear Panel Interface PCB, the 0.01 to 2 GHz Downconverter, the Leveling Detector/Directional Coupler, a Step Attenuator, or the A23U27 IC. This calibration determines the correct settings for the ALC Slope DAC and saves the values in EEPROM (A23U27). During the analog sweep mode, the ALC Slope DAC adjusts for an increasing or decreasing output power-vs.-output frequency. The ALC Slope DAC has two settings; one for ≤2 GHz, and one for >2 GHz.

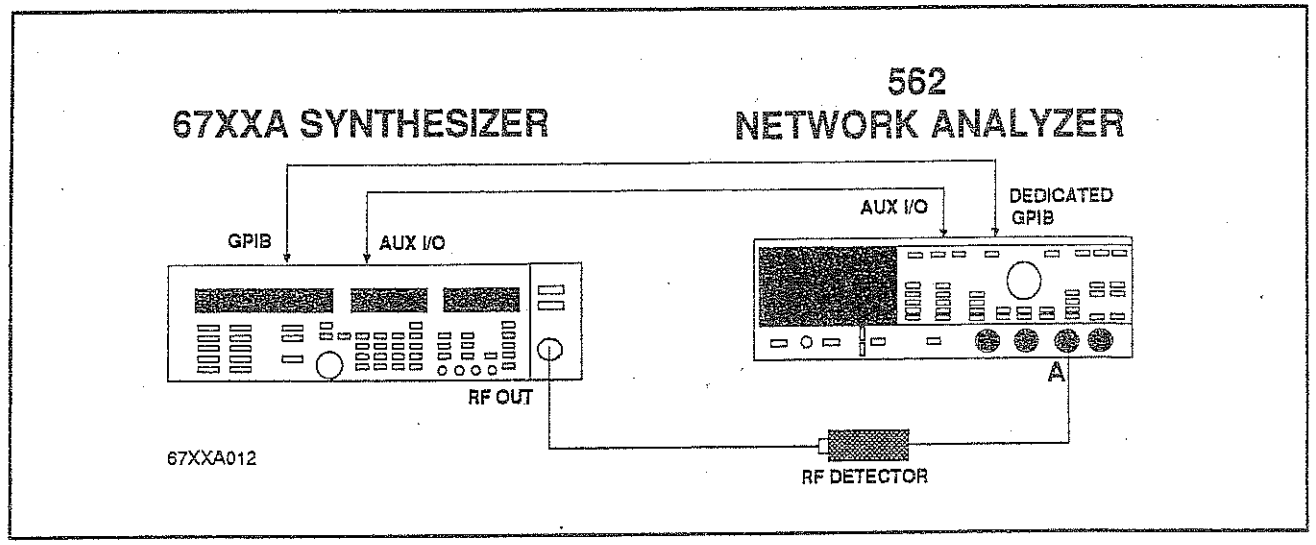

Figure 3-10. Test Equipment Setup for ALC Slope Calibration

b. Test Equipment Setup

1. Connect the equipment as shown in Figure 3-10.
   (a) Calibrate the 562 Network Analyzer with the appropriate RF Detector.
   (b) Connect the 67XXA rear panel AUX I/O to the 562 Network Analyzer AUX I/O.
   (c) Connect the 562 Network Analyzer DEDICATED GPIB to the 67XXA rear panel GPIB.
   (d) Connect the RF Detector to the 562 Network Analyzer Channal A Input.
   (e) Connect the 67XXA RF OUTPUT to the RF Detector Input.

NOTE

For 67XXA models 6717A/-20, 6722A/-20, 6747A/-20, 6759A/-10, and 6769A, the ALC Slope calibration must be performed twice – once for the≤2 GHz Level Detector circuitry and once for the >2 GHz Level Detector circuitry. The individual Test Record will indicate the appropriate F1 and F2 frequencies to be entered and the correct <Shift> TRIGGER code to be used.

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. Slope Calibration

1. Set up the 562 Network Analyzer as follows:
   (a) Press the SYSTEM MENU key.
   (b) From the System Menu display, select RESET. This resets both the 562 and the 67XXA.
   (c) Press CHANNEL 2 DISPLAY: OFF
   (d) Press CHANNEL 1 DISPLAY: ON
   (e) Press CHANNEL 1 MENU key.
   (f) From the Channel 1 Menu display, select POWER.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
   (c) On the rear panel, set the FUNCTION SELECT V/GHz to 0.5 V/GHz.
   (d) Press F1-F9 SCAN ▲ to light the F1 annunciator.
   (e) Enter the frequency indicated on the Test Record for F1.
   (f) Press F1-F9 SCAN ▲ to light the F2 annunciator.
   (g) Enter the frequency indicated on the Test Record for F2.
   (h) Press F1–F2 to start an analog sweep.
   (i) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 050 (for ≤2 GHz) or <Shift> TRIGGER 051 (for >2 GHz).
   (j) Press INT PULSE.
   (k) Enter 9 kHz.
   (l) Press CW OUTPUT SELECT.
   (m) Enter 128 MHz.
   (n) Press SET INCR/DECR SIZE
   (o) Enter 10 MHz.

3. On the 562 Network Analyzer, observe that the waveform displayed is similar to that shown in Figure 3-11.

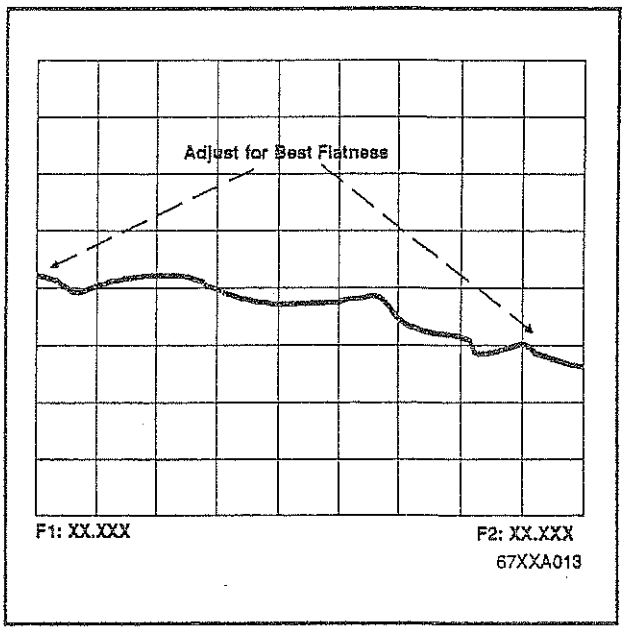

Figure 3-11. Level Detector Waveform

4. While observing the 562 Network Analyzer display, press the 67XXA DECR and INCR keys to adjust the displayed waveform for best flatness.

