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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR FUEL QUANTITY SYSTEM TEST SET SIMMONDS PRECISION/JC AIR MODEL PSD 60-1AF

Headquarters, Department of the Army, Washington, DC
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SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Fuel Quantity System Test Set, Simmonds Precision/JC Air, Model PSD 60-lAF. TO 33D2-3-119-1 was used as the prime data source in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. None

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
Capacitance measurement	Range: .1 to 1999 pf 1 to 10,000 pf (extended range) Accuracy: ±0.1% of reading or ±0.2 pf, whichever is greater
Capacitance simulators	Range: 20 pf to 8000 pf (TU) 20 pf to 1000 pf (COMP) Accuracy: ±0.1% of reading or ±0.2 pf, whichever is greater
Resistance measurement	Range: 100 kΩ to 10,000 MΩ1 Accuracy: ±10% of range

[1]100 kΩ not checked due to TI display circuitry limitations.

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 Reference Calibration Standards Set NSN 4931-00-621-7878. Alternate items may be used by the calibrating activity. 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. Where the four-to-one ratio cannot be met, the four-to-one

accuracy will be listed, and the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories required for this calibration are common usage accessories issued as indicated in **4** above, and are not listed in this calibration procedure. The following peculiar accessories are also required for this calibration: Special test cables supplied by the owner.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
CAPACITANCE MEASURING SYSTEM	Range: 20 pf to .01 μf Accuracy: ±0.025%	General Radio, Type 1620A (7910842)
CAPACITANCE STANDARD[1]	Range: .01 μf Accuracy:[2]	Arco Electronics, Model SS32 (7907233)
CAPACITANCE STANDARD VARIABLE	Range: 35 pf to 1150 pf Accuracy:[3]	Standard Capacitor Variable, General Radio, Type 1422D (8579475)
RESISTANCE STANDARD NO. 1	Range: 1 MΩ to 1 000 MΩ Accuracy: ±2.5%	Beckman, Models CR10M (8598965), CR100M (8598966), and CR1000M (8579478)
RESISTANCE STANDARD NO. 2	Range 10 GΩ Accuracy: ±2.5%	Penn Airborne, Model 9A-5120-103 (MIS-10412-4)

[1]Arco Electronics, Model SS32 is not part of secondary reference set.
[2]Characterized using capacitance measuring system ±0.025% of measured value on test report.

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 TO 33D2-3-119-1 for this TI.

d. Unless otherwise specified, all controls and control settings refer to TI.

7. Equipment Setup. Set **ON-OFF** power switch to **ON** (fig. 1) position and allow 5 minutes for TI to warm up and stabilize.

NOTE

Ensure **LO BAT** is not displayed on digital readout.

