(AIR FORCE) T.O. 33A1-8-468-1
(ARMY) TM 11-6625-1711-15
(NAVY) NAVAIR 16-30APM245-1

TECHNICAL MANUAL

OPERATION AND SERVICE/ORGANIZATIONAL, GS AND DEPOT MAINTENANCE MANUAL WITH ILLUSTRATED PARTS BREAKDOWN

SIMULATOR TEST SET AN/APM-245

HAZELTINE CORPORATION

F33657-67-C-0404
F41608-71-D-0973

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Page No.	*Change No.*	*Page No.*	*Change No.*	*Page No.*	*Change No.*
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*A	1				
i - iii	0				
1-0 - 1-3	0				
*1-4	1				
1-5	0				
1-6 Blank	0				
2-1 - 2-5	0				
2-6 Blank	0				
3-1 - 3-6	0				
4-1 - 4-23	0				
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4-25 - 4-30	0				
5-1 - 5-23	0				
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6-1 - 6-4	0				
7-1 - 7-8	0				
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7-11	0				
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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

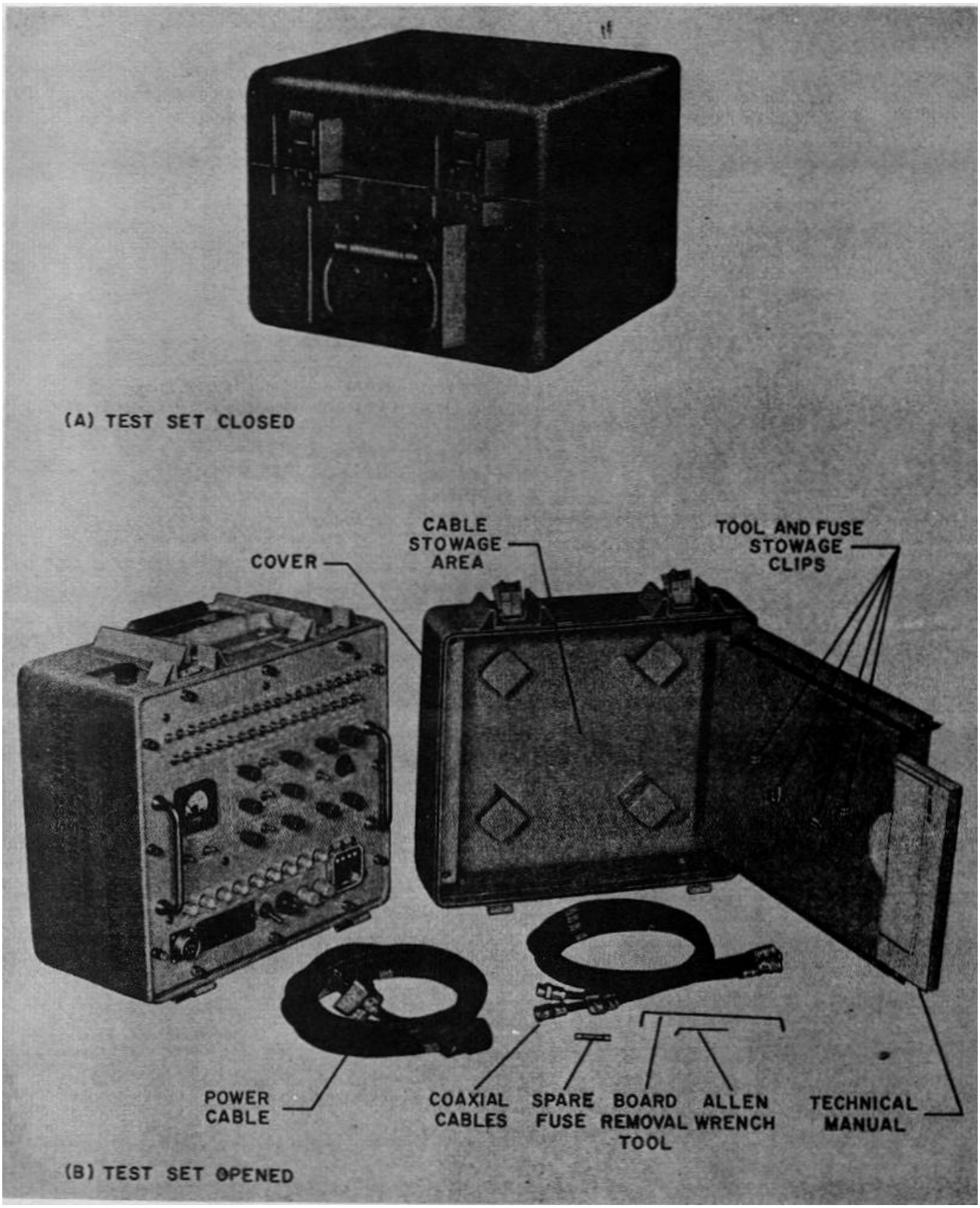


Figure 1-1. Simulator Test Set AN/APM-245

SECTION I

INTRODUCTION AND DESCRIPTION

1-1. SCOPE.

1-2. This manual contains general operation, operators and organizational maintenance, support/intermediate/field and depot overhaul maintenance instructions for Simulator Test Set AN/APM-245 (figure 1-1). It includes instructions for troubleshooting. testing, and aligning the equipment. It also lists materials and test equipment required for maintenance. A functional description of the equipment is included in Section IV; Section V contains a parts list for the equipment.

Note

This technical manual and the equipment covered herein is configured for interservice use and maintainability by direction of the Department of Defense AIMS System Program Office (DOD AIMS SPO). No changes shall be made to the equipment or the technical manual without the approval of the DOD AIMS SPO.

1-3. PURPOSE OF EQUIPMENT.

1-4. Simulator Test Set AN/APM-245, herein referred to as the test set, is a portable facility used for maintenance support of transponder and interrogator units. The test set provides the mode 4 signals necessary for bench testing and adjusting of transponder and interrogator circuits.

1-5. GENERAL DESCRIPTION.

1-6. The test set is contained in a portable aluminum carrying case which permits use of the set on a work bench along with associated test equipment and units to be tested. All controls, switches, connectors, and indicating devices are located on the front panel of the test set. Accessory and power cables, special tools, and the technical manual are located inside the cover of the front panel.

1-7. ELECTRICAL AND MECHANICAL CHARACTERISTICS.

1-8. A list of the electrical and mechanical characteristics is given in figure 1-2, table of specifications.

Nomenclature:	Simulator Test Set AN/APM-245
Weight:	23.5 lbs.
Over-all dimensions:	
Height	10.50 inches
Width	13.00 inches
Length	13.31 inches
Input power requirements:	Single-phase 115 volts, 60 or 400 Hz, 35 watts

Figure 1-2. Table of Specifications (Sheet 1 of 4)

Input signals:	
Mode 4 trigger:	
Amplitude	1.5 to 6.5 volts across an impedance of 91 ± 10% ohms
Polarity	Positive
Pulse width	0.3 to 3.0 microseconds
Rise time	0.10 microsecond maximum
Decay time	1.0 microsecond maximum
Undesired signal	±0.5 volt peak
Rate	0 to 3000 pulses per second
External trigger:	
Amplitude	4 to 40 volts across an impedance of 75 ± 10% ohms
Polarity	Positive or negative
Pulse width	0.5 to 1.0 microsecond
Rise time	0.2 microsecond maximum
Decay time	0.5 microsecond maximum
Rate	10 to 10, 000 pulses per second
Mode 4 video:	Terminated in a resistive load of 91 ± 10 ohms, 20 milliwatts maximum dissipation
Output signals:	
Test word:	
Polarity	Positive
Amplitude	Adjustable from 5.0 to 35 volts across 75 ± 10% ohms resistive
Pulse width	0.5 ± 0.1 microsecond
Rise time	0.1 microsecond maximum
Decay time	0.2 microsecond maximum
Number of pulses	Up to 37 (selectable)
Pulse spacing	Within ±0.1 microsecond of even multiples of 1 microsecond from the leading edge of the first pulse
Rate	10 to 10, 000 pulses per second
Auxiliary pulse:	
Polarity	Positive
Delay	From 0.7 microsecond before first bit to 10 microseconds after first bit

Figure 1-2. Table of Specifications (Sheet 2 of 4)

Output signals: (cont)	
Auxiliary pulse:	
Amplitude (at TEST WORD connector)	Same as test word pulses and controlled by TEST WORD AM. control
Amplitude (at AUX PULSE connector)	Adjustable from 5 to 35 volts across 75 ± 10% ohms resistive
Pulse width	0.5 ± 0.1 microsecond
Rise time	0.1 microsecond maximum
Decay time	0.2 microsecond maximum
Rate	10 to 10.000 pulses per second
Disparity pulse:	
Polarity	Positive
Amplitude	4 ± 1 volts across 91 ± 10% ohms resistive
Pulse width	0.3 to 1.0 microsecond
Rise time	0.15 microsecond maximum
Decay time	0.5 microsecond maximum
Delay position 1	Continuously variable from 8 to 76 microseconds
Delay position 2	Continuously variable from 194 to 276 microseconds
Rate	Same as mode 4 enable trigger
Mode 4 reply:	
Polarity	Positive
Amplitude	Adjustable from 2 to 35 volts across 91 ± 10% ohms resistive
Pulse width	0.3 to 0.7 microsecond
Rise time	0.1 microsecond maximum
Decay time	0.25 microsecond maximum
Pulse train position	Adjustable from 200 to 276 microseconds as measured from the first pulse position of the test word

Figure 1-2. Table of Specifications (Sheet 3 of 4)

Output signals: (cont)	
Mode 4 reply:	
Rate	Same as mode 4 trigger
Pulse spacing	3 pulses with a 1.8 ± 0.2-microsecond spacing between leading edges of consecutive pulses
Marker output:	1.0 ± 0.01 microsecond markers from a stable oscillator
Waveform	1 MHz square wave
Amplitude	Adjustable from 0 to 10 volts across 510 ± 10% ohms resistive
Trigger output:	
Polarity	Positive
Amplitude	8 ± 2 volts across 75 ohms resistive
Pulse width	0.3 microsecond minimum, 25 microseconds maximum
Rise time	0.2 microsecond maximum
Decay time	0.5 microsecond maximum
Rate	As determined by setting of INT PRF FREQ ADJ control when PRF SEL switch is in the INT-L (10 to 100 Hz), INT-MED (100 to 1000 Hz), or INT-H (1 KHz to 10 KHz) As determined by external trigger rate when PRF SEL switch is in the EXT position. The time jitter between the external trigger and the trigger output is 1.1 microseconds maximum.

Figure 1-2. Table of Specifications (Sheet 4 of 4)

1-9. Equipment Supplied

1-10. Items Comprising an Operable Equipment

FSN	QTY	Nomenclature, Part No., and Mfr Code	Fig. No.
6625-869-4015		Test Set, Simulator AN/APM-245 which includes:	1-1
	1	Cable Assembly, Power: 1177401; 80249	1-1
	4	Cable Assembly, Radio Frequency: 117743; 80249	1-1
	1	Extractor, Circuit Card: 880007-3; 80249	1-1
	1	Key, Socket Head, Screw: 050F4; 70276	1-1
		NOTE **The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc.**	

1-11. Indexes of Publications

1-12.

DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-13.

DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-14. Forms and Records

1-15.

Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-1750.

1-16.

Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58/NAVSUP PUB 378/AFR 71-4/MCO P4030.29, and DSAR 4145.8.

1-17.

Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

1-18. Reporting of Errors

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-C Fort Monmouth, NJ 07703.

Figure 1-3. Equipment Supplied. DELETED.

SECTION II

PREPARATION FOR USE

2-1. SCOPE.

2-2. This section contains procedures for unpacking, inspecting, and siting the test set. Also included in the section are information concerning power considerations and pre-operational checkout procedures.

2-3. UNPACKING.

2-4. No special instructions are required to remove the test set from its shipping container, other than the usual precautions for unpacking delicate electronic equipment. After the test set is unpacked, a visual inspection should be made to ensure that no shipping damage has occurred such as broken switches or controls, and loose panel connectors. A check should be made for completeness of equipment using the enclosed packing list and the information contained in figure 1-3.

2-5. SITING.

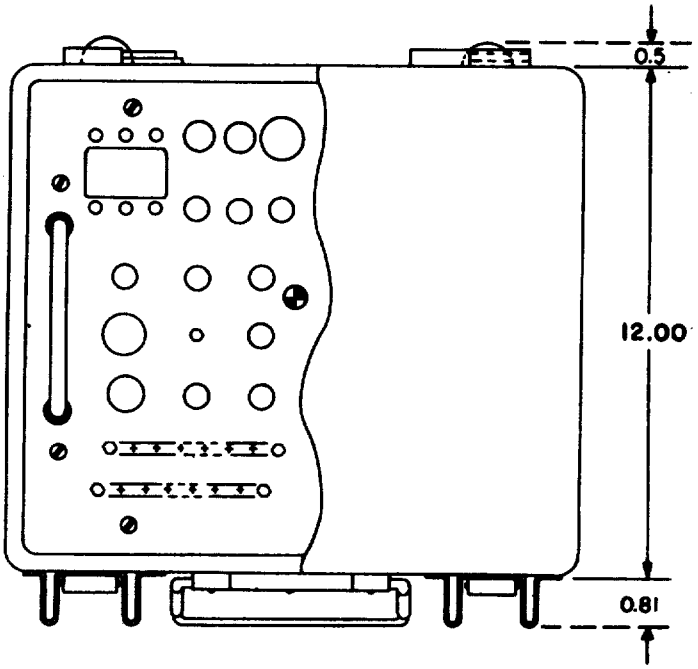
2-6. The test set is designed for use on a work bench, together with transponder and/or interrogator units and other associated simulators and test equipment. Space requirements can be determined from the table of specifications, figure 1-2, and the outline dimensional diagram, figure 2-1. Arrange the test set and other associated equipment to permit ease of access to controls and connectors. Since all of the controls, indicators, and connectors are accessible from the front panel, no special clearance arrangements are required at the rear or sides of the equipment case.

2-7. CONNECTIONS.

WARNING

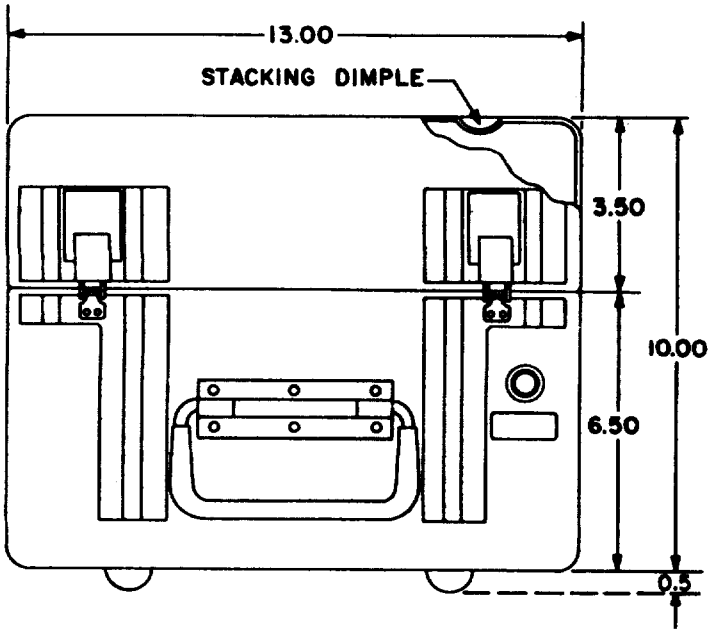
Exercise caution when working with the 115-volt power source. Serious injury or loss of life may result from contact with this voltage. Thus, make sure that the grounding blade mentioned in paragraph 2-8 below is properly seated in the power receptacle. If the grounding blade does not mate with an available two-wire receptacle at the test site, physically connect a grounding wire (terminated in a proper electrical ground) to the grounding blade.

2-8. A three-prong, grounded safety connector power cable, W1, is provided for connections to the proper 115-volt, 60- or 400-Hz power receptacle available at the site where the test set is to be used. The ground makes contact through a spring-loaded blade which must be inserted into the receptacle as part of the power connector to ensure proper grounding of the equipment. A list of input and output signal connectors on the front panel of the test set is given in figure 2-2. Figure 2-3 shows the external connections for the test set. Refer to figure 3-2 for the actual locations of these connectors on the test set.



NOTE:

1. ALL DIMENSIONS ARE IN INCHES AND ARE NOMINAL, UNLESS OTHERWISE SPECIFIED
2. ⊕ DENOTES CENTER OF GRAVITY.
3. WEIGHT OF UNIT- 26 LBS.
4. ESTIMATED POWER DISSIPATED WITHIN UNIT-35 WATTS.



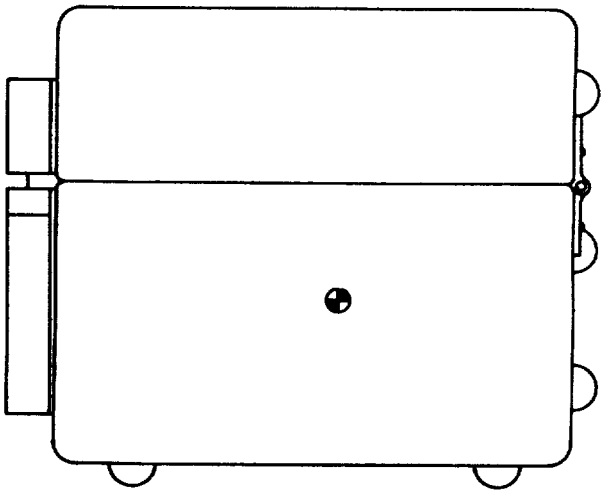


Figure 2-1. Outline Dimensional Diagram

CONNECTOR	REFERENCE DESIGNATION	FUNCTION
MODE 4 input and output connector	J1	Provides additional inputs for mode 4 trigger and video pulses and additional outputs for disparity and reply pulses.
MODE 4 connectors:		
VIDEO connector	J2	Provides input for mode 4 video pulses.
DISPARITY connector	J3	Provides output for mode 4 disparity pulse.
REPLY connector	J4	Provides output for mode 4 reply pulse train.
MKR connector	J5	Provides output for marker pulses.
AUX PULSE connector	J6	Provides output for auxiliary pulses.
TEST WORD connector	J7	Provides output for test word pulse train.
MODE 4 TRIG. connector	J8	Provides input for mode 4 trigger pulses.
EXT TRIG. connector	J9	Provides input for externally generated trigger pulses.
INT TRIG. connector	J10	Provides output for internally generated trigger pulses.
POWER connector	J11	Provides input for 115-volt, 60- or 400-Hz primary power.

Figure 2-2. Electrical Connectors

2-9. PRE-OPERATIONAL CHECKS.

Note

Service personnel should be generally familiar with the locations and functions of all controls and indicators, as referenced in figure 3-1, before attempting to perform the pre-operational checks.

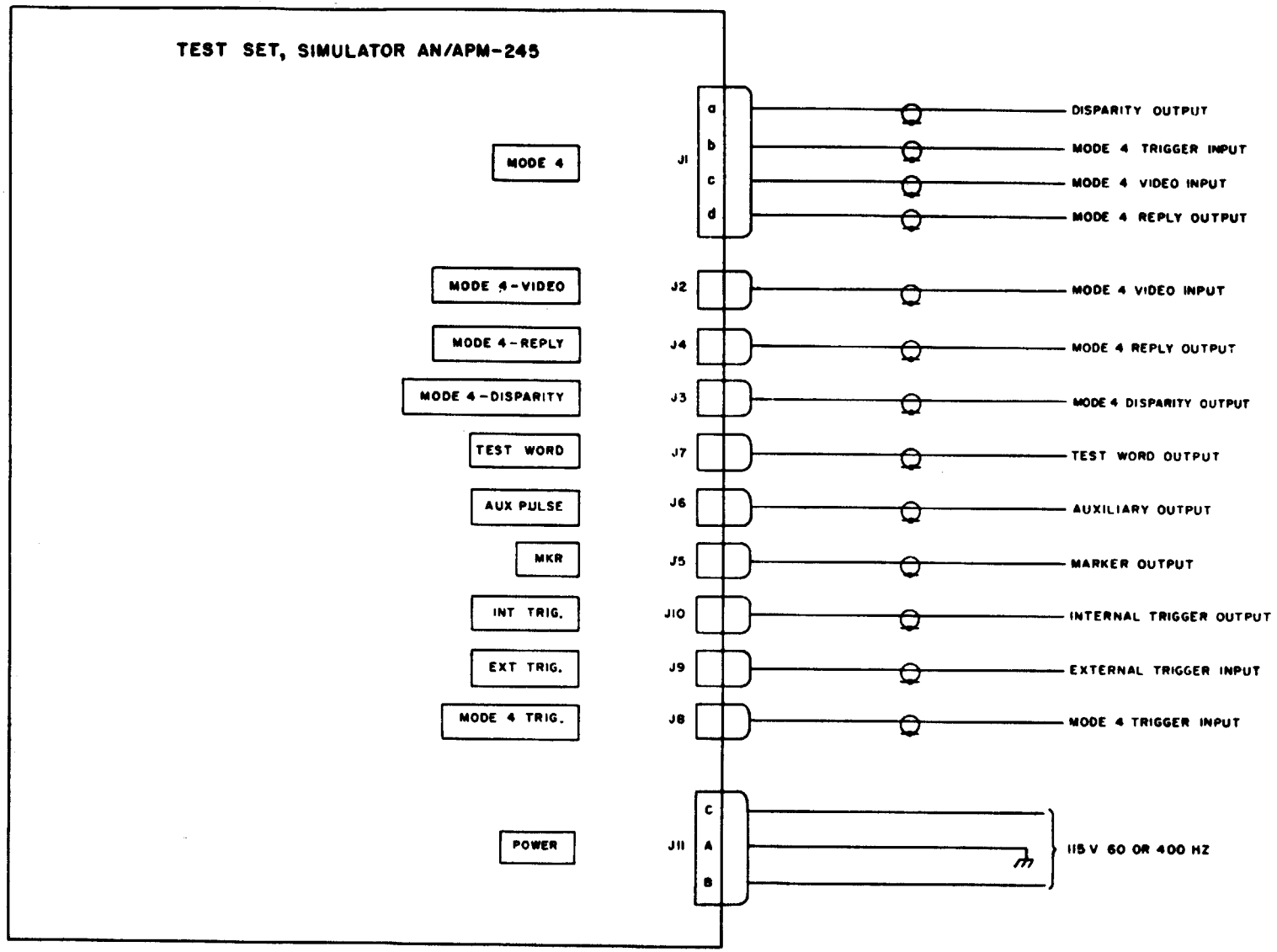


Figure 2-3. Test Set External Connections

2-10. Prior to operating the test set with other associated test equipment, the following pre-operational checks should be made:

a. Check that the test set is properly grounded.
b. Place the ON-OFF power switch at OFF.
c. Place all 37 TEST WORD switches at off (down).
d. Place AUXILIARY PULSE/ON-OFF switch at OFF.
e. Place DISPARITY DL-1/OFF/DL-2 switch at OFF.
f. Place DISPARITY DL-1 control fully counterclockwise.
g. Place DISPARITY DL-2 control fully counterclockwise.
h. Place AUXILIARY PULSE-AM control fully counterclockwise.
i. Place MODE 4 REPLY/ON-OFF switch at OFF.
j. Place MODE 4 REPLY AM control fully counterclockwise.
k. Place GO/OFF/NO-GO switch at OFF.
l. Place TEST WORD AM control fully counterclockwise.
m. Place MKR AM control fully counterclockwise.
n. Place METER-FUNCTION switch at INT/EXT.
o. Place PRF SEL switch at INT-MED.
p. Connect power cable between a 115-volt, 60- or 400-Hz power source and connector J11 of test set.
q. Place ON-OFF power switch at ON and observe that PWR indicator lights.
r. Permit test set to warm up and observe that fuses do not blow (PWR indicator remains lighted).
s. Adjust INT PRF FREQ ADJ control and observe that METER indicates pulse repetition rate.
t. Place ON-OFF power switch at OFF.

SECTION III

OPERATING INSTRUCTIONS

3-1. INTRODUCTION.

3-2. This section contains information and procedures required for personnel to operate the test set. Included in this section are a list of controls and indicators, starting and stopping instructions, and operating procedures.

3-3. CONTROLS AND INDICATORS.

3-4. A list of controls and indicators on the front panel of the test set is contained in figure 3-1. The information in figure 3-1 is keyed to figure 3-2, which illustrates the location of these controls and indicators on the front panel of the unit. Figure 3-1 also includes the reference designation and brief description of the function performed by each control or indicator.

INDEX NUMBER (Fig. 3-2)	CONTROL OR INDICATOR	REF. DESIG.	FUNCTION
1	METER-SCALE switch	S45	Selects multiplying factor, X1 or X10, to be applied to indication on PRF KHz METER.
2	METER-FUNCTION switch	S44	Selects trigger pulse source to be observed on meter as follows: When positioned at INT/EXT, repetition rate of either internally or externally generated trigger pulse is observed on PRF KHz METER. When positioned at M4 TRIG., repetition rate of mode 4 trigger pulse is observed on PRF KHz METER.
	DISPARITY controls:		
3	DL-1 control	R6	Controls delay of disparity pulse at MODE 4-DISPARITY output connector from 8 to 76 microseconds when DL-1/OFF/DL-2 switch is at DL-1.

Figure 3-1. Operating Controls and Indicators (Sheet 1 of 4)

INDEX NUMBER (Fig. 3-2)	CONTROL OR INDICATOR	REF. DESIG.	FUNCTION
4	DL-1/OFF/DL-2 switch	S43	Selects either of two delay ranges for disparity pulse and controls disparity pulse in the following manner: When positioned at DL-1, delay range of 8 to 76 microseconds from start of first bit position of test word is selected. When positioned at OFF, disparity pulse is removed from test word pulse train. When positioned at DL-2, delay range of 194 to 270 microseconds from start of first bit position of test word is selected.
5	DL-2 control	R7	Controls delay of disparity pulse at MODE 4-DISPARITY output connector from 194 to 270 microseconds when DL-1/OFF/DL-2 switch is at DL-2.
6	PRF KHz METER	M1	Indicates pulse repetition rate of trigger source selected by METER-FUNCTION switch, with multiplying factor selected by METER-SCALE switch.
	AUXILIARY PULSE controls:		
7	AM. control	R5	Controls amplitude of auxiliary pulse at AUX PULSE output connector.
8	ON-OFF switch	S42	Controls addition of auxiliary pulse to test word pulse train at TEST WORD output connector.
9	DELAY control	R4	Controls delay of auxiliary pulse from 0.7 microsecond before first bit position in test word to 10 microseconds after first bit position in test word.
	MODE 4 REPLY controls:		
10	AM. control	R3	Controls amplitude of mode 4 reply at MODE 4 REPLY output connector.

Figure 3-1. Operating Controls and Indicators (Sheet 2 of 4)

INDEX NUMBER (Fig. 3-2)	CONTROL OR INDICATOR	REF. DESIG.	FUNCTION
11	ON-OFF switch	S39	Controls application of mode 4 reply at MODE 4 REPLY output connector.
12	DELAY control	R2	Controls delay of mode 4 reply pulse train over a range of 200 to 276 microseconds from start of first bit position of test word.
13	TEST WORD switches 1 through 37	S1 through S37	Selects each of the 37 possible pulses contained in the test word pulse train. The pulses in the test word correspond in pulse position to the switch number.
14	INT PRF FREQ ADJ control	R1	Controls repetition rate of internally generated trigger pulses, when PRF SEL switch is positioned at INT-L, INT-MED, or INT-H. **Note** When adjusting the prf with the PRF SEL switch in the INT-H position, always start with the INT PRF FREQ ADJ control in the maximum counter-clockwise position and observe the PRF KHz METER. With this procedure, the non-linear region at the clockwise end of the INT PRF FREQ ADJ will be avoided.
15	PRF SEL switch	S38	Selects test word trigger pulse repetition rate as follows: When positioned at EXT, repetition rate of test word is determined by external trigger rate applied at EXT TRIG. Input connector. When positioned at INT-L, INT-MED, or INT-H, repetition rate of test word is controlled by INT PRF FREQ ADJ control.
16	GO/OFF/NO-GO switch	S41	Selects test set mode operation in the following manner: When positioned at GO or NO-GO, a given number (internally selectable from 2 to 10) of test words are generated for the go or no-go mode, respectively, of operation.

Figure 3-1. Operating Controls and Indicators (Sheet 3 of 4)

INDEX NUMBER (Fig. 3-2)	CONTROL OR INDICATOR	REF. DESIG.	FUNCTION
16 (Cont)			When positioned at OFF, test words are continuously generated.
17	GO/NO-GO pushbutton	S40	Activates either go or no-go modes as selected by GO/OFF/NO-GO switch.
18	TEST WORD AM control	R9	Controls amplitude of test word at TEST WORD output connector.
19	MKR AM control	R9	Controls amplitude of marker pulse at MKR output connector.
20	PWR indicator	DS1	Indicates 115 volts, 60- or 400-Hz power has been applied to test set.
21	ON-OFF power switch	S46	Controls application of 115 volts, 60- or 400-Hz primary power to test set.

