

TECHNICAL MANUAL
CALIBRATION PROCEDURE
FOR
FUEL QUANTITY TESTER
PSD30-2, PSD30-2AF

(SIMMONDS)



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FUEL QUANTITY TESTER**PSD30-2, PSD30-2AF****(SIMMONDS)****1 CALIBRATION DESCRIPTION:***Table 1.*

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
AC Voltage PSD30-2 Voltage	Range: 20 VAC Accuracy: ± 0.5 VAC	Measured with a Digital Multimeter and Electronic Counter
Frequency	Range: 6000 Hz Accuracy ± 500 Hz	
PSD30-2AF Voltage	Range: 20 VAC Accuracy: ± 0.05 VAC	Measured with a Digital Multimeter, Electronic Counter and Distortion Analyzer
Frequency	Range: 6000 Hz Accuracy ± 3 Hz	
Distortion	Range: 6000 Hz Accuracy: $< 1\%$ THD	
DC Voltage	Range: 0 to +40 VDC Accuracy: $\pm 0.5\%$ FS	Compared to a Meter Calibrator
Insulation Resistance	Range: 100 k Ω to 2,000 M Ω Accuracy: $\pm 10\%$ of rdg, 0 to 50 $^{\circ}\text{C}$; $\pm 15\%$ of rdg, -20 to 0 $^{\circ}\text{C}$	Compared to a Standard Resistor
DC Capacitance Measurement	Range: 0.1 to 1999.9 pF Accuracy: $\pm 0.1\%$ of rdg or 0.05 pF, whichever is greater	Compared to a Standard Capacitor
Simulation	Range: 0.1 to 1999.9 pF Accuracy: $\pm 0.1\%$ of rdg or 0.05 pF, whichever is greater	

2 EQUIPMENT REQUIREMENTS:

Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.1 DIGITAL MULTIMETER	Range: 20 VAC Accuracy: ±0.0625% of rdg	Hewlett-Packard 3458A	
2.2 ELECTRONIC COUNTER	Range: 6000 Hz Accuracy: ±0.0125% of rdg	Hewlett-Packard 5345A	
2.3 METER CALIBRATOR	Range: 0 to 40 VDC Accuracy: ±0.13% of rdg	Fluke 5700A	
2.4 RESISTORS	Range: 10 MΩ, 100 MΩ and 1000 MΩ Accuracy: ±2.5% of value	As Available	
2.5 CAPACITANCE CALIBRATION TEST UNIT	Range: 10 to 900 pF Accuracy: ±0.025% of charted value	Simmonds 473292	Simmonds 473292-1
2.6 DISTORTION ANALYZER	Range: 6 kHz Accuracy: ±3% FS	Hewlett-Packard 334A	

3 PRELIMINARY OPERATIONS:

3.1 Review and become familiar with the entire procedure before beginning the Calibration Process.



Unless otherwise designated, and prior to beginning the Calibration Process, ensure that all test equipment voltage and/or current outputs are set to zero (0) or turned off, where applicable. Ensure that all equipment switches are set to the proper position before making connections or applying power.

3.2 Use only that portion of the Calibration Process that pertains to TI being calibrated.

3.3 Connect test equipment to 115 VAC/60 Hz, set POWER to ON and allow sufficient time for warm-up.

3.4 Set TI POWER to ON and allow 5 minutes warm-up.

3.5 Since the accuracy of TI DC Capacitance Simulation is a result of DC Capacitance Measurement accuracy, the TI will be considered fully certified even though the DC Capacitance Simulation is not checked.

3.6 For the PSD30-2AF, connect TI Accessory cable to the TI J1 connector.

3.7 Prior to use, calibrate Capacitance Calibration Test Unit in accordance with T.O. 33K8-4-128-1 and chart all capacitance values. This chart is valid for a period of 24 hours. Verify T.O. 33K8-4-128-1 still meets the requirements.

4 CALIBRATION PROCESS:

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding.

