

**SERIES  
683XXC  
SYNTHESIZED HIGH PERFORMANCE  
SIGNAL GENERATOR  
MAINTENANCE MANUAL**

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# DECLARATION OF CONFORMITY

**Manufacturer's Name:** ANRITSU COMPANY

**Manufacturer's Address:** Microwave Measurements Division  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
USA

declares that the product specified below:

**Product Name:** Synthesized CW / Sweep / Signal Generator

**Model Number:** 690XXB; 691XXB; 693XXB  
680XXC; 681XXC; 683XXC

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC  
Low Voltage Directive 73/23/EEC as amended by Council directive 93/68/EEC

## **Electromagnetic Interference:**

**Emissions:** CISPR 11:1990/EN55011: 1991 Group 1 Class A

**Immunity:** EN 61000-4-2:1995/EN50082-1: 1997 - 4kV CD, 8kV AD  
EN 61000-4-3:1997/EN50082-1: 1997 - 3V/m  
ENV 50204/EN50082-1: 1997 - 3V/m  
EN 61000-4-4:1995/EN50082-1: 1997 - 0.5kV SL, 1kV PL  
EN 61000-4-5:1995/EN50082-1: 1997 - 1kV L-L, 2kV L-E

## **Electrical Safety Requirement:**

**Product Safety:** IEC 1010-1:1990 + A1/EN61010-1: 1993

  
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Marcel Dubois, Corporate Quality Director

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JAN 8, 99  
Date

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Stevenage Herts, SG1 2EF UK, (FAX 44-1438-740202)



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# **Chapter 1**

## **General Information**

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**Figure 1.** Typical Series 683XXC Synthesized High Performance Signal Generator

# Chapter 1

## General Information

### **1-1** SCOPE OF MANUAL

This manual provides service information for all models of the Anritsu Series 683XXC Synthesized High Performance Signal Generator. The service information includes replaceable parts information, functional circuit descriptions, block diagrams, performance verification tests, and procedures for calibration, troubleshooting, and assembly/subassembly removal and replacement. (Throughout this manual, the terms *683XXC* and *signal generator* will be used interchangeably to refer to the instrument.) Manual organization is shown in the table of contents.

### **1-2** INTRODUCTION

This chapter provides a general description of the Series 683XXC Synthesized High Performance Signal Generator, its identification number, related manuals, and options. Information is included concerning level of maintenance, replaceable subassemblies and RF components, exchange assembly program, and preventive maintenance. Static-sensitive component handling precautions and lists of exchangeable subassemblies and recommended test equipment are also provided.

### **1-3** DESCRIPTION

The Series 683XXC Synthesized High Performance Signal Generators are microprocessor-based, synthesized signal sources with high resolution phase-lock capability. They generate both discrete CW frequencies and broad (full range) and narrow band sweeps across the frequency range of 10 MHz to 65 GHz. All functions of the signal generators are fully controllable locally from the front panel or remotely (except for power on/standby) via the IEEE-488 General Purpose Interface Bus (GPIB).

The series presently consists of seven models covering a variety of frequency ranges and power levels. Table 1-1, on the following page, lists models, frequency ranges, and maximum leveled output.

**Table 1-1.** Series 683XXC Models

683XXC Model	Frequency (GHz)	Output Power	Output Power w/Step Attenuator	Output Power w/Electronic Step Attenuator
68317C	0.01 – 8.4 GHz	+13.0 dBm	+11.0 dBm	+9.0 dBm
68337C	2.0 – 20.0 GHz	+13.0 dBm	+11.0 dBm	+3.0 dBm
68347C	0.01 – 20.0 GHz	+13.0 dBm	+11.0 dBm	+3.0 dBm
68367C	0.01 – 2.0 GHz	+13.0 dBm	+11.0 dBm	Not Available
	2.0 – 20.0 GHz	+9.0 dBm	+7.0 dBm	
	20.0 – 40.0 GHz	+6.0 dBm	+3.0 dBm	
68377C	0.01 – 2.0 GHz	+12.0 dBm	+10.0 dBm	Not Available
	2.0 – 20.0 GHz	+10.0 dBm	+8.5 dBm	
	20.0 – 40.0 GHz	+2.5 dBm	0.0 dBm	
	40.0 – 50.0 GHz	+2.5 dBm	-1.0 dBm	
68387C	0.01 – 2.0 GHz	+12.0 dBm	+10.0 dBm	Not Available
	2.0 – 20.0 GHz	+10.0 dBm	+8.5 dBm	
	20.0 – 40.0 GHz	+2.5 dBm	0.0 dBm	
	40.0 – 50.0 GHz	+2.0 dBm	-1.5 dBm	
	50.0 – 60.0 GHz	+2.0 dBm	-2.0 dBm	
68397C	0.01 – 2.0 GHz	+12.0 dBm	Not Available	Not Available
	2.0 – 20.0 GHz	+10.0 dBm		
	20.0 – 40.0 GHz	+2.5 dBm		
	40.0 – 50.0 GHz	0.0 dBm		
	50.0 – 65.0 GHz	-2.0 dBm		
<b>With Option 15B (High Power) Installed</b>				
68317C	0.01– 2.0 Ghz	+13.0 dBm	+11.0 dBm	+11.0 dBm
	2.0 – 8.4 GHz	+17.0 dBm	+15.0 dBm	+11.0 dBm
68337C	2.0 – 20.0 GHz	+17.0 dBm	+15.0 dBm	+7.0 dBm
68347C	0.01 – 2.0 GHz	+13.0 dBm	+11.0 dBm	+11.0 dBm
	2.0 – 20.0 GHz	+17.0 dBm	+15.0 dBm	+7.0 dBm
68367C	0.01 – 20.0 GHz	+13.0 dBm	+11.0 dBm	Not Available
	20.0 – 40.0 GHz	+6.0 dBm	+3.0 dBm	
68377C	0.01 – 50.0 GHz	Standard	Standard	Not Available
68387C	0.01 – 60.0 GHz	Standard	Standard	Not Available
68397C	0.01 – 65.0 GHz	Standard	Not Available	Not Available

Note: In models with Option 22 that have a high-end frequency of ≤20 GHz, rated output power is reduced by 1 dB.  
In models with Option 22 that have a high-end frequency of >20 GHz, rated output power is reduced by 2 dB.



**1-4 IDENTIFICATION  
NUMBER**

All Anritsu instruments are assigned a unique six-digit ID number, such as “875012.” The ID number is imprinted on a decal that is affixed to the rear panel of the unit. Special-order instrument configurations also have an additional *special* serial number tag attached to the rear panel of the unit.

When ordering parts or corresponding with Anritsu Customer Service, please use the correct serial number with reference to the specific instrument’s model number (i.e., Model 68347C Synthesized Signal Generator, Serial No. 875012).

**1-5 ELECTRONIC MANUAL**

This manual is available on CD ROM as an Adobe Acrobat Portable Document Format (\*.pdf) file. The file can be viewed using Acrobat Reader, a free program that is also included on the CD ROM. The file is “linked” such that the viewer can choose a topic to view from the displayed “bookmark” list and “jump” to the manual page on which the topic resides. The text can also be word-searched. Contact Anritsu Customer Service for price and availability.

**1-6 RELATED MANUALS**

This is one of a four manual set that consists of an Operation Manual, a GPIB Programming Manual, a SCPI Programming Manual, and a Maintenance Manual.

**Operation  
Manual**

This manual provides information and instructions for operation of the series 683XXC high performance signal generators using the front panel controls. It also includes general information, performance specifications, installation instructions, and operation verification procedures. The Anritsu part number for the Operation Manual is 10370-10337.

**GPIB  
Programming  
Manual**

This manual provides information for remote operation of the series 683XXC high performance signal generators using Product Specific commands sent from an external controller via the IEEE 488 General Purpose Interface Bus (GPIB). It contains a complete listing and description of all 683XXC GPIB Product Specific commands and several programming examples. The Anritsu part number for the GPIB Programming Manual is 10370-10338.

**SCPI  
Programming  
Manual**

This manual provides information for remote operation of the series 683XXC high performance signal generators using Standard Commands for Programmable Instruments (SCPI) commands sent from an external controller via the IEEE 488 General Purpose Interface Bus (GPIB). It contains a complete listing and description of each command in the

683XXC SCPI command set and examples of command usage. The Anritsu part number for the SCPI Programming Manual is 10370-10339.

## **1-7** OPTIONS

The following instrument options are available.

- ❑ **Option 1, Rack Mounting.** Rack mount kit containing a set of track slides (90° tilt capability), mounting ears, and front panel handles for mounting the instrument in a standard 19-inch equipment rack.
- ❑ **Option 2A, 110 dB Step Attenuator.** Adds a 10 dB per step attenuator with a 110 dB range for models having a high-end frequency of  $\leq 20$  GHz. Output power is selected directly in dBm on the front panel (or via GPIB). Rated output power is reduced.
- ❑ **Option 2B, 110 dB Step Attenuator.** Adds a 10 dB per step attenuator with a 110 dB range for models having a high-end frequency of  $\leq 40$  GHz. Output power is selected directly in dBm on the front panel (or via GPIB). Rated output power is reduced.
- ❑ **Option 2C, 90 dB Step Attenuator.** Adds a 10 dB per step attenuator with a 90 dB range for models having a high-end frequency of  $\leq 50$  GHz. Output power is selected directly in dBm on the front panel (or via GPIB). Rated output power is reduced.
- ❑ **Option 2D, 90 dB Step Attenuator.** Adds a 10 dB per step attenuator with a 90 dB range for models having a high-end frequency of  $\leq 60$  GHz. Output power is selected directly in dBm on the front panel (or via GPIB). Rated output power is reduced.
- ❑ **Option 2E, 120 dB Electronic Step Attenuator.** Adds a 10 dB per step electronic attenuator with a 120 dB range for models having a high-end frequency of  $\leq 8.4$  GHz. Output power is selected directly in dBm on the front panel (or via GPIB). Rated output power is reduced.
- ❑ **Option 2F, 120 dB Electronic Step Attenuator.** Adds a 10 dB per step electronic attenuator with a 120 dB range for models having a high-end frequency of  $\leq 20$  GHz. Output power is selected directly in dBm on the front panel (or via GPIB). Rated output power is reduced.
- ❑ **Option 6, Phase Modulation ( $\Phi$ M).** Adds phase modulation capability. The internal FM generator becomes the FM/ $\Phi$ M generator. (Not available in combination with Option 7.)
- ❑ **Option 7, Delete AM/FM Generator.** Deletes the internal AM and FM generators. External AM and FM capability remains unchanged. (Not available in combination with Option 8 or Option 20.)
- ❑ **Option 8, Internal Power Measurement.** Adds an internal power measurement function that is compatible with Anritsu 560-7, 5400-71, or 6400-71 series detectors. (Not available in combination with Option 7.)

- ❑ **Option 9, Rear Panel RF Output.** Moves the RF output connector to the rear panel.
- ❑ **Option 10, User-Defined Modulation Capability.** Provides user-defined waveform capability for complex modulation. Requires computer/controller (not included). Includes cable and Windows base software. (Not available in combination with Option 7.)
- ❑ **Option 11, 0.1 Hz Frequency Resolution.** Provides frequency resolution of 0.1 Hz.
- ❑ **Option 14, Rack Mounting without Chassis Slides.** Modifies rack mounting hardware to install unit in a console that has mounting shelves. Includes mounting ears and front panel handles.
- ❑ **Option 15B, High Power Output.** Adds high-power RF components to the instrument providing increased RF output power in the 2–20 GHz frequency range. Option 15B is standard in models having a high-end frequency that is >40 GHz.
- ❑ **Option 16, High-Stability Time Base.** Adds an ovenized, 10 MHz crystal oscillator with  $<5 \times 10^{-10}$ /day frequency stability.
- ❑ **Option 17A, No Front Panel.** Deletes the front panel for use in remote control applications where a front panel display or keyboard control are not needed.
- ❑ **Option 18, mmWave Module Bias Output.** Provides bias output for 54000-xWRxx Millimeter Wave Source Modules. BNC Twinax connector, rear panel.
- ❑ **Option 19, SCPI Programmability.** Adds GPIB command mnemonics complying with Standard Commands for Programmable Instruments (SCPI), Version 1993. SCPI programming complies with IEEE 488.2-1987.
- ❑ **Option 20, SCAN Modulator.** Adds an internal SCAN modulator for simulating high-depth amplitude modulated signals in models 68337C and 68347C only. Requires an external modulating signal. (Not available in combination with Option 7.)
- ❑ **Option 22, 0.1 Hz to 10.0 MHz Audio Frequency.** Adds frequency coverage below 10 MHz. In models having a high-end frequency of  $\leq 20$  GHz, rated output power is reduced by 1 dB; in models having a high-end frequency of >20 GHz, rated output power is reduced by 2 dB.

**1-8** LEVEL OF  
MAINTENANCE

Maintenance of the 683XXC consists of:

- ❑ Troubleshooting the instrument to a replaceable subassembly or RF component.
- ❑ Repair by replacing the failed subassembly or RF component.
- ❑ Calibration.
- ❑ Preventive maintenance.

**Troubleshooting** The 683XXC firmware includes internal diagnostics that self-test most of the internal assemblies of the instrument. When the signal generator fails self-test, one or more error messages are displayed to aid in troubleshooting the failure to a replaceable subassembly or RF component. Chapter 5–Troubleshooting lists and describes the self-test error messages and provides procedures for isolating 683XXC failures to a replaceable subassembly or RF component.

**Repair** Most instrument failures are field repairable by replacing the failed subassembly or RF component. Detailed instructions for removing and replacing failed subassemblies and components are provided in Chapter 6–Removal and Replacement Procedures.

**Calibration** The signal generator may require calibration after repair. Refer to Chapter 4–Calibration for a listing of calibration requirements and calibration procedures.

**Preventive Maintenance** Preventive maintenance on the 683XXC consists of cleaning the fan honeycomb filter, described in paragraph 1-10.

**1-9** STATIC-SENSITIVE  
COMPONENT HANDLING  
PRECAUTIONS

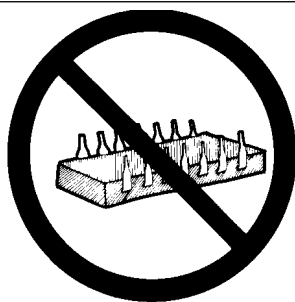
The 683XXC contains components that can be damaged by static electricity. Figure 1-2 illustrates the precautions that should be followed when handling static-sensitive subassemblies and components. If followed, these precautions will minimize the possibilities of static-shock damage to these items.

**NOTE**

Use of a grounded wrist strap when removing and/or replacing subassemblies or components is strongly recommended.



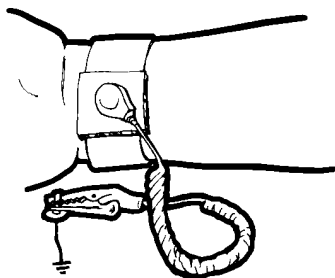
1. Do not touch exposed contacts on any static sensitive component.



2. Do not slide static sensitive component across any surface.



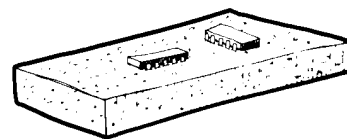
3. Do not handle static sensitive components in areas where the floor or work surface covering is capable of generating a static charge.



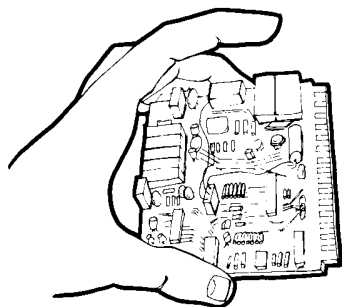
4. Wear a static-discharge wristband when working with static sensitive components.



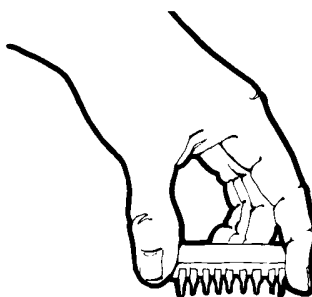
5. Label all static sensitive devices.



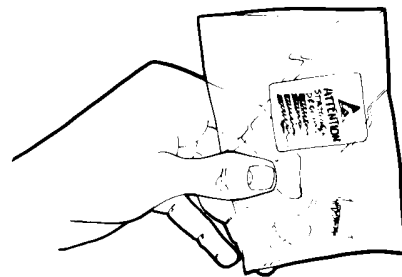
6. Keep component leads shorted together whenever possible.



7. Handle PCBs only by their edges. Do not handle by the edge connectors.



8. Lift & handle solid state devices by their bodies – never by their leads.



9. Transport and store PCBs and other static sensitive devices in static-shielded containers.

**10. ADDITIONAL PRECAUTIONS:**

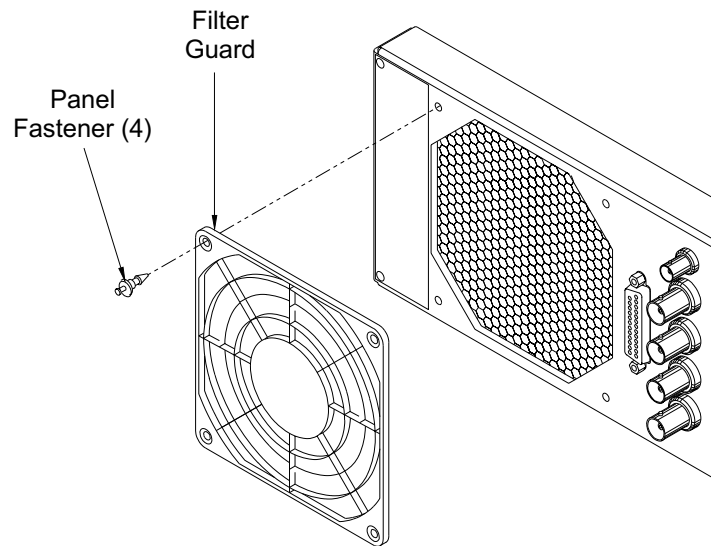
- Keep workspaces clean and free of any objects capable of holding or storing a static charge.
- Connect soldering tools to an earth ground.
- Use only special anti-static suction or wick-type desoldering tools.

**Figure 1-2.** Static-Sensitive Component Handling Precautions

**1-10 PREVENTIVE  
MAINTENANCE**

The 683XXC must always receive adequate ventilation. A blocked fan filter can cause the instrument to overheat and shut down. Check and clean the rear panel fan honeycomb filter periodically. Clean the fan honeycomb filter more frequently in dusty environments. Clean the filter as follows.

- Step 1** Remove the filter guard from the rear panel by pulling out on the four panel fasteners holding them in place (Figure 1-3).
- Step 2** Vacuum the honeycomb filter to clean it.
- Step 3** Install the filter guard back on the rear panel.
- Step 4** Press in on the panel fasteners to secure the filter guard to the rear panel.



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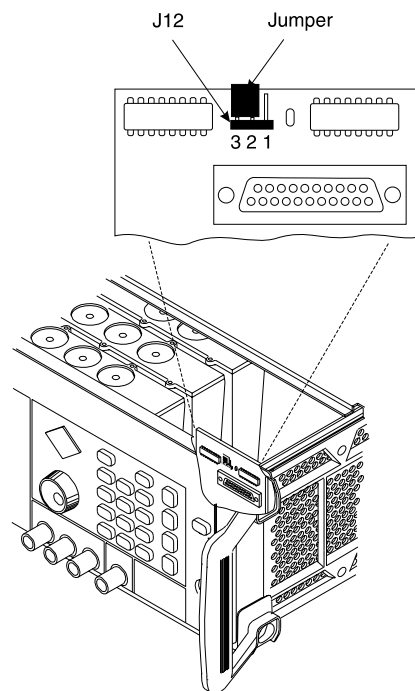
**Figure 1-3.** Removing/Replacing the Fan Filter Guard

**1-11** **STARTUP  
CONFIGURATIONS**

The 683XXC comes from the factory with a jumper across pins 2 and 3 of front panel connector J12 (Figure 1-4). In this configuration, connecting the instrument to line power automatically places it in operate mode (front panel OPERATE LED on).

The startup configuration can be changed so that the signal generator comes up in standby mode (front panel STANDBY LED on) when it is connected to line power. Change the startup configuration as follows:

- Step 1**                    Disconnect the instrument from line power.
- Step 2**                    Remove the top cover from the 683XXC. (Refer to Chapter 6 for instructions).
- Step 3**                    Locate front panel connector J12 and remove the jumper from across pins 2 and 3. It is located on the A2A1 PCB which plugs into the Front Panel Assembly.
- Step 4**                    Install the jumper across pins 1 and 2 of connector J12.
- Step 5**                    Install the top cover and connect the signal generator to line power. The instrument should come up in standby mode.



---

**Figure 1-4.** Startup Configuration of Connector J12

**1-12 RECOMMENDED TEST  
EQUIPMENT**

Table 1-2 provides a list of recommended test equipment needed for the performance verification, calibration, and troubleshooting procedures presented in this manual.

**Table 1-2.** Recommended Test Equipment (1 of 2)

<b>INSTRUMENT</b>	<b>CRITICAL SPECIFICATION</b>	<b>RECOMMENDED MANUFACTURER/MODEL</b>	<b>USAGE <sup>(1)</sup></b>
Spectrum Analyzer, with External Mixers and Diplexer Assy	<i>Frequency Range:</i> 0.01 to 65 GHz <i>Resolution Bandwidth:</i> 10 Hz	Tektronix, Model 2794, with External Mixers: WM780K (18 to 26.5 GHz) WM780A (26.5 to 40 GHz) WM780U (40 to 60 GHz) WM780E (60 to 90 GHz) Diplexer Assy: 015-0385-00	C, P, T
Spectrum Analyzer	<i>Frequency Range:</i> 20 Hz to 40 MHz <i>Resolution Bandwidth:</i> 3 Hz	Hewlett-Packard, Model 3585B	P
Frequency Counter	<i>Frequency Range:</i> 0.01 to 40 GHz <i>Input Impedance:</i> 50Ω <i>Resolution:</i> 1 Hz <i>Other:</i> External Time Base Input	Anritsu Model MF2414A	C, P
Power Meter, with Power Sensors	<i>Power Range:</i> -30 to +20 dBm (1μW to 100mW)	Anritsu Model ML2437A or ML2438A, with Power Sensors: MA2474A (0.01 to 40 GHz) MA2475A (0.01 to 50 GHz)	C, P
Digital Multimeter	<i>Resolution:</i> 4-1/2 digits (to 20V) <i>DC Accuracy:</i> 0.002% +2 counts <i>DC Input Impedance:</i> 10 MΩ <i>AC Accuracy:</i> 0.07% +100 counts (to 20 kHz) <i>AC Input Impedance:</i> 1 MΩ	John Fluke, Inc., Model 8840A, with Option 8840A-09K (True RMS AC)	C, T
Frequency Reference	<i>Frequency:</i> 10 MHz <i>Accuracy:</i> 5 x 10 <sup>-12</sup> parts/day	Absolute Time Corp., Model 300	P
Function Generator	<i>Output Voltage:</i> 2 volts peak-to-peak <i>Functions:</i> 0.1 Hz to 100 kHz sine and square waveforms	Hewlett-Packard, Model 33120A	C
Modulation Analyzer	<i>Frequency Input:</i> 10 MHz (or the IF of the Spectrum Analyzer) <i>AM Depth:</i> 0% to 90% <i>AM Modulation Rates:</i> DC to 100 kHz <i>Filters:</i> 20 kHz lowpass, 300 Hz highpass	Hewlett-Packard, Model 8901A	P
Oscilloscope	<i>Bandwidth:</i> DC to 150 MHz <i>Vertical Sensitivity:</i> 2mV/division <i>Horizontal Sensitivity:</i> 50 ns/division	Tektronix, Inc. Model TAS485	P, T
Mixer	<i>Frequency Range:</i> 2 to 26 GHz	Miteq, Model DB0226LA1	P



**Table 1-2.** Recommended Test Equipment (2 of 2)

<b>INSTRUMENT</b>	<b>CRITICAL SPECIFICATION</b>	<b>RECOMMENDED MANUFACTURER/MODEL</b>	<b>USAGE <sup>(1)</sup></b>
Scalar Network Analyzer, with RF Detector	<i>Frequency Range:</i> 0.01 to 60 GHz	Anritsu, Model 56100A, with RF Detector: 560-7K50 (0.01 to 40 GHz) 560-7VA50 (0.01 to 50 GHz) SC5198 (40 to 60 GHz)	C, T
Attenuator	<i>Frequency Range:</i> DC to 40 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 10 dB	Anritsu, Model 41KC-10	C, P
Attenuator	<i>Frequency Range:</i> DC to 40 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 20 dB	Anritsu, Model 41KC-20	P
Attenuator	<i>Frequency Range:</i> DC to 60 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 10 dB	Anritsu, Model 41V-10	C, P
Attenuator	<i>Frequency Range:</i> DC to 60 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 20 dB	Anritsu, Model 41V-20	P
RF Detector	<i>Frequency Range:</i> 0.01 to 40 GHz <i>Output Polarity:</i> Negative	Anritsu, Model 75KC50 (K input/BNC output connectors)	T
RF Detector	<i>Frequency Range:</i> 0.01 to 50 GHz <i>Output Polarity:</i> Negative	Anritsu, Model 75VA50 (V input/BNC output connectors)	T
Microwave (Pulse) Detector	<i>Output Polarity:</i> Negative <i>Frequency Range:</i> 0.01 to 40 GHz	Anritsu, Model SC3800 (K input/BNC output connectors)	P
High Pass Filter	150 MHz High-Pass Filter (DC Block)	Narda, Model 4564	P
Low Pass Filter	450 MHz Low-Pass Filter	Mini-Circuits, Model SLP-450	P
Personal Computer	<i>PC Configuration:</i> IBM AT or compatible <i>Operating System:</i> Windows 3.1, 95, or 98 <i>Accessories:</i> Mouse	Any common source	C
Special AUX I/O Cable Assy	Provides interface between the 683XXC and the Power Meter	Anritsu P/N: 806-90	P
Serial Interface Assy	Provides serial interface between the PC and the 683XXC.	Anritsu P/N: T1678	C
Tee	<i>Connectors:</i> 50Ω BNC	Any common source	C, P
Cables	<i>Connectors:</i> 50Ω BNC	Any common source	C, P, T

**NOTES:** (1) P = Performance Verification Tests (Chapter 3); C = Calibration (Chapter 4); T = Troubleshooting (Chapter 5)

**1-13 EXCHANGE  
ASSEMBLY PROGRAM**

Anritsu maintains an exchange assembly program for selected 683XXC subassemblies and RF components. If a malfunction occurs in one of these subassemblies, the defective unit can be exchanged. Upon receiving your request, Anritsu will ship the exchange subassembly or RF component to you, typically within 24 hours. You then have 45 days in which to return the defective item. All exchange subassemblies or RF components are warranted for 90 days from the date of shipment, or for the balance of the original equipment warranty, whichever is longer.

Please have the exact model number and serial number of your unit available when requesting this service, as the information about your unit is filed according to the instrument's model and serial number. For more information about the program, contact your local sales representative or call your local Anritsu service center. Refer to Table 1-5, on page 1-18, for a list of current Anritsu service centers.

**1-14 REPLACEABLE  
SUBASSEMBLIES  
AND PARTS**

Table 1-3 lists those replaceable subassemblies and RF components of the 683XXC that are presently covered by the Anritsu exchange assembly program. Table 1-4, on page 1-16, lists common replaceable parts for the 683XXC that are not presently on the exchange assembly program.

All parts listed in Tables 1-3 and 1-4 may be ordered from your local Anritsu service center.

**Table 1-3. Replaceable Subassemblies and RF Components (1 of 2)**

SUBASSEMBLY OR PART NAME	ANRITSU PART NUMBER
<b>Printed Circuit Board Assemblies</b>	
Front Panel Assy	ND40832
A3 Reference Loop PCB Assy	D40603-3
A4 Coarse Loop PCB Assy	D40634-3
A5 Fine Loop PCB Assy	D40635-3
A6 Pulse Generator PCB Assy	D40626-3
A7 YIG Loop PCB Assy	D40627-3
A8 Function Generator PCB Assy	D40608-3
A9 PIN Control PCB Assy	D40659-3
A10 ALC PCB Assy	D40610-3
A11 FM PCB Assy (All 683XXCs except 68317C)	D40651-3
A11 FM PCB Assy (68317C only)	D40651-4
A12 Analog Instruction PCB Assy	D37448-3
A13 10 MHz DDS PCB Assy	D40653-3
A14 YIG, SDM Driver PCB Assy ( $\leq 40$ GHz models)	40654-3
A14 YIG, SDM, SQM Driver PCB Assy ( $> 40$ GHz models)	40654-4
A15 Regulator PCB Assy	D40655-3
A16 CPU Interface PCB Assy	D37416-3
A17 CPU PCB Assy	D37444-3
A18 Power Supply PCB Assy	D40638-3
A19 Line Conditioner PCB Assy	D40649-3
A21 Line Filter/Rectifier PCB Assy	ND49529
A21-3 BNC/AUX I/O Connector PCB Assy	ND49528
10 MHz Crystal Oscillator Assy	D37332
<b>RF Components</b>	
YIG-Tuned Oscillator, 2 to 20 GHz	48514
YIG-Tuned Oscillator, 2 to 8.4 GHz	37266
Down Converter	D27330
Switched Doubler Module, 20 to 40 GHz	D28540
Source Quadrupler Module, 40 to 50 GHz	D28185
Source Quadrupler Module, 40 to 60 GHz	60-141
Source Quadrupler Module, 40 to 65 GHz	60-142
Forward Coupler, 60 GHz and 65 GHz	C27184
Coupler, 40 GHz	D27115
Coupler, 60 GHz	D27350
Pulsed Switched Filter	D45196
Pulsed Switched Filter (w/Option 15B)	D45200
Output Connector Assy, K female	ND39077
Output Connector Assy, V female	ND40835

**Table 1-3. Replaceable Subassemblies and RF Components (2 of 2)**

SUBASSEMBLY OR PART NAME	ANRITSU PART NUMBER
<b>RF Components (Continued)</b>	
Diplexer, 10 MHz	46504
Diplexer, <20 GHz	29860
Diplexer, >20 GHz	29850
Electronic Step Attenuator, 120 dB, 20 GHz	45720
Step Attenuator, 110 dB, 20 GHz	D27152
Step Attenuator, 110 dB, 40 GHz	D25080
Step Attenuator, 90 dB, 50 GHz	D27315
Step Attenuator, 90 dB, 60 GHz	D28957

**Table 1-4. Common Replaceable Subassemblies and Parts (1 of 2)**

SUBASSEMBLY OR PART NAME	ANRITSU PART NUMBER
Cap, Protective (for RF Output Connector)	A20304
Cover, Top	D37131
Cover, Bottom	D37135
Cover, Side	D37133
Cover, Side Handle	761-67
Cover, CPU Housing	C37063
Cover, Main Card Cage	D37064
Cover, Power Supply Housing	C37062
EMI Gasket for side covers	790-437
EMI Gasket for side covers	790-390
EMI Gasket for Front Panel Assy	790-223
Fan Assembly	A40513
Fan Mount	790-425
Fan Membrane (Honey Comb Filter)	C37137
Fan Grill	790-426
Fasteners (for Fan Grill)	790-433
Fuse, 5A, 3AG Slow Blow (110 Vac)	631-33
Fuse, 2.5A, 3AG Slow Blow (230 Vac)	631-14
Gasket, RFI ("O"rings for MCX connectors)	790-393

**Table 1-4.** *Common Replaceable Subassemblies and Parts (2 of 2)*

<b>SUBASSEMBLY OR PART NAME</b>	<b>ANRITSU PART NUMBER</b>
Handle, Side Carrying	783-830
Screw, Handle Side Carrying	900-714
Line Module	260-11
Shield Cover	D37228
Shield	D37229
Standoff	785-922
Tape	850-70
Foot, Rear Bottom Left	2000-548
Foot, Rear Bottom Right	2000-549
Foot, Rear Top Left	2000-552
Foot, Rear Top Right	2000-553
Screw, Green Head	2000-560
<hr/> <b>683XXC without Front Handles Installed</b> <hr/>	
Foot, Front Bottom Left	2000-546
Foot, Front Bottom Right	2000-547
Foot, Front Top Left	2000-550
Foot, Front Top Right	2000-551
<hr/> <b>683XXC with Front Handles Installed</b> <hr/>	
Upper Insert	B37147
Foot, Bottom Left	C37170
Foot, Bottom Right	C37171
Handle, Left	D37168-2
Handle, Right	D37169-2
Tilt Bail	790-435

**Table 1-5.** *Anritsu Service Centers*

---

**UNITED STATES**

ANRITSU COMPANY  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
Telephone: (408) 776-8300  
1-800-ANRITSU  
FAX: 408-776-1744

ANRITSU COMPANY  
10 New Maple Ave., Unit 305  
Pine Brook, NJ 07058  
Telephone: (973) 227-8999  
1-800-ANRITSU  
FAX: 973-575-0092

ANRITSU COMPANY  
1155 E. Collins Blvd  
Richardson, TX 75081  
Telephone: 1-800-ANRITSU  
FAX: 972-671-1877

**AUSTRALIA**

ANRITSU PTY. LTD.  
Unit 3, 170 Foster Road  
Mt Waverley, VIC 3149  
Australia  
Telephone: 03-9558-8177  
FAX: 03-9558-8255

**BRAZIL**

ANRITSU ELECTRONICA LTDA.  
Praia de Botafogo, 440, Sala 2401  
CEP22250-040, Rio de Janeiro, RJ, Brasil  
Telephone: 021-527-6922  
FAX: 021-53-71-456

**CANADA**

ANRITSU INSTRUMENTS LTD.  
700 Silver Seven Road, Suite 120  
Kanata, Ontario K2V 1C3  
Telephone: (613) 591-2003  
FAX: (613) 591-1006

**CHINA**

ANRITSU ELECTRONICS (SHANGHAI) CO. LTD.  
2F, Rm B, 52 Section Factory Building  
No. 516 Fu Te Rd (N)  
Shanghai 200131 P.R. China  
Telephone: 21-58680226, 58680227, 58680228  
FAX: 21-58680588

**FRANCE**

ANRITSU S.A  
9 Avenue du Quebec  
Zone de Courtaboeuf  
91951 Les Ulis Cedex  
Telephone: 016-09-21-550  
FAX: 016-44-61-065

**GERMANY**

ANRITSU GmbH  
Grafenberger Allee 54-56  
D-40237 Dusseldorf, Germany  
Telephone: 0211-968550  
FAX: 0211-968555

**INDIA**

MEERA AGENCIES PVT. LTD.  
23 Community Centre  
Zamroodpur, Kailash Colony Extension,  
New Delhi, India 110 048  
Phone: 011-2-6442700/6442800  
FAX : 011-2-644250023

**ISRAEL**

TECH-CENT, LTD.  
4 Raul Valenberg St  
Tel-Aviv 69719  
Telephone: (03) 64-78-563  
FAX: (03) 64-78-334

**ITALY**

ANRITSU Sp.A  
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00144 Roma EUR  
Telephone: (06) 50-99-711  
FAX: (06) 50-22-4252

**KOREA**

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Head Office:  
14F, Hyunjuk Building 832-41  
Yeoksam-Dong, Kangnam-Ku  
Seoul 135-080, South Korea  
Telephone: 02-553-6603  
FAX: 02-553-6604

Service Center:  
8F Hyunjuk Building  
832-41, Yeoksam Dong  
Kangnam-Gu  
Seoul, South Korea 135-080  
Telephone: 82-2-553-6603  
FAX: 82-2-553-6605

**JAPAN**

ANRITSU CUSTOMER SERVICE LTD.  
1800 Onna Atsugi-shi  
Kanagawa-Prf. 243 Japan  
Telephone: 0462-96-6688  
FAX: 0462-25-8379

**SINGAPORE**

ANRITSU (SINGAPORE) PTE LTD.  
10, Hoe Chiang Road  
#07-01/02 Keppel Towers  
Singapore 089315  
Telephone: 282-2400  
FAX: 282-2533

**SOUTH AFRICA**

ETECSA  
12 Surrey Square Office Park  
330 Surrey Avenue  
Ferndale, Randburt, 2194  
South Africa  
Telephone: 011-27-11-787-7200  
FAX: 011-27-11-787-0446

**SWEDEN**

ANRITSU AB  
Botivid Center  
Fittja Backe 13A  
145 84 Stockholm  
Telephone: (08) 534-707-00  
FAX: (08) 534-707-30

**TAIWAN**

ANRITSU CO., INC.  
7F, No. 316, Section 1  
NeiHu Road  
Taipei, Taiwan, R.O.C.  
Telephone: 886-2-8751-1816  
FAX: 886-2-8751-2126

**UNITED KINGDOM**

ANRITSU LTD.  
200 Capability Green  
Luton, Bedfordshire  
LU1 3LU, England  
Telephone: 015-82-433200  
FAX: 015-82-731303

# **Chapter 2**

## **Functional Description**

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# Chapter 2

## Functional Description

### **2-1** INTRODUCTION

This chapter provides brief functional descriptions of the major subsystems that are contained in each model of the Series 683XXC Synthesized High Performance Signal Generator. In addition, the operation of the frequency synthesis, automatic level control (ALC), and RF deck subsystems is described so that the reader may better understand the overall operation of the instrument. Block diagrams are included to supplement the written descriptions.

### **2-2** MAJOR SUBSYSTEMS

The signal generator circuitry consists of various distinct subsystems that are contained on one or more printed circuit board (PCB) assemblies or in microwave components located on the RF deck. The following paragraphs identify the subsystems that make up the instrument and provide a brief description of each. Figure 2-1 (page 2-6) is an overall block diagram of a typical 683XXC.

#### ***Digital Control***

This circuit subsystem consists of the A17 CPU and A16 CPU Interface PCBs. The central processor unit (CPU) is the main controller for the 683XXC. This controller directly or indirectly controls all functions of the instrument. The CPU contains memory that stores the main operating system components and instrument firmware, instrument calibration data, and front panel setups in the power-off condition. It has a GPIB interface that allows it to communicate with external devices over the GPIB and it has a serial interface to a serial terminal port on the rear panel. The CPU is directly linked via a dedicated data and address bus to the A2 Front Panel PCB, the A8 Function Generator PCB, the A9 PIN Control PCB, the A10 ALC PCB, the A11 FM PCB, the A12 Analog Instruction PCB, the A14 YIG, SDM, SQM Driver PCB, the A16 CPU Interface PCB, and the optional A13 10 MHz DDS PCB.

The CPU is indirectly linked via the A16 CPU Interface PCB to the A3 Reference Loop PCB, the A4 Coarse Loop PCB, the A5 Fine Loop PCB, and the A6 Pulse Generator PCB. The A16 PCB contains circuitry to perform parallel-to-serial and serial-to-parallel data conversion. It also contains circuitry for many of the rear panel signals, a 13-bit resolu-

tion DVM, and decoder circuitry for the front panel rotary data knob optical encoder.

***Front Panel***

This circuit subsystem consists of the the A1 Front Panel PCB, the A2 Front Panel Control PCB, and the Liquid Crystal Display (LCD). This subsystem interfaces the front panel LCD, LEDs, and keys to the CPU via the dedicated data and address bus. The front panel rotary data knob is indirectly linked to the CPU via the A16 CPU Interface PCB.

The A1 Front Panel PCB contains the keyboard matrix of conductive rubber switches. The A2 Front Panel Control PCB has circuitry to control the LCD dot-matrix display, turn the front panel LEDs on and off, and convert keyboard switch matrix signals to parallel keycode. It also contains the standby/operate line switch logic circuit and the optical encoder for the rotary data knob.

***Frequency  
Synthesis***

The frequency synthesis subsystem consists of the A3 Reference Loop PCB, the A4 Coarse Loop PCB, the A5 Fine Loop PCB, the A7 YIG Loop PCB, and the A11 FM PCB. It provides the reference frequencies and phase lock circuits for precise control of the YIG-tuned oscillator frequencies, as follows:

- ❑ The A3 Reference Loop PCB supplies the stable 10 MHz and 500 MHz reference frequency signals for the rest of the frequency synthesis system.
- ❑ The A4 Coarse Loop PCB generates coarse tuning frequencies of 219.5 to 245 MHz for use by the YIG Loop.
- ❑ The A5 Fine Loop PCB provides fine tuning frequencies of 21.5 to 40 MHz for use by the YIG Loop.
- ❑ The A7 YIG Loop PCB performs phase detection of the YIG-tuned oscillator's output frequency and provides a YIG loop error voltage to the A11 FM PCB.
- ❑ The A11 FM PCB processes the YIG loop error voltage, producing a correction signal that is used to fine tune and phase lock the YIG-tuned oscillator. The A11 PCB also contains circuitry for frequency modulation of the YIG-tuned oscillator RF output.

The CPU sends control data to the A3 Reference Loop PCB, the A4 Coarse Loop PCB, and the A5

Fine Loop PCB via the A16 PCB as serial data words. The CPU controls the A11 FM PCB via the dedicated data and address bus. Refer to paragraph 2-3 for a functional overview of the frequency synthesis subsystem.

***Analog  
Instruction***

The A12 Analog Instruction PCB provides the frequency tuning voltages to the A14 YIG, SDM, SQM Driver PCB. In addition, it provides a 0V to +10V ramp signal to the rear panel HORIZ OUT connector, a V/GHz signal to the rear panel AUX I/O connector, and a SLOPE signal to the A10 ALC PCB for slope-vs-frequency correction of the RF output power. The CPU controls the A12 Analog Instruction PCB via the dedicated data and address bus.

***YIG, SDM,  
SQM Driver***

The A14 YIG, SDM, SQM Driver PCB supplies the main tuning current and bias voltages for the YIG-tuned oscillator. It also provides bias voltages for the Down Converter assembly and the Switched Filter assembly. For models with a frequency range greater than 20 GHz, the A14 PCB supplies bias voltages for the Switched Doubler Module (SDM) and the Source Quadrupler Module (SQM). In addition, it provides modulator drive signals for the SQM.

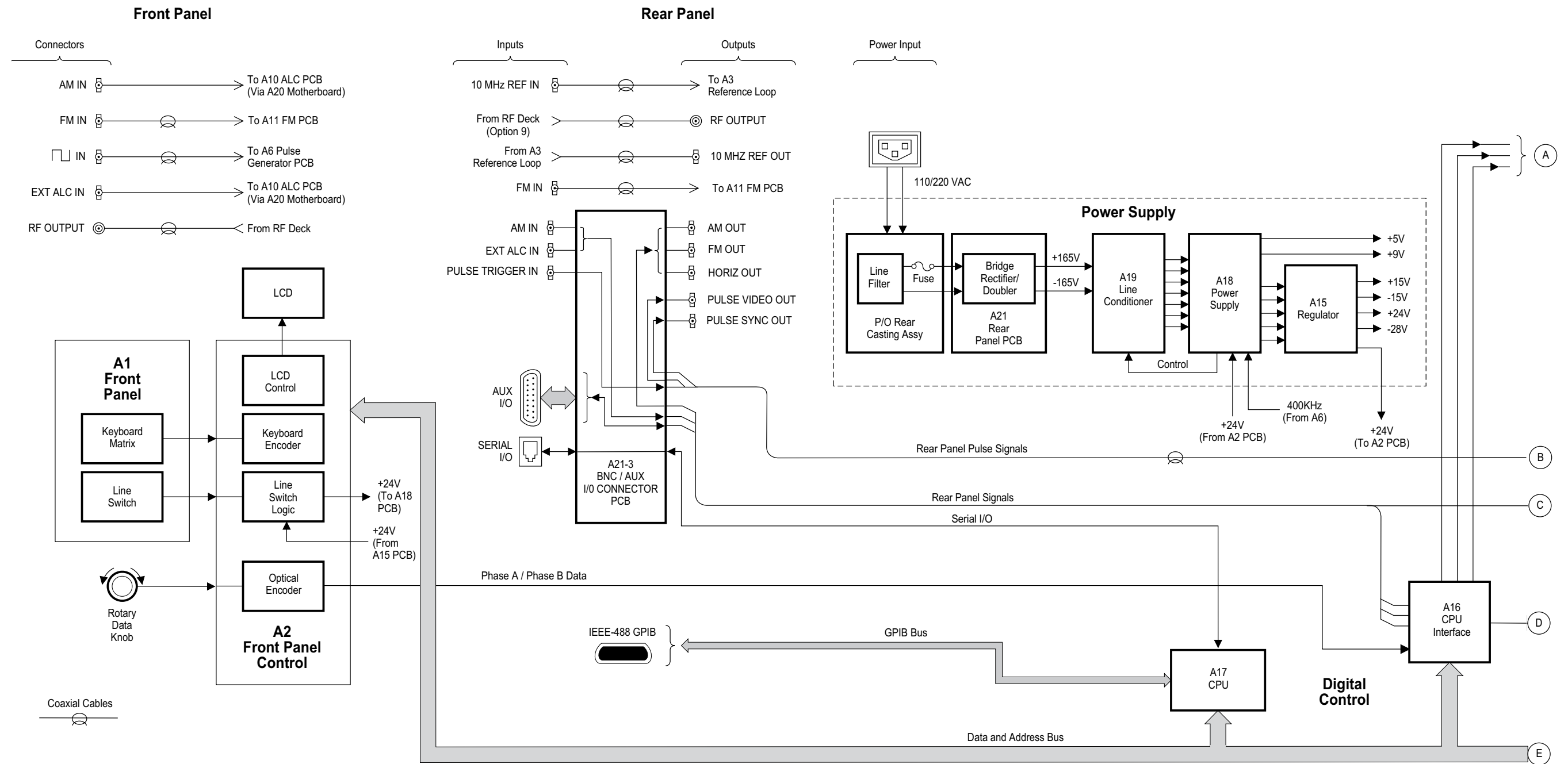
The A12 Analog Instruction PCB provides frequency tuning voltages for the main tuning coil driver of the YIG-tuned oscillator. The A17 CPU controls the A14 YIG, SDM, SQM Driver PCB via the dedicated data and address bus.

***Function  
Generator***

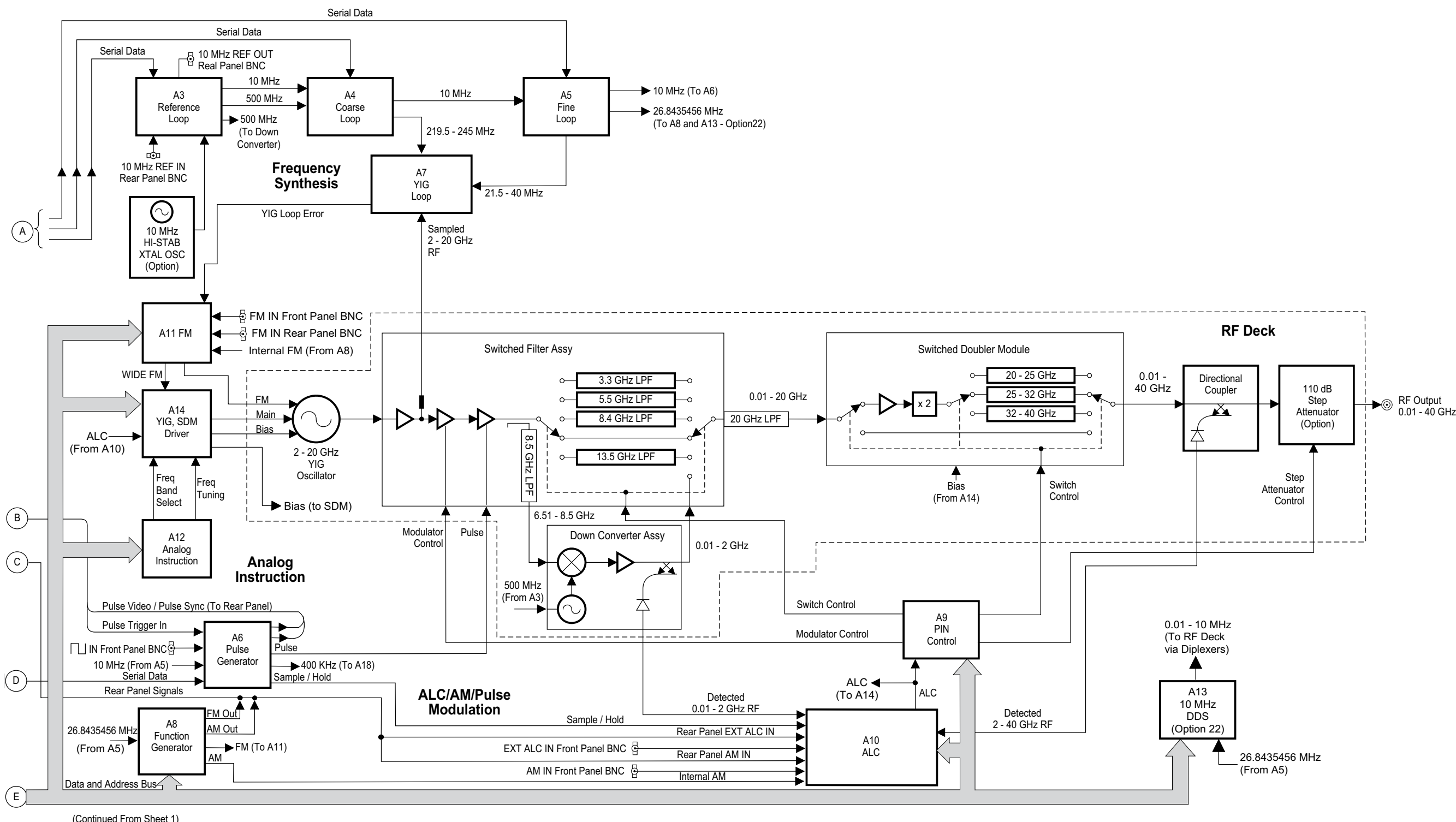
The A8 Function Generator PCB provides internally generated waveforms for amplitude and frequency modulation. The waveforms available are sine wave, square wave, triangle wave, positive ramp, negative ramp, Gaussian noise, and uniform noise. The AM waveforms are supplied to the A10 ALC PCB and the rear panel AM OUT connector; the FM waveforms are provided to the A11 FM PCB and the rear panel FM OUT connector. The CPU controls the A8 Function Generator PCB via the dedicated data and address bus.

**NOTE**

When Option 6 (phase modulation) is installed, the A8 Function Generator uses its internal FM generator to provide the available waveforms for both frequency and phase modulation.



**Figure 2-1. Block Diagram of a Typical 683XXC Synthesized High Performance Signal Generator (Sheet 1 of 2)**



**Figure 2-1.** Block Diagram of a Typical 683XXC Synthesized High Performance Signal Generator (Sheet 2 of 2)

***ALC/AM/Pulse  
Modulation***

This circuit subsystem consists of the A6 Pulse Generator PCB, the A9 PIN Control PCB, the A10 ALC PCB, and part of the A14 YIG, SDM, SQM Driver PCB. It provides the following:

- ❑ Level control of the RF output power.
- ❑ AM and pulse modulation of the RF output.
- ❑ Current drive signals to the PIN switches located in the Switched Filter assembly and Switched Doubler Module (SDM).
- ❑ Drive signals for the Step Attenuator (Option 2) and the Diplexers (used with Option 22).

The CPU controls the A9 Pin Control PCB, the A10 ALC PCB, and the A14 YIG, SDM, SQM Driver PCB via the dedicated data and address bus. It sends control data to the A6 Pulse Generator PCB via the A16 PCB as serial data words. Refer to paragraph 2-4 for a functional overview of the ALC and modulation subsystem.

***RF Deck***

This subsystem contains those elements related to the generation, modulation, and control of the sweep- and CW-frequency RF signals. These elements include; the YIG-tuned oscillator, the 0.01 to 2 GHz Down Converter assembly, the Switched Filter assembly, the Switched Doubler Module (SDM), the Source Quadrupler Module (SQM), the Directional Coupler/Level Detector, and the optional Step Attenuator. Refer to paragraph 2-5 for a functional overview of the RF deck subsystem.

***Power Supply***

The power supply subsystem consists of the A15 Regulator PCB, the A18 Power Supply PCB, the A19 Line Conditioner PCB, and part of the A21 Rear Panel PCB and Rear Casting Assembly. It supplies all the regulated DC voltages used by the signal generator circuits. The voltages are routed throughout the instrument via the A20 Motherboard PCB.

***Inputs/  
Outputs***

The A21-3 BNC/AUX I/O Connector PCB and the A16 CPU Interface PCB contain the interface circuitry for the majority of the rear panel input and output connectors, including the AUX I/O connector.

The front panel AM and External ALC inputs are routed via the A20 Motherboard PCB to the A10 ALC PCB. The front panel FM and Pulse Trigger inputs are coupled directly via coaxial cables to

**NOTE**

When Option 6 (phase modulation) is installed, the front panel and rear panel FM IN connectors also serve as the  $\Phi$ M IN connectors.

their destination PCBs—the FM input to A11 FM PCB and the Pulse/Trigger input to the A6 Pulse Generator PCB.

The rear panel connectors, 10 MHz REF OUT, 10 MHz REF IN, and FM/ $\Phi$ M IN, are coupled directly to PCBs via coaxial cables—10 MHz REF OUT and 10 MHz REF IN to the A3 Reference Loop PCB and FM/ $\Phi$ M IN to the A11 FM PCB. The rear panel connectors, PULSE TRIGGER IN, PULSE SYNC OUT, and PULSE VIDEO OUT, are coupled via the A21-1 PCB and coaxial cables directly to the A6 Pulse Generator PCB. The rear panel IEEE-488 GPIB and SERIAL I/O connectors are connected to the A17 CPU PCB via the A20 Motherboard PCB.

***Motherboard/  
Interconnec-  
tions***

The A20 Motherboard PCB and associated cables provide the interconnections for the flow of data, signals, and DC voltages between all internal components and assemblies throughout the 683XXC.

**2-3 FREQUENCY SYNTHESIS**

The frequency synthesis subsystem provides phase-lock control of the 683XXC output frequency. It consists of four phase-lock loops, the Reference Loop, the Coarse Loop, the Fine Loop, and the YIG Loop. The four phase-lock loops, operating together, produce an accurately synthesized, low-noise RF output signal. Figure 2-2 (page 2-11) is an overall block diagram of the frequency synthesis subsystem. The following paragraphs describe phase-lock loops and the overall operation of the frequency synthesis subsystem.

***Phase-Lock  
Loops***

The purpose of a phase-lock loop is to control the frequency of a variable oscillator in order to give it the same accuracy and stability as a fixed reference oscillator. It works by comparing two frequency inputs, one fixed and one variable, and by supplying a correction signal to the variable oscillator to reduce the difference between the two inputs. For example, suppose we have a 10 MHz reference oscillator with a stability of  $1 \times 10^{-7}$ /day, and we wish to transfer that stability to a voltage controlled oscillator (VCO). The 10 MHz reference signal is applied to the reference input of a phase-lock loop circuit. The signal from the VCO is applied to the variable input. A phase detector in the phase-lock loop circuit compares the two inputs and determines whether the variable input waveform is leading or lagging the reference. The phase detector generates a correction signal that (depending on polarity) causes the VCO frequency to increase or decrease to reduce any

phase difference. When the two inputs match, the loop is said to be *locked*. The variable input from the VCO then equals the reference input in phase, frequency, accuracy, and stability.