5. On the 67XXA, press RECALL to save the calibration value. Record the waveform on the Test Record.

6. If the Test Record calls for a second ALC Slope calibration, repeat steps c.2 through c.5 using the F1 and F2 frequencies and the <Shift> TRIGGER code indicated on the Test Record. When completed proceed to step c.7.

7. On the 67XXA, press <Shift> RESET to exit the calibration mode.

8. Press <Shift> TRIGGER 089, then <Shift> TRIGGER 397 to generate new EEPROM checksums.

9. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the ALC Slope calibration.

3-19 AM SENSITIVITY CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform AM Sensitivity calibration. This calibration is required following replacement of either the A15 ALC PCB or the A23U27 IC. The calibration procedure determines the correct setting of the A15 %AM DAC for each installed frequency band and stores the calibration data in EEPROM (A23U27). The %AM DAC sets the %AM-per-volt sensitivity of the external AM input for each installed frequency band.

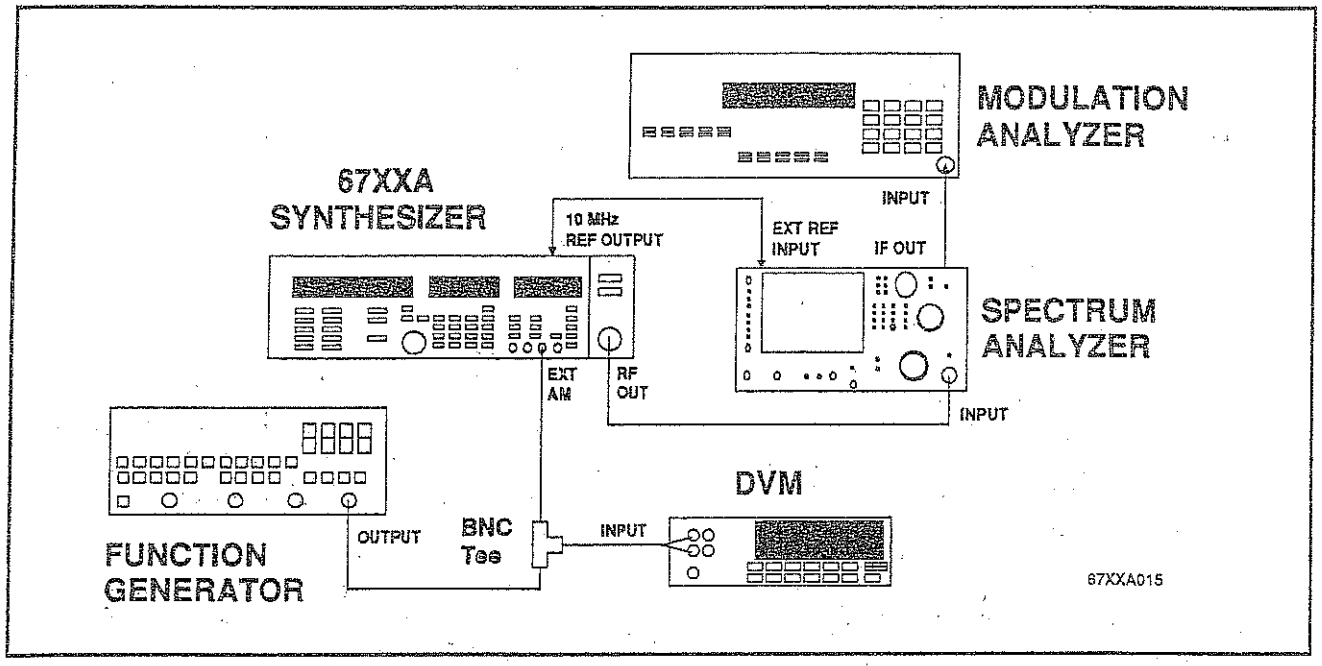

Figure 3-12. Test Equipment Setup for AM Sensitivity Calibration (0.01 to 20 GHz)

b. Test Equipment Setup (for frequencies 0.01 to 20 GHz)

1. Connect the equipment as shown in Figure 3-12.
   (a) Connect the 67XXA rear panel 10 MHZ REF OUTPUT to the Spectrum Analyzer External Reference Input.
   (b) Connect the Function Generator Output to the BNC tee. Connect one leg of the tee to the 67XXA front panel EXT AM input. Connect the other leg of the tee to the DVM input.
   (c) Connect the IF Output of the Spectrum Analyzer to the RF Input of the Modulation Analyzer.
   (d) Connect the 67XXA RF OUTPUT to the Spectrum Analyzer RF Input.

c. Test Equipment Setup (for frequencies 20 to 40 GHz)

1. Connect the equipment as shown in Figure 3-13 (see following page).
   (a) Connect the 67XXA rear panel 10 MHZ REF OUTPUT to the Spectrum Analyzer External Reference Input.
   (b) Connect the Function Generator Output to the BNC tee. Connect one leg of the tee to the 67XXA front panel EXT AM input. Connect the other leg of the tee to the DVM input.
   (c) Connect the IF Output of the Spectrum Analyzer to the RF Input of the Modulation Analyzer.
   (d) Connect the Diplexer and the appropriate external Waveguide Mixer to the Spectrum Analyzer.
   (e) Connect the 67XXA RF OUTPUT to the Waveguide Mixer input.