4.1 AC VOLTAGE CALIBRATION:

4.1.1 Connect equipment as shown in Figure 1 and set Digital Multimeter to measure VAC.

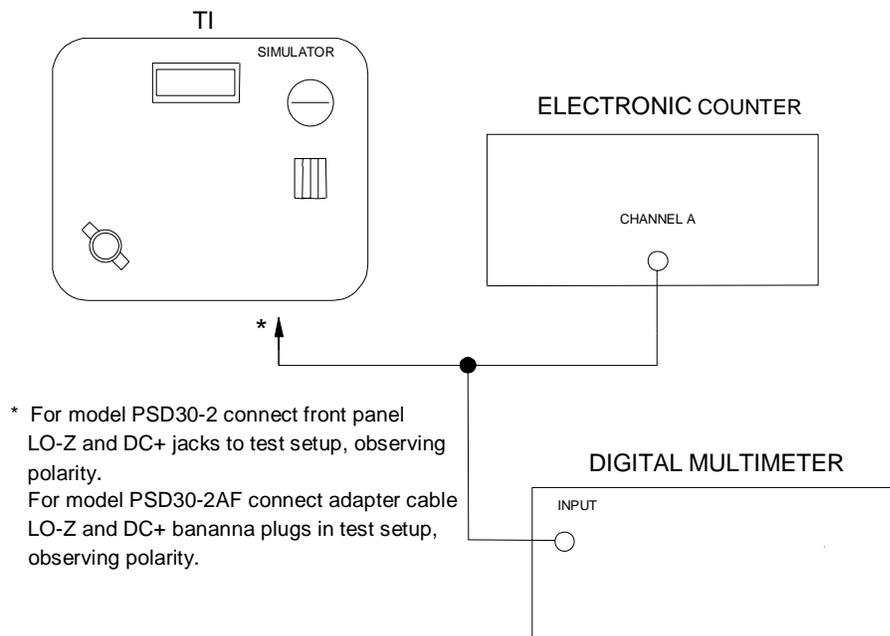


Figure 1.

4.1.2 Ensure the Electronic Counter CHANNEL A 50Ω/1 MΩ switch is set to 1 MΩ and input sensitivity controls are set to measure a 20 VAC signal.

4.1.3 Set TI FUNCTION SEL switch to MEASURE EXT for the PSD30-2 (for the PSD30-2AF, set TI FUNCTION SELECT switch to MEASURE EXT and POWER/PROBE SELECT switch to TYPE A position).

4.1.4 The Digital Multimeter must indicate within 19.5 to 20.5 VAC for the PSD30-2 (for the PSD30-2AF, the Digital Multimeter must indicate within 19.95 to 20.05 VAC).

4.1.5 The Electronic Counter must indicate within 5500 to 6500 Hz for the PSD30-2 (for the PSD30-2AF, Electronic Counter must indicate within 5997 to 6003 Hz).

4.1.6 Disconnect test setup.

4.1.7 For the PSD30-2AF, perform steps 4.1.8 through 4.1.11. For the PSD30-2, continue with para 4.2.

4.1.8 Connect Adapter Cable TI LOZ and DC+ banana plugs to Distortion Analyzer, observing polarity.

4.1.9 Standardize Distortion Analyzer for a distortion measurement at 6 kHz.

4.1.10 The measured distortion must be <1% THD.

4.1.11 Disconnect Distortion Analyzer from the TI.

4.2 DC VOLTAGE CALIBRATION:

4.2.1 Set TI FUNCTION SELECT switch to MEASURE DVM for the PSD30-2 (for the PSD30-2AF, set TI FUNCTION SEL switch to DMM JACKS).

4.2.2 Connect Meter Calibrator to TI DVM jacks for the PSD30-2 (for the PSD30-2AF, connect Meter Calibrator to TI DMM jacks), observing polarity.

4.2.3 Set Meter Calibrator Output controls for 28 VDC and OPR/STBY switch to OPR.

4.2.4 The TI must indicate within 27.80 to 28.20 VDC.

4.2.5 Set Meter Calibrator OPR/STBY switch to STBY.

4.2.6 Set Meter Calibrator Output controls for 38 VDC and OPR/STBY switch to OPR.

4.2.7 The TI must indicate within 37.80 to 38.20 VDC.

4.2.8 Set Meter Calibrator OPR/STBY switch to STBY.

4.2.9 Disconnect Meter Calibrator from TI.

4.3 INSULATION RESISTANCE CALIBRATION:

4.3.1 Set TI FUNCTION SELECT switch to MEGGER position.

4.3.2 Set TI MEGGER SEL switch to DVM JACKS position for the PSD30-2 (for the PSD30-2AF, set TI MEGGER SELECT switch to DMM JACKS).

