# *TB 9-4920-361-24

**DEPARTMENT OF THE ARMY TECHNICAL BULLETIN**

# CALIBRATION PROCEDURE FOR VERTICAL DISPLAY SYSTEM LINE TEST SET, CANADIAN MARCONI, MODEL 245-476853-( ) AND VERTICAL DISPLAY SYSTEM BENCH TEST SET, CANADIAN MARCONI, MODEL 245-476854-( )

Headquarters, Department of the Army, Washington, DC
6 June 2007



**REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS**

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, US Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our FAX number is: DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use: https://amcom2028.redstone.army.mil.



*This bulletin supersedes TB 9-4920-361-24, dated 18 July 2006, including all changes.

## SECTION I
## IDENTIFICATION AND DESCRIPTION

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Vertical Display System Line Test Set, Canadian Marconi, Model 245-476853-( ) and Vertical Display System Bench Test Set, Canadian Marconi, Model 245-476854-( ). TM 55-4920-413-13&P and TM 55-4920-412-13&P were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

**a. Model Variations**. Model 245-476854-( ) contains a simulator and a unit tester. Model 245-476853-( ) contains only a simulator.

**b. Time and Technique**. The time required for this calibration is approximately 3 hours, using the dc and low frequency technique.

**2. Forms, Records, and Reports**

**a**. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

**b**. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

**3. Calibration Description.** TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

| Test instrument parameters | Performance specifications |
|---|---|
| **MODEL 245-476853-( )** | |
| Torque No. 1 and No. 2 (simulator) | Fixed: 0 and 3.7 V dc<br>Accuracy: ±0.10 V dc<br>Variable: 0 ±0.10 to 5.42 V dc min |
| Fuel quantity No. 1 and No. 2 (simulator) | Fixed: 0 and 6.13 V dc<br>Accuracy: ±0.05 V dc<br>Variable: 0 ±0.10 to 7.63 V dc min |

Table 1. Calibration Description - Continued

| Test instrument parameters | Performance specifications |
|---|---|
| **MODEL 245-476853-( ) - continued** | |
| Turbine gas temp No. 1 and No. 2 (simulator) | Fixed: 0 and 33.80 mV dc<br>Accuracy: ±0.15 mV dc<br>Variable: 0 ±0.5 to 41.30 mV dc min |
| Engine oil temp No. 1 and No. 2 (simulator) | Fixed: 74 and 151 Ω<br>Accuracy: ±3 Ω<br>Variable: 77 to 148 Ω min |
| Xmsn oil temp (simulator) | Fixed: 85 and 230 Ω<br>Accuracy: ±6 Ω<br>Variable: 88 to 270 Ω min |
| Rotor speed (simulator) | Fixed: 0 and 11,246 Hz<br>Accuracy: ±56 Hz<br>Variable: 0 to 17,200 Hz min |
| Engine % rpm No. 1 and No. 2 (simulator) | Fixed: 0 and 1335 Hz<br>Accuracy: ±27 Hz<br>Variable: 0 to 1830 Hz min |
| Gas gen speed No. 1 and No. 2 (simulator) | Fixed: 0 and 2135 Hz<br>Accuracy: ±10 Hz<br>Variable: 0 to 2400 Hz min |
| Engine oil press No. 1 and No. 2 (simulator) | Fixed: 3.591 and 2.914 V ac<br>Accuracy: ±0.144 V ac<br>Variable: 3.447 to 2.770 V ac min |
| Xmsn oil press (simulator) | Fixed: 2.840 and 3.591 V ac<br>Accuracy: ±0.144 V ac<br>Variable: 3.447 to 2.696 V ac min |
| **MODEL 245-476854-( )** | |
| Torque No. 1 and No. 2 (simulator) | Fixed: 0 and 3.7 V dc<br>Accuracy: ±0.0037 V dc<br>Variable: 0 ±0.003 to 5.615 ±0.2 V dc |
| Fuel quantity No. 1 and No. 2 (simulator) | Fixed: 6.125 V dc<br>Accuracy: ±0.005 V dc<br>Variable: 0 ±0.01 to 7.83 ±0.2 V dc |
| Turbine gas temp No. 1 and No. 2 (simulator) | Fixed: 0 and 33.80 mV dc<br>Accuracy: ±0.10 mV dc<br>Variable: 0 ± 0.5 to 46.3 ± 0.5 mV dc |
| Engine oil temp No. 1 and No. 2 (simulator) | Fixed: 75.6 and 150.6 Ω<br>Accuracy: ±0.4 Ω<br>Variable: 75.6 ± 2 to 180 ± 10 Ω |
| Xmsn oil temp (simulator) | Fixed: 87 and 234.5 Ω<br>Accuracy: ± 0.3 and ± 0.46 Ω<br>Variable: 87 ± 3.0 Ω to 270 ± 20.0 Ω |
| Rotor speed (simulator) | Fixed: 0 and 11,246.1 Hz<br>Accuracy: ±1 Hz<br>Variable: 0 to 17,600 ± 400 Hz |
| Engine % rpm No. 1 and No. 2 (simulator) | Fixed: 0 and 1333.5 Hz<br>Accuracy: ± 1 Hz<br>Variable: 0 to 1,930 ± 100 Hz |
| Engine oil press No. 1 and No. 2 (simulator) | Fixed: 3.591 and 2.914 V ac<br>Accuracy: ±0.144 V ac<br>Variable: 3.447 to 2.770 V ac min |
| Xmsn oil press (simulator) | Fixed: 2.840 and 3.591 V ac<br>Accuracy: ±0.144 V ac<br>Variable: 3.447 to 2.696 V ac min |

Table 1. Calibration Description - continued

| Test instrument parameters | Performance specifications |
|---|---|
| **MODEL 245-476854-( ) - continued** | |
| Inter cal(unit tester):<br>Positions 1 to 14 | <br>Range: 5 V dc<br>Accuracy: ±1 V dc |
| Positions 15 to 19 | Range: 5 V dc<br>Accuracy: ±0.5 V dc |
| Rotor overspeed (unit tester) | Range: 5 V dc<br>Accuracy: ±0.5 V dc |
| Central display and signal data (unit tester) | See paragraph 21 |
| Display update (unit tester) | See paragraph 22 |

## SECTION II
## EQUIPMENT REQUIREMENTS

**4. Equipment Required.** Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/GSM-286, AN/GSM-287 or AN/GSM-705. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI.