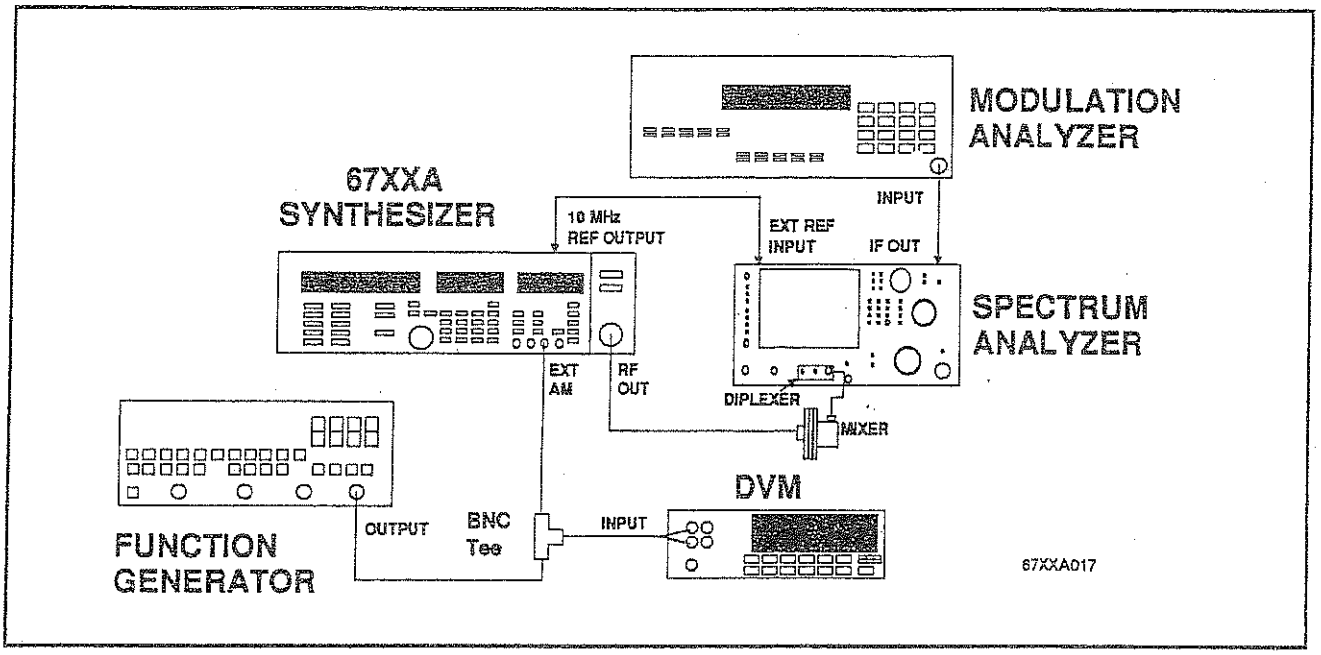

Figure 3-13. Test Equipment Setup for AM Sensitivity Calibration (20 to 40 GHz)

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

d. AM Sensitivity Calibration

1. Adjust the Function Generator for a sinewave output of 1 kHz, with an amplitude of 0.707 Vrms ±0.5% and no dc offset. The generator voltage must be set while connected to the 67XXA EXT AM input through the BNC tee.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
   (c) Press CW OUTPUT SELECT.
   (d) Enter the frequency noted on the Test Record.
   (e) Press LEVEL 1.
   (f) Enter a power level that is 3 dB below maximum rated output power.

3. Set up the Spectrum Analyzer as follows:
   (a) CF: Same as 67XXA frequency set in step d.2(d)
   (b) Span/Div: 0 Hz (labeled as 10 mSec setting on Tektronix Model 494)
   (c) Resolution BW: 100 kHz
   (d) MIN Noise: Activated

4. On the Spectrum Analyzer, locate the fundamental frequency and adjust to place the peak of the fundamental at the top most graticule line. Adjust the reference level to place the signal 10 dB below the top graticule line.

5. Set up the Modulation Analyzer for:
   (a) MEASURE AM
   (b) 300 Hz High-Pass Filter
   (c) 3 kHz Low-Pass Filter

6. On 67XXA;
   (a) Press AM.
   (b) Press <Shift> AM SENS.
   (c) Enter 50%.
   (d) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 306.
   (e) Press CW OUTPUT SELECT.
   (f) Enter 100 MHz.
   (g) Press SET INCR/DECR SIZE.
   (h) Enter 1 MHz.

7. While observing the %AM display on the Modulation Analyzer, press the 67XXA DECR and INCR keys to obtain an AM reading of 50% ± 3%.

8. On the Modulation Analyzer, press AM PK(+) and record the reading on the Test Record. Press AM PK(–) and record the reading on the Test Record. Average the AM PK(+) and AM PK(–) readings together and record the result on the Test Record. The average should be >47.0% and <53.0%.

9. On the 67XXA, press RECALL to save the calibration results.

10. If the 67XXA instrument is a multiband unit, repeat steps d.2 thru d.9 for each of the remaining bands. If the 67XXA is a single band unit, go to step d.11.

11. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397 to generate new EEPROM checksums.

12. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the AM Sensitivity calibration.

3-20 AM METER CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform AM Meter calibration. This calibration is required following replacement of either the A15 ALC PCB or the A23U27 IC. The procedure calibrates the metering function of the AM circuitry (% AM readout on the MODULATION display) and stores the calibration data in EEPROM (A23U27).

