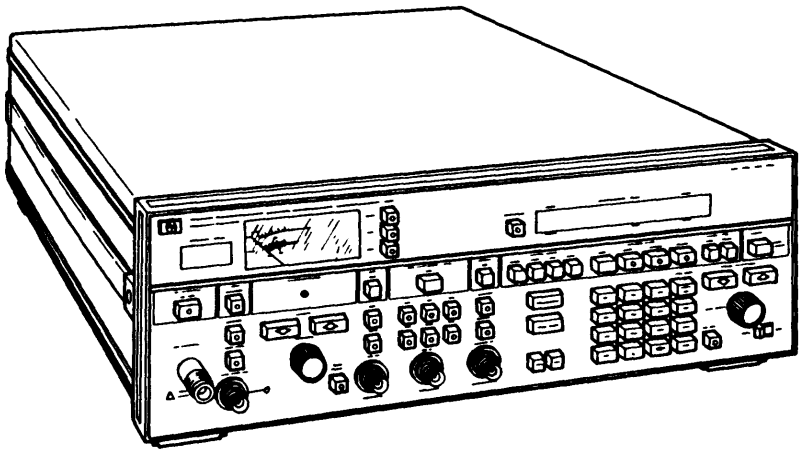
TM 11-6625-3143-40

TECHNICAL MANUAL

GENERAL SUPPORT MAINTENANCE MANUAL



SIGNAL GENERATOR SG-1219/U (NSN 6625-01-188-7441)

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 DECEMBER 1987

Change

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 November 1992

GENERAL SUPPORT MAINTENANCE MANUAL FOR SIGNAL GENERATOR SG-1219/U (NSN 6625-01-188-7441) (EIC: N/A)

TM 11-6625-3143-40, 1 December 1987, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number or by a miniature pointing hand.

Remove pages	*Insert pages*
i and 1-0	i and 1-0
1-1 through 1-15/(1-16 Blank)	1-1 through 1-15/(1-16 Blank)
2-3 and 2-4	2-3 and 2-4
2-7 through 2-16	2-7 through 2-16
2-21 through 2-30	2-21 through 2-30
2-35 through 2-42	2-35 through 2-42
2-45 through 2-48	2-45 through 2-48
2-95 through 2-98	2-95 through 2-98
2-101 through 2-112	2-101 through 2-112
2-115 through 2-116	2-115 through 2-116
2-121 through 2-124	2-121 through 2-124
2-127 through 2-136	2-127 through 2-136
2-149 through 2-166	2-149 through 2-166
2-171 and 2-172	2-171 and 2-172
2-177 through 2-180	2-177 through 2-180
2-185 through 2-200	2-185 through 2-200
INDEX-5 through INDEX-10	INDEX-5 through INDEX-10
INDEX-13 through INDEX-16	INDEX-13 through INDEX-16
FO-1	FO-1
none	FO-1 .1
FO-2 (Sheet 1 and 2 of 2)	FO-2 (Sheet 1 and 2 of 2)
FO-3 (Sheets 1 through 2 of 2)	FO-3 (Sheets 1 through 3 of 3)
FO-4 (Sheets 1 through 4 of 4)	FO-4 (Sheets 1 through 5 of 5)
FO-5	FO-5
none	FO-5.1
FO-7 through FO-12	FO-7 through FO-12
FO-14 (Sheet 1 of 2)	FO-14 (Sheet 1 of 2)

2. File this change in the front of the publication for reference purposes.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
03232

DISTRIBUTION:

To be distributed in accordance with DA Form 12-51-E, block 0140, requirements for TM 11-6625-3143-40.

Change
No. 1

HEADQUARTERS
DEPARTMENTS OF THE ARMY
Washington, DC, 15 June 1990

GENERAL SUPPORT MAINTENANCE MANUAL

FOR

SIGNAL GENERATOR SG-1219/U
(NSN 6625-01-188-7441)

TM 11-6625-3143-40, 1 December 1987, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.

Remove pages	Insert pages
2-137 and 2-138	2-137 and 2-138

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Brigadier General, United States Army
The Adjustant General

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To be distributed in accordance with DA Form 12-51 DS/GS requirements for SG-1219/U.

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

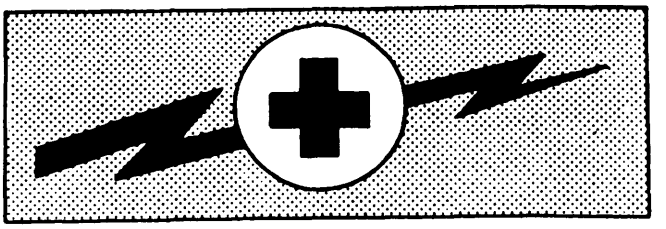
1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4. SEND FOR HELP AS SOON AS POSSIBLE

5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESPIRATION



WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When technicians are aided by operators, they must be warned about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 115-volt ac input when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING

Do not be misled by the term “LOW VOLTAGE”. Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

CAUTION

THIS EQUIPMENT CONTAINS PARTS AND ASSEMBLIES SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). USE ESD PRECAUTIONARY PROCEDURES WHEN TOUCHING, REMOVING OR INSETING PRINTED CIRCUIT BOARDS.

ESD
CLASS 1

NOTE

The symbol for static sensitive devices in military inventory is as depicted in the caution block above.

GENERAL HANDLING PROCEDURES FOR ESDS ITEMS

- USE WRIST GROUND STRAPS OR MANUAL GROUNDING PROCEDURES
- KEEP ESDS ITEMS IN PROTECTIVE COVERING WHEN NOT IN USE
- GROUND ALL ELECTRICAL TOOLS AND TEST EQUIPMENT
- PERIODICALLY CHECK CONTINUITY AND RESISTANCE OF GROUNDING SYSTEM
- USE ONLY METALIZED SOLDER SUCKERS
- HANDLING ESDS ITEMS ONLY IN PROTECTED AREAS

MANUAL GROUNDING PROCEDURES

- MAKE CERTAIN EQUIPMENT IS POWERED DOWN
- TOUCH GROUND PRIOR TO REMOVING ESDS ITEMS
- TOUCH PACKAGE OF REPLACEMENT ESDS ITEM TO GROUND BEFORE OPENING
- TOUCH GROUND PRIOR TO INSERTING REPLACEMENT ESDS ITEMS

ESD PROTECTIVE PACKAGING AND LABELING

- INTIMATE COVERING OF ANTISTATIC MATERIAL WITH AN OUTER WRAP OF EITHER TYPE 1 ALUMINIZED MATERIAL OR CONDUCTIVE PLASTIC FILM OR HYBRID LAMINATED BAGS HAVING AN INTERIOR OF ANTISTATIC MATERIAL WITH AN OUTER METALIZED LAYER
- LABEL WITH SENSITIVE ELECTRONIC SYMBOL AND CAUTION NOTE

CAUTION

Devices such as CMOS, NMOS, MNOS, VMOS, HMOS, thin-film resistors PMOS, and MOSFET used in many equipments can be damaged by static voltages present in most repair facilities. Most of the components contain internal gate protection circuits that are partially effective, but sound maintenance practice and the cost of equipment failure in time and money dictate careful handling of all electrostatic sensitive components.

The following precautions should be observed when handling all electrostatic sensitive components and units containing such components.

CAUTION

Failure to observe all of these precautions can cause permanent damage to the electrostatic sensitive device. This damage can cause the device to fail immediately or at a later date when exposed to an adverse environment.

STEP 1 Turn off and/or disconnect all power and signal source and loads used with the unit.

STEP 2 Place the unit on grounded conductive work surfaces.

STEP 3 Ground the repair operator using a conductive wrist strap or other device using a 1-M series resistor to protect the operator.

STEP 4 Ground any tools (including soldering equipment) that will contact the unit. Contact with the operator's hand provides a sufficient ground for tools that are otherwise electrically isolated.

STEP 5 All electrostatic sensitive replacement components are shipped in conductive foam or tubes and must be stored in the original shipping container until installed.

STEP 6 When these devices and assemblies are removed from the unit, they should be placed in the conductive work surface or in conductive containers.

STEP 7 When not being worked on, wrap disconnected circuit boards in aluminum foil or in plastic bags that have been coated or impregnated with a conductive material.

STEP 8 Do not handle these device unnecessarily or remove from their packages until actually used or tested.

Technical Manual

No. 11-6625-3143-40

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 December 1987

GENERAL SUPPORT MAINTENANCE MANUAL
FOR
SIGNAL GENERATOR
SG-1219/U
(NSN 6625-01-188-7441) (EIC: N/A)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028, (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in back of this manual direct to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LM-LT, Fort Monmouth, New Jersey 07703-5007.

In either case, a reply will be furnished to you.

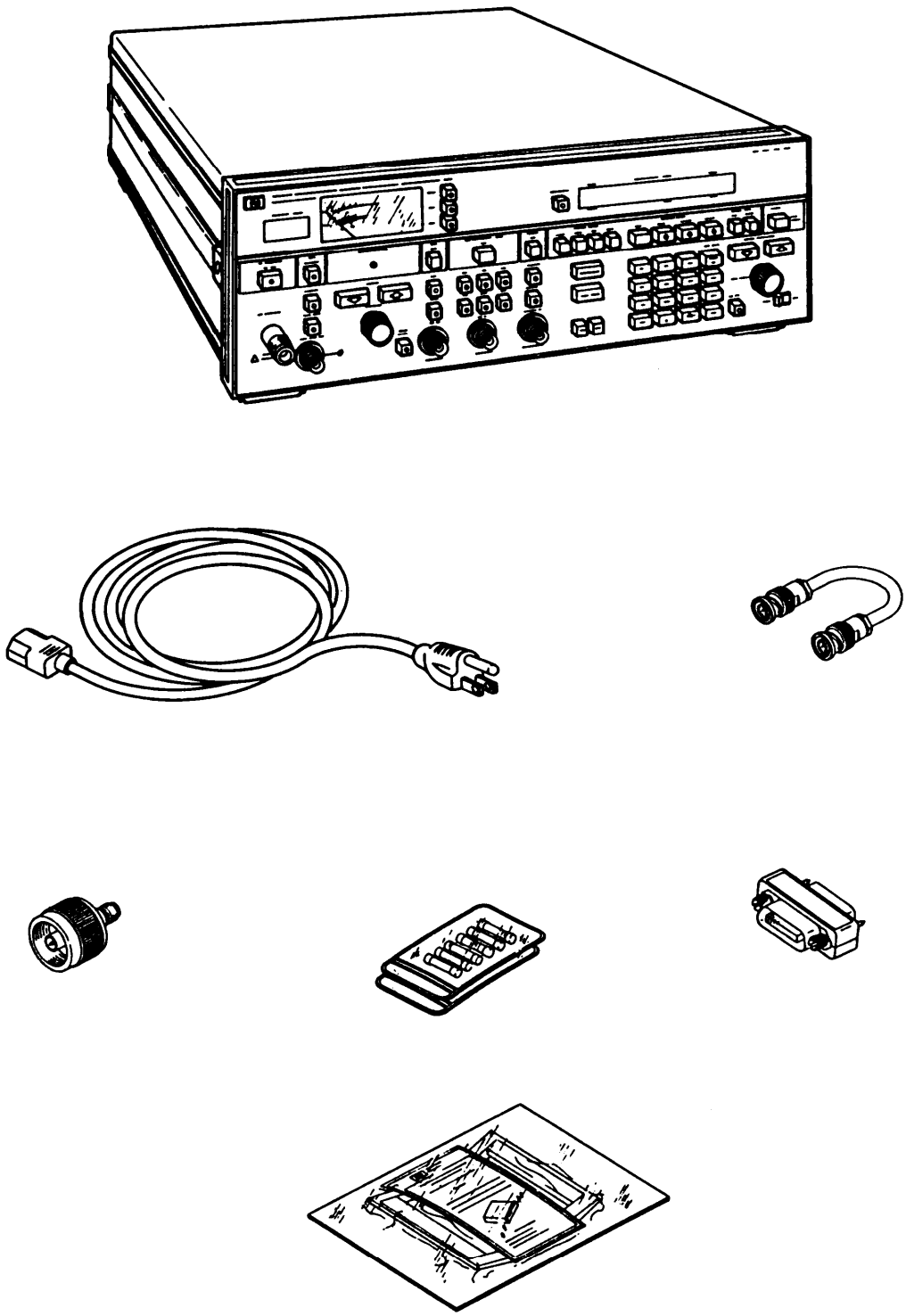


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Figure 1-l. Signal Generator SG-1219/U.

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

This manual contains general support maintenance instructions for Signal Generator SG-1219/u which includes procedures for removal, replacement, disassembly, cleaning, inspection, repair, test, and adjustment as authorized by the Maintenance Allocation Chart (MAC).

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS.

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS.

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in the Maintenance Management Update.

b. Report of Item and Packaging Deficiencies. Fill out and forward SF 364 (Report of Discrepancy) (ROD) as prescribed in AR 735-1l-2/DLAR 4140.55/NAVMATINST 4355.18/AFR 400-54/MCO 4430.3J.

c. Transportation Discrepancy Report (TDR) (SF 361). Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55-37/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D DLAR 4500.15.

1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Destruction of Army materiel to prevent enemy use is described in TM 750-244-2.

1-5. PREPARATION FOR STORAGE OR SHIPMENT.

Preparation instructions for storage and shipment are found in Chapter 2, Section V.

1-6. SAFETY, CARE, AND HANDLING.

Observe all WARNINGS, CAUTIONS, and NOTES in this manual. This equipment can be extremely dangerous if these instructions are not followed.

1-7. NOMENCLATURE CROSS-REFERENCE LIST.

Common names will be used when Signal Generator SG-1219/U is mentioned in this manual.

NOTE

Official nomenclature must be used when filling out report forms or looking up technical manuals.

Common Name	*Official Nomenclature*
Signal Generator	Signal Generator SG-1219/U
SG-1219/U	Signal Generator SG-1219/U

1-8. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your SG-1219/U needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, US Army Communications Electronics Command, Fort Monmouth. ATTN: AMSEL-ED-PH, Fort Monmouth, NJ 07703-5007. We'll send you a reply.

1-9. WARRANTY INFORMATION.

The Signal Generator is warranted by Hewlett-Packard Company for 12 months. Warranty starts on the date of shipment to the original buyer. Report all defects in material or workmanship to your supervisor who will take appropriate action.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-10. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

Refer to TM 11-6625-3143-12, Chapter 1, Section II for this information.

1-11. DIFFERENCE BETWEEN MODELS.

Refer to TM 11-6625-3143-12, Chapter 1, Section II for this information.

1-12. EQUIPMENT DATA.

Refer to TM 11-6625-3143-12, Chapter 1, Section II for this information.

Section III. PRINCIPLES OF OPERATION

1-13. GENERAL FUNCTIONAL DESCRIPTION.

Signal Generator SG-1219/U generates a continuous wave, amplitude modulated, frequency modulated, or pulse modulated output signal (fig. 1-2).

1 The front panel contains all of the controls and indicators necessary for generating output signals. Four input connectors are provided, one for external Automatic Level Control, one for AM , one for FM, and one for pulse modulation. One connector is provided for RF output signal. Two displays provide frequency, amplitude, or entry data. Eleven annunciators light appropriate labels for displays or show status of Signal Generator. Modulation depth/deviation and output power level is measured on output level meter. Various data can be entered using the entry keyboard.

2 The internal circuitry generates desired output signal dependent of front panel controls selected. If an external source is connected and correct modulation mode is selected, output signal is amplitude modulated, frequency modulated, or pulse modulated. An internal power supply provides all voltages necessary to run internal circuits.

3 The rear panel contains power input connector, fuse, voltage selection card for 115-230Vac input power selection, and an intemal/extemal switch for reference frequency selection. Nine BNC connectors are provided for frequency reference, sweep output tone marker, pen lift, blanking marker, 100MHz output, 10MHz output, frequency standard output and frequency standard input. A 24 pin connector is provided for interface connection and a 14 pin connector is provided for remote control of selected operations. A fan is provided for internal circuitry cooling.

1-14. DETAILED FUNCTIONAL DESCRIPTION (fig. FO-5 for serial prefix <3100A or fig. FO-5.1 for serial prefix >3101A).

Functionally, the Signal Generator can be divided into eight electrical subsystems. These are:

- Time Base Reference
- RF Phase Locked Loops
- YIG Tuned Oscillator Summing Loop
- Microwave Signal Path
- Automatic Level Control
- Pulse Modulation
- Digital Control Unit
- Power Supplies

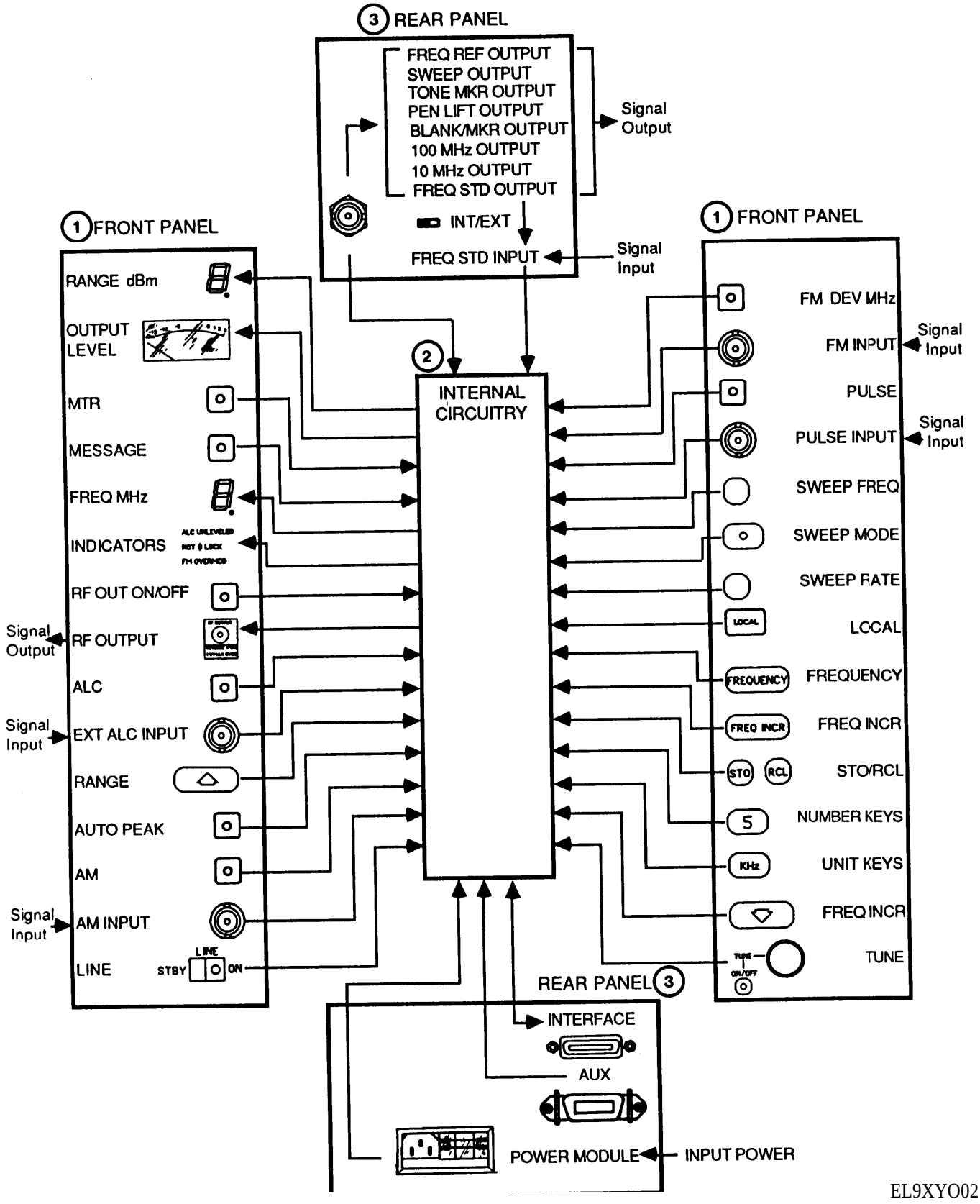


Figure 1-2. Signal Generator Block Diagram.

(1) TIME BASE REFERENCE. This subsystem generates reference frequencies for the Signal Generator. It consists of the following:

- 10MHz Reference Oscillator
- Reference Loop

The 10MHz Reference Oscillator is a temperature controlled, crystal oscillator that generates the basic 10-MHZ reference signal. A BNC connector on rear panel is provided to allow an external 5 or 10MHz reference signal to be used. The Reference Loop also contains a 100MHz Voltage Controlled Crystal Oscillator (VCXO) that is phase locked to internal 10MHz Reference Oscillator, or to an externally connected 5 or 10MHz reference signal if used.

In the Reference Loop, 100MHz signal from Voltage Controlled Crystal Oscillator is divided and multiplied to produce reference frequencies for RF Phase Locked Loops, and for Digital Control Unit. A 10MHz and 100MHz reference signal is also available at a rear-panel BNC connector.

(2) RF PHASE LOCKED LOOPS. These loops are phase locked to Time Base Reference. Under control of the Digital Control Unit , they generate signals that control the YIG Tuned Oscillator Summing Loop. The RF Phase Locked Loops subsystem contains the following:

- Low Frequency Source (LFS) Loop
- M/N Loop

The Low Frequency Source Loop generates a 20-30MHz control signal. This signal is varied by Digital Control Unit and tunes YIG Tuned Oscillator in lKHz steps. This controls the least significant four digits in front panel FREQUENCY MHz display. The M/N Loop generates a 177-197.5 MHz control signal that is varied by Digital Control Unit to tune YIG Tuned Oscillator in 10MHz steps. This controls 10MHz and higher digits of front panel FREQUENCY MHz display.

(3) YIG TUNED OSCILLATOR SUMMING LOOP. This subsystem generates the baseband or Band 1 frequencies (2-6.6GHz) under control of Digital Control Unit and signals from RF Phase Locked Loops subsystem.

The YIG Tuned Oscillator Summing Loop consists of YIG Tuned Oscillator Loop and a Digital-to-Analog Converter. The Digital-to-Analog Converter, under control of Digital Control Unit, pretunes YIG Tuned Oscillator to within ±50MHz of desired YIG Tuned Oscillator frequency. For fine tuning to desired frequency, the YIG Tuned Oscillator loop is phase locked to 20-30MHz and 177-197.5MHz outputs of Low Frequency Source and M/N loops. The YIG Tuned Oscillator Summing Loop also performs the following functions:

- Frequency modulation
- Automatic Level Control (units prefixed >3101A only)
- AM modulation (units prefixed>3101A only)

For Automatic Level Control, YIG Tuned Oscillator Summing Loop output is sampled, detected and sent to Automatic Level Control (ALC) subsystem which sends a signal to Automatic Level Control modulator to control signal level. Amplitude modulation also comes from Automatic Level Control subsystem.

(4) MICROWAVE SIGNAL PATH. This subsystem receives baseband frequencies from YIG Tuned Oscillator Summing Loop and, under Digital Control Unit control, multiplies this signal to generate final desired output frequency. The Microwave Signal Path also performs the following functions:

- Automatic Level Control (units prefixed <3l00A only)
- AM modulation (units prefixed <3100A only)
- Pulse modulation
- Attenuation

For Automatic Level Control, Microwave Signal path output is sampled, detected and sent to Automatic Level Control (ALC) subsystem which sends a signal to Automatic Level Control modulator to control signal level. Amplitude modulation also comes from Automatic Level Control subsystem. The pulse modulation signal comes from Pulse Modulation subsystem.

The Digital Control Unit controls output attenuation based on front panel RANGE inputs.

(5) AUTOMATIC LEVELING CONTROL LOOP. This subsystem has two functions

- Leveling Signal Generator RF output
- Amplitude modulating Signal Generator RF output

To level the RF signal, Automatic Level Control monitors output level, either from the internal coupler and detector or from an external reference connected to EXT ALC input connector. If level starts to change, Automatic Level Control changes drive to Automatic Level Control modulator in Microwave Signal Path (units prefixed <3100A only) or YIG Tuned Oscillator Summing Loop (units prefixed >3101A only) subsystem to counteract change, and output level stays constant. The front panel VERNIER control adjusts Automatic Level Control level to adjust output level within a 15 dB range.

The AM input is added directly to Automatic Level Control/AM modulator drive signal after passing through correction circuitry in Automatic Level Control subsystem.

(6) PULSE MODULATION. This subsystem includes circuits that control pulse modulator in Microwave Signal Path. It also generates the YTM injected pulse that compensates for YTM SRD bias which is lost between pulses in pulse mode.

(7) DIGITAL CONTROL UNIT. This subsystem is the brain of the Signal Generator. It receives data from front panel keys (local mode) or from interface bus (remote mode). After receiving input data, the Digital Control Unit processes it and sends it to various subsystems to control frequency, power level, modulation levels and modes, and other operating modes. The controller also runs diagnostics and monitors operating conditions. If a problem is detected, the controller activates the appropriate annunciators on front panel.

(8) POWER SUPPLIES. This subsystem contains negative and positive voltage regulators that provide DC voltages required for operation. The +22V regulator is turned on whenever main power is applied to the Signal Generator. The remaining regulators are not turned on until Front Panel LINE switch is set to ON.

1-15. **DETAILED CIRCUIT THEORY (fig. FO-6 thru FO-13).**

(1) TIME BASE REFERENCE SUBSYSTEM (fig. FO-6). The Time Base Reference subsystem generates precise time base reference signals of 10, 20, 100 and 400MHz. The 10, 20, and 400MHz time base reference signals are used as references for the M/N Loop, Low Frequency Source Loop, and the Digital Controller. The 100MHz signal is available on rear panel.

The Time Base Reference consists of three assemblies:

. A3A8 10MHz Reference Oscillator Assembly.
. A3A1A1 Reference Loop Phase Detector Assembly.
. A3A1A2 100MHz Voltage Controlled Crystal Oscillator Assembly.

A3A8 10MHz Reference Oscillator Assembly generates a precise 10MHz signal that is coupled over to A3J10 frequency standard input using a jumper on rear panel.

A3A1A2 100MHz Voltage Controlled Crystal Oscillator Assembly is phase locked to A3A8 10MHz Reference Oscillator by phase lock circuits in A3A1A1 Reference Loop Phase Detector Assembly. The 100MHz output from Voltage Controlled Crystal Oscillator goes three places:

- It is fed back to A3A1A1 Reference Phase Detector Assembly where it is divided by 10 (+5 and +2) and compared to A3A8 10MHz Reference Oscillator output to generate Tune Voltage that keeps A3A1A2 100MHz Voltage Controlled Crystal Oscillator Assembly phase locked to 10MHz reference. The output of +5 circuit is buffered to become the internal 20MHZ reference and the output of +2 circuit is routed to three separate buffers to become the three internal 10MHz references.

- It is sent to quadruple to produce 400MHz reference output.

- It is sent to A3J7 rear panel as 100MHz reference.

(2) RF PHASE LOCKED LOOPS SUBSYSTEM (fig. FO-7). The RF Phase Locked Loops, under control of the Digital Control Unit, vary the YIG Tuned Oscillator output frequency. Two RF Phase Locked Loops are used to accomplish this:

- The Low Frequency Source Loop, which controls YIG Tuned Oscillator frequencies of 9.999MHz and less in 1KHz steps, and

- The M/N Loop, which controls YIG Tuned Oscillator frequencies of 10MHz to 6.6GHz in 10MHz steps.

The Low Frequency Source loop synthesizes the lMHz, 100KHz, 10KHz and lKHz digits in the YIG Tuned Oscillator output frequency. This is done by generating an output signal whose frequency varies from 20.001MHz to 30.000MHz. The Digital Control Unit decodes the four least significant bits of the selected frequency and sends it to the Low Frequency Source loop as the 16-bit, Low Frequency Source lK-8M signal. This signal controls the Low Frequency Source loop output frequency which is then used as a reference input signal to the YIG Tuned Oscillator. The Low Frequency Source Loop output frequency is given by the following equation:

$f_{LFS} = 30 - x.xxx$ MHz

where:
f_{LFS} = the Low Frequency Source Loop output frequency, and
x. xxx signifies the four least significant digits of the YIG Tuned Oscillator frequency.

The YIG Tuned Oscillator frequency can be calculated from the Signal Generator output frequency by using the following formulas for each band:

Band 1 $f_{YTO} = f_{OUT}$
Band 2 $f_{YTO} = f_{OUT}2$
Band 3 $f_{YTO} = f_{OUT}3$

where:
f_{YTO}= the YIG Tuned Oscillator output frequency, and
f_{OUT}= the Signal Generator Output frequency.

The Low Frequency Source Loop consists of three assemblies:

- A2A520/30MHz Divider Assembly.

- A2A420/30MHz Phase Detector Assembly.

- A2A3 160-240MHz Voltage Controlled Oscillator Assembly.

Inputs to A2A5 20/30MHz Divider Assembly are the 10MHz reference signal from A3A1A1 Reference Phase Detector Assembly and 16 bits of digital information (LFS lK-8M) from A2A9 Frequency Output HP-IB Assembly. A 160-240MHz feedback signal, from A2A3 160-240MHz Voltage Controlled Oscillator Assembly is also input to A2A5 20/30MHz Divider Assembly. The +10/11 prescaler output, along with a programmable divider, generates a nominal 80KHz output when the Low Frequency Source loop is phase locked.

In A2A4 20/30MHz Phase Detector Assembly, this 80KHz reference signal is compared to the 10MHz +125 signal to generate a pulse whose width is determined by the phase difference of the two signals. This pulse is integrated to obtain a dc tuning voltage, which will always drive the Voltage Controlled Oscillator frequency in the correct direction to maintain phase lock. If the loop unlocks, a one-shot multivibrator is continuously retriggered and the NOT Ø LOCKED on the front panel will come on.

The A2A3 160-240MHz Voltage Controlled Oscillator Assembly contains a voltage controlled oscillator that is controlled by the TUNE OUT signal from A2A420/30MHz Phase Detector Assembly. It is tuned, based on the Low Frequency Source lK-8M inputs, in steps from 160.008MHz to 240MHz. The oscillator output has two paths. One is a filtered feedback path to A2A5 20/30MHz Divider Assembly. In the other path the signal is divided by eight and filtered to obtain a relatively clean signal between 20.001MHz and 30.000MHz. This signal goes to the YIG Tuned Oscillator Loop Subsystem.

The M/N Loop consists of three assemblies:

- A3A1A3 M/N Phase Detector Assembly.
- A3A1A5 M/N Output Assembly.
- A3A1A4 M/N Voltage Controlled Oscillator Assembly.

The MIN Loop generates a 177 to 197.5 MHz signal at +3 dBm. This signal controls the four most significant digits of the YIG Tuned Oscillator frequency. The loop is phase locked to the 400MHz reference signal from A3A1A2 100MHz Voltage Controlled Crystal Oscillator Assembly and 20MHz reference signal from A3A1A1 Reference Phase Detector Assembly. Two binary numbers (M and N), generated by the Digital Control Unit Subsystem, are used to control the M/N Loop frequency. The Digital Control Unit Subsystem generates the M and N numbers by decoding the four most significant digits (10 MHz to 10 GHz) of the selected front panel frequencies. The ratio of M/N determines the M/N OUT frequency.

For each valid M/N OUT frequency change, a 10MHz step occurs in the YIG Tuned Oscillator output. This step complements the Low Frequency Source Loop whose tuning range is 10 MHz in lKHz steps. Together, the M/N Loop, YIG Tuned Oscillator pretuning, and the Low Frequency Source Loop tune the YIG Tuned Oscillator from 2000.000 to 6599.999MHz in lKHz steps.

Phase offsets between divider outputs are constant when the M/N Loop is phase locked. If the M/N Loop unlocks, the front panel NOT Ø LOCKED light turns on.

The relationship between M/N loop output frequency and the M and N numbers is shown by the following equation:

$$f_{M/N} = [200\text{-}10(M/N)]\ \text{MHz}$$

where:
$f_{M/N}$ = M/N frequency out
M = M number
N = N number

3 YIG TUNED OSCILLATOR SUMMING LOOP SUBSYSTEM (fig. FO-8). The YIG Tuned Oscillator Summing Loop generates the Signal Generator's baseband or band 1 frequencies from 2.0-6.6GHZ. The baseband signal is multiplied to produce the Signal Generator full range of output frequencies.

The YIG Tuned Oscillator Summing Loop consists of eleven assemblies:

- A3A5 Digital to Analog Converter Assembly.
- A3A6 YIG Tuned Oscillator Driver Assembly.
- A3A9A5 Sampler Assembly.
- A3A9A4 YIG Tuned Oscillator Phase Detector Assembly.
- A3A9A32.0-6.6GHZ YIG Tuned Oscillator Assembly.
- A3A9A1 Directional Coupler (units prefixed <3100A only).
- A3A9A7 Low Pass Filter.
- A3A9A6 15dB (units prefixed <3100A) or 18dB (units prefixed>3101A) Attenuator.
- A1A6 Meter Assembly.
- A1A5 Digital to Analog Converter and Enable Assembly
- A3A7 YIG Tuned Oscillator/FM Coil Driver Assembly.
- A3A9A8 Preamplifier Assembly (units prefixed >3101A only).

The A3A5 Digital to Analog Converter Assembly receives the digital-to-analog converter 1-4800MHz signal from the Digital Control Unit Subsystem to tune the YIG Tuned Oscillator to within 50MHz of the selected frequency. The A3A5 Digital to Analog Converter Assembly output, YIG Tuned Oscillator PRETUNE, is routed to the A3A6 YIG Tuned Oscillator Driver Assembly.

The A3A6 YIG Tuned Oscillator Driver Assembly receives the YIG Tuned Oscillator PRETUNE signal from A3A5 Digital to Analog Converter Assembly and the YIG Tuned Oscillator TUNE 2 signal from A3A7 YIG Tuned Oscillator/FM Coil Driver Assembly, sums the two and sends them to A3A9A3 YIG Tuned Oscillator Assembly. The 100 MHz low pass filter circuit routes only the DC and low frequency, less than 100 Hz, components of the YIG Tuned Oscillator TUNE 2 signal to A3A9A3 YIG Tuned Oscillator Assembly.

The A3A9A5 Sampler Assembly receives the M/N Loop output from A3A1A5 M/N Output Assembly and the sampled output of A3A9A3 YIG Tuned Oscillator Assembly. The M/N output is applied to a harmonic generator. The output of the harmonic generator is then mixed with the YIG Tuned Oscillator sampled output. Since the YIG Tuned Oscillator has been pretuned to within 50 MHz of the desired frequency, one of the IF frequencies from the mixer will be close to the 20-30MHz signal from the Low Frequency Source Loop Subassembly. This IF signal is routed to A3A9A4 YIG Tuned Oscillator Phase Detector Assembly.

The A3A9A4 YIG Tuned Oscillator Phase Detector Assembly receives the 20-30 MHz signal from A2A3 160-240MHz Voltage Controlled Oscillator Assembly and the selected IF signal from A3A9A5 Sampler Assembly. These two signals are compared in a phase/frequency detector circuit. Each output of the phase/frequency detector corresponds to an error in the YIG Tuned Oscillator frequency. One output is used to indicate the YIG Tuned Oscillator frequency is too low and the other output indicates the YIG Tuned Oscillator frequency is too high. An incorrect YIG Tuned Oscillator frequency will produce a pulse on the phase/frequency detector output corresponding to the YIG Tuned Oscillator frequency being too high or too low. The width of the pulse is proportional to the phase error between the two inputs to the phase/frequency detector.

The differential amplifier circuit combines the two phase/frequency detector outputs to generate a single error signal for the loop integrator circuits. When the YIG Tuned Oscillator frequency is correct, there is no error signal at the input to the loop integrators so the YIG Tuned Oscillator Tune 1 signal does not change. When the YIG Tuned Oscillator frequency is too high or too low, the error signal at the input of the loop integrators causes the output of the loop integrators to increase or decrease until the error signal returns to zero.

The A1A6 Meter Assembly receives the FM input directly from the front panel, and control signals from the Digital Control Unit Subsystem. The FM signal is first applied to the FM band select circuit and the FM metering circuit. The FM band select circuit adjusts the FM signal level for the frequency band that has been selected. The FM metering circuit converts the FM signal to a dc level that is proportional to the level of the FM input signal. This level is sent to the front panel meter, through the meter selection switch, and to the FM overmod circuit that drives the FM OVER MODULATION signal active if the input signal level is too high. The FM overmod circuit also receives an input from the overmodulation detector in the YIG Tuned Oscillator Summing Loop.

The output of the FM band select circuit is applied to the FM amplifier circuit whose gain is controlled by the Digital Control Unit Subsystem through the FM range select circuit.

The A3A7 YIG Tuned Oscillator/FM Coil Driver Assembly receives the YTO TUNE 1 signal from A3A9A4 YIG Tuned Oscillator Phase Detector, amplifies it and routes it to a crossover network consisting of a 100Hz high pass filter circuit and a 100Hz low pass filter in A3A6 YIG Tuned Oscillator Driver Assembly. The FM signal from 100Hz to 2MHz is routed to the FM coil of A3A9A3 YIG Tuned Oscillator Assembly. The YIG Tuned Oscillator tuning signal (YTO TUNE 2 plus YTO PRETUNE) is routed to the YIG Tuned Oscillator main coil.

The FM signal from the metering control takes two paths. The first path is through a 0/40 dB attenuator circuit and an FM amplifier and shaping network circuit to the FM coil driver circuit. This directly modulates the A3A9A3 YIG Tuned Oscillator Assembly. The second path is through an integrator and a 0/40 dB attenuator circuit to the loop integrator circuit in A3A9A4 YIG Tuned Oscillator Phase Detector Assembly. This cancels the error signal produced by the phase/frequency so that FM can occur within the bandwidth of the YIG Tuned Oscillator Summing Loop.

The A3A9A8 Preamplifier Assembly (units prefixed >3101A only) is driven by the Automatic Level Control circuits to maintain the RF output signal at a constant level. This is discussed more fully under Automatic Level Control Loop Subsystem (item number 5).

(4) MICROWAVE SIGNAL PATH SUBSYSTEM (fig. FO-9). The Microwave Signal Path multiples the 2-6.6GHz YIG Tuned Oscillator output to the full 2-18GHz output frequency.

The Microwave Signal Path consists of fifteen assemblies:

- A1A9 preamplifier Assembly (units prefixed <3100A only).
- A1AT4 Attenuator (units prefixed<3100A only).
- A1CP1 Bias Tee.
- A1AT3 Pulse Modulator.
- A1FL1 High Pass Filter (units prefixed <3100A only).
- A1A5 Digital to Analog Converter and Enable Assembly.
- A1A8 Step Recovery Diode Bias Assembly.
- A1A7 YIG Driver Assembly.
- A1A11 Power Amplifier Assembly.
- A1AT2 Isolator.
- A1A10 YIG Tuned Multiplier Assembly.
- A1DC1 Directional Coupler.
- A1CR1 Detector.
- A1AT1 programmable Attenuator.
- A1A1 Attenuator Driver Assembly.

The A1A9 preamplifier Assembly (units prefixed <3100A only) is driven by the Automatic Level Control circuits to maintain the RF output signal at a constant level. This is discussed more fully under Automatic Level Control Loop Subsystem (item number 5).

A1AT4 Attenuator (units prefixed <3100A only), A1CP1 Bias Tee, A1AT3 Pulse Modulator, and A1FL1 High Pass Filter (units prefixed C3100A only) are driven by the pulse modulation circuits to pulse modulate the RF signal. This is discussed more fully under Pulse Modulation Subsystem (item number 6).

The A1A5 Digital to Analog Converter and Enable Assembly peaker digital-to-analog converter circuit is used by the Digital Control Unit Subsystem to peak the YIG Tuned Multiplier output signal for optimum performance. The A1A10 YIG Tuned Multiplier Assembly YIG filter circuit is adjusted so that the RF signal is centered in the passband of the filter to maximize available power and minimize the effects of the narrow passband on modulation.

A1A8 Step Recovery Diode Bias Assembly changes the SRD bias of A1A10 YIG Tuned Multiplier Assembly, under Digital Control Unit Subsystem control, to adjust different bias requirements at different frequencies.

In band 1, Step Recovery Diode (SRD) is forward biased to a low impedance to allow the input signal to pass through the filter. No significant harmonic generation occurs. In the multiplying bands (2-3) the SRD is biased to act as a charge controlled switch. This biasing produces a very narrow, harmonically rich pulse when the diode switches from forward to reverse bias. The pulse width is determined by the circuit inductance and the diode capacitance. Narrow pulse widths of 40 ps are required to obtain high conversion efficiency to 18GHz. The proper timing of the switching action is controlled by the dc voltage bias level. The YIG tuned filter in A1A10 YIG Tuned Multiplier Assembly selects the desired harmonic from the harmonically rich pulse to recover the desired multiple of the input frequency.

Optimum RF conversion efficiency requires that the appropriate dc bias levels be established for the SRD. These bias levels are achieved using a variable resistance FET to control the self-bias conditions of the SRD. A blocking capacitor prevents the dc current from flowing through the driving source. The resistance of the FET is controlled by varying the gate voltage.

The A1A8 Step Recovery Diode Bias Assembly also provides, under Digital Control Unit Subassembly control, frequency band adjustment signals to A1A7 YIG Driver Assembly.

The AlA10 YIG Tuned Multiplier Assembly is a broadband multiplier with an input frequency range of 2.0 to 6.625GHz and an output frequency range of 2.0 to 18.0GHz. This range is divided into three bands which correspond to the frequency multiplication factors of 1 through 3. The three bands and their input and output frequency ranges are listed below.

Band	Input Frequency Range (GHz)	Output Frequency Range (GHz)
1	2.0 to 6.6	2.0 to 6.6
2	>3.3 to 6.15	>6.6 to 12.3
3	>4.1 to 6.2	>12.3 to 18.6

The A1A10 YIG Tuned Multiplier Assembly is a standard step recovery diode (SRD) multiplier that produces a harmonic rich comb spectrum (shown below). The input frequency from the A3A9A3 YIG Tuned Oscillator Assembly is tunable. The output frequency is chosen by selecting a single harmonic component through the YIG filter circuit. The multiplier is inherently broadband in that the comb spectrum, generated by the SRD, extends from the input frequency to an upper limit above 30GHz. The required output frequency is obtained by tuning the YIG filter circuit to a specific harmonic. The YIG filter circuit suppresses all other frequencies. An input low pass filter prevents the output signal from being absorbed by the driving source.

The A1DC1 Directional Coupler receives the RF signal from A1A10 YIG Tuned Multiplier, and sends it to A1AT1 Programmable Attenuator. It also sends a –16dB signal to A1CR1 Detector. This signal is converted to a dc voltage proportional to the power of the RF signal and sends it to the A1A2 ALC/Detector Assembly.

The A1A1 Attenuator Driver Assembly decodes inputs from the Digital Control Unit Subsystem to contol A1AT1 programmable Attenuator. The signals from the Digital Control Unit Subsystem are based on the front panel RANGE settings. The A1AT1 Programmable Attenuator then reduces the amplitude of the RF output signal.

(5) AUTOMATIC LEVEL CONTROL LOOP SUBSYSTEM (fig. FO-10). The primary functions of the Automatic Level Control loop are to provide accurately calibrated output power and wideband linear AM capability. In addition, an external Automatic Level Control input makes it possible to level the power actually delivered to a remote load.

The Automatic Level Control Loop consists of eight assemblies:

- A1A2A1 Automatic Level Control Assembly.
- A1A7 YIG Driver Assembly.
- A1A8 Step Recovery Diode Bias Assembly.
- A1A5 Digital to Analog Converter and Enable Assembly.
- A1A2 ALC/Detector Assembly.
- A4A1 Front Panel Assembly.
- A1A3 Function Assembly.
- A1A6 Meter Assembly.

To accurately control the output power of the Signal Generator in the internal Automatic Level Control mode, a portion of the RF output is fed to A1CR1 Detector by means of A1DC1 Directional Coupler. This signal is logarithmically amplified in the detector circuit of the A1A2 ALC/Detector Assembly. The detector circuit output is summed with the reference voltage at the summing junction in the Automatic Level Control circuit of the A1A2 ALC/Detector Assembly. The summing junction is the input to the integrator circuit. The output of the integrator circuit is routed through an exponentiator circuit and applied to the automatic level control modulator in the A1A9 (units prefixed <3100A) or A3A9A8 (units prefixed >3101A) Preamplifier Assembly to control the RF output power. The AM signal is summed into the summing junction during AM mode operation.

During internal Automatic Level Control operation in the local mode, the active inputs to the reference amplifier circuit on A1A2 ALC/Detector Assembly are:

- F Correct
- ALC reference

The F Correct input from A1A7 YIG Driver Assembly and A1A8 Step Recovery Diode Bias Assembly compensates for the variations of RF power with increasing frequency due to losses in A1CR1 Detector, A1DC1 Coupler, A1AT1 Programmable Attenuator, and connecting hardware.

The Automatic Level Control Reference input is the reference voltage from the front panel VERNIER control. The output of the reference amplifier circuit from AlA5 Digital to Analog Converter and Enable Assembly is summed with the other active inputs at the summing junction in A1A2 ALC/Detector Assembly.

The A1CR1 Detector output is directly proportional to the output power in watts. To make the detector output proportional to output power in dB, the detector output is routed through a logarithmic amplifier circuit prior to being applied to the summing junction in the AlA2 ALC/Detector Assembly This conversion provides the linear reference voltage to control power out in dB.

During AM operation the AM input signal is routed through a log amplifier circuit in A1A3 Function Assembly prior to being applied to the summing junction in the A1A2 ALC/Detector Assembly. This provides linear, calibrated AM independent of RF output level and modulation depth.

External Automatic Level Control operation is essentially the same as internal Automatic Level Control. However, the EXT Automatic Level Control signal is routed through an absolute value amplifier circuit in A1A3 Function Assembly prior to being applied to the log amplifier circuit. The output of this amplifier is negative regardless of the input polarity. This allows any type of external reference, regardless of polarity, to be used and still get the necessary negative input required by the AlA2 ALC/Detector Assembly circuitry.

In externaI Automatic Level Control, the A1A2 ALC/Detector Assembly detector circuit output is ac coupled into the external summing junction in the Automatic Level Control circuitry. This serves the dual function of speeding up the external Automatic Level Control response and of stabilizing the external Automatic Level Control loop. When operating in band 1 in external Automatic Level Control, a clamp circuit in A1A3 Function Assembly limits the power applied to the A1A10 YIG Tuned Multiplier Assembly to prevent spurious response.

A sample of the AM input signal is sent to the AM metering circuit in A1A6 Meter Assembly. When MTR AM is selected, the output level meter indicates the proper AM level.

(6) PULSE MODULATION SUBSYSTEM (fig. FO-11). The pulse modulation circuits provide pulse modulation in the 2-18GHz frequency range.

The Pulse Modulation Subsystem consists of five assemblies:

- A1A4 Pulse Driver Processing Assembly.
- A1AT3 Pulse Modulator.
- A1CP1 Bias Tee.
- A1A5 Digital to Analog Converter and Enable Assembly.
- A1A8 Step Recovery Diode Bias Assembly.

To achieve the typical risetime of <50ns in bands 2-3, a YIG Tuned Multiplier injected pulse is used to speed up the step recover diode self-bias response time. Band 1 does not require the YIG Tuned Multiplier injected pulse to meet this specification because the YIG Tuned Multiplier internal step recovery diode is forward biased in this band.

The series and shunt pulse drivers on the A1A4 Pulse Driver Processing Assembly turn the RF signal on and off by controlling the series and shunt diodes in the AlAT3 Pulse Modulator. To turn the RF signal off, the shunt diodes in the A1AT3 Pulse Modulator are turned on and the series diode is turned off. In this configuration, the RF signal is directed to ground through a 50 ohm resistor and the shunt diodes. To turn the RF signal on, the shunt diodes are turned off and the series diode is turned on. In this configuration, the RF bypasses the 50 ohm resistor through the series diode and is routed through the AlAT3 Pulse Modulator. The timing of the series and shunt pulses controlling the A1AT3 Pulse Modulator are critical.

The A1A4 Pulse Driver Processing Assembly also generates the YIG Tuned Multiplier injected pulse. This pulse is necessary because between RF pulses the step recovery diode loses part of its bias. If the RF pulse from the A1AT3 Pulse Modulator is applied to the A1A l0 YIG Tuned Multiplier Assembly in this condition, the pulse risetime would be affected. The YIG Tuned Multiplier injected pulse is applied to the step recovery diode 50ns before the RF pulse arrives. Thus the YIG Tuned Multiplier is properly biased when the RF pulse arrives, and the pulse risetime is degraded only by the bandwidth of the YIG filter circuit in the A1A10 YIG Tuned Multiplier Assembly.

The YTM injected pulse amplitude must be varied with changes in RF power and frequency. For example, the required amplitude can change significantly if the frequency is changed by more than 50MHz or if the power is changed by 0.4dB or more.

To maintain the correct amplitude of the YTM injected pulse, the Digital Control Unit Subsystem compares the steady-state step recovery diode BIAS 1 voltage from A1A10 YIG Tuned Multiplier Assembly to the BIAS 2 voltage generated by the pulse amplitude control circuit in the A1A5 Digital to Analog Converter and Enable Assembly and adjusts the later to make the two equal.

The output of the pulse amplitude control circuit in the A1A5 Digital to Analog Converter and Enable Assembly drives an amplifier that provides a slope and an offset voltage adjustment for each band. The dc output voltage of this amplifier controls the peak amplitude of the YTM injected pulse. The slope and offset adjustments are used to optimize the YTM pulse peak amplitude for bands 2 and 3 at all output vernier levels.

Also included in the pulse modulation system is an ALC sample and hold circuit. This circuit is used during pulse modulation (in conjunction with the ALC loop previously discussed) to maintain the correct peak pulse power level. During each pulse, the sample gate driver circuit on A1A4 Pulse Driver Processing Assembly turns the FET Sample Switches on. Thus, during pulse modulation operation, the ALC loop is operating only when the RF pulse is present.. The integrating capacitor in the ALC integrator holds the proper dc leveling voltage during the time that the RF pulse is absent. The parameters of the sample gate pulse are adjusted for minimum error in pulse level accuracy.

A minimum pulse width detector circuit is included to light the ALC UNLEVELED light if the pulse width is too narrow. The typical peak level accuracy at 100ns pulse width is ±2dB relative to the CW level. Pulse widths of less than 80ns are available if unleveled power output is acceptable. The maximum pulse repetition frequency for specified level accuracy is lMHz.

(7) DIGITAL CONTROL UNIT SUBSYSTEM (fig. FO-12).

The Digital Control Unit Subsystem consists of the following assemblies:

- A Digital Controller consisting of

  A2A8 Microprocessor Assembly.
  A2A11 ROM/Converter Assembly (units prefixed <3100A only).
  A2A10 RAM Assembly (units prefixed <3100A) or RAM/ROM Assembly (units prefixed >3101A).

- A Control Section consisting of

  A2A9 Frequency Output/HP-IB Assembly.
  A2A7 Input/Output Assembly.
  A2A2 Key Code Assembly.
  A2A1 Panel Driver Assembly.
  A4 Front Panel Assembly.

The function of the Digital Control Unit is to control the internal operation of the Signal Generator. The Digital Control Unit responds to operator data inputs from the front panel as well as data and instructions from the rear panel AUX connector and the HP-IB bus connector. The Digital Control Unit communicates with all internal circuitry in the Signal Generator.

The A2A8 Microprocessor Assembly continually executes programs stored in ROM (Read Only Memory) and uses the RAM (Random Access Memory) to store front panel information and intermediate data calculations. In order to preserve the information stored in RAM when power is removed from the instruments, a battery back up system A2BT1 is used to maintain power to the RAM.

The A2A8 Microprocessor Assembly communicates with other assemblies via a bidirectional data bus, an address bus and various control lines. Information is sent and received on the data bus, the address bus controls where the information is coming from or being sent to and the control lines provide a means of controlling data flow and communication between the A2A8 Microprocessor Assembly and other assemblies.

The Digital Controller is responsible for generating and processing data for the phase locked loops, ALC circuitry and pulse circuitry. The programs that enable the Digital Controller to accomplish these functions are stored in Read Only Memory in the A2A11 ROM/Converter Assembly (units prefixed <3100A) or A2A10 RAM/ROM Assembly (units prefixed >3101A). These programs are also called firmware and are not lost when the ROM is not powered.

The A2A10 RAM Assembly (units prefixed <3100A) or the A2A10 RAM/ROM Assembly (units prefixed >3101A) is used by the A2A8 Microprocessor Assembly to store frequency values, front panel settings (including the data for the RCL 1-9 function), intermediate numerical values needed by the A2A8 Microprocessor Assembly and return addresses when subroutines are executed.

The Control Section is the interface between the Digital Controller and the rest of the Signal Generator. The Control Section can be subdivided into two smaller assemblies:

- An internal interface consisting of:

  A2A9 Frequency Output/HP-IB Assembly.
  A2A7 Input/Output Assembly.

- An external interface consisting of

  A2A2 Key Code Assembly.
  A2A1 Panel Driver Assembly.
  A4 Front Panel Assembly.
  A2A9 Frequency Output/HP-IB Assembly.

The internal interface actually controls Signal Generato operation. The A2A9 Frequency Output/HP-IB Assembly receives frequency data from the Digital Controller and generates the data needed by the YTO, M/N and LFS phase locked loops. This data is used differently by each phase locked loop. The data lines to the YTO phase locked loop are used to pretune the YTO frequency so that the YTO will not phase lock to the wrong frequency.

The data sent to the M/N phase locked loop is used to tune the M/N VCO to a specific frequency that will allow a harmonic of the M/N phase locked loop output to generate a 20-30MHz difference frequency when mixed with the YTO phase locked loop output.

The data that go to the LFS phase locked loop are used to set the LFS phase locked loop to a frequency between 20 and 30MHz with a resolution of 1 KHz.

The A2A7 Input/Output Assembly enables the A2A8 Microprocessor Assembly to read the status of various circuits, output data to circuits, and allows data to be read from the A2A2 Key Code Assembly.

The external interface allows external inputs to be read by the A2A8 Microprocessor Assembly. The external inputs can come from the HP-IB bus connector (in remote mode), the front panel keys or the AUX connector. The results of the entry are displayed on the A4 Front Panel Assembly display. The A2A8 Microprocessor Assembly communicates directly with the A2A1 Panel Driver Assembly and the A4 Front Panel Assembly display to show the current control settings.

The A2A2 Key Code Assembly accepts inputs from the A4 Front Panel Assembly keys and encodes the information. When a key is pressed, a key down (KDN-L) signal is generated by the A2A2 Key Code Assembly which tells the Digital Controller section of the Digital Control Unit Subassembly that a key has been pressed. The A2A8 Microprocessor Assembly then reads the input from the A2A2 Key Code Assembly via the A2A7 Input/Output Assembly. When the data is read, an acknowledgement signal is sent to the A2A2 Key Code Assembly that resets the circuit and allows another entry to be made. The A2A2 Key Code Assembly also processes inputs from the AUX connector in the same manner as a front panel key input.

Inputs in remote mode are processed in the HP-IB portion of the A2A9 Frequency Output/HP-IB Assembly. The HP-IB circuits contain eight registers (status registers) that can be read by the Digital Controller section of the Digital Control Unit Subassembly and eight registers (control registers) that the Digital Controller section can write data into. All communications with the HP-IB bus are done via the HP-IB circuits on the A2A9 Frequency Output/HP-IB Assembly.

8 POWER SUPPLY SUBSYSTEM (fig. FO-13). Power supplies in generate all dc operating voltages for the Signal Generator. Voltages provided are as follows:

- +22Vdc
- +20Vdc
- +10Vdc
- +5.2Vdc
- -5.2Vdc
- -10Vdc
- -40Vdc

The power supply section consists of four assemblies/parts:

- A3A11, A3T1, A3A10, and A3B1 Mainframe Components.
- A3A1 Rectifier Assembly.
- A3A3 Positive Regulator Assembly.
- A3A4 Negative Regulator Assembly.

Mainframe components consist of the A3A11 Line Module, A3T1 Power Transformer, A3A10 Mother Board Components, and A3B1 Fan. These components serve to filter and regulate input power. The A3A10K1 relay applies ac (units prefixed <3100A).or dc (units prefixed >3101A) to the B 1 Fan when instrument ac line is ON. An indicator A3A10CR1, located on the A3A10 Motherboard on the bottom of the instrument, is turned on whenever ac voltages are present on the A3A10 Motherboard.

A3A1 Rectifier Assembly rectifies all ac secondary voltage inputs to the power supplies. Unregulated dc is then routed to the appropriate regulator assemblies. Regulated +22Vdc is generated on this assembly.

A3A3 Positive Regulator Assembly contains the +20Vdc regulator, its overvoltage protection circuit, the front panel shutdown circuit, 10MHz oscillator power supply, power up/down detector, the +5.2Vdc regulator and its overvoltage protection circuit The oscillator power supply is controlled by the rear panel INT/EXT switch.

A3A4 Negative Regulator Assembly contains the –l0Vdc regulator, -5.2Vdc Regulator, Switched -10Vdc output and the -40Vdc regulator and its associated overvoltage protection circuits.

CHAPTER 2
MAINTENANCE INSTRUCTIONS

Section 1. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT.

Common tools and equipment required for general support maintenance of Signal Generator SG-1219/U are listed in the Maintenance Allocation Chart (MAC), TM 11-6625-3143-12, Appendix B.

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Special tools, TMDE, and support equipment required for general support maintenance of Signal Generator SG-1219/U are listed in the Maintenance Allocation Chart (MAC), TM 11-6625-3143-12, Appendix B. Fabrication instructions are listed in Appendix C. Bulk materials are listed in Repair Parts and Special Tools List, TM 11-6625-3143-24P.

2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 11-6625-3143-24P.

Section II. SERVICE UPON RECEIPT

2-4. SERVICE UPON RECEIPT OF MATERIAL.

a. Unpacking. The Signal Generator is packed in its own shipping carton. Unpack the equipment as follows:

- Open shipping carton and remove equipment.
- Place equipment on a suitable clean and dry surface for inspection.
- Keep all shipping materials for use in repacking and reshipping.

b. Checking Unpacked Equipment.

- Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy (ROD).
- Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.
- Check to see whether the equipment has been modified,

2-5. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT.

a. Perform the turn-on procedures given in TM 11-6625-3143-12.

b. Complete performance test (para 2-21).

Section III. TROUBLESHOOTING

SYMPTOM INDEX

2-6. GENERAL.

Troubleshooting at the general support maintenance level requires you to locate any malfunction as quickly as possible. The amount of troubleshooting you can do is based on what the Maintenance Allocation Chart says you can fix. Because of this, the only trouble symptoms you will find here are those that could be caused by faulty items you can fix.

NOTE

- Before using the troubleshooting table, check your work order and talk to organizational maintenance, if possible, for a description of the symptoms and the steps that have been taken to correct them.
- Check all forms and tags attached to, or accompanying, the equipment to determine the reason for removal from service.
- Information for different models is identified using the serial number prefix in text. When not specified (blank), the information applies to all models. Refer to paragraph 1-11 for additional information.

2-7. TROUBLESHOOTING GUIDELINES.

The following is a list of aids that you can use when troubleshooting the Signal Generator

a. The Signal Generator, has built-in tests or self-diagnostics that are used in troubleshooting. These tests are referenced from the individual troubleshooting procedures when required.

b. Refer to the principles of operation, Chapter 1, Section III as required. This provides circuit theory of the assembly or section you are troubleshooting with references to the schematic diagrams. Functional Block diagrams are located in figures FO-6 thru FO-13, and Schematic Diagram is located on figure FO-14.

c. Circuit cooler spray (Appendix B, item 1) can be used in isolating problems. The most generally used method is to spray suspected components to see if the malfunction can be temporarily fixed. This can be used to isolate a bad component. This method will not work all the time, but it can be a great timesaver. It is especially helpful on intermittent problems that get worse with a rise in temperature.

d Use signature analysis. The digital circuit tester is a good troubleshooting tool when testing digital circuits to give a go/no-go test.

e. Many problems on Signal Generators that have been in service for awhile are caused by corrosion. Sometimes removing and reseating the affected plug-in assemblies will correct a malfunction. Cleaning connector pins and/or switch contacts with alcohol (Appendix B, item 2) will repair many types of digital and analog circuit malfunctions.

2-8. EQUIPMENT INSPECTION.

The following inspection procedures shall be used to locate obvious malfunctions with the Signal Generator.

a. Inspect all external surfaces of Signal Generator for physical damage, breakage, loose or dirty contacts, and missing components.

b. Remove top and bottom covers as required to access components (para 2-47).

WARNING

Signal Generator contains high voltages. After power is remove, discharge capacitors to ground before working inside Signal Generator to prevent electrical shock.

CAUTION

Do not disconnect or remove any board assemblies in the Signal Generator unless the instrument is turned off or unplugged. Some board assemblies contain devices that can be damaged if the board is removed when the power is on. Several components, including MOS devices, can be damaged by electrostatic discharge. Use conductive foam and grounding straps when servicing is required around sensitive components. Use care when unplugging ICS from high-grip sockets.

c. Inspect printed circuit board surfaces for discoloration, cracks, breaks, and warping.

d Inspect printed circuit board conductors for breaks, cracks, cuts, erosion, or looseness.

e. Inspect all assemblies for burnt or loose components.

f. Inspect all chassis-mounted components for looseness, breakage, loose contacts or conductors.

g. Inspect Signal Generator for disconnected, broken, cut, loose, or frayed cables or wires.

2-9. TROUBLESHOOTING TABLE.

The Troubleshooting table (table 2-1) lists common malfunctions which may be found during normal operation or maintenance of the Signal Generator or its components. You should perform the tests or inspections and corrective actions in the order listed.

NOTE

- After repair of SG-1219/U verify malfunction is cleared. If not, perform the proper adjustment (table 2-3).
- All voltage readings referenced to ground unless otherwise specified.
- See figure FO-1 (units prefixed <3100A) or FO-1.1 (units prefixed >3101A) for assembly and cable location diagram.
- Before replacing any assembly, check table 2-3 for any required adjustments.
- Information for different models is identified using the serial number prefix in text. When not specified (blank), the information applies to all models. Refer to paragraph 1-11 for additional information.
- Normally units are identified by a serial prefix as to the SG-1219/U basic configuration. There is a possibility that an older unit (serial prefix <3l00A) has been repaired using a new replacement part.

Table 2-1. Troubleshooting

Malfunction	Test or inspection	Corrective action
1. SG-1219/U Displays Message Errors.	Press MESSAGE push button. Read error message number.	
	Error message number 90 (Auto Peak Malfunction):	• Adjust AlA2/A1A3/A1A4/A1A5 Pulse Modulation (para 2-45). • If malfunction still exists, perform Digital Control Unit Test (para 2-17) Function Assembly Check.
	Error message number 92 (Recall Checksum Error):	• Repeat store and recall function that caused Error. • If malfunction still exists, perform Digital Control Unit Test RAM Verification (para 2-17).
	Error message number 95 (Loss of Data On Power Up):	• Switch SG-1219/U to STBY, then back to ON. • If error remains, replace A2BT1 (para 2-77).
	Error message number 96 (Memory Test Failure):	• Switch SG-1219/U to STBY, then back to ON. • If error remains, perform Digital Control Unit Test RAM Verification and ROM Diagnostic/Assembly Check (para 2-17).
	Error message number 97 (ROM Test Failure):	• Switch SG-1219/U to STBY, then back to ON. • If malfunction still exists, perform Digital Control Unit Test ROM Diagnostic/Assembly Check (para 2-17).
	Error message number 98 (RAM Test Failure):	• Repeat store and recall function that caused Error. • If malfunction still exists, perform Digital Control Unit Test RAM Verification (para 2-17).

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action
1. SG-1219/U Displays Message Errors-Continued.		
	Error message number 99 (RAM Not Functional at Power Up):	
		• Repeat store and recall function that caused Error.
		• If malfunction still exists, perform Digital Control Unit Test RAM Verification (para 2-17).
2. Frequency Range and Resolution Test Failure.		
	Step 1. Perform Time Base Reference Test (para 2-11).	
		• Replace faulty component/assembly.
	Step 2. Perform RF Phased Locked Loops Test (para 2-12).	
		• Replace faulty component/assembly.
	Step 3. Perform YIG Tuned Oscillator Summing Loop Test (para 2-13).	
		• Replace faulty component/assembly.
3. Output High Level Accuracy and Flatness Test Failure.		
	Step 1. Adjust A1A2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42).	
	Step 2. Perform Microwave Signal Path Test (para 2-14).	
		• Replace faulty component/assembly.
	Step 3. Perform Automatic Level Control Loop Test (para 2-15).	
		• Replace faulty component/assembly.
4. Low Level Accuracy Test Failure.		
	Step 1. Perform Microwave Signal Path Test (para 2-14).	
		• Replace faulty component/assembly.
	Step 2. Perform Automatic Level Control Loop Test (para 2-15).	
		• Replace faulty component/assembly.

Table 2-1. Troubleshooting-Continued

Malfunction / Test or inspection / Corrective action

5. Harmonics, Subharmonic, and Multiples Test Failure.

Step 1. Adjust AlA2/AlA3/AlA5/AlA7 YTM Tune (para 2-40).

Step 2. Adjust AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42).

Step 3. Perform Microwave Signal Path Test (para 2-14).

- Replace faulty component/assembly.

6. Non-harmonically Related Spurious Signals Test Failure.

Troubleshoot using fig. FO-5 (units prefixed <3100A) or FO-5.1 (units prefixed >3101A) (If problem from 2-6.6GHz, check output of A3 (W7 units prefixed <3100A or A1W11 units prefixed>3100A).

- Replace faulty component/assembly.

7. Single Sideband Phase Noise Test Failure.

Step 1. Adjust A3A1A4/A3A1A5 M/N Loop (Para 2-27).

Step 2. Adjust A2A520/30MHz Loop Divider Bias (para 2-28).

Step 3. Adjust A2A3 160-240MHz Voltage Controlled Oscillator Pretune (para 2-29).

Step 4. Adjust A3A6 YTO Driver (para 2-32).

Step 5. Adjust A3A9 YTO Loop Sampler (para 2-33).

Step 6. Adjust A3A9A4 YTO Loop Offset and FM Overmodulation (para 2-34).

Step 7. Adjust A3A7 FM Driver (para 2-36).

Step 8. Perform Time Base Reference Test (para 2-11).

- Replace faulty component/assembly.

Step 9. Perform RF Phased Locked Loops Test (para 2-12).

- Replace faulty component/assembly.

Step 10. Perform YIG Tuned Oscillator Summing Loop Test (para 2-13).

- Replace faulty component/assembly.

Table 2-1. Troubleshooting-Continued

Malfunction Test or inspection Corrective action
8. Amplitude Modulation Test Failure.
Step 1. Adjust A1A2 AM Bandwidth (para 2-43).
Step 2. Perform Microwave Signal Path Test (para 2-14).
• Replace faulty component/assembly.
Step 3. Perform Automatic Level Control Loop Test (para 2-15).
• Replace faulty component/assembly.
9. FM Frequency Response Test Failure.
Step 1. Adjust A3A7 FM Driver (para 2-36).
Step 2. Adjust A1A6 FM Accuracy and Overmodulation (para 2-37).
Step 3. Perform YIG Tuned Oscillator Summing Loop Test (para 2-13).
• Replace faulty component/assembly.
10. Incidental Amplitude Modulation Test Failure.
Go to malfunction 13.
• Perform as instructed.
11. Pulse Test Failure.
Perform Pulse Modulation Test (para 2-16).
• Perform as instructed.
12. Residual Amplitude and Frequency Modulation Test Failure.
Go to malfunction 13.
• Perform as instructed.
13. All other SG-1219/U Failures.
Step 1. Set LINE switch to STBY.
• Disconnect all external cables, including power cable.

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action

13. All other SG-1219/U Failures-continued.

Step 2. Set rear panel FREQ STANDARD INT/EXT switch to INT.

- Connect jumper A3W3 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed>3101A) between A3J9 and A3J10 on rear panel.

step 3. After power cable has been disconnected from SG-1219/U for at least one minute, reconnect it and verify following indications:

LINE STBY ON indicator . . . . . ON
OVEN COLD indicator . . . . . ON
Fan . . . . . OFF

- If indications are correct, proceed with step 6.

Step 4. Observe A3A1DS1 (fig. FO-4).

- If A3A1DSl is on and STANDBY and/or OVEN COLD lights are OFF, check indicators and proceed with Step 6.

Step 5. Observe LINE STBY ON light.

- If indicator is on, perform Power Supply Test (para 2-18).
- If indicator is off, check fuse and Voltage Selection Card.

Step 6. Set LINE switch set to STBY until OVEN COLD light turns off (15 minutes or less).

Once OVEN COLD indicator turns off, set LINE switch to ON.

Verify FREQUENCY MHz display indicates any frequency between 2 and 18GHz.

Step 7. Verify voltages at following test points.

A3A1TP1	+22Vdc±0.2Vdc
A3A3TP6	+11Vdc±1.1Vdc
A3A3TP5	+20Vdc±0.002Vdc
A3A3TP2	+5.2Vdc±0.1Vdc
A3A4TP5	-5.2Vdc±0.05Vdc
A3A4TP1	-39vdcto -40.6Vdc
A3A4TP4	-l0Vdc±0.2Vdc

- If voltage (7) is correct and frequency (6) is incorrect, perform Digital Control Unit Test (para 2-17).
- If any voltage is incorrect, adjust A3Al/A3A3/A3A4 Power Supply (para 2-24).
- If voltage cannot be adjusted, proceed with Power Supply Test (para 2-18).

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action

13. All other SG-1219/U Failures-Continued.

Step 8. Press RCL then number O push buttons.

step 9. Observe MESSAGE light.

- If MESSAGE light is on, go to malfunction 1.

Step 10. Observe SG-1219/U front panel lights.

- If annunciators are not on, proceed with Step 11.
- If any of the following lights are on, proceed as follows:

LSN or TLK:	Press number 1, 9, STO, then LOCAL push buttons.
OVEN COLD:	Perform Time Base Reference Test (para 2-11).
ALC UNLEVELED:	Proceed with Step 14.
NOT Ø LOCKED:	Look at Phase Lock lights on A2A7 (fig FO-3). If REF loop light is out, perform Time Base Reference Test (para 2-11). If M/N or LFS loop light is out, perform RF Phased Locked Loops Test (para 2-12). If YTO loop light is out, perform YIG Tuned Oscillator Summing Loop Test (para 2-13).

Step 11. Verify SG-1219/U turn-on conditions:

RF OUTPUT ON/OFF light	ON
ALC INTERNAL light	ON
OUTPUT LEVEL meter	-67 to -83dBm
AUTO PEAK light	ON
MTR LVL light	ON
All AM, FM, and PULSE lights	OFF
Frequency	3000MHZ
Frequency Increment	1MHZ
Start Sweep Frequency	2000MHZ
Stop Sweep Frequency	4000MHZ
ΔF Sweep Frequency	2000MHZ
MKRS	OFF (initialized to 3, 6, 9, 12, 15GHz)
Sweep Mode	OFF
Sweep Rate Step	100 (20MHZ)
Sweep Rate Dwell	20ms
FREQ INCREMENT TUNE ON/OFF light	ON

Step 12. Press STO then number 1 push button. Press RCL, then number 1 push button; observe MESSAGE light.

- If MESSAGE light is on, go to malfunction 1.

Table 2-1. Troubleshooting-Continued

Malfunction Test or inspection Corrective action
13. All other SG-1219/U Failures-Continued.
Step 13. Perform Front Panel Data Communications Test (para 2-10). • If test results are incorrect, perform Digital Control Unit Test (para 2-17).
Step 14. Connect input of Frequency Counter to A3A9A1J1 in place of W7 (units prefixed <3100A) or to A3A9A8U1J5 in place of AlW11 (units prefixed >3101A). Disconnect A1W13 from A3A9A8J1 (units prefixed >3101A only). Connect Frequency Standard output on rear panel of Frequency Counter to FREQ STANDARD input (A3J10) on rear panel of SG-1219/U. Set SG-1219/U frequency to 2GHz and frequency increment to 111.111MHz. **NOTE** Disregard blinking message light.
Step 15. Tune SG-1219/U from 2 to 6.6GHz in 111.111MHz steps. Verify that Frequency Counter frequency agrees with SG-1219/U FREQUENCY MHz display ± 1 count. • If frequency is correct, proceed with step 21. • If frequency is incorrect reconnect W7 (units prefixed <3100A), or A1W11 and A1W13 (units prefixed >3101A).
Step 16. Verify Frequency Standard output on rear panel of Frequency Counter is connected to FREQ STANDARD input (A3J10) on rear panel of SG-1219/U. Measure frequency at following test points and verify frequency is within ±1 count. A3J7 (rear panel) ..... 100MHz A3J8 (rear panel) ..... 10MHz A3A1A1J6 ..... 10MHZ A3A1A2W1 ..... 400MHz A3A1A1J3 ..... 20MHZ • If frequencies are incorrect, perform Time Base Reference Test (para 2-11).
Step 17. Connect Frequency Counter input to A2A3J1 in place of A3W14 (green).

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action

13. All other SG-1219/U Failures-Continued.

Step 18. Set SG-1219/U frequency to 2GHz and frequency increment to 1.11lMHz. Step through frequencies listed below and verify that Frequency Counter indications are ±1 count of value shown.

SG-1219/U frequency	Frequency Counter indication
2.0000OOGHz	30.000OOOMHz
2.00111lGHz	28.889000MHz
2.002222GHz	27.778000MHz
2.003333GHz	26.667000MHz
2.004444GHz	25.556000MHz
2.005555GHz	24.445000MHz
2.006666GHZ	23.334000MHz
2.007777GHz	22.223000MHz
2.008888GHz	21.112000MHz
2.009999GHz	20.001000MHz

- If one or more frequencies are incorrect, reconnect A3W14 and perform RF Phased Locked Loops Test (para 2-12).

Step 19. Reconnect A3W14 (green) to A2A3J1. Connect Frequency Counter to A3A1A5J3 (units prefixed<3100A) or to A3A1A5J2 (units prefixed >3101A) in place of A3W8 (orange/white).

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action

13. All other SG-1219/U Failures-Continued.

Step 20. Set SG-1219/U frequency to 2.1GHz and frequency increment to 210MHz. Step through frequencies listed below and verify that Frequency Counter indications are ±1 count of value shown.