In practical applications a frequency divider is placed between the output of the variable oscillator and the variable input to the phase-lock loop. The circuit can then be used to control a frequency that is an exact multiple of the reference frequency. In this way, the variable oscillator acquires the stability of the reference without equaling its frequency. In the A3 Reference Loop, the 100 MHz oven-controlled crystal oscillator (OCXO) can be controlled by the phase-lock loop using a 10 MHz reference. This is because a divide-by-ten circuit is between the OCXO's output and the variable input to the phase-lock loop. Both inputs to the phase detector will be 10 MHz when the loop is locked.

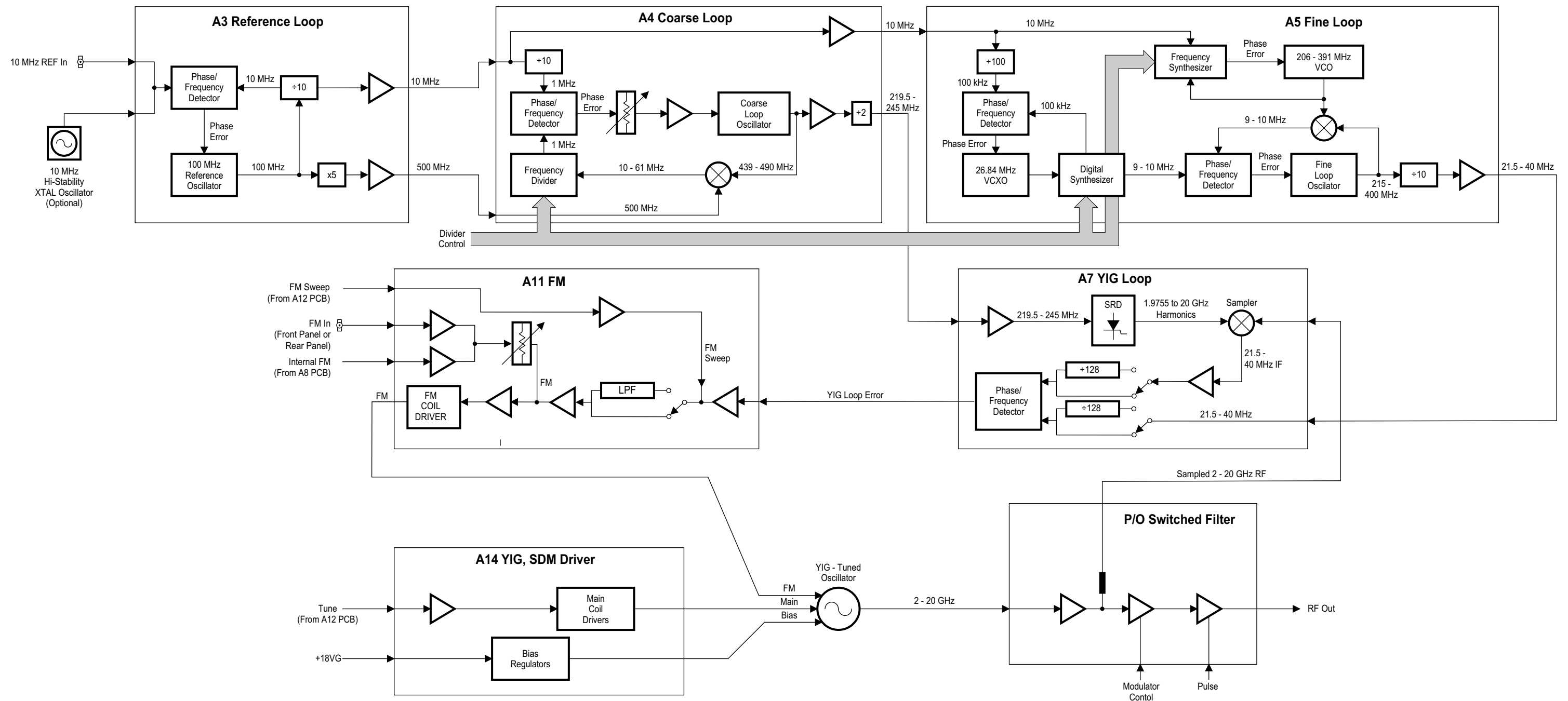
If a programmable frequency divider is used, a number of frequencies can be phase-locked to the same reference. The limitation is that all must be exact multiples of the reference. The A4 Coarse Loop and A5 Fine Loop both use programmable frequency dividers.

### ***Overall Operation***

The YIG-tuned oscillator generates a high-power RF output signal that has low broadband noise and low spurious content. The frequency of the YIG-tuned oscillator is controlled by means of (1) its main tuning coil and (2) its FM (fine tuning) coil. Main tuning coil current from the YIG Driver PCB coarsely tunes the YIG-tuned oscillator to within a few megahertz of the final output frequency. The YIG phase-lock loop is then used to fine tune the YIG-tuned oscillator to the exact output frequency and to reduce FM noise close to the carrier.

One input to the YIG Loop is the 219.5 to 245 MHz signal from the Coarse Loop. This signal is amplified to drive the step-recovery diode. The step-recovery diode produces harmonics of the coarse loop signal ( $\geq 1.9755$  to  $>20$  GHz). These harmonics are used by the sampler.





**Figure 2-2.** Block Diagram of the Frequency Synthesis Subsystem

**Table 2-1.** *RF Output and Loop Frequencies*

RF OUTPUT/LOOP FREQUENCIES (in MHz)		
RF OUT	COARSE LOOP	FINE LOOP
2000	219.5	24.5
3000	229	23
4000	234	22
5000	237	23
6000	239	25
7000	240.5	25.5
8000	241.5	30.5
9000	242.5	27.5
10000	243	37
11000	238.5	29
12000	239.5	25

The other input to the sampler is the RF output signal from the YIG-tuned oscillator. Mixing this RF output signal sample with the adjacent coarse-loop harmonic produces a low frequency difference signal that is the YIG IF signal (21.5 to 40 MHz).

The 683XXC CPU programs the coarse-loop oscillator's output frequency so that one of its harmonics will be within 21.5 to 40 MHz of the desired YIG-tuned oscillator's output frequency. The YIG Loop phase detector compares the YIG IF signal to the 21.5 to 40 MHz frequency reference signal from the Fine Loop. If there is a difference, the YIG phase detector fine tunes the YIG-tuned oscillator (via the FM circuitry and the FM coil driver) to eliminate any frequency difference between the two signals.

Phase locking the instrument's output frequency over a broad frequency range is accomplished by programming the coarse-loop oscillator's output to various frequencies that have harmonics close to the desired operating frequencies. Exact frequency tuning for each desired operating frequency is accomplished by programming the fine-loop oscillator. (In each case, the YIG-tuned oscillator is first tuned via the main tuning coil to the approximate desired operating frequency.) Table 2-1 shows the coarse-loop and fine-loop frequencies for some specific RF output frequencies.

The coarse-loop oscillator has a programming (tuning) range of 219.5 to 245 MHz and a resolution of 1 MHz. This provides harmonics from  $\geq 1.9755$  GHz to  $>20$  GHz. This allows any YIG-tuned oscillator output frequency to be down converted to a YIG IF signal of 21.5 to 40 MHz.

The YIG Loop is fine tuned by varying the 21.5 to 40 MHz reference frequency signal applied to the YIG loop phase detector. By programming the fine-loop oscillator, this signal can be adjusted in 1 kHz increments over the 21.5 to 40 MHz range. The resolution of the fine-loop oscillator (hence the resolution of the RF output signal) is 1 kHz, which is much finer than is available from the coarse loop alone. For applications requiring a resolution finer than 1 kHz, an optional tuning resolution of 0.1 Hz is available.

The Coarse Loop and Fine Loop outputs are derived from high-stability 10 MHz and 500 MHz signals generated by the Reference Loop. For applications requiring even greater stability, the 100 MHz reference oscillator can be phase locked to an optional 10 MHz reference (internal or external).

***RF Outputs  
0.00001 to  
65 GHz***

Refer to the RF Deck block diagram shown in Figure 2-1 (page 2-7) for the following description. The 683XXC uses one YIG-tuned oscillator. All other frequencies output by the signal generator, except for 0.01 to 10 MHz, are derived from the fundamental frequencies generated by this YIG-tuned oscillator.

**0.01 to 2 GHz**

RF output frequencies of 0.01 to 2 GHz are generated by down converting the fundamental frequencies of 6.51 to 8.5 GHz. This is achieved using a 6.5 GHz local oscillator signal that is phase locked to the 500 MHz output of the Reference Loop. Precise control of the 0.01 to 2 GHz frequencies to 1 kHz (0.1 Hz with Option 11) resolution is accomplished by phase-lock control of the 6.51 to 8.5 GHz fundamental frequencies prior to down conversion.

**20 to 40 GHz**

RF output frequencies of 20 to 40 GHz are produced by doubling the 10 to 20 GHz fundamental frequencies. Phase-lock control of the 10 to 20 GHz fundamental frequencies, accomplished prior to doubling, ensures precise control of the 20 to 40 GHz frequencies to 1 kHz (0.1 Hz with Option 11) resolution.

**40 to 65 GHz**

RF output frequencies of 40 to 65 GHz are developed by quadrupling the 10 to 16.25 GHz fundamental frequencies (refer to Figure 2-7, page 2-24). Precise control of the 40 to 65 GHz to 1 kHz (0.1 Hz with Option 11) resolution is achieved by phase-lock control of the 10 to 16.25 GHz fundamental frequencies prior to quadrupling.

**0.01 to 10 MHz (Option 22)**

RF output frequencies of 0.01 to 10 MHz are produced by instruments with Option 22. The 0.01 to 10 MHz signal is generated by the Direct Digital Synthesizer on the A13 10 MHz DDS PCB, installed by Option 22. Precise control of the 0.01 to 10 MHz frequencies to 0.1 Hz resolution is achieved by phase-lock control of the 26.8435456 MHz signal

from the A5 Fine Loop PCB that is doubled to produce the clock frequency for the DDS.

***Frequency  
Modulation***

Frequency modulation (FM) of the YIG-tuned oscillator RF output is achieved by summing an external or internal modulating signal into the FM control path of the YIG loop. Refer to Figures 2-1 and 2-2. The external modulating signal comes from the front panel or rear panel FM IN input; the internal modulating signal comes from the A8 Function Generator PCB. Circuits on the A11 FM PCB adjust the modulating signal for the FM sensitivity selected, then sum it into the YIG loop FM control path. There, it frequency modulates the RF output signal by controlling the YIG-tuned oscillator's FM (fine tuning) coil current.

***Phase  
Modulation  
(Option 6)***

Phase modulation ( $\Phi$ M) of the YIG-tuned oscillator RF output is achieved by summing an external or internal modulating signal into the FM control path of the YIG loop. The external modulating signal comes from the front panel or rear panel FM IN/ $\Phi$ M IN input; the internal modulating signal comes from the A8 Function Generator PCB. Circuits on the A11 FM PCB adjust the modulating signal for the  $\Phi$ M sensitivity selected, convert the modulating signal to a  $\Phi$ M signal by differentiation, and then sum it into the YIG loop FM control path. There, it phase modulates the RF output signal by controlling the YIG-tuned oscillator's FM (fine tuning) coil current.

***Analog Sweep  
Mode***

Broad-band analog frequency sweeps (>100 MHz wide) of the YIG-tuned oscillator RF output are accomplished by applying appropriate analog sweep ramp signals, generated by the A12 Analog Instruction PCB, to the YIG-tuned oscillator's main tuning coil (via the A14 YIG, SDM, SQM Driver PCB). In this mode, the start, stop, and bandswitching frequencies are phase-lock-corrected during the sweep.

Narrow-band analog frequency sweeps ( $\leq$ 100 MHz wide) of the YIG-tuned oscillator RF output are accomplished by summing appropriate analog sweep ramp signals, generated by the A12 Analog Instruction PCB, into the YIG-tuned oscillator's FM tuning coil control path. The YIG-tuned oscillator's RF output is then swept about a center frequency. The center frequency is set by applying a tuning signal (also from the A12 PCB) to the YIG-tuned oscillator's main tuning coil (via the A14 YIG, SDM, SQM

Driver PCB). In this mode, YIG loop phase locking is disabled except during center frequency correction, which occurs during sweep retrace.

***Step Sweep  
Mode***

Step (digital) frequency sweeps of the YIG-tuned oscillator RF output consist of a series of discrete, synthesized steps between a start and stop frequency. Each frequency step is generated by applying the tuning signal (from the A12 Analog Instruction PCB) to the YIG-tuned oscillator's main tuning coil, then phase-locking the RF output. Every frequency step in the sweep range is phase-locked.

**2-4 ALC/AM/PULSE  
MODULATION**

The ALC, AM, and pulse modulation subsystem provides automatic level control (ALC), amplitude modulation (AM), and pulse modulation of the signal generator's RF output signal. The ALC loop consists of circuits located on the A10 ALC PCB, the A9 PIN Control PCB, and the A14 YIG, SDM, SQM Driver PCB. These circuits interface with the Switched Filter assembly, the Down Converter assembly, the Source Quadrupler Module (SQM), and the Directional Coupler/Level Detector (all located on the RF deck). AM modulation circuits (located on the A10 ALC PCB) are included in this loop.

Pulse modulation of the RF output signal is provided by circuits located on the A6 Pulse Generator PCB. These circuits interface directly with the Switched Filter assembly located on the RF deck. The overall block diagram of the ALC and modulation subsystem is shown in Figure 2-3, page 2-17. The following paragraphs describe the operation of the subsystem components.

***ALC Loop  
Operation***

In the 683XXC, a portion of the RF output is detected and coupled out of the Directional Coupler/Level Detector as the feedback input to the ALC loop. The feedback signal from the detector is routed to the A10 ALC PCB where it is compared with a *reference voltage* that represents the desired RF power output level. If the two voltages do not match, an error correction signal is fed from the A10 ALC PCB to the modulator shaper amplifier circuits located on the A9 PIN Control PCB and the A14 YIG, SDM, SQM Driver PCB. The resulting modulator control voltage output causes the modulators, located in the Switched Filter assembly and the SQM, to adjust the RF output level. Thus, the feedback signal from the detector will be set equal to the reference voltage.

**NOTE**

The instrument uses two internal level detection circuits. For frequencies  $<2$  GHz, the level detector is part of the Down Converter. The signal from this detector is routed to the A10 ALC PCB as the Detector 0 input. For frequencies  $\geq 2$  GHz, the level detector is part of the main Directional Coupler. The signal from this detector is routed to the A10 ALC PCB as the Detector 1 input.

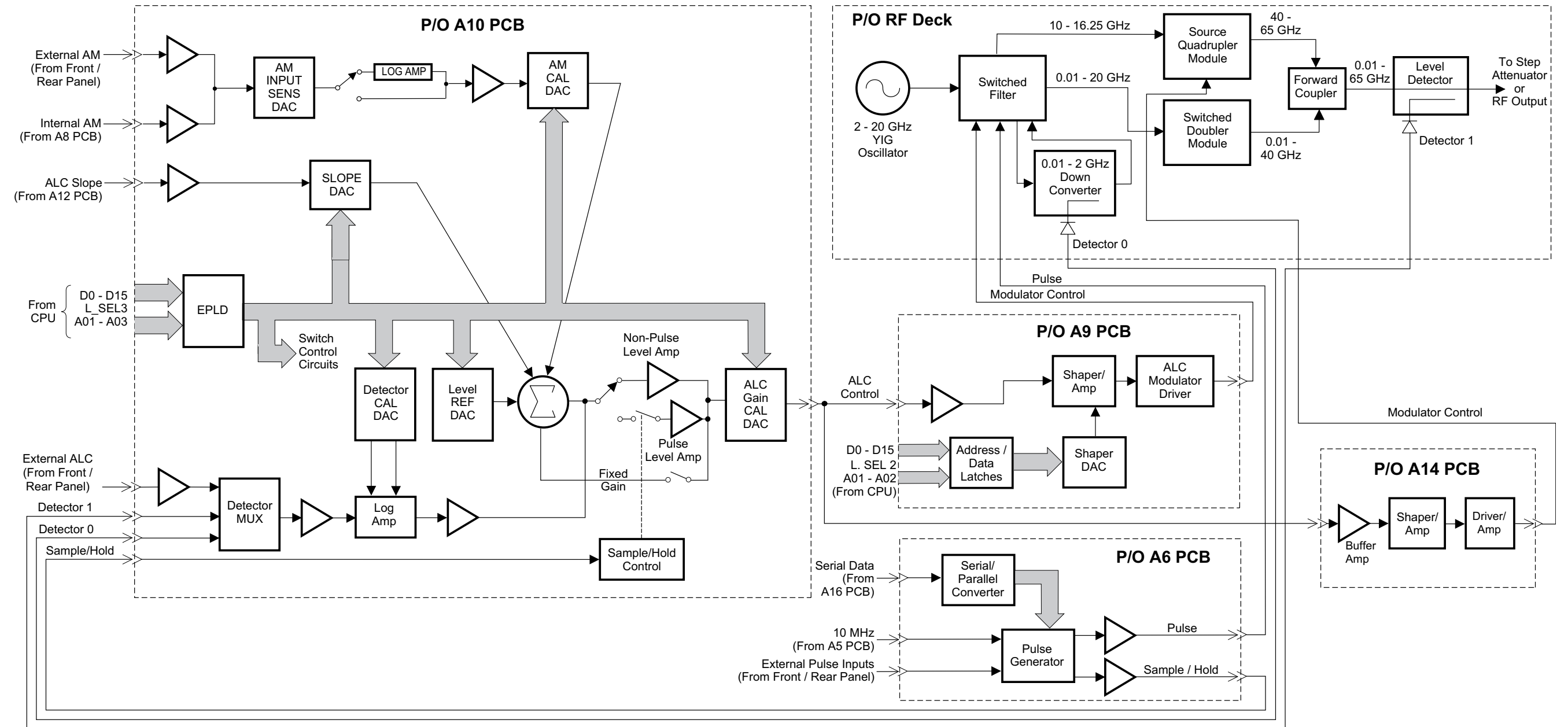
The Level Reference DAC, under the control of the CPU, provides the RF level reference voltage. By setting the output of this DAC to the appropriate voltage, the CPU adjusts the RF output power to the level selected by the user. Leveled output power can be set over a maximum range of up to 33 dB (up to 149 dB with the Option 2 step attenuator) using front panel controls or the GPIB. Instruments with Option 15B (High Power) provide leveled output power over a maximum range of up to 27 dB (up to 141 dB with the Option 2 step attenuator).

**External Leveling**

In the external leveling mode, an external detector or power meter monitors the RF output level of the 683XXC instead of an internal level detector. The signal from the external detector or power meter goes to the A10 ALC PCB from the front or rear panel inputs. The ALC controls the RF power output level as previously described.

**ALC Slope**

During analog sweeps, a slope-vs-frequency signal, from the A12 Analog Instruction PCB, is summed with the level reference and detector inputs into the ALC loop. The Slope DAC, under the control of the CPU, adjusts this ALC slope signal to compensate for an increasing or decreasing output power-vs-frequency characteristic caused by the level detectors and (optional) step attenuator. In addition, the Slope DAC lets the user adjust for the slope-vs-frequency characteristics of external components.



**Figure 2-3.** Block Diagram of the ALC/AM/Pulse Modulation Subsystem

**Power Sweep**

In this mode, the CPU has the ALC step the RF output through a range of levels specified by the user. This feature can be used in conjunction with the sweep mode to produce a set of identical frequency sweeps, each with a different RF power output level.

**Amplitude Modulation**

Amplitude modulation (AM) of the RF output signal is accomplished by summing an external or internal modulating signal into the ALC loop. External modulating signals come from the front panel or rear panel AM IN inputs; the internal modulating signal comes from the A8 Function Generator PCB. The AM Input Sensitivity DAC and the AM Calibration DAC, under the control of the CPU, adjust the modulating signal for the proper amount of AM in both the linear (log amp in) and the log (log amp bypassed) modes of operation. The adjusted modulating signal is summed with the level reference, slope, and detector inputs into the ALC loop. This produces an ALC control signal that varies with the modulating signal. The action of the ALC loop then causes the envelope of the RF output signal to track the modulation signal.

**Pulse Modulation Operation**

During pulse modulation, the ALC level amplifier (A10 ALC PCB) is operated as a sample/hold amplifier. The level amplifier is synchronized with the modulating pulses from the A6 Pulse Generator PCB so that the ALC loop effectively operates only during the *ON* portion of the pulsed modulated RF output.

***Pulse  
Generator  
Operation***

The A6 Pulse Generator PCB provides the internal pulse generating function for the signal generator. It also interfaces external pulse inputs from the front or rear panel connectors to the pulse modulator driver in the external mode.

The pulse generator produces a pulse modulation waveform consisting of single, doublet, triplet, or quadruplet pulse trains at variable pulse rates, widths, and delays. It operates at two selectable clock rates—10 MHz and 40 MHz. In addition, the pulse generator produces a sync pulse and video pulse output that goes to the rear panel and a sample/hold signal that goes to the A10 ALC PCB. The sync pulse output is for synchronizing auxiliary in-



struments to the internally generated pulse; the video pulse is a TTL level copy of the RF output pulse; and the sample/hold signal synchronizes the ALC loop to the *ON* portion of the pulse modulating waveform.

The 683XXC has five pulse modulation modes:

- ❑ Internal pulse modulation mode – The pulse modulation waveform is generated and timed internally.
- ❑ External pulse mode – The external pulse source signal from the front or rear panel connectors is interfaced by the pulse generator to the pulse modulation driver.
- ❑ External triggered mode – The pulse generator is triggered by the external pulse source signal to produce the pulse modulation waveform.
- ❑ External gated mode – The external pulse source signal gates the internal pulse generator on and off.
- ❑ Composite mode – The external pulse source signal triggers the internal pulse generator and also modulates the RF output signal. The pulse generator produces a delayed, single pulse waveform that also modulates the RF output signal.

## **2-5 RF DECK ASSEMBLIES**

The primary purpose of the RF deck assembly is to generate CW and swept frequency RF signals and route these signals to the front panel RF OUTPUT connector. It is capable of generating RF signals in the frequency range of 0.01 to 65 GHz (0.00001 to 65 GHz with Option 22).

The series 683XXC synthesized high performance signal generators use a single YIG-tuned oscillator. All other frequencies, except for 0.01 to 10 MHz, are derived from the fundamental frequencies generated by this oscillator, as follows:

- ❑ RF output frequencies of 0.01 to 2 GHz are developed by down-converting the fundamental frequencies of 6.51 to 8.5 GHz.
- ❑ RF output frequencies of 20 to 40 GHz are produced by doubling the fundamental frequencies of 10 to 20 GHz.
- ❑ RF output frequencies of 40 to 65 GHz are produced by quadrupling the fundamental frequencies of 10 to 16.25 GHz.
- ❑ RF output frequencies of 0.01 to 10 MHz are generated by the A13 10 MHz DDS PCB, installed by Option 22.

The paragraphs, on the following pages, briefly describe the operation of the RF deck assembly.

***RF Deck Con-  
figurations***

All 683XXC RF deck assemblies contain a YIG-tuned oscillator, a switched filter assembly, and a directional coupler. Beyond that, the configuration of the RF deck assembly varies according to the particular instrument model. Block diagrams of the various RF deck configurations are shown in the following figures:

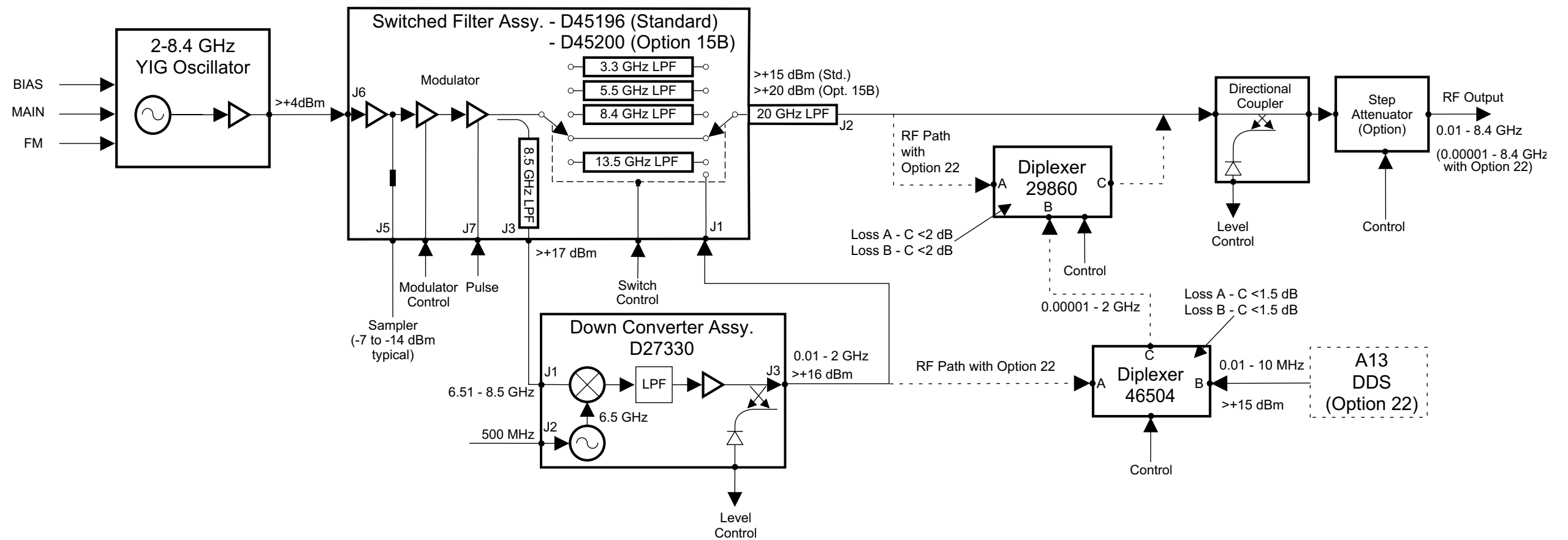
- Figure 2-4, page 2-21, is a block diagram of the RF deck assembly for Model 68317C.
- Figure 2-5, page 2-22, is a block diagram of the RF deck assembly for Models 68337C and 68347C.
- Figure 2-6, page 2-23, is a block diagram of the RF deck assembly for Model 68367C.
- Figure 2-7, page 2-24, is a block diagram of the RF deck assembly for Models 68377C, 68387C, and 68397C.

The block diagrams of the RF deck assemblies shown in Figures 2-4 thru 2-7 (pages 2-21 thru 2-24) include all of the common RF components found in the 683XXC RF deck assemblies. Refer to these block diagrams during the descriptions of RF deck operation presented in the following paragraphs.

***YIG-tuned  
Oscillator***

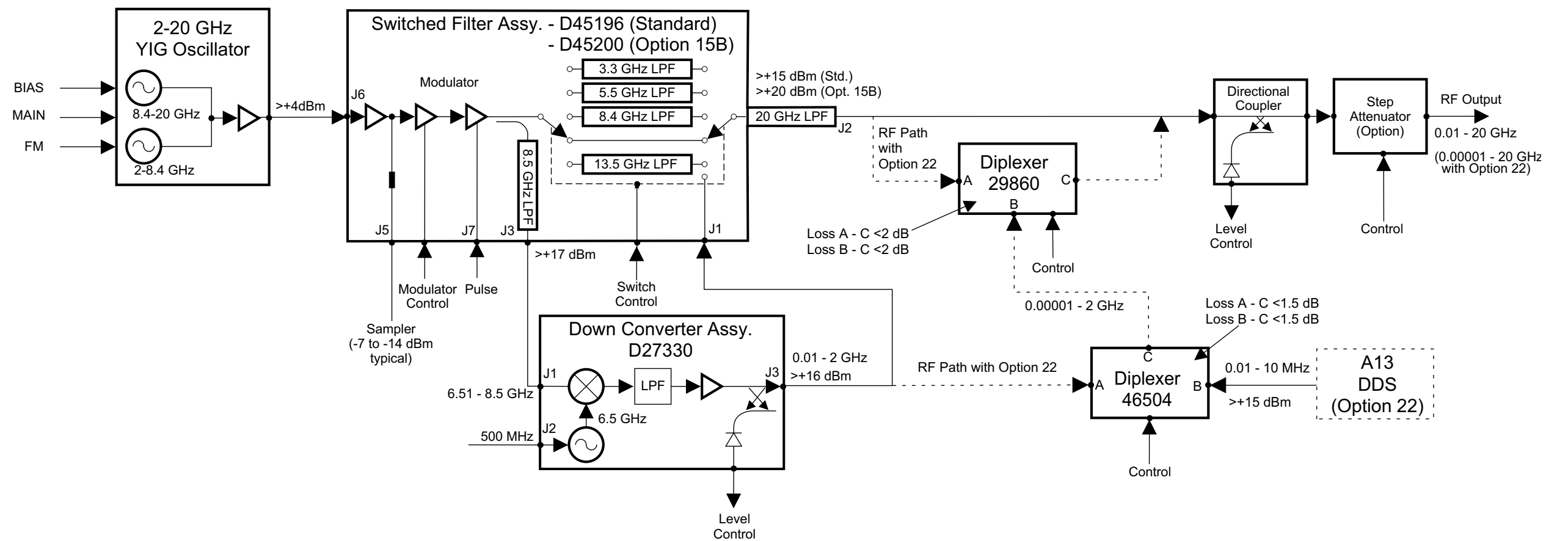
There are two configurations of YIG-tuned oscillator used in the 683XXC—a 2 to 8.4 GHz oscillator used in the 68317C model and a 2 to 20 GHz oscillator used in all other 683XXC models. The 2 to 20 GHz YIG-tuned oscillator actually contains two oscillators—one covering the frequency range of 2 to 8.4 GHz and one covering the frequency range of 8.4 to 20 GHz. Both oscillators use a common internal amplifier.

The YIG-tuned oscillator generates RF output signals that have low broadband noise and low spurious content. It is driven by the Main tuning coil current and bias voltages from the A14 YIG, SDM, SQM Driver PCB and the FM tuning coil current from the A11 FM PCB. During CW mode, the main tuning coil current tunes the oscillator to within a few megahertz of the final output frequency. The phase-lock circuitry of the YIG loop then fine adjusts the oscillator's FM tuning coil current to make the output frequency exact. Frequency modulation of the RF output is also accomplished by summing the modulating signal into the oscillator's FM tuning coil control path.



**NOTE**  
If the Electronic Step Attenuator (Option 2E) is installed, the 0.01 to 10 MHz signal (Option 22) is inserted at the Step Attenuator. Diplexers (P/Ns 29860 and 46504) are not required.

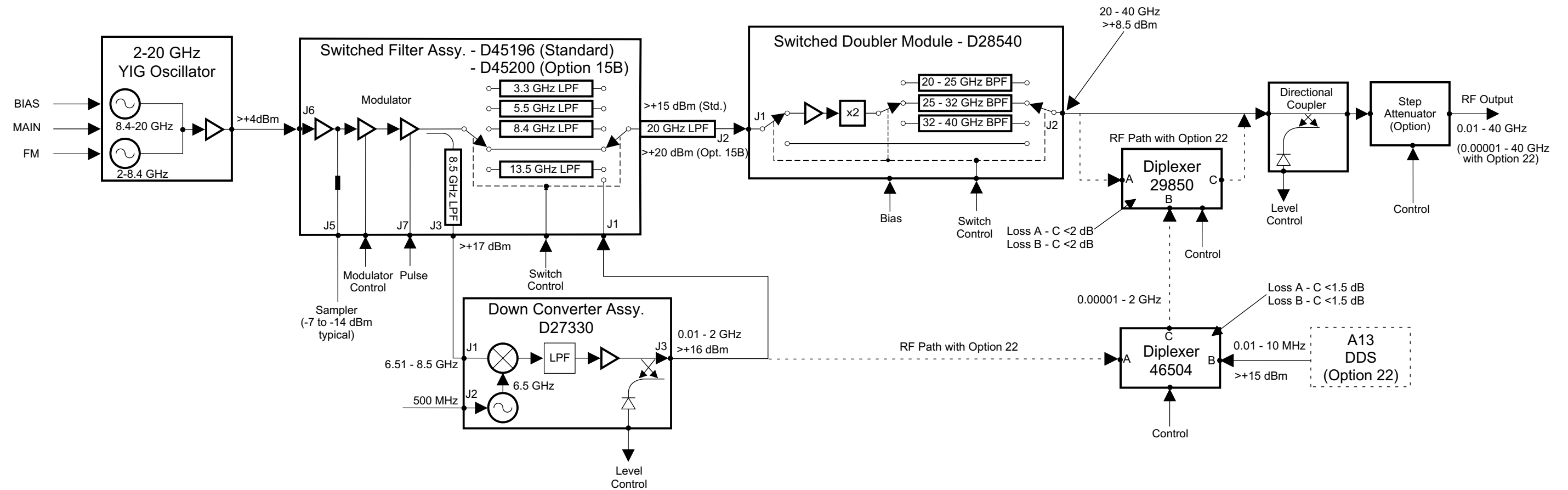
**Figure 2-4.** Block Diagram of the RF Deck Assembly for Model 68317C.



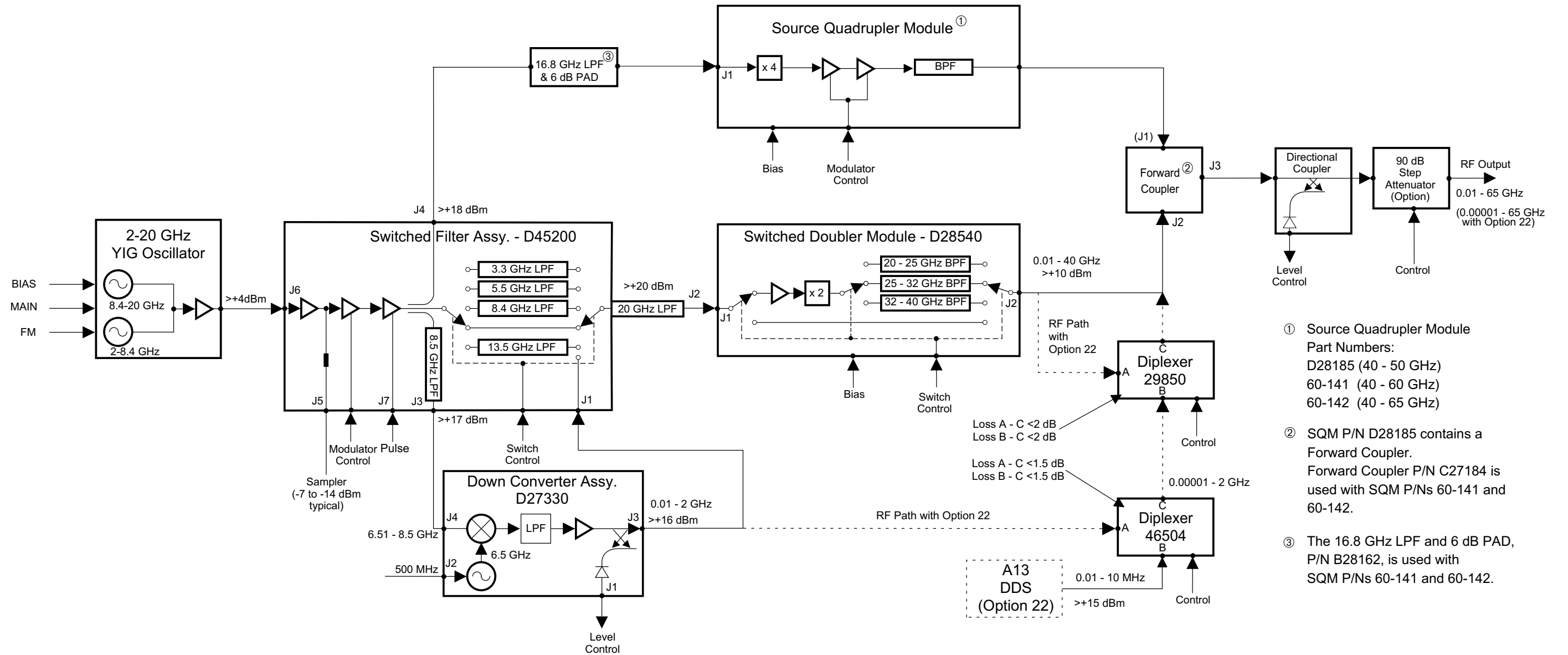
**NOTES**

1. Down Converter Assy (P/N D27330) not installed in Model 68337C.
2. If the Electronic Step Attenuator (Option 2F) is installed, the 0.01 to 10 MHz signal (Option 22) is inserted at the Step Attenuator. Diplexers (P/Ns 29860 and 46504) are not required.

**Figure 2-5.** Block Diagram of the RF Deck Assembly for Models 68337C and 68347C.



**Figure 2-6.** Block Diagram of the RF Deck Assembly for Model 68367C.



- ① Source Quadrupler Module  
Part Numbers:  
D28185 (40 - 50 GHz)  
60-141 (40 - 60 GHz)  
60-142 (40 - 65 GHz)
- ② SQM P/N D28185 contains a  
Forward Coupler.  
Forward Coupler P/N C27184 is  
used with SQM P/Ns 60-141 and  
60-142.
- ③ The 16.8 GHz LPF and 6 dB PAD,  
P/N B28162, is used with  
SQM P/Ns 60-141 and 60-142.

Figure 2-7. Block Diagram of the RF Deck Assembly for Models 68377C, 68387C, and 68397C.

When the 683XXC is generating broad-band analog frequency sweeps (>100 MHz wide), the main tuning coil current tunes the oscillator through the sweep frequency range. Phase locking to fine adjust the oscillator's output frequency is only done at the bottom and top of the sweep ramp and on both sides of each band switch point. Narrow-band analog frequency sweeps ( $\leq 100$  MHz wide) are accomplished by summing the appropriate sweep ramp signal into the oscillator's FM tuning coil control path. The YIG-tuned oscillator's RF output is then swept about a center frequency that is set by the main tuning coil current. Phase locking to fine tune the output frequency is done at the center frequency of the sweep

***Power Level  
Control and  
Modulation***

The RF output signal from the YIG-tuned oscillator is fed to connector J6 of the switched filter assembly. In the switched filter assembly, the RF signal is amplified then goes to the modulator. A portion of the RF signal to the modulator is picked off and coupled out via connector J5 to the Sampler for use by the YIG loop circuitry. The modulator provides for power level control, AM, and pulse modulation of the RF output signals.

In addition to the amplified RF signal from the YIG-tuned oscillator, the modulator has two other inputs—the modulator control input and the pulse input. The modulator control input adjusts the gain of the modulator to control the power level of the RF output signals. The modulator control signal is received from the A9 PIN Control PCB where it is developed from the ALC control signal. Amplitude modulation is accomplished by varying the modulator control signal with the modulating signal. Pulse modulation is achieved by switching the modulator on and off at a rate determined by the modulating pulse input. The modulating pulse input is received via connector J7 from the A6 Pulse Generator PCB.

***RF Signal  
Filtering***

The RF signal from the modulator is fed via PIN switches to the switched low-pass filters. PIN switch drive current is received from the A9 PIN Control PCB. A coupler in the switched filter path provides the RF signal for the down converter. Whenever an instrument is generating RF signals of <2 GHz, a RF signal is coupled out, through a 8.5 GHz low-pass filter and connector J3 to the down converter. Another coupler in the switched filter path of high

power switched filter assemblies provides the RF signal for the source quadrupler module (refer to Figure 2-7). Whenever an instrument is generating RF signals of >40 GHz, a RF signal is coupled out via J4 to the source quadrupler module.

The switched low-pass filters provide rejection of the harmonics that are generated by the YIG-tuned oscillator. In model 68317C, the 2 to 8.4 GHz RF signal from the modulator has three filtering paths—3.3 GHz, 5.5 GHz, and 8.4 GHz. In all other 683XXC models, the 2 to 20 GHz RF signal from the modulator has four filtering paths and a through path. The four filtering paths are 3.3 GHz, 5.5 GHz, 8.4 GHz, and 13.5 GHz. Signals above 13.5 GHz are routed via the through path.

After routing through the appropriate path, the 2 to 8.4 GHz or 2 to 20 GHz RF signal is multiplexed by the PIN switches and goes via a 20 GHz low-pass filter to the switched filter assembly output connector J2. The 0.01 to 2 GHz RF signal, from the down converter, is received at connector J1, then multiplexed through the same path to the switched filter output.

From J2, the RF signal goes to either the directional coupler ( $\leq 20$  GHz models) or the input connector J1 of the switched doubler module ( $> 20$  GHz models).

In units with Option 22, the RF signal from J2 goes to either input connector A of the diplexer ( $\leq 20$  GHz models) or the input connector J1 of the switched doubler module ( $> 20$  GHz models).

***0.01 to 2 GHz  
Down  
Converter***

The 0.01 to 2 GHz Down Converter assembly (Figures 2-4 thru 2-7) contains a 6.5 GHz VCO that is phase-locked to the 500 MHz reference signal from the A3 Reference Loop PCB. The 6.5 GHz VCO's phase-lock condition is monitored by the CPU. The 6.5 GHz VCO is on at all times; however, the down converter amplifier is powered on by the A14 YIG, SDM, SQM Driver PCB only when the 0.01 to 2 GHz frequency range is selected.

During CW or swept frequency operations in the 0.01 to 2 GHz frequency range, the 6.51 to 8.5 GHz RF signal output from J3 of the switched filter assembly goes to input connector J1 of the down converter. The 6.51 to 8.5 GHz RF signal is then mixed with the 6.5 GHz VCO signal resulting in a 0.01 to



**NOTE**

In units with Option 22, the 0.01 to 2 GHz RF output of the down converter is diplexed with the 0.01 to 10 MHz output of the A13 10 MHz DDS PCB. The resulting 0.00001 to 2 GHz signal is then diplexed with the RF signal from the switched filter assembly (or switched doubler module for >20 GHz models) into the RF path to the directional coupler.

***Switched  
Doubler  
Module***

2 GHz RF signal. The resultant RF signal is fed through a 2 GHz low-pass filter, then amplified and routed to the output connector J3. A portion of the down converter's RF output signal is detected, amplified, and coupled out for use in internal leveling. The detected RF sample is routed to the A10 ALC PCB.

The 0.01 to 2 GHz RF output from the down converter goes to input connector J1 of the switched filter assembly. There, the 0.01 to 2 GHz RF signal is multiplexed into the switched filter's output.

The switched doubler module (SDM), found in >20 GHz models, is used to double the fundamental frequencies of 10 to 20 GHz to produce RF output frequencies of 20 to 40 GHz.

The RF signal from the switched filter assembly is input to the SDM at J1. During CW or swept frequency operations in the 20 to 40 GHz frequency range, the 10 to 20 GHz RF signal input is routed by PIN switches to the doubler/amplifiers. PIN switch drive current is provided by the A9 PIN Control PCB and bias voltage for the doubler/amplifiers is supplied by the A14 YIG, SDM, SQM Driver PCB. The RF signal is amplified, then doubled in frequency. From the doubler, the 20 to 40 GHz RF signal is routed by PIN switches to the bandpass filters. There are three bandpass filter paths to provide good harmonic performance. The frequency ranges of the three paths are 20 to 25 GHz, 25 to 32 GHz, and 32 to 40 GHz.

After routing through the appropriate bandpass filter path, the 20 to 40 GHz RF signal is multiplexed by the PIN switches to the SDM output at connector J2. RF signals input to the SDM of  $\leq 20$  GHz are multiplexed through by the PIN switches to output connector J2.

From J2, the RF signal goes to either the directional coupler ( $\leq 40$  GHz models) or the input connector J2 of the forward coupler (>40 GHz models)

In units with Option 22, the RF signal from J2 goes to input connector A of the diplexer where it is diplexed with the 0.00001 to 2 GHz RF signal (from the down converter and A13 10 MHz DDS PCB) into the RF path to either the directional coupler

( $\leq 40$  GHz models) or the input connector J2 of the forward coupler ( $>40$  GHz models).

***Source  
Quadrupler  
Module***

The source quadrupler module (SQM), found in  $>40$  GHz models, is used to quadruple the fundamental frequencies of 10 to 16.25 GHz to produce RF output frequencies of 40 to 65 GHz. The RF signal inputs for the SQM come from the switched filter assembly. The modulator control signal for the SQM is received from the A14 YIG, SDM, SQM Driver PCB where it is developed from the ALC control signal. The A14 PCB also supplies the amplifier bias voltage(s) for the SQM.

**Model 68377C (SQM P/N D28185)**

During CW or swept frequency operations in the 40 to 50 GHz frequency range, the 10 to 12.5 GHz RF signal input is quadrupled and amplified, then goes to the modulator. The modulator provides for power level control and amplitude modulation of the RF output signal. From the modulator, the 40 to 50 GHz RF signals go via a band-pass filter to output connector J3 of the forward coupler. Note that on the 40 to 50 GHz SQM (P/N D28185), the forward coupler is an integral part of the SQM. The 0.01 to 40 GHz RF output signal from the SDM (0.00001 to 40 GHz RF output signal from the diplexer for 68377s with Option 22) are routed to input connector J2 of the SQM forward coupler. The 0.01 to 50 GHz (0.0001 to 50 GHz for the 68377s with Option 22) RF output signals go from J3 of the SQM forward coupler to the directional coupler.

**Model 68387C (SQM P/N 60-141)**

During CW or swept frequency operations in the 40 to 60 GHz frequency range, the 10 to 15 GHz RF signal input is quadrupled and amplified, then goes to the modulator. The modulator provides for power level control and amplitude modulation of the RF output signal. From the modulator, the 40 to 60 GHz RF signal goes via a band-pass filter to the output connector of the SQM.

From the SQM, the 40 to 60 GHz RF output signal goes to input connector J1 of the forward coupler, P/N C27184. The other input to the forward coupler at connector J2 is the 0.01 to 40 GHz RF output signal from the SDM (0.00001 to 40 GHz RF output signal from the diplexer for 68387Cs with Option 22). From forward coupler output connector J3, the 0.01 to 60 GHz (0.00001 to 60 GHz for the 68387Cs

with Option 22) RF output signals go to the directional coupler.

**Model 68397C (SQM P/N 60-142)**

During CW or swept frequency operations in the 40 to 65 GHz frequency range, the 10 to 16.25 GHz RF signal input is quadrupled and amplified, then goes to the modulator. The modulator provides for power level control and amplitude modulation of the RF output signal. From the modulator, the 40 to 65 GHz RF signal goes via a band-pass filter to the output connector of the SQM.

From the SQM, the 40 to 65 GHz RF output signal goes to input connector J1 of the forward coupler, P/N C27184. The other input to the forward coupler at connector J2 is the 0.01 to 40 GHz RF output signal from the SDM (0.00001 to 40 GHz RF output signal from the diplexer for 68397Cs with Option 22). From forward coupler output connector J3, the 0.01 to 65 GHz (0.00001 to 65 GHz for the 68397Cs with Option 22) RF output signals go to the directional coupler.

***Power Level  
Detection/  
ALC Loop***

The RF signal output from either the switched filter assembly ( $\leq 20$  GHz models), the SDM ( $\leq 40$  GHz models), diplexer ( $\leq 20$  GHz and  $\leq 40$  GHz models with Option 22), or forward coupler ( $> 40$  GHz models) goes to the directional coupler for transfer to the RF OUTPUT connector. A portion of the RF output signal is detected, amplified, and coupled out as feedback to the ALC circuitry on the A10 ALC PCB. In these circuits, the signal from the detector is summed with the reference voltage that represents the desired RF output power level. The resulting voltage is fed from the A10 ALC PCB to the ALC modulator driver circuit on the A9 PIN Control PCB (and the ALC modulator driver circuit on the A14 YIG, SDM, SQM Driver PCB for  $> 40$  GHz models). The resulting modulator control signals go to the modulators in the switched filter assembly and the SQM (for  $> 40$  GHz models) to adjust the RF output power level.

***Step  
Attenuators***

The optional step attenuators available for use with the 683XXC models are as follows:

- 120 dB electronic step attenuators for  $\leq 8.4$  GHz and  $\leq 20$  GHz models (Options 2E and 2F)
- 110 dB step attenuators for  $\leq 20$  GHz and  $\leq 40$  GHz models (Options 2A and 2 B)
- 90 dB step attenuators for  $\leq 50$  GHz and  $\leq 60$  GHz models (Options 2C and 2D)

The step attenuators provide attenuation of the RF output in 10 dB steps. The step attenuator drive current is supplied by the A9 PIN Control PCB.

# **Chapter 3**

## **Performance Verification**

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# Chapter 3

## Performance Verification

### **3-1** INTRODUCTION

This chapter contains tests that can be used to verify the performance of the Series 683XXC Synthesized High Performance Signal Generators to specifications. These tests support all instrument models having any version of firmware. Units with Option 2A, 2B, 2C, 2D, 2E, or 2F (110 dB, 90 dB, or 120 dB step attenuators), Option 11 (0.1 Hz frequency resolution), and Option 15B (high power output) are also covered.

### **3-2** RECOMMENDED TEST EQUIPMENT

Table 3-1 (page 3-4) provides a list of the recommended test equipment for the performance verification tests.

The test procedures refer to specific test equipment front panel control settings when the test setup is critical to making an accurate measurement. In some cases, the user may substitute test equipment having the same critical specifications as those on the recommended test equipment list.

Contact your local Anritsu service center (refer to Table 1-5 on page 1-18) if you need clarification of any equipment or procedural reference.

### **3-3** TEST RECORDS

A blank copy of a sample performance verification test record for each 683XXC model is provided in Appendix A. Each test record contains the model-specific variables called for by the test procedures. It also provides a means for maintaining an accurate and complete record of instrument performance. We recommend that you copy these pages and use them to record the results of your initial testing of the instrument. These initial test results can later be used as benchmark values for future tests of the same instrument.

### **3-4** CONNECTOR AND KEY LABEL NOTATION

The test procedures include many references to equipment interconnections and control settings. For all 683XXC references, specific labels are used to denote the appropriate menu key, data entry key, data entry control, or connector (such as CW/SWEEP 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 3-1.

**Table 3-1.** Recommended Test Equipment for Performance Verification Tests (1 of 2)

<b>INSTRUMENT</b>	<b>CRITICAL SPECIFICATION</b>	<b>RECOMMENDED MANUFACTURER/MODEL</b>	<b>TEST NUMBER</b>
Spectrum Analyzer, with External Mixers and Diplexer Assy	<i>Frequency Resolution:</i> 0.01 to 65 GHz <i>Resolution Bandwidth:</i> 10 Hz	Tektronix, Model 2794, with External Mixers: WM780K (18 to 26.5 GHz) WM780A (26.5 to 40 GHz) WM780U (40 to 60 GHz) WM780E (60 to 90 GHz) and Diplexer Assy: 015-0385-00	3-8, 3-9, 3-12, 3-13, 3-16, 3-17
Spectrum Analyzer	<i>Frequency Range:</i> 20 Hz to 40 MHz <i>Resolution Bandwidth:</i> 3 Hz	Hewlett-Packard, Model 3585B	3-10
Frequency Counter	<i>Frequency Range:</i> 0.01 to 40 GHz <i>Input Impedance:</i> 50Ω <i>Resolution:</i> 1 Hz <i>Other:</i> External Time Base Input	Anritsu Model MF2414A	3-7
Power Meter, with Power Sensors	<i>Power Range:</i> -30 to +20 dBm (1μW to 100mW)	Anritsu Model ML2437A or ML2438A, with Power Sensors: MA2474A (0.01 to 40 GHz) MA2475A (0.01 to 50 GHz)	3-11
Frequency Reference	<i>Frequency:</i> 10 MHz <i>Accuracy:</i> 5 x 10 <sup>-12</sup> parts/day	Absolute Time Corp., Model 300	3-6
Modulation Analyzer	<i>Frequency Input:</i> 10 MHz (or the IF of the spectrum analyzer) <i>AM Depth:</i> 0% to 90% <i>AM Modulation Rates:</i> dc to 100 kHz <i>Filters:</i> 20 kHz lowpass, 300 Hz highpass	Hewlett-Packard, Model 8901A	3-12
Oscilloscope	<i>Bandwidth:</i> DC to 150 MHz <i>Vertical Sensitivity:</i> 2mV/division <i>Horizontal Sensitivity:</i> 50 ns/division	Tektronix, Inc. Model TAS485	3-14, 3-15
Mixer	<i>Frequency Range:</i> 2 to 26 GHz	Miteq, Model DB0226LA1	3-10
Attenuator	<i>Frequency Range:</i> DC to 40 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 10 dB	Anritsu, Model 41KC-10	3-9, 3-10
Attenuator	<i>Frequency Range:</i> DC to 40 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 20 dB	Anritsu, Model 41KC-20	3-9
Attenuator	<i>Frequency Range:</i> DC to 60 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 10 dB	Anritsu, Model 41V-10	3-9, 3-10
Attenuator	<i>Frequency Range:</i> DC to 60 GHz <i>Max Input Power:</i> >+17 dBm <i>Attenuation:</i> 20 dB	Anritsu, Model 41V-20	3-9



**Table 3-1.** Recommended Test Equipment for Performance Verification Tests (2 of 2)

<b>INSTRUMENT</b>	<b>CRITICAL SPECIFICATION</b>	<b>RECOMMENDED MANUFACTURER/MODEL</b>	<b>TEST NUMBER</b>
Microwave (Pulse) Detector	<i>Output Polarity:</i> Negative <i>Frequency Range:</i> 0.01 to 40 GHz	Anritsu, Model SC3800 (K input/BNC output connectors)	3-14
High Pass Filter	150 MHz High-Pass Filter (DC Block)	Narda, Model 4564	3-14
Low Pass Filter	450 MHz Low-Pass Filter	Mini-Circuits, Model SLP-450	3-15
Special AUX I/O Cable Assy	Provides interface between the 683XXC and the Power Meter	Anritsu P/N: 806-90	3-11
Tee	<i>Connectors:</i> 50 $\Omega$ BNC	Any common source	3-10
Cables	<i>Connectors:</i> 50 $\Omega$ BNC	Any common source	All tests

**3-5 POWER LEVELS**

Table 3-2 is a listing of the Series 683XXC Synthesized High Performance Signal Generator models and their maximum leveled output power levels. Certain test procedures will refer you to this table for the maximum leveled output power level setting of the instrument model being tested.