Figure 3-1. Operating Controls and Indicators (Sheet 4 of 4)

3-5. STARTING AND STOPPING.

3-6. STARTING THE TEST SET. No special instructions are required to start (energize) the test set other than applying primary power. This is accomplished by performing the following steps:

CAUTION

Ensure that MODE 4 REPLY AM control is set fully clockwise before applying power. Otherwise, the equipment under test may be damaged.

a. Connect power cable to POWER input connector and to a primary 115-volt, 60- or 400-Hz power source. (Refer to paragraph 2-8.)

b. Set ON-OFF power switch at ON and observe that PWR indicator is lighted.

3-7. STOPPING THE TEST SET. Stopping (de-energizing) the test set is accomplished by placing the ON-OFF power switch at OFF and observing that the PWR indicator is not lighted. However, the test set can remain energized and test word outputs inhibited by performing steps a and b or step c.

a. Disconnect external trigger source from EXT TRIG. input connector.

b. Set PRF SEL switch at EXT.

c. Set GO/OFF/NO-GO switch at either GO or NO-GO.

3-8. OPERATING PROCEDURES.

3-9. TEST WORD. To obtain a test word output at the TEST WORD output connector, perform the following steps:

a. Determine whether internal or external trigger source is to be used. If internal trigger is selected, perform steps b through h. If external trigger is selected, proceed to step i.

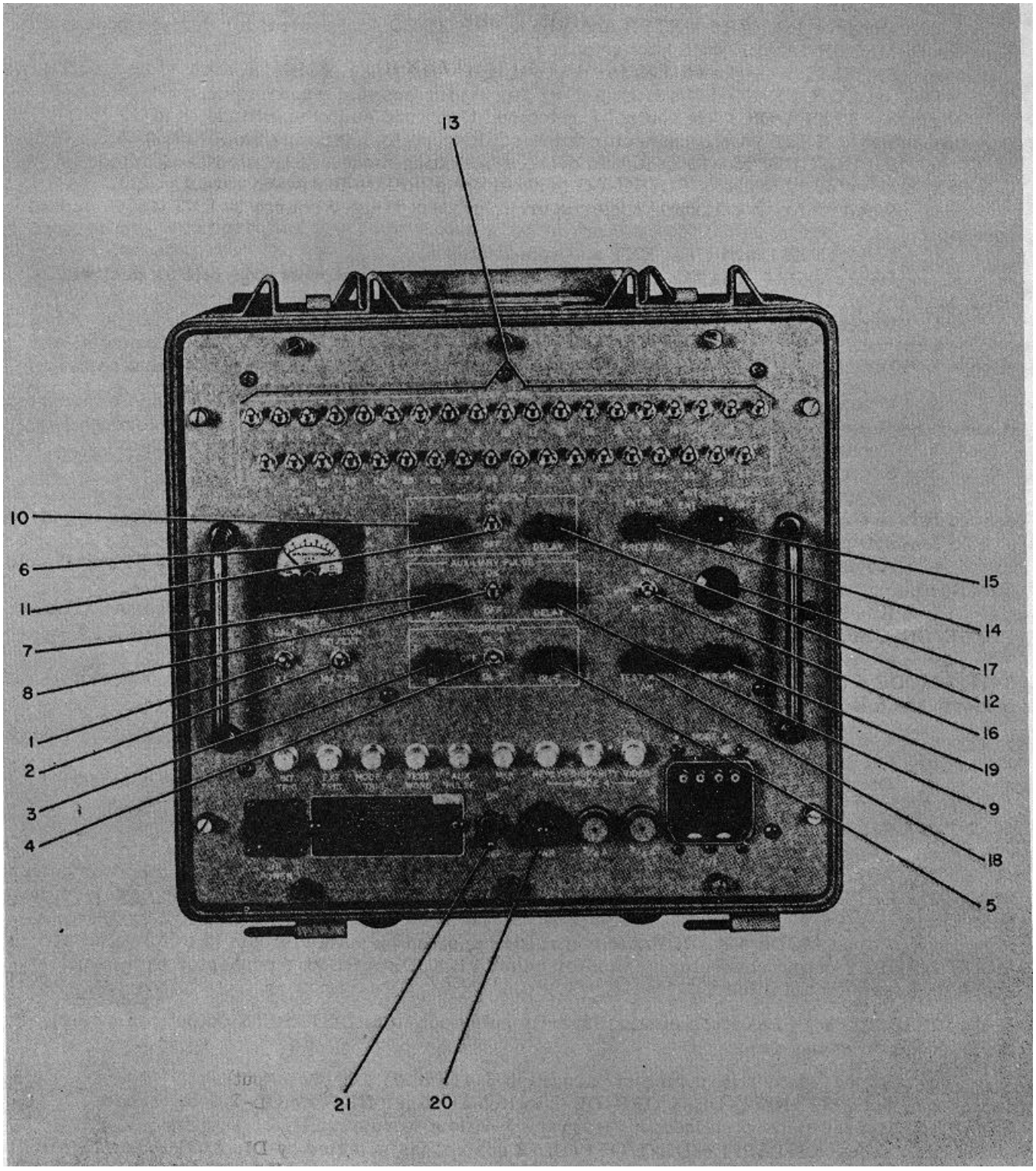


Figure 3-2. Test Set, Front Panel Operating Controls and Indicators

b. Set PRF SEL switch at desired INT-trigger range.

c. Set METER-FUNCTION switch at INT/EXT.

d. Observe PRF KHz METER and adjust PRF FREQ ADJ control for desired repetition rate, using METER-SCALE switch as required.

e. Set TEST WORD switches for desired test word pulse positions.

f. Set GO/OFF/NO-GO switch to OFF for continuous test word output.

g. Set TEST WORD AM control for desired test word output amplitude (5 to 35 volts). (Monitor output at TEST WORD connector with oscilloscope to determine amplitude.)

h. Set GO/OFF/NO-GO switch to desired operating mode. If GO or NO-GO mode is selected, momentarily depress GO/NO-GO pushbutton to initiate test word output.

i. When using an external trigger source, connect trigger source to EXT TRIG. input connector.

j. Set PRF SEL switch at EXT and repeat step c.

k. Observe PRF KHz METER and adjust external trigger repetition rate as desired, using METER-SCALE switch as required.

l. Repeat steps e through h.

3-10. AUXILIARY PULSE. To obtain auxiliary pulse output, perform the following steps:

a. If auxiliary pulse is desired in test word output pulse train, perform steps b through d If auxiliary pulse is desired only at AUX PULSE output connector, perform steps b through f.

b. Repeat steps contained in paragraph 3-9 for test word output.

c. Set AUXILIARY PULSE/ON-OFF switch at ON.

d. Adjust AUXILIARY PULSE/DELAY control for desired amount of delay (0.7 microsecond before first test word bit to 10 microseconds after first test word bit). (Monitor output at TEST WORD connector on oscilloscope to determine delay.)

e. Adjust AUXILIARY PULSE/AM control to desired output amplitude (5 to 35 volts). (Monitor output at AUX PULSE connector on oscilloscope to determine amplitude.)

f. If only auxiliary pulse is desired at the AUX PULSE output connector, set AUXILIARY PULSE/ON-OFF switch at OFF.

3-11. MODE 4 REPLY. To obtain the mode 4 reply output at the MODE 4 output connector, perform the following steps:

a. Connect mode 4 trigger source at MODE 4 TRIG input connector.

b. Set METER-FUNCTION switch at M4 TRIG.

c. Observe PRF =KHz METER and adjust mode 4 trigger repetition rate as desired (maximum 3000 pps), using MSTER-SCALE switch as required.

d. Set MODE 4 REPLY/ON-OFF switch at ON.

e. Repeat steps contained in paragraph 3-9 (test word output).

f. Adjust MODE 4 REPLY/DELAY control for desired amount of delay. (Monitor output at MODE 4 REPLY connector and input to TEST WORD connector with oscilloscope to determine delay.)

g. Adjust MODE 4 REPLY/AM control for desired output amplitude (2 to 35 volts) at MODE 4/REPLY output connector. (Monitor output at MODE 4 REPLY connector with oscilloscope to determine amplitude.)

3-12. DISPARITY PULSE. To obtain disparity pulse output at DISPARITY output connector, perform the following steps:

a. Repeat steps a through c of paragraph 3-11 (mode 4 reply output).

b. Set DISPARITY/DL-1/OFF/DL-2 switch at either DL-1 or DL-2 delay ranges.

c. Repeat steps contained in paragraph 3-9 (test word output).

d. Adjust DISPARITY/DL-1/OFF/DL-2 control (as selected by DL-1/OFF/DL-2 switch) for desired output delay at the MODE 4/DISPARITY output connector. (Monitor output at TEST WORD and MODE 4-DISPARITY connections with oscilloscope to determine delay.)

3-13. MARKER PULSE. To adjust the amplitude of the marker output pulses at the MKR output connector, adjust MKR AM. control for desired output (0 to 10 volts). (Monitor output at MKR connector with oscilloscope to determine amplitude.)

SECTION IV

MAINTENANCE INSTRUCTIONS

4-1. SCOPE.

4-2. This section contains a functional description of the test set circuitry, calibration check procedures, troubleshooting procedures, schematic diagrams, and other maintenance data for the equipment.

WARNING

Exercise caution when performing the calibration check and troubleshooting procedures. Serious injury or loss of life may result from contact with the 115-volt, a-c primary power input to the test set.

4-3. FUNCTIONAL DESCRIPTION.

4-4. GENERAL. The test set generates the necessary video signals and pulse trains required to test and adjust mode 4 transponder and interrogator circuits. Essentially, there are two main test set logic circuit groups required to generate the various signals: the test word generation circuits and the mode 4 reply generation circuits. These logic circuit groups supply the signals which enable personnel to check out mode 4 operation of transponder and interrogator units. Figures 4-1 and 4-2 are over-all functional logic diagrams of the test word generation and mode 4 reply generation circuits, respectively. Refer to the schematic diagrams, figures 4-5 through 4-8, for detailed circuit configurations.

4-5. TEST WORD GENERATION CIRCUITS. Figure 4-1, sheet 1, illustrates the logic circuits which generate the test word pulse train and auxiliary pulse, and which control the go/no modes of operation. As shown in the figure, the 2-MHz crystal oscillator output is binary-divided by flip-flop Q; the resulting 1-MHz pulse train output from flip-flop Q is then used to perform the basic timing function in generating test words. The 1-MHz train is also applied through a driver, where the pulse train amplitude is adjustable, to the MKR output connector on the front panel. Timing signals, hereafter referred to as clock "1" and clock "0", are pulses spaced 1 microsecond apart, with clock "0" delayed from clock "1" by 0.5 microsecond.

4-6. In generating test words, either internal or external triggers are used to control the test word repetition rate. These triggers have a repetition rate range of 10 to 10, 000 pulses-per-second, with the internal trigger repetition rate adjustable by means of the FREQ ADJ control on the front panel. Assuming internal triggers are selected, the PRF SEL switch allows a logic "one" (+4.5V) to gate pulses from the prf generator through AND gate 2. The logic "one" applied to AND gate 2 also inhibits AND gate 1, thereby ensuring that external triggers do not drive the logic. Input triggers drive single-shot multivibrators SS1 which provides 0.5-microsecond pulses to AND gates 3 and 10. With the METER-FUNCTION switch positioned at INT/EXT, a logic "zero" (ground) from the switch gates the trigger pulses via AND gate 10 and OR gate 4 to the PRF KHz METER, thereby indicating the repetition rate of the trigger. When external triggers are selected, the PRF SEL switch applies a logic "zero" to AND gate 2, inhibiting it and gating the external triggers via AND gate 1 to drive SS1. The repetition rate of the external trigger pulse train is also indicated on the meter.

4-7. Assuming also that either the go or no-go mode is selected, a logic "zero" from the GO/OFF/NO-GO switch is routed via OR gates 2 and 3 to trigger SS2. This causes a 0.5-microsecond pulse from the "0" output of SS2 to reset control flip-flop A and mode program counter flip-flops K through N. To start the test word generation, the GO-NO/GO pushbutton is momentarily depressed, which sets flip-flop A. A logic "one" at the true output (1 side), in coincidence with the trigger from SS1 gates the clock "0" signal through AND gate 3 and sets flip-flop B.

Logic "one" at the true output of flip-flop B gates clock "1" through AND gate 4 which, in turn, sets flip-flop C. The logic "zero" at the complement output (0 side) of flip-flop C is gated through AND gate 12 as a clock signal which drives the mode (go/no-go) program counter to one. This indicates the first test word is being generated.

4-8. Logic "one" at the true output of flip-flop B also enables the trigger gates at flip-flop D which permit the clock "1" pulses to trigger the flip-flop. The 1-microsecond clock "1" pulses are binary-divided by the flip-flop, and two-microsecond clock pulses are provided for test word counter flip-flops E through J. For each of the possible 37 bits that may be contained in the test word there is an associated front panel test word switch. Each switch is numbered, and when placed in the numbered position. a logic "one" is placed in the test word in the bit position corresponding to the number of the switch. In figure 4-1, sheet 1, a single switch and AND gate 6 are used to represent the actual 37 switches and AND gates associated with the switches. (There is one AND gate associated with each particular test word switch.)

4-9. Figure 4-1, sheet 2. illustrates the timing diagrams for generating test words, including the waveform for a test word and the test word counter. The test word waveform shown assumes a condition where switches 1, 2, 3, 4, 7, 9, 13, 16. 23, 28, and 32 are placed to their on (up) position to provide pulses in these bit positions in the test word. As each test word switch is closed, a logic "one" is applied to its associated AND gate from the switch. When the test word counter counts to the binary number of the switch, the associated gate applies a logic "one" to AND gate 7. The outputs from the 37 gates are connected together (ORed by means of a common buss line) for application to AND gate 7, and the test word waveform for the stated conditions appears as shown in figure 4-1, sheet 2.

4-10. Logic "ones" from the true output of flip-flop D. "ones" present in the test word waveform from AND gate 6, and a "one" representing a no-disable condition from the overload disable circuit gate the clock "1" signal through AND gate 7. causing a logic "one" to be placed in the pulse position corresponding to the switch number. The load monitor is essentially a GO/NO-GO ohmmeter applied to the test word load. Normally the overload disable signal is a logic "one" and serves the function of monitoring the load for changes in impedances. Should a low-impedance condition occur, the overload disable signal becomes a logic "zero" thereby inhibiting the test word output. Test words thus generated in AND gate 7 are routed via OR gate 5 and a driver, where the test word amplitude is adjustable, to the TEST WORD output connector. When the test word counter has counted to a binary count of 37. the reset B pulse from the test word counter is generated, resetting the test word counter and control flip-flops B, C, and D. This sequence repeats itself for each test word, with the mode program count increasing by one each time flip-flop C is set.

4-11. The go and no-go mode program is internally connected so that a given number of test words are generated for a go or no-go program, with the exact number ranging from two to ten test words for either program. This is accomplished by connecting the outputs from the mode program counter to go and no-go AND gates 8 and 9 in such a manner that when a predetermined number of test words have been generated, a logic "one" is obtained from the particular go or no-go gate. This signal is routed via OR gates 1 and 3 to trigger SS2. The logic "one" reset A pulse from the "0" output of SS2 resets flip-flop A and the mode program counter flip-flops. A logic "zero" at the true output of flip-flop A now inhibits AND gate 3 and the sequence can only be started again by momentarily depressing the GO/NO-GO pushbutton.

4-12. When flip-flop C is set as explained in paragraph 4-7, the logic "one" at its true output is used in three places: to trigger SS3; for application to the INT TRIG. output connector, via a driver which provides amplitude adjustment; and for application to the mode 4 reply logic. Singleshot multivibrator SS3 has an adjustable delay, controlled from the front panel. The delay sets the position of the trailing edge of its output waveform from 0.7 microsecond before the first test word bit position to 10 microseconds after the first test word bit position. This trailing edge is used to trigger SS4, which provides a pulse output for application to AND gate 5 and to a driver. The driver output, adjustable in amplitude, is routed to the AUX PULSE output connector. When the AUXILIARY PULSE/ON-OFF switch is positioned at ON, a logic "one" is applied to AND gate 5, which gates the auxiliary pulse, via OR gate 5, into the pulse train of the test word. In this case, the amplitude of the test word and auxiliary, pulse is controlled by the TEST WORD AM. control.

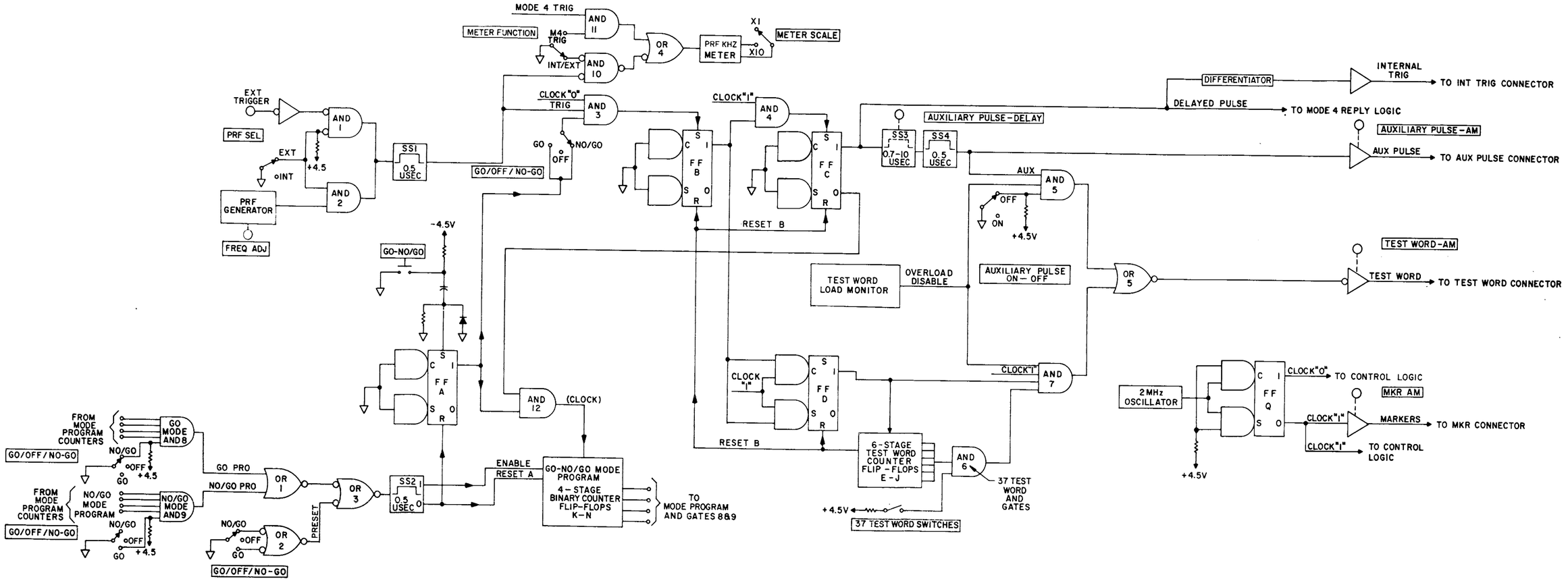


Figure 4-1. Test Word Generation, Functional Logic Diagram (Sheet 1 of 2)

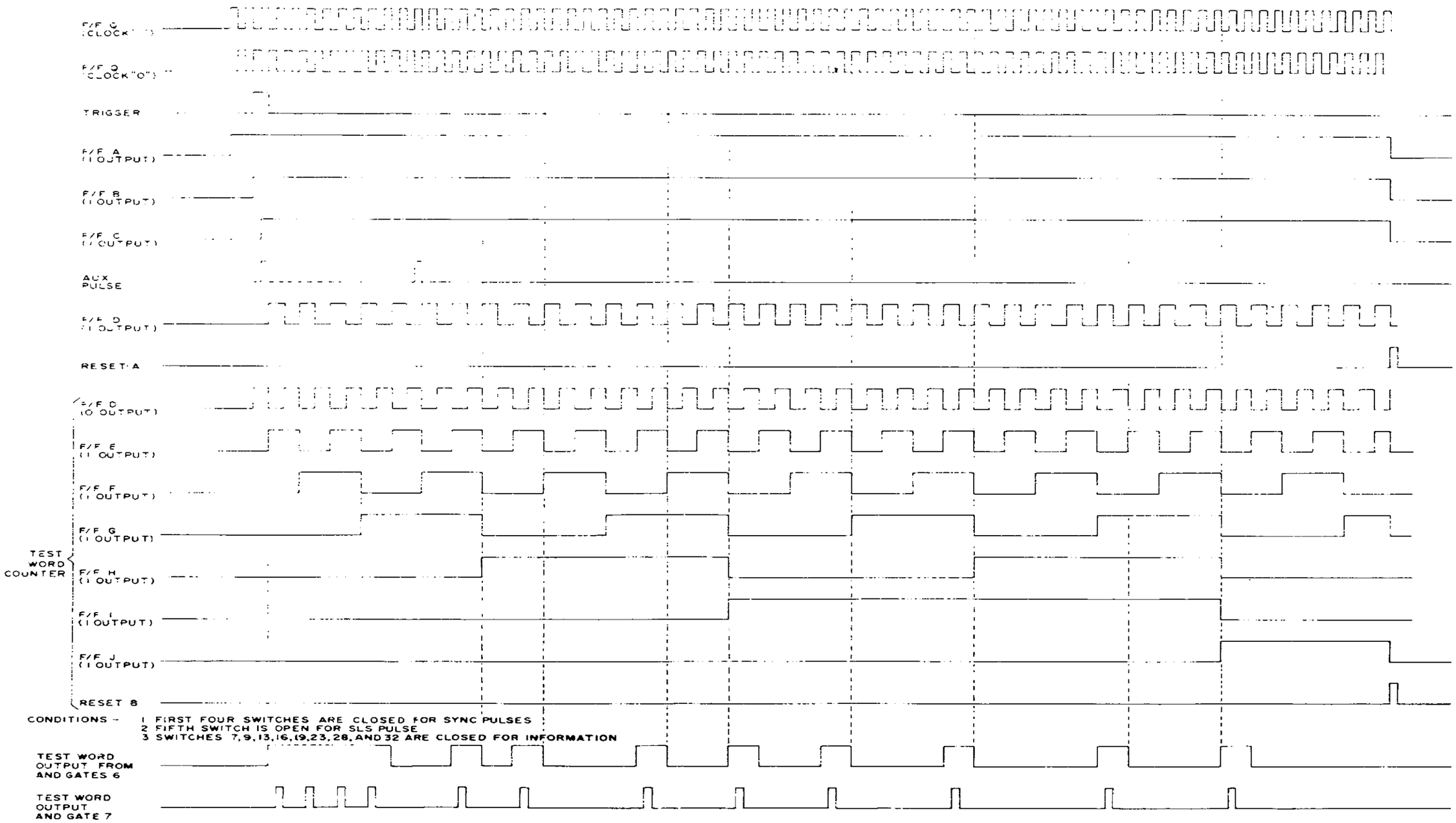
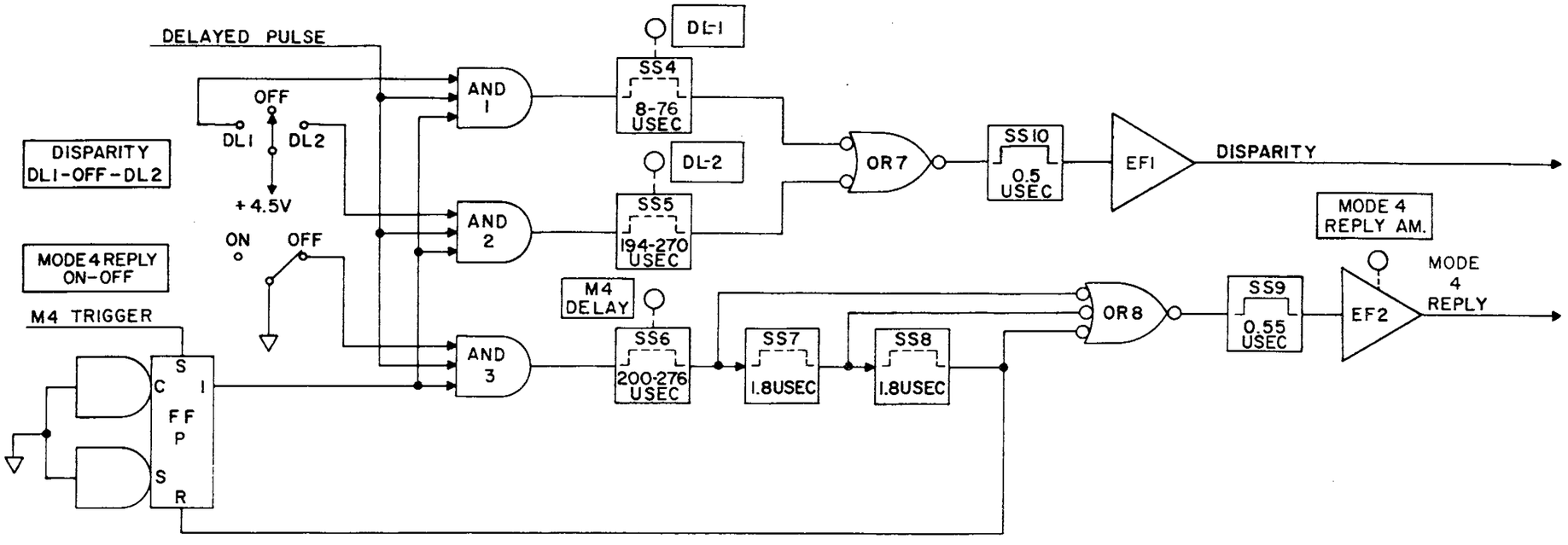


Figure 4-1. Test Word Generation, Functional Logic Diagram (Sheet 2 of 2)



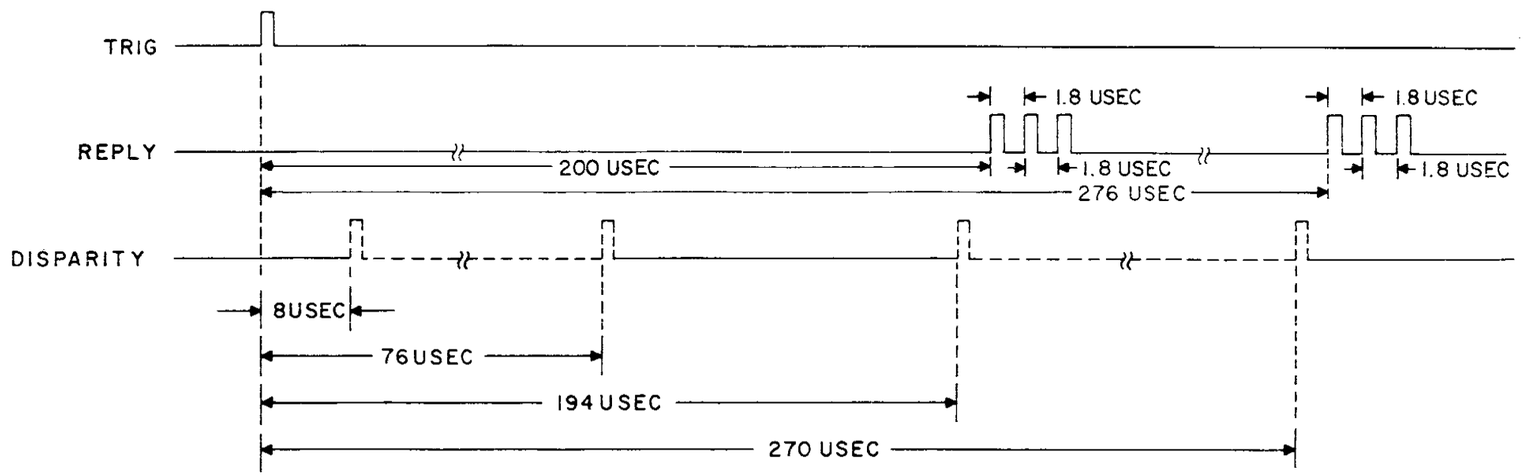


Figure 4-2. Mode 4 Relay Generation, Functional Logic Diagram

4-13. The test set is also capable of generating test words continuously at the repetition rate of the internal or external trigger. To accomplish this, the GO-NO/GO switch is positioned at OFF, which makes AND gate 3 a two input gate. This enables the coincidence of the trigger and clock "0" to set flip-flop B which starts the test word sequence over again each time control flip-flops B, C, and D are reset by the reset B signal.

4-14. MODE 4 REPLY GENERATION. The logic circuits used to generate the anode 4 reply and disparity pulse are shown in figure 4-2. The generation of each test word provides a delayed pulse signal that is applied to AND gates 1, 2, and 3. Positioning the MODE 4 REPLY ON-OFF switch at ON makes AND gate 3 a two input gate, with the second input being the output from flip-flop P. Externally applied mode 4 triggers. with a repetition rate range of 0 to 3,000 pulses-per-second, set flip-flop P, and the logic "one" at the true output gates the delayed pulse signal which triggers SS6. Single-shot multivibrator SS6 provides a delay of the mode 4 reply pulse train (continuously adjustable from the front panel) of 200 to 276 microseconds with respect to the first bit position of the test word.