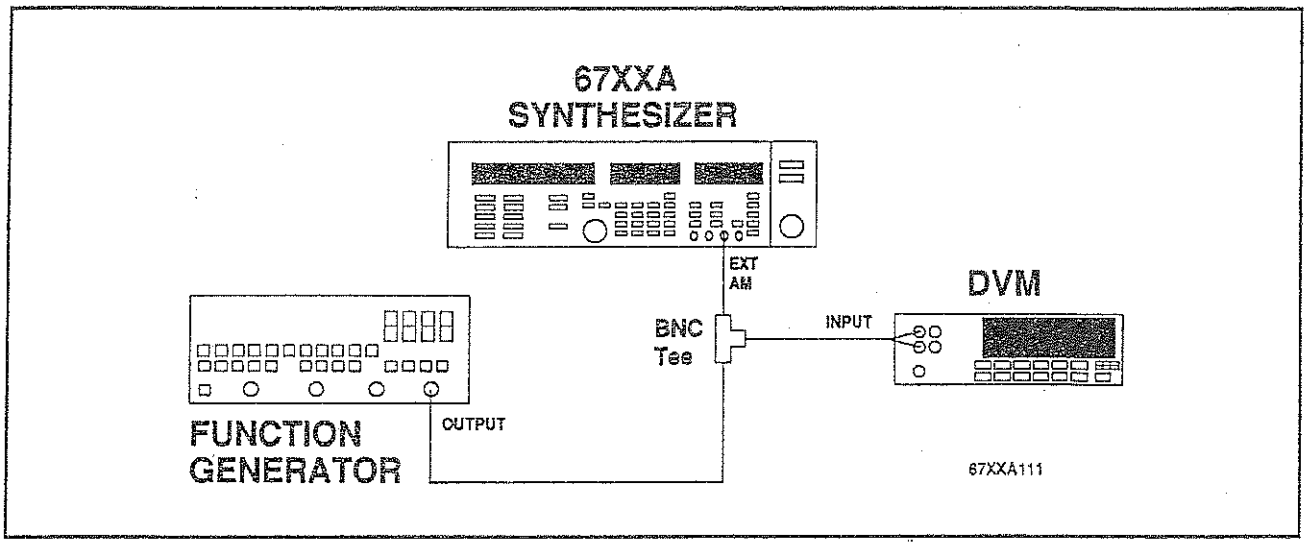

Figure 3-14. Test Equipment Setup for AM Meter Calibration

b. Test Equipment Setup

1. Connect the equipment as was shown in Figure 3-14.
   (a) Connect the Function Generator output to the BNC tee.
   (b) Connect one leg of the tee to the 67XXA front panel EXT AM input.
   (c) Connect the other leg of the tee to the DVM input.

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. AM Meter Calibration

1. Adjust the Function Generator for a sinewave output of 1 kHz, with an amplitude of 0.707 Vrms ±0.5% and no dc offset. The generator voltage must be set while connected to the 67XXA EXT AM input through the BNC tee.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
   (c) Press CW OUTPUT SELECT.
   (d) Enter the frequency noted on the Test Record.
   (e) Press AM.

3. Disconnect the Function Generator from the 67XXA EXT AM input.

4. On the 67XXA, press <Shift > TRIGGER 089, then <Shift> TRIGGER 398. This zeros the AM meter calibration data.

5. On the 67XXA, press <Shift> TRIGGER 342. This calibrates the AM meter when there is no input voltage.

6. Reconnect the Function Generator to the 67XXA EXT AM input.

7. On the 67XXA, press <Shift> TRIGGER 343. This calibrates the AM meter to a .707 Vrms input and saves the calibration data.

8. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397 to generate new EEPROM checksums.

9. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the AM Meter calibration.

d. AM Meter Calibration Verification

1. To verify the previous AM Meter calibration, perform the following procedure.

2. On the 67XXA:
   (a) Press <Shift> RESET.
   (b) Press CW OUTPUT SELECT.
   (c) Enter the frequency indicated on the Test Record.
   (d) Press <Shift> AM SENSE then enter 50%.
   (e) Press AM.
   (f) Press MEASURE AM DEPTH. The display should indicate >47.5% and <52.5%.

3-21 FM SENSITIVITY CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform FM Sensitivity calibration. This calibration is required following replacement of either the A16 FM PCB, any of the A18 thru A21 YIG Driver PCBs, any of the YIG-tuned Oscillators, or the A23U27 IC. The calibration procedure determines the correct setting of the A16 FM Attn DAC for each installed frequency band and stores the calibration data in EEPROM (A23U27). The FM Attn DAC sets the MHz/kHz-per-volt sensitivity of the external FM input for each installed frequency band.

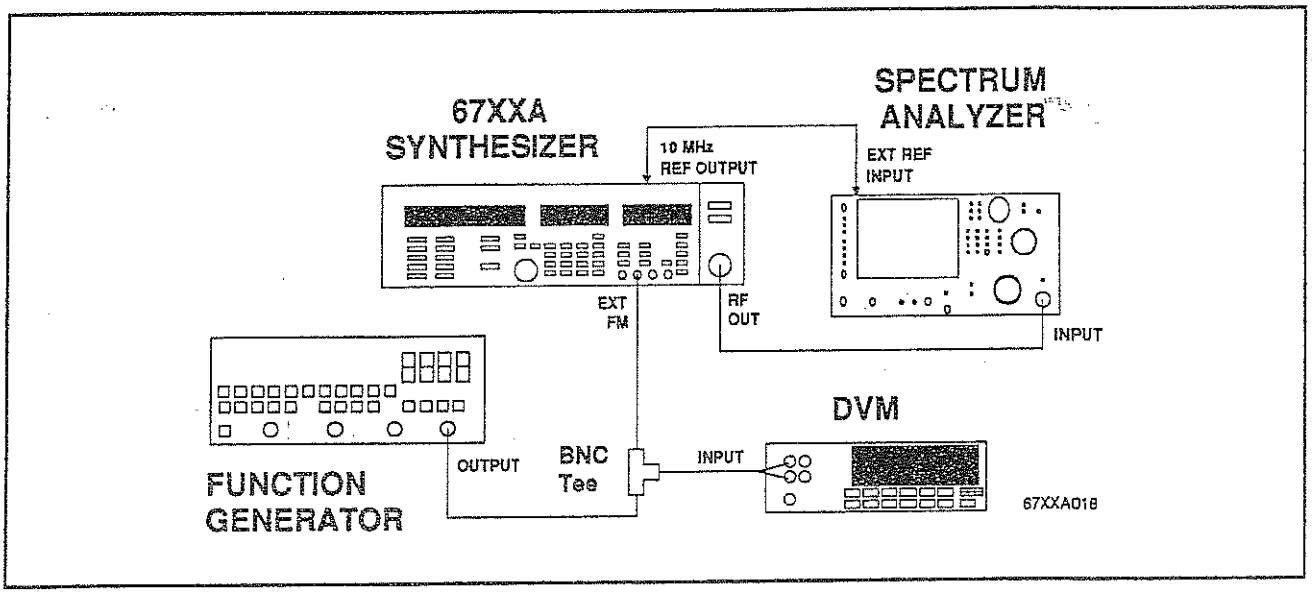

Figure 3-15. Test Equipment Setup for FM Sensitivity Calibration (0.01 to 20 GHz)