SG-1219/U frequency	Frequency Counter indication
2.1OOOOOGHZ	177.500000MHz
2.310000GHz	180.0000OOMHz
2.520000GHz	182.142857MHz
2.730000GHz	184.000000MHz
2.940000GHz	185.625000MHz
3.150000GHz	187.058824MHz
3.360000GHz	188.333333MHz
3.570000GHz	189.473684MHz
3.780000GHz	190.500000MHz
3.990000GHz	191.428571MHz
4.200000GHz	192.272727MHz
4.41OOOOGHz	193.043478MHz
4.620000GHz	193.750000MHZ
4.830000GHz	194.400000MHz
5.040000GHz	195.000000MHz
5.250000GHz	195.555556MHz
5.460000GHz	196.071429MHz
5.670000GHz	196.551724MHz
5.880000GHz	197.000000MHz
6.090000GHz	197.419355MHZ
6.300000GHz	191.818182MHz
6.51OOOOGHZ	192.352941MHz

- If frequencies are correct, reconnect A3W8 (orange/white) and perform YIG Tuned Oscillator Summing Loop Test (para 2-13).
- If frequencies are incorrect, reconnect A3W8 (orange/white) and perform RF Phase Locked Loops Test (para 2-12).

Step 21. Verify SG-1219/U frequency is set to 2GHz and frequency increment is set to 111.11lMHz.

Disconnect Frequency Counter. Connect Power Meter A3A9A1J1 (units prefixed <3100A) or to A3A9A8U1J5 (units prefixed >3101A).

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action
13. All other SG-1219/U Failures-Continued.		
	Step 22. Tune SG-1219/U from 2 to 6.5GHz, in 111.11lMHz steps and verify power level is greater than +12dBm (units prefixed <3l00A) or +10dBm (units prefixed >3101A) for all frequencies.	• If power is low at any points, perform YIG Tuned Oscillator Summing Loop Test (para 2-13).
	Step 23. Press AM OFF push button and verify that AM 30% and AM 100% lights are off.	
	Step 24. Press FM DEVIATION MHz number .3 then MTR FM push buttons and verify that both lights come on.	
	Step 25. Connect Spectrum Analyzer input to A3A9A1J1 (units prefixed <3100A) or to A3A9A8U1J5 (units prefixed >3101A). Using a BNC Tee, connect Test Oscillator output and Oscilloscope input to FM IN connector of SG-1219/U.	
	Step 26. Set Test Oscillator to 100KHz and adjust output level to obtain first carrier null. Verify voltage applied is 0.567Vrms ±0.049Vrms and SG-1219/U OUTPUT LEVEL meter indicates 240KHz ±30KHZ.	• If only voltage is incorrect, perform YIG Tuned Oscillator Summing Loop Test (para 2-13). • If only OUTPUT LEVEL meter indication is incorrect, adjust A1A6 as required (table 2-3). If adjustment does not correct problem, perform Digital Control Unit Test Meter Assembly Check (para 2-17).
	Step 27. Disconnect test equipment and reconnect W7 (units prefixed <3100A) or AlW11 (units prefixed >3101A). Connect Power Meter to RF OUTPUT connector of SG-1219/U. Press RCL, number 0, then ALC DIODE push buttons. Select 10dB output. Set frequency increment to 100MHz. Set frequency to 2.0GHZ. Verify that RF OUTPUT, ALC DIODE, and ALC UNLEVELED light are on.	
	Step 28. Increase SG-1219/U frequency to 18GHz, in 100MHz, steps and verify Power Meter level indicates at least +8dB from 2 to 18GHz.	• If indications are incorrect, perform Microwave Signal Path Test (para 2-14).
	Step 29. Disconnect test equipment. Press RCL then number 0 push buttons. Connect Test Oscillator to AM IN connector of SG-1219/U. Connect Spectrum Analyzer to RF OUTPUT connector of SG-1219/U. On SG-1219/U, press AM 30% and MTR AM push buttons, and set output power level to –l0dBm. Set Test Oscillator output to 10KHz at 0.707Vrms.	

Table 2-1. Troubleshooting-Continued

Malfunction	Test or inspection	Corrective action
13.	All other SG-1219/U Failures-Continued.	
	Step 30. Verify OUTPUT LEVEL meter indicates 30% ±3% and first sidebands displayed on Spectrum Analyzer are about 16.5dB below carrier.	• If indications are incorrect, perform Automatic Level Control Loop Test (para 2-15).
	Step 31. On SG-1219/U, press AM 100% push button. Adjust Test Oscillator output voltage to obtain sidebands that are 12dB below carrier as displayed on Spectrum Analyzer. Verify Test Oscillator output voltage is 0.354 ±0.018Vrms and SG-1219/U OUTPUT LEVEL meter indicates 40 to 60%.	• If indications are incorrect, adjust AlA3/AlA6 AM Accuracy and Meter (para 2-44). • If indications are incorrect after adjustment, perform Automatic Level Control Loop Test (para 2-15). • If malfunction is pulse modulation related, perform Pulse Modulation Test (para 2-16). • If malfunction still exists, troubleshoot using fig. FO-5 (units prefixed <3100A) or FO-5.1 (units prefixed>3101A).

2-10. FRONT PANEL DATA COMMUNICATIONS TEST.

DESCRIPTION

This test is used to check communication between the front panel push buttons and the Digital Control Unit Subsystem.

1. Set LINE switch to STBY.
2. Install MPU Test Connector on A2A8J1 and A2A8J2 (fig. FO-3).
3. Set A2A8S1 to 1 and install a jumper between A2A8TP5 and A2A8TPGND.
4. Set LINE switch to ON. Verify that all front panel lights, except OVEN COLD and STANDBY, are on and displays indicate following:

   - RANGE dBm ..... +110.0
   - FREQUENCY MHZ 1.0.1.0.1.0.1.0.1.0.1
   - AUTO SWEEP push button light . . . . . blinking

5. If any of indications in step 4 are incorrect, perform Digital Control Unit Test (para 2-17).
6. Set LINE switch to STBY. Remove MPU Test Connector and jumper from A2A8.
7. Set LINE switch to ON.
8. Press RCL then number 0 push button.
9. Set OUTPUT LEVEL meter to midrange using OUTPUT LEVEL VERNIER.

   - Verify that MTR LVL push button light is on.

10. Perform the functions as shown below:

ACTION	CONTROL	INDICATOR	INDICATION
Press	MTR AM push button	OUTPUT LEVEL meter MTR LVL push button light MTR AM push button light	ZERO OFF ON
Press	MTR FM push button	OUTPUT LEVEL meter MTR AM push button light MTR FM push button light	NO CHANGE OFF ON
Press	MTR LVL push button	OUTPUT LEVEL meter MTR FM push button light MTR LVL push button light	MIDRANGE OFF ON
Press and hold	MESSAGE push button	FREQUENCY MHz display MESSAGE push button light	00 OFF

ACTION	CONTROL	INDICATOR	INDICATION
Release	MESSAGE push button	FREQUENCY MHz display	3000.000
Press	RF OUTPUT ON/OFF push button	RF OUTPUT ON/OFF push button light OUTPUT LEVEL meter ALC Unleveled light NOT Ø LOCKED light	OFF ZERO ON ON
Press	RF OUTPUT ON/OFF push button	FREQUENCY MHz display	3000.000
Press	ALC DIODE push button	ALC INTERNAL push button light ALC DIODE push button light OUTPUT LEVEL ALC UNLEVELED light	OFF ON ZERO ON
Press	ALC PWR MTR push button	ALC INTERNAL push button light ALC DIODE push button light ALC PWR MTR push button light ALC UNLEVELED light OUTPUT LEVEL meter	OFF OFF ON ON ZERO
Press	ALC INTERNAL push button	ALC PWR MTR push button light ALC INTERNAL push button light ALC UNLEVELED light OUTPUT LEVEL meter	OFF ON OFF MIDRANGE
Press repeatedly	OUTPUT LEVEL RANGE (down arrow) push button	LEVEL dBm display	Decreases in increments of 10dB to MIN -120dBm
Press repeatedly	OUTPUT LEVEL RANGE (up arrow) push button	LEVEL dBm display	Increases in increments of 10dB to MAX +l0dBm
Adjust	OUTPUT LEVEL RANGE push buttons/OUTPUT VERNIER control	LEVEL dBm display	0dB
Rotate FCW then FCCW	OUTPUT VERNIER control	LEVEL dBm display/OUTPUT LEVEL meter	From +3 to -l0dBm in 0.1 dBm increments.
Press	RCL then number O push button	OUTPUT LEVEL meter	-70dBm
Press	AUTO PEAK push button	AUTO PEAK push button light	OFF
Press	AUTO PEAK push button	AUTO PEAK push button light	ON
Press	AM 30% push button	AM 30% push button light	ON
Press	AM 100% push button	AM 30% push button light AM 100% push button light	OFF ON

ACTION	CONTROL	INDICATOR	INDICATION
Press	AM OFF push button	AM 100% push button light	OFF
Press	FM DEVIATION MHZ		
	.03 push button	.03 push button light	ON
	.1 push button	.03 push button light	OFF
		.1 push button light	ON
	.3 push button	.1 push button light	OFF
		.3 push button light	ON
	1 push button	.3 push button light	OFF
		1 push button light	ON
	3 push button	1 push button light	OFF
		3 push button light	ON
	10 push button	3 push button light	OFF
		10 push button light	ON
		NOT Ø LOCKED light	ON
	OFF push button	10 push button light	OFF
		NOT Ø LOCKED light	OFF
Press	AUTO PEAK push button	AUTO PEAK push button light	OFF
Press	PULSE NORM push button	AUTO PEAK push button light	ON
		OUTPUT LEVEL meter	Move to MAX or MIN
		ALC UNLEVELED light	ON
Press	AUTO PEAK push button	AUTO PEAK push button light	OFF
Press	PULSE COMPL push button	AUTO PEAK push button light	ON
		OUTPUT LEVEL meter	MIDRANGE
		ALC UNLEVELED light	OFF
Press	PULSE OFF push button	PULSE COMPL push button light	OFF
		AUTO PEAK push button light	ON
Press	RCL then number 0 push button	None	None
Press and hold	SWEEP FREQ START push button	FREQUENCY MHz display	2000.000
Press and hold	SWEEP FREQ STOP push button	FREQUENCY MHz display	4000.000
Press and hold	SWEEP FREQΔF push button	FREQUENCY MHz display	2000.000
Press and hold	SWEEP FREQ MKR push button	FREQUENCY MHz display	BLANK
Press	SWEEP MODE AUTO push button	SWEEP MODE AUTO push button light	ON
		FREQUENCY MHz display	2000-4000
Press	SWEEP MODE OFF push button	SWEEP MODE AUTO push button light	OFF
		FREQUENCY MHz display	3000.000
Press	SWEEP MODE MANUAL push button	SWEEP MODE MANUAL button light	ON
		FREQUENCY MHz display	2000.00

ACTION	CONTROL	INDICATOR	INDICATION
Press	FREQ INCREMENT DN push button	FREQUENCY MHz display	NO CHANGE
Press repeatedly	FREQ INCREMENT UP push button	FREQUENCY MHz display	Increases in 20MHz steps
Press repeatedly	FREQ INCREMENT DN push button	FREQUENCY MHz display	Decrease in 20MHz steps to 2000.00
Rotate CCW	FREQ INCREMENT TUNE knob	FREQUENCY MHz display	NO CHANGE
Rotate CW	FREQ INCREMENT TUNE knob	FREQUENCY MHz display	Increases in 20MHZ steps
Press	SWEEP MODE OFF push button	SWEEP MODE MANUAL button light	OFF
Press	SWEEP MODE SINGLE push button	SWEEP MODE SINGLE button light FREQUENCY MHz display	ON 2000.000
Press	SWEEP MODE SINGLE push button	FREQUENCY MHz display	Single sweep of from 2000.00 to 4000.00 and returns to 2000.00
Press	SWEEP MODE OFF push button	SWEEP MODE SINGLE button light FREQUENCY MHz display	OFF 3000.000
Press and hold	SWEEP RATE STEP push button	FREQUENCY MHz display	10020.000
Press and hold	SWEEP RATE DWELL push button	FREQUENCY MHz display	20ms
Press	Number 9, STO, LOCAL push buttons	None	None
Press and hold	LOCAL push button	FREQUENCY MHz display	9
Press	Number 1, 9, STO, then LOCAL push buttons	None	None
Press and hold	LOCAL push button	FREQUENCY MHz display	19
Press	• then NO. 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 push buttons	FREQUENCY MHz display	.0123456789
Press 11 times	< — push button	FREQUENCY MHz display	one numeral is blanked and returns to 3000.000 after decimal blanked

ACTION	CONTROL	INDICATOR	INDICATION
Press	FREQUENCY, numbers 5, 0, 0, 0, 0, 0, 0, then KHz push buttons	FREQUENCY MHz display	5000.000
Press	FREQUENCY, numbers 5, 0, 0, 0, hen MHz push buttons	FREQUENCY MHz display	5000.000
Press	FREQUENCY, number 5, then MHz push buttons	FREQUENCY MHz display	5000.000
Press	RCL then number 0 push button	FREQUENCY MHz display	3000.000
Press	FREQ INCR, number 1, then KHz push buttons	None	None
Press repeatedly	FREQ INCREMENT UP push button	FREQUENCY MHz display	Increases in lKHz steps
Press	FREQ INCR, number 1, then MHz push buttons	None	None
Press repeatedly	FREQ INCREMENT UP push button	FREQUENCY MHz display	Increases in lMHz steps
Press	FREQ INCR, number 1, then GHz push buttons	None	None
Press repeatedly	FREQ INCREMENT UP push button	FREQUENCY MHz display	Increases in lGHz steps
Press	SWEEP RATE STEP, number 1, 5, then STEPS ms push buttons	None	None
Press	STEPS ms push button	FREQUENCY MHz display	15 133.333
Press	SWEEP RATE DWELL, number 1, 5, then STEPS ms push buttons	None	None
Press	STEPS ms push button	FREQUENCY MHz display	15 and ms light is on
Press	FREQ INCREMENT TUNE ON/OFF push button	FREQ INCREMENT TUNE ON/OFF push button light	OFF
Rotate CW/CCW	FREQ INCREMENT TUNE knob	FREQUENCY MHz display	NO CHANGE
Press	FREQ INCREMENT TUNE ON/OFF push button	FREQ INCREMENT TUNE ON/OFF push button light	ON
Rotate CW/CCW	FREQ INCREMENT TUNE knob	FREQUENCY MHz display	Increases and then decreases

2-11. TIME BASE REFERENCE TEST.

DESCRIPTION

This test is used to correct a malfunction in the Time Base Reference Subsystem (fig. FO-6).

1. Remove jumper A3W3 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A) from FREQ STANDARD input (A3J9) and FREQ STANDARD output (A3J1O) connectors on SG-1219/U rear panel. Connect Spectrum Analyzer input to FREQ STANDARD output (A3J9) connector.
2. Verify Spectrum Analyzer display indicates 10MHz A30Hz at a power level of at least +8dBm.
   - If frequency or power is incorrect adjust A3A8 as required (table 2-3). If adjustment does not correct problem, replace A3A8 Assembly (para 2-87).
   - If frequency and power are correct, disconnect Spectrum Analyzer input from FREQ STANDARD output (A3J9) connector, reconnect jumper A3W3.
3. Remove A3A1A1 Assembly (para 2-79).
4. Connect Spectrum Analyzer input to A3AlA2J1 in place of A3A1A1W1 (gray/orange/white).
5. Set Power Supply to –8Vdc and turn off. Connect Power Supply positive lead to SG-1219/U chassis ground and negative lead to A3A1A2TP1 (fig. FO-4).

CAUTION

Do not connect a positive voltage at this point or damage to A3A1A2 may result.

6. Turn SG-1219/U to ON. Turn Power Supply on and observe Spectrum Analyzer display.
7. Verify frequency is 100MHz ±lMHz at a power level of at least +3dBm.
   - If a signal is present but frequency and/or power is incorrect, adjust A3A1A2 Reference Loop (para 2-26).
   - If there is no signal or signal cannot be properly adjusted, replace A3A1A2 Assembly (para 2-80).
   - If signal is correct, leave Power Supply connected to A3A1A2TP1. Reinstall A3A1A1 Assembly (para 2-79) and reconnect all cables.
8. Connect Spectrum Analyzer input to 100MHz OUT (A3J7) connector on SG-1219/U rear panel.
9. Verify Spectrum Analyzer display indicates 100MHz±lMHz at a power level of at least 0dBm.
   - If signal is incorrect, adjust A3A1A2 as required (table 2-3). If adjustment does not correct problem, replace A3A1A2 Assembly (para 2-80).
10. Remove A3A1A2W1 (grey/red/white) from A3A1A5J1 (units prefixed <3100A) of A3A1A3J1 (units prefixed >3101A). Connect cable to Spectrum Analyzer input.
11. Verify Spectrum Analyzer display indicates 400MHz±4MHz at a power level of at least -10dBm.
    - If signal is incorrect, adjust A3A1A2 as required (table 2-3). If adjustment does not correct problem, replace A3A1A2 Assembly (para 2-80).
    - If indication is correct and A3A8 checks good (step 2), replace A3A1A1 Assembly (para 2-79).

2-11. TIME BASE REFERENCE TEST—Continued.

12. Reconnect A3A1A2W1 (gray/red/white). Remove Power Supply. Install A3A1A1 Assembly (para 2-79).

13. Troubleshoot all other malfunctions using fig. FO-6.

2-12. RF PHASED LOCKED LOOPS TEST.

DESCRIPTION

This test is used to correct a malfunction in the RF Phased Locked Loops Subsystem (fig. FO-7).

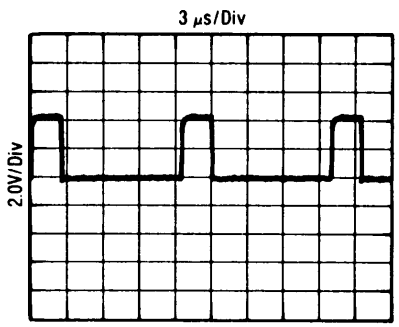
1. Disconnect A3W6 (blue) (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A) from A2A13J1 (fig. FO-3). Connect cable to Frequency Counter input.

2 Verify that frequency is 10MHz ±30Hz.

- If frequency is incorrect perform Time Base Reference Test (para 2-11).

3. Reconnect A3W6 (blue) to A2A13J1. Connect Oscilloscope to A2A5TP2.

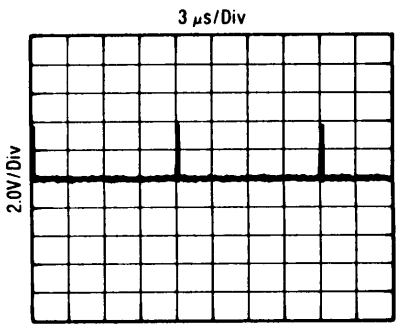
4. Verify waveform is as shown.



- If waveform is incorrect, adjust A2A5 as required (table 2-3). If adjustment does not correct problem, replace A2A5 Assembly (para 2-73).

5. Set A2A3S1 to TEST HIGH FREQ.

6. Press RCL then number 0 push button. Connect Oscilloscope to A2A5TP3. Verify waveform is as shown.



- If waveform is correct proceed with step 11.

7. Remove A2A5 Assembly (para 2-73) and reinstall on an extender board.

8. Set SG-1219/U to frequencies shown below and check input pins for logic levels given.

Freq. GHz	XA2A5-															
	11	12	13	14	15	16	17	18	29	30	31	32	33	34	35	36
3.339999	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
3.336666	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

- If all input levels are correct, adjust A2A5 as required (table 2-3). If adjustment does not correct problem, replace A2A5 Assembly (para 2-73).

2-12. RF PHASED LOCKED LOOPS TEST—Continued.

9. Remove A2A9 Assembly (para 2-74) and reinstall on two 36-pin and one 30-pin extender boards.

10. Set SG-1219/U to frequencies shown below and check input pins for logic levels given.

Freq. GHz	XA9B-										XA9A-					
	2	3	4	5	6	11	20	21	22	23	21	22	31	32	33	34
3.339999	0	0	1	0	1	1	1	0	0	1	1	1	1	0	0	1
3.336666	1	1	0	1	0	0	0	1	1	0	0	1	0	1	1	0

- If all levels are correct, troubleshoot A2A13 Assembly between A2A9 and A2A5 (fig. FO-6).
- If any levels are incorrect perform Digital Control Unit Test (para 2-17), Frequency Output/HP-IB Diagnostic.

11. Verify that A2A3S1 is set to TEST HIGH FREQ.

12. Connect Frequency Counter to A2A3J2 in place of A2W1 (red).

13. Verify Frequency Counter indicates >240MHz.

- If frequency is incorrect, adjust A2A3 as required (table 2-3). If adjustment does not correct problem, replace A2A3 Assembly (para 2-73).

14. Set A2A3S1 to TEST LO FREQ.

15. Verify Frequency Counter indicates <160MHz.

- If frequency is correct reconnect A2W1 (red) to A2A3J2.
- If frequency is incorrect, adjust A2A3 as required (table 2-3). If adjustment does not correct problem, replace A2A3 Assembly (para 2-73).

16. Connect Frequency Counter to A2A3J1 in place of A3W14 (green).

17. Verify frequency is <20MHz.

- If frequency is incorrect, adjust A2A3 as required (table 2-3). If adjustment does not correct problem, replace A2A3 Assembly (para 2-73).

18. Set A2A3S1 to TEST HIGH FREQ.

19. Verify Frequency Counter indicates >30MHz.

- If frequency is correct reconnect A3W14 (green).
- If frequency is incorrect, adjust A2A3 as required (table 2-3). If adjustment does not correct problem, replace A2A3 Assembly (para 2-73).

2-12. RF PHASED LOCKED LOOPS TEST—Continued.

20. Set A2A3S1 to TEST LOW FREQ. Connect Digital Multimeter to A2A4TP4 and verify voltage is >+14V.

    • If voltage is incorrect adjust A2A4 as required (table 2-3). If adjustment does not correct problem, replace A2A4 Assembly (para 2-73).

21. Set A2A3S1 to TEST HIGH FREQ.

22. Verify Digital Multimeter indicates <+4 volts.

    • If voltage is correct set A2A3S1 to NORMAL.

    • If voltage is incorrect, adjust A2A4 as required (table 2-3). If adjustment does not correct problem, replace A2A4 , Assembly (para 2-73).

23. Set SG-1219/U FREQ STANDARD INT/EXT switch to EXT. Connect frequency standard output from Frequency . Counter to A3J10 on SG-1219/U rear panel.

24. Connect Frequency Counter to A3A1A1J3 (fig. F0-4) in place of A3A1A3W2 (gray/white).

25. Verify frequency is 20MHz ±1 count.

    • If frequency is incorrect, perform Time Base Reference Test (para 2-11).

    • If frequency is correct, reconnect A3A1A3W2 (gray/white).

26. Remove A3A1A2W1 (gray/red/white) from A3A1A5J1 (units prefixed <3100A) or A3A1A3J1 (units prefixed >3101A). Connect cable to Frequency Counter input.

27. Verify frequency is 400MHz ±1 count.

    • If frequency is incorrect, perform Time Base Reference Test (para 2-11).

    • If frequency is correct, correct A3A1A2W1 (gray/red/white).

28. Disconnect A3A1A3W1 (white/red cable) from A3A1A5J2 (units prefixed <3100A) or A3A1A5J1 (units prefixed >3101A).

29. Remove A3A1A3 Assembly (para 2-81) and reinstall on an extender board. Connect Digital Multimeter to A3A1A3TP5.

30. Verify voltage is approximately -0.5V.

    • If voltage is incorrect, proceed with step 33.

31. Disconnect A3A1A3W2 (gray/white) from A3A1A1J3. Connect A3A1A3W1 (white/red cable), (previously disconnected in step 28) to A3A1A1J3.

32. Connect Digital Multimeter to A3A1A3TP5 and verify voltage is approximately -38V.

    • If voltage is correct, proceed with step 36.

2-12. RF PHASED LOCKED LOOPS TEST—Continued.

33. Set SG-1219/U to each frequency shown below and check for corresponding logic level on each A3A1A3 input pin shown.

Freq. GHz	XA3AlA3-										
	8	9	10	13	14	15	23	24	25	28	29
6.590	0	0	0	0	0	1	1	1	0	1	0
5.640	1	1	1	1	1	0	0	0	1	0	1

- If all levels are correct, replace A3A1A3 Assembly (para 2-81).

34. Set SG-1219/U to each frequency shown below and check for corresponding logic level on each output pin shown.

Freq. GHz	XA9A-										
	1	2	3	4	5	6	7	8	9	10	11
6.590	1	0	0	0	1	0	1	0	0	1	0
5.640	0	1	1	1	0	1	0	1	1	0	1

- If all levels are correct, troubleshoot A2A13 Assembly using FO-7.
- If any levels are incorrect, perform Digital Control Unit Test (para 2-17), Frequency Output/HP-IB Diagnostic.

35. Verify A3A1A3W1 (white/red) is connected to A3A1A1J3.

36. Connect Digital Multimeter to A3A1A4TP1 and verify voltage is approximately -38V.

- If voltage is incorrect, perform M/N Voltage Controlled Oscillator Assembly Test (para 2-19).

37. Deleted.

38. Remove A3A1A4 Assembly (para 2-82) and reinstall on an extender board. Disconnect A3A1A4W1 (white) from A3A1A5J4 (units prefixed <3100A) or A3A1A5J3 (units prefixed >3101A).

39. Connect A3A1A4W1 (white) to Spectrum Analyzer input.

40. Verify frequency is approximately 396MHz at a power level of at least 0dBm.

- If frequency and power are correct, leave A3A1A4W1 (white) connected to Spectrum Analyzer.
- If frequency and/or power is incorrect, adjust A3AlA4/A3AlA5 M/N Loop (para 2-27). If it cannot be adjusted, perform M/N Voltage Controlled Oscillator Assembly Test (para 2-19).

41. Disconnect A3AlA3Wl (white/red) from A3A1A1J3. Connect A3A1A3W2 (gray/white) to A3A1A1J3.

42. Verify frequency is approximately 342MHz at a power level of at least 0dBm.

- If frequency and power are correct, reconnect A3A1A4W1 (white) to A3A1A5J4 (units prefixed <3100A) or A3A1A5J3 (units prefixed >3101A).
- If frequency and/or power is incorrect, adjust A3AlA4/A3AlA5 M/N Loop (para 2-27). If it cannot be adjusted, perform M/N Voltage Controlled Oscillator Assembly Test (para 2-19).

2-12. RF PHASED LOCKED LOOPS TEST—Continued.

43. Connect Frequency Counter to A3A1A5J3 (units prefixed <31OOA) or A3A1A5J2 (units prefixed >3101A) in place of A3W8 (white/orange).
44. Verify frequency is approximately 171MHz.
    - If frequency is correct, reconnect A3W8 (white/orange) to A3A1A5J3 (units prefixed <3100A) or A3A1A5J2 (units prefixed >3101A).
    - If frequency is incorrect, perform M/N Voltage Controlled Oscillator Assembly Test (para 2-19).
45. Connect Frequency Counter to A3A1A5J2 (units prefixed <3100A) or A3A1A5J1 (units prefixed >3101A) and verify frequency is approximately 58MHz.
    - If frequency is correct, troubleshoot RF Phased Locked Loops Subsystem using fig. FO-7.
    - If frequency is incorrect, perform M/N Voltage Controlled Oscillator Assembly Test (para 2-19).
46. Troubleshoot all other malfunctions using fig. FO-8.
47. Disconnect test equipment reinstall circuit card assemblies, and reconnect all cables.

2-13. YIG TUNED OSCILLATOR SUMMING LOOP TEST.

DESCRIPTION

This test is used to correct a malfunction in the YIG Tuned Oscillator Summing Loop Subsystem (fig. FO-8).

1. Press RCL then number O push button. Ground A3A6TP1 (fig. FO-4).
2. Connect Frequency Counter to A3A9A1J1 in place of W7 (fig. FO-1 units prefixed <3100A) or A3A9A8U1J5 in place of AlW11 (fig. FO-1.1 units prefixed >3101A). Disconnect AlW13 (green) from A3A9A8J1 (units prefixed >3101A only). Verify frequency is 3000MHz ± 20MHz (units prefixed <3100A) or ± 2MHz (units prefixed >3101A).
    - If frequency is correct, proceed with step 8.
3. Connect Digital Multimeter to A3A5TP3 (units prefixed <3100A) or A3A5TP5 (units prefixed >3101A). Set SG-1219/U to 2GHz and then to 6.599 GHz. Verify voltages are as follows:

    2GHz ..... -6.00V
    6.599GHz ..... -19.8V

    - If voltages are correct proceed with step 7.
4. Set SG-1219/U to frequencies shown below and check input pins for indicated logic level.

Freq. GHz	XA3A5-													
	7	8	9	10	11	12	13	25	26	27	28	29	30	31
5.698	1	0	1	0	0	0	1	0	0	0	1	0	0	0
3.977	0	1	0	1	1	1	0	1	1	1	0	1	1	1

    - If all input levels areas indicated, adjust A3A5 as required (table 2-3). If adjustment does not correct problem, replace A3A5 Assembly (para 2-86).

2-13. YIG TUNED OSCILLATOR SUMMING LOOP TEST—Continued.

5. Remove A2A9 Assembly (para 2-74) and reinstall on an extender board.

6. Set SG-1219/U to frequencies shown below and check output pins for logic levels given.

Freq. GHz	XA9A-													
	23	24	25	26	27	28	29	30	31	32	33	34	35	36
5.688	0	1	0	0	0	1	0	1	0	0	0	1	0	0
3.977	1	0	1	1	1	0	1	0	1	1	1	0	1	1

- If all levels areas indicated, troubleshoot A2A13 and A3A10 Assemblies between A2A9 and A3A5 (fig. FO-8).
- If any levels are incorrect perform Digital Control Unit Test (para 2-17), Frequency Output/HP-IB Diagnostic.

7. Connect Digital Multimeter to A3A6TP2. Set SG-1219/U to 2GHz and then 6.599GHz and verify voltages are as follows:

2GHZ ..... –37.5Vdc±10%
6.599GHz ..... -32.0Vdc±l0%

- If voltages are incorrect, adjust A3A6 YTO Driver (para 2-32). If adjustment does not correct problem, replace A3A6 Assembly (para 2-86).
- If voltages are correct, and SG-1219/U has a serial prefix <3100A, proceed with step 8.
- If voltages are correct, and SG-1219/U has a serial prefix >3101A, proceed as follows:

  a. Verify SG-1219/U frequency is set to 2GHz and frequency increment is set to 111.11l MHz.

  b. Disconnect Frequency Counter. Connect Power Meter to A3A9A8U1J5 (fig. FO-1.1).

  c. Tune SG-1219/U from 2 to 6.5GHz, in 111.11l MHz steps and verify power level is greater than +l0dBm for all frequencies.

  - If levels are correct, proceed with step 8.
  - If power is low at any of the points, proceed as follows:

    (1) Disconnect Power Meter from A3A9A8U1J5. Disconnect rigid cable A3A9W1 from A3A9A8U1J3 and connect Power Meter to cable.

    (2) Set SG-1219/U frequency is to 2GHz and frequency increment is set to 100MHz.

    (3) Tune SG-1219/U from 2 to 6.599 999GHz, in 100MHz steps and verify power level is greater than + 10dBm for all frequencies.

    - If levels are correct, adjust A3A9A8 (table 2-3). If adjustments do not correct problem, replace A3A9A8 Assembly (para 2-96.1).
    - If levels are incorrect, adjust A3A9A3 (table 2-3). If adjustments do not correct problem, replace A3A9A3 Assembly (para 2-91).

2-13. YIG TUNED OSCILLATOR SUMMING LOOP TEST—Continued.

8. Connect Frequency Counter to A3A9A6 in place of A3A9W2. Verify frequency is within ±20MHz (units prefixed <3100A) or ±2MHz (units preferred >3101A) of frequency displayed on SG-1219/U front panel.

   • If frequency is incorrect, troubleshoot A3A9A1 (units prefixed <3100A only), A3A9A6, A3A9A7 (units prefixed <3100A only), and A3A9A8 (units prefixed >3101A only) using fig. FO-8. Replace A3A9A 1 Directional Coupler (para 2-89), A3A9A1 Directional Coupler (para 2-95), A3A9A7 Low Pass Filter (para 2-96), or A3A9A8 Preamplifier Assembly (para 2-96.1) as required.

9. Reconnect A3A9W2. Connect Frequency Counter to A3A9J2 in place of A3A9W4 (black). Press RCL then number O push button and verify frequency is >30MHz.

   • If frequency is correct, reconnect A3A9W4 (black) and proceed with step 12.

10. Disconnect A3W8 (white/orange) from A3A9J5. Connect cable to Frequency Counter and verify frequency is 189.375MHz ±1 count.

    • If frequency is incorrect, reconnect A3W8 (white/orange), and perform RF Phased Locked Loops Test (para 2-12).

11. Reconnect A3W8 (white/orange). Press RCL then number O push button. Place A3A9 Assembly into service position (para 2-88). Using a high impedance probe, connect Spectrum Analyzer input to right (non-grounded) side of A3A9A5R9. Verify a 189MHz signal at +7dBm is present.

    • If signal is correct, replace A3A9U1 Sampler (para 2-94).

    • If signal is incorrect, adjust A3A9 Loop Sampler (para 2-33). If adjustment does not correct problem, replace A3A9A5 Assembly (para 2-93).

12. Disconnect A3W14 (green) from A3A9J3. Connect cable to Frequency Counter and verify frequency is 30.000MHZ ±1 count.

    • If frequency is correct leave A3W14 (green) disconnected.

    • If frequency is incorrect, perform RF Phased Locked Loops Test (para 2-12).

13. Remove ground from A3A6TP1 and connect Digital Multimeter to A3A7TP2 and verify voltage is >+5V.

    • If voltage is incorrect, adjust A3A9 Loop Sampler (para 2-33). If adjustment does not correct problem, replace A3A9A4 Assembly (para 2-92).

14. Reconnect A3W14 (green) and disconnect A3A9W4 (black) from A3A9J1 and verify voltage is <-5V.

    • If voltage is incorrect, adjust A3A9 Loop Sampler (para 2-33). If adjustment does not correct problem, replace A3A9A4 Assembly (para 2-92).

15. Verify A3W14 (green) is connected to A3A9J3 and A3A9W4 (black) is disconnected horn A3A9J1.

16. Connect Digital Multimeter to A3A6TP1 and verify voltage is <-5.3V.

    • If voltage is incorrect, adjust A3A7 as required (table 2-3). If adjustment does not correct problem, replace A3A7 Assembly (para 2-86).

17. Reconnect A3A9W4 (black) to A3A9J1 and disconnect A3W14 (green) from A3A9J3, and verify Digital Multimeter indication is >6.7V.

    • If voltage is incorrect, adjust A3A7 as required (table 2-3). If adjustment does not correct problem, replace A3A7 Assembly (para 2-86).

2-13. YIG TUNED OSCILLATOR SUMMING LOOP TEST—Continued.

18. Verify A3W14 (green) is disconnected from A3A9J3 and A3A9W4 (black) is connected to A3A9J1.

19. Connect Digital Multimeter to A3A6TP2. Reconnect A3W14 (green) to A3A9J3 and record DigitaI Multimeter indication. Disconnect A3W14 (green) from A3A9J3 and record new Digital Multimeter indication. Verify Digital Multimeter indication decreases by about 0.02V when cable is removed.

- If voltage change is comet, reconnect A3W14 (green) to A3A9J3, disconnect A3A9W4 (black) from A3A9J3.
- If voltage change is incorrect, adjust A3A6 YTO Driver (para 2-32). If adjustment does not correct problem, replace A3A6 Assembly (para 2-86).

20. Connect Digital Multimeter to A3A6TP2. Reconnect A3A9W4 (black) to A3A9J1 and record Digital Multimeter indication. Disconnect A3A9W4 (black) from A3A9J1 and record Digital Multimeter indication. Verify Digital Multimeter indication increases by about 0.02V when cable is removed.

. If voltage change is correct, connect A3A9W4 (black).

- If voltage change is incorrect, adjust A3A6 YTO Driver (para 2-32). If adjustment does not correct problem, replace A3A6 Assembly (para 2-86).

21. On SG-1219/U, press RCL then number O push buttons and set FM deviation to 10MHz.

22. Connect Test Oscillator 50Ω output to SG-1219/U FM input.

23. Set Test Oscillator for 10MHz at an output level of OV.

24. Connect Oscilloscope to A3A7TP5.

25. Adjust Test Oscillator output level for lV peak display on Oscilloscope.

- If Test Oscillator output level cannot be adjusted to produce specified Oscilloscope display, adjust A1A6 as required (table 2-3). If adjustment does not correct problem, replace A1A6 Assembly (para 2-56).

26. Press following push buttons in sequence and check for corresponding signal level on Oscilloscope:

FM deviation 3, measure 0.3V peak.
FM deviation 1, measure 0.lV peak.
FM deviation .3, measure 0.03V peak.

- If any or all of above indications are incorrect, adjust A1A6 as required (table 2-3). If adjustment does not correct problem, replace A1A6 Assembly (para 2-56).

27. Remove A1A5 Assembly (para 2-56) and reinstall on an extender board. Connect Digital Multimeter to A1A5XA5 pin 7 (fig. FO-2) and observe voltage, then press FM DEVIATION MHz number .1 push button. Verify voltage jumps from OV to approximately +4.5V (>3.5V).

- If voltage does not change as indicated, adjust A1A5 as required (table 2-3). If adjustment does not correct problem, perform Digital Control Unit Test (para 2-17), DAC and Enable Assembly Check. If passed test, adjust A3A7 as required (table 2-3). If adjustment does not correct problem, replace A3A7 Assembly (para 2-86).

28. Troubleshoot all other malfunctions using fig. FO-8.

29. Disconnect test equipment, reinstall circuit card assemblies, and reconnect all cables.

2-14. MICROWAVE SIGNAL PATH TEST.

DESCRIPTION

This test is used to correct a malfunction in the Microwave Signal Path Subsystem (fig. FO-9).

CAUTION

Take care not to damage Semi-rigid coaxial cables when connecting or disconnecting from components.

1. Disconnect AlW4 from A1FL1 (fig. FO-1 units prefixed <3100A) or A1W4 from A1A11 (fig. FO-1.1 units prefixed >3101A). Disconnect A1W13 (green) from A3A9A8J1 (units prefixed >3101A only).
2. Connect Power Meter to output of A1FL1 (units prefixed <3100A) or to cable A1W4 (units prefixed >3101A).
3. Set SG-1219/U LINE switch to on, frequency to 2GHz, and frequency increment to 100MHz.
4. Tune SG- 1219/U from 2 to 6.59999GHz in 100MHz steps and verify power level does not drop below +11.5dBm (units prefixed <3100A) or +9.0dBm (units prefixed >3101A) at any frequency.
   - If indication is correct, reconnect A1W4 and A1W13 (units prefixed >3101A only), and proceed with step 9.
   - If indication is incorrect and SG-1219/U is prefixed >3101A, troubleshoot A1CP1 or A1AT3 using fig. FO-9. Replace faulty component A1CP1 Bias Tee (para 2-65), or A1AT3 Pulse Modulator (para 2-63).
   - If indication is incorrect and SG-1219/U is prefixed <3100A, proceed with step 5.
5. Reconnect AlW4 to A1FL1. Disconnect cable AlW11 from A1CP1 and connect cable to Power Meter.
6. Tune SG-1219/U from 2 to 6.59999GHz in 100MHz steps and verify power level does not drop below +12dBm at any frequency.
   - If indication is correct, adjust as required (table 2-3). If adjustment does not correct problem, troubleshoot A1CP1, A1AT3, or A1FL1 using fig. FO-9. Replace faulty component:

     A1CP1 Bias Tee (para 2-65),
     A1AT3 Pulse Modulator (para 2-63),
     A1FL1 High Pass Filter (para 2-68).
7. Reconnect AlW11 to A1CP1. Disconnect W7 from A3A9A1J1 (fig. FO-4) and connect Power Meter to A3A9A1J1.
8. Tune SG- 1219/U from 2 to 6.59999GHz in 100MHz steps and verify power level does not drop below +l0dBm at any frequency.
   - If indication is correct, adjust A1A2 as required (table 2-3). If adjustment does not correct problem, replace A1A2 (para 2-54).
   - If indication is incorrect, adjust A3A9A3 as required (table 2-3). If adjustment does not correct problem, replace A3A9A3 Assembly (para 2-91).
   - Reconnect W7 to A3A9A1J1.
9. Disconnect AlW3 from A1A10 and connect Power Meter to A1Al0.
10. Set SG-1219/U frequency to 2GHz. Set frequency increment to 100MHz. Select 10dB output and press ALC DIODE push button.

2-14. MICROWAVE SIGNAL PATH TEST—Continued.

11. Tune SG- 1219/U from 2 to 18GHz in 100MHz steps and verify power level does not drop below +l0dBm at any frequency.

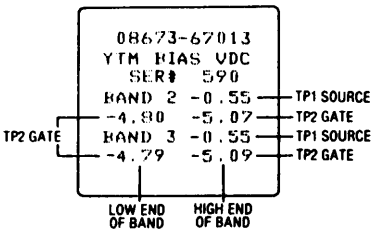
    • If indication is correct remove Power Meter, reconnect AlW3, and proceed with step 30.

    • If indication is incorrect remove Power Meter and reconnect A1W3.

12. Find SRD BIAS label (sample label is shown below) .Verify voltages at AlA8TP1 and A1A8TP2 (fig. FO-2) against label ±10mV.

    • If voltages are incorrect adjust A1A8 SRD Bias (para 2-39).

    • If adjustment does not correct problem, replace A1A8 Assembly (para 2-56).



NOTE
If only two digits are printed to the right of the decimal point (as in -4.80), the unprinted third digit is zero (thus, -4.800).

13. Remove A1A8 Assembly (para 2-56) and reinstall on an extender board. Measure voltages at XA8 pins 17 and 18 for bands 1 thru 3. Verify indication is as shown below.

XA8-	BAND		
	1	2	3
17	≈–29V	≈–5V	≈–29V
18	≈–29V	≈–29V	≈–5V

    • If indication is incorrect, adjust A1A8 as required (table 2-3). If adjustment does not correct problem, replace A1A8 Assembly (para 2-56).

14. Connect Digital Multimeter to XA8 pin 10. Set SG-1219/U to following frequencies and check for corresponding voltage.

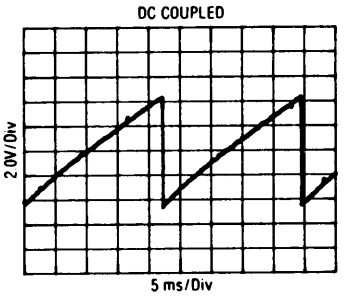
    2GHz ..... -6V ±0.lV
    4GHz ..... –12V ±0.1V
    6GHz ..... –18V +0.1V

    • If voltages are incorrect, adjust A3A5 as required (table 2-3). If adjustment does not correct problem, replace A3A5 Assembly (para 2-86).

15. Install MPU Test Connector on A2A8 and set A2A8S1 Test Switch to 5. Press number 3 push button and press A2A2S1. Install a jumper between A2A8TP5 and A2A8TPGND.

16. Connect Oscilloscope to AlA5TP4 and verify Oscilloscope displays a waveform similar to one shown.

    • If waveform is incorrect, adjust A1A5 as required (table 2-3). If adjustment does not correct problem, perform Digital Control Unit Test (para 2-17), DAC and Enable Check.



2-14. MICROWAVE SIGNAL PATH TEST—Continued.

17. Remove MPU Test Connector and set A2A8S1 test switch to 1. Disconnect jumper on A2A8TP5.

18. On SG-1219/U, press RCL, then number O push button. Set FREQ INCR to 100MHz.

19. Disconnect AlW5 from output of A1AT2. Connect Power Meter using 10dB Attenuator to A1AT2.

20. Tune the SG-1219/U in 100MHz steps to the following frequencies and verify Power Meter indication shown:

2GHz to 3GHz	≥18dBm
3GHz to 4GHz	≥21.5dBm
4GHz to 5GHz	≥22.5dBm
5GHz to 6.5GHz	≥24.5dBm

- If indication is correct, proceed with step 23.

21. Reconnect A1W5 to A1AT2. Disconnect A1W10 from A1A11. Connect Power Meter to A1A11 using 10dB Attenuator.

22. Tune the SG-1219/U in 100MHz steps to the following frequencies and verify Power Meter indication shown:

2GHz to 3GHz	≥20dBm
3GHz to 4GHz	≥23.5dBm
4GHz to 5GHz	≥24.5dBm
5GHz to 6.5GHz	≥26.5dBm

- If indication is correct, replace A1AT2 Isolator (para 2-62).
- If indication is incorrect, adjust A1A11 as required (table 2-3). If adjustment does not correct problem, replace A1A11 Assembly (para 2-60).

23. Disconnect Power Meter and reconnect AlW5 to A1AT2. Connect Digital Multimeter to A1A10 A1TP2 and verify 14.9V.

. If voltage is correct, proceed with step 25.

24. Connect Digital Multimeter to A1A10A1TP1 and verify -4.9V.

- If voltage is correct, replace A1A10A1 Assembly (para 2-59).
- If voltage is incorrect, adjust A1A10 as required (table 2-3). If adjustment does not correct problem, replace A 1 A 10 Assembly (para 2-58).

25. On SG-1219/U, press RCL then number O push button. Connect Digital Multimeter to A1A10A1TP8 and verify -0.8V.

- If voltage is incorrect replace A1A10A1 Assembly (para 2-59).

26. On SG-1219/U, set LINE switch to STBY. Disconnect AlW6 from A1A10A1J2. Connect positive lead of Digital Multimeter to A1A10A1TP7 and negative lead to A1A10A1J2 pin 7. Verify indication of 45Ω.

- If indication is correct reconnect A1W6 to A1A10A1J2.
- If open or short is indicated, replace Al A10A1 Assembly (para 2-59).

2-14. MICROWAVE SIGNAL PATH TEST—Continued.

27. On SG-1219/U, set LINE switch to ON. Set frequency to 2GHz and connect Digital Multimeter to A1A7TP3. Verify Digital Multimeter indication of -0.75V. Change frequency to 8GHz and verify Digital Multimeter indication of –2.97V. Change frequency to 15GHz and verify Digital Multimeter indication of –5.6V.

    • If voltages are all correct, adjust A1Al0 as required (table 2-3). If adjustment does not correct problem, replace A1A10 Assembly (para 2-58).

    • If voltages are all incorrect, proceed with step 29,

28. On SG-1219/U, set LINE switch to STBY. Remove AlA7 (para 2-56) and reinstall on an extender board. Set LINE switch to ON Set SG-1219/U to each frequency shown below and verify logic level.

XA7-	3.0 GHz	8.0 GHz	15.0 GHz
30	0	1	1
31	1	0	1
32	1	1	0
33	1	1	1
35	≈ –29V	≈ -1 .5V	≈ -29V
36	≈ -29V	≈ –29V	≈ -1 .5V
17	≈ –29V	≈ -29V	≈ -29V

    • If any level is incorrect adjust A1A8 as required (table 2-3). If adjustment does not correct problem, replace A1A8 Assembly (para 2-56).

    • If all levels are correct, adjust Al A7 as required (table 2-3). If adjustment does not correct problem, replace A1A7 Assembly (para 2-56).

29, Check A1Q1.

    • If A1Q1 checks good, adjust A1A7 as required (table 2-3). If adjustment does not correct problem, replace AlA7 Assembly (para 2-56).

    • If A1Q1 checks bad replace A1Q1 Transistor (para 2-69).

30. Connect SG- 1219/U RF OUTPUT to Power Meter. Set SG- 1219/U frequency to 2GHz. Set frequency increment to 100MHz. Select 10dB output and press ALC DIODE push button.

31. Tune SG-1219/U from 2 to 18GHz in 100MHz steps and verify power level does not drop below +8dBm at any frequency.

    • If indication is correct, proceed with step 34.

32. Remove A1A1 Assembly (para 2-53) and reinstall on an extender board. On SG-1219/U connect Spectrum Analyzer to RF OUTPUT connector. Press RCL then number O push button. Set output level to –5dBm. Using OUTPUT LEVEL VERNIER only, set output level to 0dBm as indicated on Spectrum Analyzer.

2-14. MICROWAVE SIGNAL PATH TEST—Continued.

33. Use OUTPUT LEVEL RANGE (down arrow) push button to change output level as shown below and verify that specified outputs are TTL high for each level. Verify Spectrum Analyzer indication decreases 10dB for each keystroke.

Output level	Output microcircuit pin numbers (HIGH)	
-lOdBm	U3-3,2	U1-3,5
–20dBm	U3-11,1O	U4-3,5
-40dBm	U3-13,14	U5-3,5
-80dBm	U3-5,6	U2-3,5

- If indications are incorrect replace A1A1 Assembly (para 2-53).
- If indications are correct, troubleshoot A1AT1 and A1DC1 using FO-9. Replace faulty component:

  A1AT1 Programmable Attenuator (para 2-61),
  A1DC1 Directional Coupler (para 2-67).

34. Troubleshoot all other malfunctions using fig. FO-9.

35. Disconnect test equipment, reinstall circuit card assemblies, and reconnect all cables.

2-15. AUTOMATIC LEVEL CONTROL LOOP TEST.

DESCRIPTION

This test is used to correct a malfunction in the Automatic Level Control Loop Subsystem (fig. FO-10).

1. Remove A1A8 (para 2-56) and reinstall on an extender board. Set SG-1219/U frequency to 2GHz, and then to 6.5GHz. Check voltage at XA8 pin 15 (fig. FO-2) at each frequency. Verify voltages areas shown below.

   2GHz ..... -0.003V ± 0.002V
   6.5GHz ..... +0.2V ± 0. lV

   - If voltages are correct proceed with step 4.

2. Connect Digital Multimeter to A1A7TP2 and set SG-1219/U frequency to 2GHz then to 6.5GHz. Verify voltages are as shown below.

   2GHZ ..... -1.8V
   6.5GHz ..... -3.5V

   - If voltages are correct, adjust AlA8 as required (table 2-3). If adjustment does not correct problem, replace A 1A8 (para 2-56).
   - If voltages are incorrect, adjust A1A7 as required (table 2-3). If adjustment does not correct problem, perform Microwave Signal Path Test (para 2-14) steps 26 thru 28.

2-15. AUTOMATIC LEVEL CONTROL LOOP TEST—Continued.

3. Connect Digital Multimeter to A1A5TP10 and Rotate OUTPUT LEVEL VERNIER fully CW then fully CCW. Verify voltages are as follows:

Fully CW 0V
Fully CCW ..... -5.7V (typical)

• If voltages are incorrect, proceed with step 5.

4. Connect Digital Multimeter to A1A5TP8 and rotate OUTPUT LEVEL VERNIER fully CW then fully CCW. Verify voltages are as follows:

Fully CW ..... Ov
Fully CCW ..... +5.8V (typical)

• If voltages are correct, proceed with step 6.

5. Connect Digital Circuit Tester as directed in Digital Control Unit Test (para 2-17) DAC and Enable Assembly Check steps 1 thru 6. Verify signatures of input signals NSTRB, address lines BAO-3 and data lines DATA0-7, as shown in DAC and Enable Diagnostic signatures table.

• If signatures are correct, replace A1A5 Assembly (para 2-56).

• If signatures are incorrect, perform Digital Control Unit Test (para 2-17).

6. Connect Power Meter to SG-1219/U RF output connector.

7. On SG- 1219/U, set output power to +8dBm (units prefixed <3100A) or +0.0dBm (units prefixed >3101A) and press ALC DIODE push button.

8. If ALC problem occurs at certain frequencies only, set SG-1219/U to one of problem frequencies. Otherwise, set SG-1219/U to any frequency between 2 and 6GHz.

• If Power Meter indication is <+8dBm (units prefixed <3l00A) or <+0.0dBm (units prefixed >3101A) at any frequency, perform Microwave Signal Path Test (para 2-14).

• If Power Meter indication is correct and Signal Generator is prefixed <3100A, proceed with step 9.

• If Power Meter indication is correct and Signal Generator is prefixed >3101A, proceed with step 20.

9. On SG-1219/U, set RF OUTPUT to OFF. Connect Digital Multimeter to A1A2C6. Adjust A1A2A2R12 for a Digital Multimeter indication of -0.920Vdc±0.02Vdc.

• If voltage is incorrect and cannot be adjusted, replace A1A2 Assembly (para 2-54).

10. On SG-1219/U, set RF OUTPUT to ON. Verify the Digital Multimeter indicates >0Vdc (>0.3Vdc typically).

• If voltage is correct, proceed with step 14.

2-15. AUTOMATIC LEVEL CONTROL LOOP TEST—Continued.

11. Remove A1CR1 (para 2-66) from SG-1219/U. Connect input of A1CR1 to RF output connector. Connect output of A1CR1 to Digital Multimeter. Set SG-1219/U RF OUTPUT to ON and verify SG-1219/U output is +8dBm. Verify Digital Multimeter indicates >0.3Vdc.

    • If incorrect replace A1CR1 Detector (para 2-66).

12. Connect Power Meter to A1DC1 coupled port where A1CR1 was connected

13. Set SG-1219/U RF OUTPUT to ON. Verify Power Meter indicates at least -2dBm.

    • If power level is incorrect replace A1DCI Directional Coupler (para 2-67).

    • If power level is correct inspect connectors on A1DC1 and A1CR1 for damage.

14. Set Power Supply to 0V, and connect to EXT ALC IN connector on SG-1219/U. Set Power Supply to lV.

15. Turn RF OUTPUT ON and rotate OUTPUT LEVEL VERNIER fully CW. Verify ALC DIODE push button is on. Verify the Power Meter indicates >+8dBm.

    • If power level is incorrect, proceed with step 17.

16. Rotate OUTPUT LEVEL VERNIER fully CCW. Verify the Power Meter indicates <–12dBm.

    • If power level is correct, proceed with step 28.

17. Remove A1A2 Assembly (para 2-54) and reinstall on an extender board.

18. Remove AlW13 (green) from A1A2A1J1 and connect a **50Ω** load and Digital Multimeter using Tee Connector. Rotate OUTPUT LEVEL VERNIER fully CCW. Verify the Digital Multimeter indicates >+2Vdc.

    • If voltage is incorrect, adjust A1A2 as required (table 2-3). If adjustment does not correct problem, replace A1A2 Assembly (para 2-54).

19. Rotate OUTPUT LEVEL VERNIER fully CW. Verify the Digital Multimeter indicates <+2Vdc.

    • If voltages are correct, replace A1A9 Assembly (para 2-57).

    • If voltages are incorrect, adjust A1A2 as required (table 2-3). If adjustment does not correct problem, replace A1A2 Assembly (para 2-54).

20. Connect Digital Multimeter to center conductor of A1A2J2 (back side of board). Rotate OUTPUT LEVEL VERNIER fully CCW and verify a Digital Multimeter indication of **≈0.002Vdc.** 0.002Vdc. Rotate OUTPUT LEVEL VERNIER fully CW and verify a Digital Multimeter indication of **≈0.033Vdc.** 0.033Vdc.

    • If reading is correct, proceed with step 23.

21. On SG-1219/U, disconnect cable AlW2 from the output of A1DC1. Connect Power Meter to AlDC1 output Record Power Meter reading.

2-15. AUTOMATIC LEVEL CONTROL LOOP TEST—Continued.

22. Reconnect cable AlW2. Remove A1CR1 (para 2-66) from SG-1219/U. Connect Power Meter to A1DC1 coupled port where A1CR1 was connected. Verify Power Meter reading is ≈ 16dB lower than reading recorded in step 21.

    • If correct, replace A1CR1 Detector (para 2-66).

    • If incorrect, replace A1DC1 Directional Coupler (para 2-67).

23. On SG-1219/U, press RCL then number O key, and set RF OUTPUT to OFF. Connect Digital Multimeter to A1A2TP3. Adjust A1A2R88 (fig. FO-2) for a Digital Multimeter indication of -0.920Vdc ± 0.02Vdc.

24. Remove A1CR1 (para 2-66) from SG-1219/U. Set Power Supply to OV, and connect positive lead to center conductor of A1A2J2 and negative lead to ground. Set SG-1219/U RF OUTPUT to ON and rotate OUTPUT LEVEL VERNIER fully CCW.

25. Connect Digital Multimeter to A1A2TP3. Set Power Supply voltages as shown below and verify Digital Multimeter indications are as specified.

    Power Supply at 0.005V ..... Digital Multimeter reads ≈ -0.09V
    Power Supply at 0.010V ..... Digital Multimeter reads ≈ +0.01V
    Power Supply at 0.015V ..... Digital Multimeter reads ≈ +0.07V
    Power Supply at 0.020V ..... Digital Multimeter reads ≈ +0.10V

    • If voltages are incorrect, adjust A1A2 as required (table 2-3). If adjustment does not correct problem, replace A1A2 Assembly (para 2-54).

26. Remove A1A2 Assembly (para 2-54) and reinstall on an extender board.

27. Remove AlW13 (green) from A1A2J1 and reconnect using a Tee connector. Connect open side of Tee connector to Digital Multimeter. Set Power Supply voltages as shown below and verify Digital Multimeter indications are as specified.

    Power Supply at 0.000V . . . . . Digital Multimeter reads ≈ -3.0V
    Power Supply at 0.0075V . . . . . Digital Multimeter reads ≈ +0.9V
    Power Supply at 0.0225V . . . . . Digital Multimeter reads ≈ +9.0V

    • If voltage is incorrect, adjust A1A2 as required (table 2-3), If adjustment does not correct problem, replace A1A2 Assembly (para 2-54).

    • If voltage is correct, adjust A2A9A8 as required (table 2-3). If adjustment does not correct problem, replace A3A9A8 Assembly (para 2-96.1).

28. Connect Digital Multimeter to A1A2A1TP5 (units prefixed <31OOA) or A1A2TP5 (units prefixed >3101A) and press front panel RF OUTPUT ON/OFF push button to turn off its light. Verify that Digital Multimeter initially indicates +0. 15 volts then drops to about 4.5 volts when RF OUTPUT ON/OFF push button is pressed, and immediately begins increasing toward OV.

    • If Digital Multimeter indication is incorrect, adjust A1A2 as required (table 2-3). If adjustment does not correct problem, replace A1A2 Assembly (para 2-54).

29. Remove A1A3 Assembly (para 2-56) and reinstall on an extender board.

2-15. AUTOMATIC LEVEL CONTROL LOOP TEST—Continued.

30. Connect Digital Multimeter to XA3-11 and observe Digital Multimeter display while rotating OUTPUT LEVEL VERNIER from full CW to full CCW. Verify voltage is as follows:

Fully CW	3.5V
Fully CCW	9.OV

- If voltages are correct adjust A1A6 as required (table 2-3). If adjustment does not correct problem, replace A1A6 Assembly (para 2-56).

- If voltages are incorrect, adjust A1A3 as required (table 2-3). If adjustment does not correct problem, replace A1A3 Assembly (para 2-56).

31. Troubleshoot all other malfunctions using fig. FO-10.

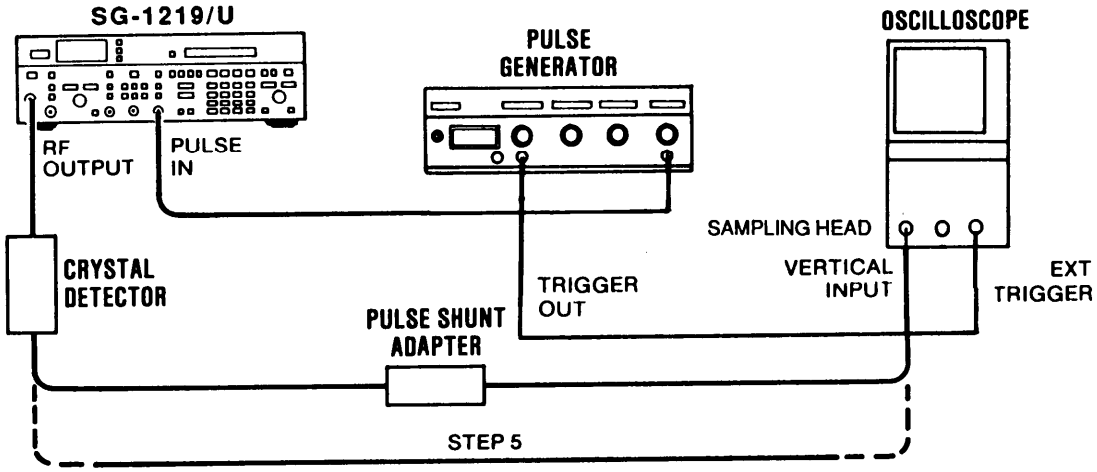
32. Disconnect test equipment reinstall circuit card assemblies, and reconnect all cables.

2-16. PULSE MODULATION TEST.

DESCRIPTION

This test is used to correct a malfunction in the Pulse Modulation Subsystem (fig. FO-11).

1. Connect test equipment as shown below. See Appendix C for fabrication of Shunt Adapter.



2. Set Pulse Generator for a l MHz pulse rate with a pulse width of 300ns and pulse height of ≈5V 5V peak. Set Variable Attenuator for 10dB attenuation.

3. On SG-1219/U, press RCL, number O, then PULSE NORM push buttons. Set output level to OdBm.

4. Observe detected pulse on Oscilloscope.

   • If pulse is absent or seriously distorted, proceed with step 12, then step 18.

2-16. PULSE MODULATION TEST—Continued.

5. Adjust Oscilloscope vertical position and sensitivity controls so that pulse base line is one division from bottom graticule line and approximately 5 divisions high in peak amplitude. SG-1219/U output level may be increased to +8dBm if necessary.

6. Set SG-1219/U to continuous wave mode (pulse mode off). Adjust Oscilloscope vertical sensitivity for a display 5 divisions above pulse base line.

NOTE

Peak of continuous wave signal is now continuous wave peak reference level. Do not touch vertical position controls after reference pulse base line has been set.

7. On SG-1219/U press PULSE NORM push button.

8. Without touching vertical sensitivity controls, measure difference between continuous wave peak reference level and average peak pulse level, excluding any over/undershoot. Verify difference is within +0.61- 0.45 division on Oscilloscope.

- If difference is incorrect proceed with step 26.

9. Reduce Pulse Generator pulse width to 100ns and repeat steps 5 thru 7.

- If difference is correct proceed with step 10.

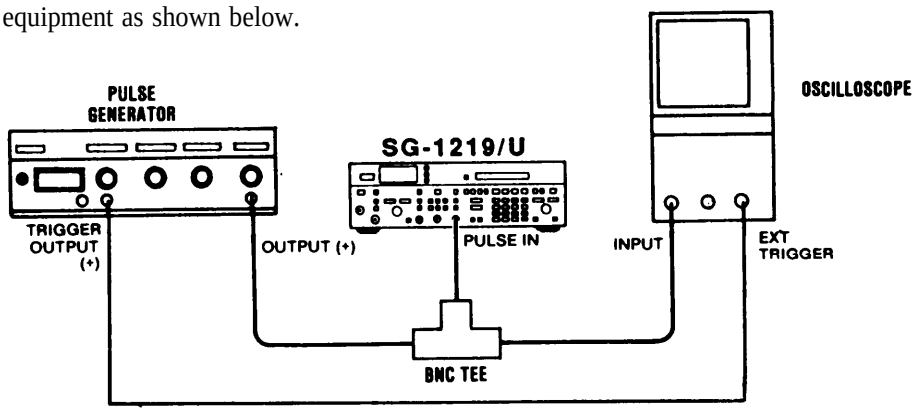
- If difference is not in range indicated in step 8, adjust AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). If this adjustment does not correct problem, proceed with step 27.

10. Set Pulse Generator pulse width to 300ns.

11. Set SG-1219/U to 12GHz and 18GHz. For each frequency; check detected pulse rise time, fall time, and overshoot and ringing. In each case, rise and fall time should be less than 50ns, and overshoot and ringing should be less than 20%.

- If rise and fall time and overshoot and ringing are incorrect, adjust A1A8 Pulse Amplitude Control (para 2-46). If adjustment does not correct problem, proceed with step 30.

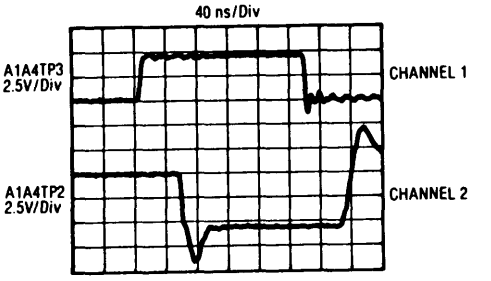
12. Connect test equipment as shown below.



13. Set Pulse Generator for 1 pulse per microsecond (1 MHz PRF) and a pulse width of 200ns.

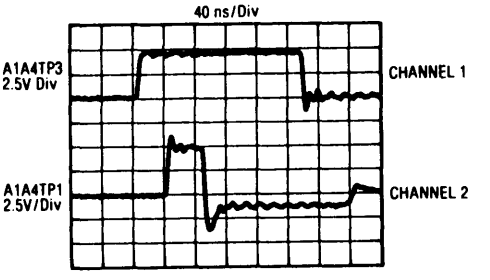
2-16. PULSE MODULATION TEST—Continued.

14. Connect channel 1 of Oscilloscope to A1A4TP3 (fig. FO-2) and channel 2 to A1A4TP2. Set channel 1 display at top of screen. Set Oscilloscope controls as shown and compare display to one shown.

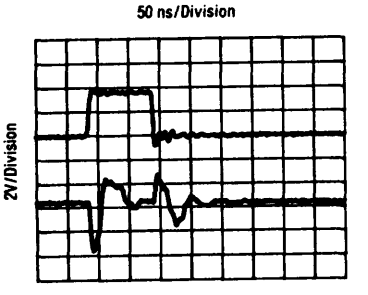


- If both channels are correct, proceed with step 18.
- If Channel 1 is correct but channel 2 is incorrect, adjust A1A4 as required (table 2-3). If adjustment does not correct problem, replace A1A4 Assembly (para 2-56).

15. Connect Oscilloscope to A1A4TP7 and verify a 200ns pulse width and PRF of l MHz.
    - If display is incorrect, troubleshoot between A4W4 and A1A4 using fig. FO-11.
16. Remove A1A4 Assembly (para 2-56) and reinstall on an extender board.
17. Connect Digital Multimeter to XA4 pin 26 and verify a TTL logic high (>3V).
    - If indication is correct perform Digital Control Unit Test (para 2-17), Pulse Driver Assembly Check.
    - If indication is incorrect, perform Digital Control Unit Test (para 2-17), DAC and Enable Assembly Check.
18. Connect channel 1 of Oscilloscope to A1A4TP3 and channel 2 to A1A4TP1. Adjust Oscilloscope and compare to waveform shown.



    - If Oscilloscope display is correct, proceed with step 25.
19. Connect Digital Multimeter to A1A4Q9 emitter. Set SG-1219/U frequency to 10GHz and verify PULSE NORM push button light is on. Verify Digital Multimeter indicates –3.4V.
    - If indication is incorrect, replace A1A4 Assembly (para 2-56).
20. Connect Oscilloscope to A1A4Q8 base. Verify display is as shown.



    - If display is correct, replace A1A4 Assembly (para 2-56).
21. Connect Digital Multimeter to A1A4U5 pin 4 and verify indication of about +4.5 volts.
    - If indication is correct, replace A1A4 Assembly (para 2-56).
22. Connect Digital Multimeter to A1A4XA4 pin 14 and verify indication of about +0.3 volts.
    - If indication is incorrect, perform Digital Control Unit Test (para 2-17), SRD Bias Assembly Check.
23. Connect Digital Multimeter to A1A4U5 pin 6 and verify indication of about +0.3 volts.
    - If indication is correct, replace A1A4 Assembly (para 2-56).

2-16. PULSE MODULATION TEST—Continued.

24. Connect Digital Multimeter to A1A4U8 pin 11 and verify indication of about +4.5Vdc.

    • If indication is incorrect, perform Digital Control Unit Test (para 2-17), Pulse Driver Assembly Check.

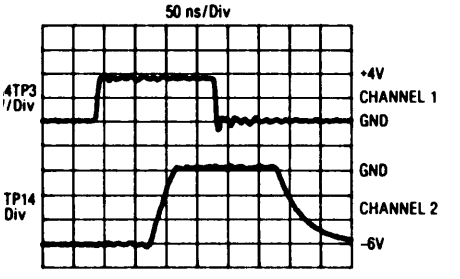
25. Set LINE switch to OFF. Remove A1CP1. Measure resistance between following points:

Port	*Resistance*
A1CP1 Bias Tee Output port and Tee	0.1Ω ±0.05Ω
A1CP1 Bias Tee Input port and Tee	∞
A1CP1 Bias Tee Input and output port	∞

    • If resistances are correct replace A1AT3 Pulse Modulator (para 2-63).

    • If resistances are incorrect, replace A1CP1 Bias Tee (para 2-65).

26. Connect channel 1 of Oscilloscope to A1A4TP3 and channel 2 of A1A4TP14. Adjust Oscilloscope and compare to waveform shown.



    • If display is correct, adjust AlA2 as required (table 2-3). If adjustment does not correct problem, replace A1A2 Assembly (para 2-54).

    • If display is incorrect adjust A1A4 as required (table 2-3). If adjustment does not correct problem, replace A1A4 Assembly (para 2-56).

27. Set Pulse Generator for a pulse width of 300ns.

28. Connect Digital Multimeter to A1A4TP5 and verify a TTL logic low (>OV).

    • If indication is incorrect, replace A1A4 Assembly (para 2-56).

29. Gradually reduce Pulse Generator pulse width to 50ns and verify Digital Multimeter indication suddenly increases to >2.4Vdc after pulse width is reduced to 80ns and before it inches 50ns.

    • If indication is incorrect, adjust AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). If adjustment does not comet problem, replace A1A4 Assembly (para 2-56).

30. Remove A1A8 Assembly (para 2-56) and install an extender board in its place. Do not install A1A8 on extender board.

31. Set Power Supply output voltage to OV. Connect positive output to XA8 pin 6 and negative to XA8 pin 1 or pin 19.

32. Set Pulse Generator for a 300ns pulse and SG-1219/U frequency to 10GHz.

33. Connect Oscilloscope to A1A4TP10.

2-16. PULSE MODULATION TEST—Continued.

34. Gradually increase Power Supply output voltage to a maximum of + 10V and verify peak amplitude of YTM pulse on Oscilloscope display should be equal to Power Supply output voltage at all levels.

    • If display is incorrect or absent, proceed with steps 19 thru 24.

35. Remove A1A5 Assembly (para 2-56) and reinstall on an extender board.

36. Set both channels of Oscilloscope for 0.5V per division and DC input. Connect channel 1 of Oscilloscope to A1A5 U7 pin 3 and channel 2 to A1A5TP2.

37. Set SG-1219/U frequency to 6.7GHz, frequency increment to 100MHz, and gradually increase frequency to 12GHz. Verify channel 1 and channel 2 displays track each other as frequency is increased.

    • If two signals do not track each other, adjust A1A5 as required (table 2-3). If adjustment does not correct problem, replace A1A5 Assembly (para 2-56).

38. Install A1A8 Assembly (para 2-56) on extender board installed in step 26. Set following variable resistors to their maximum clockwise setting:

    A1A8R10 (B2 SL)
    A1A8R11 (B3 SL)
    A1A8R12 (B4 SL)
    A1A8R13 (B2 OF)
    A1A8R14 (B3 OF)
    A1A8R15 (B4 OF)

39. Connect Digital Multimeter to XA8 pin 30 and adjust SG-1219/U frequency to obtain following voltages at XA8 pin 30. Check for corresponding voltages at A1A8TP3.

XA8 pin 30	*A1A8TP3*
4V	2V
8V	5V
12V	9V

    • If voltages at A1A8TP3 are incorrect, adjust A1A8 as required (table 2-3). If adjustment does not correct problem, replace A1A8 Assembly (para 2-56).

40. Connect Digital Multimeter to A1A10A1TP2 and verify 14.9V is present.

    • If voltage is correct replace A1A1OA1 Assembly (para 2-59).

41. Connect Digital Multimeter to A1A10A1TP1 and verify -4.9V is present.

    • If voltage is correct, replace A1A10A1 Assembly (para 2-59).

    • If voltage is incorrect, replace AlAl0 Assembly (para 2-58).

42. Troubleshoot all other malfunctions using fig. FO-11.

43. Disconnect test equipment, reinstall circuit card assemblies, and reconnect all cables.

2-17. DIGITAL CONTROL UNIT TEST.

DESCRIPTION

This test is used to correct a malfunction in the Digital Control Unit Subsystem (fig. FO-12).

CAUTION

The Digital Control Unit Subsystem contains CMOS devices which are extremely susceptible to static electricity damage. Refer to page D.

When taking signatures, it is possible to alter the diagnostic program by inadvertently shorting pins together with the probe. When this occurs, false signatures may be obtained. The diagnostic program can be returned to normal by setting the LINE switch to STBY and back to ON.

NOTE

Unless otherwise specified, perform all tests in order given.

ROM DATE CODE CHECK

1. Set LINE switch to STBY.
2. Remove A2A8 Assembly (para 2-74) and reinstall on an extender board. Install MPU Test Connector on A2A8.
3. Set A2A8S1 diagnostic switch (fig. FO-3) to B and install a jumper between A2A8TP5 and adjacent TPGND.
4. Set LINE switch to ON.
5. Verify FREQUENCY MHz display indicates “2324 1 l–l”.

   If indication is incorrect, verify 10MHz ±1 count signal at XA2A8B-22 and a stable >4.5Vdc signal at XA2A8B-2.

   - If signal at XA2A8B-22 is incorrect, perform Time Base Reference Test (para 2-1 1).
   - If signal at XA2A8B-2 is incorrect, perform Power Supply Test (para 2-18).
   - If both signals are correct, proceed with MPU FREE RUN DIAGNOSTIC below.

MPU FREE RUN DIAGNOSTIC

1. Set LINE switch to STBY. Remove AC power cable. Remove following assemblies:

   A2A2 Assembly (para 2-72),
   A2A7 thru A2A11 (units prefixed <3100A) or A2A7 thru A2A10 Assemblies (units prefixed >3101A) (para 2-74).

2. Reinstall A2A8 Assembly (para 2-74) on an extender board. Remove MPU Test Connector from A2A8. Verify jumper installed between A2A8TP5 and adjacent TPGND.

2-17. DIGITAL CONTROL UNIT TEST—Continued.

3. Connect Digital Circuit Tester as follows:

START	A2A8TP4
STOP	A2A8TP4
CLOCK	A2A8TP3
GND	A2A8TPGND

4. Set Digital Circuit Tester controls as follows:

START	Positive edge
STOP	Negative edge
CLOCK	Negative edge
HOLD	Not activated
SELF-TEST	Not activated

5. Reconnect ac power cable, then set LINE switch to ON.

6. Verify A2A8TP3 signature is 0001. If this signature is incorrect, make sure Digital Circuit Tester is properly connected and START, STOP, and CLOCK controls are in correct positions.