4-15. The logic "zero" at the output of SS6 triggers SS7 and, via OR gate 8, triggers SS9. A 0.5 microsecond logic "one" from the output of SS9 is routed via emitter-follower EF2 (where the amplitude of the pulse is controlled from the front panel) to the MODE 4 REPLY output connector as the first pulse in the mode 4 reply. Single-shot multivibrator SS7 produces a logic "zero" output 1.8 microseconds after the trigger is applied; this logic "zero" signal is applied to SS8 and, via OR gate 8, to SS9. Another 0.5 microsecond logic "one", delayed 1.8 microseconds from the first pulse, is then routed via EF2 to the MODE 4 REPLY output connector. Single-shot multivibrator SS8 produces a logic "zero" output 1.8 microseconds after the trigger is applied; this logic "zero" signal resets flip-flop P and, via OR gate 8, also triggers SS9. The SS9 output, delayed 1.8 microseconds from the second pulse, is again routed via EF2 to the MODE 4 REPLY output connector. When flip-flop P resets, AND gate 3 is inhibited and the resultant mode 4 reply pulse train is three 0.5-microsecond pulses spaced 1.8 microseconds apart. The next mode 4 trigger again sets flip-flop P and, upon coincidence with the next delayed pulse signal, the sequence repeats itself.

4-16. To generate the disparity pulse, one of two delay ranges is selected by positioning the DL-1/OFF/DL-2 switch at either the DL-1 or DL-2 position. This applies a logic "one" to either AND gate 1 or 2. AND gate 1 is associated with the DL-1 delay (8 to 76 microseconds delay from the first bit position in the test word) and AND gate 2 is associated with the DL-2 delay (194 to 270 microseconds delay from the first bit position in the test word). When the mode 4 trigger sets flip-flop P, the logic "one" at the true output gates the delayed pulse signal via the AND gate (1 or 2) to trigger SS4 or SS5. A logic "zero" from either of these single-shot multivibrators is routed via OR gate 7 to trigger SS10. The logic "one" at the output of SS10 is routed via EF1, to the DISPARITY output connector.

4-17. TEST EQUIPMENT REQUIRED.

4-18. The following test equipment is required to perform the calibration check and troubleshooting procedures:

Quantity	Item	Alternate
1	Tektronix Model 945 Oscilloscope with Type CA Plug-in Unit	Oscilloscope AN/USM-281A
1	Electronic Counter AN/USM-26A	Electronic Counter AN/USM-207A
1	Pulse Generator AN/UPM-15A	
1	Multimeter AN/PSM-6B	Multimeter TS-352B/U

Quantity	Item	Alternate
3	75-ohm, 2-watt, Carbon Resistive Termination	-
2	91-ohm, Carbon Resistive Termination	-
1	510-ohm, Carbon Resistive Termination	-

4-19. CALIBRATION CHECK.

4-20. GENERAL. The calibration check provides test procedures which, when successfully completed, assure proper operation of the test set. These tests are to be performed at least once every three months, or whenever it is necessary to ascertain the performance of the unit. The calibration check can also be used as a step-by-step bench check along with the troubleshooting tables to localize a malfunction. Remove the test set proper from its case for the calibration check by loosening the 12 captive front-panel screws. Section V contains parts location illustrations.

4-21. INTERNAL TRIGGER OPERATION. The following procedures check the internal trigger operation of the test set:

a. Connect power cable W1 between POWER connector and a 115-volt, 60- or 400-Hz power source.
b. Set power ON-OFF switch at ON and observe that PWR indicator is lighted.
c. Set the following controls at the indicated positions:

Control	Position
PRF SEL	INT-H
TEST WORD switches (all)	up
AUXILIARY PULSE	OFF
GO/OFF/NO-GO	OFF
METER-FUNCTION	INT/EXT
INT PRF FREQ ADJ	mid range
TEST WORD AM.	clockwise
MKR AM.	clockwise
MODE 4 REPLY	OFF
DISPARITY	OFF

d. Connect internally-triggered oscilloscope to INT TRIG. connector using RG-59 cable or equivalent and a tee connector at the oscilloscope end. Terminate the cable at the tee connector with 75 ohms to ground. Observe that each internal trigger pulse has the following characteristics:

Amplitude	+6 to +10 volts
Pulse width	0.3 to 25 microseconds
Rise time	0.2 microsecond
Decay time	0.5 microsecond

e. Connect the connector of step d above to frequency counter input and adjust INT PRF FREQ ADJ control for counter indication of 10,000 pps. When adjusting the prf with the PRF SEL switch in the INT-H position, always start with the INT PRF FREQ ADJ control in the maximum counterclockwise position and observe the PRF KHz METER. With this procedure, the non-linear region at the clockwise end of the INT PRF FREQ ADJ will be avoided. Adjust potentiometer R106 on board assembly A2 for full scale deflection on PRF KHz METER.

f. Adjust INT PRF FREQ ADJ control for a 5000-pps indication on the PRF KHZ METER, and check that the counter indicates between 4500 and 5500 pps.

g. Adjust INT PRF FREQ ADJ control for a 2500-pps indication on the PRF KHZ METER, and check that the counter indicates between 2000 and 3000 pps.

h. Rotate INT PRF FREQ ADJ control fully counterclockwise and observe indication on counter. Check that counter indicates 1000 pps maximum.

i. Set PRF SEL switch at INT-MED. Rotate INT PRF FREQ ADJ control fully counterclockwise and then fully clockwise and observe indication on counter at each position. Check that counter indicates 100 maximum and 1000 maximum for the counterclockwise and clockwise positions, respectively, of the control.

j. Observe the oscilloscope and ascertain that the trigger characteristics are the same as those given in step d.

k. Hold the METER-SCALE switch at X1 and adjust INT PRF FREQ ADJ control for full scale deflection on the PRF KHz METER. Check that the counter indicates between 950 and 1050 pps.

l. Reduce setting of the INT PRF FREQ ADJ control for indications of 500 pps and then 250 pps as indicated on PRF KHz METER, Hold the METEW-SCALE switch at X1 for each indication. Check that the counter indicates between 450 and 550 pps and between 200 and 300 pps for the PRF KHz METER indications of 500 pps and 250 pps, respectively.

m. Set PRF SEL switch at INT-L. Rotate INT PRF FREQ ADJ control fully clockwise and then fully counter-clockwise. Check that counter indicates 100 pps minimum and 10 pps maximum, for the fully clockwise and fully counterclockwise positions, respectively, of the INT PRF FREQ ADJ control.

n. Observe oscilloscope and ascertain that the trigger characteristics are the same as those given in step d.

o. Set PRF SEL switch at INT-MED and rotate INT PRF FREQ ADJ control for 1000 pps as indicated on counter.

p. Connect oscilloscope to MKR output connector using tee connector and RG-59 cable (or equivalent) terminated with 510 ohms to ground, as described in paragraph 4-21d. Externally synchronize oscilloscope via INT TRIG. connector and observe 1-MHz square wave pulse train. Adjust MKR AM. control fully counterclockwise and then fully clockwise, noting a uniform variation in amplitude. Check that maximum peak-to-peak amplitude is 10 volts minimum.

q. Connect frequency counter to MKR output connector. Check that the counter indicates a frequency between 0.99 and 1.01 MHz.

4-22. EXTERNAL TRIGGER OPERATION. The following procedure checks the external trigger operation of the test set.

a. Set PRF SEL switch at EXT.

b. Connect pulse generator at EXT TRIG. input connector and apply a positive 4-volt, 0.5-microsecond pulse, occurring at a prf of 1000, to the test set. Observe that PRF KHz METER indicates approximately 1000 pps.

c. Reverse polarity of input trigger (4 volts negative) and observe that PRF KHz METER indicates approximately 1000 pps.

d. Connect oscilloscope, externally synchronized to pulse generator, to INT TRIG. output connector terminated with 75 ohms to ground, as in paragraph 4-21d. Simultaneously observe external trigger and internal trigger on dual traces of oscilloscope. Check that jitter between the two triggers is 1.1 microseconds or less.

4-23. TEST WORD OUTPUT. The following procedure checks that the test set is capable of generating the test word output pulse train:

a. Set PRF SEL switch at INT-MED and rotate INT PRF FREQ ADJ control for 1000 pps as indicated on PRF KHz METER.

b. Externally synchronize oscilloscope at INT TRIG. output connector.

c. Connect oscilloscope to TEST WORD output connector using tee connector and RG-59 cable or equivalent terminated with 75 ohms to ground, as in paragraph 4-21d. Observe the presence of 37 pulses (bits) on oscilloscope.

d. Rotate TEST WORD AM. control first to full counterclockwise position and then to full clockwise position, noting a uniform variation in test word amplitude. Check that amplitude ranges from 5 volts maximum (counterclockwise) to 35 volts minimum (clockwise). Then, adjust TEST WORD AM. control for a 35-volt test word output.

e. Observe that the test word pulses have the following characteristics:

Pulse width	0.4 to 0.6 microsecond
Rise time	0.1 microsecond
Decay time	0.2 microsecond

f. Display the MKR output on the other trace of the oscilloscope and ascertain that the 2.0 microsecond spacing of each pulse is within ±0.1 microsecond of even multiples of 1.0 microsecond, referenced to the leading edge of the first pulse (e.g., the leading edge of bit 23 should be spaced 44 ± 0.1 microseconds from the leading edge of bit 1).

g. Remove the bits of the test word display one at a time by setting the switches to their off (down) position and note that their respective bit position numbers are correctly related to the switch number controlling them.

h. Set first five TEST WORD switches up and set AUXILIARY PULSE ON-OFF switch at ON.

i. Rotate AUXILIARY PULSE DELAY control fully clockwise and observe an additional pulse after the first five pulses, delayed at least 10 microseconds from the first bit of the test word. Check that this pulse has the same characteristics as the first five. in accordance with the characteristics given in steps d and e.

j. Rotate the AUXILIARY PULSE DELAY control from full clockwise to full counterclockwise noting a uniform variation in the pulse position. Observe that in the full clockwise position, this pulse is delayed from the leading edge of bit 1 by 10 microseconds minimum and in the full counterclockwise position, this pulse is leading the leading edge of bit 1 by 0.7 microsecond minimum.

k. Vary AUXILIARY PULSE AM. control and observe no effect on pulse amplitude.

l. Connect oscilloscope to AUX PULSE output connector using tee connector and RG-59 cable or equivalent terminated with 75 ohms to ground. as in paragraph 4-21d. Leave other oscilloscope channel connected to the TEST WORD connector. Set AUXILIARY PULSE AM. and DELAY controls fully clockwise. Observe oscilloscope for single positive pulse. Observe that the pulse has the following characteristics:

Amplitude	35 volts minimum
Pulse width	0.4 to 0.6 microsecond
Rise time	0.1 microsecond maximum
Decay time	0.2 microsecond maximum

m. Rotate AUXILIARY PULSE AM. control fully counterclockwise and observe the pulse for the same characteristics given in step 1, except that pulse amplitude is 5 volts maximum.

n. Rotate TEST WORD AM. control and observe that control has no effect on the pulse.

o. Set GO/OFF/NO-GO switch at GO. Connect oscilloscope at TEST WORD output connector terminated in 75 ohms and observe the absence of all pulses.

p. Set oscilloscope sweep to the 1 ms/cm range. Momentarily depress the GO/NO-GO pushbutton and observe four pulse-train groups of the 5-bit selected code.

q. Set all 37 TEST WORD switches at their on (up) position and again momentarily depress GO/NO-GO pushbutton. Observe that four pulse-train groups of 37 bits appear on oscilloscope.

r. Set GO/OFF/NO-GO switch at NO-GO. Momentarily depress GO/NO-GO pushbutton and observe that only three pulse-train groups of 37 bits appear on oscilloscope.

s. Set GO/OFF/NO-GO switch at OFF. Observe that test word pulse-train groups of 37 bits each appear continuously on oscilloscope.

4-24. MODE 4 REPLY OPERATION. The following procedure checks the mode 4 reply operation of the test set:

a. Set METER-FUNCTION switch at M4 TRIG.

b. Set the pulse generator for external triggering. Trigger the pulse generator with the signal available at the INT TRIG. connector. Set output of pulse generator to + 1.5 volts into a 91-ohm load, with pulse width of 0.3 microsecond and rise time of 0.1 microsecond. Delay output pulse 2 microseconds from input trigger. Connect pulse generator output

to MODE 4 TRIG. input connector.

c. Set METER-FUNCTION switch at INT/EXT and set PRF BEL switch at INT-MED. Observe PRF KHz METER and rotate INT PRF FREQ ADJ control until METER indicates 1000 pps.

d. Connect oscilloscope to MODE 4 REPLY output connector using RG-82 cable or equivalent terminated with tee connector and 91-ohms to ground at oscilloscope end. Set MODE 4 REPLY ON-OFF switch at ON, AM. control at full clockwise, and DELAY control at fun counterclockwise.

e. Leave one oscilloscope channel connected to the TEST WORD output connector. Externally synchronize oscilloscope with output of pulse generator.

f. Observe the mode 4 reply (three pulses spaced 1.8 microseconds apart) delayed a maximum of 200 microseconds (leading edge to leading edge from the first pulse of the test word to the first pulse of the mode 4 reply).

g. Rotate the MODE 4 REPLY DELAY control fully clockwise and observe that the delay is uniform throughout the adjustment and is a minimum of 278 microseconds at the extreme clockwise position.

h. Observe that the mode 4 reply pulse train has the following characteristics:

Amplitude (full counterclockwise)	2 volts maximum
Amplitude (full clockwise)	35 volts minimum
Pulse width	0.3 to 0.7 microsecond
Rise time	0.1 microsecond maximum
Decay time	0.25 microsecond maximum
* Pulse spacing	1.6 to 2.0 microseconds between leading edges of consecutive pulses

* Pulse spacing is initially set to 1.8 microseconds between leading edges of consecutive pulses by adjusting potentiometers R18 and R25 on board assembly A2.

i. Set MODE 4 REPLY ON-OFF switch at OFF and observe that the mode 4 reply pulse train is removed.

j. Set DISPARITY DL-1/OFF/DL-2 switch at DL-1 and rotate DL-1 control fully counterclockwise.

k. Connect oscilloscope to MODE 4 DISPARITY output connector using RG-62 cable or equivalent terminated with tee connector and 91-ohms to ground at oscilloscope end. Leave one oscilloscope channel connected to the TEST WORD output connector.

l. Observe a single positive pulse delayed a maximum of 8.0 microseconds from the leading edge of the first test word pulse to the leading edge of the single pulse.

m. Advance the DISPARITY DL-1 control fully clockwise and observe that the single pulse is delayed at least 76 microseconds from the leading edge of the first test word pulse to the leading edge of the single pulse.

n. Observe that the single pulse has the following characteristics:

Amplitude	3 to 5 volts
Pulse width	0.3 to 1.0 microsecond
Rise time	0.15 microsecond max.
Decay time	0.5 microsecond max.

o. Set DISPARITY DL-1/OFF/DL-2 switch at OFF. Observe that the pulse is no longer displayed on oscilloscope.

p. Set DISPARITY DL-1/OFF/DL-2 switch at DL-2 and rotate DL-2 control fully counterclockwise. Observe a single pulse delayed a maximum of 194 microseconds from the leading edge of the first pulse in the test word pulse train.

q. Rotate DISPARITY DL-2 control fully clockwise and observe that the single pulse is delayed a minimum of 276 microseconds from the leading edge of the first pulse in the test word pulse train.

r. Observe that the pulse has the same characteristics as given in step n.

s. Set ON-OFF power switch at OFF and disconnect pulse generator and oscilloscope.

4-25. TROUBLESHOOIING PROCEDURES. The troubleshooting procedures will aid in correcting faults when a malfunction of the test set is observed during normal operation, pre-operational checkout, or calibration check. Maintenance technicians should be thoroughly familiar with the physical makeup of the equipment and the operating

procedures and functional description. When localizing troubles, associated switches and controls should be checked for incorrect settings or malfunctions. The first step in correcting any trouble or failure is to make a visual inspection of equipment and cable connections. If a visual inspection does not disclose the fault, consider the test set as made up of the basic logic circuitry shown in the functional diagrams, figures 4-1 and 4-2.

4-26. Figure 4-3, trouble isolation procedures, lists trouble indications that may be encountered during normal operation, pre-operational checks, or calibration check. This table contains procedures for isolating the trouble from the front panel of the test set and lists the assembly replacement which should be made to minimize maintenance time. For every assembly replaced in figure 4-3, a reference is made to figure 4-4, Troubleshooting Procedures, for repairing the replaced item at some convenient time. Refer to the waveforms shown in figure 4-9, as required, during the troubleshooting process.

Trouble Indication	Fault Determination	Correction
1. PWR indicator does not light when ON-OFF power switch is set ON.	a. Check both 3/4 amp fuses.	1. If both fuses are not defective proceed to step b. 2. If either fuse is defective, replace fuse.
	b. Check indicator lamp.	1. If lamp is not defective, proceed to trouble No. 1 in figure 4-4. 2. If lamp is defective, replace lamp.
2. No output signals, no indication on PRF KHz METER and PWR indicator is lighted.	Check power supply as outlined in trouble No. 2 in figure 4-4.	
3. PRF KHz METER does not indicate an internal trigger rate.	a. Using oscilloscope, check for internal trigger at INT TRIG. output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 3 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step b.
	b. Connect pulse generator to EXT TRIG. connector and set PRF SEL switch at EXT. Observe external trigger rate on PRF KHz METER.	1. If Indication is normal, replace board assembly A2. Proceed to trouble No. 4 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step c.
	c. Using oscilloscope, check for internal trigger at INT TRIG. connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 3 in figure 4-4 to repair board. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 5 in figure 4-4 to repair board.

Figure 4-3. Trouble Isolation Procedures (Sheet 1 of 5)

Trouble Indication	Fault Determination	Correction
4. PRF KHz METER does not indicate an external trigger rate.	a. Using oscilloscope, check for trigger pulse train at INT TRIG. output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 3 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step b.
	b. Set PRF SEL switch at INT-MED and observe internal trigger rate on PRF KHz METER.	1. If indication is normal, replace board assembly A3. Proceed to trouble No. 6 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step c.
	c. Using oscilloscope, check for internal trigger at INT TRIG. output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 3 in figure 4-4 to repair board. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 5 in figure 4-4 to repair board.
5. PRF KHz METER does not indicate mode 4 trigger rate.		Replace board assembly A2. Proceed to trouble No. 3 in figure 4-4 repair board.
6. No internal trigger at INT TRIG. output connector.	a. Observe PRF KHz METER for indication of trigger.	1. If indication is normal, proceed to step b. 2. If indication is abnormal, proceed to trouble indication No. 3 (figure 4-3).
	b. Using oscilloscope, observe 1-microsecond pulse train at MKR output connector.	1. If indication is normal, proceed to step c. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 7 in figure 4-4 to repair board.
	c. Using oscilloscope, observe 0.5-microsecond auxiliary pulses, spaced at time interval determined by trigger PRF, at AUX PULSE output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 8 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step d.
	d. Using oscilloscope, observe reset pulse at A1J3.	1. If indication is normal, replace board assembly A3. Proceed to trouble No. 9 in figure 4-4 to repair board. 2. If indication is abnormal, replace board assembly A1. Proceed to trouble No. 18 in figure 4-4 to repair board.

Figure 4-3. Trouble Isolation Procedures (Sheet 2 of 5)

Trouble Indication	Fault Determination	Correction
7. No auxiliary pulse at AUX PULSE output connector.	a. Observe PRF KHz METER for indication of trigger.	1. If indication is normal. proceed to step b. 2. If indication is abnormal, proceed to trouble indication No. 3 (figure 4-3).
	b. Using oscilloscope. observe 1-microsecond pulse train at MKR output connector.	1. If indication is normal proceed to step c. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 7 in figure 4-4 to repair board.
	c. Using oscilloscope. observe internal trigger pulse train of 0.3- to 25-microsecond pulses spaced at time interval of trigger, at INT TRIG. output connector.	1. If indication is normal. proceed to step d. 2. If indication is abnormal replace board assembly A3. Proceed to trouble No. 9 in figure 4-4 to repair board.
	d. Set AUXILIARY PULSE ON-OFF switch at ON and set all TEST WORD switches off (down). Using oscilloscope. observe auxiliary pulse train at TEST WORD output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 10 in figure 4-4 to repair board. 2. If indication is abnormal. replace board assembly A3. Proceed to trouble No. 11 in figure 4-4 to repair board.
8. No marker pulse at MKR output connector.		Replace board assembly A3. Proceed to trouble No. 12 in figure 4-4 to repair board.
9. No mode 4 reply pulse train at MODE 4 REPLY output connector.	a. Observe PRF KHz METER for indication of mode 4 trigger.	1. If indication is normal,. proceed to step b. 2. If indication is abnormal, proceed to trouble indication no. 5 (figure 4-3).
	b. Set METER-FUNCTION switch at INT/EXT and observe PRF KHz METER for indication of trigger.	1. If indication is normal, proceed to step c. 2. If indication is abnormal, proceed to trouble indication for no internal or external trigger indication (steps 3, 4, and 6).
	c. Using oscilloscope, observe 1-microsecond pulse train at MKR output connector.	1. If indication is normal, proceed to step d. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 12 in figure 4-4 to repair board.

Figure 4-3. Trouble Isolation Procedures (Sheet 3 of 5)

Trouble Indication	Fault Determination	Correction
	d. Using oscilloscope, observe 0.5-microsecond auxiliary pulses spaced at time interval of trigger, at AUX PULSE output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 13 in figure 4-4 to repair board. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 9 in figure 4-4 to repair board.
10. No disparity pulse at MODE 4-DISPARITY output connector for DL-1 delay.	a. Set DISPARITY DL-1/ OFF/DL-2 switch at DL-2, and using oscilloscope, observe DL-2 disparity pulse train at MODE 4-DISPARITY output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 14 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step b.
	b. Observe PRF KHz METER for indication of mode 4 trigger.	1. If indication is normal, proceed to step c. 2. If indication is abnormal, proceed to trouble indication for no mode 4 trigger indication (step 3).
	c. Set METER-FUNCTION switch at INT/EXT and observe PRF KHz METER for indication of internal or external trigger.	1. If indication is normal, proceed to step d. 2. If indication is abnormal, proceed to trouble indication for no internal or external trigger indicated on PRF KHz METER (step 4).
	d. Using oscilloscope, observe 1-microsecond pulse train at MKR output connector.	1. If indication is normal, proceed to step e. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 7 in figure 4-4 to repair board.
	e. Using oscilloscope, observe 0.5-microsecond auxiliary pulses spaced at time interval of internal or external trigger, at AUX PULSE output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 15 in figure 4-4 to repair board. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 9 in figure 4-4 to repair board.
11. No disparity pulse at MODE 4-DISPARITY output connector for DL-2 DELAY.	a. Set DISPARITY DL-1/ OFF/DL-2 switch at DL-1, and using oscilloscope, observe DL-1 disparity pulse train at MODE 4-DISPARITY output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 16 in figure 4-4 to repair board. 2. If indication is abnormal, proceed to step b.

Figure 4-3. Trouble Isolation Procedures (Sheet 4 of 5)

Trouble Indication	Fault Determination	Correction
	b. Observe PRF KHz METER for indication of mode 4 trigger.	1. If indication is normal, proceed to step c. 2. If indication is abnormal, proceed to trouble indication for no mode 4 trigger indication (step 5).
	c. Set METER-FUNCTION switch at INT/EXT and observe PRF KHz METER for indication of, internal or external trigger.	1. If indication is normal, proceed to step d. 2. If indication is abnormal, proceed to trouble indication for no internal or external trigger indication on PRF KHz METER (steps 3, 4 and 5).
	d. Using oscilloscope, observe 1-microsecond pulse train at MKR output connector.	1. If indication is normal, proceed to step e. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 7 in figure 4-4 to repair board.
	e. Using oscilloscope, observe 0.5-microsecond auxiliary pulses spaced at time interval of internal or external trigger, at AUX PULSE output connector.	1. If indication is normal, replace board assembly A2. Proceed to trouble No. 17 in figure 4-4 to repair board. 2. If indication is abnormal, replace board assembly A3. Proceed to trouble No. 9 in figure 4-4 to repair board.
12. No test word or pulse(s) missing in test word pulse train.	a. Observe PRF KHz METER for indication of trigger.	1. If indication is normal, proceed to step b. 2. If indication is abnormal, proceed to trouble indication for no internal or external trigger indication (steps 3, 4 and 5).
	b. Substitute another A1 board assembly and observe test word pulse train at TEST WORD output connector.	1. If indication is normal, board assembly A1 is defective. Proceed to trouble No. 18 in figure 4-4 to repair board. 2. If indication is abnormal, substitute board assembly A3 and proceed to trouble No. 19 in figure 4-4 to repair board.

Figure 4-3. Trouble Isolation Procedures (Sheet 5 of 5)

4-27. The procedures contained in figure 4-4 are used for detail troubleshooting of board assemblies replaced in accordance with figure 4-3. Prior to performing any of the procedures in figure 4-4, perform the following:

a. Remove test set from case.
b. Set ON-OFF power switch at ON.
c. Set all TEST WORD switches at on (up).
d. Set METER-FUNCTION switch at INT/EXT.
e. Set PRF SEL switch at INT-MED.
f. Set GO/OFF/NO-GO switch at OFF.
g. Set AUXILLARY PULSE ON-OFF switch at OFF.
h. Set MODE 4 REPLY ON-OFF switch at ON.
i. Terminate TEST WORD, AUX PULSE, and INT TRIG. output connectors with 75 ohms to ground.
j. Terminate DISPARITY and MODE 4 REPLY output connectors with 91 ohms to ground.
k. Terminate MKR output connector with 510 ohms to ground.

Trouble Number	Procedure	Probable Cause
1		Transformer T1 and ON-OFF power switch 846 (schematic diagram, figure 4-5).
2	Using multimeter, measure voltages between the following chassis components, and chassis ground: Note The +4.5-volt and +9-volt supply levels increase to approximately +20 volts when the circuit boards are removed. (1) At emitter of Q1, measure +55 ±5 vdc. (2) At feed-through terminal of R13 and C3, measure +9 ± 1 vdc. (3) At junction of R16 and wire number 106, measure +4.5 ± 0.5 vdc. (4) At junction of R17 and wire number 103, measure +4.5 ± 0.5 vdc. (5) At junction of R18 and wire number 105, measure +4. 5 ± 0.5 vdc. (6) At junction of VR2, C7, and R19, measure -4.5 + 0.5 vdc.	Associated section of power supply (schematic diagram, figure 4-5).

Figure 4-4. Troubleshooting Procedures (Sheet 1 of 7)

Trouble Number	Procedure	Probable Cause
3	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into the extension board.	Circuit consisting of transistors Q28 and Q29 (schematic diagram, figure 4-7).
4	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board.	Circuit consisting of transistors Q25, Q26, and Q27 (schematic diagram, figure 4-7).
5	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board.	Circuit consisting of transistors Q2 and Q3 (schematic diagram, figure 4-8)
6	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board. c. Connect pulse generator at EXT TRIG. and set for 3000 pps. d. Set PRF SEL switch at EXT.	Circuit consisting of transistor Q1 (schematic diagram, figure 4-8).
7	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board.	Circuit consisting of transistors Q4, Q5, and integrated circuit element A1 (schematic diagram, figure 4-8).
8	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board.	Circuit consisting of transistors Q30, Q31, and Q32 (schematic diagram, figure 4-7).
9	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board.	Integrated circuit elements A2, A3, and A4 (schematic diagram, figure 4-8).
10	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into the extension board.	Circuit consisting of transistors Q33 through Q37 (schematic diagram, figure 4-7).
11	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board.	Circuit consisting of transistors Q9 through Q11 (schematic diagram, figure 4-8).

Figure 4-4. Troubleshooting Procedures (Sheet 2 of 7)

Trouble Number	Procedure	Probable Cause
12	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board. c. Using oscilloscope, observe 1-microsecond pulse train at J4 (yellow). If indication is normal, probable cause is trouble a. If indication is abnormal, probable cause is b.	a. Circuit consisting of transistors Q19 through Q22 (schematic diagram, figure 4-8). b. Circuit consisting of transistors Q4 and Q5 and integrated circuit element (schematic diagram, figure 4-8).
13	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board. c. Set mode 4 trigger at 3000 pps. d. Using oscilloscope, observe three 0.3- to 0.7-microsecond pulses at J7 (violet). The prf of this pulse train should be the same as the prf of the mode 4 trigger. If indication is normal, trouble is probable cause a. If indication is abnormal, proceed to step e. e. Using oscilloscope, observe 1.8-microsecond pulse, spaced at time interval of mode 4 trigger at J9 (white). If indication is normal, trouble is probable cause b. If indication is abnormal, proceed to step f. f. Using oscilloscope, observe 1.8-microsecond pulse, spaced at time interval of mode 4 trigger, at J10 (black). If indication is normal, trouble is probable cause c. If indication is abnormal, proceed to step g. g. Using oscilloscope, observe 200- to 276-microsecond pulse, spaced at time interval of mode 4 trigger, at J8 (gray). If indication is normal, trouble is probable cause d. If indication is abnormal, trouble is probable cause e.	a. Circuit consisting of transistors Q11 through Q15 (schematic diagram, figure 4-7). b. Circuit consisting of transistors Q9 and Q10 (schematic diagram, figure 4-7). c. Circuit consisting of transistors Q7 and Q8 (schematic diagram, figure 4-7). d. Circuit consisting of transistors Q5 and Q6 (schematic diagram, figure 4-7). e. circuit consisting of transistors Q3 and Q4 and integrated circuit element (schematic diagram, figure 4-7).

