TECHNICAL MANUAL

GENERAL SUPPORT MAINTENANCE MANUAL

FOR

SIGNAL GENERATOR
SG-1288/G
(NSN 6625-01-276-9421)

HEADQUARTERS, DEPARTMENT OF THE ARMY

01 OCTOBER 1989

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

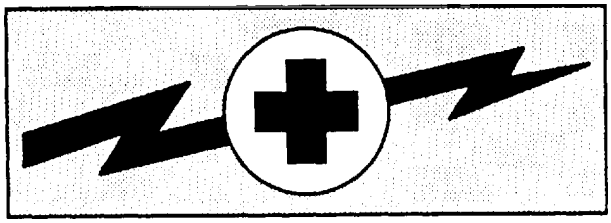
1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

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 warn them 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 the 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.

WARNING

Isopropyl Alcohol is flammable and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. avoid repeated or prolonged contact. Use only in well-ventilated areas (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames, sparks, or other sources of ignition.

For Artificial Respiration refer to FM 4-25.11.

CAUTION

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

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

LIST OF EFFECTIVE PAGES

NOTE

ON CHANGED PAGES, THE PORTION OF THE TEXT AFFECTED BY THE LATEST CHANGE IS INDICATED BY A VERTICAL LINE OR OTHER CHANGE SYMBOL IN THE OUTER MARGIN OF THE PAGE.

Dates of issue for original and changed pages are:

Original	0	01 October 1989
Change	1	13 January 2006

Total number of pages in this publication is 138 consisting of the following:

Page No.	*Change No.
Cover	1
A	0
B	1
C and D	0
E/(F blank)	1
i	1
ii and 1-0	0
1-1	1
1-2	1
1-3 through 1-14	0
1-15/(1-16 blank)	0
2-1 through 2-32	0
2-33 through 2-45	1
2-46	0
2-47 through 2-82	0
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B-1/(B-2 blank)	0
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FO-2	0
FO-3	0
FO-4	0
FO-5	0
FO-6	0
FO-7	0
FO-8	0

* Zero in this column indicates an original page.

CHANGE)
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No. 1)

Headquarters
Department of the Army
Washington, D.C., 13 January 2006

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FOR
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(NSN 6625-01-276-9421)

HAZARDOUS MATERIAL INFORMATION – This document has been reviewed for the presence of solvents containing hazardous materials as defined by the EPCRA 302 and 313 lists by the AMCOM G-4 (Logistics) Environmental Division. As of the base document, dated 01 October 1989, all references to solvents containing hazardous materials have been removed from this document by substitution with non-hazardous or less hazardous materials where possible.

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Remove Pages	Insert Pages
A and B	A and B
NONE	E/(F blank)
i/(ii blank)	i and ii
1-1 and 1-2	1-1 and 1-2

2-1 through 2-4	2-1 through 2-4
2-33 thru 2-46	2-33 thru 2-46
A-1/(A-2 blank)	A-1/(A-2 blank)
B-1/(B-2 blank)	B-1/(B-2 blank)
Cover	Cover

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Official:

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Technical Manual

No. 11-6625-3198-40

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 October 1989

GENERAL SUPPORT MAINTENANCE MANUAL

FOR

SIGNAL GENERATOR

SG-1288/G

(NSN 6625-01-276-9421)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can 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 or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Aviation and Missile Command, AMSAM-MMC-MA-NP, Redstone Arsenal, AL. 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via email, fax or the World Wide Web. Our fax number is DSN 788-6546 or Commercial 256-842-6546. Our email address is: 2028@redstone.army.mil. Instruction for sending an electronic 2028 may be found at the back of this manual immediately preceding the hardcopy 2028. For the World Wide Web use: https://amcom2028.redstone.army.mil.

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TABLE OF CONTENTS

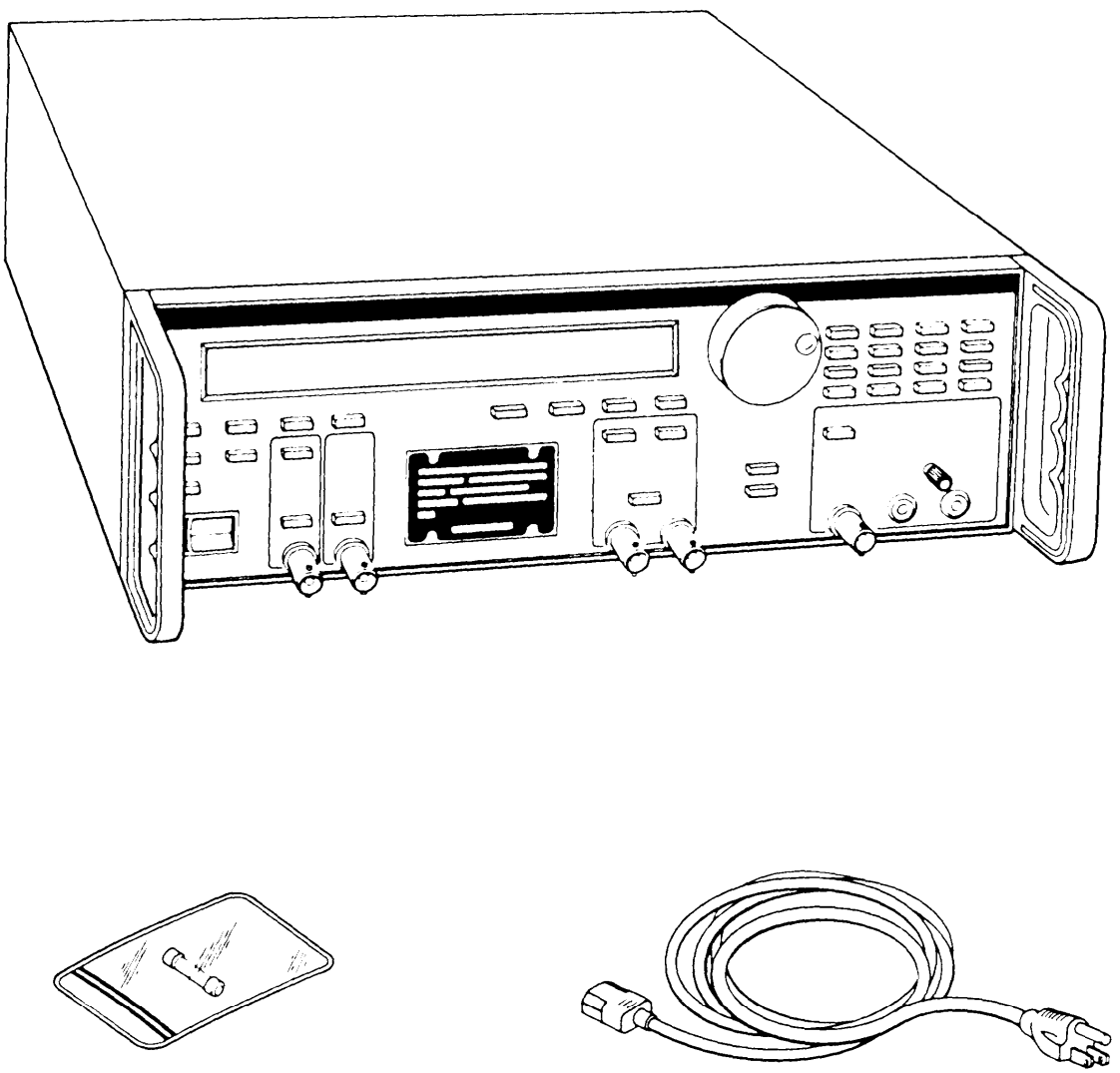
HOW TO USE THIS MANUAL

This manual tells about the Signal Generator SG-1288/G and contains instructions about how to use it during maintenance on other electronic equipment.

The technical manual for the electronic equipment being maintained will tell where to make certain connections and when to use various accessories which are part of the SG-1288/G.

When first receiving the SG-1288/G, start at the front of the manual and go all the way through to the back. Become familiar with every part of the manual and the SG-1288/G.

This manual has an edge index which will help find specific information in a hurry. Simply spread the pages on the right edge of the manual until the printed blocks can be seen. Open the manual where the block on the edge of the page lines up with the selected topic printed on the front cover block.



CE10E001

Figure 1-1. Signal Generator SG-1288/G.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

INFORMATION 1-1. SCOPE.

a. *Type of Manual:* Intermediate General Support Maintenance Manual.

b. *Equipment Name and Model Number:* Signal Generator SG-1288/G.

c. *Purpose of Equipment:* The Signal Generator is designed to provide a precision source of sine, triangle, and variable symmetry (ramp and pulse) waveforms for use in the installation and maintenance of radio receivers, transmitters, and associated electronic equipment.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 750-8, Functional Users Manual for the Army Maintenance System (TAMMS); DA Pam 738-751, Functional Users Manual for the Army Maintenance Management Systems-Aviation (TAMMS-A); or AR 700-138, Army Readiness and Sustainability.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your Signal Generator 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. If you have Internet access, the easiest and fastest way to report problems or suggestions is to go to https: //aeps.ria.army.mil/aepspublic.cfm (scroll down and choose the “Submit Quality Deficiency Report” bar). The Internet form lets you choose to submit an Equipment Improvement Recommendation (EIR), a Product Quality Deficiency Report (PQDR or a Warranty Claim Action (WCA). You may also submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 via e-mail, regular mail, or facsimile using the addresses/facsimile numbers specified in DA PAM 750-8, Functional Users Manual for the Army Maintenance Management System (TAMMS). We will send you a reply.

1-4. CORROSION PREVENTION AND CONTROL (CPC).

a. Corrosion Prevention and Control (CPC) of Army Materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

b. Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.

c. Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV)

excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.

d. SF Form 368, Product Quality Deficiency Report should be submitted to the address specified in DA Pam 750-8, Functional Users Manual for the Army Maintenance Management System (TAMMS).

1-5. DESTRUCTION AND ELECTRONICS MATERIAL.
Refer to TM 750-244-2 covering the destruction of Army materiel to prevent enemy use as provided by the proponent activity.

1-6. PREPARATION FOR STORAGE OR SHIPMENT.
Refer to TM 11-6625-3198-40, Chapter II, section V for preparation for storage or shipment procedures, including packaging and administrative storage.

1-7. QUALITY OF MATERIAL.
Material used for replacement, repair, or modification must meet the requirements of this technical manual. If quality of material requirements are not stated in this technical manual. The material must meet the requirements of the drawings, standards, specifications, or approved engineering change proposals applicable to the subject equipment.

1-8. EQUIPMENT CHARACTERISTICS.
Refer to TM 11-6625-3198-12, Chapter 1, section II for this information.

1-9. EQUIPMENT DATA.
Refer to TM 11-6625-3198-12, Chapter 1, section II for this information.

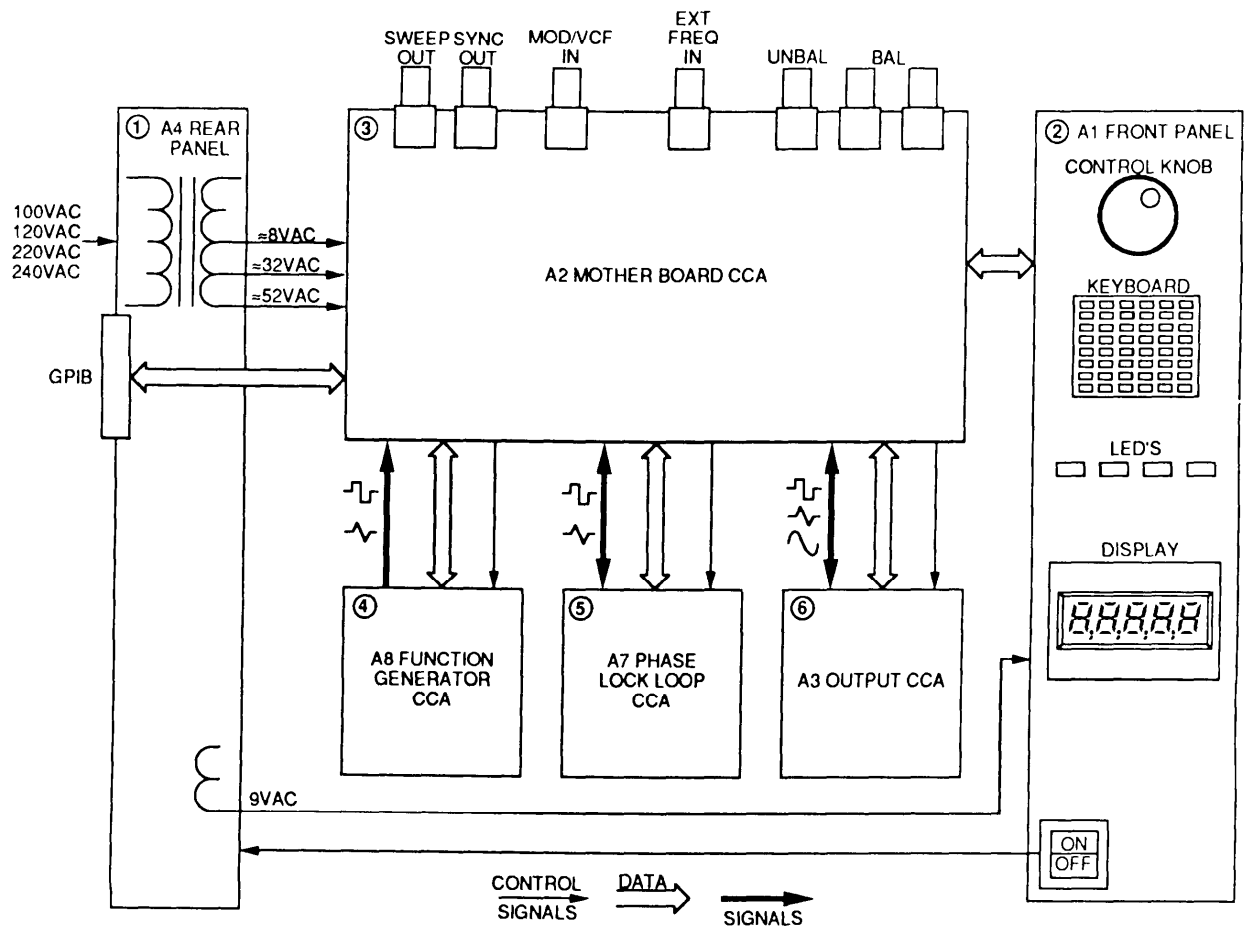
1-10. SAFETY, CARE, AND HANDLING.
Observe all WARNINGS, CAUTIONS, and NOTES in this manual. This equipment can be dangerous if these instructions are not followed.

Section III. PRINCIPLES OF OPERATION

1-11. GENERAL FUNCTIONAL DESCRIPTION.

The Signal Generator provides a highly stable output signal from 2 mHz to 20 MHz. This signal can be externally amplitude or frequency modulated, or internally swept. Sine, Triangle, and Square waveforms are available. Output signal information, entry information, and error messages are shown in the display. Various LED indicators provide additional instrument status.

SG-1288/G simplified block diagram is shown on figure 1-2. SG-1288/G detailed block diagram is shown on figure FO-1.



CE10E002

Figure 1-2. Signal Generator SG-1288/G Simplified Block Diagram.

(1) The A4 Rear Panel Assembly provides the operator with line power connection, voltage selection facilities, fuse protection, and GPIB connection. Selected input line voltage of 100/120/220/240 Vac is converted to ≈ 8 Vac, ≈ 32Vac, and ≈ 52Vac for use by the individual power supply circuits located on the A2 Motherboard Circuit Card Assembly. ≈ 9Vac is provided to the A1 Front Panel Assembly for display power. A1 Front Panel Assembly provides ON/OFF switching.

(2) The A1 Front Panel Assembly provides operator interface with the Signal Generator internal circuits. Operator commands are entered using the Control Knob or 36 key Keyboard. Measurement information and instrument status are provided using the 16 digit Vacuum Fluorescent Display (VFD) and 18 LED indicators. Signal Generator power ON/OFF switch is also provided. All signals except power ON/OFF are sent to/received from the A2 Motherboard Circuit Card Assembly,

(3) The A2 Motherboard Circuit Card Assembly is the heart of the Signal Generator and:

- Supplies the +5, ±12, and ±22 DC operating voltages to all assemblies.
- Provides overall control of all the assemblies in the Signal Generator (except the A4 Rear Panel Assembly).
- Provides interconnection and signal routing of all assemblies.
- Generates internal reference frequency signal.
- Processes and routes external MOD/VCF IN and EXTFREQ IN input signals.
- Routes SYNC OUT and SWEEP OUT output signals.
- Provides operator defined UNBAL and BAL output signals (additional attenuation and impedance).
- Provides remote operation using GPIB interface.

(4) The A8 Function Generator Circuit Card Assembly generates both the triangle and square waveforms Frequency and symmetry are controlled for both waveforms by the operator. SYNC OUT signal is provided, and if selected, SWEEP OUT signal is provided. During AUTO CALIBRATION, measured signal information is provided for use by the A2 Motherboard Circuit Card Assembly. When selected, Frequency Modulation is provided using the signal connected to MOD/VCF IN connector. Operating voltages, control signals, data, and signals are sent to/received from the A2 Motherboard Circuit Card Assembly.

(5) The A7 Phase Lock Loop Circuit Card Assembly performs three tasks.

- Provides correction voltage to lock the frequency from A8 Function Generator Circuit Card Assembly to either an external reference frequency connected to EXT FREQ IN connector or an internal reference frequency generated on the A2 Motherboard Circuit Card Assembly.
- Converts a triangle waveform from A8 Function Generator Circuit Card Assembly to a sine waveform.
- When selected, Amplitude Modulation of the converted sine wave is provided using the signal connected to MOD/VCF IN connector.

Operating voltages, control signals, data, and signals are sent to/received from the A2 Motherboard Circuit Card Assembly.

(6) The A3 Output Circuit Card Assembly provides the necessary amplification/attenuation of the selected waveform as defined by the operator. When DC OFFSET is selected, the DC offset level (±5V) is added. During AU TO CALIBRATION, measured signal information is provided for use by the A2 Motherboard Circuit Card Assembly. Operating voltages, control signals, data, and signals are sent to/received from the A2 Motherboard Circuit Card Assembly.

1-12. DETAILED FUNCTIONAL DESCRIPTION (fig. FO-2 thru FO-8).

(1) A4 REAR PANEL ASSEMBLY (fig. FO-5). Provides input line voltage connection and conversion. Acceptable line voltage of 100/120/220/240Vac is converted to low voltage AC for use by the individual power supply circuits located on the A2 Motherboard Circuit Card Assembly. J1 provides both fuse protection (F1) and line filtering. J2 is connected to the A1 Front Panel Assembly for ON/OFF power switching. J4 provides ≈ 9Vac (fluorescent display), ≈ 32Vac (±12Vdc Power Supply circuit), and ≈ 52Vac (±22Vdc Power Supply circuit). J22/J23 provides ≈ 8Vac (+5Vdc Power Supply circuit). All AC voltages are connected to the A2 Motherboard CCA for use or distribution.

(2) A1 FRONT PANEL ASSEMBLY (fig. FO-2). Provides operator interface to the Signal Generator internal circuits. Contains the necessary circuits to allow the operator to input commands, and display to the operator the various output signal parameters and equipment status. This assembly contains the following circuits:

- Display/Control Knob Circuit.
- Keyboard Circuit.
- Light Emitting Diode Circuit.

Display/Control Knob Circuit. +22Vdc is supplied and regulated to +15Vdc for use by the display controller/driver. ≈ 9Vac is used to power the fluorescent display filament. Both voltages are provided by the Power Supply Circuit on the A2 Motherboard CCA.

Display data is sent to the A1 Front Panel Assembly on the quiet data bus QD5-7. The display controller/driver receives a serial word of eight bits on the DISPDATA line. DSPCLK clocks each bit, Most Significant Bit (MSB) first. The serial word may be either a display character or a control word, the MSB determines which. The 64 possible combinations of the remaining seven bits display standard ASCII upper case characters or control various functions and addresses. This display information is then output on the fluorescent display. The display controller/driver has a limited memory and will retain only the most recent data received.

The Control Knob rotates continuously in both directions. Knob values depend on the function, mode, and range selected. Two output lines, RKA and RKB pulse at TTL logic levels as the knob is rotated. The Microprocessor Circuit on the A2 Motherboard CCA counts the pulses to determine the amount of change. The direction of rotation is determined by comparing the TTL logic level of the signals and detecting the first one to change to a new level. For clockwise rotation, RKA will change first, and for counterclockwise rotation, RKB will change first. The Microprocessor circuit on the A2 Motherboard CCA determines when the rotation has reached the end of the range selected, in either direction. If there is a further range in the direction the knob is turning, the range will automatically change. If the range is at the limit, the limit value will be displayed.

Keyboard Circuit. Consists of 36 push buttons arranged in an eight column, six row matrix (12 positions not used). The Control signal $\overline{\text{FPREG}}$ permits quiet data bus QD0-2 to latch through to the decoder. The decoder selects one of the six rows and applies +5Vdc. if any key is pressed on that row, the +5V will appear on one of the keyboard bus lines P10-P17. The Microprocessor Circuit on the A2 Motherboard CCA determines which key has been pushed by analyzing the position of the decoder when detecting +5V on a column (keyboard bus lines P10-P17).

LED Circuit. Consists of 18 LED's to indicate the mode and function selected. Control signal $\overline{\text{FPS}}$ permits quiet address bus QA0 and QA1 to select one of the four least significant outputs of the decoder. Control signals CLOCK0 and CLOCK 1 of the decoder will sequentially strobe an 8-bit number from quiet data bus (QDO-7) into both latches. Each bit (QDO-7) entered into the latches will turn on the LED indicator related to that bit. Control signal $\overline{\text{FPREG}}$ is used to illuminate the UNLK LED and ON/OFF LED in the same way. Once the LED is set, it will remain on until some change occurs. Pressing a key associated with a LED will latch new data. The previous LED will turn off and the new one will turn on.

The Power ON/OFF switch applies the selected line voltage to the transformer located in the A4 Rear Panel. CT connector provides a neutral connection for the balanced output connectors.

3 A2 MOTHER BOARD CIRCUIT CARD ASSEMBLY (fig. FO-3). Provides overall control, interconnection and signal routing, internal DC operating voltages, internal reference frequency signals, and remote operation in the Signal Generator. Data and control signals are sent to/received from all the other assemblies as required to perform all Signal Generator operations. All input/output connectors on the front and rear panel, except input power, are located on this assembly. I/O connections to all the plug-in boards are staggered to prevent the accidental insertion into the incorrect position. This assembly contains the following circuits:

- Microprocessor Circuit.
- GPIB Circuit.
- Frequency Synthesizer Circuit.
- Internal Calibration Network Circuit.
- DA C/Sample and Hold Network Circuit.
- Secondary Input/Output Network Circuit.
- Relay Driver Network Circuit.
- Balanced Output Attenuator Network and Impedance Control Circuit.
- Unbalanced Output Attenuator Network and Impedance Control Circuit.
- Power Supplies Circuit (fig. FO-8).

Microprocessor Circuit. Master control circuit for the Signal Generator. Receives inputs from the A1 Front Panel Assembly Keyboard and Display/Control Knob Circuits, or GPIB Circuits, to control all internal operation. The Microprocessor Circuit is comprised of a Microprocessor, a Processor Support Controller, and Memory (RAM and ROM). There are no test points or adjustments in this circuit.

The Microprocessor (Motorola MC6803) is the overall controller for the circuit and provides a 16-bit address as to where data is to be found or stored in Memory. Computations are performed as required by the operating system instructions in Memory (ROM), and the 8-bit result is provided to the Processor Support Controller, Memory (RAM), and GPIB Circuit for execution.

The Processor Support Controller converts the Microprocessor data and the instrument feedback data into control signals, Quiet Address (QA), and Quiet Data (QD) buses. These are the signals used by the other circuits in the Signal Generator.

The Memory is comprised of both RAM and ROM. RAM (8K) is nonvolatile and stores the calibration values generated at each calibration, and any other values required for current operation. A RAM keep alive battery (BT1) is provided to prevent the loss of data when power is turned off. ROM (16K) is permanently programmed at the factory and contains the operating system instructions. Maintenance Calibration switch (SW1) is used in conjunction with the A1 Front Panel Assembly Keyboard Circuit to perform several maintenance functions, A Life-Lite is used to verify if the Microprocessor is sequencing.

GPIB Circuit. Provides remote operation of the Signal Generator using an external controller. All functions except Power Switch and Address key are programmable using the interface. The GPIB Circuit is comprised of a Controller and two Transceivers. There are no test points or adjustments in this circuit.

The Controller (Motorola MC68488) functions as a traffic controller, permitting data to flow in either direction when the correct control information is received. The 'handshaking' routine will ensure neither the Signal Generator nor the remote controller will send data faster than the other can use. The controller has internal registers where control, data, and address words are loaded and stored until needed or requested. The Controller bus is connected to the Microprocessor Circuit Address Bus A0-A2. The identification address of an instrument is determined by five bits in the Controller address register. The Signal Generator has a default address of 09 that is automatically entered into the Controller from RAM at turn-on. A new address may be entered using the front panel keypad.

The Transceivers permit both data and control signals to move in either direction. They have sufficient input sensitivity to minimize false signals and sufficient drive current to minimize signal loss.

Frequency Synthesizer Circuit. Provides the internal reference frequency for the Signal Generator. The frequency generated corresponds to the front panel frequency setting. Not used for frequencies of <20 Hz. All test points and components are located under the shield. This circuit has two test points. TP5 is the Loop Control Voltage. TP17 is the Synthesizer Output (SYNTH). There are no adjustments in this circuit.

The Frequency Synthesizer Circuit is comprised of a Phase Lock Loop, Voltage Controlled Oscillator, Divide by Two circuit, and a Counter/Divider. The output from a 10 MHz crystal controlled reference is multiplied and divided by three numbers computed in the Microprocessor Circuit to generate the internal reference signal. The three numbers are in the form of a serial data stream of 64 bits. 14 bits divide the reference, 14 bits divide the variable, and 36 bits divide the VCO into the desired frequency. All are under software control and respond to the front panel frequency settings.

Internal Calibration Network Circuit. Measures seven analog voltages during the measurement portion of the AUTO CALIBRATION cycle. FGTST and FGTST100 signals contain information from the A8 Function Generator CCA. THD, +PK, and –PK contain information from the A3 Output Circuit Card Assembly. VLOOP contains information from the A7 Phase Lock Loop CCA. These voltages are then tested by the Microprocessor Circuit, If any are incorrect, they are corrected by applying an analog calibration voltage from the DAC/Sample and Hold Network Circuit,

A seventh voltage, the RAM keep alive battery (DVMBAT), is tested during the power on sequence. If the voltage tests low, the Microprocessor Circuit will designate the display to show "LOW BATT", If the battery tests dead, the Microprocessor Circuit will designate the display to show "CAL REQUIRED". There are no test points or adjustments in this circuit (TP1 is not used),

The seven measured DC analog voltages are converted to a binary number and sent to the Microprocessor Circuit.

DAC/Sample and Hold Network Circuit. Internal measurement and control block for the Signal Generator. The DAC/Sample and Hold Network Circuit is comprised of a Digital to Analog Converter and a Demultiplexer. TP7 is the Sample and Hold Digital/Analog Output. There are no adjustments in this circuit.

The Digital To Analog Circuit (DAC) converts the binary data from the Microprocessor Circuit into one of eight control levels in the form of a stepped waveform.

The Demultiplexer converts the stepped waveform containing the eight control levels from the DAC into eight separate analog control voltages. Four control voltages, VOFST, VPHASE, VSLEN, and VFREQ respond to the front panel settings. VSINCAL, VAMCAL, VCGZERO, and VTRIBAL respond to calibration data from the Microprocessor Circuit.

SHCLK, clocks the serial data (SHDATA) into the (DAC) during the measurement portion of the AUTO CALIBRATION cycle. From this data, the eight analog calibration voltages (-5V and +5V) are produced which slightly change the normal outputs of the eight circuits during the calibration portion of the AUTO CALIBRATION cycle. The modification changes the circuit output in the direction that will correct the signal output to the internal frequency and voltage standards. The DAC Sample and Hold Network Circuit and the Internal Calibration Network Circuit work together to alternately measure and adjust a circuit. The serial data is stored in RAM until the next AUTO CALIBRATION cycle. If the analog calibration voltage cannot change the measured voltage enough to bring it into limits, then the Microprocessor Circuit will generate an error message to be displayed. This error refers to the affected circuit.

Secondary Input/Output Network Circuit. Input signals EXT FREQ IN and MOD/VCF IN, and output signals SYNC OUT and SWEEP OUT are provided. An externally applied signal must reconnected to the EXTFREQ IN connector to observe test points. All test points and components are located under the shield. TP9 is the Limited External Frequency Input. TP10 is the Buffered External Frequency. There are no adjustments in this circuit.

The EXTFREQ IN signal is squared and compensated for any non-symmetry. If selected, it is then routed to the A7 Phase Lock Loop CCA as the reference frequency.

The MOD/VCF IN is routed to the A7 Phase Lock Loop CCA and A8 Function Generator CCA unchanged for FM, AM, and VCF operation.

The SWEEP OUT is routed to the front panel from the A8 Function Generator CCA unchanged.

The SYNC OUT signal is generated by routing the square wave signal from the A8 Function Generator CCA through a 50Ω driver network.

Relay Driver Network Circuit. Operates the relays in the Balanced and Unbalanced Output Attenuator Network and Impedance Control Circuits under control of the Microprocessor Circuit. There are no test points or adjustments in this circuit.