   • If signature is incorrect,replace A2A8 Assembly (para 2-74).

7. Use signatures listed below and on top of the next page to verify operation of A2A8.

   • If any of signatures are incorrect replace A2A8 Assembly (para 2-74).

PIN NO.	SIGNATURE	MNEMONIC
A2A8B8	HAP7	All
11	0001	A15
12	CCCC	Al
14	3827	A13
15	5P18	SA3-L
16	3C96	A12
18	5H21	A3
29	5555	AO
30	F488	SCO-L
32	956C	SB4-L
33	2828	SA2-L
34	755U	A14
35	7F7F	A2
36	OAFA	A4
A2A8C1	1293	A10
2	HPPO	A9
3	2H70	A8
4	52F8	A6
17	U68U	SC1-L
18	HC89	A7
20	04P6	SC2-L
22	UPFH	A5
29	16HH	DLE
30	CHOH	NUME

2-17. DIGITAL CONTROL UNIT TEST—Continued.

PIN NO.	SIGNATURE	MNEMONIC
A2A8J1-3	8C25	DB-A4
4	FCPP	DB-A7
5	FAPC	DB-A3
6	78P0	DB-A2
9	2395	DB-A5
10	PC1A	DB-A6
11	FAPC	DB-A8
12	C5AA	DB-A1

MPU TIMER AND IRQ ENCODER DIAGNOSTIC

1. Set LINE switch to STBY. Install MPU Test Connector on A2A8. Verify jumper installed between A2A8TP5 and adjacent TPGND. Set diagnostic switch A2A8S1 to O. Verify Digital Circuit Tester is connected as in step 3 of MPU FREE RUN DIAGNOSTIC above.

2. Set LINE switch to ON. Verify that FREQUENCY MHz display indicates “00-1”.

   • If indication is incorrect, first verify A2A8S1 is set to O and is making firm contact. If switch position is correct, replace A2A1 Assembly (para 2-72).

3. Remove jumper from A2A8TP5. Verify FREQUENCY MHz display indicates “00”.

4. Touch Digital Circuit Tester logic probe to +5V and verify signature is 6FC9.

5. Use signatures listed below to verify operation of A2A8.

   • If any of signatures are incorrect replace A2A8 Assembly (para 2-74).

PIN NO.	S1GNATURE	MNEMONIC
A2A8B 6	2256	VMA
7	6FC9	lRQA-L
24	6FC9	IRQB-L
25	6FC9	IRQIB-L
27	F637	PRW
A2A8C 5	6700	BD2
6	AA8P	E-PIA
7	6FC9	PHE-H
8	98P1	BD4
9	2U5F	BD6
16	7H31	BDO
19	AA8P	E-HPIB
21	P054	BD1
23	810P	BD3
24	944C	BD5
25	2U5F	BD7

   • Remove extender board and reinstall A2A8 Assembly (para 2-74).

2-17. DIGITAL CONTROL UNIT TEST—Continued.

FRONT PANEL DISPLAY AND DRIVER DIAGNOSTICS

1. Set LINE switch to STBY.

2. Install jumper between A2A8TP5 and TPGND. Verify MPU Test Connector connected to A2A8. Verify Digital Circuit Tester is connected as in step 3 of MPU FREE RUN DIAGNOSTIC above.

3. Set diagnostic switch A2A8S1 to 1. Set LINE switch to ON.

4. Touch Digital Circuit Tester logic probe to +5V and verify signature is CA4A. Verify that all lights, except OVEN COLD and STANDBY lights, are on and displays indicate following:

   RANGE dBm ..... +110.0
   FREQUENCY MHz 1.0.1.0.1.0.1.0.1.0.1
   AUTO SWEEP light ..... blinking

   • If indications are incorrect proceed with step 5.

   • If indications are correct proceed with next test.

5. Remove A2A1 Assembly (para 2-72) and reinstall on an extender board. Use signatures listed below to verify operation of A2A1.

   • If any of signatures are incorrect replace A2A1 Assembly (para 2-72).

PIN NO.	SIGNATURE	MNEMONIC
A2A1A-34	U5P4	FDO
36	PCFP	FD5
A2A1B-4	932C	FD6
19	A3H2	FD1
25	U92H	FD2
26	H886	FD7
27	2599	FD3
28	0977	DLE
29	3U2F	NUME
31	0371	FD4

RAM VERIFICATION

1. Set LINE switch to STBY.

2. Verify MPU Test Connector is installed on A2A8. Verify jumper installed between A2A8TP5 and adjacent TPGND. Set diagnostic switch A2A8S1 to 8.

3. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.

4. Verify both sides of test switch A2A10S1 are set to NORM. Remove A2A10 Assembly (para 2-74) and reinstall on an extender board..

5. Set LINE switch to ON.

2-17. DIGITAL CONTROL UNIT TEST—Continued.

6. Verify FREQUENCY MHz display indicates “08-1”. Disconnect jumper installed on A2A8TP5.

7. Touch Digital Circuit Tester logic probe to +5V and verify signature flickers between 0003 and 0001. Verify following front panel conditions:

   Right side of FREQUENCY MHz display cycles between “08” and “0800”.
   RANGE dBm display indicates O.
   All red and white lights; except OVEN COLD, STANDBY, and push buttons cycle on and off.

   • If indications are incorrect, or an error code starting with 1,2, or 3 is displayed, replace A2A10 (para 2-74).

8. Set LINE switch to STBY.

9. Install jumper between A2A8TP5 and TPGND. Set diagnostic switch A2A8S1 to A and both sides of NORM/TEST switch A2A10S1 to NORMAL.

10. Remove A2A10 Assembly (para 2-74) and reinstall on an extender board.

11. Set LINE switch to ON. Verify FREQUENCY MHz display indicates “10-1”.

12. Touch Digital Circuit Tester RESET probe to +5V and verify signature is U45H. Use signatures listed below to verify operation of A2A10.

    • If indications are incorrect, replace A2A10 Assembly (para 2-74).

PIN NO.	SIGNATURE	MNEMONIC
A2A10B 27	CC55	PRW
29	4UOH	AO
33	PPA7	SA2-L
A2A10C 11	U45H	PHE-H
13	PPA7	BD6
16	H9A2	BD0
22	U032	BD2
23	3248	BD1
24	8698	A5
25	C4UU	BD3
26	3CP7	BD4
27	8C35	BD5
28	PPA7	BD7

ROM DIAGNOSTIC/ASSEMBLY CHECK

1. Set LINE switch to STBY.

2. Install A2A10 and A2A11 Assemblies (units prefixed >3100A) or A2A10 Assembly (units prefixed >3101A) (para 2-74).

2-17. DIGITAL CONTROL UNIT TEST—Continued.

3. Install jumper between A2A8TP5 and TP GND. Verify MPU Test Connector is installed on A2A8. Set diagnostic switch A2A8S1 to 6.
4. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.
5. Set LINE switch to ON. Verify FREQUENCY MHz display indicates "06-1". Disconnect jumper installed on A2A8TP5.
6. Verify FREQUENCY MHz display indicates "0600".
   - If last two digits of displayed number blinks 00 on and off, proceed with step 8.
   - If last two digits of displayed number are 04, replace A2A8 Assembly (para 2-74).
   - If last two digits of displayed number are 01, 02, or 03; replace A2A11 Assembly (units prefixed <3100A) or A2A10 Assembly (units prefixed >3101A) (para 2-74).
7. Set LINE switch to STBY.
8. Remove A2A11 Assembly (units prefixed <3100A) or A2A10 Assembly (units prefixed >3101A) (para 2-74) and reinstall on an extender board. Install Test Connector and Extender Cable on A2A11J1 (units prefixed <3100A) or A2A10J1 Assembly (units prefixed >3101A). Install jumper between A2A8TP5 and TPGND. Set diagnostic switch A2A8S1 to C.
9. Set LINE switch to ON. Verify FREQUENCY MHz display indicates "12-1". Disconnect jumper installed on A2A8TP5.
10. Verify FREQUENCY MHz display indicates "1200".
    - If indication is incorrect, replace A2A11 Assembly (units prefixed <3100A) or A2A10 Assembly (units prefixed >3101A) (para 2-74).
11. Disconnect Test Connector and Extender Cable.

FREQUENCY OUTPUT/HP-IB DIAGNOSTIC

1. Set LINE switch to STBY.
2. Remove A2A10 and A2A11 Assemblies (units prefixed <3100A) or A2A10 Assembly (units prefixed >3101A) (para 2-74).
3. Reinstall A2A9 Assembly on an extender board. Set diagnostic switch A2A8S1 to 3.
4. Connect Digital Circuit Tester as follows:

START	A2A8TP4
STOP	A2A8TP4
CLOCK	A2A9TP2
GND	A2A8TPGND

5. Set Digital Circuit Tester controls as follows:

START	Positive edge
STOP	Negative edge
CLOCK	Negative edge
SELF-TEST	Not activated

2-17. DIGITAL CONTROL UNIT TEST—Continued.

6 Install jumper between A2A8TP5 and adjacent TPGND. Install MPU Test Connector on A2A8.

7. Set LINE switch to ON and verify FREQUENCY MHz display indicates “03-1”.

8. Press Digital Circuit Tester probe RESET and verify signature is A52A.

9. Use signatures listed below and on top of the next page to verify operation of A2A9.

l If output indications are incorrect and input indications are correct, replace A2A9 Assembly (para 2-74).

OUTPUT PIN NO.	SIGNATURE	MNEMONIC
A2A9A 1	413H	M5
2	0FP0	M3
3	P101	M4
4	7378	Ml
5	994A	M2
6	0H32	N5
7	95H0	N6
8	5AFU	N3
9	F813	N4
10	6876	N2
11	693P	N1
21	1H63	800K
22	758P	200K
23	UA07	DAC3200
24	468C	DAC800
25	C253	DAC400
26	H6F1	DAC200
27	1AH5	DAC100
28	1U41	DAC80
29	839U	DAC20
30	PH1A	DAC4800
31	OPC1	1 MHZ
32	8758	2 MHZ
33	F3AF	4 MHZ
34	61H6	8 MHZ
35	H652	DAC 10 MHz
36	912C	DAC 40 MHz
A2A9B 2	C1HP	20K
3	58PU	40K
4	63CH	10K
5	3AF7	400K
6	PC1H	100K
11	AF77	80K
20	3CHU	lK
21	8PU7	4K
22	lHPU	2K
23	F77C	8K
25	A52A	IRQ1B-L

2-17. DIGITAL CONTROL UNIT TEST—Continued.

PIN NO.	SIGNATURE	MNEMONIC
A2A9B 12	A52A	Al
16	A52A	A2
26	A52A	RESET-L
27	0000	PRW
29	0000	AO
33	0000	SA2-L
34	A52A	E-HPIB
35	0000	SC1-L
36	0000	A4
A2A9C 5	XXXX	BD2
6	A52A	BD1
8	A52A	BD4
9	A52A	BD6
16	A52A	BDO
23	XXXX	BD3
24	XXXX	BD5
25	XXXX	BD7

10. Set LINE switch to STBY.

11. Record present position and set HP-IB address switch A2A9S1 to 00110011.

12. Verify HP-IB connector on SG-1219AJ rear panel is disconnected.

13. Verify jumper is connected between A2A8TP5 and TPGND, and that MPU Test connector is installed on A2A8.

14. Set diagnostic switch A2A8S1 to 2.

15. Connect clock input of Digital Circuit Tester to A2A8TP3.

16. Set LINE switch to ON and verify FREQUENCY MHz display indicates “02-1”.

17. Disconnect jumper from A2A8TP5 and verify FREQUENCY MHz indicates “0011001 1“.

18. Set LINE switch to STBY. Reconnect jumper to A2A8TP5 and TPGND. Set LINE switch to ON.

19, Press Digital Circuit Tester logic probe RESET and verify signature is CA25.

20. Use signatures listed on the next page to verify operation of A2A9.

- If output indications are incorrect and input indications are correct, replace A2A9 Assembly (para 2-74).

2-17. DIGITAL CONTROL UNIT TEST—Continued.

CONNECTOR OUTPUT	SIGNATURE	MNEMONIC
A2A9B 14	7CH9	DI06
A2A9C 7	CA25	EOI
11	CU22	DIO1
12	F8U4	DI02
13	8888	DI03
14	U21P	DI04
15	U890	DI05
17	4A65	DI07
18	FUFH	DI08
19	CA25	ATN
20	CA25	SRQ
26	CA25	REN
27	CA25	IFC
28	CA25	NRFD
29	CA25	NDAC
30	CA25	DAV

CONNECTOR INPUT	SIGNATURE	MNEMONIC
A2A9B 12	P4AC	A1
15	3F76	SA3-L
16	P270	A2
26	CA25	RESET-L
27	OUF9	PRW
29	3C25	A0
33	CUOU	SA2-L
34	C5PF	E-HPIB
35	CHIA	SC1-L
36	PU59	A4
A2A9C 5	H8F1	BD2
6	6P92	BD1
8	9509	BD4
9	45H1	BD6
16	A40F	BD0
23	15FU	BD3
24	U5C7	BD5
25	6FH1	BD7

2-17. DIGITAL CONTROL UNIT TEST—Continued.

21. Install A2A9 Assembly (para 2-74).

22. Set LINE switch to STBY.

23. Set test switch A2A8S1 to 2. Verify MPU Test Connector is installed on A2A8 and jumper is installed between A2A8TP5 and adjacent TPGND.

24. Set LINE switch to ON. Verify FREQUENCY MHz display indicates "02-1". Disconnect jumper from A2A8TP5.

25. Verify FREQUENCY MHz display indicates HP-IB address switch A2A9S1 setting. Change A2A9S1 to several positions and check that each setting appears in FREQUENCY MHz display as it is changed. Disregard other front panel HP-1B lights for this diagnostic.

    • If indications are correct, reset A2A9S1 to recorded position in step 11, remove extender boards, reinstall A2A9 Assembly (para 2-74), and proceed with next test.

    • If indications are incorrect replace A2A9 Assembly (para 2-74).

I/0 ASSEMBLY TALK-AROUND DIAGNOSTIC

1. Set LINE switch to STBY. Disconnect ac power cable.

2. Reinstall A2A7 Assembly on an extender board. Set A2A7S1 switches 3,5, and 7 to OFF.

3. Verify MPU Test Connector is installed on A2A8. Install jumper between A2A8TP5 and TPGND. Set diagnostic switch A2A8S1 to 4.

4. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.

5. Connect ac power cable and set LINE switch to ON.

6. Use signatures listed on next page to verify operation of A2A7.

    • If output signatures are incorrect and input signatures are correct replace A2A7 Assembly (para 2-74).

7. Set LINE switch to STBY. Disconnect ac power cable.

8. Disconnect MPU Test Connector, jumper, and Digital Circuit Tester from A2A8.

9. Set A2A7S1 switches 3,5, and 7 to ON.

10. Remove extender boards and reinstall A2A7 Assembly (para 2-74).

2-17. DIGITAL CONTROL UNIT TEST—Continued.

INPUT SIGNATURES

PIN NO.	SIGNATURE	MNEMONIC
XA7A-1	0000	M/N UNLOCKED
2	0000	EXT REF OVEN
4	H6A6	MONITOR LFS
7	H6A6	UNLOCKED
8	H6A6	KO
9	H6A6	K2
10	H6A6	K4
11	H6A6	K6
12	0000	VUP
13	H6A6	KDN-L
15	2143	DATA 7
16	59AP	DATA 5
17	A3A3	DATA 3
18	P5AA	DATA 1
20	0000	REF UNLOCKED
22	0000	BIAS TRK
27	H6A6	K1
28	H6A6	K3
29	H6A6	K4
30	0000	BUFFERED YIG OUT
31	0000	UNLEV
32	0000	FM OM
33	0070	DATA 6
34	9142	DATA 4
35	91CU	DATA 2
36	67FH	DATA O
XA7B-1	H6A6	+5V
3	0000	GND
6	7568	VMA
8	H6A6	VDN
10	0000	GND
12	224H	A1
15	80UU	SA3-L
18	P604	A3
19	H6A6	+5V
26	H6A6	RESET-L
27	3485	PRW
28	0000	GND
29	75U2	AO
30	1P3C	SCO-L
31	0000	SB4-L
XA7C-2	A453	SC1-L
4	F9FU	SC2-L
5	22AP	BD1
7	8UP7	BD4
8	1A8A	BD6
16	UOU9	BDO
20	P223	E-PIA
21	H6A6	BD3
22	0A71	BD5

OUTPUT SIGNATURES

PIN NO.	SIGNATURE	MNEMONIC
XA7A-26	9638	KACK-L
XA7B-2	46F2	BAO
4	H6A6	OVEN OK
5	H6A6	NSTRB
7	H6A6	IRQA-L
20	12FF	BA2
22	0606	BA3
23	4P43	BA1
24	H6A6	IRQB-L
35	P198	A2
XA7C -9	0000	VTI-L
12	4P53	PEN LIFT TRIGGER
13	U4A1	OUTPUT
14	H6A6	STOP SWEEP
29	7058	END SWP

2-17. DIGITAL CONTROL UNIT TEST-Continued.

KEY CODE ASSEMBLY CHECKS

1. Verify LINE switch set to STBY.
2. Install A2A2 Assembly (para 2-72).
3. Connect ac power cable and set LINE switch to ON.
4. Verify all seven keyboard status lights on top of A2A2 are on when no front panel push buttons are pressed.
5. Press push buttons as indicated below and verify A2A2 light pattern. Verify KDN-L on XA2-37 changes states when front panel push button is pushed.

   • If indication is correct proceed next test.

   • If indication is incorrect proceed with step 6.

   • If, after second push button is pressed no further push buttons being pressed causes change, proceed with step 7.

Function Key	Key-Code Pattern							Input Pair Verified		IF Key-Code Pattern Incorrect	
	K6	K5	K4	K3	K2	K1	K0	Row	Column	Key to be Depressed to Verify Row	Key to be Depressed to Verify Column
1		L	L				L	KR1	C3L	9	2
ΔF		L	L	L		L		KR2	C3H	2	9
TUNE	L				L			KR3	C4L	3	LOCAL
ALC INT	L			L				KR0	C4H	0	RF ON/OFF
FREQ INCR	L		L		L			KR4	C5L	4	START
PULSE OFF	L		L	L	L		L	KR5	C5H	5	FM OFF
FM3	L	L			L	L		KR6	C66	6	FM1
SERVICE SWITCH	L	L		L	L	L	L	KR7	C6H	7	FM3

6. Remove A2A2 Assembly (para 2-72) and reinstall on extender board. Verify following input pairs as shown above and pressing alternate push buttons.

   • If indication is correct, install A2A2 Assembly (para 2-72).

   • If indication is incorrect, replace A2A2 Assembly (para 2-72) and perform A4 Front Panel Assembly Test (para 2-20).

7. Touch Digital Circuit Tester probe to +5V and verify a lTL high or low on XA2 pin 24 after push button is pressed.

   • If low, replace A2A7 Assembly (para 2-74).

   • If high, perform A4 Front Panel Assembly Test (para 2-20).

2-17. DIGITAL CONTROL UNIT TEST—Continued.

DAC AND ENABLE ASSEMBLY CHECK

1. Set line switch to STBY and disconnect ac power cable. Remove A1A5Assembly (para 2-56) and reinstall on an extender board.
2. Set diagnostic switch A2A8S1 to 5. Install MPU Test Connector on A2A8. Install jumper between A2A8TP5 and adjacent TPGND.
3. Connect ac power cable and set LINE switch to ON.
4. Verify Digital Circuit Tester is connected as in step 3 of MPU FREE RUN DIAGNOSTIC above.
5. Verify FREQUENCY MHz display indicates “05-1”.
6. Touch Digital Circuit Tester probe to +5V and verify signature is C37F.
7. Use signatures listed in table 2-2 DAC and Enable Diagnostic Signatures to verify operation of A1A5.
   - If output signatures are incorrect and input signatures are correct, replace A1A5 Assembly (para 2-56).
   - If all signatures are correct, install A1A5 Assembly (para 2-56) and proceed with next test.

Table 2-2. DAC and Enable Diagnostic Signatures.

PIN NO.	SIGNATURE	MNEMONIC
XA5-1	0000	GND
2	C37F	+5V
6	0000	GND
7	9A20	FM40
8	C37F	PWR UP
9	0000	ALC REF
10	0000	ALC REF GND
11	A53H	EN1
12	182U	EN2
13	8319	EN3
14	4C1C	EN4
15	09C6	EN5
16	3818	EN6
17	16F3	EN7
18	3352	EN8
19	0000	B1A51
20	40U2	NSHDN
22	C37F	+5V REF
23	0000	GND

PIN NO.	SIGNATURE	MNEMONIC
24	C37F	+5V
XA5-28	658A	NSTRB
29	1PP5	BA0
30	PU34	BA1
31	PAH6	BA2
32	1H0F	BA3
33	H9CF	RF ON
35	8958	DATA 0
36	U194	DATA 1
37	951C	DATA 2
38	39P1	DATA 3
39	H551	DATA 4
40	6H90	DATA 5
41	71A2	DATA 6
42	8F48	DATA 7
43	910U	BIAS 2

2-17. DIGITAL CONTROL UNIT TEST—Continued.

FUNCTION ASSEMBLY CHECK

1. Set line switch to STBY and disconnect ac power cable. Remove A1A3 Assembly (para 2-56) and reinstall on an extender board.

2. Set diagnostic switch A2A8S1 to 5. Install MPU Test Connector on A2A8. Install jumper between A2A8TP5 and adjacent TPGND.

3. Connect ac power cable and set LINE switch to ON.

4. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.

5. Verify FREQUENCY MHz display indicates “05-1”.

6. Touch Digital Circuit Tester probe to +5V and verify signature is C37F.

7. Use signatures listed below to verify operation of A1A3.

   • If signatures are correct, install A1A3 Assembly (para 2-56) and proceed with next test.

Pin	Signature	Signal
U10-5	4258	PEAK PAR
U10-3	H101	AM 30%
U10-13	8PCA	AM SWP ON
U10-11	H0HA	SAMPLE POWER
U11-5	F16P	INT ALC
U11-6	7212	EXT ALC
U11-3	C3C6	PWR MTR
U11-13	AF90	HN1
U11-11	3H32	HN2

8. Use signatures listed below to verify inputs to A1A3.

   • If all signatures are correct, replace A1A3 Assembly (para 2-56).

   • If EN5 and/or EN6 signatures are incorrect, perform DAC and Enable Assembly Check above.

   • If DATA O-3 signatures are incorrect, perform 1/0 Assembly Talk-Around Diagnostic above.

Pin	Signature	Signal
U10-4,12	09C6	EN5
U11-4,12	4C1C	EN4
U10-7	8958	DATA 0
U10-1	U194	DATA 1
U10-15	9F1C	DATA 2
U10-9	39P1	DATA 3

2-17. DIGITAL CONTROL UNIT TEST—Continued.

PULSE DRIVER ASSEMBLY CHECK

1. Set line switch to STBY and disconnect ac power cable. Remove A1 A4 Assembly (para 2-56) and reinstall on an extender board.

2. Set diagnostic switch A2A8S1 to 5. Install MPU Test Connector on A2A8. Install jumper between A2A8TP5 and adjacent TPGND.

3. Connect ac power cable and set LINE switch to ON.

4. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.

5. Verify FREQUENCY MHz display indicates “05-1”.

6. Touch Digital Circuit Tester probe to +5V and verify signature is C37F.

7. Use signatures listed below to verify operation of AlA4.

   • If signatures are correct install AlA4 Assembly (para 2-56) and proceed with next test.

PIN NO.	SIGNATURE	SIGNAL
U9-4	0258	PLS ON
U9-5	4843	N/A
U9-6	C961	ALC LOOP HOL
U9-7	8075	OVR
U9-9	680H	D0
U9-10	4089	D5
U9-11	6FFU	D10

2-17. DIGITAL CONTROL UNIT TEST—Continued.

8. Use signatures listed below to verify inputs to A1A4.

   • If all signatures are correct, replace A1A4 Assembly (para 2-56).

   • If EN8 signature is incorrect perform DAC and Enable Assembly Check above.

   • If DATA O-3 signatures are incorrect perform I/O Assembly Talk-Around Diagnostic above.

PIN	SIGNATURE	SIGNAL
XA4-31	8958	DATA 0
XA4-32	U194	DATA 1
XA4-33	9F1C	DATA 2
XA4-34	39P1	DATA 3
XA4-35	3352	EN8

METER ASSEMBLY CHECK

1. Set line switch to STBY and disconnect ac power cable. Remove A1A6 Assembly (para 2-56) and reinstall on an extender board.

2. Set diagnostic switch A2A8S1 to 5. Install MPU Test Connector on A2A8. Install jumper between A2A8TP5 and adjacent TPGND.

3. Connect ac power cable and set LINE switch to ON.

4. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.

5. Use signatures listed on top of next page to verify inputs to A1A6.

   • If BND1 -BND4 signatures are incorrect, install A1A6 Assembly (para 2-56) and proceed to next test.

   • If EN6 signature is incorrect, perform DAC and Enable Assembly Check above.

   • If EN7 or DATA O-3 signatures are incorrect, perform 1/0 Assembly Talk-Around Diagnostic above.

2-17. DIGITAL CONTROL UNIT TEST—Continued.

PIN NO.	SIGNATURE	MNEMONIC
11	4P92	BND1
12	4AC9	BND2
13	2PF9	BND3
14	13AA	BND4
16	3818	EN6
17	16F3	EN7
31	8958	DATA0
32	U194	DATA1
33	9F1C	DATA2
34	39P1	DATA3

6. Use signatures listed on next page to verify operation of A1A6.

   • If all signatures are correct, install A1A6 Assembly (para 2-56) and proceed to next test.

   • If EN8 signature is incorrect perform DAC and Enable Assembly Check above.

   • If DATA 0-3 signatures are incorrect perform I/O Assembly Talk-Around Diagnostic above.

2-17. DIGITAL CONTROL UNIT TEST—Continued.

PIN NO.	SIGNATURE	MNEMONIC
U2-6	57UP	FM
U3-3	636F	RO
4	FFFC	R1O
5	58AF	R20
6	40P7	R30
U4-1	47A9	M4
8	9CHP	Ml
9	U4H5	M2
16	1361	M3
U5-1	U194	DATA1
3	FFFC	R1O
4	38188	EN6
5	636F	RO
7	8958	DATAO
9	39P1	DATA3
11	40P7	R30
12	3818	EN6
13	58AF	R20
15	9F1C	DATA2
U6-1	U194	DATA1
2	5038	NAM
3	P344	AM ON
4	16F3	EN7
5	57UP	FM
6	P482	NFM
7	8958	DATAO
9	39P1	DATA3
10	U4H5	M2
11	47A9	M4
13	28A2	
14	9CHP	Ml
15	9F1C	DATA2
U7-3	8C1P	BND4
4	1PA8	BND2
5	5H05	BND3
6	F7AC	BND1

SRD BIAS ASSEMBLY CHECK

1. Set line switch to STBY and disconnect ac power cable. Remove A1A8 Assembly (para 2-56) and reinstall on an extender board.

2. Set diagnostic switch A2A8S1 to 5. Install MPU Test Connector on A2A8. Install jumper between A2A8TP5 and adjacent TPGND.

2-17. DIGITAL CONTROL UNIT TEST—Continued.

3. Connect ac power cable and set LINE switch to ON.
4. Verify Digital Circuit Tester is connected as in step 3 of MPU Free Run Diagnostic above.
5. Verify FREQUENCY MHz display indicates “05-1”.
6. Touch Digital Circuit Tester probe to +5V and verify signature is C37F.
7. Use signatures listed below to verify operation of A1A8.
   - If input signatures are incorrect, perform, I/O Assembly Talk-Around Diagnostic above.
   - If output signatures are incorrect, replace A1A8 Assembly (para 2-56).
   - If all signatures are correct, install A1A8 Assembly (para 2-56).

PIN NO.	SIGNATURE	MNEMONIC
U5 - 1	8958	DATA0
2	UHPP	NBND1
3	4P92	BND1
4	8319	EN 3
5	2PF9	BND3
6	9HC5	NBND3
7	9F1C	DATA2
8	0000	GND
9	39P1	DATA3
10	A0H6	NBND4
11	13AA	BND4
12	8319	EN 3
13	4AC9	BND2
14	U9F5	NBND2
15	U194	DATA1
16	C37F	+5V

8. Troubleshoot all other malfunctions using fig. FO-12.
9. Disconnect test equipment, reinstall circuit card assemblies, and reconnect all cables.

2-18. POWER SUPPLY TEST.

DESCRIPTION

This test is used to correct a malfunction in the Power Supply Subsystem (fig. FO-13).

1. Verify A3A1TP1 (fig. FO-4) is +22Vdc ± 0.02Vdc.

   • If indication is correct, proceed with step 3.

   • If indication is incorrect, adjust A3Al/A3A3/A3A4 Power Supply (para 2-24). If voltage can not be adjusted, proceed with step 2.

2. Check A3A1F1 and A3T1.

   • If good, replace A3A1 Assembly (para 2-78).

3. Verify A3A3TP5 is +20Vdc ± 0.002Vdc.

   • If indication is incorrect, adjust A3Al/A3A3/A3A4 Power Supply (para 2-24). If voltage can not be adjusted, proceed with step 4.

   • If indication is correct, proceed with step 5.

4. Check A3A3F2, A3Q3, and A3T1.

   • If good, replace A3A3 Assembly (para 2-86).

5. Verify A3A3TP2 is +5.2Vdc O.O1Vdc.

   • If indication is correct, proceed with step 7.

6. Check A3A3F1, A3Q4, and A3T1.

   • If good, replace A3A3 Assembly (para 2-86).

7. Ensure that rear panel FREQ STANDARD INT/EXT switch is set to INT.

8. Verify A3A3TP6 is +11 Vdc ± 1.1 Vdc.

   • If indication is correct, proceed with step 10.

9. Remove A3A3 Assembly (para 2-86), and reinstall on an extender board. Check for 0Ω between XA3A18 and ground.

   • If correct replace A3A3 Assembly (para 2-86).

   • If incorrect, troubleshoot switch A3S1 or wiring to it using fig. FO-13.

10. Verify A3A4TP4 is –l0Vdc ± 0.2Vdc.

    • If indication is correct, proceed with step 13.

2-18. POWER SUPPLY TEST—Continued.

11. Connect Digital Multimeter positive lead to A3A4TP4 and common lead to A3A4TP3 and verify indication of between –15 and –22V.

    • If indication is incorrect and A3T1 is functioning, replace A3A1 Assembly (para 2-78).

12. Check A3A4F3 and A3Q1.

    • If fuse is good, replace A3A4 Assembly (para 2-86).

13. Verify A3A4TP5 is –5.2Vdc ± 0.05Vdc with common lead connected to ground.

    • If indication is correct, proceed with step 15.

14. Check A3A4F1.

    • If fuse is good, replace A3A4 Assembly (para 2-86).

15. Verify A3A4TP1 is –39 to -4l.6Vdc with common lead connected to ground.

    • If Digital Multimeter indication is correct, proceed with step 18.

16. Connect common lead to A3A4TP2 and verify indication between 48 and -63Vdc.

    • If indication is incorrect and A3T1 is functioning, replace A3A1 Assembly (para 2-78).

17. Check A3A4F2 and A3Q2.

    • If fuse is good, replace A3A4 Assembly (para 2-86).

18. Remove A3A4 Assembly (para 2-86) and reinstall on an extender board.

19. Connect Digital Multimeter to XA3A4 pin 14 or XA3A4 pin 32 and verify indication of -10V.

20. Press front panel RF OUTPUT ON/OFF push button to turn its light off. Verify Digital Multimeter indication drops from –10V to 0V when push button is pressed.

    • If voltage does not drop to 0V, proceed with step 23.

21. Press front panel RF OUTPUT ON/OFF push button to turn its light on, and verify indication returns to –10V.

22. Jumper A3A3TP2 to ground and verify indication drops to 0V.

    • If voltage does not drop to 0V, proceed with step 25.

23. Press front panel RF OUTPUT ON/OFF push button to turn its light on.

24. Connect Digital Multimeter to XA3A4 pin 18, and press front panel RF OUTPUT ON/OFF push button to turn its light off. Verify Digital Multimeter indication drops from +5V to 0V when push button is pressed.

    • If voltage drops to 0V, replace A3A4 Assembly (para 2-86).

    • If voltage does not drop to 0V, perform Digital Control Unit Test (para 2-17), DAC and Enable Assembly Check.

2-18. POWER SUPPLY TEST—Continued.

25. Disconnect jumper from A3A3TP2. Connect Digital Multimeter to XA3A4 pin 18 and ground A3A3TP2. Verify voltage drops from +5V to OV when A3A3TP2 is grounded.

    • If indication is incorrect, replace A3A4 Assembly (para 2-86).

26. Disconnect jumper from A3A3TP2. Connect Digital Multimeter to XA3A3 pin 35 and ground A3A3TP2. Verify voltage drops from +5V to OV when A3A3TP2 is grounded.

    • If indication is correct, perform Digital Control Unit Test (para 2-17), DAC and Enable Assembly Check.

    • If indication is incorrect, replace A3A3 Assembly (para 2-86).

27. Troubleshoot all other malfunctions using fig. FO- 13.

28. Disconnect test equipment and reinstall all circuit card assemblies.

2-19. A3A1A4 M/N VOLTAGE CONTROLLED OSCILLATOR ASSEMBLY TEST.

DESCRIPTION

This test is used to correct a malfunction in the A3A1A4 M/N Voltage Controlled Oscillator Assembly.

1. Adjust A3A1A4 as required (table 2-3). If adjustment does not correct problem, remove A3A1A3 Assembly (para 2-81).

2. Remove A3A1A4 Assembly (para 2-82) and reinstall on an extender board.

3. Set Power Supply to 0V. Connect positive lead to chassis ground and negative lead to A3A1A4TP1 (fig. FO-4). Set Power Supply to –35V.

CAUTION

Do not apply a positive voltage to A3A1A4TP1 as this will destroy the voltage controlled oscillator tuning diodes.

4. Using High Impedance Probe, connect Spectrum Analyzer to A3A1A4A2Q2 emitter. Verify Spectrum Analyzer displays 395 MHz at OdBm.

    • If indication is incorrect replace A3A1A4A2 Assembly (para 2-83).

5. Using High Impedance Probe, connect Spectrum Analyzer to A3A1A4A2Q1 base. Verify Spectrum Analyzer displays 395 MHz at -34dBm.

    • If indication is correct, replace A3A1A4A2 Assembly (para 2-83).

    • If indication is incorrect, replace A3A1A4 Assembly (para 2-82).

6. Disconnect test equipment and reinstall all circuit card assemblies.

2-20. A4 FRONT PANEL ASSEMBLY TEST.

DESCRIPTION

This test is used to correct a malfunction in the Front Panel Assembly (fig. FO-14).

1. Connect ac power cable and set LINE switch to ON,
2. Verify all seven keyboard status lights on top of A2A2 (fig. FO-3) are on when no front panel push buttons are pressed,
3. Press push buttons as indicated below and verify A2A2 light pattern.
   - If indication is correct, proceed with step 6.
   - If, after second push button is pressed no further push buttons being pressed causes change, proceed with step 5.
4. Remove A2A2 Assembly (para 2-72) and reinstall on an extender board. Verify following input pairs as shown below and pressing alternate push buttons.
   - If indication is correct replace A2A2 Assembly (para 2-72).

Function Key	Key-Code Pattern							Input Pair Verified		IF Key-Code Pattern Incorrect	
	K6	K5	K4	K3	K2	K1	K0	Row	Column	Key to be Depressed to Verify Row	Key to be Depressed to Verify Column
1		L	L				L	KR1	C3L	9	2
ΔF		L	L	L		L		KR2	C3H	2	9
TUNE	L				L			KR3	C4L	3	LOCAL
ALC INT	L			L				KR0	C4H	0	RF ON/OFF
FREQ INCR	L		L		L			KR4	C5L	4	START
PULSE OFF	L		L	L	L		L	KR5	C5H	5	FM OFF
FM3	L	L			L	L		KR6	C66	6	FM1
SERVICE SWITCH	L	L		L	L	L	L	KR7	C6H	7	FM3

5. Touch Digital Circuit Tester probe to +5V and verify a TTL high or low on XA2 pin 24 after push button is pressed.
   - If low, replace adjust A2A7 as required (table 2-3). If adjustment does not correct problem, replace A2A7 Assembly (para 2-74).
6. Use fig. FO- 14, Digital Circuit Tester, and information on next two pages to verify required signal conditions between circuit elements for proper operation. Interconnects can be verified by pressing alternate push buttons which use same circuitry and/or interconnects as one under investigation. Press any push button, except number push buttons, to verify enable signals DLE and PRW from A2A8 to A2A1. Press SWEEP MODE MANUAL push button to verify address bit A2. Press RF OUTPUT ON/OFF push button to verify data bit FD4.
   - If a failure is found when alternate push buttons are pressed, perform Digital Control Unit Test (para 2-17).
7. Install A2A2 Assembly (para 2-72).
8. Troubleshoot A4A1 Front Panel Keyboard Assembly using fig. FO-14.
9. Disconnect test equipment.

Function	Front Panel Output									Key-Code Output							μP Output to Panel Driver											Panel Driver Output
	KR0	KR1	KR2	KR3	KR4	KR5	KR6	KR7	C3L C3H C4L C4H C5L C5H C6L C6H	K6	K5	K4	K3	K2	K2	K0	NUME	DLE	PRW	A0	A1	A2	FD0	FD1	FD2	FD3	FD4	FD5	FD6	FD7	
0	L								L		L	L																		
1		L							L		L	L				L														
2			L						L		L	L			L															
3				L					L		L	L			L	L														
4					L				L		L	L		L																
5						L			L		L	L		L		L														
6							L		L		L	L		L	L															
7								L	L		L	L		L	L	L														
8	L								L		L	L	L																	
9		L							L		L	L	L			L														
ΔF			L						L		L	L	L		L								NOT APPLICABLE							
AUTO				L					L		L	L	L		L	L		H	L			L								DL3-4
MKR					L				L		L	L	L	L									L							
SWEEP OFF						L			L		L	L	L	L		L							NOT APPLICABLE							
MANUAL							L		L		L	L	L	L	L								NOT APPLICABLE							
UNUSED								L	L		L	L	L	L	L	L														
LOCAL	L								L	L						L							NOT APPLICABLE							
DWELL		L							L	L						L							NOT APPLICABLE							
FREQ INCR DW			L						L	L					L								NOT APPLICABLE							
FREQ INCR UP				L					L	L					L	L							NOT APPLICABLE							
TUNE ON/OFF					L				L	L				L					L										L	DL4-6
STEPS						L			L	L				L		L				L	L		NOT APPLICABLE							
←							L		L	L				L	L								NOT APPLICABLE							
.								L	L	L				L	L	L							NOT APPLICABLE							
ALC INT	L								L		L									L	L	L	L							DL1-0
RF ON/OFF		L							L	L						L			L		L	L		L						DL1-4
UNUSED			L						L	L					L								NOT APPLICABLE							
RANGE				L					L	L					L	L							NOT APPLICABLE							
DIODE					L				L	L				L					L		L	L	L							DL1-1
PWR METER						L			L	L				L		L			L		L	L		L						DL1-2
RANGE							L		L	L				L	L								NOT APPLICABLE							
AUTO PK								L	L	L				L	L	L			L		L	L			L						DL1-3
START	L								L		L	L				L							NOT APPLICABLE							
STOP		L							L	L		L				L							NOT APPLICABLE							
NORM			L						L	L		L			L				L	L		L	L							DL2-0
FREQUENCY				L					L	L		L			L	L							NOT APPLICABLE							

2-20. A4 FRONT PANEL ASSEMBLY TEST—Continued.

Function	Front Panel Output								Key-Code Output							μP Output to Panel Driver									Panel Driver Output
	KR0	KR1	KR2	KR3	KR4	KR5	KR6	KR7	C3L	C3H	C4L	C4H	C5L	C5H	C6L	C6H	K6	K5	K4	K3	K2	K2	K0	NUME	DLE	PRW	A0	A1	A2	FD0	FD1	FD2	FD3	FD4	FD5	FD6	FD7	
FREQ INCR					L								L				L		L		L																	
COMPL						L							L				L		L		L		L			L	L		L								DL2-1
STO							L						L				L		L		L	L															
RCL								L					L				L		L		L	L	L														
AM OFF	L													L			L		L	L																	
MTR AM		L												L			L		L	L			L			L	L	L									DL4-1
MTR FM			L											L			L		L	L		L					L	L	L			L					DL4-2
FM OFF				L										L			L		L	L		L	L														
MESSAGE KEY					L									L			L		L	L	L					L	L							L			DL4-4
PULSE OFF						L								L			L		L	L	L		L														
UNUSED							L							L			L		L	L	L		L														
MTR L V L								L						L			L		L	L	L	L	L			L	L		L								DL4-0
FM .3	L														L			L	L							L	L		L								DL2-4
FM .1		L													L			L	L				L			L	L		L								DL2-3
FM .03			L												L			L	L			L				L	L		L								DL2-2
AM 30%				L											L			L	L			L	L				L		L								DL1-6
AM 100%					L										L			L	L		L						L		L								DL1-7
FM 1						L									L			L	L		L		L				L		L								DL2-5
FM 3							L								L			L	L		L	L					L		L								DL2-6
FM 10								L							L			L	L		L	L	L				L		L								DL2-7
SINGLE	L															L	L	L	L	L						L			L								DL3-6
STEP		L														L	L	L	L	L										NOT APPLICABLE							
GHz			L													L	L	L	L	L		L								NOT APPLICABLE							
MHz				L												L	L	L	L	L		L	L							NOT APPLICABLE							
UNUSED					L											L	L	L	L	L	L									NOT APPLICABLE							
UNUSED						L										L	L	L	L	L	L		L							NOT APPLICABLE							
kHz							L									L	L	L	L	L	L	L								NOT APPLICABLE							
SERVICE SWITCH								L								L	L	L	L	L	L	L	L							NOT APPLICABLE							
NOT ϕ LOCKED										NOT APPLICABLE														L	H	L	L	L	L	L								DL0-0
ALC UNLEVELED										NOT APPLICABLE														L	H	L	L	L	L		L							DL0-1
FM OVERMOD										NOT APPLICABLE														L	H	L	L	L	L			L						DL0-2
EXTERNAL REF										NOT APPLICABLE														L	H	L	L	L	L					L				DL0-3
OUT OF RANGE										NOT APPLICABLE														L	H	L	L	L	L							L		DL0-6

Section IV. MAINTENANCE PROCEDURES

2-21. PERFORMANCE TEST.

DESCRIPTION

This procedure covers:

- Frequency Range and Resolution Test.
- Low Level Accuracy Test.
- Non-harmonically Related Spurious Signals Test.
- Amplitude Modulation Test.
- Incidental Amplitude Modulation Test.
- Residual Amplitude and Frequency Modulation Test
- Output High Level Accuracy and Flatness Test.
- Harmonics Subharmonic, and Multiples Test.
- Single Sideband Phase Noise Test.
- FM Frequency Response Test.
- Pulse Test.

NOTE

- Performance test procedure steps should be done in the order given.
- Keep test equipment interconnecting cables as short as possible.
- A performance test checklist is provided at the end of the performance test procedures. Use the checklist while doing the test procedures.
- Allow an initial 20 minute warm-up period when performing the first performance test to allow the Signal Generator to stabilize.
- Allow Signal Generator 5 minutes to stabilize if turned off during performance tests.
- The initialized setup of Signal Generator controls and indicators is to be performed prior to each performance test.

INITIALIZED SETUP.

1. Initialization of Signal Generator controls and indicators is accomplished automatically by pressing RCL and number O push button.

2. Initialized state of Signal Generator should be as follows:

RF OUTPUT ON/OFF light	ON
ALC INTERNAL light	ON
OUTPUT LEVEL meter	-67.0 to -82.0dBm
AUTO PEAK light	ON
MTR LVL light	ON
All AM, FM, and PULSE lights	OFF
Frequency	3000MHz
Frequency Increment	1.000MHz*
Start Sweep Frequency	2000.000MHz*
Stop Sweep Frequency	4000.000MHz*
AF Sweep Frequency	2000.000MHz*
MKRS	OFF**
Sweep Mode	OFF
Sweep Rate Step	100 (20.000MHz)*
Sweep Rate Dwell	2oms*
FREQ INCREMENT TUNE ON/OFF light	ON

* Press key to display value.
** Press MKR key then number 1-5 alternately to display marker frequency of 3, 6,9, 12, 15GHz respectively.

FREQUENCY RANGE AND RESOLUTION TEST.

1. Remove jumper A3W3 from FREQ STANDARD input and output connectors on rear panel of SG-1219/U. Connect 10MHz FREQUENCY STANDARD output of Frequency Counter to 10MHz FREQ STANDARD input (A3J10) of SG-1219/U. Connect RF OUTPUT of SG-1219/U to 50Ω input of Frequency Counter.

2. On SG-1219/U:

   - Set frequency to 4GHz.
   - Set frequency increment to lKHz.
   - Set output power to OdBm.
   - Set FREQ STANDARD INT/EXT switch to EXT.

3. Set Frequency Counter resolution to 1 KHz and verify that frequency indication is 4.000 000GHZ ± lKHz.

4. Increase SG-1219/U by lKHz using FREQ INCR up arrow push button. Verify Frequency Counter indication increases 1 KHz from indication in step 3.

5. Decrease SG-1219/U by 2KHz using FREQ INCR down arrow push button. Verify Frequency Counter indication decreases lKHz from indication in step 3.

6. Set SG-1219/U frequency to 8GHz and verify that frequency indication is 8.000 000GHz ± 2KHz.

7. Increase SG-1219/U by 2KHz using FREQ INCR up arrow push button. Verify Frequency Counter indication increases 2KHz from indication in step 6.

8. Decrease SG-1219/U by 4KHz using FREQ INCR down arrow push button. Verify Frequency Counter indication decreases 2KHz from indication in step 6.

9. Set SG-1219/U frequency to 15GHz and verify that frequency indication is 15.000 000 GHz ± 3KHz.

10. Increase SG-1219/U by 3KHz using FREQ INCR up arrow push button. Verify Frequency Counter indication increases 3KHz from indication in step 9.

11. Decrease SG-1219/U by 6KHz using FREQ INCR down arrow push button. Verify Frequency Counter indication decreases 3KHz from indication in step 9.

12. Set SG-1219/U frequency and frequency increment as shown on next page, and verify Frequency Counter readings are within specified limits. Verify NOT Ø LOCKED light remains off. Use FREQ INCR up arrow push button to change SG-1219/U frequency.

NOTE

Changing frequency rapidly may cause NOT Ø LOCK light to flash momentarily. This is normal and does not indicate a malfunction.

FREQUENCY RANGE AND RESOLUTION TEST-Continued.

SG-1219/U Frequency	SG-1219/U FREQ INCR	Frequency Counter indication
2.000 OOOGHz	0.111 lllGHz	1.999 999GHz to 2.000 001GHz
2.111 lllGHz	0.111 lllGHz	2.111 110GHZ to 2.111 112GHz
2.222 222GHZ	0.111 lllGHz	2.222 221GHz to 2.222 223GHz
2.333 333GHz	0.111 lllGHz	2.333 332GHz to 2.333 334GHz
2.444 444GHz	0.111 lllGHz	2.444 443GHz to 2.444 445GHz
2.555 555GHz	0.111 lllGHz	2.555 554GHz to 2.555 556GHz
2.666 666GHz	0.111 lllGHz	2.666 665GHz to 2.666 667GHz
2.777 777GHz	0.111 lllGHz	2.777 776GHz to 2.777 778GHz
2.888 888GHz	0.111 lllGHz	2.888 887GHz to 2.888 889GHz
2.999 999GHz	0.111 lllGHz	2.999 998GHz to 3.000 000GHz
3.000 000GHz	1.000 000GHz	2.999 999GHz to 3.000 001GHz
4.000 000GHz	1.000 000GHz	3.999 999GHz to 4.000 001GHz
5.000 000GHz	1.000 000GHz	4.999 999GHz to 5.000 001GHz
6.000 000GHz	1.000 000GHz	5.999 999GHz to 6.000 001GHZ
7.000 000GHz	1.000 000GHz	6.999 999GHz to 7.000 001GHz
8.000 000GHz	1.000 000GHz	7.999 999GHz to 8.000 001GHz
9.000 000GHz	1.000 000GHz	8.999 999GHz to 9.000 001GHz
10.000 000GHz	1.000 000GHz	9.999 999GHz to 10.000 001GHz
11.000 000GHz	1.000 000GHz	10.999 999GHz to 11.000 001GHz
12.000 000GHz	1.000 000GHz	11 .999999GHz to 12.000001GHz
13.000 002GHz	1.000 000GHz	13.000 001GHz to 13.000 003GHz
14.000 001GHz	1.000 000GHz	14.000 000GHz to 14.000 002GHz
15.000 000GHz	1.000 000GHz	14.999 999GHz to 15.000 001GHz
16.000 002GHz	1.000 000GHz	16.000 001GHZ to 16.000 003GHz
17.000 002GHz	1.000 000GHz	17.000 000GHz to 17.000 002GHz
18.000 000GHz	1.000 000GHz	17.999 999GHz to 18.000 001GHz

13. On SG-1219/U, turn RF OUTPUT push button to OFF, replace jumper A3W3, and set FREQ STANDARD INT/EXT switch to INT.

CAUTION

Before disconnecting or connecting cable from RF output connector, verify RF OUTPUT push button is turned OFF.

OUTPUT HIGH LEVEL ACCURACY AND FLATNESS TEST.

1. Initialize SG-1219/U.
2. Connect Thermistor Mount to Power Meter and zero in dBm mode. Connect RF OUTPUT of SG-1219/U to Thermistor Mount.
3. On SG-1219/U:
   - Set frequency to 2GHz.
   - Set output level to +l0dBm.
   - Adjust VERNIER control until Power Meter indicates +8dBm.
   - Verify AUTO PEAK is on.
   - Set frequency increment to 2GHz.
4. Tune SG-1219/U from 2 to 18GHz in 2GHz steps and verify that difference between minimum and maximum Power Meter indications is less than ± 2dB.
5. On SG-1219/U:
   - Set frequency to 2GHz.
   - Adjust VERNIER control until Power Meter indicates –2dBm.
   - Turn AUTO PEAK OFF then ON.
   - Set frequency increment to 2GHz.
6. Tune SG-1219/U from 2 to 18GHz, in 2GHz steps. Set Power Meter calibration factor as appropriate and verify that difference between Power Meter indications is less than ± 2dB.
7. Repeat steps 5 and 6 using -7 and –17dBm power levels. Verify that difference between Power Meter indications is less than ± 2dB.

LOW LEVEL ACCURACY TEST.

1. Initialize SG-1219/U

2. Connect Thermistor Mount to Power Meter and zero in dBm mode. Connect RF OUTPUT of SG-1219/U to Thermistor Mount.

3. On SG-1219/U:

   • Set frequency to 2GHz.

   • Set output level to –30dBm.

   • Adjust VERNIER control until Power Meter indicates –30dBm ±.01dB.

   • Verify AUTO PEAK is on.

   • Set frequency increment to 8GHz.

4. Measure the output levels indicated on Power Meter at SG-1219 output level range settings of -30dBm and at frequencies of 2, 10, and 18GHz. Verify that Power Meter indications are within specified limits shown below.

Output level range (dBm)	Frequency					
	2GHz		10GHz		18GHz	
	Min	Max.	Min	Max.	Min	Max.
-30	-34	-26	-34	-26	-35	-25

5. On SG-1219/U:

   • Set frequency to 2GHz.

   • Set output level to –30dBm.

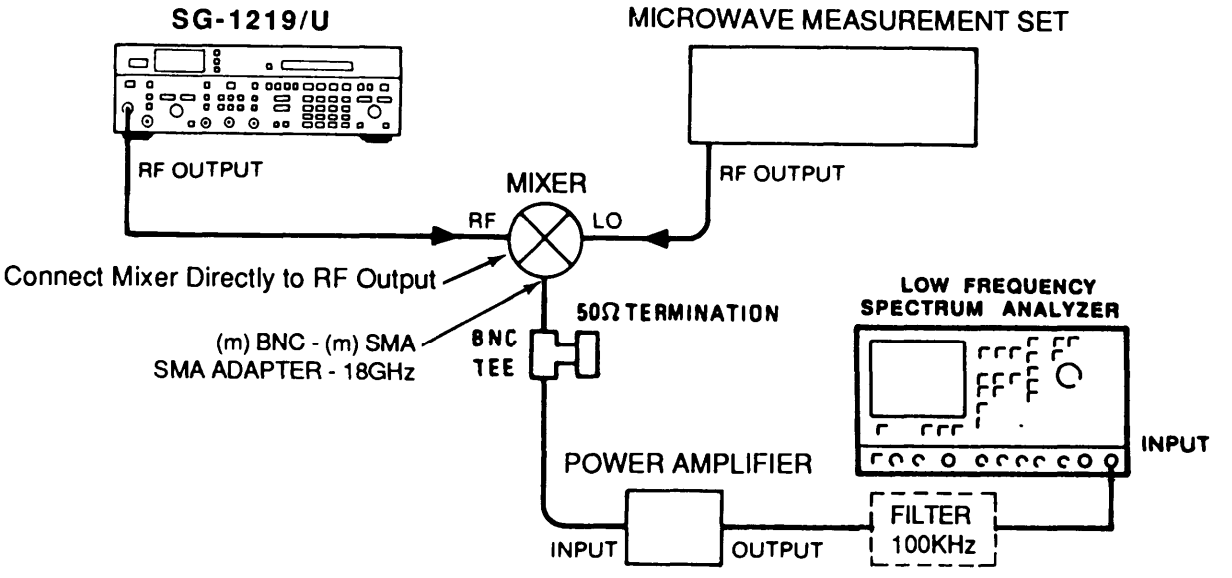
   • Adjust VERNIER control until Power Meter indicates –30dBm ±OldB.

NOTE

Do not adjust VERNIER control after –30dBm setting has been obtained as indicated on Power Meter. Use RANGE keys only to set output power levels in increments of 10dB for remainder of test.

LOW LEVEL ACCURACY TEST—Continued.

6. Connect test equipment as shown below.



7. Set Power Amplifier to 40dB gain.

8. On Microwave Measurement Set:

   • Set frequency to 2000.1MHz.

   • Set output level to +7dBm.

9. On Low Frequency Spectrum Analyzer:

   • Set center frequency to 100KHz.

   • Set frequency span to 100KHz.

   • Set resolution bandwidth to 300Hz.

   • Set sensitivity to 2dB/DIV.

   • Adjust vertical sensitivity controls so amplitude of IF signal (100KHZ) is set to center reference level. Record vertical sensitivity control setting.

10. Set SG-1219/U and Microwave Measurement Set controls as shown on top of the next page. Readjust Low Frequency Spectrum Analyzer vertical sensitivity controls at each level to bring display back to reference graticule. Verify difference below in vertical sensitivity from level in step 9 for each output level range. Verify that Low Frequency Spectrum Analyzer indications are within specified limits shown below.

LOW LEVEL ACCURACY TEST—Continued.

SG-1219/U output level range (dBm)*	SG-1219/U Frequency	Microwave Measurement Set Frequency	Low Frequency Spectrum Analyzer indication (dB)	
			Min	Max.
*-40	2.000GHz	2000. 1MHZ	-44	-36
*–50	2.000GHz	2000. lMHz	-54	-46
*–60	2.000GHz	2000. lMHZ	-64	-56
*-40	10.OOOGHZ	10.000 lGHz	-44	-36
*–50	10.OOOGHZ	10.000 lGHz	-54	-46
*–60	10.OOOGHZ	10.000 lGHz	-64	-56
*40	18.000GHZ	18.000 lGHz	-45	-35
*–50	18.000GHZ	18.000 lGHz	-55	-45
*–60	18.000GHZ	18.000 lGHz	-65	-55

* For reference only. Do not adjust VERNIER to obtain exact level. Set to nominal level shown using RANGE keys only.

11. Set Power Amplifier to 60dB gain.

12. Set SG-1219/U and Microwave Measurement Set controls as shown below. Readjust Low Frequency Spectrum Analyzer vertical sensitivity controls at each level to bring display back to reference graticule. Verify difference below in vertical sensitivity from level in step 9 for each output level range. Verify that Low Frequency Spectrum Analyzer indications are within specified limits shown below.

SG-1219/U output level range (dBm)*	SG-1219/U Frequency	Microwave Measurement Set Frequency	Low Frequency Spectrum Analyzer indication (dB)	
			Min	Max.
*–70	2.000GHz	2000.1MHz	-75.5	-64.5
*–80	2.000GHz	2000. 1MHz	-85.5	-74.5
*–90	2.000GHz	2000.1MHz	-95.5	-84.5
*–100	2.000GHz	2000.1MHz	-105.5	-94.5
*–110	2.000GHz	2000.1MHz	-115.5	-105.5
*-70	10.000GHz	10.000 1GHz	-75.5	-64.5
*-80	10.000GHz	10.000 1GHz	-85.5	-74.5
*–90	10.000GHz	10.000 1GHz	-95.5	-84.5
*–100	10.000GHz	10.000 1GHz	-105.5	-94.5
*–110	10.000GHz	10.000 1GHz	-115.5	-105.5
*–70	18.000GHz	18.000 1GHz	-76.5	-63.5
*–80	18.000GHz	18.000 1GHz	-86.5	-73.5
*–90	18.000GHz	18.000 1GHz	-96.5	-83.5
*-l00	18.000GHz	18.000 1GHz	-105.5	-93.5
*–110	18.000GHz	18.000 1GHz	-115.5	-105.5

* For reference only. Do not adjust VERNIER to obtain exact level. Set to nominal level shown using RANGE keys only.

13. Verify that all measured values are within specifications.

HARMONICS, SUBHARMONICS, AND MULTIPLES TEST.

1. Initialize SG-1219/U.
2. Connect RF OUTPUT of SG- 1219/U to 50Ω INPUT of Spectrum Analyzer.
3. On SG-1219/U:
   - Set frequency to 4GHz.
   - Set output level to +3dBm.
4. Set Spectrum Analyzer resolution bandwidth to 10KHz. Adjust controls to display fundamental signal. Adjust reference level to set signal to top graticule of display.
5. Set SG-1219/U frequency to 2GHz. Record level of second harmonic.
6. Repeat steps 3 thru 5 at SG-1219/U frequencies of 2, 4, 6, 8, 10, 12, 14, 16, and 18GHz. Check each harmonic, subharmonic, and multiple. Verify that indications are within specified limits given below.

Set SG-1219/U and Spectrum Analyzer to	Check Harmonic Levels at:			
FUNDAMENTAL	HARMONIC	SUBHARMONIC		MULTIPLE
(GHz)	(GHz)	1/3	1/2	2/3
2.0000	4.0000			
4.0000	8.0000			
6.0000	12.0000			
8.0000	16.0000		4.0000	
10.0000	20.0000		5.0000	
12.0000	24.0000		6.0000	
14.0000		4.6667		9.3333
16.0000		5.3333		10.6667
18.0000		6.0000		12.0000
LIMITS	<–40 dBc	<–35 dBc		

NON-HARMONICALLY RELATED SPURIOUS SIGNALS TEST.

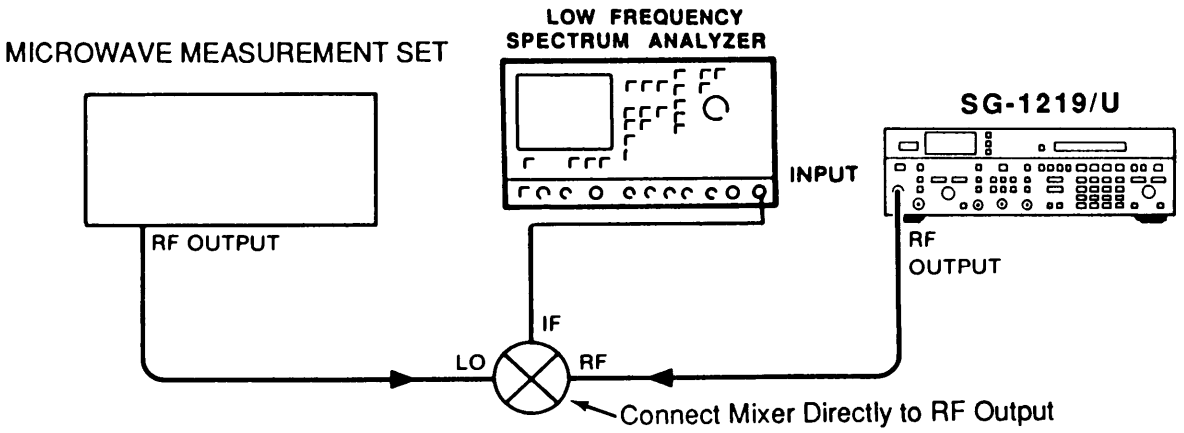
1. Initialize SG-1219/U.
2. Connect RF OUTPUT of SG-1219/U to 50Ω INPUT of Spectrum Analyzer.
3. On SG-1219/U:
   - Set frequency to 3GHz.
   - Set output level to -47dBm.

NON-HARMONICALLY RELATED SPURIOUS SIGNALS TEST—Continued.

4. On Spectrum Analyzer:
   - Set resolution bandwidth to 100KHz.
   - Set frequency span/division to 20MHz.
   - Set center frequency to 3GHz.
   - Adjust controls to display fundamental signal and carrier signal at top graticule line.
5. Increase SG-1219/U output to +3dBm. Do not adjust Spectrum Analyzer amplitude calibration. Top graticule line now represents –50dBc.
6. Tune SG-1219/U to any desired frequency between 2 and 18GHz in search of non-harmonically related spurious signals. Verify that signals found are non-harmonically related at <–70dBc.

SINGLE SIDEBAND PHASE NOISE TEST.

1. Connect test equipment as shown below.



2. Initialize SG-1219/U.
3. On Low Frequency Spectrum Analyzer:
   - Set dB/DIV to 10dB.
   - Set resolution bandwidth to 100Hz.
   - Set frequency span/division to 200Hz.
4. On SG-1219/U:
   - Set frequency to 6GHz.
   - Set output level to –20dBm.

SINGLE SIDEBAND PHASE NOISE TEST—Continued.

5. On Microwave Measurement Set:

   - Set frequency to 5.9998GHz.
   - Set output level to +8dBm.

6. Adjust Low Frequency Spectrum Analyzer controls so that 200KHz IF signal is at left edge of display. Adjust controls to place peak of signal at top graticule line.

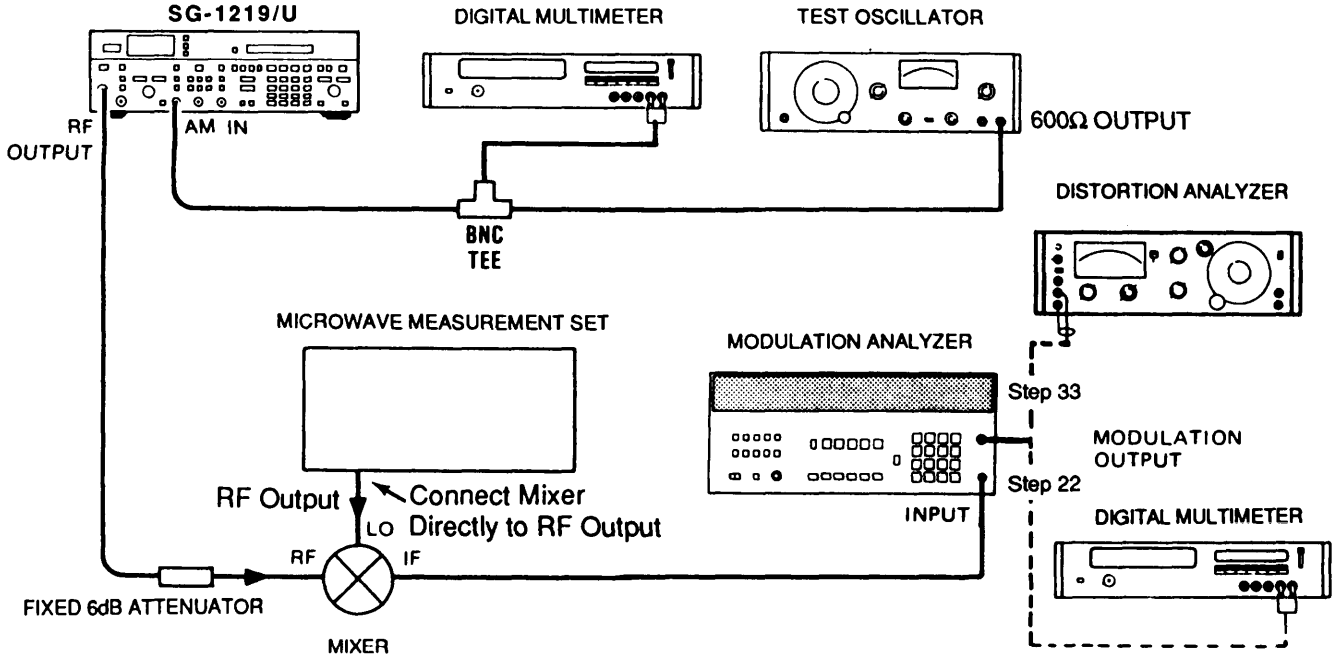
7. Record measured noise level 1KHz from carrier, add 21.3dB correction, and verify actual level is <-60dBc.

8. Set SG-1219/U and Microwave Measurement Set frequencies as shown below. Record measured noise level lKHz from carrier, add 21.3dB correction, and verify actual level is within specified limits.

SG-1219/U Frequency	Microwave Measurement Set Frequency	Actual Level
12000 0GHz	11.999 800GHz	<-60dBc
18 000 0GKHz	17.999 802GHz	<-60dBc

AMPLITUDE MODULATION TEST.

1. Connect test equipment as shown below.



AMPLITUDE MODULATION TEST—Continued.

2. Initialize SG-1219/U.
3. On SG-1219/U:
   - Set frequency to 16.6GHz.
   - Set output level to –10dBm.
   - Press MTR AM push button.
   - Set automatic leveling control to INTERNAL.
   - Set frequency modulation to OFF.
   - Set amplitude modulation to 100%.
4. On Microwave Measurement Set:
   - Set frequency to 16.5GHz.
   - Set output level +8dBm.
   - Set modulation to OFF.
5. Set Modulation Analyzer mode to AM and press PEAK + push button.
6. On Test Oscillator
   - Set frequency to lKHz.
   - Set output level to 0.35Vrms.
   - Adjust output level to achieve a 50% amplitude modulation as indicated on Modulation Analyzer.
7. Verify that OUTPUT LEVEL meter on SG-1219/U indicates a level of 50% ± 6.5%.
8. On Test Oscillator
   - Set frequency to 10KHz.
   - Set output level to 0.53Vrms.
9. Verify that OUTPUT LEVEL meter on SG-1219/U indicates a level of 70% to 80%.
10. Set SG-1219/U frequency to 6.6GHz,
11. Set Microwave Measurement Set frequency to 6.5GHz.
12. With Test Oscillator frequency of 10KHz, lKHz, and 0.1KHZ; verify that OUTPUT LEVEL meter on SG-1219/U indicates a level of 70% to 80%.

AMPLITUDE MODULATION TEST—Continued.

13. On SG-1219/U:

- Set frequency to 16.6GHz.
- Set output level to –10dBm.
- Set automatic leveling control to INTERNAL.
- Set amplitude modulation to 100%.
- Set frequency modulation to OFF.

14. On Microwave Measurement Set:

- Set frequency to 16.5GHz.
- Set output level to +8dBm.
- Set modulation to OFF.

15. Set Modulation Analyzer mode to AM and press PEAK + push button.

16. On Test Oscillator

- Set frequency to 10KHz.
- Adjust output level to obtain a 30% amplitude modulation indication on Modulation Analyzer.

17. On Modulation Analyzer, press FM push button and complete remainder of measurements given below. Verify Actual Incidental Frequency Modulation is within specified limits.

Signal Generator		Microwave Measurement Set		Incidental Frequency Modulation Actual
Frequency	Level	Frequency	Level	
6.2GHz	–l0dBm	6.lGHz	+8dBm	<10KHZ
12.3GHz	–l0dBm	12.2GHz	+8dBm	<10KHZ
18GHz	-l0dBm	17.9GHz	+8dBm	<10KHZ

18. On SG-1219/U:

- Set frequency to 4GHz.
- Set output level to -10dBm.
- Set automatic leveling control to INTERNAL.
- Set amplitude modulation to 100%.
- Set frequency modulation to OFF.

AMPLITUDE MODULATION TEST—Continued.

19. On Microwave Measurement Set:

- Set frequency to 3.9GHz.
- Set output level to +8dBm.

20. Set Modulation Analyzer mode to AM.

21. On Test Oscillator:

- Set frequency to 1KHz.
- Adjust output level for a 30% amplitude modulation depth (approximately 0.212Vrms as indicated on Digital Multimeter) and record Vrms reading as Reference Level.

22. Connect Digital Multimeter to modulation output of Modulation Analyzer and record Vrms reading as Demodulation Reference Level.

23. Calculate Upper Voltage Limit (UVL) using following formula:

    UVL = 1.4125 X DEMODULATION REFERENCE LEVEL (Step 22).

24. Calculate Lower Voltage Limit (LVL) using following formula:

    LVL = 0.7079 X DEMODULATION REFERENCE LEVEL (Step 22).

25. Set Test Oscillator frequency to 10Hz.

26. Connect input of Digital Multimeter to output of Test Oscillator. Adjust Test Oscillator output to achieve same Digital Multimeter indication recorded in step 21 (Reference Level).

27. Connect input of Digital Multimeter to output of Modulation Analyzer. Verify that Digital Multimeter indication is within calculated UVL (step 23) and LVL (step 24) limits.

28. Repeat steps 25 thru 27 using frequencies of 20, 50, 120, 240, 600, 1000, 2000, 5000, 10000, 25000, and 50000Hz. At each frequency, verify that Digital Multimeter indications are within calculated UVL (step 23) and LVL (step 24) limits.

29. On SG-1219/U:

- Set frequency to 16.6GHz.
- Set output level to -10dBm.
- Set automatic leveling control to INTERNAL.
- Set amplitude modulation to 100%.
- Set frequency modulation to OFF.

AMPLITUDE MODULATION TEST—Continued.

30. On Microwave Measurement Set:
    - Set frequency to 16.5GHz.
    - Set output level to +8dBm.
    - Set modulation to OFF.
31. Set Modulation Analyzer mode to AM.
32. On Test Oscillator
    - Set frequency to 1KHz.
    - Set output level to 0.35 Vrms.
    - Adjust output level for a 50% amplitude modulation indication on Modulation Analyzer.
33. Connect modulation output on Modulation Analyzer to input of Distortion Analyzer and verify that distortion level is less than 8%.

F M FREQUENCY RESPONSE TEST.

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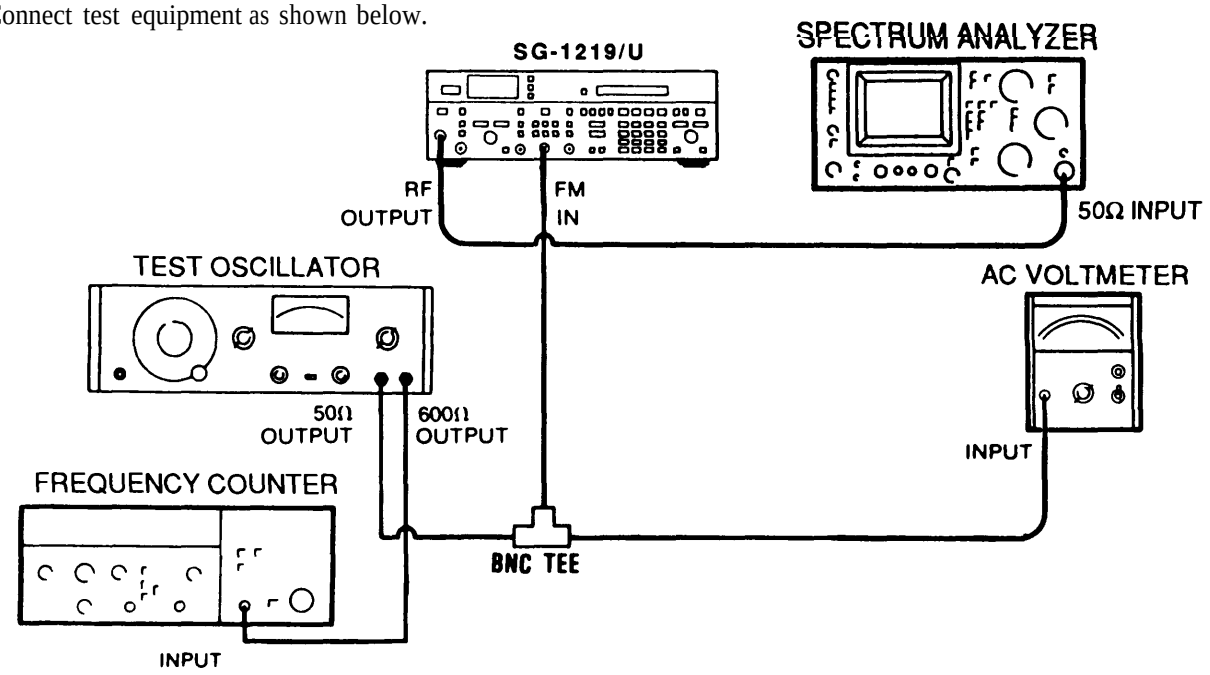
1. Connect test equipment as shown below.



2. Initialize SG-1219/U.
3. On SG-1219/U:
    - Set frequency to 4GHz.
    - Set output level to 0dBm.

FM FREQUENCY RESPONSE TEST-Continued.

4. On Spectrum Analyzer:

   l Adjust controls to display 4GHz RF signal with top of the signal at the top of graticule line.

NOTE

Top graticule line is now CW reference for the remainder of the test.

5. Set SG-1219/U FM DEVIATION MHz to 10 unlocked. The NOT Ø LOCKED indicator will light.

6. On Test Oscillator

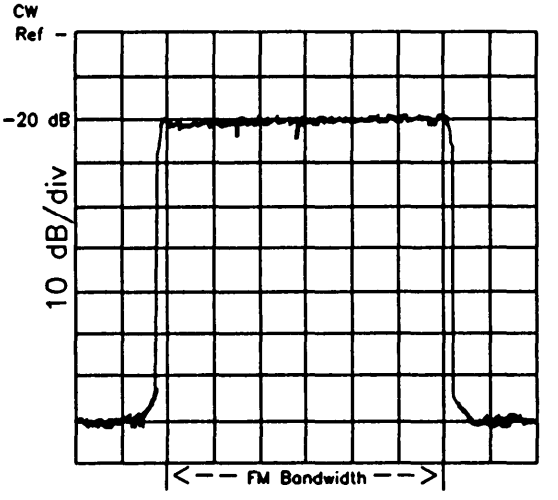
   l Set frequency to 100KHz.

   l Adjust output voltage to 0.707 Vrms.

