TM 11-6625-3050-40

TECHNICAL MANUAL

GENERAL SUPPORT MAINTENANCE

EQUIPMENT DESCRIPTION PAGE 1-2

SERVICE UPON RECEIPT PAGE 2-2

SYMPTOM INDEX PAGE 2-3

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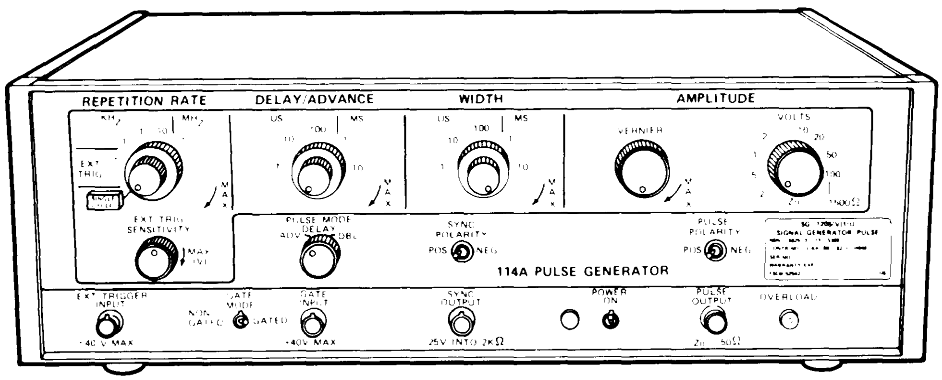
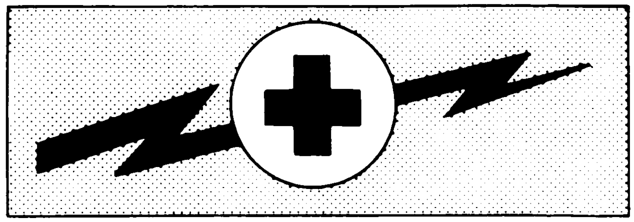
SUBJECT INDEX PAGE INDEX-1



PULSE SIGNAL GENERATOR
SG-1205(V)1/U
(NSN 6625-01-137-5369)

HEADQUARTERS, DEPARTMENT OF THE ARMY

22 DECEMBER 1983



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 incompetent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

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

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

WARNING

Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

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 WOODEN POLE OR A 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 RESUSCITATION

WARNING

A periodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended. When the equipment is operated with covers removed, DO NOT TOUCH exposed connections or components. MAKE CERTAIN you are not grounded when making connections or adjusting components inside the test instrument.

WARNING

Hot equipment parts can cause serious burns. Before working on equipment that has just been shut down, allow equipment to cool.

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C, 15 March 1990

GENERAL SUPPORT MAINTENANCE

PULSE SIGNAL GENERATOR
SG-1205(V)1/U
(NSN 6625-01-137-5369)

TM 11-6625-3050-40, 22 December 1983, is changed as follows:

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

Remove pages	*Insert pages*
i and ii	i and ii
l-1and1-2	l-l nd l-2
2-159 and 2-160	2-159 and 2-160
2-163 and 2-164	2-163 and 2-l60
2-173 and 2-174	2-173 and 2-174
2-177 and 2-178	2-l77and 2-178
2-223 and 2-224	2-223 and 2-224
A-1/(A-2 blank)	A-1/(A-2 blank)

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To be distributed in accordance with DA Form 12-36 DS/GS requirements for SG-1205(V)l/U.

TECHNICAL MANUAL
TM 11-6625-3050-40

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 22 December 1983

GENERAL SUPPORT MAINTENANCE MANUAL
PULSE SIGNAL GENERATOR SG-1205(V)1/U
(NSN 6625-01-137-5369)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ME-PS, Fort Monmouth, Ncw Jersey 07703-5000.

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

Page

HOW TO USE THIS MANUAL

Spend a few minutes looking through this manual. It has a new look that is very different from the manuals you've been using. You'll find the new look is a lot easier to use, and you can find what you're looking for a lot faster. We got rid of as many words as we could and put in lots of pictures to show just about everything you'll be doing to troubleshoot and repair your equipment. So HOW DO YOU USE THIS MANUAL?

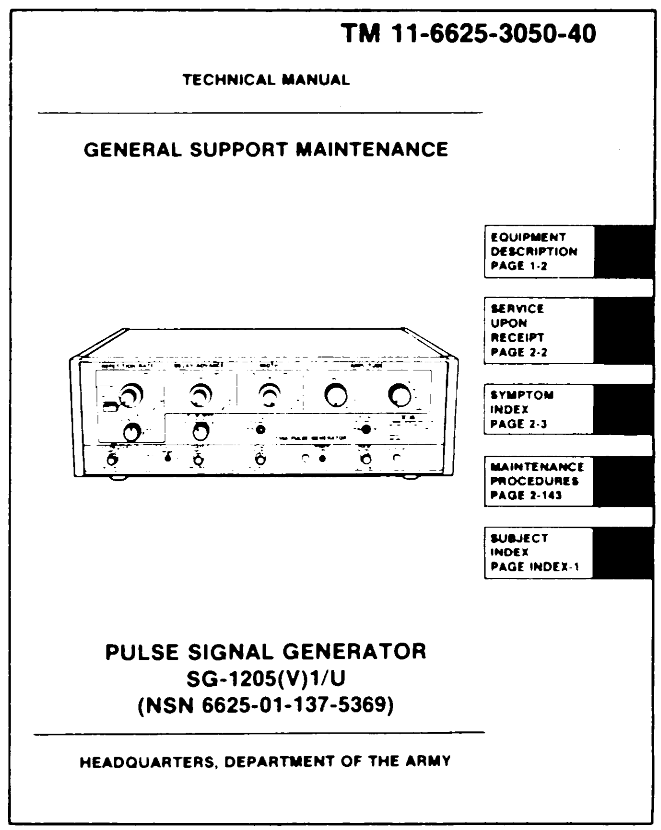
Like this:

1. Suppose you want to fix the signal generator.

2. Look at the cover and you'll see index boxes near the right-hand edge with subject titles next to them. You'll find "SYMPTOM INDEX PAGE 2-3." You can skip over to page 2-3.

OR

3. Bend the pages a bit and look at the edges. You'll see black bars on some of the pages that are lined up with the index boxes on the cover.



EL8ZU164

4. If you put your thumbnail on the black bar that is lined up with the index box on the cover for SYMPTOM INDEX and open the manual, you'll be on page 2-3.

5. On page 2-3, you'll find the trouble-shooting symptom index. Now you're ready to begin.

6. Look down the symptom column until you find the symptom, in this case "Signal Generator Cannot be Triggered Manually" and it gives you page 2-8.

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Section III. TROUBLESHOOTING

SYMPTOM INDEX

Signal Generator Symptom	Page
1 NO PULSE OUTPUT	2-6
2 SIGNAL GENERATOR BLOWS FUSES	2-7
3 NO SYNC OUTPUT	2-7
4 SIGNAL GENERATOR CANNOT BE TRIGGERED EXTERNALLY	2-7
5 SIGNAL GENERATOR CANNOT BE TRIGGERED WITH REPETITION RATE SWITCH IN A KHz OR MHz POSITION	2-7
6 SIGNAL GENERATOR CANNOT BE TRIGGERED MANUALLY	2-8

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TM 11-6625-3050-40

Table 2-1 TROUBLESHOOTING - Continued

Malfunction
Test or Inspection
Corrective Action

Step 3 Do power supply filament circuit test. See paragraph 2-18.
Replace faulty component indicated.

Step 4 Do regulator isolation test. See paragraph 2-19.
Replace faulty component indicated.

3 NO SYNC OUTPUT
Do sync output test. See paragraph 2-12.
Replace faulty component indicated.

4 SIGNAL GENERATOR CANNOT BE TRIGGERED EXTERNALLY
Do external trigger amplifier test. See paragraph 2-20.
Replace faulty component indicated.

5 SIGNAL GENERATOR CANNOT BE TRIGGERED WITH REPETITION RATE SWITCH IN A KHz OR MHz POSITION
Do repetition rate oscillator test. See paragraph 2-21.
Replace faulty component indicated.

6 SIGNAL GENERATOR CANNOT BE TRIGGERED MANUALLY
Step 1 Check that resistance is 0 ohm between pins 2 and 3 of SINGLE CYCLE switch with switch pushed in.
Remove top cover. See paragraph 2-37.

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7. Turn to page 2-8 and find the symptom "Signal Generator Cannot be Triggered Manually" and it will tell you what to check and what to do to fix it.

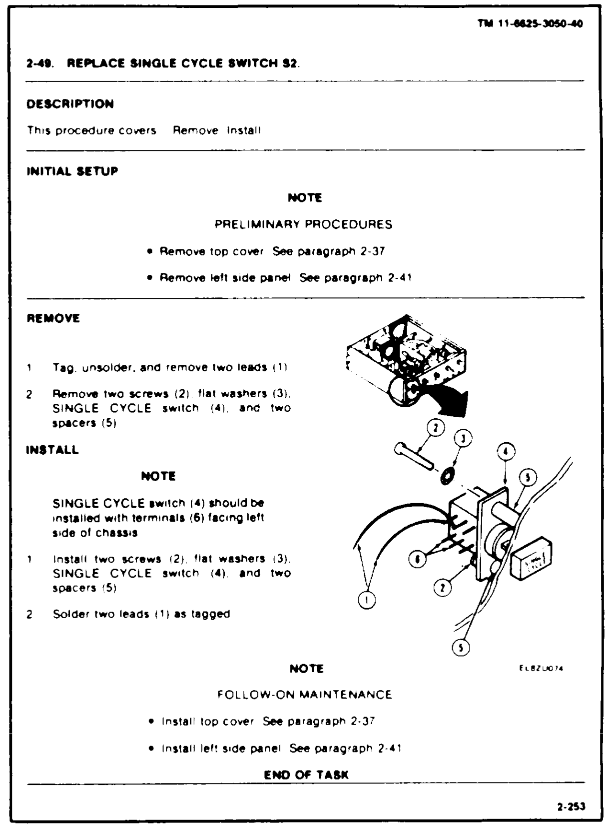
8. As you do the tests and corrective actions in the order listed, you get to "Replace SINGLE CYCLE switch. See paragraph 2-49."

9. Turn to paragraph 2-49 and look at the procedure. The procedure is divided into modules with one or more steps and a picture to show you where to look and what to look at.

10. Notice the numbered arrows. These are called index numbers. As you read each step, we tell you where to look by including the index number (in parentheses) after the name of each item we call out.

11. Do the procedure, then check to see if you have fixed the symptom.

You can also use the Table of Contents in the front of the manual or the Subject Index in the back to find the information you want. Either one will lead you to the page number of the procedure you need.


TM 11-6625-3050-40

2-49. REPLACE SINGLE CYCLE SWITCH S2.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES

- Remove top cover. See paragraph 2-37
- Remove left side panel. See paragraph 2-41

REMOVE

1 Tag, unsolder, and remove two leads (1).

2 Remove two screws (2), flat washers (3), SINGLE CYCLE switch (4), and two spacers (5).

INSTALL

NOTE

SINGLE CYCLE switch (4) should be installed with terminals (6) facing left side of chassis.

1 Install two screws (2), flat washers (3), SINGLE CYCLE switch (4), and two spacers (5).

2 Solder two leads (1) as tagged.

NOTE

FOLLOW-ON MAINTENANCE

- Install top cover. See paragraph 2-37
- Install left side panel. See paragraph 2-41

END OF TASK

2-253

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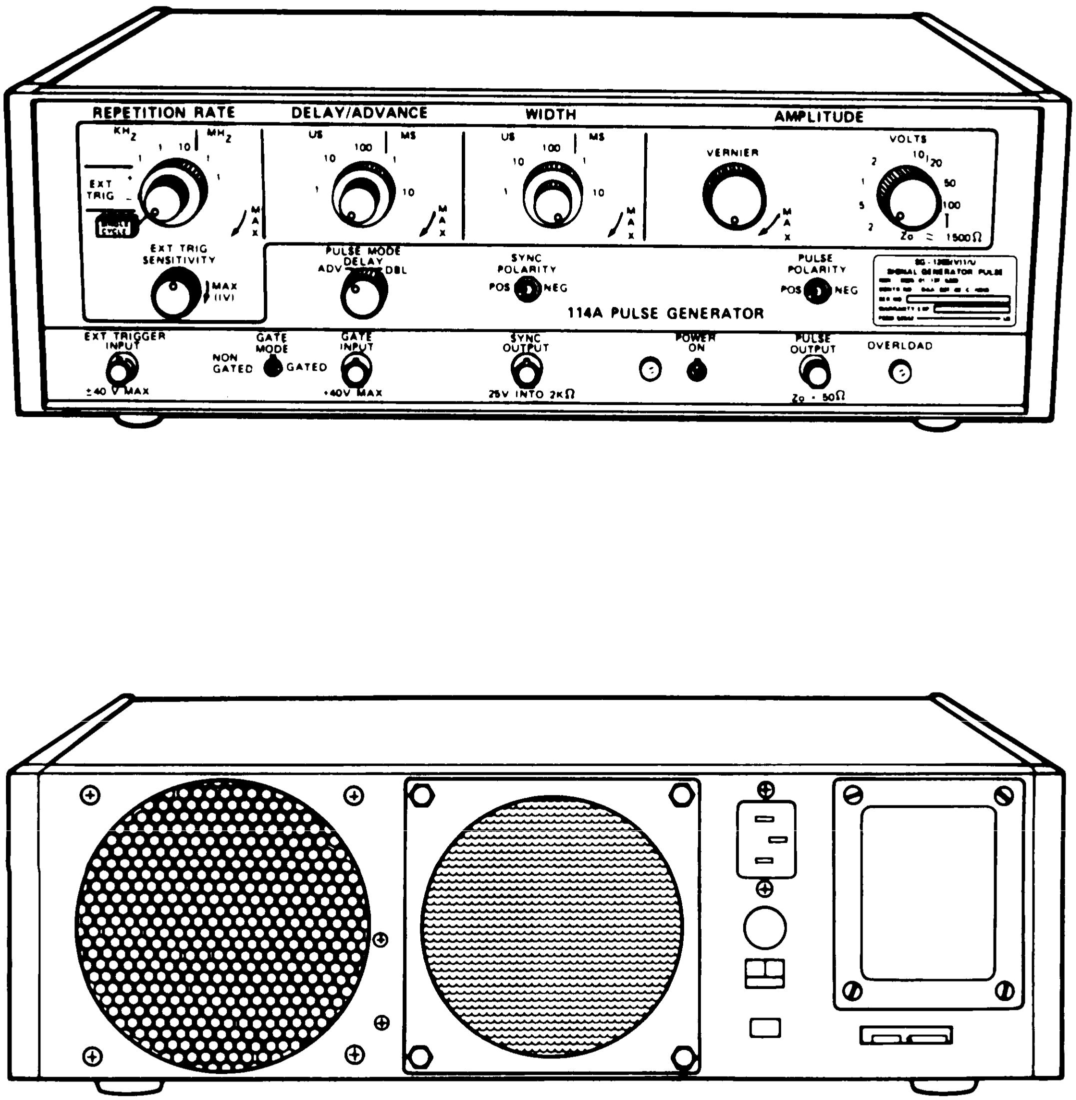

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Figure 1-1. Pulse Signal Generator SG-1205(V)1/U

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

This manual contains general support maintenance instructions for Pulse Signal Generator SG-1205(V)1/U. This manual includes procedures for removal, replacement, disassembly, cleaning, inspection, repair, test, and adjustment as authorized by the Maintenance Allocation Chart (MAC). Information is provided for maintenance of the signal generator that is beyond the scope of tools, equipment, personnel, or supplies normally available to the operator or organizational maintenance.

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

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

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

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

b. Reporting of Item and Packaging Discrepancies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/MCO 4430.3J.

c. Transportation Discrepancy *Report (TDR) (SF 361).* Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. CALIBRATION.

Procedures for Pulse Signal Generator SG-1205(V)1/U are found in TB 9-6625-2112-35.

1-5. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

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

1-6. PREPARATION FOR STORAGE OR SHIPMENT.

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

1-7. QUALITY ASSURANCE/QUALITY CONTROL.

Maintenance standards for Pulse Signal Generator SG-1205(V)1/U are given in the maintenance procedures. By performing the maintenance procedures, quality control of the equipment will be maintained.

1-8. NOMENCLATURE CROSS-REFERENCE LIST.

Common names will be used when major components of the signal generator are mentioned in this manual.

NOTE

Official nomenclature must be used when filling out report forms or looking up Technical Manuals.

Common Name	Official Nomenclature
Signal Generator	Pulse Signal Generator SG-1205(V)1/U

1-9. 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. Put in on an SF 368 (Product Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL–PA–MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

1-10. WARRANTY INFORMATION.

The signal generator is warranted by Systron Dormer Corporation for 12 months. Warranty starts on the date of shipment to the original buyer. Report all defects in material or workmanship to your supervisor who will take appropriate action.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-11. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

For information on equipment characteristics, capabilities, and features of the equipment covered in this manual, refer to TM 11-6625-3050-12.

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

For information on the location and description of the major components, refer to TM 11-6625-3050-12.

1-13. EQUIPMENT DATA.

For equipment data on the equipment covered in this manual, refer to TM 11-6625-3050-12.

1-14. SAFETY, CARE, AND HANDLING.

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

Section III. PRINCIPLES OF OPERATION

1-15. GENERAL FUNCTIONAL DESCRIPTION.

(fig. 1-2)

Pulse Signal Generator SG-1205(V)1/U produces high power 10-Hz to 1-MHz output pulses. A second synchronizing (sync) pulse is also provided.

1 The front panel contains all the controls for selecting output pulse parameters. It also contains two indicators to show power on and overload conditions. Two input connectors are provided, one for an external trigger signal and one for a gate signal. Two output connectors provide the main output pulses and the sync pulses.

2 The internal circuitry generates the main output pulses and the sync pulses. The settings of the front panel controls determine the amplitude, width, polarity, and other parameters of the pulses. An internal power supply provides all of the voltages needed by the other internal circuits.

3 The rear panel contains the input connector for input power, a fuse, and a switch for selecting 115- or 230-V ac input power. A fan is also provided for cooling the internal circuitry.

1-16. DETAILED FUNCTIONAL DESCRIPTION.

(fig. 1-3)

1 2 The repetition rate oscillator is an astable multivibrator for internal clocking of the signal generator Repetition rate of the oscillator is selected by the repetition rate switch assembly.

3 4 The gate control circuit controls the gate mode of the repetition rate oscillator The GATE MODE switch selects either GATED or NON GATED mode. In the GATED mode, the GATE INPUT signal controls the gate interval.

5 The external trigger amplifier provides for external triggering of the signal generator and amplifies the external trigger input. Positive (+) or negative (-) triggering is selected by the repetition rate switch assembly.

6 7 The trigger multivibrator shapes the pulses from the repetition rate oscillator, external trigger amplifier, or SINGLE CYCLE pushbutton switch into positive-and negative-going spikes.

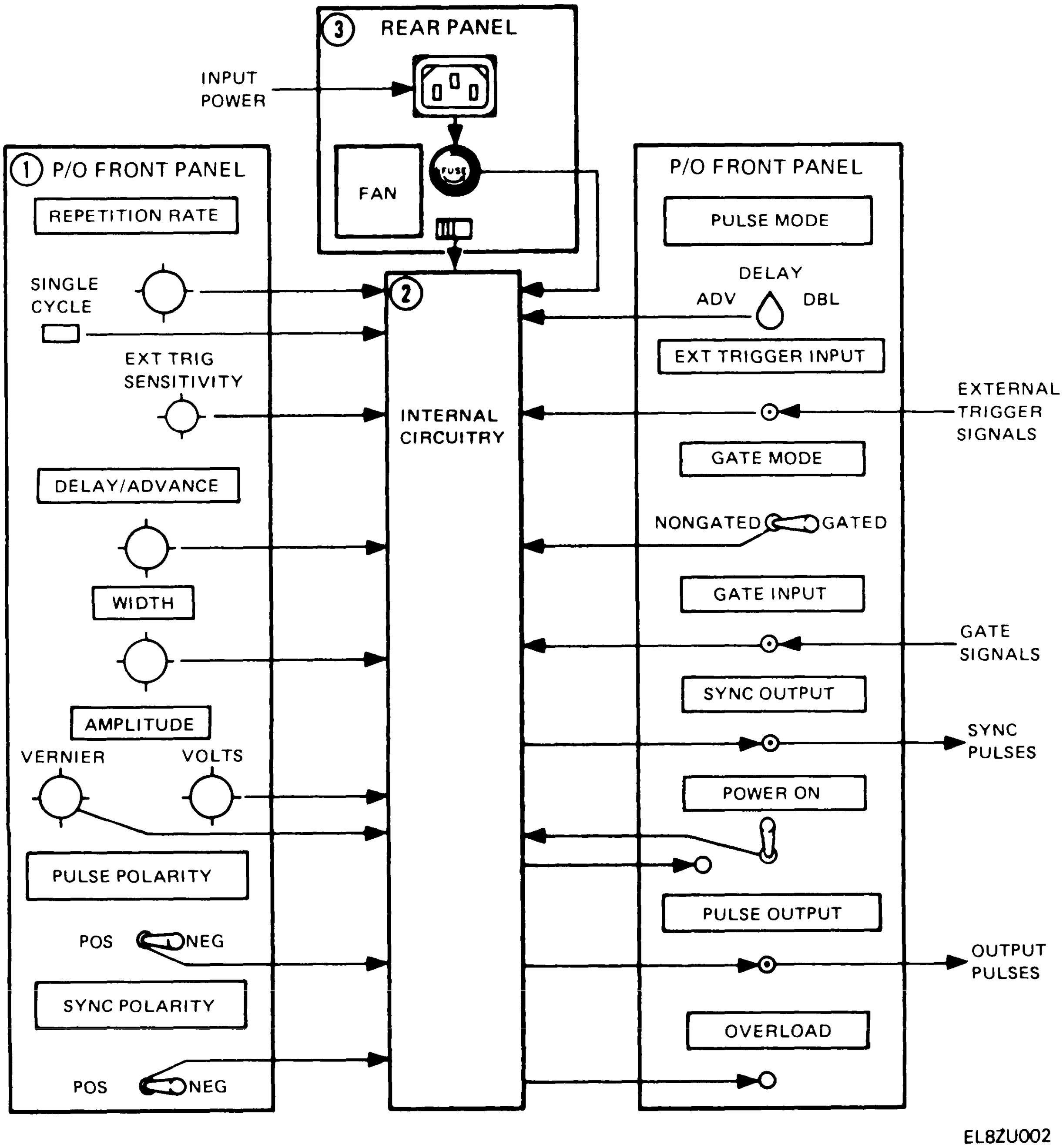

Figure 1-2. Pulse Signal Generator SG-1205(V)1/U Block Diagram

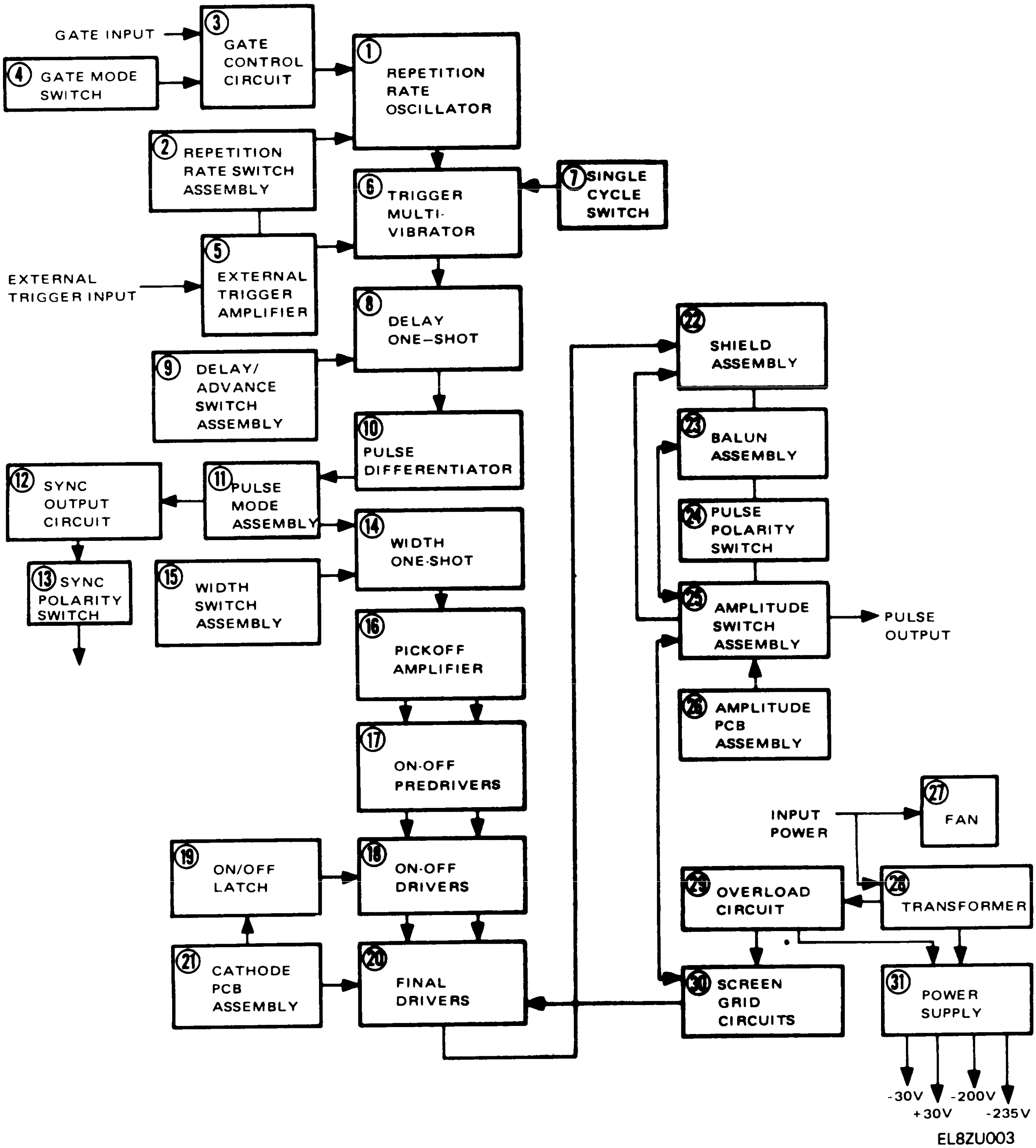

Figure 1-3. Pulse Signal Generator SG-1205(V)1/U Detailed Block Diagram

(8) The delay one-shot is triggered by the negative-going spikes from the trigger multivibrator and develops rectangular pulses. The period of time between pulses is selected by the
(9) delay/advance switch assembly.

(10) The pulse differentiator changes the rectangular pulses from the delay one-shot into
(11) positive- and negative-going spikes which are coupled to the PULSE MODE switch for selection of advance, delay, or double pulse mode.

(12) The sync output circuit amplifies the sync signal from the PULSE MODE switch. Positive
(13) or negative polarity of the sync output is selected by the SYNC POLARITY switch.

(14) The width one-shot is triggered by the negative-going spikes from the pulse differentiator, which were coupled through the PULSE MODE switch, and develops rectangular pulses.
(15) Width of the pulses is selected by the width switch assembly.

(16) The pickoff amplifier converts the leading and trailing edges of the rectangular pulses from the width one-shot into sharp positive- and negative-going spikes. The negative-going spikes are used to trigger the on/off predrivers.

(17) The on/off predrivers develop the voltage drive for the pulses that trigger the final drivers on and off.

(18) The on/off drivers develop the current drive for the pulses that trigger the final drivers on
(19) and off. The on/off latch keeps the final drivers on for the time interval of the output pulse.

(20) The output pulse is developed by the final drivers when they are biased on and off by the
(21) on/off drivers. The cathode pcb assembly clamps the cathodes of the final drivers to minimize switching aberrations.

(22) The shield assembly provides an output impedance of 50 ohms for all output pulse amplitude ranges except the 100-volt range, which is 1500 ohms.

(23) The balun assembly isolates the output signal from the output to allow for polarity
(24) selection. Polarity is selected by the PULSE POLARITY switch.

(25) The amplitude switch assembly selects the amplitude of the output pulse and the
(26) amplitude pcb assembly attenuates the output for amplitude ranges below 20 volts.

(27) The screen grid circuits consist of the screen grid power supply and screen grid overload detect. The screen grid power supply provides control of output pulse amplitude and the detect circuit detects screen grid overloads.

(28) The fan provides air circulation for cooling the heat-generating components of the signal generator.

(29) The transformer converts input power line voltage for use by the overload circuit and the power supply.

(30) The overload circuit provides protection against overloads caused by excessive amplitude, exceeding duty cycle limitations, or short circuiting the high voltage power supply.

(31) The power supply consists of four dc regulators and provides -30, +30, -200, and -235 internal voltages for operation of the internal circuits.

1-17. DETAILED CIRCUIT THEORY.

(fig. FO-1 and FO-2)

(1) REPETITION RATE OSCILLATOR. See figure FO-1. The repetition rate oscillator is an astable multivibrator. Q1 and Q2 are the active elements of the oscillator. Q3 inverts the output of Q1. Q1 and Q2 are emitter coupled through RC components selected by the position of S1. The frequency of the oscillator is determined by the selected fixed values of capacitors C6 thru C10 and the setting of vernier potentiometer R2. Resistors R6 thru R10 provide an internal switch resistance of 2.7 kilohms.

C1 and C2 filter the + 30 V dc power supply input. Zener diode CR1 drops the input voltage to +5.1 V dc across R4 and R5. Voltage dividers R4 and R5 upply Q1 base bias. C4 and C5 filter the Q1 base input.

Minimum Q1 collector voltage is approximately +4.5 V dc. Diode CR2 supplies the minimum Q1 collector input voltage and provides voltage isolation when the Q1 collector voltage exceeds +4.5 V dc. Inductor L1 provides a high Q1 collector impedance during pulse generation.

At the beginning of the cycle, Q2 is conducting. The positive Q2 emittervoltage charges a selected repetition rate capacitor from C6 thru C10. When Q1 begins to conduct, the Q1 collector voltage drops, producing a negative-going transient that is routed to the base of Q2 through R12. Q2 is turned off. The repetition rate capacitor begins to discharge through the ground in the gate control circuit due to the following conditions:

- With Q1 conducting, the positive Q1 emitter voltage charges the repetition rate capacitor on the other side.
- With Q2 not conducting, the capacitor discharge voltage is returned to ground through the gate control circuit.

Under these conditions, the Q2 emitter voltage is the capacitor discharge voltage and Q2 base bias is fixed by the clamped Q2 collector voltage, +4.5 V dc. The Q2 emitter voltage continues to decrease until the level is reached that enables the fixed Q2 base bias. At this point, Q2 conducts.

When Q2 begins to conduct, the initial positive voltage transient is coupled through the repetition rate capacitor to the Q1 emitter and Q1 stops conducting. Q1 emitter voltage decreases and the voltage across the repetition rate capacitor increases. When Q1 emitter voltage drops to about 3.7 V dc, Q1 begins to conduct and the cycle is repeated.

Q1 emitter resistance contains the following elements:

- Repetition rate switch assembly resistance of 2.7 kilohms
- R3 in parallel with the R2 vernier potentiometer.

Repetition rate frequency is determined by the oscillator time constant. Varying resistance of the vernier potentiometer changes the value of:

- Q1 emitter resistance
- Oscillator time constant
- Repetition rate frequency

Zener diode CR3 supplies 3.3 V dc across R16 and C11. Bypass capacitor C11 filters the Q3 emitter voltage. The rectangular pulse output generated at the Q1 collector is inverted by Q3 and routed through R15 to trigger the multivibrator circuit.

2 REPETITION RATE SWITCH S1 ASSEMBLY. See figure FO-1. The S1 repetition rate switch assembly provides selection of four functions:

- Positive (+) or negative (-) external trigger input
- Single cycle mode of operation
- One of five repetition rate frequency ranges
- Variable control of the selected repetition rate frequency range.

Selection of the positive (+) external trigger mode supplies +30 V dc to Q6 collector resistor R36, located in the external trigger amplifier circuit. A negative (-) external trigger mode selection provides +30 V dc to Q5 collector resistor R33.

Selection of the single cycle mode of operation supplies +30 Vdc to pin 2 of the SINGLE CYCLE pushbutton switch.

The repetition rate frequency ranges and related RC switch components are listed below. Note that all S1 resistors (R6 thru R10) are 2.7 kilohms.

RESISTOR	CAPACITOR	FREQUENCY RANGE
R6	C6, 1000 pF	1 MHz
R7	C7, 0.01 µF	0.1 MHz
R8	C8, 0.1 µF	10 kHz
R9	C9, 1 µF	1 kHz
R10	C10, 10 µF	0.1 kHz

The R2 vernier control is a 100-kilohm potentiometer. Turning the vernier control clockwise decreases the potentiometer resistance and the oscillator time constant. This action provides variable control of repetition rate frequency within the selected range.

(3) (4) GATE CONTROL CIRCUIT. See figure FO-1. GATE MODE switch S3 selects the mode of operation— GATED or NON GATED. In the gated mode of operation, the gate control circuit allows the repetition rate oscillator to generate timing pulses during the time interval of the positive external gate input signal. The nongated mode provides for continuous operation of the repetition rate oscillator.

During the gated mode of operation, the external gate signal is connected to the gate control circuit through BNC connector J1. The maximum amplitude of the gate signal must be limited to +40 volts. Toggle switch S3 is in the GATED position and supplies +30 V dc to the plate of vacuum tube V1.

Vacuum tube V1 and its related components provide a positive base input voltage to Q4 when a positive gate input signal is received. The gate input signal is coupled to the control grid of V1 through C22 and R25. R26 is the control grid return. When S3 is in the NON GATED position, 30 V dc is connected to R24 and Q4 conducts continuously. Clamp diode CR23 limits the maximum control grid input to about 5.6 V dc. Negative cathode bias is supplied through R27. In the V1 cathode follower configuration, the output is supplied from the cathode. The cathode voltage follows the control grid input. A positive signal at the gate input drives the control grid and cathode output to a positive level. The positive Q4 base input voltage allows Q4 to begin conduction, providing a ground return for the repetition rate oscillator. A negative or zero potential gate input causes a negative V1 cathode output, inhibiting the conduction of Q4.

The repetition rate oscillator operates continuously when Q4 is conducting. The oscillator is inhibited when Q4 is not conducting. During Q4 conduction, the oscillator capacitor discharge voltage is returned to ground through R21, Q4, and diodes CR21 and CR22. A stabilizing Q4 emitter voltage of about 1.2 V dc is developed across the diodes, from the 30-V dc input through R22, Capacitor C21 filters the emitter voltage.

(5) EXTERNAL TRIGGER AMPLIFIER. See figure FO-1. The external trigger amplifier consists of two circuits:

- Cathode follower V2
- Differential amplifier Q5/Q6

In the external trigger mode, the repetition rate oscillator is disabled through S1 switch selection of either positive (+) or negative (-) external trigger. Positive external trigger selection routes 30 V dc to the Q6 collector resistor, R36. Negative external trigger selection supplies 30 V dc to the Q5 collector resistor, R33. External trigger sensitivity is controlled by R40. Adjustment of R40 increases the threshold of the external trigger level from ±0.5 Vdc to ~±6 Vdc. The external trigger input is routed through BNC connector J2 and is restricted to a maximum amplitude of ±40 V dc.

The external trigger input is coupled to the control grid of V2 through C32 and R37. R35 is the control grid return resistor. The V2 cathode is connected to -30 V dc through R32. The plate of V2 is tied to +30 V dc. V2 cathode voltage follows the control grid input.

Functionally, V2 is an input buffer. A positive-going external trigger pulse drives the V2 cathode to a positive-going potential. During negative pulse periods, the V2 cathode remains at a negative potential. The output of the V2 cathode follower is supplied to the base of Q5 through R31.

For positive external triggering, S1 supplies 30 V dc to the Q6 collector resistor R36. Five volts dc is provided to the collectors of Q5 and Q6 through diodes CR32 and CR34. Q5 starts conducting when the leading edge of a positive-going pulse is received at its base. Current flows through common emitter resistor R34. Q6 stops conducting since its base input level is fixed by R40, the control potentiometer for external trigger sensitivity. Adjustment of R40 to increase Q6 base voltage results in a higher trigger level to stop the conduction of Q6 and start the conduction of Q5. Thus, the following conditions exist for the leading edge of a positive-going pulse:

- Q5 starts conducting
- Q6 stops conducting
- A positive output pulse from the external trigger amplifier is supplied through R36 and CR33 to the trigger multivibrator.

When the trailing edge of the trigger pulse is received at the base of Q5, the following conditions exist:

- Q5 stops conducting
- Q6 starts conducting
- The positive output pulse period from the external trigger amplifier ends.

Thus, for the positive external triggering mode, the external trigger amplifier provides two functions—a positive pulse output in phase with the leading edge of the external trigger input pulse, and trigger level sensitivity through the use of R40.

During negative external triggering, switch S1 provides 30 V dc to Q5 collector resistor R33. In this mode, the function of Q6 is to set the desired trigger level. Adjustment of R40 to increase Q6 base voltage increases the voltage level across common emitter resistor R34 and the Q5 input pulse level that initiates conduction. Again, Q5 starts conducting upon receipt of the leading edge of the positive-going pulse input. At this time, the external trigger amplifier output is inactive, or about 3.8 V dc. Q5 stops conducting during the trailing edge of the trigger input pulse. The 30-V dc input to R33 provides a positive output pulse through CR31 to the trigger multi vibrator. In the negative triggering mode, the positive output pulse from the external trigger amplifier is in phase with the trailing edge of the external trigger input pulse.

6 7 TRIGGER MULTIVIBRATOR. See figure FO-1. The trigger multivibrator circuit consists of Q7 and its associated components. This circuit receives positive-going pulse waveforms from either the repetition rate oscillator, the external trigger amplifier, or the SINGLE

CYCLE pushbutton switch. The output is negative-going narrow pulses, or spikes, that are in phase with the leading edge of the input pulse. Selection of input source is made using REPETITION RATE switch S1.

Two actions are required for the single cycle mode:

- Set S1 to SINGLE CYCLE.
- Press SINGLE CYCLE pushbutton switch.

When the switch is pressed, 30 V dc is supplied to the trigger multivibrator througt resistors R51 and R52. Capacitor C52 filters the 30-V dc input.

Initially, Q7 is conducting. Q7 base bias is provided by the current drain through tunnel diode CR51 from 5 Vdc. The leading edge of the positive input pulse stops the conduction of Q7. A negative-going pulse or spike is developed at the Q7 collector and is coupled through diode CR53 and capacitor C63 to the delay one-shot circuit. Capacitor C53 is charged through R54 with Q7 in a nonconducting state. When the voltage on C53 exceeds the reverse bias at the base of Q7, Q7 begins conduction. The voltage on C53 is discharged through Q7 and the Q7 collector voltage becomes more positive. The maximum collector voltage is limited to approximately 0.6 V dc by clamp diode CR52. The Q7 base voltage drops during the trailing edge of the input pulse and capacitor C53 is fully discharged through Q7 during the negative pulse cycle. C51 filters the 5-V dc power input.

8 DELAY ONE-SHOT. See figure FO-1. Delay one-shot is a variable length one-shot that provides rectangular pulse output through Q11. Circuit operation is as follows:

- Negative-going spike from trigger multivibrator stops Q8 conduction.
- Positive-going pulse at Q8 collector inhibits conduction of Q10.
- Positive-going pulse at Q10 emitter is coupled through the selected delay/advance capacitor and across Q9 base resistive network.
- Q9 starts conducting as its base voltage decreases.
- Q9 stops conducting and Q8 starts conducting, ending one-shot period.
- Positive rectangular pulses developed across Q8 collector are buffered by emitter-follower Q11.

Q8 is conducting at beginning of one-shot period. Dc biasing for Q8 base is provided through voltage division of R62 and R63. C62 and C71 provide transient filtering. The leading edge of a negative-going pulse from the trigger multivibrator is coupled through C63 and R64 to Q8 base. Q8 stops conducting. Q8 collector voltage rises sharply, producing a positive-going pulse with maximum amplitude of 30 V dc. This pulse is connected to the base of Q10 through R72 and stops Q10 conduction. The emitter potential of Q10 is driven positive by 30-V dc input routed through R76. This positive-going voltage transient is coupled through selected delay/advance capacitors C66 thru C70 to base of Q9. Initial amplitude of the positive voltage pulse is across Q9 base resistor network and Q9 starts conducting.

The conduction period of Q9 depends on the RC time constant of Q9 base resistance and the selected value of the delay/advance capacitor. During Q9 conduction, ground return through R75 is open circuited by CR63. At this time, Q9 base resistive network consists of three series elements: R74, R70, and the parallel resistance value of R65 and R66. Potentiometers R70 and R65 are set during calibration. Resistance values are selected that
9 allow generation of the one-shot pulse periods listed for DELAY/ADVANCE switch S61 and R66 vernier control over the selected pulse range. Capacitors C61 and C65 filter the -30 V dc input.

After adjustment of Q9 base potentiometers, the pulse period of the delay one-shot circuit depends upon the value of the capacitor selected by S61. A list of capacitor values and corresponding pulse periods is given below:

CAPACITOR	VALUE	PULSE PERIOD
C66	470 pF	1 µs
C67	4700 pF	10 µs
C68	0.047 µF	100 µs
C69	0.47 µF	1 ms
C70	4.7 µF	10 ms

Q9 base voltage decreases as the selected delay/advance capacitor is charged. Q9 stops conducting when its base voltage drops to about -0.7 V dc. Current flow from the -30 V dc input is routed through the Q9 base resistive network and returned to ground through R75 and CR63.

Q8 emitter voltage drops sharply when Q9 stops conducting. As the Q8 emitter voltage approaches -0.6 V dc, Q8 begins conduction. Voltage at the Q8 collector drops and ends the period of positive output pulse. Delay one-shot output remains low until the next negative-going spike is received at the base of Q8, inhibiting conduction.

Diodes CR62 and CR53 block discharge of the negative spike voltage at the base of Q8. The negative spike voltage returns to ground through RC components C63 and R61, decreasing exponentially. CR61 supplies ground return for -30 V dc input across R63, C64 provides transient filtering during periods of pulse generation,

Output pulses generated at Q8 collector are supplied through R72 to emitter-follower Q11. The Q11 emitter provides the final output for the delay one-shot circuit. The leading edge of the output pulse is in phase with the leading edge of the negative spike received from the trigger multivibrator.

10 PULSE DIFFERENTIATOR CIRCUIT. See figure FO-1. input rectangular pulses from the
delay one-shot are translated into differentiated pulses. Pulse outputs are provided to the
11 PULSE MODE switch S81 to connect selected outputs to sync output and width one-shot
circuitry. The pulse differentiator consists of three basic sections:

- Differential amplifier Q12/Q13
- One-shot Q14 thru Q16
- Differential amplifier Q17/Q18

The differentiated pulse used for the advance function is generated by differential amplifier Q12/Q13. The base of Q13 is biased at -8.1 V dc by voltage division of R87 and R88. C81 supplies transient filtering for the Q13 base bias. Initially, Q13 is conducting. When the leading edge of the positive rectangular pulse is received across R81 and R82, Q12 starts conducting and Q13 stops conducting. The resultant differentiated pulse at the Q13 collector is generated by action of L81. The pulse is very narrow. At first, output goes sharply positive, then it drops sharply. C13 output is connected to the ADV (advance) position of S81 and the one-shot section through CR81.

The positive half of the Q13 collector differentiated pulse is coupled through CR81 to Q14 base. Q14 starts conducting and Q15 stops conducting. The base bias of Q15 is fixed at 0.6 V dc. With Q14 conducting, the collector voltage of Q14 drops sharply and inhibits Q16 conduction. The resulting negative-going pulse across Q16 emitter resistors R95 and R96 stop conduction of Q17. The differentiated pulse generated at the collector of Q17 is routed to DELAY and DBL positions of PULSE MODE switch S81.

The following actions occur when Q13 output falls below 0.6 V dc:

- Q14 stops conducting
- Q15 starts conducting
- Q16 starts conducting with voltage increase across R95 and R96
- Q17 begins to conduct slowly as voltage across R96 exceeds -8.8 V dc
- Q18 stops conducting since base bias is fixed at -8.8 V dc.

Q12 stops conducting when the trailing edge of the input rectangular pulse is received at the base of Q12 and Q13 starts conducting. This continues until the leading edge of the rectangular input pulse initiates the next cycle. Two differentiated pulses are generated for each input rectangular pulse cycle:

- First pulse generated at Q13 collector
- Second pulse generated at Q17 collector.

PULSE MODE switch S81 connects these outputs to adjacent circuits as shown below:

MODE	SYNC OUTPUT	WIDTH ONE-SHOT
Advance	Q13	Q17
Delay	Q17	Q13
Double	Q17	Q13, Q17

In ADV position, output pulse from signal generator occurs before sync pulse In DELAY position, generator output pulse occurs after sync pulse. In DBL position, a pair of pulses is generated for each period. The period of time between advance, delay, or separation of pulse pair is selected by DELAY/ADVANCE switch S61.

12 13 SYNC OUTPUT CIRCUIT. See figure FO-1. Sync output is a 2-stage transistor driver with a transformer coupled output. SYNC POLARITY switch S111 selects the output polarity of the sync output pulse.

The negative half of the input differentiated pulse is coupled through CR111 to Q19 base. Q19 starts conducting. The positive conducting voltage across R114 is coupled through CR113 to the base of Q20. Q20 begins conducting and the negative-going output pulse is generated across terminals 3 and 4 of T111. The positive pulse from the emitter of Q20 is coupled through C113 to the Q19 emitter. This positive feedback increases the Q19 current gain, the voltage across R114, and the Q20 current gain.

The sync output pulse produced at the Q20 emitter is coupled through T111 to sync output switch terminals, S111 terminals 1 and 4 provide positive sync output pulse. Negative sync output pulse is available at S111 terminals 3 and 6. S111 selects polarity. The amplitude of the sync output pulse is 25 volts across a 2-kilohm load.

The sync output pulse is very narrow. End of the pulse period occurs rapidly due to two conditions:

- Initial feedback voltage at collector of Q19 begins to decrease exponentially.

- Negative amplitude of input differentiated pulse drops sharply at base of Q19.

Bias and stabilizing components prevent transient spikes during generation of the sync output pulse. C111 and C112 filter -5 V dc. CR112 maintains -5 V dc at the junction of R114 and R115, CR114 and R119 provide suppression for reverse voltage generated across T111 input winding during Q20 conduction. CR115, CR116, R120, and L111 suppress reverse voltage on the T111 output winding for either polarity selected by S111.

(14) WIDTH ONE-SHOT. See figure FO-1. Width one-shot is a variable length one-shot circuit. It translates the negative half of the input differentiated pulse into rectangular pulse periods. Either one or both differentiated pulses is selected by PULSE MODE switch position:

- Advance mode—Q17 collector
- Delay mode—Q13 collector
- Double mode—Q13 and Q17 collector inputs.

The width one-shot is triggered by the leading edge of the negative differentiated pulse from either Q13 or Q17, or both. Circuit operation is similar to delay one-shot.

(15) Q21 stops conducting when the negative-going differentiated pulse is coupled through C133 to Q21 base from either CR84 or CR85. The positive-going pulse generated at the Q21 collector inhibits Q23 conduction. The emitter of Q23 sees positive voltage transient produced by the 30-V dc input through R146. Positive-going transient is coupled through selected WIDTH switch S131 capacitor, C136 thru C140, to Q22 base. Q22 starts conducting.

The period of Q22 conduction depends on the RC time constant of the Q22 base resistor network and the selected value of S131 switch capacitor. Ground return through R145 is open circuited by CR133 during Q22 conduction. Resistance network for Q22 base and S131 capacitor values are identical to delay one-shot. Refer to delay one-shot detailed theory for additional information on pulse periods.

Q22 stops conducting when its base voltage decreases to about -0.7 V dc. Q21 starts conducting when its emitter voltage reaches -0.6 V dc. The pulse output voltage developed at the Q21 collector drops and remains low until the next differentiated pulse is received at Q21 base.

Emitter-follower Q24 buffers output pulses from the Q21 collector. The leading edge of the output pulse is in phase with the leading edge of the negative-going differentiated pulse. For double pulse mode operation, width one-shot is triggered twice.

(16) PICKOFF AMPLIFIER. See figure FO-1. The pickoff amplifier generates trigger pulse outputs from the leading and trailing edges of the rectangular pulse input from the width one-shot circuit. The pickoff amplifier consists of differential amplifier Q25/Q26, output transformers T151 and T152, and associated components. The base of Q26 is biased at about 2.3 V dc through voltage divider R158/R159. C151 filters Q26 bias input. A power supply input of -200 V dc is connected to the output windings of T151 and T152; 30 V dc provides power for the input windings and the collector of Q25/Q26.

Initially, Q26 is conducting with an emitter voltage of about 1.7 V dc across R155. The rectangular pulse input is developed across R151 of emitter-follower Q24. Q25 begins conduction when the leading edge of the input pulse exceeds 2.3 V dc. An increase in emitter voltage across R155 stops conduction of Q26.

A positive-going voltage pulse is generated at the collector of Q26 and across the input winding of T152, terminals 2 and 1. Output voltage of T152 across terminals 4 and 3 is of opposite polarity from the voltage induced across input terminals 2 and 1. Thus, a positive-going transient at the collector of Q26 induces a negative spike at the T152 output. This on trigger output pulse has a negative potential exceeding -200 V dc. R157 and CR152 suppress the reverse voltage by returning the positive transient spike to -200 V dc.

Q25 continues to conduct and Q26 is disabled during the positive period of the input rectangular pulse. When the trailing edge of the input pulse is less than 2.3 Vdc, Q25 stops conducting and Q26 starts conducting. The negative voltage transient at the collector of Q26 is inverted by T152, but is suppressed by CR152 and R157.

The positive voltage transient at the collector of Q25 produces a negative spike across T151 output terminals 1 and 2. R152 and CR151 suppress positive reverse voltage. The negative transient developed across T151 is an off trigger output pulse with a negative potential exceeding -200 V dc.

The sequence of pulse generation continues when the leading edge of the next rectangular pulse is received at the base of Q25. On trigger output is in phase with the leading pulse edge. Off trigger output is in phase with the trailing pulse edge. The position of S131 determines the elapsed time between pulses.

17 ON/OFF PREDRIVERS. See figure FO-1. On/off predriver circuits condition input trigger pulses from the pickoff amplifier. Output pulses are generated that trigger the on/off drivers and latch. The on predriver circuit processes ontrigger pulse. The off trigger pulse is conditioned and inverted by the off predriver.

Q27 begins conducting when the negative-going on trigger pulse is received. A positive voltage transient across R302 is coupled to the base of Q28 through R303, and Q28 starts to conduct. Emitter-follower Q28 supplies its positive output pulse through C302 and R305 to the base of Q29.

Q29 begins conducting. The negative voltage transient produced at the collector of Q29 is coupled through T301 to supply two outputs. The T301 output at terminals 2 and 1 provides polarity reversal of the input signal. The positive output pulse is coupled to the base of Q29. This increases current gain of Q29, Positive feedback continues through T301 until the collector voltage of Q29 reaches its minimum level. Reverse voltage suppression for T301 feedback output is supplied through CR302, CR301, and R306, The negative voltage transient at the collector of Q29 produces a negative-and positive-going spike at T301 terminals 5 and 6. CR303 and R308 suppress reverse voltage at the Q29 collector, Q30 starts conducting when initial negative part of spike is received at its base through R309. The resulting negative output pulse at the emitter of Q30 is the on predriver output supplied to the on drivers circuit. This pulse starts the final output pulse from the signal generator. The following filter capacitors provide voltage stability as the input trigger pulse is processed:

- C301
- C304
- C325

C302 and C303 are signal coupling capacitors. C305 supplies positive feedback for Q30 during the period of output pulse.

Q31 begins conduction when the negative-going off trigger pulse is received. The positive voltage transient developed at the collector of Q31 is supplied to the base of Q32 through R323. Q32 begins conduction, producing a positive voltage transient across R324. This output is coupled to the base of Q33 through C322 and R325.

Q33 begins conducting and a negative voltage transient is seen at the collector of Q33. T321 inverts the negative pulse for the base of Q33 providing positive feedback during the pulse period. CR322, CR321, and R326 suppress generation of reverse voltage at T321.

The second output of T321 supplies a negative- and positive-going spike coupled across R329 to the base of Q34. CR323 and R328 suppress reverse voltage for the collector of Q33. Q34 starts conducting when the positive part of the spike is received. The positive voltage pulse developed across R330 is the off predriver output. This output is supplied to the off drivers circuit and ends the final output pulse period. Voltage stability is provided by filter capacitors C321 and C324. C322 and C323 are signal coupling capacitors.

18 19 ON/OFF DRIVERS, ON/OFF LATCH. See figure FO-1. On/off drivers supply high current gain for the predriver pulse inputs. The output pulses from on/off driver circuits provide two functions:

- Start final output pulse and trigger on/off latch
- Stop final output pulse and disable on/off latch.

The negative-going on input pulse is coupled through C331, C332, and C333 to parallel transistors Q35, Q36, and Q37. Base returns for parallel transistors are through R331, R332, and R333. The transistors begin conduction upon receipt of a negative input pulse. Collector current flow through R355 produces a positive voltage drop. The constant potential increase across R355 is the control grid trigger inputs that turn on final drivers V351 and V352. The grid trigger inputs are connected through R351 and R352 when the on drivers are conducting.

On/off latch transistor Q41 begins conducting when the on drivers start conducting. Prior to conduction, the open circuit emitter voltage for on drivers is -200 V dc. The conducting emitter voltage is about -199.4 V dc due to the voltage drop across parallel diodes CR362, CR363, CR364, and CR365. This increases the emitter voltage of Q41 through CR331 to about -198.8 V dc. The base voltage of Q41 is fixed at about -199.4 V dc through the voltage drop of CR333. The increase in emitter voltage allows Q41 to begin conduction.

Q41 collector current maintains the constant voltage drop across R355 when the on drivers stop conducting. Grid trigger inputs are now supplied through R353 and R354. Emitter resistance to ground for Q41 consists of R337 in series with parallel resistor R338/R339. R341 is the base return resistor. CR322 suppresses switching transients. Q41 continues to conduct until the off driver pulse is generated.

Off driver transistors Q38, Q39, and Q40 start to conduct upon receipt of the positive-going pulse from the off predriver circuit. The input pulse is coupled through C334, C335, and C336. R334, R335, and R336 are base return resistors.

The positive voltage drop across R355 is returned to -235 V dc through the conducting off drivers. The voltage levels for the control grid inputs are reduced. Final drivers V351 and V352 are turned off. Terminating the cathode current flow for V351 and V352 removes the forward bias for CR362, CR363, CR364, and CR365. The emitter voltage at Q41 decreases and Q41 stops conducting.

Q41 does not conduct again until the next on driver pulse is received.

20 FINAL DRIVERS. See figure FO-1. The final drivers are two parallel pentode vacuum tubes, V351 and V352, and related components. Output voltage pulses are generated at the
21 plates of final drivers during conduction periods. Components in the cathode pcb assembly provide the cathode bias for V351 and V352. On/off control pulses are supplied from on/off drivers. The amplitude of the output pulse is controlled by screen grid potential supplied from the screen grid circuits.

The cathodes of V351 and V352 are biased at -200 ±0.7 V dc by the cathode network components. Diodes CR361 thru CR366 supply bias stability by providing a short circuit to -200 V dc during switching periods. Filter capacitors C361 thru C366 provide a low-impedance return for switching transients between -200 V dc and ground. Resistors R361 and R363 thru R365 supply low-resistance coupling that reduces initial conduction transients.

On/off control pulses are generated by the on/off drivers across R355. On/off pulses are connected to the control grids of the final drivers through pins 1 and 5. A positive change in the control grid potential from the on pulse allows conduction of V351 and V352. A reduction in control grid potential from the off pulse stops conduction of the final drivers.

Plate output amplitude is controlled by the screen grid potential through pin 4 of the final drivers. Screen grid potential is coupled to V351 through R356, and to V352 through R357. Capacitors C351 thru C353 filter the screen grid input voltage. Screen grid circuits supply the required grid voltage through selection of S401 and/or adjustment of R373.

A heater voltage of 6.9 V rms is supplied to the final drivers through pins 2 and 7. R358 provides a reference return to -200 V dc.

22 SHIELD ASSEMBLY. See figure FO-1. Shield assembly components provide an output impedance of 50 ohms for output amplitude ranges between 0.2 and 50 volts, and 1500 ohms for 100 volts.

Resistors R391 and R392 supply an output impedance of about 1500 ohms when S401 selects the 100-volt range. R392 is connected between chassis ground and zero reference ground. The effective series resistance of both resistors is approximately 1500 ohms.

Parallel resistors R401 thru R406 supply an output impedance of 50 ohms for all S401 switch positions between 0.2 and 50 volts. Capacitors C401 and C402 filter switching transients. Parallel resistance of series resistors R391 and R392 reduces the effective output impedance by less than 1.5 ohms.

23 BALUN ASSEMBLY. See figure FO-1. The balun assembly is the coupling interface between S401 and PULSE POLARITY switch S391. The selected contact of S401-5R provides the pulse signal input to the balun assembly. Zero reference ground is connected to the balun assembly and isolated from the negative pulse signal. Both isolated balun outputs are supplied to S391. Signal coupling and isolation within the balun assembly allow the output signal to be referenced to the chassis ground.

24 PULSE POLARITY SWITCH. See figure FO-1. PULSE POLARITY switch S391 selects polarity of the balun input signal with respect to input zero reference ground. The input pulse signal from the plates of V351 and V352 is positive with respect to cathode voltage. It is negative when referenced to zero reference ground. Original polarity of the output pulse signal is selected by S391 in the negative position. Positive position of S391 reverses the polarity of the pulse signal. Isolated signal outputs from the balun assembly and S391 are referenced to the chassis ground.

25 AMPLITUDE SWITCH ASSEMBLY. See figure FO-1.Amplitude witch assembly S401 is a rotary selector switch that selects a range of output pulse amplitude. Nine ranges are available, from 80 millivolts to 100 volts. Amplitude vernier R373 allows variable control of
26 output amplitude within a selected range. The amplitude pcb assembly is the resistor attenuator network, R411 thru R419. The attenuator reduces output amplitude to selected values for all ranges below 20 volts.

S401 interfaces with screen grid circuits, the shield assembly, and the attenuator. Two signal paths are affected in the screen grid circuits:

- R373 through S401-4F interface with screen grid overload detect
- -200 V dc bias input to R373 through S401-4R.

S401 directly connects the pulse amplitude of final drivers to PULSE OUTPUT connector J4 for the following ranges:

- 100 volts
- 50 volts
- 20 volts.

The pulse amplitude of these ranges is controlled by the screen grid circuits. Output amplitude of the final drivers is constant for all selected ranges between 0.2 and 20 volts. Selected resistive paths in the attenuator network reduce the input pulse amplitude to the desired value.

For example, if the R373 vernier is adjusted fully counterclockwise and S401 is set to 10 volts output, the input pulse amplitude to R412 is 20 volts. The connected resistive load is R412 in series with the parallel resistance value of R414 and R417, plus an external load of 50 ohms. The parallel resistance value is 34 ohms and the output voltage at the junction of R412 and R417 is 13 V dc. A voltage drop across R417 is about 3 volts. Output voltage across the external load is 10 volts.

(27) SCREEN GRID CIRCUITS. See figure FO-1. Screen grid circuits consists of screen grid overload detect and screen grid power supply.

The screen grid power supply provides screen grid voltage for V351 and V352 through emitter-followers Q42 and Q43. The pulse amplitude is varied by adjusting the Q43 base bias with the R373 vernier potentiometer. C371 filters the Q43 bias input and R371 is the Q43 emitter return to -200 V dc.

The screen grids draw excessive current during an amplitude overload condition. An increase in the Q43 collector current results in an increased voltage drop across R382. The R382 voltage drop is connected to the base of Q44 through R381. CR381 and CR382 prevent the voltage drop from exceeding 1.4 V dc.

Q44 starts conducting when the R382 voltage drop exceeds 0.7 V dc. The collector of Q44 is connected to the base of Q505 in the overload circuit. Q505 triggers an overload shutdown in the power supply when Q44 begins conducting.

The bias input and zero reference return voltage paths for R373 are controlled by the position of S401. Basic bias components are R378, R373, and R372.

With S401 set to 100 volts, -200 V dc bias is connected through R379 to R378. R373 return path includes R374.

With S401 set to 50 volts, -200 V dc bias is connected directly to R378. R373 return path is connected to the zero reference return.

The -200 V dc bias is connected to R378 for switch positions of 50 volts and below. The R373 return path includes R375 for switch positions of 20 volts and below.

R373 is the only amplitude control for S401 switch positions:

- 100 volts
- 50 volts
- 20 volts.

For output less than 20 volts, the attenuator network provides the required signal reduction and R373 supplies variable control for the selected range.

28 29 INPUT POWER COMPONENTS. See figure FO-2. POWER ON switch S501 supplies ac power to power on lamp DS501, cooling fan B501, and T501 which is rated at 3 amps, 250 volts and provides circuit protection for input power components.

The ac input can be either 115 or 230 volts. Slide switch S502 connects either input to the required primary winding(s). Both primary windings are connected for 115 volts input. Only the bottom primary winding is connected for 230 volts input. Either input lights DS501. R501 reduces current flow through DS501 to a safe level. C571 provides capacitive coupling between the primary power input and B501.

T501 secondary windings supply ac power to the cathode heaters, the overload circuit, and the power supply circuits.

30 OVERLOAD CIRCUIT. See figure FO-2. The overload circuit supplies protection for:

- Amplitude overload
- Excessive duty cycle
- Output short circuit for the -200 V dc power supply.

OVERLOAD lamp DS511 lights during overload periods. input ac power is rectified by CR511 thru CR514. C511 filters dc voltage input.

An amplitude overload starts conduction of Q44 in the screen grid circuits. The base voltage of Q505 is reduced and Q505 stops conducting. Q507 stops conducting. Q504 starts conducting when its base voltage increases to 0.7 V dc.

Conduction of Q504 supplies a return path for CR519 and CR520 through Q504 to zero reference ground. The base voltage of Q501 is grounded through CR519 and Q504. Q501 stops conducting. Loss of base current to series pass transistors stops conduction of Q502 and Q515 thru Q517. An increase in voltage across R513 lights DS511. The overload shutdown sequence is complete.

The minimum overload shutdown period is about 1 second. Q507 stops conducting at the beginning of overload shutdown. C516 begins charging through R523 and R524. The rate of voltage increase at the Q507 emitter depends on the RC time constant of R523 and C516. This is approximately 1 second. The Q507 emitter is forward biased about 1 second after shutdown. Q5Q7 will start conducting if amplitude overload has been removed. The base of Q505 returns to about 0.7 V dc with removal of the amplitude overload.

The startup sequence includes the following events:

- Q505 and Q507 start conducting
- Q504 stops conducting

- Q501 starts conducting
- Series pass transistors start conducting
- DS511 is turned off by a voltage drop across R513.

An excessive duty cycle will trigger overload shutdown. C515 is charged through R523 when the output pulse is off. C515 discharges through Q501 when the output pulse is on.

A voltage drop across C515 will forward bias CR521 if the output pulse exceeds the duty cycle limit. C516 discharges through R524, CR521, and Q501. Emitter voltage at Q507 decreases and Q507 stops conducting. Q505 stops conducting and the shutdown sequence begins.

Short circuit current through R520 sharply increases the positive voltage drop across R520. A positive-going pulse is sensed at the base of Q503. Theemitterof Q503hasafixed bias through voltage divider R522/R523. Q503 is forward biased by a positive pulse and Q503 starts conducting. C516 is discharged through R524and Q503. A voltage drop at the collector of Q503 reduces the emitter voltage of Q507. Q507 and Q505 stop conducting and the shutdown sequence begins.

31 POWER SUPPLY. See figure FO-2. The power supply consists of four dc regulators:

- -200 V dc
- -235 V dc
- +30 V dc
- -30 V dc.

Input ac voltage of 210 V rms is rectified by CR515 through CR518 for the -200 V dc regulator, C512 filters dc input voltage. The initial voltage transient at turn-on is developed across R514 and R515. Voltage across R515 is coupled through CR524 to the base of Q504. The surge voltage is summed with the constant bias voltage through R527 and CR526. Q504 starts conducting. The input base voltage for series pass transistors Q502 and Q515 thru Q517 is reduced, Initial surge current is limited by R516 and returned to ground through Q504. Initial Q504 conduction prevents the surge current from damaging series pass transistors Q502 and Q515 thru Q517.

The output voltage of the -200 V dc regulator is controlled by series pass transistor Q508. C518 filters the output. Emitter voltage is referenced to about -6.9 V dc across R532 by CR529 and CR526. CR526 blocks positive transients. A percentage of the regulator output level is used for the Q508 base bias through R535. The conduction level of Q508 depends on the output voltage amplitude.

A decrease in Q508 conduction is seen for output levels below -200 V dc. The emitter of Q506 is referenced to about -13 V dc by CR525. Q506 starts conducting when its base voltage is greater than -12.4 V dc. A decrease in Q508 conduction reduces the positive level of the Q506 base input voltage and Q506 conduction. The reduced current flow through Q506 collector increases the Q501 base bias. An increase in Q501 conduction results in the following:

- Bias increase for Q502 and Q515 thru Q517
- Output current increase through Q502 and Q515 thru Q517.

The process is reversed for output levels above -200 V dc. The control sequence follows:

- Conduction is increased for Q508 and Q506
- Bias and conduction of Q501 is reduced
- Output current flow is reduced through Q502 and Q515 thru Q517.

The -235 V dc regulator is referenced to -200 Vdc. Regulator output is controlled at -35 V dc below the -200 V dc return reference. An input ac voltage of 32 V rms is rectified by CR541 thru CR544. C541 filters the input dc voltage and C542 filters the output voltage. CR549 supplies turn-on stability.

Operational amplifier 2501 controls the regulator output voltage. The negative input of Z501 is referenced by CR548 across R544. The positive reference voltage through R546 is equal to the Z501 negative input when regulator output is -235 V dc. Operating voltage for Z501 is supplied through pin 6. Positive transients in the supply voltage are blocked by CR547.

A decrease in regulator output voltage below -235 Vdc increases the positive voltage level for the Z501 positive reference input. A positive increase of 2501 output voltage increases the base bias of Q510 and the output current flow through Q510. R543 and CR546 provide a reference voltage path for the Q510 base bias and the Q509 collector.

An increase in regulator output voltage reduces the level of positive reference for 2501. The positive output of Z501 is reduced and the output current flow through Q510 is decreased.

Q509 provides short circuit current protection for the -235 V dc regulator. Excessive current flow through parallel resistors R541 and R542 forward bias Q509 through CR545. Q509 begins conducting. The bias potential for Q510 is reduced through Q509 return. Output current flow through Q510 is decreased or terminated, depending on the amount of excess current.

The ±30 V dc regulators are referenced to the chassis ground. Acinputs of 32 V rms are rectified by CR551, CR552, CR561, and CR562. Polarity reference of ac inputs is established by a ground connection between the two input windings. C551 and C561 filter dc inputs to the ±30 V dc regulator.

Dc/dc regulator Z504 supplies regulation for +30 V dc output. C564 filters the input to Z504. C566 filters the Z504 output. Voltage divider R575/R576 supplies an output reference connected to adjust the input of Z504. C552 filters the +30 V dc regulator output. CR557 provides turn-on stability.

The -30 V dc output is regulated by Z503. C567 filters Z503 input voltage. C569 filters Z503 output. Voltage divider R578/R577 supplies an output reference to adjust the input of Z503. C562 filters the -30 V dc regulator output. CR566 provides output stability during turn-on.

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 Pulse Signal Generator SG-1205(V)1/U are listed in the Maintenance Allocation Chart (MAC), TM 11-6625-3050-12, Appendix B.

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

There are no special tools, TMDE, or support equipment required for general support maintenance of the signal generator.

2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list, TM 11-6625-3050-24P, covering organizational and general support maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

2-4. SERVICE UPON RECEIPT OF MATERIEL.

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

(1) Open shipping carton and remove equipment.

(2) Place equipment on a suitable clean and dry surface for inspection.

(3) Keep all shipping materials for use in repacking and reshipping.

b. Checking Unpacked Equipment.

(1) Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF-364, Report of Discrepancy (ROD).

(2) Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

(3) Check to see whether the equipment has been modified.

2-5. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT.

a. If input line voltage being used does not match power transformer configuration, reconfigure power transformer primary taps as shown below.

LINE VOLTAGE	PAD CE	PAD CH
100/200 V ac	Blk/Wht wire	Red/Wht wire
115/230 V ac	Brn wire	Orn wire
125/250 V ac	Blk/Yel wire	Red/Blk wire

b. Do performance test. See paragraph 2-38.

Section III. TROUBLESHOOTING

SYMPTOM INDEX

2-6. GENERAL.

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

NOTE

- Before using the troubleshooting table, check your work order and talk to organizational maintenance, if possible, for a description of the symptoms and the steps that have been taken to correct them.
- Check all forms and tags attached to, or accompanying, the equipment to determine the reason for removal from service.

2-7. EQUIPMENT INSPECTION.

The following inspection procedures shall be used ato locate obvious malfunctions within the signal generator.

a. Remove top and bottom covers as required to access components. See paragraph 2-37.

WARNING

Signal generator contains high voltages. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

b. Inspect printed circuit boards for discoloration, cracks, breaks, and warping. A slight discoloration is normal.

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

d. Inspect all assemblies for burnt or loose components.

e. Inspect equipment for broken, cut, or loose wires.

2-8. USING THE TROUBLESHOOTING TABLE.

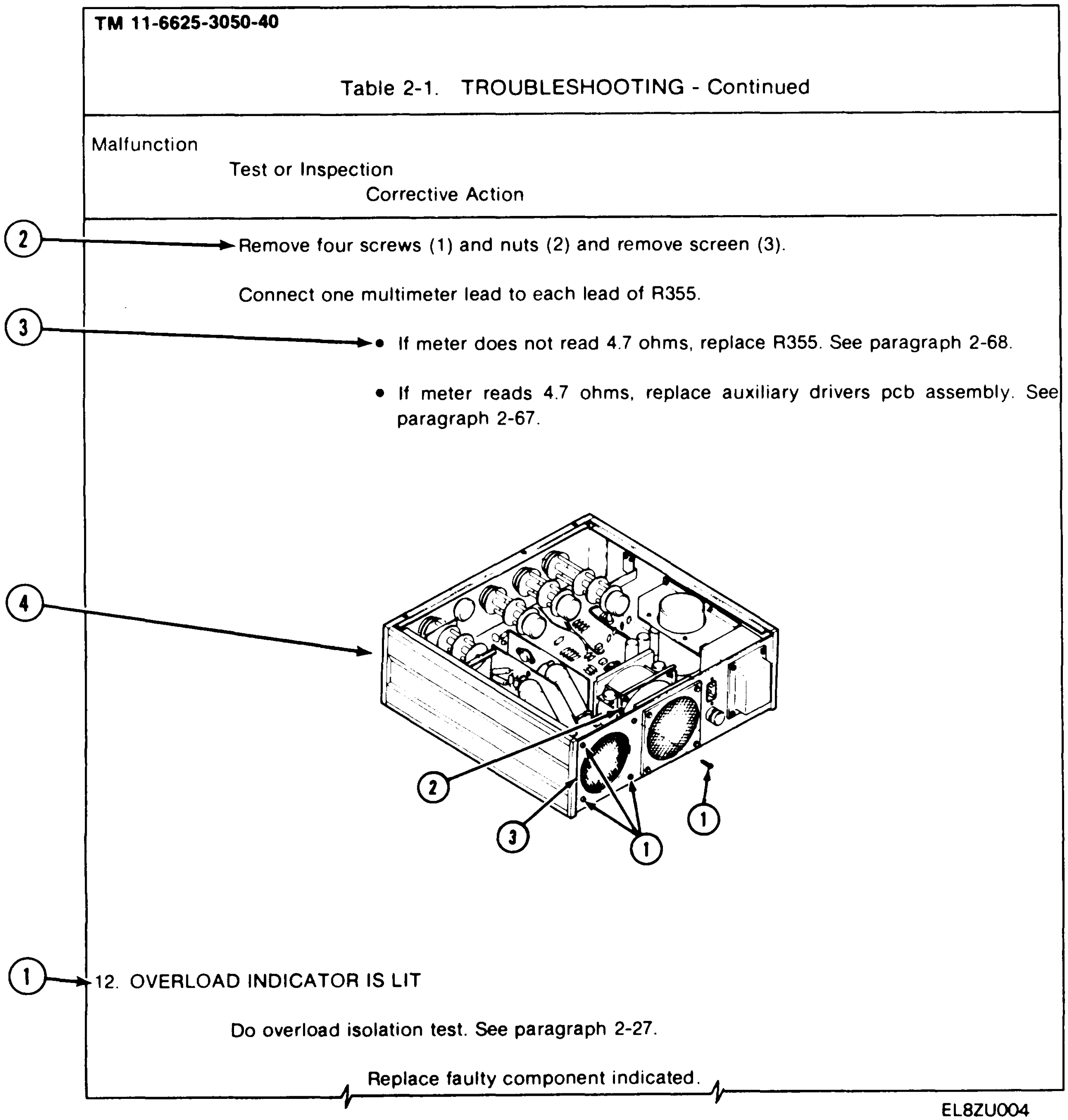
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Table 2-1. TROUBLESHOOTING - Continued

Malfunction
Test or Inspection
Corrective Action

(2) Remove four screws (1) and nuts (2) and remove screen (3).

Connect one multimeter lead to each lead of R355.

(3)
- If meter does not read 4.7 ohms, replace R355. See paragraph 2-68.
- If meter reads 4.7 ohms, replace auxiliary drivers pcb assembly. See paragraph 2-67.

(4)

(1) 12. OVERLOAD INDICATOR IS LIT

Do overload isolation test. See paragraph 2-27.

Replace faulty component indicated.

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1. Malfunctions are those that cause symptoms seen or heard at the equipment without using test equipment.

2. Test or inspections are procedure steps that isolate the damaged part.

3. Corrective action tells technician what needs to be done to correct the problem.

4. Illustrations show what the text is talking about.

2-9. TROUBLESHOOTING TABLE.

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

NOTE

- This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify next higher level of maintenance.

- Resistance values given for capacitors and diodes are nominal values.

Table 2-1. TROUBLESHOOTING

Malfunction
Test or Inspection
Corrective Action

1. NO PULSE OUTPUT

Step 1. Check that power indicator is lit.

Set POWER switch to ON.

- If indicator is lit, go to step 3.
- If indicator is not lit, replace indicator. See paragraph 2-51.
- If indicator is still not lit, replace S501. See paragraph 2-47.

Step 2. Check that resistance of R501 is between 10.8 and 13.2 ohms.

Replace R501. See paragraph 2-53.

Step 3. Check that pulse output is absent with AMPLITUDE VOLTS switch set to 20,50, and 100.

Set AMPLITUDE VOLTS switch, in turn, to 20, 50, and 100.

- If pulse is present only with switch set to 100, do shield assembly test. See paragraph 2-10.
- If pulse is present only with switch set to 20, 50, and 100, replace amplitude switch assembly. See paragraph 2-45.

Table 2-1. TROUBLESHOOTING - Continued

Malfunction

Test or Inspection

Corrective Action

Step 4. Check that pulse output is absent with PULSE MODE switch set to ADV, to DELAY, and to DBL.

