TM 55-4920-430-13

TECHNICAL MANUAL
OPERATOR'S, AVIATION
INTERMEDIATE MAINTENANCE
AND
ILLUSTRATED PARTS BREAKDOWN

TEST SET, BENCH
ADVANCED FLIGHT CONTROL SYSTEM (AFCS)
145G0008-1

NSN 4920-01-121-0602

HEADQUARTERS, DEPARTMENT OF THE ARMY

20 SEPTEMBER 1983

CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 29 September 1989

Operator's, Aviation Intermediate
Maintenance and Illustrated
Parts Breakdown

TEST SET, BENCH
ADVANCED FLIGHT CONTROL SYSTEM (AFCS)
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5-5 and 5-6	5-5 and 5-6
5-7 and 5-8	5-7 and 5-8
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To be distributed in accordance with DA Form 12-31, AVUM and AVIM Maintenance requirements for CH-47D Helicopter, Cargo Transport.

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Operator's, Aviation Intermediate
Maintenance and Illustrated
Parts Breakdown

TEST SET, BENCH
ADVANCED FLIGHT CONTROL SYSTEM (AFCS)
145G0008-1

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2-23 through 2-26	2-23 through 2-26
4-29 through 4-32	4-29 through 4-32
5-5 through 5-8	5-5 through 5-8
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SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS.

Maintenance personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. To avoid casualties, always remove power and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE.

Under no circumstances should any person reach into the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION.

Personnel working with or near high voltage should be familiar with modern methods of resuscitation (CPR). Ref FM 21-11. Such information maybe obtained from the Bureau of Medicine and Surgery.

The following warnings appear in the text in this volume, and are repeated here for emphasis.

WARNING

The unit weighs approximately 90 pounds. Be careful when lifting the test set to avoid personal injury.

WARNING

HIGH VOLTAGE is used in this equipment. DEATH ON CONTACT or SEVERE INJURY can result if personnel fail to observe safety precautions.

Learn the equipment areas containing high voltage. Before working inside this equipment, turn off the equipment and disconnect all power at the source. Be careful not to touch high voltage connections when performing maintenance on this equipment.

WARNING

Naphtha and dry cleaning solvent are combustible and toxic. Keep away from open flame.

Isopropyl alcohol and trichloroethane are toxic. Use these chemicals with adequate ventilation. They can irritate skin. In case of contact, immediately flush skin or eyes with water for 15 minutes. Get medical attention at once.

TECHNICAL MANUAL
No. 55-4920-430-13

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 20 September 1983

OPERATOR'S, AVIATION INTERMEDIATE MAINTENANCE, AND ILLUSTRATED PARTS BREAKDOWN TEST SET, BENCH, ADVANCED FLIGHT. CONTROL SYSTEM (AFCS) 145G0008-1 NSN 4920-01-121-0602

REPORTING OF ERRORS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications) or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Aviation Systems Command, ATTN: AMSAV-MPSD, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF FOLDOUT

LIST OF TABLES

NOTE

Page identification for foldout pages has been designated as FO-1, FO-2, etc. and the pages are placed in the back of the manual at time of pminting. Upon receipt of this manuaI, insert foldout pages FO-2 through FO-54 after page 4-2.

Chapter 1

INTRODUCTION

SECTION I GENERAL INFORMATION

1-1. General.

This manual contains operational description and maintenance instructions for the Boeing Vertol Advanced Flight Control System (AFCS) Bench Test Set 145G0008-1. (See fig. 1-1.) The operational information which follows provides maintenance personnel with a description of the purpose and functions of the various circuits contained in the test set without detailing external circuits with which it is interfaced in the normal testing environment. The information is tailored to provide sufficient knowledge to fully support normal maintenance, troubleshooting, and repair of the test set. In addition, operating instructions for initial start up and shutdown of the test set in the normal testing environment are provided.

1-2. Purpose of Equipment.

The test set is used to test the AFCS panel 145VS110-3, AFCS computer 145 VS100-3, pitch cockpit control drive actuators (CCDA) 145CS6100-1, and thrust cockpit control driver actuator 145CS6100-2 of the CH-47D helicopter.

1-3. Reports of Maintenance and Unsatisfactory Equipment.

Use equipment forms and records in accordance with instructions in DA PAM 738-751.

1-4. Reporting of Equipment Manual Improvements.

The reporting of errors, omissions and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to: Commander, US Army Aviation Systems Command, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798, ATTN: AMSAV-MPSD.

1-5. Temporary Storage.

Administrative storage of equipment issued to, and used by, Army activities shall be in accordance with TM 740-90-1.

1-6. Destruction of Army Equipment to Prevent Enemy Use.

Destruction of Army equipment to prevent enemy use shall be in accordance with TM 750-244-2.

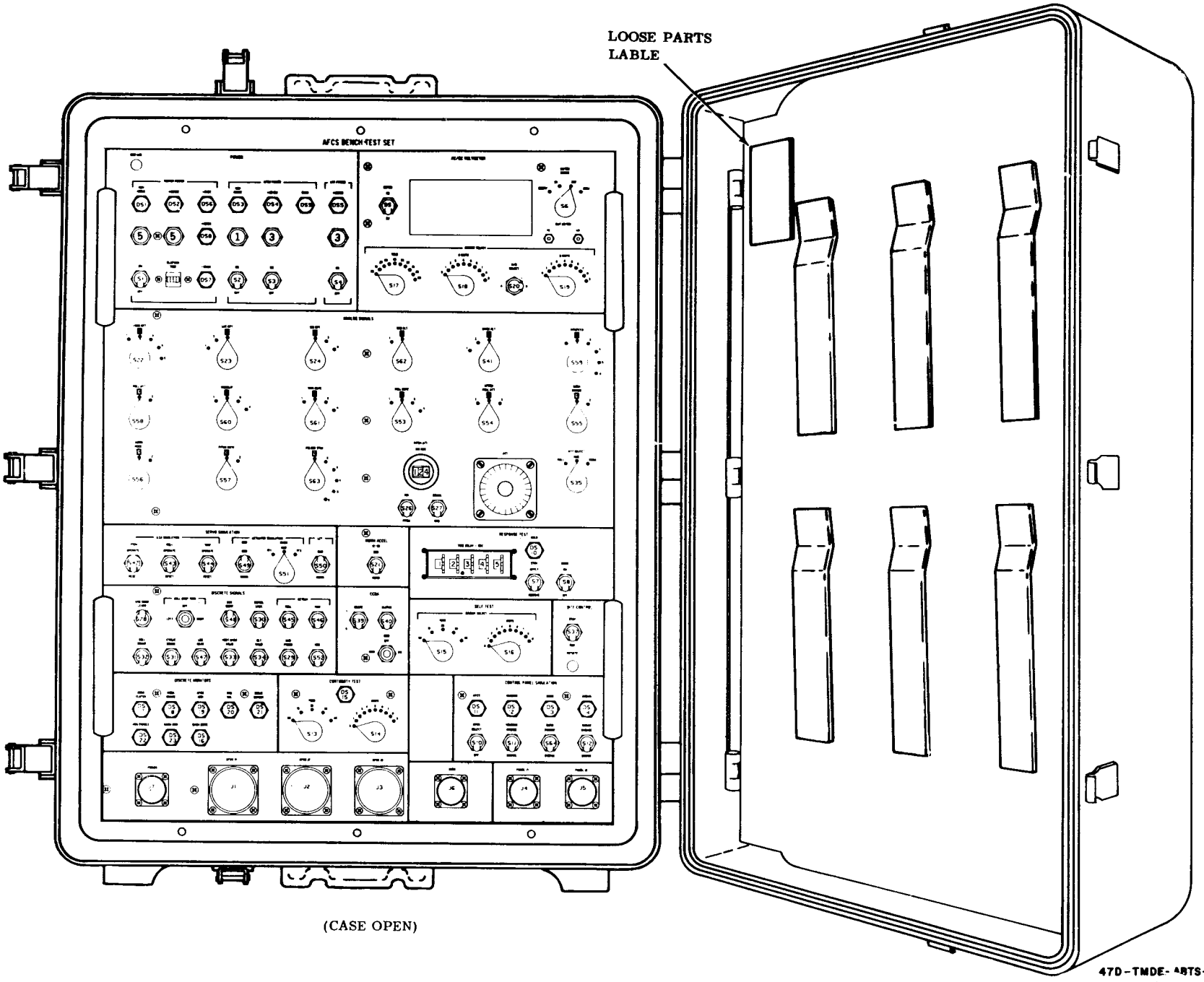


Figure 1-1. AFCS Bench Test Set

1-7. Notes, Cautions and Warnings.

Warnings, cautions, and notes emphasize important and critical instructions. They are defined as follows:

WARNING

An operating procedure or practice which, if not correctly followed, will result in personnel injury or loss of life.

CAUTION

An operating procedure or practice which, if not strictly observed, will result in damage or destruction of equipment.

NOTE

An operating procedure or condition which it is essential to highlight.

SECTION II EQUIPMENT DESCRIPTION AND DATA

1-8. Test Set Description. (See fig. 1-1.) The test set is used to test the AFCS panel, AFCS computers, and cockpit control driver actuators (CCDA) of the advanced flight control system of the CH-47D helicopter. The test set includes a large number of independent test circuits that share a common AC/DC voltmeter display and internal power supplies. The test set provides drive voltages to operate external valves and actuators and excitation voltages for external position transducers and sensors. Signals are developed to simulate position and feedback signals from position transducers. Test set circuits are functionally divided into 12 distinct sections. The groupings are indicated in the organization of controls and indicators on the test set panel. The control and indicators in each of these groups are listed and described in chapter 2, figure 2-2 and para 2-4.

1-9. Test Set Capabilities.

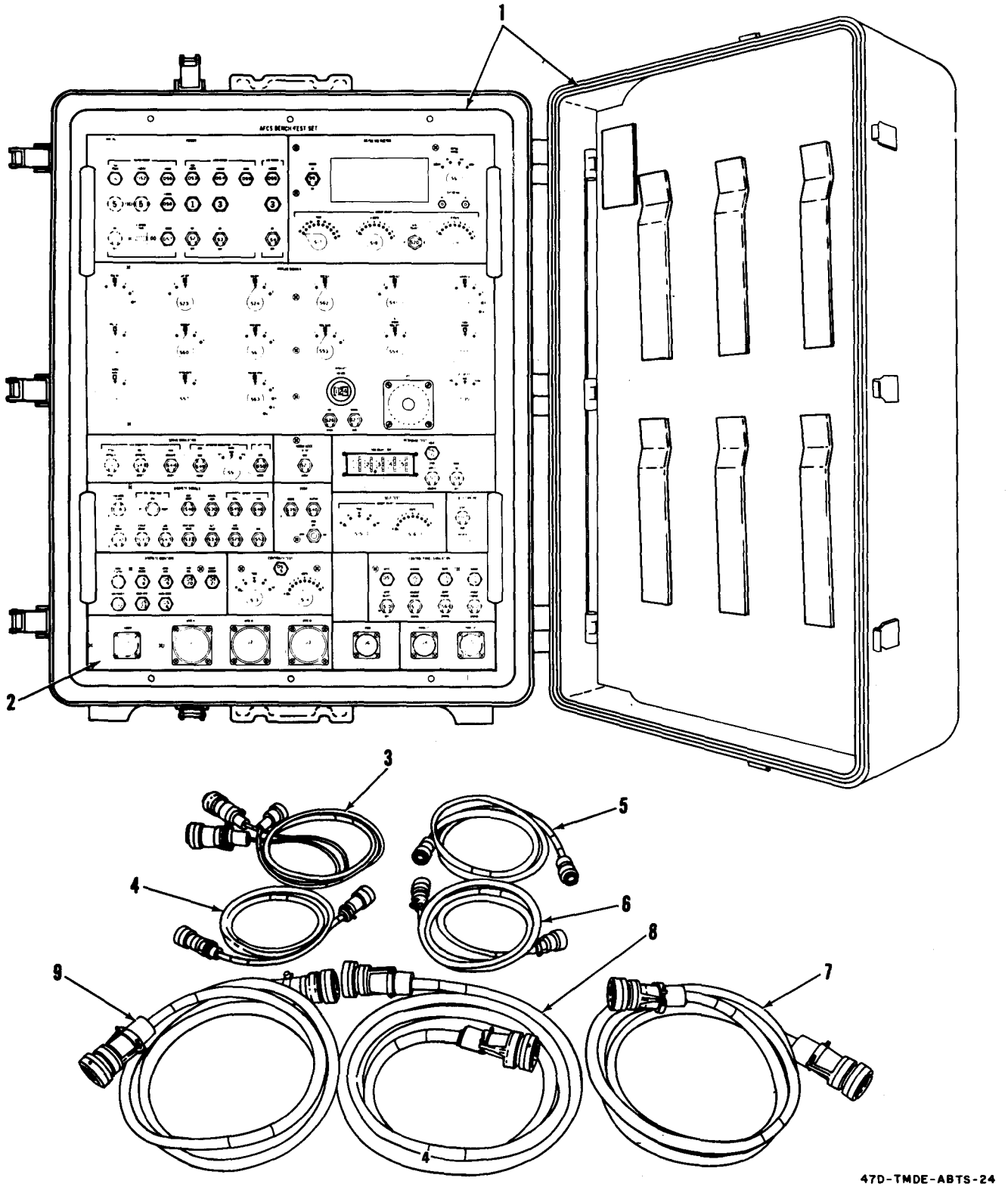
The test set provides the control functions to test AFCS panel 145VS110-3, AFCS computer 145VS100-3, longitudinal (pitch) cockpit control driver actuators (CCDA) 145C6100-1, and collective thrust (CCDA) 145C6100-2.

1-10. Leading Particulars. The test set is a suitcase type containing a control panel and seven cable assemblies. Operating power is obtained from shop ac and dc power sources. See table 1-1 for leading particulars.

Table 1-1. AFCS Bench Test Set Leading Particulars

Dimensions (approximate)	
Height	16.1 inches
Width	28.2 inches
Depth	20.9 inches
Weight (approximate)	90 pounds
Electrical Requirements	
Power Inputs	115 vac 400-Hz, 5 amp 28 vdc, 5 amp
Signal Outputs	115-vac 400-Hz, 28 vdc, varying signals from 0 to 13V 400 Hz, various ac and dc signal levels from 0 to 30 volts

1-11. Tools and Test Equipment Required. No tools or test equipment are required for operation of this test set.



1. Case 234G5281
2. Panel 145G5200-1
3. Power Cable W7, 145G5183-1
4. CCDA Cable, W6, 145G5182-1
5. Control Panel Cable W5, 145G5181-1
6. Control Panel Cable W4, 145G5180-1
7. AFCS Cable W3, 145G5179-1
8. AFCS Cable W2, 145G5178-1
9. AFCS Cable W1, 145G5177-1

Figure 1-2. Bench Test Set Accessories

SECTION III TECHNICAL PRINCIPLES OF OPERATION

1-12. Principles of Operation.

a. The test set consists of a large number of independent test circuits. These circuits share, a common digital voltmeter display and internal power supply voltages to operate external valves and actuators. There are common excitation voltage supplies for external position transducers and sensors. Signals are developed to simulate feedback and position signals.

b. Test set circuits are functionally divided into 12 distinct sections. These divisions are indicated by the grouping of switches and indicators on the test sets control panel. (See fig. 1-1.) The switches and indicators in each of these groups are listed and described in para 2-4. The manner in which they are interconnected within the test set is illustrated in the schematic diagram. (See FO-1.) A detailed description of test circuits are provided in para 1-13 thru 1-18.

1-13. AC/DC Voltmeter Circuitry. (See fig. 1-3.) Meter M2 is a self-contained multimeter. Test set switching is used to select type of voltage (ac/dc) and range (.2, 2, 20, 200) for measurements. (See fig. 1-3.) A hold signal from sample and hold CCA A4 provides a preselected time interval between initial application of an unknown input and the time that the signal is measured. Decimal point position is determined by the setting of METER RANGE switch S6.

1-14. Pitch, Roll, and Yaw Integrated Lower Control Actuator (ILCA) Series Simulator Circuits. Circuit card A1 includes three circuits which simulate the servo valves and feedback devices of the pitch, roll, and yaw ILCA. Three feedback outputs are developed, two self and one cross. A combination of these outputs is selected by external switches to simulate the position feedback signal of the actuator for a particular axis. Except for reference designations, the pitch, roll, and yaw circuits on the card are identical.

a. Pitch ILCA Servo Simulator Circuit. (See fig. 1-4.)

(1) The impedance of the extensible link servo valve is simulated by resistors R1, R2, R3, and R5 and amplifier U18, with pin 14 of card A1 grounded through a 200-ohm resistance. This is the value of the circuit sense resistor in the servo amplifier. The gain of amplifier U18 from pin 10 to TP1 is - 2 vdc/ma.

(2) The output of amplifier U18 is fed to an integrator, made up of amplifier U17, resistor R4, and capacitor C2. The integrator simulates the servo valve of the extensible link. Zener diodes VR1 and VR2 simulate the limits of extensible link travel. The transfer function of the integrator is -20 vdc/ second. Output is limited to -12.5 to +12.5 volt dc by VR1 and VR2. Resistor R8 is selected to establish the drift of the integrator at zero.

(3) Analog multiplier U16 simulates the extensible link position transducer. The gain of the multiplier is (X1-X2) (Y1-Y2) ÷ 10. When 13 volt ac is applied to pin 1, the voltage at Y1 is fixed at 5 volt ac by voltage divider resistors R13, R14, and R15. Resistors R11 and R12 form a 3:1 voltage divider vider which fixes the maximum input voltage to the multiplier at about 9 volt when integrator output is maximum. Modulator gain from the integrator output to pin 32 is 0.76 x 0.5 vrms/vdc = -0.38 vrms/ vdc. The normal output at pin 32 is 15 vrms/sec-ma. This output controlled by the current input at pin 10, which is limited to about 4.75 volt rms or 6.7 volt peak. Resistor R14 is selected to control the gain of the modulator. Resistor R17 is selected to establish the dc offset of U16 at zero.

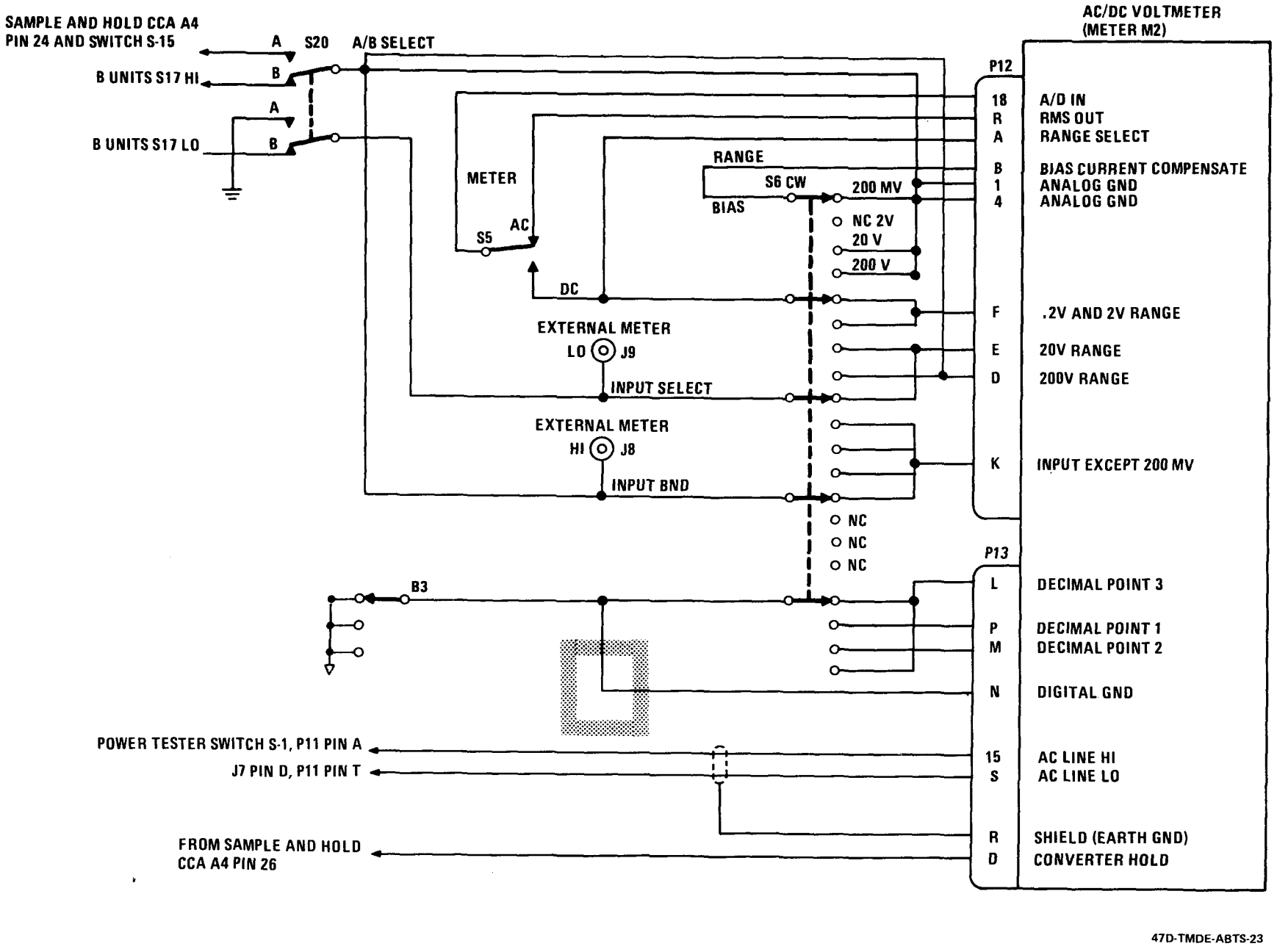
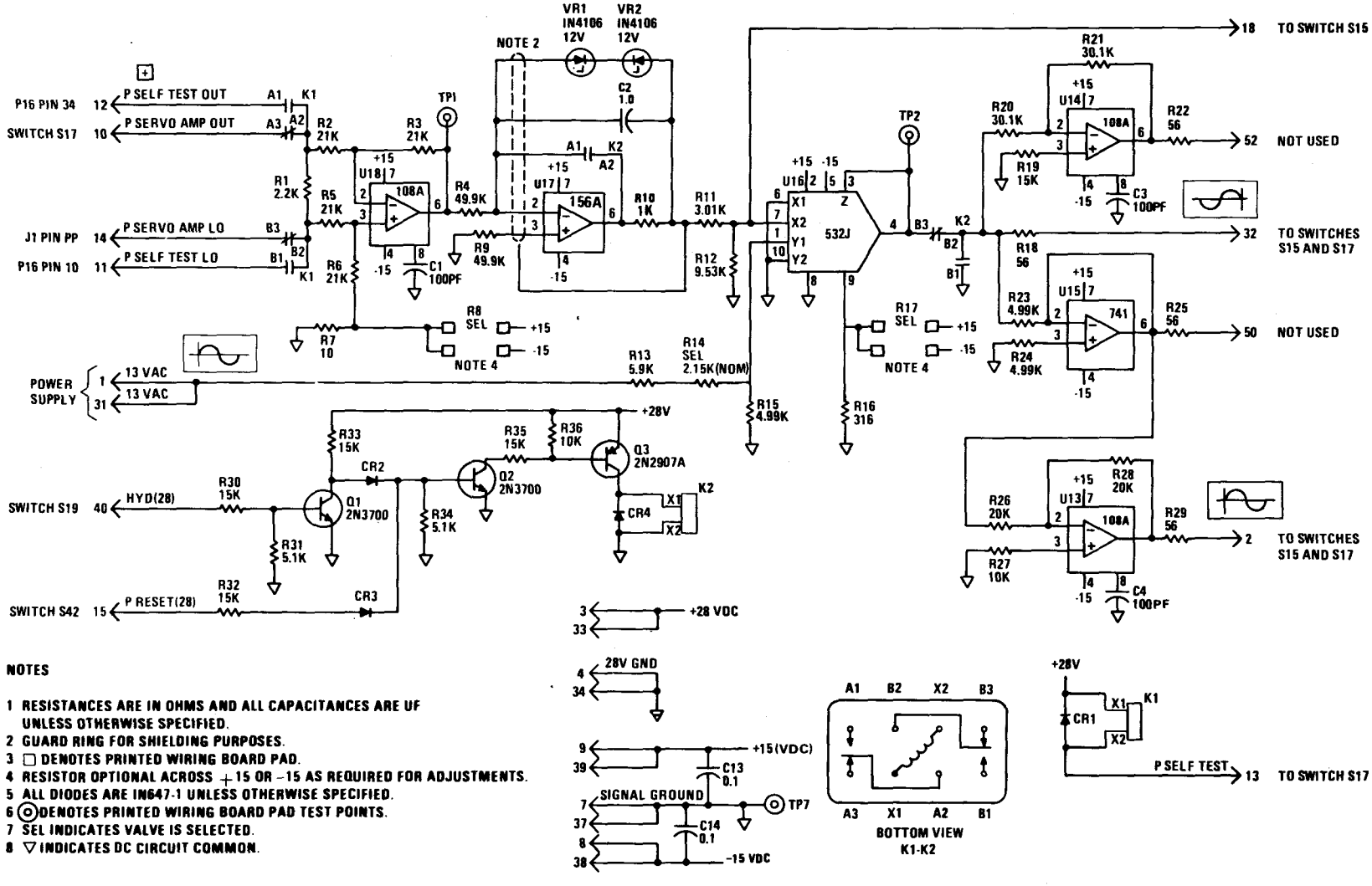


Figure 1-3. *Ac/Dc Voltmeter Schematic Diagram*



NOTES

1 RESISTANCES ARE IN OHMS AND ALL CAPACITANCES ARE UF UNLESS OTHERWISE SPECIFIED.
2 GUARD RING FOR SHIELDING PURPOSES.
3 □ DENOTES PRINTED WIRING BOARD PAD.
4 RESISTOR OPTIONAL ACROSS +15 OR -15 AS REQUIRED FOR ADJUSTMENTS.
5 ALL DIODES ARE IN647-1 UNLESS OTHERWISE SPECIFIED.
6 ⊙ DENOTES PRINTED WIRING BOARD PAD TEST POINTS.
7 SEL INDICATES VALVE IS SELECTED.
8 ▽ INDICATES DC CIRCUIT COMMON.

47D-TMDE-ABTS-25

Figure 1-4. *Pitch ILCA Servo Simulator Schematic Diagram*

(4) With a positive input at pin 10, one pitch feedback output at pin 32 is 180° out-of-phase with the input voltage at pin 1. The other pitch feedback signal at the output of U13 pin 2 is -0.5 volt, out-of-phase in relation to the output at pin 32. Load isolation resistors R18 and R29, fix the output impedance at pins 2 and 32 at about 56 ohms.

NOTE

The outputs of U14 at pin 52 and of U15 at pin 50 are not used.

(5) When relay K2 is energized, integrator U17 is gated and output modulator U16 is disconnected. Relay K2 is energized when the 28 vdc hydraulic pressure signal is removed from pin 40 or when pin 40 is connected to ground at pin 4 by HYD PRESS switch S29. Relay K2 is also energized when a 28 vdc reset signal is present at pin 15. When pin 13 is connected to ground at pin 4. Self test relay K1 is energized. This connects the self test input at pins 11 and 12 to the input of the servo simulator. It also disconnects the AFCS computer servo amplifier output from the input of servo simulator U18.

b. Roll ILCA Servo Simulator Circuit. (See fig. 1-5.)

(1) The impedance of the extensible links servo valve is simulated by resistors R37, R38, R39, and R41 and amplifier U12, with pin 22 of card A1 grounded through a 200-ohm resistance. This is the value of the current servo resistors in the servo amplifier. The gain of amplifier U12 from pin 22 to TP3 is -2 vdc/ma.

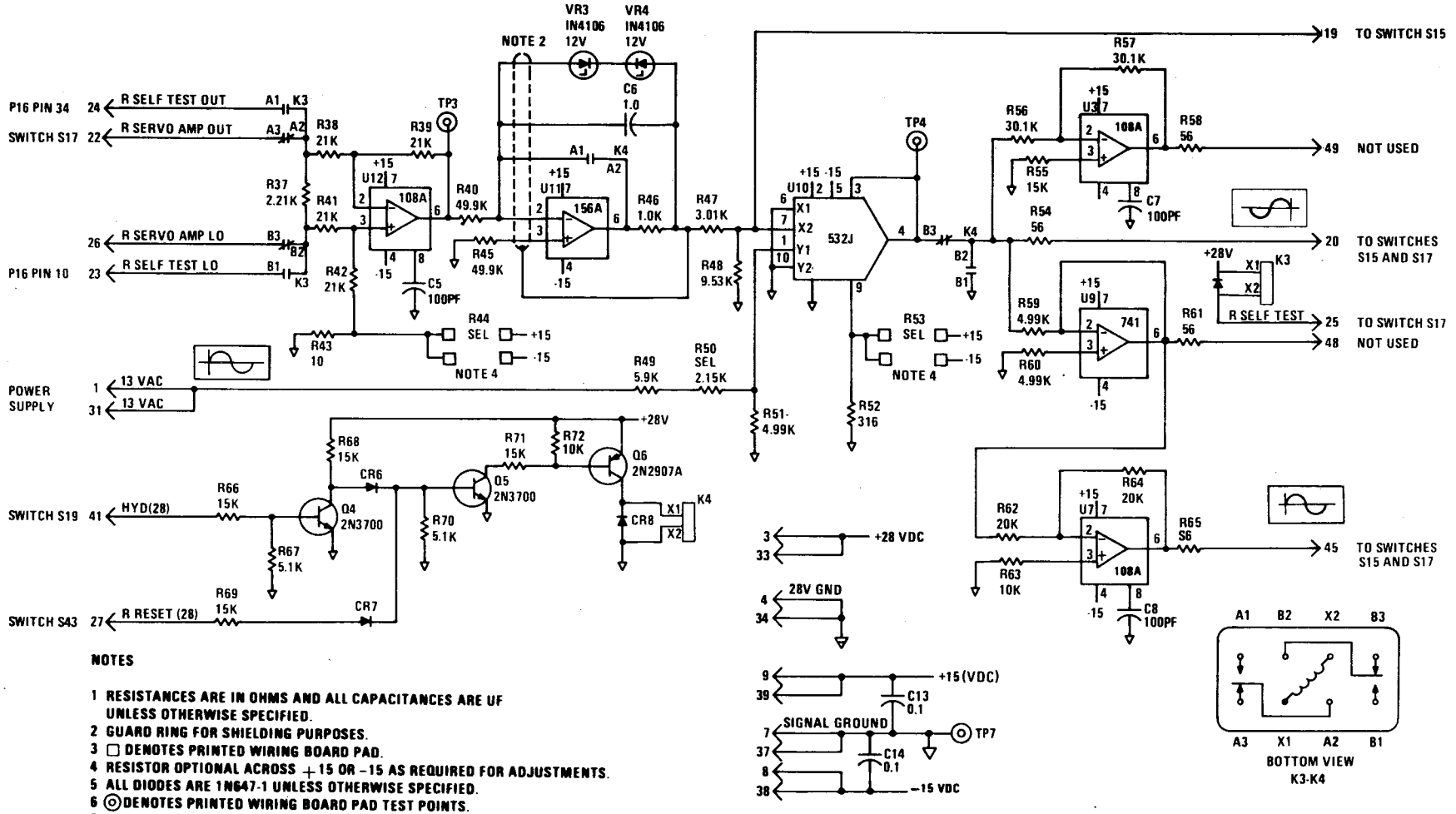
(2) The output of amplifier U12 is fed to an integrator made up of amplifier U11, resistor R40, and capacitor C6. The integrator simulates the servo valve of the extensible link zener diodes VR3 and VR4 simulate the limits extensible link travel. The transfer function of the integrator is -20 vdc/vdc second. Output is limited to -12.5 to +12.5 volt dc, by VR3 and VR4. Resistor R44 is selected to extablished the drift of the integrator at zero.

(3) Analog multiplier U10 simulates the extensible link position transducer. The gain of the multiplier is (X1-X2) (Y1-Y2) ÷ 10. When 13-volt ac is applied to pin 1, the voltage at Y1 is fixed at 5-volt ac by a voltage divider consisting of resistors R49, R50, and R51. Resistors R47 and R48 from a 3:1 voltage divider which fixes the maximum input voltage to the multiplier at about 9-volt dc when integrator output is maximum. Modulator gain from the integrator output to pin 20 is 0.76 x -0.5 vrms/vdc = 0.38 vrms/vdc. The normal output at pin 20 is 15 vrms/sec-ma. This output is controlled by the current input at pin 22, which is limited to about 4.75-volt rms or 6.7-volt peak. Resistor R50 is selected to control the gain of the modulator. Resistor R53 is selected to establish the dc offset of U10 at 0.

(4) With a positive input at pin 22, one roll feedback output at pin 20 is 180° out-of-phase with the input voltage at pin 1. The other roll feedback signal at the output of U7 pin 45 is -0.5-volt out-of-phase in relation to the output at pin 20. Load isolation resistors R54 and R65 fix the output impedance at pins 20 and 45 at about 56 ohms.

NOTE

The outputs of U8 at pin 49 and of U9 at pin 48 are not used.



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5 ALL DIODES ARE 1N647-1 UNLESS OTHERWISE SPECIFIED.
6 ⓞ DENOTES PRINTED WIRING BOARD PAD TEST POINTS.
7 SEL INDICATESVALVE IS SELECTED.
8 ▽ INDICATES DC CIRCUIT COMMON.

47D-TMDE-ABTS-26

Figure 1-5. ***Roll ILCA Servo Simulator Schematic Diagram***

(5) When relay K4 is energized, integrator U11 is gated and output modulator U10 is disconnetted. Relay K4 is energized when the 28 volt vdc hydraulic pressure signal is removed from pin 41 or when pin 41 is connected to ground at pin 4 by HYD PRESS switch S29. Relay K4 is also energized when a 28-volt vdc reset signal is present at pin 27. When pin 25 is connected to ground at pin 4, self-test relay K3 is energized. This connects the self-test input at pins 23 and 24 to the input of the servo simulator. It also disconnects the AFCS computer servo amplifier output from the input of the servo simulator U12.

c. Yaw ILCA Servo Simulator Circuit (See fig. 1-6.)

(1) The impedance of the extensible link servo valve is simulated by resistors R73, R74, R75 and R77 and amplifier U6, with pin 57 of card A1 grounded through 200 ohm resistance. This is the value of the current sense resistor in the servo amplifier. The gain of amplifier U6 from pin 57 to TP5 is -2 vdc/ma.

(2) The output of amplifier U6 is fed to an integrator, made up of amplifier U5 resistor R76 and capacitor C10. The integrator simulates the servo valve of the extensible link. Zener diodes VR5 and VR6 simulate the limits of extensible link travel. The transfer functions of the integrator is -20 vdc/vdc seconds. Output is limited to -12.5 to +12.5-volt dc by VR5 and VR6. Resistor R80 is selected to establish the drift of the integrator at zero.

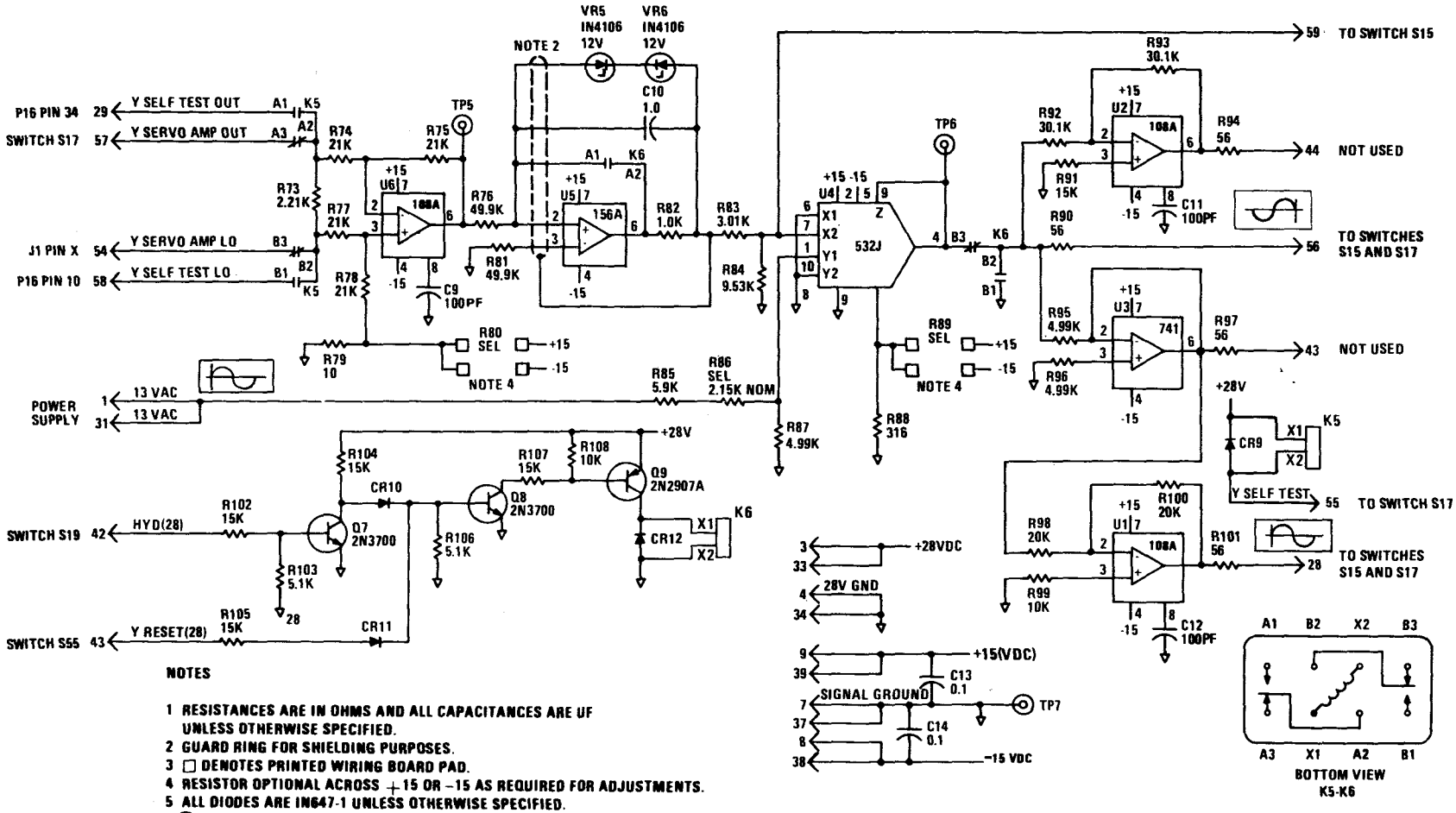
(3) Analog multiplier U4, simulates the extensible link position transducer. The gain of the multiplier is (X1-X2) (Y1-Y2) ÷ 10. When 13 volt ac is applied to pin 1, the voltage at Y1 is fixed at 5-volt ac by a voltage divider circuit consisting of resistors R85, R86, and R87. Resistors R83 and R84 form a 3:1 voltage divider which fixes the maximum input voltage to the multiplier at about 9 volts dc when integrator output is maximum. Modulator gain from the integrator output to pin 56 is 0.76 x -0.5 vrms/vdc = 0.38 vrms/vdc. The normal output at pin 56 is 15 vrms/sec-ma. This output is controlled by the current input at pin 57, which is limited to approximately 4.75-volt rms or 6.7-volt peak. Resistor R86 is selected to control the gain of the modulator. Resistor R89 is selected to establish the dc offset of U4 at zero.

(4) With a positive input at pin 57, one yaw feedback output at pin 56 is 180° out-of-phase with the input voltage at pin 1. The other roll feedback signal at the output of U1 pin 28 is -0.5-volt out-of-phase in relation to output at pin 56. Load isolation resistors R90 and R101 fix the output impedance of pins 28 and 56 to about 56 ohms.

NOTE

The output of U2 at pin 44, and of U3 at pin 43 are not used.

(5) When relay K6 is energized, integrator U5 is gated and output modulator U4 is disconnected. Relay K6 is energized when the 28 volt dc hydraulic pressure signal is removed from pin 42, or when pin 42 is connected to ground at pin 4 by HYD PRESS switch S29. Relay K6 is also energized when 28 vdc reset signal is present at pin 53. When pin 55 is connected to ground pin 4, self-test relay K5 is energized, which connects the self test input at pins 58 and 29 to the input of the servo simulator, and disconnects the AFCS computer servo amplifier output from the input of servo simulator U6.



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6 ⊙ DENOTES PRINTED WIRING BOARD PAD TEST POINTS.
7 SEL INDICATES VALVE IS SELECTED.
8 ▽ INDICATES DC CIRCUIT COMMON.

47D-TMDE-ABTS-27

Figure 1-6. *Yaw ILCA Servo Simulator Schematic Diagram*

1-15. LCT, CC DA, and DASH Actuator Simulator Circuits. Circuit card A2 includes three circuits which simulate LCT, CCDA, and DASH electromechanical actuators and their feedback devices.

a. Longitudinal Cyclic Trim Actuator (LCT) Simulator Circuit. (See fig. 1-7.) LCT actuator static/dynamic gains are simulated by amplifiers U1 through U4 and their associated resistors, capacitors, and diodes. The electrical load of the split-field motor of the actuator is simulated by 8.06-ohm resistors R20, R21, R22, and R23 (not shown). Resistors R20 and R21, in series to ground, simulate the extend winding of the actuator motor. Resistors R22 and R23, also in series to ground, simulate the retract winding.

(1) Amplifier U4, with resistors R1 through R3, form an inverter. The inverter develops opposite directional sense for the retract and extend inputs, both of which are +28-volt dc. The gain of amplifier U4 is -0.43, providing a -12-volt dc output for a +28 volt-dc input at pin 26.

(2) Amplifier U3 is a summing amplifier. Gain for the extend signal is -1, gain for the *retract* signal is -0.43. As a result, gain for the extend input from pin 26 to TP2 is +0.43. Gain for *retract* input from pin 27 to TP2 is -0.43. The rc characteristic of the motor is simulated by the 0.2-second lag in resistor R8 and capacitors C2 and C3.

(3) Amplifier U2, resistor R10, and capacitor C6 form an integrator which similates the steady-state velocity characteristic of the motor and gear train. Gain from the output of U2 to TP4 is 0.01 volt-dc. Actuator limit switches are simulated by diodes VR1 and CR3. Zener diode VR1 limits output to -6.8-volt dc nominal. Diode CR3 passes only the negative output. As a result, the output swing is 0 to -6.8-volt dc. Integrator drift rate is set to zero by resistor R4.

(4) Amplifier U1 is connected as a voltage follower to isolate the integrator from the external load at pin 58. Output impedance is fixed at about 58 ohms by load isolation resistor R14.

(5) When a positive voltage, an actuator *extend* signal, is applied to pin 26, the output at pin 58, increases in a negative direction. This simulates the feedback signal from the actuator. The opposite occur when a negative voltage, an actuator *retract* signal, is applied to pin 27.

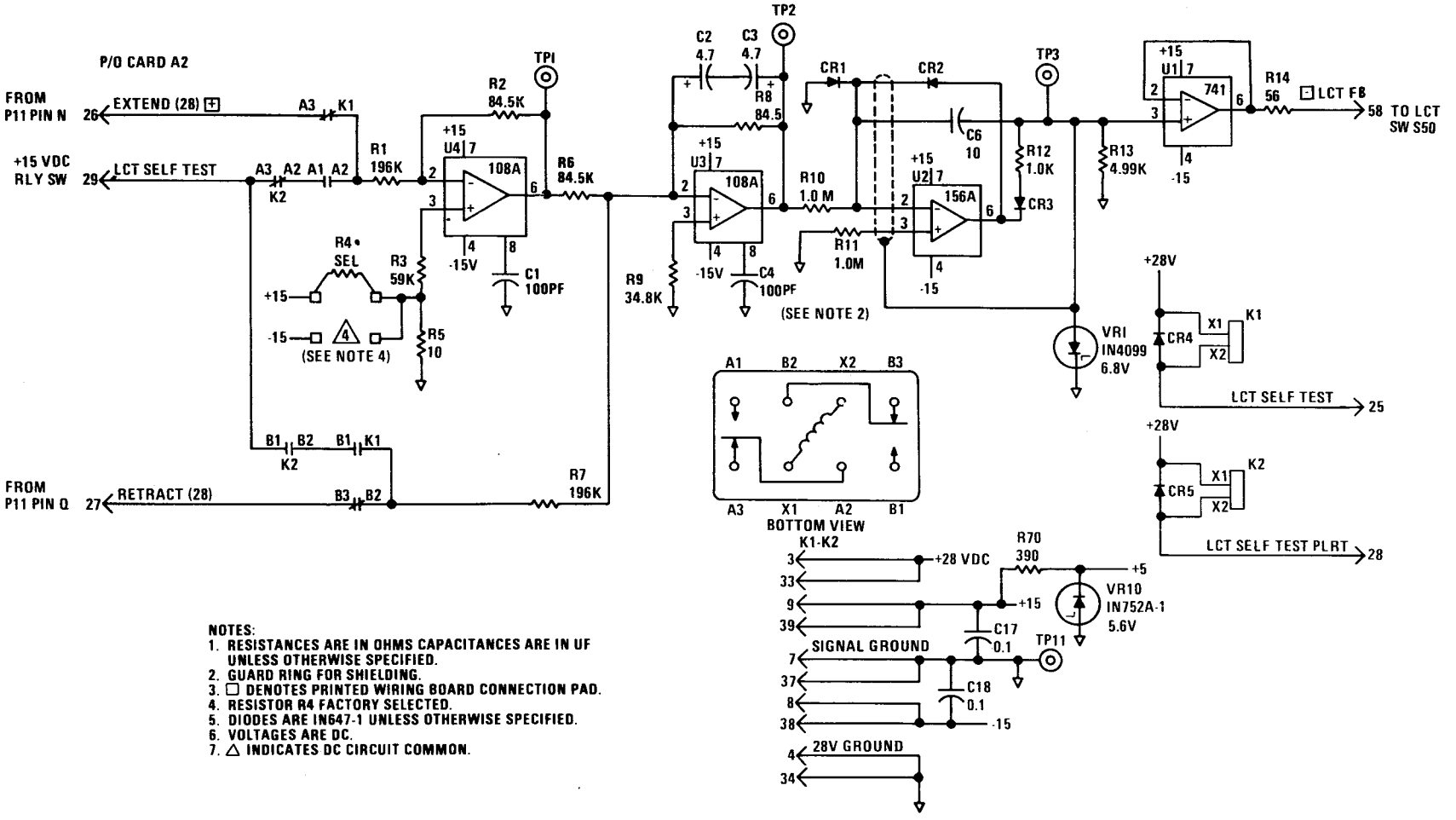
(6) During *extend* self-test, pin 25 is connected to ground at pin 4 by SELF TEST switch S16 (not shown). This operates lct self-test relay K1 and connects a self-test *extend* signal from pin 29 to the input of amplifier U4. Relay K1 also disconnects the extend signal circuit at pin 26 from the input of U4 during *retract* self-test. SELF TEST switch S16 connects pin 25 and 28 to ground at pin 4. This operates self-test relay K1 and polarity relay K2, connecting a self-test retract signal to amplifier U3. Relay K2 also disconnects the retract signal circuit at pin 27 from the input of amplifier U3.

b. Cockpit Control Driver Actuator (CCDA) Simulator Circuit. (See fig. 1-8.) Integrated circuits U9 and U11 through U15 simulate the collective CCDA actuator. This actuator includes a 2-phase motor, a servo amplifier, two clutches, a gear train, and an ac feedback device.

(1) The CCDA output of the AFCS computer is a 400 Hz voltage, leading, or lagging a 400 Hz reference by 90°. This voltage is demodulated and amplified by amplifiers U15 and U13. The gain of the demodulator-amplifier is 2 volt/volt. The output at TP10 is negative when input voltage is leading. Output is positive when input voltage is lagging.

(2) The gain of amplifier U12 is -1.82. The time constant, fixed lag resistor R57 and capacitor C15, is 0.1 second nominal. Zener diodes VR8 and VR9 limit the output of U12 to ±10.5-volt dc.

(3) Analog multiplier U9 is connected as a modulator. The transfer function of the multiplier is (X1-X2) (Y1-Y2) ÷ 10. The voltage applied at Y1 is fixed by resistors R62, R63, and R64 at 6.8 volts nominal. Resistors R60 and R61 form a 9:1 voltage divider. As a result, the gain from the output of amplifier U12 to pin 40 is 0.9 x 6.8 ÷ 10 = 0.61-volt rms/volt dc. The simulated servo limits are 10.5 vac x 0.81=6.4-volts rms nominal. The output of U9 at pin 40 is in phase with the reference voltage applied at pins 1 and 31 when the input signal applied to pin 41 leads the reference by 90°. The output is out-of-phase when the input signal lags. This simulates the feedback from the actuator.



NOTES:
1. RESISTANCES ARE IN OHMS CAPACITANCES ARE IN UF UNLESS OTHERWISE SPECIFIED.
2. GUARD RING FOR SHIELDING.
3. □ DENOTES PRINTED WIRING BOARD CONNECTION PAD.
4. RESISTOR R4 FACTORY SELECTED.
5. DIODES ARE IN647-1 UNLESS OTHERWISE SPECIFIED.
6. VOLTAGES ARE DC.
7. △ INDICATES DC CIRCUIT COMMON.

47D-TMDE-ABTS-28

Figure 1-7. LCT Servo Simulator Schematic Diagram

(4) Drive voltage for the demodulator is obtained by lagging the input reference voltage by 90°. The lag is developed in the network comprised of resistors R43, R44, and R45 and capacitors C13 and C14. The output of the network is applied to the input of U14. The output of the zero crossing detector U14 is a square wave which leads the reference by 90°.

(5) Resistors R68 and R69 and capacitor C16 form a low-pass filter with a time constant of 60 milliseconds. The input to the filter is connected to pin 12. The output of the lag filter is connected to pin 44.

(6) During self-test, pin 43 is connected to ground at pin 4 by self-test switch S16. This operates ccda self-test relay K6. This connects CCDA self-test signal from pin 42 to the input of analog switch U15. At the same time, it disconnects the CCDA servo amplifier signal at pin 41 from the input of U15.

c. Differential Airspeed Hold (DASH) Actuator Simulator Circuit. (See fig. 1-9.) This circuit includes two transfer function circuits. No. 1 transfer, function (TF1) is an integrator which simulates electrically the DASH actuator extending or retracting. No. 2 transfer function (TF2) is a first order lag which simulates aircraft response to the dash actuator extending or retracting.

(1) Chassis mounted resistor R24, connected between pin 55 and pin 56, simulates the actuator servo motor. For each direction of rotation, one side of resistor R24 is grounded and +28 volt dc is applied to the other side by relay K3.

(2) With the input signal at pin 54 simulating an *extend* signal, the gain of amplifier U7 is -0.36. With the input signal at pin 57 simulating a retract signal, the gain of amplifier U7 is +0.36. For a +28 volt dc input signal, the output of amplifier U7 is 10-volt dc.

(3) The integration rate of U10 is fixed at -0.41 volt/volt seconds by resistor R21 and capacitor C8. The output of U10 is limited to ±12.5 volts dc by zero diodes VR2 and VR3. Resistor R24 and R25 form a 5.7:4.3 voltage divider. As a result, the simulated feedback output of TF1, at TP5 is -0.22 volt/volt second, limited to ± 6.6-volts dc. Integrator drift rate is set to zero by resistor R19.

(4) The static gain of U5 is -1.33 volt/volt nominal, fixed by resistor R28 and R29. The lag, developed in resistor R29 and capacitors C9 and C10, is 0.49 seconds. The quiescent output of U5 is set to zero by resistor R31.

(5) The ratio of the voltage divider formed by resistor R32, R33, and R26 is 5.7:4.3. As a result the output of transfer function TF2 at TF5 is approximately 6.6-volts dc.

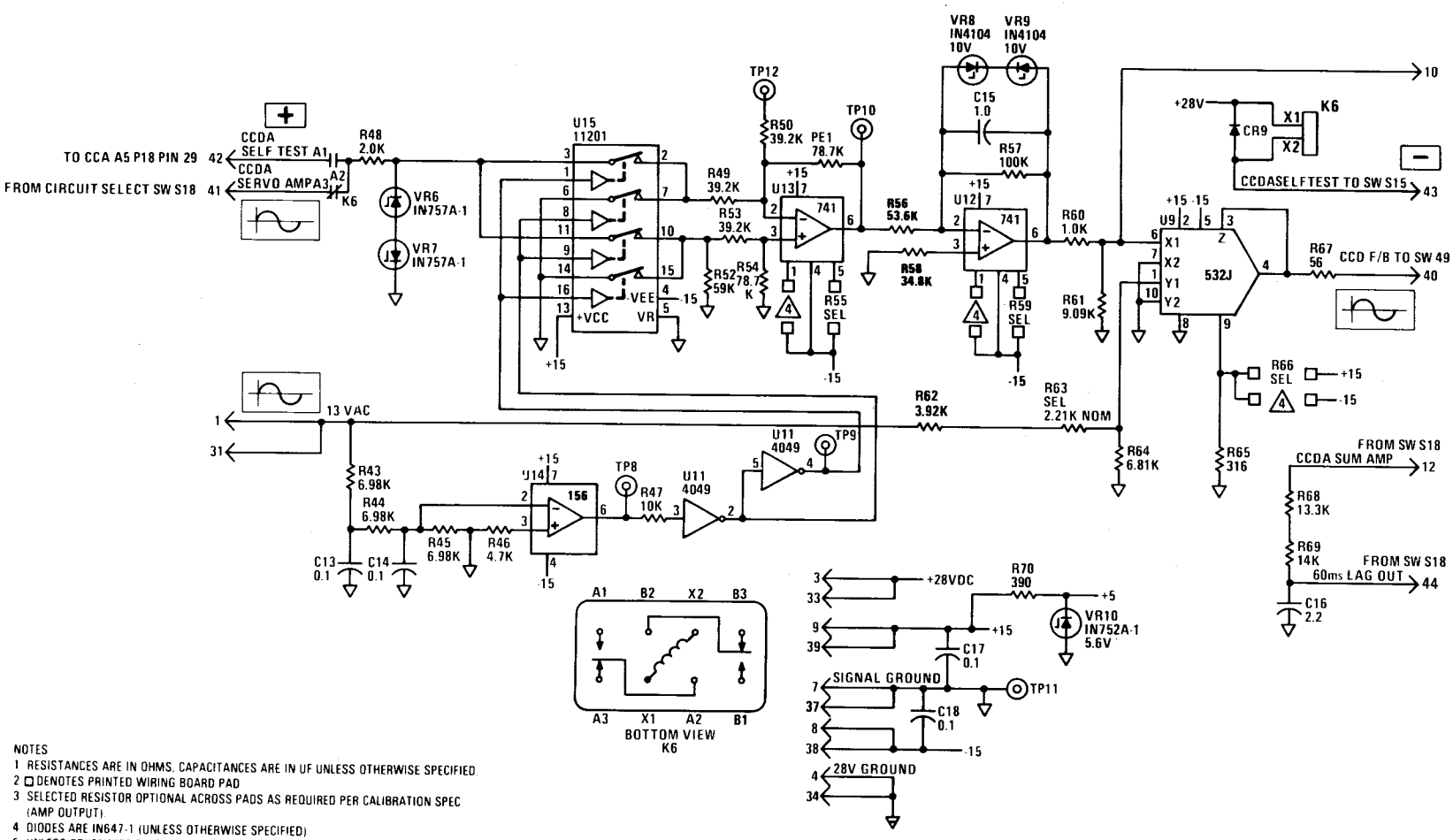
(6) Transfer function TF1 is selected when +28-volt dc is applied to pin 13. This causes integrator U10 to be gated, releasing relay K5B, and connecting the output of U10 to input of U8. Transfer function TF2 is selected when +28-volt dc is applied to pin 14. The output at pin 59 is 0-volt dc. When pins 13 and 14 are at 0-volts dc (ground) or open.

(7) During self-test, connecting pin 43 to ground at pin 4 by self-test switch S16, operates self-test relay K3. This connects the dash self-test pulse signal from pin 52 to the input of U7. It also connects pins 23 and 24 to pin 4. This operates self-test relay K3 and self-test polarity relay K4. These relays connects the DASH self-test negative signal from pin 53 to the input of U7.

1-16. Dc Stimulus Circuit. (See fig. 1-10.) Dc stimulus circuit card A3 includes circuits for generating dc stimulus signals and actuator drive currents. The card also contains circuits for making continuity measurements. Two type of dc voltages are generated: Steady-state dc voltages are provided at constant levels. Dc stimulus signals in step form are developed from dc relay switched outputs.

a. Steady-State Voltage Circuits.

(1) With -15-volt dc applied across resistor R61 to inverting input pin 2 of op-amp U2 the roll detent signal output at pin 11 is +7-volt dc.



NOTES
1 RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF UNLESS OTHERWISE SPECIFIED
2 □ DENOTES PRINTED WIRING BOARD PAD
3 SELECTED RESISTOR OPTIONAL ACROSS PADS AS REQUIRED PER CALIBRATION SPEC (AMP OUTPUT)
4 DIODES ARE IN647-1 (UNLESS OTHERWISE SPECIFIED)
5 UNLESS OTHERWISE SPECIFIED, VOLTAGES ARE DC
6 ▽ INDICATES DC CIRCUIT COMMON

47D-TMDE-ABTS-29

Figure 1-8. *CCDA Servo Simulator Schematic Diagram*

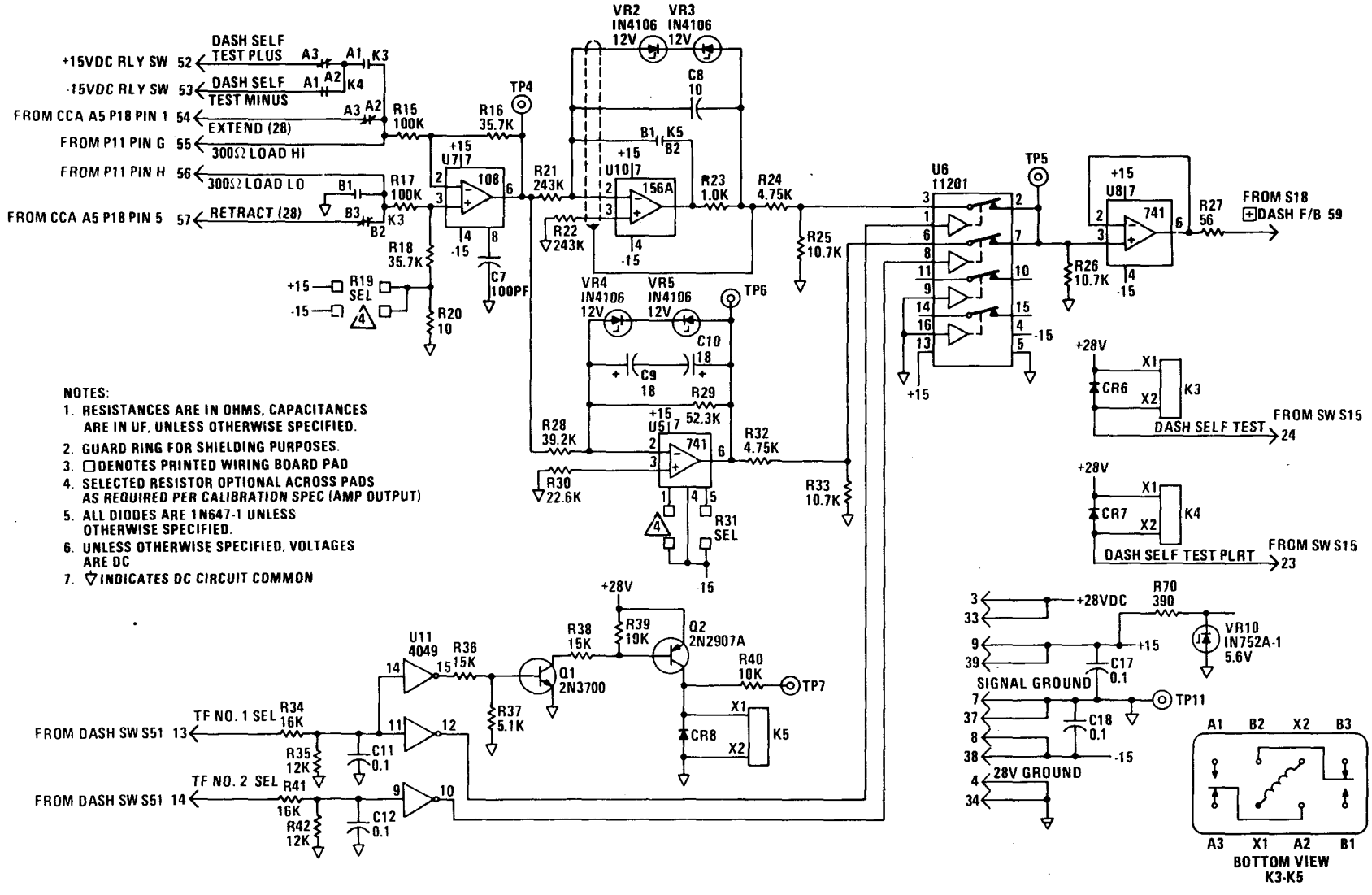


Figure 1-9. *Dash Servo Simulator Schematic Diagram*

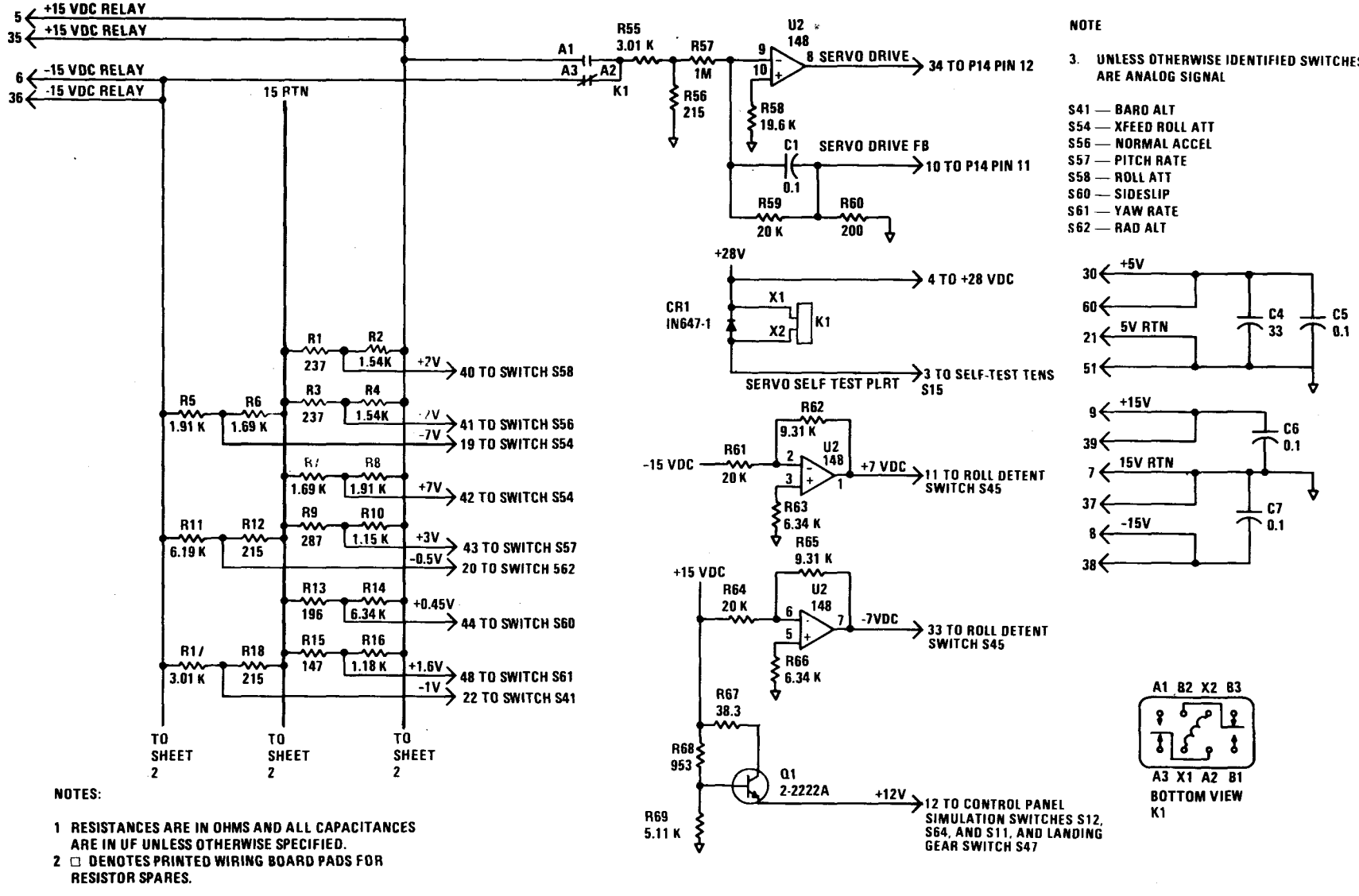
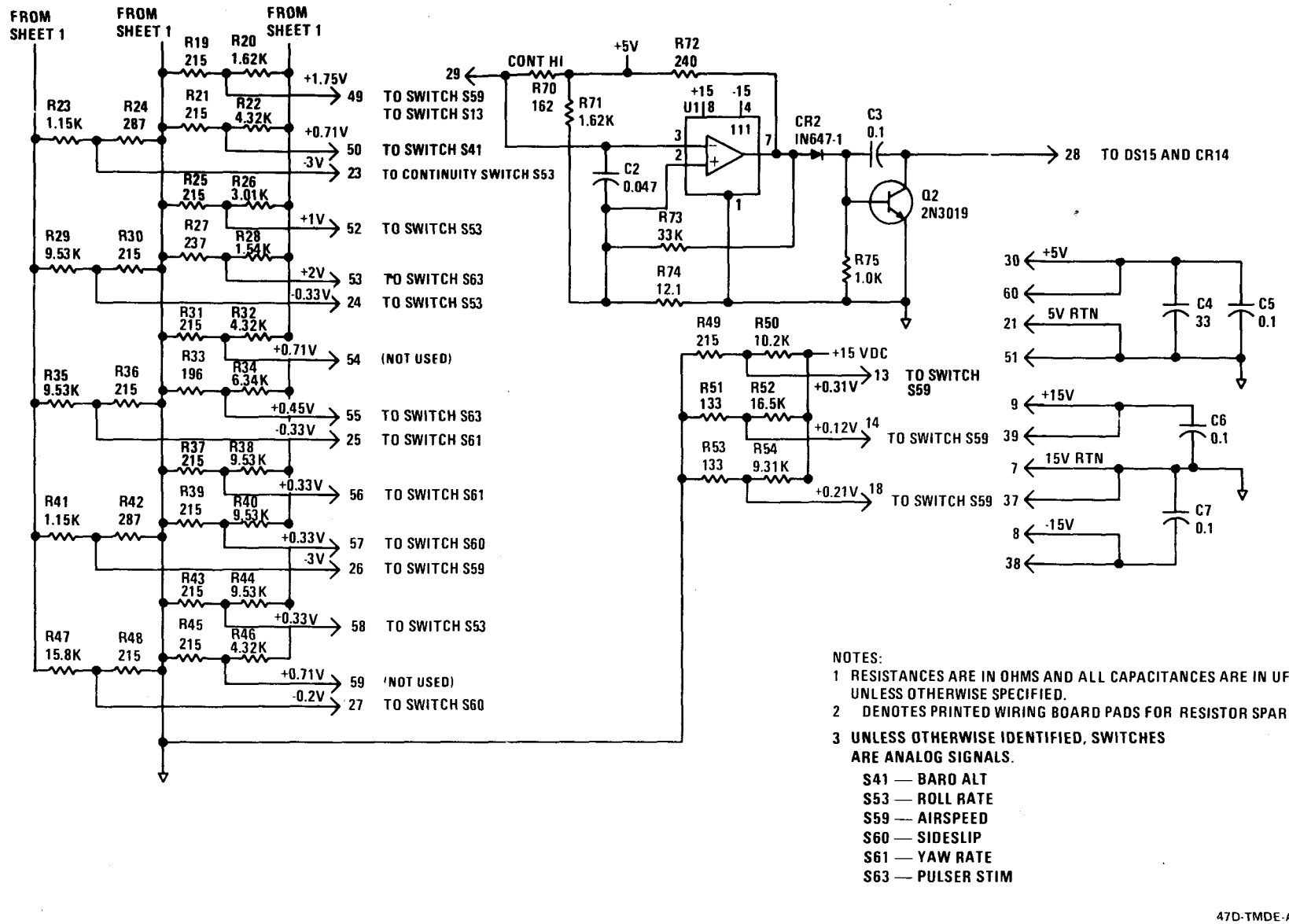


Figure 1-10. *Dc Stimulus Schematic Diagram (Sheet 1 of 2)*



NOTES:

1 RESISTANCES ARE IN OHMS AND ALL CAPACITANCES ARE IN UF UNLESS OTHERWISE SPECIFIED.

2 DENOTES PRINTED WIRING BOARD PADS FOR RESISTOR SPARES.

3 UNLESS OTHERWISE IDENTIFIED, SWITCHES ARE ANALOG SIGNALS.

S41 — BARO ALT
S53 — ROLL RATE
S59 — AIRSPEED
S60 — SIDESLIP
S61 — YAW RATE
S63 — PULSER STIM

47D-TMDE-ABTS-34

Figure 1-10. *Dc Stimulus Schematic Diagram (Sheet 2 of 2)*

(2) With +15 vdc applied across resistor 68 to Q1, the control panel simulation voltage at pin 12 is +12-volt dc.

(3) With +15-volt dc applied to resistors R49 and R50, the airspeed output at pin 13 is +0.31 volt dc.

(4) With +15-volt dc applied to resistors R51 and R52, the airspeed output at pin 14 is +0.12-volt dc.

(5) With +15-volt dc applied to resistors R53 and R54, the airspeed output at pin 18 is +0.21-volt dc.

(6) With +15-volt dc applied across resistor R64 to pin 6, the inverting input of op-amp U2, the roll detent voltage at pin 33 is -7-volt dc.

b. Step Dc Voltage Circuits.

INPUT VOLTAGE	VOLTAGE DIVIDER	FUNCTION	CONNECTOR PIN	OUTPUT VOLTAGE
−15-volt dc	R5, R6	XFEED ROLL ATT	19	−7-volt dc
−15-volt dc	R11, R12	RAD ALT	20	−0.5-volt dc
−15-volt dc	R17, R18	BARO ALT	22	−1-volt dc
−15-volt dc	R23, R24	ROLL RATE	23	−3-volt dc
−15-volt dc	R29, R30	ROLL RATE	24	−0.33-volt dc
−15-volt dc	R35, R36	SIDESLIP	25	−0.33-volt dc
−15-volt dc	R41, R42	AIRSPEED	26	−3-volt dc
−15-volt dc	R47, R48	SIDESLIP	27	−0.2-volt dc
+15-volt dc	R1, R2	ROLL ATT	40	+2-volt dc
+15-volt dc	R3, R4	NORMAL ACCEL	41	+2-volt dc
+15-volt dc	R7, R8	XFEED ROLL ATT	42	+7-volt dc
+15-volt dc	R9, R10	PITCH RATE	43	+3-volt dc
+15-volt dc	R13, R14	SIDESLIP	44	+0.45-volt dc
+15-volt dc	R15, R16	YAW RATE	48	+1.6-volt dc
+15-volt dc	R19, R20	AIRSPEED	49	+1.75-volt dc
+15-volt dc	R21, R22	BARO ALT	50	+.071-volt dc
+15-volt dc	R25, R26	ROLL RATE	52	+1-volt dc
+15-volt dc	R27, R29	PULSER STIM	53	+2-volt dc
+15-volt dc	R33, R34	PULSER STIM	55	+0.45-volt dc
+15-volt dc	R37, R38	YAW RATE	56	+0.33-volt dc
+15-volt dc	R39, R40	SIDESLIP	57	+0.33-volt dc
+15-volt dc	R43, R44	ROLL RATE	58	+0.33-volt dc

c. Servo Drive Current Circuits. (See fig. 1-10, sh. 1.)

(1) Resistors R55 thru R60, capacitor C1, and amplifier U2, provide 0.1 ma current. This current is used as a self-test input signal for pitch, roll, and yaw servo simulators.

(2) With a -15-volt dc input, the output of voltage divider R55/R56 is -l-volt dc. The current thru resistor R57 is –1 ua. This current is balanced by the current thru resistor R59, which is also 1 ua. This current produces a +0.020-volt dc servo drive feedback voltage at pin 10. The current thru R60 is +0.020-volt dc ÷ 200 ohms = +0.1 ma. The current through the load resistance between pin 34 and pin 10 is the sum of the currents thru R59 and R60.

d. Continuity Circuit.

(1) The continuity test circuits includes a resistance bridge, voltage comparator, and lamp divider.

(2) The resistance bridge consists of resistors R70, R71, and R74, with a variable resistance element switch S14 connected between circuit card pins 29 and 21. An external resistance of 1.2 ohms balances the bridge.

(3) The inputs of comparator U1 are connected across the bridge. With a resistance greater than 1.35 ohms between pins 21 and 29, the voltage on pin 3 of comparator U1, is greater than the voltage on pin 2. Output voltage at pin 7 of U1 is negative. When the resistance between pins 21 and 29 is less than 1.2 ohms, the voltage on pin 2 of U1 is greater than the voltage on pin 3. In this case, output voltage from pin 7 of U1 is positive. When U1 output is positive, the feedback thru resistor R73 maintains a positive output voltage on pin 7 of U1 for resistances up to 1.35 ohms connected between pins 21 and 29.

(4) Transistor Q2 is a ground side switch which controls CONTINUITY TEST indicator DS15. When the output at pin 7 of U1 is positive, NPN transistor Q2 conducts and CONTINUITY TEST indicator DS15 comes on. For a negative comparator output, transistor Q2 does not conduct for a resistance less than 1.2 ohms. An open circuit, more than 1.2 ohms, does not light DS15.

1-17. Sample and Hold Circuit. (See fig. 1-11.) Circuit card assembly A4 includes circuits for making sample-and-hold time response measurements. The circuit consist of a time delay generator, stimulus power switching relays, and the sample-and-hold amplifier. Two toggle switches and a five-digit thumbwheel switch control the circuit. Hold status is displayed by HOLD indicator DS10.

a. Power Switching Relays Circuit. This circuit applies a step voltage, by mean of relays and a dc stimulus signal, to the computer network to be tested.

(1) When mode switch S8 is at OFF, an open circuit exists at pin 20 of circuit card A5. This connects pin 10 of or gate U11, to +5-volt dc through resistor R2. With +5-volt dc at pin 10, the output of U11 at pin 8 is a logic 1. This signal is connected to the input of U16 at pins 1, 3, 5, and 13. With a logic 1 at the input of buffer inverters U16, the logic 1 is invertered to give a logic 0 at the outputs. This applies a ground to the windings of relays K1 through K5. The relays operate and apply power to the stimulus circuit.

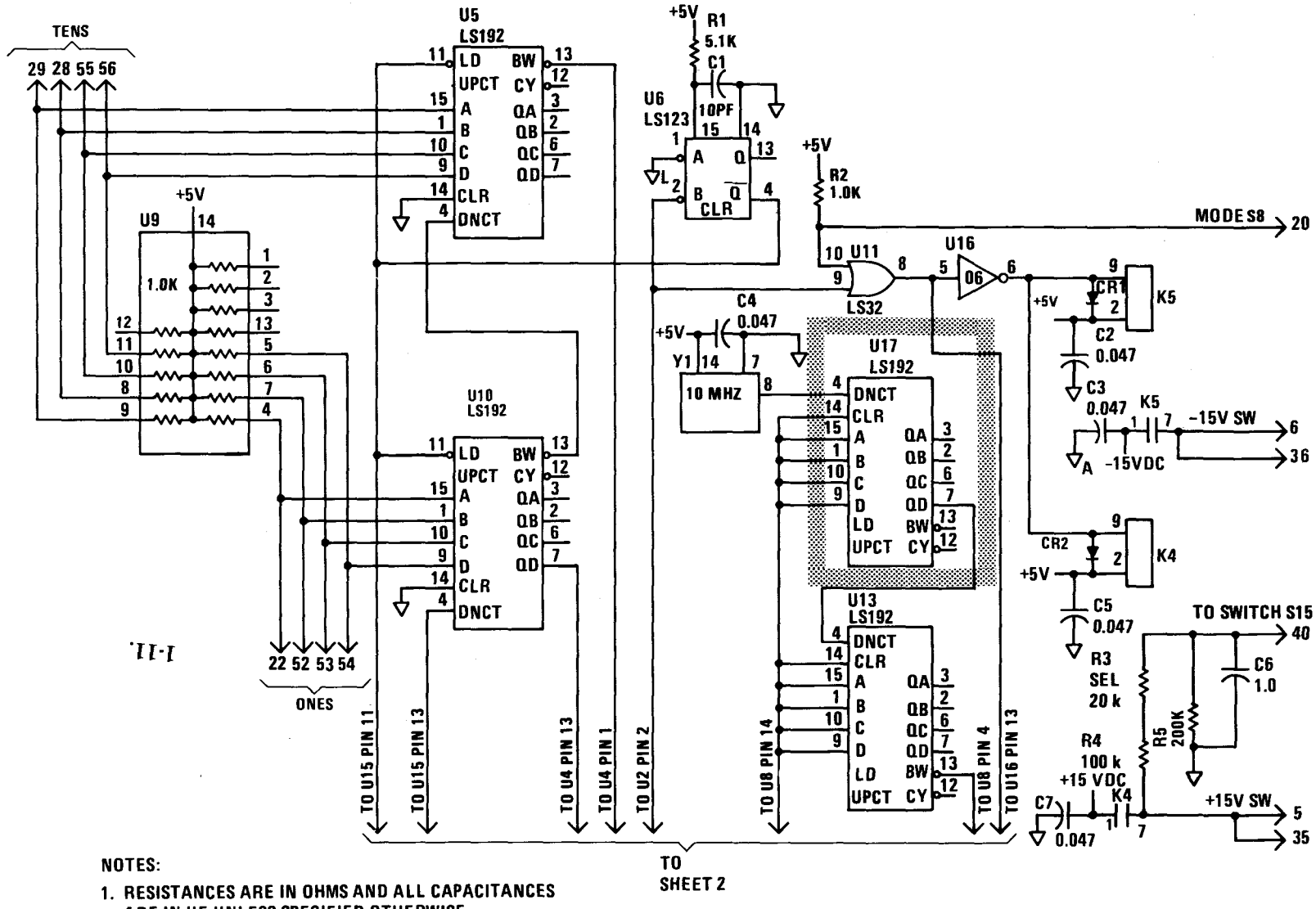
(2) When the MODE switch is set to ON ground is connected to pin 10 of *or* gate U11 through connector pin 20. With a ground at pin 10 of U11, the logic 1 is changed to a logic 0. The output of U16 is a logic 1, which removes the ground from the windings of relays K1 through K5. The relays are released, removing the stimulus signals from the computer under test.

b. Time Delay Generator Circuit. The time delay generator consist of a 10-megahertz oscillator, nine binary-coded-decimal (BCD) counters U3, U5, U8, U10, U13, U15, U17, U18, and U19, two pull-up resistors U9 and U14, one gate of gate U2, and one half of flip flop U12 and U4.

(1) When STIM switch S7 is at APPLY and MODE switch S8 is at OFF. Power is applied to the stimulus circuits. This loads the counter with the time delay setting and starts the count down. Latch U2 is set, removing a clear, allowing U12 to change state and output a logic 1. The logic 1 from pin 5 is applied to pin 2 of *nand* gate U2 when it is clocked by the l-kilohertz clock pulse from counter U3 pin 13.

(2) The 1-kilohertz clock pulses are routed to time delay counters U5, U10, U15, U18, and U19. These count the 1-kilohertz pulses from U2 pin 3 down from the time delay setting until the counters have all counted down to zero. At this point a logic 0 borrow pulse is produced at U5 pin 13. At the end of the time delay interval, counter U5 outputs the logic borrow pulse from pin 13 to clock the input of flip-flop U4 at pin 1, changing the state of U4.

(3) When flip-flop U4 changes state, the results area logic 0 at the Q output on pin 6. The logic 0 level signal is connected to sample-and-hold amplifier U7 pin 8, of the FET switch, opening the interval switch to the sample-and-hold amplifier. The amplifier and hold capacitor C21 now hold the voltage present at the input, just prior to the opening of the FET switch.