7. Adjust Test Oscillator output voltage control until the FM Bandwidth as displayed on the Spectrum Analyzer is equal to 20.2MHz ±0.5MHz. Record AC Voltmeter indication below.

NOTE

FM Bandwidth is determined by measuring the frequency span of all sidebands more than 20dB below the CW reference in step 4 as shown.



8. Tune Test Oscillator to 0.050KHz and adjust output voltage to obtain FM Bandwidth of 20.0MHZ to.5MHz as displayed on the Spectrum Analyzer. Record AC Voltmeter indication below.

9. Repeat steps 7 and 8 for each of remaining frequencies given in table.

FM Rate (KHz)	Desired FM Bandwidth (MHz)	Measured Voltage (Vrms)	Calculated Response (dB)
0.50	20.0		
0.100	20.0		
1	20.0		
10	20.0		
30	20.0		
100	20.2		0
300	20.6		
1000	22.0		
2000	24.0		

FM FREQUENCY RESPONSE TEST-Continued.

10. Use following equation to calculate FM frequency response in dB:

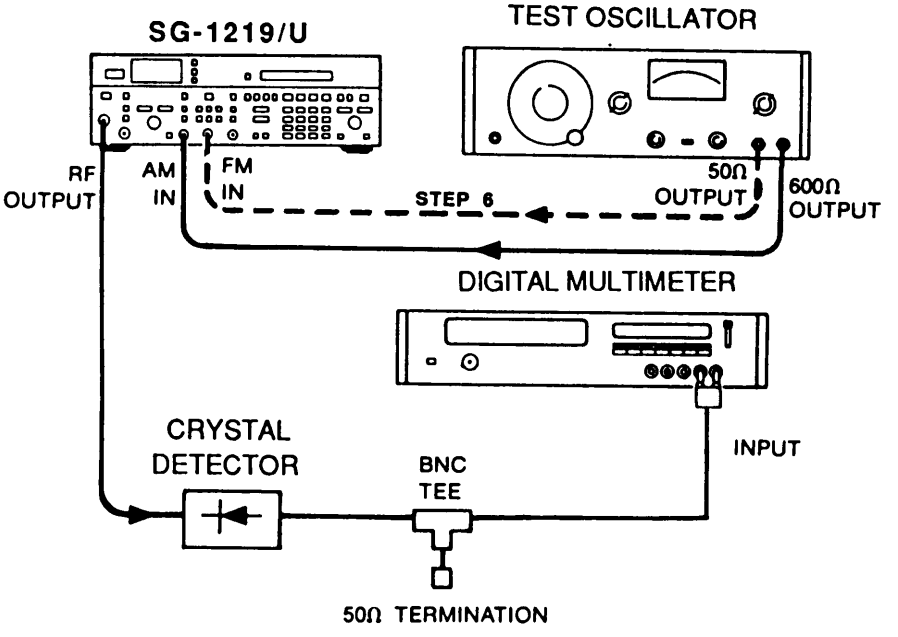
dB =20 log (Vx/Vo)

where: dB = calculated frequency response,
Vx = measured voltage
Vo = reference voltage measured at 100KHz (step 7)

11. Verify that all calculated response (dB) readings are 0±3dB.

INCIDENTAL AMPLITUDE MODULATION TEST.

1. Connect test equipment as shown below.



2. Initialize SG-1219/U.

3. On SG-1219/U:

- Set frequency to 2GHz.
- Set output level to 0dBm.
- Set amplitude modulation to 30%.
- Press MTR AM push button.

4. On Test Oscillator

- Set frequency to 10KHz.
- Adjust output for a 5% amplitude modulation indication on SG-1219/U.

INCIDENTAL AMPLITUDE MODULATION TEST—Continued.

5. Record Digital Multimeter Vrms indication as Reference Level.

6. Connect Test Oscillator output to SG-1219/U FM input.

7. On SG-1219/U:

   • Set Amplitude Modulation to OFF.

   • Set frequency modulation deviation to 1MHz.

8. On Test Oscillator:

   • Set frequency to 100KHz.

   • Vary output amplitude between 0 and 0.5 Vrms and verify that Digital Multimeter indication is less than indication recorded in step 5 (Reference Level).

9. On SG-1219/U:

   • Set frequency to 6.7GHz.

   • Set output level to 0dBm.

10. Vary Test Oscillator output amplitude between 0 and 0.707Vrms and verify that Digital Multimeter indication is less than indication recorded in step 5 (Reference Level).

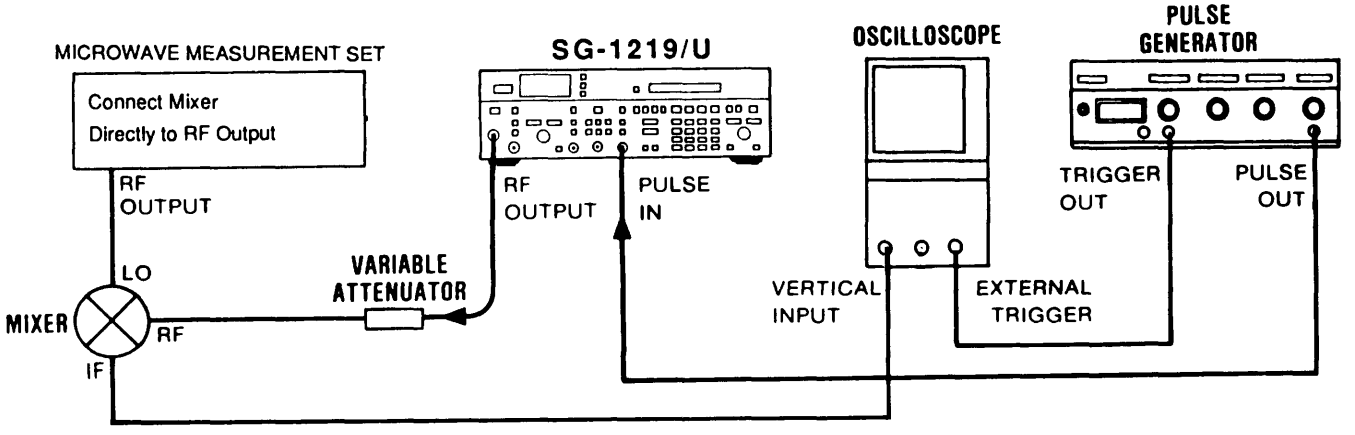
11. Repeat steps 9 and 10 using frequencies of 12.4 and 18GHz, respectively.

12. Repeat steps 7 thru 11 with frequency modulation deviation in 10MHz.

PULSE TEST.

---

1. Connect test equipment as shown below.



PULSE TEST-Continued.

2. Initialize SG-1219/U.

3. Set Variable Attenuator for 10dB attenuation.

4. On SG-1219/U:

   • Set frequency to 2GHz.

   • Set output level to +3dBm.

   • Press pulse NORM push button.

5. On Microwave Measurement Set:

   • Set frequency to 2.07GHz.

   • Set output level to +8dBm.

6. On Pulse Generator:

   • Set pulse rate to 1MHz.

   • Set pulse width to 80nsec.

   • Set POL to POS.

   • Set INT load to OUT.

   • Set pulse output level to 5V PEAK.

   • Set MODE to NORM.

7. On Oscilloscope:

   • Set vertical display channel A to 50 Ω.

   • Set time/division main to 0.2µsec.

   • Set time/division delayed to 20nsec.

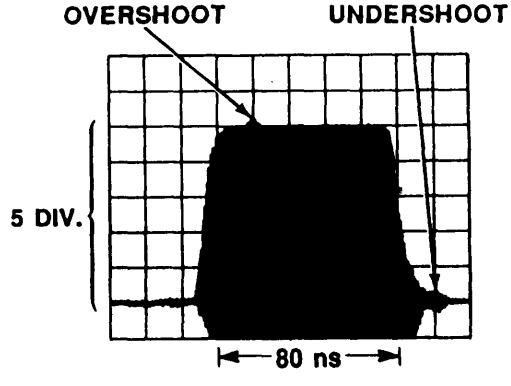
   • Set vertical sensitivity to 0.02V/DIV.

   • Set trigger to EXT DC.

   • Set coupling to CPLD.

   • Set sweep to MIXED.

   • Adjust Oscilloscope SWEEP DELAY to center modulated 70MHz RF pulse as shown. Adjust VERTICAL controls for a 5 division peak pulse display.



PULSE TEST—Continued.

8. Tune SG-1219/U and Microwave Measurement Set to each frequency shown below. Set SG-1219/U OUTPUT LEVEL and variable attenuation as shown for each frequency. Measure undershoot and overshoot at each selected frequency and verify that indications are within specified limits.

NOTE

Readjust vertical controls on Oscilloscope to maintain 5 divisions.

MMS FREQ (MHz)	SG-1219/U FREQ (MHz)	OUTPUT LEVEL	VAR ATTEN	UNDERSHOOT 80nsec	OVERSHOOT 80nsec
2070.000	2000.000	+3dB	20dB	<20%	<20%
2070.000	2000.000	–10dB	10db	<20%	<20%
6670.000	6600.000	+3dB	20dB	<20%	<20%
667.000	6600.000	-10dB	10dB	<20%	<20%
6670.002	6600.002	+3dB	20dB	<20%	<20%
6670.002	6600.002	0dB	20dB	<20%	<20%
6670.002	6600.002	-10dB	10dB	<20%	<20%
6770.002	6700.002	+3dB	20dB	<20%	<20%
6770.002	6700.002	0dB	20dB	<20%	<20%
6770.002	6700.002	-10dB	10dB	<20%	<20%
12360.002	12290.002	+3dB	20dB	<20%	<20%
12360.002	12290.002	0dB	20dB	<20%	<20%
12360.002	12290.002	-10dB	10dB	<20%	<20%
12370.003	12300.003	+3dB	20dB	<20%	<20%
12370.003	12300.003	0dB	20dB	<20%	<20%
12370.003	12300.003	-10dB	10dB	<20%	<20%
18069.904	17999.904	+3dB	20dB	<20%	<20%
18069.904	17999.904	0dB	20dB	<20%	<20%
18069.904	17999.904	-10dB	10dB	<20%	<20%

9. Disconnect test equipment and connect RF OUTPUT of SG-1219/U to 50Ω input of Spectrum Analyzer.

10. On SG-1219/U:

- Set frequency to 2GHz.
- Set output level vernier fully CCW.
- Set output level range to –12dBm.
- Readjust output level vernier to –10dBm.
- Press pulse COMPL push button.
- Set amplitude modulation to OFF.
- Set frequency modulation deviation to OFF.
- Set sweep mode to OFF.

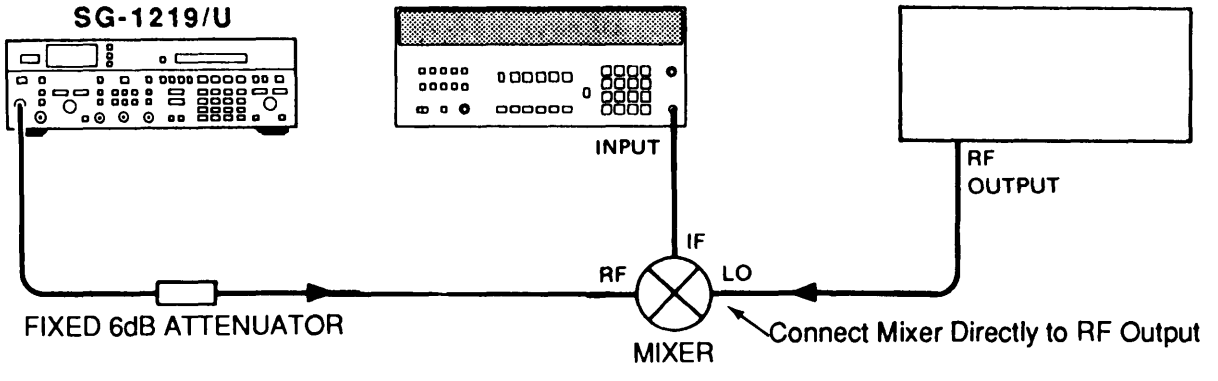
PULSE TEST—Continued.

11. On Spectrum Analyzer:
    - Set input attenuation (MIN) to 20dB.
    - Set bandwidth (MAX.) to 1KHz.
    - Set frequency span to 50K.Hz.
    - Adjust controls to establish a reference signal at top graticule line.
12. On SG-1219/U, press NORM push button.
13. Reduce Spectrum Analyzer reference level as needed to observe residual signal. Verify signal >80dB below to graticule line.
14. Repeat steps 11 thru 13 using SG-1219/U frequencies listed below and verify readings are within specified limits.

SG-1219/U Frequency (GHz)	Spectrum Analyzer Level (dB Below Top Graticule Line)
3.0	>80dB
4.0	>80dB
5.0	>80dB
6.0	>80dB
6.6	>80dB

RESIDUAL AMPLITUDE AND FREQUENCY MODULATION TEST.

1. Connect test equipment as shown below.



RESIDUAL AMPLITUDE AND FREQUENCY MODULATION TEST-Continued.

2. Initialize SG-1219/U.

3. On SG-1219/U:

   • Set frequency to 6.6GHz.

   • Set output level to –10dBm.

   • Set automatic leveling control to INTERNAL.

   • Set amplitude modulation to OFF.

   • Set frequency modulation to OFF.

4. On Microwave Measurement Set:

   • Set frequency to 6.663GHz.

   • Set output level to +8dBm.

   • Set modulation to OFF.

5. Set Modulation Analyzer mode to AM and press PEAK + push button.

6. Read actual AM depth on Modulation Analyzer. Using SG-1219/U and Microwave Measurement Set frequencies shown below, verify that AM depth indicated on Modulation-Analyzer is less than 0.5%.

Signal Generator Frequency	Microwave Measurement Set Frequency	Modulation Analyzer AM Depth Reading
6.6GHz	6.663GHz	<0.5%
12.2GHz	12.263GHz	<0.5%
18GHz	18.063GHz	<0.5%

7. On Modulation Analyzer:

   • Set mode to FM.

   • Set high-pass filter to 50Hz.

   • Set low-pass filter to 15KHz.

8. Using SG-1219/U and Microwave Measurement Set frequencies shown below, verify that deviation indicated on Modulation Analyzer is less than 10KHz.

Signal Generator Frequency	Microwave Measurement Set Frequency	Modulation Analyzer FM Deviation Reading
6.6GHz	6.663GHz	<10KHz
12.2GHz	12.263GHz	<10KHz
18GHz	18.063GHz	<10KHz

PERFORMANCE TEST CHECKLIST

Test and step		Measured value	Desired value
FREQUENCY RANGE AND RESOLUTION TEST			
4.000000GHz	Step 3	_____ GHz	3.999999 to 4.000001GHz
4.000001GHz	Step 4	_____ GHz	4.000000 to 4.000002GHz
3.999999GHz	Step 5	_____ GHz	3.999998 to 4.000000GHz
8.000000GHz	Step 6	_____ GHz	8.999998 to 4.000002GHz
8.000002GHz	Step 7	_____ GHz	8.000000 to 8.000004GHz
7.999998GHz	Step 8	_____ GHz	7.999996 to 8.000000GHz
15.000000GHz	Step 9	_____ GHz	15.999997 to 15.000003GHz
15.000003GHz	Step 10	_____ GHz	15.000000 to 15.000006GHz
14.999997GHz	Step 11	_____ GHz	14.999994 to 15.000000GHz
2.000000GHz	Step 12	_____ GHz	1.999999 to 2.000001GHz
2.111111GHz	Step 12	_____ GHz	2.111110 to 2.111112GHz
2.222222GHz	Step 12	_____ GHz	2.222221 to 2.222223GHz
2.333333GHz	Step 12	_____ GHz	2.333332 to 2.333334GHz
2.444444GHz	Step 12	_____ GHz	2.444443 to 2.444445GHz
2.555555GHz	Step 12	_____ GHz	2.555554 to 2.555556GHz
2.666666GHz	Step 12	_____ GHz	2.666665 to 2.666667GHz
2.777777GHz	Step 12	_____ GHz	2.777776 to 2.777778GHz
2.888888GHz	Step 12	_____ GHz	2.888887 to 2.888889GHz
2.999999GHz	Step 12	_____ GHz	2.999998 to 3.000000GHz
3.000000GHz	Step 12	_____ GHz	2.999999 to 3.000001GHz
4.000000GHz	Step 12	_____ GHz	3.999999 to 4.000001GHz
5.000000GHz	Step 12	_____ GHz	4.999999 to 5.000001GHz
6.000000GHz	Step 12	_____ GHz	5.999999 to 6.000001GHz
7.000000GHz	Step 12	_____ GHz	6.999999 to 7.000001GHz
8.000000GHz	Step 12	_____ GHz	7.999999 to 8.000001GHz
9.000000GHz	Step 12	_____ GHz	8.999999 to 9.000001GHz
10.000000GHz	Step 12	_____ GHz	9.999999 to 10.000001GHz
11.000000GHz	Step 12	_____ GHz	10.999999 to 11.000001GHz
12.000000GHz	Step 12	_____ GHz	11.999999 to 12.000001GHz
13.000002GHz	Step 12	_____ GHz	13.000001 to 13.000003GHz
14.000001GHz	Step 12	_____ GHz	14.000000 to 14.000002GHz
15.000000GHz	Step 12	_____ GHz	14.999999 to 15.000001GHz
16.000002GHz	Step 12	_____ GHz	16.000001 to 16.000003GHz
17.000001GHz	Step 12	_____ GHz	17.000000 to 17.000002GHz
18.000000GHz	Step 12	_____ GHz	17.999999 to 18.000001GHz

PERFORMANCE TEST CHECKLIST-Continued.

Test and step		Measured value	Desired value
OUTPUT LEVEL, HIGH LEVEL ACCURACY AND FLATNESS TEST			
2GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
4GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
6GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
8GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
10GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
12GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
14GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
16GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
18GHz	Step 4	_____ dBm	+6.00 to +10.00dBm
2GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
4GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
6GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
8GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
10GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
12GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
14GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
16GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
18GHz	Step 6	_____ dBm	–4.00 to +0.00dBm
2GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
4GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
6GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
8GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
10GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
12GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
14GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
16GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
18GHz	Step 7	_____ dBm	–9.00 to –5.00dBm
2GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
4GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
6GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
8GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
10GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
12GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
14GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
16GHz	Step 7	_____ dBm	–19.00 to –15.00dBm
18GHz	Step 7	_____ dBm	–19.00 to –15.00dBm

PERFORMANCE TEST CHECKLIST—Continued.

Test and step		Measured value	Desired value
LOW LEVEL ACCURACY TEST			
-30dBm at 2GHz	Step 4	_____ dBm	-34 to -26dBm
-30dBm at 10GHz	Step 4	_____ dBm	-34 to -26dBm
–30dBm at 18GHz	Step 4	_____ dBm	-35 to -25dBm
-40dBm at 2GHz	Step 12	_____ dBm	-44 to -36dBm
–50dBm at 2GHz	Step 12	_____ dBm	-54 to -46dBm
-60dBm at 2GHz	Step 12	_____ dBm	-64 to -56dBm
–70dBm at 2GHz	Step 12	_____ dBm	–75.5 to –64.5dBm
-80dBm at 2GHz	Step 12	_____ dBm	-85.5 to -74.5dBm
-90dBm at 2GHz	Step 12	_____ dBm	-95.5 to –84.5dBm
-40dBm at 10GHz	Step 12	_____ dBm	-44 to -36dBm
-50dBm at 10GHz	Step 12	_____ dBm	–54 to -46dBm
-60dBm at 10GHZ	Step 12	_____ dBm	-64 to -56dBm
–70dBm at 10GHz	Step 12	_____ dBm	–75.5 to –64.5dBm
-80dBm at 10GHz	Step 12	_____ dBm	–85.5 to –74.5dBm
-90dBm at 10GHz	Step 12	_____ dBm	-95.5 to -84.5dBm
-40dBm at 18GHz	step 12	_____ dBm	-45 to -35dBm
–50dBm at 18GHz	Step 12	_____ dBm	-55 to -45dBm
-60dBm at 180GHz	Step 12	_____ dBm	-65 to -55dBm
–70dBm at 18GHz	Step 12	_____ dBm	-76.5 to -63.5dBm
-80dBm at 18GHz	Step 12	_____ dBm	-86.5 to –73.5dBm
–90dBm at 18GHz	Step 12	_____ dBm	-96.5 to –83.5dBm
–100dBm at 2GHz	Step 14	_____ dBm	–105.5 to –94.5dBm
-110dBm at 2GHz	Step 14	_____ dBm	–115.5 to –105.5dBm
-100dBm at 10GHz	Step 14	_____ dBm	-105.5 to -94.5dBm
-110dBm at 10GHz	Step 14	_____ dBm	–115.5 to –105.5dBm
-100dBm at 18GHz	Step 14	_____ dBm	–105.5 to –93.5dBm
-110dBm at 18GHz	Step 14	_____ dBm	-115.5 to –105.5dBm

HARMONICS, SUBHARMONICS, AND MULTIPLES TEST

FUND	HARMONIC			
2.0GHz	4.0GHz	Step 6	_____ dBc	<-40dBc
4.0GHz	8.0GHz	Step 6	_____ dBc	<-40dBc
6.0GHz	12.0GHz	Step 6	_____ dBc	<-40dBc
8.0GHz	16.0GHz	Step 6	_____ dBc	<-40dBc
10.0GHz	20.0GHz	Step 6	_____ dBc	<-40dBc
12.0GHz	24.0GHz	Step 6	_____ dBc	<-40dBc

FUND	SUBHARMONIC 1/2			
8.0GHz	4.0GHz	Step 6	_____ dBc	<–35dBc
10.0GHz	5.0GHz	Step 6	_____ dBc	<–35dBc
12.0GHz	6.0GHz	Step 6	_____ dBc	<-35dBc

PERFORMANCE TEST CHECKLIST—Continued.

Test and step		Measured value		Desired value
HARMONICS, SUBHARMONICS, AND MULTIPLES TEST—Continued				
FUND SUBHARMONIC 1/3				
14.0GHz 4.6667GHz	Step 6	_____	dBc	<–35dBc
16.0GHz 5.3333GHz	Step 6	_____	dBc	<-35dBc
18.0GHz 6.0000GHz	Step 6	_____	dBc	<–35dBc
FUND SUBHARMONIC 2/3				
14.0GHz 9.3333GHz	Step 6	_____	dBc	<-35dBc
16.0GHz 10.6667GHz	Step 6	_____	dBc	<–35dBc
18.0GHz 12.0GHz	Step 6	_____	dBc	<–35dBc
NON-HARMONICALLY RELATED SPURIOUS SIGNALS TEST				
2 to 18GHz	Step 6	_____	dBc	<–70dBc
SINGLE-SIDEBAND PHASE NOISE TEST				
6.0GHz	Step 7	_____	dBc	<-60dBc
12.0GHz	Step 8	_____	dBc	<-60dBc
18.0GHz	Step 8	_____	dBc	<-60dBc
AMPLITUDE MODULATION TEST				
	Step 7	_____	%	43.5 to 56.5%
	Step 9	_____	%	70 to 80%
10KHz	Step 12	_____	%	70 to 80%
lKHz	Step 12	_____	%	70 to 80%
.lKHz	Step 12	_____	%	70 to 80%
6.2GHz	Step 17	_____	KHz	<10KHz
12.3GHz	Step 17	_____	KHz	<10KHz
18GHz	Step 17	_____	KHz	<10KHz
Reference Level	Step 21	_____	Vrms	
DEMOD REF LVL	Step 22	_____	Vrms	
UVL	Step 23	_____	Vrms	
LVL	Step 24	_____	Vrms	
10Hz	Step 27	_____	Vrms	LVL to UVL
20Hz	Step 28	_____	Vrms	LVL to UVL
50Hz	Step 28	_____	Vrms	LVL to UVL
120Hz	Step 28	_____	Vrms	LVL to UVL

PERFORMANCE TEST CHECKLIST—Continued.

Test and step		Measured value		Desired value
AMPLITUDE MODULATION TEST—Continued				
240Hz	Step 28	_____	Vrms	LVL to UVL
600Hz	Step 28	_____	Vrms	LVL to UVL
1000Hz	Step 28	_____	Vrms	LVL to UVL
2000Hz	Step 28	_____	Vrms	LVL to UVL
5000Hz	Step 28	_____	Vrms	LVL to UVL
10000HZ	Step 28	_____	Vrms	LVL to UVL
25000Hz	Step 28	_____	Vrms	LVL to UVL
50000HZ	Step 28	_____	Vrms	LVL to UVL
AM Distortion	Step 33	_____	%	<8%
FM FREQUENCY RESPONSE TEST				
100KHz Reference	Step 7	_____	Vrms	
10Hz	Step 10	_____	dB	–3dB to +3dB
100Hz	Step 10	_____	dB	–3dB to +3dB
1KHz	Step 10	_____	dB	–3dB to +3dB
3KHz	Step 10	_____	dB	–3dB to +3dB
10KHz	Step 10	_____	dB	–3dB to +3dB
30KHz	Step 10	_____	dB	–3dB to +3dB
300KHz	Step 10	_____	dB	–3dB to +3dB
1000KHz	Step 10	_____	dB	–3dB to +3dB
3000KHz	Step 10	_____	dB	–3dB to +3dB
INCIDENTAL AM TEST				
Reference LVL	Step 5	_____	Vrms	
6.7GHz at 1MHz	Step 10	_____	Vrms	Less than Reference LVL
12.4GHz at 1MHz	Step 11	_____	Vrms	Less than Reference LVL
18GHz at 1MHz	Step 11	_____	Vrms	Less than Reference LVL
6.7GHz at 10MHz	Step 12	_____	Vrms	Less than Reference LVL
12.4GHz at 10MHz	Step 12	_____	Vrms	Less than Reference LVL
18GHz at 10MHz	Step 12	_____	Vrms	Less than Reference LVL

PERFORMANCE TEST CHECKLIST—Continued.

Test and step		Measured value	Desired value
PULSE TEST			
2000000MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
2000000MHz/-l0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6600000MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6600000MHz/-l0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6600002MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6600002MHz/0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6600002MHz/-10dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6700002MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6700002MHz/0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
6700002MHz/-10dB	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
12290002MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
12290002MHz/0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
12290002MHz/-10dB	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
12300003MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
12300003MHz/0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%

PERFORMANCE TEST CHECKLIST—Continued.

Test and step		Measured value	Desired value
PULSE TEST—Continued			
12300003MHz/-l0dB	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
17999904MHz/+3dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
17999904MHz/0dBm	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
17999904MHz/-l0dB	Step 8		
Undershoot		_____ %	<20%
Overshoot		_____ %	<20%
2.0GHz	Step 13	_____ dB	>80dB
3.0GHz	Step 14	_____ dB	>80dB
4.0GHz	Step 14	_____ dB	>80dB
5.0GHz	Step 14	_____ dB	>80dB
6.0GHz	Step 14	_____ dB	>80dB
6.6GHz	Step 14	_____ dB	>80dB
RESIDUAL AMPLITUDE AND FREQUENCY MODULATION TEST			
6.6GHz	Step 6	_____ %	<0.5%
12.263GHz	Step 6	_____ %	<0.5%
18.063GHz	Step 6	_____ %	<0.5%
6.6GHz	Step 8	_____ KHz	<10KHz
12.263GHz	Step 8	_____ KHz	<10KHz
18.063GHz	Step 8	_____ KHz	<10KHz

2-22. ADJUSTMENTS.

The adjustment procedures cover

Adjust A3A1/A3A3/A3A4 Power Supply (para 2-24).
Adjust A3A8 10MHz Reference Oscillator (para 2-25).
Adjust A3A1A2 Reference Loop (pare 2-26).
Adjust A3A1A4/A3A1A5 M/N Loop (para 2-27).
Adjust A2A5 20/30MHz Loop Divider Bias (para 2-28).
Adjust A2A3 160-240MHz Voltage Controlled Oscillator Pretune (para 2-29).
Adjust A2A4 LFS Loop Notch Filter (para 2-30).
Adjust A3A5 YTO Pretune Digital To Analog Converter (para 2-31).
Adjust A3A6 YTO Diver (para 2-32).
Adjust A3A9 YTO Loop Sampler Adjustment (para 2-33).
Adjust A3A9A4 YTO Loop Offset and FM Overmodulation (para 2-34).
Adjust A3A9A4 YTO Loop Phase Detector (para 2-35).
Adjust A3A7 FM Driver (para 2-36).
Adjust A1A6 FM Accuracy and Overmodulation (para 2-37).
Adjust A2A7 Sweep Output and blanking Marker (para 2-38).
Adjust A1A8 SRD Bias (para 2-39).
Adjust A1A2/A1A3/A1A5/A1A7 YTM Tune (para 2-40).
Adjust A1A3 clamp (Para 2-41).
Adjust A1A2/A1A3/A1A5/A1A8 Flatness and ALC (para 2-42).
Adjust A1A2 AM Bandwidth (para 2-43).
Adjust A1A3/A1A6 AM Accuracy and Meter (para 2-44).
Adjust A1A2/A1A3/A1A4/A1A5 Pulse Modulation (para 2-45).
Adjust A1A8 Pulse Amplitude Control (para 2-46).

NOTE

- Specific adjustments may be necessary after repair/replacement of specific assemblies in the Signal Generator or failure of a performance test. Adjustment is not required if malfunction has been cleared after repair.

- Never perform all adjustments from para 2-24 thru 2-46 at one time.

- The adjustment needed after repair/replacement of specific assemblies areas shown in table 2-3.

- All indications and waveforms are referenced to chassis ground unless otherwise specified.

- Assembly and cable location diagram is fig. FO-1 (units prefixed <3100A) or fig. FO-1.1 (units prefixed >3101A). Individual circuit card component locator diagrams are fig. FO-2 thru FO-4 and FO-14.

- After adjust procedure is completed remove power and replace top cover (para 2-47).

- Information for different models is identified using the serial number prefix in text. When not specified (blank), the information applies to all models. Refer to paragraph 1-11 for additional information.

- Normally units are identified by a serial prefix as to the SG- 1219/U basic configuration. There is a possibility that an older unit (serial prefix <3100A) has been repaired using a new replacement part.

Table 2-3. Post Repair/Replace Adjustments.

Repaired/Replaced Assembly	Adjust
A1A2 Assembly	AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). A1A2 AM Bandwidth (para 2-43). AlA3/AlA6 AM Accuracy and Meter (para 2-44).
A1A3 Assembly	A1A6 FM Accuracy and Overmodulation (para 2-37). AlA3/AlA6 AM Accuracy and Meter (para 2-44).
A1A4 Assembly	AlA2/AlA3/AlA5/A1A8 Flatness and ALC (para 2-42). AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). A1A8 Pulse Amplitude Control (para 2-46).
A1A5 Assembly	AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). A1A8 Pulse Amplitude Control (para 2-46).
A1A6 Assembly	A1A6 FM Accuracy and Overmodulation (para 2-37). AlA3/AlA6 AM Accuracy and Meter (para 2-44).
A1A7 Assembly	AlA2/AlA3/AlA5/AlA7 YTM Tune (para 2-40).
A1A8 Assembly	A1A8 SRD Bias (para 2-39). AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). A1A8 Pulse Amplitude Control (para 2-46).
A1A9 Assembly (units prefixed<3100A)	AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). A1A2 AM Bandwidth (para 2-43). AlA3/AlA6 AM Accuracy and Meter (para 2-44).
A1A10 Assembly	A1A8 SRD Bias (para 2-39). AlA2/AlA3/AlA5/AlA7 YTM Tune (para 2-40). AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). A1A2 AM Bandwidth (para 2-43). A1A3/A1A6 AM Accuracy and Meter (para 2-44). AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). A1A8 Pulse Amplitude Control (para 2-46).
A1A11 Assembly	A1A3 clamp (para 2-41). AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45).
A1AT3 Pulse Modulator	AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45).
A1CP1 Bias Tee	A1A8 Pulse Amplitude Control (para 2-46).
A1CR1 Detector	AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45).

Table 2-3. Post Repair/Replace Adjustments-Continued.

Repaired Assembly	Adjust
AlDCl Directional Coupler	AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45).
A1FL1 High Pass Filter	AlA2/AlA3/AlA4/AlA5 Pulse Modulation (para 2-45). A1A8 Pulse Amplitude Control (para 2-46).
A2A3 Assembly	A2A5 20/30MHz Loop Divider Bias (para 2-28). A2A3 160-240MHz Voltage Controlled Oscillator Pretune (para 2-29). A2A4 LFS Loop Notch Filter (para 2-30) (units prefixed <3100A).
A2A4 Assembly	A2A5 20/30MHz Loop Divider Bias (para 2-28). A2A3 160-240MHz Voltage Controlled Oscillator Pretune (para 2-29). A2A4 LFS Loop Notch Filter (para 2-30) (units prefixed <3100A).
A2A5 Assembly	A2A5 20/30MHz Loop Divider Bias (para 2-28). A2A3 160-240MHz Voltage Controlled Oscillator Pretune (para 2-29). A2A4 LFS Loop Notch Filter (para 2-30) (units prefixed <3100A).
A2A7 Assembly	A2A7 Sweep Output and Blanking Marker (para 2-38).
A3A1 Assembly	A3A1/A3A3/A3A4 Power Supply (para 2-24).
A3A1A1 Assembly	A3A1A2 Reference Loop (para 2-26).
A3A1A2 Assembly	A3A1A2 Reference Loop (para 2-26).
A3A1A3 Assembly	A3A1A4/A3AlA5 M/N Loop (para 2-27).
A3A1A4 Assembly	A3AlA4/A3AlA5 M/N Loop (para 2-27).
A3A3 Assembly	A3Al/A3A3/A3A4 Power Supply (Para 2-24).
A3A4 Assembly	A3A1/A3A3/A3A4 Power Supply (para 2-24).
A3A5 Assembly	A3A5 YTO Pretune Digital To Analog Converter (para 2-31). A3A6 YTO Driver (para 2-32). A3A9 YTO Loop Sampler (para 2-33). A3A9A4 YTO Loop Offset and FM Overmodulation (para 2-34). A3A9A4 YTO Loop Phase Detector (para 2-35).
A3A6 Assembly	A3A5 YTO Pretune Digital To Analog Converter (para 2-31). A3A6 YTO Driver (para 2-32). A3A9 YTO Loop Sampler (para 2-33). A3A9A4 YTO Loop Offset and FM Overmodulation (Para 2-34)/ A3A9A4 YTO Loop Phase Detector (para 2-35).

Table 2-3. Post Repair/Replace Adjustments-Continued.

Repaired/Replaced Assembly	Adjust
A3A7 Assembly	A3A5 YTO Pretune Digital To Analog Converter (para 2-31). A3A6 YTO Driver (para 2-32). A3A9 YTO Loop Sampler (para 2-33). A3A9A4 YTO Loop Offset and FM Overmodulation (para 2-34). A3A9A4 YTO Loop Phase Detector (para 2-35). A3A7 FM Driver (para 2-36).
A3A8 Assembly	A3A8 10 MHz Reference Oscillator (para 2-25).
A3A9A3 Assembly	A3A5 YTO Pretune Digital To Analog Converter (para 2-31). A3A6 YTO Driver (para 2-32). A3A9 YTO Loop Sampler (para 2-33). A3A9A4 YTO Loop Offset and FM Overmodulation (para 2-34). A3A9A4 YTO Loop Phase Detector (para 2-35). A3A7 FM Driver (para 2-36). A1A6 FM Accuracy and Overmodulation (para 2-37).
A3A9A8 Assembly (units prefixed >3101A)	AlA2/AlA3/AlA5/AlA8 Flatness and ALC (para 2-42). A1A2 AM Bandwidth (para 2-43). AlA3/AlA6 AM Accuracy and Meter (para 2-44).

2-23. INITIAL SETUP

1. Remove top cover (para 2-47).

WARNING

Dangerous voltages are present with the covers removed. Where maintenance can be performed without power applied, the power should be removed.

2. Connect jumper A3W3 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A) between A3J9 (FREQ STD OUT) and A3J10 (FREQ STD IN) on rear panel. Set INT/EXT switch to INT.

3. Connect power and turn SG- 1219/U power switch to ON. Press RCL then number 0 push button.

NOTE

Allow a 1 hour warm-up before performing adjustments.

2-24. ADJUST A3A1/A3A3/A3A4 POWER SUPPLY.

1. Connect Digital Multimeter to A3A1TP1 (fig. FO-4).

   • Adjust A3A1R2 for +22Vdc ± 0.002Vdc.

2. Connect Digital Multimeter to A3A3TP5.

   • Adjust A3A3R50 for +20Vdc ± 0.002Vdc.

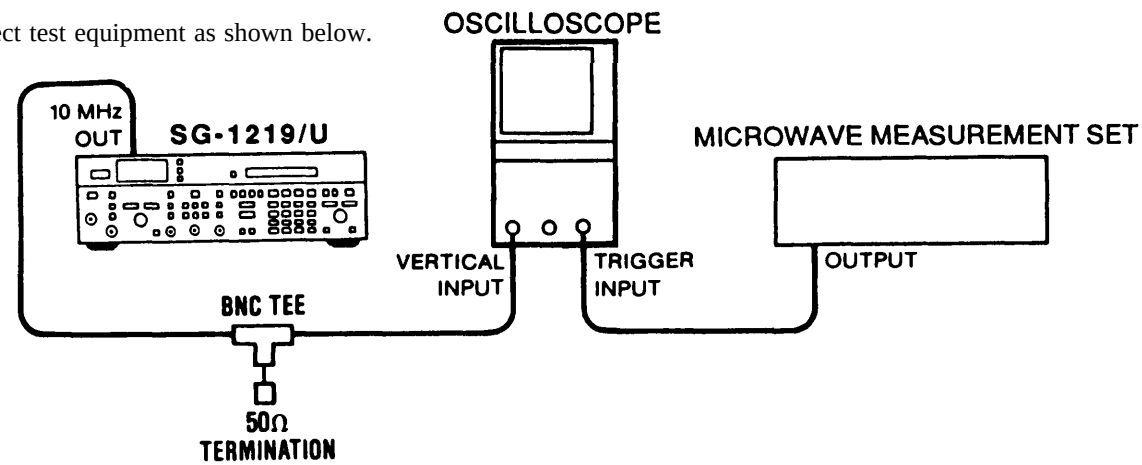
3. Check power supplies at test points shown below.

Power supply	Test point	Voltage (Vdc)	
		Minimum	Maximum
+11.0Vdc	A3A3TP6	+9.9	+12.1
+5.2Vdc	A3A3TP2	+5.1	+5.3
–5.2Vdc	A3A4TP5	–5.15	–5.25
–10.0Vdc	A3A4TP4	–9.8	–10.2
–40.0Vdc	A3A4TP1	–39.0	–40.6

4. Set Disconnect test equipment.

2-25. ADJUST A3A8 10MHz REFERENCE OSCILLATOR.

1. Connect test equipment as shown below.



2. Set FREQ adjustment on A3A8 (fig. FO-4) so signal on Oscilloscope is not drifting.

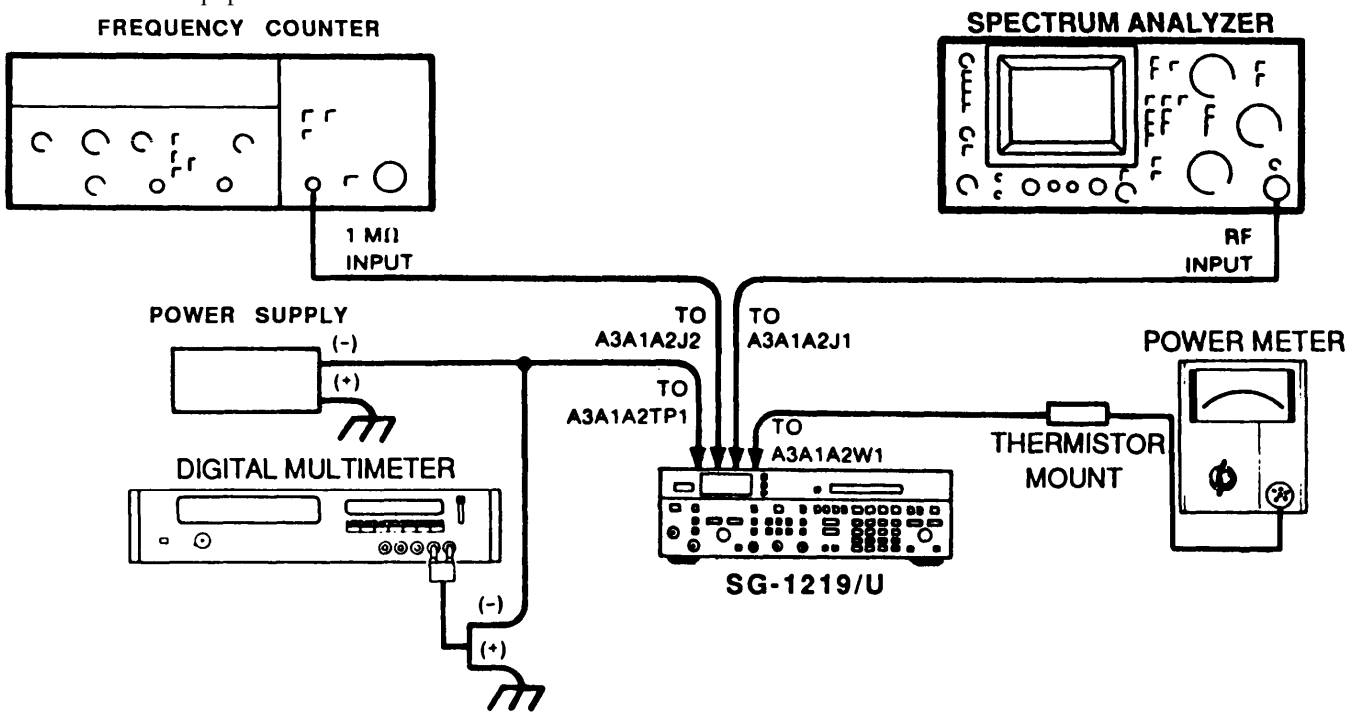
3. Verify that in 10 seconds display drifts less than 360°.

   • A drift of 360° in 10 seconds corresponds to an adjustment accuracy of 1 X 10^{-8}.

4. Disconnect test equipment.

2-26. ADJUST A3A1A2 REFERENCE LOOP.

1. Connect test equipment as shown below.



NOTE

Connect Frequency Counter to A3A1A2J2 (fig. FO-4) in place of termination and connect Spectrum Analyzer to A3A1A2J1 in place of A3A1A1W1 (gray/orange/white).

2. Apply –8Vdc ±0.01Vdc to A3A1A2TP1.

NOTE

Power Supply must not be at ground reference.

3. Adjust A3A1A2C4 (100MHz), for maximum 100MHz signal level as viewed on Spectrum Analyzer display.

4. Adjust A3A1A2C4 to increase frequency (and decrease amplitude) until oscillation stops on high frequency side; then adjust A3A1A2C4 to start oscillation. Continue to decrease frequency until oscillation stops.

- If oscillation does not stop at high end, decrease value of A3A1A2C8 by lpF from its present value.
- If it does not stop at low end, increase value of A3A1A2C8 by lpF.
- If a value of A3A1A2C8 cannot be found within range of 0 to 12pF, change A3A1A2L4. The range of values for A3A1A21A is listed in step 7.
- If a change of components is necessary, repeat this step.

2-26. ADJUST A3A1A2 REFERENCE LOOP-Continued.

5. Adjust A3A1A2C4 to obtain maximum signal level as viewed on Spectrum Analyzer display. Slowly adjust A3A1A2C4 to a higher frequency until power drops by ldB. Subtract 100MHz from frequency reading on Frequency Counter to 10Hz resolution, and record as Δ F1.

6. Adjust A3A1A2C4 to a lower frequency until power is decreased ldB on other side of peak. Subtract frequency reading on Frequency Counter from 100MHz to 10Hz resolution, and record as Δ F2.

7. Verify reading within specification using the following formula

$$0.5 \leq \frac{\Delta F1}{\Delta F2} \leq 2$$

- If ratio is less than 0.5, decrease A3A12L4 one value to increase center frequency.
- If ratio is greater than 2, increase A3A1A2L4 one value to decrease center frequency.
- A3A1A2L4 inductor values are listed below:
- If component value is changed, repeat steps 3 thru 7.

A3A1A2L4 Inductor values

Value
0.68µH
0.56µH
0.47µH
0.39µH
0.33µH
0.27µH
0.22µH

8. Adjust A3A1A2C4 to obtain an indication of 100MHz±100Hz.

9. Disconnect Spectrum Analyzer from A3A1A2J1 and reconnect A3A1A1W1 (gray/orange/white).

10. Disconnect A3A1A2W1 (gray-red-white) from A3A1A5J1 (units prefixed <3100A) or A3A1A3J1 (units prefixed >3101A) and connect cable to Spectrum Analyzer.

11. On Spectrum Analyzer:

- Set frequency span/division to 100MHz.
- Set center frequency to 500MHz.
- Set vertical sensitivity/division to 10dB LOG.

12. Adjust A3A1A2C3, C2, and C1, in that order, to obtain maximum 400MHz signal with lowest harmonic levels possible.

2-26. ADJUST A3A1A2 REFERENCE LOOP—Continued.

13. Check various harmonics of 100MHz signal relative to 400MHz signal level. The 200 and 800MHz harmonics should be greater than 25dB down. The 100, 300, 500, 600, 700, and 900MHz harmonics should be greater than 35dB down.

- If necessary, repeat steps 10 thru 12.

14. Disconnect Spectrum Analyzer from A3A1A2W1 (gray-red-white) and connect cable to Power Meter.

15. The Power Meter reading should be from –10 to –13dBm.

- If power is incorrect, select values of A3A1A2R67, R68, and R69 from attenuator resistor values given below to obtain proper power level. Attenuation should always be 3dB or greater.
- If amount of attenuation is changed, repeat steps 10 thru 13.

Attenuator resistor values

Attenuation (dB)	Resistor (Ohms)		
	R67	R68	R69
3	261	17.8	261
4	215	23.7	215
5	178	31.6	178
6	147	38.3	147
7	133	46.4	133
8	121	51.1	121
9	110	61.9	110

16. Set SG-1219/U LINE switch to STBY. Disconnect all test equipment, except Digital Multimeter, and reconnect all SG-1219/U cables.

17. Set SG-1219/U LINE switch to ON. Verify that DC voltage at A3A1A2TP1 is –8Vdc ±1Vdc.

- If voltage is out of tolerance, repeat step 8 then adjust A3A8 10MHz Reference Oscillator (para 2-25).

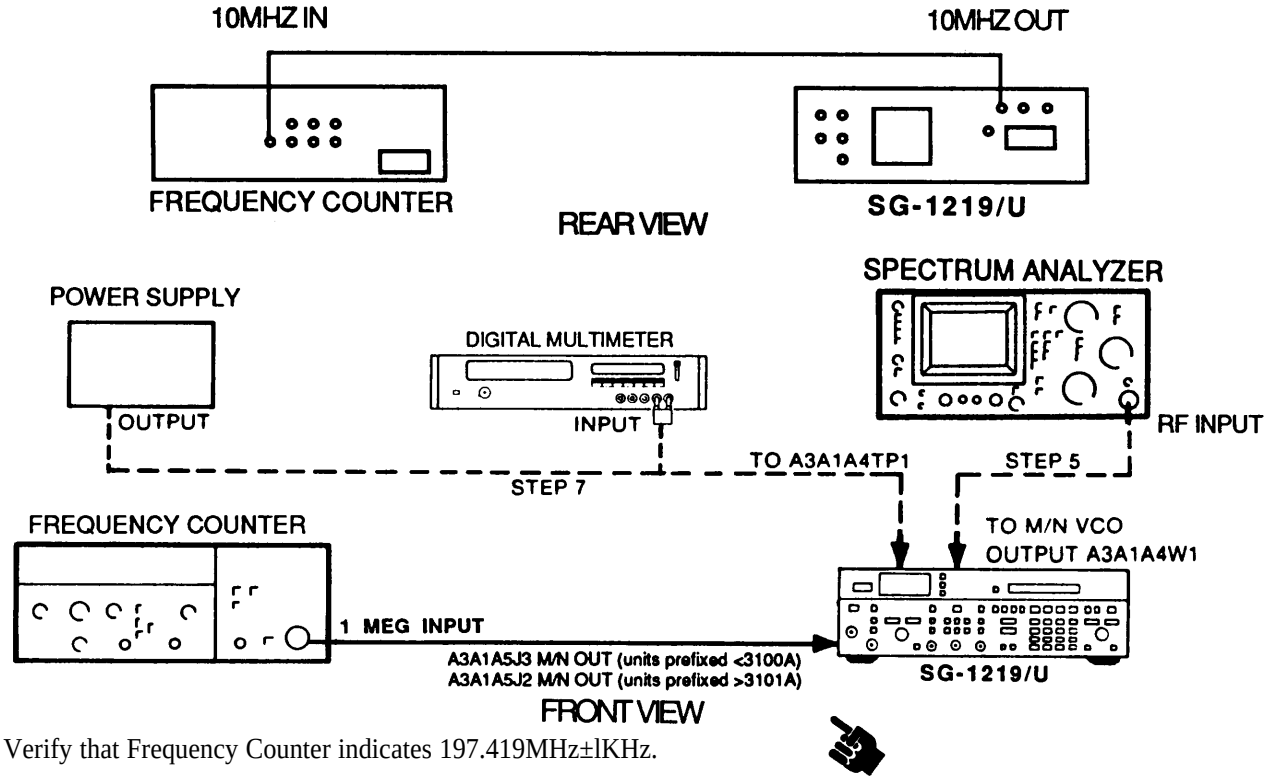
18. Connect Frequency Counter to SG-1219/U RF OUTPUT connector.

19. Set SG-1219/U frequency to 2GHz and verify Frequency Counter indication is 2GHz ±lKHz. Set SG-1219/U frequency to 6.6GHz and verify Frequency Counter indication is 6.6GHz±lKHz.

20. Disconnect test equipment.

2-27. ADJUST A3A1A4/A3A1A5 M/N LOOP.

1. On SG-1219/U, set frequency to 6.09GHz.
2. Connect test equipment as shown below.



3. Verify that Frequency Counter indicates 197.419MHz±lKHz.
4. On SG-1219/U:
   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Remove A3A1A4 Assembly (para 2-82) and reinstall on an extender board.
5. On Spectrum Analyzer:
   - Connect input to A3A1A4W1 (white) (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A).
   - Set center frequency to 394MHz.
   - Set frequency span to 100MHz.
6. On SG-1219/U, reconnect ac power cable and set LINE switch to ON.

CAUTION

Do not apply positive voltage to A3A1A4TP1.

2-27. ADJUST A3A1A4/A3A1A5 M/N LOOP—Continued.

7. Apply –35Vdc ±0.5Vdc to A3A1A4TP1 (fig. FO-4).

NOTE

Adjustment screws for A3A1A4A1C1 and C5 are held in place by locknuts. After making adjustments, tighten locknuts and recheck frequency and level.

8. Loosen locknut for A3A1A4A1C5.

- Adjust A3A1A4A1C5 for an output level of 0dBm ±2dBm. Tighten locknut.

9. Slowly reduce Power Supply voltage at A3A1A4TP1 and verify power is greater than -2dBm between 395 MHz (-35Vdc) and 355MHz (-2.3Vdc) as displayed on Spectrum Analyzer.

10. Disconnect Power Supply.

11. On SG-1219/U:

- Set LINE switch to STBY.
- Disconnect ac power cable.
- Reinstall A3A1A4 Assembly (para 2-82).
- Reconnect ac power cable.
- Set LINE switch to ON.
- Set frequency to 6.09GHz.

12. Adjust A3A1A4A1C1 for a voltage level of –35.0Vdc ±0.5Vdc, measured at A3A1A4TP1.

13. Tune SG-1219/U to 2.1GHz. Verify that frequency is 177.500MHz as indicated on Frequency Counter and voltage is -2.4Vdc ±0.7Vdc at A3A1A4TP1.

14. Disconnect all test equipment from SG-1219/U and reconnect all cables.

15. Connect Frequency Counter to SG-1219/U RF OUTPUT connector.

16. Set SG-1219/U frequency to 2GHz and verify Frequency Counter indication is 2GHz ±lKHz. Set SG-1219/U frequency to 6.6GHz and verify Frequency Counter indication is 6.6GHz ±lKHz.

17. Disconnect test equipment.

2-28. ADJUST A2A5 20/30 LOOP DIVIDER BIAS.

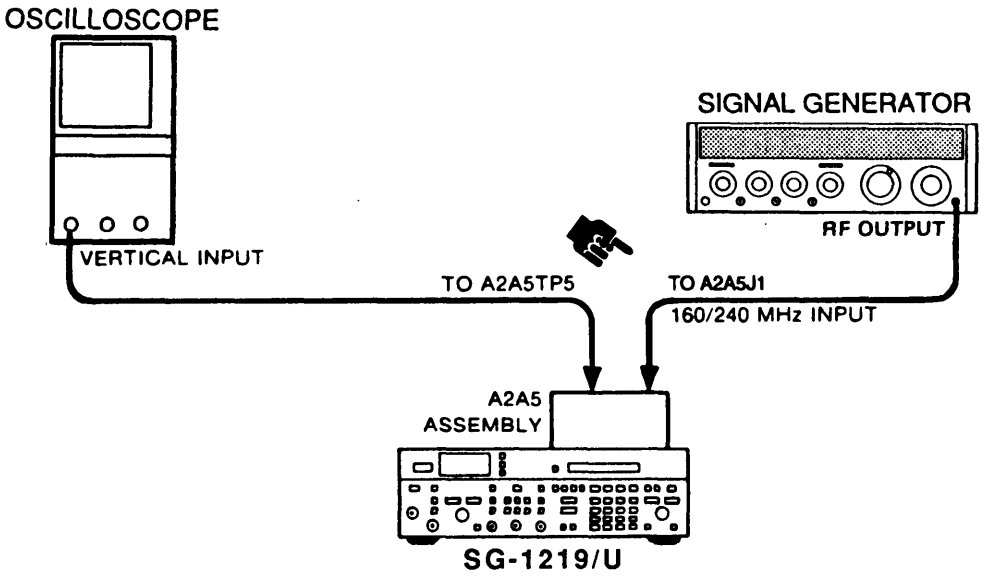
1. On SG-1219/U:

   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Remove A2A5 Assembly (para 2-73) and reinstall on an extender board.
   - Disconnect A2W2 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A) from A2A5J1 (fig. FO-3).
   - Center A2A5R4.
   - Reconnect ac power cable.
   - Set LINE switch to ON.

2. On Signal Generator

   - Set frequency to 240MHz.
   - Set output level to -5dBm.

3. Connect test equipment as shown below.



4. Observe clock signal on Oscilloscope display.

   - Adjust A2A5R4 to obtain a stable clock frequency.

5. Reduce output level of Signal Generator while readjusting A2A5R4 to obtain a stable clock at lowest possible signal.

   - Verify that a stable clock signal is obtained with an input signal of -l0dBm or less.

2-28. ADJUST A2A5 20/30 LOOP DIVIDER BIAS—Continued.

6. Disconnect test equipment.
7. On SG-1219/U:
   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Reinstall A2A5 Assembly (para 2-73).
   - Reconnect A2W2 to A2A5J1.

2-29. ADJUST A2A3 160-240 MHz VOLTAGE CONTROLLED OSCILLATOR PRETUNE.

1. On SG-1219/U:
   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Remove A2A3 Assembly (para 2-73) and reinstall on an extender board.
   - Disconnect A3W14 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A) from A2A3J1 (fig. FO-3).
   - Reconnect ac power cable.
2. Connect Frequency Counter output to A2A3J1.
3. On SG-1219/U, set LINE switch to ON.
4. Set A2A3S1 to TEST HIGH FREQ position. Frequency should be greater than 30.5MHz.

NOTE

If frequency is less than 30.4MHz, the oscillator coil must be moved closer to the printed wiring board. The oscillator cover must be removed before adjusting the coil.

5. If adjustment is necessary, reposition oscillator coil as follows:
   - Unsolder four comers of oscillator cover.
   - Unsolder oscillator coil leads (A2A3T1), move coil closer to printed wiring board, and resolder coil leads.
   - Clip excess oscillator lead length on circuit side of printed wiring board if necessary.
   - Reinstall oscillator cover by temporarily soldering one corner of cover.

2-29. ADJUST A2A3 160-240 MHz VOLTAGE CONTROLLED OSCILLATOR PRETUNE-Continued.

6. Repeat steps 2 thru 4.

7. Set A2A3S1 to TEST LOW FREQ position.

   • Verify a frequency indication of less than 19.5MH.z.

   • If necessary; set SG-1219/U LINE switch to STBY, reposition coil, reinstall cover, and repeat steps 4 thru 6.

8. Set A2A3S1 to NORMAL position.

NOTE

Do not solder the entire perimeter of the oscillator cover. The cover is for frequency stability, not for RFI leakage.

9. Disconnect test equipment.

10. On SG-1219/U:

    • Set LINE switch to STBY.

    • Disconnect ac power cable.

    • Reinstall oscillator cover permanently by soldering all four corners.

    • Reinstall A2A3 Assembly (para 2-73).

    • Reconnect A3W14 to A2A3J1.

2-30. ADJUST A2A4 LFS LOOP NOTCH FILTER (UNITS PREFIXED <3100A ONLY).

1. On SG-1219/U

   • Set LINE switch to STBY.

   • Disconnect ac power cable.

   • Remove A2A4 Assembly (para 2-73) and reinstall on an extender board.

   • Unsolder input end (top) of A2A4R28 (fig. FO-3).

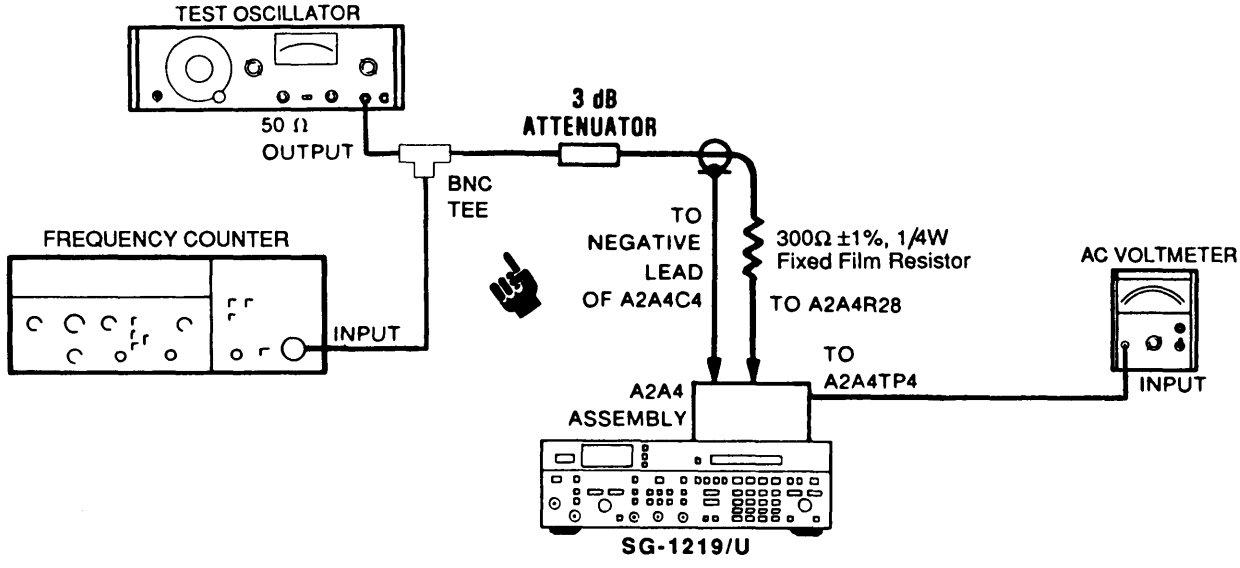
   • Reconnect ac power cable.

2-30. ADJUST A2A4 LFS LOOP NOTCH FILTER—Continued.

2. **Connect equipment as** shown below.

NOTE

Leads from attenuator should be as short as possible. Connect ground wire to negative side of A2A4C4.



3. Set SG-1219/U LINE switch to ON.
4. **On** Test Oscillator:
   - Set frequency to 1KHz.
   - Adjust output for a +10dBm indication on AC Voltmeter.
   - Adjust frequency to 7985Hz.
5. Adjust A2A4L3 and LA to minimize meter indication. Indication must be <-50dBm.
6. Detune Test Oscillator away from 7985Hz and verify AC Voltmeter indication increases.
7. Disconnect test equipment.
8. On SG-1219/U:
   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Resolder top of A2A4R28.
   - Reinstall A2A4 Assembly (para 2-73).

2-31. ADJUST A3A5 YTO PRETUNE DIGITAL TO ANALOG CONVERTER.

1. On SG-1219/U, press RCL then number 0 pushbuttons. Set frequency to 4.8GHz (units prefixed <3100A) or 6598.000MHz (units prefixed >3101A).
2. Connect Digital Multimeter ground lead to A3A6TP5 (fig. FO-4).
   - If SG-1219/U is prefixed <3100A, proceed with step 3.
   - If SG-1219/U is prefixed >3101A, connect positive lead to A3A5TP4 and verify Digital Multimeter reads -6.300 Vdc ±0.163Vdc. If incorrect, perform YIG Tuned Oscillator Summing Loop Test (para 2-13). If correct proceed with step 4.

NOTE

Ground lead must remain connected to this test point for remainder of this procedure.

3. Set SG-1219/U and connect Digital Multimeter positive lead as indicated below. Repeat procedure until all voltage readings are within specified limits.

SG-1219/U Frequency	Connect Digital Multimeter	Short Test Points	SG-1219/U Adjustment	Digital Multimeter Indication
4.8GHz	A3A5TP4	None	A3A5R13	-6.5Vdc ±0.04Vdc
4.8GHz	A3A5TP1	None	None	+ 10.75Vdc ±0.25Vdc
4.8GHz	A3A5TP2	None	None	+ 10Vdc ±.15Vdc
4.8GHz	A3A5TP3	A2A9TP1 to A2A9TP3	A3A5R4	-4.8Vdc ±0.01Vdc
4.8GHz	A3A5TP3	None	A3A5R3	-14.4Vdc ±0.001Vdc
4900MHz	A3A5TP3	A2A9TP1 to A2A9TP3	A3A5R29	-5.1Vdc ±0.001Vdc
4810MHz	A3A5TP3	A2A9TP1 to A2A9TP3	A3A5R42	-4.83Vdc ±0.001Vdc
5000MHz	A3A5TP3	A2A9TP1 to A2A9TP3	A3A5R24	-5.4Vdc ±0.001Vdc
2GHz	A3A5TP3	None	A3A5R22	-6Vdc ±0.001Vdc
2.4GHz	A3A5TP3	None	A3A5R20	–7.2Vdc ±0.001Vdc
3.2GHz	A3A5TP3	None	A3A5R18	-9.6Vdc ±0.001Vdc
4.801GHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	-4.803 ±0.001
4.802GHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	-4.806 ±0.001
4.804GHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	4.812±0.001
4.808GHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	-4.824 ±0.001
4.810GHZ	A3A5TP3	A2A9TP1 to A2A9TP3	None	-4.830 ±0.001
4.820GHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	-4.860 ±0.001
4.840GHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	-4.920 ±0.001
4910MHz	A3A5TP3	A2A9TP1 to A2A9TP3	None	-5.13Vdc ±0.002Vdc
4910MHz	A3A5TP3	None	None	–14.73Vdc ±0.002Vdc

4. Set SG- 1219/U and connect Digital Multimeter positive lead as indicated below. Repeat procedure until all voltage readings are within specified limits.

SG-1219/U Frequency	Connect Digital Multimeter	Short Test Points	SG-1219/U Adjustment	Digital Multimeter Indication
6598.000MHz	A3A5TP5	A3A5TP1 to A3A5TP2	A3A5R15	+6.00mVdc ±0.02mVdc
6598.000MHz	A3A5TP5	None	A3A5R8	–19.794Vdc ±0.001Vdc
3066.000MHz	A3A5TP5	None	None	-9.198Vdc ±0.003Vdc
4049.000MHz	A3A5TP5	None	None	–12.147Vdc ±0.03Vdc

5. Disconnect test equipment.

2-32. ADJUST A3A6 YTO DRIVER.

1. On SG-1219/U, adjust output level to 0dBm.
2. Connect Frequency Counter to SG-1219/U RF OUTPUT connector.
3. Short A3A6TP5 to A3A7TP2 (fig. FO-4).
4. Set SG-1219/U frequency to 2GHz.
   - Adjust A3A6R34 to obtain 2000MHz ±0.1MHz.
5. Set SG-1219/U frequency to 6.599GHz.
   - Adjust A3A6R25 to obtain 6599MHz ±0.1 MHz.
6. Repeat steps 4 and 5 until required tolerance is obtained at both frequencies.
7. Disconnect short from A3A6TP5 and A3A7TP2.
8. Set SG-1219/U frequency to 2GHz and verify Frequency Counter indication is 2GHz ±1KHz. Set SG-1219/U frequency to 6.6GHz and verify Frequency Counter indication is 6.6GHz ±1KHz.
9. Disconnect test equipment.

2-33. ADJUST A3A9 TO LOOP SAMPLER.

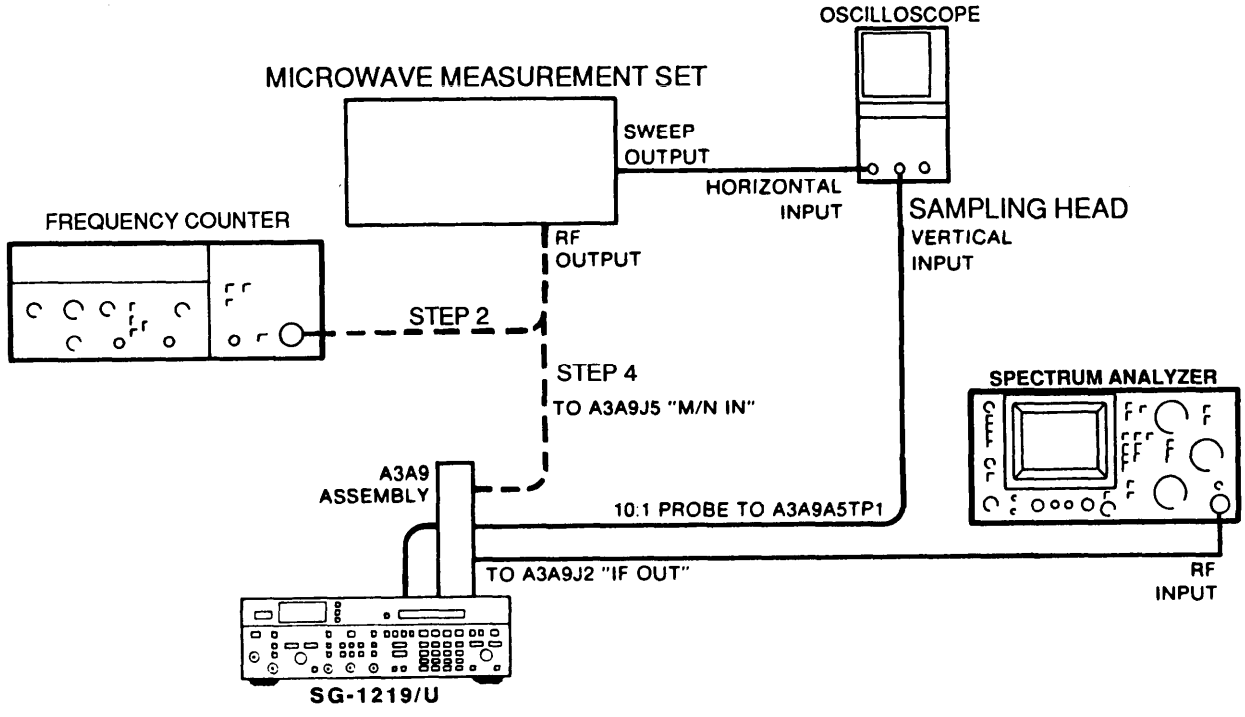
1. On SG-1219/U:
   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Rotate A3A9 Assembly into its service position (para 2--88, steps 1 thru 4 only).
   - Remove A3A9A5 Assembly Cover (para 2-93).
   - Connect Thermistor Mount to A3A9A1J1 in place of W7 (fig. FO-1 units prefixed <3100A) or to A3A9A8U1J5 in place of A1W11 (fig. FO-1.1 units prefixed >3101A).
   - Reconnect ac power cable.

2. On Microwave Measurement Set:

- Set controls for a leveled output level of 0dBm.
- Set center frequency range to 187.5MHz ±1.0MHZ (measured by Frequency Counter).
- Set sweep range to 200MHz.

2-33. ADJUST A3A9 YTO LOOP SAMPLER—Continued.

3. Connect equipment as shown below. Set SG-1219/U LINE switch to ON.



4. Connect Microwave Measurement Set RF output to A3A9J5 in place of A3W8 (white/orange).

5. Using an insulated adjustment tool, adjust A3A9A5C1 and C2 (fig. FO-4) to obtain an Oscilloscope display similar to that shown.

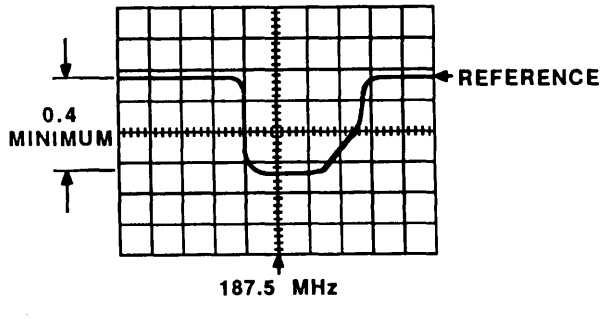
   - Adjust for maximum negative voltage and flatness over center two divisions.
   - Minimum change from reference level to maximum negative voltage should be >0.4 volts.

6. Jumper A3A7TP2 to A3A6TP5.

7. Set SG-1219/U frequency to 2.1GHz and disconnect A3W16 (gray) from A3A9J6. Remove Oscilloscope Probe from A3A9A5TP1.

8. On Microwave Measurement Set:

   - Set center frequency to 177.5MHz ±.0MHZ.
   - Set sweep width to 10MHz.
   - Set sweep mode to manual.



2-33. ADJUST A3A9 YTO LOOP SAMPLER—Continued.

9. On spectrum Analyzer:

   - Set frequency span to 0 to 100MHz.
   - Set other controls to display swept IF signal.
   - Second and third harmonics should be visible at 60, and 90MHz.

10. Tune Microwave Measurement Set slightly to align the largest signal (30MHz Fundamental) on Spectrum Analyzer display.

11. Adjust A3A9A5R1 so that displayed IF signal at 30MHz is +2dBm ±1dBm (units prefixed <3100A) or to +0dBm ±ldBm (units prefixed >3101A).

    - If level is too low, or if levels in following step are not within levels given, select a new value for C22. Values should be within range of 120 to 150 pF. 130 pf is usually best value.

12. Slowly tune Microwave Measurement Set center frequency from 174 to 181 MHz and observe fundamental harmonic output level. Using the following frequencies, verify that power level is within specified limits shown below:

    6 to 20MHz ..... –3dBm minimum.
    20 to 30MHz ..... +2 to +6dBm.
    30 to 70MHz ..... -10dBm minimum.

13. Disconnect all test equipment.

14. On SG-1219/U:

    - Set LINE switch to STBY.
    - Disconnect ac power cable.
    - Disconnect Jumper.
    - Reconnect A3W16 (gray) to A3A9J6 and A3W8 (white/orange) to A3A9J3.
    - Remove Thermistor Mount.
    - Reinstall A3A9A5 Assembly Cover (para 2-93).
    - Reinstall A3A9 Assembly (para 2-88).

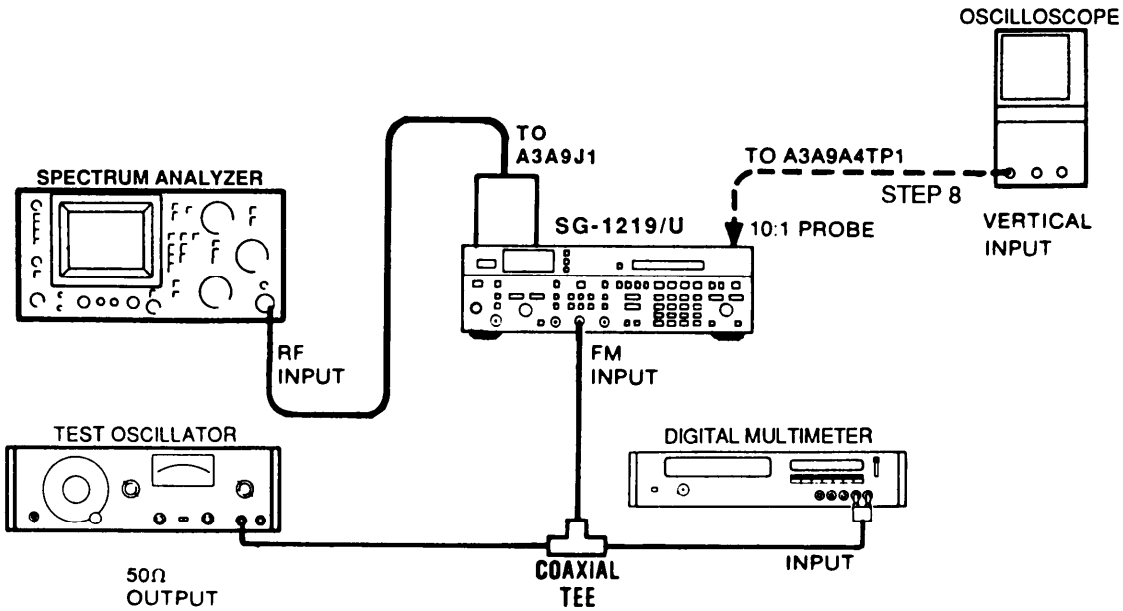
15. Connect Frequency Counter to SG-1219/U RF OUTPUT connector.

16. Set SG-1219/U Frequency to 2GHz and verify Frequency Counter indication is 2GHz ±lKHz. Set SG-1219/U frequency to 6.6GHz and verify Frequency Counter indication is 6.6GHz ±1KHz.

