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(ARMY) TM 11-6625-1646-24-1

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TECHNICAL MANUAL

**ORGANIZATIONAL  
INTERMEDIATE AND DEPOT  
MAINTENANCE INSTRUCTIONS  
WITH  
ILLUSTRATED PARTS BREAKDOWN**

**TEST SET, TRANSPONDER SET  
TS-1843B/APX**

ASC Systems Corporation  
F33657-71-C-0175

PUBLISHED BY DIRECTION OF SECRETARIES OF THE AIR FORCE, NAVY AND ARMY

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**24 NOVEMBER 1976**



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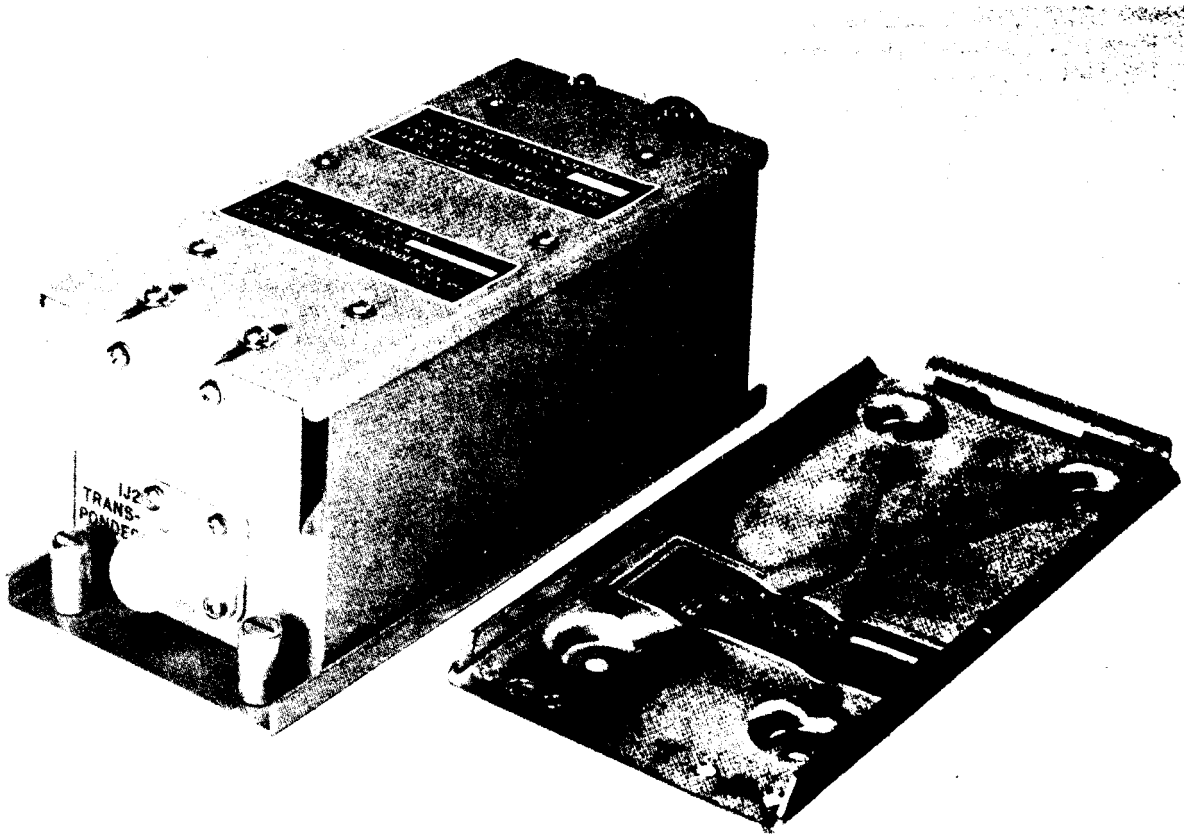


Figure 1-1. Test Set, Transponder Set TS-1843 B/APX and Mounting MT-3513/APX

SECTION 1

DESCRIPTION

1-1. SCOPE OF TECHNICAL MANUAL.

1-2. This technical manual contains instructions and procedures to be used by Intermediate and Depot activities in the maintenance and repair of Test Set, Transponder Set TS-1843B/APX, designed and manufactured by ASC Systems Corporation, Chicago, Illinois under contract F33657-71-C-0175. The equipment covered herein is configured for inter-service DOD AIMS System use. Any changes affecting form, fit, or function shall be by Configuration Control Board Directive only. The technical manual may be revised by or for the procuring activity without approval of the DOD AIMS Configuration Control Board in the following instances, providing form, fit, or function is not affected:

a. When the changes consist of clarifying, expanding, connecting or updating existing information in the technical manual.

b. When the item described in the technical manual is no longer available, and a substitute item must be used.

NOTE

When empty parentheses are used in the nomenclature of equipment used (as in C-6280( )/APX) this means that any model of the equipment may be used.

1-3. PURPOSE OF EQUIPMENT.

1-4. Test Set, Transponder Set TS-1843B/APX is an in-flight GO/NO-GO test device, designed for installation in airborne IFF/SIF (Identification Friend or Foe/Selective Identification Feature) transponder systems. The test set has two operational modes: Test and Monitor. The TS-1843B/APX provides an operating voltage to an indicator lamp on the associated Transponder Set Control C-6280( )/APX (or equivalent) to give a visual GO/NO-GO indication of the status of the transponder.

1-5. In the Test mode of operation, the TS-1843B/APX generates, upon command, rf interrogation test signals at a preset power level which enable the interrogator to check the response of his transponder set in the absence of external interrogation signals.

1-6. In the Monitor mode of operation, the test set continuously and automatically evaluates the SIF replies being transmitted by the associated transponder on a reply-by-reply basis when it receives IFF interrogation signals from an interrogator set.

1-7. DESCRIPTION OF EQUIPMENT.

1-8. **PHYSICAL DESCRIPTION.** The Test Set TS-1843B/APX (figure 1-1) is a single unit of 2-7/8 by 3 by 7-3/4 inch dimensions. It weighs approximately 2 lbs 15 oz (including mounting). At each end of the unit an rf receptacle is located for connecting the test set into the line between the transponder and its antenna. On the ANTENNA end is located the multiple-pin POWER receptacle (1J1) for power and control connections. On the other end are mounted three service adjustments which are protected during operation by a hinged cover plate. These adjustments are in the form of small control dials which are coupled to variable resistors inside the equipment. Each dial is provided with a locking device. The TS-1843B/APX is installed in the aircraft on Mounting MT-3513( )/APX (figure 1-2). This mounting plate is permanently attached to the aircraft by four screws. The TS-1843B/APX is secured to the mounting by two fast-action screw-driver-operated Dzus fasteners. Although the mounting plate MT-3513( )/APX is permanently attached to the aircraft, design of the TS-1843B/APX permits the Test Set to be installed in either direction within the mounting plate. This is accomplished by removing the bottom plate from the TS-1843B/APX, rotating the plate 180° and replacing the plate on the TS-1843B/APX. The test set may then be installed in the mounting in the reverse direction from that shown in figure 1-1.



Make sure the antenna cable is connected (1J3) and the transponder cable is connected to the TRANSPONDER connector (1J2). Reversing these connections may result in damage to the TS-1843B/APX.

1-9. The TS-1843B/APX consists of a cast aluminum case with an integral directional coupler channel enclosing the main conductor rod between the rf receptacles at each end of the box. The electronic circuitry is contained in seven assemblies: Power and Control Assembly (A1), Timing Assembly (A2), Evaluator Assembly (A3), Regulator Assembly (A4), Receiver/Signal Generator Assembly (A5), VSWR Adjust Assembly (A6), and Directional Coupler Assembly (A7). The A1 assembly contains printed wiring and electrical contacts that receive the mating connectors of assemblies A2, A3, A4, and A6, each of which is readily detachable for maintenance or replacement.

1-10. FUNCTIONAL DESCRIPTION. The Test Set, Transponder Set <sup>TS-1843B/APX</sup> is a dual-function device which allows determination of proper operation of airborne IF F/SIF transponders. When operated with Control Transponder Set C-6280( )/APX, using the TEST light on the control unit as an indicator, it will provide a GO, NO-GO check based upon the following transponder characteristics:

- a. Receiver Sensitivity
- b. Receiver Tuned Frequency
- c. Transponder Decoding
- d. Reply Frequency
- e. Reply Code Bracket Pulse Spacing
- f. Reply Peak-Pulse Power
- g. Antenna System VSWR

1-11. As a test device, the unit will, upon command, interrogate the transponder system under test, evaluate the transponder replies, and indicate satisfactory performance. As a monitor device, the unit will evaluate the transponder replies that result from external interrogations and will indicate correct responses.

1-12. The <sup>TS-1843B/APX</sup> contains the following functional circuits which accomplish the checks described above:

- a. Interrogation Code Generator for modes 1, 2, 3/A, and C (prf 400  $\pm$  50 pps)
- b. RF Signal Generator
- c. RF Pulse Peak Power Detector
- d. SIF Reply Bracket Spacing Decoder
- e. RF Wavemeter (reply frequency evaluator)
- f. VSWR evaluator
- g. Ratio Reply Evaluator (Test Mode)
- h. Rate Reply Evaluator (Monitor Mode)

1-13. If all transponder receiver and transmitter characteristics are within the proper limits, the control unit TEST lamp will light, indicating a GO condition. Failure of the TEST lamp to go on when one of the Mode Enable switches on the control unit is held in the TEST position indicates a failure in the receiver, decoder, or transmitter section of the transponder.

1-14. INSTALLATION.

**CAUTION**

Make sure the antenna cable is connected to the ANTENNA connector (1J3) and the transponder cable is connected to the TRANSPONDER connector (1J2). Reversing these connections may result in damage to the <sup>TS-1843B/APX</sup>.

1-15. The installation plans for the <sup>TS-1843B/APX</sup> vary with the individual aircraft types and/or transponder systems used and are not covered in this manual. For detailed installation instructions, refer to the specific aircraft and transponder manuals, or to special installation drawings provided by the using services. The physical dimensions of the Test Set, Transponder Set <sup>TS-1843B/APX</sup> and the Mounting MT-3513()/APX are shown in figure 1-2.

1-16. REFERENCE DATA.

1-17. Basic electrical performance data and physical data for the Test Set, Transponder Set <sup>TS-1843B/APX</sup> are listed in table 1-1. The transistor complement is listed in table 1-2, and the integrated circuit complement is listed in table 1-3. The assemblies and subassemblies of the <sup>TS-1843B/APX</sup> are listed in table 1-4.

1-18. INDEXES OF PUBLICATIONS (ARMY).

1-19. 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.

1-20. Refer to the latest issue of DA Pam 310-7 to determine whether there are modification work orders (MWOs) pertaining to the equipment.

1-21. FORM AND RECORDS (ARMY).

1-22. REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT. Use equipment forms and records in accordance with instructions in TM 38-750.

1-23. REPORT OF PACKAGING AND HANDLING DEFICIENCIES (ARMY). Fill out and forward DD Form 6 (Reporting of Packaging and Handling Deficiencies) as prescribed in AR 700-58.

1-24. DISCREPANCY IN SHIPMENT REPORT (DISREP) (SF 361) (ARMY). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38.

**1-25. REPORTING OF IMPROVEMENTS FOR EQUIPMENT MANUALS (ARMY).** Reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028. DA Form 2028 will be forwarded direct to Commanding General. U.S. Army Electronics Command. ATTN: AMSEL-MA-PSA, Fort Monmouth, New Jersey 07703.

**1-26. DEMOLITION OF EQUIPMENT TO PREVENT ENEMY USE (ARMY).** Refer to TM 750-244-2 for procedures to be used for this equipment.

**1-27. ADMINISTRATIVE STORAGE (ARMY).** Refer to TM 740-90-1 for procedures to be used when this equipment is to be placed in administrative storage.

Table 1-1. Reference Data

CHARACTERISTIC	SPECIFICATION LIMITS
Interrogation Outputs: Frequency Mode 1 Pulse Spacing Mode 2 Pulse Spacing Mode 3/A Pulse Spacing Mode C Pulse Spacing Level Rate	1030 ± 0.5 MHz 2 pulses spaced 3 ± 0.1µsec 2 pulses spaced 5 ± 0.1µsec 2 pulses spaced 8 ± 0.1µsec 2 pulses spaced 21 ± 0.1µsec -54 to -81 dbm (-67 to -94 dbv) adjustable 400 ± 50 pulse pairs/sec
Reply Analyzer: Frequency GO Frequency NO-GO Bracket Spacing GO Bracket Spacing NO-GO Power GO	1090 ± 3 MHz ≤ 1086 MHz or ≥ 1094 MHz 20.3 ± 0.15 µsec ≤ 20.0 sec or ≥ 20.6 µsec 20 to 28 dbw, ±2db from preset level
Antenna System VSWR: G O  N O - G O	Dial set at 6 db . . . . VSWR < 8 db Dial set at 9 db . . . . VSWR < 11 db Dial set at 12 db. . . . VSWR < 14db  Dial set at 6 . . . VSWR 8 db or greater Dial set at 9 . . . VSWR 11 db or greater Dial set at 12 . . . VSWR 14 db or greater NOTE Momentary high VSWR (up to 12 db) for no longer than 2 milliseconds will not cause a NO-GO indication.
Primary Power Input: Normal Limits	27.5 vdc, 15 w max. 21 to 29 vdc
Operating Secondary Power	12.0 ± 0.5 vdc and 5.0 ± 0.25 vdc
Weight: TS-1843B/APX with MT-3513 ( )/APX	2 lbs. 15 oz.
Dimensions: TS-1843B/APX MT-3513 ( )/APX	2.875 by 3.062 by 7.750 inch 0.25 by 3.25 by 7.37 inch
Service Conditions: Altitude Temperature: Operating Operation with degradation of performance Non-Operating Humidity Vibration	up to 100,000 ft. -54°C to +95°C +95°C to +125°C -64°C to +150°C Up to 100 percent MIL-E-5400G Curve IV

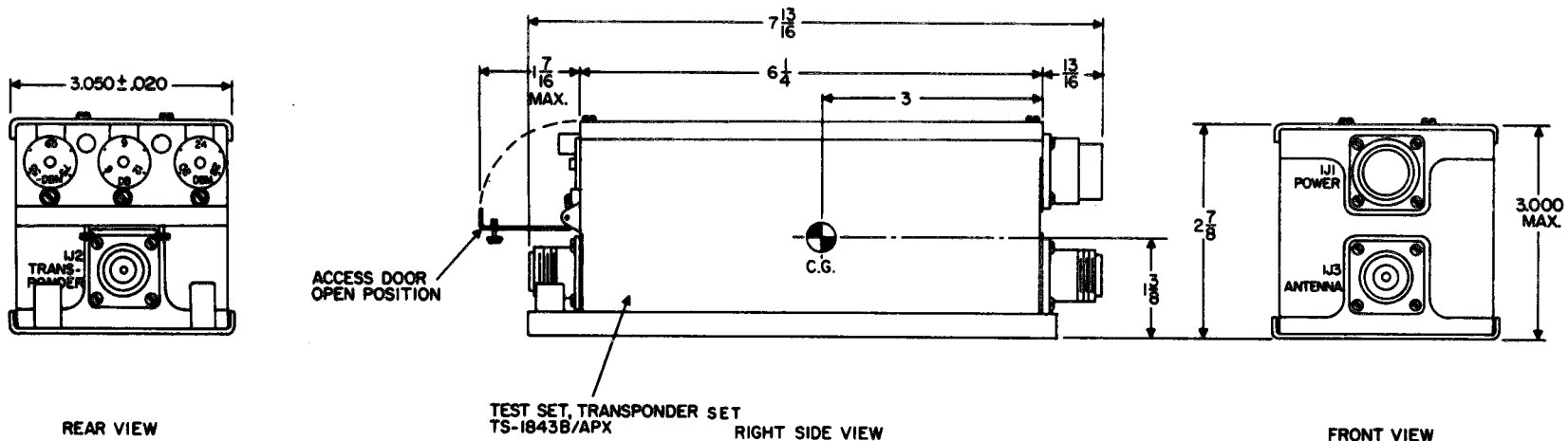
Table 1-2. Transistor Complement

DESIG	TYPE NO.	FUNCTION
A1Q1	2N2222	Monitor Mode Control
A1Q2	2N2222	Test Mode Control
A1Q3	2N2222	Monitor/Test Control
A1Q4	2N2222	Regulator Control
A1Q5	2N2907A	Lamp Switch
A2Q1	3N128	20 MHz Oscillator
A2Q2	3N140	Oscillator Gated Amplifier
A2Q3	2N2907	Modulator (Reply)
A2Q4	2N2907	Modulator (Frequency Check)
A3Q1	2N2222	PRF Generator Gate Input
A3Q2	2N491A	PRF Generator
A3Q3	2N2907	Sync Output Amplifier
A3Q4	2N2222	Read Gate switch
A3Q5	2N2222	Test Integrator Buffer
A3Q6	2N2222	Lamp Driver Enable
A3Q7	2N2222	Monitor Clamp
A3Q8	2N2222	Monitor Integrator Control
A3Q9	2N491A	Monitor Integrator
A3Q10	2N2222	Power Level Detector Input
A3Q11	2N2222	Power Level Detector
A3Q12	3N140	VSWR Recognition
A3Q13	2N2222	VSWR Amplifier
A3Q14	2N2222	Frequency Buffer
A4Q1	2N2907A	On-Off Control
A4Q2	2N2222	Over-Voltage Protection
A4Q3	2N2222	Over-Current Protection
A5A1Q1	3N128	85.833 MHz Oscillator
A5A1Q2	3N140	Gated Amplifier
A5A1Q3	2N2481	Tuned Amplifier
A5A1Q4	2N2481	60 MHz Amplifier (First)
A5A1Q5	2N2481	60 MHz Amplifier (Second)
A5A1Q8	2N2481	60 MHz Amplifier (Third)
A5A1Q7	2N2481	Detector/Amplifier

Table 1-3. Integrated Circuit Complement

DESIG	ASC SYSTEMS PART NO.	FUNCTION
A2U1	600A8	Binary Counter
A2U2	600A22	⊕ 4 Binary Counter
A2U3	600A11	⊕ 5 Binary Counter
A2U4	600A8	Binary Counter (Time Base Generator)
A2U5	600A8	Binary Counter (Time Base Generator)
A2U6	600A3	Pulse Matrix AND Gates (0 μsec, 13 μsec)
A2U7	600A3	Pulse Matrix AND Gates (16 μsec, 18 μsec)
A2U8	600A3	Pulse Matrix AND Gates (19 μsec, 21 μsec)
A2U9	600A5	Pulse Duration Generator
A2U10	600A23	Window Delay Generator
A2U11	600A5	Window Duration Generator
A2U12	600A19	Frequency Check Generator/Mode Gate Inverter
A3U1	600A7	Read Gate/Monitor Sample Hold
A3U2	600A21	Test Enable Gate/Bracket Decode Gate/Comp. Evaluation Gate
A3U3	600A19	Inverter/Gate
A3U4	600A5	Power Shaper
A3U5	600A5	Decode Delay Timer
A3U6	600A7	Inverter/Gate
A4U1	593A96	12 volt Regulator
A4U2	593A96	5 volt Regulator

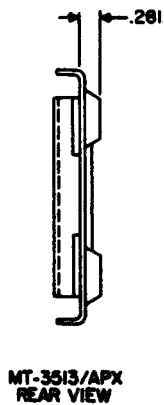




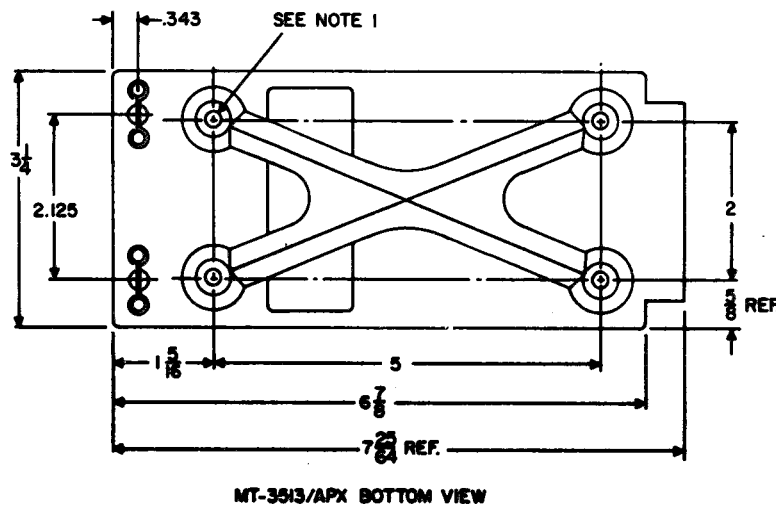
REAR VIEW

TEST SET, TRANSPONDER SET  
TS-1843B/APX  
RIGHT SIDE VIEW

FRONT VIEW



MT-3513/APX  
REAR VIEW



MT-3513/APX BOTTOM VIEW

SHIPPING DATA				
TEST SET, TRANSPONDER SET W/MOUNTING MT-3513/APX				
UNCRATED				
OVERALL DIMENSIONS	VOLUME		WEIGHT	
HEIGHT	WIDTH	DEPTH	(CU INCH)	(LBS)
3.28	3.25	7.81	83.3	2.9
CRATED				

NOTES:

1. MOUNTING MT-3513/APX HAS FOUR HOLES  $.87 \pm .002$  ON THE BOTTOM TO ALLOW MOUNTING OF THE UNIT BY THE BOTTOM.
2. ALLOW APPROXIMATELY .625 INCH CLEARANCE ABOVE UNIT TO INSERT AND REMOVE TEST SET TS-1843B/APX FROM MOUNTING.
3. PLACEMENT OF THE TS-1843B/APX WITHIN THE MT-3513 ( ) APX IS DETERMINED BY INSTALLING THE BOTTOM PLATE OF THE TS-1843B/APX IN THE DESIRED POSITION AND SECURING THE TEST SET IN THE MOUNT IN THE DESIRED DIRECTION.

Figure 1-2. Outline Dimensional Drawing

Table 1-4. Identification of Assemblies and Subassemblies

REF DESIG	NAME	PART NO.
A 1	Power and Control Assembly	GE5476
A 2	Timing Assembly	GC5434
A 3	Evaluator Assembly	GC5435
A 4	Regulator Assembly	GB5500
A 5	Signal Generator and Receiver	GD5483
A5A1	Receiver-Generator Board	GE5480
A 6	VSWR Adjust Assembly	GD5496
A 7	Directional Coupler Assembly	GC5426

SECTION II

TEST EQUIPMENT AND TOOLS

2-1. GENERAL.

2-2. This section lists the test equipment and tools required to perform disassembly, reassembly, testing, and alignment procedures described in the following sections of this manual.

2-3. TEST EQUIPMENT REQUIRED.

2-4. The test equipment required for maintenance of the TS-1843B/APX is listed in table 2-1. Equivalent test equipment may be used if the exact types listed are not available.

Table 2-1. Test Equipment Required

Name	Nomenclature or Model
Transponder Set	AN/APX-64(V) or RT-859( )/APX-72
Test Set, Transponder	AN/APM-239A
Test Set, Transponder	AN/APM-362
Test Set, Radar	AN/UPM-137
Test Set, Radar	AN/UPM-98( )
Oscilloscope	AN/USM-140 or AN/USM-281A
Multimeter	AN/PSM-6( )
Standing Wave Indicator	Hewlett Packard 415B
Slotted Lime	Hewlett Packard 805C
Slide Screw Tuner	Hewlett Packard 872A
3 db Pad	Microlab AA-03B
RF Termination	Weinschel 569A
VTVM	RCA Voltohmyst
Circuit Card Extenders (2) (Figure 2-1)	ASC Systems Corp. Part Nos. GB5728 and GB5729
Counter	Hewlett Packard 5245L

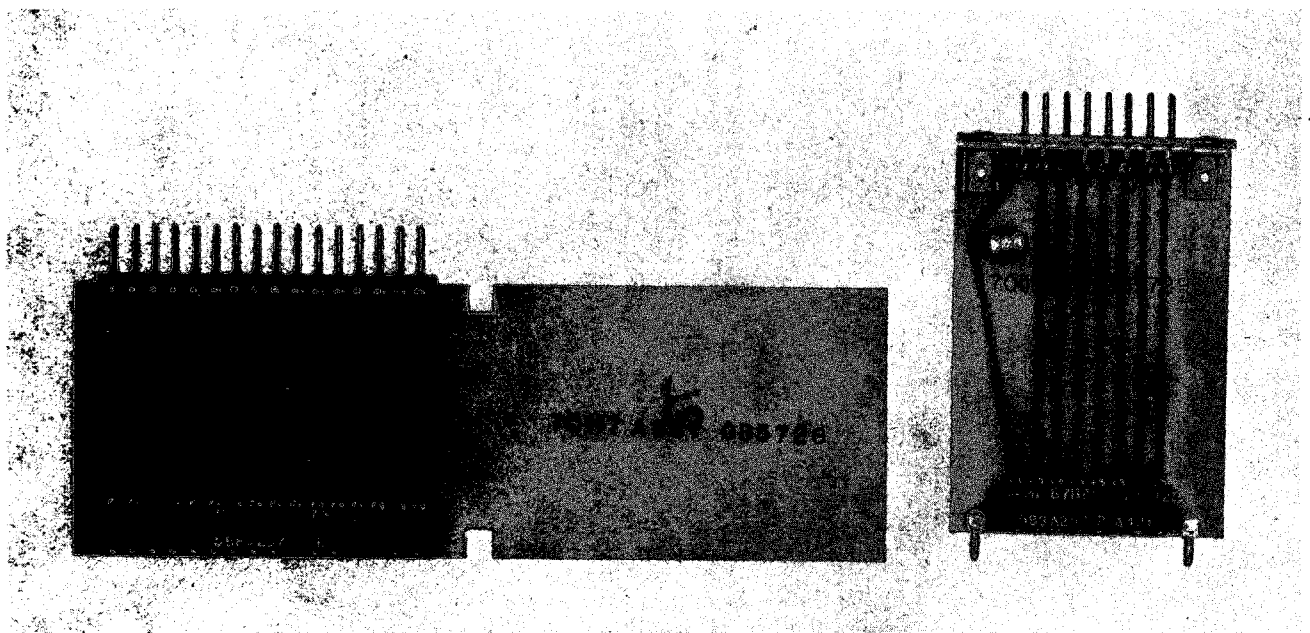


Figure 2-1. Circuit Card Extenders



SECTION III

THEORY OF OPERATION

3-1. INTRODUCTION.

3-2. This section explains the functions of the circuits in Test Set, Transponder Set TS-1843B/APX. The circuits are first described on a block diagram level, then a detailed circuit description is given.

3-3. OVERALL FUNCTIONAL DESCRIPTION

3-4. The test set is connected in series with the antenna line of the aircraft transponder, where it will continuously monitor the performance of the transponder (Monitor mode of operation) and may be used to test the transponder in a selected mode of interrogation (Test mode of operation). In the Test mode of operation, the test set generates simulated interrogation pulse pairs in the desired IFF mode, uses them to modulate the CW (continuous wave) output of a crystal-controlled rf oscillator at a frequency of 85.833 MHz (megahertz), and feeds this pulse-modulated signal at a preset power level via a 12th harmonic generator into the aircraft transponder at a frequency of  $1030 \pm 0.5$  MHz. If the transponder replies to this test signal, it is an indication that its receiver tuned frequency and sensitivity are correct and that its decoding circuits are functioning properly. The test set analyzes the replies put out by the transponder, checking the power level, frequency, and bracket pulse spacing. At the same time, the VSWR (Voltage Standing Wave Ratio) of the antenna circuit is checked to see that it is below the acceptable level. If all checks are GO the test set will cause the TEST lamp on the control unit to light, which indicates to the operator that the transponder set is functioning normally. If any of the test results does not meet the prescribed standards, the TEST lamp will not light, indicating that the transponder set is not operating properly.

3-5. In the Monitor mode of operation, a GO indication is given when the transponder properly replies to a normal (external) interrogation and the reply power, frequency, bracket pulse spacing, and antenna VSWR are within preset limits.

3-6. As shown in the overall block diagram of figure 3-1, the test set contains circuits for in-flight testing and for continuous monitoring of the associated transponder. The power regulator needed for these circuits is also included. In the Test mode of operation (selected by the Mode Enable switches on the associated control unit) the test set makes several tests or checks simultaneously on the transponder, then sums up the combined results of these tests in a

single GO or NO-GO indication by lighting the TEST lamp on the control unit. (GO is indicated when the lamp is lit.) The TS-1849B/APX test mode of operation is activated whenever one of the four Mode Enable switches on the control unit is placed in the TEST position. The checks made simultaneously in the test mode are:

- a. Transponder Receiver Sensitivity
- b. Receiver Tuned Frequency
- c. Receiver Interrogation Decoding
- d. Transponder Reply Frequency
- e. Reply Peak Pulse Power
- f. Reply Bracket Pulse Spacing
- g. Antenna System VSWR

3-7. In the Monitor mode of operation (RAD TEST/OUT/MON switch on control unit in MON position) the test set simultaneously checks the antenna VSWR and the bracket pulse spacing, signal frequency, and power of the transponder reply, giving a GO or NO-GO indication on the same TEST lamp as above. When the control unit RAD TEST/OUT/MON switch is in the OUT position (and no Mode Enable switches are in the TEST position) the test set will not function as either a monitor or tester, but will provide only a passive link in the antenna line through the directional coupler main line.

NOTE

If a Mode Enable switch on the control unit should be placed in the TEST position while the RAD TEST/OUT/MON switch is in the MON position, the Mode Enable switch will take precedence and a test will be made in the selected mode.

3-8. The test set requires no standby power or warm-up time. The set is energized by selecting either the Test mode of operation by placing one of the four Mode Enable switches on the control unit in the TEST position (grounding the appropriate line) or by placing the RAD TEST/OUT/MON switch in the MON position, energizing the monitoring circuits. In selecting the Monitor mode of operation, a ground is applied to Monitor Mode Control AIQ1, which in turn actuates Regulator Control AIQ4. Grounding one of the four

mode selecting lines into Test Modes Control A1Q2 puts an input into Regulator Control A1Q4 which causes it to actuate the Power Switch/Voltage Regulators in the A4 Regulator Assembly. This assembly supplies +5 and +12 volts for the test set circuits. These voltages are developed from the +28 volts fed into the circuit.

3-9. When power is first applied, all test set circuits are supplied power, and the PRF Generator will start operating at a rate of  $400 \pm 50$  pps, the 85.833 MHz oscillator will start free-running, the 20 MHz Timing Oscillator will start running, and all "flip-flop" circuits will switch to their stable (low output) state.

3-10. When the first output pulse from the PRF Generator A3Q1/Q2/Q3 (figure 3-1) is applied to the Read Gate (A3U1 A/U1 B) the pulse resets it, causing it to produce a high level output which is applied to the Test Enable Gate A3U2A as one of three inputs required to initiate a reply evaluation. The prf (pulse repetition frequency) trigger is also routed to the modulation select and timing circuitry to initiate a pulse pair having the spacing required for the selected test mode. The code generator output is employed to pulse-modulate the output of an 85.833 MHz crystal oscillator power amplifier chain.

3-11. The pulsed rf output from the 85.833 MHz Oscillator A5A1Q1 is applied to a harmonic multiplier circuit in the Multiplier/Mixer Cavity A5 Z1 which selects the twelfth harmonic (1030 MHz). The 1030 MHz signal in the Multiplier/Mixer Cavity A5 Z1 is capacitively coupled to the SIG GEN probe in the Directional Coupler Assembly, which feeds the signal into the transponder as a simulated interrogation. The output level (between -54 and -81 dbm) of the simulated interrogation signal at the TRANSPONDER connector 1J2 is determined by the modulation level set by the R-F OUT control on the Timing Assembly A2. If the transponder receiver frequency, sensitivity, and decoding are correct, the transponder will reply in the same mode as the interrogation. This reply should occur within less than five microseconds ( $\mu\text{sec}$ ). (It will normally occur within  $3.0 \pm 0.5 \mu\text{sec}$  because of the transponder design specification.) To ensure that the reply analyzing circuits accept only the replies to the simulated interrogation from the test set and not to extraneous signals, a Test Reply Search Gate pulse is generated in the test set along with each interrogation. This gate pulse permits the acceptance only of replies occurring less than  $5 \mu\text{sec}$  after the interrogation. The Reply Search Gate circuit is activated simultaneously with the P3 (last) pulse of the interrogation by means of a trigger from the  $21 \mu\text{sec}$  output from the Pulse Selection Matrix A2 U6/U7/U8 in the Timing Assembly A2. The output of the Reply Search Gate Generator A3 U3B/U3C is applied to the Test Enable Gate A3U2A as the second of three required inputs; the first being the reset output of the Read Gate A3 U1A/U1 B. If an SIF reply of sufficient power is received from the transponder within the  $5 \mu\text{sec}$  search period, some portion of the first bracket pulse P1 will be detected by Power Level Detector A3Q10/Q11, passed through Power Shaper A3U4 to produce a  $0.1 \mu\text{sec}$  reference pulse, and will

be applied to the Test Enable Gate A3U2A as the third and last required input.

3-12. With all three inputs present at the Test Enable Gate (read gate in reset condition, reply search gate present, and Power Shaper P3 output present) the Test Enable Gate produces an output which actuates the Test Gate Generator A3U3D/U3E to initiate a 30 to 50  $\mu\text{sec}$  timing period. The output from the Test Gate Generator is applied as one input to the Bracket Decode Gate A3U2B. With all three of its inputs present simultaneously (decode window from A2, Power Shaper A3U4 output, and test gate from A3U3D/U3E) the Bracket Decode Gate generates an output which triggers the Decode Delay and Timer A3 U3 F/U5. The latter produces a  $0.4 \mu\text{sec}$  negative pulse, differentiated so as to produce a narrow ( $0.07 \mu\text{sec}$ ) negative pulse at the leading edge and a  $0.07 \mu\text{sec}$  positive pulse at the trailing edge. The negative pulse has no effect on the circuit, but the  $0.4 \mu\text{sec}$  delayed,  $0.07 \mu\text{sec}$  wide positive pulse is passed on via Inverter A3 U3 F to the Composite Evaluation Gate A3U2C as the delayed bracket decode input. When inputs are also present from the frequency-checking circuits and from the VSWR-checking circuits, the evaluating circuits will produce a GO output which will light the TEST lamp on the control unit.

3-13. TEST MODE SWITCH CIRCUITS. These circuits, located on the Power and Control Assembly A1, consist of Test Mode Control A1Q2, Monitor/Test Control A1Q3, and Regulator Control A1Q4 working in conjunction with Pulse Selection Matrix A2U6/U7/U8 in Timing Assembly A2. The mode of interrogation to be simulated for the purpose of testing the transponder is determined by which one of the four Mode Select lines (from the Mode Enable switches on the control unit) is grounded. The ground is applied (through one of the four isolating diodes) to the base of Test Modes Control A1Q2.

#### NOTE

In order to obtain a TEST actuation in mode C a connection must be made between pins 9 and 10 of 1J1 on the TS-1843B/APX (normally supplied by Altitude Encoder.)

A1Q2 provides outputs which are fed to both Monitor/Test Control A1Q3 (to enable the Reply Search Gate Generator in Evaluator Assembly A3) and Regulator Control A1Q4 (to enable Regulator Assembly A4, supplying regulated power to the test circuits.) The individual mode selection lines are also connected into the Pulse Selection Matrix A2U6/U7/U8 to enable the proper sections of the matrix to produce pulse pairs having the required spacing for the desired interrogation mode.

3-14. MONITOR SWITCH CIRCUITS. These circuits, located in Power and Control Assembly A1, consist of Monitor Mode Control A1 Q1, working in conjunction with Regulator Control A1Q4. When the Monitor Enable line, coming from the RAD TEST/OUT/MON switch on the control unit, is grounded, Monitor

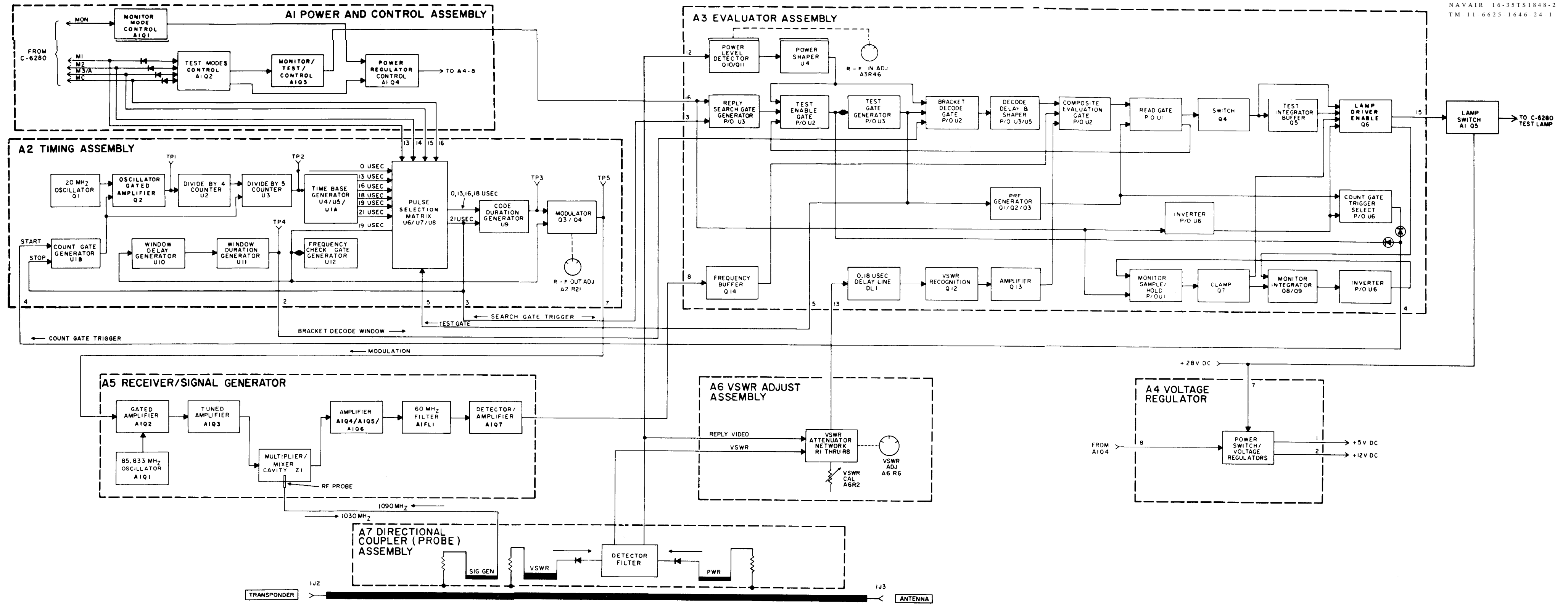


Figure 3-1. Overall Functional Block Diagram, TS-1843B/APX

Mode Control A1Q1 (normally conducting), is caused to go into non-conduction, which in turn causes Regulator Control A1Q4 to conduct. This causes Regulator Assembly A4 to become energized and apply regulated power to the test set circuits.

3-15. **LAMP SWITCH CIRCUITS.** Lamp Switch A1Q5 is a transistor located on the Power and Control Assembly A1 which acts as a solid-state switch in the line from +28 volts to the TEST lamp on the control unit. When conducting, the transistor appears as a closed switch; when non-conducting, it appears open. The switch is actuated by the voltage on the line coming from pin 15 of the Evaluator Assembly A3. This line will go low, causing A1Q5 to conduct, only when all tests have been passed and a GO indication (lit) is desired on the control unit TEST lamp. The Lamp Switch A1Q5 can supply a current up to 50 milliamperes at 28 volts dc to light the indicator lamp. In the testing mode of operation, the lamp will remain on while the GO condition continues; in the monitoring mode of operation, it will go on for two seconds, then will be turned off automatically, on again after a few milliseconds, and will cycle on and off while the GO condition continues.

3-16. **TIMING CIRCUITS.** Synchronization and timing are provided by a master trigger generator, a crystal controlled pulse spacing reference source, and gating circuitry which aids in establishing the test mode code configuration and programs the performance evaluators.

3-17. The trigger (prf) generation function is performed by a stable unijunction transistor (A3Q2) and as-

sociated circuitry. The prf generator operates at a nominal rate of  $400 \pm 50$  pulses per second and is on in Test or Monitor mode of operation. In the former it provides the basic test interrogation rate and resets evaluator circuitry; in the latter it resets evaluator circuitry and defines the maximum rate at which monitor replies will be evaluated.

3-18. Precision encoding and decoding timing is provided by a crystal-controlled pulse spacing reference source and by gating circuitry which aids in establishing the pulse spacing for the test mode selected and programs the performance evaluators (including reply bracket spacing evaluation). These circuits are contained in the Timing Assembly A2. The relative timing of test set functions is shown in figure 3-2, Timing Sequence Chart. A list of test points showing the signals at each is given in table 5-1.

3-19. A crystal-controlled continuous-wave oscillator with an accuracy of better than 0.05% (better than  $0.01 \mu$  sec in  $20 \mu$ sec) provides a precise timing and pulse spacing reference. This degree of precision is required to accurately define the spacing of the simulated interrogation pulse pairs for testing and to properly monitor the reply bracket pulse spacing. The clock circuit consists of crystal-controlled 20 MHz Oscillator A2Q1, Gated Amplifier A2Q2, Divide-by-Four Counter A2U2, Divide-by-Five Counter A2U3, and Time Base Generator A2U4/U5/U1A.

3-20. The cw output of 20 MHz Oscillator A2Q1 is fed into Gated Amplifier A2Q2, which is gated on by Count Gate Generator A2U1B when it is triggered on by a count gate trigger signal from the Count Gate Trigger

Table 3-1. Inputs to Pulse Select Matrix Required for Outputs

MATRIX AND GATE	* U4A-13 INPUT	U4A-8 A	U4A-9 A	U4B-6 B	U4B-5 B	U5A-8 C	U5A-9 R	U5B-6 D	U5B-5 D	U1A-8 E	U1A-9 E	MODE GATE	TEST GATE
MODE C P1 (0 $\mu$ sec) A2U6A	Pin 9	Pin 10		Pin 12		Pin 11(b)		Pin 11(a)		Pin 13		M - C Pin 11(c)	
MODE 3 P1 (13 $\mu$ sec) A2U6B	Pin 5		Pin 3(a)	Pin 4			Pin 2		Pin 1			M - 3 Pin 3(b)	
MODE 2 P1 (16 $\mu$ sec) A2U7A	Pin 5	Pin 4		Pin 2		Pin 3(a)					Pin 1	M - 2 Pin 3(b)	
MODE 1 P1 (18 $\mu$ sec) A2U7B	Pin 9	Pin 12			Pin 10						Pin 13	M - 1 Pin 11	
FREQ. TEST (19 $\mu$ sec) A2U8A	Pin 5		Pin 2		Pin 4						Pin 1		Pin 3
ALL MODES P3 (21 $\mu$ sec) A2U8B	Pin 9		Pin 10				Pin 13				Pin 12		

\* Matrix inputs identified by Time Base Generator output numbers and logic letters assigned.