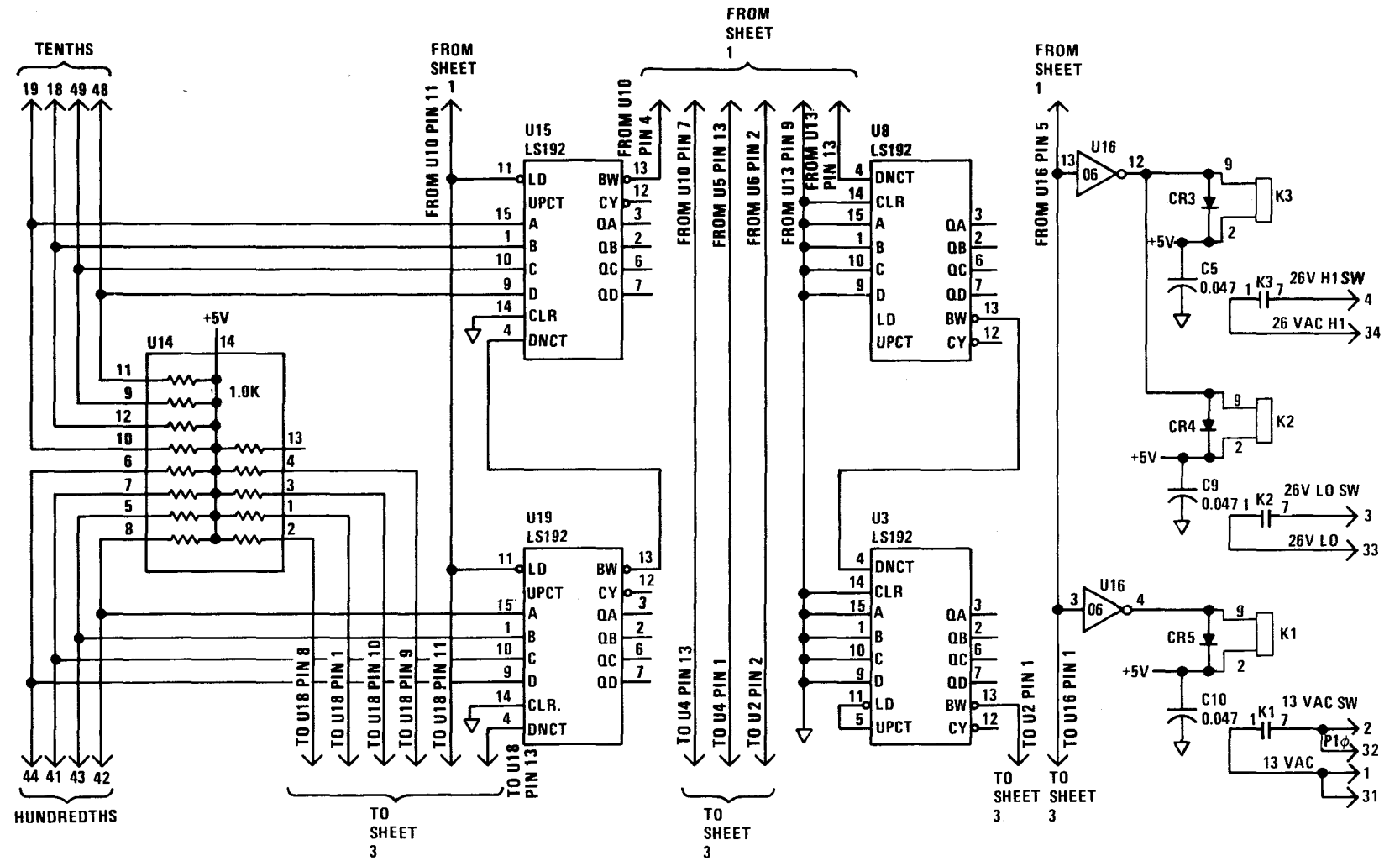


NOTES:

1. RESISTANCES ARE IN OHMS AND ALL CAPACITANCES ARE IN UF UNLESS SPECIFIED OTHERWISE.
2. OC DENOTES OPEN COLLECTOR
3. ALL DIODES IN647-1 UNLESS SPECIFIED OTHERWISE.

47D-TMDE-ABTS-35

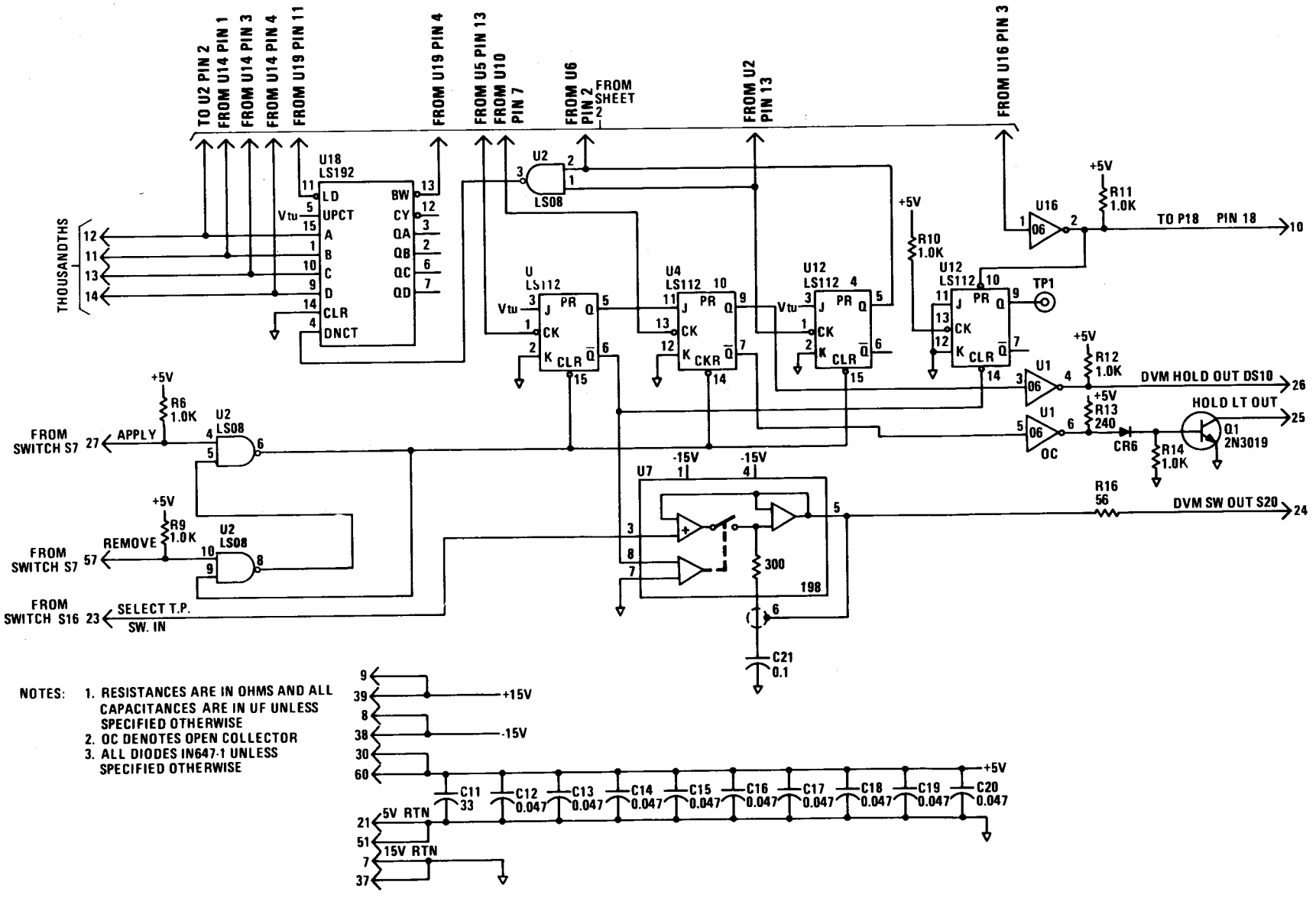
Figure 1-11. *Sample-and-Hold Circuit Schematic Diagram (Sheet 1 of 3)*



NOTES:
1. RESISTANCES ARE IN OHMS AND ALL CAPACITANCES ARE IN UF UNLESS SPECIFIED OTHERWISE
2. DC DENOTES OPEN COLLECTOR
3. ALL DIODES IN647-1 UNLESS SPECIFIED OTHERWISE

47D-TMDE-ABTS-36

Figure 1-11. *Sample-and-Hold Circuit Schematic Diagram (Sheet 2 of 3)*



NOTES:
1. RESISTANCES ARE IN OHMS AND ALL CAPACITANCES ARE IN UF UNLESS SPECIFIED OTHERWISE
2. OC DENOTES OPEN COLLECTOR
3. ALL DIODES IN647-1 UNLESS SPECIFIED OTHERWISE

47D-TMDE-ABTS-37

Figure 1-11. *Sample-and-Hold Circuit Schematic Diagram (Sheet 3 of 3)*

(4) The counters continue counting and 2 seconds after the time delay interval, the QD output on pin 7 of U10 goes to a logic 0 level as the digit transitions from eight to seven. Since the Q output of U4 pin 5, is already at logic 1, the logic 0 pulse from QD is applied to the clock input of U4. This changes the state of the flip-flop, which changes the states of the outputs on connector pins 25 and 26. Q output is now forward biased and will conduct the current of the hold light, which is connected externally to +5-volt dc and the ground side is switched by turning on Q1. Output at pin 26 is a logic 0.

(5) The four bit BCD digit is loaded on the counter inputs, with D being the most significant bit (MSD), and A the least significant bit (LSD). The counter inputs are connected to a +5-volt dc, through pull-up-resistors U9 and U14, to form a logic 1 inputs. The BCD code is generated by grounding the appropriate connector pins to the 5-volt dc return to form the logic 0 of the BCD code for each digit.

(6) Resistors R3, R4, R5 and capacitor 6 form an rc network with a time constant of 75 milliseconds. When relay K4 is energized this circuit is used for self-test to simulate a unit under test response.

(7) The output at pin 9 of flip-flop U12 is set to logic 1 when the output from the buffer U16 pin 2 is at a logic 0, which occurs when the contacts of the relays K1 through K5 are closed. Whenever the Q output pin 6 of flip-flop U4 is applied to the CLR input of flip-flop U12, the output at pin 9 of U12 is set to 0. This condition will occur at the end of the time delay interval. The pulse produced at TP1 is a pulse width equal to the time delay interval. When the MODE switch is set to OFF, the output of flip-flop U12 pin 9 will be set to logic 0.

1. Therefore the first pulse at TP1 in the step response mode test mode (MODE switch to ON) will not correspond to the time delay interval, the STIM switch must be first set to APPLY and then to REMOVE. With the MODE switch remaining in the ON position, subsequent setting of the STIM switch and TIME DELAY switches will produce a pulse on TP1 corresponding to the time delay interval. Test point TP1 is from the Q output of flip-flop U12 at pin 9 and is used as a diagnostic aid to check out and to debug the circuit card.

1-18. AC Stimulus and Self-Test Circuits. (See fig. 1-12.) Circuit card assembly A5 includes circuits for generating 400 Hz ac stimulus signals and self-test signals. A5 includes the following circuits.

- 90° phase shift networks.
- Voltage dividers.
- DASH drive frequency dividers.
- Continuity self-test circuits.
- Logic stimulus circuits.

a. 90° Phase Shift Network.

(1) Connecting pin J1-18 to ground at P17-10 operates relay K1. The relay contacts connect the 13-volt ac signal from J1-2 and J1-32 to the 90° phase shift network and the voltage divider.

(2) The 90° lagging phase shift network includes resistors R1, R2, and R3 and capacitors C2 and C3. With relay K1 operated, the 13-volt ac signal is applied to the input of the phase shift network. In the network, the signal is shifted and lagged 90°. The output of the network is about 4.36 volts. The gain of amplifier U1 at pin 7 is 1.04. This is determined by voltage divider resistors R6 and R9. Amplifier U1 and resistors R7 and R8 form an inverter with unity gain. The output voltage at pin 8 is 4.5-volt ac which leads the J1-2 input by 90°.

(3) When relay K2 operates, the phase shifted signal is selected at connector pin 29. With a 13-volt 400 Hz ac signal applied to pins J1-2 or J1-32 and connector pin J1-18 connected to ground at J1-21, the voltage at J1-29 is 4.5-volt ac which is lagging the input by 90°. When pin J1-24 is connected to ground at J1-21, K2 is operated. With relay K2 operated, the 90° leading voltage is selected at pin J1-29.

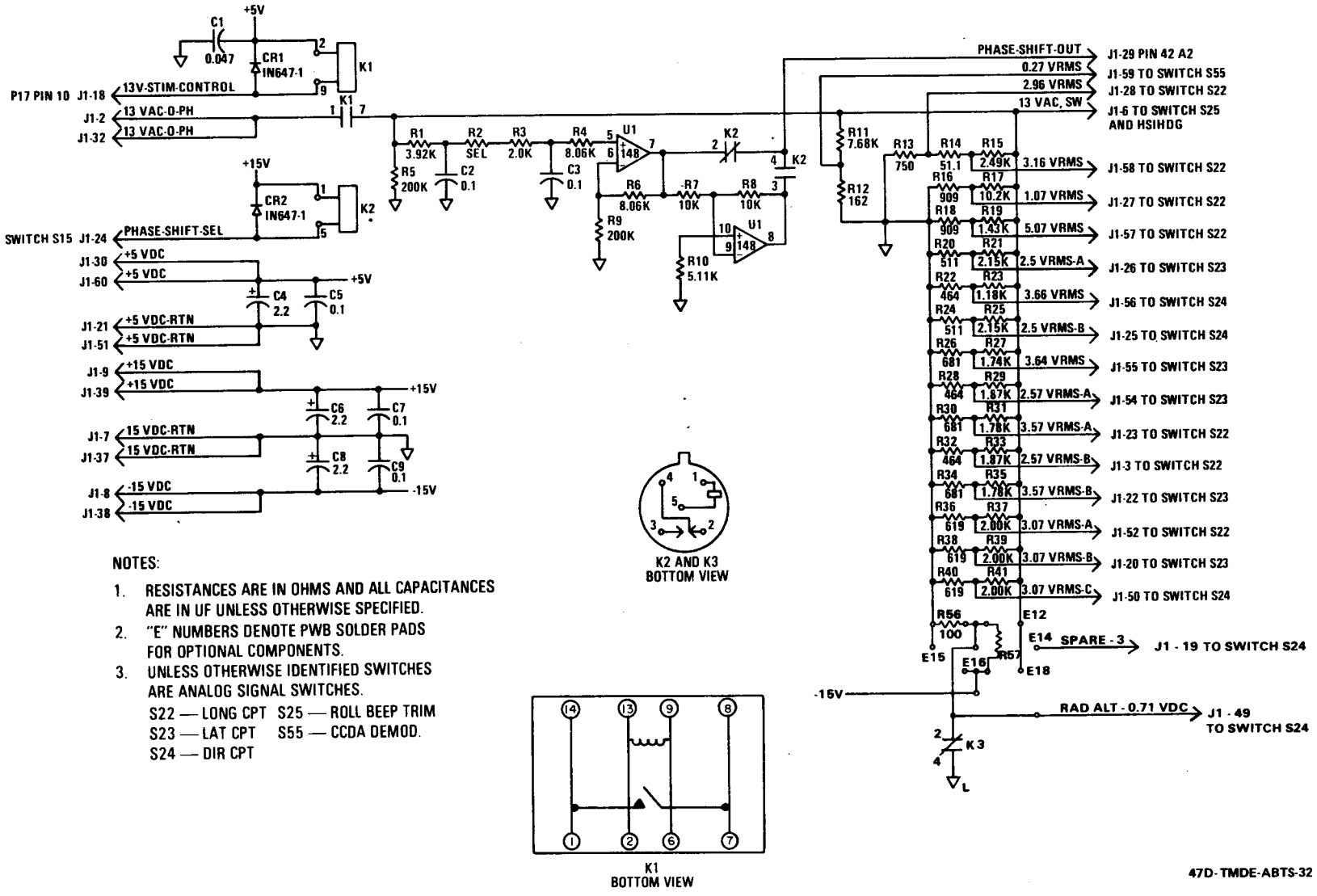
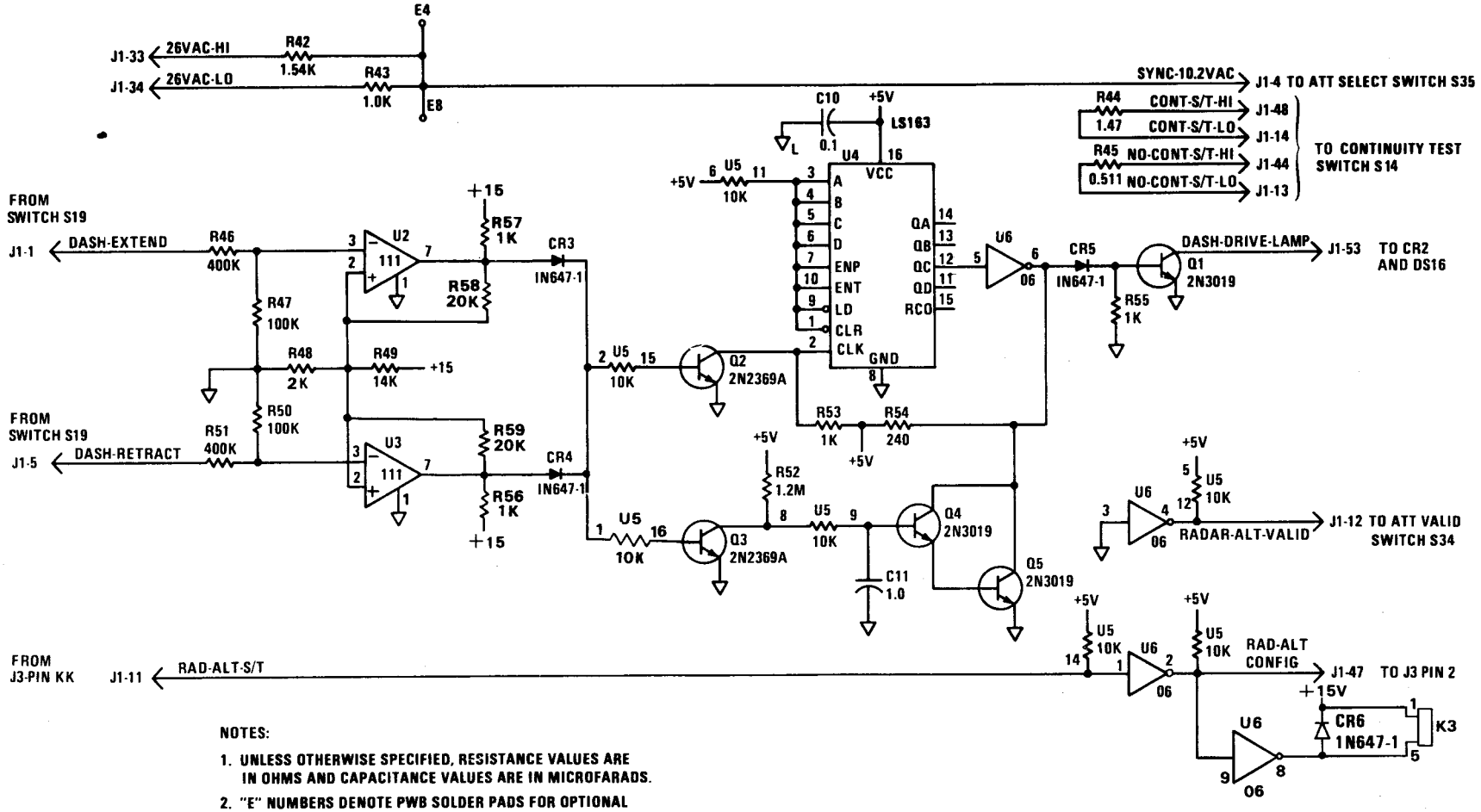


Figure 1-12. *Ac Stimulus and Self-Test Schematic Diagram (Sheet 1 of 2)*



NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. "E" NUMBERS DENOTE PWB SOLDER PADS FOR OPTIONAL COMPONENTS.

47D-TMDE-ABTS-31

Figure 1-12. *Ac Stimulus and Self-Test Schematic Diagram (Sheet 2 to 2)*

b. Voltage Divider. The voltage dividers consists of ac voltage dividers R11 thru R41 and dc voltage dividers R56 and R57.

INPUT VOLTAGE	VOLTAGE DIVIDER	FUNCTION	CONNECTOR PIN	OUTPUT VOLTAGE
13 vac	Resistors R11 and R12	CCDA DEMOD	J1-59	0.27 vac
13 vac	Resistors R13, R14 and R15	LONG CPT	J1-28	2.96 vac
13 vac	Resistors R14 and R15	LONG CPT	J1-58	3.16 vac
13 vac	Resistors R16 and R17	LONG CPT	J1-27	1.07 vac
13 vac	Resistors R18 and R19	LONG CPT	J1-57	5.07 vac
13 vac	Resistors R20 and R21	LAT CPT	J1-26	2.5 vac
13 vac	Resistors R22 and R23	DIR CPT	J1-56	3.66 vac
13 vac	Resistors R24 and R25	DIR LAT	J1-25	2.5 vac
13 vac	Resistors R26 and R27	LAT CPT	J1-55	3.64 vac
13 vac	Resistors R28 and R29	LAT CPT	J1-54	2.57 vac
13 vac	Resistors R30 and R31	LONG CPT	J1-23	3.57 vac
13 vac	Resistors R32 and R33	LONG CPT	J1-3	2.57 vac
13 vac	Resistors R34 and R35	LAT CPT	J1-22	3.57 vac
13 vac	Resistors R36 and R37	LONG CPT	J1-52	3.07 vac
13 vac	Resistors R38 and R39	LAT CPT	J1-20	3.07 vac
13 vac	Resistors R40 and R41	DIR CPT	J1-50	3.07 vac
–15 vdc	Resistors R56 and R57	DIR CPT	J1-49	0.71 vdc

c. DASH Drive Frequency Divider. The frequency divider consists of two voltage comparators, a 8 ÷ 1frequency divider, and a lamp drive circuit.

(1) The DASH drive signal cart be a steady 28-volt dc signal or a 7 pps 28-volt signal. This signal is applied to the extend input at J1-1 or the retract input at J1-5.

(2) Comparator U2 senses the 28-volt dc extend input signal. Resistors R46 and R47 form a voltage divider with a ratio of 50:1. With a 28-volt dc extend signal on J1-1 the voltage on pin 3 of comparator U2 is +5.6-volt dc. The voltage on pin 2 of U2 is 1-volt dc; established by resistors R48 and R49. With voltage on pin 3 greater than voltage on pin 2, output at pin 7 of U2 is close to positive power supply voltage. When the input signal at J1-1 is ground or an open circuit, voltage at pin 3 of U2 is less than voltage at pin 2. The output at pin 7 is about –15 volt dc.

(3) Diode CR3 passes only the positive-half comparator output to transistor Q2 and Q3.

(4) Resistors R50, R51, diode CR4, and comparator U3 perform a similar function for the retract signal at J1-5. Comparator U2 or U3 ouput is applied to the bases of Q2 and Q3.

(5) Transistor Q2 performs a voltage transformation to transistor transistor logic (TTL) logic levels. The clock input at pin 2 of U4 is connected to a +5-volt dc thru pull-up resistor R53. When a positive voltage is applied to the base of Q2, transistor Q2 conducts and connects pin 2 of U4 to ground thru the collector emitter junction of Q2. The QC output of U4 performs a ÷ 8 function on the clock input. For a clock input of 7 Hz (7 pps) the frequency at QC is 0.875 Hz.

(6) Inverter gate U6 is a buffer. If provides sufficient base current to the lamp drive transistor Q1, which is a ground side switch for DASH DRIVE indicator DS16.

(7) The network formed by transistor Q3 thru Q5, capacitor C11, resistors R52 and U5 turn out the DASH DRIVE lamp, when there is no DASH extend or retract signal. This is necessary since the QC output from U4 could be left in either state. Its state would depend on its initial state and the number of pulses applied to the clock input. The drive signal to the DASH drive lamp is turned off when Darlington pair Q4 and Q5 conduct and ground the base of lamp drive transistor Q1. To adequately form and bias transistors Q4 and Q5, the voltage at capacitor Cl1 must be 1.4 volt dc or greater.

(8) Capacitor C11 is charged thru resistor R52 and U5 for an rc time constant of 1.21 second. Capacitor C11 is discharged thru a 10K ohm resistor in U5 and transistor Q3, for a time constant of 10 US. The time for capacitor C11 to charge to 1.4 volt dc is 0.33 second. Since the period of the 7 Hz dash drive signal is 0.143 second, the long charging time constant of capacitor C11 inhibits turning off the DASH drive lamp between the 7 Hz pulses.

d. Continuity Self-Test Resistors.

(1) Resistor R44 is connected across connector pins J1-48 and J1-14. It is the nominal 1.5-ohm resistance for continuity self-test.

(2) Resistor R45 is connected across connector pins J1-44 and J1-13. It is the nominal 0.5-ohm resistance for continuity self-test.

e. Logic Stimulus signals.

(1) The output at pin 4 of inverter U6 is connected to connector pin J 1-12. The output is used as a TTL logic 1 voltage with a nominal level of 4.5-volt dc.

(2) The RAD-ALT-S/T signal from connector pin J1-11 is applied to pin 1 of inverter U6. U6 provides an inverted TTL logic output on connector pin J1-47. When connector pin J 1-11 is an open circuit, the output from inverter U6 at connector pin J1-47 is 0-volt dc (logic 0). When connector pin J1-11 is connected to ground at connector pin J1-21, the ouput from inverter U6 at connector pin J1-47 is 4.5-volt dc (logic 1).

(3) When the output at pin 2 of inverter U6 is high, the output at pin 8 of inverter U6 is low. With a low at pin 8, relay K3 is activated.

CHAPTER 2

OPERATING INSTRUCTIONS

SECTION I PREPARATION FOR USE

2-1. Unpacking the Equipment.

a. Packaging Data. When packed for shipment, the AFCS bench test set is cushioned with styrofoam and placed in a cleated plywood box. (See fig. 2-1.)

b. Removing Contents.

(1) Use the nailpuller to remove the nails from the cleated plywood cover and remove the cover.

(2) Use the nailpuller to remove the nails from one side panel of the box and remove the side panel.

(3) Remove the top and side pads of cushioning material.

WARNING

The test set weighs about 90 pounds, Be careful when lifting the test set to prevent personal injury.

(4) Remove the test set from the box.

2-2. Checking Unpacked Equipment.

a. Inspect the equipment for damage. If the equipment has been damaged, report the damage as specified in para 1-3.

b. Check that the equipment is complete, as listed on the packing list. Report discrepancies in accordance with para 1-3.

c. If the equipment has been used or is reconditioned, see if it has been changed by a Modification Work Order (MWO). If the equipment has been modified, the MWO number shall appear on the cover near the nameplate. If modified, check that operational changes resulting from the modification are included in the equipment manual.

NOTE

Current MWO applicable to the equipment are listed in DA PAM 310-1.

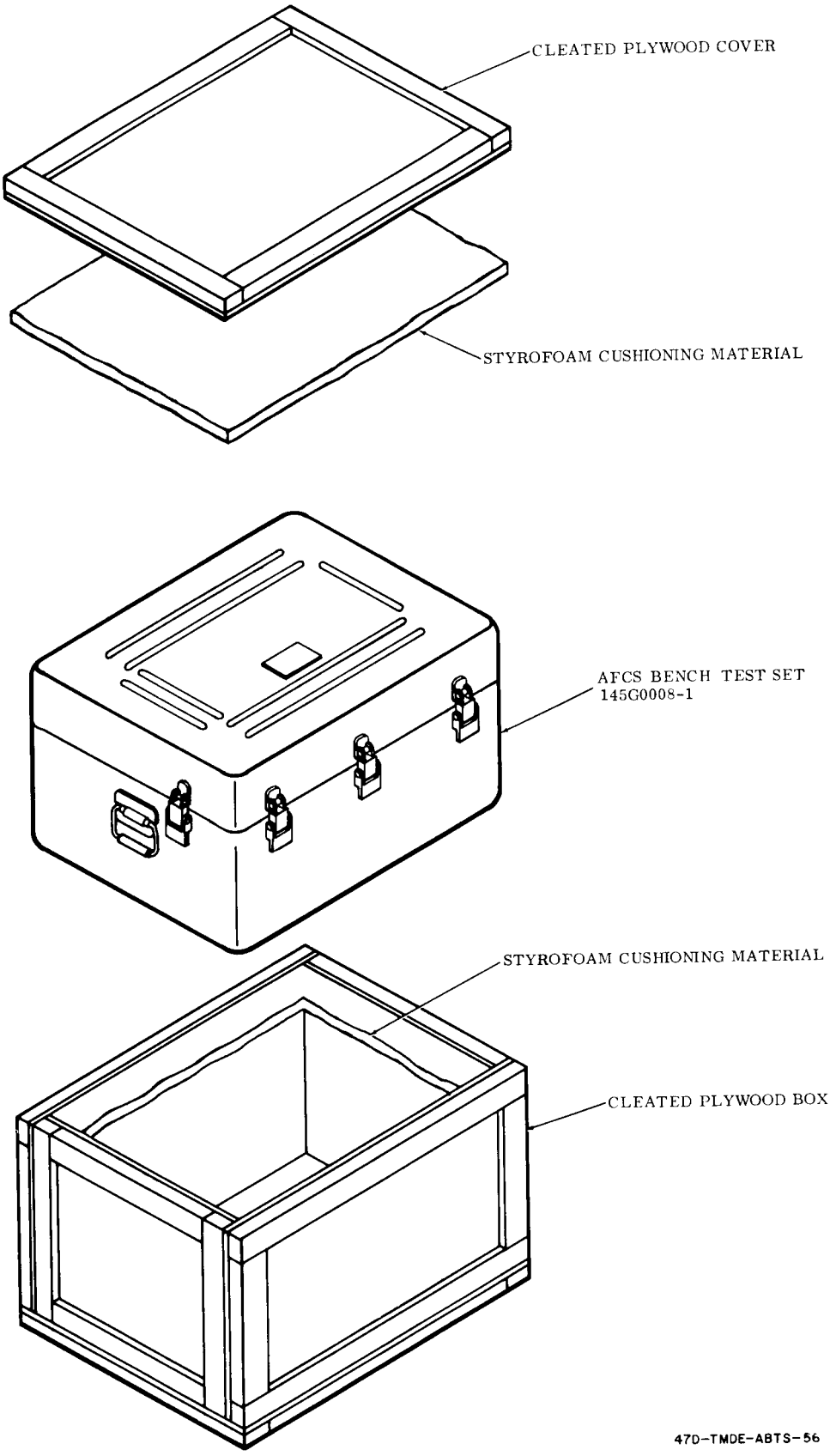


Figure 2-1. Typical Packaging of Test Set

2-3. Preparation for Use.

The test set is portable. No special installation is required. Power requirements are 115-volt 400-Hz 5-ampere single-phase ac and 28-volt, 5 ampere dc. Prepare the test set as follows:

a. Press air pressure relief valve in the cover to equalize inside and outside air pressure.

b. Unlatch and remove the cover from the test set. Release the three fasteners and open the door in the cover. Remove the seven test set cables from the cover.

c. Connect power cable W7 to test set POWER receptacle J7. Connect the other ends to shop 115-volt 400-Hz ac and 28-volt dc power sources.

NOTE

If 115 VAC 400 Hz shop power is not available, fabricate power cable (reference fig. 2-1.1). Connect static inverter and AFCS bench test set to +28 VDC power source.

d. Perform the connection and operation procedures in Section II.

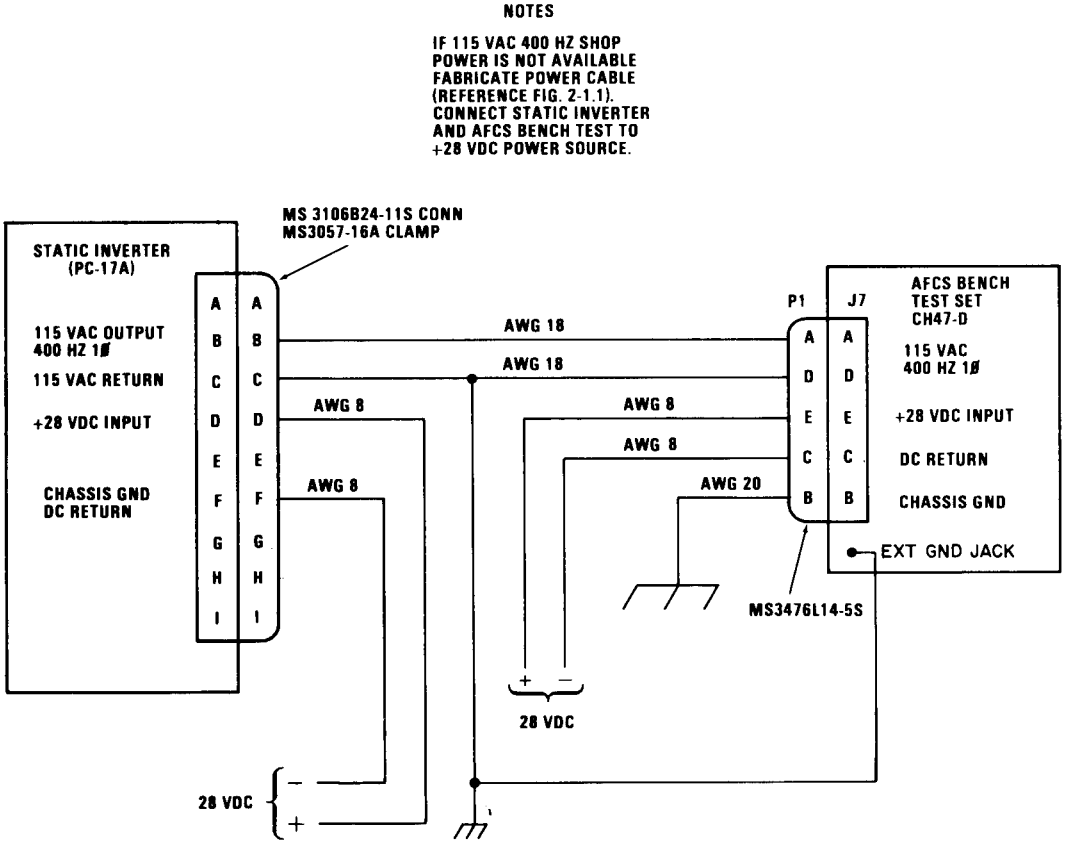


Figure 2-1.1. Alternate Power Cable Hookup

SECTION II OPERATION

2-4. Controls and Indicators.

(See fig. 2-2.) The test set controls and indicators are described in table 2-1.

Table 2-1. Controls and Indicators

CONTROL/INDICATOR	DESCRIPTION
TESTER POWER Group	
115 VAC 400 Hz indicator DS1	Indicator light. Indicates that 115-volt 400 Hz ac is connected to the test set.
Circuit breaker CB1	5-ampere circuit breaker. Protects test set and 115-volt 400-Hz ac power source in an overload.
ON-OFF switch S1	2-position toggle switch. ON - Connects 115-volt 400-Hz ac power and 28-volt dc power for test set and unit under test. OFF - Disconnects power.
+28 VDC indicator DS2	Indicator light. Indicates that 28-volt dc power is connected to the test set.
Circuit breaker CB2	5-ampere circuit breaker. Protects test set and 28-volt dc power source in an overload.
Elapsed time indicator M1	4-digit display. Indicates total time that 115-volt 400-Hz ac power has been applied to test set.
+5 VDC indicator DS6	Indicator light. Indicates that +5 vdc power is available for test set circuits.
+15 VDC indicator DS8	Indicator light. Indicates that +15 vdc power is available for test set circuits.
–15 VDC indicator DS7	Indicator light. Indicates that –15-volt dc power is available for test set circuits.
GND LUG J10	Jack. Provides test set chassis ground connection.
AFCS POWER Group	
115 VAC 400 HZ indicator DS3	Indicator light. Indicates that 115-volt 400-Hz ac power is applied to unit under test.
Circuit breaker CB3	Protects unit under test and test set 115-volt 400-Hz ac circuits in an overload.
ON-OFF switch S2	2-position toggle switch. ON - Connects 115-volt 400-Hz ac power to unit under test circuits. OFF - Disconnects power.
+28 VDC indicator DS4	Indicator light. Indicates that 28-volt dc power is applied to unit under test.
Circuit breaker CB4	3-ampere circuit breaker. Protects unit under test and test set +28-volt dc circuits in an overload.
ON-OFF switch S3	2-position toggle switch. ON - Connects +28-volt dc power to unit under test. OFF - Disconnects power.
5 VAC indicator DS9	Indicator light. Indicates that 5-volt ac power is applied to unit under test.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
LCT POWER Group	
+28 VDC indicator DS5	Indicator light. Indicates that 28-volt dc power is applied to unit under test.
Circuit breaker CB5	3-ampere circuit breaker. Protects unit under test and test set 28-volt-dc lct circuits in an overload.
ON-OFF switch S4	2-position toggle switch. ON — Connects 28-volt dc power to unit under test circuits. OFF — Disconnects power.
AC/DC VOLTMETER Group	
AC/DC VOLTMETER M2	Digital voltmeter. Displays ac or dc voltage from the circuits selected by the CIRCUIT SELECT switches in a digital readout.
METER switch S5	2-position toggle switch. AC — Selects ac meter function. DC — Selects dc meter function.
METER RANGE switch S6	4-position rotary switch. Selects AC/DC VOLTMETER range. 200 MV — Selects 200 millivolt range. 2 V — Selects 2-volt range. 20 V — Selects 20-volt range. 200 V — Selects 200-volt range.
EXT METER jack J8, J9	Provides connections for an external voltmeter to monitor the input signal to AC/DC VOLTMETER. HI — Connects positive or line voltage to external meter. LO — Connects ground or return voltage to external meter.
CIRCUIT SELECT TENS switch S17	10-position rotary switch used in conjunction with A-UNITS and B-UNITS switches. Selects from 10 groupings of input signals from the unit under test for display on the AC/DC VOLTMETER switch position.
CIRCUIT SELECT A-UNITS switch S18	10-position rotary switch. Selects one of the A grouping of input signals from the unit under test for display on the AC/DC VOLTMETER switch positions. Test points monitored are listed below.

UNITS	0	1	2	3	4	5	6	7	8	9
TENS 00		J2-56	J2-57	J2-58	J2-59	J2-60	J2-54	J2-55	J2-63	J1-m
10	J1-W	J1-L	J1-N	J2-72	J1-NN	J3-H	J2-14	J2-11	J1-s	J1-g
20	J2-8	J2-9	J2-12	J2-13	J2-16	J2-15	J3-MM	J1-JJ	J2-69	J2-22
30	J1-HH	J2-70	J3-L	J2-33	J1-FF	J1-BB	J1-LL	J2-61	J2-66	J2-64
40	J2-47	J2-49	J3-w	J2-10	J3-DD	J2-39	J2-68	J2-48	J2-76	J2-7
50	J3-x	J3-g	J3-F	J2-34	J2-65	J2-67	J2-74	J2-75	J2-78	J2-79
60	J2-36	J2-36	J2-52	J2-50	J3-E	J2-51	J3-e	J2-80	J2-81	J2-21

A/B SELECT switch	Two-position toggle switch. Used in conjunction with A-UNITS and B-UNITS switches. A. Selects A-UNITS group of input signals for display on the AC/DC VOLTMETER. B. Selects B-UNITS group of input signals for display on the AC/DC VOLTMETER.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
CIRCUIT SELECT B-UNITS switch S19	10-position rotary switch. Selects one of the B grouping of input signals from the unit under test for display on the AC/DC VOLTMETER. Test points monitored are listed below.

UNITS	0	1	2	3	4	5	6	7	8	9
TENS 00			J4-M J4-B	J5-M J4-B	J3-HH J3-JJ	J1-S J1-C	J1-T J1-C	J3-HH J1-C	J3-JJ J1-C	J2-62 J1-C
10	J1-B J1-D	J1-A J1-C	J2-1 J2-3	J3-v J3-C	J2-2 J2-3	J3-c J3-C	J3-NN J3-C	J2-4 J2-3	J1-P J1-R	J1-F J1-G
20	J1-Y J1-Z	J3-A J1-C		J1-b J1-C	J1-c J1-C			J2-18 J3-N		
30	J6-D J6-E	J6-F J6-C								

ANALOG SIGNALS Group

LONG CPT switch S22 — 5-position rotary switch. Selects input level of simulated longitudinal cpt signal to be applied to computer under test.

NOTE

☐ Panel marking: indicates initial setting.

1. Connects 6.9 inches of forward longitudinal stick signal.
2. Signal disconnected.
3. Connects 0.35 inch of aft longitudinal stick signal.
4. Connects 1.92 inches of aft longitudinal stick signal.
5. Connects 6.9 inches of aft longitudinal stick signal.

LAT CPT switch S23 — 3-position rotary switch. Selects input level of simulated lateral cpt signal to be applied to computer under test.

1. Connects 1.15 inches of left lateral stick signal.
2. Connects 1.0 inch of left lateral stick signal.
3. Signal disconnected.

DIR CPT switch S24 — 3-position toggle switch. Selects input level of simulated directional cpt signal to be applied to computer under test.

1. Signal disconnected.
2. Connects 0.67 inch of right pedal signal.
3. Connects 0.77 inch of right pedal signal.

RAD ALT switch S62 — 2-position toggle switch. Selects a fixed-level simulated radar altitude signal for application to the computer under test.

1. Connects 71.4 feet of radar altitude signal.
2. Signal disconnected.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
BARO ALT switch S41	3-position toggle switch. Selects a fixed-level barometric altitude BITE stimulus signal and a push-to-test logic signal for application to computer under test. 1. Connects 25,000-ft altitude signal. 2. Connects 8,333-ft altitude signal. [3.] Signal disconnected.
AIRSPEED switch S59	6-position toggle switch. Selects a fixed-level airspeed BITE stimulus signal for application to computer under test. 1. Test signal to check the lag filter and buffer amplifier in the AFCS computer, located on the A6 card. [2.] Signal disconnected. 3. Connects 35-knot airspeed signal. 4. Connects 46-knot airspeed signal. 5. Connects 56-knot airspeed signal. 6. Connects 132-knot airspeed signal.
ROLL ATT switch S58	2-position toggle switch. Selects a fixed-level roll attitude BITE stimulus signal for application to computer under test. [1.] Signal is disconnected. 2. Connects 1.24° of left roll attitude signal.
SIDESLIP switch S60	4-position toggle switch. Selects a fixed-level sideslip BITE stimulus signal for application to the computer under test. 1. Connects a signal that equals 0.036 psi of left sideslip. [2.] Signal disconnected. 3. Connects a signal that equals 0.12 psi of right sideslip. 4. Connects a signal that equals 0.16 psi of right sideslip.
YAW RATE switch S61	4-position toggle switch. Selects a fixed-level yaw rate BITE stimulus signal for application to computer under test. 1. Connects a signal equal to 2.0 deg/sec of right yaw. [2.] Signal is disconnected. 3. Connects a signal that is equal to 2.0 deg/sec of left yaw. 4. Connects a signal that is equal to 10.4 deg/sec of left yaw.
ROLL RATE switch S53	4-position toggle switch. Selects a fixed-level roll-rate BITE stimulus signal for application to the computer under test. 1. Connects a signal that is equal to 2.0 deg/sec of right roll. [2.] Signal disconnected. 3. Connects a signal that is equal to 2.0 deg/sec of left roll. 4. Connects a signal that is equal to 6.0 deg/sec of left roll.
XFEED ROLL ATT switch S54	3-position toggle switch. Selects a fixed-level simulated crossfeed roll attitude error signal for application to computer under test. 1. Connects a −7.0 vdc test signal which is not equated to bank angle. [2.] Signal is disconnected. 3. Connects a +7.0 vdc test signal for application to bank angle.

Table 2-1. Controls and Indictors - Continued

CONTROL/INDICATOR	DESCRIPTION
CCDA DEMOD switch S55	2-position toggle switch. Selects a fixed-level CCDA modulator BITE stimulus signal for application to computer under test. 1. Signal is disconnected. 2. Connects a signal equal to 0.084 inch of CCDA.
NORM ACCEL switch S56	2-position toggle switch. Selects a fixed-level normal acceleration BITE stimulus signal for application to computer under test. 1. Signal is disconnected. 2. Connects a signal equal to 12.8 ft/sec of acceleration.
PITCH RATE switch S57	2-position toggle switch. Selects a fixed-level pitch-rate stimulus signal for application to computer under test. 1. Signal is disconnected. 2. Connects a signal equal to 10 deg/sec of nose-down pitch.
PULSER STIM switch S63	6-position toggle switch. Selects fixed-level pitch pulser/failure panel stimulus signals for application to computer under test. 1. Signal is disconnected. 2. Connects a signal equal to 0.475 inch of CCDA input. 3. Connects a signal equal to −0.12 inch of pitch ILCA input. 4. Connects a signal equal to −0.12 inch of roll ILCA input. 5. Connects a signal equal to −0.117 inch of yaw ILCA input. 6. Connects a signal equal to −0.3 inch of DASH input.
PITCH ATT HSI HDG control R19	10-turn 5-ohm variable resistor which varies the magnitude of simulated pitch attitude and hsi heading signal to computer under test. Signal is zero at center and 13-volt ac in-phase or out-of-phase at max cw or ccw.
PITCH/HSI switch S26	2-position toggle switch. Connects control R19 through S27 to pitch attitude or hsi heading circuits of computer under test. PITCH — Connects pitch attitude signal from PITCH ATT HSI HDG control to computer under test when SIGNAL/GND switch is at SIGNAL. HSI — Connects hsi heading signal from PITCH ATT HSI HDG control to computer under test when SIGNAL/GND switch is at SIGNAL.
SIGNAL/GND switch S27	2-position toggle switch. Connects pitch attitude or hsi heading circuits of computer under test to ground or to PITCH ATT HSI HDG control. SIGNAL — Connects the pitch attitude or hsi heading circuits of computer under test to PITCH ATT HSI HDG control. GND — Connects the pitch attitude or hsi heading circuits of computer under test to GND.
ATT synchro B1	0 to 360° dial synchro. Varies magnitude of simulated, 3-wire roll, heading, and ccda signals to computer under test.
ATT SELECT switch S35	3-position rotary switch. Selects the ccda, heading, or roll circuits of the computer under test to be connected to the ATT synchro signals. ROLL — Connects the roll attitude signal from the ATT synchro to the roll circuits of computer under test. HDG — Connects the hdg attitude signal from the ATT synchro to the hdg circuits of the computer under test. CCDA — Connects the roll attitude signal from the ATT synchro to the ccda circuits of the computer under test.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
SERVO SIMULATION Group	
ILCA SIMULATION PITCH switch S42	2-position toggle switch. OPERATE — Connects normal pitch ILCA actuator servo simulation output to AFCS computer. RESET — Disconnects signal.
ILCA SIMULATION ROLL switch S43	2-position toggle switch. OPERATE — Connects normal roll ILCA actuator servo simulation output to AFCS computer. RESET — Disconnects signal.
ILCA SIMULATION YAW switch S44	2-position toggle switch. OPERATE — Connects normal yaw ILCA actuator servo simulation output to AFCS computer. RESET — Disconnect signal.
ACTUATOR SIMULATION CCDA switch S49	2-position toggle switch. NORM — Connects normal CCDA actuator simulation signal to the AFCS computer. GND — Disconnects signal.
ACTUATOR SIMULATION DASH switch S51	3-position rotary switch. TF1 — Applies 28 vdc to the integrator circuit of circuit card A2. Causes the integration signal to be applied to feedback signal. TF2 — Connects 28 vdc to circuit card A2. GND — Disconnects signal.
LCT switch S50	2-position toggle switch. NORM — Connects a normal LCT actuator simulated signal to the AFCS computer. GND — Disconnects signal.
DISCRETE SIGNALS Group	
ENG COND LEVER switch S28	2-position toggle switch. Provides engine condition lever discrete signal to AFCS computer. 1 — Is a logic ground simulating the engine condition lever at STOP. 0 — Is a logic open circuit, simulating the engine condition lever out of STOP.
ROLL BEEP TRIM switch S25	3-position toggle switch. Simulates roll beep trim input from control stick to AFCS computer. LEFT — Simulates moving the beep trim switch to the left to change roll bank angle. OFF — Disconnects signal. RIGHT — Simulates moving the beep trim switch to the right to change the roll bank angle.
BOX IDENT switch S48	2-position toggle switch. Provides a box identifier logic discrete signal to the AFCS computer. 1 — Logic 1 position is +12 volt dc, "Simulates Box No. 1." 0 — Logic 0 position is a logic ground, "Simulates Box No. 2."

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
SWIVEL LOCK switch S30	2-position toggle switch. Provides a swivel locked discrete signal to AFCS computer. 1 — Logic 1 position is +28-volt dc. 0 — Logic 0 position is a logic ground.
ROLL switch S45	2-position toggle switch. Provides roll detent discrete signal to AFCS computer. 1 — Logic 1 position is +7-volt dc. 0 — Logic 0 position is –7-volt dc.
YAW switch S46	2-position toggle switch. Provides a yaw detent discrete signal to AFCS computer. 1 — Logic 1 position is +7-volt dc. 0 — Logic 0 position is –7-volt dc.
COLL BRAKE S32	2-position toggle switch. Provides collective magnetic brake discrete signal to AFCS computer. 1 — Logic 1 position is +28-volt dc. 0 — Logic 0 position is an open circuit.
CYCLIC BRAKE S31	2-position toggle switch. Provides cyclic magnetic brake discrete signal to AFCS computer. 1 — Logic 1 position is +28-volt dc. 0 — Logic 0 position is open circuit.
LDG GEAR switch S47	2-position toggle switch. Provides landing gear switch closed discrete signal to AFCS computer. 1 — Logic 1 position is +12-volt dc. 0 — Logic 0 position is open circuit.
VERT GYRO VALID switch S33	2-position toggle switch. Provides vertical gyro validity signal to AFCS computer. 1 — Logic 1 position is logic ground. 0 — Logic 0 position is open circuit.
ALT VALID switch S34	2-position toggle switch. Provides radar altitude validity discrete signal to AFCS computer. 1 — Logic 1 position is 4.5-volt dc. 0 — Logic 0 position is ground.
HYD PRESS switch S29	2-position toggle switch. Provides hydraulic pressure on discrete signal to AFCS computer. 1 — Logic 1 position is ground. 0 — Logic 0 position is open circuit.
HDG switch S52	2-position toggle switch. Provides heading switch enable discrete signal to AFCS computer. 1 — Logic 1 position is ground. 0 — Logic 0 position is an open circuit.
NORM ACCEL J2-52 switch S21	2-position toggle switch. Provides a stimulus signal to AFCS computer J2-52 test point. NORM — Is an open circuit. GND — Is a ground.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
DISCRETE MONITORS Group	
CCDA CLUTCH indicator DS17	Indicator light. Indicates that the AFCS computer CCDA clutch discrete signal is a logic 1.
CCDA BRAKE indicator DS18	Indicator light. Indicates that the AFCS computer CCDA brake discrete signal is a logic 1.
AFCS ANN indicator DS19	Indicator light. Indicates that AFCS computer annunciator discrete signal is a logic 1.
HYD SOL indicator DS20	Indicator light. Indicates that AFCS computer hydraulic solenoid discrete signal is a logic 1.
ERECT CUTOUT indicator DS21	Indicator light. Indicates that AFCS computer roll erection cutout discrete signal is a logic 1.
HDG ENABLE indicator DS22	Indicator light. Indicates that AFCS computer heading enable discrete signal is logic 1.
DASH ANN indicator DS23	Indicator light. Indicates that AFCS computer DASH actuator annunciator discrete signal is logic 1.
DASH DRIVE indicator DS16	Indicator light. When pulsing ON and OFF, indicates that DASH drive signal is activated.
CCDA Group	
BRAKE switch S39	2-position toggle switch. Provides ccda magnetic brake discrete signal to longitudinal and collective CCDA actuator. 1 — Logic 1 position is +28 vdc. Brake is released. 0 — Logic 0 position is an open circuit. Brake is engaged.
CLUTCH switch S40	2-position toggle switch. Provides CCDA clutch discrete signal to collective ccda actuator. 1 — Logic 1 position is +28 vdc obtained from S39. Clutch is engaged. 0 — Logic 0 position is an open circuit. Clutch disengaged.
CMD switch S38	3-position toggle switch. Provides CCDA command discrete signal to longitudinal ccda actuator simulating the beep trim switch on the cyclic stick. CW — Clockwise position, connect a 13 vac drive signal to J1 pin M of the actuator. OFF — Off position is an open circuit. CCW — Counterclockwise position, connect a 13 ac drive signal to J1 pin N of the actuator.
CONTINUITY TEST Group	
CONTINUITY indicator DS15	Indicator light. Indicates that the unit under test circuit resistance is less than 1 ohm.
TENS switch S13	5-position rotary switch. Selects the tens group of the unit under test continuity test circuits. Test points are listed with UNITS switch.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
UNITS switch S14	10-position rotary switch. Selects the units group of the unit under test continuity test circuits. Test points are listed below.

UNITS		0	1	2	3	4	5	6	7	8	9
TENS	00			J4-F J4-N	J4-G J4-N	J5-H J5-N	J4-H J4-N	J4-K J5-K	J4-P J4-L	J5-P J5-L	J4-R J4-L
	10	J5-R J5-L	J4-L J5-L	J4-P J4-U	J4-R J4-V	J5-P J5-U	J5-R J5-V				
	20	J2-3 J3-AA	J3-C J3-AA	J1-R J1-f	J3-D J3-AA	J3-N J3-AA	J3-f J3-AA	J3-t J3-AA	J1-J J3-AA	J1-h J3-AA	J1-z J3-AA
	30	J1-M J3-AA	J1-K J3-AA	J1-KK J3-AA	J1-P J3-AA	J1-GG J3-AA	J1-t J3-AA	J1-X J3-AA			

RESPONSE TEST Group

TIME DELAY-SEC switch S9	5-section thumbwheel switch. Selects the time delay in seconds between application of stimulus and measurement during transit response testing from 00.000 to 99.999 seconds.
HOLD indicator DS10	Indicator light. Indicates that the sample and hold amplifier has acquired the signal for measurement.
STIM switch S7	2-position toggle switch. Controls the application of the unit under test stimulus signals. APPLY — Stimulus signal is applied to unit under test. REMOVE — The stimulus signal is removed from the unit under test.
MODE switch S8	2-position toggle switch. Selects either the transient response mode of testing or normal steady state mode of testing. ON — Transient response mode. OFF — Normal steady state mode.

Table 2-1. Controls and Indicators - Continued

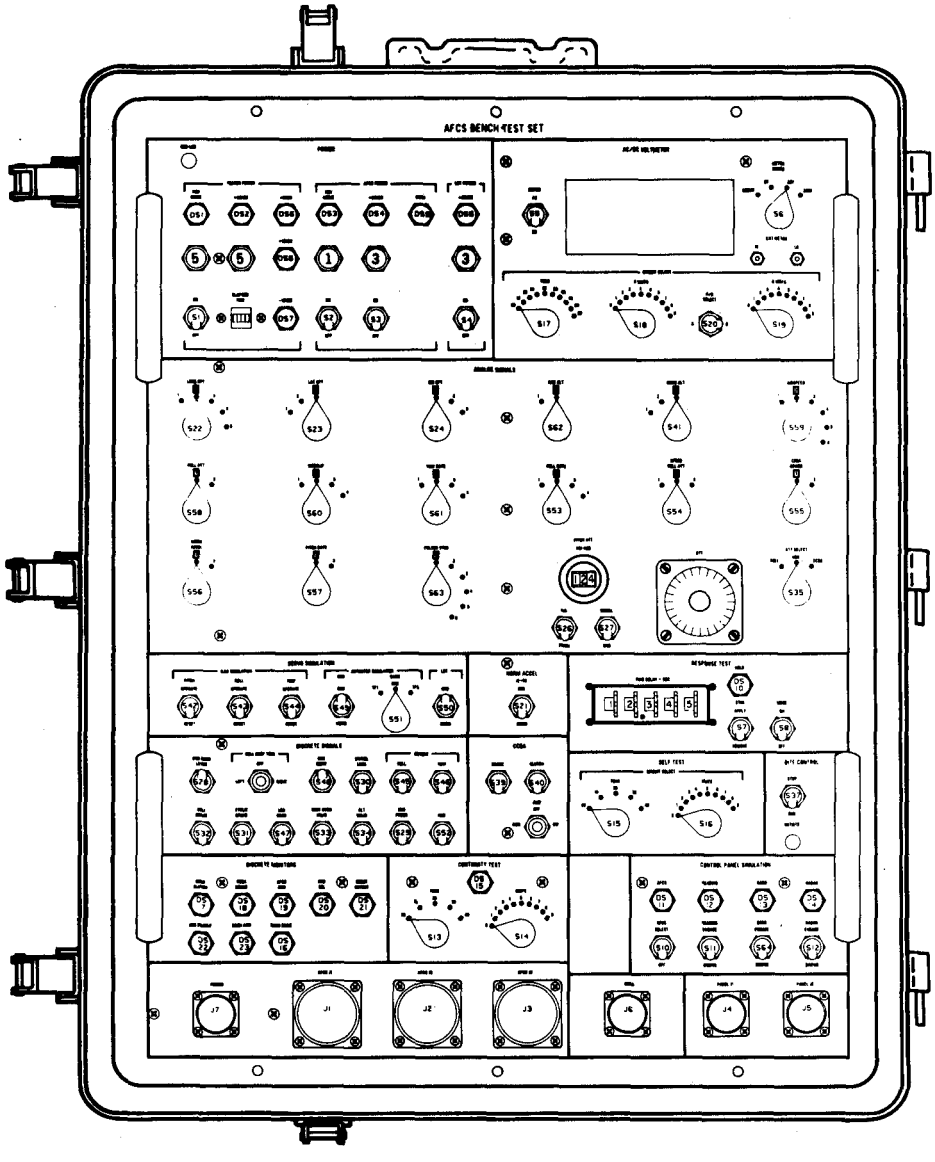
CONTROL/INDICATOR	DESCRIPTION
SELF TEST CIRCUIT SELECT Group	
TENS switch S15	5-position rotary switch. Selects the tens group of the test set self test circuits. For switch positions, see below.
UNITS switch S16	10-position rotary switch. Selects the units group of the test set self test circuits. For switch positions, see below.

UNITS		0	1	2	3	4	5	6	7	8	9
TENS	00	Self Test Open	Self Test Short	J4-F J4-N	J4-G J4-N	J5-H J5-N	J4-H J4-N	J4-K J5-K	J4-P J4-L	J5-P J5-L	J4-R J4-L
	10	J5-R J5-L	J4-L J5-L	J4-P J4-U	J4-R J4-V	J5-P J5-U	J5-R J5-V				
	20	J2-3 J3-AA	J3-C J3-AA	J1-R J1-f	J3-D J3-AA	J3-N J3-AA	J3-f J3-AA	J3-t J3-AA	J1-J J3-AA	J1-h J3-AA	J1-z J3-AA
	30	J1-M J3-AA	J1-K J3-AA	J1-KK J3-AA	J1-P J3-AA	J1-GG J3-AA	J1-t J3-AA	J1-X J3-AA			

BITE CONTROL Group	
BITE CONTROL switch S37	2-position toggle switch. Provides a control of the AFCS computer Built-In-Test-Equipment. STEP — A single-step operation of the AFCS computer's BITE. RUN — A continuous BITE operation.
INITIATE switch S36	Pushbutton momentary switch. Initiates a BITE sequence when S37 is at RUN. Advances the BITE sequence one test when S37 is at STEP. Also illuminates all segments of the AFCS computer's BITE display.
CONTROL PANEL SIMULATION Group	
AFCS switch S10	2-position toggle switch. Provides AFCS select signal to the AFCS computer. SELECT — Applies 28-volt dc to AFCS computer. OFF — An open circuit.
AFCS indicator DS11	Indicator light. Indicates that the AFCS switch S10 is at SELECT.
HEADING switch S11	2-position toggle switch. Provides heading engaged signal to the AFCS computer. ENGAGE — Engaged position is +12-volt dc to AFCS computer. DISENG — Open circuit.
HEADING indicator DS12	Indicator light. Indicates that HEADING switch S11 is at ENGAGE.
BARO switch S64	2-position toggle switch. Provides barometric altitude select signal to AFCS computer. ENGAGE — +12 vdc to AFCS computer. DISENG — Open circuit.
BARO indicator DS13	Indicator light. Indicates that BARO switch S64 is at ENGAGE.

Table 2-1. Controls and Indicators - Continued

CONTROL/INDICATOR	DESCRIPTION
RADAR switch S12	2-position toggle switch. Provides radar altitude select signals to the AFCS computer. ENGAGE — +12 vdc to AFCS computer. DISENG — Open circuit.
RADAR indicator DS14	Indicator light. Indicates that the RADAR switch S12 is at ENGAGE.
CONNECTOR Group	
POWER CONNECTOR J7	Connects the test set to 115-volt 400-Hz and 28-volt dc power source with the use of power cable assembly W7.
AFCS CONNECTOR J1	Connects the test set to AFCS computer thru AFCS cable W1.
AFCS CONNECTOR J2	Connects the test set to AFCS computer thru AFCS cable W2.
AFCS CONNECTOR J3	Connects the test set to AFCS computer thru cable W3.
CCDA CONNECTOR J6	Connects the test set to ccda actuators, longitudinal and collective, thru cable W6.
PANEL CONNECTOR J4	Connects the test set to AFCS PANEL CONNECTOR J1 thru cable W4.
PANEL CONNECTOR J5	Connects the test set to AFCS PANEL CONNECTOR J2 thru cable W5.



(FRONT PANEL)

47D-TMDE-ABTS-22

Figure 2-2. Test Set Controls and Indicators (Sheet 1 of 4)

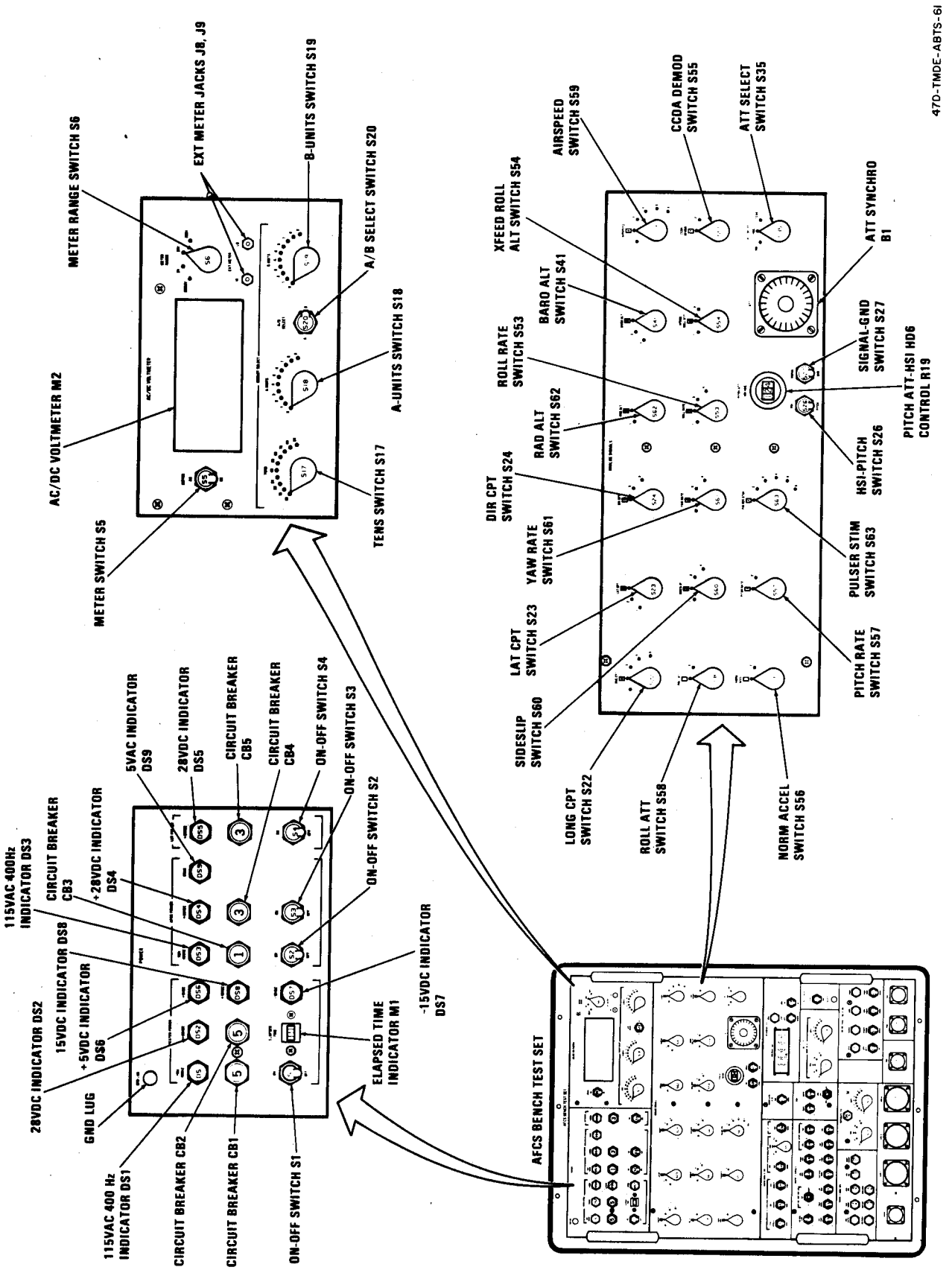


Figure 2-2. Test Set Controls and Indicators (Sheet 2 of 4)

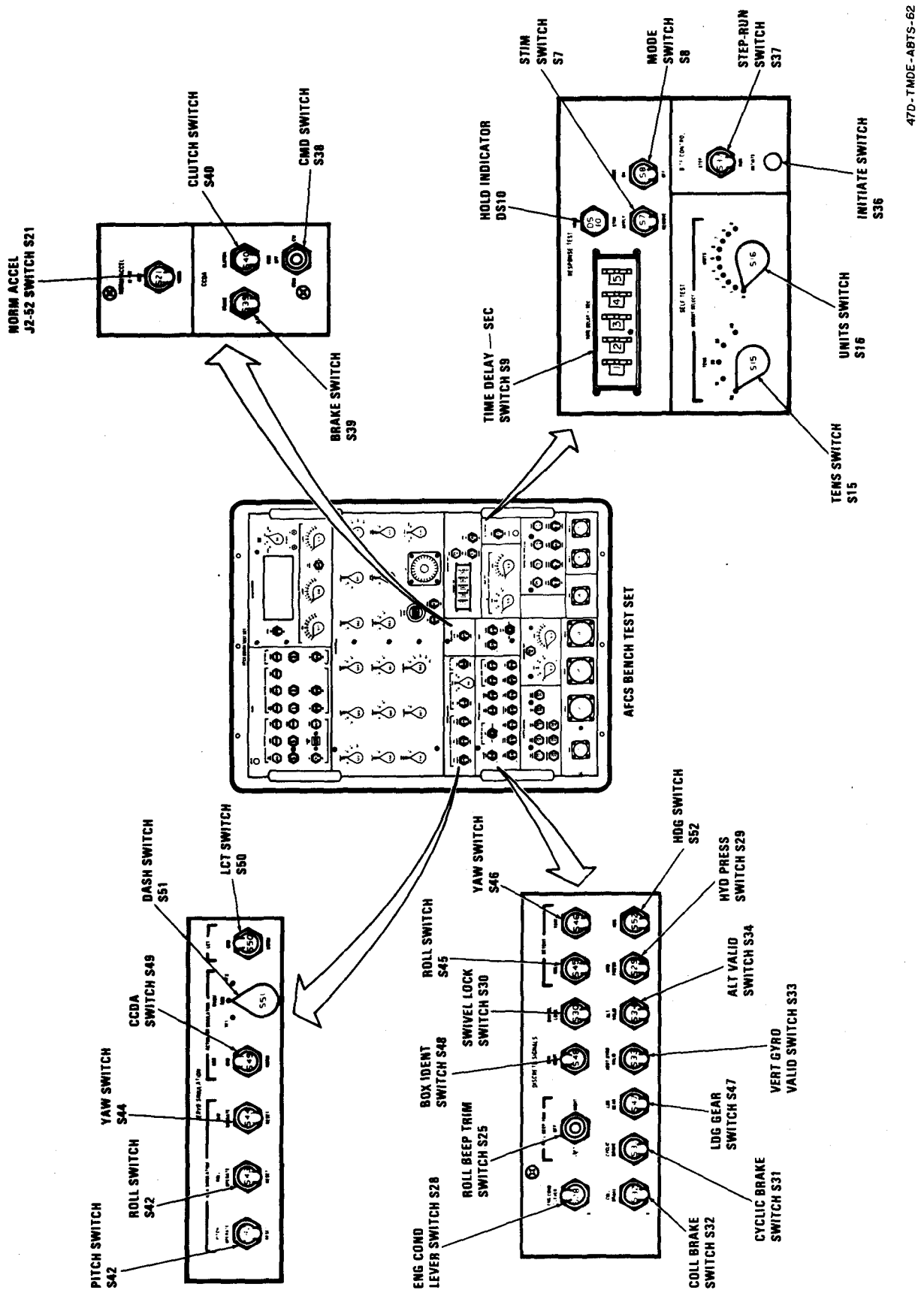


Figure 2-2. Test Set Controls and Indicators (Sheet 3 of 4)

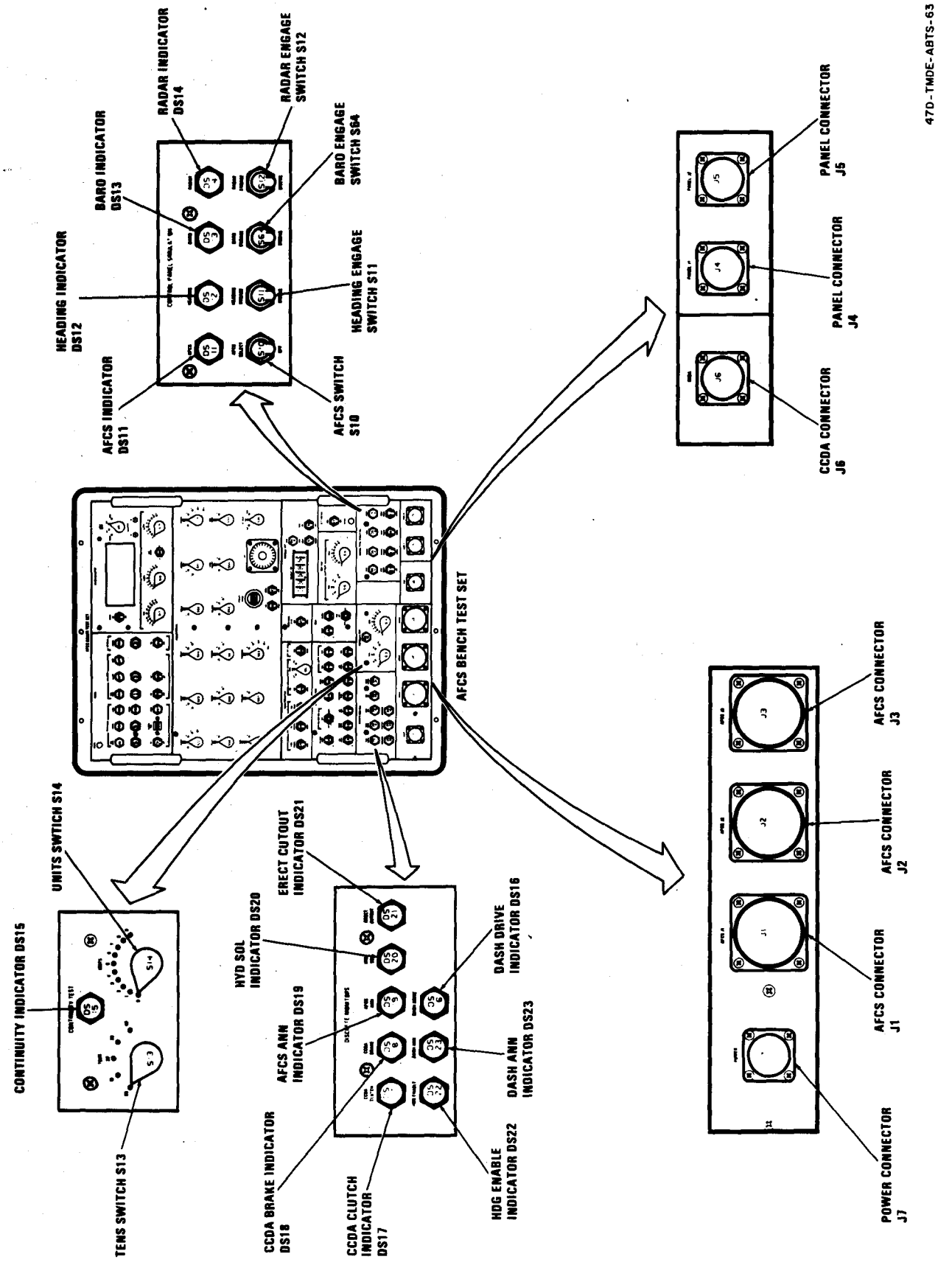


Figure 2-2. Test Set Controls and Indicators (Sheet 4 of 4)

2-5. Initial Adjustments and Control Setting.

As a first step before operating the test set, set the controls to the initial positions listed in table 2-2.

Table 2-2. AFCS Bench Test Set Initial Switch Positions

CONTROL	POSITION
TESTER POWER Group	
TESTER POWER switch	OFF
AFCS POWER switch	OFF
AFCS POWER switch	OFF
LCT POWER switch	OFF
AC/DC VOLTMETER Group	
METER switch	DC
METER RANGE switch	200 V
CIRCUIT SELECT TENS switch	00
CIRCUIT SELECT A-UNITS switch	0
A/B SELECT switch	B
B-UNITS switch	0
ANALOG SIGNALS Group	
NOTE For the first 15 switches in this group, the initial position is straight up, at the position marked by the number in the box.	
LONG CPT switch	2
LAT CPT switch	3
DIR CPT switch	1
RAD ALT switch	2
BARO ALT switch	3
AIRSPEED switch	2
ROLL ATT switch	1
SIDESLIP switch	2
YAW RATE switch	2
ROLL RATE switch	2
XFEED ROLL ATT switch	2
CCDA DEMOD switch	1
NORMAL ACCEL switch	1
PITCH RATE switch	1
PULSER STIM switch	1
PITCH ATT HSI/HDG control	500
HSI/PITCH switch	PITCH
SIGNAL/GND switch	SIGNAL
ATT synchro switch	0.0°
ATT SELECT switch	HDG

Table 2-2. AFCS Bench Test Set Initial Switch Positions - Continued

CONTROL	POSITION
SERVO SIMULATION Group	
PITCH ILCA SIMULATION SWITCH	RESET
ROLL ILCA SIMULATION SWITCH	RESET
YAW ILCA SIMULATION SWITCH	RESET
CCDA ACTUATOR SIMULATION switch	GND
DASH ACTUATOR SIMULATION switch	GND
LCT switch	GND
NORM ACCEL Group	
NORM ACCEL J2-52 switch	NORM
RESPONSE TEST Group	
TIME DELAY-SEC switch	12.345
STIM switch	REMOVE
MODE switch	OFF
DISCRETE SIGNALS Group	
ENG COND LEVER switch	1
ROLL BEEP TRIM switch	OFF
BOX IDENT switch	1
SWIVEL LOCK switch	0
ROLL DETENT switch	0
YAW DETENT switch	0
COLL BRAKE switch	0
CYCLIC BRAKE switch	0
LDG GEAR switch	0
VERT GYRO VALID switch	0
ALT VALID switch	0
HYD PRESS switch	0
HDG switch	0
CCDA Group	
BRAKE switch	0
CLUTCH switch	0
CMD switch	OFF
SELF TEST AND BITE CONTROL Group	
CIRCUIT SELECT TENS switch	00
CIRCUIT SELECT UNITS switch	0
BITE CONTROL Group	
STEP/RUN switch	RUN
INITIATE switch	OUT (RELEASED)
CONTINUITY TEST Group	
TENS switch	00
UNITS switch	0

Table 2-2. AFCS Bench Test Set Initial Switch Positions - Continued

CONTROL	POSITION
CONTROL PANEL SIMULATION Group	
AFCS switch	OFF
HEADING switch	DISENGAGE
BARO switch	DISENGAGE
RADAR switch	DISENGAGE

2-6. Operational Connections and Start-Up Procedures.

a. Connection Procedures. (See fig. 2-3.)

(1) Set all test set controls to initial positions listed in table 2-2.

(2) On power cable W7, connect plug P1 to the test set POWER receptacle. Connect plug P2 to a source of 115-volt 400-Hz ac. Connect plug P3 to a source of 28-volt dc.

(3) On Power cable W7, connect common return (plug P2 pin D) of the 115-volt AC 400-Hz power supply to common return (plug P3 pin B) of the 28-volt DC power supply.

b. Start-Up Procedures.

(1) Check that all circuit breakers are closed.

(2) Set the TESTER POWER switch to ON. The five indicator lights in the TESTER POWER group shall come on.

(3) Set the AFCS POWER 115 VAC 400 HZ and +28 VDC switches to ON. The three indicator lights in the AFCS POWER group shall come on.

(4) Set the LCT POWER switch to ON. The +28 VDC LCT POWER indicator light shall come on.

(5) Check that the four CIRCUIT SELECT switches are at 00, 0, B, 0, left to right.

(6) Perform the self test sequence of table. 2-3.

(7) Check that the CONTINUITY TEST switches are at 00, 0. The continuity test light shall be out.

(8) Set the CONTINUITY TEST UNITS switch to 1. The continuity test light shall come on.

(9) Set the CONTINUITY TEST UNITS switch to 2. The continuity test lamp shall go out.

(10) Set the CONTINUITY TEST UNITS switch to 0.

(11) Set the AFCS POWER 115 V 400 HZ and +28 VDC Switches to OFF.

(12) If an AFCS computer unit is to be tested, connect as follows: (See fig. 2-4.)

(a) Connect plug P1 of cable W 1 to test set receptacle AFCS J1. Connect cable plug P2 to AFCS computer unit receptacle 1.

(b) Connect plug P1 of cable W2 to test set receptacle AFCS J2. Connect cable plug P2 to AFCS computer unit receptacle J2.

(c) Connect plug P1 of cable W3 to test set receptacle AFCS J3. Connect cable plug P2 to AFCS computer unit receptacle J3.

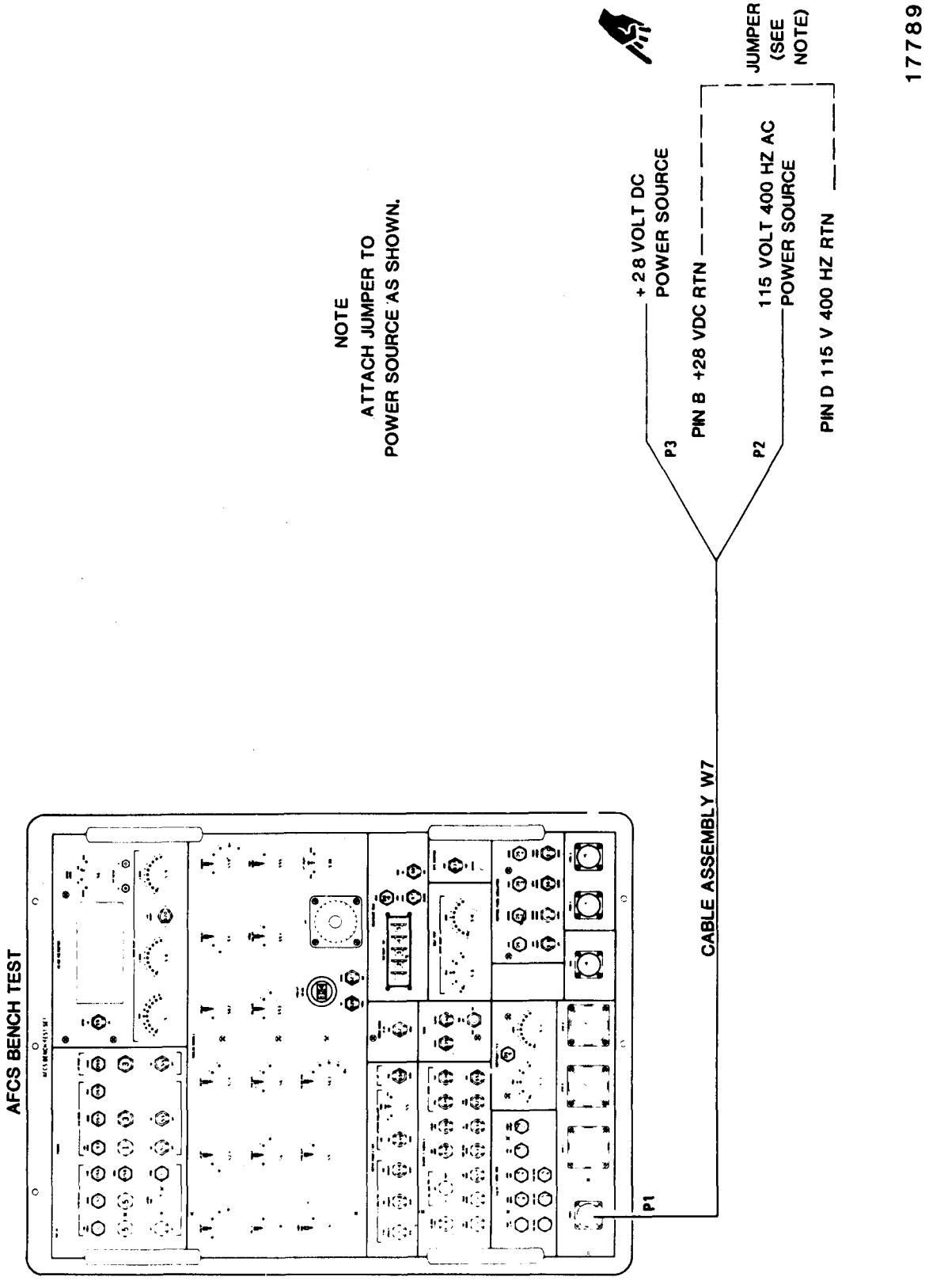


Figure 2-3. AFCS Bench Test Set Power Connections

(13) If an AFCS panel is to be tested, connect as follows: (See fig. 2-5.)

(a) Connect cable plug P1 of W4 to test set receptacle panel J1. Connect cable plug P2 to AFCS panel receptacle J1.

(b) Connect cable plug P1 of W5 to test set receptacle panel J2. Connect cable plug P2 to AFCS panel receptacle J2.

(14) If a longitudinal or a collective CCDA actuator is to be tested, connect plug P1 of cable W6 to test set receptacle CCDA J6. Connect cable plug P2 to the receptacle on the CCDA. (See fig. 2-6.)

(15) Refer to TM 55-1520-240-23 for instructions for testing the AFCS computer, AFCS panel, and CCDA actuators of the CH-47D Advanced Flight Control System (AFCS).

NOTE

If HOLD light comes on, when not called for in test, cycle MODE switch to ON, then OFF, to turn out light.