b. Test Equipment Setup (for frequencies 0.01 to 20 GHz)

1. Connect the equipment as shown in Figure 3-15.
   (a) Connect the 67XXA rear panel 10 MHZ REF OUTPUT to the Spectrum Analyzer External Reference Input.
   (b) Connect the Function Generator Output to the BNC tee.
   (c) Connect one leg of the tee to the 67XXA front panel EXT FM input.
   (d) Connect the other leg of the tee to the DVM input.
   (e) Connect the 67XXA RF OUTPUT to the Spectrum Analyzer RF Input.

c. Test Equipment Setup (for frequencies 20 to 40 GHz)

1. Connect the equipment as shown in Figure 3-16 (see following page).
   (a) Connect the 67XXA rear panel 10 MHZ REF OUTPUT to the Spectrum Analyzer External Reference Input.
   (b) Connect the Function Generator Output to the BNC tee.
   (c) Connect one leg of the tee to the 67XXA front panel EXT FM input.
   (d) Connect the other leg of the tee to the DVM input.
   (e) Connect the Diplexer and the appropriate external Waveguide Mixer to the Spectrum Analyzer.
   (f) Connect the 67XXA RF OUTPUT to the Waveguide Mixer input.

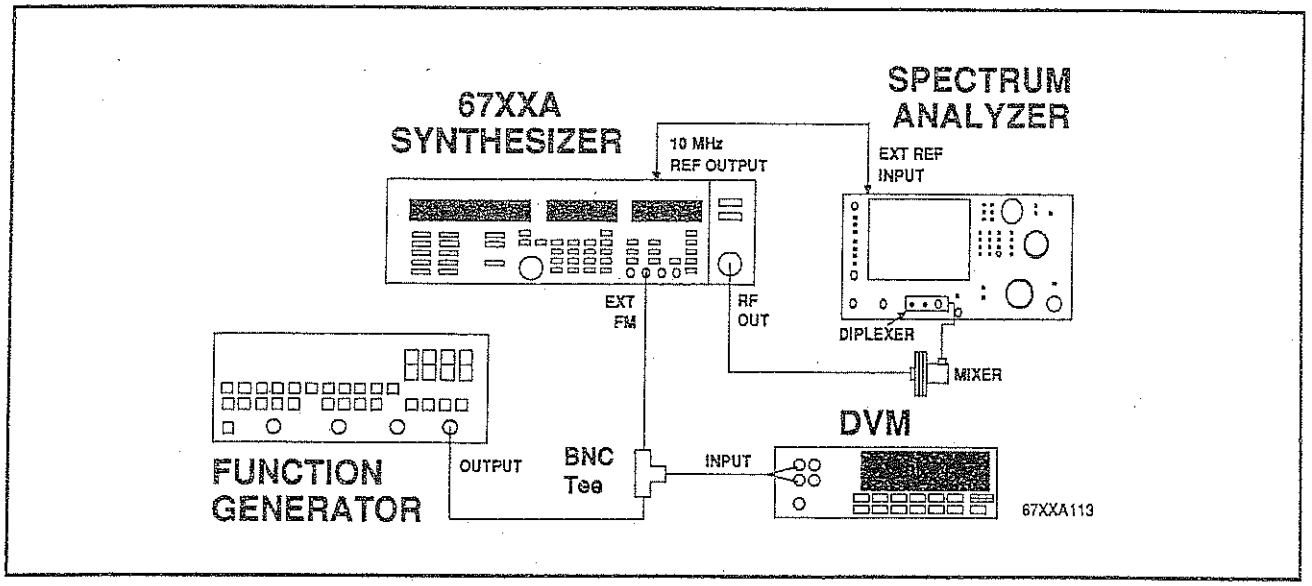

Figure 3-16. Test Equipment Setup for FM Sensitivity Calibration (20 to 40 GHz)

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

d. FM Sensitivity Calibration

1. Adjust the Function Generator for a sinewave output of 40 kHz ±200 Hz with an amplitude of 0.707 Vrms ±0.5% and no dc offset. The generator voltage must be set while connected to the 67XXA EXT FM input through the BNC tee.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).
   (c) Press CW OUTPUT SELECT.
   (d) Enter the frequency indicated on the Test Record.

3. Set the Spectrum Analyzer as follows:
   (a) CF: Same as the 67XXA CW frequency set in step d.2(d)
   (b) Span/Div: 10 kHz
   (c) RBW: 1 kHz
   (d) Filter: Wide
   (e) Ref Level: Adjust to place the signal peak at the top graticule of the display (with 67XXA FM off)

4. On the 67XXA;
   (a) Press <Shift> FM SENS.
   (b) Enter 96 kHz.
   (c) Press FM.
   (d) Press <Shift> TRIGGER 089, then press <Shift> TRIGGER 308.
   (e) Press CW OUTPUT SELECT.
   (f) Enter 2300 MHz (if calibrating frequency band 26.5 to 40 GHz, enter 1200 MHz).
   (g) Press SET INCR/DECR SIZE.
   (h) Enter 100 MHz.