**Table 3-2.** 683XXC Maximum Leveled Output Power

683XXC Model	Frequency (GHz)	Max Leveled Output Power	Max Leveled Output Power w/Step Attenuator	Max Leveled Output Power w/Electronic Step Attenuator
68317C	0.01 – 8.4 GHz	+13.0 dBm	+11.0 dBm	+9.0 dBm
68337C	2.0 – 20.0 GHz	+13.0 dBm	+11.0 dBm	+3.0 dBm
68347C	0.01 – 20.0 GHz	+13.0 dBm	+11.0 dBm	+3.0 dBm
68367C	0.01 – 2.0 GHz	+13.0 dBm	+11.0 dBm	Not Available
	2.0 – 20.0 GHz	+9.0 dBm	+7.0 dBm	
	20.0 – 40.0 GHz	+6.0 dBm	+3.0 dBm	
68377C	0.01 – 2.0 GHz	+12.0 dBm	+10.0 dBm	Not Available
	2.0 – 20.0 GHz	+10.0 dBm	+8.5 dBm	
	20.0 – 40.0 GHz	+2.5 dBm	0.0 dBm	
	40.0 – 50.0 GHz	+2.5 dBm	-1.0 dBm	
68387C	0.01 – 2.0 GHz	+12.0 dBm	+10.0 dBm	Not Available
	2.0 – 20.0 GHz	+10.0 dBm	+8.5 dBm	
	20.0 – 40.0 GHz	+2.5 dBm	0.0 dBm	
	40.0 – 50.0 GHz	+2.0 dBm	-1.5 dBm	
	50.0 – 60.0 GHz	+2.0 dBm	-2.0 dBm	
68397C	0.01 – 2.0 GHz	+12.0 dBm	Not Available	Not Available
	2.0 – 20.0 GHz	+10.0 dBm		
	20.0 – 40.0 GHz	+2.5 dBm		
	40.0 – 50.0 GHz	0.0 dBm		
	50.0 – 65.0 GHz	-2.0 dBm		
<b>With Option 15B (High Power) Installed</b>				
68317C	0.01 – 2.0 GHz	+13.0 dBm	+11.0 dBm	+11.0 dBm
	2.0 – 8.4 GHz	+17.0 dBm	+15.0 dBm	+11.0 dBm
68337C	2.0 – 20.0 GHz	+17.0 dBm	+15.0 dBm	+7.0 dBm
68347C	0.01 – 2.0 GHz	+13.0 dBm	+11.0 dBm	+11.0 dBm
	2.0 – 20.0 GHz	+17.0 dBm	+15.0 dBm	+7.0 dBm
68367C	0.01 – 20.0 GHz	+13.0 dBm	+11.0 dBm	Not Available
	20.0 – 40.0 GHz	+6.0 dBm	+3.0 dBm	
68377C	0.01 – 50.0 GHz	Standard	Standard	Not Available
68387C	0.01 – 60.0 GHz	Standard	Standard	Not Available
68397C	0.01 – 65.0 GHz	Standard	Not Available	Not Available

Note: In models with Option 22 that have a high-end frequency of  $\leq 20$  GHz, rated output power is reduced by 1 dB.  
In models with Option 22 that have a high-end frequency of  $>20$  GHz, rated output power is reduced by 2 dB.

**3-6 INTERNAL TIME BASE  
AGING RATE TEST  
(Optional)**

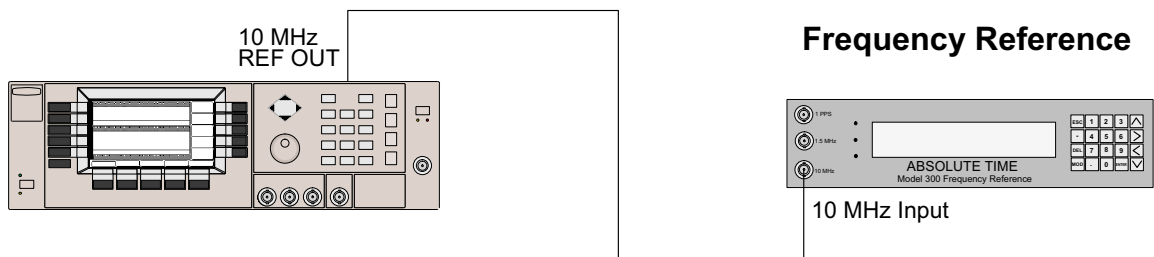
The following test can be used to verify that the 683XXC 10 MHz time base is within its aging specification. The instrument derives its frequency accuracy from an internal 100 MHz crystal oscillator standard. (With Option 16 installed, frequency accuracy is derived from an internal high-stability 10 MHz crystal oscillator.) An inherent characteristic of crystal oscillators is the effect of crystal *aging* within the first few days to weeks of operation. Typically, the crystal oscillator's frequency increases slightly at first, then settles to a relatively constant value for the rest of its life. The 683XXC reference oscillator aging is specified as  $<2 \times 10^{-8}$  parts per day ( $<5 \times 10^{-10}$  with Option 16).

**NOTES**

Do not confuse crystal aging with other short term frequency instabilities; i.e., noise and temperature. The internal time base of the instrument may not achieve its specified aging rate before the specified warm-up time of 7 to 30 days has elapsed; therefore, this performance test is optional.

For greatest absolute frequency accuracy, allow the 683XXC to warm up until its RF output frequency has stabilized (usually 7 to 30 days). Once stabilized, the change in reference oscillator frequency should remain within the aging rate if; (1) the time base oven is not allowed to cool, (2) the instrument orientation with respect to the earth's magnetic field is maintained, (3) the instrument does not sustain any mechanical shock, and (4) ambient temperature is held constant. This test should be performed upon receipt of the instrument and again after a period of several days to weeks to fully qualify the aging rate.

**683XXC Signal Generator**



**Figure 3-1.** Equipment Setup for Internal Time Base Aging Rate Test

**Test Setup**

Connect the 683XXC rear panel 10 MHz REF OUT to the Frequency Reference front panel input connector labeled 10 MHz when directed to do so during the test procedure.

**Test  
Procedure**

The frequency error is measured at the start and finish of the test time period of 24 hours. The aging rate is the difference between the two error readings.

1. Set up the Frequency Reference as follows:
  - a. Press the **ESC** key until the MAIN MENU is displayed.
  - b. At the MAIN MENU display, press **1** to select CONFIGURATION MENU.
  - c. At the CONFIGURATION MENU display, press **8** to select MEAS.
  - d. Press the **MOD** key and use the Up/Down Arrow keys to get to the menu display:  
MEASUREMENT = FREQ.
  - e. Press the **ENTER** key.
  - f. Press the **ESC** key until the MAIN MENU is displayed.
  - g. At the MAIN MENU display, press **3** to select the REVIEW MENU.
  - h. At the REVIEW MENU display, press **8** to select TFM.
2. Connect the 683XXC rear panel 10 MHz REF OUT signal to the Frequency Reference front panel 10 MHz input.
3. Wait approximately 90 minutes (default setting) until the FMFOM on the Frequency Reference display decreases from 9 to 1. (The default setting is recommended to achieve optimum measurements.)

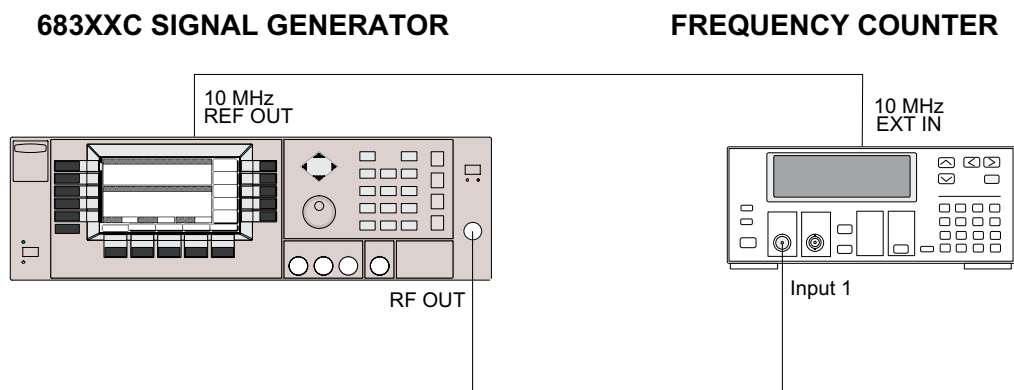
The frequency error in the signal under test is displayed in ps/s (Picosecond/Second). For example, an error of -644681 ps/s is  $-644681 \times 10^{-12}$  or  $-6.44681 \times 10^{-7}$  away from the 10 MHz internal reference of the Frequency Reference.

The frequency error display is continuously updated as a running 5000-second average. The averaging smooths out the short-term instability of the oscillator.

4. Record the frequency error value, displayed on the Frequency Reference, on the Test Record.
5. Wait for 24 hours, then record the current frequency error value on the Test Record.
6. The aging rate is the difference between the two frequency error values.
7. Record the computed result on the Test Record. To meet the specification, the computed aging rate must be  $<2 \times 10^{-8}$  per day ( $<5 \times 10^{-10}$  per day with Option 16).

**3-7 FREQUENCY  
SYNTHESIS TESTS**

The following tests can be used to verify correct operation of the frequency synthesis circuits. Frequency synthesis testing is divided into two parts—coarse loop/YIG loop tests and fine loop tests.



**Figure 3-2.** Equipment Setup for Frequency Synthesis Tests

**Test Setup**

Connect the equipment, shown in Figure 3-2, as follows:

1. Connect the 683XXC rear panel 10 MHz REF OUT to the Frequency Counter 10 MHz External Reference input.
2. Connect the 683XXC RF OUTPUT to the Frequency Counter Input 1.

**Coarse Loop/  
YIG Loop Test  
Procedure**

The following procedure tests both the coarse loop and YIG loop by stepping the signal generator through its YIG-tuned oscillator's frequency range in 1 GHz steps and measuring the RF output at each step.

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to the first test frequency indicated on the Test Record for the model being tested.

**NOTE**

The Frequency Counter reading is typically within  $\pm 1$  Hz because the instruments use a common time base. Differences of a few Hertz can be caused by noise or counter limitations. Differences of  $\geq \pm 100$  Hz indicate a frequency synthesis problem.

***Fine Loop  
Test  
Procedure***

2. Record the Frequency Counter reading on the Test Record. The Frequency Counter reading must be within  $\pm 100$  Hz of the displayed 683XXC frequency to accurately complete this test.
3. On the 683XXC, use the cursor control key (diamond-shaped key) to increment F1 to the next test frequency on the Test Record. Record the Frequency Counter reading on the Test Record.
4. Repeat step 3 until all frequencies listed on the Test Record have been recorded.

The following procedure tests the fine loop by stepping the instrument through ten 1 kHz steps (ten 100 Hz steps for instruments with Option 11) and measuring the RF output at each step.

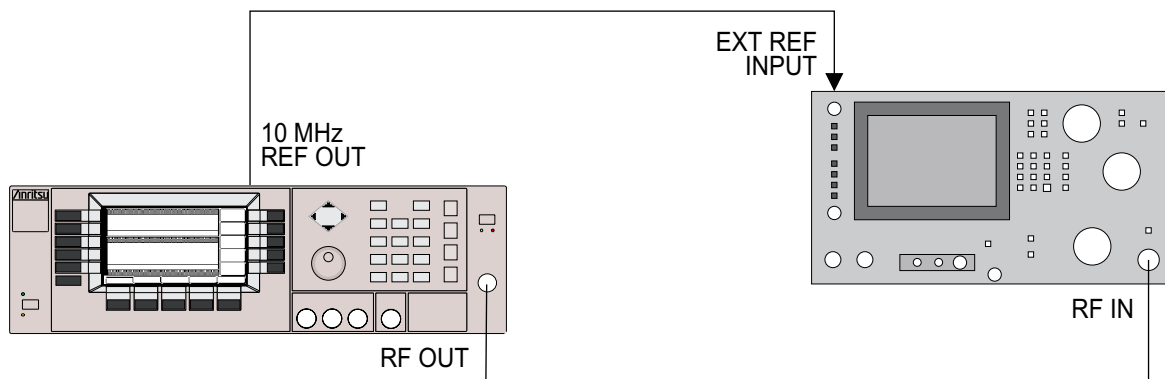
1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to the first test frequency indicated on the Test Record.
2. Record the Frequency Counter reading on the Test Record. The Frequency Counter reading must be within  $\pm 100$  Hz of the displayed 683XXC frequency ( $\pm 10$  Hz for instruments with Option 11) to accurately complete this test.
3. On the 683XXC, use the cursor control key (diamond-shaped key) to increment F1 to the next test frequency on the Test Record. Record the Frequency Counter reading on the Test Record.
4. Repeat step 3 until all frequencies listed on the Test Record have been recorded.

**3-8 SPURIOUS SIGNALS  
TEST: RF OUTPUT  
SIGNALS <2 GHz**

The following test can be used to verify that the signal generator meets its spurious signals specifications for RF output signals from 0.01 to 2 GHz. This test is applicable only to instruments which cover the frequency range 10 MHz to 2 GHz.

**683XXC SIGNAL GENERATOR**

**SPECTRUM ANALYZER**



**Figure 3-3.** Equipment Setup for Spurious Signals Test: RF Output Signals <2 GHz

**Test Setup**

Connect the equipment, shown in Figure 3-3, as follows:

1. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
2. Connect the 683XXC RF OUTPUT to the Spectrum Analyzer RF Input.

**Test Procedure**

The following procedure lets you measure the worst case spurious signals (harmonic and non-harmonic) of the 0.01 to 2 GHz RF output to verify that they meet specifications.

1. Set up the Spectrum Analyzer as follows:
  - a. Span: 10 MHz/div
  - b. CF: 50 MHz
  - c. RBW: 1 MHz
  - d. Sweep Time/Div: Auto (to resolve signal peaks clearly)



**Table 3-3.** *Spurious Signals Specifications*

<b>Harmonic and Harmonic Related:</b>	
10 MHz to ≤50 MHz:	<-30 dBc
>50 MHz to ≤2 GHz:	<-40 dBc
>2 GHz to ≤20 GHz:	<-60 dBc
>20 GHz to ≤40 GHz:	<-40 dBc
<b>Harmonic and Harmonic Related (Models having a high-end frequency of &gt;40 GHz and units with Option 15B at maximum specified leveled output power):</b>	
10 MHz to ≤50 MHz:	<-30 dBc
>50 MHz to ≤2 GHz:	<-40 dBc
>2 GHz to ≤20 GHz:	<-50 dBc
>20 GHz to ≤40 GHz:	<-40 dBc
<b>50 GHz units:</b>	
>40 GHz to ≤50 GHz:	<-40 dBc
<b>60 GHz units:</b>	
>40 GHz to ≤60 GHz:	<-30 dBc
<b>65 GHz units:</b>	
>40 GHz to ≤45 GHz:	<-25 dBc
>45 GHz to ≤65 GHz:	<-30 dBc
<b>Non-Harmonics:</b>	
10 MHz to ≤2 GHz:	<-40 dBc
>2 GHz to ≤65 GHz:	<-60 dBc

2. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
  - b. Press **Edit L1** to open the current power level parameter for editing.
  - c. Set L1 to the lesser of +10 dBm or the maximum leveled power level for the instrument being tested (refer to Table 3-2, page 3-6).
  - d. Press **Edit F1** to open the current frequency parameter for editing.
  - e. Set F1 to 10 MHz.
3. On the Spectrum Analyzer, measure the worst case harmonic and non-harmonic signals for the 10 MHz carrier. Record their presence by entering the levels on the Test Record. Refer to Table 3-3 for the specified level limits.

**NOTE**

Harmonics appear at multiples of the CW frequency and diminish quickly as the CW frequency gets greater than 1 GHz.

4. Repeat step 3 with F1 set first to 20 MHz, then set to 30 MHz. Measure the worst case harmonics and non-harmonics for each carrier frequency and record their presence by entering their levels on the Test Record.
5. Change the Spectrum Analyzer setup as follows:
  - a. Span: 100 MHz/div
  - b. CF: 500 MHz
6. Repeat step 3 with F1 set to 40 MHz. Measure the worst case harmonic and non-harmonic signals for the 40 MHz carrier and record their presence by entering their levels on the Test Record.
7. Change the Spectrum Analyzer setup as follows:
  - a. Span: 200 MHz/div (or maximum span width)
  - b. CF: 1 GHz (N/A if at maximum span width)
8. Repeat step 3 with F1 set to 350 MHz. Measure the worst case harmonic and non-harmonic signals for the 350 MHz carrier and record their

presence by entering their levels on the Test Record.

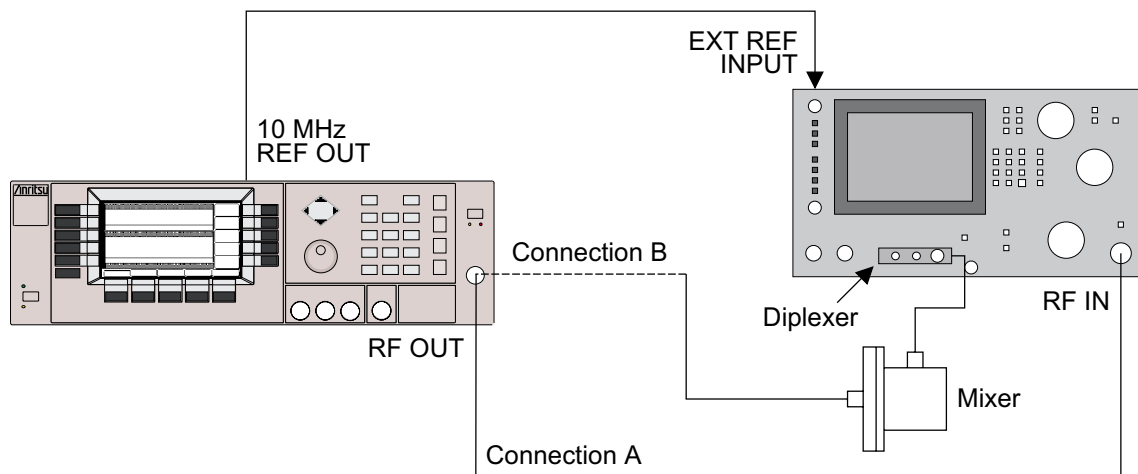
9. Set F1 to 1.6 GHz. Measure the worst case non-harmonic signal for the 1.6 GHz carrier and record its presence by entering its level on the Test Record.
10. Change the Spectrum Analyzer setup as follows:
  - a. Span: 10 MHz/div
  - b. CF: 1.6 GHz
  - c. RBW: 1 MHz
11. Adjust the Spectrum Analyzer Reference Level control to place the signal at the top of the screen graticule.
12. Change the Spectrum Analyzer CF first to 3.2 GHz, then to 4.8 GHz. Compare the harmonic levels with the signal level at 1.6 GHz. Measure the harmonic levels and record them on the Test Record.

**3-9 HARMONIC TEST: RF  
OUTPUT SIGNALS FROM  
2 TO 20 GHz**

The following test can be used to verify that the 683XXC meets its harmonic specifications for RF output signals from 2 to 20 GHz. Test record entries are supplied for harmonics up to a frequency limit of 40 GHz. Additional harmonic checks may be made at any frequency of interest up to the RF output frequency limit of the 683XXC model being tested. These additional harmonic checks can be accomplished through the use of waveguide mixers to extend the frequency range of the spectrum analyzer.

**683XXC SIGNAL GENERATOR**

**SPECTRUM ANALYZER**



**Figure 3-4.** Equipment Setup for Harmonic Test: RF Output Signals from 2 to 20 GHz

**Test Setup**

Connect the equipment, shown in Figure 3-4, as follows:

1. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
2. Connect the diplexer and appropriate external waveguide mixer to the Spectrum Analyzer.
3. Connect the 683XXC RF OUTPUT to the Spectrum Analyzer as shown in Connection A (683XXC RF OUTPUT to Spectrum Analyzer RF IN).

**Test  
Procedure  
(2 to 10 GHz)**

The following procedure lets you measure the 2 to 10 GHz RF output harmonic levels to verify that they meet specifications.

**Table 3-4. Spurious Signals Specifications**

<b>Harmonic and Harmonic Related:</b>	
10 MHz to ≤50 MHz:	<-30 dBc
>50 MHz to ≤2 GHz:	<-40 dBc
>2 GHz to ≤20 GHz:	<-60 dBc
>20 GHz to ≤40 GHz:	<-40 dBc
<b>Harmonic and Harmonic Related (Models having a high-end frequency of &gt;40 GHz and units with Option 15B at maximum specified leveled output power):</b>	
10 MHz to ≤50 MHz:	<-30 dBc
>50 MHz to ≤2 GHz:	<-40 dBc
>2 GHz to ≤20 GHz:	<-50 dBc
>20 GHz to ≤40 GHz:	<-40 dBc
<b>50 GHz units:</b>	
>40 GHz to ≤50 GHz:	<-40 dBc
<b>60 GHz units:</b>	
>40 GHz to ≤60 GHz:	<-30 dBc
<b>65 GHz units:</b>	
>40 GHz to ≤45 GHz:	<-25 dBc
>45 GHz to ≤65 GHz:	<-30 dBc
<b>Non-Harmonics:</b>	
10 MHz to ≤2 GHz:	<-40 dBc
>2 GHz to ≤65 GHz:	<-60 dBc

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
  - b. Press **Edit L1** to open the current power level parameter for editing.
  - c. Set L1 to the lesser of +10 dBm or the maximum leveled power level for the instrument being tested (refer to Table 3-2, page 3-6).
  - d. Press **Edit F1** to open the current frequency parameter for editing.
  - e. Set F1 to the frequency indicated on the Test Record.
2. Set up the Spectrum Analyzer as follows:
  - a. Span: 5 kHz/div
  - b. CF: Set to the 683XXC frequency value.
  - c. RBW: 1 kHz
  - d. Video Filter Wide: On
3. Adjust the Spectrum Analyzer Peaking control for maximum signal level, then adjust the Reference Level Control to place the signal at the top of the screen graticule.
4. Change the Spectrum Analyzer CF to each of the harmonic frequencies listed on the Test Record and record the signal levels. Refer to Table 3-4 for the specified harmonic signal level limits.
5. Repeat steps 1 through 4 for each of the 683XXC CW carrier and harmonic frequencies listed on the Test Record. Record the harmonic signal levels on the Test Record.

**Test  
Procedure  
(11 to 20 GHz)**

The following procedure lets you measure the 11 to 20 GHz RF output harmonic levels to verify that they meet specifications.

**NOTE**

Because an external mixer is required for these measurements, the RF output flatness of the signal generator is used to correct for; (1) variations caused by switching from the fundamental input to the external mixer input of the Spectrum Analyzer, and (2) the flatness of the mixer.

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to the frequency indicated on the Test Record.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to -30 dBm output power.

**NOTE**

If the 683XXC is not fitted with Option 2, install a 30 dB attenuator (Anritsu 41KC-20 and 41KC-10 for  $\leq 40$  GHz models; 41V-20 and 41V-10 for  $> 40$  GHz models) and set L1 to 0.0 dBm output power.

2. Set up the Spectrum Analyzer as follows:
  - a. Span: 5 kHz/div
  - b. CF: Set to the 683XXC frequency value.
  - c. RBW: 1 kHz
  - d. Video Filter Wide: On
3. Adjust the Spectrum Analyzer Peaking control for maximum signal, then adjust the Reference Level control to place the signal at the top of the screen graticule. It may be necessary to also adjust the 683XXC output power level slightly to accomplish this; however, *do not exceed -20 dBm output power*.

4. Remove Connection A and connect the 683XXC RF OUTPUT to the waveguide mixer input of the Spectrum Analyzer as shown in Connection B.
5. On the 683XXC, remove 30 dB of attenuation from the RF output. Do this by either increasing the output power level by 30 dB or by removing the 30 dB attenuator installed in step 1.e.
6. Change the Spectrum Analyzer CF to the harmonic frequency listed on the Test Record. Verify that the signal displayed on the Spectrum Analyzer is  $\geq 30$  dB below the top of the screen graticule.

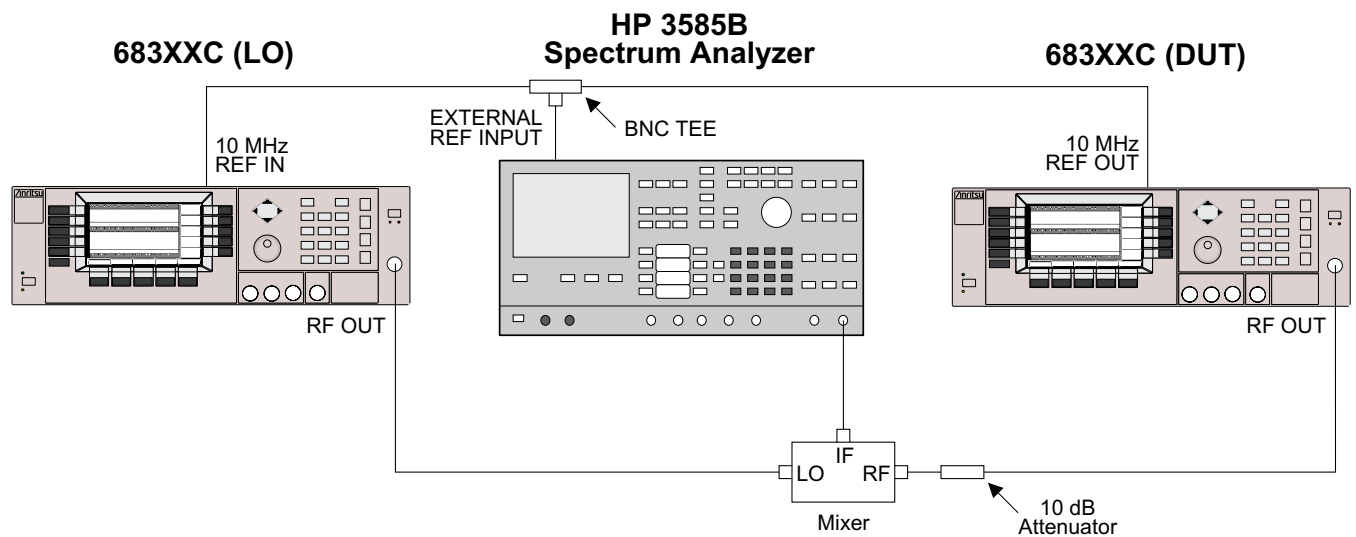
**NOTE**

The  $< -30$  dB signal level plus the 30 dB attenuation provided by the waveguide mixer equals a harmonic frequency signal level of  $< -60$  dBc (specification).

7. Record the harmonic signal level on the Test Record.
8. Repeat steps 1 through 7 for each of the 683XXC CW carrier and harmonic frequencies listed on the Test Record. Record the harmonic signal levels on the Test Record.

**3-10 SINGLE SIDEBAND  
PHASE NOISE TEST**

The following test can be used to verify that the signal generator meets its single sideband phase noise specifications. For this test, a second 683XXC is required. This additional instrument acts as a local oscillator (LO). The CW RF output of the 683XXC under test (DUT) is mixed with the CW RF output from the 683XXC LO which is offset by 1 MHz. Single sideband phase noise is measured at offsets of 100 Hz, 1 kHz, 10 kHz, and 100 kHz away from the resultant 1 MHz IF.



**Figure 3-5.** Equipment Setup for Single Sideband Phase Noise Test

**Test Setup**

Connect the equipment, shown in Figure 3-5, as follows:

1. Connect the 683XXC DUT rear panel 10 MHz REF OUT to the BNC tee. Connect one leg of the tee to the 683XXC LO rear panel 10 MHz REF IN. Connect the other leg of the tee to the Spectrum Analyzer External Reference Input.
2. Connect the 683XXC DUT RF OUTPUT to the Mixer's R input via a 10 dB attenuator.
3. Connect the 683XXC LO RF OUTPUT to the Mixer's L input.
4. Connect the Mixer's X output to the Spectrum Analyzer 50Ω input.

**Test  
Procedure**

The following procedure lets you measure the RF output single sideband phase noise levels to verify that they meet specifications.

**NOTE**

The following technique is a measurement of phase noise and AM noise. To avoid erroneous results, on the 683XXC DUT set L1 for maximum leveled output power and select External Detector leveling. This will prevent any AM noise from degrading the phase noise measurements.

1. Set up the 683XXC DUT as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to the frequency indicated on the Test Record.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to the maximum leveled power level for the instrument being tested (refer to Table 3-2, page 3-6).
  
2. Set up the 683XXC LO as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to a frequency that is 1 MHz lower than the 683XXC DUT frequency set in step 1.c.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to the maximum leveled power level for the instrument model (refer to Table 3-2).



**NOTE**

If the 683XXC LO output is less than 10 dBm, the Mixer's local oscillator port will not be saturated and the resulting measurements may be in error.

**Table 3-5.** *Single Sideband Phase Noise Test Specification*

CW Carrier Frequency	Offset From Carrier	Test Specification*
2.0 GHz	100 Hz	<-77 dBc
	1 kHz	<-85 dBc
	10 kHz	<-83 dBc
	100 kHz	<-99 dBc
6.0 GHz	100 Hz	<-75 dBc
	1 kHz	<-85 dBc
	10 kHz	<-83 dBc
	100 kHz	<-99 dBc
10.0 GHz	100 Hz	<-70 dBc
	1 kHz	<-83 dBc
	10 kHz	<-80 dBc
	100 kHz	<-99 dBc
20.0 GHz	100 Hz	<-63 dBc
	1 kHz	<-75 dBc
	10 kHz	<-75 dBc
	100 kHz	<-97 dBc

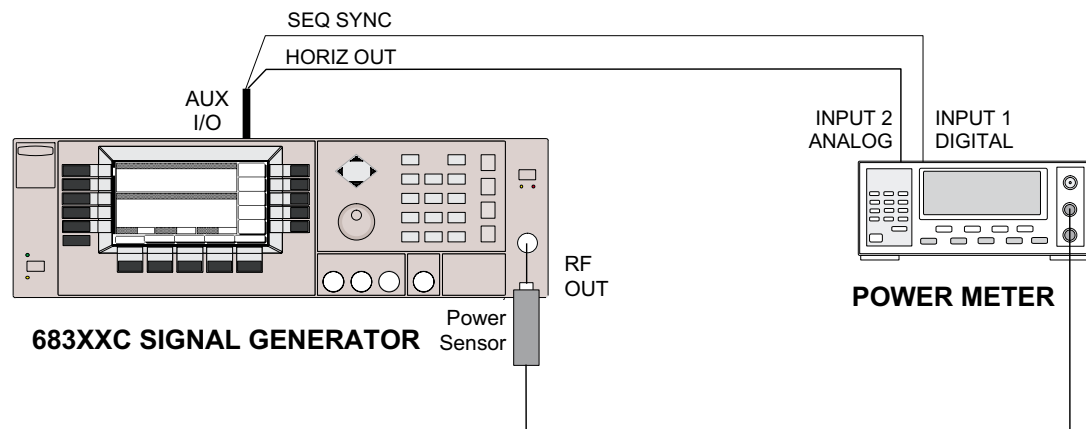
\* 3 dB difference from 683XXC single sideband phase noise specifications to account for LO phase noise.

3. Set up the Spectrum Analyzer as follows:
  - a. Center Frequency: 1 MHz
  - b. Frequency Span: 300 Hz
  - c. RBW: 3 Hz
  - d. Position the Marker to the peak of the signal.
  - e. Select OFFSET, ENTER OFFSET, and MKRCF.
  - f. Adjust the marker for a 100 Hz offset.
  - g. Select NOISE LVL.
4. Measure the phase noise level 100 Hz offset from the carrier frequency. Record the level on the Test Record.
5. On the Spectrum Analyzer:
  - a. Deselect NOISE LVL.
  - b. Set Frequency Span to 20 kHz.
  - c. Set RBW to 100 Hz.
  - d. Adjust the Marker for a 1 kHz offset.
  - e. Select NOISE LVL.
6. Measure the phase noise level 1 kHz offset from the carrier frequency. Record the level on the Test Record.
7. On the Spectrum Analyzer:
  - a. Deselect NOISE LVL.
  - b. Set Frequency Span to 100 kHz.
  - c. Adjust the Marker for a 10 kHz offset.
  - d. Select NOISE LVL.
8. Measure the phase noise level 10 kHz offset from the carrier frequency. Record the level on the Test Record.

9. On the Spectrum Analyzer:
  - a. Deselect NOISE LVL.
  - b. Set Frequency Span to 300 kHz.
  - c. Adjust the Marker for a 100 kHz offset.
  - d. Select NOISE LVL.
10. Measure the phase noise level 100 kHz offset from the carrier frequency. Record the level on the Test Record.
11. Repeat steps 1 through 10 for all frequencies listed on the Test Record.

**3-11 POWER LEVEL  
ACCURACY AND  
FLATNESS TESTS**

The following tests can be used to verify that the 683XXC meets its power level specifications. Power level verification testing is divided into two parts—power level accuracy tests and power level flatness tests.



**Figure 3-6.** Equipment Setup for Power Level Accuracy and Flatness Tests

**Test Setup**

Connect the equipment, shown in Figure 3-6, as follows:

1. Calibrate the Power Meter with the Power Sensor.

**NOTE**

For  $\leq 40$  Ghz models, use the MA2474A power sensor; for  $> 40$  Ghz models, use the MA2475A power sensor.

2. Connect the Power Sensor to the RF OUTPUT of the 683XXC.
3. Connect the special AUX I/O interface cable (Anritus Part No. 806-90) to the 683XXC rear panel AUX I/O connector. Connect the cable end having BNC connectors as follows:
  - a. Connect the cable end labeled “SEQ SYNC” to the Power Meter rear panel INPUT 1 DIGITAL connector.
  - b. Connect the cable end labeled “HORIZ OUT” to the Power Meter rear panel INPUT 2 ANALOG connector.

**Power Level  
Accuracy Test  
Procedure**

Power level accuracy is tested by stepping the output power level down in 1 dB increments from its maximum rated power level and measuring the output power level at each step.

1. Set up the Power Meter as follows:
  - a. Reset the Power Meter by pressing System|Setup|-more-|PRESET|RESET.
  - b. Configure the Power Meter to perform power measurement with Sensor|Setup|MODE set to Default.
  - c. Sensor|CalFactor|SOURCE set to V/GHz.
  - d. Press any hard key to begin measurement.
2. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to the CW frequency indicated on the Test Record.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to the power level indicated on the Test Record.
3. Measure the output power level with the Power Meter and record the reading on the Test Record.
4. On the 683XXC, use the cursor control key (diamond-shaped key) to decrement L1 to the next test power level on the Test Record. Measure and record the Power Meter reading on the Test Record.
5. Repeat step 4 for each of the test power levels listed on the Test Record for the current CW frequency.
6. Repeat steps 2 thru 5 for all CW frequencies listed on the Test Record.

**NOTE**

In models with Option 22 that have a high-end frequency of  $\leq 20$  GHz, rated output power is reduced by 1 dB. In models with Option 22 that have a high-end frequency of  $>20$  GHz, rated output power is reduced by 2 dB.

***Power Level  
Flatness Test  
Procedure***

Power level flatness is tested by measuring the output power level variation during a full band sweep; first in the manual sweep mode, then in analog sweep mode.

1. Set up the 683XXC as follows for a manual sweep power level flatness test:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. The CW Menu is displayed.
  - b. Press **Manual** to place the signal generator in the manual sweep frequency mode and display the Manual Sweep Menu.
  - c. With the Manual Sweep Menu displayed, press the main menu key

**FREQUENCY  
CONTROL**

The Sweep Frequency Control Menu is then displayed.

- d. Press **Full** to select a full range frequency sweep.
- e. Press **Edit L1** to open the current power level parameter for editing.
- f. Set L1 to the power level indicated on the test record.
- g. Now, return to the Manual Sweep Menu by pressing the main menu key

**CW/SWEEP  
SELECT**

- h. At the Manual Sweep Menu, press the soft-key **Num of Steps** to open the number-of-steps parameter for editing.
  - i. Set the number-of-steps to 200.
2. Using the rotary data knob, sweep the 683XXC through the full frequency range. Measure the maximum and minimum Power Meter readings and record the values on the Test Record. Verify that the variation (difference between the maximum and minimum readings) does not exceed the value noted on the Test Record.

3. Set up the 683XXC as follows for an analog sweep power level flatness test:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. The CW Menu is displayed.
  - b. Press **Analog** to place the 683XXC in the analog sweep frequency mode and display the Analog Sweep Menu.
  - c. With the Analog Sweep Menu displayed, press the main menu key

**FREQUENCY  
CONTROL**

The Sweep Frequency Control Menu is then displayed.

- d. Press **Full** to select a full range frequency sweep.
- e. Press **Edit L1** to open the current power level parameter for editing.
- f. Set L1 to the power level noted on the test record.
- g. Now, return to the Analog Sweep Menu by pressing the main menu key

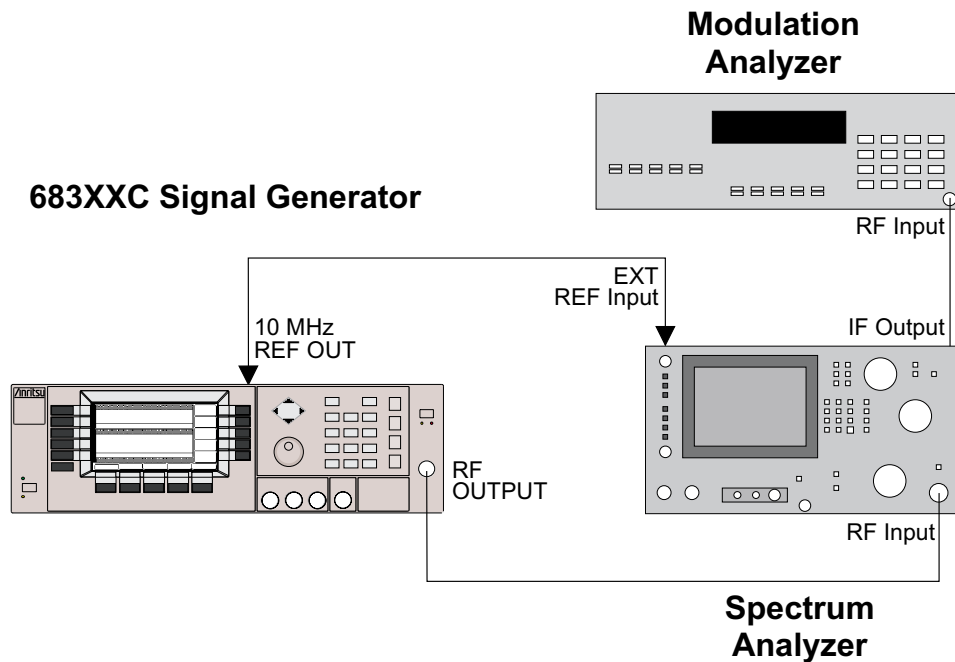
**CW/SWEEP  
SELECT**

- h. At the Analog Sweep Menu, press the menu soft-key **Sweep Ramp** to go to the Analog Sweep Ramp Menu.
  - i. At this menu, press **Sweep Time** to open the sweep time parameter for editing.
  - j. Set the sweep time to 99 seconds.
4. During the analog sweep, measure the maximum and minimum Power Meter readings and record the values on the Test Record. Verify that the variation (difference between the maximum and minimum readings) does not exceed the value noted on the Test Record.

**3-12** **AMPLITUDE  
MODULATION TEST**

This procedure verifies the operation of the 683XXC amplitude modulation input sensitivity circuit.

The RF OUTPUT of the 683XXC is monitored on a Spectrum Analyzer display. The (modulated) IF Output of the Spectrum Analyzer is monitored with a Modulation Analyzer. A 50% AM (default value) signal is set to a reference point on the Spectrum Analyzer. The actual modulation value is then computed from the indicated Modulation Meter values. (The absolute values of the AM PK+ and AM PK- readings are used in the given formula to compensate for non-linearity errors in the test equipment.



**Figure 3-7.** Equipment Setup for Amplitude Modulation Tests

**Test Setup**

Connect the equipment, shown in Figure 3-7, as follows:

1. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
2. Connect the IF Output of the Spectrum Analyzer to the RF Input of the Modulation Analyzer.
3. Connect the RF OUTPUT of the 683XXC to the Spectrum Analyzer RF Input.

***AM Input  
Sensitivity  
Procedure***

The following procedure lets you measure the absolute peak AM values for a 50% AM signal and calculate the actual modulation value.

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to a power level that is 6 dB below maximum rated power (refer to Table 3-2, page 3-6).
  - f. Press **MODULATION**, then **AM**. At the resulting AM Status menu, press **On/Off** to turn AM on.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 0 Hz
  - c. RBW: 100 kHz
  - d. MIN Noise: Activate
3. On the Spectrum Analyzer, adjust the reference level to place the trace 6 to 8 dB below the top graticule of the display.
4. Set up the Modulation Analyzer for:
  - a. AM PK(+)
  - b. 300 Hz High-Pass Filter
  - c. 20 kHz Low-Pass Filter
5. Measure the peak AM on the Modulation Analyzer. Record the AM PK(+) reading on the Test Record.
6. Press PK(-) on the Modulation Analyzer.
7. Measure the peak AM on the Modulation Analyzer. Record the AM PK(-) reading on the Test Record.



8. Compute the actual AM input sensitivity with the following formula:

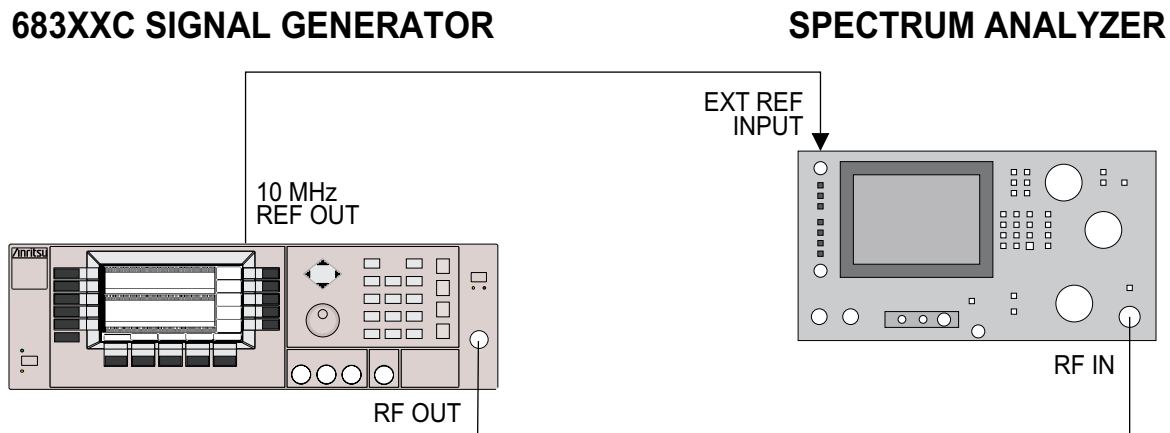
$$\%AM = 100 \times \left[ \frac{|AMPK(+)| + |AMPK(-)|}{200 + |AMPK(+)| - |AMPK(-)|} \right]$$

9. The calculated result should be between 45% and 55% AM. Record this result in the Test Record.

**3-13** **FREQUENCY  
MODULATION TESTS**

This procedure verifies the operation of the 683XXC frequency modulation input sensitivity circuitry.

The RF OUTPUT of the 683XXC is monitored on a Spectrum Analyzer display. In Unlocked Wide FM mode, the Spectrum Analyzer is used as a frequency counter to measure the actual FM deviation and determine FM accuracy. In Unlocked Narrow, Locked, and Locked Low-Noise FM modes, the Spectrum Analyzer is used to monitor the carrier level. FM accuracy is determined by measuring the actual FM deviation necessary to reduce the carrier level to its lowest level. These tests qualify how the FM input signal affects the signal generator's RF output.



**Figure 3-8.** *Equipment Setup for Frequency Modulation Tests*

**Test Setup**

Connect the equipment, shown in Figure 3-8, as follows:

1. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
2. Connect the RF OUTPUT of the 683XXC to the Spectrum Analyzer RF Input.

**FM Input  
Sensitivity  
Procedure**

The following procedure lets you measure the FM deviation for a specific input sensitivity in Unlocked Wide, Unlocked Narrow, Locked, and Locked Low-Noise FM modes and determine FM accuracy.

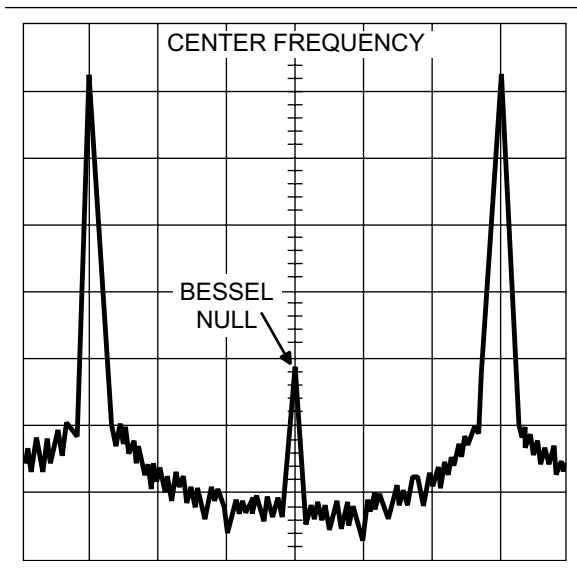
**Unlocked Wide FM Mode**

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 50 MHz (500 MHz across the display)
3. On the 683XXC, make the following settings:
  - a. Press **MODULATION**, then **FM**. At the resulting FM Status menu, press **More** to go to the additional FM Status menu.
  - b. At the additional FM Status menu, press **Unlocked Wide**, then press **Previous Menu** to return to the main FM Status menu.
  - c. At the FM Status menu, press **Mod. Wave** to go to the Modulation Waveform Selection menu. Use the cursor control key to highlight the squarewave modulation waveform, then press **Select**.
  - d. Press **Previous Menu** to return to the FM Status menu, then press **Edit Dev.** and set the deviation to 100 MHz. Press **Edit Rate** and set the rate to 0.4 Hz.
  - e. Press **On/Off** to turn FM on.
4. On the Spectrum Analyzer, change the Span/Div setting to 5 MHz to use the analyzer as a frequency counter.
  - a. Adjust the center frequency control to position the low carrier at the center of the display. Record the frequency reading on the Test Record.
  - b. Adjust the center frequency control to position the high carrier at the center of the display. Record the frequency reading on the Test Record.
5. The difference between these two frequencies is the actual peak-to-peak frequency deviation.

It should be between 190 MHz and 210 MHz.  
Record the difference on the Test Record.

**Unlocked Narrow FM Mode**

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 100 kHz (1 MHz across the display)
3. On the 683XXC, make the following settings:
  - a. Press **MODULATION**, then **FM**. At the resulting FM Status menu, press **More** to go to the additional FM Status menu.
  - b. At the additional FM Status menu, press **Unlocked Narrow**, then press **Previous Menu** to return to the main FM Status menu.
  - c. At the FM Status menu, press **Edit Dev.** and set the deviation to 0.240 MHz.
  - d. Press **Edit Rate** and set the rate to 99.8 kHz.
  - e. Press **On/Off** to FM on.
4. Since the 683XXC is now in Unlocked Narrow FM mode, it is necessary to retune the Spectrum Analyzer to center the display.
5. On the 683XXC, use the cursor control key to place the cursor under the last 0 in the deviation setting (0.240 MHz). While observing the first Bessel null (Figure 3-9), increase/decrease the deviation frequency with the cursor control key to reduce the carrier as low as possible.
6. Record the FM deviation frequency, displayed on the 683XXC, on the Test Record.
7. Compute the FM accuracy with the following formula:



**Figure 3-9.** Typical Spectrum Analyzer Display of Bessel Null on FM Waveform

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-48$  dBc null.

$$Accuracy(in\%) = \left( \frac{FM\ Deviation(in\ kHz)}{240} \right) \times 100$$

8. The calculated result should be between 93.7% and 106.3%. Record this result on the Test Record.

**Locked FM Mode**

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 100 kHz (1 MHz across the display)
3. On the 683XXC, make the following settings:
  - a. Press **MODULATION**, then **FM**. The FM Status menu is displayed.
  - b. At the FM Status menu, press **Edit Dev.** and set the deviation to 0.240 MHz.
  - c. Press **Edit Rate** and set the rate to 99.8 kHz.
  - d. Press **On/Off** to FM on.
4. On the 683XXC, use the cursor control key to place the cursor under the last 0 in the deviation setting (0.240 MHz). While observing the first Bessel null (Figure 3-9), increase/decrease the deviation frequency with the cursor control key to reduce the carrier as low as possible.
5. Record the FM deviation frequency, displayed on the 683XXC, on the Test Record.

6. Compute the FM accuracy with the following formula:

$$Accuracy(in\%) = \left( \frac{FM\ Deviation(in\ kHz)}{240} \right) \times 100$$

7. The calculated result should be between 93.7% and 106.3%. Record this result on the Test Record.

**Locked Low-Noise FM Mode**

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 100 kHz (1 MHz across the display)
3. On the 683XXC, make the following settings:
  - a. Press **MODULATION**, then **FM**. At the resulting FM Status menu, press **More** to go to the additional FM Status menu.
  - b. At the additional FM Status menu, press **Locked LN**, then press **Previous Menu** to return to the main FM Status menu.
  - c. At the FM Status menu, press **Edit Dev.** and set the deviation to 0.240 MHz.
  - d. Press **Edit Rate** and set the rate to 99.8 kHz.
  - e. Press **On/Off** to FM on.
4. On the 683XXC, use the cursor control key to place the cursor under the last 0 in the deviation setting (0.240 MHz). While observing the first Bessel null (Figure 3-9), increase/decrease the deviation frequency with the cursor control key to reduce the carrier as low as possible.
5. Record the FM deviation frequency, displayed on the 683XXC, on the Test Record.

6. Compute the FM accuracy with the following formula:

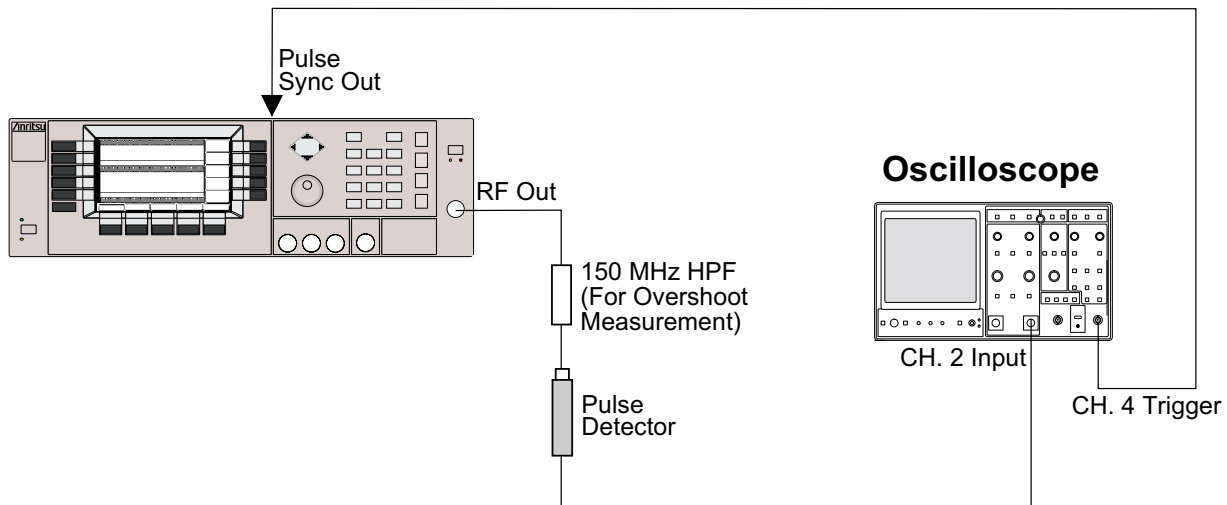
$$Accuracy(in\%) = \left( \frac{FM\ Deviation\ (in\ kHz)}{240} \right) \times 100$$

7. The calculated result should be between 93.7% and 106.3%. Record this result on the Test Record.

**3-14 PULSE MODULATION  
TESTS: RISE TIME,  
FALL TIME, OVER-  
SHOOT, AND LEVEL**

Pulse modulation tests verify correct operation as well as rise time, fall time, overshoot, and level. The pulse leveling accuracy test compares the pulsed RF output level to verify the performance of the level detector(s), detector amplifiers, and ALC sample/hold circuits.

**683XXC Signal Generator**



**Figure 3-10.** Equipment Setup for Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level

**Test Setup**

Connect the equipment, shown in Figure 3-10, as follows:

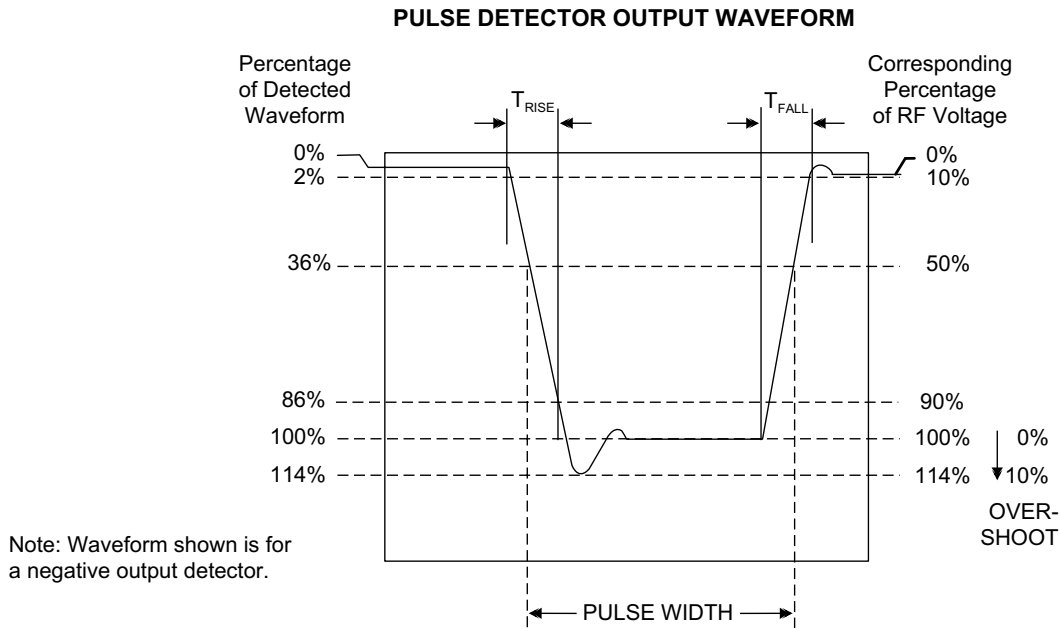
1. Connect the 683XXC rear panel PULSE SYNC OUT to the Oscilloscope Trigger Input.
2. Connect the Pulse Detector Output to the Vertical Input of the Oscilloscope.
3. On the Oscilloscope, select 50 $\Omega$  input impedance.
4. Connect the Pulse Detector Input through a 150 MHz High Pass Filter to the 683XXC RF OUTPUT.



***Rise/Fall  
Time and  
Overshoot***

The following procedure lets you measure the rise time, fall time, and overshoot parameters of the pulse modulation waveform.