- If pulse is present only with switch set to DBL, replace CR85. See paragraph 2-64.
- If pulse is present with switch set to ADV, but absent with switch set to DELAY, replace PULSE MODE switch. See paragraph 2-46.
- If pulse is present with switch set to ADV or to DELAY, but second pulse is absent with switch set to DBL, replace CR84. See paragraph 2-64.
- If pulse is present on DELAY, but absent on ADV, go to step 9.

Step 5. Do power supply output test. See paragraph 2-11.

Replace faulty component indicated.

Step 6. Do sync output test. See paragraph 2-12.

Replace faulty component indicated.

Step 7. Do output amplifier test. See paragraph 2-13.

Replace faulty component indicated.

Step 8. Do pulse polarity switch test. See paragraph 2-14.

Replace faulty component indicated.

Step 9. Do pulse differentiator advance circuit test. See paragraph 2-15.

Replace faulty component indicated.

2. SIGNAL GENERATOR BLOWS FUSES

Step 1. Do power supply input circuits test. See paragraph 2-16.

Replace faulty component indicated.

Step 2. Do regulator filter test. See paragraph 2-17.

Replace faulty component indicated.

Table 2-1. TROUBLESHOOTING - Continued

Malfunction
Test or Inspection
Corrective Action

Step 3. Do power supply filament circuit test. See paragraph 2-18.

Replace faulty component indicated.

Step 4. Do regulator isolation test. See paragraph 2-19.

Replace faulty component indicated.

3. NO SYNC OUTPUT

Do sync output test. See paragraph 2-12.

Replace faulty component indicated.

4. SIGNAL GENERATOR CANNOT BE TRIGGERED EXTERNALLY

Do external trigger amplifier test. See paragraph 2-20.

Replace faulty component indicated.

5. SIGNAL GENERATOR CANNOT BE TRIGGERED WITH REPETITION RATE SWITCH INA KHz OR MHz POSITION

Do repetition rate oscillator test. See paragraph 2-21.

Replace faulty component indicated.

6. SIGNAL GENERATOR CANNOT BE TRIGGERED MANUALLY

Step 1. Check that resistance is 0 ohm between pins 2 and 3 of SINGLE CYCLE switch with switch pushed in.

Remove top cover. See paragraph 2-37.

Table 2-1. TROUBLESHOOTING - Continued

Malfunction

Test or Inspection

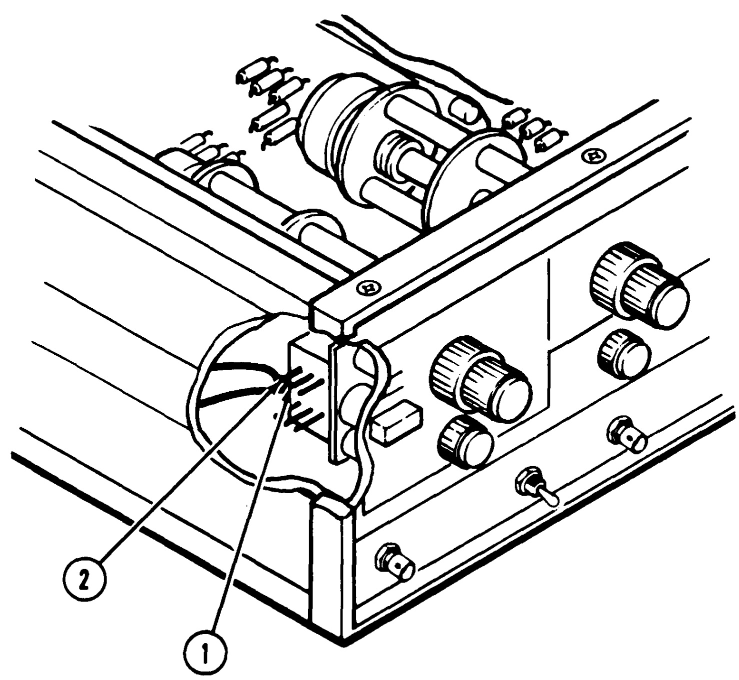
Corrective Action

WARNING

Signal generator contains high voltages. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

Connect one multi meter lead to pin 2 (1) and other lead to pin 3 (2). Push in switch.

Replace SINGLE CYCLE switch. See paragraph 2-49.



Step 2. Check that resistance of R52 is between 200 and 230 ohms.

See figure FO-3. Connect one multimeter lead to each end of R52.

Replace R52. See paragraph 2-64.

Table 2-1. TROUBLESHOOTING - Continued

Malfunction

Test or Inspection

Corrective Action

Step 3. Check that resistance of R51 is between 3.1 and 3.5 kilohms.

See figure FO-3. Connect one multimeter lead to each end of R51.

Replace R51. See paragraph 2-64.

Step 4. Check that resistance of C52 is more than 1 megohm.

See figure FO-3. Connect positive (+) multi meter lead to front lead of C52 and negative (-) lead to rear lead of C52.

Replace C52. See paragraph 2-64.

7. SIGNAL GENERATOR CANNOT BE GATED ON

Do gate control circuit test. See paragraph 2-22.

Replace faulty component indicated.

8. OUTPUT PULSE POSITION DOES NOT CHANGE WHEN SETTING OF DELAY ADVANCE CONTROL IS CHANGED

Do delay one-shot circuit test. See paragraph 2-23.

Replace faulty component indicated.

9. OUTPUT PULSE WIDTH DOES NOT CHANGE WHEN SETTING OF WIDTH SWITCH IS CHANGED

Check that pulse width of signal at TP1K changes when setting of WIDTH switch is changed.

Remove top cover. See paragraph 2-37.

Plug power cable into power source and set POWER switch to ON.

Table 2-1. TROUBLESHOOTING - Continued

Malfunction

Test or Inspection

Corrective Action

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

See figure FO-4. Connect oscilloscope probe to TP1K.

Change setting of WIDTH switch.

- If pulse width changes, do pickoff amplifier test. See paragraph 2-24.
- If pulse width does not change, do width one-shot test. See paragraph 2-25.

10. OUTPUT PULSE AMPLITUDE CANNOT BE ADJUSTED USING VERNIER CONTROL

Do screen grid supply test. See paragraph 2-26.

Replace faulty component indicated.

11. OUTPUT PULSE APPEARS AS TWO SPIKES

Check that resistance of R355 is between 4.23 and 5.17 ohms. See figure FO-7.

Remove top and bottom covers. See paragraph 2-37.

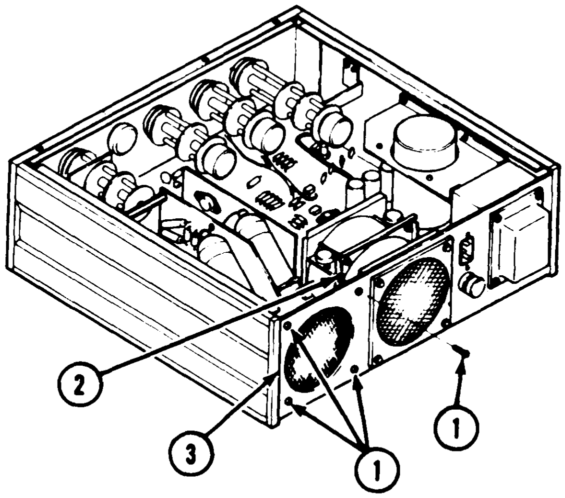
Table 2-1. TROUBLESHOOTING - Continued

Malfunction
Test or Inspection
Corrective Action

Remove four screws (1) and nuts (2) and remove screen (3).

Connect one multimeter lead to each lead of R355.

- If meter does not read between 4.23 and 5.17 ohms, replace R355. See paragraph 2-68.
- If meter reads between 4.23 and 5.17 ohms, replace auxiliary drivers pcb assembly. See paragraph 2-67.



12. OVERLOAD INDICATOR IS LIT

Do overload isolation test. See paragraph 2-27.

Replace faulty component indicated.

13. PULSE WIDTH ERRATIC

Do width one-shot test. See paragraph 2-25.

Replace faulty component indicated.

Table 2-1. TROUBLESHOOTING - Continued

Malfunction
Test or Inspection
Corrective Action

14. TOP OF OUTPUT PULSE CONTAINS RIPPLE OR IS NOT FLAT

Check that all wires connecting cathode pcb assembly to auxiliary drivers pcb assembly are in place and secure,

Remove top cover. See paragraph 2-37.

Replace cathode pcb assembly. See paragraph 2-67.

2-10. SHIELD ASSEMBLY TEST.

DESCRIPTION

This test is to make sure that shield assembly components are not faulty.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

SHIELD ASSEMBLY TEST - Continued

1. Set AMPLITUDE VOLTS switch to 100.

WARNING

Signal generator contains high voltages. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

2. Check that resistance of shield assembly network is between 59.6 and 60.8 ohms. See figure FO-5.

   - Connect one multi meter lead to center conductor of cable at E401 and connect other lead to cable shield.
   - If meter reads more than 60.8 ohms, go to step 3.
   - If meter reads less than 59.6 ohms, go to step 4.
   - If meter reads between 59.6 and 60.8 ohms, test is complete.

3. Check that resistance of resistors R401, R402, R403, R404, R405, and R406 is between 298 and 304 ohms, See figures FO-5 and FO-6.

   - Unsolder and lift one lead of each resistor.
   - Connect one multimeter lead to each lead of each resistor.
   - If resistance of any resistor is not between 298 and 304 ohms, replace resistor. See paragraph 2-64.
   - Connect resistor leads.

4. Check that resistance of capacitors C401 and C402 is more than 2 megohms. See figure FO-5.

   - Unsolder and lift one lead of each capacitor.
   - Connect one multimeter lead to each lead of each capacitor.

SHIELD ASSEMBLY TEST - Continued

- If resistance of either capacitor is not more than 2 megohms, replace capacitor. See paragraph 2-64.
- Connect capacitor leads.

END OF TEST

2-11. POWER SUPPLY OUTPUT TEST.

DESCRIPTION

This test is to isolate a power supply fault to a regulator circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

1. Check that voltage at TP5F is between -190 and -210 V dc. See figures FO-3 and FO-4.

   - Connect negative (-) multimeter lead to positive (+) lead of C518 and positive (+) lead to TP5F.

POWER SUPPLY OUTPUT TEST - Continued

- Plug power cord into power source and set POWER switch to ON.

- If meter does not read within limits given, do -200 volt regulator test. See paragraph 2-28.

2. Check that voltage at TP5G is between -224 and -246 V dc. See figures FO-3 and FO-4.

   - Connect negative (-) multimeter lead to positive (+) lead of C518 and positive (+) lead to TP5G.

   - If meter does not read within limits given, do -235 volt regulator test. See paragraph 2-29.

3. Check that voltage at TP5H is between 28 and 32 V dc. See figure FO-4.

   - Connect negative (-) multimeter lead to chassis and positive (+) lead to TP5H.

   - If meter does not read within limits given, do +30 volt regulator test. See paragraph 2-30.

4. Check that voltage at TP5J is between -28 and -32 V dc. See figure FO-4.

   - Connect negative (-) multimeter lead to chassis and positive (+) lead to TP5J.

   - If meter does not read within limits given, do -30 volt regulator test. See paragraph 2-31.

END OF TEST

2-12. SYNC OUTPUT TEST.

DESCRIPTION

This test is to isolate a fault within the sync output circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

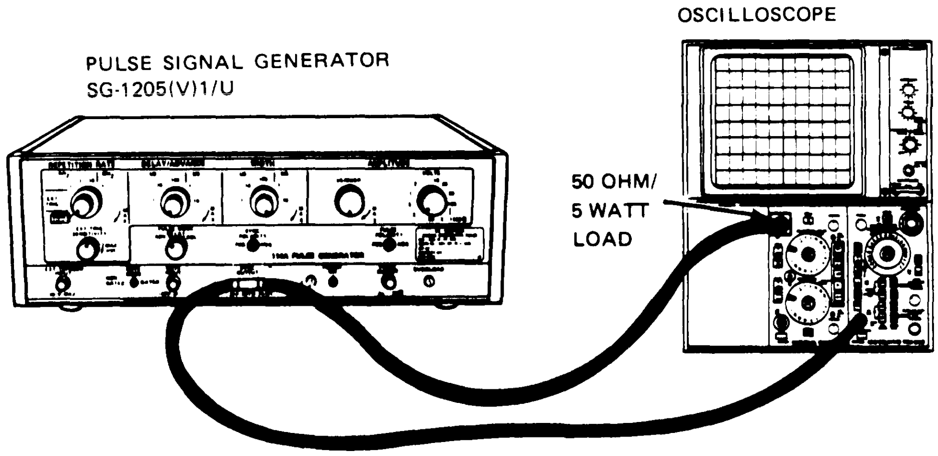
High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

1. Plug power cable into power source.

2. Connect signal generator and oscilloscope.



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SYNC OUTPUT TEST - Continued

3. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	1 MHz
Vernier	Cw
DELAY/ADVANCE	1 ms
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
POWER	ON

4. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	5 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	Out
AC COUPL	In
TRIG SOURCE	EXT
SEC/DIV	1 µs

5. Set signal generator SYNC POLARITY switch to NEG.

- Oscilloscope will display about one negative pulse per division, about 5 divisions high.

6. Change signal generator SYNC POLARITY switch to POS.

- Oscilloscope will display about one positive pulse per division, about 5 divisions high.
- If correct pulses are displayed in steps 5 and 6, test is complete.
- If correct pulses are displayed in steps 5 and 6, but overshoot is present on trailing edges, replace CR116. See paragraph 2-53.
- If correct pulse is displayed in one step, but pulse is absent in other step, replace SYNC POLARITY switch. See paragraph 2-48.
- If pulse is absent in both steps, go to step 7.

7. Remove cable from oscilloscope CH1 jack and connect 1X probe.

SYNC OUTPUT TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

8. Check that resistance of R118 is between 45.9 and 56.1 ohms.
   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R118.
   - If meter does not read between 45.9 and 56.1 ohms, replace R118. See paragraph 2-53.
9. Check for presence of pulses at anode of CR81. See figure FO-3.
   - Connect oscilloscope probe to anode of CR81.
   - Set POWER switch to ON.
   - If pulses are absent, do pulse timing circuits test. See paragraph 2-32.
10. Check for presence of pulses at TP1H. See figure FO-4.
    - Connect oscilloscope probe to TP1H.
    - If pulses are absent, go to step 21.
11. Set POWER switch to off.
12. Unsolder and lift one lead each of R119 and R120. See figure FO-3.
13. Tag, unsolder, and lift left rear (pin 3) and right rear (pin 2) leads of T111.
14. Check forward resistance of diodes CR 114, CR115, and CR116. See figure FO-3.
    - Connect negative (-) multimeter lead to cathode and positive (+) lead to anode of each diode. Note meter reading for each diode.
    - If any meter reading is greater than 100 ohms, replace diode. See Paragraph 2-64.

SYNC OUTPUT TEST - Continued

15. Check reverse resistance of diodes CR114, CR115, and CR116. See figure FO-3.

- Connect positive (+) multimeter lead to cathode and negative (-) lead to anode of each diode. Note meter reading for each diode.

- If any meter reading is less than 100 kilohms, replace diode. See paragraph 2-64.

16. Check continuity of T111 windings.

- Connect one multimeter lead each to right front and right rear leads of T111. Note meter reading.

- Connect one multimeter lead each to left front and left rear leads to T111. Note meter reading.

- If either reading is more than 2 ohms, replace T111. See paragraph 2-64.

17. Check resistance of R119 and R120. See figure FO-3.

- Connect one multimeter lead to each lead of R119. Meter should read between 95 and 105 ohms.

- Connect one multimeter lead to each lead of R120. Meter should read between 209 and 231 ohms.

- If either meter reading is not within limits given, replace resistor. See paragraph 2-64.

18. Check resistance of L111. See figure FO-3.

- Connect one multimeter lead to each lead of L111. Note meter reading.

- If meter does not read less than 5 ohms, replace L111. See paragraph 2-64.

19. Connect leads of R119 and R120.

20. Connect leads of T111 as tagged.

21. Check for presence of pulses at anode of CR113. See figure FO-3.

- Connect oscilloscope probe to anode of CR113.

- Set POWER switch to ON.

- If pulses are present, go to step 22.

- If pulses are absent, go to step 24.

SYNC OUTPUT TEST - Continued

22. Check for presence of pulses at cathode of CR113. See figure FO-3.

- Connect oscilloscope probe to cathode of CR113.
- If pulses are present, go to step 23.
- If pulses are absent, replace CR113. See paragraph 2-64.

23. Check resistance of R116 and R117. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R116. Meter should read between 2.56 and 2.84 kilohms.
- Connect one multimeter lead to each lead of R117. Meter should read between 22.8 and 25.2 ohms.
- If either reading is not within limits given, replace resistor. See paragraph 2-64.
- If both readings are within limits given, replace Q20. See paragraph 2-64.

24. Check for presence of pulses at base of Q19. See figure FO-3.

- Connect oscilloscope probe to rear lead of R112.
- Set POWER switch to ON.
- If pulses are absent, go step 25.
- If pulses are present, go to step 28.

25. Check for presence of pulses at anode of CR111. See figure FO-3.

- Connect oscilloscope probe to anode of CR111.
- If pulses are absent, replace CR111. See paragraph 2-64.

26. Check resistance of R111. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to anode of CR111 and connect positive (+) lead to front lead of R111. Meter should read between 710 and 790 ohms.
- If meter does not read within limits given, replace R111. See paragraph 2-64.

SYNC OUTPUT TEST - Continued

27. Check resistance of R112. See figure FO-3.

- Connect negative (-) multimeter lead to front lead of R112 and positive (+) lead to rear lead of R112. Meter should read between 1425 and 1575 ohms.

- If meter does not read within limits given, replace R112. See paragraph 2-64.

28. Check for presence of pulses at emitter of Q19. See figure FO-3.

- Connect oscilloscope probe to right lead of R113.

- Set POWER switch to ON.

- If pulses are absent, go to step 29.

- If pulses are present, go to step 31.

29. Check resistance of C113. See figure FO-3.

- Set POWER switch to off.

- Connect negative (-) multimeter lead to right lead of R113 and positive (+) lead to right lead of R117.

- If meter does not read more than 1 megohm, replace C113. See paragraph 2-64.

30. Check resistance of R113. See figure FO-3.

- Connect negative (-) multimeter lead to right lead of R113 and positive (+) lead to ground.

- If meter does not read between 209 and 231 ohms, replace R113. See paragraph 2-64.

31. Check voltage at collector of Q19. See figure FO-3.

- Set oscilloscope COUPLING switch to DC.

- Connect oscilloscope probe to anode of CR113.

- Set POWER switch to ON.

- If scope indicates about -5 V dc, replace Q19. See paragraph 2-64.

- If scope indicates about -30 V dc, replace Q19 and CR112. See paragraph 2-64.

- If scope indicates 0 V dc, go to step 32.

SYNC OUTPUT TEST - Continued

32. Check resistance of R114 and R115. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to front lead of R114 and positive (+) lead to rear lead of R114. Meter should read between 3135 and 3465 ohms.
- Connect one multimeter lead to each lead of R115. Meter should read between 950 and 1050 ohms.
- If either reading is not within limits given, replace resistor. See paragraph 2-64.

33. Check resistance of C111 and C112. See figure FO-3.

- Unsolder and lift one lead each of C111 and C112.
- Connect one multimeter lead to each lead of C111. Meter should read more than 2 megohms.
- Connect negative (-) multimeter lead to right (-) lead of C112 and positive (+) lead to left (+) lead of C112. Meter should read more than 1 megohm.
- If either reading is not within limits given, replace capacitor. See paragraph 2-64.
- Connect leads of C111 and C112.

END OF TEST

2-13. OUTPUT AMPLIFIER TEST.

DESCRIPTION

This test is to isolate a fault within the output amplifier.

INITIAL SETUP

General Safety Instructions:

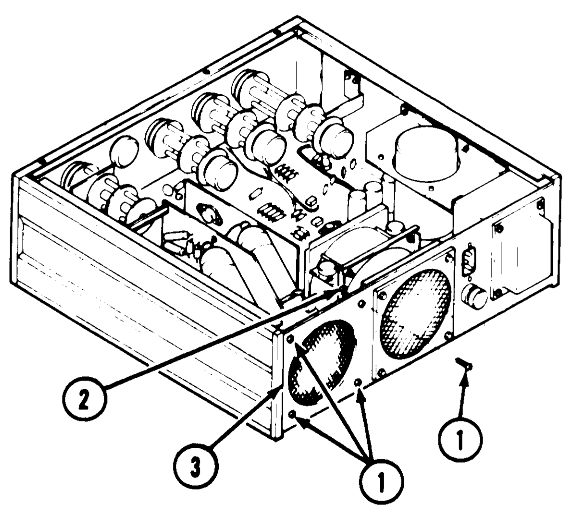
WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top and bottom covers. See paragraph 2-37.

1. Working at rear of signal generator, remove four screws (1) and nuts (2) and remove screen (3).



OUTPUT AMPLIFIER TEST - Continued

2. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Ccw
GATE MODE	NON GATED
PULSE MODE	DELAY
PULSE POLARITY	NEG
POWER	OFF

3. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

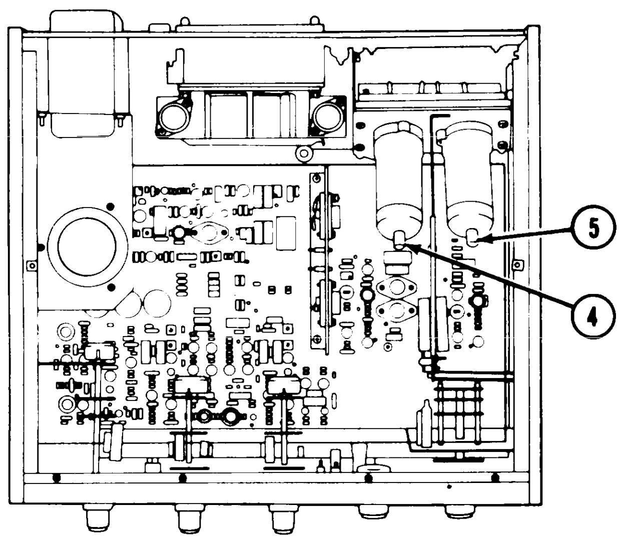
4. Check amplitude of pulses at plate of V351 with V352 removed.

- Remove V352. See paragraph 2-66.

- Connect oscilloscope probe clip lead to chassis.

OUTPUT AMPLIFIER TEST - Continued

- Connect oscilloscope probe to plate cap of V351 (4).
- Set POWER switch to ON.
- Check amplitude of pulses on oscilloscope.
- Set POWER switch to off.
- Install V352. See paragraph 2-66.



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5. Check amplitude of pulses at plate of V352 with V351 removed.
   - Remove V351. See paragraph 2-66.
   - Connect oscilloscope probe clip lead to chassis.
   - Connect oscilloscope probe to plate cap of V352 (5).
   - Set POWER switch to ON.
   - Check amplitude of pulses on oscilloscope.
   - Set POWER switch to off.
   - Install V351. See paragraph 2-66.

OUTPUT AMPLIFIER TEST - Continued

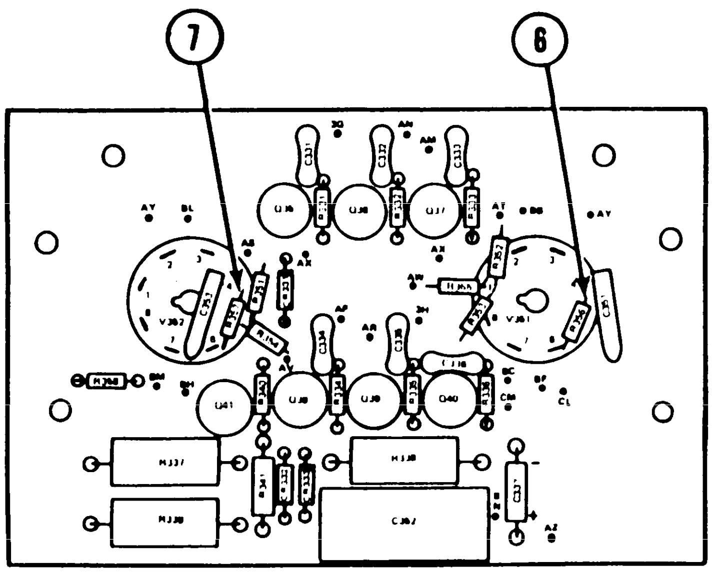
- If pulses are absent at steps 4 and 5, go to step 6.
- If amplitude in step 4 is less than amplitude in step 5 by three or more minor divisions on oscilloscope, go to step 10.
- If amplitude in step 5 is less than amplitude in step 4 by three or more minor divisions on oscilloscope, go to step 11.
- If amplitudes in steps 4 and 5 are within three minor divisions of each other on oscilloscope, test is complete.

6. Check for presence of pulses at TP3A and TP3D. See figure FO-4.
   - Connect oscilloscope probe to TP3A and check for pulses.
   - Connect oscilloscope probe to TP3D and check for pulses.
   - If pulses are absent at one test point, do pickoff amplifier test. See paragraph 2-24.
   - If pulses are absent at both test points, go to step 12.
7. Check for presence of pulses at TP3G and TP3H. See figure FO-7.
   - Set POWER switch to ON.
   - Connect oscilloscope probe to TP3G and check for pulses.
   - Connect oscilloscope probe to TP3H and check for pulses.
   - If pulses are absent at TP3G, do on predriver test. See paragraph 2-33.
   - If pulses are absent at TP3H, do off predriver test. See paragraph 2-34.
8. Check for presence of pulses at collectors of on drivers. See figure FO-7.
   - Connect oscilloscope probe to solder point AS.
   - If pulses are absent, replace auxiliary drivers pcb assembly. See paragraph 2-67.
9. Check for presence of pulses at collectors of off drivers. See figure FO-7.
   - Connect oscilloscope probe to solder point AV.
   - If pulses are absent, replace auxiliary drivers pcb assembly. See paragraph 2-67.
   - If pulses are present, go to step 16.

OUTPUT AMPLIFIER TEST - Continued

10. Check for presence of +90 V dc at screen grid of V351. See figures FO-7 and FO-8.

- Set AMPLITUDE VOLTS switch to 0.2 and turn AMPLITUDE VERNIER control fully clockwise.
- Set POWER switch to off.
- Connect negative (-) multimeter lead to solder point BD and positive (+) lead to pin 4 (6).
- Set POWER switch to ON. Meter should read 90 V dc.
- if 90 V dc is absent, go to step 12.
- If 90 V dc is present, go to step 13.



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11. Check for presence of +90 V dc at screen grid of V352. See figures FO-7 and FO-8.

- Set AMPLITUDE VOLTS switch to 0.2 and turn AMPLITUDE VERNIER control fully clockwise.
- Set POWER switch to off.
- Connect negative (-) multimeter lead to solder point BK and positive (+) lead to pin 4 (7).
- Set POWER switch to ON. Meter should read 90 V dc.
- If 90 V dc is absent, go to step 14.
- if 90 V dc is present, go to step 15.

OUTPUT AMPLIFIER TEST - Continued

12. Check that resistance of R356 is between 5.04 and 6.16 ohms. See figure FO-7.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R356.
- If meter reads between 5.04 and 6.16 ohms, replace C351. See paragraph 2-68.
- If meter does not read between 5.04 and 6.16 ohms, replace R356. See paragraph 2-68.

13. Check that resistance of R352 and R353 are both between 2.43 and 2.97 ohms. See figure FO-7.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R352. Note meter reading.
- Connect one multimeter lead to each lead of R353.
- If meter does not read between 2.43 and 2.97 ohms for one resistor, replace that resistor. See paragraph 2-68.
- If meter reads between 2.43 and 2.97 ohms for each resistor, replace V351. See paragraph 2-66.

14. Check that resistance of R357 is between 5.04 and 6.16 ohms. See figure FO-7.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R357.
- If meter reads between 5.04 and 6.16 ohms, replace C353. See paragraph 2-68.
- If meter does not read between 5.04 and 6.16 ohms, replace R357. See paragraph 2-68.

15. Check that resistance of R351 and R354 are both between 2.43 and 2.97 ohms. See figure FO-7.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R351. Note meter reading.
- Connect one multimeter lead to each lead of R354.
- If meter does not read between 2.43 and 2.97 ohms for one resistor, replace that resistor. See paragraph 2-68.
- If meter reads between 2.43 and 2.97 ohms for each resistor, replace V352. See paragraph 2-66.

OUTPUT AMPLIFIER TEST - Continued

16. Check for presence of +90 V dc at screen grids of V351 and V352. See figures FO-7 and FO-8.

    Set AMPLITUDE VOLTS switch 0.2 and turn AMPLITUDE VERNIER control fully clockwise.

    Set POWER switch to off.

    Connect negative (-) multimeter lead to solder point BK and positive (+) lead to pin 4 (7).

    Set POWER switch to ON. Meter should read 90 V dc.

    Set POWER switch to off.

    Connect negative (-) multimeter lead to solder point BD and positive (+) lead to pin 4 (6).

    Set POWER switch to ON. Meter should read 90 V dc.

    If 90 V dc is absent at either solder point, replace auxiliary drivers pcb assembly. See paragraph 2-67.

    If 90 V dc is absent at both solder points, do screen grid supply test. See paragraph 2-26.

17. Check for 6.9 V ac at filaments of V351 and V352. See figure FO-7.

    - Connect one multimeter lead to solder point BB and other lead to solder point BC.
    - If meter does not read 6.9 V ac, go to step 20.

18. Check resistance of R391 and R392. See figure FO-6.

    - Set POWER switch to off.
    - Connect one multimeter lead to each lead of R391. Meter should read between 950 and 1050 ohms.
    - Connect one multimeter lead to each lead of R392. Meter should read between 712 and 785 ohms.
    - If either reading is not within limits given, replace resistor. See paragraph 2-70.
    - If both readings are within limits given, replace V351 and V352. See paragraph 2-66.

19. Check for presence of pulses at TP1L. See figure FO-4.

    - Connect oscilloscope probe to TP1L.
    - Set POWER switch to ON.

OUTPUT AMPLIFIER TEST - Continued

- If pulses are present, do pickoff amplifier test. See paragraph 2-24.
- If pulses are absent, do width one-shot test. See paragraph 2-25.

20. Check filaments voltage with V351 and V352 removed. See figure FO-7.

- Set POWER switch to off.
- Remove V351 and V352. See paragraph 2-66.
- Set POWER switch to ON.
- Connect one lead of multimeter to solder point BB and other lead to solder point BC.
- If meter reads 6.9 V ac, replace V351 and V352. See paragraph 2-66.
- If meter does not read 6.9 V ac, replace T501. See paragraph 2-57.

END OF TEST

2-14. PULSE POLARITY SWITCH TEST.

DESCRIPTION

This test is to make sure that PULSE POLARITY switch and balun assembly are not faulty.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

PULSE POLARITY SWITCH TEST - Continued

1. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

2. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
POWER	ON

PULSE POLARITY SWITCH TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

CAUTION

Do not connect oscilloscope probe or probe clip lead to chassis ground while testing input to PULSE POLARITY switch. Equipment damage can result from grounding either signal line.

1. Check for presence of pulses at input to PULSE POLARITY switch.

   - Connect oscilloscope probe clip lead to lower left pin (1) and connect probe to upper left pin (2).

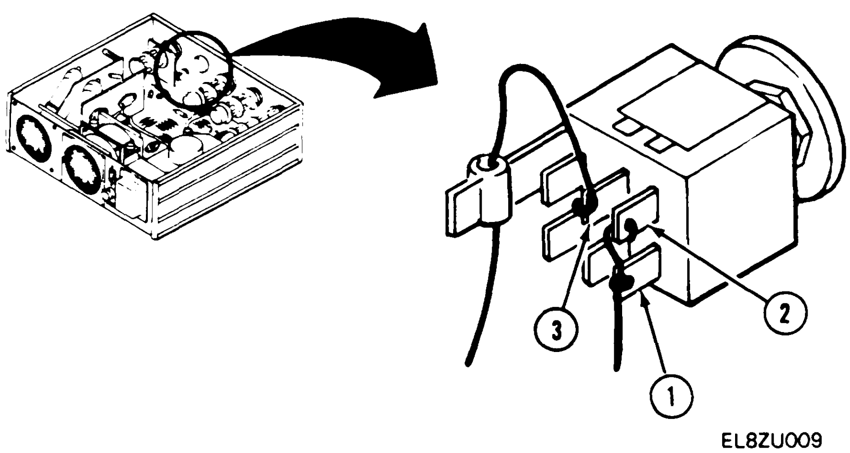
   - If pulses are not present, replace balun assembly. See paragraph 2-63.

2. Check for presence of pulses at output of PULSE POLARITY switch.

   - Connect oscilloscope probe clip lead to chassis ground and connect probe to top center pin (3).

   - If pulses are present, replace amplitude switch assembly. See paragraph 2-45.

   - If pulses are not present, replace PULSE POLARITY switch. See paragraph 2-48.



END OF TEST

2-15. PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST.

DESCRIPTION

This test is to isolate a fault within the pulse differentiator advance circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
PULSE MODE	ADV
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
PULSE POLARITY	NEG
GATE MODE	NON GATED
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	10 µs

PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of negative spikes at TP1J. See figure FO-4.

   - Connect oscilloscope probe to TP1J.
   - If spikes are absent, go to step 5.
   - If spikes are present, test is complete.

4. Check for presence of positive and negative spikes at anode of CR81. See figure FO-3.

   - Connect oscilloscope probe to anode of CR81.
   - If spikes are absent, do pulse differentiator input circuit test. See paragraph 2-35.

5. Check for presence of pulses at TP1G. See figure FO-4.

   - Connect oscilloscope probe to TP1G.
   - If pulses are absent, go to step 18.

6. Check for presence of spikes at cathode of CR85. See figure FO-3.

   - Connect oscilloscope probe to cathode of CR85.
   - If spikes are absent, go to step 9.

7. Check that forward resistance of CR85 is less than 100 ohms. See figure FO-3.

   - Set POWER switch to off.
   - Connect negative (-) multimeter lead to cathode of CR85 and positive (+) lead to anode of CR85.

PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST - Continued

- If meter reads less than 100 ohms, replace R131. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR85. See paragraph 2-64.

8. Check for presence of spikes at collector of Q17. See figure FO-3.
   - Connect oscilloscope probe to right lead of R82.
   - Set POWER switch to ON.
   - If spikes are present, replace PULSE MODE switch. See paragraph 2-46.
   - If spikes are absent, go to step 10.
9. Check for presence of pulses at base of Q17. See figure FO-3.
   - Connect oscilloscope probe to left lead of R98.
   - If pulses are absent, replace R98. See paragraph 2-64.
10. Check for presence of pulses at emitter of Q17. See figure FO-3.
   - Connect oscilloscope probe to right lead of R100.
   - If pulses are absent, go to step 12.
   - If pulses are present, go to step 13.
11. Check that resistance of R100 is between 950 and 1050 ohms. See figure FO-3.
   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R100.
   - If meter reads between limits given, replace Q17. See paragraph 2-64.
   - If meter does not read between limits given, replace R100. See paragraph 2-64.
12. Check for presence of spikes at collector of Q18. See figure FO-3.
   - Connect oscilloscope probe to left lead of R101.
   - Set POWER switch to ON.
   - If spikes are absent, go to step 14.
   - If spikes are present, go to step 17.

PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST - Continued

13. Check that voltage at base of Q18 is between 8.4 and 9.3 V dc. See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to right lead of C84.
- If meter reads more than 9.3 V dc, replace R102. See paragraph 2-64.
- If meter reads less than 8.4 V dc, go to step 16.

14. Check that resistance of R101 is between 209 and 231 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R101.
- If meter reads between limits given, replace Q18. See paragraph 2-64.
- If meter does not read between limits given, replace R101. See paragraph 2-64.

15. Check that resistance of R103 is between 22.8 and 25.2 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R103.
- If meter reads between limits given, replace C84. See paragraph 2-64.
- If meter does not read between limits given, replace R103. See paragraph 2-64.

16. Check that resistance of R99 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of R99.
- Connect one multimeter lead to each lead of R99.
- If meter reads between limits given, connect lead of R99 and replace L82. See paragraph 2-64.
- If meter does not read between limits given, replace R99. See paragraph 2-64.

17. Check for presence of pulses at collector of Q15. See figure FO-3.

- Connect oscilloscope probe to front lead of R92.

PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST - Continued

- Set POWER switch to ON.
- If pulses are absent, go to step 26.

18. Check for presence of pulses at collector of Q14. See figure FO-3.
    - Connect oscilloscope probe to left lead of R90.
    - If pulses are absent, go to step 25.
19. Check for presence of pulses at emitter of Q16. See figure FO-3.
    - Connect oscilloscope probe to front lead of C83.
    - If pulses are absent, go to step 22.
20. Check that resistance of R96 is between 4.8 and 5.4 kilohms. See figure FO-3.
    - Set POWER switch to off.
    - Connect one multimeter lead to each lead of R96.
    - If meter reads between limits given, replace R95. See paragraph 2-64.
    - If meter does not read between limits given, replace R96. See paragraph 2-64.
21. Check that reverse resistance of CR82 is more than 100 kilohms. See figure FO-3.
    - Set POWER switch to off.
    - Connect positive (+) multimeter lead to chassis and negative (-) lead to anode of CR82.
    - If meter reads less than 100 kilohms, replace CR82. See paragraph 2-64.
22. Check voltage at collector of Q16. See figure FO-3.
    - Connect negative (-) multimeter lead to chassis and positive (+) lead to cathode of CR83.
    - Set POWER switch to ON.
    - If meter reads 30 V dc, replace CR83. See paragraph 2-64.
    - If meter reads 5 V dc, replace Q16. See paragraph 2-64.
    - If meter reads 0 V dc, go to step 24.
23. Check that resistance of R97 is between 710 and 790 ohms. See figure FO-3.
    - Set POWER switch to off.
    - Connect one multimeter lead to each lead of R97.

PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST - Continued

- If meter reads between limits given, replace C82. See paragraph 2-64.
- If meter does not read between limits given, replace R97. See paragraph 2-64.

24. Check voltage at collector of Q14. See figure FO-3.
    - Connect negative (-) multimeter lead to chassis and positive (+) lead to left lead of R90.
    - Set POWER switch to ON.
    - If meter reads +5 V dc, replace R94. See paragraph 2-64.
    - If meter reads 0 V dc, replace Q14. See paragraph 2-64.
    - If meter reads -30 V dc, replace R90. See paragraph 2-64.
25. Check for presence of pulses at emitter of Q14. See figure FO-3.
    - Connect oscilloscope probe to right lead of R91.
    - If pulses are absent, go to step 30.
26. Check that voltage at collector of Q15 is +5 V dc. See figure FO-3.
    - Connect negative (-) multimeter lead to chassis and positive (+) lead to front lead of R92.
    - If meter does not read 5 V dc, replace R92. See paragraph 2-64.
27. Check that voltage at base of Q15 is between 0 and 1 V dc. See figure FO-3.
    - Connect negative (-) multimeter lead to chassis and positive (+) lead to anode of CR82.
    - If meter reads more than 1 V dc, replace CR82. See paragraph 2-64.
28. Check that resistance of R93 is between 9.5 and 10.5 kilohms. See figure FO-3.
    - Set POWER switch to off.
    - Connect one multimeter lead to each lead of R93.
    - If meter reads between limits given, replace Q15. See paragraph 2-64.
    - If meter does not read between limits given, replace R93. See paragraph 2-64.
29. Check for presence of pulses at base of Q14. See figure FO-3.
    - Connect oscilloscope probe to cathode of CR81.
    - Set POWER switch to ON.
    - If pulses are absent, go to step 31.

PULSE DIFFERENTIATOR ADVANCE CIRCUIT TEST - Continued

30. Check that resistance of R91 is between 3.4 and 3.8 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R91.
- If meter reads between limits given, replace Q14. See paragraph 2-64.
- If meter does not read between limits given, replace R91. See paragraph 2-64.

31. Check that forward resistance of CR81 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to cathode of CR81 and positive (+) lead to anode of CR81.
- If meter reads less than 100 ohms, replace R89. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR81. See paragraph 2-64.

END OF TEST

2-16. POWER SUPPLY INPUT CIRCUITS TEST.

DESCRIPTION

This test is to isolate a fault to a component in the power supply input circuits.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

POWER SUPPLY INPUT CIRCUITS TEST - Continued

WARNING

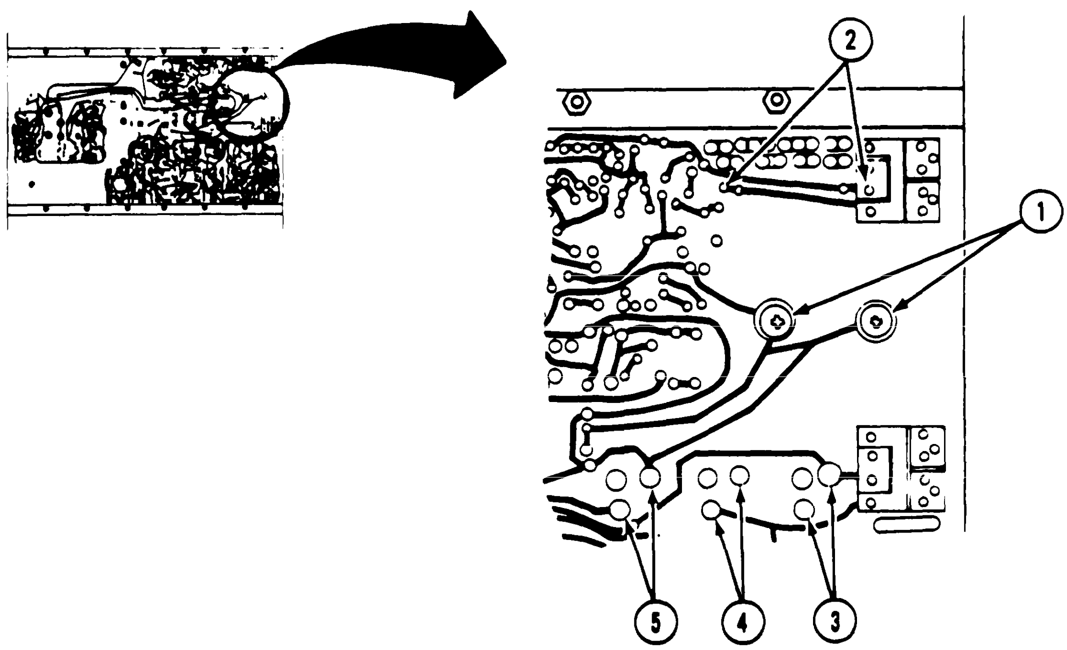
Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

CAUTION

Use a 6-watt, 50-ohm load to discharge capacitors or equipment can be damaged.

1. Working through bottom of signal generator, discharge capacitors to ground.

   - Connect one end of 6-watt, 50-ohm load to ground and connect other end, in turn, to each lead of capacitors C512 (1), C511 (2), C551 (3), C561 (4), and C541 (5).



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POWER SUPPLY INPUT CIRCUITS TEST - Continued

2. Check that resistance of C511 is more than 1 megohm.

   - Connect positive (+) multimeter lead to positive lead of C511 (6) and negative (-) lead to negative lead of C511 (7).

   - If meter reads less than 1 megohm, replace C511. See paragraph 2-64.

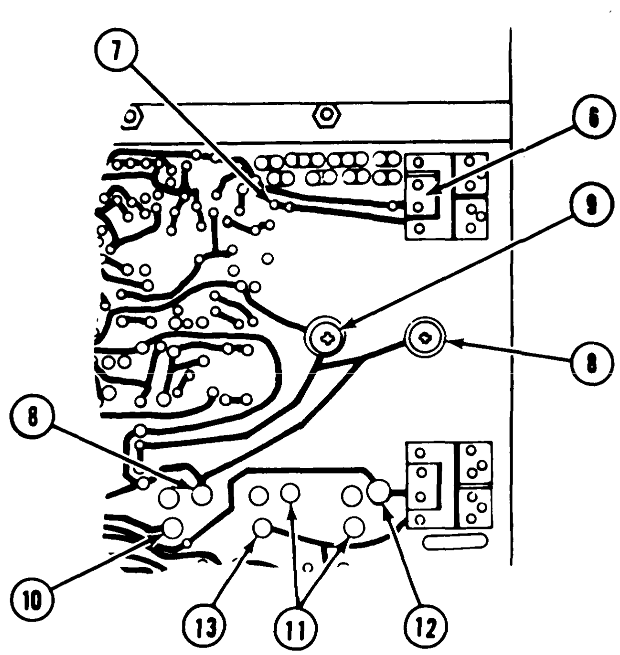
NOTE

When testing capacitors C512, C541, C551, and C561, note time when multi meter leads are connected. If meter still reads 0 ohm after multimeter is connected for 2 minutes, capacitor is faulty.

3. Check that resistance of C512, C541, C551, and C561 is not 0 ohm.

   - Refer to table 2-2. At each capacitor, connect multimeter leads.

   - If meter reads 0 ohm 2 minutes after leads are connected to a capacitor, replace capacitor. See paragraph 2-64.



EL8ZU011

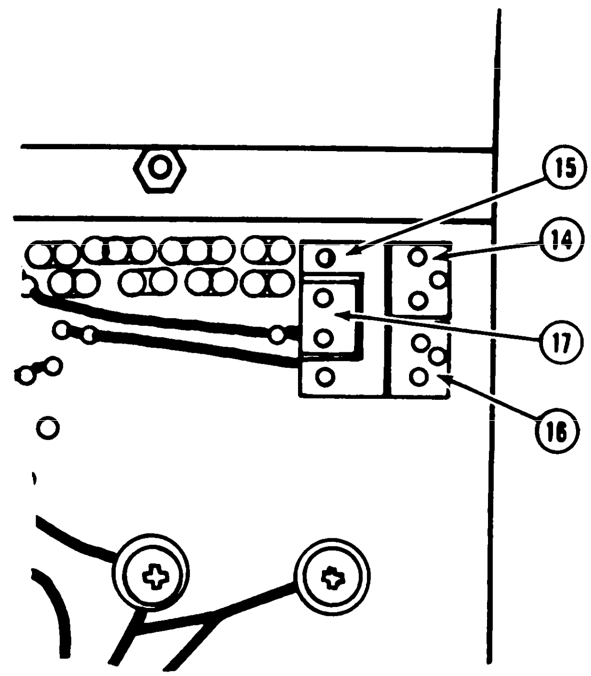
Table 2-2. MULTI METER CONNECTIONS TO CAPACITORS

Capacitor	Multimeter Leads	
	Negative (-)	Positive (+)
C512	8	9
C541	10	8
C551	11	12
C561	13	11

POWER SUPPLY INPUT CIRCUITS TEST - Continued

4. Check reverse resistance of CR511, CR512, CR513, and CR514.

- Refer to table 2-3. Connect multi meter leads to leads of diodes as given in Multimeter Leads columns.
- If meter reads less than 10 kilohms for any diode, replace diode. See paragraph 2-64.



EL8ZU012

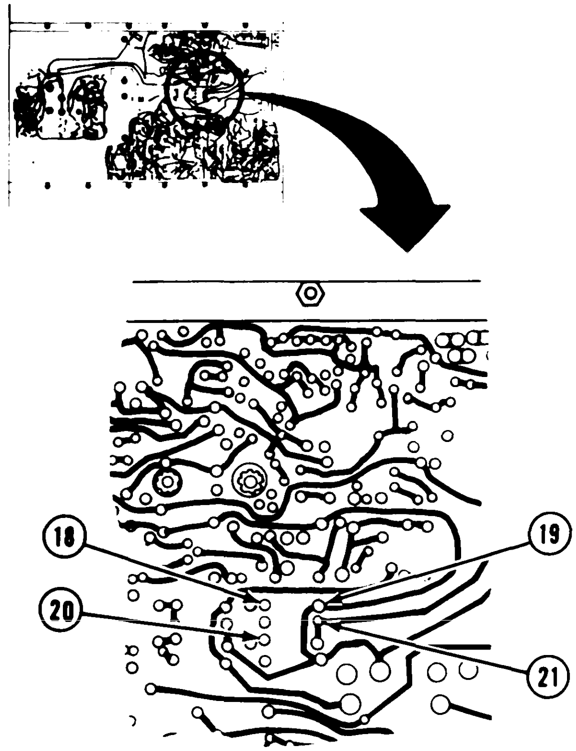
Table 2-3. MULTI METER CONNECTIONS TO CR511, CR512, CR513, CR514

Diode	Multimeter Leads	
	Positive (+)	Negative (-)
CR511	14	15
CR512	16	15
CR513	17	14
CR514	17	16

POWER SUPPLY INPUT CIRCUITS TEST - Continued

5. Check reverse resistance of CR515, CR516, CR517, and CR518.

   - Refer to table 2-4. Connect multimeter leads to leads of diodes as given in Multimeter Leads columns.
   - If meter reads less than 10 kilohms for any diode, replace diode. See paragraph 2-64.



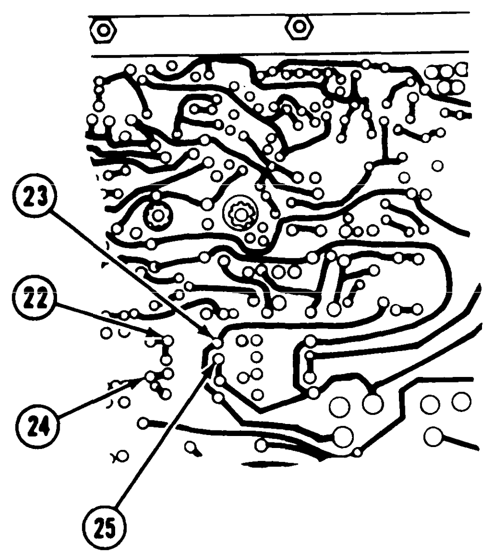
EL8ZU013

Table 2-4. MULTIMETER CONNECTIONS TO CR515, CR516, CR517, CR518

Diode	Multimeter Leads	
	Positive (+)	Negative (-)
CR515	18	19
CR516	20	19
CR517	21	18
CR518	21	20

6. Check reverse resistance of CR541, CR542, CR543, and CR544.

   - Refer to table 2-5. Connect multimeter leads to leads of diodes as given in Multimeter Leads columns.
   - It meter reads less than 10 kilohms for any diode, replace diode. See paragraph 2-64.



EL8ZU014

POWER SUPPLY INPUT CIRCUITS TEST - Continued

Table 2-5. MULTIMETER CONNECTIONS TO CR541, CR542, CR543, CR544

Diode	Multimeter Leads	
	Positive (+)	Negative (-)
CR541	22	23
CR542	24	23
CR543	25	22
CR544	25	24

7. Check reverse resistance of CR561, CR562, CR551 , CR552.

   - Refer to table 2-6. Connect multimeter leads to leads of diodes as given in Multimeter Leads columns,
   - If meter reads less than 10 kilohms for any diode, replace diode. See paragraph 2-64.

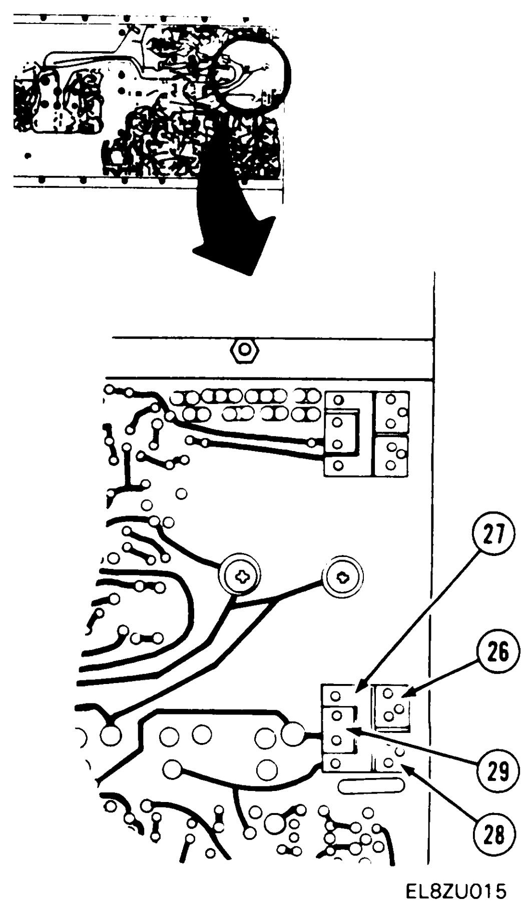


Table 2-6. MULTI METER CONNECTIONS TO CR561 , CR562, CR551 , CR552

Diode	Multimeter Leads	
	Positive (+)	Negative (-)
CR561	26	27
CR562	28	27
CR551	29	26
CR552	29	28

END OF TEST

2-17. REGULATOR FILTER TEST.

DESCRIPTION

This test is to make sure that filter components of voltage regulators are not faulty.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

WARNING

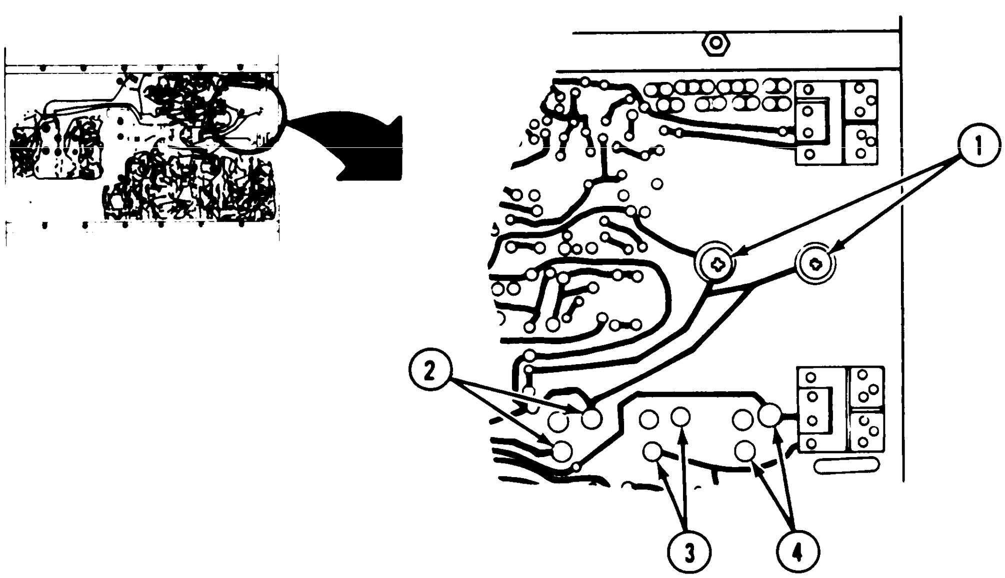
Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

CAUTION

Use a 6-watt, 50-ohm load to discharge capacitors or equipment can be damaged.

1. Working at bottom of signal generator, discharge C512, C541, C551, and C561 to ground.

- Connect one end of 6-watt, 50-ohm load to chassis and connect other end, in turn, to two capacitor C512 leads (1), C541 leads (2), C561 leads (3), and C551 leads (4).



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REGULATOR FILTER TEST - Continued

2. Turn signal generator right side up.

3. Working through top of signal generator, discharge C511 and C518 to ground using a 6-watt, 50-ohm load. See figure FO-3.

   - Connect one end of load to chassis and other end, in turn, to both leads of C511 and to both leads of C518.

4. Check that resistance of C517 is more than 1 megohm. See figure FO-3.

   - Connect negative (-) multimeter lead to front lead of C517 and positive (+) lead to rear lead of C517.
   - If meter reads less than 1 megohm, replace C517. See paragraph 2-64.

5. Check that resistance of C518 is more than 1 megohm. See figure FO-3.

   - Connect negative (-) multimeter lead to rear lead of C518 and positive (+) lead to front lead of C518.
   - If meter reads less than 1 megohm, replace C518. See paragraph 2-64.

6. Check that resistance from TP5G to TP5F is more than 1 megohm. See figure FO-4.

   - Connect negative (-) multimeter lead to TP5G and positive (+) lead to TP5F.
   - If meter reads less than 1 megohm, go to step 9.

7. Check that resistance from chassis to TP5H is more than 1 megohm. See figure FO-4.

   - Connect negative (-) multimeter lead to chassis and positive (+) lead to TP5H.
   - If meter reads less than 1 megohm, go to step 10.

8. Check that resistance from TP5J to chassis is more than 1 megohm. See figure FO-4.

   - Connect negative (-) multimeter lead to TP5J and positive (+) lead to chassis.
   - If meter reads less than 1 megohm, go to step 11.
   - If meter reads more than 1 megohm, test is complete.

9. Check that resistance of C542 is more than 1 megohm. See figure FO-3.

   - Unsolder and lift one lead of C542.
   - Connect negative (-) multimeter lead to front lead of C542 and positive (+) lead to rear lead of C542.

REGULATOR FILTER TEST - Continued

- If meter reads less than 1 megohm, replace C542. See paragraph 2-64.
- If meter reads more than 1 megohm, connect lead of C542 and replace CR549. See paragraph 2-64.

10. Check that resistance of C552 is more than 1 megohm. See figure FO-3.

- Unsolder and lift one lead of C552.
- Connect negative (-) multimeter lead to rear lead of C552 and positive (+) lead to front lead of C552.
- If meter reads less than 1 megohm, replace C552. See paragraph 2-64.
- If meter reads more than 1 megohm, connect lead of C552 and replace CR557. See paragraph 2-64.

11. Check that resistance of C562 is more than 1 megohm. See figure FO-3.

- Unsolder and lift one lead of C562.
- Connect negative (-) multimeter lead to front lead of C562 and positive (+) lead to rear lead of C562.
- If meter reads less than 1 megohm, replace C562. See paragraph 2-64.
- If meter reads more than 1 megohm, connect lead of C562 and replace CR566. See paragraph 2-64.

END OF TEST

2-18. POWER SUPPLY FILAMENT CIRCUIT TEST.

DESCRIPTION

This test is to make sure that tube filaments and filament circuit components are not faulty.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

1. Remove V1 and V2. See paragraph 2-64.

2. Remove V351 and V352. See paragraph 2-66.

3. Check that -200 volt and -235 volt windings of T501 are not grounded. See figure FO-4.

   - Connect one multimeter lead to chassis and connect other lead, in turn, to solder points CS and CU. Check ohm scale for infinity reading,

   - If meter reads less than infinity at either reading, replace T501. See paragraph 2-57,

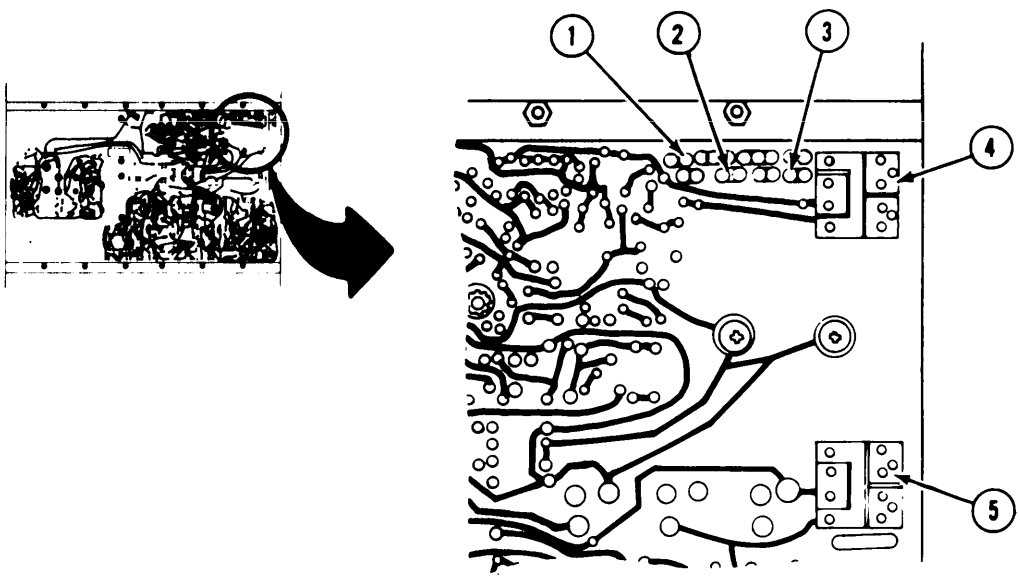
4. Turn signal generator upside down.

POWER SUPPLY FILAMENT CIRCUIT TEST - Continued

5. Check that primary, filament, 30-volt, and overload windings of T501 are not grounded.

   - Connect one multimeter lead to chassis and other lead, in turn, to solder points CE (1), CH (2), CM (3), CN (4), and CV (5). Check ohm scale for infinity reading.

   - If meter reads less than infinity at any reading, replace T501. See paragraph 2-57.



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6. Turn signal generator right side up.

7. Check that fuse does not blow with V1 installed.

   - Install V1. See paragraph 2-64.

   - Set POWER switch to ON.

   - If power indicator does not light, replace V1. See paragraph 2-64.

8. Check that fuse does not blow with V2 installed.

   - Set POWER switch to off.

   - Install V2. See paragraph 2-64.

   - Set POWER switch to ON.

   - If power indicator does not light, replace V2. See paragraph 2-64.

POWER SUPPLY FILAMENT CIRCUIT TEST - Continued

9. Check that fuse does not blow with V351 installed.

- Set POWER switch to off.
- Install V351, See paragraph 2-66.
- Set POWER switch to ON.
- If power indicator does not light, replace V351. See paragraph 2-66,

10. Check that fuse does not blow with V352 installed.

- Set POWER switch to off.
- Install V352. See paragraph 2-66.
- Set POWER switch to ON.
- If power indicator does not light, replace V352. See paragraph 2-66.
- If power indicator lights, test is complete.

END OF TEST

2-19. REGULATOR ISOLATION TEST.

DESCRIPTION

This test is to isolate a low-resistance fault to a regulator circuit or to a component of the power input circuitry.

INITIAL SETUP

Reference: TM 11-6625-3050-12

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

REGULATOR ISOLATION TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

CAUTION

Disconnected transformer wires contain output voltages of transformer. Keep wires from touching conductors with power applied or equipment will be damaged.

1. Set POWER switch to off.
2. Tag, unsolder, and remove transformer output wires from solder points CV, CS, and CU. See figure FO-4.
   - Remove yellow wire from CV.
   - Remove white/green wire from CS.
   - Remove white/violet wire from CU.
3. Check that fuse does not blow with regulators disconnected.
   - Set POWER switch to ON.
   - If power indicator does not light, go to step 15.
4. Set POWER switch to off.
5. Connect wire to solder point CS as tagged.

REGULATOR ISOLATION TEST - Continued

6. Check that fuse does not blow with 200-volt regulator connected.
   - Set POWER switch to ON.
   - If power indicator does not light, set POWER switch to off, replace fuse F501 (see TM 11-6625-3050-12), and replace heatsink/fan assembly. See paragraph 2-56.
7. Set POWER switch to off.
8. Connect wire to solder point CU as tagged.
9. Check that fuse does not blow with -235 volt regulator connected.
   - Set POWER switch to ON.
   - If power indicator does not light, set POWER switch to off, replace fuse F501 (see TM 11-6625-3050-12), and do -235 volt regulator test. See paragraph 2-29.
10. Set POWER switch to off.
11. Connect wire to solder point CV as tagged.
12. Tag, unsolder, and remove wire from solder point DS.
13. Check that fuse does not blow with -30 volt regulator connected.
    - Set POWER switch to ON.
    - If power indicator does not light, set POWER switch to off, replace fuse F501 (see TM 11-6625-3050-12), and do -30 volt regulator test. See paragraph 2-31.
14. Connect wire to solder point DS and do +30 volt regulator test. See paragraph 2-30.
15. Check that resistance of C571 is more than 1 megohm. See figure FO-10.
    - Set POWER switch to off.
    - Unsolder and lift one lead of C571.
    - Connect one multimeter lead to each lead of C571.
    - If meter reads less than 1 megohm, replace C571. See paragraph 2-61.
    - If meter reads more than 1 megohm, connect lead of C571 and go to step 16.

REGULATOR ISOLATION TEST - Continued

16. Check that resistance of each winding of B501 is more than 2 ohms. See figure FO-10.

- Tag, unsolder, and remove two leads of B501.
- Connect multimeter leads to B501 leads to measure resistance from each lead to other two leads.
- If meter reads less than 2 ohms for any measurement, replace heatsink/fan assembly. See paragraph 2-56.
- If meter reads more than 2 ohms for each measurement, replace T501. See paragraph 2-57.

END OF TEST

2-20. EXTERNAL TRIGGER AMPLIFIER TEST.

DESCRIPTION

This test is to isolate a fault within the external trigger amplifier circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

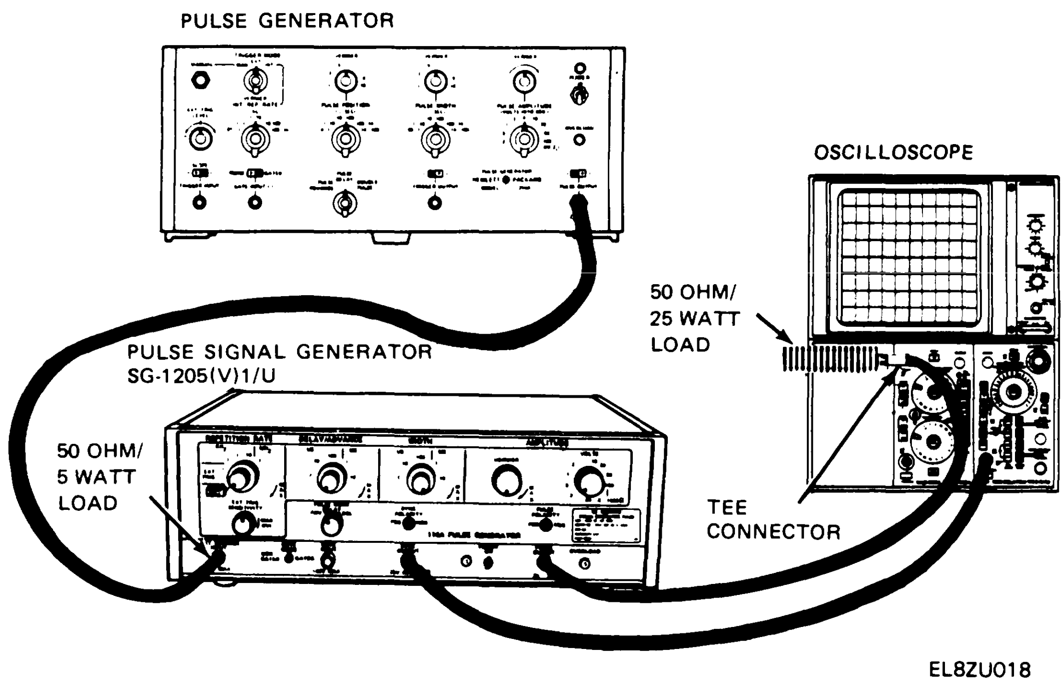
NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

1. Plug power cable into power source.

2. Connect signal generator, pulse generator, and oscilloscope.



3. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	EXT TRIG –
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	10 V
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE MODE	DELAY
PULSE POLARITY	NEG
POWER	ON

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

4. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	0.5 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	Out
AC COUPL	In
TRIG SOURCE	EXT
SEC/DIV	1 µs

5. Set pulse generator controls as follows:

CONTROL	SETTING
TRIGGER MODE	INT.
INT. REP. RATE	10—1000
Vernier	Cw
PULSE POSITION	0—1
VERNIER	1
PULSE WIDTH	.05—1
VERNIER	5
PULSE AMPLITUDE	20
VERNIER	Cw
NORM./GATED	NORM.
Pulse mode	PULSE DELAY
PULSE OUTPUT –/+	(neg)
POWER	ON

6. At signal generator, turn EXT TRIG SENSITIVITY control to right until pulses appear stable on oscilloscope.

   - If pulses are absent, go to step 10.

7. Set REPETITION RATE switch to EXT TRIG +.

8. Turn EXT TRIG SENSITIVITY control to left until pulses appear stable on oscilloscope.

   - If pulses are absent, go to step 33.

9. Remove cable from oscilloscope CH1 jack and connect 1X probe.

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied, After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

10. Check for presence of pulses at TP1C. See figure FO-4.

    - Connect oscilloscope probe to TP1C.
    - If pulses are present, do trigger multivibrator test, See paragraph 2-36,
    - If pulses are absent, go to step 11.

11. Check for presence of pulses at TP1B. See figure FO-4.

    - Connect oscilloscope probe to TP1B.
    - If pulses are absent, go to step 26,

12. Check for pulses at collector of Q5. See figure FO-3.

    - Connect oscilloscope probe to can of Q5.
    - If pulses are absent, go to step 18.

13. Press oscilloscope GND pushbutton to in position.

14. Turn CH1 POSITION control to move baseline to middle of oscilloscope screen.

15. Press oscilloscope GND pushbutton to out position.

16. Check voltage at collector of Q5. See figure FO-3.

    - Connect oscilloscope probe to can of Q5.
    - If baseline moves up to about +5 V dc, replace CR31. See paragraph 2-64.
    - If baseline stays below +5 V dc, go to step 17.

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

17. Check voltage at anode of CR32. See figure FO-3.

- Connect oscilloscope probe to anode of CR32.
- If baseline moves up to about +5 V dc, replace CR32. See paragraph 2-64.
- If baseline stays at 0 V dc, replace C31. See paragraph 2-64.

18. Check for presence of pulses at collector of Q6. See figure FO-3.

- Connect oscilloscope probe to can of Q6.
- If pulses are present, replace Q5. See paragraph 2-64.
- If pulses are absent, go to step 19.

19. Check for presence of pulses at base of Q5. See figure FO-3.

- Connect oscilloscope probe to right lead of R31.
- If pulses are absent, replace R31. See paragraph 2-64.

20. Check for presence of pulses at emitter of Q5. See figure FO-3.

- Connect oscilloscope probe to front lead of R34.
- If pulses are absent, replace Q5. See paragraph 2-64.

21. Check voltage at base of Q6. See figure FO-3.

- Connect oscilloscope probe to left lead of C33. Baseline should stay between +8 and -8 volts dc.
- If baseline goes to -30 V dc, go to step 24.
- If baseline goes to +30 V dc, go to step 25.
- If baseline goes to 0 V dc, go to step 22.

22. At signal generator, turn EXT TRIG SENSITIVITY control full right. Baseline should go to about +8 V dc on oscilloscope.

- If baseline stays at 0 V dc, go to step 23.
- If baseline goes to +8 V dc, go to step 24.

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

23. Check resistance of C33. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of C33.
- If meter reads more than 1 megohm, replace R38. See paragraph 2-64.
- If meter reads less than 1 megohm, replace C33. See paragraph 2-64.

24. Check for 0 V dc at collector of Q6. See figure FO-3.

- Connect oscilloscope probe to can of Q6.
- Set POWER switch to ON.
- If baseline moves to +5 V dc, replace Q6. See paragraph 2-64.

25. Check voltage at anode of CR34. See figure FO-3.

- Connect oscilloscope probe to anode of CR34.
- If baseline stays at 0 V dc, replace C31. See paragraph 2-64.
- If baseline goes to +5 V dc, replace CR34. See paragraph 2-64.

26. Check resistance of R39. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R39.
- If meter reads between 7, 8 and 8.6 kilohms, replace R40. See paragraph 2-64.
- If meter does not read between 7.8 and 8.6 kilohms, replace R39. See paragraph 2-64.

27. Check resistance of R41. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R41.
- If meter reads between 7.8 and 8.6 kilohms, replace R40. See paragraph 2-64.
- If meter does not read between 7.8 and 8.6 kilohms, replace R41. See paragraph 2-64.

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

28. Check for presence of pulse at grid of V2. See figure FO-3.

- Connect oscilloscope probe to left lead of C32.
- Set POWER switch to ON.
- If pulse is absent, go to step 31.

29. Check for -30 V dc at cathode of V2. See figure FO-3.

- Connect positive (+) multimeter lead to chassis and connect negative (-) lead to TP1B.
- If -30 V dc is absent, go to step 32.

30. Check for 6.3 V ac at filament of V2. See figure FO-4.

- Connect one multimeter lead to chassis and other lead to solder point CZ.
- If 6.3 V ac is absent, replace T501. See paragraph 2-57.

31. Check for +30 V dc at plate of V2. See figure FO-4.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to TP5H.
- If +30 V dc is absent, do +30 volt regulator test. See paragraph 2-30.
- If +30 V dc is present, replace V2. See paragraph 2-64.

32. Check resistance of R32. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R32.
- If meter reads between 28.5 and 31.5 kilohms, do -30 volt regulator test. See paragraph 2-31.
- If meter does not read between 28.5 and 31.5 kilohms, replace R32. See paragraph 2-64.

33. Check resistance of R35. See figure FO-3.

- Connect one multimeter lead to each lead of R35. Meter should read between 0.95 and 1.05 megohms.
- If meter does not read between limits given, replace R35. See paragraph 2-64.

EXTERNAL TRIGGER AMPLIFIER TEST - Continued

34. Check resistance of R37. See figure FO-3.

- Connect one multimeter lead to each lead of R37.
- If meter reads between 1.14 and 1.26 kilohms, replace C32. See paragraph 2-64.
- If meter does not read between 1.14 and 1.26 kilohms, replace R37. See paragraph 2-64.

35. Check that reverse resistance of CR34 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to anode of CR34 and positive (+) lead to cathode of CR34.
- If meter reads less than 100 kilohms, replace CR34. See paragraph 2-64.

36. Check that forward resistance of CR34 is less than 100 ohms. See figure FO-3.

- Connect negative (-) multimeter lead to cathode of CR34 and positive (+) lead to anode of CR34.
- If meter reads more than 100 ohms, replace CR34. See paragraph 2-64,

37. Check that forward resistance of CR33 is less than 100 ohms. See figure FO-3.

- Connect negative (-) multimeter lead to cathode of CR33 and positive (+) lead to anode of CR33.
- If meter reads less than 100 ohms, replace R36. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR33. See paragraph 2-64.

END OF TEST

2-21. REPETITION RATE OSCILLATOR TEST.

DESCRIPTION

This test is to isolate a fault within the repetition rate oscillator.

INITIAL SETUP

General Safety Instructions:

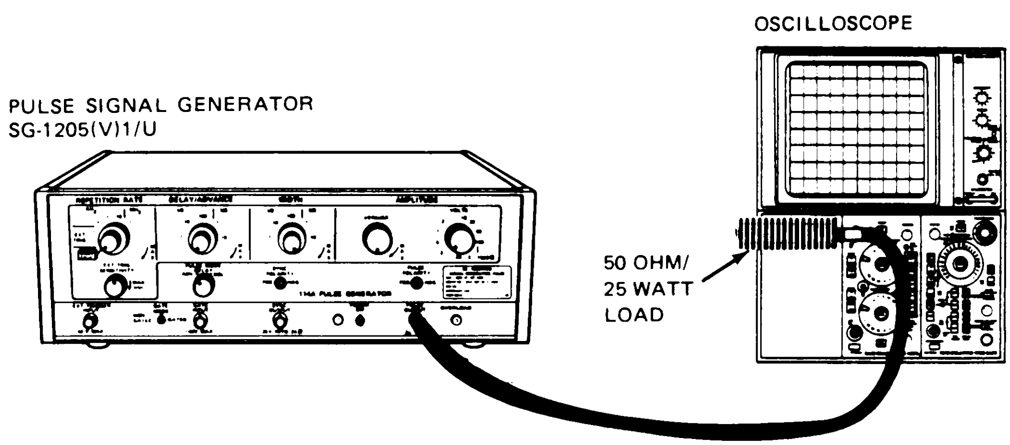
WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

1. Plug power cable into power source.
2. Connect signal generator and oscilloscope.



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REPETITION RATE OSCILLATOR TEST - Continued

3. Set signal generator controls as follows:

CONTROL	SETTING
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	10 V
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE MODE	DELAY
PULSE POLARITY	NEG
POWER	ON

4. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	1.0 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE

5. Refer to table 2-7. Set SEC/DIV control of oscilloscope to each setting in Oscilloscope column, and set REPETITION RATE control and WIDTH control of signal generator to each setting in Signal Generator column. Check that pulses are present at each setting.