Table 2-3. Self Test

SWITCH OR CONTROL	POSITION	METER/INDICATOR NORMAL RESULT
SERVO SIMULATION Group		
ILCA SIMULATION PITCH	RESET	
ILCA SIMULATION ROLL	RESET	
ILCA SIMULATION YAW	RESET	
ACTUATOR SIMULATION CCDA	NORM	
ACTUATOR SIMULATION DASH	TF2	
LCT	NORM	
CONTROL PANEL SIMULATION Group		
AFCS	SELECT	
CIRCUIT SELECT	00-0-B-0	
METER	AC	
RANGE	200V	
AFCS PO WER 115VAC/400-Hz	OFF	
AFCS POWER +28VDC	OFF	
LCT POWER +28VDC	OFF	
SELF TEST CIRCUIT SELECT	00-1	6 VAC MAX
AFCS POWER 115V/400-Hz	ON then OFF	112.2 to 117.7 VAC
METER	DC	
SELF TEST CIRCUIT SELECT	00-2	-0.6 to +0.6 VDC

Table 2-3. Self Test — Continued

SWITCH OR CONTROL	POSITION	METER/INDICATOR NORMAL RESULT
AFCS POWER +28VDC	ON then OFF	+24 to +28.5 VDC
METER RANGE	20V	
SELF TEST CIRCUIT SELECT	00-3 then	+14.9 to+15.1 VDC
	00-4 then	–14.9 to-15.l VDC
	00-5	+4.9 to +5.1 VDC
METER	AC	
SELF TEST CIRCUIT SELECT	00-6	0.0 to 0.2 VAC
AFCS POWER l15V/400 HZ	ON then OFF	4 to 6 VAC
SELF TEST CIRCUIT SELECT	00-7 then	12 to 14 VAC
	00-8	12 to 14 VAC
METER RANGE	200V	
SELF TEST CIRCUIT SELECT	00-9	24 to 28 VAC
METER RANGE	20V	
METER	DC	
SELF TEST CIRCUIT SELECT	10-0 then	+14.9 to+15.l VDC
	10-1	-14.9 to-15.1 VDC
RESPONSE TEST MODE	ON	-0.06 to +0.06 VDC
SELF TEST CIRCUIT SELECT	10-0	–0.06 to +0.06 VDC
METER RANGE	200V	
METER	AC	
SELF TEST CIRCUIT SELECT	10-2	-0.6 to 0.6 VAC
RESPONSE TEST MODE	OFF	
METER RANGE	20V	
SELF TEST CIRCUIT SELECT	10-3 then	12 to 14 VAC
	10-4	12 to 14 VAC
RESPONSE TEST MODE	ON	
SELF TEST CIRCUIT SELECT	10-3 then	0.0 to 0.1 VAC
	10-4	0.0 to 0.1 VAC
RESPONSE TEST MODE	OFF	

Table 2-3. Self Test - Continued

SWITCH OR CONTROL	POSITION	METER/INDICATOR NORMAL RESULT
SELF TEST CIRCUIT SELECT	20-0	ALL DISCRETE MONITORS lights ON ALL CONTROL PANEL SIMULATION lights ON RESPONSE TEST HOLD It ON CONTINUITY TEST It ON
RESPONSE TEST TIME DELAY-SEC	00.075	
SELF TEST CIRCUIT SELECT	20-1	
METER	DC	
METER RANGE	2V	
RESPONSE TEST MODE	ON	-0.1 to +0.1 VDC
METER RANGE	20V	
RESPONSE TEST STIM	APPLY	+5.5 to +6.5 VDC HOLD It ON in 1 to 3 sec
	then REMOVE	HOLD It OUT -0.1 to +0.1 VDC
SELF TEST CIRCUIT SELECT	20-2	
RESPONSE TEST TIME DELAY-SEC	02.000	
SERVO SIMULATION PITCH RESPONSE TEST STIM	OPERATE, APPLY, (Together) then REMOVE	+4.86 to +7.30VDC when HOLD It comes on HOLD light goes out
SERVO SIMULATION PITCH SELF TEST CIRCUIT SELECT	RESET 20-3	
SERVO SIMULATION PITCH RESPONSE TEST STIM	OPERATE, APPLY (Together) then	-4.86 to -7.30 VDC when HOLD It comes on
RESPONSE TEST STIM	REMOVE	HOLD light goes out
METER RESPONSE TEST MODE	AC OFF	
SELF TEST CIRCUIT SELECT	20-4 then 20-5	4.35 to 4.9 VAC 2.18 to 2.58 VAC
METER	DC	
RESPONSE TEST MODE	ON	
SERVO SIMULATION PITCH	RESET	
SELF TEST CIRCUIT SELECT	20-6	
SERVO SIMULATION ROLL RESPONSE TEST STIM	OPERATE, APPLY, (Together) then REMOVE	+4.86 to +7.30 VDC when HOLD It comes on HOLD light goes out

Table 2-3. Self Test - Continued

SWITCH OR CONTROL	POSITION	METER/INDICATOR NORMAL RESULT
SERVO SIMULATION ROLL	RESET	
SELF TEST CIRCUIT SELECT	20-7	
SERVO SIMULATION ROLL RESPONSE TEST STIM	OPERATE APPLY, then REMOVE	-4.86 to -7.30 VDC when HOLD It comes on HOLD light goes out
METER	AC	
RESPONSE TEST MODE	OFF	
SELF TEST CIRCUIT SELECT	20-8 then 20-9	4.35 to 4.95 VAC 2.18 to 2.58 VAC
METER	DC	
RESPONSE TEST MODE	ON	
SERVO SIMULATION ROLL	RESET	
SELF TEST CIRCUIT SELECT	30-0	
SERVO SIMULATION YAW RESPONSE TEST STIM	OPERATE, APPLY, Together then REMOVE	+4.86 to +7.30 VDC when HOLD It comes on HOLD light goes out
SERVO SIMULATION YAW	RESET	
SELF TEST CIRCUIT SELECT	30-1	
SERVO SIULATION YAW RESPONSE TEST STIM	OPERATE, APPLY, Together then REMOVE	-4.86 to -7.30 VDC when HOLD It comes on HOLD light goes out
METER	AC	
RESPONSE TEST MODE	OFF	
SELF TEST CIRCUIT SELECT	30-2 then 30-3	4.35 to 4.95 VAC 2.18 to 2.58 VAC
METER	DC	
SERVO SIMULATION YAW	RESET	
SELF TEST CIRCUIT SELECT	30-4	
SERVO SIMULATION LCT	NORM	-6.65 to -7.35 VDC
RESPONSE TEST MODE	ON	
SELF TEST CIRCUIT SELECT	30-5	
RESPONSE TEST TIME DELAY-SEC “Wait 30 sec (CRITICAL), then”	03.120	
RESPONSE TEST STIM	APPLY, then REMOVE	-4.50 to -5.50 VDC when HOLD It comes on HOLD light goes out
SELF TEST CIRCUIT SELECT	30-4	

Table 2-3. Self Test - Continued

SWITCH OR CONTROL	POSITION	METER/INDICATOR NORMAL RESULT
RESPONSE TEST STIM	APPLY, then REMOVE	-1.50 to -2.5 VDC when HOLD It comes on HOLD light goes out
SERVO SIMULATION LCT	GND	
SELF TEST CIRCUIT SELECT	30-6	
RESPONSE TEST TIME DELAY-SEC	02.750	
ACTUATOR SIMULATION DASH	TF1	
RESPONSE TEST STIM	APPLY, then REMOVE	+2.56 to +3.86 VDC when HOLD It comes on HOLD light goes out
RESPONSE TEST MODE	OFF	+6.3 to +7.0 VDC
ACTUATOR SIMULATION DASH	GND	
SELF TEST CIRCUIT SELECT	30-7	
RESPONSE TEST MODE	ON	
ACTUATOR SIMULATION DASH	TF1	
RESPONSE TEST STIM	APPLY, then REMOVE	-2.56 to -3.86 VDC when HOLD It comes on HOLD light goes out
RESPONSE TEST MODE	OFF	-6.3 to -7 VDC
ACTUATOR SIMULATION DASH	GND	
RESPONSE TEST TIME DELAY-SEC	00.500	
RESPONSE TEST MODE	ON	
ACTUATOR SIMULATION DASH	TF2	
RESPONSE TEST STIM	APPLY, then REMOVE	-1.89 to -2.85 VDC when HOLD It comes on HOLD light goes out
RESPONSE TEST MODE	OFF, then ON	-3.55 to -3.95 VDC
SELF TEST CIRCUIT SELECT	30-6	
RESPONSE TEST STIM	APPLY, then REMOVE	+1.89 to +2.85 VDC when HOLD It comes on HOLD light goes out
RESPONSE TEST MODE	OFF	+3.55 to +3.95 VDC
ACTUATOR SIMULATION DASH	GND	
SELF TEST CIRCUIT SELECT	30-8	
METER RANGE	20V	
RESPONSE TEST MODE	ON	
RESPONSE TEST TIME DELAY-SEC	00.100	
ACTUATOR SIMULATION CCDA	NORM	
RESPONSE TEST STIM	APPLY, then REMOVE	+6.86 to +11.42 VDC when HOLD It comes on HOLD light goes out

Table 2-3. Self Test - Continued

SWITCH OR CONTROL	POSITION	METER/INDICATOR NORMAL RESULT
SELF TEST CIRCUIT SELECT	30-9	
RESPONSE TEST STIM	APPLY, then REMOVE	-6.86 to -11.42 VDC when HOLD It comes on HOLD light goes out
METER	AC	
RESPONSE TEST MODE	OFF	
SELF TEST CIRCUIT SELECT	40-0	5.2 to 7.2 VAC
ACTUATOR SIMULATION CCDA	GND	
S/T CIRCUIT SELECT TENS	00	
S/T CIRCUIT SELECT UNITS	0	

NOTE

At end of self test, set switches to initial settings, refer to table 2-2.

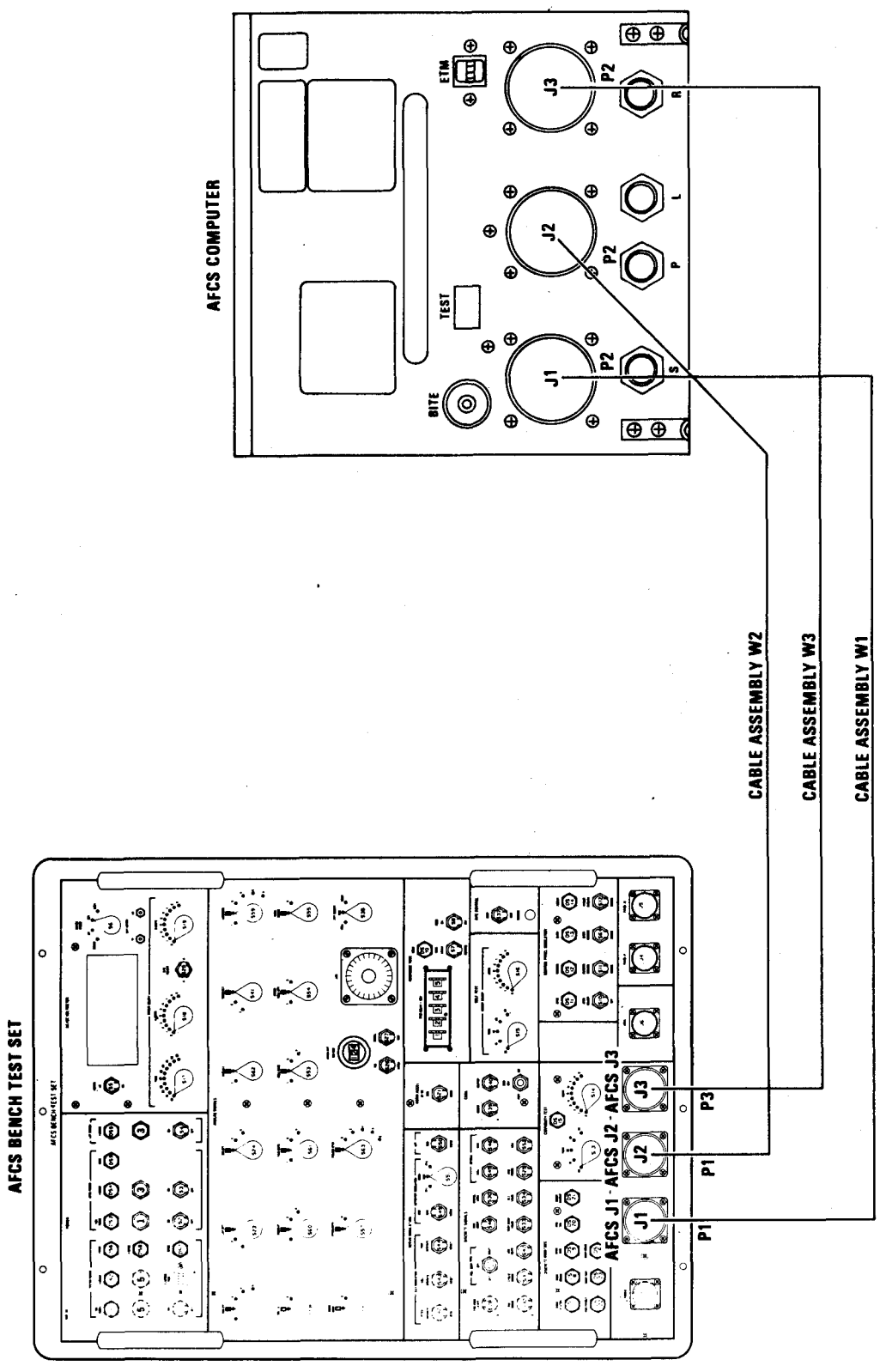


Figure 2-4. AFCS Computer Test Connections

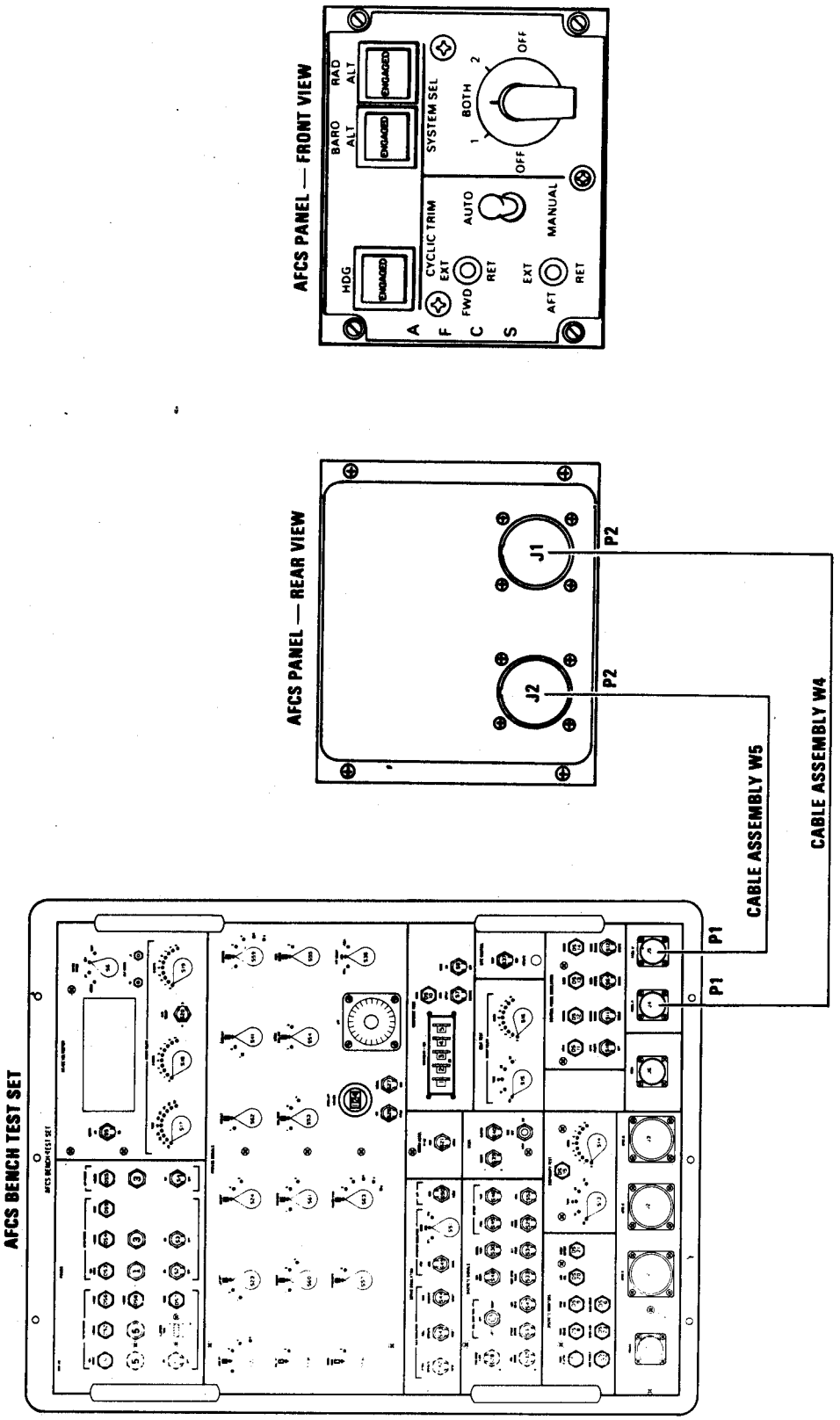


Figure 2-5. AFCS Panel Test Connections

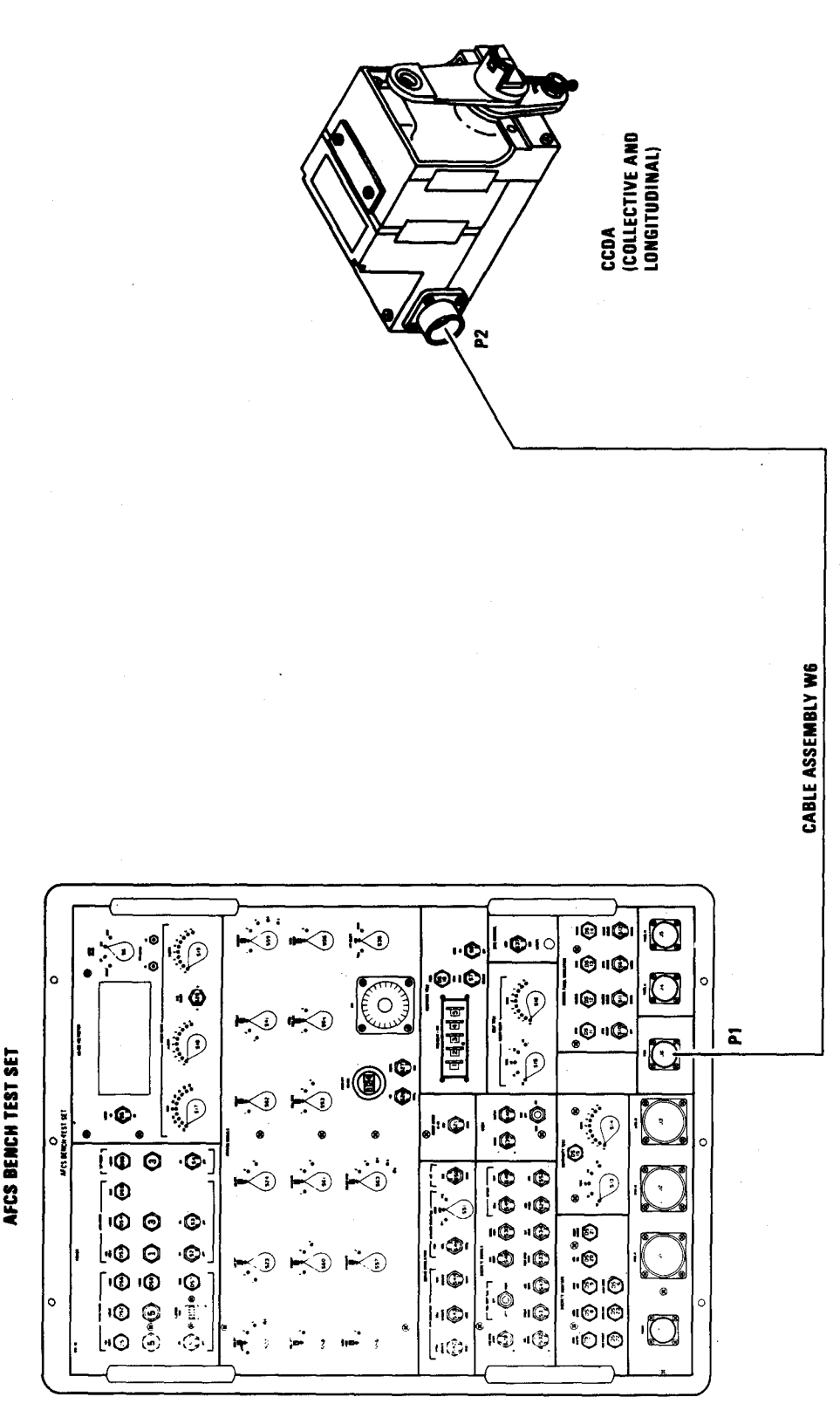


Figure 2-6. CCDA Actuator Test Connations

SECTION III PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-7. Preventive Maintenance. Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce out-of-service time, and to ensure that the equipment is serviceable.

a. Systematic Care. The procedures in para 2-8 cover routine systematic care and cleaning essential to proper unkeep and operation of the test set.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services chart (para 2-8) outlines functions to be performed at specific intervals. These checks and services are performed to maintain the test set in serviceable condition; that is, in good general (physical) condition and in good operating condition. Certain checks are performed before, during, and after operation of the test set. Other checks and services are performed weekly.

(1) Before you operate. Perform your *before* (B) checks and services.

(2) While you operate. Perform your *during* (D) checks. If the test set fails to operate, troubleshoot using the specified test equipment and the procedures in Section III. Report deficiencies using the proper forms. (Refer to TM 38-750.)

(3) After you operate. Perform your *after* (A) checks.

2-8. Operator Preventive Maintenance Checks and Services Chart.

NOTE

Within designated interval, these checks are to be performed in the order listed.

B-Before A-After
D-During

Item No.	Interval B	D	A	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
1	•			Case and cover	Clean exterior, using cloth. For stubborn dirt, use cloth damp with cleaning solvent.	
2	•			Nameplate	Condition, legibility.	
3	•			Handles	Condition, secure mounting, positive closure.	
4	•			Latches	Condition, secure mounting.	
5	•			Air valve	Cleanliness, operation.	
6	•			Cables	Insulation for condition. Repair damaged insulation using tape. Connector shells for condition. Replace cable if shell is damaged. Contacts for cleanliness. Clean as required. Straighten bent pins.	
7	•			Panel	Clean, using paint brush. For stubborn dirt, use cloth damp with cleaning solvent.	
8	•			Receptacles	Straightness of pins. Straighten bent pins.	
9	•			Control knobs	Tight on shaft. Tighten setscrew if necessary.	
10	•			Indicator lights	Condition of lenses. Replace if damaged.	
11	•			Meter.	Condition of cover. Replace if cracked or marred.	
12	•			Rotary switches	Secure mounting, positive detent.	
13	•			Receptacles toggle switches, indicators, circuit breakers	Secure mounting, positive	

Item No.	Interval B	D	A	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
14	●			Synchro	Smooth operation from 30° left to 30° right	Operation is not smooth or range is not as specified.
15	●			Time delay switches	Smooth operation from 0 to 9	
16	●			Elapsed time indicator	Appropriate change since last check.	
17	●			PITCH ATT HSI HDG control	Smooth operation from 0 (ccw) to 1000 (cw)	Operation is not smooth or range is not as specified.
				POWER ON CHECKS		
18	●			Test set	Perform operational start and connection (para 2-6a).	Requirements of check are not met.
19		●		Test set	Perform self test (para 2-6b).	Requirements of check are not met.
20			●	Test set	Perform shutdown (para 2-9).	

2-9. Shutdown Procedures.

a. Set the LCT POWER switch, the two AFCS POWER switches, and the TESTER POWER switch to OFF.

b. Set all other test set switches and controls to their initial position as listed in table 2-2.

c. Disconnect the test set cables from the unit under test.

d. Disconnect the power cable W7 from the power source.

CHAPTER 3

OPERATORS MAINTENANCE INSTRUCTIONS

3-1. General.

This chapter provides maintenance procedures authorized for the operator. Except for the procedures covered in this chapter, no special maintenance instructions are required. Repair at this level is limited to lamp and lens replacement and cable replacement or repair.

3-2. Servicing.

a. There are no servicing requirements except for those procedures identified in the preventive maintenance checks and services chart (para 2-8).

b. The following special tool is required to perform operator's maintenance on the test set: Crimping tool assembly NSN 5120-00-075-2544.

3-3. Cleaning.

a. Inspect the exterior of the equipment. The exterior surface should be face of dust, dirt, grease, and fungus. Remove dust and loose dirt with a clean soft cloth.

WARNING

Dry cleaning solvent, type I is combustible and toxic. It can irritate skin and cause burns. Use only with adequate ventilation, away from open flame. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Get medical attention for eyes.

b. Remove grease, fungus, and ground-in dirt from the equipment using a cloth damp with solvent. (Item 1, table 3-1.)

c. Clean the front panel, AC/DC VOLTMETER lens, and control knobs and switches: use a clean, soft cloth. If necessary, dampen the cloth (item 2, table 3-1) with water, Use mild soap (item 3, table 3-1) for more effective cleaning.

3-4. Touch-Up Painting.

a. Case or Cover. Refer to applicable cleaning and refinishing practices in TM 43-0139.

(1) Finish.

(a) Remove corrosion from case or cover by sanding with abrasive cloth. (Item 4, table 3-1.)

WARNING

Naphtha is combustible and toxic. It can irritate skin and cause burns. Use only with adequate ventilation, away from open flame. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Get medical attention for eyes.

(b) Clean sanded surface using naphtha. (Item 5, table 3-1,)

(c) Apply epoxy coating (item 9, table 3-1) to sanded areas of the case or cover.

(d) Apply light gray enamel (item 6, table 3-1) to areas with epoxy coating.

(2) Marking.

Table 3-1. Consumable Materials

ITEM NUMBER	NOMENCLATURE	MILITARY SPECIFICATION
1	Dry Cleaning Solvent	P-D-680
2	Cloth, Cleaning	CCC-C46A
3	Soap, Toilet, Liquid and Paste	P-S-624
4	Cloth, Abrasive; Type II, Class I, 220 Grit or Finer	GGG-C-520
5	Naphtha, Aliphatic, Type II	TT-N-95
6	Enamel Light Gray, Semi-Gloss, Type III, Class 2	MIL-E-15090
7	Enamel, Gloss Black, Color No. 17038	MIL-STD-595A
8	Enamel, Flat Black	MIL-C-22750
9	Epoxy Primer	MIL-P-23377

(a) Touch-up case or cover markings with gloss black enamel. (Item 7, table 3-1.)

b. Panel.

(1) Finish - Touch-up is not recommended.

(2) Markings - For touch-up of lettering use flat black enamel. (Item 8, table 3-1.)

3-5. Replacement of Knobs.

a. Loosen the two recessed socket head screws on the knob.

b. Remove the knob from the shaft.

c. Position the replacement knob on the shaft.

d. Tighten the two screws on the shaft.

3-6. Replacement of Lamps.

a. Unscrew the lens from the lamp holder.

b. Lift out the defective lamp.

c. Insert the replacement lamp.

d. Position the lens on the lamp holder and hand tighten.

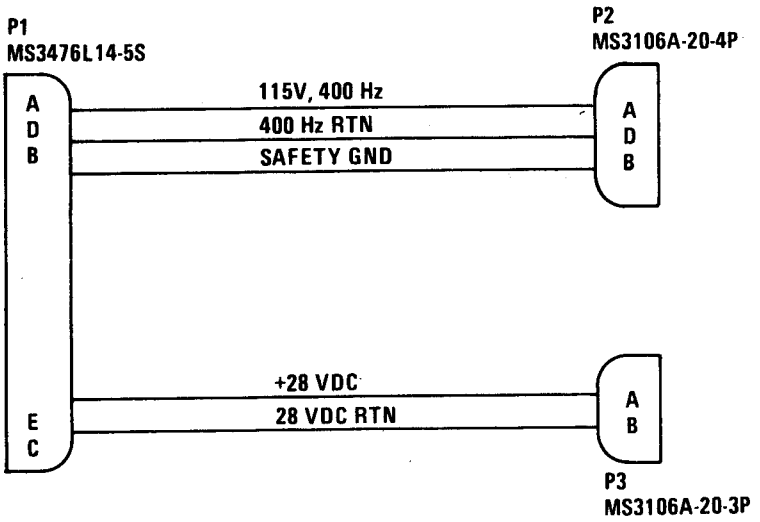
3-7. Cable/Connector Repair.

Refer to TM 55-1500-323-25. Cable wiring diagrams are in fig. 3-1 thru 3-6 of this manual.

3-8. Replacement of AC/DC VOLTMETER Lens Cover.

a. Remove the lens cover by inserting a thin screw driver or knife blade, under the edge of the cover and apply pressure.

b. Install the lens cover, by placing the lens cover on the AC/DC VOLTMETER, and apply only enough force to snap the lens cover on the AC/DC VOLTMETER.

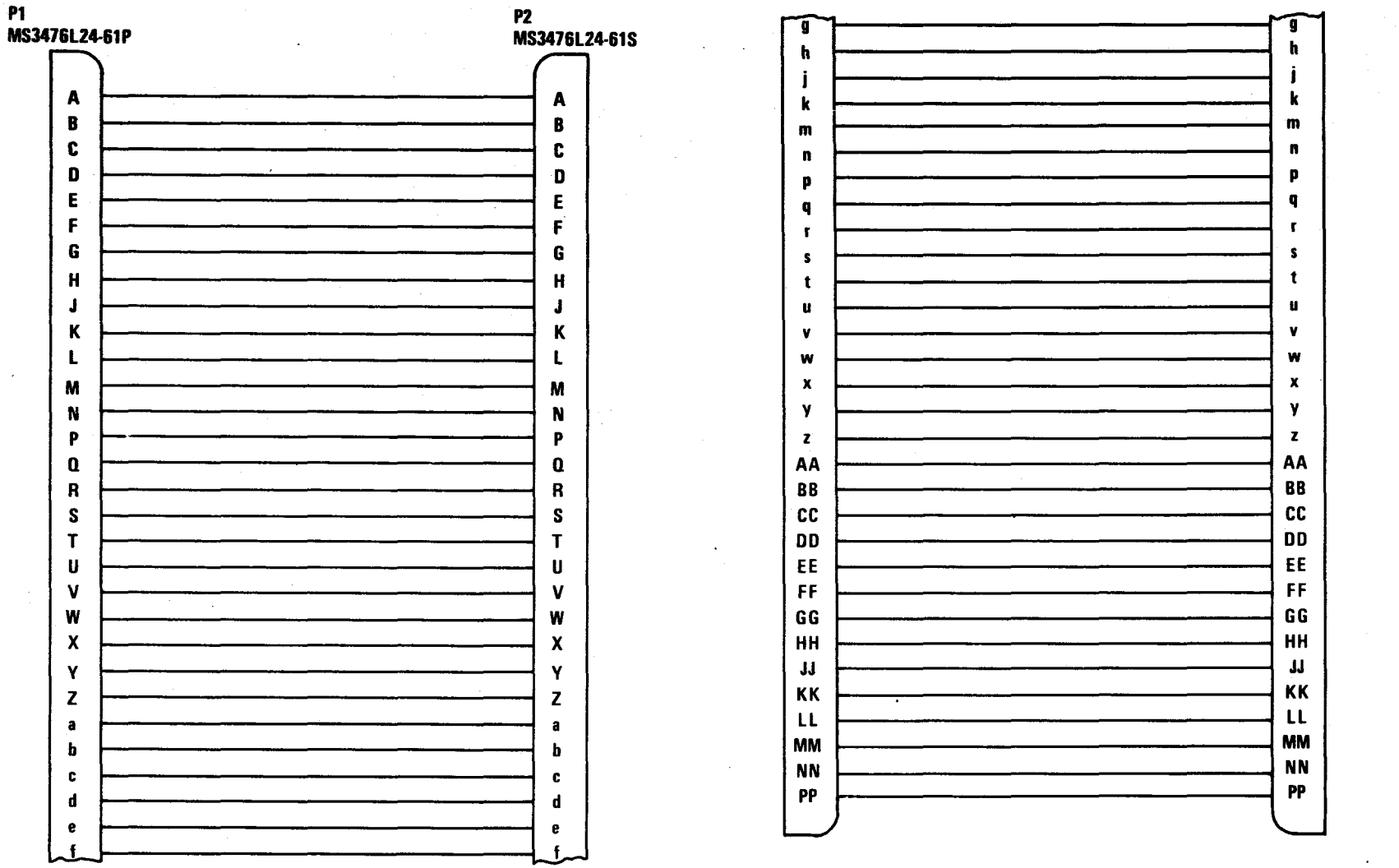


NOTE

1. ALL LEAD WIRE NO. 22 AWG.

47D-TMDE-ABTS-47

Figure 3-1. Test Set Cable W7(145G5183-1) Wiring Diagram

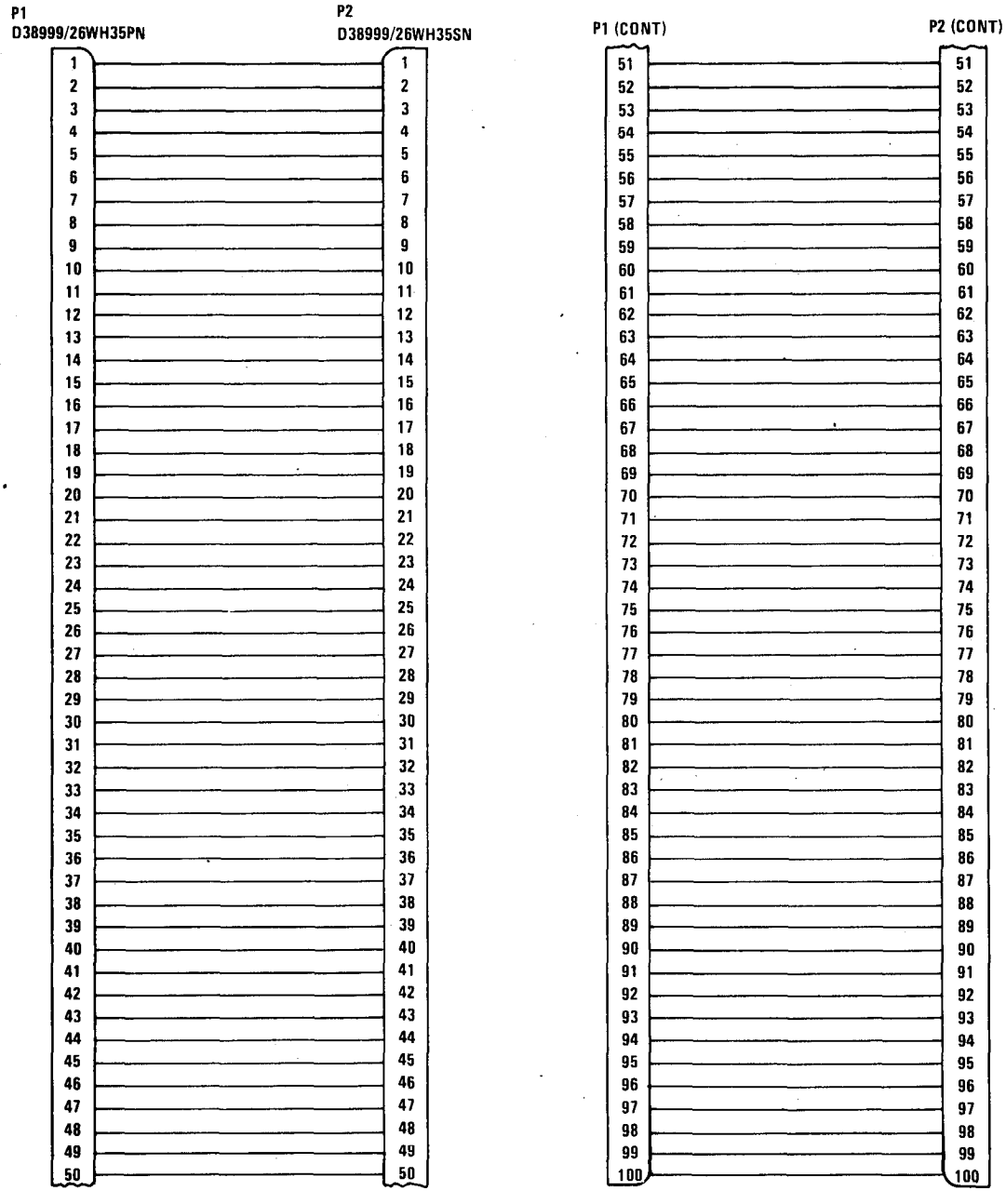


NOTE

1. ALL LEAD WIRE NO. 22 AWG.

47D-TMDE-ABTS-42

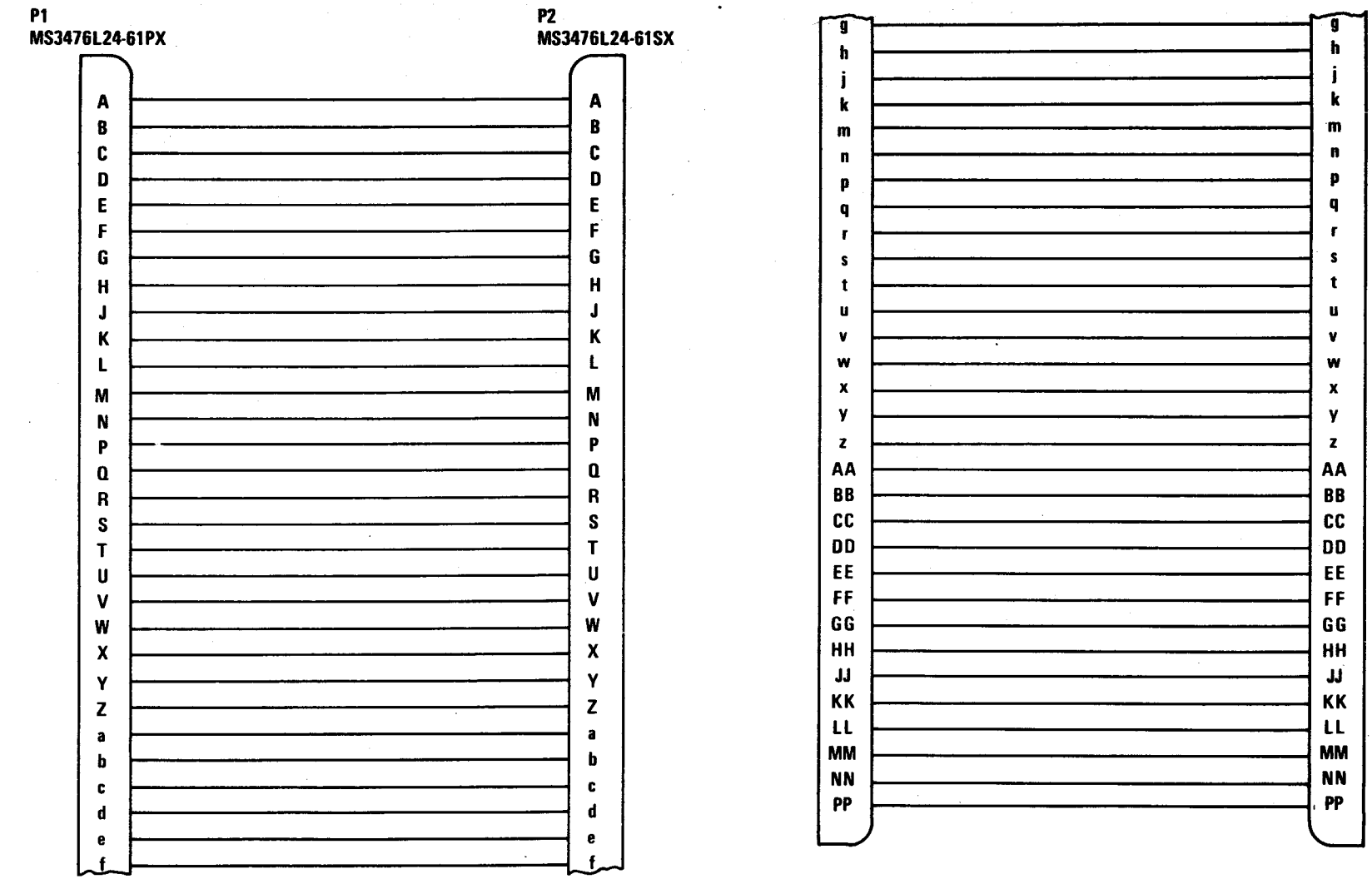
Figure 3-2. Test Set Cable W1 (145G5177-1) Wiring Diagram



NOTE
1. ALL LEAD WIRE NO. 22 AWG.

47D-TMDE-ABTS-43

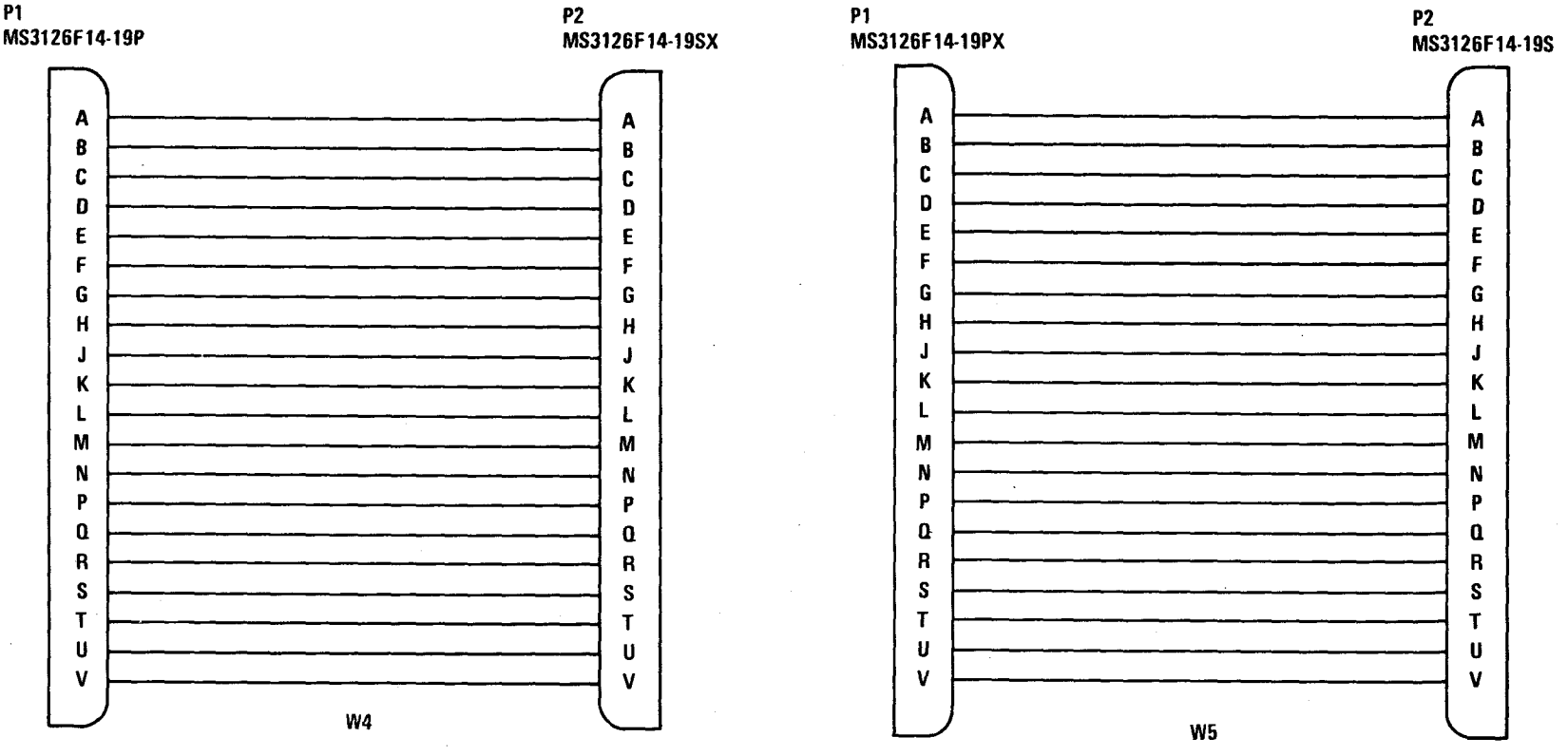
Figure 3-3. Test Set Cable W2 (145G5178-1) Wiring Diagram



NOTE
1. ALL LEAD WIRE NO. 22 AWG.

47D-TMDE-ABTS-44

Figure 3-4. Test Set Cable W3 (145G5179-1) Wiring Diagram

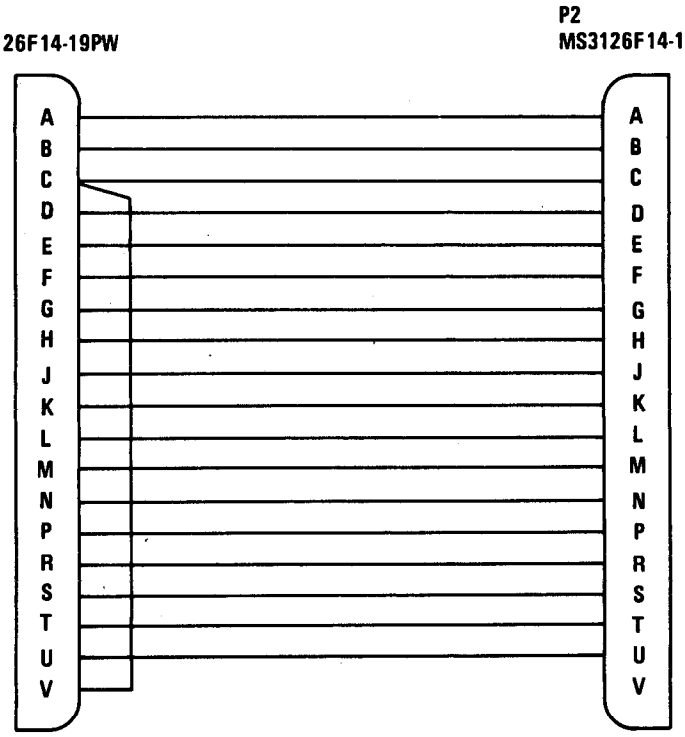


NOTE

1. ALL LEAD WIRE NO. 22 AWG.

47D-TMDE-ABTS-45

Figure 3-5. Test Set Cables W4 and W5 (145G5180-1 and 145G5181-1) Wiring Diagram



NOTE
1. ALL LEAD WIRE NO. 22 AWG.

47D-TMDE-ABTS-46

Figure 3-6. Test Set Cable W6 (145G5182-1) Wiring Diagram

SECTION I PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-9. Preventive Maintenance. Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce out-of-service time, and to ensure that the equipment is serviceable.

a. Systematic Care. The procedures in para 3-10 cover routine systematic care and cleaning essential to proper upkeep and operation of the test set.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services chart (para 3-10) outlines functions to be performed at specific intervals. These checks and services are performed to maintain the test set in serviceable condition; that is, in good general (physical) condition and in good operating condition. Certain checks are performed before operation of the test set. Other checks and services are performed weekly.

(1) Before you operate. Perform your *before* (B) checks and services.

(2) Weekly. Perform your *weekly* (W) checks.

3-10. Preventive Maintenance Checks and Services Chart.

NOTE

Within designated interval, these checks are to be performed in the order listed.

If the test set is being operated for the first time, the *weekly* (W) checks are to be performed, as well as the *before* (B) checks.

B-Before W-Weekly

Item No.	Interval B	D	A	W	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is Not Read/ Available if:
1				●	Case and cover	Clean exterior, using cloth. For stubborn dirt, use cloth damp with cleaning solvent.	
2				●	Nameplate	Condition, legibility.	
3				●	Latches	Condition, secure mounting.	
4				●	Handles	Condition, secure mounting, positive closure.	
5				●	Air valve	Cleanliness, operation.	

Item No.	Interval B	D	A	W	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
6	•				Cables	Insulation for condition. Repair damaged insulation using tape. Connector shells for condition. Replace cable if shell is damaged. Contacts for cleanliness. Clean as required. Straighten bent pins.	
7	•				Front	Clean, using paint brush. For stubborn dirt, use cloth damp with cleaning solvent.	
8	•				Receptacles	Straightness of pins. Straighten bent pins.	
9	•				Control knobs	Tight on shaft. Tighten setscrew if necessary.	
10	•				Indicator lights	Condition of lenses. Replace if damaged.	
11	•				Meter	Condition of cover. Replace if cracked or marred.	
12				•	Rotary switches	Secure mounting, positive detent.	
13				•	Receptacles toggle switches, indicators, circuit breakers	Secure mounting.	

Chapter 4

MAINTENANCE

SECTION I TROUBLESHOOTING (CRC)

4-1. General Instructions.

a. Troubleshooting procedures are provided in logic tree format. Testing and troubleshooting are correlated. For each test paragraph, there is a troubleshooting paragraph with a similar heading. For each failure to meet a test requirement, there is a trouble symptom with a similar title. Use the schematic diagrams (see FO-1, 1-3 through 1-12) and the wiring diagrams (see FO-55) as aids in troubleshooting.

b. On wiring diagrams, wire connections to the moving contacts of rotary wafer switches stop at the edge of the wafer. Physically, the moving contact is on the side of the wafer opposite the fixed contacts and is centered between two fixed contacts. In troubleshooting logic, moving contacts are identified with prefix W (wiper).

c. During troubleshooting, observe the following precautions and procedures.

(1) Voltage measurements. This equipment has transistor and microcircuits. When you measure voltage, use tape or plastic sleeving (spaghetti) to insulate the entire test prod, except for the extreme tip. A momentary short can ruin a transistor or microcircuit. Use the same or equivalent digital multimeter specified in para 4-2.

(2) Resistance Measurements. Perform resistance and continuity checks with all electrical power off.

(3) When the test set **is** disconnected from external test connections, all grounds in the test set are not at the same potential. Chassis ground is at receptacle pin J7-B. Dc common, logic ground, and ac signal ground are at TB1-3. Ac neutral is at TB2-7.

(4) Use a card extender, where necessary, for making test measurements at card receptacles.

4-2. Test Equipment Required.

TEST EQUIPMENT	SPECIFICATIONS
Function Generator	0 to 15 vac ±90° phase shift
AC Power Supply, 400 Hz	0 to 115 vac
Oscilloscope	Dual trace, 0 to 100 mHz, 350 picosecond rise time
Digital Multimeter (2 ea)	50 mV to 150 vac ±0.5%, 10 mV to 50 vdc ±0.1%
Decade Capacitance Box	0.01 to 1.0 uf, 1.0 to 10.0 uf ±0.1%
Decade Resistance Box	0.5 ohm to 1.1 megohms
Frequency Counter/Timer	1 Hz to 1 mHz
DC Power Supply 0-36V (2 ea)	0 to 36 vdc, ±0.5%
Stop Watch	0.1 sec increments
Signal Test Aid	Local fabricated (fig. 4-10)
Resistance Test Aid	Local fabricated (fig. 4-10)
Card Extenders	Receptacle M55302/27-06 (60 pin) to plug M55302/26-02

NOTE

Page identification for foldout pages has been designated as FO-1, FO-2, etc. and the pages are placed in the back of the manual at time of printing. Upon receipt of this manual, insert foldout pages FO-2 through FO-54 after page 4-2.

4-8. Fixed-Level Analog Signal Circuit Troubleshooting.

Isolate fault to receptacles, card connector, ANALOG SIGNAL switches, wiring, or circuit card A3. Repair or replace as required. Refer to FO-1, sheet 2, and FO-55.

4-9. Control Positions Transducer Signal Circuit Troubleshooting.

Isolate fault to receptacles, card connector, ANALOG SIGNAL switches, wiring, or circuit card A5. Repair or replace as required. Refer to FO-1, sheet 2, and FO-55.

4-10. Heading and Attitude Variable Analog Signal Circuit Troubleshooting.

Isolate fault to receptacle, connector, ATT controls and switches, wiring or circuit card A5. Repair or replace as required. Refer to FO-1, sheets 1 and 2, and FO-55.

4-11. Radar Altitude Self Test Analog and Confidence Signal Circuit Troubleshooting.

Isolate fault to receptacle J3, plug A5 P18, BARO ALT switch S41, wiring, or circuit card A5. Repair or replace as required. Refer to FO-1, sheet 2, and FO-55.

4-12. Pitch, Roll, and Yaw ILCA Simulation Resistance Circuit Troubleshooting.

Isolate fault to receptacle J1, plug A1P14, wiring, or circuit card A1. Repair or replace as required. Refer to FO-1, sheets 3 and 4, fig. 1-4, 1-5, 1-6, and FO-55.

4-13. Pitch ILCA Simulator Performance Circuit Troubleshooting.

Isolate fault to receptacle J1, plug A1P14, ILCA SIMULATION PITCH switch S42, wiring, or circuit card A1. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-4, and FO-55.

4-14. Roll ILCA Simulator Performance Circuit Troubleshooting.

Isolate fault to receptacle 1, plug A1P14, ILCA SIMULATION ROLL switch S43, wiring, or circuit card A1. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-5, and FO-55.

4-15. Yaw ILCA Simulator Performance Circuit Troubleshooting.

Isolate fault to receptacle J1, plug A1P14, ILCA SIMULATION YAW switch S44, wiring, or circuit card A1. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-6, and FO-55.

4-16. Components Interface Output Logic Discrete Signal Circuit Troubleshooting.

Isolate fault to receptacles, plugs A3P16, A5P18, DISCRETE SIGNALS switches, wiring or circuit cards A3, A5. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, and FO-55.

4-17. Component Interface Input Logic Discrete Signal Circuit Troubleshooting.

a. Resistance measurement is not within tolerance or is infinity.

Isolate fault to receptacles, terminal boards, wiring or resistors. Repair or replace as required. Refer to FO-1, sheet 3, and FO-55.

b. One indicator light does not come on when lamps are installed.

Isolate fault to receptacle, lamps, lampholder, wiring, or terminal boards. Repair or replace as required. Refer to FO-1, sheet 3, and FO-55.

4-18. LCT Actuator Simulator Circuit Troubleshooting.

a. Resistance measurement is not within tolerance or is infinity.

Isolate fault to receptacle J1 or J3, plug A2P15, LCT switch S50, wiring or circuit card A2. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-7, and FO-55.

b. Multimeter does not indicate correct voltage or does not indicate a null.

Isolate fault to receptacle J1 or J3, plug A2P15, LCT switch S50, wiring or circuit card A2. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-7, and FO-55.

4-19. CCDA Actuator Simulator Circuit Troubleshooting.

a. Resistance measurement not within tolerance or is infinity.

Isolate fault to receptacle J1 or J3, plug A2P15, wiring or circuit card A2. Repair or replace as required. Refer to FO-1, sheet 1 thru 4, fig. 1-8, and FO-55.

b. Improper voltages indicated on multimeter when voltage measurements are made at receptacle J3.

Isolate fault to receptacle J3, plug A2P15, CCDA switch S49, wiring or circuit card A2. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-8, and FO-55.

4-20. DASH Actuator Simulator Circuit Troubleshooting.

Isolate fault to receptacle J3, plug A2P15, ACTUATOR SIMULATION DASH switch S51, wiring or circuit card A2. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-9, and FO-55.

4-21. Control Panel Simulation Circuit Troubleshooting.

Isolate fault to receptacle J1 or J3, plug A3P16, CONTROL PANEL SIMULATION switches AFCS S10, HEADING S11, BARO S64 and RADAR S12 and indicator lights AFCS DS11, HEADING DS12, BARO DS13, RADAR DS14, wiring or circuit card A3. Repair or replace as required. Refer to FO-1, sheet 2, and FO-55.

4-22. Built- In-Test Equipment (BITE) Circuit Troubleshooting.

Isolate fault to receptacle J2 or J3, BITE INITIATE switch S36, BITE CONTROL switch S37 or wiring. Repair or replace as required. Refer to FO-1, sheet 2, and FO-55.

4-23. Response Test Circuit Troubleshooting.

Isolate fault to receptacle J3, plug A4P17, RESPONSE TEST switches MODE S8, TIME DELAY SEC S9, STIM S7, AC/DC voltmeter, M2 CIRCUIT SELECT switches S17, S18, S19 and S20, wiring or circuit card A4. Repair or replace as required. Refer to FO-1, sheet 1 thru 4, fig. 1-10, sheets 1 thru 3, and FO-55.

4-24. Continuity Test Circuit Troubleshooting.

Isolate fault to receptacles J1, J3, J4, or J5, plugs A3P16, or A5P18, continuity test switches S13 and S14, indicator light DS15, NORMAL ACCEL J2-52 switch S21, wiring or circuit cards A3 or A5. Repair or replace as required. Refer to FO-1, sheet 1 thru 4, fig. 1-10, sheets 1 and 2, 1-12, sheets 1 and 2, and FO-55.

4-25. CCDA Test Circuits Troubleshooting.

Isolate fault to receptacle J6, plug A5P18, CCDA switches BRAKE S39, CLUTCH S40, CMD S38 or ATT SELECT switch S35, ATT synchro B1, CIRCUIT SELECT switches S17, S18, S19 or S20, wiring, or circuit card A5. Repair or replace as required. Refer to FO-1, sheets 1 thru 4, fig. 1-12, sheets 1 and 2, and FO-55.

SECTION II MAINTENANCE

4-26. General.

This section covers AFCS bench test set Aviation Intermediate Maintenance (AVIM) repair. Repair is limited to component replacement. Tools and test equipment are listed in para 4-4. A list of consumables is included in table 4-1.

4-27. Inspection.

Visually check the panel components and cable assemblies as follows:

a. Check all electrical connectors and receptacles for bent or broken pins.

b. Check wires for frayed or worn insulation.

c. Check soldered connections for corrosion or poor mechanical connection.

d. Check rotary switches for proper alignment of switch position, and panel marking.

e. Operate the controls. Observe that the mechanical action of knobs and switches is smooth, and free from internal and external binding. There shall be no excessive looseness. .

f. Check the lens cover of the AC/DC VOLTMETER for cracks, scratches, and looseness.

g. Check indicator lamps for damaged lenses.

4-28. Operational Check.

a. Perform the connection procedures in chapter 2.

b. Perform the startup procedures in chapter 2.

c. Perform the self-test and built-in-test procedures in chapter 2.

4-29. Removal of Panel (CRC).

a. Press the air valve to equalize inside and outside air pressures. (See fig. 4-1.)

b. Unlatch and remove cover.

c. Remove 18 screws from the panel.

WARNING

The panel weighs about 55 pounds. Be careful when lifting the panel to avoid personal injury.

d. Remove the panel from the case.

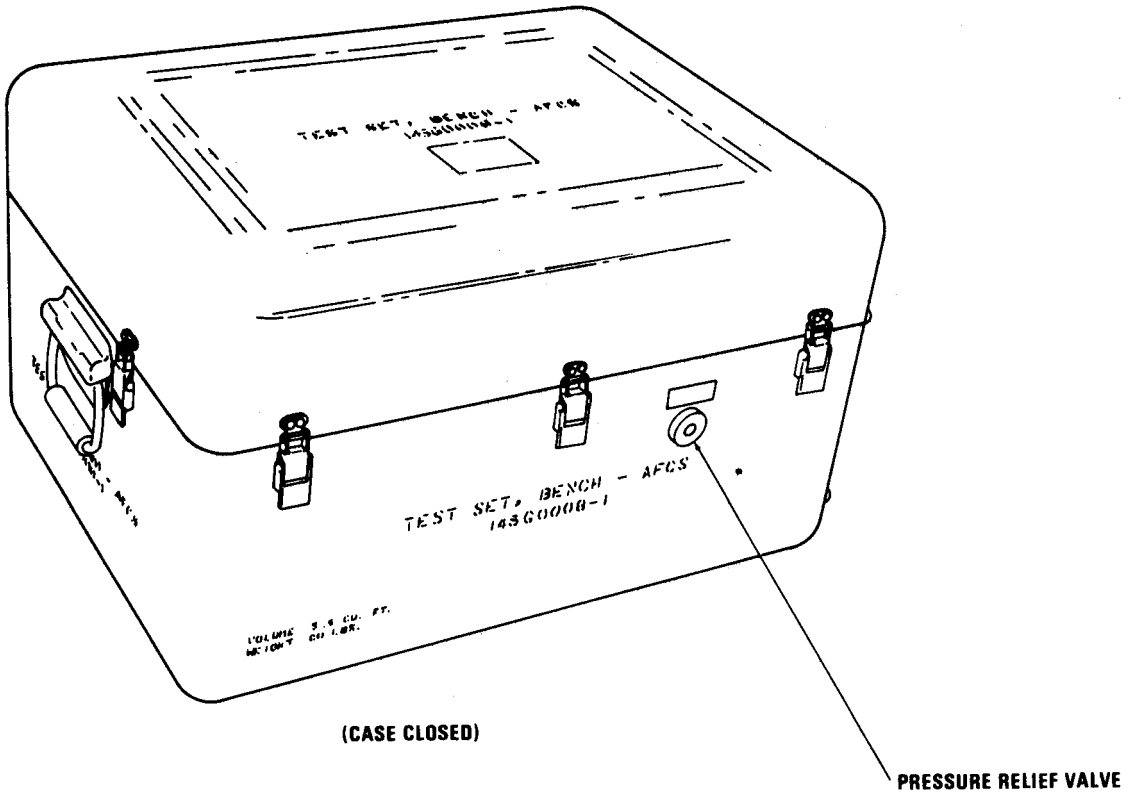


Figure 4-1. AFCS Bench Test Set (Case Closed)

4-30. Disassembly of Card Cage (CRC).

a. (See fig. 5-4.) Remove the panel from the case (para 4-29).

b. Remove five circuit cards (para 4-32).

c. Remove six screws and washers, that secure the card cage to the chassis.

d. Remove card cage for access to the switches.

4-31. Cleaning (CRC).

a. Inspect the exterior of the equipment. The exterior should be free of dust, dirt, grease, and fungus. Remove dust and loose dirt with clean soft cloth (item 2, table 4-1).

WARNING

Isopropyl alcohol is toxic. It can irritate skin and cause burns. Avoid inhaling. Use only with adequate ventilation. Avoid contact with skin, eyes, or clothing. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Get medical attention for eyes.

b. Clean exposed switch contacts with isopropyl alcohol (item 1, table 4-1).

c. Use a vacuum cleaner and soft brush to remove dirt and dust from the test set chassis and the interior of the case.

WARNING

Dry cleaning solvent, type I is combustible and toxic. It can irritate skin and cause burns. Use only with adequate ventilation, away from open flame. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Get medical attention for eyes.

d. Remove grease or oil with a cleaning cloth (item 2, table 4-1) moistened with dry cleaning solvent (item 3, table 4-1).

WARNING

Trichloroethane is toxic. It can irritate skin and cause burns. Use only with adequate ventilation. Avoid contact with skin, eyes, or clothing. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Get medical attention for eyes.

e. Clean exterior of the case and the panel, with cleaning cloth moist with trichloroethane (item 4, table 4-1).

Table 4-1. Consumable Materials.

ITEM NUMBER	NOMENCLATURE	MILITARY SPECIFICATION
1	Isopropyl Alcohol	TTT-I-735
2	Cloth Cleaning	CCC-C-46
3	Dry Cleaning Solvent	P-D-680
4	Trichloroethane	MIL-T-81533
5	Solder	QQ-S-571
6	Heat Sink Compound	Dow Corning No. 340 or Equiv.

4-32. Replacement of Circuit Cards (CRC).

CAUTION

Do not handle or store circuit cards, except in a static-free environment, using static-free materials. Microcircuits can be damaged by static.

a. (See fig. 5-4.) Remove the panel from the case (para 4-29).

b. Remove the card retainer.

CAUTION

When removing or installing a card, be careful not to damage components of the card or those of adjacent cards.

c. Remove the card (82, 83, 84, 85, or 86) from its receptacle. Pull it straight out.

d. Install the replacement card, components toward panel, in its receptacle. Make sure reference designations on card and card cage are the same.

e. Align the cards and install the card retainer.

f. Install panel in case (para 4-39).

g. Perform final test (para 4-40).

4-33. Replacement of Panel Components (CRC).

NOTE

Refer to the wiring diagram (FO-55) for component orientation and wire connections.

a. Replacement of AC/DC VOLTMETER. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Disconnect plugs P12 and P13 from the AC/DC VOLTMETER.

(3) Remove the meter lens cover (para 3-8).

(4) Remove the attaching hardware, and remove the AC/DC VOLTMETER. Retain the hardware.

(5) Install the replacement AC/DC VOLTMETER and attaching hardware.

(6) Connect plugs P12 and P13 to the AC/DC VOLTMETER.

(7) Install the meter lens cover (para 3-8).

(8) Install the panel in the case (para 4-39).

(9) Perform AC/DC VOLTMETER adjustment (para 4-37).

(10) Test the AC/DC VOLTMETER (para 4-45).

b. Replacement of rotary or toggle switch. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag the wires, then unsolder or disconnect by removing the screws.

(3) For a rotary switch, remove the knob by removing two screws from the knob.

(4) Remove the nut and washer that secure the switch to the panel.

(5) Note its orientation and remove the switch from the panel.

(6) Position the replacement switch in the panel.

(7) Secure the switch to the panel with the nut and washer.

(8) Solder the wires, or connect them by installing screws, Use solder (item 5, table 4-1). Remove the tags.

(9) For rotary switches, position the knob and tighten two screws.

(10) Install the panel in the case (para 4-39).

(11) Perform final test (para 4-40).

c. Repair or replacement of receptacles and terminal boards. Refer to TM 55-1500-323-25. See the wiring diagram in FO-55.

d. Replacement of RESPONSE TEST TIME DELAY - SEC switch. (See fig. 5-4.)

(1) Remove the panel from the case.

(2) Tag and unsolder the wires from the terminals.

(3) Remove the four screws and washers that secure the switch to the panel.

(4) Remove the switch.

(5) Position the replacement switch in the panel.

(6) Secure the switch with four screws and washers.

(7) Solder the wires to the terminals. Use solder (item 5, table 4-1). Remove tags.

(8) Install the panel in the case (para 4-39).

(9) Perform response test (para 4-64).

e. Replacement of pitch ATT-HSI HDG potentiometer R19. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag and unsolder the wires from the potentiometer.

(3) Remove retaining nut.

(4) Remove the potentiometer from the panel.

(5) Position the replacement potentiometer in the panels.

(6) Secure the potentiometer to panel with the retaining nut.

(7) Solder the wires to the potentiometer. Use solder (item 5, table 4-1). Remove the tags.

4-35. Assembly of Card Cage (CRC).

a. (See fig. 5-1). Position the card cage on the chassis.

b. Secure the card cage with six screws and washers.

c. Install the five circuit cards. (Refer to para 4-32.)

4-36. DC Power Supply voltage Adjustments (CRC).

The +15, -15 and +5 volt dc power supplies are adjustcd by screwdriver adjustments on the power supplies. (See fig. 4-2.)

(8) Install the panel in the case (para 4-39).

(9) Perform heading and attitude variable analog signal test (para 4-51).

f . Replacement of synchro B1. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag and unsolder the wires from the terminals.

(3) Remove the four screws and washers that secure the synchro.

(4) Remove the synchro.

(5) Position the replacement synchro in the panel.

(6) Secure the synchro with four screws and washers.

(7) Solder the wires to the terminals. Use solder (item 5, table 4-1). Remove the tags.

(8) Install the panel in the case (para 4-39).

(9) Perform synchro electrical zeroing (para 4-38).

(10) Perform heading and attitude variable analog signal tests (para 4-51).

g. Replacement of lamp holder or circuit breaker. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag and unsolder the wires or remove screws from the terminals of the circuit breaker or la np holder.

(3) Remove the nut and washer that secure the component to the panel.

(4) Remove the component from the panel.

(5) Position the circuit breaker or lamp holder on the panel.

(6) Install the nut and washer.

(7) Solder the wires to the terminals or replace screws. Use solder (item 5, table 4-1). Remove the tags.

(8) Install the panel in the case (para 4-39).

(9) Perform final test (para 4-40).

4-34. Replacement of Chassis Components (CRC).

NOTE

Refer to the wiring diagrams (FO-55) for components orientation and wire connections.

a. Replacement of power supply or transformers. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag and unsolder the wires from the power supply or transformer.

(3) Remove four screws or four nuts and washers that secure the power supply or transformer. Note its orientation.

(4) Remove the power supply or transformer from the chassis.

(5) Coat mounting surface and bottom of power supply or transformer with heat sink compound (item 6, table 4-1). Secure the replacement power supply or transformer to the chassis. Use four screws or four nuts and washers.

(6) Solder the wires to the terminals. Use solder (item 5, table 4-1). Remove the tags.

(7) Install the panel in the case (para 4-39).

(8) Perform DC power supply voltage adjustments as applicable (para 4-36).

(9) Perform final test (para 4-40).

b. Replacement of chassis mounted resistor. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag and unsolder the wires from the resistor terminals.

(3) Remove two screws and washers that secure the resistor to the chassis. Remove the resistor.

(4) Position the replacement resistor on the chassis. Secure the resistor with two screws and washers.

(5) Solder the wires to the resistor terminals. Use solder (item 5, table 4-1). Remove the tags.

(6) Install the panel in the case (para 4-39).

(7) Perform final test (para 4-40).

c. Replacement of rf filters FL1 thru FL4. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29).

(2) Tag and unsolder the wires from the filters.

(3) Remove the nut and washer that secures the filter to the bracket.

(4) Remove the filter from the bracket.

(5) Position the replacement filter on the bracket.

(6) Secure filter with the nut and washer.

(7) Solder the wires to the filter terminals. Use solder (item 5, table 4-1). Remove the tags.

(8) Perform power section check (para 4-44).

(9) Install the panel in the case (para 4-39).

d. (Test Sets with MWO 55-4920-430-50-1). Replacement of diode CR15. (See fig. 5-4.)

(1) Remove the panel from the case (para 4-29.)

(2) Tag and unsolder the wires from the diode.

(3) Remove the nut, insulator, bushing insulator, lug, and diode from the bracket.

(4) Install the replacement diode, insulator, bushing insulator, lug, and nut.

(5) Solder the wire from plug J7 pin E to the anode of diode CR15. Solder the wire from filter FL3 to the diode terminal lug.

(6) Perform power section check (para 4-44.)

(7) Install the panel in the case (para 4-39.)

a. Connect plug P1 of power cable W7 to test set POWER receptacle J7. Connect plug P2 to a 115-volt ac power source. Connect plug P3 to a 28-volt dc power source.

b. Set the 115V 400 Hz and +28 VDC TESTER POWER switches to ON. Allow 2 minutes for warmup.

c. Adjust the digital multi meter to the 20 volt dc range. Connect the test leads of the multimeter to EXT METER jacks HI and LO.

d. Adjust power supply PS1 for +5 volt output as follows:

(1) Set the METER switch to DC. Set the METER RANGE switch to 20V.

(2) Set SELF TEST CIRCUIT SELECT switches to 00,5.

(3) Turn the screwdriver adjustment on power supply PS1 until the digital multimeter reads +5 volts.

e. Adjust power supply PS2 for +15 volt output as follows.

(1) Set the METER RANGE switch to 20V.

(2) Set the METER switch to DC.

(3) Set the SELF TEST CIRCUIT SELECT switches to 00,3.

(4) Turn the screwdriver adjustment on power supply PS2 until the digital multimeter reads +15 volts.

f. Adjust power supply PS3 for +15 volt dc output as follows.

(1) Set the METER RANGE switch to 20V.

(2) Set the METER switch to DC.

(3) Set the SELF TEST CIRCUIT SELECT switches to 00,4.

(4) Turn the screwdriver adjustments on power supply PS3, until the digital multimeter reads -15 volts.

4-37. AC/DC VOLTMETER Adjustment (CRC).

NOTE

Insure that Para. 4-36 has been complied with prior to start of AC/DC VOLTMETER adjustments.

These adjustments set the AC/DC VOLTMETER input offset null, zero-width adjust, and gain. (See fig. 4-3 and 4-7.)

a. Connect plug P1 of power cable W7 to test set POWER receptacle J7. Connect plug P2 to a 115-volt ac power source. Connect plug P3 to a 28-volt dc power source.

b. Set the 115V 400HZ and +28VDC TESTER POWER switches to ON. Allow 2 minutes for warmup.

c. Remove the AC/DC VOLTMETER lens.

d. Adjust input offset null and zero width as follows (fig. 4-2).

(1) Set the AC/DC VOLTMETER CIRCUIT SELECT switches to 00,0, B, 0.

(2) Set the SELF TEST CIRCUIT SELECT switches to 00,0.

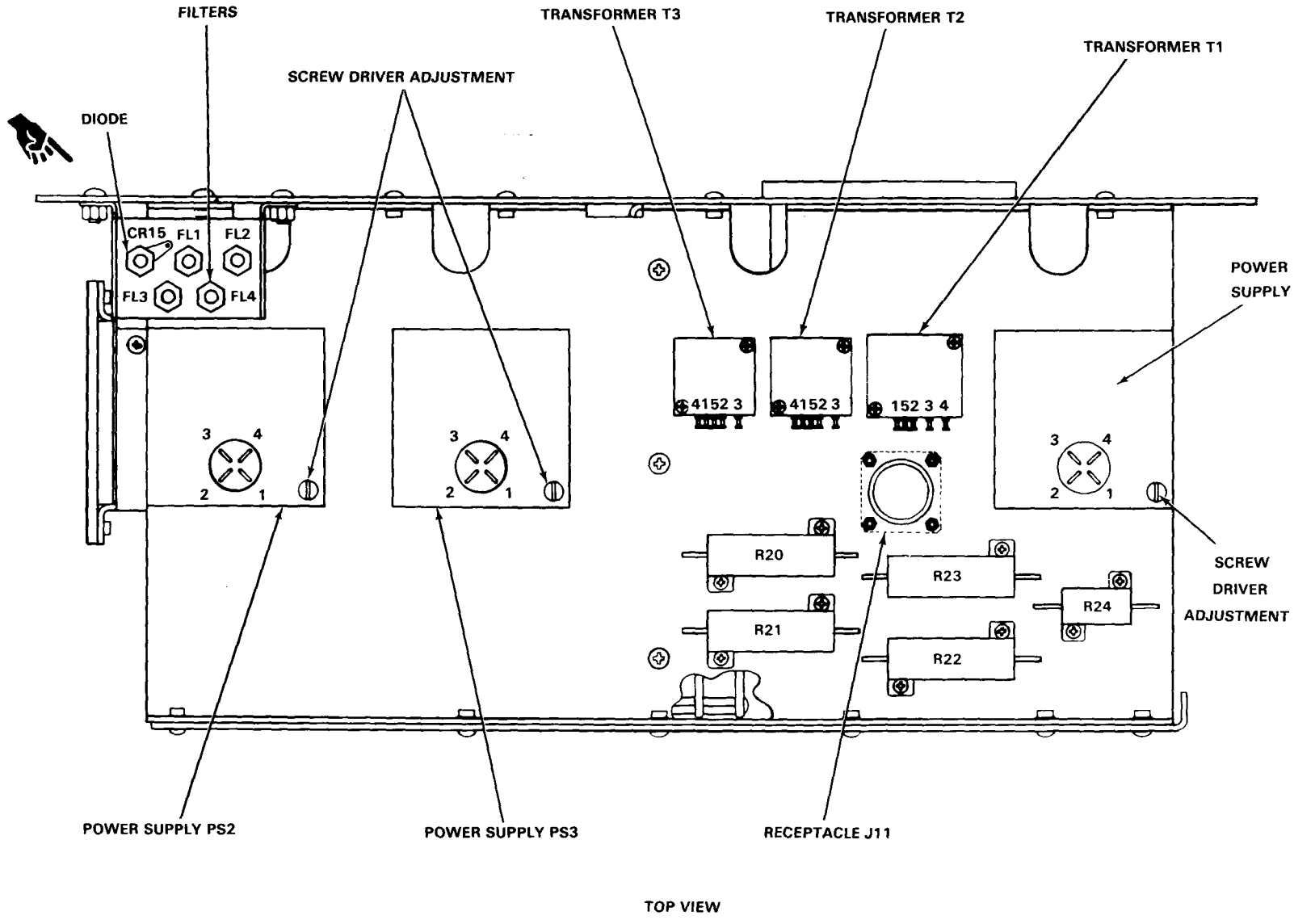


Figure 4-2. Power Supply Adjustments

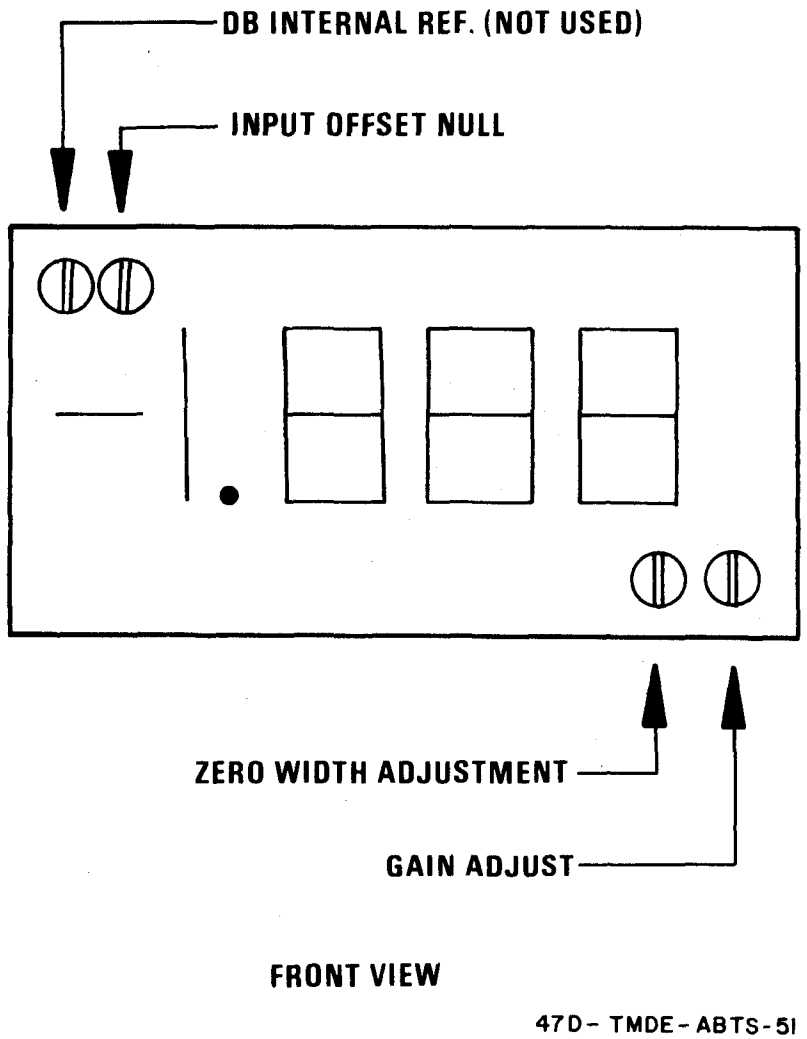


Figure 4-3. AC/DC VOLTMETER Adjustments

(3) Set the METER switch to AC. Set the METER RANGE switch to 200MV.

(4) Turn the zero-width adjust screw on the meter fully clockwise.

(5) Adjust the input offset null screw on the meter for minimum reading on the AC/DC VOLTMETER.

(6) Turn the zero-width adjust screw counterclockwise until the AC/DC VOLTMETER reads +00.0.

e. Adjust gain as follows (fig. 4-4).

(1) Set the METER switch to DC.

(2) Set the METER RANGE switch to 20V.

(3) Set the SELF TEST CIRCUIT SELECT switches to 00,3.

(4) Set the digital multimeter to 20 volt dc range. Connect the test leads of the multimeter to EXT METER JACKS HI and LO. The digital multimeter shall read 14.900 to 15.100.

(5) Turn the AC/DC VOLTMETER gain adjust screw until the AC/DC VOLTMETER reads the same as the digital multimeter, to 3 decimal places.

(6) Set the SELF TEST CIRCUIT SELECT switches to 00,4. The digital multimeter shall read -14.900 to -15.100.

(7) Turn the zero-width screw until the AC/DC VOLTMETER reads the same as the digital multimeter, to 3 decimal places. Set SELF TEST CIRCUIT SELECT switches to 00,3. Note the reading.

(8) Adjust the gain adjust screw until the AC/DC VOLTMETER reads the same as the digital multimeter.

(9) Repeat steps (6) through (8) as required until AC/DC VOLTMETER and digital multimeter readings are equal.

(10) Disconnect the digital multimeter and install the AC/DC VOLTMETER lens.

4-38. Synchro Electrical Zeroing (CRC).

Zero ATT synchro B1 as follows. (See fig. 4-5.)

a. Connect plug P1 of power cable W7 to test set POWER receptacle J7. Connect plug P2 to a 115-volt ac power source. Connect plug P3 to a 28 volt dc power source.

b. Set the 115V 400 Hz, and +28 VDC TESTER POWER switches to ON. Allow 2 minutes, for warmup. Check that MODE switch is at OFF. If the HOLD/STIM light is on, set the MODE switch to ON, then OFF.

c. Set the ATT SELECT switch to ROLL. Turn the ATT synchro dial to 180°.

d Set the digital multimeter to the 20-volt range. Connect the multimeter test leads to receptacles J3-pins, U (line) and V.

e. Connect oscilloscope CHANNEL A across the digital multimeter. Keep it connected to those leads throughout the test.

f. At the rear of the synchro, loosen three screws on the stator.

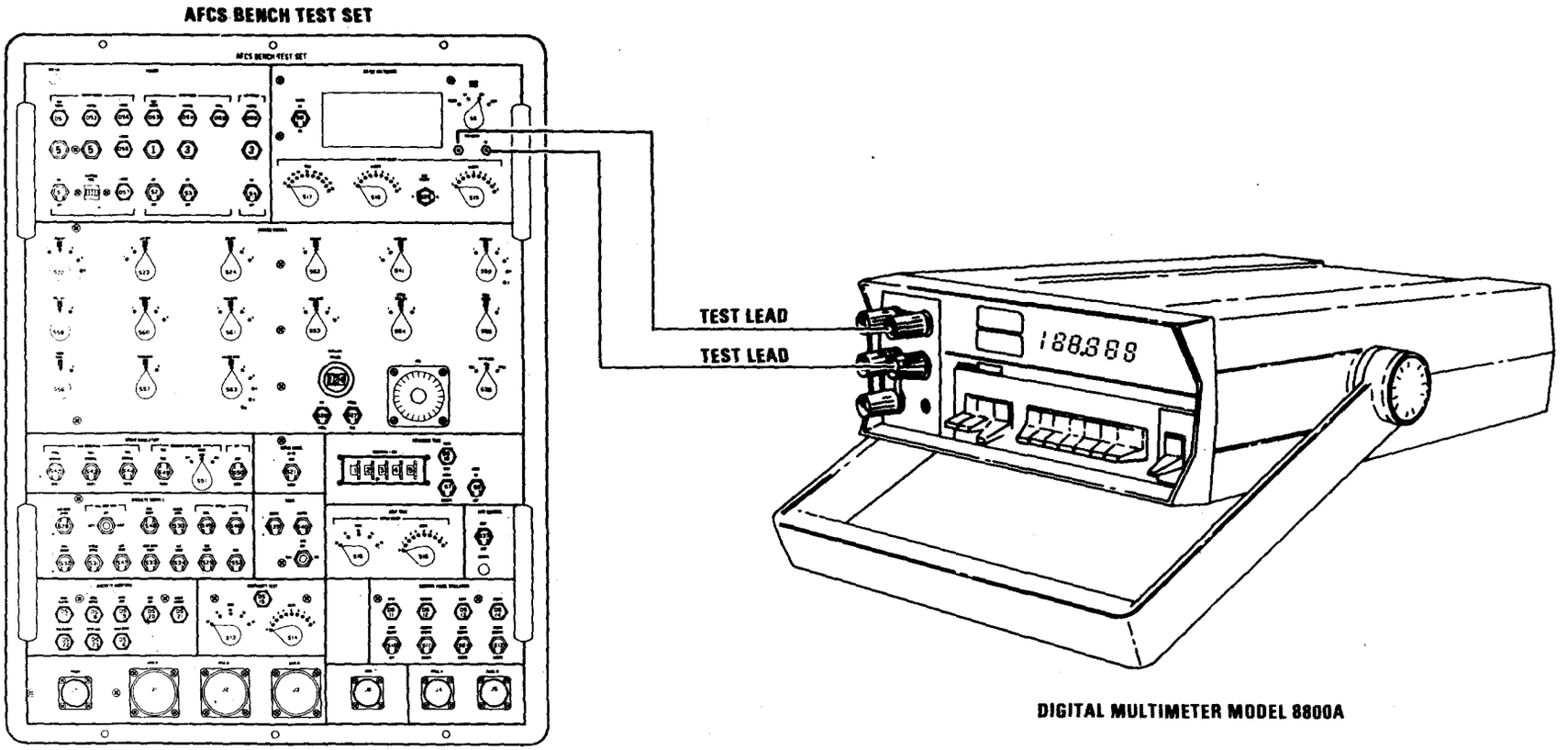
g. Adjust the synchro stator for minimum reading on the digital multimeter.

h. Tighten the three screws on the synchro stator.

i. Connect the multimeter to receptacle pin J3-T (line) and pin J1-D. Connect jumper wire between pins J1-D and J3-V.

j. Connect oscilloscope CHANNEL B to receptacle pin J1-B.

k. Check that the multimeter indicates 9.2 to 11.2 volts ac. Check that CHANNEL A and B waveforms are in phase. If not, proceed to step n.