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to the maximum leveled output power level for the instrument being tested (refer to Table 3-2, page 3-6).
  - f. Press **MODULATION**, then **Pulse**. The Internal Pulse Status menu is displayed.
  - g. At the Internal Pulse Status menu, press **Edit Width** and set pulse width W1 to 5.0  $\mu$ s.
  - h. Press **Edit Period** and set the PRI to 0.01 ms.
  - i. Press **On/Off** to turn pulse modulation on.
2. On the Oscilloscope, turn off CH.4. Observe the output of the Pulse Detector on the Oscilloscope. Refer to Figure 3-11 to interpret the detector waveform. Adjust the Oscilloscope controls to measure the following waveform parameters.
  - a. Rise/Fall Time (10 to 90%): <10 ns
  - b. Pulse Width: 5  $\mu$ s  $\pm$ 10 ns (5 ns, typical)
  - c. PRI: 0.010 ms  $\pm$ 10 ns (5 ns, typical)
  - d. Overshoot: <10%
3. Record the results on the Test Record.



**Figure 3-11.** Measurement Parameters for a Pulse Modulation Waveform

**Pulse  
Leveling  
Accuracy**

The following procedure lets you measure the pulsed RF output level and CW output level and compare them to verify pulse leveling accuracy.

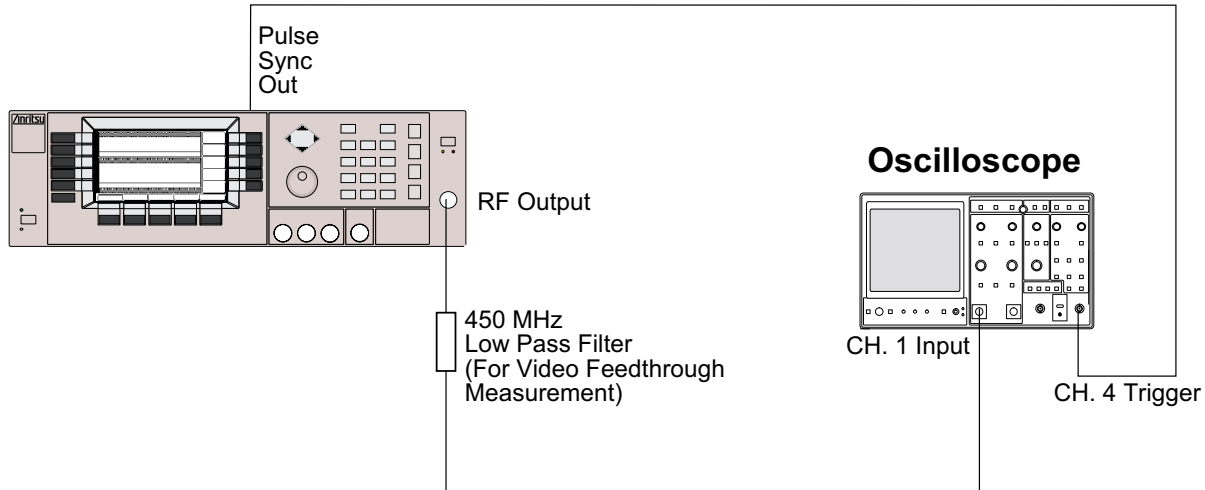
1. On the 683XXC:
  - a. Press **On/Off** (Internal Pulse Status menu) to turn off pulse modulation.
  - b. Press **CW/SWEEP SELECT** to return to the CW Menu display.
  - c. At the CW menu, press **Edit F1** and set F1 to the frequency noted in the Test Record.
2. On the Oscilloscope:
  - a. Adjust the vertical offset to place the trace exactly on the center graticule; this is used as the CW-level reference line.
  - b. Use the Auto Triggering mode to continue sweeping the display when the pulse is off.
  - c. Adjust the vertical sensitivity to the most sensitive setting (mV/div) possible while keeping the trace at the center graticule reference line.

3. On the 683XXC:
  - a. Press **MODULATION**, then **Pulse** to go to the Internal Pulse Status Menu display.
  - b. Press **Edit Width** and set W1 to the pulse width noted in the Test Record.
  - c. Press **On/Off** to turn on pulse modulation.
4. On the Oscilloscope, observe that the nominal level of the displayed pulse peak has shifted vertically, slightly off of the centerline. It may be necessary to readjust the scope trigger level.
5. On the 683XXC:
  - a. Press **CW/SWEEP SELECT** to return to the CW Menu display.
  - b. Record the value of the output level L1, shown in the Level display area, on the Test Record.
  - c. Press **Edit L1** and adjust the power level until the nominal peak level is evenly centered on the display centerline reference.
  - d. Record this value of the output level L1 on the Test Record.
6. Subtract the L1 reading recorded in step 5.d from the reading recorded in step 5.b. This is the pulse level error. Record it on the Test Record.
7. On the 683XXC:
  - a. Press **Edit L1** and set L1 to the maximum leveled output power level for the instrument being tested (refer to Table 3-2, page 3-6).
  - b. Press **MODULATION**, then **Pulse** to return to the Internal Pulse Status Menu display.
  - c. Press **On/Off** to turn off pulse modulation.
8. Repeat steps 1 through 7 for any other frequencies and pulse widths noted in the Test Record. Record the results on the Test Record.

**3-15 PULSE MODULATION  
TEST: VIDEO  
FEEDTHROUGH**

This pulse modulation test verifies that video feedthrough is within specifications.

**683XXC Signal Generator**



**Figure 3-12.** Equipment Setup for Pulse Modulation Test: Video Feedthrough

**Test Setup**

Connect the equipment, shown in Figure 3-12, as follows:

1. Connect the 683XXC rear panel PULSE SYNC OUT to the Oscilloscope Trigger Input.
2. On the Oscilloscope, select 50 $\Omega$  input impedance.
3. Connect the 683XXC RF OUTPUT to the Oscilloscope Vertical Input through a 450 MHz Low Pass Filter.

**Test  
Procedure**

The following procedure lets you measure the video feedthrough that occurs during pulse modulation.

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
  - d. Press **Edit L1** to open the current power level parameter for editing.
  - e. Set L1 to the maximum leveled output power level for the instrument being tested (refer to Table 3-2, page 3-6).
  - f. Press **MODULATION**, then **Pulse**. The Internal Pulse Status menu is displayed.
  - g. At the Internal Pulse Status menu, press **Edit Width** and set pulse width W1 to 5.0  $\mu$ s.
  - h. Press **Edit Period** and set the PRI to 0.01 ms.
  - i. Press **On/Off** to turn pulse modulation on.
2. Set the Oscilloscope controls as follows:
  - a. Vertical Sensitivity: 5 mV/div
  - b. External Trigger: On the positive slope of the Channel 1 signal input
  - c. Horiz Time Base: 1  $\mu$ s/div

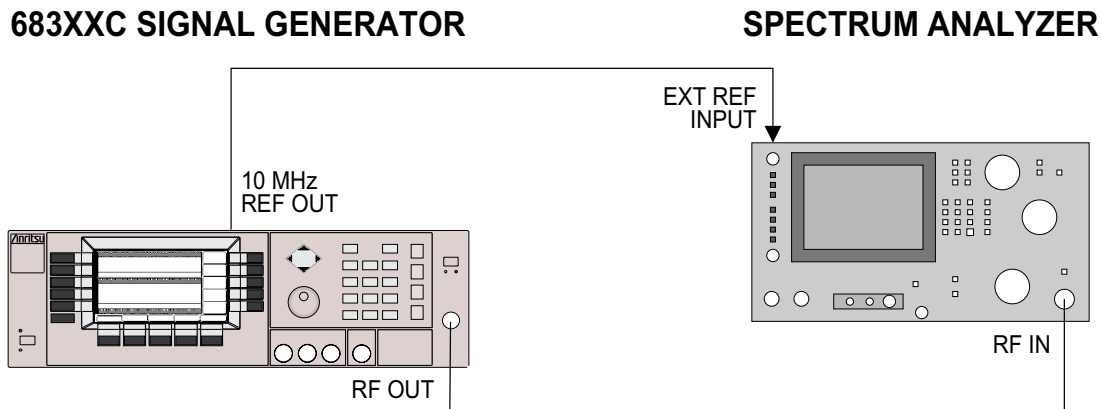
**NOTE**

Use the Oscilloscope's 20 MHz bandwidth limit to aid in viewing the voltage spikes. It may be necessary to adjust the Oscilloscope's horizontal level as any ripple or voltage spikes are generally very small in amplitude.

3. Measure and record the voltage spikes (video feedthrough) on the Test Record. To meet specifications, they must be  $\leq \pm 10$  mV.

**3-16 PULSE MODULATION  
TEST: RF ON/OFF  
RATIO**

This pulse modulation test verifies that the ratio of RF on power to RF off power is within specifications.



**Figure 3-13.** Equipment Setup for Pulse Modulation Test: RF On/Off Ratio

**Test Setup**

Connect the equipment, shown in Figure 3-13, as follows:

1. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
2. Connect the RF OUTPUT of the 683XXC to the Spectrum Analyzer RF Input.

**Test Procedure**

The following procedure lets you determine the ratio of RF on power to RF off power during pulse modulation.

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to the frequency noted on the Test Record.
  - d. Press **MODULATION**, then **Pulse**. The Internal Pulse Status menu is displayed.
  - e. Press **More** to go to the additional Internal Pulse Status Menu display.

- g. Press **Internal/External** to select the external source for the modulation signal. The External Pulse Status Menu is displayed.
      - h. Press **Front/Rear** to select the rear panel PULSE TRIGGER IN connector.
      - i. Press **On/Off** to turn pulse modulation on.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: Same as the 683XXC CW frequency noted in step 1.c.
  - b. Span/Div: 10 kHz
  - c. RBW: 1 kHz
  - d. Video Filter: Wide
  - e. MIN Noise: Activated
  - f. Reference Level: Adjust to place the signal at the top graticule of the screen.
3. Connect a short between the 683XXC rear panel PULSE TRIGGER IN BNC connector center and outer conductors.
4. On the Spectrum Analyzer, decrease the Reference Level by 20 dB, then measure the signal amplitude and record it on the Test Record. The measured signal must be  $\geq 60$  dB from the top graticule.

**NOTE**

A 60 dB level change plus a 20 dB decrease in the reference level equals an 80 dB on/off ratio (specification).

5. If the signal level drifts slowly after connecting the short, remove the short momentarily and apply it again. (Make the measurement as soon as possible after applying the short.) This drift is the result of the Sample/Hold circuit not holding the level because of the pulse duty factor (ratio of RF ON to RF OFF). This drift will not be present in normal pulse operation as the minimum pulse repetition rate is 0.597 Hz.
6. Remove the short.

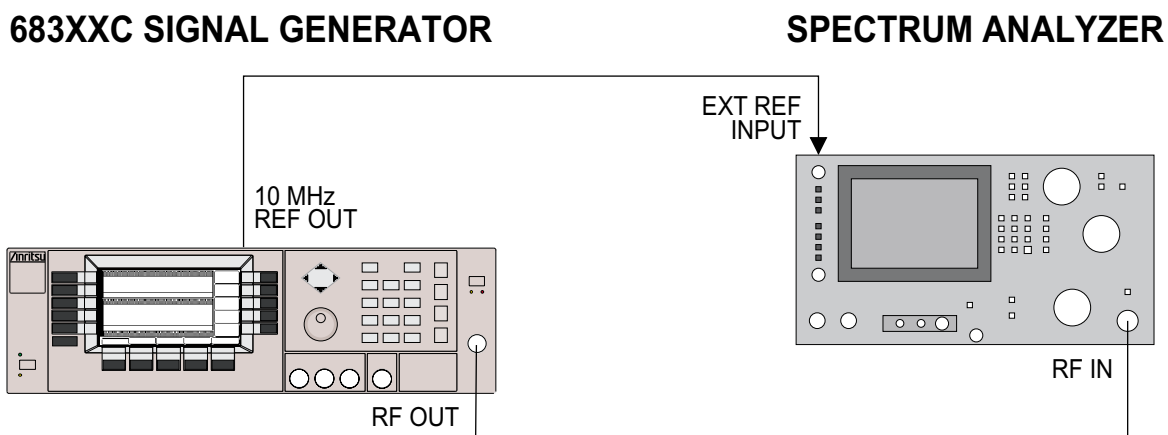
7. Repeat steps 1 through 6 for any other frequencies noted on the Test Record. Record the results on the Test Record.



**3-17 PHASE MODULATION  
TESTS**

This procedure verifies the operation of the phase modulation ( $\Phi$ M) input sensitivity circuits in 683XXCs with Option 6.

The carrier level of the 683XXC RF output is monitored on a Spectrum Analyzer display.  $\Phi$ M accuracy, in both Wide and Narrow  $\Phi$ M modes, is determined by measuring the actual  $\Phi$ M deviation necessary to reduce the carrier level to its lowest level. These tests qualify how the FM input signal affects the signal generator's RF output.



**Figure 3-14.** Equipment Setup for Phase Modulation Tests

**Test Setup**

Connect the equipment, shown in Figure 3-14, as follows:

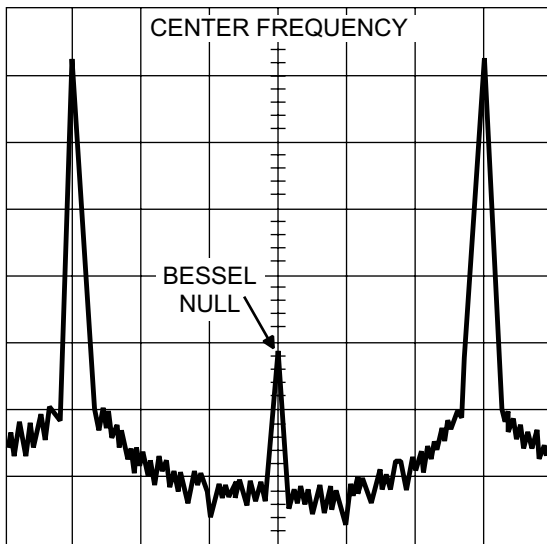
1. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
2. Connect the RF OUTPUT of the 683XXC to the Spectrum Analyzer RF Input.

**$\Phi$ M Input  
Sensitivity  
Procedure**

The following procedure lets you measure the  $\Phi$ M deviation for a specific input sensitivity in Wide and Narrow  $\Phi$ M modes and determine  $\Phi$ M accuracy.

**Wide  $\Phi$ M Mode**

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 100 kHz (1 MHz across the display)
3. On the 683XXC, make the following settings:
  - a. Press **MODULATION**, then  **$\Phi$ M**. At the resulting  $\Phi$ M Status menu, press **More** to go the additional  $\Phi$ M Status menu.
  - b. At the additional  $\Phi$ M Status menu, press **Wide**, then press **Previous Menu** to return to the main  $\Phi$ M Status menu.
  - c. At the  $\Phi$ M Status menu, press **Edit Dev.** and set the deviation for 2.40 rad.
  - d. Press **Edit Rate** and set the rate to 99.8 kHz.
  - e. Press **On/Off** to turn  $\Phi$ M on.
4. On the 683XXC, use the cursor control key to place the cursor under the last 0 in the deviation setting (2.40 rad). While observing the first Bessel null (Figure 3-15), increase/decrease the  $\Phi$ M deviation with the cursor control key to reduce the carrier as low as possible.



**Figure 3-15.** Typical Spectrum Analyzer Display of Bessel Null on  $\Phi$ M Waveform

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-48$  dBc null.

$$Accuracy(in\%) = \left( \frac{\Phi M \text{ Deviation}(in \text{ rad})}{240} \right) \times 100$$

5. Record the  $\Phi$ M deviation, displayed on the 683XXC, on the Test Record.
6. Compute the  $\Phi$ M accuracy with the following formula:
7. The calculated result should be between 93.7% and 106.3%. Record this result on the Test Record.

**Narrow  $\Phi$ M Mode**

1. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM**, then **Reset**. Upon reset, the CW Menu is displayed.
  - b. Press **Edit F1** to open the current frequency parameter for editing.
  - c. Set F1 to 5.0 GHz.
2. Set up the Spectrum Analyzer as follows:
  - a. CF: 5.0 GHz
  - b. Span/Div: 100 kHz (1 MHz across the display)
3. On the 683XXC, make the following settings:
  - a. Press **MODULATION**, then  **$\Phi$ M**. At the resulting  $\Phi$ M Status menu, press **More** to go to the additional  $\Phi$ M Status menu.
  - b. At the additional  $\Phi$ M Status menu, press **Narrow**, then press **Previous Menu** to return to the main  $\Phi$ M Status menu.
  - c. At the  $\Phi$ M Status menu, press **Edit Dev.** and set the deviation to 2.40 rad.
  - d. Press **Edit Rate** and set the rate to 99.8 kHz.
  - e. Press **On/Off** to turn  $\Phi$ M on.
4. On the 683XXC, use the cursor control key to place the cursor under the last 0 in the deviation setting (2.40 rad). While observing the first Bessel null (Figure 3-15), increase/decrease the  $\Phi$ M deviation with the cursor control key to reduce the carrier as low as possible.
5. Record the  $\Phi$ M deviation, displayed on the 683XXC, on the Test Record.
6. Compute the  $\Phi$ M accuracy with the following formula:
$$Accuracy(in\%) = \left( \frac{\Phi M\ Deviation(in\ rad)}{240} \right) \times 100$$
7. The calculated result should be between 93.7% and 106.3%. Record this result on the Test Record.

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-48$  dBc null.



# Chapter 4

## Calibration

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# Chapter 4

## Calibration

### **4-1** INTRODUCTION

This chapter contains procedures for calibrating the Series 683XXC Synthesized High Performance Signal Generators. These procedures are typically performed because out-of-tolerance conditions have been noted during performance verification testing (see Chapter 3) or as a result of replacement of subassemblies or RF components.

#### **NOTE**

The calibration procedures herein support operating firmware versions 1.00 and above. It is recommended that you upgrade your instrument's operating firmware to the latest available version prior to calibration.

### **4-2** RECOMMENDED TEST EQUIPMENT

Table 4-1 (page 4-4) provides a list of the recommended test equipment for these calibration procedures.

The procedures refer to specific test equipment front panel control settings when the test setup is critical to making accurate measurements. In some cases, the user may substitute test equipment having the same critical specifications as those on the recommended test equipment list.

Contact your local Anritsu service center (Refer to Table 1-5 on page 1-18) if you need clarification of any equipment or procedural reference.

### **4-3** TEST RECORDS

A blank copy of a sample calibration test record for each 683XXC model is provided in Appendix A. It provides a means for maintaining an accurate and complete record of instrument calibration. We recommend that you copy these pages and use them to record (1) your calibration of out-of-tolerance 683XXC circuits, or (2) your calibration of the 683XXC following replacement of subassemblies or RF components.

**4-4 CALIBRATION  
FOLLOWING  
SUBASSEMBLY  
REPLACEMENT**

Table 4-2 (page 4-6) lists the calibration that should be performed following the replacement of 683XXC subassemblies or RF components.

**4-5 CONNECTOR AND KEY  
LABEL NOTATION**

The calibration procedures include many references to equipment interconnections and control settings. For all 683XXC references, specific labels are used to denote the appropriate menu key, data entry key, data entry control, or connector (such as CW/SWEEP 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 4-1.

**Table 4-1.** Recommended Test Equipment for Calibration Procedures (1 of 2)

INSTRUMENT	CRITICAL SPECIFICATION	RECOMMENDED MANUFACTURER/MODEL	PROCEDURE NUMBER
Frequency Counter	Frequency Range: 1 to 40 GHz Input Impedance: 50Ω Resolution: 1 Hz	Anritsu Model MF2414A	4-7
Spectrum Analyzer	Frequency Range: 1 to 20 GHz Resolution Bandwidth: 10 Hz	Tektronix, Model 2794	4-13, 4-14
Power Meter, with Power Sensors	Power Range: -30 to +20 dBm (1μW to 100mW)	Anritsu Model ML2437A or ML2438A, with Power Sensors: MA2474A (0.01 to 40 GHz) MA2475A (0.01 to 50 GHz)	4-12
Frequency Reference	Frequency: 10 MHz Accuracy: $5 \times 10^{-12}$ parts/day	Absolute Time Corp., Model 300	4-7
Function Generator	Output Voltage: 2 volts peak-to-peak Functions: 0.1 Hz to 100 kHz sine and square waveforms	Hewlett-Packard, Model 33120A	4-12, 4-13, 4-14
Digital Multimeter	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-09K (True RMS AC)	4-12, 4-13, 4-14
Scalar Network Analyzer, with RF Detector	Frequency Range: 0.01 to 60 GHz	Anritsu Model 56100A, with RF Detector: 560-7K50 (0.01 to 40 GHz) 560-7VA50 (0.01 to 50 GHz) SC5198 (40 to 60 GHz)	4-8, 4-10
Attenuator	Frequency Range: DC to 40 GHz Max Input Power: >+17 dBm Attenuation: 10 dB	Anritsu, Model 41KC-10	4-8, 4-9



**Table 4-1.** *Recommended Test Equipment for Calibration Procedures (2 of 2)*

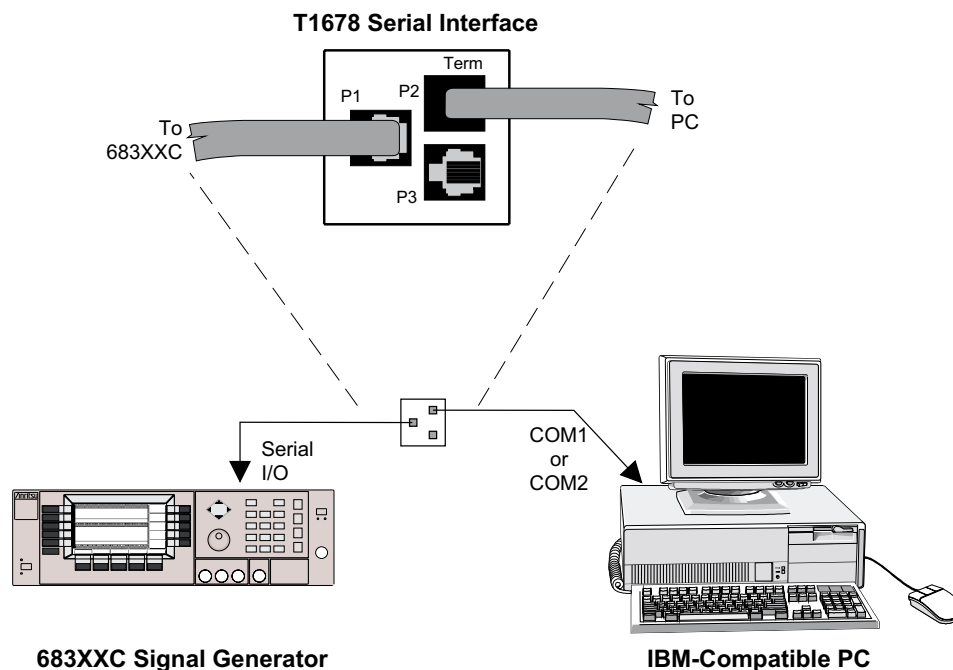
<b>INSTRUMENT</b>	<b>CRITICAL SPECIFICATION</b>	<b>RECOMMENDED MANUFACTURER/MODEL</b>	<b>PROCEDURE NUMBER</b>
Attenuator	<i>Frequency Range: DC to 60 GHz Max Input Power: &gt;+17 dBm Attenuation: 10 dB</i>	Anritsu, Model 41V-10	4-8, 4-9
Personal Computer	<i>PC Configuration: IBM AT or compatible Operating System: Windows 3.1, 95, or 98 Accessories: Mouse</i>	Any common source	All procedures
Serial Interface Assy	<i>Provides serial interface between the PC and the 683XXC.</i>	Anritsu P/N: T1678	All procedures
Tee	<i>Connectors: 50Ω BNC</i>	Any common source	4-12, 4-13, 4-14
Cables	<i>Connectors: 50Ω BNC</i>	Any common source	All procedures

**Table 4-2.** Calibration Following Subassembly/RF Component Replacement

<b>Subassembly/RF Component Replaced</b>	<b>Perform the Following Calibration(s) in Paragraph(s):</b>
A1, A2 Front Panel Assy	None
A3 Reference Loop PCB	4-7
A4 Coarse Loop PCB	4-7
A5 Fine Loop PCB	4-7
A6 Pulse Generator PCB	None
A7 YIG Loop PCB	None
A8 Function Generator PCB	4-12
A9 PIN Control PCB	4-8, 4-9, 4-10, 4-11
A10 ALC PCB	4-8, 4-9, 4-10, 4-11, 4-12
A11 FM PCB	4-13 (and 4-14 if Option 6 is installed)
A12 Analog Instruction PCB	4-7
A13 10 MHz DDS PCB (Option 22)	4-8, 4-9, 4-10, 4-11
A14 YIG, SDM, SQM Driver PCB	4-7, 4-9, 4-10, 4-11
A15 Regulator PCB	None
A16 CPU Interface PCB	4-7
A17 CPU PCB	4-7 thru 4-13. None, if calibration EEPROM reused.
A18 Power Supply PCB	None
A19 AC Line Conditioner PCB	None
A21 Line Filter/Rectifier PCB	None
A21-1 BNC/Aux IO Connector PCB	None
YIG-tuned Oscillator	4-7
0.01 to 2 GHz Down Converter Assy	4-8, 4-9, 4-10, 4-11
Switched Filter Assy	4-8, 4-9, 4-10, 4-11
Switched Doubler Module (SDM)	4-8, 4-9, 4-10, 4-11
Source Quadrupler Module (SQM)	4-8, 4-9, 4-10, 4-11
Forward Coupler	4-8, 4-9, 4-10, 4-11
Directional Coupler	4-8, 4-9, 4-10, 4-11
Step Attenuator (Option 2)	4-8, 4-9, 4-10

**4-6 INITIAL SETUP**

The 683XXC is calibrated using an IBM compatible PC and external test equipment. The PC must have the Windows 3.1, Windows 95, or Windows 98 operating system installed and be equipped with a mouse. Initial setup consists of interfacing the PC to the signal generator.



**Figure 4-1.** PC to 683XXC Interconnection for Calibration

**Interconnection**

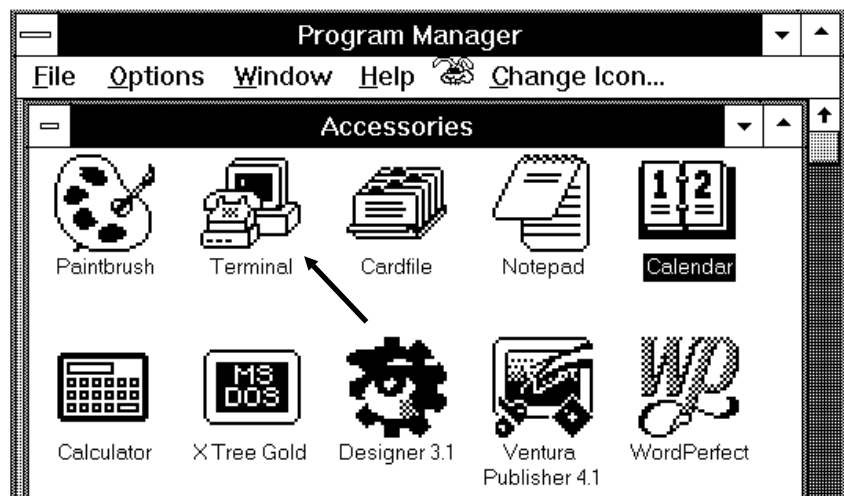
Using the ANRITSU P/N T1678 serial interface assembly, connect the PC to the 683XXC as follows:

1. Connect the wide flat cable between the 683XXC rear panel SERIAL I/O connector and the P1 connector on the T1678 serial interface PCB.
2. Connect the narrow flat cable between the P2 (TERM) connector on the T1678 serial interface PCB and the COM1 or COM2 connector on the PC. Use the RJ11-to-DB-9 or RJ11-to-DB-25 adapter, provided with the T1678 serial interface assembly, to make the connection at the PC.

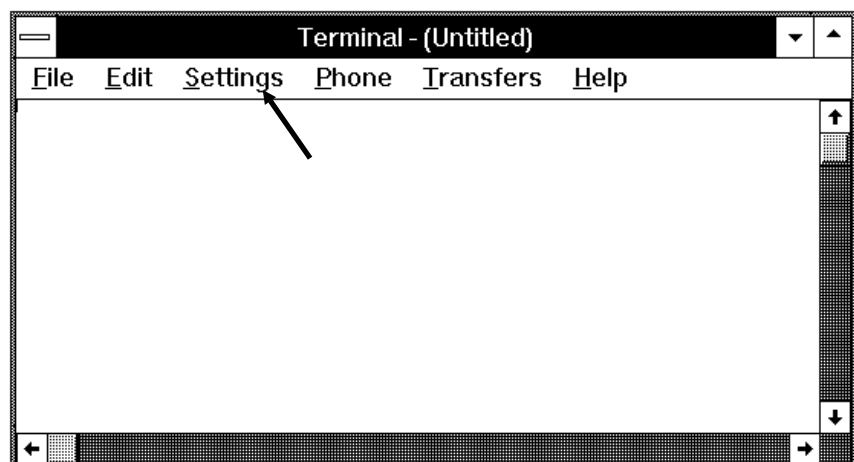
**PC Setup —  
Windows 3.1**

Configure the PC with Windows 3.1 operating system to interface with the 683XXC as follows:

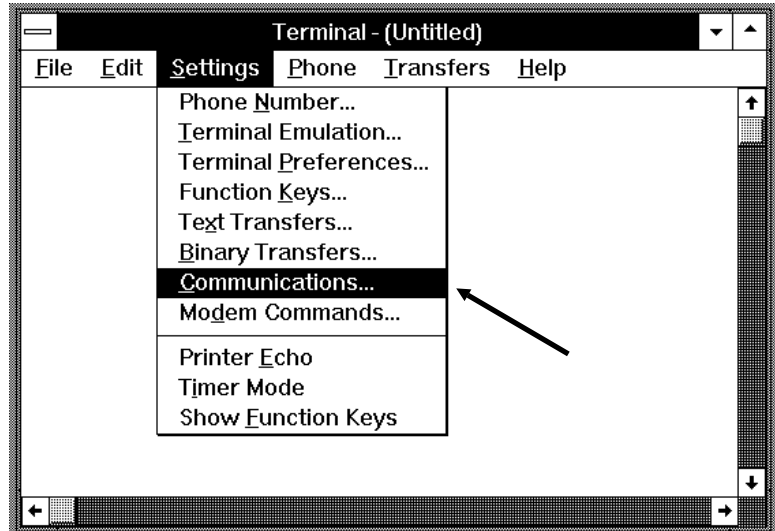
1. Power up the 683XXC.
2. Power up the PC and place it in Windows.
3. Double click on the Terminal Icon to bring up the Terminal (Untitled) window. The initial installation of Windows places the Terminal Icon in the Accessories window.



4. At the Terminal window, click on Settings to display the Settings menu.

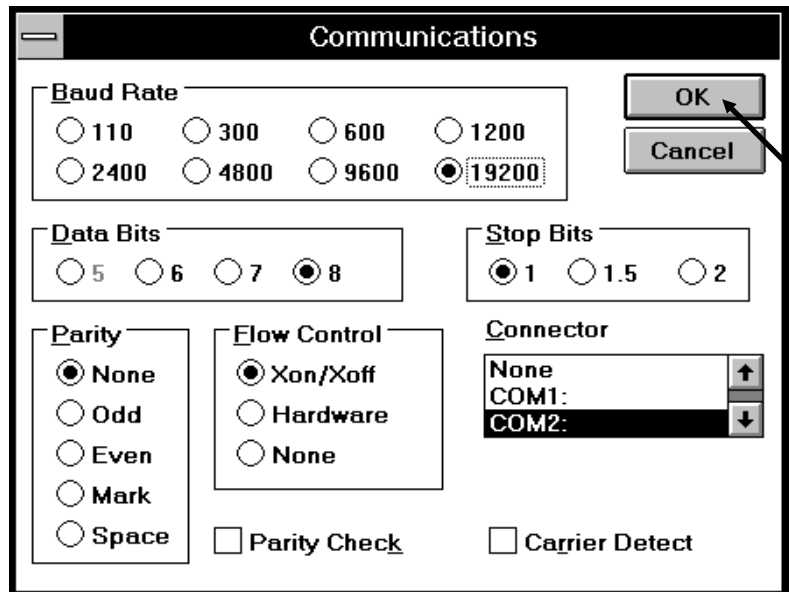


5. Click on Communications.



6. At the Communications Dialog box, select the following options:

Baud Rate	19200
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	Xon/Xoff
Connector	Select connection made during interconnection



7. After making the selections, click on the OK button.
8. Press <ENTER> on the keyboard.
9. Verify that a \$ prompt appears on the PC display.
10. This completes the initial setup for calibration.

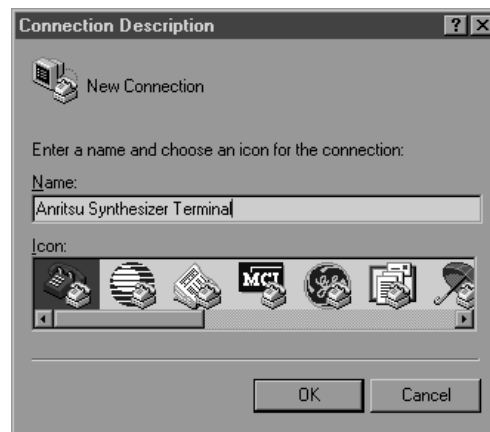
***PC Setup —  
Windows 95/  
Windows 98***

Configure the PC with Windows 95 or Windows 98 operating system to interface with the 683XXC as follows:

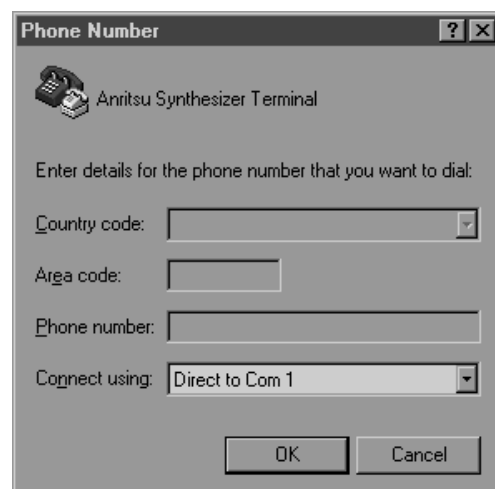
1. Power up the 683XXC.
2. Power up the PC and place it in Windows.
3. Click on the Start button to activate the first menu.
4. Go to Programs and place the mouse pointer on Accessories to highlight the third menu.
5. Select Hyper Terminal to bring up the selection window (below).



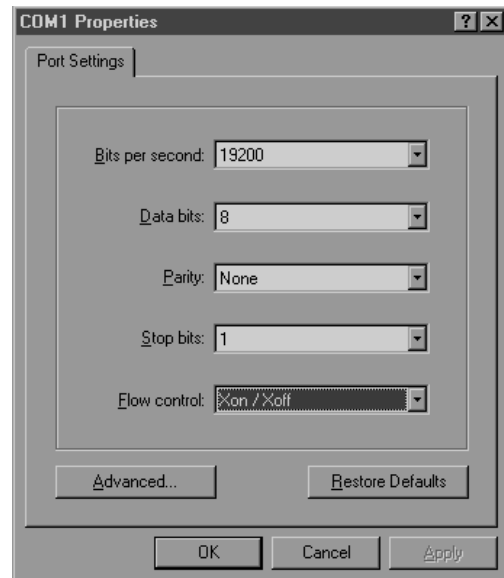
6. Click on Hypertrm (Hypertrm.exe) to bring up the New Connection window (next page).



7. In the New Connection Name box, type a name for the connection, then click on the OK button. The window below is now displayed.



8. In the Connect using box, type **Direct to Com " \_ "**. Enter the number of the communications port being used, for example: Com1.
9. Click on OK. The Communications Port Properties window is displayed (next page).



10. In the Properties window, make the following selections:

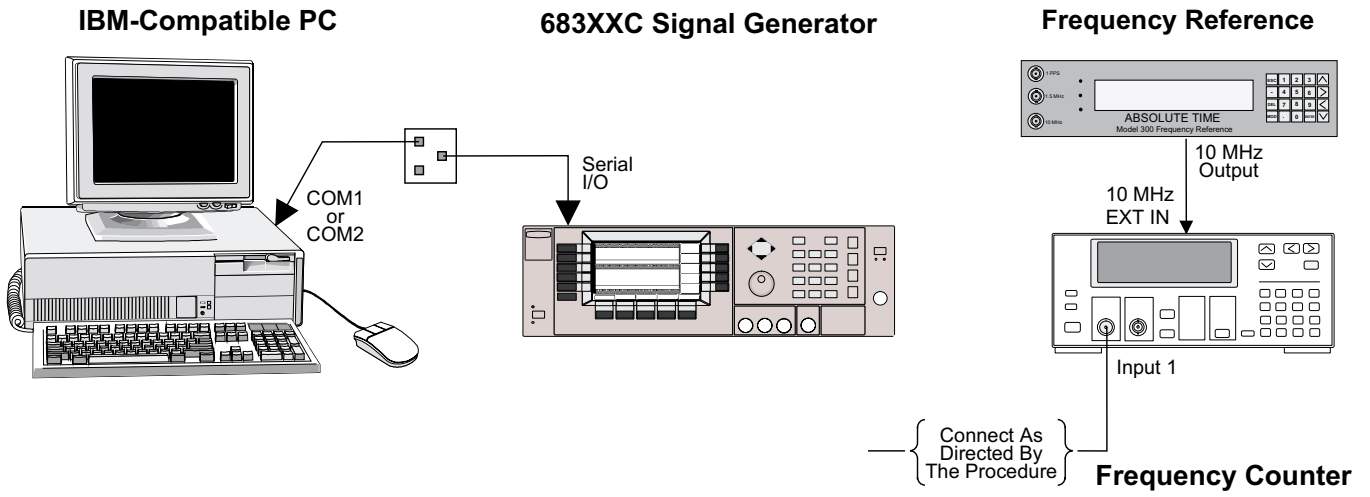
<u>B</u> its per second	19200
<u>D</u> ata bits	8
<u>P</u> arity	None
<u>S</u> top bits	1
<u>F</u> low control	Xon / Xoff

11. After making the selections, click on the OK button.
12. Press <ENTER> on the keyboard.
13. Verify that the \$ prompt appears on the PC display.
14. This completes the initial setup for calibration.



**4-7 PRELIMINARY CALIBRATION**

This procedure provides the steps necessary to initially calibrate the coarse loop, fine loop, frequency instruction, and internal DVM circuitry and the 100 MHz reference oscillator of the 683XXC.



**Figure 4-2.** Equipment Setup for Preliminary Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-2, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.
2. Connect the Frequency Counter to the 683XXC when directed to do so during the calibration procedure.

**NOTES**

If the 683XXC has option 19 installed, verify that the GPIB is configured for the Native external interface language before beginning instrument calibration.

Before beginning this calibration procedure, *always* let the 683XXC warm up for a minimum of one hour.

**Calibration  
Steps**

Each of the steps in this procedure provides initial calibration of a specific 683XXC circuit or component. To ensure accurate instrument calibration, each step of this procedure must be performed in sequence.

1. Calibrate the internal DVM circuitry as follows:
  - a. At the **\$** prompt, type: **calterm 119** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
2. Calibrate the Coarse Loop Pretune DAC as follows:
  - a. At the **\$** prompt, type: **calterm 137** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
3. Calibrate the Fine Loop Pretune DAC as follows:
  - a. At the **\$** prompt, type: **calterm 136** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
4. Calibrate the Sweep Time DAC as follows:
  - a. At the **\$** prompt, type: **calterm 132** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
5. Calibrate the YIG Frequency Offset DAC as follows:
  - a. At the **\$** prompt, type: **calterm 134** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
6. Calibrate the YIG Frequency Linearizer DACs as follows:
  - a. At the **\$** prompt, type: **calterm 127** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.

**NOTE**

To save the calibration data after completing any calibration step, type: **calterm 787** and press <ENTER>.

**NOTE**

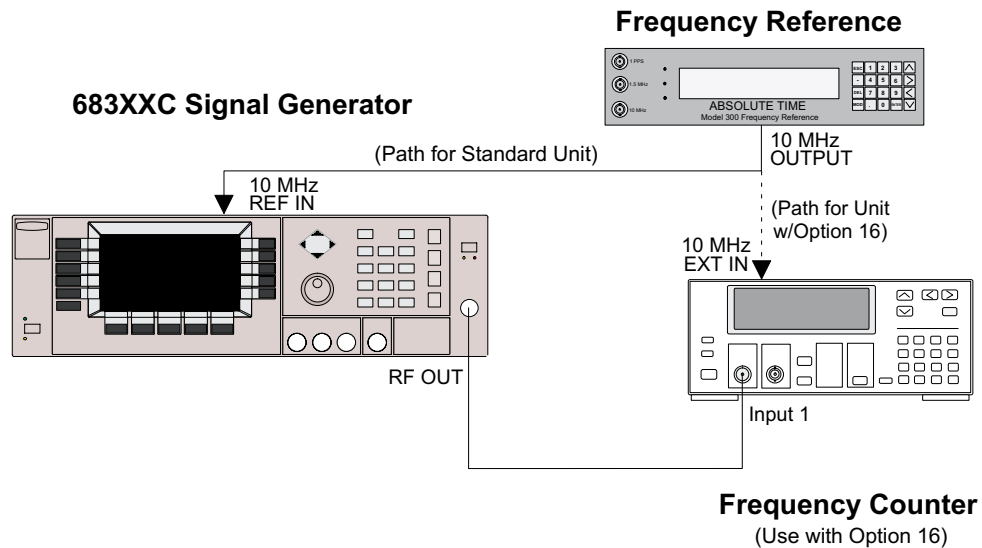
For an alternate 100 MHz Reference Oscillator Calibration procedure, go to page 4-17.

7. Calibrate the 100 MHz Reference Oscillator as follows:
  - a. If Option 16 (High Stability Time Base) is installed, disconnect the cable at A3J6.
  - b. Connect the Frequency Counter to the 683XXC RF output connector.
  - c. At the **\$** prompt, type: **calterm 130** and press <ENTER>.
  - d. Follow the instructions on the screen.
  - e. Reconnect the cable to A3J6, if removed.
  - f. If Option 16 is installed, use a Phillips screwdriver and remove the screw on top of the 10 MHz High Stability Crystal Oscillator assembly to gain access to the timebase adjustment screw.
  - g. On the 683XXC, press **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
  - h. Press **Edit F1** to open the current frequency parameter for editing.
  - i. Set F1 to 10 GHz (5 GHz for model 68317C).
  - j. Using the Phillips screwdriver, adjust the timebase to obtain a frequency counter reading of exactly 10 GHz (5 GHz for model 68317C).
  - k. Record step completion on the Test Record.
8. Calibrate the Ramp Center DAC as follows:
  - a. At the **\$** prompt, type: **calterm 129** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
9. Calibrate the Sweep Width DAC as follows:
  - a. At the **\$** prompt, type: **calterm 133** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
10. Calibrate the Center Frequency DAC as follows:
  - a. At the **\$** prompt, type: **calterm 114** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.

**CAUTION**

When saving calibration data, turning off the instrument before the **\$** prompt returns to the screen can cause all stored data to be lost.

11. Store the calibration data as follows:
  - a. At the **\$** prompt, type: **calterm 787** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration data has been stored.)
  - b. Record step completion on the Test Record.



**Figure 4-2a.** Equipment Setup for 100 MHz Reference Oscillator Calibration (Alternate Method)

**Alternate  
Reference  
Oscillator  
Calibration**

This 100 MHz Reference Oscillator calibration procedure is an alternate to Step 7 of the Preliminary Calibration procedure (page 4-15).

**NOTE**

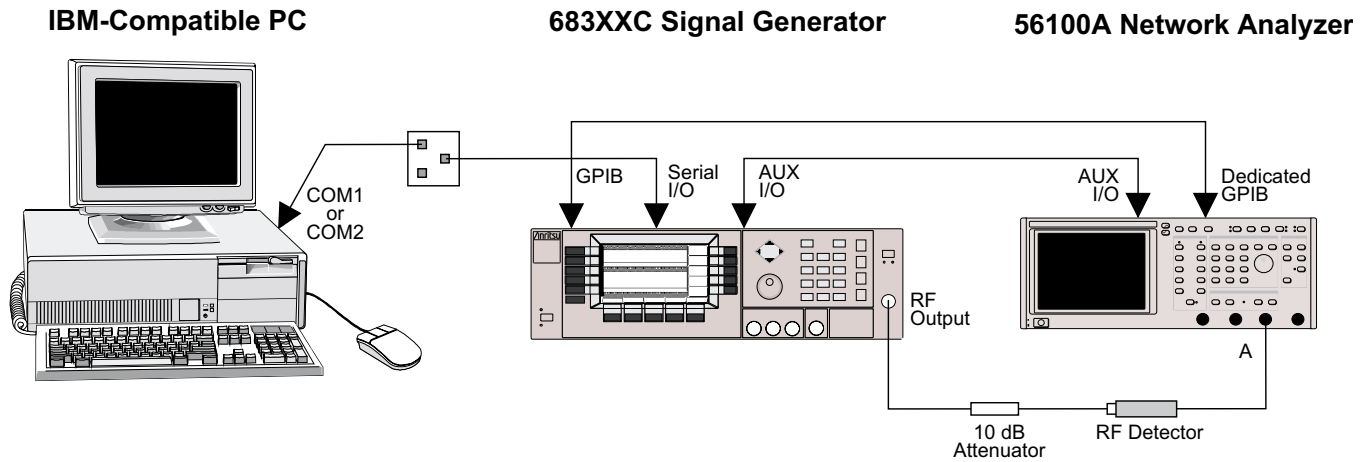
If this procedure is used as a substitute for Step 7 of the Preliminary Calibration procedure, you must still perform Steps 8, 9, 10, and 11 to complete preliminary calibration of the 683XXC.

- 7a. Calibrate the 100 MHz Reference Oscillator as follows:
  - a. If Option 16 (High Stability Time Base) is installed, disconnect the cable at A3J6.
  - b. Connect the Frequency Reference 10 MHz OUTPUT to the 10 MHz REF IN connector on the 683XXC rear panel.
  - c. On the 683XXC, press the **SYSTEM** main menu key. At the System Menu display, press **Cal Menu** to go to the Calibration Menu.
  - d. Press **Refrcnce Cal** to begin calibration. The Calibration Status Menu is displayed.
  - e. Press **Proceed** to start the calibration. The date parameter opens for data entry.

- f. Using the key pad, enter the current date (in any desired format). Then, press any terminator key. The Calibration Status Menu display changes to indicate calibration is in progress.
- g. When the Reference Oscillator calibration is complete, the Calibration Menu is displayed.
- h. Reconnect the cable to A3J6, if removed.
- i. If Option 16 is installed, connect the 683XXC RF OUTPUT to the Frequency Counter Input 1.
- j. Connect the Frequency Reference 10 MHz OUTPUT to the 10 MHz EXT IN connector on the Frequency Counter rear panel.
- k. Use a Phillips screwdriver and remove the screw on top of the 10 MHz High Stability Crystal Oscillator assembly to gain access to the timebase adjustment screw.
- l. On the 683XXC, press **SYSTEM**, then **Reset**. Upon reset the CW Menu is displayed.
- m. Press **Edit F1** to open the current frequency parameter for editing.
- n. Set F1 to 10 GHz (5 GHz for model 68317C).
- o. Using a Phillips screwdriver, adjust the timebase to obtain a frequency counter reading of exactly 10 GHz (5 GHz for model 68317C).
- p. Record step completion on the Test Record.
- q. Proceed to Step 8 of the Preliminary Calibration procedure (page 4-15).

**4-8 SWITCHED FILTER SHAPER CALIBRATION**

This procedure provides the steps necessary to adjust the Switched Filter Shaper Amplifier gain to produce a more constant level amplifier gain with power level changes.



**Figure 4-3.** Equipment Setup for Switched Filter Shaper Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-3, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.
2. Using the Auxiliary I/O cable, connect the 683XXC rear panel AUX I/O connector to the 56100A AUX I/O connector.
3. Using the GPIB cable, connect the 56100A DEDICATED GPIB connector to the 683XXC IEEE-488 GPIB connector.
4. Connect the RF Detector to the 56100A Channel A Input connector.
5. Connect the 683XXC RF OUTPUT connector to the RF Detector via a 10 dB Attenuator.

**NOTE**

Before beginning this calibration procedure, *always* let the 683XXC warm up for a minimum of one hour.

***Log Amplifier  
Zero Calibration***

Before the Switched Filter Shaper Amplifier can be adjusted, zero calibration of the ALC Log amplifier must be performed to eliminate any DC offsets.

1. Perform ALC Log amplifier zero calibration as follows:
  - a. At the **\$** prompt on the PC display, type:  
**calterm 115** and press <ENTER>. The **\$** prompt will appear on the screen when ALC Log amplifier zero calibration is complete. (This can take up to 3 minutes for a 40 GHz unit.)
  - b. Record step completion on the Test Record.

**NOTE**

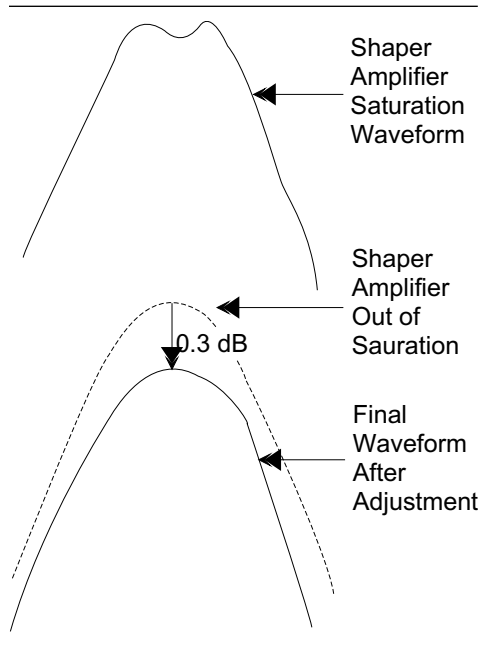
The following Limiter DAC adjustment procedure applies only to 683XXCs with Option 15B (High Power Output). If your instrument does not have this option, go directly to the Shaper DAC adjustment procedure.

***Limiter DAC  
Adjustment***

The following steps in the procedure let you adjust the Switched Filter Limiter DAC which controls the maximum gain of the Switched Filter Shaper Amplifier. Each frequency band will be scanned for the maximum unlevelled power point before adjustment of the Limiter DAC to ensure that the Shaper Amplifier is not driven to saturation.

1. Set up the 56100A Network Analyzer as follows:
  - a. Press the System Menu key.
  - b. From the System Menu display, select RESET.
  - 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.
  - g. Press OFFSET/RESOLUTION.
  - h. Set Resolution to 5 dB/Div.
  - i. Adjust Offset to center the display.





**Figure 4-4.** Limiter DAC Adjustment Waveforms

2. Adjust the Switched Filter Limiter DAC for each of the frequency bands as follows:
  - a. At the **\$** prompt on the PC display, type: **calterm 145** and press <ENTER>.
  - b. On the Network Analyzer, set the Resolution to 0.2 dB and adjust the offset to center the top of the triangle waveform on the display.
  - c. Observe the displayed waveform to determine whether the Shaper Amplifier is being driven to saturation. This is indicated by a dip in the top of the triangle waveform (Figure 4-4).

If the displayed waveform indicates there is no saturation, proceed to step e. If there is a dip in the waveform, go to step d.
  - d. On the computer keyboard, use 8, 9, or 0 to decrement the value of the DAC's setting until the top of the triangle waveform starts to become rounded (Shaper Amplifier is no longer being driven to saturation). Continue decrementing until the top of the waveform is 0.3 dB below this point.
  - e. Press **Q** on the keyboard to go to the next frequency band.
  - f. Repeat steps b thru e until the DAC has been checked and adjusted for all frequency bands.
  - g. Press **Q** on the keyboard to exit the program. (The **\$** prompt will appear on the screen.)
  - h. Record step completion on the Test Record.

***Shaper DAC  
Adjustment***

The following step in the procedure adjusts the Switch Filter Shaper DAC which controls the gain of the Switched Filter Shaper Amplifier. Each frequency band will be scanned for the minimum un-leveled power point before automatic adjustment of the shaper DAC.

1. At the **\$** prompt on the PC display, type: **calterm 138** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration is complete.)

**NOTE**

The calibration routine may take up to 20 minutes depending on the frequency range of the 683XXC being calibrated.

2. Store the calibration data in non-volatile memory (EEPROMs) on the A17 CPU PCB as follows:
  - a. Type: **calterm 787** and press <ENTER>. (The **\$** prompt will appear on the screen when the data has been stored.)
  - b. Record step completion on the Test Record.

**CAUTION**

When saving calibration data, turning off the instrument before the **\$** prompt returns to the screen can cause all stored data to be lost.

**4-9 RF LEVEL CALIBRATION**

RF level calibration requires the use of an automated test system. A computer-controlled power meter measures the 683XXC power output at many frequencies throughout the frequency range of the instrument. Correction factors are then calculated and stored in non-volatile memory (EEPROM) located on the A17 CPU PCB.

This calibration is required following replacement of either the A9 PIN Control PCB, the A10 ALC PCB, the A13 10 MHz DDS PCB (Option 22), the A14 YIG, SDM, SQM Driver PCB, the Switched Filter Assembly, the 0.01 to 2 GHz Down Converter Assembly, the Switched Doubler Module (SDM), the Source Quadrupler Module (SQM), the Forward Coupler, the Directional Coupler, or the Step Attenuator.

The RF level calibration software is available from Anritsu by ordering:

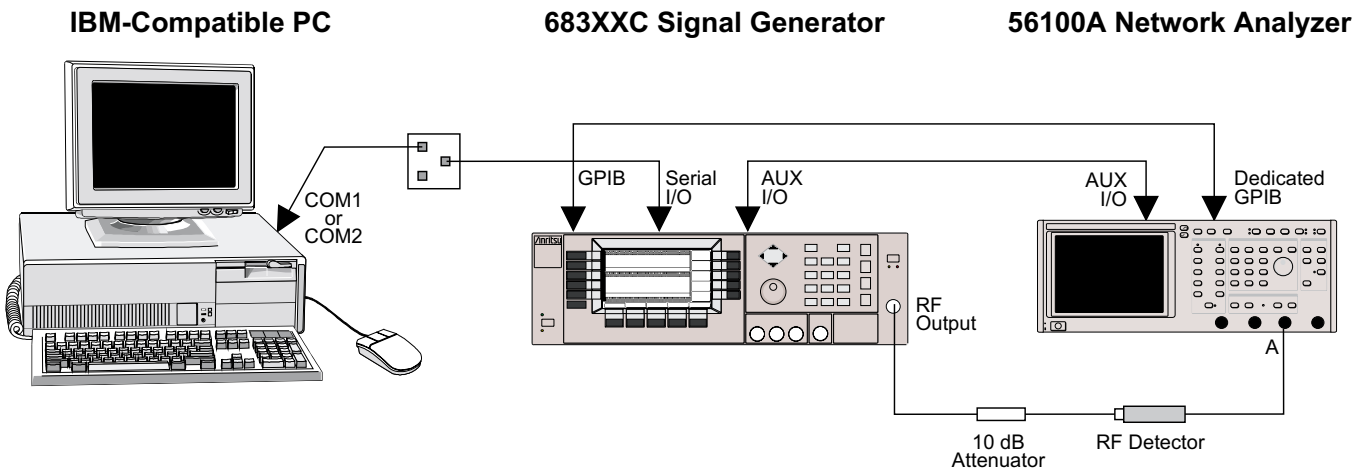
- Part number 2300-104, Version 2.6 and above, for all ≤50 GHz 683XXC models.
- Part number 2300-209, Version 1.4 and above, for 60 GHz and 65 GHz 683XXC models.