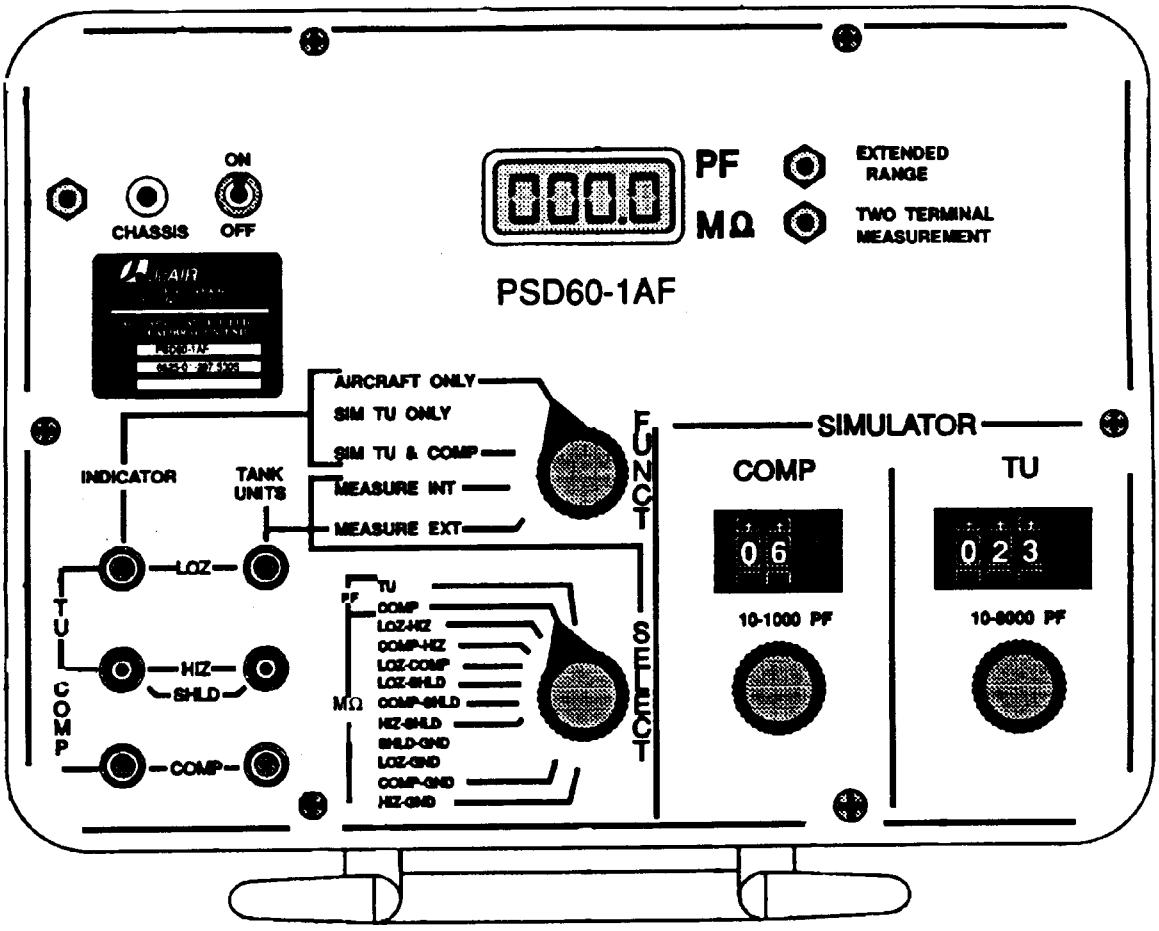

Figure 1. Front panel.

8. Capacitance Measuring Section Accuracy

a. Performance Check

(1) Set **SELECT** switch to **TU.**

(2) Set **FUNCT** switch to **MEASURE EXT.**

(3) Set variable capacitance standard to 35 pf.

NOTE

Over range is indicated when display indicates **:0:0:00**.

(4) Connect variable capacitance standard 115 output terminal to TI **TANK UNITS HIZ** terminal using coaxial lead.

NOTE

Leave shield of coaxial lead unconnected at variable capacitance standard end. Do not connect chassis ground of TI to capacitance standard chassis.

(5) Connect variable capacitance standard **GND** terminal to TI **TANK UNITS LOZ** terminal using special cable.

(6) TI display will indicate within ±0.2 pf of measured value on variable capacitance standard test report.

(7) Set variable capacitance standard to 1000 pf.

(8) Connect TI **TANK UNITS HIZ** terminal to variable capacitance standard **1150** output terminal and repeat technique of (4) and (5) above.

(9) TI display will indicate within ±0.1% of variable capacitance standard test report value; if not, perform **b** below.

(10) Remove connections from variable capacitance standard.

(11) Characterize 0.01 μf capacitance standard using capacitance measuring system.

(12) Use technique of (4) and (5) above to connect TI to **HIZ** and **LOZ** terminals of 0.01 μf characterized capacitance standard.

(13) Press **EXTENDED RANGE** pushbutton. TI display will indicate within ±0.1% of characterized value as measured with capacitance measuring system; if not, perform **b** below.

(14) Set **SELECT** switch to **COMP** and substitute TI **TANK UNITS COMP** connection for TI **TANK UNITS LOZ** connection and repeat technique of (3) through (13) above.

b. Adjustments

NOTE

TI contains static-sensitive devices. Proper precautions should be taken to prevent damage to TI electronic components.

(1) Remove capacitance standard connection from TI **TANK UNITS LOZ** and **HIZ** terminals.

(2) Remove six screws from front panel and remove front panel assembly from case.

(3) Adjust CLRZ potentiometer (fig. 2) until TI display indicates **0000** and - sign on the display alternately illuminates (R).

(4) While pressing **EXTENDED RANGE** pushbutton, adjust CERZ (fig. 2) potentiometer until TI display indicates **0000** and **-** sign on the display alternately illuminates (R).

(5) Repeat steps (3) and (4) above as necessary.

(6) Repeat technique of **a**(7) and (8) above.

(7) Adjust CLRG (fig. 2) potentiometer for a TI display indication within ±0.1% of test report value (R).