**5. Accessories Required.** The accessories required for this calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure. The following peculiar accessories are also required for this calibration: Extender Board, Canadian Marconi P/N 220-419916-( ) and DC Power Supply, Elgar, Model DCS40-30EM1-2 (13589313).

Table 2. Minimum Specifications of Equipment Required

| Common name | Minimum use specifications | Manufacturer and model (part number) |
|---|---|---|
| AUTOTRANSFORMER | Range: 105 to 125 V ac at 400 Hz<br>Accuracy: ±1% | Ridge, Model 9020A (9020A) |
| CALIBRATOR | Range: 6 V at 400 Hz<br>Accuracy: ±1% | Fluke, Model 5720A (5700A/EP) (p/o MIS-35947) |
| FREQUENCY COUNTER | Range: 600 ms to 18.0 kHz<br>Accuracy: ±0.002% | Fluke, Model PM6681/656 (PM6681/656) |
| MULTIMETER | Range: -11 to +28 V dc, 1.32 to 12.5 V ac<br>Accuracy: ±0.02% dc, ±1% ac<br>Range: 71 to 270Ω (4-wire)<br>Accuracy: ±0.05% | Hewlett-Packard, Model 3458A (3458A) |
| OSCILLOSCOPE | Range: 1.5 to 6 V p-p<br>Accuracy: ±3% | (OS-303/G) |

## SECTION III
## CALIBRATION PROCESS

### 6. Preliminary Instructions

**a.** The instructions outlined in paragraphs **6** and **7** are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

**b.** Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

**c**. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in TM 55-4920-412-13&P for model 245-476854-( ) and TM 55-4920-413-13&P for model 245-476853-( ).

**d.** When indications specified in paragraphs **8** through **22** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **22**. Do not perform power supply check if all other parameters are within tolerance.

**e**. Unless otherwise specified, all controls and control settings refer to the TI.

**f.** Perform paragraphs **8** through **18**, **23**, and **24** for model 245-476853-( ) and paragraphs **8** through **24** for model 245-476854-( ).

### 7. Equipment Setup

**WARNING**

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

**a.** If calibrating TI model 245-476854-( ), do not connect unit tester to simulator unit until instructed to do so.

**b.** Set **ON-OFF-SIM ONLY** switch to **OFF**.

**c.** Connect equipment as shown in figure 1.

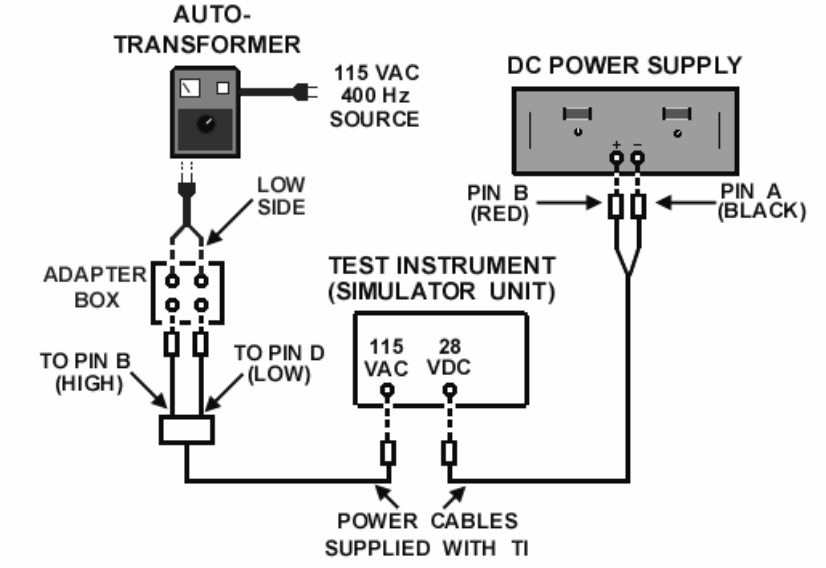


Figure 1. Power supply - equipment setup.

**d.** Adjust autotransformer output for 115 V.

**e.** Connect multimeter to dc power supply and adjust dc power supply for a 28 V output indication on multimeter.

**f.** Disconnect multimeter from equipment setup.

**g.** Set **ON-OFF-SIM ONLY** switch to **ON** and allow at least 30 minutes for warm-up.

**h.** Set **ON-OFF-SIM ONLY** switch to **OFF**.

**CAUTION**

To prevent damage to TI, always turn power off before making connections.

**8. Output Voltages**

**a. Performance Check**

(1) Connect multimeter between TI connector No. 1 pins FF (HI) and HH (LO). Refer to figure 2 for pin locations.

(2) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY** and **INTEGRAL LIGHTING** switch to **INT**. Multimeter will indicate between 4.0 and 6.0 V ac.

(3) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(4) Connect multimeter between connector No. 1 pins P (HI) and EE (LO), refer to figure 2.

(5) Set **ON-OFF-SIM ONLY** switch to **ON**. If multimeter does not indicate between 11.5 and 12.5 V dc, perform **b** below.

(6) Set **ON-OFF-SIM ONLY** switch to **OFF**.