470 - TMDE - ABTS - 53

Figure 4-4. AC/DC Voltmeter Gain Adjustment

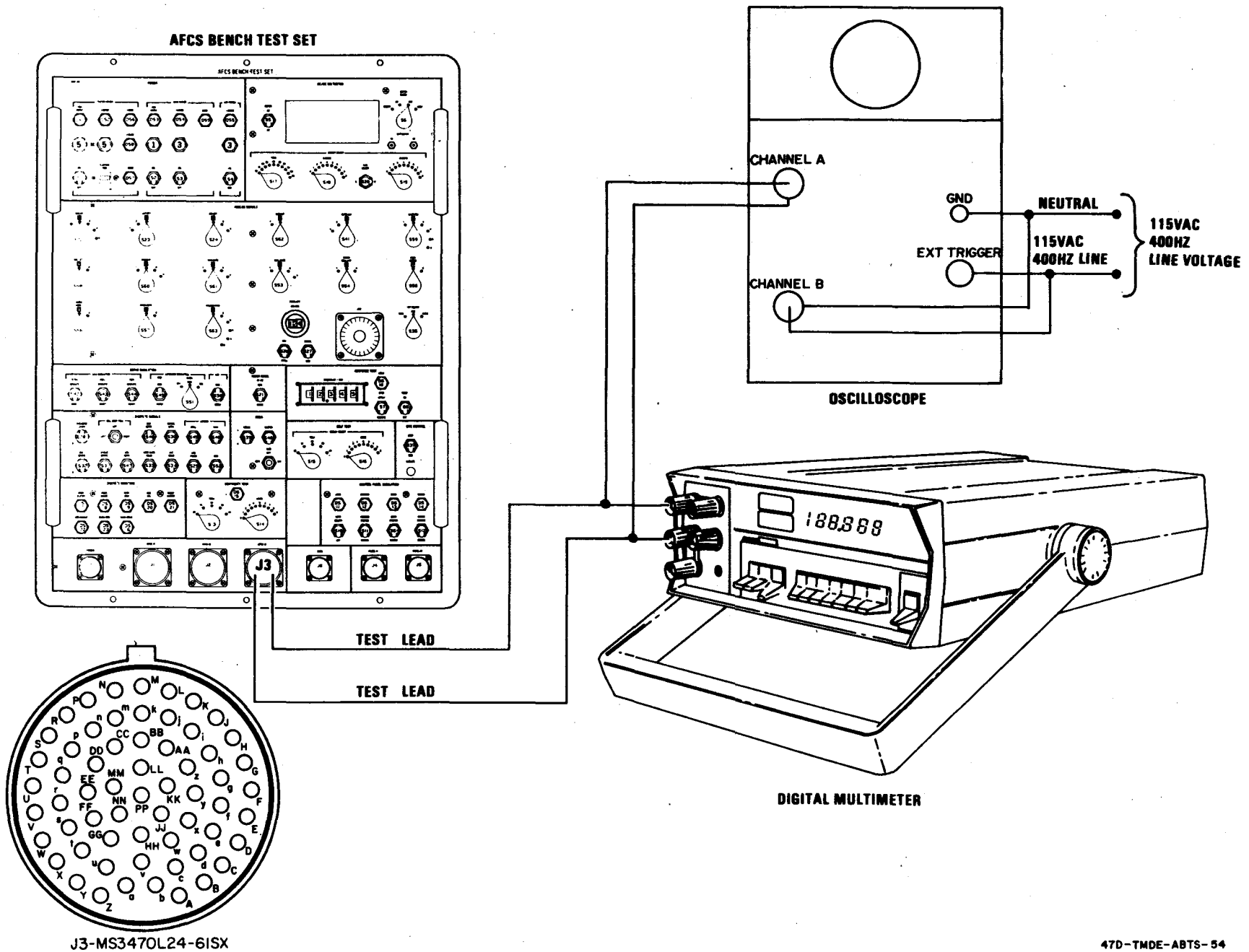


Figure 4-5. Synchro Electrical Zeroing

NOTE

Because of AFCS aircraft configuration, the relationship of the phase at ATT synchro setting of 180° is in-phase with reference source.

l. Disconnect jumper wire from pin J3-V and connect to J3-U.

m. Check that the multimeter indicates 9.2 to 11.2 volts ac. Check that CHANNEL A and B waveforms are in phase.

n. If the phase requirement is not met, proceed as follows:

(1) Set the ATT synchro dial to 180°.

(2) At the rear of the synchro, loosen three screws on the stator.

(3) Rotate the synchro stator 180°.

(4) Repeat steps d. thru m.

(5) Disconnect multimeter and oscilloscope from test set.

(6) Set the 115V 400 Hz, and +28VDC TESTER POWER switches to OFF.

(7) Disconnect the power cable from the power source.

4-39. Installation of Panel (CRC).

a. Install the panel in the transit case.

b. Install the 18 screws around the edge of the panel. Tighten the screw until panel is secure in case.

4-40. FINAL TEST (CRC).

4-41. General.

These procedures ensure that the set meets performance standards for use, return to stock, or reissue. These procedures are required when a test set is repaired or its performance is suspect.

4-42. Test Equipment Required. The following test equipment is required:

Equipment	Specification	Function
Digital Multimeter (2 ea)	Vac 50 mV to 150V .5% (AC Sample) Vac 10 mV to 50V .1% (Rate Critical)	Measure continuity, resistance ac and dc voltage
Oscilloscope	Dual Trace 0 to 100 mHz 350 Picosecond Rise Time	Measure Sine Wave
Decade Capacitance Box	0.01 to 1.0 uf 1.0 to 10.0 uf (±0.1% +0.5 pf)	Insert Capacitance
Decade Resistance Box	10 ohms to 100 ohms 0.5 ohms to 1.1 megohms	Insert Resistance
Frequency Counter/Timer	1 hz to 1 mHz	Measure Frequency
DC Power Supply (2 ea)	0 to 36 vdc ±0.5%	Provides Test Voltage
Function Generator	0 to 15 vac	Ref Volt Shift ±90°
AC Power Supply 400 Hz	0 to 115 vac ±.5%	Provides Test Voltage
Stop Watch	0.1 sec min	Timer

Equipment	Specification	Function
Signal Test Aid	Local Fab	Phase testing
Resistance Test Aid	Local Fab	Resistance measurement

4-43. Test Procedures.

These tests ensure the performance of all circuits of the test set but are organized so that the performance of a particular test circuit can be evaluated. In addition, the troubleshooting procedures in section I are correlated to this test by malfunction description. Perform the tests in the order in which they are presented.

a. Continuity Tests (Power Disconnected). Using a multimeter, set to Rx 1, measure the resistance in the safety ground circuit between POWER receptacle J7 pin B and GND LUG J10. Resistance shall be 0 ohm.

b. Resistance Checks (Power Disconnected).

(1) Measure resistance between receptacle pins as follows. Use a multimeter set to a range which shows the reading below half scale.

NOTE

Receptacles J1 and J3 are marked AFCS

Receptacle Pins	Resistance (ohms)
(a) J1-F to J1-G	50 to 62
(b) J1-P to J1-R	243 to 297
(c) J1-Y to J1-Z	74 to 90
(d) J3-F to J3-AA	900 to 1100
(e) J3-v to J3-C	900 to 1100
(f) J3-c to J3-C	558 to 682
(g) J3-NN to J3-C	2160 to 2640
(h) J3-g to J3-y	900 to 1100

c. Connection Procedures.

(1) Check that the test set controls are at their initial settings. (Refer to table 2-2.)

(2) Connect cable plug P1 of W7 to test set POWER receptacle J7. Connect plug J2 to a 115-volt 400-Hz ac power source. Connect cable plug J3 to a 28-volt dc power source.

NOTE

Do not connect any other cables to the test set.

4-44. Power Section Check (CRC). Check power circuits and indicators as follows:

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	INDICATOR OR TEST PROCEDURE	METER/INDICATOR NORMAL RESULTS
a.	TESTER POWER switch S1	ON	(1) 115V 400Hz Indicator DS1	(1) Light Comes On.
			(2) +28VDC Indicator DS2	(2) Light Comes On.
			(3) +5VDC Indicator DS6	(3) Light Comes On.
			(4) +15VDC Indicator DS8	(4) Light Comes On.
			(5) -15VDC Indicator DS7	(5) Light Comes On.
b.	AFCS POWER 115V 400Hz switch S2	ON	(1) 115V 400Hz Indicator DS3	(1) Light Comes On.
			(2) 5VAC Indicator DS9	(2) Light Comes On.
			(3) Measure Power Voltage, Receptacle AFCS J1-B (line) to J1-D	(3) 112.5 to 117.5 vac.
			(4) Measure Power Voltage, Receptacle PANEL J2-B, J2-D J2-F (line) to J2-C	(4) 4.5 to 5.5 vac
c.	AFCS POWER +28VDC switch S3	ON	(1) +28 VDC Indicator DS4	(1) Light Comes On.
			(2) Measure Power Voltage, Receptacle AFCS J1-A (+) to J1-C	(2) 24 to 28.5 vdc.
			(3) Measure Power Voltage, Receptacle PANEL J1-A (+) and PANEL J2-A (+) to J1-B	(3) 24 to 28.5 vdc.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	INDICATOR OR TEST PROCEDURE	METER/INDICATOR NORMAL RESULTS
d.	LCT PWR switch S4	ON	(1) LCT PWR +28 vdc Indicator DS5	(1) Light Comes On.
			(2) Measure Power Voltage, Receptacle AFCS J1-E (+) to J1-C	(2) 24 to 28.5 vdc.
e.	(1) LCT PWR switch S4	(1) OFF	(1) Associated Indicator	(1) Light Goes Out.
	(2) AFCS POWER 28VDC switch S3	(2) OFF	(2) Associated Indicator	(2) Light Goes Out.
	(3) AFCS POWER 115 VAC 400Hz switch S2	(3) OFF	(3) Associated Indicators	(3) Lights Go Out.
	(4) TESTER POWER SWITCH S1	(4) OFF	(4) Associated Indicators	(4) Lights Go Out.

4-45. Ac/Dc Voltmeter Tests (CRC). Allow the test set to warm up for 20 minutes before performing the following AC/DC VOLTMETER tests. Adjustment procedures are in para 4-36.

a. Set TESTER POWER switch S1 to ON.

b. Set the AC/DC VOLTMETER CIRCUIT SELECT switches to 40, 0, B, 0. Check that the METER switch is at AC. Check that the METER RANGE switch is at 200V.

NOTE

The following test will be performed using a variable ac power supply, 50mv to 100 volts.

c. Connect the line side of the ac power supply and the positive test lead of the multimeter to EXT METER HI jack J8. (See fig. 4-6.) Connect the other terminal of the ac power supply and the negative test lead of the multimeter to EXT METER LO jack J9. Set the digital multimeter to read ac volts. Adjust ac power supply frequency to 400 Hz. For each input signal level, the AC/DC VOLTMETER shall read as listed below.

METER RANGE SWITCH	INPUT SIGNAL LEVEL	AC/DC VOLTMETER READING (AC)
200 MV	50.0 mV	49.1 to 50.9 mV
	100.0 mV	98.6 to 101.4 mV
	150.0 mV	148.1 to 151.9 mV
	190.0 mV	187.7 to 192.3 mV
	220.0 mV	flashing
2 V	0.500 V	0.491 to 0.509 V
	1.000 V	0.986 to 1.014 V
	1.500 V	1.481 to 1.519 V
	1.900 V	1.877 to 1.923 V
	2.200 V	flashing
20 V	5.00 V	4.91 to 5.09 V
	10.00 V	9.86 to 10.14V
	15.00 V	14.81 to 15.19V
	19.00 V	18.77 to 19.23 V
	22.00 V	flashing
200 V	50.0 V	49.1 to 50.9 V
	100.0 V	98.6 to 101.4 V

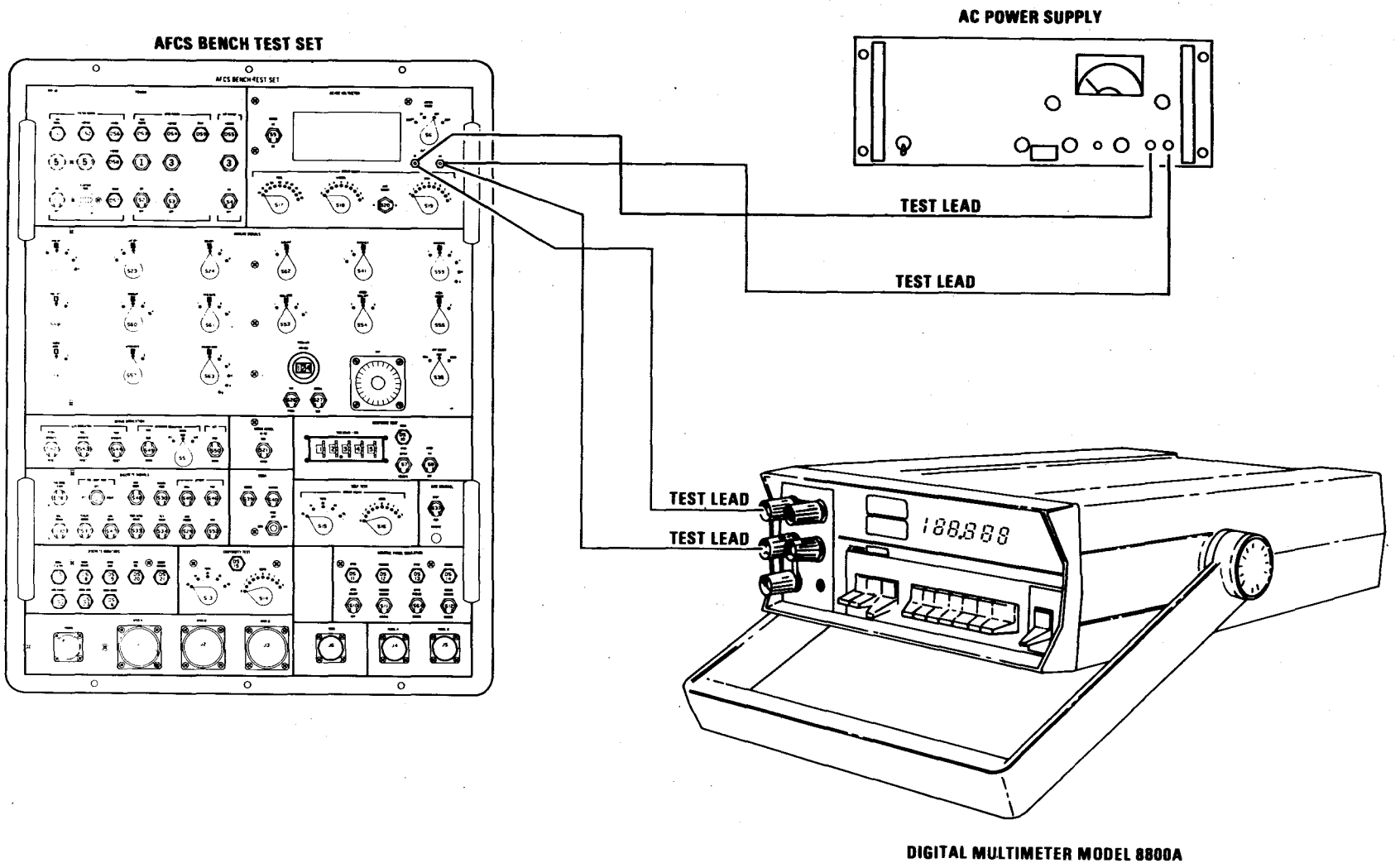


Figure 4-6. AC/DC VOLTMETER — Ac Voltage Test Setup

d. Disconnect the ac power supply and the digital multimeter from the EXTERNAL METER jacks.

e. Set the METER switch to DC.

f. Connect the positive terminal of the variable dc power supply and positive test lead of the digital multimeter to EXT METER HI jack J8. Connect the negative terminal of the dc power supply and the negative test lead of the digital multimeter to EXT METER LO jack J9. Set the digital multi meter to read dc voltage. Adjust the dc power supply to the input levels listed below. For each dc input level, the AC/DC VOLTMETER reading shall be as listed below. (See fig. 4-7.)

METER RANGE SWITCH	DC INPUT LEVEL	AC/DC VOLTMETER READING (DC)
200 MV		
	50.0 mV	49.0 to 51.0 mV
	100.0 mV	98.4 to 101.6 mV
	150.0 mV	147.8 to 152.2 mV
	190.0 mV	187.3 to 192.7 mV
	220.0 mV	flashing
2 V		
	0.500 V	0.495 to 0.505 V
	1.000 V	0.995 to 1.005 V
	1.500 V	1.494 to 1.506 V
	1.900 V	1.894 to 1.906 V
	2.200 V	flashing
20 V		
	5 .00 V	4.94 to 5.06 V
	10.00 V	9.93 to 10.07 V
	15.00 V	14.91 to 15.09 V
	19.00 V	18.90 to 19.10 V
	22.00 V	flashing
200 V		
	5.0 V	+4.6 to +5.4 V
	15.0 V	+14.5 to +15.5 V
	30.0 V	+29.4 to +30.6 V

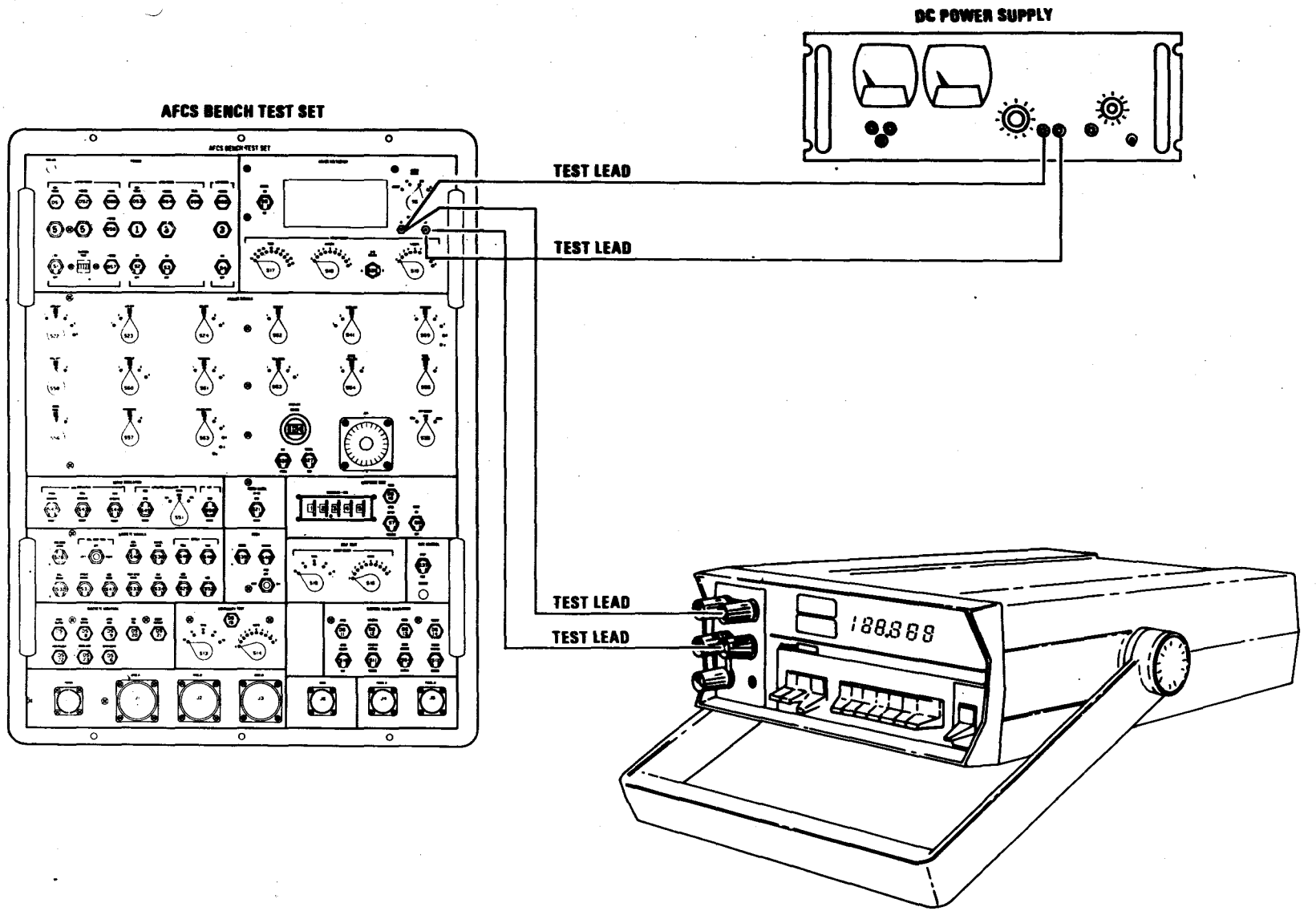


Figure 4-7. AC/DC VOLTMETER — Dc Voltage Test Setup

g. Reverse the connections to the dc power supply to check negative indications. For each dc input level, the AC/DC VOLTMETER reading shall be as listed below.

METER RANGE SWITCH	DC INPUT LEVEL	AC/DC VOLTMETER READING (DC)
200 MV		
	50.0 mV	-49.0 to -51.0 mV
	100.0 mV	-98.4 to -101.6 mV
	150.0 mV	-147.8 to -152.2 mV
	190.0 mV	-187.3 to -192.7 mV
	220.0 mV	flashing
2 V		
	0.500 V	-0.495 to -0.505 V
	1.000 V	-0.995 to -1.005 V
	1.500 V	-1.494 to -1.506 V
	1.900 V	-1.894 to -1.906 V
	2.200 V	flashing
20 V		
	5.00 V	-4.94 to -5.06 V
	10.00 V	-9.93 to -10.07 V
	15.00V	-14.91 to -15.09 V
	19.00 V	-18.90 to -19.10 V
	22.00 V	flashing
200 V		
	5.0 V	-4.6 to -5.4 V
	15.0 V	-14.5 to -15.5 V
	30.0 V	-29.4 to –30.6 V

h. Disconnect the digital multimeter and the dc power supply.

4-46. AC/DC VOLTMETER Circuit Select Tests (CRC). Check voltmeter switching circuits as follows:

a. Set the METER RANGE switch to 2V and METER switch to DC.

b. Set the A/B SELECT switch to A.

c. Connect the negative terminal of the dc power supply and the negative test lead of the digital multimeter to receptacle AFCS J3, pin AA. Connect the positive test lead of the multimeter to the positive terminal of the dc power supply. Adjust the multimeter to read dc volts. Adjust the power supply for 0.25-volt output.

d. Set the CIRCUIT SELECT A switches to the positions listed below. At each position, connect the 0.25-volt output of the dc power supply to the receptacle pin listed below. For each position and pin, the AC/DC VOLTMETER shall read 0.225 to 0.275. (See fig. 4-8.)

Receptacles J1, J2, and J3 are marked AFCS.

A flashing indication on the AC/DC VOLTMETER is normal with no voltage applied.

UNITS Switch	0	1	2	3	4	5	6	7	8	9
TENS Switch 00		J2-56	J2-57	J2-58	J2-59	J2-60	J2-54	J2-55	J2-63	J1-m
10	J1-W	J1-L	J1-N	J2-72	J1-NN	J3-H	J2-14	J2-11	J1-s	J1-j
20	J2-8	J2-9	J2-12	J2-13	J2-16	J2-15	J3-MM	J1-JJ	J2-69	J2-22
30	J1-HH	J2-70	J3-L	J2-33	J1-FF	J1-BB	J1-LL	J2-61	J2-66	J2-64
40	J2-47	J2-49	J3-w	J2-10	J3-DD	J2-39	J2-68	J2-48	J2-76	J2-7
50	J3-x*	J3-g	J3-F	J2-34	J2-65	J2-67	J2-74	J2-75	J2-78	J2-79
60	J2-36	J2-36	J2-52	J2-50	J3-E	J2-51	J3-e**	J2-80	J2-81	J2-21

* At 50, 0 the SERVO SIMULATION LCT switch must be set to NORM for that test only.

** At 60, 6 the CCDA switch must be set to norm for this test only.

e. Set the A/B SELECT switch to B. Set the CIRCUIT SELECT B switches to the positions listed below. At each position, connect the 0.25-volt output of the dc power supply between the receptacle pins listed below. For each position and pins, the AC/DC VOLTMETER shall read 0.225 to 0.275.

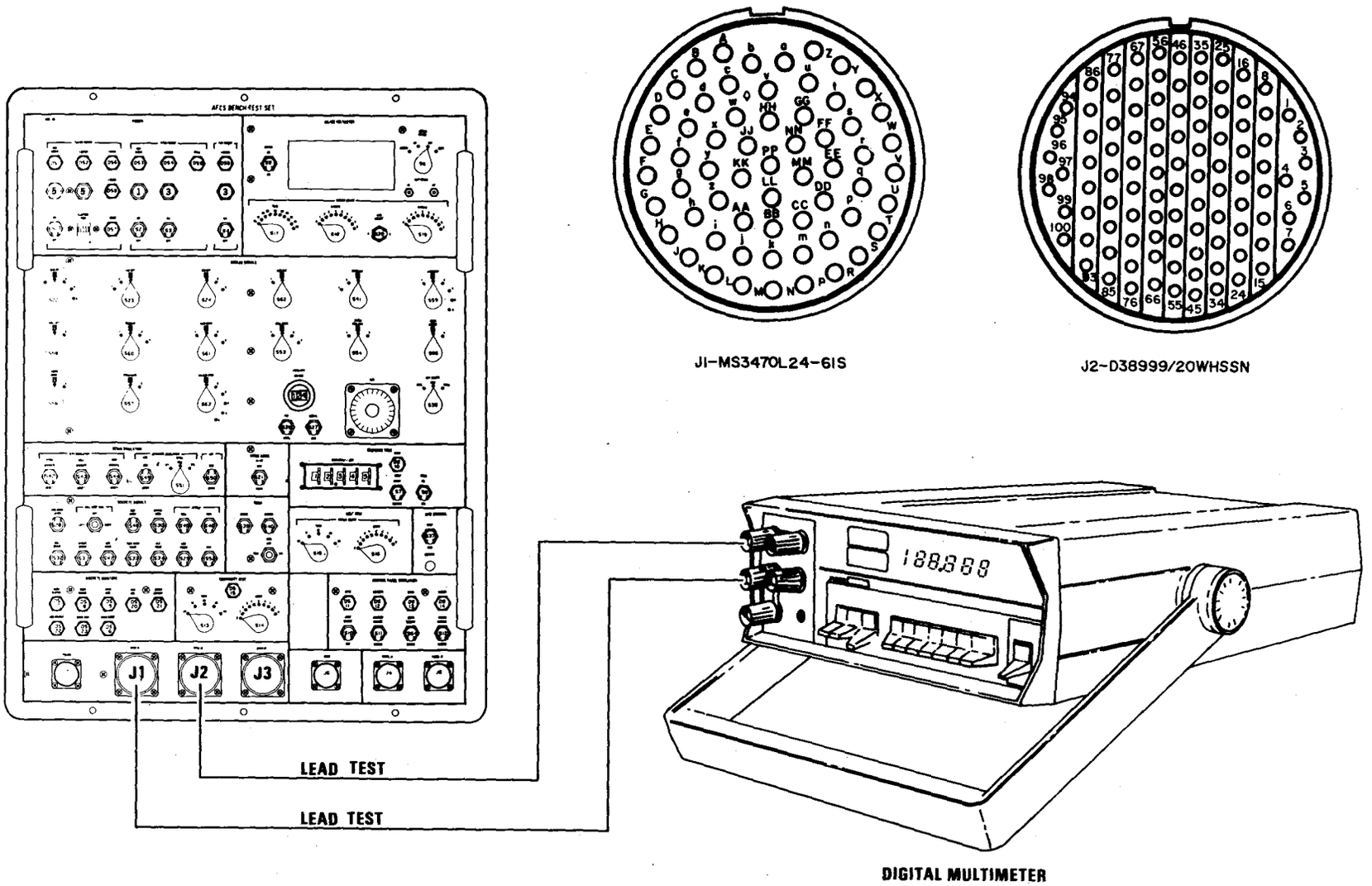
NOTES

Receptacles J1, J2, and J3 are marked AFCS. Receptacles J4 and J5 are marked PANEL. Receptacle J6 is marked CCDA.

For each set of connector pins, the positive meter lead is connected to the first pin listed and the negative lead to the second pin listed

UNITS Switch	0	1	2	3	4	5	6	7	8	9
TENS Switch 00			J4-M J4-B	J5-M J4-B	J3-HH J3-JJ	J1-S J1-C	J1-T J1-C	J3-HH J1-C	J3-JJ J1-C	J2-62 J1-C
10	J1-B J1-D	J1-A J1-C	J2-1 J2-3	J3-v J3-C	J2-2 J2-3	J3-c J3-C	J3-NN J3-C	J2-4 J2-3	J1-P J1-R	J1-F J1-G
20	J1-Y J1-Z	J3-A J1-C		J1-b J1-C	J1-c J1-C			J2-18 J3-N		
30	J6-D J6-E	J6-F J6-C								

f. Disconnect the dc power supply and the digital multimeter.



47D-TMDE-ABTS-50

Figure 4-8. AC/DC VOLTMETER — Measurement Test Setup

4-47. Power Section Self Test Circuit Tests (CRC). Proceed as follows:

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	INDICATOR OR TEST PROCEDURE	METER/INDICATOR NORMAL RESULTS
a.	AC/DC VOLTMETER CIRCUIT SELECT switches	00,0, B, 0	None	None
b.	SELF TEST CIRCUIT SELECT switches	00, 0	None	None
c.	TESTER POWER switch S1	ON	(1) 115V 400HZ Indicator DS1	(1) Light Comes On.
			(2) +28VDC Indicator DS2	(2) Light Comes On.
			(3) +5VDC Indicator DS6	(3) Light Comes On.
			(4) +15VDC Indicator DS8	(4) Light Comes On.
			(5) -15VDC Indicator DS7	(5) Light Comes On.
d.	AFCS POWER 115V 400HZ switch S2	ON	(1) 115V 400 Hz Indicator DS3	(1) Light Comes On.
			(2) 5 VAC Indicator DS9	(2) Light Comes On.
e.	AFCS POWER +28VDC switch S3	ON	+28VDC Indicator DS4	Light Comes On.
f.	LCT PWR switch S4	ON	+28VDC LCT PWR Indicator DS5	Light Comes On.
g.	METER switch S5	AC	(1) METER RANGE switch S6 to following positions	
			(a) 200 MV	(a) Less than 00.6
			(b) 2 V	(b) Less than 0.006
			(c) 20 V	(c) Less than 0.06
			(d) 200 V	(d) Less than 00.6

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	INDICATOR OR TEST PROCEDURE	METER/INDICATOR NORMAL RESULTS
		DC	(2) METER RANGE switch S6 to following positions	
			(a) 200 MV	(a) Less than 00.6
			(b) 2 V	(b) Less than 0.006
			(c) 20 V	(c) Less than 0.06
			(d) 200 V	(d) Less than 00.6

4-48. Self-test Circuit Test (CRC). Proceed as follows:

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	METER/INDICATOR OR NORMAL RESULTS
a.	INITIAL SETTINGS		
	Servo Simulation Section		
	ILCA SIMULATION PITCH	RESET	
	ILCA SIMULATION ROLL	RESET	
	ILCA SIMULATION YAW	RESET	
	ACTUATOR SIMULATION CCDA	NORM	
	ACTUATOR SIMULATION DASH	TF2	
	LCT	NORM	
	Control Panel Simulation Section		
	AFCS	SELECT	
b.	AC/DC VOLTMETER		
	CIRCUIT SELECT	00,0,B0	
	METER RANGE	AC 200V	
	AFCS POWER 115 VAC/400 Hz	OFF	
	AFCS POWER +28 VDC	OFF	
	LCT POWER +28 VDC	OFF	
	SELF-TEST CIRCUIT SELECT	00-1	0 to 6 VAC

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	METER/INDICATOR NORMAL RESULTS
c.	AFCS POWER 115V/400 Hz	ON, then OFF	112.2 to 117.7 VAC
d.	METER	DC	
	SELF-TEST CIRCUIT SELECT	00-2	-0.6 to +0.6 VDC
e.	AFCS POWER +28 VDC	ON, then OFF	24 to 28.5 VDC
f.	METER RANGE	20V	
	SELF-TEST CIRCUIT SELECT	00-3, then	+14.9 to +15.l
		00-4 then	-14.9 to -15.l VDC
		00-5	4.9 to 5.l
g.	METER	AC	
	SELF-TEST CIRCUIT SELECT	00-6	
	AFCS POWER	ON, then OFF	4 to 6 VAC
h.	SELF-TEST CIRCUIT SELECT	00-7, then	12 to 14
		00-8	12 to 14 VAC
i.	METER RANGE	200 V	
	SELF-TEST CIRCUIT SELECT	00-9	24 to 28 VAC
j.	METER RANGE	20 V	
	METER	DC	
	SELF-TEST CIRCUIT SELECT	10-0, then	+14.9 to +15.1 VDC
		10-1	-14.9 to -15.1 VDC
k.	RESPONSE TEST MODE	ON	–0.06 to +0.06 VDC
l.	SELF-TEST CIRCUIT SELECT	10-0	-0.06 to +0.06 VDC
m.	METER RANGE	200 V	
	METER	AC	
	SELF-TEST CIRCUIT SELECT	10-2	-0.6 to +0.6 VAC
	RESPONSE TEST MODE	OFF	
n.	METER RANGE	20V	
	SELF-TEST CIRCUIT SELECT	10-3 then	12 to 14 VAC
		10-4	12 to 14 VAC
o.	RESPONSE TEST MODE	ON	
	SELF-TEST CIRCUIT SELECT	30,3 then	0 to 0.1 VAC
		10-4	0 to 0.1 VAC
p.	RESPONSE TEST MODE	OFF	
	SELF-TEST CIRCUIT SELECT	20-0	All DISCRETE MONITORS lights ON. All CONTROL PANEL SIMULATION lights ON. RESPONSE TEST HOLD light ON. CONTINUITY TEST HOLD It ON.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	METER/INDICATOR NORMAL RESULTS
q.	RESPONSE TEST TIME DELAY — SEC	00.075	
	SELF-TEST CIRCUIT SELECT	20-1	
	METER	DC	
	METER RANGE	2V	
	RESPONSE TEST MODE	ON	-0.1 to +0.1 VDC
r.	METER RANGE	20V	
	RESPONSE TEST STIM	APPLY	+5.86 to +6.00 VDC
		then	HOLD light ON in 1 to 3 Sec.
		REMOVE	HOLD light out.
			-0.1 to +0.1 VDC
s.	SELF-TEST CIRCUIT SELECT	20-2	
	RESPONSE TEST TIME DELAY - SEC	02.000	
	SERVO SIMULATION PITCH	OPERATE } Together	+4.86 to +7.30 VDC
	RESPONSE TEST STIM	APPLY, } Together	when HOLD light comes on.
		then	
		REMOVE	HOLD light goes out.
t.	SERVO SIMULATION PITCH	RESET	
	SELF-TEST CIRCUIT SELECT	20-3	
	SERVO SIMULATION PITCH	OPERATE } Together	-4.86 to -7.30 VDC
	RESPONSE TEST STIM	APPLY, } Together	when HOLD light comes on.
		then	
	RESPONSE TEST STIM	REMOVE	HOLD light goes out.
	METER	AC	
u.	RESPONSE TEST MODE	OFF	4.45 to 5.05 VAC
	SELF-TEST CIRCUIT SELECT	20-4,	
		then	2.18 to 2.58 VAC
		20-5	
v.	METER	DC	
	RESPONSE TEST MODE	ON	
	SERVO SIMULATION PITCH	RESET	
	SELF-TEST CIRCUIT SELECT	20-6	
	SERVO SIMULATION ROLL	OPERATE } Together	+4.86 to +7.30 VDC
	RESPONSE TEST STIM	APPLY, } Together	when HOLD light comes on.
		then	
		REMOVE	
w.	SERVO SIMULATION ROLL	RESET	
	SELF-TEST CIRCUIT SELECT	20-7	
	SERVO SIMULATION ROLL	OPERATE } Together	-4.86 to -7.30
	RESPONSE TEST STIM	APPLY, } Together	when HOLD light comes on.
		then	
		REMOVE	HOLD light goes out.
x.	METER	AC	
	RESPONSE TEST MODE	OFF	
	SELF-TEST CIRCUIT SELECT	20-8,	4.45 to 5.05 VAC
		then	
		20-9	2.18 to 2.58 VAC
y.	METER	DC	
	RESPONSE TEST MODE	ON	
	SERVO SIMULATION ROLL	RESET	
	SELF-TEST CIRCUIT SELECT	30-0	

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION		METER/INDICATOR NORMAL RESULTS
	SERVO SIMULATION YAW RESPONSE TEST STIM	OPERATE APPLY, then	Together	+4.86 to +7.30 VDC when HOLD light comes on.
		REMOVE		HOLD light goes out.
z.	SERVO SIMULATION YAW SELF-TEST CIRCUIT SELECT SERVO SIMULATION YAW RESPONSE TEST STIM	RESET 30,1 OPERATE APPLY, then	Together	-4.86 to -7.30 VDC when HOLD light comes on.
		REMOVE		HOLD light goes out.
aa.	METER RESPONSE TEST MODE SELF-TEST CIRCUIT SELECT	AC OFF 30-2, then		4.45 to 5.05 VAC
		30-3		2.18 to 2.58 VAC
ab	METER SERVO SIMULATION YAW SELF-TEST CIRCUIT SELECT SERVO SIMULATION LCT	DC RESET 30-4 NORM		-6.65 to -7.35 (slowly)
ac.	RESPONSE TEST MODE SELF-TEST CIRCUIT SELECT RESPONSE TEST TIME DELAY — SEC Wait 30 sec then (critical)	ON 30-5 03.120 APPLY, then		-4.50 to -5.50 VDC when HOLD light comes on.
	RESPONSE TEST STIM	REMOVE		HOLD light goes out.
ad.	SELF-TEST CIRCUIT SELECT RESPONSE TEST STIM	30-4 APPLY, then		-1.50 to -2.5 VDC when HOLD light comes on.
		REMOVE		HOLD light goes out.
ae.	SERVO SIMULATION LCT SELF-TEST CIRCUIT SELECT RESPONSE TEST TIME DELAY — SEC ACTUATOR SIMULATION DASH RESPONSE TEST STIM	GND 30-6 02.750 TF1 APPLY, then		+2.56 to +3.86 VDC when HOLD light comes on.
		REMOVE		HOLD light goes out.
af.	RESPONSE TEST MODE ACTUATOR SIMULATION DASH SELF-TEST CIRCUIT SELECT RESPONSE TEST MODE ACTUATOR SIMULATION DASH RESPONSE TEST STIM	OFF GND 30-7 ON TF1 APPLY, then		+6.3 to +7.0 VDC -2.56 to -3.86 VDC when HOLD light comes on.
		REMOVE		HOLD light goes out.
ag.	RESPONSE TEST MODE	OFF		-6.3 to -7 VDC
ah.	ACTUATOR SIMULATION DASH RESPONSE TEST TIME DELAY — SEC RESPONSE TEST MODE ACTUATOR SIMULATION DASH RESPONSE TEST STIM	GND 00.500 ON TF2 APPLY, then		-1.89 to -2.85 VDC when HOLD light comes on.
		REMOVE		HOLD light goes out.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	METER/INDICATOR NORMAL RESULTS
ai.	RESPONSE TEST MODE	OFF, then ON	-3.55 to -3.95 VDC
aj.	SELF-TEST CIRCUIT SELECT RESPONSE TEST STIM	30-6 APPLY, then REMOVE	 +1.89 to +2.85 VDC when HOLD light comes on HOLD light goes out.
ak.	RESPONSE TEST MODE	OFF	+3.55 to +3.95 VDC
al.	ACTUATOR SIMULATION DASH	GND	
	SELF-TEST CIRCUIT SELECT RESPONSE TEST MODE RESPONSE TEST TIME DELAY — SEC ACTUATOR SIMULATION CCDA RESPONSE TEST STIM	30-8 ON 00.100 NORM APPLY, then REMOVE	 +6.86 to+ 11.42 VDC when HOLD light comes on HOLD light goes out.
am.	SELF-TEST CIRCUIT SELECT RESPONSE TEST STIM	30-9 APPLY, then REMOVE	 -6.86 to -11.42 VDC when HOLD light comes on HOLD light goes out.
an.	METER RESPONSE TEST MODE SELF-TEST CIRCUIT SELECT	AC OFF 40-0	 5.2 to 7.2 VAC
	ACTUATOR STIMULATION CCDA S/T CIRCUIT SELECT TENS S/T CIRCUIT SELECT UNITS	GND 00 0	

NOTE

At end of self test, switches are at initial settings, except the following:

CONTROL/S WITCH	SET TO
METER	D C
METER RANGE	200V
RESPONSE TEST TIME DELAY-SEC	12.345
AFCS POWER	OFF

4-49. Fixed-Level Analog Signal Tests (CRC). **Proceed as follows:**

a. Adjust the digital multi meter to measure dc volts.

b. Set SERVO SIMULATION CCD switch S49 to NORM.

c. Connect the negative test lead of the multimeter to receptacle AFCSJ3, pin AA.

d. Set the ANALOG SIGNALS switches to the position listed below. For each switch setting, connect the positive test lead of the multimeter to the receptacle and pin listed for it. At each pin, the voltage shall be as listed for RESPONSE TEST MODE switch OFF and for MODE switch ON.

NOTE

- When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.
- The minus sign (–) before an ac voltage indicates out-of-phase,

SWITCH	CONNECTOR & PIN	SWITCH POS	VOLTAGE MODE SW OFF VDC OR VAC	VOLTAGE MODE SWON VDC OR VAC
RAD ALT S62	**J3-BB**	1	-0.4$)2 to -0.508 VDC	-0.005 to +0.005 VDC
		2	-0.005 to +0.005 VDC	-0.005 to +0.005 VDC
BARO ALT 541	**J2-38**	1	-3.048 to -2.952 VDC	-0.005 to +0.005 VDC
		2	-1.016 to -0.984 VDC	-0.005 to +0.005 VDC
		3	Open Circuit	
AIR SPEED S59	**J2-24**	1	-3.048 to -2.952 VDC	-0.005 to +0.005 VDC
		2	Open Circuit	
		3	+0.l18 to +0.122 VDC	+0.118 to +0.122 VDC
		4	+0.207 to +0.218 VDC	+0.207 to +0.213 VDC
		5	+0.305 to +0.315 VDC	+0.305 to +0.315 VDC
		6	+1.72 to +1.78 VDC	-0.005 to +0.005 VDC
SIDE SLIP S60	**J2-30**	1	-0.204 to -0.196 VDC	-0.005 to +0.005 VDC
		2	Open Circuit	
		3	+0.325 to +0.335 VDC	-0.005 to +0.005 VDC
		4	+0.443 to +0.552 VDC	-0.000 to +0.005 VDC
YAW RATE S61	**J2-28**	1	-0.325 to -0.335 VDC	-0.005 to +0.005 VDC
		2	Open Circuit	
		3	+0.335 to +0.325 VDC	-0.005 to +0.005 VDC
		4	+ 1.643 to +1.697 VDC	-0.005 to +0.005 VDC
ROLL RATE S53	**J2-25**	1	-0.335 to -0.325 VDC	-0.005 to +0.005 VDC
		2	Open Circuit	
		3	+0.325 to +0.335 VDC	-0.005 to +0.005 VDC
		4	+0.984 to +1.016 VDC	-0.005 to +0.005 VDC
XFEED ROLL ATT .$54	**J3-PP**	1	-7.112 to -6.888 VDC	-0.005 to +0.005 VDC
		2	-0.005 to +0.005 VDC	-0.005 to +0.005 VDC
		3	+6.888 to +7.112 VDC	-0.005 to +0.005 VDC
CCDA DEMOD S55 (ACTUATOR SIMULATION CCD SW TO GND.)	**J3-e**	1	0.000 to 0.005 VAC	0.000 to 0.005 VAC
		2	0.266 to 0.754 VAC	0.000 to 0.005 VAC
NORM ACCEL S56	**J2-37**	1	Open Circuit	
		2	+2.460 to +2.540 VDC	-0.005 to +0.005 VDC
PITCH RATE S57	**J2-46**	1	Open Circuit	
		2	+2.952 to +3.048 VDC	0.005 to +0.005 VDC
ROLL ATT STIM S58	**J2-71**	1	Open Circuit	
		2	+1.968 to +2.032 VDC	-0.005 to +0.005 VD
PULSER STIM S63	**J2-41**	1	Open Circuit	
	J2-42	1	Open Circuit	
	J2-43	1	Open Circuit	
	J2-44	1	Open Circuit	
	J2-45	1	Open Circuit	
	J2-45	**2**	+0.443 to +0.477 VDC	-0.005 to +0.005 VI
	J2-43	**3**	+0.699 to +0.721 VDC	-0.005 to +0.005 VI
	J2-41	**4**	+0.699 to +0.721 VDC	-0.005 to +0.005 VI
	J2-42	**5**	+0.699 to +0.721 VDC	-0.005 to +0.005 VI
	J2-44	**6**	+1.968 to +2.032 VDC	-0.005 to +0.005 VI

4-50. Control Position Transducer Signals Tests (CRC) **For each position of the LONG CPT, LAT CPT, and DIR CPT ANALOG SIGNALS switches, measure the magnitude of the voltages. Connect the digital multimeter, set to measure ac volts, across the receptacle pins-listed below.**

SIGNAL	RECEPTACLE PINS	RESPONSE TEST STIMULUS	SWITCH	POSITION	VOLTAGE MODE SWITCH OFF (VAC)
LONG CPT	J1-K (line) to J1-H	*	522	1	3.83 to 4.17
		*		2	0.000 to 0.006
		*		3	0.18 to 0.22
		*		4	0.95 to 1.05
				5	3.83 to 4.17
	J1-K (line) to J3-AA			1	1.038 to l.102
				2	2.978 to 3.162
				3	3.065 to 3.255
				4	3.463 to 3.677
				5	4.918 to 5.222
	J1-H (line) to J3-AA			1	4.918 to 5.222
				2	2.978 to 3.162
				3	2.871 to 3.049
				4	2.493 to 2.647
				5	1.038 to 1.102
LAT CPT	J1-g (line) to J1-i	*	S23	1	1.08 to 1.20
		*		2	0.95 to 1.05
				3	0.000 to 0.006
	J1-g (line) to J3-AA			1	2.425 to 2.575
				2	2.493 to 3.647
				3	2.978 to 3.162
	J l-i (line) to J3-AA			1	3.531 to 3.749
				2	3.463 to 3.677
				3	2.978 to 3.162
DIR CPT	J1-AA (line) to J1-y		S24	1	0.000 to 0.005
		*		2	0.95 to 1.05
		*		3	1.l0 to l.22
	J1-AA (line) to J3-AA			1	2.978 to 3.162
				2	3.463 to 3.677
				3	3.550 to 3.770
	J1-y (line) to J3-AA			1	2.978 to 3.162
				2	2.493 to 3.647
				3	2.425 to 2.575

* Check that the signal levels are less than 0.005 vac when RESPONSE TEST MODE switch S8 is set to ON.

4-51. Heading and Attitude Variable Analog Signal Tests (CRC). **The following test checks the ATT synchro, which simulates the vertical gyro that furnishes the pitch and roll attitude signals to the AFCS.**

NOTE

- When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.
- The minus sign (-) before an ac voltage indicates out-of-phase.

a. **Connect the digital multimeter, set to measure ac volts across the receptacle pins listed below.**

b. **Check that results are within the ranges listed below.**

c. **Set switches and control as listed in test steps.**

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT	DIGITAL MULTIMETER/ NORMAL RESULTS
a.	(1) ATT SELECT switch S35	(1) ROLL	(1) None	(1) None
	(2) ATT Synchro	(2) 0.0° (Corresponds to 0.0° of roll)	(2) None	(2) None
			(a) J3-V (line) to J3 -U	(a) -0.05 to +0.05 Vac
			(b) J3-T (line) to J3-V	(b) -9.69 to -10.71 Vac
			(c) J3-T (line) to J3-U	(c) -9.69 to -10.71 Vac
	(3) RESPONSE TEST MODE switch S8	(3) ON	(a) J3-V (line) to J3-U	(a) -0.05 to +0. 05Vac
			(b) J3-T (line) to J3-V	(b) -0.05 to +0.05Vac
			(c) J3-T (line) to J3-U	(c) -0.05 to +0.05Vac
			(d) J3-X (line) to J3-W	(d) -0.05 to +0.05Vac
			(e) J3-Y (line) to J3-X	(e) -9.69 to -10.71Vac
			(f) J3-Y (line) to J3-W	(f) -9.69 to -10.71Vac
b.	(1) RESPONSE TEST MODE switch S8	(1) OFF	(1) None	(1) None
	(2) ATT Synchro	(2) 330.0°	(2) None	(2) None
			(a) J3-V (line) to J3-U	(a) -5.6 to -6.2Vac
			(b) J3-T (line) to J3-V	(b) -5.6 to -6.2Vac

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	VOLTAGE MEASUREMENT	DIGITAL MULTIMETER/ NORMAL RESULTS
			(c) J3-T (line) to J3-U	**(c)** -11.2 to -12. 4Vac
c.	(1) ATT SELECT switch S35	(1) HDG	(1) None	(1) None
	(2) ATT Synchro	(2) 0.0° (Corresponds to 0.0° heading)	(2) None	(2) None
			(a) J3-X (line) to J3-W	(a) -0.05 to 0.05Vac
			(b) J3-Y (line) to J3-X	(b) -9.69 to -10.71Vac
			(c) J3-Y (line) to J3-W	(c) -9.69 to -10.71Vac
	(3) Response TEST MODE switch S8	(3) ON	(3) None	(3) None
			(a)' J3-V (line) to J3-U	(a) $-0_0 05$ to +0.05Vac
			(b) J3-T (line) to J3-V	(b) -10.14 to -10.51Vac
			(c) J3-T (line) to J3-U	(c) -9.69 to -10.71Vac
			(d) J3-X (line) to J3-W	(d) -0.05 to +0.05Vac
			(e) J3-Y (line) to J3-X	(e) -0.05 to +0.05Vac
			(f) J3-Y (line) to J3-W	(f) -0.05 to +0.05Vac
d.	(1) RESPONSE TEST MODE switch S8	(1) OFF	(1) None	(1) None
	(2) ATT Synchro	(2) 330.0°	(2) None	(2) None

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT	DIGITAL MULTIMETER/ NORMAL RESULTS
			(a) J3-X (line) to J3-W	(a) -5.6 to -6.2Vac
			(b) J3-Y (line) to J3-X	(b) -5.6 to -6.2Vac
			(c) J3-Y (line) to J3-W	(c) -11.2 to -12.4Vac
e.	ATT SELECT switch S35	CCDA	None	None
			(1) J6-L (line) to J6-J .	(1) -5.6 to -6.2Vac
			(2) J6-K (line) to J6-L	(2) -5.6 to -6.2Vac
			(3) J6-K (line) to J6-J	(3) -11.2 to -12.4Vac
f.	(1) PITCH HSI switch S26 .	(1) PITCH	(1) None	(1) None
	(2) SIGNAL-GND switch S27	(2) SIGNAL	(2) None	(2) None
	(3) PITCH ATT HSI HDG	(3) Rotate cw to 954	(3) J3-P (line) to J3 -AA	(3) 10.75 to 12.87 Vac
	(4) PITCH ATT HSI HDG	(4) Rotate ccw to 46	(4) J3-P (line) to J3-AA	(4) -10.73 to -12.87 Vac
	(5) PITCH ATT HSI HDG	(5) Rotate cw to 500	(5) J3-P (line) to J3-AA	(5) -1.07 to +1.07 Vac
g.	(1) CIRCUIT SELECT SWITCHES	(1) 20, 0 B, 6	(1) None	(1) None

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT	DIGITAL MULTIMETER/ NORMAL RESULTS
	(2) PITCH-HSI switch S26	(2) PITCH	(2) None	(2) None
	(3) PITCH ATT-HSI HDG	(3) Rotate cw to 913 to 995	(3) J3-P (line) to J3-AA	(3) (a) 11.8Vac (b) +11.67 to +11.93 (AC/DC VOLTMETER)
h.	Response TEST MODE switch S8	ON	J3-P (line) to J3 -AA	-0.04 to +0.04 Vac
i.	(1) RESPONSE TEST MODE switch S8	(1) OFF	(1) None	(1) None
	(2) SIGNAL GND switch S27	(2) GND	(2) J3-S (line) to J3-AA	(2) -0.04 to +0.04Vac
	NOTE Set multimeter to read DC Voltage.			
j.	(1) BARO ALT switch S41	3	(1) J3-Z (line) to J3-AA	(1) -0.05 to +0.05Vdc
	(2) BARO ALT switch S41	3	(2) J3-KK (line) to J3-AA	(2) +4. 0 to +5.0Vdc
	(3) BARO ALT switch S41	1	(3) J3-KK (line) to J3-AA	(3) -0.1 to +0.1 Vdc
	(4) BARO ALT switch S41	2	(4) J3-KK (line) to J3-AA	(4) -0.1 to +0.1Vdc

4-52. Radar Altitude Self -Test Analog and Confidence Signal Test (CRC). **The following test checks response to the radar altimeter self-test and validity test signals that are supplied to the AFCS computer.**

a. **Set BARO ALT switch to position 3.**

b. **Connect the digital multimeter, set to measure dc volts, between receptacle 3 pin z (+) and pin AA. The multimeter shall indicate -.5 to +.5 volt dc.**

c. Connect a jumper between receptacle pins J3-KK and to J3-AA. The multimeter shall indicate +4 to +5.5 volts dc.

d. Disconnect jumper.

e. Disconnect multi meter.

f. Connect the digital multimeter, set to measure dc volts, to receptacle pins J3-KK and J3-AA.

g. Set BARO ALT switch to 1. The multimeter shaIl indicate –.1 to +.1 volt.

h. Set BARO ALT switch to 2. The multimeter shall indicate –.1 to +.1 volt.

4-53. Pitch, Roll, and Yaw ILCA Simulator Resistance Test (CRC). (See fig. 4-9.) This **test checks** the resistor in the circuit that simulates the impedance of the ILCA servo valve. The measurement is taken between VALVE HI and VALVE LO pins. Proceed as follows:

a. Set the test set POWER switch to OFF.

b. Measure resistance between receptacle pins as listed below. Use a multimeter set to a resistance range which shows the reading below half scale. Resistances shall be as listed below:

RECEPTACLE PINS	RESISTANCE (OHMS)
J1-JJ to J1-PP	**2188 to 2232**
J1-NNtoJl-MM	**2188 to 2232**
J1-HHtoJ1-v	**2188 to 2232**

4-54. Pitch ILCA Simulator Performance Tests. (See fig. **4-9.) This test** ensures the test set provides independent simulation for the two servo amplifiers outputs of the AFCS computer in the pitch axis. The positive input test simulates the actuator extending. The negative input-test simulates the actuator retracting. Feedback No. 1, simulates the self-feedback. Feedback No. 2 is one-half of the cross-feedback. Feedback No. 3 ***is the*** other half of the cross-feedback.

a. Positive input test.

(1) Set the test set POWER switch to ON.

(2) Set the SERVO SIMULATION PITCH switch to OPERATE.

(3) Connect the positive terminal of No. 1 dc power supply to one side of the decade resistor. Connect the other side of the decade resistor to receptacle pin J1-JJ. Connect the negative side of the power supply to receptacle pin J I- PP. Set the decade resistor to 1000 ohms.

(4) Connect the digital multimeter across the decade resistor, positive lead of the multimeter to the positive output of the power supply. Set the multimeter to the 2 volt dc range.

(5) Adjust the output of the power supply for +0.100 Vdc on the digital multimeter.

NOTE

This applies approximately 0.1 ma of input current through J1-JJ.

(6) Disconnect the digital multimeter from the power supply and decade resistor.

(7) Connect the digital multimeter set to measure 20-volt ac to receptacle pins J1-W (line) and J3-**AA. The multimeter shall indicate less than .03 vat.**

(8) Connect No. 2 power supply across receptacle pins J3-A (+) and J1-C.

NOTE

When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.

(9) Adjust the output of No. 2 power supply to +28 volt dc. Monitor the feedback No. 1 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 3.0 volts ac out-of-phase. The indication shall rise to 4.45 to 5.05 volts ac out-of-phase.

(10) Set the PITCH switch to RESET. The digital multimeter shall indicate less than .03 vat.

(11) Disconnect the positive lead of the multimeter from receptacle pin J1-W. Connect it to receptacle pin J1-L.

(12) Set the PITCH switch to OPERATE. Monitor the Feedback No. 2 output on the multimeter. Within 1.6 to 2.4, seconds the multimeter shall indicate 1.5 volts ac out-of-phase. The indications shall rise to 2.18 to 2.58 volts ac out-of-phase.

(13) Set the PITCH switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(14) Disconnect the positive lead of the digital multimeter, from receptacle pin J l-L. Connect it to receptacle pin J l-N.

(15) Set the PITCH switch to OPERATE. Monitor Feedback No. 3 output voltage on the multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volts ac out-of-phase. The indication shall rise to 2.18 to 2.58 volts ac out-of-phase.

(16) Set the PITCH switch to RESET. The multimeter shall indicate less than .03 volt ac.

(17) Reduce the output of the power supply No. 2 to 0 volt.

(18) Disconnect No. 2 power supply.

(19) Disconnect the multimeter.

(20) Disconnect No. 1 power supply and the decade resistor.

*b. **Negative Input Test.***

(1) Set the SERVO SIMULATION PITCH switch to OPERATE.

(2) Connect the negative terminal of No. 1 power supply to one side of the decade resistor. Connect the other side of the decade resistor to receptacle pin J1-JJ. Connect the positive side of the power supply to receptacle pin J1-PP. Set the decade resistor to 1000 ohms.

(3) Connect the digital multi meter across the decade resistor, positive lead of the multimeter to the negative output of the power supply. Set the multi meter to the 2 vdc range.

(4) Adjust the output of No. 1 power supply for -0.10 volt on the digital multimeter.

NOTE

This applies approximately 0.1 milliampere of input current through J1 - JJ.

(5) Disconnect. the digital multimeter from No. 1 power supply and the decade resistor (6). Connect the digital multimeter set to read 20-volt ac, across receptacle pins J1- W (line) and J3-AA. The multimeter shall indicate less than 0.03 volt ac.

(6) Connect No. 2 power supply across receptacle pins J3-A (+) and J1-C.

NOTE

When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.

(7) Adjust the output of No. 2 power supply to +28 volts dc. Monitor the Feedback No. 1 output on the multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 3.0 volts ac, in-phase. The indication shall rise to 4.45 to 5.05 volts ac, in-phase.

(8) Set the PITCH switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(9) Disconnect the positive lead of the multimeter from receptacle pin J1-W. Connect it to receptacle pin J l-L.

(10) Set the PITCH switch to OPERATE. Monitor the Feedback No. 2 output on the multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volts ac, in-phase. The indication shall rise to 2.18 to 2.58 volts ac in-phase.

(11) Set the PITCH switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(12) Disconnect the positive lead of the multimeter from receptacle pin J1-L. Connect it to receptacle pin J l-N.

(13) Set the PITCH switch to OPERATE. Monitor the Feedback No. 3 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volts ac. The indication shall rise to 2.18 to 2.58 volts ac, in-phase.

(14) Set the PITCH switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(15) Reduce the output of both power supplies to O.

(16) Disconnect the multi meter.

(17) Disconnect No. 2 power supply.

(18) Disconnect No. 1 power supply and decade resistor.

4-55. Roll ILCA Simulator Performance Tests. This test insures the test set provides independent simulation for the two servo amplifier outputs of the AFCS computer in the roll axis. The positive input test simulates the actuator extending. The negative input test simulates the actuator retracting. Feedback No. 1 simulates the self-feedback. Feedback No. 2 is one-half of the cross-feedback. Feedback No. 3 is the other half of the cross-feedback.

a. Positive Input test.

(1) Set the test set power switch to ON.

(2) Set the SERVO SIMULATION ROLL switch to OPERATE.

(3), Connect the positive terminal of No. 1 dc power supply to one side of the decade resistor. Connect the other side of the decade resistor to J1-NN. Connect the negative side of the power supply to Jl - MM. Set the decade resistor to 1000 ohms.

(4) Connect the digital multimeter across the decade resistor, positive lead of the multimeter connetted to the positive output of the power supply. Set multimeter to the 2 volt DC range.

(5) Adjust the output of the power supply for +0.100 volt dc on the digital multimeter.

NOTE

This applies approximately 0.1 milliampere of input current to J1-

(6) Disconnect digital multimeter from power supply and decade resistor. Connect the digital multimeter set to measure 20-volt ac to receptacle pins J1-s (line) and J3-AA. The multi meter shall indicate less than 0.03 volt ac.

(7) Connect No. 2 power supply across receptacle pinsJ3-A (+) and J1-C.

NOTE

When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.

(8) **Adjust the output of No.** 2 **power supply to +28 volt dc. Monitor the Feedback No. 1 output on the digital multimeter. Within** 1.6 **to 2.4 seconds the multimeter shall indicate 3.0 volts ac out-of-phase. The indication shall rise to 4.45 to 5.05 volt ac, out-of-phase.**

(9) **Set the ROLL switch to RESET. The digital multimeter shall indicate less than 0.03 volt ac.**

(10) Disconnect the positive lead of the multi meter from receptacle pin J1-s. Connect it to receptacle pin J1-j.

(11) Set the ROLL switch to OPERATE. Monitor the Feedback No. 2 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volts ac out-of-phase. The indication shall rise to 2.18 to 2.58 volts ac, out-of-phase.

(12) Set the ROLL switch to RESET. The multi meter shall indicate less than 0.03 volt ac.

(13) Disconnect the positive lead of the digital multi meter, from receptacle J1-j. Connect it to receptacle pin J1-m.

(14) Set the ROLL switch to OPERATE. Monitor the Feedback No. 3 output voltage on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volt ac, out-of-phase. The indication shall rise to 2.18 to 2.58 volt ac, out-of-phase.

(15) Set the ROLL switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(16) Reduce the output of the power supplies to 0.

(17) Disconnect No. 2 power supply.

(18) Disconnect the multi meter.

(19) Disconnect No. 1 power supply and decade resistor.

b. Negative Input test.

(1) Set the SERVO SIMULATION ROLL switch to OPERATE.

(2) Connect the negative terminal of No. 1 power supply to one side of the decade resistor. Connect the other side of the decade resistor to receptacle pin J1-NN, connect the positive side of the power supply to receptacle pin J1-MM. Set the decade resistor to 1000 ohms.

(3) Connect the digital multimeter across the decade resistor, positive input of the multimeter to negative output of the power supply. Set the multimeter to the 2 vdc range.

(4) Adjust the output of No. 1 power supply for -0.10 volt on the digital multimeter.

NOTE

This applies approximately 0.1 milliampere input current through J1-NN.

(5) Disconnect the digital multimeter from No. 1 power supply and the decade resistor.

(6) Connect the digital multimeter set to read 20-volt dc, to receptacle pinJ1-s (line) and J3-AA. The digital multimeter shall indicate less than 0.03 volt ac.

(7) Connect No. 2 power supply across receptacle pins J3-A (+) and J1-C.

NOTE

When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.

(8) Adjust the output of No. 2 power supply to +28 volt dc. Monitor the Feedback No. 1 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 3.0 volt ac, in-phase. The indication shall rise to 4.45 to 5.05 volt ac, in-phase.

(9) Se the ROLL switch to RESET. The multi meter shall indicate less than 0.03 volt ac.

(10) Disconnect the positive lead of the digital multimeter from receptacle pin J l-s. Connect it to receptacle pin J l-j.

(11) Set the ROLL switch to OPERATE. Monitor the Feedback No. 2 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volts ac in-phase. The indication shall rise to 2.18 to 2.58 volt ac in-phase.

(12) Set the ROLL switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(13) Disconnect the positive lead of the digital multimeter from receptacle pin J1-j. Connect it to receptacle pin J l-m.

(14) Set the ROLL switch to OPERATE. Monitor the Feedback No. 3 output voltage on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volt ac, in-phase. The indication shall rise to 2.18 to 2.58 volt ac, in-phase.

(15) Set the ROLL switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(16) Reduce the output of both the power supplies to O.

(17) Disconnect the multimeter.

(18) Disconnect No. 2 power supply.

(19) Disconnect No. 1 power supply and decade resistor.

4-56. YAW ILCA Simulator Performance Tests (CRC). (See fig. 4-9.) This test insures the test set provides independent simulation for the two servo amplifier outputs of the AFCS computer in the yaw axis. The positive input test simulates the actuator extending. The negative input test simulates the actuator retracting. Feedback No. 1 simulates the self-feedback. Feedback No. 2 is one-half of the cross-feedback. Feedback No. 3 is the other half of the cross-feedback.

a. Positive Input Test.

(1) Set the test set POWER switch to ON.

(2) Set SERVO SIMULATION YAW switch to OPERATE.

(3) Connect the positive terminal of No. 1 power supply to one side of the decade resistor. Connect the other side of the decade resistor to receptacle pin J1-HH. Connect the negative side of the power supply to pin J l-v. Set the decade resistor to 1000 ohms.

(4) Connect the digital multimeter across the decade resistor, positive lead of the multimeter to the positive output of the power supply. Set the multimeter to the 2 volt ac range.

(5) Adjust the output of the power supply for +0.100 volt dc on the digital multimeter.

NOTE

This applies approximately 0.1 milliampere of input current through J1-HH.

(6) Disconnect the digital multimeter from the power supply and decade resistor.

(7) Connect the digital multimeter, set to measure 20-volt ac to receptacle pins J1-FF (line) and J3-AA. The multimeter shall indicate less than 0.03 volt ac.

(8) Connect No. 2 power supply across receptacles pins J3-A (+) and Jl-C.

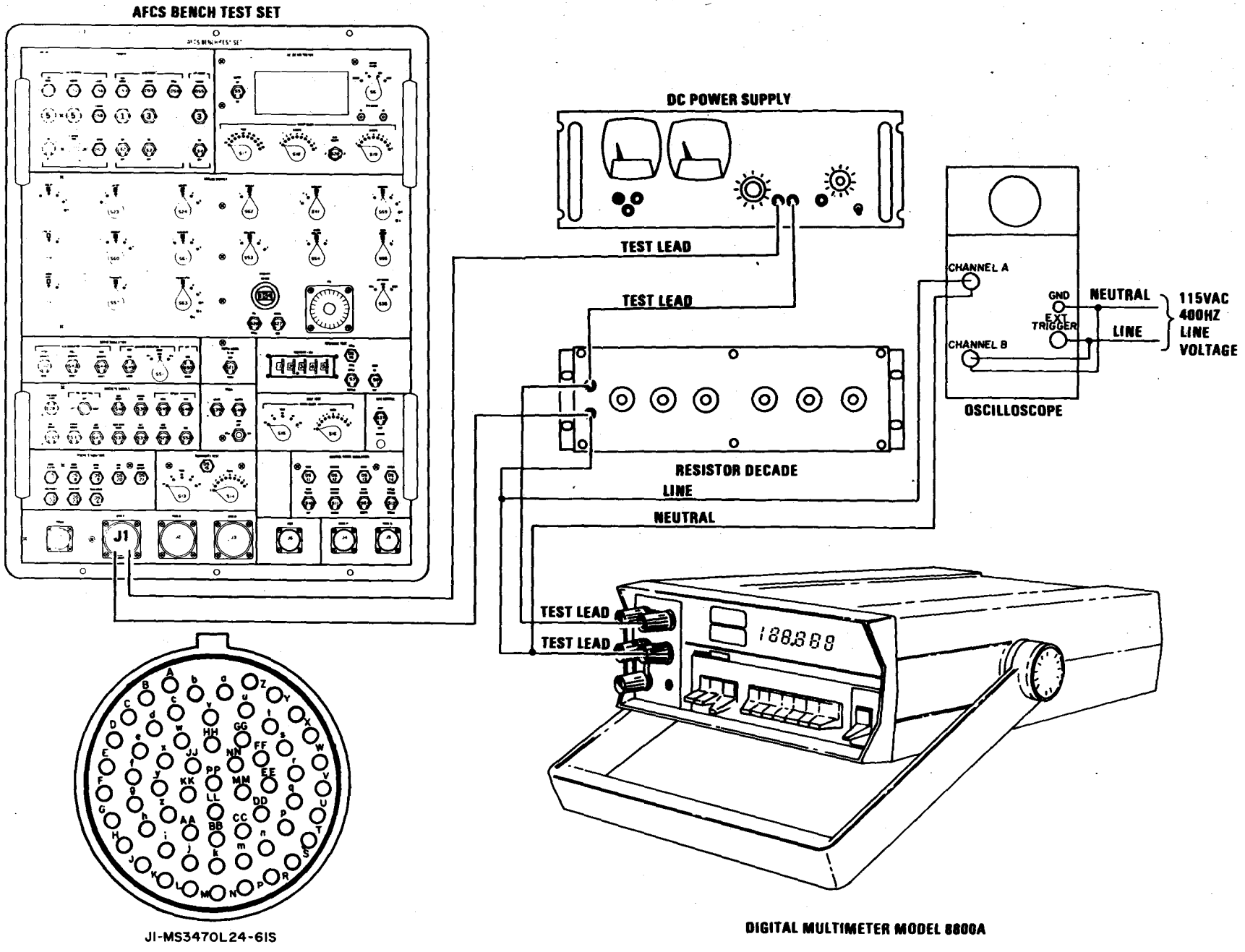
NOTE

When a test includes a requirement that an ac voltage be In-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.

(9) Adjust the output of the power supply to +28 volt dc. Monitor the Feedback No. 1 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 3.0 volt ac, out-of-phase. The indication shall rise to 4.45 to 5.05 volt ac, out-of-phase.

(10) Set the YAW switch to RESET. The digital muitimeter shall indicate less than 0.03 volt ac.

(11) Disconnect the positive lead of the multimeter from receptacle pin J1-FF. Connect it to receptacle pin J1-BB.



47D-TMDE-ABTS-55

Figure 4-9. ILCA Simulator Performance Test Setup

(12) Set the YAW switch to OPERATE. Monitor the Feedback No. 2 output on the digital multimeter. Within 1.6 to 2.4 seconds the multimeter shall indicate 1.5 volts ac, out-of-phase. The indication shall rise to 2.18 to 2.58 volts ac, out-of-phase.

(13) Set the YAW switch to RESET. The multi meter shall indicate less than 0.03 volt ac.

(14) Disconnect the positive lead of the multi meter from receptacle pin J1-BB. Connect it to receptacle pin J1-LL.

(15) Set the YAW switch to OPERATE. Monitor the Feedback No. 2 output on the digital multimeter. Within 1.6 to 2.4 seconds the multi meter shall indicate 1.5 volt ac out-of-phase. The indication shall rise to 2.18 to 2.58 volt ac, out-of-phase.

(16) Set the YAW switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(17) Reduce the output of the power supplies to 0.

(18) Disconnect No. 2 power supply.

(19) Disconnect the multimeter.

(20) Disconnect No. 1 power supply and the decade resistor.

b. Negative Input test.

(1) Set the SERVO SIMULATION YAW switch to OPERATE.

(2) Connect the negative terminal of No. 1 power supply to one side of the decade resistor. Connect the other side of the decade resistor to receptacle pin J1-HH. Connect the positive side of the power supply to receptacle l-v. Set the decade resistor to 1000 ohms.

(3) Connect the digital multimeter across the decade resistor, positive input of the multimeter to negative input of the power supply. Set the multi meter to the 2 vdc range.

(4) Adjust the output of No. 1 power supply for 0.100 volt on the digital multimeter.

NOTE

This applies approximately 0.1 milliampere of input current through J1-JJ .

(5) Disconnect the digital multimeter from No. 1 power supply and the decade resistor.

(6) Connect the digital multimeter, set to read 20-volt ac across receptacle J1-FF (line) and J3-AA. The digital multimeter shall indicate less than 0.03 VAC.

(7) Connect No. 2 power supply across receptacle pins J3-A (+) and J l-C.

NOTE

When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope external triggered from the ac source.

(8) Adjust the output of No. 2 power supply to +28 volt dc. Monitor the Feedback No. 1 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 3.0 volt ac in-phase. The indication shall rise to 4.45 to 5.05 volt ac, in-phase.

(9) Set the YAW switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(10) Disconnect the positive lead of the multimeter from receptacle pin J1-FF. Connect at receptacle pin J1-BB.

(11) Set the YAW switch to OPERATE. Monitor the Feedback No. 2 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volt ac in-phase. The indication shall rise to 2.18 to 2.58 volt ac, in-phase.

(12) Set the YAW switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(13) Disconnect the positive lead of the digital multimeter from receptacle pin J1-BB. Connect it to receptacle pin J1-LL.

(14) Set the YAW switch to OPERATE. Monitor the Feedback No. 3 output on the digital multimeter. Within 1.6 to 2.4 seconds, the multimeter shall indicate 1.5 volt ac. The indication shall rise to 2,18 to 2.58 volts ac, in-phase.

(15) Set the YAW switch to RESET. The multimeter shall indicate less than 0.03 volt ac.

(16) Reduce the output of both power supplies to O.

(17) Disconnect the multimeter.

(18) Disconnect No. 2 power supply.

(19) Disconnect No. 1 power supply and decade box.

4-57. Component Interface Output Logic Discrete Signals Test (CRC). The output logic discrete signals, simulate the aircraft components that interface with the AFCS computer. The two-position toggle switches on the test set simulate the logic discrete input signals to the AFCS computer. The toggle switches apply a voltage, an open circuit, or a ground as required for the following discrete outputs. Check the following logic discrete signals by operating the switches and measuring output signals at the receptacle pins listed below. Use a digital multimeter, set appropriate range and function.

NOTE

- When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.
- The minus sign (-) before an ac voltage indicates out-of-phase.

SWITCH	RECEPTACLE PINS	SWITCH POSITION	VOLTAGE MODE SW OFF	MODE SW ON
HYD PRESS	**J3-A (+) to J1-C**	1	**-0.006 to +0.006 Vdc**	—
S29		0	**–0.006 to +0.006 Vdc**	—
ENGINE CONDITION	**J3-B (+) to J3-AA**	1	**-0.006 to +0.006 Vdc**	—
LEVER S28		0	**-0.006 to +0.006 Vdc**	—
LDG GEAR — RIGHT	**J3-b (+) to J3-AA**	1	**+11.4 to +12.6 Vdc**	—
S47		0	**-0.006 to +0.006 Vdc**	—
LDG GEAR — LEFT	**J3-G (+) to J3-AA**	1	**+11.4 to 12.6 Vdc**	—
S47		0	**-0.006 to +0.006 Vdc**	—
SWIVEL LOCK	**J3-d (+) to J1-C**	1	**+24 to +28.5 Vdc**	—
S30		0	**–0.006 to +0.006 Vdc**	—
CYCLIC MAG BRAKE	**J1-a (+) to J1-C**	1	**+24 to +28.5 Vdc**	—
S31		0	**-0.006 to +0.006 Vdc**	—
COLLECTIVE MAG	**J1-w (+) to J1-C**	1	**+24 to +28.5 Vdc**	—
BRAKES S32		0	**OPEN**	—
ROLL DETENT	**J3-J (+) to J3-AA**	1	**+6.86 to 7.14 Vdc**	—
S45		0	**–6.86 to -7.14 Vdc**	—
YAW DETENT	**J3-M (+) to J3-AA**	1	**+6.86 to +7.14 Vdc**	—
S46		0	**-6.86 to -7.14 Vdc**	—
ROLL BEEP TRIM — LEFT	**J3-FF (+) to J3-AA**	1	**+12 to +14 VAC**	**less than 0.5 Vac**
S25		0	**OPEN**	**less than 0.5 Vac**
ROLL BEEP TRIM — RIGHT	**J3-GG (+) to J3-AA**	1	**+12 to +14 VAC**	**less than 0.5 Vac**
S25		0	**OPEN**	**less than 0.5 Vac**
BOX lNDENTIFIER	**J3-K (+) to J3-AA**	1	**+11.4 to 12.6Vdc**	—
S48		0	**-0.006 to +0.006 Vdc**	—
NORM ACCEL	**J2-52 (+) to J1-C**	NORM	**-0.006 to +0.006 Vdc**	—
J2-52 S21		**GND**	**OPEN**	—
VERTICAL GYRO	**J3-R (+) to J3-AA**	1	**-0.006 to +0.006 Vdc-**	—
VALID S33		0	**OPEN**	—
ALT VALID	**J3-LL (+) to J1-C**	1	**+4.7 to +5.3 Vdc**	—
S34		0	**–0.006 to +0.006 Vdc**	—

4-58. Component Interface Input Logic Discrete Signal Test (CRC). The logic discrete input signal include an indicator light and a resistive load for each discrete output signal from the AFCS computer.

a. Resistance Measurement.

(1) Set TESTER POWER switch to OFF. Set AFCS POWER 28 vdc switch is ON.

(2) Remove the following indicator lamps.

(a) CCDA Clutch Indicator DS17

(b) CCDA Brake Indicator DS18

(c) AFCS ANN Indicator DS19

(d) HYD SOL Indicator DS20

(e) ERECT Cutout Indicator DS21

(f) HDG Enable Indicator DS22

(g) DASH ANN Indicator DS23

(3) Set the digital multimeter FUNCTION switch to ohms. Set the RANGE switch to 2K ohms. Make the following resistance measurements.

(a) Connect the multimeter leads between receptacle pins J l-c and Jl-C. The multimeter shall indicate 294 to 306 ohms. Disconnect multi meter.

(b) Connect test leads to receptacle pins J1-b and J1-C. The multimeter shall indicate 294 to 306 ohms. Disconnect the multimeter.

(c) Connect the multimeter leads to receptacle pins J3-A and J l-C. The multimeter shall indicate 282 to 294 ohms. Disconnect the multi meter.

(d) Connect the multimeter leads between receptacle pins J3-S and J l-A. The multimeter shall indicate 294 to 306 ohms. Disconnect the multi meter.

(e) Connect multimeter lead between receptacle pins J3-u and J1-A. Measure the resistance between receptacles. The. multimeter shall indicate 700.7 to 729.3 ohms. Disconnect the multimeter.

(f) Connect the multimeter lock to receptacle pins J1-V and J1-A. The multimeter shall indicate 900 to 1100 ohms. Disconnect the multi meter.

(4) Set the digital multimeter RANGE switch to 20K ohms.

(5) Connect multimeter leads between receptacle pins J3-Z and J l-A. The multimeter shall indicate 9K to 11K ohms. Disconnect multi meter.

b. Indicator Light Test.

(1) Install the following indicator lamps.

(a) CCDA Clutch Indicator DA17

(b) CCDA Brake Indicator DS18

(c) AFCS ANN Indictor DS19

(d) HYD SOL Indicator DS20

(e) ERECT Cutout Indicator DS21

(f) HDG Enable Indicator DS22

(g) DASH ANN Indicator DS23

(2) Connect the dc power supply between receptacle pins J l-c (+) and J1-C. Apply 28 volt dc. The CCDA CLUTCH Indicator shall come ON. Disconnect the DC power supply.

(3) Connect the dc power supply to receptacle J1-b (+) and J1-C. Apply 28 volt dc (+). The CCDA MAG BRAKE Indicator shall come ON. Disconnect the DC power supply.

(4) Connect the dc power supply to receptacleJ3-A (+) and Jl-C. Apply 28 volt dc. The HYD SOLENOID Indicator shall come ON. Disconnect the DC power supply.

(5) Set the TESTER POWER switch to ON.

(6) Connect a jumper between receptacle pins J3-Z and Jl-C. The AFCS ANN indicator shall come ON. Disconnect the jumper.

(7) Connect a jumper between receptacle pins J3-S and J1-C, The ROLL ERECT CUTOUT Indicator shall come ON. Disconnect the jumper.

(8) Connect a jumper between to receptacle pins J1-V and J l-C. The HEADING ENABLE indictor shall come ON. Disconnect the jumper.

(9) Connect a jumper between receptacle pins J3-Z and J l-C. The DASH ANN Indicator shall come ON.

4-59. LCT Actuator Simulator Test (CRC). **This test ensures that the actuator simulator provides the appropriate position signal in response to a drive signal.**

a. Resistance Checks (Power Disconnected). **Measure the resistance between receptacle pins as follows. Set the digital multimeter FUNCTION switch to OHMS. Set the RANGE switch to 200.**

RECEPTACLE PINS	RESISTANCE (OHMS)
(1) J1-S to J1-C	14.4 to 17.6
(2) J1-T to Jl-C	14.4 to 17.6

b. Null Voltage Test (Power Connected).