Figure 4-4. Troubleshooting Procedures (Sheet 3 of 7)

Trouble Number	Procedure	Probable Cause
14	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board. c. Set DISPARITY DL-1/OFF/DL-2 switch at DL-1.	Circuit consisting of transistors Q16 and Q17 (schematic diagram, figure 4-7).
15	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board. c. Set DISPARITY DL-1/OFF/DL-2 switch at DL-1. d. Using oscilloscope, observe 0.5-microsecond disparity pulses, spaced at time interval of mode 4 trigger, at J11 (brown) on A2. If indication is normal, trouble is probable cause a. If indication is abnormal, proceed to step e. e. Using oscilloscope, observe an 8- to 76-microsecond pulse, spaced at time interval of mode 4 trigger, at J12 (red). If indication is normal, trouble is probable cause b. If indication is abnormal, trouble is probable cause c.	a. Circuit consisting of transistors Q22, Q23, and Q24 (schematic diagram. figure 4-7). b. Circuit consisting of transistors Q20 and Q21 (schematic diagram, figure 4-7). c. Integrated circuit element A1, and transistors Q16 and Q17 (schematic diagram, figure 4-7).
16	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board. c. Set DISPARITY DL-1/OFF/DL-2 switch at DL-2.	Circuit consisting of transistors Q18 and Q19 (schematic diagram, figure 4-7).
17	a. Insert extension board into A2 connector. b. Insert defective board assembly A2 into extension board. c. Set DISPARITY DL-1/OFF/DL-2 switch at DL-2.	a. Circuit consisting of transistors Q22, Q23, and Q24 (schematic diagram, figure 4-7). b. Circuit consisting of transistors Q20 and Q21 (schematic diagram, figure 4-7). c. Integrated circuit element A1, and transistors Q18 and Q19 (schematic diagram, figure 4-7).

Figure 4-4. Troubleshooting Procedures (Sheet 4 of 7)

Trouble Number	Procedure	Probable Cause
	d. Using oscilloscope, observe 0.5-microsecond disparity pulses, spaced at time interval of mode 4 trigger at J11 (brown). If indication is normal, trouble is probable cause a. If indication is abnormal, proceed to step e. e. Using oscilloscope, observe 194- to 276-microsecond pulses, spaced at time interval of mode 4 trigger, at J13 (orange). If indication is normal, trouble is probable cause b. If indication is abnormal, trouble is probable cause c.	
18	a. Insert extension board into A1 connector. b. Insert defective board assembly A1 into extension board. c. Set all TEST WORD switches at on (up). d. Set PRF SEL switch at INT-MED. e. Using oscilloscope, observe 1-microsecond pulses, spaced at time interval of trigger, at J3 (orange) on A1. If indication is normal, proceed to step m. If indication is abnormal, proceed to step f. f. Using dual-trace oscilloscope, check binary counter by connecting one probe at pin 5 (input) of integrated circuit A1 and second probe at pin 2 (output) of printed circuit A1. Observe output pulses with time period twice input pulses time period. If indication is normal, proceed to step g. If indication is abnormal, probable cause of trouble is a. g. Repeat step f for circuit elements A2 through A6. If all indications are normal, proceed to step h.	a. Circuit element (A1 through A6) where abnormal indication occurs (schematic diagram, figure 4-6). b. Circuit element (A7 or A10) where abnormal indication occurs (schematic diagram, figure 4-6). c. Circuit element (A7, A8, or A9) where abnormal indication occurs (schematic diagram, figure 4-6). d. Circuit element (A11 or A12) where abnormal indication occurs (schematic diagram, figure 4-6). e. Circuit element A11 (schematic diagram, figure 4-6). f. Circuit consisting of transistors Q1, Q2, and Q3 (schematic diagram, figure 4-6). g. AND gate consisting of four diodes associated with the switch(es) of missing pulse(s) (schematic. diagram, figure 4-6).

Figure 4-4. Troubleshooting Procedures (Sheet 5 of 7)

Trouble Number	Procedure	Probable Cause
	h. Using oscilloscope, observe pulse train at pin 2 of circuit element A7 and pins 2 and 10 of circuit element A10. At each pin, a pulse train comprised of groups of four 2-microsecond wide pulses should be observed. If indication is normal, proceed to step i. If indication is abnormal, probable cause of trouble is b. i. Using oscilloscope, observe pulse train at pin 10 of circuit element A7 and pins 2 and 10 of circuit elements A8 and A9. At each pin, a pulse train comprised of groups of five 2-microsecond wide pulses should be observed. If indication is normal, proceed to step j. If indication is abnormal, probable cause of trouble is c. j. Using oscilloscope, observe pulse train at pin 10 of circuit element A11 and at pins 2 and 10 of A12. At each pin, a pulse train comprised of 16-microsecond wide pulses should be observed. If indication is normal, proceed to step k. If indication is abnormal, probable cause of trouble is d. k. Using oscilloscope, observe a pulse train of 14-microsecond wide pulses at pin 2 of circuit element A11. If indication is normal, proceed to step 1. If indication is abnormal, probable cause of trouble is e. l. Using oscilloscope, observe a pulse train of 12-microsecond wide pulses at pin 2 of circuit element A13. If indication is normal, probable cause of trouble is f. If indication is abnormal, probable cause of trouble is g. m. Using dual trace oscilloscope, connect one probe to J1 (brown) and second probe to J2 (red) on A1. Signal at J1 is a group of 37 two-microsecond pulses. Signal at J2	h. Circuit consisting of transistors Q4 and Q5 (schematic diagram figure 4-6).

Figure 4-4. Troubleshooting Procedures (Sheet 6 of 7)

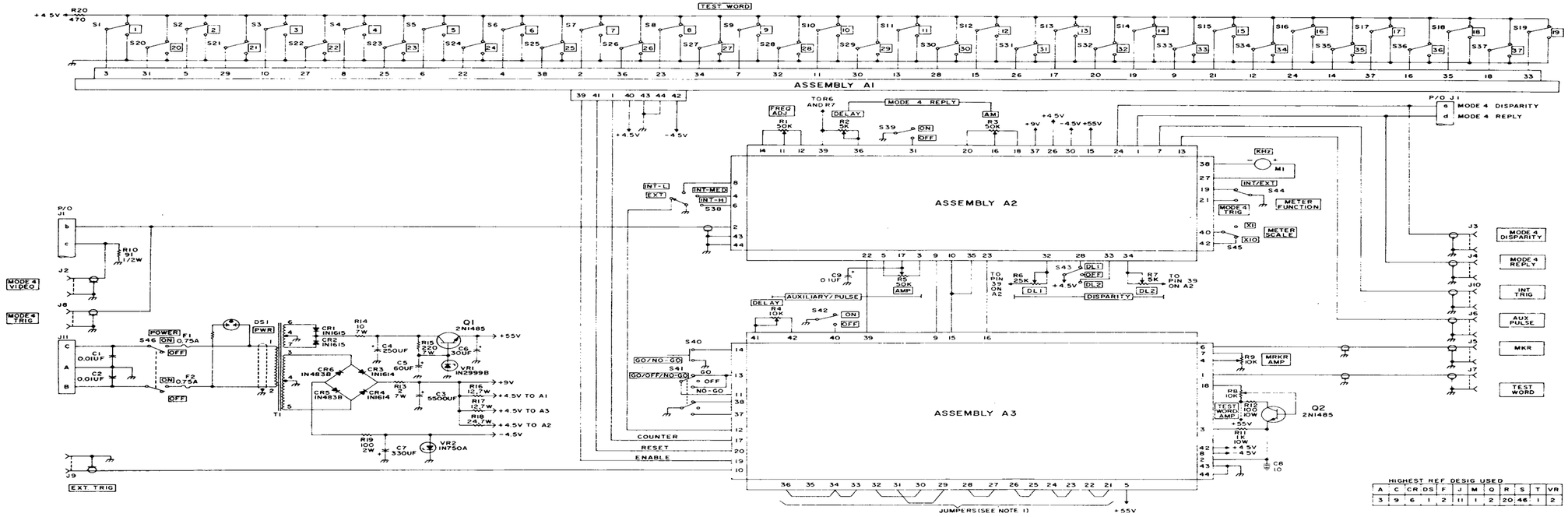
Trouble Number	Procedure	Probable Cause
	should be a 74-microsecond pulse train, occurring at the repetition rate of the trigger. Observe the two traces and ascertain that 37 pulses from J1 occur during each 74-microsecond pulse from J2. If signal at J2 is not 74 microseconds, count the number of 2-microsecond pulses and determine which pulse(s) are missing. Probable cause of trouble is g. If indication is normal, probable cause of trouble is h.	
19	a. Insert extension board into A3 connector. b. Insert defective board assembly A3 into extension board. c. Using oscilloscope, observe 1-microsecond pulse train at MKR output connector. If indication is normal, proceed to step d. If indication is abnormal, probable cause of trouble is a. d. Connect a 75-ohm resistor from INT TRIG. output connector to ground. e. Using oscilloscope, observe internal trigger pulse at INT TRIG. output connector. If indication is normal, proceed to step f. If indication is abnormal, probable cause of trouble is b. f. Set AUXILIARY PULSE ON-OFF switch at ON and all TEST WORD switches at off (down). g. Using oscilloscope, observe auxiliary pulse at TEST WORD output connector. If indication is normal, probable cause of trouble is c. If indication is abnormal, proceed to step h. h. Using multimeter, check for 4. 5 volts at J8 (gray). on A3. If indication is normal, probable cause of trouble is d. If indication is abnormal, probable cause of trouble is e.	a. Circuit consisting of transistors Q4, Q5, and circuit element A1 (schematic diagram, figure 4-8). b. Circuit elements A2, A3, or A4 (schematic diagram, figure 4-8). c. Circuit element A4 (schematic diagram, figure 4-8). d. Circuit consisting of transistor Q13 (schematic diagram, figure 4-8). e. Circuit consisting of transistors Q17 and Q18 (schematic diagram, figure 4-8).

Figure 4-4. Troubleshooting Procedures (Sheet 7 of 7)

4-28. CLEANING AND LUBRICATION. Periodically clean the test set exterior surfaces of dust and/or foreign matter by wiping with a clean soft cloth. Since the test set has no moving parts, lubrication is not required.

4-29. SCHEMATIC DIAGRAMS. The schematic diagrams are illustrated in figures 4-5 through 4-8. Figure 4-5, the chassis schematic diagram, illustrates the components mounted on the chassis and interconnecting wiring to the assembly boards. Figures 4-6 through 4-8 illustrate the schematic diagram for each of the assembly boards contained in the test set.

4-30. GO/NO-GO MODE PROGRAM. The number of test words generated for the go and no-go modes of operation are determined by the jumper connections made at certain pins of board assembly A3. As shown in figure 4-5, four test words are generated for the go mode and three for the no-go mode. However, these jumper connections may be changed so that from two to ten test words are generated for either mode. The connections for other combinations of test words are given in the notes on figure 4-5.



NOTES

1. JUMPERS ARE CONNECTED TO GIVE FOUR TEST WORDS FOR GO MODE AND THREE TEST WORDS FOR NO-GO MODE. TO OBTAIN OTHER COMBINATIONS OF TEST WORDS REFER TO TABLE BELOW:

DESIRED NUMBER OF TEST WORDS	2	3	4	5	6	7	8	9	10	MODES
CONNECT PIN 24 TO PIN	22	23	22	23	22	23	22	23	22	NO-GO PROGRAM
" " 28 " "	27	27	26	26	27	27	26	26	27	
" " 32 " "	30	30	31	31	31	31	30	30	30	
" " 36 " "	34	34	34	34	34	34	35	35	35	
CONNECT PIN 21 TO PIN	22	23	22	23	22	23	22	23	22	GO PROGRAM
" " 25 " "	27	27	26	26	27	27	26	26	27	
" " 29 " "	30	30	31	31	31	31	30	30	30	
" " 33 " "	34	34	34	34	34	34	35	35	35	

2. UNLESS OTHERWISE NOTED:
   - ALL RESISTANCES ARE IN OHMS, 1/4 WATT, 5%
   - ALL CAPACITANCES ARE IN MICROFARADS (UF)

Figure 4-5. Simulator Test Set AN/APM-245 Chassis, Schematic Diagram

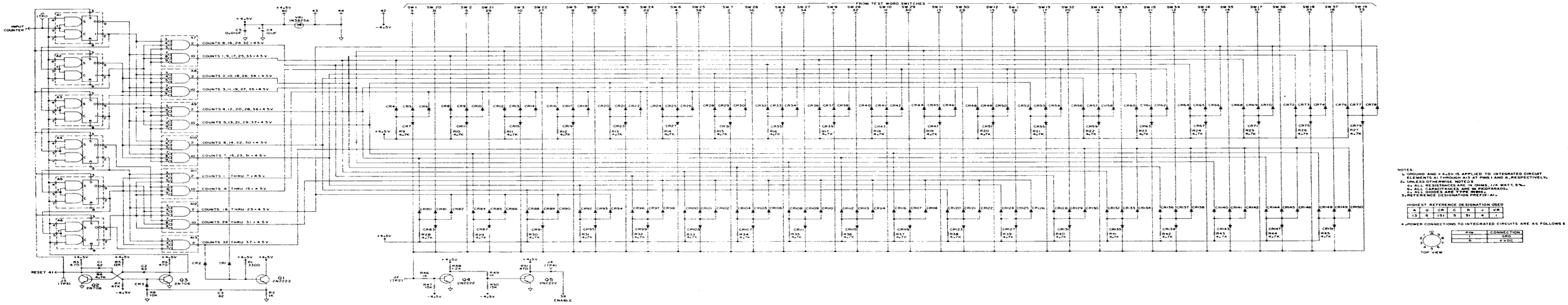


Figure 4-6. Board Assembly A1, schematic Diagram

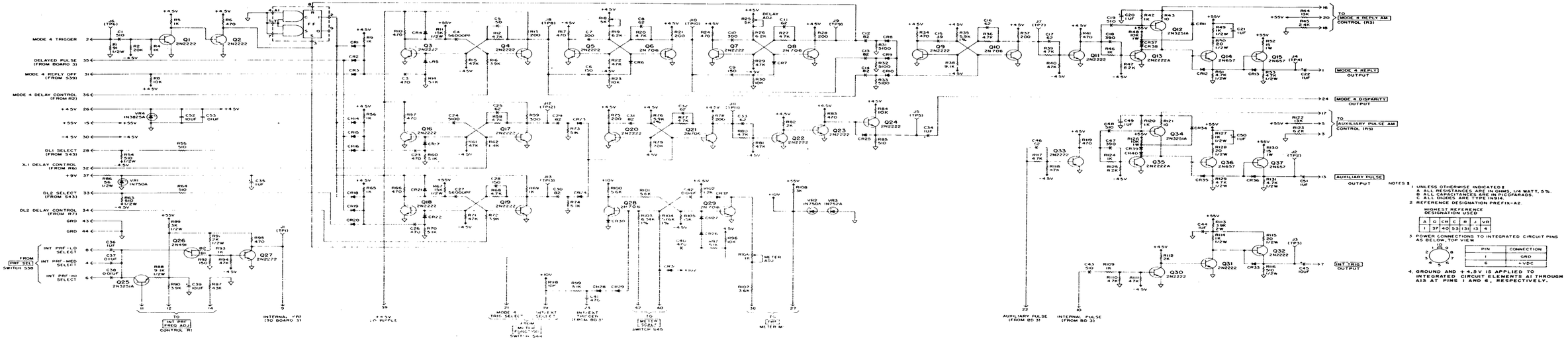


Figure 4-7. Board Assembly A2, Schematic Diagram

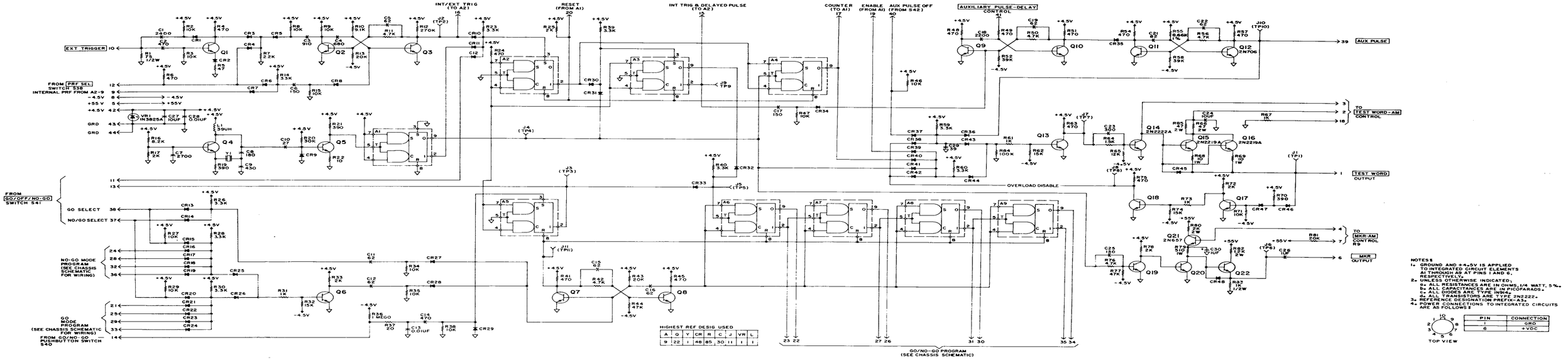
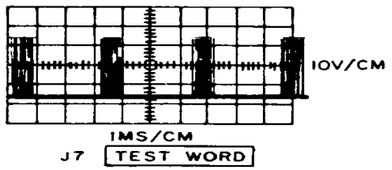
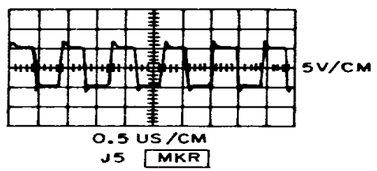
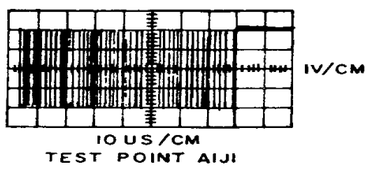
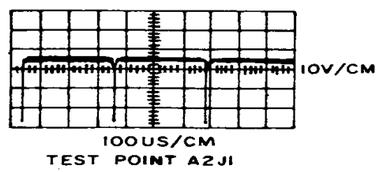


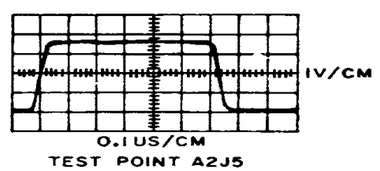
Figure 4-8. Board Assembly A3, Schematic Diagram

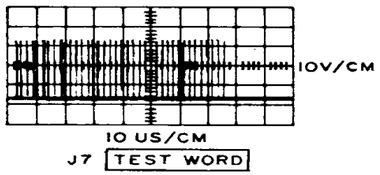


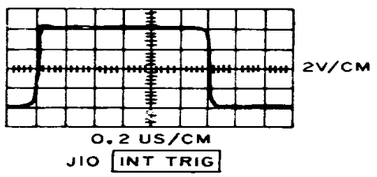


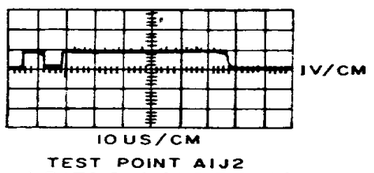


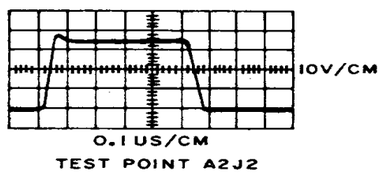


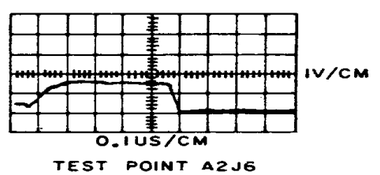


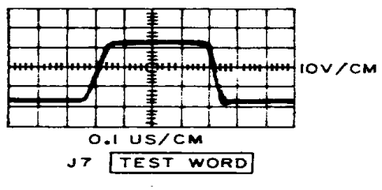


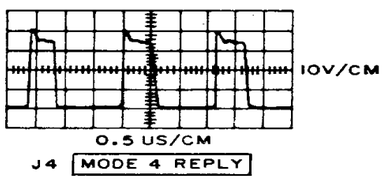


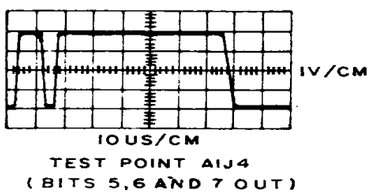


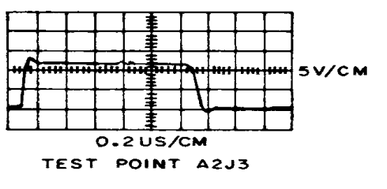


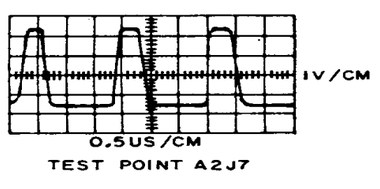


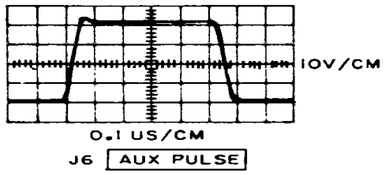


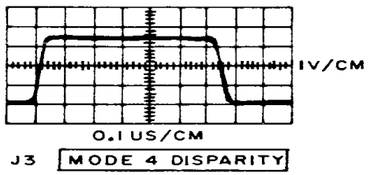


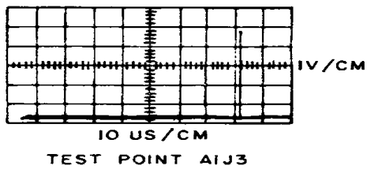


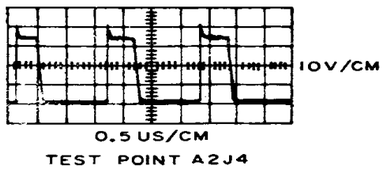












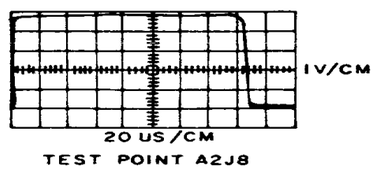


Figure 4-9. Waveforms (Sheet 1 of 2)

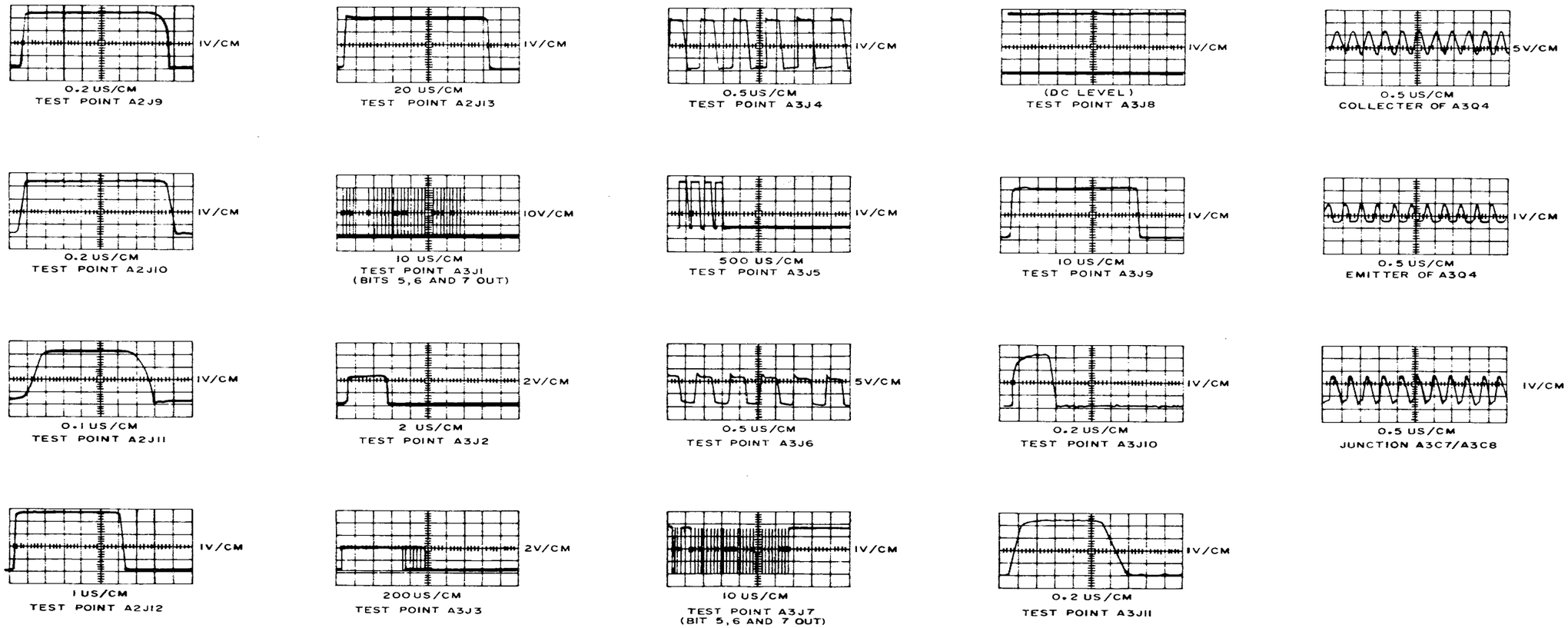


Figure 4-9. Waveforms (Sheet 2 of 2)

SECTION V
PARTS LIST

5-1. INTRODUCTION.

5-2. This Parts List lists, describes and illustrates the assemblies, subassemblies and detail parts that comprise the Test Set Simulator AN/APM-245. This equipment is manufactured by Hazeltine Corporation, Little Neck, New York, under contract number F33657-67-C-0404.

5-3. The Parts List is arranged in the following two groups: INTRODUCTION, ILLUSTRATIONS AND PARTS LISTING.

5-4. ILLUSTRATIONS.

5-5. The illustrations are arranged consecutively by figure number and carry the same caption as their accompanying listing. Each assembly is illustrated to a degree necessary to identify its detail parts.

5-6. PARTS LISTING.

5-7. The Parts Listing is arranged in three columns as follows: SECTION, FIGURE AND INDEX NO., PART NO., and DESCRIPTION.

5-8. The SECTION AND INDEX NO. column lists the section in the handbook, the figure number of the illustration, and the index number of the parts shown in the illustration.

5-9. The PART NO. column lists the manufacturer's part number or the government standard part number When the latter is used, the DESCRIPTION column cites the applicable controlling government agency code.

5-10. The DESCRIPTION column lists the name of the part with applicable modifiers and any additional information necessary to identify the part. Each detail part or subassembly is indented to indicate the relationship to its next higher assembly. For vendor parts, the vendor's code, in accordance with Federal Supply Code for Manufacturers H4-1, will be found in this column enclosed in parentheses, followed by the contractor's part number also enclosed in parentheses. Vendor codes for government standard parts are also listed in the Description column. When a Vendor's Code is not listed, Hazeltine is the manufacturer of the part. Explanation of Vendor's Codes will be found in paragraph 5-27.

5-11. SERIAL NUMBER EFFECTIVELY.

5-12. Where part differences exist between equipments of varying serial numbers they are noted parenthetically in the Description column, i. e.: Figure 5-4-13 Lists an RC07GF473J resistor followed by the notation (used on serial numbers 1, 2 and 8 to 42).

5-13. **NUMERICAL INDEX**.

5-14. The Numerical Index, which immediately follows the parts listing, includes parts shown in the Part Number Column of the Parts Listing cross referenced to the Provisioning Codes assigned by the Navy and the Air Force.

5-15. PROVISIONING CODES.

5-16. GENERAL. Provisioning codes assigned by the Navy representatives are shown in the Navy Source Code and Recoverability Code columns of the Numerical Index. Definitions and explanations of these codes are contained in BUWEPS INSTRUCTIONS 4423.2.

5-17. Provisioning Codes assigned by the Air Force are shown in the Air Force Source Code and Repair Code columns.

5-18. AIR FORCE SOURCE CODE DEFINITIONS.