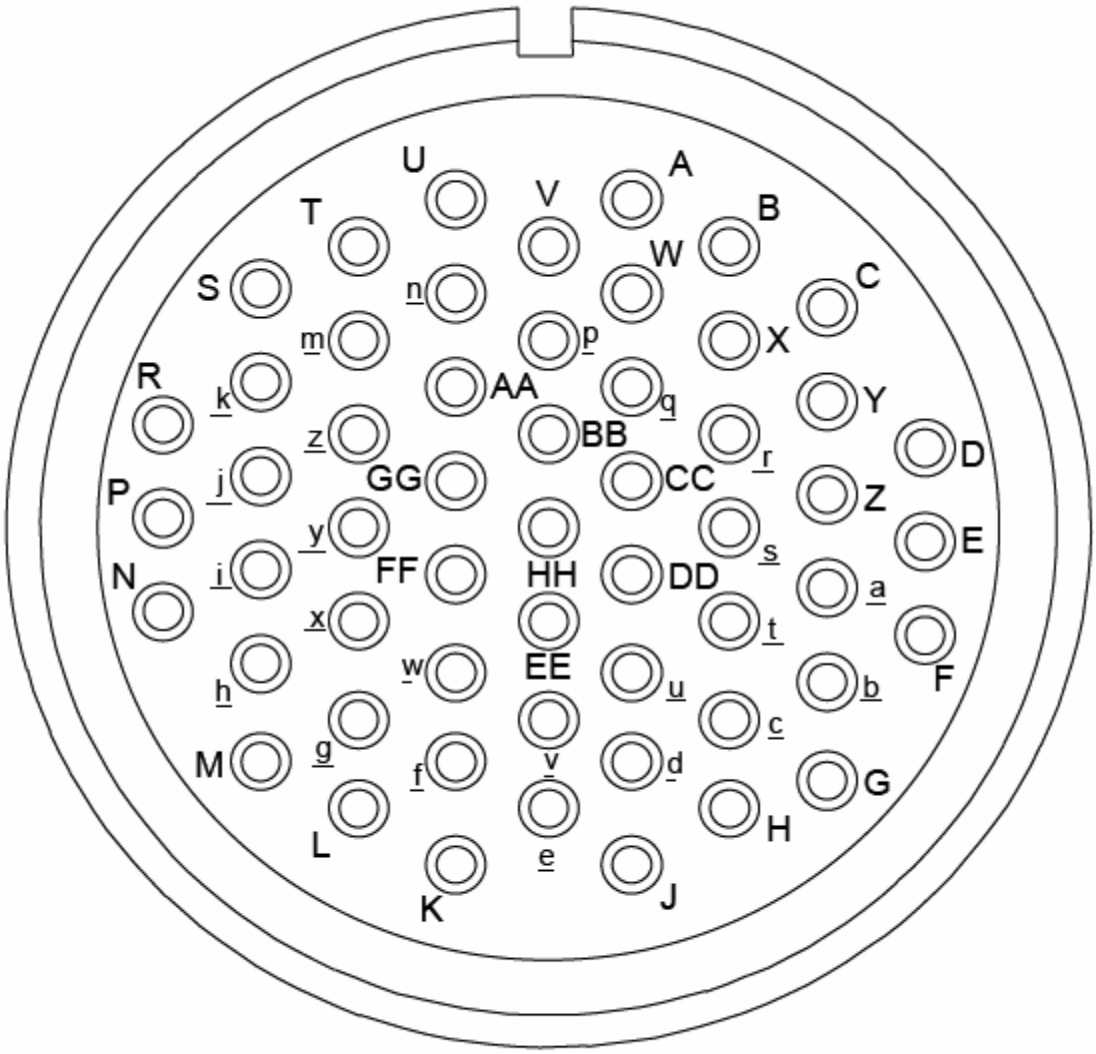


Figure 2. Simulator unit - pin locations.

(7) Connect multimeter between connector No. 1 y (HI) and EE (LO).

(8) Set **ON-OFF-SIM ONLY** switch to **ON**. If multimeter does not indicate between -11.5 and -12.5 V dc, perform **b** below.

(9) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(10) Connect multimeter between connector No. 1 pins J (HI) and EE (LO).

(11) Set **ON-OFF-SIM ONLY** switch to **ON**. Multimeter will indicate between 5 and 6 V dc.

(12) Set **ON-OFF-SIM ONLY** switch to **OFF**.

**b. Adjustments**. Perform paragraph **23**.

**9. Torque No. 1 and No. 2**

**NOTE**
Values in parenthesis pertain to Model 245-476854-( ).

**a. Performance Check**

(1) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(2) Connect multimeter to TI connector No. 1 pins E (HI) and F (LO). Refer to figure 2 for pin locations.

(3) Set **TORQUE NO. 1 CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**.

(4) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. Multimeter will indicate between 3.6 (3.6963) and 3.8 (3.7037) V dc.

(5) Set **TORQUE NO. 1 HI/LO** switch to **LO**. Multimeter will indicate between -0.1 (-0.0001) and +0.1 (+0.0001) V dc.

(6) Set **TORQUE NO. 1 CAL/NOR** switch to **NOR** and turn variable control fully ccw. Multimeter will indicate between -0.1 (-0.003) and +0.1 (+0.003) V dc.

(7) Adjust variable control fully cw. Multimeter will indicate 5.415 V dc minimum (between 5.415 and 5.815 V dc).

(8) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(9) Disconnect leads from connector No. 1 pins E (HI) and F (LO) and connect to connector No. 2 pins a (HI) and b (LO).

(10) Repeat (3) through (8) above, except use **TORQUE No. 2** controls.

**b. Adjustments**. No adjustments can be made.

**10. Fuel Quantity No. 1 and No. 2**

**a. Performance Check**

(1) Connect multimeter to connector No. 1 pins G (HI) and H (LO).

(2) Set **FUEL QUANTITY NO. 1 CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**.

(3) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. Multimeter will indicate between 6.08 (6.12) and 6.18 (6.13) V dc.

(4) Set **FUEL QUANTITY NO. 1 HI/LO** switch to **LO**. Multimeter will indicate between -0.1 (-0.001) and +0.1 (+0.001) V dc.

(5) Set **FUEL QUANTITY NO. 1 CAL/NOR** switch to **NOR** and adjust variable control fully ccw. Multimeter will indicate between -0.1 (-0.01) and + 0.1 (+0.01) V dc.

(6) Adjust variable control fully cw. Multimeter will indicate 7.63 V dc minimum (between 7.63 and 8.03 V dc).

(7) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(8) Disconnect leads from TI connector No. 1 pins G (HI) and H (LO) and connect to connector No. 2 pins G (HI) and H (LO).

(9) Repeat (2) through (7) above, except use fuel quantity No. 2 controls.