(1) Set TESTER POWER 115V 400 Hz switch S1 to ON.

(2) **Set LCT switch S50 to NORM.**

(3) **Connect jumpers between receptacle pins J1-S,Jl-T, and Jl-C.**

(4) **Connect the multimeter, set to measure 2 Vdc, across receptacle pins J3-x (+) and J3-AA. The multimeter shall indicate –0.1 to +0.1 volt dc.**

(5) Disconnect the jumper.

c. ***Drift Voltage Test.***

(1) Connect the dc power supply across receptacle pins J1-S (+) and J l-T.

(2) **Connect the digital multimeter, set to measure 20 Vdc, across the power supply.**

(3) **Connect No. 2 multimeter between receptacle pins J3-x *(+)* and J3-AA.**

(4) Adjust the power supply for +15 volt dc on No. 1 multi meter. Disconnect the power supply when No. 2 multimeter reads about *-2* volt dc.

(5) Check No. 2 multimeter. The No. 2 multimeter shall not change more than 100 mV in 10 seconds.

(6) Disconnect No. 1 and No. 2 multimeters.

d. Integration Rate Test.

(1) Connect the dc power supply across receptacle pins J1-T (+) and J1-S. Connect No. 1 digital multimeter across the dc power supply. Adjust the power supply for 15 volt dc on No. 1 multimeter. Connect No. 2 multimeter between receptacle pins J3-x (+) to J3-AA. The multimeter shall indicate -0.006 to +0.006 volt dc.

(2) Reverse the connections from the power supply. Apply +15 volt dc across receptacle pins J1-S (+) and Jl-T. Within 2.5 to 3.7 seconds, No. 2 multimeter shall change to -1.0 to -3.0 volt dc. Wait 10 seconds. Allow output to saturate. The multimeter shall rise to -6.65 to –7.35 volt dc.

(3) Reverse the connections from the power supply. Apply +15 volt dc across receptacle pins J1-T (+) and J1-S. Within 2.5 to 3.7 seconds, No. 2 multimeter shall change to -3.0 to -1.0 volt dc.

(4) Set the LCT switch to GND. Set No. 2 multimeter RANGE switch to 2V. The multimeter shall indicate -0.001 to +0.001 volt dc.

(5) Disconnect the dc power supply and digital mulimeters.

4-60. CCDA Actuator Simulator Test (CRC). **(See fig. 4-10.) This test ensures that the actuator simulator provides the appropriate position signal in response to a drive signal.**

a. Resistance Test (Power Disconnected).

(1) Set the TESTER POWER 115V 400 HZ switch to OFF.

(2) Connect the resistance test aid to receptacle AFCS J3.

(3) Connect the multimeter between test aid pins J3-E and J3-AA. Set multimeter RANGE to 20 K. The multimeter shall indicate 1,890 to 2,310 ohms. Do not disconnect the test aid.

CAUTION

Do not change the test connections between the power-off and power-on resistance tests, If test connections are changed, test equipment can be damaged.

NOTE

Power-on resistance tests are not usually performed but the circuit under test is, in this case, passive. The test, as written, poses no hazard to test equipment, provided that the test equipment remains correctly connected to J3-E and J3-AA.

b. Resistance Test (Power Connected).

(1) Set the TESTER POWER 115V 400 HZ switch to ON. The multimeter shall indicate 35.1 to 42.9K ohms.

(2) Set the TESTER POWER 115V 400 HZ switch to OFF,

(3) Disconnect the resistance test aid.

c. Voltage Test (Power Connected).

(1) Set TESTER POWER 115V 400 HZ switch to ON.

(2) Set the CCDA switch to NORM.

(3) Connect a jumper between receptacle pins J3-E and J3-AA.

(4) Set the digital multi meter to measure 2 vdc. Connect the multimeter across receptacle pins J3-e (+) and J3-AA. The multimeter shall indicate -0.02 to +0.02 volt dc. Set multimeter FUNCTION switch to AC. The multimeter shall indicate less than 0.65 volt ac.

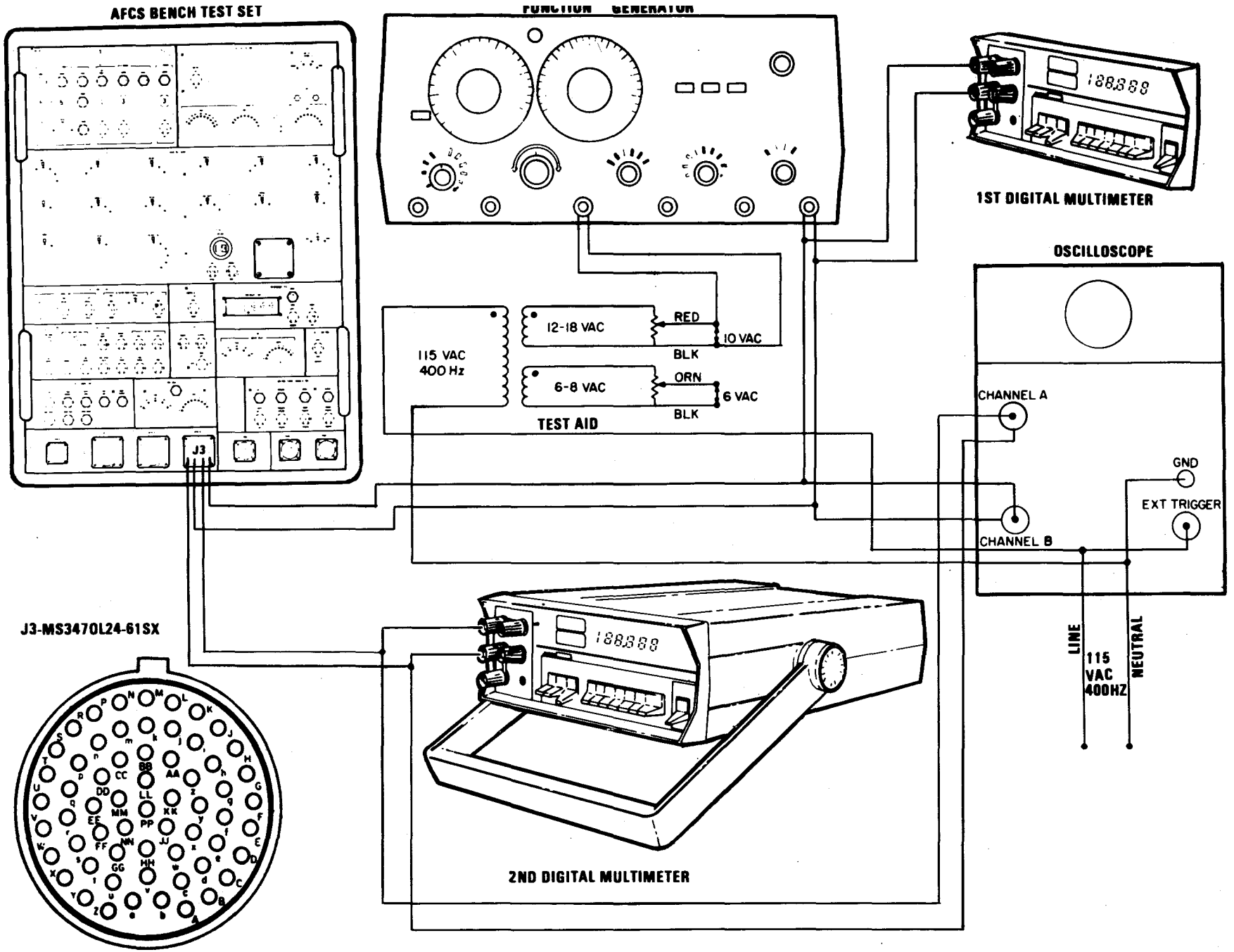
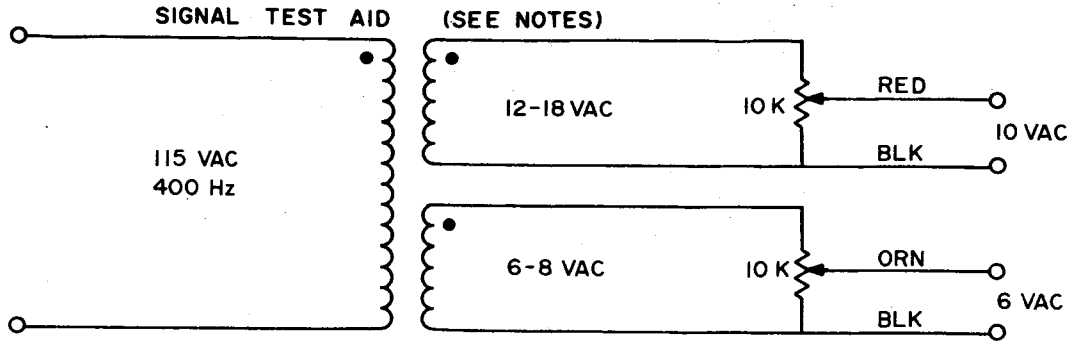


Figure 4-10. CCDA Actuator Simulator Test Setup and Test Aids (Sheet 1 of 2)

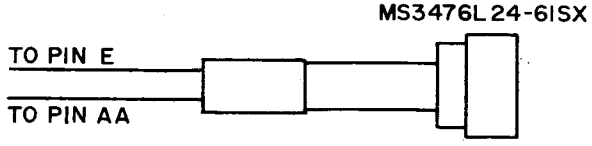


●INDICATES START OF WINDING

NOTES:

1. CONNECT AS SPECIFIED ON SHEET 1.
2. ALSO USED TO TEST AFCS LINE TEST SET.

RESISTANCE TEST AID



LEAD WIRE NO. 22

47D-TMDE-ABTS-64

Figure 4-10. CCDA Actuator Simulator Test Setup and Test Aids (Sheet 2 of 2)

(5) Disconnect the jumper.

CAUTION

Make sure the peak voltage applied to receptacle pin J3-E does not exceed 10 volts. Damage to circuit card A2will occur.

(6) Connect the ac power supply to the phase reference input of the function generator, using signal test aid (fig. 4-10). Connect the 50-ohms output jack to the dual trace oscilloscope and digital multimeter and across receptacle pins J3-E (line) and J3-AA.

NOTE

- When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.

(7) Adjust the signal test aid and function generator for a +90° leading quadrature of 2.5 volts rms on the oscilloscope and digital multi meter and across receptacle pins J3-E (line) and J3-AA. Connect the 'oscilloscope and second multi meter across receptacle pins J3-e (line) and J3-AA. The output signal shall be 4.5 to 5.5 volts rms in-phase.

(8) Increase the input signal to 4.0 volts rms. The output signal shall be increased to 6.1 to 6.8 volts rms on the second multimeter.

(9) Adjust the function generator for a -90° lagging quadrature signal of 2.5 volts rms on the oscilloscope and digital multi meter. The output signal shall be 4.5 to 5.5 volts rms on the second multimeter.

(10) Increase the input signal to 4.0 volts rms. The output signal shall increase to 6.1 to 6.8 volts rms on the second multi meter.

(11) Adjust the function generator to apply a +22.5° leading quadrature input step signal of 2.5 volts rms on the oscilloscope and digital multi meter. Within 0.1 second, the output signal shall rise to 2.52 to 3.79 volts rms on the second multi meter.

(12) Set the CCDA switch to GND. Set the CCDA DEMOD switch to 1. The output signal shall be less than 10 mvac on the second multimeter.

4-61. DASH Actuator Simulator Test (CRC). **This test ensures that the actuator simulator provides the appropriate position signal in response to a drive signal.**

a. Resistance Test.

(1) Set the TESTER POWER 115V 400Hz switch S1 to OFF.

(2) **Measure resistance between receptacle pins J3-JJ and J3-HH. Use the multimeter set to 2KOHM range. The multimeter shall indicate 270 to 330 ohms.**

(3) Disconnect multimeter.

b. Voltage Test.

(1) Set TESTER POWER 115V 400Hz switch S1 to ON.

(2) Set digital multimeter range and function switches, as appropriate for making the following voltage measurements.

(3) Connect dc power supply leads to receptacle pins and apply voltage as indicated below. Measure voltage between receptacle pins as follows.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	POSITION	VOLTAGE/ TEST PROCEDURE	DIGITAL MULTIMETER NORMAL RESULTS
(a)	TF1-TESTS		Connect Jumpers J3-JJ and J3-HH to J1-C.	
	(1) DASH switch S51	(1) TF1	(1) J3-w (+) to J3-AA	(1) Meter will drift at 0. 000 ±10mV per second
	(2) DASH switch S51	(2) GND	(2) J3-w (+) to J3-AA	(2) -20 to +20mV
	(3) None	(3) None	(3) Disconnect J3-JJ and J3-HH from J1-C.	(3) None
	(4) DASH switch S51	(4) TFI	(4) Apply 28Vdc to J3-HH (+) and J3-JJ	(4) Measure voltage at the output, J3 -w (+) to J3-AA shall reach +6.00Vdc in 2.2 to 3.3 seconds, will saturate at +6.3 to 7.0 Vdc.
	(5) DASH switch	(5) GND	(5) Disconnect 28Vdc from J3-HH (+) and J3-JJ, and connect jumper J3-HH to J1-C	(5) None
	(6) DASH switch S51	(6) TF1	(6) Apply 28 Vdc to J3-JJ (+) and J3-HH.	(6) Output voltage at J3-w to J3-AA shall reach +6. 00 Vdc in 2.2 to 3.3 sec and output shall saturate at +6.3 to +7.0 Vdc
	(7) DASH switch S51	(7) GND	(7) J3-w to J3-AA	(7) -0.02 to +0.02 Vdc
	TF2 TEST			
	(1) None	(1) None	(1) Disconnect +28Vdc from J3-JJ to J3-HH	(1) None

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	TEST CONNECTION	DIGITAL MULTIMETER/ NORMAL RESULTS
	(2) None	(2) None	(2) Connect J3-JJ and J3-HH to J1-C	(2) None
	(3) DASH switch S51	(3) TF2	(3) J3-w to J3-AA	(3) -0.02 to +0.02 Vdc
	(4) Same	(4) Same	(4) Disconnect connection from J3-HH and J3-JJ to J1-C.	(4) None
	(5) Same	(5) Same	(5) Apply +15Vdc at J3-HH (+) to J3-JJ (-), and measure voltage between J3-w (+) ad J3-AA (-)	(5) +3. 563 to 3. 937Vdc
	(6) Same	(6) Same	(6) Adjust Power Supply to +28Vac. Apply +28Vdc to J3-HH (+) and J3-JJ (-). Measure voltage between J3-w (+) and J3-AA (-).	(6) +6.0 to +7. 0Vdc
	(7) Same	(7) Same	(7) Disconnect +28 Vdc connections. Apply +15Vdc to J3-JJ (+) and J3-HH (-). Measure voltage between J3-w (-t-) and J3-AA (-).	(7) -3.937 to -3.563 Vdc
	(8) Same	(8) Same	(8) Adjust Power Supply to +28Vdc. Apply +28Vdc to J3-JJ (+) and J3-HH (-). Measure voltage between J3-w (+) and J3-AA (-).	(8) -7. 0 to -6. 0Vdc

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE/ TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
	(9) Same	(9) Same	(9) Apply a step voltage of +15Vdc between J3-JJ (+) and J3-HH. Measure voltage between J3-w (+) and J3-AA (-).	(9) Shall reach -2.37 Vdc in 0.4 to 0.6 second.
	(10) DASH switch S51	(10) GND	(10) Disconnect all external connections	(10) None

(4) Disconnect dc power supply, and digital multimeter from receptacle pins.

4-62. Control Panel Simulation Test (CRC). (See fig. 4-8.) The following test checks the switches that simulate the input and output signals that the control panel provides to the AFCS computer. Proceed as follows:

a. Set digital multimeter FUNCTION switch to DC.

b. Set the digital multimeter RANGE switch to the voltage range necessary to make the voltage measurement, Measure voltage between receptacle pins as follows.

STEP NO.	SWITCH	POSITION	RECEPTACLE PINS	VOLTAGE/INDICATOR	
(1)	HEADING switch S11	l-ENGAGE	J3-h(+) to J3-AA	11.4 to 12.6 VDC	DS12 will come ON.
		O-DISENG	J3-h(+) to J3-AA	OPEN	DS12 will go OUT.
(2)	BARO switch S64	l-ENGAGE	J3-i (+) to J3-AA	11.4 to 12.6 VDC	DS13 will come ON.
		0-DISENG	tJ3-i (+) to J3-AA	OPEN	DS13 will go OUT.
(3)	RADAR switch S12	l-ENGAGE	J3-j (+) to J3-AA	11.4 to 12.6 VDC	DS14 will come ON.
		0-DISENG	J3-j (4) to J3-AA	OPEN	DS14 will go OUT.
(4)	AFCS switch S10	l-SELECT	J3-k (+) to J1-C	24 to 28.5 VDC	DS11 will come ON.
		0-OFF	J3-k (+) to J1-C	OPEN	DS1l will go OUT.

c. Remove digital multimeter test leads from receptacle pins.

4-63. Built- In-Test Equipment (BITE) Control Test (CRC). **(See fig. 4-8.) The following test checks the switches of the test set that control the AFCS computer Built-In Test Equipment (BITE). Proceed as follows:**

a. **Set digital multi meter range switch to 200 ohms, function switch to resistance.**

b. **Measure continuity between receptacle pins as follows.**

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	CONTINUITY TEST PROCEDURE	DIGITAL MULTIMETER/ NORMAL RESULTS
(1)	(a) **BITE INITI-** ATE switch	(a) **Pressed** 1	(a) **J2-5 to J3-AA**	**(a)** Continuity
	(b) BITE INITI- ATE switch	**(b)** Released 0	(b) J2-5 to J3-AA	(b) Infinity
(2)	(a) **BITE INITI-** ATE switch	(a) Pressed 1	(a) J2-40 to J3-AA	(a) Continuity
	(b) BITE INITI- ATE switch	**(b)** Released 0	(b) J2-40 to J3-AA	(b) Infinity
(3)	(a) BITE CONTROL Switch S37	(a) STEP 1	(a) J2-31 to **J3-AA**	(a) Continuity
	, (b) BITE CONTROL Switch S37	(b) RUN O	(b) J2-31 to J3-AA	(b) Infinity

4-64. Response Test (CRC). **(See fig. 4-8.) The test set contains a sample-and-hold amplifier and a** time delay generator. These circuits measure transit response where a signal voltage is sampled and measured at a predetermined time. This response test determines the accuracy of these signals from the shaping networks by measuring them with a digital multimeter at AFCS receptacle 3.

a. Set the control switches to positions listed below.

b. Make connector and voltage measurement as listed below.

c. Set POWER switch to ON.

d. Set NORM ACCEL 12-52 switch to NORMAL.

NOTE

- **When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source.**
- **The plus sign (+) before an ac voltage indicates in-phase.**

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT/ TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(1)	(a) XFEED ROLL ATT switch S54	(a) 3	(a) None	(a) None
	(b) RESPONSE TEST MODE switch S8	(b) OFF	(b) None	(b) None
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) J3-PP (+) to J 3 - A A	(C) +6.888 to +7.112 Vdc
(2)	(a) TIME DELAY - SEC switch S9	(a) 1.000	(a) None	(a) None
	(b) RESPONSE TEST MODE S8	(b) ON	(b) J3-PP (+) to J3-AA (-)	(b) -0.01 to +0.01 Vdc
(3)	RESPONSE TEST STIM switch S7	APPLY	J3-PP (+) to J3-AA (-)	+6.888 to +7.112Vdc HOLD indicator comes on after 4 sec.
(4)	RESPONSE TEST STIM switch S7	REMOVE	J3-PP (+) to J3-AA	-0.01 to +0.01 Vdc. HOLD indicator goes out
(5)	Response TEST MODE switch S8	OFF	J3-PP (+) to J3-AA	+6.888 to +7.112Vdc
(6)	Response TEST STIM	APPLY	J3-PP (+) to J3-AA	+6.888 to +7.112Vdc

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(7)	(a) TIME DELAY-SEC switch S9	(a) 4.000	(a) None	(a) None
	(b) CYCLIC BRAKE switch S31	(b) 1	(b) J3-PP (+) to J3-AA	(b) +6.888 to +7.112Vdc HOLD indicator comes on after 5 to 7 seconds
	(c) CYCLIC BRAKE switch S31	(c) 0	(c) None	(c) None
(8)	(a) AC/DC VOLT-METER SELECT A,0 Switches	(a) 60, 2,	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S8	(b) REMOVE	(b) None	(b) None
	(c) RESPONSE TEST MODE switch S7	(c) **ON** then OFF	(c) None	(c) None
	(d) METER switch S5	(d) DC	(d) None	(d) None
	(e) RANGE switch S6	(e) 20V	(e) Connect decade resistor set to 1 megohm from J3-PP to J2-52	(e) AC/DC VOLT-METER reads +6.92 to +7.08 Vdc
		NOTE		
		Resistor remains connected until step 52.		
(9)	(a) RESPONSE TEST MODE switch S8	(a) ON	(a) None	(a) None
	(b) RANGE switch S6	(b) 200MV	(b) None	(b) AC/DC VOLT-METER reads -0.01 to +0.01 Vdc.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(10)	(a) RANGE switch S6	(a) 20V	(a) None	(a) None
	(o) RESPONSE TEST STIM switch S7	(b) APPLY	(b) None	(b) AC/DC VOLTMETER reads +5.5 to +8.5Vdc after 7 sec.
(11)	(a) NORM ACCEL J2-52 switch S21	(a) GND	(a) None	(a) AC/DC VOLTMETER continues to display +5.5 to +8.5Vdc
	(b) NCRM ACCEL J2-52 switch S21	(b) NORM	(b) None	(b) None
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(12)	(a) TIME DELAY-SEC switch S9	(a) 00.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) None	(b) HOLD indicator comes on after 1 to 3 sec.
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD indicator goes out.
(13)	(a) AC/DC VOLTMETER CIRCUIT SELECT switches	(a) 00,0, B, 0	(a) None	(a) None
	(b) CIRCUIT SELECT SELF TEST switches	(b) 20, 1	(b) None	(b) None
	(c) TIME DELAY-SEC switch S9	(c) 00.075	(c) None	(c) None
	(d) RESPONSE TEST STIM switch S7	(d) APPLY	(d) Record METER Reading	(d) +5.86 to +6.00Vdc

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
	(e) RESPONSE TEST STIM switch S7	(e) REMOVE	(e) None	(e) None
(14)	(a) TIME DELAY-SEC switch S9	(a) 00.074	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Less than 13(d).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(C) None
(15)	(a) TIME DELAY-SEC switch S9	(a) 00.073	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Less than 14(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(16)	(a) TIME DELAY-SEC switch S9	(a) 00.072	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Less than 15(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(17)	(a) TIME DELAY-SEC switch S9	(a) 00.071	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) Apply	(b) Record METER Reading	(b) Less than 16(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(18)	(a) TIMED DELAY-SEC switch S9	(a) 00.070	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER	(b) Less than 17(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(19)	(a) TIME DELAY-SEC switch S9	(a) 00.076	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than step 13(d).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(20)	(a) TIME DELAY-SEC switch S9	(a) 00.077	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 19(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(21)	(a) TIME DELAY-SEC switch S9	(a) 00.078	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER	(b) Greater than 20(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(22)	(a) TIME DELAY-SEC switch S9	(a) 00.079	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 21(b)

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(23)	(a) TIME DELAY-SEC switch S9	(a) 00.005	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) As Indicated.
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(24)	(a) TIME DELAY-SEC switch S9	(a) 00.015	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 23(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(25}	(a) TIME DELAY-SEC switch S9	(a) 00.025	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 24(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	‘c) None
(26)	(a) TIME DELAY-SEC switch S9	(a) 00.035	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 25(b).
	(c) RESPONSE TEST STIM S7	(c) REMOVE	(c) None	(c) None

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(27)	(a) TIME DELAY-SEC switch S9	(a) 00.045	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 26(b).
	(c) RESPONSE TEST STIM switch	(c) REMOVE	(c) None	(c) None
(28)	(a) TIME DELAY-SEC switch S9	(a) 00.055	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	**(b)** APPLY	(b) Record METER Reading	(b) Greater than 27(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(29)	(a) TIME DELAY-SEC STIM switch S7	(a) 00.065 Sec	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 28(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(30)	(a) TIME DELAY-SEC switch S9	**(a) 00.075**	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	**(b)** APPLY	(b) Record METER Reading	(b) Greater than 29(b).
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(31)	(a) TIME DELAY-SEC switch S9	(a) 00.085	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 30(b)

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(32)	(a) **TIME DELAY-** SEC switch S9	**(a) 00.095**	**(a)** None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 31(b)
	(c) RESPONSE TEST STIM switch S7	**(c) REMOVE**	**(c)** None	(c) None
(33)	(a) SELF TEST CIRCUIT SELECT switches	(a) 00, 0	(a) None	(a) None
	(b) AC/DC VOLT-METER CIR- CUIT SELECT switches	**(b) 60, 2, A, 0**	**(b) None**	(b) None
	(c) TIME DELAY- SEC switch S9	(C) 00.100	(c) Connect decade capacitor, set to 1 uf from J2-52 to J3-AA.	**(c) None**
		NOTE Capacitor remains connected until step (52).		
	(d) RESPONSE TEST STIM switch S7	(d) APPLY	(d) Record METER Reading	**(d)** As Indicated.
	(e) RESPONSE TEST STIM switch S7	**(e) REMOVE**	**(e) None**	**(e) None**
(34)	(a) **TIME DELAY-SEC switch S9**	(a) 00.200	(a) **None**	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than step 33(d)

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(35)	(a) TIME DELAY-SEC switch S9	(a) 00.300	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) Apply	(b) Record METER Reading	(b) Greater than step 34(b)
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(36)	(a) TIME DELAY-SEC switch S9	(a) 00.400	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 35(b)
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	
(37)	(a) TIME DELAY SEC switch S9	(a) 00.500	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 36(b)
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(38)	(a) TIME DELAY-SEC switch S9	(a) 00.600	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 37(b)

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURE	DIGITAL MULTIMETER/ NORMAL RESULTS
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(39)	(a) TIME DELAY-SEC switch S9	(a) 00.700	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 38(b)
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(40)	(a) TIME DELAY-SEC switch S9	(a) 00.800	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 39(b)
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(41)	(a) TIME DELAY-SEC switch S9	(a) 00.900	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record METER Reading	(b) Greater than 40(h)
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) None
(42)	(a) TIME DELAY SEC switch S9	(a) 11.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) None	(b) HOLD Indicator comes on in 12 to 14 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD Indicator OUT.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(43)	(a) TIME DELAY-SEC switch S9	(a) 22.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 23 to 25 seconds
	(c) RESPONSE TEST STIM S7	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.
(44)	(a) TIME DELAY-SEC switch S9	(a) 33.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 34 to 36 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.
(45)	(a) TIME DELAY-SEC switch S9	(a) 44.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 45 to 47 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) REMOVE	(c) HOLD Indicator goes out.
(46)	(a) TIME DELAY-SEC switch S9	(a) 55.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 56 to 58 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(47)	(a) TIME DELAY-SEC switch S9	(a) 66.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time	(b) HOLD Indicator comes on in 67 to 69 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.
(48)	(a) TIME DELAY-SEC switch S9	(a) 77.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 78 to 80 seconds
	(c) RESPONSE TEST switch S9	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.
(49)	(a) TIME DELAY-SEC switch S9	(a) 88.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 89 to 91 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.
(50)	(a) TIME DELAY-SEC switch S9	(a) 99.000	(a) None	(a) None
	(b) RESPONSE TEST STIM switch S7	(b) APPLY	(b) Record time.	(b) HOLD Indicator comes on in 100 to 102 seconds
	(c) RESPONSE TEST STIM switch S7	(c) REMOVE	(c) None	(c) HOLD Indicator goes out.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(51)	(a) RANGE switch S6	(a) 20V	(a) None	(a) None
	(b) TIME DELAY-SEC switch S9	(b) 1.000	(b) None	(b) None
	(c) RESPONSE TEST STIM switch S7	(c) APPLY	(c) None	(c) +4.237 to +4.611 Vdc
	(d) RESPONSE TEST STIM switch S7	(d) REMOVE	(d) None	(d) None
(52)	(a) AC/DC VOLT-METER CIRCUIT 0 SELECT switches	(a) 60, 0, A,	(a) None	(a) None
	(b) TIME DELAY-SEC switch S9	(b) 00.062	(b) Remove 1 meg-ohm resistor. Remove 1 uf capacitor. Connect jumper between J3-PP and J2-36	(b) -0.06 to +0.06Vdc
	(c) RESPONSE TEST STIM switch S7	(c) APPLY	(c) None	(c) +4.111 to +4.729 Vdc
	(d) RESPONSE TEST STIM switch S7	(d) REMOVE	(d) None	(d) None
	(e) RESPONSE TEST MODE switch S8	(e) OFF	(e) None	(e) None
	(f) XFEED ROLL ATT switch S54	(f) 2	(f) None	(f) None
	(g) AC/DC VOLT-METER CIRCUIT 0 SELECT switches	(g) 00, 0, B	(g) Disconnect all test connections	(g) None

4-65. Continuity Test (CRC). (See fig. 4-8.) Test of the control panel consists of continuity and voltage measurements. The following test checks the circuit that provides a source of continuity test current, an indicator light that indicates continuity, and two selector switches that connect the test circuit to all control panel pins for continuity testing. For this test, continuity is defined as a resistance of 0.5 to 1.5 ohms. Proceed as follows:

a. Perform the following continuity test by setting the continuity test TENS and UNITS switches S13 and S14. Observe the continuity light while 0.5 ohms is connected between the test points; the light shall be ON. Change to 1.5 ohms; the light shall be OFF.

b. For the self test open test (position 00-0), the light shall be off. For position 00-1, the light shall be on (self short test).

NOTE

- Continuity selector positions 00-2 thru 10-5 are for AFCS panel tests. Positions 20-0 thru 30-6 are for AFCS computer test.
- J4 is PANEL J1. J5 is PANEL J2.

CAUTION

DO NOT connect CCDA cable assembly W6 to the test set during this test.

UNITS		0	1	2	3	4	5	6	7	8	9
TENS	00	Off Self Test Open	On Self Test Short	J4-F J4-N	J4-G J4-N	J5-H J5-N	J4-H J4-N	J4-K J5-K	J4-P J4-L	J5- P J5-L	J4-R J4- L
	10	J5-R J5-L	J4-L J5-L	J4-P J4-U	J4-R J4-V	J5-P J5-U	J5-R J5-V				
	20	J2-3 J3-AA	J3-C J3-AA	J1-R J1-f	J3-D J3-AA	J3-N J3-AA	J3-f J3-AA	J3-t J3-AA	J1-J J3-AA	J1-h J3-AA	J1-z J3-AA
	30	J1-M J3-AA	J1-k J3-AA	J1-KK J3-AA	J1-p J3-AA	J1-GG J3-AA	J1-t J3-AA	J1-X J3-AA			

4-66. CCDA Test Circuit Check (CRC). (See fig. 4-9.) The CCDA discrete signal outputs are simulated by three toggle switches, the BRAKE, CLUTCH, and CMD. The switches apply a voltage or open circuit connection. The clutch and brake are interconnected so that a clutch 1 voltage level requires a 1 voltage level at the brake discrete output. Proceed as follows:

a. Set switch to position indicated below.

b. Connect ac signal voltage and digital multimeter to the receptacle pins listed below.

NOTE

Receptacle J6 is marked CCDA.

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	VOLTAGE MEASUREMENT TEST PROCEDURES	DIGITAL MULTIMETER/ NORMAL RESULTS
(1)	AFCS 115VAC 400Hz POWER Switch S2	ON	CCDA J6-B (line) to J6-C	112.5 to 117.5Vac
	NOTE CCDA Cable W6 has a jumper from J6-C to J6-V to connect the 28Vdc and 115Vac grounds together for CCDA tests. Connect a jumper between receptacle pins J6-C and J6-V.			
(2)	AFCS 28VDC POWER switch S3	ON	CCDA J6-A to J6-C	24 to 28.5Vdc
(3)	None	None	Apply 13Vac to CCDA J6-F (line) to J6-C	None
(4)	CCDA DISCRETE SIGNAL switches			
	(a) BRAKE switch S39	(a) 1	(a) J6-G(+) to J6-C	(a) 24 to 28.5Vdc
	(b) BRAKE switch S39	(b) 0	(b) J6-G(+) to J6-C	(b) OPEN
	(C) CLUTCH switch S40 (For Brake 1)	(c) 1	(c) J6-H(+) to J6-C	(c) 24 to 28.5Vdc
	(d) CLUTCH switch S40 (For Brake 1)	(d) 0	(d) J6-H(+) to J6-C	(d) OPEN
	(e) CLUTCH switch S40 (For Brake 0)	(e) 1	(e) J6-H(+) to J6-C	(e) OPEN
	(f) CLUTCH switch S40 (For Brake 0)	(f) 0	(f) J6-H(+) to J6-C	(f) OPEN

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	RECEPTACLE PIN NO.	DIGITAL MULTIMETER/ NORMAL RESULTS
	(g) CCDA CMD switch S38	1. CW	1. J6-M (line) to J6-C	1. 11.72 to 14.28Vac
		2. OFF	2. J6-M (line) to J6-C	2. OPEN
		3. CCW-1	3. J6-N (line) to J6-C	3. 11.72 to 14.28Vac
		4. OFF-0	4. J6-N (line) to J6-C	4. OPEN
(5)	AFCS 115VAC 400HZ Power and 13Vac External Power	OFF	CCDA J6-P to J6 -D	Read open on ohmmeter
	NOTE ● When a test includes a requirement that an ac voltage be in-phase or out-of-phase, oscilloscope channel A must be connected across the digital multimeter. Oscilloscope channel B must be connected to the ac source and the oscilloscope externally triggered from the ac source. ● The minus sign (-) before an ac voltage indicates out-of-phase.			
(6)	(a) ATT SELECT switch S35	(a) CCDA	(a) None	(a) None
	(b) ATT Syncro	(b) 0.0°	1. J6-L (line) to J6-J	1. -0.05 to +0.05 Vac
	(c) AFCS 115VAC 400HZ Power	(c) ON		
	(d) 13Vac External Power	(d) ON	2. J6-K (line) to J6-L	2. -9.69 to -10.71 Vac
			3. J6-K (line) to J6-J	3. -9.69 to -10.71 Vac

STEP NO.	CONTROL/SWITCH NOMENCLATURE	CONTROL/SWITCH POSITION	RECEPTACLE PIN NO.	DIGITAL MULTIMETER/ NORMAL RESULTS
	(e) ATT Synchro	(e)330°	1. J6-L (line) to J6-J	1. -5.605 to -6.195 Vac
			2. J6-K (line) to J6-L	2. -5.605 to -6.195 Vac
			3. J6-K (line) to J6-J	3. -11.21 to -12.39 Vac
(7)	AC/DC VOLT-METER CIRCUIT SELECT switches	300, 0, B, 1	Apply 10Vac to CCDA J6-F (line) to J6-C	9 to 11Vac on AC/ DC VOLTMETER
(8)	AC/DC VOLT-METER CIRCUIT SELECT	30, 0, B, 2	Apply 10Vac to CCDA J6-D (line) to J6-E	9 to 11Vac on AC/ DC VOLTMETER

4-67. Repackaging for Shipment or Limited Storage.

(See fig. 2-1.) The exact procedure for repackaging depends on material available and the conditions under which the equipment is to be shipped or stored. Adapt the procedure below whenever circumstances permit.

4-68. Packing.

The information concerning the original packaging (para 2-1) will be helpful.

a. Material Requirements. Obtain 20 square feet of styrofoam cushioning material or equal.

b. Packaging. Cut styrofoam to fit cushion on each side of the test set.

c. *Packing.* Pack the test set in a cleated plywood box.

4-69. Preparation for Storage.

No special preparations are required for storing the test set. Refer to figure 1-2 to be certain that the test set is complete before closing the cover and storing the test set. The test set shall be stored in a clean dry area.

4-70. Preparation for Shipment.

Prepare the test set for shipment as follows:

a. Disconnect and secure cables in cover of the test set.

b. Refer to figure 1-2 to be certain that the test set is complete.

c. Place the cover on the test set. Secure the five latches on the test set. The test set is now ready for shipment.

Chapter 5

ILLUSTRATED PARTS BREAKDOWN

SECTION I INTRODUCTION

5-1. Purpose. This chapter describes and illustrates the assemblies and detail parts required for maintenance of AFCS Bench Test Set 145G0008-1. Part numbers are for reference only. Refer to TM 55-4920-430-30P for parts requisition. Although the parts breakdowns shown disassembly relationship, this chapter is not the authority for assembly or disassembly procedures. These procedures are in Chapter 3 of this manual.

a. This chapter consists of an Introduction, Index of Reference Designations, Index of Part Numbers, and Detailed Parts List.

5-2. Reference Designation Index. This index consists of all the reference designations shown on schematic and wiring diagrams and on subassemblies of this test set. The index is arranged in columns as follows:

a. The Reference Designation column contains the reference designations in alphanumerical sequence. Reference Designation Numbers for detail parts of electronic subassemblies are prefixed with the Reference Designation Number for the subassembly.

b. The figure and number column contains the figure and item number assigned to parts having electrical and electronic reference designation codes.

REFERENCE DESIGNATION	FIGURE	INDEX
A1	5-4	82
A3	5-4	84
A4	5-4	85
A6	5-4	83
B1	5-4	43
CB1	5-4	36
CB2	5-4	36
CB3	5-4	38
CB4	5-4	39
CB5	5-4	39
CR15	5-4	55E
DS1	5-4	4
		5
DS2	5-4	7
DS2	5-4	6
DS3	5-4	4
		5
DS4	5-4	6
DS4	5-4	7
DS5	5-4	6
DS5	5-4	7

REFERENCE DESIGNATION	FIGURE	INDEX
DS6	5-4	7
DS6	5-4	8
DS7	5-4	7
DS7	5-4	37
DS8	5-4	7
DS8	5-4	37
DS9	5-4	8
DS9	5-4	9
DS10	5-4	8
DS10 thru DS23	5-4	23
DS1l	5-4	8
DS12	5-4	8
DS13	5-4	8
DS14	5-4	8
DS15	5-4	8
DS16	5-4	8
DS17	5-4	6
DS18	5-4	6
DS19	5-4	6
DS20	5-4	6
DS21	5-4	6
DS22	5-4	6
DS23	5-4	6
F1	5-4	54
F2	5-4	54
F3	5-4	54
F4	5-4	54
J2	5-4	29
J3	5-4	28
J4	5-4	26
J4	5-4	30
J5	5-4	25
J6	5-4	27
J7	5-4	31
J8	5-4	16
J9	5-4	15
J11	5-4	63
Ml	5-4	47
PS1	5-4	60
PS2	5-4	65
PS3	5-4	65
P1l	5-4	76
P12	5-4	69
P13	5-4	71
P14	5-4	80
P15	5-4	80
P16	5-4	80
P17	5-4	80
P18	5-4	80
R19	5-4	48
R20	5-4	62
R21	5-4	62
R22	5-4	62
R23	5-4	62
R24	5-4	61
S1	5-4	24
S2	5-4	24
S3	5-4	34

REFERENCE DESIGNATION	FIGURE	INDEX
S4	5-4	34
S5	5-4	10
S6	5-4	14
S7	5-4	10
S8	5-4	21
S9	5-4	49
S10	5-4	24
S11	5-4	24
S12	5-4	24
S13	5-4	44
S14	5-4	17
S15	5-4	50
S16	5-4	17
S17	5-4	40
S18	5-4	17
S19	5-4	17
S20	5-4	31
S20	5-4	70
S21	5-4	34
S21	5-4	70
S22	5-4	35
S23	5-4	42
S24	5-4	42
S25	5-4	45
S26	5-4	10
S27	5-4	10
S28	5-4	34
S29	5-4	34
S30	5-4	10
S31	5-4	21
S32	5-4	34
S33	5-4	21
S34	5-4	10
S35	5-4	20
S36	5-4	22
S37	5-4	10
S38	5-4	51
S39	5-4	10
S40	5-4	10
S41	5-4	42
S42	5-4	10
S43	5-4	10
S44	5-4	10
S45	5-4	10
S46	5-4	10
S47	5-4	34
S48	5-4	34
S49	5-4	10
S50	5-4	10
S51	5-4	41
S52	5-4	34
S53	5-4	46
S54	5-4	41
S55	5-4	19
S56	5-4	19
S57	5-4	19
S58	5-4	19

REFERENCE DESIGNATION	FIGURE	INDEX
S59	5-4	18
S60	5-4	46
S61	5-4	46
S62	5-4	19
S63	5-4	18
S64	5-4	24
TB1	5-4	72
TB2	5-4	73
TB3	5-4	74
TB4	5-4	75
T1	5-4	58
T2	5-4	56
T3	5-4	56
W1	5-1	5
W1	5-2	1
W1P1	5-2	2
W2	5-1	6
W1P2	5-2	4
W2	5-2	1
W2P1	5-2	2
W2P2	5-2	4
W3	5-1	7
W3	5-2	1
W3P1	5-2	2
W3P2	5-2	4
W4	5-1	8
W4	5-3	1
W4P1	5-3	2
W4P2	5-3	4
W5	5-1	9
W5	5-3	1
W5P1	5-3	2
W5P2	5-3	4
W6	5-1	10
W6	5-3	1
W6P1	5-3	2
W6P2	5-3	4
W7	5-1	11
W7	5-2	1
W7P1	5-2	2
W7P2	5-2	4
W7P3	5-2	6

5-3. Index of PART Numbers. This index contains a complete listing of all items shown in the Detailed Parts List compiled in alphanumeric sequence. The index is arranged in columns as follows:

a. The Part Number Column contains the part numbers of the manufacturer of the part or the part number assigned to it by the Boeing Vertol Co. Requisition parts thru TM 55-4920-430-30P.

(1) Part number arrangement begins at the extreme left position and continues, one position at a time, until all parts are arranged in sequence. The order of precedence, beginning the part number arrangement at the extreme left (first) position, is as follows:

Letters A through Z for the alpha index.
Numerals 0 thru 9 for the numeric index.

(2) The order of precedence in continuing the part number arrangement on the second and succeeding positions of the part number from left to right is as follows:

Space (blank column)
Diagonal (/)
Point (.)
Dash or hyphen (-)
Letters A through Z, then
Numerals 0 through 9

Alphabetic (letter) O is listed as numerical zero's

Examples of part number sequence.
ABC0158
AN509-10
AN509C1R7
A39539-10-001
ZB45-37C
10-60732-3
10001
11
112304
5008CW
65-2716-27
6553

b. The Figure and Index number columns contain the figure and index number listing/s assigned to a part.

PART NUMBER	FIGURE	ITEM
AN3057-12B	5-2	5
D38999/20WH35SN	5-4	29
D38999/26WH35PN	5-2	2
D38999/26WH35SN	5-2	4
D922673-5	5-4	78
MS16108-2A	5-4	16
MS16108-3A	5-4	15
MS17322-10	5-4	47
MS21044C04	5-4	33
MS21044C08	5-4	52
MS24524-22	5-4	24

PART NUMBER	FIGURE	ITEM
MS24524-23	5-4	21
MS24524-27	5-4	51
MS24693-272	5-4	98
MS25082C4	5-4	55
MS25237-381	5-4	8
MS25237-387	5-4	6
MS25237-8918	5-4	37
MS3106A20-3P	5-2	6
MS3106A20-4P	5-2	4
MS3120E16-26P	5-4	63
MS3122E14-19SW	5-4	27
MS3126E16-26S	5-4	76
MS3417-14N	5-2	7
MS3417-14N	5-2	3
MS3417-14N	5-3	3
MS3417-24N	5-2	3
MS3417-24N	5-2	5
MS3470L14-19S	5-4	26
MS3470L14-19SX	5-4	25
MS3470L14-5P	5-4	31
MS3470L24-61S	5-4	30
MS3470L24-61SX	5-4	28
MS3476L14-19P	5-3	2
MS3476L14-19PW	5-3	2
MS3476L14-19PX	5-3	2
MS3476L14-19S	5-3	4
MS3476L14-19SX	5-3	4
MS3476L14-5S	5-2	2
MS3476L24-61P	5-2	2
MS3476L24-61PX	5-2	2
MS3476L24-61S	5-2	4
MS3476L24-61SX	5-2	4
MS35335-60	5-4	94
MS35650-304	5-4	55C
MS55302/27-06	5-4	80
MS77069-1	5-4	55D
MS90310-221	5-4	34
MS90310-231	5-4	10
MS90310-271	5-4	45
MS91528-1K2B	5-4	13
M15098/11-001	5-4	5
M22710/15-425	5-4	49
M3786/36-0085	5-4	40
M3786/36-0239	5-4	17
M3786/4-5001	5-4	19
M3786/4-5002	5-4	41
M3786/4-5003	5-4	46
M3786/4-5005	5-4	18
M3786/4-5013	5-4	42
M3786/4-5015	5-4	35
M3786/4-5015	4-4	44
M3786/4-5041	5-4	14
M3786/4-5059	5-4	50
M3786/4-5062	5-4	10
NAS1535-06-6	5-4	67
NAS1635-00-2	5-1	2
NAS1635-02-5	5-4	79
NAS1635-04-20	5-4	57
NAS1635-04-28	5-4	59
NAS1635-04-5	5-4	64

PART NUMBER	FIGURE	ITEM
NAS1635-04-6	5-4	32
NAS1635-08-6P	5-4	12
NAS1635-08-8	5-4	53
NAS1635-3-10	5-1	12
NAS1635-3-4	5-4	93
NAS1786A08-30	5-4	90
NAS1786A08-40	5-4	89
RER70F3010M	5-4	61
RER75F8R06M	5-4	62
ST990019-005	5-4	55A
VS25113-4	5-1	3
1N1202A	5-4	55E
10021668-104	5-4	55B
10028712-101	5-4	70
10031356-101	5-4	54
10039725-105	5-4	56
10039725-107	5-4	58
10039726-102	5-4	65
10039731-101	5-4	60
10066999-101	5-1	4
10073031-103	5-4	95
10080532-106	5-4	48
10080816-101	5-4	11
10080817-101	5-4	43
10080821-101	5-4	22
10080822-101	5-4	3
10080928-101	5-4	38
10080928-102	5-4	39
10080928-103	5-4	36
10080929-101	5-4	71
10080929-102	5-4	69
145G0008-1	5-1	1
145G5177-1	5-1	5
	5-2	1
145G5178-1	5-1	6
	5-2	1
145G5179-1	5-1	7
	5-2	1
145G5180-1	5-1	8
	5-3	1
145G5181-1	5-1	9
	5-3	1
145G5182-1	5-1	10
	5-3	1
145G5183-1	5-1	11
	5-2	1
l45G5186-1	5-4	82
145G5189-1	5-4	86
145G5192-1	5-4	84
145G5195-1	5-4	85
145G5198-1	5-4	83
145G5200-1	5-1	13
	5-4	1
145G5203-1	5-4	99
145G5218-1	5-4	87
145G5290-1	5-4	66
145G5291-1	5-4	92
145G5292-1	5-4	96
145G5293-1	5-4	68
145G5294-2	5-4	91
145G5295-1	5-4	77

PART NUMBER	FIGURE	ITEM
145G5296-1	5-4	97
145G5297-1	5-4	72
145G5298-1	5-4	73
145G5299-1	5-4	74
145G5300-1	5-4	75
234G5219-1	5-4	88
234G5281-1	5-1	14
414G5217-1	5-4	81
440688-12	5-4	4
440688-3	5-4	7
440688-4	5-4	9
440688-6	5-4	23
459066-14	5-4	2

5-4. Detailed Parts List. The text portion of the Detailed Parts Lists is arranged in columns as follows:

a. Figure and Index Number - The number in the left position in the first column of each text page is the figure number. The number in the right position is the index number which keys the part number to the illustration when the part is illustrated. When a breakdown consists of both left- and right-hand assemblies, only left-hand parts are illustrated.

b. Part Number - This column contains the identifying number assigned to each part. If any item does not have a part number, NO NUMBER will appear in this column. A complete description of the item will be included in the description column. Requisition parts thru TM 55-4920-430-30P.

c. Description - This column lists a description of each part by Government standard vendor, or manufacturer's drawing title. Included in this column, when required, are the following:

(1) A five-digit vendor code, preceded by the capital letter V. Vendor codes used in the Detailed Parts List are as follows:

Vendor Code Index

CODE	VENDOR NAME AND ADDRESS
94580	Honeywell Inc. Avionics Div. 2600 Ridgway Pkwy Minneapolis, MN 55413

(2) Abbreviations are used to describe parts. Abbreviations used in the Detailed Parts List areas follows:

ABBREVIATION	DESCRIPTION
AC	Alternating Current
AFCS	Advanced Flight Control System
ALTN PN	Alternate Part Number
ASSY	Assembly
BKDN	Breakdown
CCD	Cockpit Control Driver (Actuator)
DASH	Differential Airspeed Hold (Actuator)
DC	Direct Current
FIG	Figure
INTR	Interior
LCT	Longitudinal Cyclic Trim (Actuator)
NHA	Next Higher Assembly
PWR	Power
SERVO	Servomechanism
Thru	Through
U/W	Used With

(3) Oversize and undersize parts such as studs and bushings are listed immediately following the standard size part. The degree of fit is also stated.

(4) When an assembly is broken down in another figure, a reference to that figure is provided.

(5) When the next higher assembly appears in another figure, a reference to that figure is provided.

(6) Manufacturer's specification and source control drawing numbers are listed in the part number column. Equivalent vendor part numbers and codes are listed in the description column.

(7) For proper identification of details and next lower assemblies, the listings are subordinated in an indention system. The indention system shows the subordination of assembly in accordance with the following outline:

```
1 2 3 4 5 6 7
Device
  Attaching parts for assembly
. Assembly
. . Attaching parts for subassembly
. . Subassembly of device
. . . Detail parts of subassembly
```

(8) Each Boeing part is given the number of the drawing from which the part is made. The drawings are numbered according to a system in which a prefix of three digits is used. Boeing Vertol part numbers are prefixed with the numbers 114, 145, 165, 173, 234, 308, and 414.

(9) Specification and Source Control part numbers are listed in the part number column. Vendor equivalent part numbers are listed in the Nomenclature column. In addition to the above, Boeing-Vertol standard parts listed are prefixed by the letters BAC and VS.

NOTE

Vendor codes are not used for Boeing-Vertol, Boeing Standard parts, Boeing-Kent, and military standard part numbers.

(10) Usable Code - This column indicates the applicability of an item to other types or makes of equipment.

(11) Units per Assembly - This column lists the number of units required per assembly or subassembly. When more than one assembly is required, the total for these assemblies will be listed. The letters AR indicate as required. The letters REF are used on items that are listed for reference purposes.

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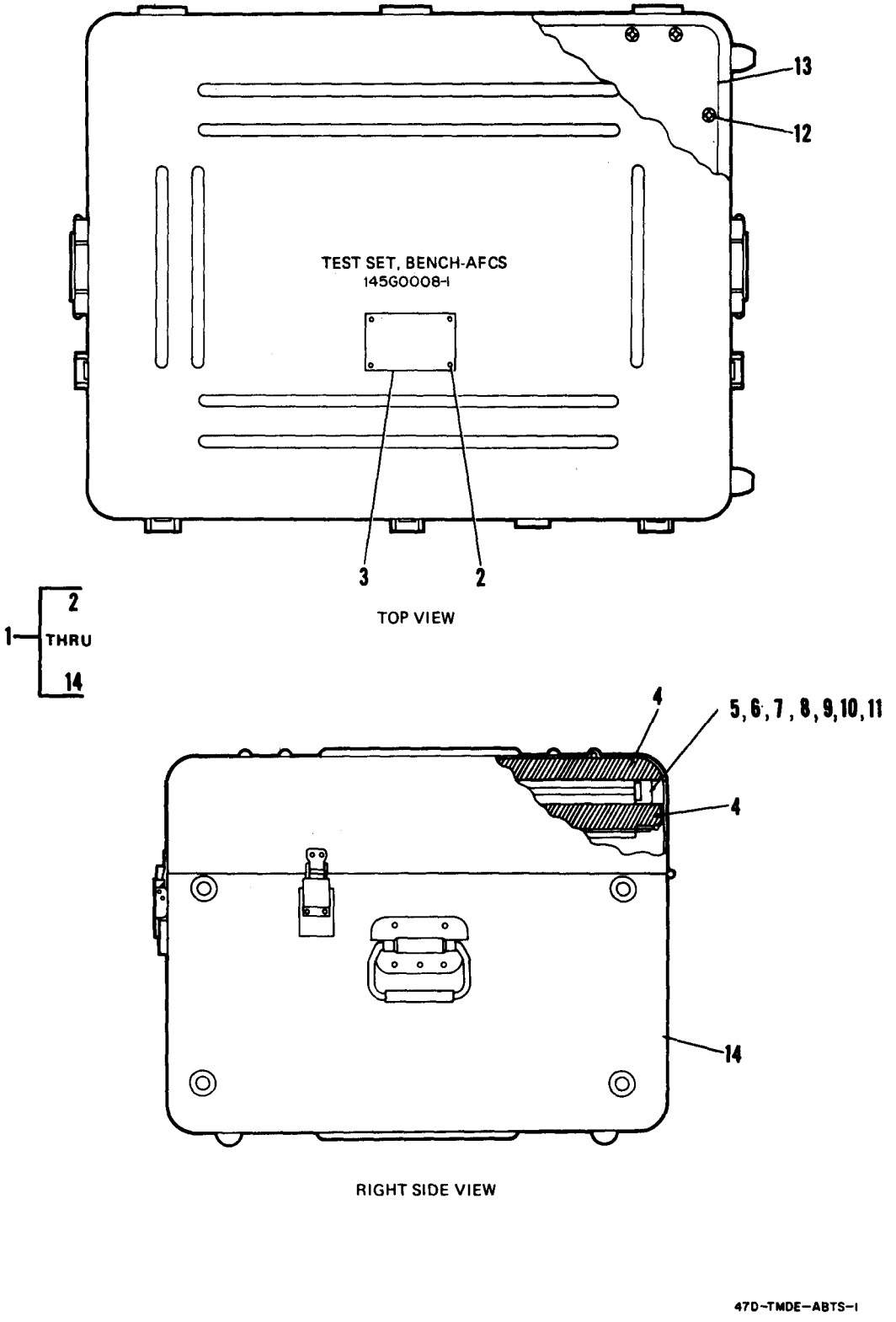


Figure 5-1. AFCS Bench Test Set Assy

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
5-1- 1	145 G0008-1	TEST SET, AFCS bench	1	
2	NAS1635-00-2	. SCREW	4	
3	VS25113-4	. PLATE,identification	1	
4	10066999-101	. PACKING,foam insert ..... (V94580)	2	
5	145G5177-1	. CABLE ASSY(W1) ..... see fig 5-2 for bkdn	1	
6	145G5178-1	. CABLE ASSY(W2) ..... see fig 5-2 for bkdn	1	
7	145G5179-1	. CABLE ASSY(W3) ..... see fig 5-2 for bkdn	1	
8	145G5180-1	. CABLE ASSY(W4) ..... see fig 5-3 for bkdn	1	
9	145G5181-1	. CABLE ASSY(W5) ..... see fig 5-3 for bkdn	1	
10	145G5182-1	. CABLE ASSY(W6) ..... see fig 5-3 for bkdn	1	
11	145G5183-1	. CABLE ASSY(W7) ..... see fig 5-2 for bkdn	1	
12	NAS1635-3-10	. SCREW	18	
13	145G5200-1	. PANEL ASSY,test set ..... see fig 5-4 for bkdn	1	
14	234G5281-1	. CASE,modified	1	

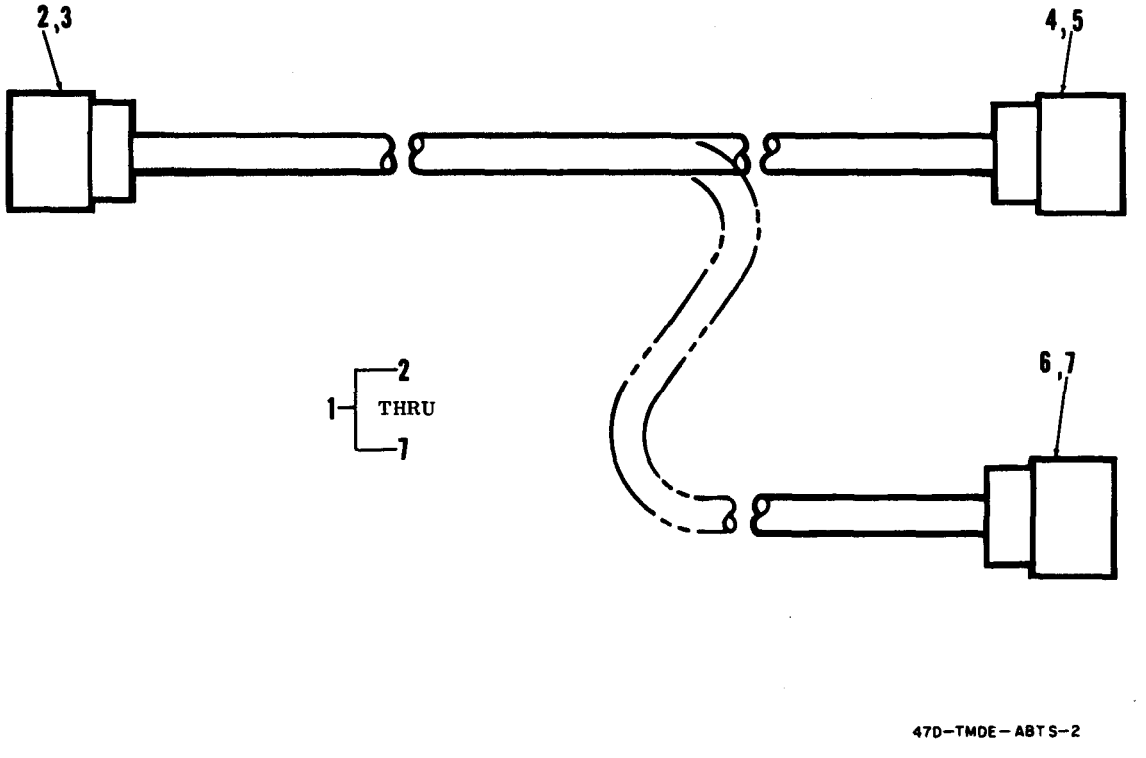


Figure 5-2. Cable Assy W1, W2, W3, and W7

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
5-2-1	145G5177-1	CABLE ASSY(W1) ..... see fig 4-1 for NHA	REF	
1	145 G5178-1	CABLE ASSY(W2) ..... see fig 4-1 for NHA	REF	
1	145G5179-1	CABLE ASSY(W3) ..... see fig 4-1 NHA	REF	
1	145G5183-1	CABLE ASSY(W7) ..... see fig 4-1 for NHA	REF	
2	MS3476L24-61P	. CONNECTOR(W1P1), ... (u/w145G5177-1)	1	
2	D38999/26WH35PN	. CONNECTOR(W2P1), ... (u/w145G5178-1)	1	
2	MS3476L24-61PX	. CONNECTOR(W3P1) ..... (u/w145G5179-1)	1	
2	MS3476L14-5S	. CONNECTOR(W7P1), ... (u/w145G5183-1)	1	
3	MS3417-24N	. CLAMP(u/w145G5177-1, ... 145G5178-1,and 145G5179-1)	1	
3	MS3417-14N	. CLAMP(u/w145G5183-1)	1	
4	MS3476L24-61S	. CONNECTOR(W1P2) , ... (u/w145G5177-1)	1	
4	D38999/26WH35SN	. CONNECTOR(W2P2) , ... (u/w145G5178-1)	1	
4	MS3476L24-61SX	. CONNECTOR(W3P2), ... (u/w145G5179-1)	1	
4	MS3106A20-4P	. CONNECTOR(W7P2) , ... (u/w145G5183-1)	1	
5	MS3417-24N	. CLAMP(u/w145G5177-1, ... 145G5178-1,and 145G5179-1)	1	
5	AN3057-12B	. CLAMP(u/w145G5183-1)	1	
6	MS3106A20-3P	. CONNECTOR(W7P3) , ... (u/w145G5183-1)	1	
7	MS3417-14N	. CLAMP(u/w145G5183-1)	1	

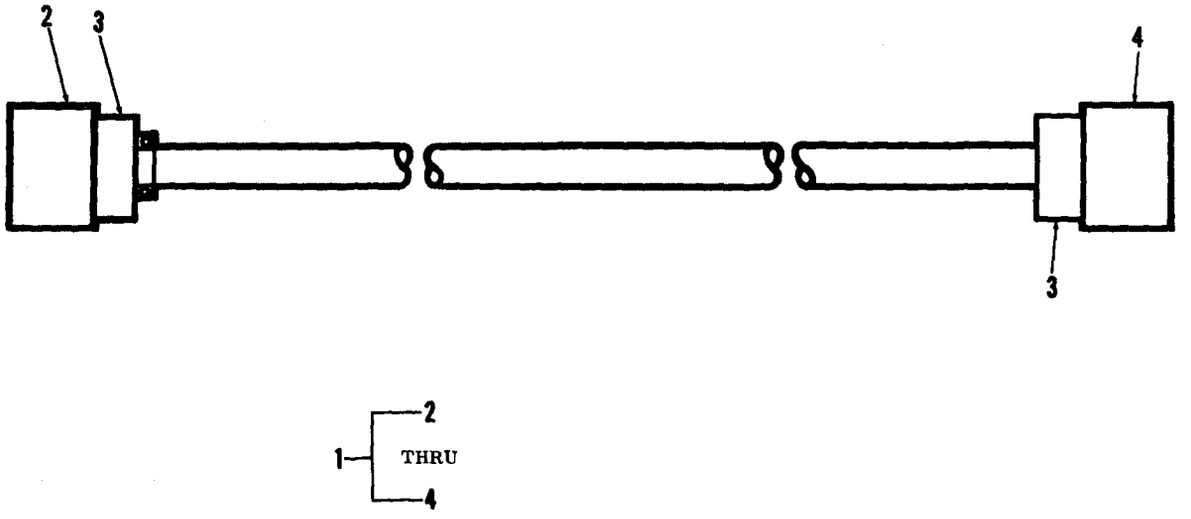


Figure 5-3. Cable Assy W4, W5, and W6

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
5-3-1	145 G5180-1	CABLE ASSY, (W4) ..... see fig 4-1 for NHA	REF	
1	145 G5181-1	CABLE ASSY, (W5) ..... see fig 4-1 for NHA	REF	
1	145G5182-1	CABLE ASSY, (W6) ..... see fig 4-1 for NHA	REF	
2	MS3476L14-19P	. CONNECTOR(W4P1), ... (u/w145G5180-1)	1	
2	MS3476L14-19PX	. CONNECTOR(W5P1), ... (u/w145G5181-1)	1	
2	MS3476L14-19PW	CONNECTOR(W6P1), ... (u/w145G5182-1)	1	
3	MS3417-14N	CLAMP, strain relief	2	
4	MS3476L14-19SX	. CONNECTOR(W4P2), ... (u/w145G5180-1)	1	
4	MS3476L14-19S	CONNECTOR(W5P2 ,W6P2), ... (u/w145G5181-1, and 145G5182-1)	1	

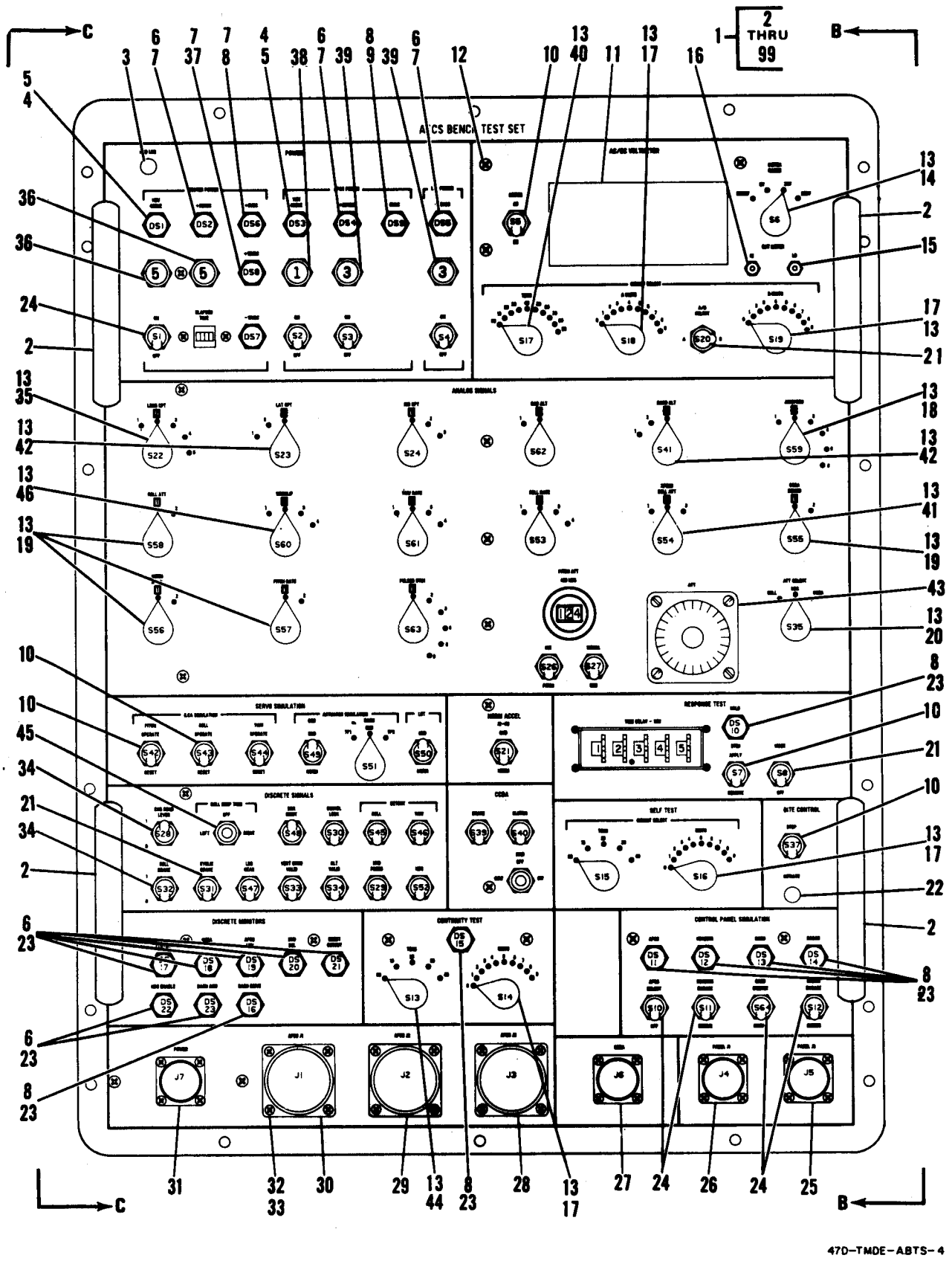


Figure 5-4. Panel Assy (Sheet 1 of 5)

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
5-4- 1	145G5200-1	PANEL ASSY,test set..... see fig 4-1 for NHA	REF	
2	459066-14	HANDLE,oval(V94580).....	4	
3	10080822-101	POST,binding(V94580).....	1	
4	440688-12	LIGHT,indicator(V94580)..... (DS1,DS3)	2	
5	M15098/11-001	LAMP,neon 115VAC NE2D..... (DS1,DS3)	2	
6	MS25237-387	LAMP,incand,28V(DS2,DS4,..... DS5,and DS17 thru DS23)	10	
7	440688-3	LIGHT,INDICATOR(DS2,and..... DS4 thru DS8)	6	
8	MS25237-381	LAMP,incand,5V(DS6,DS9,and..... DS10 thru DS16)	9	
9	440688-4	LIGHT INDICATOR(DS9).....	1	
10	MS90310-231	SWITCH,toggles(S5,S7,S26,S27,.. S39,S40,S45,S46,S30,S34,S37, S42,S43,S44,S49, and S50)	16	
11	10080816-101	PANEL,meter.....	1	
12	NAS1635-03-6	SCREW,panhead	34	
13	MS91528-1K2B	KNOB.....	25	
14	M3786/4-5041	SWITCH,rotary(S6).....	1	
15	MS16108-3A	JACK,tip,low voltage(J9).....	1	
16	MS16108-2A	JACK,tip,low voltage(J8).....	1	
17	M3786/36-0239	SWITCH,rotary(S14,S16,S18,..... and S19)	4	
18	M3786/4-5005	SWITCH,rotary(S59,S63)	2	
19	M3786/4-5001	SWITCH,rotary(S55 thru..... S58,and S62)	5	
20	M3786/4-5062	SWITCH,rotary(S35).....	1	
21	MS24524-23	SWITCH,toggle(S8,S31,S33,..... and S20)	4	
22	10080821-101	SWITCH,push-button(S36).....	1	
23	440688-6	LIGHT,indicator..... (DS10 thru DS23)	14	
24	MS24524-22	SWITCH,toggle(S1,S2,S10,..... S11,S12,and S64)	6	
25	MS3470L14-19SX	CONNECTOR(J5).....	1	
26	MS3470L14-19S	CONNECTOR(J4).....	1	
27	MS3122E14-19SW	CONNECTOR(J6).....	1	
28	MS3470L24-61SX	CONNECTOR(J3).....	1	
29	D38999/20WH35SN	CONNECTOR(J2).....	1	
30	MS3470L24-61S	CONNECTOR(J1).....	1	
31	MS3470L14-5P	CONNECTOR(J7).....	1	
32	NAS1635-04-6	SCREW,panhead.....	10	
33	MS21044-C04	NUT,self-locking.....	36	
34	MS90310-221	SWITCH,toggle(S3,S4,S28,..... S48, S32,S47,S29,S21, and S52)	9	
35	M3786/4-5015	SWITCH,rotary(S22).....	1	
36	10080928-103	CIRCUIT BREAKER(V94580),..... (CB1,CB2)	2	
37	MS25237-8918	LAMP,incand 15V(DS7,DS8).....	2	

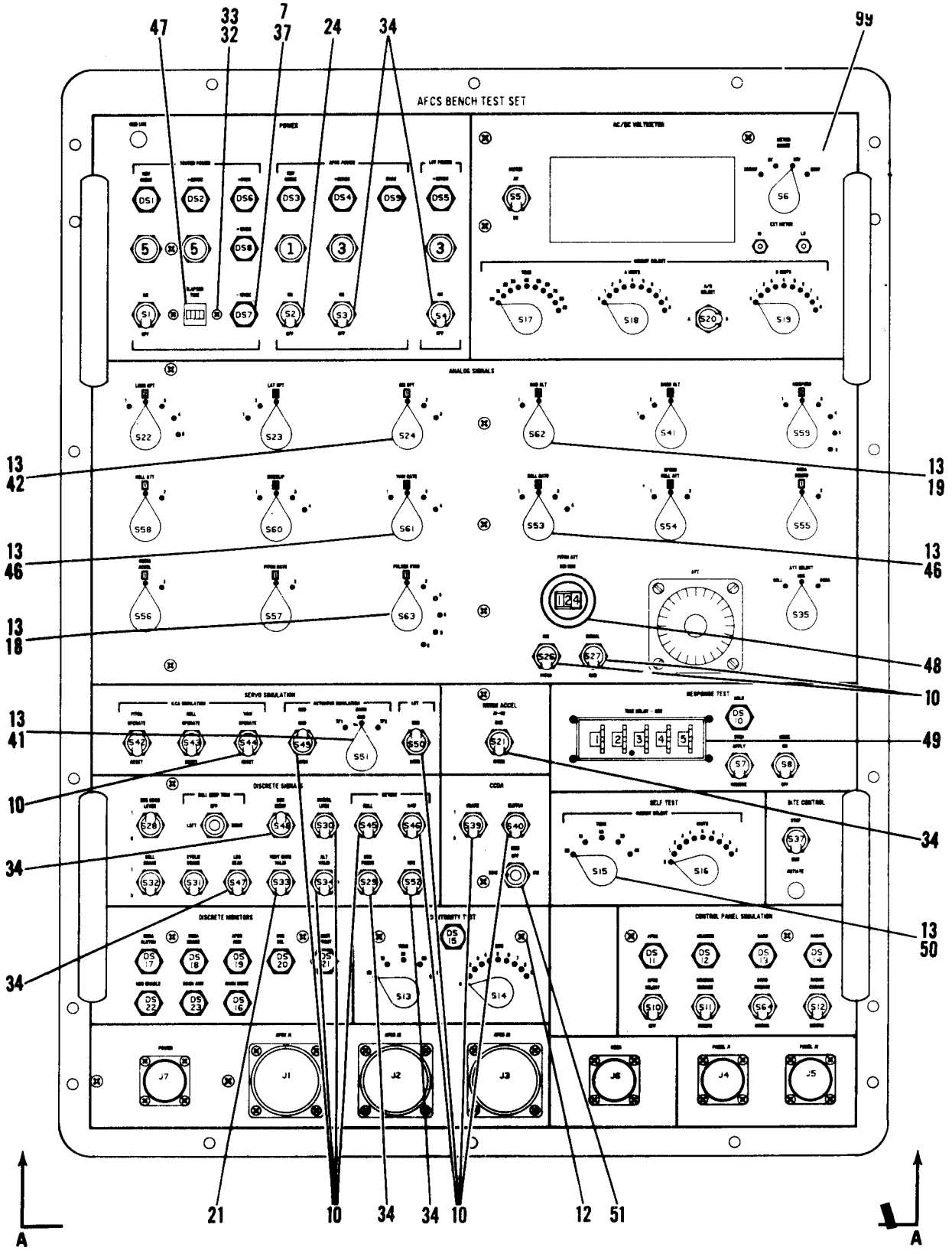
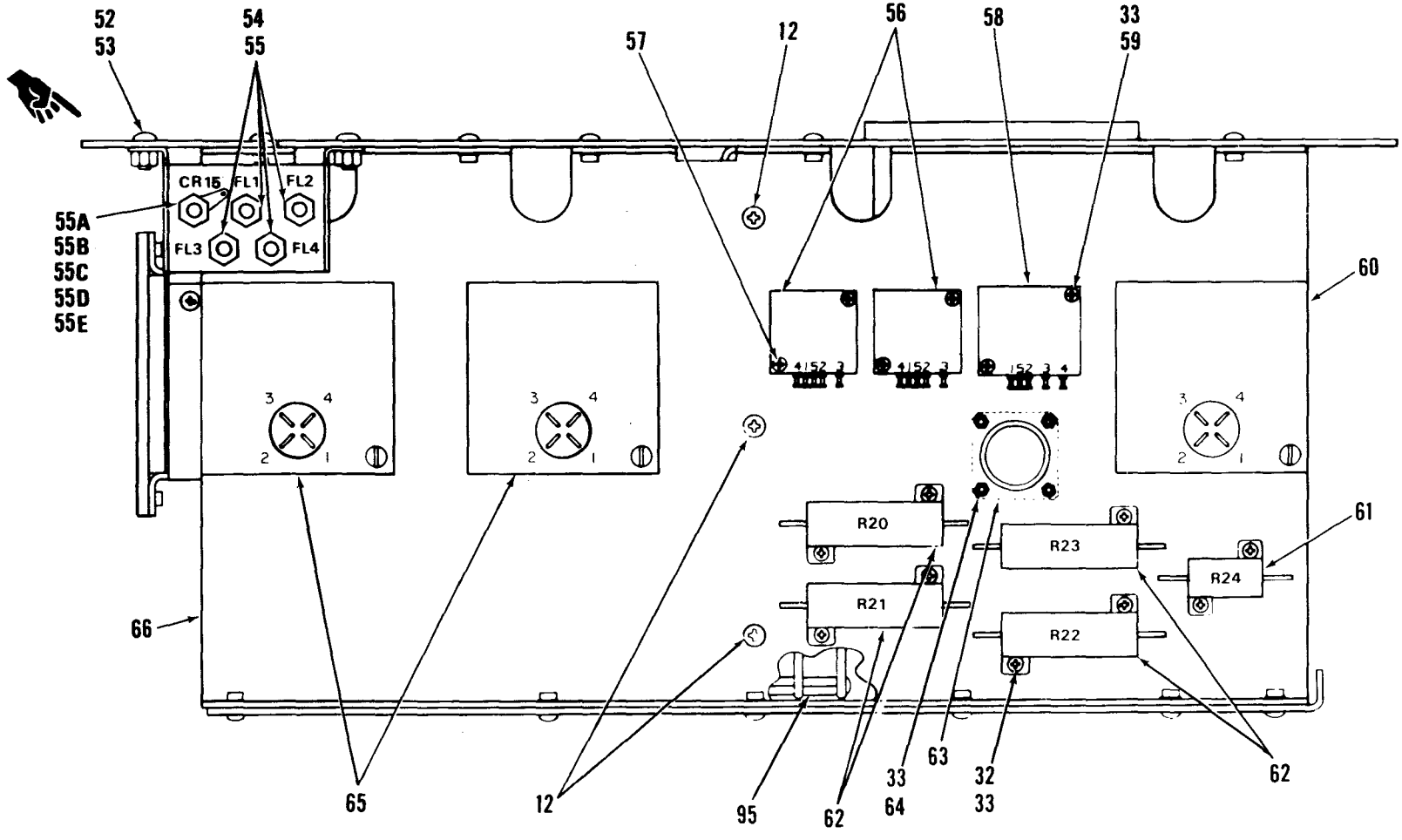


Figure 5-4. Panel Assy (Sheet 2 of 5)

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
38	10080928-101	CIRCUIT BREAKER (V94580), ... (CB3)	1	
39	10080928-102	CIRCUIT BREAKER(V94580), ... (CB4,CB5)	2	
40	M3786/36-0085	SWITCH,rotary(S17)	1	
41	M3786/4-5002	. SWITCH,rotary(S51,S54)	2	
42	M3786/4-5013	. SWITCH,rotary(S23,S24,and ..... S41)	3	

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
43	10080817-101	DIAL, SYNCHRO ASSY (V94580) ..... (B1)	1 1	
44	M3786/4-5015	SWITCH, rotary (S13)	1	
45	MS90310-271	SWITCH, toggle ((S25)	3	
46	M3786/4-5003	SWITCH, rotary (S53, S60, and ..... S61)	1	
47	MS17322-10	. METER, time totalizing (M1)	1	
48	10080532-106	. POTENTIOMETER, 10 turn ..... (V94580) (R19)	1	
49	M22710/15-425	. SWITCH, thumbwheel (S9)	1	
50	M3786/4-5059	SWITCH, rotary (S15)	1	
51	MS24524-27	SWITCH, toggle (S38)	2	
52	MS21044C08	NUT, self-locking	2	
53	NAS1635-08-8	SCREW, panhead	4	
54	10031356-101	FILTER, radio INTR (FL1, FL2, ... FL3, and FL4)	4	
55	MS25082C4	. NUT, electrical		
55A	ST990019-005	. INSULATOR	1	
55B	10021668-104	. BUSHING, INSULATOR	1	
55C	MS35650-304	NUT, PLAIN HEX	1	
55D	MS77069-1	. LUG, TERMINAL	1	
55E	1N1202A	. DIODE, CR15	1	
56	10039725-105	. TRANSFORMER 26vac (V94520), ... (T2, T3)	2	
57	NAS1635-04-20	SCREW, panhead	4	
58	10039725-107	TRANSFORMER, 5vac (T1)	1	
59	NAS1635-04-28	. SCREW, panhead	2	
60	10039731-101	. POWER SUPPLY, 5vdc (PS1)	1	
61	RER70F3010R	RESISTOR (R24)	1	
62	RER75F8R06R	RESISTOR (R20, thru R23)	4	
63	MS3120E16-26P	CONNECTOR (J11)	1	
64	NAS1635-04-5	. SCREW, panhead	20	
65	10039726-102	POWER SUPPLY, 15vdc (94580), ... (PS2, PS3)	2	
66	145G5290-1	SUPPORT, pwr supply	1	
67	NAS1635-06-6	. SCREW, panhead	26	
68	145G5293-1	BRACKET, meter	1	
69	10080929-101	CONNECTOR, card ..... (V94580) (P12)	1	
70	10028712-101	KEY, connector (V94580) ..... (VS20, S21)	2	
71	10080929-102	CONNECTOR, card (V94580) ..... (P13)	1	
72	145G5297-1	TERMINAL BOARD ASSY (TB1)	1	
73	145G5298-1	. TERMINAL BOARD ASSY (TB2)	1	
74	145G5299-1	TERMINAL BOARD ASSY (TB3)	1	
75	145G5300-1	. TERMINAL BOARD ASSY (TB4)	1	
76	MS3126E16-26S	. PLUG (P11)	1	
77	145G5295-1	PLATE CONNECTOR	2	
78	D922673-5	NUT, self-locking	10	
79	NAS1635-02-5	. SCREW, panhead	10	



VIEW A-A

Figure 5-4. Panel Assy (Sheet 3 of 5)

FIGURE		DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
80	M55302/27-06	CONNECTOR,card(P14 thru P18)	5	
81	414 G5217-1	RETAINER,card	2	
82	145 G5186-1	CARD ASSY,pitch,roll and yaw servo simulator,circuit (A1)	1	
83	145 G5198-1	CARD ASSY,ac stimulus,circuit (A5) ..	1	
84	145G5192-1	CARD ASSY,dc stimulus, circuit(A3)	1	
85	145 G5196-1	CARD ASSY,sample and hold,circuit(A4)	1	
86	145G5189-1,-3	CARD ASSY,ICT,CCD,and dash servo simulator,circuit (A2)	1	
87	145G5218-1	TOP,card cage	2	
88	234G5219-1	BASE,card cage	2	
89	NAS1786A08-40	POST,spacer	2	
90	NAS1786A08-30	POST,spacer	2	
91	145G5294-1	BRACKET,filter	1	
92	145G5291-1	SUPPORT,meter	1	
93	NAS1635-3-4	SCREW,panhead	12	
94	MS35335-60	WASHER,lock	12	
95	10073031-103	STANDOFF	16	
96	145G5292-1	SUPPORT,chassis	1	
97	145G5296-1	PLATE,bottom	1	
98	MS24693-272	SCREW,flat head	8	
99	145G5203-1	PANEL	1	

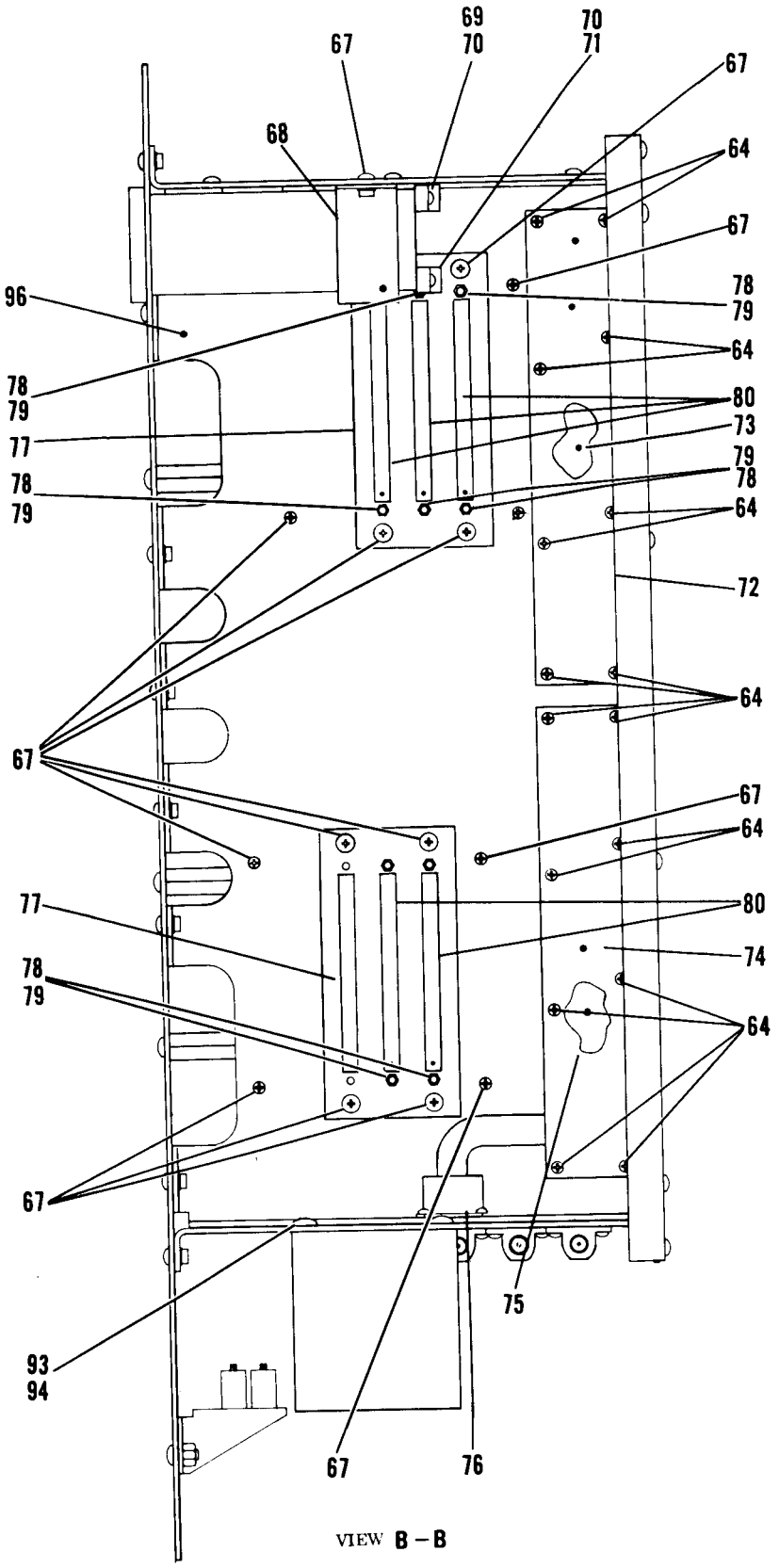


Figure 5-4. Panel Assy (Sheet 4 of 5)

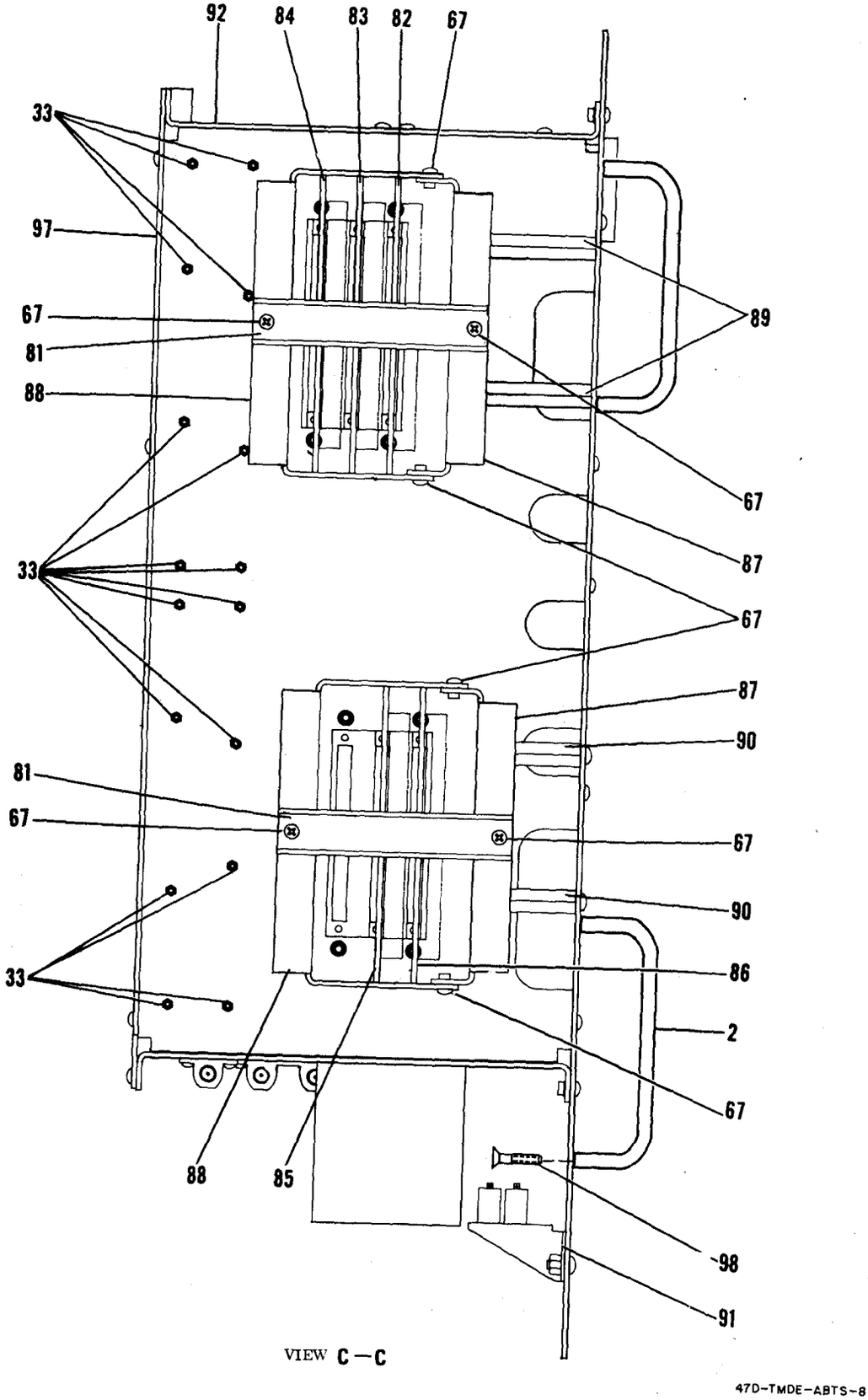


Figure 54. Panel Assy (Sheet 5 of 5)

APPENDIX A

REFERENCES

Following is a list of references available to the organizational and intermediate repairman of AFCS Bench Test Set.