This calibration program warrants level accuracy specifications from maximum power to -70 dBm. For calibration below -70 dBm, the signal generator must be returned to your Anritsu service center for calibration. The RF level calibration software comes on a 3.5-inch/1.44 Mbyte, MS-DOS formatted floppy disk.

For information concerning test equipment requirements and ordering the automated program, contact your Anritsu service center (refer to Table 1-5 on page 1-18).

**4-10** ALC SLOPE  
CALIBRATION

This procedure provides the steps necessary to perform ALC Slope calibration. The ALC Slope is calibrated to adjust for decreasing output power-vs-output frequency in full band analog sweep.



**Figure 4-5.** Equipment Setup for ALC Slope Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-5, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.
2. Using the Auxiliary I/O cable, connect the 683XXC rear panel AUX I/O connector to the 56100A AUX I/O connector.
3. Using the GPIB cable, connect the 56100A DEDICATED GPIB connector to the 683XXC IEEE-488 GPIB connector.
4. Connect the RF Detector to the 56100A Network Analyzer Channel A Input connector.
5. Connect the 683XXC RF OUTPUT connector to the RF Detector via a 10 dB Attenuator.

**NOTE**

Before beginning this calibration procedure, *always* let the 683XXC warm up for a minimum of one hour.

***ALC Slope  
DAC  
Adjustment***

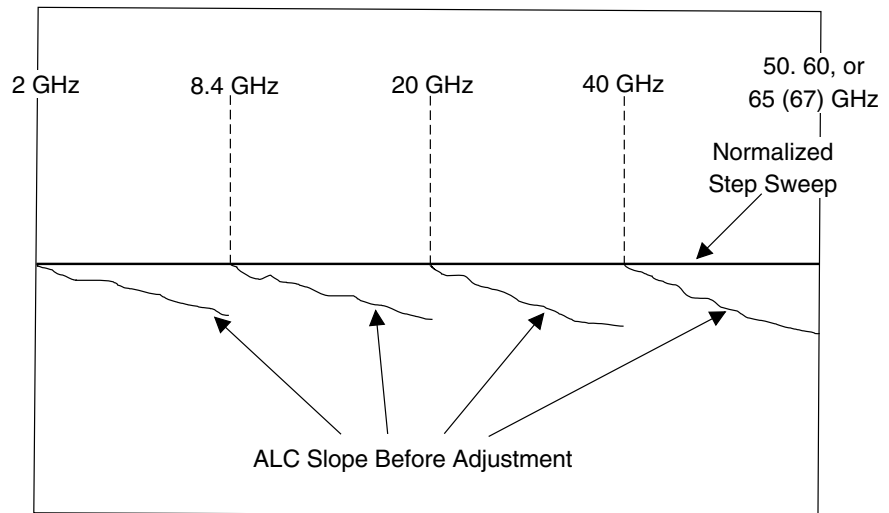
The following procedure lets you adjust the ALC Slope over individual frequency ranges to compensate for decreasing output power-vs-frequency in analog sweep.

The procedure begins by letting you adjust the ALC Slope for band 0 (0.01 to 2.0 GHz), if installed. It then continues letting you adjust the ALC Slope from 2 GHz to the top frequency of the instrument in up to four bands. The band frequency ranges are:

Band 1	2.0 to 8.4 GHz
Band 2	8.4 to 20.0 GHz
Band 3	20.0 to 40.0 GHz
Band 4	40.0 to 65.0 GHz

During band 1 thru 3/4 ALC Slope adjustment, the 56100A Network Analyzer display (Figure 4-6) shows the response from 2 GHz to the top frequency of the model, as adjustment is done band by band.

1. Set up the 56100A Network Analyzer as follows:
  - a. Press the System Menu key.
  - b. From the System Menu display, select RESET.
  - c. Press CHANNEL 2 DISPLAY: OFF.
  - d. Press CHANNEL 1 DISPLAY: ON.
  - e. Press CHANNEL 1 MENU key.
  - f. From the Chanel 1 Menu Display, select TRANSMISSION and SELECT INPUT (NON-RATIO A).
2. Set up the 683XXC as follows:
  - a. Reset the instrument by pressing **SYSTEM** then **Reset**. Upon reset the CW Menu is displayed.
  - b. Press **Step**. The Step Sweep Menu is displayed.
  - c. Press **FREQUENCY CONTROL**, then **Full** to select the full frequency range of the unit being calibrated.
  - d. Press **CW/SWEEP SELECT** to return to the Step Sweep Menu display.
  - e. Press **Sweep Ramp**. At the resulting Step Sweep Ramp Menu, press **Num of Steps** and set the number of steps to 400.



**Figure 4-6.** ALC Slope Adjustment Waveform Display

3. Make the following selections on the 56100A Network Analyzer to normalize the step sweep.
  - a. Press CALIBRATION and follow the menu on the display.
  - b. Press AUTOSCALE.
  - c. Press OFFSET/RESOLUTION and set the Resolution to 0.5 dB.
4. On the 683XXC, press **Analog** to select the analog sweep mode.
5. Adjust the ALC Slope as follows:
  - a. At the **\$** prompt on the PC display, type: **slpcal** and press <ENTER>.
 

On the computer keyboard, the adjustment keys are:

Slope (all bands)	<b>E</b> (Up)	<b>D</b> (Down)
Offset (band 1-4 only)	<b>Q</b> (Up)	<b>A</b> (Down)
  - b. Adjust the ALC Slope so that the power at the start and stop frequencies (of the analog sweep for band 0) match as closely as possible the normalized straight line in step sweep mode. When completed, press **n** for the next band.

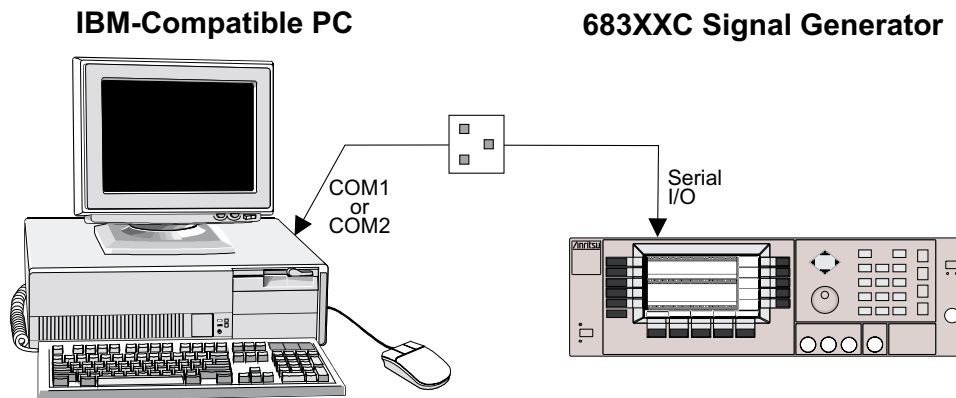
**CAUTION**

When saving calibration data, turning off the instrument before the **\$** prompt returns to the screen can cause all stored data to be lost.

- c. Using the Slope and Offset adjustment keys, continue until the ALC Slope for all bands has been adjusted.
  - d. Type: **X** and press <ENTER> to exit the calibration routine. (The **\$** prompt will appear on the screen.)
  - e. Record step completion on the Test Record.
6. Store the new DACs setting values in non-volatile memory (EEPROMs) on the A17 CPU PCB as follows:
- a. Type: **calterm 787** and press <ENTER>. (The **\$** prompt will appear on the screen when the data has been stored.)
  - b. Record step completion on the Test Record.

**4-11** ALC BANDWIDTH  
CALIBRATION

This procedure provides the steps necessary to perform ALC Bandwidth calibration. The ALC Bandwidth is adjusted to compensate for gain variations of the modulator. The adjustment is performed for each frequency band. This provides a more consistent bandwidth throughout the frequency range of the instrument.



**Figure 4-7.** Equipment Setup for ALC Bandwidth Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-7, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.

**NOTE**

Before beginning this calibration procedure, *always* let the 683XXC warm up for a minimum of one hour.

**Bandwidth Calibration**

The following procedure lets you (1) calibrate the ALC bandwidth and (2) store the calibration data in non-volatile memory (EEPROMs) on the A17 CPU PCB.

1. Enter the ALC Bandwidth calibration routine as follows:
  - a. At the \$ prompt on the PC display, type: **calterm 110** and press <ENTER>.
 

The \$ prompt will appear on the screen when the ALC Bandwidth calibration is complete. (This can take up to 15 minutes depending on the frequency range of the 683XXC.)
  - b. Record step completion on the Test Record.



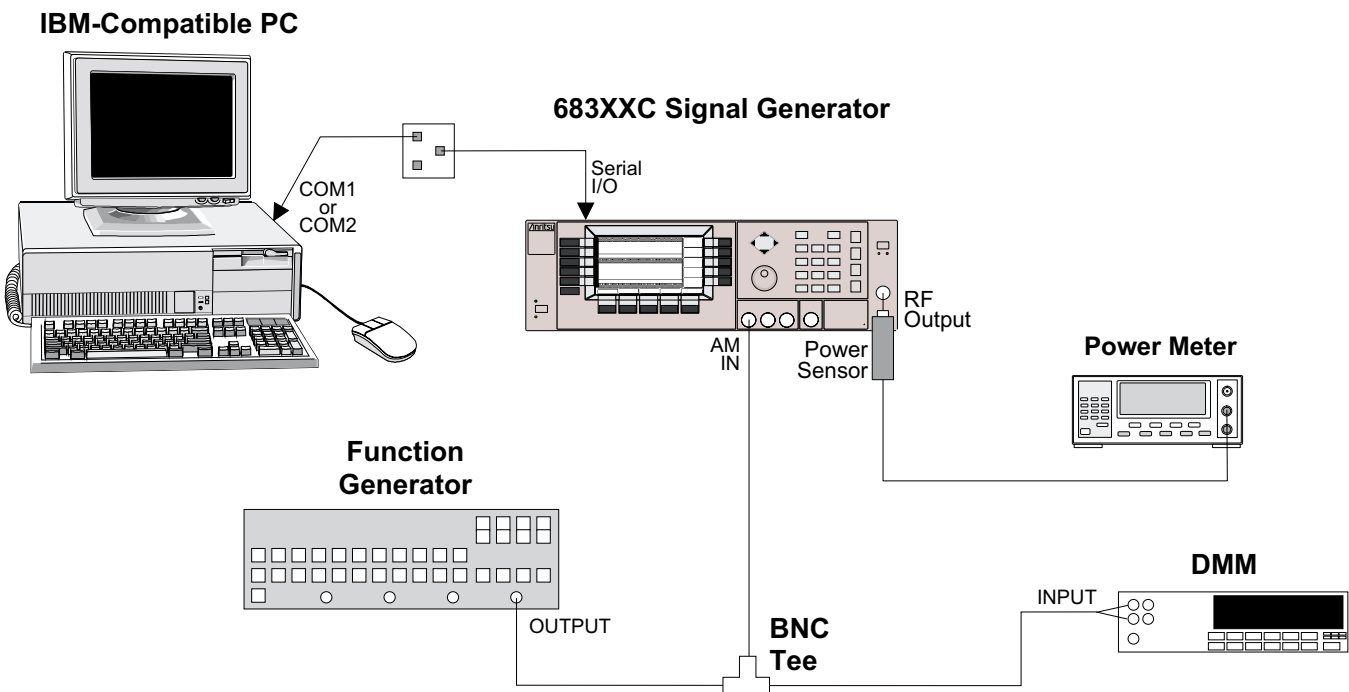
**CAUTION**

When saving calibration data, turning off the instrument before the **\$** prompt returns to the screen can cause all stored data to be lost.

2. Store the calibration data as follows:
  - a. At the **\$** prompt, type: **calterm 787** and press <ENTER>. (The **\$** prompt will appear on the screen when the calibration data has been stored.)
  - b. Record step completion on the Test Record.

**4-12** AM CALIBRATION

This procedure provides the steps necessary to perform AM calibration. This consists of calibrating the AM Calibration DAC, the AM Meter circuit, and the AM Function Generator. The AM Calibration DAC is calibrated for input sensitivities of 100%/V (linear mode) and 25 dB/V (logarithmic mode) for frequencies  $\leq 2$  GHz and  $> 2$  GHz.



**Figure 4-8.** Equipment Setup for AM Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-8, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.
2. Connect the Function Generator Output to the BNC tee. Connect one leg of the tee to the 683XXC front panel AM IN. Connect the other leg of the tee to the DMM input.
3. Calibrate the Power Meter with the Power Sensor.

4. Connect the Power Sensor to the RF Output of the 683XXC.

**NOTE**

Before beginning this calibration procedure, *always* let the 683XXC warm up for a minimum of one hour.

**AM  
Calibration  
Procedure**

The following procedure let you (1) adjust the AM Calibration DAC to provide the correct amount of AM in both linear (100%/V sensitivity) and log (25 dB/V sensitivity) modes of operation for frequencies of  $\leq 2$  GHz and  $> 2$  GHz, (2) calibrate the AM Meter circuit, (3) calibrate the AM Function Generator, and (4) store the results in non-volatile memory (EEPROM) on the A17 CPU PCB.

**NOTE**

For those instruments that contain a Down Converter, the procedure for Linear AM and Log AM calibration must be performed twice—once for frequencies  $\leq 2$  GHz and once for frequencies  $> 2$  GHz. Upon initial completion of each procedure, the program will automatically return you to the start to repeat the procedure.

1. Set up the Function Generator as follows:
  - a. Mode: EXT
  - b. Signal: Square Wave
2. Perform Linear AM calibration as follows:
  - a. At the **\$** prompt on the PC screen, type: **calterm 112** and press <ENTER>.
  - b. Set the function generator output to 0.00 volts. When done, press any key on the keyboard to continue calibration.
  - c. Now, set the function generator to output  $\pm 0.50$  volts. Use the COMPL button on the function generator to toggle the output between +0.50 volts and -0.50 volts.
  - d. On the computer keyboard, use 1, 2 or 3 to increment and 8, 9 and 0 to decrement the value of the DAC's setting to obtain a 9.54 dB difference in the power meter's reading when the function generator's output is toggled.

- e. When the DAC has been adjusted, press **Q** on the keyboard to exit the program. (If the instrument has a Down Converter installed, you will be returned to the start of the program to perform this calibration for frequencies of >2 GHz.)

When the DAC has been completely adjusted, the program will exit to the **\$** prompt.

- e. Record step completion on the Test Record.

3. Perform Log AM calibration as follows:

- a. At the **\$** prompt, type: **calterm 113** and press <ENTER>.
- b. Set the function generator's output  $\pm 0.20$  volts. Use the COMPL button to toggle the output between  $-0.20$  volts and  $+0.20$  volts.
- c. On the computer keyboard, use 1, 2, or 3 to increment and 8, 9, and 0 to decrement the value of the DAC's setting to obtain a 10.00 dB difference in the power meter's reading when the function generator's output is toggled.
- d. When the DAC has been adjusted, press **Q** on the keyboard to exit the program. (If the instrument has a Down Converter installed, you will be returned to the start of the program to perform this calibration for frequencies of >2 GHz.)

When the DAC has been completely adjusted, the program will exit to the **\$** prompt.

- e. Record step completion on the Test Record.

4. Perform AM Meter calibration as follows:

- a. At the **\$** prompt, type: **calterm 147** and press <ENTER>.
- b. Set up the Function Generator for a 1 kHz sine wave with an output level of 0.354 volts RMS (1 volt peak to peak). When done, press any key on the keyboard to continue calibration.

The **\$** prompt will appear on the screen when the calibration is complete.

- c. Record step completion on the Test Record.

**NOTE**

To save the calibration data after completing any calibration step, type: **calterm 787** and press <ENTER>.

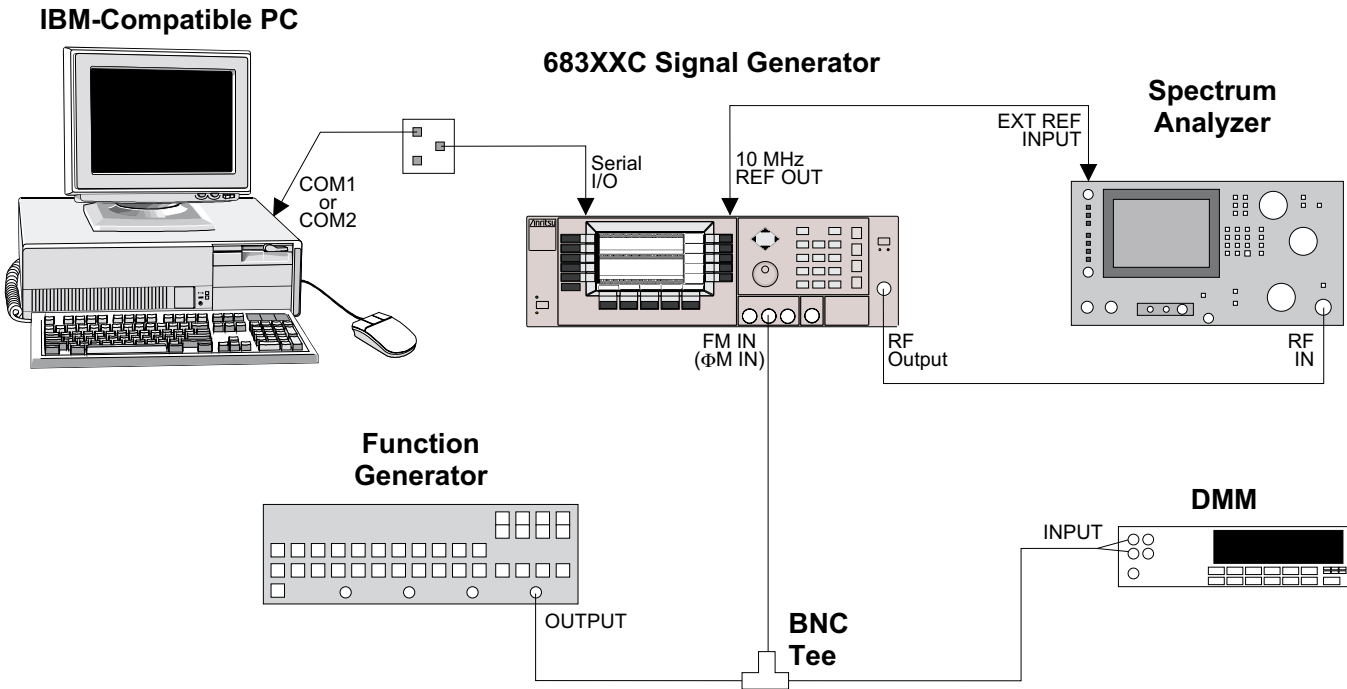
**CAUTION**

When saving calibration data, turning off the instrument before the \$ prompt returns to the screen can cause all stored data to be lost.

5. Perform AM Function Generator calibration as follows:
  - a. At the \$ prompt, type: **calterm 146** and press <ENTER>. (The \$ prompt will appear on the screen when the calibration is complete.)
  - b. Record step completion on the Test Record.
  
6. Store the calibration data as follows:
  - a. At the \$ prompt, type: **calterm 787** and press <ENTER>. (The \$ prompt will appear on the screen when the calibration data has been stored.)
  - b. Record step completion on the Test Record.

**4-13** FM CALIBRATION

This procedure provides the steps necessary to perform FM calibration. This consists of calibrating the FM Meter circuit and the FM Variable Gain Control DAC. The FM Variable Gain Control DAC is calibrated for input sensitivities in Locked, Locked Low-Noise, Unlocked Narrow, and Unlocked Wide FM modes.



**Figure 4-9.** Equipment Setup for FM Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-9, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.
2. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference input.
3. Connect the Function Generator Output to the BNC tee. Connect one leg of the tee to the 683XXC front panel FM IN. Connect the other leg of the tee to the DMM input.
4. Connect the 683XXC RF Output to the Spectrum Analyzer RF Input.

**FM  
Calibration  
Procedure**
**NOTE**

Before beginning this calibration procedure, always let the 683XXC warm up for a minimum of one hour.

The following steps in the procedure lets you calibrate the (1) FM Meter circuit; (2) FM Variable Gain Linearity; (3) Locked, Locked Low-Noise, Unlocked Narrow, and Unlocked Wide FM Mode Sensitivity; and (4) FM Rear Panel Input Gain, and store the results in non-volatile memory (EEPROM) on the A17 CPU PCB.

**NOTE**

To ensure accurate calibration, each step of this procedure must be performed in sequence.

1. Perform FM Meter calibration as follows:
  - a. At the **\$** prompt on the PC screen, type: **calterm 123** and press <ENTER>.
  - b. Set up the Function Generator for a 100.0 kHz sine wave with an output level of 0.707 volts  $\pm 0.01$  volts RMS (2 volts peak to peak). Use a frequency counter to verify the output frequency of your function generator is set to  $\pm 1\%$ . When done, press any key on the keyboard to continue calibration.  
  
The **\$** prompt will appear on the screen when the calibration is complete.
  - c. Record step completion on the Test Record.
2. Perform FM Variable Gain Linearity calibration as follows:
  - a. At the **\$** prompt on the PC screen, type: **calterm 148** and press <ENTER>.
  - b. Set up the Function Generator for a +1.00 Vdc output. When done, press any key on the keyboard to continue calibration.  
  
The **\$** prompt will appear on the screen when the calibration is complete.
  - c. Record step completion on the Test Record.

**NOTE**

To save the calibration data after completing any calibration step, type: **calterm 787** and press <ENTER>.

3. External Unlocked Wide FM Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to obtain a 200 MHz FM deviation at frequencies of 5 GHz and 15 GHz. The modulating signal input is from the external Function Generator.

Perform the calibration as follows:

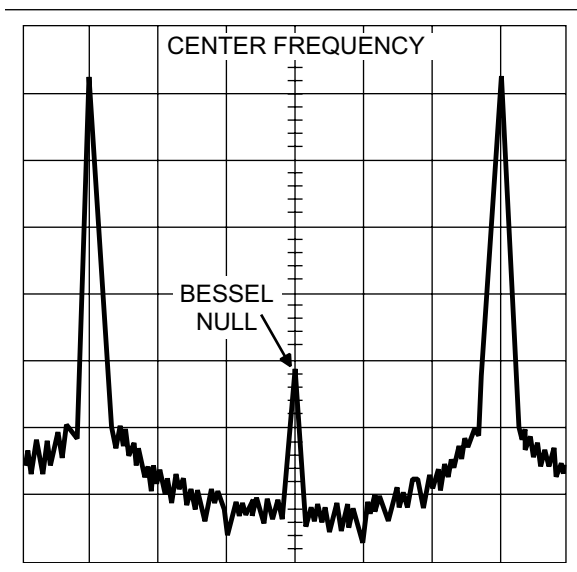
- a. At the **\$** prompt, type: **calterm 124** and press <ENTER>.
- b. Set up the Function Generator for a 0.1 Hz square wave with an output level of  $\pm 1$  volt  $\pm 0.002$  volts (2 volts peak to peak).
- c. On the Spectrum Analyzer, set the Span/Div to 50 MHz per division.
- d. On the computer keyboard, use the **'**, **1**, **2**, and **3** keys to increment and the **7**, **8**, **9**, and **0** keys to decrement the value of the DAC's setting. Start calibration by pressing the **'** key.
- e. While observing the Spectrum Analyzer display, adjust the value of the DAC's setting to obtain a 200 MHz peak to peak deviation. This is the coarse adjustment.
- f. On the Spectrum Analyzer, set the Span/Div to 5 MHz per division and adjust the center frequency control to position the low carrier at the center of the display. Note the frequency reading.
- g. Now, adjust the center frequency control to position the high carrier at the center of the display. Note the frequency reading.
- h. The difference between these two frequencies is the actual peak-to-peak frequency deviation. It should be 200 MHz  $\pm 0.5$  MHz. If not, fine adjust the value of the DAC's setting to obtain this deviation.
- i. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step (adjusting the DAC to obtain a 200 MHz deviation at 15 GHz).  
When the DAC has been completely adjusted, the program will exit to the **\$** prompt.
- j. Record step completion on the Test Record.



4. Internal Unlocked Wide FM Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to obtain a 200 MHz FM deviation at frequencies of 5 GHz and 15 GHz. The modulating signal input is from the internal Function Generator.

Perform the calibration as follows:

- a. At the **\$** prompt, type: **calterm 143** and press <ENTER>. The screen will display the following menu:
  - 1) Toggle polarity (this lets you go from a positive deviation to negative deviation.)
  - 2) Change DAC value.
  - 3) Quit.
- b. On the Spectrum Analyzer, set the Span/Div to 50 MHz per division.
- c. On the computer keyboard, enter **2** to begin calibration.
- d. On the computer keyboard, use the **'**, **1**, **2**, and **3** keys to increment and the **7**, **8**, **9**, and **0** keys to decrement the value of the DAC's setting. Start calibration by pressing the **'** key.
- e. While observing the Spectrum Analyzer display, adjust the value of the DAC's setting to obtain a 100 MHz change in frequency.
- f. On the keyboard, press **Q** to return to the menu, then enter **1** to toggle the polarity.
- g. Measure the change in frequency on the Spectrum Analyzer. The change in frequency should be 200 MHz. If not, enter **2** and adjust the DAC.
- h. Repeat steps 4.f and 4.g as necessary to obtain a 200 MHz frequency change. When finished adjusting the DAC, press **Q** to return to the menu.
- i. On the Spectrum Analyzer, set the Span/Div to 5 MHz per division and adjust the center frequency control to position the high (or low) carrier at the center of the display. Note the frequency reading.
- j. On the keyboard, enter **1** to toggle the polarity.



**Figure 4-10.** Typical Spectrum Analyzer Display of Bessel Null on FM Waveform

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-50$  dBc null.

- k. Now adjust the center frequency control to position the low (or high) carrier at the center of the display. Note the frequency reading.
  - l. The difference between these two frequencies should be 200 MHz  $\pm$ 0.5 MHz. If not, enter **2** and fine adjust the DAC to obtain this deviation.
  - m. When finished setting the DAC, press **Q** on the keyboard to return to the menu, then enter **3** to go to the next calibration step (adjusting the DAC to obtain a 200 MHz deviation at 15 GHz).
- When the DAC has been completely adjusted, the program will exit to the **\$** prompt.
- n. Record step completion on the Test Record.

- 5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to reduce the carrier level as low as possible at frequencies of 5 GHz and 20 GHz. The modulating signal is from the external Function Generator.

Perform the calibration as follows:

- a. At the **\$** prompt, type: **calterm 125** and press <ENTER>.
- b. Set up the Function Generator for a 99.8 kHz sine wave with an output level of 0.707 volts RMS (2 volts peak to peak). Use a frequency counter to verify the output frequency of your function generator is set to  $\pm$ 1%.
- c. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- d. On the computer keyboard, use the **,** **1**, **2**, and **3** keys to increment and the **7**, **8**, **9**, and **0** keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- e. While observing the first Bessel null (Figure 4-10) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- f. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step.

When the DAC has been completely adjusted, the program will exit to the \$ prompt.

g. Record step completion on the Test Record.

6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to reduce the carrier level as low as possible at frequencies of 5 GHz and 20 GHz. The modulating signal input is from the internal Function Generator.

Perform the calibration as follows:

- a. At the \$ prompt, type: **calterm 144** and press <ENTER>.
- b. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- c. On the computer keyboard, use the ', 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- d. While observing the first Bessel null (Figure 4-10) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- e. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step. When the DAC has been completely adjusted, the program will exit to the \$ prompt.
- f. Record step completion on the Test Record.

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the >-50 dBc null.

7. The FM Rear Panel Input Gain is calibrated to balance the Locked and Unlocked Narrow FM Mode Sensitivity obtained when the same external modulating signal is applied to either the front panel or rear panel FM input.

Perform the calibration as follows:

- a. On the 683XXC, disconnect the coaxial cable from the front panel FM IN connector and connect it to the rear panel FM IN connector.
- b. At the \$ prompt, type: **calterm 154** and press <ENTER>.
- c. Set up the Function Generator for a 99.8 kHz sine wave with an output level of 0.707 volts

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-50$  dBc null.

**CAUTION**

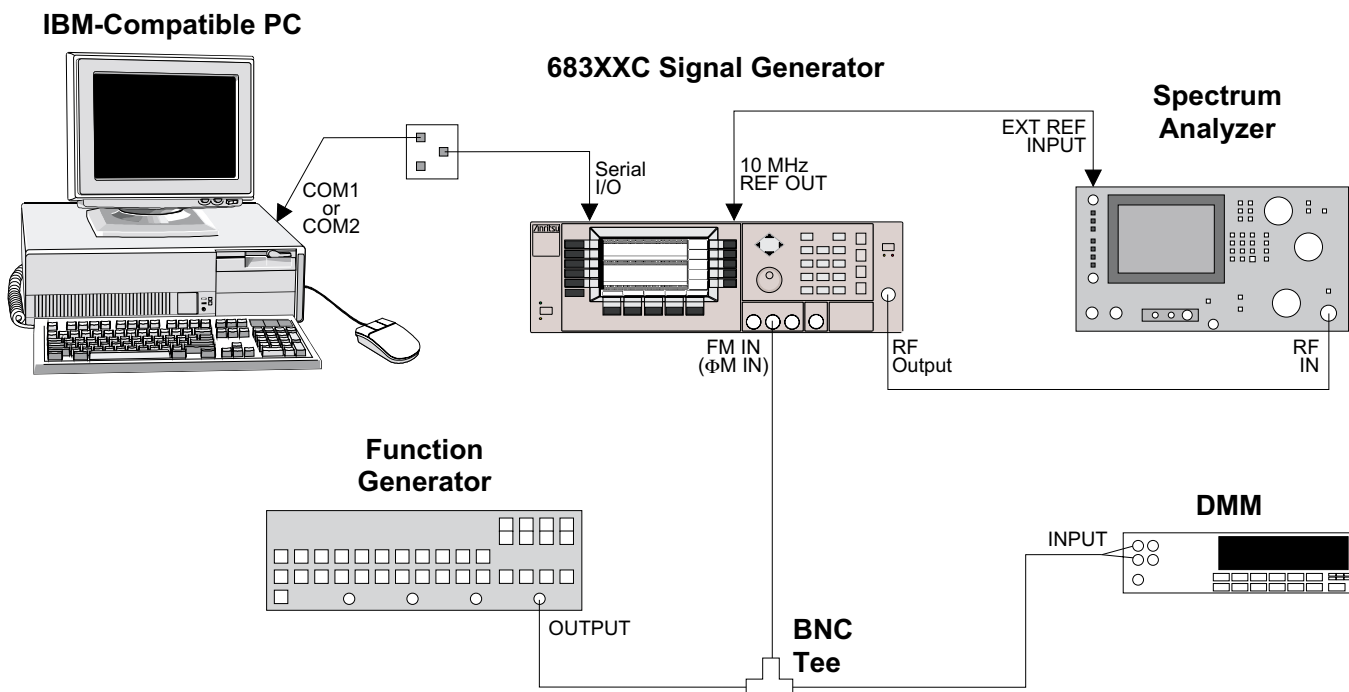
When saving calibration data, turning off the instrument before the \$ prompt returns to the screen can cause all stored data to be lost.

RMS (2 volts peak to peak). Use a frequency counter to verify the output frequency of your function generator is set to  $\pm 1\%$ .

- d. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
  - e. On the computer keyboard, use the ', 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
  - f. While observing the first Bessel null (Figure 4-10) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
  - g. When finished setting the DAC, press **Q** on the keyboard to exit the calibration routine.
  - h. Record step completion on the Test Record.
8. Store the calibration data as follows:
- a. At the \$ prompt, type: **calterm 787** and press <ENTER>. (The \$ prompt will appear on the screen when the calibration data has been stored.)
  - b. Record step completion on the Test Record.

**4-14 PHASE MODULATION  
( $\Phi$ M) CALIBRATION**

This procedure provides the steps necessary to perform phase modulation ( $\Phi$ M) calibration for 683XXCs with Option 6. This consists of calibrating the FM Variable Gain Control DAC and the  $\Phi$ M Flatness DAC for input sensitivities in Narrow and Wide  $\Phi$ M modes.



**Figure 4-11.** Equipment Setup for  $\Phi$ M Calibration

**Equipment Setup**

Connect the equipment, shown in Figure 4-11, as follows:

1. Interface the PC to the 683XXC by performing the initial setup procedure, pages 4-7 to 4-12.
2. Connect the 683XXC rear panel 10 MHz REF OUT to the Spectrum Analyzer External Reference Input.
3. Connect the Function Generator Output to the BNC tee. Connect one leg of the tee to the 683XXC front panel FM IN ( $\Phi$ M IN). Connect the other leg of the tee to the DMM input.

4. Connect the 683XXC RF Output to the Spectrum Analyzer RF Input.

**NOTE**

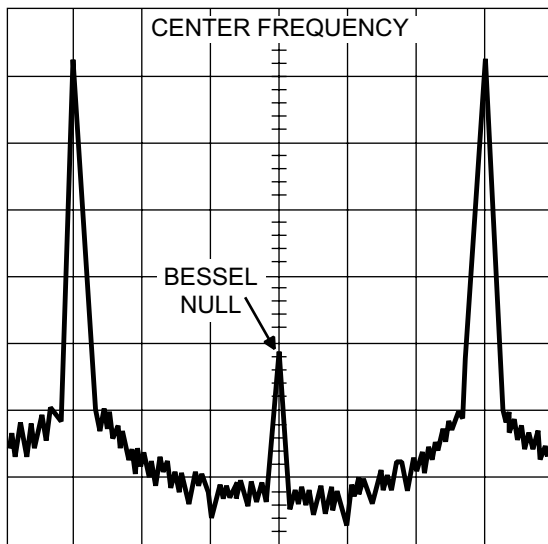
Before beginning this calibration procedure, always let the 683XXC warm up for a minimum of one hour.

**$\Phi$ M  
Calibration  
Procedure**

The following steps in the procedure lets you calibrate the FM Variable Gain Control DAC and the  $\Phi$ M Flatness DAC in both Wide and Narrow  $\Phi$ M modes and store the results in non-volatile memory (EEPROM) on the A17 CPU PCB.

**NOTE**

To ensure accurate calibration, each step of this procedure must be performed in sequence.



**Figure 4-12.** Typical Spectrum Analyzer Display of Bessel Null on  $\Phi$ M Waveform

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-40$  dBc null.

1. External Wide FM Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to reduce the carrier level as low as possible at frequencies of 5 GHz and 20 GHz. The modulating signal input is from the external Function Generator.

Perform the calibration as follows:

- a. At the \$ prompt, type: **calterm 149** and press <ENTER>.
- b. Set up the Function Generator for a 99.8 kHz sine wave with an output level of 0.707 volts RMS (2 volts peak to peak). Use a frequency counter to verify the output frequency of your function generator is set to  $\pm 1\%$ .
- c. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- d. On the computer keyboard, use the ', 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- e. While observing the first Bessel null (Figure 4-12) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- f. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step.

**NOTE**

To save the calibration data after completing any calibration step, type: **calterm 787** and press <ENTER>.

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-40$  dBc null.

When the DAC has been completely adjusted, the program will exit to the **\$** prompt.

g. Record step completion on the Test Record.

2. Internal Wide  $\Phi$ M Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to reduce the carrier level as low as possible at frequencies of 5 GHz and 20 GHz. The modulating signal input is from the internal Function Generator.

Perform the calibration as follows:

- a. At the **\$** prompt, type: **calterm 151** and press <ENTER>.
- b. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- c. On the computer keyboard, use the **,** **1**, **2**, and **3** keys to increment and the **7**, **8**, **9**, and **0** keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- d. While observing the first Bessel null (Figure 4-12) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- e. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step.  
When the DAC has been completely adjusted, the program will exit to the **\$** prompt.
- f. Record step completion on the Test Record.

3. Wide  $\Phi$ M Mode Flatness calibration is accomplished by adjusting the  $\Phi$ M Flatness DAC to reduce the carrier level as low as possible for sensitivity settings of 2.4 Rad/V and 14.9 Rad/V at 5 GHz. The modulating signal input is from the external Function Generator.

Perform the calibration as follows:

- a. At the **\$** prompt, type: **calterm 155** and press <ENTER>.
- b. Set up the Function Generator for a 400 Hz sine wave with an output level of 0.707 volts RMS (2 volts peak to peak). Use a frequency counter to verify the output frequency of your function generator is set to  $\pm 1\%$ .

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the >-40 dBc null.

- c. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- d. On the computer keyboard, use the ', 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- e. While observing the first Bessel null (Figure 4-12) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- f. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step. When the DAC has been completely adjusted, the program will exit to the **\$** prompt.
- g. Record step completion on the Test Record.

- 4. External Narrow ΦM Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to reduce the carrier level as low as possible at frequencies of 5 GHz and 20 GHz. The modulating signal input is from the external Function Generator.

Perform the calibration as follows:

- a. At the **\$** prompt, type: **calterm 150** and press <ENTER>.
- b. Set up the Function Generator for a 99.8 kHz sine wave with an output level of 0.707 volts RMS (2 volts peak to peak). Use a frequency counter to verify the output frequency of your function generator is set to ±1%.
- c. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- d. On the computer keyboard, use the ', 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- e. While observing the first Bessel null (Figure 4-12) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- f. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step.

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the >-50 dBc null.



When the DAC has been completely adjusted, the program will exit to the \$ prompt.

g. Record step completion on the Test Record.

5. Internal Narrow  $\Phi$ M Mode Sensitivity calibration is accomplished by adjusting the FM Variable Gain Control DAC to reduce the carrier level as low as possible at frequencies of 5 GHz and 20 GHz. The modulating signal input is from the internal Function Generator.

Perform the calibration as follows:

- a. At the \$ prompt, type: **calterm 152** and press <ENTER>.
- b. On the Spectrum Analyzer, set the Span/Div to 50 kHz per division.
- c. On the computer keyboard, use the , 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start calibration by pressing an increment key.
- d. While observing the first Bessel null (Figure 4-12) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
- e. When finished setting the DAC, press **Q** on the keyboard to go to the next calibration step. When the DAC has been completely adjusted, the program will exit to the \$ prompt.
- f. Record step completion on the Test Record.

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-50$  dBc null.

6. Narrow  $\Phi$ M Mode Flatness calibration is accomplished by adjusting the  $\Phi$ M Flatness DAC to reduce the carrier level as low as possible for a sensitivity setting of 2.4 Rad/V at 5 GHz. The modulating signal input is from the external Function Generator.

Perform the calibration as follows:

- a. At the \$ prompt, type: **calterm 156** and press <ENTER>.
- b. Set up the Function Generator for a 400 Hz sine wave with an output level of 0.707 volts RMS (2 volts peak to peak). Use a frequency counter to verify the output of your function generator is set to  $\pm 1\%$ .

**NOTE**

You may need to adjust the RBW setting on the Spectrum Analyzer in order to see the  $>-40$  dBc null.

**CAUTION**

When saving calibration data, turning off the instrument before the \$ prompt returns to the screen can cause all stored data to be lost.

- c. On the Spectrum Analyzer, set the Span/Div of 50 kHz per division.
  - d. On the computer keyboard, use the ', 1, 2, and 3 keys to increment and the 7, 8, 9, and 0 keys to decrement the value of the DAC's setting. Start the calibration by pressing an increment key.
  - e. While observing the first Bessel null (Figure 4-12) on the Spectrum Analyzer display, adjust the value of the DAC's setting to reduce the carrier level as low as possible.
  - f. When finished setting the DAC, press **Q** on the keyboard.  
The program will exit to the \$ prompt.
  - g. Record step completion on the Test Record.
7. Store the calibration data as follows:
- a. At the \$ prompt, type: **calterm 787** and press <ENTER>. (The \$ prompt will appear on the screen when the calibration data has been stored.)
  - b. Record step completion on the Test Record.

# **Chapter 5**

## **Troubleshooting**

### ***Table of Contents***

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The majority of the troubleshooting procedures presented in this chapter require the removal of the instrument covers to gain access to test points on printed circuit boards and other subassemblies.

**WARNING**

Hazardous voltages are present inside the 683XXC whenever ac line power is connected. Turn off the instrument and remove the line cord before removing any covers or panels. Troubleshooting or repair procedures should only be performed by service personnel who are fully aware of the potential hazards.

**CAUTION**

Many subassemblies in the signal generator contain static-sensitive components. Improper handling of these subassemblies may result in damage to the components. ***Always*** observe the static-sensitive component handling precautions described in Chapter 1, Figure 1-2.

# Chapter 5

## Troubleshooting

### **5-1** INTRODUCTION

This chapter provides information for troubleshooting signal generator malfunctions. The troubleshooting procedures presented in this chapter support fault isolation to a replaceable subassembly or RF component. (Remove and replace procedures for the subassemblies and RF components are found in Chapter 6.)

### **5-2** RECOMMENDED TEST EQUIPMENT

The recommended test equipment for the troubleshooting procedures presented in this chapter is listed in Chapter 1, Table 1-2 (page 1-12).

### **5-3** ERROR AND WARNING/STATUS MESSAGES

During normal operation, the 683XXC generates error messages to indicate internal malfunctions, abnormal instrument operations, or invalid signal inputs or data entries. It also displays warning messages to alert the operator to conditions that could result in inaccurate signal generator output. In addition, status messages are displayed to remind the operator of current menu selections or settings.

#### ***Self-Test Error Messages***

The 683XXC firmware includes internal diagnostics that self-test the instrument. These self-test diagnostics perform a brief go/no-go test of most of the instrument PCBs and other internal assemblies.

You can perform an instrument self-test at any time during normal operation by pressing **SYSTEM** and then the System Menu soft-key **Selftest**.

If the signal generator fails self-test, an error message(s) is displayed on the front panel data display. These error messages describe the malfunction and, in most cases, provide an indication of what has failed. Table 5-1 is a summary listing of the self-test error messages. Included for each is a reference to the troubleshooting table that provides a description of the probable cause(s) and a procedure for identifying the failed component or assembly.

**Table 5-1.** *Self-Test Error Messages (1 of 3)*

<b>Error Message</b>	<b>Troubleshooting Table</b>	<b>Page Number</b>
Error 100 DVM Ground Offset Failed	5-5	5-16
Error 101 DVM Positive 10V Reference	5-5	5-16
Error 102 DVM Negative 10V Reference	5-5	5-16
Error 105 Power Supply Voltage(s) out of Regulation	5-6	5-17
Error 106 Power Supply not Locked	5-6	5-25
Error 107 Sweep Time Check Failed	5-16	5-33
Error 108 Crystal Oven Cold	5-8	5-26
Error 109 The 100MHz Reference is not Locked to the External Reference	5-8	5-26
Error 110 The 100MHz Reference is not Locked to the High Stability 10MHz Crystal Oscillator	5-8	5-27
Error 111 Fine Loop Osc Failed	5-9	5-27
Error 112 Coarse Loop Osc Failed	5-11	5-29
Error 113 Yig Loop Osc Failed	5-13	5-30
Error 114 Down Converter LO not Locked	5-14	5-31
Error 115 Not Locked Indicator Failed	5-13	5-30
Error 116 FM Loop Gain Check Failed	5-15	5-32
Error 117 Linearizer Check Failed	5-16	5-33
Error 118 Switchpoint DAC Failed	5-16	5-33
Error 119 Center Frequency Circuits Failed	5-16	5-33

**Table 5-1.** *Self-Test Error Messages (2 of 3)*

<b>Error Message</b>	<b>Troubleshooting Table</b>	<b>Page Number</b>
Error 120 Delta-F Circuits Failed	5-16	5-33
Error 121 Unleveled Indicator Failed	5-17	5-34
Error 122 Level Reference Failed	5-17	5-34
Error 123 Detector Log Amp Failed	5-17	5-34
Error 124 Full Band Unlocked and Unleveled	5-18	5-36
Error 125 8.4 – 20 GHz Unlocked and Unleveled	5-18	5-36
Error 126 2 – 8.4 GHz Unlocked and Unleveled	5-18	5-36
Error 127 Detector Input Circuit Failed	5-17	5-34
Error 128 .01 – 2 GHz Unleveled	5-20	5-40
Error 129 Switched Filter or Level Detector Failed	5-20	5-43
Error 130 2 – 3.3 GH Switched Filter	5-20	5-46
Error 131 3.3 – 5.5 GH Switched Filter	5-20	5-46
Error 132 5.5 – 8.4 GH Switched Filter	5-20	5-46
Error 133 8.4 – 13.25 GH Switched Filter	5-20	5-46
Error 134 13.25 – 20 GH Switched Filter	5-20	5-46
Error 135 Modulator or Driver Failed	5-20	5-47
Error 142 Sample and Hold Circuit Failed	5-17	5-34
Error 143 Slope DAC Failed	5-17	5-35

**Table 5-1.** *Self-Test Error Messages (3 of 3)*

<b>Error Message</b>	<b>Troubleshooting Table</b>	<b>Page Number</b>
Error 144 RF was Off when Selftest started. Some tests were not performed.	5-25	5-52
Error 145 AM meter or associated circuitry failed	5-26	5-52
Error 147 Internal FM circuitry failed	5-27	5-53
Error 148 Pulse 40 MHz reference circuitry failed	5-28	5-53
<b>683XXC Models with SDM</b>		
Error 138 SDM Unit or Driver Failed	5-22	5-48
Error 139 32 – 40 GHz SDM Section Failed	5-22	5-49
Error 140 25 – 32 GHz SDM Section Failed	5-22	5-49
Error 141 20 – 25 GHz SDM Section Failed	5-22	5-49
<b>683XXC Models with SQM</b>		
Error 136 SQM Unit or Driver Failed	5-24	5-50



**Normal  
Operation  
Error and  
Warning/  
Status  
Messages**

When an abnormal condition is detected during operation, the 683XXC displays an error message to indicate that the output is abnormal or that a signal input or data entry is invalid. It also displays warning messages to alert the operator to conditions that could cause an inaccurate signal generator output. Status messages to remind the operator of current menu selections or settings are also generated.

Table 5-2 is a summary list of possible error messages that can be displayed during normal operations. Table 5-3 is a summary list of possible warning/status messages.

**Table 5-2.** Possible Error Messages during Normal Operations (1 of 2)

Error Message	Description
<b>ERROR</b>	Displayed (on the frequency mode title bar) when (1) the output frequency is not phase-locked, (2) an invalid frequency parameter entry causes a frequency range error, or (3) an invalid pulse parameter entry causes a pulse modulation error.
<b>LOCK ERROR</b>	Displayed (in the frequency parameters area) when the output frequency is not phase-locked. The frequency accuracy and stability of the RF output is greatly reduced. Normally caused by an internal component failure. Run self-test to verify malfunction.
<b>RANGE</b>	Displayed (in the frequency parameters area) when (1) the analog sweep start frequency entered is greater than the stop frequency, (2) the dF value entered results in a sweep outside the range of the instrument, (3) the step size value entered is greater than the sweep range, (4) the number of steps entered results in a step size of less than 1 kHz (0.1 Hz with Option 11) or 0.1 dB (0.001 mV), or (5) the step sweep time entered divided by the number of steps entered results in a dwell time of <10 ms. Entering valid values usually clears the error.
<b>SLAVE</b>	Displayed (in the frequency parameters area of the Master 68XXXB/C) during master-slave operation in VNA mode when the slave frequency offset value entered results in a CW frequency or frequency sweep outside the range of the slave 68XXXB/C. Entering a valid offset value clears the error.
<b>ERR</b>	Displayed (in the modulation status area) when one or more of the following error conditions occurs: (1) The external AM modulating signal exceeds the input voltage range. In addition, the message " <b>Reduce AM Input Level</b> " appears at the bottom of the AM status display. (Continued on next page)

**Table 5-2.** Possible Error Messages during Normal Operations (2 of 2)

Error Message	Description
<b>ERR</b>	<p><i>Continued:</i></p> <p>(2) The external FM modulating signal exceeds the input voltage range. In addition, the message “<b>Reduce FM Input Level</b>” appears at the bottom of the FM status display.</p> <p>(3) A pulse parameter setting is invalid for the current pulse modulation state, as follows:</p> <p><b>Single Pulse Mode:</b>  Free Run or Gated Trigger:  <math>Width1 &gt; PRI</math>  Delayed Trigger:  <math>Delay1 + Width1 &gt; PRI</math></p> <p><b>Doublet Pulse Mode:</b>  Free Run Trigger:  <math>Width1 &gt; Delay2</math> or  <math>Width1 + (Delay2 - Width1) + Width2 &gt; PRI</math>  Delayed Trigger:  <math>Width1 &gt; Delay2</math> or  <math>Delay1 + Width1 + (Delay2 - Width1) + Width2 &gt; PRI</math>  External Trigger with or without Delay:  <math>Width1 &gt; Delay2</math></p> <p><b>Triplet Pulse Mode:</b>  Free Run Trigger:  <math>Width1 &gt; Delay2</math> or <math>Width2 &gt; Delay3</math> or  <math>Width1 + (Delay2 - Width1) + Width2 + (Delay3 - Width2) + Width3 &gt; PRI</math>  Delayed Trigger:  <math>Width1 &gt; Delay2</math> or <math>Width2 &gt; Delay3</math> or  <math>Delay1 + Width1 + (Delay2 - Width1) + Width2 + (Delay3 - Width2) + Width3 &gt; PRI</math>  External Trigger with or without Delay:  <math>Width1 &gt; Delay2</math> or <math>Width2 &gt; Delay3</math></p> <p><b>Quadruplet Pulse Mode:</b>  Free Run Trigger:  <math>Width1 &gt; Delay2</math> or <math>Width2 &gt; Delay3</math> or  <math>Width3 &gt; Delay4</math> or  <math>Width1 + (Delay2 - Width1) + Width2 + (Delay3 - Width2) + Width3 + (Delay4 - Width3) + Width4 &gt; PRI</math>  Delayed Trigger:  <math>Width1 &gt; Delay2</math> or <math>Width2 &gt; Delay3</math> or  <math>Width3 &gt; Delay4</math> or  <math>Delay1 + Width1 + (Delay2 - Width1) + Width2 + (Delay3 - Width2) + Width3 + (Delay4 - Width3) + Width4 &gt; PRI</math>  External Trigger with or without Delay:  <math>Width1 &gt; Delay2</math> or <math>Width2 &gt; Delay3</math> or  <math>Width3 &gt; Delay4</math></p>

**Table 5-3.** Possible Warning/Status Messages during Normal Operation

Warning/Status Message	Description
<b>OVN COLD</b>	This warning message indicates that the 100 MHz Crystal oven (or the 10 MHz Crystal oven if Option 16 is installed) has not reached operating temperature. Normally displayed during a cold start of the signal generator. If the message is displayed during normal operation, it could indicate a malfunction. Run self-test to verify.
<b>UNLEVELED</b>	Displayed when the RF output goes unlevelled. Normally caused by exceeding the specified leveled-power rating. Reducing the power level usually clears the warning message. If the warning message is displayed only when AM is selected ON, the modulating signal may be driving the RF output unlevelled. Reducing the modulating signal or adjusting the power level usually clears the warning.
<b>UNLOCKED</b>	When Unlocked/Narrow FM or Unlocked/Wide FM is selected ON, this warning message appears indicating that the instrument is not phase-locked during this FM mode of operation.
<b>Reduce Rate</b>	This warning message is displayed when the AM Rate or FM Rate is set >100 kHz for a non-sinewave modulating waveform. Amplitude or frequency modulation of the output signal will continue but the modulating waveform may be distorted.
<b>EXT REF</b>	This status message indicates that an external 10 MHz signal is being used as the reference signal for the 683XXC.
<b>OFFSET</b>	This status message indicates that a constant (offset) has been applied to the displayed power level.
<b>SLOPE</b>	This status message indicates that a power slope correction has been applied to the ALC.
<b>USER 1...5</b>	This status message indicates that a user level flatness correction power-offset table has been applied to the ALC.
<b>SS MODE</b>	This status message indicates that the 683XXC has been placed in a source lock mode for operation with a 360B Vector Network Analyzer.

**5-4 MALFUNCTIONS NOT  
DISPLAYING AN ERROR  
MESSAGE**

The 683XXC must be operating to run self-test. Therefore, malfunctions that cause the instrument to be non-operational do not produce error messages. These problems generally are a failure of the 683XXC to power up properly. Table 5-4, beginning on page 5-12, provides troubleshooting procedures for these malfunctions.

Malfunctions related to pulse modulating the RF output do not produce error messages. In those 683XXC models that produce RF outputs of >40 GHz, malfunctions related to quadrupling the source signal do not generate error messages. Troubleshooting procedures for these malfunctions are included in Table 5-4.