**b. Adjustments**. No adjustments can be made.

**11. Turbine Gas Temp No. 1 and No. 2**

**a. Performance Check**

(1) Connect multimeter to connector No. 1 pins L (HI) and M (LO).

(2) Set **TURBINE GAS TEMP NO. 1 CAL/NOR** switch to **CA**L and **HI/LO** switch to **HI**.

(3) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. Multimeter will indicate between 33.65 (33.69) and 33.95 (33.89) mV dc.

(4) Set **TURBINE GAS TEMP NO. 1 HI/LO** switch to **LO**. Multimeter will indicate between -0.50 (-0.10) and +0.50 (+0.10) mV dc.

(5) Set **TURBINE GAS TEMP NO. 1 CAL/NOR** switch to **NOR** and adjust variable control fully ccw. Multimeter will indicate between -0.50 and +0.50 mV dc.

(6) Adjust variable control fully cw. Multimeter will indicate 41.30 mV dc minimum (between 41.30 and 51.30 mV dc).

(7) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(8) Disconnect leads from connector No. 1 pins L (HI) and M (LO) and connect to connector No. 2 pins L (HI) and M (LO).

(9) Repeat (2) through (7) above except use **TURBINE GAS TEMP NO**. **2** controls.

**b. Adjustments.** No adjustments can be made.

**12. Engine Oil Temp No. 1 and No. 2**

**a. Performance Check**

(1) Connect multimeter **Input (2 Wire) HI** and **LO** to connector No. 1 pins g (HI) and h (LO) and connect multimeter **Ω Sense (4 wire) HI** and **LO** to connector No. 1 pins g (HI) and h (LO). In addition, connect multimeter **Guard** to connector No. 1 pin h (LO).

(2) Set multimeter for 4-wire ohms measurement mode.

(3) Set **ENGINE OIL TEMP NO. 1 CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**. On model 245-476854-( ), adjust **ENGINE OIL TEMP NO. 1 CAL/NOR** variable control fully cw.

(4) Measure resistance. Multimeter will indicate between 148 Ω (150.2 Ω) and 154 Ω (151 Ω).

(5) Set **ENGINE OIL TEMP NO. 1 HI/LO** switch to **LO**. Multimeter will indicate between 71 Ω (75.3 Ω) and 77 Ω (75.9 Ω).

(6) On model 245-476853-( ), set **ENGINE OIL TEMP NO. 1 CAL/NOR** switch to **NOR** and adjust variable control from fully ccw to fully cw. Multimeter indication will vary from 77 Ω or less to 148 Ω or more.

(7) On model 245-476854-( ), set **ENGINE OIL TEMP NO. 1 CAL/NOR** switch to **NOR**. Multimeter will indicate between 170 Ω and 190 Ω. Adjust variable fully ccw. Multimeter will indicate between 73.6 Ω and 77.6 Ω.

(8) Disconnect leads from connector No. 1 pins g (HI) and h (LO) and connect to connector No. 2 pins g (HI) and h (LO).

(9) Repeat (3) through (7) above, except use engine oil temp No. 2 controls.

**b. Adjustments.** No adjustments can be made.

**13. Xmsn Oil Temp**

**a. Performance Check**

(1) Connect multimeter **Input (2 Wire) HI** and **LO** to connector No. 2 pins J (HI) and K (LO) and connect multimeter **Ω Sense (4 wire) HI** and **LO** to connector No. 2 pins J (HI) and K (LO). In addition, connect multimeter **Guard** to connector No. 2 pin K (LO).

(2) Set multimeter for 4-wire ohms measurement mode.

(3) Set **XMSN OIL TEMP CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**.

On model 245-476854-( ), adjust **XMSN OIL TEMP CAL/NOR** variable control fully cw.

(4) Measure resistance. Multimeter will indicate between 224 Ω (234.04 Ω) and 236 Ω (234.96 Ω).

(5) Set **XMSN OIL TEMP HI/LO** switch to **LO**. Multimeter will indicate between 79 Ω (86.7 Ω) and 91 Ω (87.3 Ω).

(6) On model 245-476853-( ), set **XMSN OIL TEMP CAL/NOR** switch to **NOR** and adjust variable control from fully ccw to fully cw. Multimeter indication will vary from 88 Ω or less to 270 Ω or more.

(7) On model 245-476854-( ), set **XMSN OIL TEMP CAL/NOR** switch to **NOR**. Multimeter will indicate between 250 Ω and 290 Ω. Adjust variable control fully ccw. Multimeter will indicate between 84 Ω and 90 Ω.

**b. Adjustments**. No adjustments can be made.

**14. Rotor Speed**

**a. Performance Check**

(1) Connect frequency counter to connector No. 1 pins A (HI) and B (LO).

(2) Set **ROTOR SPEED CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**. On model 245-476854-( ), adjust **ROTOR SPEED CAL/NOR** variable control fully cw.

(3) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**.

(4) Measure frequency. Frequency counter will indicate between 11,190 (11,245.1) and 11,302 (11,247.1) Hz.

(5) Set **ROTOR SPEED HI/LO** switch to **LO**. Frequency counter will indicate 0. (Disregard residual noise count).

(6) On model 245-476853-( ), set **ROTOR SPEED CAL/NOR** to **NOR** and adjust **ROTOR SPEED** variable control from fully ccw to fully cw. Frequency counter indication will vary from 0 to 17,200 Hz minimum.

(7) On model 245-476854-( ), set **ROTOR SPEED CAL/NOR** to **NOR**. Frequency counter will indicate between 17,200 and 18,000 Hz.

(8) On model 245-476854-( ), adjust **ROTOR SPEED** variable control from fully cw to fully ccw. Frequency counter indication will vary from 17,200 Hz minimum to 0.

(9) Set **ON-OFF-SIM ONLY** switch to **OFF**.

**b. Adjustments**. No adjustments can be made.

**15. Engine % Rpm No. 1 and No. 2**

**a. Performance Check**

(1) Connect frequency counter to connector No. 1 pins C (HI) and D (LO).

(2) Set **ENGINE % RPM NO. 1 CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**.

(3) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. Frequency counter will indicate between 1308 (1332.5) and 1362 (1334.5) Hz.