(8) Remove variable capacitance standard.

(9) Repeat technique of **a**(4) and (5) above substituting .01 μf capacitor standard.

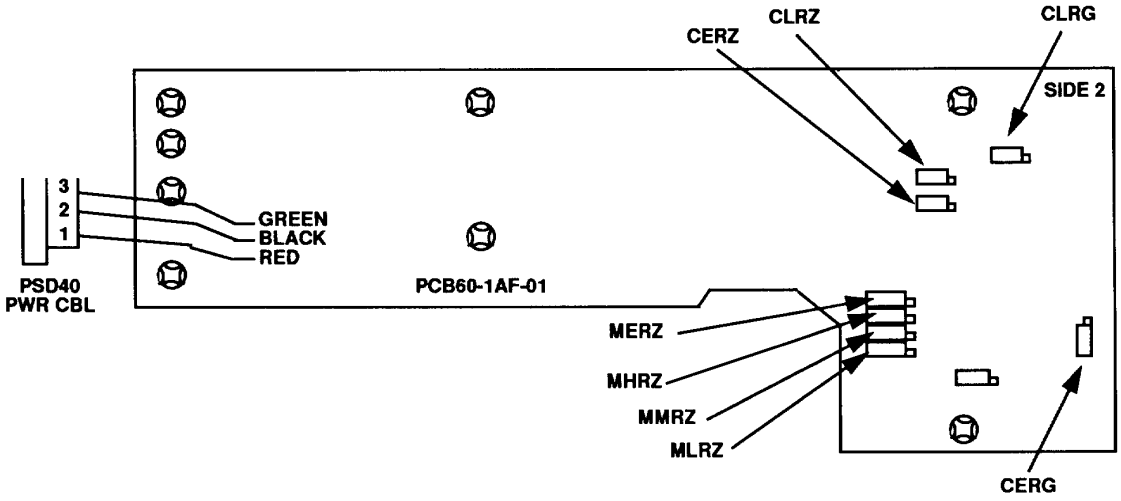

Figure 2. PCB60-1AF-01, side 2 - adjustment locations.

(10) While pressing **EXTENDED RANGE** pushbutton, adjust CERG potentiometer (fig. 2) for a TI display indication within ±0.1% of recorded value (R).

(11) Repeat steps **a**(3) through (13) above as necessary.

(12) Install front panel assembly in case and reinstall six screws which were removed.

9. Capacitance Simulation Accuracy

a. Performance Check

(1) Set **SELECT** switch to **TU.**

(2) Set **FUNCT** switch to **MEASURE INT.**

(3) Press and release **SIMULATOR TU +** or **-** pushbuttons as necessary for **SIMULATOR TU** decade indication of **000**.

(4) Turn **SIMULATOR TU** control for indication of **20.0** on TI digital display.

(5) Set **SELECT** switch to **COMP.**

(6) Press and release **SIMULATOR COMP +** or **-** pushbuttons as necessary for **SIMULATOR COMP** decade indication of **00**.

(7) Turn **SIMULATOR COMP** control for indication of **20.0** on TI digital display.

(8) Measure lead capacitance using capacitance measuring system and subtract lead capacitance from results in following tests (between **HIZ** and **LOZ** center conductors).

(9) Connect capacitance measuring system **UNKNOWN L** terminal to TI **INDICATOR TU LOZ** terminal using special test cable.

(10) Connect capacitance measuring system **UNKNOWN H** terminal to TI **INDICATOR TU HIZ** terminal using coaxial lead.

NOTE

When **FUNCT** switch is set to the **SIM TU ONLY** or **SIM TU & COMP** position, indications on TI display are to be disregarded.

(11) Connect **CHASSIS** on TI to chassis of capacitance measuring system.

(12) Set **ON-OFF** power switch to **OFF.**

(13) Set **FUNCT** switch to **SIM TU ONLY.**

(14) Measure capacitance on capacitance measuring system. Measured capacitance will be between 19.8 and 20.2 pf.

(15) Move connection from **INDICATOR TU LOZ** to **INDICATOR COMP.**

(16) Connect a short from **INDICATOR TU LOZ** (center post) to **CHASSIS.**

(17) Set **FUNCT** switch to **SIM TU & COMP.**

(18) Repeat (14) above.

(19) Set **ON-OFF** power switch to **ON.**

(20) Set **FUNCT** switch to **MEASURE INT** and remove short from **INDICATOR TU LOZ** and **CHASSIS.**

(21) Press and release **+** pushbutton below 10 digits of **COMP** decade to increment decade to 01 and verify TI display increases by approximately 10.