Select circuit in the Evaluator Assembly. The 20 MHz output of A2Q2 is divided by four in Divide-by-Four Counter A2U2A/U2B, then by five in Divide-by-Five Counter A2U3 which is also gated on by Count Gate Generator A2U1B. The 1 MHz output of A2U3 is passed on to the Time Base Generator A2U4/U5/U1A where a series of JK flip-flops produces outputs at 0  $\mu$  sec, 13  $\mu$  sec, 16  $\mu$  sec, 18  $\mu$  sec, 19  $\mu$  sec, and 21  $\mu$  sec. These outputs are all fed into Pulse Selection Matrix A2U6/U7/U8 where mode gate lines from the control unit select the appropriate pairs of outputs to produce pulses spaced at 3  $\mu$  sec (for mode 1), 5  $\mu$  sec (for mode 2), 8  $\mu$  sec (for mode 3), and 21  $\mu$  sec (for mode C). These pulse pairs will be used to simulate interrogation signals in the desired mode for testing the transponder receiver (see figure 3-3).

3-21. The selected pulse pair is passed through Code Duration Generator A2U9 which establishes the correct modulation pulse width, then is applied to Modulator A2Q3/Q4 which passes the simulated interrogation pulse pair along to the Receiver/Signal Generator A5 to be used in producing 1030 MHz pulse signals for injection into the transponder receiver.

3-22. DIRECTIONAL COUPLER. The Directional Coupler Assembly provides a direct link between the transponder and its antenna, both for outgoing reply signals and incoming interrogation signals. It provides means for sampling the transmitter signals passing through, and it permits the injection of locally generated test signals. The directional coupler assembly in actuality is three couplers in one; it has three independent "probe" sections; a forward power probe, a reverse power probe, and a test signal injection probe. The assembly includes a Detector/Filter section which demodulates and filters the signals from the power probe, (forward signal) and the VSWR probe (reflected signal) and feeds the outputs to the VSWR and power evaluator circuits. The main conductor of the directional coupler is assembled into a channel which is an integral part of the TS-1843B/APX main casting; the probes and detector/filter circuits are contained in Directional Coupler Assembly A7 which is placed over the channel and conductor rod.

3-23. RECEIVER/SIGNAL GENERATOR CIRCUITS. These circuits include the signal generator consisting of 85.833 MHz Oscillator A5A1Q1, Gated Amplifier A5A1Q2, Tuned Amplifier A5A1Q3, and Multiplier/Mixer Cavity A5Z1, which is used to simulate the normal interrogation signal for test purposes. This 1030 MHz signal (12th harmonic of the 85.833 MHz oscillator signal), pulse-coded by the modulating signal from the timing circuits, is fed into the transponder antenna line through the directional coupler. When the transponder replies correctly to this signal having precise frequency, power level, and pulse characteristics, the receiver tuned frequency and sensitivity are considered to be correct, and at the same time the decoding of the simulated interrogation will have checked out the decoding capability of the transponder.

3-24. The receiver circuit, consisting of Multiplier Mixer Cavity A5Z1, Amplifier A5A1Q4/Q5/Q6, 60 MHz Filter A5A1FL1, and Detector/Amplifier A5A1Q7 is used to check the signal frequency of the transponder replies by providing a circuit which simulates the receiver portion of an interrogator set.

3-25. The 1090 MHz signal from the transponder enters the Directional Coupler Assembly through the TRANSPONDER connector. A sample of the signal is picked off by the SIG GEN probe and fed into the Multiplier/Mixer Cavity A5Z1 in Receiver/Signal Generator A5. The 1090 MHz signal is heterodyned in the Mixer Cavity with a 1030 MHz signal resulting from a frequency check modulation input to the signal generator and the resulting 60 MHz i-f signal is amplified in Amplifier A5A1Q4/Q5/Q6. If the i-f signal is of the proper frequency, it is passed through the narrow-passband 60 MHz Filter A5A1FL1, then is demodulated and amplified in Detector/Amplifier A5A1Q7. The demodulated signal is fed into the Evaluator Assembly A3 through pin 8, and through Frequency Buffer A3Q14 to the Composite Evaluation Gate A3U2C where it is applied as one of three coincident inputs required to define an acceptable transponder reply.

3-26. VSWR CIRCUITS. The VSWR Adjust Assembly A6 consists primarily of an adjustable, precisely calibrated resistive network for comparing the two voltages derived from the power (forward-going signal) and VSWR (reflected signal) probes in the Directional Probe Assembly A7. A sample of the forward-going transponder output signal is picked off the antenna line by the PWR probe, demodulated and filtered in the Detector/Filter, and passed on to the VSWR Adjust Assembly A6 (as well as to the Power Level Detector A3Q10/Q11 in the Evaluator Assembly.) At the same time, a sample of any reflected signal coming back down the antenna line toward the transponder is taken off by the VSWR probe, demodulated and filtered in the Detector/Filter, and fed into the VSWR Adjust Assembly A6.

The PWR voltage fed into the comparison network is positive and the VSWR voltage is negative. By algebraically adding the two in the resistive network, a difference or error voltage is produced which is proportional to the ratio of the two voltages and incidentally to the associated Voltage Standing Wave Ratio. A high proportion of reflected to forward power and the associated high standing wave ratio is indicative of some impedance mismatch or discontinuity.

3-27. The acceptance threshold set by VSWR control A6R6 may be at any level between 6 and 12 db. (Dial markings are 6, 9, and 12 db.) By means of the internal VSWR CAL control A6R2, the settings of the VSWR control are precisely calibrated at the factory so that the settings are accurate within  $\pm 1.5$  db. The output voltage (error signal) from VSWR Adjust Assembly A6 is fed into the Evaluator Assembly A3 through pin 13. The signal is passed through 0.18  $\mu$  sec Delay Line A3DL1, which delays the signal

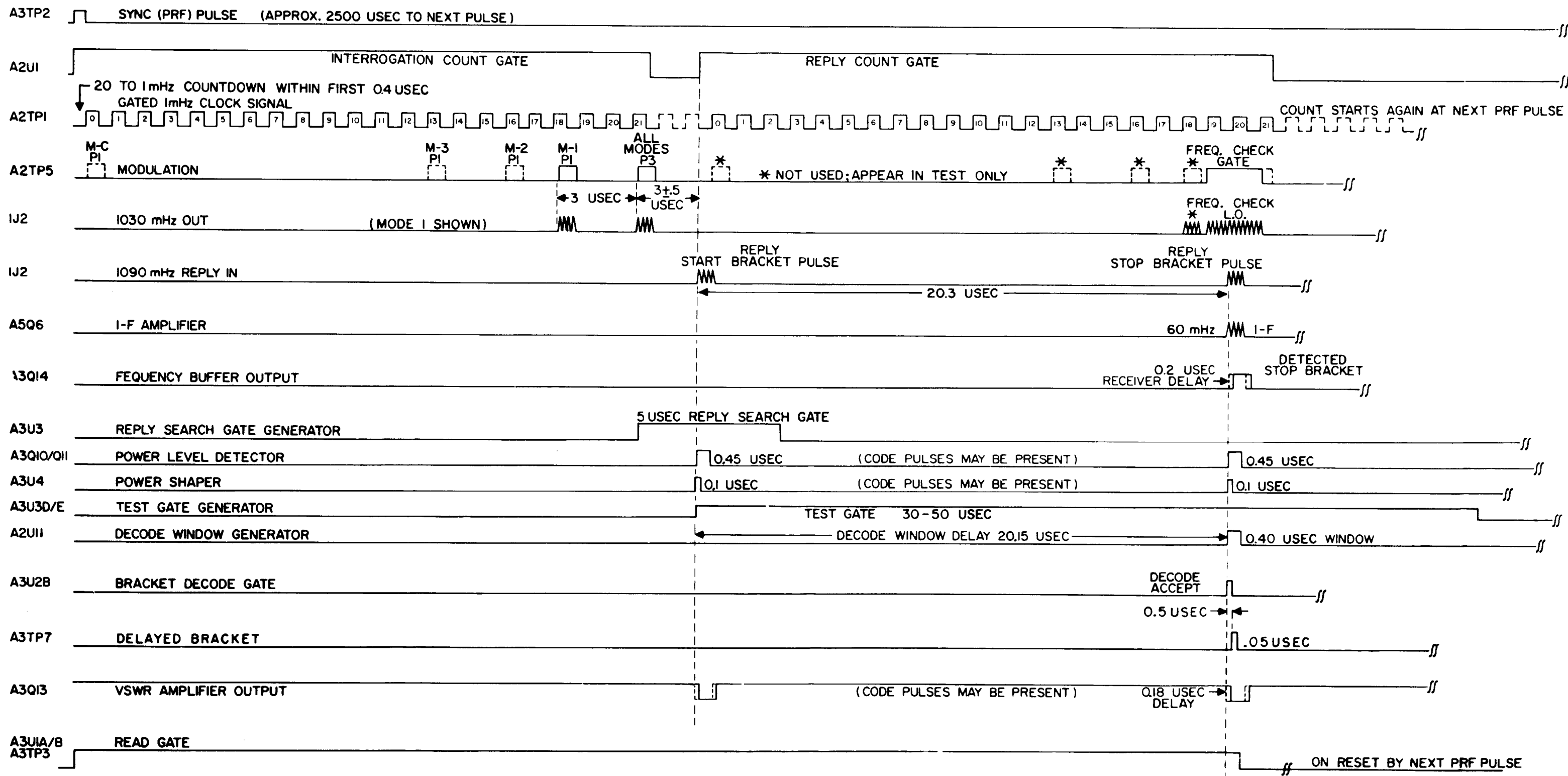
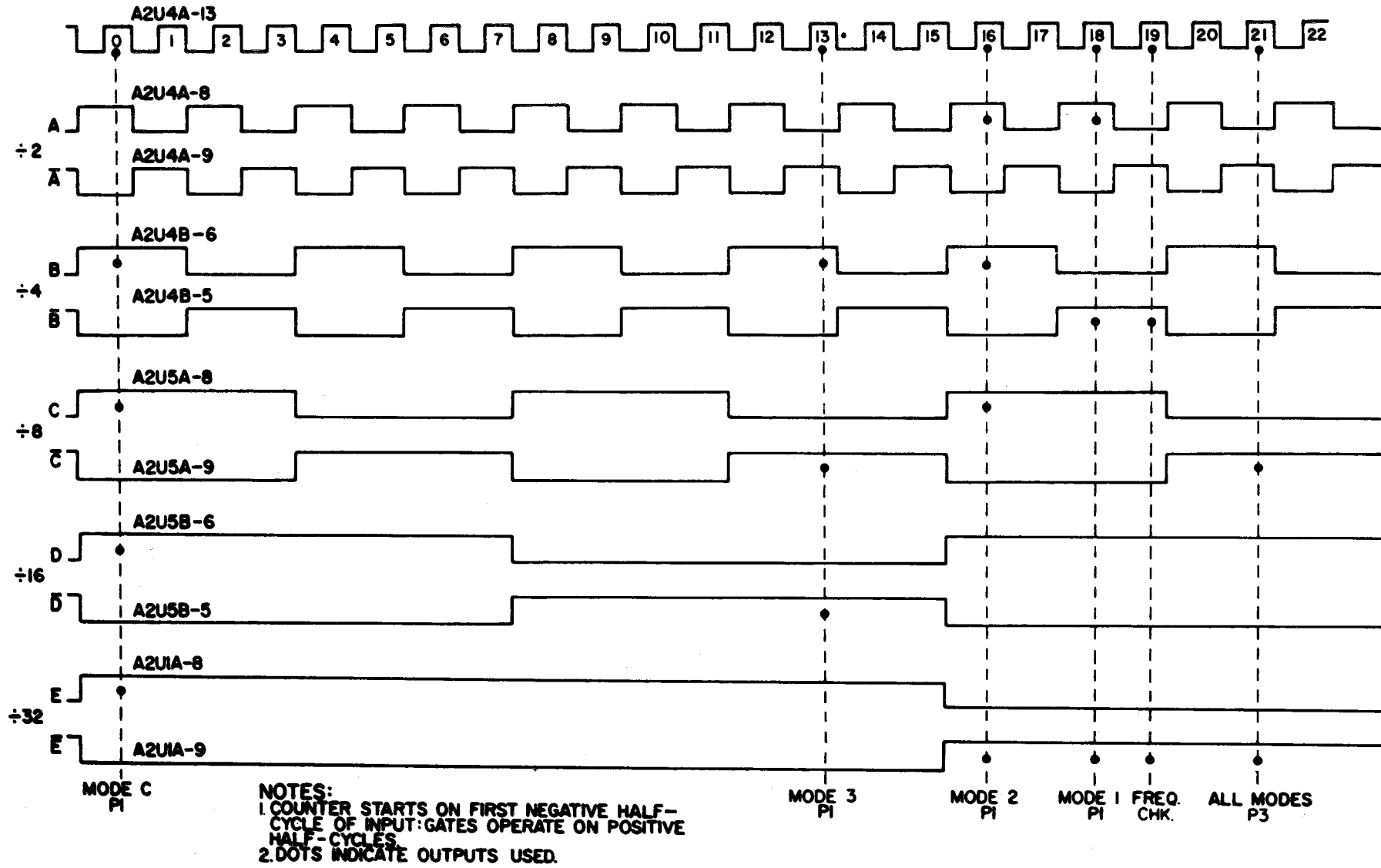


Figure 3-2. Timing Sequence Chart

COUNTER STARTS

1mHz CLOCK PULSE INPUT: POSITIVE PULSES NUMBERED ACCORDING TO TIME IN USEC.



T.O. 12P4-2APX-202  
 NAVAIR 16-35TS1843-2  
 TM-11-6625-1646-24-1

Figure 3-3. Time Base Generator Output Potential Chart

slightly to permit ensuing measurements to be taken at the center of each signal pulse for the best accuracy. It is then applied to the VSWR Recognition circuit (A3Q12) which produces an output only if the signal is above the reject threshold level. This output is amplified by Amplifier/Inverter A3Q13 and applied to the Composite Evaluation Gate A3U2C as one of its three coincident inputs. The A3Q13 output remains high if the VSWR is acceptable.

3-28. EVALUATION CIRCUITS. The circuitry of this group has the principal functions of analyzing each transponder reply on a reply-by-reply basis, and, in the Test mode, making a determination that correct replies are being received to more than 80% of the test interrogations, or, in the Monitor mode, that more than 5 correct responses at a rate of at least 100 pps have been transmitted in response to external interrogations.

The correct reply evaluation basis includes:

- Reply power, both bracket pulses
- Reply bracket spacing
- Reply frequency
- Antenna system VSWR

The reply power analyzer or power level detection function is provided by A3Q10 and A3Q11 which comprise an adjustable threshold amplifier. The R-F IN control establishes the minimum power level to which the test set will respond. Signals below the preset threshold will not be amplified sufficiently to trigger the Power Shaper A3U4. The outputs of the power shaper are narrow pulses approximately  $0.1 \mu \text{ sec}$  in duration. The first bracket pulse initiates a bracket spacing evaluation timing cycle of the precision clock system (paragraph 3-42). The clock system output is a decode "window" of approximately  $0.4 \mu \text{ sec}$ , starting at approximately  $20.15 \mu \text{ sec}$  after the initiating pulse (start bracket pulse). The triple input Bracket Decode Gate A3U2B is enabled by the test gate, the decode window, and the power shaper A3U4 outputs. During the possible interval of triple coincidence, nominally  $20.1$  to  $20.5 \mu \text{ sec}$ , a bracket decode can occur, signifying that the reply bracket spacing is within the allowable limits of  $20.3 \mu \text{ sec} \pm 0.3 \mu \text{ sec}$ . Thus the output of Bracket Decode Gate A3U2B signifies adequate power and acceptable bracket spacing limits. This output is delayed and reshaped by the Active Delay Generator A3U5, a differentiation network, and by Inverter A3U3F. The output of A3U3F is identified as the delayed bracket decode signal and is employed as one input of the triple input Composite Evaluation Gate A3U2C. The A5 receiver output (frequency) and the VSWR channel output provide the balance of the inputs to the composite evaluation gate; the VSWR input will be high if VSWR is acceptable, the frequency input will be high if the transponder reply frequency is within acceptable limits, and the narrow positive delayed decode trigger will be accepted, producing an inverted trigger output from A3U2C, and identifying one correct reply. This output is employed to toggle the Read Gate Binary multivibrator A3U1A/U1B to its "read" state (A3U1A output low). This state of the Read Gate inhibits all signal processing for its duration of nominally 2500

$\mu \text{ sec}$  and provides a drive signal for the "ratio" or "rate" reply evaluators. The read gate is reset by the first succeeding prf trigger.

Note that if the transponder is replying correctly and continuously to the internally generated test interrogations, the read gate will be "on" almost continuously. When in the Monitor mode the read gate will be "on" for  $2500 \mu \text{ sec}$  for each correct reply decision. When in the Test mode the test set must indicate a GO if correct replies are received to at least 80% of the test interrogations and must indicate NO-GO if fewer than 50% correct replies are received. These conditions are identified by averaging the ON time of the read gate and providing a drive input to Lamp Driver Enable transistor A3Q6 if an acceptable ratio exists. In turn, A3Q6 provides drive power to Lamp Switch A1Q5 and an energizing voltage for the remote GO/NO-GO lamp.

In the Monitor mode of operation the test integrator output is disabled (A3U6 and A3CR5) and the monitor integrator chain enabled (the A3R27 and A3CR10 junction goes high) allowing the sample-and-hold binary multivibrator (A3U1C/U1D) to become active. This flip-flop acts as a steering device, in one state allowing the monitor integrator (A3Q8 and A3Q9) to act as a storage step counter, counting read gate inputs until 5 to 10 are received, whereupon the Monitor Integrator Switch A3Q9 is toggled, sequentially toggling the sample-and-hold binary to its "read" state, which provides drive to the lamp driver enabling stage via A3R31, A3R32, and A3CR13, and lighting the test lamp as described above. This state is held for the time interval (approximately 2 seconds) required to charge A3C10 via A3R31 and A3R34 to the firing level of A3Q9. As A3Q9 fires, discharging A3C10, it resets the monitor sample-and-hold binary multivibrator, and if acceptable transponder replies are still being transmitted, the cycle will repeat.

3-29. TIMING SEQUENCE. The Timing Sequence Chart in figure 3-2 is based on a mode 1 test operation. It also assumes that a reply to the test set interrogation will be put out by the transponder  $3 \mu \text{ sec}$  after the last pulse of the interrogation. Differences for other test modes and for monitor operation will be explained later.

3-30. As shown in the Timing Sequence Chart, the action starts with the application of an M-1 Mode Enable ground which turns on power to all circuits, actuating the clock circuits, the PRF Generator, and the Signal Generator circuits. The choice of mode 1 activates the proper Pulse Selection Matrix (A2U6/U7/U8) circuits to produce a pair of interrogation pulses spaced  $3 \mu \text{ sec}$  apart ( $18$  and  $21 \mu \text{ sec}$  outputs).

3-31. The second significant event occurs at  $18 \mu \text{ sec}$  ( $18$ th pulse in  $1 \text{ MHz}$  clock signal). The mode 1 P1 modulation pulse, width-standardized at  $0.8 \mu \text{ sec}$  (A5 rf output) by Duration Generator A2U9, is applied to Modulator A2Q3/Q4 which applies it to the  $1030 \text{ MHz}$  Signal Generator, producing the P1 pulse in the rf interrogation signal.

3-32. At the 19  $\mu$ sec clock count, the Frequency Check Gate Generator A3U12A/U12B is activated by the 19  $\mu$ sec output from the Pulse Select Matrix. The Frequency Check Gate gates the signal generator on during the 2  $\mu$ sec period when the reply "stop" bracket signal frequency is to be checked (by heterodyning with 1030 MHz signal and passing through a 60 MHz filter.) The 19  $\mu$ sec output also activates Window Delay Generator A2U10 which puts out a delayed window trigger to Window Duration Generator A2U11, which feeds the 0.40  $\mu$ sec window pulse to Bracket Decode Gate A3U2B. The delay introduced by A2U10 provides a point to introduce vernier delay control in the decode window timing.

3-33. The "stop" bracket pulse, spaced 20.3  $\mu$ sec from the "start" bracket and shaped to 0.1  $\mu$ sec width, falls within the 0.40  $\mu$ sec window period and within the 30 to 50  $\mu$ sec Test Gate also applied to Bracket Decode Gate A3U2B. Bracket Decode Gate A3U2B puts out an "accept" pulse which triggers Decode Delay and Shaper A3U3/U5. Decode Delay and Shaper A3U3/U5 produces a 0.07  $\mu$ sec pulse at the trailing edge of the 0.5  $\mu$ sec delay pulse. (This centers the decode pulse on the frequency and VSWR pulses.)

3-34. At the 21  $\mu$ sec clock count, the P3 modulation pulse is produced. It follows the same path to the rf output as the P1 pulse. The 21  $\mu$ sec matrix output is also applied as an input to Reply Search Gate Generator A3U3B/U3C to initiate the 5 $\mu$ sec Reply Search Gate, and is applied to Count Gate Generator A2U1B to stop the clock pulse counting.

3-35. A "start" bracket reply pulse nominally 0.45  $\mu$ sec wide occurring at a point 24  $\mu$ sec after the first clock pulse (assuming a reply 3  $\mu$ sec after the interrogation P3 pulse) will be narrowed to 0.1  $\mu$ sec by Power Shaper A3U4 and applied to Test Enable Gate A3U2A. The 0.1  $\mu$ sec pulse falls within the 5  $\mu$ sec Reply Search Gate and is accepted. The Test Enable Gate will apply a pulse to Test Gate Generator A3U3D/U3E which will generate a test gate pulse 30 to 50  $\mu$ sec long, applying it to Bracket Decode Gate A3U2B. The test gate is also applied to A2U8A in the Pulse Selection Matrix readying the 19  $\mu$ sec AND Gate.

3-36. The 0.07  $\mu$ sec pulse is fed into the Composite Evaluation Gate A3U2C, which puts out a pulse to Read Gate A3U1. This pulse causes A3U1/U1B to reset the read gate. At this time, Switch A3Q4 actuates Integrator/Buffer A3Q5, and (if a sufficient number of correct replies are occurring) causes it to actuate Lamp Driver Enable A3Q6 and Lamp Switch A1Q5, giving a GO indication. At the same time, Read Gate A3U1A/U1B disables Test Enable Gate A3U2A, terminating testing, until the next prf pulse resets the read gate and is applied to Count Gate Trigger Select A3U6B causing it to start Count Gate Generator A2U1B for the next interrogation sequence.

3-37. When tests are initiated in interrogation modes other than mode 1, the action is the same except for the timing of the P1 pulses: in mode 2, the 16  $\mu$ sec

matrix output will be used (5  $\mu$ sec before P3), in mode 3 the 13  $\mu$ sec pulse (8  $\mu$ sec before P3), and in Mode C, the "0"  $\mu$ sec output (21  $\mu$ sec before P3).

3-38. When the Monitor mode of operation is used, the power circuits are actuated through Monitor Mode Control A1Q1 rather than Test Mode Control A1Q2 and Monitor/Test Control A1Q3. In this mode of operation, no interrogation signals are generated in the TS-1843B/APX, so the Pulse Select Matrix is not activated by the Time Base Generator (figure 3-3). Since the reply signals being analyzed are in response to external interrogations having no time relationship to the test set, the reply search gating function is discontinued and replies are accepted randomly. The test set signal generator is required to supply a local oscillator signal during monitoring, so the modulator is gated on during the frequency check period. From the time of receipt of a reply start bracket pulse, the test set functions as described above: the first pulse initiates a Test Gate and Reply Count Gate, a Frequency Check Trigger is generated at the 19  $\mu$ sec point, and evaluation goes on as before. The Monitor Sample/Hold A3U1C and D, Clamp A3Q7, and Monitor Integrator A3Q8/Q9 are activated to drive the TEST lamp on for a 2 second period, then off, and on again, repeating for as long as the correct replies continue.

### 3-39. DETAILED CIRCUIT DESCRIPTION.

#### 3-40. POWER AND CONTROL ASSEMBLY A1.

Primary power at +28 volts is applied to the test set through pin 1 of POWER connector 1J1 (figure 3-4). The return line is through grounded pin 2. Input voltage may vary from 21 to 29 volts without affecting the test set performance. It will not be damaged if the input should rise to as high as 30 volts or drop to as low as 17 volts. Power consumption is less than 16 watts.

3-41. Incoming +28 volt power is filtered by an RC filter made up of A1R11, A1C8, and A1C2. It is then passed through transient suppressor diode A1CR7, and past negative spike clipper A1CR8, after which part goes on out of the A1 assembly to the Regulator Assembly A4 (through A4J1 pin 7) while the remainder is applied through A1R12 to the emitter of Lamp Switch A1Q5 (a PNP transistor). When the A1Q5 base is grounded through limiting resistor A1R14 by the evaluator output stage, the transistor will conduct current through limiting resistor A1R15 and out through pin 8 of the POWER connector 1J1 to light the TEST indicator lamp on the control unit. Base bias for A1Q5 is supplied by A1R13. AC bypassing is provided by A1C9 and A1C3.

3-42. **TIMING ASSEMBLY A2.** The basic timing element in the Timing Assembly (Figures 3-5 and 3-5A) is the FET (Field Effect Transistor) Oscillator A2Q1. The frequency of oscillation is determined by 20 MHz Crystal A2Y1, connected between source and gate, which holds it to an accuracy of .05% or better. Power (+12v) for the oscillator transistor is supplied through choke A2L1 and resistor A2R2, and is bypassed by A2C1. Resistor A2R1 and diode A2CR1

provide a bias source for the gate of A2Q1. The oscillator signal is coupled through capacitor A2C2 to one gate (pin 3) of dual gate Oscillator Gate Amplifier A2Q2. A second input on the other gate (pin 2) will permit the transistor to be gated on. This second input is a gate pulse from the Count Gate Generator A2U1B. The 20 MHz output of A2Q2 is coupled through A2VR3 to the input (pin 1) of the  $\div 4$  Counter A2U2, which is enabled by the count gate from A2U1B. The two sections of integrated circuit A2U2 are connected so that each section acts as a binary ( $\div 2$ ) counter. The output (pin 13) of section A is fed into the input (pin 5) of section B so that the final output at pin 8 is the 20 MHz input frequency divided by 4, or 5 MHz.

3-4-3. The 5 MHz output of the  $\div 4$  Counter (pin 8) is fed into the biquinary  $\div 5$  Counter A2U3 which is an integrated-circuit decade counter containing four binary counters and two gates interconnected to provide both a  $\div 2$  circuit and a  $\div 5$  circuit. In this application only the  $\div 5$  section is employed. The input at pin 1 will be divided by 5 at pin 8. The 5 MHz input from the  $\div 4$  Counter will now be divided down to a frequency of 1MHz. Counting occurs during the period of the count gate pulse fed from pin 5 of the Count Gate Generator A2U1B into pins 2 and 3 of the  $\div 5$  Counter A2U3. The 1 MHz output, used as a "clock" or reference signal, is fed into the Time Base Generator (A2U4/U5/U1A) which provides outputs at the points in time required for spacing the simulated interrogation pulse pairs in the various modes and for timing the reply pulse evaluation.

3-4-4. The Time Base Generator consists of a cascaded series of five binary counters (flip-flops). With an input ("clock") signal frequency of 1MHz, pulses are applied which are spaced 1  $\mu$  sec apart. With each input pulse, a change is made in the pattern of high and low potentials on the ten output lines taken from various points in the series of flip-flops. The five-section counter is automatically reset by the 21  $\mu$  sec gate output.

3-4-5. The ten outputs from the Time Base Generator, plus the 1 MHz input signal, are connected into the six NAND gates of the Pulse Selection Matrix A2U6/U7/U8 in such a way that a certain NAND gate will give an output only at a point in the pulse counting sequence when the proper pattern of high potentials exists on its input lines. Thus, NAND Gate A2U6A will give an output only at the "0" time point, A2U6B at the 13  $\mu$  sec point, A2U7A at the 16  $\mu$  sec point, and A2U7B, A2U8A, and A2U8B at the 18  $\mu$  sec, 19  $\mu$  sec, and 21  $\mu$  sec points, respectively. The outputs from the Time Base Generator are shown graphically in figure 3-3. Table 3-1 shows the Pulse Selection Matrix in inputs required to obtain the various outputs.

3-4-6. The 21  $\mu$  sec output is used to develop the P3 pulse in all modes, while the P1 pulse is developed from the outputs occurring at 18  $\mu$  sec (3  $\mu$  sec earlier), 16  $\mu$  sec (5  $\mu$  sec earlier), 13  $\mu$  sec (8  $\mu$  sec earlier),

and 0  $\mu$  sec (21  $\mu$  sec earlier) for modes 1, 2, 3/A, and C, respectively. Which of the NAND gates (other than 21  $\mu$  sec NAND Gate A2U8B) will put out a pulse will be determined by the application of a gate signal to one of the four Mode Gate input lines. For example when a mode 1 gate (A2J1 pin 16) is fed in (through pins 5 and 6 of Mode Gate Inverter A2U12F) the gate is applied through diode A2CR9 to pin 11 of AND Gate A2U7B (18  $\mu$  sec) in the Pulse Selection Matrix. When inputs are present on pins 9, 10, 12, and 13 of A2U7B (from the "0" input of A2U4A, and from A2U4B-5, A2U4A-8, and A2U1A-9, respectively) this AND gate will produce an inverted output. (This will occur only when the 18th clock pulse in the series has entered the counter). This inverted output pulse represents P1 of the mode 1 interrogation. It is passed on to input pin 4 of Duration Generator A2U9, which establishes the pulse width as approximately 0.95  $\mu$  sec, which will produce an rf output pulse nominally 0.8  $\mu$  sec in duration. Control and adjustment of the pulse duration from 0.8 to 1.0  $\mu$  sec is provided by means of A2R33 and variable resistor A2R34.

#### NOTE

In earlier models (Serial No. 4999 and below) the modulation pulse duration is set by selecting a resistance value for A2R12 which will provide a P3 pulse duration of  $0.9 \pm 0.5 \mu$  sec. (Refer to parts listing and usable on codes for range and selection of resistance values to be used.)

3-4-7. During the same gating period, inputs are being applied to pins 9, 10, 12, and 13 of NAND Gate A2U8B (21  $\mu$  sec) from the "0" input, and from A2U4-9, A2U1A-9, and A2U5-9, respectively. This will occur only when the 21st clock pulse has entered the counter. The 21  $\mu$  sec output is fed into the Duration Generator A2U9, then the A2U9 output is applied to Amplifier A2Q3 of the Modulator circuit. The 21  $\mu$  sec pulse serves as the P3 pulse and the 18  $\mu$  sec pulse (3  $\mu$  sec earlier) serves as the P1 pulse in the interrogation. The combined signal is sent out of the A2 assembly (through A2J1 pin 7) as the signal generator modulation signal. The maximum level of the A2Q3 output is adjusted by means of A2R20. The output level of the modulation signal is set by A2R21, while the minimum settable level is determined by A2R22. The A2R20 and A2R22 adjustments calibrate the R-F OUT control A2R21.

3-4-8. Modulator A2Q3, fed by the interrogation pulses from Duration Generator A2U9, provides an adjustable output, permitting control of the rf signal level through Gated Amplifier A5A1Q2 of the harmonic generator in Multiplier/Mixer Cavity A5Z1, and thus providing control of the test set rf output level. Modulator A2Q4, driven by the reply Frequency Check Generator A2U12A/U12B switches nearly the full supply potential onto the Gated Amplifier A5A1Q2,

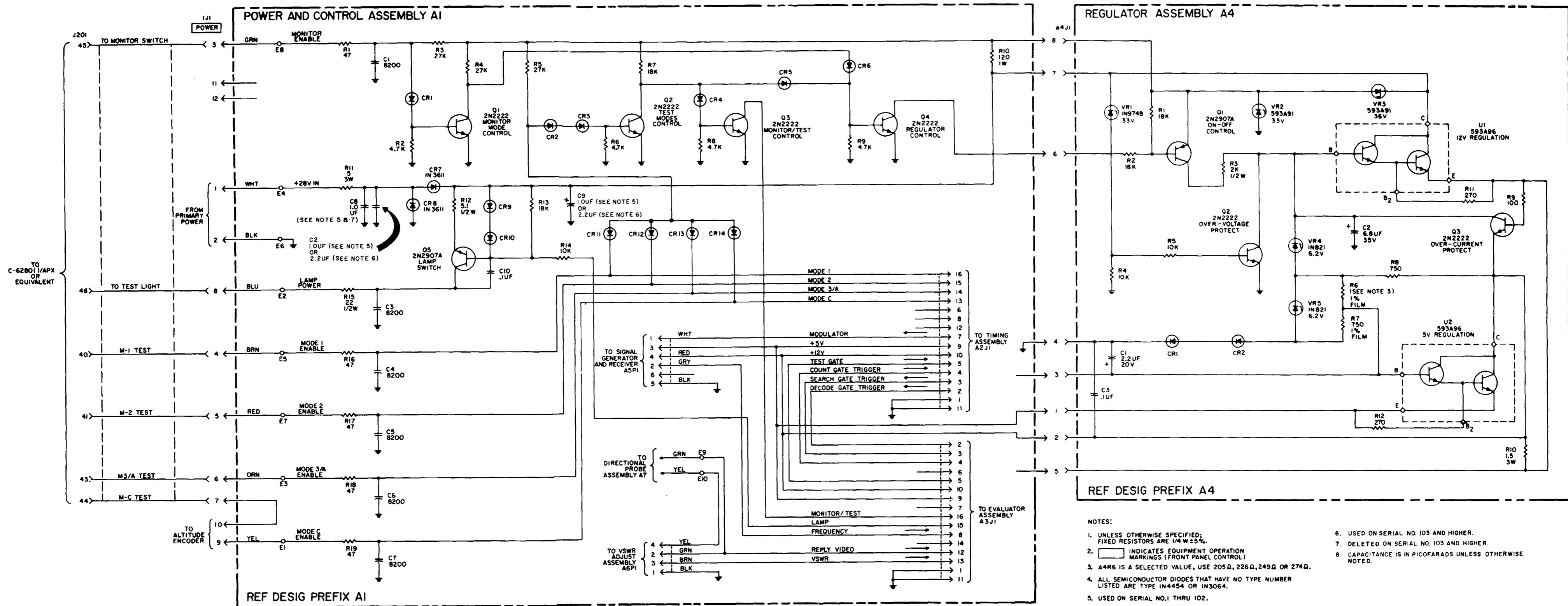
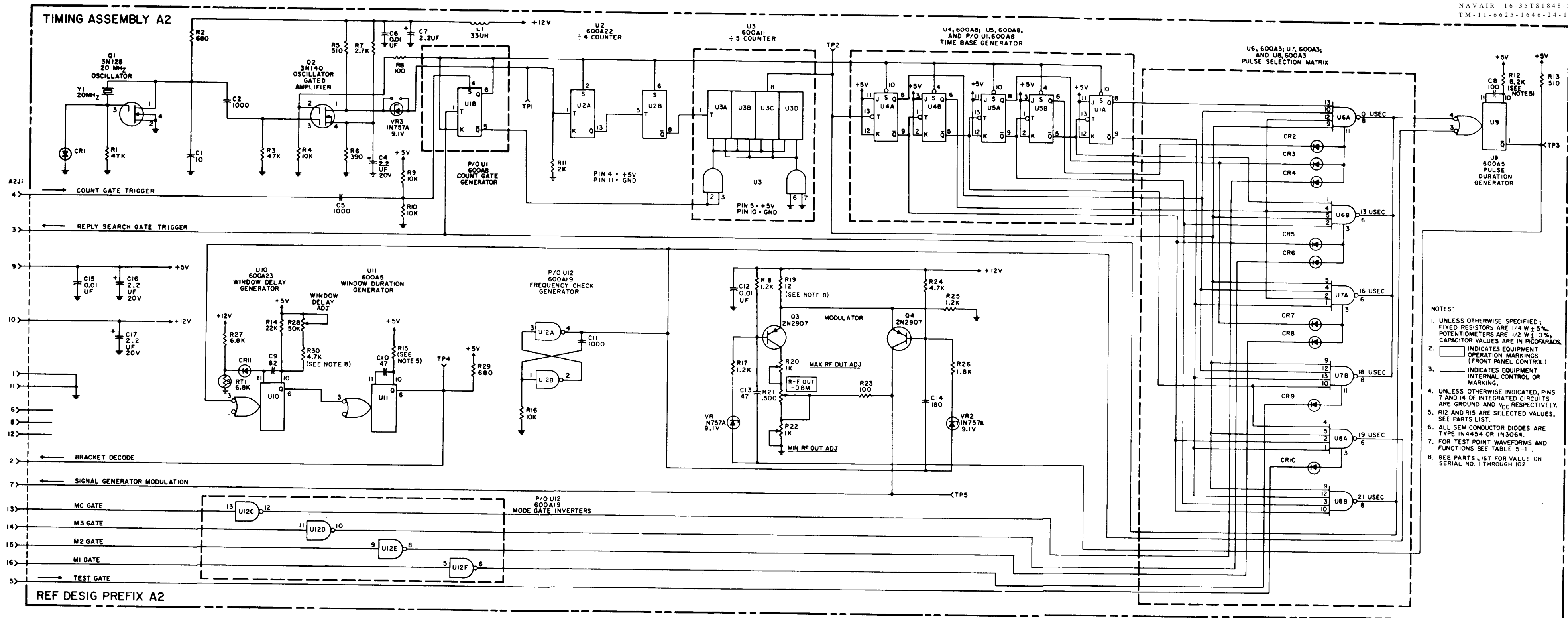


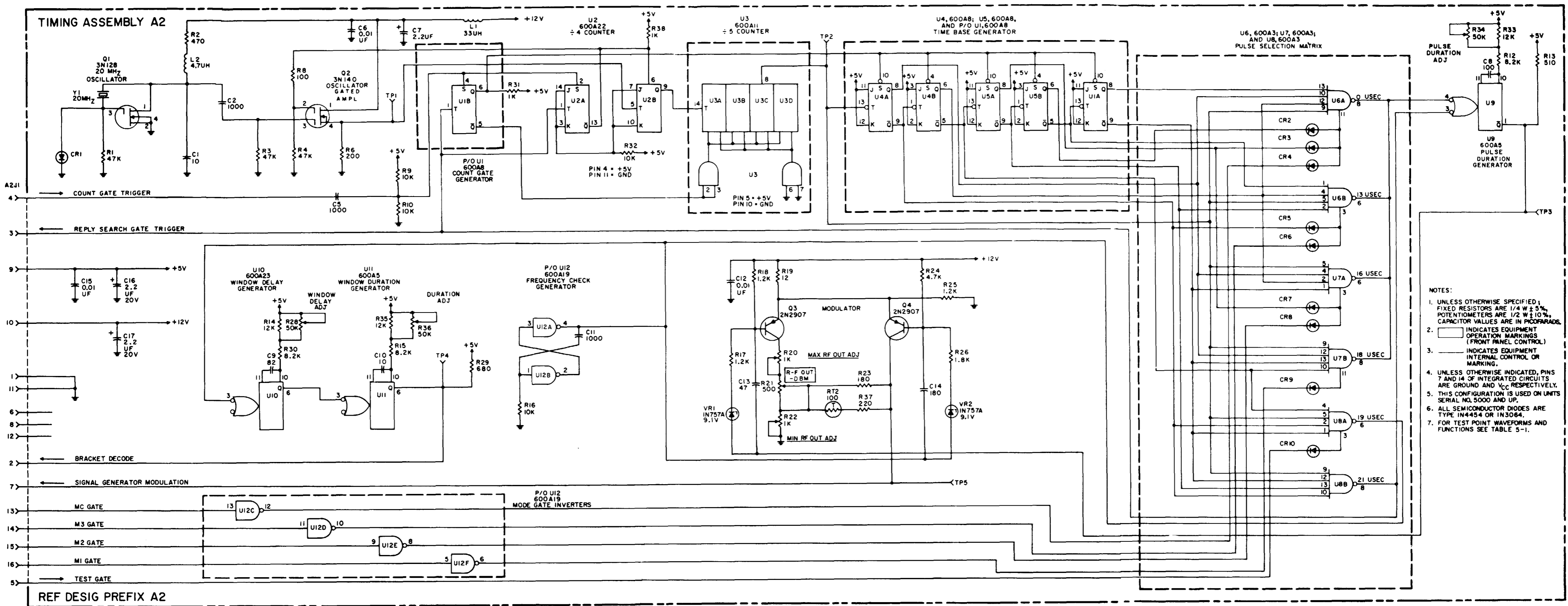
Figure 3-4. Power and Control Assembly A1 and Regulator Assembly A4, Schematic Diagram



- NOTES:**
- UNLESS OTHERWISE SPECIFIED, FIXED RESISTORS ARE 1/4 W ± 5%, POTENTIOMETERS ARE 1/2 W ± 10%, CAPACITOR VALUES ARE IN PICOFARADS.
  - INDICATES EQUIPMENT OPERATION MARKINGS (FRONT PANEL CONTROL)
  - INDICATES EQUIPMENT INTERNAL CONTROL OR MARKING.
  - UNLESS OTHERWISE INDICATED, PINS 7 AND 14 OF INTEGRATED CIRCUITS ARE GROUND AND V<sub>CC</sub> RESPECTIVELY.
  - R12 AND R15 ARE SELECTED VALUES, SEE PARTS LIST.
  - ALL SEMICONDUCTOR DIODES ARE TYPE IN4454 OR IN3064.
  - FOR TEST POINT WAVEFORMS AND FUNCTIONS SEE TABLE 5-1.
  - SEE PARTS LIST FOR VALUE ON SERIAL NO. 1 THROUGH 102.

Figure 3-5. Timing Assembly A2, Schematic Diagram (Ser. Nos. Below 5000)





- NOTES:
- UNLESS OTHERWISE SPECIFIED, FIXED RESISTORS ARE 1/4 W ± 5%, POTENTIOMETERS ARE 1/2 W ± 10%, CAPACITOR VALUES ARE IN PICOFARADS.
  - INDICATES EQUIPMENT OPERATION MARKINGS (FRONT PANEL CONTROL)
  - INDICATES EQUIPMENT INTERNAL CONTROL OR MARKING.
  - UNLESS OTHERWISE INDICATED, PINS 7 AND 14 OF INTEGRATED CIRCUITS ARE GROUND AND V<sub>CC</sub> RESPECTIVELY.
  - THIS CONFIGURATION IS USED ON UNITS SERIAL NO. 5000 AND UP.
  - ALL SEMICONDUCTOR DIODES ARE TYPE IN4454 OR IN3064.
  - FOR TEST POINT WAVEFORMS AND FUNCTIONS SEE TABLE 5-1.

Figure 3-6. Timing Assembly A2, Schematic Diagram (Ser. Nos. 5000 and Higher)

producing maximum drive and maximum rf output. The R-F OUT level control A2R21 has dial markings indicating -55, -65, and -75 dbm. The control is accurately calibrated at these points by means of A2R20 and A2R22.