5-19. "P" SERIES - PARTS PROCURED AND UNDER INVENTORY STOCK CONTROL:

a. Code "P" identifies parts which may be requisitioned and installed by any level of maintenance consistent with the activity's authorized scope of maintenance. Code "P" is applied to parts on which usage

is anticipated or known. Restricted (emergency) service manufacture of code "P" items is considered practical but may be accomplished only after confirmation of non-availability from supply source.

b. Code "PD" identifies parts which may be requisitioned and installed by AF activities authorized depot-level maintenance only. Code "PD" is applied to parts on which usage is anticipated or known. Restricted (emergency) service manufacture of code "PD" parts is considered practical but may be accomplished only after confirmation of non-availability from supply sources.

c. Code "P1" identifies parts which may be requisitioned and installed by any maintenance level consistent with the activity's authorized scope of maintenance. Code "P1" is applied to parts on which usage is anticipated or known, and which service manufacture is considered impractical.

d. Code "PID" identifies parts which may be requisitioned and installed by AF activities authorized depot-level maintenance only. Code "PID" is applied to parts on which usage is anticipated or known, and which service manufacture is considered impractical.

e. Code "P2" identifies insurance-type spare parts which can be installed by any AF activity consistent with the activity's authorized scope of maintenance. This code is applied to such parts as are basically structural items if very limited usage, require special tools, templates, and/or jigs, and are very difficult, impractical, or uneconomical to manufacture by AF activities. These items are not subject to periodic replacement or wearout but may require infrequent replacement as a result of accidents or other unexpected occurrences. Delayed procurement items are included under this code.

f. Code "P2D" identifies insurance-type parts which may be installed by AF activities which are authorized depot-level maintenance only. This code is applied to parts as described under code "P2" and to delayed procurement items.

5-20. "M" SERIES - MANUFACTURE, PARTS NOT PROCURED:

a. Code "M" identifies parts, the manufacture and installation of which are within the capabilities of field maintenance activities; and to which all of the following conditions apply:

1. Procurement is not justified because of low usage or peculiar storage and installation factors. Needs are to be met by local manufacture only as required.
2. Their manufacture does not require tools, equipment or skills not normally authorized at field maintenance level.
3. Does not require test equipment not normally authorized at field maintenance level.
4. Does not require material not normally available in AF inventory.

b. Code "M1" identifies parts which can be manufactured at activities authorized depot-level maintenance facilities and to which all of the following conditions apply:

1. Procurement is not justified because of low usage or peculiar storage and installation factors. The need of base activities are to be met by requisitioning from the geographical AMA, SSM AMA, or IM AMA.
2. Their manufacture is beyond capabilities of field maintenance activities as outlined above.
3. Their manufacture does not require tools or equipment not normally authorized at all AMAs.

5-21. "A" SERIES - ASSEMBLE, ASSEMBLE NOT PROCURED

a. Code "A' identifies items capable of being assembled at any level of maintenance and is applied to assemblies of two or more parts, the majority of which are purchased and/or service manufactured.

b. Code "A1" identifies assemblies which can be assembled at AF activities authorized, depotlevel maintenance only and is applied to assemblies described under "A" code.

5-22. "X" SERIES - PARTS CONSIDERED IMPRACTICAL FOR SERVICE MANUFACTURE:

a. Code "'X" is applied to main structural members or similar parts, which, if required, would suggest extensive repair. The need for a part or parts coded "X" (wing spars, center section structure, etc.) should normally result in a recommendation to retire the article from service.

b. Code "X1" identifies parts applicable at any level of maintenance consistent with the activity's authorized scope of maintenance and for which it is more feasible to obtain the next higher assembly; for example, an integral detail part such as a welded segment inseparable from its assembly; a part machined in a matched set; or a part of any assembly which, if required, would suggest extensive reconditioning of such assembly. In some cases, code "X1" may be used to indicate an integral detail part of an assembly which has no anticipated usage and as an assembly was source-coded "M" or "M1".

c. Code “X1D" identifies parts. which are described under the "X1" code but which are applicable to AF activities authorized depot-level maintenance only.

d. Code "X2" identifies parts which are applicable to any level of maintenance consistent with the activity's authorized scope of maintenance, for which there is no anticipated usage, and which are impractical for service manufacture. This type of item will not be stocked. Such parts shall be obtained from reclamation or, if not available from this source, requisitioned through normal supply channels together with supporting justification for one-time procurement and immediate use. Repeated requests shall justify a change to a code "P1" or "P2", as applicable, if considered economical to procure and store such parts.

e. Code "X2D" identifies parts which are described under the "X2" code but which are applicable to AF activities authorized depot-level maintenance only. Repeated requests for such parts shall justify a change to a "P1D" or "P2D" code, as applicable, if considered economical and feasible to procure and stock such parts.

5-23. CODE "U" - PARTS NOT PROCURED, MANUFACTURED, OR STOCKED. Code "U" is applied to installation drawings, diagrams, instruction sheets, field-service drawing numbers, and parts not otherwise of supply significance, including obsolete parts, which cannot be procured or service manufactured.

5-24. MAINTENANCE REPAIR LEVEL CODES. The following are the maintenance repair level codes and their definitions:

a. CODE "S" - NO REPAIR. Code "S" identifies items which are nonrepairable and have no reclamation value. When these items fail they will be disposed of at user level as condemmed material.

b. CODE "B" - NO REPAIR; RECONDITION. Code "B" identifies assemblies or parts that will be reconditioned at the user level by adjusting, cleaning, soldering broken connection, etc. If these items cannot be returned to serviceable condition by such means they will be disposed of at user level as condemned material. No repair parts or tools are specially procured for maintenance of these items.

c. CODE "F" - REPAIR AT FIELD LEVEL. Code "F" identifies items which will be repaired by the field level maintenance activities. Normal servicing will be done by organizational level maintenance. Selected parts, tools and technical order data are procured and provided to applicable field level maintenance activities for repair of these items. No SRA is established for these items. If the condition of these items is such that they cannot be returned to serviceable condition by the field level maintenance activity with authorized parts and tools, they will be disposed of as condemned material. If repair of "F" coded items cannot be accomplished due to unavailability of authorized parts, tools, or other capability, the applicable SSM/M will be so advised with request for disposition instructions. "F" coded Hi-Valu or Critical Items, regardless of condition, will be turned into supply for disposition instructions from the applicable SSM/IM.

d. CODE "D" - LIMITED FIELD REPAIR; DEPOT OVERHAUL. Code "D" identifies items on which a limited degree of repair can be accomplished by field level maintenance activities. Normal servicing will be done at organizational level. SRA is established for overhaul of these items. A range of repair parts, tools, and technical order data consistent with the capability of repair are procured and provided to applicable field maintenance activities. Because of the design characteristics and complexity of repair, the degree of repair which is authorized on these items at the field maintenance level is necessarily determined by the degree of technical skills required and the cost of special tools, special test equipment, spare parts, and the predicted frequency of failure generation. If these items cannot be returned to serviceable condition with authorized parts and tools they will be returned to supply for shipment to the designated SRA.

e. CODE "DM" - LIMITED FIELD REPAIR; MOBILE DEPOT OVERHAUL. Code "DM" identifies items to which all the conditions of code "D" apply except that repair beyond field capability will be done by the mobile depot activity (MDA). If the MDA cannot repair these items, they will determine whether these items should be condemned or sent to the SRA.

f. CODE "L" - DEPOT LEVEL MAINTENANCE ONLY. Code "L" identifies items that will be repaired only at designated SRA. Repair parts and tools for repair are procured and provided only to these authorized activities. Required functional checkout and bench check equipment may be provided to applicable organizational and field level maintenance activities for accomplishing external adjustment or calibration and for verifying serviceability of these items. If they are found unserviceable they will be turned in to supply for shipment to the SRA.

g. CODE "LM" - DEPOT LEVEL MAINTENANCE ONLY; MOBILE DEPOT ACTIVITY. Code "LM" identifies items to which all conditions of Code "L" apply except that repair will be accomplished by MDA. If MDA cannot repair these items. they will determine whether these items should be condemned or sent to the SRA.

5-25. HOW TO USE THIS PARTS LIST.

5-26. To find the part number if the major assembly incorporating that part is known:

a. Locate the part and its corresponding index number in the appropriate illustration.

b. Find the corresponding index number in the Parts Listing to determine the part number and description.

5-27. VENDORS' CODES.

Code	Manufacturers' Name and Addresses
00779	AMP Inc. Harrisburg, Pa.
02660	Amphenol Corp. 2801 S. 25th Avenue Broadview, Ill. 60153
06229	Electrovert Inc. 86 Hartford Avenue Mount Vernon, N. Y. 10553
06540	Amathom Electronic Hardware Co., Inc. 432 Main Street New Rochelle, N. Y. 10801
07047	Ross Milton Co., The 511 Second Street Pike Southampton. Pa. 18966
09922	Burndy Corp. Norwalk, Conn.
12615	U. S. Terminals Inc. Cincinnati, Ohio
13103	Thermalloy Co. Dallas, Texas
18324	Signetics Corp. 811 East Argues Avenue Sunnyvale, Calif. 94086
19178	Zero Mfg. Co. Monson, Mass.
61007	Tubular Rivet and Stud Co. Wollaston, Mass.
	Oakland, Calif. 94601

Code	Manufacturers' Name and Addresses
70276	Allen Mfg. Co. Box 570 Hartford, Conn.
71785	Cinch Mfg. Co. and Howard B. Jones Div. 1026 S. Homan Avenue Chicago. Ill. 60624
72962	Elastic Stop Nut Corp. of America 2330 Vauxhall Road Union, N. J. 07083
77147	Patton MacGuyer Co. Edgewood station Providence, R.I.
78947	Ucinite Co., The Division of United Carr, Inc. 459 Wattertown Street Newtonville, Mass. 02160
79963	Zierick Mfg. Corp. 83 Rockdale Avenue New Rochelle. N. Y.
91506	Augat Inc. 33 Perry Avenue Attleboro, Mass. 02703
99378	Atlee Corp. 2 Lowell Avenue Winchester, Mass. 01890
99392	STM 2904 Chapman Street

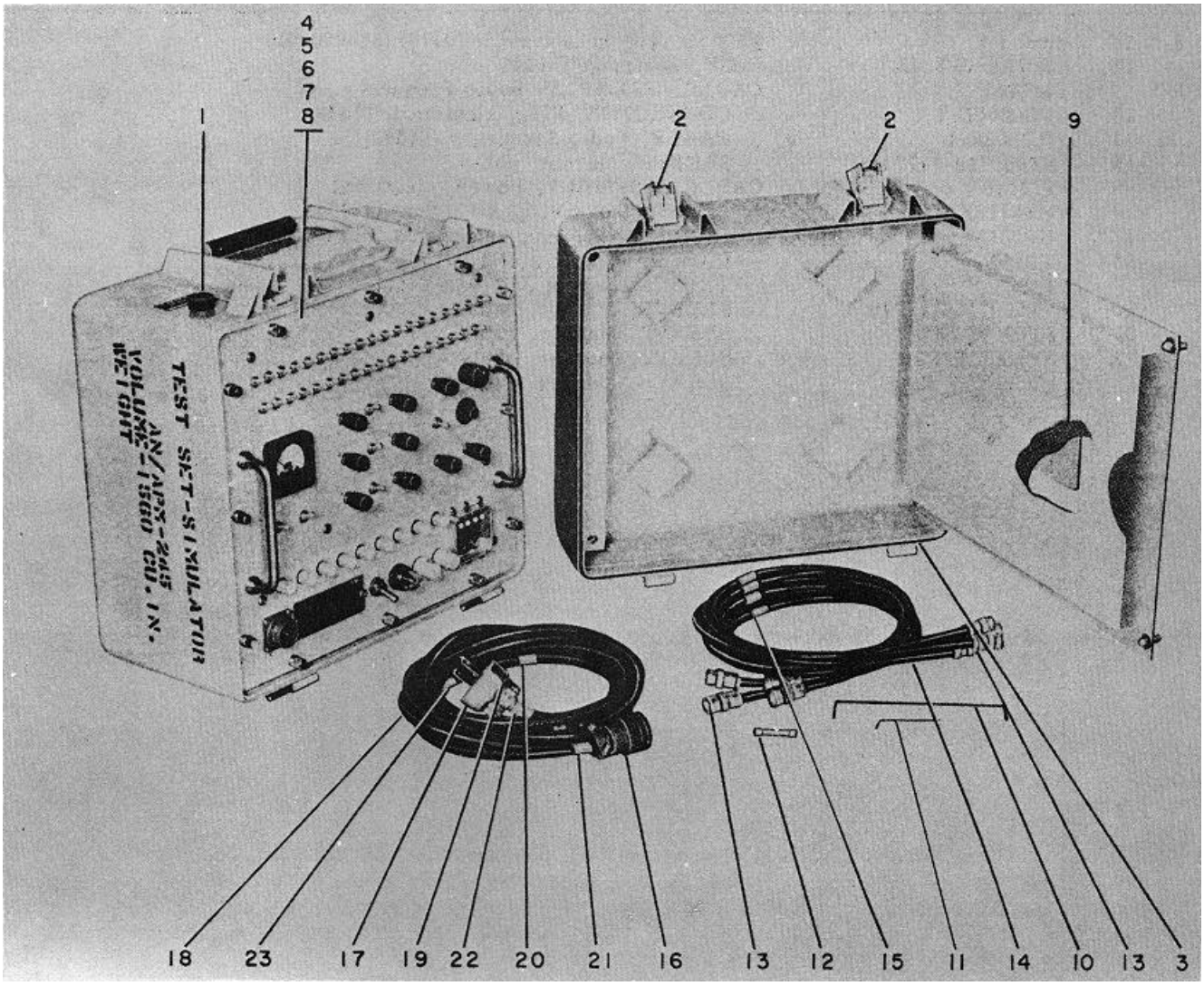


Figure 5-1. Test Set, Simulator - AN/APM-245

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-1-	117733	TEST SET, SIMULATOR - AN/APM-245
5-1-	360086	. COMBINATION CASE, Test Set Simulator
-1	ZSP6-602	. . PRESSURE EQUALIZER, Manual (19178)
-2	ZSP2-204	. . LATCH ASSEMBLY, Push Button (19178)
-3	ZSP5-502-47	. . GASKET, Case, watertight (19178)
-4	117474	. PANEL AND CHASSIS ASSEMBLY, Test Set Simulator (See figure 5-2 for detail breakdown)
-5	751647	. PIN, Locating
-6	MS15795-808	. WASHER, Flat (96906)
-7	MS35338-138	. WASHER, Lock (96906)
-8	NAS671C10	. NUT (80205)
-9	651006	. PLATE, Item List
-10	880007-3	. TOOL, Etraction, circuit card

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-1-11	050-F4	. KEY, Screw, socket head (70278) (880000-01)
-12	F02A250V3/4A	. FUSE, Cartridge (81349)
5-1-	117743	. CABLE ASSEMBLY, Radio Frequency
-13	UG-260E/U	. . CONNECTOR, Plug, electrical (81349)
-14	RG-6WA/U	. . CABLE, Radio Frequency (81349)
-15	ST650712-117743	. . SLEEVE, Marker, cable
5-1-	117740	. CABLE ASSEMBLY, Power, electrical
-16	MS3116F14-5S	. . CONNECTOR, Plug, electrical (96908)
-17	UP131M	. . CONNECTOR, Plug, electrical (81349)
-18	THOF-3	. . CABLE, Power, electrical (81349)
-19	41821	. . TERMINAL, Lug (00779) (T850007-2)
-20	ST650716-117740	. . SLEEVE, Marker, cable
-21	ST650716-P1	. . SLEEVE, Marker, cable
-22	ST650716-P2	. . SLEEVE, Marker, cable
-23	ST650716-W1	. . SLEEVE, Marker, cable

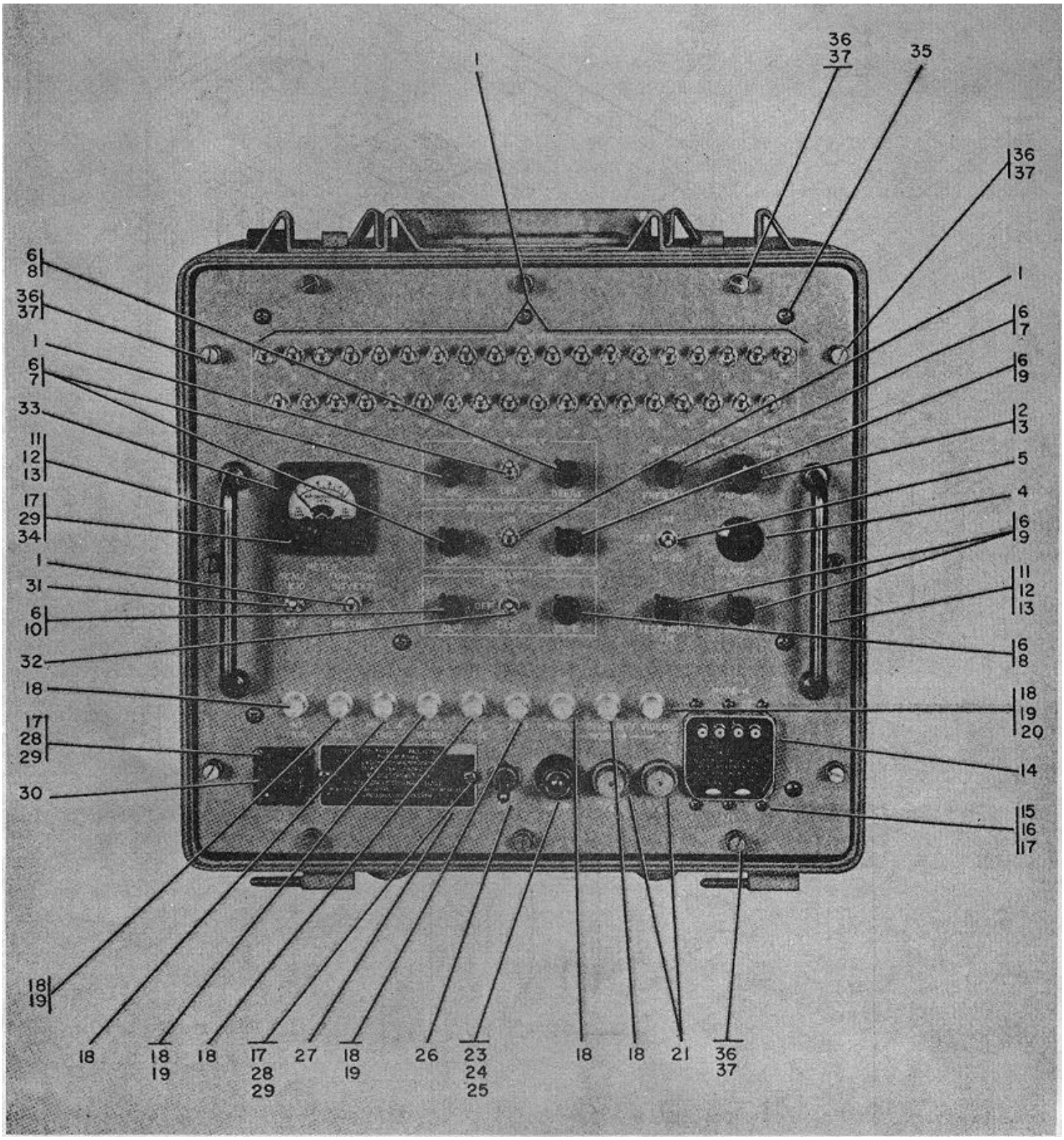


Figure 5-2. Panel and Chassis Assembly, Test Set Simulator (Sheet 1 of 2)

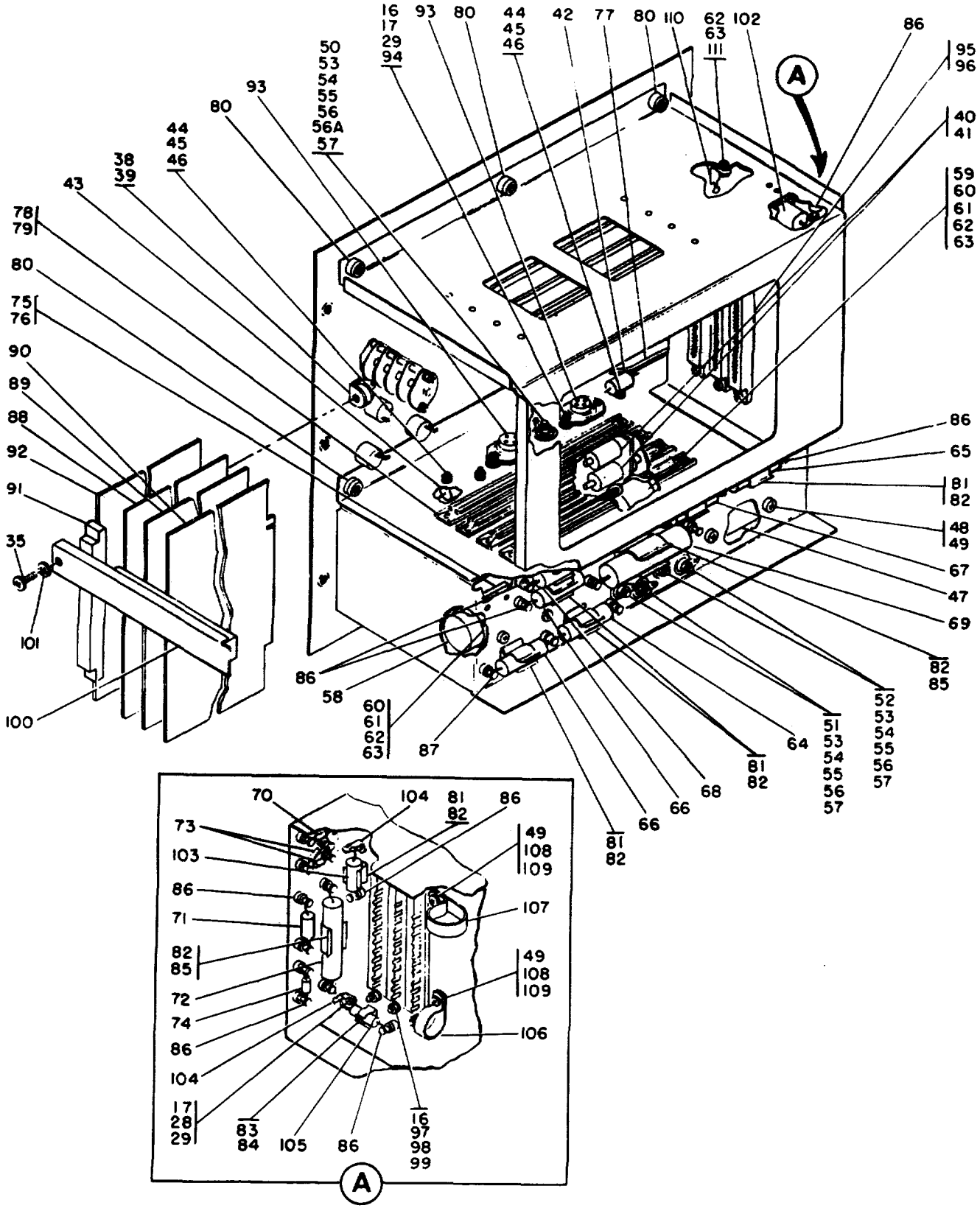


Figure 5-2. Panel and Chassis Assembly. Test Set Simulator (Sheet 2 of 2)

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-2-	117474	PANEL AND CHASSIS ASSEMBLY, Test Set Simulator (See figure 5-1 for next higher assembly)
-1	MS24655-231	. SWITCH, Toggle (96906)
-2	MS91528-1E2B	. KNOB (96906)
-3	840797	. SWITCH, Rotary, 6 sections
-4	MS25089-3C	. SWITCH, Rotary (96906)
-5	MS75029-21	. SWITCH, Toggle (96906)
-6	MS91528-0DIB	. KNOB (96906)
-7	RV6NAYSD503A	. RESISTOR, Variable, composition (81349)
-8	RV6NAYSD502A	. RESISTOR, Variable, composition (81349)
-9	RV6NAYSD103A	. RESISTOR, Variable, composition (81349)
-10	RV6NAYSD253A	. RESISTOR, Variable, composition (81349)
-11	410120	. HANDLE, Front Panel
-12	340297-3	. FERRULE, Handle
-13	MS24693-C271	. SCREW (96906)
-14	94-62548-33	. CONNECTOR, Receptacle, electrical (02660) (350886-5)
-15	MS51957-16	. SCREW (96906)
-16	MS15795-803	. WASHER, Flat (96906)
-17	MS35338-135	. WASHER, Lock (96906)
-18	UG-1094AU	. CONNECTOR, Receptacle, electrical (96906)
-19	850186-1	. TERMINAL, Lug, altered from 77147 part No. 5064
-20	RC20GF910J	. RESISTOR, Fixed, composition (81349)
-21	FHN20G	. FUSEHOLDER, Non-Indicating (81349)
-22	F02A250V3/4A	. FUSE, Cartridge (81349)
-23	LH78	. LAMPHOLDER, Indicator (81349)
-24	LC19CN	. LENS, Indicator (81349)
-25	NE51H	. LAMP, Neon (81349)
-26	ST840004-22	. SWITCH, Toggle, double-pole
-27	651005	. PLATE, Identification
-28	MS51957-15	. SCREW (96906)
-29	MS16210-2	. NUT (96906)
-30	MS3112E14-5P	. CONNECTOR, Receptacle, electrical (96906)
-31	MS75028-26	. SWITCH, Toggle (96906)
-32	MS75028-21	. SWITCH, Toggle (96906)
-33	MR13WOOlDCMAR	. METER, DC, 0-0.10 milliamperes scale (81349)
-34	NAS1635-04-10P	. SCREW (80205)
-35	MS51957-45	. SCREW (96906)
5-2-	117731	. FRONT PANEL SUBASSEMBLY, Test Set Simulator
-36	6106-SS0832-7	. . SCREW, Captive (06540) (810659-19)
-37	6312B-SS-0832	. . NUT, Plain, clinch (06540) (660430-8)
-38	22NA7-68-82	. . NUT, Anchor (72962)(660261-3)
-39	MS20426AD3-4	. . RIVET, Solid (96906)
-40	CZ23BKF103	. CAPACITOR, Fixed, feedthru (81349)
-41	650	. TERMINAL, Lug (79963)(850121)
-42	RE65N1001	. RESISTOR, Fixed, wirewound (81349)
-43	RE60G1000	. RESISTOR, Fixed, wirewound (81349)
-44	MS51957-3	. SCREW (96906) (Used on serial numbers 1 to 551)
	MS51957-4	. SCREW (96906) (Used on serial numbers 552 and up)
-45	MS35338-134	. WASHER, Lock (96906)
-46	MS16210-1	. NUT (96906)
-47	890356	. TRANSFORMER, Power, set-up
-48	MS51957-43	. SCREW (96906)
-49	MS15795-807	. WASHER, Flat (96906)
-50	lN2999B	. SEMICONDUCTOR DEVICE, Diode (81349)
-51	lN1614	. SEMICONDUCTOR DEVICE, Diode (81349)
-52	lN1615	. SEMICONDUCTOR DEVICE, Diode (81349)
-53	MS35431-8	. TERMINAL, Lug (96906)
-54	930129-8	. WASHER, Nonmetallic