Balanced Output Attenuator Network and Impedance Control Circuit. Provides output signal to BAL output connectors. Operates under control of the Microprocessor Circuit through the Relay Driver Network Circuit. Output signals (BOUT1 and BOUT2) from the A3 Output CCA are selected and routed through a –40 dB attenuator as required by the amplitude setting at the front panel. The desired impedance of 135Ω or 600Ω is selected and the signal is routed to the front panel BAL connectors. There are no test points or adjustments in this circuit.

Unbalanced Output Attenuator Network and Impedance Control Circuit. Provides output signal to UNBAL output connector. Operates under control of the Microprocessor Circuit through the Relay Driver Network Circuit. Output signal (UBOUT) from the A3 Output CCA are selected and routed through a –40 dB attenuator as required by the amplitude setting at the front panel. The desired impedance of 50Ω, 75Ω or 600Ω is selected and the signal is routed to the front panel UNBAL connector. There are no test points or adjustments in this circuit.

Power Supplies Circuit (fig. FO-8). Provides DC/AC voltage necessary to operate all internal circuits in the Signal Generator. The Power Supplies Circuit is comprised of a +5V Power Supply, ±12V Power Supply, ±22V Power Supply, and VFD AC Filament Supply. This circuit has five test points. JMP4 is the +12Vdc output. JMP5 is the –12Vdc Output. JMP6 is the +5Vdc output. TP14 is the +22Vdc output. TP15 is the –22Vdc output. There are no adjustments in this circuit.

+5V Power Supply. Provides +5Vdc for all of the TTL logic and relay circuits in the Signal Generator. The +5V supply can be isolated from the internal circuits by removing jumper JMP6.

±12V Power Supplies. Provides positive and negative 12Vdc used in the Signal Generator. These power supplies are highly regulated by a precision voltage reference source, The precision reference signal, VREF, is also used in the Internal Calibration Network. The +12V supply can be isolated from the internal circuits by removing jumper JMP4. The –12V supply can be isolated from the internal circuits by removing jumper JMP5.

±22V Power Supplies. Provides positive and negative 22V used in the Signal Generator. +12V supply provides a reference voltage to the positive 22V supply. Power Supply cannot be isolated.

VFD AC Filament Supply. Unregulated voltage ≈ 8 Vrms used to supply current to the display characters in the Vacuum Fluorescent Display.

4 A8 FUNCTION GENERATOR CIRCUIT CARD ASSEMBLY (fig. FO-7). Primary signal generation circuit for the Signal Generator. Both the triangle and the square waveforms are generated. The triangle wave is sent to the A7 Phase Lock Loop CCA for conversion to a sine wave. The triangle and square wave are sent to the A3 Output CCA for amplitude correction. The input register develops digital control signals from the Microprocessor Circuit on the A2 Motherboard CCA for use in selecting/maintaining frequency, symmetry, sweep, and modulation. Frequency Modulation, and SWEEP OUT are also provided. This assembly contains the following circuits:

- Voltage Controlled Generator (VCG) Summing Amplifier Circuit.
- Sweep Generator Circuit.
- Symmetry Control Circuit.
- VCG Current Sources Circuit.
- High Frequency Compensation Circuit.
- Comparator Circuit.
- Frequency Range Switches Circuit.
- Capacitance Multiplier Circuit.
- Triangle Buffer Circuit.
- Auto Calibration Circuit.

VCG Summing Amplifier. Develops a voltage that is the negative sum of its input control voltages. The input control voltages consist of five analog signals:

- Frequency set point (V FREQ) and the calibration voltage (VCGZERO) from the DA C/Sample and Hold Network Circuit on the A2 Motherboard CCA.
- Feedback control (V LOOP) from the Lock-Loop Filter Circuit on the A7 Phase Lock Loop CCA.
- Sweep voltage (SWEEP) from the Sweep Generator Circuit (if selected).
- Modulating signal (MOD IN) from the Secondary Input/Output Network Circuit on the A2 Motherboard CCA (if selected).

All signals are summed and used to provide an accurate DC voltage, containing operator defined frequency, sweep, and FM information (if selected). The output signal (VSUM) is provided to the Symmetry Control Circuit and the Auto Calibration Circuit. TP2 is the Control Frequency Voltage Summation (VSUM) output. There are no adjustments in this circuit.

Sweep Generator *Circuit.* Provides one of the inputs to the VCG Summing Amplifier Circuit for swept frequency operation. Also provides a ramp signal to the A2 Motherboard CCA SWEEP OUT connector. Controls the sweep modulation frequency and time limits as set by the operator on the front panel. The start frequency limit (VSLEN) is set by the analog signal generated in the DA C/Sample and Hold Network Circuit on the A2 Motherboard CCA. The Microprocessor Circuit on the A2 Motherboard CCA supplies 256 sequential digital numbers (QD0-7). The numbers, starting at zero and ending at 255, sequentially divide VSLEN and determine the voltage representing the stop frequency limit. The 256 numbers are delivered to the Sweep Generator at the rate (time) set by the operator on the front panel, After the last digital number (255) is used, the cycle starts over with the number zero, which sets the frequency to the start value. As the frequency changes from low to high (or high to low), the Sweep Out ramp voltage will follow. When sweep modulation is not in use, there is no sweep voltage input to the VCG Summing Amplifier or SWEEP OUT connector. There are no test points or adjustments in this circuit.

Symmetry Control Circuit. Provides symmetry control of the generated waveform under direction of the Microprocessor Circuit on the A2 Motherboard CCA. VCG Summing Amplifier Circuit output signal (VSUM) is divided into two signals. One controls the first half of the waveform, the other controls the second half. If the operator defined front panel symmetry setting remains at 50% (symmetrical waveform), each signal receives the same amplification. As the symmetry setting changes from 50%, in either direction, one signal receives greater amplification and the other receives greater attenuation. The Symmetry Control Circuit output signals (+FCV and –FCV) are routed to the Autocalibration Circuit, the High Frequency Compensation Circuit, and the VCG Current Sources Circuit. This circuit has two test points. TP3 is the Positive Function Control Voltage (+FCV). TP4 is the Negative Function Control Voltage (–FCV). There are no adjustments in this circuit.

VCG Current Sources Circuit. Converts the +FCV and –FCV voltages from the Symmetry Control Circuit to current flow for use by the Comparator Circuit. +FCV is converted to current (+VI) flowing to, and –FVC is converted to current (–VI) flowing from the Comparator Circuit. If the symmetry setting is not 50%, the current flow will be non symmetrical. This circuit has four test points. TP5 is the VCG Current Sources positive reference voltage. TP8 is the VCG Current Sources negative reference voltage. TP6 is the positive integrator voltage source current flow into the Comparator Circuit. TP7 is the negative integrator voltage source current flow out of the Comparator Circuit, There are no adjustments in this circuit.

High frequency Compensation Circuit. Compensates for internal circuit time delay in the 200 kHz to 2 MHz and 2 MHz to 20 MHz frequency ranges, As the frequency is set higher, controlling or calculating the shape, rise and fall times, and levels begin to take a measurable part of the time required by the wave form. A calculated value which compensates for the time delay required slightly alters the +FCV and –FCV signals from the Symmetry Control circuit. The +COMP and -COMP output signals are routed to the Autocalibration Circuit and Comparator Circuit. There are no test points or adjustments in this circuit.

Comparator Circuit. Combines the input signal representing the frequency set point (+COMP and -COMP), and compares it with the actual triangle waveform being generated by the current flows (+VI and -VI). As the output triangle reaches the positive peak set point, the comparator switches the output signal (SQWAVE) to a negative level. When the triangle reaches the negative peak, SQWAVE switches to a positive value, SQWAVE is used as the source square output waveform, and SYNC OUT signal. The switching SQWAVE signal alternately permits the current from the VCG Current Sources Circuit to flow into then out of the Comparator Circuit current sense point (TRINODE). This carefully controlled alternating current flow is sensed in the Triangle Buffer Circuit as a triangle wave (TRIOUT). During the control part of the AUTO CALIBRATION cycle, VTRIBAL is adjusted to the necessary voltage to insure a symmetrical triangle signal is measured by the measurement part of the AUTO CALIBRATION cycle. This circuit has two test points. TP13 is reference square wave, or the level the triangle must reach in order to switch. TP14 is the switched square wave. TP15 is the Square Wave output. There are no adjustments in this circuit.

Frequency Range Switches Circuit. Provide control for the frequency and symmetry of the output signals, Determines how long the current from the VCG Current Sources Circuit must flow to reach the level required to switch the Comparator Circuit. The longer the current flows, the lower the frequency. These switches select one or more capacitors for the current to flow into and out of. The capacitors are selected by the Microprocessor Circuit on the A2 Motherboard CCA and are based on the frequency and symmetry selections. TP9 is the Triangle Wave Summing Node. There are no adjustments in this circuit.

Capacitance Multiplier Circuit. Used when generating the lower frequencies, Lower frequencies require larger capacitors, which often fail to maintain the necessary precision value overtime. When selected, the the Capacitance Multiplier Circuit supplies or drains current from the TRINODE point as follows:

- When the VCG Current Source Circuit is supplying current (+VI) to the Comparator Circuit, the Capacitance Multiplier Circuit it will take some of the current away from the TRINODE point.
- When the VCG Current Source Circuit is taking current (–VI) from the Comparator Circuit, the Capacitance Multiplier Circuit it will add some of the current to the TRINODE point.

Because the VCG Current Source Circuit is supplying/taking a precision amount of current into a precision capacitor, and the Capacitance Multiplier Circuit is taking/supplying a precision amount of current, the sense point takes longer to reach the Comparator Circuit level. This makes the frequency lower. The amount of current supplied or drained by the Capacitance Multiplier Circuit is controlled by the Microprocessor Circuit on the A2 Motherboard CCA using the frequency and symmetry selections. TP11 is the capacitance multiplier output. There are no adjustments in this circuit.

Triangle Buffer Circuit. Isolates and converts the TRINODE value to a triangle output waveform (TRIOUT). TRIOUT is used as the source triangle output waveform, for the Comparator Circuit sense point, and the source of the sine wave form generated on the A7 Phase Lock Loop CCA. Both the buffer signal ground (TRICOM) and the intermediate voltage (TRIBAL) are provided to the Auto Calibration Circuit. TP12 is the triangular wave low impedance output. There are no adjustments in this circuit.

Auto Calibration Circuit. Measures the signals on the A8 Function Generator CCA and provides the measurement information to the Internal Calibration Network Circuit on the A2 Motherboard CCA during the measurement part of the AUTOCALIBRATION cycle. The AUTO CALIBRATION cycle sequence steps the eight measured signals (and common) as required through both the “times one” output (FGTST) and the "times 100" output (FGTST100). The Microprocessor Circuit on the A2 Motherboard CCA selects the signal required to measure the necessary accuracy. There are no test points or adjustments in this circuit.

5 A7 PHASE LOCK LOOP CIRCUIT CARD ASSEMBLY (fig. FO-6). Selects and locks triangle or square wave signal to internal or external reference, generates the sine wave signal, and provides amplitude modulation of the sine wave signal. The input register develops digital control signals from the Microprocessor Circuit on the A2 Motherboard CCA for use in selecting/maintaining external phase lock range and source, frequency, symmetry, and modulation. This assembly contains the following circuits:

- Variable Supply Circuit.
- Sine Converter Circuit.
- Sine Buffer Circuit.
- Sine Z-Cross Circuit.
- Source Select Circuit.
- Phase Comparator Circuit.
- Charge Pump Circuit.
- Lock-Loop Filter Circuit.
- X-Y Multiplier Circuit.
- AM Buffer Circuit.

Variable Supply Circuit. Provides an isolated ±12V used only by the Sine Converter Circuit. Continuous fine tuning of the Variable Supply Circuit is provided by the Microprocessor Circuit on the A2 Motherboard CCA using VSINCAL. During the measurement phase of the AUTO CALIBRATE cycle, sine wave distortion is set to a minimum using the THD signal from the A3 Output CCA. During the control part of the AU TO CALIBRATE cycle, VSINCAL fine tunes the Variable Supply Circuit output. There are no test points in this circuit. R97 provides balance adjustment of the Variable Supplies.

Sine Converter Circuit. The TRIOUT triangle signal from the A8 Function Generator CCA is used to generate the sine waveform. A known distortion is introduced to the triangle voltage. This produces a current flow into and out of the Sine Buffer Circuit that is detected as a sine wave. TP13 is the sine wave converter output. R33 adjusts the input level of the Sine Converter Circuit.

Sine Buffer Circuit. Converts the sine current flow from the Sine Converter Circuit into a pair of sine wave signals (SIN1 and SIN3). Signal SIN1 is routed to the A3 Output CCA as the sine wave source, and to the X-Y Multiplier Circuit for AM. Signal SIN3 is routed to the Sine Z-Cross Circuit. TP10 is the sine wave buffered output. R64 adjusts signal DC level. R208 adjusts sine wave amplitude.

Sine Z-Cross Circuit. Converts the sine wave (SIN 3) from the Sine Buffer Circuit to a square wave by changing the DC output level as the sine wave crosses zero. The square wave is then routed to the Source Select Circuit. All test points and components are located under the shield. TP1 is the sine wave zero crossing output. There are no adjustments in this circuit.

Source Selector Circuit. Selects a reference and a generated waveform to be routed to the Phase Comparator Circuit. Available reference signals are SYNTH (internal) or BXFREQ (external). Available waveforms are SQWAVE (square wave) and SIN3 (sine wave). Signal routing is based on the front panel selections under control of the Microprocessor Circuit on the A2 Motherboard CCA. All components are located under the shield. TP2 is the buffered external reference frequency (external signal must be connected to EXT FREQ IN). TP3 is the frequency synthesizer output. There are no adjustments in this circuit.

Phase Comparator Circuit. Compares a reference signal and a generated waveform as selected by the Source Selector Circuit. Output depends on the positive edge arrival times of each selected signal. The comparison generates one of three output level sets on the output lines VLAGR and VLEADR.

- The reference signal and generated waveform arrive at the same time.
- The reference signal leads the generated waveform.
- The reference signal lags the generated waveform.

VLAGR and VLEADR are routed to the Charge Pump Circuit. All components are located under the shield, There are no test points or adjustments in this circuit.

Charge Pump Circuit. Pumps current into or out of the Lock Loop Filter Circuit based on the VLAGR and VLEADR signals from the Phase Comparator Circuit. Current flow represents the difference between the selected reference frequency and the variable generated waveform frequency set at the front panel. The current will pulse briefly during the positive edge comparison and then will stop. The amount of current that is pumped is determined by the arrival time difference between the VLAGR and VLEADR signals. Current direction is determined by the VLAGR and VLEADR signal arrival order. No current is pumped if the two signals arrive at the same time. All test points and components are located under the shield. TP7 is the variable lag reference. TP8 is the variable lead reference. There are no adjustments in this circuit.

Lock Loop Filter Circuit. Converts the current flow from the Charge Pump Circuit into an error voltage (VLOOP) used by the VCG summing Amplifier Circuit on the A8 Function Generator CCA. The pulsing current flow is smoothed into a voltage that is the average of the current pulses. Error voltage is positive when the average current is flowing out of the circuit, and negative when the average current is flowing into the circuit. VLOOP gradually changes the VCG Summing Amplifier Circuit output signal (VSUM) on the A8 Function Generator CCA in the direction that generates a frequency closer to the reference frequency.

Under certain conditions the VLOOP error signal is not used and the Microprocessor Circuit on the AZ Motherboard will open the signal line to the VCG Summing Amplifier Circuit on the A8 Function Generator CCA.

- If the reference to variable frequency difference is too great, the error signal may generate an even greater error in the opposite direction. When this occurs, the Microprocessor Circuit on the A2 Motherboard turns on the UNLOCK indicator at the front panel and disconnects the VLOOP signal.
- When FM or Sweep modulation is selected at the front panel. If Sweep or FM is selected, the VLOOP signal is disconnected, but the UNLOCK indicator is not turned on.

The Lock Loop Filter Circuit characteristics are varied by the Microprocessor Circuit on the A2 Motherboard CCA, depending on the selected frequency. The Lock Loop Filter Circuit is fine tuned during the control segment of the AUTO CALIBRATION cycle using the VPHASE voltage from the DA C/Sample and Hold Network Circuit on the A2 Motherboard CCA. TP9 is the phase lock loop error voltage. There are no adjustments in this circuit.

X-Y Multiplier Circuit. Generates an Amplitude Modulated output signal using the sine wave (SIN1) signal from the Sine Buffer Circuit, and the external MOD IN signal. The Microprocessor Circuit on the A2 Motherboard CCA routes the signal connected to the MOD/VCF IN connector to the X-Y Multiplier Circuit when AM is selected. One multiplier output is composed of modulation above zero and the other output the modulation below zero.

Continuous fine tuning of the X-Y Multiplier Circuit is provided by the Microprocessor Circuit on the A2 Motherboard CCA using VAMCAL. During the measurement of the AUTO CALIBRATION cycle, +PK and –PK signals on the A3 Output CCA are measured. During the control part of the AUTO CALIBRATION cycle, VAMCAL from the DAC/Sample and Hold Network on the A2 Motherboard CCA fine tunes the X-Y Multiplier Circuit. There are no test points in this circuit. R102 provides adjustment of the sine wave input. R108 provides adjustment of the modulation signal input,

AM Bufler Circuit. Combines the two output signals from the X-Y Multiplier Circuit into one signal, symmetrical around zero. The voltage level is set so the output is compatible with the other signals selected at the A3 Output CCA. TP12 is the amplitude modulated buffer output. R125 provides DC level offset adjustment.

6 A3 OUTPUT CIRCUIT CARD ASSEMBLY (fig. FO-4). Provides amplification/attenuation necessary to set the generated triangle, sine, and square wave signal output amplitude. Sets the DC offset level for all four output signals/level. Signal amplitude and DC level is selected by the front panel, but are under control of the Microprocessor Circuit on the A2 Motherboard CCA. The input register develops digital control signals from the Microprocessor Circuit on the A2 Motherboard CCA for use in selecting/maintaining output type/signal amplitude and DC level. This assembly contains the following circuits:

- Function Selector Circuit.
- Preamplifier Circuit.
- R-R2 Ladder Circuit.
- Power Amplifier Circuit.
- –20dB Attenuator Circuit.
- Balanced Drivers Circuit,
- Peak Detector Circuit.

Function Selector Circuit. Selects the generated waveform to be routed to the Preamplifier Circuit. Available signals are:

- SQWAVE (square wave) from the A8 Function Generator CCA.
- TRIOUT (triangle wave) from the A8 Function Generator CCA.
- SIN1 (sine wave) from the A7 Phase Lock Loop CCA.
- AMSIG (amplitude modulated signal) from the A7 Phase Lock Loop CCA.
- DC (selects no signal).

TRIOUT, SIN1, and AMSIG are routed unchanged. SQWAVE is shaped and set to the same level as the other signals. Signal routing is based on the front panel selections under control of the Microprocessor Circuit on the A2 Motherboard CCA. TP1 is the shaped square wave input. There are no adjustments in this circuit.

Preamplifier Circuit. Fixed gain, wide band amplifier that amplifies the selected 2Vp-p signal (SQWAVE, TRIOUT. SIN1, or AMSIG) from the Function Selector Circuit to a 6Vp-p signal (PREAMP). PREAMP is routed to the R-R2 Ladder Circuit and the Peak Detector Circuit. TP2 is the preamplifier output. C22 adjusts frequency peaking.

R-R2 Ladder Circuit. Digital binary pre-attenuator provides 0 to 20 dB of variable attenuation. Provides fine adjustment to the output of the Preamplifier Circuit. With the exception of the first step of attenuation, each selected step doubles the attenuation of the previous step. Attenuation selected is based on the front panel selections under control of the Microprocessor Circuit on the A2 Motherboard CCA. There are no test points or adjustments in this circuit.

Power Amplifier Circuit. Fixed gain, wide band amplifier providing the necessary power to drive the output of the R-R2 Ladder Circuit into 50Ω. PA OUT is routed to the –20dB Attenuator Circuit and Peak Detector Circuit. TP4 is the power amplifier output. There are no adjustments in this circuit.

The final stage of the Power Amplifier Circuit is a push/pull complimentary/symmetry stage. Q18 through Q23 are heats inked.

For frequencies up to 1 kHz, Q13, Q14, and Q15 perform level shifting. Transistor Q14A and Q14B are an NPN matched pair. These lower frequencies are direct coupled into the emitter of Q18. The two transistor pair Q16 and Q17, develop base bias voltage for Q18 and Q19. As the direct coupled signal changes the emitter bias of Q18, the current through Q18 will change in direct proportion. The current will flow from +22V through Q18, through the emitters of the Q20/Q21 pair and into ground through the signal line PA OUT. This current flow will develop a voltage at the junction of Q18 and CR24 permitting a complimentary current flow to –22V through Q19, Q22 and Q23 from the signal line PA OUT. As the current through Q18 increases, the current through Q19 decreases and vice versa. The voltage of the signal PA OUT will be more positive when more current is greater through Q18 and more negative when the current is greater through Q19.

When the frequency is above 1 kHz, the direct coupled path to the emitter of Q18 has less influence due to the shunting effect of R86 and C57. The higher frequencies are coupled into the power amplifier through capacitors C46 and C47, which begin having an influence near 1 kHz. Transistors Q20 and Q21 (and their compliment, Q22 and Q23) are connected in parallel to enable sufficient current to pass without exceeding individual transistor limits.

Diodes CR30 and CR31 are used for protection of the four transistors driving the output line. Diode CR30 prevents the PA OUT signal from exceeding +22V while CR31 prevents the signal from exceeding -22V. If either condition were to occur, the transistors would conduct in the reverse direction causing damage. These diodes are only used to minimize PA OUT transient levels above +22V and below -22V, not steady levels that may over heat the diodes. Diodes CR28 and CR29 perform the same protective function for the base emitter junctions of the output transistors.

Input signal (VOFST) performs two functions:

- Continuous fine tuning of the Power Amplifier Circuit is provided by the Microprocessor Circuit on the A2 Motherboard CCA using VOFST when any of the three waveforms or AM is selected. During the measurement of the AUTOCALIBRATION cycle, PA OUT is measured. During the control part of the AUTOCALIBRATION cycle, VOFST from the DAC/Sample and Hold Network Circuit on the A2 Motherboard CCA fine tunes the Power Amplifier Circuit by shifting the Q18 emitter bias. This compensates for temperature and aging effects.
- If DC is selected, the front panel Control Knob changes VOSFT by adding to or subtracting from the AUTOCALIBRATION cycle generated voltage. This is accomplished by the Microprocessor and DAC/Sample and Hold Network Circuits on the A2 Motherboard CCA. Selecting DC and adjusting the offset voltage does not change the VOFST in memory used during AUTOCALIBRATION cycle for the AC waveforms.

–20 dB Attenuator Circuit. Provides 0dB or -20dB of attenuation to the PA OUT signal from the Power Amplifier Circuit. Attenuation selected is based on the front panel selections under control of the Microprocessor Circuit on the A2 Motherboard CCA. There are no test points or adjustments in this circuit.

Three attenuator circuits in the Signal Generator work together to set the desired output signal amplitude under control of the Microprocessor Circuit on the A2 Motherboard CGA.

- The -20dB Attenuator Circuit and R-R2 Ladder Circuit are on the A3 Output CCA.
- A -40dB Attenuator is on the Balanced and Unbalanced Output Attenuator Network and Impedance Control Circuits on the A2 Motherboard CCA.

The lower the output amplitude setting, the more attenuation is inserted. When the R-R2 Ladder reaches its maximum attenuation, the -20dB Attenuator is activated and the R-R2 Ladder is set back to minimum attenuation. As the Microprocessor Circuit demands more attenuation (from front panel settings), the R-R2 Ladder again reaches it maximum attenuation. When this happens, the -40dB Attenuator is activated and both the -20dB Attenuator and the R-R2 Ladder are set to minimum attenuation. As the output amplitude setting increases, more attenuation is removed from the signal line. The attenuators are removed in the reverse order they are inserted.

Balanced Drivers Circuit. Generates and routes the balanced or unbalanced signals from the output from the -20dB Attenuator Circuit, The two possible signal routes are based on the front panel selections under control of the Microprocessor Circuit on the A2 Motherboard CCA. TP6 is the negative balance driver output. TP7 is the positive balance driver output. There are no adjustments in this circuit.

- The unbalanced signal (UNBAL OUT) is routed to the Unbalanced Output Attenuator Network and Impedance Control Circuits on the A2 Motherboard CCA unchanged as (UBOUT).
- The unbalanced signal (UNBAL OUT) is routed through two complimentary drivers. The driver outputs result in two signals, 180° apart (BOUT1 and BOUT2). Both signals are routed to the Peak Detector Circuit, and Balanced Output Attenuator Network and Impedance Control Circuits on the A2 Motherboard.

Peak Detector Circuit. Performs one of three functions under control of the Microprocessor Circuit on the A2 Motherboard CCA. TP8 is the total harmonic distortion notch filter output. TP9 is the positive peak detector output (not measurable), TP10 is the negative peak detector output (not measurable). There are no adjustments in this circuit.

- Measures the signals (PREAMP, PA OUT, BOUT1, or BOUT2) on the A3 Output CCA and provides the measurement information (THD, +PK, and -PK) to the Internal Calibration Network Circuit on the A2 Motherboard CCA during the measurement part of the AU TO CALIBRATION cycle. The AUTOCALIBRATION cycle sequence steps the four measured signals. The Microprocessor Circuit on the A2 Motherboard CCA selects the signal required to correct the signal, if necessary.
- Selects the peak values of an AC signal for measurement. Converts an AC signal to two DC values (+PK and -PK) representing the maximum positive and the maximum negative peaks.
- Selects a direct line for DC measurement, DC value is routed to the +PK output.

CHAPTER 2
MAINTENANCE INSTRUCTIONS

Section I. 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-1288/G are listed in the Maintenance Allocation Chart (MAC), TM 11-6625-3198-12, 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-1288/G are listed in the Maintenance Allocation Chart (MAC), TM 11-6625-3198-12, Appendix B.

2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 11-6625-3198-24P.

Section II. SERVICE UPON RECEIPT

2-4. SERVICE UPON RECEIPT OF MATERIAL.

a. Unpacking. Special design reusable packing material inside this shipping carton provides maximum protection for Signal Generator. Avoid damaging carton and packing material during equipment unpacking. Use the following steps for unpacking Signal Generator:

- Cut and remove paper sealirg tape on carton top and open carton.
- Grasp Signal Generator firmly while restraining shipping carton and lift equipment and packing material vertically.
- Place Signal Generator and end cap packing material on a suitable flat clean and dry surface.
- Remove end cap packing material while firmly supporting Signal Generator.
- Remove protective plastic bag from Signal Generator. Place desiccant bags back inside protective plastic bag.
- Place protective plastic bag and end cap packing material inside shipping carton.
- Return shipping carton to supply system.

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 turn-on procedures given in TM 11-6625-3198-12.

b. Complete performance tests (para 2-27).

Section III. TROUBLESHOOTING

SYMPTOM INDEX

2-6. GENERAL.

Troubleshooting at the intermediate 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 unit 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.

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 self tests that are used in troubleshooting. Procedures for self tests are specified in troubleshooting procedures.

b. Refer to the principles of operation, Chapter 1, Section Ill as required. This provides circuit theory of the section you are troubleshooting with references to the detailed functional diagrams. Signal Generator Detailed Functional Block diagram, Wiring Diagram, and assembly/cable locator is located on figure FO-1. Detailed Functional Block diagrams and assembly component locators for all major assemblies are located on figures FO-2 thru FO-7. Detailed Schematic diagram for the Power Supply circuit is shown FO-8.

c. Circuit cooler spray (Appendix B, item 4) can be used in isolating problems. The most generally used method is to spray suspected circuits/components to see if the malfunction can be temporarily fixed. 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. Many problems on Signal Generators that have been in service for awhile are caused by corrosion. Sometimes removing and reseating the affected cable or circuit card will correct a malfunction. Cleaning connector pins and/or switch contacts with alcohol (Appendix B, item 1) will repair many types of digital and analog circuit malfunctions.

e. For microcircuit and connector orientation, pin one is identified by a "1" and a square pad on printed circuit board.

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 ordlrty contacts, and missing components.

b. Remove top cover/shield (para 2-35) and bottom cover (para 2-36) as required to access components.

WARNING

Signal Generator contains high voltages. After power is removed, discharge capacitors to ground through a 100 Ω resistor 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 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 IC's 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 all motherboard connectors for missing, broken, or corroded contacts.

h. 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 tests or inspections and corrective actions in the order listed.

NOTE

- After repair of Signal Generator verify malfunction is cleared. if not, perform the proper adjustment (table 2-2).
- All voltage readings referenced to analog ground (black test points) unless otherwise specified.
- See figure FO-1 for assembly and cable location diagram.
- Calibration referenced in the following procedures does not replace the calibration performed in accordance with the technical bulletin listed in TB 43-180 for this equipment.

Table 2-1. Troubleshooting.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. Signal Generator Displays ERR XXXXXXXXX Errors.
Step 1. Press and hold down A2SW1 (fig. FO-3) then press the front panel CALIBRATE key. Verify display indicates WVTK SN X, XXX, XXX or WVTK SN 0.
Step 2. Press the front panel RESET key, then CALIBRATE key. Verify display indicates CALIBRATION OFF.
Step 3. After 20 minutes, press the front panel CALIBRATE key. Verify display indicates CALIBRATING for = 20 seconds.
Step 4. Evaluate front panel display.
• If AUTO CALIBRATED displayed, unit operational.
• If different error message displayed, repeat steps 1 to 4.
• If identical error message displayed, proceed with step 5.
Step 5. Evaluate displayed error message.
ERR BAL AMPL
Perform A3 Output Circuit Card Test (para 2-12).
•Replace faulty component/assembly.
ERR BAL OFFSET
Perform Offset Error Test (para 2-19).
•Replace faulty component/assembly.
ERR FIND NOTCH
Perform Find Notch Error Test (para 2-15).
•Replace faulty component/assembly.
ERR OFSTGAIN
Perform Offset Error Test (para 2-19).
•Replace faulty component/assembly.
ERR OFSTZERO
Perform Offset Error Test (para 2-19).
•Replace faulty component/assembly.
ERR SINE AMPL
Perform Sine Error Test (para 2-21).
• Replace faulty component/assembly.