3-49. The mode 2, 3/A, and C modulation pulse pairs are developed in a similar manner. In mode 2, Mode Gate Inverter A2U12E is used for the mode gate input, while in modes 3/A and C, Mode Gate Inverters A2U12D and A2U12C are used. The P1 pulse is produced in mode 2 by the 16  $\mu$  sec AND Gate A2U7A, while in modes 3/A and C, the 13  $\mu$  sec AND Gate (A2U6B) and the 0  $\mu$  sec AND Gate (A2U6A) are used. In all modes the 21  $\mu$  sec AND Gate A2U8B is used to produce the P3 pulse.

3-50. During the reply frequency check, the output of the 19  $\mu$  sec AND Gate A2U8A is applied to the Window Delay Generator A2U10 which drives Window Duration Generator A2U11 to produce a Bracket Decode window gate pulse which is fed out of the assembly through A2J1 pin 2 to the Bracket Decode Gate A3U2B in the Evaluator Assembly. The delay of A2U10 is adjustable by Window Delay Adjust A2R28, while the A2U11 duration is set by selecting the proper A2R15 value on assemblies Serial No. 1 through 4999. On assemblies using board Serial No. 5000 and higher, the A2U11 window duration is controlled and adjusted by means of A2R35 and variable resistor A2R36. The  $\mu$ sec output of Frequency Check Generator A2U12A/U12B is applied to Modulator A2Q4 which puts it on the output line of Modulator A2Q3 so that it also goes out on the Signal Generator Modulation line. The output of the 21  $\mu$  sec AND Gate A2U8B is put out through pin 3 of A2J1 as the Reply Search Gate, Trigger and Clock Count termination.

3-51. EVALUATOR ASSEMBLY A3. This assembly contains the prf generator or self synchronization circuitry which programs the test cycle, evaluation circuitry which defines the acceptability of the transponder replies, and control circuitry to enable the TEST lamp switch when a GO decision has been achieved. Transponder reply analysis is based upon reply power level, reply bracket pulse spacing, reply frequency, and antenna system VSWR.

3-52. PRF Generator A3Q1/Q2/Q3 consists essentially of a unijunction transistor (UJT) relaxation oscillator A3Q2 with a reset (gating) transistor amplifier A3Q1 and an isolation amplifier which provides an output for synchronizing external equipment. The PRF Generator develops a synchronizing trigger signal which determines the basic pulse repetition frequency (prf) of the simulated interrogation signal (P1 and P3). It also resets the read gate and count gate circuits at the same rate. The frequency of operation of the PRF Generator is nominally 400 pps ( $\pm 50$  pps), adjustable by PRF Adjust Control A3R2.

3-53. The basic oscillator is the unijunction transistor A3Q2 which repeatedly fires when the voltage across capacitor A3C2 reaches the triggering level. The charging rate of capacitor A3C2 is determined pri-

marily by A3R3 and PRF Adjust potentiometer A3R2. On assemblies (Serial No. 12,048 and higher) the charging rate of A3C2 is primarily determined by the PRF adjust potentiometer A3R2 and selection of the proper resistance value from 68 Kohm to 100 Kohm for resistor A3R3. When the UJT fires, a negative pulse is developed at base 2 (pin 4) which is coupled through A3C4 to one input (pin 9) of the Read Gate A3U1A/U1B. The same pulse is coupled through A3C3 to the emitter-follower A3Q3 for use as an external sync signal. A positive pulse is also developed at base 1 (pin 2) of the UJT which is connected directly to input pin 9 of the Count Gate Trigger Select circuit A3U6B.

3-54. The function of the gating transistor A3Q1 is to reset the timing cycle during the Test Gate interval in order to establish a fixed duration timing cycle when the Test Set is in the monitor mode of operation. A3Q1 is gated on by the Test Gate, discharging A3C2, forcing the charge timing cycle to be reinitiated at the termination of the Test Gate period. As this discharge mode is more thorough than the UJT emitter discharge, rapid partial recharge of the timing capacitor is provided via clamp diode A3CR1. The test set may be sync-locked to external test equipment (operating at an equal or slightly higher prf) by the application of the external sync signal through A3TP1, A3R4, and A3C2 to the UJT emitter.

3-55. The Read Gate A3U1A/B identifies an acceptable reply evaluation. This is a binary unit consisting of two cross-coupled dual-input gate elements. It is switched to the "off" state (A3TP3 high) by an output of the prf generator. It can be set to the "Read" state only by a trigger from the composite evaluation gate A3U2C, and will be reset by the next prf trigger. Note that the read gate may be "off" continuously in the absence of acceptable transponder replies; however, it can remain in the Read State for the Pulse Recurrence Time (PRT) only, whereupon it is reset and remains off until the termination of the next successful test and evaluation cycle. The OFF state of the Read Gate provides a high input to the Test Enable Gate A3U2A. The ON state of the Read Gate is translated to a high output at the collector of switch transistor A3Q4. The switch transistor provides a transition from the 5 volt logic system to the higher (12 v) voltage levels used for the Test and Monitor integrator systems.

3-56. Test evaluations are initiated by an output of the prf generator supplying a trigger, via A3U6 count gate trigger select, to the timing assembly A2, causing test interrogations of the selected test mode to be generated and routed to the transponder, as discussed under A2 and A7.

3-57. The Transponder Reply signal is sampled by the PWR probe of the directional coupler A7, demodulated and fed into the Evaluator Assembly A3, via A3J1 pin 12, to the attenuator network A3R45, A3R46, A3R47. The R-F IN control A3R46 is employed to adjust the pulse (positive) voltage level into the Power Level Detector A3Q10 and A3Q11. A3Q10

is a pulse amplifier biased beyond cut-off by the voltage established by A3Q11 across the common emitter load A3R49. This bias level is adjustable (by the CAL ADJ control A3R51) to enable proper calibration of the R-F IN control A3R46. Pulses which significantly exceed the bias threshold are amplified by A3Q10 and trigger the Power Shaper A3U4. The function of A3U4, an integrated circuit one-shot multivibrator, is to standardize the width and amplitude of all transponder reply pulses which meet an acceptable power threshold. Note that code pulses will likewise be processed but have no effect on the signal processing chain; the significant pulses are the Reply Bracket Pulses. The shaped Reply Video is available at A3TP4 for reference and equipment alignment purposes, and is employed as one of the inputs required by Test Enable Gate A3U2A and Bracket Decode Gate A3U2B.

3-58. In the Test mode, precautions are taken to insure that the transponder reply being analyzed is the response to the internally generated test interrogation. This security is provided by the 5  $\mu$  sec Reply Search Gate A3U3B/C, triggered by a pulse from the P3 position of the Timing Assembly A2. The presence of the Reply Search Gate and the Read Gate "off" at the triple input Test Enable Gate permits the first pulse of a reply (normally positioned  $3 \pm 0.5 \mu$  sec with respect to the test interrogation) to trigger the 50  $\mu$  sec Test Gate Generator A3U3D/E. The Test Gate Generator outputs provide a decode timing start trigger to the A2 clock system via A3CR18, an enable gate to the A2 pulse selection "19"  $\mu$ sec tap (enabling the frequency check pulse and the bracket decode timing outputs), an enable gate to the Bracket Decode Gate A3U2B, and a reset gate to the PRF timer via the base of A3Q1. In the Monitor mode, internal test interrogations are not generated, hence the Reply Search Gate binary multivibrator is continuously enabled to allow random entry of replies to external interrogations. Note, however, that the action of the Read Gate inhibits reply signal processing to a rate less than that of the internal prf generator. In either mode of operation, the timing sequence started by the initiation of the Test Gate will result in a bracket decode window from timing assembly A2, 20.15  $\mu$ sec (as measured between A3TP4 and A2TP4) after the initiating transponder pulse (normally the first bracket pulse).

The triple-input bracket decode gate A3U2B is enabled by the Test Gate, the Bracket Decode Window, and the shaped reply video pulses. If the second bracket pulse is positioned within the limits of 20.10 to 20.50  $\mu$  sec, a useful decode output will occur and the decode delay timer A3U5 will be triggered. (The foregoing cites an optimum performance characteristic; the test set requirement is that bracket spacing of 20.3  $\pm 0.15 \mu$ sec will be accepted, 20.3  $\pm 0.3 \mu$ sec will be rejected, and spacings between these limits may or may not be accepted.) The active delay generator, A3U5, is a one-shot multivibrator which generates a gate pulse nominally 0.5  $\mu$  sec in duration. By differentiation and inversion in A3C13, A3R42, and A3U3F, a narrow

(0.07  $\mu$ sec) shaped, delayed bracket decode pulse is derived. This pulse is displayed at A3TP7 and provides one input to the triple input composite evaluation gate A3U2C.

3-59. The voltage representing the VSWR is fed into the Evaluator Assembly through A3J1 pin 13. The signal is passed through 0.18  $\mu$ sec Delay Line A3DL1 which delays the signal to permit ensuing measurements to be taken at the center of each signal pulse for the best accuracy. It is then applied to the VSWR Recognition circuit (A3Q12) which produces high output only if the signal exceeds the reject threshold level. This output is inverted by Amplifier A3Q13 and applied to pin 11 of the Composite Evaluation Gate A3U2C as one of its three inputs. The VSWR signal is available at A3TP6.

3-60. The reply frequency check signal from Receiver/Signal Generator A5 is fed into the Evaluator Assembly A3 through A3J1 pin 8 and coupled through capacitor A3C21 to the base of Frequency Buffer A3Q14. The output of A3Q14 is applied to pin 9 of the Composite Evaluation Gate A3U2C as one of its three required inputs. The frequency check pulse is available at A3TP5.

3-61. The presence of three acceptable signals at the inputs of the Evaluation Gate results in a trigger pulse output which turns on the Read Gate (Para. 3-55). The acceptable bracket decode input is a narrow, flat-topped fixed-amplitude positive pulse. The acceptable VSWR input is a high level pulse, corresponding roughly in duration to the reply pulse. (An unacceptable VSWR level is indicated by a low-level pulse). The acceptable reply frequency input is a pulse approximately 3 volts in amplitude with a curved top. This pulse shape is the result of slight variations in transponder frequency at the edges of the transmitted rf pulse. Since the amplitude at the center of the frequency input pulse is most representative of the transponder frequency, the bracket decode input pulse is delayed and narrowed so that it coincides with the center of the frequency input pulse.

3-62. The single trigger pulse from the A3U2C Composite Evaluation Gate, which triggered the Read Gate A3U1A/B (see para. 3-55) identifies one acceptable reply evaluation; multiple, sequential correct replies are required for activation of the Test Lamp. In the Test mode of operation replies must be received to at least 80% of the test interrogations to give a GO indication and fewer than 50% correct replies must not result in a GO indication. In the Monitor mode of operation, at least 5 and no more than 10 correct replies at a rate of at least 100 pps must be transmitted to give a GO indication, and the GO condition must have a duration of at least 2 seconds. These integration and Test lamp activation functions are provided by the circuitry driven by the Read Gate switch A3Q4.

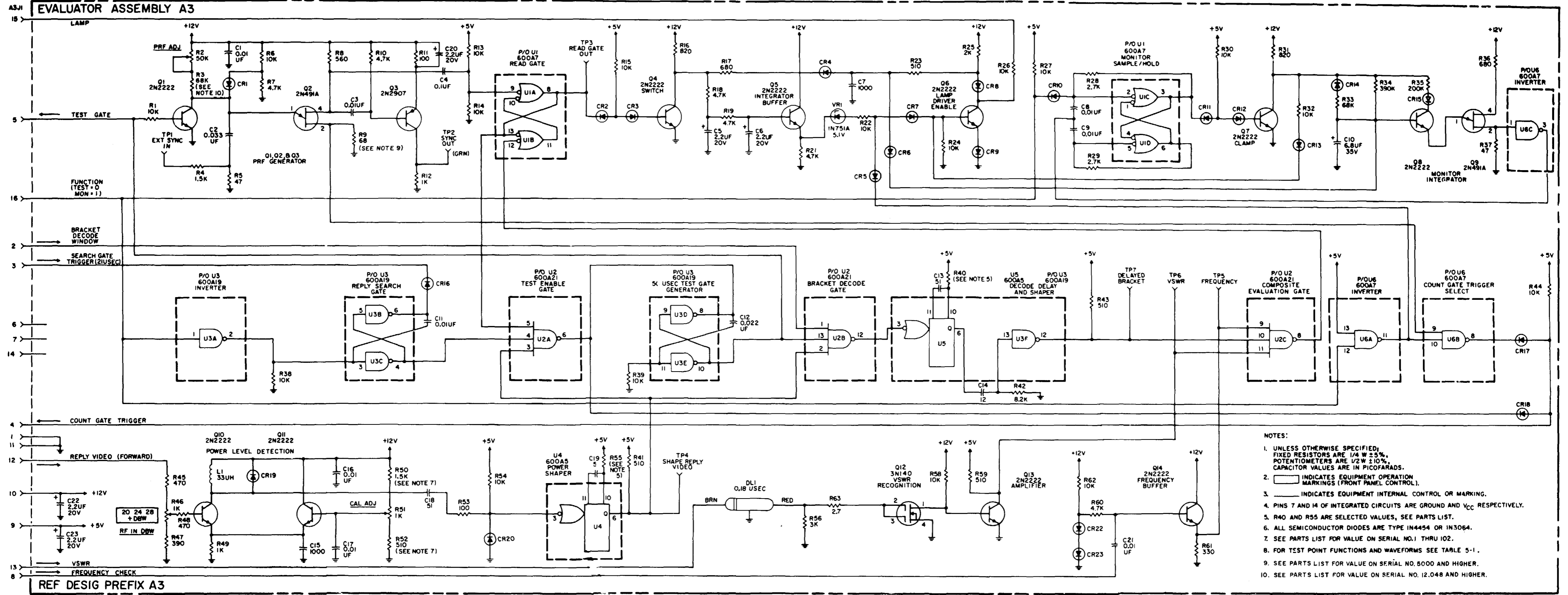


Figure 3-7. Evaluator Assembly A3, Schematic Diagram

In either the Test or Monitor mode of operation the A3Q4 switch output will be an amplified, inverted representation of the waveform at A3 TP3; that is, when the Read Gate is on, the collector of A3Q4 will be high. When multiple evaluations are occurring the waveform at this point will be a nonsymmetrical square wave, with the duration of the "high" portion nominally 2500  $\mu$ sec. The off portion will vary from nominally 45  $\mu$ sec, with continuous correct replies, to several multiples of 2500  $\mu$ sec. In the Test mode, capacitive integrator A3R18/A3C5/A3R19/A3C6 averages the read gate rate and when the average voltage at the emitter of buffer A3Q5 exceeds the breakdown voltage of A3VR1, the drive current is provided to the base of Lamp Driver Enable A3Q6 through A3R10 and A3CR7, causing the collector voltage to drop and the PNP lamp switch transistor A1Q5 to be enabled, thus supplying current to the remote TEST lamp.

In the monitor mode of operation, integration is accomplished on a counting rather than on an averaging basis. The selection of the Monitor function removes a virtual ground from the cathode of A3CR10, allowing the Monitor Sample/Hold binary multivibrator A3U1 to function. Simultaneously, the output of buffer A3Q5 is inhibited via A3CR5 by the low state of inverter A3U6A. The Monitor Sample/Hold binary multivibrator acts as a steering device; if pin 3 is high the collector of clamp A3Q7 will be low and there will be no input to the Lamp Driver Enable A3Q6. When A3Q7 is cut off the collector is high and A3Q6 drive is provided through A3R32 and A3CR13. The collector of A3Q6 will be high, and current will flow into A3C10 through A3R25 and A3R23 via A3CR6 if the collector of A3Q4 is high, as it will be during a Read Gate on period. A3CR6 prevents discharge of A3C10 during the off time of the Read Gate. The charging time constant is such that 5 to 10 Read Gate on periods are required to raise the potential of the A3Q9 emitter to the firing point. In order to avoid long term integration of spurious replies, noise, etc. a slow discharge path is provided via A3R33, A3CR14, and A3R34, through clamp A3Q7. When the potential of A3C10 is sufficiently positive, current passed through buffer A3Q8 by diode action (the collector is low at this point) will trigger the Unijunction Switch transistor A3Q9, discharging A3C10, and providing a trigger pulse through inverter A3U6C, to switch the Monitor Sample/Hold binary multivibrator. The collector of A3Q7 will now be high, and Lamp Driver Enable A3Q6 will be driven on through A3R31, A3R32 and A3CR13, enabling the lamp switch A1Q5 and the remote TEST lamp. Note that with the collector of A3Q6 low the step charging current to A3C10 is disabled. Charging current is now supplied to A3C10 through A3R31 and A3R34, a relatively high resistance; hence the charging interval is of extended duration (greater than 2 seconds). During this charging interval the TEST lamp enable circuitry remains ON. In order to minimize shunt loading and provide the required firing current the coupling transistor A3Q8 now acts as an emitter follower.

Again, when the potential of A3C10 becomes sufficiently positive A3Q9 will fire, resetting the Sample/ Hold binary multivibrator and allowing the cycle to repeat if acceptable transponder replies are being transmitted.

3-63. VOLTAGE REGULATOR A4. The TS-1843B/APX Test Set will operate from a power source having a voltage ranging from 21 to 29 volts. It will not be damaged by input voltages as low as 17 volts or as high as 30 volts. Voltage Regulator A4 (figure 3-4) is turned on automatically when any one of the four Mode-Enable toggle switches on the control unit is held in the spring-loaded TEST position or the RAD TEST/OUT/MON switch is placed in the MON position. A ground provided by any one of these will indirectly cause Regulator Control A1Q4 to actuate Regulator Assembly A4 which supplies regulated 5 volts and 12 volts to the test set circuits.

3-64. The +28 volt input power is fed into Regulator Assembly A4 through A4J1 pin 7. Current flows through the collector-emitter junction of the second transistor in the 12 volt Regulation Darlington pair A4U1 which acts as a dropping regulator for the 12-volt output going through resistor A4R10 and out through pin 2 of A4J1. Part of the 12-volt output is fed through the collector-emitter junction of the second transistor in the 5 volt Regulation Darlington pair A4U2 which drops and regulates it to a 5-volt level. The 5-volt output is fed out through pin 1 of A4J1.

3-65. The resistive voltage divider consisting of A4R8, A4R6, and A4R7 (shunted by reference diode A4VR5) between the +12 volt line and ground, provides a reference bias for the input base of the 5 Volt Regulation Darlington pair A4U2. The reference diode A4VR4, above the 5 volt reference, provides the reference bias for the +12 volt regulator pair A4U1.

The 12-volt regulator (and thus the entire supply) is turned on and off by means of On-Off Control A4Q1. The power turn-on sequence is as follows:

When not monitoring (or testing), ground is removed from pin 3 of 1J1 on the Power and Control Assembly A1, so the A1CR1 anode is ungrounded and the positive voltage applied through A1R3 and A1R10 causes A1CR1 to conduct through A1R2 to ground. The positive potential developed across A1R2 and applied to the base of Monitor Mode Control A1Q1 keeps it conducting. While conducting, the collector voltage of A1Q1 is low, under which condition NPN Regulator Control A1Q4 is non-conducting. The collector of A1Q4 obtains its positive operating voltage through A4J1 pin 6 through A4R2 and A4R1 in the Regulator Assembly A4, out again through A4J1 pin 8, and back through A1R10 to the +28 volt line. When A1Q4 is not conducting, the base of PNP transistor A4Q1 is kept positive by the voltage from A4R1 tied to the +28 volt line, and A4Q1 does not conduct. The

potential on the base of the input transistor of 12 volt Regulator A4U1 is relatively low, it does not conduct, and the regulator acts as an open switch.

3-66. When the RAD TEST/OUT/MON switch on the control unit is placed in the MON position, a ground is applied to the anode of A1CR1 (through 1J1 pin 3 and A1R1). Diode A1CR1 is back-biased so that it does not conduct, the base potential of A1Q1 goes relatively negative and A1Q1 stops conducting. As a result, the A1Q1 collector voltage goes high, causing Regulator Control A1Q4 to conduct. When A1Q4 is conducting, it acts as a ground connection for the base of PNP transistor A4Q1 which permits A4Q1 to conduct. A4Q1, in turn, acts as a path to the +28 volt line (through A4R3) for the input base of 12 volt Regulation Darlington pair A4U1. A4U1 now conducts, providing a path for the power supply current.

3-67. Similarly, when in the Test mode of operation, a ground is supplied to the <sup>TS-1843B/APX</sup> by momentarily placing one of the four Mode Enable toggle switches on the control unit in the TEST position. The ground is applied through one of the four coupling diodes (A1CR11 through A1CR14) to the anode of A1CR2 which normally is supplying a positive voltage through A1CR3 to the base of A1Q2 to keep it conducting. Grounding the anode of A1CR2 back-biases it so that the A1Q2 base goes relatively low, stopping conduction. The resulting rise in A1Q2 collector voltage is passed through A1CR5 to the base of Regulator Control A1Q4, causing it to conduct as described before.

3-68. Over-Current Protection transistor A4Q3 "senses" the voltage drop across A4R10 (through A4R9). Excessive current through A4R10 will cause a larger positive potential to develop which will cause NPN transistor A4Q3 to conduct, in effect shorting the base of the first NPN transistor in the 12 volt Regulation Darlington pair A4U1, and causing the regulator to go into lower conduction so that it does not overload.

3-69. Over-Voltage Protection transistor A4Q2 senses the input voltage (through Zener diode A4VR1). When the positive input voltage exceeds the backward breakdown threshold of A4VR1, it conducts, causing a positive potential to develop at the top of A4R4 which is applied through A4R5 to the base of Over-Voltage Protection transistor A4Q2. A4Q2 is an NPN transistor, so the positive potential causes it to conduct, in effect shorting the base of the input transistor in 12 Volt Regulation Darlington pair A4U1, causing the regulator to turn off. (Capacitor A4C2 shunting the input to A4U1 serves to slow down the shut-off action so that it cannot be actuated by transient voltage pulsations.) Backward breakdown (Zener) diodes A4VR3 and A4VR2, in series, present a path to ground for positive transient spikes in the input voltage which are above approximately 72 volts in amplitude. Also, the series diodes present a low impedance path to ground for negative transient pulsations.

3-70. RECEIVER/SIGNAL GENERATOR A5. The A5 assembly (figure 3-7) is enclosed in an aluminum case for rf shielding and physical protection. It contains circuits which perform two different functions: The signal generator section provides a 1030 MHz pulse-modulated rf signal which simulates those from an interrogator set transmitter. This signal is fed from the Multiplier/Mixer Cavity in the A5 assembly to the Directional Probe Assembly A7, where it is injected by the directional coupler into the transponder antenna line for test purposes. This 1030 MHz signal is also used in the <sup>TS-1843B/APX</sup> as the receiver local oscillator signal for heterodyning the transponder reply signals down to the 60 MHz i-f.

3-71. The 1090 MHz reply signal entering the receiver section through the directional coupler main conductor is picked off by the SIG GEN probe. It is fed into the multiplier/Mixer Cavity A5Z1 in the Receiver/Signal Generator Assembly A5, where it is mixed (heterodyned) with the crystal-controlled 1030 MHz signal from the signal generator section, generating sum and difference frequency products. The sum-frequency (2120 MHz) signal is rejected by the succeeding circuits, while the difference-frequency (60 MHz) signal is accepted as the i-f signal. The 60 MHz signal from mixer diode A5CR2 in the cavity assembly is fed through capacitive feedthrough A5C2 to the primary of toroidal, broadband coupling transformer A5A1 T3 in the receiver section. The secondary of A5A1 T3 feeds the signal to the base of Amplifier A5A1 Q4. The output of A5A1 Q4 is applied to the input of the emitter-coupled amplifier made up of A5A1 Q5 and A5A1 Q6. This type of circuit is very stable; it compensates for the effects of temperature changes and it permits ready control of gain by means of the FREQ DISC ADJ potentiometer A5A1 R23 in the common emitter leg. The output of A5A1 Q6 (across collector load resistor A5A1 R21) is fed into the narrow bandpass filter A5A1 FL1. This 60 MHz bandpass filter consists of seven parallel-resonant sections (high side capacitively coupled) providing an overall passband of 6.2 to 6.8 MHz at the 6 db-down points and less than 7.5 MHz at the 12 db-down points. This sharply skirted filter section, centered on the down-converted acceptable frequency range of the transponder, acts in conjunction with the Composite Evaluation Gate (paragraph 3-51) to provide frequency discrimination by amplitude detection. This characteristic may be narrowed or broadened slightly by means of the I. F. Gain Adjust A5A1 R23.

3-72. The output Detector/Amplifier A5A1 Q7 in Receiver/Signal Generator A5 is a non-loading, gain-producing circuit element which provides a relatively constant high impedance termination for the 60 MHz Filter A5A1 FL1. The final inductor in the 60 MHz filter has a secondary winding which couples it across the base and emitter of Detector/Amplifier A5A1 Q7. The base-to-emitter junction of A5A1 Q7 serves to demodulate the pulse-modulated 60 MHz signal. Video is produced by "bootstrapping" the emitter load, giving a useful output of 1 to 5 volts

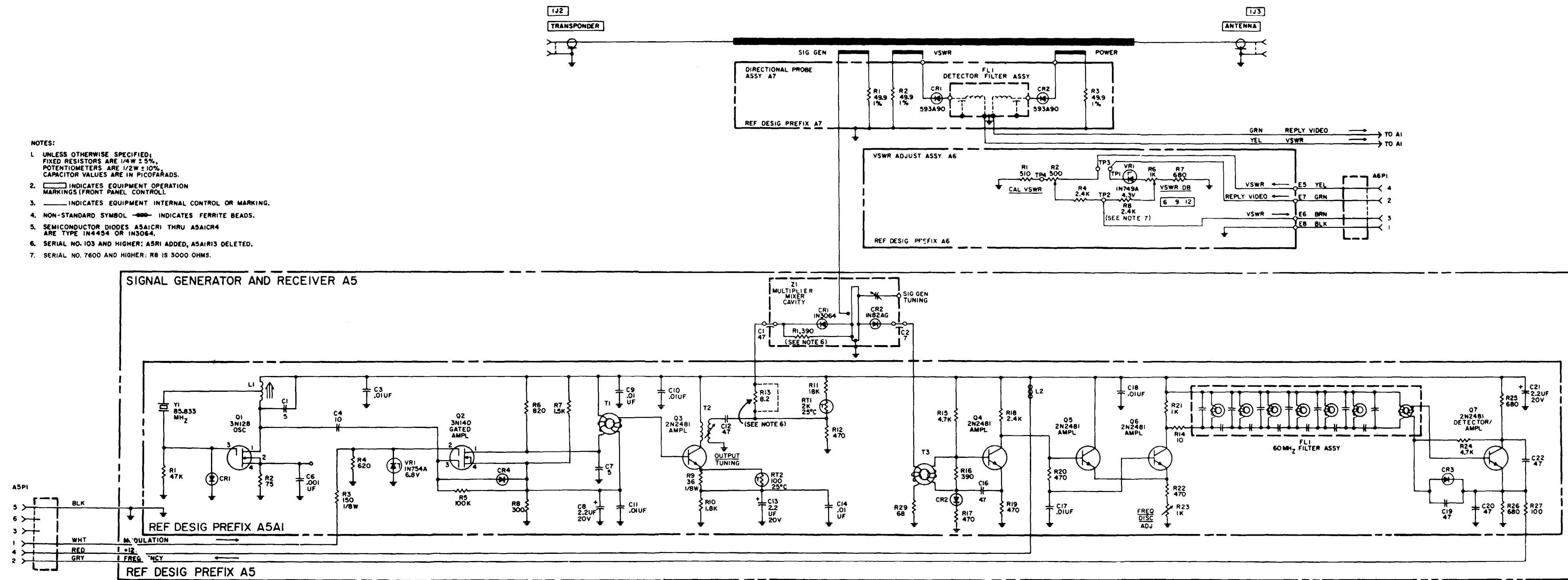


Figure 3-8. Receiver/Signal Generator A5, VSWR Adjust Assembly A6, and Directional Coupler Assembly A7, Schematic Diagram.



of demodulated signal. The output signal, which is delayed approximately  $0.2 \mu\text{sec}$  with respect to the 1090 MHz reply input, is used as one of the inputs for the Composite Evaluation Gate A3 U2C after passing through Frequency Buffer A3Q14.

3-73. The signal generator section of the A5 assembly consists of 85.833 MHz Oscillator A5A1Q1, Gated Amplifier A5A1Q2, Tuned Amplifier A5A1Q3, and Multiplier/Mixer Cavity A5 Z1. The crystal-controlled continuous-wave oscillator circuit has an accuracy of better than  $\pm 0.5 \text{ MHz}$ .

3-74. The FET oscillator A5A1Q1 is free-running; its cw output is gated on and off by the Gated Amplifier A5A1Q2. The Gated Amplifier is gated on and off by the pulses in the modulation signal from Timing Assembly A2. The frequency of oscillation is determined by 85.833 MHz crystal A5A1Y1, connected between the transistor gate and the tap on the source tuning coil A5A1L1. Power (+12 volts) for the oscillator transistor is supplied through A5A1L1 and is decoupled by capacitor A5A1C3. Resistor A5A1R1 and diode A5A1CR1 provide a ground return for the gate of A5A1Q1. The drain is returned to ground through A5A1R2, bypassed by A5A1C6. The oscillator signal is coupled through capacitor A5A1C4 to one gate (pin 3) of dual-gate Gated Amplifier A5A1Q2. A second input on the other gate (pin 2) will permit the transistor to be gated on. The second input is the modulation signal from the Timing Assembly A2, fed into the A5 assembly through A5P1 pin 1. The pulse-modulated output from A5A1Q2 is coupled through toroidal transformer A5A1T1 to the base of Amplifier A5A1Q3. The collector load of rf amplifier A5A1Q3 is provided by output transformer A5A1T2, resonated in the secondary (to 85.833 MHz) by the series combination of A5A1C13 and feed-through capacitor A5C1. Timing adjustment is provided by slug-tuning A5A1T2. The gain of the rf amplifier is thermally adjusted by A5A1RT2, which shunts a degenerative load in the A5A1Q3 emitter circuit. A5A1RT1 thermally adjusts the small back bias applied to A5CR1.

3-75. The 1030 MHz signal is fed into the Multiplier/Mixer Cavity Assembly A5Z1 through capacitive feed-through A5C1 and harmonic generator diode A5CR1. The cavity is tuned to the twelfth harmonic of 85.833 MHz (approximately 1030 MHz). This 1030 MHz signal is capacitively coupled to the SIG GEN probe in the Directional Probe Assembly A7 for injection into the transponder antenna line. This signal is also used as the local oscillator signal in the receiver section.

3-76. When making reply frequency checks, the 85.833 MHz oscillator signal is gated through the Gated Amplifier A5A1Q2 for  $2 \mu\text{sec}$  at maximum level during the anticipated period of second bracket pulse arrival (initiated by the  $1 \mu\text{sec}$  pulse from the Pulse Selection Matrix A2U6/U7/U8.)

3-77. **VSWR ADJUST ASSEMBLY A6.** The VSWR Adjust Assembly A6 contains five fixed resistors, a reverse breakdown diode, and two variable resistors. As shown in the schematic diagram, figure 3-8, the resistive network may be considered as two voltage dividers, each with an adjustable tap, and both connected to a common output line. The positive voltage proportional to the forward reply signal entering through A6P1 pin 2 causes current to flow to ground (A6P1 pin 1) through the voltage divider made up of A6VR1, VSWR potentiometer A6R6, and A6R7 (when it exceeds the 4.3 volt breakdown threshold of A6VR1). The negative voltage proportional to the reflected signal entering through A6P1 pin 4 causes current to flow to ground through the voltage divider made up of A6R3, CAL potentiometer A6R2, and A6R1. The movable arms of the two potentiometers are each connected through a 2.4K resistor (A6R4 and A6R8) to the common line on A6P1 pin 3. It is seen that for a given ratio of forward to reflected signal, the potentiometers may be set for equal and opposite voltages so that the tapped voltages cancel at the junction, giving a zero error signal, or they may be set to produce a desired output voltage for actuation of the circuits to follow. The VSWR potentiometer A6R6 is an external control used to set the acceptable level of VSWR. The control dial is marked in db increments from 6 to 12 db with the 6, 9, and 12 db points specifically identified. The CAL potentiometer is used to calibrate the control so that the 6, 9, and 12 db threshold settings will be accurate and will agree from one unit to the next. The "error" voltage produced in this circuit is fed out of the A6 assembly through A6P1 Pin 3 and into the Evaluation Assembly A3 through A3J1 pin 13.

3-78. **DIRECTIONAL COUPLER ASSEMBLY A7.** The Directional Coupler Assembly consists of parts contained in Directional Probe Assembly A7 and parts contained in the overall <sup>TS-1843B/APX</sup> housing. The main conductor for the directional coupler is a rod running the length of the unit in a special enclosed channel in the main casting, from the center conductor of the ANTENNA connector at one end to the TRANSPONDER connector at the other end (figure 3-8). RF gasketing is provided in the channel at each end to prevent rf leakage around the connectors. The Directional Probe Assembly A7 is on a rectangular plate which fits over the channel containing the rod, positioning the three coupler probes in proximity to the rod. The Directional Probe Assembly A7 contains (in addition to the three rf probes) the Detector Filter Assembly A7FL1, two detector diodes A7CR1 and A7CR2, and three terminating resistors A7R1, A7R2, and A7R3. The POWER probe is positioned so as to take a sample of the rf energy passing down the line from the transponder to the antenna, while the VSWR probe is positioned in the opposite manner so as to take a sample of the reflected energy coming back down the line from the antenna to the transponder.



(The POWER probe is approximately 20 db down and has more than 20 db directivity, while the VSWR probe is approximately 20 db down with more than 33 db directivity. ) Both probes are terminated in a resistor (A7R2 and A7R3) at the end and coupled through a detector diode (A7CR1 and A7CR2) to A7FL1 at the other end. The rf signal, rectified by the diodes, is smoothed by the filter and passed out to the VSWR Adjust Assembly A6 and the Evaluation Assembly A3. The three terminating resistors are enclosed in shields soldered into the A7 plate so that they appear as an integral part of the assembly. The SIG GEN probe is positioned so as to take a sample of the transponder reply signals. (The SIG GEN probe

is approximately 26 db down with more than 20 db directivity. ) It couples the transponder transmitter signal into the test receiver circuit in the Signal Generator/Receiver Assembly A5, and when testing the transponder receiver, it couples in the rf test signal from the signal generator.

3 - 7 9 . When the TS-1843B/APX test set is operating or not operating, the main rod of the Directional Coupler Assembly provides a direct link between the transponder and its antenna. The insertion loss of the assembly is less than 0.5 db and it will increase the VSWR by no more than 1.1 to 1.

SECTION IV

DESCRIPTION OF SYSTEM TIE-IN

4-1. GENERAL.

4-2. This section describes the integration of the Test Set, Transponder Set TS-1843B/APX into an operational IFF/SIF transponder system. The TS-1843B/APX is intended primarily for use with Transponder Sets AN/APX-64(V) and AN/APX-72 or equivalent transponder sets. Installation of the TS-1843B/APX into the system will cause no more than 0.5 db insertion loss and no more than a 1.1:1 increase in VSWR.

4-3. EQUIPMENT TIE-IN.

4-4. The TS-1843B/APX is installed between the antenna connection of a transponder and the associated IFF/SIF antenna as shown in figure 4-1. Its operation

is controlled by Transponder Set Control C-6280( ) /APX (or equivalent). The control determines the operational mode of the TS-1843B/APX (Monitor or Test) and also permits selection of the IFF mode to be employed for test interrogations. The performance of the transponder system is evaluated by the TS-1843B/APX on a GO/NO-GO basis. The GO condition is indicated when the TEST lamp on the Transponder Set Control unit is lit. If one or more of the evaluated parameters of the transmitted reply signals (peak power, signal frequency, or bracket spacing) or the antenna line VSWR are not within the predetermined limits, a NO-GO condition is assumed on the basis of the TEST lamp not being lit. The individual signal and control lines to and from the TS-1843B/APX are identified in figure

4-2.

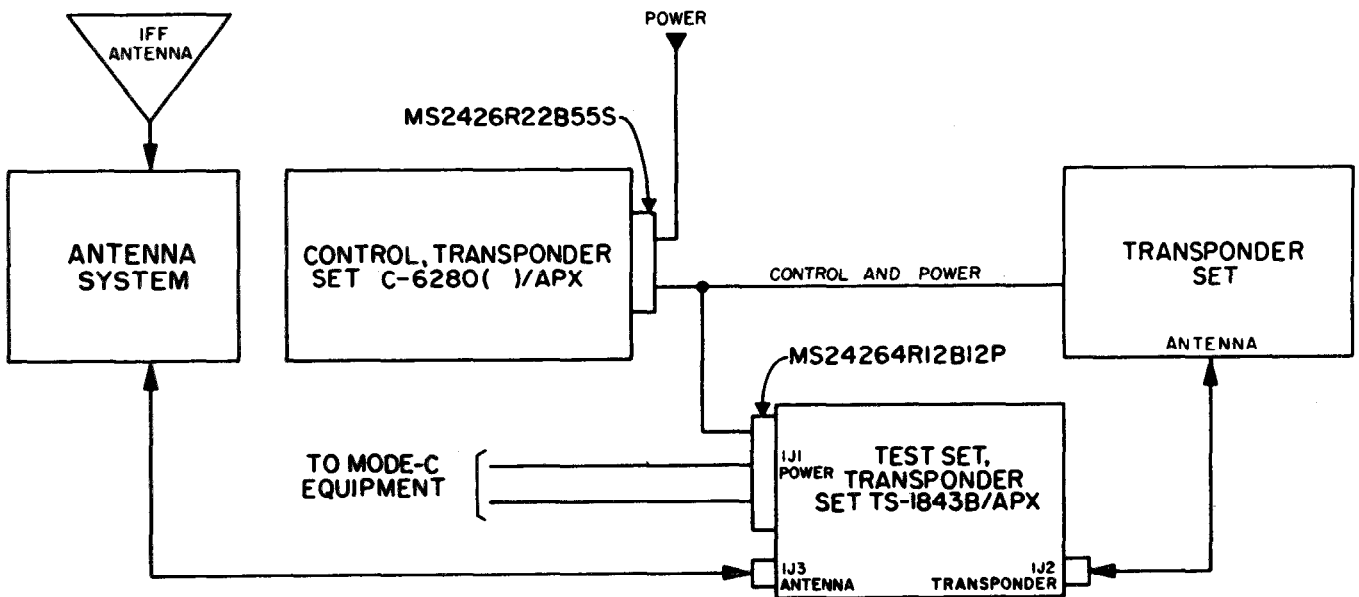


Figure 4-1. System Installation Diagram

**CAUTION**

MAKE SURE THE ANTENNA CABLE IS CONNECTED TO THE ANTENNA CONNECTOR (1J3) AND THE TRANSPONDER CABLE IS CONNECTED TO THE TRANSPONDER CONNECTOR (1J2). REVERSING THESE CONNECTORS MAY RESULT IN DAMAGE TO THE TS-1843B/APX.

**NOTE:**

IN ORDER TO PERFORM MODE C TESTS WHEN THE ALTITUDE DATA EQUIPMENT IS NOT CONNECTED, A JUMPER MUST BE CONNECTED BETWEEN PINS 9 AND 10 OF 1J1.

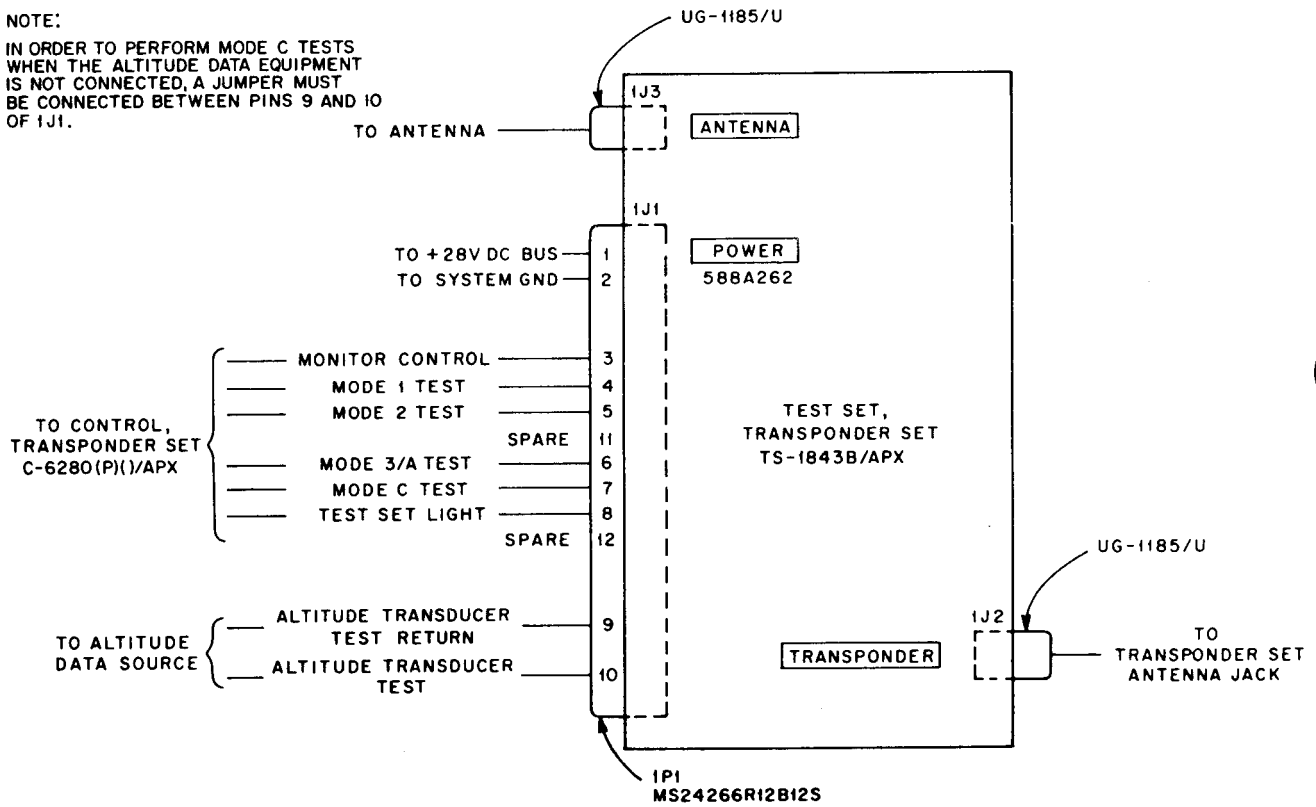


Figure 4-2. TS-1843B/APX Interconnection Diagram

SECTION V

INTERMEDIATE MAINTENANCE

5-1. GENERAL.

5-2. This section contains instructions for intermediate (field) level maintenance of the TS-1843B/APX. At this level of maintenance the technician will be required to perform adjustments of external preset controls, simple adjustments of the internal circuitry, troubleshooting for locating faulty plug-in modules, and repair of parts or components which will not require recalibration of the unit. If the replacement or repair of a module requires recalibration, the TS-1843B/APX should be forwarded to the depot specializing in this work. No repair of the rf section should be attempted at this level.