5. While observing the Spectrum Analyzer display, press the 67XXA DECR and INCR keys to adjust the waveform displayed so that the center portion (Bessel null) is at minimum amplitude (see Figure 3-17).

6. On the 67XXA, press SET INCR/DECR SIZE and enter a step size of 10 MHz.

7. Using the 67XXA DECR and INCR keys, fine-adjust the Bessel null to at least 40 dB below the top graticule (if necessary, change the step size to 1 MHz).

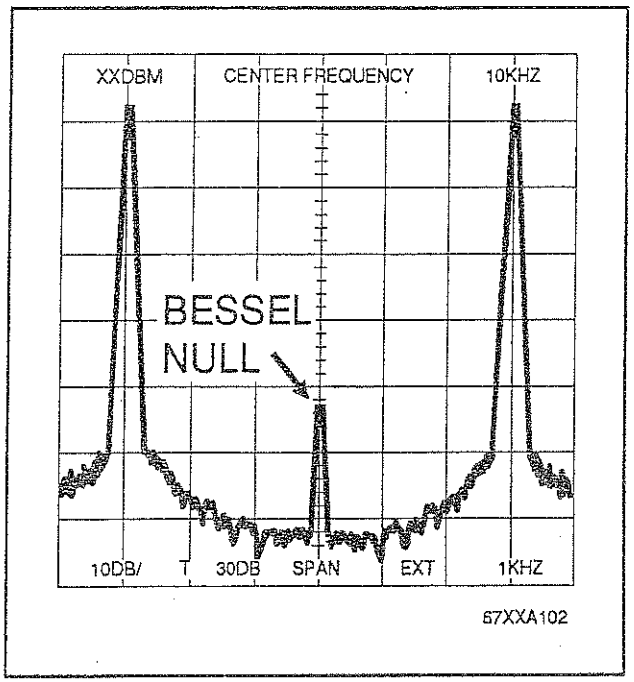

Figure 3-17. Typical Spectrum Analyzer Display of Bessel Null on FM Modulation Waveform

8. On the 67XXA, press RECALL to store the calibration data. Record the waveform on the Test Record.

9. If the 67XXA instrument is a multiband unit, press CW OUTPUT SELECT, then enter the next frequency indicated on the Test Record. If the 67XXA instrument is a single-band unit skip to step d.11.

10. Repeat steps d.3 through d.9 for the remaining band(s) to be calibrated.

11. When all bands have been calibrated, press <Shift> to exit the calibration mode.

12. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397 to generate new EEPROM checksums.

13. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the FM Sensitivity calibration.

3-22 FM FLATNESS CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform FM Flatness calibration. This calibration is required following replacement of either the A12 YIG Phase Detector PCB, the A16 FM PCB, any of the A18 thru A21 YIG Driver PCBs, any of the YIG-tuned Oscillators, or the A23U27 IC. The calibration procedure determines the correct setting of the A16 Phase Mod Cal DAC for each installed frequency band and stores the calibration data in EEPROM (A23U27). The Phase Mod Cal DAC sets the flatness of the FM circuit response by adjusting the FM deviation in the phase-lock mode.

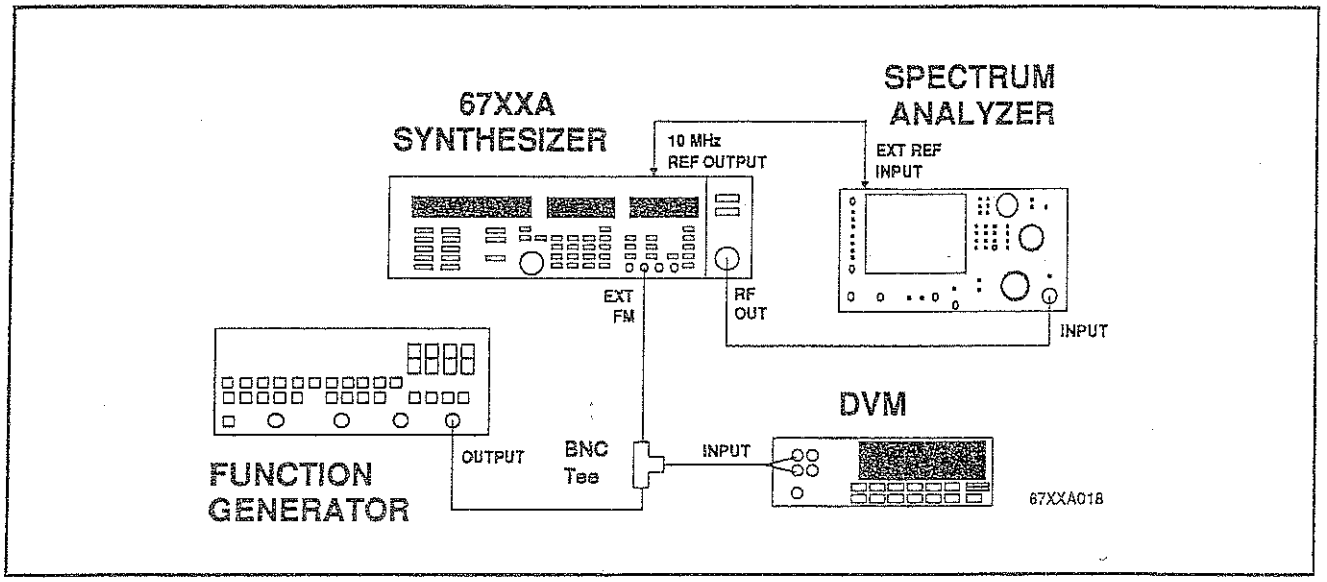

Figure 3-18. Test Equipment Setup for FM Flatness Calibration (0.01 to 20 GHz)

b. Test Equipment Setup (for frequencies 0.01 to 20 GHz)

1. Connect the equipment as was shown in Figure 3-18.
   (a) Connect the 67XXA rear panel 10 MHZ REF OUTPUT to the Spectrum Analyzer External Reference Input.
   (b) Connect the Function Generator Output to the BNC tee.
   (c) Connect one leg of the tee to the 67XXA front panel EXT FM input.
   (d) Connect ther other leg of the tee to the DVM input.
   (e) Connect the 67XXA RF OUTPUT to the Spectrum Analyzer RF Input.

c. Test Equipment Setup (for frequencies 20 to 40 GHz)

1. Connect the equipment as shown in Figure 3-19 (see following page).
   (a) Connect the 67XXA rear panel 10 MHZ REF OUTPUT to the Spectrum Analyzer External Reference Input.
   (b) Connect the Function Generator Output to the BNC tee.
   (c) Connect one leg of the tee to the 67XXA front panel EXT FM input.
   (d) Connect the other leg of the tee to the DVM input.
   (e) Connect the Diplexer and the appropriate external Waveguide Mixer to the Spectrum Analyzer.
   (f) Connect the 67XXA RF OUTPUT to the Waveguide Mixer.