- If pulses are absent at one setting, replace repetition rate switch assembly. See paragraph 2-43.

- If pulses are absent at all settings, go to step 6.

- If pulses are present at all settings, test is complete.

REPETITION RATE OSCILLATOR TEST - Continued

Table 2-7. REPETITION RATE CONTROL SETTINGS

Signal Generator			Oscilloscope
REPETITION RATE	Vernier	WIDTH	SEC/DIV
0.1 MHz	Cw	1 µs	10 µs
10 kHz	Cw	10 µs	0.1 ms
1 kHz	Cw	100 µs	1 ms
0.1 kHz	Cw	1 ms	10 ms
0.1 kHz	Ccw	10 ms	0.1 s

6. Disconnect cable from oscilloscope CH1 jack and connect 1X probe.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

7. Check for presence of pulses at collector of Q1. See figure FO-3.
   - Connect oscilloscope probe to cathode of CR2.
   - If pulses are absent, go to step 14.
8. Check for presence of pulses at collector of Q3. See figure FO-3.
   - Connect oscilloscope probe to right lead of R15.
   - If pulses are present, replace R15. See paragraph 2-64.
   - If pulses are absent, go to step 10.
9. Check for presence of pulses at base of Q3. See figure FO-3.
   - Connect oscilloscope probe to left lead of R13.
   - If pulses are absent, replace R13. See paragraph 2-64.

REPETITION RATE OSCILLATOR TEST - Continued

10. Check for presence of pulses at emitter of Q3. See figure FO-3.

- Connect oscilloscope probe to left lead of R14.
- If pulses are present, replace Q3. See paragraph 2-64.
- If pulses are absent, go to step 11.

11. Measure voltage at emitter of Q3. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to left lead of R14.
- If meter reads between 20 and 27 V dc, replace Q3. See paragraph 2-64.
- If meter reads 30 V dc, replace R16. See paragraph 2-64.
- If meter reads 0 V dc, go to step 12.

12. Check voltage at anode of CR3, See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to anode of CR3.
- If meter reads between 20 and 27 V dc, replace R14. See paragraph 2-64.
- If meter reads 0 V dc, go to step 13.

13. Check that resistance of C11 is more than 1 megohm. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of C11.
- Connect one multimeter lead to each lead of C11.
- If meter reads more than 1 megohm, connect lead of C11 and replace CR3. See paragraph 2-64.
- If meter reads less than 1 megohm, replace C11. See paragraph 2-64.

14. Check voltage at collector of Q1. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to cathode of CR2.
- Set POWER switch to ON.
- If meter reads about 25 V dc, go to step 15.

REPETITION RATE OSCILLATOR TEST - Continued

- If meter reads about 25.5 V dc, go to step 31.
- If meter reads 0 V dc, go to step 27.
- If meter reads 30 V dc, go to step 38.

15. Check voltage at emitter of Q2. See figure FO-4.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to solder Point C.
- If meter reads 30 V dc, replace Q2. See paragraph 2-64.
- If meter reads 0 V dc, go to step 16.

16. Check voltage at emitter of Q4. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to anode of CR21.
- If meter reads 30 V dc, go to step 17.
- If meter reads O V dc, go to step 18.
- If meter reads between 1 and 4 V dc, go to step 19.

17. Check that forward resistance of CR21 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to cathode of CR21 and positive (+) lead to anode of CR21.
- If meter reads less than 100 ohms, replace CR22. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR21. See paragraph 2-64.

18. Check that resistance of C21 is more than 1 megohm. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of C21.
- Connect one multimeter lead to each lead of C21.
- If meter reads less than 1 megohm, replace C21. See paragraph 2-64.

  If meter reads more than 1 megohm, connect lead of C21 and replace R22. See paragraph 2-64.

REPETITION RATE OSCILLATOR TEST - Continued

19. Check voltage at TPIA. See figure FO-4.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to TP1A.
- Set POWER switch to ON.
- If meter reads 0 V dc, go to step 20.
- If meter reads 30 V dc, go to step 21.

20. Check that resistance of R24 is between 9.5 and 10.5 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R24.
- If meter reads between limits given, replace GATE MODE switch. See paragraph 2-47.
- If meter does not read between limits given, replace R24. See paragraph 2-64.

21. Check for +30 V dc at base of Q4. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to right lead of R23.
- Set POWER switch to ON.
- If meter does not read 30 V dc, replace R23. See paragraph 2-64.

22. Check that resistance of R21 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multi meter lead to each lead of R21.
- If meter does not read between limits given, replace R21. See paragraph 2-64.

23. Check that voltage at base of Q2 is about 25 V dc. See figure FO-3.

- Set POWER switch to ON.
- Connect negative (-) multimeter lead to chassis and positive (+) lead to left lead of R12.
- If meter does not read about 25 V dc, replace R12. See paragraph 2-64.

REPETITION RATE OSCILLATOR TEST - Continued

24. Check that voltage at base of Q1 is about 21 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to right lead of C4.

- If meter reads 25 V dc, replace R5. See paragraph 2-64.

25. Check that forward resistance of emitter-base junction of Q2 is less than 100 ohms. See figures FO-3 and FO-4.

- Set POWER switch to off.

- Connect negative (-) multimeter lead to solder point C and positive (+) lead to left lead of R12.

- If meter reads more than 100 ohms, replace Q2. See paragraph 2-64.

26. Check resistance of collector-base junction of Q2. See figure FO-3.

- Connect negative (-) multimeter lead to cathode of CR3 and positive (+) lead to left lead of R12.

- If meter reads more than 100 ohms, replace Q2. See paragraph 2-64.

- If meter reads less than 100 ohms, replace Q4. See paragraph 2-64.

27. Check that resistance of C1 is more than 1 megohm. See figure FO-3.

- Set POWER switch to off.

- Unsolder and lift one lead of C1.

- Connect one multimeter lead to each lead of C1.

- If meter reads less than 1 megohm, replace C1. See paragraph 2-64.

- If meter reads more than 1 megohm, connect lead of C1 and go to step 28.

28. Check that resistance of C2 is more than 1 megohm. See figure FO-3.

- Unsolder and lift one lead of C2.

- Connect negative (-) multimeter lead to negative (-) lead of C2 and positive (+) lead to positive (+) lead of C2.

- If meter reads less than 1 megohm, replace C2. See paragraph 2-64.

- If meter reads more than 1 megohm, connect lead of C2 and go to step 29.

REPETITION RATE OSCILLATOR TEST - Continued

29. Check resistance of R11 and L1 in series. See figure FO-3.

- Connect negative (-) multimeter lead to cathode of CR1 and positive (+) lead to cathode of CR2.
- If meter reads between 170 and 195 ohms, do +30 volt regulator test. See paragraph 2-30.
- If meter indicates an open circuit, go to step 30.

30. Check that resistance of R11 is between 170 and 190 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of R11.
- If meter reads between 170 and 190 ohms, replace L1. See paragraph 2-64.
- If meter indicates an open circuit, replace R11. See paragraph 2-64.

31. Check that voltage at base of Q1 is 20 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to right lead of C4.
- Set POWER switch to ON.
- If meter reads 0 V dc, go to step 34.

32. Check resistance from emitter of Q1 to ground. See figure FO-4.

- Set POWER switch to off.
- Connect one multimeter lead to solder point B and connect other lead to chassis.
- If meter reads between 2.7 and 67 kilohms, replace Q1. See paragraph 2-64.
- If meter indicates an open circuit, go to step 33.

33. Check resistance of R2 and R3 in parallel. See figure FO-4.

- Connect one multimeter lead to chassis and other lead to solder point A.
- If meter reads between 0 and 65 kilohms, replace repetition rate switch assembly. See paragraph 2-43.
- If meter indicates an open circuit, replace R2 and R3. See paragraph 2-64.

34. Check that voltage at anode of CR1 is +25 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to anode of CR1.

REPETITION RATE OSCILLATOR TEST - Continued

- Set POWER switch to ON.
- If meter reads 0 V dc, go to step 37.

35. Check that resistance of R4 is between 640 and 720 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R4.
- If meter does not read between limits given, replace R4. See paragraph 2-64.

36. Check that resistance of C5 is more than 1 megohm. See figure FO-3.

- Unsolder and lift one lead of C5.
- Connect one multimeter lead to each lead of C5.
- If meter reads more than 1 megohm, connect lead of C5 and replace C4. See paragraph 2-64.
- If meter reads less than 1 megohm, replace C5. See paragraph 2-64.

37. Check that resistance of C3 is more than 1 megohm. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of C3.
- Connect one multimeter lead to each lead of C3.
- If meter reads more than 1 megohm, connect lead of C3 and replace CR1. See paragraph 2-64.
- If meter reads less than 1 megohm, replace C3. See paragraph 2-64.

38. Check that forward resistance of CR2 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to cathode of CR2 and positive (+) lead to anode of CR2.
- If meter reads less than 100 ohms, replace CR1. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR2. See paragraph 2-64.

END OF TEST

2-22. GATE CONTROL CIRCUIT TEST.

DESCRIPTION

This test is to isolate a fault to a component of the gate control circuit.

INITIAL SETUP

General Safety Instructions:

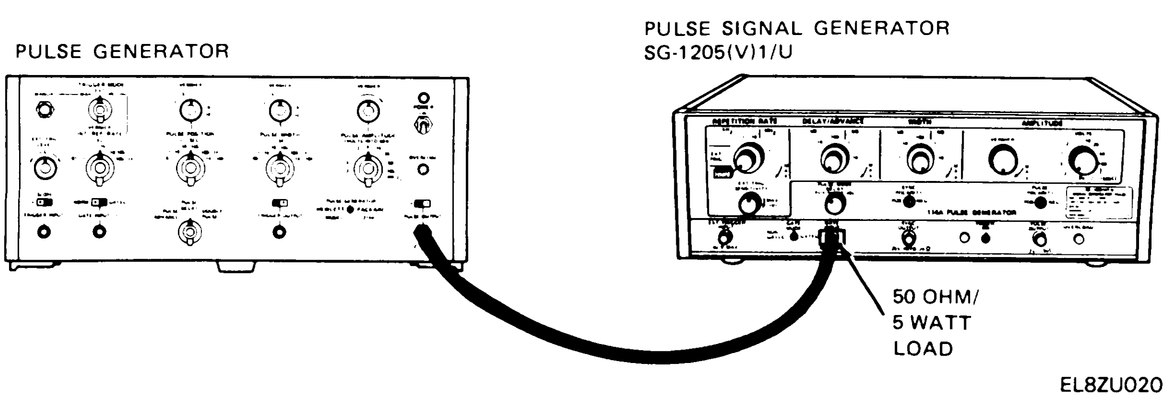
WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

1. Plug power cable into power source.
2. Connect signal generator and pulse generator.



GATE CONTROL CIRCUIT TEST - Continued

3. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	10 V
AMPLITUDE VERNIER	Cw
GATE MODE	GATED
POWER	ON

4. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	10V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	10µs

5. Set pulse generator controls as follows:

CONTROL	SETTING
TRIGGER MODE	INT.
INT. REP. RATE	1—10
Vernier	Cw
PULSE POSITION	0—1
VERNIER	1
PULSE WIDTH	1—10
VERNIER	5
PULSE AMPLITUDE	20
VERNIER	Cw
NORM./GATED	NORM.
Pulse mode	PULSE DELAY
PULSE OUTPUT —/+	+(pos)
POWER	ON

GATE CONTROL CIRCUIT TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

6. Check for presence of groups of pulses at emitter of Q2. See figure FO-4.
   - Connect oscilloscope probe clip lead to chassis and connect probe to solder point C.
   - If groups of pulses are present, do repetition rate oscillator test. See paragraph 2-21.
   - If groups of pulses are absent, go to step 7.
7. Check for presence of pulses at TP1A. See figure FO-4.
   - Connect oscilloscope probe to TP1A.
   - If pulses are absent, go to step 13.
8. Check for presence of pulses at collector of Q4. See figure FO-3.
   - Connect oscilloscope probe to front lead of R21.
   - If pulses are present, replace R21. See paragraph 2-64.
   - If pulses are absent, go to step 9.
9. Check for presence of pulses at base of Q4. See figure FO-3.
   - Connect oscilloscope probe to right lead of R23.
   - If pulses are absent, replace R23. See paragraph 2-64.
10. Check voltage at emitter of Q4. See figure FO-3.
    - Connect negative (-) multimeter lead to chassis and positive (+) lead to anode of CR21.
    - If meter reads between 1 and 4 V dc, replace Q4. See paragraph 2-64.

GATE CONTROL CIRCUIT TEST - Continued

- If meter reads 0 V dc, go to step 11.
- If meter reads 30 V dc, go to step 12.

11. Check reverse resistance of CR21 and CR22 in series. See figure FO-3.

- Set POWER switch to off.
- Connect positive (+) multimeter lead to chassis and negative (-) lead to anode of CR21.
- If meter reads more than 150 kilohms, replace R22. See paragraph 2-64.
- If meter reads 0 ohm, replace C21. See paragraph 2-64.

12. Check forward resistance of CR21. See figure FO-3.

- Connect negative (-) multimeter lead to cathode of CR21 and positive (+) lead to anode of CR21.
- If meter reads less than 100 ohms, replace CR22. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR21. See paragraph 2-64.

13. Check for presence of pulses at grid of V1. See figure FO-3.

- Connect oscilloscope probe to anode of CR23.
- Set POWER switch to ON.
- If pulses are absent, go to step 17.

14. Check for presence of 6.3 V ac on heater of VI. See figure FO-4.

- Connect oscilloscope probe to solder point CZ.
- If voltage is absent, replace T501. See paragraph 2-57.

15. Check for presence of +30 V dc on plate of V1. See figure FO-4.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to solder point F.
- If voltage is absent, do +30 volt regulator test. See paragraph 2-30.
- If +30 volt regulator test is correct, replace S3. See paragraph 2-47.

GATE CONTROL CIRCUIT TEST - Continued

16. Check for presence of -30 V dc on cathode of V1. See figure FO-4.

- Connect positive (+) multimeter lead to chassis and connect negative (-) lead to TP1A.
- If voltage is absent, replace R27. See paragraph 2-64.
- If voltage is present, replace V1. See paragraph 2-64.

17. Check voltage on grid of V1, See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to anode of CR23.
- If meter reads 5 V dc, replace CR23. See paragraph 2-64.
- If meter reads 0 V dc, go to step 18.

18. Check resistance of R26. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R26.
- If meter reads between 256 and 284 kilohms, go to step 19.
- If meter does not read between 256 and 284 kilohms, replace R26. See paragraph 2-64,

19. Check resistance of R25. See figure FO-3.

- Connect one multimeter lead to each lead of R25.
- If meter reads between 171 and 189 kilohms, replace C22. See paragraph 2-64.
- If meter does not read between 171 and 189 kilohms, replace R25. See paragraph 2-64.

END OF TEST

2-23. DELAY ONE-SHOT CIRCUIT TEST.

DESCRIPTION

This test is to isolate a fault within the delay one-shot circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

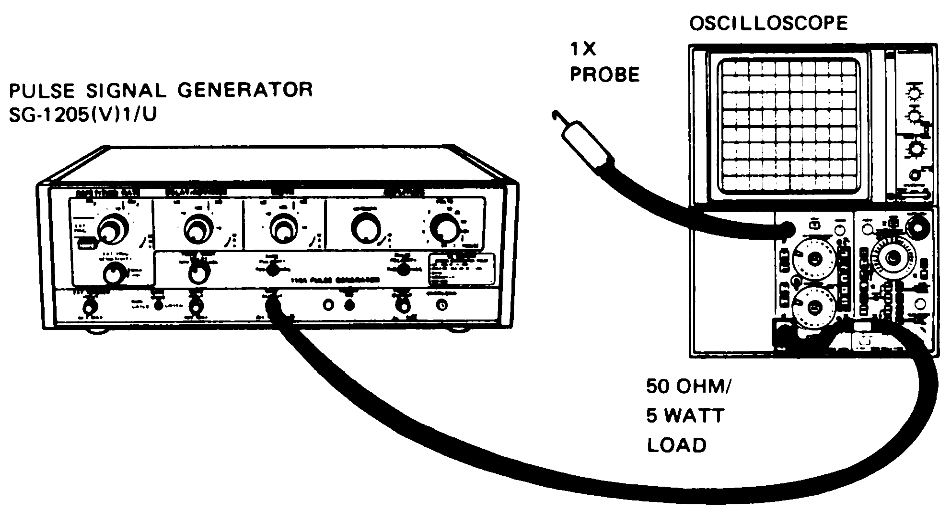
High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

1. Plug power cable into power source.

2. Connect signal generator and oscilloscope.



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DELAY ONE-SHOT CIRCUIT TEST - Continued

3. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Cw
WIDTH	1 µs
Vernier	Ccw
GATE MODE	NON GATED
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
PULSE POLARITY	NEG
POWER	ON

4. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	ALT
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	Out
AC COUPL	In
TRIG SOURCE	EXT
SEC/DIV	1 µs

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

5. Check for presence of delayed pulses at TP1F. See figure FO-4.

- Connect oscilloscope probe clip lead to chassis and connect probe to TP1F.

DELAY ONE-SHOT CIRCUIT TEST - Continued

- Set signal generator and oscilloscope controls to settings given in steps A through E of table 2-8. At each step, pulse will appear on bottom trace, followed by pulse on top trace. Delay between pulses will be as given in Pulse Delay column.

- If pulse is absent from top trace at any step, replace delay/advance switch assembly. See paragraph 2-44.

- If pulses are present at all steps, but delay time does not change when DELAY/ADVANCE setting is changed, go to step 26.

- If pulses are present at all steps, but delay time is not stable at one step, go to step 32.

- If pulses are absent at all steps, go to step 6.

- If pulses are present at all steps, and delay time changes when DELAY/ADVANCE setting is changed, test is complete.

Table 2-8. DELAY TEST

Step	DELAY/ ADVANCE	WIDTH		SEC/ DIV	Pulse Delay
		Range	Vernier		
A	1 µs	1 µs	Ccw	1 µs	1 µs
B	10 µs	1 µs	Cw	5 µs	10 µs
C	100 µs	1 µs	Cw	20 µs	100 µs
D	1 ms	1 ms	Cw	1 ms	1 ms
E	10 ms	1 ms	Cw	5 ms	10 ms

6. Check for presence of pulses at TP1D. See figure FO-4.

   - Connect oscilloscope probe to TP1D. Pulses should appear on top trace.

   - If pulses are absent, do trigger multivibrator test. See paragraph 2-36.

7. Check for presence of pulses at TP1E. See figure FO-4.

   - Connect oscilloscope probe to TP1E. Pulses should appear on top trace.

   - If pulses are absent, go to step 9.

DELAY ONE-SHOT CIRCUIT TEST - Continued

8. Check for presence of pulses at base of Q11. See figure FO-3.

- Connect oscilloscope probe to left lead of R71. Pulses should appear on top trace.
- If pulses are absent, replace R71. See paragraph 2-64.
- If pulses are present, replace Q11. See paragraph 2-64.

9. Check for presence of pulses at base of Q8. See figure FO-3.

   Connect oscilloscope probe to left lead of R64. Pulses should appear on top trace,

   If pulses are absent, go to step 15.

10. Check for presence of pulses at emitter of Q8. See figure FO-3.

- Connect oscilloscope probe to left lead of R69. Pulses should appear on top trace.
- If pulses are absent, go to step 22.

11. Check voltage at collector of Q8. See figure FO-3.

- Connect positive (+) multi meter lead to left lead of R68 and negative (-) lead to chassis.
- If meter reads 5 V dc, go to step 23.
- If meter reads 0 V dc, go to step 12.

12. Check for presence of +5 V dc at junction of R67 and R68. See figure FO-3.

- Connect positive (+) multi meter lead to left lead of R68 and negative (-) lead to chassis.
- If meter reads 5 V dc, replace R68. See paragraph 2-64.
- If meter does not read 5 V dc, go to step 13.

13. Check that resistance of C62 is more than 2 megohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of C62.
- Connect one multimeter lead to each lead of C62.
- If meter does not read more than 2 megohms, replace C62. See paragraph 2-64.
- If meter reads more than 2 megohms, connect lead of C62 and go to step 14.

DELAY ONE-SHOT CIRCUIT TEST - Continued

14. Check that resistance of C71 is more than 2 megohms. See figure FO-3.

    Unsolder and lift one lead of C71.

    Connect one multimeter lead to each lead of C71.

    If meter reads less than 2 megohms, replace C71. See paragraph 2-64.

    If meter reads more than 2 megohms, connect lead of C71 and replace R67. See paragraph 2-64.

15. Check for presence of pulses at anode of CR62. See figure FO-3.

    Connect oscilloscope probe to anode of CR62. Pulses should appear on top trace.

    Set POWER switch to ON.

    If pulses are present, replace R64. See paragraph 2-64.

    If pulses are absent, go to step 16.

16. Check for presence of dc voltage at anode of CR62. See figure FO-3.

    Connect negative (-) multimeter lead to anode of CR62 and positive (+) lead to chassis.

    If meter reads between 0 and -1 V dc, go to step 17.

    If meter reads between -1 and -4 V dc, replace CR61. See paragraph 2-64.

    If meter reads a positive voltage, go to step 18.

17. Check that forward resistance of CR62 is between 2 and 100 ohms. See figure FO-3.

    Set POWER switch to off.

    Connect negative (-) multi meter lead to cathode of CR62 and positive (+) lead to anode of CR62.

    If meter reads between 2 and 100 ohms, go to step 21.

    If meter does not read between 2 and 100 ohms, replace CR62. See paragraph 2-64.

18. Check reverse resistance of CR61 and resistance of C134. See figure FO-3.

    Set POWER switch to off.

    Connect negative (-) multi meter lead to chassis and positive (+) lead to cathode of CR61.

DELAY ONE-SHOT CIRCUIT TEST - Continued

- If meter reads more than 100 kilohms, go to step 19.
- If meter reads less than 100 kilohms, go to step 20.

19. Check that forward resistance of CR62 is less than 100 ohms. See figure FO-3.

- Connect negative (-) multi meter lead to cathode of CR62 and positive (+) lead to anode of CR62.
- If meter reads more than 100 ohms, replace CR62. See paragraph 2-64.
- If meter reads less than 100 ohms, replace R63. See paragraph 2-64.

20. Check that resistance of C64 is more than 2 megohms. See figure FO-3.

- Unsolder and lift one lead of C64.
- Connect one multimeter lead to each lead of C64.
- If meter reads less than 2 megohms, replace C64. See paragraph 2-64.
- If meter reads more than 2 megohms, connect lead of C64 and replace CR61. See paragraph 2-64.

21. Check resistance of R62. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R62.
- If meter reads between 2.3 and 2.5 kilohms, replace C63. See paragraph 2-64.
- If meter does not read between 2.3 and 2.5 kilohms, replace R62. See paragraph 2-64.

22. Check that resistance of R69 is between 2.85 and 3.15 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R69.
- If meter reads between limits given, replace Q8. See paragraph 2-64.
- If meter does not read between limits given, replace R69. See paragraph 2-64.

23. Check voltage at emitter of Q10. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to front lead of R76.

DELAY ONE-SHOT CIRCUIT TEST - Continued

- Set POWER switch to ON.
- If meter reads 30 V dc, replace Q9. See paragraph 2-64.
- If meter reads 0 V dc, go to step 24.

24. Check that resistance of R76 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off,
- Connect one multimeter lead to each lead of R76.
- If meter does not read between limits given, replace R76. See paragraph 2-64.
- If meter reads between limits given, go to step 25.

25. Check voltage at base of Q10. See figure FO-4.

- Connect positive (+) multimeter lead to TP1 E and negative (-) lead to chassis.
- Set POWER switch to ON.
- If meter reads 5 V dc, replace Q10. See paragraph 2-64.
- If meter reads 0 V dc, replace R72. See paragraph 2-64.

26. Check for presence of positive spikes at junction of R73 and R75. See figure FO-3.

- Connect oscilloscope probe to left lead of R75.
- If spikes are absent, go to step 28.

27. Check for presence of positive spikes at base of Q9. See figure FO-3.

- Connect oscilloscope probe to right lead of R73.
- If spikes are present, replace Q9. See paragraph 2-64.
- If spikes are absent, replace R73. See paragraph 2-64.

28. Check for presence of pulses at emitter of Q10. See figure FO-3.

- Connect oscilloscope probe to front lead of R76.
- If pulses are absent, go to step 30.

DELAY ONE-SHOT CIRCUIT TEST - Continued

29. Check that forward resistance of CR63 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to cathode of CR63 and positive (+) lead to chassis,
- If meter reads more than 100 ohms, replace CR63. See paragraph 2-64,
- If meter reads less than 100 ohms, replace R75. See paragraph 2-64.

30. Check for presence of pulses at TP1E. See figure FO-4.

- Connect oscilloscope probe to TP1E.
- Set POWER switch to ON.
- If pulses are absent, replace R72. See paragraph 2-64,

31. Check that resistance of R76 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R76.
- If meter reads between limits given, replace Q10, See paragraph 2-64,
- If meter does not read between limits given, replace R76. See paragraph 2-64.

32, Check for -30 V dc at negative (-) end of C65. See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to rear lead of C65.
- Set POWER switch to ON.
- If meter does not read -30 V dc, go to step 35.

33. Check for continuity through R65 and R66. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each end of R66.
- If meter reads infinity, replace R65. See paragraph 2-64. Replace delay/advance switch assembly. See paragraph 2-44.

34. Check for continuity through R74. See figure FO-3.

- Connect one multimeter lead to each end of R74.

DELAY ONE-SHOT CIRCUIT TEST - Continued

- If meter reads infinity, replace R74. See paragraph 2-64.
- If meter does not read infinity, replace R70. See paragraph 2-64.

35. Check that resistance of C61 is more than 2 megohms. See figure FO-3.

- Set POWER switch to off.
- Momentarily short across C61.
- Unsolder and lift one lead of C61.
- Connect one multimeter lead to each lead of C61.
- If meter reads more than 2 megohms, connect lead of C61 and replace C65. See paragraph 2-64.
- If meter does not read more than 2 megohms, replace C61. See paragraph 2-64.

END OF TEST

2-24. PICKOFF AMPLIFIER TEST.

DESCRIPTION

This test is to isolate a fault to a component of the pickoff amplifier.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

PICKOFF AMPLIFIER TEST - Continued

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µS
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE POLARITY	NEG
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of spikes at TP3A and TP3D. See figure FO-4.

- Connect oscilloscope probe clip lead to chassis.
- Connect oscilloscope probe to TP3A. Note oscilloscope display.

PICKOFF AMPLIFIER TEST - Continued

- Connect oscilloscope probe to TP3D. Note oscilloscope display.
- If negative spikes are present at both test points, test is complete.
- If positive spikes are present at TP3A, go to step 4.
- If positive spikes are present at TP3D, go to step 6.
- If negative spikes are absent at TP3A, go to step 8.
- If negative spikes are absent at TP3D, replace T151. See paragraph 2-64.
- If negative spikes are absent at both test points, go to step 12.

4. Check resistance of R157 and reverse resistance of CR152. See figure FO-3.
   - Set POWER switch to off.
   - Connect positive (+) multi meter lead to right lead of R157 and negative (-) lead to left lead of R157. Meter should read between 140 and 158 ohms.
   - If meter reads more than 158 ohms, replace R157. See paragraph 2-64.
   - If meter reads less than 140 ohms, replace CR152. See paragraph 2-64.

5. Check forward resistance of CR152. See figure FO-3.
   - Connect negative (-) multimeter lead to CR152 cathode and positive (+) lead to CR152 anode.
   - If meter reads more than 100 ohms, replace CR152. See paragraph 2-64.

6. Check resistance of R152 and reverse resistance of CR151. See figure FO-3.
   - Set POWER switch to off.
   - Connect positive (+) multimeter lead to left lead of R152 and negative (-) lead to right lead of R152. Meter should read between 140 and 158 ohms.
   - If meter reads more than 158 ohms, replace R152. See paragraph 2-64.
   - If meter reads less than 140 ohms, replace CR151. See paragraph 2-64.

PICKOFF AMPLIFIER TEST - Continued

7. Check forward resistance of CR151. See figure FO-3.

   - Connect negative (-) multimeter lead to CR151 cathode and positive (+) lead to CR151 anode.

   - If meter reads more than 100 ohms, replace CR151. See paragraph 2-64.

8. Check for presence of spikes at T152, pin 2. See figure FO-3.

   - Connect oscilloscope probe to right rear lead of T152.

   - Set POWER switch to ON.

   - If spikes are present, replace T152. See paragraph 2-64.

   - If spikes are absent, go to step 9.

9. Check that voltage at base of Q26 is between 2.1 and 2.5 V dc. See figure FO-3.

   - Connect negative (-) multimeter lead to chassis and positive (+) lead to left lead of R156.

   - If meter is within limits given, replace Q26. See paragraph 2-64.

   - If meter does not read within limits given, go to step 10.

10. Check resistance of R159 and C151. See figure FO-3.

    - Set POWER switch to off.

    - Connect one multimeter lead to each lead of R159. Meter should read between 950 and 1050 ohms.

    - If meter reads more than 1050 ohms, replace R159. See paragraph 2-64.

    - If meter reads less than 950 ohms, replace C151. See paragraph 2-64.

11. Check resistance of R158 and R156. See figure FO-3.

    - Connect one multimeter lead to each lead of R158. Meter should read between 11.4 and 12.6 kilohms.

    - Connect one multimeter lead to each lead of R156. Meter should read between 21 and 23 ohms.

    - If either reading is not within limits given, replace resistor. See paragraph 2-64.

PICKOFF AMPLIFIER TEST - Continued

12. Check for presence of pulses at TP1L. See figure FO-4.

- Connect oscilloscope probe to TP1L.
- Set POWER switch to ON.
- If pulses are absent, do width one-shot test. See paragraph 2-25.

13. Check for presence of pulses at base of Q25. See figure FO-3.

- Connect oscilloscope probe to right lead of R153.
- If pulse is absent, replace R153. See paragraph 2-64.

14. Check for presence of pulses at emitter of Q25. See figure FO-3.

- Connect oscilloscope probe to right lead of R155.
- If pulses are absent, go to step 17.

15. Check voltage at collector of Q25. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to left rear lead of T151.
- If meter reads 30 V dc, replace Q25, See paragraph 2-64.
- If meter reads 0 V dc, go to step 16.

16. Check for presence of +30 V dc at T151, pin 4. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to right rear lead of T151.
- If meter reads 30 V dc, replace T151. See paragraph 2-64.
- If meter reads 0 V dc, replace R154. See paragraph 2-64.

17. Check voltage drop across R155. See figure FO-3.

- Connect positive (+) multimeter lead to right lead of R155 and negative (-) lead to left lead of R1550
- If meter reads between 1 and 30 V dc, replace Q25. See paragraph 2-64.
- If meter reads 0 V dc, replace R155. See paragraph 2-64.

END OF TEST

2-25. WIDTH ONE-SHOT TEST.

DESCRIPTION

This test is to isolate a fault within the width one-shot circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock, See general warning page.

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Cw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE POLARITY	NEG
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH 1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	10 µs

WIDTH ONE-SHOT TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of pulses at TP1L. See figure FO-4.

- Connect oscilloscope probe to TP1L.
- Set REPETITION RATE and WIDTH controls on signal generator and set SEC/DIV control on oscilloscope to positions given in steps A thru E of table 2-9. Oscilloscope should display pulses at each step.
- If pulses are absent at one step, replace width switch assembly. See paragraph 2-44.
- If pulses are absent at all steps, go to step 4.
- If pulses are present at all steps, but pulse width does not change when WIDTH switch setting is changed, go to step 25.
- If pulses are present at all steps, but pulse width changes from pulse to pulse, go to step 31.
- If pulses are present at all steps, and pulse width changes when WIDTH switch setting is changed, test is complete.

Table 2-9. PULSE WIDTH CONTROL SETTINGS

Step	REPETITION RATE	Vernier	WIDTH	SEC/DIV
A	0.1 MHz	Cw	1 µs	10 µs
B	10 kHz	Cw	10 µs	0.1 ms
c	1 kHz	Cw	100 µs	1 ms
D	0.1 kHz	Cw	1 ms	10 ms
E	0.1 kHz	Ccw	10 ms	0.1 s

WIDTH ONE-SHOT TEST - Continued

4. Check for presence of pulses at TP1J. See figure FO-4.
   - Connect oscilloscope probe to TP1J.
   - If pulses are absent, do pulse differentiator advance circuit test. See paragraph 2-15.
5. Check for presence of pulses at TP1 K. See figure FO-4.
   - Connect oscilloscope probe to TP1K.
   - If pulses are absent, go to step 8.
6. Check for presence of pulses at base of Q24. See figure FO-3.
   - Connect oscilloscope probe to left lead of R141.
   - If pulses are absent, replace R141. See paragraph 2-64.
7. Check that resistance of R151 is between 950 and 1050 ohms. See figure FO-3.
   - Set POWER switch to off.
   - Connect negative (-) multimeter lead to TP1L and positive (+) lead to chassis.
   - If meter reads between limits given, replace Q24. See paragraph 2-64.
   - If meter does not read between limits given, replace R151. See paragraph 2-64.
8. Check for presence of pulses at base of Q21. See figure FO-3.
   - Connect oscilloscope probe to right lead of R134.
   - Set POWER switch to ON.
   - If pulses are absent, go to step 14.
9. Check for presence of pulses at emitter of Q21. See figure FO-3.
   - Connect oscilloscope probe to left lead of R139.
   - If pulses are absent, go to step 21.
10. Check for presence of +5 V dc at collector of Q21. See figure FO-3.
    - Connect positive (+) multimeter lead to right lead of R142 and negative (-) lead to chassis.

WIDTH ONE-SHOT TEST - Continued

- If meter reads 5 V dc, go to step 22,
- If meter reads 0 V dc, go to step 11.

11. Check for presence of +5 V dc at junction of R137 and R138. See figure FO-3.
    - Connect positive (+) multi meter lead to left lead of R137 and negative (-) lead to chassis.
    - If 5 V dc is present, replace R138. See paragraph 2-64.
    - If 5 V dc is absent, go to step 12.
12. Check that resistance of C132 is more than 2 megohms. See figure FO-3.
    - Set POWER switch to off.
    - Unsolder and lift one lead of C132.
    - Connect one multimeter lead to each lead of C132.
    - If meter does not read more than 2 megohms, replace C132. See paragraph 2-64.
    - If meter reads more than 2 megohms, connect lead of C132 and go to step 13.
13. Check that resistance of C141 is more than 2 megohms. See figure FO-3.
    - Unsolder and lift one lead of C141.
    - Connect one multimeter lead to each lead of C141.
    - If meter does not read more than 2 megohms, replace C141. See paragraph 2-64.
    - If meter reads more than 2 megohms, connect lead of C141 and replace R137. See paragraph 2-64.
14. Check for presence of pulses at anode of CR132. See figure FO-3.
    - Connect oscilloscope probe to anode of CR132.
    - Set POWER switch to ON.
    - If pulses are present, replace R134. See paragraph 2-64.
    - If pulses are absent, go to step 15.
15. Check for presence of dc voltage at anode of CR132. See figure FO-3.
    - Connect negative (-) multimeter lead to anode of CR132 and positive (+) lead to chassis.

WIDTH ONE-SHOT TEST - Continued

- If meter reads between 0 and -1 V dc, go to step 16.
- If meter reads between -1 and -4 V dc, replace CR131. See paragraph 2-64.
- If meter reads a positive voltage, go to step 17.

16. Check that forward resistance of CR132 is between 2 and 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multi meter lead to cathode of CR132 and positive (+) lead to anode of CR132.
- If meter reads between 2 and 100 ohms, go to step 20.
- If meter does net read between 2 and 100 ohms, replace CR132. See paragraph 2-64.

17. Check reverse resistance of CR131 and check resistance of C134. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to chassis and positive (+) lead to cathode of CR131.
- If meter reads more than 100 kilohms, go to step 18.
- If meter reads less than 100 kilohms, go to step 19.

18. Check that forward resistance of CR132 is less than 100 ohms. See figure FO-3.

- Connect negative (-) multi meter lead to cathode of CR132 and positive (+) lead to anode of CR132.
- If meter reads more than 100 ohms, replace CR132. See paragraph 2-64.
- If meter reads less than 100 ohms, replace R133. See paragraph 2-64.

19. Check that resistance of C134 is more than 2 megohms. See figure FO-3.

- Unsolder and lift one lead of C134.
- Connect one multimeter lead to each lead of C134.
- If meter reads less than 2 megohms, replace CR134. See paragraph 2-64.
- If meter reads more than 2 megohms, connect lead of C134 and replace CR131. See paragraph 2-64.

WIDTH ONE-SHOT TEST - Continued

20. Check that resistance of R132 is between 2.3 and 2.5 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R132.
- If meter reads between limits given, replace C133. See paragraph 2-64.
- if meter does not read between limits given, replace R132. See paragraph 2-64.

21. Check that resistance of R139 is between 3.7 and 4.1 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R139.
- If meter reads between limits given, replace Q21. See paragraph 2-64.
- If meter does not read between limits given, replace R139. See paragraph 2-64.

22. Check for presence of +30 V dc at emitter of Q23. See figure FO-4.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to solder point AG.
- Set POWER switch to ON.
- If meter reads 30 V dc, replace Q22. See paragraph 2-64.
- If meter reads 0 V dc, go to step 23.

23. Check that resistance of R146 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R146.
- If meter does not read between limits given, replace R146. See paragraph 2-64.
- If meter reads between limits given, go to step 24.

24. Check for presence of +5 V dc at base of Q23. See figure FO-4.

- Connect positive (+) multi meter lead to TP1K and negative (-) lead to chassis.
- Set POWER switch to ON.

WIDTH ONE-SHOT TEST - Continued

- If meter reads 5 V dc, replace Q23. See paragraph 2-64.
- If meter reads 0 V dc, replace R142. See paragraph 2-64.

25. Check for presence of positive spikes at junction of R143 and R145. See figure FO-4.

- Connect oscilloscope probe to solder point AF.
- If spikes are absent, go to step 27.

26. Check for presence of positive spikes at base of Q22. See figure FO-3.

- Connect oscilloscope probe to right lead of R143.
- If spikes are present, replace Q22. See paragraph 2-64.
- If spikes are absent, replace R143. See paragraph 2-64.

27. Check for presence of pulses at emitter of Q23. See figure FO-4.

- Connect oscilloscope probe to solder point AG.
- If pulses are absent, go to step 29.

28. Check that forward resistance of CR133 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to cathode of CR133 and positive (+) lead to chassis.
- If meter reads more than 100 ohms, replace CR133. See paragraph 2-64.
- If meter reads less than 100 ohms, replace R145. See paragraph 2-64.

29. Check for presence of pulses at TP1K. See figure FO-4.

- Connect oscilloscope probe to TP1K.
- Set POWER switch to ON.
- If pulses are absent, replace R142. See paragraph 2-64.

30. Check that resistance of R146 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R146.

WIDTH ONE-SHOT TEST - Continued

- If meter reads between limits given, replace Q23. See paragraph 2-64.
- If meter does not read between limits given, replace R146. See paragraph 2-64.

31. Check for -30 V dc at negative (-) rear lead of C135. See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to rear lead of C135.
- Set POWER switch to ON.
- If meter does not read -30 V dc, go to step 34.

32. Check for continuity through R135 and R136. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each end of R136.
- If meter reads infinity, replace R135. See paragraph 2-64. Replace width switch assembly. See paragraph 2-44.

33. Check for continuity through R144. See figure FO-3.

- Connect one multimeter lead to each lead of R144.
- If meter reads infinity, replace R144. See paragraph 2-64.
- If meter does not read infinity, replace R140. See paragraph 2-64.

34. Check that resistance of C131 is more than 2 megohms. See figure FO-3.

- Set POWER switch to off.
- Momentarily short across C131.
- Unsolder and lift one lead of C131.
- Connect one multi meter lead to each lead of C131.
- If meter reads more than 2 megohms, connect lead of C131 and replace C136. See paragraph 2-64.
- If meter does not read more than 2 megohms, replace C131. See paragraph 2-64.

END OF TEST

2-26. SCREEN GRID SUPPLY TEST.

DESCRIPTION

This test is to isolate a fault to a component of the screen grid circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover, See paragraph 2-37.

1. Plug power cable into power source.

WARNING

Signal generator contains high voltages, Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

2. Check that voltage range at TP3J is between 29 and 130 V dc with AMPLITUDE VOLTS control set to 100. See figure FO-4.

   - Connect positive (+) multimeter lead to chassis and negative (-) lead to TP3J.
   - Set AMPLITUDE VOLTS control to 100.
   - Set POWER switch to ON.
   - While watching meter, turn AMPLITUDE VERNIER control to full left, then to full right.

SCREEN GRID SUPPLY TEST - Continued

- If meter reads 200 V dc with no changes, go to step 7.
- If meter reads between 131 and 199 V dc, go to step 8.
- If meter reads less than 29 V dc, go to step 13.

3. Check that voltage range at TP3J is between 36 and 145 V dc with AMPLITUDE VOLTS control set to 50.

   - Set AMPLITUDE VOLTS control to 50.
   - While watching meter, turn AMPLITUDE VERNIER control to full left, then to full right.
   - If meter reads more than 145 V dc, go to step 10.
   - If meter reads less than 36 V dc, go to step 14.

4. Check that voltage range at TP3J is between 109 and 170 V dc with AMPLITUDE VOLTS control set to 20.

   - Set AMPLITUDE VOLTS control to 20.
   - While watching meter, turn AMPLITUDE VERNIER control to full left, then to full right.
   - If meter reads more than 170 V dc, go to step 9.
   - If meter reads less than 109 V dc, go to step 14.

5. Check that voltage changes at emitter of Q43 when AMPLITUDE VERNIER control is changed. See figure FO-3.

   - Connect positive (+) multi meter lead to chassis and negative (-) lead to left lead of R371.
   - While watching meter, turn AMPLITUDE VERNIER control to full left, then to full right.
   - If meter reads 0 V dc, go to step 6.
   - If meter reads 200 V dc, go to step 8.
   - If meter reading is not 0 V dc, but does not change, replace Q43. See paragraph 2-64.
   - If meter reading changes, replace Q42. See paragraph 2-64.

6. Check resistance of R371. See figure FO-3.

   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R371.

SCREEN GRID SUPPLY TEST - Continued

- If meter reads between 20.9 and 23.1 kilohms, replace Q43. See paragraph 2-64.
- If meter does not read between 20.9 and 23.1 kilohms, replace R371. See paragraph 2-64.

7. Check resistance of C371. See figure FO-3.
   - Set POWER switch to off.
   - Connect one multi meter lead to each lead of C371.
   - If meter reads less than 19 kilohms, replace C371. See paragraph 2-64.
   - If meter reads more than 19 kilohms, go to step 10.
8. Check that resistance of R374 is between 4.75 and 5.25 kilohms. See figure FO-3.
   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R374.
   - If meter does not read between limits given, replace R374. See paragraph 2-64.
   - If meter reads between limits given, go to step 10.
9. Check that resistance of R375 is between 14.25 and 15.75 kilohms. See figure FO-3.
   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R375.
   - If meter does not read between limits given, replace R375. See paragraph 2-64,
10. Check that resistance of R372 is between 3.13 and 3.47 kilohms. See figure FO-3.
    - Set POWER switch to off.
    - Connect one multimeter lead to each lead of R372.
    - If meter does not read between limits given, replace R372. See paragraph 2-64.
11. Check that resistance of R382 is between 1.95 and 2.05 ohms. See figure FO-3.
    - Connect one multimeter lead to each lead of R382.
    - If meter does not read between limits given, replace R382. See paragraph 2-64.

SCREEN GRID SUPPLY TEST - Continued

12. Check that resistance of R373 is between 9.5 and 10.5 kilohms. See figure FO-4.

- Connect one multimeter lead each to solder points BS and BR.
- If meter does not read between limits given, replace R373. See paragraph 2-64.
- If meter reads between limits given, replace amplitude switch assembly. See paragraph 2-45.

13. Check that resistance of R379 is between 4.4 and 5.0 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R379.
- If meter does not read between limits given, replace R379. See paragraph 2-64.

14. Check that resistance of R378 is between 4.84 and 5.36 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R378.
- If meter does not read between limits given, replace R378. See paragraph 2-64.

15. Check that resistance of R373 is between 9.5 and 10.5 kilohms. See figure FO-4.

- Connect one multimeter lead each to solder points BS and BR.
- If meter does not read between limits given, replace R373. See paragraph 2-64.
- If meter reads between limits given, replace amplitude switch assembly. See paragraph 2-45.

END OF TEST

2-27. OVERLOAD ISOLATION TEST.

DESCRIPTION

This test is to isolate an overload condition to the -200 volt regulator or to the output amplifier.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

WARNING

Signal generator contains high voltages. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

1. Unsolder and lift one end each of two jumper wires from solder point DK and from solder point DP. See figure FO-4.

2. Plug power cable into power source.

3. Set POWER switch to ON.

   - If OVERLOAD indicator lights, set POWER switch to off, connect two jumper wires at solder points DK and DP, and do -200 volt regulator test. See paragraph 2-28.

   - If OVERLOAD indicator does not light, set POWER switch to off, connect two jumper wires at solder points DK and DP, and do output amplifier test. See paragraph 2-13.

END OF TEST

2-28. -200 VOLT REGULATOR TEST.

DESCRIPTION

This test is to make sure that components of the -200 volt regulator are not faulty.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

1. Plug power cable into power source.

2. Check that voltage at TP5F is between -190 and -210 V dc. See figures FO-3 and FO-4.

   Connect positive (+) multimeter lead to rear lead of CR528 and negative (-) lead to TP5F.

   Set POWER switch to ON.

   If meter reads between limits given, test is complete.

   If meter reads 0 V dc, go to step 3.

   If meter reads less than 190 V dc, go to step 4.

   If meter reads more than 210 V dc, go to step 31.

3. Check that resistance of R520 is between 0.9 and 1.1 ohms. See figure FO-3.

   Set POWER switch to off.

-200 VOLT REGULATOR TEST - Continued

- Connect one multimeter lead to each lead of R520.
- If meter reads between 0.9 and 1.1 ohms, go to step 5.
- If meter does not read between 0.9 and 1.1 ohms, replace R520. See paragraph 2-64.

4. Adjust R535 for -200 ± 10 V dc. See figures FO-3 and FO-4.

- Connect positive (+) multimeter lead to rear lead of CR528 and negative (-) lead to TP5F.
- Turn R535 to right to make meter reading less negative.
- Turn R353 to left to make meter reading more negative.
- If voltage can be adjusted within limits given, test is complete.
- If voltage cannot be adjusted within limits given, go to step 5.

5. Check that voltage between TP5B and TP5F is more than 200 V dc. See figure FO-4.

- Set POWER switch to ON.
- Connect negative (-) multimeter lead to TP5F and positive (+) lead to TP5B.
- If meter reads less than 200 V dc, go to step 28.

6. Check that voltage between emitter and collector of Q501 is less than 15 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to CR520 anode and positive (+) lead to CR521 cathode.
- If meter reads more than 15 V dc, go to step 18.
- If meter reads 0 V dc, go to step 23.

7. Check that voltage drop across R516 is 0 V dc. See figure FO-4.

- Connect positive (+) multimeter lead to TP5A and negative (-) lead to solder point DE.
- If meter reads 0 V dc, replace heatsink/fan assembly. See paragraph 2-56.
- If meter reads more than 0 V dc, go to step 8.

8. Check that voltage drop across Q507 is less than 6 V dc. See figure FO-4.

- Connect negative (-) multimeter lead to TP5E and positive (+) lead to TP5C.
- Set POWER switch to ON.

-200 VOLT REGULATOR TEST - Continued

- If meter reads more than 6 V dc, go to step 11.
- If meter reads 0 V dc, go to step 15.

9. Check that voltage drop across Q505 is less than 0.5 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to rear lead of CR528 and positive (+) lead to can of Q505.
- If meter reads more than 0.5 V dc, go to step 41.

10. Check that resistance of R515 is between 37 and 41 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to front lead of R515 and positive (+) lead to rear lead of R515.
- If meter reads between limits given, replace CR524. See paragraph 2-64.
- If meter does not read between limits given, replace R515. See paragraph 2-64.

11. Check that voltage drop across R531 is less than 5.5 V dc. See figure FO-3.

- Connect negative (-) multi meter lead to front lead of R531 and positive (+) lead to rear lead of R531 .
- Set POWER switch to ON.
- If meter reads more than 5.5 V dc, go to step 12.
- If meter reads less than 5.5 V dc, go to step 13.

12. Check that resistance of R531 is between 14.25 and 15.75 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R531.
- If meter reads between limits given, replace CR527. See paragraph 2-64.
- If meter does not read between limits given, replace R531. See paragraph 2-64.

13. Check that resistance of R523 is between 3.7 and 4.1 kilohms. See figure FO-3.

- Set POWER switch to off.

-200 VOLT REGULATOR TEST - Continued

- Connect one multimeter lead to each lead of R523.
- If meter does not read between limits given, replace R523. See paragraph 2-64.

14. Check that resistance of C516 is more than 1 megohm. See figure FO-3.

- Connect positive (+) multimeter lead to positive (+) lead of C516 and negative (-) multi meter lead to negative (-) lead of C516.
- If meter reads more than 1 megohm, replace Q507. See paragraph 2-64.
- If meter reads less than 1 megohm, replace C516. See paragraph 2-64.

15. Check that voltage drop across Q44 is between 0.7 and 0.9 V dc. See figure FO-3.

- Connect negative (-) multi meter lead to emitter of Q44 and positive (+) lead to collector of Q44.
- Set POWER switch to ON.
- If meter reads less than 0.7 V dc, go to step 16.
- If meter reads more than 0.9 V dc, go to step 17.

16. Check that resistance of R382 is between 1.8 and 2.2 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to outside lead of R382 and positive (+) lead to inside lead of R382.
- If meter reads between 1.8 and 2.2 ohms, replace Q44. See paragraph 2-64.
- If meter does not read between 1.8 and 2.2 ohms, replace R382. See paragraph 2-64.

17. Check that resistance of R381 is between 95 and 105 ohms. See figure FO-3.

    Set POWER switch to off.

- Connect one multimeter lead to each lead of R381.
- If meter reads between limits given, replace Q44. See paragraph 2-64.
- If meter does not read between limits given, replace R381. See paragraph 2-64.

-200 VOLT REGULATOR TEST - Continued

18. Check that voltage across C514 is between 1.9 and 2.1 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to rear lead of C514 and positive (+) lead to front lead of C514.
- Set POWER switch to ON.
- If meter does not read between limits given, go to step 20.

19. Check that reverse resistance of CR520 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to CR520 anode and positive (+) lead to CR520 cathode.
- If meter reads more than 100 kilohms, replace Q501. See paragraph 2-64.
- If meter reads less than 100 kilohms, replace CR520. See paragraph 2-64.

20. Check that resistance of R517 and R518, in series, is between 1300 and 1450 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to rear lead of R517 and other lead to front lead of R518.
- If meter does not read between limits given, go to step 22.

21. Check that resistance of C513 is more than 1 megohm. See figure FO-3.

- Connect negative (-) multi meter lead to negative lead of C513 and positive (+) multimeter lead to positive lead of C513.
- If meter reads more than 1 megohm, replace C514. See paragraph 2-64.
- If meter reads less than 1 megohm, replace C513. See paragraph 2-64.

22. Check that resistance of R517 is between 780 and 860 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of R517.
- If meter reads between limits given, replace R518. See paragraph 2-64.
- If meter does not read between limits given, replace R517. See paragraph 2-64.

-200 VOLT REGULATOR TEST - Continued

23. Check that the voltage drop across Q518 is less than 1 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to cathode of CR521 and positive (+) lead to emitter (left lead) of Q518.
- Set POWER switch to ON.
- If meter reads more than 1 V dc, go to step 24.
- If meter reads 0 V dc, go to step 26.

24. Check that reverse resistance of CR535 is more than 1 kilohm. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to CR535 anode and positive (+) lead to CR535 cathode.
- If meter reads less than 1 kilohm, replace CR535. See paragraph 2-64.

25. Check that resistance of R569 is between 1.4 and 1.6 kiiohms. See figure FO-3.

- Connect one multimeter lead to each lead of R569.
- If meter reads between limits given, replace Q518. See paragraph 2-64.
- If meter does not read between limits given, replace R569. See paragraph 2-64.

26. Check that forward resistance of CR522 is less than 100 ohms. See figure FO-3.

Set POWER switch to off.

- Connect negative (-) multi meter lead to cathode of CR522 and positive (+) lead to CR522 anode,
- If meter reads more than 100 ohms, replace CR522. See paragraph 2-64.

27. Check that resistance of R574 is between 95 and 105 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of R574.
- If meter reads between limits given, replace R519. See paragraph 2-64.

If meter does not read between limits given, replace R574. See paragraph 2-64.

28. Check that forward resistance of CR525 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.

-200 VOLT REGULATOR TEST - Continued

- Connect negative (-) multimeter lead to CR525 cathode and positive (+) lead to CR525 anode.
- If meter reads more than 100 ohms, replace CR525. See paragraph 2-64.

29. Check that resistance of R533 is between 25.3 and 28.5 kilohms. See figure FO-3.

- Connect positive (+) multimeter lead to front lead of R533 and negative (-) lead to rear lead of R533.
- If meter does not read between limits given, replace R533. See paragraph 2-64.

30. Check that resistance of R534 is between 1.1 and 1.3 kilohms. See figure FO-3.

- Connect one multimeter lead to each lead of R534.
- If meter reads between limits given, replace R535. See paragraph 2-64.
- If meter does not read between limits given, replace R534. See paragraph 2-64.

31. Adjust R535 for -200 ±10 V dc. See figures FO-3 and FO-4.

- Connect positive (+) multimeter lead to rear lead of CR528 and negative (-) lead to TP5F.
- Set POWER switch to ON.
- Turn R535 right to make meter reading less negative.
- Turn R535 left to make meter reading more negative.
- If voltage can be adjusted within limits given, test is complete.
- If voltage cannot be adjusted within limits given, go to step 32.

32. Check that voltage between TP5B and TP5F is less than 200 V dc. See figure FO-4.

- Connect negative (-) multimeter lead to TP5F and positive (+) lead to TP5B.
- If meter reads more than 200 V dc, go to step 34.

33. Check that reverse resistance of CR519 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect negtive (-) multimeter lead to CR519 anode and positive (+) lead to CR519 cathode.

-200 VOLT REGULATOR TEST - Continued

- If meter reads more than 100 kilohms, replace heatsink/fan assembly. See paragraph 2-56.
- If meter reads less than 100 kilohms, replace CR519. See paragraph 2-64.

34. Check that voltage drop across R533 is more than 185 V dc. See figure FO-3.

- Connect negative (-) multi meter lead to front lead of R533 and positive (+) lead to rear lead of R533.
- Set POWER switch to ON.
- If meter reads less than 185 V dc, go to step 37.

35. Check that resistance of R526 and R528, in parallel, is between 11.4 and 12.6 kilohms. See figure FO-3.

Set POWER switch to off.

- Connect one multimeter lead to each lead of R526.
- If meter reads between limits given, replace Q506. See paragraph 2-64.
- If meter does not read between limits given, go to step 36.

36. Check that resistance of R526 is between 22.8 and 25.2 kilohms. See figure FO-3.

- Unsolder and lift one lead of R526.
- Connect multimeter lead to each lead of R526.
- If meter reads between limits given, connect lead of R526 and replace R528. See paragraph 2-64.
- If meter does not read between limits given, replace R526. See paragraph 2-64.

37. Check that voltage drop across Q508 is less than 195 V dc. See figure FO-3.

- Connect negative (-) multimeter lead to rear lead of R533 and positive (+) lead to CR529 anode.
- Set POWER switch to ON.
- If meter reads more than 195 V dc, go to step 39.

38. Check that forward resistance of CR528 is less than 100 ohms, See figure FO-3.

- Set POWER switch to off.

-200 VOLT REGULATOR TEST - Continued

- Connect negative (-) multimeter lead to CR528 cathode and positive (+) lead to CR528 anode.
- If meter reads less than 100 ohms, replace CR529. See paragraph 2-64.
- If meter reads more than 100 ohms, replace CR528. See paragraph 2-64.

39. Check that resistance of R536 is between 37 and 41 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R536.
- If meter does not read between limits given, replace R536. See paragraph 2-64.

40. Check that resistance of R535 is between 950 and 1050 ohms. See figure FO-3.

- Connect one multimeter lead to rear lead of R536 and other lead to rear lead of R534.
- If meter reads between limits given, replace Q508. See paragraph 2-64.
- If meter does not read between limits given, replace R535. See paragraph 2-64.

41. Check that voltage drop across R522 is less than 1.5 V dc. See figure FO-3.

- Connect negative (-) multi meter lead to rear lead of R522 and positive (+) lead to front lead of R522.
- Set POWER switch to ON.
- If meter reads less than 1.5 V dc, replace Q505. See paragraph 2-64.
- If meter reads more than 1.5 V dc, replace Q503. See paragraph 2-64.

END OF TEST

2-29. -235 VOLT REGULATOR TEST.

DESCRIPTION

This test is to isolate a fault to a component of the -235 volt regulator.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

NOTE

- If -235 volt regulator test is being done because signal generator blows fuses, go to step 1.
- If -235 volt regulator test is being done because -35 volts or -235 volts is absent from circuits, go to step 4.

1. Check that emitter-collector resistance of Q510 is more than 1 megohm. See figure FO-4.

   - Set POWER switch to off.
   - Connect negative (-) multimeter lead to solder point DL and positive (+) lead to solder point DN.
   - If meter reads less than 1 megohm, replace Q510. See paragraph 2-62.

-235 VOLT REGULATOR TEST - Continued

2. Check that forward resistance of CR546 is more than 20 ohms. See figure FO-3.

   - Connect negative (-) multi meter lead to cathode of CR546 and positive (+) lead to anode of CR546.
   - If meter reads less than 20 ohms, replace CR546. See paragraph 2-64.

3. Check that forward resistance of CR548 is less than 1 kilohm. See figure FO-3.

   - Connect negative (-) multimeter lead to cathode of CR548 and positive (+) lead to anode of CR548.
   - If meter reads more than 1 kilohm, replace CR548. See paragraph 2-64.
   - If meter reads less than 1 kilohm, replace 2501. See paragraph 2-64.

4. Check that voltage at TP5F is between -190 and -210 V dc. See figures FO-3 and FO-4.

   - Connect positive (+) multimeter lead to front lead of C518 and negative (-) lead to TP5F.
   - Set POWER switch to ON.
   - If meter does not read between limits given, do -200 volt regulator test. See paragraph 2-28.

5. Check that voltage across C541 is between 40 and 45 V dc. See figure FO-3.

   - Connect positive (+) multi meter lead to rear lead of R543 and negative (-) lead to front lead of R541.
   - If meter does not read between limits given, do power supply input circuits test. See paragraph 2-16.

6. Check that resistance of R543 and CR546 in series is between 5.4 and 6.0 kilohms. See figure FO-3.

   - Set POWER switch to off.
   - Unsolder and lift rear lead of R543.
   - Connect negative (-) multimeter lead to anode of CR546 and positive (+) lead to rear lead of R543.
   - If meter does not read between limits given, go to step 12.
   - If meter reads between limits given, connect lead of R543 and go to step 7.

-235 VOLT REGULATOR TEST - Continued

7. Check that resistance of R544 and CR548 in series is between 2.7 and 3.0 kilohms. See figure FO-3.

   - Unsolder and lift front lead of R544.
   - Connect negative (-) multimeter lead to front lead of R544 and positive (+) lead to cathode of CR548.
   - If meter does not read between limits given, go to step 13.
   - If meter reads between limits given, connect lead of R544 and go to step 8.

8. Check that resistance of R545, R546, and R547, in series, is between 7.5 and 8.3 kilohms. See figures FO-3 and FO-4.

   - Unsolder and lift rear lead of R545.
   - Connect one multimeter lead to rear lead of R545 and other lead to TP5G.
   - If meter does not read between limits given, go to step 14.
   - If meter reads between limits given, connect lead of R545 and go to step 9.

9. Check that emitter-collector resistance of Q509 is more than 1 megohm. See figure FO-3.

   - Connect negative (-) multimeter lead to front lead of R541 and positive (+) lead to anode of CR546.
   - If meter does not read more than 1 megohm, replace Q509. See paragraph 2-64.

10. Check that emitter-base resistance of Q510 is less than 1.5 kilohms. See figure FO-4.

    - Connect negative (-) multimeter lead to solder point DL and positive (+) lead to solder point DM.
    - If meter reads more than 1.5 kilohms, replace Q510. See paragraph 2-62.

11. Check that collector-base resistance of Q510 is less than 1.5 kilohms. See figure FO-4.

    - Connect negative (-) multimeter lead to solder point DN and positive (+) lead to solder point DM.
    - If meter reads more than 1.5 kilohms, replace Q510. See paragraph 2-62.
    - If meter reads less than 1.5 kilohms, replace Z501. See paragraph 2-64.

-235 VOLT REGULATOR TEST - Continued

12. Check that reverse resistance of CR546 is between 20 and 1000 ohms. See figure FO-3.

- Connect negative (-) multimeter lead to CR546 anode and positive (+) lead to CR546 cathode.
- If meter reads between limits given, replace R543. See paragraph 2-64.
- If meter does not read between limits given, connect lead of R543 and replace CR546. See paragraph 2-64.

13. Check that reverse resistance of CR548 is between 20 and 1000 ohms. See figure FO-3.

- Connect negative (-) multimeter lead to CR548 anode and positive (+) lead to CR548 cathode.
- If meter reads between limits given, replace R544. See paragraph 2-64.
- If meter does not read between limits given, connect lead of R544 and replace CR548. See paragraph 2-64.

14. Check that resistance of R545 is between 1.7 and 1.9 kilohms. See figure FO-3.

- Connect one multimeter lead to each lead of R545.
- If meter does not read between limits given, replace R545. See paragraph 2-64.

15. Check that resistance of R546 is between 950 and 1050 ohms. See figure FO-3.

- Connect one multimeter lead each to front lead of R545 and rear lead of R547.
- If meter reads between limits given, replace R547. See paragraph 2-64.
- If meter does not read between limits given, replace R546. See paragraph 2-64.

END OF TEST

2-30. +30 VOLT REGULATOR TEST.

DESCRIPTION

This test is to isolate a fault to a component in the +30 volt regulator.

INITIAL SETUP

Reference: TM 11-6625-3050-12

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

NOTE

- If +30 volt regulator test is being done because signal generator is blowing fuses, go to step 1.
- If +30 volt regulator test is being done because +30 volts is absent in other circuits, go to step 5.

1. See figure FO-9. Unsolder and lift one lead of C564.
2. Unsolder and lift one lead of C566.
3. Check that fuse does not blow with capacitors disconnected.
   - Set POWER switch to ON.
   - If power indicator does not light, set POWER switch to off, replace fuse F501 (see TM 11-6625-3050-12), and go to step 4.
   - If power indicator lights, set POWER switch to off and go to step 5.

+30 VOLT REGULATOR TEST- Continued

4. Check that resistance of C564 is more than 1 megohm. See figure FO-9.

   - Set POWER switch to off.
   - Connect positive (+) multimeter lead to rear lead of C564 and negative (-) lead to front lead of C564.
   - If meter reads more than 1 megohm, connect lead of C564 and replace C566. See paragraph 2-62.
   - If meter reads less than 1 megohm, connect lead of C566 and replace C564 See paragraph 2-62.

5. Check that resistance of R576 is between 240 and 246 ohms. See figure FO-9.

   - Unsolder and lift lead of R576 from solder tab DT.
   - Connect one multimeter lead to each lead of R576.
   - If meter reads between limits given, go to step 6.
   - If meter does not read between limits given, replace R576. See paragraph 2-62.

6. Check that resistance of R575 is between 5.56 and 5.68 kilohms. See figure FO-9.

   - Connect one multimeter lead to each lead of R575.
   - If meter reads between limits given, connect lead of R576 to solder tab DT and replace Z504. See paragraph 2-62.
   - If meter does not read between limits given, connect lead R576 to solder tab DT and replace R575. See paragraph 2-62.

7. Check that voltage across C551 is between 35 and 45 V dc See figure FO-4.

   - Connect negative (-) multimeter lead to chassis and positive (+) lead to solder point DS.
   - Set POWER switch to ON.
   - If meter does not read between 35 and 45 V dc do power supply input circuits test. See paragraph 2-16.
   - If meter reads between 35 and 45 V dc go to step 5.

END OF TEST

2-31. -30 VOLT REGULATOR TEST.

DESCRIPTION

This test is to isolate a fault to a component in the -30 volt regulator.

INITIAL SETUP

Reference: TM 11-6625-3050-12

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

NOTE

- If -30 volt regulator test is being done because signal generator is blowing fuses, go to step 1.
- If -30 volt regulator test is being done because -30 volts is absent in other circuits, go to step 5.

1. See figure FO-9. Unsolder and lift one lead of C567.
2. Unsolder and lift one lead of C569.
3. Check that fuse does not blow with capacitors disconnected.
   - Set POWER switch to ON.

-30 VOLT REGULATOR TEST - Continued

- If power indicator does not light, set POWER switch to off, replace fuse F501 (see TM 11-6625-3050-12), and go to step 4.

- If power indicator lights, set POWER switch to off and go to step 5.

4. Check that resistance of C567 is more than 1 megohm. See figure FO-9.

   - Set POWER switch to off.

   - Connect positive (+) multimeter lead to rear lead of C567 and negative (-) lead to front lead of C567.

   - If meter reads more than 1 megohm, connect lead of C567 and replace C569. See paragraph 2-62.

   - If meter reads less than 1 megohm, connect lead of C569 and replace C567. See paragraph 2-62.

5. Check that resistance of R578 is between 240 and 246 ohms. See figure FO-9.

   - Unsolder and lift lead of R578 from solder post DX.

   - Connect one multimeter lead to each lead of R578.

   - If meter reads between limits given, go to step 6.

   - If meter does not read between limits given, replace R578. See paragraph 2-62.

6. Check that resistance of R577 is between 5.56 and 5.68 kilohms. See figure FO-9.

   - Connect one multimeter lead to each lead of R577.

   - If meter reads between limits given, connect lead of R578 to solder post DX and replace Z503. See paragraph 2-62.

   - If meter does not read between limits given, connect lead of R578 to solder post DX and replace R577. See paragraph 2-62.

7. Check that voltage across C561 is between 35 and 45 V dc

   - Connect positive (+) multimeter lead to chassis and negative (-) lead to front lead of C567.

   - Set POWER switch to ON.

-30 VOLT REGULATOR TEST - Continued

- If meter does not read between 35 and 45 V dc do power supply input circuits test. See paragraph 2-16.
- If meter reads between 35 and 45 V dc go to step 5.

END OF TEST

2-32. PULSE TIMING CIRCUITS TEST.

DESCRIPTION

This test is to isolate a fault to one of the pulse timing circuits.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
POWER	ON

PULSE TIMING CIRCUITS TEST - Continued

2 . Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	0.5 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

3. Check for presence of pulses at TP1F. See figure FO-4.

- Connect oscilloscope probe to TP1F.
- If pulses are present, do pulse differentiator input circuit test. See paragraph 2-35.
- If pulses are absent, go to step 4.

4. Check for presence of pulses at TP1C. See figure FO-4.

- Connect oscilloscope probe to TP1C.
- If pulses are absent, do repetition rate oscillator test. See paragraph 2-21.

5. Check for presence of pulses at TP1D.

- Connect oscilloscope probe to TP1D.
- If pulses are present, do delay one-shot circuit test. See paragraph 2-23.
- If pulses are absent, do trigger multivibrator test. See paragraph 2-36.

END OF TEST

2-33. ON PREDRIVER TEST.

DESCRIPTION

This test is to isolate a fault within the on predriver circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
WIDTH	1 µs
Vernier	Cw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE POLARITY	NEG
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

ON PREDRIVER TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of negative pulses at TP3C. See figure FO-4.

   - Connect oscilloscope probe clip lead to chassis and connect probe to TP3C.
   - If pulses are absent, go to step 4.
   - If negative pulses are present with positive pulses following, go to step 15.
   - If negative pulses are present with no positive pulses, test is complete.

4. Check for presence of negative spikes at TP3A. See figure FO-4.

   - Connect oscilloscope probe to TP3A.
   - If spikes are absent, do pickoff amplifier test. See paragraph 2-24.

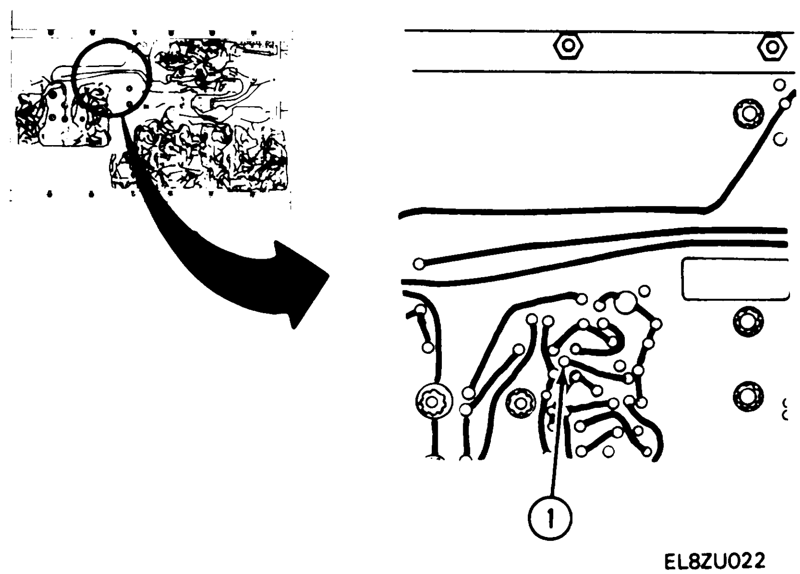
5. Check for presence of negative pulses at TP3B. See figure FO-4.

   - Connect oscilloscope probe to TP3B.
   - If pulses are absent, go to step 17.

ON PREDRIVER TEST - Continued

6. Check for presence of negative pulses at base of Q30.

- Connect oscilloscope probe to base of Q30 (1).
- If pulses are absent, go to step 10.



7. Check that voltage at collector of Q30 is -235 V dc. See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to left lead of R311.
- If voltage is absent, go to step 9.

8. Check that resistance of R310 is between 142.5 and 157.5 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R310.
- If meter reads between limits given, replace Q30. See paragraph 2-64,
- If meter does not read between limits given, replace R310. See paragraph 2-64.

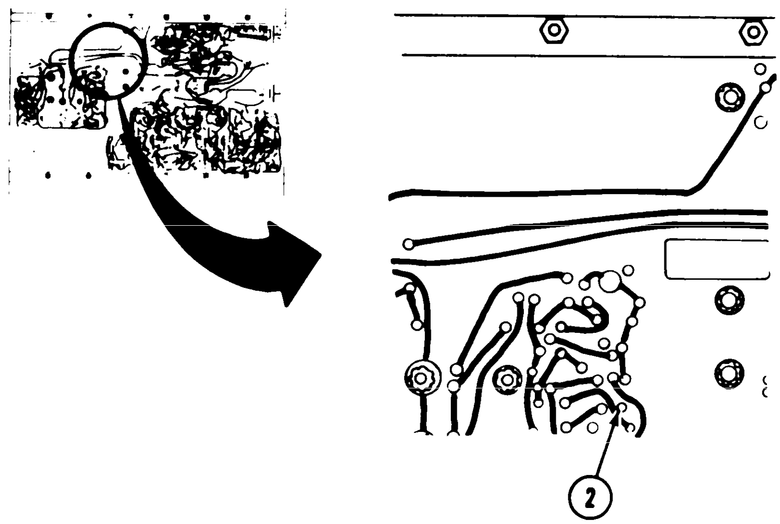
9. Check that resistance of C305 is more than 2 megohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of C305.
- If meter reads more than 2 megohms, replace R311. See paragraph 2-64.
- If meter reads less than 2 megohms, replace C305. See paragraph 2-64.

ON PREDRIVER TEST - Continued

10. Check for presence of negative pulses at pin 5 of T301.

- Connect oscilloscope probe to pin 5 of T301 (2).
- Set POWER switch to ON.
- If pulses are present, replace R309. See paragraph 2-64.
- If pulses are absent, go to step 11.



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11. Check for presence of negative pulses at collector of Q29. See figure FO-3.

- Connect oscilloscope probe to left lead of R308.
- If pulses are present, replace T301. See paragraph 2-64.
- If pulses are absent, go to step 12.

12. Check for presence of positive pulses at emitter of Q29. See figure FO-3.

- Connect oscilloscope probe to left lead of C303.
- If pulses are present, replace Q29. See paragraph 2-64.
- If pulses are absent, go to step 13.

13. Check that resistance of C303 is more than 2 megohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of C303.

ON PREDRIVER TEST - Continued

- Connect one multimeter lead to each lead of C303.
- If meter does not read more than 2 megohms, replace C303. See paragraph 2-64.
- If meter reads more than 2 megohms, connect lead of C303 and go to step 14.

14. Check that resistance of R307 is between 31.3 and 34.7 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of R307.
- If meter reads between limits given, replace Q29. See paragraph 2-64.
- If meter does not read between limits given, replace R307. See paragraph 2-64.

15. Check that resistance of R308 is between 78 and 86 ohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of R308.
- Connect one multimeter lead to each lead of R308.
- If meter reads between limits given, go to step 16.
- If meter does not read between limits given, replace R308. See paragraph 2-64.

16. Check that forward resistance of CR303 is less than 100 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of CR303.
- If meter reads less than 100 ohms, connect lead of R308 and replace CR302. See paragraph 2-64.
- If meter reads more than 100 ohms, connect lead of R308 and replace CR303. See paragraph 2-64.

17. Check for presence of positive spikes at collector of Q27. See figure FO-3.

- Connect oscilloscope probe to right lead of R303.
- Set POWER switch to ON.
- If spikes are absent, go to step 26.

ON PREDRIVER TEST - Continued

18. Check for presence of positive spikes at emitter of Q28. See figure FO-3.

- Connect oscilloscope probe to left lead of R305.
- If spikes are absent, go to step 23.

19. Check that reverse resistance of CR302 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of CR302.
- Connect negative (-) multimeter lead to anode of CR302 and positive (+) lead to cathode of CR302.
- If meter reads less than 100 kilohms, replace CR302. See paragraph 2-64.
- If meter reads more than 100 kilohms, connect lead of CR302 and go to step 20.

20. Check that voltage at TP3B is -235 V dc See figure FO-4.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to TP3B.
- Set POWER switch to ON.
- If -235 V dc is absent, replace R306. See paragraph 2-64.

21. Check that reverse resistance of CR301 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of CR301.
- Connect negative (-) multimeter lead to anode of CR301 and positive (+) lead to cathode of CR301.
- If meter reads less than 100 kilohms, replace CR301. See paragraph 2-64.
- If meter reads more than 100 kilohms, connect lead of CR301 and go to step 22.