The basic bench test setup for checkout and troubleshooting is shown in figure 5-1. The locations of the assemblies, test points, and adjustments are shown in figures 5-2 and 5-3. In table 5-1 are listed the test points applicable to this level of maintenance, along with a short functional description.

5-3. OPERATIONAL CHECKOUT.

5-4. CHECKOUT PROCEDURE. The following procedure can be used for an operational bench check of the TS-1843B/APX. If incorrect indications are obtained during the checkout, reset the external R-F OUT control to maximum level, the VSWR control to maximum level, and the R-F IN control to minimum level, and repeat the procedure because the faulty indications may have been caused by the preset limits having been too stringent. When the settings of these external controls have been changed during the checkout, it will be necessary to reset them to the desired limits before returning to service (see paragraph 5-11). If correct indications cannot be obtained with the relaxed limits, this is an indication that there is actually a malfunction rather than only a misadjustment. Proceed to isolate the fault to a specific module or section by applying a logical troubleshooting procedure such as that given in figure 5-4 and making use of the schematic diagrams, parts location illustrations, and other aids provided in the Theory of Operation section.

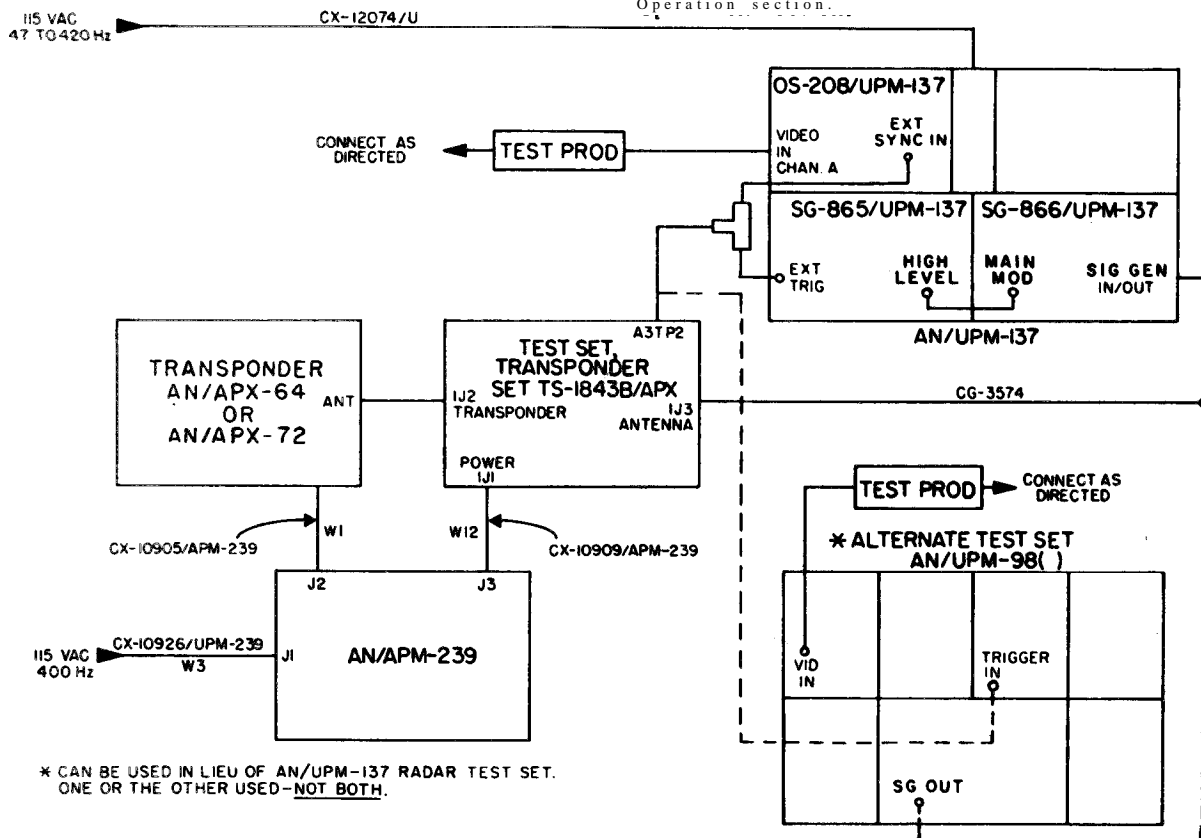


Figure 5-1. Intermediate Level (Bench) Test Setup

**NOTE**

For detailed operational procedures for AN/UPM-137, AN/UPM-98( ), AN/APM-239, and AN/APM-362, refer to the applicable technical manuals for these equipments.

Step 1. Connect the equipment on the test bench as shown in figure 5-1.

- Step 2. Set the controls on C-6280 (on AN/APM-239) as listed in table 5-2.
- Step 3. Set C-6280 MASTER switch to NORM.
- Step 4. Hold C-6280 M-1 Mode Enable switch in TEST position. The TEST lamp should go on.
- Step 5. While holding the M-1 Mode Enable switch in the TEST position, disconnect the cable from the ANTENNA connector on the T.S. 1843B/APX. The TEST lamp should go out.

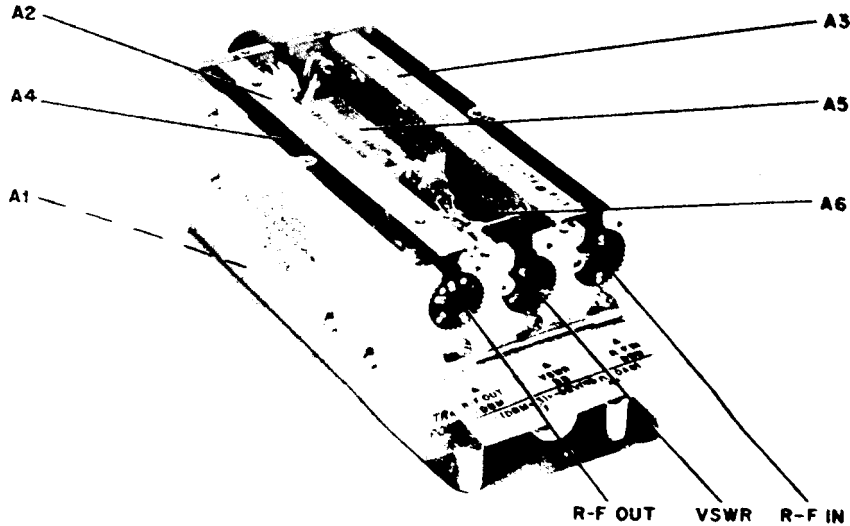


Figure 5-2. Assembly and External Adjustment Locations

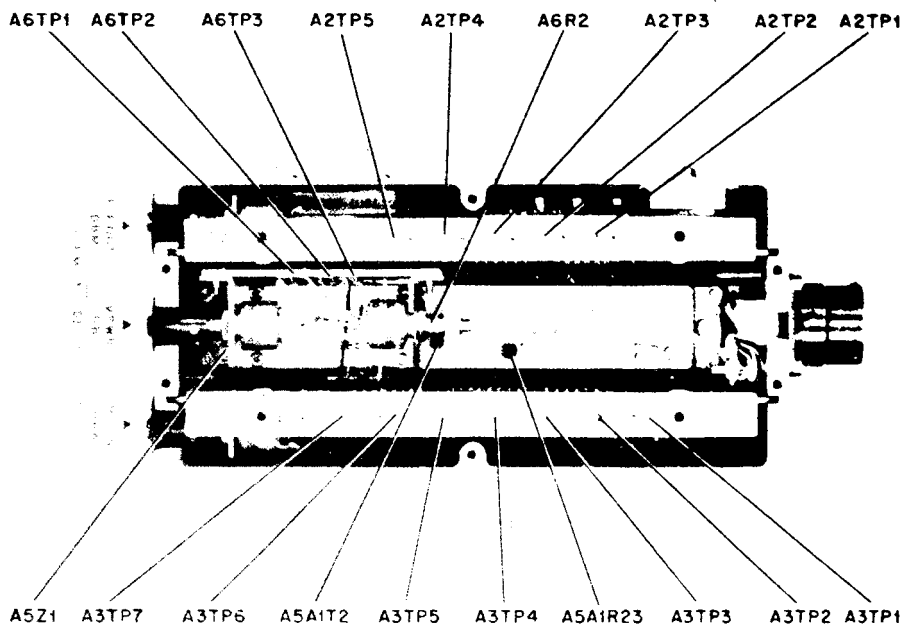


Figure 5-3. Test Point and Internal Adjustment Locations

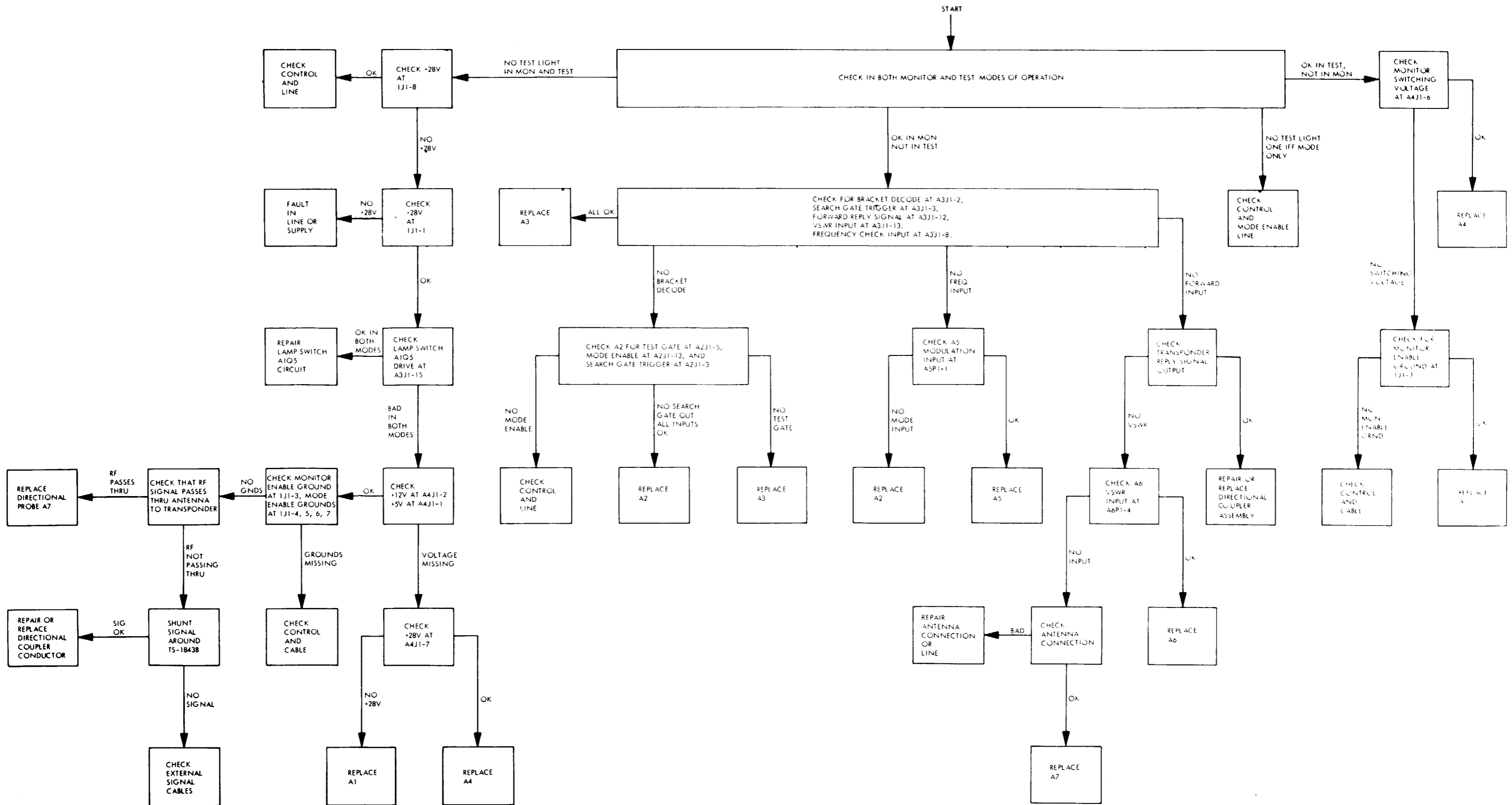


Figure 5-4. Troubleshooting Chart

Table 5-1. List of Test Points

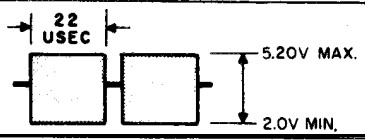
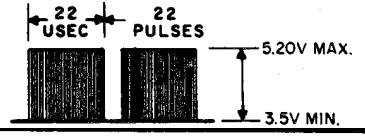

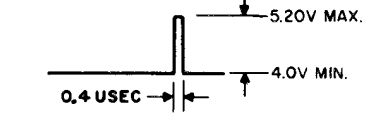
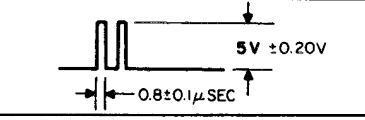
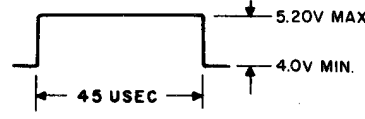
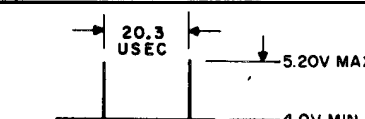
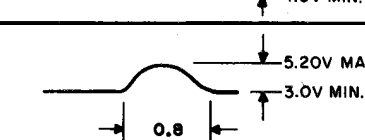
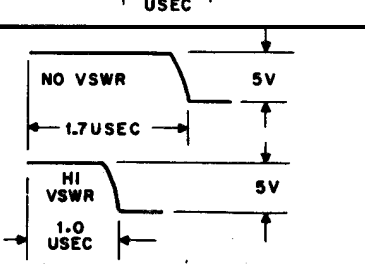
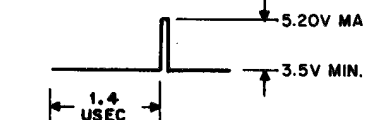
Reference Designation	Function	Normal Reading	Waveshape
A2TP1	20 MHz Gated Oscillator A2Q2 Output	Gated 20 MHz +100 KHz	
A2TP2	Divide-by-5 counter A2U3 Output (Clock Signal)	Gated 1 MHz	
A2TP3	Modulation Duration Generator A2U9 Output	0.8 +0.1 μsec pulses	
A2TP4	Window Duration A2U11 Bracket Decode Output		
A2TP5	Modulator A2Q3/Q4 RF Output	Pairs of 0.8 +0.1 μsec pulses	
A3TP1	E X T S Y N C I N	(input)	
A3TP2	SYNC OUT Output of PRF Generator A3Q1/Q2/Q3	400 ± 50 pps pulses	
A3TP3	READ GATE Output of A3U1		
A3TP4	SHAPED REPLY VIDEO Output of A3U4		
A3TP5	FREQUENCY Output of A3Q14		
A3TP6	VSWR Output of Recognition Amplifier A3Q12/Q13		
A3TP7	DELAYED BRACKET Output of Positioning Timer A3U3		
A4TP1	+12 v	+12 v ±0.5 v	

Table 5-1. List of Test Points (Cont.)

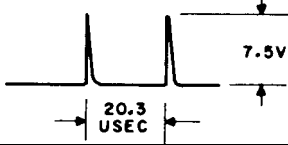
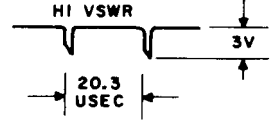
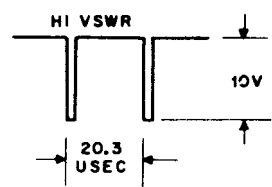
Reference Designation	Function	Normal Reading	Waveshape
A4TP2	+5 v	+5 v $\pm$ 0.25 v	
A6TP1	Reply Input for VSWR		
A6TP2	VSWR Output Voltage		
A6TP3	Reflected Input for VSWR		

Table 5-2. AN/APM-239A Control Settings (C-6280)

CONTROL	POSITION	CONTROL	POSITION
MASTER	NORM	MODE 1 Code Select	Any Code Number
M-1	ON	MODE 3/A Code Select	Any Code Number
M-2	ON	IDENT/OUT/MIC	OUT
M-3/A	ON	MODE 4	OUT
M-C	ON	AUDIO/OUT/LIGHT	OUT
RAD TEST/OUT/MON	OUT		

- Step 6. Release the M-1 Mode Enable switch and reconnect ANTENNA cable.
- Step 7. Successively hold the M-2, M-3/A, and M-C Mode Enable switches in the TEST position. When each switch is held in the TEST position, the TEST lamp should go on, then go off when the switch is released.
- Step 8. Place the control unit C-6280 RAD TEST/OUT/MON switch in the MON position.
- Step 9. Set up radar test set to provide mode 1 interrogation pulses at 1030 MHz. Adjust output attenuator to provide an rf signal level of approximately -65 dbm for AN/UPM-137 (-78 dbv for AN/UPM-98) at transponder antenna connector. TEST lamp should light.
- Step 10. Decrease the radar test set signal generator output until the rf signal level at the transponder antenna connector is below the

receiver sensitivity limit. The TEST lamp should go out.

5-5. TROUBLESHOOTING.

5-6. The troubleshooting chart given in figure 5-4 is designed to illustrate a systematic method of locating a faulty module or part within the TS-1843B/APX. Each block on the chart contains an instruction which, when followed, will result in one of the conditions indicated by a line. By following the line indicating the observed condition, the technician will be led to the faulty module which should then be replaced, or in some cases repaired. After the faulty assembly has been repaired or replaced and all checks have been satisfactorily completed, the technician should repeat the adjustment procedures before it is returned to use.

5-7. Before starting the troubleshooting procedures, remove the top and bottom plates from the TS-1843B/APX for access to test points and connections. When



checking the plug-in assemblies A2, A3 and A4, they may be extended out from the test set on extender cards for access to components and connections on both sides of the boards. Connect the equipment as shown in figure 5-1. Start reading the chart at the block at the top center at the line labeled "start". Follow instructions in the box and observe the resultant indications. Follow the line labeled with the observed indication to locate the next instruction box.

5-8. REMOVAL AND REPLACEMENT OF ASSEMBLIES.

5-9. To remove the plug-in assemblies from the TS-1843B/APX refer to figure 5-2 and proceed as follows:

a. Remove the ten Phillips head screws on the top cover and remove the cover.

b. Using a screwdriver or a similar tool, carefully lift the board assemblies A2 and A3 to disengage them from the connector pins on A1. The assemblies now can be removed by pulling them out of the unit by hand.

c. To remove the Regulator Assembly A4, loosen the four Phillips head screws on the side of the unit, carefully disengage the assembly from the A1 connector pins, and lift out.

d. To gain access to the rf section of the TS-1843B/APX (assemblies A5, A6, and A7), loosen the six Phillips head screws (two each at both ends and the center) on the Receiver/Signal Generator Assembly A5 and lift up the assembly slightly, then carefully disengage plugs A5P1 and A6P1 from the bottom board A1. The A5 and A6 assemblies can now be taken out.

e. If it is necessary to separate the VSWR Adjust Assembly A6 from the Receiver/Signal Generator A5, unscrew the two remaining Phillips head screws at the end of the assembly close to the VSWR dial.

f. If it is necessary to remove the Directional Probe Assembly A7 from the casting, unscrew the two recessed Phillips head screws at the center of the plate. The assembly A7 is connected to the main board A1 by two soldered wires. Do not break or unsolder these connections unless complete removal of the A7 assembly is required. To unsolder the connections, the bottom plate must be removed for access to the bottom of A1.

g. To remove the main conductor rod from Directional Coupler Assembly, remove four mounting screws from the TRANSPONDER connector and gently pull connector outward so that it slips off the center conductor which is an extension of the rod. Gently pull rod out of connector at the other end of the channel and remove from channel. Take care not to disturb the rf gasket material at each end of the channel. To reassemble, carefully insert the rod into place in the channel so that the center conductor

of the ANTENNA connector at the opposite end slides into place. Carefully replace TRANSPONDER connector over end of rod so that center conductor fits into place. Fasten TRANSPONDER connector with four mounting screws.

h. To remove main board assembly A1, first remove assemblies A2 and A3 and unplug connectors A5P1 and A6P1 on A1, then remove bottom plate by removing eight screws. Next unsolder two wires from A7 at bottom of A1 board, noting the position of these connections. Remove six large and four small mounting screws from bottom of A1, taking care not to lose flat washers and lockwashers, and noting positions of screws. The A1 board may now be swung out on the remaining connecting wires. If necessary to remove the board entirely, unsolder the seven wires connected to A1, noting the position of each wire connection.

i. To reinstall the assemblies and reassemble the unit, reverse the above disassembly sequence.

5-10. PRESETTING TS-1843B/APX EXTERNAL CONTROLS.

5-11. GENERAL. Test Set, Transponder Set TS-1843B/APX has three calibrated adjustment controls mounted on one end of the unit and protected by a hinged cover. These controls are designated R-F OUT, VSWR, and R-F IN. When installing the TS-1843B/APX into a system, they should be preset for the specific values consistent with the operational parameters of the system components as described in the following paragraphs.

5-12. R-F IN (A3R46). This control is set for the minimum peak power level of the rf reply signal emitted by the transponder that will cause the TS-1843B/APX to give a GO indication on the associated Transponder Set Control TEST lamp. The markings in dbw on the R-F IN dial are calibrated between 20 and 28 dbw with an accuracy of  $\pm 2$  db.

To preset the R-F IN control for a specific value, loosen the Phillips head locking screw below the dial and set the dial so that the desired number is facing the marker at the right-hand side of the dial, then carefully tighten the locking screw.

5-13. R-F OUT (A2R21). This control determines the peak level of the rf interrogation signal generated by the TS-1843B/APX in the Test mode of operation. The control dial is calibrated to provide an rf output at the TRANSPONDER connector of the TS-1843B/APX within  $\pm 2$  db of the preset level between -54 and -81 dbm (-67 to -94 dbv). To preset the R-F OUT control for a specified value, loosen the locking screw below the dial, set the dial for the desired signal level, and tighten the locking screw.

5-14. VSWR (A6R6). This control determines the level of antenna system VSWR above which a NO-GO indication will result. The control dial is calibrated from 6 to 12 db in 3-db divisions. The TS-1843B/APX will provide a NO-GO indication when the antenna

system (including the transmission lines) reaches a VSWR level within  $\pm 1.5$  db of the preset value. To preset the VSWR control, loosen the locking screw below the dial, set the dial for the desired value and tighten the locking screw.

**NOTE**

For the purpose of checking the TS-1843B/APX reaction to antenna system VSWR, a simple method of simulating impedance mis-

match conditions may be used. This method, which is sufficiently accurate for this purpose, consists of connecting open-ended lengths of rf cable to the ANTENNA connector on the TS-1843B/APX. The resulting VSWR, expressed in db, is shown in figure 5-5. For example, an 11.5-foot length of RG-58 cable, connected to 1J3 and open at the other end, will be seen to give a VSWR of approximately 10 db.

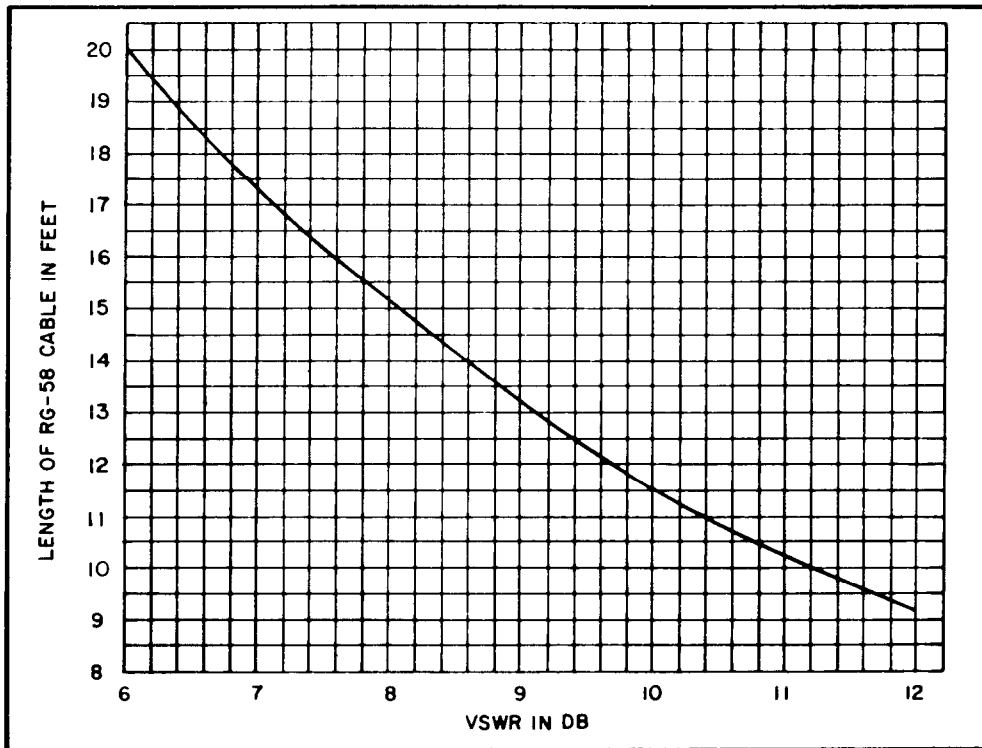


Figure 5-5. RG-58 Cable Length vs VSWR

SECTION VI

DEPOT MAINTENANCE

6-1. **GENERAL.**

6-2. This section contains instructions for depot level maintenance of the TS-1843B/APX. At this level all maintenance work on the unit not assigned to lower maintenance levels will be performed. This

includes calibration and internal alignment of the unit, as well as the repair and testing of assemblies found to be defective or sent in from lower maintenance levels. The adjustment and alignment controls are listed in Table 6-1.

Table 6-1. Adjustment and Alignment Controls

<u>Reference Designation</u>	<u>Function</u>	<u>Adjustment Procedure Paragraph</u>
A2R20	Upper range calibration adjustment for R-F OUT preset control A2R21	6-24
A2R22	Lower range calibration adjustment for R-F OUT preset control A2R21	6-24
A2R28	Window Delay Adjustment	6-14
A2R34	Pulse Duration Adjustment	6-14
A2R36	Window Duration Adjustment	6-14
A3R2	Internal PRF generator rate adjustment	6-25
A3R51	Calibration adjustment for R-F IN preset control A3R46	6-23
A5Z1	Signal generator 1030 MHz cavity tuning.	6-27
A5AIR23	Frequency discriminator adjustment (60 MHz filter input level)	6-27
A5AIT2	Signal Generator Amplifier A5Q3 tuning	6-27
A6R2	Calibration adjustment of VSWR preset control A6R6	6-26

6-3. **DISASSEMBLY AND REASSEMBLY.**

6-4. For TS-1843B/APX disassembly, assembly removal, and reassembly procedures see paragraph 5-8 of this manual.

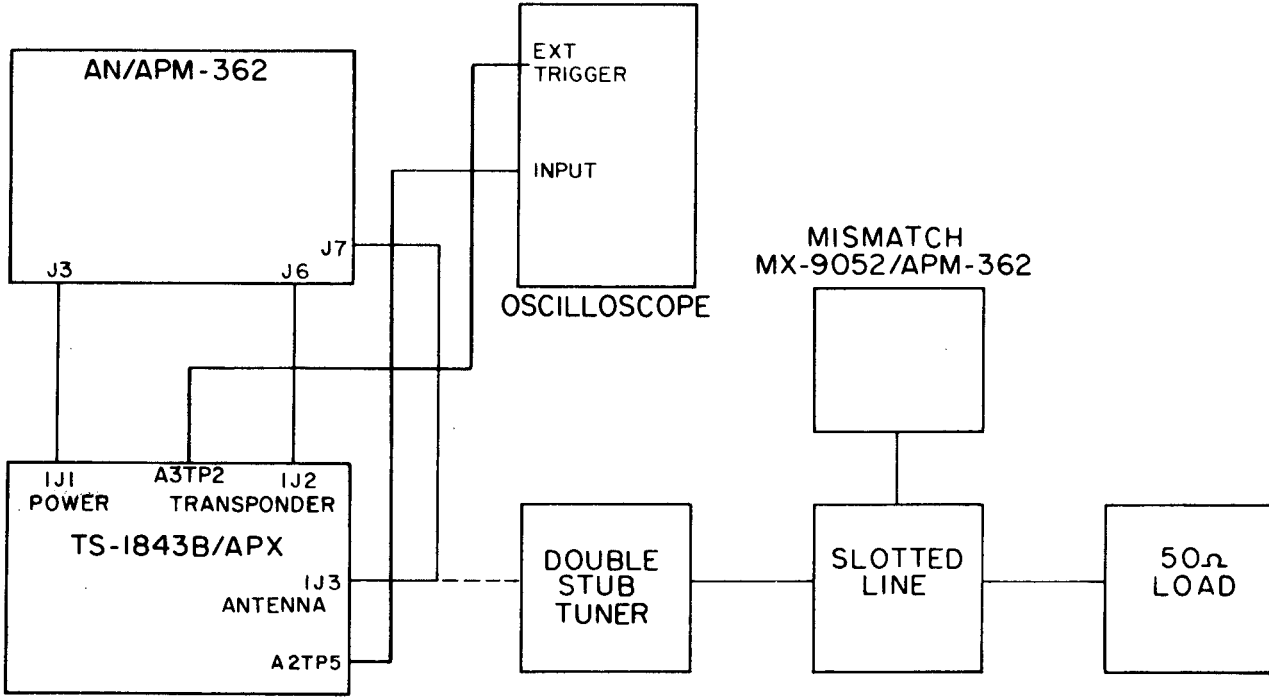
6-5. **CHECKOUT PROCEDURES.**

6-6. **GENERAL.** For an overall operational checkout, the procedure given in paragraph 5-4 using a transponder and Radar Test Set AN/UPM-137 (or AN/UPM-98 ( )) may be used. An AN/APM-362 may be used to eliminate the need for a transponder.

NOTE

For detailed operational procedures for AN/UPM-137, AN/UPM-98 ( ), AN/APM-239, and AN/APM-362, refer to the applicable technical manuals for these equipments.

6-7. **OVERALL CHECKOUT USING AN/APM-362.** To perform an overall functional checkout of the TS-1843B/APX using Test Set, Transponder Test Set AN/APM-362 as a transponder simulator, connect equipment as shown in figure 6-1 and use procedure given in table 6-2.



NOTE:  
 WHEN MAKING VSWR  
 TESTS CONNECT DOUBLE  
 STUB TUNER DIRECTLY  
 TO IJ3

Figure 6-1. Equipment Setup for Checkout of TS-1843B/APX Using Transponder Test Set AN/APM-362.

Table 6-2. Overall Checkout Using AN/APM-362

STEP NO.	PROCEDURE	INDICATION	CIRCUIT FUNCTION TESTED
1	Set up equipment as in figure 6-1.		
2	Place AN/APM-362 switches in the following positions:		
	REPLY FREQUENCY SELECT MHZ           1090		
	BRACKET SPACING SELECT MICRO- SECONDS           20.30		
	PRF SELECT           400		
	INTERROGATION LEVEL DBM           -65		
	BEAT FREQUENCY SELECT           OFF		
	OPERATE/STANDBY POWER           ON	REPLY FREQUENCY READY light comes on	
	115 VAC ON/OFF   ON (Wait 90 sec delay)		
	OPERATE/STANDBY TS-1843/APX LINE VOLTAGE SELECT   28		
	MODE C CIRCUIT TEST MODE SELECT       OFF		
	POWER LEVEL ADJUST +23 TO +26 DBV (To be 3 db above TS-1843B/APX R-F IN setting)		

Table 6-2. Overall Checkout Using AN/APM-362 (Cont.)

STEP NO.	PROCEDURE	INDICATION	CIRCUIT FUNCTION TESTED
3	Set the TS - 1843 B/APX controls as follows:  R-F IN                      20 dbw# VSWR                        -9 db# R-F OUT                     65 dbm#  = Or to alternate operational levels.	After a delay of approximately 60 seconds from power turn on: GO and OPERATE indicators light. Test Set CURRENT meter indicates approx. 320ma. STANDBY indicator goes out.	
4	Move REPLY FREQUENCY SELECT MHz switch through all positions  Return REPLY FREQUENCY SELECT MHz switch to 1090 position	NO indicator lights in all switch positions.	Reply frequency evaluator
5	Move BRACKET SPACING SELECT MICROSECONDS switch through -0.30, -0.15, 20.30, +0.15, and +0.30 positions.  Return BRACKET SPACING SELECT MICROSECONDS switch to 20.30 position.	NO indicator lights for all switch positions.	Bracket spacing evaluator
6	Move PRF SELECT switch to 100/5 position.  Move PRF SELECT switch to 100/10 position.	NO indication given.  NO indicator light cycles on and off once every four seconds and should be lighted approximately two seconds of every cycle.	Reply rate evaluator  Reply rate evaluator (monitor mode)
7	Place switches in the following positions:  MODE                        1 PRF SELECT                50%  Move PRF SELECT switch to 80% position.  Repeat 50% and 80% for modes 2 and 3/A. Turn on MODE C CIRCUIT TEST switch and repeat for mode C. Turn off MODE C CIRCUIT TEST switch. Return MODE SELECT switch to mode 1 and PRF SELECT to 50%.	NO indicator lights.  NO indicator lights.	Reply percentage evaluator
8	Note TS-1843B/APX R-F IN control setting  Adjust OUTPUT POWER LEVEL ADJUST control to the GO/NO-GO threshold.	Outpeak Peak Power Level Meter indicates TS-1843B/APX R-F IN setting $\pm 2$ dbw	Reply Power evaluator
9	Synchronize the oscilloscope with the Sync Out signal from A3TP2 on the TS-1843B/APX.		Display adjust
	NOTE  Two interrogation pulses will be observed in steps 9 through 15.		

Table 6-2. Overall Checkout Using AN/APM-362 (Cont.)

STEP NO.	PROCEDURE	INDICATION	CIRCUIT FUNCTION TESTED
10	Place BEAT FREQUENCY SELECT switch in BEAT position and OPERATE/STANDBY switch to STANDBY. Adjust BEAT FREQUENCY TUNE control to obtain zero beat indication on the oscilloscope display.	At zero beat the BEAT FREQUENCY TUNE control setting should be between -0.5 and +0.5 MHz.	Interrogation Frequency
11	Note the R-F OUT control setting on the TS-1843B/APX. Place BEAT FREQUENCY SELECT switch in PULSE position. Adjust the INTERROGATION LEVEL control so that the pulse generated by the simulator is the same amplitude as the interrogation pulses from the TS-1843B/APX.	LEVEL setting should be the same as the R-F OUT setting $\pm 2$ dbm.	Interrogation Level
12	Repeat step 11 for an R-F OUT control setting of -65 dbm on the TS-1843/APX.	LEVEL setting should be $-65 \pm 2$ dbm.	
13	Place BEAT FREQUENCY SELECT control in the OFF position and OPERATE/STANDBY switch to OPERATE. Adjust oscilloscope controls for a convenient display of the interrogation pulses.	Pulses are spaced $3.0 \pm 0.1$ 11 sec apart; pulse width at 50% amplitude is $0.8 \pm 0.1$ u sec. Rise time should be 0.1 u sec maximum. Decay time should be 0.2 u sec maximum.	Mode 1 pulse spacing and characteristics
14	Set MODE SELECT switch to position 2.	Pulses are spaced $5.0 \pm 0.1$ u sec apart.	Mode 2 pulse spacing
15	Set MODE SELECT switch to position 31A.	Pulses are spaced $8.0 \pm 0.1$ u sec apart.	Mode 3 pulse spacing
16	Set MODE SELECT switch to position C and hold MODE C CIRCUIT TEST switch in the ON position.	Pulses are spaced $21.0 \pm 0.1$ u sec apart.	Mode C pulse spacing
17	Set MODE SELECT switch to position 1. Connect the AN/UPM-137 PRF COUNTER input to Sync Out test point A3TP2 on the TS-1843B/APX.  NOTE  The prf may also be measured with the oscilloscope.	Meter indicates $400 \pm 50$ pps.	Internal PRF
18	Place PRF SELECT to 400 and MODE SELECT to MONITOR. Connect the VSWR measuring equipment to the ANTENNA connector 1J3 on the TS-1843B/APX as shown in figure 6-1. Note the VSWR control setting on the TS-1843B/APX. Adjust Mismatch MX-9052/APM-362 for a VSWR corresponding to the GO/NO-GO threshold of the reply status indicator lamps.	At the threshold the VSWR should be TS-1843B/APX VSWR setting $\pm 2$ db.	VSWR evaluator

6-8. **OVERALL CHECKOUT USING TRANSPONDER.**  
 To perform an overall functional checkout of the  
 TS-1843B/APX using a transponder in the test set-  
 up, see paragraph 5-4.

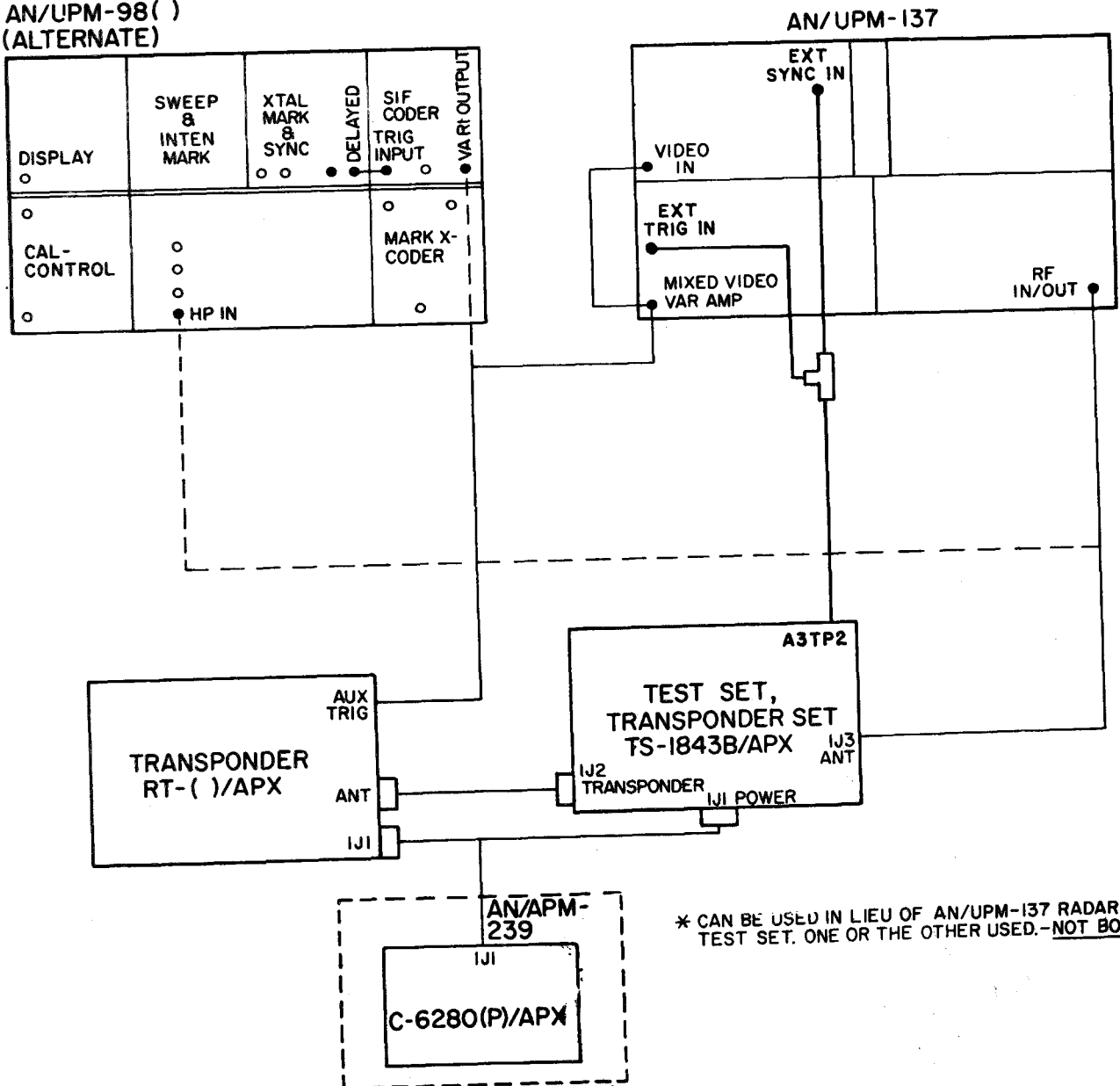
6-9. **BRACKET DISCRIMINATION CHECK.** Check  
 the bracket pulse spacing discrimination as follows:

Step 1. Connect the equipment as shown in figure  
 6-2.

Step 2. On the C-6280( ) set the MASTER switch to  
 the NORM position, the RAD TEST/OUT/MON  
 switch to the MON position, and all other toggle  
 switches to the OUT position.

Step 3. On the AN/UPM-137 radar test set, place the  
 MIXED VID SEL switch in the SIF 1 position  
 (VARI OUTPUT on AN/UPM-98 ( )  
 SIF Coder).

\*RADAR TEST SET  
 AN/UPM-98( )  
 (ALTERNATE)



\* CAN BE USED IN LIEU OF AN/UPM-137 RADAR  
 TEST SET. ONE OR THE OTHER USED. -NOT BOTH.

Figure 6-2. Bracket Discrimination Test Setup.

- Step 4.** On the AN/UPM-137 radar test set place the SUBST PULSE SEL switch in the F2 position (SP position on the AN/UPM-98), and set PRF controls for a prf of 350 to 450 pps.
- Step 5.** Using the radar test set oscilloscope and the 1.45  $\mu$  sec crystal markers, vary the SUBST PULSE POSN control so that the SIF reply bracket pulses are spaced as described below. Check for the proper TEST light indication at each spacing.

Bracket Spacing	Test Light Indication
20.15 u sec	GO
20.00 u sec	NO-GO
20.45 u sec	GO
20.60 u sec	NO-GO

6-10. **TEST SET INTERROGATION FREQUENCY CHECK.** To check the frequency of the TS-1843B/APX simulated interrogation signal using an AN/UPM-98( ) or other Radar Test Set, proceed as follows:

- Step 1.** Spot - calibrate the AN/UPM-98( ) wave-meter at 1030 MHz to an accuracy of  $\pm 0.1$  MHz.
- Step 2.** Connect equipment as shown in figure 6-3.
- Step 3.** Set controls on control unit as in table 5-2.
- Step 4.** Turn on Radar Test Set and oscilloscope.
- Step 5.** Adjust Radar Test Set for a mode 1 interrogation at 1030 MHz (checked with wavemeter) at an rf output level approximately equal to the level of the interrogation signal from the TS-1843B/APX.
- Step 6.** Place M-1 Mode Enable switch on the control unit in the TEST position.
- Step 7.** Adjust the trigger delay on the Radar Test Set so that one pulse from the TS-1843B/APX and one pulse from the Radar Test Set are superimposed on the oscilloscope display.
- Step 8.** On the Radar Test Set, rock the signal generator frequency control slowly around 1030 MHz until a zero beat indication is seen on the oscilloscope.
- Step 9.** Read the frequency of the Radar Test Set signal generator at the zero beat point. This is the TS-1843B/APX interrogation signal frequency. It should be  $1030 \pm 0.5$  MHz.