Table 2-1. Troubleshooting — Continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. Signal Generator Displays ERR XXXXXXXXX Errors - Continued.
Step 5. Evaluate displayed error message - Continued.
ERR SQRAMPL
Perform Square Error Test (para 2-23).
• Replace faulty component/assembly.
ERR TRI AMPL
Perform A3 Output Circuit Card Test (para 2-12).
• Replace faulty component/assembly.
ERR VAMCAL
Perform Amplitude Modulation Error Test (para 2-13).
• Replace faulty component lassembly.
ERR VSINCAL
Perform Variable Supply Error Test (para 2-26).
• Replace faulty component/assembly.
All other error codes.
Perform Function Error Test (para 2-17).
• Replace faulty component/assembly.
2. All other SG-1288/G Failures.
Step 1. Set POWER switch to OFF.
• Disconnect all external cables except power cable.
Step 2. Set POWER switch to ON. Verify front panel display indicates WAVETEK SG1288/G.
• If indications are correct, proceed with step 5.
Step 3. Press RESET key. Verify front panel display indicates RESET (VX.XX)
•If indications are correct, proceed with step 5.
Step 4. Press PANEL LOCK then RESET key. Verify front panel display Indicates RESET (VX . XX).
•If indications are correct, proceed with step 5.
•If indications are incorrect, perform Front Panel Test (para 2-16)
Step 5. Verify Signal Generator performs correct turn-on TM 11-6625-3198-12, Chapter 2, paragraph 2-6.
•If Turn-on correct, proceed with step 6.
•If “ERR XXXXXXXXX” errors displayed, perform malfunction number 1.
•If “LOW BATT X.XXX V" or "CAL REQUIRED" displayed, perform A2BT1 Battery Test (para 2-11).
•If front panel indications incorrect, perform Front Panel Test (para 2-16).

Table 2-1. Troubleshooting — Continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. All other SG-1288/G Failures—Continued. Step 6. Complete performance tests (para 2-27). •If all performance test pass, unit is operational •If performance tests fail, troubleshoot malfunction using table 2-1, malfunctions 3 through 14. **NOTE** • Before troubleshooting a failed performance test, press CALIBRATE key. Troubleshoot any error using malfunction number 1 in table 2-1. • Complete as many performance tests as possible to assist in isolatlng malfunction. • If only a specific parameter failed wlthin the performance test, record and use when completing individual troubleshooting tests. • If performance tests all pass, and malfunction is only during remote operation, perform A2 Motherboard Circuit Card Test (para 2-10).
3. Frequency Range Test Failure. Perform SYNC Output Test (para 2-25). •Replace faulty component/assembly.
4. Frequency Resolution Test Failure. Perform SYNC Output Test (para 2-25). •Replace faulty component/assembly.
5. Symmetry Verification Test Failure. Perform SYNC Output Test (para 2-25). •Replace faulty component/assembly.
6. VCF/FM Operation Test Failure. Perform MOD IN/VCF Test (para 2-18). •Replace faulty component/assembly.
7. Waveforms and Sweep Verification Test Failure. For waveforms failure, perform Output Signal Test (para 2-20). For sweep failure, perform Sweep Output Test (para 2-24). •Replace faulty component/assembly.
8. Pulse Characteristics Test Failure. Step 1. Perform Adjust Square Wave (para 2-30). Step 2. If SYNC output connector failure, perform SYNC Output Test (para 2-25). If UNBAL output connector failure, perform Output Signal Test (para 2-20) •Replace faulty component/assembly

Table 2-1. Troubleshooting—Continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. Outputs Verification Test Failure.
Perform Output Signal Test (para 2-20).
• Replace faulty component/assembly.
10. AM Verification Test Failure.
Step 1. Perform Adjust Amplitude Modulation (para 2-33).
Step 2. Perform MOD IN/VCF Test (para 2-18).
• Replace faulty component/assembly.
11. Sine Wave Purity Test Failure.
Step 1. On SG-1288/G, press CALIBRATE key.
• If "ERR XXXXXXXXX" errors displayed, perform malfunction number 1.
Step 2. Complete Sine Wave Purity performance test (para 2-27).
• If correct, unit is operational.
Step 3. Perform Adjust Sine Wave (para 2-31).
Step 4. Complete Sine Wave Purity performance test (para 2-27).
• If correct, perform Sine Purity Test (para 2-22). Replace faulty component/assembly.
Step 5. On SG-1288/G, press RESET. Using an Oscilloscope, verify A2 P6 pin 16 is 1 kHz triangle wave at ≈ 2.5 Vp-p. Verify wave shape is linear and has no bumps.
• If correct, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
• If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
12. Amplitude Accuracy Test Failure.
Step 1. Perform Adjust Amplitude (para 2-32).
Step 2. Perform Output Signal Test (para 2-20).
• Replace faulty component/assembly.
13. DC Offset and Attenuator Accuracy Test Failure.
Perform Output Signal Test (para 2-20).
• Replace faulty component/assembly.
14. External Lock Test Failure.
Step 1. Perform Adjust Phase (para 2-34).
Step 2. Perform External Frequency Test (para 2-14).
• Replace faulty component/assembly.

2-10. A2 MOTHERBOARD CIRCUIT CARD TEST.

DESCRIPTION

This test is used to isolate a problem in the A2 Motherboard Circuit Card Assembly (fig. FO-3) to the malfunctioning component.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. Using a Digital Multimeter, verify A2BT1 (fig. FO-3) is $\geq$ + 2.8 Vdc.
   - If incorrect, replace defective A2BT1 Battery (para 2-41).
3. Using a Digital Multimeter, verify A2JMP6 is + 5.0 Vdc ± 0.2Vdc.
   - If incorrect, troubleshoot and replace defective A2CR40 Bridge Rectifier (para 2-42), A2Q7 Transistor (para 2-44), and/or A2Q1O Transistor (para 2-45) using fig. FO-8.
4. Using a Digital Multimeter, verify A2JMP+12 is + 12.0 Vdc ± 0.2Vdc.
   - If incorrect, troubleshoot and replace defective A2VR3 Transistor (para 2-45) using fig. FO-8.
5. Using a Digital Multimeter, verify A2JMP–12 is – 12.0 Vdc ± 0.2Vdc.
   - If incorrect, troubleshoot and replace defective A2VR4 Transistor (para 2-45) using fig. FO-8.
6. Using a Digital Multimeter, verify A2TP14 is + 22.0 Vdc ± 0.2Vdc.
   - If incorrect, troubleshoot and replace defective A2VR7 Transistor (para 2-45) using fig. FO-8.
7. Using a Digital Multimeter, verify A2TP15 is –22.0 Vdc ± 0.2Vdc.
   - If incorrect, troubleshoot and replace defective A2VR8 Transistor (para 2-45) using fig. FO-8
8. Visually inspect A2J15 to A2J19.
   - If defective or damaged, replace A2J15 to A2J19 BNC Connectors (para 2-43) as required.
9. If all the above conditions are correct, or if replaced component does not correct malfunction, replace defective A2 Motherboard Circuit Card Assembly (para 2-40).
10. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-11. A2BT1 BATTERY TEST.

DESCRIPTION

This test is used to isolate an error message of LOWBATT or CAL REQUIRED in the Signal Generator (fig. FO-1) to the malfunctioning component.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWERON/OFF to OFF.
2. Using a Digital Multimeter, verify A2BT1 (fig. FO-3) is $\geq$ + 2.8 Vdc.
   - If incorrect, replace defective A2BT1 Battery (para 2-41).
3. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
4. After 20 minutes, press CALIBRATE key. Verify display indicates CALIBRATING for $\approx$ 20 seconds then reads AUTOCALIBRATED.
   - If incorrect, troubleshoot using table 2-1.
   - If correct, unit is operational.
5. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-12. A3 OUTPUT CIRCUIT CARD TEST.

DESCRIPTION

This test is used to isolate a problem in the A3 Output Circuit Card Assembly (fig. FO-4) to the malfunctioning component.

WARNING

Use caution when handling Circuit Card Assembly as heats ink may be hot.

CAUTION

Do not operate Signal Generator with heats ink removed from A3 Output Circuit Card Assembly.

2-12. A3 OUTPUT CIRCUIT CARD TEST — Continued.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. Using an Oscilloscope, verify A3TP2 (fig. FO-4) is a 1 kHz sine wave at 6.0 Vp-p.
   - If incorrect, replace defective A3 Output Circuit Card Assembly (para 2-46).
3. Using an Oscilloscope, verify A3TP4 is a 1 kHz sine wave at 10.0 Vp-p.
   - If incorrect, troubleshoot and replace defective transistor A3Q18 thru Q23 Transistor (para 2-47) using fig. FO-4.
4. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-13. AMPLITUDE MODULATION ERROR TEST.

DESCRIPTION

This test is used to isolate an error code of ERR VAMCAL in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
   - Press and hold down A2SW1 (fig. FO-3) then press the CALIBRATE key.
   - Verify display indicates WVTK SN X,XXX,XXX or WVTK SN 0.
   - Press RESET key.
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.

2-13. AMPLITUDE MODULATION ERROR TEST — Continued.

2. Using a Digital Multimeter, verify A2P9 pin 15 is + 2.00 Vdc ± 0.02 Vdc.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If correct, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
3. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-14. EXTERNAL FREQUENCY TEST.

DESCRIPTION

This test is used to isolate External Lock performance test failure in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. Connect a Electronic Synthesizer to the SG-1288/G front panel EXT FREQ IN connector using a 50Ω feedthru.
2. Set Electronic Synthesizer Controls as follows:
   - Set Function to SINE.
   - Set Frequency to 1 kHz.
   - Set Level to 1 Vp-p.
3. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
4. Using an Oscilloscope, verify A2P8 pin 21 (fig. FO-3) is a 1 kHz, 2 Vp-p TTL signal.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If correct, replace defective A7 Phase Lock Loop Circuit Card Assembly para 2-49).
5. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-15. FIND NOTCH ERROR TEST.

DESCRIPTION

This test is used to isolate an ERR error code of FIND NOTCH in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. Remove A3 Output Circuit Card Assembly (para 2-46) and reinstall on an extender board.
2. On SG-1288/G,
   - SET POWER ON/OFF to ON.
   - Press RESET key.
   - Set START frequency to 9 kHz.
   - Set STOP frequency to 11 kHz.
   - Set TIME to 5 sec.
   - Set MODULATION to SWEEP.
   - Verify SWEEP RUN is displayed.
3. Using an Oscilloscope, verify A2P10 pin 40 (fig. FO-3) IS 9 to 11 kHz swept signal at ≈ 1.2 Vp-p.
   - If incorrect, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
4. Using an Oscilloscope, verify A3TP2 (fig. FO-4) IS 9 to 11 kHz swept signal at ≈ 6.0 Vp-p.
   - If incorrect, perform A3 Output Circuit Card Test (para 2-12).
5. Using an Oscilloscope, verify A3TP8 is a 0 to +2.5 Vdc swept DC output.
   - If incorrect, perform A3 Output Circuit Card Test (para 2-12).
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
6. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-16. FRONT PANEL TEST.

DESCRIPTION

This test is used to isolate a incorrect front panel indications in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test, Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G, observe/exercise display, annunciators, control knob, and keys.
   - If ONLY front panel display not on, perform Front Panel Test — Blank Display Check below.
   - If ONLY front panel display incorrect, perform Front Panel Test — Garbled Display Check below.
   - If display AND annunciators incorrect, perform Front Panel Test — LED Check below.
   - If keys not functioning, perform Front Panel Test — Key Check below.
   - If control knob not functioning, perform Front Panel Test — Knob Check below,
   - If unlock indicator flashing without phase lock ON indicator and error code, perform Front Panel Test — Unlock Indicator Check below.
2. After troubleshooting, remove power, reinstall all circuit cards, and disconnect test equipment.

FRONT PANEL TEST — BLANK DISPLAY CHECK

1. On SG-1288/G, verify A2CR6 (fig. FO-3) is flashing.
   - If incorrect, proceed with step 2.
   - If correct, proceed with step 4.
2. Using a Digital Multimeter, verify A2JMP6 is + 5Vdc.
   - If incorrect, proceed with step 3.
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
3. Using a Digital Multimeter, verify that between A2P22 and P23 is ≈ 8 Vac.
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If incorrect, replace defective A4 Rear Panel Assembly (para 2-48).
4. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A1 Front Panel Assembly (para 2-39).
   - Position A1 Front Panel Assembly in front of Signal Generator and reconnect P3/J3.
   - Set POWER ON/OFF to ON.
5. Using a Digital Multimeter, verify that between A2J12 pins 16 to 36 is ≈ 8.5 Vac.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If correct, replace A1 Front Panel Assembly (para 2-39).

2-16. FRONT PANEL TEST — GARBLED DISPLAY CHECK.

1. On SG-1288/G,
   - Remove A8 Function Generator Circuit Card Assembly (para 2-50).
   - Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Remove A3 Output Circuit Card Assembly (para 2-46).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. On SG-1288/G, verify display reads RESET (VX.XX).
   - If incorrect, proceed with step 3.
   - If correct, proceed with step 8.
3. On SG-1288/G, verify A2CR6 (fig. FO-3) is flashing.
   - If incorrect, proceed with step 4.
   - If correct, proceed with step 15.
4. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A1 Front Panel Assembly (para 2-39).
   - Position A1 Front Panel Assembly in front of Signal Generator and reconnect P3/J3.
   - Set POWER ON/OFF to ON.
5. On SG-1288/G, verify A2CR6 is flashing.
   - If incorrect, proceed with step 17.
   - If correct, proceed with step 6.
6. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Reinstall A1 Front Panel Assembly (para 2-39).
   - Set POWER ON/OFF to ON.
7. On SG-1288/G, press RESET key and verify display reads RESET (VX.XX).
   If incorrect, replace defective A1 Front Panel Assembly (para 2-39).
   If correct, proceed with step 8.
8. On SG-1288/G,
   Set POWER ON/OFF to OFF.
   Reinstall A8 Function Generator Circuit Card Assembly (para 2-50).
   Set POWER ON/OFF to ON.
9. On SG-1288/G, press RESET key and verify display reads RESET (VX.XX).
   - If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
   - If correct, proceed with step 10.

2-16. FRONT PANEL TEST — GARBLED D/SPLAY CHECK — Continued.

10. On SG-1288/G,
    - Set POWER ON/OFF to OFF.
    - Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
    - Set POWERON/OFF to ON.
11. On SG-1288/G, press RESET key and verify display reads RESET (VX.XX).
    - If incorrect, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
    - If correct, proceed with step 12.
12. On SG-1288/G,
    - Set POWER ON/OFF to OFF.
    - Reinstall A3 Output Circuit Card Assembly (para 2-46).
    - Set POWER ON/OFF to ON.
13. On SG-1288/G, press RESET key and verify display reads RESET (VX.XX).
    - If incorrect, perform A3 Output Circuit Card Test (para 2-12).
    - If correct, wait 20 minutes and press CALIBRATE key.
14. After 20 seconds verify SG-1288/G display indicates AUTOCALIBRATED.
    - If incorrect, troubleshoot error message using malfunction number 1 in table 2-1.
    - If correct, unit is operational.
15. On SG-1288/G,
    Set POWER ON/OFF to OFF.
    - Reinstall A3 Output Circuit Card Assembly (para 2-46).
    - Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
    - Reinstall A8 Function Generator Circuit Card Assembly (para 2-50).
    - Press and hold down A2SW1 while setting POWER ON/OFF to ON.
16. Using an Oscilloscope, verify front panel UNBAL connector is a 1 kHz 5 Vp-p sine wave.
    - If correct, replace defective A1 Front Panel Assembly (para 2-39).
    - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
17. Using a Digital Multimeter, verify A2JMP6 is + 5 Vdc.
    - If incorrect, proceed with step 18.
    - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
18. Using a Digital Multimeter, verify that between A2P22 and P23 is ≈ 8 Vac.
    - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
    - If incorrect, replace defective A4 Rear Panel Assembly (para 2-48).

2-16. *FRONT PANEL TEST — LED CHECK.*

1. On SG-1288/G,

   • Set POWER ON/OFF to OFF.

   • Verify fuse and voltage selection are correct.

   • Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).

   • Remove A8 Function Generator Circuit Card Assembly (para 2-50).

   • Remove A3 Output Circuit Card Assembly (para 2-46).

   • Set POWER ON/OFF to ON.

2. On SG-1288/G,

   Press RESET key.

   Press FUNCTION select key and verify all four annunciators light. Press RESET key.

   Press MODULATION select key and verify all four annunciators light.

   Press FUNCTION OUTPUTS select key and verify all six annunciators light.

   Press RESET key. Press EXT LOCK ON/OFF key and verify the ON annunciator lights, and the UNLOCK indicator flashes.

   Press KNOB key twice and verify the ENABLE annunciator goes out then lights.

   • If results are incorrect, proceed with step 9.

   • If results are correct, proceed with step 3.

3. On SG-1288/G,

   • Set POWER ON/OFF to OFF.

   • Reinstall A8 Function Generator Circuit Card Assembly (para 2-50).

   • Set POWER ON/OFF to ON.

4. Repeat step 2.

   • If results in step 2 are incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).

   • If results in step 2 are correct, proceed with step 5.

5. On SG-1288/G,

   • Set POWER ON/OFF to OFF.

   • Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).

   • Set POWER ON/OFF to ON.

6. Repeat step 2.

   • If results in step 2 are incorrect, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).

   • If results in step 2 are correct, proceed with step 7.

7. On SG-1288/G,

   • Set POWER ON/OFF to OFF.

   • Reinstall A3 Output Circuit Card Assembly (para 2-46).

   • Set POWER ON/OFF to ON.

2-16. FRONT PANEL TEST — LED CHECK — Continued.

8. Repeat step 2.
   - If results in step 2 are incorrect, perform A3 Output Circuit Card Test (para 2-12).
   - If results in step 2 are correct, proceed with step 9.
9. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Reinstall A8 Function Generator Circuit Card Assembly (para 2-50).
   - Reinstall A3 Output Circuit Card Assembly (para 2-46).
   - Remove A1 Front Panel Assembly (para 2-39).
   - Position A1 Front Panel Assembly in front of Signal Generator and reconnect P3/J3.
   - Press and hold down A2SW1 (fig. FO-3) while setting POWERON/OFF to ON.
10. Using an Oscilloscope, verify A2J19 (unbalanced output) is a 1 kHz 5 Vp-p sine wave.
    - If correct, replace defective Al Front Panel Assembly (para 2-39).
    - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).

FRONT PANEL TEST — KEY CHECK.

1. On SG-1288/G, verify PANEL LOCK not on and REMOTE operation not active,
2. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A1 Front Panel Assembly (para 2-39).
   - Position A1 Front Panel Assembly in front of Signal Generator and reconnect P3/J3.
   - Press and hold down A2SW1 (fig. FO-3) while setting POWER ON/OFF to ON.
3. Using an Oscilloscope, verify A2J19 (unbalanced output) is a 1 kHz 5 Vp-p sine wave.
   - If correct, replace defective A1 Front Panel Assembly (para 2-39).
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).

FRONT PANEL TEST — KNOB CHECK.

1. On SG-1288/G, verify PANEL LOCK not on, REMOTE operation not active, and knob enabled,
2. Connect Oscilloscope channel A input to A2C147 (fig. FO-3) and channel B input to A2C146. Connect probes to leads closest to shield (forward).
3. On SG-1288/G,
   - Press FREQUENCY key.
   - Turn CONTROL KNOB CW and CCW.
4. Verify Oscilloscope display shows two TTL pulses while knob is turning.
   - If incorrect, replace defective A1 Front Panel Assembly (para .2-39).
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).

2-16. FRONT PANEL TEST — UNLOCK INDICATOR CHECK.

1. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
   - Press and hold down A2SW1 (fig. FO-3) then press the CALIBRATE key.
   - Verify display indicates WVTK SNX,XXX,XXX or WVTK SN 0.
   - Press RESET key.
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
2. After 20 minutes, press CALIBRATE key.
   - If error message displayed, perform malfunction number 1 in table 2-1.
   - If unlocked indicator still flashing without error message, proceed with step 3.
   - If display indicates AUTOCALIBRATED and unlocked indicator is off, unit is operational.
3. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
   - Set FREQUENCY to 15 MHz.
4. Using an Oscilloscope, verify A2P8 pin 2 is TTL pulses at 15 MHz.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
5. On SG-1288/G,
   - Press RESET key.
   - Press FUNCTION select key and verify all four annunciators light. Press RESET key.
   - Press MODULATION select key and verify all four annunciators light.
   - Press FUNCTION OUTPUTS select key and verify all six annunciators light.
6. Analyze results of step 5.
   - If correct, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - If incorrect, proceed with step 7.
7. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Remove A1 Front Panel Assembly (para 2-39).
   - Position A1 Front Panel Assembly in front of Signal Generator and reconnect P3/J3.
   - Press and hold down A2SW1 while setting POWER ON/OFF to ON.
8. Using an Oscilloscope, verify A2J19 (unbalanced output) is a 1 kHz 5 Vp-p sine wave.
   - If correct, replace defective A1 Front Panel Assembly (para 2-39).
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).

2-17. FUNCTION ERROR TEST.

DESCRIPTION

This test is used to isolate ERR error codes of COMP8+, COMP9+, POSVCGOFF, SCALE, SNEGVCGOFF, SPOSVCGOFF, SWP LENGTH, SYMM50PCT, TORFR3, TORFR4, TORFR5, TORFR6, TORFR7, VCGZERO, VFREQO, VFREQOS, and VTRIBAL in the Signal Generator (fig. FO-1) to the malfunctioning assembly

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Remove A3 Output Circuit Card Assembly (para 2-46).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. After 20 minutes, press CALIBRATE key.
   - If identical error is displayed, proceed with step 3.
   - If ERR FIND NOTCH is displayed, proceed with step 7.
   - If any other error is displayed, perform A2 Motherboard Circuit Card Test (para 2-10).
3. On SG-1288/G,

   Press RESET key.

   Press FUNCTION select key and verify all four annunciators light. Press RESET key.

   Press MODULATION select key and verify all four annunciators light.

   Press FUNCTION OUTPUTS select key and verify all six annunciators light.

   Press RESET key. Press EXT LOCK ON/OFF key and verify the annunciator lights.

   Press KNOB key twice and verify the ENABLE annunciator goes out then lights.

   - If results are incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If results are correct, proceed with step 4.
4. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A8 Function Generator Circuit Card Assembly (para 2-50).
   - Set POWER ON/OFF to ON.
   - Press RESET key.

2-17. FUNCTION ERROR TEST — Continued.

5. After 20 minutes, press CALIBRATE key.
   - If ERR VCGZERO is displayed, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
   - If any other error is displayed, perform A2 Motherboard Circuit Card Test (para 2-10).
6. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
7. After 20 minutes, press CALIBRATE key.
   - If ERR FIND NOTCH is displayed, proceed with step 8.
   - If original error is displayed, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - If any other error is displayed, perform A2 Motherboard Circuit Card Test (para 2-10).
8. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Reinstall A3 Output Circuit Card Assembly (para 2-46).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
9. After 20 minutes, press CALIBRATE key.
   - If ERR FIND NOTCH is displayed, perform Find Notch Error Test (para 2-15).
   - If original error is displayed, perform A3 Output Circuit Card Test (para 2-12).
   - If any other error is displayed, perform malfunction 1 in table 2-1.
10. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-18. MOD IN/VCF TEST.

DESCRIPTION

This test is used to isolate VCF/FM Operation and AM Verification performance test failures in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. Connect a Electronic Synthesizer to the SG-1288/G front panel MOD IN/VCF connector using a 50Ω feedthru.
2. Set Electronic Synthesizer Controls as follows:
   - Set Function to SINE.
   - Set Frequency to 1 kHz.
   - Set Level to 1 Vp-p.
3. On SG-12881G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
   - If malfunction is FM/VCF related, proceed with step 4.
   - If malfunction is AM related, proceed with step 5.
4. Using an Oscilloscope, verify that A2P6 pin 20 (fig. FO-3) is a 1 kHz, 1 Vp-p signal.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If correct, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
5. Using an Oscilloscope, verify that A2P9 pin 1 is a 1 kHz, 1 Vp-p signal.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If correct, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
6. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-19. OFFSET ERROR TEST.

DESCRIPTION

This test is used to isolate ERR error codes of BAL OFFSET, OFSTGAIN, or OFSTZERO in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A3 Output Circuit Card Assembly (para 2-46).
   - Set POWER ON/OFF to ON.
   - Press RESET key.
   - Press and hold down A2SW1 (fig. FO-3) then press the CALIBRATE key.
   - Verify display indicates WVTK SN X, XXX, XXX or WVTK SN 0.
   - Press RESET key.
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
2. Using a Digital Multimeter, verify A2P10 pin 20 is from -25 mVdc to + 25 mVdc.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
3. On SG-1288/G, use CURSOR keys and CONTROL KNOB to set DC OFF to 0.3 VDC.
4. Using a Digital Multimeter, verify A2P10 pin 20 is ≈ – 0.4 Vdc.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If correct, perform A3 Output Circuit Card Test (para 2-12).
5. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-20. OUTPUT SIGNAL TEST.

DESCRIPTION

This test is used to isolate Waveforms and Sweep Verification, Outputs Verification, Amplitude Accuracy, and DC Offset and Attenuator Accuracy performance test failures in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-12881G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. Using an Oscilloscope (with 50Ω feedthru), verify UNBAL connector has a 1 kHz, 5 Vp-p signal. Set Output to 600Q BAL and verify BAL connector has a 1 kHz, 5 Vp-p signal (using a 600 Ω feedthru).
   - If correct, set SG-1288/G controls to failed performance test parameters. Verify signal failure.
3. Using an Oscilloscope,

   UNBAL problems (UNBAL selected), verify A2P11 pin 1 (fig. FO-3) is a 1 kHz, 10 Vp-p signal (or as set by SG-1288/G controls).

   BAL problems (BAL selected), verify A2P11 pins 3 and 4 are a 1 kHz, 5 Vp-p signal (or as set by SG-1288/G controls).
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
4. Using an Oscilloscope, verify A3TP2 (fig. FO-4) is a 1 kHz (or as set by SG-1288/G controls), ≈ 6 Vp-p signal .
   - If correct, perform A3 Output Circuit Card Test (para 2-12).
5. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A3 Output Circuit Card Assembly (para 2-46).
   - Set POWER ON/ OFF to ON.
   - Press RESET key.
6. Using an Oscilloscope, verify:

   A2P10 pin 1 is a 1 kHz (or as set by SG-1288/G controls), ≈ 2.0 Vp-p square wave.

   A2P10 pin 20 is a 0 Vdc (or as set by SG-1288/G OFFSET control) level (+ 5Vdc OFFSET gives ≈– 6.5 Vdc).

   A2P10 pin 36 is a 1 kHz (or as set by SG-1288/G controls), ≈ 2,5 Vp-p triangle wave.

   A2P10 pin 38 is a 1 kHz (or as set by SG-1288/G controls), ≈ 6.5 Vp-p sine wave (AM if connected and selected).

   A2P10 pin 40 is a 1 kHz (or as set by SG-1288/G controls), ≈ 2,5 Vp-p sine wave.
   - If correct, perform A3 Output Circuit Card Test (para 2-12).

2-20. OUTPUT SIGNAL TEST — Continued.

7. Using an Oscilloscope, verify:

   A7TP10 (fig. FO-6) is 1 kHz (or as set by SG-1288/G controls), ≈2.5 Vp-p sine wave.

   A7TP12 is 1 kHz (or as set by SG-1288/G controls), ≈6.5 Vp-p sine wave (AM if connected and selected).

   .If incorrect, proceed with step 8.

   .If correct, proceed with step 9.

8. Using an Oscilloscope, verify A2P6 pin 16 is a 1 kHz (or as set by SG-1288/G controls) ≈2.5 Vp-p triangle wave. Verify signal is linear without bumps.

   .If correct, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).

   .If incorrect. replace defective A8 Function Generator Circuit Card Assembly (para 2-50).

9. Using an Oscilloscope, verify:

   A2P6 pin 16 is a 1 kHz (or as set by SG-1288\G controls) 2.5 Vp-p triangle wave. Verify signal is linear without bumps.

   A2P6 pin 1 is a 1 kHz (or as set by SG-1288/G controls) 2.25 Vp-p square wave.

   • If correct, perform A2 Motherboard Circuit Card Test (para 2-10).

   • If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).

10. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-21. SINE ERROR TEST.

DESCRIPTION

This test is used to isolate an error code of ERR SINE AMPL in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test, Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,

   • Remove A3 Output Circuit Card Assembly (para 2-46),

   • Set POWER ON/OFF to ON.

   • Press RESET key.

   .Press and hold down A2SW1 (fig, FO-3) then press the CALIBRATE key.

   .Verify display indicates WVTK SN X, XXX, XXX or WVTK SN 0.

   • Press RESET key.

   .Press CALIBRATE key.

   .Verify display indicates CALIBRATION OFF.

   .After 20 minutes, press CALIBRATE key.

2-21. SINE ERROR TEST — Continued.