(4) Set **ENGINE % RPM NO. 1 HI/LO** switch to **LO**. Frequency counter will indicate 0.

(5) On model 245-476853-( ), set **ENGINE % RPM NO. 1 CAL/NOR** to **NOR** and adjust **ENGINE % RPM NO. 1** variable control from fully ccw to fully cw. Frequency counter indication will vary from 0 to 1830 Hz minimum.

(6) On model 245-476854-( ), set **ENGINE % RPM NO. 1 CAL/NOR** to **NOR**. Frequency counter will indicate between 1,830 and 2,030 Hz. Adjust **ENGINE % RPM NO. 1** variable control from fully cw to fully ccw. Frequency counter will indicate 0 Hz.

(7) On model 245-476853-( ), adjust **ENGINE % RPM NO. 1** variable control fully ccw.

(8) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(9) Disconnect leads from connector No. 1 pins C (HI) and D (LO) and connect to connector No. 2 pins Y (HI) and Z (LO).

(10) Repeat (2) through (8) above, except use **ENGINE % RPM NO. 2** controls.

**b. Adjustments**. No adjustments can be made.

**16. Gas Gen Speed No. 1 and No. 2**

**a. Performance Check**

(1) Connect frequency counter to TI connector No. 1 pins c (HI) and d (LO).

(2) Set **GAS GEN SPEED NO. 1 CAL/NOR** switch to **CAL** and **HI/LO** switch to **HI**. On model 245-476854-( ), adjust **GAS GEN SPEED NO. 1** variable control fully cw.

(3) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. Frequency counter will indicate between 2125 (2134.3) and 2145 (2136.3) Hz.

(4) Set **GAS GEN SPEED NO. 1 HI/LO** switch to **LO**. Frequency counter will indicate 0.

(5) On model 245-476853-( ), set **GAS GEN SPEED NO. 1 CAL/NOR** switch to **NOR** and adjust **GAS GEN SPEED NO. 1** variable control from fully ccw to fully cw. Frequency counter indication will vary from 0 to 2400 Hz minimum.

(6) On model 245-476854-( ), set **GAS GEN SPEED NO. 1 CAL/NOR** switch to **NOR**. Frequency counter will indicate between 2,375 and 2,480 Hz.

(7) On model 245-476854-( ), adjust **GAS GEN SPEED NO. 1** variable control fully ccw. Frequency counter will indicate 0 Hz.

(8) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(9) Disconnect leads from connector No. 1 pins c (HI) and d (LO) and connect to connector No. 2 pins c (HI) and d (LO).

(10) Repeat (2) through (8) above, except use **GAS GEN SPEED NO. 2** controls.

**b. Adjustments**. No adjustments can be made.

**17. Engine Oil Press No. 1 and No. 2**

**a. Performance Check**

(1) Connect equipment as shown in figure 3, connection A for connector No. 1. Do not disconnect equipment connected in figure 1.

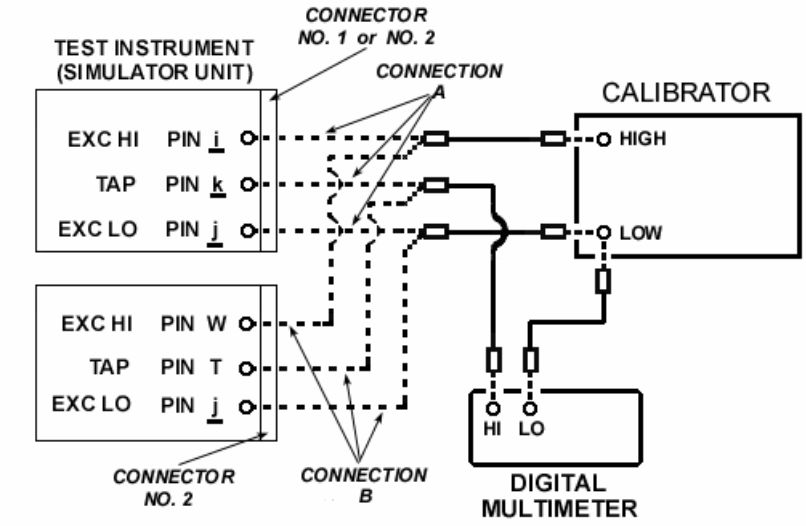


Figure 3. Engine oil pressure - equipment setup.

(2) Set TI **ENGINE OIL PRESS NO. 1 CAL/NOR** switch to **CAL** and **HI/LO** switch to **LO**.

(3) Set calibrator for a 6 V, 400 Hz output.

(4) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. If multimeter does not indicate between 3.447 and 3.735 V ac, perform **b** (1) through (4) below.

(5) Set **ENGINE OIL PRESS NO. 1 HI/LO** switch to **HI**. Multimeter will indicate between 2.770 and 3.058 V ac.

(6) Set **ENGINE OIL PRESS NO. 1 CAL/NOR** switch to **NOR** and adjust **ENGINE OIL PRESS NO. 1** variable control from fully ccw to fully cw. If multimeter does not indicate from more than 3.447 to less than 2.770 V ac, perform **b** (1) through (3) and (5) and (6) below.

(7) Set **ON-OFF-SIM ONLY** switch to **OFF** and calibrator to **STBY**.

(8) Connect equipment as shown in figure 3, connection A, for connector No. 2.

(9) Repeat (2) through (7) above except use **ENGINE OIL PRESS NO. 2** controls. If not within tolerance in (4) above, perform **b** (1) through (3) and (7) below. If not in tolerance in (6) above, perform **b** (1) through (3) and (8) and (9) below.

**b. Adjustments**

(1) Set autotransformer and dc power supply to **OFF**, and calibrator to **STBY**.

(2) Remove pressure board A2 (fig. 4) and reinstall, using extender board.