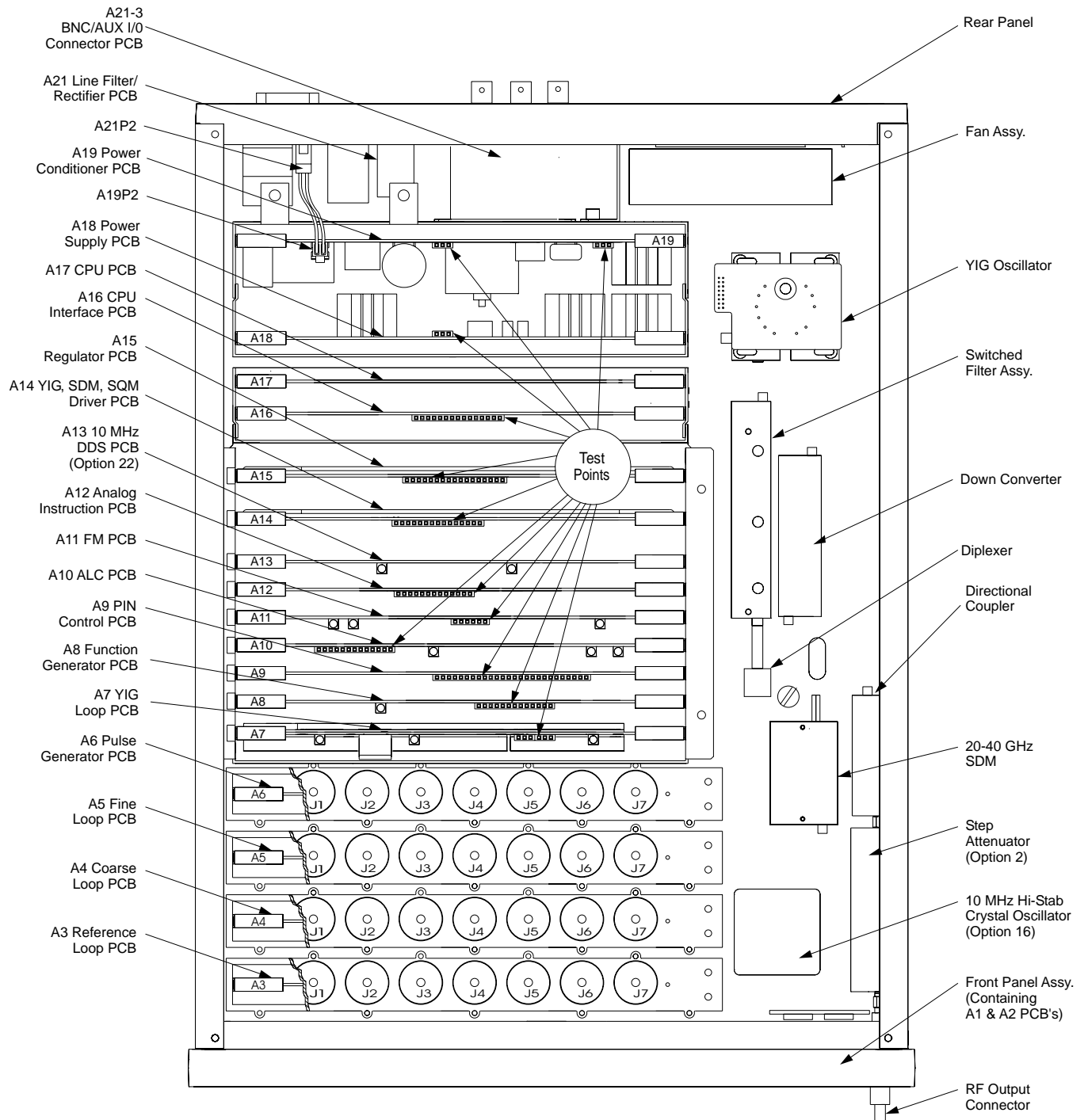
**5-5 TROUBLESHOOTING  
TABLES**

Tables 5-4 through 5-27, beginning on page 5-12, provide procedures for isolating malfunctions to a replaceable subassembly or RF component. In those cases where any of several subassemblies or RF components could have caused the problem, subassembly/RF component replacement is indicated. The recommended replacement order is to replace first the subassemblies/RF components that are most likely to have failed.

Figure 5-1, on the following page, shows the location of the 683XXC connectors and test points that are called out in the troubleshooting procedures of Tables 5-4 through 5-27.

**CAUTION**

**Never** remove or replace a subassembly or RF component with power applied. Serious damage to the instrument may occur.



**Figure 5-1.** Top View of the 683XXC Showing Connector and Test Point Locations

**Table 5-4.** *Malfunctions Not Displaying an Error Message (1 of 4)*

---

**Signal Generator Will Not Turn On  
(OPERATE light is OFF)**

**Normal Operation:** When the 683XXC is connected to the power source, the OPERATE light should illuminate and the instrument should power up.

- Step 1.** Disconnect the 683XXC from the power source, then check the line fuse on the rear panel.
- If the line fuse is good, go to step 2.
  - If the line fuse is defective, replace but do **not** apply power. Go to step 2.
- Step 2.** Remove the 683XXC top cover and the cover over the A18 and A19 PCBs.
- Step 3.** After connecting the negative lead of a digital multimeter (DMM) to A19TP5 and the positive lead to A19TP6, connect the 683XXC to the power source and check for a 330 volt reading on the DMM.
- If the voltage is correct, go to step 4.
  - If the voltage is incorrect or the line fuse blows, replace the A21 Line Filter/Rectifier PCB (located on the rear panel).
- Step 4.** Connect the negative lead of the DMM to A19TP3 and the positive lead to A19TP2, then check for a  $+28 \pm 2$  volt reading on the DMM.
- If the voltage is correct, go to step 5.
  - If the voltage is incorrect or the line fuse blows, replace the A19 PCB.
- Step 5.** Connect the negative lead of the DMM to A15TP1 and the positive lead to A15TP14, check for a  $+23.58 \pm 0.5$  volts reading on the DMM.
- If the voltage is correct, the Front Panel assembly or the cable between Motherboard connector A20J22 and the Front Panel assembly may be defective.
  - If the voltage is incorrect, the +24V standby power supply may be loaded down by (1) a shorted oven heater for the 100 MHz reference oscillator located on the A3 PCB, (2) a shorted heater for the optional 10 MHz high stability time base (if installed), or (3) a defective Front Panel assembly.
-

**Table 5-4.** *Malfunctions Not Displaying an Error Message (2 of 4)*

---

**Signal Generator Will Not Turn On  
(OPERATE light is ON)**

**Normal Operation:** When the 683XXC is connected to the power source, the OPERATE light should illuminate and the instrument should power up.

- Step 1.** Remove the 683XXC top cover and the cover over the A18 and A19 PCBs.
- Step 2.** Connect the negative lead of the DMM to A18TP1 and the positive lead to A18TP3.
- Step 3.** Check for a  $+23.58 \pm 0.5$  volt reading on the DMM.
- If the voltage is correct, go to step 4.
  - If the voltage is incorrect or missing, the Front Panel assembly or the cable between Motherboard connector A20J22 and the Front Panel assembly may be defective.
- Step 4.** Press the front panel RF OUTPUT ON/OFF button. Do the yellow and red LEDs toggle?
- If yes, the malfunction may be caused by a failed front panel circuit. Replace the Front Panel assembly.
  - If the LEDs do not toggle or if both LEDs are lit, the problem may be caused by a malfunction on the A17 CPU PCB.
-

**Table 5-4.** Malfunctions Not Displaying an Error Message (3 of 4)**No Pulse Modulation of the RF Output**

**Description:** The signal generator does not display any error messages during self-test; however, there is no pulse modulation of the RF output.

**Step 1.** Set up the 683XXC as follows:

- a. Press **SYSTEM**, then **Reset**.
- b. Press **MODULATION**, then **Pulse** to go to the Internal Pulse Modulation Status display.
- c. Press **On/Off** to turn on pulse modulation.

**Step 2.** Using an oscilloscope, verify the presence of a TTL pulse (with a pulse width of approximately 25 ns) at the rear panel PULSE SYNC OUT connector.

- If present, go to step 5.
- If not present, go to step 3.

**Step 3.** Disconnect the cable, W129, from A6J4.

**Step 4.** Using an oscilloscope, verify the presence of the Pulse Sync signal at A6J4.

- If present, replace the cable W129.
- If not present, replace the A6 PCB.

**Step 5.** Using a coaxial cable with BNC connectors, connect the rear panel PULSE SYNC OUT connector to the External Trigger Input on an oscilloscope and select External Trigger.

**Step 6.** Disconnect the cable, W122, from A6J6 and the cable, W123, from A6J7.

**Step 7.** Using the oscilloscope, verify the presence of (1) a pulse train at A6J7 (pulse signal to the Switched Filter) with an output level of +2 volts to -2 volts, a pulse period of 1 ms, and a pulse width of 200  $\mu$ s; and (2) a pulse train at A6J6 (sample and hold signal to the A10 ALC PCB) with an output level of 0 volts to +1 volt, a pulse period of 1 ms, and a pulse width of 200  $\mu$ s.

Note that on an expanded timebase, the signal at A6J6 starts approximately 50 ns before the signal at A6J7.



**Table 5-4.** *Malfunctions Not Displaying an Error Message (4 of 4)*

---

- If the signals are present and correct, go to step 8.
- If the signals are not present or are incorrect, replace the A6 PCB.

**Step 8.** Disconnect the cable, W123, from J7 of the Pulsed Switched Filter assembly.

**Step 9.** Using the oscilloscope, verify the presence of a pulse train with an output level of +2 volts to -2 volts, a pulse period of 1 ms, and a pulse width of 200  $\mu$ s at the end of the cable, W123.

- If present, replace the Pulse Switched Filter assembly.
  - If not present, replace the cable W123.
-

**Table 5-5.** *Error Messages 100, 101, and 102*

---

### **Internal DVM Tests**

**Error 100 DVM Ground Offset Failed, or  
Error 101 DVM Positive 10V Reference, or  
Error 102 DVM Negative 10V Reference**

**Description:** The DVM circuitry, located on the A16 CPU Interface PCB, is calibrated using the  $\pm 10$  volts from the reference supplies on the A12 Analog Instruction PCB. The error messages indicate a calibration-related problem or a defective  $\pm 10$  volt reference.

**Step 1.** Perform a manual pre-calibration. (Refer to chapter 4 for the calibration procedure.)

**Step 2.** Run self-test.

- If no error message is displayed, the problem is cleared.
- If any of the error messages, 100, 101, and 102, are displayed, go to step 3.

**Step 3.** Connect the negative lead of the DMM to A12TP1.

**Step 4.** Measure the  $\pm 10$ V reference voltages at A12TP4 and A12TP8. A12TP4 should be  $-10\text{V} \pm 0.036\text{V}$ ; A12TP8 should be  $+10\text{V} \pm 0.036\text{V}$ .

- If the  $\pm 10$ V reference voltages are correct, go to step 5.
- If incorrect, replace the A12 PCB.

#### **NOTE**

Even if the  $\pm 10$ V reference voltages are correct, there could still be a malfunction of the DVM multiplexer on the A12 PCB or the DVM circuitry on the A16 CPU Interface PCB.

**Step 5.** Replace the A12 PCB and run self-test again.

- If no error message is displayed, the problem is cleared.
- If any of the error messages, 100, 101, and 102, are displayed, go to step 6.

**Step 6.** Replace the A16 PCB, then run self-test.

- If no error message is displayed, the problem is cleared.
  - If any of the error messages, 100, 101, and 102, are displayed, contact your local Anritsu service center for assistance.
-

**Table 5-6.** Error Messages 105 and 106 (1 of 9)**Power Supply Tests****WARNING**

Voltages hazardous to life are present throughout the power supply circuits, even when the front panel LINE switch is in the STANDBY position. When performing maintenance, use utmost care to avoid electrical shock.

**Error 105 Power Supply Voltage(s) out of Regulation.**

**Description:** The out of regulation circuit, located on the A15 Regulator PCB, monitors all of the regulated power supply outputs. This error message indicates that one or more of the voltages from the power supply, with the exception of the 5 volt supply, is out of regulation. If the 5 volt supply is faulty, the 683XXC will not operate.

**Step 1.** Measure the regulated voltages at the test points shown in Table 5-7.

- If incorrect for a supply, go to the referenced step.
- If incorrect for several supplies, go to step 2.
- If all voltages are correct, go to step 3.

**Table 5-7.** Regulated Power Supply Voltages

Regulated Voltage	Measurement Point	Reference Point	Value	Refer to Step
+15VG	A15 TP3	A15 TP1	+15.06V $\pm$ 0.3V	4
-15VG	A15 TP9	A15 TP1	-15.07V $\pm$ 0.3V	4
+15VA	A15 TP2	A15 TP1	+15.06V $\pm$ 0.3V	5
-15VA	A15 TP7	A15 TP1	-15.07V $\pm$ 0.3V	5
+15VLP	A15 TP12	A15 TP1	+15.06V $\pm$ 0.3V	6
-15VLP	A15 TP13	A15 TP1	-15.07V $\pm$ 0.3V	6
+15VFM	A15 TP8	A15 TP1	+15.06V $\pm$ 0.3V	7
-15VFM	A15 TP11	A15 TP1	-15.07V $\pm$ 0.3V	7
-28VT	A15 TP10	A15 TP1	-28.47V $\pm$ 0.56V	8
+24VH	A15 TP6	A15 TP1	+24.08V $\pm$ 0.5V	9

**Table 5-6.** *Error Messages 105 and 106 (2 of 9)*

---

- Step 2.** Perform the following procedure to isolate malfunctions when the voltages from several regulated supplies are incorrect.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the regulated voltages per Table 5-7.
    - If the voltages are correct, the problem is cleared.
    - If the voltages are incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Replace the A18 PCB.
  - f. Place the LINE switch to OPERATE and measure the regulated voltages per Table 5-7.
    - If the voltages are correct, the problem is cleared.
    - If the voltages are still incorrect, contact your local Anritsu service center for assistance.
- Step 3.** Run self-test again.
- If no error message is displayed, the problem is cleared.
  - If error 105 displays again, contact your local Anritsu service center for assistance.
-

**Table 5-6.** *Error Messages 105 and 106 (3 of 9)*

---

### **±15VG Supply Problems**

This supply provides ±15 volts to the YIG, SDM, SQM Driver circuits; the CPU I/O circuits, the YIG-tuned Oscillator, Switched Filter, and Down Converter assemblies; the Electronic Step Attenuator (if Option 2E or 2F is installed); and the 10 MHz DDS circuits (if Option 22 is installed).

- Step 4.** Perform the following procedure to isolate malfunctions to the ±15VG supply and outlying load circuits.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the ±15VG voltages per Table 5-7.
    - If the voltages are correct, the problem is cleared.
    - If the voltages are incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Remove the A13 (if installed), A14, and A16 PCBs.
  - f. Place the LINE switch to OPERATE and measure the ±15VG voltages.
    - If the voltages are correct, go to step j.
    - If the voltages are still incorrect, go to step g.
  - g. Place the LINE switch to STANDBY.
  - h. Remove the electronic step attenuator (if installed) and the YIG-tuned oscillator, switched filter, and down converter assemblies.
  - i. Place the LINE switch to OPERATE and measure the ±15VG voltages.
    - If the voltages are correct, go to step j.
    - If the voltages are still incorrect, contact your local Anritsu service center for assistance.
  - j. Place the LINE switch to STANDBY, then install one of the removed PCBs/assemblies.
  - k. Place the LINE switch to OPERATE and measure the ±15VG voltages.
  - l. Continue steps j and k until the faulty PCB/assembly is located.
-

**Table 5-6.** *Error Messages 105 and 106 (4 of 9)*

---

### **±15VA Supply Problems**

This supply provides ±15 volts to the Function Generator, PIN Control, ALC, and Analog Instruction circuits and the Electronic Step Attenuator (if Option 2E or 2F is installed).

- Step 5.** Perform the following procedure to isolate malfunctions to the ±15VA supply and outlying load circuits.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the ±15VA voltages per Table 5-7.
    - If the voltages are correct, the problem is cleared.
    - If the voltages are incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Remove the A8, A9, A10, and A12 PCBs and the electronic step attenuator (if installed).
  - f. Place the LINE switch to OPERATE and measure the ±15VA voltages.
    - If the voltages are correct, go to step g.
    - If the voltages are still incorrect, contact your local Anritsu service center for assistance.
  - g. Place the LINE switch to STANDBY, then install one of the removed PCBs/assemblies.
  - h. Place the LINE switch to OPERATE and measure the ±15VA voltages.
  - i. Continue steps g and h until the faulty PCB/assembly is located.
-

**Table 5-6.** *Error Messages 105 and 106 (5 of 9)*

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### **±15VLP Supply Problems**

This supply provides ±15 volts to the Pulse Generator and the Reference, Coarse, Fine, and YIG Loop circuits.

- Step 6.** Perform the following procedure to isolate malfunctions to the ±15VLP supply and outlying load circuits.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the ±15VLP voltages per Table 5-7.
    - If the voltages are correct, the problem is cleared.
    - If the voltages are incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Remove the A3, A4, A5, A6, and A7 PCBs.
  - f. Place the LINE switch to OPERATE and measure the ±15VLP voltages.
    - If the voltages are correct, go to step g.
    - If the voltages are still incorrect, contact your local Anritsu service center for assistance.
  - g. Place the LINE switch to STANDBY, then install one of the removed PCBs.
  - h. Place the LINE switch to OPERATE and measure the ±15VLP voltages.
  - i. Continue steps g and h until the faulty PCB is located.
-

**Table 5-6.** *Error Messages 105 and 106 (6 of 10)*

---

### **±15VFM Supply Problems**

This supply provides ±15 volts to the FM circuits.

- Step 7.** Perform the following procedure to isolate malfunctions to the ±15VFM supply and its outlying load circuit.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the ±15VFM voltages per Table 5-7.
    - If the voltages are correct, the problem is cleared.
    - If the voltages are incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Remove the A11 PCB.
  - f. Place the LINE switch to OPERATE and measure the 15VFM voltages.
    - If the voltages are correct, replace the A11 PCB.
    - If the voltages are still incorrect, contact your local Anritsu service center for assistance.
-



**Table 5-6.** *Error Messages 105 and 106 (7 of 9)*

---

### **-28VT Supply Problems**

This supply provides -28 volts to the front panel LCD contrast circuit and to drive the YIG-tuned oscillator main tuning coil.

- Step 8.** Perform the following procedure to isolate malfunctions to the -28VT supply and its outlying load circuit.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the -28VT voltage per Table 5-7.
    - If the voltage is correct, the problem is cleared.
    - If the voltage is incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Remove the A14 PCB and the YIG-tuned oscillator assembly.
  - f. Place the LINE switch to OPERATE and measure the -28VT voltage.
    - If the voltage is correct, go to step i.
    - If the voltage is still incorrect, go to step g.
  - g. Replace the front panel assembly by following the steps in paragraph 6-3 of Chapter 6—Removal and Replacement Procedures.
  - h. Place the LINE switch to OPERATE and measure the -28VT voltage.
    - If the voltage is correct, the problem is cleared.
    - If the voltage is still incorrect, contact your local Anritsu service center for assistance.
  - i. Place the LINE switch to STANDBY.
  - j. Install the A14 PCB.
  - k. Place the LINE switch to OPERATE and measure the -28VT voltage.
    - If the voltage is correct, replace the YIG-tuned oscillator assembly.
    - If the voltage is incorrect, replace the A14 PCB.
-

**Table 5-6.** *Error Messages 105 and 106 (8 of 9)*

---

### **+24VH Supply Problems**

This supply provides +24 volts for the YIG-tuned oscillator heater, YIG-tuned oscillator bias, the step attenuator and diplexer driver circuits on the A9 PCB, the V/GHz circuit on the A12 PCB, and the coarse, fine, and YIG loop circuits. When the 683XXC is switched to OPERATE, it also takes over the function of the 24VS supply and supplies +24 volts to the 100 MHz reference oscillator oven heater, the front panel LINE switch circuitry, and the optional 10 MHz high stability time base oven heater.

- Step 9.** Perform the following procedure to isolate malfunctions to the +24VH supply and outlying load circuits.
- a. Place the LINE switch to STANDBY.
  - b. Replace the A15 PCB assembly.
  - c. Place the LINE switch to OPERATE and measure the +24VH voltage per Table 5-7.
    - If the voltage is correct, the problem is cleared.
    - If the voltage is incorrect, go to step d.
  - d. Place the LINE switch to STANDBY.
  - e. Remove the A4, A5, A7, A9, A12, and A14 PCBs and the YIG-tuned oscillator assembly.
  - f. Place the LINE switch to OPERATE and measure the +24VH voltage.
    - If the voltage is correct, go to step g.
    - If the voltage is still incorrect, contact your local Anritsu service center for assistance.
  - g. Place the LINE switch to STANDBY, then install one of the removed PCBs or the YIG-tuned oscillator assembly.
  - h. Place the LINE switch to OPERATE and measure the +24VH voltage.
  - i. Continue steps g and h until the faulty PCB/assembly is located.
-

**Table 5-6.** *Error Messages 105 and 106 (9 of 19)*

---

### **Power Supply Not Phase-Locked**

#### **Error 106 Power Supply not Locked**

**Description:** The switching power supply is not phase locked to the 400 kHz reference signal from the A6 Pulse Generator PCB. Error 106 may be displayed alone or it may be accompanied by error 148 (Pulse 40 MHz reference circuitry failed).

#### **Power Supply not Locked and Error 148 is not Displayed**

- Step 1.** Using an oscilloscope, verify the presence of a 400 kHz TTL square wave at TP12 on the A6 PCB.
- If present, replace the A18 Power Supply PCB.
  - If not present, replace the A6 PCB.

#### **Power Supply not Locked and Error 148 is Displayed**

- Step 1.** Troubleshoot the cause of error 148 (Table 5-28, page 5-53). In most cases, this will also be the cause of error 106.
-

**Table 5-8.** *Error Messages 108, 109 and 110 (1 of 2)*

---

### **A3 Reference Loop**

#### **Error 108 Crystal Oven Cold**

**Description:** The oven of the 100 MHz crystal oscillator or the Option 16 high-stability 10 MHz crystal oscillator has not reached operating temperature.

- Step 1.** Allow a 30 minute warm up, then run self-test again.
- If error 108 is not displayed, the problem is cleared.
  - If error 108 displays and Option 16 is not installed, replace the A3 PCB.
  - If error 108 displays and Option 16 is installed, go to step 2.
- Step 2.** Disconnect the cable between Motherboard connector A20J4 and the Option 16 crystal oscillator assembly.
- Step 3.** Run self-test again.
- If error 108 is not displayed, replace the Option 16 crystal oscillator assembly.
  - If error 108 is still displayed, replace the A3 PCB.

#### **Error 109 The 100MHz Reference is not phase-locked to the External Reference**

**Description:** The reference loop is not phase-locked to the external 10 MHz reference.

- Step 1.** Using a coaxial cable with BNC connectors, connect the rear panel 10 MHz REF IN connector to the rear panel 10 MHz REF OUT connector.
- Step 2.** Disconnect the cable, W110, from A3J7.
- Step 3.** Using an oscilloscope, verify the presence of a 10 MHz signal at the end of the cable. The signal amplitude should be >0.5 volts peak-to-peak (into 50Ω).
- If present, replace the A3 PCB.
  - If not present, replace the cable W110.
-

**Table 5-8.** *Error Messages 108, 109 and 110 (2 of 2)*

---

**Error 110 The 100MHz Reference is not Locked to the High Stability 10MHz Crystal Oscillator**

**Description:** The reference loop is not phase-locked to the Option 16 high stability 10 MHz crystal oscillator.

**Step 1.** Disconnect the cable from A3J6.

**Step 2.** Using an oscilloscope, verify the presence of a 10 MHz signal at the end of the cable. The signal amplitude should be  $\geq 1$  volt (into  $50\Omega$ ).

- If present, replace the A3 PCB.
  - If not present, replace the Option 16 crystal oscillator assembly.
- 

**Table 5-9.** *Error Message 111 (1 of 2)*

---

**A5 Fine Loop**

**Error 111 Fine Loop Osc Failed**

**Description:** One or more of the oscillators within the fine loop is not phase-locked.

**Step 1.** Disconnect cable W121 at A5J5.

**Step 2.** Using a spectrum analyzer, verify the presence of a 0 dBm  $\pm 3$  dB, 10 MHz signal at the end of the cable.

- If present, go to step 9.
- If not present, go to step 3.

**Step 3.** Disconnect cable W121 at A4J7.

**Step 4.** Using the spectrum analyzer, verify the presence of the 0 dBm  $\pm 3$  dB, 10 MHz signal at A4J7.

- If present, replace the cable W121.
- If not present, go to step 5.

**Step 5.** Disconnect cable W105 at A4J6.

---

**Table 5-9.** *Error Message 111 (2 of 2)*

- Step 6.** Using the spectrum analyzer, verify the presence of the 0 dBm  $\pm$ 3 dB, 10 MHz signal at the end of the cable.
  - If present, replace the A4 PCB.
  - If not present, go to step 7.
- Step 7.** Disconnect cable W105 at A3J4.
- Step 8.** Using the spectrum analyzer, verify the presence of the 0 dBm  $\pm$ 3 dB, 10 MHz signal at A3J4.
  - If present, replace the cable W105.
  - If not present, replace the A3 PCB.
- Step 9.** Reconnect cable W121 to A5J5 and disconnect cable W107 at A5J1.
- Step 10.** Set up the 683XXC to generate the CW frequencies listed in Table 5-10.
- Step 11.** Using a spectrum analyzer, measure the frequency and amplitude of the signal at A5J1 for each of the CW frequencies generated. In each case, the signal amplitude should be +3 dBm  $\pm$ 3 dB with sidebands at  $<$ -65 dBc.
  - If the signals are correct in both frequency and amplitude, go to step 12.
  - If the signals are incorrect, replace the A5 PCB.
- Step 12.** Reconnect cable W107 to A5J1 and run self-test again.
  - If error 111 is not displayed, the problem is cleared.
  - If error 111 is still displayed, contact your local Anritsu service center for assistance.

**Table 5-10.** *Fine Loop Frequencies*

683XXC CW Frequency	Measured Frequency at A5J1
10.102 GHz	22 MHz
10.110 GHz	30 MHz
10.120 GHz	40 MHz

*Table 5-11. Error Message 112*

**A4 Coarse Loop**

**Error 112 Coarse Loop Osc Failed**

**Description:** The coarse loop oscillator is not phase-locked.

- Step 1.** Disconnect cable W103 at A4J1 and cable W105 at A4J6.
- Step 2.** Using a spectrum analyzer, verify the presence of a +7 dBm  $\pm$ 4 dB, 500 MHz signal at the end of cable W103 and a +0 dBm  $\pm$ 3 dB, 10 MHz signal at the end of cable W105.
  - If present, go to step 5.
  - If one or both of the signals are not present, go to step 3.
- Step 3.** Disconnect cable W103 at A3J1 and cable W105 at A3J4.
- Step 4.** Using the spectrum analyzer, verify the presence of the +7 dBm  $\pm$ 4 dB, 500 MHz signal at A3J1 and the +0 dBm  $\pm$ 3 dB, 10 MHz signal at A3J4.
  - If the 500 MHz signal is present, replace cable W103.
  - If the 10 MHz signal is present, replace cable W105.
  - If the signals are not present, replace the A3 PCB.
- Step 5.** Reconnect cable W103 to A4J1 and cable W105 to A4J6, then disconnect cable W106 at A4J3.
- Step 6.** Set up the 683XXC to generate the CW frequencies listed in Table 5-12.
- Step 7.** Using a spectrum analyzer, measure the frequency and amplitude of the signal at A4J3 for each of the CW frequencies generated. In each case, the signal amplitude should be +4 dBm  $\pm$ 6 dB with sidebands at  $<$ -50 dBc.
  - If the signals are correct in both frequency and amplitude, go to step 8.
  - If the signals are incorrect, replace the A4 PCB.
- Step 8.** Reconnect cable W106 to A4J3 and run self-test again.
  - If error 112 is not displayed, the problem is cleared.
  - If error 112 is still displayed, contact your local Anritsu service center for assistance.

*Table 5-12. Coarse Loop Frequencies*

<b>683XXC CW Frequency</b>	<b>Measured Frequency at A4J3</b>
2.000 GHz	219.5 MHz $\pm$ 10 kHz
2.050 GHz	225.0 MHz $\pm$ 10 kHz
2.225 GHz	244.5 MHz $\pm$ 10 kHz

---

**Table 5-13.** Error Messages 113 and 115 (1 of 2)

---

**A7 YIG Loop****Error 113 YIG Loop Osc Failed**  
**Error 115 Not Locked Indicator Failed**

**Description:** Error 113 indicates that the YIG loop is not phase-locked. Error 115 indicates a failure of the not phased-lock indicator circuit.

- Step 1.** Verify the signal output from the A4 Coarse Loop PCB by performing steps 5 thru 7 in Table 5-11.
- If the coarse loop signals are correct in both frequency and amplitude, go to step 2.
  - If the coarse loop signals are incorrect, replace the A4 PCB.
- Step 2.** Verify the signal output from the A5 Fine Loop PCB by performing steps 9 thru 11 in Table 5-9.
- If the fine loop signals are correct in both frequency and amplitude, go to step 3.
  - If the fine loop signals are incorrect, replace the A5 PCB.
- Step 3.** Disconnect the semi-rigid cable at output port J5 of the switched filter assembly.
- Step 4.** Set up the 683XXC to generate a CW frequency of 2.000 GHz.
- Step 5.** Using a spectrum analyzer, measure the frequency and amplitude of the signal at J5 of the switched filter assembly. The frequency should be 2.000 GHz  $\pm$ 25 MHz and the amplitude should be from -7 to -14 dBm.
- If the signal is correct in both frequency and amplitude, go to step 6.
  - If the signals are incorrect, replace the switched filter assembly.
- Step 6.** Repeat steps 4 and 5, incrementing the CW frequency in 1 GHz steps up to 20.000 GHz (8.4 GHz for Model 68317C).
- Step 7.** If the signals from the coarse loop, fine loop, and switched filter assembly are all correct, replace the A7 YIG Loop PCB.
-



**Table 5-13.** *Error Messages 113 and 115 (2 of 2)*

---

- Step 8.** Run self-test.
- ❑ If error 113 or 115 is not displayed, the problem is cleared.
  - ❑ If either error 113 or 115 is displayed, contact your local Anritsu service center for assistance.
- 

**Table 5-14.** *Error Message 114*

---

### **Down Converter**

#### **Error 114 Down Converter LO not Locked**

**Description:** The local oscillator in the down converter assembly is not phase-locked.

- Step 1.** Disconnect cable W115 at A3J2.
- Step 2.** Using a spectrum analyzer, verify the presence of a +7 dBm  $\pm 4$  dB, 500 MHz signal at A3J2.
- ❑ If present, go to step 3.
  - ❑ If not present, replace the A3 PCB.
- Step 3.** Reconnect cable W115 to A3J2, then disconnect cable W115 at J2 of the down converter assembly.
- Step 4.** Using a spectrum analyzer, verify the presence of a +7 dBm  $\pm 4$  dB, 500 MHz signal at the end of cable W115.
- ❑ If present, replace the down converter assembly.
  - ❑ If not present, replace cable W115.
-

**Table 5-15.** *Error Message 116*

---

### **A11 FM PCB**

#### **Error 116 FM Loop Gain Check Failed**

**Description:** The FM loop has failed or the loop gain is out of tolerance.

- Step 1.** Perform a preliminary calibration. (Refer to chapter 4 for the calibration procedure.)
- Step 2.** Run self-test.
- If error 116 is not displayed, the problem is cleared.
  - If error 116 is still displayed, go to step 3.
- Step 3.** Replace the A11 PCB and run self-test again.
- If error 116 is not displayed, the problem is cleared.
  - If error 116 is displayed, contact your local Anritsu service center for assistance.
-

**Table 5-16.** *Error Messages 107, 117, 118, 119, and 120*

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### **A12 Analog Instruction**

**Error 107 Sweep Time Check Failed**

**Error 117 Linearizer Check Failed**

**Error 118 Switchpoint DAC Failed**

**Error 119 Center Frequency Circuits Failed**

**Error 120 Delta-F Circuits Failed**

**Description:** Each of these error messages indicates a problem in the circuitry on the A12 Analog Instruction PCB that provides frequency tuning voltages for the YIG-tuned oscillator.

- Step 1.** Perform a preliminary calibration. (Refer to chapter 4 for the calibration procedure.)
- Step 2.** Run self-test.
- If no error message is displayed, the problem is cleared.
  - If any of the error messages, listed above, is displayed, go to step 3.
- Step 3.** Replace the A12 PCB and run self-test again.
- If no error message is displayed, the problem is cleared.
  - If any of the error messages, listed above, is displayed, contact your local Anritsu service center for assistance.
-

**Table 5-17.** Error Messages 121, 122, 123, 127, 142, and 143 (1 of 2)

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### **A10 ALC**

**Error 121 Unleveled Indicator Failed**

**Error 122 Level Reference Failed**

**Error 123 Detector Log Amp Failed**

**Error 127 Detector Input Circuit Failed**

**Description:** Error 121 indicates a failure of the circuit that alerts the CPU whenever the RF output power becomes unleveled. Each of the other error messages indicates a problem in the circuitry on the A10 ALC PCB that provides control of the RF output power level.

**Step 1.** Replace the A10 PCB, and run self-test.

- ❑ If no error message is displayed, the problem is cleared.
- ❑ If any of the error messages, listed above, is displayed, contact your local Anritsu service center for assistance.

**Error 142 Sample and Hold Circuit Failed**

**Description:** Error 142 indicates a failure of the sample and hold circuitry on the A10 PCB.

**Step 1.** Set up the 683XXC as follows:

- a. Press **SYSTEM**, then **Reset**.
- b. Press **MODULATION**, then **Pulse** to go to the Internal Pulse Modulation Status display.
- c. Press **On/Off** to turn on pulse modulation.

**Step 2.** Disconnect the cable, W122, from A6J6.

**Step 3.** Using an oscilloscope, verify the presence of a pulse train at A6J6 (sample and hold signal to the A10 ALC PCB) with an output level of 0 volts to +1 volt, a pulse period of 1 ms, and a pulse width of 200  $\mu$ s.

- ❑ If the signal is present and correct, reconnect cable W122 to A6J6 and go to step 4.
- ❑ If the signal is not present or is incorrect, replace the A6 PCB.

**Step 4.** Disconnect the cable, W122, from A10J1.

**Step 5.** Using the oscilloscope, verify the presence of the sample and hold signal (pulse train described in step 3) at the end of the cable, W122.

---

**Table 5-17.** *Error Messages 121, 122, 123, 127, 142, and 143 (2 of 2)*

---

- ❑ If present, replace the A10 PCB.
- ❑ If not present, replace the cable W122.

### **Error 143 Slope DAC Failed**

**Description:** Error 143 indicates a problem with the level slope DAC circuitry on the A10 PCB.

**Step 1.** Recalibrate the ALC slope. (Refer to chapter 4 for the calibration procedure.)

**Step 2.** Run self-test.

- ❑ If error 143 is not displayed, the problem is cleared.
- ❑ If error 143 is still displayed, go to step 3.

**Step 3.** Replace the A10 PCB and run self-test again.

- ❑ If error 143 is not displayed, the problem is cleared.
- ❑ If error 143 is still displayed, go to step 4.

**Step 4.** Replace the A12 PCB and run self-test again.

- ❑ If error 143 is not displayed, the problem is cleared.
  - ❑ If error 143 is still displayed, contact your local Anritsu service center for assistance.
-

**Table 5-18.** *Error Messages 124, 125, and 126 (1 of 4)*

---

### **YIG-tuned Oscillator**

**Error 124 Full Band Unlocked and Unleveled**

**Error 125 8.4-20 GHz Unlocked and Unleveled**

**Error 126 2-8.4 GHz Unlocked and Unleveled**

**Description:** These error messages indicate a failure of the YIG-tuned oscillator assembly.

#### **Model 68317C YIG-tuned oscillator failure**

**Step 1.** Connect a 56100A Scalar Network Analyzer to the 68317C as follows:

- a. Connect the 68317C AUX I/O to the 56100A AUX I/O.
- b. Connect the 56100A DEDICATED GPIB to the 68317C IEEE-488 GPIB.
- c. Connect the RF Detector to the 56100A Channel A Input.

**Step 2.** Set up the 68317C as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 2.000 GHz  
F2: 8.400 GHz  
Sweep Time: 0.100 Sec

**Step 3.** Set up the 56100A Scalar Network Analyzer as follows:

- a. Press SYSTEM MENU key.
- b. From System Menu display, select RESET.
- 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.

**Step 4.** Using the scalar network analyzer, measure the RF output directly at the YIG-tuned oscillator's output connector. The amplitude of the RF signal should be >4 dBm throughout the full sweep.

- If the RF signal is correct in both frequency and amplitude throughout the full sweep, go to step 8.
  - If there is no RF signal for all or part of the sweep or if the amplitude of the RF signal is low, go to step 5.
-

**Table 5-18.** *Error Messages 124, 125, and 126 (2 of 4)*

- Step 5.** Connect the X input of an oscilloscope to the 68317C rear panel HORIZ OUT connector.
- Step 6.** Using the oscilloscope, check for a -0.2 to -3.5 volt YIG tuning ramp at A14TP10.
- ❑ If the ramp signal is correct, go to step 7.
  - ❑ If the ramp signal is incorrect or not present, replace the A14 PCB.
- Step 7.** Using the oscilloscope, check for the YIG bias voltages at the test points shown in Table 5-19.
- ❑ If the YIG bias voltages are correct, replace the YIG-tuned oscillator assembly.
  - ❑ If the YIG bias voltages are incorrect, replace the A14 PCB.
- Step 8.** Run self-test again.
- ❑ If no error message is displayed, the problem is cleared.
  - ❑ If any of the error messages, listed above, are displayed, contact your local Anritsu service center for assistance.

**NOTE**

When replacing the A14 PCB, refer to Table 6-1, page 6-12, for the correct part number and switch S1 setting for the replacement PCB.

**Table 5-19.** *YIG-tuned Oscillator Bias Voltages*

Test Point	Bias Voltages
A14TP2	+15V
A14TP3	0V
A14TP4	-5V
A14TP5	+7V

**Table 5-18.** *Error Messages 124, 125, and 126 (3 of 4)*

---

**YIG-tuned oscillator failure (All models except 68317C)**

- Step 1.** Connect a 56100A Scalar Network Analyzer to the 683XXC as follows:
- a. Connect the 683XXC AUX I/O to the 56100A AUX I/O.
  - b. Connect the 56100A DEDICATED GPIB to the 683XXC IEEE-488 GPIB.
  - c. Connect the RF Detector to the 56100A Channel A Input.
- Step 2.** Set up the 683XXC as follows:
- a. CW/SWEEP SELECT: Analog  
F1: 2.000 GHz  
F2: 20.000 GHz  
Sweep Time: 0.100 Sec
- Step 3.** Set up the 56100A Scalar Network Analyzer as follows:
- a. Press SYSTEM MENU key.
  - b. From System Menu display, select RESET.
  - 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.
- Step 4.** Using the scalar network analyzer, measure the RF output directly at the YIG-tuned oscillator's output connector. The amplitude of the RF signal should be >4 dBm throughout the full sweep.
- If the RF signal is correct in both frequency and amplitude throughout the full sweep, go to step 8.
  - If there is no RF signal for all or part of the sweep or if the amplitude of the RF signal is low, go to step 5.
-



**Table 5-18.** *Error Messages 124, 125, and 126 (3 of 4)*

- Step 5.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.
- Step 6.** Using the oscilloscope, check for a -0.2 to -3.5 volt YIG tuning ramp at A14TP10.
- If the ramp signal is correct, go to step 7.
  - If the ramp signal is incorrect or not present, replace the A14 PCB.
- Step 7.** Using the oscilloscope, check for the YIG bias voltages at the test points shown in Table 5-19A.
- If the YIG bias voltages are correct, replace the YIG-tuned oscillator assembly.
  - If the YIG bias voltages are incorrect, replace the A14 PCB.
- Step 8.** Run self-test again.
- If no error message is displayed, the problem is cleared.
  - If any of the error messages, listed above, are displayed, contact your local Anritsu service center for assistance.

**NOTE**

When replacing the A14 PCB, refer to Table 6-1, page 6-12, for the correct part number and switch S1 setting for the replacement PCB.

**Table 5-19A.** *YIG-tuned Oscillator Bias Voltages*

Test Point	YIG-tuned Oscillator Bias Voltages	
	2 to 8.4 GHz	8.4 to 20 GHz
A14TP5	+7V	+7V
A14TP3	0V	+8V
A14TP4	-5V	-5V
A14TP2	+8V	0V

**Table 5-20.** Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (1 of 8)

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### **Output Power Level Related Problems (0.01 to 20 GHz)**

#### **Error 128 .01-2 GHz Unleveled**

**Description:** Error 128 indicates a failure of the down converter leveling circuitry. The 683XXC may or may not produce an RF output in the 0.01 to 2 GHz frequency range. Thus, there are two troubleshooting paths for this problem—unleveled with output power and unleveled with no/low output power.

**Unleveled with output power** (The warning message **UNLEVELED** appears on the front panel display):

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 0.010 GHz  
F2: 2.000 GHz  
Sweep Time: 0.100 Sec  
L1: +1.00 dBm
- b. LEVEL/ALC SELECT: ALC Mode  
ALC Mode: Ext ALC Front  
Leveling Menu: External Detector

**Step 2.** Connect a detector to the 683XXC RF OUTPUT connector and connect the detected DC output of the detector to the front panel EXTERNAL ALC IN connector.

- If the warning message **UNLEVELED** no longer appears on the front panel display, replace the down converter.
  - If the warning message **UNLEVELED** is still displayed, replace the A10 PCB.
-

**Table 5-20.** *Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (2 of 8)*

---

**Unleveled with no/low output power:**

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 0.010 GHz  
F2: 2.000 GHz  
Sweep Time: 0.100 Sec  
L1: +1.00 dBm
- b. LEVEL/ALC SELECT: ALC Mode  
Leveling Menu: Internal

**Step 2.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.

**Step 3.** Disconnect the cable, W100, from A10J3.

**Step 4.** Using the oscilloscope, check at the end of cable W100 for a >2.0 volt down converter detector output throughout the full sweep.

- If the detector voltage is correct, replace the A10 PCB.
- If the detector voltage is incorrect, go to step 5.

**Step 5.** Using the oscilloscope, check for a +15 volt down converter bias voltage at A14TP12.

- If the bias voltage is correct, go to step 6.
- If the bias voltage is not correct, replace the A14 PCB.

**Step 6.** Using the oscilloscope, check for a –2 volt PIN switch drive voltage at A9TP19 and A9TP22. If the 683XXC has a SDM installed, also check for a +20 volt PIN switch drive voltage at A9TP9.

- If the PIN switch drive voltage(s) is correct, go to step 7.
- If the PIN switch drive voltage(s) is not correct, replace the A9 PCB.

**NOTE**

When replacing the A14 PCB, refer to Table 6-1, page 6-12, for the correct part number and switch S1 setting for the replacement PCB.

**Table 5-20.** *Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (3 of 8)*

---

- Step 7.** Connect a 56100A Scalar Network Analyzer to the 683XXC as follows:
- a. Connect the 683XXC AUX I/O to the 56100A AUX I/O.
  - b. Connect the 56100A DEDICATED GPIB to the 683XXC IEEE-488 GPIB.
  - c. Connect the RF Detector to the 56100A Channel A Input.
- Step 8.** Set up the 56100A Scalar Network Analyzer as follows:
- a. Press SYSTEM MENU key.
  - b. From System Menu display, select RESET.
  - 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.
- Step 9.** Using the scalar network analyzer, measure the RF output at J3 of the switched filter assembly. The amplitude of the RF signal should be >17 dBm throughout the full sweep.
- If the amplitude of the RF signal is correct, replace the down converter assembly.
  - If there is no RF signal or if the amplitude of the RF signal is low, replace the switched filter assembly.
-

**Table 5-20.** Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (4 of 8)

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### **Error 129 Switched Filter or Level Detector Failed**

**Description:** Error 129 indicates a failure of either the switched filter or level detector circuitry. The 683XXC may or may not produce an RF output in the 2 to 20 GHz frequency range (2 to 8.4 GHz for Model 68317C). Thus, there are two troubleshooting paths for this problem—unleveled with output power and unleveled with no/low output power.

**Unleveled with output power** (The warning message **UNLEVELED** appears on the front panel display):

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 2.000 GHz  
F2: 20.000 GHz (8.4 GHz for Model 68317C)  
Sweep Time: 0.100 Sec  
L1: +1.00 dBm
- b. LEVEL/ALC SELECT: ALC Mode  
ALC Mode: Ext ALC Front  
Leveling Menu: External Detector

**Step 2.** Connect a detector to the 683XXC RF OUTPUT connector and connect the detected DC output of the detector to the front panel EXTERNAL ALC IN connector.

- If the warning message **UNLEVELED** no longer appears on the front panel display, replace the directional coupler.
  - If the warning message **UNLEVELED** is still displayed, replace the A10 PCB.
-

**Table 5-20.** Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (5 of 8)

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**Unleveled with no/low output power:**

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 2.000 GHz  
F2: 20.000 GHz (8.4 GHz for Model 68317C)  
Sweep Time: 0.100 Sec  
L1: +1.00 dBm
- b. LEVEL/ALC SELECT: ALC Mode  
Leveling Menu: Internal

**Step 2.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.

**Step 3.** Using the oscilloscope, check the switched filter bias voltages at A14TP5 and A14TP6. The bias voltage at A14TP5 should be +7 volts; the bias voltage at A14TP6 should be +8 volts. If the 683XXC has a SDM installed, also check for a +20 volt PIN switch drive voltage at A9TP9.

- If the bias and the PIN switch drive voltages are correct, go to step 4.
- If the bias voltages are not correct, replace the A14 PCB.
- If the PIN switch drive voltage is not correct, replace the A9 PCB.

**Step 4.** Connect a 56100A Scalar Network Analyzer to the 683XXC as follows:

- a. Connect the 683XXC AUX I/O to the 56100A AUX I/O.
- b. Connect the 56100A DEDICATED GPIB to the 683XXC IEEE-488 GPIB.
- c. Connect the RF Detector to the 56100A Channel A Input.

**NOTE**

When replacing the A14 PCB, refer to Table 6-1, page 6-12, for the correct part number and switch S1 setting for the replacement PCB.

**Table 5-20.** *Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (6 of 8)*

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- Step 5.** Set up the 56100A Scalar Network Analyzer as follows:
- a. Press SYSTEM MENU key.
  - b. From System Menu display, select RESET.
  - 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.
- Step 6.** Using the scalar network analyzer, measure the RF output at J2 of the switched filter assembly. The amplitude of the RF signal should be  $>+15$  dbm ( $>+20$  dBm with Option 15B) throughout the full sweep.
- If the amplitude of the RF signal is correct, check for bad cables.
  - If there is no RF signal or if the amplitude of the RF signal is low, replace the switched filter assembly.
-

**Table 5-20.** Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (7 of 8)**Error 130** 2-3.3 GH Switched Filter**Error 131** 3.3-5.5 GH Switched Filter**Error 132** 5.5-8.4 GH Switched Filter**Error 133** 8.4-13.25 GH Switched Filter**Error 134** 13.25-20 GH Switched Filter

**Description:** Each of these error messages indicates a failure in a switched filter path within the switched filter assembly. The 683XXC may or may not produce an RF output in the frequency range of the failed switched filter path.

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog
  - F1: 2.000 GHz
  - F2: 20.000 GHz (8.4 GHz for Model 68317C)
  - Sweep Time: 0.100 Sec

**Step 2.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.

**Step 3.** Using the oscilloscope, check for the switched filter PIN switch drive voltages at the test points shown in Table 5-21.

- If the PIN switch drive voltages are correct, replace the switched filter assembly.
- If the PIN switch drive voltages are incorrect, replace the A9 PCB.

**Table 5-21.** Switched Filter PIN Switch Drive Voltages

Test Point	Active Frequency Range	Active Voltage	Inactive Voltage
A9TP18	2 to 3.3 GHz	-2.35V	+1.0V
A9TP10	3.3 to 5.5 GHz	-2.0V	+1.0V
A9TP12	5.5 to 8.4 GHz	-2.0V	+1.0V
A9TP16	8.4 to 13.25 GHz	-2.0V	+1.0V
A9TP21	13.25 to 20 GHz	-2.0V	+1.0V
A9TP17	2 to 8.4 GHz	-2.3V	+2.0V



**Table 5-20.** *Error Messages 128, 129, 130, 131, 132, 133, 134, and 135 (8 of 8)*

---

**Error 135 Modulator or Driver Failed**

**Description:** Error 135 indicates a failure of the modulator in the switched filter assembly or the modulator driver circuitry on the A9 PIN Control PCB.

**Step 1.** Replace the A9 PCB and run self-test.

- If error 135 is not displayed, the problem is cleared.
- If error 135 is still displayed, go to step 2.

**Step 2.** Replace the switched filter assembly and run self-test again.

- If error 135 is not displayed, the problem is cleared.
  - If error 135 is still displayed, contact your local Anritsu service center for assistance.
-

**Table 5-22.** Error Messages 138, 139, 140, and 141 (1 of 2)**Output Power Level Related Problems  
(20 to 40 GHz)  
683XXC Models with SDM****Error 138 SDM Unit or Driver Failed**

**Description:** Error 138 indicates a failure of the SDM, a failure of the SDM bias regulator or frequency band selection circuitry on the A14 YIG, SDM, SQM Driver PCB. The 683XXC will not produce an RF output in the 20 to 40 GHz frequency range.

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 20.000 GHz  
F2: 40.000 GHz  
Sweep Time: 0.100 Sec  
L1: +1.00 dBm

**Step 2.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.

**Step 3.** Using the oscilloscope, check for a +8 volts SDM bias voltage at A14TP7 throughout the full sweep.

- If the SDM bias voltage is correct, replace the SDM.
- If the SDM bias voltage is not correct, go to step 4.

**Step 4.** Replace the A14 PCB and run self-test again.

- If error 138 is not displayed, the problem is cleared.
- If error 138 is still displayed, contact your local Anritsu service center for assistance.

**NOTE**

When replacing the A14 PCB, refer to Table 6-1, page 6-12, for the correct part number and switch S1 setting for the replacement PCB.

**Table 5-22.** *Error Messages 138, 139, 140, and 141 (2 of 2)*

**Error 139 32-40 GHz SDM Section Failed**  
**Error 140 25-32 GHz SDM Section Failed**  
**Error 141 20-25 GHz SDM Section Failed**

**Description:** Each of these error messages indicates a failure in a switched doubler filter path within the SDM. The 683XXC will not produce an RF output in the frequency range of the failed switched doubler filter path.

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog
  - F1: 2.000 GHz
  - F2: 40.000 GHz
  - Sweep Time: 0.100 Sec
  - L1: +1.00 dBm

**Step 2.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.

**Step 3.** Using the oscilloscope, check the PIN switch drive voltages at A9TP11, A9TP15, and A9TP24 (shown in Table 5-23).

- If the PIN switch drive voltages are correct, replace the SDM.
- If the PIN switch drive voltages are not correct, replace the A9 PCB.

**Table 5-23.** *SDM PIN Switch Drive Voltages*

Test Point	Active Frequency Range	Active Voltage	Inactive Voltage
A9TP9	0.01 to 20 GHz	+20V	-15V
A9TP11	20 to 25 GHz	+20V	-15V
A9TP15	25 to 32 GHz	+20V	-15V
A9TP24	32 to 40 GHz	+20V	-15V

**Table 24.** Error Message 136 (1 of 2)**Output Power Related Problems  
(>40 GHz)  
683XXC Models with SQM****Error 136 SQM Unit or Driver Failed**

**Description:** Error 136 indicates a failure of the SQM or a failure of the SQM bias regulator or frequency band selection circuitry on the A14 YIG, SDM, SQM Driver PCB. The 683XXC will not produce and RF output above 40 GHz.

**Step 1.** Set up the 683XXC as follows:

- a. CW/SWEEP SELECT: Analog  
F1: 40.0 GHz  
F2: 50.0, 60.0, or 65.0 GHz (Model dependent)  
Sweep Time: 0.100 Sec  
L1: -2.0 dBm

**Step 2.** Connect the X input of an oscilloscope to the 683XXC rear panel HORIZ OUT connector.

**Step 3.** Using the oscilloscope, check the following voltages:

- a. For models having a high end frequency of 50 GHz, check the SQM bias voltages at A14TP8 and A14TP9. The bias voltage at A14TP8 should be +10 volts; the bias voltage at A14TP9 should be -5 volts.  
  
For models having a high end frequency of 60 or 65 GHz, check for a +11 volts SQM bias voltage at A14TP8.
- b. For all models, check for a -2 volt PIN switch drive voltage at A9TP22.
  - If the SQM bias and PIN switch drive voltages are correct, go to step 4.
  - If the SQM bias voltage(s) is not correct, replace the A14 PCB.
  - If the PIN switch drive voltage is not correct, replace the A9 PCB.

**NOTE**

When replacing the A14 PCB, refer to Table 6-1, page 6-12, for the correct part number and switch S1 setting for the replacement PCB.

**Table 5-24.** *Error Message 136 (2 of 2)*

---

- Step 4.** Connect a 56100A Scalar Network Analyzer to the 683XXC as follows:
- a. Connect the 683XXC AUX I/O to the 56100A AUX I/O.
  - b. Connect the 56100A DEDICATED GPIB to the 683XXC IEEE-488 GPIB.
  - c. Connect the RF Detector to the 56100A Channel A Input.
- Step 5.** Set up the 56100A Scalar Network Analyzer as follows:
- a. Press SYSTEM MENU display.
  - b. From System Menu display, select RESET.
  - 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.
- Step 6.** Using the scalar network analyzer, measure the RF output at J4 of the switched filter assembly. The amplitude of the RF signal should be >+18 dBm throughout the full sweep.
- If the amplitude of the RF signal is correct, replace the SQM.
  - If there is no RF signal or if the amplitude of the RF signal is low, replace the switched filter assembly.
-

*Table 5-25. Error Message 144*

---

**Error 144 RF was Off when Selftest started. Some tests were not performed**

**Description:** Indicates that some self-tests were not performed because the RF Output was selected OFF on the front panel.

**Step 1.** Press the OUTPUT key on the front panel to turn the RF Output ON.

**Step 2.** Run self-test again.

---

*Table 5-26. Error Message 145*

---

**Error 145 AM Meter or associated circuitry failed**

**Description:** Indicates a failure of the internal amplitude modulation function. The 683XXC may or may not provide amplitude modulation of the RF output signal using modulating signals from an external source.

**Step 1.** Set up the 683XXC as follows:

- a. Press **SYSTEM**, then **Reset**.
- b. Press **MODULATION**, then **AM** to go to the Internal AM Status display.
- c. Press **On/Off** to turn internal amplitude modulation on.

**Step 2.** Using an oscilloscope, verify the presence of a 10 volt peak to peak sine wave signal with a period of 100  $\mu$ s at the rear panel AM OUT connector.

- If present, replace the A10 PCB.
  - If not present, replace the A8 PCB.
-

**Table 5-27.** Error Message 147

---

**Error 147 Internal FM circuitry failed**

**Description:** Indicates a failure of the internal frequency modulation function. The 683XXC may or may not provide frequency modulation of the RF output signal using modulating signals from an external source.

- Step 1.** Set up the 683XXC as follows:
- a. Press **SYSTEM**, then **Reset**.
  - b. Press **MODULATION**, then **FM** to go to the Internal FM Status display.
  - c. Press **On/Off** to turn internal frequency modulation on.
- Step 2.** Using an oscilloscope, verify the presence of a 10 volt peak to peak sine wave signal with a period of 100  $\mu$ s at the rear panel FM OUT connector.
- If present, replace the A11 PCB.
  - If not present, replace the A8 PCB.
- 

**Table 5-28.** Error Message 148 (1 of 2)

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**Error 148 Pulse 40 MHz reference circuitry failed.**

**Description:** Indicates a failure of the pulse generator 40 MHz oscillator circuitry. The pulse generator may still function; however, the 40 MHz oscillator is not phase locked to the 10 MHz reference time-base. The pulse modulation function may or may not operate. Error 106 (Power Supply not Phase-locked) may also be displayed.