6-11. **TEST SET INTERROGATION POWER CHECK.** To check the power level of the TS-1843B/APX sim-

ulated interrogation signal using an AN/UPM-98( ) or equivalent Radar Test Set, proceed as follows:

- Step 1.** Connect equipment as shown in figure 5-1 and connect oscilloscope probe to VIDEO MONITOR connector on the Transponder Set.
- Step 2.** Apply power to equipment and allow to warm up.
- Step 3.** Set controls on control unit as in table 5-2.
- Step 4.** On the C-6280( ) hold the M-1 switch in the TEST position and note as a reference the amplitude of the demodulated pulses observed on the oscilloscope display.
- Step 5.** Release the M-1 switch. Set up the radar test set to provide mode 1 interrogation.
- Step 6.** On the radar test set adjust the output attenuator control so that the amplitude of the demodulated pulses observed on the oscilloscope display is equal to the reference level noted in step 4.
- Step 7.** Taking cable losses into account, determine the rf signal level at the transponder antenna connector. It should be within 2 db of the R-F OUT control setting on the TS-1843B/APX.

#### 6-12. CHECKOUT OF ASSEMBLIES.

6-13. **GENERAL.** Modular subassemblies of the TS-1843B/APX intended for repair or replacement may be checked out individually using specially designed testing fixtures which simulate the normal power and signal input and output connections. If such special testing equipment is not available, the assemblies may be checked out using a TS-1843B/APX known to be in proper operating condition as part of the test bench setup. For access to components and connections on assemblies A2, A3 and A4 make use of the special assembly extender cards. To check the operation of the assembly, perform the TS-1843B/APX checkout procedure given in Section V.

6-14. **CHECKOUT OF TIMING ASSEMBLY A2.** To check assembly A2 on the bench, make any resistance and continuity measurements indicated, then provide connections for ground (pin 1) +12 volts (pin 10) and +5 volts (pin 9). Apply a simulated count gate trigger (a -3.5 to -5.0 volt, negative-going, 8 microsecond pulse) to pin 4.

- Step 1.** Connect the oscilloscope input probe to Modulation Duration test point A2TP3.
- Step 2.** Apply a ground (M-1 gate) to pin 16 and check the display for a pair of pulses (P1 and P3) spaced approximately 3 microseconds apart. Check that the P3 pulse duration can be adjusted by means of A2R34 from



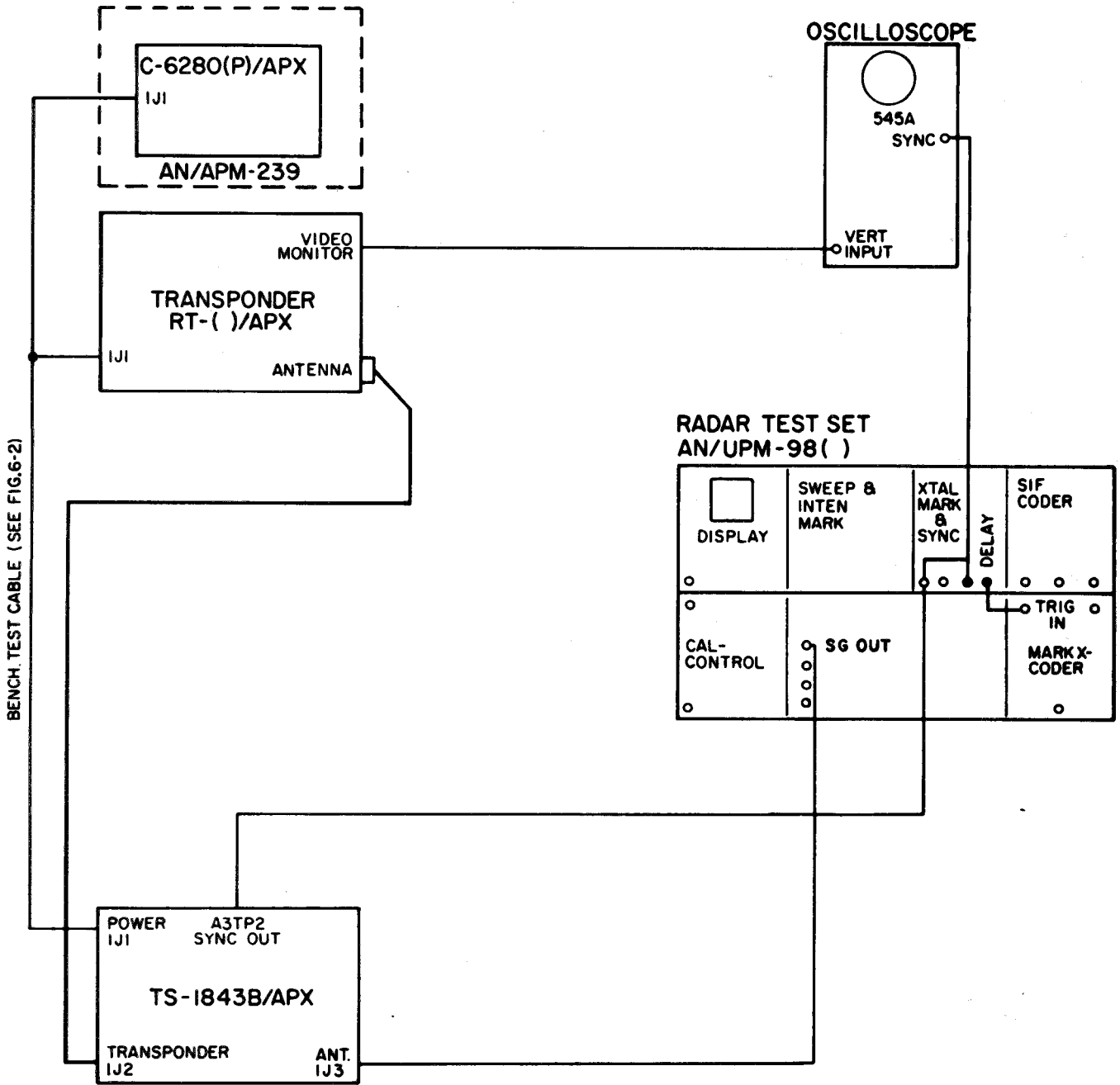


Figure 6-3. Test Set Interrogation Frequency and Power Test Setup

0.8 to 1.0 microsecond. Set A2R34 for a P3 pulse duration of 0.9 microsecond.

**NOTE**

On earlier models (Serial No. 4999 and below) the modulation pulse duration is set by selecting a resistance value for A2R12 which will provide a P3 pulse duration of  $0.9 \pm 0.5 \mu\text{sec}$ . (Refer to parts list and usable on codes for range and selection of resistance values to be used.)

Step 3. Move the ground from pin 16 to pin 15 (M-2 gate). Check for modulation pulse

pairs spaced approximately 5 microseconds apart.

Step 4. Move the ground from pin 15 to pin 14 (M-3/A gate). Check for modulation pulse pairs spaced approximately 8 microseconds apart.

Step 5. Move the ground from pin 14 to pin 13 (M-C gate). Check for modulation pulse pairs spaced approximately 21 microseconds apart.

Step 6. Connect oscilloscope Channel A input probe to test point A2TP2. Adjust the oscilloscope delay so that the 50% point of the leading edge of the 20th clock pulse intersects a vertical line on the graticule.

Step 7. Apply +5 volts dc to pin 5. Connect the oscilloscope input to test point A2TP4. Check that the leading edge of the bracket decode pulse observed may be varied by means of A2R28 from less than 0.5 microsecond to more than 1 microsecond with respect to the 20th clock pulse position

established in step 6 above.

Step 8. Adjust A2R36 for a bracket decode pulse with a duration of 0.37 microsecond at A2TP4.

**NOTE**

On earlier models (Serial No. 4999 and below) the bracket decode pulse duration is set by selecting a resistance value for A2R15 which will provide a pulse duration of  $0.37 \pm 0.03 \mu\text{sec}$ . (Refer to parts listing and usable on codes for range and selection of resistance values to be used.)

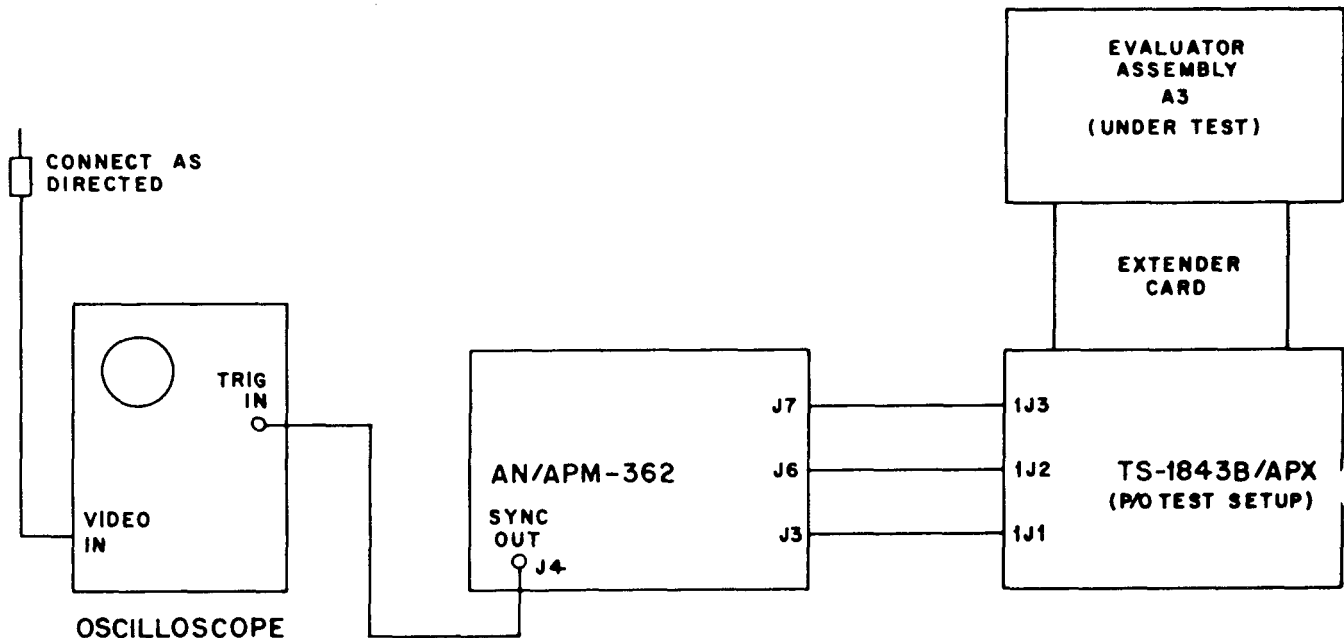


Figure 6-4. Evaluator Assembly A3 Test Setup

6-15. **CHECKOUT OF EVALUATOR ASSEMBLY A3.** To check assembly A3 on the bench, make any resistance and continuity measurements indicated, then connect to test equipment as shown in figure 6-4. Place controls on AN/APM-362 in positions shown in table 6-2, step 2.

- Step 1.** Turn on power to TS-1843B/APX. Check that output at pin 15 of A3 assembly (lamp actuating line) goes to approximately +12 volts.
- Step 2.** Connect oscilloscope to pin 5 of A3 assembly and check that the Test Gate (50  $\mu$  sec pulse) is present.
- Step 3.** Move oscilloscope connection to pin 4 of A3 assembly and check that the Count Gate Trigger Signal is present.
- Step 4.** Connect oscilloscope to pin 15 of A3 assembly. Note that the output at pin 15 is alternately high and low, staying low for approximately 2 seconds.
- Step 5.** On AN/APM-362, place REPLY FREQUENCY SELECT switch in +4 position (1094 MHz). The output at pin 15 should go to approximately +24 volts. Return the REPLY FREQUENCY SELECT switch to 1090 MHz. The output at pin 15 should return to approximately +12 volts.
- Step 6.** Disconnect the cable from 1J3 on the TS-1843B/APX. The voltage at pin 15 of A3 assembly should go to approximately +24 volts. Reconnect the cable to 1J3 on the TS-1843B/APX. The voltage at pin 15 should return to approximately +12 volts.
- Step 7.** On the AN/APM-362, move the BRACKET SPACING SELECT switch to -0.30  $\mu$  sec. The output at pin 15 should go to approximately +24 volts. Return the BRACKET SPACING SELECT switch to 20.30  $\mu$  sec. The output at pin 15 should return to approximately +12 volts.
- Step 8.** While observing the output at pin 15, move the BRACKET SPACING SELECT switch to +0.30  $\mu$  sec. The output at pin 15 should again go to approximately +24 volts. Return the BRACKET SPACING SELECT switch to 20.30  $\mu$  sec. The output at pin 15 should return to approximately +12 volts.
- Step 9.** Connect the oscilloscope to test point A3TP4 on the TS-1843B/APX A3 assembly. Shaped reply pulses approximately 0.1  $\mu$  sec wide and +5 volts in amplitude should be present.

a. If outputs are not normal, check at A3TP2 for the Sync Out signal of approximately +10 volts amplitude at 400 pps  $\pm$  50 pps to determine whether or not the PRF Generator is working. Check that the Read Gate Generator circuit is functioning by observing the 4 volt, 25  $\mu$ sec gate pulse at A3TP3.

b. If all circuits appear to be functioning, connect oscilloscope channel A to A3TP4 (shaped Reply Video) and channel B to pin 1 of Bracket Decode Gate A3U2B and if necessary proceed as follows:

(1) In assemblies using board Serial No. 3500 or higher, replace A3R55 with a value between 6.65K and 24.3 Kohm which will center the A3TP4 pulse on the A3U3B pulse.

(2) In assemblies using board Serial No. 1 through 3499 replace A3R55 with a value between 4.7K and 33 Kohm.

c. Connect the oscilloscope to A3TP5 (Frequency) and A3TP7 (Delayed Bracket) and if necessary proceed as follows:

(1) In assemblies using board Serial No. 3500 or higher, replace A3R40 with a value between 6.65K and 24.3 Kohm which will center the narrow A3TP7 pulse on the A3TP5 pulse.

(2) In assemblies using board Serial No. 1 through 3499 replace A3R40 with a value between 4.7K and 22 Kohm and repeat test above.

6-16. **CHECKOUT OF REGULATOR ASSEMBLY A4.** To check assembly A4 on the bench, make any resistance and continuity measurements indicated, then provide connections for ground (pin 4), and +28 volts (pin 7). Connect a 120 ohm 1 watt resistor between pins 7 and 8. Connect voltmeter to pin 2 (+12 volt output).

**Step 1.** Apply simulated control input (ground connection) to pin 6. Check for +12 volts at pin 2.

**Step 2.** Move voltmeter connection to pin 1. Check for +5 volts. If output is not 5 volts, replace A4R6 with value (205 ohms, 226 ohms, 249 ohms, or 274 ohms) which will give the proper voltage.

6-17. **CHECKOUT OF POWER AND CONTROL ASSEMBLY A1.** To check the A1 assembly on the bench, proceed as follows:

**Step 1.** Check for continuity between the following points:

1J1 pin 2 and chassis

1J1 pin 7 and pin 10  
A2J1 pin 1 and pin 11 and chassis  
A3J1 pin 1 and pin 11 and chassis  
A5P1 pin 5 and chassis  
A6P1 pin 1 and chassis  
A4J1 pin 1 and A2J1 pin 9 - A5P1 pin 3  
and A3J1 pin 9  
A4J1 pin 2 and A2J1 pin 10 - A5P1 pin 4  
and A3J1 pin 10  
A6P1 pin 3 and A3J1 pin 13  
A6P1 pin 2 and A3J1 pin 12  
A4J1 pin 4 and chassis  
A2J1 pin 5 and A3J1 pin 5  
A2J1 pin 4 and A3J1 pin 4  
A2J1 pin 3 and A3J1 pin 3  
A2J1 pin 2 and A3J1 pin 2

Step 2. Make the following resistance measurements:

1J1 pin 4 to A2J1 pin 16 (47 ohms  $\pm 5\%$ )  
1J1 pin 5 to A2J1 pin 15 (47 ohms  $\pm 5\%$ )  
1J1 pin 6 to A2J1 pin 14 (47 ohms  $\pm 5\%$ )  
1J1 pin 9 to A2J1 pin 13 (47 ohms  $\pm 5\%$ )

Step 3. Connect ground to 1J1 pin 2 and +28 volts to 1J1 pin 1.

Step 4. Temporarily connect a 28 volt lamp between 1J1 pin 8 and ground.

Step 5. Ground A3J1 pin 15 (lamp enable) . Note that lamp goes on.

Step 6. Temporarily connect a 36K resistor between A4J1 pin 6 and pin 8. Connect voltmeter + lead to A4J1 pin 6, - lead to chassis.

Step 7. Ground 1J1 pin 3 (Monitor Enable) and note that voltage at A4J1 pin 6 drops. Remove ground at 1J1 pin 3. Voltage should rise.

Step 8. Apply ground to 1J1 pin 4. Voltage at A4J1 pin 6 should drop. Remove ground; voltage should rise.

Step 9. Apply ground to 1J1 pin 5. Voltage at A4J1 pin 6 should drop. Remove ground; voltage should rise.

Step 10. Apply ground to 1J1 pin 6. Voltage at A4J1 pin 6 should drop. Remove ground; voltage should rise.

Step 11. Apply ground to 1J1 pin 9. Voltage at A4J1 pin 6 should drop. Remove ground; voltage should rise.

6-18. CHECKOUT OF SIGNAL GENERATOR/RECEIVER ASSEMBLY A5. To check the A5 assembly on the bench, proceed as follows:

Step 1. Check for the indicated resistances measured between ground and the following points on connector A5P1:

Pin 1  $800 \pm 40$  ohms

Pin 2  $800 \pm 40$  ohms

Pin 4  $200 \pm 20$  ohms

Pin 5 Less than 1 ohm

Step 2. Connect a VTVM (with a 100 Kilohm, 1/4 watt resistor in series with the probe) to pin 3 of A5A1Q1. Set the VTVM to the negative scale and check that the negative voltage is 0.75 volt or higher.

6-19. CHECKOUT OF VSWR ADJUST ASSEMBLY A6. To check the A6 assembly on the bench, proceed as follows:

Step 1. Measure resistance from A6P1 pin 3 (brown wire) to wiper of A6R6 (white wire). It should be  $2.4K \pm 5\%$ .

Step 2. Measure resistance from A6P1 pin 3 (brown wire) to wiper of A6R2 (gray wire). It should be  $2.4K \pm 5\%$ .

Step 3. Check for continuity between A6P1 pin 4 (yellow wire) and high side of A6R2.

Step 4. Check for continuity between A6P1 (black wire) and A6 board ground bus.

6-20. CHECKOUT OF DIRECTIONAL PROBE ASSEMBLY A7. To check the A7 assembly on the bench, proceed as follows:

Step 1. Measure resistance from SIG GEN probe input line to chassis. It should be  $49.9 \text{ ohms} \pm 0.5 \text{ ohms}$ .

Step 2. Apply positive ohmmeter lead to green input lead; negative ohmmeter lead to chassis. Resistance should be  $150 \text{ ohms} \pm 0.5 \text{ ohms}$ . Reverse leads; resistance should be greater than 50K ohms.

Step 3. Apply positive ohmmeter lead to yellow input lead; negative ohmmeter lead to chassis. Resistance should be  $150 \text{ ohms} \pm 0.5 \text{ ohms}$ . Reverse leads; resistance should be greater than 50K ohms.

6-21. **TROUBLESHOOTING ASSEMBLIES.** When locating a specific faulty circuit and component in an assembly determined to be malfunctioning, troubleshoot by means of standard techniques using the support information provided in the schematic diagrams, theory of operation, etc, in this manual. Resistance and continuity measurements may be taken through circuits which are essentially resistive; however, best results will be obtained from voltage measurements taken with the normal operating voltages connected to the assembly. Signal tracing may be utilized by injecting suitable input signals, and logic circuits may be checked by applying the proper input grounds and voltages. Assemblies for which extender cards are available may be checked while connected into a TS-1843B/APX which is known to be operating properly.

6-22. **CALIBRATION AND ALIGNMENT.**

6-23. **R-F IN CONTROL A3R46.** The R-F IN control A3R46, located on the rear end of the TS-1843B/APX, should be calibrated to provide a GO indication by the TEST lamp of Transponder Set Control C-6280(/)APX when transponder IFF reply signals within  $\pm 2$ db of a preset level between 20 and 28 dbw are received at the ANTENNA receptacle 1J2. To calibrate the A3R46 control proceed as follows:

Step 1. Connect the equipment as shown in figure 6-5.

Step 2. On the TS-1843B/TPX set the R-F IN control to 20 dbw.

Step 3. On the AN/APM -362 set the controls as follows:

ON/OFF	ON
POWER	ON
MODE SELECT	MONITOR
OPERATE/ STANDBY	OPERATE

PRF SELECT	400
OUTPUT POWER LEVEL ADJUST	20 dbw indication on OUTPUT PEAK POWER LEVEL meter
REPLY FREQUENCY SELECT	1090
BRACKET SPACING SELECT	20.30
INTERROGATION LEVEL	-50 DBM
BEAT FREQUENCY SELECT	OFF
TS-1843B/APX LINE VOLTAGE	28

Step 4. On the TS-1843B/APX set the CAL ADJ control A3R51 for a GO indication on the AN/APM-362, just above the threshold of the GO/NO-GO point of the reply status indicator lamp.

Step 5. On the TS-1843B/APX set the R-F IN control A3R46 to 28 dbw.

Step 6. On the AN/APM-362 set the OUTPUT POWER LEVEL ADJUST control for a 28dbw indication on the OUTPUT PEAK POWER LEVEL meter.

Step 7. Check that the reply status GO lamp on the AN/APM -362 is lit. If it is not lit, readjust A3R51 until it does light.

Step 8. Repeat steps 2 through 7 until a GO/NO-GO threshold is obtained at both the 20 dbw and 28 dbw preset levels.

Step 9. Set the dial for the desired operational R-F IN threshold level and tighten the locking screw.

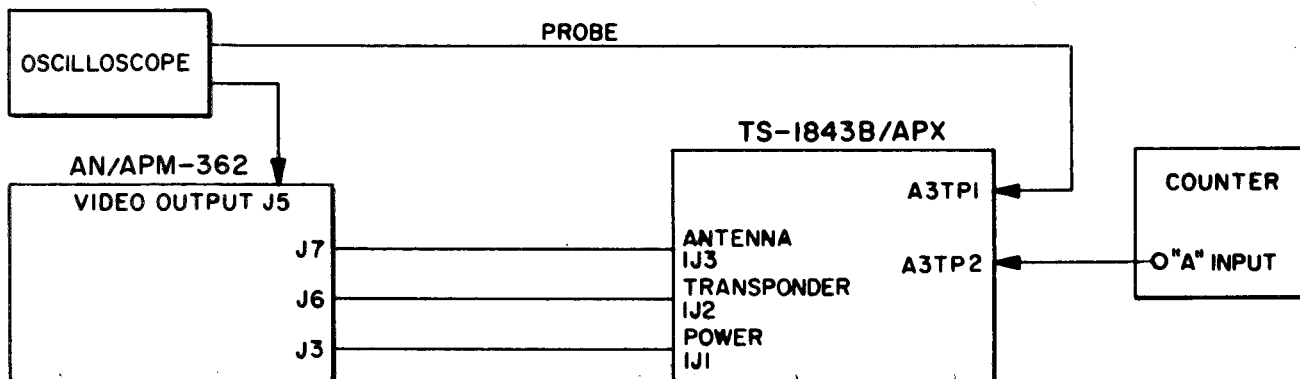


Figure 6-5. R-F IN Control Setup

6-24. **R-F OUT CONTROL A2R21.** The R-F OUT control A2R21, located on the rear end of the TS-1843B/APX, should be calibrated to provide IFF interrogation signal outputs in the selected mode at a preset level of -65 dbm. To calibrate the A2R21 control proceed as follows:

- Step 1. Connect equipment as shown in figure 6-5 with TS-1843B/APX RF OUT control set at 65 dbm.
- Step 2. Connect oscilloscope to J5 video out jack on the AN/APM-362 and oscilloscope probe to TP1 on A3 of TS-1843B/APX.
- Step 3. On the AN/APM-362 set the controls as follows:

ON/OFF	ON
POWER	ON
MODE SELECT	MODE 1
OPERATE/STANDBY	STANDBY
PRF SELECT	80%
REPLY FREQUENCY SELECT	1090
BRACKET SPACING SELECT	20.30
BEAT FREQUENCY SELECT	PULSE
- Step 4. While observing the P1 and P3 Mode 3/A pulses, peak A5Z1 and A5A1T2 for maximum signal output and best wave shape. (Adjust A5A1T2 to the inner peak, which allows the greatest portion of the tuning slug to be inside the coil form.)
- Step 5. Set R-F Out control A2R21 for -55 dbm.
- Step 6. Set AN/APM-362 INTERROGATION LEVEL DBM for -55 dbm.
- Step 7. Adjust A2R20 (Max RF Out Adj) so that the P1 and P3 interrogation pulses are the same amplitude as the -55 dbm reference pulse.
- Step 8. Set the R-F Out Control A2R21 for -75 dbm.
- Step 9. Adjust the AN/APM-362 INTERROGATION LEVEL DBM for -75 dbm.
- Step 10. Adjust A2R22 (Min RF Out Adj) so that the P1 and P3 interrogation pulses are the same amplitude as the -75 dbm reference pulse.
- Step 11. Set the R-F Out Control A2R21 to -65 dbm and return the AN/APM-362 INTERROGATION LEVEL DBM control to -65 dbm. Pulses should be the same amplitude, if not, repeat steps 5 thru 10 until desired results are obtained.

6-25. **PRF ADJUSTMENT A3R2.** The internal triggering rate of the TS-1843B/APX can be adjusted to a rate between 350 and 450 pulses per second by means of the PRF ADJ control A3R2. To adjust the triggering rate, proceed as follows:

- Step 1. Energize the TS-1843B/APX in a system setup as shown in figure 6-5.
- Step 2. Connect Sync Out test point A3TP2 on the TS-1843B/APX to the "A" input connector on the counter. Adjust PRF ADJ control A3R2 for a prf of 400 pps, or any required operational rate between 350 and 450 pps.

6-26. **VSWR CONTROL A6R6.** The VSWR control A6R6, located on the transponder end of the TS-1843B/APX, should be calibrated to cause the TEST lamp on the transponder control to indicate a NO-GO condition when the VSWR of the antenna system exceeds the preset threshold level (between 6 and 12db) by 2 db or more. To calibrate the VSWR dial proceed as follows:

- Step 1. Connect the equipment for VSWR measurements as shown in figure 6-1.

#### NOTE

The VSWR measuring equipment is calibrated according to the instructions in paragraph 5-5 of the AN/APM-362 technical manual (T.O. 33D7-8-81-1).

- Step 2. Remove cable from stub tuner and connect to J7 of the AN/APM-362. Set the controls on the AN/APM-362 and the TS-1843B/APX as in steps 2 and 3 of Table 6-2 except that the OUTPUT POWER LEVEL ADJUST control is to be set for an output level of 30 dbw.
- Step 3. Remove cable from J7 of the AN/APM-362 and reconnect to stub tuner. Using a low capacitance (10:1) probe, connect the oscilloscope input to the VSWR video test point A6TP2 on the TS-1843B/APX.
- Step 4. Adjust Mismatch MX-9052/APM-362 for an SWR of 9db.
- Step 5. While observing the displayed VSWR video, set the slide assembly for an average video output between maximum and minimum. Disconnect the probe from A6TP2.
- Step 6. Adjust the calibration control A6R2 to obtain a GO/NO-GO threshold. Tighten the locking nut on A6R2.
- Step 7. Adjust the mismatch for an SWR of 10.5 db and displace the slide assembly  $\pm 100$  degrees. At all positions the NO-GO lamp on the AN/APM-362 should be lit.

Step 8. Adjust the mismatch for an SWR of 7.5db and displace the slide assembly +100 degrees. At all positions the GO lamp on the AN/APM-362 should be lit.

6-27. **ADJUSTMENT AND ALIGNMENT OF SIGNAL GENERATOR/RECEIVER A5.** The alignment of this assembly consists of two phases: (a) Prealignment of the A5A1 subassembly; (b) Alignment of the complete assembly installed in a TS1843B/APX case.

a. **Prealignment of Subassembly A5A1.** - To align and adjust the A5A1 subassembly on the bench proceed as follows:

1. **Oscillator Adjustment.**

Step 1. Set up assembly as shown in figure 6-6. Turn power on. Make certain that the VTVM is set to negative scale and that the 100K, 1/4 watt resistor is in series with the probe (this resistor is required to remove the probe capacitance and must be employed as the probe tip.)

Step 2. Adjust L1 for minimum inductance by turning the slug to the unwound end of the coil form.

Step 3. Place the resistor-terminated VTVM probe on pin 3 of Q1 (or some convenient portion of the circuit directly connected to it) and adjust the L1 tuning slug for an increased inductance while observing the VTVM. The voltage should rise to a negative peak, -0.75 volts or higher. Continue tuning past the peak until the output just starts to decrease. If the peak voltage is -1.2 volts or less, the oscillator adjustment is complete. If the peak voltage exceeds -1.2 volts, continue tuning through the peak (increased inductance) until the output is decreased by 10% of the peak output (e.g. reduce -2.0 volts to -1.8 volts.)

**NOTE**

DO not use any other method for oscillator tuning or returning other than the one given.

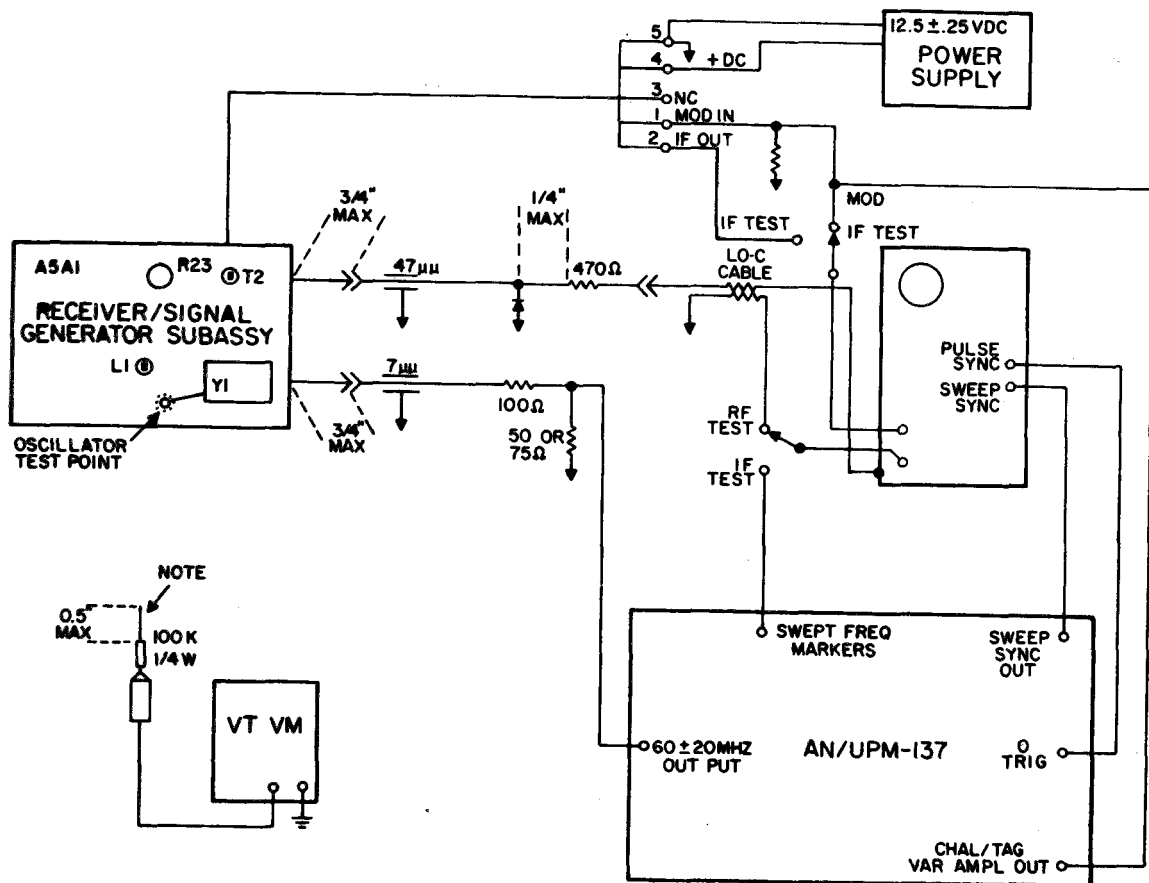


Figure 6-6. Test Setup for Oscillator, Pulse Amplifier, and IF Gain Adjustment

## 2. Pulse Amplifier Pretuning.

- Step 1. Set up equipment as in figure 6-6. Place RF Test/IF Test switch in RF Test position.
- Step 2. Adjust the Receiver Signal Generator Modulation input level to +8 volts and observe the demodulated 85.833 MHz output of the test detector.
- Step 3. Adjust transformer A5A1T2 for the maximum detector output (tune to the "inner" peak, which allows the greatest portion of the tuning slug to be inside the coil form). The peak output should be 0.6 volt minimum.

## 3. 60 MHz Amplifier and Frequency Discriminator Adjustment.

- Step 1. Set up equipment as shown in figure 6-6. Place RF Test/IF Test switch in IF Test position.
- Step 2. Switch on power, disable or reduce the 60 MHz RF test level below -70 dbv and observe the dc output level (oscilloscope baseline). It should be approximately +1.5 volts (this is the "No Signal" level).
- Step 3. Set the gain potentiometer A5A1R23 fully clockwise, and adjust the signal generator attenuator to increase the dc output level at 60 MHz to 1 volt greater than the No Signal level. The required level setting should not be more than -32 dbv. (This represents the receiver sensitivity).
- Step 4. Set the gain control A5A1R23 fully counter clockwise and readjust the signal generator attenuator to obtain the 1 volt greater output specified in step 3 above. The input should be greater than -35 dbv.
- Step 5. Adjust the gain control A5A1R23 to maximum gain.
- Step 6. (Sweep Mode Required). - Increase the input 6 db and note (from frequency markers or calibrated oscilloscope trace) the 1-volt amplitude points on the response curve. (The 6 db bandwidth is defined by the difference between these frequencies.) The 6 db bandwidth would be a minimum of 6.2 MHz.

### b. Alignment of complete Signal Generator/Receiver Assembly A5.

- Step 1. Install the signal generator/receiver assembly (under test) in a TS-1843B/APX Test Set from which the signal generator/receiver assembly has been removed.

- Step 2. Connect the equipment as shown in figure 6-7.

- Step 3. Set the controls on the AN/APM -362 as follows:

POWER IN	ON
BEAT FREQUENCY SELECT	PULSE
INTERROGATION LEVEL	-65 DBM
OPERATE/STANDBY	STANDBY
PRF SELECT	80%
REPLY FREQUENCY SELECT	1090 MHz
BRACKET SPACING SELECT	20.3 USEC
OUTPUT POWER LEVEL ADJUST	20 DBW
T3-1843/APX LINE VOLTAGE SELECT	28
MODE	MODE 1
MODE C CIRCUIT TEST	OFF
POWER SWITCH (in Power and Control Section of AN/APM-362)	ON

- Step 4. Observe the demodulated interrogation pulses on the channel A display. Note the level of the receiver video.
- Step 5. Adjust A2R21 (RF out, -DBM) to 65 dbm.
- Step 6. Adjust A5Z1 and A5A1T2 for the maximum amplitude at the best wave shape. (Adjust A5A1T2 to the inner peak, which allows the greatest portion of the tuning slug to be inside the coil form.)
- Step 7. Set R-F Out control A2R21 for -55 dbm.
- Step 8. Set AN/APM-362 INTERROGATION LEVEL DBM for -55 dbm.
- Step 9. Adjust A2R20 (Max RF Out Adj) so that the TS-1843B/APX P1 and P3 interrogation pulses are the same amplitude as the -55 dbm reference pulse.
- Step 10. Set the R-F Out Control A2R21 for -75 dbm
- Step 11. Adjust the AN/APM-362 INTERROGATION LEVEL DBM for -75 dbm.
- Step 12. Adjust A2R22 (Min RF Out Adj) so that the P1 and P3 interrogation pulses are the same amplitude as the -75 dbm reference pulse.



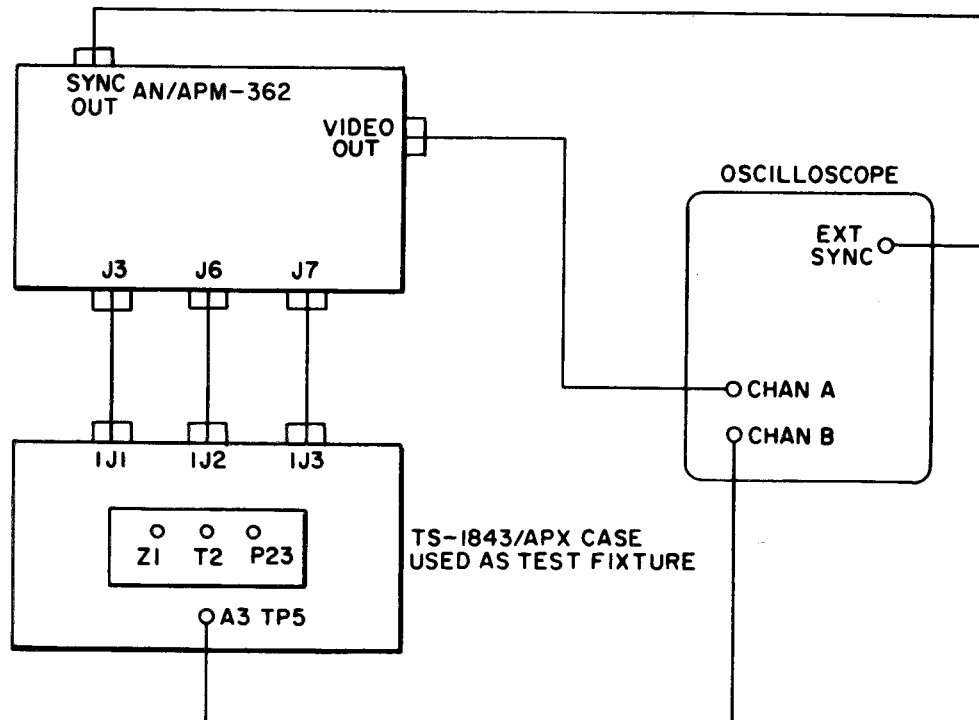


Figure 6-7. Signal Generator/Receiver Assembly Adjustment Setup

- Step 13. Set the R-F Out Control A2R21 to -65 dbm and return the AN/APM-362 INTERROGATION LEVEL DBM control to -65 dbm. Pulses should be the same amplitude, if not, repeat steps 5 thru 10 until desired results are obtained.
- Step 14. Adjust R-F Out Control A2R21 to -65 dbm. Connect Chan B of oscilloscope to TP5 of A3 assembly, place MODE SELECT to MONITOR, PRF SELECT to 400 and OPERATE/STANDBY switch to OPERATE.
- Step 15. While observing the frequency pulse on the channel B display, adjust A5A1 R23 for maximum pulse amplitude.
- Step 16. Select reply frequencies from 1086 MHz to 1094 MHz by turning the REPLY FREQUENCY SELECT control to each position. Adjust A5A1R23 to establish a minimum output of 1.2 volts at 1087 or 1093 MHz, whichever gives the lowest output. The IF output should not be less than 0.7 volt at 1094 and 1086 MHz, +1.2 volts or greater at 1093 and 1087 MHz, and +3.0 volts minimum at 1090 MHz.

6-28. REPAIR PROCEDURES.

6-29. GENERAL. No special repair procedures are required for the TS-1843B/APX. Standard techniques for the repair of solid-state electronic circuitry are discussed below.

6-30. REPLACEMENT OF PARTS ON PRINTED CIRCUIT BOARDS. Because transistorized circuits require comparatively low operating voltages, it is unlikely that failures like those common to electron tube equipment will occur. However, if a shorted or burnt component should occasionally be encountered, extreme care should be exercised in troubleshooting the suspected circuits so that no additional damage is done. Avoid unsoldering parts from the circuit boards just for the purpose of testing.

**CAUTION**

When soldering parts on printed circuit boards, use only a small pencil-type soldering iron with a power rating of 40 watts or less. A heavier soldering iron may damage the boards or the small components on them. Use only thin 60-40 rosin-core solder (such as Kester No. 44).

Because of the compactness of the equipment, the parts are mounted on the printed circuit boards with very short leads. To remove such parts, apply heat from the bottom of the board while gently lifting the part with a suitable small tool. Remove the heat source as soon as the part is released, then clean the area by scraping off the old solder and brushing it away. Open up the mounting holes and insert a new part in the same position as the removed part. Apply a small amount of solder to the connection points on the printed circuit side of the board and re-coat the heated area with moisture-resistant varnish.

**CAUTION**

The use of ultrasonic cleaning methods on printed circuit board assemblies is not recommended since it can be harmful to the transistors and integrated circuits mounted on them. Severe ultrasonic stresses at certain frequencies may weaken or fracture the small wires in the transistors and IC's or cause damage that may result in early failure.

6-31. **REPAIRING FOIL BREAKS.** Occasionally it may become necessary to repair breaks in the copper circuits etched on the boards. Such breaks can result from accidents during repair or from placing excessive strain on the board. If the break is small and is located close to a soldered connection, it can easily be repaired by cleaning the broken section and adding some solder to close the break. If a break occurs while removing a component, leave a longer lead on the new component and bend it to bridge the break, then apply solder to join both the lead and the foil.

**CAUTION**

When working on printed circuit boards, keep all soldering operations on the copper foil to a minimum. Excessive heat can loosen the copper strips from the boards and cause damage. Always remove the soldering iron tip as soon as the solder is melted.

In some areas the copper connections on the boards are very closely spaced. When repairing breaks or soldering new components, avoid leaving excessive deposits of solder. Small particles of solder left sticking to the board may cause a short or an intermittent condition to occur.

6-32. **MAINTENANCE ALLOCATION (ARMY).** For Maintenance Allocation and the Maintenance Allocation Chart, see Appendix A.

SECTION VII

**PARTS LIST**

**7-1. INTRODUCTION.**

7-2. This Parts List lists, describes and illustrates the assemblies, subassemblies and detail parts that comprise the Test Set, Transponder Set TS-1843B/APX manufactured by ASC Systems Corporation, Chicago, Illinois, under contract number F33657-71-C-0175.

**7-3. GROUP ASSEMBLY PARTS LIST.**

7-4. The Group Assembly Parts List consists of illustrations and columnar listing of parts in order of disassembly sequence, except where such a sequence of disassembly cannot be maintained. The first illustration of the parts list is an overall view of the equipment to serve as a visual index to the group breakdown of the article into further subassemblies presented on succeeding illustrations.