2. Using an Oscilloscope, verify A7TP10 (fig. FO-6) is a 1 kHz sine wave at 2.5 Vp-p.
   - If incorrect, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - If correct, perform A3 Output Circuit Card Test (para 2-12).
3. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-22. SINE PURITY TEST.

DESCRIPTION

This test IS used to Isolate a Sine Wave Purity performance test failure in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. After 20 minutes, press CALIBRATE key.
   - If error is displayed, troubleshoot using malfunction number 1 in table 2-1.
3. Complete Sine Wave Purity performance test (para 2-27). Verify reading is with specified limits.
   - If correct, unit is operational.
4. On SG-1288/G, set FREQUENCY to 10 kHz.
5. Using an Oscilloscope, verify A2P11 pin 13 (fig. FO-3) DC offset is minimum at ≈10 kHz. Use SG-1288/G CONTROL KNOB to very frequency.
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
   - If Incorrect, perform A3 Output Circuit Card Test (para 2-12).
6. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-23. SQUARE ERROR TEST.

DESCRIPTION

This test is used to isolate an error code of ERR SQR AMPL in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. Connect Oscilloscope to SYNC OUT connector using a 50Ω feedthru. Verify display is 1 kHz TTL square wave at =2.5 Vp-p.

   .If correct, perform A3 Output Circuit Card Test (para 2-12).

2. On SG-1288/G,

   .Set POWER ON/OFF to OFF.

   .Remove A3 Output Circuit Card Assembly (para 2-46).

   • Set POWER ON/OFF to ON.

   .Press RESET key.

3. Verify Oscilloscope display is 1 kHz TTL square wave at =2.5 Vp-p.

   .If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).

   .If correct, perform A3 Output Circuit Card Test (para 2-12).

4. Remove power, reinstall all circuit cards. and disconnect test equipment.

2-24. SWEEP OUTPUT TEST.

DESCRIPTION

This test is used to isolate SWEEP output problems, including Waveforms and Sweep Verification performance test failure, in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,

   Set POWER ON/OFF to ON.

   • Press RESET key.

   • Set MODULATION to SWEEP.

   • Verify display indicates SWEEP RUN.

2. Using an Oscilloscope, verify SWEEP output connector is a 0 to + 6 V ramp signal at a rate of 1 second.

   • If incorrect, proceed with step 4.

3. Using an Oscilloscope and 50Ω feedthru, verify UNBAL output connector is a swept 2 Hz to 2 kHz sine wave at a rate of 1 sec.

   • If correct, unit is operational.

   • If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).

4. Using an Oscilloscope, verify A2P7 pin 1 (fig, FO-3) is a 0 to + 6 V ramp signal at a rate of 1 second.

   • If correct, perform A2 Motherboard Circuit Card Test (para 2-10).

   • If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).

5. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-25. SYNC OUTPUT TEST.

DESCRIPTION

This test is used to isolate SYNC output problems, including Frequency Range, Frequency Resolution, Symmetry Verification, and/or Pulse Characteristics performance test failures, in the Signal Generator (fig. FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to ON.
   - Press RESET key.
2. Using a Frequency Counter, verify front panel SYNC OUT connector frequency is 1 kHz ± 1 Hz. Verify time interval is 500µs ± 10µs. Frequency Counter settings for time interval measurement found in Symmetry Verification Test (para 2-27).
   - If incorrect, proceed with step 4.
3. On SG-1288/G, enter desired frequency (2 mHz to 20 MHz) and symmetry (10% to 90%). Verify the Frequency Counter reads frequency with ± 0.1% and time interval within ± 2%. Frequency Counter settings for time interval measurement found in Symmetry Verification Test (para 2-27).
   - If correct, unit is operational.
   - If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
4. Using an Oscilloscope, verify A2P6 pin 1 (fig. FO-3) is 1 kHz square wave at 2.25 Vp-p.
   - If correct, perform A2 Motherboard Circuit Card Test (para 2-10).
5. Using an Oscilloscope, verify A2P6 pin 16 is 1 kHz triangle wave at = 2.5 Vp-p. Verify wave shape is linear and has no bumps.
   - If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
6. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A3 Output Circuit Card Assembly (para 2-46).
   - Set POWER ON/OFF to ON.
7. Using an Oscilloscope, verify A2P6 pin 1 is 1 kHz square wave at 2.25 Vp-p.
   - If correct, perform A3 Output Circuit Card Test (para 2-12).
   - If incorrect, replace defective A8 Function Generator Circuit Card Assembly (para 2-50).
8. Remove power, reinstall all circuit cards, and disconnect test equipment.

2-26. VARIABLE SUPPLY ERROR TEST.

DESCRIPTION

This test is used to isolate an error code of ERR VSINCAL in the Signal Generator (fig, FO-1) to the malfunctioning assembly.

NOTE

Perform this procedure only when instructed from table 2-1 or another troubleshooting test. Do not perform this or any other troubleshooting test as a separate procedure unless otherwise instructed as certain conditions have been established and/or tested prior to performing this test.

1. On SG-1288/G,
   - Set POWER ON/OFF to OFF.
   - Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Remove A3 Output Circuit Card Assembly (para 2-46).
   - Set POWERON/ OFF to ON.
   - Press RESET key.
   - Press and hold down A2SW1 (fig. FO-3) then press the CALIBRATE key.
   - Verify display indicates WVTK SN X,XXX, XXX or WVTK SN 0.
   - Press RESET key,
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
2. Using a Digital Multimeter, verify A2P9 pin 16 is from - 15 mVdc to + 15 mVdc.
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
3. On SG-1288/G,
   - Press RESET key,
   - Press and hold down A2SW1 then press the front panel CALIBRATE key.
   - Verify display indicates WVTK SN X,XXX, XXX or WVTK SN 0.
   - Press the front panel RESET key.
   - Press —> CURSOR key.
   - Verify display indicates ARMY SN X,XXX or ARMY SN 0.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 15 seconds.
   - Verify display indicates PEAKING C22 or ERR FIND NOTCH.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates R33,97,64, VSINE XXX.

2-26. VARIABLE SUPPLY ERROR TEST — Continued.

4. Connect Digital Multi meter to A2P9 pin 16.
5. On SG-1288/G, turn CONTROL KNOB to set displayed R33,97,64, VSINE XXX from 0 to 255. Verify Digital Multimeter reads from -3 Vdc (128) to + 3 Vdc (127).
   - If incorrect, perform A2 Motherboard Circuit Card Test (para 2-10).
6. On SG-1288/G,
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
   - Press RESET key.
   - Set POWER ON/OFF to OFF.
   - Reinstall A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - Set POWER ON/OFF to ON.
7. Connect Oscilloscope to A7TP10 (fig. FO-6).
8. On SG-1288/G,
   - Press RESET key.
   - Press and hold down A2SW1 then press the front panel CALIBRATE key.

     Verify display indicates WVTKSN X,XXX,XXX or WVTK SN 0.

     Press the front panel RESET key.
   - Press —> CURSOR key.
   - Verify display indicates ARMY SN X,XXX or ARMY SN 0.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 15 seconds.
   - Verify display indicates PEAKING C22 or ERR FIND NOTCH.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates R33,97,64, VSINE XXX.
9. On SG-1288/G, rotate CONTROL KNOB CW. Verify display changes from 0 to 255 and displayed waveform increases in amplitude from 0 to 127, drops at 128, and increases to 255.
   - If incorrect, replace defective A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
   - If correct, perform A3 Output Circuit Card Test (para 2-12).
10. Remove power, reinstall all circuit cards, and disconnect test equipment.

Section IV. MAINTENANCE PROCEDURES 2-27.

PERFORMANCE TEST.

DESCRIPTION

This procedure covers:

- Frequency Range Test
- Symmetry Verification Test
- Waveforms and Sweep Verification Test
- OutputsVerificationTest
- Sine Wave Purity Test
- DC Offset and Attenuator Accuracy Test
- Frequency Resolution Test
- VCF/FM Operation Test
- Pulse Characteristics Test
- AM Verification Test
- Amplitude Accuracy test
- External Lock 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.
- When performing an Autocal, no external test equipment should be connected to any of the Signal Generator inputs or outputs
- Allow an initial 20 minute warm-up period when performing the first performance test to allow the Signal Generator to stabilize.
- Allow Signal Generator one minute to stabilize if turned off less than five minutes during performance tests.
- Calibration referenced in the following procedures does not replace the calibration performed in accordance with the technical bulletin listed in TB 43-18 for this equipment.

INITIALIZED SETUP.

1. Set POWER ON/OFF to ON, wait 20 minutes, and then press CALIBRATE key. After ~ 20 seconds, verify display reads AUTOCALIBRATED.

2. Initialization of Signal Generator controls and indicators is accomplished by pressing RESET key.

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

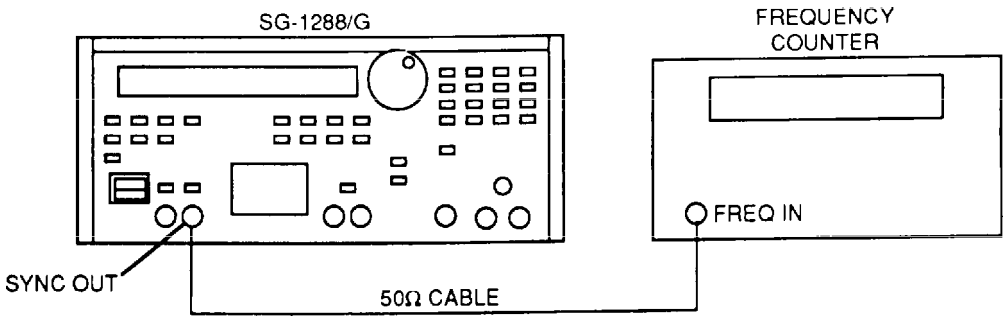
DISPLAY	RESET (VX.XX)
FUNCTION	% (sine) indicator ON
MODULATION FUNCTION	CW indicator ON
OUTPUTS	50Q and UNBAL indicators ON
All other displays and indicators	OFF
* FREQUENCY	FREQ 1 KHZ/PER 1 MILISEC
* AMPLITUDE	AMPL5VPP/AMPL 2.5 VP/AMPL 1.77 VRMS/AMPL 18DBM
* DISPLAY	INTENSITY 16
* SYMMETRY	SYMM 50 PCT
* PHASE	PHASE 0 DEG/PHASE 0 RAD
* OFFSET	DCOFF 0 VDC
* START/STOP	START 2 HZ/STOP 2 KHZ
* TIME	SWP TIME 1 SEC/SWPRATE 1 HZ
* ADDRESS	ADDRS 00 to 30

* Press key to display default value(s).

FREQUENCY

RANGE TEST

1. On SG-1288/G.
   - Verify POWERON/OFF to ON.
   - Press CALIBRATE key. After ~ 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set FREQUENCY to 20 MHz.



2. Connect test equipment as shown.
3. Set Frequency Counter IMPEDANCE to 50W.
4. Set Frequency Counter controls to display SG-1288/G output. Verify Frequency Counter displays from 19.98 to 20.02 MHz.
5. On SG-12881G, select FM/VCF modulation.
6. Verify Frequency Counter displays from 19.4 to 20.6 MHz.
7. Set SG-1288/G controls as shown. Verify Frequency Counter readings are within specified limits.
8. Disconnect test equipment.

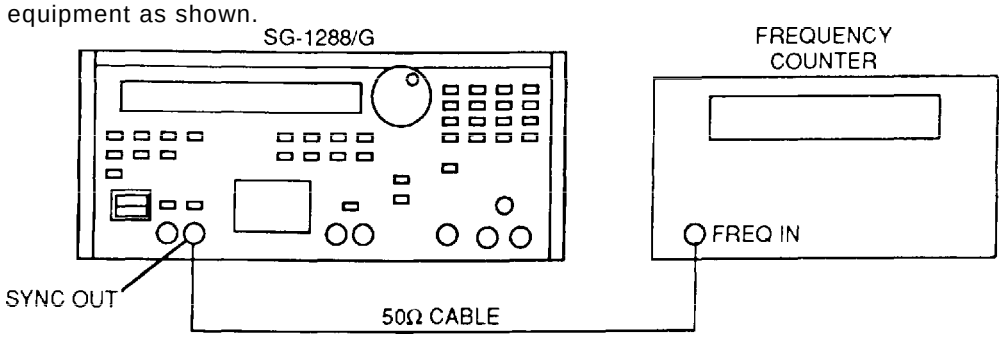
NOTE

Do not change frequency in FM modulation mode.

SG-1288/G Modulation	SG-1288/G Frequency	Frequency Counter Display
CW	2,000 MHz	1.998 to 2.002 MHz
FM/VCF	2.000 MHz	1.94 t0 2.06 MHz
CW	200 kHz	199.9 to 200.1 kHz
FM/VCF	200 kHz	194 to 206 kHz
CW	20 kHz	19.99 to 20.01 kHz
FM/VCF	20 kHz	19.4 t0 20.6k Hz
CW	2 k H z	1.999 t0 2.001 kHz
FM/VCF	2 k H z	1.940 to 2.060 kHz
CW	200 Hz	199.9 to 200.1 Hz
FM/VCF	200 Hz	194 to 206 Hz

FREQUENCY RESOLUTION TEST.

1. On SG-1288/G,
   - Verify POWER ON/OFF to ON.
   - Press CALIBRATE key. After ~ 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set FREQUENCY to 1999 Hz.
2. Connect test equipment as shown.



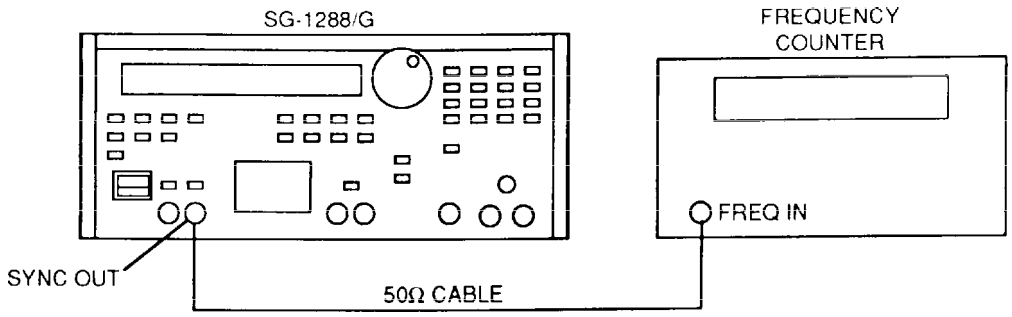
3. Set Frequency Counter IMPEDANCE to 50W.
4. Set Frequency Counter controls to display SG-1288/G output. Verify Frequency Counter displays from 1998.000 Hz to 1999.999 Hz.
5. Set SG-1288/G controls as shown. Verify Frequency Counter readings are within specified limits.
6. Disconnect test equipment.

SG-1288/G Frequency	Frequency Counter Display
1888 Hz	1887.056 Hz to 1888.944 Hz
1777 Hz	1776.111 Hz to 1777.888 Hz
1666 Hz	1665.167 Hz to 1666.833 Hz
1555 Hz	1554.222 Hz to 1555.777 Hz
1444 Hz	1443.278 Hz to 1444.722 Hz
1333 Hz	1332.333 Hz to 1333.666 Hz
1222 Hz	1221.389 Hz to 1222.611 Hz
1111 Hz	1110.444 HZ to 1111.555HZ
999 Hz	998.500 Hz to 999.499 Hz
888 Hz	887.556 Hz to 888.444 Hz
777 Hz	776.611 Hz to 777.388 Hz
666 Hz	665.667 Hz to 666.333 Hz
555 Hz	554.722 Hz to 555.277 Hz
444 Hz	443.778 Hz to 444.222 Hz
333 Hz	332.833 Hz to 333.166 Hz
222 Hz	221.889 Hz to 222.111 Hz

SYMMETRY VERIFICATION TESTS

1. On SG-1288/G,
   - Verify POWER ON/ OFF to ON.
   - Press CALIBRATE key. After = 20 seconds, verify AUTO CALIBRATED is displayed.
   - Press RESET key.
   - Press SYMMETRY key.
   - Set SYMMETRY to 10 PCT.

2. Connect test equipment as shown.



3. Set Frequency Counter controls as follows:
   - IMPEDANCE to 50W.
   - FUNCTION to TIME INT A TO B.
   - SEP COM A to COM A.
   - Channel A slope to –.
   - Channel B slope to +.
4. Verify Frequency Counter reads 100µs ± 2µs.
5. Set SG-1288/G controls as shown. Verify Frequency Counter readings are within specified limits

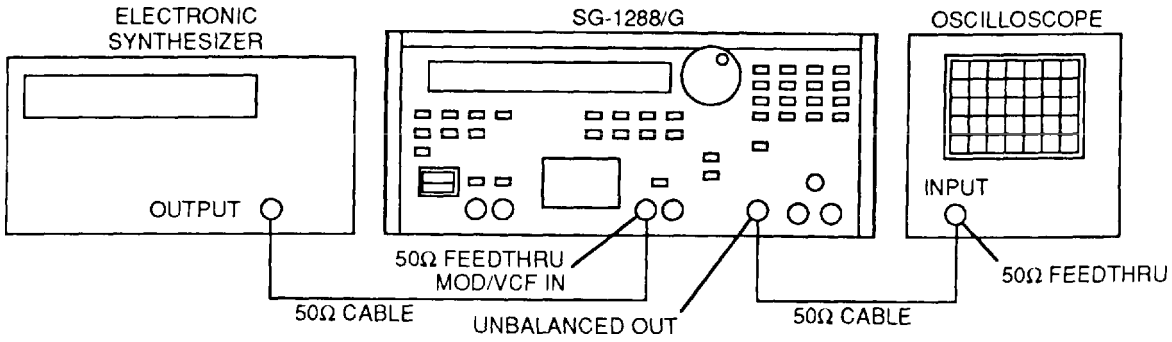
SG-12881G Symmetry	Frequency Counter Display
20 PCT	200 µs ± 4 µs
30 PCT	300 µs ± 6 µs
40 PCT	400 µs ± 8 µs
50 PCT	500 µs ± 10 µs
60 PCT	600 µs ± 12 µs
70 PCT	700 µs ± 14 µs
80 PCT	800 µs ± 16 µs
90 PCT	900 µs ± 18 µs

6. Disconnect test equipment.

VCF/FM OPERATION TEST.

1. On SG-1288/G,
   - Verify POWERON/OFF to ON.
   - Press CALIBRATE key. After ~ 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set Modulation to FM/VCF.

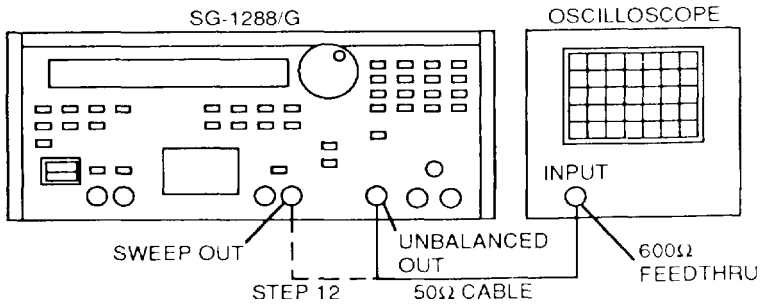
2. Connect test equipment as shown.



3. Set Electronic Synthesizer controls as follows:
   - Set Function to SINE.
   - Frequency to 100 Hz.
   - Level to 1 Vp-p.
4. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays frequency modulated signal with ~ 1 kHz carrier at ~ 5 Vp-p with visible frequency deviation.
5. Set Electronic Synthesizer output level to 4 Vp-p.
6. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays frequency modulated signal with ~ 1 kHz carrier at ~ 5 Vp-p with increased frequency deviation (from step 4).
7. Disconnect test equipment.

WAVEFORMS AND SWEEP VERIFICATION TEST.

1. On SG-1288/G
   - Verify POWER ON/OFF to ON.
   - Press CALIBRATE key. After ≈ 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set OUTPUT to 600Ω UNBAL.
2. Connect test equipment as shown



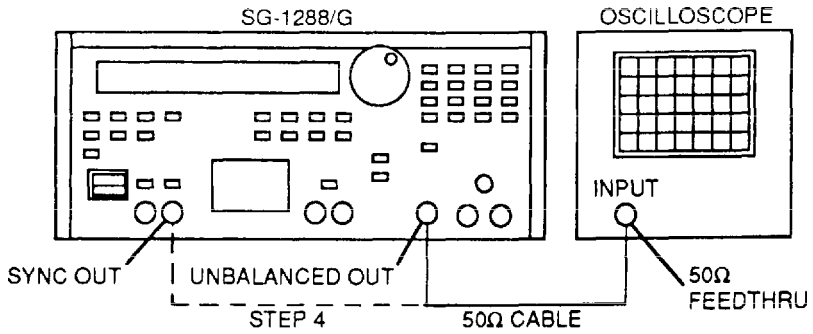
3. Set Oscilloscope controls to display SG-1288/G output Verify Oscilloscope displays 1 kHz sine wave at 5 Vp-p.
4. On SG-1288/G, select ∿ (triangle).
5. Verify Oscilloscope displays 1 kHz triangle wave at 5 Vp-p.
6. On SG-1288/G, select ⎍ (square).
7. Verify Oscilloscope displays 1 kHz square wave at 5 Vp-p.
8. On SG-1288/G,
   - Select DC.
   - Set OFFSET to + 5 Vdc.
9. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays + 5 Vdc level.
10. On SG-1288/G,
    - Press RESET key.
    - Set OUTPUT to 600Ω UNBAL.
    - Set START frequency to 100 Hz.
    - Set STOP frequency to 10 kHz.
    - Set SWEEP TIME to 1 SEC.
    - Set Modulation to SWEEP.
    - Verify SWEEP RUN shown in display.
11. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays swept frequency (≈100 Hz to 10 kHz) at 5 Vp-p with 1 second sweep time.
12. Move 50Ω BNC cable from UNBAL OUT connector to SWEEP OUT connector.
13. Set Oscilloscope coupling to DC, and other controls to display SG-1288/G output. Verify Oscilloscope displays positive going 0 to +3V ramp at a 1 second rate.
14. Disconnect test equipment.

PULSE CHARACTERISTICS TEST.

1. On SG 1288/G

   - Verify POWER ON/OFF to ON.
   - Press CALIBRATE key. After = 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set FREQUENCY to 1 MHz.
   - Set FUNCTION (square).

2. Connect test equipment as shown.



3. Set Oscilloscope controls to display SG-1288/G output.
   - Verify Oscilloscope displays a 1 MHz square wave at 5 Vp-p.
   - Verify rise and fall time is <13 ns.
   - Verify positive and negative going transition peak to peak aberration is <270m V.
4. Move 50 BNC cable from UNBAL OUT connector to SYNC OUT connector.
5. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays a 1 MHz square wave at from 1 Vp-p to 2.5 Vp-p. Verify rise and fall time is <13 ns.
6. Disconnect test equipment.

OUTPUTS VERIFICATION TEST.

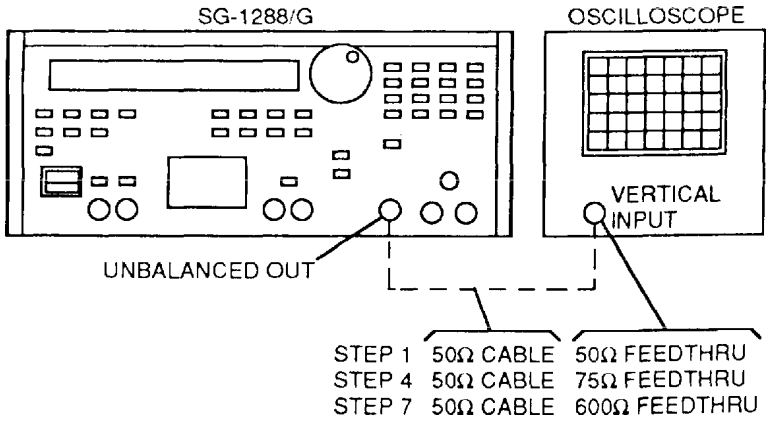
1. On SG-1288/G

   - Verify POWER ON/OFF to ON
   - Press CALIBRATE key. After ~20 seconds. Verify AUTOCALIBRATED is displayed
   - Press RESET key.

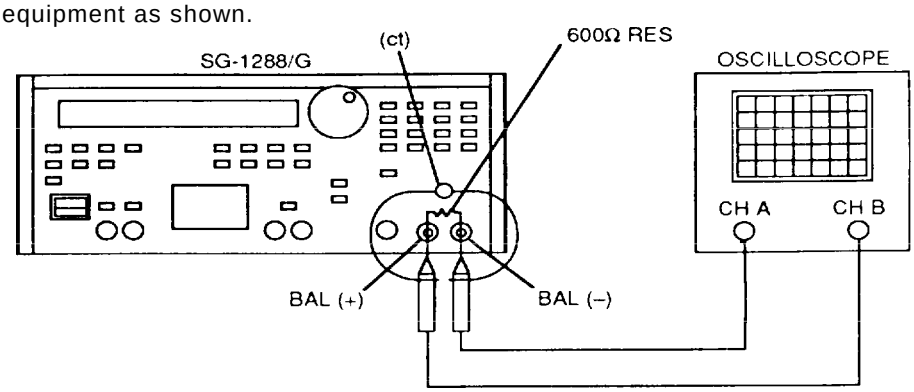
2. Connect test equipment as shown.

OUTPUTS VERIFICATION TEST — Continued.

2. Connect test equipment as shown.



3. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays a 1 kHz sine wave at 5 Vp-p.
4. Connect test equipment as shown above.
5. On SG-1288/G, select 75W UNBAL.
6. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays a 1 kHz sine wave at 5 Vp-p.
7. Connect test equipment as shown above.
8. On SG-1288/G, select 600W UNBAL.
9. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays a 1 kHz sine wave at 5 Vp-p.
10. Connect test equipment as shown.



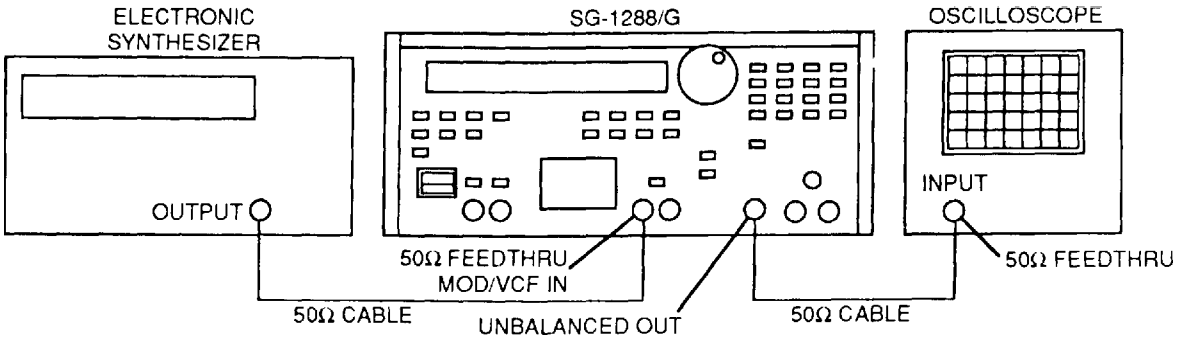
11. On SG-1288/G, set OUTPUT to 600W and BAL.
12. Set Oscilloscope controls as follows:
    - Trigger to channel A.
    - Other controls to display both SG-1288/G outputs.
    - Verify Oscilloscope displays two 180° out of phase 1 kHz sine waves at 2.5 Vp-p.
13. On SG-1288/G, set OUTPUT to 135W and BAL.
14. Set Oscilloscope controls to display both SG-1288/G outputs. Verify Oscilloscope displays two 180° out of phase 1 kHz sine waves at ~ 4.0 Vp-p.
15. Disconnect test equipment.

AM VERIFICATION TEST.

1. On SG-1288/G,

- Verify POWER ON/OFF to ON
- Press CALIBRATE key. After =20 seconds, verify AUTOCALIBRATED is displayed.
- Press RESET key.
- Set FREQUENCY to 100 khz.
- Set MODULATION to AM.

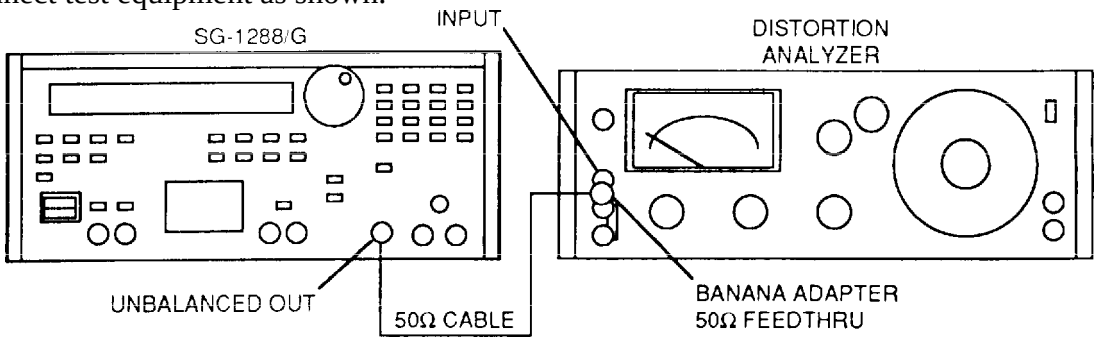
2. Connect test equipment as shown.



3. Set Electronic Synthesizer controls as fellows:
   - Set Function to SINE.
   - Frequency to 1 kHz.
   - Level to 2 Vp-p.
4. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays a 100 kHz sine wave at = 7.5 Vp-p (equal to modulation depth at 50%), and modulation rate at = 1 kHz.
5. Disconnect test equipment.