- Step 1.** Disconnect cable W108 at A6J1.
- Step 2.** Using an oscilloscope, verify the presence of a 10 MHz at the end of cable W108.
- If present, replace the A6 PCB.
  - If not present, go to step 3.
- Step 3.** Reconnect cable W108 to A6J1 and disconnect it at A5J4.
- Step 4.** Using the oscilloscope, verify the presence of a 10 MHz TTL signal at A5J4.
- If present, replace the cable W108.
  - If not present, go to step 5.
-

**Table 5-28.** *Error Message 148 (2 of 2)*

- 
- Step 5.** Reconnect cable W108 to A5J4 and disconnect cable W121 at A5J5.
- Step 6.** Using the oscilloscope, verify the presence of a 10 MHz TTL signal at the end of cable W121.
- If present, replace the A5 PCB.
  - If not present, go to step 7.
- Step 7.** Reconnect cable W121 to A5J5 and disconnect it at A4J7.
- Step 8.** Using the oscilloscope, verify the presence of a 10 MHz TTL signal at A4J7.
- If present, replace the cable W121.
  - If not present, go to step 9.
- Step 9.** Reconnect cable W121 to A4J7 and disconnect cable W105 at A4J6.
- Step 10.** Using the oscilloscope, verify the presence of a 10 MHz TTL signal at the end of cable W105.
- If present, replace the A4 PCB.
  - If not present, go to step 11.
- Step 11.** Reconnect cable W105 to A4J6 and disconnect it at A3J4.
- Step 12.** Using the oscilloscope, verify the presence of a 10 MHz TTL signal at A3J4.
- If present, replace the cable W105.
  - If not present, replace the A3 PCB.
-



# **Chapter 6**

## **Removal and Replacement Procedures**

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# Chapter 6

## Removal and Replacement Procedures

### 6-1 INTRODUCTION

This chapter provides procedures for gaining access to the major 683XXC assemblies, subassemblies, and components for troubleshooting or replacement.

#### **WARNING**

Hazardous voltages are present inside the 683XXC whenever ac line power is connected. Turn off the unit and remove the line cord before removing any covers or panels. Troubleshooting and repair procedures should only be performed by service personnel who are fully aware of the potential hazards.

#### **CAUTION**

Many subassemblies in the signal generator contain static-sensitive components. Improper handling of these subassemblies may result in damage to the components. **Always** observe the static-sensitive component handling procedures described in Chapter 1, Figure 1-2.

#### **NOTE**

Many assemblies, subassemblies, and components within the 68XXC family of instruments are type and model dependent. Before replacing an assembly, subassembly, or component, **always** verify the part number of the replacement item. Part numbers can be found in Chapter 1, Tables 1-3 and 1-4.

**6-2 REMOVING AND  
REPLACING THE  
CHASSIS COVERS**

Troubleshooting procedures require removal of the top cover. Replacement of some 683XXC assemblies and parts require removal of all covers. The following procedure describes this process.

**Preliminary** Disconnect the power cord from the unit.

**Procedure** Remove and replace the chassis covers as follows:

**NOTE**

The screws with green heads have metric threads. When it becomes necessary to replace any of these screws, *always* use the exact replacement green-headed screws (Anritsu P/N 2000-560) to avoid damage to the instrument.

**Step 1** Using a Phillips screwdriver, remove the screws and the two feet from the top corners at the rear of the instrument (Figure 6-1).

**Step 2** Remove the screw that fastens the top cover to the chassis. (The screw is located at the rear of the instrument.)

**Step 3** Slide the top cover out along the grooves in the chassis and set it aside.

**Step 4** Turn the instrument over so that the bottom cover is on top.

**Step 5** Remove the screws and the two feet from the bottom corners at the rear of the instrument.

**Step 6** Remove the screw that fastens the bottom cover to the chassis. (The screw is located at the rear of the instrument.)

**Step 7** Slide the bottom cover out along the grooves in the chassis and set it aside.

**Step 8** Turn the instrument over to return it to the upright position.

**Step 9** Remove the screws and the carrying handle from the side handle cover. (The two screws fastening the carrying handle through the side handle cover to the chassis are accessible by lifting up the rubber covering at the each end of the handle.)

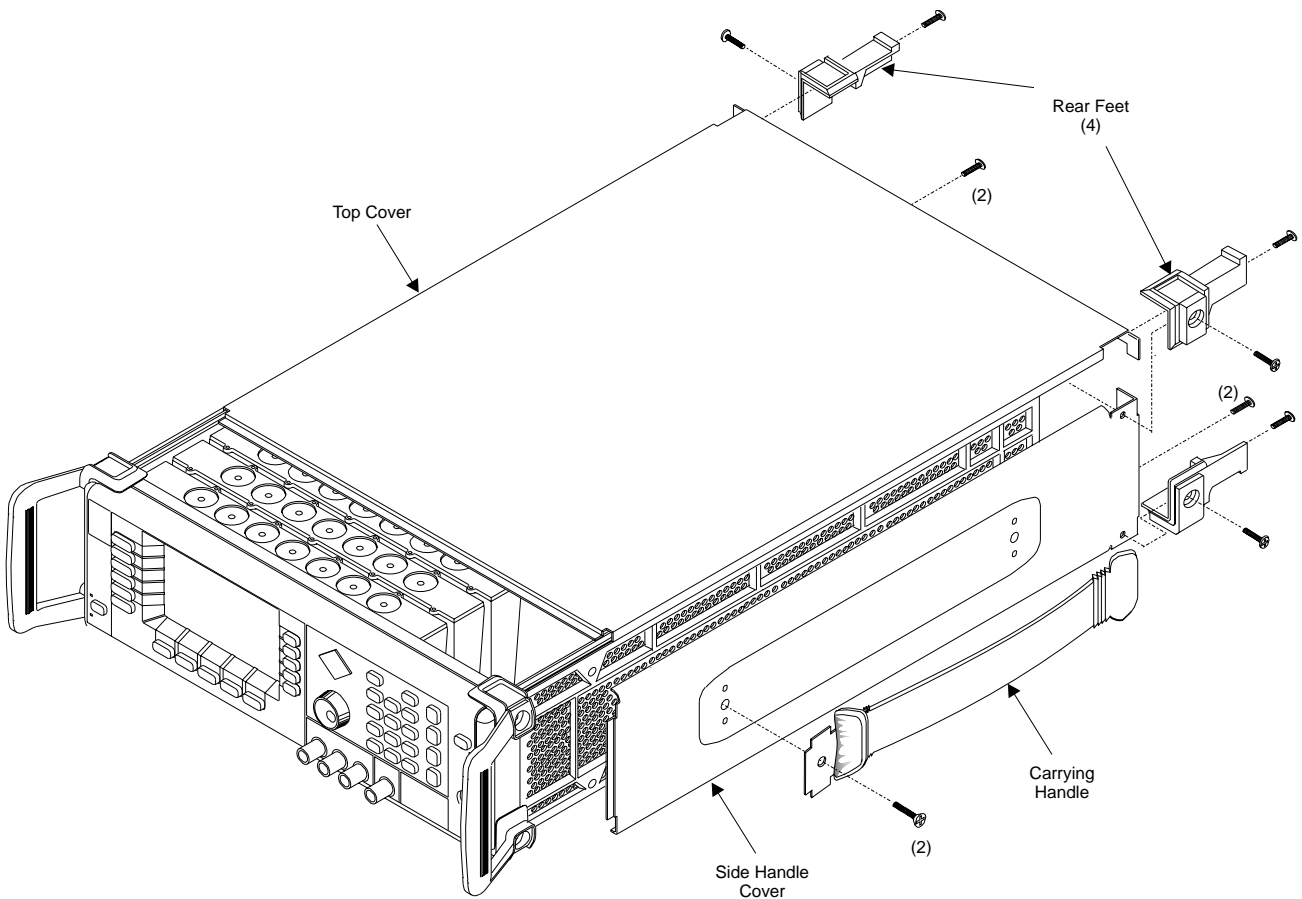
**Step 10** Remove the screw that fastens the side handle cover to the chassis. (The screw is located at the rear of the instrument.)

**Step 11** Remove the side handle cover and set it aside.

**Step 12** Remove the screw that fastens the other side cover to the chassis. (The screw is located at the rear of the instrument.)

**Step 13** Remove the side cover and set it aside.

**Step 14** To replace the chassis covers, reverse the procedure used to remove them.



683MM29.CDR

**Figure 6-1.** Chassis Covers Removal

**6-3 REMOVING AND  
REPLACING THE FRONT  
PANEL ASSEMBLY**

This paragraph provides instructions for removing and replacing the front panel assembly of the 683XXC. The front panel assembly contains the A1 and A2 Front Panel PCBs. Refer to Figure 6-2 during this procedure.

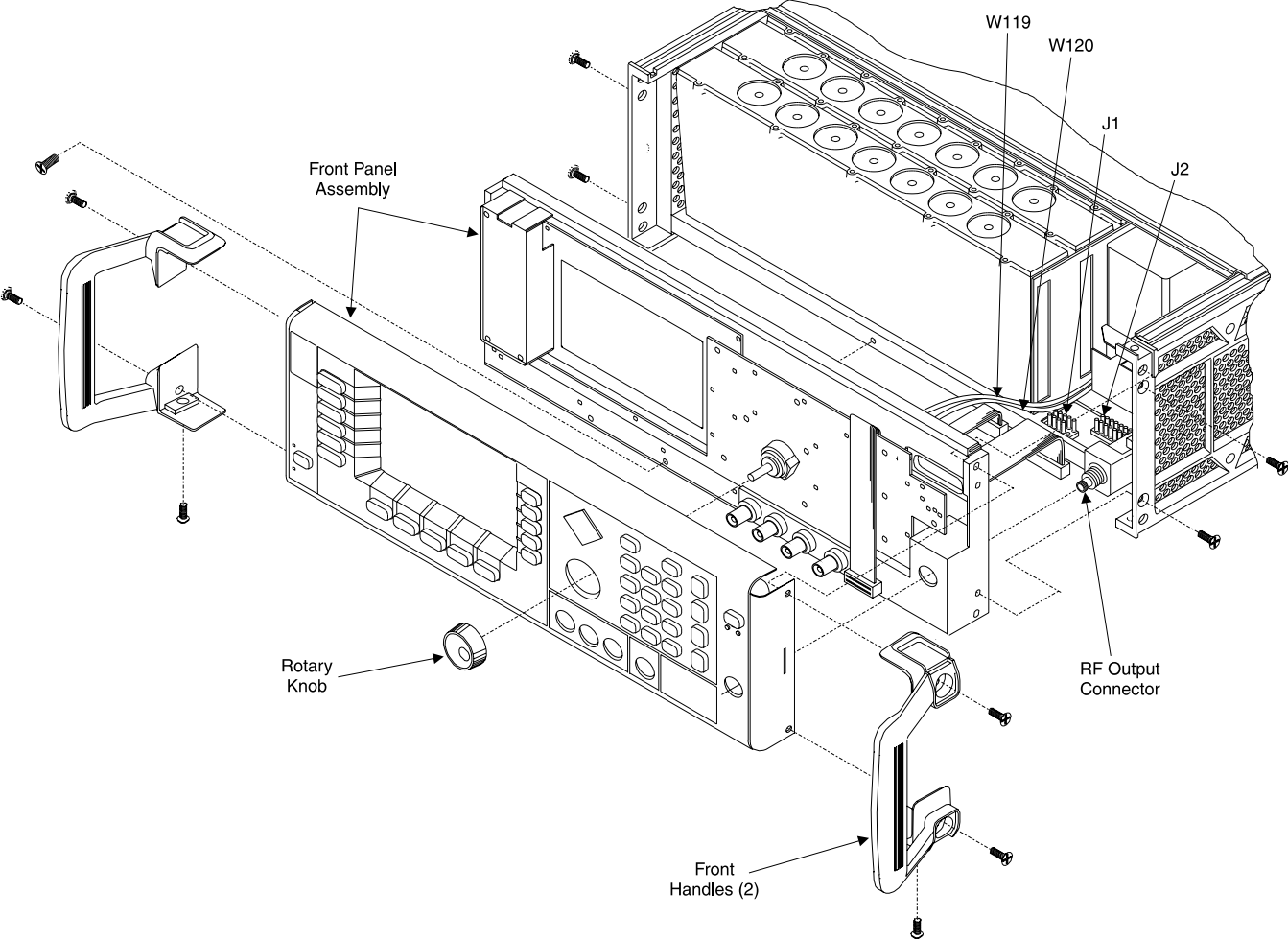
**Preliminary** Disconnect the power cord from the unit and remove the chassis covers as described in paragraph 6-2.

**Procedure** Remove and replace the front panel assembly as follows:

- Step 1** Using a Phillips screwdriver, remove the screws and the front handle assemblies from the instrument. (For instruments not having front handles, remove the screws and the front top and bottom feet from the instrument.)
- Step 2** Remove the rotary knob from the front panel by pulling straight out on it.
- Step 3** Carefully pull the front panel away from the chassis until the screws attaching the front panel assembly to the chassis are accessible.
- Step 4** Remove the screws attaching the front panel assembly to the chassis sides.
- Step 5** Disconnect the front panel ribbon cables from connectors J1 and J22 of the Motherboard.
- Step 6** Turn the instrument upside down.
- Step 7** Remove the screw attaching the front panel assembly to the chassis pan.
- Step 8** Carefully pull the front panel assembly forward until it is clear of the RF OUTPUT connector.
- Step 9** Disconnect the coaxial cables, W119 and W120, from the front panel assembly connectors A2J14 and A2J13 by pulling straight out on the cable connectors.
- Step 10** To replace the front panel assembly, reverse the removal process.

**NOTE**

The screws with green heads have metric threads. When it becomes necessary to replace any of these screws, *always* use the exact replacement green-headed screws (Anritsu P/N 2000-560) to avoid damage to the instrument.



**Figure 6-2.** Front Panel Assembly Removal

**6-4 REMOVING AND  
REPLACING THE A3, A4,  
A5, OR A6 PCB**

This paragraph provides instructions for removing and replacing the A3 Reference Loop PCB, the A4 Coarse Loop PCB, the A5 Fine Loop PCB, or the A6 Pulse Generator PCB, all of which are located in the RF housing (see Figure 6-3).

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

**Procedure** Remove and replace the A3, A4, A5, or A6 PCB as follows:

**Step 1** Disconnect the coaxial cables from the PCB to be removed by lifting up on the cable connectors.

**Step 2** Using a Phillips screwdriver, remove the nine screws that retain the RF housing cover and set aside.

**Step 3** Remove the RF housing cover and set aside.

**Step 4** Lift up on the edge tabs of the PCB and lift it out of the RF housing.

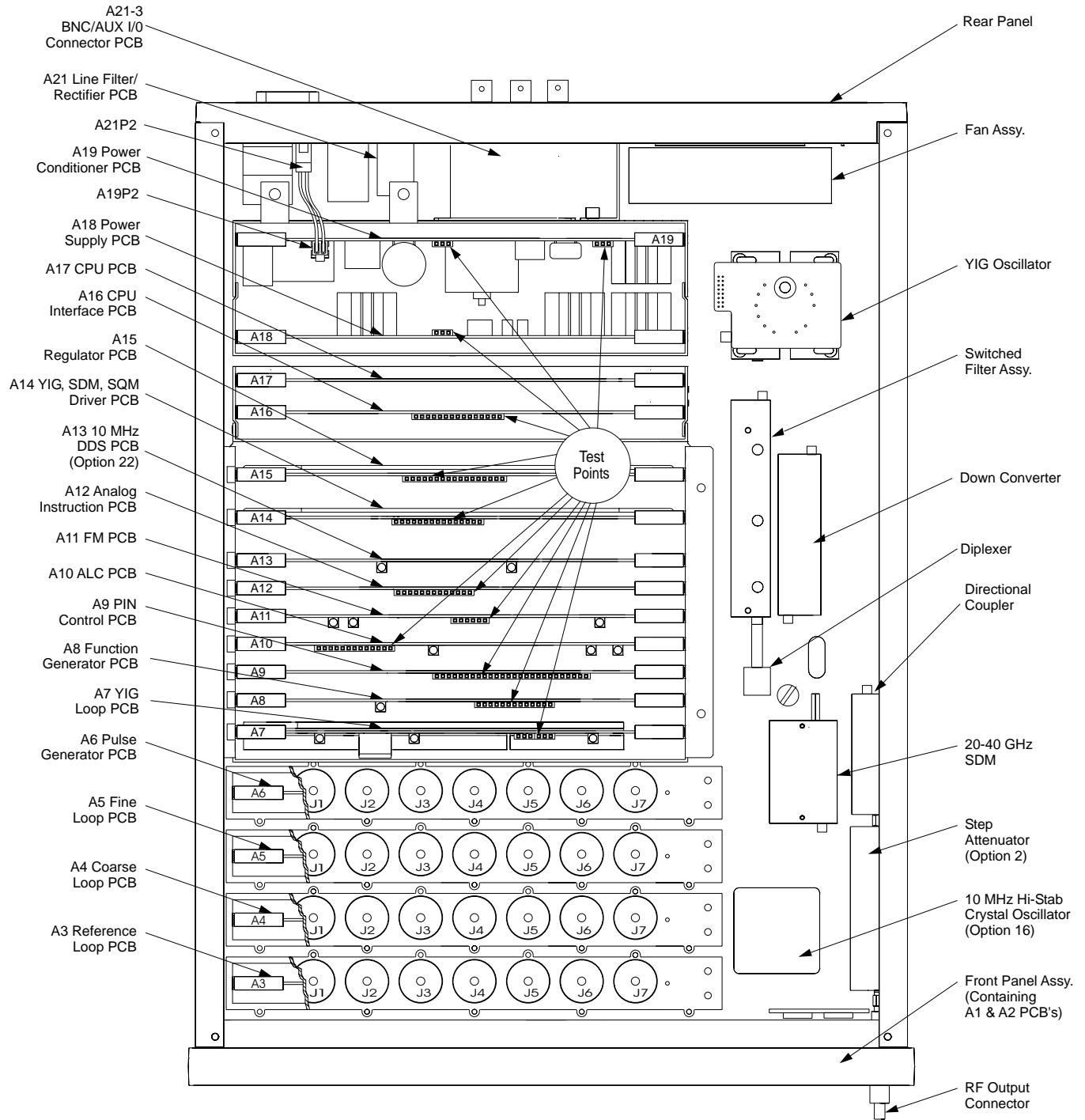
**Step 5** Remove the “O” rings installed on each MCX connector and retain them for use on the replacement PCB.

**Step 6** To replace the PCB, reverse the removal process.



# REMOVAL AND REPLACEMENT PROCEDURES

# PCB AND COMPONENT LOCATOR DIAGRAM



**Figure 6-3.** Assembly and Component Locator Diagram

**6-5** **REMOVING AND  
REPLACING THE A7 PCB**

This paragraph provides instructions for removing and replacing the A7 YIG Loop PCB, which is located in the main card cage (see Figure 6-3).

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

**Procedure** Remove and replace the A7 PCB as follows:

**Step 1** Remove the main card cage cover and set aside.

**Step 2** Using a  $\frac{5}{16}$ -inch wrench, disconnect coaxial cable W31 from the Sampler/SRD module on the PCB.

**Step 3** Disconnect the coaxial cables at A7J1 and A7J5 by lifting up on the cable connectors.

**Step 4** Lift up on the edge tabs of the PCB and lift it out of the card cage.

**Step 5** To replace the A7 PCB, reverse the removal process.

**6-6** **REMOVING AND  
REPLACING THE A8, A9,  
A10, A11, OR A12 PCB**

This paragraph provides instructions for removing and replacing the A8 Function Generator PCB, the A9 PIN Control PCB, the A10 ALC PCB, the A11 FM PCB, or the A12 Analog Instruction PCB, all of which are located in the main card cage (see Figure 6-3).

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

**Procedure** Remove and replace the A8, A9, A10, A11, or A12 PCB as follows:

**Step 1** Remove the main card cage cover and set aside.

**Step 2** Disconnect any coaxial cables from the PCB to be removed by lifting up on the cable connectors.

**Step 3** Lift up on the edge tabs of the PCB and lift it out of the card cage.

**Step 4** To replace the PCB, reverse the removal process.

**6-7 REMOVING AND  
REPLACING THE A13 OR  
A15 PCB**

This paragraph provides instructions for removing and replacing the A13 10 MHz DDS PCB (added by Option 22) or the A15 Regulator PCB, both of which are located in the main card cage (see Figure 6-3). Each of these PCB assemblies consists of a PCB and a PCB Heat Sink subassembly.

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

**Procedure** Remove and replace the A13 or A15 PCB as follows:

**Step 1** Remove the main card cage cover and set aside.

**NOTE**

If the A13 PCB is being removed, first disconnect the coaxial cables from the PCB by lifting up on the cable connectors.

**Step 2** Lift up on the edge tabs of the PCB and lift it out of the card cage.

**Step 3** Using a Phillips screwdriver, remove the two screws that fasten the PCB Heat Sink subassembly to the chassis pan.

**Step 4** Lift the PCB Heat Sink subassembly out of the card cage.

**Step 5** To replace the PCB, reverse the removal process.

**6-8 REMOVING AND  
REPLACING THE A14  
PCB**

This paragraph provides instructions for removing and replacing the A14 YIG, SDM, SQM Driver PCB, which is located in the main card cage (see Figure 6-3). The PCB assembly consists of a PCB and PCB Heat Sink subassembly.

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

**Procedure** Remove and replace the A14 PCB as follows:

**Step 1** Remove the main card cage cover and set aside.

**Step 2** Lift up on the edge tabs of the PCB and lift it out of the card cage.

**Table 6-1.** A14 PCB SW1 Settings

Model	A14 PCB Assy Part Number	SW1 Setting
68317C	40654-3	9
68337C	40654-3	3
68347C	40654-3	3
68367C	40654-3	2
68377C	40654-4	2
68387C	40654-4	2
68397C	40654-4	2

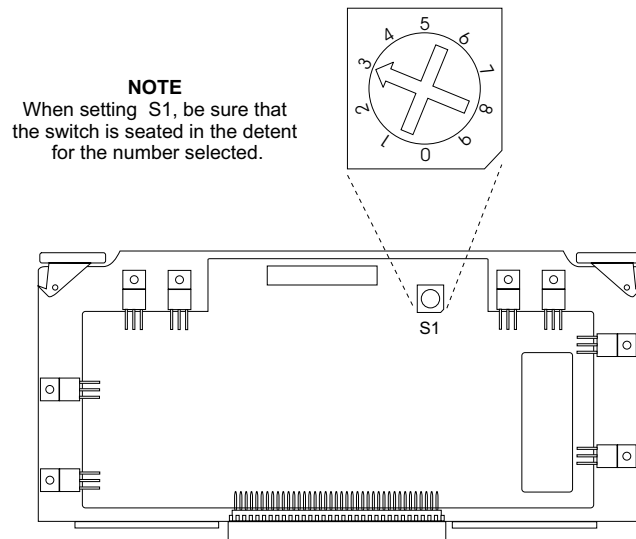
**Step 3** Using a Phillips screwdriver, remove the two screws that fasten the PCB Heat Sink subassembly to the chassis pan.

**Step 4** Lift the PCB Heat Sink subassembly out of the card cage.

**Step 5** Inspect the replacement A14 PCB assembly to ensure that it is the correct part number for the 683XXC model in which it is being installed (see Table 6-1).

**Step 6** Set switch S1 (Figure 6-4) to the correct setting for the 683XXC model in which the A14 PCB is being installed (see Table 6-1).

**Step 7** To replace the PCB, reverse the removal process.



**Figure 6-4.** Switch S1 Location on the A14 PCB

**6-9** **REMOVING AND  
REPLACING THE A16 OR  
A17 PCB**

This paragraph provides instructions for removing and replacing the A16 CPU Interface PCB or the A17 CPU PCB, both of which are located in the CPU housing assembly (see Figure 6-3).

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

**Procedure** Remove and replace the A16 or A17 PCB as follows:

**Step 1** Remove the CPU cover and set aside.

**Step 2** Lift up on the edge tabs of the PCB and lift it out of the CPU housing.

**Step 3** To replace the PCB, reverse the removal process.

**6-10** **REMOVING AND  
REPLACING THE A18  
OR A19 PCB**

This paragraph provides instructions for removing and replacing the A18 Power Supply PCB or the A19 AC Line Conditioner PCB, both of which are located in the power supply housing assembly (see Figure 6-3).

**Preliminary** Disconnect the power cord from the unit and remove the top cover as described in paragraph 6-2.

---

**WARNING**

When power is removed from the instrument, **always** allow five minutes for the capacitors on the A21 Line Filter/Rectifier PCB to discharge before removing either the A18 or A19 PCB.

**Procedure** Remove and replace the A18 or A19 PCB as follows:

**Step 1** Remove the power supply cover and set it aside.

**Step 2** If the A19 PCB is being removed, (1) disconnect the cable assembly from the A21 Line Filter/Rectifier PCB at A19P2 and (2) remove the Nylatch fastener used to secure the PCB to the housing assembly.

**Step 3** Lift up the edge tabs on the PCB and lift it out of the power supply housing.

**Step 4** To replace the PCB, reverse the removal process.

**6-11 REMOVING AND  
REPLACING THE REAR  
PANEL ASSEMBLY**

This paragraph provides instructions for removing and replacing the rear panel assembly of the 683XXC. The rear panel assembly contains the A21 Line Filter/Rectifier PCB, the A21-1 BNC/AUX I/O Connector PCB, the line module assembly, and the fan assembly. Refer to Figure 6-5 during this procedure.

**Preliminary** Disconnect the power cord from the unit and remove the chassis covers as described in paragraph 6-2.

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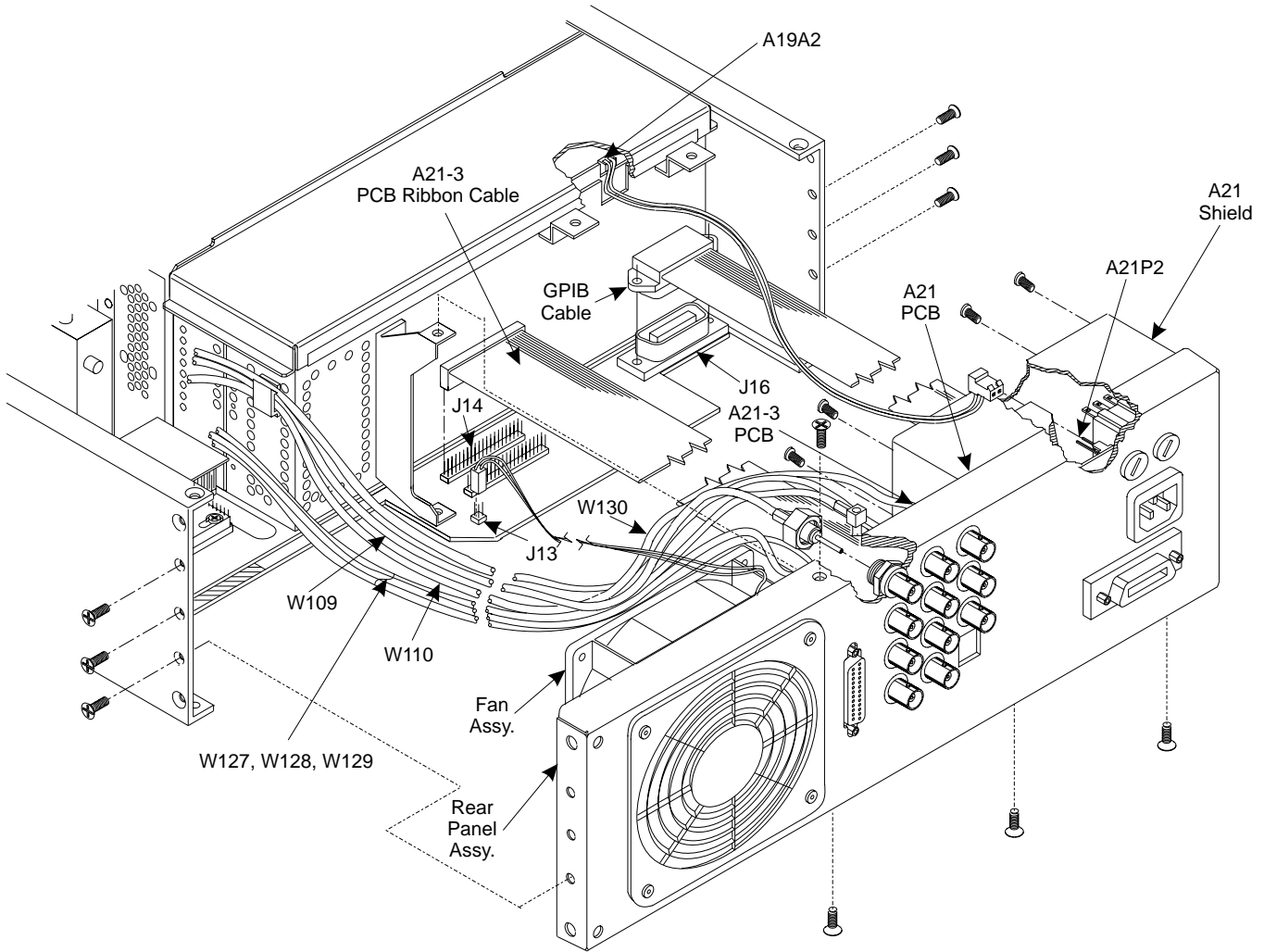
**WARNING**

When power is removed from the instrument, **always** allow five minutes for the capacitors on the A21 Line Filter/Rectifier PCB to discharge before removing the rear panel assembly.

**Procedure** Remove and replace the rear panel assembly as follows:

- Step 1** Using a Phillips screwdriver, remove the screw on the top of the rear panel assembly that fastens the rear panel assembly to the bracket attached to the power supply housing.
- Step 2** Turn the instrument upside down.
- Step 3** Remove the three screws from the rear panel assembly. (One screw fastens the rear panel assembly to the bracket attached to the power supply housing; the other two screws attach the rear panel assembly to the Motherboard.)
- Step 4** Return the instrument to the upright position.
- Step 5** Remove the screws attaching the rear panel assembly to the chassis sides.
- Step 6** Using a  $\frac{7}{16}$ -inch wrench, disconnect the coaxial cables (W110, W109, and W130) going to the rear panel 10 MHz REF IN, 10 MHz REF OUT, and FM IN BNC connectors.
- Step 7** Disconnect the coaxial cables W127, W128, and W129 from the A21-3 PCB by lifting up on the cable connectors.
- Step 8** Remove the power supply cover and set it aside.

- Step 9** Disconnect the cable assembly from the A21 Line Filter/Rectifier PCB at connector P2 on the A19 PCB.
- Step 10** Carefully pull the rear panel assembly away from the signal generator chassis until the cable connections to the Motherboard are accessible.
- Step 11** Disconnect the fan cable connector from J13 on the Motherboard.
- Step 12** Disconnect the A21-3 PCB ribbon cable connector from J14 on the Motherboard.
- Step 13** Disconnect the GPIB cable connector from J16 on the Motherboard.
- Step 14** Carefully pull the rear panel assembly completely free from the 683XXC chassis.
- Step 15** To replace the rear panel assembly, reverse the removal process.



**Figure 6-5.** Rear Panel Assembly Removal



**6-12 REMOVING AND  
REPLACING THE  
A21 PCB**

This paragraph provides instructions for removing and replacing the A21 Line Filter/Rectifier PCB, which is located on the rear panel assembly (see Figure 6-5).

**Preliminary** Disconnect the power cord from the unit. Remove the chassis covers as described in paragraph 6-2. Remove the rear panel assembly as described in paragraph 6-11.

---

**WARNING**

When power is removed from the instrument, **always** allow five minutes for the capacitors on the A21 Line Filter/Rectifier PCB to discharge before removing the rear panel assembly.

**Procedure** Remove and replace the A21 PCB as follows:

**Step 1** Using a Phillips screwdriver, remove the four screws that fasten the A21 shield to the A21 PCB.

**Step 2** Remove the shield and set it aside.

**Step 3** Disconnect the cables connected to P1, P2, and P6 on the PCB.

**Step 4** Using a Phillips screwdriver, remove the four screws that fasten the PCB to the rear panel assembly and set aside.

**Step 5** Remove the PCB from the rear panel assembly.

**Step 6** To replace the PCB, reverse the removal process.

**6-13 REMOVING AND  
REPLACING THE  
A21-3 PCB**

This paragraph provides instructions for removing and replacing the A21-3 BNC/AUX I/O Connector PCB, which is located on the rear panel assembly (see Figure 6-5).

**Preliminary** Disconnect the power cord from the unit. Remove the chassis covers as described in paragraph 6-2. Remove the rear panel assembly as described in paragraph 6-11.

---

**WARNING**

When power is removed from the instrument, **always** allow five minutes for the capacitors on the A21 Line Filter/Rectifier PCB to discharge before removing the A21-3 PCB.

**Procedure** Remove and replace the A21-3 PCB as follows:

- Step 1** Using a Phillips screwdriver, remove the four screws that fasten the A21 shield to the A21 PCB.
- Step 2** Remove the shield and set it aside.
- Step 3** Disconnect the ribbon cable connector from the A21-3 PCB.
- Step 4** Using a Anritsu P/N T1451 tool, remove the dress nuts from the 8 rear panel BNC connectors.
- Step 5** Carefully remove the A21-3 PCB from the rear panel assembly.
- Step 6** To replace the PCB, reverse the removal process.

**6-14 REMOVING AND  
REPLACING THE FAN  
ASSEMBLY**

This paragraph provides instructions for removing and replacing the fan assembly, which is located on the rear panel assembly (see Figure 6-5).

**Preliminary** Disconnect the power cord from the unit. Remove the chassis covers as described in paragraph 6-2. Remove the rear panel assembly as described in paragraph 6-11.

---

**WARNING**

When power is removed from the instrument, **always** allow five minutes for the capacitors on the A21 Line Filter/Rectifier PCB to discharge before removing the rear panel assembly.

**Procedure** Remove and replace the fan assembly as follows:

- Step 1** With the rear panel laying flat, use a Phillips screwdriver to remove the four screws and flat washers that fasten the fan mount to the rear panel.
- Step 2** Lift the fan mount, containing the fan assembly, from the rear panel assembly.
- Step 3** Remove the fan assembly from the fan mount.
- Step 4** Clean the honeycomb fan filter as required before replacing the fan assembly.
- Step 5** To replace the fan assembly, reverse the removal process.

**NOTE**

To ensure proper cooling of the unit, **always** mount the fan assembly with the airflow direction indicator arrow on the fan body pointing toward the interior of the instrument.



# Appendix A

## Test Records

### **A-1** INTRODUCTION

This appendix provides test records for recording the results of the Performance Verification tests (Chapter 3) and the Calibration procedures (Chapter 4). They jointly provide the means for maintaining an accurate and complete record of instrument performance. Test records are provided for all models of the Series 683XXC Synthesized High Performance Signal Generators. Table A-1 provides the location of each test record in this appendix.

Each test record has been customized to cover a particular 683XXC model. It contains specific references to frequency parameters and power levels that are applicable only to that instrument model and its available options.

We recommend that you make a copy of these pages each time the test procedures are performed. By dating each Test Record copy, a detailed history of instrument performance can be accumulated.

**Table A-1.** *Test Record Index*

Model Number	Performance Verification	Calibration
68317C	A-3 thru A-17	A-19 thru A-21
68337C	A-23 thru A-36	A-37 thru A-39
68347C	A-41 thru A-56	A-57 thru A-59
68367C	A-61 thru A-74	A-75 thru A-77
68377C	A-79 thru A-89	A-91 thru A-93
68387C	A-95 thru A-105	A-107 thru A-109
68397C	A-111 thru A-120	A-121 thru A-123



Anritsu Model 68317C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

<b>3-6 Internal Time Base Aging Rate Test</b>
---

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____per day	$2 \times 10^{-8}$ per day ( $5 \times 10^{-10}$ per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (Standard 68317C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specification for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68317C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz



**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 10 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 20 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 30 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 40 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 350 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-40 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the level of the harmonics of the 1.6 GHz carrier:		
3.2 GHz (2nd harmonic) . . . . .	_____dBc	-40 dBc
4.8 GHz (3rd harmonic) . . . . .	_____dBc	-40 dBc

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

<i>Test Procedure (2 to 10 GHz)</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.1 GHz Record the level of all harmonics of the 2.1 GHz carrier:		
4.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
6.3 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
8.4 GHz (4th harmonic) . . . . .	_____dBc	-60 dBc*
10.5 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*
12.6 GHz (6th harmonic) . . . . .	_____dBc	-60 dBc*
14.7 GHz (7th harmonic) . . . . .	_____dBc	-60 dBc*
16.8 GHz (8th harmonic) . . . . .	_____dBc	-60 dBc*
18.9 GHz (9th harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 3.6 GHz Record the level of all harmonics of the 3.6 GHz carrier:		
7.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
10.8 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
14.4 GHz (4th harmonic) . . . . .	_____dBc	-60 dBc*
18.0 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 8.4 GHz Record the level of all harmonics of the 7 GHz carrier:		
16.8 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
25.2 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*

\* -50 dBc if Option 15B (High Power) installed.

**3-10 Single Sideband Phase Noise Test**

**Test Procedure**

**Measured Value**

**Upper Limit**

Set F1 to 2.0 GHz

Record the phase noise levels at these offsets:

100 Hz . . . . .	_____dBc	-77 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc

Set F1 to 6.0 GHz

Record the phase noise levels at these offsets:

100 Hz . . . . .	_____dBc	-75 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68317C w/o Option 2 Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+ 13 dBm	_____dBm	+ 13 dBm	_____dBm
+ 12 dBm	_____dBm	+ 12 dBm	_____dBm
+ 11 dBm	_____dBm	+ 11 dBm	_____dBm
+ 10 dBm	_____dBm	+ 10 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 13 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 13 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 8.4 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68317C w/Option 2A Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+ 11 dBm	_____dBm	+ 11 dBm	_____dBm
+ 10 dBm	_____dBm	+ 10 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm
+ 0 dBm	_____dBm	+ 0 dBm	_____dBm
- 1 dBm	_____dBm	- 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 11 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 11 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 8.4 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68317C w/Option 2E Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm
+ 0 dBm	_____dBm	+ 0 dBm	_____dBm
- 1 dBm	_____dBm	- 1 dBm	_____dBm
- 2 dBm	_____dBm	- 2 dBm	_____dBm
- 3 dBm	_____dBm	- 3 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 9 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 9 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 8.4 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68317C w/Option 15B High Power & w/o Option 2 Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+13 dBm	_____dBm	+17 dBm	_____dBm
+12 dBm	_____dBm	+16 dBm	_____dBm
+11 dBm	_____dBm	+15 dBm	_____dBm
+10 dBm	_____dBm	+14 dBm	_____dBm
+ 9 dBm	_____dBm	+13 dBm	_____dBm
+ 8 dBm	_____dBm	+12 dBm	_____dBm
+ 7 dBm	_____dBm	+11 dBm	_____dBm
+ 6 dBm	_____dBm	+10 dBm	_____dBm
+ 5 dBm	_____dBm	+ 9 dBm	_____dBm
+ 4 dBm	_____dBm	+ 8 dBm	_____dBm
+ 3 dBm	_____dBm	+ 7 dBm	_____dBm
+ 2 dBm	_____dBm	+ 6 dBm	_____dBm
+ 1 dBm	_____dBm	+ 5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 13 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 13 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 8.4 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68317C w/Option 15B & w/Option 2A Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+15 dBm	_____dBm
+10 dBm	_____dBm	+14 dBm	_____dBm
+ 9 dBm	_____dBm	+13 dBm	_____dBm
+ 8 dBm	_____dBm	+12 dBm	_____dBm
+ 7 dBm	_____dBm	+11 dBm	_____dBm
+ 6 dBm	_____dBm	+10 dBm	_____dBm
+ 5 dBm	_____dBm	+ 9 dBm	_____dBm
+ 4 dBm	_____dBm	+ 8 dBm	_____dBm
+ 3 dBm	_____dBm	+ 7 dBm	_____dBm
+ 2 dBm	_____dBm	+ 6 dBm	_____dBm
+ 1 dBm	_____dBm	+ 5 dBm	_____dBm
+ 0 dBm	_____dBm	+ 4 dBm	_____dBm
- 1 dBm	_____dBm	+ 3 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 11 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 11 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 8.4 GHz)(typical, not a specification).



**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68317C w/Option 15B & w/Option 2E Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+11 dBm	_____dBm
+10 dBm	_____dBm	+10 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm
+ 0 dBm	_____dBm	+ 0 dBm	_____dBm
- 1 dBm	_____dBm	- 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 11 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 11 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 8.4 GHz)(typical, not a specification).

**3-12 Amplitude Modulation Test**

<b>AM Input Sensitivity Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<b>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<b>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68317C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<b>FM Input Sensitivity Procedure (Locked FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68317C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68317C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRI (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (1 GHz, Pulse Width = 1.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 1.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (1 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level (Continued)**

<i>Pulse Level Accuracy (5 GHz, Pulse Width = 0.5 <math>\mu</math>s)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

<i>Test Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s Set PRI (period) to 0.01 ms			
Measure and record the Video Feedthrough voltage spikes . . . . .	-10 mV	_____ mV	+10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

**Test Procedure (1 GHz)**

Set F1 to 1.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

Lower Limit	Measured Value	Upper Limit
60 dB	_____ dB	N/A

**Test Procedure (5 GHz)**

Set F1 to 5.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

Lower Limit	Measured Value	Upper Limit
60 dB	_____ dB	N/A

**3-17 Phase Modulation Tests**

**$\Phi$ M Input Sensitivity Procedure  
(Wide  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68317C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%

**$\Phi$ M Input Sensitivity Procedure  
(Narrow  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68317C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%



Anritsu Model 68317C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

***Procedure Step***

**Step Completion**

- 1. Internal DVM Calibration (calterm119) . . . . . \_\_\_\_\_
- 2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . . \_\_\_\_\_
- 3. Fine Loop Pretune DAC Calibration (calterm 136). . . . . \_\_\_\_\_
- 4. Sweep Time DAC Calibration (calterm 132) . . . . . \_\_\_\_\_
- 5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . . \_\_\_\_\_
- 6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . . \_\_\_\_\_
- 7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . . \_\_\_\_\_
- 8. Ramp Center DAC Calibration (calterm 129) . . . . . \_\_\_\_\_
- 9. Sweep Width DAC Calibration (calterm 133) . . . . . \_\_\_\_\_
- 10. Center Frequency DAC Calibration (calterm 114) . . . . . \_\_\_\_\_
- 11. Store the Calibration Data . . . . . \_\_\_\_\_

**4-8 Switched Filter Shaper Calibration**

***Log Amplifier Zero Calibration***

**Step Completion**

- 1. Log Amplifier Zero Calibration (calterm 115) . . . . . \_\_\_\_\_

***Limiter DAC Adjustment (68317C's with Option 15B)***

- 2. Limiter DAC Adjustment (calterm 145). . . . . \_\_\_\_\_

***Shaper DAC Adjustment***

- 2. Shaper DAC Adjustment (calterm 138) . . . . . \_\_\_\_\_
- 3. Store the Calibration Data . . . . . \_\_\_\_\_

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____
6. Store the Calibration Data . . . . .	_____



**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
5. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
6. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152). . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____



Anritsu Model 68337C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

<b>3-6 Internal Time Base Aging Rate Test</b>
---

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____ per day	$2 \times 10^{-8}$ per day ( $5 \times 10^{-10}$ per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____
9.000 000 000	_____
10.000 000 000	_____
11.000 000 000	_____
12.000 000 000	_____
13.000 000 000	_____
14.000 000 000	_____
15.000 000 000	_____
16.000 000 000	_____
17.000 000 000	_____
18.000 000 000	_____
19.000 000 000	_____
20.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (Standard 68337C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specification for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68337C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz

**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

This test is not applicable to the 68337C model.

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

<i>Test Procedure (2 to 10 GHz)</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.1 GHz Record the level of all harmonics of the 2.1 GHz carrier:		
4.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
6.3 GHz (3rd harmonic). . . . .	_____dBc	-60 dBc*
8.4 GHz (4th harmonic). . . . .	_____dBc	-60 dBc*
10.5 GHz (5th harmonic). . . . .	_____dBc	-60 dBc*
12.6 GHz (6th harmonic). . . . .	_____dBc	-60 dBc*
14.7 GHz (7th harmonic). . . . .	_____dBc	-60 dBc*
16.8 GHz (8th harmonic). . . . .	_____dBc	-60 dBc*
18.9 GHz (9th harmonic). . . . .	_____dBc	-60 dBc*
Set F1 to 3.6 GHz Record the level of all harmonics of the 3.6 GHz carrier:		
7.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
10.8 GHz (3rd harmonic). . . . .	_____dBc	-60 dBc*
14.4 GHz (4th harmonic). . . . .	_____dBc	-60 dBc*
18.0 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 7.0 GHz Record the level of all harmonics of the 7 GHz carrier:		
14.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 10.0 GHz Record the level of all harmonics of the 10 GHz carrier:		
20.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*

\* -50 dBc if Option 15B (High Power) installed.

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz (Continued)**

<i>Test Procedure (11 to 20 GHz)</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 12.4 GHz Record the level of all harmonics of the 12.4 GHz carrier:		
24.8 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
37.2 GHz (3rd harmonic). . . . .	_____dBc	-60 dBc*
Set F1 to 16.0 GHz Record the level of all harmonics of the 16.0 GHz carrier:		
32.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 20.0 GHz Record the level of all harmonics of the 20.0 GHz carrier:		
40.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*

\* -50 dBc if Option 15B (High Power) installed.

**3-10 Single Sideband Phase Noise Test**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-77 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 6.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-75 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 10.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-70 dBc
1 kHz . . . . .	_____dBc	-83 dBc
10 kHz . . . . .	_____dBc	-80 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 20.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-63 dBc
1 kHz . . . . .	_____dBc	-75 dBc
10 kHz . . . . .	_____dBc	-75 dBc
100 kHz . . . . .	_____dBc	-97 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68337C w/o Option 2 Step Attenuator)****Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz

Set L1 to:	Measured Power *
+13 dBm	_____dBm
+12 dBm	_____dBm
+11 dBm	_____dBm
+10 dBm	_____dBm
+ 9 dBm	_____dBm
+ 8 dBm	_____dBm
+ 7 dBm	_____dBm
+ 6 dBm	_____dBm
+ 5 dBm	_____dBm
+ 4 dBm	_____dBm
+ 3 dBm	_____dBm
+ 2 dBm	_____dBm
+ 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+13.0 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+13 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 2.0 dB (typical, not a specification).



<b>3-11 Power Level Accuracy and Flatness Tests (Continued) (Model 68337C w/Option 2A Step Attenuator)</b>
--

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz

Set L1 to:	Measured Power *
+11 dBm	_____dBm
+10 dBm	_____dBm
+ 9 dBm	_____dBm
+ 8 dBm	_____dBm
+ 7 dBm	_____dBm
+ 6 dBm	_____dBm
+ 5 dBm	_____dBm
+ 4 dBm	_____dBm
+ 3 dBm	_____dBm
+ 2 dBm	_____dBm
+ 1 dBm	_____dBm
+ 0 dBm	_____dBm
- 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+11 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+11 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 6.0 dB (typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68337C w/Option 2F Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz

Set L1 to:      Measured Power \*

+ 3 dBm	_____dBm
+ 2 dBm	_____dBm
+ 1 dBm	_____dBm
+ 0 dBm	_____dBm
- 1 dBm	_____dBm
- 2 dBm	_____dBm
- 3 dBm	_____dBm
- 4 dBm	_____dBm
- 5 dBm	_____dBm
- 6 dBm	_____dBm
- 7 dBm	_____dBm
- 8 dBm	_____dBm
- 9 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 6.0 dB (typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68337C w/Option 15B High Power & w/o Option 2 Step Attenuator)****Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz

Set L1 to:	Measured Power *
+17 dBm	_____dBm
+16 dBm	_____dBm
+15 dBm	_____dBm
+14 dBm	_____dBm
+13 dBm	_____dBm
+12 dBm	_____dBm
+11 dBm	_____dBm
+10 dBm	_____dBm
+ 9 dBm	_____dBm
+ 8 dBm	_____dBm
+ 7 dBm	_____dBm
+ 6 dBm	_____dBm
+ 5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+17 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+17 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 2.0 dB (typical, not a specification).

**3-11 Power Level Accuracy And Flatness Tests (Continued)  
(Model 68337C w/Option 15B High Power & w/Option 2A Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz

Set L1 to:	Measured Power *
+15 dBm	_____dBm
+14 dBm	_____dBm
+13 dBm	_____dBm
+12 dBm	_____dBm
+11 dBm	_____dBm
+10 dBm	_____dBm
+ 9 dBm	_____dBm
+ 8 dBm	_____dBm
+ 7 dBm	_____dBm
+ 6 dBm	_____dBm
+ 5 dBm	_____dBm
+ 4 dBm	_____dBm
+ 3 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+15 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+15 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 6.0 dB (typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68337C w/Option 15B High Power & w/Option 2F Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz

Set L1 to:	Measured Power *
+ 7 dBm	_____dBm
+ 6 dBm	_____dBm
+ 5 dBm	_____dBm
+ 4 dBm	_____dBm
+ 3 dBm	_____dBm
+ 2 dBm	_____dBm
+ 1 dBm	_____dBm
+ 0 dBm	_____dBm
- 1 dBm	_____dBm
- 2 dBm	_____dBm
- 3 dBm	_____dBm
- 4 dBm	_____dBm
- 5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 7.5 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 7.5 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 6.0 dB (typical, not a specification).

**3-12 Amplitude Modulation Test**

<b>AM Input Sensitivity Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<b>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<b>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68337C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<b>FM Input Sensitivity Procedure (Locked FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68337C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68337C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRI (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (5 GHz, Pulse Width = 0.5  $\mu$ s)**

Set F1 to 5.0 GHz			
Set pulse width W1 to 0.5 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 5.0 GHz			
Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

<i>Test Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s Set PRI (period) to 0.01 ms			
Measure and record the Video Feedthrough voltage spikes . . . . .	-10 mV	_____ mV	+10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

<i>Test Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .	60 dB	_____ dB	N/A

**3-17 Phase Modulation Tests**

<i><math>\Phi</math>M Input Sensitivity Procedure (Wide <math>\Phi</math>M Mode)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the $\Phi$ M deviation displayed on the 68337C . . . . .		_____ rad	
Calculate and record the $\Phi$ M accuracy . . . . .	93.7%	_____ %	106.3%

<i><math>\Phi</math>M Input Sensitivity Procedure (Narrow <math>\Phi</math>M Mode)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the $\Phi$ M deviation displayed on the 68337C . . . . .		_____ rad	
Calculate and record the $\Phi$ M accuracy . . . . .	93.7%	_____ %	106.3%



Anritsu Model 68337C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

<i>Procedure Step</i>	<b>Step Completion</b>
1. Internal DVM Calibration (calterm119) . . . . .	_____
2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . .	_____
3. Fine Loop Pretune DAC Calibration (calterm 136). . . . .	_____
4. Sweep Time DAC Calibration (calterm 132) . . . . .	_____
5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . .	_____
6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . .	_____
7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . .	_____
8. Ramp Center DAC Calibration (calterm 129) . . . . .	_____
9. Sweep Width DAC Calibration (calterm 133) . . . . .	_____
10. Center Frequency DAC Calibration (calterm 114) . . . . .	_____
11. Store the Calibration Data . . . . .	_____

**4-8 Switched Filter Shaper Calibration**

<i>Log Amplifier Zero Calibration</i>	<b>Step Completion</b>
1. Log Amplifier Zero Calibration (calterm 115) . . . . .	_____

***Limiter DAC Adjustment (Model 68337C's with Option 15B)***

2. Limiter DAC Adjustment (calterm 145). . . . .	_____
--	-------

***Shaper DAC Adjustment***

2. Shaper DAC Adjustment (calterm 138) . . . . .	_____
3. Store the Calibration Data . . . . .	_____

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____
6. Store the Calibration Data . . . . .	_____

**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
7. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
8. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152). . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____



Anritsu Model 68347C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

<b>3-6 Internal Time Base Aging Rate Test</b>
---

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____ per day	$2 \times 10^{-8}$ per day ( $5 \times 10^{-10}$ per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____
9.000 000 000	_____
10.000 000 000	_____
11.000 000 000	_____
12.000 000 000	_____
13.000 000 000	_____
14.000 000 000	_____
15.000 000 000	_____
16.000 000 000	_____
17.000 000 000	_____
18.000 000 000	_____
19.000 000 000	_____
20.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz.

**Fine Loop Test Procedure (Standard 68347C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specifications for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68347C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz.

**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

<b>Test Procedure</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 10 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 20 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 30 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 40 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 350 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-40 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the level of the harmonics of the 1.6 GHz carrier:		
3.2 GHz (2nd harmonic) . . . . .	_____dBc	-40 dBc
4.8 GHz (3rd harmonic) . . . . .	_____dBc	-40 dBc

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

**Test Procedure (2 to 10 GHz)**

**Measured Value**

**Upper Limit**

Set F1 to 2.1 GHz

Record the level of all harmonics of the 2.1 GHz carrier:

4.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
6.3 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
8.4 GHz (4th harmonic) . . . . .	_____dBc	-60 dBc*
10.5 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*
12.6 GHz (6th harmonic) . . . . .	_____dBc	-60 dBc*
14.7 GHz (7th harmonic) . . . . .	_____dBc	-60 dBc*
16.8 GHz (8th harmonic) . . . . .	_____dBc	-60 dBc*
18.9 GHz (9th harmonic) . . . . .	_____dBc	-60 dBc*

Set F1 to 3.6 GHz

Record the level of all harmonics of the 3.6 GHz carrier:

7.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
10.8 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
14.4 GHz (4th harmonic) . . . . .	_____dBc	-60 dBc*
18.0 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*

Set F1 to 7.0 GHz

Record the level of all harmonics of the 7 GHz carrier:

14.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
-----------------------------------	----------	----------

Set F1 to 10.0 GHz

Record the level of all harmonics of the 10 GHz carrier:

20.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
-----------------------------------	----------	----------

\* -50 dBc if Option 15B (High Power) installed.



**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz (Continued)**

<b>Test Procedure (11 to 20 GHz)</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 12.4 GHz Record the level of all harmonics of the 12.4 GHz carrier:		
24.8 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
37.2 GHz (3rd harmonic). . . . .	_____dBc	-60 dBc*
Set F1 to 16.0 GHz Record the level of all harmonics of the 16.0 GHz carrier:		
32.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 20.0 GHz Record the level of all harmonics of the 20.0 GHz carrier:		
40.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*

\* -50 dBc if Option 15B (High Power) installed.