(22) Repeat technique of (21) above for 10 digits 2 through 9.

(23) Repeat technique of (21) above for 100 digits 1 through 9 and verify TI display increases by approximately 100.

(24) Set **SELECT** switch to **TU.**

(25) Press and release **+** pushbutton below 10 digits on **TU** decade and verify TI display increases by approximately 10.

(26) Repeat technique of (25) above for digits 2 through 9.

(27) Repeat technique of (25) above for 100 digits and verify TI display increases by approximately 100.

NOTE

Press **PF EXTENDED RANGE** pushbutton for TI display indications above 1,999.

(28) Repeat technique of (25) above for 1000 digits 1 through 7 and verify TI display increases by approximately 1000.

b. Adjustments. No adjustments can be made.

10. Megometer Accuracy

a. Performance Check

(1) Set **SELECT** switch to **LOZ-HIZ.**

(2) Set **FUNCT** switch to **MEASURE EXT.**

(3) Connect resistance standard No. 1, **1 MΩ, HI** terminal to TI **TANK UNITS HIZ** terminal. Connect resistance standard No. 1 **LO** terminal to TI **LOZ** terminal, using special test cable.

(4) TI display will indicate between .9000 and 1.100.

(5) Set **SELECT** switch to **COMP-HIZ.**

(6) Move resistance standard No. 1 connection from TI **TANK UNITS LOZ** to TI **TANK UNITS COMP** (replace special cable).

(7) Repeat technique of (3) and (4) above. TI display will indicate between .9000 and 1.100.

(8) Set **SELECT** switch to **LOZ-COMP.**

(9) Move resistance standard No. 1 connection from TI **TANK UNITS HIZ** to TI **TANK UNITS LOZ.**

(10) Repeat (7) above.

(11) Set **SELECT** switch to **LOZ-SHLD.**

(12) Move resistance standard No. 1 connection from TI **TANK UNITS COMP** to **SHLD** of TI **TANK UNITS LOZ.**

(13) Repeat (7) above.

NOTE

GND, when indicated, means **CHASSIS** connection.

(14) Set **SELECT** switch to each remaining position and move resistance standard No. 1 connections as indicated by **SELECT** switch position.

(15) Repeat (7) above for each **SELECT** switch position.

(16) Set **SELECT** switch to **HIZ-SHLD** position.

(17) Connect resistance standards as indicated in table 3 to TI **TANK UNITS HIZ** and TI **TANK UNITS HIZ** outer shell **(SHLD).** TI indications will be within those listed in table 3; if not, perform adjustments as indicated in table 3.

Table 3. Resistance Measurement Accuracy

Resistance standard settings (MΩ)	Test instrument		
	Min	Max	Adjustments
10	9.00	11.00	**b**(1) through (5) and (10) (R)
100	90.00	110.0	**b**(1) through (3) and (6), (7), and (10) (R)
1000	900.0	1100.00	**b**(1) through (3) and (8) through (10) (R)
10,000[1]	9000	11000	**b**(1) through (3) and (10) through (12) (R)

[1]Substitute resistance standard No. 1 with resistance standard No. 2.

b. Adjustments

(1) Remove resistance standard connections.

(2) Remove six screws from front panel and lift front panel from case.

(3) Set **SELECT** switch to **LOZ-HIZ.**

(4) Connect 10 MΩ resistance standard to TI **TANK UNITS LOZ** and **HIZ** using special test cables.

(5) Adjust MLRZ potentiometer (fig. 2) for display indication of 10.00 (R).

(6) Connect 100 MΩ resistance standard to TI **TANK UNITS LOZ** and **HIZ** using special test cables.

(7) Adjust MMRZ potentiometer (fig. 2) for display indication of 100.0 (R).

(8) Connect 1000 MΩ resistance standard to TI **TANKS UNITS LOZ** and **HIZ** using special test cables.

(9) Adjust MHRZ potentiometer (fig. 2) for display indication of 1000 (R).

(10) Connect 10 GΩ resistance standard to TI **TANK UNITS LOZ** and **HIZ** using special test cables.

(11) Adjust MERZ potentiometer (fig. 2) for display indication of 10000 (R).

(12) Replace front panel in case and reinstall six screws.

11. Final Procedure

a. Deenergize and disconnect all equipment.

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

By Order of the Secretary of the Army:

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