22. Check that resistance of R305 is between 446 and 494 ohms. See figure FO-3.

- Connect negative (-) multimeter lead to left lead of R305 and positive (+) lead to right lead of R305.
- If meter reads less than 446 ohms, replace C302. See paragraph 2-64.
- If meter reads more than 494 ohms, replace R305. See paragraph 2-64.

ON PREDRIVER TEST - Continued

23. Check for presence of positive spikes at base of Q28. See figure FO-3.

- Connect oscilloscope probe to left lead of R303.
- Set POWER switch to ON.
- If spikes are absent, replace R303. See paragraph 2-64.

24. Check that voltage at emitter of Q28 is -235 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to left lead of R305.
- If -235 V dc is absent, go to step 25.
- If -235 V dc is present, replace Q28. See paragraph 2-64.

25. Check that resistance of R304 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect positive (+) multimeter lead to left lead of R304 and negative (-) lead to right lead of R304.
- If meter reads between limits given, do -235 volt regulator test. See paragraph 2-29.
- If meter does not read within limits given, replace R304. See paragraph 2-64.

26. Check for presence of pulses at emitter of Q27. See figure FO-3.

- Connect oscilloscope probe to right lead of R301.
- Set POWER switch to ON.
- If pulses are present, go to step 29.
- If pulses are absent, go to step 27.

27. Check that voltage at emitter of Q27 is -200 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to right lead of R301.
- If -200 V dc is present, replace Q27. See paragraph 2-64.
- If -200 V dc is absent, go to step 28.

28. Check that resistance of R301 is between 114 and 126 ohms. See figure FO-3.

- Set POWER switch to off.

ON PREDRIVER TEST - Continued

- Connect one multimeter lead to each lead of R301.
- If meter reads between limits given, do -200 volt regulator test. See paragraph 2-28.
- If meter does not read between limits given, replace R301. See paragraph 2-64.

29. Check that voltage at collector of Q27 is -235 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to right lead of R303.
- Set POWER switch to ON.
- If meter reads between limits given, replace Q27. See paragraph 2-64.
- If meter does not read between limits given, go to step 30.

30. Check that resistance of R302 is between 1.14 and 1.26 kilohms. See figure FO-3.

Set POWER switch to off.

Connect negative (-) multimeter lead to collector of Q27 and positive (+) lead to anode of CR302.

- If meter reads between limits given, do -235 volt regulator test See paragraph 2-29.
- If meter does not read between limits given, replace R302. See paragraph 2-64.

END OF TEST

2-34. OFF PREDRIVER TEST.

DESCRIPTION

This test is to isolate a fault within the off predriver circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
WIDTH	1 µs
Vernier	Cw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE POLARITY	NEG
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

OFF PREDRIVER TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of negative pulses at TP3F. See figure FO-4.
   - Connect oscilloscope probe to TP3F.
   - If pulses are absent, go to step 4.
   - If negative pulses are present with positive pulses following, go to step 15.
   - If negative pulses are present with no positive pulses, test is complete.
4. Check for presence of negative spikes at TP3D. See figure FO-4.
   - Connect oscilloscope probe to TP3D.
   - If spikes are absent, do pickoff amplifier test. See paragraph 2-24.
5. Check for presence of negative pulses at TP3E. See figure FO-4.
   - Connect oscilloscope probe to TP3E.
   - If pulses are absent, go to step 17.
6. Check for presence of positive pulses at base of Q34. See figure FO-3.
   - Connect oscilloscope probe to right lead of R329.
   - If pulses are absent, go to step 10.
7. Check that voltage at collector of Q34 is 200 V dc See figure FO-3.
   - Connect positive (+) multimeter lead to chassis and negative (-) lead to left lead of C325.
   - If voltage is absent, do -200 volt regulator test. See paragraph 2-28.

OFF PREDRIVER TEST - Continued

8. Check that voltage at emitter of Q34 is -235 V dc See figure FO-4.

   - Connect positive (+) multimeter lead to chassis and negative (-) lead to TP3F.
   - If voltage is present, replace Q34. See paragraph 2-64.

     If voltage is absent, go to step 9.

9. Check that resistance of R330 is between 142 and 158 ohms. See figure FO-3.

   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R330.
   - If meter reads between limits given, do -235 volt regulator test. See paragraph 2-29.
   - If meter does not read between limits given, replace R330. See paragraph 2-64.

10. Check that resistance of R329 and output winding of T321 in parallel is less than 5 ohms. See figure FO-3.

    - Set POWER switch to off.
    - Connect one multimeter lead to each lead of R329.
    - If meter reads more than 5 ohms, replace T321. See paragraph 2-64.

11. Check that resistance of R329 is between 484 and 536 ohms. See figure FO-3.

    - Unsolder and lift one lead of R329.
    - Connect one multimeter lead to each lead of R329.
    - If meter does not read between limits given, replace R329. See paragraph 2-64.

12. Check for presence of negative pulses at collector of Q33. See figure FO-3.

    - Connect oscilloscope probe to left lead of R328.
    - Set POWER switch to ON.
    - If pulses are present, replace T321. See paragraph 2-64.
    - If pulses are absent, go to step 13.

13. Check for presence of positive pulses at emitter of Q33. See figure FO-3.

    - Connect oscilloscope probe to left lead of R327.

OFF PREDRIVER TEST - Continued

- If pulses are present, replace Q33. See paragraph 2-64.
- If pulses are absent, go to step 14.

14. Check resistance of C323. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of C323.
- Connect one multimeter lead to each lead of C323.
- If meter does not read more than 2 megohms, replace C323. See paragraph 2-64.
- If meter reads more than 2 megohms, connect lead of C323 and go to step 15.

15. Check that resistance of R327 is between 31.3 and 34.7 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of R327.
- If meter reads between limits given, replace Q33. See paragraph 2-64.
- If meter does not read between limits given, replace R327. See paragraph 2-64.

16. Check that resistance of R328 is between 78 and 86 ohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of R328.
- Connect one multimeter lead to each lead of R328.
- If meter reads between limits given, go to step 17.
- If meter does not read between limits given, replace R328. See paragraph 2-64.

17. Check that forward resistance of CR323 is less than 100 ohms. See figure FO-3.

- Connect one multimeter lead to each lead of CR323.
- If meter reads less than 100 ohms, connect lead of R328 and replace CR322. See paragraph 2-64.
- If meter reads more than 100 ohms, connect lead of R328 and replace CR323. See paragraph 2-64.

OFF PREDRIVER TEST - Continued

18. Check for presence of positive spikes at collector of Q31. See figure FO-3.

- Connect oscilloscope probe to left lead of R322.
- Set POWER switch to ON.
- If spikes are absent, go to step 27.

19. Check for presence of positive spikes at emitter of Q32. See figure FO-3.

- Connect oscilloscope probe to right lead of R325.
- If spikes are absent, go to step 24.

20. Check that reverse resistance of CR322 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of CR322.
- Connect negative (-) multimeter lead to anode of CR322 and positive (+) lead to cathode of CR322.
- If meter reads less than 100 kilohms, replace CR322. See paragraph 2-64.
- If meter reads more than 100 kilohms, connect lead of CR322 and go to step 21.

21. Check that voltage at TP3E is -235 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to TP3E.
- Set POWER switch to ON.
- If -235 V dc is absent, replace R326. See paragraph 2-64.

22. Check that reverse resistance of CR321 is more than 100 kilohms. See figure FO-3.

- Set POWER switch to off.
- Unsolder and lift one lead of CR321.
- Connect negative (-) multimeter lead to anode of CR321 and positive (+) lead to cathode of CR321.
- If meter reads less than 100 kilohms, replace CR321. See paragraph 2-64,
- If meter reads more than 100 kilohms, connect lead of CR321 and go to step 23.

OFF PREDRIVER TEST - Continued

23. Check that resistance of R325 is between 446 and 494 ohms. See figure FO-3.

- Connect negative (-) multimeter lead to right lead of R325 and positive (+) lead to left lead of R325.
- If meter reads less than 446 ohms, replace C322. See paragraph 2-64.
- If meter reads more than 494 ohms, replace R325. See paragraph 2-64.

24. Check for presence of positive spikes at base of Q32. See figure FO-3.

- Connect oscilloscope probe to left lead of R323.
- Set POWER switch to ON.
- If spikes are absent, replace R323. See paragraph 2-64.

25. Check that voltage at emitter of Q32 is -235 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to right lead of R325.
- If -235 V dc is absent, go to step 26.
- If -235 V dc is present, replace Q32. See paragraph 2-64.

26. Check that resistance of R324 is between 950 and 1050 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect positive (+) multimeter lead to left lead of R324 and negative (-) lead to right lead of R324.
- If meter reads between limits given, do -235 volt regulator test. See paragraph 2-29.
- If meter does not read between limits given, replace R324. See paragraph 2-64.

27. Check for presence of pulses at emitter of Q31. See figure FO-3.

- Connect oscilloscope probe to right lead of R321.
- Set POWER switch to ON.
- If pulses are present, go to step 30.
- If pulses are absent, go to step 28.

OFF PREDRIVER TEST - Continued

28. Check that voltage at emitter of Q31 is -200 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to right lead of R321.
- If -200 V dc is present, replace Q31. See paragraph 2-64,
- If -200 V dc is absent, go to step 29.

29. Check that resistance of R321 is between 114 and 126 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect one multimeter lead to each lead of R321.
- If meter reads between limits given, do -200 volt regulator test. See paragraph 2-28.
- If meter does not read between limits given, replace R321. See paragraph 2-64.

30. Check that voltage at collector of Q31 is -235 V dc See figure FO-3.

- Connect positive (+) multimeter lead to chassis and negative (-) lead to left lead of R322.
- Set POWER switch to ON.
- If meter reads between limits given, replace Q31. See paragraph 2-64.
- If meter does not read between limits given, go to step 31.

31. Check that resistance of R322 is between 1.14 and 1.26 kilohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to left lead of R322 and positive (+) lead to right lead of R322.
- If meter reads between limits given, do -235 volt regulator test. See paragraph 2-29.
- If meter does not read between limits given, replace R322. See paragraph 2-64.

END OF TEST

2-35. PULSE DIFFERENTIATOR INPUT CIRCUIT TEST.

DESCRIPTION

This test is to make sure that components of pulse differentiator input circuit are not faulty.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	0.1 MHz
Vernier	Cw
DELAY/ADVANCE	1 µs
Vernier	Ccw
WIDTH	1 µs
Vernier	Ccw
AMPLITUDE VOLTS	5
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE POLARITY	NEG
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	2 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	10 µs

PULSE DIFFERENTIATOR INPUT CIRCUIT TEST - Continued

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of spikes at anode of CR81. See figure FO-3.

   - Connect oscilloscope probe clip lead to chassis and connect probe to anode of CR81.
   - If spikes are present, test is complete.
   - If spikes are absent, go to step 4.

4. Check for presence of pulses at TP1F. See figure FO-4.

   - Connect oscilloscope probe to TP1F.
   - If pulses are absent, do delay one-shot circuit test. See paragraph 2-23.

5. Check for presence of pulses at emitter of Q12. See figure FO-3.

   - Connect oscilloscope probe to right lead of R86.
   - If pulses are absent, go to step 9.

6. Check voltage at base of Q13. See figure FO-3.

   - Connect positive (+) multimeter lead to chassis and negative (-) lead to left lead of C81.
   - If meter reads 30 V dc replace R87. See paragraph 2-64.
   - If meter reads between 7.5 and 8.7 V dc go to step 7.
   - If meter reads 0 V dc go to step 8.

7. Check resistance of R86 and L81 in parallel. See figure FO-3.

   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R86.
   - If meter reads less than 10 ohms, replace Q13. See paragraph 2-64.

PULSE DIFFERENTIATOR INPUT CIRCUIT TEST - Continued

- If meter reads between 950 and 1050 ohms, replace L81. See paragraph 2-64.
- If meter reads infinite resistance, replace R86 and L81. See paragraph 2-64.

8. Check resistance of C81 and R87 in parallel. See figure FO-3.
   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R87.
   - If meter reads between 9.5 and 10.5 kilohms, replace R88. See paragraph 2-64.
   - If meter reads 0 ohm, replace C81. See paragraph 2-64.
9. Check for presence of pulses at base of Q12. See figure FO-3.
   - Connect oscilloscope probe to front lead of R83.
   - Set POWER switch to ON.
   - If pulses are absent, go to step 11.
10. Check that resistance of R86 is between 1.14 and 1.26 kilohms. See figure FO-3.
    - Set POWER switch to off.
    - Connect one multimeter lead to each end of R86.
    - If meter reads between 1.14 and 1.26 kilohms, go to step 13.
    - If meter does not read between 1.14 and 1.26 kilohms, replace R86. See paragraph 2-64.
11. Check for presence of pulses at junction of R81 and R82. See figure FO-3.
    - Connect oscilloscope probe to rear lead of R81.
    - Set POWER switch to ON.
    - If pulses are present, replace R83. See paragraph 2-64.
    - If pulses are absent, go to step 12.
12. Check voltage at junction of R81 and R82. See figure FO-3.
    - Connect positive (+) multimeter lead to chassis and negative (-) lead to rear lead of R81.

PULSE DIFFERENTIATOR INPUT CIRCUIT TEST - Continued

If meter reads 35 V dc replace C80 and R81. See paragraph 2-64.

If meter reads 0 V dc replace R82. See paragraph 2-64.

13. Check that resistance of R84 is between 209 and 231 ohms. See figure FO-3.

Set POWER switch to off.

Connect one multimeter lead to each lead of R84.

If meter reads between 209 and 231 ohms, replace Q12. See paragraph 2-64.

If meter does not read between 209 and 231 ohms, replace R84. See paragraph 2-64.

END OF TEST

2-36. TRIGGER MULTIVIBRATOR TEST.

DESCRIPTION

This test is to isolate a fault within the trigger multivibrator circuit.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

TRIGGER MULTIVIBRATOR TEST - Continued

1. Set signal generator controls as follows:

CONTROL	SETTING
REPETITION RATE	1 kHz
Vernier	Cw
WIDTH	100 µs
Vernier	Cw
AMPLITUDE VOLTS	10
AMPLITUDE VERNIER	Cw
GATE MODE	NON GATED
PULSE POLARITY	NEG
POWER	ON

2. Set oscilloscope controls as follows:

CONTROL	SETTING
CH1 VOLTS/DIV	1 V
CAL	Cw
MODE	CH1
DISPLAY MODE	MAIN SWP
SWP MAG	Out
AUTO TRIG	In
AC COUPL	In
TRIG SOURCE	LINE
SEC/DIV	1 µs

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied. After power is removed, discharge capacitors to ground using a 6-watt, 50-ohm load before working inside signal generator to prevent electrical shock.

3. Check for presence of pulses at TP1D. See figure FO-4.

- Connect oscilloscope probe to TP1D.
- If pulses are present, test is complete.
- If pulses are absent, go to step 4.

TRIGGER MULTIVIBRATOR TEST - Continued

4. Check that resistance of R61 is between 1.4 and 1.6 kilohms. See figure FO-3.
   - Set POWER switch to off.
   - Connect one multimeter lead to each lead of R61.
   - If meter does not read between limits given, replace R61. See paragraph 2-64.
5. Check for presence of pulses at TP1C. See figure FO-4.
   - Connect oscilloscope probe to TP1C.
   - Set POWER switch to ON.
   - If pulses are absent, do repetition rate oscillator test. See paragraph 2-21.
6. Check for presence of pulses at emitter of Q7. See figure FO-3.
   - Connect oscilloscope probe to rear lead of R54.
   - If pulses are absent, go to step 10.
7. Check for presence of pulses at collector of Q7. See figure FO-3.
   - Connect oscilloscope probe to anode of CR52.
   - If pulses are absent, go to step 8.
   - If pulses are present, replace CR53. See paragraph 2-64.
8. Check voltage at collector of Q7. See figure FO-3.
   - Connect positive (+) multimeter lead to chassis and negative (-) lead to anode of CR52.
   - If meter reads -30 V dc replace Q7. See paragraph 2-64.
   - If meter reads 0 V dc go to step 9.
9. Check that reverse resistance of CR52 is more than 100 kilohms. See figure FO-3.
   - Set POWER switch to off.
   - Connect positive (+) multimeter lead to chassis and negative (-) lead to anode of CR52.
   - If meter reads more than 100 kilohms, replace R55. See paragraph 2-64.
   - If meter reads less than 100 kilohms, replace CR52. See paragraph 2-64.

TRIGGER MULTIVIBRATOR TEST - Continued

10. Check for presence of pulses at base of Q7. See figure FO-3.

- Connect oscilloscope probe to front lead of R53.
- Set POWER switch to ON.
- If pulses are absent, replace R53. See paragraph 2-64.

11. Check voltage at emitter of Q7. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to rear lead of R54.
- If meter reads 0 V dc replace R54. See paragraph 2-64.
- If meter reads +5 V dc replace C53. See paragraph 2-64.
- If meter reads +30 V dc go to step 12.

12. Check that emitter-base forward resistance of Q7 is less than 100 ohms. See figure FO-3.

- Set POWER switch to off.
- Connect negative (-) multimeter lead to front lead of R53 and positive (+) lead to rear lead of R54.
- If meter reads more than 100 ohms, replace Q7. See paragraph 2-64.

13. Check voltage at cathode of CR51. See figure FO-3.

- Connect negative (-) multimeter lead to chassis and positive (+) lead to cathode of CR51.
- Set POWER switch to ON.
- If meter reads 5 V dc replace CR51. See paragraph 2-64.
- If meter reads 0 V dc replace C51. See paragraph 2-64.

END OF TEST

Section IV. MAINTENANCE PROCEDURES

2-37. REPLACE TOP OR BOTTOM COVER.

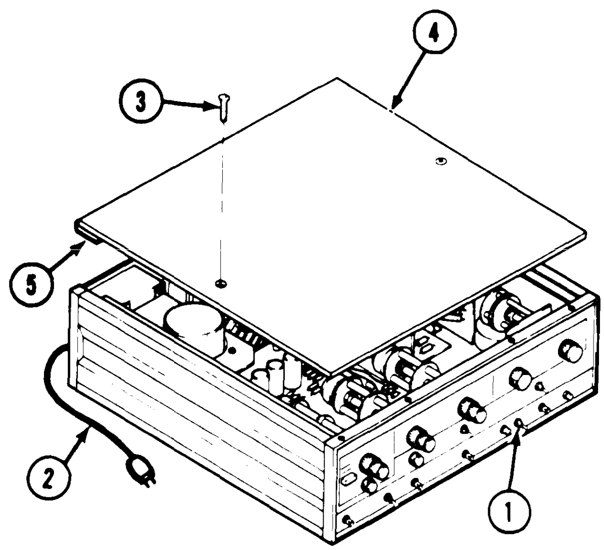
DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

NOTE

This task is the same for both the top and bottom cover. Top cover is shown.



1. Set POWER switch (1) to off.
2. Unplug power cord (2) from power source.
3. Remove two screws (3).
4. Slide top cover (4) toward rear to clear lip (5).
5. Lift top cover (4) up and off.

INSTALL

1. Place top cover (4) on chassis.
2. Slide top cover (4) forward to catch lip (5) and aline screw holes.
3. Install two screws (3).

END OF TASK

2-38. PERFORMANCE TEST.

DESCRIPTION

This procedure covers:

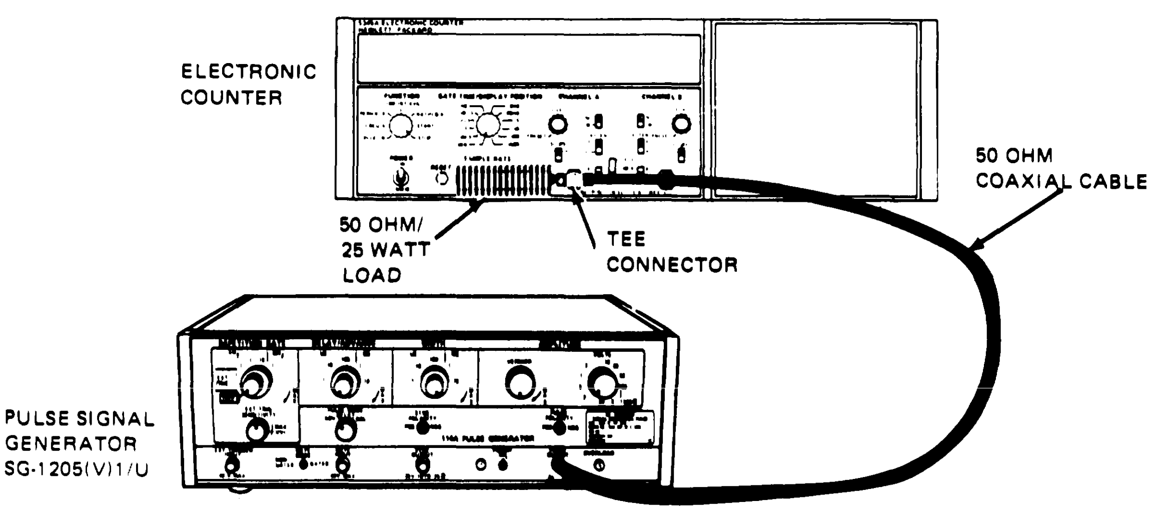
- Repetition Rate Test.
- Delay/Advance Test.
- Pulse Width Test.
- Pulse Amplitude Test.
- Pulse Shape Test.
- Single Cycle Test.
- Double Pulse Test.
- Jitter Test.
- Sync Output Test.
- External Trigger Test.
- External Gate Test.

NOTE

- Performance test procedures must be done in the order given.
- A performance test checklist is provided at the end of the performance test procedures. Use the checklist while doing the test procedures.

REPETITION RATE TEST

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Counter		Connect signal generator to counter.	



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REPETITION RATE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
2	Counter	Power cable	Plug in.	
3		POWER switch	ON	
4		FUNCTION control	FREQ A	
5		DISPLAY POSITION switch	AUTO	
6		CHANNEL A 50 Ω/1 M Ω	50 Ω	
7		CHANNEL A X1/X10 switch	X1	
8		CHANNEL A AC/DC switch	DC	
9		CHECK/COM A/ SEP switch	SEP	
10		SAMPLE RATE control	HOLD	
11	Signal Generator	POWER cable	Plug in.	
12		REPETITION RATE selector	0.1 kHz	
13		REPETITION RATE vernier	Fully counterclockwise	
14		DELAY/ADVANCE selector	1 µs	
15		DELAY/ADVANCE vernier	Fully counterclockwise	
16		WIDTH selector	1 µs	
17		WIDTH vernier	Fully counterclockwise	
18		AMPLITUDE VOLTS selector	2 volts	

REPETITION RATE TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
19	Signal Generator (cont)	AMPLITUDE VERNIER	Fully counterclockwise	
20		GATE MODE selector	NON GATED	
21		PULSE MODE selector	DELAY	
22		PULSE POLARITY switch	NEG	
23		POWER	ON	Power indicator lights.
24		AMPLITUDE VERNIER	Fully clockwise	
25	Counter	RESET switch	Press	
26		CHANNEL A LEVEL control	Rotate until GATE lamp flashes.	
27	Signal Generator and Counter		Set signal generator and counter controls and check counter indication per table 2-10, pressing RESET switch after each indication.	
28	Counter	POWER switch	STANDBY	
29			Disconnect signal generator from counter.	

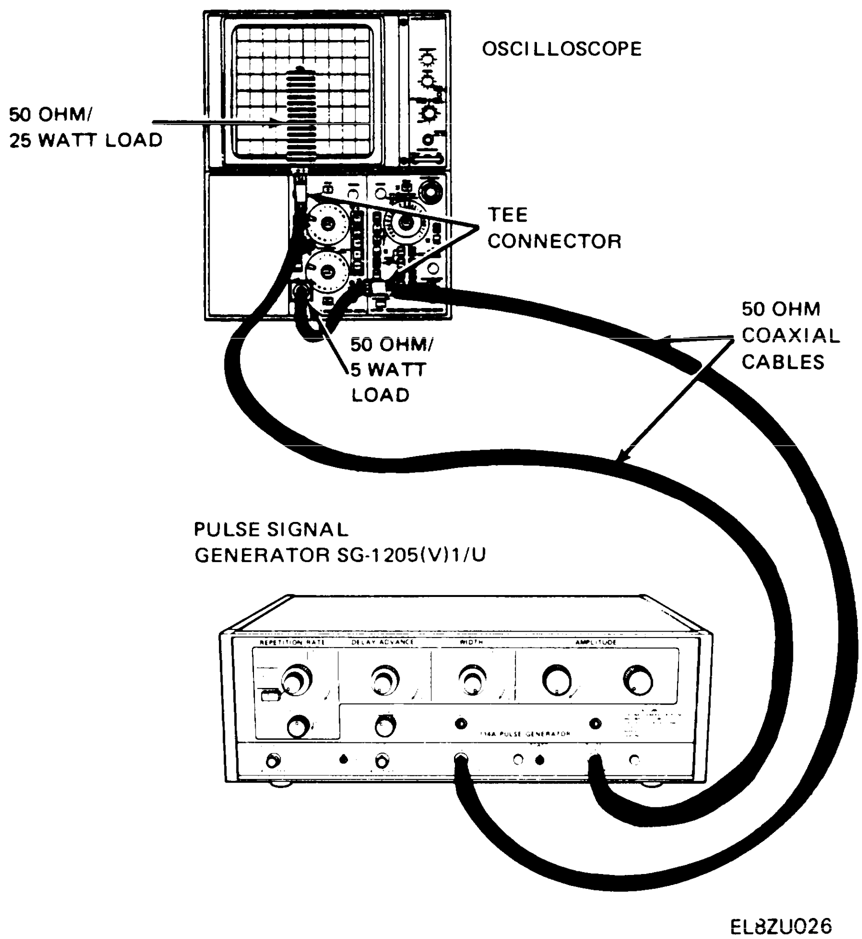
REPETITION RATE TEST - Continued

Table 2-10. REPETITION RATE CONTROL SETTINGS

Signal Generator		Counter	
REPETITION RATE Selector	REPETITION RATE Vernier	GATE TIME Selector	Indication
0.1 kHz	Counterclockwise (ccw)	10 s	≤ 0.01 kHz
0.1 kHz	Clockwise (cw)	10 s	>0.1 kHz
1 kHz	ccw	1 s	<0.1 kHz
1 kHz	cw	1 s	>1 kHz
10 kHz	ccw	100 ms	<1 kHz
10 kHz	cw	100 ms	>10 kHz
0.1 MHz	ccw	10 ms	<10 kHz
0.1 MHz	cw	10 ms	>0.1 MHz
1 MHz	ccw	1 ms	<0.1 MHz
1 MHz	cw	1 ms	≥ 1 MHz

DELAY/ADVANCE TEST

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	

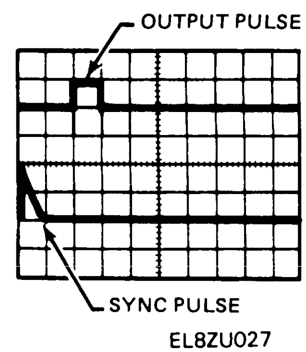


2	Signal Generator	REPETITION RATE selector	1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		DELAY/ADVANCE selector	1 µs	

DELAY/ADVANCE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
5	Signal Generator (cont)	DELAY/ADVANCE vernier	Fully counterclockwise	
6		WIDTH selector	1 µs	
7		WIDTH vernier	Fully counterclockwise	
8		AMPLITUDE VOLTS selector	10 volts	
9		AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13		SYNC POLARITY switch	POS	
14	Oscilloscope	POWER switch	On	
15		DISPLAY ON pushbutton	In	
16		CH1 VOLTS/DIV control	10 V	
17		CAL control	Fully clockwise (calibrated)	
18		CH2 VOLTS/DIV control	10 V	
19		CAL control	Fully clockwise (calibrated)	

DELAY/ADVANCE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
20	Oscilloscope (cont)	MODE pushbuttons	CH1/DUAL and CH2/TRACE	
21		TRIGGER pushbuttons	CH2	
22		AUTO TRIG pushbutton	In	
23		TRIG SOURCE pushbuttons	EXT	
24		DISPLAY MODE pushbuttons	MAIN SWP	
25		SEC/DIV control	0.2 µs	
26		INTENSITY control	Adjust so signals on display are sharp and clear.	
27		FOCUS control	Adjust so signals on display are sharp and clear.	
28		POSITION controls	Adjust so that leading edge of sync pulse is at left side of oscilloscope.	
29	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check grid spaces between leading edges of output pulse and sync pulse per table 2-11.	

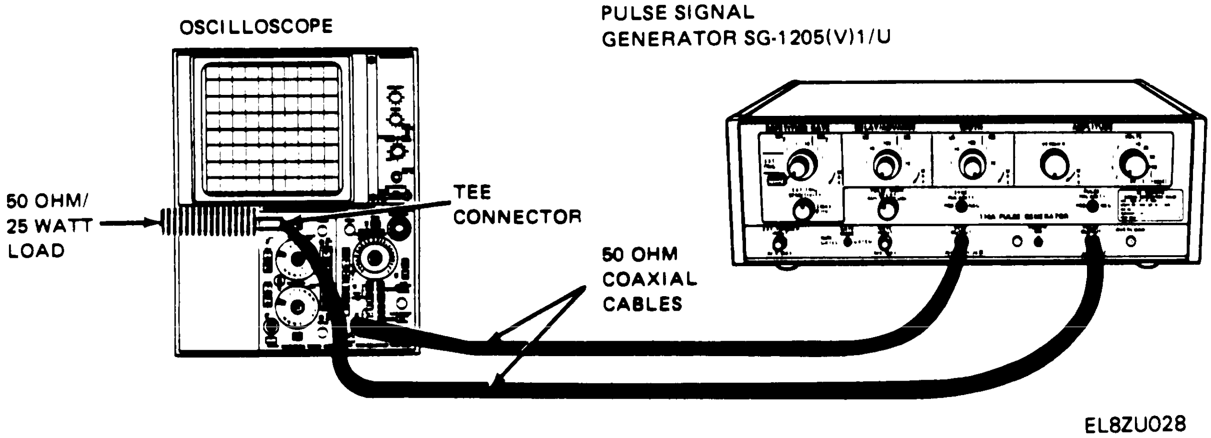
DELAY/ADVANCE TEST - Continued

Table 2-11. DELAY/ADVANCE CONTROL SETTINGS

Signal Generator					Oscilloscope	
DELAY/ ADVANCE Selector	DELAY/ ADVANCE Vernier	REPETITION RATE Selector	WIDTH Selector	WIDTH Vernier	SEC/DIV Control	Leading Edge Grid Space
1 µs	ccw	1 MHz	1 µs	ccw	0.2 µs	Passes through sync (less than 0)
1 µs	cw	0.1 MHz	1 µs	ccw	0.5 µs	$\geq$2 ($\geq$1 µs)
10 µs	ccw	0.1 MHz	1 µs	ccw	0.5 µs	<2 (<1 µs)
10 µs	cw	10 kHz	1 µs	cw	5 µs	$\geq$2 ($\geq$10 µs)
100 µs	ccw	10 kHz	1 µs	cw	5 µs	<2 (<10 µs)
100 µS	cw	1 kHz	1 µs	cw	50 µs	$\geq$2 ($\geq$100 µs)
1 ms	ccw	1 kHz	10 µs	cw	50 µs	<2 (< 100 µs)
1 ms	cw	0.1 kHz	10 µs	cw	0.5 ms	$\geq$2 ($\geq$1 ms)
10 ms	ccw	0.1 kHz	1 ms	cw	0.5 ms	< 2 (<1 ms)
10 ms	cw	0.1 kHz with vernier ccw	1 ms	cw	5 ms	$\geq$2 ($\geq$10 ms)

PULSE WIDTH TEST

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



2	Signal Generator	REPETITION RATE selector	1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		DELAY/ADVANCE selector	1 µs	
5		DELAY/ADVANCE vernier	Fully counterclockwise	

PULSE WIDTH TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
6	Signal Generator (cont)	WIDTH selector	1 µs	
7		WIDTH vernier	Fully counterclockwise	
8		AMPLITUDE VOLTS selector	10 volts	
9		AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	10 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	
17		AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	EXT	
19		DISPLAY MODE pushbuttons	MAIN SWP	
20		SEC/DIV control	20 µs	

PULSE WIDTH TEST - Continued

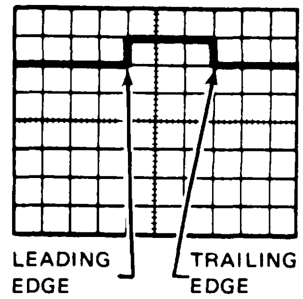
Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
21	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check grid spaces between leading and trailing edges of output pulse per table 2-12.	

Table 2-12. PULSE WIDTH CONTROL SETTINGS

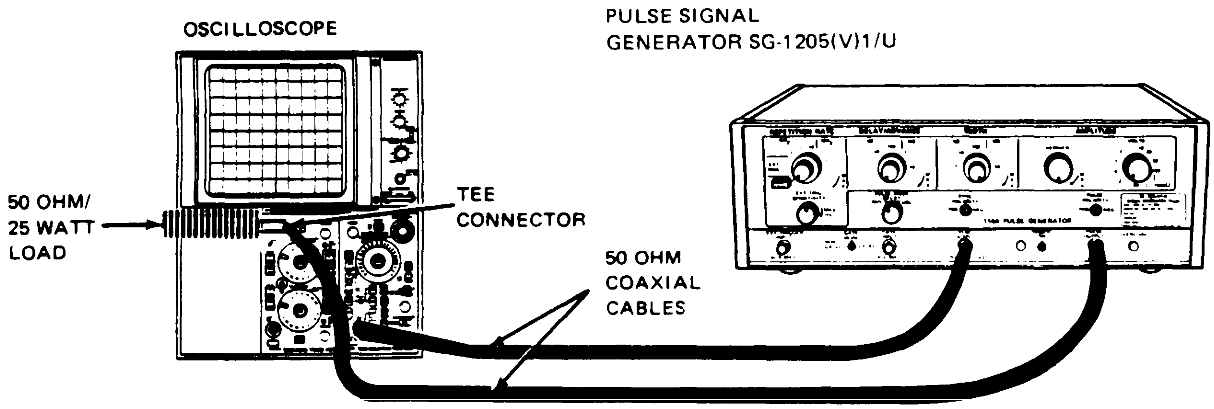
CAUTION

Always decrease repetition rate before increasing pulse width and decrease pulse width before increasing repetition rate to prevent overload.

Signal Generator			Oscilloscope	
REPETITION RATE Selector	WIDTH Selector	WIDTH Vernier	SEC/DIV Control	Leading/Trailing Edge Grid Space
1 MHz	1 µs	ccw	20 ns	≥ 2.5 (≤ 50 ns)
0.1 MHz	1 µs	cw	0.2 µs	>5 (>1 µs)
0.1 MHz	10 µs	ccw	0.2 µs	<5 (<1 µs)
10 kHz	10 µs	cw	2 µs	>5 (> 10 µs)
10 kHz	100 µs	ccw	2 µs	<5 (< 10 µs)
1 kHz	100 µs	cw	20 µs	>5 (> 100 µs)
1 kHz	1 ms	ccw	20 µs	<5 (< 100 µs)
0.1 kHz	1 ms	cw	0.2 ms	>5 (>1 ms)
0.1 kHz	10 ms	ccw	0.2 ms	<5 (<1 ms)
0.1 kHz with vernier ccw	10 ms	cw	2 ms	≥ 5(≥ 10 ms)

PULSE AMPLITUDE TEST

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



Step	Equipment	Item	Action	Remarks
2	Signal Generator	WIDTH selector	1 µs	
3		WIDTH vernier	Fully clockwise	
4		REPETITION RATE selector	10 kHz	
5		REPETITION RATE vernier	Fully clockwise	
6		DELAY/ADVANCE selector	1 µs	

PULSE AMPLITUDE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
7	Signal Generator (cont)	DELAY/ADVANCE vernier	Fully counterclockwise	
8		AMPLITUDE VOLTS selector	0.2 volt	
9		AMPLITUDE VERNIER	Fully counterclockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	0.1 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	
17		AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	EXT	
19		DISPLAY MODE pushbuttons	MAIN SWP	
20		SEC/DIV control	1 µs	

PULSE AMPLITUDE TEST - Continued

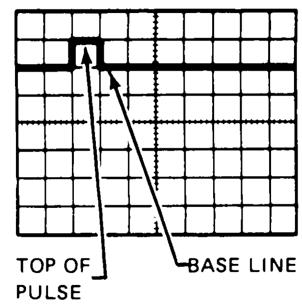
Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
21	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check grid spaces between top of output pulse and base-line per table 2-13.	Use 10X, 50-ohm 2-watt attenuator when AMPLITUDE VOLTS selector is set to 100 and AMPLITUDE VERNIER is fully clockwise. 
22	Signal Generator	AMPLITUDE VOLTS selector	0.2 volt	

Table 2-13. PULSE AMPLITUDE CONTROL SETTINGS

Signal Generator		Oscilloscope	
AMPLITUDE VOLTS Selector	AMPLITUDE VERNIER	CH1 VOLTS/ DIV Control	Number of Grid Spaces
0.2 volt	ccw	0.1 mV	< 1 (≤ 80 mV)
0.2 volt	cw	0.2 V	> 1 (> 0.2 V)
0.5 volt	ccw	0.2 V	< 1 (< 0.2 V)
0.5 volt	cw	0.5 V	> 1 (> 0.5 V)
1 volt	ccw	0.5 V	< 1 (< 0.5 V)

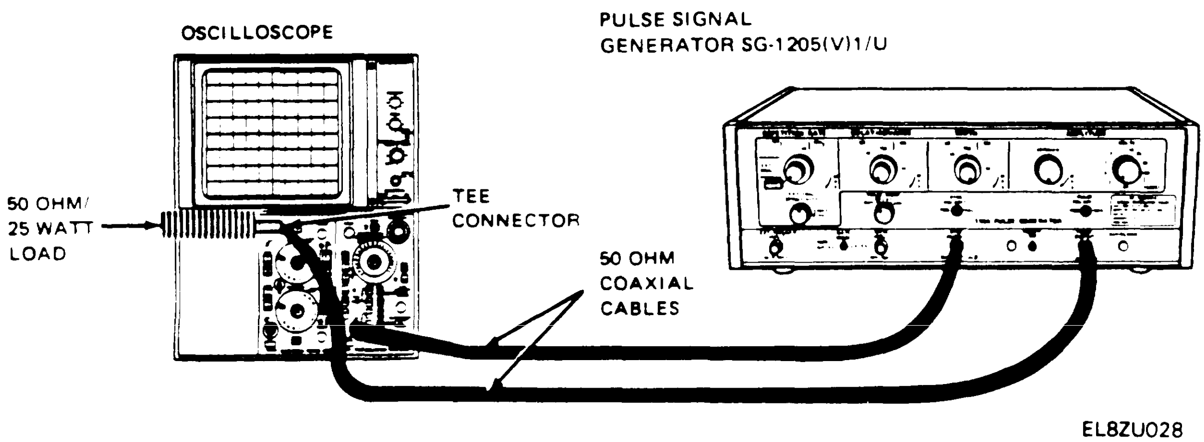
PULSE AMPLITUDE TEST - Continued

Table 2-13. PULSE AMPLITUDE CONTROL SETTINGS - Continued

Signal Generator		Oscilloscope	
AMPLITUDE VOLTS Selector	AMPLITUDE VERNIER	CH1 VOLTS/ DIV Control	Number of Grid Spaces
1 volt	cw	1 V	>1 (>1 V)
2 volts	ccw	1 V	<1 (<1 V)
2 volts	cw	2 V	>1 (>2 V)
5 volts	ccw	2 V	<1 (<2 V)
5 volts	cw	5 V	>1 (> 5V)
10 volts	ccw	5 V	<1 (<5 V)
10 volts	cw	10 V	>1 (>10 V)
20 volts	ccw	10 V	<1 (<10 V)
20 volts	cw	10 V	>2 (>20 V)
50 volts	ccw	10 V	<2 (<20 V)
50 volts	cw	10 V	>5 (>50 V)
100 volts	ccw	10 V	<5 (<50 V)
100 volts	cw	10 V with 10X attenuator	≥2 (≥100 V)

PULSE SHAPE TEST

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	

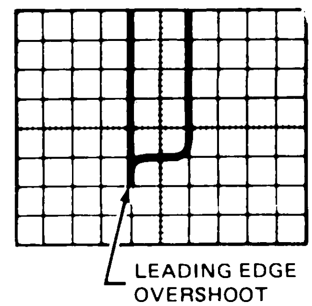
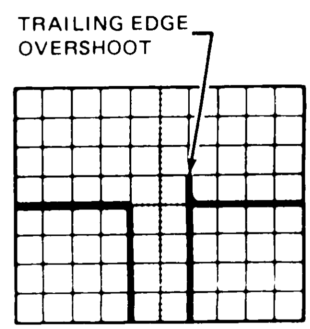


Step	Equipment	Item	Action	Remarks
2	Signal Generator	REPETITION RATE selector	0.1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		WIDTH selector	1 µs	
5		WIDTH vernier	Fully clockwise	
6		AMPLITUDE VOLTS selector	0.2 volt	
7		AMPLITUDE VERNIER	Adjust for 0.2-volt output pulse	
8		GATE MODE selector	NON GATED	
9		PULSE MODE selector	DELAY	

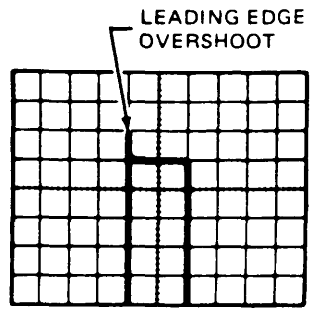
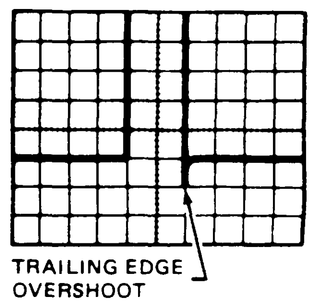
PULSE SHAPE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
10	Signal Generator (cont)	PULSE POLARITY switch	NEG	
11	Oscilloscope	CH1 VOLTS/ DIV control	20 mV	
12		CAL control	Fully clockwise (calibrated)	
13		MODE pushbuttons	CH1/DUAL	
14		TRIGGER pushbuttons	CH1	
15		AUTO TRIG pushbutton	In	
16		TRIG SOURCE pushbuttons	EXT	
17		DISPLAY MODE pushbuttons	MAIN SWP	
18		SEC/DIV control	0.5 µs	
19	Signal Generator	DELAY/ADVANCE selector and vernier	Adjust so a single pulse is displayed on oscilloscope.	
20	Oscilloscope	CH1 POSITION control	Adjust so top of negative pulse is displayed.	

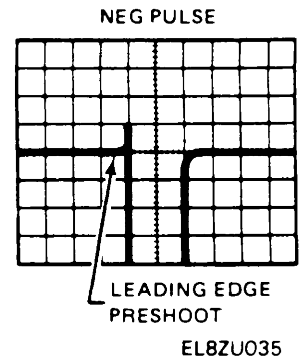
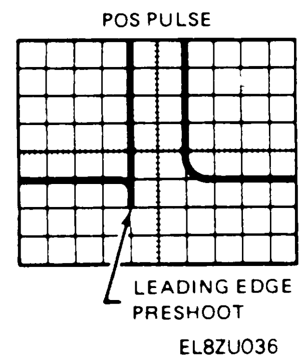
PULSE SHAPE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
21	Oscilloscope (cont)	Display	Check that leading edge overshoot is about 0.6 grid space or less.	 EL8ZU031
22		CH1 POSITION control	Adjust so baseline of pulse is displayed.	
23		Display	Check that trailing edge overshoot is about 0.6 grid space or less.	 EL8ZU032
24	Signal Generator	PULSE POLARITY switch	POS	
25	Oscilloscope	CH1 POSITION control	Adjust so top of positive pulse is displayed.	

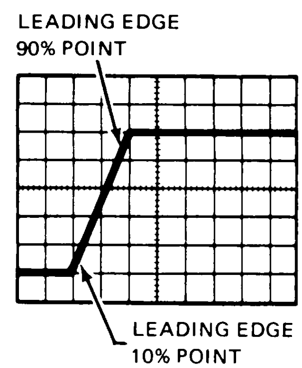
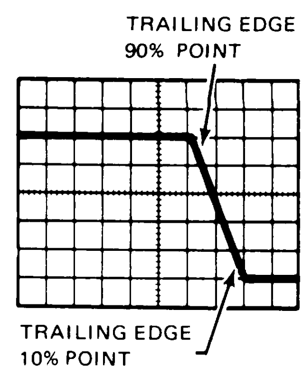
PULSE SHAPE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
26	Oscilloscope (cont)	Display	Check that leading edge overshoot is about 0.6 grid space or less.	 EL8ZU033
27		CH1 POSITION control	Adjust so baseline of pulse is displayed.	
28		Display	Check that trailing edge overshoot is about 0.6 grid space or less.	 EL8ZU034
29	Signal Generator	PULSE POLARITY switch	NEG	
30	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check pulse overshoot for each control setting listed in table 2-14, repeating steps 20 thru 29 for each setting.	
31	Oscilloscope	CH1 VOLTS/DIV control	20 mV	

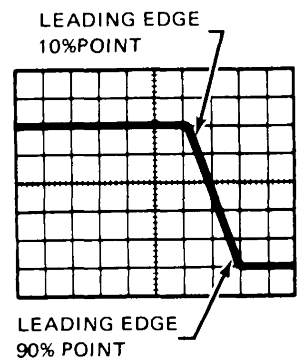
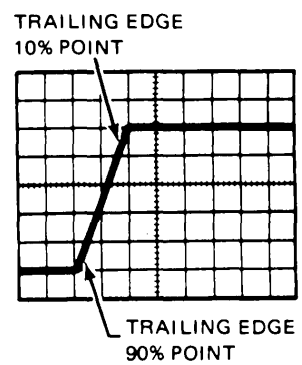
PULSE SHAPE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
32	Oscilloscope (cont)	Display	Check that pulse preshoot at leading edge is less than 0.6 grid space.	
33	Signal Generator	PULSE POLARITY switch	POS	
34	Oscilloscope	Display	Check that pulse preshoot at leading edge is less than 0.6 grid space.	
35	Signal Generator	PULSE POLARITY switch	NEG	
36	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check pulse preshoot for each control setting listed in table 2-15 repeating steps 32 thru 35 for each setting.	
37	Oscilloscope	CH1 VOLTS/ DIV control	50 mV	
38		SWP MAG pushbutton	In	

PULSE SHAPE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
39	Oscilloscope (cont)	SEC/DIV control	10 ns	
40	Signal Generator	PULSE POLARITY switch	POS	
41	Oscilloscope	POSITION controls	Adjust so leading edge of signal is displayed.	
42		Display	Check that rise time between leading edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	 EL8ZU037
43		POSITION controls	Adjust so trailing edge of signal is displayed.	
44		Display	Check that fall time between trailing edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	 EL8ZU038
45	Signal Generator	PULSE POLARITY switch	NEG	
46	Oscilloscope	POSITION controls	Adjust so leading edge of signal is displayed.	

PULSE SHAPE TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
47	Oscilloscope (cont)	Display	Check that rise time between leading edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	 EL8ZU039
48		POSITION controls	Adjust so trailing edge of pulse is displayed.	
49		Display	Check that fall time between trailing edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	 EL8ZU040
50	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check rise and fall times for each control setting listed in table 2-16, repeating steps 40 thru 49 for each setting.	May take oscilloscope out of calibration if required.
51	Signal Generator	REPETITION RATE selector	0.1 kHz	
52		REPETITION RATE vernier	Fully counterclockwise	

PULSE SHAPE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
53	Signal Generator (cont)	WIDTH selector	10 ms	
54		WIDTH vernier	Fully clockwise	
55		AMPLITUDE VOLTS selector	50 volts	
56		PULSE POLARITY switch	POS	
57	Oscilloscope	SEC/DIV control	2 ms	
58		CH1 VOLTS/ DIV control	5 V	
59		Display	Check that vertical grid spaces between flat of pulse and top of trailing edge (pulse droop) are less than one and a half grid spaces (< 3 V).	
60	Signal Generator	AMPLITUDE VOLTS selector	10 volts	

PULSE SHAPE TEST - Continued

Table 2-14. PULSE OVERSHOOT CONTROL SETTINGS

Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Overshoot Grid Space
0.2 volt	20 mV	< 0.6 (< 12 mV)
0.5 volt	50 mV	<0.6 (< 30 mV)
1 volt	0.1 V	< 0.6 (< 60 mV)
2 volts	0.2 V	<0.6 (< 0.12 V)
5 volts	0.5 V	<0.6 (< 0.3 V)
10 volts	1 V	<0.6 (< 0.6 V)
20 volts	2 V	<0.6 (< 1.2 V)
50 volts	5 V	<0.6 (< 3 V)
100 volts	10 V	<0.6 (< 6 V)

Table 2-15. PULSE PRESHOOT CONTROL SETTINGS

Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Preshoot Grid Space
100 volts	10 V	< 0.6 (< 6 V)
50 volts	5 V	<0.6 (< 3 V)
20 volts	2 V	<0.6 (< 1.2 V)
10 volts	1 V	< 0.6 (< 0.6 V)
5 volts	0.5 V	<0.6 (< 0.3 V)

PULSE SHAPE TEST - Continued

Table 2-15. PULSE PRESHOOT CONTROL SETTINGS - Continued

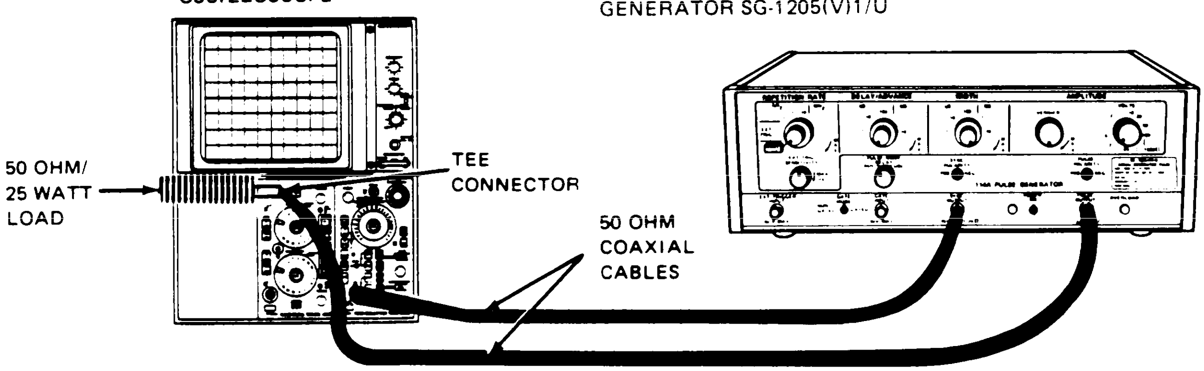
Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Preshoot Grid Space
2 volts	0.2 V	<0.6 (< 0.12 V)
1 volt	0.1 V	< 0.6 (< 60 mV)
0.5 volt	50 mV	<0.6 (< 30 mV)
0.2 volt	20 mV	< 0.6 (< 12 mV)

Table 2-16, RISE/FALL TIME CONTROL SETTINGS

Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Rise/Fall Time Grid Spaces
0.2 volt	50 mV	≤ 1.3 (13 ns)
0.5 volt	0.1 V	≤ 1.3 (13 ns)
1 volt	0.2 V	≤ 1.3 (13 ns)
2 volts	0.5 V	≤ 1.3 (13 ns)
5 volts	1 V	≤ 1.3 (13 ns)
10 volts	2 V	≤ 1.3 (13 ns)
20 volts	5 V	≤ 1.3 (13 ns)
50 volts	10 V	≤ 1.5 (15 ns) Rise/ ≤ 1.3 (13 ns) Fall
100 volts	2 V with 10X attenuator	≤ 1.7 (17 ns)

SINGLE CYCLE TEST

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



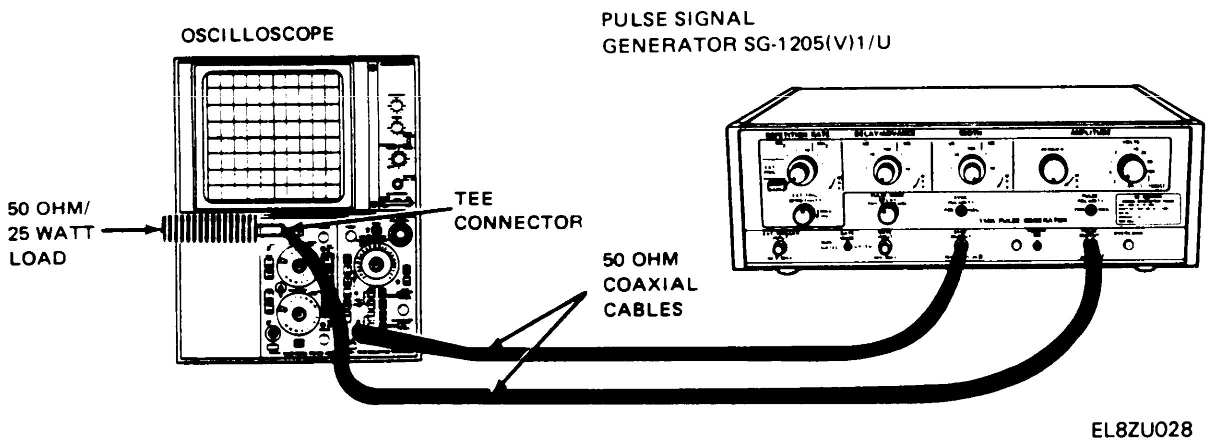
Step	Equipment	Item	Action	Remarks
2	Signal Generator	REPETITION RATE selector	SINGLE CYCLE	
3		REPETITION RATE vernier	Fully clockwise	
4		WIDTH selector	1 µs	
5		WIDTH vernier	Fully clockwise	
6		AMPLITUDE VOLTS selector	10 volts	
7		AMPLITUDE VERNIER	Fully clockwise	

SINGLE CYCLE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
8	Signal Generator (cont)	GATE MODE selector	NON GATED	
9		PULSE MODE selector	DELAY	
10		PULSE POLARITY switch	NEG	
11	Oscilloscope	CH1 VOLTS/ DIV control	2 V	
12		CAL control	Fully clockwise (calibrated)	
13		MODE pushbuttons	CH1/DUAL	
14		TRIGGER pushbuttons	CH1	
15		AUTO TRIG pushbuttons	In	
16		TRIG SOURCE pushbuttons	EXT	
17		DISPLAY MODE pushbuttons	MAIN SWP	
18		SWP MAG pushbutton	Out	
19		SEC/DIV control	0.5 µs	
20		SINGLE CYCLE pushbutton	Press and verify that one pulse is displayed on oscilloscope each time pushbutton is pressed.	

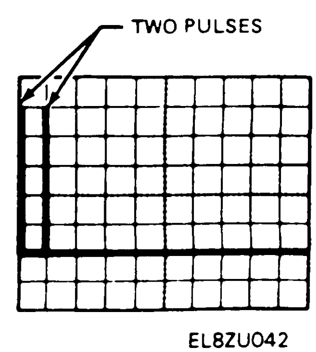
DOUBLE PULSE TEST

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



Step	Equipment	Item	Action	Remarks
2	Signal Generator	WIDTH selector	1 µs	
3		WIDTH vernier	Fully counterclockwise	
4		REPETITION RATE selector	0.1 MHz	
5		REPETITION RATE vernier	Fully clockwise	
6		DELAY/ADVANCE selector	1 µs	
7		DELAY/ADVANCE vernier	Fully clockwise	
8		AMPLITUDE VOLTS selector	10 volts	

DOUBLE PULSE TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
9	Signal Generator (cont)	AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DBL	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	2 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	
17		AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	EXT	
19		DISPLAY MODE pushbuttons	MAIN SWP	
20		SEC/DIV control	1 µs	
21		Display	Check that two pulses are displayed.	

DOUBLE PULSE TEST - Continued

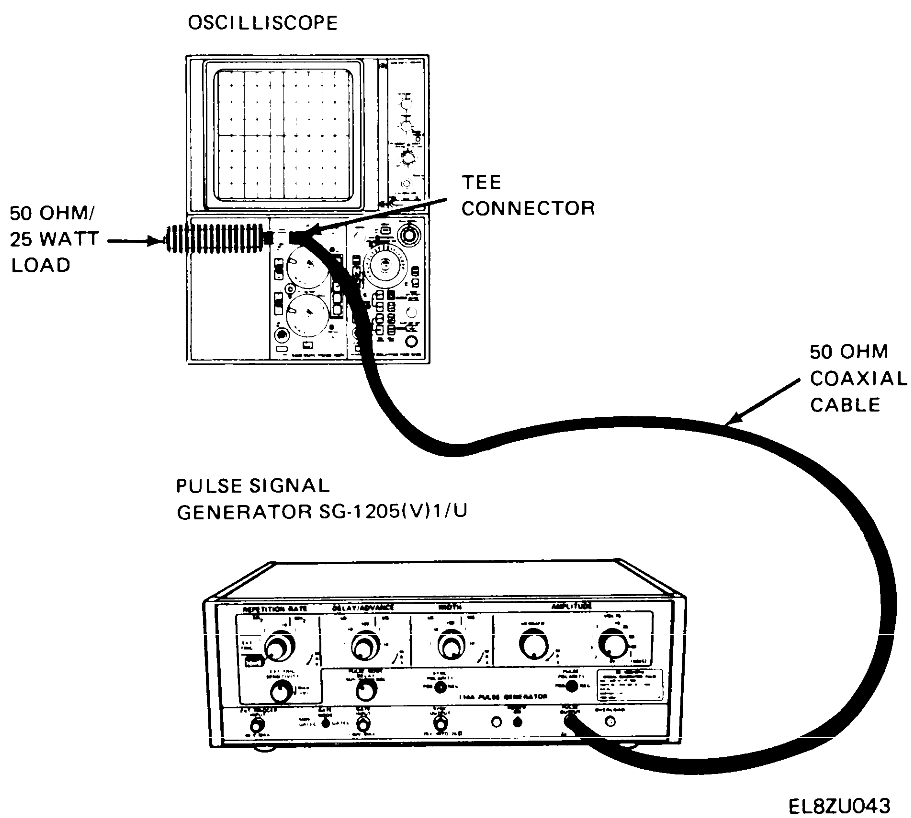
Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
22	Signal Generator	DELAY/ADVANCE vernier	Fully counterclockwise. Check pulse separation.	For 1-µs DELAY/ADVANCE range, check pulse separation where second pulse disappears.
23		DELAY/ADVANCE vernier	Fully clockwise.	
24	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check pulse separation for each control setting listed in table 2-17, repeating steps 21 thru 23 for each setting.	Adjust signal generator WIDTH controls as required.

Table 2-17. DOUBLE PULSE CONTROL SETTINGS

Signal Generator			Oscilloscope	
DELAY/ADVANCE Selector	REPETITION RATE Selector	REPETITION RATE Vernier	SEC/DIV Control	Pulse Separation Grid Spaces
1 µs	0.1 MHz	Fully clockwise	1 µs	<1 (<1 µs)
10 µs	0.1 MHz	Fully counterclockwise	1 µs	<2.5 (<2.5 µs)
100 µs	10 kHz	Fully counterclockwise	10 µs	<2.5 (<25 µs)
1 µs	1 kHz	Fully counterclockwise	0.1 ms	<2.5 (<0.25 ms)
10 ms	0.1 kHz	Fully counterclockwise	1 ms	<2.5 (<2.5 ms)

JITTER TEST

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	

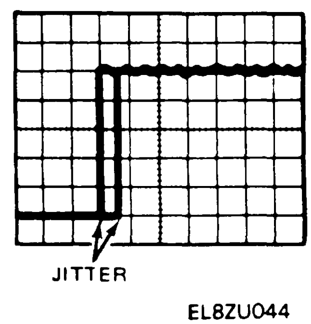


Step	Equipment	Item	Action	Remarks
2	Signal Generator	REPETITION RATE selector	0.1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		DELAY/ADVANCE selector	1 µs	
5		DELAY/ADVANCE vernier	Fully clockwise	
6		WIDTH selector	1 µs	

JITTER TIEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
7	Signal Generator (cont)	WIDTH vernier	Fully clockwise	
8		AMPLITUDE VOLTS selector	10 volts	
9		AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	2 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	
17		AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	RIGHT	
19		+ SLOPE pushbutton	In	
20		DISPLAY MODE pushbuttons	MAIN SWP	

JITTER TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
21	Oscilloscope (cont)	SWP MAG pushbutton	In	
22		SEC/DIV control	10 ns	
23		Display	Check that repetition rate jitter is not more than one-half grid space (5 ns).	
24	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls per table 2-18 and check that width jitter is not more than one grid space for each control setting.	
25			Set signal generator and oscilloscope controls per table 2-18 and check that delay jitter is not more than one grid space for each control setting.	

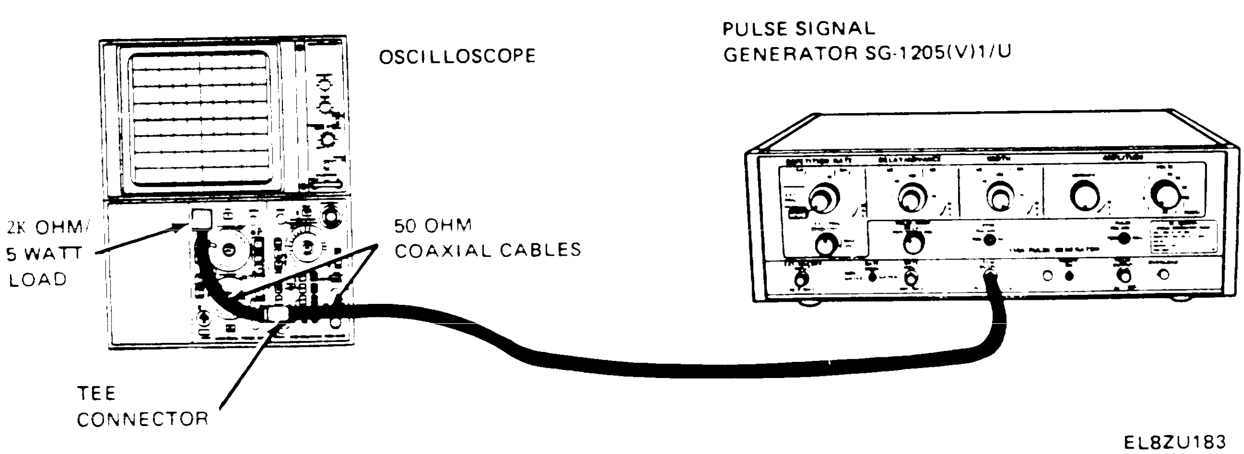
JITTER TEST - Continued

Table 2-18. WIDTH/DELAY JITTER CONTROL SETTINGS

Signal Generator			Oscilloscope	
REPETITION RATE Selector	REPETITION RATE Vernier	WIDTH and DELAY/ ADVANCE Selectors	SEC/DIV Control	Jitter Grid Spaces
10 kHz	cw	10 µs	10 ns	<1 (< 10 ns)
1 kHz	cw	100 µs	0.1 µs	<1 (< 100 ns)
0.1 kHz	cw	1 ms	1 µs	<1 (<1 µs)
1 kHz	ccw	10 ms	10 µs	<1 (< 10 µs)

SYNC OUTPUT TEST

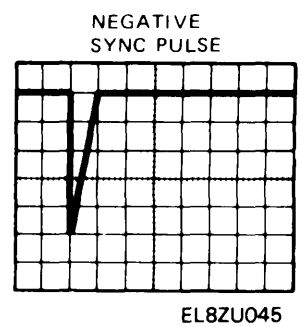
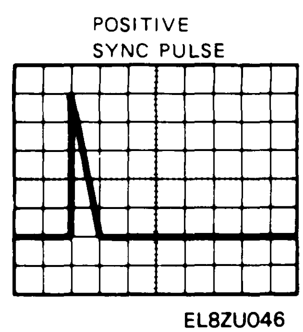
Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



SYNC OUTPUT TEST - Continued

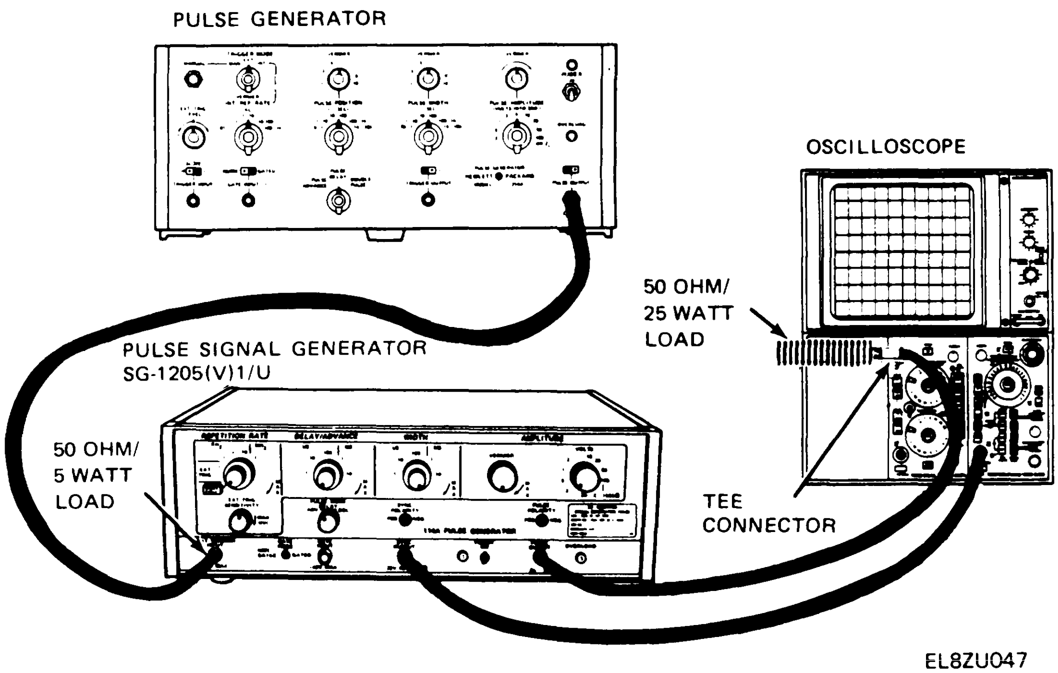
Step	Procedure			Remarks
	Equipment	Item	Action	
2	Signal Generator	REPETITION RATE selector	1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		DELAY/ADVANCE selector	1 µs	
5		DELAY/ADVANCE vernier	Fully counterclockwise	
6		WIDTH selector	1 µs	
7		WIDTH vernier	Fully counterclockwise	
8		GATE MODE selector	NON GATED	
9		SYNC POLARITY switch	NEG	
10	Oscilloscope	CH1 VOLTS/ DIV control	5 V	
11		CAL control	Fully clockwise (calibrated)	
12		MODE pushbuttons	CH1/DUAL	
13		TRIGGER pushbuttons	CH1	
14		AUTO TRIG pushbutton	In	
15		TRIG SOURCE pushbuttons	EXT	
16		DISPLAY MODE pushbuttons	MAIN SWP	

SYNC OUTPUT TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
	Oscilloscope (cont)	SWP MAG pushbutton	Out	
		SEC/DIV control	0.1 µs	
19		Display	Check that a negative pulse of about five grid spaces (≈ 25 V) is displayed.	
20	Signal Generator	SYNC POLARITY switch	POS	
21	Oscilloscope	Display	Check that a positive pulse of about five grid spaces (≈ 25 V) is displayed.	

EXTERNAL TRIGGER TEST

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator, Pulse Generator, and Oscilloscope		Connect equipment.	



2	Pulse Generator	POWER switch	ON	
3		TRIGGER MODE selector	INT.	

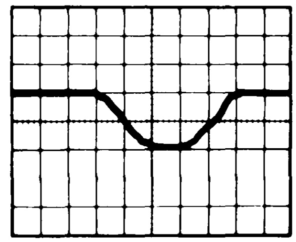
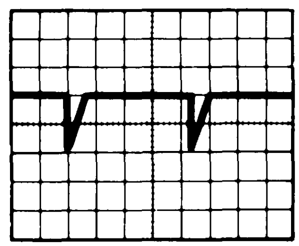
EXTERNAL TRIGGER TEST - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
4	Pulse Generator (cont)	INT. REP. RATE selector	10-100	
5		INT. REP. RATE vernier	10	
6		PULSE WIDTH selector	0.5–1	
7		PULSE WIDTH VERNIER	1	
8		PULSE AMPLITUDE selector	50	
9		PULSE AMPLITUDE VERNIER	Adjust for 40 volts	
10		PULSE OUTPUT —/+ switch	– (neg)	
11	Signal Generator	REPETITION RATE selector	EXT TRIG –	
12		DELAY/ADVANCE selector	1 µs	
13		DELAY/ADVANCE vernier	Fully counterclockwise	
14		WIDTH selector	1 µs	
15		WIDTH vernier	Fully counterclockwise	
16		AMPLITUDE VOLTS selector	10 volts	
17		AMPLITUDE VERNIER	Fully clockwise	

EXTERNAL TRIGGER TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
18	Signal Generator (cont)	GATE MODE selector	NON GATED	
19		PULSE MODE selector	DELAY	
20		PULSE POLARITY switch	NEG	
21	Oscilloscope	CH1 VOLTS/ DIV control	5 V	
22		CAL control	Fully clockwise (calibrated)	
23		MODE pushbuttons	CH1/DUAL	
24		TRIGGER pushbuttons	CH1	
25		AUTO TRIG pushbutton	In	
26		TRIG SOURCE pushbuttons	EXT	
27		DISPLAY MODE pushbuttons	MAIN SWP	
28		MAG SWP pushbutton	In	
29		SEC/DIV control	10 ns	

EXTERNAL TRIGGER TEST - Continued

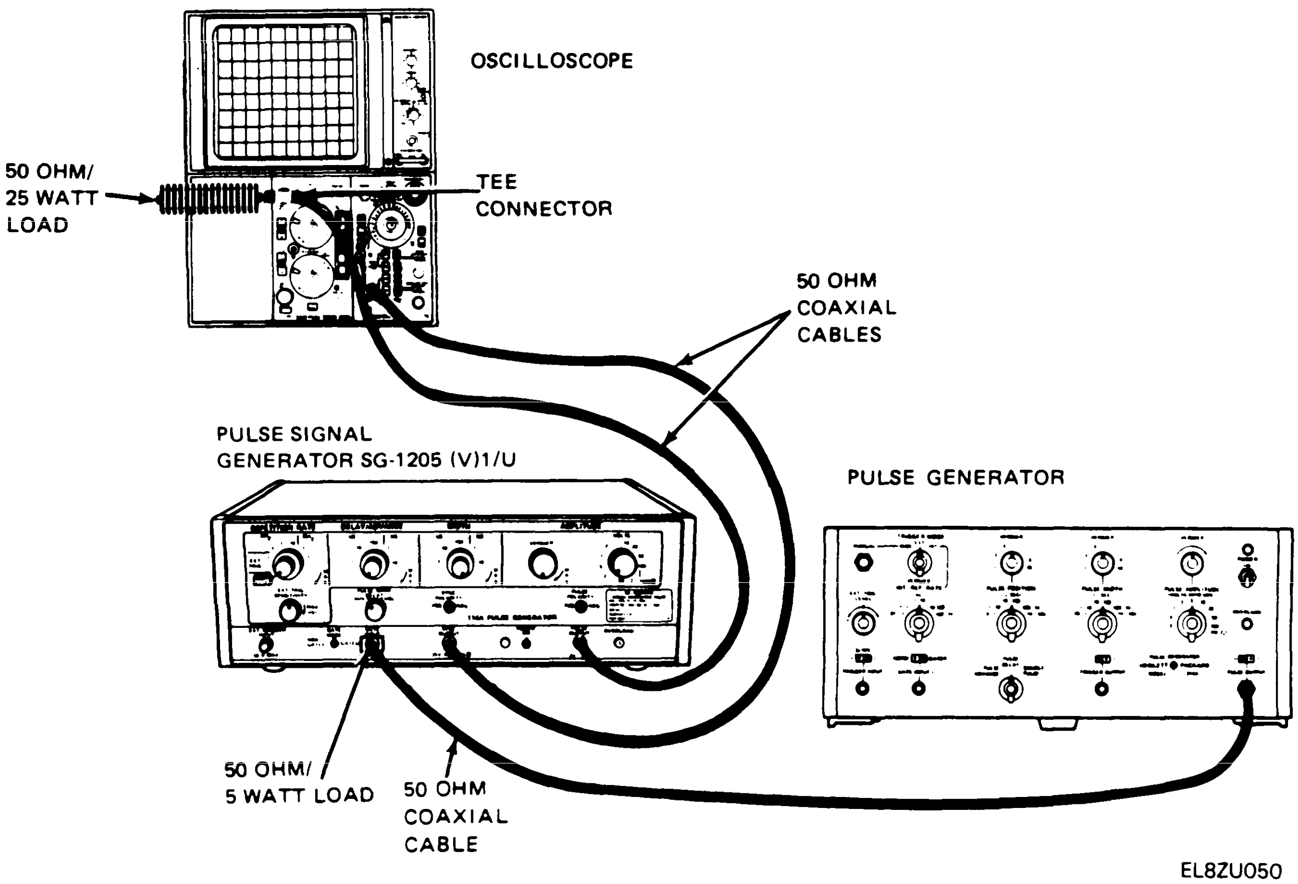
Step	Procedure			Remarks
	Equipment	Item	Action	
30	Signal Generator	EXT TRIG SENSITIVITY control	Adjust for stable triggering.	
31	Oscilloscope	Display	Check display for a negative 10-volt pulse with a width of five grid spaces (50 ns).	 EL8ZU048
32		SEC/DIV control	2 µs	
33		Display	Check that a negative pulse is displayed about every five grid spaces (≈ 10 µs).	 EL8ZU049
34	Signal Generator	REPETITION RATE selector	EXT TRIG +	
35		EXT TRIG SENSITIVITY control	Adjust for stable triggering.	
36	Oscilloscope	Display	Check that a negative pulse is displayed about every five grid spaces (≈ 10 µs).	
37	Pulse Generator	PULSE OUTPUT –/+ switch	+ (pos)	
38	Signal Generator	REPETITION RATE selector	EXT TRIG –	

EXTERNAL TRIGGER TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
39	Oscilloscope	Display	Check that a negative pulse is displayed about every five grid spaces (≈ 10 μs).	
40	Signal Generator	REPETITION RATE selector	EXT TRIG +	
41		EXT TRIG SENSITIVITY control	Adjust for stable triggering.	
42	Oscilloscope	Display	Check that a negative pulse is displayed about every five grid spaces (≈ 10 μs).	
43	Pulse Generator	PULSE AMPLI-TUDE selector	0.5	
44		PULSE AMPLI-TUDE VERNIER	Fully clockwise	
45		PULSE OUTPUT —/+ switch	– (neg)	
46	Signal Generator	REPETITION RATE selector	EXT TRIG —	
47		EXT TRIG SENSITIVITY control	Adjust for stable triggering.	
48	Oscilloscope and Signal Generator		Repeat steps 33 thru 42	

EXTERNAL GATE TEST

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator, Pulse Generator, and Oscilloscope		Connect equipment.	