SINE WAVE PURITY TEST.

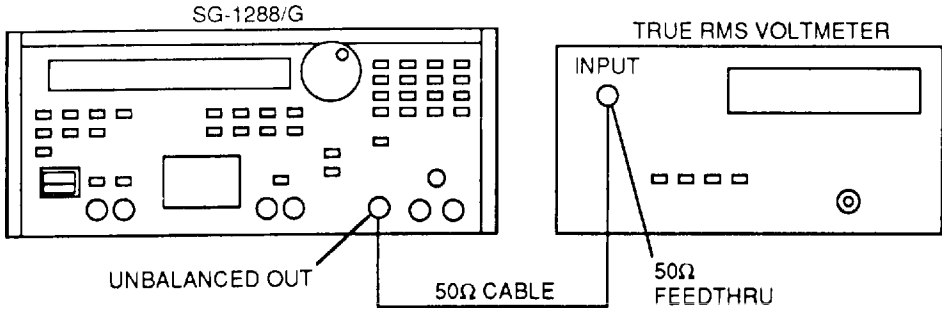
1. On SG-1288/G,
   - Verify POWER ON/OFF to ON.
   - Press CAL IBRATE key. After = 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
2. Connect test equipment as shown.



3. Set Distortion Analyzer controls to display SG-12881G output distortion. Verify total harmonic distortion is better than – 46 dB at 1 kHz.

4. Disconnect test equipment.

AMPLITUDE ACCURACY TEST.



AMPLITUDE ACCURACY TEST — Continued.

1. On SG-1288/G,
   - Verify POWER ON/OFF to ON.
   - Press CALIBRATE key .after = 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set AMPLITUDE to 1.11 Vp-p.
2. Verify Digital Multimeter reads from 0.380 to 0.403 Vrms.
3. Set SG-1288/G controls as shown. Verify Digital Multimeter readings are within specified limits.

SG-1288/G Amplitude	Digital Multimeter Reading
2.22 Vp-p	0.765 to 0.804 Vrms
3.33 Vp-p	1.149 to 1.204 Vrms
4.44 Vp-p	1.535 to 1.604 Vrms
5.55 Vp-p	1.919 to 2.004 Vrms
6.66 Vp-p	2.304 to 2.405 Vrms
7.77 Vp-p	2.688 to 2.805 Vrms
8.88 Vp-p	3.073 to 3.206 Vrms
9.99 Vp-p	3.457 to 3.606 Vrms
15.0 Vp-p	5.193 to 5.412 Vrms

4. On SG-1288/G,
   - Set FUNCTION to - (triangle).
   - Set AMPLITUDE to 1.11 Vp-p.
5. Verify Digital Multimeter reads from 0.307 to 0.332 Vrms.
6. Set SG-1288/G controls as shown. Verify Digital Multi meter readings are within specified limits.

SG-1288/G Amplitude	Digital Multimeter Reading
2.22 Vp-p	0.618 to 0.663 Vrms
3.33 Vp-p	0.929 to 0.992 Vrms
4.44 Vp-p	1.240 to 1.323 Vrms
5.55 Vp-p	1.550 to 1.653 Vrms
6.66 Vp-p	1.862 to 1.983 Vrms
7.77 Vp-p	2.172 to 2.313 Vrms
8.88 Vp-p	2.483 to 2.642 Vrms
9.99 Vp-p	2.794 to 2.973 Vrms
15.0 Vp-p	4.197 to 4.462 Vrms

7. On SG-12881G,
   - Set Function to - (square).
   - Set AMPLITUDE to 1.11 Vp-p.
8. Verify Digital Multimeter reads from 0.533 to 0.576 Vrms.

AMPLITUDE ACCURACY TEST — Continued.

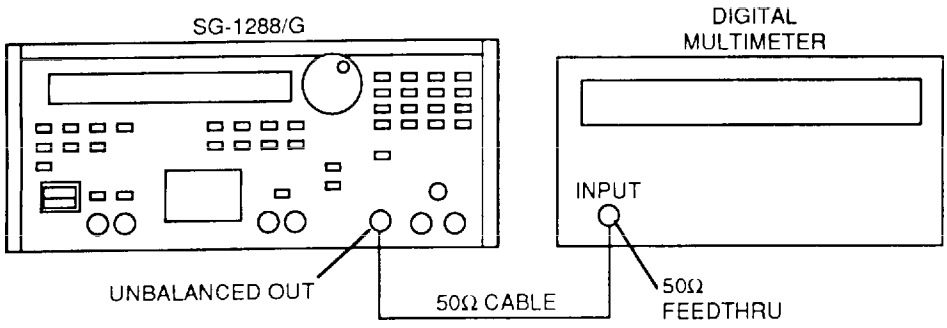
10. Set SG-1288/G controls as shown. Verify Digital Multimeter readings are within specified limits.

SG-1288/G Amplitude	Digital Multimeter Reading
2.22 Vp-p	1.071 to 1.148 Vrms
3.33 Vp-p	1.610 to 1.719 Vrms
4.44 Vp-p	2.148 to 2.291 Vrms
5.55 Vp-p	2.686 to 2.863 Vrms
6.66 Vp-p	3.225 to 3.434 Vrms
7.77 Vp-p	3.763 to 4.006 Vrms
8.88 Vp-p	4.301 to 4.578 Vrms
9.99 Vp-p	4.840 to 5.149 Vrms
15.0 Vp-p	7.270 to 7.730 Vrms

DC OFFSET AND ATTENUATOR ACCURACY TEST.

1. On SG 12881G,
   - Verify POWER ON/OFF to ON.
   - PressCALIBRATEkey.After= 20 seconds, verify AUTOCALIBRATED is displayed.
   - Press RESET key.
   - Set FUNCTION to DC.
   - Set OFFSET to 5.00 Vdc.

2. Connect test equipment as shown.



3. Verify Digital Multimeter reads from 4.930 to 5.070 Vdc.

DC OFFSET AND ATTENUATOR ACCURACY TEST - Continued.

4. Set SG-1288/G controls as shown. Verify Digital Multimeter readings are within specified limits.

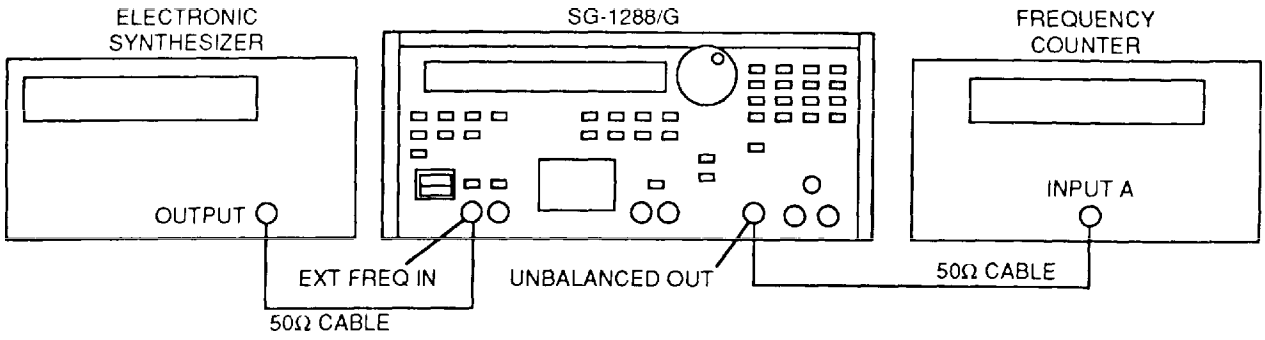
SG-1288/G Offset	Digital Multimeter Reading
2.50 Vdc	2.455 to 2.545Vdc
1.00 Vdc	0.970 to 1.030Vdc
500 mVdc	475.0 to 525.0 mVdc
250 mVdc	242.5 to 257.5 mVdc
100 mVdc	94.00 to 106.0 mVdc
50 mVdc	44.50 to 55.50mVdc
25 mVdc	19.75 to 30.25 mVdc
10 mVdc	4.90 to 15.10mVdc
5.0 mVdc	-0.050 to + 10.05 mVdc
2.5 mVdc	-2.525 to + 7.525mVdc
1.0 mVdc	-4.010 to + 6.010 mVdc

5. Disconnect test equipment.

1. On SG-12881G,

- Verify POWER ON/ OFF to ON.
- Press CALIBRATE key. After = 20 seconds, verify AUTO CALIBRATED is displayed
- Press RESET key. Connect test equipment as shown.

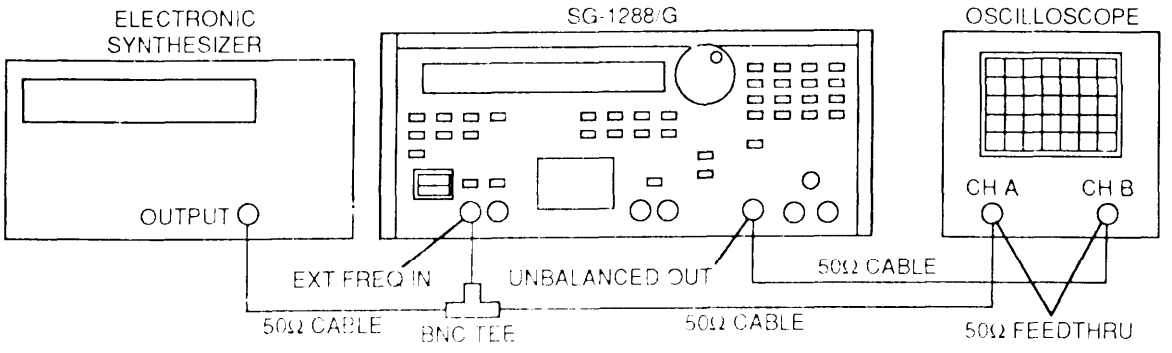
2. Connect test equipment as shown.



3. Verify Frequency Counter reads from 999 to 1001 Hz.
4. Set Electronic Synthesizer controls as follows:
   - Set Function to SINE.
   - Frequency to 1010 Hz.
   - Output level to 5 Vp-p.

EXTERNAL LOCK TEST — Continued.

5. On SG-1288/G, select EXT LOCK to ON.
6. Verify Frequency Counter reads from 957.5 to 1061.5 Hz.
7. Connect the test equipment as shown.



8. On SG-1288/G, set PHASE to 0 DEG.
9. Set Oscilloscope controls to display both SG-1288/G outputs (trigger from A). Verify Oscilloscope displays two 1 kHz sine waves at 5 Vp-p that are in phase ± 4° (±11 µsec).

NOTE

At 1010 Hz, one degree = 2.75 µsec as displayed Oscilloscope.

10. Set SG-1288/G controls as shown. Verity displayed waveform phase relationship are within specified limits.

SG-1288/G Phase	Oscilloscope Display Phase
+ 180 DEG	+ 176 to + 184
- 180 DEG	- 184 to - 176

11. Disconnect test equipment.

PERFORMANCE TEST CHECKLIST.

Test and step		Measured value	Desired value
FREQUENCY RANGE TEST.			
CW 20 MHz	Step 4	_____ MHz	19.98 to 20.02 MHz
FM/VCF 20 MHz	Step 6	_____ MHz	19.4 to 20.6 MHz
CW2 MHz	Step 7	_____ MHz	1.998 to 2.002 MHz
FM/VCF 2 MHz	Step 7	_____ MHz	1.94 to 2.06 MHz
CW 200 kHz	Step 7	_____ kHz	199.9 to 200.1 kHz
FM/VCF 200kHz	Step 7	_____ kHz	194 to 206 kHz
CW 20 kHz	Step 7	_____ kHz	19.99 to 20.01 kHz
FM/VCF 20 kHz	Step 7	_____ kHz	19.4 to 20.6 kHz
CW2kHz	Step 7	_____ kHz	1.999 to 2.001 kHz
FM/VCF 2 kHz	Step 7	_____ kHz	1.940 to 2.060 kHz
CW 200 Hz	Step 7	_____ Hz	199.9 to 200.1 Hz
FM/VCF 200 Hz	Step 7	_____ Hz	194 to 206 Hz
FREQUENCY RESOLUTION TEST.			
1999 Hz	Step 4	_____ Hz	1998.000 Hz to 1999.999 Hz
1888 Hz	Step 5	_____ Hz	1887.056 Hz to 1888.944 Hz
1777 Hz	Step 5	_____ Hz	1776.111 Hz to 1777.888 Hz
1666 Hz	Step 5	_____ Hz	1665.167 Hz to 1666.833 Hz
1555 Hz	Step 5	_____ Hz	1554.222 Hz to 1555.777 Hz
1444 Hz	Step 5	_____ Hz	1443.278 Hz to 1444.722 Hz
1333 Hz	Step 5	_____ Hz	1332.333 Hz to 1333.666 Hz
1222 Hz	Step 5	_____ Hz	1221.389 Hz to 1222.611 Hz
1111Hz	Step 5	_____ Hz	1110.444 Hz to 1111.555 Hz
999 Hz	Step 5	_____ Hz	998.500 Hz to 999.499 Hz
888 Hz	Step 5	_____ Hz	887,556 Hz to 888.444 Hz
777 Hz	Step 5	_____ Hz	776.611 Hz to 777.388 Hz
666 Hz	Step 5	_____ Hz	665.667 Hz to 666.333 Hz
555 Hz	Step 5	_____ Hz	554.722 Hz to 555.277 Hz
444 Hz	Step 5	_____ Hz	443.778 Hz to 444.222 Hz
333 Hz	Step 5	_____ Hz	332.833 Hz to 333.166 Hz
222 Hz	Step 5	_____ Hz	221.889 Hz to 222.111 Hz

PERFORMANCE TEST CHECKLIST.

Test and step		Measured value	Desired value
SYMMETRY VERIFICATION TEST.			
10% Symmetry	Step 4	_____ µs	98 to 102 µs
20% Symmetry	Step 5	_____ µs	196 to 204 µs
30% Symmetry	Step 5	_____ µs	294 to 306 µs
40% Symmetry	Step 5	_____ µs	392 to 408 µs
50% Symmetry	Step 5	_____ µs	490 to 510 µs
60% Symmetry	Step 5	_____ µs	588 to 612 µs
70% Symmetry	Step 5	_____ µs	686 to 714 µs
80% Symmetry	Step 5	_____ µs	714 to 816 µs
90% Symmetry	Step 5	_____ µs	812 to 918 µs
VCF/FM OPERATION TEST			
FM Deviation	Step 4	_____ (ck)	Frequency Modulated Carrier
FM Deviation	Step 6	_____ (ck)	Frequency Modulated Carrier
WAVEFORMS AND SWEEP VERIFICATION TEST			
Sine	Step 3	_____ Hz	1 kHz
		_____ Vp-p	5 Vp-p
Triangle	Step 5	_____ Hz	1 kHz
		_____ Vp-p	5 Vp-p
Square	Step 7	_____ Hz	1 kHz
		_____ Vp-p	5 Vp-p
DC	Step 9	_____ Vdc	+ 5 Vdc
Sweep	Step 11	_____ Hz (start)	≈ 100 Hz
		_____ kHz (stop)	≈ 10 kHz
		_____ Vp-p	5 Vp-p
		_____ sec	1 second
Sweep Out	Step 13	_____ V (start)	0 V
		_____ V (stop)	+ 3 V
		_____ sec	1 second

PERFORMANCE TEST CHECKLIST.

Test and step		Measured value	Desired value
PULSE CHARACTERISTICS TEST			
UNBAL rise time	Step 3	_____ ns	<13 ns
UNBAL fall time	Step 3	_____ ns	<13 ns
UNBAL +p-p	Step 3	_____ %	<270 mV
UNBAL –p-p	Step 3	_____ %	<270 mV
SYNCOUT rise time	Step 5	_____ ns	<13 ns
SYNC OUT fall time	Step 5	_____ ns	<13 ns
OUTPUTS VERIFICATION TEST			
50Ω UNBAL	Step 3	_____ Hz	1 kHz
		_____ Vp-p	5 Vp-p
75Ω UNBAL	Step 6	_____ Hz	1 kHz
		_____ Vp-p	5 Vp-p
600Ω UNBAL	Step 9	_____ Hz	1 kHz
		_____ Vp-p	5 Vp-p
600Ω BAL	Step 11	_____ Hz	1 kHz
		_____ Vp-p	2.5 Vp-p
		_____ °	180° phase difference
135Ω BAL	Step 14	_____ Hz	1 kHz
		_____ Vp-p	4.0 Vp-p
		_____ °	180° phase difference
AM VERIFICATION TEST			
AM Depth	Step 4	_____ %	≈50%
AM Rate	Step 4	_____ Hz	≈1000 Hz
SINE WAVE PURITY TEST			
THD at 1 kHz	Step 3	_____ dB	≤ -46 dB

PERFORMANCE TEST CHECKLIST.

Test and step		Measured value	Desired value
AMPLITUDE ACCURACY TEST			
1.11 Vp-p Sine	Step 3	_____ Vrms	0.380 to 0.403 Vrms
2.22 Vp-p Sine	Step 4	_____ Vrms	0.765 to 0.804 Vrms
3.33 Vp-p Sine	Step 4	_____ Vrms	1.149 to 1.204 Vrms
4.44 Vp-p Sine	Step 4	_____ Vrms	1.535 to 1.604 Vrms
5,55 Vp-p Sine	Step 4	_____ Vrms	1.919 to 2.004 Vrms
6.66 Vp-p Sine	Step 4	_____ Vrms	2.304 to 2.405 Vrms
7.77 Vp-p Sine	Step 4	_____ Vrms	2.688 to 2.805 Vrms
8.88 Vp-p Sine	Step 4	_____ Vrms	3.073 to 3.206 Vrms
9.99 Vp-p Sine	Step 4	_____ Vrms	3.457 to 3.606 Vrms
15.0 Vp-p Sine	Step 4	_____ Vrms	5.193 to 5.412 Vrms
1.11 Vp-p Triangle	Step 6	_____ Vrms	0.307 to 0.332 Vrms
2.22 Vp-p Triangle	Step 7	_____ Vrms	0.618 to 0.663 Vrms
3.33 Vp-p Triangle	Step 7	_____ Vrms	0.929 to 0.992 Vrms
4.44 Vp-p Triangle	Step 7	_____ Vrms	1.240 to 1.323 Vrms
5.55 Vp-p Triangle	Step 7	_____ Vrms	1.550 to 1.653 Vrms
6,66 Vp-p Triangle	Step 7	_____ Vrms	1.862 to 1.983 Vrms
7.77 Vp-p Triangle	Step 7	_____ Vrms	2.172 to 2.313 Vrms
8.88 Vp-p Triangle	Step 7	_____ Vrms	2.483 to 2.642 Vrms
9.99 Vp-p Triangle	Step 7	_____ Vrms	2.794 to 2.973 Vrms
15.0 Vp-p Triangle	Step 7	_____ Vrms	4.197 to 4.462 Vrms
1.11 Vp-p Square	Step 9	_____ Vrms	0.533 to 0.576 Vrms
2.22 Vp-p Square	Step 10	_____ Vrms	1.071 to 1.148 Vrms
3.33 Vp-p Square	step 10	_____ Vrms	1.610 to 1.719 Vrms
4,44 Vp-p Square	Step 10	_____ Vrms	2.148 to 2.291 Vrms
5.55 Vp-p Square	Step 10	_____ Vrms	2.686 to 2.863 Vrms
6.66 Vp-p Square	Step 10	_____ Vrms	3.225 to 3.434 Vrms
7.77 Vp-p Square	Step 10	_____ Vrms	3.763 to 4.006 Vrms
8.88 Vp-p Square	Step 10	_____ Vrms	4.301 to 4.578 Vrms
9.99 Vp-p Square	Step 10	_____ Vrms	4.840 to 5.149 Vrms
15.0 Vp-p Square	Step 10	_____ Vrms	7.270 to 7.730 Vrms

PERFORMANCE TEST CHECKLIST.

Test and step		Measured value	Desired value
DC OFFSET AND ATTENUATOR ACCURACY TEST			
5.00 Vdc	Step 3	_____ Vdc	4.930 to 5.070 Vdc
2.50 Vdc	Step 4	_____ Vdc	2455 to 2.545 Vdc
1.00 Vdc	Step 4	_____ Vdc	0.970 to 1.030 Vdc
500 mVdc	Step 4	_____ Vdc	475.0 to 525.0 mVdc
250 mVdc	Step 4	_____ Vdc	242.5 to 257.5 mVdc
100 mVdc	Step 4	_____ Vdc	94.00 to 106.0 mVdc
50 mVdc	Step 4	_____ Vdc	44.50 to 55.50 mVdc
25 mVdc	Step 4	_____ Vdc	19.75 to 30.25 mVdc
10 mVdc	Step 4	_____ Vdc	4.90 to 15.10 mVdc
5.0 mVdc	Step 4	_____ Vdc	-0.050 to + 10.05 mVdc
2.5 mVdc	Step 4	_____ Vdc	-2.525 to + 7.525 mVdc
1.0 mVdc	Step 4	_____ Vdc	-4.010 to + 6.010 mVdc
EXTERNAL LOCK TEST			
Internal Lock	Step 4	_____ Hz	999 to 1001 Hz
External Lock	Step 6	_____ Hz	957.5 to 1061.5 Hz
0° Phase	Step 9	_____ °	–4° to + 4°
+180° Phase	Step 10	_____ °	+176° to + 184°
– 180° Phase	Step 10	_____ °	– 184° to – 176°

2-28. ADJUSTMENTS.

DESCRIPTION

The adjustment procedures cover:

Adjust Square Wave (para 2-30).

Adjust Sine Wave (para 2-31).

Adjust Amplitude (para 2-32).

Adjust Amplitude Modulation (para 2-33).

Adjust Phase (para 2-34).

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 2-30 thru 2-34 at one time.
- The adjustment needed after repair/replacement of specific assemblies are as shown in table 2-2.
- All indications and waveforms are referenced to analog ground (black test points) unless otherwise specified.
- Assembly and cable location diagram is figure FO-1. Individual circuit card component locator diagrams are on figures F-O2 thru FO-7.
- After adjust procedure is completed remove power and install top cover (para 2-35).
- Calibration referenced in the following procedures does not replace the calibration performed in accordance with the technical bulletin listed in TB 43-180 for this equipment.

Table 2-2. Post Repair/Replace Adjustments.

Repaired/Replaced Assembly	Adjust
A1 Front Panel Assembly	None.
A2 Motherboard Circuit Card Assembly	None.
A3 Output Circuit Card Assembly	Adjust Square Wave (para 2-30).
A4 Rear Panel Assembly	None.
A7 Phase Lock Loop Circuit Card Assembly	Adjust Sine Wave (para 2-31). Adjust Amplitude (para 2-32). Adjust Amplitude Modulation (para 2-33), Adjust Phase (para 2-34).
A8 Function Generator Circuit Card Assembly	Adjust Sine Wave (para 2-31). Adjust Amplitude (para 2-32). Adjust Phase (para 2-34).

2-29. INITIAL SETUP

1. Remove five top cover screws (para 2-35).

NOTE

Keep the top shield and top cover in place during the procedures except when necessary to make an internal adjustment.

2. Perform turn-on procedures TM 11-6625-3198-12, paragraph 2-6.

WARNING

Dangerous voltages are present with the covers removed. Where maintenance can be performed without power applied, the power should be removed. Battery voltage is present even with AC power cable removed.

3. Slide the top cover back, Press and hold down A2SW1 (fig. FO-3) then press the front panel CALIBRATE key.
4. Verify the Signal Generator display indicates WVTK SN X,XXX,XXX or WVTK SN 0. Press the front panel —> CURSOR key.
5. Verify the Signal Generator display flashes CALIBRATING then indicates ARMY SN X,XXX or ARMY SN 0.

2-30. ADJUST SQUARE WAVE.

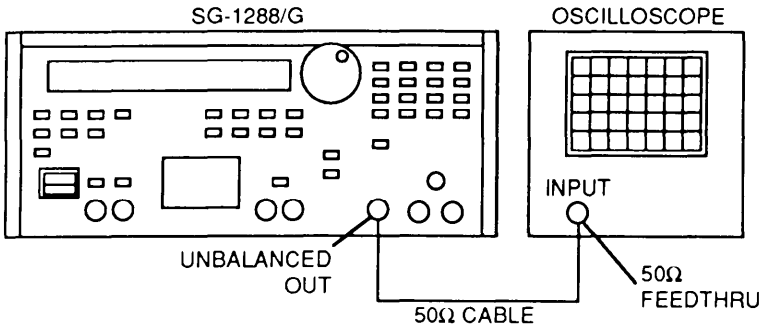
NOTE

Before performing adjustment procedure, initial setup (para 2-29) must be completed.

1. Verify the Signal Generator display indicates ARMY SN X,XXX or ARMY SN 0.
2. On SG-1288/G,
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈15 seconds.
   - Verify display indicates PEAKING C22.

2-30. ADJUST SQUARE WAVE — Continued.

3. Connect test equipment as shown.



4. Set Oscilloscope controls to display SG-1288/G output, Verify Oscilloscope displays peak-to-peak aberrations are greater than 150 mV and less than 270 mV.
   - If incorrect, adjust A3C22 (fig. FO-4) until reading is within specified limits.
5. On SG-1288/G,
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
6. Remove power and disconnect test equipment. Install top cover (para 2-35).

2-31. ADJUST SINE WAVE.

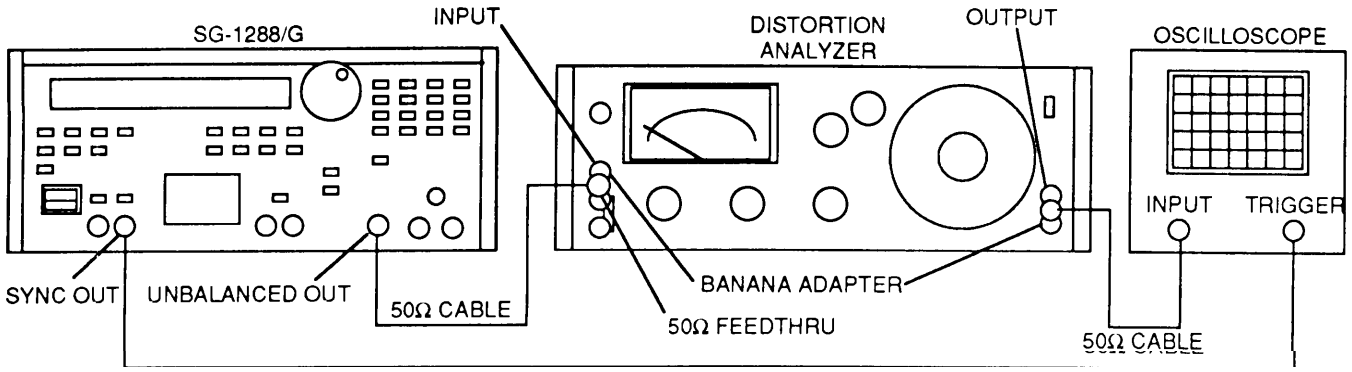
NOTE

Before performing adjustment procedure, initial setup (para 2-29) must be completed.

1. Verify the Signal Generator display indicates ARMY SN X,XXX or ARMY SN 0.
2. On SG-1288/G,
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 15 seconds.
   - Verify display indicates PEAKING C22.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates R33,97,64, VSINE XXX.

2-31. ADJUST SINE WAVE — Continued.

3. Connect test equipment as shown.



4. Set Distortion Analyzer controls to display SG-1288/G output signal Total Harmonic Distortion (THD) in dB.

5. On SG-1288/G, slowly adjust CONTROL KNOB until THD as displayed on Distortion Analyzer is minimum. Verify reading is ≤ -50 dB at 10 kHz.

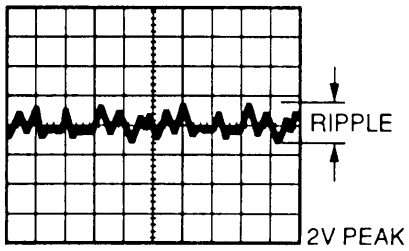
   • if correct, proceed with step 10.

   • If incorrect, proceed with step 6.

6. Set Oscilloscope controls to display Distortion Analyzer output.

   • Adjust A7R33 (fig. FO-6) until waveform peaks are clearly visible in the residue.

   • Adjust A7R97 until waveform peaks are symmetrical, one above the average value of the residue signal and one below.

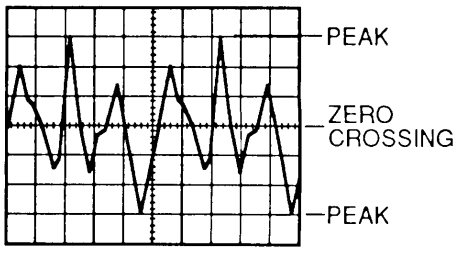


7. Adjust A7R33 until the peaks disappear back into the residue. Record the level of ripple.

8. Observe the overall ripple in the residue in the area of the waveform zero crossings as displayed on the Oscilloscope. Turn the SG-1288/G CONTROL KNOB CW until the waveform peaks are clearly visible in the residue and repeat step 7.

   • If the overall ripple has decreased, continue procedure always turning the SG-1288/G CONTROL KNOB CW.

   • If the overall ripple has increased, continue procedure always turning the SG-1288/G CONTROL KNOB CCW.



9. Repeat steps 7 and 8 until:

   • Amplitude of the overall ripple in the residue signal is minimum as displayed on the Oscilloscope.

   • THD as measured on the Distortion Analyzer is ≤ –50 dB.

10. Disconnect test equipment.

2-31. ADJUST SINE WAVE — Continued.