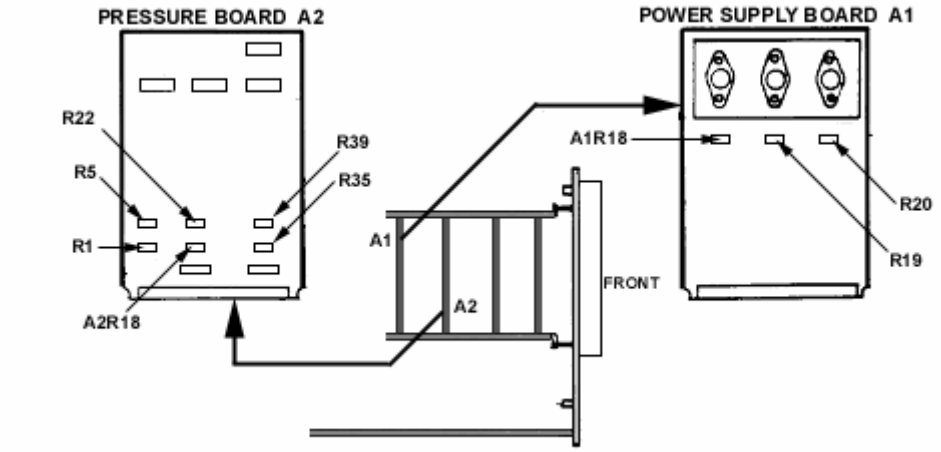


Figure 4. Simulator unit - internal left view.

(3) Set autotransformer, dc power supply, and calibrator power to **ON**.

(4) Adjust R5 (fig. 4) for a 3.591 V ac indication on multimeter (R).

(5) Turn **ENGINE OIL PRESS NO. 1** variable control fully ccw.

(6) Adjust R1 (fig. 4) for a 3.591 V ac indication on multimeter (R).

(7) Adjust R22 (fig. 4) for a 3.591 V ac indication on multimeter (R).

(8) Turn **ENGINE OIL PRESS NO. 2** variable control fully ccw.

(9) Adjust A2R18 (fig. 4) for a 3.591V ac indication on multimeter (R).

**18. Xmsn Oil Press**

**a. Performance Check**

(1) Connect equipment as shown in figure 3, connection B, for connector No. 2. Do not disconnect equipment connected in figure 1.

(2) Set **XMSN OIL PRESS CAL/NOR** switch to **CAL** and **HI/LO** switch to **LO**.

(3) Set calibrator for a 6 V, 400 Hz output.

(4) Set **ON-OFF-SIM ONLY** switch to **SIM ONLY**. If multimeter does not indicate between 3.447 and 3.735 V ac, perform **b** (1) through (4) below.

(5) Set **XMSN OIL PRESS HI/LO** switch to **HI**. Multimeter will indicate between 2.696 and 2.984 V ac.

(6) Set **XMSN OIL PRESS CAL/NOR** switch to **NOR** and adjust **XMSN OIL PRESS** variable control from fully ccw to fully cw. If multimeter does not indicate from more than 3.447 to less than 2.770 V ac, perform **b** (1) through (3) and (5) through (7) below.

(7) Set **ON-OFF-SIM ONLY** switch to **OFF**.

**b. Adjustments**

(1) Set autotransformer and dc power supply to **OFF**, and calibrator to **STBY**.

(2) Remove pressure board A2 (fig. 4) and reinstall, using extender board.

(3) Set autotransformer, dc power supply, and calibrator power to **ON**.

(4) Adjust R39 (fig. 4) for a 3.591 V ac indication on multimeter (R).

(5) Turn **XMSN OIL PRESS** variable control fully ccw.

(6) Adjust R35 (fig. 4) for a 3.591 V ac indication on multimeter (R).

(7) Repeat **a** (2) through (6) above and adjust for best in-tolerance condition.

**19. Inter Cal (Unit Tester)**

**NOTE**

Do not perform paragraphs **19** through **22** when calibrating model 245-476853-( ). Go to paragraph **23**.

**a. Performance Check**

(1) Disconnect calibrator and multimeter from equipment setup.

(2) Connect simulator **INTERCONNECT** jack to unit tester **J5 INTERCONNECT** jack, using cable (219-419742-( ), supplied with TI).

**NOTE**

Using cable supplied with TI and connecting it to appropriate jack being tested, while performing paragraphs **19** through **22** (tables 4, 5, and 6) and using opposite end of cable to complete test, may prevent possible damage to connectors on TI.

(3) Connect multimeter to unit tester connector J8 pin 17 (HI) and COM test point.

(4) Set **INTER CAL SELECT** switch to **1**.

(5) Set **ON-OFF-SIM ONLY** switch to **ON**. Multimeter will indicate between 4 and 6 V dc.

(6) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(7) Repeat technique of (3) through (6) above for **INTER CAL SELECT** switch positions and pin connections listed in table 4. Multimeter will indicate within limits specified. Refer to figure 5 for pin locations on J2, J3, and J9.

(8) Set **ON-OFF-SIM ONLY** switch to **ON**.

(9) Set **INTER CAL SELECT** switch to **21** and **ANALOG SET** switch to **SLO** and then to **FAST** while observing analog **INTERFACE MONITOR** which will count at a faster rate and reset after counting to 1827.

(10) Set **INTER CAL SELECT** and **ON-OFF-SIM ONLY** switches to **OFF**.

Table 4. Inter Cal Select (Unit Tester)

| Unit tester | | Multimeter indications (V dc) | |
|---|---|---|---|
| **INTER CAL SELECT** switch position no. | Pin connections | Min | Max |
| 2 | J8 Pin 19 | 4 | 6 |
| 3 | J8 Pin 18 | 4 | 6 |
| 4 | J8 Pin 20 | 4 | 6 |
| 5 | J8 Pin 21 | 4 | 6 |
| 6 | J9 Pin 44 | 4 | 6 |
| 7 | J9 Pin 45 | 4 | 6 |
| 8 | J9 Pin 46 | 4 | 6 |
| 9 | J9 Pin 47 | 4 | 6 |
| 10 | J8 Pin 22 | 4 | 6 |
| 11 | J8 Pin 23 | 4 | 6 |
| 12 | J9 Pin 48 | 4 | 6 |
| 13 | J9 Pin 49 | 4 | 6 |
| 14 | J9 Pin 50 | 4 | 6 |
| 15 | J2 Pin 37 | 4.5 | 5.5 |
| 16 | J3 Pin 37 | 4.5 | 5.5 |
| 17 | J3 Pin 37 | 4.5 | 5.5 |
| 18 | J3 Pin 37 | 4.5 | 5.5 |
| 19 | J2 Pin 43 | 4.5 | 5.5 |