2	Pulse Generator	TRIGGER MODE selector	INT.	
3		INT. REP. RATE selector	10-100	

EXTERNAL GATE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
4	Pulse Generator (cont)	INT. REP. RATE vernier	10	
5		PULSE WIDTH selector	0.5—1	
6		PULSE WIDTH VERNIER	1	
7		PULSE AMPLI-TUDE selector	10	
8		PULSE AMPLI-TUDE VERNIER	Adjust for 8 volts	
9		PULSE OUTPUT —/+ switch	+ (pos)	
10	Signal Generator	REPETITION RATE selector	1 MHz	
11		REPETITION RATE vernier	Fully clockwise	
12		DELAY/ADVANCE selector	1 µs	
13		DELAY/ADVANCE vernier	Fully counterclockwise	
14		WIDTH selector control	1 µs	
15		WIDTH vernier	Fully counterclockwise	
16		AMPLITUDE VOLTS selector	10 volts	
17		AMPLITUDE VERNIER	Fully clockwise	

EXTERNAL GATE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
18	Signal Generator (cont)	GATE MODE selector	NON GATED	
19		PULSE MODE selector	DELAY	
20		PULSE POLARITY switch	NEG	
21	Oscilloscope	CH1 VOLTS/ DIV control	5 V	
22		CAL control	Fully clockwise (calibrated)	
23		MODE pushbuttons	CH1/DUAL	
24		TRIGGER pushbuttons	CH1	
25		AUTO TRIG pushbutton	In	
26		TRIG SOURCE pushbuttons	EXT	
27		DISPLAY MODE pushbuttons	MAIN SWP	
28		MAG SWP pushbutton	Out	
29		SEC/DIV control	1 µs	
30	Signal Generator	GATE MODE selector	Set to GATED and check that output pulses appear on oscilloscope only during time interval of gate pulse.	

EXTERNAL GATE TEST - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
31	Signal Generator (cont)	GATE MODE selector	NON GATED	
32	Pulse Generator	PULSE AMPLITUDE selector	50	
33		PULSE AMPLITUDE VERNIER	Adjust for 40 volts	
34	Signal Generator	GATE MODE selector	Set to GATED and check that output pulses appear on oscilloscope only during time interval of gate pulse.	
35	Signal Generator, Pulse Generator, and Oscilloscope	POWER switches	Off	
36			Disconnect all equipment.	

PERFORMANCE TEST CHECKLIST

REPETITION RATE TEST

Step	REPETITION RATE		Counter Indication	Indication Received
	Selector	Vernier		
27	0.1 kHz	ccw	≤0.01 kHz	Yes _ No _
	0.1 kHz	cw	>0.1 kHz	Yes _ No _
	1 kHz	ccw	< 0.1 kHz	Yes _ No _
	1 kHz	cw	> 1 kHz	Yes _ No _
	10 kHz	ccw	< 1 kHz	Yes _ No _
	10 kHz	cw	> 10 kHz	Yes _ No _
	0.1 MHz	ccw	< 10 kHz	Yes _ No _
	0.1 MHz	cw	> 0.1 MHz	Yes _ No _
	1 MHz	ccw	< 0.1 MHz	Yes _ No _
	1 MHz	cw	≥ 1 MHz	Yes _ No _

DELAY/ADVANCE TEST

Step	DELAY/ADVANCE		Oscilloscope Indication-Grid Spaces	Indication Received
	Selector	Vernier		
29	1 µs	ccw	Passes through sync (less than 0)	Yes _ No _
	1 µs	cw	≥ 2 (≥ 1µs)	Yes _ No _
	10 µs	ccw	<2 (<1 µs)	Yes _ No _
	10 µs	cw	≥ 2 (≥ 10 µs)	Yes _ No _

DELAY/ADVANCE TEST - Continued

Step	DELAY/ADVANCE Selector	DELAY/ADVANCE Vernier	Oscilloscope Indication-Grid Spaces	Indication Received
	100 µs	ccw	< 2 (< 10 µs)	Yes _ No _
	100 µs	cw	≥ 2 (≥ 100 µs)	Yes _ No _
	1 ms	ccw	< 2 (< 100 µs)	Yes _ No _
	1 ms	cw	≥ 2 (≥ 1 ms)	Yes _ No _
	10 ms	ccw	< 2 (< 1 ms)	Yes _ No _
	10 ms	cw	≥ 2 (≥ 10 ms)	Yes _ No _

PULSE WIDTH TEST

Step	WIDTH Selector	WIDTH Vernier	Oscilloscope Indication-Grid Spaces	Indication Received
21	1 µs	ccw	≤ 2.5 (≤ 50 ns)	Yes _ No _
	1 µs	cw	>5 (>1 µs)	Yes_ No _
	10 µs	ccw	<5 (<1 µs)	Yes _ No _
	10 µs	cw	>5 (>10 µs)	Yes _ No _
	100 µs	ccw	<5 (<10 µs)	Yes _ No _
	100 µs	cw	>5 (>100 µs)	Yes _ No _
	1 ms	ccw	<5 (<100 µs)	Yes _ No _
	1 ms	cw	>5 (>1 ms)	Yes_ No _
	10 ms	ccw	<5 (<1 ms)	Yes _ No _
	10 ms	cw	≥ 5 (≥ 10 ms)	Yes_ No _

PULSE AMPLITUDE TEST

Step	AMPLITUDE		Oscilloscope Indication-Grid Spaces	Indication Received
	VOLTS Selector	Vernier		
21	0.2 volt	ccw	< 1 (≤ 80 mV)	Yes _ No _
	0.2 volt	cw	> 1 (> 0.2 V)	Yes _ No _
	0.5 volt	ccw	< 1 (< 0.2 V)	Yes _ No _
	0.5 volt	cw	> 1 (> 0.5 V)	Yes _ No _
	1 volt	ccw	< 1 (< 0.5 V)	Yes _ No _
	1 volt	cw	> 1 (>1 V)	Yes _ No _
	2 volts	ccw	< 1 (<1 V)	Yes _ No _
	2 volts	cw	> 1 (>2 V)	Yes _ No _
	5 volts	ccw	< 1 (<2 V)	Yes _ No _
	5 volts	cw	> 1 (>5 V)	Yes _ No _
	10 volts	ccw	< 1 (<5 V)	Yes _ No _
	10 volts	cw	> 1 (>10 V)	Yes _ No _
	20 volts	ccw	< 1 (<10 V)	Yes _ No _
	20 volts	cw	> 1 (>20 V)	Yes _ No _
	50 volts	ccw	< 1 (<20 V)	Yes _ No _
	50 volts	cw	> 1 (>50 V)	Yes _ No _
	100 volts	ccw	< 1 (<50 V)	Yes _ No _
	100 volts	cw	≥ 2 (≥ 100 V)	Yes _ No _

PULSE SHAPE TEST

Step	AMPLITUDE VOLTS Selector	Function Tested-Overshoot	Oscilloscope Indication-Grid Spaces	Indication Received
21	0.2 volt	Neg pulse leading edge	< 0.6 (< 12 mV)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	< 0.6 (< 12 mV)	Yes _ No _
21	0.5 volt	Neg pulse leading edge	<0.6 (< 30 mV)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	< 0.6 (< 30 mV)	Yes _ No _
21	1 volt	Neg pulse leading edge	< 0.6 (< 60 mV)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	< 0.6 (< 60 mV)	Yes _ No _
21	2 volts	Neg pulse leading edge	< 0.6 (< 0.12 V)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	< 0.6 (< 0.12 V)	Yes _ No _
21	5 volts	Neg pulse leading edge	<0.6 (< 0.3 V)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No_
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	<0.6 (< 0.3 V)	Yes _ No _

PULSE SHAPE TEST - Continued

Step	AMPLITUDE VOLTS Selector	Function Tested-Overshoot	Oscilloscope Indication-Grid Spaces	Indication Received
21	10 volts	Neg pulse leading edge	<0.6 (< 0.6 V)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	<046 (< 0.6 V)	Yes _ No _
21	20 volts	Neg pulse leading edge	<0.6 (< 1.2 V)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	< 0.6 (< 1.2 V)	Yes _ No _
21	50 volts	Neg pulse leading edge	< 0.6 (< 3 V)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	< 0.6 (< 3 V)	Yes _ No _
21	100 volts	Neg pulse leading edge	< 0.6 (< 6 V)	Yes _ No _
23		Neg pulse trailing edge		Yes _ No _
26		Pos pulse leading edge		Yes _ No _
28		Pos pulse trailing edge	<0.6 (< 6 V)	Yes _ No _

PULSE SHAPE TEST - Continued

Step	AMPLITUDE VOLTS Selector	Function Tested-Preshoot	Oscilloscope Indication-Grid Spaces	Indication Received
32	100 volts	Neg pulse	< 0.6 (< 6 V)	Yes _ No _
34		Pos pulse		Yes _ No _
32	50 volts	Neg pulse	< 0.6 (< 3 V)	Yes _ No _
34		Pos pulse		Yes _ No _
32	20 volts	Neg pulse	<0.6 (< 1.2 V)	Yes _ No _
34		Pos pulse		Yes _ No _
32	10 volts	Neg pulse	< 0.6 (< 0.6 V)	Yes _ No _
34		Pos pulse		Yes _ No _
32	5 volts	Neg pulse	<0.6 (< 0.3 V)	Yes _ No _
34		Pos pulse		Yes _ No _
32	2 volts	Neg pulse	<0.6 (< 0.12 V)	Yes _ No _
34		Pos pulse		Yes _ No _
32	1 volt	Neg pulse	< 0.6 (< 60 mV)	Yes _ No _
34		Pos pulse		Yes _ No _
32	0,5 volt	Neg pulse	< 0.6 (< 30 mV)	Yes _ No _
34		Pos pulse		Yes _ No _
32	0.2 volt	Neg pulse	< 0.6 (< 12 mV)	Yes _ No _
34		Pos pulse		Yes _ No _

PULSE SHAPE TEST - Continued

Step	AMPLITUDE VOLTS Selector	Function Tested	Oscilloscope Indication-Grid Spaces	Indication Received
42	0.2 volt	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	0.5 volt	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	1 volt	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	2 volts	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	5 volts	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _

PULSE SHAPE TEST - Continued

Step	AMPLITUDE VOLTS Selector	Function Tested	Oscilloscope Indication-Grid Spaces	Indication Received
42	10 volts	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	20 volts	Pos pulse rise time	< 1.3 (13 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	50 volts	Pos pulse rise time	< 1.5 (15 ns)	Yes _ No _
44		Pos pulse fall time	< 1.3 (13 ns)	Yes _ No _
47		Neg pulse rise time	< 1.5 (15 ns)	Yes _ No _
49		Neg pulse fall time	< 1.3 (13 ns)	Yes _ No _
42	100 volts	Pos pulse rise time	< 1.7 (17 ns)	Yes _ No _
44		Pos pulse fall time		Yes _ No _
47		Neg pulse rise time		Yes _ No _
49		Neg pulse fall time	< 1.7 (17 ns)	Yes _ No _

Step	Function Tested	Oscilloscope Indication	Indication Received
59	Pulse droop	< 1-1/2 grid space (< 3 V)	Yes _ No _

SINGLE CYCLE TEST

Step	Oscilloscope Indication	Indication Received
20	One pulse when SINGLE CYCLE pushbutton pressed	Yes _ No _

DOUBLE PULSE TEST

Step	DELAY/AD-VANCE Selector	Function Tested	Oscilloscope Indication-Grid Spaces	Indication Received
21	1 µs	Double pulse	Two pulses	Yes _ No _
22		Pulse separation	< 1 (<1 µs)	Yes _ No _
21	10 µs	Double pulse	Two pulses	Yes _ No _
22		Pulse separation	<2.5 (<2.5 µs)	Yes _ No _
21	100 µs	Double pulse	Two pulses	Yes _ No _
22		Pulse separation	<2.5 (<25 µs)	Yes _ No _
21	1 ms	Double pulse	Two pulses	Yes _ No _
22		Pulse separation	< 2.5 (<0.25 ms)	Yes _ No _
21	10 ms	Double pulse	Two pulses	Yes _ No _
22		Pulse separation	< 2.5 (<2.5 ms)	Yes _ No _

JITTER TEST

Step	Function Tested	Oscilloscope Indication	Indication Received
23	Repetition rate jitter	< 1/2 grid space (< 5 ns)	Yes _ No _

JITTER TEST - Continued

Step	WIDTH Selector	Function Tested	Oscilloscope Indication-Grid Spaces	Indication Received
24	10 µs	Width jitter	≤ 1 ($\leq$ 10 ns)	Yes _ No _
	100 µs		≤ 1 ($\leq$ 100 ns)	Yes _ No _
	1 ms		≤ 1 ($\leq 1\ \mu s$)	Yes _ No _
	10 ms		≤ 1 ($\leq 10\ \mu s$)	Yes _ No _

Step	DELAY/AD-VANCE selector	Function Tested	Oscilloscope Indication-Grid Spaces	Indication Received
25	10 µs	Delay jitter	≤ 1 ($\leq$ 10 ns)	Yes _ No _
	100 µs		≤ 1 ($\leq$ 100 ns)	Yes _ No _
	1 ms		≤ 1 ($\leq 1\ \mu s$)	Yes _ No _
	10 ms		≤ 1 ($\leq 10\ \mu s$)	Yes _ No _

SYNC OUTPUT TEST

Step	Function Tested	Oscilloscope Indication	Indication Received
19	Negative sync pulse	Amplitude $\approx$ 5 grid spaces ($\approx$ 25 V)	Yes _ No _
21	Positive sync pulse	Amplitude $\approx$ 5 grid spaces ($\approx$ 25 V)	Yes _ No _

EXTERNAL TRIGGER TEST

Step	Trigger			Oscilloscope Indication	Indication Received
	Amplitude	Polarity	Slope		
33	40 volts	Neg	Neg	Neg pulse about every 5 grid spaces (≈ 10 µs)	Yes _ No _
36		Neg	Pos		Yes _ No _
39		Pos	Neg		Yes _ No _
42		Pos	Pos		Yes _ No _
33	0.5 volt	Neg	Neg	Neg pulse about every 5 grid spaces (≈ 10 µs)	Yes _ No _
36		Neg	Pos		Yes _ No _
39		Pos	Neg		Yes _ No _
42		Pos	Pos		Yes _ No _

EXTERNAL GATE TEST

Step	Gate Pulse Amplitude	Oscilloscope Indication	Indication Received
30	8 volts	Gated output	Yes _ No _
34	40 volts	Gated output	Yes _ No _

2-39. ALINEMENT.

DESCRIPTION

This procedure covers:

Power Supply Alinement.
Pulse Amplitude Alinement.
Pulse Shape Alinement.
Repetition Rate Alinement.
Pulse Width Alinement.
Overload Alinement.
Delay/Advance Alinement.

NOTE

Alinement procedures must be done in order given.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

POWER SUPPLY ALINEMENT

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Variac	Power cable	Plug into power source	
2		POWER switch	ON	
3		VOLTAGE control	120 volts	
4	Signal Generator	Power cable	Plug into variac	

POWER SUPPLY ALINEMENT - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
5	Signal Generator (cont)	POWER switch	ON	
6		REPETITION RATE selector	SINGLE CYCLE	
7		PULSE POLARITY switch	NEG	
8	Multimeter	Power cable	Plug into power source	
9		LINE switch	ON	
10		FUNCTION switch	DC	
11		RANGE switches	1000 V	

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
12	Signal Generator, Multimeter, and Variac		Refer to table 2-19. Connect multieter to signal generator test points and adjust potentiometers listed to obtain multimeter display indications.	Test point and potentiometer locations are shown in figures FO-3 and FO-4.

POWER SUPPLY ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
12	Signal Generator, Multimeter, and Variac (cont)		At each test point, adjust variac voltage from 105 thru 125 volts and verify that display indication does not change more than 1.5 volts.	
13	Multimeter	LINE switch	OFF	
14			Disconnect multimeter from signal generator.	
15	Oscilloscope	Power cable	Plug into power source.	
16		POWER switch	ON	
17		DISPLAY ON pushbutton	In	
18		CH1 VOLTS/DIV control	10 mV	
19		CAL control	Fully clockwise (calibrated)	
20		MODE pushbuttons	CH1/ALT	
21		TRIGGER pushbuttons	CH1	
22		AUTO TRIG pushbutton	In	
23		AC COUPL pushbutton	In	
24		TRIG SOURCE pushbuttons	RIGHT	

POWER SUPPLY ALINEMENT - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
25	Oscilloscope (cont)	DISPLAY MODE pushbuttons	MAIN SWP	
26		SEC/DIV control	10 ms	
27	Oscilloscope and Signal Generator		Connect oscilloscope CH1 input to TP5F.	
28		INTENSITY and FOCUS controls	Adjust so signals on display are sharp and clear.	
29	Variac and Oscilloscope	VOLTAGE control	Adjust from 105 to 125 and check that ripple on oscilloscope display is less than five grid spaces (< 50 mV) peak-to-peak.	
30			Connect oscilloscope CH1 input to TP5G, TP5H, and TP5J, repeating steps 28 and 29 for each test point.	

CAUTION

The adjustment in step 31 disables overload threshold control. Signal generator must be operated within specified duty limits until overload control is set. Always reduce repetition rate before increasing pulse width and reduce pulse width before increasing repetition rate.

Step	Equipment	Item	Action	Remarks
31	Signal Generator	Potentiometer R519	Fully counterclockwise	
32	Variac	VOLTAGE control	115 volts	

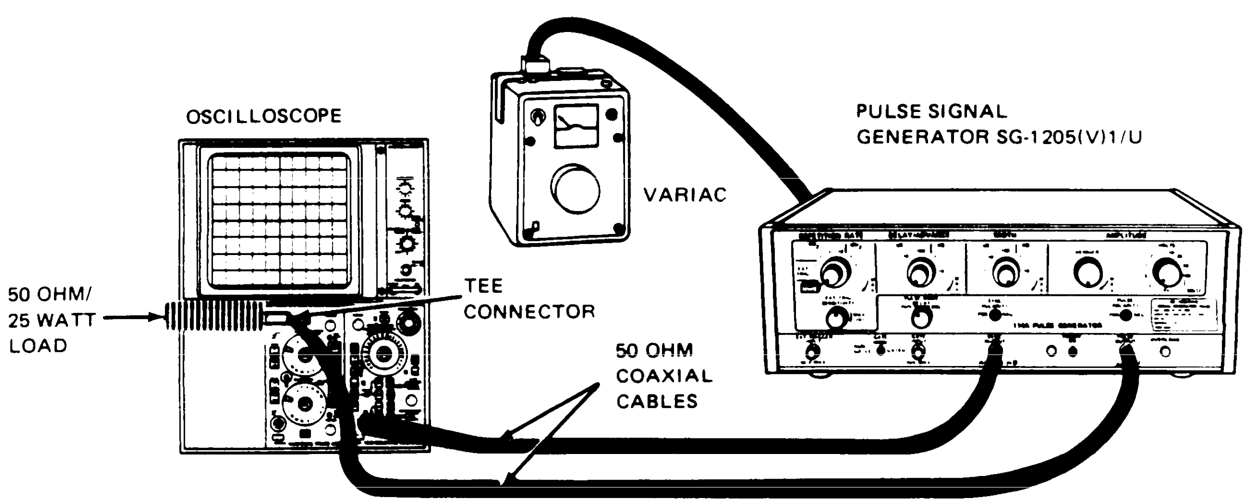
POWER SUPPLY ALINEMENT - Continued

Table 2-19. POWER SUPPLY ALINEMENTS

Signal Generator			Multimeter	
LOW Input of Multimeter	HIGH Input of Multimeter	Adjust Potentiometer	RANGE Switch	Display Indication (volts)
+lead of C518	TP5F	R535	1000	-190 to -210
TP5G	TP5F	R546	100	34 to 36
Chassis ground	TP5H	——	100	28 to 32
Chassis ground	TP5J	——	100	-28 to -32

PULSE AMPLITUDE ALINEMENT

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



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PULSE AMPLITUDE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
2	Signal Generator	WIDTH selector	1 µs	
3		WIDTH vernier	Fully clockwise	
4		REPETITION RATE selector	10 kHz	
5		REPETITION RATE vernier	Fully clockwise	
6		DELAY/ADVANCE selector	1 µs	
7		DELAY/ADVANCE vernier	Fully counterclockwise	
8		AMPLITUDE VOLTS selector	100 volts	
9		AMPLITUDE VERNIER	Fully counterclockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	10 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	

PULSE AMPLITUDE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
17	Oscilloscope (cont)	AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	EXT	
19		DISPLAY MODE pushbuttons	MAIN SWP	
20		SEC/DIV control	1 µs	

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

21	Signal Generator	Potentiometer R309	Fully counterclockwise	Potentiometer locations are shown in figure FO-3.
22		Potentiometer R374	Adjust so that signal on oscilloscope display is less than five grid spaces high (< 50 V).	
23	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check grid spaces between top of output pulse and base-line per table 2-20.	Use 10X, 50-ohm, 2-watt attenuator when AMPLITUDE VOLTS sel-ector is set to 100 and AMPLITUDE VERNIER is fully clockwise.
24	Signal Generator	PULSE POLARITY switch	NEG	

PULSE AMPLITUDE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
25	Signal Generator (cont)		Repeat step 23, checking negative pulse.	
26		AMPLITUDE VOLTS selector	0.2 volt	

Table 2-20. PULSE AMPLITUDE CONTROL SETTINGS

Signal Generator		Oscilloscope	
AMPLITUDE VOLTS Selector	AMPLITUDE VERNIER	CH1 VOLTS/ DIV Control	Number of Grid Spaces
0.2 volt	ccw	0.1 mV	<1 (≤ mV)
0.2 volt	cw	0.2 V	>1 (> 0.2 V)
0.5 volt	ccw	0.2 V	<1 (< 0.2 V)
0.5 volt	cw	0.5 V	>1 (> 0.5 V)
1 volt	ccw	0.5 V	<1 (< 0.5 V)
1 volt	cw	1 V	>1 (> 1 V)
2 volts	ccw	1 V	<1 (<1 V)
2 volts	cw	2 V	>1 (>2 V)
5 volts	ccw	2 V	<1 (<2 V)
5 volts	cw	5 V	>1 (>5 V)
10 volts	ccw	5 V	<1 (<5 V)
10 volts	cw	10 V	>1 (>10 V)

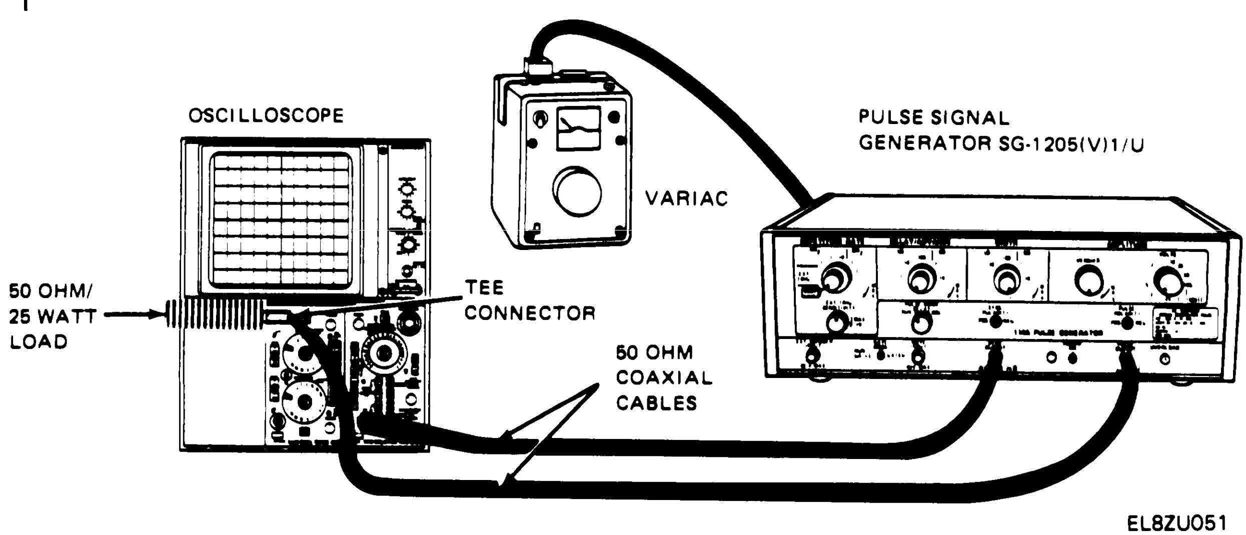
PULSE AMPLITUDE ALINEMENT - Continued

Table 2-20. PULSE AMPLITUDE CONTROL SETTINGS - (Cont)

Signal Generator		Oscilloscope	
AMPLITUDE VOLTS Selector	AMPLITUDE VERNIER	CH1 VOLTS/ DIV Control	Number of Grid Spaces
20 volts	ccw	10 V	<1 (< 10 V)
20 volts	cw	10 V	>2 (> 20 V)
50 volts	ccw	10 V	<2 (< 20 V)
50 volts	cw	10 V	>5 (> 50 V)
100 volts	ccw	10 V	<5 (< 50 V)
100 volts	cw	10 V with 10X attenuator	>2 (> 100 V)

PULSE SHAPE ALINEMENT

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



PULSE SHAPE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
2	Signal Generator	REPETITION RATE selector	0.1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		WIDTH selector	1 µs	
5		WIDTH vernier	Fully clockwise	
6		AMPLITUDE VOLTS selector	0.2 volt	
7		AMPLITUDE VERNIER	Adjust for 0.2-volt output pulse.	
8		GATE MODE selector	NON GATED	
9		PULSE MODE selector	DELAY	
10		PULSE POLARITY switch	NEG	
11	Oscilloscope	CH1 VOLTS/ DIV control	20 mV	
12		CAL control	Fully clockwise (calibrated)	
13		MODE pushbuttons	CH1/DUAL	
14		TRIGGER pushbuttons	CH1	
15		AUTO TRIG pushbutton	In	
16		TRIG SOURCE pushbuttons	EXT	

PULSE SHAPE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
17	Oscilloscope (cont)	DISPLAY MODE pushbuttons	MAIN SWP	
18		SEC/DIV control	0.5 μs	
19	Signal Generator	DELAY/ADVANCE selector and vernier	Adjust so a single pulse is displayed on oscilloscope.	
20	Oscilloscope	CH1 POSITION control	Adjust so top of negative pulse is displayed.	

WARNING

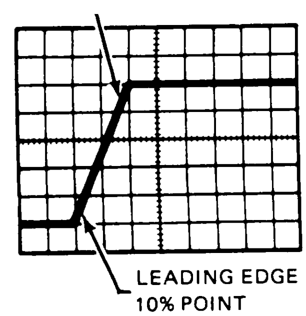
Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

Step	Equipment	Item	Action	Remarks
21	Signal Generator	Potentiometer R309	Adjust for minimum pulse top aberrations.	Potentiometer locations are shown in figure FO-3.
22		Capacitor C401	Adjust for minimum pulse overshoot.	Capacitor C401 location is shown in figure FO-5.
23	Oscilloscope	CH1 POSITION control	Adjust so top of negative pulse is displayed.	

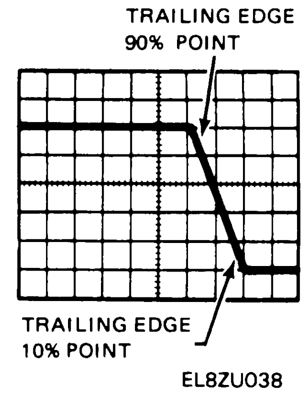
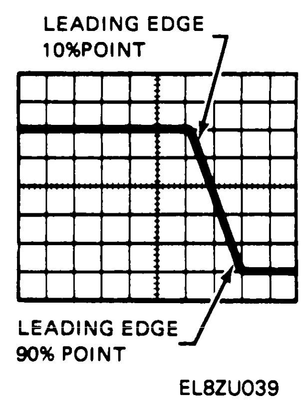
PULSE SHAPE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
24	Oscilloscope (cont)	Display	Check that pulse top aberrations are about 0.6 grid space or less.	
25	Signal Generator	PULSE POLARITY switch	POS	
26	Oscilloscope	CH1 POSITION control	Adjust so top of positive pulse is displayed.	
27		Display	Check that pulse top aberrations are about 0.6 grid space or less.	
28	Signal Generator	PULSE POLARITY switch	NEG	
29	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check pulse top aberrations for each control setting listed in table 2-21, repeating steps 23 thru 28 for each setting.	
30	Oscilloscope	CH1 VOLTS/DIV control	50 mV	

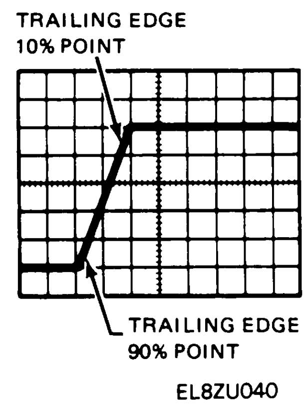
PULSE SHAPE ALINEMENT - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
31	Oscilloscope (cont)	SWP MAG pushbutton	In	
32		SEC/DIV control	10 ns	
33	Signal Generator	AMPLITUDE VOLTS selector	0.2 volt	
34		PULSE POLARITY switch	POS	
35	Oscilloscope	POSITION controls	Adjust so leading edge of signal is displayed.	
36		Display	Check that rise time between leading edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	 EL8ZU037
37		POSITION controls	Adjust so trailing edge of signal is displayed.	

PULSE SHAPE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
38	Oscilloscope (cont)	Display	Check that fall time between trailing edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	
39	Signal Generator	PULSE POLARITY switch	NEG	
40	Oscilloscope	POSITION controls	Adjust so leading edge of signal is displayed.	
41		Display	Check that rise time between leading edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	
42		POSITION controls	Adjust so trailing edge of pulse is displayed.	

PULSE SHAPE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
43		Display	Check that fall time between trailing edge 10% and 90% points is less than 1.3 grid spaces (13 ns).	
44	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check rise and fall times for each control setting listed in table 2-22, repeating steps 34 thru 43 for each setting.	May take oscilloscope out of calibration if required.
45	Signal Generator	REPETITION RATE selector	0.1 kHz	
46		REPETITION RATE vernier	Fully counterclockwise	
47		WIDTH selector	10 ms	
48		WIDTH vernier	Fully clockwise	
49		AMPLITUDE VOLTS selector	50 volts	
50		PULSE POLARITY switch	POS	
51	Oscilloscope	SEC/DIV control	2 ms	

PULSE SHAPE ALINEMENT - Continued

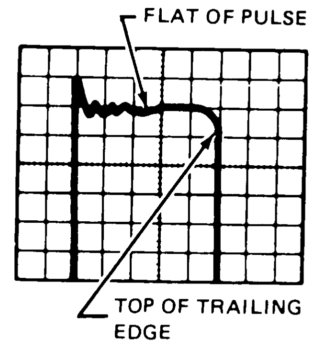
Step	Procedure			Remarks
	Equipment	Item	Action	
52	Oscilloscope (cont)	CH1 VOLTS/ DIV control	5 V	
53		Display	Check that vertical grid spaces between flat of pulse and top of trailing edge (pulse droop) are less than one and a half grid space (<3 V).	 EL8ZU041
54	Signal Generator	AMPLITUDE VOLTS selector	10 volts	
55			Disconnect signal generator from oscilloscope.	

Table 2-21. PULSE TOP ABERRATIONS CONTROL SETTINGS

Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Pulse Top Aberrations Grid Space
0.2 volt	20 mV	<0.6 (< 12 mV)
0.5 volt	50 mV	<0.6 (< 30 mV)
1 volt	0.1 V	<0.6 (< 60 mV)
2 volts	0.2 V	<0.6 (< 0.12 V)
5 volts	0.5 V	<0.6 (< 0.3 V)

PULSE SHAPE ALINEMENT - Continued

Table 2-21. PULSE TOP ABERRATIONS CONTROL SETTINGS - Continued

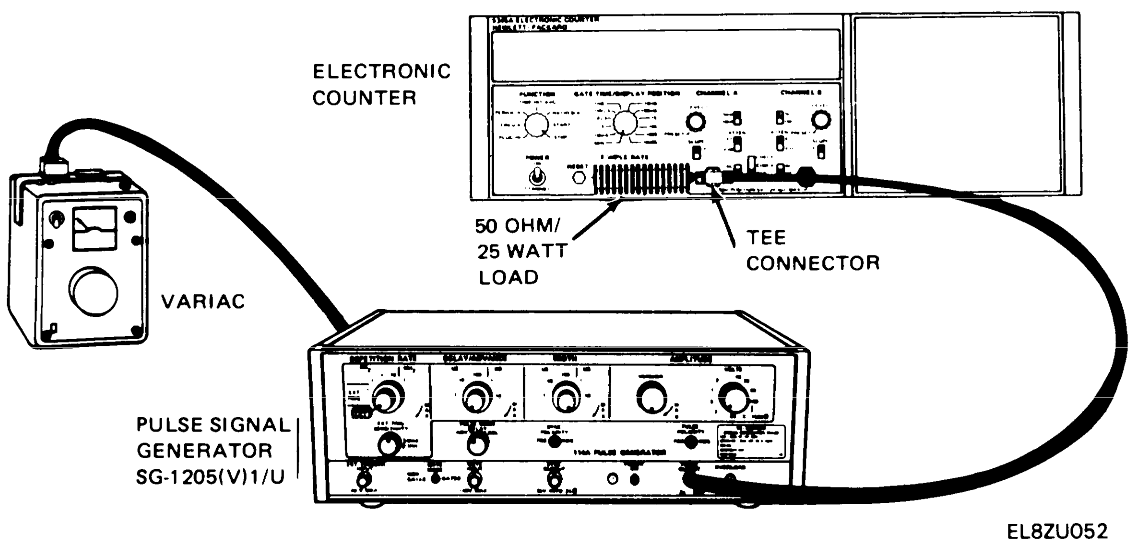
Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Pulse Top Aberrations Grid Space
10 volts	1 V	< 0.6 (< 0.6 V)
20 volts	2 V	< 0.6 (< 1.2 V)
50 volts	5 V	< 0.6 (< 3 V)
100 volts	10 V	< 0.6 (< 6 V)

Table 2-22. RISE/FALL TIME CONTROL SETTINGS

Signal Generator	Oscilloscope	
AMPLITUDE VOLTS Selector	CH1 VOLTS/DIV Control	Rise/Fall Time Grid Spaces
0.2 volt	50 mV	≤ 1.3 (13 ns)
0.5 volt	0.1 V	≤ 1.3 (13 ns)
1 volt	0.2 V	≤ 1.3 (13 ns)
2 volts	0.5 V	≤ 1.3 (13 ns)
5 volts	1 V	≤ 1.3 (13 ns)
10 volts	2 V	≤ 1.3 (13 ns)
20 volts	5 V	≤ 1.3 (13 ns)
50 volts	10 V	≤ 1.5 (15 ns) Rise/ ≤ 1.3 (13 ns) Fall
100 volts	2 V with 10X attenuator	≤ 1.7 (17 ns)

REPETITION RATE ALINEMENT

Step	Procedure			Remarks
	Equipment	Item	Action	
1	Signal Generator and Counter		Connect signal generator to counter.	



2	Counter	Power cable	Plug in.	
3		POWER switch	ON	
4		FUNCTION control	FREQ A	
5		DISPLAY POSITION switch	AUTO	
6		CHANNEL A 50 Ω/1 M Ω	50 Ω	
7		CHANNEL A X1/X10 switch	X1	

REPETITION RATE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
8	Counter (cont)	CHANNEL A AC/DC switch	DC	
9		CHECK/COM A/ SEP switch	SEP	
10		SAMPLE RATE control	HOLD	
11	Signal Generator	POWER cable	Plug in	
12		REPETITION RATE selector	0.1 kHz	
13		REPETITION RATE vernier	Fully counterclockwise	
14		DELAY/ADVANCE selector	1 µs	
15		DELAY/ADVANCE vernier	Fully counterclockwise	
16		WIDTH selector	1 µs	
17		WIDTH vernier	Fully counterclockwise	
18		AMPLITUDE VOLTS selector	2 volts	
19		AMPLITUDE VERNIER	Fully counterclockwise	
20		GATE MODE selector	NON GATED	
21		PULSE MODE selector	DELAY	
22		PULSE POLARITY switch	NEG	

REPETITION RATE ALINEMENT -Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
23	Signal Generator (cont)	POWER	ON	Power indicator lights
24		AMPLITUDE VERNIER	Fully clockwise	
25	Counter	RESET switch	Press	
26		CHANNEL A LEVEL control	Rotate until GATE lamp flashes.	
27	Signal Generator and Counter		Set signal generator and counter controls and check counter indication per table 2-23, pressing RESET switch after each indication.	
28	Counter	POWER switch	STANDBY	
29			Disconnect signal generator from counter.	

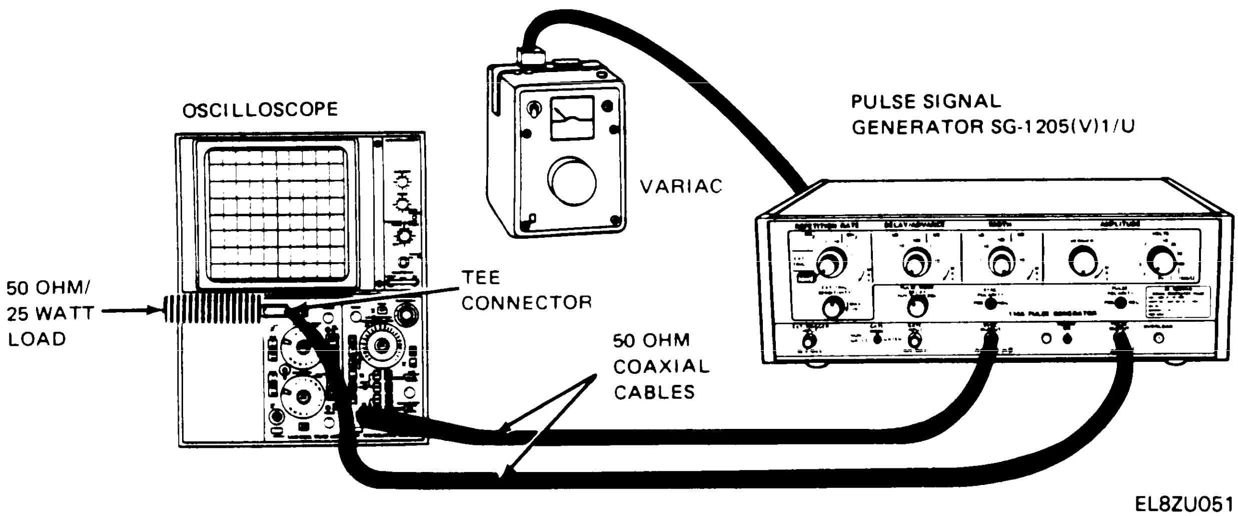
REPETITION RATE ALINEMENT - Continued

Table 2-23. REPETITION RATE CONTROL SETTINGS

Signal Generator		Counter	
REPETITION RATE Selector	REPETITION RATE Vernier	GATE TIME Selector	Indication
0.1 kHz	ccw	10 s	<0.01 kHz
0.1 kHz	cw	10 s	>0.1 kHz
1 kHz	ccw	1 s	<0.1 kHz
1 kHz	cw	1 s	>1 kHz
10 kHz	ccw	100 ms	<1 kHz
10 kHz	cw	100 ms	>10 kHz
0.1 MHz	ccw	10 ms	<10 kHz
0.1 MHz	cw	10 ms	>0.1 MHz
1 MHz	ccw	1 ms	<0.1 MHz
1 MHz	cw	1 ms	>1 MHz

PULSE WIDTH ALINEMENT

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



Step	Equipment	Item	Action	Remarks
2	Signs Generator	REPETITION RATE selector	0.1 MHz	
3		REPETITION RATE vernier	Fully clockwise	
4		DELAY/ADVANCE selector	1 µs	
5		DELAY/ADVANCE vernier	Fully counterclockwise	
6		WIDTH selector	1 µs	
7		WIDTH vernier	Fully counterclockwise	
8		AMPLITUDE VOLTS selector	10 volts	

PULSE WIDTH ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
9	Signal Generator (cont)	AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	10 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	
17		AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	EXT	
19		DISPLAY MODE pushbuttons	MAIN SWP	
20		SWP MAG pushbutton	In	
21		SEC/DIV control	10 ns	

PULSE WIDTH ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
22	Oscilloscope (cont)	FOCUS and INTENSITY controls	Adjust for a clear trace on display.	

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

Step	Equipment	Item	Action	Remarks
23	Signal Generator	Potentiometer R140	Adjust so that signal on oscilloscope display is less than five grid spaces wide (<50 ns).	Potentiometer locations are shown in figure FO-3.
24		REPETITION RATE selector	1 kHz	
25		WIDTH selector	100 µs	
26		WIDTH vernier	Fully clockwise	
27	Oscilloscope	SEC/DIV control	20 µs	
28	Signal Generator	Potentiometer R135	Adjust so that signal on oscilloscope display is greater than five grid spaces wide (> 100 µs).	
29	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check pulse width of output pulse per table 2-24.	

PULSE WIDTH ALINEMENT - Continued

Table 2-24. PULSE WIDTH CONTROL SETTINGS

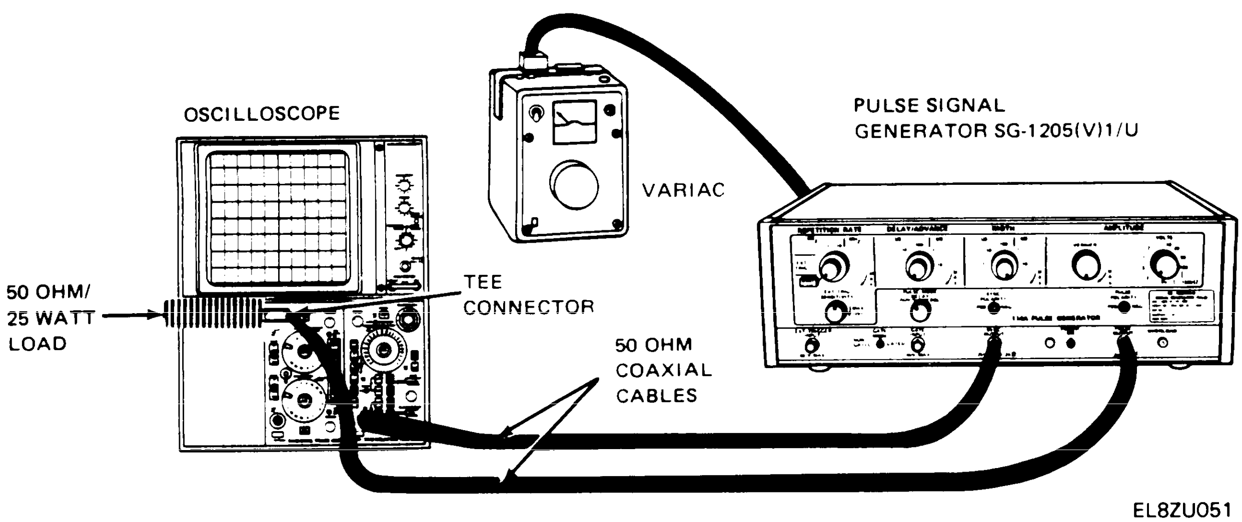
CAUTION

Always decrease repetition rate before increasing pulse width and decrease pulse width before increasing repetition rate to prevent overload.

Signal Generator			Oscilloscope	
REPETITION RATE Selector	WIDTH Selector	WIDTH Vernier	SEC/DIV Control	Pulse Width Grid Space
1 MHz	1 µs	ccw	10 ns	≤ 5 (≤ 50 ns)
0.1 MHz	1 µs	cw	0.2 µs	>5 (>1 µs)
0.1 MHz	10 µs	ccw	0.2 µs	<5 (<1 µs)
10 kHz	10 µs	cw	2 µs	>5 (>10 µs)
10 kHz	100 µs	ccw	2 µs	<5 (<10 µs)
1 kHz	100 µs	cw	20 µs	>5 (>100 µs)
1 kHz	1 ms	ccw	20 µs	<5 (<100 µs)
0.1 kHz	1 ms	cw	0.2 ms	>5 (>1 ms)
0.1 kHz	10 ms	ccw	0.2 ms	<5 (<1 ms)
0.1 kHz with vernier ccw	10 ms	cw	2 ms	≥ 5 (≥ 10 ms)

OVERLOAD ALINEMENT

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator, Oscilloscope, and Variac		Connect signal generator to oscilloscope and variac.	

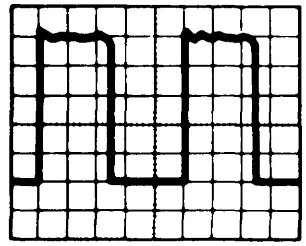


Step	Equipment	Item	Action	Remarks
2	Signal Generator	WIDTH selector	10 ms	
3		WIDTH vernier	Fully counterclockwise	
4		REPETITION RATE selector	0.1 kHz	
5		REPETITION RATE vernier	Fully clockwise	
6		DELAY/ADVANCE selector	1 µs	
7		DELAY/ADVANCE vernier	Fully counterclockwise	

OVERLOAD ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
8	Signal Generator (cont)	AMPLITUDE selector	10 volts	
9		AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13	Oscilloscope	CH1 VOLTS/ DIV control	2 V	
14		CAL control	Fully clockwise (calibrated)	
15		MODE pushbuttons	CH1/DUAL	
16		TRIGGER pushbuttons	CH1	
17		AUTO TRIG pushbutton	In	
18		TRIG SOURCE pushbuttons	EXT	
19		DISPLAY MODE pushbuttons	MAIN SWP	
20		SEC/DIV control	2 ms	

OVERLOAD ALINEMENT - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
21	Signal Generator	WIDTH vernier	Adjust display for 50% duty cycle.	 EL8ZU053
22	Oscilloscope	SEC/DIV control	1 ms	
23	Signal Generator	WIDTH vernier	Adjust so each pulse is 5-1/2 grid spaces wide (5.5 ins).	
24		DELAY/ADVANCE selector and vernier	Adjust so a single pulse is displayed on oscilloscope.	

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

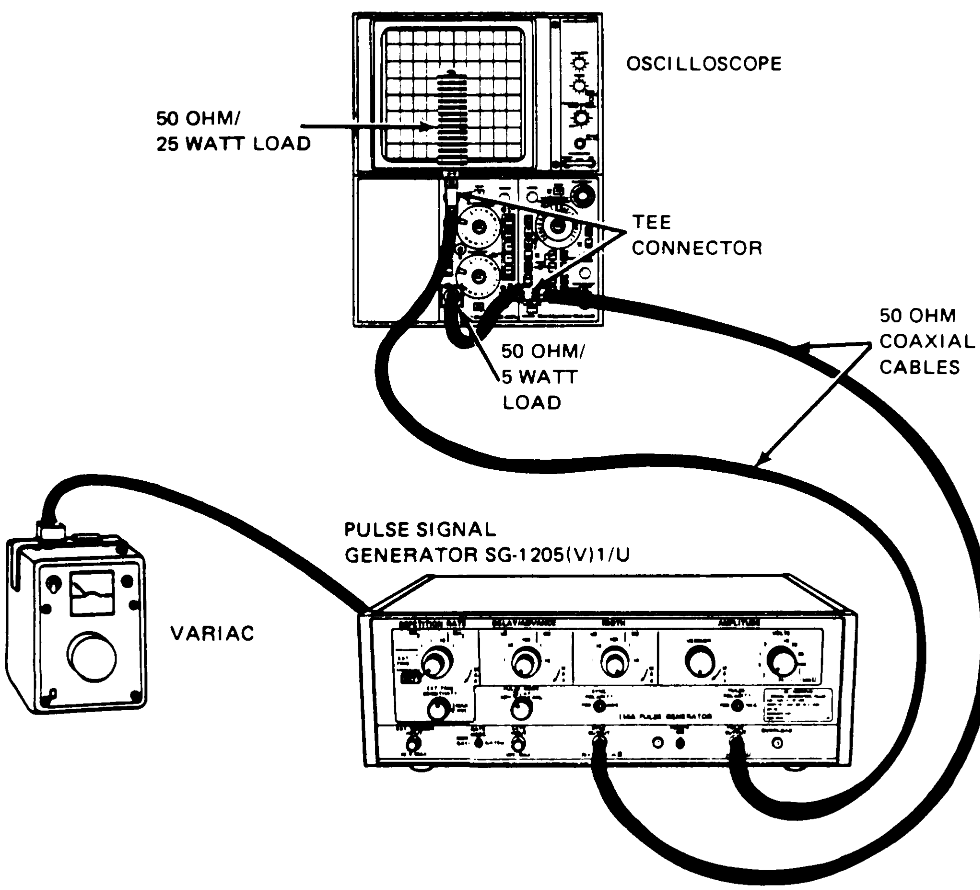
Step	Equipment	Item	Action	Remarks
25		Potentiometer R519	Adjust slowly clockwise until pulse on oscilloscope display just disappears.	Potentiometer locations are shown in figure FO-3.
26	Oscilloscope	Display	Check that pulse disappears and reappears at about 1-second intervals.	
27	Variac	VOLTAGE control	105 volts	

OVERLOAD ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
28	Signal Generator	Potentiometer R512	Adjust so OVERLOAD indicator just lights, then adjust in opposite direction until indicator just starts to flash.	
29	Oscilloscope	Display	Check that pulse disappears at same time OVERLOAD indicator flashes.	
30	Variac	VOLTAGE control	115 volts	
31	Signal Generator	WIDTH vernier	Adjust for a pulse width of five grid spaces (5 ms) on oscilloscope and check that output pulse is constant.	
32		WIDTH vernier	Fully counterclockwise	
33	Oscilloscope	CH1 VOLTS/ DIV control	10 V	
34	Signal Generator	AMPLITUDE VOLTS selector	100 volts	
35		WIDTH vernier	Adjust slowly clockwise and check that pulse width can be increased to more than one grid space (>1 ms) before pulse disappears and OVERLOAD indicator begins to flash.	
36		AMPLITUDE VOLTS selector	10 volts	

DELAY/ADVANCE ALINEMENT

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks
1	Signal Generator and Oscilloscope		Connect signal generator to oscilloscope.	



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2	Signal Generator	REPETITION RATE selector	10 kHz	
3		REPETITION RATE vernier	Fully clockwise	

DELAY/ADVANCE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
4	Signal Generator (cont)	DELAY/ADVANCE selector	10 µs	
5		DELAY/ADVANCE vernier	Fully clockwise	
6		WIDTH selector	1 µs	
7		WIDTH vernier	Fully counterclockwise	
8		AMPLITUDE VOLTS selector	10 volts	
9		AMPLITUDE VERNIER	Fully clockwise	
10		GATE MODE selector	NON GATED	
11		PULSE MODE selector	DELAY	
12		PULSE POLARITY switch	POS	
13		SYNC POLARITY switch	POS	
14	Oscilloscope	POWER switch	On	
15		DISPLAY ON pushbutton	In	
16		CH1 VOLTS/DIV control	10 V	
17		CAL control	Fully clockwise (calibrated)	

DELAY/ADVANCE ALINEMENT - Continued

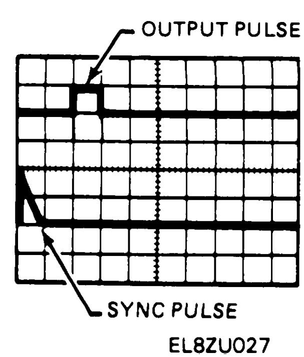
Step	Procedure			Remarks
	Equipment	Item	Action	
18	Oscilloscope (cont)	CH2 VOLTS/DIV control	10 V	
19		CAL control	Fully clockwise (calibrated)	
20		MODE pushbutton	CH1/DUAL and CH2/TRACE	
21		TRIGGER pushbuttons	CH2	
22		AUTO TRIG pushbutton	In	
23		TRIG SOURCE pushbuttons	EXT	
24		DISPLAY MODE pushbuttons	MAIN SWP	
25		SEC/DIV control	5 µs	
26		INTENSITY control	Adjust so signals on display are sharp and clear.	
27		FOCUS control	Adjust so signals on display are sharp and clear.	
28		POSITION controls	Adjust so that leading edge of sync pulse is at left side of oscilloscope.	

DELAY/ADVANCE ALINEMENT - Continued

Step	Procedure: Equipment	Procedure: Item	Procedure: Action	Remarks

WARNING

Signal generator contains high voltages. Be careful when working inside signal generator with power applied to prevent electrical shock.

Step	Equipment	Item	Action	Remarks
29	Signal Generator	Potentiometer R65	Adjust so that leading edge of output pulse is greater than two grid spaces (> 10 µs) to the right of leading edge of sync pulse.	Potentiometer locations are shown in figure FO-3.
30		REPETITION RATE selector	1 kHz	
31		DELAY/ADVANCE selector	100 µs	
32		DELAY/ADVANCE vernier	Fully counterclockwise	
		Potentiometer R70	Adjust so that leading edge of output pulse is less than two grid spaces (< 10 µs) to the right of leading edge of sync pulse,	
33	Signal Generator and Oscilloscope		Set signal generator and oscilloscope controls and check grid spaces between leading edges of output pulse and sync pulse per table 2-25.	

DELAY/ADVANCE ALINEMENT - Continued

Step	Procedure			Remarks
	Equipment	Item	Action	
34	Signal Generator, Oscilloscope, and Variac	POWER switches	Off	
35			Disconnect all equipment.	

Table 2-25. DELAY/ADVANCE CONTROL SETTINGS

Signal Generator					Oscilloscope	
DELAY/ ADVANCE Selector	DELAY/ ADVANCE Vernier	REPETITION RATE Selector	WIDTH Selector	WIDTH Vernier	SEC/DIV Control	Leading Edge Grid Space
1 µs	ccw	1 MHz	1 µs	ccw	0.2 µs	Passes through sync (less than 0)
1 µs	cw	0.1 MHz	1 µs	ccw	0.5 µs	≥ 2 (≥ 1 µs)
10 µs	ccw	0.1 MHz	1 µs	ccw	0.5 µs	<2 (<1 µs)
10 µs	cw	10 kHz	1 µs	cw	5 µs	≥ 2 (≥ 10 µs)
100 µs	ccw	10 kHz	1 µs	cw	5 µs	< 2 (< 10 µs)
100 µs	cw	1 kHz	1 µs	cw	50 µs	≥ 2 (≥ 100 µs)
1 ms	ccw	1 kHz	10 µs	cw	50 µs	< 2 (< 100 µs)
1 ms	cw	0.1 kHz	10 µs	cw	0.5 ms	≥ 2 (≥ 1 ms)
10 ms	ccw	0.1 kHz	1 ms	cw	0.5 ms	< 2 (<1 ms)
10 ms	cw	0.1 kHz with vernier ccw	1 ms	cw	5 ms	≥ 2 (≥ 10 ms)

2-40. REPLACE CHASSIS FEET.

DESCRIPTION

This procedure covers: Front Chassis Feet. Remove. Install.
Rear Chassis Feet. Remove. Install.

INITIAL SETUP

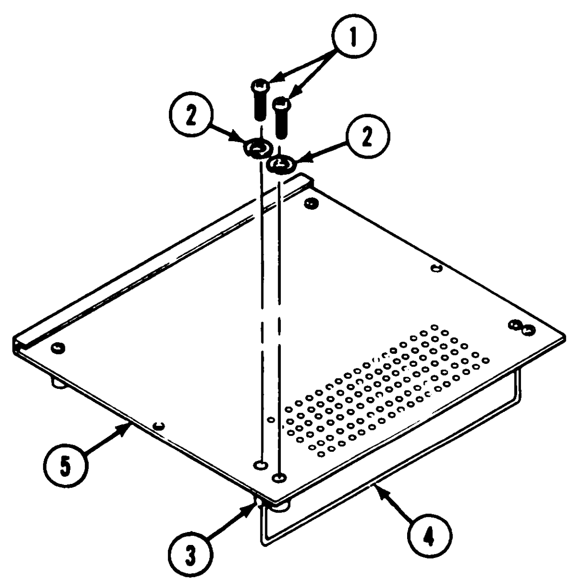
NOTE

PRELIMINARY PROCEDURE: Remove bottom cover. See paragraph 2-37.

REMOVE FRONT CHASSIS FEET

NOTE

This task is the same for left and right front chassis feet. Left front chassis foot is shown,



1. Remove two screws (1) and lockwashers (2).
2. Pull off chassis foot (3).

INSTALL FRONT CHASSIS FEET

1. Insert end of stand (4) in slot in chassis foot (3) .
2. Position chassis foot (3) on bottom cover (5).
3. Install two screws (1) and lockwashers (2).

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

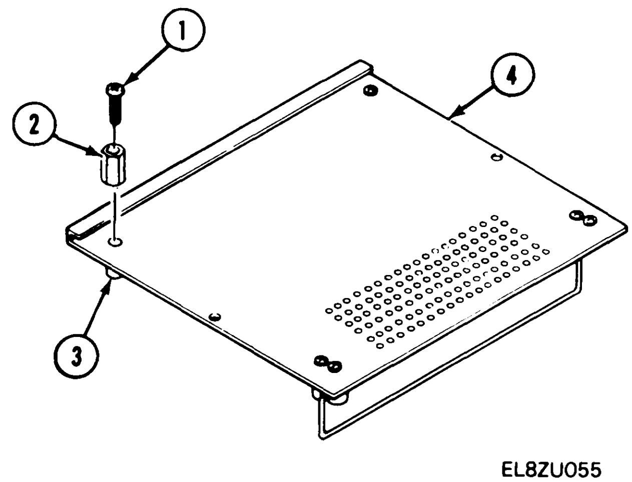
END OF TASK

REMOVE REAR CHASSIS FEET

NOTE

- This task is the same for left and right rear chassis feet except where noted. Left rear chassis foot is shown.
- Right rear chassis foot does not have spacer.

1. Remove screw (1) and spacer (2).
2. Pull off chassis foot (3).



INSTALL REAR CHASSIS FEET

1. Position chassis foot (3) on bottom cover (4).
2. Install screw (1) and spacer (2).

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

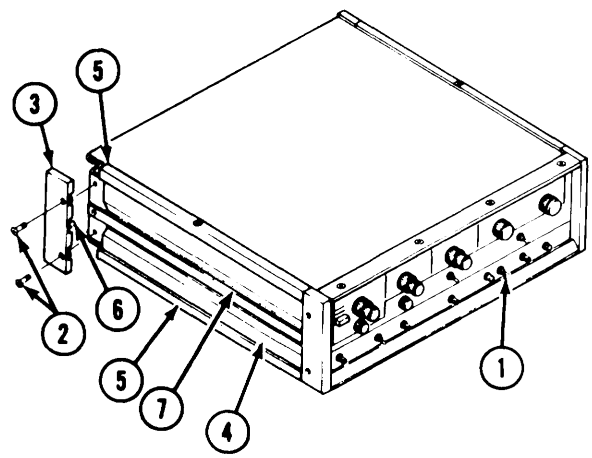
END OF TASK

2-41. REPLACE SIDE PANELS.

DESCRIPTION

This procedure covers: Remove. Install.

REMOVE



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NOTE

This task is the same for left and right side panels. Left side panel is shown.

1. Set POWER switch (1) to off.
2. Remove two screws (2).
3. Remove rear end plate (3).
4. Slide side panel (4) out of two side brackets (5).

INSTALL

1. Slide side panel (4) between two side brackets (5).
2. Insert pin (6) on end plate (3) through hole in handle (7).
3. Position end plate (3) and handle (7) on chassis.
4. Install two screws (2).

END OF TASK

2-42. REPLACE HANDLES.

DESCRIPTION

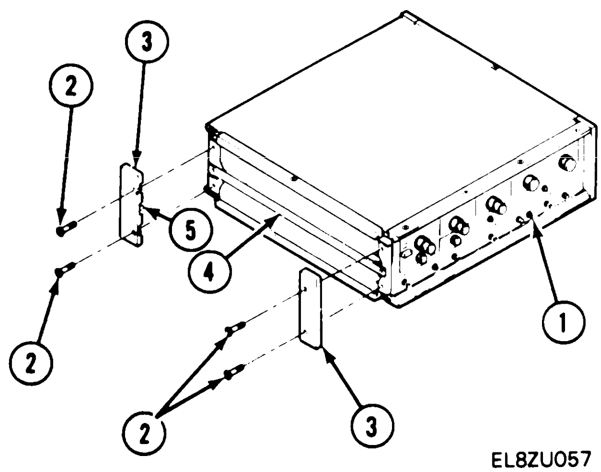
This procedure covers: Remove. Install.

REMOVE

NOTE

This task is the same for left and right handle. Left handle is shown.

1. Set POWER switch (1) to off.
2. Remove four screws (2).
3. Remove two end plates (3).
4. Remove handle (4).



INSTALL

1. Insert pin (5) on each end plate (3) through holes at ends of handle (4).
2. Position two end plates (3) and handle (4) on chassis.
3. Install four screws (2).

END OF TASK

2-43. REPLACE REPETITION RATE SWITCH ASSEMBLY S1.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

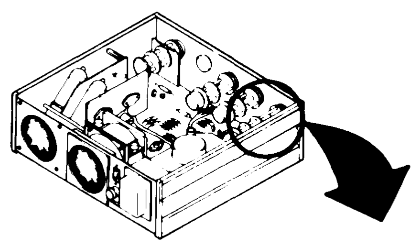
Reference: TM 11-6625-3050-12

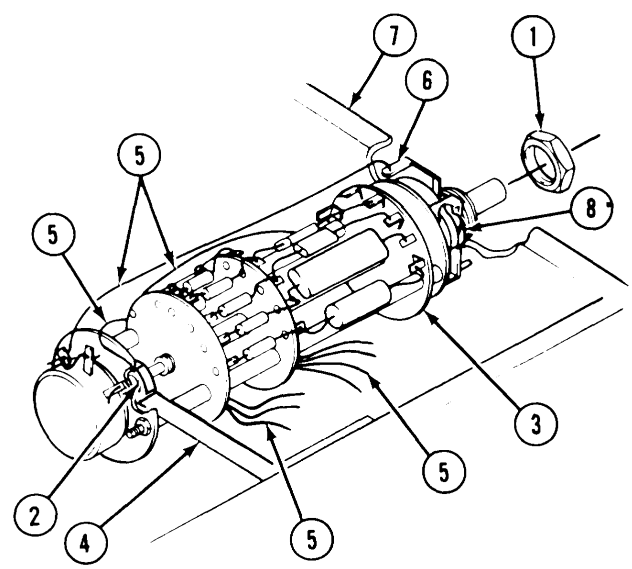
NOTE

PRELIMINARY PROCEDURES:

- Remove top cover. See paragraph 2-37.
- Remove switch assembly front panel control knobs. See TM 11-6625-3050-12.

REMOVE





EL8ZU058

1. Loosen nut (1).
2. Loosen nut (2) and remove switch assembly (3) from switch bracket (4).

NOTE

- Rotate switch assembly (3) as required to remove 10 wires (5).
- Do not unsolder wire from ground lug (6).

3. Tag, unsolder, and remove 10 wires (5).
4. Remove nut (1).
5. Carefully pull switch assembly (3) out of front panel (7).
6. Remove ground lug (6) and lockwasher (8) from switch assembly (3).

END OF TASK

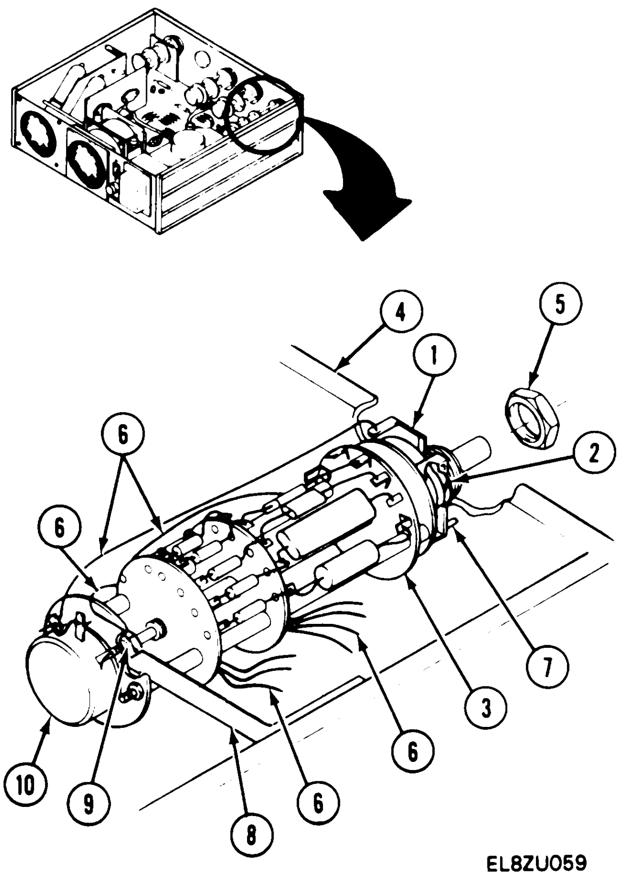
INSTALL

1. Install ground lug (1) and lockwasher (2) on switch assembly (3).
2. Insert switch assembly (3) in front panel (4).
3. Loosely install nut (5) on switch assembly (3).

NOTE

Rotate switch assembly (3) as required to solder 10 wires (6).

4. Solder 10 wires (6) as tagged.
5. Rotate switch assembly (3) so that pin (7) on switch assembly alines with pinhole in front panel (4).
6. Insert switch assembly (3) in switch bracket (8), with bracket between nut (9) and potentiometer (10).
7. Tighten nut (5).
8. Tighten nut (9).



NOTE

FOLLOW-ON MAINTENANCE:

- Install switch assembly front panel control knobs. See TM 11-6625-3050-12.
- Install top cover. See paragraph 2-37.

END OF TASK

2-44. REPLACE DELAY/ADVANCE SWITCH ASSEMBLY S61 OR WIDTH SWITCH ASSEMBLY S131.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

Material: Cable Ties, Item 3, Appendix B

Reference: TM 11-6625-3050-12

NOTE

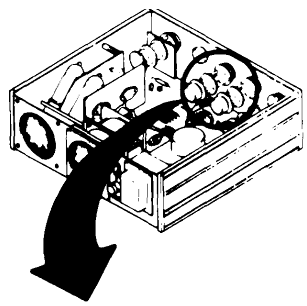
PRELIMINARY PROCEDURES:

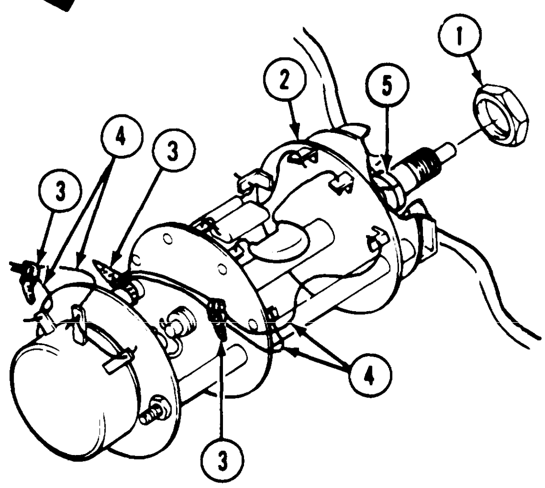
- Remove top cover. See paragraph 2-37.
- Remove switch assembly front panel control knobs. See TM 11-6625-3050-12.

REMOVE

NOTE

This task is the same for both the DELAY/ADVANCE and the WIDTH switch assemblies. WIDTH switch assembly is shown.





1. Loosen nut (1).
2. Turn switch assembly (2) to access three cable ties (3) and four wires (4).
3. Remove three cable ties (3).
4. Tag, unsolder, and remove four wires (4).
5. Remove nut (1).
6. Pull out switch assembly (2).
7. Remove lockwasher (5) from switch assembly (2).

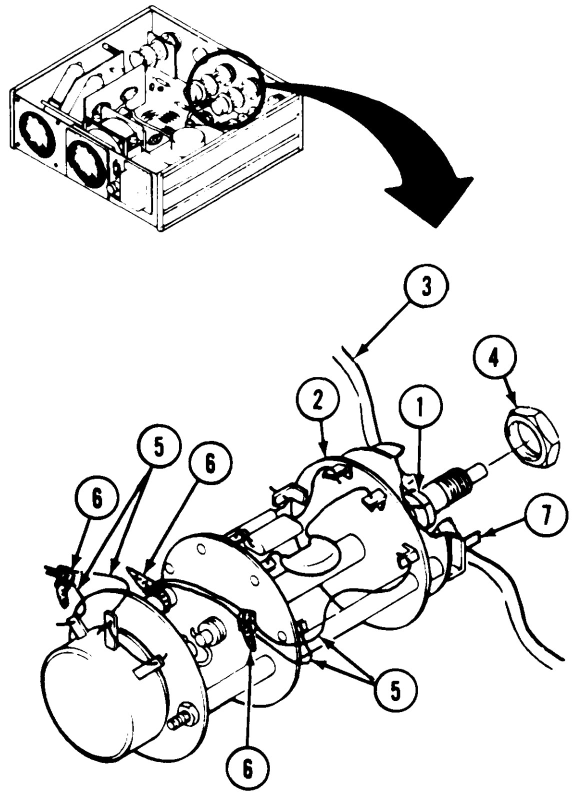
END OF TASK

INSTALL

NOTE

This task is the same for both the DELAY/ADVANCE and the WIDTH switch assemblies. WIDTH switch assembly is shown.

1. Install lockwasher (1) on switch assembly (2).
2. Insert switch assembly (2) in front panel (3).
3. Loosely install nut (4) onto switch assembly (2).
4. Solder four leads (5) as tagged.
5. Install three cable ties (6).
6. Turn switch assembly (2) so that pin (7) on switch assembly alines with pinhole in front panel (3).
7. Tighten nut (4).



NOTE

FOLLOW-ON MAINTENANCE:

- Install switch assembly front panel control knobs. See TM 11-6625-3050-12.
- Install top cover. See paragraph 2-37.

END OF TASK

2-45. REPLACE AMPLITUDE VOLTS SWITCH ASSEMBLY S401.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

Material: Cable Ties, Item 3, Appendix B

Reference: TM 11-6625-3050-12

NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers. See paragraph 2-37.
- Remove right side panel. See paragraph 2-41.
- Remove switch assembly front panel control knobs. See TM 11-6625-3050-12.

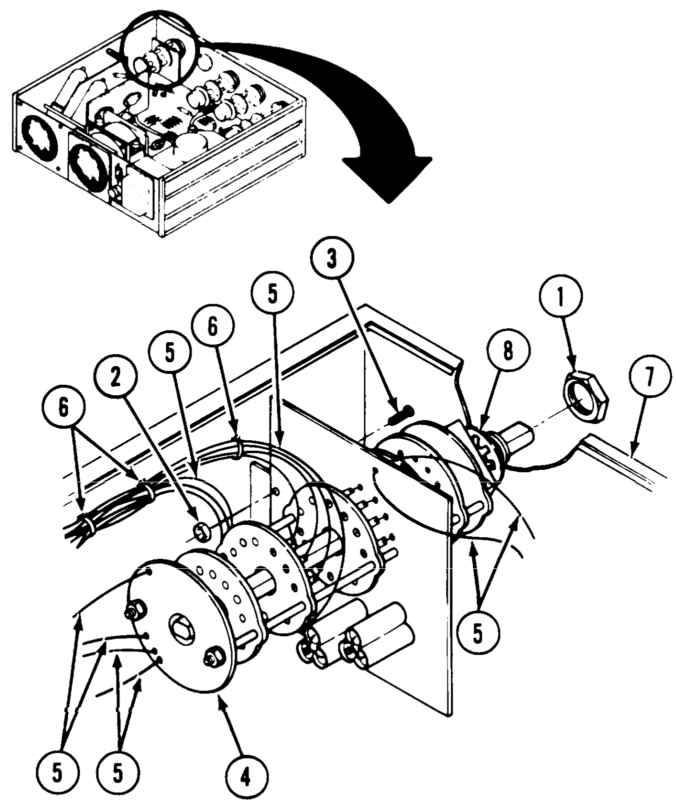
REMOVE

1. Loosen nut (1).
2. Remove nut (2) and screw (3).

NOTE

Rotate switch assembly (4) as required to remove 13 wires (5).

3. Remove three cable ties (6).
4. Tag, unsolder, and remove 13 wires (5).
5. Remove nut (1).
6. Carefully pull switch assembly (4) out of front panel (7).
7. Remove lockwasher (8) from switch assembly (4).



EL8ZU062

END OF TASK

INSTALL

1. Install lockwasher (1) on switch assembly (2).

2. Insert switch assembly (2) into front panel (3).

3. Loosely install nut (4) on switch assembly (2).

NOTE

Rotate switch assembly (2) as required to solder 13 wires (5).

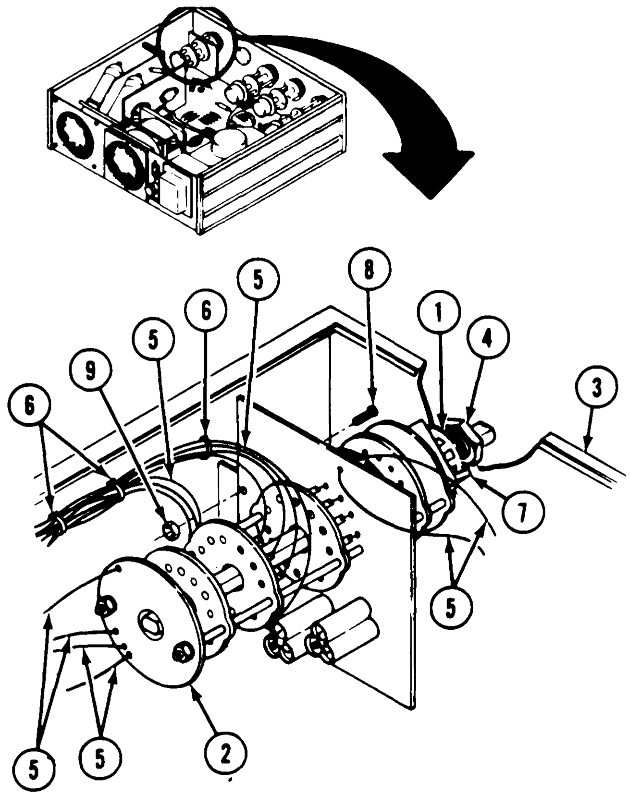
4. Solder 13 wires (5) as tagged.

5. Install three cable ties (6).

6. Rotate switch assembly (2) so that pin bracket (7) on switch assembly alines with hole in front panel (3).

7. Install screw (8) and nut (9).

8. Tighten nut (4).



EL8ZU063

NOTE

FOLLOW-ON MAINTENANCE:

- Install top and bottom covers. See paragraph 2-37.
- Install right side panel. See paragraph 2-41.
- Install switch assembly front panel control knobs. See TM 11-6625-3050-12.