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-2-55	930120-2	. WASHER, Nonmetallic
-56	MS35338-138	. WASHER, Lock (96906)
-56A	MS15795-808	. WASHER, Flat (96906)
-57	NAS671C10	. NUT (80205)
-58	105EZ25HB552	. CAPACITOR, Fixed, electrolytic, 5500 uf, +100%, -10%, 25 vdcw (99392) (270285)
-59	M62/3-066	. CAPACITOR, Fixed, electrolytic (81349)
-60	C3-M	. CLAMP, Capacitor (06229) (310159-6)
-61	N5	. STRAP, Retaining, capacitor (06229) (310159-13)
-62	MS51957-26	. SCREW (96906)
-63	MS35338-136	. WASHER, Lock (96906)
-64	RW55V2RO	. RESISTOR, Fixed, wirewound (81349)
-65	RW55V100	. RESISTOR, Fixed, wirewound (81349)
-66	RW55V120	. RESISTOR, Fixed, wirewound (81349)
-67	RW55V221	. RESISTOR, Fixed, wirewound (81349)
-68	RW55V240	. RESISTOR, Fixed, wirewound (81349)
-69	M62/2-028	. CAPACITOR, Fixed, electrolytic (81349)
-70	RC07GF47WJ	. RESISTOR, Fixed, composition (81349)
-71	RC42GF101J	. RESISTOR, Fixed, composition (81349)
-72	M62/2-012	. CAPACITOR, Fixed, electrolytic (81349)
-73	1N483B	. SEMICONDUCTOR DEVICE, Diode (81349)
-74	IN750A	. SEMICONDUCTOR DEVICE, Diode (81349)
5-2-	117738	. CHASSIS SUBASSEMBLY, Test Set Simulator
-75	482139	. . BLOCK, Guide Pin
-76	MS20426AD4-6	. . RIVET, Solid (96906)
-77	440148-02	. . CHANNEL, Rubber
-78	11903-300-9	. . GUIDE, Circuit Card (99378) (341033-1)
-79	20196-8-64	. . RIVET, Tubular (61007) (ST390471-8)
-80	NC1-82A	. . NUT, Self-Locking, clinch (72962) (660169-7A)
-81	6014-14CC	. . CLIP, Component (91506) (310205-10)
-82	20194-8-64	. . RIVET, Tubular (61007) (ST390472-8)
-83	6024-4CC	. . CLIP, Component (91506) (310205-25)
-84	7961-7-64	. . RIVET, Tubular (61007) (5T390470-7)
-85	6016-11CC	. . CLIP, Component (91506) (310205-23)
-86	SL235-269	. . TERMINAL, Stud (12615) (850124-1)
-87	SL236-270	. . TERMINAL, Feedthru (12615) (850124-2)
-88	117460	. CIRCUIT CARD ASSEMBLY, Logic No. 1 (See figure 5-3 for detail breakdown)
-89	117461	. CIRCUIT CARD ASSEMBLY, Logic No. 2 (See figure 5-4 for detail breakdown)
-90	117462	. CIRCUIT CARD ASSEMBLY, Logic No. 3 (See figure 5-5 for detail breakdown)
5-2-	117459	. PRINTED CIRCUIT BOARD, Extension
-91	251-22-30-270	. . CONNECTOR, Receptacle, electrical (71785) (350284)
-92	865703	. . PRINTED WIRING BOARD, Extension
-93	106513-1	. TRANSISTOR, Power, pnp
-94	MS51957-17	. SCREW (96906)
-95	350580	. KEY, Polarizing, circuit card
-96	350582	. CONNECTOR, Receptacle, electrical
-97	MS51957-18	. SCREW (96906)
-98	MS21044C04	. NUT (96906)
-99	481273-1	. SPACER, Connector
-100	117736	. STRAP ASSEMBLY, Retaining, circuit card
-101	MS35338-137	. WASHER, Lock (96906)
-102	M62/2-033	. CAPACITOR, Fixed, electrolytic (81349)
-103	CPO9A3B104K1	. CAPACITOR, Fixed, paper dielectric (81349)
-104	147-4	. TERMINAL, Lug (79963) (5T850064-01)
-105	CS13BH106M	. CAPACITOR, Fixed, electrolytic (81349)
-106	HP-7N	. CLAMP, Loop (09922) (310002-07)
-107	HP-12N	. CLAMP, Loop (09922) (310002-12)
-108	MS51957-46	. SCREW (96906)
-109	MS21044C08	. NUT (96906)

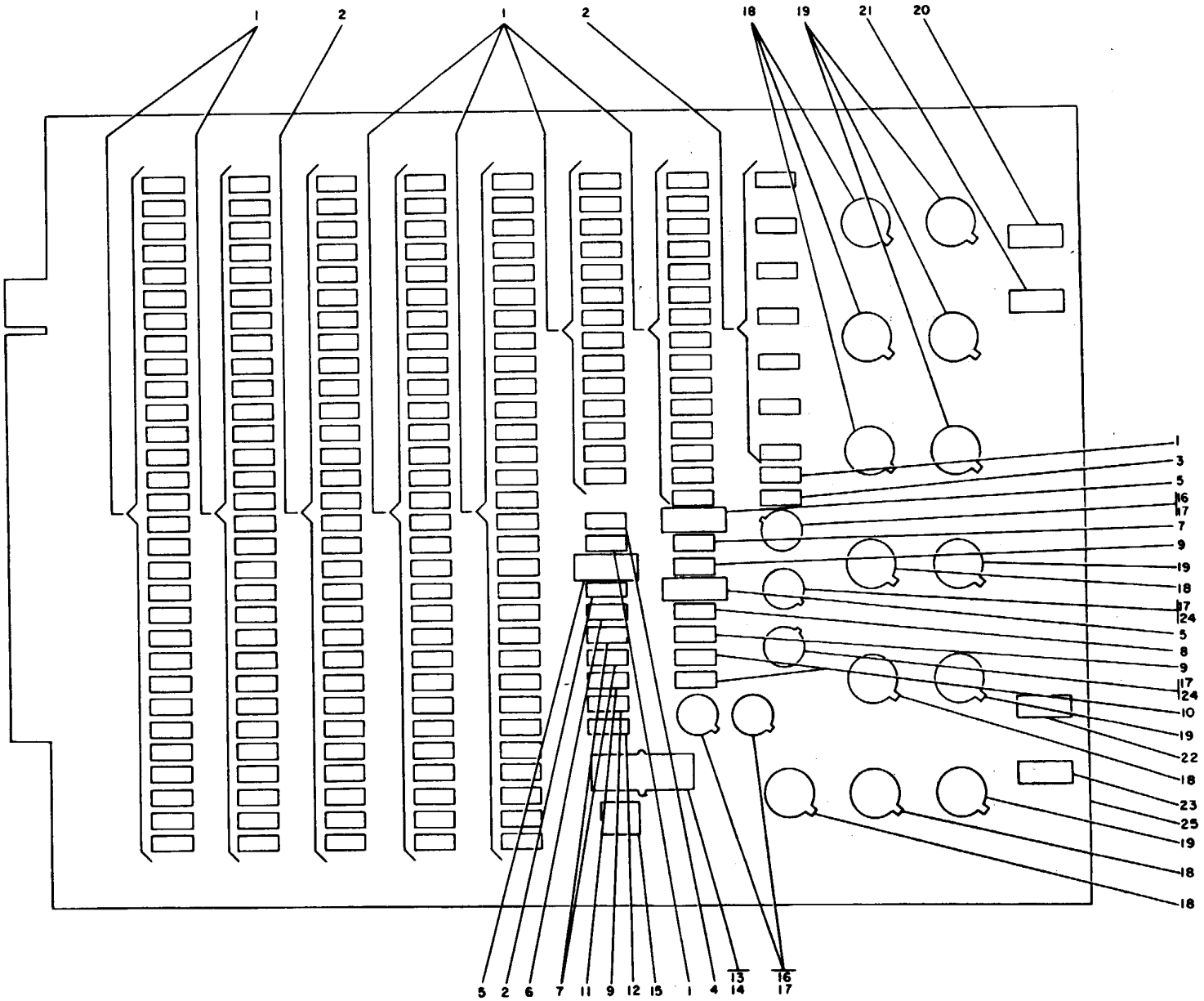


Figure 5-3. Circuit Card Assembly, Logic No. 1

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-2-110	147-6	. TERMINAL. Lug (79963) (STA50064-02)
-111	MS16210-3	. NUT (96906)
5-3-	117460	CIRCUIT CARD ASSEMBLY. Logic No. 1. (See figure 5-2 for next higher assembly)
-1	1N914	SEMICONDUCTOR DEVICE, Diode (81349)
-2	RC07GF472J	. RESISTOR, Fixed, composition (81349)
-3	RC07GF332J	. RESISTOR. Fixed. composition (81349)
-4	RC07GF103J	. RESISTOR. Fixed, composition (81349)
-5	ST270641-321	. CAPACITOR, Fixed, mica, radial leads. 62 pf, ±5%, 500 vdcw
-6	RC07GF473J	. RESISTOR, Fixed, composition (81349)
-7	RC07GF102J	. RESISTOR, Fixed, composition (81349)
-8	RC07GF123J	. RESISTOR, Fixed, composition (81349)
-9	RC07GF471J	. RESISTOR. Fixed, composition (81349)
-10	RC07GF153J	. RESISTOR. Fixed, composition (81349)
-11	RC07GF122J	. RESISTOR, Fixed, composition (81349)
-12	CK06CW103K	. CAPACITOR, Fixed. ceramic (81349)
-13	310073-2	. STRAP. Rubber, capacitor mounting
-14	CS13BF106M	. CAPACITOR, Fixed, tantalum (81349)
-15	1N3825A	. SEMICONDUCTOR DEVICE, Diode (81349)
-16	2N2222	. TRANSISTOR (81349)
-17	7717-18-N	. PAD, Mounting, transistor (13103) (670099)
-18	SU315K	. INTEGRATED CIRCUIT. Dual Three, input norgate (18324) (910442-3)
-19	SU320K	. INTEGRATED CIRCUIT, J-K Binary Element (18324) (910443-3)
-20	119437-D	. JACK. Tip, circuit card (78947) (ST350594-1)
-21	119437-B	. JACK, Tip, circuit card (78947) (ST350594-2)
-22	119437-F	. JACK, Tip, circuit card (78947) (ST350594-3)
-23	119437-H	. JACK, Tip, circuit card (78947) (ST350594-4)
-24	2N706	. TRANSISTOR (81349)
-25	865704	. PRINTED WIRING BOARD, Logic No. 1

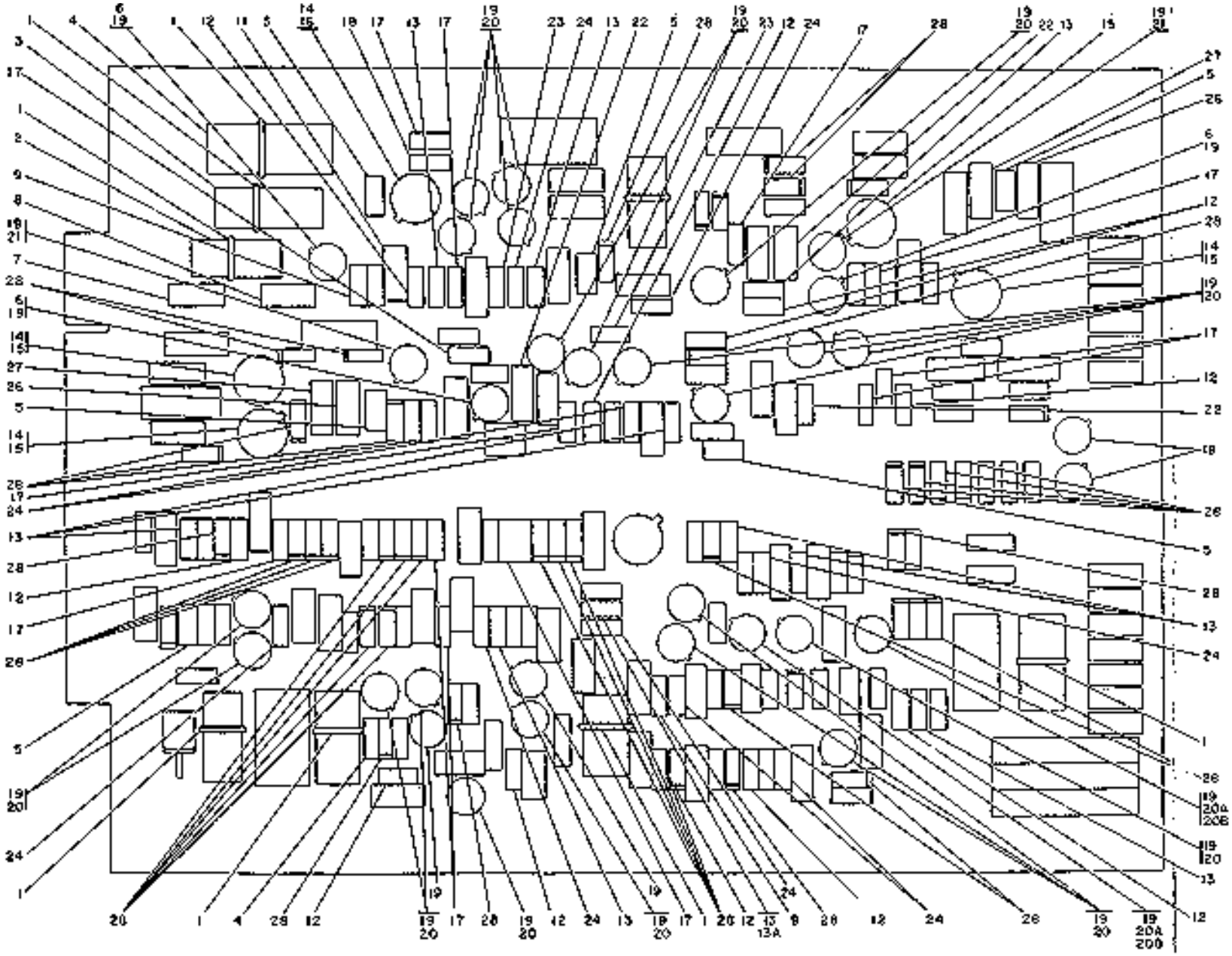


Figure 5-4. Circuit Card Assembly Logic No. 2 (Sheet 1 of 2)

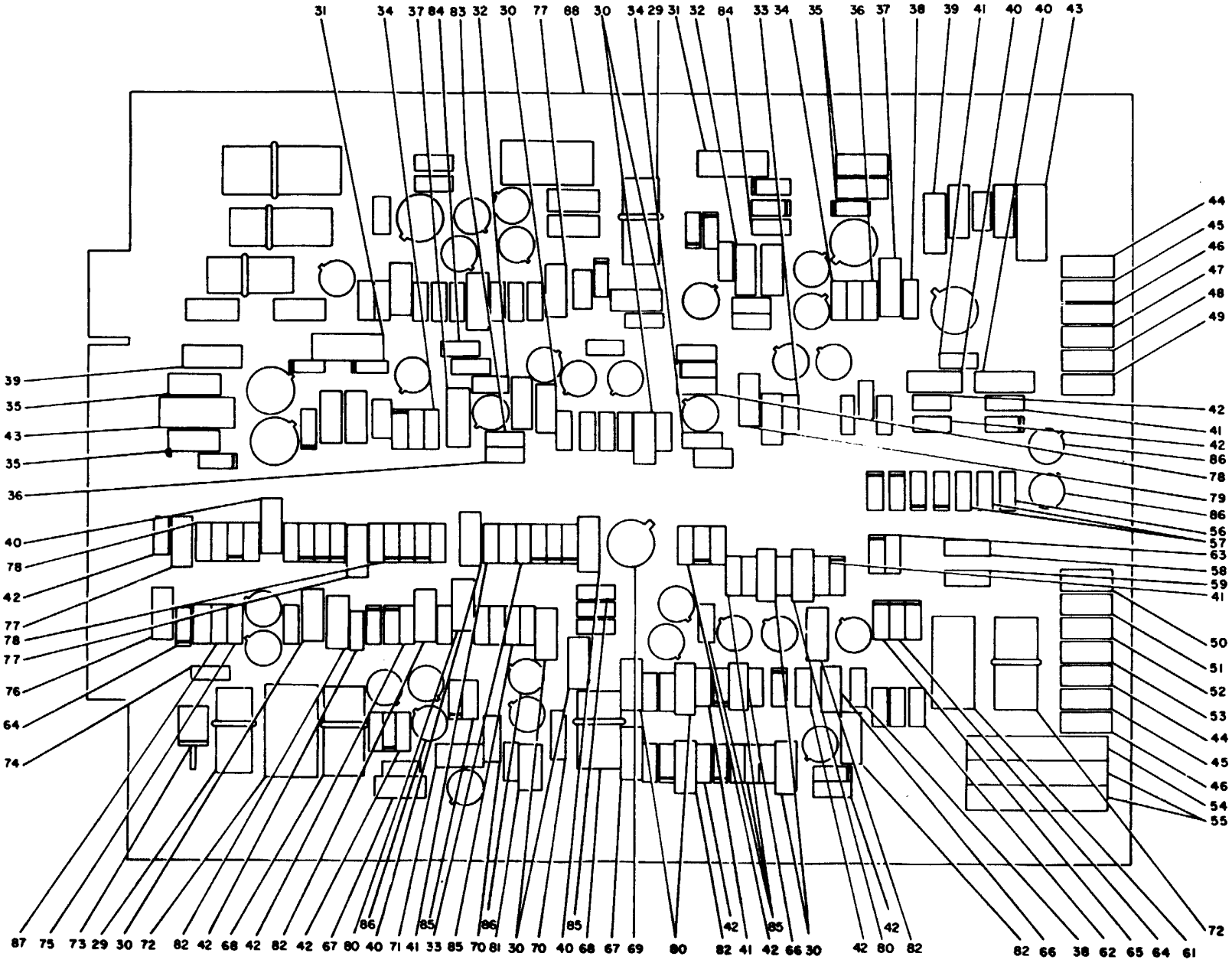


Figure 5-4. Circuit Card Assembly, Logic No. 2 (Sheet 2 of 2)

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-4-	117461	CIRCUIT CARD ASSEMBLY, Logic No. 2 (See figure 5-2 for next higher assembly)
-1	310073-2	. STRAP, Rubber, capacitor mounting
-2	CS13BH106M	. CAPACITOR, Fixed, tantalum (81349)
-3	CP09A1KB103K1	. CAPACITOR, Fixed, Paper dielectric (81349)
-4	CP05A1KB104K1	CAPACITOR, Fixed, Paper dielectric (81349)
-5	CS13BF105M	. CAPACITOR, Fixed, tantalum (81349)
-6	2N3251A	. TRANSISTOR (81349)
-7	RC20GF302J	. RESISTOR, Fixed, composition (81349)
-8	RC20GF912J	. RESISTOR, Fixed, composition (81349)
-9	RC07GF392J	. RESISTOR, Fixed, composition (81349)
-10	RC07GF433J	. RESISTOR, Fixed, composition (81349)
-11	RC20GF202J	. RESISTOR, Fixed, composition (81349)
-12	RC07GF471J	. RESISTOR, Fixed, composition (81349)
-13	RC07GF473J	. RESISTOR, Fixed, composition (81349) (Used on serial numbers 1, 2 and 8 to 42)
-13A	RC07GF912J	. RESISTOR, Fixed, composition (81349) (Used on serial numbers 3 to 7 and 43 and up)
-14	A-10020-RED	. PAD, Mounting, transistor (07047) (620403-01)
-15	2N657	. TRANSISTOR (81349)
-16	2N491	. TRANSISTOR (81349)
-17	RC07GF102J	. RESISTOR, Fixed, composition (81349)
-18	RC07GF151J	. RESISTOR, Fixed, composition (81349)
-19	7717-18-N	. PAD, Mounting, transistor (13103) (670099)
-20	2N2222	. TRANSISTOR (81349)
-20A	2N2222	. TRANSISTOR (81349) (Used on serial numbers 1 to 8)
-20B	2N706	. TRANSISTOR (81349) (Used on serial numbers 9 and up)
-21	2N2222A	. TRANSISTOR (81349)
-22	ST270641-343	. CAPACITOR, Fixed, mica, radial leads, 510 pf, ±5%, 500 vdcw
-23	RC07GF202J	. RESISTOR, Fixed, composition (81349)
-24	RC07GF472J	. RESISTOR, Fixed, composition (81349)
-25	RC42GF392J	. RESISTOR, Fixed, composition (81349)
-26	RC20GF102J	. RESISTOR, Fixed, composition (81349)
-27	RC20GF200J	. RESISTOR, Fixed, composition (81349)
-28	1N914	. SEMICONDUCTOR DEVICE, Diode (81349)
-29	CS13BF106M	. CAPACITOR, Fixed, tantalum (81349)
-30	ST270641-321	. CAPACITOR, Fixed, mica, radial leads, 62 pf, ±5%, 500 vdcw
-31	RC32GF103J	. RESISTOR, Fixed, composition (81349)
-32	ST270641-340	. CAPACITOR, Fixed, mica, radial leads, 390 pf, ±5%, 500 vdcw
-33	RC07GF203J	. RESISTOR, Fixed, composition (81349)
-34	RC07GF100J	. RESISTOR, Fixed, composition (81349)
-35	RC20GF472J	. RESISTOR, Fixed, composition (81349)
-36	RC07GF133J	. RESISTOR, Fixed, composition (81349)
-37	CS13BG105K	. CAPACITOR, Fixed, tantalum (81349)
-38	RC07GF622J	. RESISTOR, Fixed, composition (81349)
-39	CS13BH105M	. CAPACITOR, Fixed, tantalum (81349)
-40	ST270641-342	. CAPACITOR, Fixed, mica, radial leads, 470 pf, ±5%, 500 vdcw
-41	RC07GF103J	. RESISTOR, Fixed, composition (81349)
-42	RC07GF512J	. RESISTOR, Fixed, composition (81349)
-43	RC32GF150J	. RESISTOR, Fixed, composition (81349)
-44	119437-D	. JACK, Tip, circuit card (78947) (ST350594-1)
-45	119437-B	. JACK, Tip, circuit card (78947) (ST350594-2)
-46	119437-F	. JACK, Tip, circuit card (78947) (ST350594-3)
-47	119437-H	. JACK, Tip, circuit card (78947) (ST350594-4)
-48	119437-E	. JACK, Tip, circuit card (78947) (ST350594-5)
-49	119437-G	. JACK, Tip, circuit card (78947) (ST350594-6)
-50	119437-K	. JACK, Tip, circuit card (78947) (ST350594-7)
-51	119437-J	. JACK, Tip, circuit card (78947) (ST350594-8)
-52	119437-A	. JACK, Tip, circuit card (78947) (ST350594-9)
-53	119437-C	. JACK, Tip, circuit card (78947) (ST350594-10)
-54	RJ12BP102	. RESISTOR, Variable, non-wirewound (81349)
-55	RJ12BP502	. RESISTOR, Variable, non-wirewound (81349)

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-4-56	FC07GF153J	. RESISTOR, Fixed, composition (81349)
-57	RC07GF562J	. RESISTOR, Fixed, composition (81349)
-58	RN60C6341F	. RESISTOR, Fixed, film (81349)
-59	RN60C5762F	. RESISTOR, Fixed, film (81349)
-60	CQ09A1MA103G1	. CAPACITOR, Fixed, plastic (81349)
-61	RC42GF302J	. RESISTOR, Fixed, composition (81349)
-62	RC07GF362J	. RESISTOR, Fixed, composition (81349)
-63	RC07GF122J	. RESISTOR, Fixed, composition (81349)
-64	1N750A	. SEMICONDUCTOR DEVICE, Diode (81349)
-65	1N752A	. SEMICONDUCTOR DEVICE, Diode (81349)
-66	CY12C301G	. CAPACITOR, Fixed, glass (81349)
-67	RC20GF153J	. RESISTOR, Fixed, composition (81349)
-68	CQ09A1MA563G	. CAPACITOR, Fixed, plastic (81349)
-69	SU320K	. INTEGRATED CIRCUIT, J-K Binary Element (18324) (910443-3)
-70	RN60C5901F	. RESISTOR. Fixed, film (81349)
-71	CY12C820G	. CAPACITOR, Fixed! glass (81349)
-72	CY20C512G	. CAPACITOR, Fixed, glass (81349)
-73	1N3825A	. SEMICONDUCTOR DEVICE, Diode (81349)
-74	CK66CW103K	. CAPACITOR, Fixed, ceramic (81349)
-75	RC07GF182J	. RESISTOR, Fixed, composition (81349)
-76	RC20GF560J	. RESISTOR, Fixed, composition (81349)
-77	RC20GF511J	. RESISTOR, Fixed, composition (81349)
-78	RC07GF511J	. RESISTOR, Fixed, composition (81349)
-79	RC20GF910J	. RESISTOR, Fixed, composition (81349)
-80	ST270641-330	. CAPACITOR, Fixed, mica, radial leads, 150 pf, ±5%, 500 vdcw
-81	CY12C390G	. CAPACITOR, Fixed, glass (81349)
-82	ST270641-324	. CAPACITOR, Fixed, mica, radial leads, 82 pf, ±5%, 500 vdcw
-83	RC07GF242J	. RESISTOR, Fixed, composition (81349)
-84	RC07GF822J	. RESISTOR, Fixed, composition (81349)
-85	RC07GF201J	. RESISTOR, Fixed, composition (81349)
-86	2N706	. TRANSISTOR (81349)
-87	RC07GF301J	. RESISTOR, Fixed, composition (81349)
-88	865705	. PRINTED WIRING BOARD, Logic No. 2

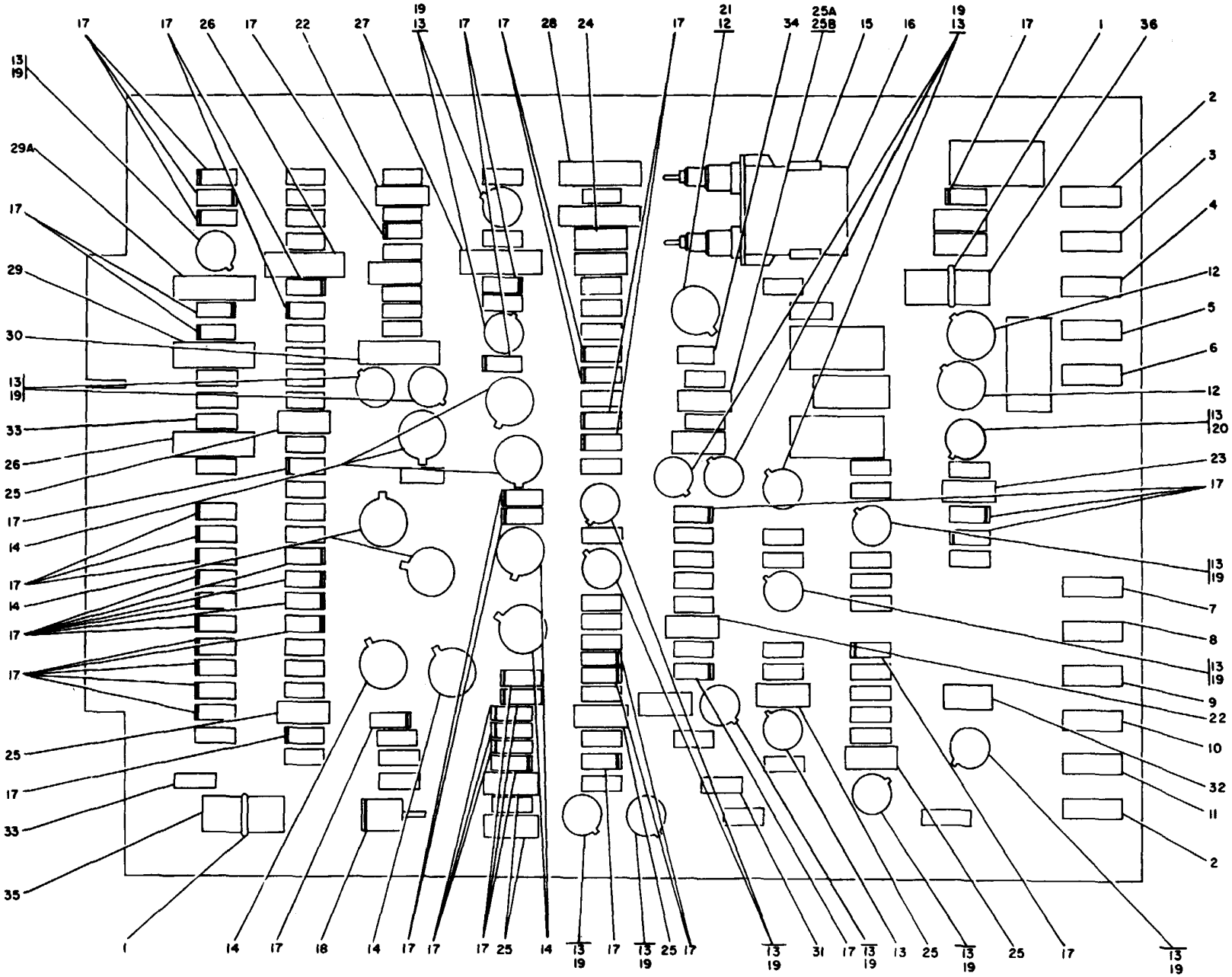


Figure 5-5. Circuit Card Assembly, Logic No. 3 (Sheet 1 of 2)