7-5. The parts listing is arranged in five columns as follows:

a. 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.

b. The PART NO. column lists the Government standard part number or the manufacturer's part number for each part listed.

c. 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 properly 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, is shown in this column enclosed in parentheses, followed by the ASC Systems Corp. part number also enclosed in parentheses. When a vendor's code is not listed, ASC Systems Corporation is the manufacturer of the part. For explanation of Vendor's Codes reference should be made to the latest edition of Handbook H4-1.

d. In the UNITS PER ASSY column are shown quantities of the part used in that particular assembly.

e. The USABLE ON CODE column contains coding for assemblies and parts to indicate specific usability of the listed parts by serial numbers of the TS-1843B/APX equipment. Where no Usable On Code appears,

the part is applicable to all assemblies. Refer to the listing of the Usable On Codes given below.

TS-1843B/APX MASTER USABLE ON CODING LIST

<u>Usable On Code</u>	<u>Serial No.</u>
A	1 to 102
B	103 and higher
C	1 to 4999
D	5000 and higher
E	1 to 7599
F	7600 and higher
G	1 to 3499
H	3500 to 4999
J	3500 and higher
K	1 to 12,047
L	12,048 and higher

**7-6. NUMERICAL INDEX.**

7-7. 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 Air Force and Navy.

**7-8. PROVISIONING CODES.**

7-9. Policies, general information, and procedures for changing source and maintenance coding are contained in T.O. 00-25-195. Generally, the source codes and maintenance repair level codes herein (see Source Code and Repair Code columns) were assigned by Air Force and Navy personnel when this equipment was purchased. Assignment of codes was influenced by (a) maintenance policies, (b) predicted maintenance actions, (c) base facilities and capabilities, (d) economic considerations. Definitions of these codes are as described below.

**7-10. AIR FORCE SOURCE CODES AND DEFINITIONS.**

**7-11. "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 practicable but may be accomplished only after confirmation of non-availability from supply sources.

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" 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 "P1D" identifies parts which may be requisitioned and installed by AF activities authorized depot-level maintenance only. Code "P1D" 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 an AF activity consistent with the activity's authorized scope of maintenance. This code is applied to such parts as are basically structural items of 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 placement 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.

7-13. "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.

7-13. "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, depot-level maintenance only and is applied to assemblies described under "A" code.

7-14. "X" SERIES - PARTS CONSIDERED IMPRACTICAL FOR SERVICE MANUFACTURE.

a. Code "X" is applied to main structural member 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 channel 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.

7-15. **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.

7-16. **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 nonreparable and have no reclamation value. When these items fail they will be disposed of at user level as condemned 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/IM will be so advised with request or 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.

#### 7-17. NAVY SOURCE CODES AND DEFINITIONS.

##### 7-18. **P SERIES - PURCHASED ITEMS.**

a. **P** - Applied to items which are purchased in view of known or anticipated usage and which are relatively simple to manufacture within the Navy if necessary.

b. **P1** - Applied to items which are purchased in view of known or anticipated usage and which are difficult, impractical, or uneconomical to manufacture within the Navy.

c. **P2** - Applied to items for which little usage is anticipated, but which are purchased in limited quantity for insurance purposes. Items coded "P2" are difficult to manufacture, require special tooling or stock not normally available within the Naval Establishment or require long production lead time.

d. P3 - Applied to repair parts items which are purchased in limited quantity in accordance with life expectancy. Items coded "P3" are normally deteriorative in nature and may require special storage conditions.

e. P4 - Applied to items which are procured only for initial outfitting or for special control and not carried in system stock for replenishment purposes.

7-19. M SERIES - MANUFACTURED ITEMS WHICH ARE NOT PURCHASED OR STOCK NUMBERED.

a. MF - Applied to items which are capable of being manufactured within Fleet activities. Items coded "MF" have no anticipated usage, or possess restrictive installation or storage factors. Code "MF" will not be applied to an item when the same item is coded in the "P" series for other applications for the item is carried in the Navy Supply System. With respect to support equipment, the naval manufacturing activity may later alter the design of Source Codes "MF" material and/or processes provided that fit, function, use and safety are not impaired.

b. MO - Applied to items which are capable of being manufactured within overhaul/rework activities. Items coded "MO" have no anticipated or relatively low usage, or possess restrictive installation or storage factors or are manufactured more economically by the Government. Code "MO" will not be applied to an item when the same item is coded in the "P" series for other applications or the item is carried in the Navy Supply System. With respect to support equipment, the naval manufacturing activity may alter the design of Source Code "MO" material and/or processes provided that fit, function, use and safety are not impaired.

c. MOA - Applied to items to be manufactured by the prime overhaul/rework point when required.

7-20. A SERIES - ASSEMBLE - ASSEMBLY NOT PURCHASED.

a. AF - Applied to assemblies which are not purchased but which are to be assembled within activities prior to installation. At least one of the items in the assembly must be a coded "P" item which carries an individual part number and description.

b. AO - Applied to assemblies which are not purchased but which are to be assembled within overhaul/rework activities prior to installation. At least one of the items in the assembly must be a coded "P" series item which carries an individual part number and description.

c. AOA - Applied to items to be assembled by the prime overhaul/rework point when required.

7-21. N SERIES - NOT STOCKED NORMALLY - WILL BE PURCHASED ON DEMAND.

a. N - Applied to items which do not meet established criteria for stocking and which are readily available from commercial sources, i. e., nuts, bolts, screws, washers, shims, rivets, knobs, cotter pins (not included in the Navy Supply System), protective closures, bead chains, adhesives, and cabinet locks.

b. N1 - Applied to Bureau of Yards and Docks Supply Office ("Y") cognizance items under fraction code "A" which are: (1) commercially available to all continental United States activities, (2) authorized for local stocking at the retail level, (3) replenished by local purchase within the continental United States, (4) carried in wholesale stock only for overseas and fleet activities, and (5) stock numbered and published in the Navy Stock List of the Yards and Docks Supply Office.

7-22. X SERIES - NOT PROCURED, NORMALLY IMPRACTICAL FOR STOCKING, MAINTENANCE OR MANUFACTURE.

a. X - Applied to items which, if damaged, would require uneconomical repair. The need for an item, or items coded "X" will normally result in recommendation for retirement of equipment from service.

b. X1 - Applied to items for which purchase of the next larger assembly Source Coded in the "P" series is justified.

c. X2 - Applied to items which are not purchased for stock, but may be required for use through salvage or one time purchase. Activities requiring such items will attempt to obtain them from salvage; if not obtainable from salvage or readily manufactured, such items shall be requisitioned through normal supply channels with supporting justification. Repeated requisitions shall justify a change to the "P" series code.

7-23. U SERIES - U - APPLIED WHEN NOT OF SUPPLY OR MAINTENANCE STOCKING SIGNIFICANCE.

7-24. MATERIAL ACCOUNTABILITY RECOVERABILITY CODES (MARC). Codes which are assigned only to aeronautical provisioned items to reflect the accountability, recoverability and repair policy determined for an item of equipment or material required for the maintenance, repair or rework of an end article. MARC codes are as follows:

Code Application of Accountability /Recoverability Codes

R Code "R" shall be applied to reparable (except end items of support equipment) items which are economical and practical to repair on a pro-

grammed basis through a major rework activity. It is intended that Code "R" items be repaired locally by using activities or fleet support activities whenever the extent of required repair falls within the maintenance capability of the local command. However, the decision that the maintenance characteristics of the item are such as to warrant repair programming at a major military or commercial rework activity shall be the governing criteria for assignment of the "R" code. After initial outfitting, supply system issues of Code "R" items shall be made only when exchange procedures provide for turn-in of the replaced item or when necessary to replace an item expended by approved survey.

- D Code "D" shall be applied to end items of support equipment which are economical and practical to repair on a scheduled basis through a major rework activity. Code "D" items will be maintained on a custodial signature basis and shall be surveyed when lost or missing or when beyond economical repair. After initial outfitting, the supply officer of the support activity will not issue Code "D" end items without turn-in of the replaced item. Code "D" items shall be repaired by fleet support activities, including Public Works Departments, when the extent and type of repair fall within assigned maintenance responsibility. Every effort shall be made to repair items locally or through fleet support activities prior to turning the item into the supply system as non-RFI material. If repairs are required beyond local or fleet support maintenance capabilities, the damaged or defective material must be properly identified and return immediately to the supporting supply department.
- L Code "L" shall be applied to repairable items (except end items of support equipment) which are to be repaired locally by using activities or the local fleet support activity within their assigned maintenance responsibility. Repair parts are normally procured to support Code "L" items. Code "L" items will be scrapped when beyond local economical repair. After initial outfitting, supply system issues of Code "L" items shall be made only when exchange procedures provide for turn-in of the replaced item or when necessary to replace an item expended by approved survey.
- E Code "E" shall be applied to end items of support equipment which are to be repaired locally. The criterion for assignment of Code "E" is that the end item can be maintained/repared locally by using or fleet supporting activities within their assigned maintenance responsibility. Code "E" items will be maintained on a custodial signature

basis when in use and will be surveyed when lost or missing. After initial outfitting the Supply Officer of the supporting activity will not issue Code "E" items without turn-in of the replaced item. If the repair of Code "E" items is beyond the assigned maintenance responsibility of the using activity, the next higher level of fleet maintenance shall be requested to perform repair. Operating procedures shall be set up locally with sufficient flexibility to allow for local repair and to encourage such action. If repair cannot be accomplished by local or supporting fleet levels of maintenance, including the Public Works Department, the cognizant BUWEPFLEREADREP shall be immediately notified and will provide assistance regarding repair. The cognizant BUWEPFLEREADREP may authorize repair through customer service from a major rework activity. If repair of Code "E" items cannot be accomplished locally or through customer service in time to meet operational maintenance requirements, a ready-for-issue replacement item may be requisitioned. The Code "E" item requiring repair beyond the capability of the highest level of fleet maintenance must be appropriately tagged and turned into supply at the time of issue of the replacement item. The Supply Officer shall promptly notify the cognizant BUWEPFLEREADREP who will provide for screening and disposition. The item requiring repair will be screened by the cognizant BUWEPFLEREADREP and authorized for transfer to a major rework activity for repair or will be designated for processing through normal supply procedures for appropriate disposal action.

- B Code "B" shall be applied to items which are consumable for expendable but require item for item exchange for issue after the initial outfitting. Such items may contain precious metals, may be highly pilferable or may be certain high-cost items.
- C Code "C" shall be applied to items consumed or expended in use and do not require an item for item exchange.

7-25. HOW TO USE THIS PARTS LIST.

7-26. 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.

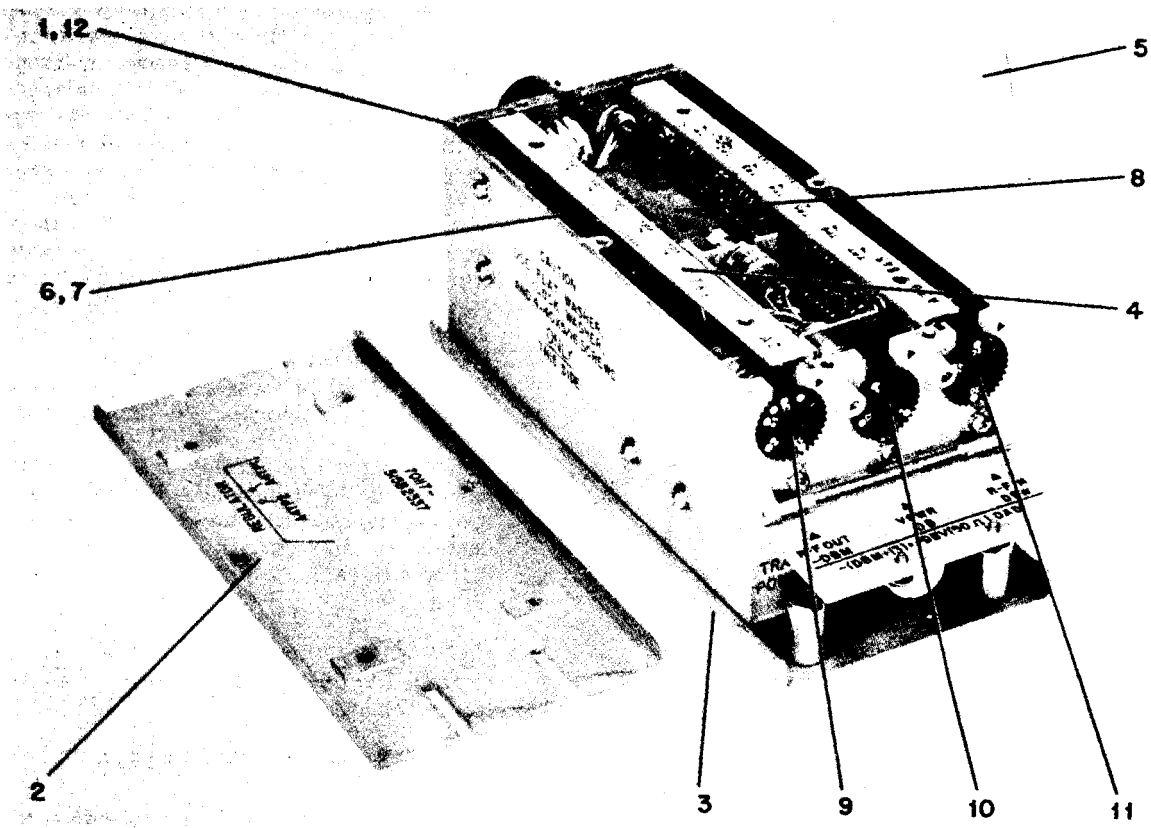


Figure 7-1. TS-1843B/APX. Overall Assembly



FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
7-1-1	GD5382	TEST SET, TRANSPONDER SET TS-1843B/APX. . . .	1	
	526C640	. PLATE, IDENTIFICATION: AF . . . . .	1	
	526C649	. PLATE, IDENTIFICATION: FAA . . . . .	1	
-2	515B2537	. COVER, TOP . . . . .	1	
	AN1960-C4	. WASHER, FLAT (AP) . . . . .	4	
	MS51957-15	. SCREW, MACHINE (AP) . . . . .	4	
	501B182	. SCREW, MACHINE (AP) . . . . .	6	
-3	GB5333	. PLATE, BOTTOM . . . . .	1	
	MS24693-C2	. SCREW, MACHINE (AP) . . . . .	8	
-4	GC5434	. TIMING ASSEMBLY (See Fig. 7-2 for breakdown). .	1	
-5	GC5435	. EVALUATOR ASSEMBLY (See Fig. 7-4 for break- down)	1	
-6	GB5500	. REGULATOR ASSEMBLY (See Fig. 7-6 for break- down)	1	
	MS15795-804	. WASHER, FLAT (AP) . . . . .	4	
	MS35338-135	. WASHER, LOCK (AP) . . . . .	4	
	MS351957-14	. SCREW, MACHINE (AP) . . . . .	4	
-7	539B48	. INSULATOR, PLATE . . . . .	2	
-8	GD5483	. SIGNAL GENERATOR AND RECEIVER ASSEMBLY (See Fig. 7-7 for breakdown)	1	
	MS35338-134	. WASHER, LOCK (AP) . . . . .	6	
	622-750-C2-52	. SCREW, MACHINE (AP) . . . . .	2	
	622-1000-C2-52	. SCREW, MACHINE (AP) . . . . .	4	
-9	GC5386-1	. KNOB, DIAL . . . . .	1	
-10	GC5386-2	. KNOB, DIAL . . . . .	1	
-11	GC5386-3	. KNOB, DIAL . . . . .	1	
	MS51021-1	. SCREW, SET, HEX SOCKET (AP) . . . . .	6	
-12	GD5497	. HOUSING SUBASSEMBLY (See Fig. 7-10 for break- down)	1	
-13	GB5381	MOUNTING MT-3513/APX . . . . .	1	
	526C641	. PLATE, IDENTIFICATION . . . . .	1	
	516D758	. PLATE . . . . .	1	
	PB3 1-2	. FASTENER, TURNLOCK (72794) (501 C40- 13) . . . .	2	
	MS20426A3-4	. RIVET (AP) . . . . .	4	

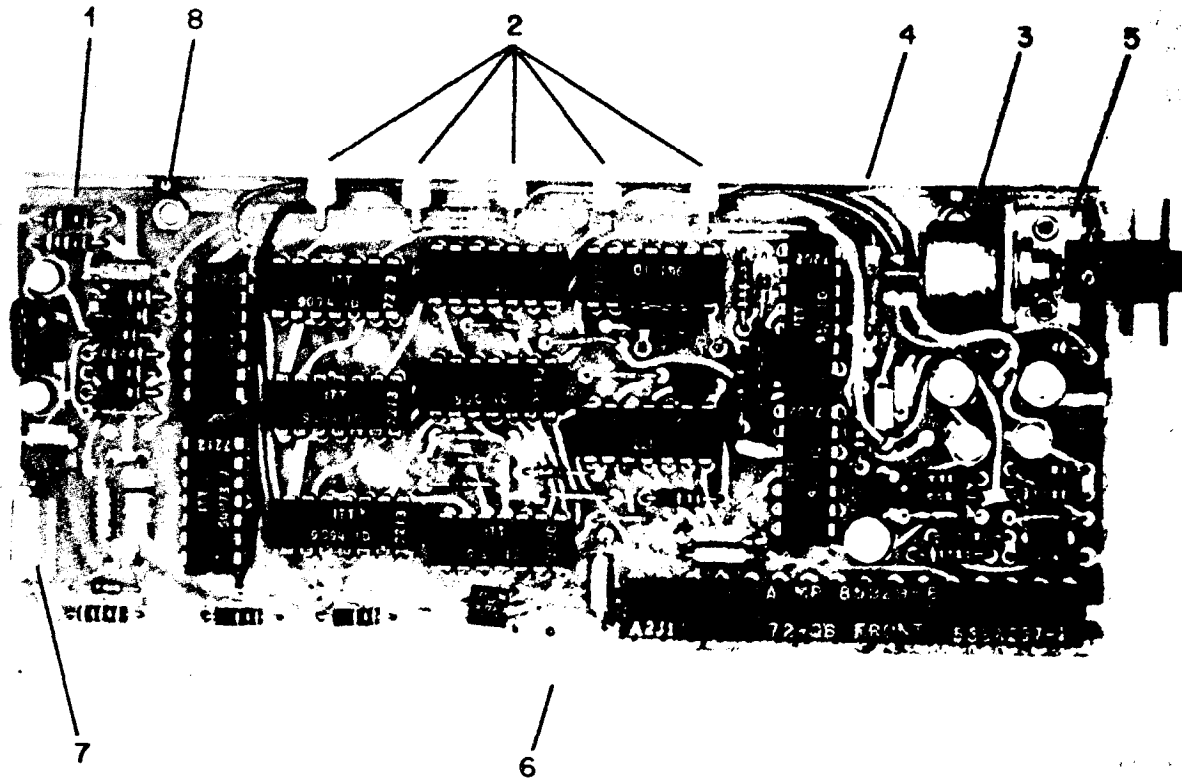


Figure 7-2. Timing Assembly A2

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY.								USABLE ON CODE	
			1	2	3	4	5	6	7			
7-2-	GC5434	TIMING ASSEMBLY (See Figure 7-1 for NHA) . . . . .									REF	
-1	GE5477	. TIMING BOARD ASSEMBLY (See Fig. 7-3 for . . . . . breakdown)									1	
-2	SKT- 14	. JACK, TIP (98291) (586 C10-24) . . . . .									5	
-3	575C27-4	. RESISTOR, VARIABLE . . . . .									1	
-4	515B2539-1	. BRACKET, ANGLE . . . . .									1	
-4	506C3-15-7	. EYELET, METALLIC (AP) . . . . .									2	
-5	515B2538	. BRACKET, ANGLE . . . . .									1	
-5	506C1-13-102	. RIVET, TUBULAR (AP) . . . . .									2	
-6	508B27	. PIN, LOCATING . . . . .									1	
-6	506C-1-102	. RIVET, TUBULAR (AP) . . . . .									1	
-7	518C259-29	. CLIP, SPRING TENSION . . . . .									1	
-7	506C1-1-102	. RIVET, TUBULAR (AP) . . . . .									1	
-8	502C117-8	. FASTENER, SELF CLINCHING . . . . .									2	

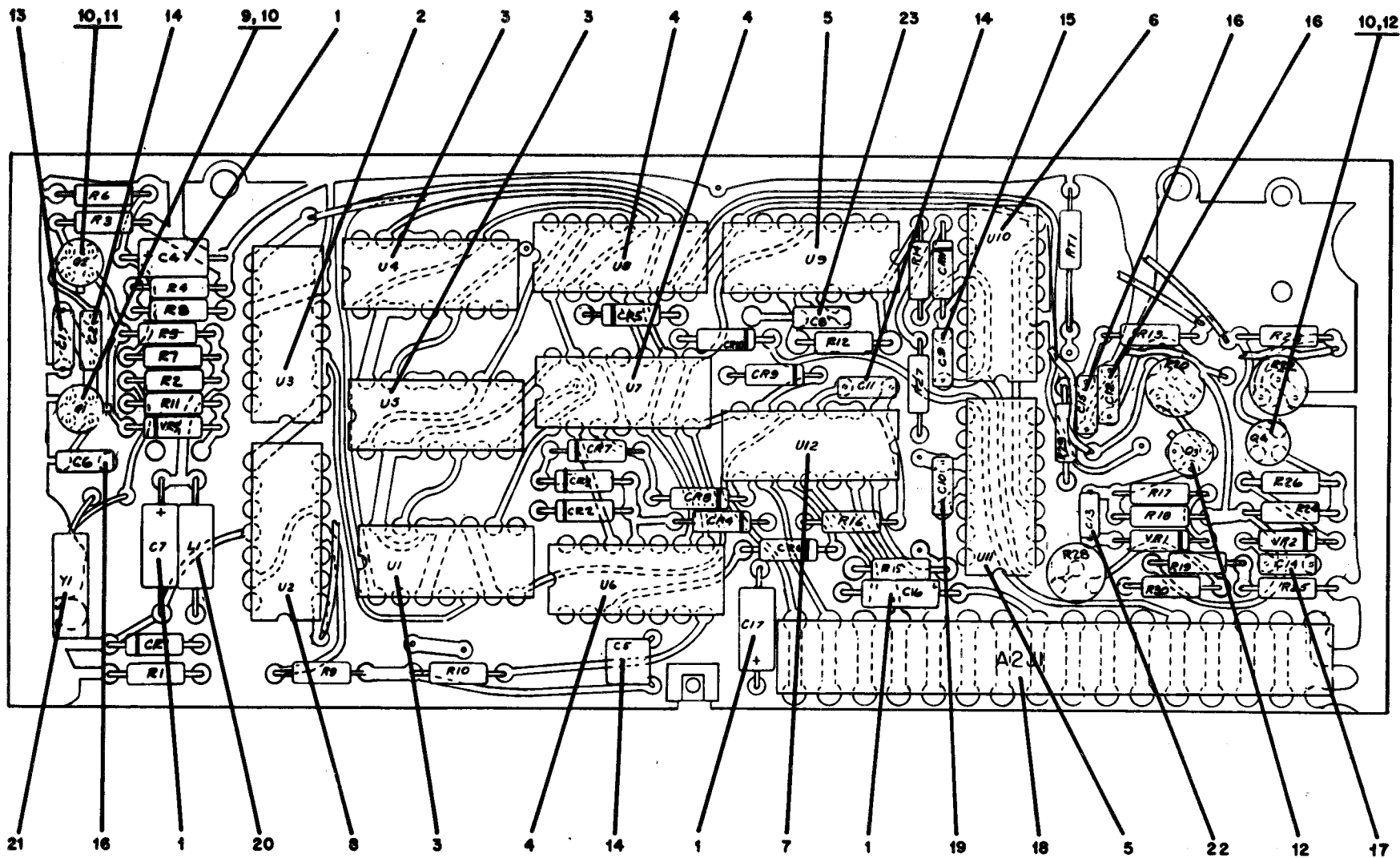


Figure 7-3. Timing Assembly A2 (1 of 3)

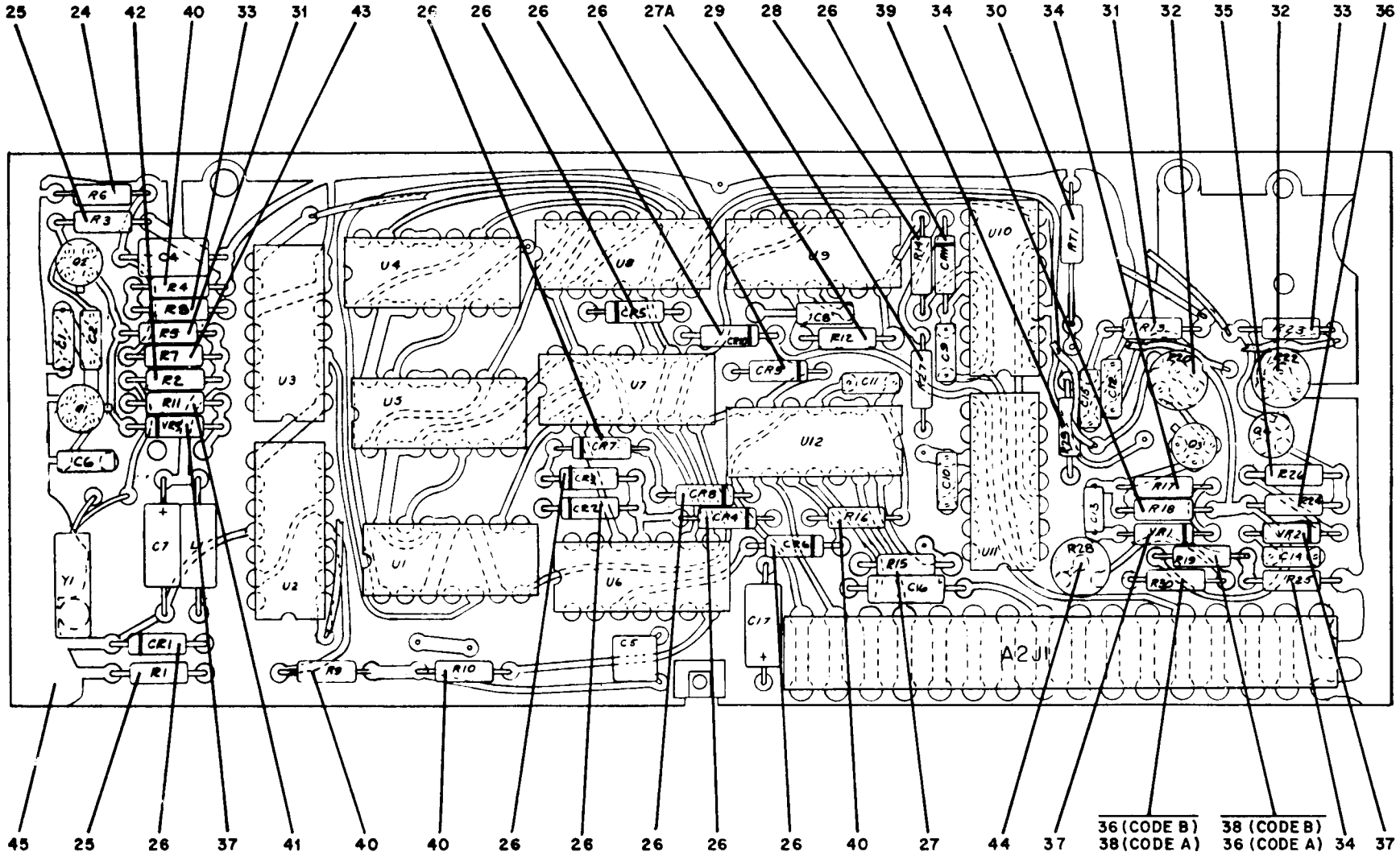


Figure 7-3. Timing Assembly A2 (2 of 3)

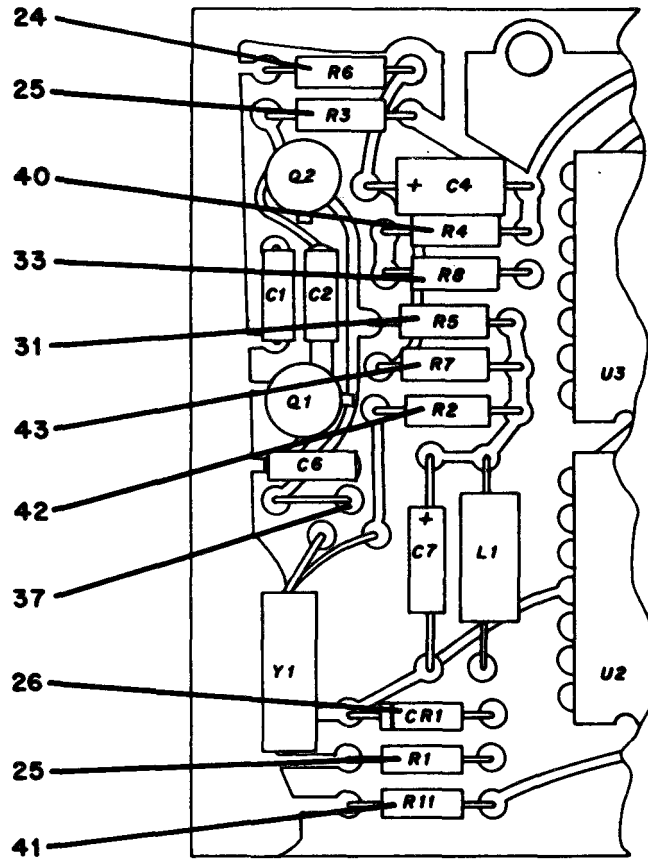


Figure 7-3. P/O Timing Assembly A2 (3 of 3), Parts Layout For Serial No. 1 thru 150

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE		
			1	2	3	4
7-3-	GE5477	TIMING BOARD ASSEMBLY (See Fig. 7-2 for NHA)..	REF			
-1	CSR13BE225KL	. CAPACITOR, FIXED, ELECTROLYTIC, DI- . . . . ELE CTRIC: Tantalum	4			
-2	600A11	. INTEGRATED CIRCUIT . . . . .	1			
-3	600A8	. INTEGRATED CIRCUIT . . . . .	3			
-4	600A3	. INTEGRATED CIRCUIT . . . . .	3			
-5	600A5	. INTEGRATED CIRCUIT . . . . .	2			
-6	600A23	. INTEGRATED CIRCUIT . . . . .	1			
-7	600A19	. INTEGRATED CIRCUIT . . . . .	1			
-8	600A22	. INTEGRATED CIRCUIT . . . . .	1			
-9	3N128	. TRANSISTOR (14936) (593A95) . . . . .	1			
-10	7717-18NWHITE	. PAD, TRANSISTOR (08289) (533 B385) . . . . .	2			
-11	593A83-1	. TRANSISTOR (14936) (Selected 3N140) . . . . .	1			
-12	2N2907 or 2N2907A	. TRANSISTOR . . . . .	2			

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY.	USABLE ON CODE
		1	2	3	4	5	6	7		
7-3-13	CM05CD100JP3 OR CM05CD100DP3	CAPACITOR, FIXED, MICA DIELECTRIC . . . . .							1	
-14	CK05BX102K	CAPACITOR, FIXED, CERAMIC DIELECTRIC . . .							3	
-15	CM05DD820GP3 OR CM05ED820GP3	CAPACITOR, FIXED, MICA DIELECTRIC . . . . .							1	
-16	CK05BX103K	CAPACITOR, FIXED, CERAMIC DIELECTRIC . . .							3	
-17	CK05BX181K	CAPACITOR, FIXED, CERAMIC DIELECTRIC . . .							1	
-18	85929-8	CONNECTOR, ELECTRICAL (00779) (588 A257-1) . .							1	
-19	DM5-470J	CAPACITOR, FIXED, MICA ELECTRIC: (72136) . (565A107-4)							1	
-20	MS18130-26	COIL, RF . . . . .							1	
-21	CR-64/U	CRYSTAL UNIT: 20 MHz . . . . .							1	
-22	CK05BX470K	CAPACITOR, FIXED, CERAMIC DIELECTRIC . . .							1	
-23	CM05DD101GP3 OR CM05FD101GP3	CAPACITOR, FIXED, MICA DIELECTRIC . . . . .							1	
-24	RCR07G391JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-25	RCR07G473JM	. RESISTOR, FIXED, COMPOSITION . . . . .							2	
-26	1N3064 OR 1N4454	. SEMICONDUCTOR DEVICE, DIODE . . . . .							11	
-27	RCR07G . . . JM	. RESISTOR, FIXED, COMPOSITION . . . . . Selected Value from RCR07G272JM to RCR07G104JM							1	G
	RN55D . . . . F	. RESISTOR, FIXED, FILM . . . . . Selected Value from RN55D6651F to RN55D2432F							1	H
-27A	RCR07G . . . JM	. RESISTOR, FIXED, COMPOSITION . . . . . Selected Value from RCR07G272JM to RCR07G104JM							1	G
	RN55D . . . . F	. RESISTOR, FIXED, FILM . . . . . Selected Value from RN55D3921F to RN55D3922F							1	H
-28	RCR07G223JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-29	RCR07G682JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-30	RTH22ES682K	RESISTOR, THERMAL . . . . .							1	
-31	RCR07G511JM	. RESISTOR, FIXED, COMPOSITION . . . . .							2	
-32	575A68-1	. RESISTOR, VARIABLE . . . . .							2	
-33	RCR07G101JM	RESISTOR, FIXED, COMPOSITION . . . . .							2	
-34	RCR07G122JM	. RESISTOR, FIXED, COMPOSITION . . . . .							3	
-35	RCR07G182JM	RESISTOR, FIXED, COMPOSITION . . . . .							1	
-36	RCR07G472JM	. RESISTOR, FIXED, COMPOSITION . . . . .							2	A
-37	1N757A	SEMICONDUCTOR DEVICE, DIODE: Zener . . . . .							3	
-38	RCR07G120JM	RESISTOR, FIXED, COMPOSITION . . . . .							1	B
-39	RCR07G471JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-40	RCR07G103JM	. RESISTOR, FIXED, COMPOSITION . . . . .							4	
-41	RCR07GF202JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-42	RCR07G102JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-42	RCR07G681JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-43	RCR07G272JM	. RESISTOR, FIXED, COMPOSITION . . . . .							1	
-44	3329H-1-503	RESISTOR, VARIABLE (80294) (575A68-2) . . . . .							1	
-45	532E1016	. PRINTED WIRING BOARD (Revision H) . . . . .							1	

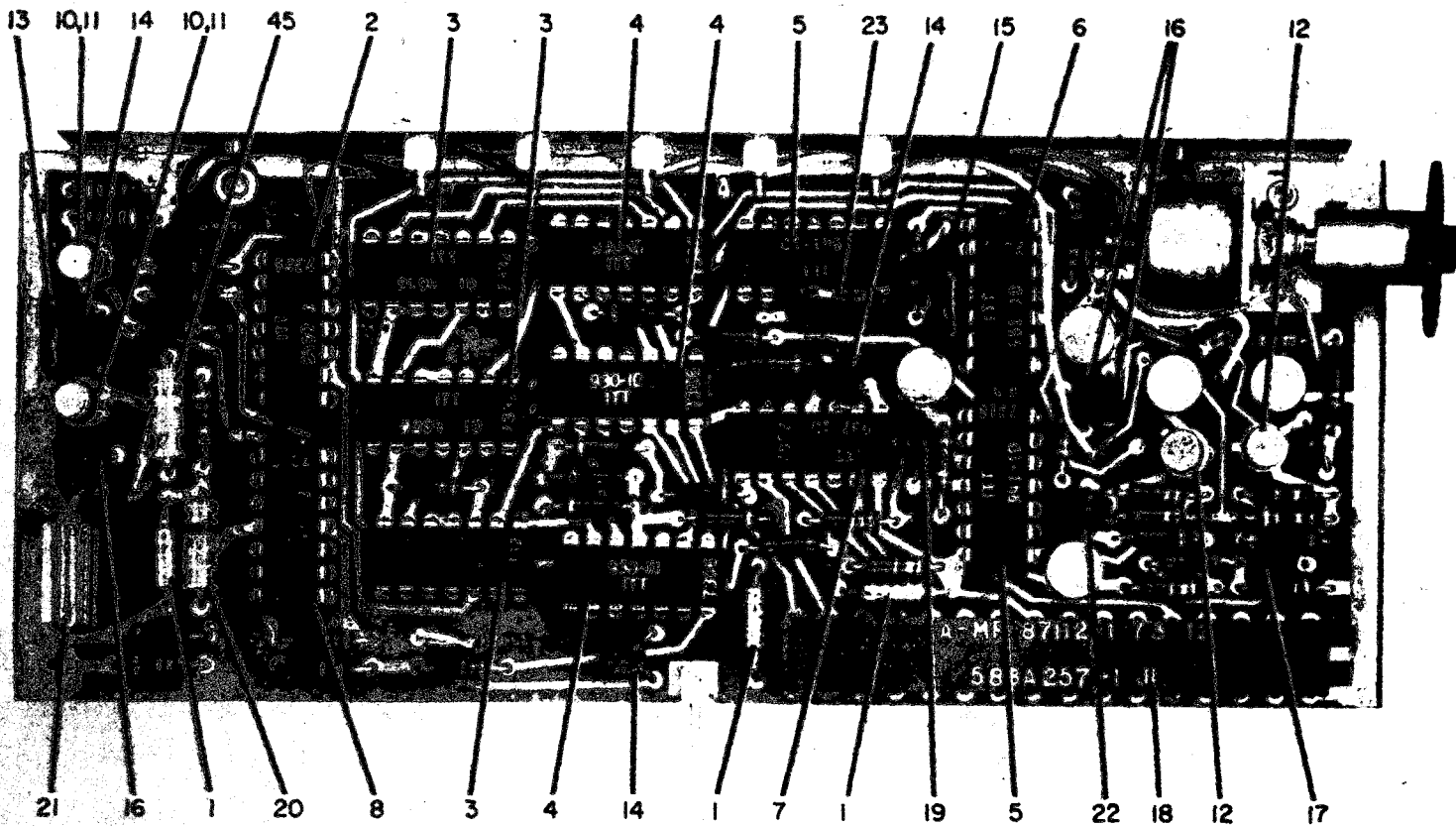


Figure 7-3A. Timing Board Assembly (1 of 2)

T.O. 12P4-2APX-202  
 NAVVAIR 16-35TS1843-2  
 TM-11-6625-1646-24-1

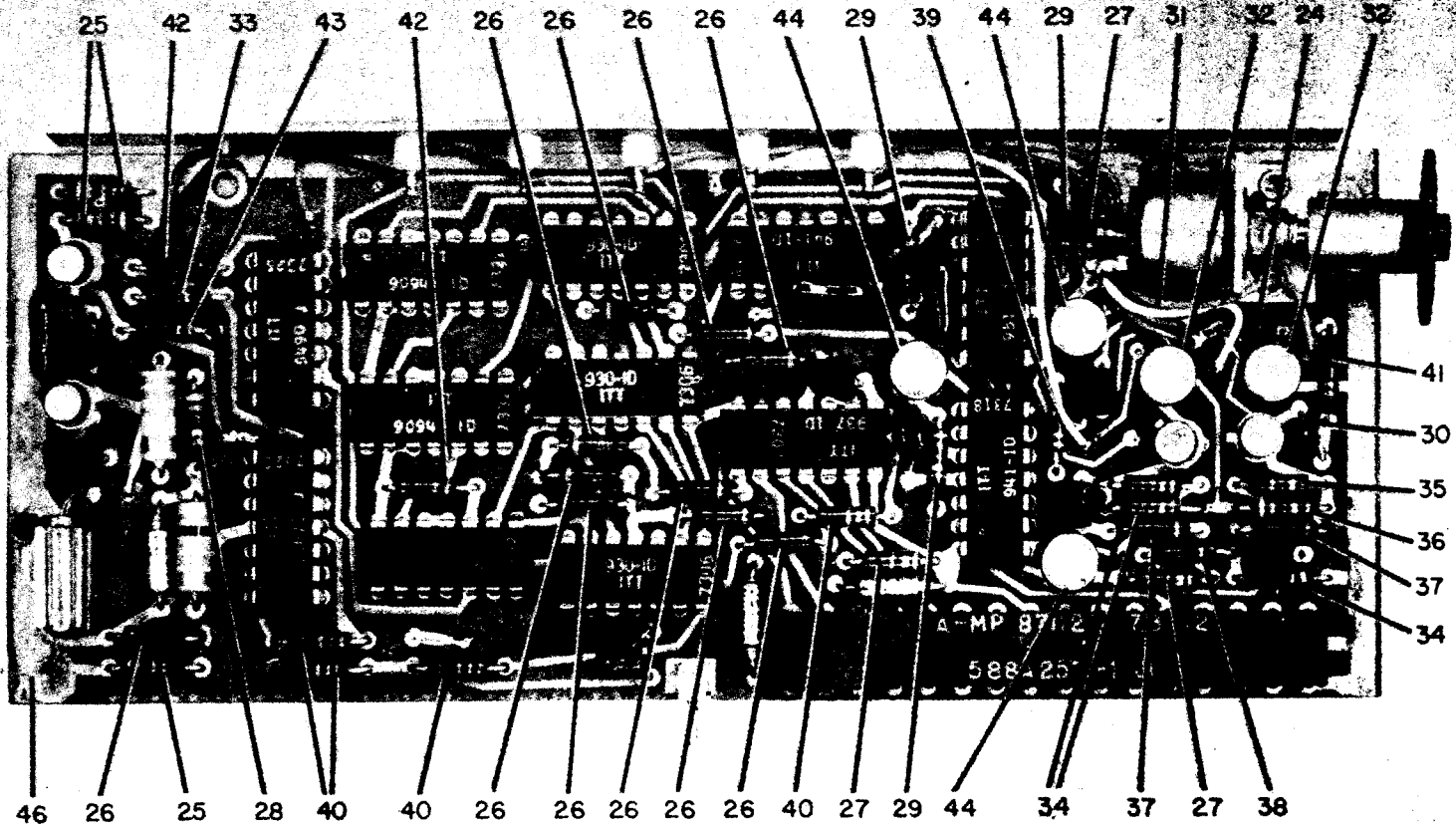


Figure 7-3A. Timing Board Assembly (2 of 2)



FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
7-3A-	GE5477	TIMING BOARD ASSEMBLY (See Fig. 7-2 for NHA). (PC BOARD REVISION H and higher)	REF	D
-1	CSR13BE225KL	. CAPACITOR, FIXED, ELECTROLYTIC, DI- . . . . ELECTRIC: Tantalum	3	
-2	600A11	. INTEGRATED CIRCUIT . . . . .	1	
-3	600A8	. INTEGRATED CIRCUIT . . . . .	3	
-4	600A3	. INTEGRATED CIRCUIT . . . . .	3	
-5	600A5	. INTEGRATED CIRCUIT . . . . .	2	
-6	600A23	. INTEGRATED CIRCUIT . . . . .	1	
-7	600A19	. INTEGRATED CIRCUIT . . . . .	1	
-8	600A22	. INTEGRATED CIRCUIT . . . . .	1	
-9	3N128	. TRANSISTOR (14936) (593A95) . . . . .	1	
-10	7717-18NWHITE	. PAD, TRANSISTOR (08289) (533 B385) . . . . .	2	
-11	593A83-1	. TRANSISTOR (14936) (Selected 3N140) . . . . .	1	
-12	2N2907 OR 2N2907A	. TRANSISTOR . . . . .	2	
-13	CM05CD100JP3 OR CM05CD100DP3	. CAPACITOR, FIXED, MICA DIELECTRIC . . . . .	1	
-14	CK05BX102K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC . . . . .	3	
-15	CM05DD820GP3 OR CM05ED820GP3	. CAPACITOR, FIXED, MICA DIELECTRIC . . . . .	1	
-16	CK05BX103K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC . . . . .	3	
-17	CK05BX181K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC . . . . .	1	
-18	85929-8	. CONNECTOR, ELECTRICAL (00779) (588 A257-1).	1	
-19	DM5-100J	. CAPACITOR, FIXED, MICA ELECTRIC: (72136) (565 A107-5) . . . . .	1	
-20	MS18130-26	. COIL, RF . . . . .	1	
-21	CR-64/U	. CRYSTAL UNIT: 20 MHz . . . . .	1	
-22	CK05BX470K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC . . . . .	1	
-23	CM05DD510GP3 OR CM05FD101GP3	. CAPACITOR, FIXED, MICA DIELECTRIC . . . . .	1	
-24	RCR07G181JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-25	RCR07G473JM	. RESISTOR, FIXED, COMPOSITION . . . . .	3	
-26	1N3064 OR 1N4454	. SEMICONDUCTOR DEVICE, DIODE . . . . .	10	
-27	RCR07G123JM	. RESISTOR, FIXED, COMPOSITION . . . . .	3	
-28	RCR07G471JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-29	RCR07G822JM	. RESISTOR, FIXED, COMPOSITION . . . . .	3	
-30	KB21J1	. RESISTOR, THERMAL (02606) (561 C28-3). . . . .	1	
-31	RCR07G511JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-32	575A68-1	. RESISTOR, VARIABLE . . . . .	2	
-33	RCR07G101JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-34	RCR07G122JM	. RESISTOR, FIXED, COMPOSITION . . . . .	3	
-35	RCR07G182JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-36	RCR07G472JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-37	1N757A	. SEMICONDUCTOR DEVICE, DIODE: Zener . . . . .	2	
-38	RCR07G120JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-39	RCR07G681JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-40	RCR07G103JM	. RESISTOR, FIXED, COMPOSITION . . . . .	4	
-41	RCR07GF221JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-42	RCR07G102JM	. RESISTOR, FIXED, COMPOSITION . . . . .	2	
-43	RCR07G201JM	. RESISTOR, FIXED, COMPOSITION . . . . .	1	
-44	3329H-1-503	. RESISTOR, VARIABLE (80294) (575A68-2) . . . . .	3	
-45	MS18130-16	. COIL, RF . . . . .	1	
-46	532E1016	. PRINTED WIRING BOARD (REV G) . . . . .	1	D

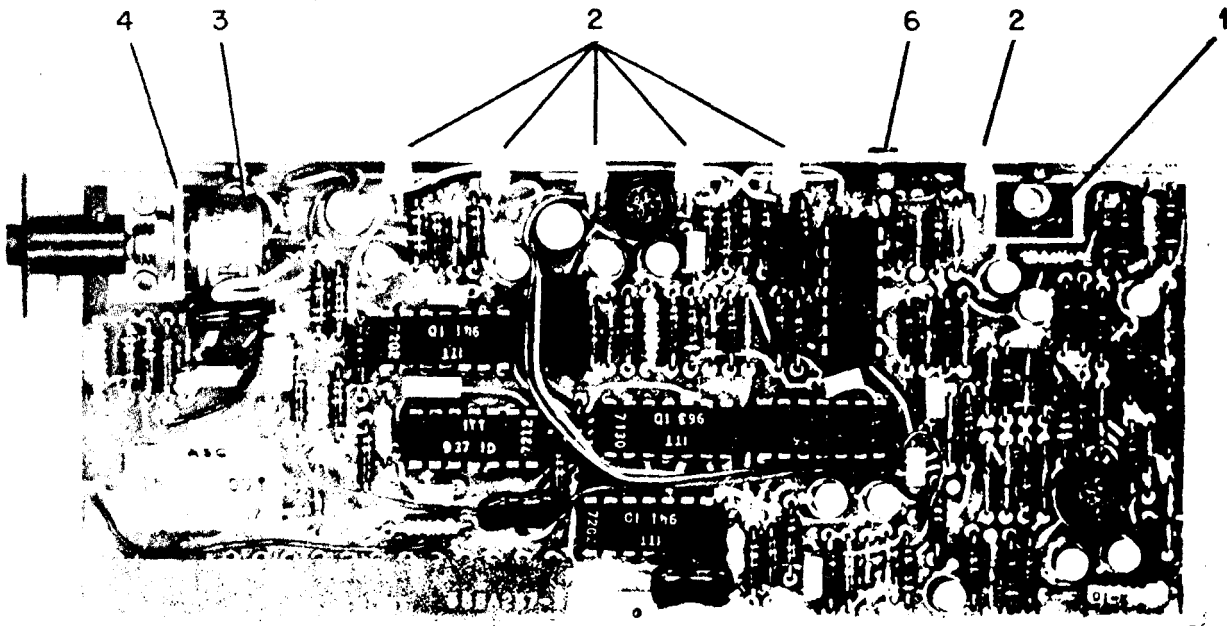


Figure 7-4. Evaluator Assembly A3

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY.	USABLE ON CODE
		1	2	3	4	5	6	7		
7-4-	GC5435	EVALUATOR ASSEMBLY (See Fig. 7-1 for NHA). . .							REF	
-1	GE5478	. EVALUATOR BOARD ASSEMBLY (See Fig. 7-5 . . . for breakdown)							1	
-2	SKT-14	. JACK, TIP (98291) (586 C10-24). . . . .							6	
-3	575C27-5	. RESISTOR, VARIABLE . . . . .							1	
	515B2538	. BRACKET, ANGLE . . . . .							1	
	506C1-13-102	. RIVET, TUBULAR (AP) . . . . .							2	
-4	515B2539-2	. BRACKET, ANGLE . . . . .							1	
	502C117-8	. FASTENER, SELF CLINCHING . . . . .							2	
-5	508B27	. PIN, LOCATING . . . . .							1	
	506C1-3-102	. RIVET, TUBULAR . . . . .							1	
-6	586C10-24F	. JACK TIP (98291) . . . . .							1	

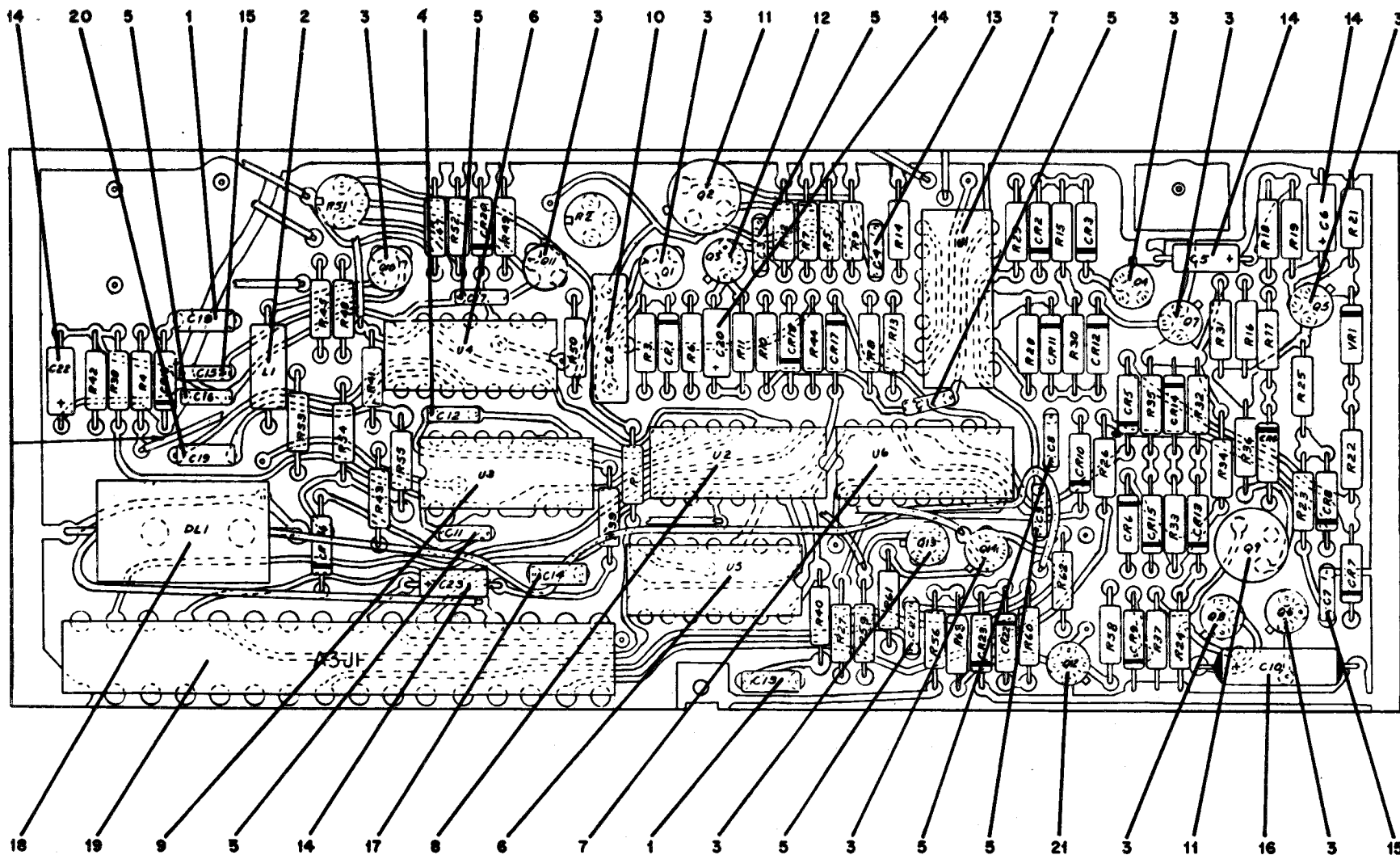


Figure 7-5. Evaluator Board Assembly A3 (1 of 3)

T.O. 12P4-2APX-202  
 NAVAIR 16-35TS1843-2  
 TM-11-6625-1646-24-1

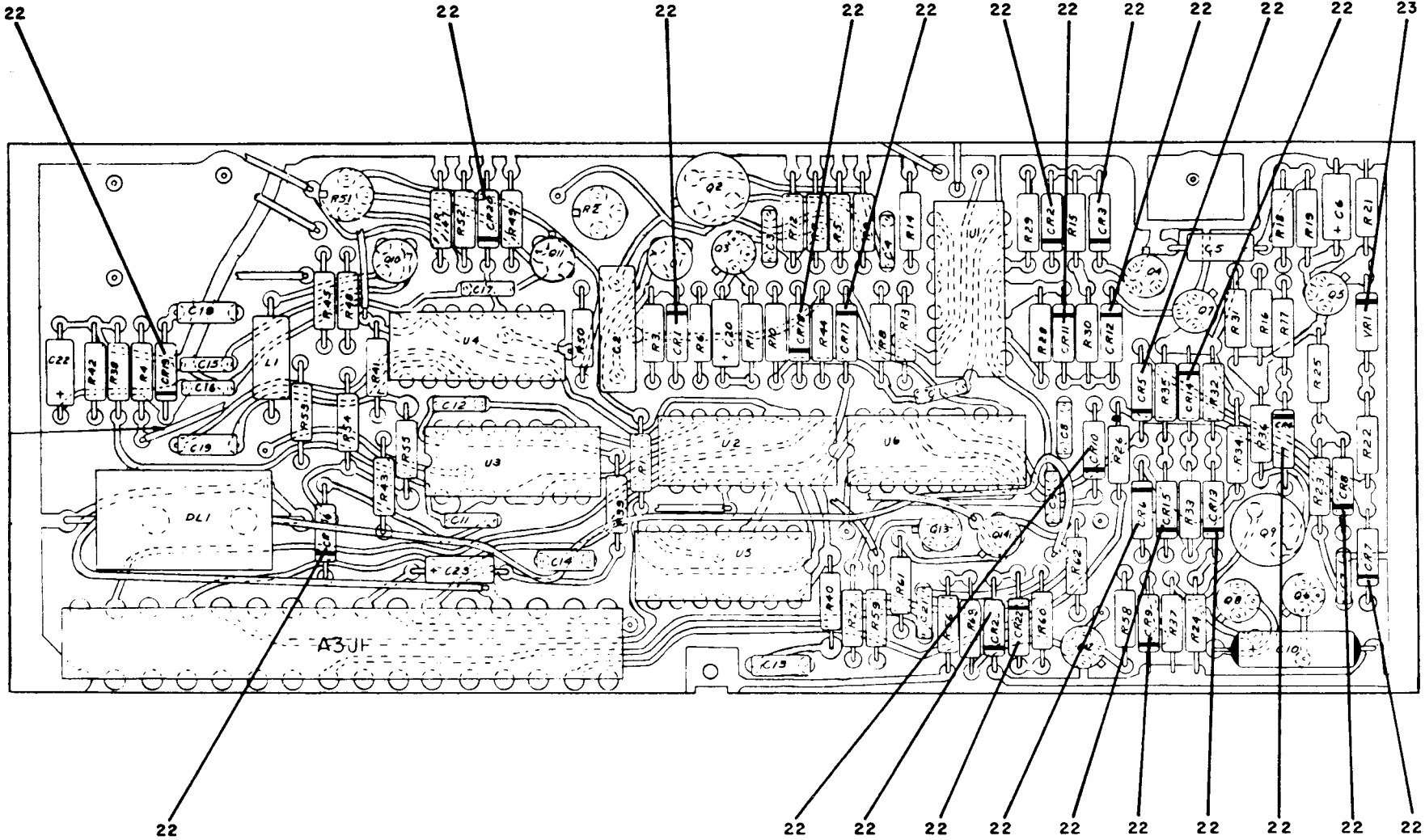


Figure 7-5. Evaluator Board Assembly A3 (2 of 3)

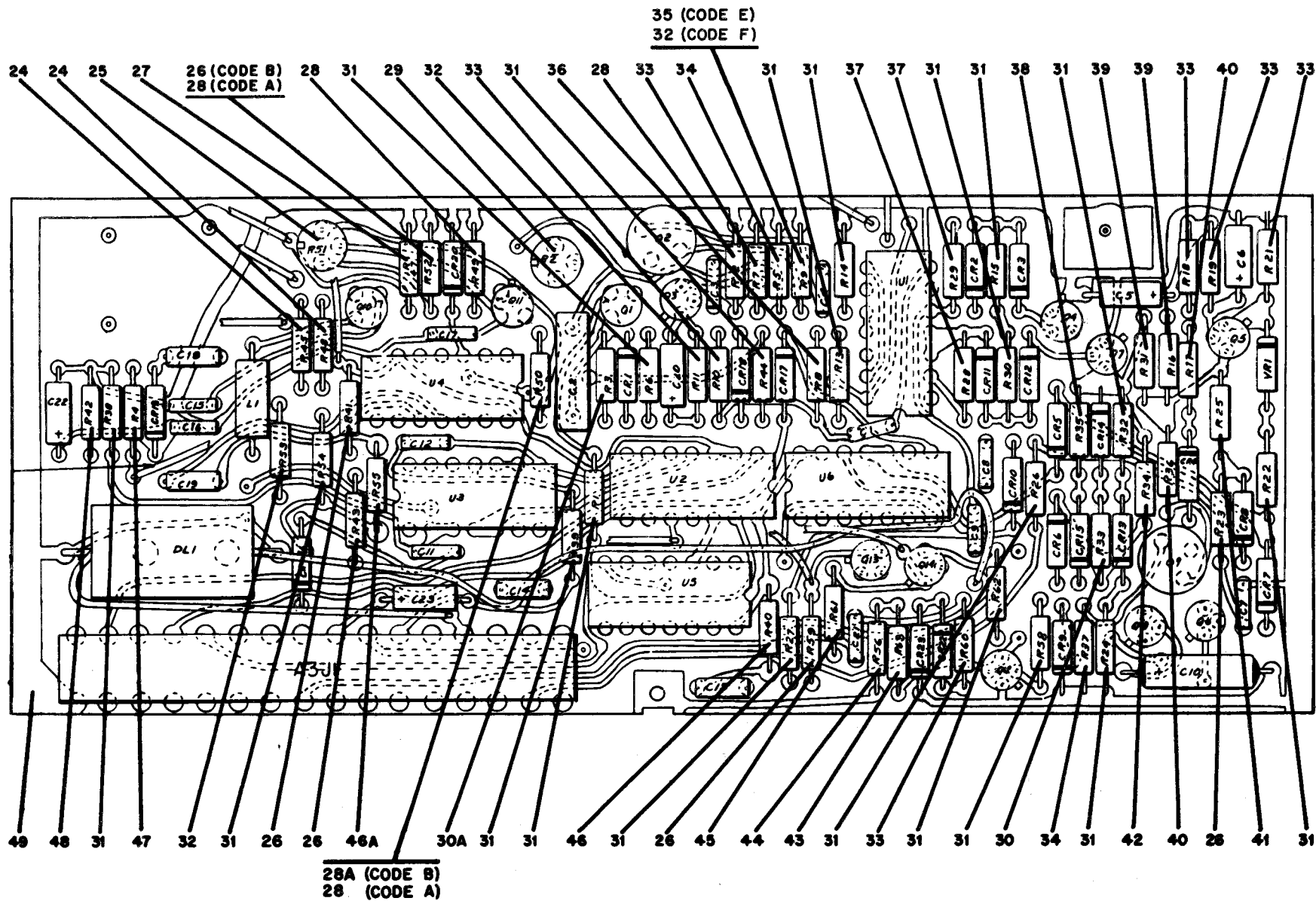
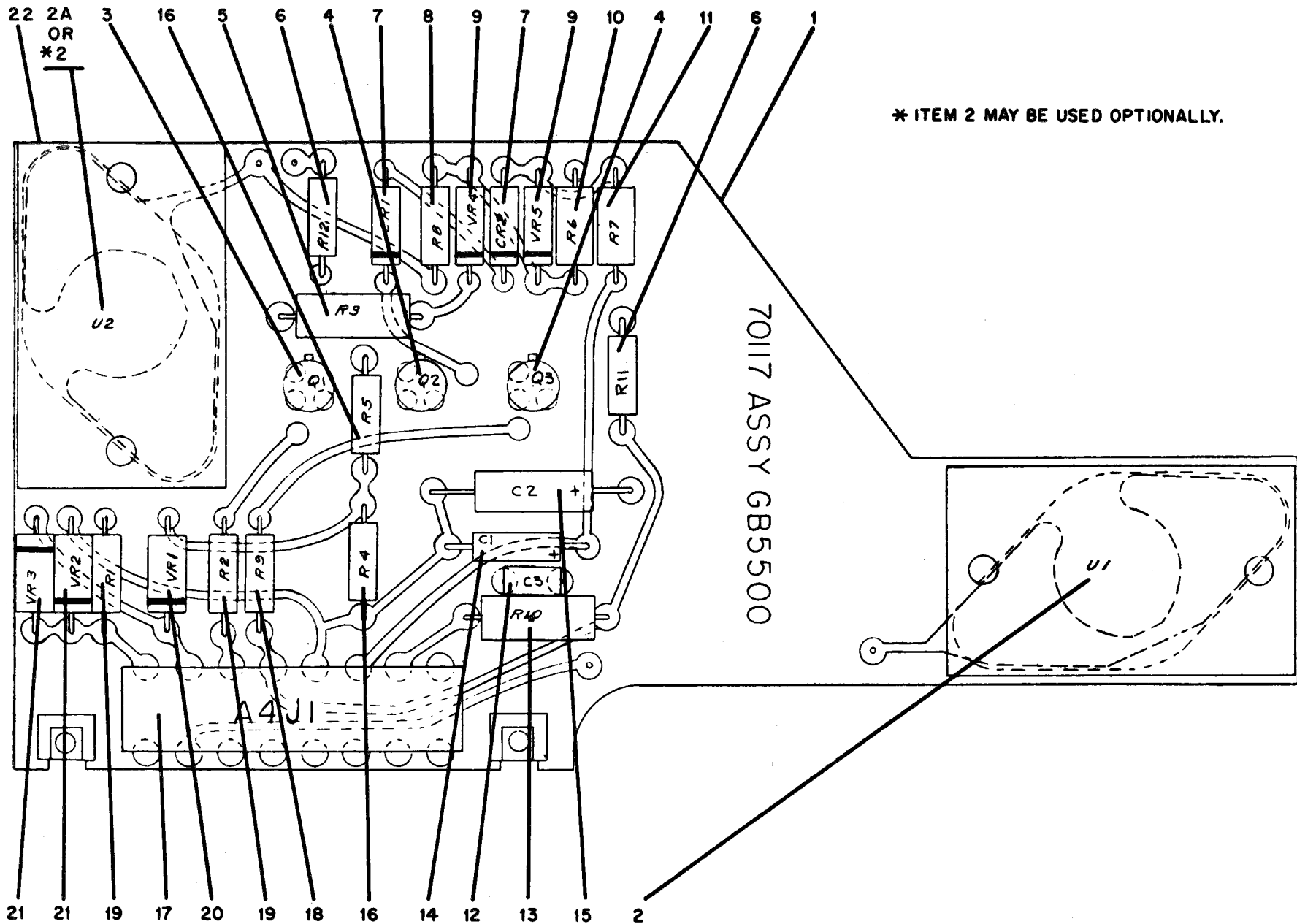


Figure 7-5. Evaluator Board Assembly A3 (3 of 3)

T. O. 12P4-2APX-302  
NAVAIR 16-35TS18A3-2  
TM-11-6625-1646-24-1

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
7-5-	GE5478	EVALUATOR BOARD ASSEMBLY (See Fig. 7-4 for .. NHA)	REF	
-1	CM05DD510GP3 OR CM05ED510GP3	CAPACITOR, FIXED, MICA ELECTRIC. ....	2	
-2	MS18130-26	. COIL, RF .....	1	
-3	2N2222	. TRANSISTOR .....	10	
	7717-18NWHITE	. PAD, TRANSISTOR (08289) (533 B385) .....	12	
-4	CK06BX223K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	1	
-5	CK05BX103K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	8	
-6	600A5	. INTEGRATED CIRCUIT .....	2	
-7	600A7	. INTEGRATED CIRCUIT .....	2	
-8	600A21	. INTEGRATED CIRCUIT .....	1	
-9	600A19	. INTEGRATED CIRCUIT .....	1	
-10	KA3302FK50K	. CAPACITOR, FIXED, FILM (05397) (565 C99-1)...	1	
-11	2N491A	. TRANSISTOR .....	2	
	7717-4NWHITE	. PAD, TRANSISTOR (13103) (533 B329) .....	2	
-12	2N2907 OR 2N2907A	. TRANSISTOR .....	1	
-13	CK06BX104K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	1	
-14	CSR13E225KL	. CAPACITOR, FIXED, ELECTROLYTIC: Tantalum	5	
-15	CK05BX102K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	2	
-16	CSR13F685KL	. CAPACITOR, FIXED, ELECTROLYTIC: Tantalum	1	
-17	CM05CD120KP3 OR CM05CD120JP3	. CAPACITOR, FIXED, MICA DIELECTRIC .....	1	
-18	572C36-3	. DELAY LINE .....	1	
-19	85929-8	. CONNECTOR, ELECTRICAL (00779) (588 A257-1) ..	1	
-20	CM05CD050DP3	. CAPACITOR, FIXED, MICA DIELECTRIC .....	1	
-21	593A83-1	. TRANSISTOR (Selected 3N140) .....	1	
-22	1N3064 OR 1N4454	. SEMICONDUCTOR DEVICE, DIODE .....	22	
-23	1N751A	. SEMICONDUCTOR DEVICE, DIODE: Zener .....	1	
-24	RCR07G471JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-25	3320H102	. RESISTOR, VARIABLE (80294) (575 A68-1) .....	1	
-26	RCR07G511JM	. RESISTOR, FIXED, COMPOSITION .....	5	
-27	RCR07G391JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-28	RCR07G102JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-28A	RCR07G152JM	. RESISTOR, FIXED, COMPOSITION .....	1	B
-29	3329H-1-503	. RESISTOR, VARIABLE (80294) (575A68-2) .....	1	
-30	RCR07G683JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-30A	RCR07G683JM	. RESISTOR, FIXED, COMPOSITION .....	1	K
	RCR07G ... JM	. RESISTOR, FIXED, COMPOSITION .....	1	L
		Value Selected from RCR07G683JM to RCR07G104JM		
-31	RCR07G103JM	. RESISTOR, FIXED, COMPOSITION .....	17	
-32	RCR07G101JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-33	RCR07G472JM	. RESISTOR, FIXED, COMPOSITION .....	6	
-34	RCR07G470JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-35	RCR07G680JM	. RESISTOR, FIXED, COMPOSITION .....	1	C
-36	RCR07G561JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-37	RCR07G272JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-38	RCR07G204JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-39	RCR07G821JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-40	RCR07G681JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-41	RCR07G202JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-42	RCR07G394JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-43	RCR07G2R7JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-44	RCR07G302JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-45	RCR07G331JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-46	RCR07G ... JM	. RESISTOR, FIXED, COMPOSITION .....	1	G
		Value Selected from RCR07G472JM to RCR07G223JM		
	RN55D .... F	. RESISTOR, FIXED, FILM .....	1	J
		Value Selected from RN55D6651F to RN55D2432F		
-46A	RCR07G ... JM	. RESISTOR, FIXED, COMPOSITION .....	1	G
		Value Selected from RCR07G472JM to RCR07G333JM		
	RN55D .... F	. RESISTOR, FIXED, FILM .....	1	J
		Value Selected from RN55D6651F to RN55D2432F		
-47	RCR07G152JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-48	RCR07G822JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-49	532F101 7	. PRINTED CIRCUIT BOARD .....	1	



\* ITEM 2 MAY BE USED OPTIONALLY.

Figure 7-6. Regulator Assembly A4

T.O. 12P4-2APX-202  
 NAVAIR 16-35TS1843-2  
 TM-11-6625-1646-24-1

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY.	USABLE ON CODE
		1	2	3	4	5	6	7		
7-6-	GB5500	REGULATOR ASSEMBLY (See Fig. 7-1 for NHA) . . . .							REF	
- 1	GD5479	. REGULATOR BOARD ASSEMBLY . . . . .							1	
- 2	U2T2006	. . INTEGRATED CIRCUIT (12969) (593 A96-1) . . . .							1	
- 2 A	U2T2023	. . INTEGRATED CIRCUIT (12969) (593 A96-2) . . . .							1	
	GB5509	. . HEAT SINK ASSEMBLY . . . . .							2	
	MS24693-C3	. . SCREW, MACHINE (AP) . . . . .							4	
- 3	2N2907 OR 2N2907A	. . TRANSISTOR . . . . .							1	
	FP-10	. . PAD, TRANSISTOR (08289) (533 B320) . . . . .							3	
- 4	2N2222	. . TRANSISTOR . . . . .							2	
- 5	RCR20G202JM	. . RESISTOR, FIXED, COMPOSITION . . . . .							1	
- 6	RCR07G271JM	. . RESISTOR, FIXED, COMPOSITION . . . . .							2	
- 7	1N3064 OR 1N4454	. . SEMICONDUCTOR DEVICE, DIODE . . . . .							2	
- 8	RCR07G751JM	. . RESISTOR, FIXED, COMPOSITION . . . . .							1	
- 9	1N821	. . SEMICONDUCTOR DEVICE, DIODE . . . . .							2	
- 10	RN55D . . . F	. . RESISTOR, FIXED, COMPOSITION . . . . .							1	
		Value Selected from RN55D2050F, RN55D2260F, RN55D2490F, RN55D2740F								
- 11	RN55D7500F	. . RESISTOR, FIXED, COMPOSITION . . . . .							1	
- 12	CK05BX104K	. . CAPACITOR, FIXED, CERAMIC DIELECTRIC . . . . .							1	
- 13	4034	. . RESISTOR, WIREWOUND (44655) (560A73-1) . . . .							1	
- 14	CSR13E225KL	. . CAPACITOR, FIXED, ELECTROLYTIC . . . . .							1	
		DIELECTRIC: Tantalum								
- 15	CSR13F685KL	. . CAPACITOR, FIXED, ELECTROLYTIC: . . . . .							1	
		Tantalum								
- 16	RCR07G103JM	. . RESISTOR, FIXED, COMPOSITION . . . . .							2	
- 17	3-85929-7	. . CONNECTOR, ELECTRICAL: (00779) . . . . .							1	
		(588A257-2)								
- 18	RCR07G101JM	. . RESISTOR, FIXED, COMPOSITION . . . . .							1	
- 19	RCR07G183JM	. . RESISTOR, FIXED, COMPOSITION . . . . .							2	
- 20	1N974B	. . SEMICONDUCTOR DEVICE, DIODE: Zener . . . .							1	
- 21	UZ5833	. . SEMICONDUCTOR DEVICE, DIODE: (12969) . . . .							2	
		(593A91)								
- 22	532D1034	. . PRINTED CIRCUIT BOARD . . . . .							1	



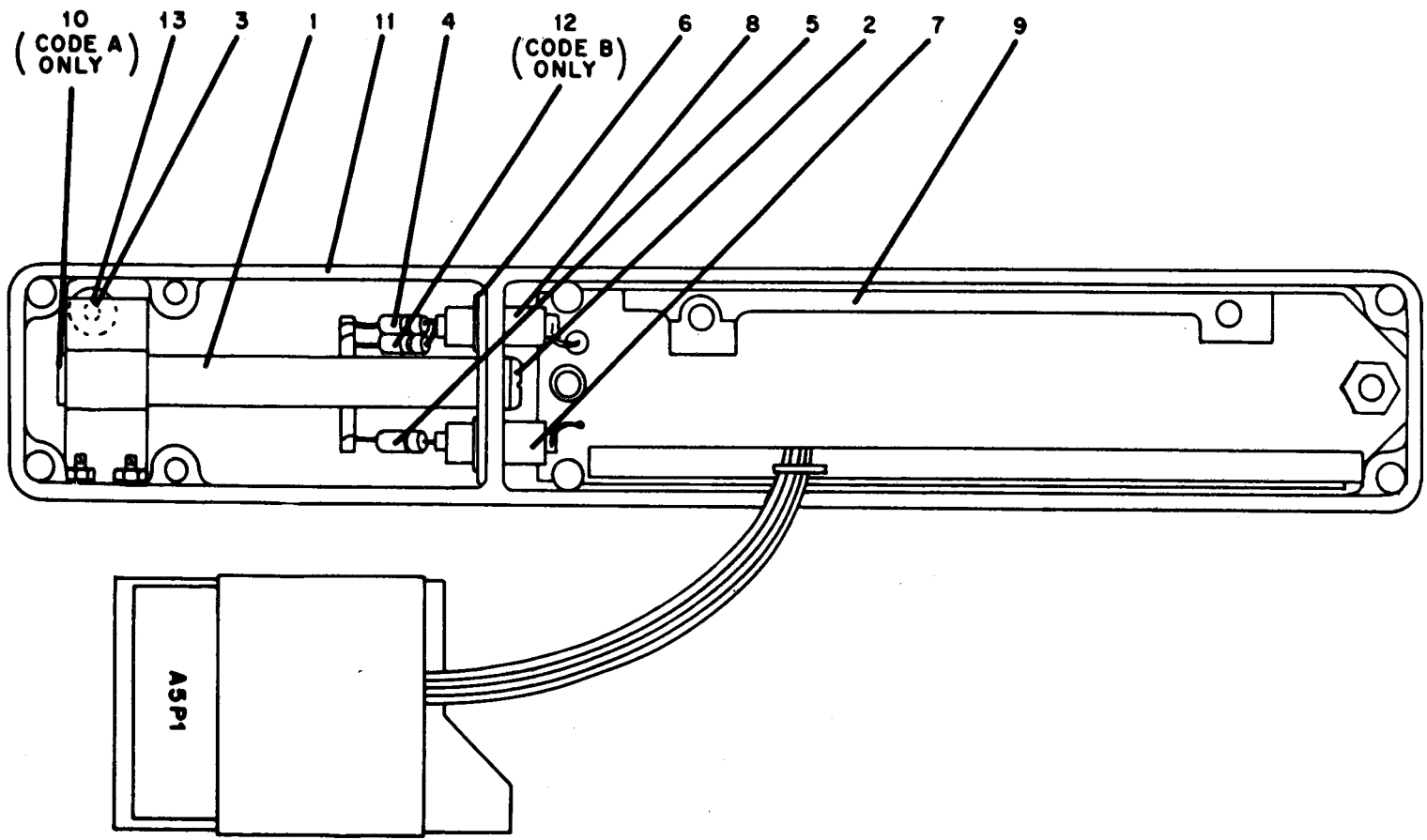


Figure 7-7. Signal Generator and Receiver Assembly A5

T.O. 12P4-2APX-202  
 NAVVAIR 16-35T61843-2  
 TM-11-6625-1646-24-1

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY.	USABLE ON CODE
		1	2	3	4	5	6	7		
7-7-	GD5483	SIGNAL GENERATOR AND RECEIVER ASSEMBLY .. (See Fig. 7-1 for NHA)							REF	
-1	528B303	. TUNING ROD.....							1	
-2	MS35338-136	. WASHER, LOCK (AP) .....							1	
	MS51957-28	. SCREW, MACHINE (AP) .....							1	
-3	518B370	. SPRING, FLAT .....							1	
	MS51960-2	. SCREW, MACHINE (AP) .....							2	
	503B1-91	. WASHER, FLAT (AP) .....							2	
	MS35650-314	. NUT, HEXAGON (AP) .....							2	
-4	1N3064	. SEMICONDUCTOR DEVICE, DIODE .....							1	
-5	1N82AG	. SEMICONDUCTOR DEVICE, DIODE .....							1	
-6	GB5495-2	. PLATE ASSEMBLY .....							1	
	515B2519	. . PLATE .....							1	
-7	2404-002S2L0709D	. . CAPACITOR, FEEDTHRU: (72982) (565C101-2).							1	
-8	2404-002-T2H0- 470K	. . CAPACITOR, FEEDTHRU: (72982) (565A106-2).							1	
-9	GE5480	. CIRCUIT CARD ASSY (See Fig. 7-8 for breakdown).							1	
	MS35338-134	. WASHER, LOCK (AP) .....							2	
	MS51957-3	. SCREW, MACHINE (AP) .....							2	
-10	529B279	. SPACER .....							1	A
	MS51959-2	. SCREW, MACHINE (AP) .....							1	A
-11	GB5481	. HOUSING ASSEMBLY .....							1	
	520C259	. . HOUSING .....							1	
	FE0440	. NUT, CLINCH: (46384) (502C117-8) .....							2	
	GD5496	. VSWR ADJUST ASSEMBLY (See Fig. 7-9 for .....							1	
		breakdown)								
	MS35338-136	. WASHER, LOCK (AP) .....							2	
	MS51957-3	. SCREW, MACHINE (AP) .....							2	
-12	RCR07G391JM	. RESISTOR, FIXED .....							1	B
-13	CS-26	. SET SCREW (00141) (501C125-16) .....							1	

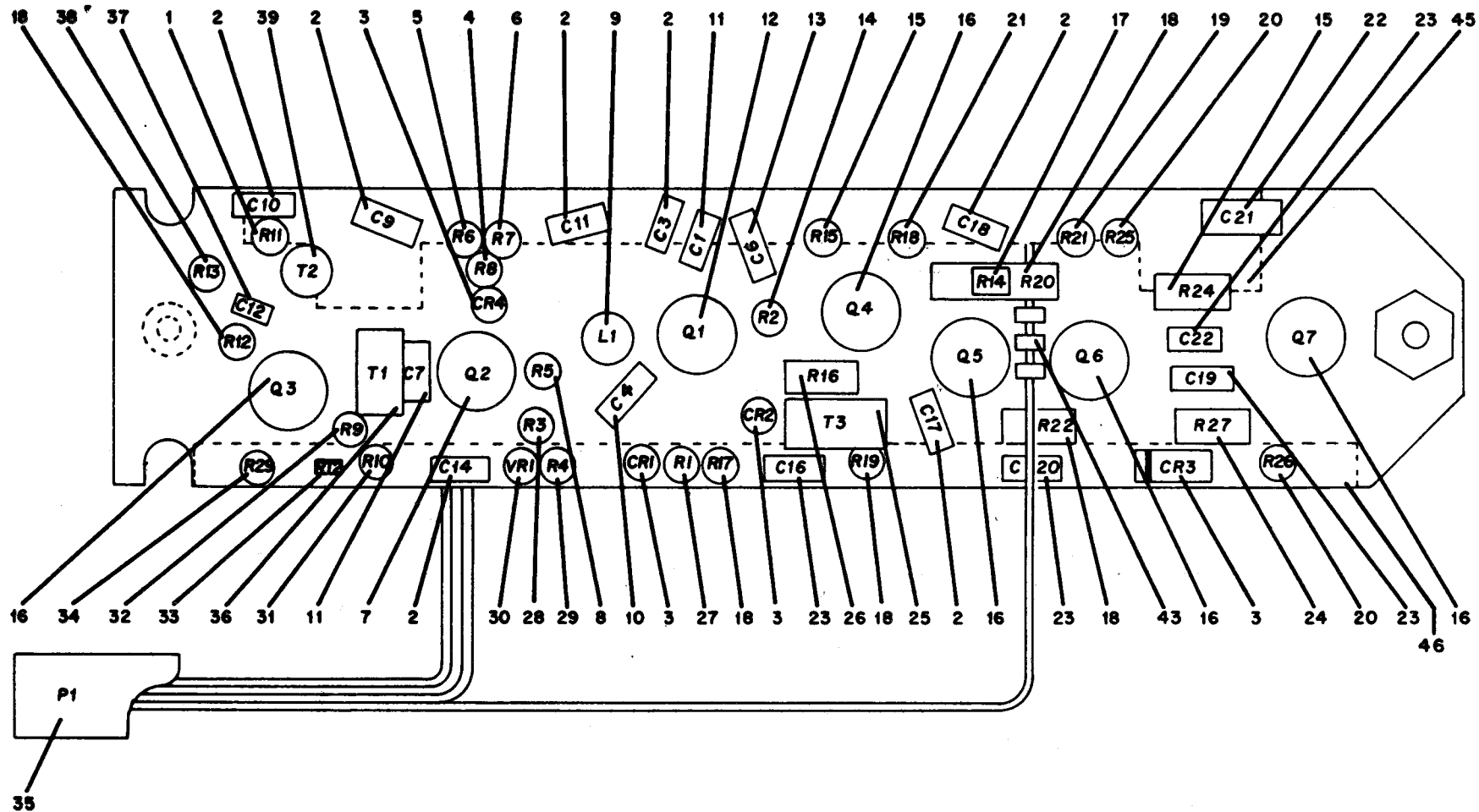


Figure 7-8. Receiver - Generator Board A5A1 (1 of 2)

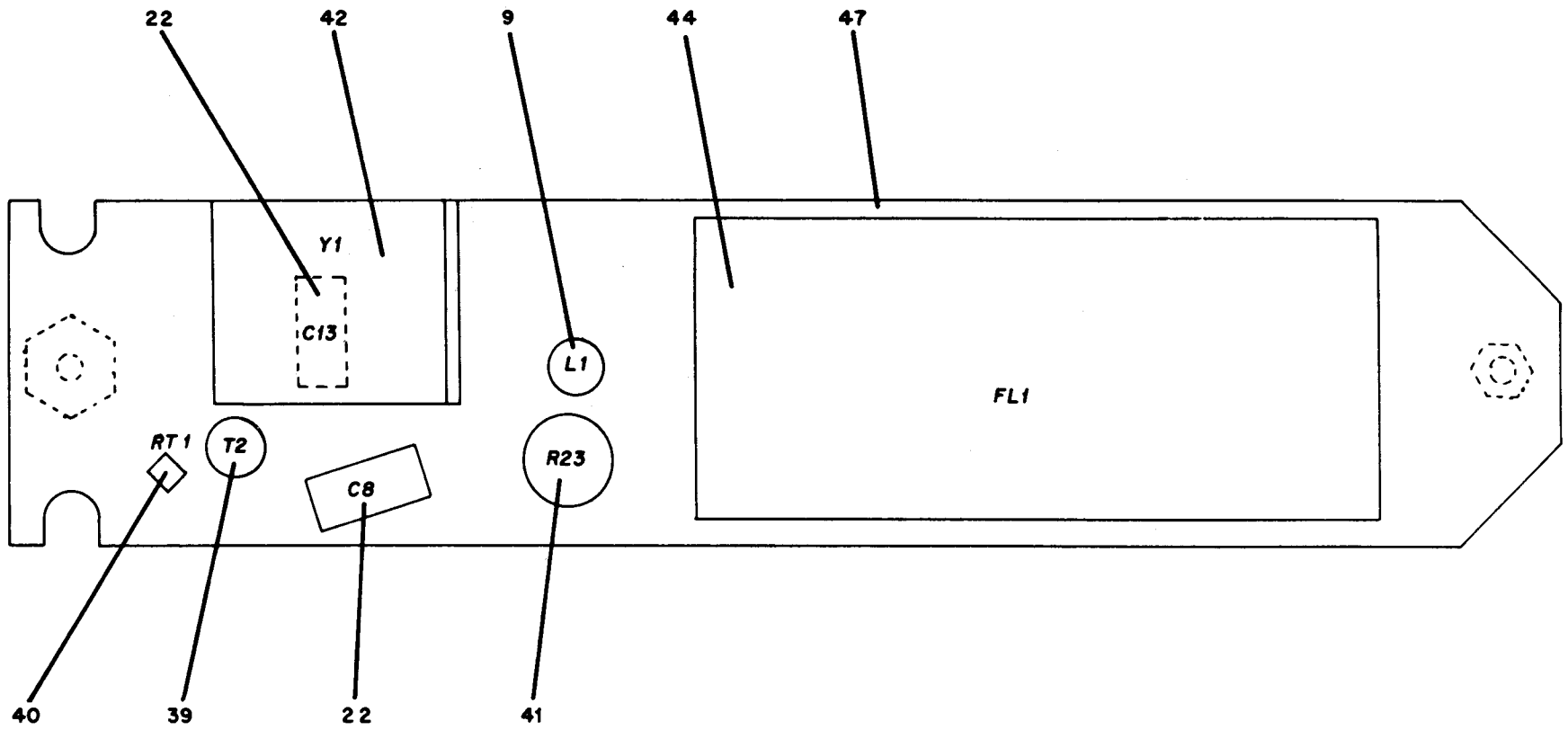


Figure 7-8. Receiver - Generator Board A5A1 (2 of 2)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
7-8-	GE5480	CIRCUIT CARD ASSEMBLY (See Fig. 7-7 for NHA) ..	REF	
-1	RCR07G183JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-2	CK05BX103K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	7	
-3	1N3064 OR 1N4454	. SEMICONDUCTOR DEVICE, DIODE .....	4	
-4	RCR07G301JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-5	RCR07G821JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-6	RCR07G152JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-7	593A83	. TRANSISTOR (Selected 3N140) .....	1	
	FP-10	. PAD, TRANSISTOR (08289) (533 B320) .....	7	
-8	RCR07G104JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-9	573A86	. COIL, RF .....	1	
-10	DMS-100J	. CAPACITOR, FIXED, MICA DIELECTRIC: (72136) (565A107-5)	1	
-11	DM5-050D	. CAPACITOR, FIXED, MICA DIELECTRIC: (72136) (565A107-1)	2	
-12	583A95	. TRANSISTOR (Selected 3N128) .....	1	
-13	CK05BX102K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	1	
-14	RCR07G750JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-15	RCR07G472JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-16	2N2481	. TRANSISTOR .....	5	
-17	RCR07G100JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-18	RCR07G471JM	. RESISTOR, FIXED, COMPOSITION .....	5	
-19	RCR07G102JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-20	RCR07G681JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-21	RCR07G242JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-22	CSR13E225KL	. CAPACITOR, FIXED, ELECTROLYTIC: Tantalum.	3	
-23	CK05BX470K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...	4	
-24	RCR07G101JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-25	572A48-2	. TRANSFORMER, RF .....	1	
-26	RCR07G391JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-27	RCR07G473JM	. RESISTOR, FIXED, COMPOSITION .....	1	B
-28	05-3700-12-1500	. RESISTOR, FIXED, FILM: (24546) (560A75-151J) .	1	
-29	RCR07G621JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-30	1N754A	. SEMICONDUCTOR DEVICE, DIODE: Zencr .....	1	
-31	RCR07G182JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-32	05-3700-12-0360	. RESISTOR, FIXED, FILM: (24546) (560 A75-360J) .	1	
-33	KB21J1	. RESISTOR, THERMAL: (02606) (561 C28-3) .....	1	
-34	RCR07G680JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-35	GC5502	. CONNECTOR ASSEMBLY .....	1	
	532B1014	. . PRINTED WIRING BOARD .....	1	
	3-85929-6	. . CONNECTOR, ELECTRICAL: (00779) .....	1	
		(588A257-3)		
-36	572A48-1	. TRANSFORMER, RF .....	1	
-37	DM5-470J	. CAPACITOR, FIXED, MICA DIELECTRIC: (72136) (565A107-4)	1	
-38	RCR07G8R2JM	. RESISTOR, FIXED, COMPOSITION .....	1	A
-39	572A49	. TRANSFORMER, RF .....	1	
-40	FB32J1	. RESISTOR, THERMAL: (02606) (561 C28-4) .....	1	
-41	3329H-1-102	. RESISTOR, VARIABLE: (80294) (575 A68-1) .....	1	
-42	CR-56A/U	. CRYSTAL UNIT, QUARTZ: 85.883 MHz .....	1	
	518B373	. CLIP, CRYSTAL .....	1	
-43	5659065-3B	. SUPPRESSOR, PARASITIC: (02114) (573C79) .....	3	
-44	573A85	. FILTER, BANDPASS .....	1	
	532B1080	. INSULATOR, PLATE .....	1	
-45	532C1021	. CONTACT STRIP .....	1	
	527B939	. POST, SHOULDERED .....	5	
-46	515B2547	. CONTACT STRIP .....	1	
-47	GB5447	. PRINTED WIRING BOARD .....	1	