DA PAM 310-1	Consolidated Index of Army Publications and Blank Forms
DA PAM 738-751	Functional Users Manual for The Army Maintenance Management System - Aviation (TAMMS-A)
FM21-11	First Aid Soldiers
TB 750-25-1	Maintenance of Supplies and Equipment Army Metrology and Calibration System
TM 38-750	Army Equipment Record Procedures
TM 43-0139	Painting Instruction for Field Use
TM 55-1500-204-25/1	General Aircraft Maintenance Manual
TM 55-1500-323-25	Organizational, Direct Support, General Support and Depot Maintenance Manual: Installation Practices for Aircraft Electric and Electronic Wiring
TM 55-1520-240-23	AVUM and AVIM Maintenance Manual, CH-47D Helicopter
TM 55-4920-430-30P	AFCS Bench Test Set Repair Parts and Special Tools List
TM 740-90-1	Administrative Storage of Equipment
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use

APPENDIX B

MAINTENANCE ALLOCATION CHART

SECTION I INTRODUCTION

B-1. MAINTENANCE ALLOCATION A CHART.

a. This Maintenance Allocation Chart (MAC) assigns maintenance functions in accordance with the Three Levels of Maintenance concept for army aircraft. These maintenance levels: Aviation Unit Maintenance (AVUM), Aviation Intermediate Maintenance (AVIM), and Depot Maintenance are depicted on the MAC as:

AVUM which corresponds to the O code in the Repair Parts and Special Tools List (RPSTL).

AVIM which corresponds to the F code in the Repair Parts and Special Tools List (RPSTL).

Depot which corresponds to the D code in the Repair Parts and Special Tools List (RPSTL).

b. The maintenance to be performed below depot and in the field is described as follows:

(1) Aviation Unit Maintenance (AVUM). AVUM activities will be staffed and equipped to perform high frequency *On-Equipment* maintenance tasks required to retain or return equipment to a serviceable condition. The maintenance capability of the AVUM will be governed by the MAC and limited by the amount and complexity of support equipment, facilities required, and number of spaces and critical skills available. The range and quantity of authorized spare modules/components will be consistent with the mobility requirements dictated by the air mobility concept.

(2) Aviation Intermediate Maintenance (AVIM). AVIM provides mobile, responsive *One Stop* maintenance support. (Maintenance functions which are not conductive to sustaining air mobility will be assigned to depot maintenance.) Performs all maintenance functions authorized to be done at AVUM. Repair of equipment for return to user will emphasize support or operational readiness requirements. Authorized maintenance includes replacement and repair of modules/components and end items which can be accomplished efficiently with available skills, tools, and equipment. Establishes the Direct Exchange (DX) program for AVUM units by repairing selected items for return to stock when such repairs cannot be accomplished at the AVUM level. Inspects, troubleshoots, tests, diagnoses, repairs, adjusts, calibrates, and aligns system modules/components. Module/component disassembly and repair will support the DX program and will normally be limited to tasks requiring cleaning and the replacement of seals, fittings and items of common hardware. Unserviceable reparable modules/components and end items which are beyond the capability of AVIM to repair will be evacuated to Depot Maintenance. This level will perform special inspections which exceed AVUM capability. Provides quick response maintenance support, on-the-job training, and technical assistance through the use of mobile maintenance contact teams. Maintenance authorized operational readiness float. Provides collections and classification services for serviceable/unserviceable material. Operates a cannibalization activity in accordance with AR 750-50.

(3) At AVIM level, complex electronic repair and testing are performed by Calibration Repair Center (CRC) Personnel of the Army TMDE Support Team (ATST).

B-2. Use of the Maintenance Allocation Chart.

a. The MAC assigns maintenance functions to the lowest level of maintenance based on past experience and the following considerations:

(1) Skills available.

(2) Time required.

(3) Tools and test equipment required and/or available.

b. Only the lowest level of maintenance authorized to perform a maintenance function is indicated. If the lowest level of maintenance cannot perform all tasks of any single maintenance function (e.g., test, repair), then the higher maintenance level(s) that can accomplish additional tasks will also be indicated.

c. A maintenance function assigned to a maintenance level will automatically be authorized to be performed at any higher maintenance level.

d. A maintenance function that cannot be performed at the assigned level of maintenance for any reason may be evacuated to the next higher maintenance organization. Higher maintenance levels will perform the maintenance functions of lower maintenance levels when required or directed by the appropriate commander.

e. The assignment of a maintenance function will not be construed as authorization to carry the associated repair parts in stock. Authority to requisition, stock, or otherwise secure necessary repair parts will be as specified in the repair parts and special tools list appendix.

f. Normally there will be no deviation from the assigned level of maintenance. In cases of operational necessity, maintenance functions assigned to a maintenance level may, on a one-time basis and at the request of the lower maintenance level, be specifically authorized by the maintenance officer to the level of maintenance to which the function is assigned. The special tools, equipment, etc., required by the lower level of maintenance to perform this function will be furnished by the maintenance level to which the function is assigned. This transfer of a maintenance function to a lower maintenance level does not relieve the higher maintenance level of the responsibility of the function. The higher level of maintenance has the authority to determine:

(1) If the lower level is capable of performing the work.

(2) If the lower level will require assistance or technical supervision and on-site inspection.

(3) If the authorization will be granted.

g. Changes to the MAC will be based on continuing evaluation and analysis by responsible technical personnel and on reports received from field activities.

B-3. Definitions.

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

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

c. Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents and air.

d. Adjust. To rectify to the extend necessary to bring into proper operating range.

e. Align. To adjust specified variable elements of an item to bring to optimum performance.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise 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 or test equipment being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an emplacement, site or vehicle.

b. ***Replace.*** To replace unserviceable items with serviceable assemblies, subassemblies or parts.

i. ***Repair.*** To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

j. ***Overhaul.*** To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards prepared and published for the specific item to be overhauled.

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

B-4. Functional Groups. Group numbers correspond to the breakdowns in Repair Parts and Special Tools List (RPSTL) TM 55-4920-430-30P

B-5. Maintenance Categories and Work Times. The maintenance categories (levels) AVUM, AVIM, and DEPOT are listed on the Maintenance Allocation Chart with individual columns that indicate the work times for maintenance functions at each maintenance level. Work time presentations such as 0.1 indicate the average time it requires a maintenance level to perform a specified maintenance function. If a work time has not been established, the columnar presentation shall indicate "-.-". Maintenance levels higher than the level of maintenance indicated are authorized to perform the indicated function.

B-6. Tools and Test Equipment (Section III). Common tool sets (not individual tools), special tools, test and support equipment required to perform maintenance functions are listed alphabetically with a reference number to permit cross-referencing to column 5 in the MAC. In addition, the maintenance category authorized to use the device is listed along with the item National Stock Number (NSN) and, if applicable, the tool number to aid in identifying the tool/device.

MAINTENANCE ALLOCATION CHART
SECTION II

NOMENCLATURE OF END ITEMS
AFCS BENCH TEST SET 145G0008-1

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category AVUM	AVIM	DEPOT	(5) Tools and Equipment	(6) Remarks
01	AFCS BENCH TEST SET						
02	CABLE ASSEMBLIES						
	Connector	Inspect		—			
		Test		—		1	
		Replace		—		8	
		Repair		—		8,9	
	Cable	Inspect		—			
		Test		—		1	
		Replace		—		8	
		Repair		—		8,9	
03	PANEL ASSEMBLY						
	Knobs	Inspect		—			
		Replace		—		8	
	Lamps	Inspect		—			
		Replace		—			
	Light Assembly	Inspect		—*			
		Test		—*		1	
		Replace		—*		8	
		Repair		—*		8	
	AC/DC Voltmeter	Inspect		—*			
		Test		—*		1,5,7	
		Adjust		—*		1,8	
		Calibrate		—*		1,5,7	
		Replace		—*		8	
		Repair			—		
	Power Supplies	Inspect		—*			
		Test		—*		1	
		Adjust		—*		1,8	
		Calibrate		—*		1,8	
		Replace		—*		8	
		Repair			—		
	Transformer	Inspect		—*			
		Test		—*		1	
		Replace		—*		8	
	Switches	Inspect		—*			
		Test		—*		1	
		Replace		—*		8	

MAINTENANCE ALLOCATION CHART
SECTION II

NOMENCLATURE OF END ITEMS

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category AVUM	AVIM	DEPOT	(5) Tools and Equipment	(6) Remarks
	Circuit Breaker	Inspect		-.-*			
		Test		-.-*		1	
		Replace		-.-		8	
	Circuit Board Assembly	Inspect		-.-*			
		Test		-.-*		1,2,3,4, 5,6,7,10, 11,12	
		Replace		-.-*	-.-	8	
		Repair					
	Dial, Synchro Assembly	Inspect		-.-*			
		Test		-.-*		1,2	
		Adjust		-.-*		1,2	
		Calibrate		-.-*		1,2	
		Replace		-.-*		8	
	Potentiometer, 10-Turn	Inspect		-.-*			
		Test		-.-*		1	
		Replace		-.-*		8	
	Filter, Radio Intrf	Inspect		-.-			
		Test		-.-		1	
		Replace		-.-		8	
	Diode CR15	Inspect		-.-*			
		Test		-.-*		1	
		Replace		-.-*		8	
	Connector, Card	Inspect		-.-			
		Test		-.-		1	
		Replace		-.-		8	
	Wire	Inspect		-.-*			
		Test		-.-*		1	
		Replace		-.-*		8	
		Repair		-.-*		8,9	

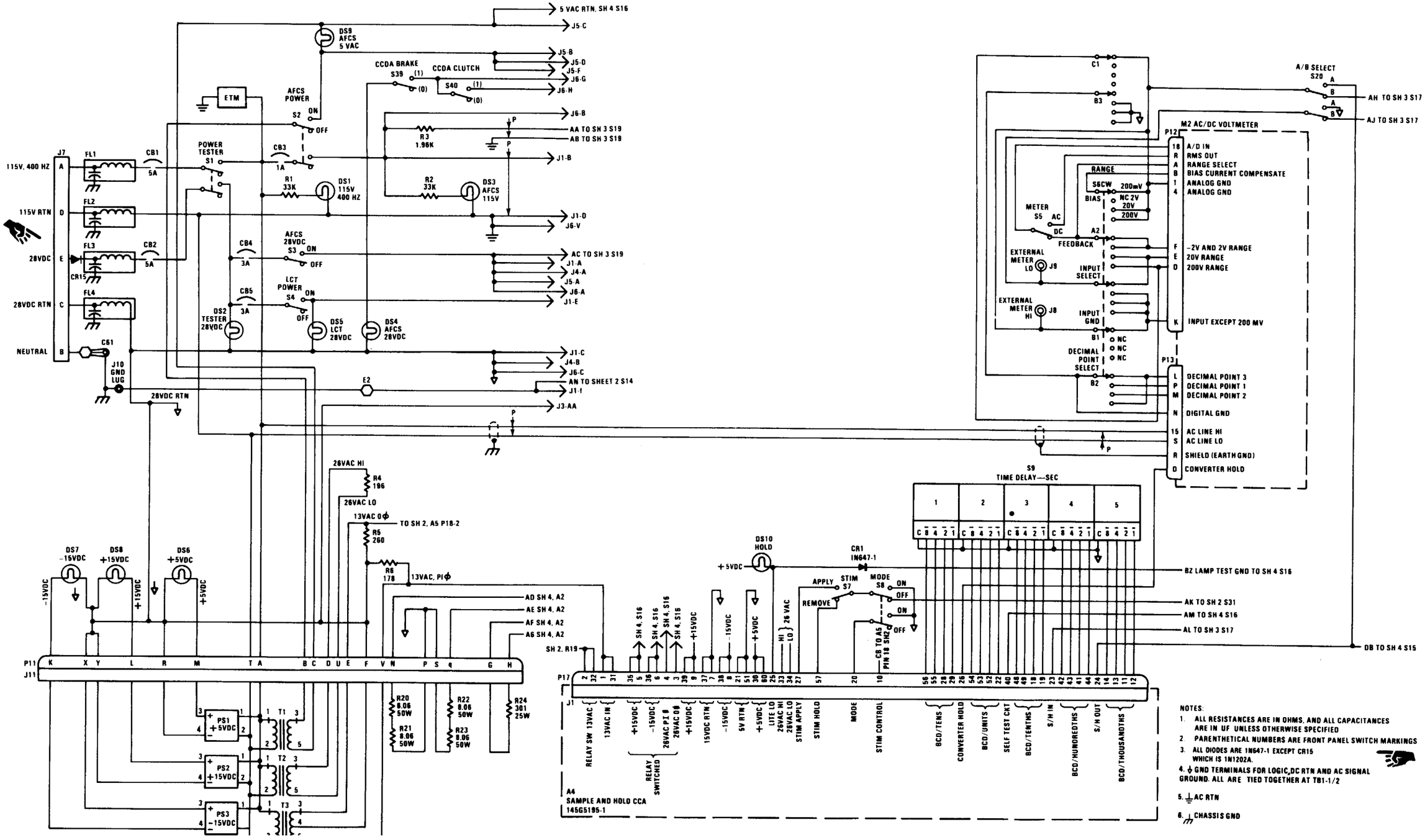
SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS FOR AFCS BENCH TEST SET 145G0008-1

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	F	Digital Multimeter (2), Fluke 8800A or equal		
2	F	Oscilloscope, Tektronix 5440 W/plug in 5S-14N or equal		
3	F	Decade Capacitance Box, Biddle Gray 1192B or equal		
4	F	Frequency Counter/Timer, General Radio or equal		
5	F	Dc Power Supply 0-36V (2), NJE CS36CR30 or equal		
6	F	Function Generator, Wavetek 186 or equal		
7	F	Ac Power Supply 400 Hz NH Research SF613 or equal		
8	F	Tool Kit electronic Equipment TK-100/G	5180-00-605-0079	
9	F	Crimping Tool	5120-00-075-2544	
10	F	Signal Test Aid (fig. 4-10)		
11	F	Resistance Test Aid (fig. 4-10)		
12	F	Stop Watch, 0.1 Sec Min		
13	F	Static Inverter PC-17A		

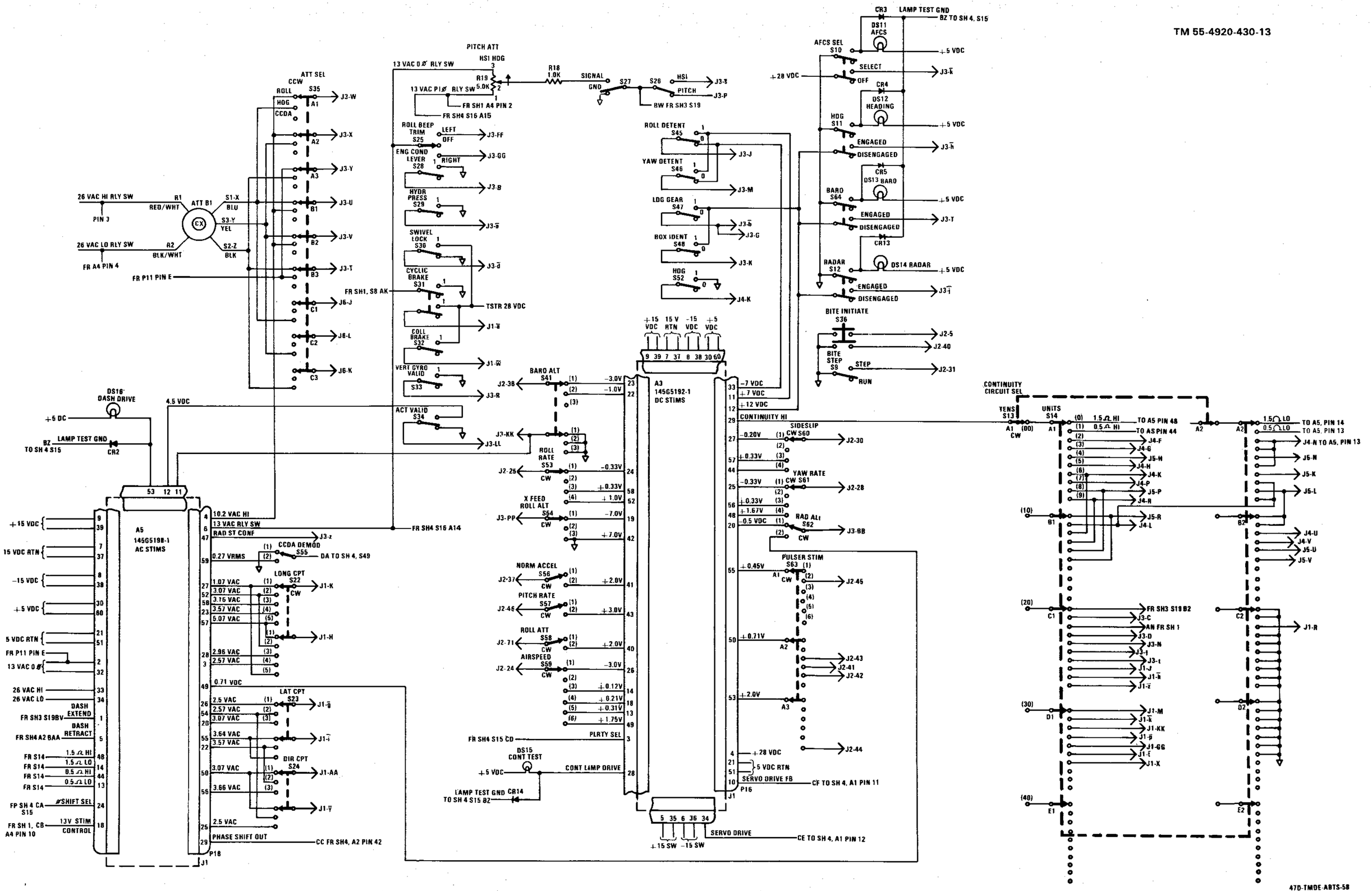
*U.S. Government Printing Office:1989-654-031/55085 PIN: 054103-002

ALPHABETICAL INDEX

D

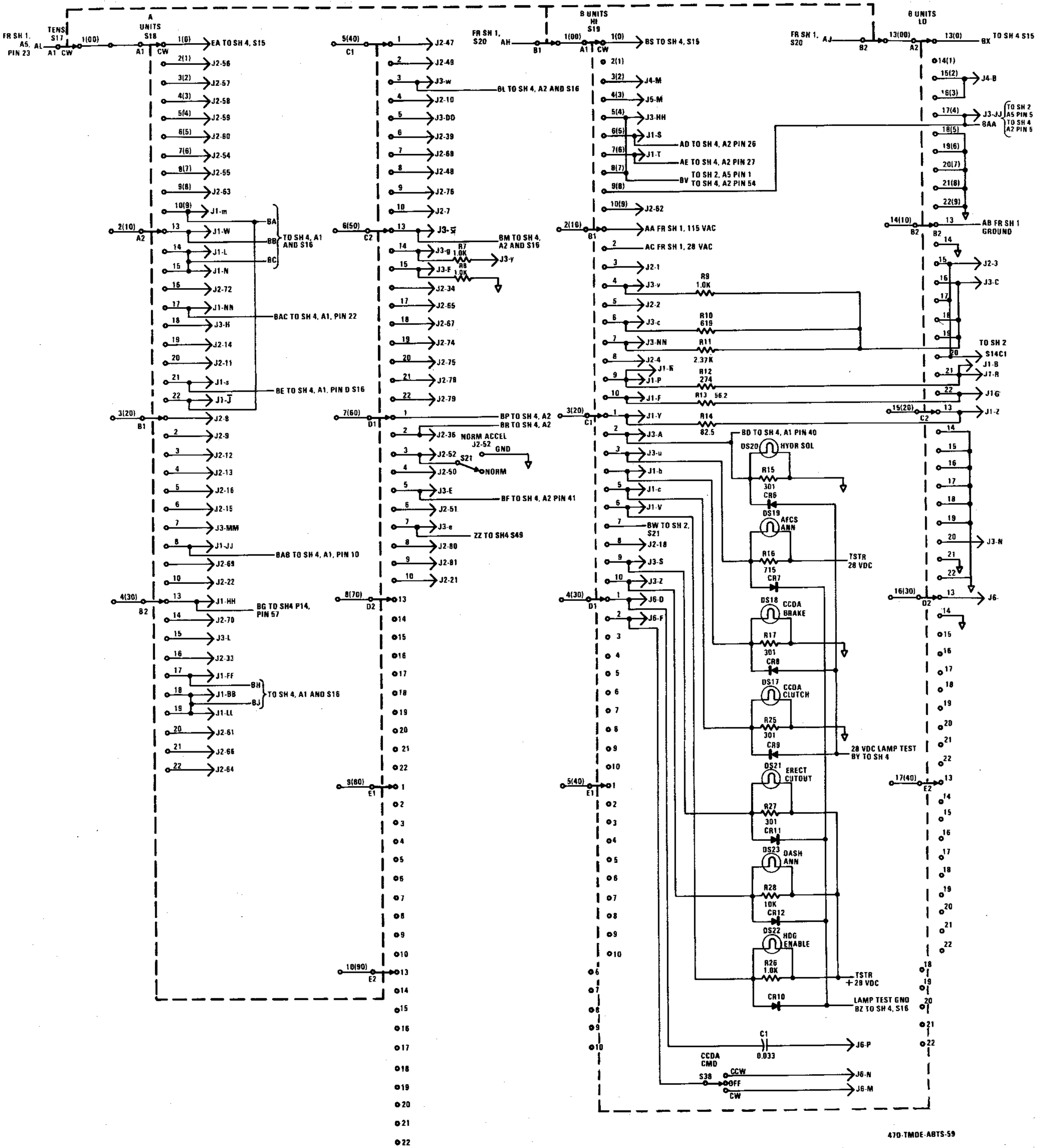


FO-1 AFCS Bench Test Set Schematic Diagram
(Sheet 1 of 4)

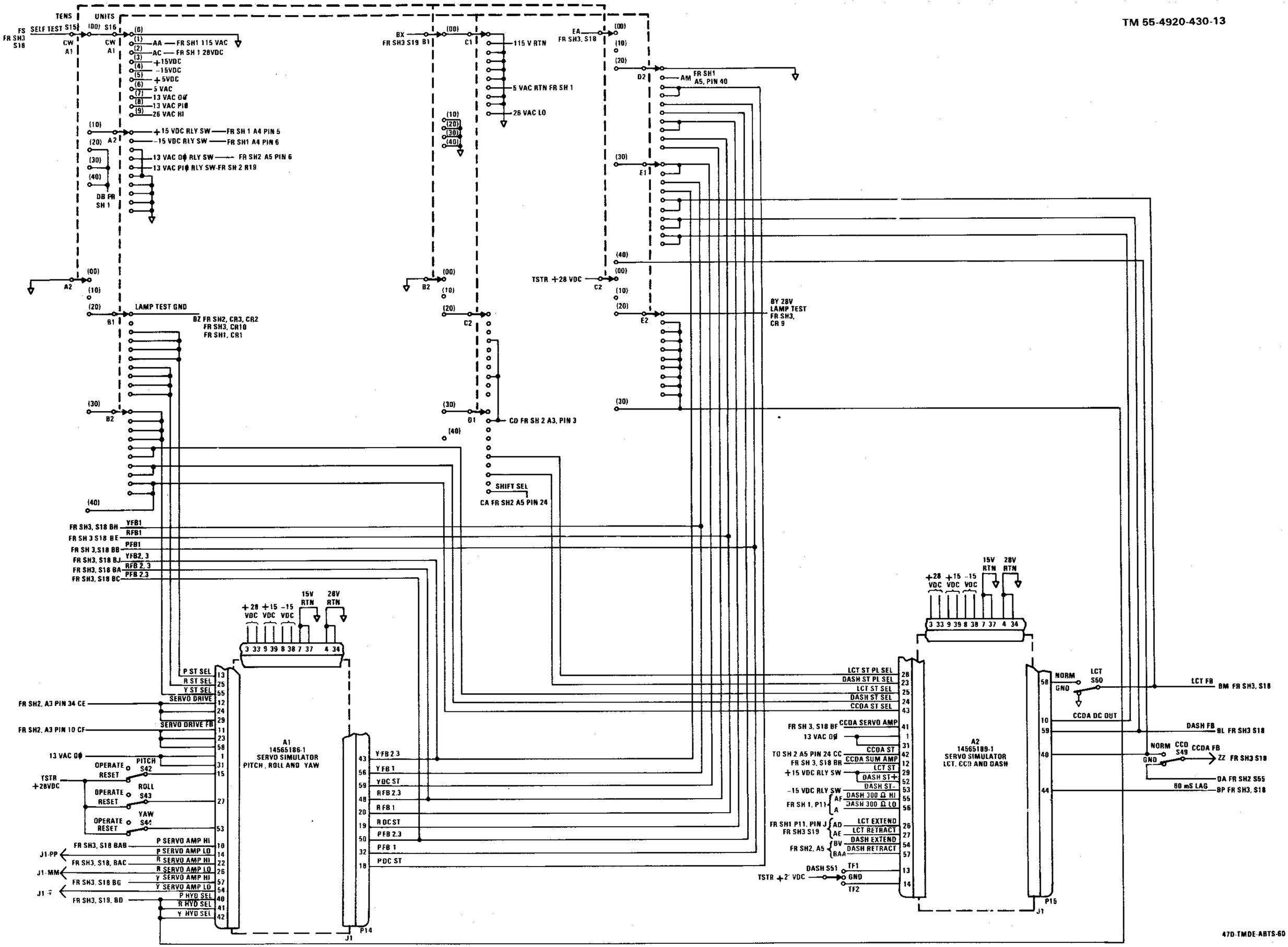


FO-1. *AFCS Bench Test Set Schematic Diagram (Sheet 2 of 4)*

47D-TMDE-ABTS-58



FO-1. *AFCS Bench Test Set Schematic Diagram (Sheet 3 of 4)*



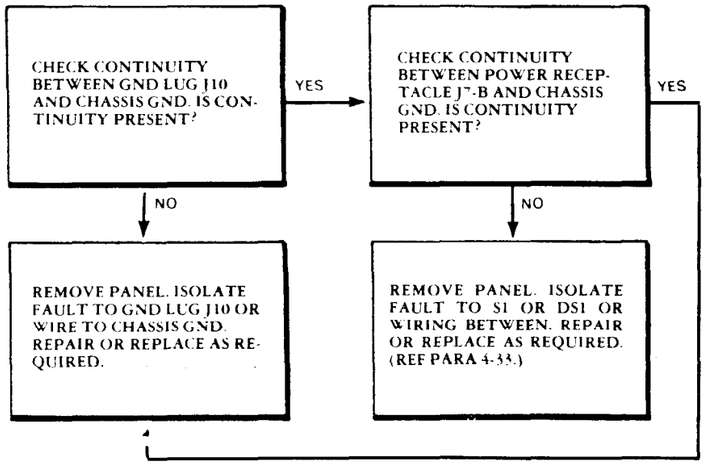
FO-1. *AFCS Bench Test Set Schematic Diagram (Sheet 4 of 4)*

4-3. Resistance and Continuity Troubleshooting.

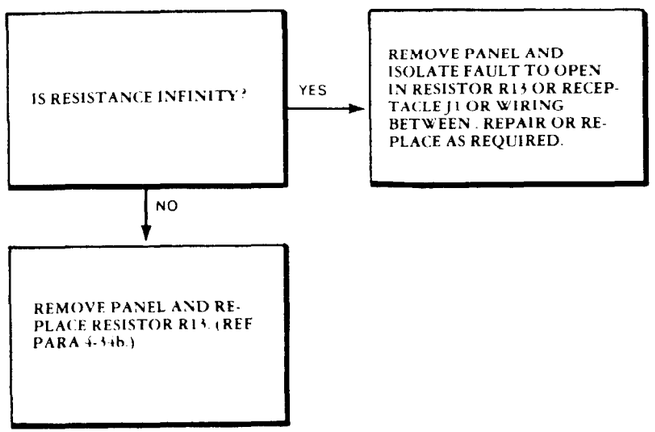
a. Resistance higher than 1 ohm between power receptacle J7 and GND lug J10.

NOTE

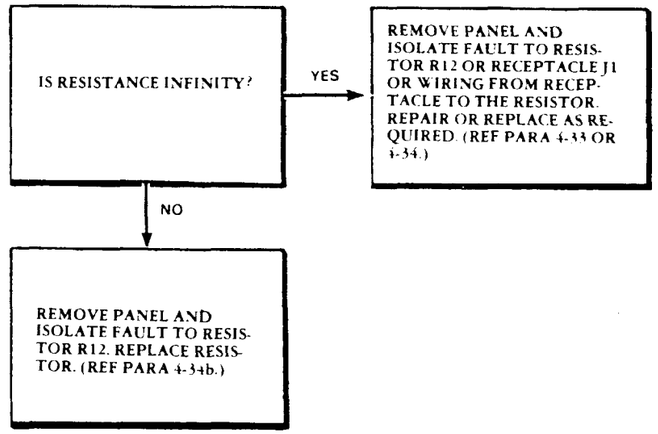
Receptacles J1, J2, and J3 are marked AFCS.



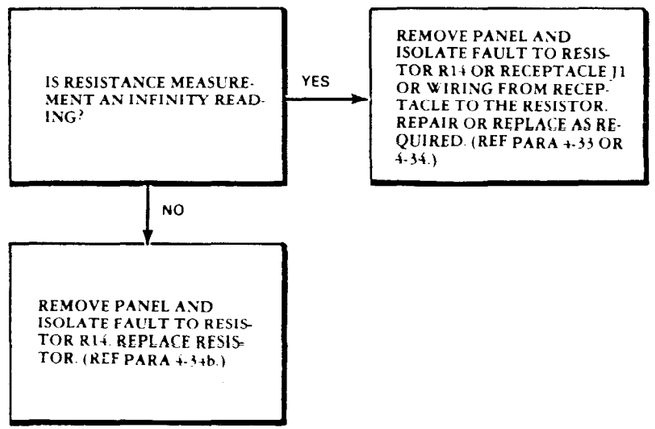
b. Resistance between receptacle J1 pins F and G not within tolerance.



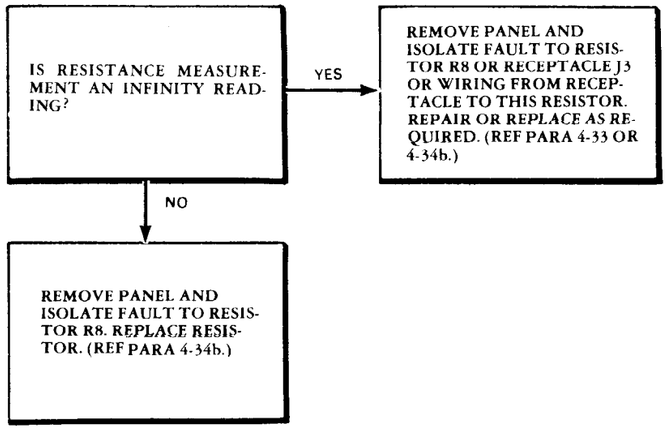
c. Resistance between receptacle J1 pins P and R is not within tolerance.



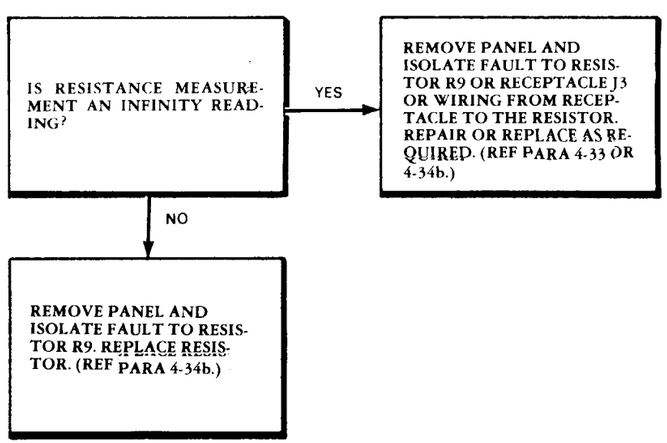
d. Resistance between receptacle J1 pins, Y and Z is not within tolerance.



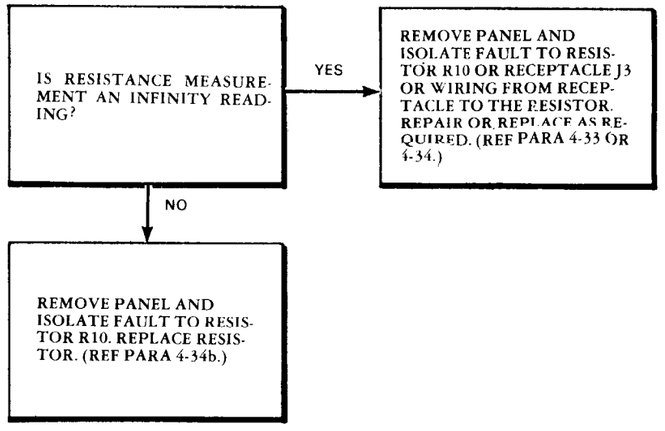
e. Resistance between receptacle J3, pins F and AA is not within tolerance.



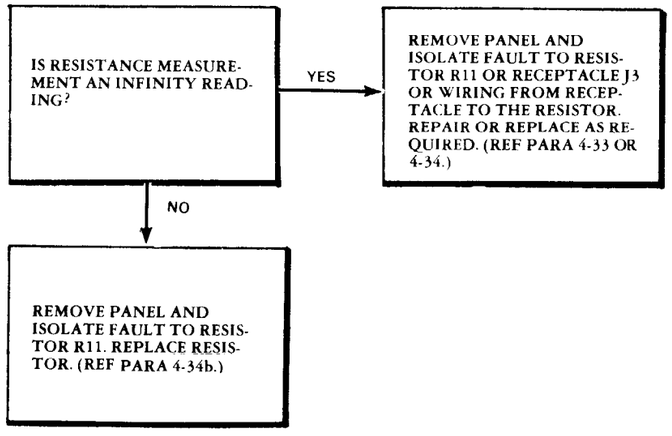
f. Resistance between receptacle J3, pins v and C. is not within tolerance.



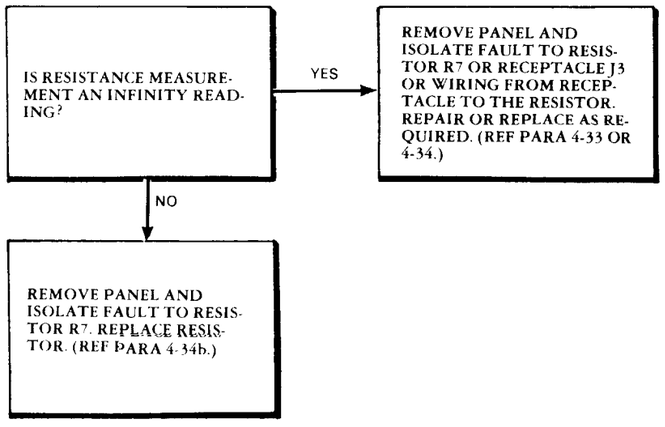
g. Resistance between receptacle J3, pins c and C is not within tolerance.



h. Resistance between receptacle J3, pins NN and C is not within tolerance.

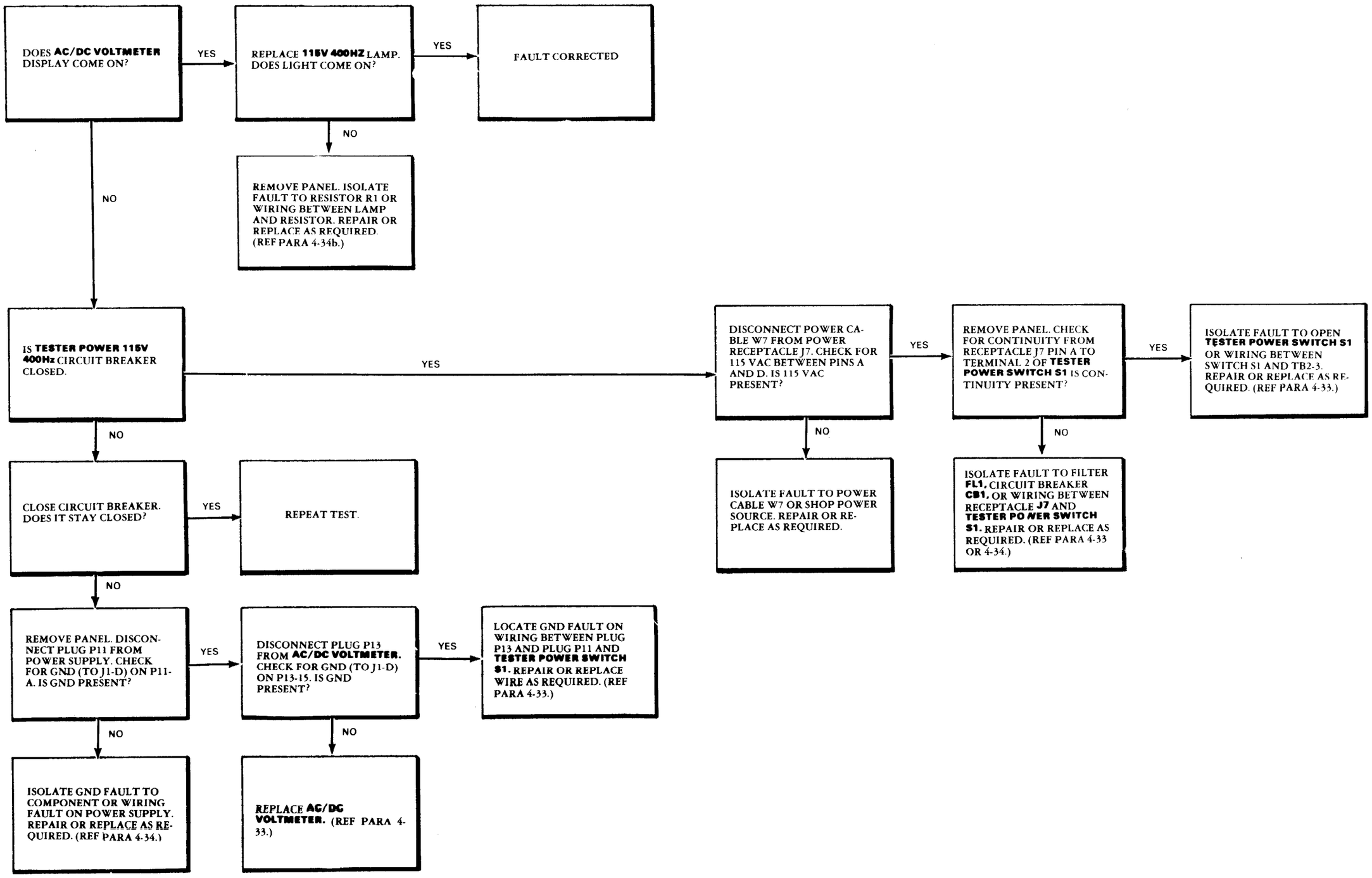


i. Resistance between receptacle J3, pins g and y. is not within tolerance.

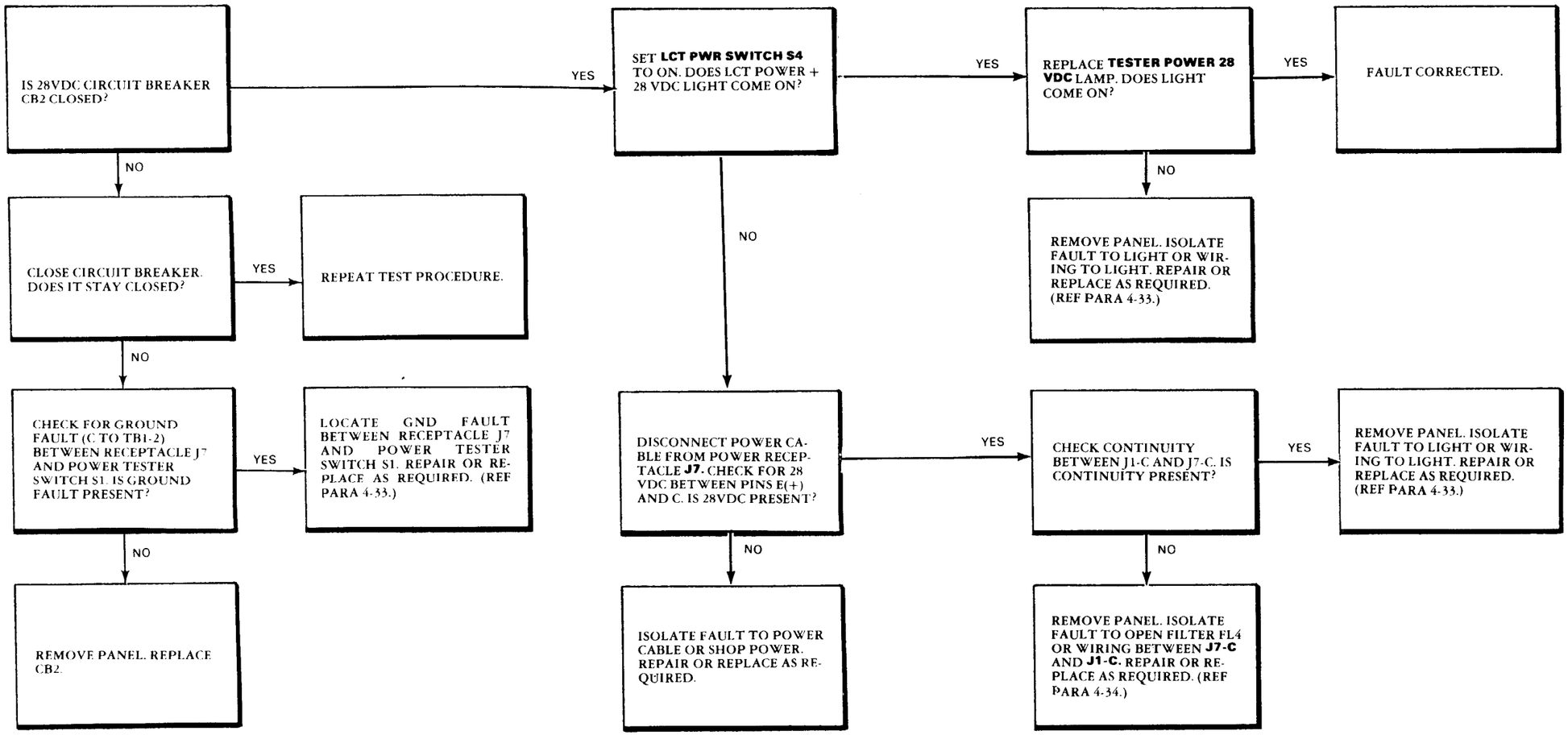


4-4. Power Section Circuit Troubleshooting.

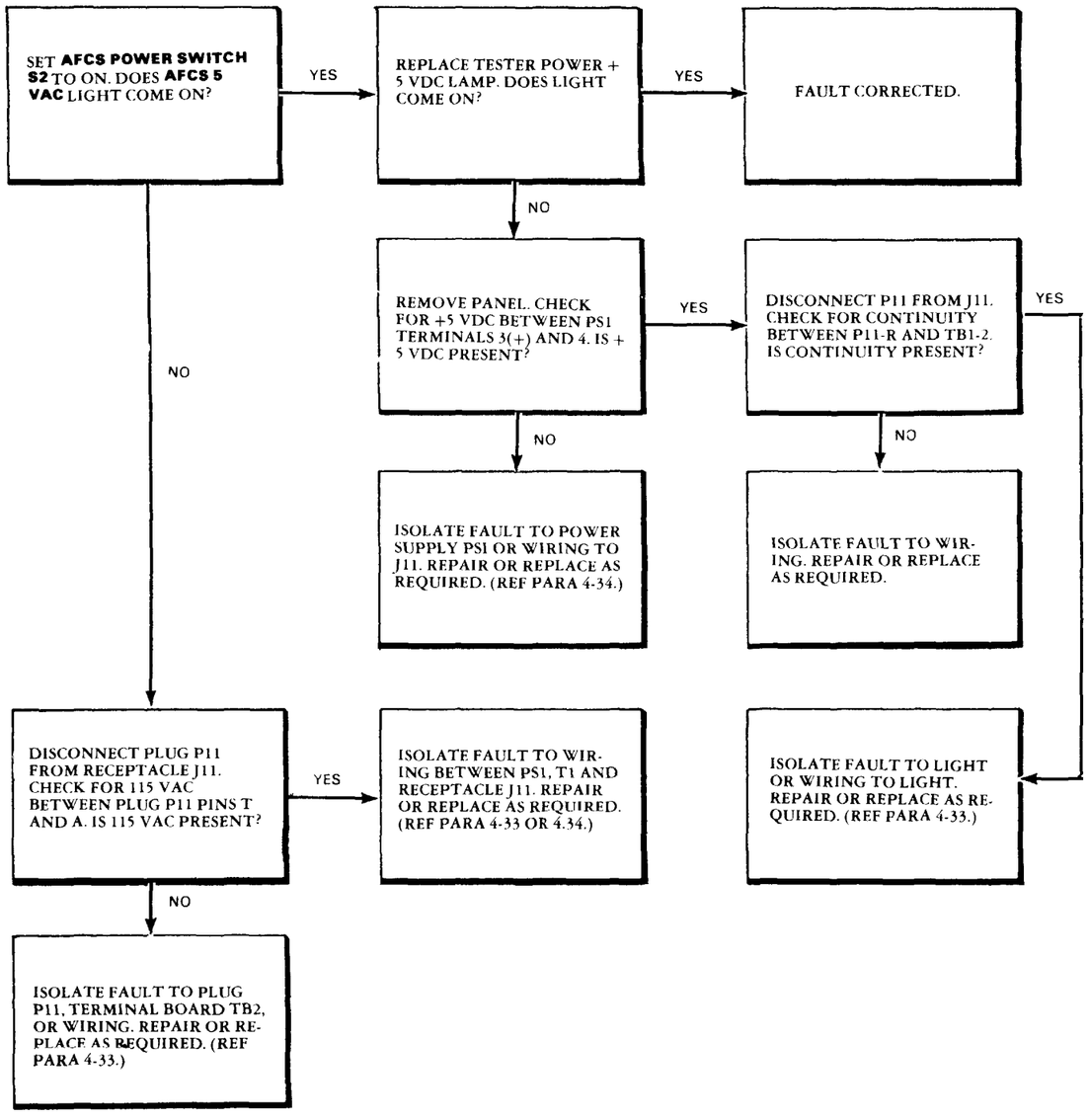
a. TESTER POWER 115V 400 Hz light does not come on.



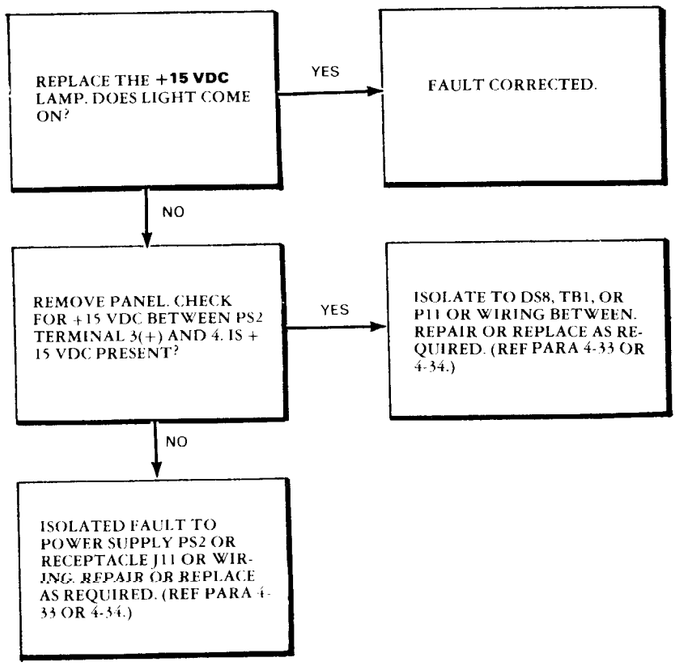
b. TESTER POWER +28 VDC light does not come on.



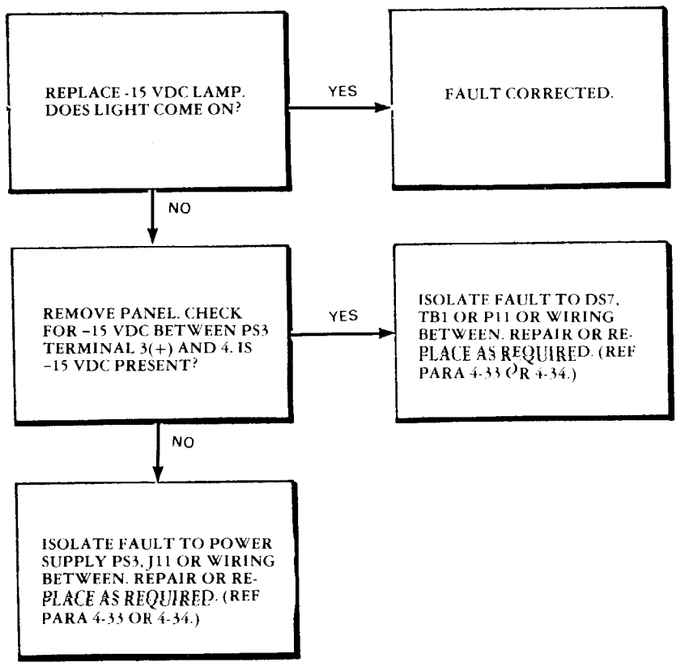
c. TESTER POWER +5 VDC light does not come on.

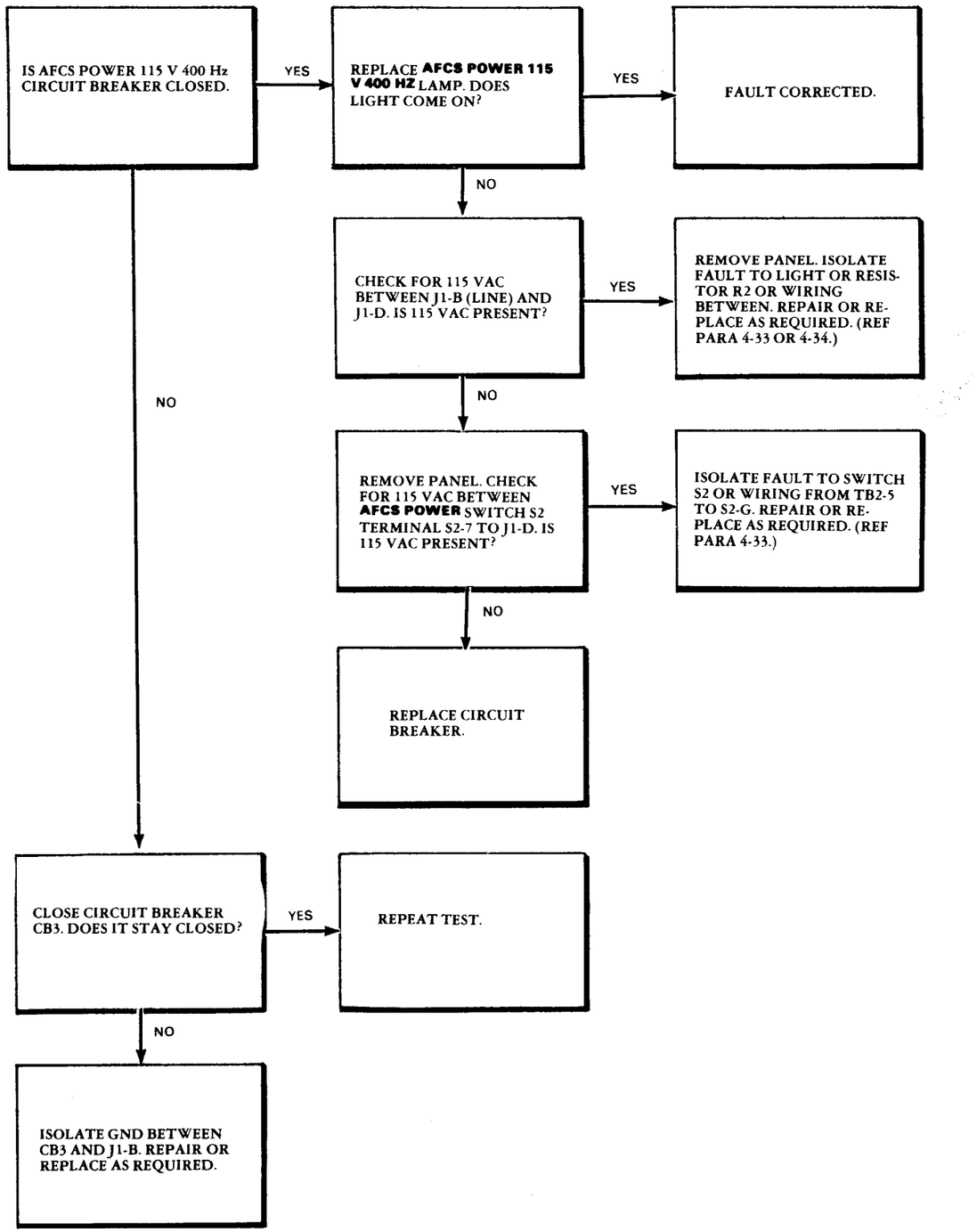


d. TESTER POWER +15VDC light does not come on.



e. TESTER POWER -15VDC light does not come on.

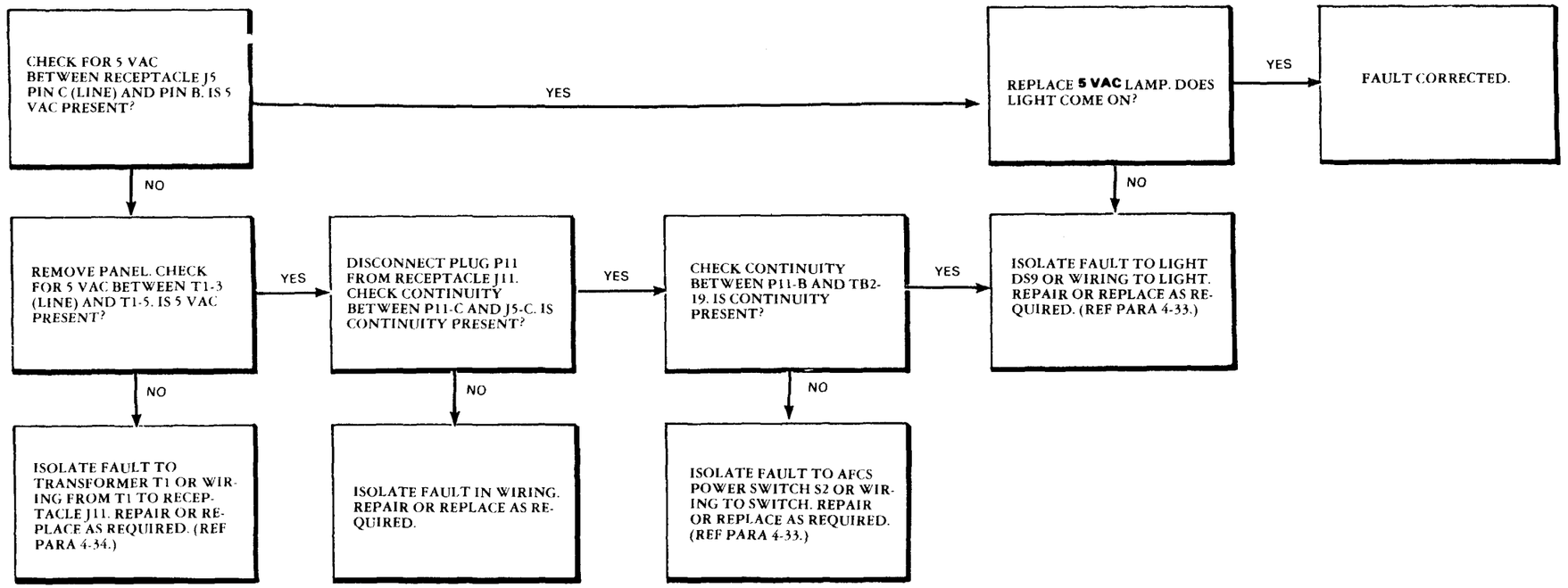



IS AFCS POWER 115 V 400 Hz CIRCUIT BREAKER CLOSED.
YES
REPLACE AFCS POWER 115 V 400 HZ LAMP. DOES LIGHT COME ON?
YES
FAULT CORRECTED.
NO
CHECK FOR 115 VAC BETWEEN J1-B (LINE) AND J1-D. IS 115 VAC PRESENT?
YES
REMOVE PANEL. ISOLATE FAULT TO LIGHT OR RESISTOR R2 OR WIRING BETWEEN. REPAIR OR REPLACE AS REQUIRED. (REF PARA 4-33 OR 4-34.)
NO
NO
REMOVE PANEL. CHECK FOR 115 VAC BETWEEN AFCS POWER SWITCH S2 TERMINAL S2-7 TO J1-D. IS 115 VAC PRESENT?
YES
ISOLATE FAULT TO SWITCH S2 OR WIRING FROM TB2-5 TO S2-G. REPAIR OR REPLACE AS REQUIRED. (REF PARA 4-33.)
NO
REPLACE CIRCUIT BREAKER.
CLOSE CIRCUIT BREAKER CB3. DOES IT STAY CLOSED?
YES
REPEAT TEST.
NO
ISOLATE GND BETWEEN CB3 AND J1-B. REPAIR OR REPLACE AS REQUIRED.

g. AFCS POWER 5VAC light does not come on.

NOTE

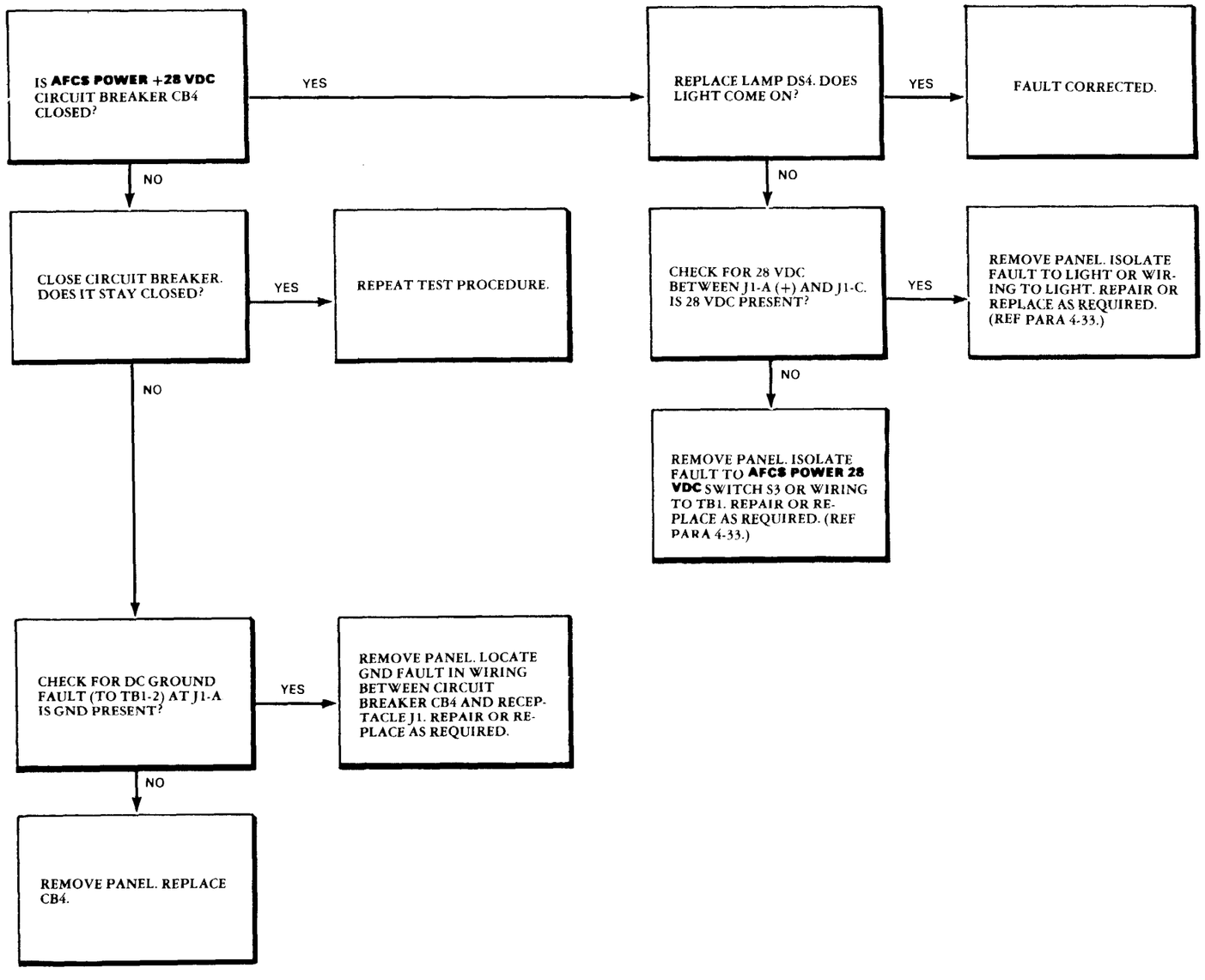
J5 is marked PANEL J2.



h. 112.5 to 117.5 VAC is not present between receptacle J1 pin B to pin D. Remove panel. Isolate fault to wiring or receptacle J1. Repair or replace as required. (Ref para 4-33.)

i. 4.5 to 5.5 VAC is not present at receptacle J5 pins B (line), D (line), F (line) to C. Remove panel. Isolate fault to wiring or receptacle J5. Repair or replace as required. (Ref para 4-33.)

j. AFCS power +28 VDC light DS4 does not come on.



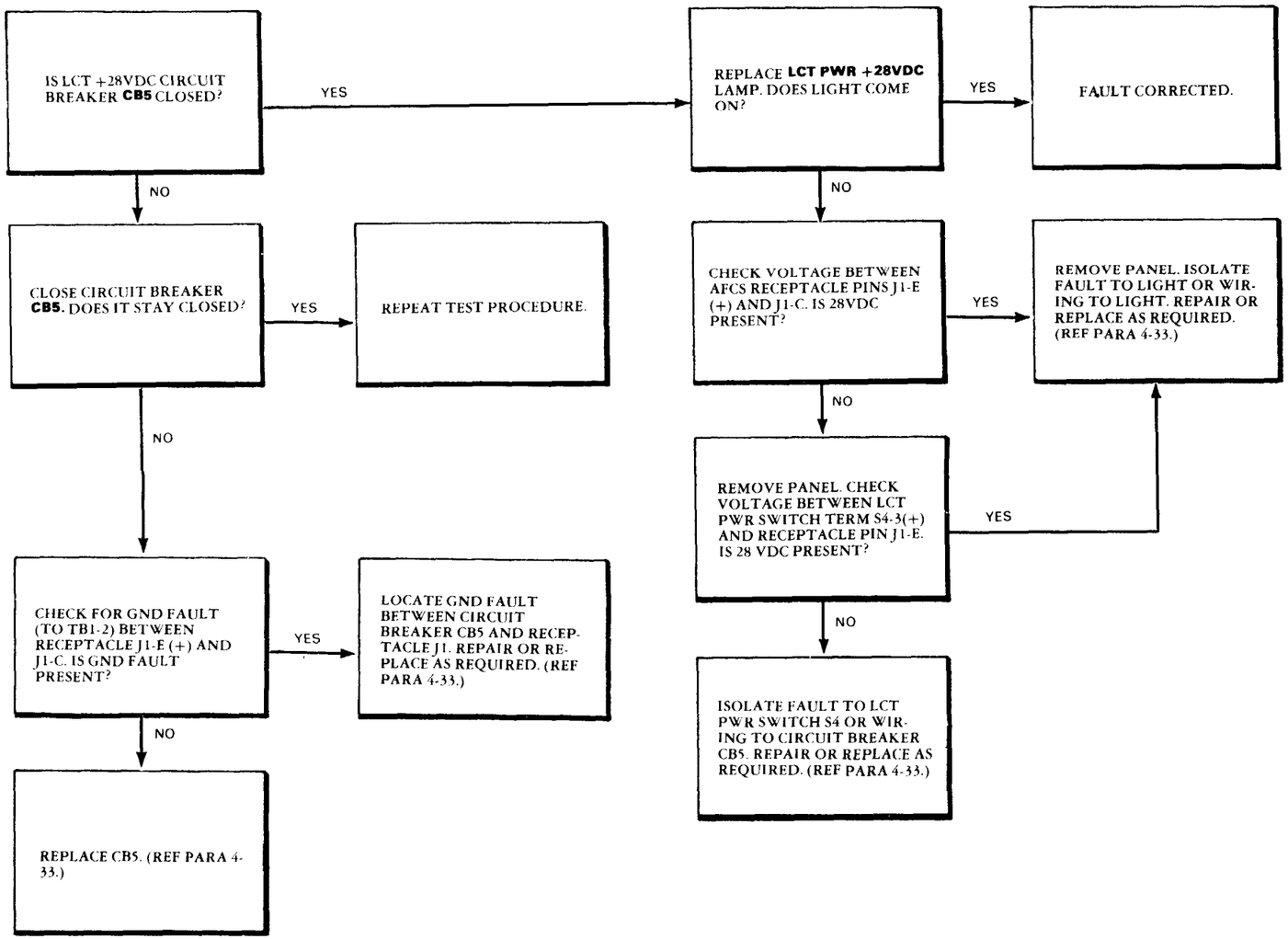
k. 24 to 28.5 VDC is not present at AFCS receptacle pins J1-A (+) to J1-C. Remove panel. Isolate fault to receptacle J1 or wiring from terminal board TB1 or wiring to ground connection. Repair or replace as required. (Ref para 4-33.)

l. 24 to 28.5 VDC is not present at panel receptacle pins J4-A (+) to J4-B and receptacle pins J5-A (+) to J4-B. Remove panel. Isolate fault to receptacle or wiring between receptacles J4 and J5. Repair or replace as required. (Ref para 4-33.)

NOTE

J4 is marked PANEL J1.

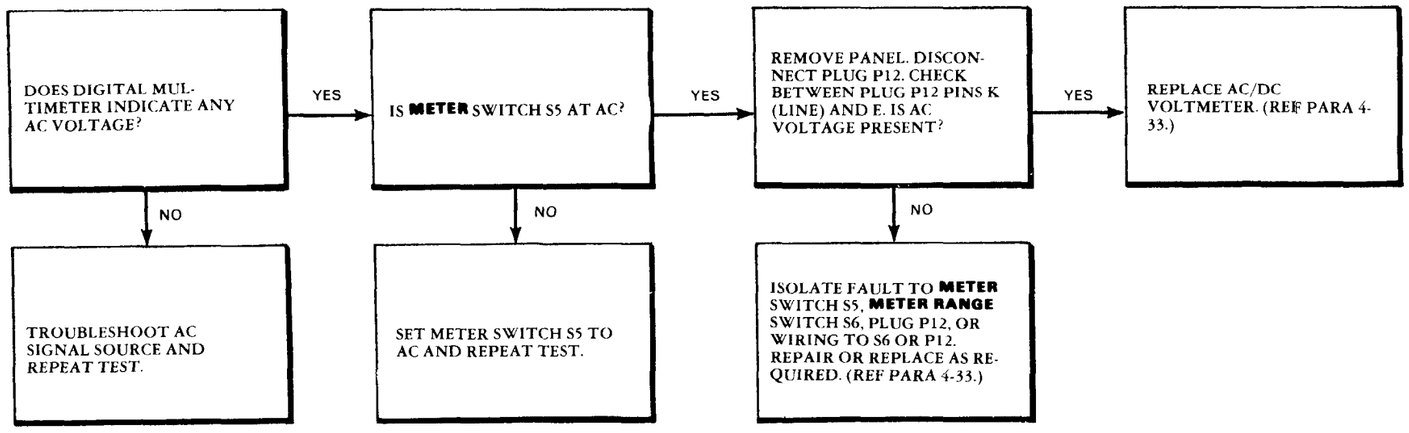
m. LCT PWR +28 VDC light DS5 does not come on.



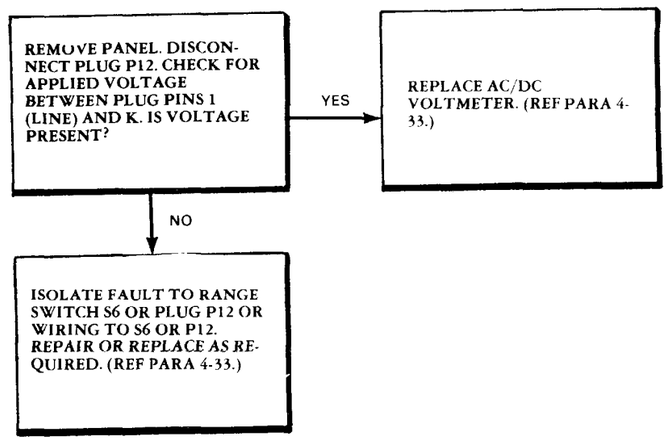
n. 24 to 28.5 VDC is not present at receptacle pins J1-E (+) and J1-C. Remove panel. Isolate fault to receptacle J1 or wiring from light to J1. Repair or replace as required. (Ref para 4-33.)

4-5. AC/DC Voltmeter Circuit Troubleshooting.

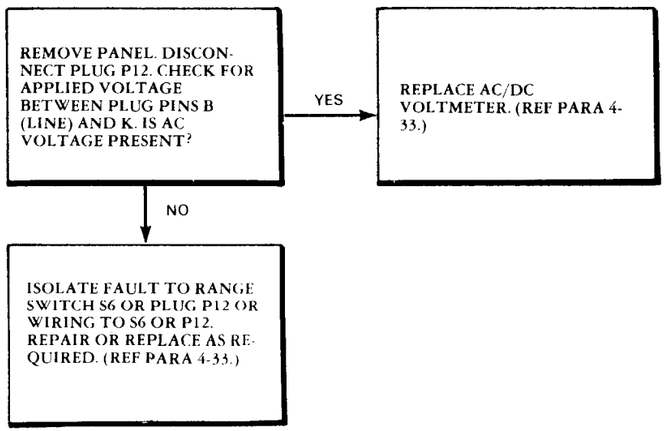
a. (200 MV) AC/DC VOLTMETER does not indicate ac voltage or does not indicate 187.7 to 192.3 mv on 190 mv test.



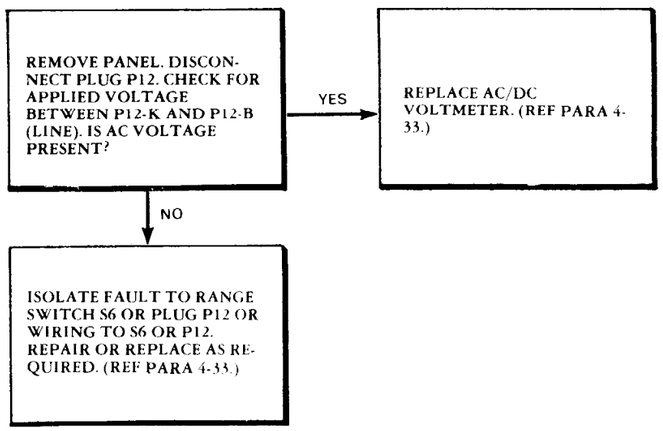
b. (2V) AC/DC VOLTMETER does not indicate or does not indicate 1.877 to 1.923V on 1.9V test.



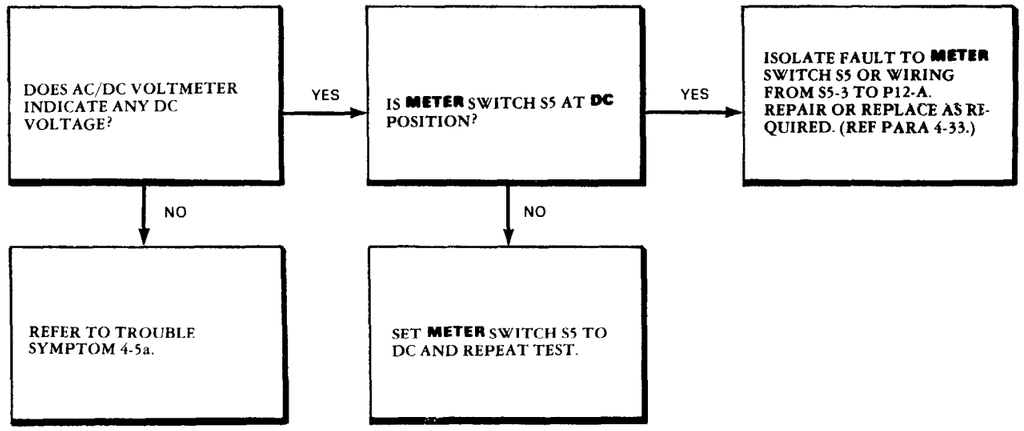
c. (20V) AC/DC VOLTMETER does not indicate or does not indicate 18.77 to 19.23V on 19V test.



d. (200V) AC/DC VOLTMETER does not indicate or does not indicate 98.6 to 101.4 on 100V test.



e. (+200 MV) AC/DC VOLTMETER does not indicate or does not indicate 187.3 to 192.7 MV on 190 MV test.