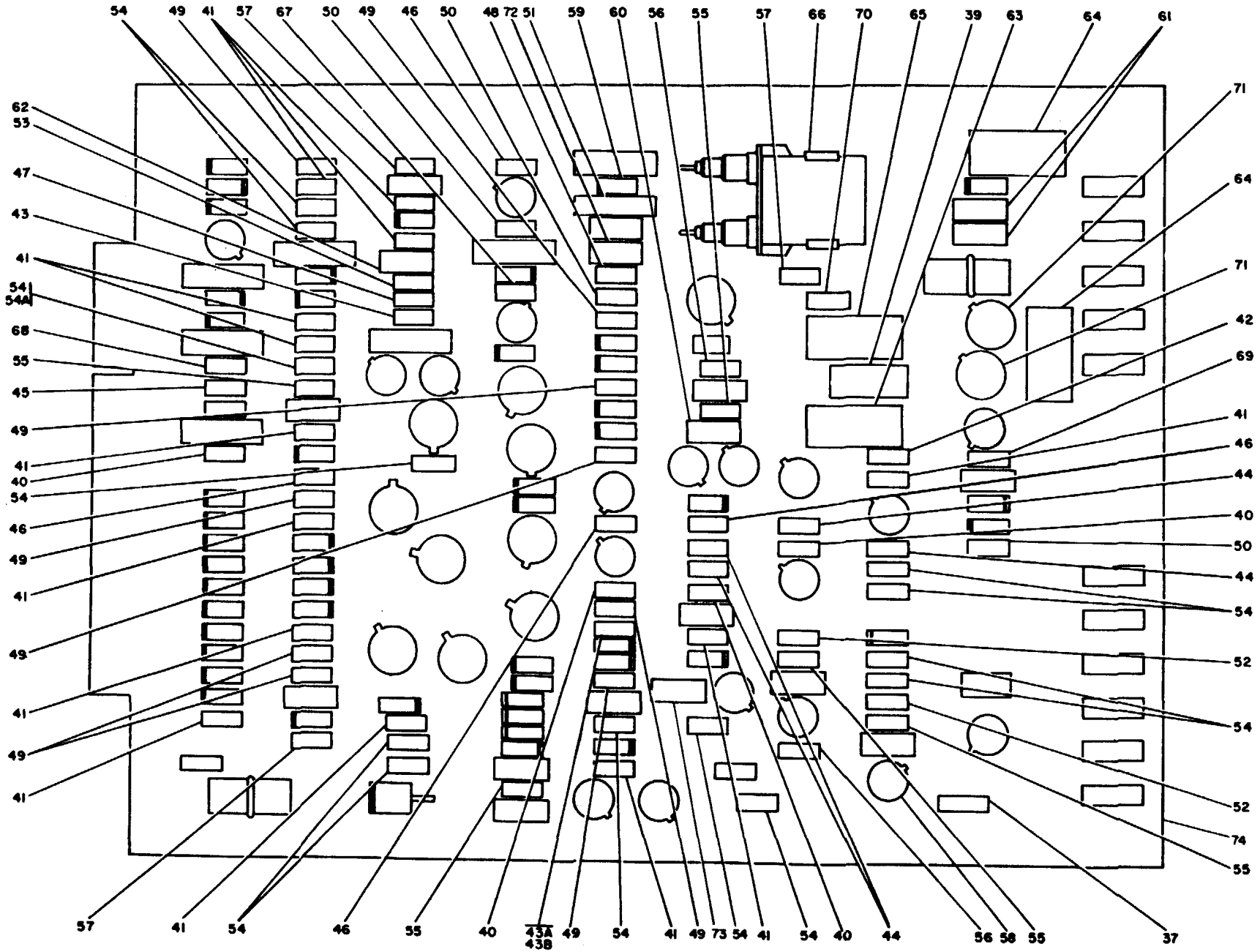


Figure 5-5. Circuit Card Assembly, Logic No. 3 (Sheet 2 of 2)

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-5-	117462	CIRCUIT CARD ASSEMBLY, Logic No. 3 (See figure 5-2 for next higher assembly)
-1	310073-2	. STRAP, Rubber, capacitor mounting
-2	119437-D	. JACK, Tip, circuit card (78947) (ST350594-1)
-3	119437-B	. JACK, Tip, circuit card (78947) (ST350594-2)
-4	119437-F	. JACK, Tip, circuit card (78947) (ST350594-3)
-5	119437-H	. JACK, Tip, circuit card (78947) (ST350594-4)
-6	119437-E	. JACK, Tip, circuit card (78947) (ST350594-5)
-7	119437-G	. JACK, Tip, circuit card (78947) (ST350594-6)
-8	119437-K	. JACK, Tip, circuit card (78947) (ST350594-7)
-9	119437-J	. JACK, Tip, circuit card (78947) (ST350594-8)
-10	119437-A	. JACK, Tip, circuit card (78947) (ST350594-9)
-11	119437-C	. JACK, Tip, circuit card (78947) (ST350594-10)
-12	A-10020-RED	. PAD, Mounting, transistor (07047) (620403-01)
-13	7717-18-N	. PAD, Mounting, transistor (13103) (670099)
-14	SU320K	. INTEGRATED CIRCUIT, J-K Binary Element (18324) (910443-3)
-15	8000-DG2	. SOCKET, Crystal (91506) (350666-4)
-16	330586-2	. CRYSTAL UNIT, Quartz
-17	1N914	. SEMICONDUCTOR DEVICE, Diode (81349)
-18	1N825A	. SEMICONDUCTOR DEVICE, Diode (81349)
-19	2N2222	. TRANSISTOR (81349)
-20	2N2222A	. TRANSISTOR (81349)
-21	2N657	. TRANSISTOR (81349)
-22	ST270641-330	. CAPACITOR, Fixed, mica, radial leads, 150 pf, ±5%, 500 vdcw
-23	ST270641-337	. CAPACITOR. Fixed, mica, radial leads, 300 pf, ±5%, 500 vdcw
-24	ST270641-332	. CAPACITOR, Fixed, mica, radial leads, 180 pf, ±5%, 500 vdcw
-25	ST270641-321	. CAPACITOR, Fixed, mica, radial leads, 62 pf, ±5%, 500 vdcw
-25A	ST270641-321	. CAPACITOR, Fixed, mica, radial leads, 62 pf, ±5%, 500 vdcw (Used on serial numbers 1, 2 and 8 to 42)
-25B	ST270641-330	. CAPACITOR, Fixed, mica, radial leads, 150 pf, ±5%, 500 vdcw (Used on serial numbers 3 to 7 and 43 and up)
-26	ST270641-342	. CAPACITOR, Fixed, mica, radial leads, 470 pf, ±5%, 500 vdcw
-27	ST270641-341	. CAPACITOR, Fixed, mica, radial leads, 430 pf, ±5%, 500 vdcw
-28	ST270641-360	. CAPACITOR, Fixed, mica, radial leads, 2700 pf, ±5%, 500 vdcw
-29	ST270641-349	. CAPACITOR, Fixed, mica, radial leads, 910 pf, ±5%, 500 vdcw
-29A	ST270641-359	. CAPACITOR, Fixed, mica, radial leads, 2400 pf, ±5%, 500 vdcw
-30	ST270641-346	. CAPACITOR, Fixed, mica, radial leads, 680 pf, ±5%, 500 vdcw
-31	CK06CW222K	. CAPACITOR, Fixed, ceramic (81349)
-32	CY12C820G	. CAPACITOR, Fixed, glass (81349)
-33	CK06CW103K	. CAPACITOR, Fixed, ceramic (81349)
-34	CS13BF105M	. CAPACITOR, Fixed, tantalum (81349)
-35	CS13BF106M	. CAPACITOR, Fixed, tantalum (81349)
-36	CS13BH106M	. CAPACITOR, Fixed, tantalum (81349)
-37	RN60C8661F	. RESISTOR, Fixed, film (81349)
-38	Deleted	
-39	RC32GF511J	. RESISTOR, Fixed, composition (81349)
-40	RC07GF102J	. RESISTOR, Fixed, composition (81349)
-41	RC07GF103J	. RESISTOR, Fixed, composition (81349)
-42	RC07GF123J	. RESISTOR, Fixed, composition (81349)
-43	RC07GF912J	. RESISTOR, Fixed, composition (81349)
-43A	RC07GF912J	. RESISTOR, Fixed, composition (81349) (Used on serial numbers 1, 2 and 8 to 42)
-43B	RC07GF104J	. RESISTOR, Fixed, composition (81349) (Used on serial numbers 3 to 7 and 43 and up)
-44	RC07GF153J	. RESISTOR, Fixed, composition (81349)
-45	RC07GF200J	. RESISTOR, Fixed, composition (81349)
-46	RC07GF202J	. RESISTOR, Fixed, composition (81349)
-47	RC07GF222J	. RESISTOR, Fixed, composition (81349)
-48	RC07GF303J	. RESISTOR, Fixed, composition (81349)
-49	RC07GF332J	. RESISTOR, Fixed, composition (81349)
-50	RC07GF391J	. RESISTOR, Fixed, composition (81349)
-51	MS18100-20	. COIL, Radio frequency (81349)

FIG. & INDEX NO.	PART NO.	PART NAME (NOMENCLATURE. OR DESCRIPTION) 1 2 3 4 5 6 7
5-5-52	RC07GF393J	. RESISTOR, Fixed, composition (81349)
-53	RC07GF470J	. RESISTOR, Fixed, composition (81349)
-54	RC07GF471J	. RESISTOR, Fixed, composition (81349)
-54A	RC07GF271J	. RESISTOR, Fixed, composition (81349)
-55	RC07GF472J	. RESISTOR, Fixed, composition (81349)
-56	RC07GF473J	. RESISTOR, Fixed, composition (81349)
-57	RC07GF203J	. RESISTOR, Fixed, composition (81349)
-58	2N706	. TRANSISTOR (81349)
-59	RC07GF822J	. RESISTOR, Fixed, composition (81349)
-60	RC20GF102J	. RESISTOR, Fixed, composition (81349)
-61	RC32GF100J	. RESISTOR, Fixed, composition (81349)
-62	RC20GF75W	. RESISTOR, Fixed, composition (81349)
-63	RC42GF122J	. RESISTOR, Fixed, composition (81349)
-64	RC42GF47W	. RESISTOR, Fixed, composition (81349)
-65	RC42GF202J	. RESISTOR, Fixed, composition (81349)
-66	ST390472-9	. RIVET, Tubular
-67	RC07GF100J	. RESISTOR, Fixed, composition (81349)
-68	RC07GF105J	. RESISTOR, Fixed, composition (81349)
-69	RC07GF152J	. RESISTOR, Fixed, composition (81349)
-70	CS13BF105K	. CAPACITOR, Fixed, tantalum (81349)
-71	2N2219A	. TRANSISTOR (81349)
-72	ST270641-312	. CAPACITOR, Fixed, mica, radial leads, 27 pf, ±5%, 500 vdcw
-73	ST270641-316	. CAPACITOR, Fixed, mica, radial leads, 39 pf, ±5%, 500 vdcw
-74	865706	. PRINTED WIRING BOARD, Logic No. 3

PART NUMBER	SOURCE CODE AIR FORCE	SOURCE CODE NAVY	REPAIR CODE AIR FORCE	RECOVER CODE NAVY
A-10020-RED				
CK06CW103K	P1	P1	NS	C
CK06CW222K	P1	P1	NS	C
CP05A1KB104K1	P1	P1	NS	C
CP09A1KB103K1	P1		NS	
CP09A3B104K1	P1	P1	NS	C
CQ09A1MA103G1	P1		NS	
CQ09A1MA563G1	P1		NS	
CS13BF105K	P1		NS	
CS13BF105M	P1		NS	
CS13BF106M	P1		NS	
CS13BG105K	P1		NS	
CS13BH105M	P1		NS	
CS13BH106M				
CY12C301G				
CY12C390G				
CY12C820G				
CY20C512G				
CZ23BKF103	P1	P1	NS	C
C3-M	P1	P1	NS	C
FHN20G	P1	P1	NS	C
F02A250V3/4A	P1	P1	NS	C
HP-7N				
HP-12N				
LC19CN	P1	P1	NS	C
LH78	P1	P1	NS	C
MR13W001DCMAR	P1	P1	NS	C
MS15795-803	P1	P1	NS	C
MS15795-807	P1	P1	NS	C
MS15795-808	P1	P1	NS	C
MS16210-1	P1	P1	NS	C
MS16210-2				
MS16210-3				
MS18100-20	P1	P1	NS	C
MS20426AD3-4	P1	P1	NS	C
MS20426AD4-6	P1	P1	NS	C
MS21044C04	P1	P1	NS	C
MS21044C08	P1	P1	NS	C
MS24655-231				
MS24693-C271	P1	P1	NS	C
MS25036-3				
MS25089-3C	P1	P1	NS	C
MS3112E14-5P	P1	P1	NS	C
MS3116F14-5S	P1	P1	NS	C
MS35338-134	P1	P1	NS	C
MS35338-135	P1	P1	NS	C
MS35338-136	P1	P1	NS	C
MS35338-137	P1	P1	NS	C
MS35338-138	P1	P1	NS	C
MS35431-8	P1	P1	NS	C
MS51957-3	P1	P1	NS	C
MS51957-4		P1		C
MS51957-15	P1	P1	NS	C
MS51957-16	P1	P1	NS	C
MS51957 -17	P1	P1	NS	C
MS51957-18	P1	P1	NS	C
MS51957-26	P1	P1	NS	C
MS51957-43				
MS51957-45	P1	P1	NS	C
MS51957-46	P1	P1	NS	C
MS75028-21	P1	P1	NS	C
MS75028-26	P1	P1	NS	C
MS75029-21	P1	P1	NS	C
MS91528-0D1B	P1	P1	NS	C
MS91528-1E2B	P1	P1	NS	C
M62/2-012				
M62/2-028				
M62/2-033				
M62/3-066				
NAS1635-04-10P				
NAS671C10	P1	P1	NS	C
NC1-82A	P1	P1	NS	C
NE51H	P1	P1		C
N5	P1	P1	NS	C
RC07GF100J	P1	P1	NS	C
RC07GF102J	P1	P1	NS	C
RC07GF103J	P1	P1	NS	C
RC07GF104J	P1		NS	
RC07GF105J	P1	P1	NS	C
RC07GF122J	P1	P1	NS	C
RC07GF123J	P1	P1	NS	C
RC07GF133J	P1	P1	NS	C
RC07GF151J	P1	P1	NS	C
RC07GF152J	P1	P1	NS	C
RC07GF153J	P1	P1	NS	C
RC07GF182J	P1	P1	NS	C
RC07GF200J	P1	P1	NS	C
RC07GF201J	P1	P1	NS	C
RC07GF202J	P1	P1	NS	C
RC07GF203J	P1	P1	NS	C
RC07GF222J	P1	P1	NS	C
RC07GF242J	P1	P1	NS	C
RC07GF271J	P1	C		
RC07GF301J	P1	P1	NS	C
RC07GF303J	P1	P1	NS	C
RC07GF332J	P1	P1	NS	C
RC07GF362J	P1	P1	NS	C
RC07GF391J	P1	P1	NS	C
RC07GF392J	P1	P1	NS	C
RC07GF393J	P1	P1	NS	C
RC07GF433J	P1	P1	NS	C
RC07GF470J	P1	P1	NS	C
RC07GF471J	P1	P1	NS	C
RC07GF472J	P1	P1	NS	C
RC07GF473J	P1	P1	NS	C
RC07GF511J	P1	P1	NS	C
RC07GF512J	P1	P1	NS	C
RC07GF562J	P1	P1	NS	C
RC07GF622J	P1	P1	NS	C
RC07GF822J	P1	P1	NS	C
RC07GF912J	P1	P1	NS	
RC20GF102J				
RC20GF153J				
RC20GF200J				
RC20GF202J				
RC20GF302J				
RC20GF472J				
RC20GF511J				
RC20GF560J				

PART NUMBER	SOURCE CODE AIR FORCE	SOURCE CODE NAVY	REPAIR CODE AIR FORCE	RECOVER CODE NAVY
RC20GF750J				
RC20GF910J				
RC20GF912J				
RC32GF100J	P1		NS	
RC32GF103J	P1	P1	NS	C
RC32GF150J	P1	P1	NS	C
RC32GF511J	P1	P1	NS	C
RC42GF101J	P1	P1	NS	C
RC42GF122J	P1	P1	NS	C
RC42GF202J	P1	P1	NS	C
RC42GF302J	P1	P1	NS	C
RC42GF392J	P1	P1	NS	C
RC42CF470J	P1	P1	NS	C
RE60G1000	P1	P1	NS	C
RE65N1001	P1	P1	NS	C
RG-62A/U				
RJ12BP102	P1		NS	
RN12BP502	P1	P1	NS	C
RN60C5762F	P1	P1	NS	C
RN60C5901F	P1	P1	NS	C
RN60C6341F	P1	P1	NS	C
RN60C8661F	P1		NS	
RV6NAYSD103A	P1	P1	NS	C
RV6NAYSD253A	P1	P1	NS	C
RV6NAYSD502A	P1	P1	NS	C
RV6NAYSD503A	P1	P1	NS	C
RW55V100	P1	P1	NS	C
RW55V120	P1	P1	NS	C
RW55V2R0	P1	P1	NS	C
RW55V221	P1	P1	NS	C
RW55V240	P1	P1	NS	C
SL235-269	P1	P1	NS	C
SL236-270	P1	P1	NS	C
ST270641-312				
ST270641-316				
ST270641-321				
ST270641-324				
ST270641-330				
ST270641-332				
ST270641-337				
ST270641-340				
ST270641-341				
ST270641-342				
ST270641-343				
ST270641-346				
ST270641-349				
ST270641-359		P1		C
ST270641-360				
ST390472-9	X2	X2	F	
ST650712-117743	M	MO	F	
ST650716-P1	M	MO	F	
ST650716-P2	M	MO	F	
ST650716-W1	M	MO	F	
ST650716-117740	M	MO	F	
ST840004-22				
SU315K	P1	P1	NS	C
SU320K	P1	P1	NS	C
THOF-3	P1	P1	NS	C
UG-1094AU		P1		C
UG-260E/U				
UP131M	P1	P1	NS	C
ZSP2-204	P1	P1	NS	C
ZSP5-502-47	X2	X2	F	
ZSP6-602	P1	P1	NS	C
O50-F4	X2	X2	F	
1N1614				
1N1615	P1	P1	NS	C
1N2999B	P1	P1	NS	C
1N3825A	P1	P1	NS	C
1N483B	P1	P1	NS	C
1N750A	P1	P1	NS	C
1N752A	P1	P1	NS	C
1N914	P1	P1	NS	L
105EZ25HB552	P1	P1	NS	C
106513-1				
117459	X2	X2	F	
117460	P1	P1	XF	L
117461	P1	P1	XF	L
117462	P1	P1	XF	L
117474	X2	X2	D	
117731	X2	X2	F	
117733	A	P1	D	E
117736	M	MO	F	
117738	X1	X1	F	
117740	A	AF	F	
117743	A	AF	F	
11903-300-9	P1	P1	NS	C
119437-A	P1	P1	NS	C
119437-B	P1	P1	NS	C
119437-C	P1	P1	NS	C
119437-D	P1	P1	NS	C
119437-E	P1	P1	NS	C
119437-F	P1	P1	NS	C
119437-G	P1	P1	NS	C
119437-H	P1	P1	NS	C
119437-J	P1	P1	NS	C
119437-K	P1	P1	NS	C
147-4	P1	P1	NS	C
147-6				
2-323930-2				
2N2219A	P1		NS	
2N2222	P1		NS	
2N2222A		P1		C
2N3251A	P1	P1	NS	C
2N491A		P1		C
2N657	P1	P1	NS	C
2N706	P1	P1	NS	C
20194-8-64	X2	X2	F	
20196-8-64	X2	X2	F	
22NA7-68-82	P1	P1	NS	C
251-22-30-270	X1	X1	F	
310073-2	M	MF	F	
327137				
330586-2				
340297-3	X2	X2	F	
350579				
350580	P1	P1	NS	C
350581-1				

PART NUMBER	SOURCE CODE AIR FORCE	SOURCE CODE NAVY	REPAIR CODE AIR FORCE	RECOVER CODE NAVY
350582	P1	P1	NS	C
360086	X2	X2	F	
410120	X2	X2	F	
41821				
440148-02	X2	X2	F	
481273-1	M	MO	F	
482139	M	MO	F	
6014-14CC	P1	P1	NS	C
6016-11CC	X2	X2	F	
6024-4CC	P1	P1	NS	C
6106-SS-0832-7	P1	P1	N	C
6312B-SS-0832	P1	P1	NS	C
650	P1	P1	NS	C
651005	M	MO	F	
651006	M	MO	F	
751647	X2	X2	F	
7717-18-N				
7961-7-64	P1	P1	NS	C
8000-DG2				
840797	P1	P1	NS	C
850186-1	M	MF	F	
865703	X1	X1	F	
865704	X1	X1	F	
865705	X1			
865706	X1	X1	F	
880007-3	X2	X2	F	
890356	P1	P1	NS	C
930120-2	P1	P1	NS	C
930129-8	M	MO	F	
94-62548-33	P1	P1	NS	C

SECTION VI

ORGANIZATIONAL PREVENTIVE MAINTENANCE

6-1. INTRODUCTION.

6-2. This section contains organizational preventive maintenance procedures for the test set. These procedures should be performed to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

6-3. PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

6-4. The preventive maintenance checks and services charts (figures 6-1 through 6-3) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the Reference column lists the illustrations or paragraphs which either contain reference data, locate parts, or contain detailed procedures. If the defect cannot be remedied by performing the corrective action indicated, higher echelon maintenance or repair is required.

Sequence No.	Item	Procedure	References
1	Completeness	Check that the equipment is complete.	Figure 1-3.
2	Connectors	Check the tightness of all connectors.	Figure 3-2.
3	PRF KHz METER glass and indicator lenses.	Check PRF KHz METER glass and indicator lenses for cracks.	Figure 3-2.
4	Controls and indicators	While performing pre-operational check (items 5 through 7), observe that the mechanical action of each knob, dial, and switch is smooth and free of external or internal binding and no excessive looseness is apparent. Also check PRF KHz METER for sticking or bent pointer.	Figure 3-2.

Figure 6-1. Daily Preventive Maintenance Checks and Services Chart (Sheet 1 of 2)

Sequence No.	Item	Procedure	References
5	Preliminary	Set the controls as follows: a. ON-OFF .....OFF b. TEST WORD.....All down (Off) c. AUXILIARY PULSE/ ON-OFF.....OFF d. DISPARITY DL-1/ OFF/DL-2 .....OFF e. DISPARITY DL-1 ..... Fully ccw f. DISPARITY DL-2 ..... Fully ccw g. AUXILIARY PULSE-AM..... Fully ccw h. MODE 4 REPLY/ ON-OFF.....OFF i. MODE 4 REPLY AM..... Fully ccw j. GO/OFF/NO-GO .....OFF k. TEST WORD AM ..... Fully ccw l. METER FUNCTION ..... INT/EXT m. PRF SEL .....INT-MED n. MRK AM..... Fully ccw	Figure 3-2.
6	ON-OFF switch	Set to ON. Observe that PWR indicator lamp lights.	Figure 4-3.
7	FREQ ADJ control	Vary INT PRF FREQ AJ control and observe that METER indicates pulse repetition rate.	Figure 4-3.

Figure 6-1. Daily Preventive Maintenance Checks and Services Chart (Sheet 2 of 2)

Sequence No.	Item	Procedure	References
1	Cables	Check cables for cuts, kinks, breaks or fraying. Repair any cuts in cable insulation by covering with rubber tape and then with friction tape. Repair or replace all damaged cables.	Figure 1-1.
2	Connectors	Check for bent or broken pins, or damaged threads. Clean dirt from contacts. Replace all damaged connectors.	Figure 3-2.
3	Handles and latches	Inspect handles, latches, and hinges for looseness. Replace or tighten as necessary.	Figure 1-1.
4	Exterior surfaces	Inspect exposed metal surfaces for rust and corrosion. Clean and touch-up paint as required.	Paragraphs 6-5 and 6-7.

Figure 6-2. Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Pluckout items	Inspect seating of pluckout items such as boards A1 through A3, and crystal A3Y1. Make certain that respective connectors and holder grip pluckout items tightly.	Figures 5-2 and 5-5.
2	Transformer terminals	Inspect the terminals on power transformer T1. All screws must be tight. No dirt or corrosion should be evident.	Figure 5-2.

Figure 6-3. Monthly Preventive Maintenance Checks and Services Chart

6-5. CLEANING.

6-6. Inspect the exterior surfaces of the test set. These surfaces should be clean, free of dust, dirt, grease and fungus. If required, clean the exterior surfaces as follows:

a. Remove dust and loose dirt with a clean soft cloth.

WARNING

The cleaning compound used in step b below is flammable and its fumes are toxic. Therefore, when using this cleaning compound, provide adequate ventilation and do not use near a flame.

b. Remove grease, fungus, and ground-in dirt from cases, using a clean, lint-free cloth dampened (not wet) with cleaning compound Federal Stock No. 7930-395-9542 (or equivalent).

c. Remove dust or dirt from plugs with a brush.

CAUTION

Do not press on the PRF KHz METER glass when cleaning; the meter may be damaged.

d. Clean front panel, meter, and control knob with a clean soft cloth. If dirt is difficult to remove, dampen the cloth with water; use mild soap, if necessary.

6-7. TOUCH-UP PAINTING.

6-8. Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to applicable cleaning and refinishing practices specified in TB SIG 364.

SECTION VII

DEPOT OVERHAUL STANDARDS

7-1. APPLICABILITY OF DEPOT INSPECTION STANDARDS.

7-2. The test set must be tested thoroughly after rebuild or repair to insure that it meets adequate performance standards for return to stock and reissue. Use the tests described in this section to measure the performance of the repaired test set. It is mandatory that repaired equipment to be reissued, or returned to stock for reissue, meet all of the performance standards given in this section.

7-3. APPLICABLE REFERENCES.

7-4. REPAIR STANDARDS. Applicable procedures of the depots performing this test and the general standards for repaired electronic equipment given in TB SIG-355-1, TB SIG-355-2, and TB SIG-355-3 form a part of the requirements for testing this test set.

7-5. TECHNICAL PUBLICATIONS. No technical publications are required other than this manual.

7-6. MODIFICATION WORK ORDERS. Perform all modification work orders applicable to this equipment before making the tests specified. DA Pam 310-7 lists all available MWO's.

7-7. TEST FACILITIES REQUIRED.

7-8. The following items are required for depot testing:

Item	Technical Manual	Common Name
Multimeter TS-352B	TM-11-6625-366-15	Multimeter Pulse
Oscilloscope AN/USM-281A		Oscilloscope
Electronic Counter AN/USM-207A	TM-11-6625-700-10	Frequency Counter
Pulse Generator AN/UPM-15A		Pulse generator
75-ohm, 2-watt, Carbon Resistive Termination (3 required)		75-ohm termination
91 -ohm, Carbon Resistive Termination (2 required)		91-ohm termination
510-ohm, Carbon Resistive Termination		510-ohm termination

7-10. Most of the tests will be performed under the conditions given below and illustrated in figures 7-1 through 7-4. Testing will be simplified if connections and panel-control settings are made initially and modifications are made as required for the individual tests.

a. Remove the test set from its case by loosening 12 front-panel captive screws.

b. Connect power cable W1 between POWER connector J11 and a 115-volt, 60- or 400-Hz power source.

c. Set the power ON-OFF switch at ON and observe that the PWR indicator lamp is lighted.

d. Set the front-panel controls as follows:

Control	Position
PRF SEL switch	INT-H Pulse
TEST WORD switches	All at on (up)
AUXILIARY PULSE switch	OFF
GO/OFF/NO-GO switch	OFF
METER-FUNCTION switch	INT/EXT
INT PRF FREQ ADJ control	Fully counter-clockwise
TEST WORD AM. control	Fully clockwise
MKR WORD AM. control	Fully clockwise
MODE 4 REPLY ON-OFF switch	OFF
DISPARITY DL-1/OFF/DL-2 switch	OFF

7-11. INTERNAL TRIGGER OPERATION TESTS. (See figure 7-1.)

7-12. To perform the internal trigger operation tests, proceed as follows:

a. Connect the test set to the oscilloscope as shown in figure 7-1A.