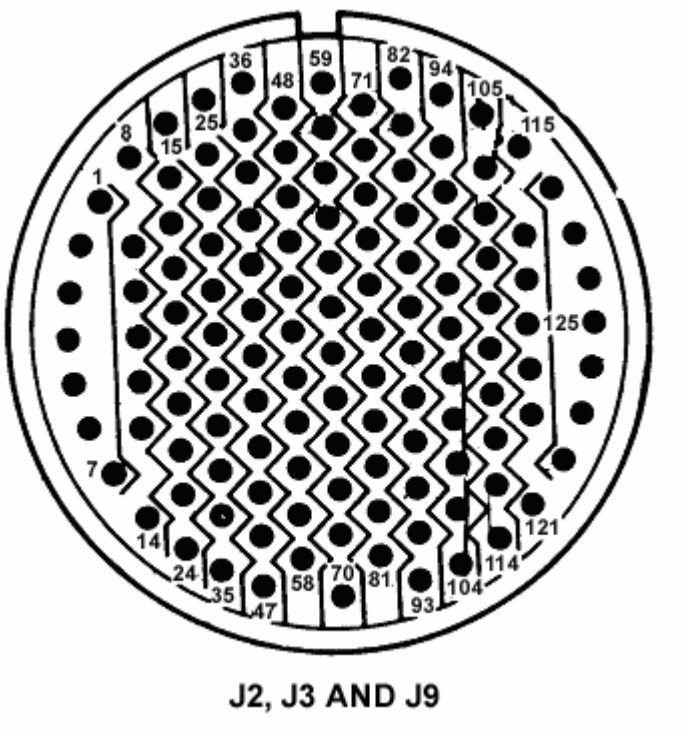


Figure 5. Unit tester - pin locations.

**b. Adjustments**. No adjustments can be made.

**20. Rotor Overspeed (Unit Tester)**

**a. Performance Check**

(1) Disconnect lead from J2 pin 43 and connect to J6 pin 31 on unit tester.

(2) Set **ROTOR OVERSPEED 127%** switch to **ON**.

(3) Set **ON-OFF-SIM ONLY** switch to **ON**. Multimeter will indicate between 4.5 and 5.5 V dc.

(4) Set **ROTOR OVERSPEED 127%** and **ON-OFF-SIM ONLY** switches to **OFF**.

(5) Disconnect lead from J6 pin 31 and connect to J6 pin 32.

(6) Repeat (2) through (4) above, except use **ROTOR OVERSPEED 137%** switch.

(7) Disconnect lead from J6 pin 32 and connect to J6 pin 33.

(8) Repeat (2) through (4) above, except use **ROTOR OVERSPEED 142%** switch.

**b. Adjustments**. No adjustments can be made.

**21. Central Display and Signal Data (Unit Tester)**

**a. Performance Check**

(1) Disconnect lead from J6 pin 33 and connect to J2 pin 1 on unit tester.

(2) Set **LOGIC P/S** switch to **1**.

(3) Set **ON-OFF-SIM ONLY** switch to **ON**. Multimeter will indicate between 13 and 17 V dc.

(4) Set **ON-OFF-SIM ONLY** switch to **OFF**.

(5) Repeat technique of (1) through (4) above at unit tester switch settings and pin connections listed in table 5. Multimeter will indicate within limits specified.

Table 5. Central Display and Signal Data

| Unit tester | | Multimeter indications (V dc) | |
|---|---|---|---|
| Logic P/S switch settings | Pin connections | Min | Max |
| 1 | J2 Pin 3 | -13.0 | -17.0 |
| 1 | J2 Pin 5 | 6.5 | 9.5 |
| 1 | J2 Pin 6 | 6.5 | 9.5 |
| 1 | J2 Pin 35 | 4.5 | 5.5 |
| 2 | J3 Pin 1 | 13.0 | 17.0 |
| 2 | J3 Pin 3 | -13.0 | -17.0 |
| 2 | J3 Pin 5 | 6.5 | 9.5 |
| 2 | J3 Pin 6 | 6.5 | 9.5 |
| 2 | J3 Pin 35 | 3.5 | 6.5 |
| 1 | J6 Pin 26 | 10.0 | 11.0 |
| - - - | J6 Pin 27 | -10.0 | -11.0 |
| - - - | J6 Pin 16 | 4.0 | 6.0 |
| - - - | J6 Pin 29 | 4.0 | 6.0 |
| - - - | J8 Pin 13 | 4.0 | 6.0 |
| - - - | J8 Pin 16 | 4.0 | 6.0 |
| 1 | J9 Pin 2 | 13.0 | 17.5 |
| 1 | J9 Pin 4 | -13.5 | -17.5 |
| 1 | J9 Pin 7 | 6.5 | 9.5 |
| PILOTS control fully cw | J1 Pin 4 | 4.5 | 5.5 |
| PILOTS control fully cw | AD/P test point | 4.5 | 5.5 |
| COPILOTS control fully cw | J4 Pin 4 | 4.5 | 5.5 |
| COPILOTS control fully cw | AD/CP test point | 4.5 | 5.5 |
| P/S Control to Remote and variable P/S Control fully CW (connect jumper between J3-26 and J3-27) | IL/S test point | 4.5 | 5.5 |

(6) Disconnect multimeter from equipment setup.

(7) Connect multimeter positive to J3 pin 93 and negative to J3 pin 26 (jumper should still be connected between J3-26 and J3-27).

(8) Set **ON-OFF-SIM ONLY** switch to **ON**. Multimeter will indicate between 7.5 and 12.5 V ac.

(9) Set **ON-OFF-SIM ONLY** switch to **OFF**.

**b. Adjustments**. No adjustments can be made.

**22. Display Update (Unit Tester)**

**a. Performance Check**

(1) Connect equipment as shown in figure 6. Do not disconnect equipment connected in figure 1.