END OF TASK

2-46. REPLACE PULSE MODE SWITCH S81.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

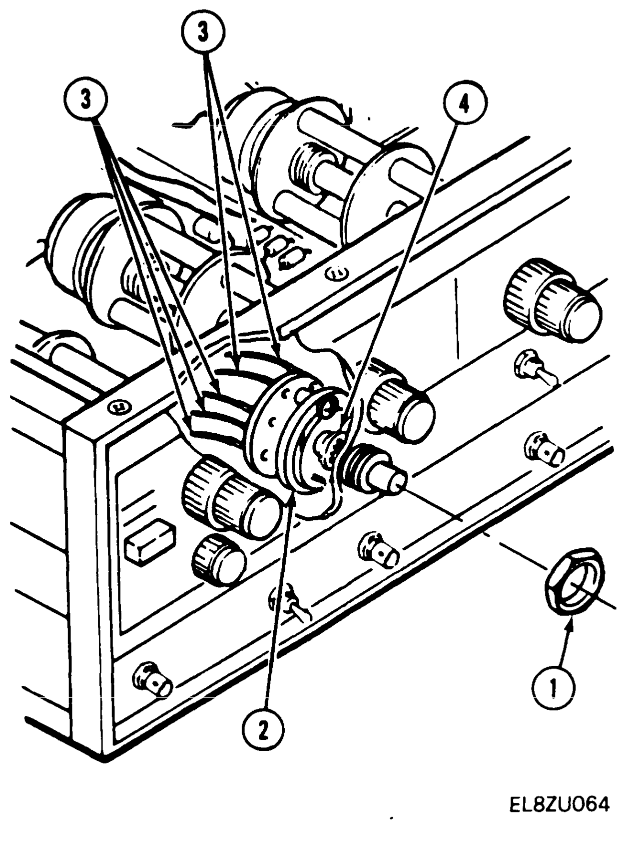
Reference: TM 11-6625-3050-12

NOTE

PRELIMINARY PROCEDURES:

- Remove top cover. See paragraph 2-37.
- Remove switch front panel control knob. See TM 11-6625-3050-12.

REMOVE



EL8ZU064

1. Loosen nut (1).

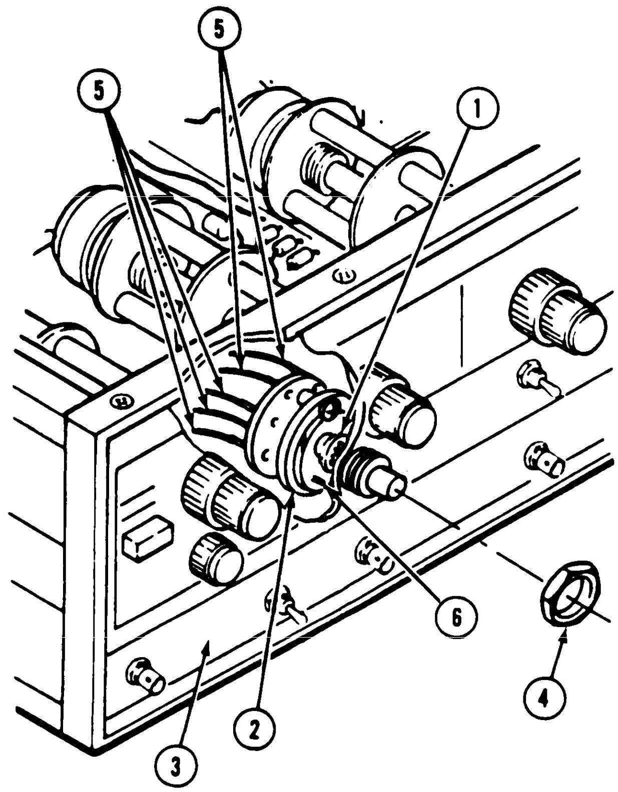
NOTE

Turn switch (2) as needed to remove five leads (3).

2. Tag, unsolder, and remove five leads (3).
3. Remove nut (1).
4. Pull out switch (2).
5. Remove lockwasher (4) from switch (2).

END OF TASK

INSTALL



1. Install lockwasher (1) on switch (2).
2. Insert switch (2) in front panel (3).
3. Loosely install nut (4).

NOTE

Turn switch (2) as needed to solder five leads (5).

4. Solder five leads (5) as tagged.
5. Turn switch (2) so that pin (6) on switch alines with pinhole in front panel (3).
6. Tighten nut (4).

NOTE

FOLLOW-ON MAINTENANCE:

- Install switch front panel control knob, See TM 11-6625-3050-12.
- Install top cover. See paragraph 2-37.

END OF TASK

2-47. REPLACE POWER SWITCH S501 OR GATE MODE SWITCH S3.

DESCRIPTION

This procedure covers: POWER Switch S501. Remove. Install.
GATE MODE Switch S3. Remove. Install.

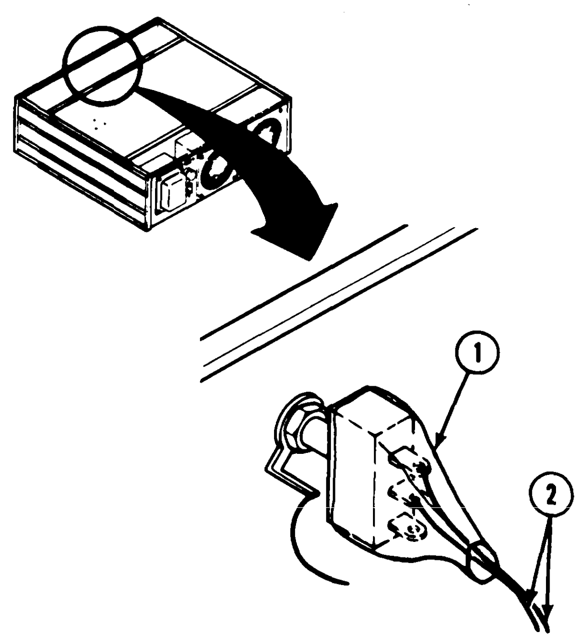
INITIAL SETUP

Materials: Sleeving, Item 8, Appendix B

NOTE

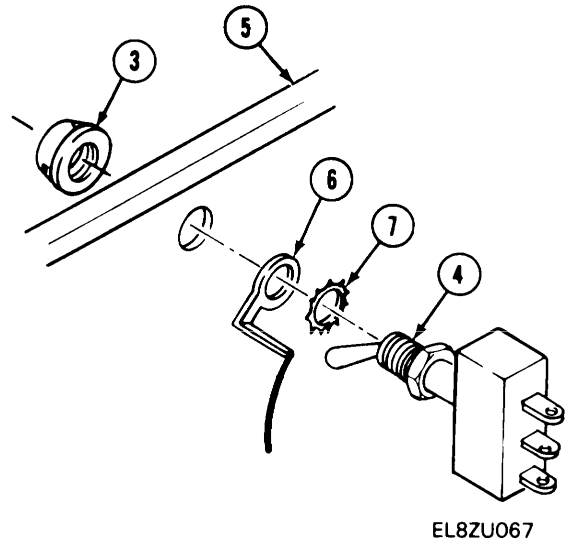
PRELIMINARY PROCEDURE: Remove bottom cover. See paragraph 2-37.

REMOVE POWER SWITCH S501.



1. Cut and remove insulation sleeving (1).
2. Tag, unsolder, and remove two leads (2).

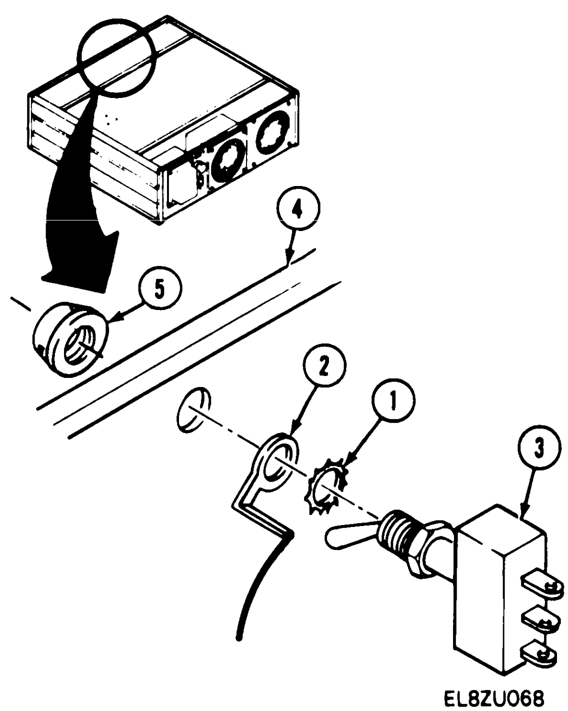
REMOVE POWER SWITCH S501 - Continued



3. Remove mounting nut (3).
4. Pull POWER switch (4) out of front panel (5).
5. Remove terminal lug (6) and star washer (7) from POWER switch (4).

END OF TASK

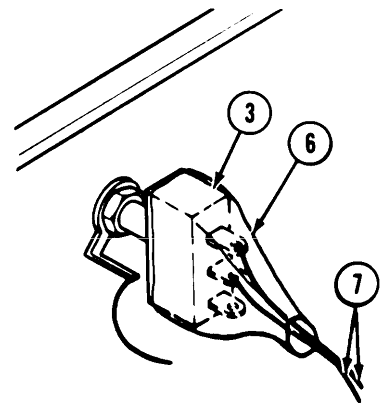
INSTALL POWER SWITCH S501



1. Put star washer (1) and terminal lug (2) on POWER switch (3).
2. Insert POWER switch (3) in front panel (4).
3. Set POWER switch (3) to off position.
4. Install mounting nut (5).

INSTALL POWER SWITCH S501 - Continued

5. Slide 1-inch piece of insulation sleeving (6) over two leads (7).
6. Solder two leads (7) as tagged.
7. Slide insulation sleeving (6) down over POWER switch (3) and shrink in place.



EL8ZU069

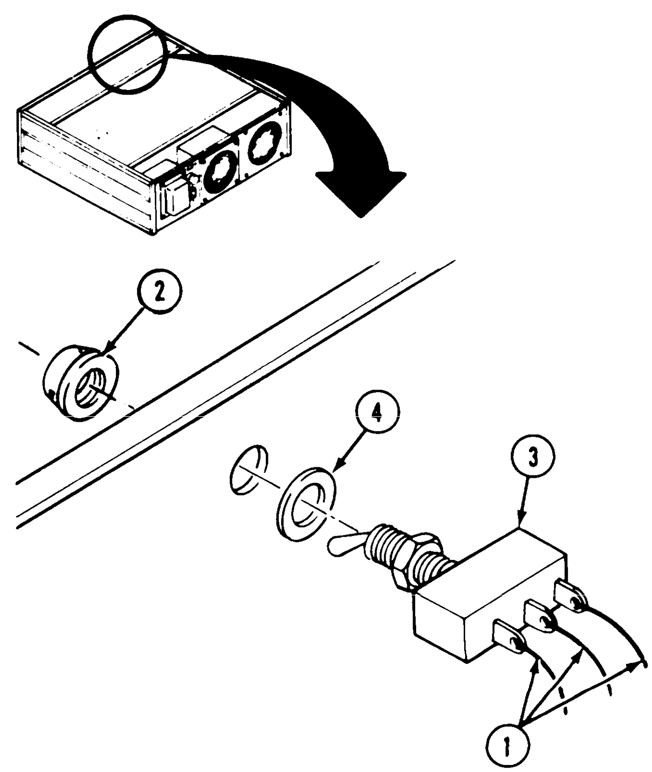
NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

END OF TASK

REMOVE GATE MODE SWITCH S3

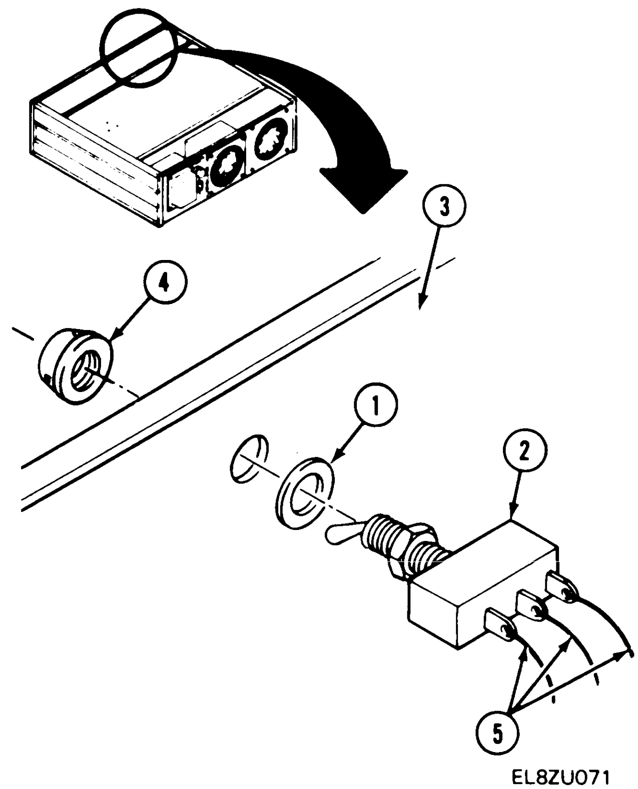
1. Tag, unsolder, and remove three leads (1).
2. Remove mounting nut (2).
3. Pull out GATE MODE switch (3) and washer (4).



EL8ZU070

END OF TASK

INSTALL GATE MODE SWITCH S3



1. Install washer (1) on GATE MODE switch (2).
2. Insert GATE MODE switch (2) in front panel (3).
3. Set GATE MODE switch (2) to NON GATED position.
4. Install mounting nut (4).
5. Solder three leads (5) as tagged.

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover, See paragraph 2-37.

END OF TASK

2-48. REPLACE SYNC POLARITY SWITCH S111 OR PULSE POLARITY SWITCH S391.

DESCRIPTION

This procedure covers: SYNC POLARITY Switch S111. Remove. Install.
PULSE POLARITY Switch S391. Remove. Install.

INITIAL SETUP

NOTE

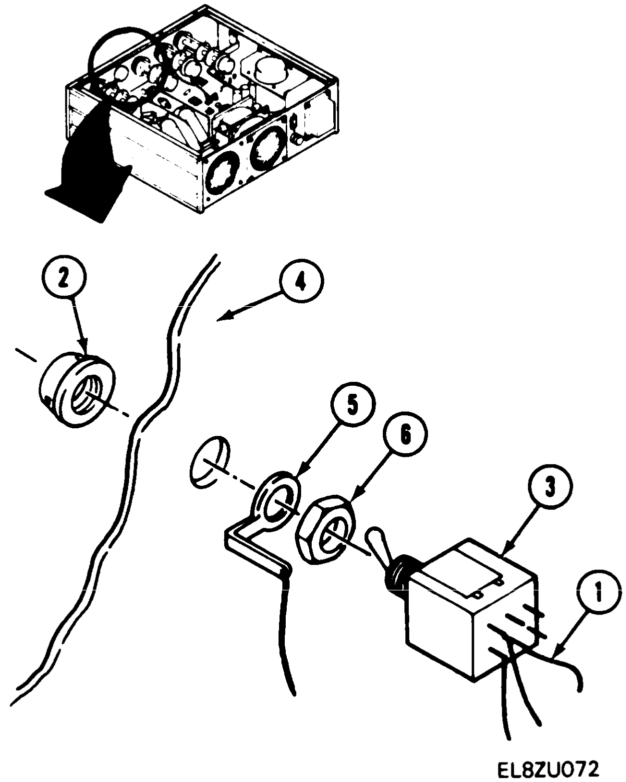
PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

REMOVE SYNC POLARITY SWITCH S111

1. Remove resistor R118 and diode CR116. See paragraph 2-64.
2. Tag, unsolder, and remove three leads (1).
3. Remove mounting nut (2).
4. Pull switch (3) out of front panel (4).
5. Remove terminal lug (5) and nut (6) from switch (3).

INSTALL SYNC POLARITY SWITCH S111

1. Install nut (6) and terminal lug (5) on switch (3).
2. Insert switch (3) in front panel (4).
3. Install mounting nut (2).
4. Solder three leads (1) as tagged.



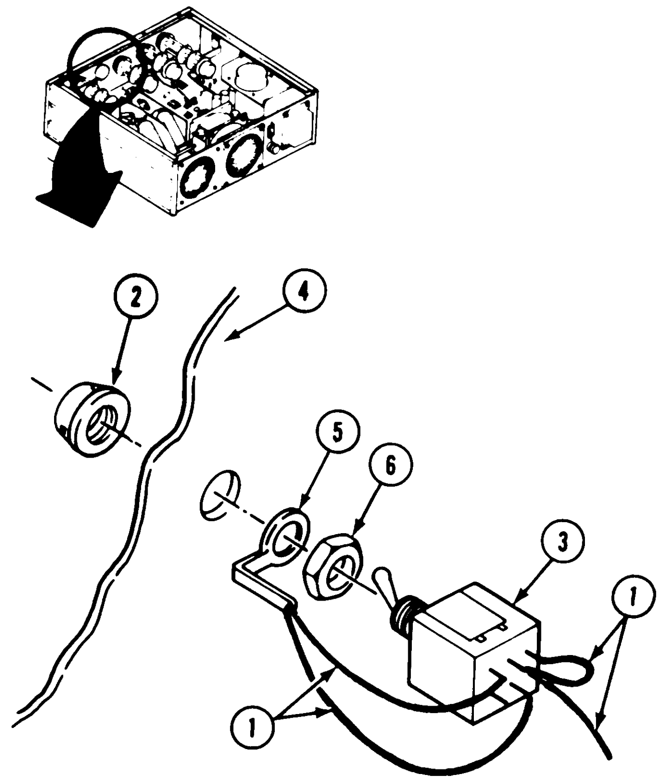
NOTE

FOLLOW-ON MAINTENANCE:

- Install resistor R118 and diode CR116. See paragraph 2-64.
- Install top cover. See paragraph 2-37.

END OF TASK

REMOVE PULSE POLARITY SWITCH S391



1. Tag, unsolder, and remove four leads (1).
2. Remove mounting nut (2).
3. Pull switch (3) out of front panel (4).
4. Remove terminal lug (5) and nut (6) from switch (3).

INSTALL PULSE POLARITY SWITCH S391

1. Install nut (6) and terminal lug (5) on switch (3).
2. Insert switch (3) in front panel (4).
3. Install mounting nut (2).
4. Install four leads (1) as tagged.

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

2-49. REPLACE SINGLE CYCLE SWITCH S2.

DESCRIPTION

This procedure covers: Remove. Install.

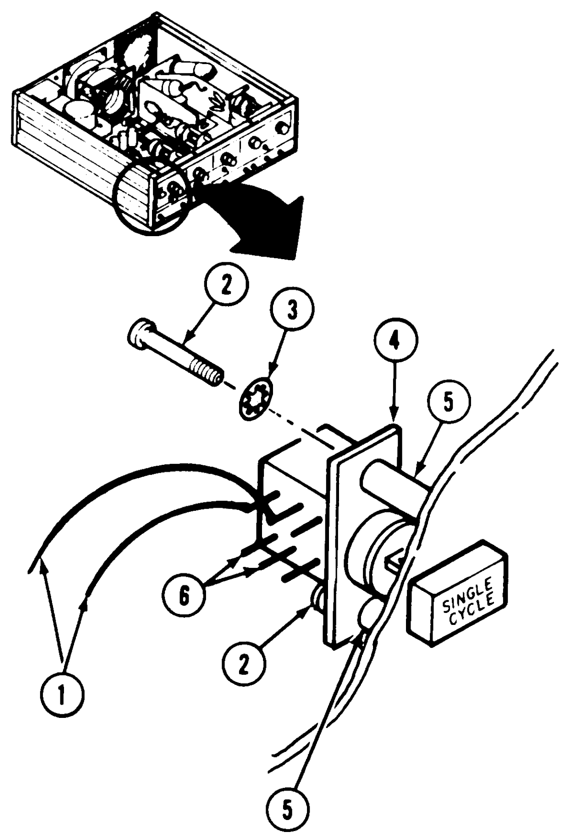
INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

- Remove top cover. See paragraph 2-37.
- Remove left side panel. See paragraph 2-41.

REMOVE



1. Tag, unsolder, and remove two leads (1).
2. Remove two screws (2), flat washers (3), SINGLE CYCLE switch (4), and two spacers (5).

INSTALL

NOTE

SINGLE CYCLE switch (4) should be installed with terminals (6) facing left side of chassis.

1. Install two screws (2), flat washers (3), SINGLE CYCLE switch (4), and two spacers (5).
2. Solder two leads (1) as tagged.

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover. See paragraph 2-37.
- Install left side panel. See paragraph 2-41.

END OF TASK

2-50. REPLACE EXT TRIG SENSITIVITY POTENTIOMETER R40 OR AMPLITUDE VERNIER POTENTIOMETER R373.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

Reference: TM 11-6625-3050-12

NOTE

PRELIMINARY PROCEDURES:

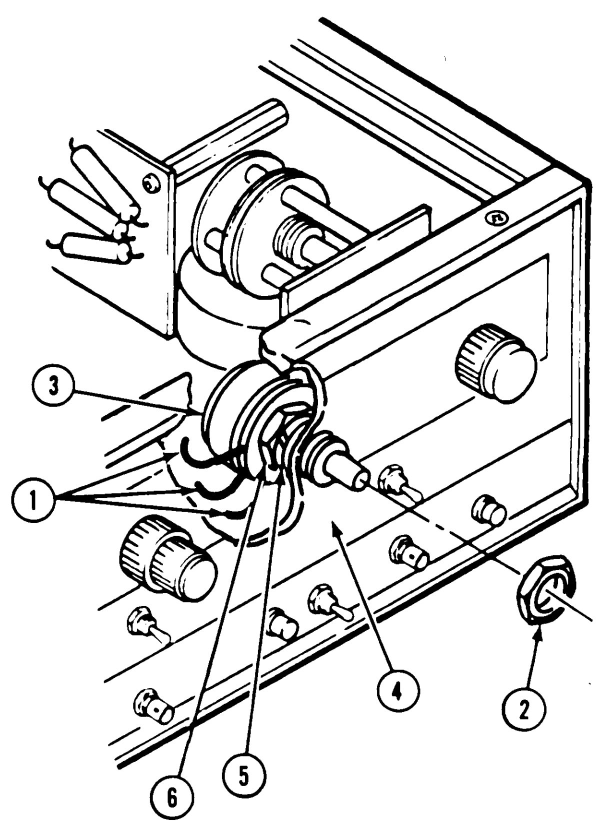
- Remove top cover. See paragraph 2-67.
- Remove switch front panel control knob. See TM 11-6625-3050-12.

REMOVE

NOTE

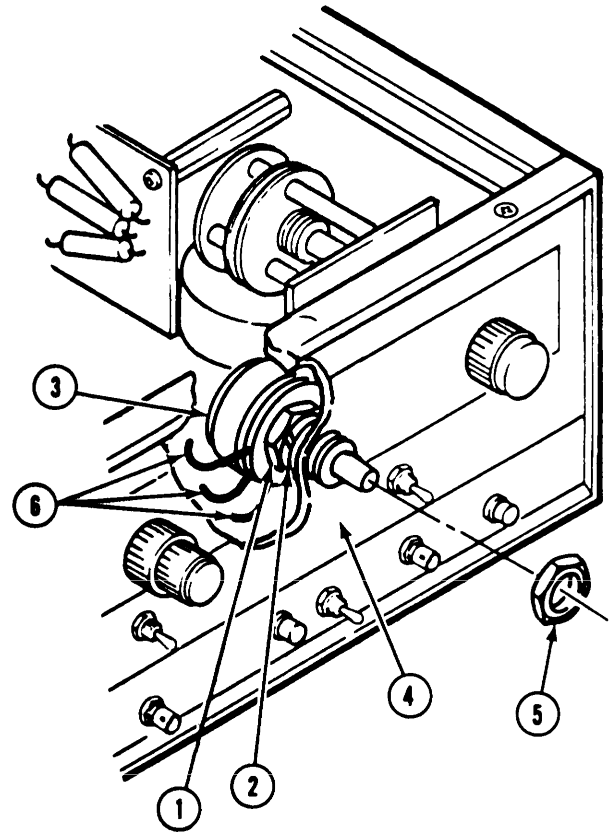
This task is the same for EXT TRIG SENSITIVITY and AMPLITUDE VERNIER potentiometers. AMPLITUDE VERNIER potentiometer is shown.

1. Tag, unsolder, and remove three leads (1).
2. Remove nut (2).
3. Pull potentiometer out of front panel (4).
4. Remove lockwasher (5) and nut (6) from potentiometer (3).



END OF TASK

INSTALL



NOTE

This task is the same for EXT TRIG SENSITIVITY and AMPLITUDE VERNIER potentiometers. AMPLITUDE VERNIER potentiometer is shown.

1. Install nut (1) and lockwasher (2) on potentiometer (3).
2. Insert potentiometer (3) in front panel (4).
3. Install nut (5).
4. Solder three leads (6) as tagged.

NOTE

FOLLOW-ON MAINTENANCE:

- Install top cover. See paragraph 2-37.
- Install switch front panel control knobs. See TM 11-6625-3050-12.

END OF TASK

2-51. REPLACE POWER INDICATOR DS501 OR OVERLOAD INDICATOR DS511.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURE: Remove bottom cover. See paragraph 2-37.

REMOVE

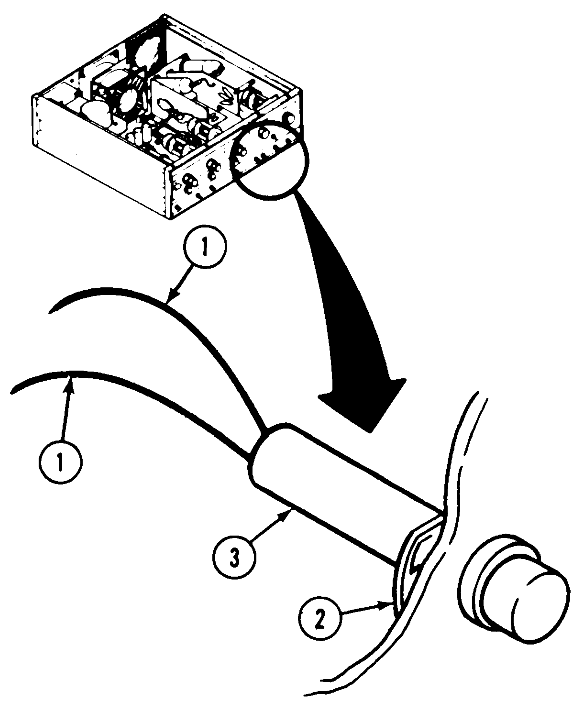
NOTE

This task is the same for both the power and OVERLOAD indicators.

1. Tag, unsolder, and remove two leads (1)
2. Remove mounting clip (2).
3. Pull indicator (3) out of front of panel.

INSTALL

1. Position indicator (3) in front panel.
2. Install mounting clip (2) on back of indicator (3).
3. Solder two leads (1) as tagged.



EL8ZU077

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

END OF TASK

2-52. REPLACE INPUT CONNECTORS J1 AND J2 0R OUTPUT CONNECTORS J3 AND J4.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURE: Remove bottom cover. See paragraph 2-37.

REMOVE

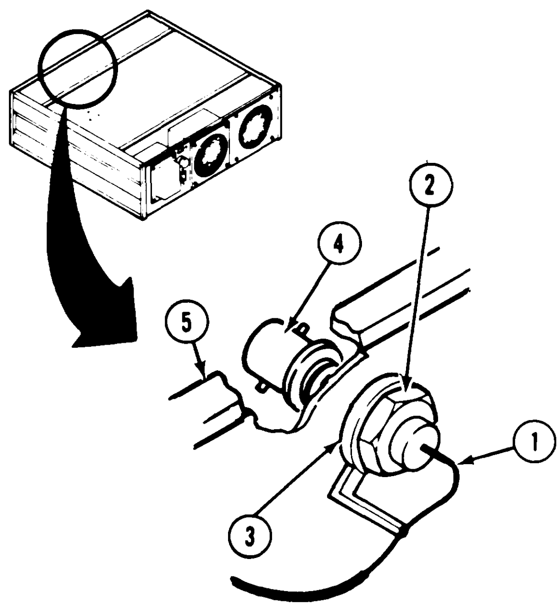
NOTE

This task is the same for connectors J1, J2, J3, and J4.

1. Tag, unsolder, and remove lead (1).
2. Remove nut (2) and ground lug (3).
3. Pull out connector (4).

INSTALL

1. Insert connector (4) in front panel (5).
2. Install ground lug (3) and nut (2).
3. Solder lead (1) as tagged.



EL8ZU078

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

END OF TASK

2-53. REPLACE FRONT PANEL RESISTORS R118 AND R501 AND DIODE CR116.

DESCRIPTION

This procedure covers: Resistors R118 and R501. Remove. Install.
Diode CR116. Remove. Install.

INITIAL SETUP

Materials: Sleeving, Item 8, Appendix B

NOTE

PRELIMINARY PROCEDURE: Remove top and bottom covers. See paragraph 2-37.

REMOVE RESISTORS R118 AND R501

NOTE

This task is the same for resistors R118 and R501 except where noted. R118 is shown.

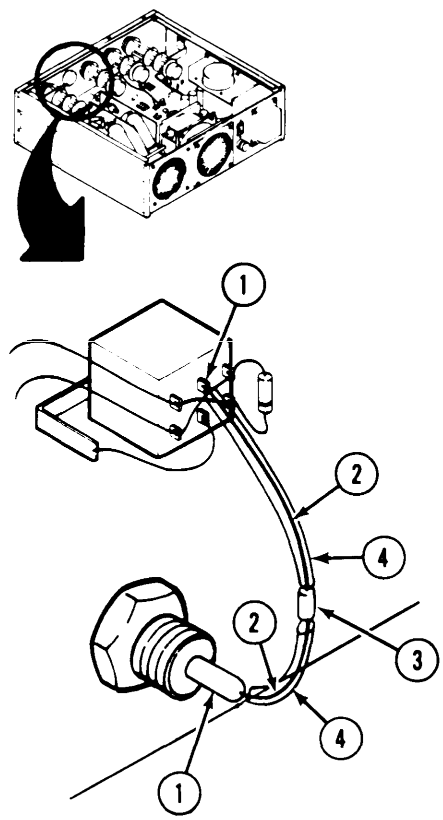
1. Tag two terminals (1).
2. Unsolder two leads (2) and pull off resistor (3).

INSTALL RESISTORS R118 AND R501

NOTE

Resistor R501 does not have insulation sleeving (4).

1. Install insulation sleeving (4) on two resistor leads (2).
2. Solder two leads (2) to two terminals (1) as tagged.

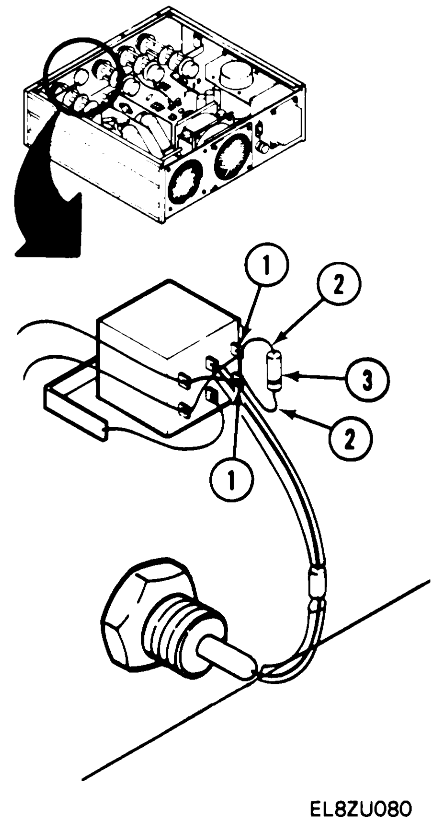


NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE DIODE CR116



1. Tag positive (+) and negative (-) terminals (1).

2. Unsolder two leads (2) and pull off diode (3).

INSTALL DIODE CR116

CAUTION

Be sure to solder positive (+) lead to positive terminal and negative (-) lead to negative terminal or equipment will be damaged.

Solder two leads (2) to two terminals (1) as tagged.

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

2-54. REPAIR CABLE ASSEMBLY.

INITIAL SETUP

Materials: Cable Ties, Item 3, Appendix B

NOTE

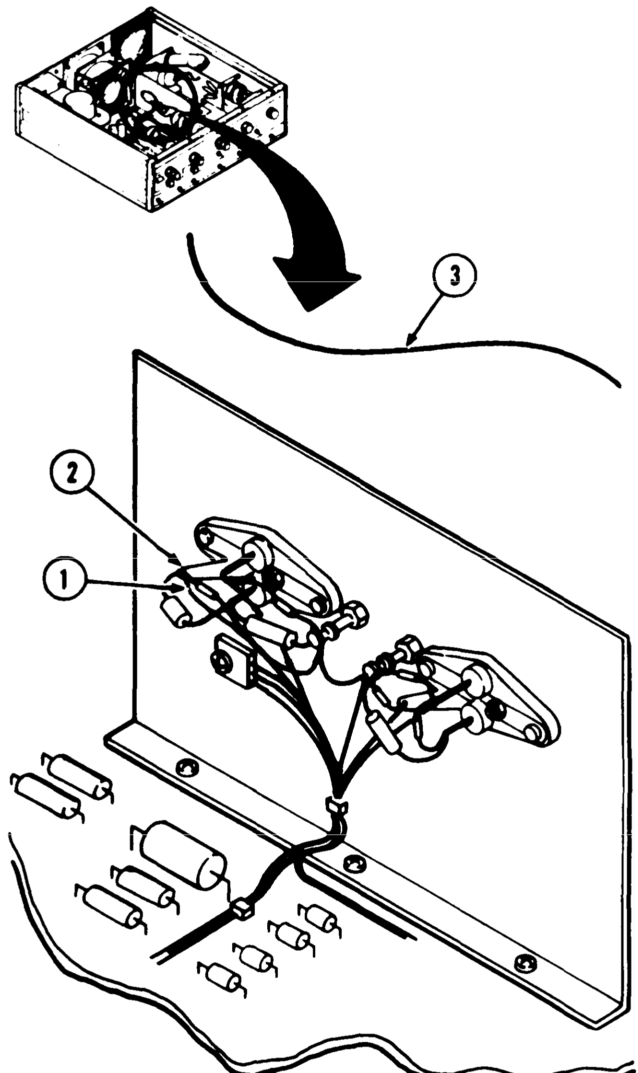
PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

NOTE

This task is the same for front panel cable assembly, rear panel cable assembly, and heatsink/bracket cable assembly. Heatsink/bracket cable assembly is shown.

1. Unsolder and remove damaged wire (1) from terminal lug (2).

2. Solder new wire (3) to terminal lug (2).



EL8ZU081

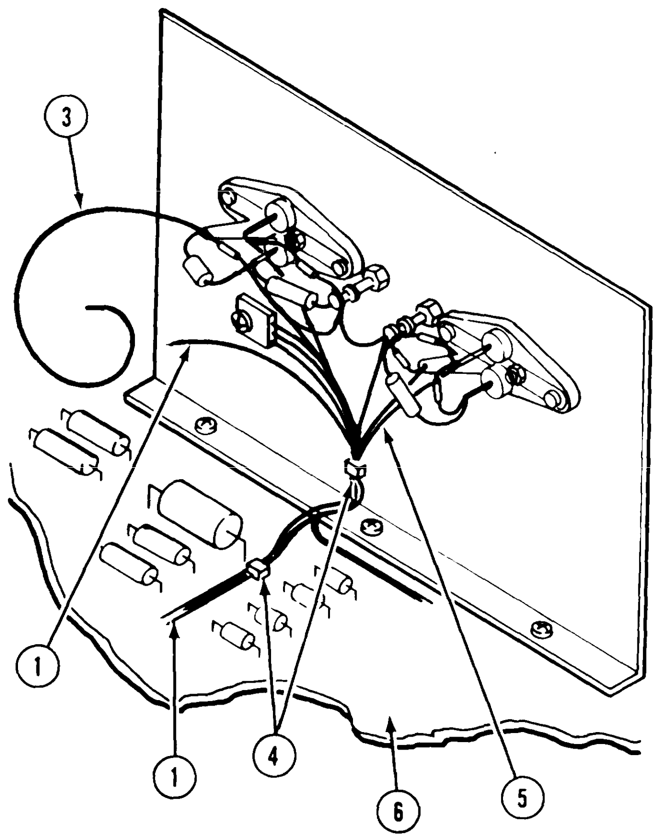
REPAIR CABLE ASSEMBLY - Continued

3. Cutting cable ties (4) as needed, remove damaged wire (1) from cable assembly (5).
4. Cut new wire (3) to same length as damaged wire (1).

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering wire or equipment will be damaged.

5. Unsolder damaged wire (1) from main pcb assembly (6).
6. Install new wire (3) in cable assembly (5).
7. Solder new wire (3) to main pcb assembly (6) where damaged wire (1) was removed.
8. Install cable ties (4) as needed.



EL8ZU082

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

2-55. REPLACE REAR PANEL.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

Materials: Cable Ties, Item 3, Appendix B

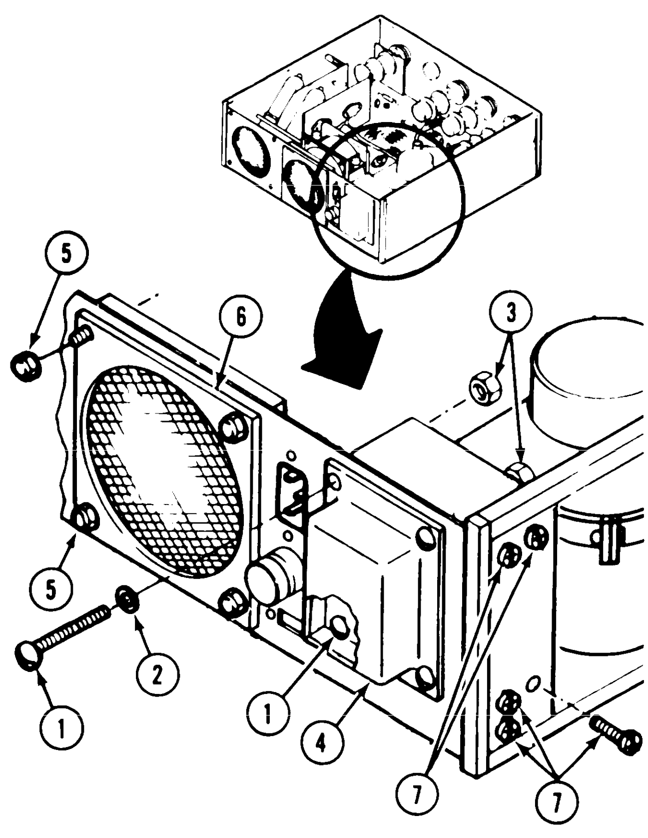
NOTE

PRELIMINARY PROCEDURES:

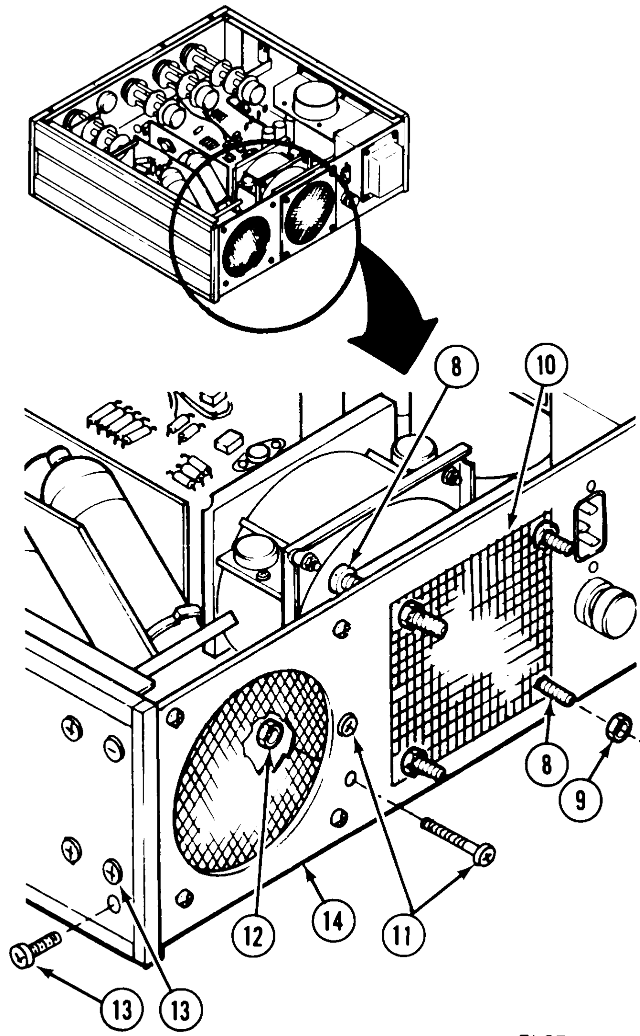
- Remove top and bottom covers. See paragraph 2-37.
- Remove two side panels. See paragraph 2-41.

REMOVE

1. Remove four screws (1), rubber washers (2), and nuts (3).
2. Remove transformer cover (4).
3. Remove four capnuts (5).
4. Remove air filter housing (6).
5. Remove five screws (7).



REMOVE - Continued



6. Remove four screws (8) and nuts (9).
7. Remove fan screen (10).
8. Remove two screws (11) and nuts (12).
9. Remove five screws (13).

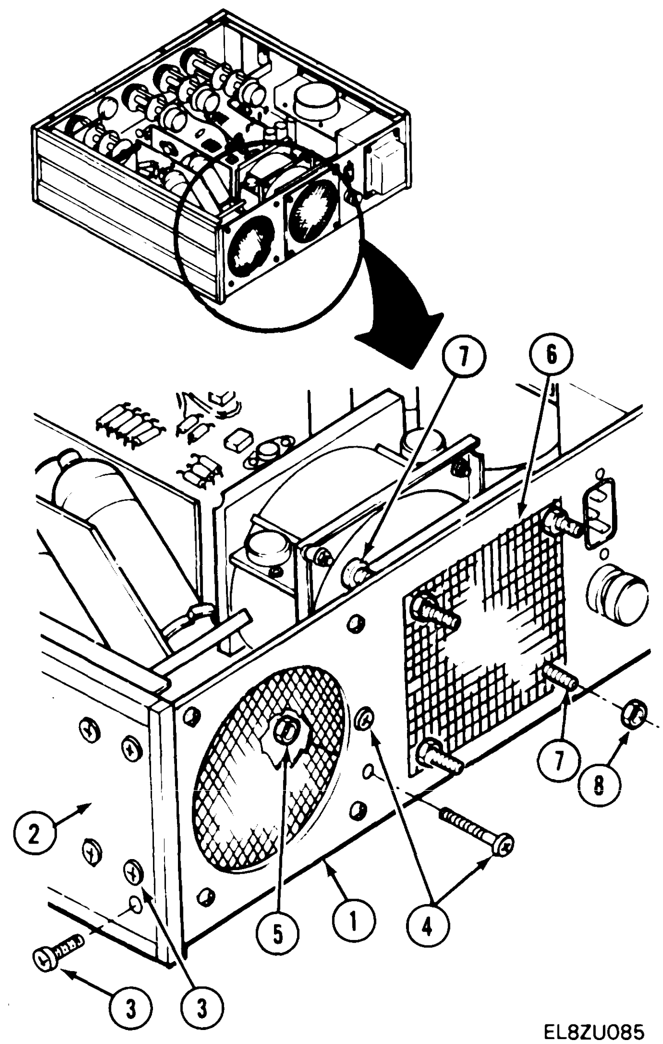
CAUTION

Rear panel is still attached to chassis by many wires. Do not pull rear panel out too far or equipment will be damaged.

10. Pull rear panel (14) off chassis and lay it face down.

END OF TASK

INSTALL

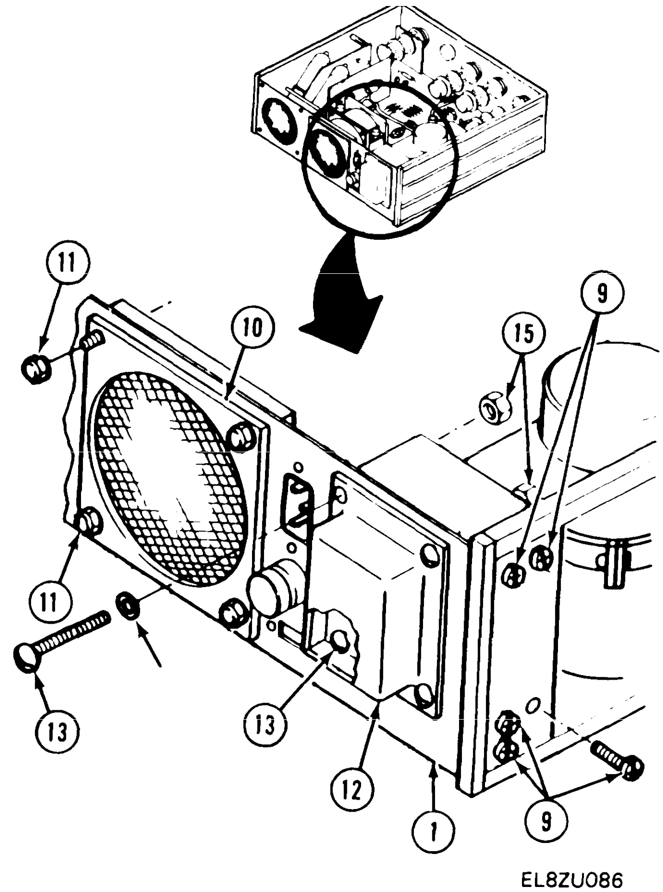


CAUTION

Rear panel is attached to chassis by many wires. Be careful when installing rear panel or equipment will be damaged.

1. Position rear panel (1) on chassis (2).
2. Install five screws (3).
3. Install two screws (4) and nuts (5).
4. Install fan screen (6), four screws (7), and four nuts (8).

INSTALL - Continued



5. Install five screws (9).

6. Install air filter housing (10).

CAUTION

Filter housing (10) can be damaged if capnuts (11) are tightened too tight.

7. Install four capnuts (11).

8. Put transformer cover (12) on rear panel (1).

9. Install four screws (13), rubber washers (14), and nuts (15).

NOTE

FOLLOW-ON MAINTENANCE:

- Install top and bottom covers, See paragraph 2-37.
- Install two side panels, See paragraph 2-41.

END OF TASK

2-56. REPLACE HEATSINK/FAN ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

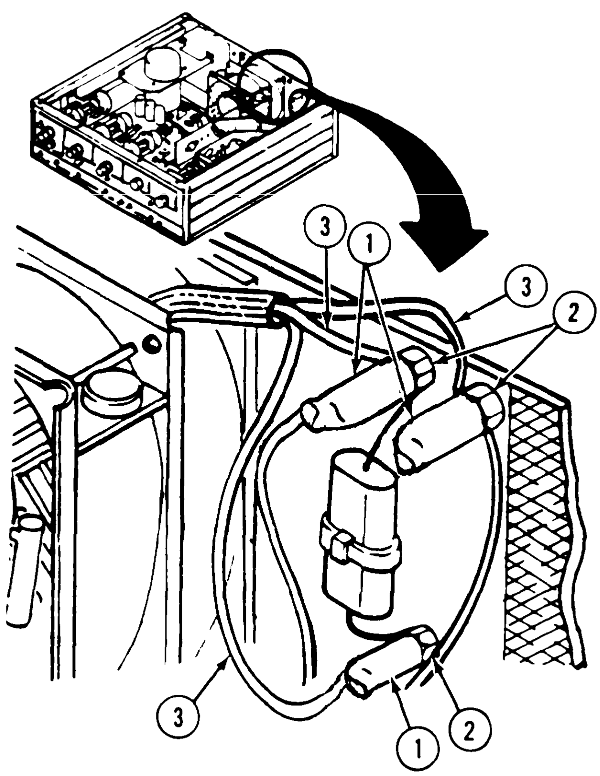
INITIAL SETUP

Materials: Cable Ties, Item 3, Appendix B
Sleeving, Item 8, Appendix B

NOTE

PRELIMINARY PROCEDURE: Remove top and bottom covers. See paragraph 2-37.

REMOVE

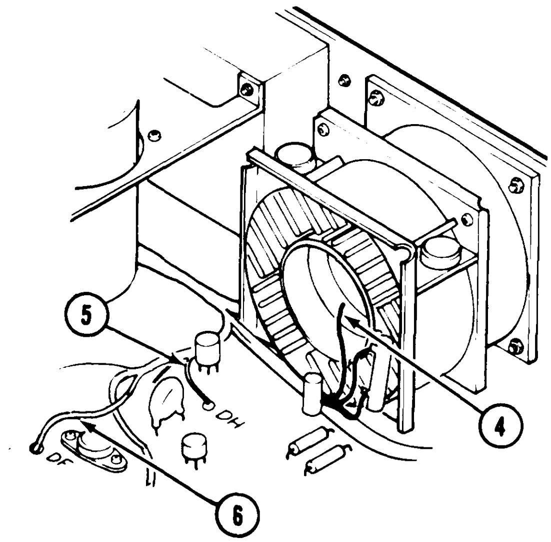


1. Working through top cover opening, cut and remove insulation sleeving (1).
2. Tag three terminal lugs (2).
3. Tag, unsolder, and remove three fan leads (3) from terminal lugs (2).

REMOVE - Continued

4. Tag, unsolder, and remove red heatsink lead (4).

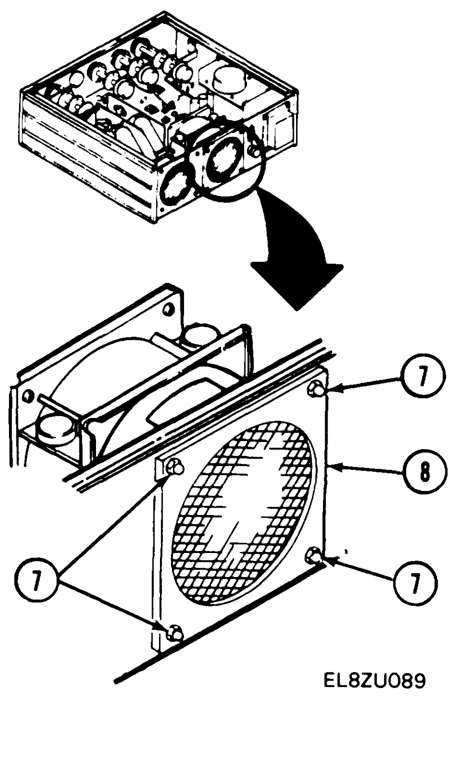
5. Tag, unsolder, and remove blue heatsink lead (5) and yellow heatsink lead (6).



EL8ZU088

6. Working at rear panel, remove four capnuts (7).

7. Remove air filter housing (8).



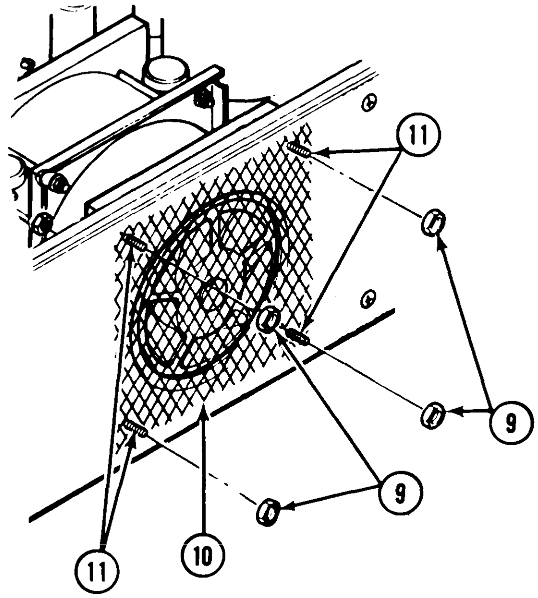
EL8ZU089

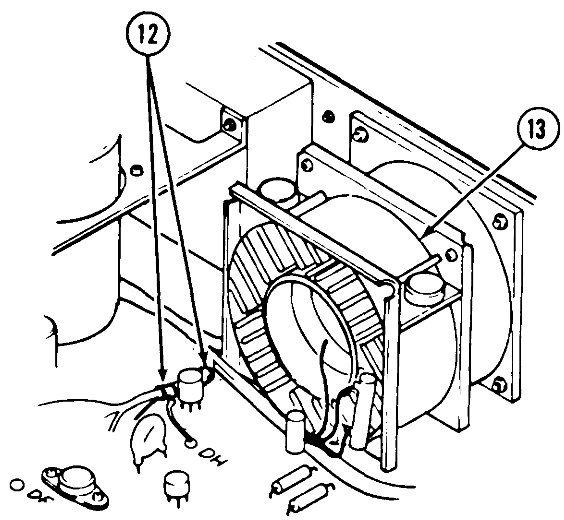
REMOVE - Continued

8. Remove four nuts (9).

9. Remove fan screen (10).

10. Remove four screws (11).





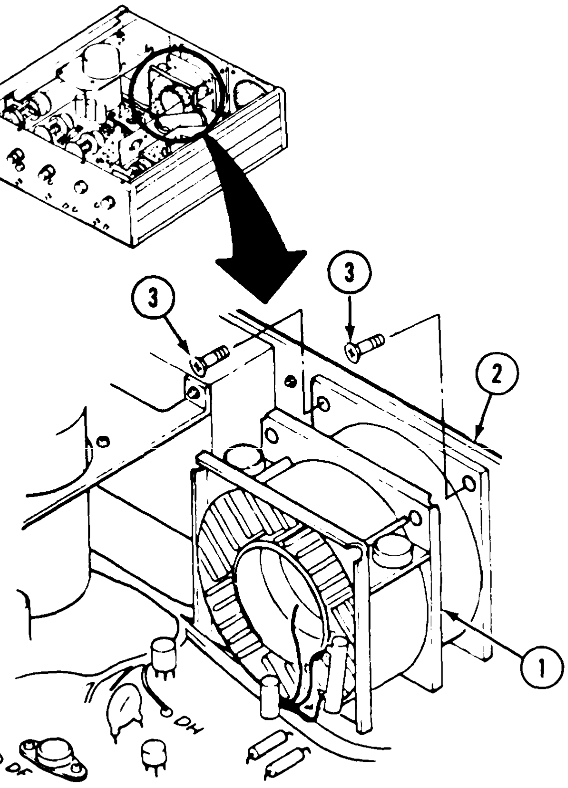
NOTE

Remove cable ties (12) as needed when removing heatsink/fan assembly (13).

11. Working through top cover opening, carefully lift heatsink/fan assembly (13) out of chassis.

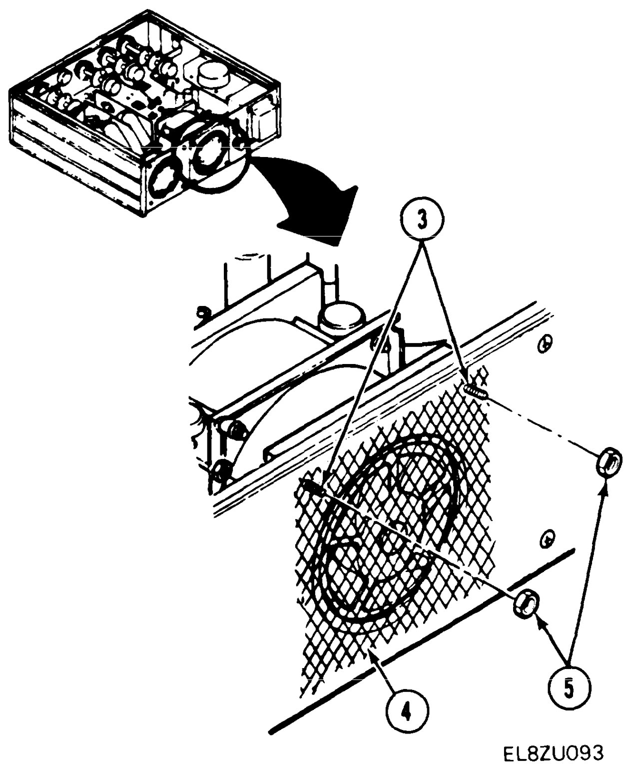
END OF TASK

INSTALL



1. Working through top cover opening, position heatsink/fan assembly (1) in chassis (2).
2. Install two screws (3) through heatsink/fan assembly (1).

EL8ZU092



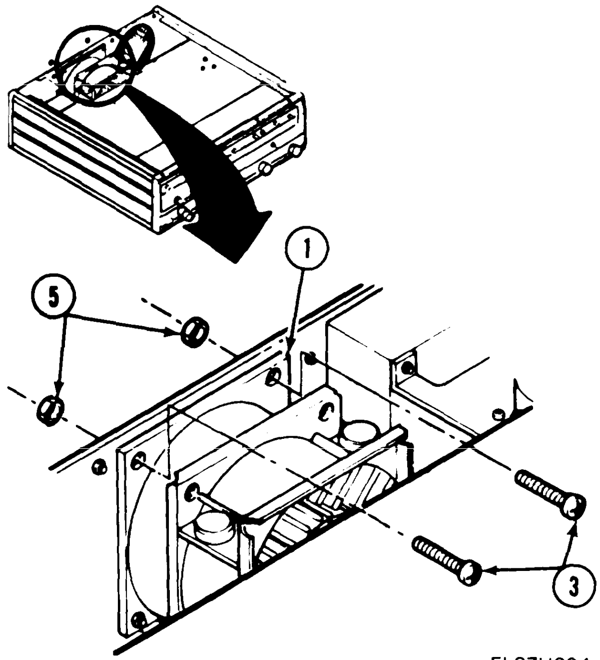
3. Working at rear panel, position fan screen (4) on two screws (3).
4. Install two nuts (5).

EL8ZU093

INSTALL - Continued

5. Working through bottom cover opening, install two screws (3) through heatsink/fan assembly (1).

6. Install two nuts (5).



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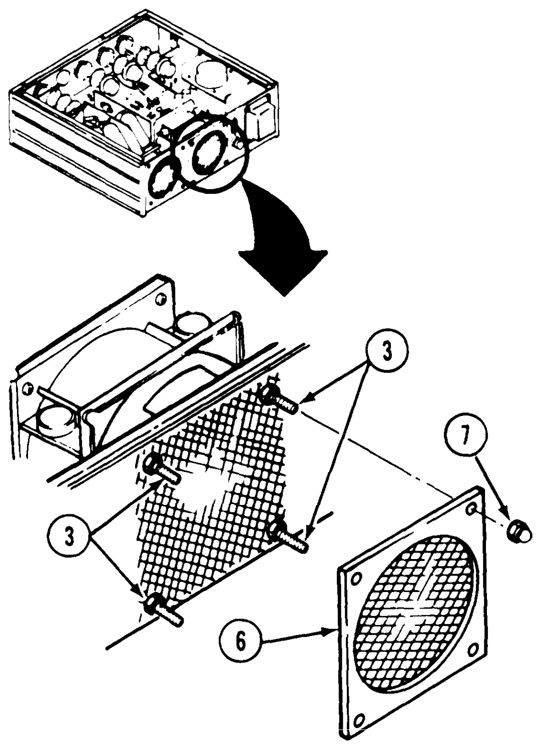
7. Working at rear panel, position air filter housing (6) on four screws (3).

CAUTION

Filter housing (6) can be damaged if capnuts (7) are tightened too tight.

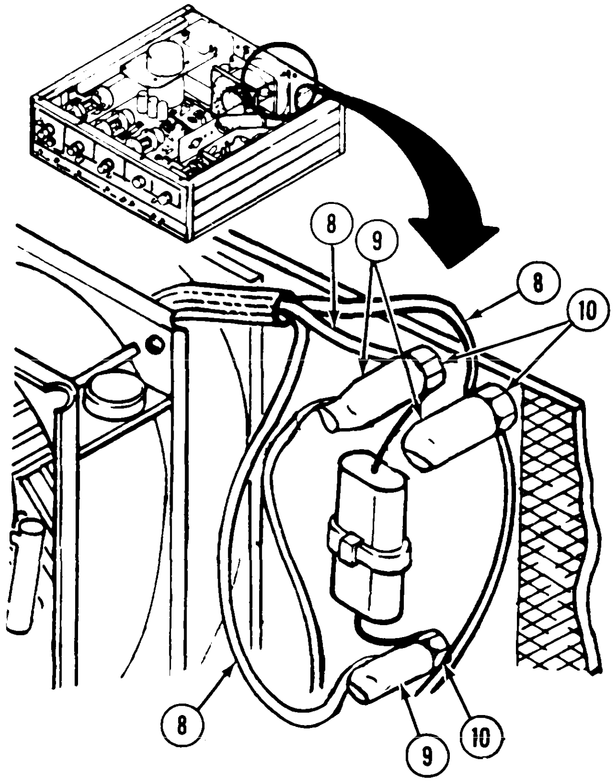
8. Install four capnuts (7).



INSTALL - Continued

9. Solder three fan leads (8) as tagged.

10. Slide three 1-inch insulation sleeves (9) over three terminal lugs (10) and shrink in place.



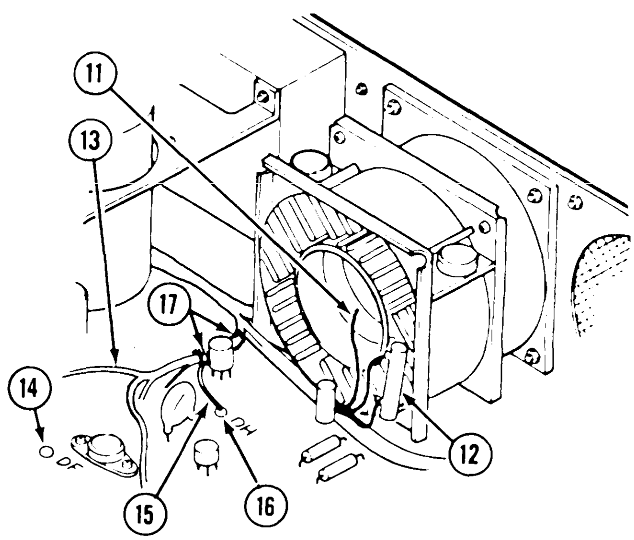
EL8ZU096

11. Solder red heatsink lead (11) to top lead of resistor R516 (12).

12. Solder yellow heatsink lead (13) to solder point DF (14).

13. Solder blue heatsink lead (15) to solder point DH (16).

14. Install cable ties (17) every 2 inches as needed.



EL8ZU097

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

2-57. REPLACE TRANSFORMER T501.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

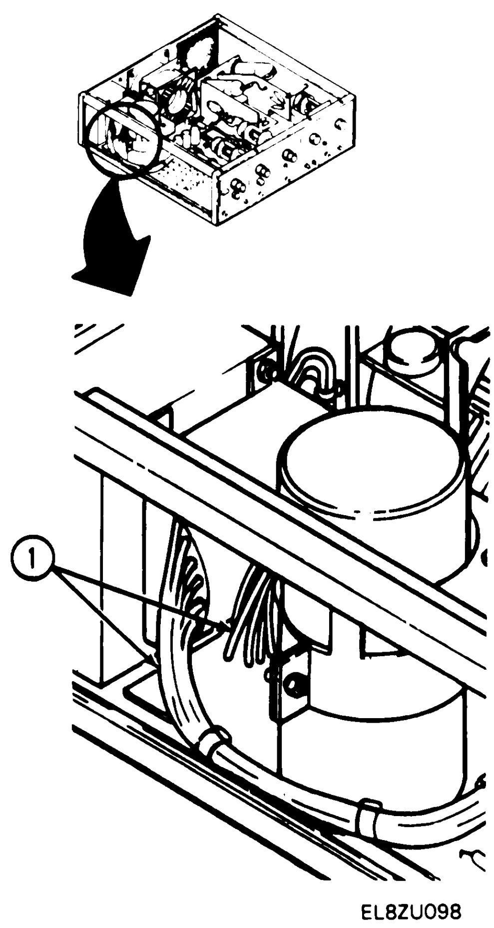
Materials: Cable Ties, Item 3, Appendix B

NOTE

PRELIMINARY PROCEDURES:

- Remove top and bottom covers. See paragraph 2-37.
- Remove left side panel. See paragraph 2-41.

REMOVE

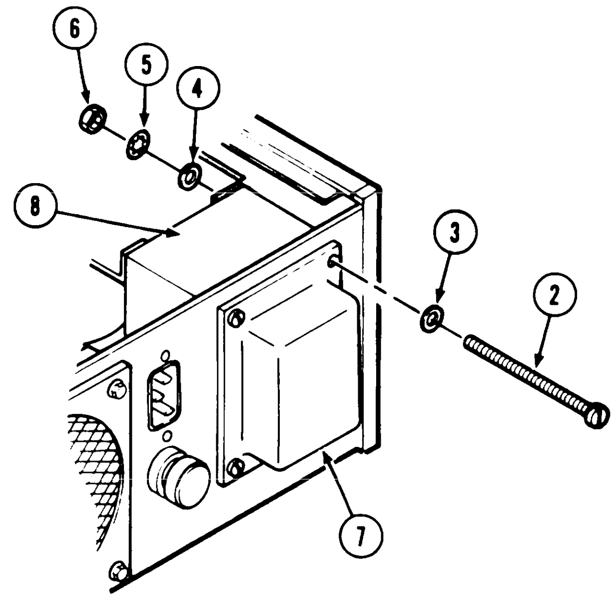


1. Working through top cover opening, tag 18 wires (1), cutting cable ties as required.
2. Working through bottom cover opening, unsolder and remove 18 wires (1).

REMOVE - Continued

3. Working through top cover opening, remove four screws (2), rubber washers (3), flat washers (4), lockwashers (5) and nuts (6).

4. Remove transformer cover (7) and pull out transformer (8).



EL8ZU099

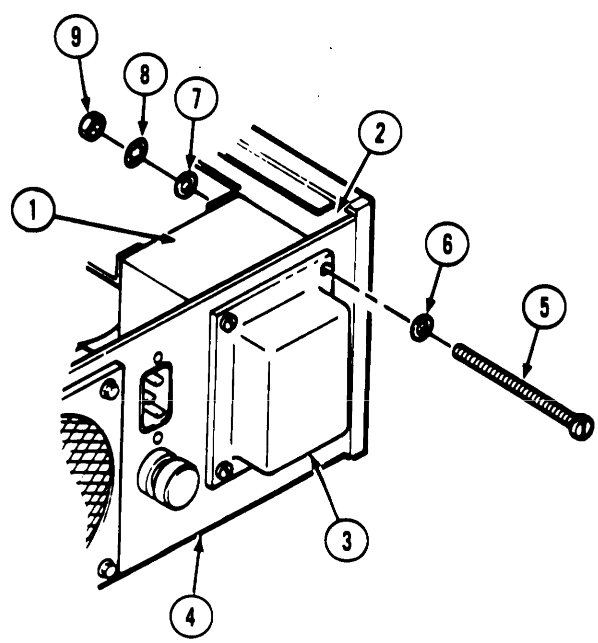
END OF TASK

INSTALL

1. Position transformer (1) in chassis (2).

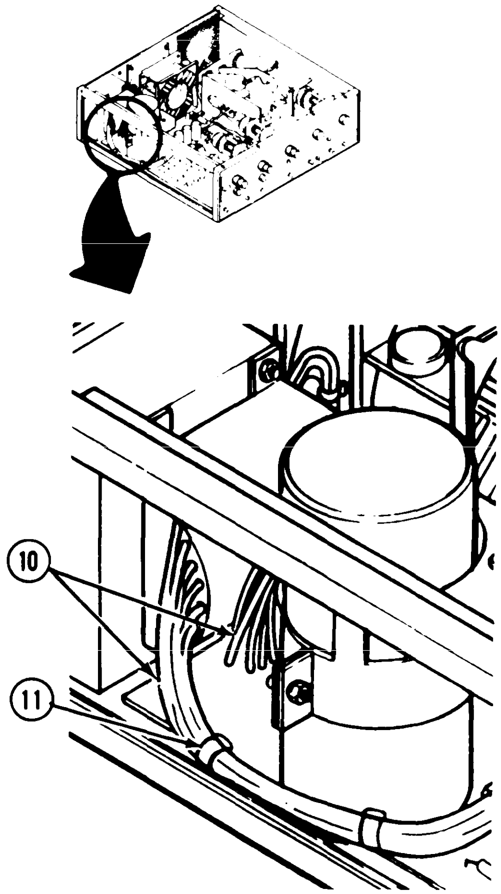
2. Position transformer cover (3) on rear panel (4).

3. Install four screws (5), rubber washers (6), flat washers (7), lockwashers (8), and nuts (9).



EL8ZU100

INSTALL - Continued



4. Working through bottom cover opening, solder 18 wires (10) as tagged.

5. Working through top cover opening, install cable ties (11) on 18 wires (10) every 2 inches.

NOTE

FOLLOW-ON MAINTENANCE:

- Install top and bottom covers. See paragraph 2-37.
- Install left side panel. See paragraph 2-41.

END OF TASK

2-58. REPLACE POWER CONNECTOR.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

Reference: TM 11-6625-3050-12

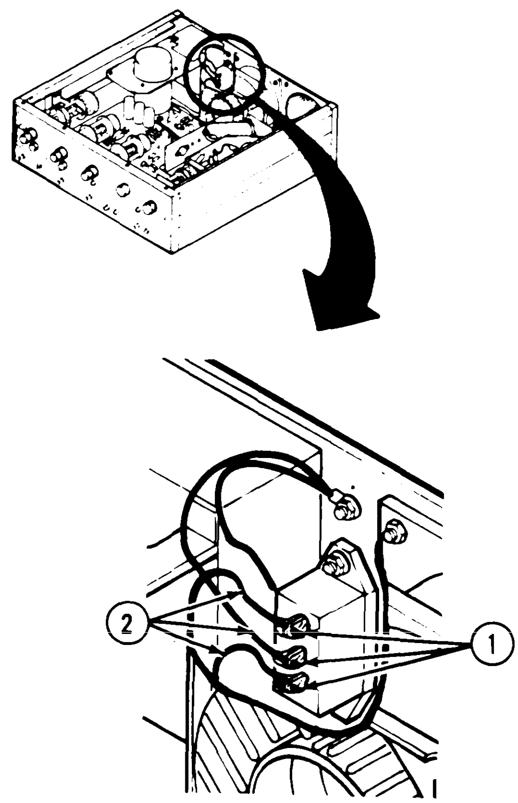
Materials: Sleeving, Item 8, Appendix B

NOTE

PRELIMINARY PROCEDURES:

- Remove fuse. See TM 11-6625-3050-12.
- Remove rear panel. See paragraph 2-55.

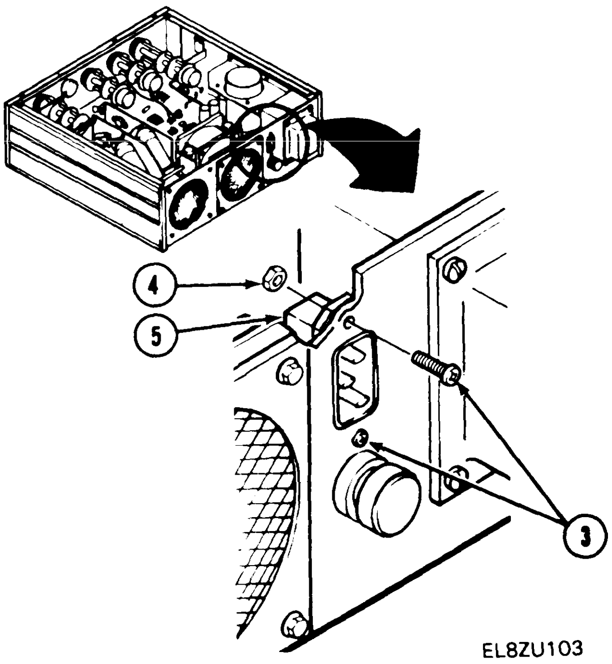
REMOVE



EL8ZU102

1. Cut insulation sleeving (1) off three leads (2).
2. Tag, unsolder, and remove three leads (2).

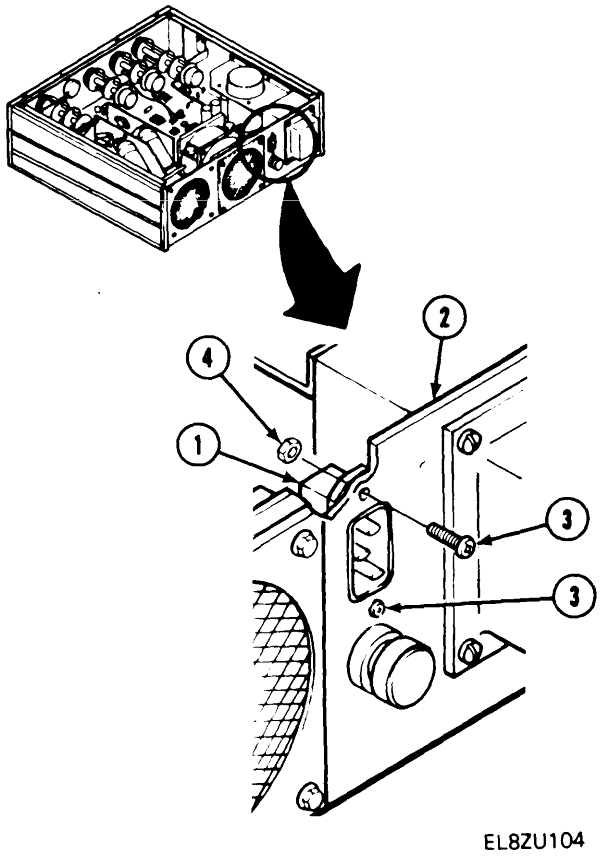
REMOVE - Continued



3. Working at rear panel, remove two screws (3) and nuts (4).
4. Pull out power connector (5).

END OF TASK

INSTALL



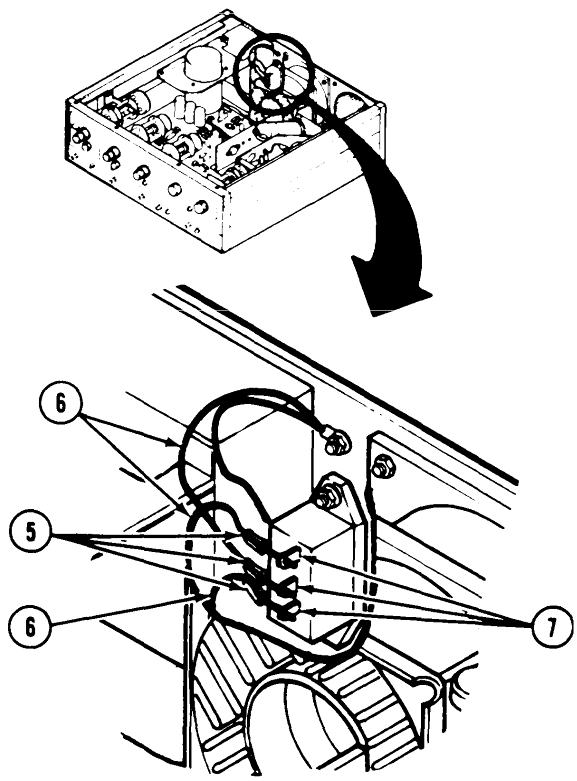
1. Insert power connector (1) in rear panel (2).
2. Install two screws (3) and nuts (4).

INSTALL - Continued

3. Working through top cover opening, slide three 3/4-inch long insulation sleevings (5) onto three leads (6).

4. Solder three leads (6) as tagged.

5. Slide three insulation sleevings (5) over three power connector lugs (7) and shrink in place.



EL8ZU105

NOTE

FOLLOW-ON MAINTENANCE:

- Install rear panel. See paragraph 2-55.
- Install fuse. See TM 11-6625-3050-12.

END OF TASK

2-59. REPLACE FUSEHOLDER SOCKET.

DESCRIPTION

This procedure covers: Remove. install.