17. Disconnect all test equipment.

2-34. ADJUST A3A9A4 YTO LOOP OFFSET AND FM OVERMODULATION.

1. On SG-1219/U:
   - Set LINE switch to STBY.
   - Disconnect ac power cable.
   - Rotate A3A9 Assembly into its service position (para 2-88, steps 1 thru 4 only).
   - Remove A3A9A4 Assembly Cover (para 2-92).
   - Reconnect ac power cable.
2. Connect equipment as shown below. Set SG-1219/U LINE switch to ON.



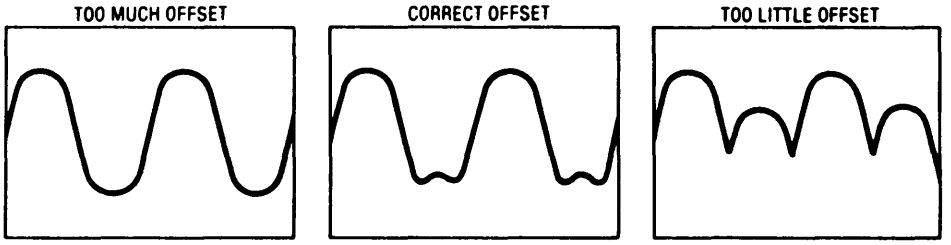
3. On SG-1219/U, set FM deviation to 3MHz.
4. Tune Test Oscillator to 100KHz.
5. Adjust Spectrum Analyzer controls to display carrier and 100KHz sidebands,
6. Adjust Test Oscillator output level for first carrier null as observed on Spectrum Analyzer display. Record Test Oscillator output level as V1. Divide V1 value by 2.4 and record result as V2.
7. Readjust Test Oscillator output level to computed level V2.
8. Connect Oscilloscope to A3A9A4TP1 (fig. FO-4) using 10:1 probe. Adjust controls to view 100KHz signal.

2-34. ADJUST A3A9A4 YTO LOOP OFFSET AND FM OVERMODULATION—Continued.

9. Adjust A3A9A4R53 so sinusodial waveform just begins to fold over as shown below.

NOTE

There may be two settings of A3A9A4R53 that give proper offset. Use position closest to center of adjustment range.



10. Disconnect Oscilloscope.

11. Rotate A3A9A4R30 to full clockwise position.

12. Disconnect test equipment.

13. On SG-1219/U:

- Set LINE switch to STBY.
- Disconnect ac power cable.
- Reinstall A3A9A4 Assembly Cover (para 2--92).
- Reinstall A3A9 Assembly (para 2--88).

2-35. ADJUST A3A9A4 YTO LOOP PHASE DETECTOR.

CAUTION

Do not allow center contact of interconnect cable to contact any metal surface.

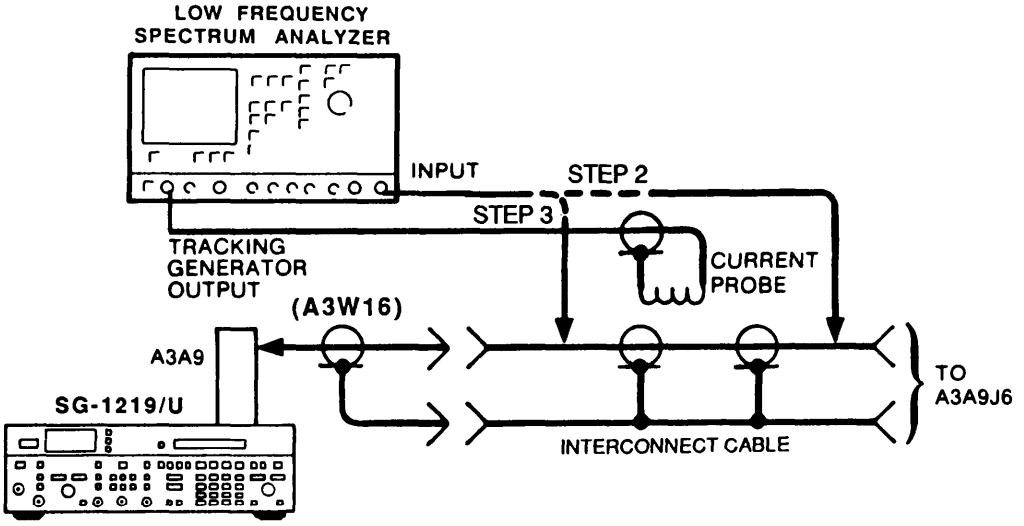
1. Press RCL then number 0 push buttons and verify SG-1219/U RF OUTPUT ON/OFF push button light is on.

2-35. ADJUST A3A9A4 YTO LOOP PHASE DETECTOR—Continued.

2. Connect equipment as shown below.

NOTE

A special interconnect cable (appendix C) is inserted between A3W16 (gray) and A3A9J6 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A).

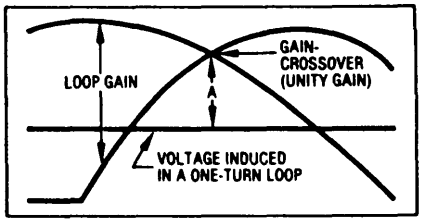


3. On Low Frequency Spectrum Analyzer:

- Set scan from 0 to 50KHz.
- Set vertical sensitivity per division to 2dB.
- Set scan mode to single.
- Set display variable persistence to maximum.
- Set reference level to -60dBm.
- Set sweep mode to single.
- Press single sweep key.
- Press Store A->B key.
- Press View B key.
- Move input to cable side (A3W16) of special cable as shown.

2-35. ADJUST A3A9A4 YTO LOOP PHASE DETECTOR—Continued.

4. On Low Frequency Spectrum Analyzer, press SINGLE sweep key. Check that gain crossover frequency is 20KHz ±2KHz.



- If gain crossover frequency is not correct, a new value for A3A9A4R20 (fig. FO-4) must be selected from 348 Ω to 1.21K Ω as follows:
- Set SG-1219/U LINE switch to STBY.
- Disconnect ac power cable.
- Rotate A3A9 Assembly into its service position (para 2-88, steps 1 thru 4 only).
- Remove A3A9A4 Assembly Cover (para 2-92).
- Select new value from 348 Ω to 1.21K Ω for resistor R20 using following formula

$$R2 = R1 \frac{F1}{20KH.z}$$

where: R2 = required value for R20,
R1 = present value of R20,
F1= measured frequency.

- Install l/4W fixed carbon COMP resistor with a value as close as possible to the value calculated above.

5. On SG-1219/U, reconnect ac power cable, and set LINE switch to ON. Repeat steps 1 thru 4.
6. Disconnect test equipment.
7. On SG-1219/U:

- Set LINE switch to STBY.
- Disconnect ac power cable.
- Reinstall A3A9A4 Assembly Cover (para 2-92).
- Reinstall A3A9 Assembly (para 2-88).

2-36. ADJUST A3A7 FM DRIVER.

1. Set SG-1219/U FM DEVIATION to 0.1MHz.
2. Connect Oscilloscope to A3A7TP3 (fig. FO-4).

- Adjust A3A7R28 for a voltage level of 0Vdc ±0.lVdc.

2-36. ADJUST A3A7 FM DRIVER—Continued.

3. Set SG-1219/U FM DEVIATION to 3MHz.

   • Verify a voltage level of 0Vdc ±2Vdc.

4. Verify RF OUTPUT ON/OFF is ON.

5. Set Test Oscillator for an output of 5mVrms at 5KHz.

6. Connect Oscilloscope to A3A7TP2. Connect Test Oscillator output to FM IN connector and verify <20mV peak-to-peak signal.

   l Adjust A3A7R40 to null any FM signal present.

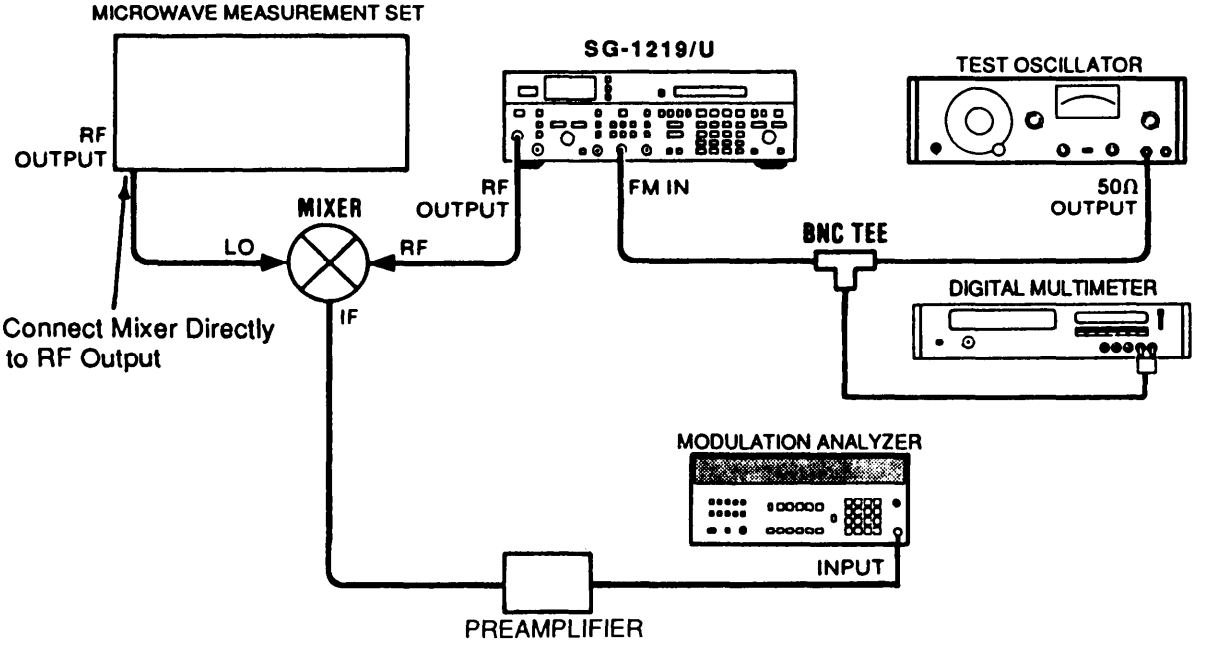
7. Set SG-1219/U FM DEVIATION to 0.lMHz and Test Oscillator output level to 0.15 Vrms.

   l Adjust A3A7R46 to null any FM signal present.

8. Disconnect test equipment.

2-37. ADJUST A1A6 FM ACCURACY AND OVERMODULATION.

1. Connect test equipment as shown below.

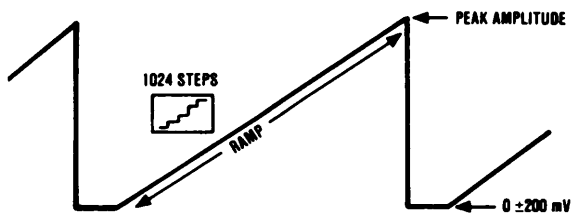


2-37. ADJUST A1A6 FM ACCURACY AND OVERMODULATION—Continued.

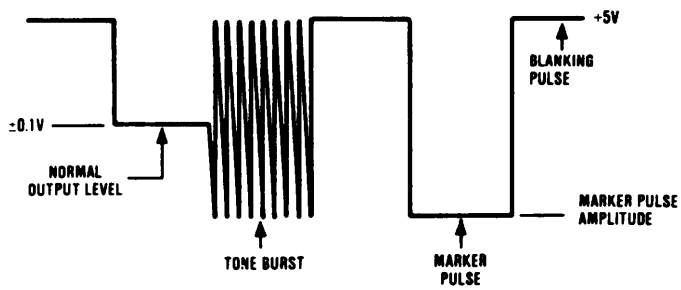
2. On SG-1219/U:
   - Set frequency to 15GHz.
   - Set output level to –20dBm.
   - Set meter scale to FM.
   - Set frequency modulation deviation to 0.1MHz.
3. On Microwave Measurement Set:
   - Set frequency to 15.1GHz.
   - Set output level to +7dBm.
   - Set modulation to OFF.
4. Set Preamplifier gain to 26dB.
5. Set Test Oscillator amplitude to 0.707 1Vrms and frequency to 100KHz.
   - Adjust A1A6R35 (fig. FO-2) for a Modulation Analyzer indication of 100KHz ±0.lKHz.
   - Adjust A1A6R70 for a full scale indication of 100KHz on SG-1219/U OUTPUT LEVEL meter.
6. Set SG-1219/U FM deviation range to 0.03MHz.
7. Verify that SG-1219/U OUTPUT LEVEL meter agrees with Modulation Analyzer indication ±4KHz.
8. Set Test Oscillator amplitude for a Digital Multimeter indication of 0.7425 Vrms.
9. Rotate A1A6R54 to fully clockwise position.
   - Slowly adjust A1A6R54 in a counterclockwise direction until SG-1219/U FM OVERMOD light just turns on.
10. Disconnect test equipment.

2-38. ADJUST A2A7 SWEEP OUTPUT AND BLANKING MARKER.

1. On SG-1219/U:
   - Set LINE switch to STBY.
   - Remove A2 Assembly Cover (para 2-71).
   - Install MPU Test Connector on top of A2A8 Assembly (fig. FO-3).
   - Install jumper between A2A8TP5 and adjacent A2A8TPGND.
   - Set A2A8S1 to 4.
   - Set LINE switch to ON.
   - Verify that FREQUENCY MHz display indicates “04-1”.
2. Connect SG-1219/U rear panel SWEEP OUTPUT connector to Oscilloscope channel B input.
3. On Oscilloscope:
   - Set trigger to channel B.
   - Set channel B to DC coupling.
   - Adjust Oscilloscope for display as shown.



4. Adjust A2A7R34 for approximately + 10V ramp peak-to-peak and verify that ramp contains no discontinuities.
5. Connect SG-1219/U rear panel BLANKING/MARKER connector to channel A of Oscilloscope. Leave trigger set to channel B.
6. Using GND on channel A of Oscilloscope, set a reference for normal output level as shown. Switch channel A to DC coupling.



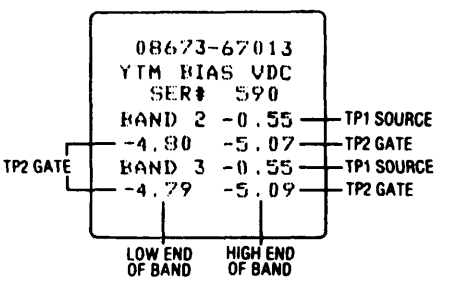
7. Adjust A2A7R50 for a marker pulse –5V below reference.
8. Disconnect test equipment.
9. On SG-1219/U:
   - Set LINE switch to STBY.
   - Reinstall A2 Assembly Cover (para 2-71).
   - Remove MPU Test Connector on A2A8 Assembly.
   - Disconnect jumper between A2A8TP5 and adjacent A2A8TPGND.
   - Set A2A8S1 to 1.

2-39. ADJUST A1A8 SRD BIAS.

1. On SG-1219/U:
   - Set LINE switch to STBY.
   - Remove Al Assembly Cover (para 2-52).
2. Connect Digital Multimeter to A1A8TP1 (fig. FO-2).
3. On SG-1219/U:
   - Set LINE switch to ON.
   - Press number 6 push button.
   - Press service switch A2A2S1 (fig. FO-3).
   - Press RCL and number 1 push buttons.
   - Adjust A1A8R84 (B 1 Source) to –3.80 ±0.01Vdc.
4. Locate SRD calibration label located directly behind A2A5 20/30 Divider assembly. Sample label is shown.

NOTE

Label contains unique calibration voltages for source and gate voltages for this serial number YIG tuned multiplier (YTM). YTM serial number is printed on calibration label. Notice that calibration label has one source voltage and two gate voltages for Band 2.



5. On SG-1219/U:
   - Press RCL and number 2 push buttons.
   - Adjust A1A8R85 (B2 Source) equal to Band 2 source voltage on YTM calibration label ±0.001Vdc.
   - Press RCL and number 3 push buttons.
   - Adjust A1A8R86 (B3 Source) equal to Band 3 source voltage on YTM calibration label ±0.001Vdc.
6. Connect Digital Multimeter to A1A8TP2.
7. On SG-1219/U:
   - Press RCL and number 2 push buttons.
   - Tune frequency to 12299.902MHz.
   - Adjust A1A8R31 (B2 HI) equal to Band 2 HI gate voltage ±.005 Vdc, located on right side of YTM calibration label.
   - Tune frequency to 6600.002MHz.
   - Adjust A1A8R61 (B2 LO) equal to Band 2 LO gate voltage ±.005 Vdc, located on left side of YTM calibration label.

2-39. ADJUST A1A8 SRD BIAS—Continued.

8. Repeat adjustments in step 7 until voltages within ±0.005Vdc.
9. On SG-1219/U:
   - Press RCL and number 3 push buttons.
   - Tune frequency to 18599.991MHz.
   - Adjust A1A8R32 (B3 HI) equal to Band 3 HI gate voltage ±.005 Vdc, located on right side of YTM calibration label.
   - Tune frequency to 12300.003MHz.
   - Adjust A1A8R62 (B3 LO) equal to Band 3 LO gate voltage ±.005 Vdc, located on left side of YTM calibration label.
10. Repeat adjustments in step 9 until voltages within ±0.005Vdc.
11. Disconnect test equipment.
12. On SG-1219/U:
   - Set LINE switch to STBY.
   - Reinstall A1 Access cover (para 2-52).

2-40. ADJUST A1A2/A1A3/A1A5/A1A7 YTM TUNE.

1. On SG-1219/U:
   - Set LINE switch to STBY.
   - Remove A1 Access cover (para 2-52).
   - Set LINE switch to ON.
2. Connect Digital Multimeter negative to A1A7TP1 (fig. FO-2) and positive to A1A7TP6.
   - Adjust A1A7R8 for +12.400 ±0.005Vdc.
3. On Oscilloscope:
   - Connect ground lead to A1A5TP5.
   - Connect probe to A1A5TP4.
   - Set vertical sensitivity to lV/DIV.
   - Set DC Coupling to ON.
   - Set horizontal time base to 5 msec/DIV.

2-40. ADJUST A1A2/A1A3/A1A5/A1A7 YTM TUNE—Continued.

4. On SG-1219/U:
   - Set LINE switch to STBY.
   - Remove A2 Access cover (para 2-71).
   - Install MPU Test Connector on top of A2A8 Assembly (fig. FO-3).
   - Install jumper between A2A8TP5 and adjacent A2A8TPGND.
   - Set A2A8S1 to 5.
   - Set LINE switch to ON.
   - Verify that FREQUENCY MHz display indicates “05-1”.
   - Disconnect jumper between A2A8TP5 and adjacent A2A8TPGND.
   - Adjust A1A5R60 for an absolute negative peak on sawtooth ramp of -4.30 ±0.1Vdc, referenced to ground.
   - Set LINE switch to STBY.
   - Remove MPU Test Connector on A2A8 Assembly.
   - Set A2A8S1 to 1.

5. Connect Digital Multimeter to A1A2C6 (units prefixed <3100A) or to A1A2TP3 (units prefixed >3101A).

6. On SG-1219/U:
   - Set LINE switch to ON.
   - Press RCL and number 0 push buttons.
   - Turn RF OUTPUT ON/OFF to OFF.
   - Adjust A1A2A2R12 (units prefixed <3100A) or A1A2R88 (units prefixed >3101A) for -0.920 ±0.1Vdc.

7. Disconnect Digital Multimeter.

8. On SG-1219/U:
   - Rotate A1A3R51 fully counterclockwise.
   - Rotate EXT ALC IN CAL adjustment (front panel) fully clockwise.

2-40. ADJUST A1A2/A1A3/A1A5/A1A7 YTM TUNE—Continued.

9. On oscilloscope:

- Using 10:1 probe, connect channel A input to A1A2C6 (units prefixed <3100A) or to A1A2TP3 (units prefixed >3101A).
- Using 10:1 probe, connect channel B input to A1A5TP4.
- Set vertical sensitivity channel A to 0.01 V/DIV.
- Set horizontal sensitivity channel B to 0.5 V/DIV.
- Set horizontal display to X-Y (A vs B).

10. On SG-1219/U:

- Press RCL, number 0, and number 6 push buttons.
- Press service switch A2A2S1.
- Set output level to –70dBm.
- Press Pulse NORM push button.
- Press number 3 push button.
- Press service switch A2A2S1.

11. Use Oscilloscope channel B VOLTS/DIV CAL control and horizontal position control to adjust for a full 10 division horizontal sweep across display.

NOTE

This sets YIG Tuned Multiplier “auto-peak” sweep sensitivity to approximately 40MHz/DIV as measured on Oscilloscope.

12. On SG-1219/U:

- Press number 4 push button.
- Press service switch A2A2S1.

13. Using Oscilloscope horizontal position control, center dot on Oscilloscope display. Do not adjust vertical gain controls to center dot.

CAUTION

Be careful not to allow the cable connector to short against any printed wiring board traces.

2-40. ADJUST A1A2/A1A3/A1A5/A1A7 YTM TUNE—Continued.

14. Disconnect AlW7 from A1AT3 (fig. FO-1 units prefixed <3100A) or (fig. FO-1.1 units prefixed >3101A).

NOTE

If amplitude of displayed signal decreases at any time during adjustment, press PULSE OFF, PULSE NORM, then number 3 push buttons, then service switch A2A2S1 before preceding with adjustment.

15. On SG-1219/U:

- Press PULSE OFF then PULSE NORM push buttons.
- Press number 3 push button.
- Press service switch A2A2S1.
- Tune frequency down to 2000.000MHz.
- Adjust A1A7R69 (B1 LO) to center YIG Tuned Multiplier passband response horizontally on Oscilloscope display.
- Using TUNE KNOB, tune frequency to 6.6GHz.
- Press PULSE OFF then PULSE NORM push buttons.
- Press number 3 push button.
- Press service switch A2A2S1.
- Adjust A1A7R14 (Bl HI) to center YIG Tuned Multiplier passband on Oscilloscope display.

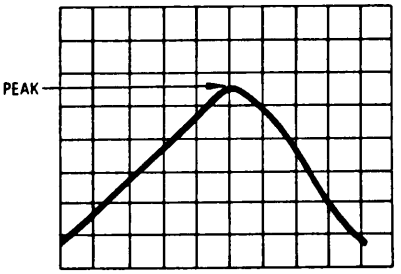
16. Repeat step 15 until both ends of band are within 1 division of screen center on Oscilloscope display.

17. Using TUNE KNOB, tune SG-1219/U to scan entire band (from 2.0 to 6.6GHz) and verify that YIG Tuned Multiplier passband response tracks within 2 divisions of screen center on Oscilloscope display.

- If response peak does vary more than 2 divisions, readjust A1A7R14 (B1 HI) and A1A7R69 (Bl LO) for best compromise.

2-40. ADJUST A1A2/A1A3/A1A5/A1A7 YTM TUNE—Continued.

18. On SG-1219/U:



- Press RCL then number 2 push buttons.
- Press PULSE NORM push button.
- Press number 3 push button.
- Press service switch A2A2S1.
- Using TUNE KNOB, tune frequency to 6600.002MHz.
- Adjust A1A7R68 (B2 LO) to center YIG Tuned Multiplier response peak on Oscilloscope display.
- Using TUNE KNOB, tune frequency to 12299.902MHz.
- Adjust A1A7R17 (B2 HI) to center YIG Tuned Multiplier response peak on Oscilloscope display.

19. Repeat step 18 until both ends of band are within 1 division of screen center on Oscilloscope display.

20. Using TUNE KNOB, tune SG-1219/U to scan entire band (from 6.6 to 12.3GHz) and verify that YIG Tuned Multiplier passband response tracks within 2 divisions of screen center on Oscilloscope display.

- If response peak does vary more than 2 divisions, readjust A1A7R17 (B2 HI) and A1A7R68 (B2 LO) for best compromise.

21. On SG-1219/U:

- Press RCL then number 3 push buttons.
- Press PULSE NORM push button.
- Press number 3 push button.
- Press service switch A2A2S1.
- Using TUNE KNOB, tune frequency to 12300.003MHz.
- Adjust AlA7R67 (B3 LO) to center YIG Tuned Multiplier response peak on Oscilloscope display.
- Using TUNE KNOB, tune frequency to 17024.928MHz.
- Adjust A1A7R18 to center YIG Tuned Multiplier response peak on Oscilloscope display.

22. Repeat step 21 until both ends of band are within 1 division of screen center on Oscilloscope display..

2-40. ADJUST A1A2/A1A3/A1A5/A1A7 YTM TUNE—Continued.

23. On SG-1219/U:

- Using TUNE KNOB, tune frequency to 18599.901MHz.
- Adjust Adjust A1A7R51 to center YIG Tuned Multiplier response peak on Oscilloscope display.

24. Using TUNE KNOB, tune SG-1219/U to scan entire band (from 12.3 to 18.6GHz) and verify that YIG Tuned Multiplier passband response tracks within 2 divisions of screen center on Oscilloscope display.

- If response peak does vary more than 2 divisions, readjust A1A7R67 (B3 LO), A1A7R18, and A1A7R51 for best compromise.

25. Reconnect AlW7 to A1AT3.

26. Disconnect test equipment.

27. On SG-1219/U:

- Set LINE switch to STBY.
- Reinstall A2 Access cover (para 2-71).

28. Perform Adjust A1A3 Clamp (para 2-41).

2-41. ADJUST A1A3 CLAMP.

1. Connect Power Meter to SG-1219/U RF Output connector.

2. On SG-1219/U:

- Rotate A1A3R51 (fig. FO-2) fully clockwise.
- Press RCL and number 0 push buttons.
- Set frequency to 6GHz.
- Set output level to 0dBm.
- Set ALC DIODE to on.
- Rotate EXT ALC IN CAL (front panel) fully clockwise.
- Rotate A1A3R51 counterclockwise until Power Meter indicates +11dBm ±0.2dBm.

2-41. ADJUST A1A3 CLAMP—Continued.

3. On SG-1219/U:

   - Set ALC to INTERNAL.
   - Set output level range to +l0dBm range, and maximum vernier.
   - Set SG-1219/U frequency increment to 50MHz.

4. Press FREQ INCREMENT (down arrow) push button to tune from 6.6 to 2.0GHZ while observing Power Meter indication.

   - If power changes suddenly by several dB while changing frequency, decrease A1A3R51 in 0.5dB increments (step 2) and repeat this step until no sudden change by several dB exists.

NOTE

It should not be necessary to set A1A3R51 lower than +l0dBm.

5. Disconnect test equipment.

2-42. ADJUST A1A2/A1A3/A1A5/A1A8 FLATNESS AND ALC.

1. Connect Power Meter to SG-1219/U RF output connector.

2. On SG-1219/U:

   - Set LINE switch to STBY.
   - Remove A1 Access cover (para 2-52).
   - Set LINE switch to ON.
   - Press RCL and number 0 push buttons.
   - Set frequency to 2GHz.
   - Set output power level to -3dBm.
   - Press number 6 push button.
   - Press service switch A2A2S1 (fig. FO-3).

3. On SG-1219/U:

   - Press RCL then number 1 push buttons.
   - Adjust A1A2A2R29 (units prefixed <3100A) or A1A2R105 (units prefixed >3101A) (fig. FO-2) for a Power Meter indication of –3.0dBm±0.2dBm.

2-42. ADJUST A1A2/A1A3/A1A5/A1A8 FLATNESS AND ALC—Continued.

4. Using TUNE KNOB, tune SG-1219/U frequency from 2 to 6.6GHz. Record minimum and maximum Power Meter indications at frequencies where they occur.

   - Adjust A1A8R55 to reduce difference between minimum and maximum Power Meter indications.

5. Using TUNE KNOB, tune SG-1219/U to 2GHz.

   - Readjust A1A2A2R29 (units prefixed <3l00A) or A1A2R105 (units prefixed >3101A) to give a -3.0dBm indication on Power Meter.

6. Verify that SG-1219/U output power level stays within ±1dB of –3dBm from 2 to 6.6GHz.

7. Repeat steps 4 thru 6 until output power level stays within 1dB of –3dBm or until no further improvement can be made.

8. On SG-1219/U, press RCL and number 2 push buttons.

9. Using TUNE KNOB, tune SG-1219/U from 6.600002 to 12.299902GHz. Record minimum and maximum Power Meter indications at frequencies where they occur.

   - Adjust A1A8R82 to minimize difference between minimum and maximum Power Meter indications.

NOTE

If the minimum or maximum output power levels are more than ±1.5dB from –3dBm, perform steps 3 thru 7 to ±1.5dB of -3dBm.

10. On SG-1219/U:

    - Press SWEEP MODE OFF push button.
    - Set frequency to 2GHz.
    - Set frequency increment to 200MHz.

11. Verify that Power Meter indicates –3dBm ±0.2dBm.

    - Readjust A1A2A2R29 (units prefixed <3100A) or A1A2R105 (units prefixed >3101A) if necessary.

12. Using TUNE KNOB, tune SG-1219/U from 2 to 12.2GHz and verify that difference between minimum and maximum Power Meter indications are equal to or less than 3dB.

    - Repeat steps 3 thru 7 and 8 thru 12 as necessary.

13. On SG-1219/U, press RCL and number 3 push buttons.

14. Using TUNE KNOB, tune SG-1219/U from 12.300003 to 18.599901GHz. Record minimum and maximum Power Meter indications and at frequencies where they occur.

    - Adjust A1A8R67 to minimize difference between minimum and maximum Power Meter indications.

2-42. ADJUST A1A2/A1A3/A1A5/A1A8 FLATNESS AND ALC—Continued.

NOTE

If the minimum or maximum output power levels are more than ±1.75dB from –3dBm, repeat steps 3 thru 12 to ±1.75dB of -3dBm.

15. On SG-1219/U:

- Press SWEEP MODE OFF push button.
- Set frequency to 2GHz.
- Set frequency increment of 200MHz.

16. Verify that Power Meter indicates –3dBm ±.2dB.

- Readjust A1A2A2R29 (units prefixed <3100A) or A1A2R105 (units prefixed >3101A) if necessary.

17. Using TUNE KNOB, tune SG-1219/U from 2 to 18GHz. Record minimum and maximum Power Meter indications. Verify that Minimum Power Level – Maximum Power Level = <4dB.

- If not within specification, readjust as necessary.

NOTE

Each band adjustment affects all of the higher band adjustments. After making a band adjustment, readjust all of the higher bands (e.g., adjusting Band 2 (steps 8 thru 12) requires readjustment of Band 3 (steps 13 and 14) but not necessarily Band 1 (steps 3 thru 7).

18. Using TUNE KNOB, tune SG-1219/U to a frequency that has an output power level halfway between minimum and maximum output power levels recorded in step 17 (e.g., for a minimum power level of -4.75dBm and a maximum power level of -2dBm, tune to a frequency that has a power level of -3.4dBm).

NOTE

The following adjustments should all be done at frequencies set at this time. Do not change any frequencies for the remainder of this procedure.

19. On SG-1219/U:

- Set output power level to –3.0dBm as indicated by Power Meter.
- Press AM 30% push button.
- Adjust A1A3R43 for –3.0dBm as indicated on Power Meter. Verify that there is no noticeable output power level difference between AM off and AM 30% modes.

2-42. ADJUST A1A2/A1A3/A1A5/A1A8 FLATNESS AND ALC—Continued.

20. On SG-12191U:

- Set output power level to -3.0dBm as indicated by LEVEL dBm display.
- Using OUTPUT LEVEL VERNIER, set output power level to +3.0dBm as indicated on LEVEL dBm display.
- Press AM OFF and MTR LVL push buttons.
- Adjust A1A3R31 for an indication of +3dBm on OUTPUT LEVEL meter.
- Using OUTPUT LEVEL VERNIER, set output power level to -10dBm as indicated on LEVEL dBm display.
- Adjust A1A5R9 for a –10dBm indication on OUTPUT LEVEL meter.

21. Using OUTPUT LEVEL VERNIER, set output power level to 0.0dBm as indicated by Power Meter. Record power level indicated by SG-1219/U LEVEL dBm display.

NOTE

The SG-1219/U OUTPUT LEVEL meter should indicate approximately 0dBm with the MTR LVL mode selected. The OUTPUT LEVEL meter should not indicate –l0dBm.

22. On SG-1219/U, press RANGE (up arrow) push button one time and adjust OUTPUT LEVEL VERNIER until LEVEL dBm display indicates same power level as recorded in step 21.

NOTE

The SG-1219/U OUTPUT LEVEL meter should indicate approximately –l0dBm with the MTR LVL mode selected. The OUTPUT LEVEL meter should not indicate 0dBm.

- Adjust A1A2A1R1 (units prefixed <3100A) or A1A2R1 (units prefixed >3101A) for a Power Meter indication of 0.0dBm.

23. Connect Digital Multimeter to A1A2C6 (units prefixed <3100A) or to A1A2TP3 (units prefixed >3101A).

24. On SG-1219/U:

- Turn off RF OUTPUT ON/OFF.
- Adjust A1A2A2R12 (units prefixed <3100A) or A1A2R88 (units prefixed >3101A) to -0.920Vdc ±0.1Vdc.

25. On SG-1219/U:

- Place top cover on SG-1219/U. Do not install.
- Allow temperature stabilize for 15 minutes minimum.
- After internal temperature has stabilized, top remove and quickly readjust A1A2A2R12 (units prefixed <3100A) or A1A2R88 (units prefixed >3101A) for -0.920Vdc ±0.02Vdc.

2-42. ADJUST A1A2/A1A3/A1A5/A1A8 FLATNESS AND ALC—Continued.

26. Repeat step 25 until voltage is -0.920Vdc ±0.02Vdc with cover on.

27. Set SG-1219/U output power level for a -10.0dBm indication on LEVEL dBm display.

NOTE

The SG-1219/U OUTPUT LEVEL meter should indicate approximately -10dBm with the MTR LVL mode selected. The OUTPUT LEVEL meter should not indicate 0dBm.

- Turn on RF OUTPUT ON/OFF.
- Adjust A1A2A2R40 (units prefixed <3100A) or A1A2R116 (units prefixed >3101A) for a Power Meter indication of -10.0dBm.
- Adjust OUTPUT LEVEL VERNIER for a LEVEL dBm display indication of -4.0dBm.
- Adjust A1A2A2R29 (units prefixed <3100A) or A1A2R105 (units prefixed >3101A) for a Power Meter indication of -4.0dBm.
- Set output power level to +8dBm as indicated by LEVEL dBm display.
- Adjust A1A2A2R26 (units prefixed <3100A) or A1A2R102 (units prefixed >3101A) for a Power Meter indication of +8.0dBm.

28. Repeat step 27 until all values are within 0.2dB.

29. Set SG-1219/U output power level for +5dBm as indicated on LEVEL dBm display. Press PWR MTR push button.

30. Connect EXT ALC IN connector on SG-1219/U to RECORDER OUT connector on Power Meter. Set Power Meter range to 0dBm.

31. On SG-1219/U:

- Adjust EXT ALC IN CAL (front panel) for a Power Meter indication of -5.0dBm.
- Adjust OUTPUT LEVEL VERNIER for a +10.0dBm indication on LEVEL dBm display.
- Adjust A1A3R72 for a Power Meter indication of 0.0dBm.
- Adjust SG-1219/U OUTPUT LEVEL VERNIER for a +5.0dBm indication on LEVEL dBm display.

32. Repeat step 31 until less than 0.1dB improvement can be made.

NOTE

Once the adjustment is complete, the SG-1219/U OUTPUT LEVEL meter should track Power Meter indications (±0.2dB) with a 10dB offset (e.g., a -5dBm Power Meter indication corresponds to a +5dBm OUTPUT LEVEL meter indication).

33. Disconnect test equipment.

2-43. ADJUST A1A2 AM BANDWIDTH.

1. Connect Low Frequency Spectrum Analyzer tracking output to SG-1219/U AM IN connector. Connect Low Frequency Spectrum Analyzer input to A1A2C6 (units prefixed <3100A) or to A1A2TP3 (units prefixed >3101A) (fig. FO-2). Connect Thermistor Mount to SG-1219/U RF OUTPUT connector.

2. On SG-1219/U:

   - Set start frequency to 2GHz.
   - Set stop frequency to 6.6GHz.
   - Set step size to 10MHz.
   - Set output level to 0dBm.
   - Set amplitude modulation mode to 100%.
   - Set output level meter to AM.
   - Set automatic peaking to OFF.

3. On Low Frequency Spectrum Analyzer, adjust tracking generator level so that SG-1219/U OUTPUT LEVEL meter indicates approximately 30% AM.

4. On SG-1219/U, press MTR LVL push button.

5. On Low Frequency Spectrum Analyzer:

   - Set start frequency to 20Hz.
   - Set stop frequency to 200KHz.
   - Set vertical sensitivity to 2dB per division.
   - Adjust reference level and linear sensitivity so left portion of displayed signal is on a convenient display screen graticule line (two or three divisions from top of screen).

NOTE

This represents reference level for determining amplitude modulation rolloff.

6. On SG-1219/U:

   - Press SWEEP MODE MANUAL push button.
   - Tune SG-1219/U from 2000 to 6600MHz in 10MHz steps and record where the sharpest rolloff occurs in amplitude modulation response. Record as Maximum Rolloff Frequency.

2-43. ADJUST A1A2 AM BANDWIDTH—Continued.

NOTE

This corresponds to highest negative difference in level at far right of display (200KHz) as compared to reference level at left side of display (0KHZ).

7. When maximum rolloff frequency is found, vary SG-1219/U output power level from -10 to +8dB to determine at what level maximum rolloff occurs. Record as Maximum Rolloff Output Power Level.

NOTE

When changing output power level, only use two ranges.

8. Set SG-1219/U to Maximum Rolloff Frequency and Maximum Rolloff Output Power Level as recorded in step 7.

   • Adjust A1A2A1R61 (units prefixed <3100A) or A1A2R61 (units prefixed >3101A) to set amplitude modulation rolloff to –3dB at 200KHz as displayed on Low Frequency Spectrum Analyzer.

9. Vary SG-1219/U output level from -10 to +8dB, using two ranges only, to determine at what level sharpest peaking occurs.

   • If this peaking level exceeds +2dB with respect to 0HZ, readjust A1A2A1R61 (units prefixed <3100A) or A1A2R61 (units prefixed >3101A) to obtain +2dB.

10. Set SG-1219/U to Maximum Rolloff Frequency and Maximum Rolloff Output Power Level as recorded in step 7, and verify that rolloff does not exceed –3dB at a 100KHz rate.

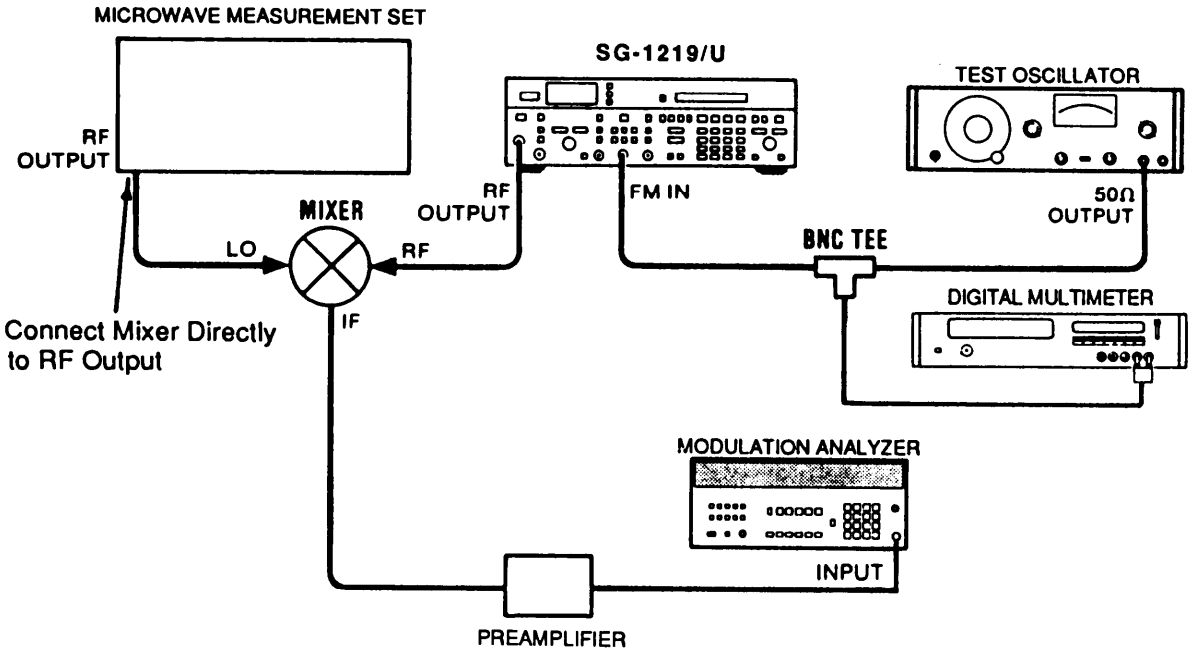
11. Repeat steps 2 thru 10 using values given below. All other settings remain the same.

Adjustment (Steps 8 and 9)	Frequency Tuning (Steps 2 and 6)	Output Power Level (Steps 7 and 9)
A1A2A1R59 (units prefixed <3100A) or AlA2R59 (units prefixed >3101A)	6610 to 12300MHz	-10db to +8dB
A1A2A1R58 (units prefixed <3100A) or A1A2R58 (units prefixed >3101A)	12310 to 17900MHz	-10db to +8dB
A1A2A1R58 (units prefixed <3100A) or AlA2R58 (units prefixed >3101A)	18000 to 18600MHz	-10db to +4dB

12. Disconnect test equipment.

2-44. ADJUST A1A3/A1A6 AM ACCURACY AND METER.

1. Connect test equipment as shown below.



2. On SG-1219/U:
   - Set frequency to 2GHz.
   - Set output level to -25dBm.
   - Set AM 100% to ON.
   - Set MTR AM to ON
3. Set Microwave Measurement Set controls as follows:
   - Set frequency to 2.07GHz.
   - Set output level to +5dBm.
4. Set Preamplifier to 26dB gain.
5. On Test Oscillator
   - Set frequency to 1 KHz.
   - Set output amplitude for a Digital Multimeter indication of 0.5303 Vrms.

2-44. ADJUST A1A3/A1A6 AM ACCURACY AND METER—Continued.

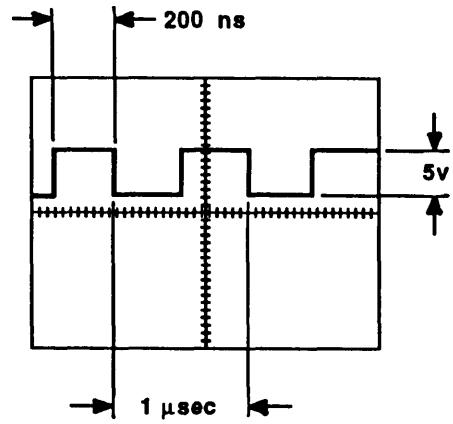
6. On SG-1219/U:
   - Adjust A1A3R83 (fig. FO-2) for a Modulation Analyzer indication of 73 ±0.01% amplitude modulation depth.
   - Adjust A1A6R84 so that SG-1219/U OUTPUT LEVEL meter indicates exactly 75% on middle scale.
7. Disconnect test equipment.

2-45. ADJUST A1A2/A1A3/A1A4/A1A5 PULSE MODULATION.

1. On SG-1219/U:
   - Set RF OUTPUT ON/OFF to ON.
   - Set PULSE NORM to ON.
2. Connect Digital Multimeter to A1A2C6 (units prefixed <3100A) or to A1A2TP3 (units prefixed >3101A) (fig. FO-2).
   - Adjust A1A2A2R21 (units prefixed <3100A) or A1A2R97 (units prefixed >3101A) for -0.56Vdc ±0.03Vdc.
3. Connect Digital Multimeter to A1A5TP2.
4. Jumper A1A5TP3 to chassis ground.
5. Set SG-1219/U RF OUTPUT ON/OFF to OFF, then ON.
   - Adjust A1A5R47 for 2.750Vdc ±0.005Vdc.
6. Remove jumper and Digital Multimeter.
7. Rotate A1A4R19 to center of its adjustment range.
8. Connect Pulse Generator output to Oscilloscope input.
9. On Pulse Generator:
   - Set pulse period range to 20NS -1µs.
   - Set pulse delay range to 35NS -1µs.
   - Set pulse width range to 10NS -1µs.
   - Set MODE to NORM.
   - Set POL to POS.
   - Set amplitude range to 4 to 10V PK.
   - Set OFFSET (+Output) to OFF.
   - Set INT LOAD to OUT.

2-45. ADJUST A1A2/A1A3/A1A4/A1A5 PULSE MODULATION—Continued.

10. Set Oscilloscope's vertical input to DC coupled, 50 ohm impedance. Adjust Pulse Generator's controls to display waveform as shown.



11. Connect output of Pulse Generator to PULSE IN connector of SG-1219/U.

12. On Oscilloscope:

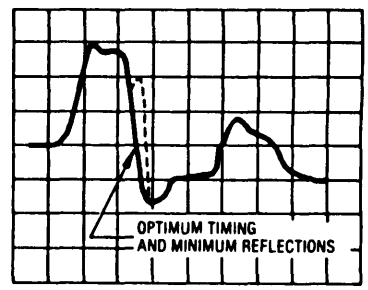
- Set input to AC mode, 1 megohm impedance.
- Connect input to XA4 pin 12 using a 10:1 probe.
- Set vertical sensitivity to 0.1V per division.

13. On SG-1219/U:

- Set frequency to 6.6GHz.
- Set PULSE NORM to ON.

14. Adjust Pulse Generator's pulse delay to center pulse waveform on Oscilloscope display.

15. Adjust A1A4R25 to obtain waveform as shown.



16. Rotate A1A4R9 fully clockwise.

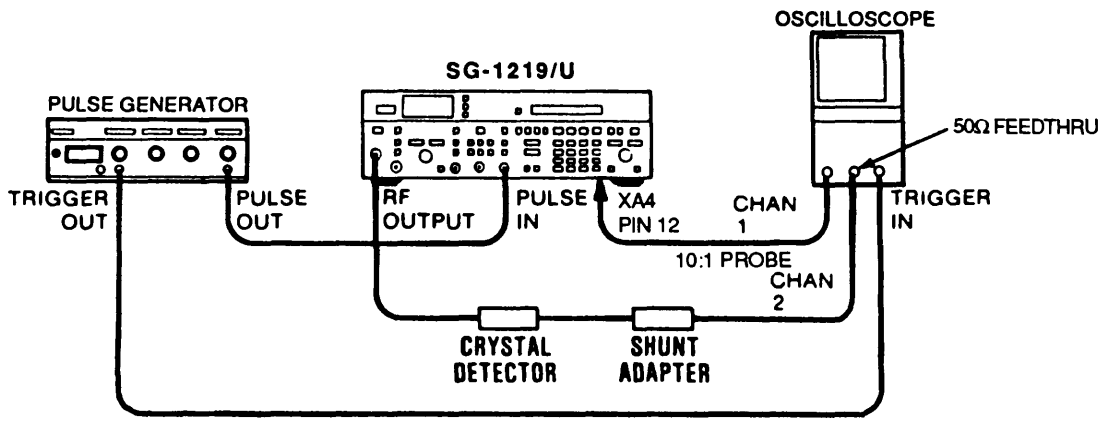
17. Set Pulse Generator's pulse period to 1µs and pulse width to 98ns.

18. Remove bottom cover (para 2-47).

19. Connect test equipment as shown.

NOTE

Cable between Oscilloscope and shunt adapter (appendix C) must not be longer than 24 inches.



2-45. ADJUST A1A2/A1A3/A1A4/A1A5 PULSE MODULATION—Continued.

20. On SG-1219/U:

- Set frequency to 6.6GHz.
- Set PULSE NORM to ON.

21. On Oscilloscope:

- Set channel 1 to 2V/DIV, AC COUPLED, 1MEG Ω.
- Set channel 2 to 0.02V/DIV, DC COUPLED, 50 Ω, Inverted.
- Set vertical display to ALT.
- Set HORIZ DISP to MAIN.
- Set sweep mode to AUTO.
- Set MAIN TRIG to DC, EXT.
- Set time to 0.05µS/DIV.

22. Set SG-1219/U output level to +8dBm.

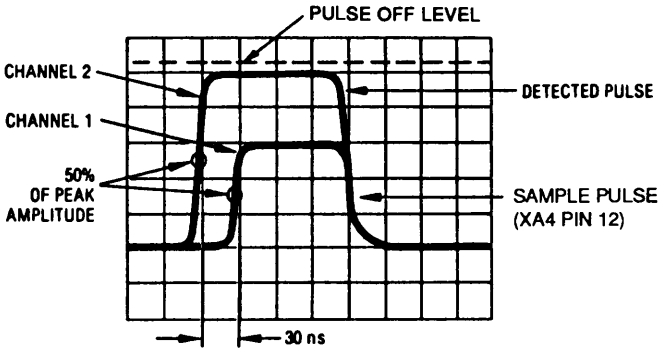
23. Adjust Oscilloscope channel 2 vertical sensitivity for maximum vertical deflection.

24. On Pulse Generator:

- Set pulse period to approximately 1µs.
- Set pulse width to 100ns ±3ns using displayed RF detected pulse waveform on Oscilloscope channel 2.

25. Switch SG-1219/U between pulse normal and pulse off modes.

- Adjust A1A4R43 to minimize difference between pulse off level and detected pulse peak in pulse norm mode. Verify within ±1dB of each other on Oscilloscope display.



26. On SG-1219/U:

- Set output level to –6dBm.
- Using OUTPUT LEVEL VERNIER, set output level to –6dBm or lowest power output that will give at least 4 divisions of deflection on Oscilloscope's 1mV/DIV range. Change Oscilloscope channel 2 coupling to DC (switch out of 50 ohm mode).

2-45. ADJUST A1A2/A1A3/A1A4/A1A5 PULSE MODULATION—Continued.

NOTE

The closer the adjustment point is to -10dBm output power, the more accurate the measurement becomes as long as a four division deflection is maintained.

27. Readjust Oscilloscope's channel 2 vertical sensitivity for a display greater than 4 divisions.

- Adjust A1A4R52 to minimize difference between pulse off level and detected pulse peak in pulse norm mode.

28. Repeat steps 22 thru 27 until error is minimized at both power output levels.

NOTE

- Use DC 50 ohm coupling when making high output level adjustments.
- Adjust the sample pulse as wide as possible without sacrificing accuracy.

29. On SG-1219/U:

- Set output frequency to 6.6GHz.
- Set PULSE NORM to ON.

30. On Pulse Generator:

- Set pulse period to approximately 1µs.
- Set pulse width to 80ns ±3ns while using Oscilloscope display.

31. Rotate A1A4R9 in a counterclockwise direction until ALC UNLEVELED light on SG-1219/U just goes out.

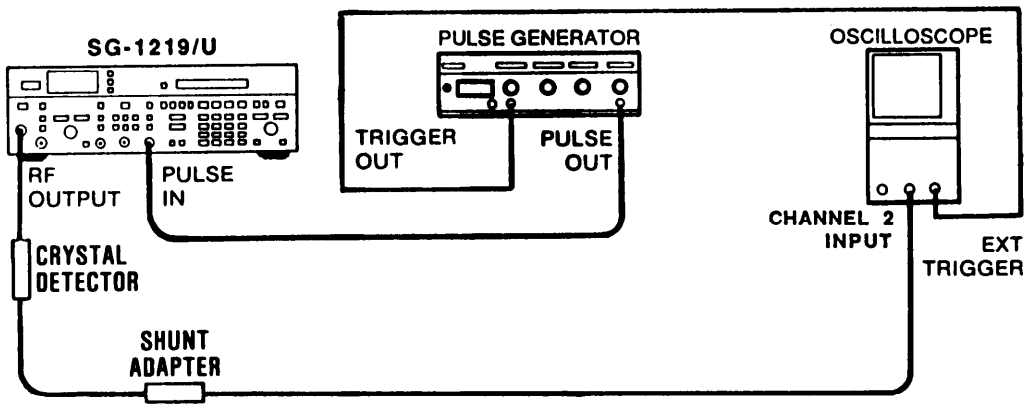
32. Set Pulse Generator's pulse width vernier fully clockwise, then slowly rotate it counterclockwise. Verify ALC UNLEVELED light on SG-1219/U turns on shortly after pulse width narrows to less than 80ns.

33. Disconnect test equipment.

34. Install bottom cover (para 2-47).

2-46. ADJUST A1A8 PULSE AMPLITUDE CONTROL

1. Connect equipment as shown below.



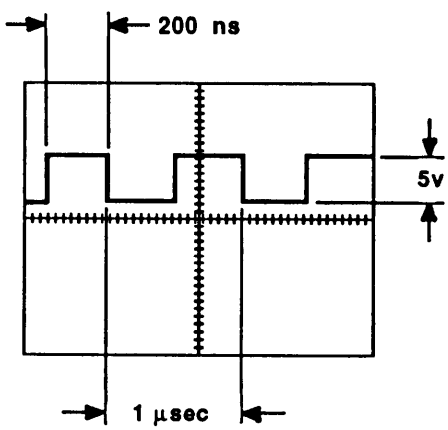
2. On SG-1219/U:

   - Press number 6 push button.
   - Press service switch A2A2S1 (fig. FO-3).

3. On Pulse Generator:

   - Set pulse period range to 20NS -1µs.
   - Set pulse delay range to 35NS -1µs.
   - Set pulse width range to 10NS -1µs.
   - Set MODE to NORM.
   - Set POL to POS.
   - Set amplitude range to 4 to 10V PK.
   - Set OFFSET (+Output) to OFF.
   - Set INT LOAD to OUT.

4. Set Oscilloscope channel 2 input to DC coupled, 50 Ω impedance, inverted. Adjust Pulse Generator amplitude to display waveform as shown.



2-46. ADJUST A1A8 PULSE AMPLITUDE CONTROL—Continued.

5. On SG-1219/U:
   - Press RCL then number 2 push button.
   - Set output power level to –6dBm.
   - Using OUTPUT LEVEL VERNIER, set output power level to –10dBm.
   - Set PULSE NORM to ON.
6. Set SG-1219/U frequency to 6.600002GHz. Set Oscilloscope input coupling to DC 1MEG Ω.
   - Adjust A1A8R13 overshoot and undershoot to under 20%.
7. Using TUNE KNOB, tune SG-1219/U to 12.2GHz.
   - Adjust A1A8R10 for a pulse shape with less than 20% overshoot and undershoot.
8. Using TUNE KNOB, tune SG-1219/U to 6.600002GHz. Using OUTPUT LEVEL VERNIER, set output power level to +3dBm. Switch Oscilloscope input coupling to DC 50 Ω.
   - Adjust A1A8R13 for a detected pulse with less than 20% overshoot and undershoot.
9. Using TUNE KNOB, tune SG-1219/U to 12.200000GHz.
   - Adjust A1A8R10 for a detected pulse with less than 20% overshoot and undershoot.
10. Repeat steps 6 thru 9 until four points are within specifications.
11. Using OUTPUT LEVEL VERNIER, set SG-1219/U output power level to +3dBm.
12. Using TUNE KNOB, tune SG-1219/U from 6.600002GHZ to 12.200000GHz and verify that detected pulse has less than 20% overshoot and undershoot.
13. Repeat steps 11 and 12 with output power levels of –5 and –10dBm. Use DC 1MEG ohm coupling to view –10dBm pulse.
14. On SG-1219/U:
    - Press RCL then number 3 push buttons.
    - Set frequency to 12.300003GHz.
    - Set output power level to –6dBm.
    - Using OUTPUT LEVEL VERNIER, set output power level to -10dBm.
    - Adjust A1A8R14 for a detected pulse with less than 20% overshoot and undershoot.

2-46. ADJUST A1A8 PULSE AMPLITUDE CONTROL—Continued.

15. Using TUNE KNOB, tune SG-1219/U to 18.599901GHz.

- Adjust AlA8R11 for a detected pulse with less than 20% overshoot and undershoot.

16. Using TUNE KNOB, tune SG-1219/U 12.300003GHz. Using OUTPUT LEVEL VERNIER, set output power level to +3dBm. Switch Oscilloscope input coupling to DC 50 Ω.

- Adjust AlA8R14 for a detected pulse with less than 20% overshoot and undershoot.

17. Using TUNE KNOB, tune SG-1219/U to 18.599901GHz.

- Adjust AlA8R11 for a detected pulse with less than 20% undershoot and overshoot.

18. Repeat steps 14 thru 17 until all four frequency/power output levels are within specifications.

19. Set SG-1219/U output power level to +3dBm.

20. Using TUNE KNOB, tune from 12.300003 to 18.599901GHz and verify that detected pulse has less than 20% overshoot and undershoot.

21. Repeat steps 29 and 30 with output power levels of -5 and –10dBm. Use DC 1MEG ohm coupling to view -10dBm pulse.

22. Disconnect test equipment.

2-47. REPLACE TOP/BOTTOM COVERS.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

WARNING

DANGEROUS VOLTAGES ARE PRESENT WITH COVERS REMOVED.

NOTE

PRELIMINARY PROCEDURES:

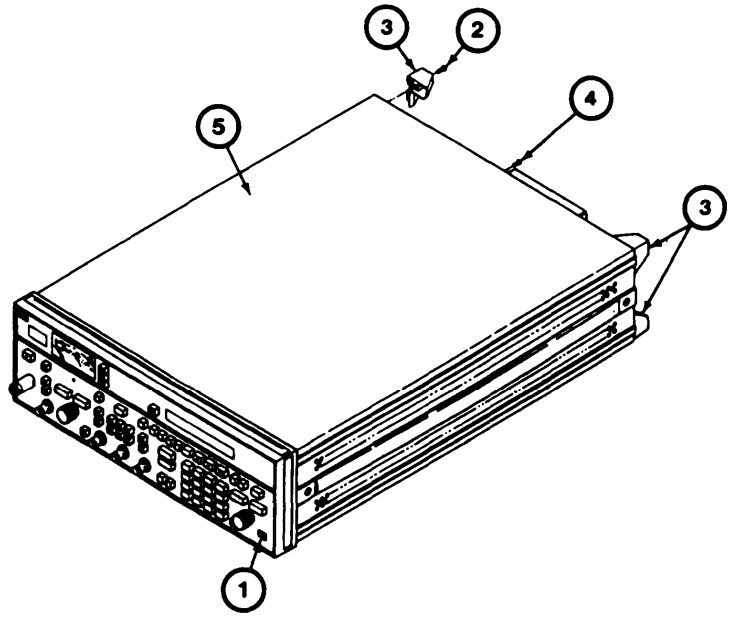
Task same for top and bottom covers. Only top cover shown.

REMOVE

1. Set power switch (1) to off and remove power cable from source.
2. Remove two screws (2) and two upper rear bumpers (3).
3. Loosen top cover retaining screw (4).
4. Slide back and remove top cover (5).

INSTALL

1. Install top cover (5) and slide forward until retaining screw (4) contacts rear frame.
2. Tighten top cover retaining screw (4).
3. Install two upper rear bumpers (3) and two screws (2).



END OF TASK

2-48. REPLACE SIDE COVERS.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

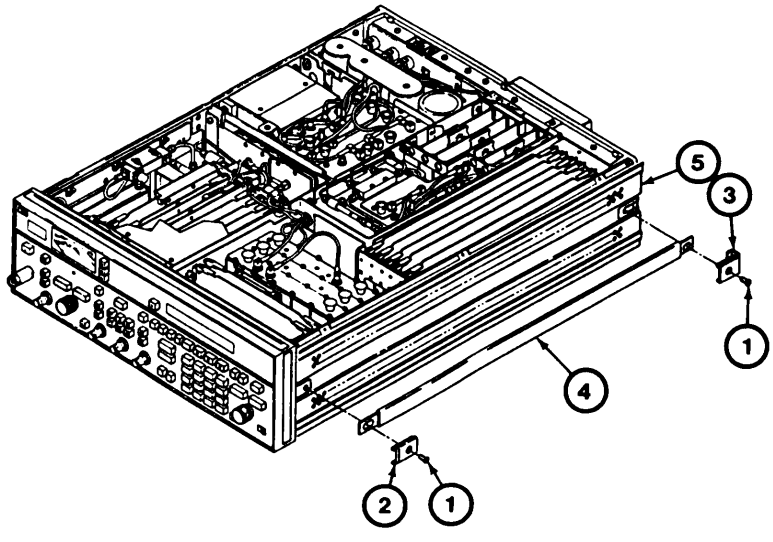
NOTE

PRELIMINARY PROCEDURES:

- Task same for right and left covers. Only right side shown.
- Remove top and bottom covers (para 2-47).

REMOVE

1. Remove two screws (1) and handle retainers front (2) and rear (3).
2. Remove side handle (4).
3. Slide back and remove side cover (5).



INSTALL

1. Install side cover (5), and slide forward.
2. Install side handle (4), front handle retainer (2), rear handle retainer (3), and two screws (1).

NOTE

FOLLOW-ON MAINTENANCE:

Install bottom and top covers (para 2-47).

END OF TASK

2-49. REPLACE FRONT FRAME.

DESCRIPTION

This procedure covers: Remove. Install

INITIAL SETUP

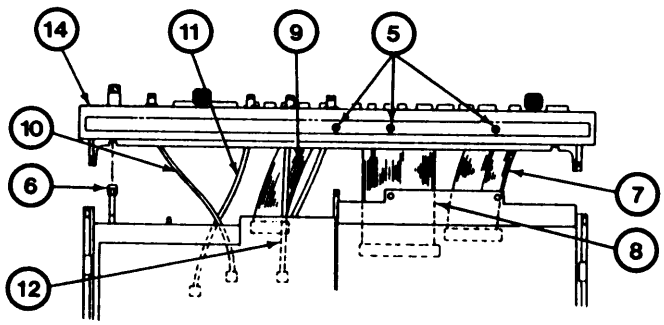
NOTE

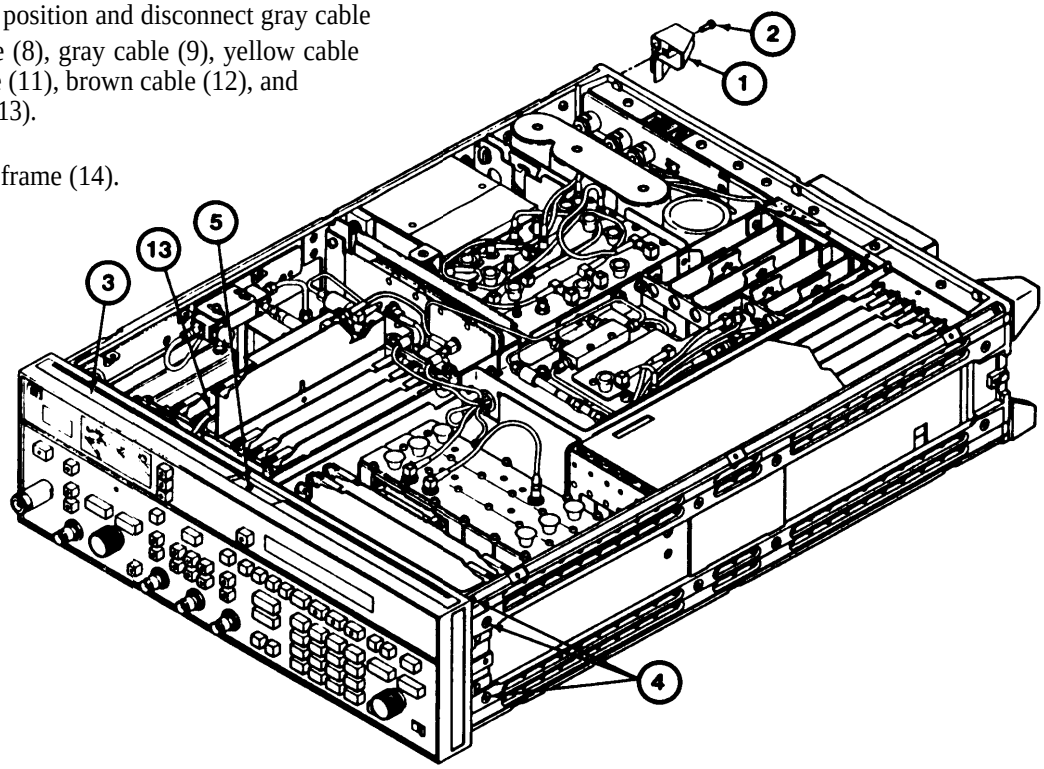
PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Remove both side covers (para 2-48).

REMOVE

1. Install four rear bumpers (1) and four screws (2). Stand Signal Generator on rear bumpers.
2. Remove top trim (3).
3. Remove eight screws (4) and four screws (5), and rigid cable (6).
4. Gently pull up and remove frame from chassis. Hold frame in position and disconnect gray cable (7), gray cable (8), gray cable (9), yellow cable (10), red cable (11), brown cable (12), and orange cable (13).
5. Remove front frame (14).





2-49. REPLACE FRONT FRAME—Continued.

INSTALL

1. Position front frame (14) on chassis and connect gray cable (7), gray cable (8), gray cable (9), yellow cable (10), red cable (11), brown cable (12), and orange cable (13).
2. Folding cables in place, install front frame in chassis.
3. Install eight screws (4) and four screws (5), and rigid cable (6).
4. Install top trim (3).
5. Lay Signal Generator on bottom side and remove four rear bumpers (1) and four screws (2).

NOTE

FOLLOW-ON MAINTENANCE:

- Install both side covers (para 2-48).
- Install top and bottom covers (para 2-47).

END OF TASK

2-50. REPLACE FRONT PANEL.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

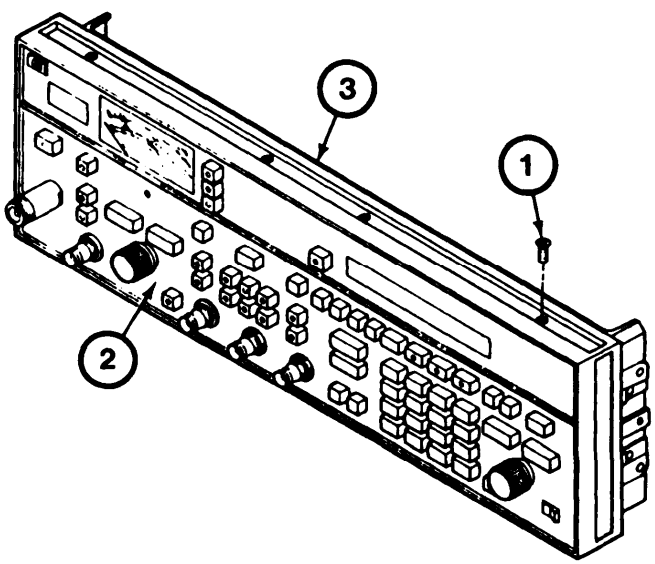
- Remove top and bottom covers (para 2-47).
- Remove both side covers (para 2-48).
- Remove front frame (para 2-49).

REMOVE

1. Remove eight screws (1).
2. From rear, gently push front panel (2) out of frame (3).

INSTALL

1. From front, gently install panel (2) in frame (3).
2. Install eight screws (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install front frame (para 2-49).
- Install both side covers (para 2-48).
- Install bottom and top covers (para 2-47).

END OF TASK

2-51. REPLACE REAR FRAME.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

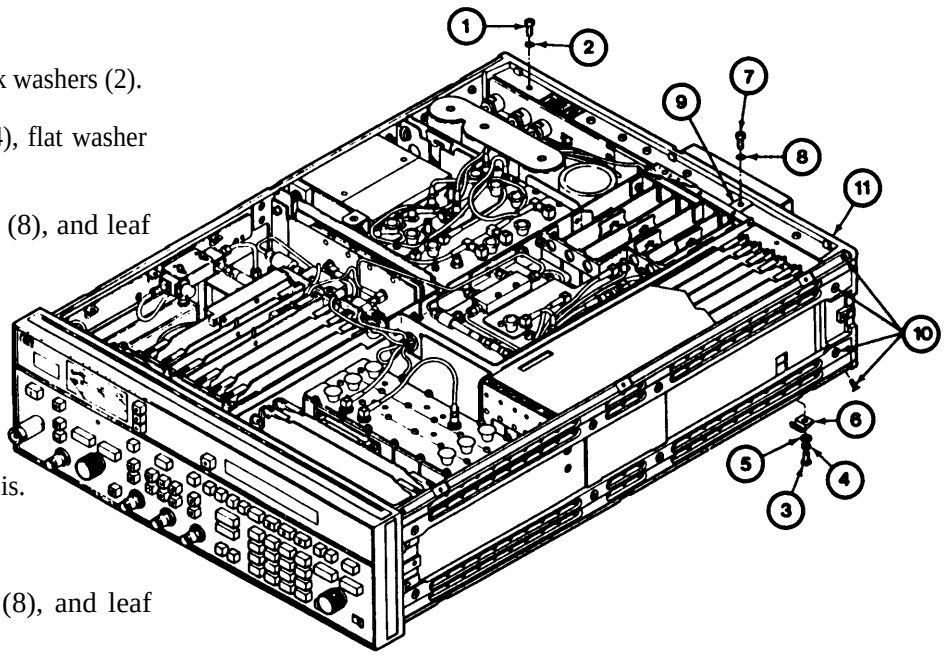
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Remove both side covers (para 2-48).

REMOVE

1. Remove twelve screws (1) and lock washers (2).
2. Remove screw (3), lock washer (4), flat washer (5), and cable clamp (6).
3. Remove screw (7), lock washer (8), and leaf spring (9).
4. Remove eight screws (10).
5. Pull rear frame (11) out of chassis.



INSTALL

1. Position rear frame (11) into chassis.
2. Install eight screws (10).
3. Install screw (7), lock washer (8), and leaf spring (9).
4. Install screw (3), lock washer (4), flat washer (5), and cable clamp (6).
5. Install twelve screws (1) and lock washers (2).

NOTE

FOLLOW-ON MAINTENANCE:

- Install both side covers (para 2-48).
- Install bottom and top covers (para 2-47).

END OF TASK

2-52. REPLACE A1 ACCESS COVER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

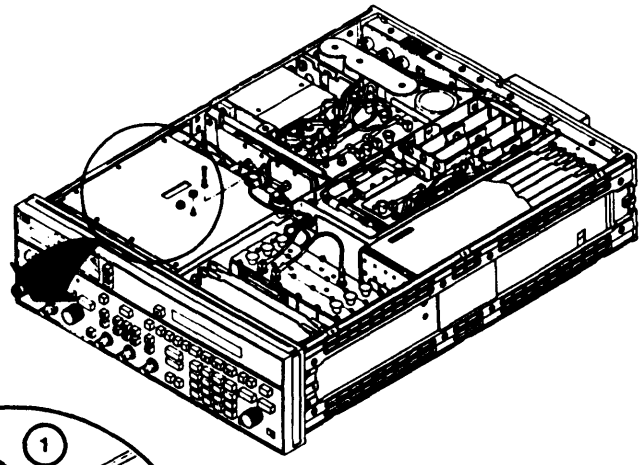
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).

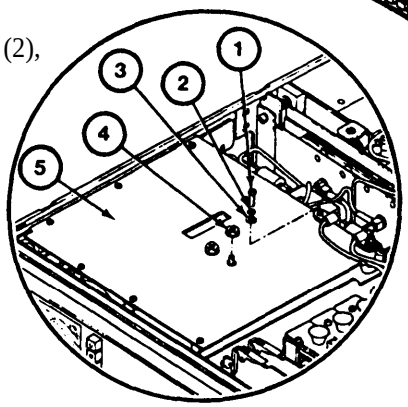
REMOVE

1. Remove eight screws (1) eight lock washers (2), and two flat washers (3).
2. Remove two nuts (4).
3. Remove access cover (5).



INSTALL

1. Install access cover (5).
2. Install two nuts (4).
3. Install eight screws (1) eight lock washers (2), and two flat washers (3).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-53. REPLACE A1A1 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

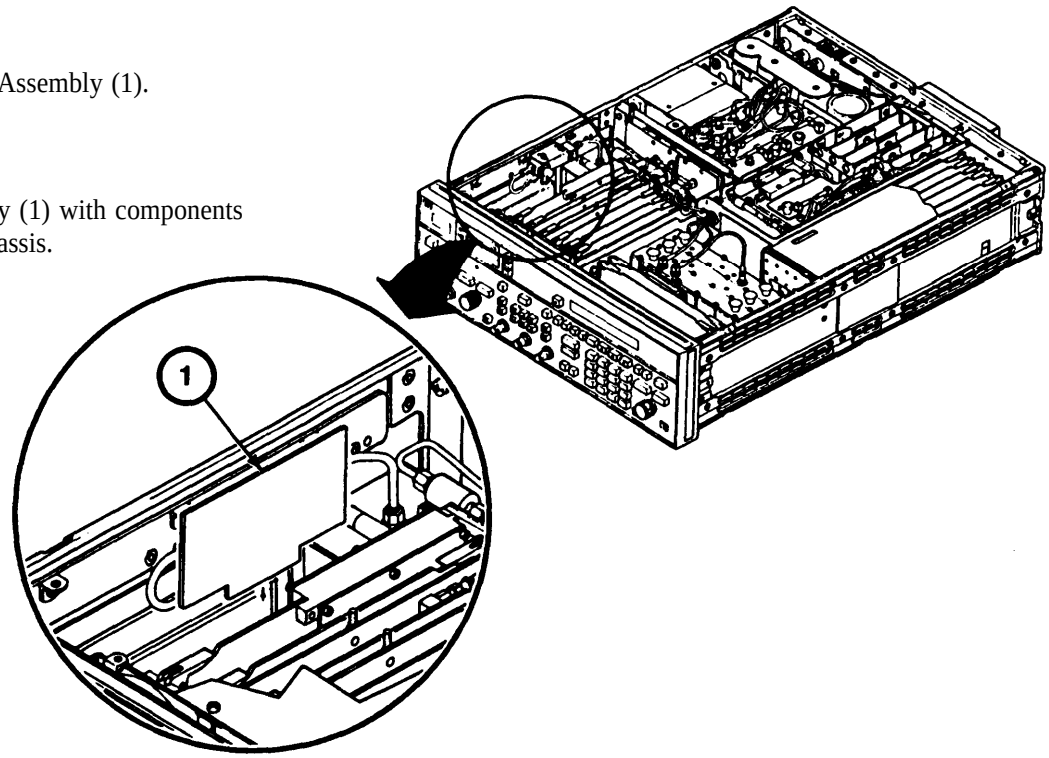
- Remove top cover (para 2-47).
- Remove A1 access cover (para 2-52).