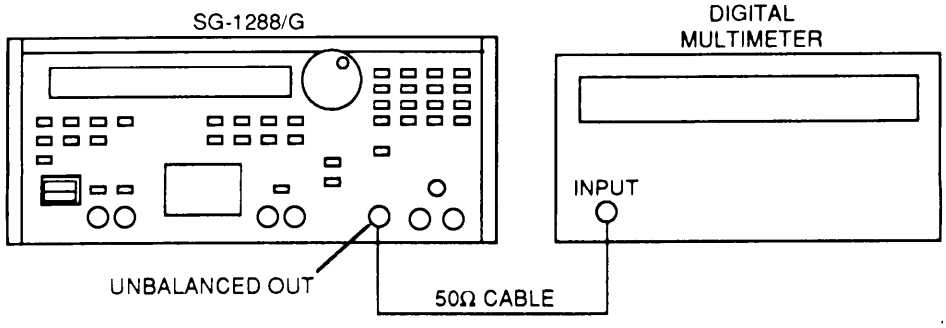
11. Connect Digital Multi meter + lead to A7TP10 and – lead to A7TP11. Verify Digital Multimeter displays from -1 mVdv to +1 mVdc.
    - If incorrect, adjust A7R64 until reading is within specified limits.
12. If adjustment was necessary, press —> CURSOR key once, and perform Adjust Amplitude (para 2-32) starting with step 3.
13. On SG-1288/G,
    - Press CALIBRATE key.
    - Verify display indicates CALIBRATION OFF.
14. Remove power and disconnect test equipment. Install top cover (para 2-35).

2-32. ADJUST AMPLITUDE.

NOTE

Before performing adjustment procedure, initial setup (para 2-29) must be completed.

1. Verify the Signal Generator display indicates ARMY SN X,XXX or ARMY SN 0.
2. On SG-1288/G,
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 15 seconds.
   - Verify display indicates PEAKING C22.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates R33,97,64, VSINE XXX.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 5 seconds.
   - Verify display indicates SIN AMP R208.
3. Connect test equipment as shown.



2-32. ADJUST AMPLITUDE — Continued.

4. Verify Digital Multimeter reads 7.071 Vrms ± 100 mVrrns.
   - If incorrect, adjust A7R208 (fig. FO-6) until reading is within specified limits.
5. On SG-1288/G,
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
5. Remove power and disconnect test equipment. Install top cover (para 2-35).

2-33. ADJUST AMPLITUDE MODULATION.

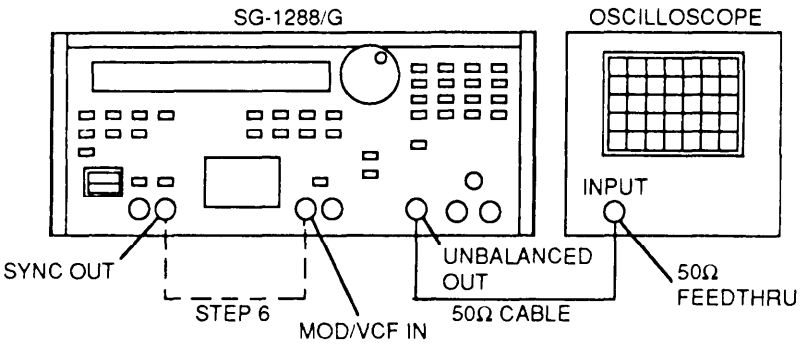
NOTE

Before performing adjustment procedure, initial setup (para 2-29) must be completed.

1. Verify the Signal Generator display indicates ARMY SN X,XXX or ARMY SN 0.
2. On SG-1288/G,
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 15 seconds.
   - Verify display indicates PEAKING C22.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates R33,97,64, VSINE XXX.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 5 seconds.
   - Verify display indicates SIN AMP R208.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 5 seconds.
   - Verify display indicates ADJ AM POTS.

2-33. ADJUST AMPLITUDE MODULATION — Continued.

3. Connect test equipment as shown.



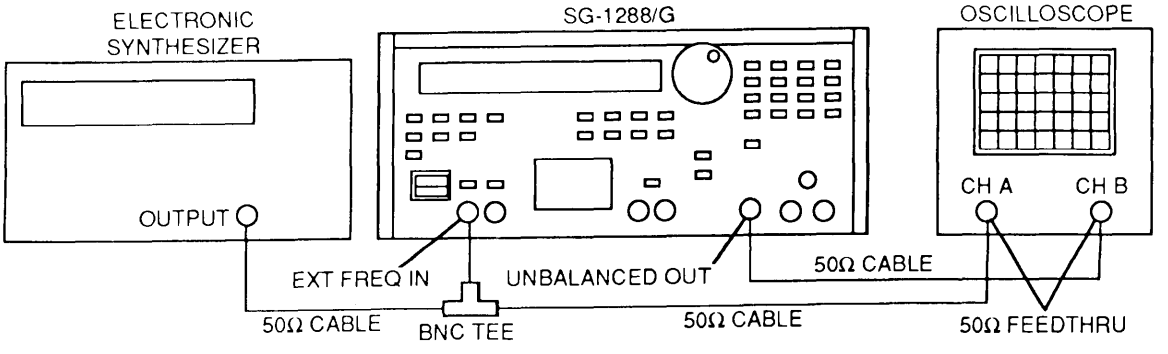
4. Set Oscilloscope controls to display SG-1288/G output. Verify Oscilloscope displays <50 mVp-p AC ripple and <5 mVdc offset.
   - If carrier null is incorrect, adjust A7R108 (fig. FO-6) for minimum indication.
   - If DC offset is incorrect, adjust A7R125 until reading is within specified limits.
5. On SG-1288/G.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates AM MOD NULL,
   - Connect a jumper between A7TP11 and A7TP13.
6. Connect a 50Ω BNC cable from SYNC OUT connector to MOD/VCF IN connector.
7. Verify Oscilloscope displays <100 mVp-p AC ripple.
   - incorrect, adjust A7R102 for minimum indication.
8. On SG-1288/G.
   - Press CALIBRATE key.
   - Verify display indicates CALIBRATION OFF.
9. Remove power, remove jumper, and disconnect test equipment. Install top cover (para 2-35).

2-34. ADJUST PHASE.

NOTE

Before performing adjustment procedure, initial setup (para 2-29) must be completed.

1. Verify the Signal Generator display indicates ARMY SN X,XXX or ARMY SN 0.
2. On SG-1288/G,
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 15 seconds.
   - Verify display indicates PEAKING C22.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates R33,97,64, VSINE XXX.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING or ≈ 5 seconds.
   - Verify display indicates SIN AMP R208
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING or ≈ 5 seconds.
   - Verify display indicates ADJ AM POTS.
   - Press —> CURSOR key.
   - Verify display flashes CALIBRATING for ≈ 1 second.
   - Verify display indicates AM MOD NULL.
   - Press —> CURSOR key.
   - Verify display indicates CALIBRATING for ≈ 5 seconds.
   - Verify display indicates PHASE 0 XX,XXX.
3. Connect test equipment as shown.



2-34. ADJUST PHASE — Continued.

4. Set Electronic Synthesizer controls as follows:

   Set Function to SINE.

   • Frequency to 2 kHz.

   • Output Level to 5 V p-p.

5. Set Oscilloscope controls as follows:

   • Trigger to channel A.

   • Channel A and B vertical controls so settings are identical and waveforms are displayed.

   • Channel A and B horizontal controls so settings are identical and waveforms are displayed.

   • Adjust controls to accurately superimposed both waveforms.

   Select channel B INVERT.

   Select A and B ADD to on.

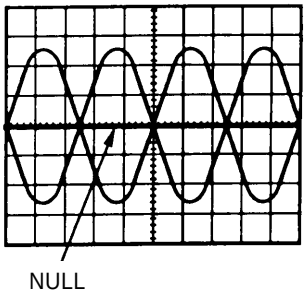
6. On SG-1288/G,

   Adjust CONTROL KNOB (numerious turns required for change) to null the added waveform (minimum displayed signal) on the Oscilloscope display.

   Press —> CURSOR key.

   • Verify display flashes CALIBRATING for= 1 second.

   • Verify display indicates PHASE + 180 XX, XXX.



7. Set Oscilloscope controls as follows:

   Select A and B ADD to off.

   • Channel A and B vertical controls so settings are identical and waveforms are displayed.

   • Channel A and B horizontal controls so settings are identical and waveforms are displayed.

   • Adjust controls to accurately superimposed both waveforms.

   • Select channel B normal (non-invert).

   • Select A and B ADD to on.

8. On SG-1288/G,

   • Adjust CONTROL KNOB to null the added waveform (minimum displayed signal) on the Oscilloscope display.

   • Press —> CURSOR key.

   • Verify display flashes CALIBRATING for= 1 second.

   • Verify display indicates PHASE -180 XX, XXX.

   • Adjust CONTROL KNOB to null the added waveform (minimum displayed signal) on the Oscilloscope display.

9. On SG-1288/G,

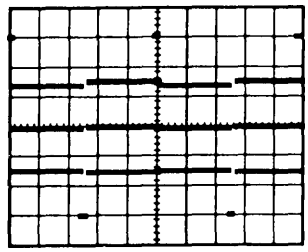
   • Press —> CURSOR key.

   • Verify display flashes CALIBRATING for= 1 second.

   • Verify display indicates SQ PHASE 0 XX, XXX.

2-34. ADJUST PHASE — Continued.

10. Set Electronic Synthesizer controls as follows:
    - Function to SQUARE.
    - Frequency to 2 kHz.
    - Output Level to 5 V p-p.
11. Set Oscilloscope controls as follows:
    - Trigger to channel A.
    - Channel A and B vertical controls so settings are identical and waveforms are displayed.
    - Channel A and B horizontal controls so settings are identical and waveforms are displayed.
    - Adjust controls to accurately superimposed both waveforms.
    - Select channel B INVERT.
    - Select A and B ADD to on.
12. On SG-1288/G,
    - Adjust CONTROL KNOB until phase error is minimum as shown on the Oscilloscope display.
    - Press CALIBRATE key.
    - Verify display indicates CALIBRATION OFF.
13. Remove power and disconnect test equipment. Install top cover (para 2-35).



PHASE ERROR

2-35. REPLACE TOP COVER AND SHIELD.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

WARNING

Dangerous voltages are present with covers removed.

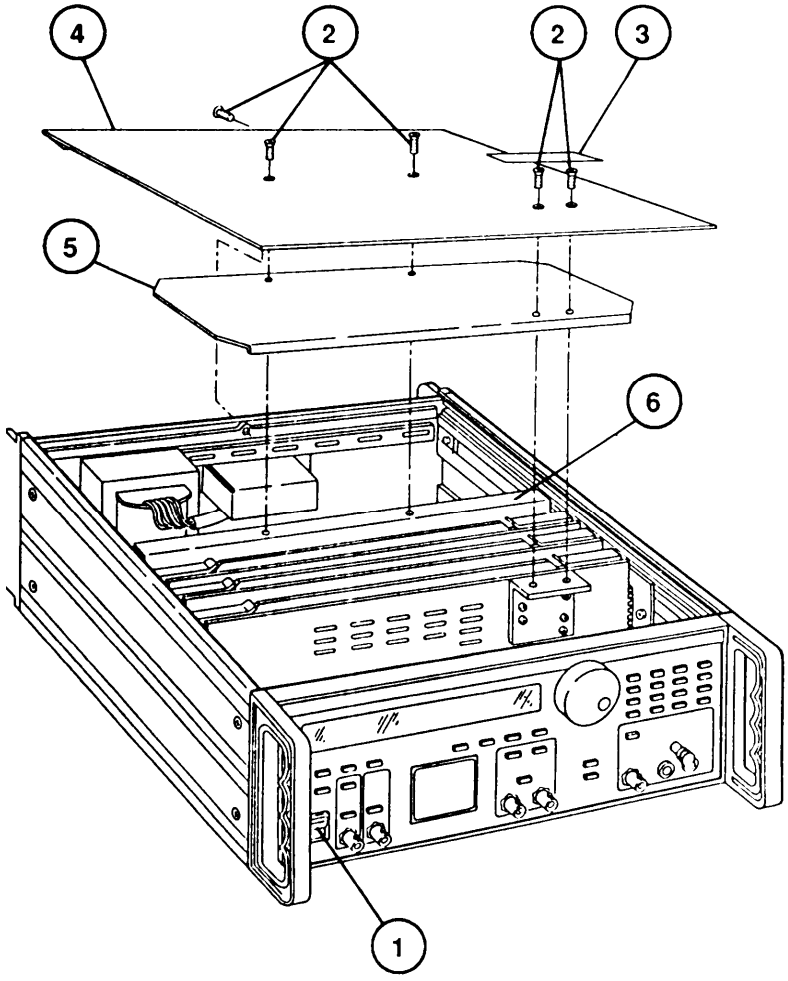
REMOVE

1. Set POWER switch (1) to off and remove AC power cable.
2. Remove five screws (2).

NOTE

Two of the screws are located under the calibration label (3).

3. Slide top cover (4) toward rear and remove. Remove shield (5).



INSTALL

1. Install shield (5) on card housing (6) aligning screw holes.
2. Install top cover (4).
3. Install five screws (2).
4. Reconnect AC power cable and POWER switch (1) to ON.

END OF TASK

2-36. REPLACE BOTTOM COVER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

WARNING

Dangerous voltages are present with covers removed.

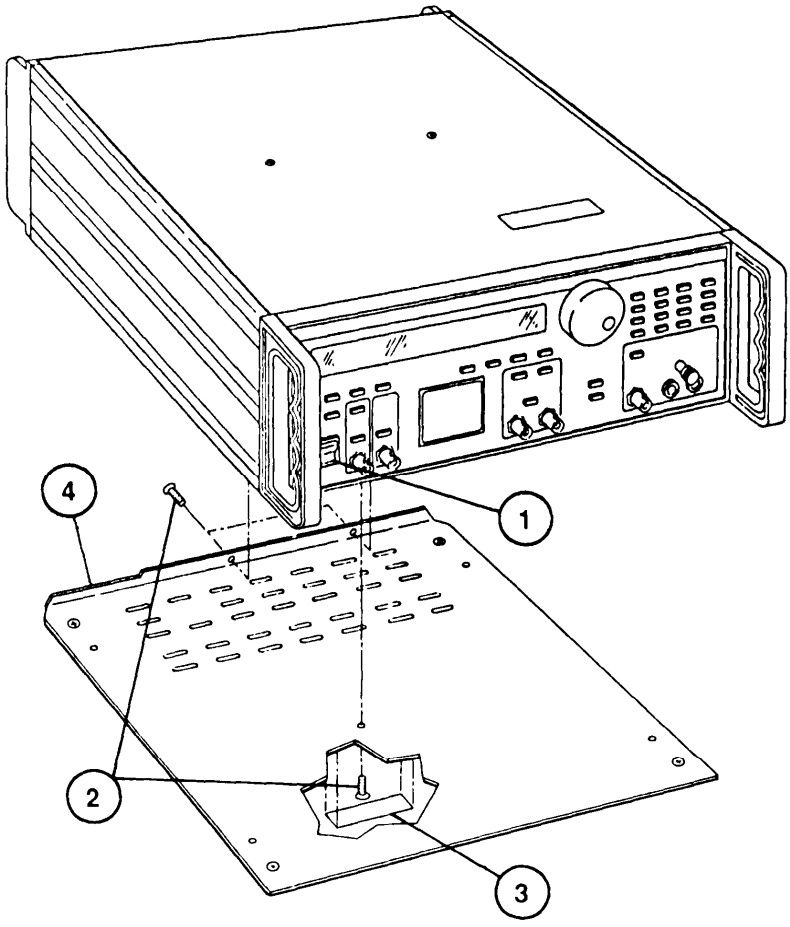
REMOVE

1. Set POWER switch (1) to off and remove AC power cable.
2. Remove three screws (2).

NOTE

One of the screws is located under the calibration label (3).

3. Slide bottom cover (4) toward rear and remove.



INSTALL

1. Install bottom cover (4).
2. Install three screws (2).
3. Reconnect AC power cable and set POWER switch (1) to ON.

END OF TASK

2-37. REPLACE BOTTOM FEET.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

- Remove bottom cover (para 2-36).
- Task the same for all feet and only one is shown.

REMOVE

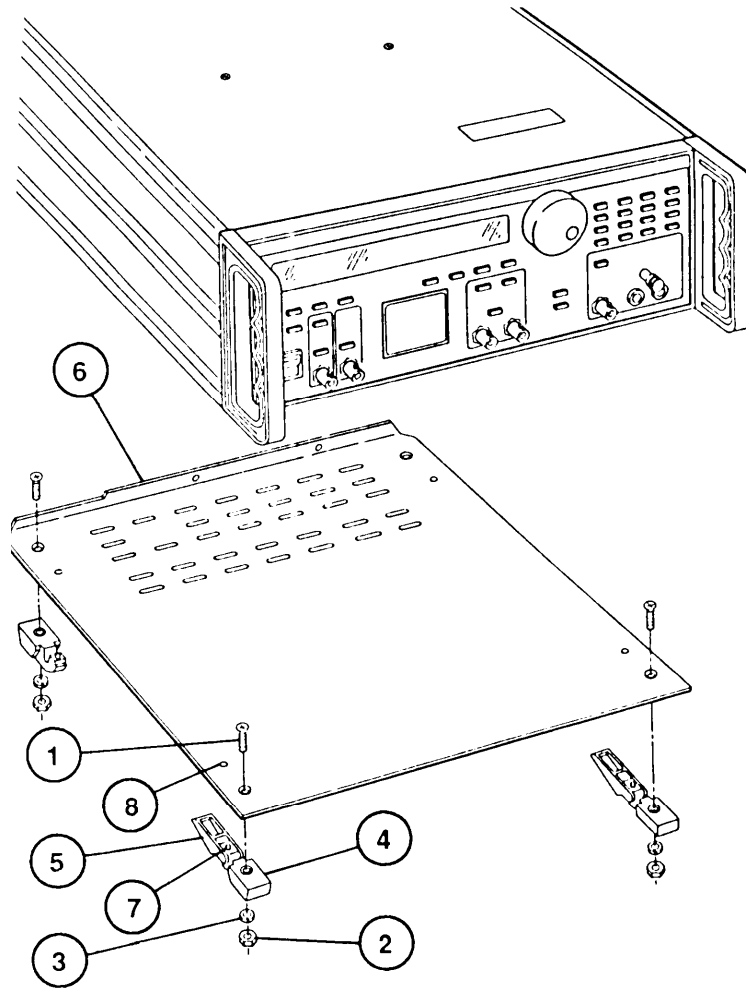
1. Remove screw (1), nut (2), and lockwasher (3).
2. Remove bottom foot (4) and stand (5).

NOTE

Stand only used on front feet.

INSTALL

1. If installing front foot, snap stand (5) into foot (4).
2. Install foot (4) on bottom cover (6) so key (7) is aligned with keyhole (8)
3. Install screw (1), lockwasher (3), and nut (2).



NOTE

FOLLOW-ON MAINTENANCE:

- Install bottom cover (para 2-36).

END OF TASK

2-38. REPLACE FRONT HANDLES.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- Task the same for both handles and only one is shown.
- If possible, work with Signal Generator positioned on it's side to keep circuit boards and shields in place.

REMOVE

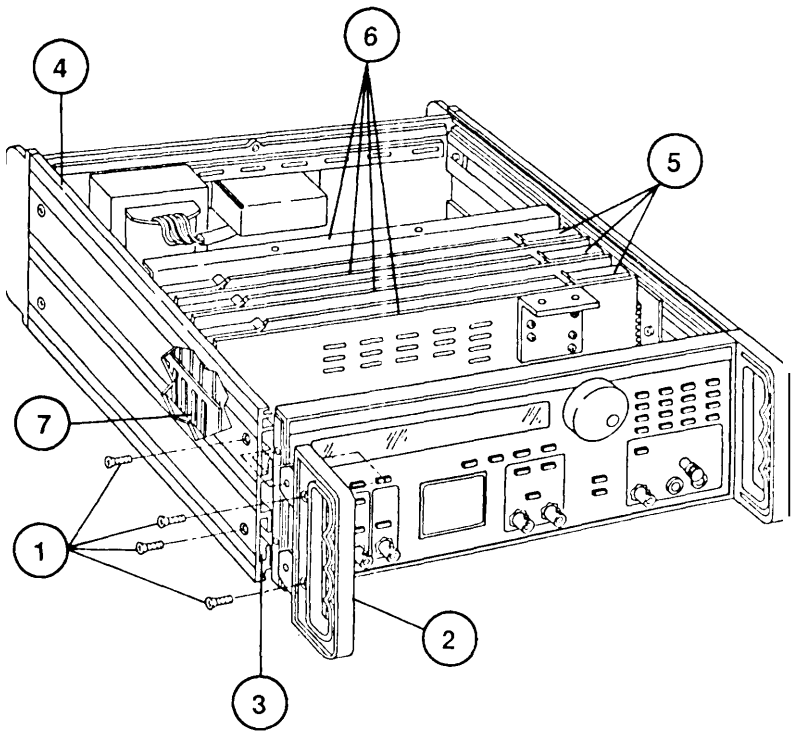
1. Remove four screws (1).
2. Remove front handle (2).

INSTALL

1. Position front handle (2) with flanges (3) in side covers (4). Press into place.
2. Install four screws (1).

NOTE

Make sure the Circuit Cards (5) and shields (6), and are aligned with side plate slot (7) before tightening four screws (1).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-39. REPLACE A1 FRONT PANEL ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

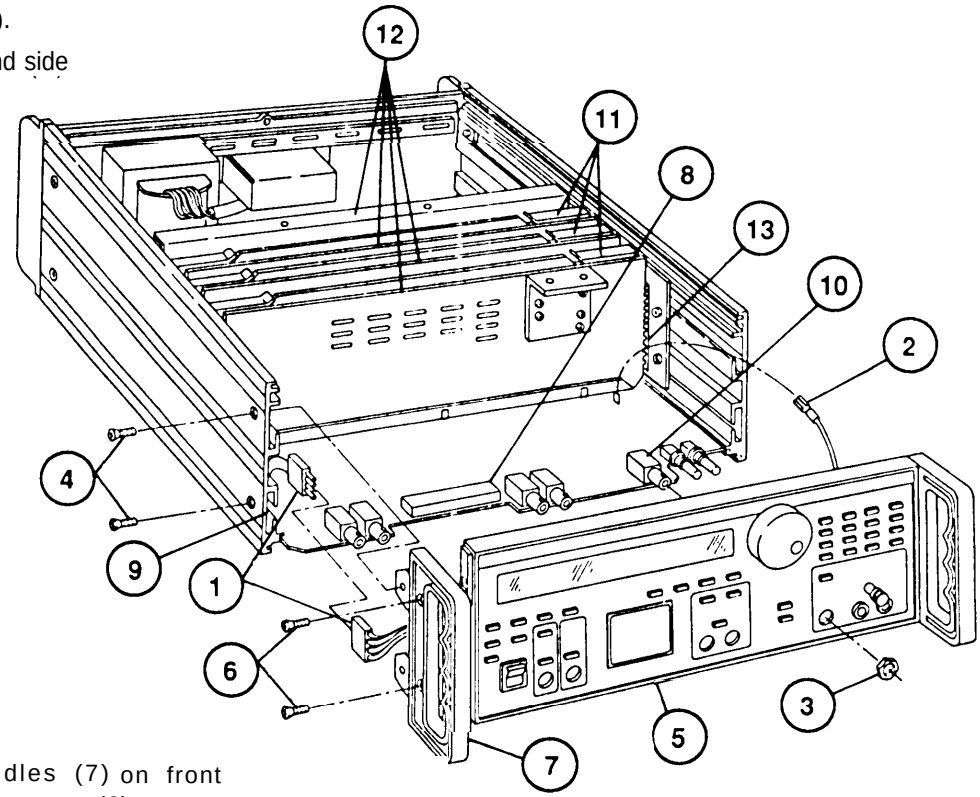
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- If possible, work with Signal Generator positioned on it's side to keep circuit boards and shields in place.

REMOVE

1. Disconnect four conductor cable P3/J3 (1) and neutral wire J13 (2).
2. Remove five nuts (3).
3. Remove four screws (4).
4. Remove front panel (5).
5. Remove four screws (6) and side handles (7).



INSTALL

1. Install both side handles (7) on front panel (5). Install four screws (6).
2. Position front panel (5) so J12 connector (8) and flanges (9) are aligned. Press into place.

2-39. REPLACE A1 FRONT PANEL ASSEMBLY — Continued.

NOTE

Take care to align BNC/post connectors (10) with front panel holes. Make sure J12/J2 connector (8) fully seats.

3. Install four screws (4).

NOTE

Make sure the Circuit Cards (11) and shields (12), and are aligned with side plate slots (13) before tightening four screws (4).

4. Install five nuts (3).
5. Reconnect four conductor cable P3/J3 (1) and neutral wire J13 (2).

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-40. REPLACE A2 MOTHERBOARD CIRCUIT CARD ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- Remove A3 Output Circuit Card Assembly (para 2-46).
- Remove A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
- Remove A8 Function Generator Circuit Card Assembly (para 2-50).

REMOVE

1. Remove five nuts (1). Disconnect neutral wire J13 (10).
2. Remove three screws (2).
3. Remove two shields (3) and bracket (4).
4. Remove rear panel (5) (para 2-48).
5. Carefully slide Motherboard Circuit Card

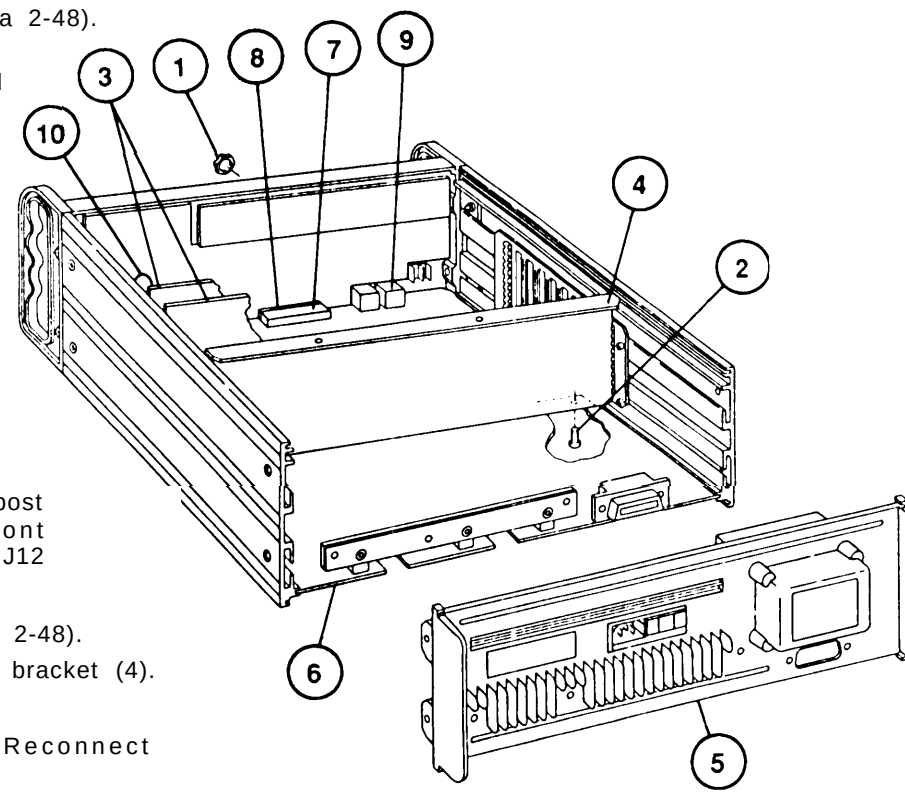
INS

1. Position A2 Motherboard Curcuit Card Assembly (6) in side panel slots and slide forward until J12 connector (7) mates with front panel J2 connector (8).

NOTE

Take care to align BNC/post connectors (9) with front panel holes. Make sure J12 connector (7) fully seats.

2. Install rear panel (5) (para 2-48).
3. Install two shields (3) and bracket (4).
4. Install three screws (2).
5. Install five nuts (1). Reconnect neutral wire J13 (10).



2-40. REPLACE A2 MOTHERBOARD CIRCUIT CARD ASSEMBLY — Continued.

NOTE

FOLLOW-ON MAINTENANCE:

- Install A3 Output Circuit Card Assembly (para 2-46).
- Install A7 Phase Lock Loop Circuit Card Assembly (para 2-49).
- Install A8 Function Generator Circuit Card Assembly (para 2-50).
- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-41. REPLACE A2BT1 BATTERY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

WARNING

- DO NOT heat, short circuit, crush, puncture, mutilate, or disassemble battery. DO NOT USE any battery which shows signs of damage, such as bulging, swelling, disfigurement, brown liquid in the plastic wrap, a swollen plastic wrap, etc. DO NOT test lithium batteries for capacity. DO NOT recharge lithium batteries.
- This procedure must be performed with power applied and covers removed. Dangerous voltages are present where A2BT1 is located.

CAUTION

- DO NOT dispose of lithium batteries with ordinary trash/refuse. Turn-in batteries to your local serving Defense Reutilizatlon and Marketing Office.
- Internal Calibration data will be lost if the battery is disconnected without power applied.

NOTE

PRELIMINARY PROCEDURES:

- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).