4.3.3 Connect 10 MΩ Resistor to TI DVM jacks for PSD30-2 (for the PSD30-2AF, connect 10 MΩ Resistor to DMM JACKS).

4.3.4 The TI must indicate within the corresponding values listed in the Limits column of Table 2.

Table 2.

Function	Applied (MΩ)	Limits (MΩ)
MEGGER	10	9.0 to 11.0
	100	90.0 to 110.0
	1000	900 to 1100

4.3.5 Disconnect 10 M Ω Resistor from corresponding TI input jacks.

4.3.6 Repeat steps 4.3.3 through 4.3.5 using the 100 M Ω and 1000 M Ω Resistor.

4.4 DC CAPACITANCE MEASUREMENT CALIBRATION: (PSD30-2)

NOTE

If any adjustments to either zero or limits is made to TI, both zero and limits must be rechecked as the adjustments interact.

4.4.1 Set TI FUNCTION SEL switch to MEASURE EXT and RANGE switch to LO.

4.4.2 Verify TI display indicates 00.00.

4.4.3 Set TI RANGE switch to HI and verify display indicates 000.0.

4.4.4 Connect Capacitance Calibration Test Unit 10 pF LOW-Z, DC+, DC- and CHASSIS jacks to the TI LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.4.5 Set TI RANGE switch to LO.

4.4.6 The TI display must indicate within ± 0.05 pF of the charted value of the Capacitance Calibration Test Unit.

4.4.7 Disconnect TI from the Capacitance Calibration Test Unit.

4.4.8 Connect Capacitance Calibration Test Unit 500 pF (for P/N 473292-1, 180 pF) LOW-Z, DC+, DC- and CHASSIS jacks to the TI LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.4.9 Set TI RANGE switch to HI (for P/N 473292-1, leave TI RANGE switch set to LO).

4.4.10 The TI display must indicate within ± 0.5 pF (for P/N 473292-1, ± 0.18 pF) of the charted value of the Capacitance Calibration Test Unit.

4.4.11 Disconnect TI from the Capacitance Calibration Test Unit.

4.4.12 Connect Capacitance Calibration Test Unit 900 pF LOW-Z, DC+, DC- and CHASSIS jacks to the TI LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.4.13 If not already accomplished, set TI RANGE switch to HI.

4.4.14 The TI display must indicate within ± 0.9 pF of the charted value of the Capacitance Calibration Test Unit.

4.4.15 Disconnect TI from the Capacitance Calibration Test Unit.

4.4.16 Connect Capacitance Calibration Test Unit 10, 500 and 900 pF (for P/N 473292-1: 10, 180 and 900 pF) LOW-Z jacks in parallel.

4.4.17 Connect Capacitance Calibration Test Unit 10, 500 and 900 pF (for P/N 473292-1: 10, 180 and 900 pF) DC+ and DC- jacks in parallel.

4.4.18 Connect Capacitance Calibration Test Unit 900 pF LOW-Z, DC+, DC- and CHASSIS jacks to the TI LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.4.19 The TI display must indicate within ± 1.4 pF (for P/N 473292-1, ± 1.1 pF) of the sum of the charted values of the Capacitance Calibration Test Unit.

4.4.20 Set Power to OFF or STANDBY, disconnect and secure all equipment.

4.5 DC CAPACITANCE MEASUREMENT CALIBRATION: (PSD30-2AF)

4.5.1 Set TI FUNCTION SELECT switch to MEASURE EXT and POWER/PROBE SELECT switch to TYPE A.

4.5.2 Verify TI display indicates 00.00 pF without the cable attached to J1. Check POWER/PROBE SELECT TYPES B, C, D and E positions for the following display indications:

4.5.2.1 Probe type B, display indicates 00.00 pF.

4.5.2.2 Probe type C, display indicates -00.57 pF. If the display indicates any other value, adjust R187 for a display value of -00.57 pF.

4.5.2.3 Probe type D, display indicates 00.00 pF.

4.5.2.4 Probe type E, display indicates -00.22 pF. If the display indicates any other value, adjust R189 for a display value of -00.22 pF.

4.5.3 Set TI POWER/PROBE SELECT switch to TYPE A and verify the Pf LED is illuminated.

4.5.4 Connect Capacitance Calibration Test Unit 10 pF LOW-Z, DC+, DC- and CHASSIS jacks to the TI Accessory cable LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.5.5 The TI display must indicate within ± 0.05 pF of the charted value of the Capacitance Calibration Test Unit.