REMOVE

1. Gently remove A1A1 Assembly (1).

INSTALL

1. Install A1A1 Assembly (1) with components facing outward into chassis.



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-54. REPLACE A1A2 ASSEMBLY.

DESCRIPTION

This procedure covers Remove. Install.

INITIAL SETUP

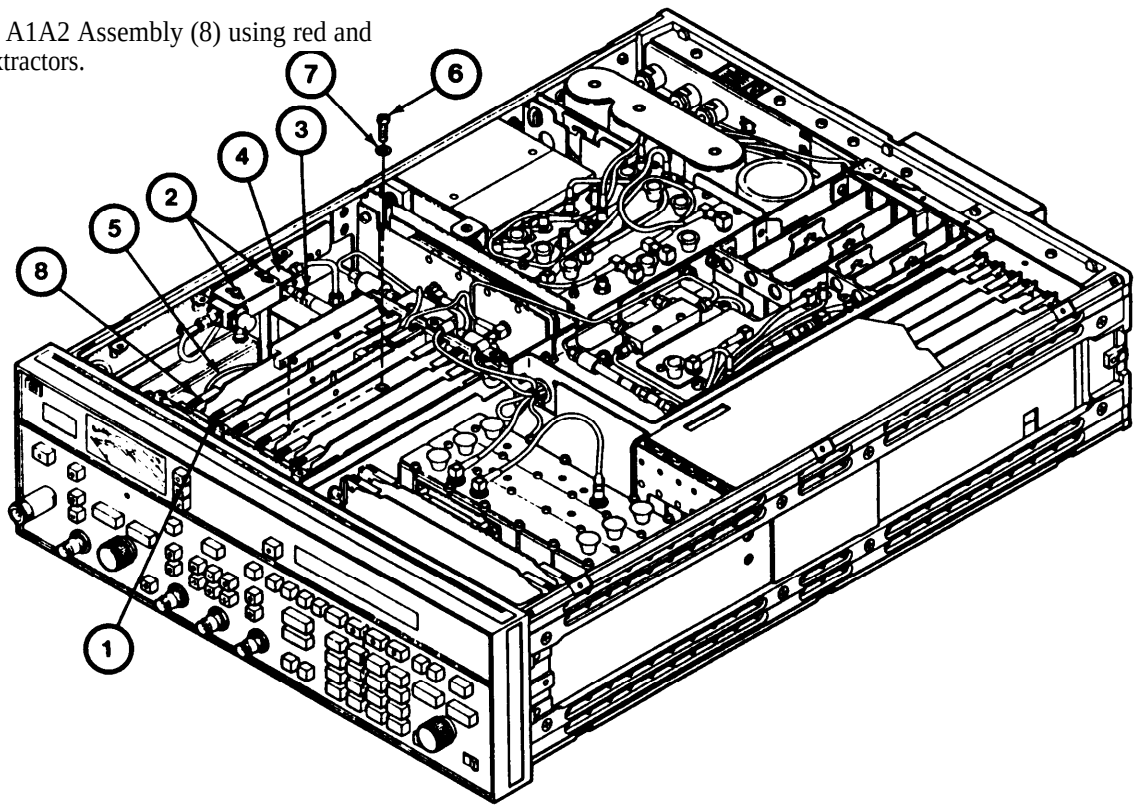
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).
- Remove A1 access cover (para 2-52).

REMOVE

1. Gently remove A1A3 Assembly (1) using orange and black extractors.
2. Loosen two screws (2).
3. Loosen A1CR1 Crystal Detector (3) nut attached to A1DC1 Directional Coupler (4).
4. Disconnect green cable (5).
5. On units with serial prefixes <3100A, remove screw (6) and lock washer (7).
6. Remove A1A2 Assembly (8) using red and black extractors.



2-54. REPLACE A1A2 ASSEMBLY—Continued.

INSTALL

1. Install A1A2 Assembly (8) with components facing outward.
2. On units with serial prefixes <3100A, install screw (6) and lock washer (7).
3. Connect green cable (5).
4. Tighten A1CR1 Crystal Detector (3) nut attached to A1DC1 Directional Coupler (4).
5. Tighten two screws (2).
6. Install A1A3 Assembly (1) with components facing outward.

NOTE

FOLLOW-ON MAINTENANCE

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-55. REPLACE A1A2A1/A1A2A2 ASSEMBLIES.

NOTE

Do to the one-way interchangeability between units prefixed >3101A and <3100A, these subassemblies are no longer separately replaceable.

This procedure has been deleted

2-56. REPLACE A1A3 THRU A1A8 ASSEMBLIES.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

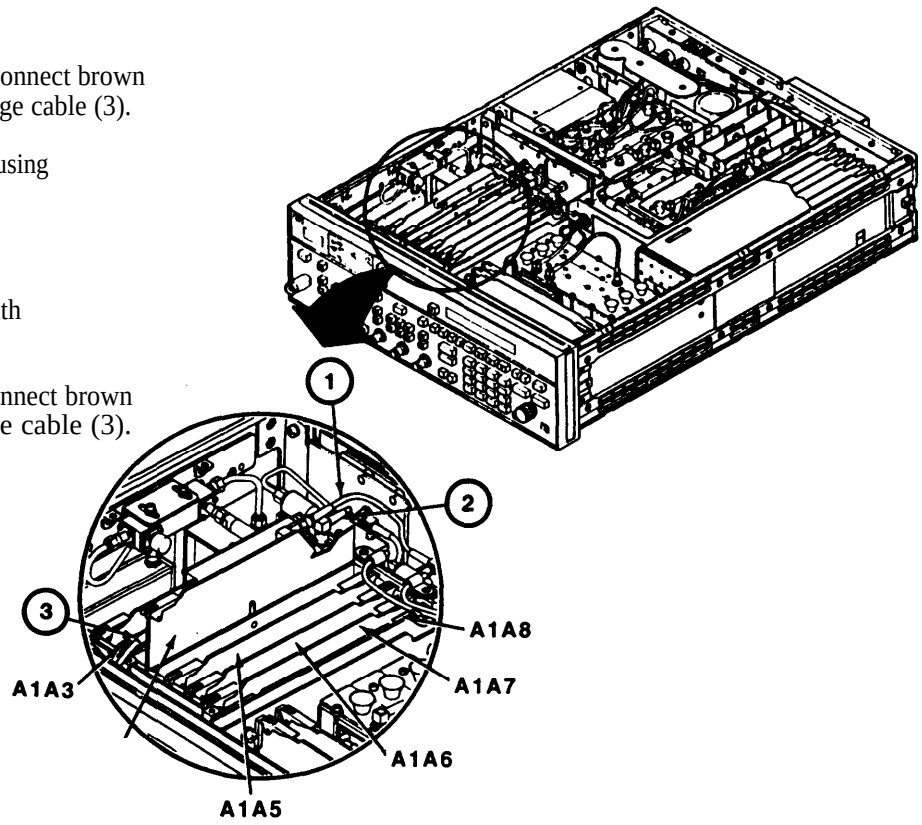
- Remove top cover (para 2-47).
- Remove A1 access cover (para 2-52).

REMOVE

1. If removing A1A4 Assembly, disconnect brown cable (l), white cable (2), and orange cable (3).
2. Gently remove desired Assembly using extractors.

INSTALL

1. Install Assembly in proper slot with components facing outward.
2. If installing A1A4 Assembly, reconnect brown cable (1), white cable (2), and orange cable (3).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-57. REPLACE A1A9 ASSEMBLY (UNITS PREFIXED <3100A ONLY).

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

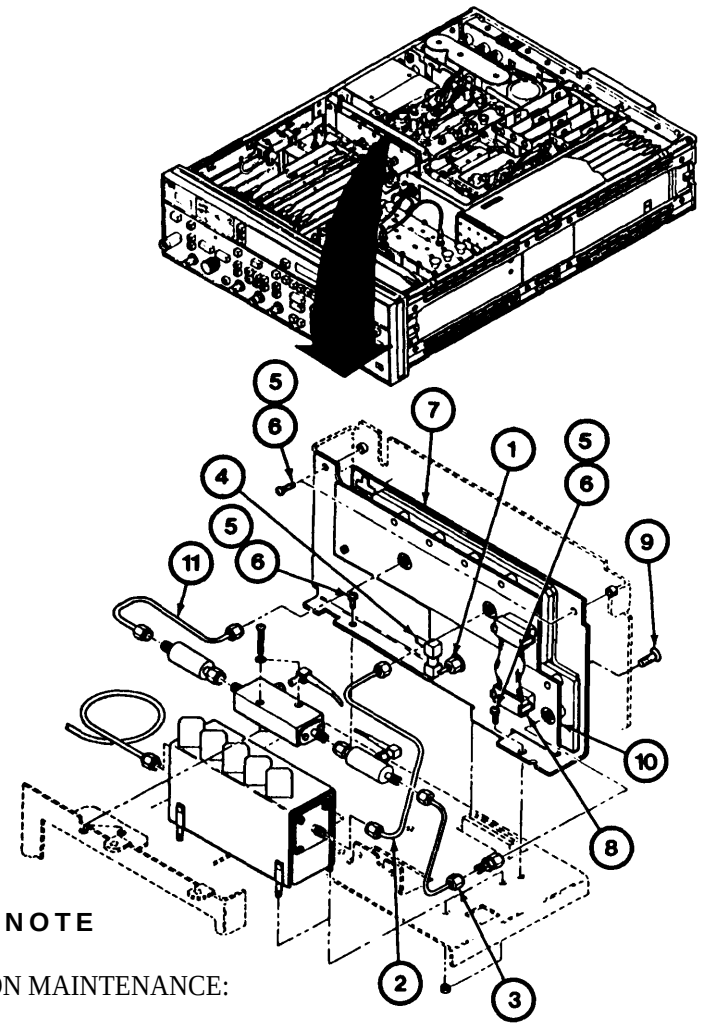
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).
- Remove A1 access cover (para 2-52).

REMOVE

1. Disconnect rigid cable (1), rigid cable (2), rigid cable (3), rigid cable (11), and green cable (4).
2. Remove four screws (5) and four lock washers (6).
3. Remove A1A9/A1A11 and bracket combination (7).
4. Remove ribbon cable (8) and rigid cable (1).
5. Remove eight screws (9).
6. Remove A1A9 Assembly (10).



INSTALL

1. Install A1A9 Assembly (10) on bracket using thermal compound (appendix B, item 3).
2. Install eight screws (9).
3. Install ribbon cable (8) and rigid cable (1).
4. Install A1A9/A1A11 and bracket combination (7) with components facing forward into chassis.
5. Install four screws (5) and four lock washers (6).
6. Connect rigid cable (1), rigid cable (2), rigid cable (3), rigid cable (11), and green cable (4).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-58. REPLACE A1A10 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

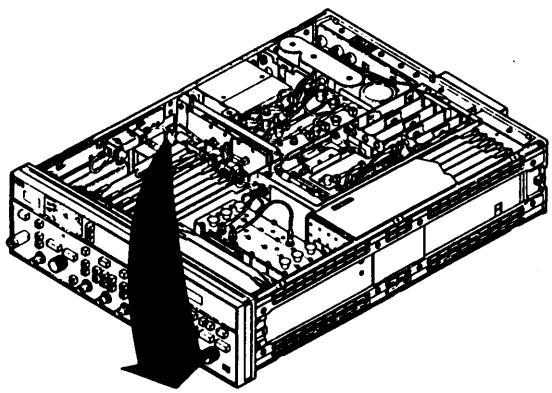
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Remove A1 access cover (para 2-52).
- Remove A1DC1 Directional Coupler (para 2-67).
- If SG-1219/U serial prefix is <3100A, remove A1FL1 High Pass Filter (para 2-68).

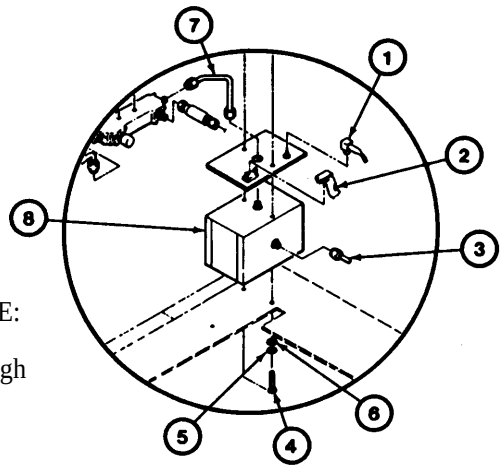
REMOVE

1. Disconnect white cable (1), ribbon cable (2), and rigid cable (3).
2. Remove two screws (4), two lock washers (5), and two flat washers (6).
3. Remove rigid cable (7).
4. Remove A1A10 Assembly (8).



INSTALL

1. Install A1A10 Assembly (8) in chassis.
2. Install rigid cable (7).
3. Install two screws (4), two lock washers (5), and two flat washers (6).
4. Connect white cable (1), ribbon cable (2), and rigid cable (3).



NOTE

FOLLOW-ON MAINTENANCE:

- If SG-1219/U serial prefix is <3100A, install A1FL1 High Pass Filter (para 2-68).
- Install A1DC1 Directional Coupler (para 2-67).
- Install A1 access cover (para 2-52).
- Install top and bottom covers (para 2-47).

END OF TASK

2-59. REPLACE A1A10A1 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

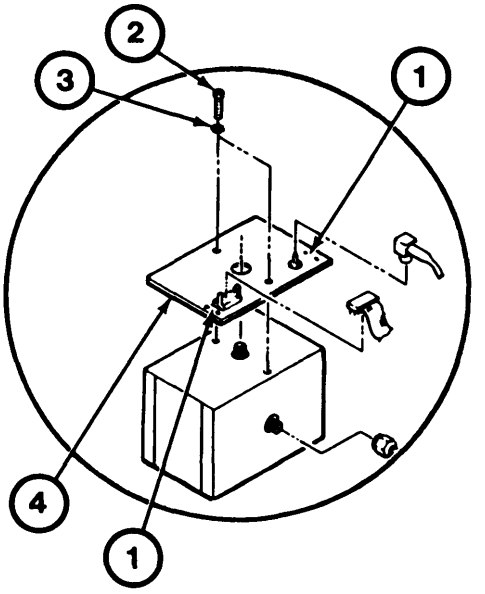
- Remove top and bottom covers (para 2-47).
- Remove A1 access cover (para 2-52).
- Remove A1A10 Assembly (para 2-58).

REMOVE

1. Working from top, tag, unsolder and disconnect four wires (1).
2. Remove two screws (2) and two lock washers (3).
3. Remove A1A10A1 Assembly (4).

INSTALL

1. Install A1A10A1 Assembly (4) on A1A10 Assembly. Verify insulator (5) is in place.
2. Install two screws (2) and two lock washers (3).
3. Working from top, connect and solder four wires (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1A10 Assembly (para 2-58).
- Install A1 access cover (para 2-52).
- Install top and bottom covers (para 2-47).

END OF TASK

2-60. REPLACE A1A11 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

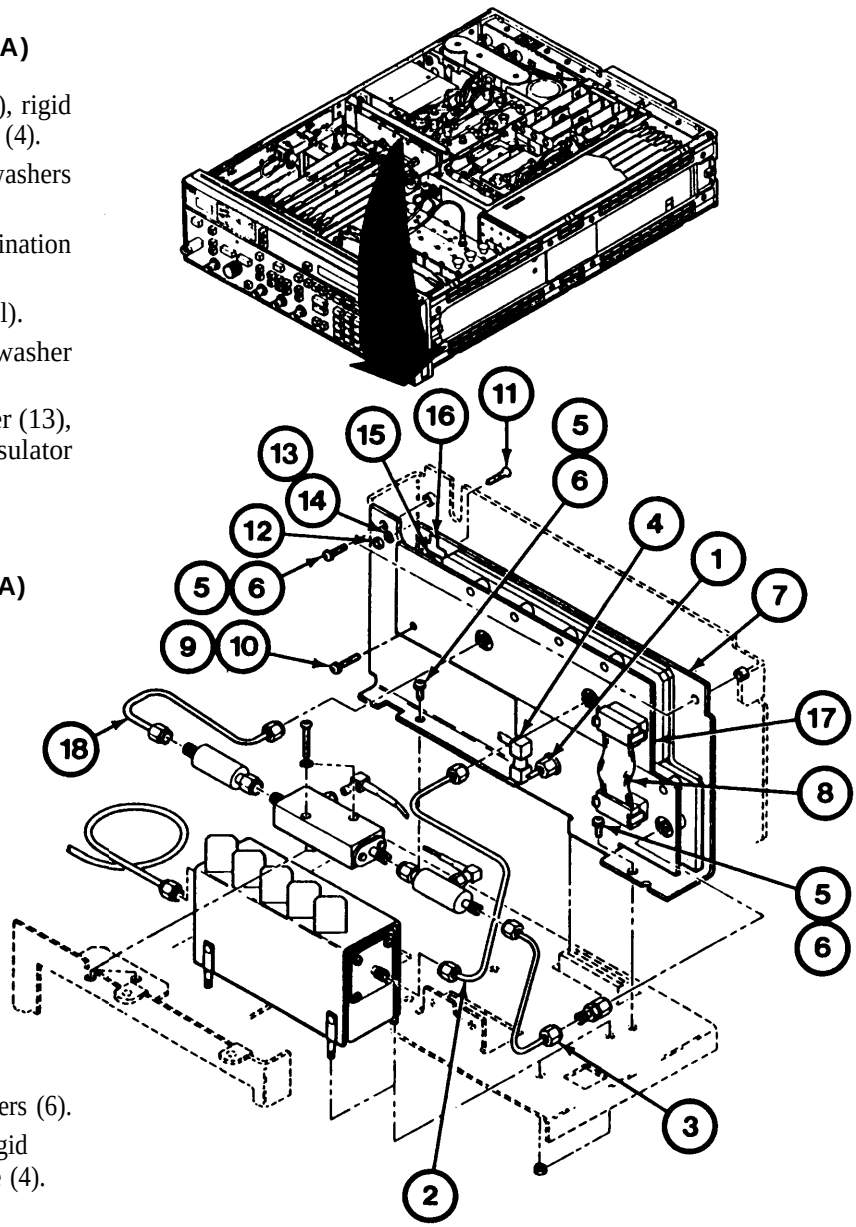
- Remove top cover (para 2-47).
- Remove A1 access cover (para 2-52).

REMOVE (UNITS PREFIXED <3100A)

1. Disconnect rigid cable (1), rigid cable (2), rigid cable (3), rigid cable (18), and green cable (4).
2. Remove four screws (5) and four lock washers (6).
3. Remove A1A9/A1A11 and bracket combination (7).
4. Remove ribbon cable (8) and rigid cable (l).
5. Remove nine screws (9) and one lock washer (lo).
6. Remove screw (11), nut (12), flat washer (13), lock washer (14), insulator (15), and insulator (16).
7. Remove A1A11 Assembly (17).

INSTALL (UNITS PREFIXED <3100A)

1. Install A1A11 Assembly (17) on bracket using thermal compound (appendix B, item 3).
2. Install insulator (16) using thermal compound (appendix B, item 3), screw (11), nut (12), flat washer (13), lock washer (14), and insulator (15).
3. Install nine screws (9) and one lock washer (10).
4. Install ribbon cable (8) and rigid cable (1).
5. Install A1A9/A1A11 and bracket combination (7) with components facing forward into chassis.
6. Install four screws (5) and four lock washers (6).
7. Connect rigid cable (1), rigid cable (2), rigid cable (3), rigid cable (18), and green cable (4).



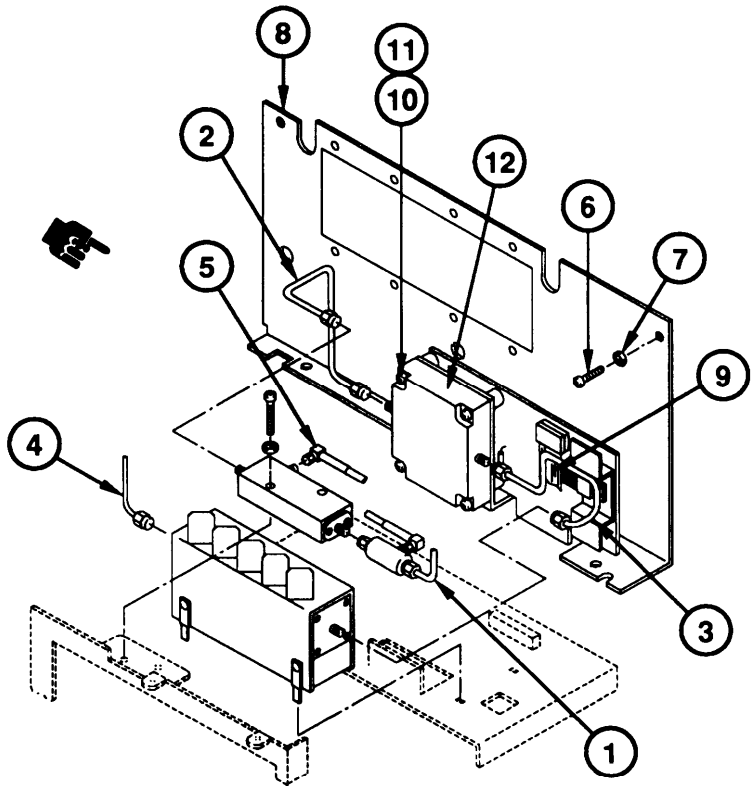
2-60. REPLACE A1A11 ASSEMBLY—Continued.

REMOVE (UNITS PREFIXED >3101A)

1. Disconnect rigid cable (1), rigid cable (2), rigid cable (3), rigid cable (4), and blue cable (5).
2. Remove four screws (6) and four lockwashers (7).
3. Remove A1A11 and bracket combination (8).
4. Remove ribbon cable (9).
5. Remove four screws (10) and lockwashers (11).
6. Remove A1A11 Assembly (12).

INSTALL (UNITS PREFIXED >3101A)

1. Install A1A11 Assembly (12) on bracket.
2. Install four screws (10) and lockwashers (11).
4. Install ribbon cable (9).
5. Install A1A11 and bracket combination (8) with components facing forward into chassis.
6. Install four screws (6) and four lock washers (7).
7. Connect rigid cable (1), rigid cable (2), rigid cable (3), rigid cable (4), and blue cable (5).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-61. REPLACE A1AT1 PROGRAMMABLE ATTENUATOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

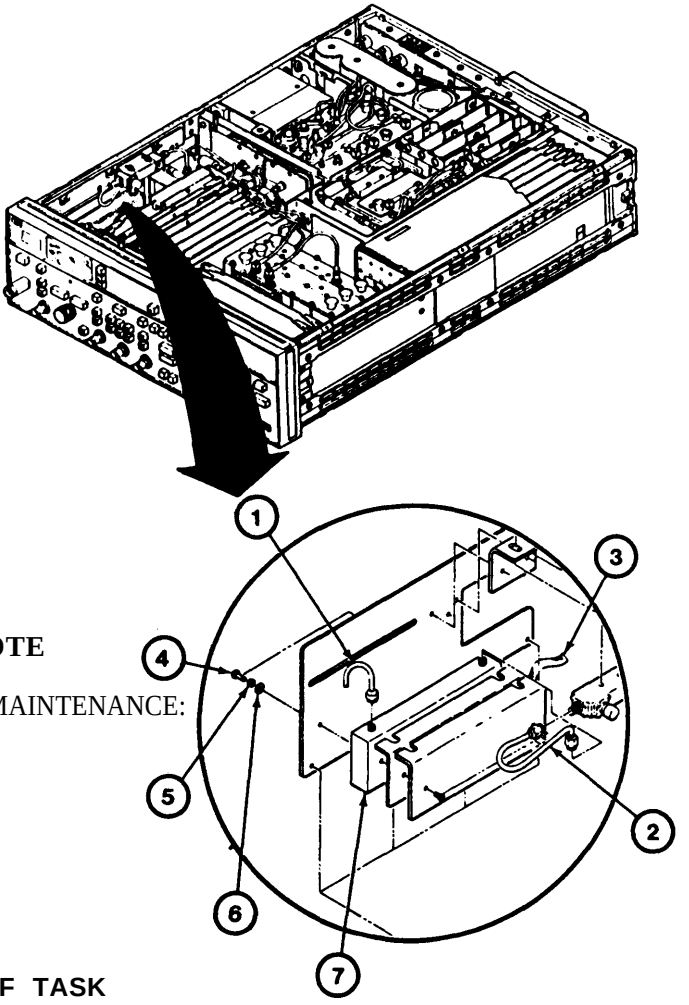
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).
- Remove left side cover (para 2-48).
- Remove A1 access cover (para 2-52).
- Remove A1A1 Attenuator Driver Assembly (para 2-53).

REMOVE

1. Disconnect rigid cable (1), rigid cable (2), and ribbon cable (3).
2. Remove two screws (4), two lock washers (5), and two flat washers (6).
3. Remove A1AT1 Programmable Attenuator (7) from chassis.



INSTALL

1. Position A1AT1 Programmable Attenuator (7) in chassis.
2. Install two screws (4), two lock washers (5), and two flat washers (6).
3. Connect rigid cable (1), rigid cable (2), and ribbon cable (3).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A1A1 Assembly (para 2-53).
- Install A1 access cover (para 2-52).
- Install left side cover (para 2-48).
- Install top cover (para 2-47).

END OF TASK

2-62. REPLACE A1AT2 ISOLATOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

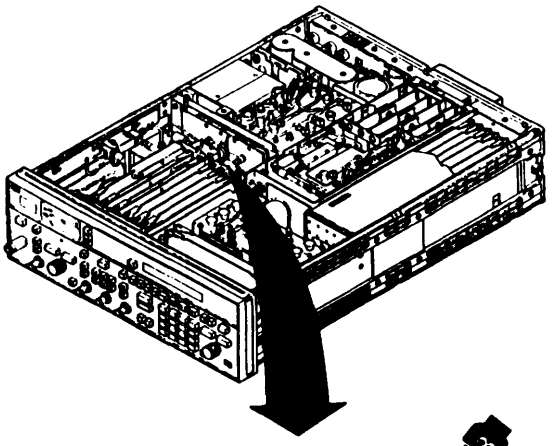
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Remove A1 access cover (para 2-52).
- Remove A1CP1 Bias Tee (para 2-65).
- Remove A1AT3 Pulse Modulator (para 2-63).
- If SG-1219/U serial prefix is <3100A, remove A1FL1 High Pass Filter (para 2-68).
- If SG-1219/U serial prefix is <3100A, remove A1A9 Assembly (para 2-57 only to step 3).
- If SG-1219/U serial prefix is >3101A, remove A1A11 Assembly (para 2-60).
- Remove A1A10 Assembly (para 2-58).

REMOVE

1. Remove four nuts (1).
2. Tilt support (2) to side and remove A1AT2 Isolator (3) and insulator (4).



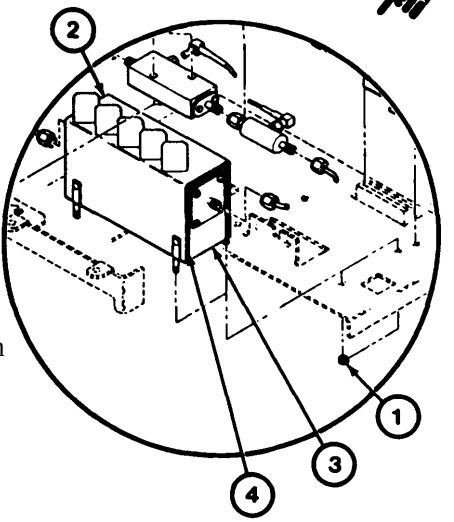
INSTALL

1. Wrap insulator (4) around A1AT2 Isolator (3) and slide into support (2).
2. Install support (2) into chassis and install four nuts (1).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A1A10 Assembly (para 2-58).
- If SG-1219/U serial prefix is >3101A, install A1A11 Assembly (para 2-60).
- If SG-1219/U serial prefix is >3101A, install A1A9 Assembly (para 2-57).
- Install A1CP1 Bias Tee (para 2-65).
- Install A1AT3 Pulse Modulator (para 2-63).
- If SG-1219/U serial prefix is >3101A, install A1FL1 High Pass Filter (para 2-68).
- Install A1 access cover (para 2-52).
- Install top and bottom covers (para 2-47).



END OF TASK

2-63. REPLACE A1AT3 PULSE MODULATOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

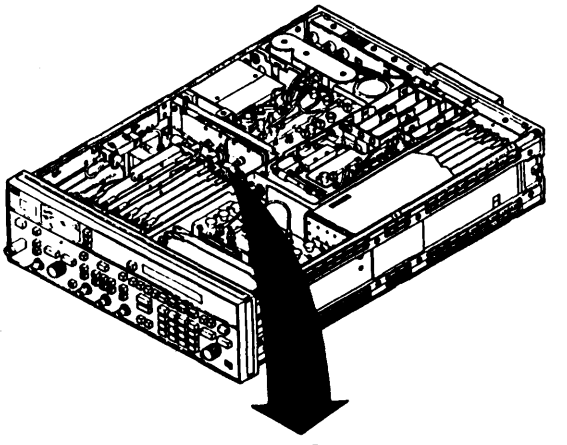
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).
- Remove A1 access cover (para 2-52).

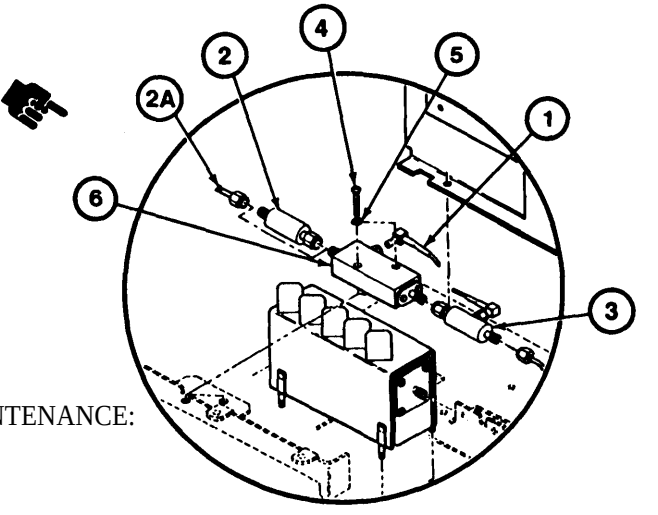
REMOVE

1. Disconnect blue cable (l).
2. Disconnect A1FL1 High Pass Filter (2) for units prefixed <3100A, or rigid cable (2A) for units prefixed >3101A.
3. Disconnect A1CP1 Bias Tee (3).
4. Remove two screws (4) and lock washers (5).
5. Remove A1AT3 Pulse Modulator (6).



INSTALL

1. Install A1AT3 Pulse Modulator (6) on bracket.
2. Install two screws (4) and lock washers (5).
3. Connect A1CP1 Bias Tee (3).
4. Connect A1FL1 High Pass Filter (2) for units prefixed <3100A, or rigid cable (2A) for units prefixed >3101A.
5. Connect blue cable (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-64. REPLACE A1AT4 ATTENUATOR (UNITS PREFIXED <3100A ONLY).

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

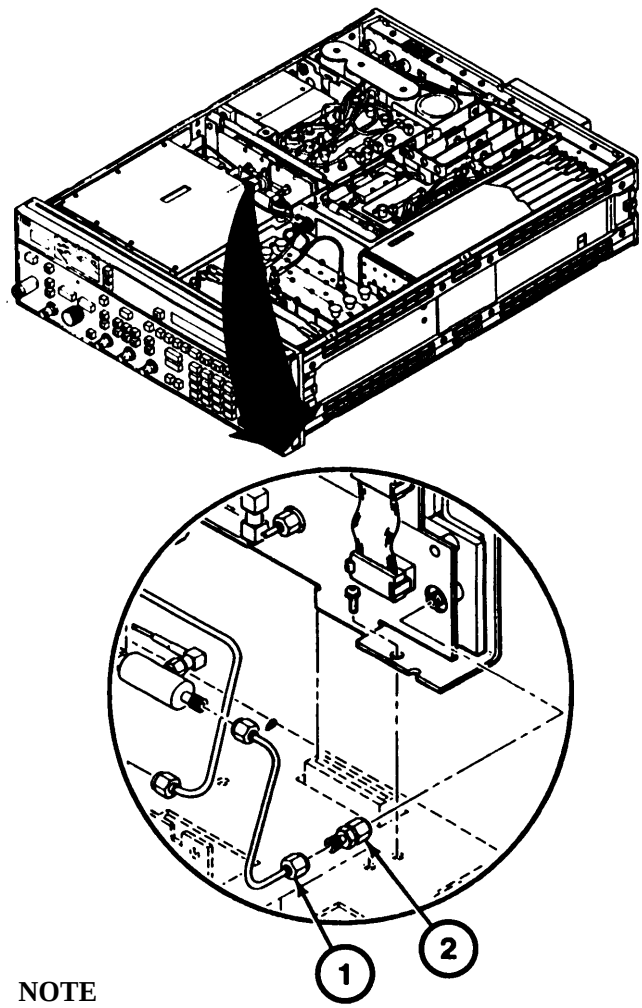
- Remove top cover (para 2-47).

REMOVE

1. Remove rigid cable (1).
2. Remove A1AT4 Attenuator (2).

INSTALL

1. Install A1AT4 Attenuator (2) to A1A9 Assembly.
2. Connect rigid cable (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-65. REPLACE A1CP1 BIAS TEE.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

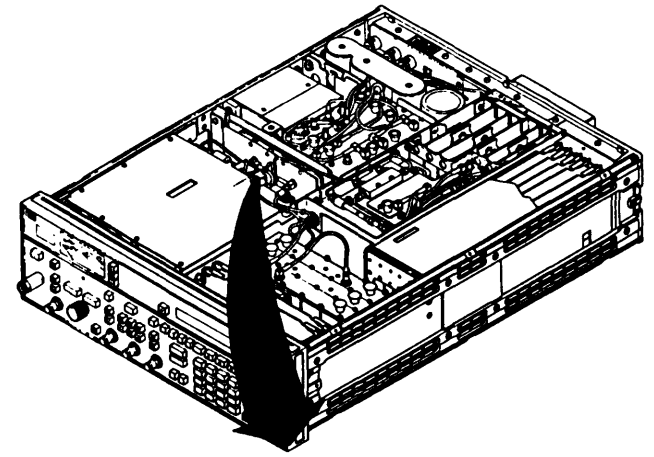
- Remove top cover (para 2-47).

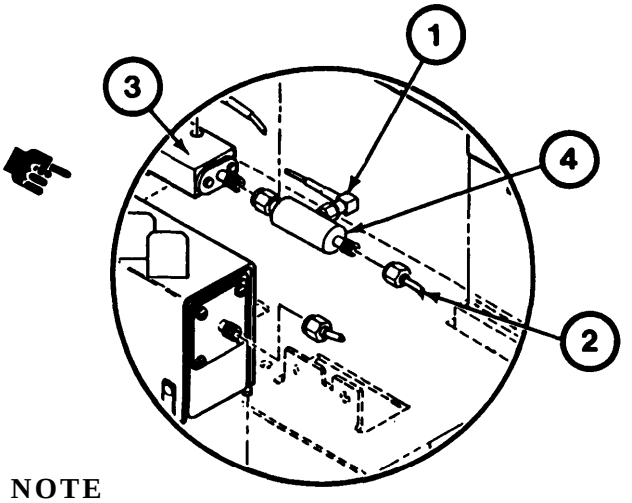
REMOVE

1. Disconnect brown cable (1) and rigid cable (2).
2. Disconnect A1AT3 Pulse Modulator (3).
3. Remove A1CP1 Bias Tee (4).

INSTALL

1. Install A1CP1 Bias Tee (4) in chassis.
2. Connect A1AT3 Pulse Modulator (3).
3. Connect brown cable (1) and rigid cable (2).





NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-66. REPLACE A1CR1 DETECTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

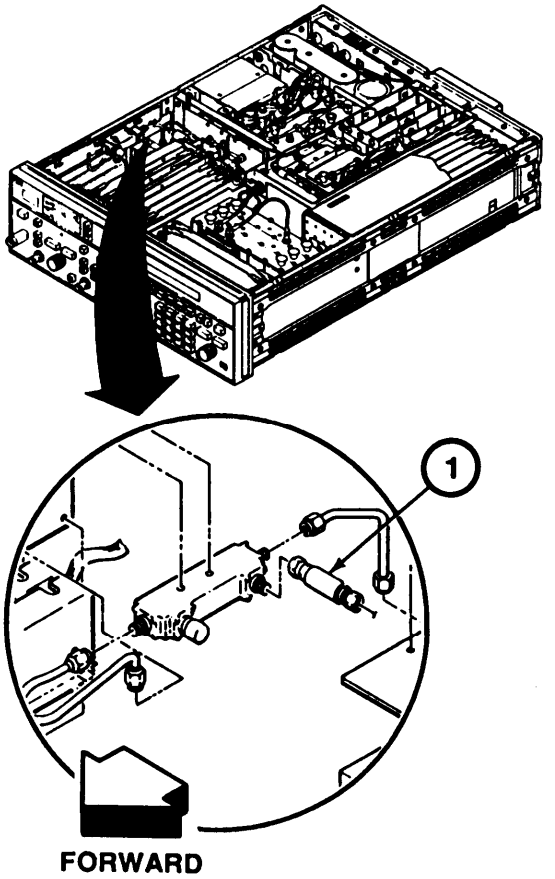
- Remove top cover (para 2-47).
- Remove A1A2 Assembly (para 2-54).

REMOVE

1. Remove A1CR1 Detector (1).

INSTALL

1. Install A1CR1 Detector (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1A2 Assembly (para 2-54).
- Install top cover (para 2-47).

END OF TASK

2-67. REPLACE A1DC1 DIRECTIONAL COUPLER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

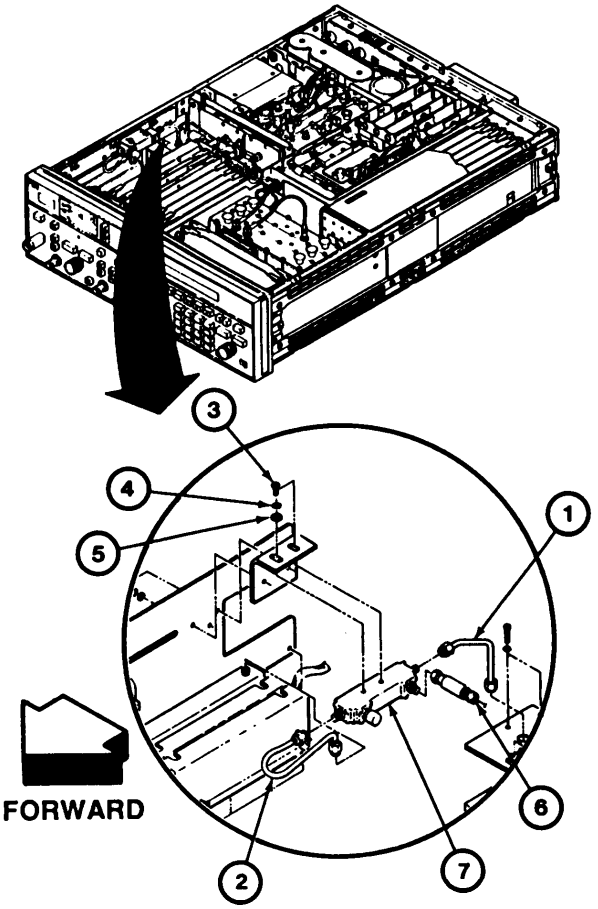
- Remove top cover (para 2-47).
- Remove Al access cover (para 2-52).

REMOVE

1. Disconnect rigid cable (1) and rigid cable (2).
2. Remove two screws (3), two lock washers (4), and two flat washers (5).
3. Disconnect A1CR1 Detector (6).
4. Remove A1DC1 Directional Coupler (7).

INSTALL

1. Install A1DC1 Directional Coupler (7) under bracket.
2. Connect A1CR1 Detector (6).
3. Install two screws (3), two lock washers (4), and two flat washers (5).
4. Connect rigid cable (1) and rigid cable (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top cover (para 2-47).

END OF TASK

2-68. REPLACE A1FL1 HIGH PASS FILTER (UNITS PREFIXED <3100A ONLY).

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

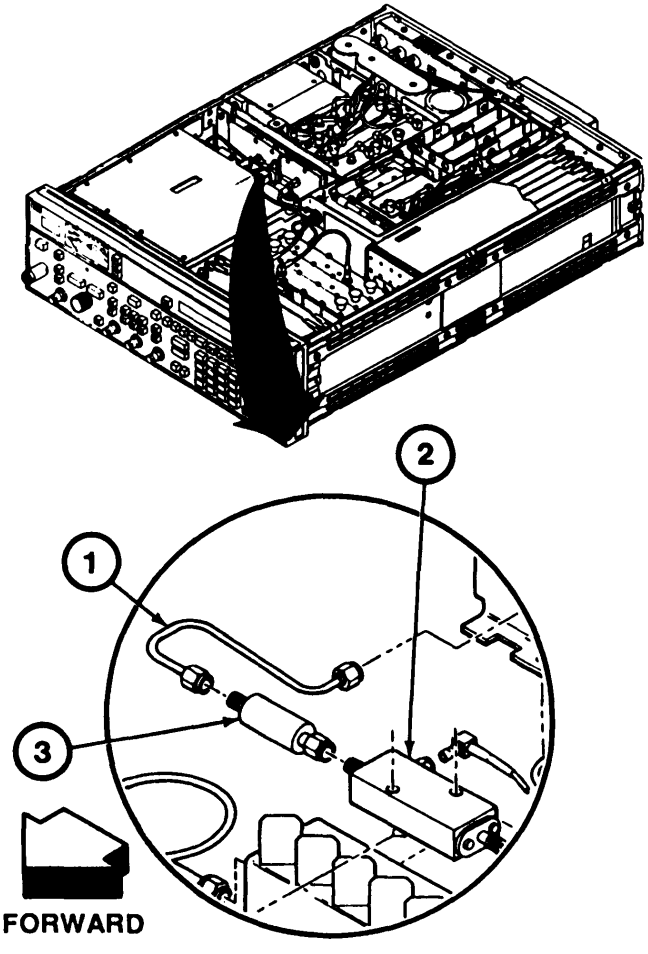
- Remove top cover (para 2-47).

REMOVE

1. Disconnect rigid cable (1).
2. Disconnect A1AT3 Pulse Modulator (2).
3. Remove A1FL1 High Pass Filter (3).

INSTALL

1. Install A1FL1 High Pass Filter (3) in chassis.
2. Connect A1AT3 Pulse Modulator (2).
3. Connect rigid cable (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-69. REPLACE A1Q1 TRANSISTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

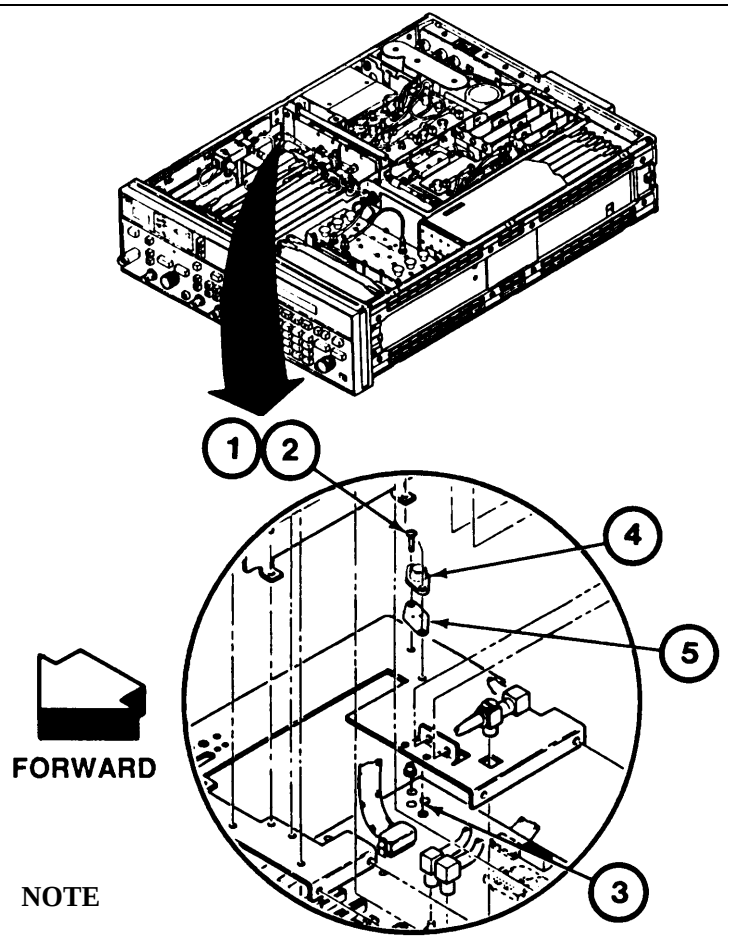
- Remove top and bottom covers (para 2-47).
- Remove A1A10 Assembly (para 2-58).

REMOVE

1. Remove two screws (1) and lock washers (2).
2. Working from bottom, unsolder leads of transistor from A1A12 Assembly (3)
3. Remove A1Q1 Transistor (4).
4. Remove insulator (5).

INSTALL

1. Install insulator (5) using thermal compound (appendix B, item 3).
2. Install A1Q1 Transistor (4) into chassis.
3. Working from bottom, solder leads of transistor to A1A12 Assembly (3)
4. Install two screws (1) and lock washers (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1A10 Assembly (para 2-58).
- Install top and bottom covers (para 2-47).

END OF TASK

2-70. REPLACE A1R1 RESISTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

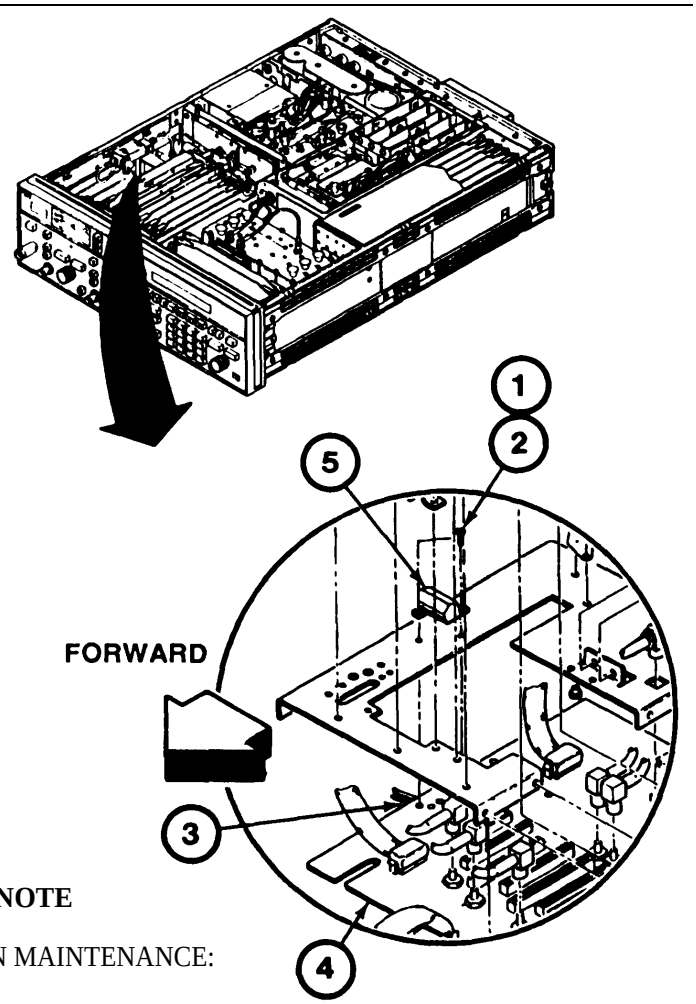
- Remove top and bottom covers (para 2-47).
- Remove A1 access cover (para 2-52).

REMOVE

1. Remove two screws (1) and lock washers (2).
2. Working from bottom, unsolder two black wires (3) from A1A12 Assembly (4)
3. Remove A1R1 Resistor (5).

INSTALL

1. Remove A1R1 Resistor (5) into chassis.
2. Working from bottom, solder two black wires (3) to A1A12 Assembly (4)
3. Install two screws (1) and lock washers (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 access cover (para 2-52).
- Install top and bottom covers (para 2-47).

END OF TASK

2-71. REPLACE A2 ACCESS COVER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

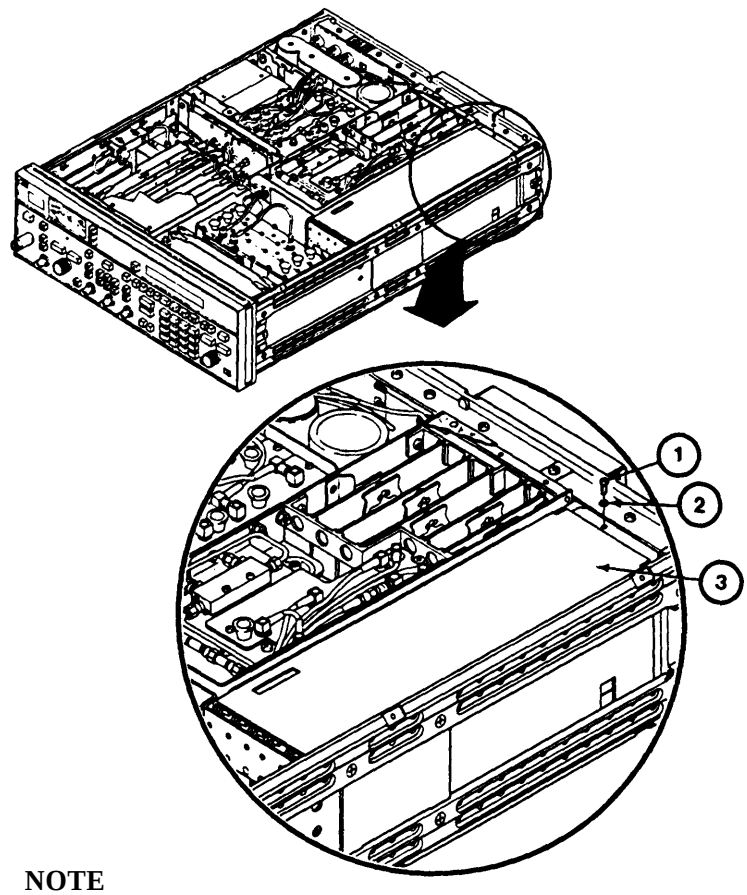
- Remove top cover (para 2-47).

REMOVE

1. Remove screw (1) and lock washer (2).
2. Remove access cover (3).

INSTALL

1. Install access cover (3).
2. Install screw (1) and lock washer (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-72. REPLACE A2A1/A2A2 ASSEMBLIES.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

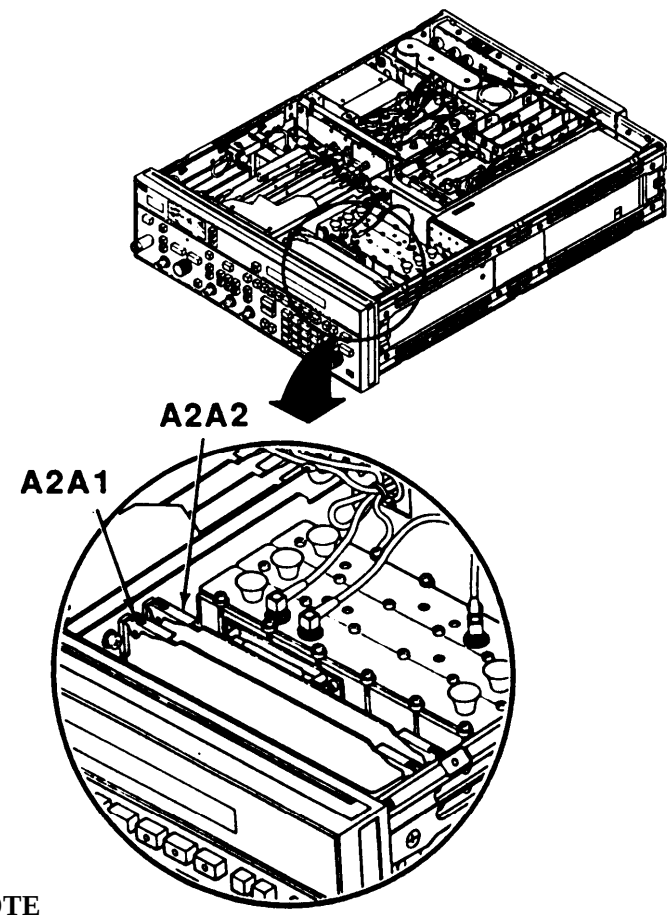
- Remove top cover (para 2-47).

REMOVE

1. Gently remove desired assembly using extractors.

INSTALL

1. Install assembly into proper slot with components facing forward.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-73. REPLACE A2A3/A2A4/A2A5 ASSEMBLIES.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

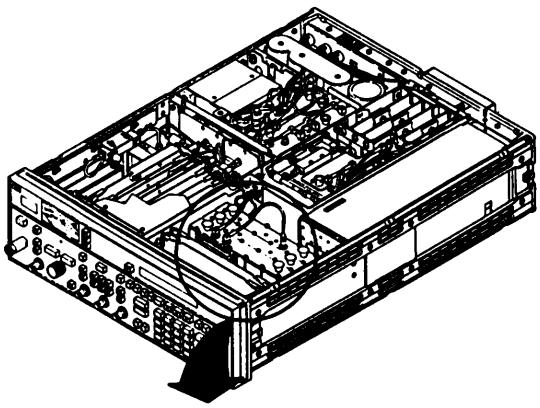
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).

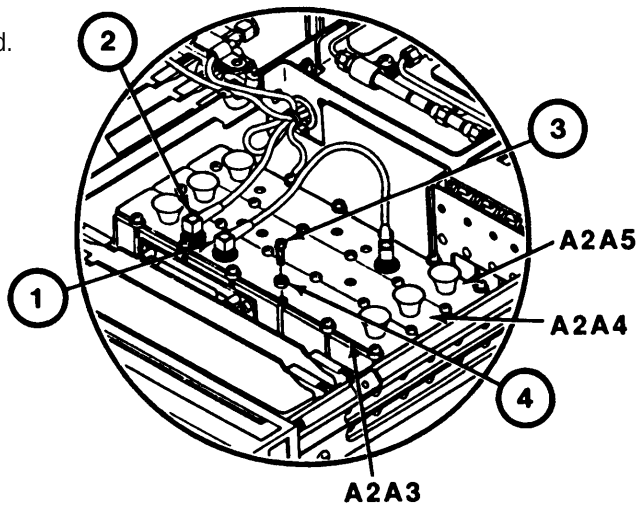
REMOVE

1. Disconnect red cable (1) and green cable (2) as required.
2. Remove screws (3) and washers (4) as required.
3. Gently remove desired assembly using two knobs.



INSTALL

1. Install assembly into proper slot with components facing forward.
2. Install screws (3) and washers (4) as required.
3. Connect red cable (1) and green cable (2) as required



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-74. REPLACE A2A7 THRU A2A11 ASSEMBLIES.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

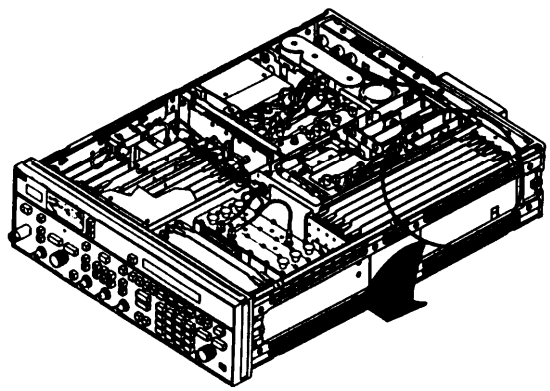
- Remove top cover (para 2-47).
- Remove A2 access cover (para 2-71).

REMOVE

1. Gently remove desired assembly using extractors.

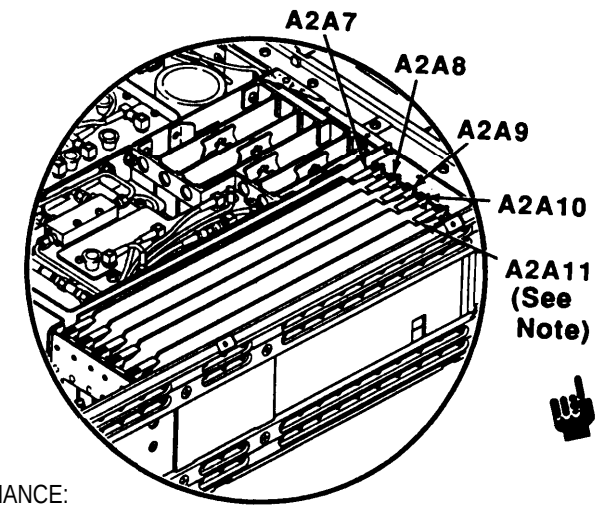
NOTE

Illustration shows A2A11 installed. This assembly is only installed in units prefixed <3100A. In units prefixed >3101A, this slot is blank.



INSTALL

1. Install assembly into proper slot with components facing outward.



NOTE

FOLLOW-ON MAINTENANCE:

- Install A2 access cover (para 2-71).
- Install top cover (para 2-47).

END OF TASK

2-75. REPLACE A2A14 ASSEMBLY.

DESCRIPTION

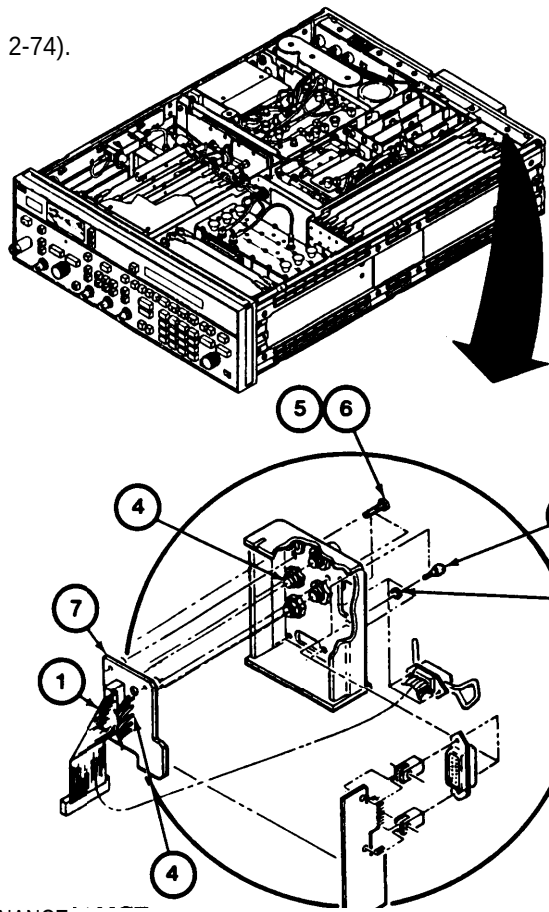
This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).
- Remove A2 access cover (para 2-71).
- Remove A2A7 thru A2A11 Assemblies (para 2-74).



REMOVE

1. Disconnect ribbon cable (1).
2. Remove two standoffs (2) and two lock washers (3).
3. Tag, unsolder, and disconnect sixteen wires (4).
4. Remove three screws (5) and three lock washers (6).
5. Remove A2A14 Assembly (7).

INSTALL

1. Install A2A14 Assembly (7). in chassis.
2. Install three screws (5) and three lock washers (6).
3. Connect and solder sixteen wires (4).
4. Install two standoffs (2) and two lock washers (3).
5. Connect ribbon cable (1).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A2A7 thru A2A11 Assemblies (para 2-74).
- Install A2 access cover (para 2-71).
- Install top cover (para 2-47).

END OF TASK

2-76. REPLACE A2A15 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

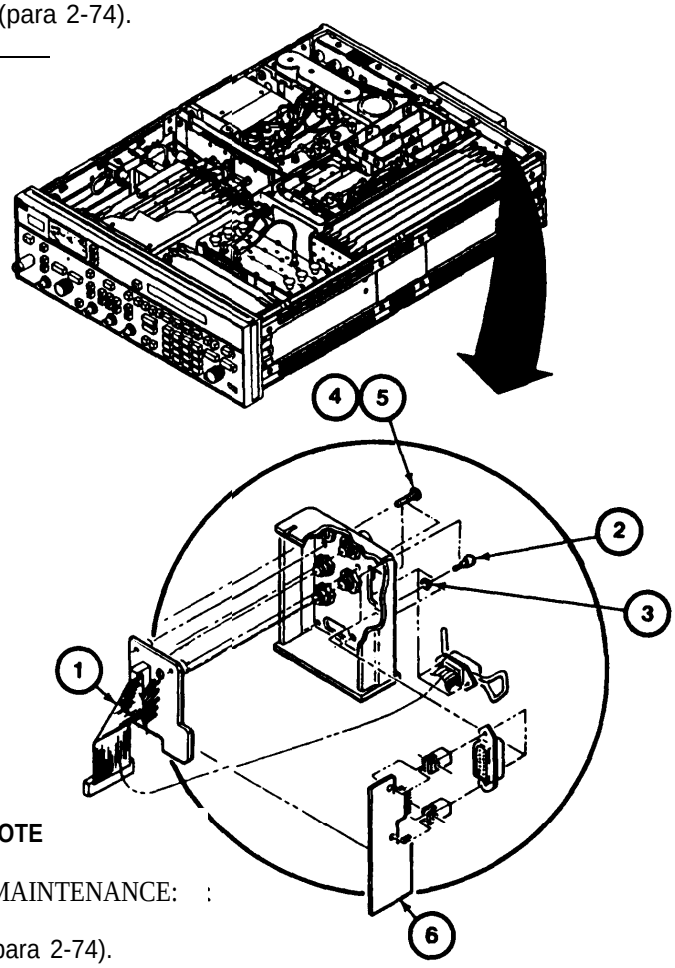
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).
- Remove A2 access cover (para 2-71).
- Remove A2A7 thru A2A11 Assemblies (para 2-74).

REMOVE

1. Disconnect ribbon cable (1).
2. Remove two standoffs (2) and two lock washers (3).
3. Remove three screws (4) and three lock washers (5).
4. Remove A2A15 Assembly (6).



INSTALL

1. Install A2A15 Assembly (6) in chassis.
2. Install three screws (4) and three lock washers (5).
3. Install two standoffs (2) and two lock washers (3).
4. Connect ribbon cable (1).

NOTE

FOLLOW-ON MAINTENANCE: :

- Install A2A7 thru A2A11 Assemblies (para 2-74).
- Install A2 access cover (para 2-7 1).
- Install top cover (para 2-47).

END OF TASK

2-77. REPLACE A2BT1 BATTERY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

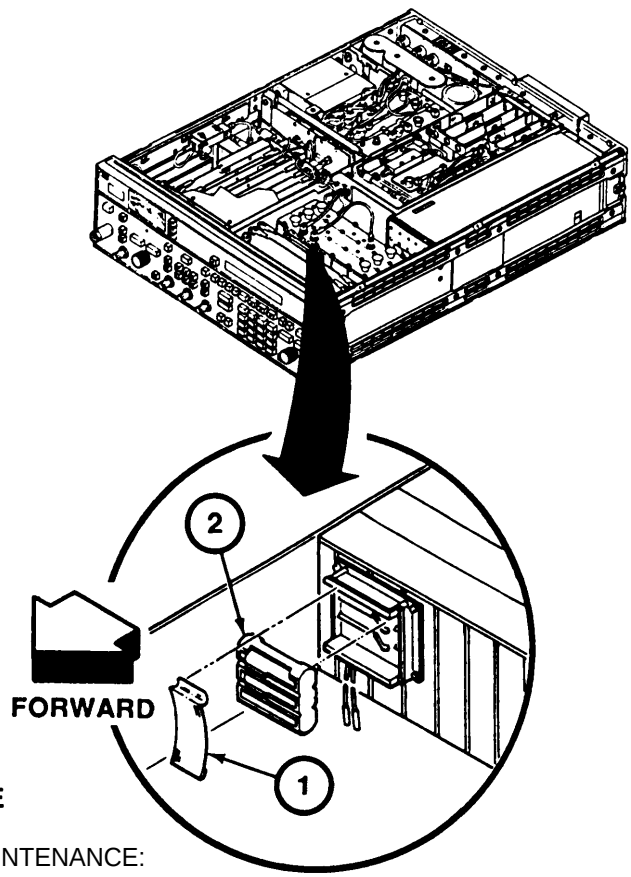
- Remove top cover (para 2-47).
- Remove A2A2 Assembly (para 2-72).

REMOVE

1. Remove retainer clip (1).
2. Remove A2BT1 Battery (2).

INSTALL

1. Install A2BT1 Battery (2) in battery holder (3).
2. Install retainer clip (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A2A2 Assembly (para 2-72).
- Install top cover (para 2-47).

END OF TASK

2-78. REPLACE A3A1 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

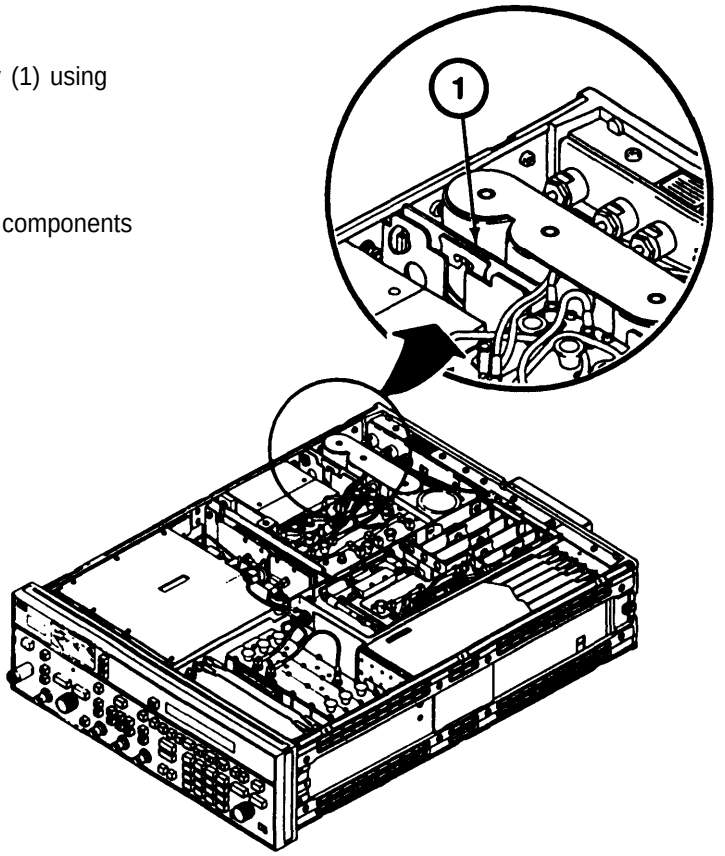
- Remove top cover (para 2-47).

REMOVE

1. Gently Remove A3A1 Assembly (1) using black extractor.

INSTALL

1. Install A3A1 Assembly (1) with components facing toward rear.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-79. REPLACE A3A1A1 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

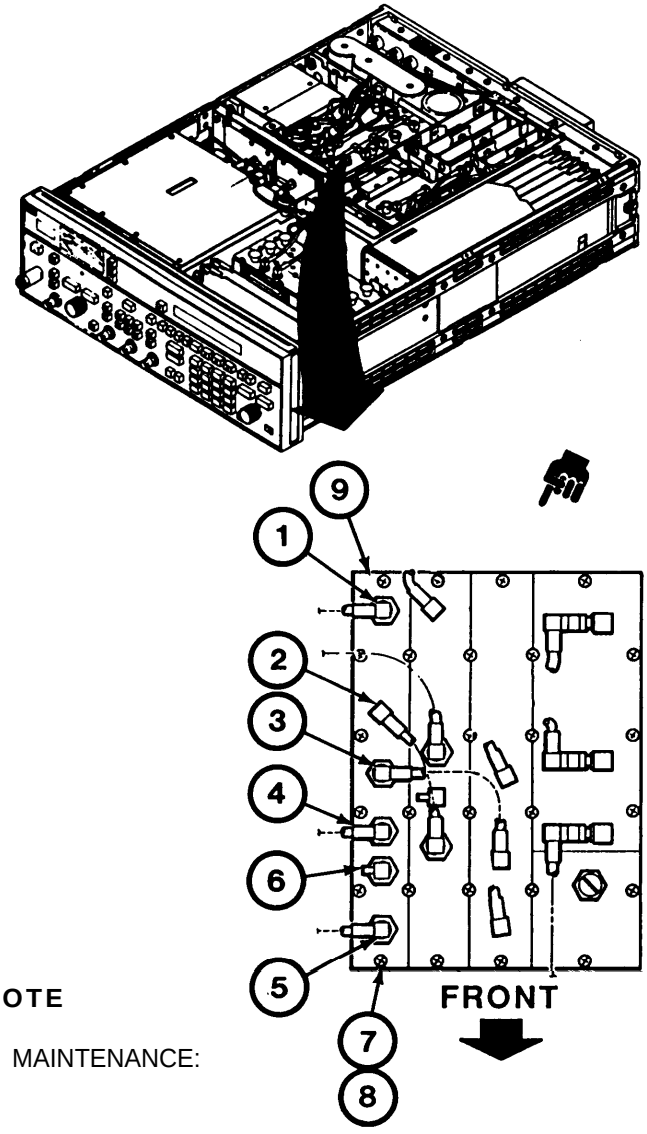
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).

REMOVE

1. Disconnect gray/black cable (1), gray/white/orange cable (2), gray/white cable (3), gray/blue cable (4), and blue cable (5).
2. Remove 50 ohm termination (6).
3. Remove ten screws (7) and four washers (8).
4. Gently remove A3A1A1 Assembly (9) using two knobs.



INSTALL

1. Install A3A1A1 Assembly (9) into chassis.
2. Install ten screws (7) and four washers (8).
3. Install 50 ohm termination (6).
4. Connect gray/black cable (1), gray/white/orange cable (2), gray/white cable (3), gray/blue cable (4), and blue cable (5).

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-80. REPLACE A3A1A2 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

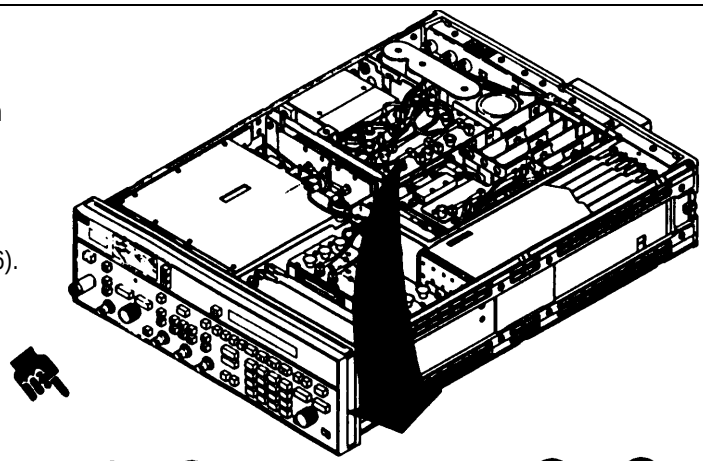
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).

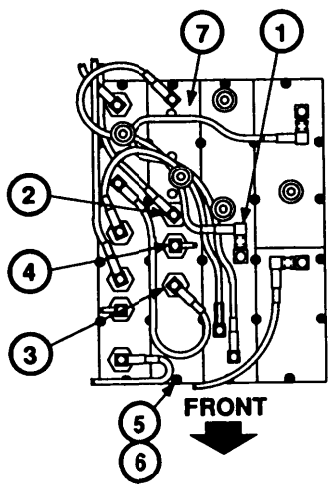
REMOVE

1. Disconnect gray//white cable (1), gray/green cable (2), and gray/orange/white cable(s).
2. Remove 50 ohm termination (4).
3. Remove ten screws (5) and ten lock washers (6).
4. Gently remove A3A1A2 Assembly (7) using two knobs.

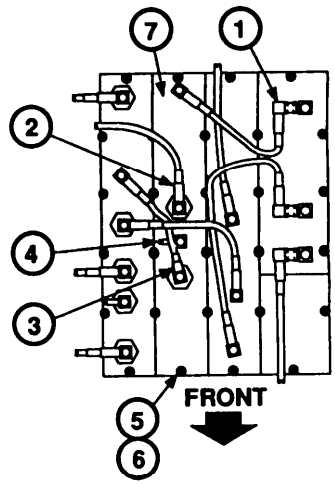


INSTALL

1. Install A3A1A2 Assembly (7) into chassis.
2. Install ten screws (5) and ten lock washers (6).
3. Install 50 ohm termination (4).
4. Connect gray/red/white cable (1), gray/green cable (2), and gray/orange/white cable (3).



UNITS PREFIXED >3101A



UNITS PREFIXED <3100A

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-81. REPLACE A3A1A3 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

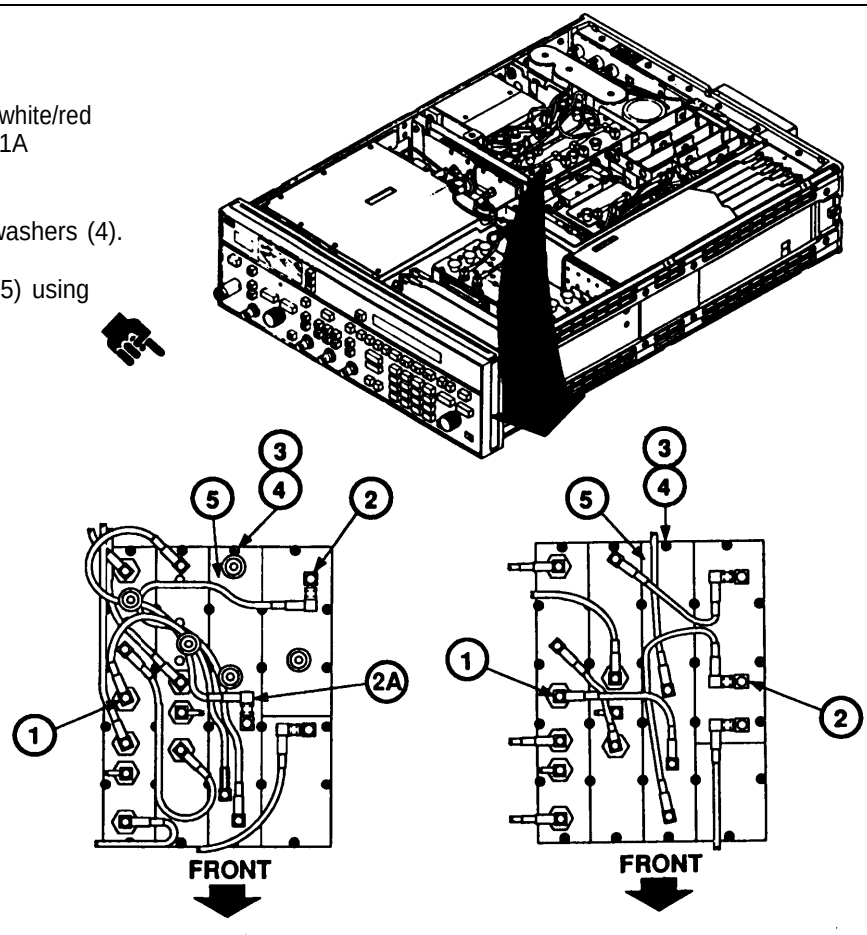
- Remove top cover (para 2-47).