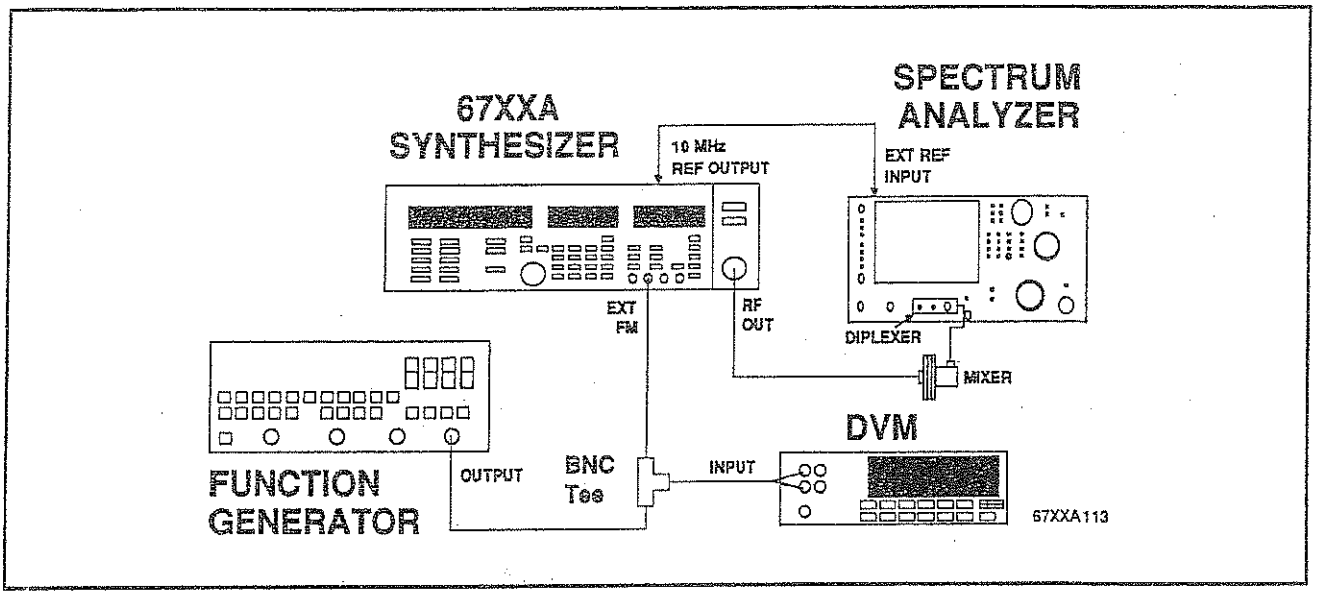

Figure 3-19. Test Equipment Setup for FM Flatness Calibration (20 to 40 GHz)

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

d. FM Flatness Calibration

1. Adjust the Function Generator for a sinewave output of 2 kHz ±10 Hz , with an amplitude of 0.339 Vrms ±0.003 Vrms and no dc offset. The generator voltage must be set while connnected to the 67XXA EXT FM input through the BNC tee.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper in the CAL position (see Figure 3-1).
   (c) Press CW OUTPUT SELECT.
   (d) Enter the frequency indicated on the Test Record.

3. Set the Spectrum Analyzer as follows:
   (a) CF: Same as the 67XXA CW frequency set in step d.2(d)
   (b) Span/Div: 1 kHz
   (c) RBW: 1 kHz
   (d) Ref Level: Adjust to place the signal peak at the top graticule of the display (with 67XXA FM off)

4. On the 67XXA;
   (a) Press <Shift> FM SENS.
   (b) Enter 10 kHz.
   (c) Press FM.

5. On the Spectrum Analyzer, observe that the fundamental has dropped in amplitude and has 2 kHz sidebands (see Figure 3-20).

6. On the 67XXA;
   (a) Press <Shift> TRIGGER 089, then <Shift> TRIGGER 317.
   (b) Press CW.
   (c) Enter 80 MHz.
   (d) Press SET INCR/DECR SIZE.
   (e) Enter 10 MHz.

7. While observing the Spectrum Analyzer display, press the 67XXA DECR and INCR keys to adjust the fundamental as far as possible down from the reference established in step d.3(d).

8. On the 67XXA, press SET INCR/DECR SIZE and enter a step size of 1 MHz.

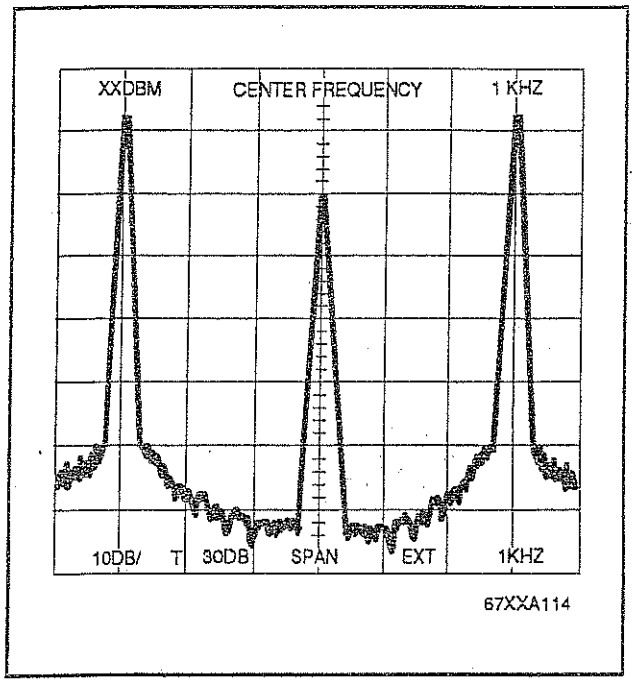

Figure 3-20. Typical Spectrum Analyzer Display of FM Flatness Response

9. Using the 67XXA DECR and INCR keys, fine adjust to set the fundamental level to at least 10 dB below the top graticule.