4.5.6 Disconnect TI from the Capacitance Calibration Test Unit.

4.5.7 Connect Capacitance Calibration Test Unit 500 pF (for P/N 473292-1, 180 pF) LOW-Z, DC+, DC- and CHASSIS jacks to the TI Accessory cable LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.5.8 The TI display must indicate within ± 0.5 pF (for P/N 473292-1, ± 0.18 pF) of the charted value of the Capacitance Calibration Test Unit.

4.5.9 Disconnect TI from the Capacitance Calibration Test Unit.

4.5.10 Connect Capacitance Calibration Test Unit 900 pF LOW-Z, DC+, DC- and CHASSIS jacks to the TI Accessory cable LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.5.11 The TI display must indicate within ± 0.9 pF of the charted value of the Capacitance Calibration Test Unit.

4.5.12 Disconnect TI from the Capacitance Calibration Test Unit.

4.5.13 Connect Capacitance Calibration Test Unit 10, 500 and 900 pF (for P/N 473292-1: 10, 180 and 900 pF) LOW-Z jacks in parallel.

4.5.14 Connect Capacitance Calibration Test Unit 10, 500 and 900 pF (for P/N 473292-1: 10, 180 and 900 pF) DC+ and DC- jacks in parallel.

4.5.15 Connect Capacitance Calibration Test Unit 900 pF LOW-Z, DC+, DC- and CHASSIS jacks to the TI Accessory cable LO-Z, DC+, DC- and CHASSIS jacks respectively.

4.5.16 The TI display must indicate within ± 1.4 pF (for P/N 473292-1, ± 1.1 pF) of the sum of the charted values of the Capacitance Calibration Test Unit.

4.5.17 Repeat steps 4.5.4 through 4.5.16 for all Probe types while modifying the Capacitance Calibration Test Unit values as follows:

4.5.17.1 Probe type B, multiply the Capacitance Calibration Test Unit values by 0.98875.

4.5.17.2 Probe type C, multiply the Capacitance Calibration Test Unit values by 0.9905 minus 0.57.

4.5.17.3 Probe type D, multiply the Capacitance Calibration Test Unit values by 1.

4.5.17.4 Probe type E, multiply the Capacitance Calibration Test Unit values by 0.99661 minus 0.22.

4.5.18 Set Power to OFF or STANDBY, disconnect and secure all equipment.

CALIBRATION PERFORMANCE TABLE

4.1 AC VOLTAGE CALIBRATION:

<u>Applied</u>	<u>Limits</u>	
	<u>PSD30-2</u>	<u>PSD30-2AF</u>
20 VAC	19.5 to 20.5 VAC	19.95 to 20.05 VAC
6000 Hz	5500 to 6500 Hz	5997 to 6003 Hz
20 VAC @ 6000 Hz		<1% THD

4.2 DC VOLTAGE CALIBRATION:

<u>Range</u>	<u>Applied (VDC)</u>	<u>Limits (VDC)</u>
0 to 40 VDC	28	27.80 to 28.20
	38	37.80 to 38.20

4.3 INSULATION RESISTANCE CALIBRATION:

<u>Range</u>	<u>Applied (MΩ)</u>	<u>Limits (MΩ)</u>
100 to 2000 MΩ	10	9.0 to 11.0
	100	90.0 to 110.0
	1000	900 to 1100

CALIBRATION PERFORMANCE TABLE (Cont.)

4.4 DC CAPACITANCE MEASUREMENT CALIBRATION: (PSD30-2)

<u>Range</u>	<u>Applied (pF)</u>	<u>Limits (pF)</u>
0.1 to 1999.9 pF	10	9.95 to 10.05
	180 *	179.82 to 180.18
	500 **	499.5 to 500.5
	900	899.1 to 900.9
	1090 *	1088.9 to 1091.1
	1410 **	1408.6 to 1411.4

* Applicable for P/N 473292-1 only.

** Applicable for P/N 473292 only.

4.5 DC CAPACITANCE MEASUREMENT CALIBRATION: (PSD30-2AF)

<u>Range</u>	<u>Applied (pF)</u>	<u>Limits (pF)</u>
0.1 to 1999.9 pF	10	9.95 to 10.05
	180 *	179.82 to 180.18
	500 **	499.5 to 500.5
	900	899.1 to 900.9
	1090 *	1088.9 to 1091.1
	1410 **	1408.6 to 1411.4

* Applicable for P/N 473292-1 only.

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