REMOVE

1. Disconnect gray/white cable (1) and white/red cable (2) and for units prefixed >3101A gray/red/white cable (2A).
2. Remove ten screws (3) and ten lock washers (4).
3. Gently remove A3A1A3 Assembly (5) using two knobs.

INSTALL

1. Install A3A1A3 Assembly (5) into chassis.
2. Install ten screws (3) and ten lock washers (4).
3. Connect gray/white cable (1) and white/red cable (2) and for units prefixed >3101A gray/red/white cable (2A).



NOTE

FOLLOW-ON MAINTENANCE:

. Install top cover (para 2-47).

END OF TASK

2-82. REPLACE A3A1A4 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

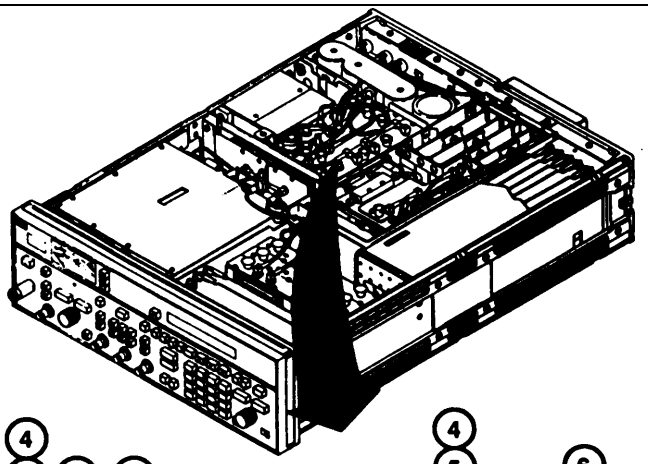
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover (para 2-47).

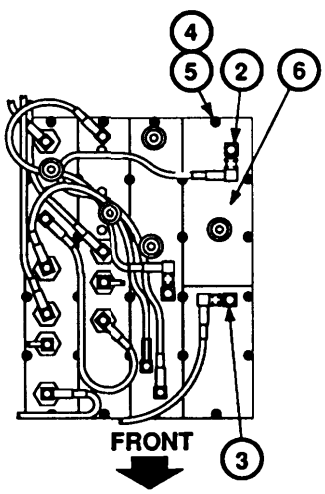
REMOVE

1. Disconnect gray/white/red cable for units prefixed <3100A only (1), white/red cable (2). and white/orange cable (3) (all units).
2. Remove ten screws (4) and ten lock washers (5).
3. Gently remove A3A1A4 Assembly (6) using two knobs.

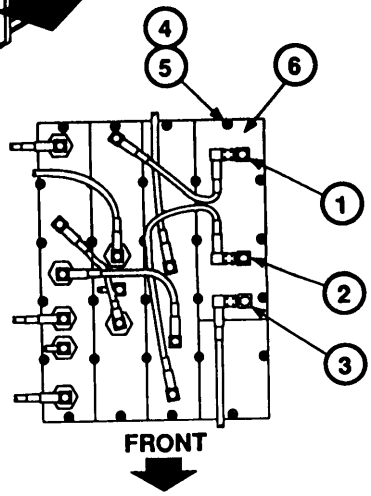


INSTALL

1. Install A3A1A4 Assembly (6) into chassis.
2. Install ten screws (4) and ten lock washers (5).
3. Connect gray/white/red cable for units prefixed <3100A only (1), white/red cable (2), and white/orange cable (3) (for all units).



UNITS PREFIXED >3101A



UNITS PREFIXED <3100A

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-83. REPLACE A3A1A4A2 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

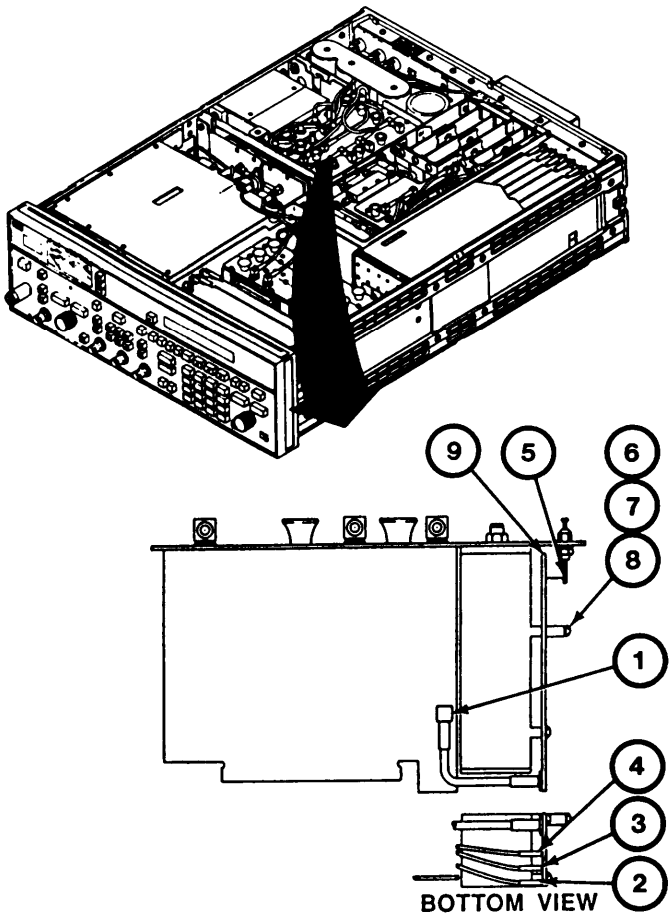
- Remove top cover (para 2-47).
- Remove A3A1A4 Assembly (para 2-82).

REMOVE

1. Disconnect white cable (1).
2. Disconnect black wire (2), yellow wire (3), and violet wire (4).
3. Tag, unsolder, and disconnect wire (5).
4. Remove four screws (6), four lock washers (7), and one spacer (8).
5. Gently remove A3A1A4A2 Assembly (9).

INSTALL

1. Install A3A1A4A2 Assembly (9) on two contacts.
2. Install four screws (6), four lock washers (7), and one spacer (8).
3. Connect and solder wire (5).
4. Connect black wire (2), yellow wire (3), and violet wire (4).
5. Connect white cable (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A1A4 Assembly (para 2-82).
- Install top cover (para 2-47).

END OF TASK

2-84. REPLACE A3A1A6 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install (for repair purposes only).

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

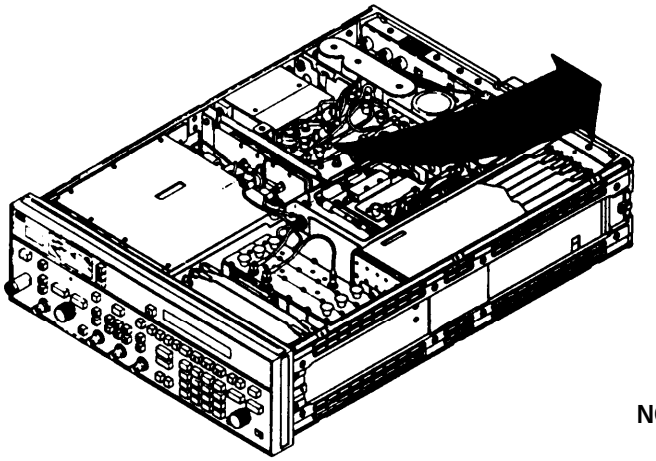
- Remove top and bottom covers (para 2-47).
- Remove A3A1A7 Reference Housing Assembly (para 2-85).

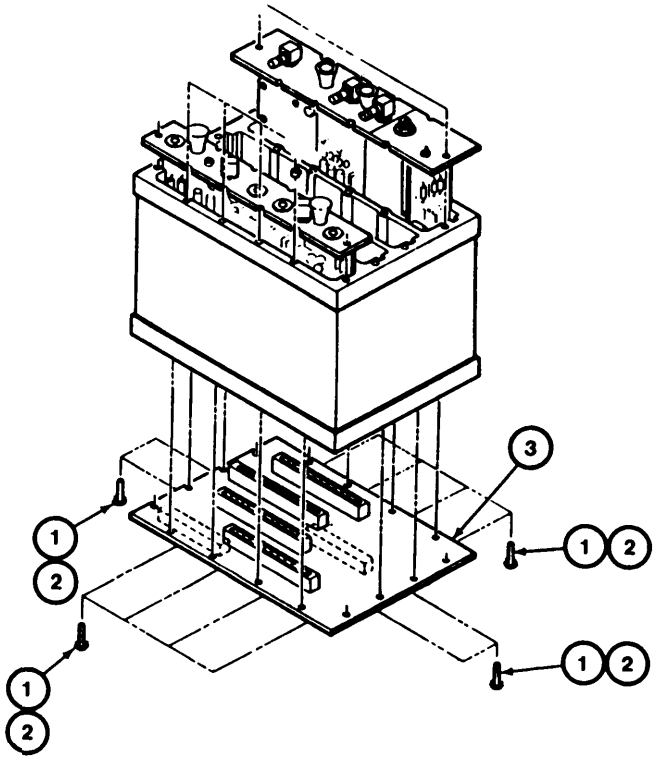
REMOVE

1. Remove twenty-four screws (1) and twenty-four lock washers (2).
2. Gently remove A3A1A6 Assembly (3).

INSTALL

1. Install A3A1A6 Assembly (3) on housing assembly (4).
2. Install twenty-four screws (1) and twenty-four lock washers (2).





NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A1A7 Reference Housing Assembly (para 2-85).
- Install top and bottom covers (para 2-47).

END OF TASK

2-85. REPLACE A3A1A7 REFERENCE HOUSING ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install,

INITIAL SETUP

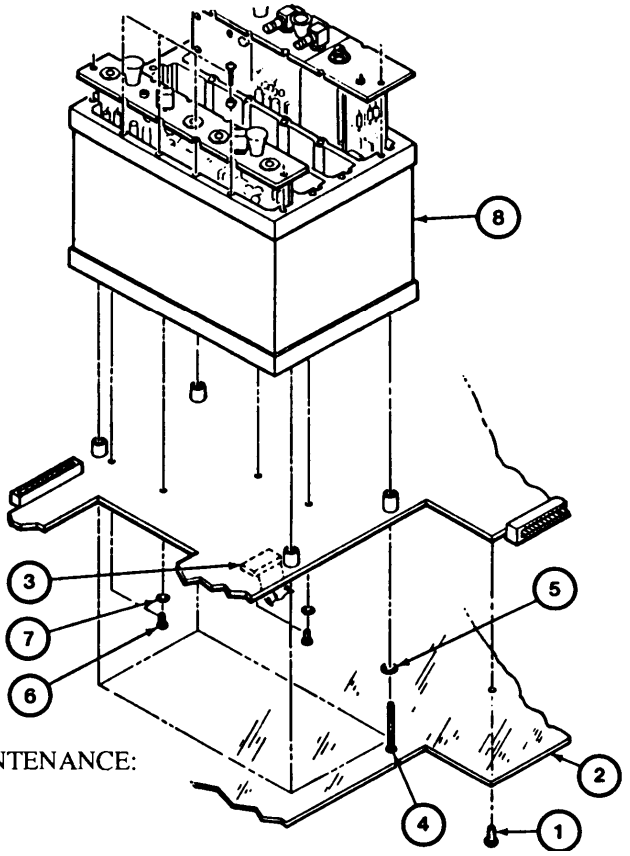
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Remove A3A1A1 Assembly (para 2-79).
- Remove A3A1A2 Assembly (para 2-80).
- Remove A3AlA3 Assembly (para 2-81).
- Remove A3A1A4 Assembly (para 2-82).

REMOVE

1. Remove five nylon screws (1) and safety shield (2).
2. Disconnect ribbon cable (3).
3. Remove four screws (4) and four lock washers (5).
4. Remove four screws (6) and four lock washers (7).
5. Remove Reference Housing Assembly (8).



INSTALL

1. Install Housing Assembly (8) into chassis.
2. Install four screws (6) and four lock washers (7).
3. Install four screws (4) and four lock washers (5).
4. Connect ribbon cable (3).
5. Install safety shield (2) and five nylon screws (1).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A1A1 Assembly (para 2-79).
- Install A3A1A2 Assembly (para 2-80).
- Install A3A1A3 Assembly (para 2-81).
- Install A3A1A4 Assembly (para 2-82).
- Install top and bottom covers (para 2-47).

END OF TASK

2-86. REPLACE A3A3 THRU A3A7 ASSEMBLIES.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

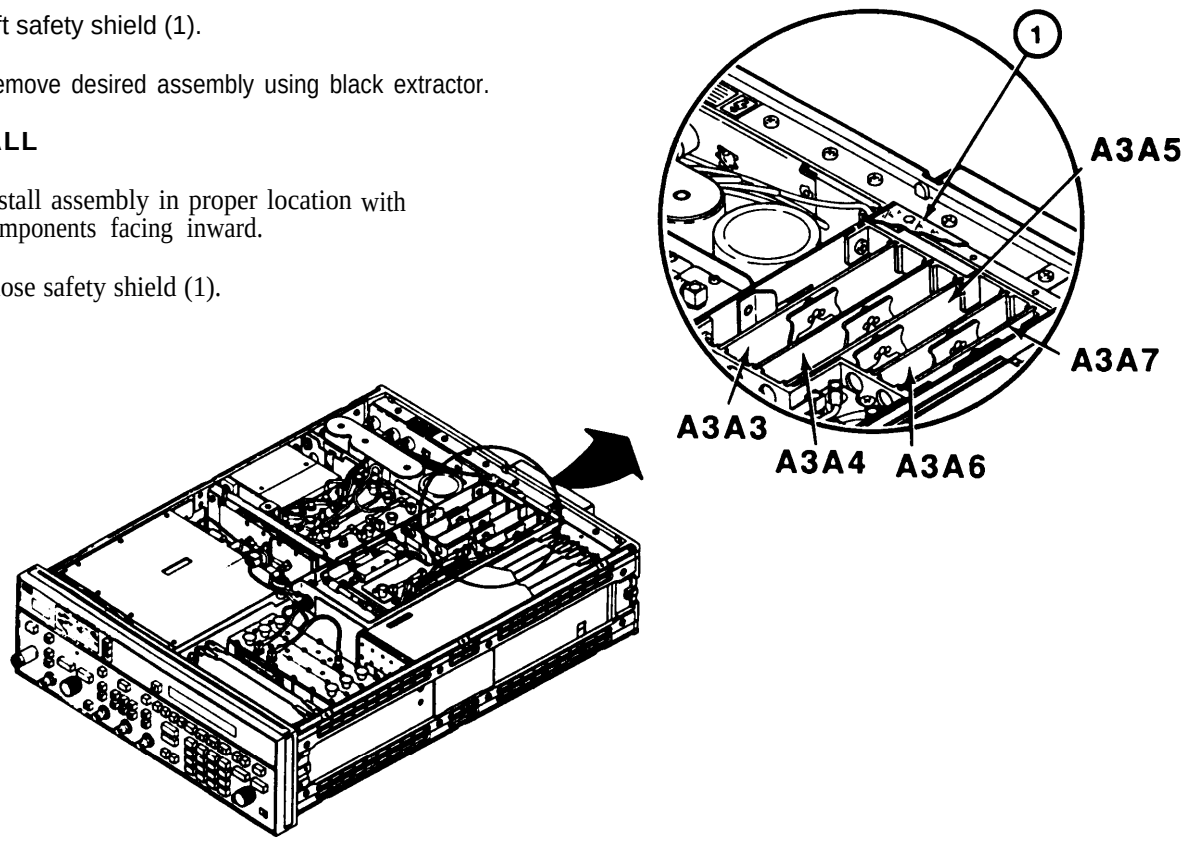
- Remove top cover (para 2-47).

REMOVE

1. Lift safety shield (1).
2. Remove desired assembly using black extractor.

INSTALL

1. Install assembly in proper location with components facing inward.
2. Close safety shield (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-87. REPLACE A3A8 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

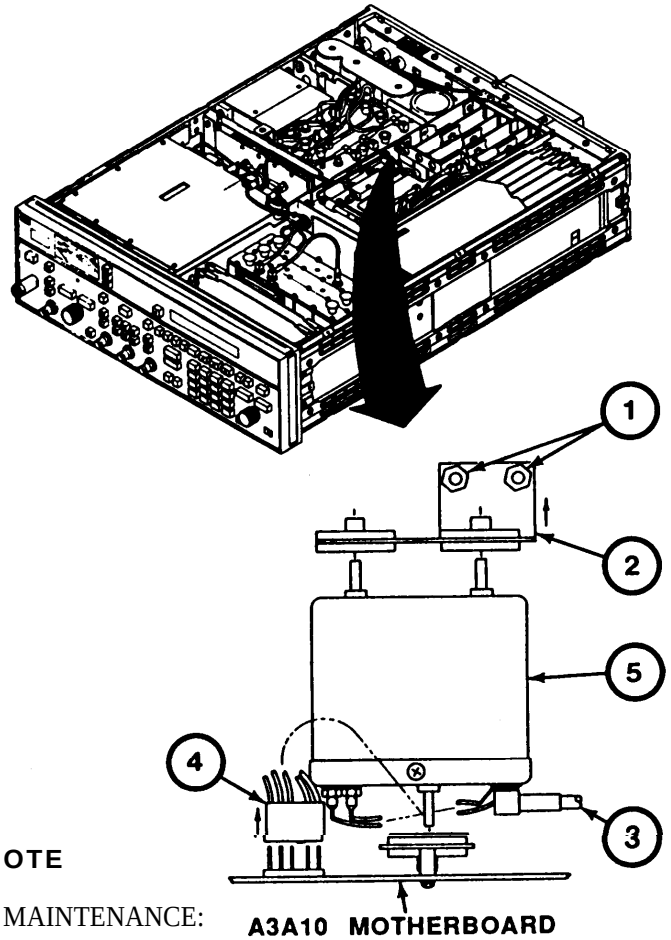
- Remove top and bottom covers (para 2-47).
- Remove A3A9 Assembly (para 2-88) and place in SERVICE position.

REMOVE

1. Remove two nuts (1).
2. Remove upper mounting bracket (2).
3. Disconnect gray/violet cable (3) and cable (4).
4. Remove A3A8 Assembly (5).

INSTALL

1. Install A3A8 Assembly (5) on bottom shock mount.
2. Connect gray/violet cable (3) and cable (4).
3. Install upper mounting bracket (2).
4. Install two nuts 1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A9 Assembly (para 2-88).
- Install top cover (para 2-47).

END OF TASK

2-88. REPLACE A3A9 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

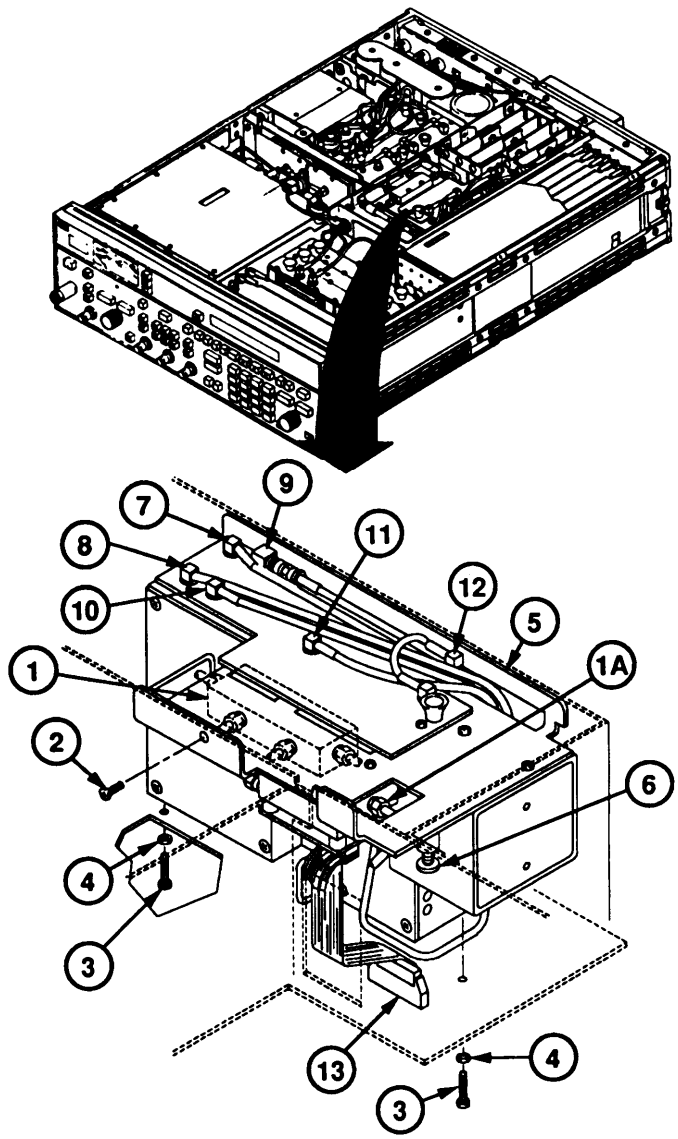
To place A3A9 Assembly in SERVICE position, perform remove steps 1 to 4 only.

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).

REMOVE

1. Remove rigid cable (1) for units prefixed <3100A or rigid cable (1A) for units prefixed >3101A.
2. Remove one screw (2).
3. Working from bottom, remove two screws labeled "A" (3), and two lock washers (4).
4. Pull A3A9 Assembly (5) out of chassis, rotate 90°, slide channel onto chassis, and fasten captive screw (6) (SERVICE position).
5. Disconnect white/orange cable (7), gray cable **(8), violet cable (9),** white cable (10), green cable (11), black cable (12), and ribbon cable (13).
6. Cut and discard cable tie (14).
7. Loosen retaining screw (6) and remove A3A9 Assembly (5).



2-88. REPLACE A3A9 ASSEMBLY—Continued.

INSTALL

1. Place A3A9 Assembly (5) in SERVICE position and tighten captive screw (6).
2. Connect white/orange cable (7), gray cable (8), violet cable (9), white cable (10), green cable (11), black cable (12), and ribbon cable (13).
3. Attach cable tie (14) (appendix B, item 4) around cables and housing.
4. Loosen retaining screw (6) and install A3A9 Assembly (5) into chassis.
5. Working from bottom, install two screws (3) and two lock washers (4) in holes labeled “A”.
6. Install one screw (2).
7. Install rigid cable (1) for units prefixed <3100A or rigid cable (1A) for units prefixed >3101A.

NOTE

FOLLOW-ON MAINTENANCE:

- Install top and bottom covers (para 2-47).

END OF TASK

2-89. REPLACE A3A9A1 DIRECTIONAL COUPLER (UNITS PREFIXED <3100A ONLY).

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

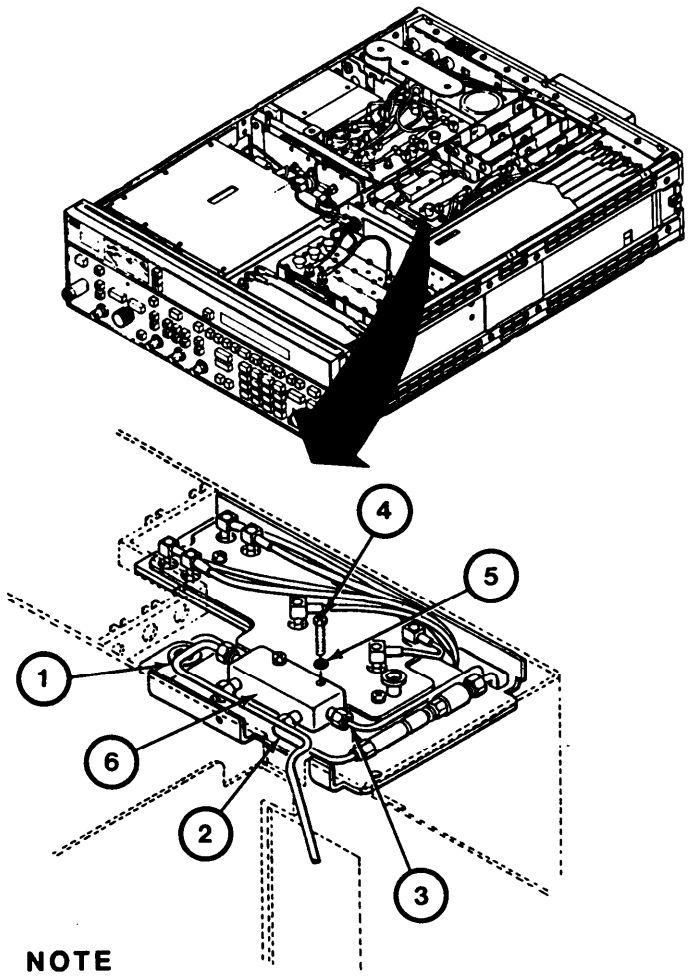
- Remove top cover (para 2-47).

REMOVE

1. Disconnect rigid cable (1), rigid cable (2), and rigid cable (3).
2. Remove two screws (4) and two lock washers (5).
3. Remove A3A9A1 Directional Coupler (6).

INSTALL

1. Install A3A9A1 Directional Coupler (6) in place on A3A9 Assembly.
2. Install two screws (4) and two lock washers (5).
3. Connect rigid cable (1), rigid cable (2), and rigid cable (3).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover (para 2-47).

END OF TASK

2-90. REPLACE A3A9A2 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

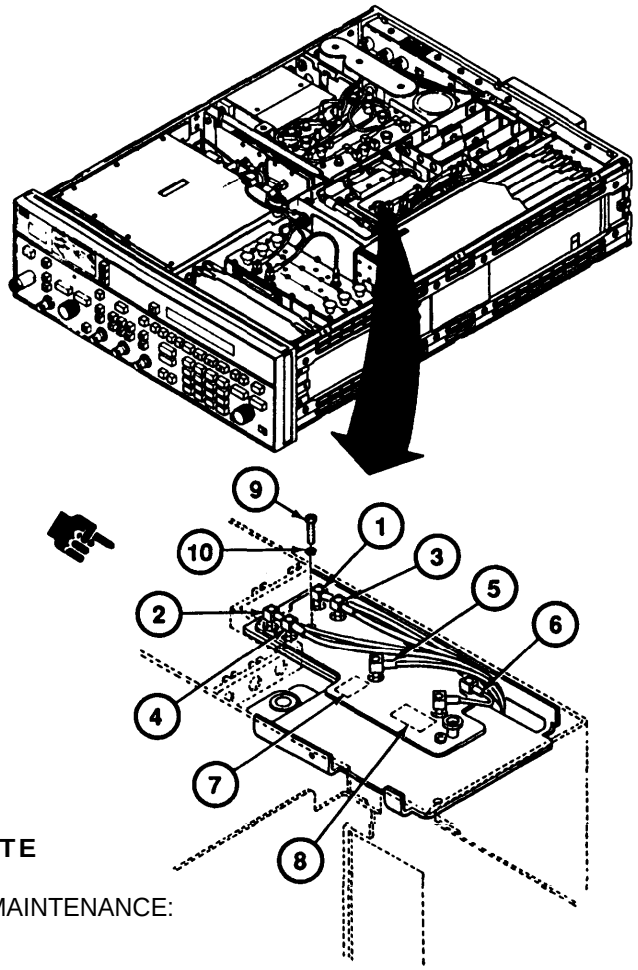
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Place A3A9 Assembly (para 2-88) in SERVICE position.

REMOVE

1. Disconnect white/orange cable (1), gray cable (2), violet cable (3), white cable (4), green cable (5), black cable (6), ribbon cable (7), and ribbon cable (8).
2. Remove two screws (9) and two lock washers (10).
3. Remove A3A9A2 Assembly (11) using two knobs.



INSTALL

1. Install A3A9A2 Assembly (11) on A3A9 Assembly.
2. Install two screws (9) and two lock washers (10).
3. Connect white/orange cable (1), gray cable (2), violet cable (3), white cable (4), green cable (5), black cable (6), ribbon cable (7), and ribbon cable (8).

NOTE

FOLLOW-ON MAINTENANCE:

Ž Install A3A9 Assembly (para 2-88).

Ž Install top and bottom covers (para 2-47).

END OF TASK

2-91. REPLACE A3A9A3 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

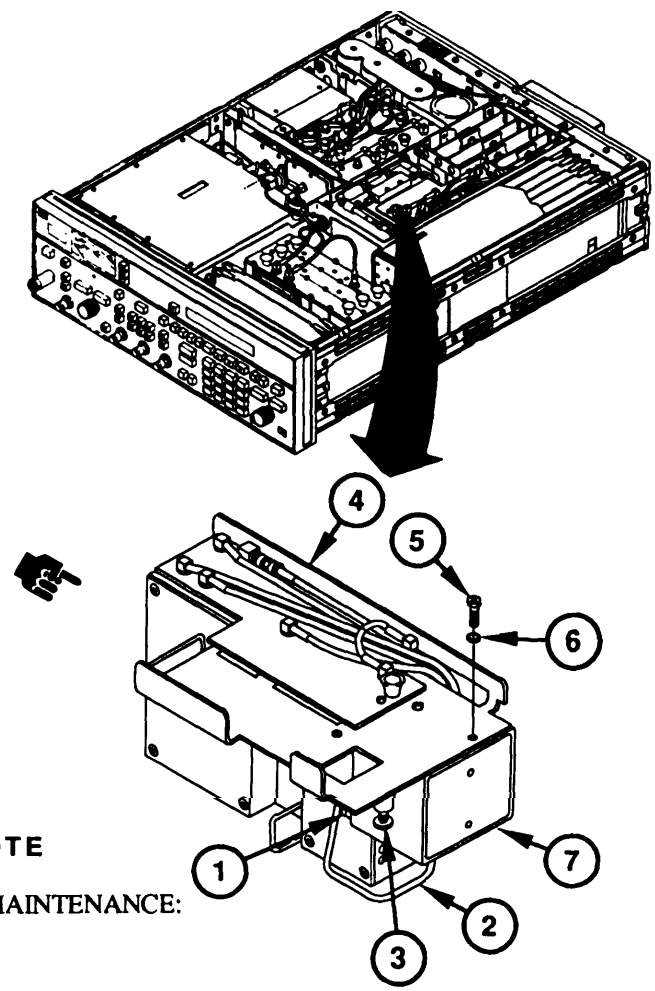
- Remove top and bottom covers (para 2-47).
- Place A3A9 Assembly (para 2-88) in SERVICE position.

REMOVE

1. Disconnect rigid cable (2) and ribbon cable (1).
2. Loosen retainer screw (3) and reposition A3A9 Assembly (4).
3. Remove two screws (5) and two lock washers (6).
4. Remove A3A9A3 Assembly (7).

INSTALL

1. Install A3A9A3 Assembly (7) on A3A9 Assembly (4).
2. Install two screws (5) and two lock washers (6).
3. Place A3A9 Assembly (4) in SERVICE position and tighten retainer screw (3).
4. Connect ribbon cable (1) and rigid cable (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A9 Assembly (para 2-88).
- Install top and bottom covers (para 2-47).

END OF TASK

2-92. REPLACE A3A9A4 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

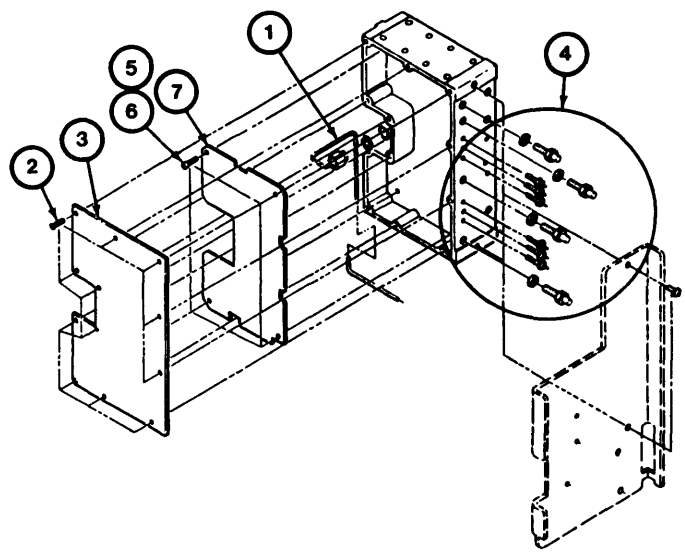
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Place A3A9 Assembly (para 2-88) in SERVICE position.
- If SG-1219/U serial prefix is >3100A, remove A3A9A6 Attenuator (para 2-95).
- If SG-1219/U serial prefix is >3100A, remove A3A9A7 Attenuator (para 2-96).

REMOVE

1. Remove rigid cable (1).
2. Remove twelve (units prefixed <3100A) or eleven (units prefixed >3101A) screws (2).
3. Remove access cover (3).
4. Tag, unsolder, and disconnect ten connections (4).
5. Remove five screws (5) and five lock washers (6).
6. Remove A3A9A4 Assembly (7).



INSTALL

1. Install A3A9A4 Assembly (7) in housing.
2. Install five screws (5) and five lock washers (6).
3. Connect and solder ten connections (4).
4. Install access cover (3).
5. Install twelve (units prefixed <3100A) or eleven (units prefixed >3101A) screws (2).
6. Install rigid cable (1).

NOTE

FOLLOW-ON MAINTENANCE:

- If SG-1219/U serial prefix is >3100A, install A3A9A6 Attenuator (para 2-95).
- If SG-1219/U serial prefix is >3100A, install A3A9A7 Attenuator (para 2-96).
- Install A3A9 Assembly (para 2-88).
- Install top and bottom covers (para 2-47).

END OF TASK

2-93. REPLACE A3A9A5 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

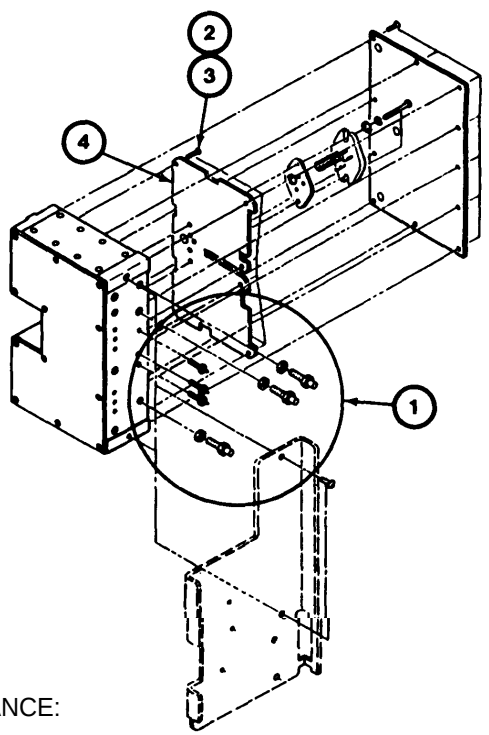
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Place A3A9 Assembly (para 2-88) in SERVICE position.
- Remove A3A9U1 Sampler (para 2-94).

REMOVE

1. Tag, unsolder, and disconnect six connections (1).
2. Remove six screws (2) and six lock washers (3).
3. Remove A3A9A5 Assembly (4).



INSTALL

1. Install A3A9A5 Assembly (4) in housing.
2. Install six screws (2) and six lock washers (3).
3. Connect and solder six connections (1).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A9U1 Sampler (para 2-94).
- Install A3A9 Assembly (para 2-88).
- Install top and bottom covers (para 2-47).

END OF TASK

2-94. REPLACE A3A9U1 SAMPLER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

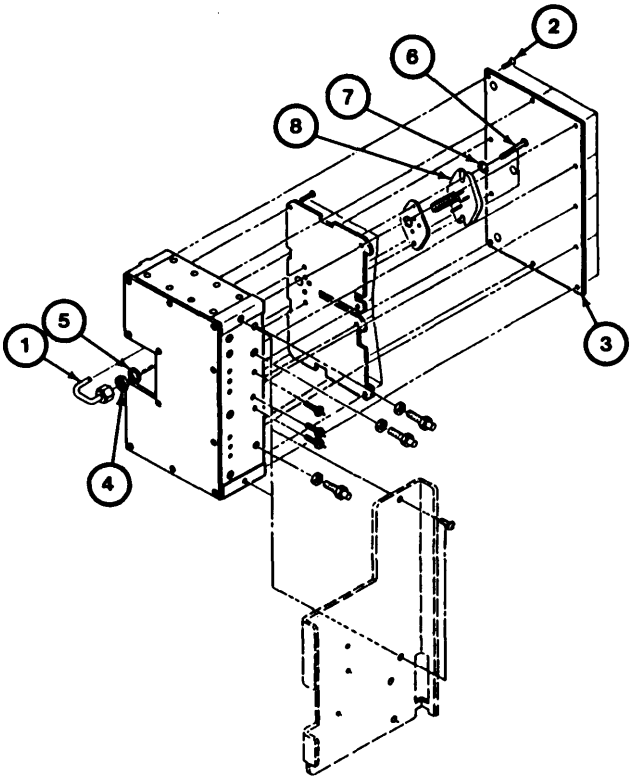
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Place A3A9 Assembly (para 2-88) in SERVICE position.

REMOVE

1. Remove rigid cable (1).
2. Remove twelve (units prefixed <3100A) or eleven (units prefixed >3101A) screws (2).
3. Remove access cover (3).
4. Remove one nut (4) and one lock washer (5).
5. Remove two screws (6) and four flat washers (7).
6. Remove A3A9U1 Sampler (8).



INSTALL

1. Install A3A9U1 Sampler (8) on A3A9A5 Assembly (9) in housing.
2. Install two screws (6) and four flat washers (7).
3. Install one nut (4) and one lock washer (5).
4. Install access cover (3).
5. Install twelve (units prefixed <3100A) or eleven (units prefixed >3101A) screws (2).
6. Install rigid cable (1).

NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A9 Assembly (para 2-88).
- Install top and bottom covers (para 2-47).

END OF TASK

2-95. REPLACE A3A9A6 ATTENUATOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

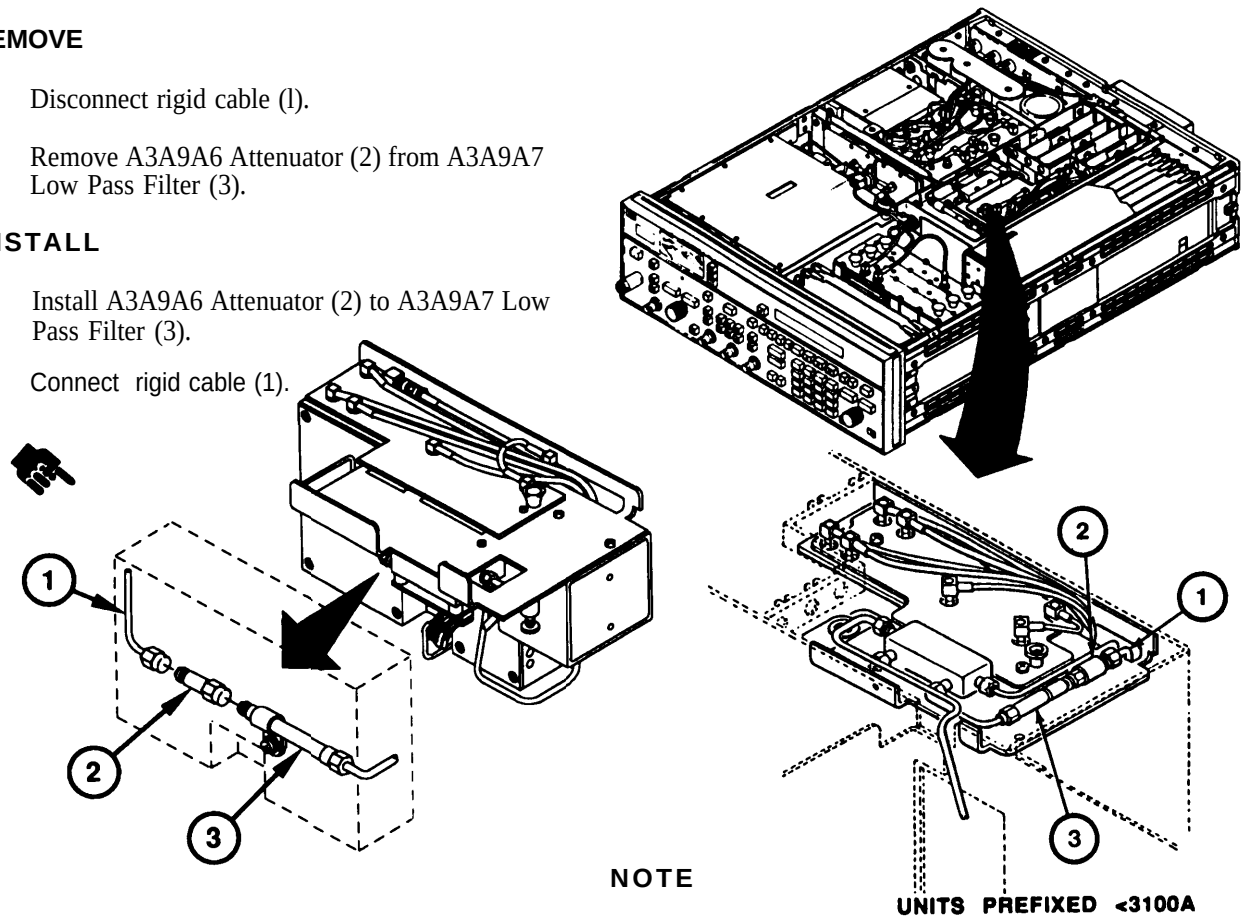
- Remove top cover (para 2-47).
- If SG-1219/U serial prefix is >3100A, place A3A9 Assembly (para 2-88) in SERVICE position.

REMOVE

1. Disconnect rigid cable (l).
2. Remove A3A9A6 Attenuator (2) from A3A9A7 Low Pass Filter (3).

INSTALL

1. Install A3A9A6 Attenuator (2) to A3A9A7 Low Pass Filter (3).
2. Connect rigid cable (1).



NOTE

FOLLOW-ON MAINTENANCE:

- If SG-1219/U serial prefix is >3100A, install A3A9 Assembly (para 2-88).
- Install top cover (para 2-47).

END OF TASK

2-96. REPLACE A3A9A7 LOW PASS FILTER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

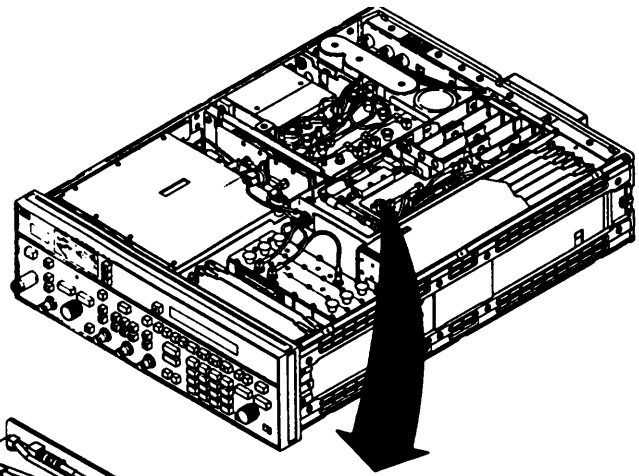
- Remove top cover (para 2-47).
- If SG-1219/U serial prefix is >3100A, place A3A9 Assembly (para 2-88) in SERVICE position.

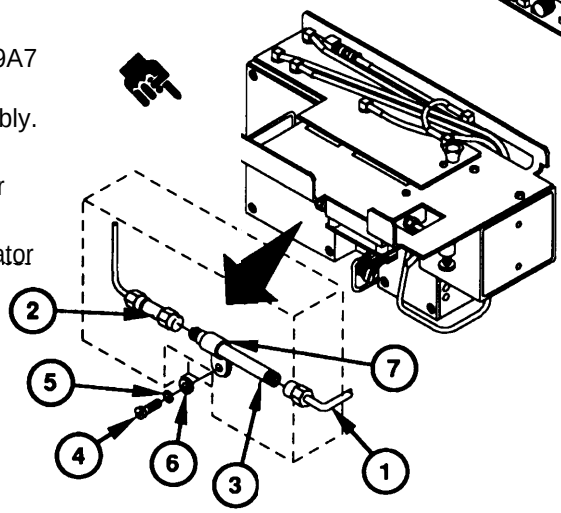
REMOVE

1. Disconnect rigid cable (1).
2. Disconnect A3A9A6 Attenuator (2) from A3A9A7 Low Pass Filter (3).
3. Remove one screw (4), lock washer (5), and flat washer (6).
4. Remove A3A9A7 Low Pass Filter (3) and clamp (7).
5. Remove clamp (7).

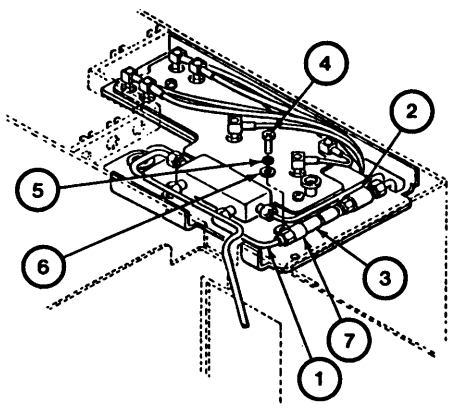
INSTALL

1. Install clamp (7) on A3A9A7 Low Pass Filter (3) and position on A3A9 Assembly.
2. Install one screw (4), lock washer (5), and flat washer (6).
3. Connect A3A9A6 Attenuator (2) to A3A9A7 Low Pass Filter (3).
4. Connect rigid cable (1).





UNITS PREFIXED >3101A



UNITS PREFIXED <3100A

NOTE

FOLLOW-ON MAINTENANCE:

- If SG-1219/U serial prefix is >3100A, install A3A9 Assembly (para 2-88).

Ž Install top cover (para 2-47).

END OF TASK

2-96.1. REPLACE A3A9A8 PREAMPLIFIER ASSEMBLY (UNITS PREFIXED >3101A ONLY).

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

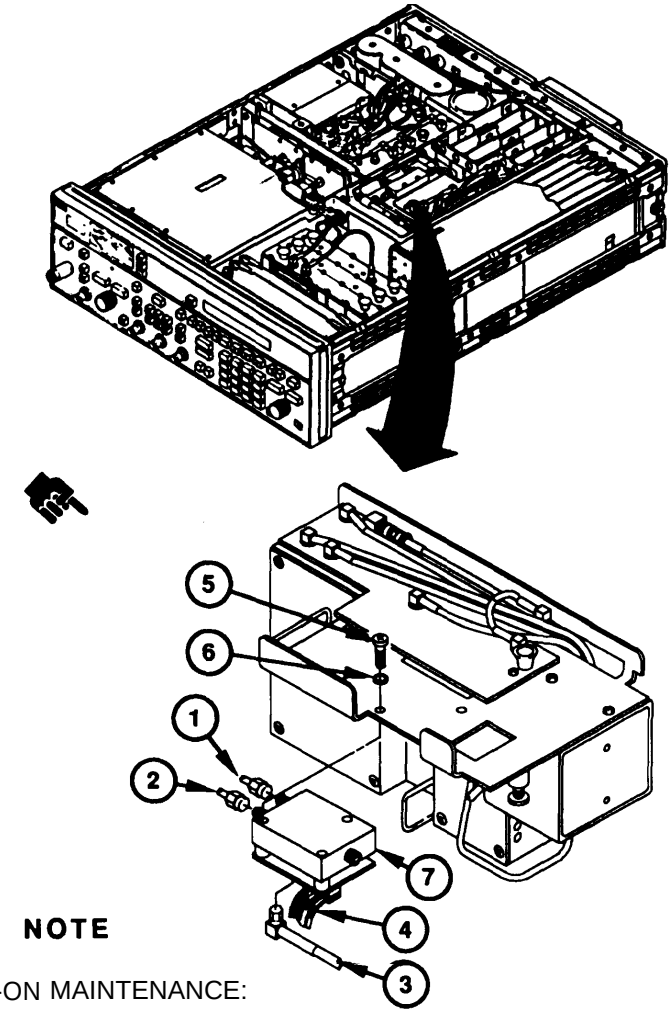
- Remove top and bottom covers (para 2-47).
- Place A3A9 Assembly (para 2-88) in SERVICE position.

REMOVE

1. Disconnect rigid cable (1), rigid cable (2), green cable (3), and ribbon cable (4).
2. Remove three screws (5) and lockwashers (6).
3. Remove A3A9A8 Assembly (7).

INSTALL

1. Install A3A9A8 Assembly (7) on bracket.
2. Install three screws (5) and lockwashers (6).
3. Connect rigid cable (1), rigid cable (2), green cable (3), and ribbon cable (4).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A9 Assembly (para 2-88).
- Install top and bottom covers (para 2-47).

END OF TASK

2-97. REPLACE A3A11 LINE MODULE.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

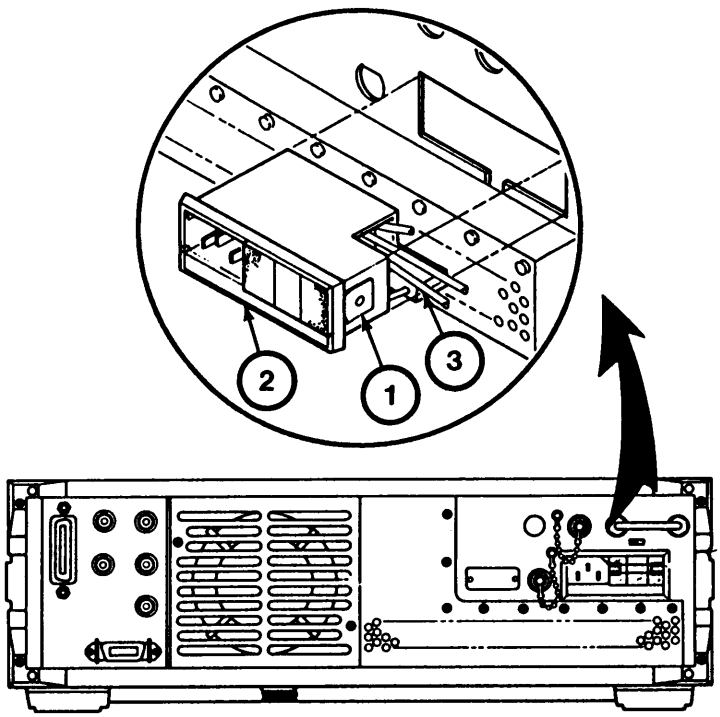
- Remove top and bottom covers (para 2-47).
- Remove left side cover (para 2-48).
- Remove A3A1 Assembly (para 2-78).
- Remove A3C1 and A3C2 Capacitor (para 2-99).

REMOVE

1. Press retainers (1) and carefully pull A3A11 Line Module (2) out of rear panel enough to expose wires.
2. Tag, unsolder, and disconnect ten wires (3).
3. Remove A3A11 Line Module (2).

INSTALL

1. Position A3A11 Line Module (2) next to rear panel.
2. Connect and solder ten wires (3).
3. Install A3A11 Line Module (2) in rear panel and press into place.



NOTE

FOLLOW-ON MAINTENANCE:

- Install A3C1 and A3C2 Capacitor (para 2-99).
- Install A3A1 Assembly (para 2-78).
- Install left side cover (para 2-48).
- Install top and bottom covers (para 2-47).

END OF TASK

2-98. REPLACE A3BI FAN.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

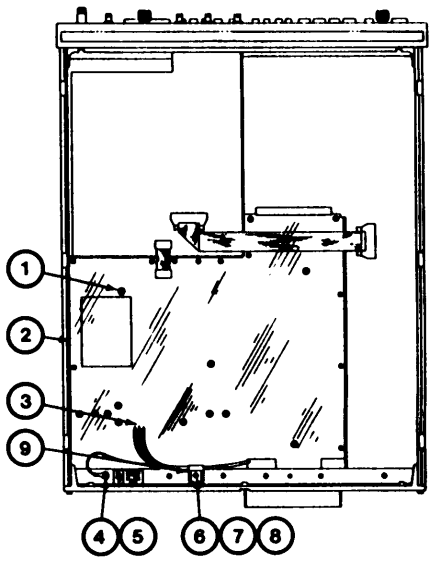
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- If SG-1219/U serial prefixis>3100A, remove A3A3 thru A3A7 Assemblies (para 2-86).

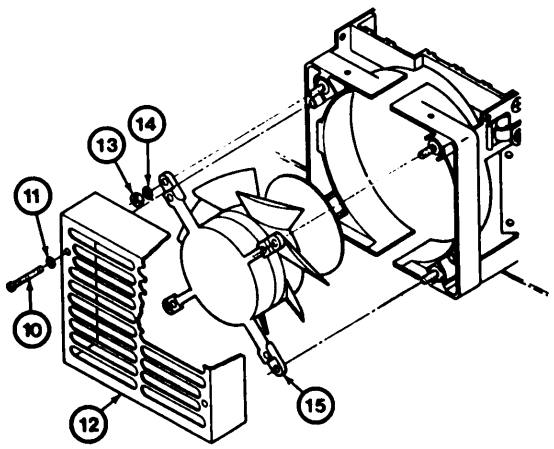
REMOVE (UNITS PREFIXED <3100A)

1. Remove five screws (1) and safety shield (2).
2. Tag, unsolder, and disconnect three wires (3).
3. Remove screw (4) and lock washer (5).
4. Remove screw (6), lock washer (7), flat washer (8), and cable clamp (9).
5. Remove two screws (10) and lock washers (11).
6. Remove fan guard (12).
7. Remove four nuts (13) and lock washers (14).
8. Remove A3B1 Fan (15) while feeding cable out of rear panel.



INSTALL (UNITS PREFIXED <3100A)

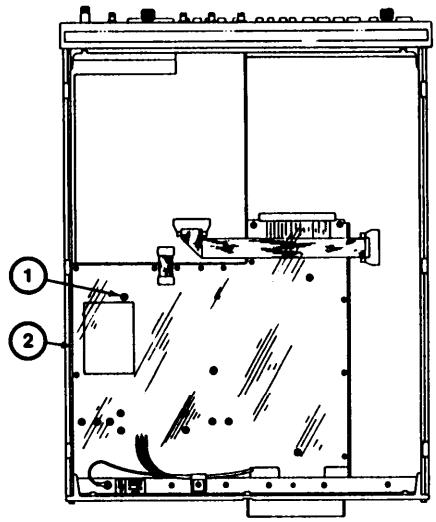
1. Install A3B1 Fan (15) onto four posts while feeding cable into rear panel.
2. Install four nuts (13) and lock washers (14).
3. Install fan guard (12).
4. Install two screws (10) and lock washers (11).
5. Install screw (6), lock washer (7), flat washer (8), and cable clamp (9).
6. Install screw (4) and lock washer (5).
7. Connect and solder three wires (3).
8. Install five screws (1) and safety shield (2).



2-98. REPLACE A3B1 FAN - Continued.

REMOVE (UNITS PREFIXED >3101A)

1. Remove five screws (1) and safety shield (2),
2. Remove four nuts (3) and lockwashers (4).
3. Remove A3B1 Fan (5)/cover (6)/guard (7) combination and place on flat surface behind the rear panel.
4. Remove A3B1 Fan (5) from cover (6).
5. Disconnect cable (8) and remove spacers (9).
6. Separate fan guard (7) from cover (6).



INSTALL (UNITS PREFIXED >3101 A)

NOTE

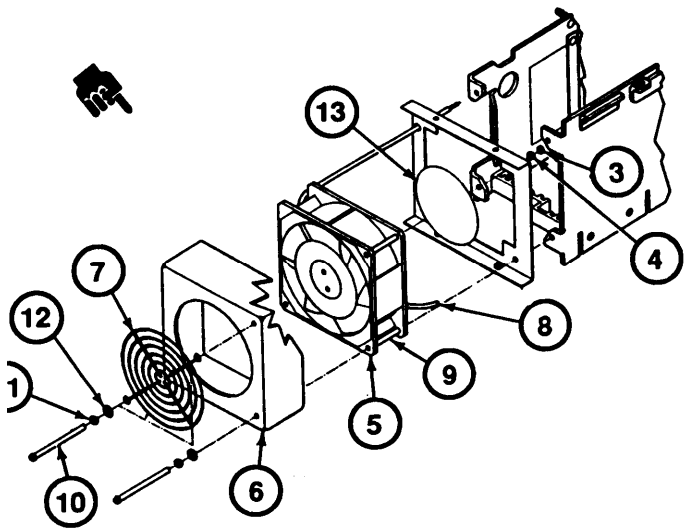
If installing a NEW replacement fan, verify shields (13) are in place.

1. Assemble fan guard (7) on cover (6) using four screws (10), lockwashers (11), and flat washers (12). Position combination on surface (guard down) behind the rear panel.
2. Install spacers (9) on A3B1 Fan (5), and place combination inside cover (6). Air flow is out-to-in.
3. Connect cable (8)
4. Install A3B1 Fan (5)/cover (6)/guard(7) combination in rear panel.

NOTE

Fan must be positioned with the connector in the lower right comer (when viewing from the rear panel).

5. Install four nuts (3) and lock washers (4).
6. Install five screws (1) and safety shield (2).



NOTE

FOLLOW-ON MAINTENANCE:

- If SG-1219/U serial prefix is >3100A, install A3A3 thru A3A7 Assemblies (para 2-86).
- Install top and bottom covers (para 2-47).

END OF TASK

2-99. REPLACE A3C1 THRU A3C4 CAPACITOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

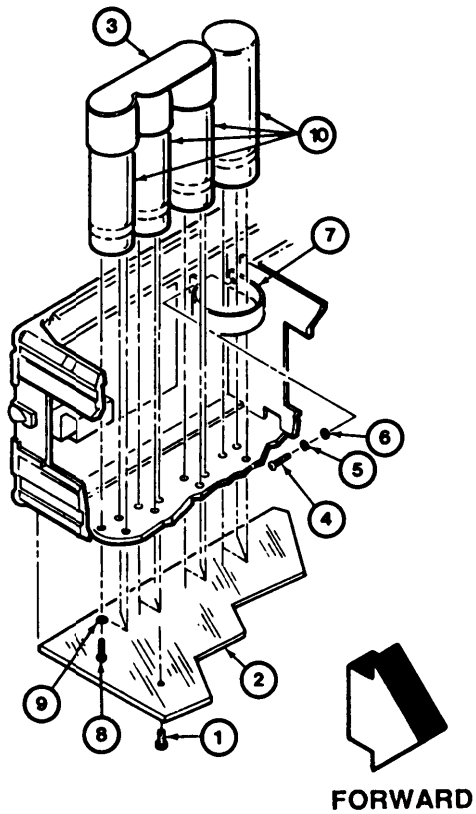
NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).

REMOVE

1. If removing A3C2, remove five screws (1) and safety shield (2).
2. If removing A3C1 thru A3C3, remove capacitor retainer (3).
3. If removing A3C4, remove screw (4), lock washer (5), flat washer (6), and capacitor retainer (7).
4. Remove two screws (8) and two lock washers (9).
5. Remove A3C1 thru A3C4 Capacitor (10).



INSTALL

1. Install A3C1 thru A3C4 Capacitor (10).
2. Install two screws (8) and two lock washers (9).
3. If installing A3C4, install screw (4), lock washer (5), flat washer (6), and capacitor retainer (7).
4. If installing A3C 1 thru A3C3, install capacitor retainer (3).
5. If installing A3C2, install five screws (1) and safety shield (2).

NOTE

FOLLOW-ON MAINTENANCE:

- Install top and bottom covers (para 2-47).

END OF TASK

2-100. REPLACE A3Q1 THRU A3Q4 TRANSISTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

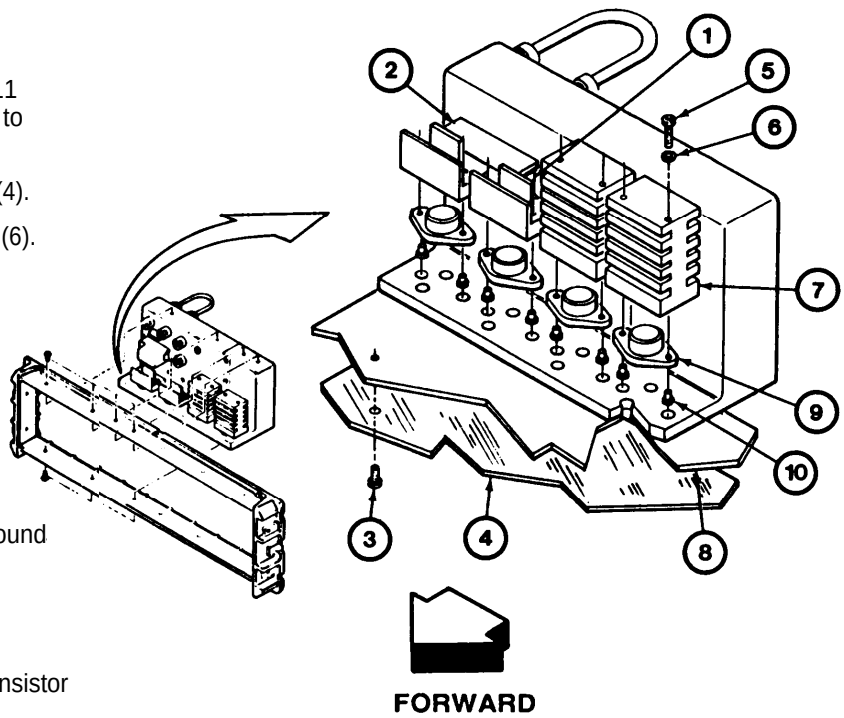
- Remove top and bottom covers (para 2-47).

REMOVE

1. Press retainers (1) and carefully pull A3A11 Line Module (2) out of rear panel enough to expose wires.
2. Remove five screws (3) and safety shield (4).
3. Remove two screws (5) and lock washers (6).
4. Remove heat sink (7).
5. Working from bottom unsolder leads of transistor from A3A10 Assembly (8)
6. Remove A3Q1 to A3Q4 Transistor (9).
7. Remove insulator (10).

INSTALL

1. Install insulator (10) using thermal compound (appendix B, item 3).
2. Install A3Q1 to A3Q4 Transistor (9) into chassis, base facing toward rear.
3. Working from bottom, solder leads of transistor to A3A10 Assembly (8)
4. Install heat sink (7).
5. Install two screws (5) and lock washers (6).
6. Install five screws (3) and safety shield (4).
7. Carefully install A3A11 Line Module (2) into rear panel and press into place.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top and bottom covers (para 2-47).

END OF TASK

2-101. REPLACE A3T1 TRANSFORMER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers (para 2-47).
- Remove left side cover (para 2-48).
- Remove A3A11 Line Module (para 2-97).

REMOVE

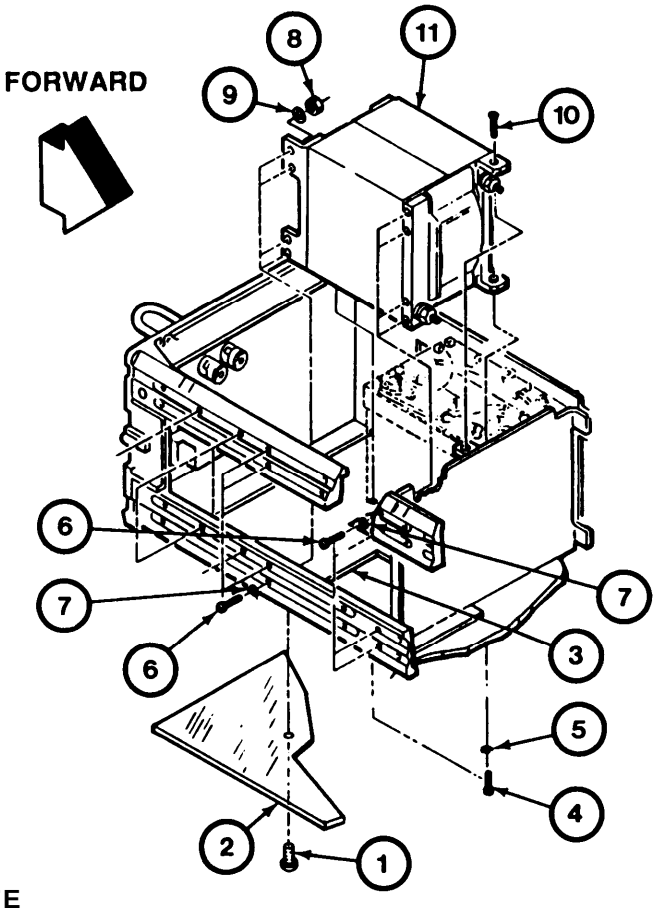
1. Remove five screws (1) and safety shield (2).
2. Tag, unsolder, and disconnect ten wires (3).
3. From bottom, remove two screws (4), and lock washers (5).
4. From side, remove eight (units prefixed <3100A) or six (units prefixed >3101A) screws (6) and lockwashers (7).

   For units prefixed c3100A, remove four nuts (8), and four flat washers (9).
5. Remove screw (10).
6. Remove A3T1 Transformer (11).

INSTALL

1. Install A3T1 Transformer (11] into chassis with wires facing toward rear. Place inward wires through circuit card and outward wires through side.
2. Install screw (10).
3. From side, install eight (units prefixed <3100A) or six (units prefixed >3101A) screws (6) and lockwashers (7).

   For units prefixed <3100A, install four nuts (8), and four flat washers (9).
4. From bottom, install two screws (4) and lock washers (5).
5. Connect and solder ten wires (3).
6. Install five screws (1) and safety shield (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A3A11 Line Module (para 2-97).
- Install left side cover (para 2-48).
- Install top and bottom covers (para 2-47).

END OF TASK

2-102. REPLACE A4A1 ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

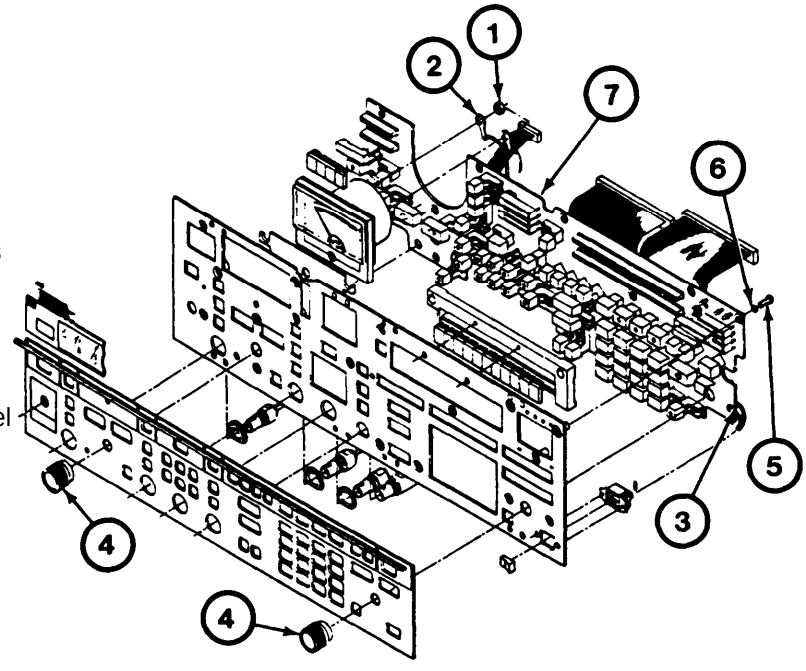
- Remove top and bottom covers (para 2-47).
- Remove both side covers (para 2-48).
- Remove front frame (para 2-49).
- Remove front panel (para 2-50).

REMOVE

1. Remove two nuts (1) and terminal lugs (2). Move rigid cable to one side if required.
2. Tag, unsolder, and disconnect two wires (3).
3. Remove two knobs (4).
4. Remove seventeen screws (5) and lock washers (6).
5. Remove A4A1 Assembly (7).

INSTALL

1. Install A4A1 Assembly (7) through front panel (8).
2. Install seventeen screws (5) and lock washers (6).
3. Install two knobs (4).
4. Connect and solder two wires (3).
5. Install two nuts (1) and terminal lugs (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install front panel (para 2-50).
- Install front frame (para 2-49).
- Install both side covers (para 2-48).
- Install top and bottom covers (para 2-47).

END OF TASK

2-103. REPLACE A4A1S2 THRU S58 KEYBOARD SWITCH.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

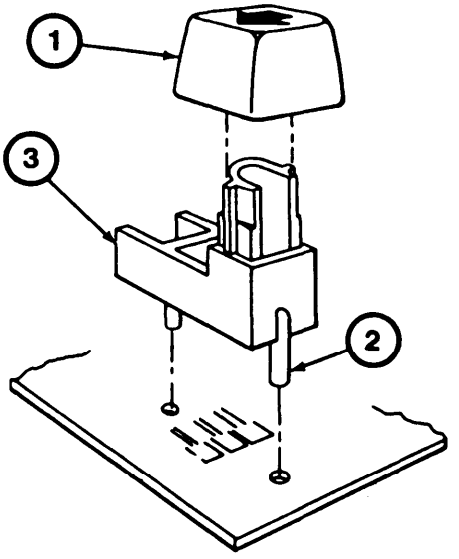
- Remove top and bottom covers (para 2-47).
- Remove both side covers (para 2-48).
- Remove front frame (para 2-49).
- Remove front panel (para 2-50).
- Remove A4A1 Assembly (para 2-102).

REMOVE

NOTE

Do not handle or clean contact surface areas as keyboard surface acts as a contact in switch operation.

1. Remove push button (1).
2. From top, carefully cut switch studs (2).
3. Remove switch (3).



2-103. REPLACE A4A1S2 THRU S58 KEYBOARD SWITCH—Continued.

INSTALL

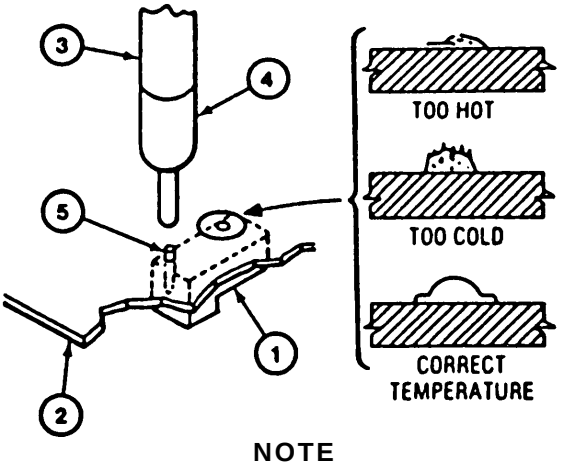
1. From front, insert switch (1) in keyboard assembly (2).

NOTE

- Switch must be mounted tightly against keyboard surface for proper operation.
- Proper heat for element with staking tip is 440° C (825° F).

2. Using a 35W element (3) with staking tip (4) attached, melt plastic stud (5).

3. Verify that switch is mounted firmly against keyboard and melted post has a smooth, round surface.



NOTE

FOLLOW-ON MAINTENANCE:

- Install A4A1 Assembly (para 2-102).
- Install front panel (para 2-50).
- Install front frame (para 2-49).
- Install both side covers (para 2-48).
- Install top and bottom covers (para 2-47).

END OF TASK

2-104. REPLACE A4S1 POWER SWITCH.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

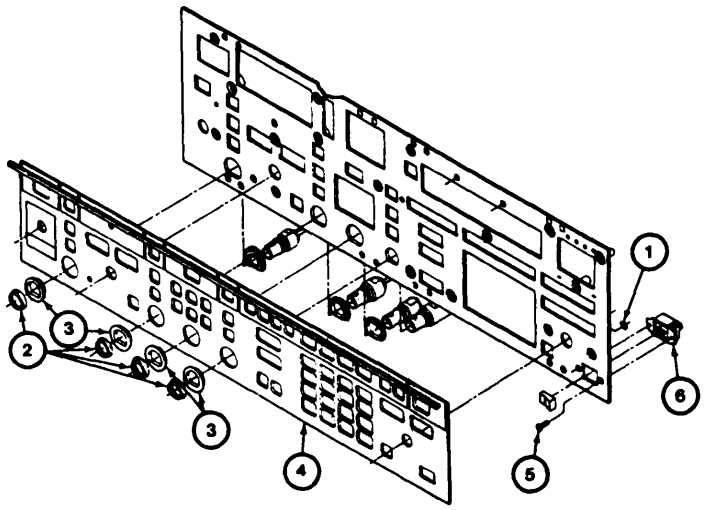
- Remove top and bottom covers (para 2-47).
- Remove both side covers (para 2-48).
- Remove front frame (para 2-49).
- Remove front panel (para 2-50).
- Remove A4A1 Assembly (para 2-102).

REMOVE

1. Remove four panel retainers 1).
2. Remove four nuts (2) and washers (3).
3. Remove dress panel (4).
4. Remove two screws (5).
5. Remove A4S1 Power Switch (6).

INSTALL

1. Install A4S1 Power Switch (6) in front panel (7).
2. Install two screws (5).
3. Install dress panel (4).
4. Install four nuts (2) and washers (3).
5. Install four panel retainers (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A4A1 Assembly (para 2-102).
- Install front panel (para 2-50).
- Install front frame (para 2-49).
- Install both side covers (para 2-48).
- Install top and bottom covers (para 2-47).

END OF TASK

Section V. PREPARATION FOR STORAGE OR SHIPMENT

2-105. PACKAGING.

Package Signal Generator in original shipping container. When using packing materials other than the original, use the following guidelines:

- Wrap Signal Generator inelastic packing material.
- Use double-wall cardboard shipping container.
- Protect all sides with shock-absorbing material to prevent Signal Generator from movement within the container.
- Seal the shipping container with approved sealing tape.
- Mark “FRAGILE" on all sides, top, and bottom of shipping container.

2-106. TYPES OF STORAGE.

- Short-Term (administrative)=1 to 45 days. Refer to TM 740-90-1 for administrative storage procedures.
- Intermediate=46 to 180 days.
- Long term=over 180 days. After long term storage, perform memory check (TM 11-6625-3143-12, Table 2-1). If this check fails, replace A2BT1 Battery (para 2-77).

2-107. ENVIRONMENT.