(2) Set **DISPLAY UPDATE** switch to **ON**.

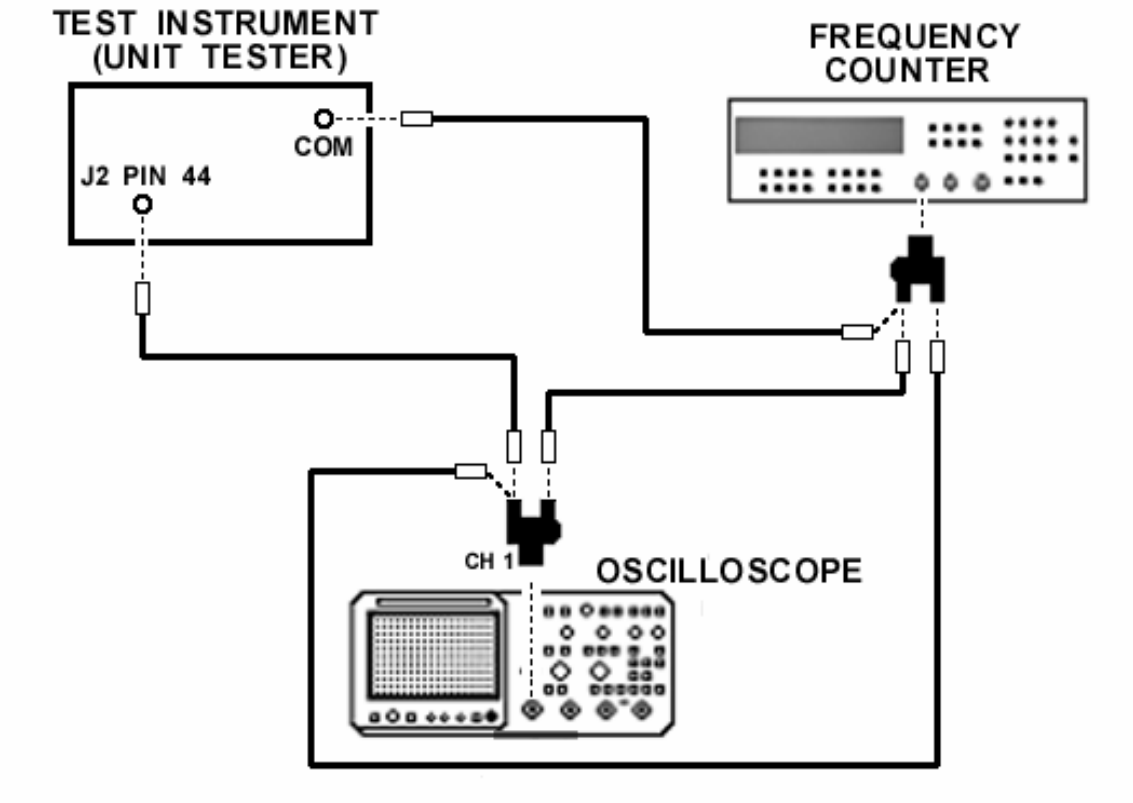


Figure 6. Display control - equipment setup.

**NOTE**

When measuring negative pulse amplitude with oscilloscope, disconnect frequency counter after verifying frequency.

(3) Set **ON-OFF-SIM ONLY** switch to **ON**. Oscilloscope will indicate negative pulses between 4.0 and 6.0 V and frequency counter will indicate between 1300 and 1900 Hz.

(4) Set **DISPLAY UPDATE** and **ON-OFF-SIM ONLY** switches to **OFF**.

(5) Repeat technique of (2) through (4) above, connecting lead to pin connections listed in table 6. Oscilloscope and frequency counter will indicate within limits specified.

**b. Adjustments**. No adjustments can be made.

Table 6. Display Update (Unit Tester)

| Unit tester pin connections | Oscilloscope indications | Frequency counter indications |
|---|---|---|
| J2 Pin 45<br>46<br>47<br>48<br>49<br>50<br><br>J3 Pin 44<br>45<br>46<br>47<br>48<br>49<br>50<br><br>J6 Pin 17<br>18<br>19<br>20<br>21<br>22<br>23 | Negative pulses between 4.0 and 6.0 V | Between 1300 and 1900 Hz |
| J2 Pin 51<br>52<br><br>J3 Pin 51<br>52<br><br>J6 Pin 14<br>15 | Square wave between 4.0 and 6.0 V | Between 285 and 1000 ms |

**23. Power Supply**

**NOTE**

Do not perform power supply check if all other parameters are within tolerance.

**a. Performance Check**

(1) Set all power to TI to **OFF**.

(2) Remove power supply board (A1) (fig. 4) and reconnect, using extender board.

(3) Connect multimeter positive to loop 18 and negative to loop 14 on extender board.

(4) Set power to TI to **ON**. If multimeter does not indicate between 11.5 and 12.5 V dc, perform **b** (1) below.

(5) Disconnect lead from loop 18 and connect to loop 46. If multimeter does not indicate between 11.5 and 12.5 V dc, perform **b** (2) below.

(6) Disconnect lead from loop 46 and connect to loop 13. If multimeter does not indicate between -11.5 and -12.5 V dc, perform **b** (3) below.

(7) Remove extender board and reinstall power supply board.

**b. Adjustments**

(1) Adjust R19 (fig. 4) for 12.0 V dc indication on multimeter (R).

(2) Adjust A1R18 (fig. 4) for 12.0 V dc indication on multimeter (R).

(3) Adjust R20 (fig. 4) for -12.0 V dc indication on multimeter (R).

## 24. Final Procedure

**a.** Deenergize and disconnect all equipment and if required, reinstall protective cover on TI.

**b**. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
*General, United States Army*
*Chief of Staff*

Official:

JOYCE E. MORROW
*Administrative Assistant to the*
*Secretary of the Army*

0709403

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342048, requirements for calibration procedure TB 9-4920-361-24.

## Instructions for Submitting an Electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@redstone.army.mil
To: <2028@redstone.army.mil

Subject: DA Form 2028

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

This is the text for the problem below line 27.