INITIAL SETUP

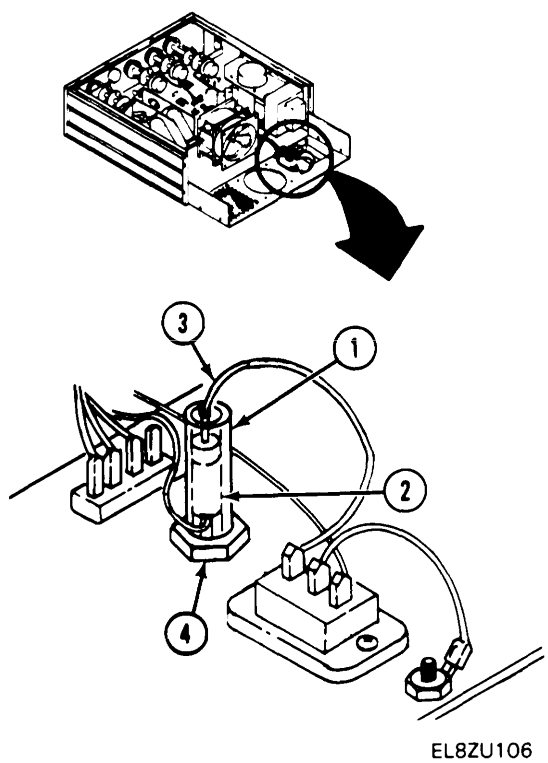
Reference: TM 11-6625-3050-12

NOTE

PRELIMINARY PROCEDURES:

- Remove fuse. See TM 11-6625-3050-12.
- Remove rear panel. See paragraph 2-55.

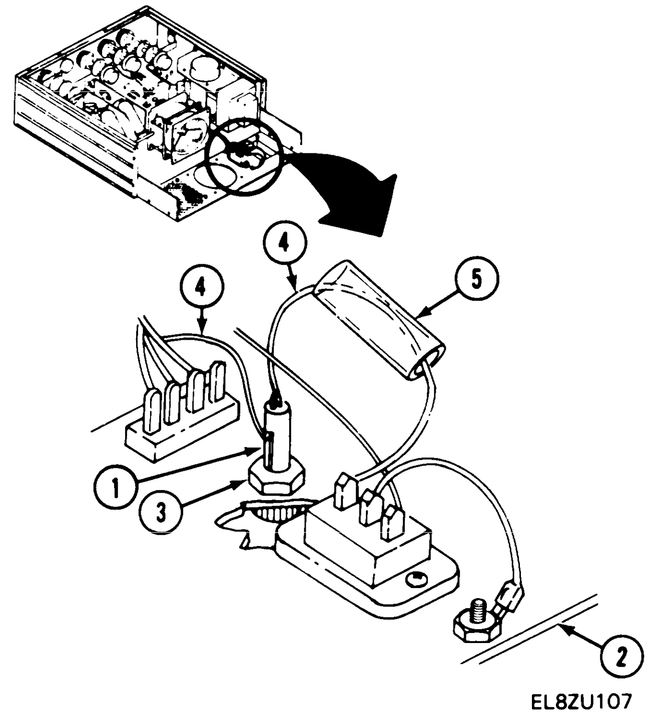
REMOVE



1. Slide insulating tubing (1) away from fuseholder socket (2).
2. Tag, unsolder, and remove two leads (3).
3. Remove nut (4).
4. Pull out fuseholder socket (2).

END OF TASK

INSTALL



1. Insert fuseholder socket (1) in rear panel (2).
2. Install nut (3).
3. Solder two leads (4) as tagged.
4. Slide insulating tubing (5) over fuseholder socket (1).

NOTE

FOLLOW-ON MAINTENANCE:

- Install rear panel. See paragraph 2-55.
- Install fuse. See TM 11-6625-3050-12.

END OF TASK

2-60. REPLACE LINE POWER SELECTOR SWITCH S502.

DESCRIPTION.

This procedure covers: Remove. Install.

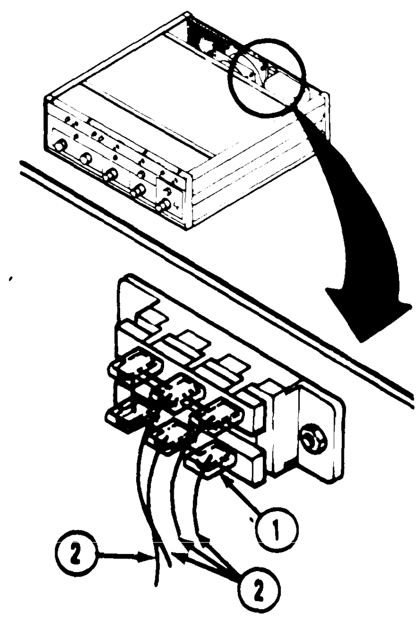
INITIAL SETUP

Materials: Sleeving, Item 8, Appendix B

NOTE

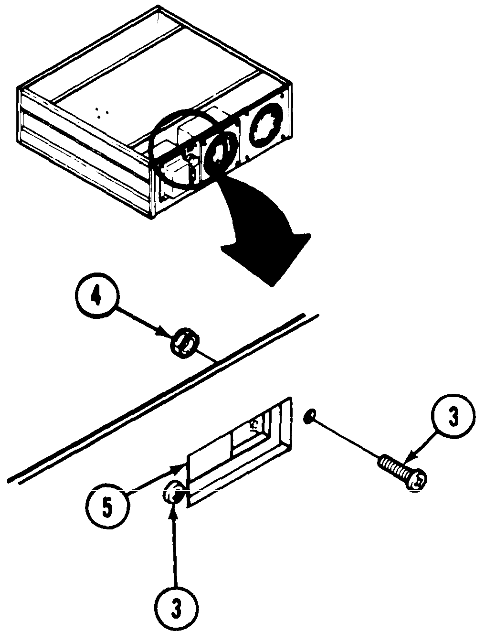
PRELIMINARY PROCEDURE: Remove bottom cover. See paragraph 2-37.

REMOVE



1. Cut insulation sleeving (1) off four leads (2).
2. Tag, unsolder, and remove four leads (2).

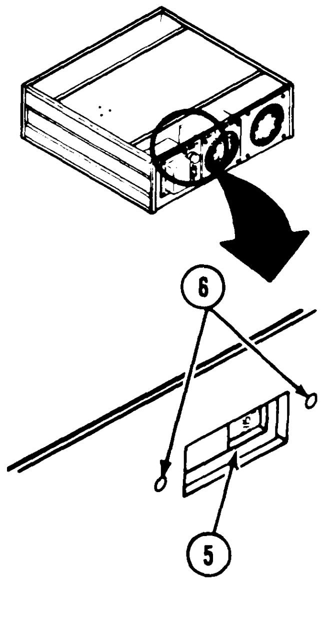
REMOVE - Continued



NOTE

- If switch is screwed in, do steps 3 and 4.
- If switch is riveted in, go to step 5.

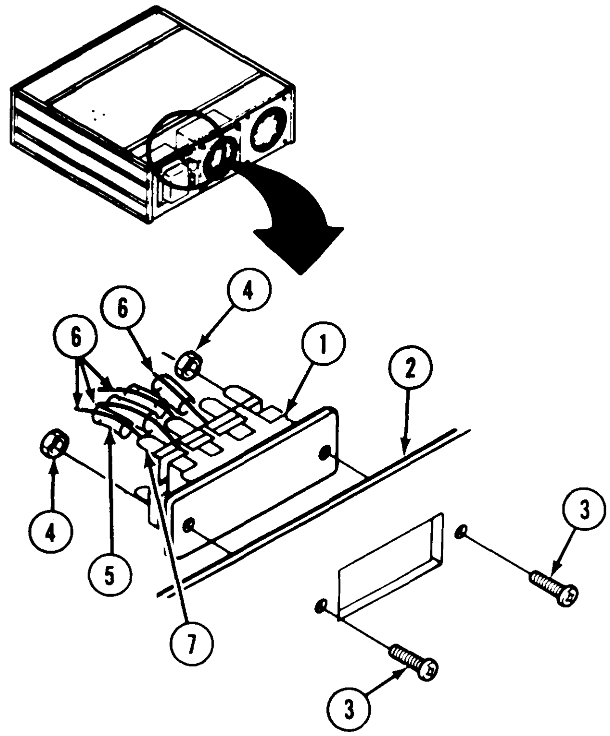
3. Working at rear panel, remove two screws (3) and nuts (4).
4. Pull out switch (5).



5. Working at rear panel, drill out two rivets (6).
6. Pull out switch (5).

END OF TASK

INSTALL



1. Position switch (1) on rear panel (2).
2. Install two screws (3) and nuts (4).
3. Slide four 3/4-inch long insulation sleevings (5) onto four leads (6).
4. Solder four leads (6) as tagged.
5. Slide four insulation sleevings (5) over four connector lugs (7) and shrink in place.

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

END OF TASK

2-61. REPLACE CAPACITOR C571.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

Materials: Cable Tie, Item 3, Appendix B
Sleeving, Item 8, Appendix B

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

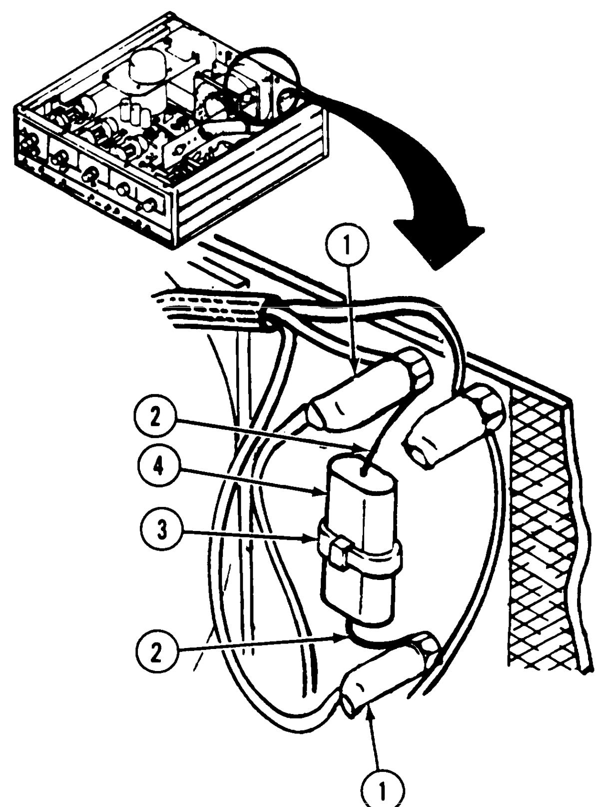
PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

REMOVE

WARNING

Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground to prevent electrical shock.

1. Cut and remove insulation sleevings (1).
2. Unsolder and remove two capacitor leads (2).
3. Cut cable tie (3).
4. Remove capacitor C571 (4).
5. Remove cable tie (3).

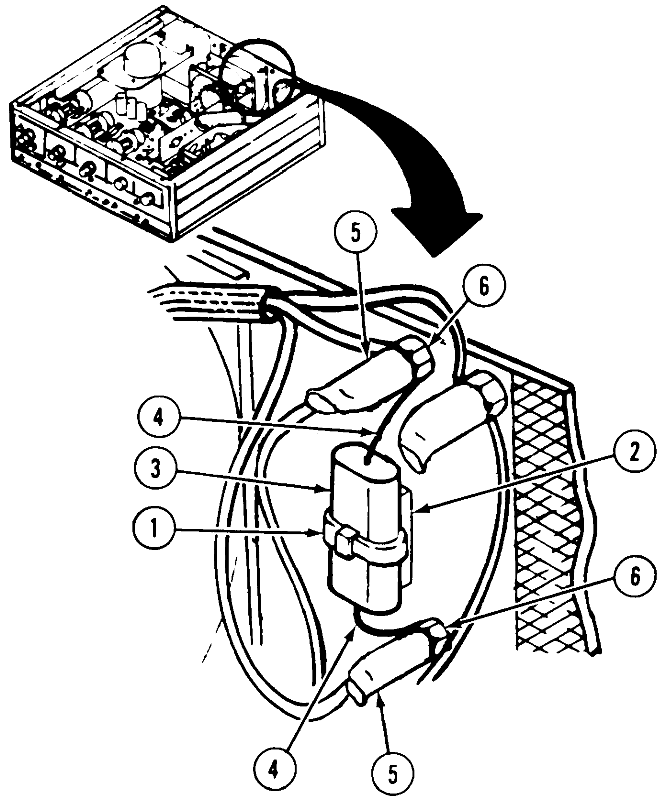


EL8ZU112

END OF TASK

INSTALL

1. Install cable tie (1) in cable tie clamp (2).
2. Place capacitor C571 (3) against cable tie (1) and tighten cable tie around capacitor.
3. Solder two capacitor leads (4).
4. Slide two 1-inch long insulation sleeves (5) over two terminal lugs (6) and shrink in place.



NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

2-62. REPAIR CHASSIS SUBASSEMBLY.

DESCRIPTION

This procedure covers: Resistor R516. Remove. Install.
Capacitors C564, C566, C567, and C569. Remove. Install.
Resistors R575 thru R578. Remove. Install.
Voltage Regulators Z503 and Z504. Remove. Install.
Transistor Q510. Remove. Install.

INITIAL SETUP

Materials: Silicon Compound, Item 7,
Appendix B
Locking Compound, Item 6,
Appendix B

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

REMOVE RESISTOR R516

1. Tag, unsolder, and remove three wires (1).
2. Remove screw (2), nylon washer (3), and flat washer (4).
3. Lift out resistor (5), flat washer (6), and nylon washer (7).

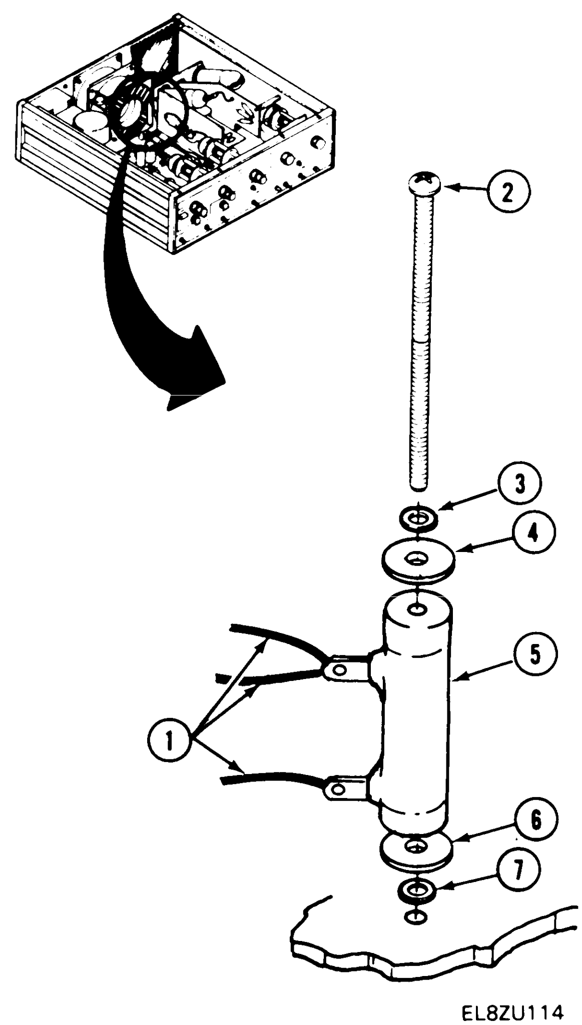
INSTALL RESISTOR R516

1. Place nylon washer (3) and flat washer (4) on screw (2).

NOTE

Apply locking compound to bottom half of screw (2) before inserting in resistor (5).

2. Insert screw (2) through top of resistor (5).
3. Place flat washer (6) and nylon washer (7) on screw (2) at bottom of resistor (5).
4. Position resistor (5) in chassis and tighten screw (2).
5. Solder three wires (1) as tagged.



NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

REMOVE CAPACITORS C564, C566, C567, AND C569

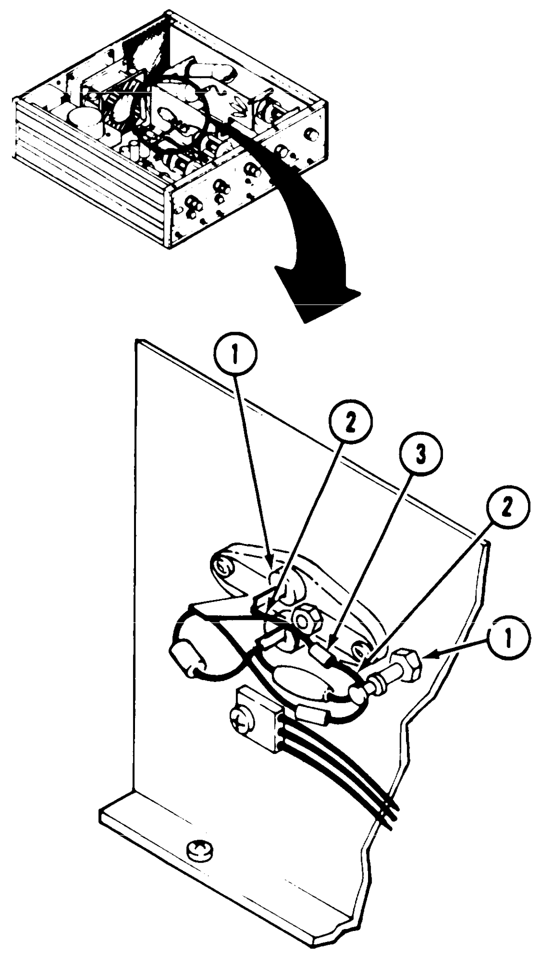
WARNING

Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground to prevent electrical shock.

NOTE

This task is the same for capacitors C564, C566, C567, and C569. Capacitor C566 is shown.

1. Tag positive (+) and negative (-) terminals (1).
2. Unsolder two leads (2).
3. Lift out capacitor (3).



INSTALL CAPACITORS C564, C566, C567, AND C569

CAUTION

Be sure to solder positive (+) lead to positive terminal and negative (-) lead to negative terminal or equipment will be damaged.

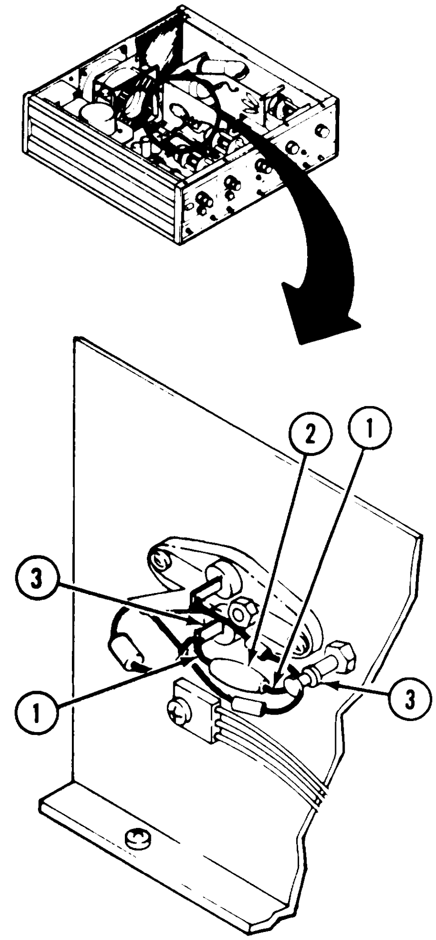
Solder two leads (2) to two terminals (1) as tagged.

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

REMOVE RESISTORS R575 THRU R578



NOTE

This task is the same for resistors R575 thru R578. Resistor R575 is shown.

1. Unsolder two leads (1).

2. Lift out resistor (2).

INSTALL RESISTORS R575 THRU R578

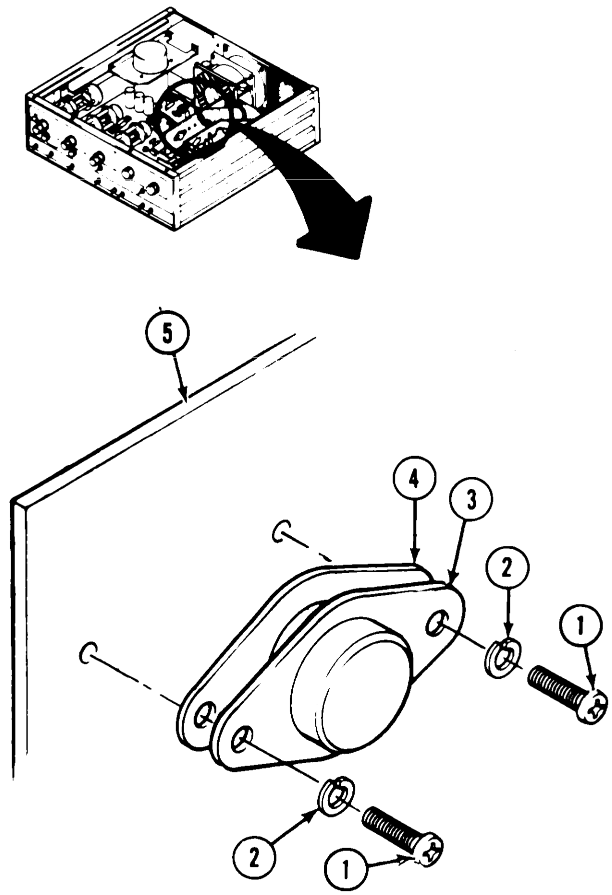
Solder two leads (1) to two terminals (3).

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

REMOVE VOLTAGE REGULATORS Z503 AND Z504



NOTE

This task is the same for voltage regulators Z503 and Z504. Voltage regulator Z503 is shown.

1. Remove two screws (1) and lockwashers (2).

2. Pull off voltage regulator (3) and insulator (4).

INSTALL VOLTAGE REGULATORS Z503 AND Z504

1. Apply silicon compound to both sides of insulator (4).

2. Position insulator (4) on heatsink/bracket assembly (5).

3. Position voltage regulator (3) on insulator (4).

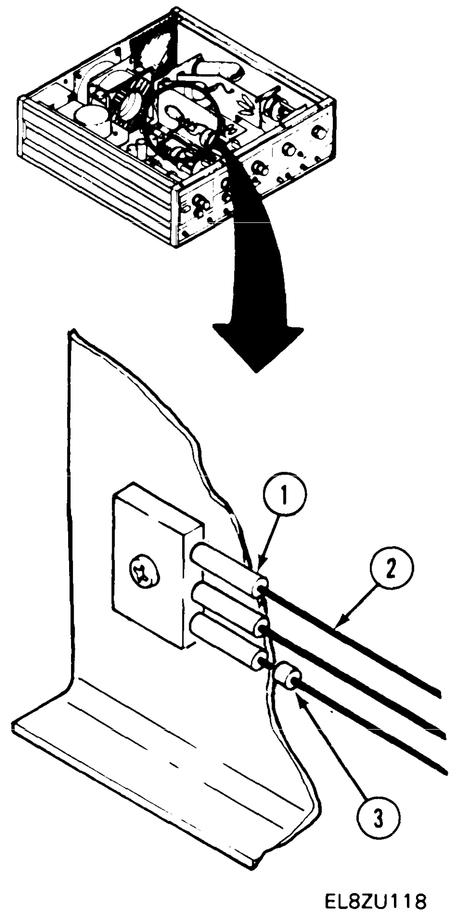
4. Install two screws (1) and lockwashers (2).

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

REMOVE TRANSISTOR Q510

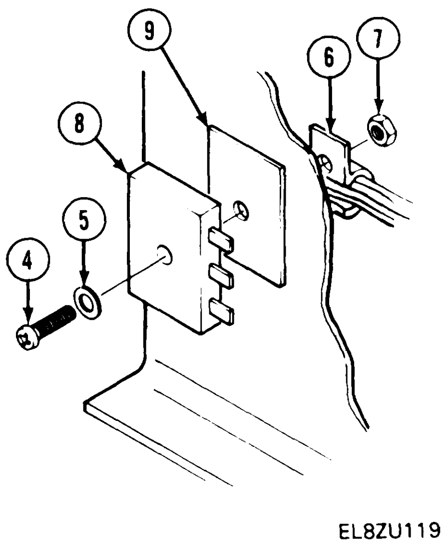


1. Remove insulation sleeving (1) from three wires (2).

NOTE

Do not remove ferrite bead (3) when removing three wires (2).

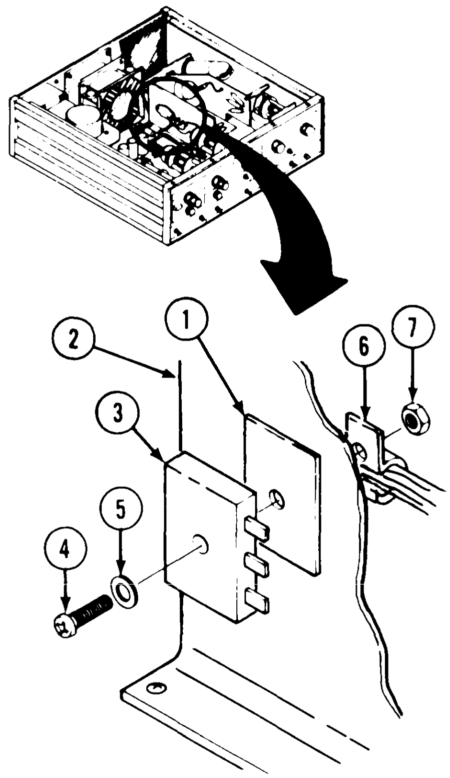
2. Tag, unsolder, and remove three wires (2).



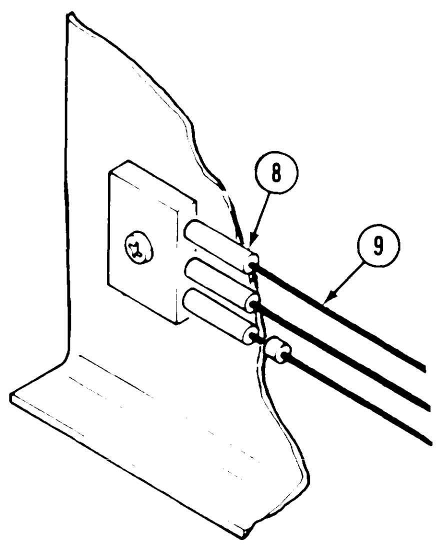
3. Remove screw (4), washer (5), cable clamp (6), and nut (7).
4. Pull off transistor (8) and insulator (9).

END OF TASK

INSTALL TRANSISTOR Q510



1. Apply silicon compound to both sides of insulator (1).
2. Position insulator (1) on heatsink/bracket assembly (2).
3. Position transistor (3) on insulator (1).
4. Install screw (4), washer (5), cable clamp (6), and nut (7).



5. Install three 1/2-inch pieces of insulation sleeving (8) on three wires (9).
6. Solder three wires (9) as tagged.
7. Slide three pieces of insulation sleeving (8) over soldered end of three wires (9) and shrink in place.

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

2-63. REPLACE BALUN ASSEMBLY T391.

DESCRIPTION

This procedure covers: Remove. Install.

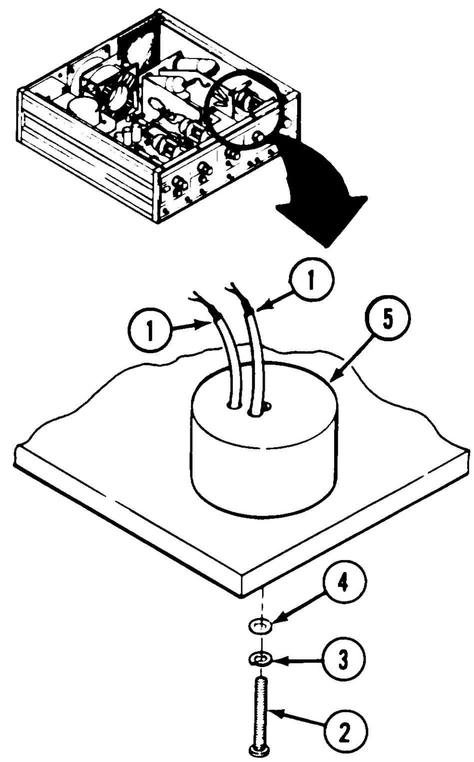
INITIAL SETUP

NOTE

PRELIMINARY PROCEDURE: Remove top and bottom covers. See paragraph 2-37.

REMOVE

1. Working through top cover opening, tag, unsolder, and remove two leads (1).
2. Working through bottom cover opening, remove screw (2), lockwasher (3), and flat washer (4).
3. Working through top cover opening, pull out balun assembly (5).



EL8ZU122

INSTALL

1. Working through top cover opening, position balun assembly (5) in chassis.
2. Working through bottom cover opening, install screw (2), lockwasher (3), and flat washer (4).
3. Working through top cover opening, solder two leads (1) as tagged.

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

2-64. REPAIR MAIN PRINTED CIRCUIT BOARD (PCB) ASSEMBLY.

DESCRIPTION

This procedure covers:
- Capacitors C1 thru C511 and C513 thru C563. Remove. Install.
- Capacitor C512. Remove. Install.
- Diodes CR1 thru CR566. Remove. Install.
- Inductors L1, L81, L82, and L111 and Resistors R1 thru R574. Remove. Install.
- Transistors Q42, Q43, Q502, Q504, and Q515 thru Q517. Remove. Install.
- Transistors Q1 thru Q18, Q21 thru Q28, Q30, Q31, Q32, Q34, Q44, Q503, Q505 thru Q514 and Q518. Remove. Install.
- Transistors Q19, Q20, Q29, Q33, and Q501. Remove. Install.
- Pulse Transformers T111, T151, T152, T301, and T321. Remove Install.
- Vacuum Tubes V1 and V2. Remove. Install.
- Vacuum Tube Sockets XV1 and XV2. Remove. Install.
- Integrated Circuit Operational Amplifier Z501. Remove. Install.
- Potentiometers R65, R70, R135, R140, R309, R374, R512, R519, R535, and R546. Remove. Install.

INITIAL SETUP

Materials: Silicon Compound, Item 7, Appendix B

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top and bottom covers. See paragraph 2-37.

REMOVE CAPACITORS C1 THRU C511 AND C513 THRU C563.

WARNING

Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground using a 6-watt, 50-ohm load to prevent electrical shock.

CAUTION

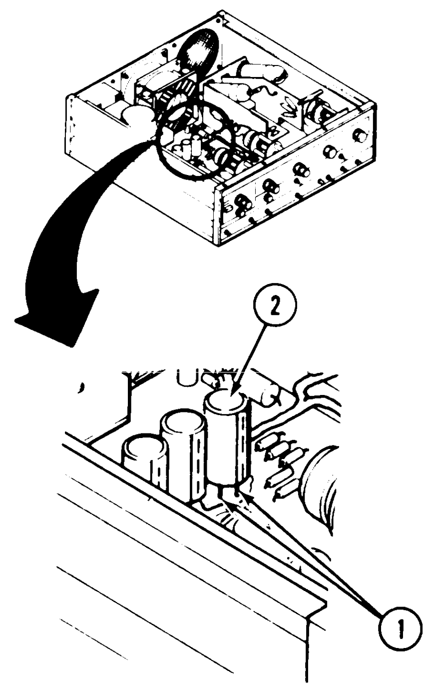
Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for capacitors C1 thru C511 and C513 thru C563. Capacitor C541 is shown.

1. Working on circuit side of board, unsolder two leads (1).

2. Working on component side of board, pull out capacitor (2).



EL8ZU123

END OF TASK

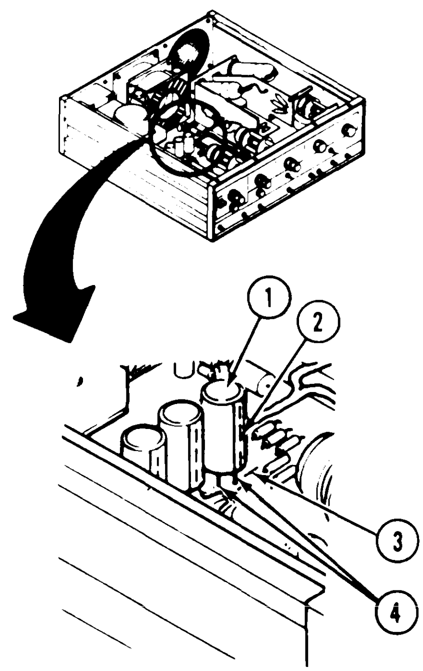
INSTALL CAPACITORS C1 THRU C511 AND C513 THRU C563

CAUTION

Polarity of a capacitor is shown by a plus (+) or minus (-) sign. Install capacitor with plus or minus sign alined with sign stamped into circuit board or equipment will be damaged.

NOTE

- This task is the same for capacitors C1 thru C511 and C513 thru C563 except where noted. Capacitor C541 is shown.
- Only capacitors C2, C4, C11, C52, C65, C112, C135, C325, C511, C513, C515-C518, C541 , C542, C551 , C552, C561, and C562 have polarity.



EL8ZU124

1. Position capacitor (1) on component side of board with minus (-) sign (2) on capacitor alined with minus sign (3) on circuit board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, solder two leads (4).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE CAPACITOR C512

WARNING

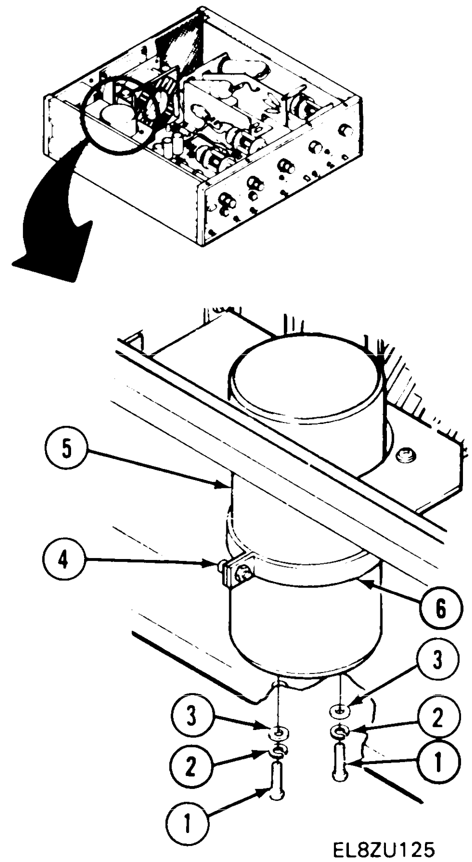
Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground using a 6-watt, 50-ohm load to prevent electrical shock.

1. Remove left side panel. See paragraph 2-41.

2. Working on circuit side of board, remove two screws (1), lockwashers (2), and flat washers (3).

3. Working on component side of board, through left side opening, loosen screw (4).

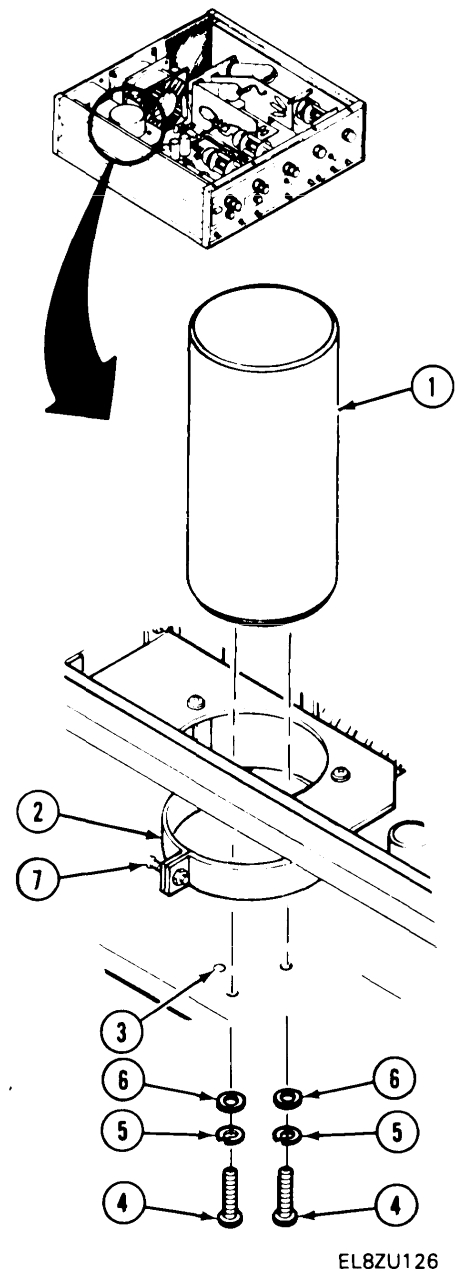
4. Pull capacitor (5) straight up and out of clamp (6).



EL8ZU125

END OF TASK

INSTALL CAPACITOR C512



CAUTION

Polarity of a capacitor is shown by a plus (+) sign. Install capacitor with plus sign alined with plus sign stamped on circuit board or equipment will be damaged.

1. Working on component side of board, place capacitor (1) in clamp (2).
2. Working on circuit side of board, turn capacitor (1) until white dot on bottom of capacitor shows through viewing hole (3) on circuit board.
3. Install two screws (4), lockwashers (5), and flat washers (6).
4. Working through left side opening, tighten screw (7).

NOTE

FOLLOW-ON MAINTENANCE:

- Install left side panel. See paragraph 2-41.
- Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE DIODES CR1 THRU CR566

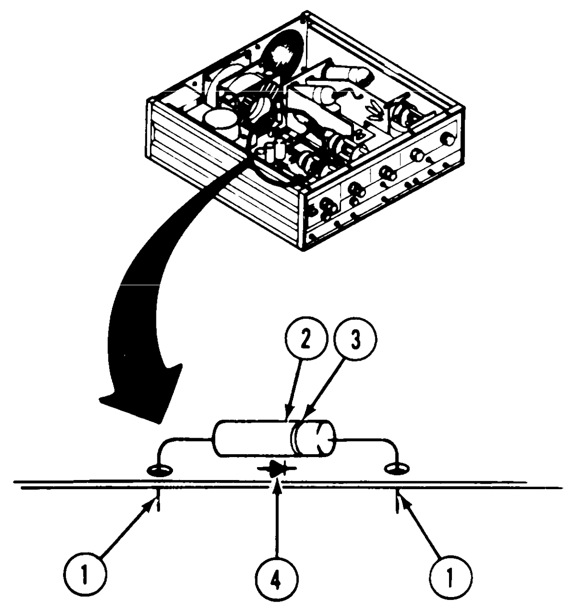
CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for diodes CR1 thru CR566. Diode CR23 is shown.

1. Working on circuit side of board, unsolder two leads (1).
2. Working on component side of board, pull out diode (2).



INSTALL DIODES CR1 THRU CR566

CAUTION

The polarity of a diode is shown by a band. Install diode with band at cathode end of symbol stamped into pcb or equipment will be damaged.

1. Position diode (2) on component side of board with band (3) at cathode end of symbol (4) on circuit board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, solder two leads (1).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE INDUCTORS L1, L81, L82, AND L111 AND RESISTORS R1 THRU R574

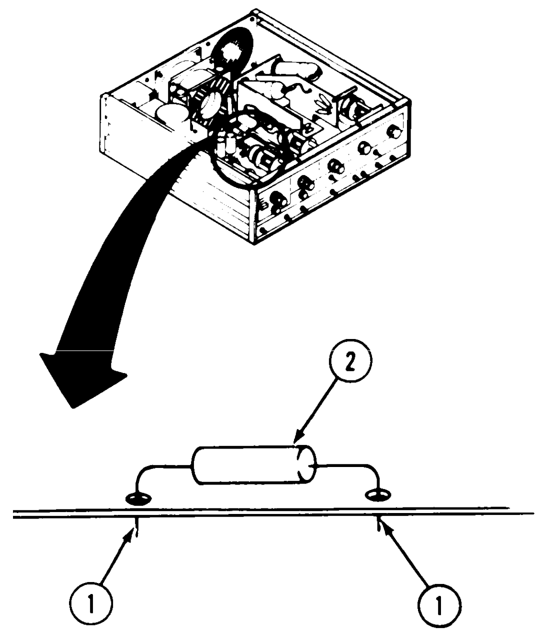
CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for inductors L1, L81, L82, and L111 and resistors R1 thru R574. Inductor L111 is shown.

1. Working on circuit side of board, unsolder two leads (1).
2. Working on component side of board, pull out inductor (2).



EL8ZU182

INSTALL INDUCTORS L1, L81, L82, AND L111 AND RESISTORS R1 THRU R574

1. Position inductor (2) on component side of board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, solder two leads (1).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE TRANSISTORS Q42, Q43, Q502, Q504 AND Q515 THRU Q517

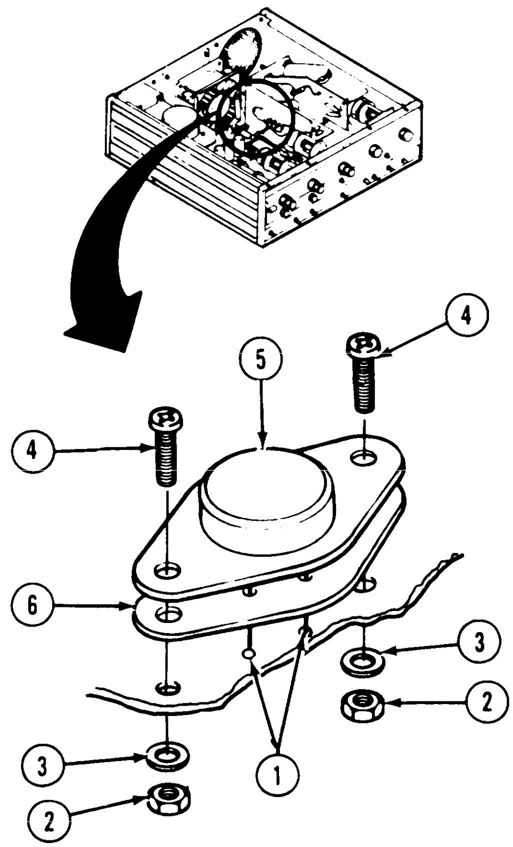
CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for transistors Q42, Q43, Q502, Q504 and Q515 thru Q517. Transistor Q43 is shown.

1. Working on circuit side of board, unsolder two leads (1).
2. Remove two nuts (2) and flat washers (3).
3. Working on component side of board, pull out two screws (4).
4. Pull out transistor (5) and insulator (6).



EL8ZU128

INSTALL TRANSISTORS Q42, Q43, Q502, Q504, AND Q515 THRU Q517

1. Apply silicon compound to both sides of insulator (6).
2. Position insulator (6) on transistor (5).
3. Position transistor (5) and insulator (6) on component side of board.
4. Install two screws (4), flat washers (3), and nuts (2).

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

5. Working on circuit side of board, solder two leads (1).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE TRANSISTORS Q1 THRU Q18, Q21 THRU Q28, Q30, Q31, Q32, Q34, Q44, Q503, Q505 THRU Q514, AND Q518

CAUTION

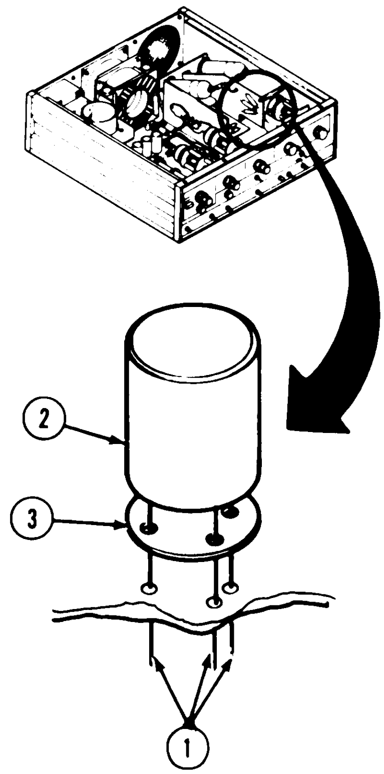
Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for transistors Q1 thru Q18, Q21 thru Q28, Q30, Q31, Q32, Q34, Q44, Q503, Q505 thru Q514, and Q518. Transistor Q31 is shown.

1. Working on circuit side of board, unsolder three leads (1).

2. Working on component side of board, pull out transistor (2) and transistor pad (3).



EL8ZU129

INSTALL TRANSISTORS Q1 THRU Q18, Q21 THRU Q28, Q30, Q31 Q32, Q34, Q44, Q503, Q505 THRU Q514, AND Q518

1. Position transistor pad (3) over three leads (1).

2. Position transistor (2) and transistor pad (3) on component side of board,

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

3. Working on circuit side of board, solder three leads (1).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE TRANSISTORS Q19, Q20, Q29, Q33, AND Q501

NOTE

This task is the same for transistors Q19, Q20, Q29, Q33, and Q501. Transistor Q29 is shown.

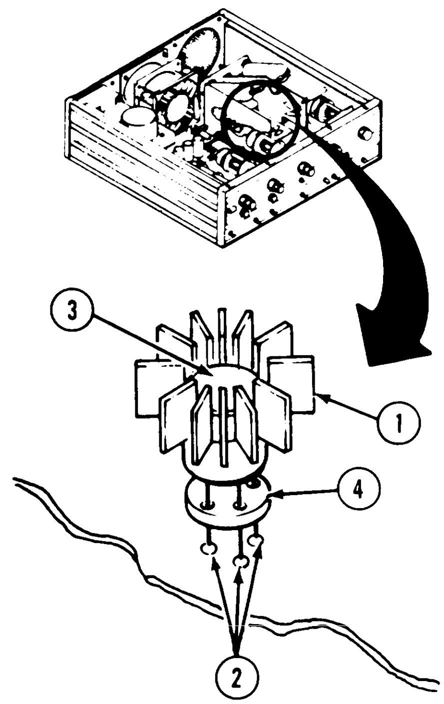
1. Working on component side of board, pull off heatsink (1).

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, unsolder three leads (2).

3. Working on component side of board, pull out transistor (3) and transistor pad (4).



EL8ZU130

INSTALL TRANSISTORS Q19, Q20, Q29, Q33, AND Q501

1. Position transistor pad (4) over three leads (2).

2. Position transistor (3) and transistor pad (4) on component side of board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

3. Working on circuit side of board, solder three leads (2).

4. Install heatsink (1) on transistor (3).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE PULSE TRANSFORMERS T111, T151, T152, T301, AND T321

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

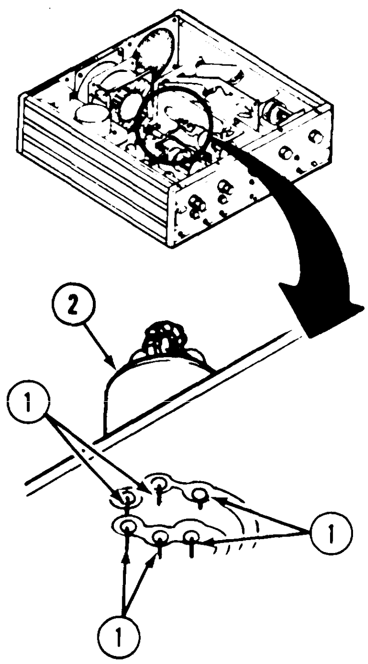
- This task is the same for pulse transformers T111, T151, T152, T301, and T321 except where noted. Pulse transformer T301 is shown.
- Pulse transformers T111, T151, and T152 have four leads (1).

1. Working on circuit side of board, unsolder six leads (1).

NOTE

Pulse transformers are polarized and must be installed in one position only.

2. Working on component side of board, note position and pull out pulse transformer (2).



EL8ZU131

END OF TASK

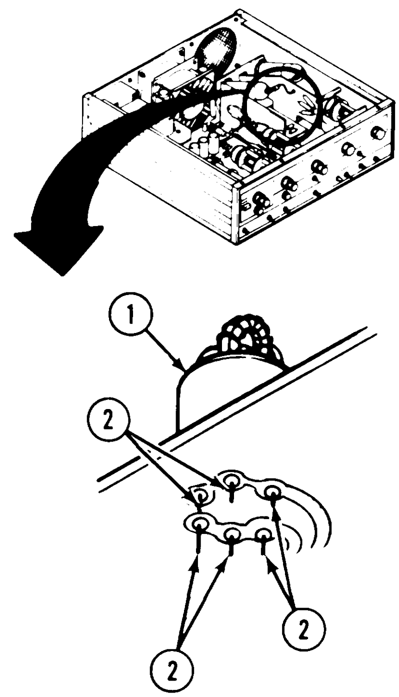
INSTALL PULSE TRANSFORMERS T111, T151, T152, T301, AND T321

CAUTION

Pulse transformers are polarized and must be installed in one position only or equipment will be damaged.

NOTE

This task is the same for pulse transformers T111, T151, T152, T301, and T321 except where noted. Pulse transformer T301 is shown.



1. Position pulse transformer (1) on component side of board in position noted during removal.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

Pulse transformers T111, T151, and T152 have four leads (2).

2. Working on circuit side of board, solder six leads (2).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

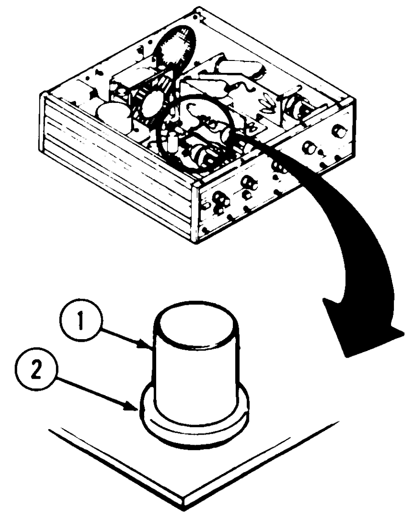
END OF TASK

REMOVE VACUUM TUBES V1 AND V2

NOTE

This task is the same for vacuum tubes V1 and V2. Vacuum tube V1 is shown.

Grasp vacuum tube (1) and pull straight up and out of socket (2).



INSTALL VACUUM TUBES V1 AND V2

1. Position vacuum tube (1) on socket (2).
2. Push vacuum tube (1) into socket (2) until it stops.

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE VACUUM TUBE SOCKETS XV1 AND XV2

NOTE

This task is the same for vacuum tube sockets XV1 and XV2. Vacuum tube socket XV1 is shown.

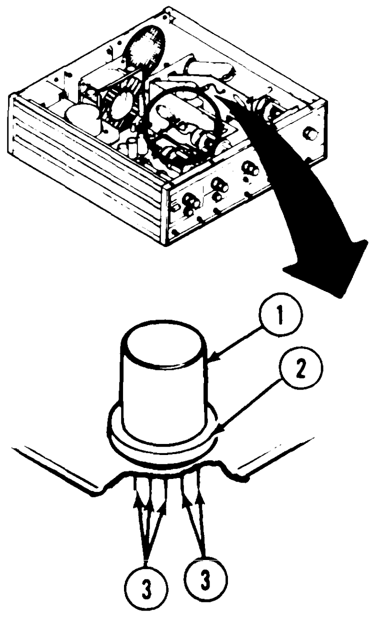
1. Working on component side of board, pull vacuum tube (1) straight out of socket (2).

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, unsolder five leads (3).

3. Working on component side of board, pull out socket (2).



EL8ZU134

INSTALL VACUUM TUBE SOCKETS XV1 AND XV2

1. Position socket (2) on component side of board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, solder five leads (3).

3. Position vacuum tube (1) in socket (2) and push in until it stops.

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers, See paragraph 2-37.

END OF TASK

REMOVE INTEGRATED CIRCUIT OPERATIONAL AMPLIFIER Z501

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

1. Working on circuit side of board, unsolder eight leads (1), four on each side of integrated circuit operational amplifier (2).

2. Pull out integrated circuit operational amplifier (2).

INSTALL INTEGRATED CIRCUIT OPERATIONAL AMPLIFIER 2501

CAUTION

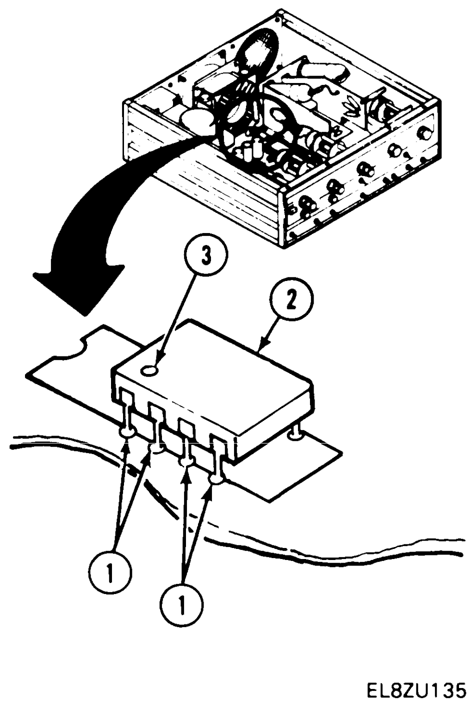
Dot on integrated circuit shows the correct position for installation. Install integrated circuit with dot and at cutout stamped on circuit board or equipment will be damaged.

1. Position integrated circuit operational amplifier (2) on component side of board with dot (3) at cutout stamped on circuit board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, solder eight leads (1), four on each side of integrated circuit operational amplifier (2).



NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

REMOVE POTENTIOMETERS R65, R70, R135, R140, R309, R374, R512, R519, R535, AND R546

CAUTION

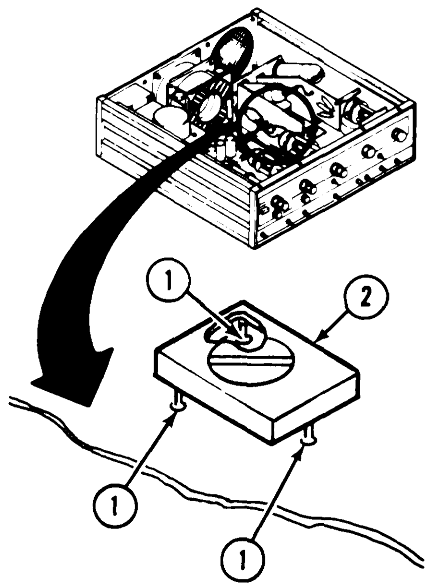
Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for potentiometers R65, R70, R135, R140, R309, R374, R512, R519, R535, and R546. Potentiometer R140 is shown.

1. Working on circuit side of board, unsolder three leads (1).

2. Working on component side of board, pull out potentiometer (2).



EL8ZU136

INSTALL POTENTIOMETERS R65, R70, R135, R140, R309, R374, R512, R519, R535, AND R546

1. Position potentiometer (1) on component side of board.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Working on circuit side of board, solder three leads (2).

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

2-65. REPLACE OUTPUT AMPLIFIER ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

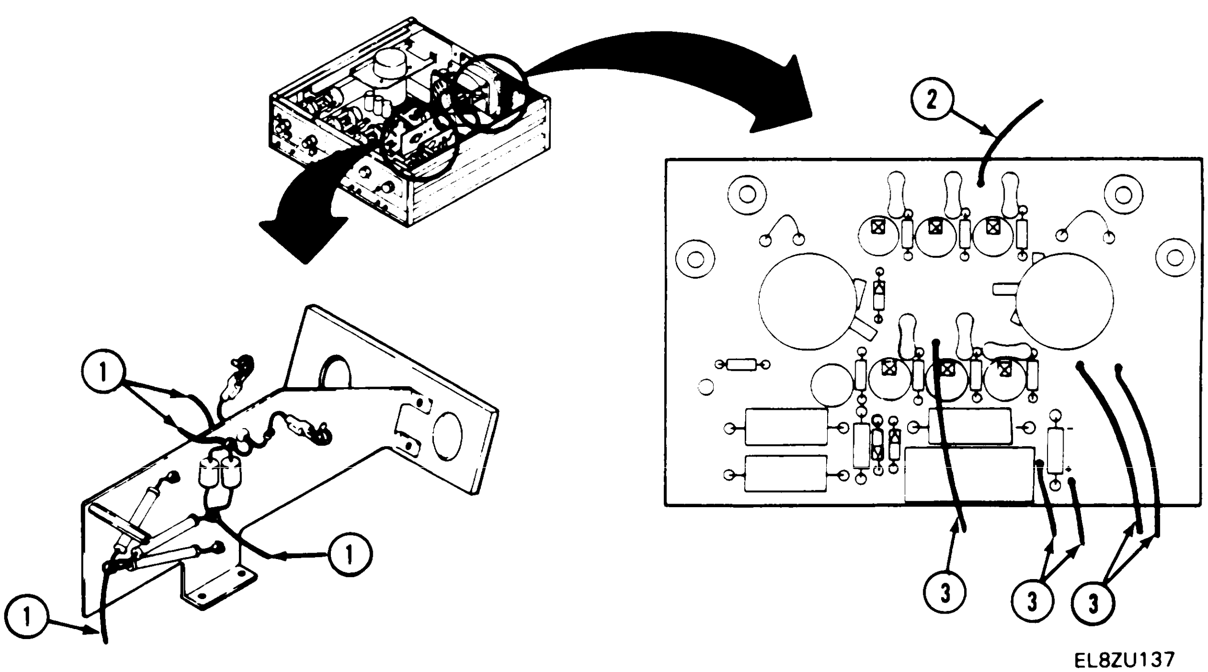
NOTE

PRELIMINARY PROCEDURES:

- Remove vacuum tubes V351 and V352. See paragraph 2-66.
- Remove bottom cover. See paragraph 2-37.
- Remove right side panel. See paragraph 2-41.

REMOVE

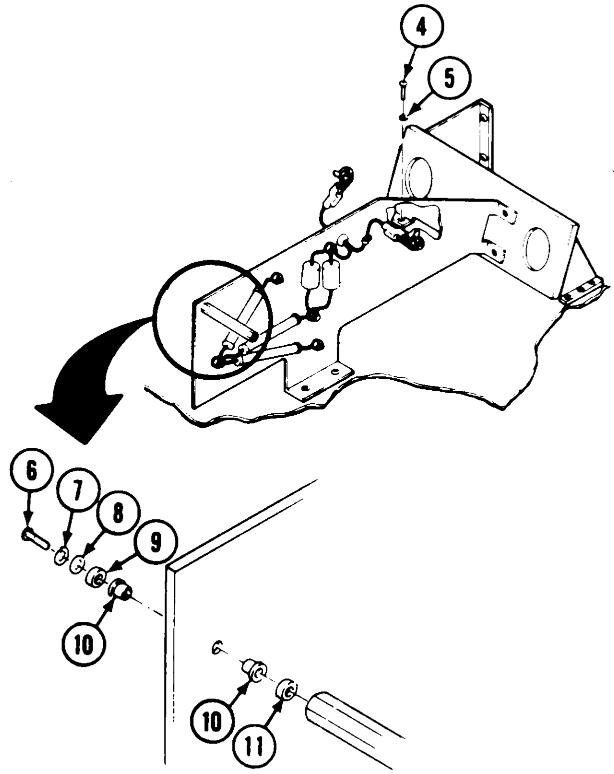
1. Tag, unsolder, and remove four wires (1).
2. Tag, unsolder, and remove wire (2).
3. Working through bottom, tag, unsolder, and remove five wires (3).



REMOVE - Continued

4. Working through top, remove screw (4) and lockwasher (5).

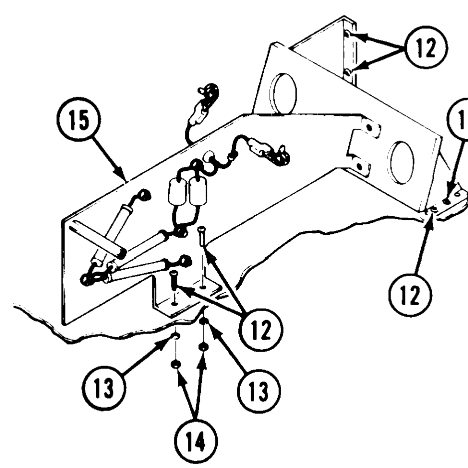
5. Remove screw (6), lockwasher (7), flat washer (8), nylon spacer (9), two shoulder washers (10), and nylon spacer (11).



EL8ZU138

6. Remove six screws (12), flat washers (13), and nuts (14).

7. Lift out output amplifier assembly (15).

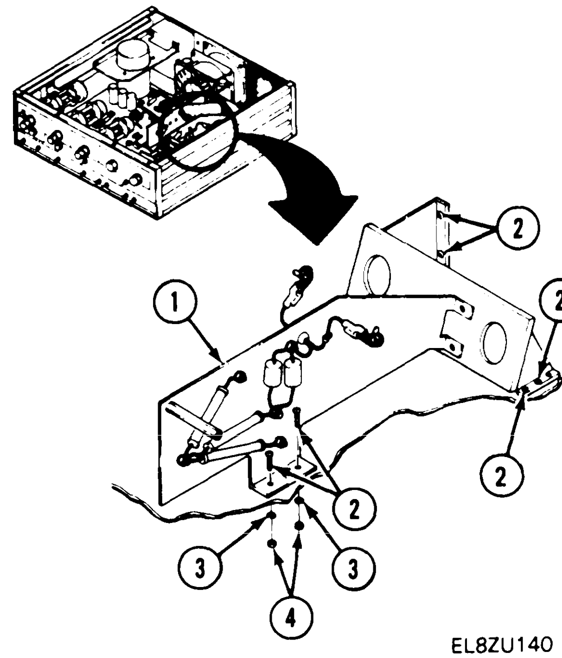


EL8ZU139

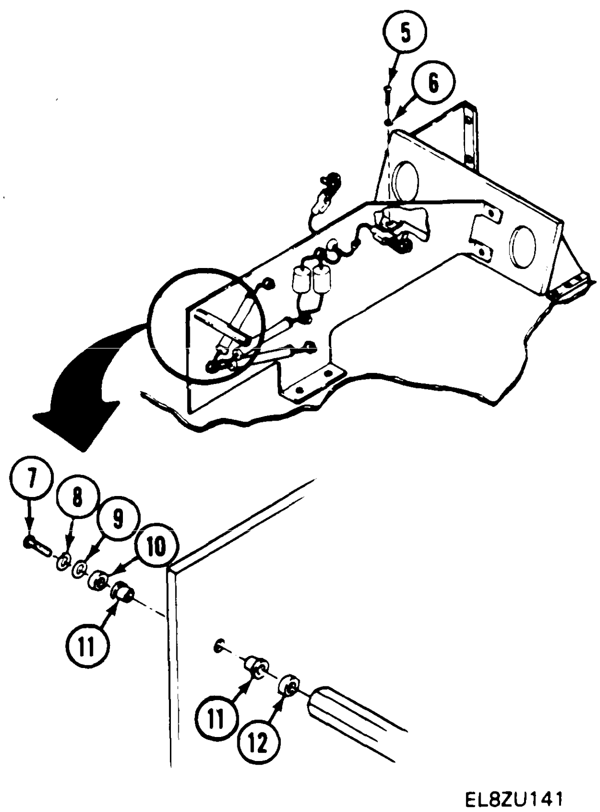
END OF TASK

INSTALL

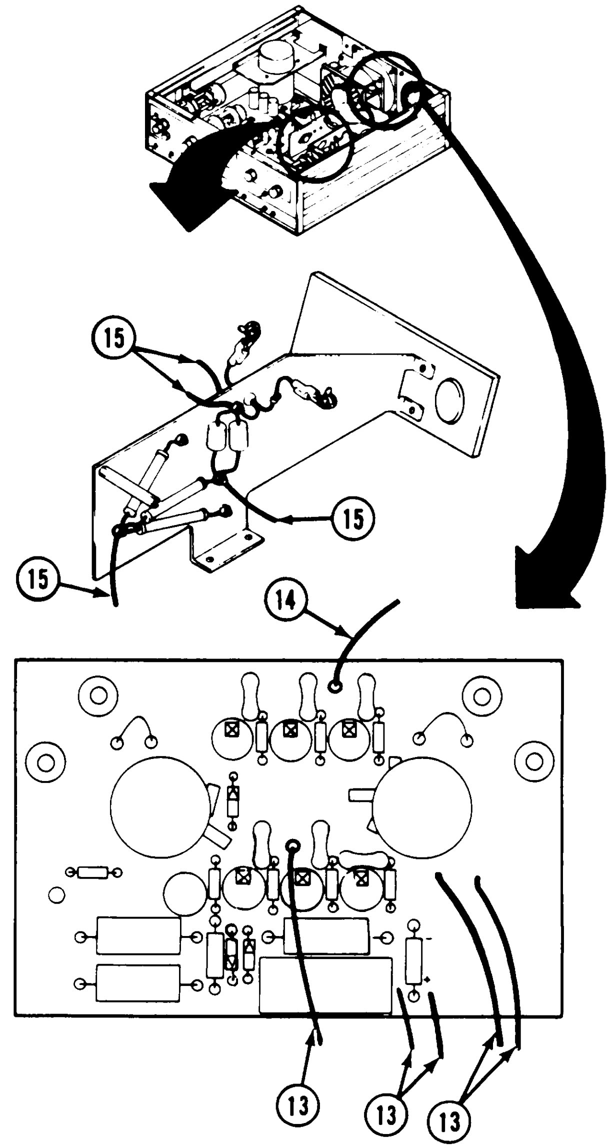
1. Working through top, position output amplifier assembly (1) in chassis.
2. Install six screws (2), flat washers (3), and nuts (4).



3. Install screw (5) and lockwasher (6).
4. Install screw (7), lockwasher (8), flat washer (9), nylon spacer (10), two shoulder washers (11), and nylon spacer (12).



INSTALL - Continued



5. Working through bottom, solder five wires (13) as tagged.

6. Working through top, solder wire (14) as tagged.

7. Solder four wires (15) as tagged.

NOTE

FOLLOW-ON MAINTENANCE:

- Install vacuum tubes V351 and V352. See paragraph 2-66.
- Install bottom cover. See paragraph 2-37.
- Install right side panel. See paragraph 2-41.
- Do alinement procedures. See paragraph 2-39.

END OF TASK

2-66. REPLACE VACUUM TUBES V351 AND V352.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

General Safety Instructions:

WARNING

Hot equipment parts can cause burns. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

REMOVE

WARNING

Vacuum tubes (1) may be hot after power is removed. Be careful when working on vacuum tubes to prevent injury.

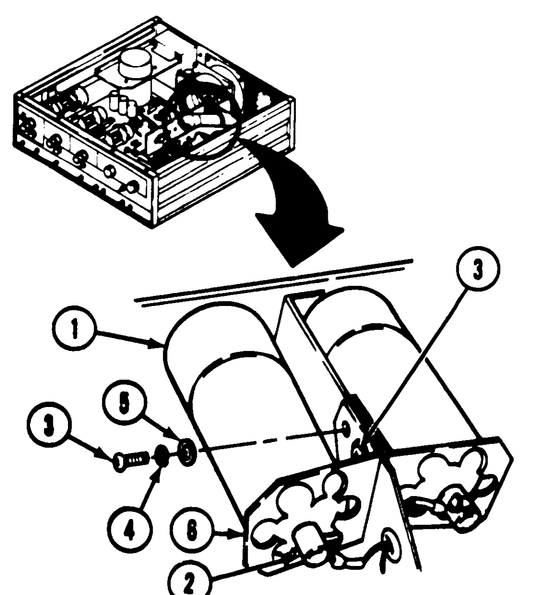
NOTE

This task is the same for vacuum tubes V351 and V352. Vacuum tube V351 is shown.

1. Pull plate cap clamp (2) off vacuum tube (1).

2. Remove two screws (3), lockwashers (4), and flat washers (5) and pull off tube holder bracket (6).

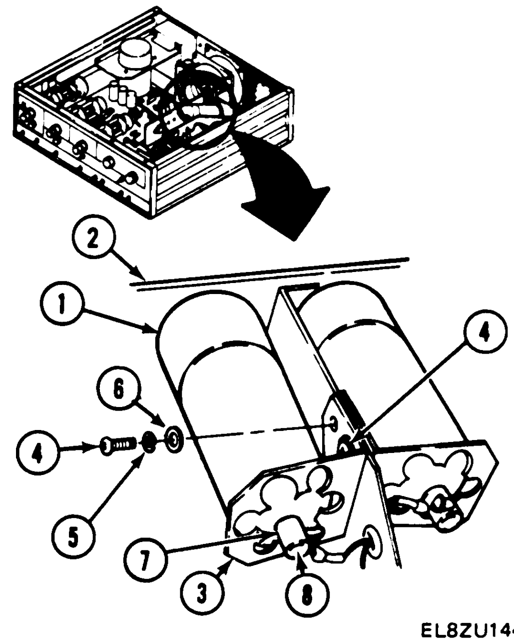
3. Carefully pull out vacuum tube (1).



EL8ZU143

END OF TASK

INSTALL



NOTE

This task is the same for vacuum tubes V351 and V352. Vacuum tube V351 is shown.

1. Plug vacuum tube (1) in tube mounting bracket (2).

2. Place tube holder bracket (3) over tube (1) and install two screws (4), lockwashers (5), and flat washers (6).

3. Install plate cap clamp (7) on plate cap (8).

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

2-67. REPLACE AUXILIARY DRIVERS OR CATHODE PRINTED CIRCUIT BOARD (PCB) ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

NOTE

PRELIMINARY PROCEDURES:

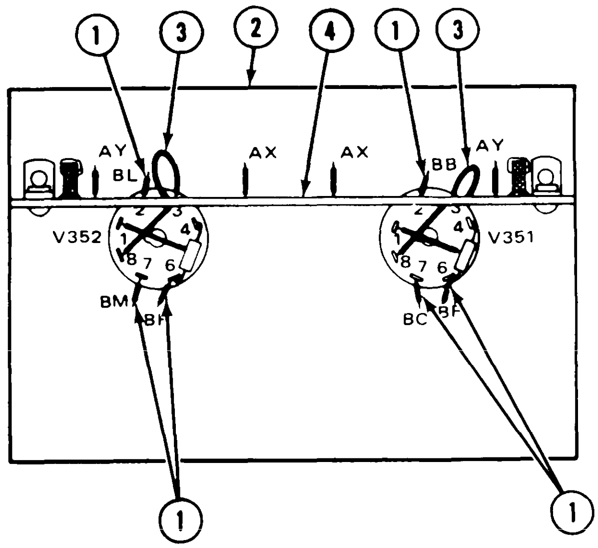
- Remove output amplifier assembly. See paragraph 2-65.
- Remove resistors R351 thru R355 and capacitors C351 and C353. See paragraph 2-68.

REMOVE

NOTE

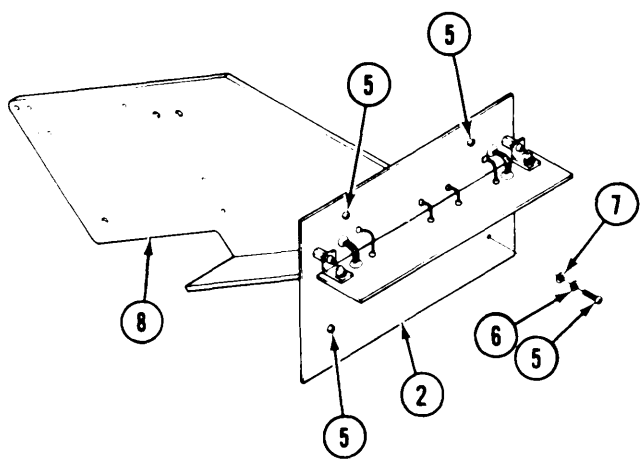
This task is the same for auxiliary drivers pcb assembly and cathode pcb assembly except where noted.

1. Tag unsolder, and remove six jumper wires (1) from auxiliary drivers pcb assembly (2).
2. Tag, unsolder, and remove two jumper wires (3) from cathode pcb assembly (4).



EL8ZU145

3. Remove four screws (5), lockwashers (6), and flat washers (7).
4. Separate auxiliary drivers pcb assembly (2) from output amplifier assembly (8).



EL8ZU146

REMOVE - Continued

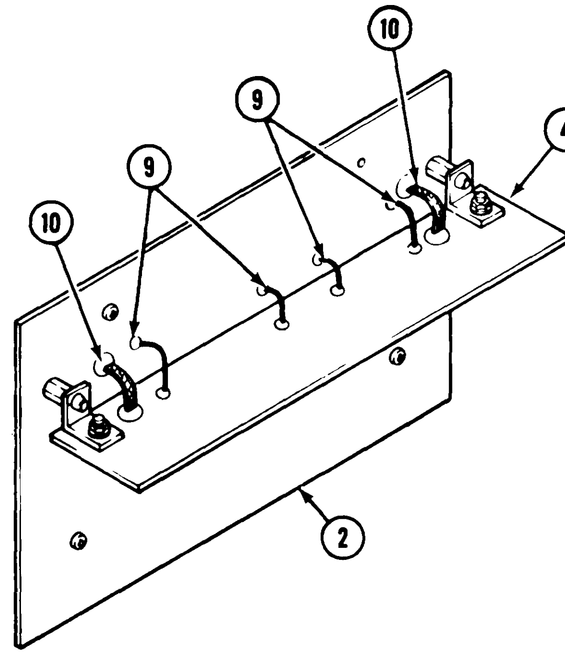
CAUTION

Too much heat can damage printed circuit boards. Be careful when unsoldering leads or equipment will be damaged.

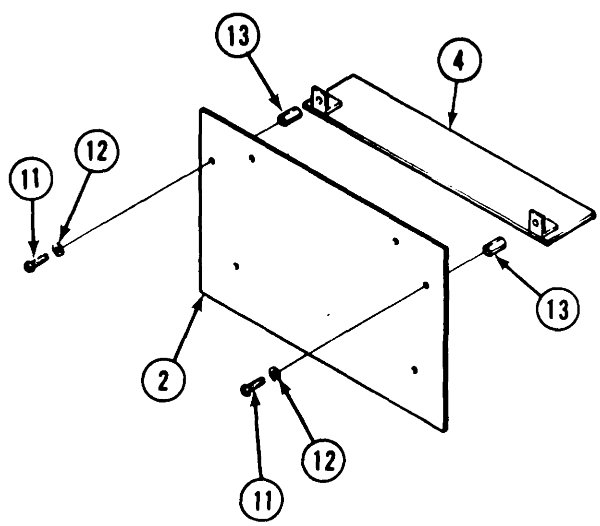
NOTE

- If replacing auxiliary drivers pcb assembly (2), unsolder four jumper wires (9) and two ground straps (10) from auxiliary drivers pcb assembly.
- If replacing cathode pcb assembly (4), unsolder four jumper wires (9) and two ground straps (10) from cathode pcb assembly.

5. Tag, unsolder, and remove four jumper wires (9) and two ground straps (10).



EL8ZU147



EL8ZU148

6. Separate cathode pcb assembly (4) from auxiliary drivers pcb assembly (2) by removing two screws (11), lockwashers (12), and spacers (13).

END OF TASK

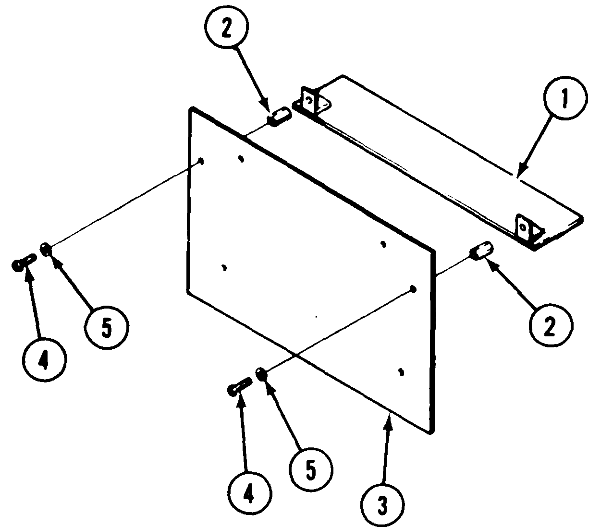
INSTALL

NOTE

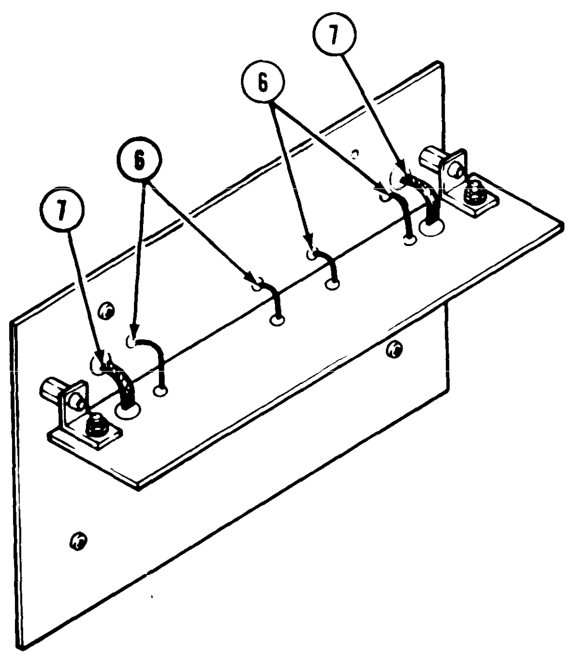
This task is the same for auxiliary drivers pcb assembly and cathode pcb assembly.