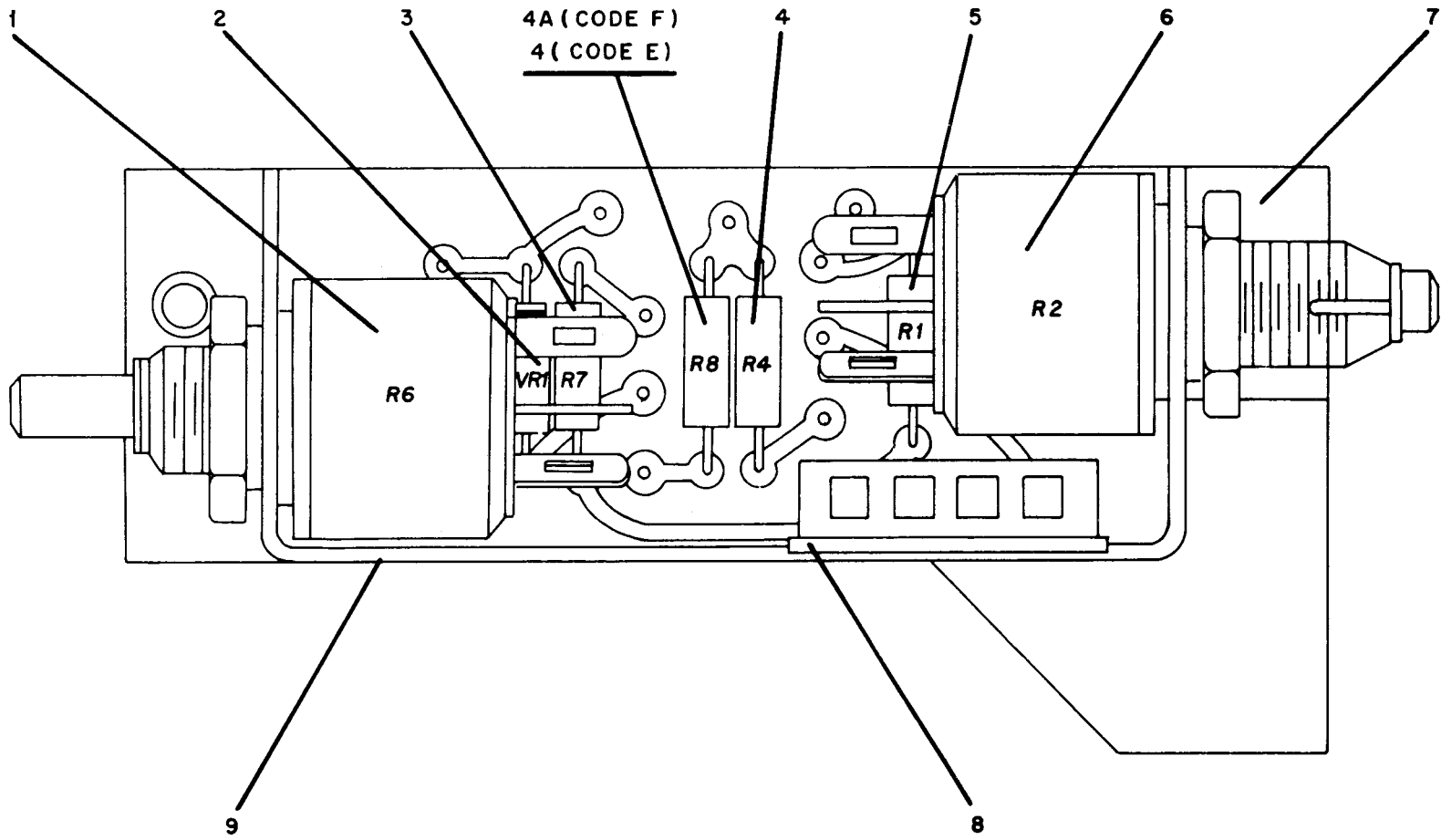


Figure 7-9. VSWR Adjust Assembly A6

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	JNITS PER ASSY.	USABLE ON CODE
7-9-	GD5496	VSWR ADJUST ASSEMBLY (See Fig. 7-7 for NHA) ..	REF	E F
-1	575C27-5	. RESISTOR, VARIABLE .....	1	
-2	1N749A	. SEMICONDUCTOR DEVICE, DIODE: Zener .....	1	
-3	RCR07G681JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-4	RCR07G242JM	. RESISTOR, FIXED, COMPOSITION .....	2	
-4A	RCR07G302JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-5	RCR07G511JM	. RESISTOR, FIXED, COMPOSITION .....	1	
-6	RV6LAYS501A	. RESISTOR, VARIABLE .....	1	
-7	532C1030	. PRINTED WIRING BOARD .....	1	
	MS51957-3	. SCREW, MACHINE (AP) .....	2	
-8	GC5501	. CONNECTOR SUBASSEMBLY .....	1	
	3-85929-5	. . CONNECTOR: (00779) (588 A257-4) .....	1	
	532B1015	. . PRINTED WIRING BOARD .....	1	
-9	GB5443	. BRACKET .....	1	
	UL256-1	. . NUT, CLINCH: (46384) (502C117-9) .....	2	
	515C2540	. . BRACKET .....	1	

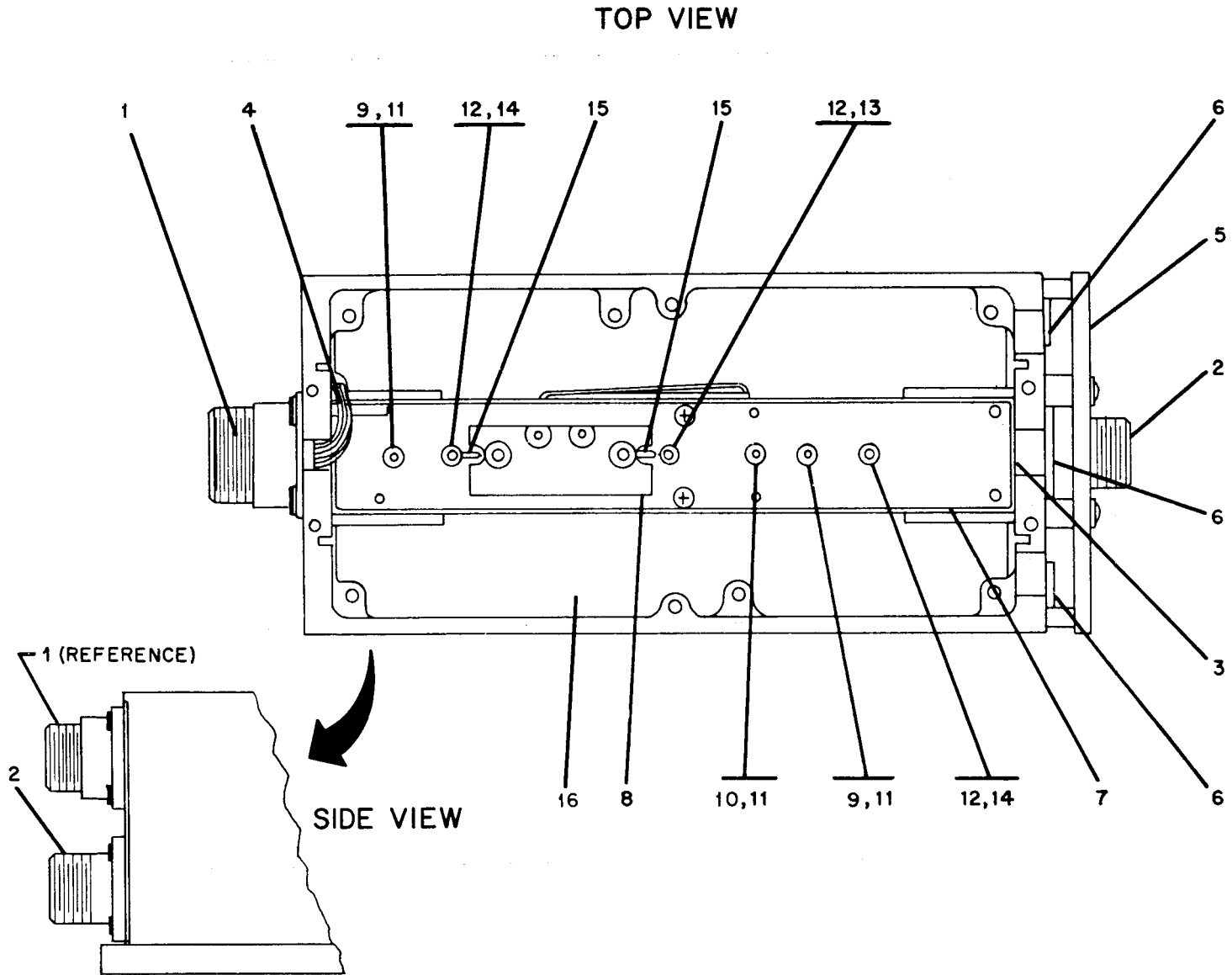


Figure 7-10. Housing Assembly



FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY.	USABLE ON CODE
7-10-	GD5497	HOUSING SUBASSEMBLY (See Fig. 7-1 for NHA) . . .	REF	
-1	588A262	. CONNECTOR, ELECTRICAL	1	
	MS35338-135	. WASHER, LOCK (AP) . . . . .	4	
	MS51957-14	. SCREW, MACHINE (AP) . . . . .	4	
-2	588B230	. CONNECTOR, ELECTRICAL . . . . .	2	
	MS35338-135	. WASHER, LOCK (AP) . . . . .	8	
	MS51957-14	. SCREW, MACHINE (AP) . . . . .	8	
	536B85	. GASKET, RF . . . . .	2	
-3	528C305	. CENTER CONDUCTOR . . . . .	1	
-4	MS3367-4	. STRAP, TIE DOWN . . . . .	1	
-5	515B2536	. COVER . . . . .	1	
	528B304	. SHAFT, STRAIGHT (AP) . . . . .	1	
-6	530B288	. GEAR, PINION . . . . .	3	
	MS35338-135	. WASHER, LOCK (AP) . . . . .	3	
	MS51957-15	. SCREW, MACHINE (AP) . . . . .	3	
-7	GC5426	. DIRECTIONAL COUPLER ASSEMBLY . . . . .	1	
	MS51959-2	. SCREW, MACHINE (AP) . . . . .	2	
	515B2548	. . . PLATE . . . . .	1	
-8	532B1022	. . . TERMINAL BOARD . . . . .	1	
-9	527B933-2	. . . CUP, RESISTOR MOUNTING . . . . .	2	
-10	527B933-1	. . . CUP, RESISTOR MOUNTING . . . . .	1	
-11	560A74	. . . RESISTOR, FIXED, COMPOSITION . . . . .	3	
-12	1145-SW-40	. . . TERMINAL, FEEDTHRU: (97814) (510C31-1) . .	3	
	SE-223	. . . EYELET: (90030) (506C3-2-102) . . . . .	3	
	505D1-110	. . . WASHER, NONMETALLIC . . . . .	5	
-13	515B2542	. . . BAR . . . . .	1	
-14	515B2541	. . . BAR . . . . .	2	
-15	1N5711	. . . SEMICONDUCTOR DEVICE, DIODE: (593A90) . .	2	
-16	GE5476	. POWER AND CONTROL ASSEMBLY (See Fig. 7-11. for breakdown)	1	
	MS35338-134	. WASHER, LOCK (AP) . . . . .	4	
	504C8-208-102	. WASHER, FLAT (AP) . . . . .	4	
	MS51957-3	. SCREW, MACHINE (AP) . . . . .	4	
	504C8-211-102	. WASHER, FLAT (AP) . . . . .	6	
	MS35338-135	. WASHER, LOCK (AP) . . . . .	6	
	MS51957-14	. SCREW, MACHINE (AP) . . . . .	6	

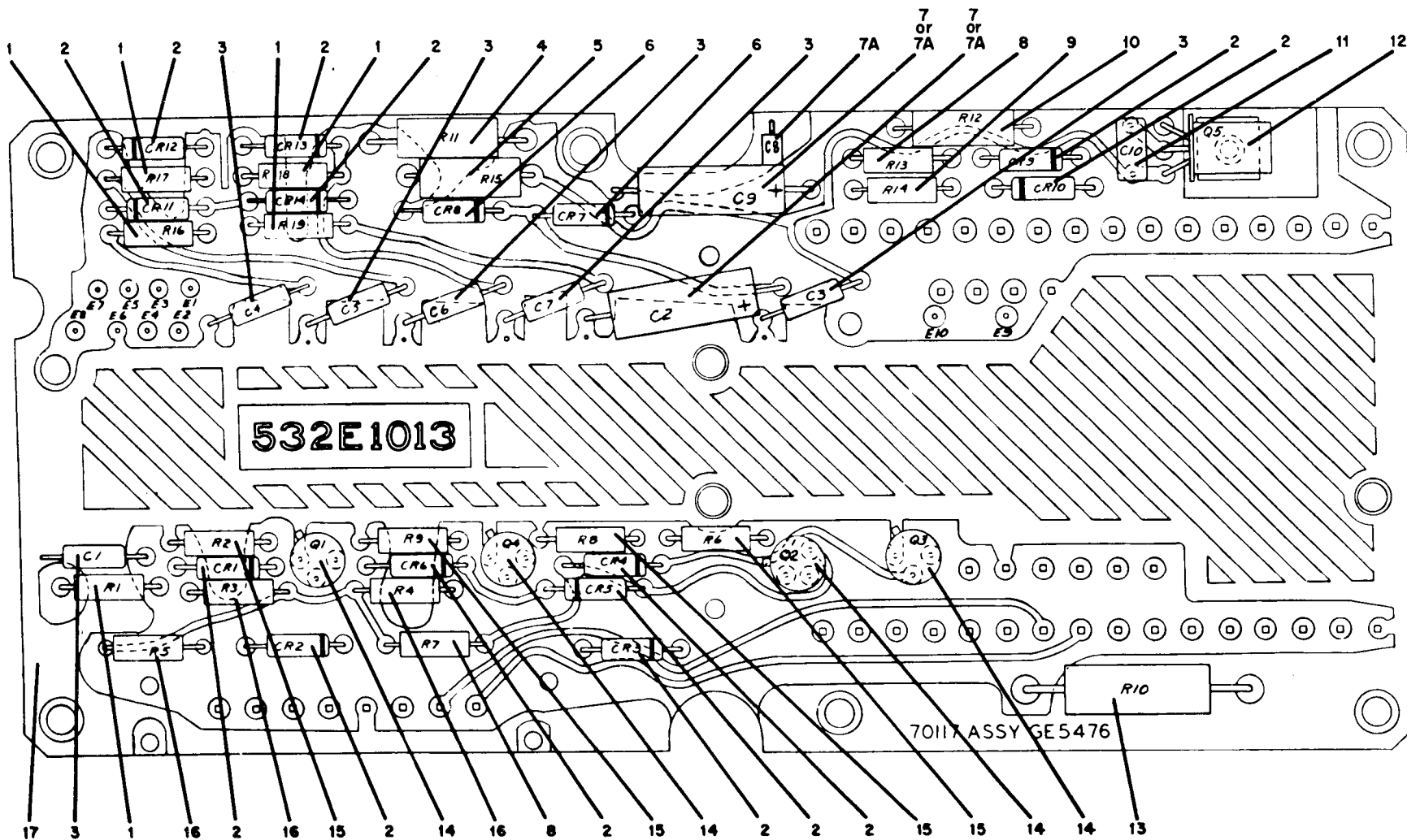


Figure 7-11. Power and Control Board Assembly A1

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY.	USABLE ON CODE
		1	2	3	4	5	6	7		
7-11-	GE5476	POWER AND CONTROL ASSEMBLY (See Fig. 7-10.. for NHA)							REF	
-1	RCR07G470JM	. RESISTOR, FIXED, COMPOSITION .....							5	
-2	1N3064 OR 1N4454	. SEMICONDUCTOR DEVICE, DIODE .....							12	
-3	CK62AW822M	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...							6	
-4	4349	. RESISTOR, FIXED, COMPOSITION: (44655)..... (560A73-2)							1	
-5	RCR20G220JM	. RESISTOR, FIXED, COMPOSITION .....							1	
-6	1N3611	. SEMICONDUCTOR DEVICE, DIODE .....							2	
-7	CSR13H225KL	. CAPACITOR, FIXED, ELECTROLYTIC .....							2	
-7A	CK06BX105K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC							3	B
-8	RCR07G183JM	. RESISTOR, FIXED, COMPOSITION .....							2	A
-9	RCR07G103JM	. RESISTOR, FIXED, COMPOSITION .....							1	
-10	RCR20G5R1JM	. RESISTOR, FIXED, COMPOSITION .....							1	
-11	CK06BX104K	. CAPACITOR, FIXED, CERAMIC DIELECTRIC ...							1	
-12	2N2907A	. TRANSISTOR .....							1	
-13	RCR32G121JM	. RESISTOR, FIXED, COMPOSITION .....							1	
-14	2N2222	. TRANSISTOR .....							4	
	7717-18NWHITE	. PAD, TRANSISTOR: (08289) (533 B385) .....							4	
-15	RCR07G472JM	. RESISTOR, FIXED, COMPOSITION .....							4	
-16	RCR07G273JM	. RESISTOR, FIXED, COMPOSITION .....							3	
-17	532E1013	. PRINTED WIRING BOARD .....							1	
	86144-2	. POST, ELECTRICAL: (00779) (515 B2549).....							50	
	6015-27A	. CLIP, ELECTRICAL: (91506) (139-2672-00).....							1	
	506C1-1-102	. RIVET, TUBULAR (AP) .....							1	

Numerical Index

PART NUMBER	FIG. & INDEX NO.	AIR FORCE CODES		NAVY CODE	PART NUMBER	FIG. & INDEX NO.	AIR FORCE CODES		NAVY CODE
		SOURCE	REPAIR				SOURCE	REPAIR	
AN960-C4	7-1-2	P1	NS	P1GEG	GE5477	7-2-1	X1		X1DDD
CK05BX102K	7-3-14	P1D	NS	P1GZG		7-3-			
	7-3A-14					7-3A-			
	7-5-15				GE5478	7-4-1	X1		X1DZD
	7-8-13			P1DZD		7-5-			
CK05BX103K	7-3-16	P1D	NS	P1GZG	GE5480	7-7-9	X2		X2DD
	7-3A-16				KA3302FK50K	7-5-10	P1	NS	P1GZG
	7-5-5				KB21J1	7-3A-30	P1D	NS	P1DZD
	7-8-2			P1DZD		7-8-31			
CK05BX181K	7-3-17	P1	NS	P1GZG	MS15795-804	7-1-6	P1	NS	P1GZG
	7-3A-17				MS18130-16	7-3A-45	P1	NS	P1GZG
CK05RX470K	7-3-22	P1D	NS	P1DZD	MS18130-26	7-3-20	P1	NS	P1GZG
	7-3A-22					7-5-2			
	7-8-23				MS20426A3-4	7-1-13	X1		X1GZG
	7-5-13	P1	NS	P1GZG	MS24693-C2	7-1-3	P1	NS	P1GZG
	7-6-12				MS24693-C3	7-6-2	P1	NS	P1GEG
	7-11-11				MS3367-4	7-10-4	X2		NNDZD
CK06BX223K	7-5-4	P1	NS	P1GZG	MS35338-134	7-1-8	P1	NS	P1GZG
CK62AW822M	7-11-3	P1	NS	P1GZG		7-7-9			
CM05CD050DP3	7-5-20	P1	NS	P1GZG		7-10-16			
CM05CD100DP3	7-3-13	P1	NS	P1GZG	MS35338-135	7-1-6	P1	NS	P1GEG
	7-3A-13					7-10-1			
CM05CD100JP3	7-3-13	P1	NS	P1GZG		7-10-2			
	7-3A-13					7-10-6			
CM05CD120JP3	7-5-17	P1	NS	P1GZG		7-10-16			
CM05CD120KP3	7-5-17	P1	NS	P1GZG	MS35338-136	7-7-2	P1D	NS	P1DZD
CM05DD101GP3	7-3-23	P1	NS	P1GZG	MS35650-314	7-7-3	P1D	NS	P1DZD
CM05DD510GP3	7-3A-23	P1	NS	P1GZG	MS51021-1	7-1-11	P1	NS	P1GZG
	7-5-1				MS51957-14	7-1-6	P1	NS	P1GZG
CM05DD820GP3	7-3-15	P1	NS	P1GZG		7-10-1			
	7-3A-15					7-10-2			
CM05ED510GP3	7-5-1	P1	NS	P1GZG		7-10-16			
CM05ED820GP3	7-3-15				MS51957-15	7-1-2	P1	NS	P1GZG
	7-3A-15					7-10-6			
CM05ED101GP3	7-3-23				MS51957-28	7-7-2	P1D	NS	P1DZD
	7-3A-23				MS51957-3	7-7-9	P1D	NS	P1DZD
CR-56A/U(85.833 MHz)	7-8-42	P1D	NS	P1DZD		7-9-7			
CR-64/U(20 MHz)	7-3-21	P1	NS	P1GZG		7-10-16			
	7-3A-21				MS51959-2	7-7-10	X2		P1DZD
CS-26	7-7-13					7-10-7			
CSR13E225KL	7-3-1	P1	NS	P1GZG	MS51960-2	7-7-3	P1D	NS	P1DZD
	7-3A-1				PB3 1-2	7-1-13	X1		X1GZG
	7-5-14				RCR07G100JM	7-8-17			
	7-6-14				RCR07G101JM	7-3-33	P1	NS	P1GZG
	7-8-22					7-3A-33			
CSR13F685KL	7-5-16	P1	NS	P1GZG		7-5-32			
	7-6-15					7-6-18			
CSR13H225KL	7-11-7					7-8-24			
DM5-050D	7-8-11	P1D	NS	P1DZD	RCR07G102JM	7-3-42	P1D	NS	P1DZD
DM5-100J	7-3A-19	P1D	NS	P1DZD		7-3A-42			
	7-8-10					7-5-28			
DM5-470J	7-3-19	P1D	NS	P1DZD	RCR07G103JM	7-8-19			
						7-3-40	P1	NS	P1GZG
FB32J1	7-8-40	P1D	NS	P1DED		7-3A-40			
FE0446	7-7-11	X2				7-5-31			
FP-10	7-6-3	P1	NS	P1GZG		7-6-16			
	7-8-7					7-11-9			
GB5333	7-1-3	P1	NS	P1GZG	RCR07G104JM	7-8-8	P1D	NS	P1DZD
GB5381	7-1-13	P1	NS	P1GZG	RCR07G120JM	7-3-38	P1	NS	P1GZG
GB5443	7-9-9	A1		ADDDD		7-3A-38			
GB5447	7-8-47	X1		X1DZD	RCR07G122JM	7-3-34	P1	NS	P1GZG
GB5481	7-7-11	X2		X2DZD	RCR07G123JM	7-3A-27	P1	NS	P1GZG
GB5495-2	7-7-6	A1		ADDDD	RCR07G152JM	7-5-47	P1	NS	P1GZG
GB5500	7-1-6	P1	PF	P1GG		7-8-6			
	7-6-				RCR07G181JM	7-3A-24	P1	NS	P1GZG
GB5509	7-6-2			P1GZG	RCR07G182JM	7-3-35	P1D	NS	P1DZD
GC5386-1	7-1-9	P1	NS	P1GZG		7-8-31			
GC5386-2	7-1-10	P1	NS	P1GZG	RCR07G183JM	7-6-19	P1	NS	P1GZG
GC5386-3	7-1-11	P1	NS	P1GZG		7-8-1			
GC5426	7-10-7	P1D	TL	NNGZG		7-11-8			
GC5434	7-1-4	P1	TD	P1GGD	RCR07G201JM	7-3A-43	P1	NS	P1GZG
	7-2				RCR07G202JM	7-3-41	P1	NS	P1GZG
GC5435	7-1-5	P1D	TD	P1GGD		7-5-41			
	7-5-				RCR07G204JM	7-5-38	P1	NS	P1GZG
GC5501	7-9-8	P1D	NS	P1DZD	RCR07G223JM	7-3-28			
GC5502	7-8-35	P1D	NS	P1DXD	RCR07G242JM	7-8-21	P1D	NS	P1DZD
GD5382	7-1-1	P1	TD	P1GGD		7-9-4			
GD5479	7-6-1	X1		X1GG	RCR07G272JM	7-3-43	P1	NS	
GD5483	7-1-8	P1D	TL	F1DDD		7-5-37			
	7-7-				RCR07G273JM	7-11-16	P1	NS	P1GZG
GD5496	7-7-11				RCR07G301JM	7-8-4	P1D	NS	P1DZD
	7-9				RCR07G302JM	7-5-44	P1	NS	P1GZG
GD5497	7-1-12	X2		X2DD		7-9-4A			
	7-10-				RCR07G331JM	7-5-45	P1	NS	P1GZG
GE5476	7-10-16	P1	PF	P1GGG	RCR07G391JM	7-3-24	P1D	NS	P1DZD
	7-11-					7-5-27			

Numerical Index (Cont.)

PART NUMBER	FIG. & INDEX NO.	AIR FORCE CODES		NAVY CODE	PART NUMBER	FIG. & INDEX NO.	AIR FORCE CODES		NAVY CODE
		SOURCE	REPAIR				SOURCE	REPAIR	
RCR07G391JM	7-7-12				2N2907	7-5-12	P1	NS	PIGZG
	7-8-26					7-6-3			
RCR07G394JM	7-5-42	P1	NS	PIGZG		7-11-12			
RCR07G470JM	7-5-34	P1	NS	PIGZG	2N491A	7-5-11	P1	NS	PIGZG
	7-11-1				2404-002-TH047K	7-7-8	P1D	NS	PIDED
RCR07G471JM	7-3-39	P1	NS	PIGZG	2404-002S2L0709D	7-7-7	P1D	NS	PIDED
	7-3A-28				3N128	7-3-9	P1D	NS	PIDED
	7-5-24	P1D	NS	PIDZD		7-3A-9			
RCR07G472JM	7-8-18				3N140	7-8-12			
	7-3-36	P1D	NS	PIDZD		7-3-11	P1	NS	PIDED
	7-3A-36					7-3A-11			
	7-5-33					7-5-21			PIGZG
	7-8-15					7-8-7	P1D		
	7-11-15					7-9-8	X1		X1DZD
RCR07G473JM	7-3-25	P1D	NS	PIDZD	3-85929-5	7-8-35	X1		X1DZD
	7-3A-35				3-85929-6	7-6-17	P1	NS	PIGZG
	7-8-27				3329H-1-102	7-5-25	P1D	NS	PIDZG
RCR07G511JM	7-3-31	P1	NS	PIGZG		7-8-41			PIDED
	7-3A-31				3329H-1-503	7-3-44	P1	NS	PIGZG
	7-5-26					7-3A-44			
	7-9-5					7-5-29			
RCR07G561JM	7-5-36	P1	NS	PIGZG	4034	7-6-13	P1	NS	PIGZG
RCR07G621JM	7-8-29	P1D	NS	PIDZD	4349	7-11-4	P1	NS	PIGZG
RCR07G680JM	7-5-35	P1D	NS	PIDZD	501B182	7-1-2	X2		NNGEG
	7-9-34				501C125-16	7-7-13			
RCR07G681JM	7-3-42	P1D	NS	PIDZD	501C40-13	7-1-13	X1		X1GZG
	7-3A-39				502C117-8	7-2-8	X2		NNDZD
	7-5-40					7-4-4			
	7-8-20					7-7-11			
	7-9-3				502C117-9	7-9	P1D	NS	PIDZD
RCR07G682JM	7-3-29	P1	NS	PIGZG	503B1-91	7-7-3	X2		NNDZD
RCR07G683JM	7-5-30	P1	NS	PIGZG	504C8-208-102	7-10-16			
	7-5-30A				504C8-211-102	7-10-16	X2		NNGZG
RCR07G750JM	7-8-14	P1D	NS	PIDZD	505D1-110	7-10-12	X1		X1DZD
RCR07G751JM	7-8-6	P1	NS	PIGZG	506C1-1-102	7-2-6	X2		NNGZG
RCR07G821JM	7-5-39	P1D	NS	PIDZD		7-2-7			
	7-8-5				506C1-13-102	7-2-5	X2		NNGZG
	7-5-48	P1	NS	PIGZG		7-4-3			
RCR07G822JM	7-5-43				506C1-3-102	7-4-5	X2		NNGZG
RCR07G2R7JM	7-8-38	P1D	NS	PIDZD	506C3-15-7	7-2-5	X2		NNGZG
RCR07G8R2JM	7-3A-29	P1	NS	PIGZG	506C3-2-102	7-10	X1		X1DZD
RCR07G822JM	7-11-10	P1	NS	PIGZG	508B27	7-2-6	P1	NS	PIGZG
RCR20G5R1JM	7-6-5	P1	NS	PIGZG		7-4-6			
RCR20G202JM	7-11-5	P1	NS	PIGZG	510C31-1	7-10-12	X1		X1DZD
RCR20G220JM	7-11-13	P1	NS	PIGZG	515B2519	7-7-6	M1		MDDZD
RCR32G121JM	7-6-11	P1	NS	PIGZG	515B2536	7-10-5	M1		MDDZD
RN55D7500F	7-9-30	P1	NS	PIGZG	515B2537	7-1-2	M1		MDGZG
RTH22ES682K	7-9-6	P1D	NS	PIDZL	515B2538	7-2-5	M1		MDDZD
RV6LA YSA501A	7-10-12	X1		X1DZD		7-4-3			
SE-24	7-2-2	P1	NS	PIGZG	515B2539-1	7-2-4	M1		MDDZD
SKT-14	7-4-2				515B2539-2	7-4-4	M1		MDDZD
	7-4-6	P1	NS	PIGZG	515B2541	7-10-4	X1		X1DZD
SKT-4F	7-9-9	P1D	NS	PIDZD	515B2542	7-10-13	X1		X1DZD
UL256-1	7-6-2	P1	NS	PIGZG	515B2547	7-8-46	M1		MDDZD
U2T2006	7-6-2A	P1	NS	PIGZG	515B2548	7-10-7	X1		X1DZD
U2T2023	7-6-21	P1	NS	PIGZG	515B2549	7-11-17	P1	NS	PIGZG
U25833	7-8-32				515C2540	7-9-9	M1		MDDZD
05-3700-12-0360	7-8-28				516D758	7-1-13	X1		X1GZG
05-3700-12-1500	7-3-26	P1	NS	PIGZG	518B370	7-7-3	X2		X2DZD
1N3064	7-3A-26				518B373	7-8-42	X2		X2DZD
	7-5-22				518C259-29	7-2-7	X2		NNGZG
	7-6-7				520C259	7-7-11	X2		X1DZD
	7-7-4				526C640	7-1-1	P1	NS	PIGGG
	7-8-3				526C641	7-1-13	X1		X1GZG
	7-11-2				526C649	7-1-1	P1	NS	PIGGA
1N3611	7-11-6	P1	NS	PIGZG	527B933-1	7-10-10	X1		X1DZD
1N4454	7-3-26	P1	NS	PIGZG	527B933-2	7-10-9	X1		X1DZD
	7-3A-26				527B939	7-8-45	M1		MDDZD
	7-5-22				528B303	7-7-1	X2		X2DZD
	7-6-7				528B304	7-10-5	M1		MDGZG
	7-8-3				528C305	7-10-3	P1D	NS	PIDZD
	7-11-2				529B279	7-7-10			
1N5711	7-10-5	P1D	NS	PIDZD	530B288	7-10-6	P1	NS	PIGZG
1N749A	7-9-2				532B1014	7-8-35	X1		X1DZD
1N751A	7-5-23	P1	NS	PIGZG	532B1015	7-9-8	X1		X1DZD
1N754A	7-8-30	P1D	NS	PIDZD	532B1022	7-10-8	X1		X1DZD
1N757A	7-3-37	P1	NS	PIGZG	532B1080	7-8-44			
	7-3A-27				532C1021	7-8-45	M1		MDDZD
1N82AG	7-7-5	P1D	NS	PIDZD	532C1030	7-9-7	P1D	NS	PIDZD
1N821	7-6-9	P1	NS	PIGZG	532D1034	7-6-22	X1		X1GZG
1N974B	7-6-20	P1	NS	PIGZG	532E1013	7-11-17	X1		X1GZG
1145-SW-40	7-10-12	X1		X1DZD	532E1016	7-3-45	X1		X1DZD
139-2672-00	7-11-17	X2		NNGZG		7-3A-45			
2N2222	7-5-3	P1	NS	PIGZG	532E1017	7-5-49	X1		X1DZD
	7-6-4				533B320	7-6-3	P1	NS	PIGEG
	7-11-14					7-8-7			
2N2481	7-8-16	P1D	NS	PIDZD	533B329	7-5-11	P1	NS	PIGZG
2N2907 OR 2N2907A	7-3-12	P1	NS	PIGZG					

Numerical Index (Cont.)

PART NUMBER	FIG. & INDEX NO.	AIR FORCE CODES		NAVY CODE	PART NUMBER	FIG. & INDEX NO.	AIR FORCE CODES		NAVY CODE
		SOURCE	REPAIR				SOURCE	REPAIR	
533B385	7-3-10	P1	NS	P1GZG					
	7-3A-10								
	7-5-3								
	7-6-3								
	7-11-14								
536B85	7-10-2	P1D	NS	P1DZD					
539B48	7-1-7	M1		M1GZG					
560A73-1	7-6-13	P1	NS	P1GZG					
560A73-2	7-11-4	P1	NS	P1GZG					
560A74	7-10-11	X1		X1DZD					
560A75-151J	7-8-28								
560A75-360J	7-8-32								
561C28-3	7-3A-30	P1D	NS	P1DZD					
	7-8-31								
561C28-4	7-8-40	P1D	NS	P1DZD					
565A106	7-7-8	P1D	NS	P1DZD					
565A107-1	7-8-11	P1D	NS	P1DZD					
565A107-4	7-3-19	P1D	NS	P1DZD					
565A107-5	7-3A-19	P1D	NS	P1DZD					
	7-8-10								
565C99-1	7-5-10	P1	NS	P1GZG					
5659065-3B	7-8-43	P1D	NS	P1DZD					
572A48-1	7-8-36	P1D	NS	P1DZD					
572A48-2	7-8-25	P1D	NS	P1DZD					
572A49	7-8-39	P1D	NS	P1DZD					
572C36-3	7-5-18	P1	NS	P1GZG					
573A85	7-8-44	P1D	NS	P1DZD					
573A86	7-8-9	P1D	NS	P1DZD					
573C79	7-8-43	P1D	NS	P1DZD					
575A68-1	7-3-32	P1D	NS	P1DZD					
	7-5-25								
	7-8-41								
575A68-2	7-3-44	P1	NS	P1GZG					
	7-5-29								
575 C27-4	7-2-3	P1	NS	P1GZG					
575 C27-5	7-4-3	P1D	NS	P1DZD					
	7-9-1								
586C10-24	7-2-2	P1	NS	P1GZG					
	7-4-2								
586C10-24F	7-4-6	P1	NS	P1GZG					
588A257-1	7-3-18	P1D	NS	P1DZD					
	7-3A-18								
	7-5-19								
588A257-2	7-6-17	P1	NS	P1GZG					
588A257-3	7-8-35	X1		X1DZD					
588A257-4	7-9-8	X1		X1DZD					
588A262	7-10-1	P1	NS	P1GZG					
588B230	7-10-2	P1D	NS	P1DZD					
593 A83-1	7-3-11	P1	NS	P1DZD					
	7-3A-11								
	7-5-21								
	7-8-7	P1D							
593A90	7-10-15	P1D	NS	P1DZD					
593A91	7-6-21	P1	NS	P1GZG					
593A95	7-3-9	P1D	NS	P1DZD					
	7-3A-9								
	7-8-12								
593A96-1	7-6-2	P1	NS	P1GZG					
593 A96-2	7-6-2A	P1	NS	P1GZG					
600A11	7-3-2	P1D	NS	P1DZD					
	7-3A-2								
600A19	7-3-7	P1D	NS	P1DZD					
	7-3A-7								
	7-5-9								
600A21	7-5-8	P1D	NS	P1DZD					
600A22	7-3-8	P1D	NS	P1DZD					
	7-3A-8								
600A23	7-3-6	P1D	NS	P1DZD					
	7-3A-6								
600A3	7-3-4	P1D	NS	P1DZD					
	7-3A-4								
600A5	7-3-5	P1D	NS	P1DZD					
	7-3A-5								
	7-5-6								
600A7	7-5-7	P1D	NS	P1DZD					
600A8	7-3-3	P1D	NS	P1DZD					
	7-3A-3								
6015-27A	7-11-7	X2		NNGZG					
622-1000-C2-52	7-	P1	NS	P1GEG					
622-750-C2-52	7-1-8	P1	NS	P1GZG					
7717-18N WHITE	7-3-10								
	7-3A-10								
	7-5-3								
	7-5-11								
	7-6-3								
	7-11-14								
85929-8	7-3-18	P1D	NS	P1DZD					
	7-3A-18								
	7-5-19								
86144-2	7-11-17	P1	NS	P1GZG					







APPENDIX A

MAINTENANCE ALLOCATION

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A-1. General.

This appendix provides a summary of the maintenance operations for the TS-1843B/APX. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

A-2. Maintenance Function.

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an Item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

d. Adjust. Maintain within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring end diagnostic equipment used in precision measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment/system.

h. Replace The act of substituting a serviceable like-type part, subassembly, model (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system.

j. Overhaul. That periodic maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

#### A-3. Maintenance Allocation Chart Column Entries. (Table A-1)

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn (s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of man-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, modules, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

- C - Operator/Crew
- O - Organizational
- F - Direct Support
- H - General Support
- D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

A-4. Tool and Test Equipment Requirements (Table A-2).

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for Manufacturers (5-digit) in parentheses.

TABLE A-1. MAINTENANCE ALLOCATION CHART  
 FOR  
 TRANSPONDER SET, TEST SET TS-1843B/APX

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	TRANSPONDER SET, TEST SET TS-1843B/APX	Inspect Test <sup>1</sup> Replace Repair		0.1 0.1 0.1				4.0  1 2 3-20

(1) Operational test.

TABLE A-2. TOOL AND TEST EQUIPMENT REQUIREMENTS  
 FOR  
 TRANSPONDER SET , TEST SET TS-1843B/APX

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NA ONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O	TEST SET, TRANSPONDER AN/APM-123(V)1	625-00-069-8951	
2	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	180-00-064-5178	
3	D	RECEIVER-TRANSMITTER, RADIO RT-859/APX-72	895-00-089-7179	
4	D	SLOTTED LINE, WAVEGUIDE IM-92( )/U		
5	D	INDICATOR, STANDING WAVE RATIO IM-175/U	625-00-892-5670	
6	D	TEST SET, TRANSPONDER SET AN/APM-239A	625-00-802-7425	
7	D	MULTIMETER AN/USM-223	625-00-999-7465	
8	D	OSCILLOSCOPE AN/USM-281A	625-00-228-2201	
9	D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	180-00-610-8177	
10	D	TEST SET, RADAR AN/UFM-98A	625-00-912-0423	
11	D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	180-00-605-0079	
12	D	TEST SET, SEMICONDUCTOR DEVICE TS-1836B/U	625-00-168-0954	
13	D	TEST SET, CRYSTAL UNIT, QUARTZ TS-268E/U	625-00-669-1215	
14	D	TOOL KIT TK-186( )/FRG-81(V)		
15	D	RF TERMINATION 50 OHMS (GR 874-W50B)		
16	D	3 DB AND 6 DB PADS CN-1285/U (HP-8491A)	625-00-058-2774	
17	D	TEST SET, TRANSPONDER TEST SET AN/APM-362 (01A236150)		
18	D	DOUBLE STUB TUNER (MICROLAB N300A)		
19	D	SIGNAL GENERATOR (MIL-G-9997)		
20	D	FREQUENCY COUNTER (MIL-C-9988A)		



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