10. On the 67XXA, press RECALL to store the calibration data. Record the waveform on the Test Record..

11. If the 67XXA instrument is a multiband unit, press CW OUTPUT SELECT, then enter the next frequency indicated on the Test Record. If the 67XXA instrument is a single band unit skip to step d.12.

12. Repeat steps d.3 thru d.11 for the remaining band(s) to be calibrated.

13. When all bands have been calibrated, press <Shift> to exit the calibration mode.

14. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397 to generate new EEPROM checksums.

15. Restore the A23 PCB CAL/NORM jumper to the NORM position. This completes the FM Flatness calibration.

3-23 FM METER CALIBRATION

a. Procedure Description

This procedure provides the steps necessary to perform FM Meter calibration. This calibration is required following replacement of the A16 FM PCB or the A23U27 IC. The procedure calibrates the metering function of the FM circuitry (FM MHz/V or FM KHz/V readout on the MODULATION display) and stores the calibration data in EEPROM (A23U27).

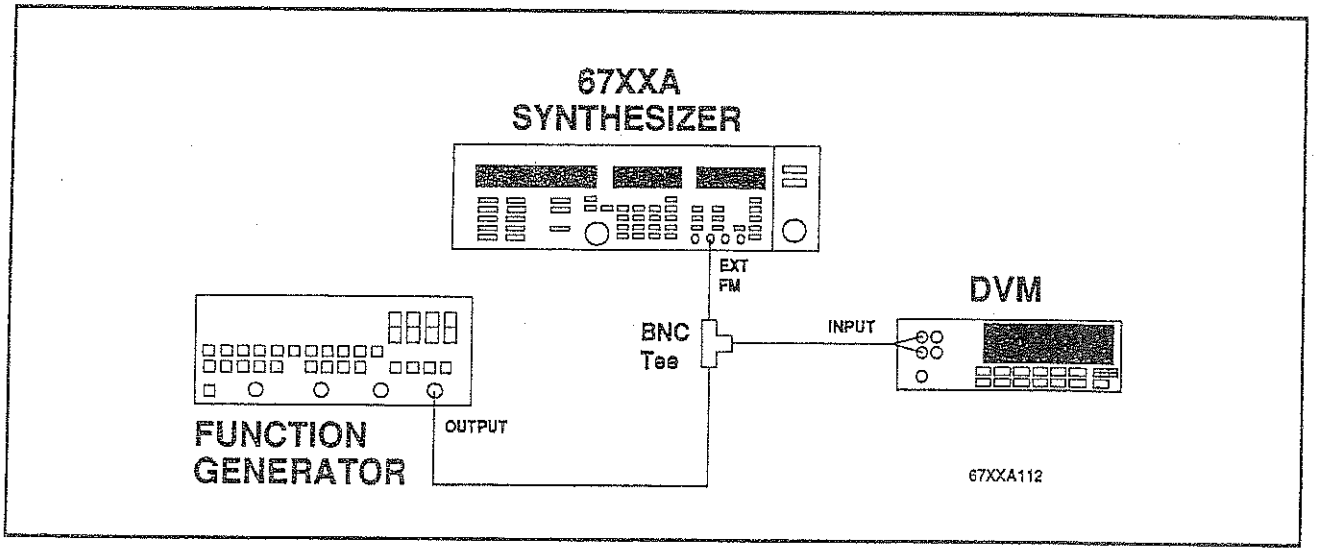

Figure 3-21. Test Equipment Setup for FM Meter Calibration

b. Test Equipment Setup

1. Connect the equipment as was shown in Figure 3-21.
   (a) Connect the Function Generator output to the BNC tee.
   (b) Connect one leg of the tee to the 67XXA front panel EXT FM input.
   (c) Connect the other leg of the tee to the DVM input.

CAUTION

Care must be exercised when entering <Shift> TRIGGER codes during calibration procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

c. FM Meter Calibration

1. Adjust the Function Generator for a sinewave output of 40 kHz, with an amplitude of 0.707 Vrms ±0.5% and no dc offset. The generator voltage must be set while connected to the 67XXA EXT FM input through the BNC tee.

2. Set up the 67XXA as follows:
   (a) Press <Shift> RESET.
   (b) On the A23 Microprocessor PCB, move the CAL/NORM jumper to the CAL position (see Figure 3-1).

3. Disconnect the Function Generator from the 67XXA EXT FM input.

4. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 340. This calibrates the FM meter when there is no input voltage.

5. Reconnect the Function Generator to the EXT FM input.

6. On the 67XXA, press <Shift> TRIGGER 341. This calibrates the FM meter to a .707 Vrms input and saves the calibration data.

7. On the 67XXA, press <Shift> TRIGGER 089, then <Shift> TRIGGER 397 to generate new EEPROM checksums.

8. Restore the A23 CAL/NORM jumper to the NORM position. This completes the FM Meter calibration.

d. FM Meter Calibration Verification

1. To verify the previous FM Meter calibration, perform the following procedure.

2. On the 67XXA;
   (a) Press FM.
   (b) Press MEASURE FM DEV.
   (c) Verify that the MODULATION display reads 300 kHz ±15 kHz.