1. Position cathode pcb assembly (1) and two spacers (2) on auxiliary drivers pcb assembly (3).

2. Install two screws (4) and lockwashers (5).



EL8ZU149



CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering leads or equipment will be damaged.

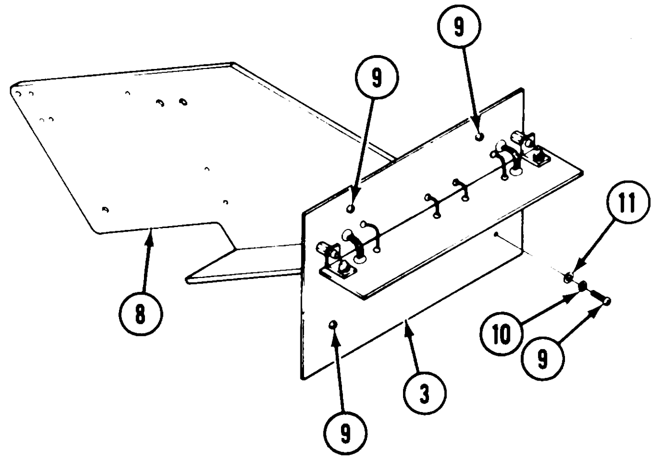
3. Solder four jumper wires (6) and two ground straps (7) as tagged.

EL8ZU150

INSTALL - Continued

4. Position auxiliary drivers pcb assembly (3) on output amplifier assembly (8).

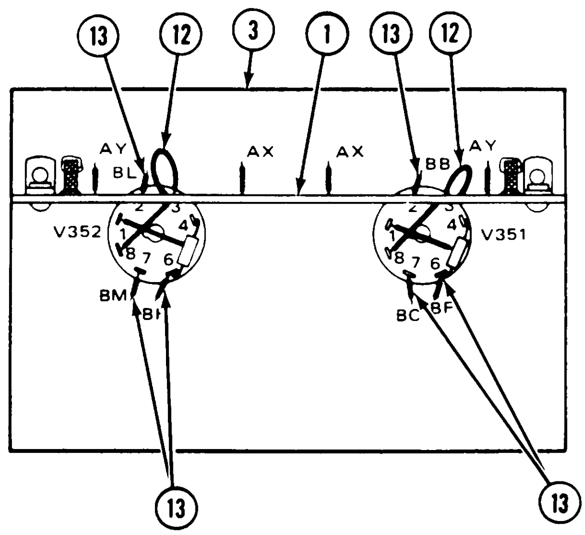
5. Install four screws (9), lockwashers (10), and flat washers (11).



EL8ZU151

6. Solder two jumper wires (12) to cathode pcb assembly (1) as tagged.

7. Solder six jumper wires (13) to auxiliary drivers pcb assembly (3) as tagged.



EL8ZU152

NOTE

FOLLOW-ON MAINTENANCE:

- Install resistors R351 thru R355 and capacitors C351 and C353. See paragraph 2-68.

- Install output amplifier assembly, See paragraph 2-65.

END OF TASK

2-68. REPAIR OUTPUT AMPLIFIER ASSEMBLY.

DESCRIPTION

This procedure covers: Capacitors C351 and C353. Remove. Install.
Resistors R351 thru R357. Remove. Install.

INITIAL SETUP

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove bottom cover. See paragraph 2-37.

REMOVE CAPACITORS C351 AND C353

WARNING

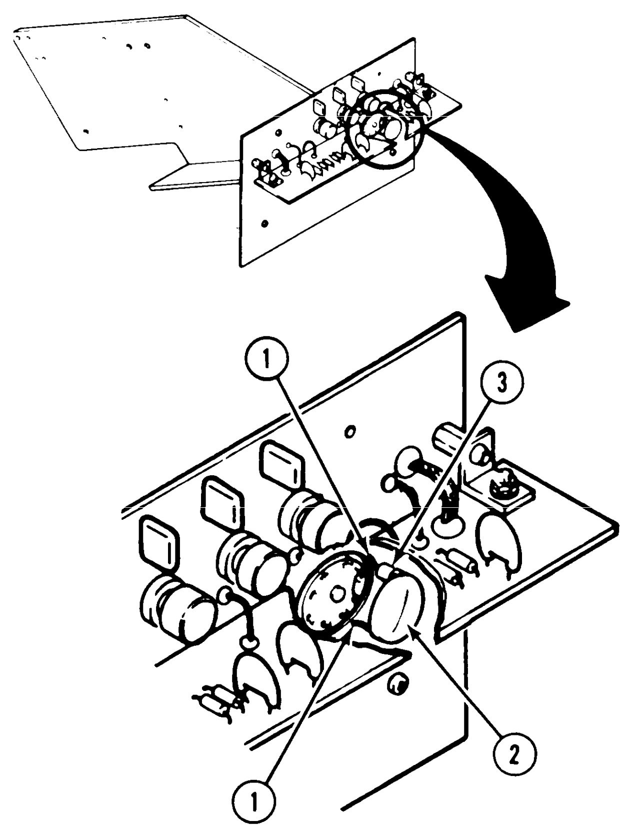
Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground to prevent electrical shock.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

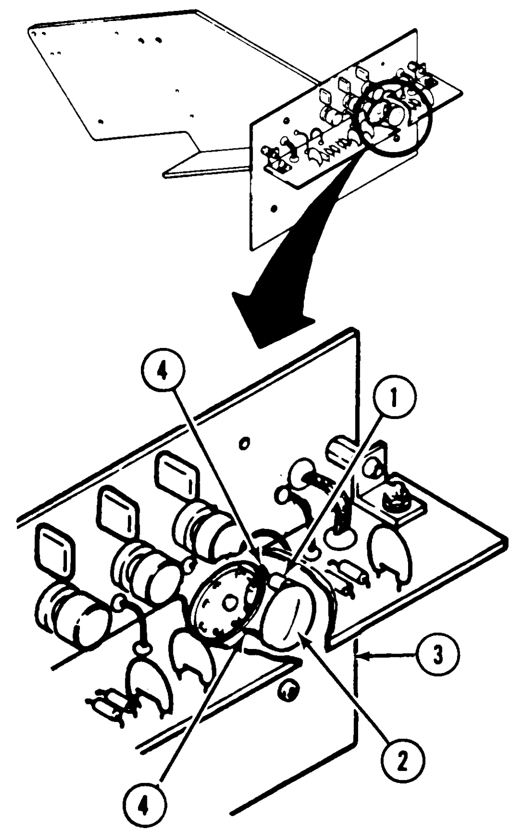
This task is the same for capacitors C351 and C353. Capacitor C351 is shown.



1. Unsolder two leads (1).
2. Lift out capacitor (2).
3. Pull ferrite bead (3) off capacitor (2).

END OF TASK

INSTALL CAPACITORS C351 AND C353



1. Place ferrite bead (1) on capacitor (2).

2. Position capacitor (2) on output amplifier assembly (3).

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

3. Solder two leads (4).

NOTE

FOLLOW-ON MAINTENANCE: Install bottom cover. See paragraph 2-37.

END OF TASK

REMOVE RESISTORS R351 THRU R357

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

NOTE

This task is the same for resistors R351 thru R357. Resistor R356 is shown.

1. Unsolder two leads (1).

2. Lift out resistor (2).

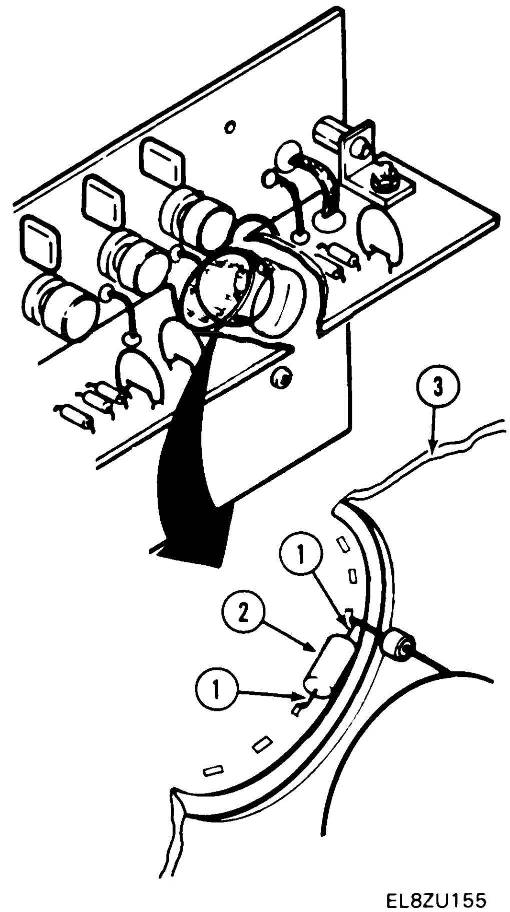
INSTALL RESISTORS R351 THRU R357

1. Position resistor (2) on output amplifier assembly (3).

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

2. Solder two leads (1).



NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

2-69. REPLACE SHIELD ASSEMBLY.

DESCRIPTION

This procedure covers: Remove. Install.

INITIAL SETUP

General Safety Instructions:

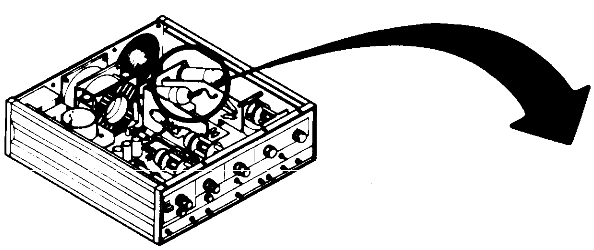
WARNING

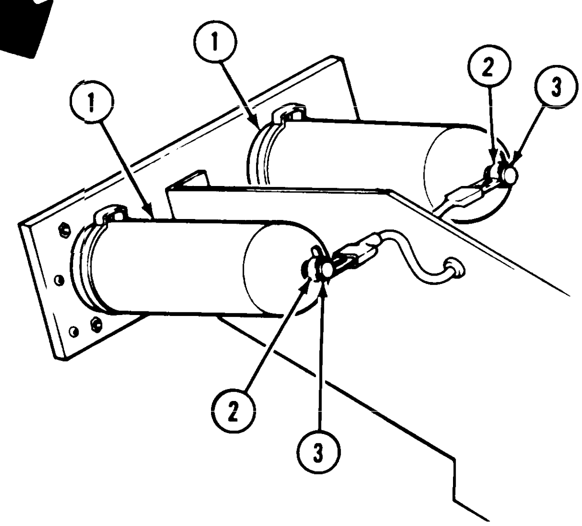
Hot equipment parts can cause burns. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top and bottom covers. See paragraph 2-37.

REMOVE





EL8ZU156

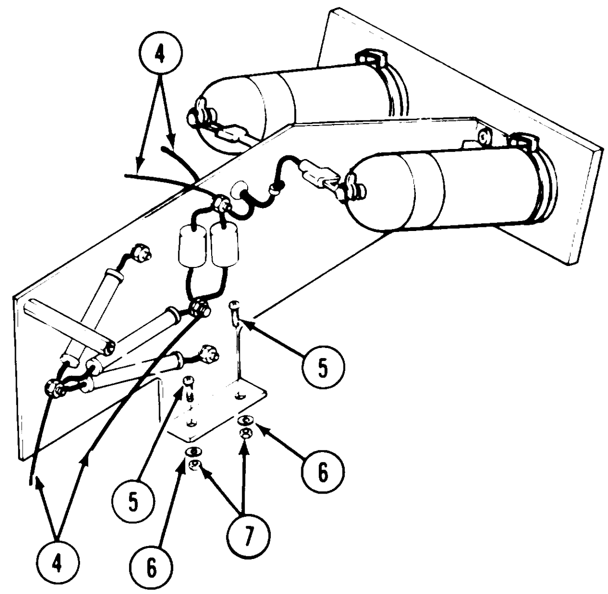
WARNING

Vacuum tubes (1) may be hot after power is removed. Be careful when working on or near vacuum tubes to prevent injury.

1. Remove two plate cap clamps (2) from vacuum tube plate caps (3).

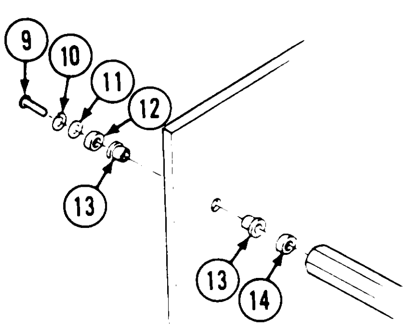
REMOVE - Continued

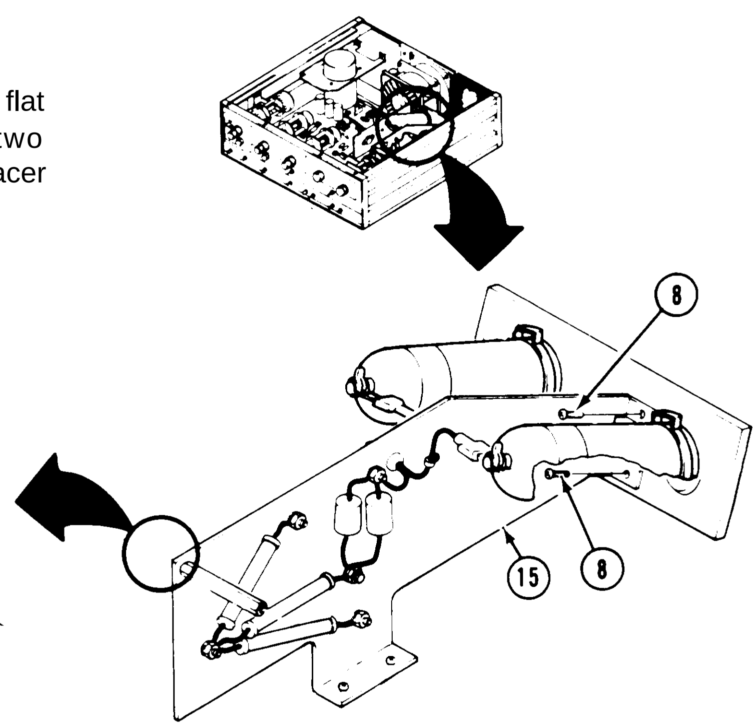
2. Tag, unsolder, and remove four wires (4).
3. Working through top and bottom openings, remove two screws (5), flat washers (6), and nuts (7).



EL8ZU185

4. Remove two screws (8).
5. Remove screw (9), lockwasher (10), flat washer (11), nylon spacer (12), two shoulder washers (13), and nylon spacer (14).
6. Lift out shield assembly (15).



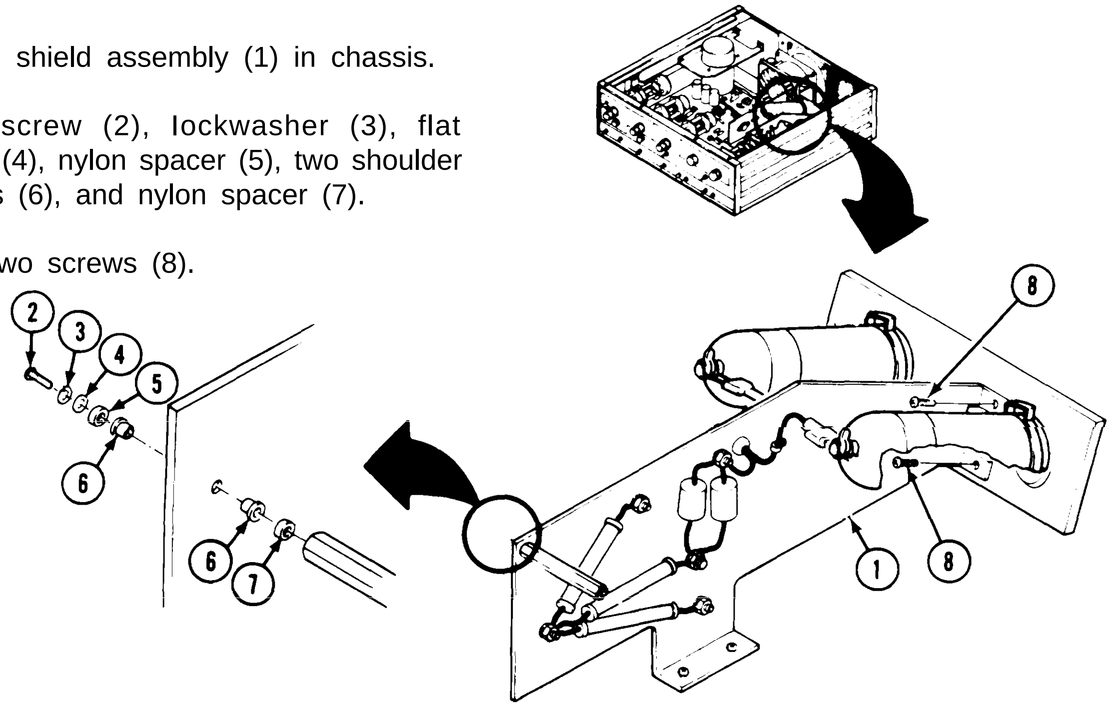


EL8ZU157

END OF TASK

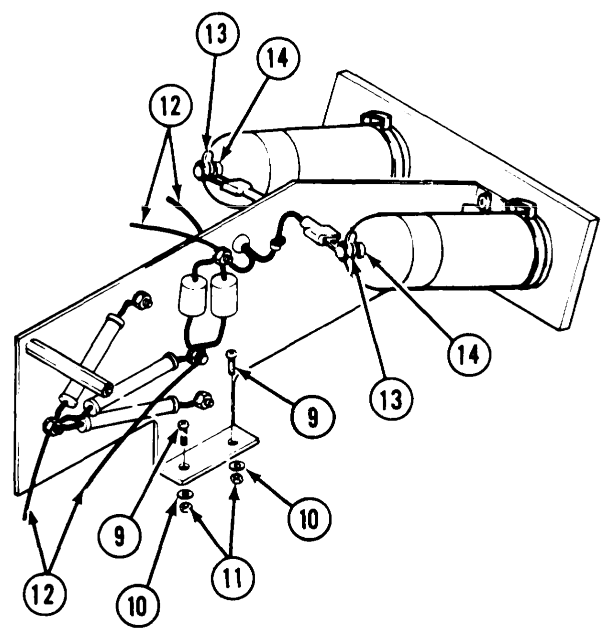
INSTALL

1. Position shield assembly (1) in chassis.
2. install screw (2), lockwasher (3), flat washer (4), nylon spacer (5), two shoulder washers (6), and nylon spacer (7).
3. Install two screws (8).



EL8ZU158

4. Working through top and bottom openings, install two screws (9), flat washers (10), and nuts (11).
5. Solder four wires (12) as tagged.
6. Install two plate cap clamps (13) on plate caps (14).



EL8ZU159

NOTE

FOLLOW-ON MAINTENANCE: Install top and bottom covers. See paragraph 2-37.

END OF TASK

2-70. REPAIR SHIELD ASSEMBLY.

DESCRIPTION

This procedure covers: Resistors R401 thru R406. Remove. Install
Resistors R391 and R392. Remove. Install.
Capacitor C402. Remove. Install.
Capacitor C401. Remove. Install.

INITIAL SETUP

Material: Sleeving, Item 8, Appendix B

General Safety Instructions:

WARNING

High voltages can cause burns and electrical shock. See general warning page.

NOTE

PRELIMINARY PROCEDURE: Remove top cover. See paragraph 2-37.

REMOVE RESISTORS R401 THRU R406

NOTE

Resistors R401 thru R406 are replaced the same way. Resistor R401 is shown.

1. Unsolder two leads (1).

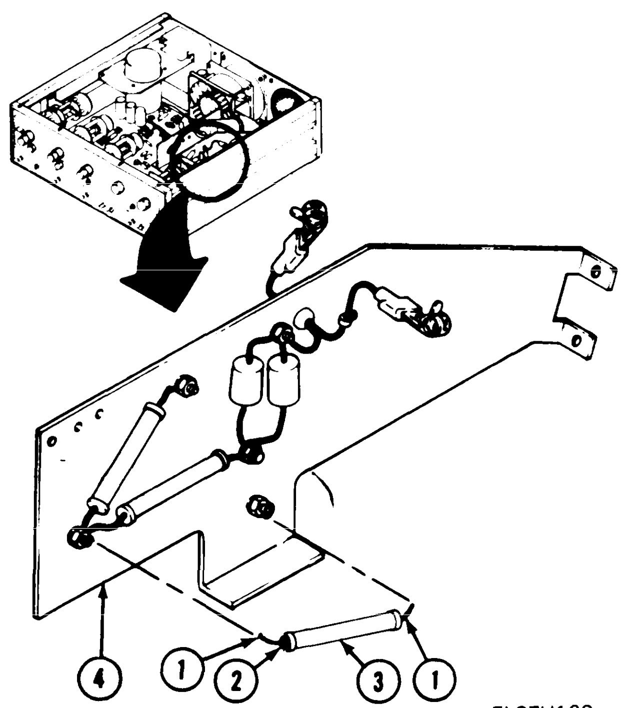
2. Pull off resistor (2).

INSTALL RESISTORS R401 THRU R406

1. Install 1-1/4-inch piece of insulation sleeving (3) on resistor (2).

2. Position resistor (2) on shield assembly (4).

3. Solder two leads (1).



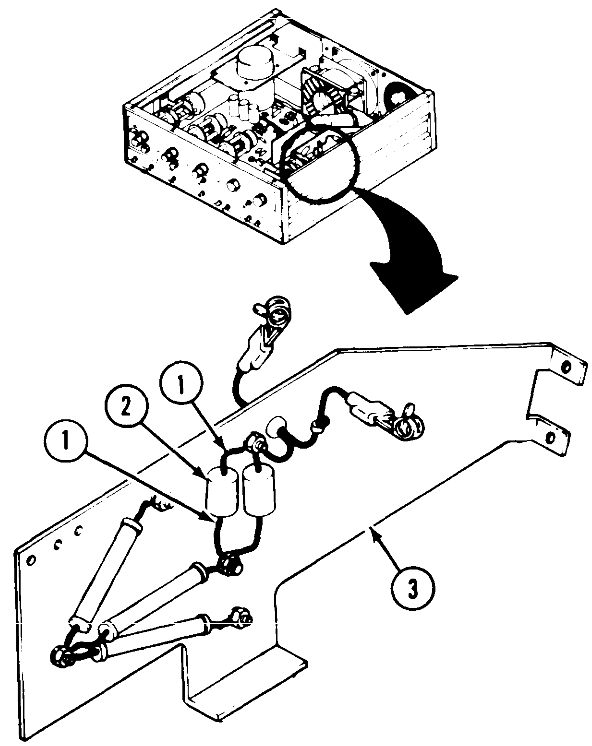
EL8ZU160

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

REMOVE RESISTORS R391 AND R392



NOTE

Resistors R391 and R392 are replaced the same way. Resistor R392 is shown.

1. Unsolder two leads (1).
2. Pull off resistor (2).

INSTALL RESISTORS R391 AND R392

1. Position resistor (2) on shield assembly (3).
2. Solder two leads (1).

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

REMOVE CAPACITOR C402

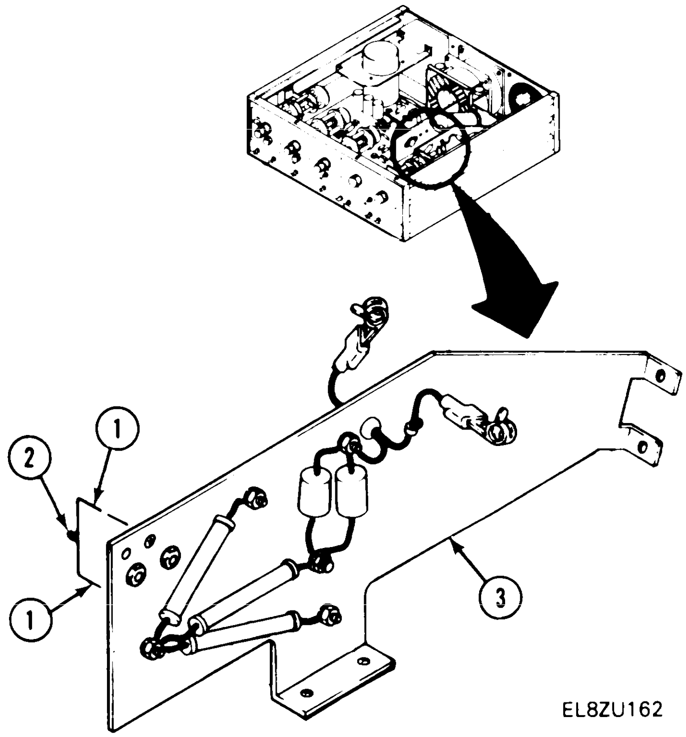
WARNING

Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground to prevent electrical shock.

1. Unsolder two leads (1).
2. Pull off capacitor (2).

INSTALL CAPACITOR C402

1. Position capacitor (2) on shield assembly (3).
2. Solder two leads (1).



NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

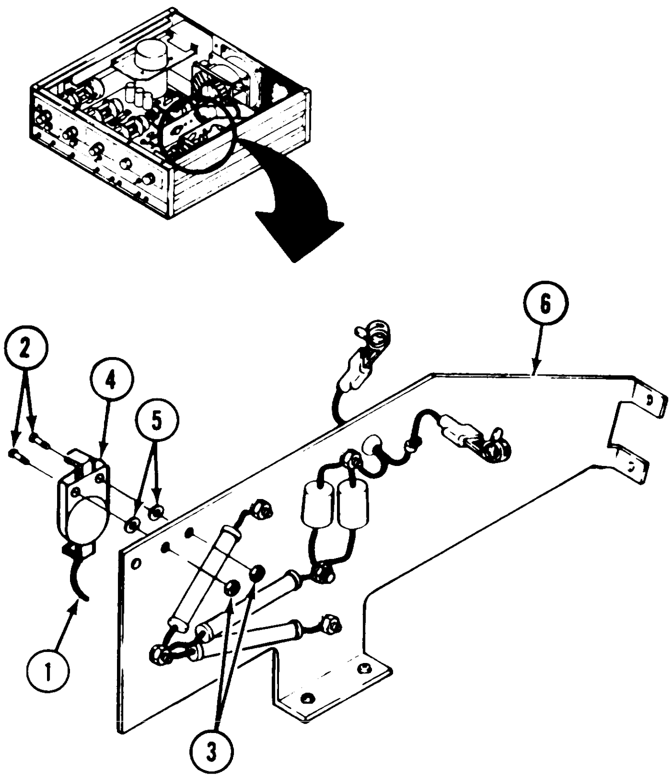
END OF TASK

REMOVE CAPACITOR C401

WARNING

Capacitors hold electrical charges after power is removed. Before working on equipment, discharge all capacitors to ground to prevent electrical shock.

1. Remove capacitor C402. See paragraph 2-70.
2. Unsolder lead (1).
3. Remove two screws (2) and nuts (3).
4. Pull off capacitor (4) and two fiber washers (5).



EL8ZU163

INSTALL CAPACITOR C401

1. Position capacitor (4) and two fiber washers (5) on shield assembly (6).
2. Install two screws (2) and nuts (3).
3. Solder lead (1) in place.
4. Install capacitor C402. See paragraph 2-70.

NOTE

FOLLOW-ON MAINTENANCE: Install top cover. See paragraph 2-37.

END OF TASK

Section V. PREPARATION FOR STORAGE OR SHIPMENT

2-71. PREPARATION FOR STORAGE OR SHIPMENT.

a. Wrap the signal generator in heavy paper or plastic before placing it into the shipping container.

b. Select a strong shipping container or wooden box to contain the signal generator.

c. Use an adequate layer of shock-absorbing material on all sides of the signal generator (3- to 5-inch layer) to provide cushioning and prevent movement inside the container. Protect the front panel with additional layers of cardboard.

d. Seal the package with filament tape; if a wooden box is used, strap with metal bands.

e. Mark the shipping container “FRAGILE-DELICATE INSTRUMENT” to insure proper handling.

2-72. TYPES OF STORAGE.

a. Short-term (administrative)= 1 to 45 days. All equipment in administrative storage must be able to be made ready within 24 hours for use on a mission. Before placing any item in administrative storage, make sure the next scheduled PMCS has been done and any deficiencies have been corrected. The administrative storage site should provide required protection from extreme weather conditions and allow you to reach the equipment for visual inspections or exercises when applicable.

b. Intermediate = 46 to 180 days.

c. Long-term = over 180 days.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, technical bulletins, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Technical Manuals	DA Form 2028-2
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Transportation Discrepancy Report (TDR)	SF 361
Report of Discrepancy (ROD)	SF 364
Product Quality Deficiency Report.	SF 368

A-3. TECHNICAL MANUALS.

The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)	TM 750-244-2
Pulse Signal Generator SG-1205(V)1/U Repair Parts and Special Tools List	TM 11-6625-3050-24P
Operator's and Organizational Maintenance Manual for Pulse Signal Generator SG-1205(V)1/U	TM 11-6625-3050-12

A-4. MISCELLANEOUS.

Common Table of Allowances	CTA 50-970
Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30
First Aid for Soldiers	FM 21-11
Abbreviations for Use on Drawings, Specifications, Standards and in Technical Documents	MIL-STD-12

☆U.S. GOVERNMENT PRINTING OFFICE: 1990-712-094/20295

APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain Pulse Signal Generator SG-1205(V)1/U. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

B-2. EXPLANATION OF COLUMNS.

a. Column (7) - 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, Appx. B“.

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

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) - U/M (Unit of Measure). 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 NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	O	6810-00-753-4993	ALCOHOL, ISOPROPYL, 8 OZ CAN, MIL-A-10428, GRADE A(81349)	CN
2	C	8020-00-205-6512	BRUSH, SASH (96906)	EA
3	H		CABLE TIES	
4	C	8305-00-267-3015	CLOTH, CHEESECLOTH, COTTON, LISTLESS, CCC-C-440, TYPE II, CLASS 2(81348)	YD
5	C		DETERGENT, MILD LIQUID	OZ
6	H		LOCKING COMPOUND	TU
7	H	5850-00-927-9461	SILICON COMPOUND, 5 OZ TUBE, DC 340-5 OZ (71984)	TU
8	H		SLEEVING, INSULATION, SHRINKABLE	

GLOSSARY

Section I. ABBREVIATIONS

EIR . . . . Equipment Improvement Recommendations

TMDE . . . . Test, Measurement, and Diagnostic Equipment

TAMMS . . . . The Army Maintenance Management System

Section II. DEFINITION OF UNUSUAL TERMS

Aberration — Something that departs from the standard or normal state.

Jitter — Instability of a signal. Used to describe minor variations in a signal reproduced on the screen of a cathode-ray tube.

SUBJECT INDEX

P

Q

R

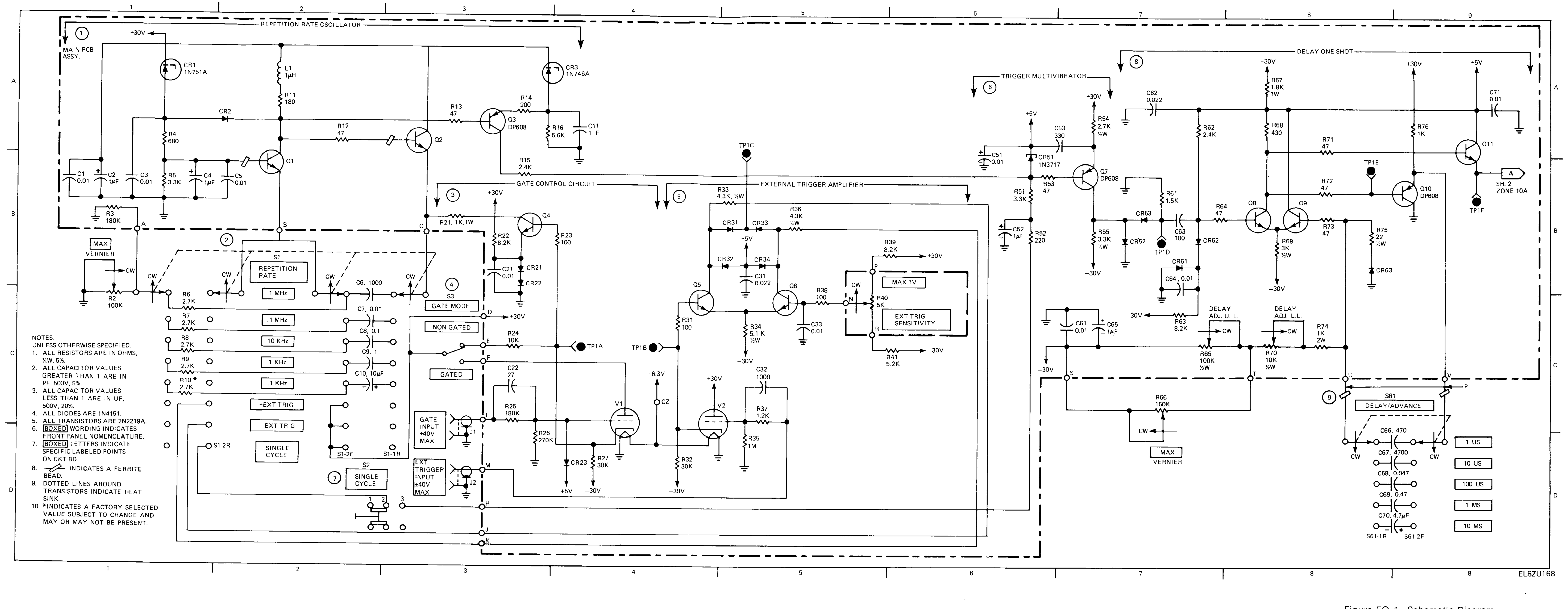


Figure FO-1. Schematic Diagram, Signal Circuits (Sheet 1 of 4)

Figure FO-1. Schematic Diagram, Signal Circuits (Sheet 2 of 4)

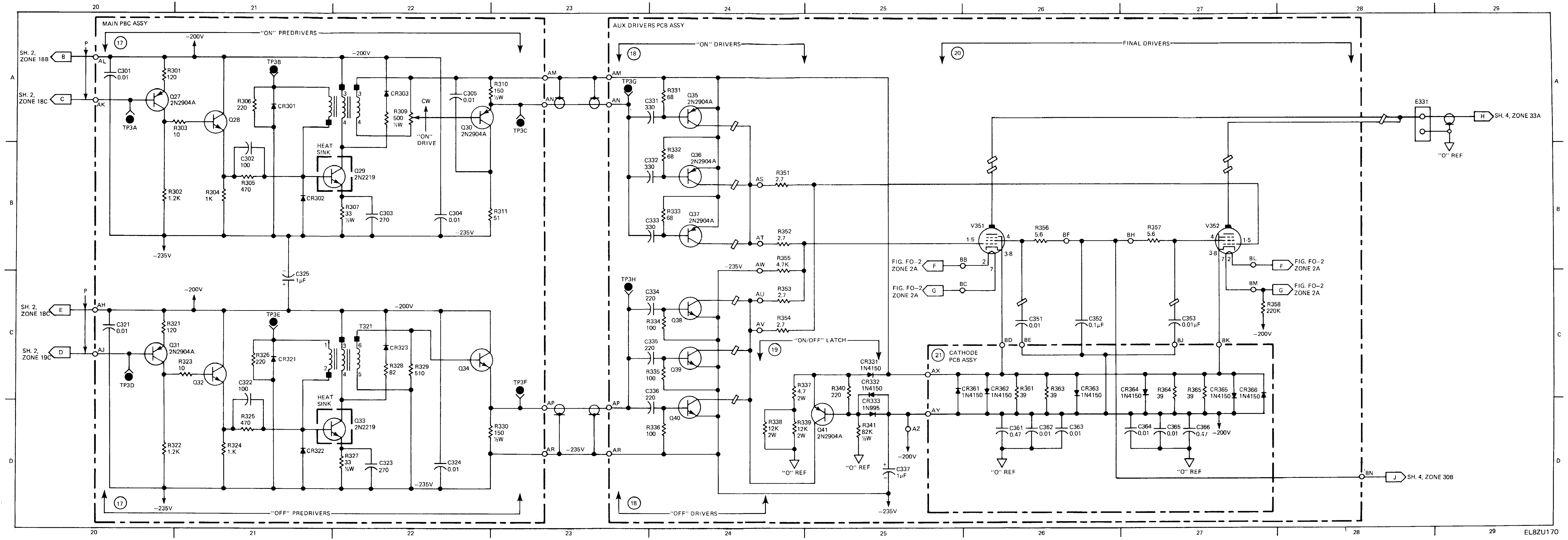


Figure FO-1. Schematic Diagram, Signal Circuits (Sheet 3 of 4)

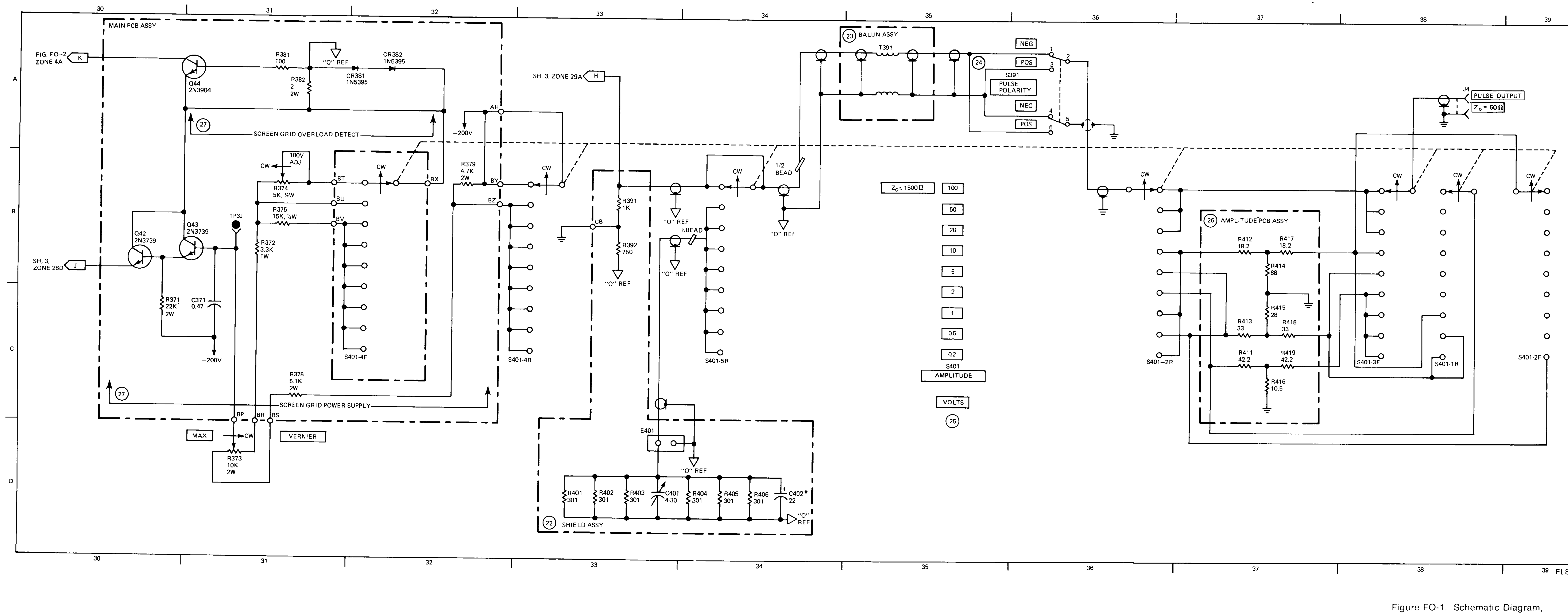
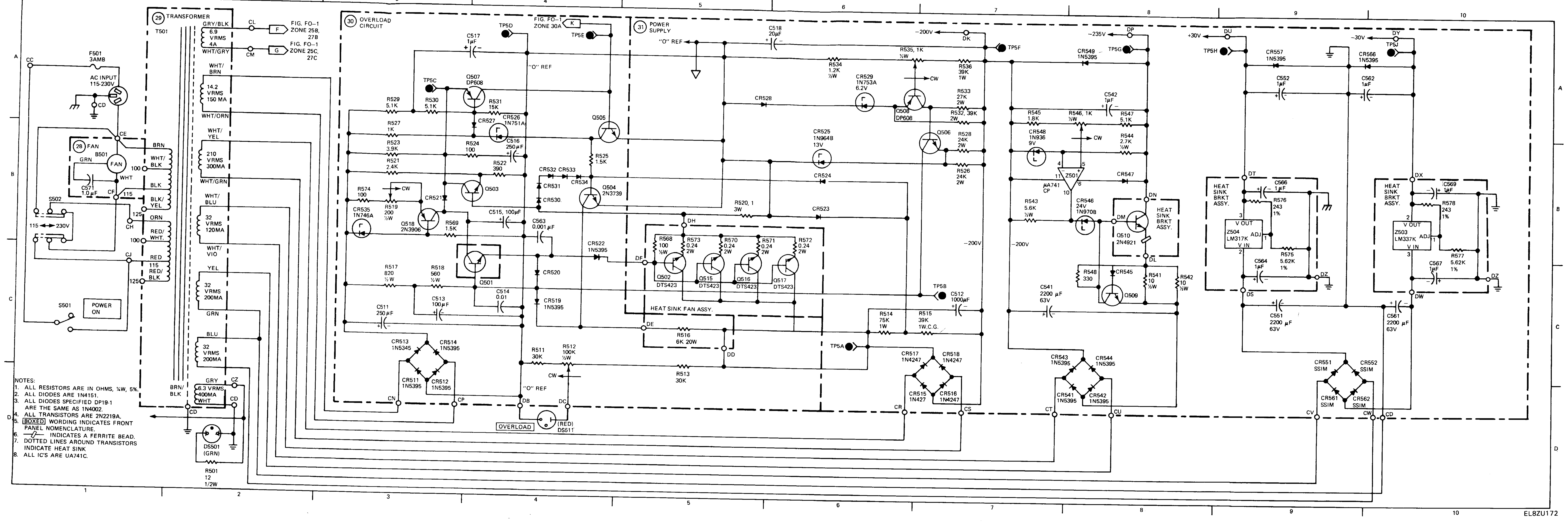


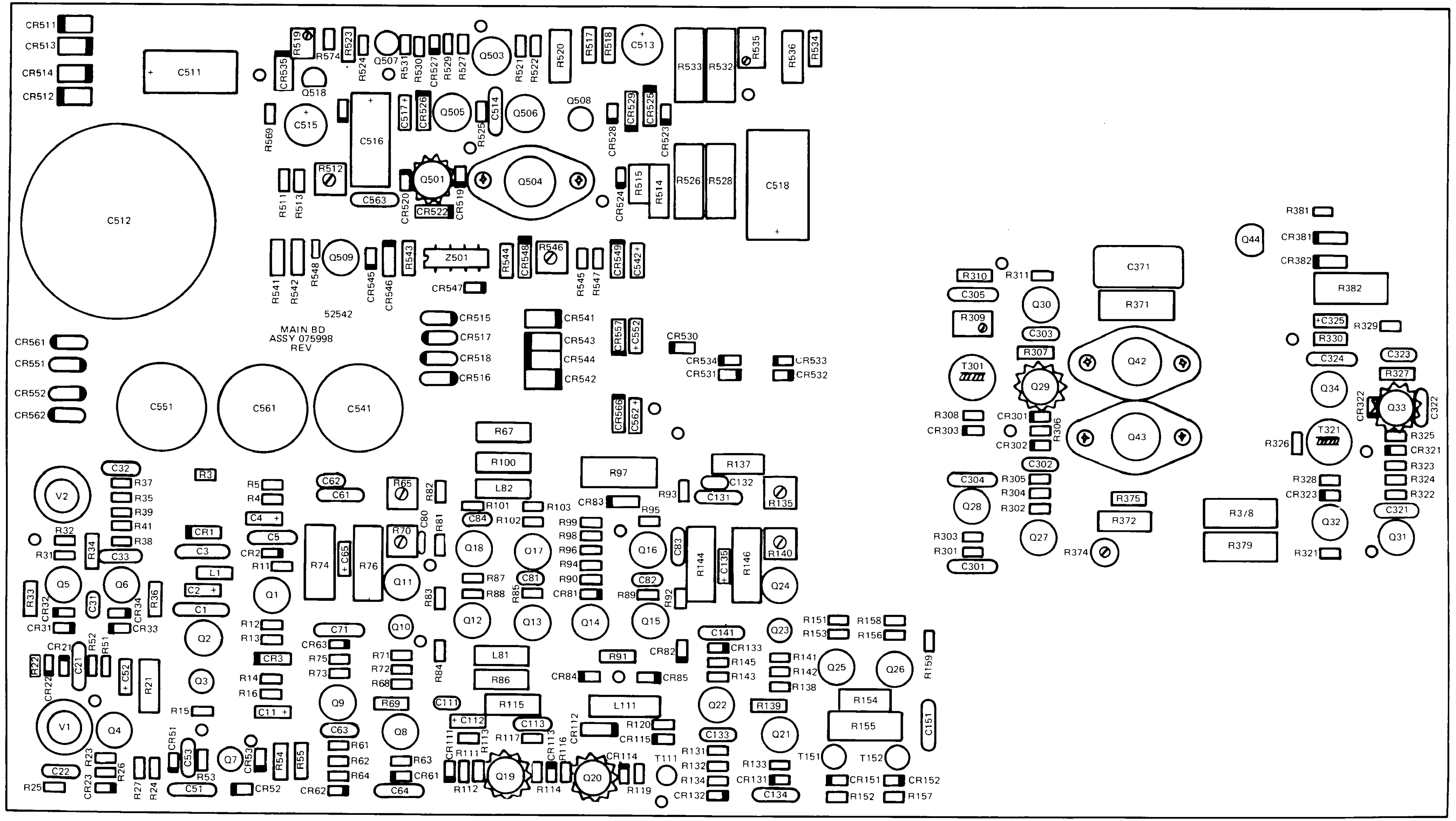
Figure FO-1. Schematic Diagram, Signal Circuits (Sheet 4 of 4)



NOTES:
1. ALL RESISTORS ARE IN OHMS, ¼W, 5%.
2. ALL DIODES ARE 1N4151.
3. ALL DIODES SPECIFIED DP19-1 ARE THE SAME AS 1N4002.
4. ALL TRANSISTORS ARE 2N2219A.
5. BOXED WORDING INDICATES FRONT PANEL NOMENCLATURE.
6. INDICATES A FERRITE BEAD.
7. DOTTED LINES AROUND TRANSISTORS INDICATE HEAT SINK
8. ALL IC'S ARE UA741C.

EL8ZU172

Figure FO-2. Schematic Diagram, Power Supply



EL8ZU173

Figure FO-3. Main PCB Assembly,
Parts Locations

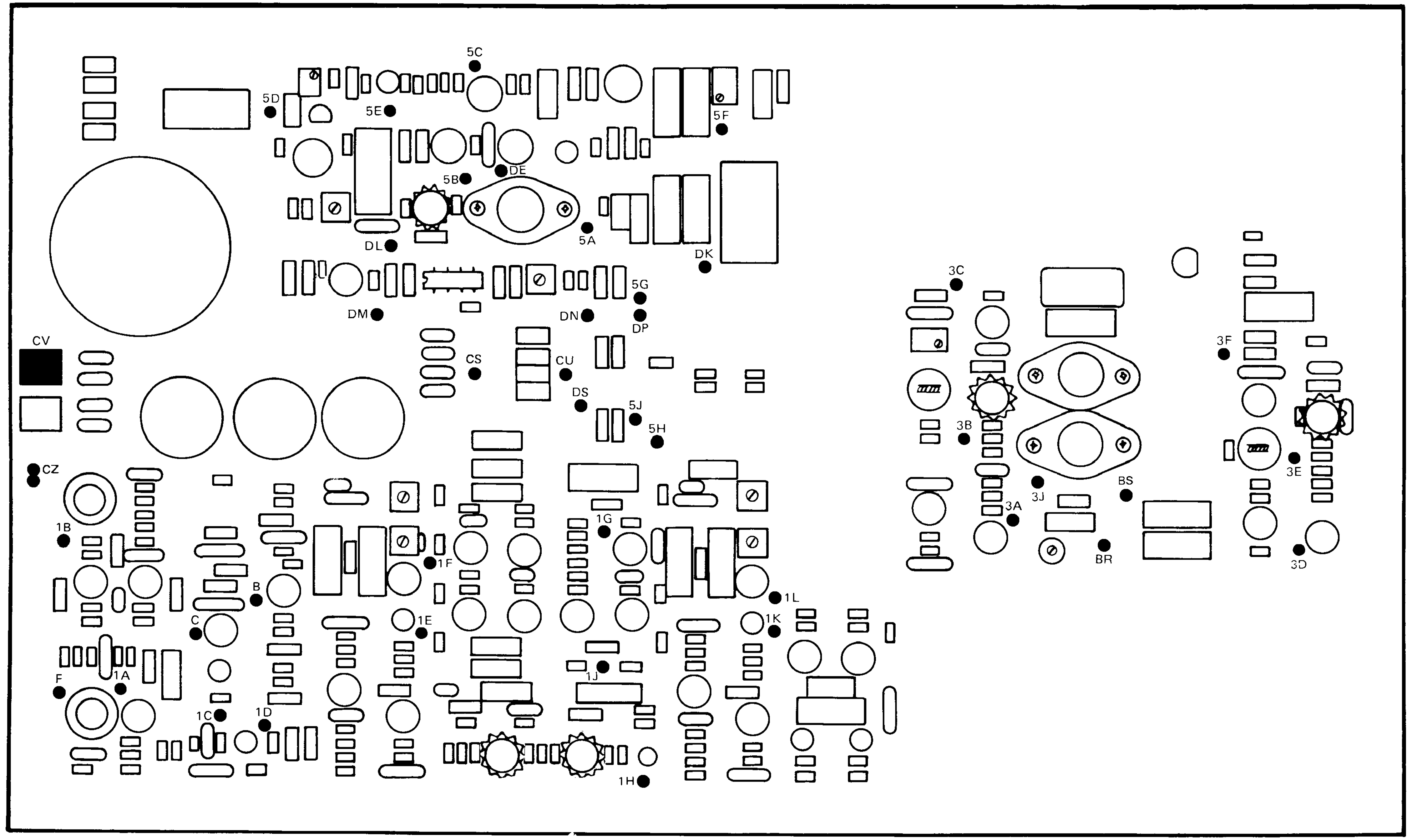


Figure FO-4. Main PCB Assembly,
Test Point Locations

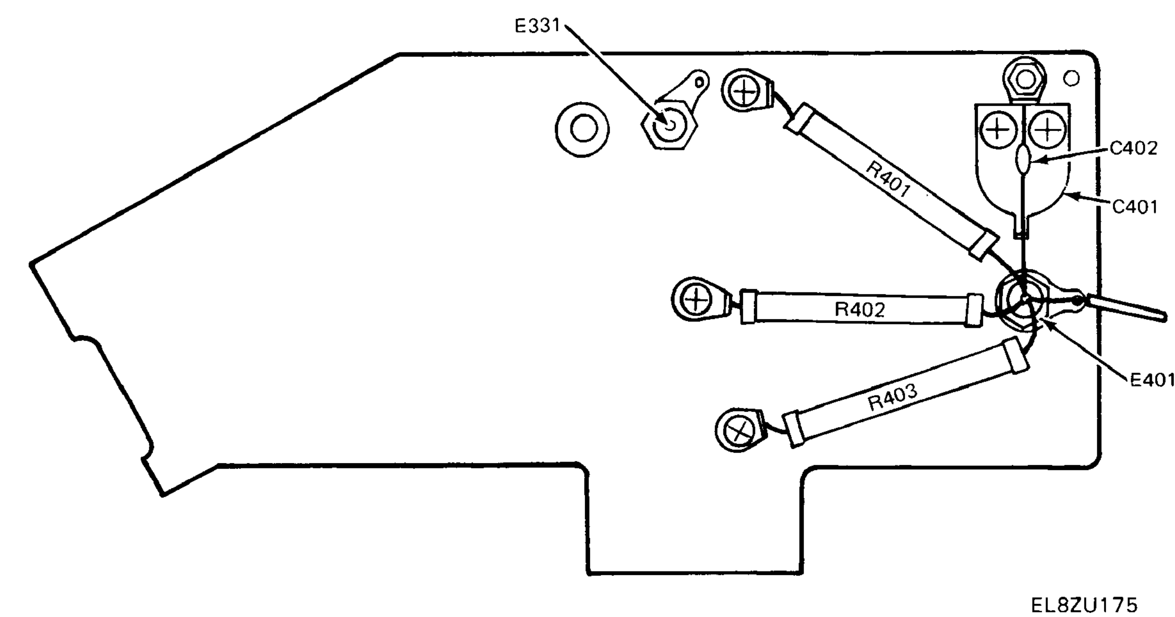


Figure FO-5. Shield Assembly, Left Side,
Parts Locations

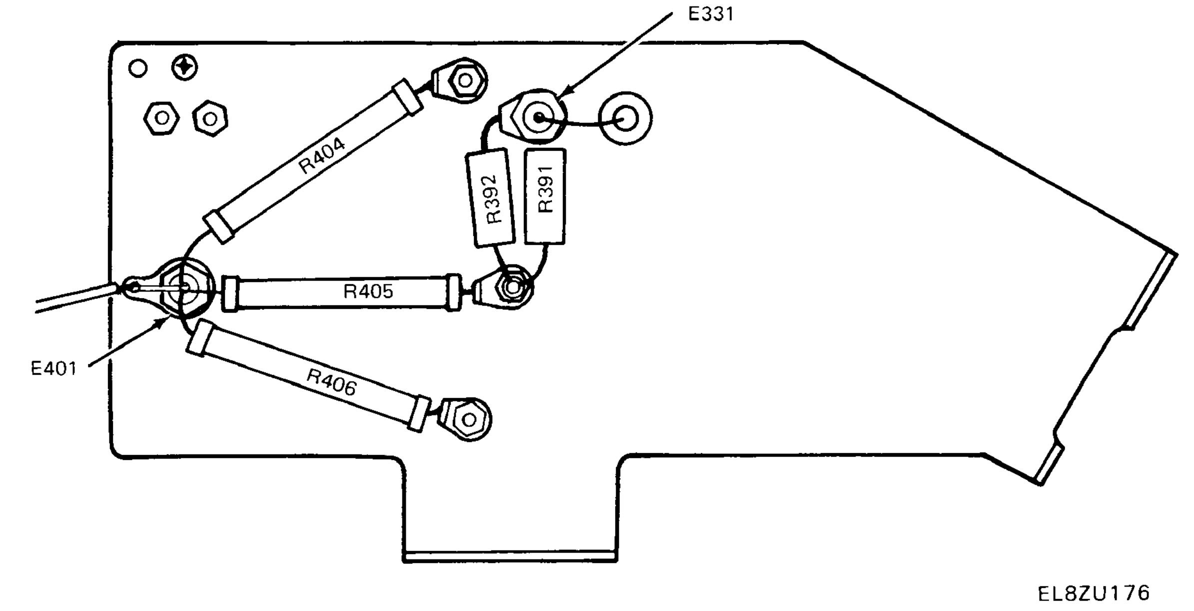


Figure FO-6. Shield Assembly, Right Side, Parts Locations

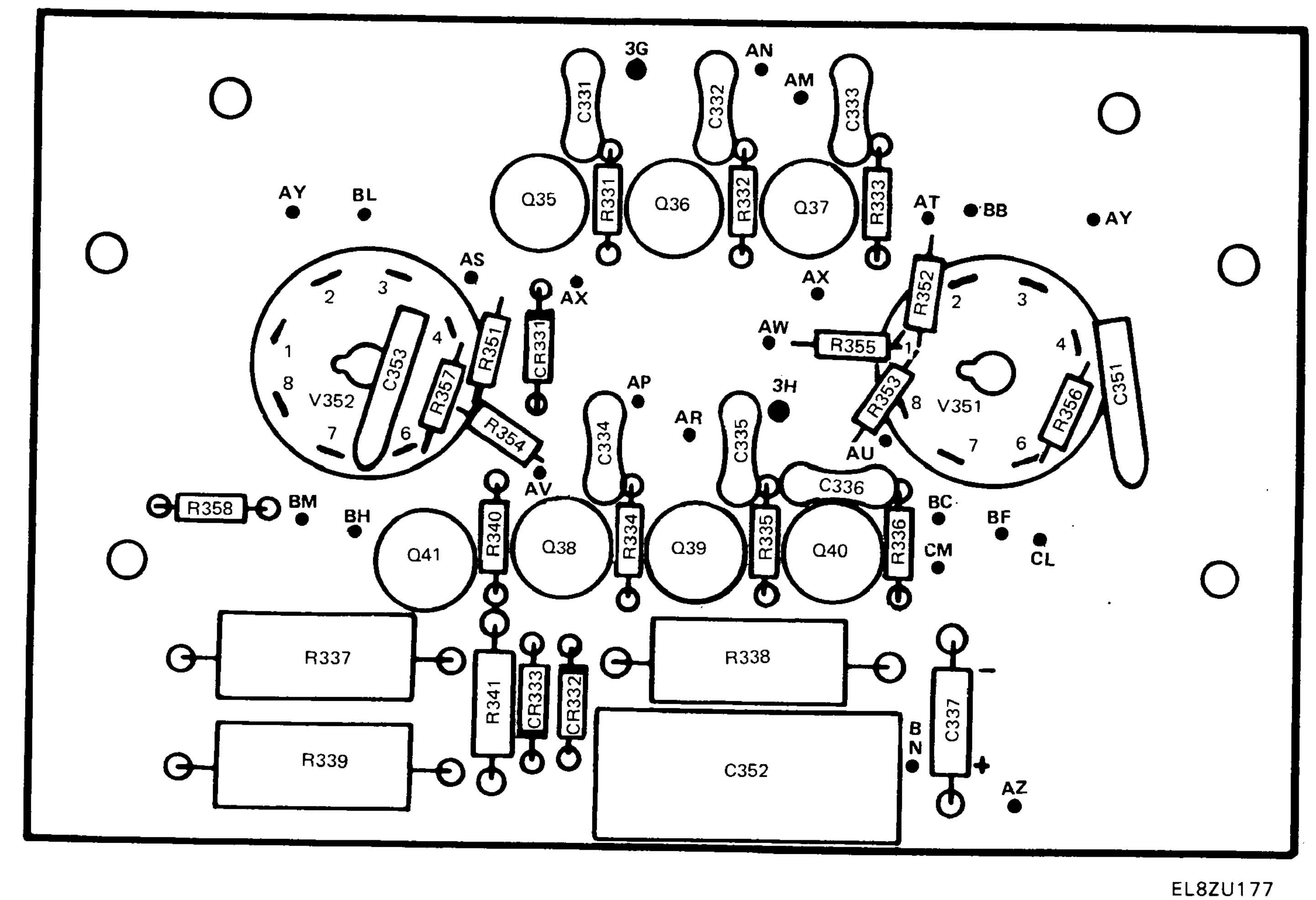
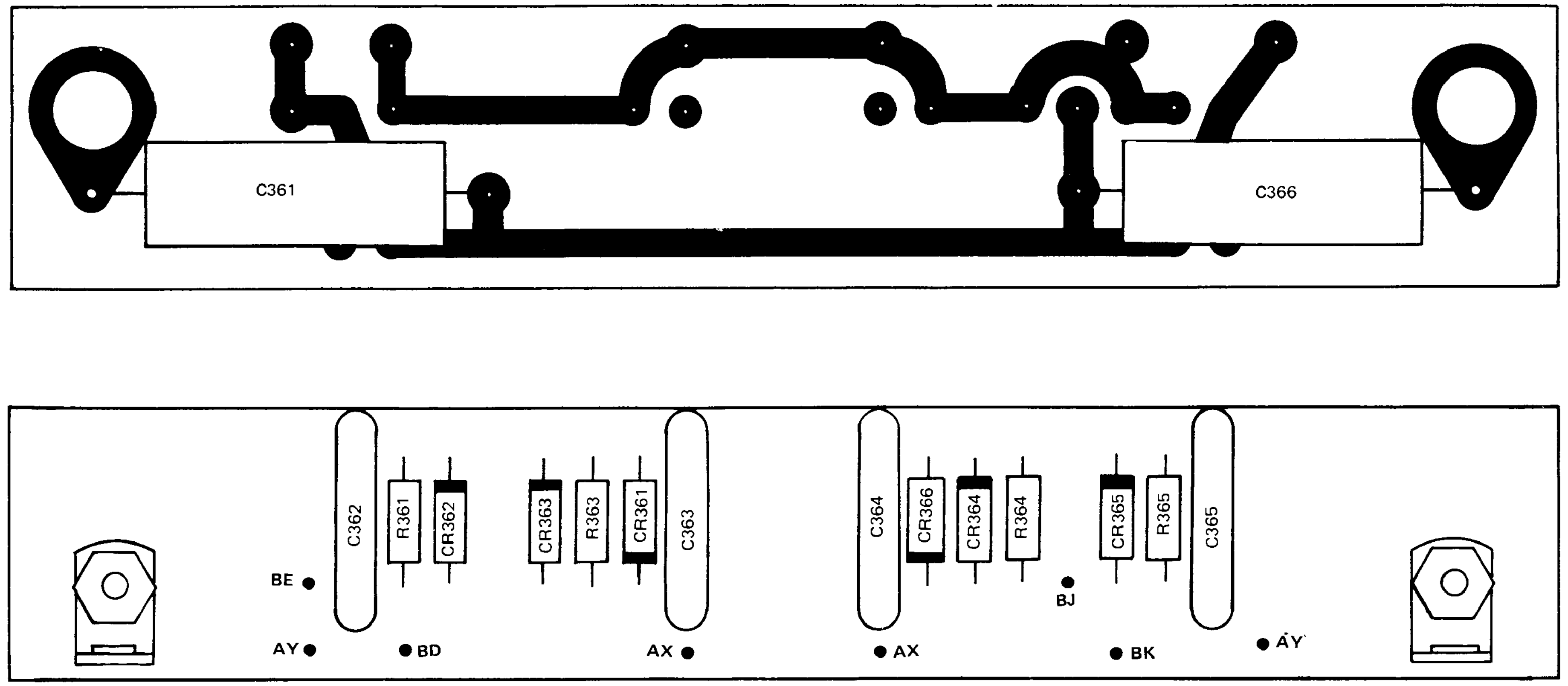
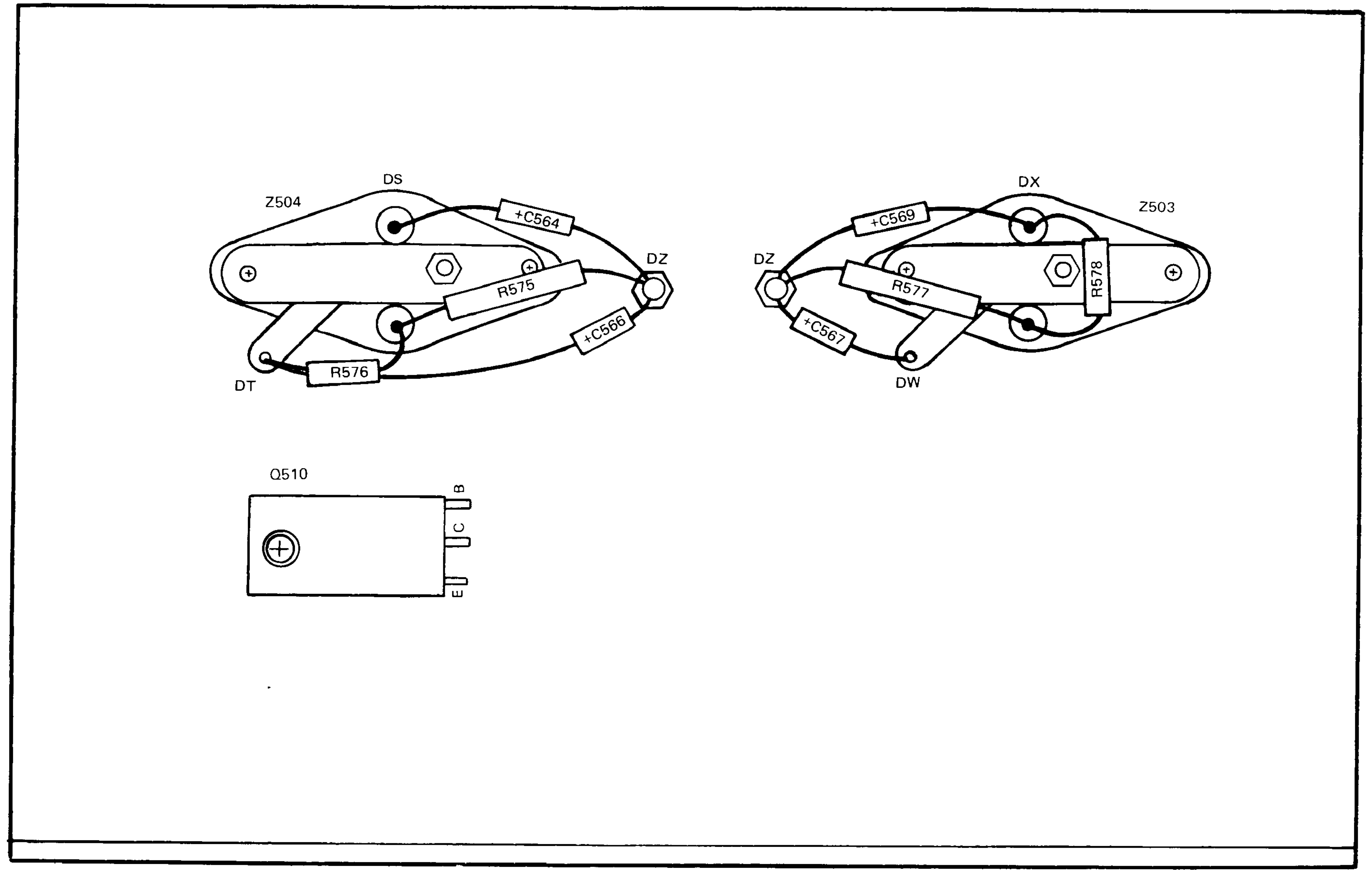


Figure FO-7. Auxiliary Drivers PCB Assembly, Parts and Test Point Locations



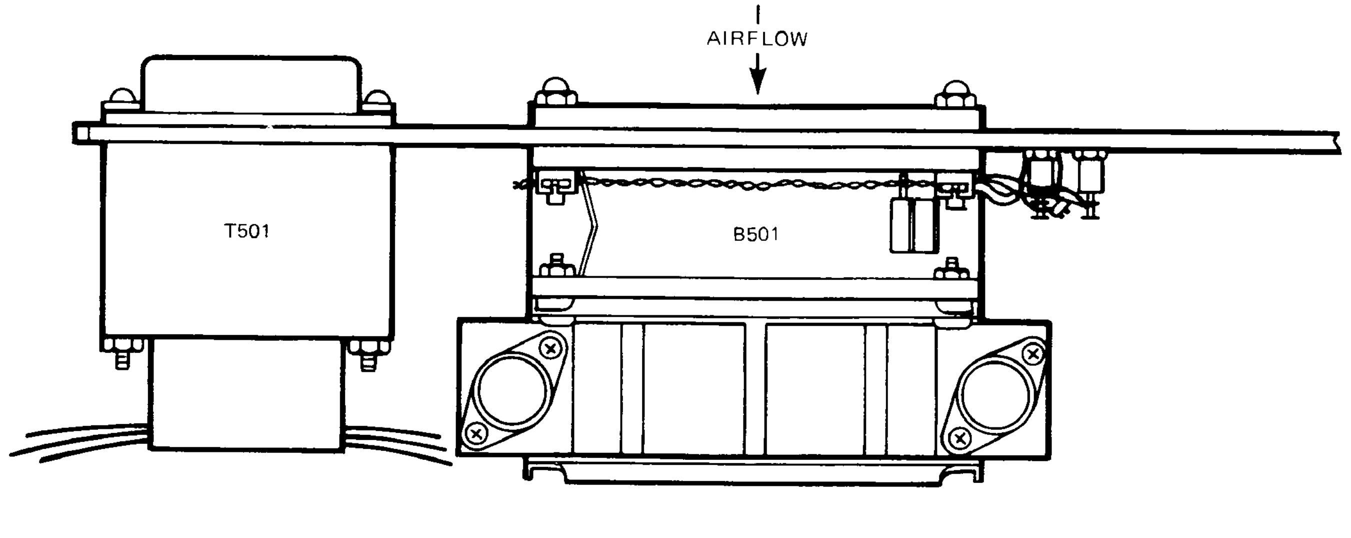
EL8ZU178

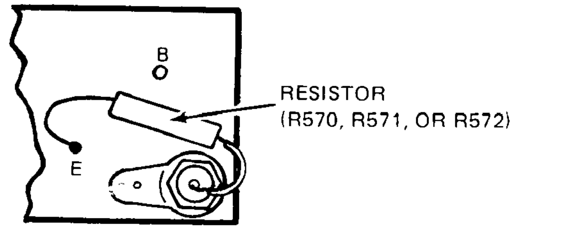
Figure FO-8. Cathode PCB Assembly,
Parts and Test Point Locations

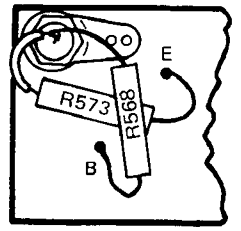


EL8ZU179

Figure FO-9. Heatsink Bracket, Parts Locations







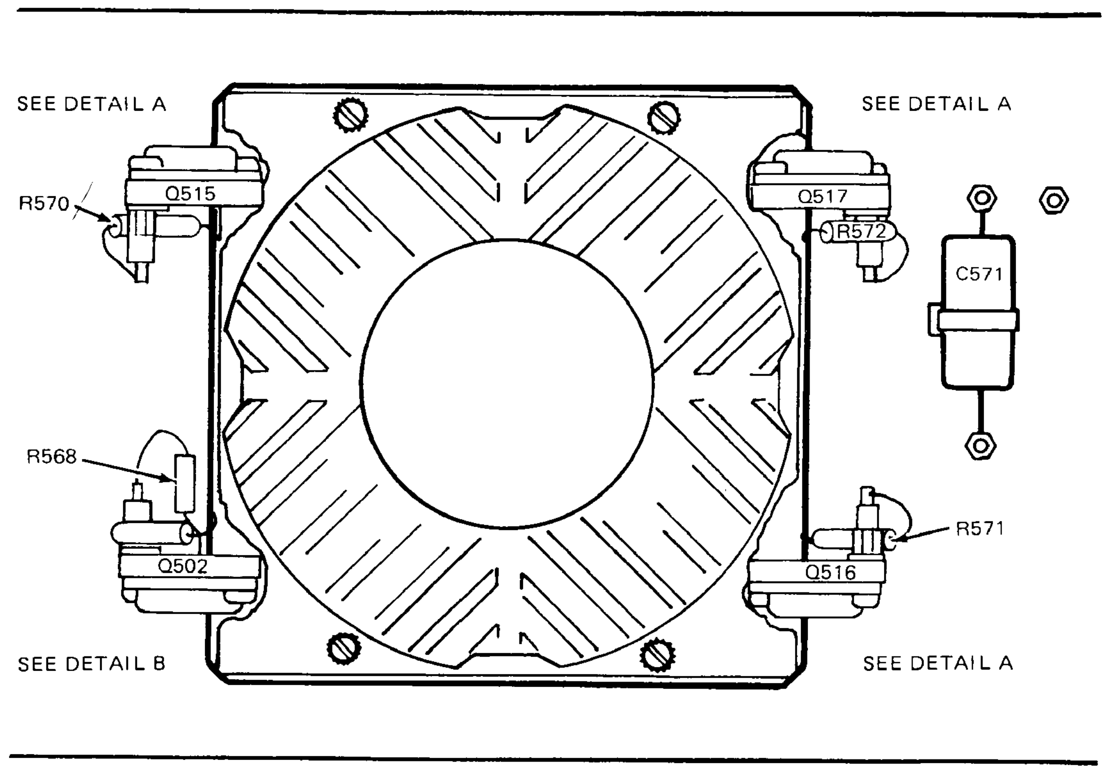


Figure FO-10. Rear Panel Assembly,
Parts Locations

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}. REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

TEAR ALONG PERFORATED LINE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE
SSG I. M. DeSpiritof 999-1776	SSG I. M. DeSpiritof

DA FORM 1 JUL 79 2028-2 PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: DRSEL-ME-MP
Fort Monmouth, New Jersey 07703

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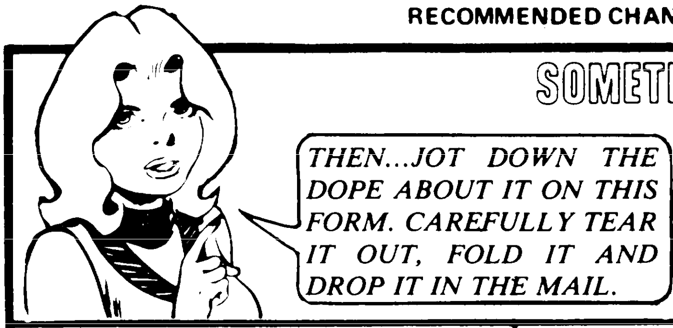

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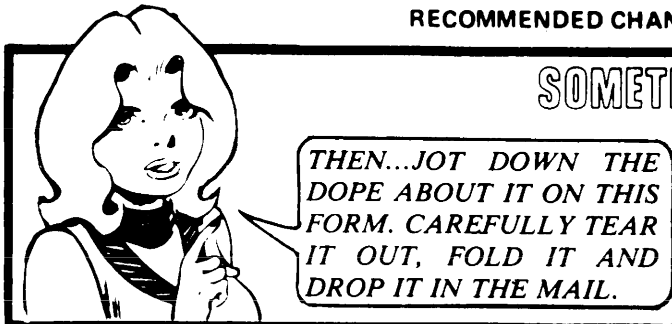

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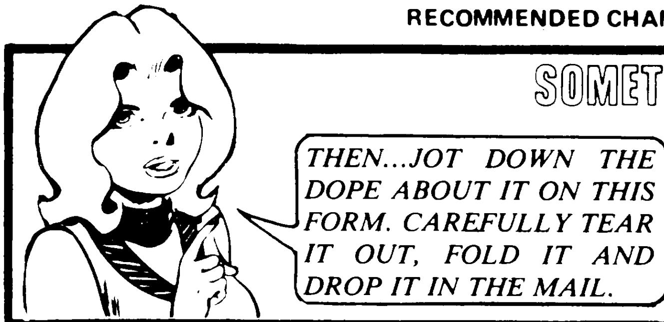

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