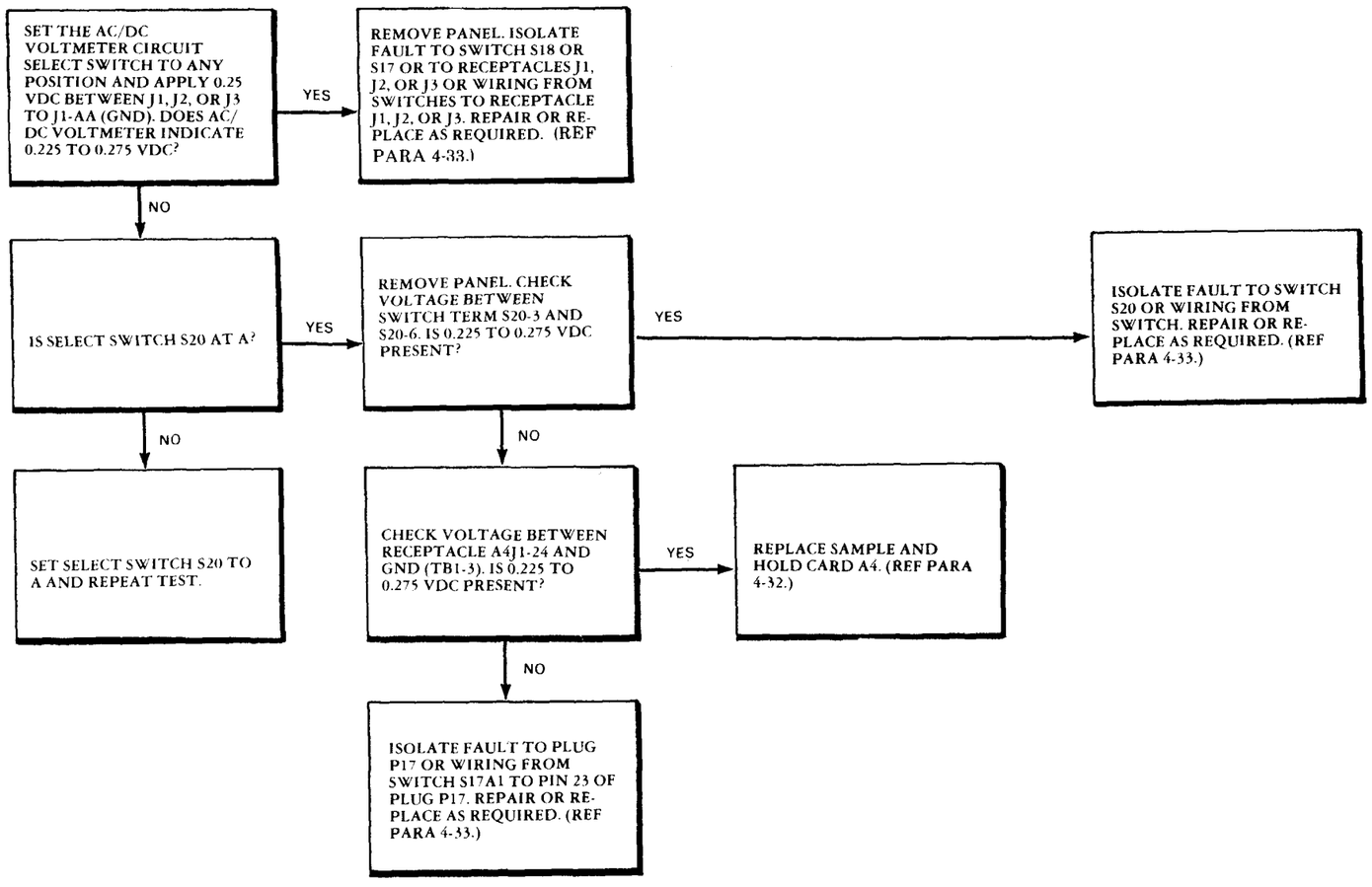
f. AC/DC VOLTMETER does not indicate or does not indicate 1.894 to 1.906V on 1.9V, 18.90 to 19.10V on 19V or 29.4 to 30.6V on 30V tests. Refer to trouble symptom 4-5e.

g. (−200 MV) AC/DC VOLTMETER does not indicate or does not indicate −187.3 to 192.7 MV on 190 MV test. Isolate fault to METER switch S5 or wiring from S5-3 to pin P12-A. Repair or replace as required. (Ref para 4-33.)

h. AC/DC VOLTMETER does not indicate or does not indicate −1.894 to −1.906V on 1.9V, −18.90 to −19.10V on −19V or −29.4 to −30.6V on 30V tests. Isolate fault to METER switch S5 or wiring from S5-3 to P12-A. Repair or replace as required. (Ref para 4-33.)

4-6. AC/DC Voltmeter Select Circuits.

a. 0.25 VDC not indicated on AC/DC voltmeter when circuit select switches are set to any one of the following positions: 00,1, A,00 thru 60,9, A,00.



b. 0.25 VDC is not indicated on AC/DC VOLTMETER when circuit select switches are set to any one of the following positions: 00,0, B,2 thru 30,0, B,1.

4-7. Self Test Circuit Troubleshooting.

a. TESTER POWER 115V 400 HZ light does not come on when TESTER POWER switch S1 is set to ON. Refer to trouble symptom 4-4a.

b. TESTER POWER +28 VDC light does not come on when TESTER POWER switch S1 is set to ON. Refer to trouble symptom 4-4b.

c. TESTER POWER +5 VDC light does not come on when TESTER POWER switch S1 is set to ON. Refer to trouble symptom 4-4c.

d. TESTER POWER +15 VDC light does not come on when TESTER POWER switch S1 is set to ON. Refer to trouble symptom 4-4d.

e. TESTER POWER −15 VDC light does not come on when TESTER POWER switch S1 is set to ON. Refer to trouble symptom 4-4e.

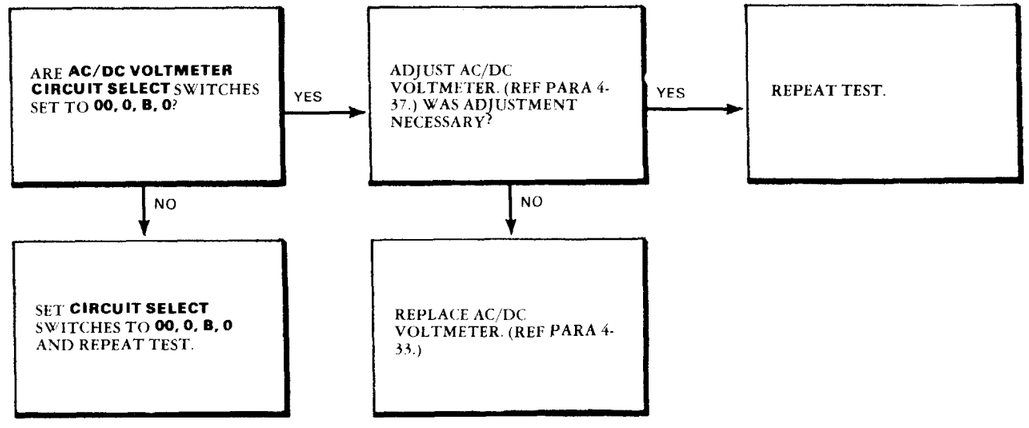
f. AFCS POWER 115V 400 HZ light does not come on when AFCS POWER 115V 400 HZ switch S2 is set to ON. Refer to trouble symptom 4-4f.

g. AFCS POWER 5 VAC light does not come on when AFCS POWER 115V 400 HZ switch S2 is set to ON. Refer to trouble symptom 4-4g.

h. AFCS POWER +28 VDC light does not come on when AFCS POWER +28 VDC switch S3 is set to ON. Refer to trouble symptom 4-4j.

i. LCT PWR 28 VDC LCT PWR light does not come on when LCT PWR switch S4 is set to ON. Refer to trouble symptom 4-4m.

j. AC/DC VOLTMETER does not indicate less than 0.006 when METER switch S5 is set to AC and METER RANGE switch S6 is set to 200MV, 2V, 20V, or 200V and SELF TEST CIRCUIT SELECT switches are set to 00, 0.

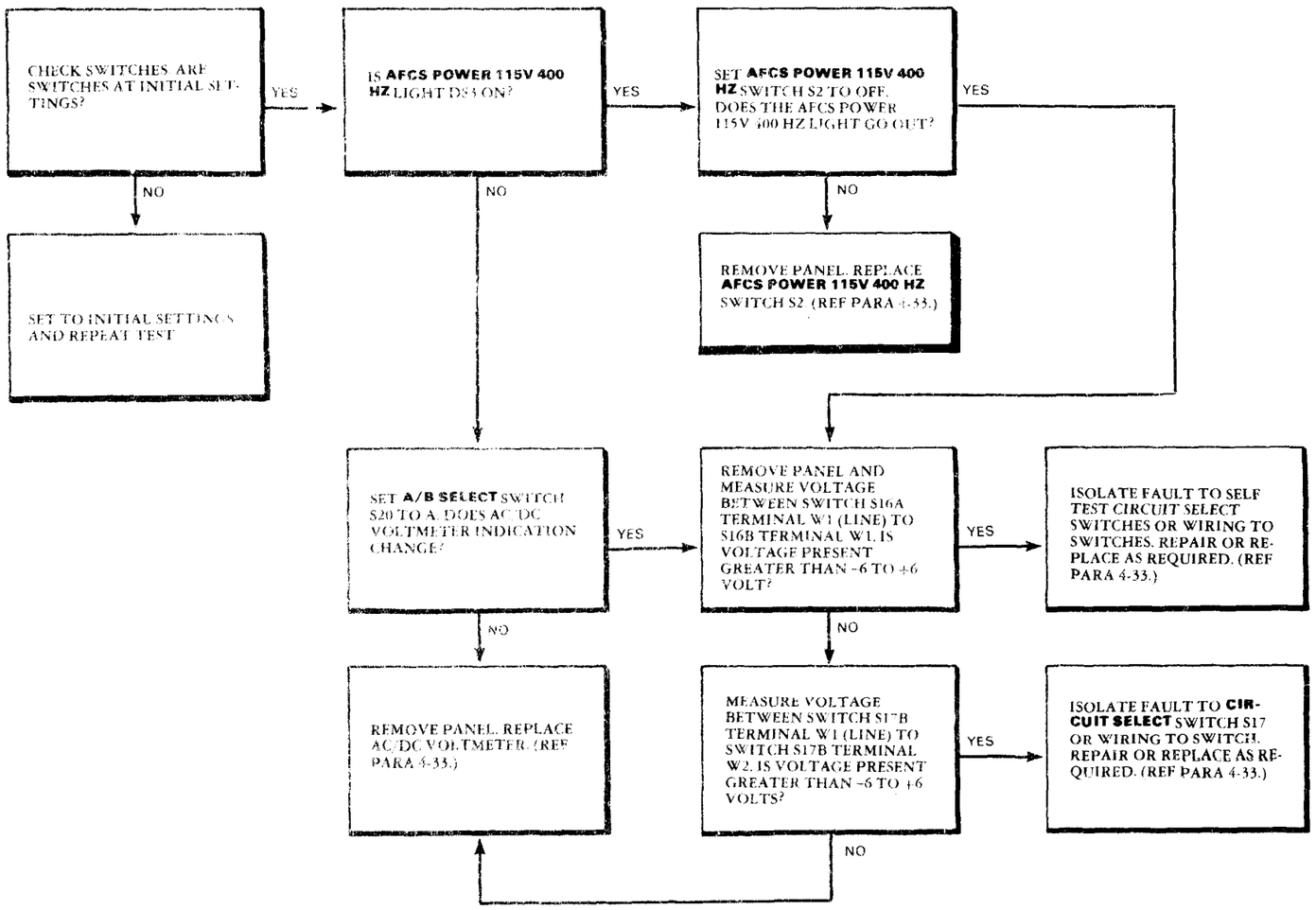


k. AC/DC VOLTMETER does not indicate less than 0.006 when METER switch S5 is set to DC, METER RANGE switch S6 is set to 200MV, 2V, 20V, or 200V, and SELF TEST CIRCUIT SELECT switches are set to 00,0. Refer to trouble symptom 4-7j.

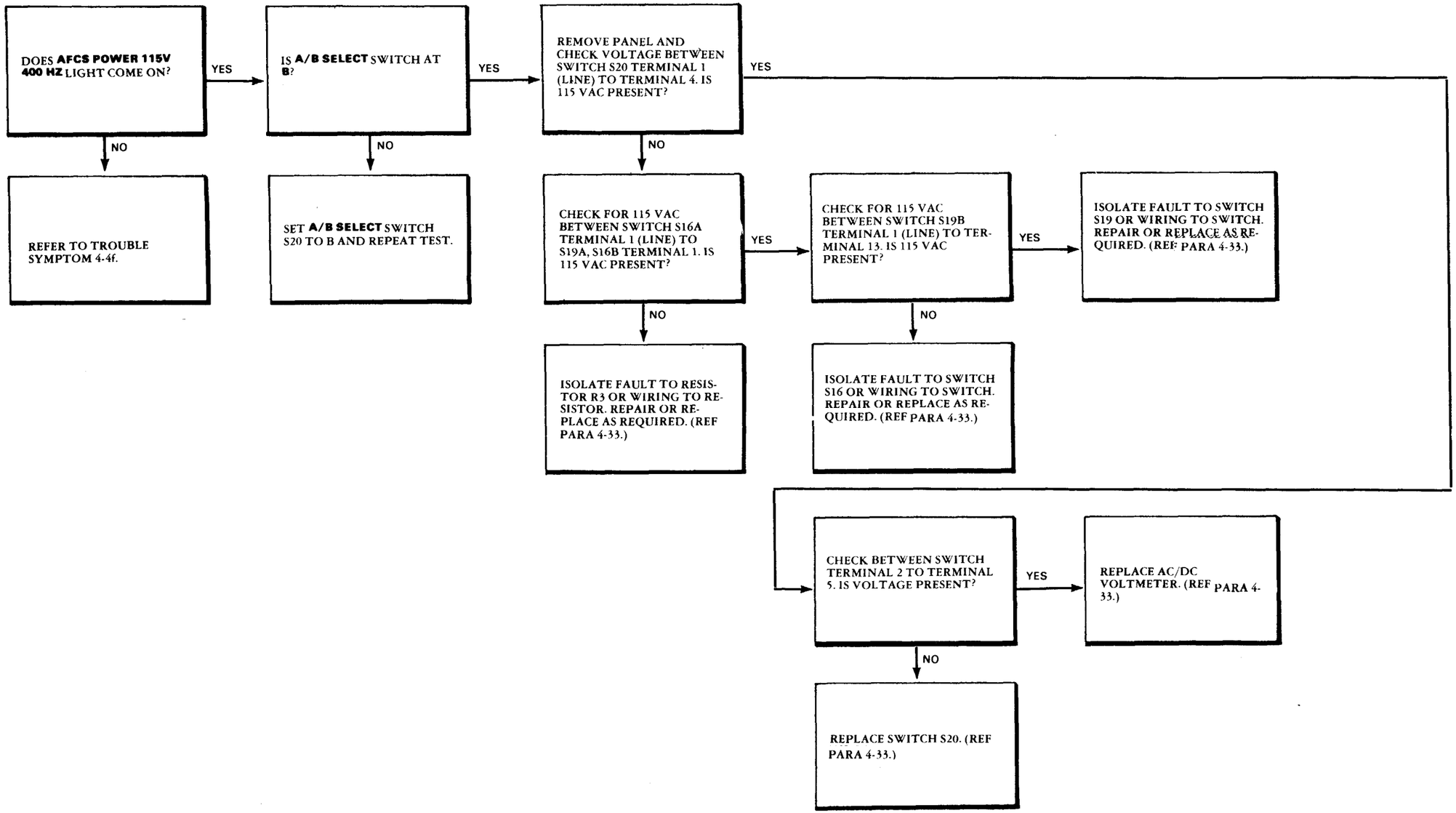
l. AC/DC VOLTMETER indicates more than −6 to +6 volts when SELF TEST CIRCUIT SELECT switches are set to 00,1.

NOTE

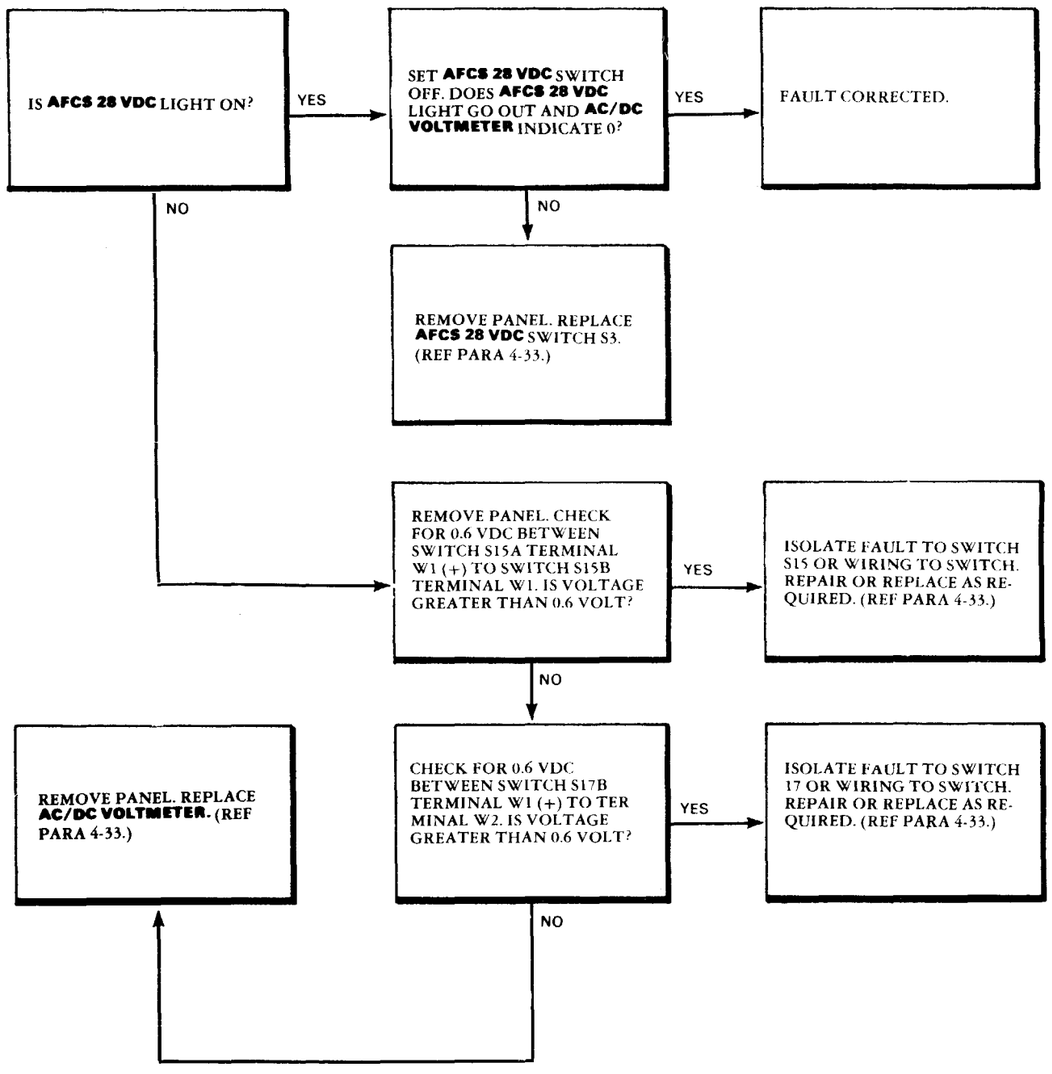
Voltage is floating between −6 and +6.



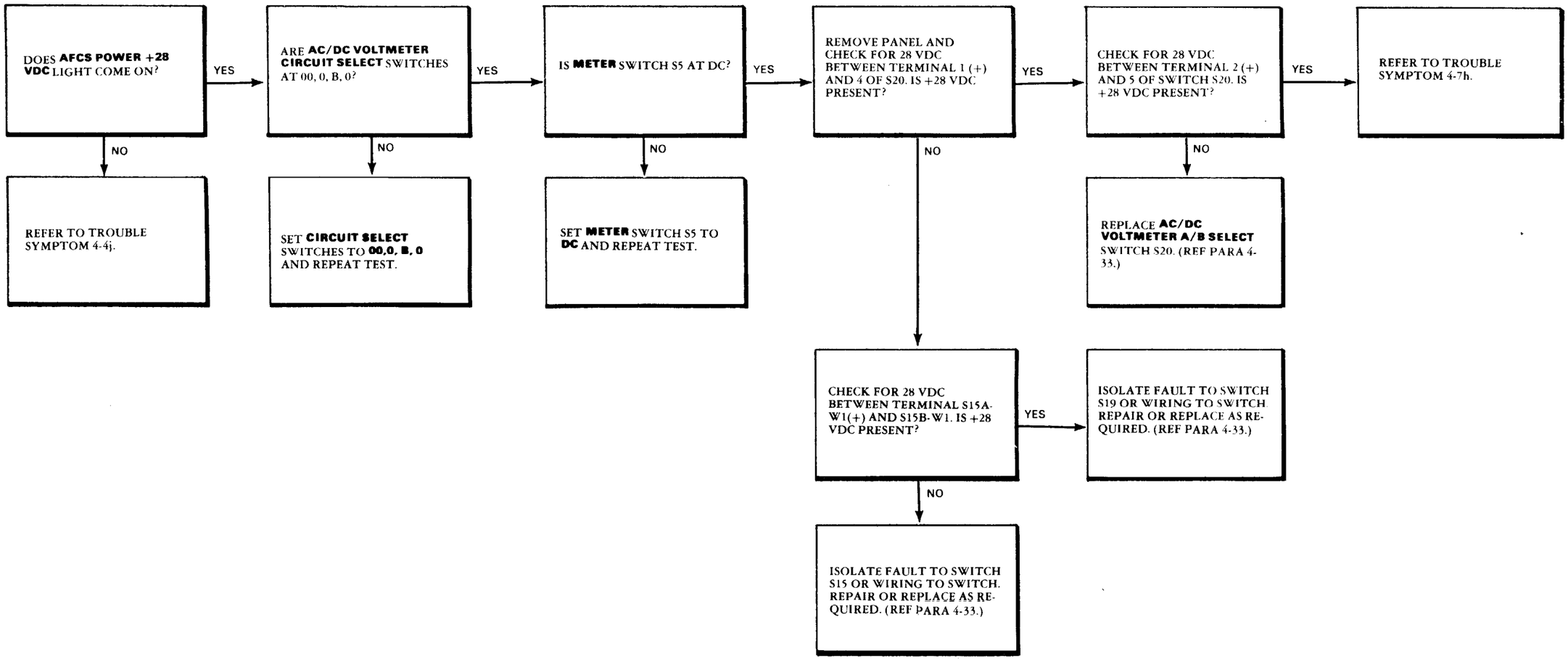
m. AC/DC VOLTMETER does not indicate 112.2 to 117.7 vac, when AFCS POWER 115/400 HZ switch is set to ON and SELF TEST CIRCUIT SELECT switches are set to 00,1.



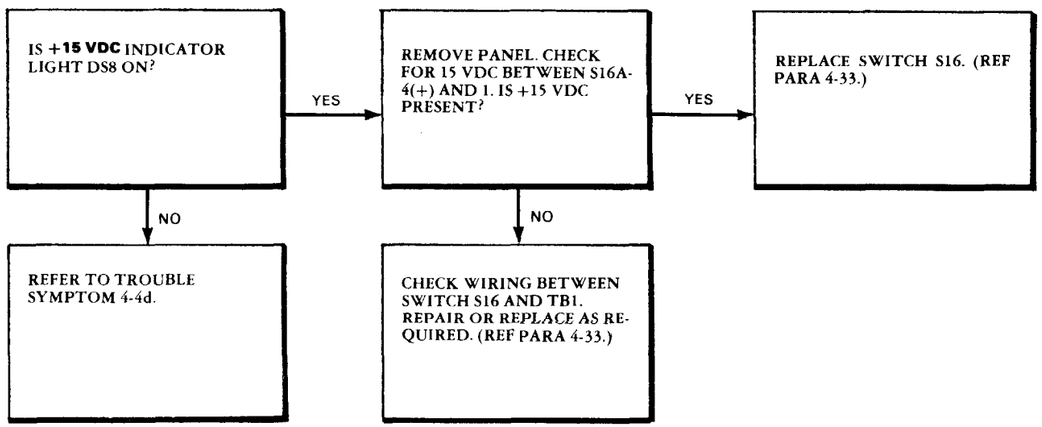
n. AC/DC VOLTMETER indicates more than −0.6 to +0.6 when SELF TEST CIRCUIT SELECT switches are set to 00,2 and METER switch is set to DC.



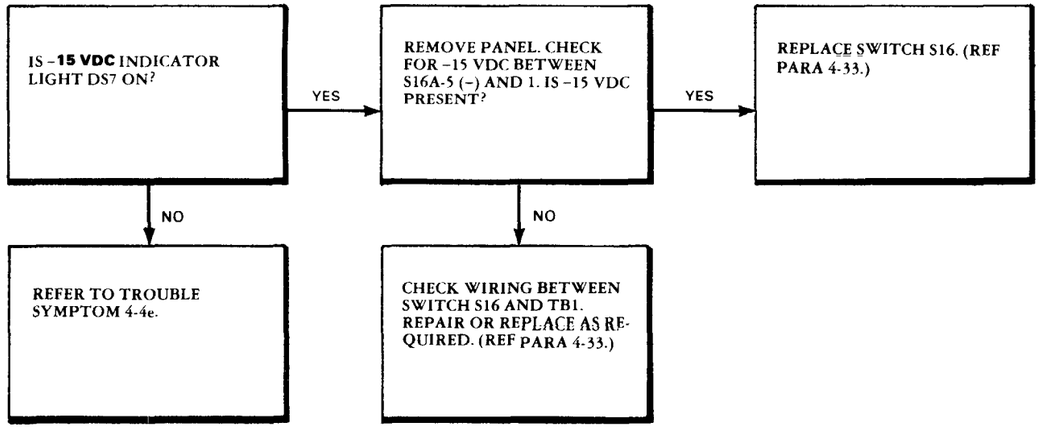
o. AC/DC VOLTMETER does not indicate 28 vdc when AFCS POWER +28 VDC switch S3 is set to ON and SELF TEST CIRCUIT SELECT switches are set to 00,2.



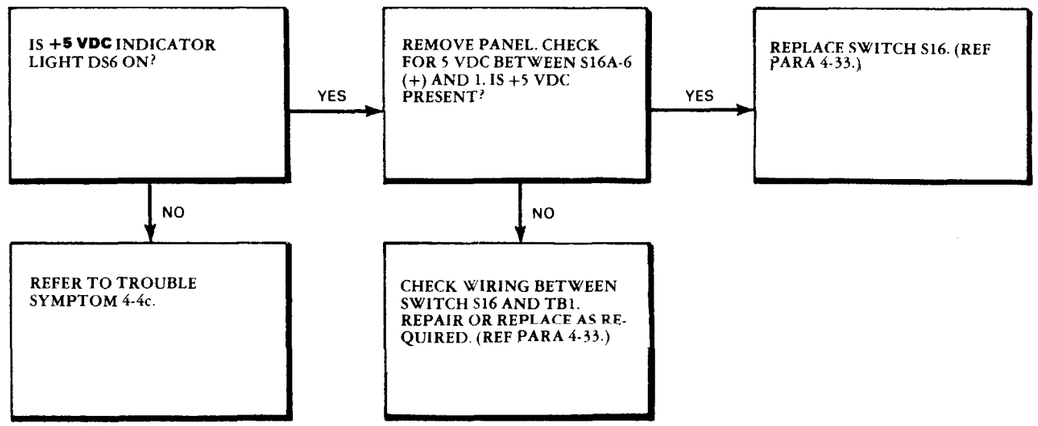
p. AC/DC VOLTMETER does not indicate +15 vdc when SELF TEST CIRCUIT SELECT switches are at 00,3.



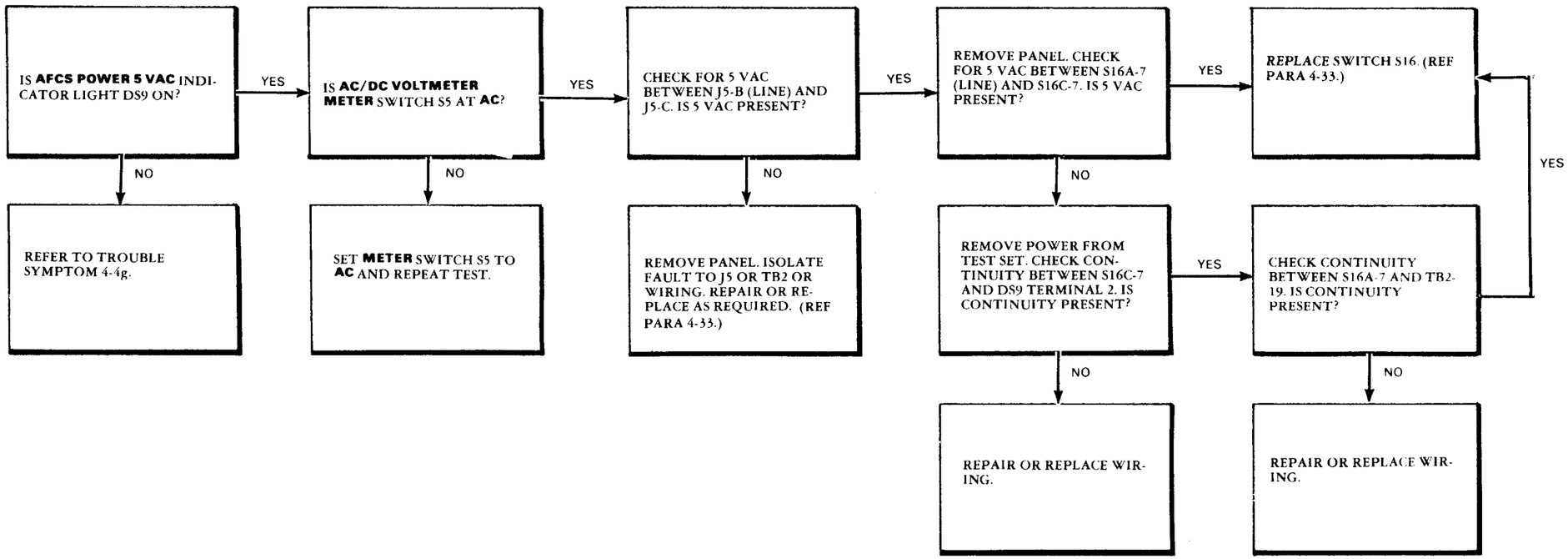
q. AC/DC VOLTMETER does not indicate −15 vdc when SELF TEST CIRCUIT SELECT switches are at 00,4.



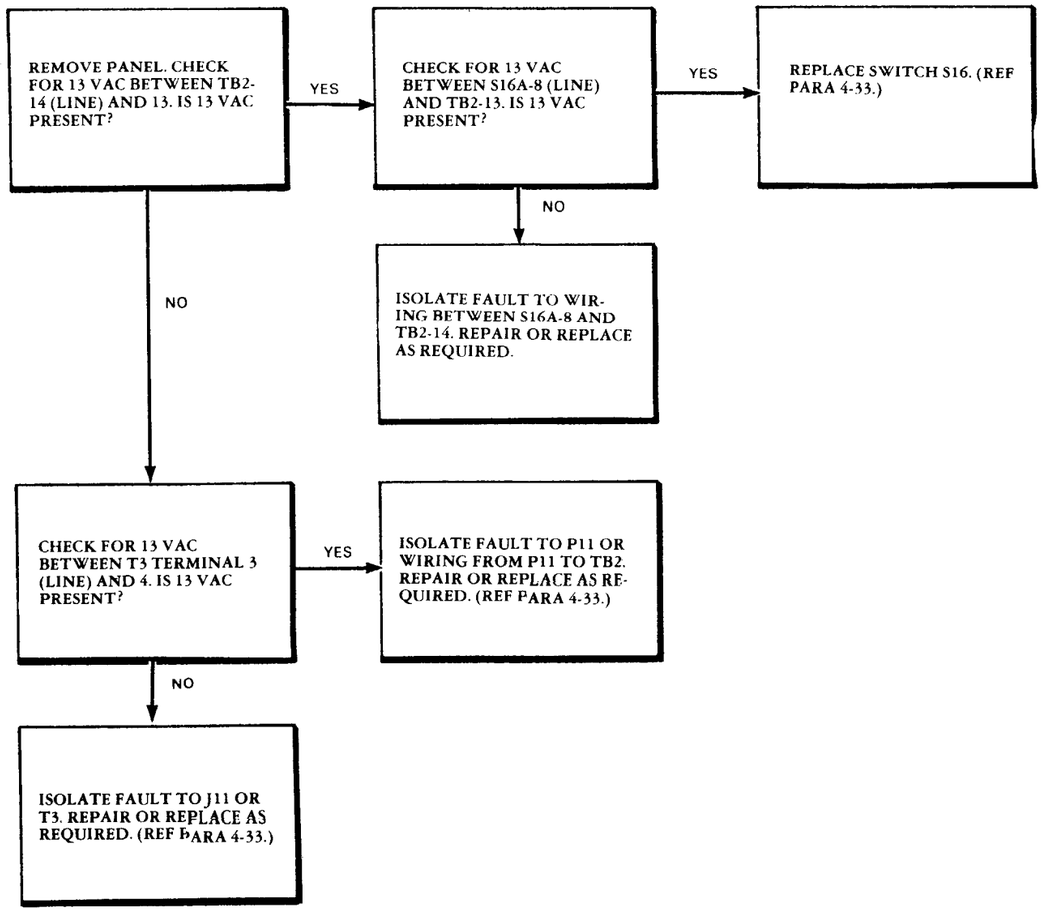
r. AC/DC VOLTMETER does not indicate +5 vdc when SELF TEST CIRCUIT SELECT switches are at 00,5.



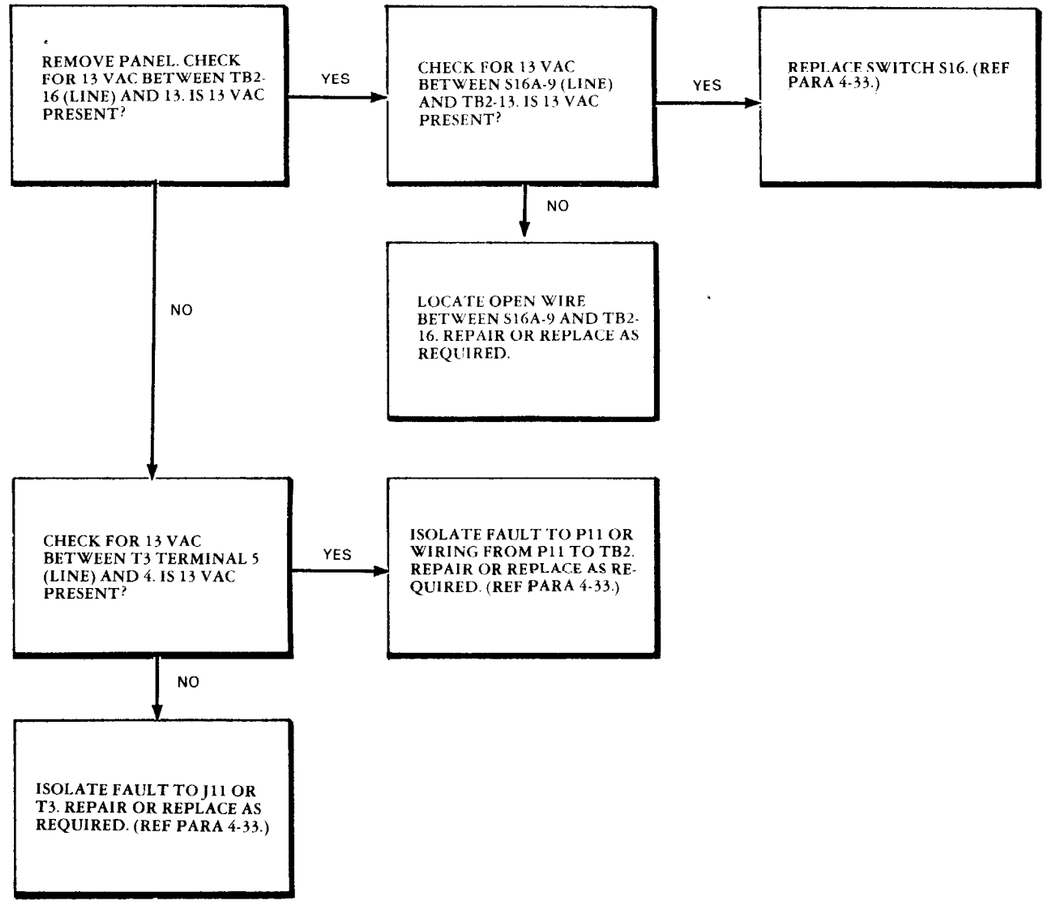
s. AC/DC VOLTMETER does not indicate 5 vac when SELF TEST CIRCUIT SELECT switches are at 00,6.



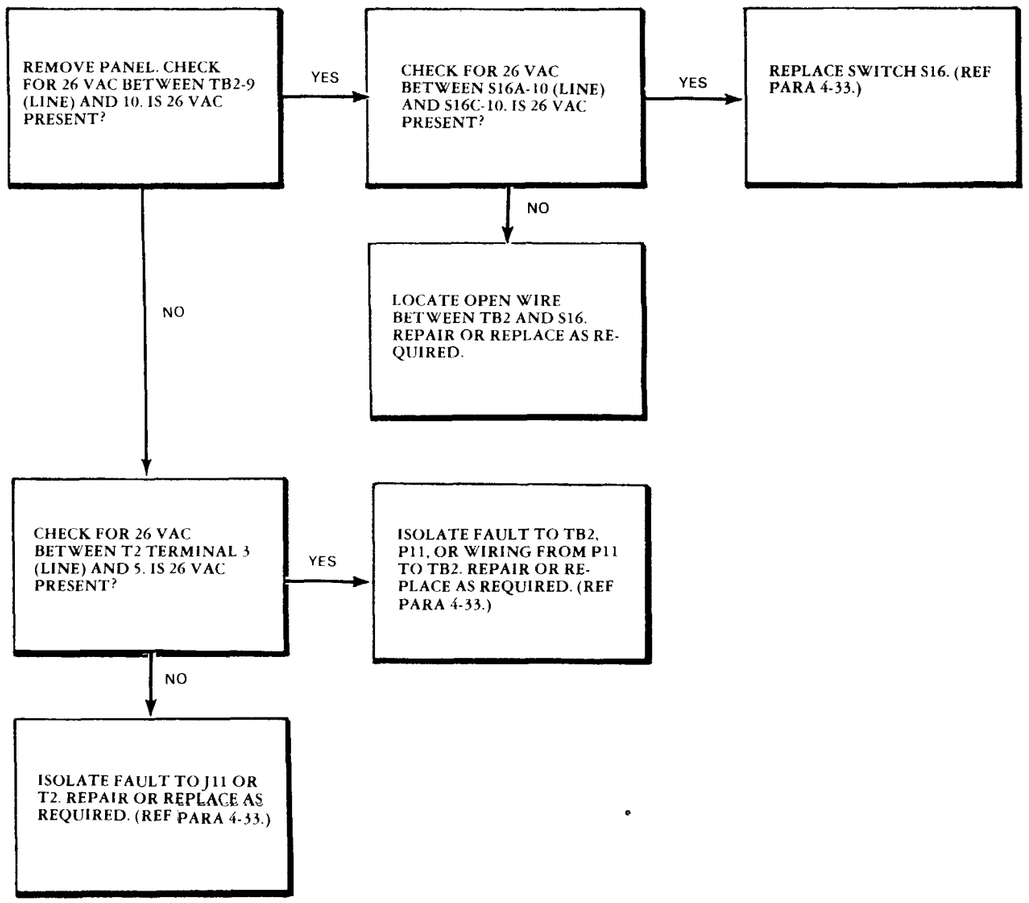
t. AC/DC VOLTMETER does not indicate 13 vac when SELF TEST CIRCUIT SELECT switches are at 00,7.



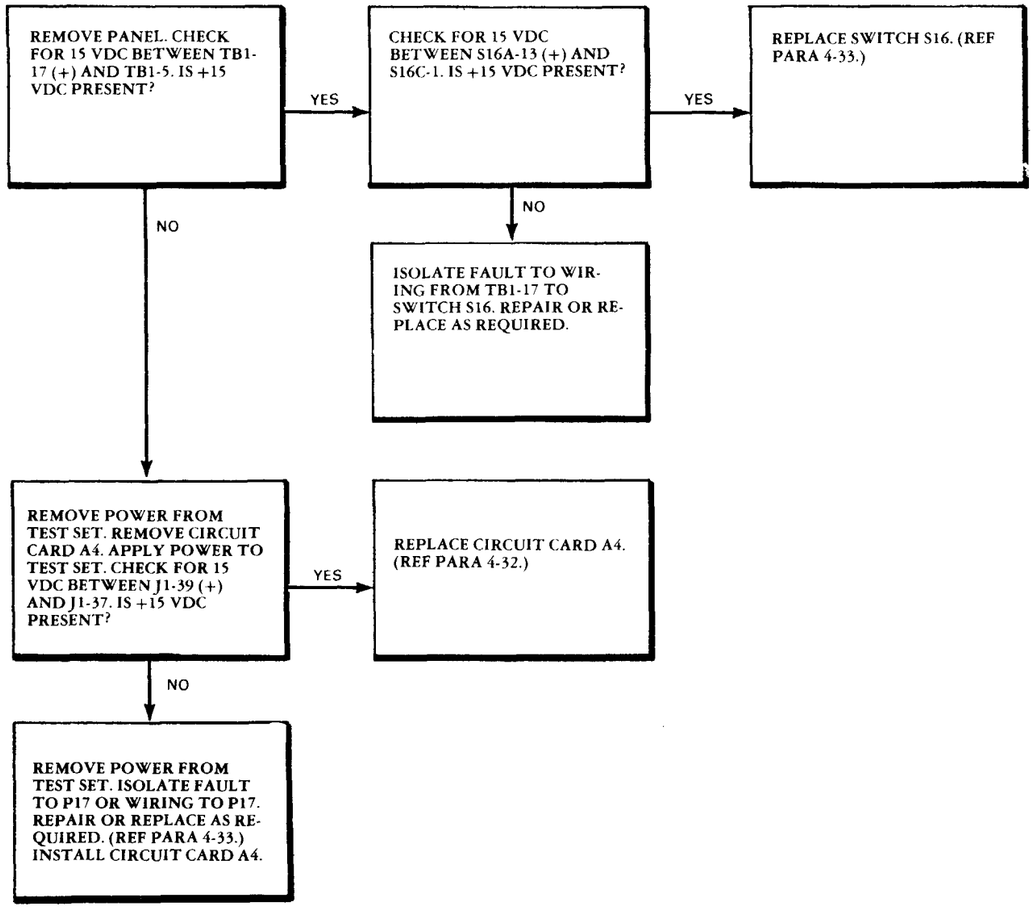
u. AC/DC VOLTMETER does not indicate 13 vac when SELF TEST CIRCUIT SELECT switches are at 00,8.



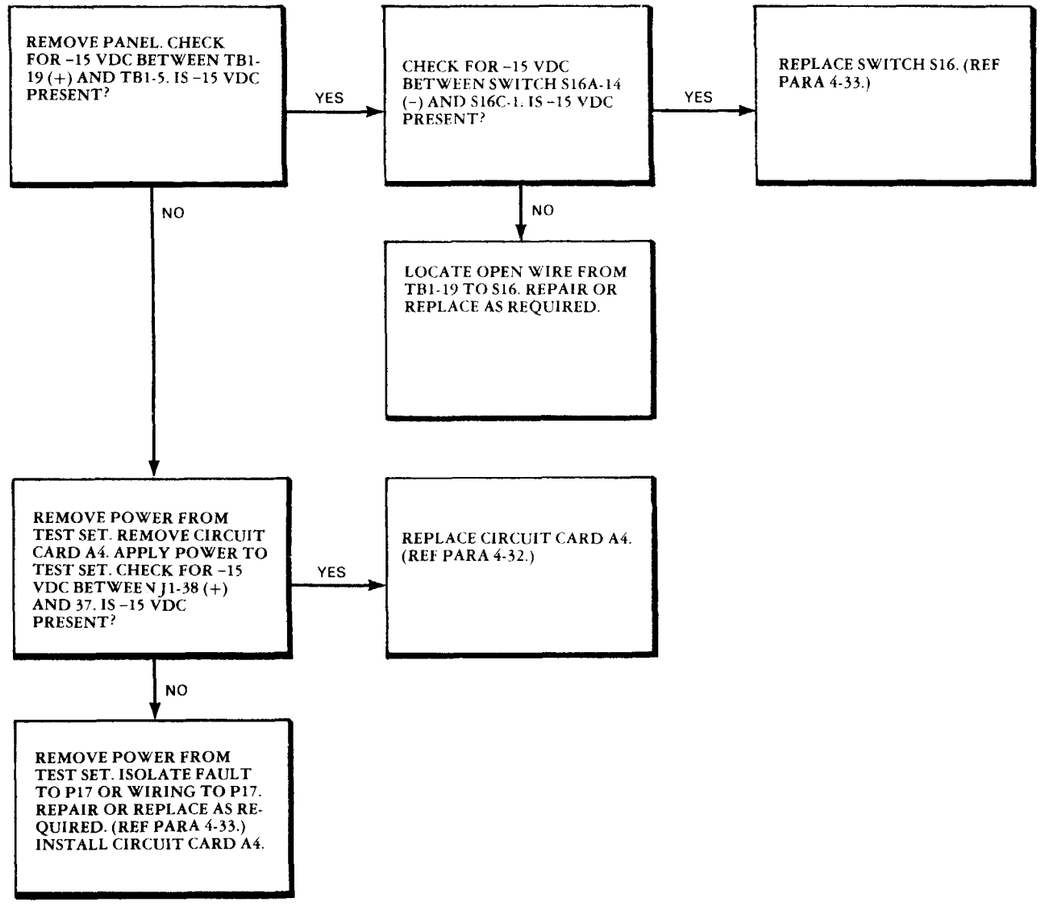
v. AC/DC VOLTMETER does not indicate 26 vac when SELF TEST CIRCUIT SELECT switches are at 00,9.



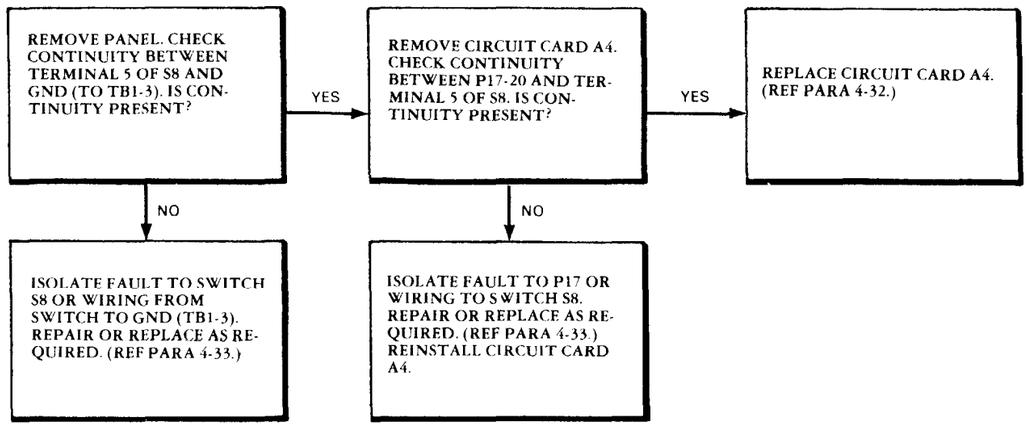
w. AC/DC VOLTMETER does not indicate +15 vdc when SELF TEST CIRCUIT SELECT switches are at 10,0.



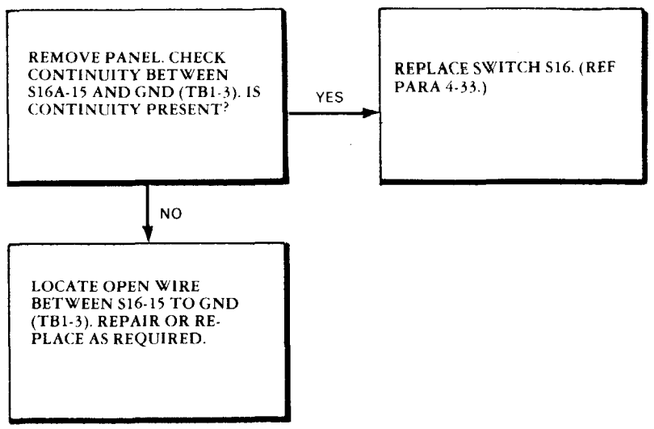
x. AC/DC VOLTMETER does not indicate −15 vdc when SELF TEST CIRCUIT SELECT switches are at 10,1.

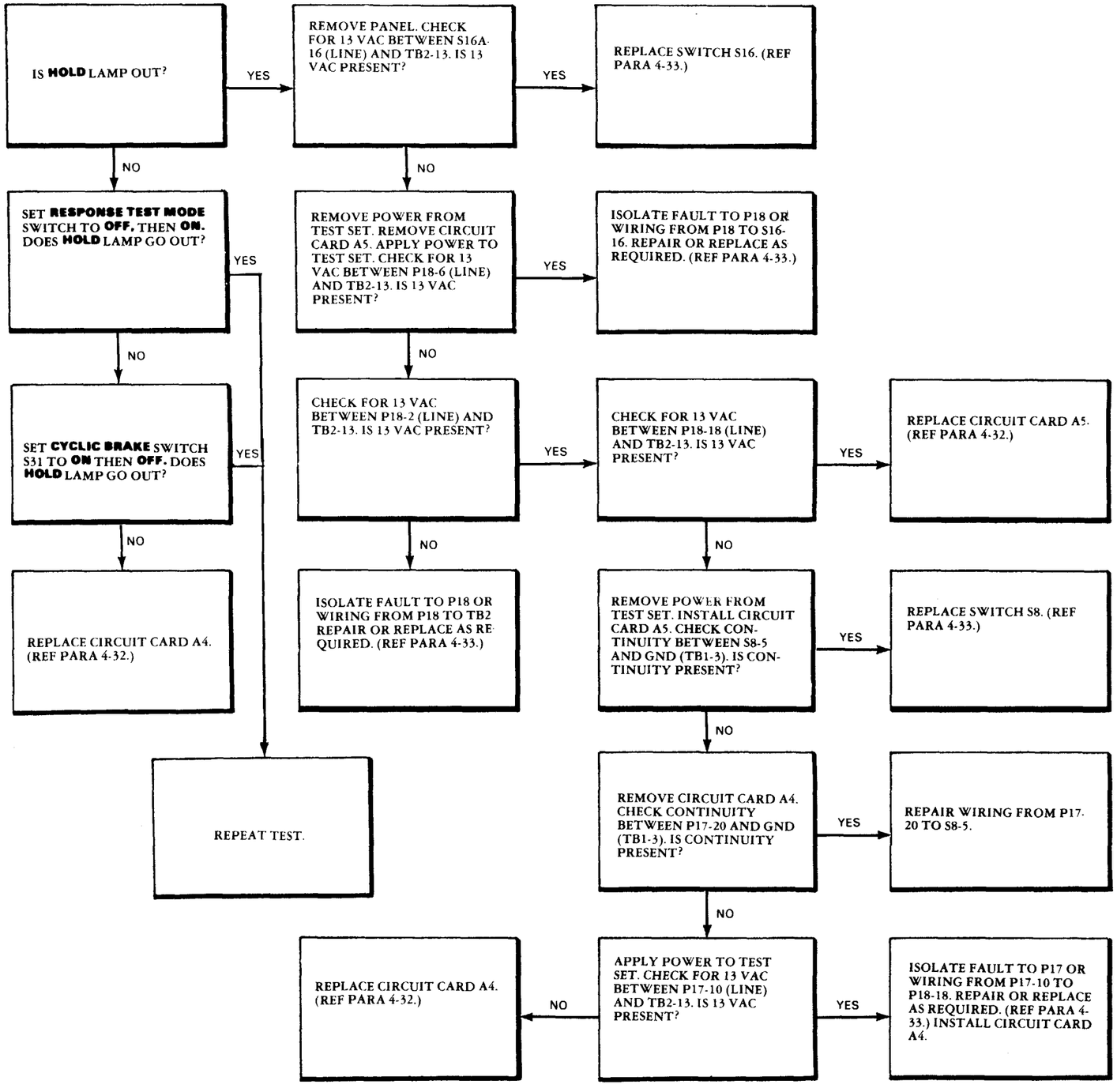


y. AC/DC VOLTMETER does not indicate 0.00V when SELF TEST CIRCUIT SELECT switches are at 10,0 or 10,1 and RESPONSE TEST MODE switch is at ON.

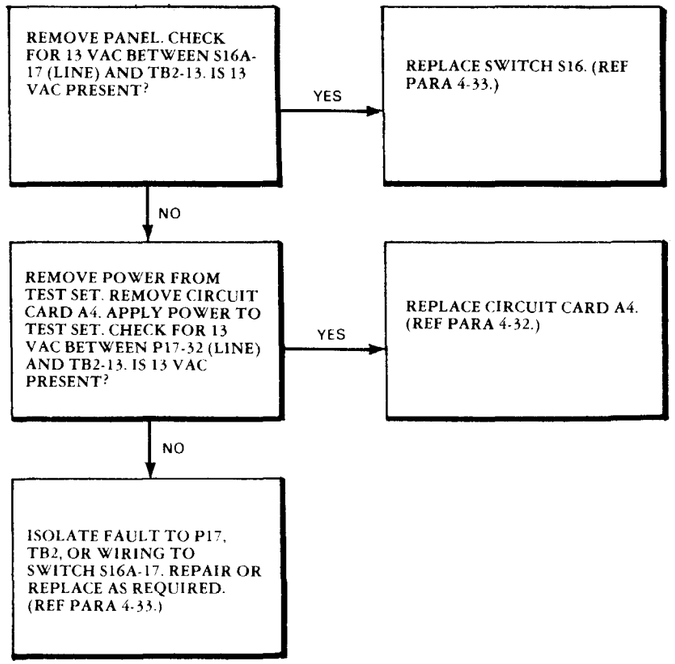


z. AC/DC VOLTMETER does not indicate 0.0V when SELF TEST CIRCUIT SELECT switches are at 10,2, METER switch is at AC, and RESPONSE TEST MODE switch is at ON.




IS HOLD LAMP OUT?
YES
REMOVE PANEL. CHECK FOR 13 VAC BETWEEN S16A-16 (LINE) AND TB2-13. IS 13 VAC PRESENT?
YES
REPLACE SWITCH S16. (REF PARA 4-33.)
NO
NO
SET RESPONSE TEST MODE SWITCH TO OFF, THEN ON. DOES HOLD LAMP GO OUT?
YES
REMOVE POWER FROM TEST SET. REMOVE CIRCUIT CARD A5. APPLY POWER TO TEST SET. CHECK FOR 13 VAC BETWEEN P18-6 (LINE) AND TB2-13. IS 13 VAC PRESENT?
YES
ISOLATE FAULT TO P18 OR WIRING FROM P18 TO S16-16. REPAIR OR REPLACE AS REQUIRED. (REF PARA 4-33.)
NO
NO
SET CYCLIC BRAKE SWITCH S31 TO ON THEN OFF. DOES HOLD LAMP GO OUT?
YES
CHECK FOR 13 VAC BETWEEN P18-2 (LINE) AND TB2-13. IS 13 VAC PRESENT?
YES
CHECK FOR 13 VAC BETWEEN P18-18 (LINE) AND TB2-13. IS 13 VAC PRESENT?
YES
REPLACE CIRCUIT CARD A5. (REF PARA 4-32.)
NO
NO
NO
REPLACE CIRCUIT CARD A4. (REF PARA 4-32.)
ISOLATE FAULT TO P18 OR WIRING FROM P18 TO TB2 REPAIR OR REPLACE AS REQUIRED. (REF PARA 4-33.)
REMOVE POWER FROM TEST SET. INSTALL CIRCUIT CARD A5. CHECK CONTINUITY BETWEEN S8-5 AND GND (TB1-3). IS CONTINUITY PRESENT?
YES
REPLACE SWITCH S8. (REF PARA 4-33.)
NO
REPEAT TEST.
REMOVE CIRCUIT CARD A4. CHECK CONTINUITY BETWEEN P17-20 AND GND (TB1-3). IS CONTINUITY PRESENT?
YES
REPAIR WIRING FROM P17-20 TO S8-5.
NO
REPLACE CIRCUIT CARD A4. (REF PARA 4-32.)
NO
APPLY POWER TO TEST SET. CHECK FOR 13 VAC BETWEEN P17-10 (LINE) AND TB2-13. IS 13 VAC PRESENT?
YES
ISOLATE FAULT TO P17 OR WIRING FROM P17-10 TO P18-18. REPAIR OR REPLACE AS REQUIRED. (REF PARA 4-33.) INSTALL CIRCUIT CARD A4.

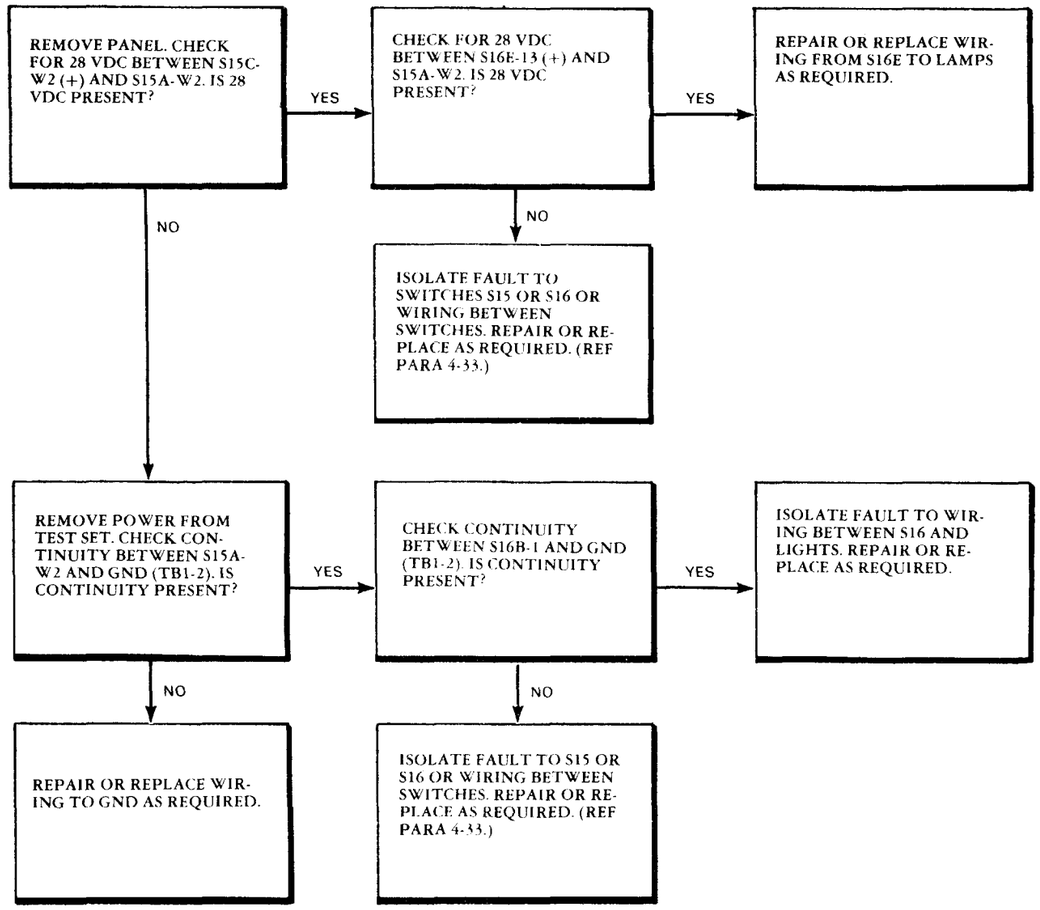
ab. AC/DC VOLTMETER does not indicate 13 vac with SELF TEST CIRCUIT SELECT switches at 10,4 and RESPONSE TEST MODE switch at OFF.



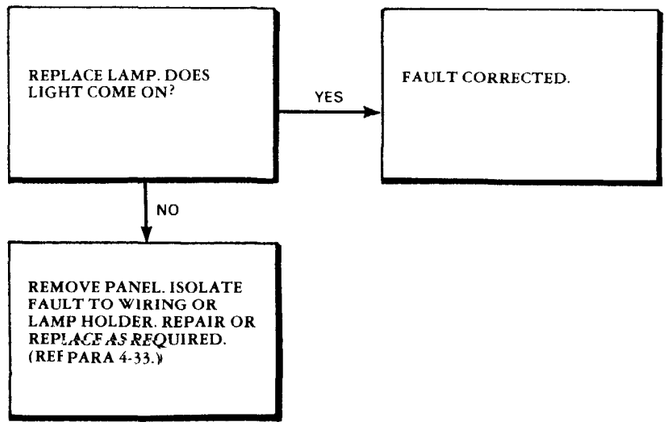
ac. AC/DC VOLTMETER does not indicate 0.0 volt with SELF TEST CIRCUIT SELECT switches at 10, 3 and RESPONSE TEST MODE switch at ON. Remove panel. Replace circuit card A4. (Ref para 4-32.)

ad. AC/DC VOLTMETER does not indicate 0.0 volt with SELF TEST CIRCUIT SELECT switches at 10,4 and RESPONSE TEST MODE switch at ON. Remove panel. Replace circuit card A4. (Ref para 4-32.)

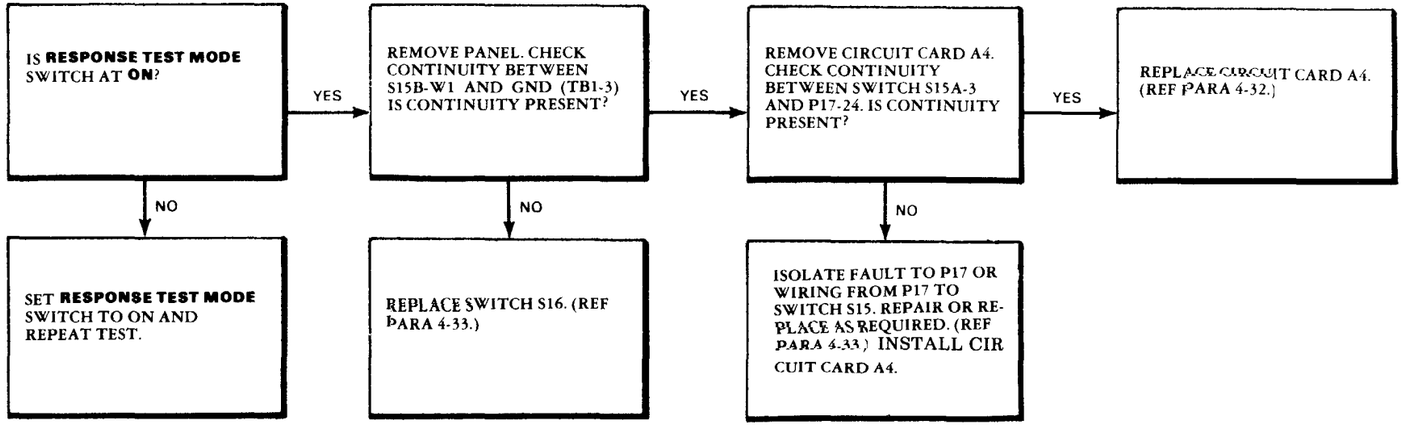
ae. No lights come on with SELF TEST CIRCUIT SELECT switches at 20,0.



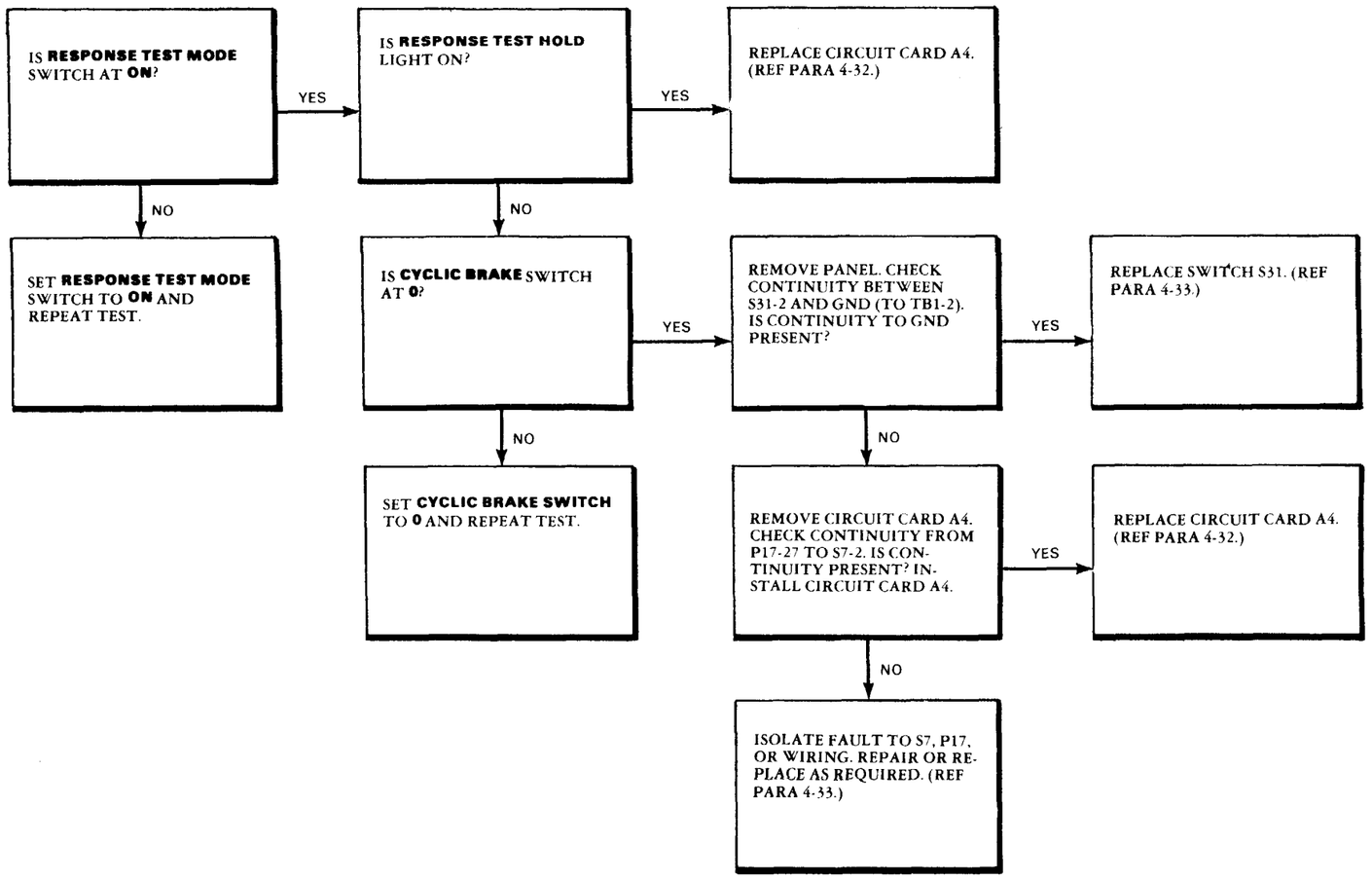
af. One light does not come on when SELF TEST CIRCUIT SELECT switches are at 20,0.



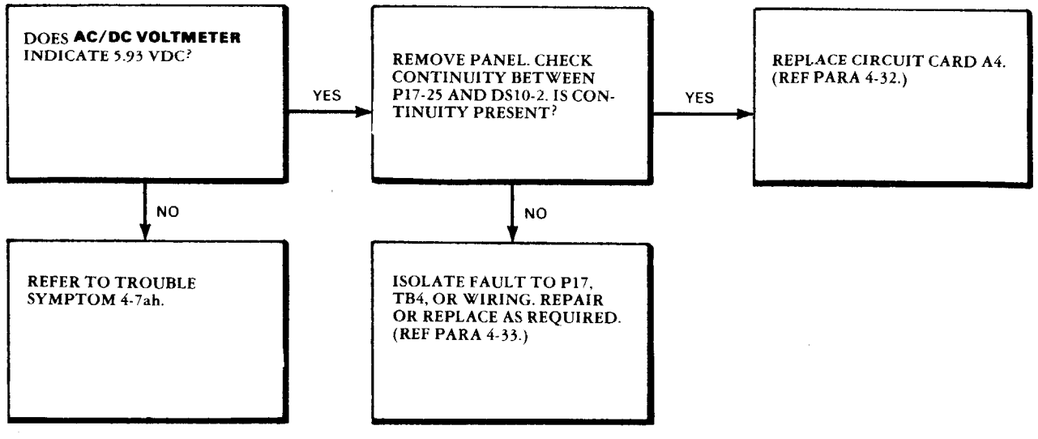
ag. AC/DC VOLTMETER does not indicate 0.0 vdc with SELF TEST CIRCUIT SELECT switches at 20,1.



ab. AC/DC VOLTMETER does not indicate 5.93 vdc with RESPONSE TEST STIM switch at APPLY and SELF TEST CIRCUIT SELECT switches are set to 20,1..



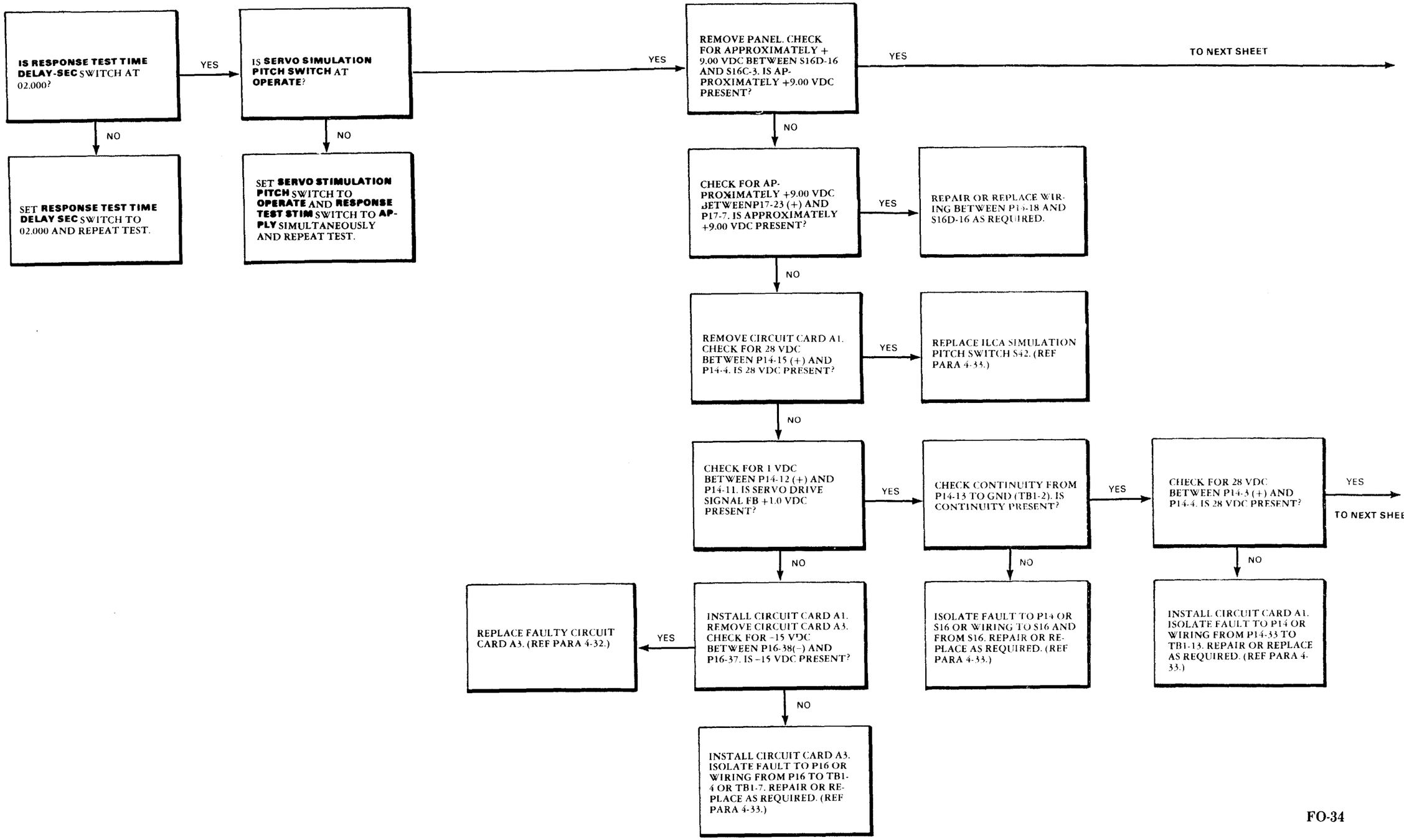
ai. RESPONSE TEST HOLD light does not come on with RESPONSE TEST switch at APPLY and SELF TEST CIRCUIT SELECT switches are set to 20,1.



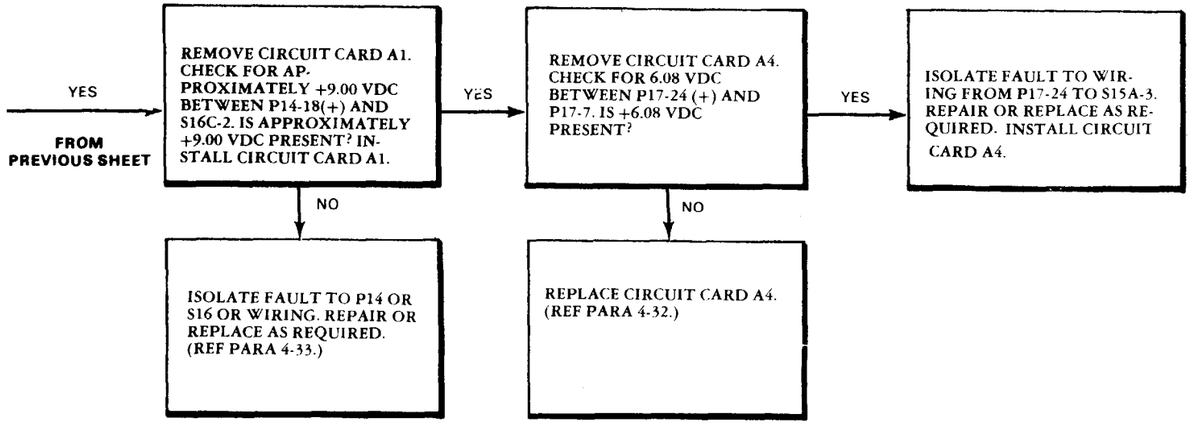
aj. RESPONSE TEST HOLD light does not go out with RESPONSE TEST STIM switch at REMOVE, and SELF TEST CIRCUIT SELECT switches are set to 20,1. Remove panel. Replace circuit card A4. (Ref para 4-32.)

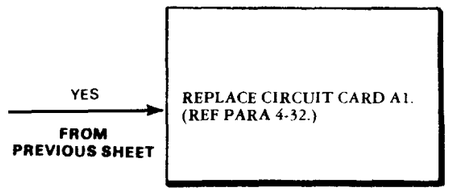
ak. AC/DC VOLTMETER does not indicate 0.0 vdc with RESPONSE TEST STIM switch at REMOVE, and SELF TEST CIRCUIT SELECT switches are set to 20,1. Refer to trouble symptom 4-7ag.

al. AC/DC VOLTMETER does not indicate +6.08 vdc when RESPONSE TEST HOLD light comes on and RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are set to 20,2.



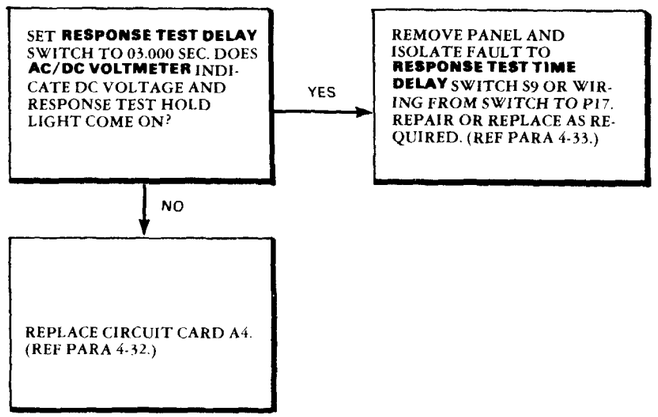
al. AC/DC VOLTMETER does not indicate +6.08vdc when RESPONSE TEST HOLD light comes on and RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are set to 20, 2. (Continued)





am. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates +6.08 vdc when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,2. Isolate fault to switch S16, P14, A1 or wiring.

an. AC/DC VOLTMETER does not indicate +6.08 vdc and RESPONSE TEST HOLD light does not come on when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,2.

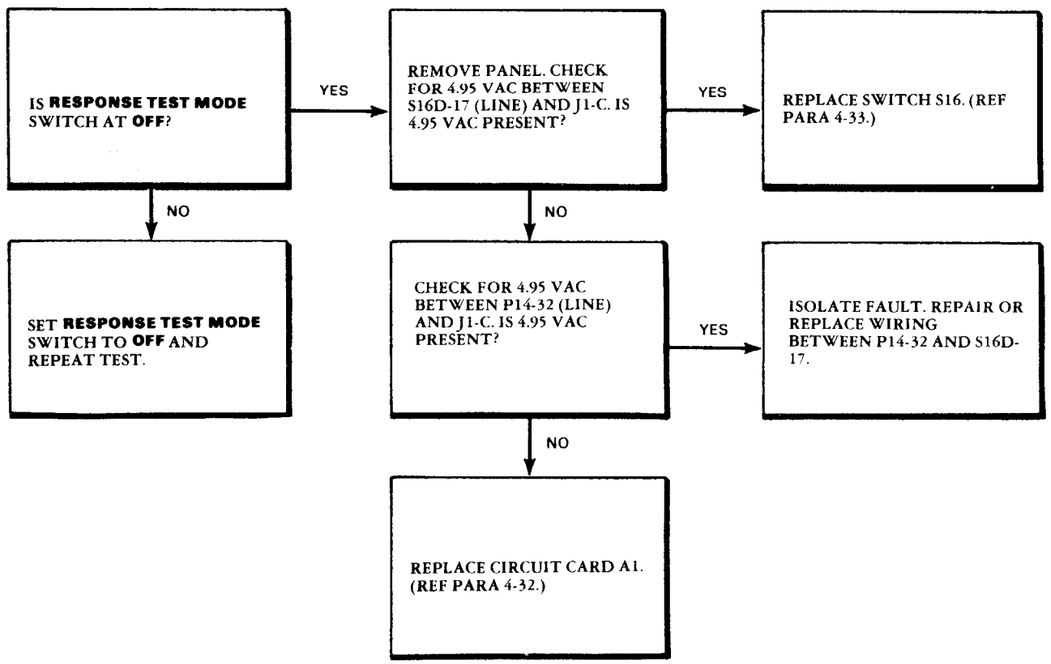


ao. AC/DC VOLTMETER does not indicate +6.08 vdc when RESPONSE TEST HOLD light comes on and RESPONSE TEST STIM switch is at APPLY, and SELF TEST CIRCUIT SELECT switches are set to 20,2. Remove panel. Replace switch S16. (Ref para 4-33.)

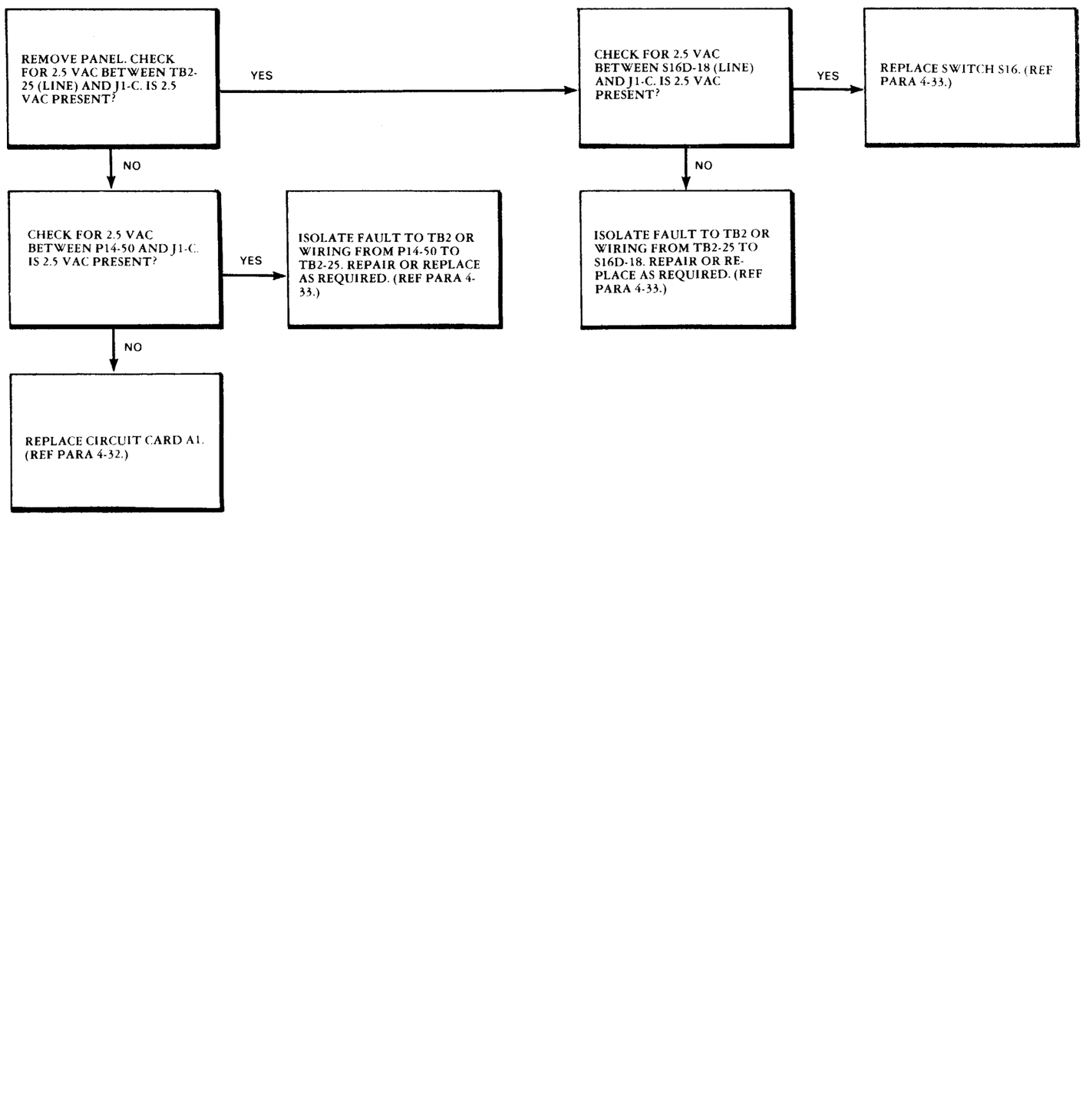
ap. RESPONSE TEST HOLD light does not come on but AC/DC VOLTMETER indicates –6.08 vdc when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,3. Refer to trouble symptom 4-7am.

aq. AC/DC VOLTMETER does not indicate –6.08 vdc and RESPONSE TEST HOLD light does not come on when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,3. Refer to trouble symptom 4-7an.