Observe the following internal trigger pulse characteristics on the oscilloscope:

Amplitude..... +6 to +10 volts
Pulse width..... 0.3 to 25 microseconds
Rise time..... 0.2 microsecond
Decay time..... 0.5 microsecond

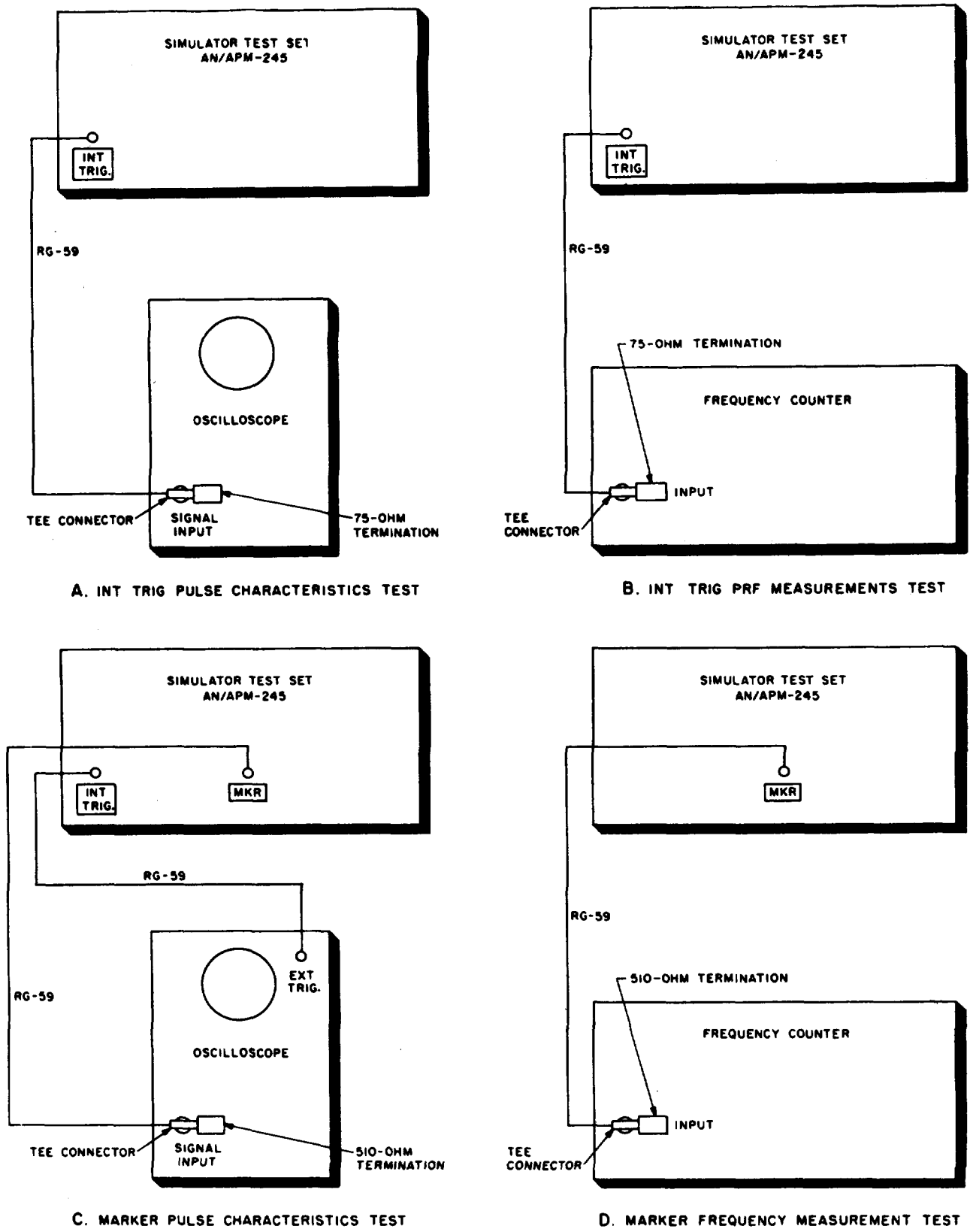


Figure 7-1. Internal Trigger Tests, Test Setups

b. Connect the test set to the frequency counter as shown in figure 7-1B. Turn the INT PRF FREQ ADJ control until the frequency counter indicates a prf of 10,000 pps. When adjusting the prf, start with the TNT PRF FREQ ADJ control in the Maximum counterclockwise position and observe the frequency counter. With this procedure, the non-linear region at the clockwise end of the TNT PRF FREQ ADJ will be avoided. Then, adjust potentiometer R106 on board assembly A2 for a full-scale indication on the PRF KHz METER.

c. Turn the INT PRF FREQ AW control until the PRF KHz METER indicates 5000 pps. Observe that the frequency counter indicates a prf of between 4500 and 5500 pps.

d. Turn the INT PRF FREQ ADJ control until the PRF KHz METER indicates 2500 pps. Observe that the frequency counter indicates a prf of between 2000 and 3000 pps.

e. Turn the INT PRF FREQ ADJ control fully counterclockwise and observe that the frequency counter indicates a prf of 1000 pps or less.

f. Set the PRF SEL switch at INT-MED. While observing the indication on the frequency counter, turn the INT FREQ ADJ control fully counterclockwise and then fully clockwise; the frequency counter should indicate a prf of 100 pps or less and 1000 pps or more for the counterclockwise and clockwise positions, respectively, of the control.

g. Repeat step d.

h. Connect the test set to the frequency counter as shown in figure 7-1B. While holding the METER-SCALE switch at X1, turn the INT PRF FREQ ADM control until a full-scale indication is obtained on the PRF KHz METER. Observe that the frequency counter indicates a prf of between 950 and 1050 pps.

i. While holding the METER-SCALE switch at X1, turn the TNT PRF FREQ ADJ control until the PRF KHz METER indicates 500 pps. Observe that the frequency counter indicates a prf of between 450 and 550 pps.

j. While holding the METER-SCALE switch at XI, turn the INT PRF FREQ ADJ control until the PRF KHz METER indicates 250 pps. Observe that the frequency counter indicates a prf of between 200 and 300 pps.

k. Set the PRF SEL switch at INT-L. While observing the indication on the frequency counter, turn the INT PRF FREQ ADJ control fully counterclockwise and then fully clockwise; the frequency counter should indicate a prf of 10 pps or less and 100 pps or more for the counterclockwise and clockwise positions, respectively, of the control.

l. Repeat step d.

m. Set the PRF SEL switch at INT-MED. Turn the INT PRF FREQ ADJ control until the Frequency counter indicates a prf of 1000 pps.

n. Connect the test set to the oscilloscope as shown in figure 7-1C. Set the oscilloscope for external triggering. While observing the oscilloscope, turn the MKR AM. control fully counterclockwise and then fully clockwise. Observe that the marker amplitude variation is uniform as the MKR AM. control is rotated from fully counterclockwise to fully clockwise, and that the maximum peak-to-peak amplitude of the marker output is 10 volts or more.

o. Connect the test set to the oscilloscope as shown in figure 7-1D. Observe that the frequency counter indicates a frequency of between 0.99 and 1.01 MHz.

7-13. EXTERNAL TRIGGER OPERATION TESTS. (See figure 7-2.)

7-14. To perform the-external trigger operation tests, proceed as follows:

a. Set the PRF SEL switch at EXT.

b. Using an RQ-59 cable (or equivalent), connect the pulse generator to the EXT TRIG. connector on the test set. Adjust the pulse generator controls so as to obtain a positive 4-volt, 0.5-microsecond output pulse, occurring at a prf of 1000 pps. Observe that the PRF KHz METER indicates approximately 1000 pps.

c. Reverse the polarity of the pulse generator output from positive 4 volts to negative 4 volts. Observe that the PRF KHz METER indicates approximately 1000 pps.

d. Connect the test set, oscilloscope, and pulse generator as shown in figure 7-2. Set the oscilloscope for external triggering. While observing the oscilloscope, note that the jitter between the external and internal triggers is 1.1 microseconds or less.

7-15. TEST WORD OUTPUT TESTS. (See figure 7-3.)

7-16. To perform the test word output tests, proceed as follows:

a. Set the PRF SEL switch at INT-MED and turn the INT PRF FREQ ADJ control until the PRF KHz METER indicates 1000 pps.

b. Connect the test set to the oscilloscope as shown in figure 7-3A. Set the oscilloscope for external triggering. Observe that 37 pulses (bits) appear on the oscilloscope display.

c. While observing the oscilloscope, turn, the TEST WORD AM. control fully counterclockwise and then fully clockwise. Observe that the test word amplitude variation is uniform as the TEST WORD AM. control is rotated from fully counterclockwise to fully clockwise, and that the amplitude of the test word is 5 volts or less and 35 volts or more for the counterclockwise and clockwise positions, respectively, of the TEST WORD AM. control.

d. Adjust the TEST WORD AM. control until the amplitude of the test word is 35 volts.

e. Observe that each of the test word pulses has the following characteristics:

Pulse width..... 0.4 to 0.6 microsecond

Rise time..... 0.1 microsecond

Decay time..... 0.2 microsecond

f. Using an RG-59 cable (or equivalent), connect the MKR connector on the test set to the other channel input of the oscilloscope. Observe that the 2-microsecond spacing of each test word pulse (bit) is within ± 0.1 microsecond, referenced to the leading edge of the first bit (e.g., the leading edge of bit 23 should be spaced 44 ± 0.1 microseconds from the leading edge of bit 1).

g. Set TEST WORD switch 1 at its off (down) position and observe that bit 1 of the test word disappears from the oscilloscope display. Repeat this procedure for bits 2 through 37, using the corresponding TEST WORD switches.

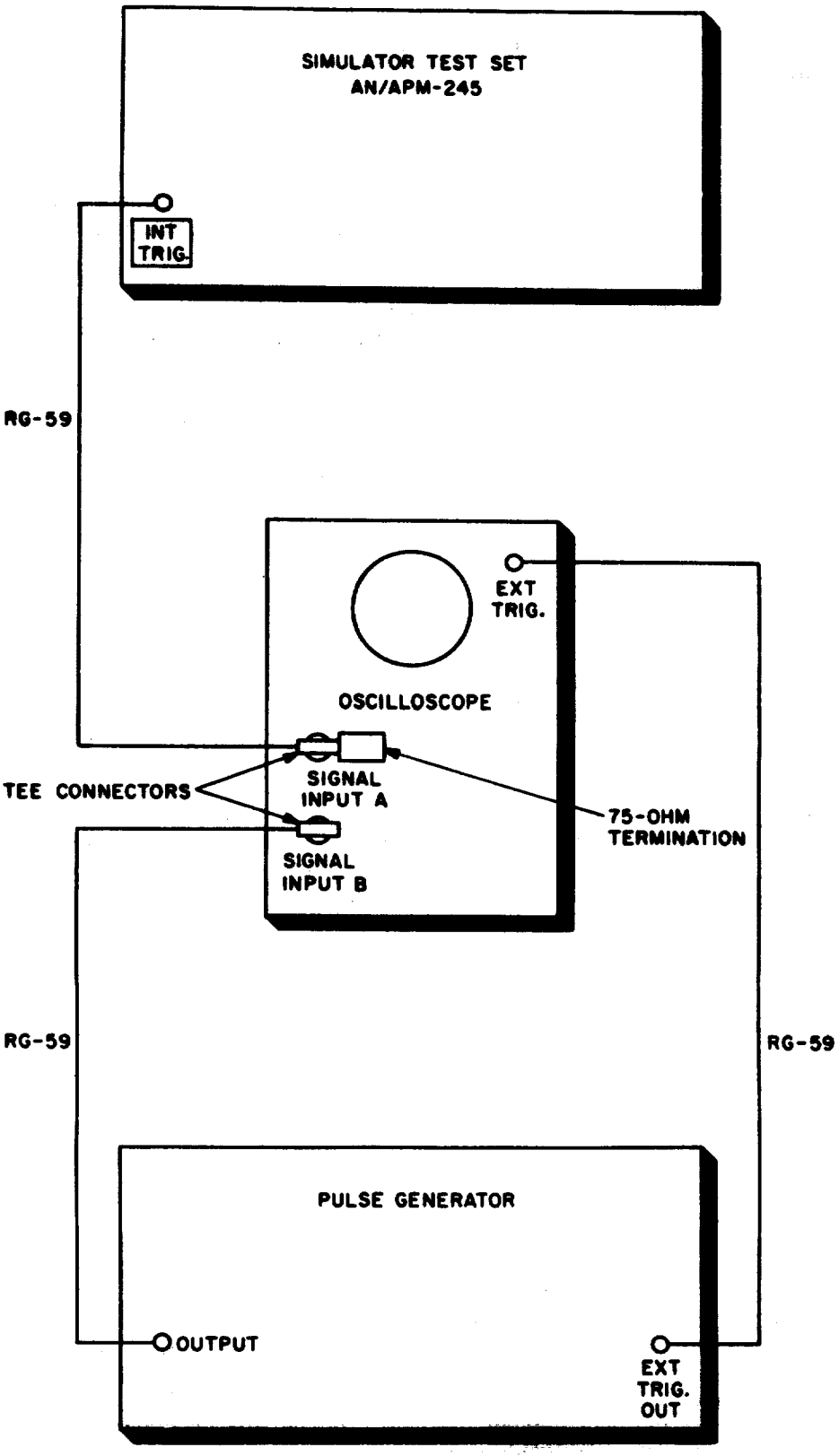
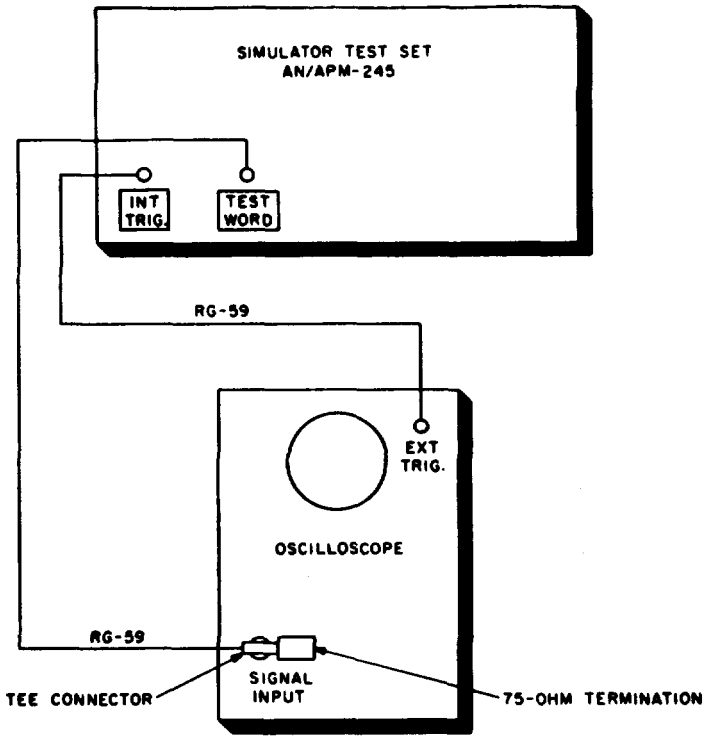
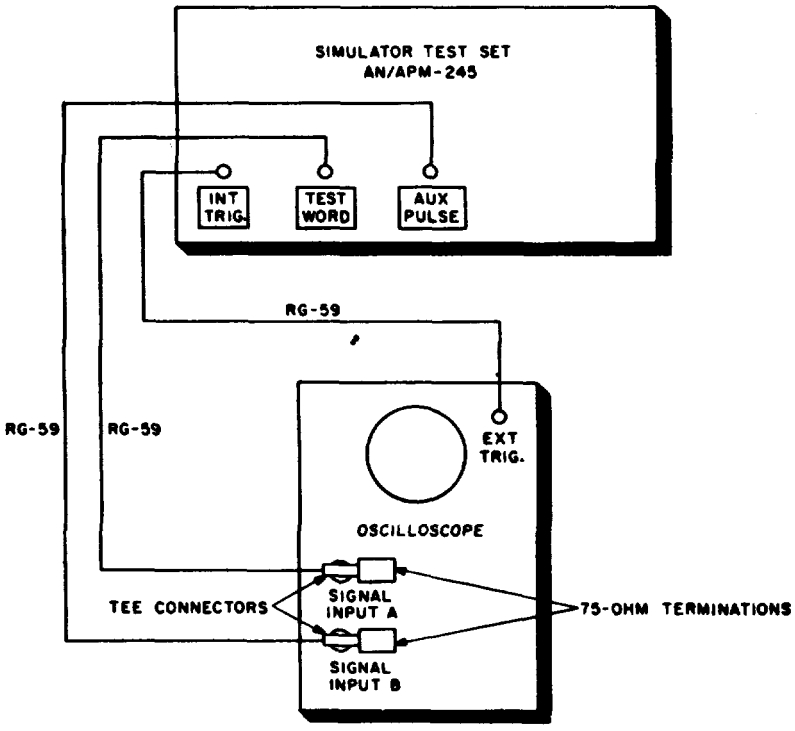


Figure 7-2. External Trigger Vs. Internal Trigger Jitter Test, Test Setup



A. TEST WORD PULSES CHARACTERISTICS TEST



B. AUXILIARY PULSE CHARACTERISTICS TEST

Figure 7-3. Test Word Output Tests, Test Setups

h. Set TEST WORD switches 1 through 5 at their on position, and the AUXILIARY PULSE ON-OFF switch at ON. Turn the AUXILIARY PULSE DELAY control fully clockwise and observe that an auxiliary pulse appears after the first five hits of the test word, delayed 10 microseconds or more from the leading edge of bit 1. Check that the characteristics of the auxiliary pulse are identical to those given in steps c and e.

i. While observing the oscilloscope, turn the AUXILIARY PULSE DELAY control from the-fully clockwise to fully counterclockwise position. Observe that the auxiliary pulse of the upper oscilloscope trace lines up, within ± .05 microseconds, with the auxiliary pulse displayed on the lower oscilloscope trace.

j. Turn the AUXILIARY PULSE AM. control and observe that the control has no effect on the amplitude of the auxiliary pulse displayed on the oscilloscope.

k. Connect the test set to the oscilloscope as shown in figure 7-3B. Set the oscilloscope for external triggering and the AUXILIARY PULSE AM. and AUXILIARY PULSE DELAY controls fully clockwise. Observe that the auxiliary pulse of the upper oscilloscope trace is in coincidence with the auxiliary pulse displayed on the lower oscilloscope trace. Also observe the following auxiliary pulse characteristics on the oscilloscope:

Amplitude ..... 35 volts or more

Pulse width ..... 0.4 to 0.6 microsecond

Rise time ..... 0.1 microsecond or less

Decay time ..... 0.2 microsecond or less

l. Turn the AUXILIARY PULSE AM. control fully counterclockwise and observe that the amplitude of the auxiliary pulse displayed on the lower trace (input signal B) of the oscilloscope is 5 volts or less. Also observe that the characteristics of this pulse are identical to those given in step k.

m. Turn the TEST WORD AM. control and observe that the control has no effect on the amplitude of the auxiliary pulse displayed on the lower trace (input signal B) of the oscilloscope.

n. Connect the test set to the oscilloscope as shown in figure 7-3A. Set the oscilloscope for external triggering and the GO/OFF/NO-GO switch at GO. Observe that the test word is not displayed on the oscilloscope.

o. Set the oscilloscope sweep control to the 1 ms/cm range. Momentarily depress the GO/NO-GO pushbutton and observe that four pulse-train groups of the selected 5-bit code are displayed on the oscilloscope.

p. Set all the TEST WORD switches to their on position and momentarily depress the GO/NO-GO pushbutton. Observe that four pulse-train groups of 37 bits are displayed on the oscilloscope.

q. Set the GO/OFF/NO-GO switch at NO-GO. Momentarily depress the GO/NO-GO pushbutton and observe that three pulse-train groups of 37 bits are displayed continuously on the oscilloscope.

7-17. MODE 4 REPLY OPERATION TESTS. (See figure 7-4.)

7-18. To perform the mode 4 reply operation tests, proceed as follows:

a. Set the METER-FUNCTION switch at M4 TRIG.

b. Set the output of the PULSE Generator to T1.5V into a 91OHM Load. Set the pulse width to 0.3 microsecond with a rise time of 0.1 microsecond and a delay output pulse 2 microseconds from input Trigger. Remove the 91OHM load and connect the test set, oscilloscope and pulse generator as shown in figure 7-4.

c. Set the METER-FUNCTION switch at INT/EXT and the PRF SEL switch at INT-MED. Turn the INT PRF FREQ ADJ control until the PRF KHz METER indicates 1000 pps.

d. Set the MODE 4 REPLY ON-OFF switch at ON, the MODE 4 REPLY AM. Control fully clockwise, and the MODE 4 REPLY DELAY control fully counterclockwise. Observe that the leading edge of the first pulse of the Mode 4 reply train (three pulses spaced 1.8 microseconds apart) is delayed 200 microseconds or less from the leading edge of the first bit of the test word.

e. While observing the oscilloscope, turn the MODE 4 REPLY control from the fully counterclockwise to fully clockwise position. Observe that the mode 4 reply train delay is uniform as the MODE 4 REPLY DELAY control is rotated from fully counterclockwise to fully clockwise, and that the leading edge of the first pulse of the mode 4 reply train is delayed 276 microseconds or more from the leading edge of the first test word bit, when the MODE 4 REPLY DELAY control is set fully clockwise.

f. Observe the following mode 4 reply train characteristics on the oscilloscope:

Amplitude	2 volts or less with MODE 4 REPLY AM. control set fully ccw; 35 volts or more with control set fully cw
Pulse width	0.3 to 0.7 microsecond
Rise time	0.1 microsecond or less
Pulse spacing	1.6 to 2.0 microseconds between leading edges of consecutive pulses

Note

Pulse spacing of the mode 4 reply train is initially set to 1.8 microseconds between leading edges of consecutive pulses by adjusting potentiometers R18 and R25 on board assembly A2.

g. Set the MODE 4 REPLY ON-OFF switch at OFF and observe that the mode 4 reply train disappears from the oscilloscope display.

h. Set the DISPARITY DL-1/OFF/DL-2 switch at DL-1 and turn the DISPARITY DL-1 control fully counterclockwise.

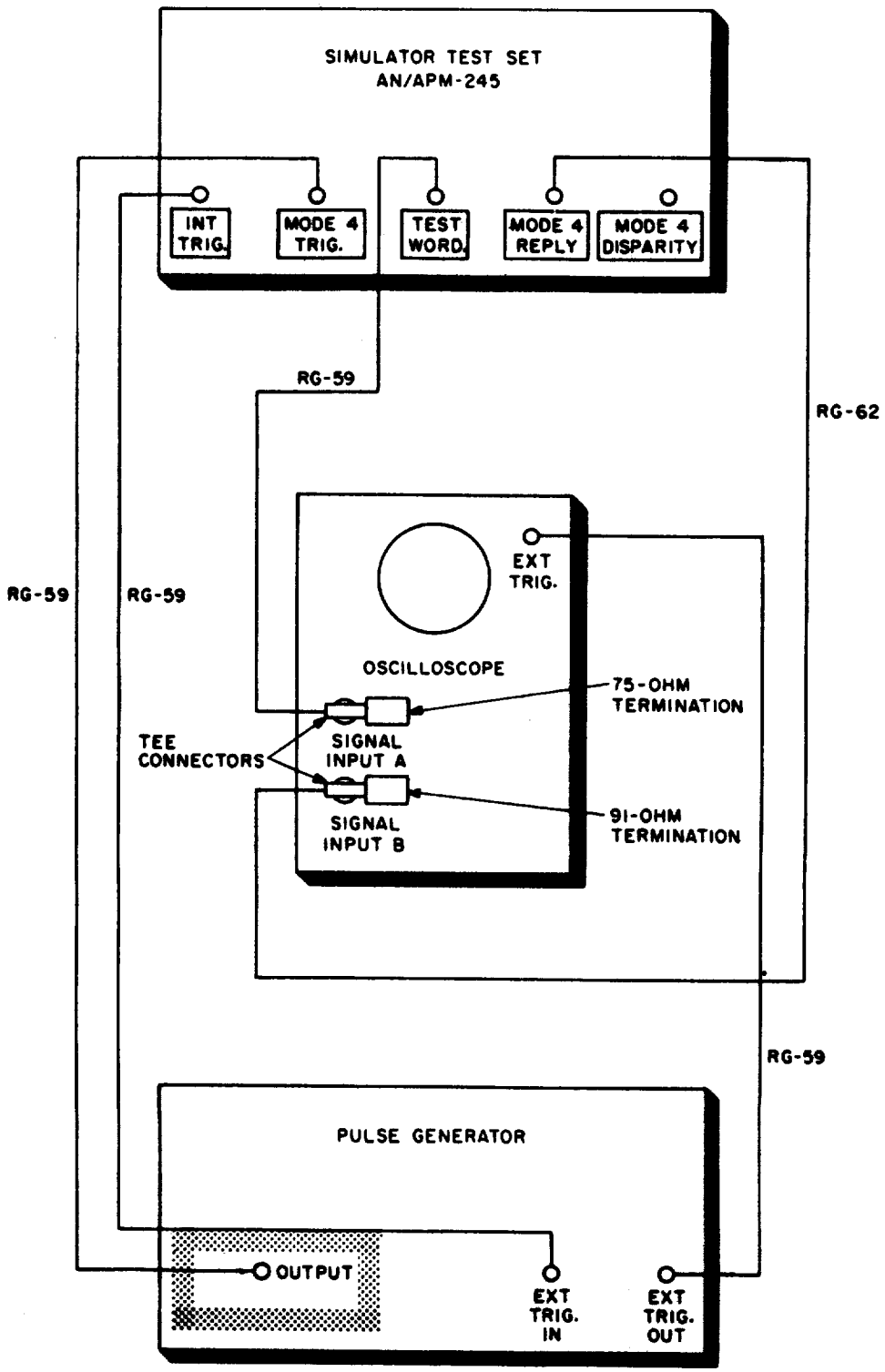


Figure 7-4. Mode 4 Tests, Test Setup

i. Disconnect the RG-62 cable from the MODE 4 REPLY connector and reconnect the cable to the MODE 4 DISPARITY connector. Observe that the leading edge of the disparity pulse is delayed 8.0 microseconds or less from the leading edge of the first test word bit.

j. Turn the DISPARITY DL-1 control fully clockwise and observe that the leading edge of the disparity pulse is delayed 76 microseconds or more from the leading edge of the first test word bit.

k. Observe the following disparity pulse characteristics on the oscilloscope:

Amplitude ..... 3 to 5 volts

Pulse width ..... 0.3 to 1.0 microsecond

Rise time ..... 0.15 microsecond or less

Decay time ..... 0.5 microsecond or less

l. Set the DISPARITY DL-1/OFF/DL-2 switch at OFF and observe that the disparity pulse disappears from the oscilloscope display.

m. Set the DISPARITY DL-1/OFF/DL-2 switch at DL-2 and turn the DISPARITY DL-2 control fully counterclockwise. Observe that the leading edge of the disparity pulse is delayed 194 microseconds or less from the leading edge of the first test word bit.

n. Turn the DISPARITY DL-2 control fully clockwise and observe that the leading edge of the disparity pulse is delayed 276 microseconds or more from the leading edge of the first test word bit.

o. Observe that the disparity pulse displayed on the oscilloscope has the same characteristics as those given in step k.

p. Set the power ON-OFF switch at OFF and disconnect the oscilloscope and pulse generator.

7-19. MODE 4 CONNECTORS RESISTANCE TESTS.

7-20. To perform the mode 4 connectors resistance tests, proceed as follows:

a. Set the multimeter for use as an ohmmeter and connect the multimeter leads between the center conductor and outer shell of the MODE 4 VIDEO connector. Multimeter should indicate from 81 to 101 ohms.

b. Check for continuity between pins of MODE 4 connector J1 and the center conductor of the connector indicated below.

From	To
J1-c	MODE 4 VIDEO connector
J1-b	MODE 4 TRIG connector
J1-a	MODE 4 DISPARITY connector
J1-d	MODE 4 REPLY connector

APPENDIX B

MAINTENANCE ALLOCATION

SECTION I. INTRODUCTION

B-1. GENERAL.

a. This appendix assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate maintenance category.

b. Columns in the maintenance allocation chart are as follows:

(1) Part or component. This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the component. Components, assemblies, and subassemblies are listed in top-down order. That is, the assemblies which are part of a component are listed immediately below that component, and the subassemblies which are part of an assembly are listed immediately below that assembly. Each generation breakdown (components, assemblies, or subassemblies) is listed in disassembly order or alphabetical order.

(2) Maintenance function. This column indicates the various maintenance functions allocated to the categories.

(a) Service. To clean, to preserve, and to replenish lubricants.

(b) Adjust. To regulate periodically to prevent malfunction.

(c) Inspect. To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(d) Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(e) Replace. To substitute serviceable components, assemblies, or subassemblies, for unserviceable components, assemblies, or subassemblies.

(f) Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

(g) Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

(h) Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(i) Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

(j) Rebuild. To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications and subsequent reassembly of the item.

(3) Operator, organizational, direct support, general support and depot maintenance levels. The symbol X indicates the categories responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Categories higher than those marked by X are authorized to perform the indicated operation.

(4) Tools required. This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required- to perform the maintenance function.

(5) Remarks. Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding columns.

c. Columns in the allocation of tools for maintenance functions are as follows:

(1) Tools required for maintenance functions. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

(2) Operator, organizational, direct support, general support, and depot maintenance levels. The dagger (†) symbol in these columns indicates the categories normally allocated the facility.

(3) Tool code. This column lists the tool code assigned.

B-2. MAINTENANCE BY USING ORGANIZATIONS.

When this equipment is used by signal services organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance. functions allocated up to and including general support are authorized to the organization operating this equipment.

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER	Component Assembly Nomenclature	Maintenance functions											Tools and equipment	Remarks
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	SIMULATOR, TEST SET AN/APM-245	O	O	O				O	O				6,7	Simple tests
			H		H	H	H			H	H		1 thru 6	and adjustment
			D		D	D	D			D	D	D	1 thru 6	

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS
TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIP	MAINT. CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
		AN/APM-245 (continued)		
1	H,D	MULTIMETER AN/PSM6B	6625-957-4374	
2	H,D	PULSE GENERATOR SET AN/UPM-15A	6625-643-5769	
3	H,D	COUNTER, ELECTRONIC DIGITAL READOUT AN/USM-207	6625-911-6368	
4	H,D	TOOL KIT TK-100/G	5180-605-0079	
5	H,D	OSCILLOSCOPE AN/USM-281	6625-053-3112	
6	O,H,D	TRANSISTOR TEST SET TS-1836/U	6625-893-2628	
7	O	MULTIMETER, AN/USM-223	6625-999-7465	

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USAAVNTBD (2)
USAMB (10)
USACDCCEA (1)
USACDCCEA Ft Huachuca (1)
OS Maj Comd (2)
LOGCOMD (2)
MDW (1)
Armies (1)
USASCS (10)
USASESS (10)
USAADS (5)
USAINTS (3)
Army Dep (1) except
SAAD (70)
LBAD (50
TOAD (23)
LEAD (7)
Gen Deps (2)
Sig Sec Gen Deps (5)
Sig Dep (5)
USARV (5)
USMACV (20)
Sig FLDMS (1)
USACDCEC (10)
ARADCOM (2)
ARADCOM Rgn (2)
USAESC (40)

NG: State AG (3)
USAR: None
For explanation of abbreviations used, see AR 320-50.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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