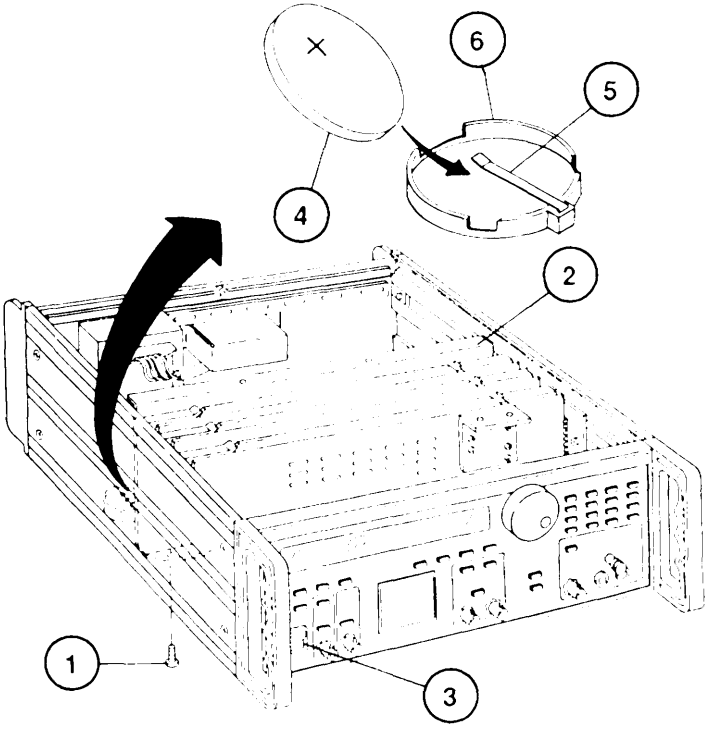
REMOVE

1. Remove three screws (l).
2. Remove bracket (2).
3. Connect power cable to rear panel and set POWER (3) to on.

CAUTION

Take care not to drop battery in instrument as outer surface is metal.

4. Lift edge of battery (4) furthest from contact (5) and slide out of holder (6).
5. Remove A2BT1 Battery (4).



2-41. REPLACE A2BT1 BATTERY — Continued.

INSTALL

CAUTION

Take care not to drop battery in instrument as outer surface is metal.

1. Install A2BT1 Battery (4) observing polarity (+ up) in battery holder (6) and slide into place.
2. Set POWER (3) to off and disconnect power cable.
3. Install bracket (2).
4. Install three screws (1).
5. Using a Digital Voltmeter, verify voltage between + terminal of battery (top) and ground (A2TP2) is $\geq$ 3.2 Vdc.

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-42. REPLACE A2CR40 BRIDGE RECTIFIER.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

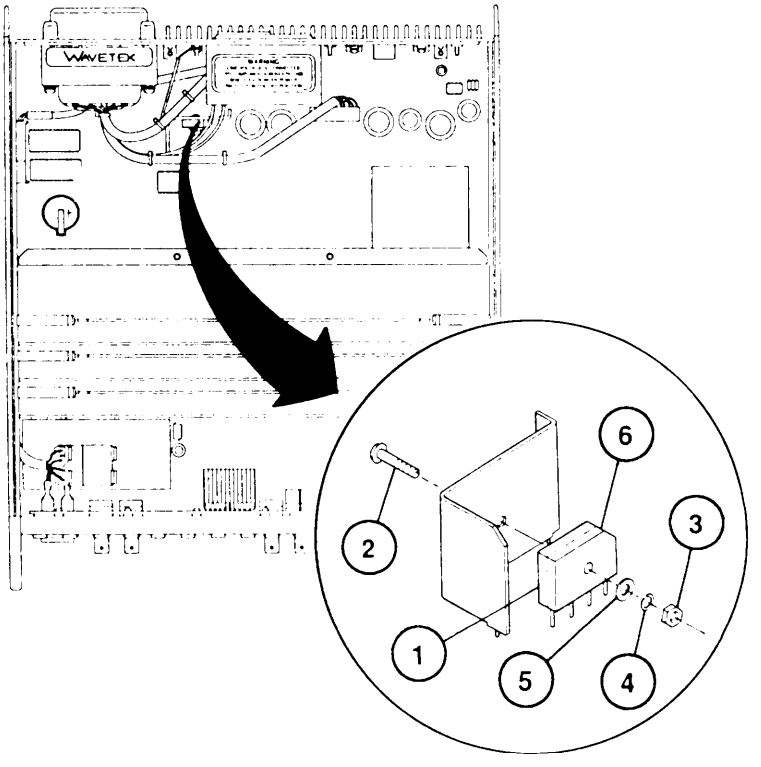
- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).

REMOVE

1. Unsolder A2CR40 (1) terminals.
2. Remove screw (2), nut (3), lockwasher (4), and flatwasher (5).
3. Remove A2CR40 Bridge Rectifier (1).

INSTALL

1. Install A2CR40 Bridge Rectifier (1) with key (6) facing towards top and inboard.
2. Install screw (2), nut (3), lockwasher (4), and flatwasher (5).
3. Resolder A2CR40 (1) terminals.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-43. REPLACE A2J15 TO A2J19 BNC CONNECTORS.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

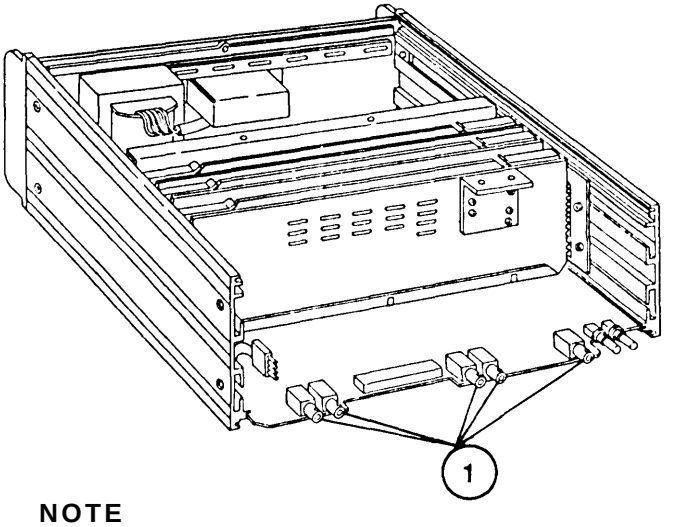
- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- Remove A1 Front Panel Assembly (para 2-39),
- Task the same for all connectors and only one is shown.

REMOVE

1. Unsolder connector (1) terminals,
2. Remove connector (1),

INSTALL

1. Install connector (1) with shell facing forward.
3. Resolder connector (1) terminals.



NOTE

FOLLOW-ON MAINTENANCE:

- Install A1 Front Panel Assembly (para 2-39).
- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-44. REPLACE A2Q7 TRANSISTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

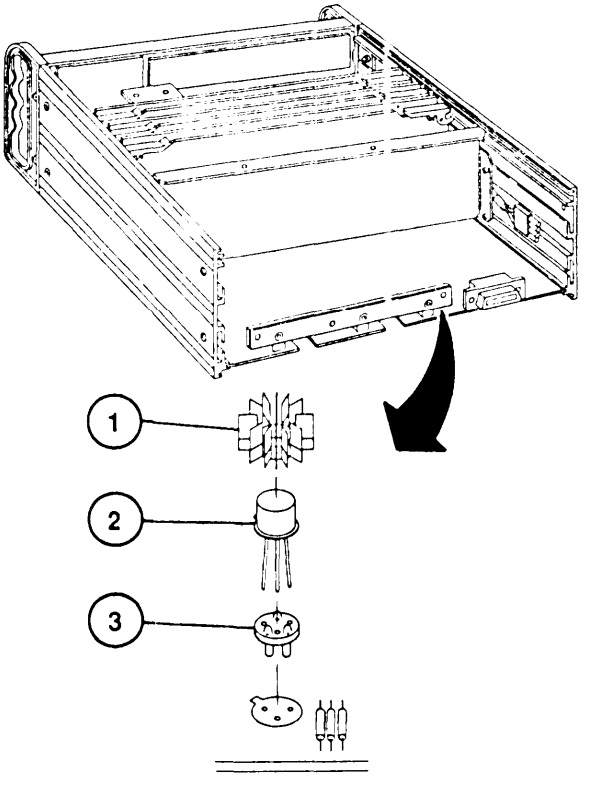
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- Remove A4 Rear Panel Assembly (para 2-48).

REMOVE

1. Remove heats ink (1) from transistor (2).
2. Unsolder and remove transistor (2) and spacer (3) from board.



INSTALL

1. Insert transistor (2) with spacer (3) into board. Align tab on transistor with marking on board.
2. Resolder transistor (2),
3. Install heats ink (1) on transistor (2),

NOTE

FOLLOW-ON MAINTENANCE:

- Install A4 Rear Panel Assembly (para 2-48).
- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-45. REPLACE A2Q10/VR3/VR4/VR7/VR8 TRANSISTORS.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

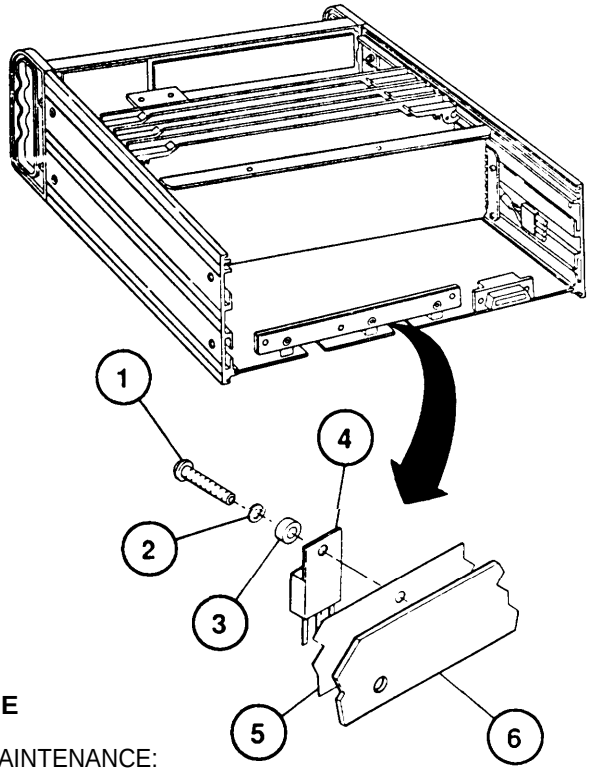
- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- Remove A4 Rear Panel Assembly (para 2-48).
- Task the same for all components and only one is shown.

REMOVE

1. Remove screw (1), lockwasher (2), and insulator (3).
2. Unsolder and remove transistor (4).

INSTALL

1. Verify insulator (5) is in place on heats ink (6).
2. Insert transistor (4) into board. Align hole on transistor with hole on heats ink (6).
3. Install screw (1), lockwasher (2), and insulator (3).
4. Resolder transistor (4).



NOTE

FOLLOW-ON MAINTENANCE:

- Install A4 Rear Panel Assembly (para 2-48).
- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-46. REPLACE A3 OUTPUT CIRCUIT CARD ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

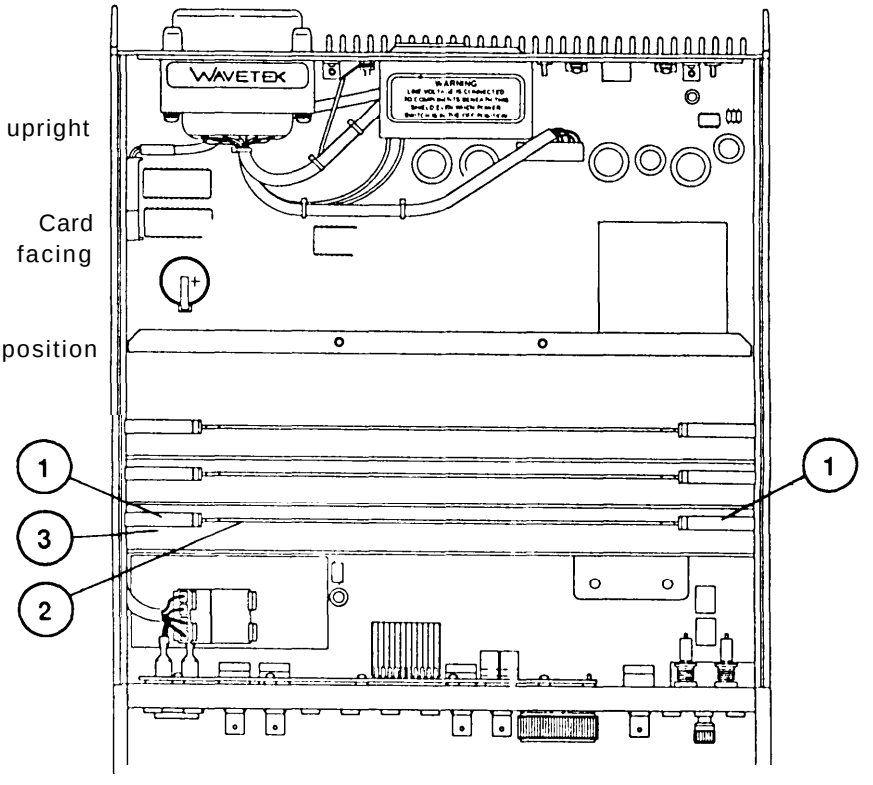
Remove top cover and shield (para 2-35).

REMOVE

1. Lift both extractors (1) full upright position.
2. Remove A3 Output Curcuit Card Assembly (2).

INSTALL

1. Verify extractors (1) are in full upright position.
2. Install A3 output Circuit Card Assembly (2) with shield facing forward in proper slot (3)
3. Push extractors (1) to closed position to seat circuit card.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).

END OF TASK

2-47. REPLACE A3Q18 THRU A3Q23 TRANSISTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

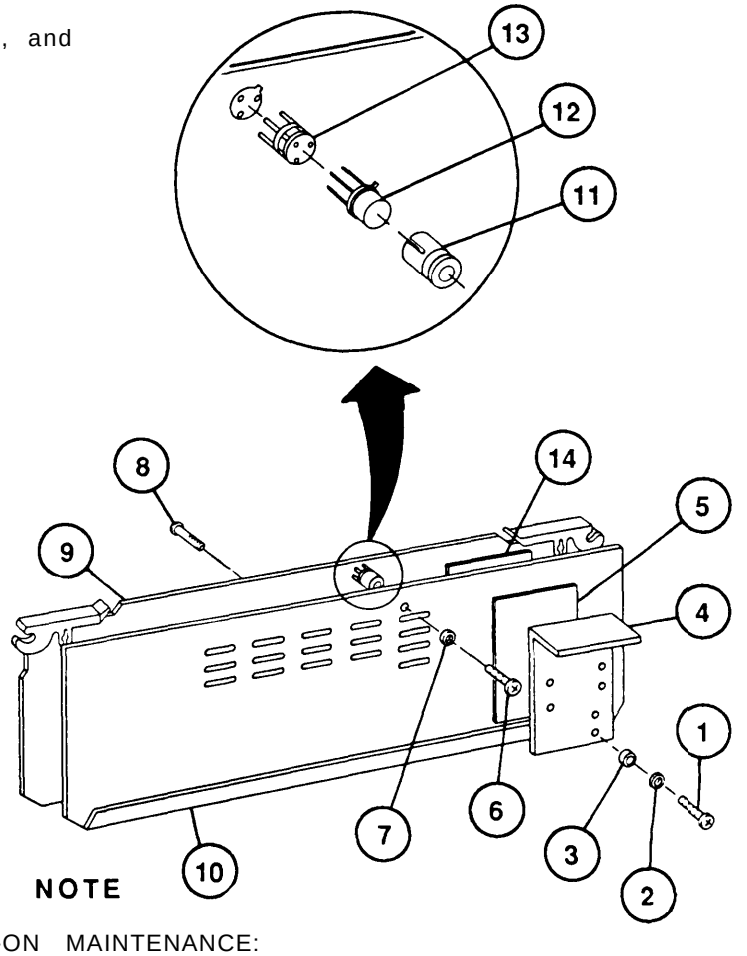
- Remove topcover and shield (para 2-35).
- Remove A3 Output Circuit Card Assembly (para 2-46).
- Task the same for all transistors and only one is shown.

REMOVE

1. Remove six screws (1), lockwashers (2), and insulators (3).
2. Remove bracket (4) and insulator (5).
3. Remove screw (6) and lockwasher (7).
4. Remove five screws (8).
5. Lift Circuit Card (9) from shield (10).
6. Remove heats ink (11) from transistor (12).
7. Unsolder and remove transistor (12) and spacer (13) from board.

INSTALL

1. Insert transistor (12) with spacer (13) into board. Align tab on transistor with marking on board.
2. Resolder transistor (12).
3. Install heats ink (11) on transistor (12).
4. Verify insulator (14) is installed and position Circuit Card (9) on shield (10).
5. Install five screws (8).
6. Install screw (6) and lockwasher (7).
7. Install bracket (4) and insulator (5).
8. Install six screws (1), lockwashers (2), and insulators (3).



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).
- Install A3 Output Circuit Card Assembly (para 2-46).

END OF TASK

2-48. REPLACE A4 REAR PANEL ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

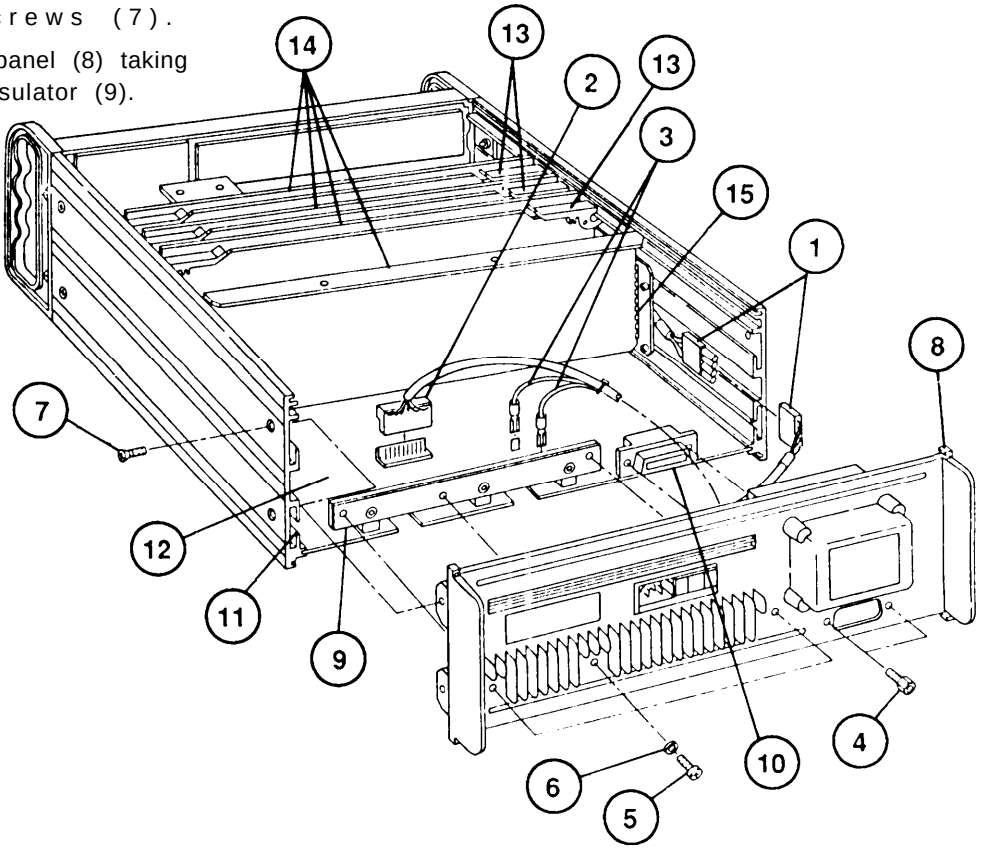
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover and shield (para 2-35).
- Remove bottom cover (para 2-36).
- If possible, work with Signal Generator positioned on it's side to keep circuit boards and shields in place.

REMOVE

1. Disconnect four conductor cable P2/J2 (1), nine conductor cable J4 (2), and two blue wires J22/J23 (3).
2. Remove two standoffs (4) three screws (5) and lockwashers (6).
3. Remove four screws (7).
4. Carefully remove rear panel (8) taking care not to destroy insulator (9).



2-48. REPLACE A4 REAR PANEL ASSEMBLY — Continued.

INSTALL

1. Verify insulator (9) is in place and undamaged. Position rear panel (8) so J5 connector (10) and flanges (11) are aligned. Press into place.

NOTE

Make sure the A2 Motherboard Circuit Card (12) aligns with rear panel slot.

2. Install four screws (7).

NOTE

Make sure the Circuit Cards (13) and shields (14), and are aligned with side plate slots (15) before tightening four screws (7).

3. Install two standoffs (4) three screws (5) and lockwashers (6).
4. Reconnect four conductor cable P2/J2 (1), nine conductor cable J4 (2), and two blue wires J22/J23 (3).

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).
- Install bottom cover (para 2-36).

END OF TASK

2-49. REPLACE A7 PHASE LOCK LOOP CIRCUIT CARD ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

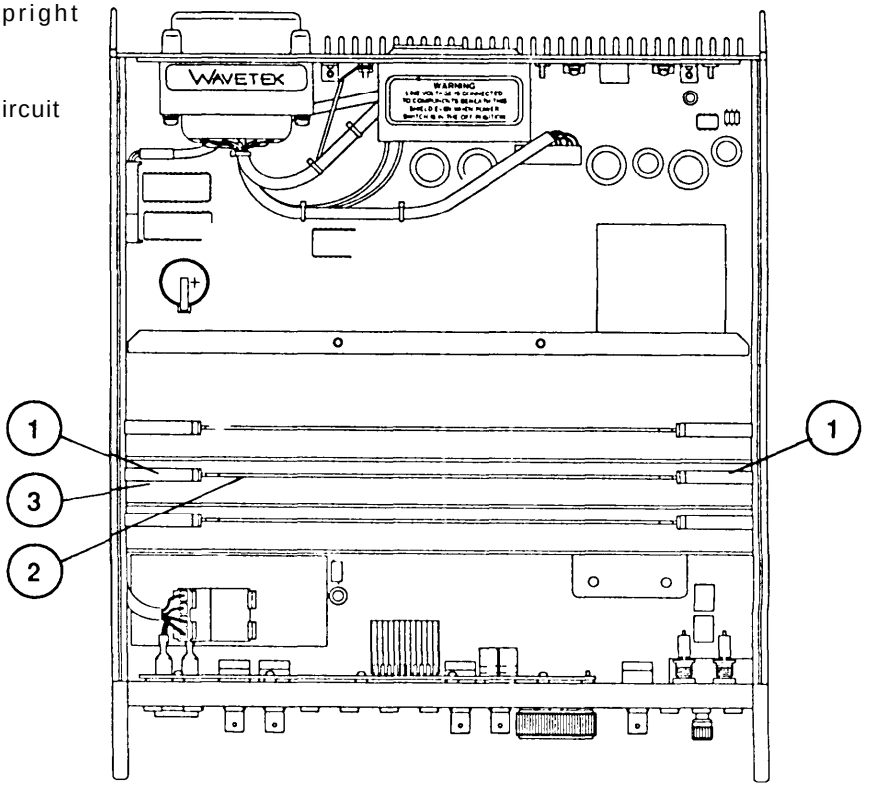
Remove top cover and shield (para 2-25).

REMOVE

1. Lift both extractors (1) full upright position.
2. Remove A7 Phase Lock Loop Circuit Card Assembly (2).

INSTALL

1. Verify extractors (1) are full upright position.
2. Install A7 Phase Lock Loop Circuit Card Assembly (2) with components facing forward in proper slot (3).
3. Push extractor (1) to closed position to seat circuit card.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35),

END OF TASK

2-50. REPLACE A8 FUNCTION GENERATOR CIRCUIT CARD ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

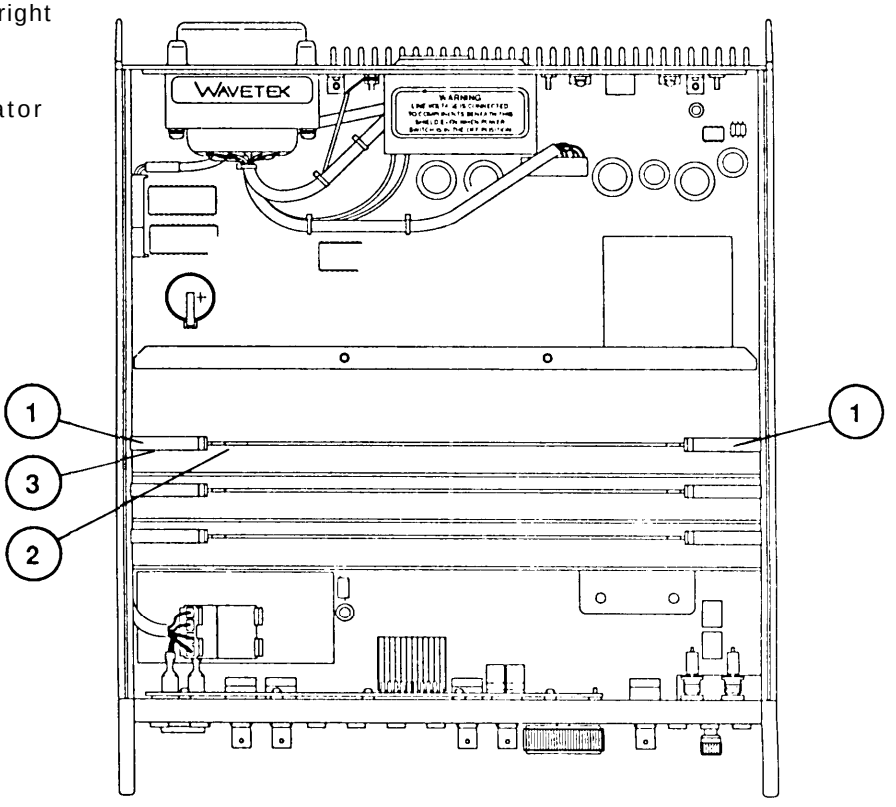
- Remove top cover and shield (para 2-35).

REMOVE

1. Lift both extractors (1) full upright position.
2. Remove A8 Function Generator Circuit Card Assembly (2)

INSTALL

1. Verify extractors (1) are in full upright position.
2. Install A8 Function Generator Circuit Card Assembly (2) with components facing forward in proper slot (3).
3. Push extractors (1) to closed position to seat circuit card.



NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover and shield (para 2-35).

END OF TASK

Section V. PREPARATION FOR STORAGE OR SHIPMENT

2-51. PACKAGING.

Package Signal Generator in original shipping container. When using packing materials other than the original, use the following guidelines:

- Wrap Signal Generator in plastic packing material.
- Use double-wall cardboard shipping container.
- Protect all sides with shock-absorbing material to prevent Signal Generator movement within the container.
- Seal the shipping container with approved sealing tape,
- Mark "FRAGILE" on all sides, top, and bottom of shipping container.

2-52. TYPES OF STORAGE.

- Short-Term (administrative) = 1 to 45 days.
- Intermediate = 46 to 180 days.
- Long term=over 180 days. After long term storage, perform turn-on procedure (TM 11-6625-3198-12, para 2-6). If this procedure fails, perform troubles hooting procedures (table 2-1).

2-53. ENVIRONMENT.

The Signal Generator should be stored in a clean, dry environment, In high humidity environments, protect the Signal Generator from temperature variationsthat could cause internal condensation. The following environmental conditions apply to both shipping and storage:

Temperature	-40°F to +158°F (-400 C to + 75° C)
Relative Humidity (sea level)	less than 95% at + 25°C
Altitude	less than 40,000 feet (12,195 meters)
Vibration	less than 2 g
Shock	less than 30 g

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.

Equipment Inspection and Maintenance Worksheet .....DA Form 2404

Product Quality Deficiency Report .....Form SF 368

Recommended Changes to Publications and Blank Forms .....DA Form 2028

A-3. TECHNICAL MANUALS.

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command) .....TM 750-244-2

Operators and Unit Maintenance Manual for Signal Generator SG-1288/G .....TM 11-6625-3198-12

Unit, Direct Support, and General Support Repair Parts and Special Tools, List for Signal Generator SG-1288/G .....TM 11-6625-3198-24P

A-3. MISCELLANEOUS.

Abbreviations and Acronyms..... ASME-Y14.38M

Interactive Electronic Technical Manual for Calibration and Repair Requirement for the Maintenance of Army Material.....EM 0022

Expendable/Durable items (except Medical, Class V, Repair Parts, and Heraldic Items).....CTA 50-970

Consolidated Index of Army Publications and Blank Forms .....DA Pam 25-30

First Aid.....FM 4-25.11

Safety Precautions for Maintenance of Electrical/Electronic Equipment .....TB 385-4

The Army Maintenance Management System (TAMMS) Users Manual.....DA Pam 750-8

APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists expendable supplies you will need for maintenance on Signal Generator SG-1288/G. 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. B").

b. *Column (2) -Level.* This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew.

O - Unit Maintenance.