The Signal Generator should be stored in a clean, dry environment. In high humidity environments, protect the Signal Generator from temperature variations that could cause internal condensation. The following environmental conditions apply to both shipping and storage:

Temperature	-55° C to +75° C (-66° F to +158° F)
Relative Humidity	less than 95%
Altitude	less than 15,300 meters (50,000 feet)

APPENDIX A
REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms ..... DA Form 2028

Recommended Changes to Equipment Technical Manuals ..... DA Form 2028-2

Equipment Inspection and Maintenance Worksheet ..... DA Form 2404

Discrepancy in Shipment Report (DISREP) ..... Form SF 361

Report of Discrepancy (ROD) ..... Form SF 364

Quality Deficiency Report ..... Form SF 368

A-3. TECHNICAL MANUALS.

The Army Maintenance Management System (TAMMS) ..... DA Pam 738-750

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command) . . . . . TM 750-244-2

Operator's and Organizational Maintenance Manual, Signal Generator SG-1219/U ..... TM 11-6625-3143-12

Organizational, Direct Support, and General Support Repair Parts and Special Tools List, for Signal Generator SG-1219/U ..... TM 11-6625-3143-24P

Administrative Storage procedures ..... TM 740-90-1

Calibration Procedures ..... TB 43-180

A-4. MISCELLANEOUS.

Common Table of Allowances ..... CTA 50-970

Consolidated Index of Army Publications and Blank Forms ..... DA Pam 25-30

First Aid for Soldiers ..... FM 21-11

Safety Precautions for Maintenance of Electrical/Electronic Equipment ..... TB 385-4

Abbreviations for Use on Drawings, Specifications, Standards and in Technical Documents MIL-STD-12D

APPENDIX B
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists expendable supplies you will need for general support maintenance on Signal Generator SG-1219/U. These items are authorized to you by CTA 50-970, Expendable items (Except Medical, Class V, Repair Parts, and Heraldic Items).

B-2. EXPLANATION OF COLUMNS.

a Column (1)--Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column (2)-Level. This column identifies the lowest level of maintenance that requires the listed item.

0- Organizational Maintenance.

c. Column (3)-National Stock Number. This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.

d. Column (4)-Description. This column indicates the federal item name and if required, a minimum description to identify the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

e. Column *(5)Unit of Measure (U/M).* This column indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	H	6850-00-405-9385	Circuit Cooler, Freon 12 Base MS240 (18598)	CN
2	H	6810-00-753-4993	Alcohol, Isopropyl, 80Z Can, MIL-A-10428, Grade A (81349)	CN
3	H		Thermal Compound, Silicon (13103) THERMALCOTE	CN
4	H		Cable Ties TY23M-8 (59730)	EA

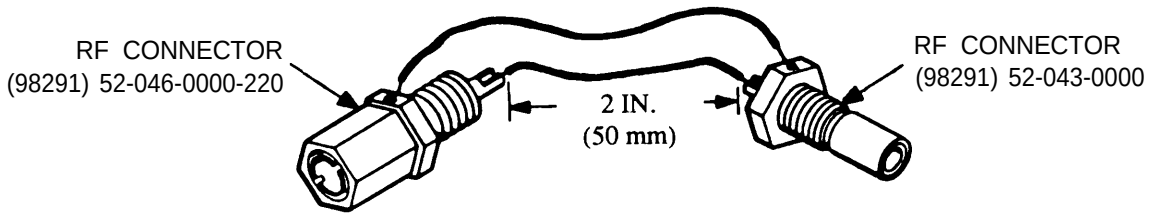
APPENDIX C
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

C-1. SCOPE.

This appendix inculdes complete instructions for making items authorized to be manufactured or fabricated at general support maintenance level for SG-1219/U.

All bulk materials needed for manufacture of an item are listed by part number.

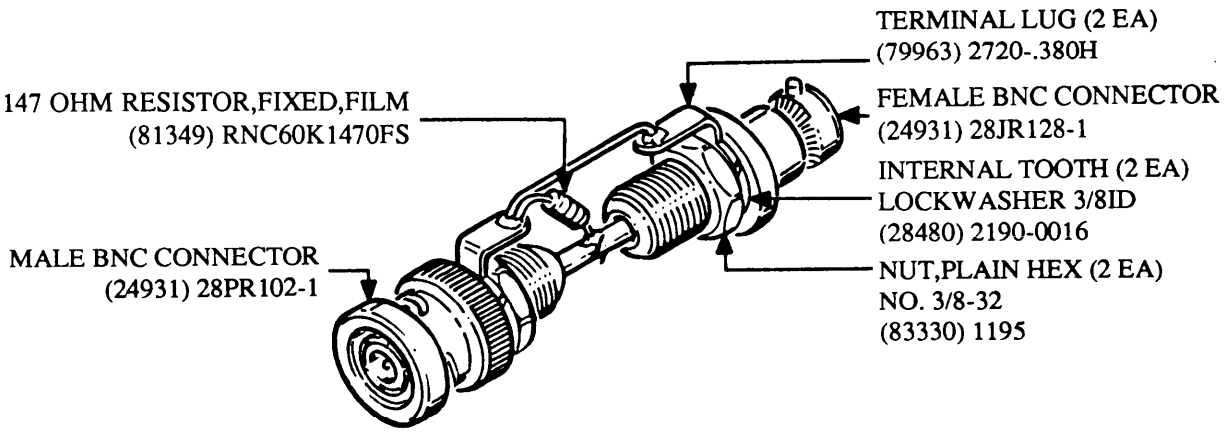


NOTE

- Use number 22 AWG wire and solder outer cases of both connectors.
- Use number 22 AWG wire and solder center conductor of both connectors.

EL9XY003

Figure C-1. Interconnect Cable.

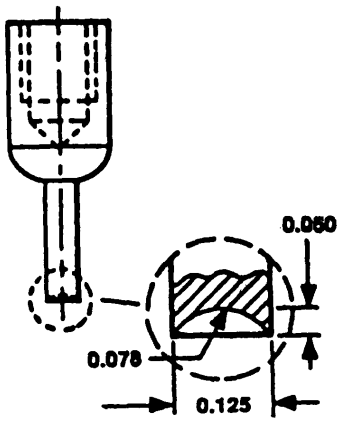


NOTE

- Install terminal lugs, lock washer and nuts on both connectors.
- Solder center conductor of both connectors.
- Use number 22 AWG wire and solder both terminal lugs.
- Solder one side of resistor to terminal lug and other to center conductor.

EL9XYO04

Figure C-2. Pulse Shunt Adapter.



NOTE

- Fabricate from (13036) PL-111 solder tip.
- All Dimensions are in inches.

EL9XYO05

Figure C-3. Heat Staking Tip.

INDEX

Subject — Paragraph/Figure/Table

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INDEX (Continued)

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FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
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Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703-5007

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
I. M. DeSpiritof

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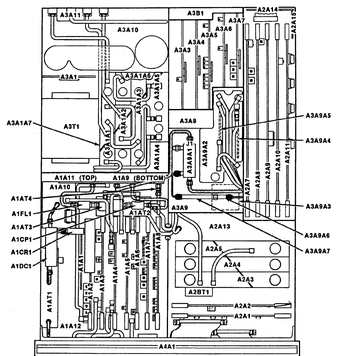
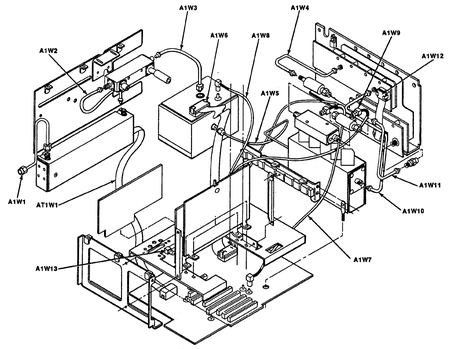
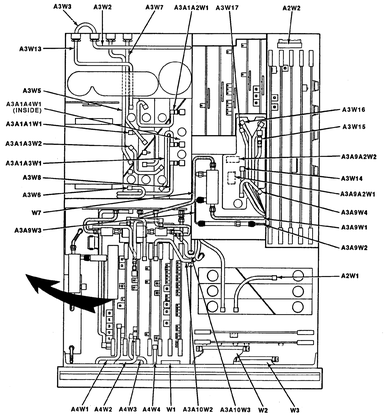
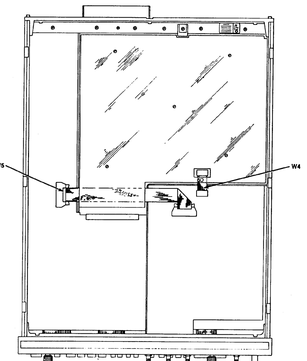


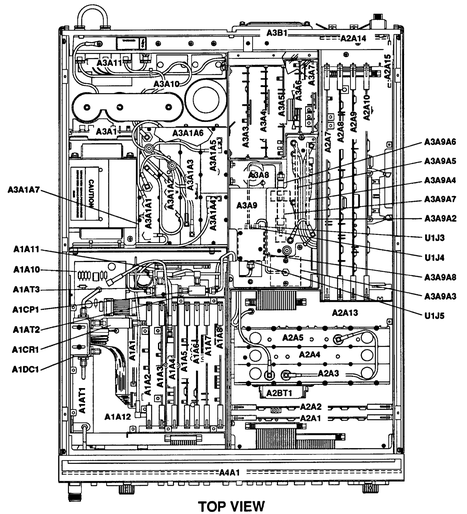




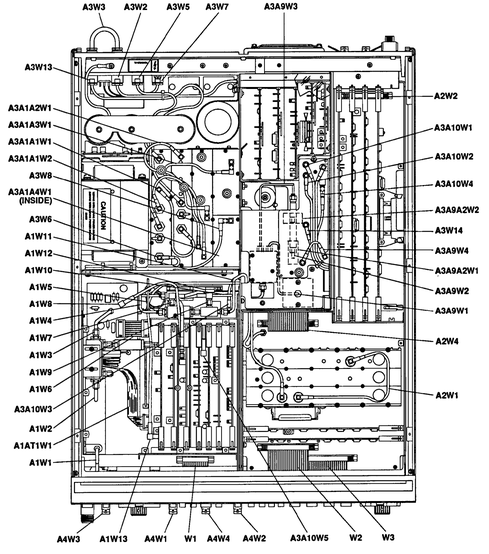


EL9XY006

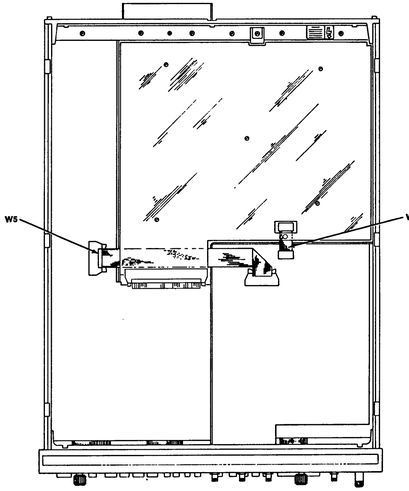
Figure FO-1. Assembly and Cable Locator Diagram (Serial Prefix <3100A).



TOP VIEW



TOP VIEW



BOTTOM VIEW

EL9XY026

Figure FO-1.1. Assembly and Cable Locator Diagram (Serial Prefix >3100A).

NOTES:

⚠ INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

⚠ INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

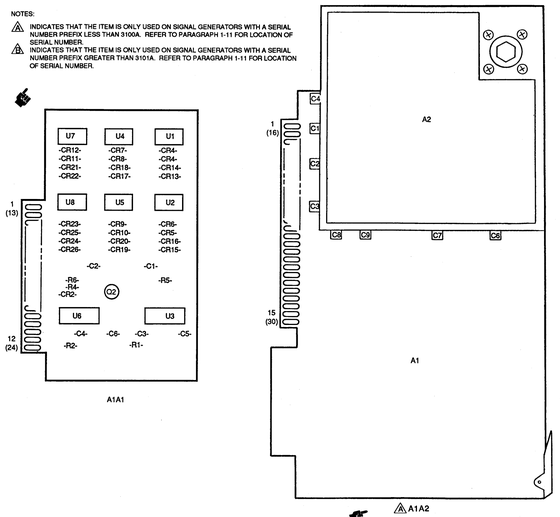
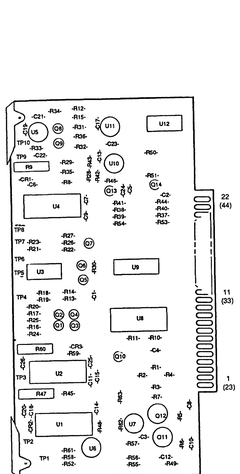
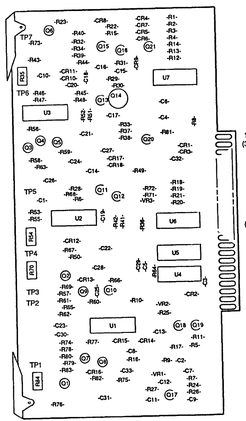
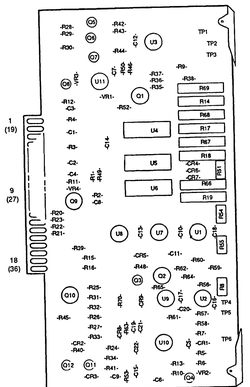
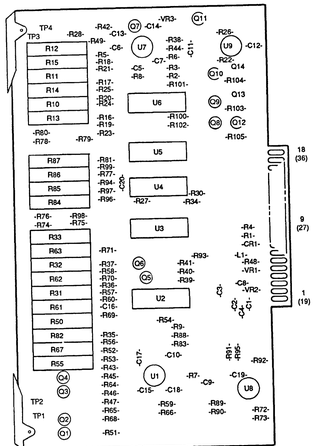


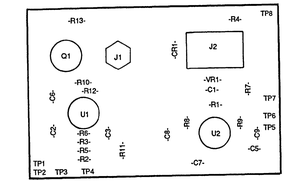
Figure FO-2. A1 Assembly Component Locator Diagram (Sheet 1 of 2).

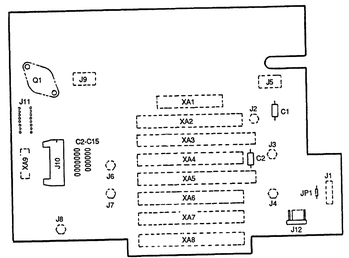












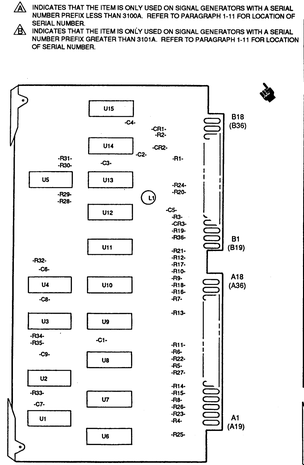
EL9XY008

Figure FO-2. A1 Assembly Component Locator Diagram (Sheet 2 of 2).

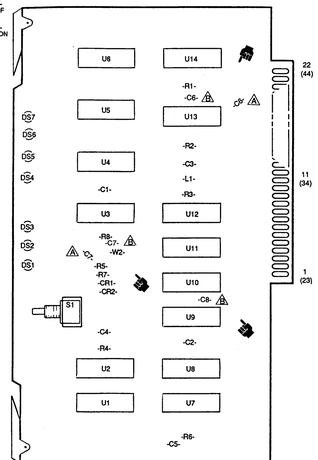
NOTES:

⚠ INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

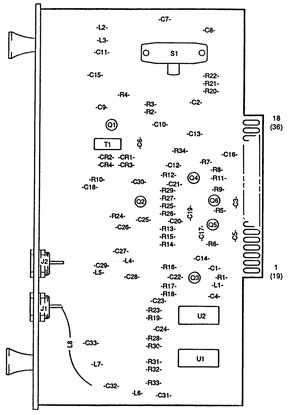
⚠ INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.



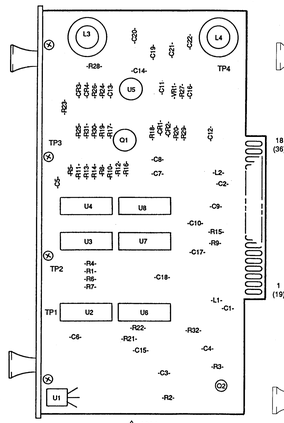
A2A1



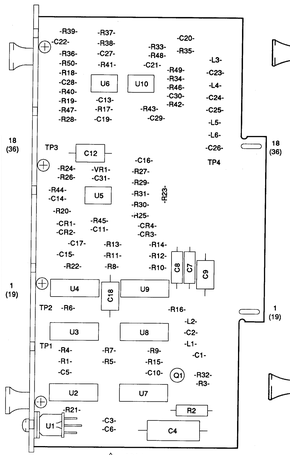
A2A2



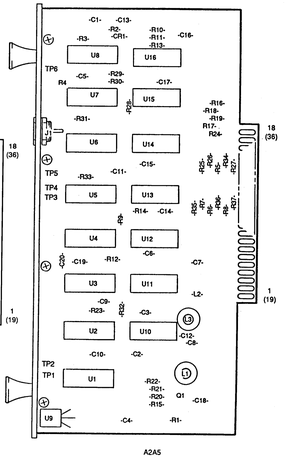
A2A3



⚠ A2A4



⚠ A2A4

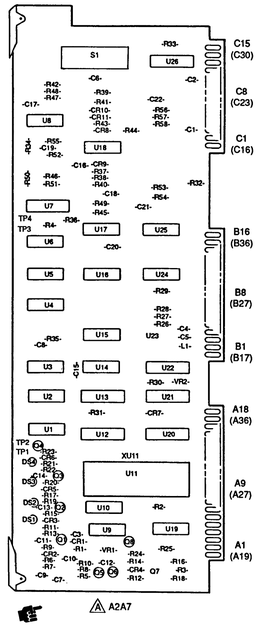


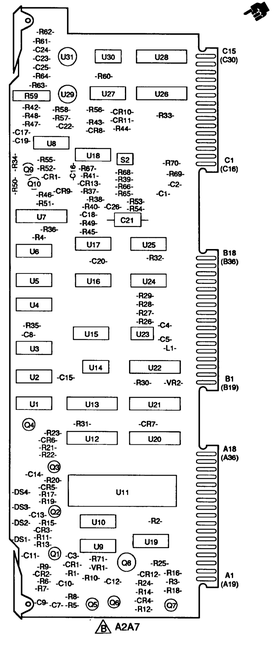
A2A5

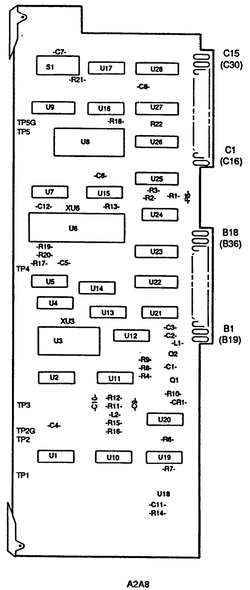
EL9XY009

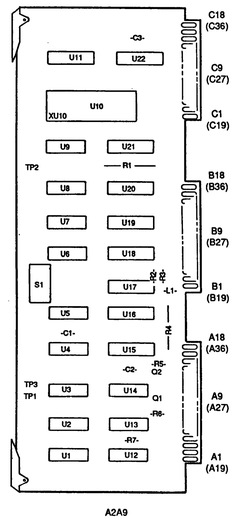
Figure FO-3. A2 Assembly Component Locator Diagram (Sheet 1 of 3).

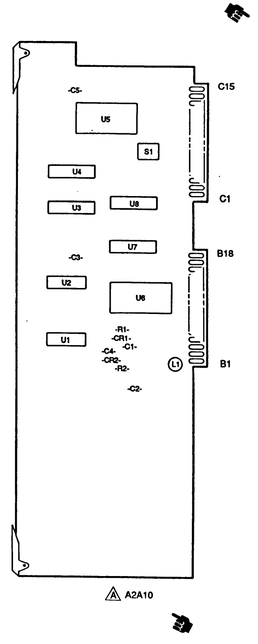
SEE SHEET 1 FOR NOTES

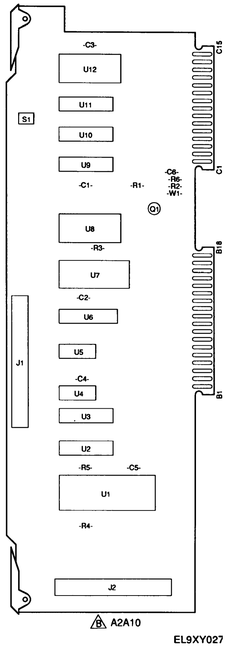












EL9XY027

Figure FO-3. A2 Assembly Component Locator Diagram (Sheet 2 of 3).

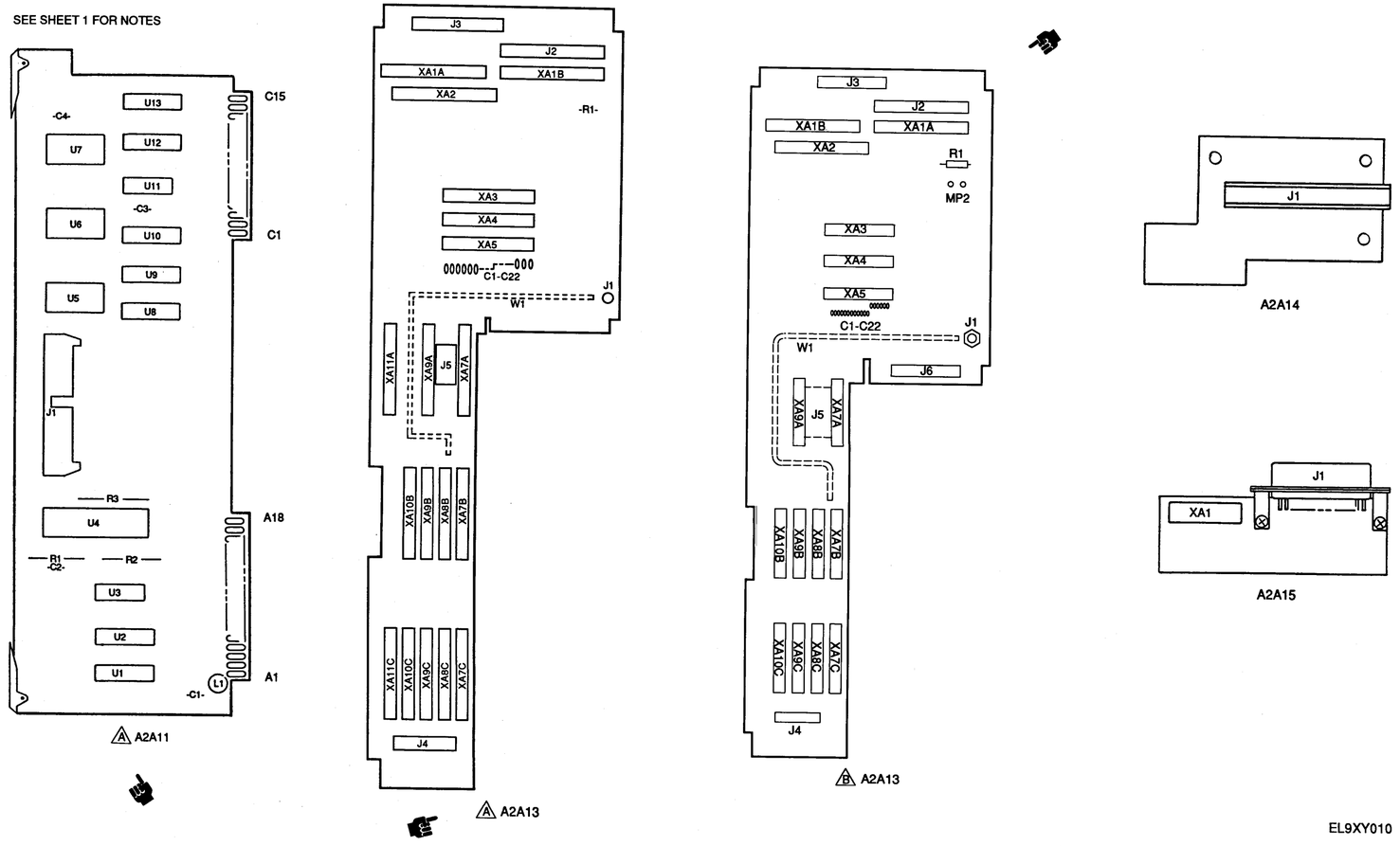
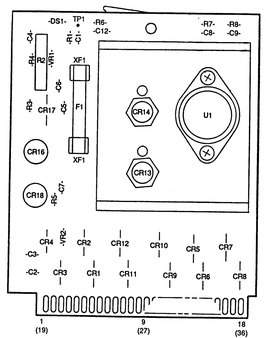


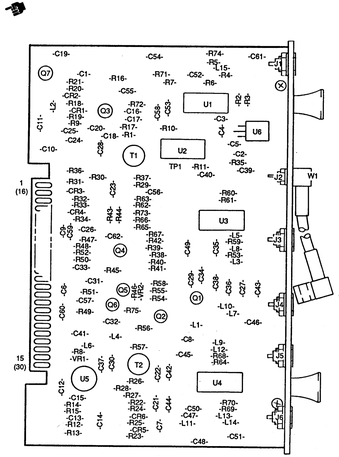
Figure FO-3. A2 Assembly Component Locator Diagram (Sheet 3 of 3).

NOTES:

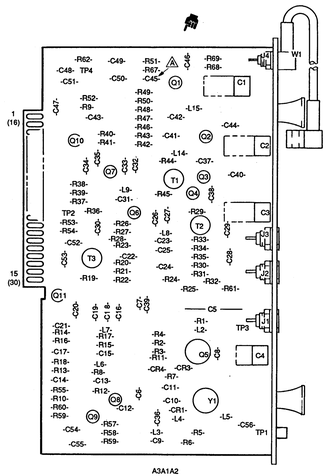
1. INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.
2. INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.



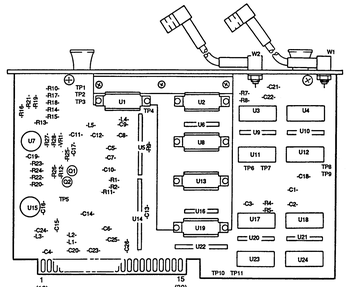
A3A1



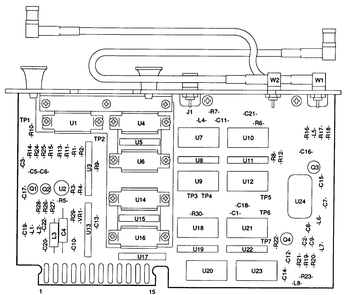
A3A1A1



A3A1A2



A3A1A3

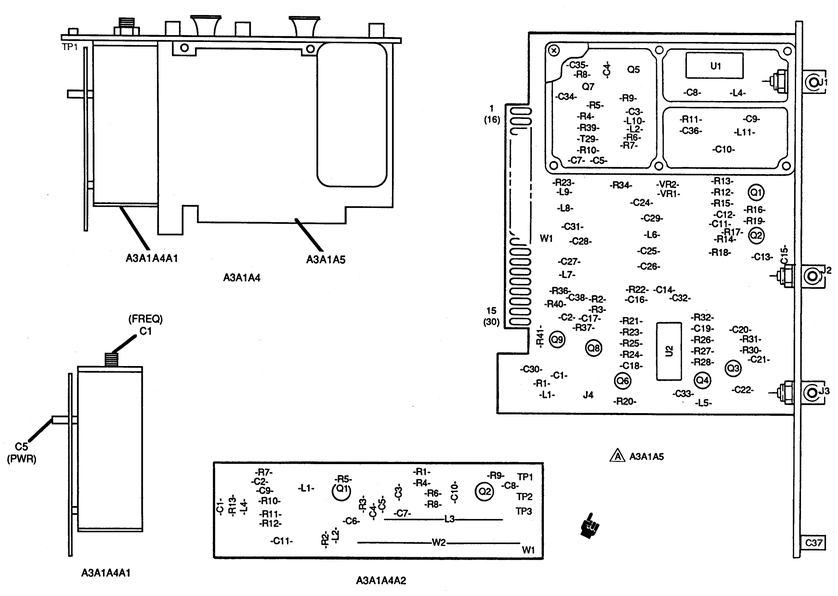


A3A1A3

EL9XY011

Change 2

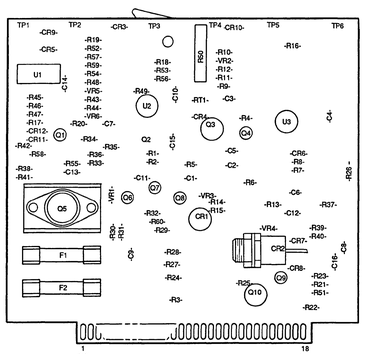
Figure FO-4. A3 Assembly Component Locator Diagram (Sheet 1 of 5).



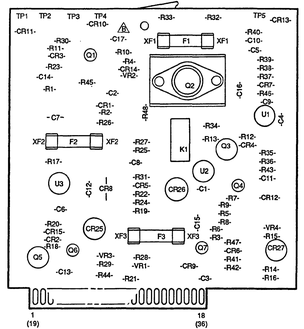
EL9XY012

Figure FO-4. A3 Assembly Component Locator Diagram (Sheet 2 of 5).

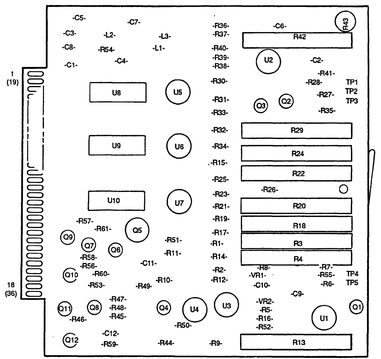
SEE SHEET 1 FOR NOTES



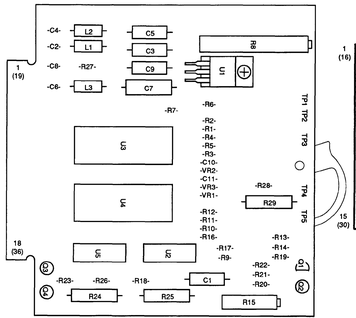
A3A3



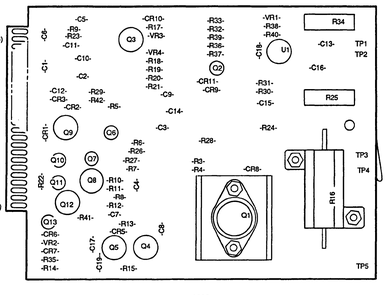
A3A4



⚠ A3A5



⚠ A3A5

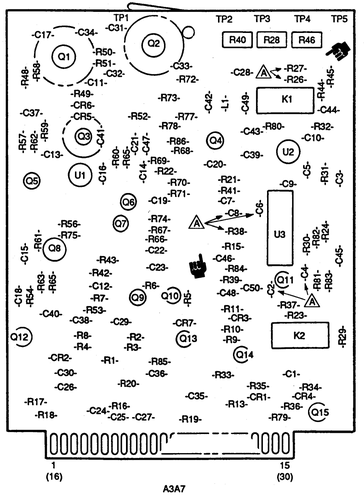


A3A6

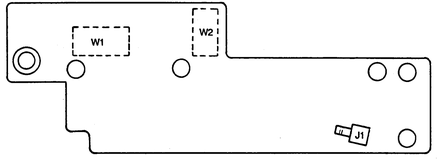
EL9XY013

Figure FO-4. A3 Assembly Component Locator Diagram (Sheet 3 of 5).

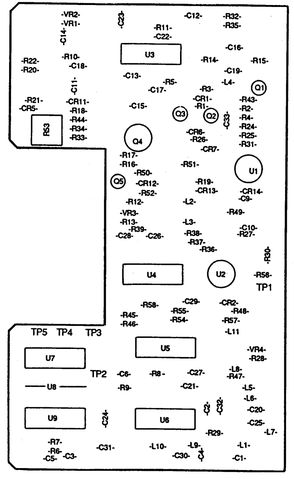
SEE SHEET 1 FOR NOTES



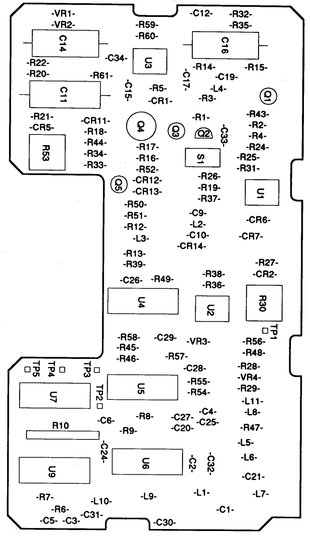
A3A7



A3A9A2



A3A9A4

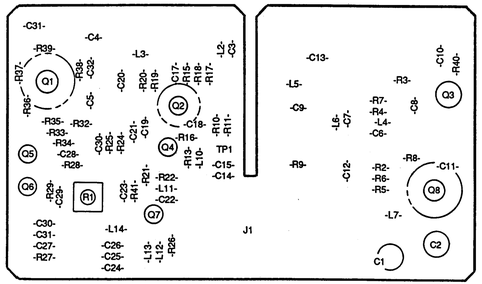


A3A9A4

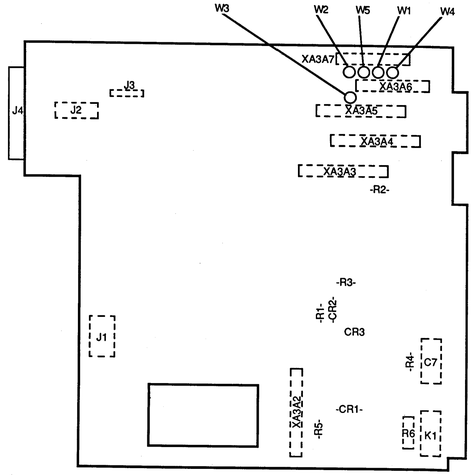
EL9XY014

Figure FO-4. A3 Assembly Component Locator Diagram (Sheet 4 of 5).

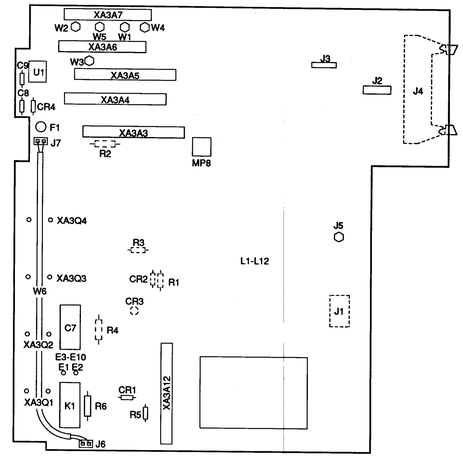
SEE SHEET 1 FOR NOTES



A3A9A5



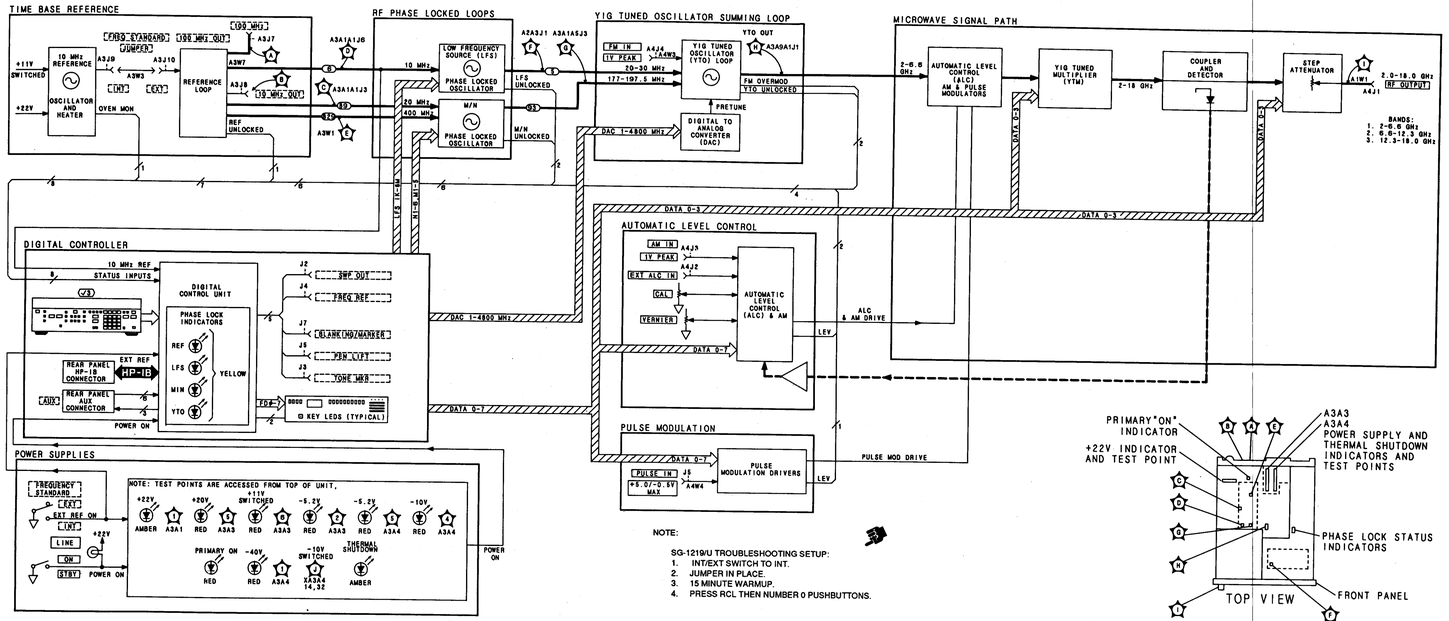
⚠ A3A10



⚠ A3A10

EL9XY028

Figure FO-4. A3 Assembly Component Locator Diagram (Sheet 5 of 5).



EL9XY015

Figure FO-5. Signal Generator Detailed Block Diagram (Serial Prefix <3100A).

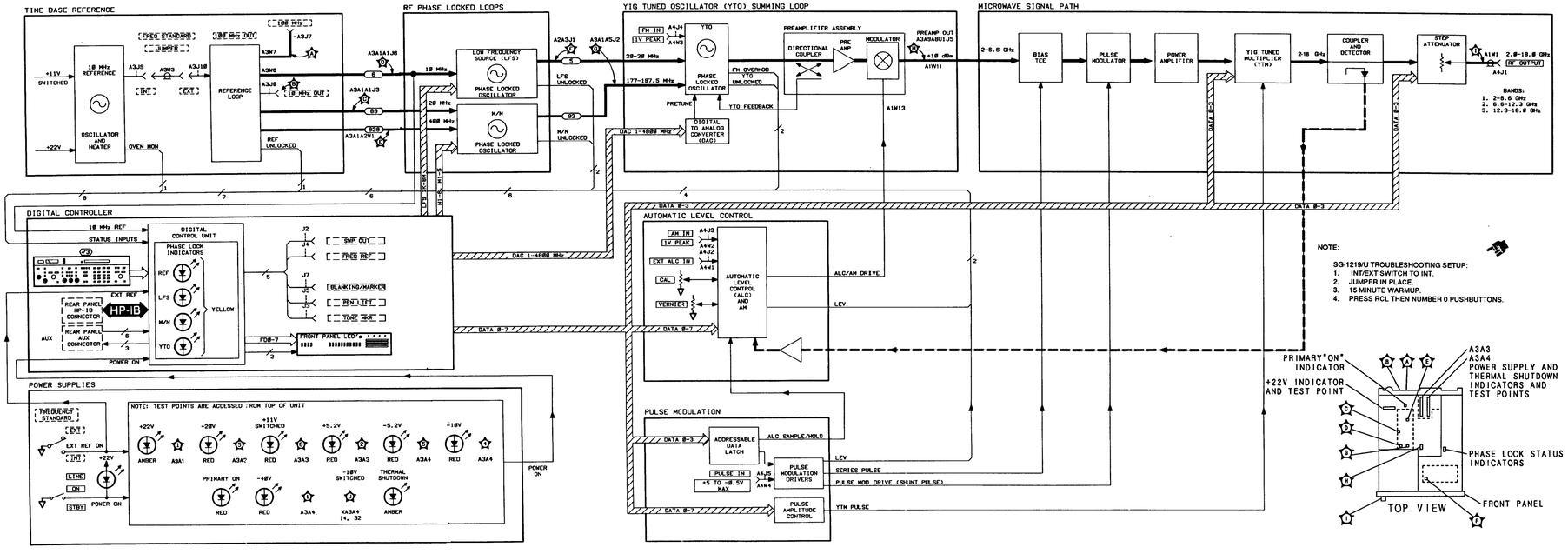
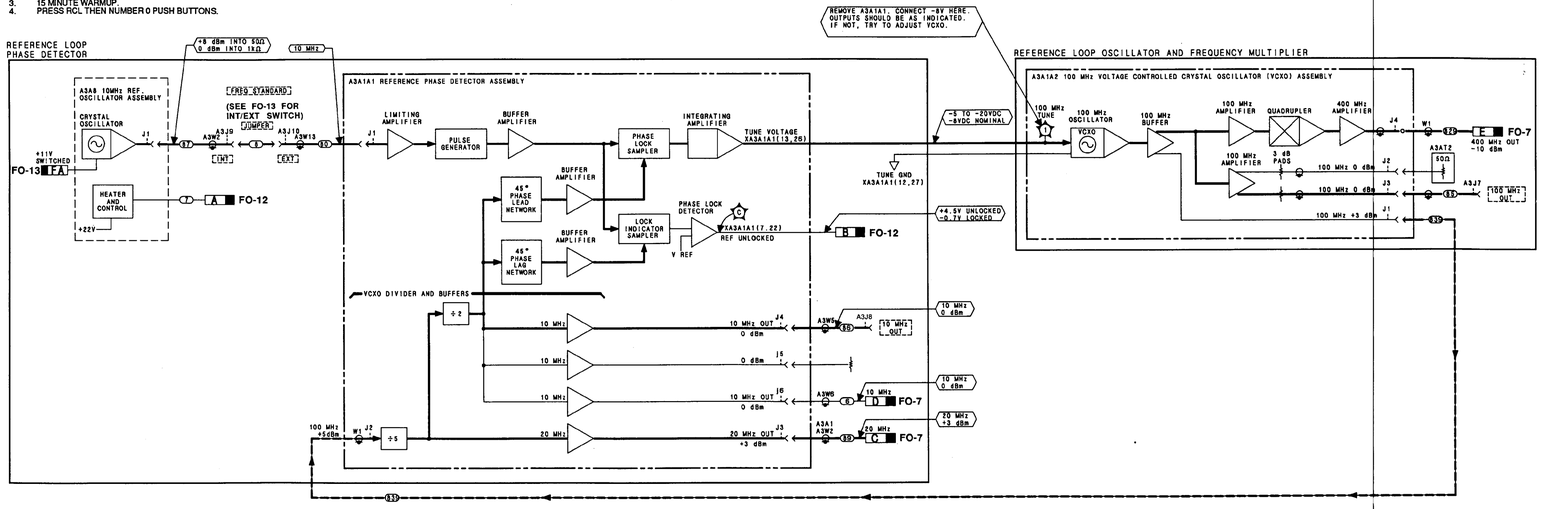


Figure FO-5.1. Signal Generator Detailed Block Diagram (Serial Prefix >3100A).

SG-1219/U TROUBLESHOOTING SETUP:

1. INT/EXT SWITCH TO INT.
2. JUMPER IN PLACE.
3. 15 MINUTE WARMUP.
4. PRESS RCL THEN NUMBER 0 PUSH BUTTONS.



EL9XY016

Figure FO-6. Time Base Reference Subsystem Functional Block Diagram.

TROUBLESHOOTING NOTES:

LFS LOOP

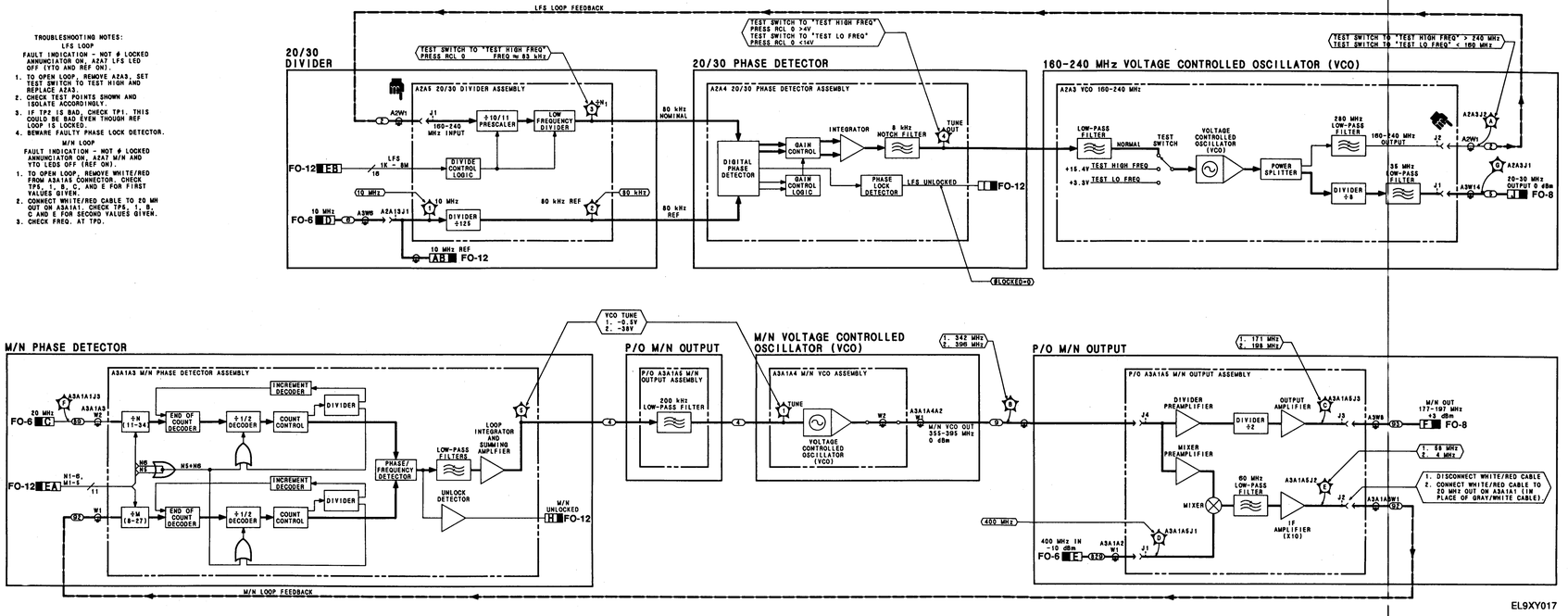
FAULT INDICATION - NOT Φ LOCKED ANNUNCIATOR ON; A2A7 LFS LED OFF (YTO AND REF ON).

1. TO OPEN LOOP, REMOVE A2A3, SET TEST SWITCH TO TEST HIGH AND REPLACE A2A3.
2. CHECK TEST POINTS SHOWN AND ISOLATE ACCORDINGLY.
3. IF TP2 IS BAD, CHECK TP1. THIS COULD BE BAD EVEN THOUGH REF LOOP IS LOCKED.
4. BEWARE FAULTY PHASE LOCK DETECTOR.

M/N LOOP

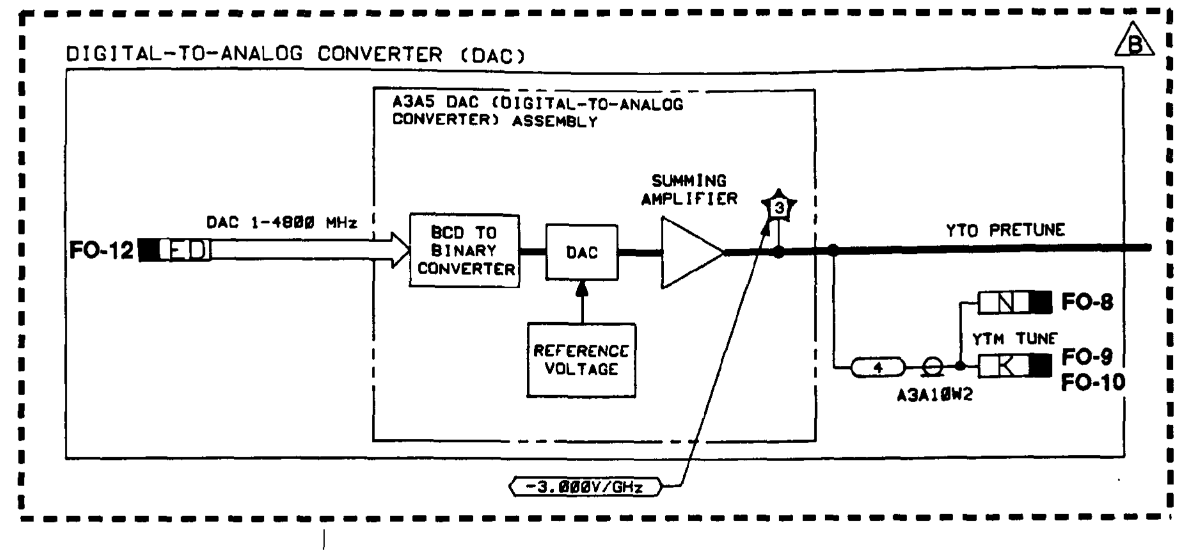
FAULT INDICATION - NOT Φ LOCKED ANNUNCIATOR ON; A2A7 M/N AND YTO LEDS OFF (REF ON).

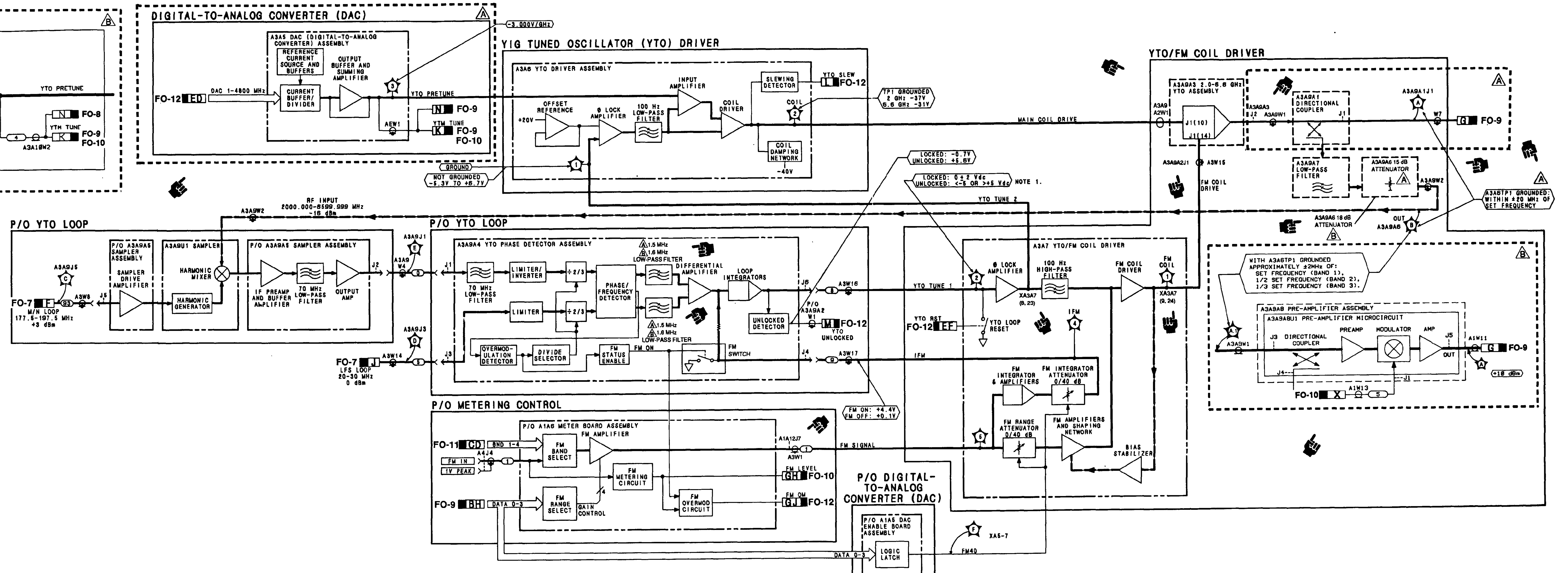
1. TO OPEN LOOP, REMOVE WHITE/RED FROM A3A1A5 CONNECTOR. CHECK TP5, 1, B, C, AND E FOR FIRST VALUES GIVEN.
2. CONNECT WHITE/RED CABLE TO Z0 WH OUT ON A3A1A1. CHECK TP5, 1, B, C AND E FOR SECOND VALUES GIVEN.
3. CHECK FREQ. AT TPD.



EL9XY017

Figure FO-7. RF Phased Locked Loops Subsystem Functional Block Diagram.





NOTE 1:

IF THE VOLTAGE HERE IS <-2 AND >-5 OR >+2 AND <+5, THE YTO IS STILL LOCKED, BUT DAC A3A5 SHOULD BE ADJUSTED.

GENERAL NOTES:

(A) INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

(B) INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

TROUBLESHOOTING NOTES:

FAULT INDICATION: NOT Ø LOCKED ANNUNCIATOR ON YTO Ø LOCK LED OFF (REF. LFS & M/N LEDS ON).

1. OPEN LOOP BY GROUNDING A3A6TP1
2. FOR UNITS PREFIXED <3100A, MEASURED FREQUENCY AT A3A9A1J1 SHOULD BE WITHIN ±20 MHz OF FREQUENCY SET ON FRONT PANEL. FOR UNITS PREFIXED >3101A, MEASURED FREQUENCY AT A3A9A8U1J5 SHOULD BE WITHIN ±2 MHz OF FREQUENCY SET ON FRONT PANEL. IF NOT OK, USE TEST POINTS INDICATED TO ISOLATE BETWEEN A3A5, A3A6, A3A9A3, AND A3A7.
3. IF A3A5TP3 (UNITS PREFIXED <3100A) OR A3A5TP5 (UNITS PREFIXED >3101A) IS BAD, CHECK DAC 1-4800 SIGNATURES USING FREQUENCY OUTPUT DIAGNOSTIC UNDER CONTROLLER TROUBLESHOOTING.
4. IF TPA IS OK, CHECK TPB. IF OK, REMOVE GROUND FROM A3A6TP1 AND ISOLATE BETWEEN A3A9A2, A3A9A3, A3A9A4, A3A9A5, AND A3A9A7 BY CHECKING TEST POINTS.

FAULT INDICATION: NO OR FAULTY FM.

1. PRESS RCL 0, FM DEVIATION MHz 0.1
2. SET TEST OSCILLATOR FOR:
   100 kHz
   0.707 Vrms
   AND CONNECT TO FM IN JACK.
3. CHECK A3A7 TP1, TP4, TP5 AND ISOLATE FAULT ACCORDINGLY.

EL9XY018

Figure FO-8. YIG Tuned Oscillator Summing Loop Subsystem Functional Block Diagram.

NOTES:

A INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

B INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

TROUBLESHOOTING NOTES

FAULT INDICATION: NO OR LOW POWER, ALL BANDS

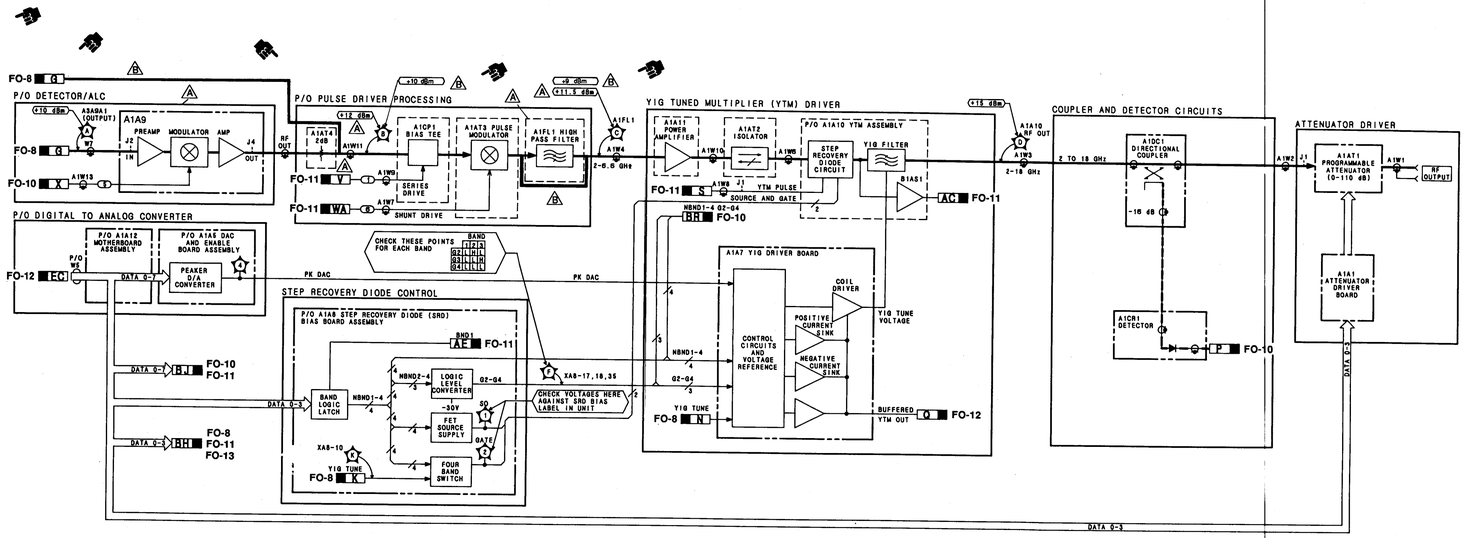
1. MEASURE POWER AT TEST POINTS IN MICROWAVE CHAIN UNTIL LOW POWER IS FOUND.
2. IF POWER LOW AT TPD (OK AT TPA, B, AND C), CHECK A1A8 TP1 AND TP2 AND TPF TO ISOLATE BETWEEN A1A8 AND A1A7/A1A8.

FAULT INDICATION: NO OR LOWPOWER CERTAIN BAND (S) ONLY

CHECK A1A8 TEST POINTS FIRST. IF THEY ARE OK, CHECK A1A7/A1A10.

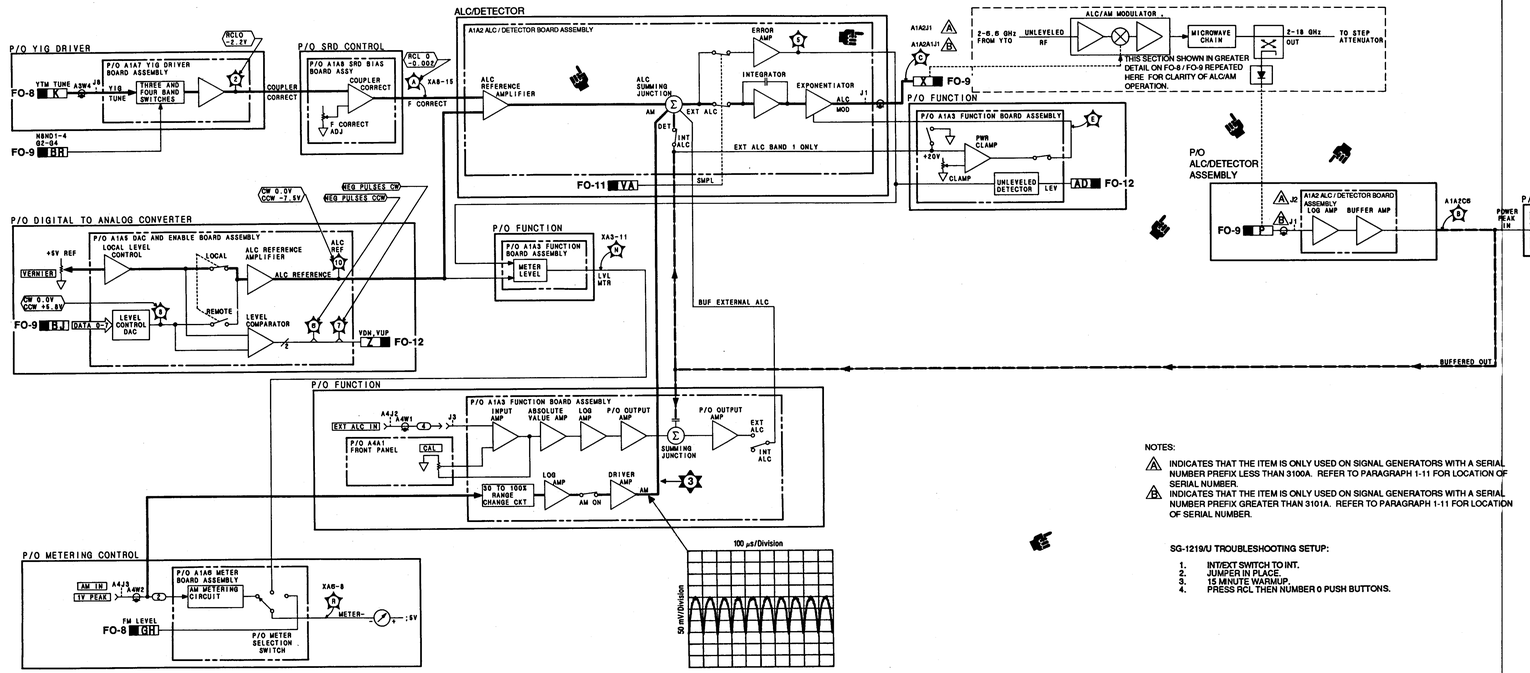
FAULT INDICATION: AUTO PEAK DOES NOT WORK.

CHECK OPERATION OF PEAKER DAC



EL9XY019

Figure FO-9. Microwave Signal Path Subsystem Functional Block Diagram.



NOTES:

A INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

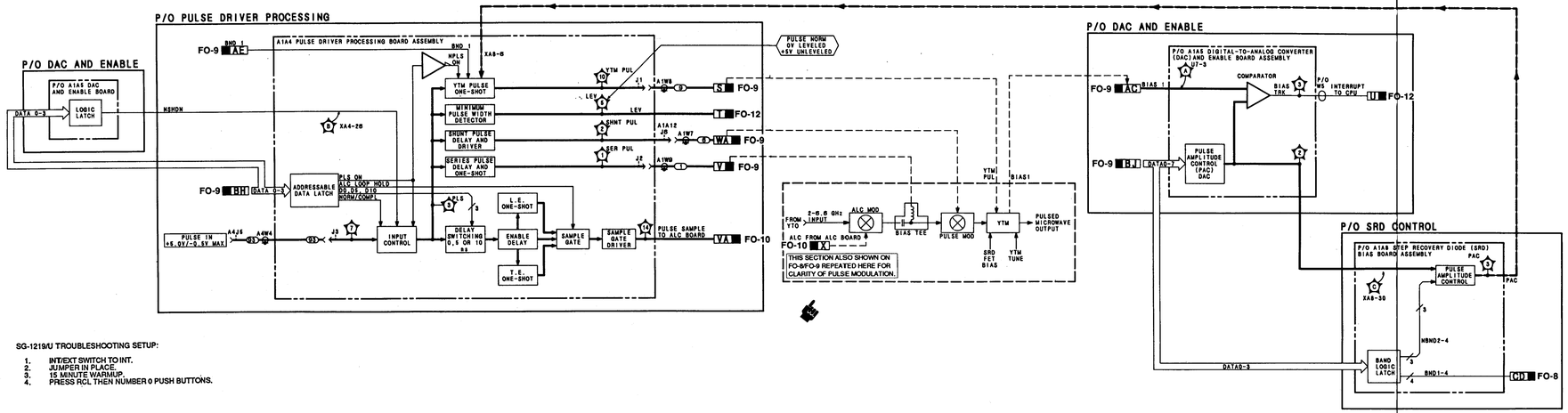
B INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

SG-1219/U TROUBLESHOOTING SETUP:

1. INT/EXT SWITCH TO INT.
2. JUMPER IN PLACE.
3. 15 MINUTE WARMUP.
4. PRESS RCL THEN NUMBER 0 PUSH BUTTONS.

EL9XY020

Figure FO-10. Automatic Level Control Loop Subsystem Functional Block Diagram.



SG-1219/U TROUBLESHOOTING SETUP:

1. INT/EXT SWITCH TO INT.
2. JUMPER IN PLACE.
3. 15 MINUTE WARMUP.
4. PRESS RCL THEN NUMBER 0 PUSH BUTTONS.

EL9XY021

Figure FO-11. Pulse Modulation Subsystem Functional Block Diagram.

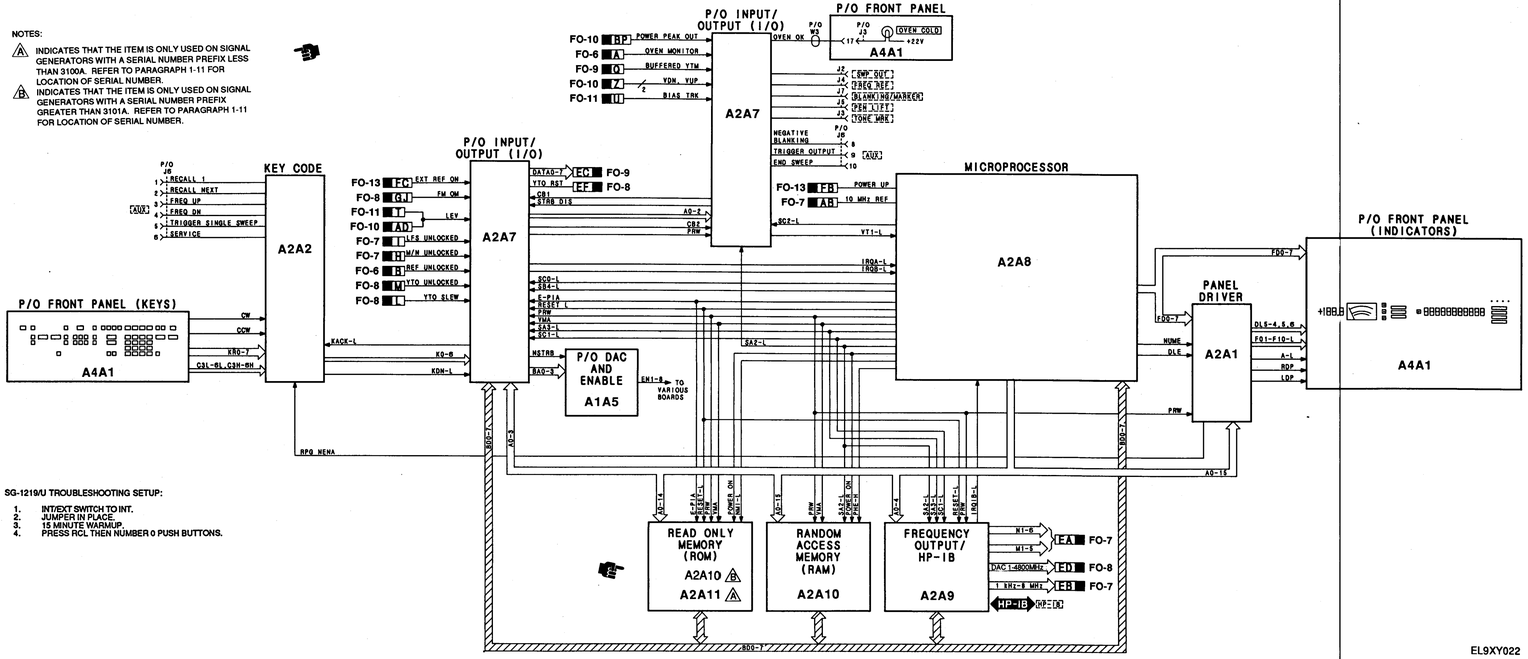
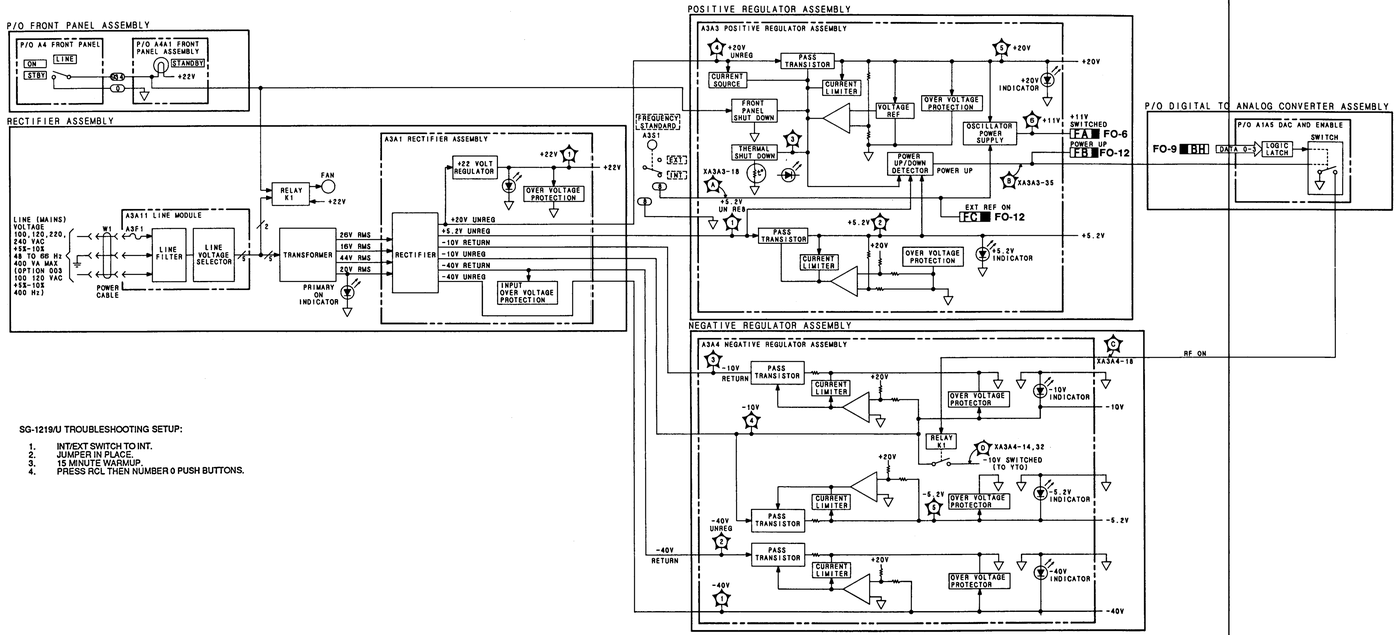


Figure FO-12. Digital Control Unit Subsystem Functional Block Diagram.



SG-1219/U TROUBLESHOOTING SETUP:

1. INT/EXT SWITCH TO INT.
2. JUMPER IN PLACE.
3. 15 MINUTE WARMUP.
4. PRESS RCL THEN NUMBER 0 PUSH BUTTONS.

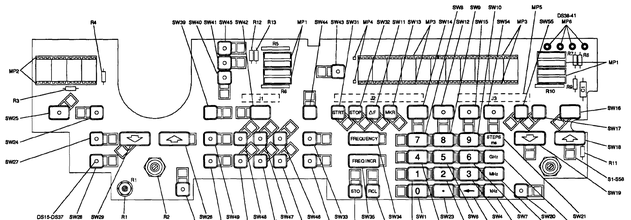
EL9XY023

Figure FO-13. Power Supply Subsystem Functional Block Diagram.

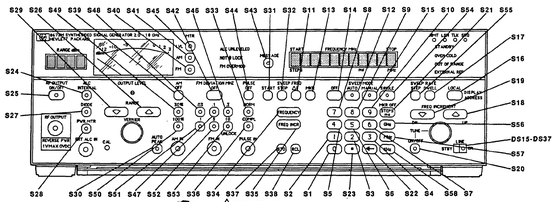
NOTES:

⚠ INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX LESS THAN 3100A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.

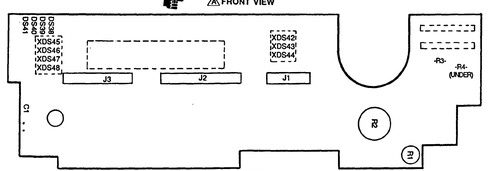
⚠ INDICATES THAT THE ITEM IS ONLY USED ON SIGNAL GENERATORS WITH A SERIAL NUMBER PREFIX GREATER THAN 3101A. REFER TO PARAGRAPH 1-11 FOR LOCATION OF SERIAL NUMBER.



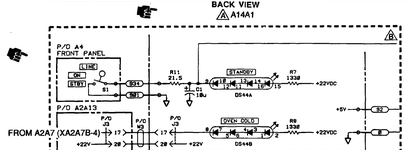
⚠ A4A1

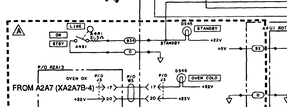


⚠ FRONT VIEW



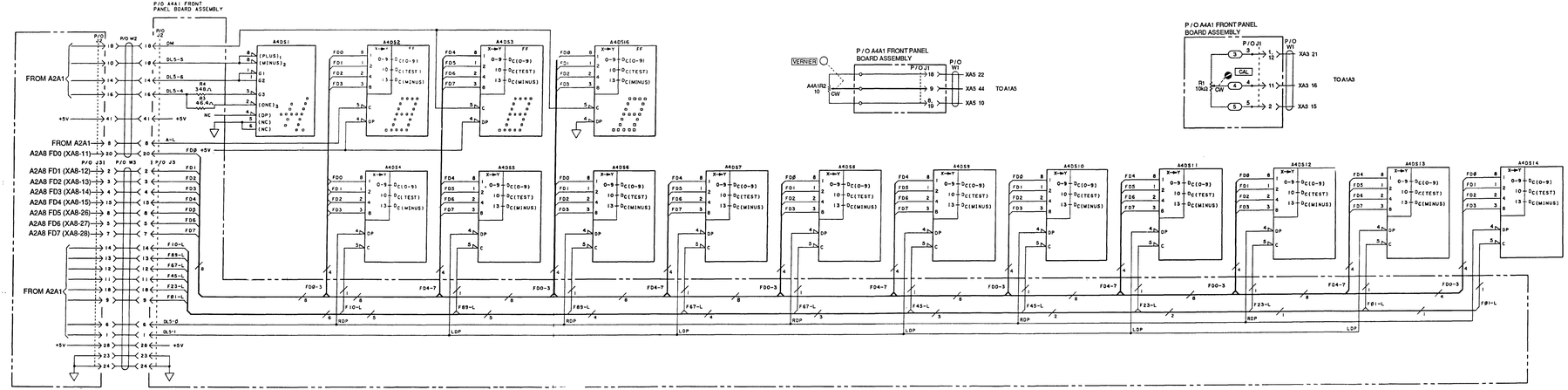
⚠ BACK VIEW
⚠ A14A1





EL9XY024

Figure FO-14. A1A4 Keyboard Schematic Diagram (Sheet 1 of 2).



EL9XY025

Figure FO-14. A1A4 Keyboard Schematic Diagram (Sheet 2 of 2).