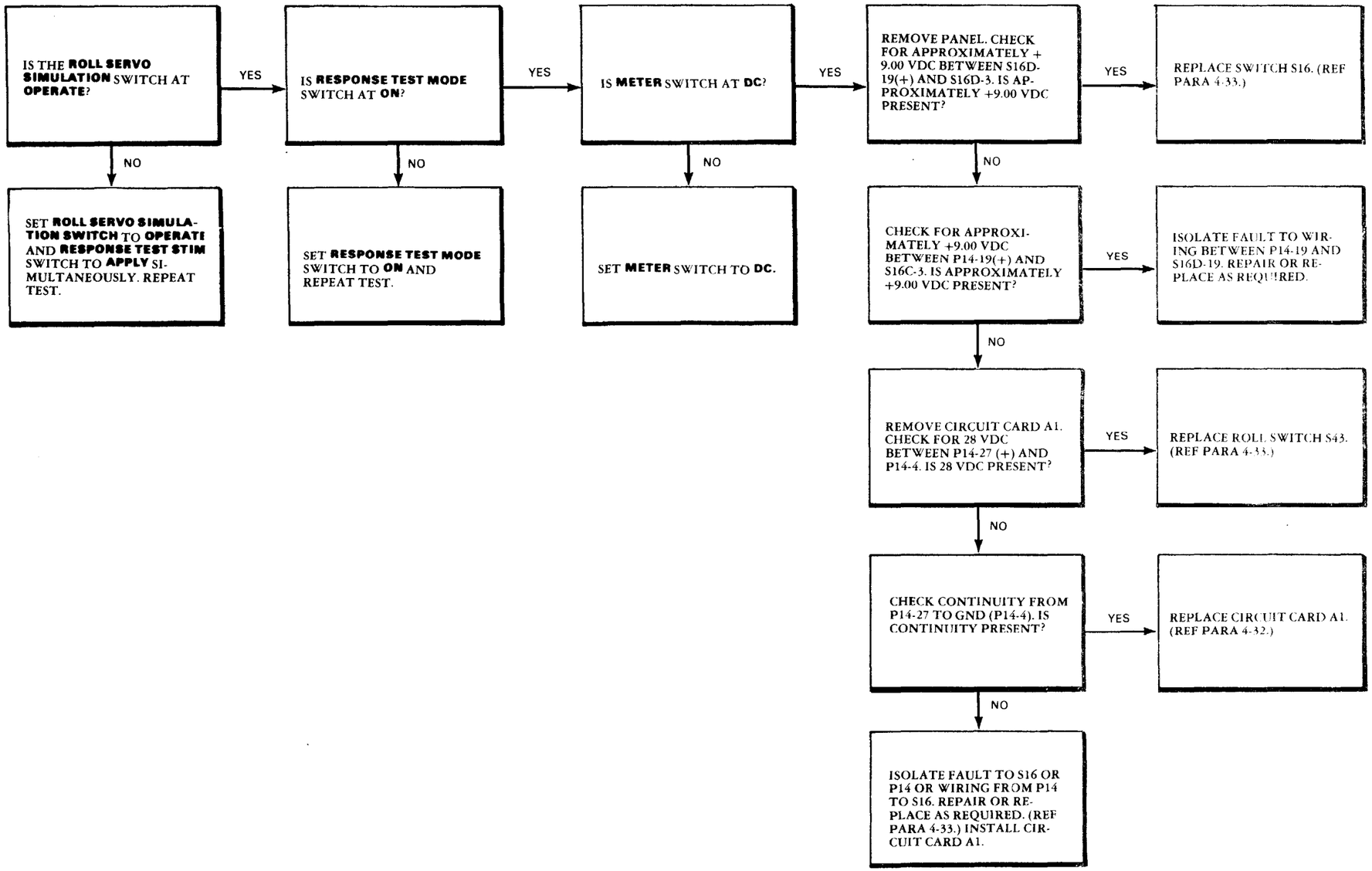
ar. AC/DC VOLTMETER does not indicate 4.95 vac when RESPONSE TEST STIM switch is at REMOVE and METER switch is at AC and SELF TEST CIRCUIT SELECT switches are set to 20,4..



as. AC/DC VOLTMETER does not indicate 2.5 vac when SELF TEST CIRCUIT SELECT switch is at 20,5.



at. AC/DC VOLTMETER does not indicate +6.08 vdc when RESPONSE TEST HOLD light comes on and RESPONSE TEST STIM switch is at APPLY, and SELF TEST CIRCUIT SELECT switches are set to 20,6.



au. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates +6.08 vdc when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,6. Refer to trouble symptom 4-7am.

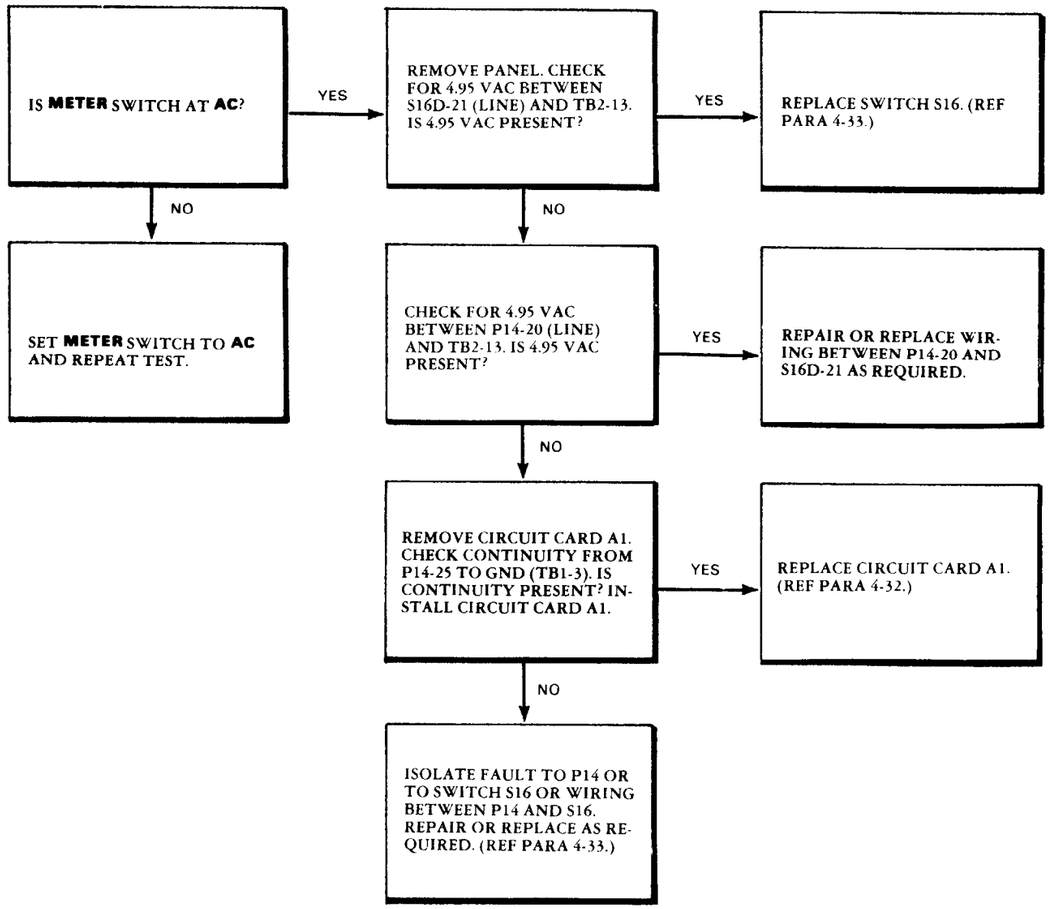
av. AC/DC VOLTMETER does not indicate +6.08 vdc and RESPONSE TEST HOLD light does not come on when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,6. Refer to trouble symptom 4-7an.

aw. AC/DC VOLTMETER does not indicate +6.08 vdc when RESPONSE TEST HOLD light comes on and RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are set to 20,6. Remove panel. Replace S16. (Ref para 4-33.).

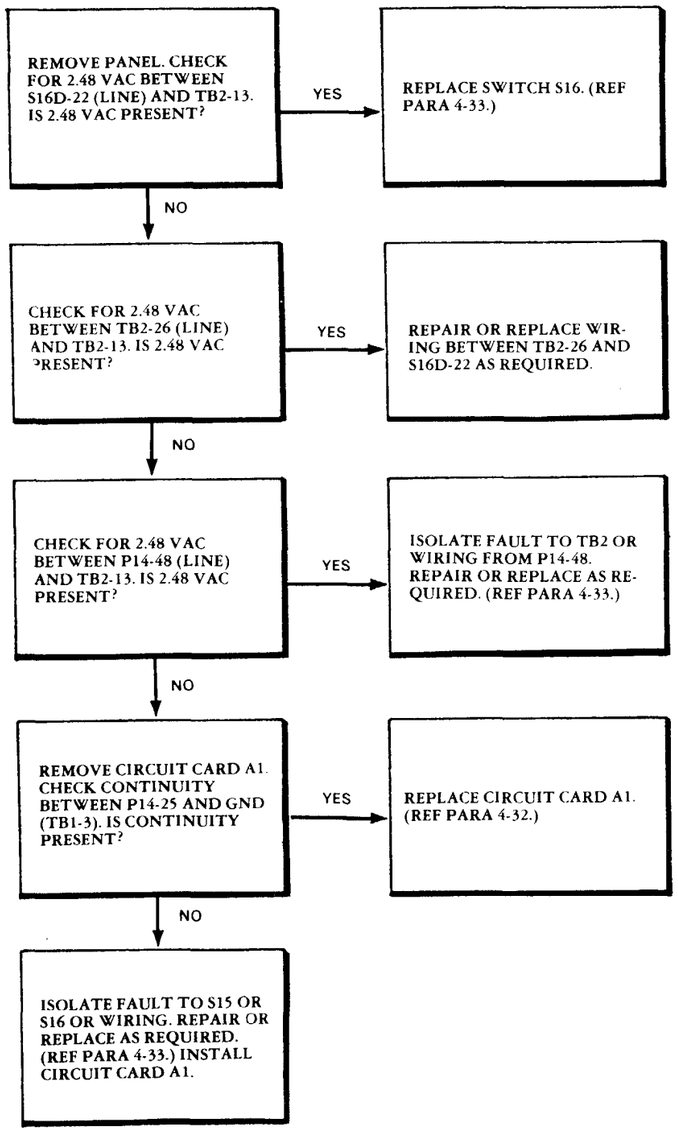
ax. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates -6.08 vdc when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,7. Refer to trouble symptom 4-7am.

ay. AC/DC VOLTMETER does not indicate -6.08 vdc and RESPONSE TEST HOLD light does not come on when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 20,7. Refer to trouble symptom 4-7an.

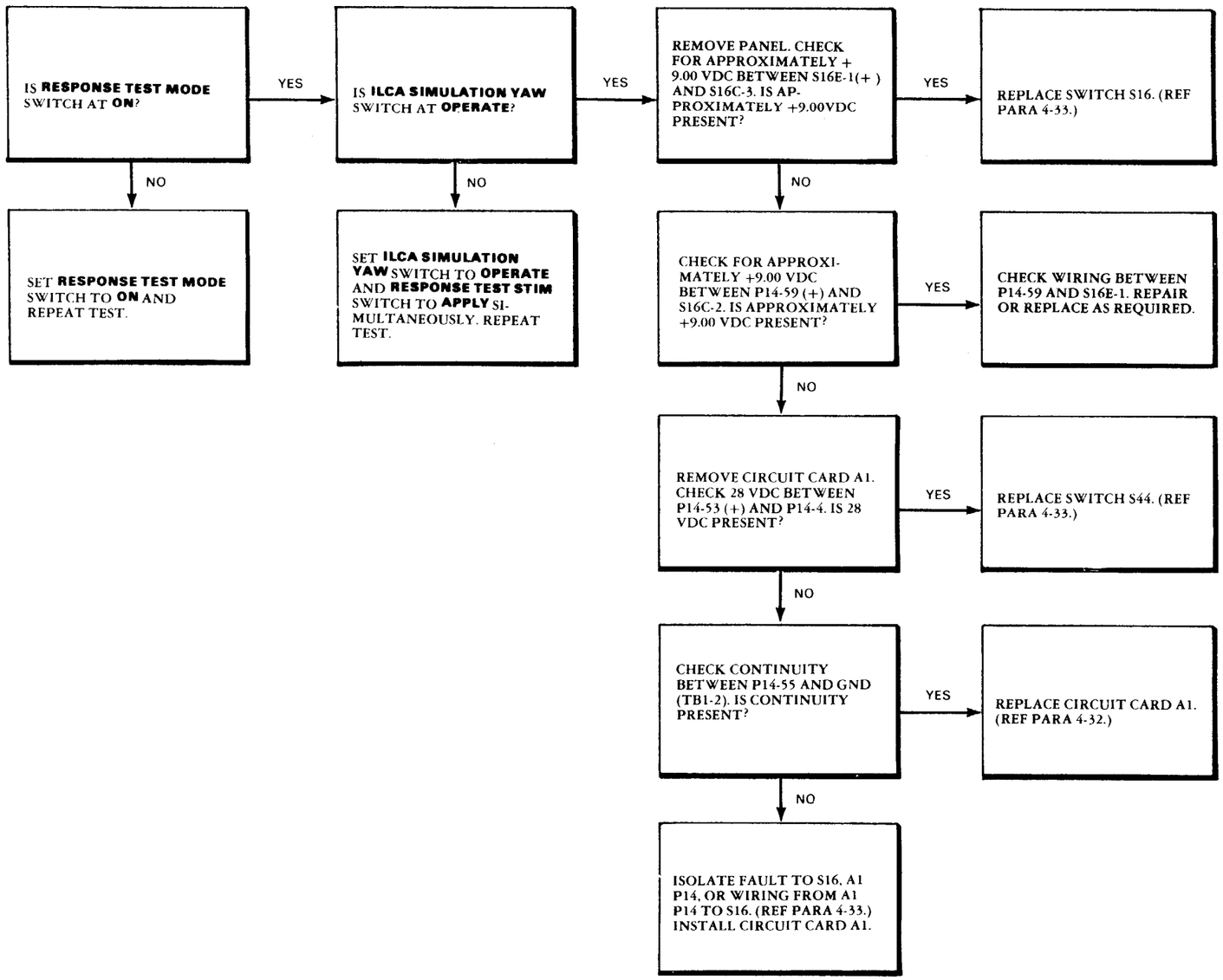
az. AC/DC VOLTMETER does not indicate 4.95 vac when SELF TEST CIRCUIT SELECT switches are at 20,8 and RESPONSE TEST MODE switch is at OFF.



ba. AC/DC VOLTMETER does not indicate 2.48 vac when SELF TEST CIRCUIT SELECT switches are at 20,9 and RESPONSE TEST MODE switch is at OFF.



bb. AC/DC VOLTMETER does not indicate +6.08 vdc when RESPONSE TEST HOLD LIGHT comes on and RESPONSE TEST STIM switch is at APPLY, and SELF TEST CIRCUIT SELECT switches are set to 30,0.



bc. RESPONSE TEST HOLD light does not come on but AC/DC VOLTMETER indicates +6.08 vdc when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 30,0. Refer to trouble symptom 4-7am.

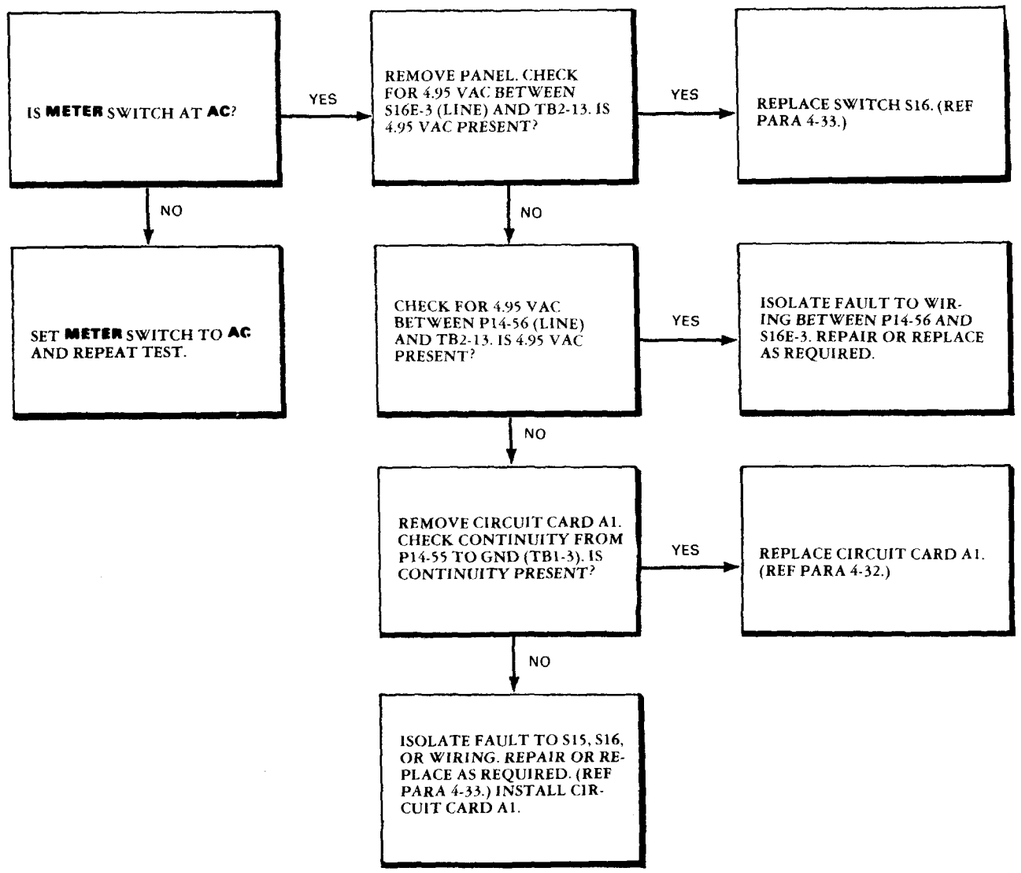
bd. AC/DC VOLTMETER does not indicate +6.08 vdc and RESPONSE TEST HOLD light does not come on when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 30,0. Refer to trouble symptom 4-7an.

be. AC/DC VOLTMETER does not indicate –6.08 vdc when RESPONSE TEST HOLD light comes on and RESPONSE TEST STIM switch is at APPLY, and SELF TEST CIRCUIT SELECT switches are set to 30,1. Isolate fault to S16 or wiring between S16E-1 and S16E-2. Repair or replace as required. (Ref para 4-33.)

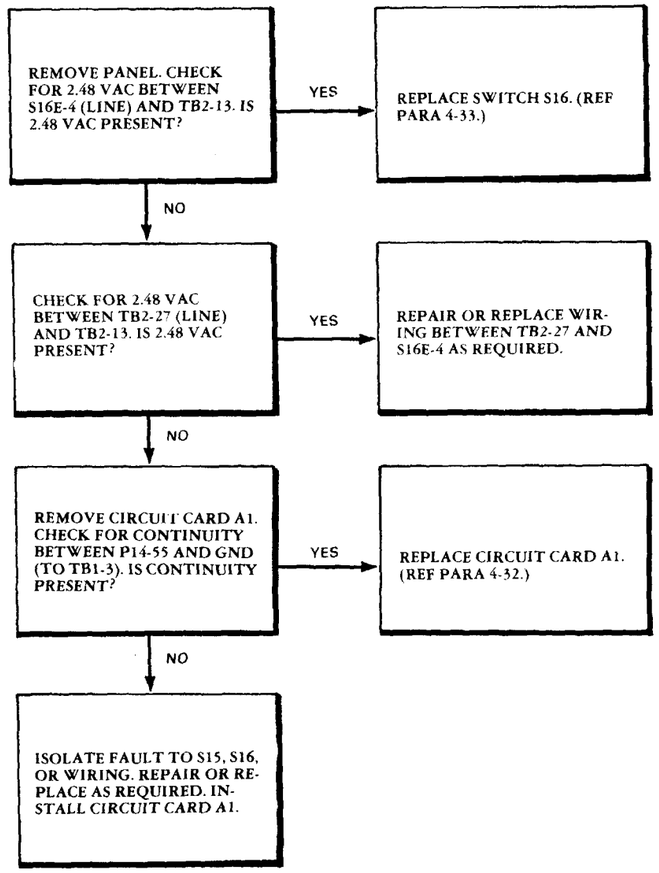
bf. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates –6.08 vdc when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 30,1. Refer to trouble symptom 4-7am.

bg. AC/DC VOLTMETER does not indicate –6.08 vdc and RESPONSE TEST HOLD light does not come on when RESPONSE TEST STIM switch is at APPLY and SELF TEST CIRCUIT SELECT switches are at 30,1. Refer to trouble symptom 4-7an.

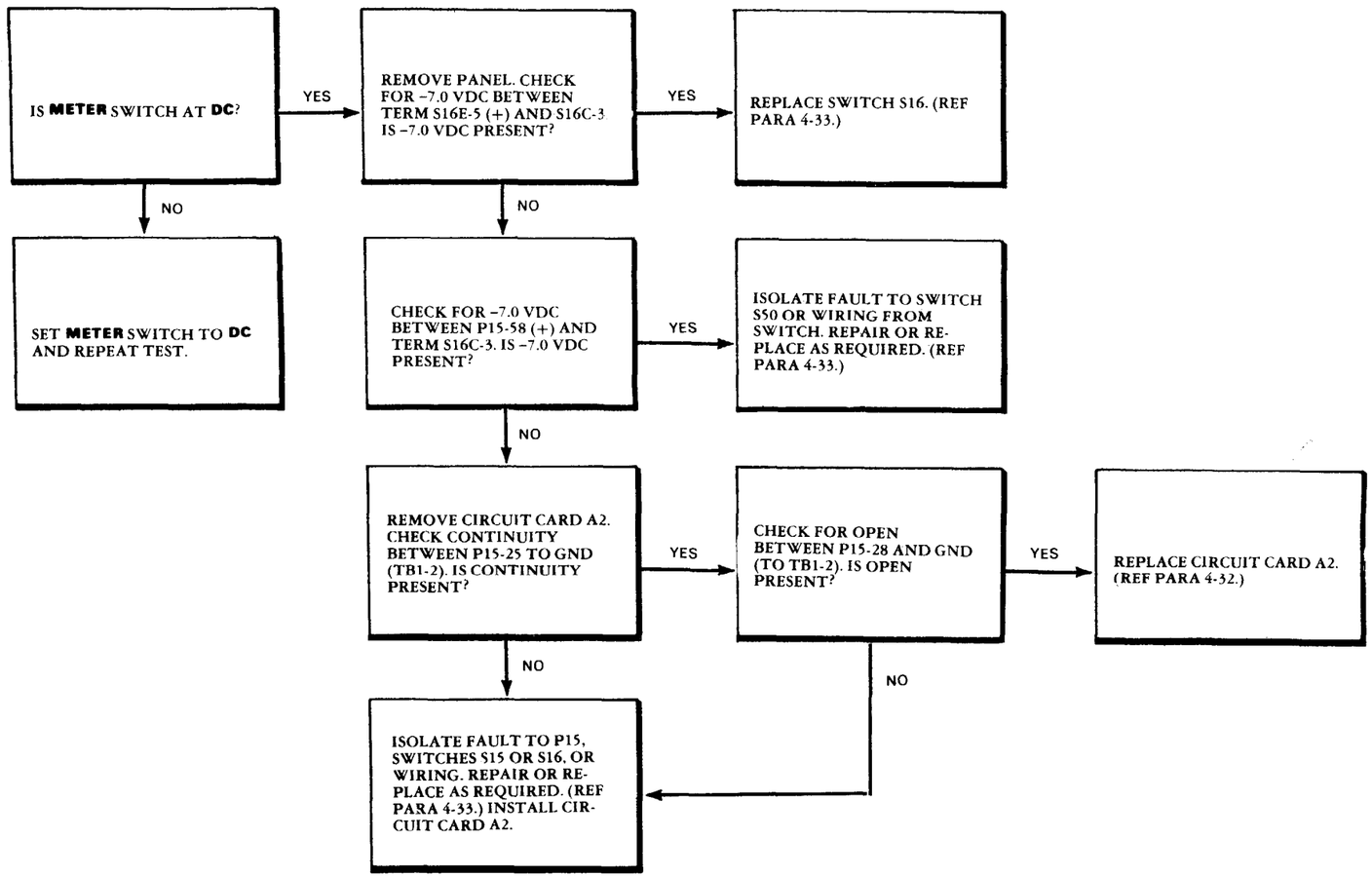
bb. AC/DC VOLTMETER does not indicate 4.95 vac when SELF TEST CIRCUIT switches are at 30,2 and RESPONSE TEST MODE switch is at OFF.



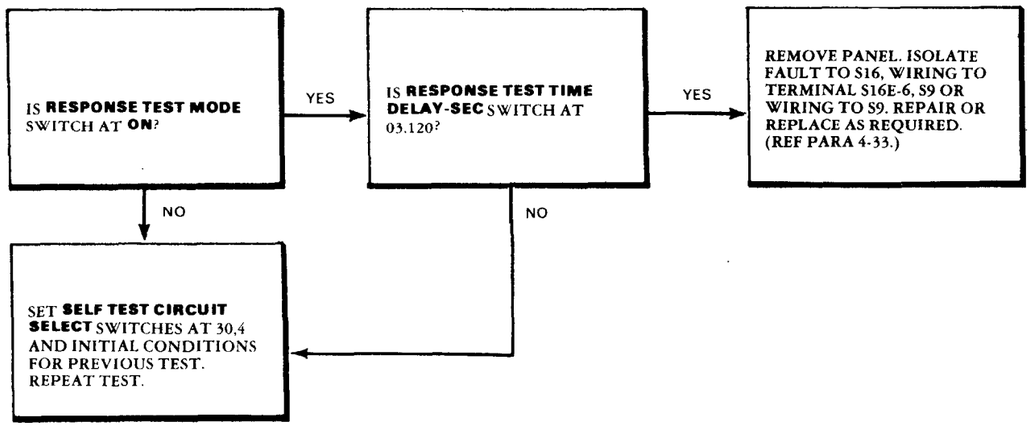
bi. AC/DC VOLTMETER does not indicate 2.48 vac when SELF TEST CIRCUIT SELECT switches are at 30,3, and RESPONSE TEST MODE switch is at OFF.



bj. AC/DC VOLTMETER does not indicate −7.00 vdc when SERVO SIMULATION LCT switch is at NORM and SELF TEST CIRCUIT SELECT switches are at 30,4.



bk. AC/DC VOLTMETER does not indicate −5.00 vdc when RESPONSE TEST HOLD light comes on, and SELF TEST CIRCUIT SELECT switches are at 30,5.



bl. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates −5.00 vdc when SELF TEST CIRCUIT SELECT switches are at 30,5 and RESPONSE TEST STIM switch is at APPLY. Isolate fault to S50, S16, P15, wiring, or circuit card A2.

bm. AC/DC VOLTMETER does not indicate −5.00 vdc and RESPONSE TEST HOLD light does not come on when SELF TEST CIRCUIT SELECT switches are at 30,5. Isolate fault to S16, P15, wiring, or circuit card A2.

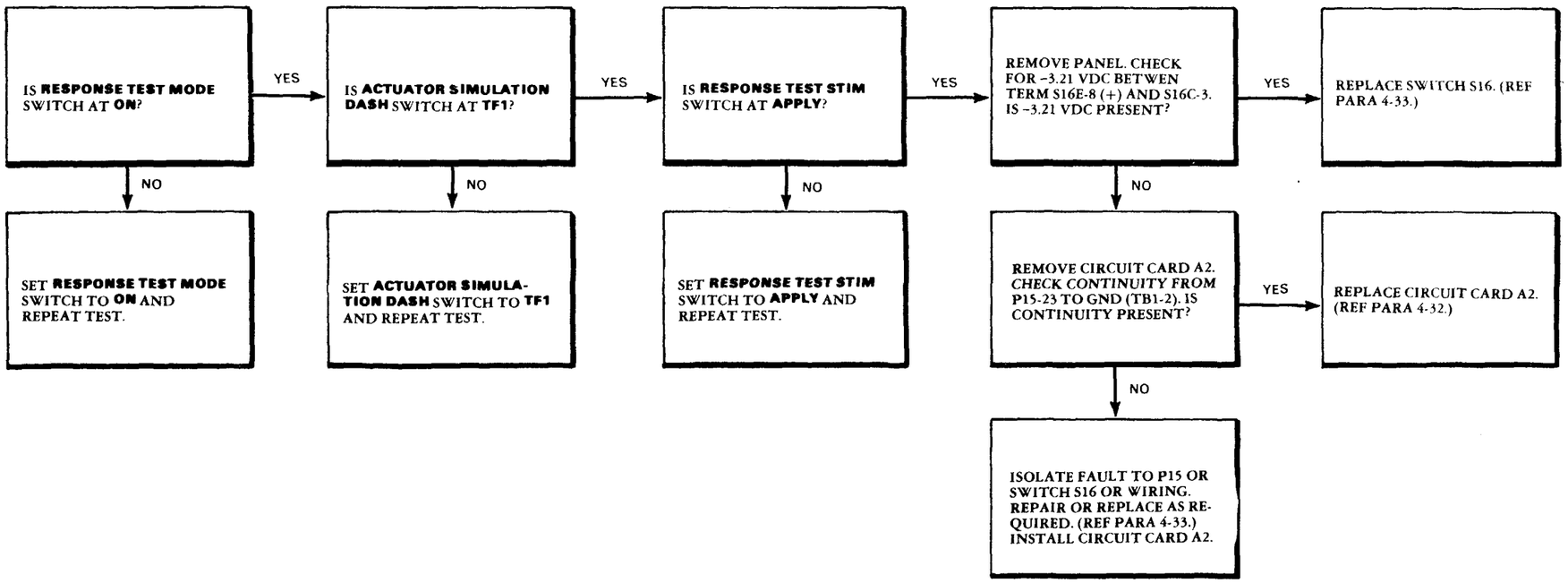
bn. AC/DC VOLTMETER does not indicate −2.00 vdc and RESPONSE TEST HOLD light does not come on when SELF TEST CIRCUIT SELECT switches are at 30,4. Refer to trouble symptom 4-7bm.

bo. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates +3.21 vdc when SELF TEST CIRCUIT SELECT switches are at 30,6. Isolate fault to S9, S16, S51, P15, wiring or circuit card A2.

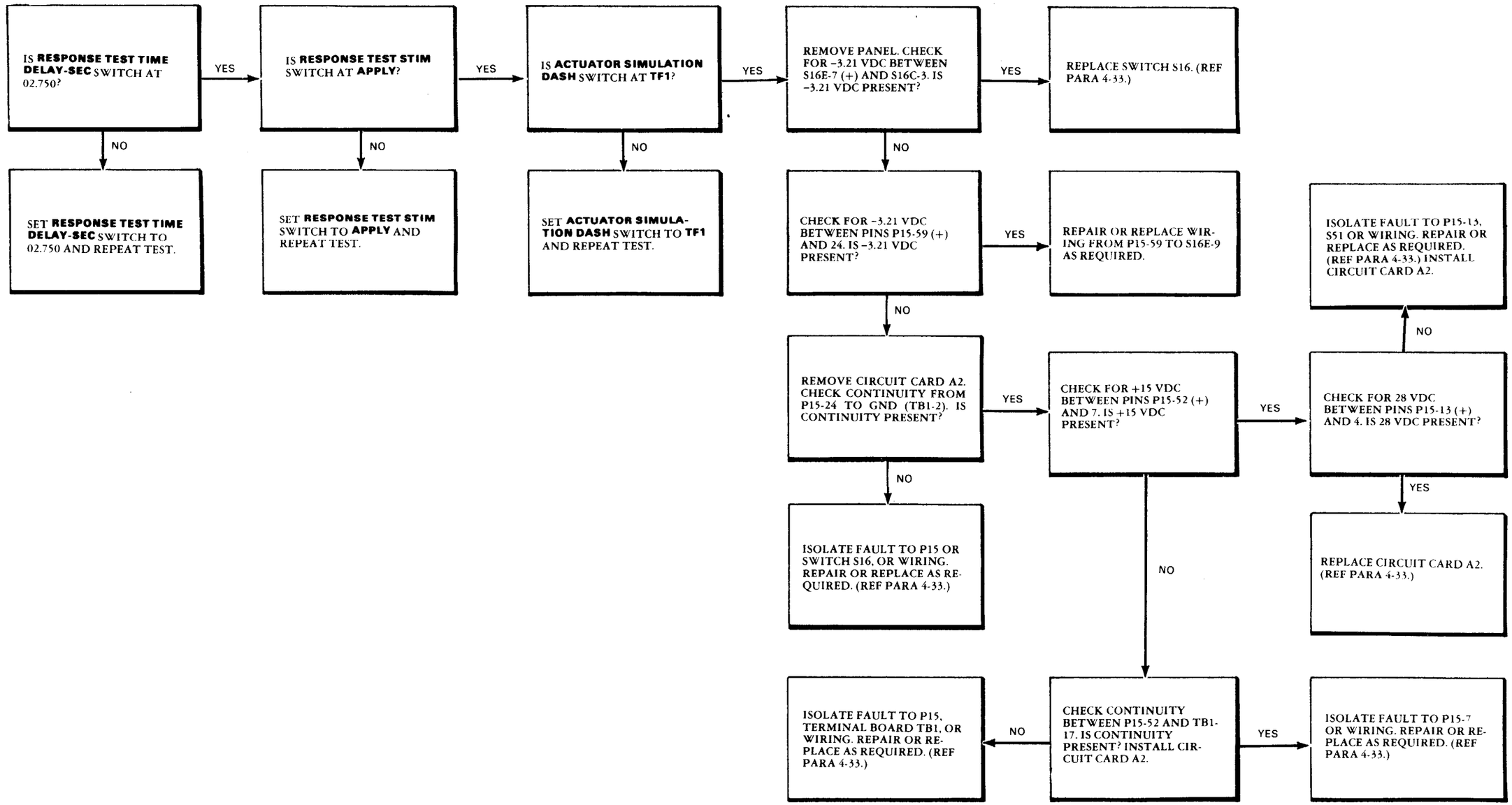
bp. AC/DC VOLTMETER does not indicate +3.21 vdc and RESPONSE TEST HOLD light does not come on when SELF TEST CIRCUIT SELECT switches are at 30,6. Refer to trouble symptom 4-7bm.

bq. AC/DC VOLTMETER does not indicate +7.00 vdc when RESPONSE TEST MODE switch is at OFF, and SELF TEST CIRCUIT SELECT switches are set to 30,6. Replace circuit card A4. (Ref para 4-32.)

br. AC/DC VOLTMETER does not indicate −3.21 vdc when RESPONSE TEST HOLD light comes on and SELF TEST CIRCUIT SELECT switches are at 30,7.



bs. AC/DC VOLTMETER does not indicate −3.21 vdc when RESPONSE TEST HOLD light comes on and SELF TEST CIRCUIT SELECT switches are at 30,7 and RESPONSE TEST MODE switch is at ON.

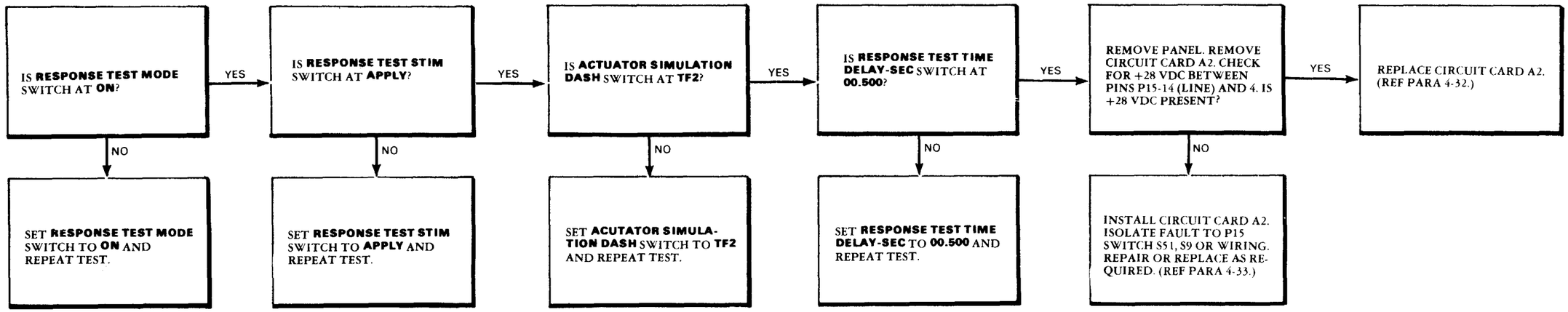


bt. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates −3.21 vdc when SELF TEST CIRCUIT SELECT switches are at 30,7. Replace circuit card A4. (Ref para 4-32.)

bu. AC/DC VOLTMETER does not indicate −3.21 vdc and RESPONSE TEST HOLD light does not come on when SELF TEST CIRCUIT SELECT switches are at 30,7. Replace circuit card A4. (Ref para 4-32.)

bv. AC/DC VOLTMETER does not indicate −7.00 vdc when RESPONSE TEST MODE switch is at OFF, and SELF TEST CIRCUIT SELECT switches are set to 30,7. Replace circuit card A4. (Ref para 4-32.)

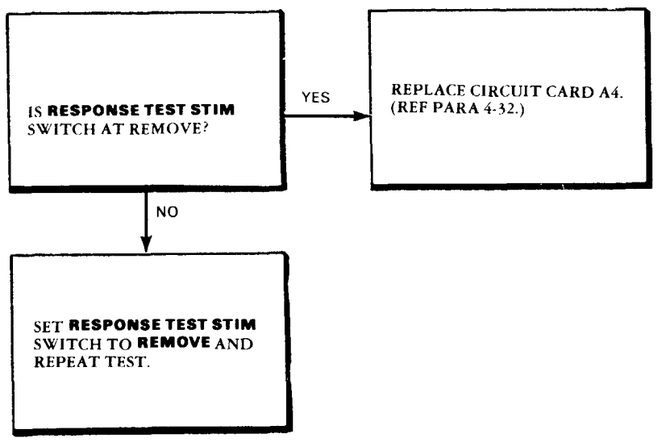
bw. AC/DC VOLTMETER does not indicate −2.37 vdc when RESPONSE TEST HOLD light comes on and SELF TEST CIRCUIT SELECT switches are at 30,7.



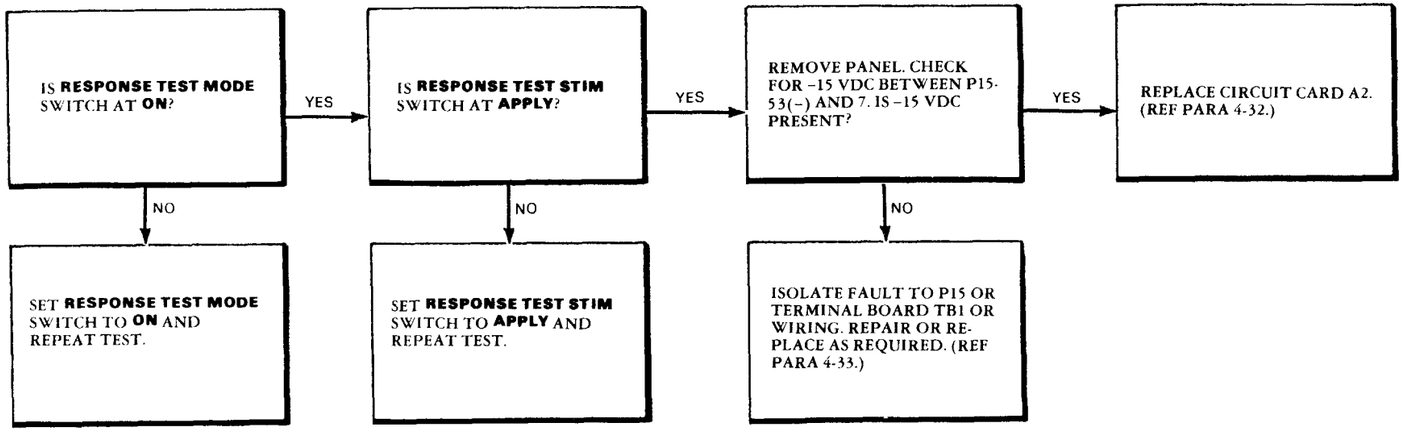
bx. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates −2.37 vdc when SELF TEST CIRCUIT SELECT switches are at 30,7. Replace circuit card A4. (Ref para 4-32.)

by. AC/DC VOLTMETER does not indicate −2.37 vdc and RESPONSE TEST HOLD light does not come on, when SELF TEST CIRCUIT SELECT switches are at 30,7. Replace circuit card A4. (Ref para 4-32.)

bz. AC/DC VOLTMETER does not indicate −3.75 vdc when RESPONSE TEST MODE switch is at OFF, and SELF TEST CIRCUIT SELECT switches are set to 30,7.



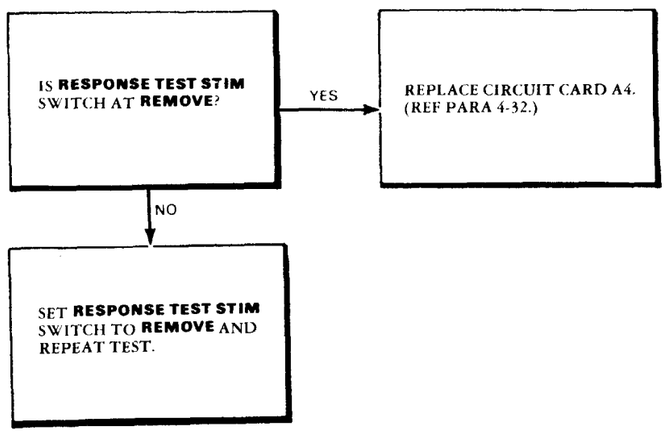
ca. AC/DC VOLTMETER does not indicate +2.37 vdc when RESPONSE TEST HOLD lamp comes on, and SELF TEST CIRCUIT SELECT switches are at 30,6.



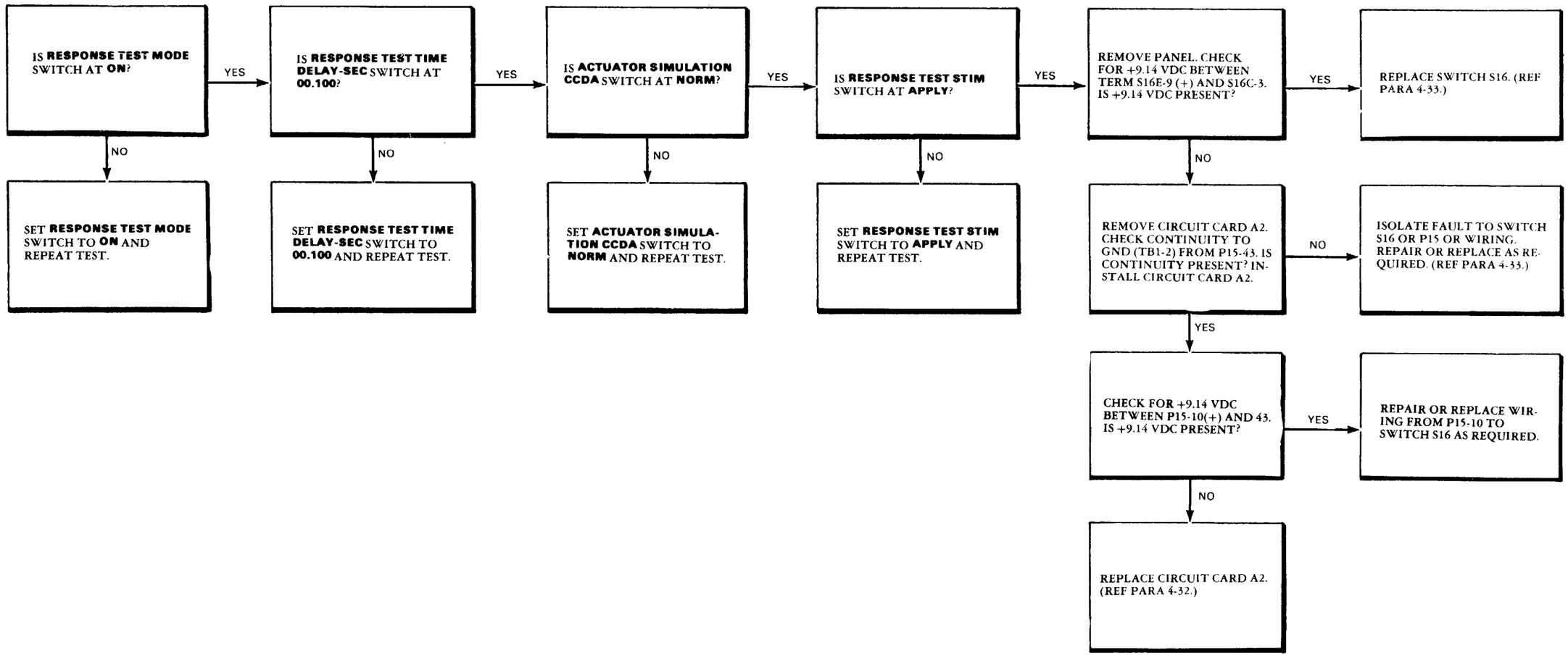
cb. RESPONSE TEST HOLD lamp does not come on, but AC/DC VOLTMETER indicates +2.37 vdc when SELF TEST CIRCUIT SELECT switches are at 30,6. Replace circuit card A4.

cc. AC/DC VOLTMETER does not indicate +2.37 vdc and RESPONSE TEST HOLD lamp does not come on when SELF TEST CIRCUIT SELECT switches are at 30,6. Replace circuit card A4.

cd. AC/DC VOLTMETER does not indicate +3.75 vdc when RESPONSE TEST MODE switch is at OFF, and SELF TEST CIRCUIT SELECT switches are set to 30,6.



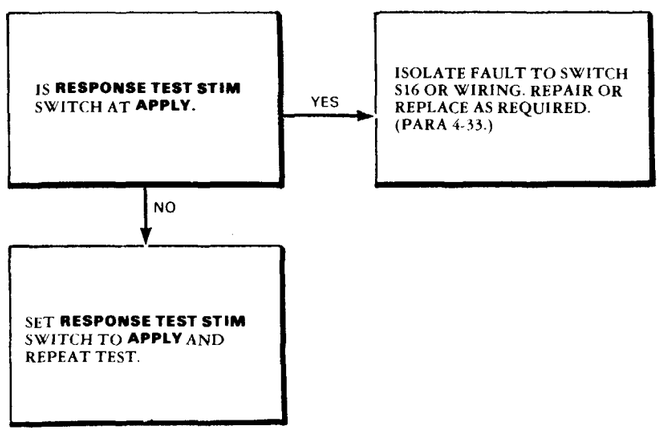
ce. AC/DC VOLTMETER does not indicate +9.14 vdc when RESPONSE TEST HOLD light comes on and SELF TEST CIRCUIT SELECT switches are at 30,8.



cf. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates +9.14 vdc when SELF TEST CIRCUIT SELECT switches are at 30,8. Replace circuit card A4. (Ref para 4-32.)

cg. AC/DC VOLTMETER does not indicate +9.14 vdc and RESPONSE TEST HOLD light does not come on when SELF TEST CIRCUIT SELECT switches are at 30,8. Replace circuit card A4. (Ref para 4-32.)

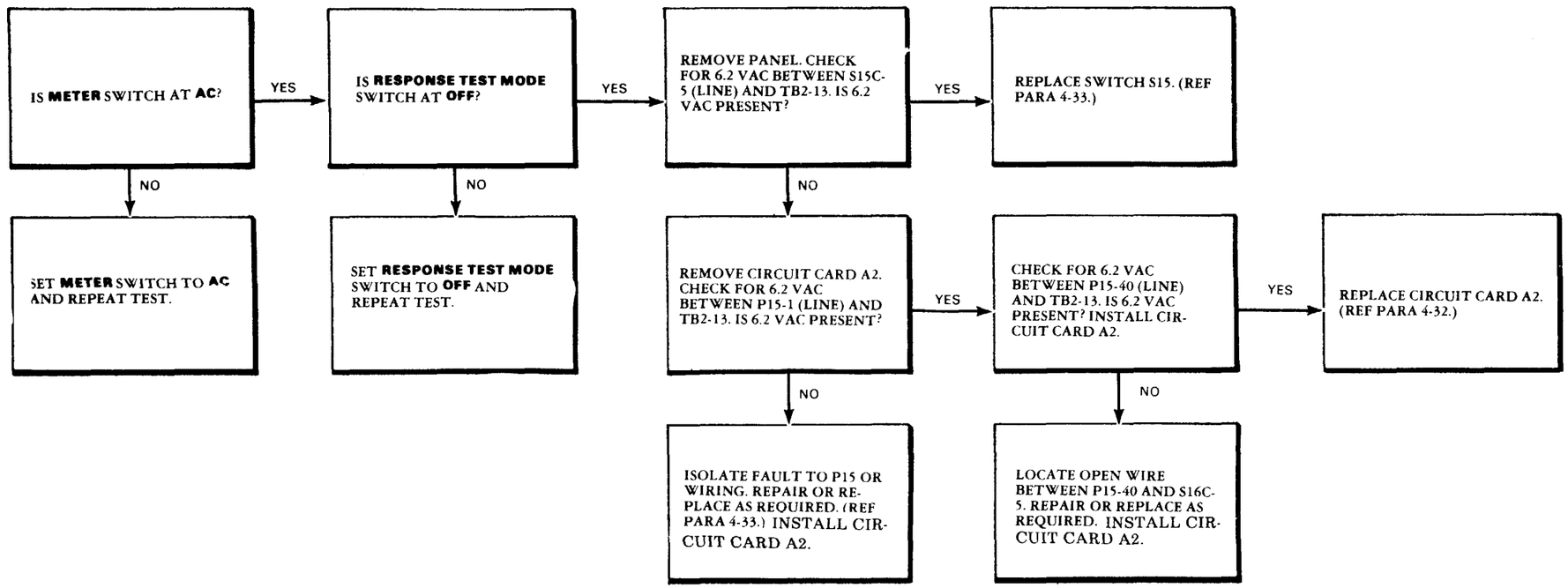
ch. AC/DC VOLTMETER does not indicate −9.14 vdc when RESPONSE TEST HOLD light is on and SELF TEST CIRCUIT SELECT switches are at 30,9.

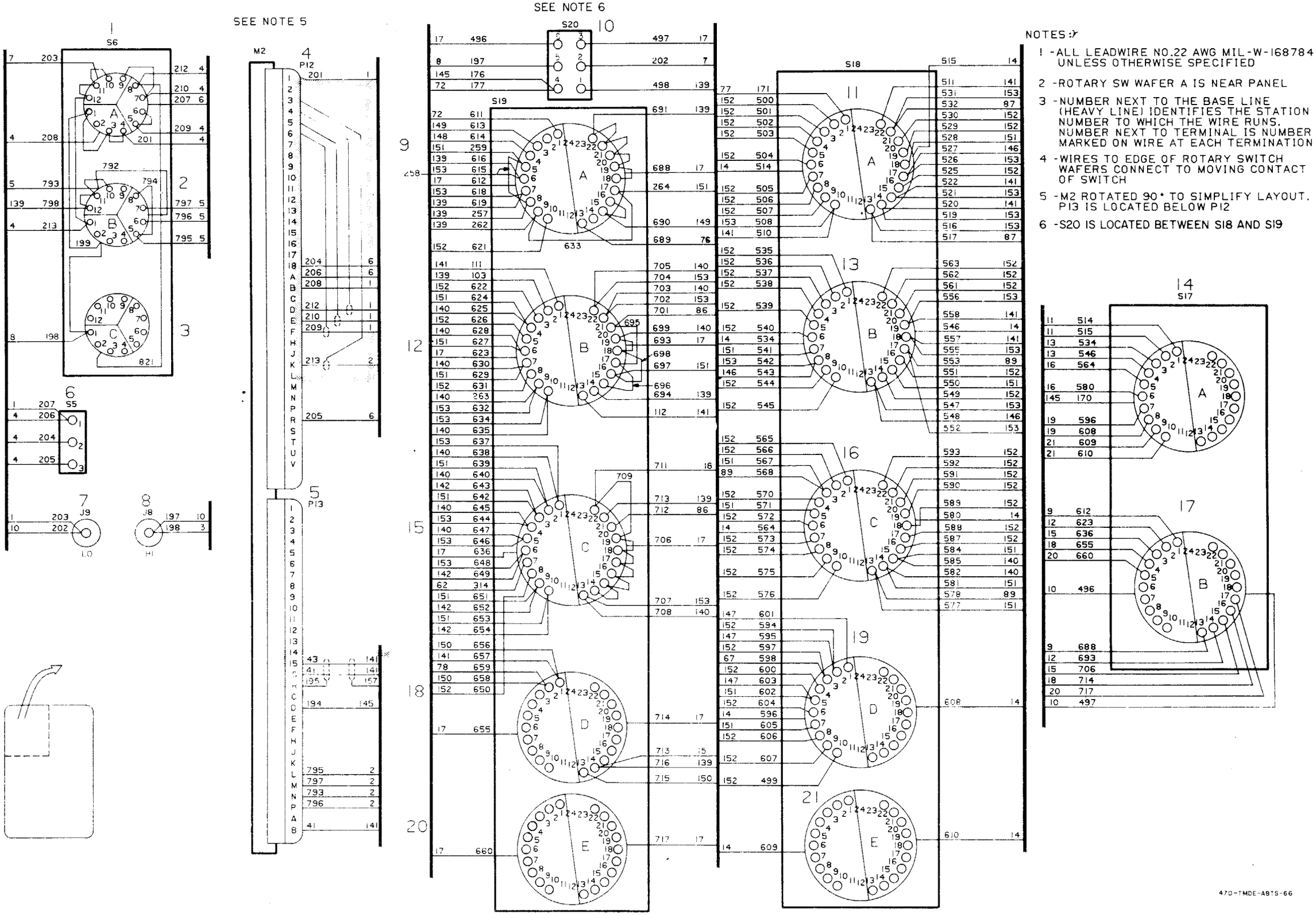


ci. RESPONSE TEST HOLD light does not come on, but AC/DC VOLTMETER indicates −9.14 vdc when SELF TEST CIRCUIT SELECT switches are at 30,9. Replace circuit card A4. (Ref para 4-32.)

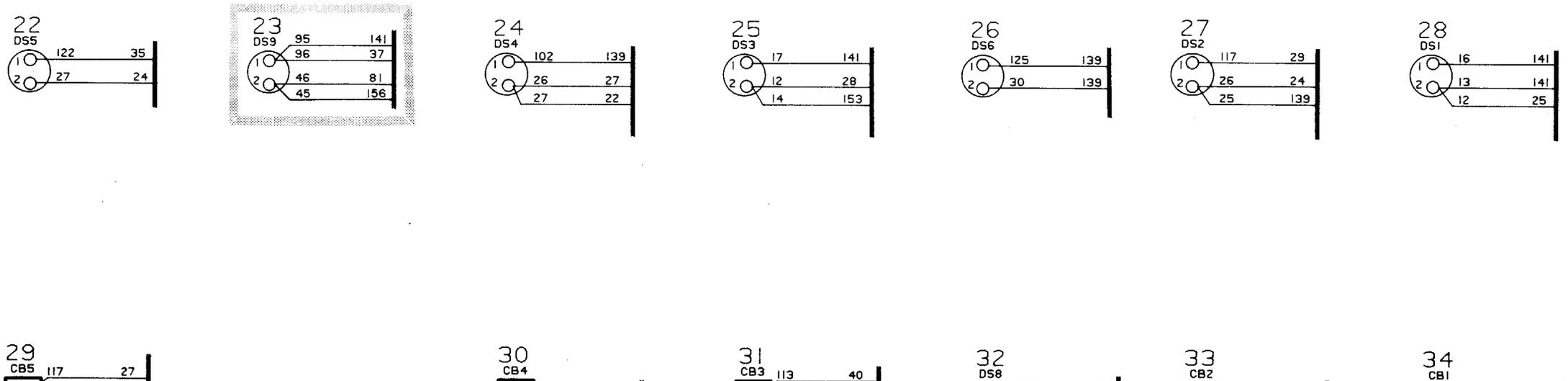
cj. AC/DC VOLTMETER does not indicate −9.14 vdc and RESPONSE TEST HOLD light does not come on when SELF TEST CIRCUIT SELECT switches are at 30,9. Replace circuit card A4. (Ref para 4-32.)

ck. AC/DC VOLTMETER does not indicate 6.2 vac when SELF TEST CIRCUIT SELECT switches are at 40,0.



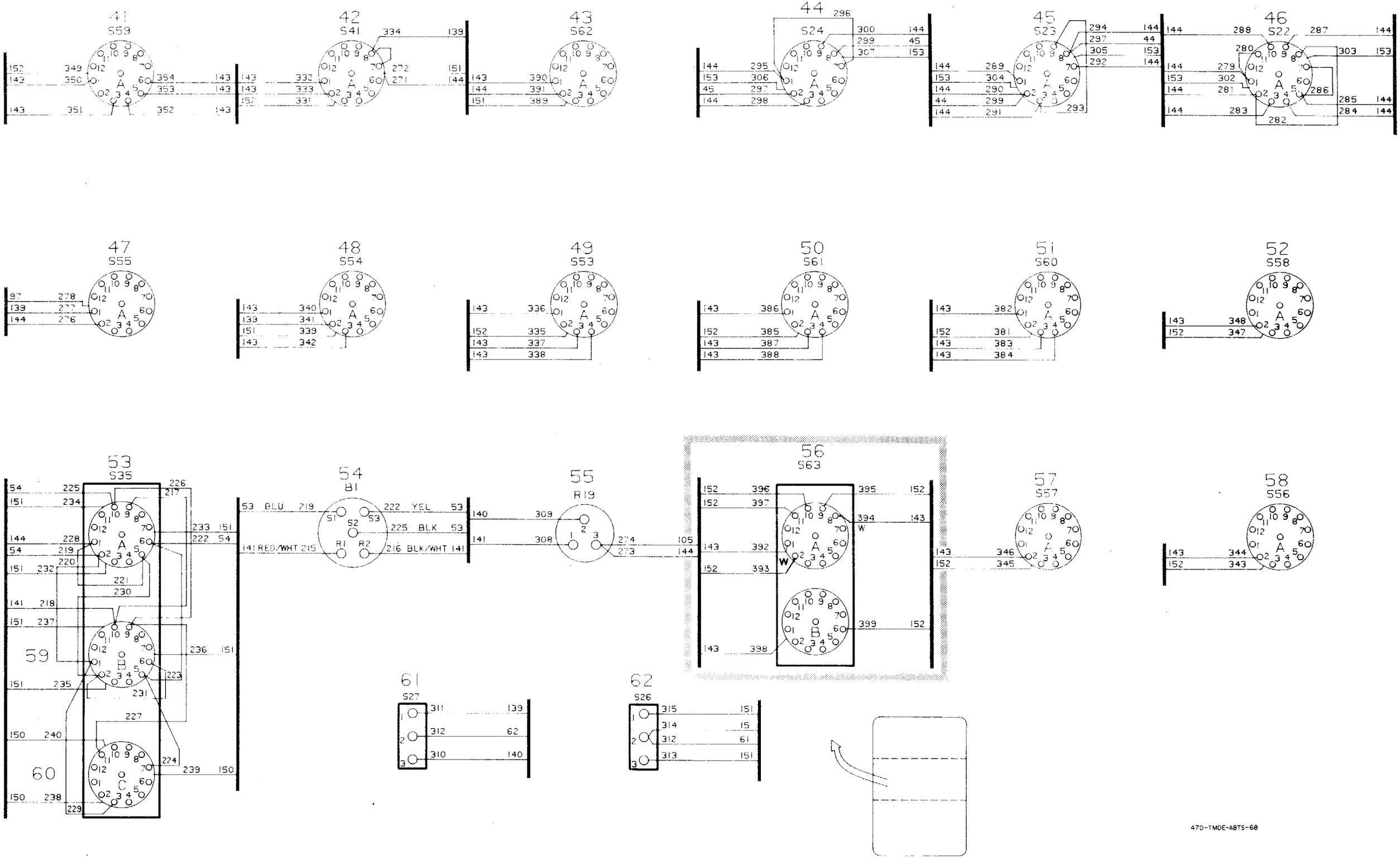


FO-55. ***Wiring Diagram (Sheet 1 of 9)***

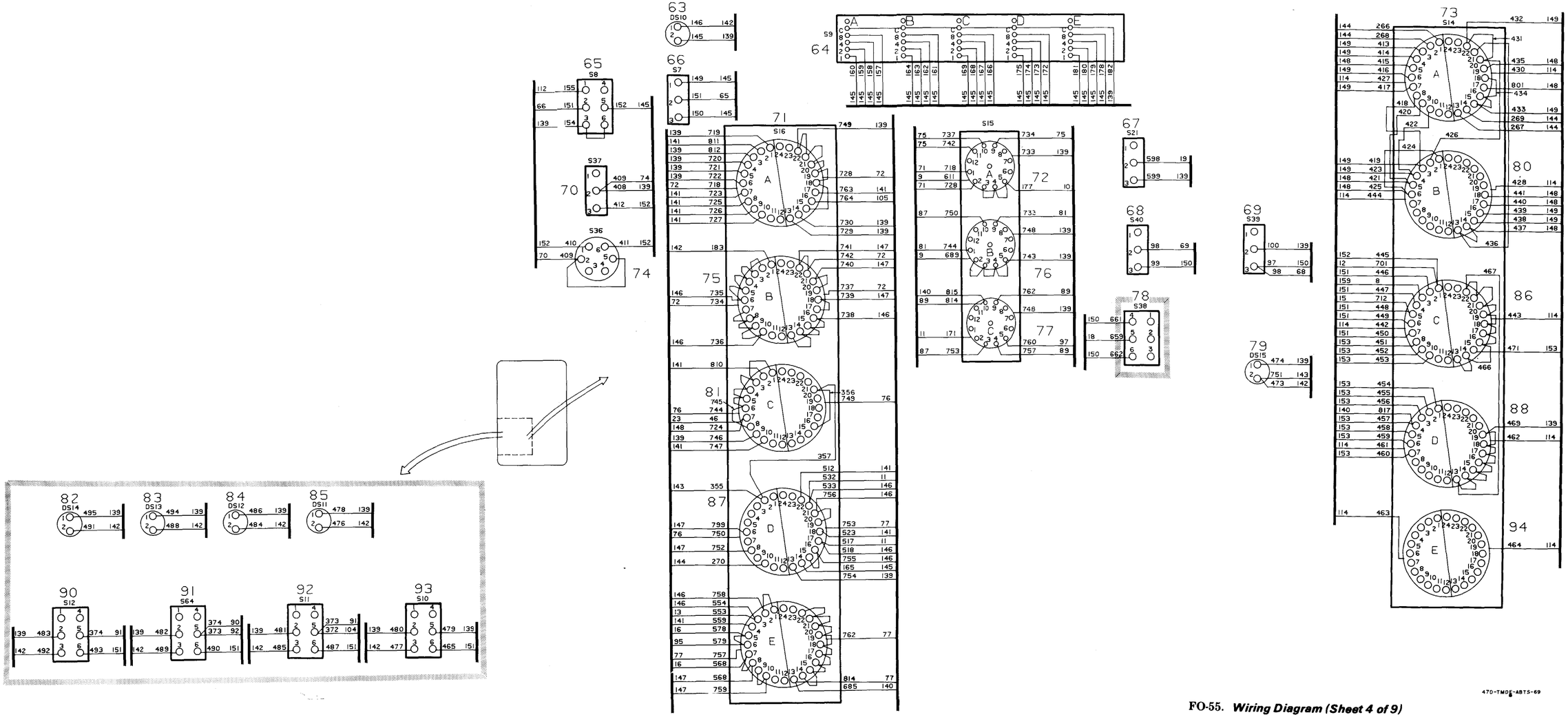


47D-TMDE-ABTS-67

FO-55. ***Wiring Diagram (Sheet 2 of 9)***

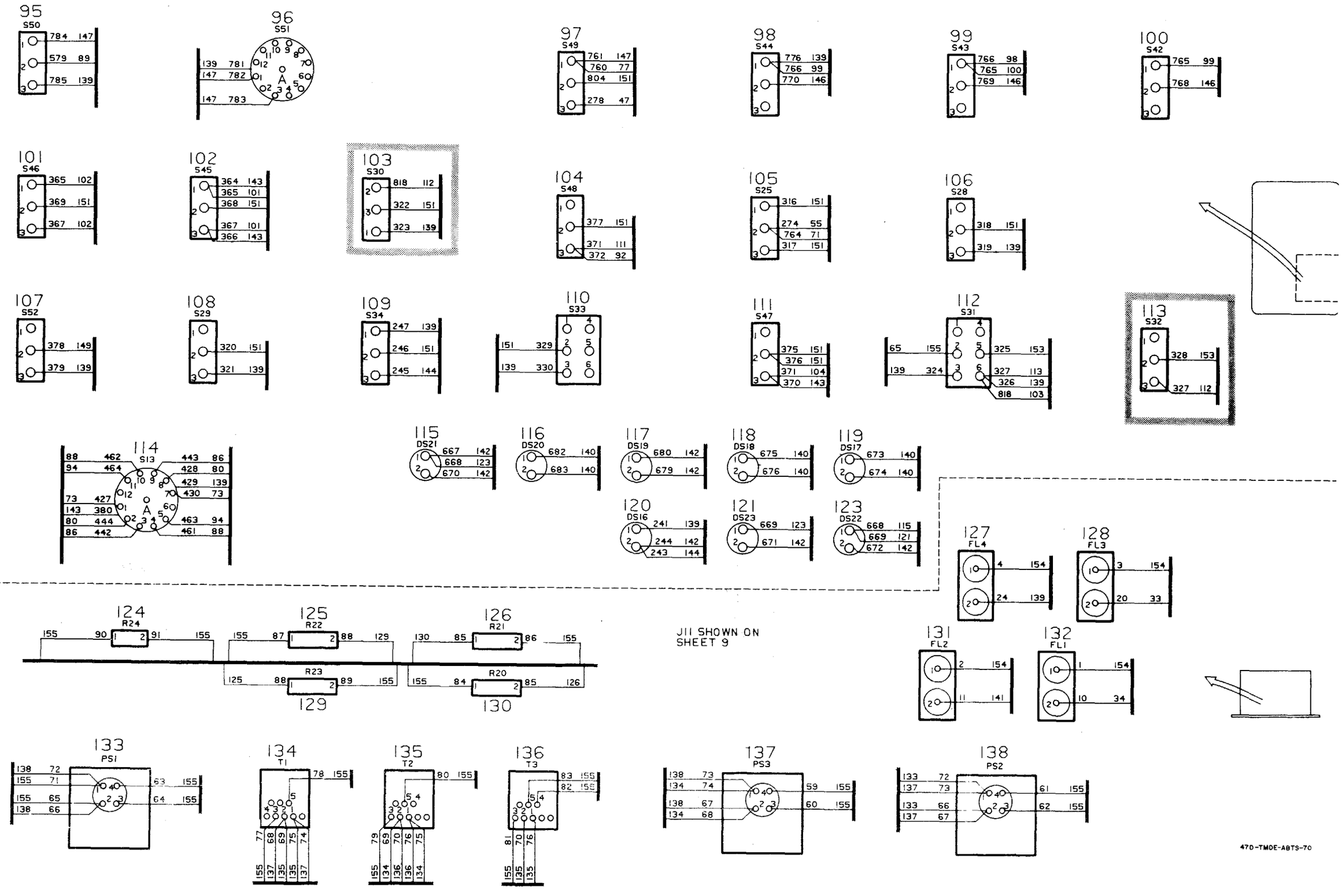


FO-55. ***Wiring Diagram (Sheet 3 of 9)***

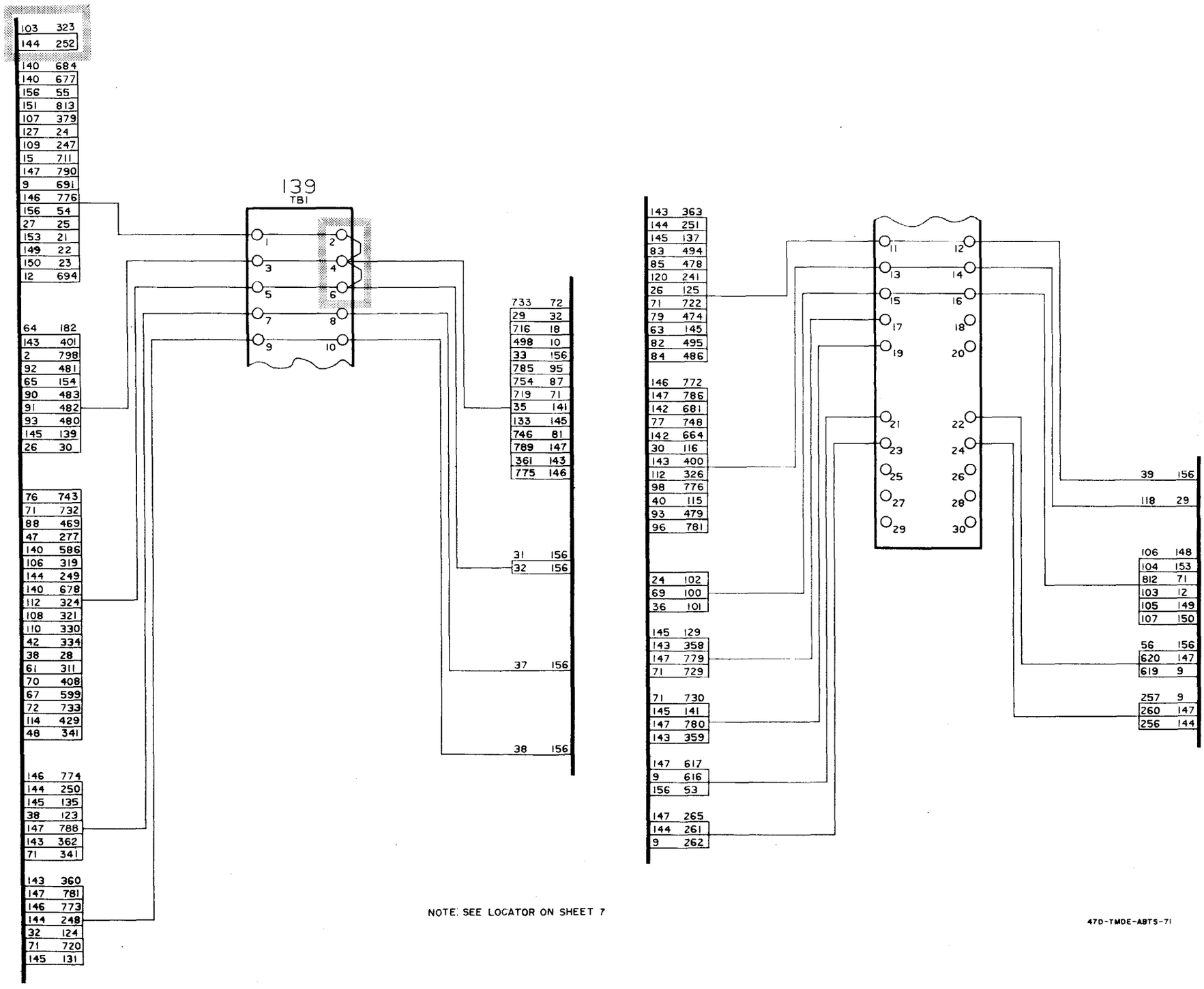


470-TMOE-ABTS-69

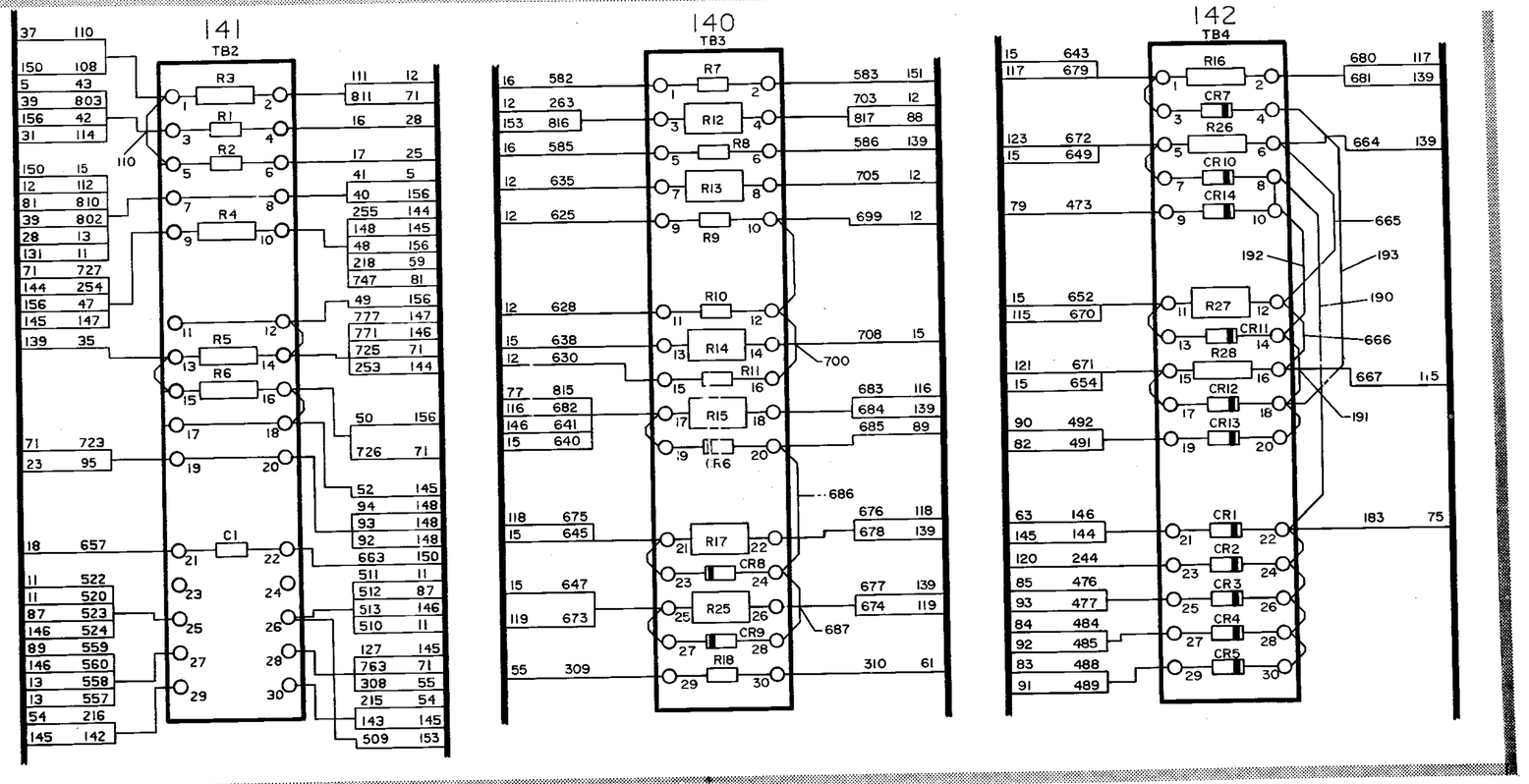
FO-55. ***Wiring Diagram (Sheet 4 of 9)***



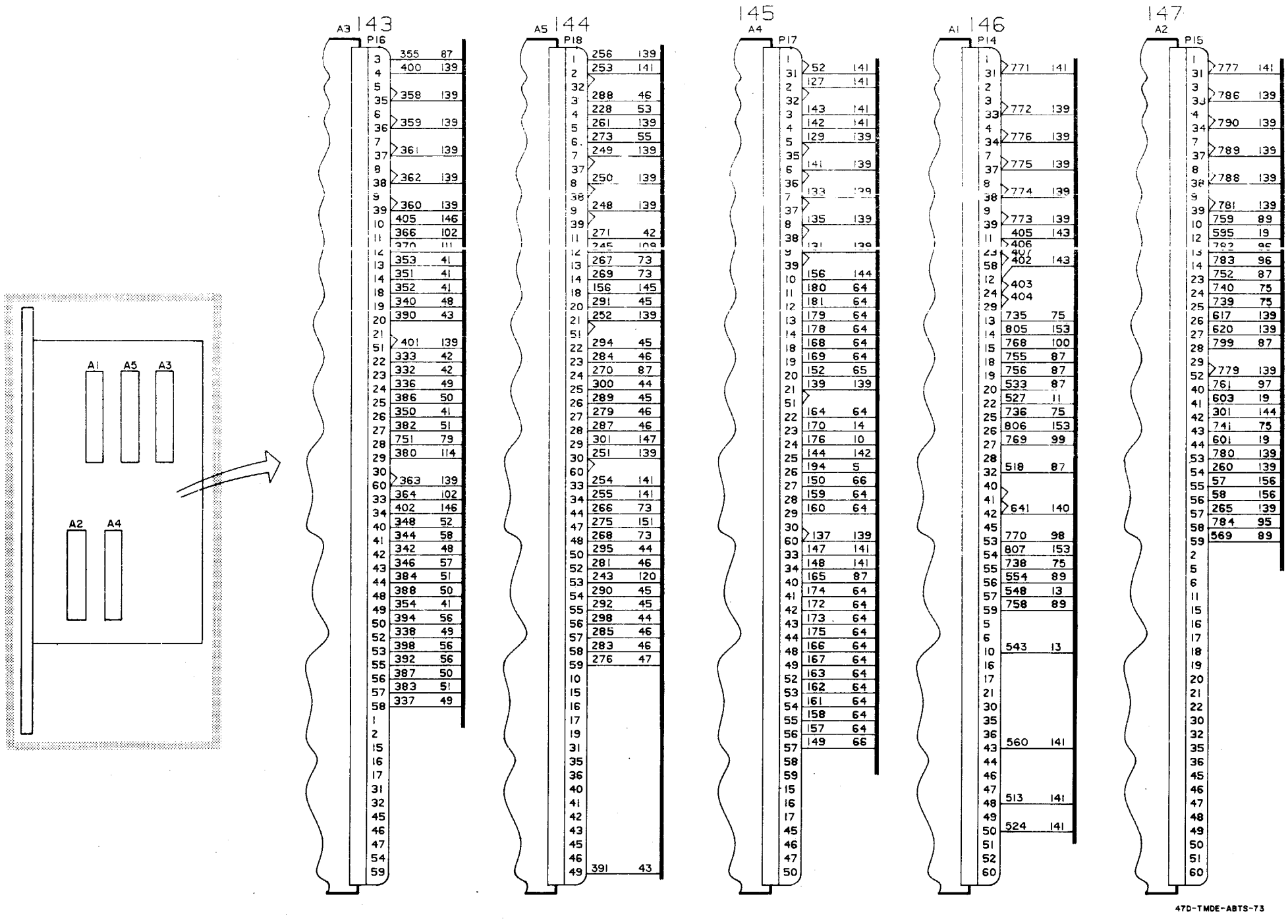
FO-55. ***Wiring Diagram (Sheet 5 of 9)***



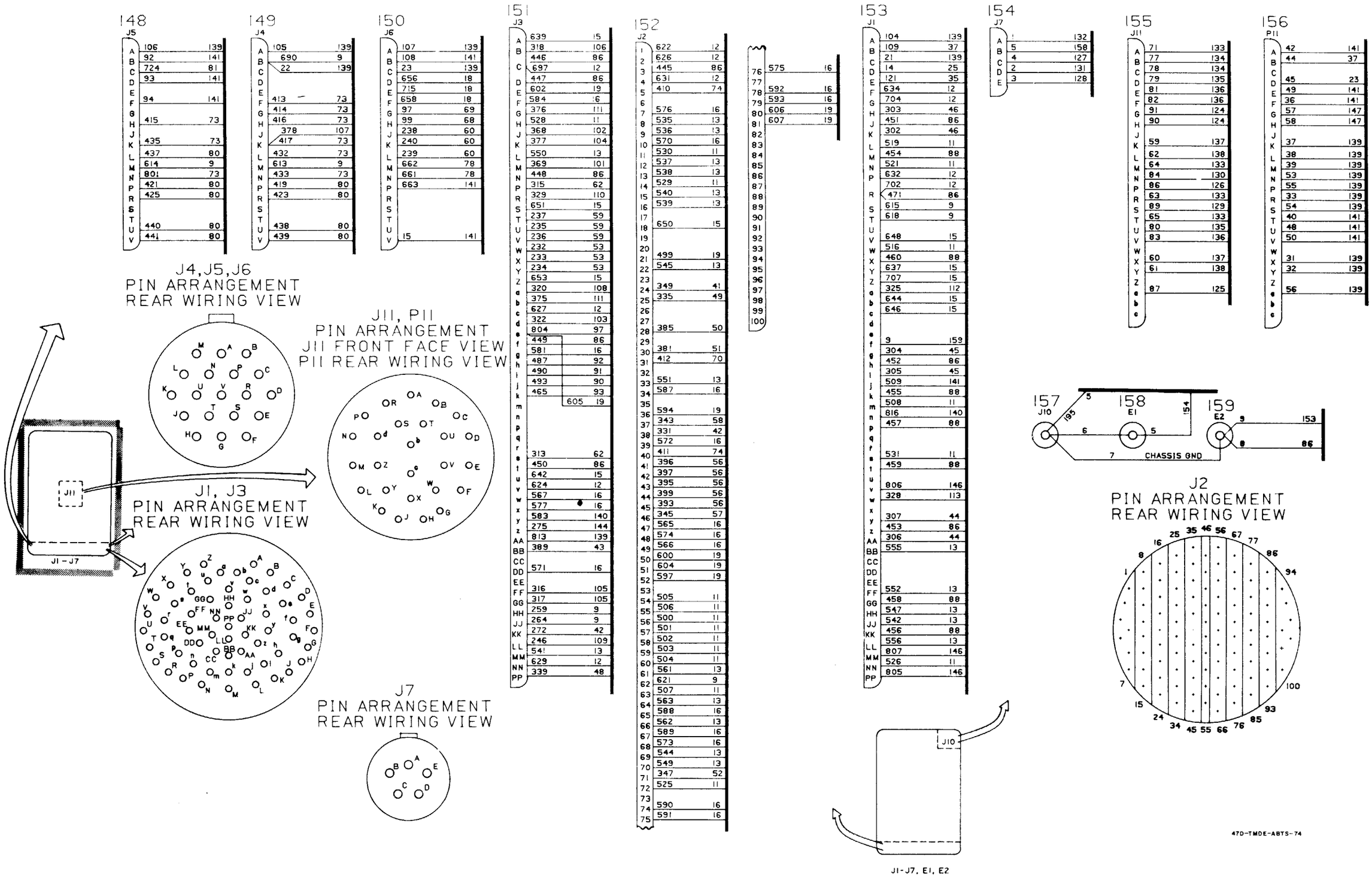
FO-55. ***Wiring Diagram (Sheet 6 of 9)***



FO-55. *Wiring Diagram (Sheet 7 of 9)*



FO-55. ***Wiring Diagram (Sheet 8 of 9)***



FO-55. ***Wiring Diagram (Sheet 9 of 9)***

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
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COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 55-4920-430-13	20 Sep 83	Test Set, Bench Advanced Flight Control System (AFCS) 145G0008-1 NSN 4920-01-121-0602

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO	TABLE NO.
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe
JOHN DOE

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

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The Metric System and Equivalents

Linear Measure

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

Weights

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

Liquid Measure

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

Square Measure

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

Cubic Measure

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

Approximate Conversion Factors

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

Temperature (Exact)

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