H - General Support 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 commercial and government entity code (CAGE)(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	O	6810-00-753-4993	Alcohol, Isopropyl, 8 0Z Can, TT-I-735, Grade A (81349)	CN
2	C	8305-00-267-3015	Cloth, Cheesecloth, Cotton, Lintless, CCC-C-440, Type II, Class 2 (81349)	YD
3	C		Detergent, Mild, Liquid	OZ
4	H	6850-01-333-1841	Freezing Compound, MS-242N (18598)	CN

INDEX

INDEX — Continued

INDEX — Continued

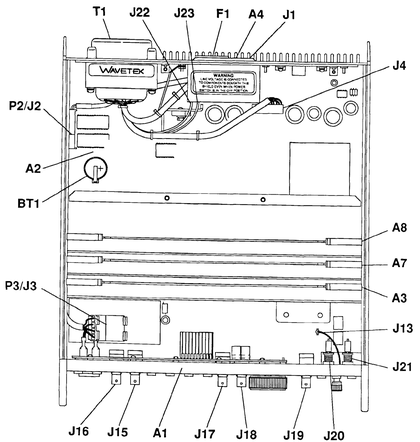
INDEX — Continued

INDEX — Continued

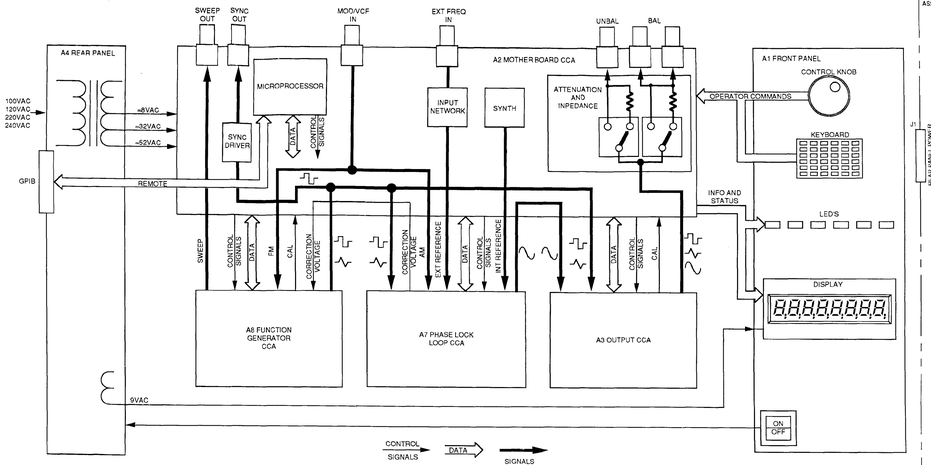
INDEX — Continued

NOTES:

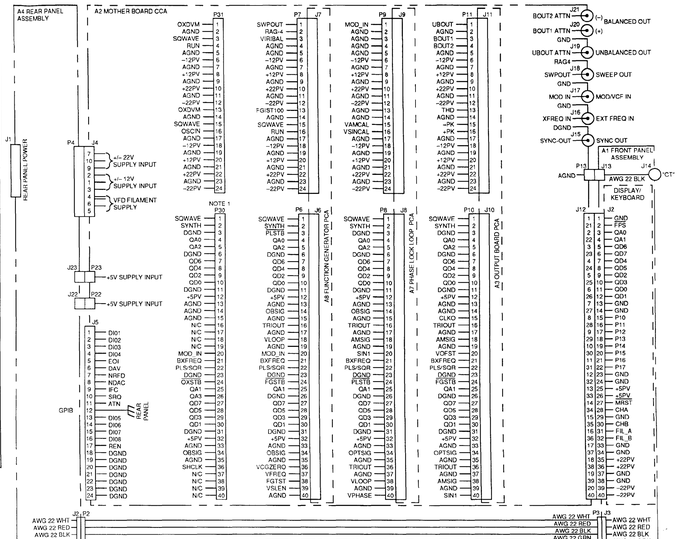
1. P30 AND P31 NOT USED. INFORMATION PROVIDED FOR TROUBLESHOOTING PURPOSES ONLY.



ASSEMBLY AND CABLE LOCATOR – TOP VIEW



BLOCK DIAGRAM



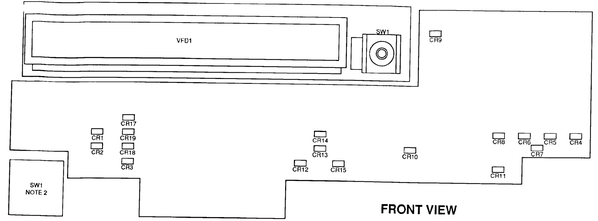
WIRING DIAGRAM

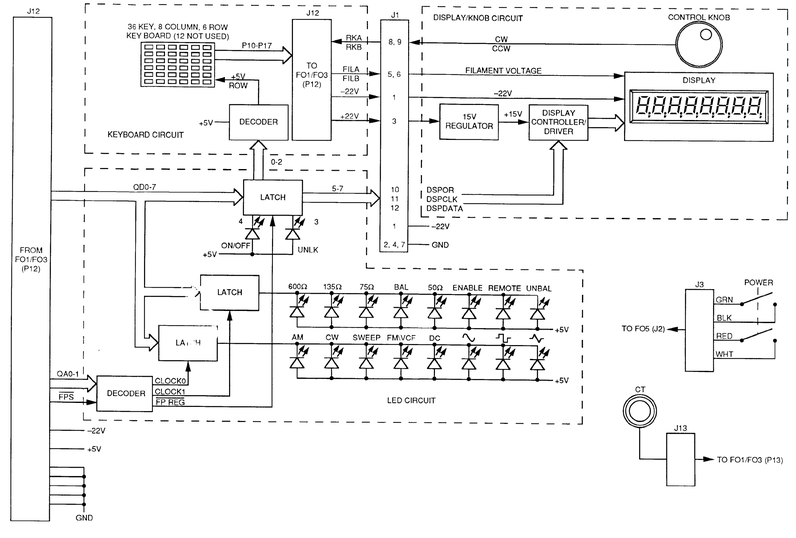
CE10E003

Figure FO-1. SG-1288/G Assembly and Cable Locator, Detailed, and Wiring Diagram.

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD A1A1 TO ABBREVIATION FOR COMPLETE REFERENCE DESIGNATOR.
2. ADD ONLY A1 TO ABBREVIATED REFERENCE DESIGNATOR.
3. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE IS IN Ω (METAL FILM,1/8W, ±1%)
   CAPACITANCE IS IN μF
   INDUCTANCE IS IN μH
4. UNLESS OTHERWISE SPECIFIED, INITIAL SETUP FOR VOLTAGES AND WAVEFORMS IS:
   SET POWER TO ON.
   PRESS RESET KEY.
   WAIT 20 MINUTES.
   PRESS CALIBRATE KEY.
   VERIFY DISPLAY SHOWS AUTOCALIBRATED.
5. UNLESS OTHERWISE SPECIFIED, ALL VOLTAGE READINGS AND WAVEFORMS TAKEN WITH RESPECT TO ANALOG GROUND.





CE10E004

Figure FO-2. A1 Front Panel Component Locator and Functional Block Diagram.

NOTES:

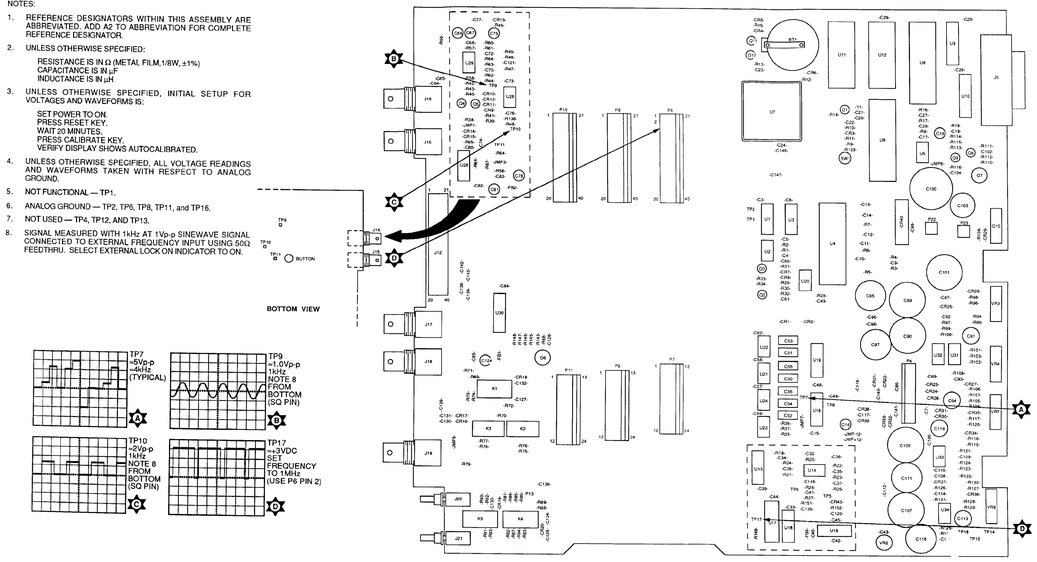
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD A2 TO ABBREVIATION FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE SPECIFIED:

   RESISTANCE IS IN Ω (METAL FILM,1/8W, ±1%)
   CAPACITANCE IS IN μF
   INDUCTANCE IS IN μH
3. UNLESS OTHERWISE SPECIFIED, INITIAL SETUP FOR VOLTAGES AND WAVEFORMS IS:

   SET POWER TO ON.
   PRESS RESET KEY.
   WAIT 20 MINUTES.
   PRESS CALIBRATE KEY.
   VERIFY DISPLAY SHOWS AUTOCALIBRATED.
4. UNLESS OTHERWISE SPECIFIED, ALL VOLTAGE READINGS AND WAVEFORMS TAKEN WITH RESPECT TO ANALOG GROUND.
5. NOT FUNCTIONAL — TP1.
6. ANALOG GROUND — TP2, TP6, TP8, TP11, and TP16.
7. NOT USED — TP4, TP12, AND TP13.
8. SIGNAL MEASURED WITH 1kHz AT 1Vp-p SINEWAVE SIGNAL CONNECTED TO EXTERNAL FREQUENCY INPUT USING 50Ω FEEDTHRU. SELECT EXTERNAL LOCK ON INDICATOR TO ON.

TP9 ○
TP10 ○
TP11 ○ BUTTON

BOTTOM VIEW

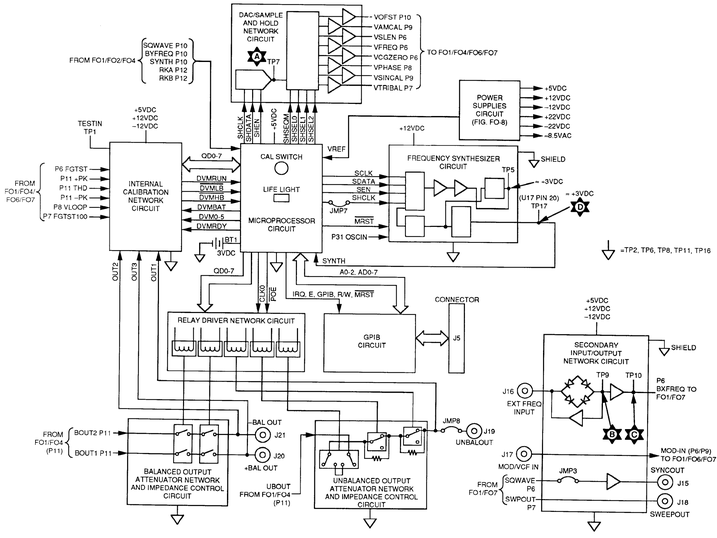


TP7
+5Vp-p
~4kHz
(TYPICAL)

TP9
~1.2Vp-p
1kHz
NOTE 8
FROM
BOTTOM
(SQ PIN)

TP10
~2Vp-p
1kHz
NOTE 8
FROM
BOTTOM
(SQ PIN)

TP17
~+3VDC
SET
FREQUENCY
TO 1MHz
(USE P6 PIN 2)

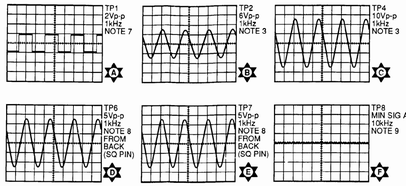


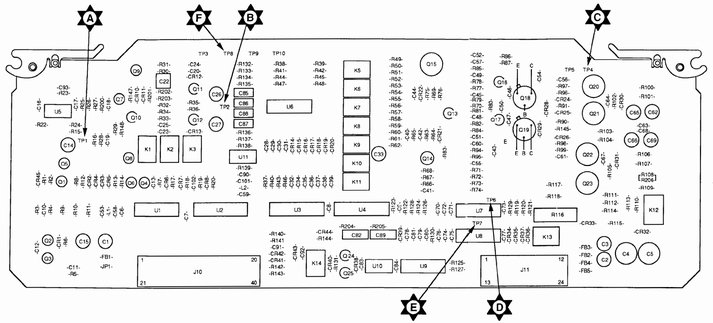
CE10E005

Figure FO-3. A2 Motherboard Circuit Card Assembly Component Locator and Functional Block Diagram.

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD A3 TO ABBREVIATION FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE IS IN Ω (METAL FILM,1/8W, ±1%)
   CAPACITANCE IS IN µF
   INDUCTANCE IS IN µH
3. UNLESS OTHERWISE SPECIFIED, INITIAL SETUP FOR VOLTAGES AND WAVEFORMS IS:
   SET POWER TO ON.
   PRESS RESET KEY.
   WAIT 20 MINUTES.
   PRESS CALIBRATE KEY.
   VERIFY DISPLAY SHOWS AUTOCALIBRATED.
4. UNLESS OTHERWISE SPECIFIED, ALL VOLTAGE READINGS AND WAVEFORMS TAKEN WITH RESPECT TO ANALOG GROUND.
5. ANALOG GROUND — TP3 AND TP5.
6. NOT MEASURABLE — TP9 AND TP10.
7. SIGNAL MEASURED WITH FUNCTION SET TO SQUARE.
8. SIGNAL MEASURED WITH OUTPUT SET TO 600Ω AND BAL.
9. SIGNAL MEASURED WITH FREQUENCY AT 10kHz. TUNE TO MINIMUM DC OFFSET.
10. DO NOT OPERATE SIGNAL GENERATOR WITH HEAT SINK REMOVED.
11. * DENOTES CONTROL SIGNAL





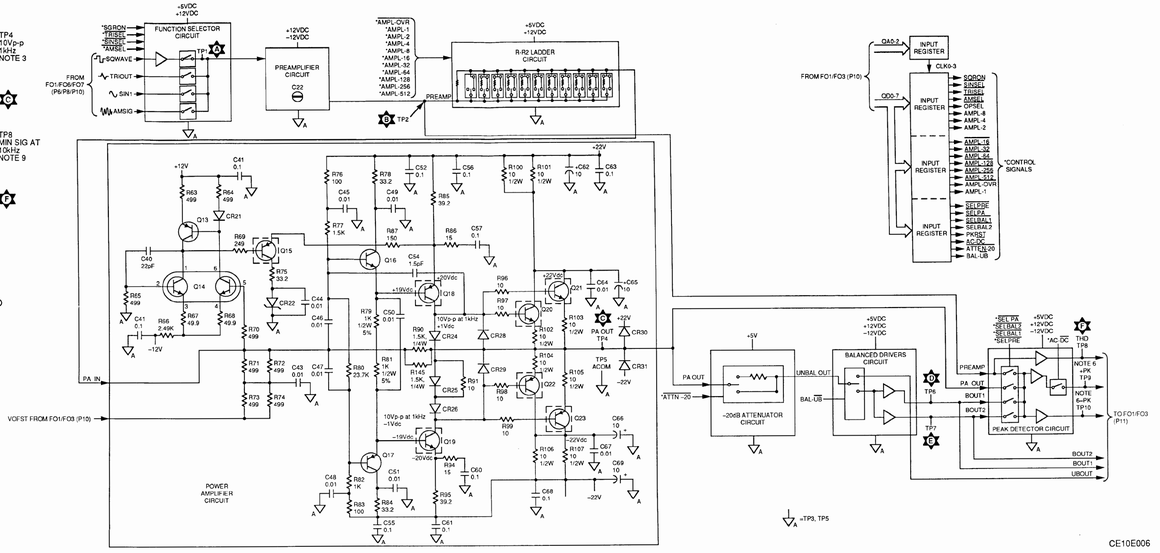
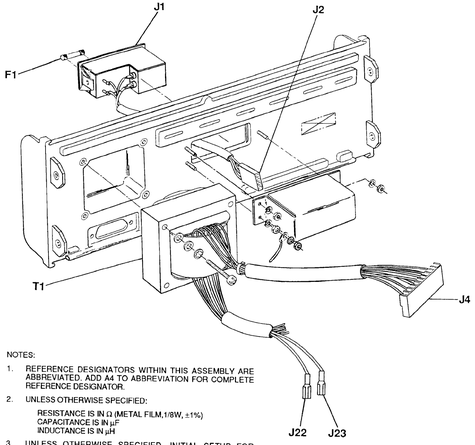


Figure FO-4. A3 Output Circuit Card Assembly Component Locator and Functional Block Diagram.



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD A4 TO ABBREVIATION FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE SPECIFIED:

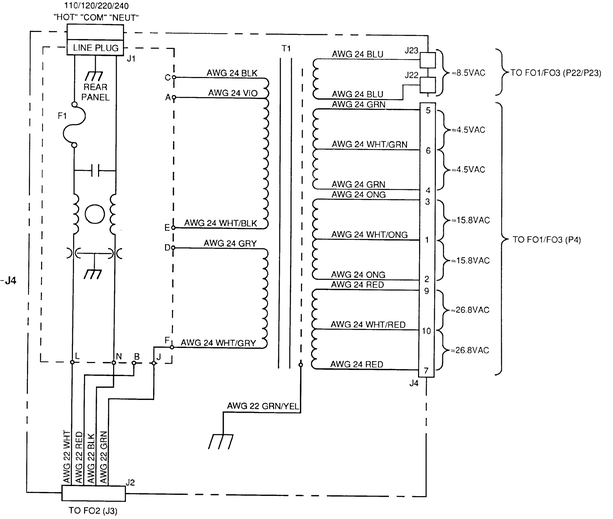
   RESISTANCE IS IN Ω (METAL FILM,1/8W, ±1%)
   CAPACITANCE IS IN μF
   INDUCTANCE IS IN μH
3. UNLESS OTHERWISE SPECIFIED, INITIAL SETUP FOR VOLTAGES AND WAVEFORMS IS:

   SET POWER TO ON.
   PRESS RESET KEY.
   WAIT 20 MINUTES.
   PRESS CALIBRATE KEY.
   VERIFY DISPLAY SHOWS AUTOCALIBRATED.
4. 100VAC= A-B, C-D, E-F

   120VAC= E-F, B-C-D

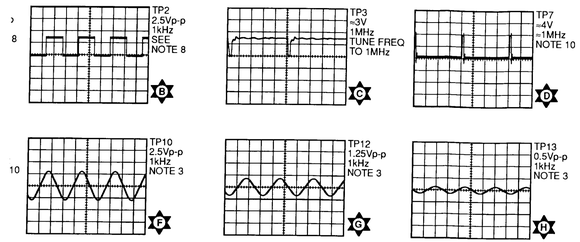
   220VAC= A-B, D-E

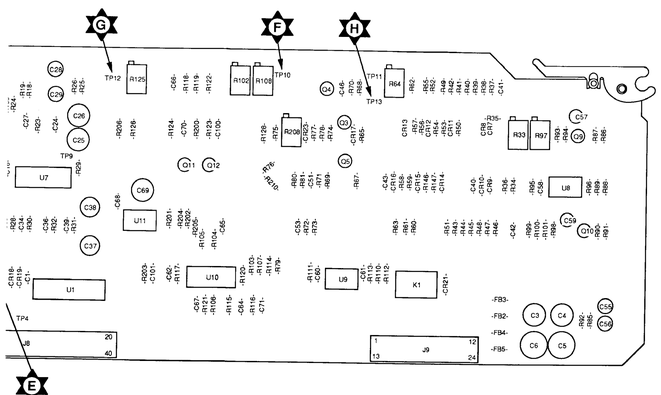
   240VAC= B-C, D-E

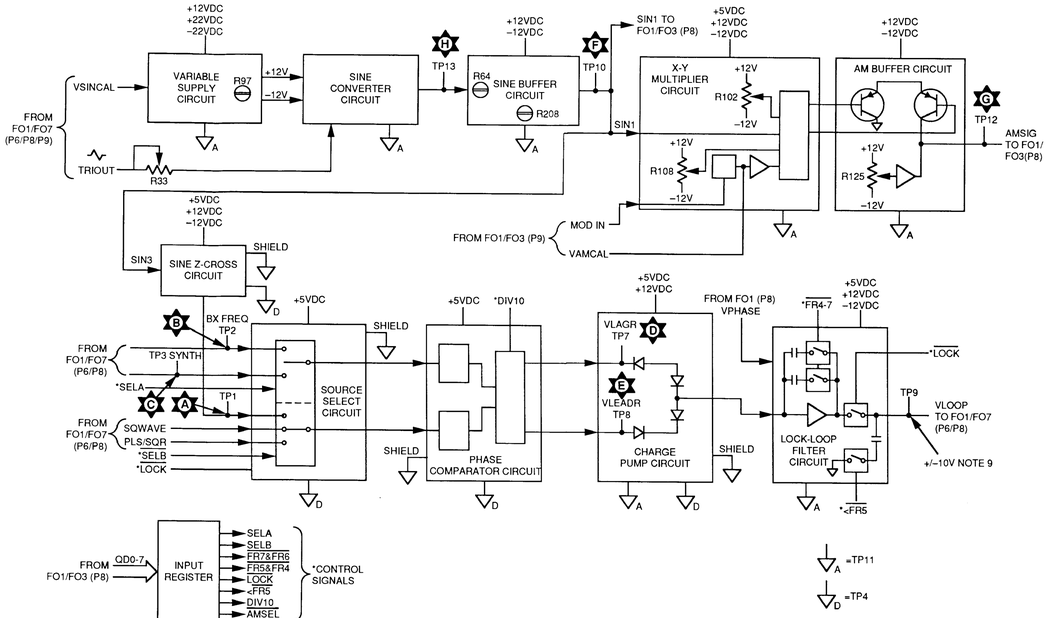


CE10E007

Figure FO-5. A4 Rear Panel Assembly Component Locator and Wiring Diagram.





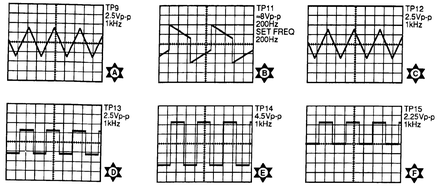


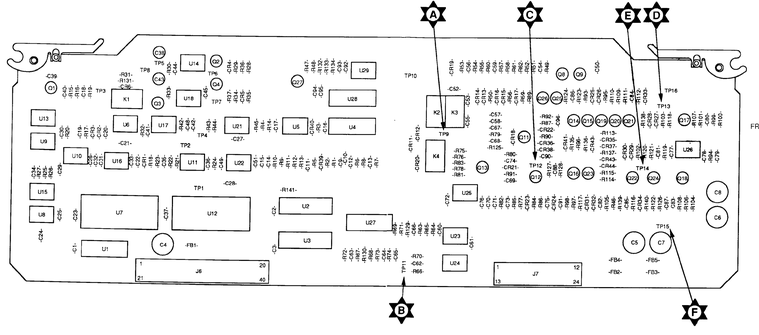
CE10E008

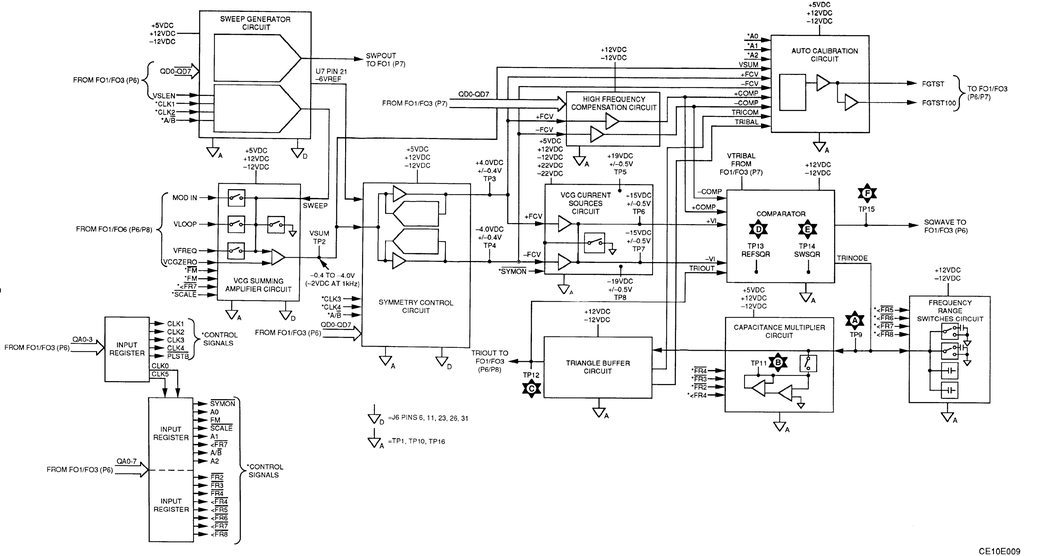
Figure FO-6. A7 Phase Lock Loop Circuit Card Assembly Component Locator and Functional Block Diagram.

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD A8 TO ABBREVIATION FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE IS IN Ω (METAL FILM,1/8W, ±1%)
   CAPACITANCE IS IN µF
   INDUCTANCE IS IN µH
3. UNLESS OTHERWISE SPECIFIED, INITIAL SETUP FOR VOLTAGES AND WAVEFORMS IS:
   SET POWER TO ON.
   PRESS RESET KEY.
   WAIT 20 MINUTES.
   PRESS CALIBRATE KEY.
   VERIFY DISPLAY SHOWS AUTOCALIBRATED.
4. UNLESS OTHERWISE SPECIFIED, ALL VOLTAGE READINGS AND WAVEFORMS TAKEN WITH RESPECT TO ANALOG GROUND.
5. ANALOG GROUND — TP1, TP10, and TP16.
6. * DENOTES CONTROL SIGNAL.

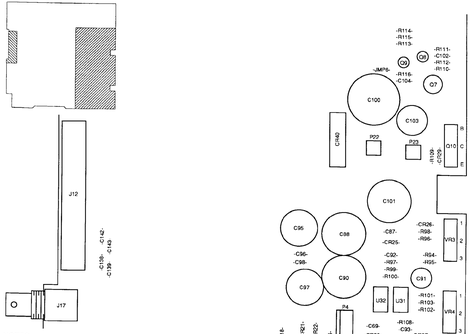






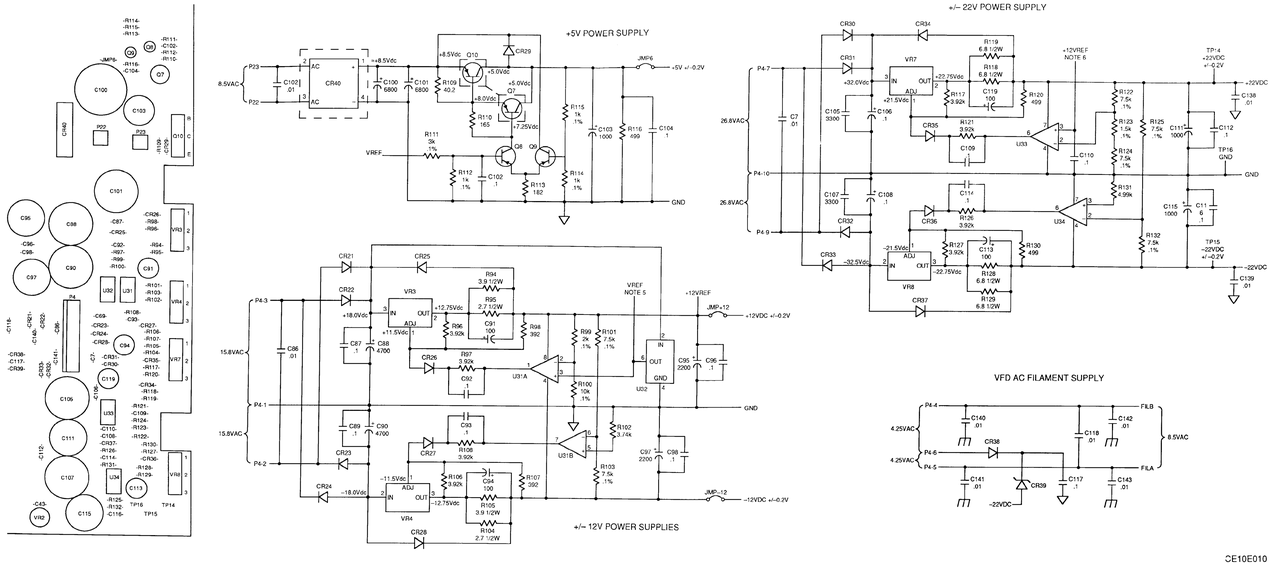
CE10E009

Figure FO-7. A8 Function Generator Circuit Card Assembly Component Locator and Functional Block Diagram.



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD A2 TO ABBREVIATION FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE IS IN Ω (METAL FILM,1/8W, ±1%)
   CAPACITANCE IS IN μF
   INDUCTANCE IS IN μH
3. UNLESS OTHERWISE SPECIFIED, INITIAL SETUP FOR VOLTAGES AND WAVEFORMS IS:
   SET POWER TO ON.
   PRESS RESET KEY.
   WAIT 20 MINUTES.
   PRESS CALIBRATE KEY.
   VERIFY DISPLAY SHOWS AUTOCALIBRATED.
4. UNLESS OTHERWISE SPECIFIED, ALL VOLTAGE READINGS AND WAVEFORMS TAKEN WITH RESPECT TO ANALOG (A2TP8) GROUND.
5. VREF SIGNAL TO INTERNAL CALIBRATION NETWORK CIRCUIT ON FIG. FO-3.
6. +12REF SIGNAL FROM +12V SUPPLY IN FIG. FO-3.



CE10E010

Figure FO-8. Power Supply Schematic Diagram.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
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To: 2028@redstone.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19−OCT−93
8. ***Pub no:*** 55−2840−229−23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04−JUL−85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123−123−1234
17. ***Problem:*** **1**
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem below line 27.

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PUBLICATION/FORM NUMBER	DATE	TITLE
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ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.

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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

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