**3-10 Single Sideband Phase Noise Test**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-77 dBc
1 kHz . . . . .	_____ dBc	-85 dBc
10 kHz . . . . .	_____ dBc	-83 dBc
100 kHz . . . . .	_____ dBc	-99 dBc
Set F1 to 6.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-75 dBc
1 kHz . . . . .	_____ dBc	-85 dBc
10 kHz . . . . .	_____ dBc	-83 dBc
100 kHz . . . . .	_____ dBc	-99 dBc
Set F1 to 10.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-70 dBc
1 kHz . . . . .	_____ dBc	-83 dBc
10 kHz . . . . .	_____ dBc	-80 dBc
100 kHz . . . . .	_____ dBc	-99 dBc
Set F1 to 20.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-63 dBc
1 kHz . . . . .	_____ dBc	-75 dBc
10 kHz . . . . .	_____ dBc	-75 dBc
100 kHz . . . . .	_____ dBc	-97 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68347C w/o Option 2 Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+13 dBm	_____dBm	+13 dBm	_____dBm
+12 dBm	_____dBm	+12 dBm	_____dBm
+11 dBm	_____dBm	+11 dBm	_____dBm
+10 dBm	_____dBm	+10 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+13 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+13 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68347C w/Option 2A Step Attenuator)****Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+11 dBm	_____dBm
+10 dBm	_____dBm	+10 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm
+ 0 dBm	_____dBm	+ 0 dBm	_____dBm
- 1 dBm	_____dBm	- 1 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.\* Specification is  $\pm 1.0$  dB.**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+11 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+11 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68347C w/Option 2F Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm
+ 0 dBm	_____dBm	+ 0 dBm	_____dBm
- 1 dBm	_____dBm	- 1 dBm	_____dBm
- 2 dBm	_____dBm	- 2 dBm	_____dBm
- 3 dBm	_____dBm	- 3 dBm	_____dBm
- 4 dBm	_____dBm	- 4 dBm	_____dBm
- 5 dBm	_____dBm	- 5 dBm	_____dBm
- 6 dBm	_____dBm	- 6 dBm	_____dBm
- 7 dBm	_____dBm	- 7 dBm	_____dBm
- 8 dBm	_____dBm	- 8 dBm	_____dBm
- 9 dBm	_____dBm	- 9 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68347C w/Option 15B High Power & w/o Option 2 Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+13 dBm	_____dBm	+17 dBm	_____dBm
+12 dBm	_____dBm	+16 dBm	_____dBm
+11 dBm	_____dBm	+15 dBm	_____dBm
+10 dBm	_____dBm	+14 dBm	_____dBm
+ 9 dBm	_____dBm	+13 dBm	_____dBm
+ 8 dBm	_____dBm	+ 12dBm	_____dBm
+ 7 dBm	_____dBm	+11 dBm	_____dBm
+ 6 dBm	_____dBm	+10 dBm	_____dBm
+ 5 dBm	_____dBm	+ 9 dBm	_____dBm
+ 4 dBm	_____dBm	+ 8 dBm	_____dBm
+ 3 dBm	_____dBm	+ 7dBm	_____dBm
+ 2 dBm	_____dBm	+ 6 dBm	_____dBm
+ 1 dBm	_____dBm	+ 5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+13 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+13 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68347C w/Option 15B High Power & w/Option 2A Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+15 dBm	_____dBm
+10 dBm	_____dBm	+14 dBm	_____dBm
+ 9 dBm	_____dBm	+13 dBm	_____dBm
+ 8 dBm	_____dBm	+12 dBm	_____dBm
+ 7 dBm	_____dBm	+11 dBm	_____dBm
+ 6 dBm	_____dBm	+10 dBm	_____dBm
+ 5 dBm	_____dBm	+ 9 dBm	_____dBm
+ 4 dBm	_____dBm	+ 8 dBm	_____dBm
+ 3 dBm	_____dBm	+ 7 dBm	_____dBm
+ 2 dBm	_____dBm	+ 6 dBm	_____dBm
+ 1 dBm	_____dBm	+ 5 dBm	_____dBm
+ 0 dBm	_____dBm	+ 4 dBm	_____dBm
- 1 dBm	_____dBm	+ 3 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+11 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+11 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68347C w/Option 15B High Power & w/Option 2F Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+ 7 dBm	_____dBm
+10 dBm	_____dBm	+ 6 dBm	_____dBm
+ 9 dBm	_____dBm	+ 5 dBm	_____dBm
+ 8 dBm	_____dBm	+ 4 dBm	_____dBm
+ 7 dBm	_____dBm	+ 3 dBm	_____dBm
+ 6 dBm	_____dBm	+ 2 dBm	_____dBm
+ 5 dBm	_____dBm	+ 1 dBm	_____dBm
+ 4 dBm	_____dBm	+ 0 dBm	_____dBm
+ 3 dBm	_____dBm	- 1 dBm	_____dBm
+ 2 dBm	_____dBm	- 2 dBm	_____dBm
+ 1 dBm	_____dBm	- 3 dBm	_____dBm
+ 0 dBm	_____dBm	- 4 dBm	_____dBm
- 1 dBm	_____dBm	- 5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 7 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 7 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz)(typical, not a specification).



**3-12 Amplitude Modulation Test**

<b>AM Input Sensitivity Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<b>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<b>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</b>			
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68347C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<b>FM Input Sensitivity Procedure (Locked FM Mode)</b>			
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68347C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68347C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRF (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (1 GHz, Pulse Width = 1.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 1.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (1 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level (Continued)**

<i>Pulse Level Accuracy (5 GHz, Pulse Width = 0.5 μs)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 μs			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0 μs)**

Set F1 to 5.0 GHz Set pulse width W1 to 5.0 μs			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

<i>Test Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 μs Set PRI (period) to 0.01 ms			
Measure and record the Video Feedthrough voltage spikes . . . . .	-10 mV	_____ mV	+10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

**Test Procedure (1 GHz)**

Set F1 to 1.10 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

Lower Limit	Measured Value	Upper Limit
60 dB	_____dB	N/A

**Test Procedure (5 GHz)**

Set F1 to 5.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

60 dB	_____dB	N/A
-------	---------	-----

**3-17 Phase Modulation Tests**

**$\Phi$ M Input Sensitivity Procedure  
(Wide  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68347C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%

**$\Phi$ M Input Sensitivity Procedure  
(Narrow  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68347C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%

Anritsu Model 68347C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

***Procedure Step***

**Step Completion**

- 1. Internal DVM Calibration (calterm119) . . . . . \_\_\_\_\_
- 2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . . \_\_\_\_\_
- 3. Fine Loop Pretune DAC Calibration (calterm 136). . . . . \_\_\_\_\_
- 4. Sweep Time DAC Calibration (calterm 132) . . . . . \_\_\_\_\_
- 5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . . \_\_\_\_\_
- 6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . . \_\_\_\_\_
- 7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . . \_\_\_\_\_
- 8. Ramp Center DAC Calibration (calterm 129) . . . . . \_\_\_\_\_
- 9. Sweep Width DAC Calibration (calterm 133) . . . . . \_\_\_\_\_
- 10. Center Frequency DAC Calibration (calterm 114) . . . . . \_\_\_\_\_
- 11. Store the Calibration Data . . . . . \_\_\_\_\_

**4-8 Switched Filter Shaper Calibration**

***Log Amplifier Zero Calibration***

**Step Completion**

- 1. Log Amplifier Zero Calibration (calterm 115) . . . . . \_\_\_\_\_

***Limiter DAC Adjustment (Model 68347C's with Option 15B)***

- 2. Limiter DAC Adjustment (calterm 145). . . . . \_\_\_\_\_

***Shaper DAC Adjustment***

- 2. Shaper DAC Adjustment (calterm 138) . . . . . \_\_\_\_\_
- 3. Store the Calibration Data . . . . . \_\_\_\_\_

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<b>Step Completion</b>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<b>Step Completion</b>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<b>Step Completion</b>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____
6. Store the Calibration Data . . . . .	_____

**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
7. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
8. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152). . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____





Anritsu Model 68367C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

<b>3-6 Internal Time Base Aging Rate Test</b>
---

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____ per day	$2 \times 10^{-8}$ per day ( $5 \times 10^{-10}$ per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____
9.000 000 000	_____
10.000 000 000	_____
11.000 000 000	_____
12.000 000 000	_____
13.000 000 000	_____
14.000 000 000	_____
15.000 000 000	_____
16.000 000 000	_____
17.000 000 000	_____
18.000 000 000	_____
19.000 000 000	_____
20.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz.

**Fine Loop Test Procedure (Standard 68367C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specifications for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68367C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz.

**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 10 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 20 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 30 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 40 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 350 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-40 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the level of the harmonics of the 1.6 GHz carrier:		
3.2 GHz (2nd harmonic) . . . . .	_____dBc	-40 dBc
4.8 GHz (3rd harmonic) . . . . .	_____dBc	-40 dBc

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

<i>Test Procedure (2 to 10 GHz)</i>	Measure Value	Upper Limit
Set F1 to 2.1 GHz		
Record the level of all harmonics of the 2.1 GHz carrier:		
4.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
6.3 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
8.4 GHz (4th harmonic) . . . . .	_____dBc	-60 dBc*
10.5 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*
12.6 GHz (6th harmonic) . . . . .	_____dBc	-60 dBc*
14.7 GHz (7th harmonic) . . . . .	_____dBc	-60 dBc*
16.8 GHz (8th harmonic) . . . . .	_____dBc	-60 dBc*
18.9 GHz (9th harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 3.6 GHz		
Record the level of all harmonics of the 3.6 GHz carrier:		
7.2 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
10.8 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
14.4 GHz (4th harmonic) . . . . .	_____dBc	-60 dBc*
18.0 GHz (5th harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 7.0 GHz		
Record the level of all harmonics of the 7 GHz carrier:		
14.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 10.0 GHz		
Record the level of all harmonics of the 10 GHz carrier:		
20.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*

\* -50 dBc if Option 15B (High Power) installed.

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz (Continued)**

<i>Test Procedure (11 to 20 GHz)</i>	<b>Measure Value</b>	<b>Upper Limit</b>
Set F1 to 12.4 GHz Record the level of all harmonics of the 12.4 GHz carrier:		
24.8 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
37.2 GHz (3rd harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 16.0 GHz Record the level of all harmonics of the 16.0 GHz carrier:		
32.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*
Set F1 to 20.0 GHz Record the level of all harmonics of the 20.0 GHz carrier:		
40.0 GHz (2nd harmonic) . . . . .	_____dBc	-60 dBc*

\* -50 dBc if Option 15B (High Power) installed.

**3-10 Single Sideband Phase Noise Test**

<b>Test Procedure</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-77 dBc
1 kHz . . . . .	_____ dBc	-85 dBc
10 kHz . . . . .	_____ dBc	-83 dBc
100 kHz . . . . .	_____ dBc	-99 dBc
Set F1 to 6.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-75 dBc
1 kHz . . . . .	_____ dBc	-85 dBc
10 kHz . . . . .	_____ dBc	-83 dBc
100 kHz . . . . .	_____ dBc	-99 dBc
Set F1 to 10.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-70 dBc
1 kHz . . . . .	_____ dBc	-83 dBc
10 kHz . . . . .	_____ dBc	-80 dBc
100 kHz . . . . .	_____ dBc	-99 dBc
Set F1 to 20.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____ dBc	-63 dBc
1 kHz . . . . .	_____ dBc	-75 dBc
10 kHz . . . . .	_____ dBc	-75 dBc
100 kHz . . . . .	_____ dBc	-97 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68367C w/o Option 2B Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz		Set F1 to 25.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+13 dBm	_____dBm	+ 9 dBm	_____dBm	+ 6dBm	_____dBm
+12 dBm	_____dBm	+ 8 dBm	_____dBm	+ 5 dBm	_____dBm
+11 dBm	_____dBm	+ 7 dBm	_____dBm	+ 4 dBm	_____dBm
+10 dBm	_____dBm	+ 6 dBm	_____dBm	+ 3 dBm	_____dBm
+ 9 dBm	_____dBm	+ 5 dBm	_____dBm	+ 2dBm	_____dBm
+ 8 dBm	_____dBm	+ 4 dBm	_____dBm	+ 1 dBm	_____dBm
+ 7 dBm	_____dBm	+ 3 dBm	_____dBm	+ 0 dBm	_____dBm
+ 6 dBm	_____dBm	+ 2 dBm	_____dBm	- 1 dBm	_____dBm
+ 5 dBm	_____dBm	+ 1 dBm	_____dBm	- 2 dBm	_____dBm
+ 4 dBm	_____dBm	+ 0 dBm	_____dBm	- 3 dBm	_____dBm
+ 3 dBm	_____dBm	- 1 dBm	_____dBm	- 4 dBm	_____dBm
+ 2 dBm	_____dBm	- 2 dBm	_____dBm	- 5 dBm	_____dBm
+ 1 dBm	_____dBm	- 3 dBm	_____dBm	- 6 dBm	_____dBm

\* Specification is ±1.0 dB.

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**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 6 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 6 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz); 4.0 dB (20 to 40 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68367C w/Option 2B Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz		Set F1 to 25.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+ 7 dBm	_____dBm	+ 3 dBm	_____dBm
+10 dBm	_____dBm	+ 6 dBm	_____dBm	+ 2 dBm	_____dBm
+ 9 dBm	_____dBm	+ 5 dBm	_____dBm	+ 1 dBm	_____dBm
+ 8 dBm	_____dBm	+ 4 dBm	_____dBm	+ 0 dBm	_____dBm
+ 7 dBm	_____dBm	+ 3 dBm	_____dBm	- 1 dBm	_____dBm
+ 6 dBm	_____dBm	+ 2 dBm	_____dBm	- 2 dBm	_____dBm
+ 5 dBm	_____dBm	+ 1 dBm	_____dBm	- 3 dBm	_____dBm
+ 4 dBm	_____dBm	+ 0 dBm	_____dBm	- 4 dBm	_____dBm
+ 3 dBm	_____dBm	- 1 dBm	_____dBm	- 5 dBm	_____dBm
+ 2 dBm	_____dBm	- 2 dBm	_____dBm	- 6 dBm	_____dBm
+ 1 dBm	_____dBm	- 3 dBm	_____dBm	- 7 dBm	_____dBm
+ 0 dBm	_____dBm	- 4 dBm	_____dBm	- 8 dBm	_____dBm
- 1 dBm	_____dBm	- 5 dBm	_____dBm	- 9 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz); 8.2 dB (20 to 40 GHz)(typical, not a specification).



**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68367C w/Option 15B High Power & w/o Option 2B Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz		Set F1 to 25.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+13 dBm	_____dBm	+13 dBm	_____dBm	+ 6 dBm	_____dBm
+12 dBm	_____dBm	+12 dBm	_____dBm	+ 5 dBm	_____dBm
+11 dBm	_____dBm	+11 dBm	_____dBm	+ 4 dBm	_____dBm
+10 dBm	_____dBm	+10 dBm	_____dBm	+ 3 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm	+ 2 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm	+ 1 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm	+ 0 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm	- 1 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm	- 2 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm	- 3 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm	- 4 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm	- 5 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm	- 6 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 6 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 6 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz); 4.0 dB (20 to 40 GHz)(typical, not a specification).

**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68367C w/Option 15B High Power & w/Option 2B Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 1.0 GHz		Set F1 to 5.0 GHz		Set F1 to 25.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+11 dBm	_____dBm	+11 dBm	_____dBm	+ 3 dBm	_____dBm
+10 dBm	_____dBm	+10 dBm	_____dBm	+ 2 dBm	_____dBm
+ 9 dBm	_____dBm	+ 9 dBm	_____dBm	+ 1 dBm	_____dBm
+ 8 dBm	_____dBm	+ 8 dBm	_____dBm	+ 0 dBm	_____dBm
+ 7 dBm	_____dBm	+ 7 dBm	_____dBm	- 1 dBm	_____dBm
+ 6 dBm	_____dBm	+ 6 dBm	_____dBm	- 2 dBm	_____dBm
+ 5 dBm	_____dBm	+ 5 dBm	_____dBm	- 3 dBm	_____dBm
+ 4 dBm	_____dBm	+ 4 dBm	_____dBm	- 4 dBm	_____dBm
+ 3 dBm	_____dBm	+ 3 dBm	_____dBm	- 5 dBm	_____dBm
+ 2 dBm	_____dBm	+ 2 dBm	_____dBm	- 6 dBm	_____dBm
+ 1 dBm	_____dBm	+ 1 dBm	_____dBm	- 7 dBm	_____dBm
+ 0 dBm	_____dBm	+ 0 dBm	_____dBm	- 8 dBm	_____dBm
- 1 dBm	_____dBm	- 1 dBm	_____dBm	- 9 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB.

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 3 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz); 8.2 dB (20 to 40 GHz)(typical, not a specification).

**3-12 Amplitude Modulation Test**

<b>AM Input Sensitivity Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<b>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<b>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68367C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<b>FM Input Sensitivity Procedure (Locked FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68367C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68367C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRI (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (1 GHz, Pulse Width = 1.0  $\mu$ s)**

Set F1 to 1.0 GHz  
Set pulse width W1 to 1.0  $\mu$ s

Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (1 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 1.0 GHz  
Set pulse width W1 to 5.0  $\mu$ s

Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level (Continued)**

<i>Pulse Level Accuracy (5 GHz, Pulse Width = 0.5 <math>\mu</math>s)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

<i>Test Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s Set PRI (period) to 0.01 ms			
Measure and record the Video Feedthrough voltage spikes . . . . .	-10 mV	_____ mV	+10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

**Test Procedure (1 GHz)** **Lower Limit    Measured Value    Upper Limit**

Set F1 to 1.10 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

60 dB                      \_\_\_\_\_ dB                      N/A

**Test Procedure (5 GHz)**

Set F1 to 5.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

60 dB                      \_\_\_\_\_ dB                      N/A

**3-17 Phase Modulation Tests**

**$\Phi$ M Input Sensitivity Procedure (Wide  $\Phi$ M Mode)** **Lower Limit    Measured Value    Upper Limit**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68367C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%                      \_\_\_\_\_ %                      106.3%

**$\Phi$ M Input Sensitivity Procedure (Narrow  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68367C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%                      \_\_\_\_\_ %                      106.3%

Anritsu Model 68367C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

<i><b>Procedure Step</b></i>	<b>Step Completion</b>
1. Internal DVM Calibration (calterm119) . . . . .	_____
2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . .	_____
3. Fine Loop Pretune DAC Calibration (calterm 136). . . . .	_____
4. Sweep Time DAC Calibration (calterm 132) . . . . .	_____
5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . .	_____
6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . .	_____
7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . .	_____
8. Ramp Center DAC Calibration (calterm 129) . . . . .	_____
9. Sweep Width DAC Calibration (calterm 133) . . . . .	_____
10. Center Frequency DAC Calibration (calterm 114) . . . . .	_____
11. Store the Calibration Data . . . . .	_____

**4-8 Switched Filter Shaper Calibration**

<i><b>Log Amplifier Zero Calibration</b></i>	<b>Step Completion</b>
1. Log Amplifier Zero Calibration (calterm 115) . . . . .	_____
 <i><b>Limiter DAC Adjustment (Model 68367C's with Option 15B)</b></i>	
2. Limiter DAC Adjustment (calterm 145). . . . .	_____
 <i><b>Shaper DAC Adjustment</b></i>	
2. Shaper DAC Adjustment (calterm 138) . . . . .	_____
3. Store the Calibration Data . . . . .	_____

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____
6. Store the Calibration Data . . . . .	_____



**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
7. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
8. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152) . . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____



Anritsu Model 68377C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

**3-6 Internal Time Base Aging Rate Test**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____ per day	2x10 <sup>-8</sup> per day (5x10 <sup>-10</sup> per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____
9.000 000 000	_____
10.000 000 000	_____
11.000 000 000	_____
12.000 000 000	_____
13.000 000 000	_____
14.000 000 000	_____
15.000 000 000	_____
16.000 000 000	_____
17.000 000 000	_____
18.000 000 000	_____
19.000 000 000	_____
20.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz.

**Fine Loop Test Procedure (Standard 68377C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specifications for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68377C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz.

**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

<b>Test Procedure</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 10 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 20 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 30 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 40 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 350 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-40 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the level of the harmonics of the 1.6 GHz carrier:		
3.2 GHz (2nd harmonic) . . . . .	_____dBc	-40 dBc
4.8 GHz (3rd harmonic) . . . . .	_____dBc	-40 dBc

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

<b>Test Procedure (2 to 10 GHz)</b>	<b>Measure Value</b>	<b>Upper Limit</b>
Set F1 to 2.1 GHz		
Record the level of all harmonics of the 2.1 GHz carrier:		
4.2 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
6.3 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
8.4 GHz (4th harmonic) . . . . .	_____dBc	-50 dBc
10.5 GHz (5th harmonic) . . . . .	_____dBc	-50 dBc
12.6 GHz (6th harmonic) . . . . .	_____dBc	-50 dBc
14.7 GHz (7th harmonic) . . . . .	_____dBc	-50 dBc
16.8 GHz (8th harmonic) . . . . .	_____dBc	-50 dBc
18.9 GHz (9th harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 3.6 GHz		
Record the level of all harmonics of the 3.6 GHz carrier:		
7.2 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
10.8 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
14.4 GHz (4th harmonic) . . . . .	_____dBc	-50 dBc
18.0 GHz (5th harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 7.0 GHz		
Record the level of all harmonics of the 7 GHz carrier:		
14.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 10.0 GHz		
Record the level of all harmonics of the 10 GHz carrier:		
20.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
 <b>Test Procedure (11 to 20 GHz)</b>		
Set F1 to 12.4 GHz		
Record the level of all harmonics of the 12.4 GHz carrier:		
24.8 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
37.2 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 16.0 GHz		
Record the level of all harmonics of the 16.0 GHz carrier:		
32.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 20.0 GHz		
Record the level of all harmonics of the 20.0 GHz carrier:		
40.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc

**3-10 Single Sideband Phase Noise Test**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-77 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 6.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-75 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 10.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-70 dBc
1 kHz . . . . .	_____dBc	-83 dBc
10 kHz . . . . .	_____dBc	-80 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 20.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-63 dBc
1 kHz . . . . .	_____dBc	-75 dBc
10 kHz . . . . .	_____dBc	-75 dBc
100 kHz . . . . .	_____dBc	-97 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68377C w/o Option 2C Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz		Set F1 to 25.0 GHz		Set F1 to 45.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+10 dBm	_____dBm	+ 2.5 dBm	_____dBm	+ 2.5 dBm	_____dBm
+ 9 dBm	_____dBm	+ 1.5 dBm	_____dBm	+ 1.5 dBm	_____dBm
+ 8 dBm	_____dBm	+ 0.5 dBm	_____dBm	+ 0.5 dBm	_____dBm
+ 7 dBm	_____dBm	- 0.5 dBm	_____dBm	- 0.5 dBm	_____dBm
+ 6 dBm	_____dBm	- 1.5 dBm	_____dBm	- 1.5 dBm	_____dBm
+ 5 dBm	_____dBm	- 2.5 dBm	_____dBm	- 2.5 dBm	_____dBm
+ 4 dBm	_____dBm	- 3.5 dBm	_____dBm	- 3.5 dBm	_____dBm
+ 3 dBm	_____dBm	- 4.5 dBm	_____dBm	- 4.5 dBm	_____dBm
+ 2 dBm	_____dBm	- 5.5 dBm	_____dBm	- 5.5 dBm	_____dBm
+ 1 dBm	_____dBm	- 6.5 dBm	_____dBm	- 6.5 dBm	_____dBm
+ 0 dBm	_____dBm	- 7.5 dBm	_____dBm	- 7.5 dBm	_____dBm
- 1 dBm	_____dBm	- 8.5 dBm	_____dBm	- 8.5 dBm	_____dBm
- 2 dBm	_____dBm	- 9.5 dBm	_____dBm	- 9.5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.5$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 2.5 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB (0.01 to 40 GHz); 2.2 dB (40 to 50 GHz).

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 2.5 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz); 4.0 dB (20 to 40 GHz); 5.0 dB (40 to 50 GHz)(typical, not a specification).



**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68377C w/Option 2C Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz		Set F1 to 25.0 GHz		Set F1 to 45.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+ 8.5 dBm	_____dBm	+ 0 dBm	_____dBm	- 1 dBm	_____dBm
+ 7.5 dBm	_____dBm	- 1 dBm	_____dBm	- 2 dBm	_____dBm
+ 6.5 dBm	_____dBm	- 2 dBm	_____dBm	- 3 dBm	_____dBm
+ 5.5 dBm	_____dBm	- 3 dBm	_____dBm	- 4 dBm	_____dBm
+ 4.5 dBm	_____dBm	- 4 dBm	_____dBm	- 5 dBm	_____dBm
+ 3.5 dBm	_____dBm	- 5 dBm	_____dBm	- 6 dBm	_____dBm
+ 2.5 dBm	_____dBm	- 6 dBm	_____dBm	- 7 dBm	_____dBm
+ 1.5 dBm	_____dBm	- 7 dBm	_____dBm	- 8 dBm	_____dBm
+ 0.5 dBm	_____dBm	- 8 dBm	_____dBm	- 9 dBm	_____dBm
- 0.5 dBm	_____dBm	- 9 dBm	_____dBm	- 10 dBm	_____dBm
- 1.5 dBm	_____dBm	- 10 dBm	_____dBm	- 11 dBm	_____dBm
- 2.5 dBm	_____dBm	- 11 dBm	_____dBm	- 12 dBm	_____dBm
- 3.5 dBm	_____dBm	- 12 dBm	_____dBm	- 13 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.5$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
- 1 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB (0.01 to 40 GHz); 2.2 dB (40 to 50 GHz).

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
- 1 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz); 8.2 dB (20 to 40 GHz); 10.2 dB (40 to 50 GHz)(typical, not a specification).

**3-12 Amplitude Modulation Test**

<i>AM Input Sensitivity Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<i>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<i>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68377C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<i>FM Input Sensitivity Procedure (Locked FM Mode)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68377C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68377C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRI (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (1 GHz, Pulse Width = 1.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 1.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (1 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level (Continued)**

**Pulse Level Accuracy (5 GHz, Pulse Width = 0.5  $\mu$ s)**      Lower Limit    Measured Value    Upper Limit

Set F1 to 5.0 GHz  
Set pulse width W1 to 5.0  $\mu$ s

Record the displayed output level L1 (step 5.b) . . . . . \_\_\_\_\_ dBm

Record the displayed output level L1 (step 5.d) . . . . . \_\_\_\_\_ dBm

Calculate and record the pulse level error. . . . .      -1.0 dB      \_\_\_\_\_ dB      +1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 5.0 GHz  
Set pulse width W1 to 5.0  $\mu$ s

Record the displayed output level L1 (step 5.b) . . . . . \_\_\_\_\_ dBm

Record the displayed output level L1 (step 5.d) . . . . . \_\_\_\_\_ dBm

Calculate and record the pulse level error. . . . .      -0.5 dB      \_\_\_\_\_ dB      +0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

**Test Procedure**      Lower Limit    Measured Value    Upper Limit

Set F1 to 5.0 GHz  
Set pulse width W1 to 5.0  $\mu$ s  
Set PRI (period) to 0.01 ms

Measure and record the Video Feedthrough voltage spikes . . . . .      -10 mV      \_\_\_\_\_ mV      +10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

**Test Procedure (1 GHz)**

Set F1 to 1.10 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.)

**Lower Limit      Measured Value      Upper Limit**

60 dB      \_\_\_\_\_ dB      N/A

**Test Procedure (5 GHz)**

Set F1 to 5.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.)

60 dB      \_\_\_\_\_ dB      N/A

**3-17 Phase Modulation Tests**

**$\Phi$ M Input Sensitivity Procedure  
(Wide  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68377C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%

**$\Phi$ M Input Sensitivity Procedure  
(Narrow  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68377C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%



Anritsu Model 68377C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

***Procedure Step***

**Step Completion**

- 1. Internal DVM Calibration (calterm119) . . . . . \_\_\_\_\_
- 2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . . \_\_\_\_\_
- 3. Fine Loop Pretune DAC Calibration (calterm 136). . . . . \_\_\_\_\_
- 4. Sweep Time DAC Calibration (calterm 132) . . . . . \_\_\_\_\_
- 5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . . \_\_\_\_\_
- 6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . . \_\_\_\_\_
- 7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . . \_\_\_\_\_
- 8. Ramp Center DAC Calibration (calterm 129) . . . . . \_\_\_\_\_
- 9. Sweep Width DAC Calibration (calterm 133) . . . . . \_\_\_\_\_
- 10. Center Frequency DAC Calibration (calterm 114) . . . . . \_\_\_\_\_
- 11. Store the Calibration Data . . . . . \_\_\_\_\_

**4-8 Switched Filter Shaper Calibration**

***Log Amplifier Zero Calibration***

**Step Completion**

- 1. Log Amplifier Zero Calibration (calterm 115) . . . . . \_\_\_\_\_

***Limiter DAC Adjustment***

- 2. Limiter DAC Adjustment (calterm 145). . . . . \_\_\_\_\_

***Shaper DAC Adjustment***

- 2. Shaper DAC Adjustment (calterm 138) . . . . . \_\_\_\_\_
- 3. Store the Calibration Data . . . . . \_\_\_\_\_

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____



**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
7. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
8. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152). . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____



Anritsu Model 68387C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

<b>3-6 Internal Time Base Aging Rate Test</b>
---

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____ per day	$2 \times 10^{-8}$ per day ( $5 \times 10^{-10}$ per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____
9.000 000 000	_____
10.000 000 000	_____
11.000 000 000	_____
12.000 000 000	_____
13.000 000 000	_____
14.000 000 000	_____
15.000 000 000	_____
16.000 000 000	_____
17.000 000 000	_____
18.000 000 000	_____
19.000 000 000	_____
20.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz.

**Fine Loop Test Procedure (Standard 68387C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specifications for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68387C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz.

**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 10 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 20 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 30 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 40 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 350 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-40 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the level of the harmonics of the 1.6 GHz carrier:		
3.2 GHz (2nd harmonic) . . . . .	_____dBc	-40 dBc
4.8 GHz (3rd harmonic) . . . . .	_____dBc	-40 dBc

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

<b>Test Procedure (2 to 10 GHz)</b>	<b>Measure Value</b>	<b>Upper Limit</b>
Set F1 to 2.1 GHz		
Record the level of all harmonics of the 2.1 GHz carrier:		
4.2 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
6.3 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
8.4 GHz (4th harmonic) . . . . .	_____dBc	-50 dBc
10.5 GHz (5th harmonic) . . . . .	_____dBc	-50 dBc
12.6 GHz (6th harmonic) . . . . .	_____dBc	-50 dBc
14.7 GHz (7th harmonic) . . . . .	_____dBc	-50 dBc
16.8 GHz (8th harmonic) . . . . .	_____dBc	-50 dBc
18.9 GHz (9th harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 3.6 GHz		
Record the level of all harmonics of the 3.6 GHz carrier:		
7.2 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
10.8 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
14.4 GHz (4th harmonic) . . . . .	_____dBc	-50 dBc
18.0 GHz (5th harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 7.0 GHz		
Record the level of all harmonics of the 7 GHz carrier:		
14.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 10.0 GHz		
Record the level of all harmonics of the 10 GHz carrier:		
20.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
 <b>Test Procedure (11 to 20 GHz)</b>		
Set F1 to 12.4 GHz		
Record the level of all harmonics of the 12.4 GHz carrier:		
24.8 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
37.2 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 16.0 GHz		
Record the level of all harmonics of the 16.0 GHz carrier:		
32.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
Set F1 to 20.0 GHz		
Record the level of all harmonics of the 20.0 GHz carrier:		
40.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc

**3-10 Single Sideband Phase Noise Test**

**Test Procedure**

**Measured Value**

**Upper Limit**

Set F1 to 2.0 GHz

Record the phase noise levels at these offsets:

100 Hz . . . . .	_____dBc	-77 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc

Set F1 to 6.0 GHz

Record the phase noise levels at these offsets:

100 Hz . . . . .	_____dBc	-75 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc

Set F1 to 10.0 GHz

Record the phase noise levels at these offsets:

100 Hz . . . . .	_____dBc	-70 dBc
1 kHz . . . . .	_____dBc	-83 dBc
10 kHz . . . . .	_____dBc	-80 dBc
100 kHz . . . . .	_____dBc	-99 dBc

Set F1 to 20.0 GHz

Record the phase noise levels at these offsets:

100 Hz . . . . .	_____dBc	-63 dBc
1 kHz . . . . .	_____dBc	-75 dBc
10 kHz . . . . .	_____dBc	-75 dBc
100 kHz . . . . .	_____dBc	-97 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68387C w/o Option 2D Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz		Set F1 to 25.0 GHz		Set F1 to 50.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+10 dBm	_____dBm	+ 2.5 dBm	_____dBm	+ 2 dBm	_____dBm
+ 9 dBm	_____dBm	+ 1.5 dBm	_____dBm	+ 1 dBm	_____dBm
+ 8 dBm	_____dBm	+ 0.5 dBm	_____dBm	+ 0 dBm	_____dBm
+ 7 dBm	_____dBm	- 0.5 dBm	_____dBm	- 1 dBm	_____dBm
+ 6 dBm	_____dBm	- 1.5 dBm	_____dBm	- 2 dBm	_____dBm
+ 5 dBm	_____dBm	- 2.5 dBm	_____dBm	- 3 dBm	_____dBm
+ 4 dBm	_____dBm	- 3.5 dBm	_____dBm	- 4 dBm	_____dBm
+ 3 dBm	_____dBm	- 4.5 dBm	_____dBm	- 5 dBm	_____dBm
+ 2 dBm	_____dBm	- 5.5 dBm	_____dBm	- 6 dBm	_____dBm
+ 1 dBm	_____dBm	- 6.5 dBm	_____dBm	- 7 dBm	_____dBm
0 dBm	_____dBm	- 7.5 dBm	_____dBm	- 8 dBm	_____dBm
- 1 dBm	_____dBm	- 8.5 dBm	_____dBm	- 9 dBm	_____dBm
- 2 dBm	_____dBm	- 9.5 dBm	_____dBm	- 10 dBm	_____dBm

\* Specification is ±1.0 dB.

\* Specification is ±1.0 dB.

\* Specification is ±1.5 dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
+ 2 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB (0.01 to 40 GHz); 2.2 dB (40 to 60 GHz).

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
+ 2 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz); 4.0 dB (20 to 40 GHz); 5.0 dB (40 to 60 GHz)(typical, not a specification).



**3-11 Power Level Accuracy and Flatness Tests (Continued)  
(Model 68387C w/Option 2D Step Attenuator)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz		Set F1 to 25.0 GHz		Set F1 to 50.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+ 8.5 dBm	_____dBm	+ 0 dBm	_____dBm	- 1.5 dBm	_____dBm
+ 7.5 dBm	_____dBm	- 1 dBm	_____dBm	- 2.5 dBm	_____dBm
+ 6.5 dBm	_____dBm	- 2 dBm	_____dBm	- 3.5 dBm	_____dBm
+ 5.5 dBm	_____dBm	- 3 dBm	_____dBm	- 4.5 dBm	_____dBm
+ 4.5 dBm	_____dBm	- 4 dBm	_____dBm	- 5.5 dBm	_____dBm
+ 3.5 dBm	_____dBm	- 5 dBm	_____dBm	- 6.5 dBm	_____dBm
+ 2.5 dBm	_____dBm	- 6 dBm	_____dBm	- 7.5 dBm	_____dBm
+ 1.5 dBm	_____dBm	- 7 dBm	_____dBm	- 8.5 dBm	_____dBm
+ 0.5 dBm	_____dBm	- 8 dBm	_____dBm	- 9.5 dBm	_____dBm
- 0.5 dBm	_____dBm	- 9 dBm	_____dBm	-10.5 dBm	_____dBm
- 1.5 dBm	_____dBm	-10 dBm	_____dBm	-11.5 dBm	_____dBm
- 2.5 dBm	_____dBm	-11 dBm	_____dBm	-12.5 dBm	_____dBm
- 3.5 dBm	_____dBm	-12 dBm	_____dBm	-13.5 dBm	_____dBm

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.0$  dB.

\* Specification is  $\pm 1.5$  dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
- 1.5 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB (0.01 to 40 GHz); 2.2 dB (40 to 60 GHz).

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
- 1.5 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 7.0 dB (0.01 to 0.05 GHz); 6.0 dB (0.05 to 20 GHz); 8.2 dB (20 to 40 GHz); 10.2 dB (40 to 60 GHz)(typical, not a specification).

**3-12 Amplitude Modulation Test**

<b>AM Input Sensitivity Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<b>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<b>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68387C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<b>FM Input Sensitivity Procedure (Locked FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68387C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68387C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRI (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (1 GHz, Pulse Width = 1.0  $\mu$ s)**

Set F1 to 1.0 GHz  
Set pulse width W1 to 1.0  $\mu$ s

Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (1 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 1.0 GHz  
Set pulse width W1 to 5.0  $\mu$ s

Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level (Continued)**

<b>Pulse Level Accuracy (5 GHz, Pulse Width = 0.5 <math>\mu</math>s)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

<b>Test Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s Set PRI (period) to 0.01 ms			
Measure and record the Video Feedthrough voltage spikes . . . . .	-10 mV	_____ mV	+10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

**Test Procedure (1 GHz)**

Set F1 to 1.10 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

Lower Limit

Measured Value

Upper Limit

60 dB

\_\_\_\_\_ dB

N/A

**Test Procedure (5 GHz)**

Set F1 to 5.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.) .

60 dB

\_\_\_\_\_ dB

N/A

**3-17 Phase Modulation Tests**

**$\Phi$ M Input Sensitivity Procedure  
(Wide  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68387C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%

**$\Phi$ M Input Sensitivity Procedure  
(Narrow  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68387C . . . . .

\_\_\_\_\_ rad

Calculate and record the  $\Phi$ M accuracy . . . . .

93.7%

\_\_\_\_\_ %

106.3%



Anritsu Model 68387C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

***Procedure Step***

**Step Completion**

- 1. Internal DVM Calibration (calterm119) . . . . . \_\_\_\_\_
- 2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . . \_\_\_\_\_
- 3. Fine Loop Pretune DAC Calibration (calterm 136). . . . . \_\_\_\_\_
- 4. Sweep Time DAC Calibration (calterm 132) . . . . . \_\_\_\_\_
- 5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . . \_\_\_\_\_
- 6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . . \_\_\_\_\_
- 7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . . \_\_\_\_\_
- 8. Ramp Center DAC Calibration (calterm 129) . . . . . \_\_\_\_\_
- 9. Sweep Width DAC Calibration (calterm 133) . . . . . \_\_\_\_\_
- 10. Center Frequency DAC Calibration (calterm 114) . . . . . \_\_\_\_\_
- 11. Store the Calibration Data . . . . . \_\_\_\_\_

**4-8 Switched Filter Shaper Calibration**

***Log Amplifier Zero Calibration***

**Step Completion**

- 1. Log Amplifier Zero Calibration (calterm 115) . . . . . \_\_\_\_\_

***Limiter DAC Adjustment***

- 2. Limiter DAC Adjustment (calterm 145). . . . . \_\_\_\_\_

***Shaper DAC Adjustment***

- 2. Shaper DAC Adjustment (calterm 138) . . . . . \_\_\_\_\_
- 3. Store the Calibration Data . . . . . \_\_\_\_\_

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____
6. Store the Calibration Data . . . . .	_____



**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
7. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
8. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152). . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____



Anritsu Model 68397C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Tested By: \_\_\_\_\_

<b>3-6 Internal Time Base Aging Rate Test</b>
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<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Record frequency error value . . . . .	_____	
Record frequency error value (after 24 hours) . . . . .	_____	
Record the computed aging rate . . . . .	_____ per day	$2 \times 10^{-8}$ per day ( $5 \times 10^{-10}$ per day with Option 16)

**3-7 Frequency Synthesis Tests**

**Coarse Loop/YIG Loop Test Procedure**

Test Frequency (in GHz)	Measured Value *
2.000 000 000	_____
3.000 000 000	_____
4.000 000 000	_____
5.000 000 000	_____
6.000 000 000	_____
7.000 000 000	_____
8.000 000 000	_____
9.000 000 000	_____
10.000 000 000	_____
11.000 000 000	_____
12.000 000 000	_____
13.000 000 000	_____
14.000 000 000	_____
15.000 000 000	_____
16.000 000 000	_____
17.000 000 000	_____
18.000 000 000	_____
19.000 000 000	_____
20.000 000 000	_____

\* Specification for all frequencies listed above is  $\pm 100$  Hz.

**Fine Loop Test Procedure (Standard 68397C)**

Test Frequency (in GHz)	Measured Value **
2.000 001 000	_____
2.000 002 000	_____
2.000 003 000	_____
2.000 004 000	_____
2.000 005 000	_____
2.000 006 000	_____
2.000 007 000	_____
2.000 008 000	_____
2.000 009 000	_____
2.000 010 000	_____

\*\* Specifications for all frequencies listed above is  $\pm 100$  Hz

**Fine Loop Test Procedure (68397C with Option 11)**

Test Frequency (in GHz)	Measured Value ***
2.000 000 100	_____
2.000 000 200	_____
2.000 000 300	_____
2.000 000 400	_____
2.000 000 500	_____
2.000 000 600	_____
2.000 000 700	_____
2.000 000 800	_____
2.000 000 900	_____
2.000 001 000	_____

\*\*\* Specification for all frequencies listed above is  $\pm 10$  Hz.

**3-8 Spurious Signals Test: RF Output Signals <2 GHz**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 10 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 20 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 30 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 40 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-30 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 350 MHz		
Record the presence of the worst case harmonic . . . . .	_____dBc	-40 dBc
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the presence of the worst case non-harmonic . . . . .	_____dBc	-40 dBc
Set F1 to 1.6 GHz		
Record the level of the harmonics of the 1.6 GHz carrier:		
3.2 GHz (2nd harmonic) . . . . .	_____dBc	-40 dBc
4.8 GHz (3rd harmonic) . . . . .	_____dBc	-40 dBc

**3-9 Harmonic Test: RF Output Signals From 2 to 20 GHz**

**Test Procedure (2 to 10 GHz)**

**Measure Value**

**Upper Limit**

Set F1 to 2.1 GHz

Record the level of all harmonics of the 2.1 GHz carrier:

4.2 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
6.3 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
8.4 GHz (4th harmonic) . . . . .	_____dBc	-50 dBc
10.5 GHz (5th harmonic) . . . . .	_____dBc	-50 dBc
12.6 GHz (6th harmonic) . . . . .	_____dBc	-50 dBc
14.7 GHz (7th harmonic) . . . . .	_____dBc	-50 dBc
16.8 GHz (8th harmonic) . . . . .	_____dBc	-50 dBc
18.9 GHz (9th harmonic) . . . . .	_____dBc	-50 dBc

Set F1 to 3.6 GHz

Record the level of all harmonics of the 3.6 GHz carrier:

7.2 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
10.8 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc
14.4 GHz (4th harmonic) . . . . .	_____dBc	-50 dBc
18.0 GHz (5th harmonic) . . . . .	_____dBc	-50 dBc

Set F1 to 7.0 GHz

Record the level of all harmonics of the 7 GHz carrier:

14.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
-----------------------------------	----------	---------

Set F1 to 10.0 GHz

Record the level of all harmonics of the 10 GHz carrier:

20.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
-----------------------------------	----------	---------

**Test Procedure (11 to 20 GHz)**

Set F1 to 12.4 GHz

Record the level of all harmonics of the 12.4 GHz carrier:

24.8 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
37.2 GHz (3rd harmonic) . . . . .	_____dBc	-50 dBc

Set F1 to 16.0 GHz

Record the level of all harmonics of the 16.0 GHz carrier:

32.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
-----------------------------------	----------	---------

Set F1 to 20.0 GHz

Record the level of all harmonics of the 20.0 GHz carrier:

40.0 GHz (2nd harmonic) . . . . .	_____dBc	-50 dBc
-----------------------------------	----------	---------

**3-10 Single Sideband Phase Noise Test**

<i>Test Procedure</i>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 2.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-77 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 6.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-75 dBc
1 kHz . . . . .	_____dBc	-85 dBc
10 kHz . . . . .	_____dBc	-83 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 10.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-70 dBc
1 kHz . . . . .	_____dBc	-83 dBc
10 kHz . . . . .	_____dBc	-80 dBc
100 kHz . . . . .	_____dBc	-99 dBc
Set F1 to 20.0 GHz		
Record the phase noise levels at these offsets:		
100 Hz . . . . .	_____dBc	-63 dBc
1 kHz . . . . .	_____dBc	-75 dBc
10 kHz . . . . .	_____dBc	-75 dBc
100 kHz . . . . .	_____dBc	-97 dBc

**3-11 Power Level Accuracy and Flatness Tests  
(Model 68397C)**

**Power Level Accuracy Test Procedure**

Set F1 to 5.0 GHz		Set F1 to 25.0 GHz		Set F1 to 50.0 GHz	
Set L1 to:	Measured Power *	Set L1 to:	Measured Power *	Set L1 to:	Measured Power *
+10 dBm	_____dBm	+ 2.5 dBm	_____dBm	0 dBm	_____dBm
+ 9 dBm	_____dBm	+ 1.5 dBm	_____dBm	- 1 dBm	_____dBm
+ 8 dBm	_____dBm	+ 0.5 dBm	_____dBm	- 2 dBm	_____dBm
+ 7 dBm	_____dBm	- 0.5 dBm	_____dBm	- 3 dBm	_____dBm
+ 6 dBm	_____dBm	- 1.5 dBm	_____dBm	- 4 dBm	_____dBm
+ 5 dBm	_____dBm	- 2.5 dBm	_____dBm	- 5 dBm	_____dBm
+ 4 dBm	_____dBm	- 3.5 dBm	_____dBm	- 6 dBm	_____dBm
+ 3 dBm	_____dBm	- 4.5 dBm	_____dBm	- 7 dBm	_____dBm
+ 2 dBm	_____dBm	- 5.5 dBm	_____dBm	- 8 dBm	_____dBm
+ 1 dBm	_____dBm	- 6.5 dBm	_____dBm	- 9 dBm	_____dBm
0 dBm	_____dBm	- 7.5 dBm	_____dBm	- 10 dBm	_____dBm
- 1 dBm	_____dBm	- 8.5 dBm	_____dBm	- 11 dBm	_____dBm
- 2 dBm	_____dBm	- 9.5 dBm	_____dBm	- 12 dBm	_____dBm

\* Specification is ±1.0 dB.

\* Specification is ±1.0 dB.

\* Specification is ±1.5 dB.

**Power Level Flatness Test Procedure (Manual Sweep)**

Set L1 to:	Max Power	Min Power	Variation **
0 dBm	_____dBm	_____dBm	_____dB

\*\* Maximum variation is 1.6 dB (0.01 to 40 GHz); 2.2 dB (40 to 65 GHz).

**Power Level Flatness Test Procedure (Analog Sweep)**

Set L1 to:	Max Power	Min Power	Variation ***
0 dBm	_____dBm	_____dBm	_____dB

\*\*\* Maximum variation is 4.0 dB (0.01 to 0.05 GHz); 2.0 dB (0.05 to 20 GHz); 4.0 dB (20 to 40 GHz); 5.0 dB (40 to 65 GHz)(typical, not a specification).



**3-12 Amplitude Modulation Test**

<b>AM Input Sensitivity Procedure</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the Modulation Analyzer AM PK(+) reading . . . . .		_____	
Measure and record the Modulation Analyzer AM PK(-) reading . . . . .		_____	
Calculate and record the actual AM input sensitivity . . . . .	45%	_____ %	55%

**3-13 Frequency Modulation Tests**

<b>FM Input Sensitivity Procedure (Unlocked Wide FM Mode)</b>	<b>Lower Limit</b>	<b>Measured Value</b>	<b>Upper Limit</b>
Set F1 to 5.0 GHz			
Measure and record the low carrier frequency . . . . .		_____ MHz	
Measure and record the high carrier frequency . . . . .		_____ MHz	
Calculate and record the actual peak-to-peak frequency deviation .	190 MHz	_____ MHz	210 MHz

<b>FM Input Sensitivity Procedure (Unlocked Narrow FM Mode)</b>			
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68397C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

<b>FM Input Sensitivity Procedure (Locked FM Mode)</b>			
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68397C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-13 Frequency Modulation Tests (Continued)**

**FM Input Sensitivity Procedure  
(Locked Low-Noise FM Mode)**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Record the FM deviation frequency displayed on the 68397C . . . . .		_____ MHz	
Calculate and record the FM accuracy . . . . .	93.7%	_____ %	106.3%

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level**

**Rise Time, Fall Time, and Overshoot**

	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz			
Measure and record the following:			
Rise Time . . . . .	N/A	_____ ns	10 ns
Pulse Width . . . . .	-10 ns	_____ $\mu$ s	+10 ns
PRI (period) . . . . .	-10 ns	_____ ms	+10 ns
Overshoot . . . . .	N/A	_____ %	10%

**Pulse Level Accuracy (1 GHz, Pulse Width = 1.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 1.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (1 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 1.0 GHz			
Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-14 Pulse Modulation Tests: Rise Time, Fall Time, Overshoot, and Level (Continued)**

<i>Pulse Level Accuracy (5 GHz, Pulse Width = 0.5 <math>\mu</math>s)</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-1.0 dB	_____ dB	+1.0 dB

**Pulse Level Accuracy (5 GHz, Pulse Width = 5.0  $\mu$ s)**

Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s			
Record the displayed output level L1 (step 5.b) . . . . .		_____ dBm	
Record the displayed output level L1 (step 5.d) . . . . .		_____ dBm	
Calculate and record the pulse level error. . . . .	-0.5 dB	_____ dB	+0.5 dB

**3-15 Pulse Modulation Test: Video Feedthrough**

<i>Test Procedure</i>	Lower Limit	Measured Value	Upper Limit
Set F1 to 5.0 GHz Set pulse width W1 to 5.0 $\mu$ s Set PRI (period) to 0.01 ms			
Measure and record the Video Feedthrough voltage spikes . . . . .	-10 mV	_____ mV	+10 mV

**3-16 Pulse Modulation Test: RF On/Off Ratio**

**Test Procedure (1 GHz)**

Set F1 to 1.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.)

Lower Limit	Measured Value	Upper Limit
60 dB	_____ dB	N/A

**Test Procedure (5 GHz)**

Set F1 to 5.0 GHz

Measure and record the peak of the signal on the Spectrum Analyzer. (Measured signal must be >60 dB below top graticule to meet specification; this represents an On/Off Ratio of >80 dB.)

Lower Limit	Measured Value	Upper Limit
60 dB	_____ dB	N/A

**3-17 Phase Modulation Tests**

**$\Phi$ M Input Sensitivity Procedure  
(Wide  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68397C . . . . .

\_\_\_\_\_rad

Calculate and record the  $\Phi$ M accuracy . . . . .

Lower Limit	Measured Value	Upper Limit
93.7%	_____ %	106.3%

**$\Phi$ M Input Sensitivity Procedure  
(Narrow  $\Phi$ M Mode)**

Set F1 to 5.0 GHz

Record the  $\Phi$ M deviation displayed on the 68397C . . . . .

\_\_\_\_\_rad

Calculate and record the  $\Phi$ M accuracy . . . . .

Lower Limit	Measured Value	Upper Limit
93.7%	_____ %	106.3%

Anritsu Model 68397C

Date: \_\_\_\_\_

Serial Number \_\_\_\_\_

Calibrated By: \_\_\_\_\_

**4-7 Preliminary Calibration**

***Procedure Step***

**Step Completion**

- 1. Internal DVM Calibration (calterm119) . . . . . \_\_\_\_\_
- 2. Coarse Loop Pretune DAC Calibration (calterm 137) . . . . . \_\_\_\_\_
- 3. Fine Loop Pretune DAC Calibration (calterm 136). . . . . \_\_\_\_\_
- 4. Sweep Time DAC Calibration (calterm 132) . . . . . \_\_\_\_\_
- 5. YIG Frequency Offset DAC Calibration (calterm 134) . . . . . \_\_\_\_\_
- 6. YIG Frequency Linearizer DACs Calibration (calterm 127) . . . . . \_\_\_\_\_
- 7. 100 MHz Reference Oscillator Calibration (calterm 130) . . . . . \_\_\_\_\_
- 8. Ramp Center DAC Calibration (calterm 129) . . . . . \_\_\_\_\_
- 9. Sweep Width DAC Calibration (calterm 133) . . . . . \_\_\_\_\_
- 10. Center Frequency DAC Calibration (calterm 114) . . . . . \_\_\_\_\_
- 11. Store the Calibration Data . . . . . \_\_\_\_\_

**4-8 Switched Filter Shaper Calibration**

***Log Amplifier Zero Calibration***

**Step Completion**

- 1. Log Amplifier Zero Calibration (calterm 115) . . . . . \_\_\_\_\_

***Limiter DAC Adjustment***

- 2. Limiter DAC Adjustment (calterm 145). . . . . \_\_\_\_\_

***Shaper DAC Adjustment***

- 2. Shaper DAC Adjustment (calterm 138) . . . . . \_\_\_\_\_
- 3. Store the Calibration Data . . . . . \_\_\_\_\_

**4-9 RF Level Calibration**

This calibration is performed using an automatic test system. Contact Anritsu Customer Service for further information.

**4-10 ALC Slope Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
5. ALC Slope DAC adjustment . . . . .	_____
6. Store the DAC setting value(s). . . . .	_____

**4-11 ALC Bandwidth Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
1. ALC Bandwidth Calibration (Calterm 110) . . . . .	_____
2. Store the Calibration Data . . . . .	_____

**4-12 AM Calibration**

<i>Procedure Step</i>	<i>Step Completion</i>
2. Linear AM Calibration (calterm 112) . . . . .	_____
3. Log AM Calibration (calterm 113) . . . . .	_____
4. AM Meter Calibration (calterm 147) . . . . .	_____
5. AM Function Generator Calibration (calterm 146) . . . . .	_____
6. Store the Calibration Data . . . . .	_____

**4-13 FM Calibration**

<b>Procedure Step</b>	<b>Step Completion</b>
1. FM Meter Calibration (calterm 123) . . . . .	_____
2. FM Variable Gain Linearity Calibration (calterm 148) . . . . .	_____
3. External Unlocked Wide FM Mode Sensitivity Calibration (calterm 124) . . . . .	_____
4. Internal Unlocked Wide FM Mode Sensitivity Calibration (calterm 143) . . . . .	_____
5. External Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 125). . . . .	_____
6. Internal Locked, Locked Low-Noise, and Unlocked Narrow FM Mode Sensitivity Calibration (calterm 144). . . . .	_____
7. FM Rear Panel Input Gain Calibration (calterm 154) . . . . .	_____
8. Store the Calibration Data . . . . .	_____

**4-14 Phase Modulation ( $\Phi$ M) Calibration (Option 6)**

<b>Procedure Step</b>	<b>Step Completion</b>
1. External Wide $\Phi$ M Mode Sensitivity Calibration (calterm 149) . . . . .	_____
2. Internal Wide $\Phi$ M Mode Sensitivity Calibration (calterm 151) . . . . .	_____
3. Wide $\Phi$ M Mode Flatness Calibration (calterm 155) . . . . .	_____
4. External Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 150) . . . . .	_____
5. Internal Narrow $\Phi$ M Mode Sensitivity Calibration (calterm 152). . . . .	_____
6. Narrow $\Phi$ M Mode Flatness Calibration (calterm 156) . . . . .	_____
7. Store the Calibration Data . . . . .	_____





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