OPERATION MANUAL

PSD90-1C
UNIVERSAL AC/DC CAPACITANCE TESTER

MANUAL NUMBER: 06-1000-61 (Hard Copy)
E6-1000-61 (CD-ROM)
REVISION: 06
DATE: 05/11/2007

WARNING: INFORMATION SUBJECT TO EXPORT CONTROL LAWS

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ELECTROSTATIC DISCHARGE GENERAL WARNINGS FOR ALL EQUIPMENT

CAUTION: THIS EQUIPMENT MAY CONTAIN ELECTROSTATIC DISCHARGE (ESD) SENSITIVE COMPONENTS. TO PREVENT ESD SENSITIVE EQUIPMENT FROM POSSIBLE DAMAGE, OBSERVE THE FOLLOWING PRECAUTIONS WHEN HANDLING ANY ESD SENSITIVE COMPONENTS, OR UNITS CONTAINING ESD SENSITIVE COMPONENTS:

a. Maintenance or service personnel must be grounded though a conductive wrist strap, or a similar grounding device, using a 1 MΩ series resistor for equipment protection against static discharge, and personal protection against electrical shock.

b. All tools must be grounded (including soldering tools) that may come into contact with the equipment. Hand contact will provide sufficient grounding for tools that are not otherwise grounded, provided the operator is grounded through an acceptable grounding device such as a wrist strap.

c. Maintenance or service of the unit must be done at a grounded, ESD workstation.

d. Before maintenance or service of the equipment, disconnect all power sources, signal sources, and loads connected to the unit.

e. If maintenance or service must be performed with power applied, take precautions against accidental disconnection of equipment components. Specifically, do not remove integrated circuits or printed circuit boards from equipment while the equipment has power applied.

f. All ESD sensitive components are shipped in protective tubes or electrically conductive foam. The components should be stored using the original container/package when not being used or tested. If the original storage material is not available, use similar or equivalent protective storage material.

g. When ESD sensitive components are removed from a unit, the components must be placed on a conductive surface, or in an electrically conductive container.

h. When in storage or not being repaired, all printed circuits boards must be kept in electrically conductive bags, or other electrically conductive containers.

i. Do not unnecessarily pick up, hold, or directly carry ESD sensitive devices.

Failure to comply with these precautions may cause permanent damage to ESD sensitive devices. This damage can cause devices to fail immediately, or at a later time without apparent cause.

Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate this equipment.

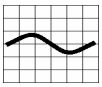
WARNING The **WARNING** notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in **PERSONAL INJURY** or **DEATH**. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

CAUTION The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in **damage to the product** or **loss of important data**. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

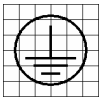
Caution (refer to accompanying documents). Attention – refer to the manual. This symbol indicates that information about usage of a feature is contained in the manual.

Equipment Markings

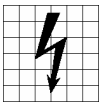
The following markings may appear on this equipment:



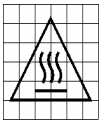
Alternating current. This symbol indicates that the equipment requires alternating current input.



Protective conductor terminal. This symbol indicates the protective ground (earth) terminal.



Caution, risk of electric shock. Danger – high voltage.



Caution, hot surface. Danger – high temperature surface.

CE Mark. ™ of the European Community.

Fuse Symbol. To indicate a fuse.

Caution (refer to accompanying documents). Attention – refer to the manual. This symbol indicates that information about usage of a feature is contained in the manual.

Warnings

WARNING Do not use the equipment in a manner not specified in this manual!

WARNING Equipment should only be serviced by authorized personnel.

WARNING When using in hazardous environment locations, the PSD90-1C test set should only be operated from the internal battery. Do not operate on external power in a hazardous environment.

WARNING Only connect the PSD90-1C to external power in dry non-hazardous locations.

WARNING The PSD90-1C is a safety-critical device. Improper calibration, repair, or parts substitution may create a hazardous condition that could result in PERSONAL INJURY or DEATH.

WARNING Test Procedure 04-1000-60 must be performed after any repair involving replacement of individual circuit board components. Either Test Procedure 04-1000-60 or 04-1000-62 must be performed after any repair that does not involve replacement of individual circuit board components.

WARNING Power cord connection (P2) to Front Panel connector (J2) must be clean and dry before attaching. Replace protective cap on J2 whenever power cord is not connected.

CLEANING WARNING

Keep the equipment dry to avoid damage to the equipment. To prevent damage, never apply solvents to the equipment housing. For cleaning, wipe the equipment with a cloth that is lightly dampened with water, mild detergent, or alcohol. Do not use aromatic hydrocarbons, chlorinated solvents, or methanol-based fluids.

Proper Fuse. To avoid fire hazard, use only a fuse identical in type, voltage rating, and current rating as specified in the fuse rating label and/or in the manual.

PROPER POWER CORD

Use only the power cord and connector appropriate for the voltage and plug configuration in your country. Use only a power cord that is in good condition. Refer cord and connector changes to qualified service personnel.

DO NOT REMOVE COVER

To avoid personal injury or death, do not remove the equipment cover. Do not operate the equipment without the cover properly installed. Normal calibration is accomplished with the cover closed, and there are no user-serviceable parts inside the equipment, so there is no need for the operator to ever remove the cover. Access procedures and the warnings for such procedures are contained in the manual. Service procedures are for qualified service personnel only.

DO NOT ATTEMPT TO OPERATE IF PROTECTION MAY BE IMPAIRED.

If the equipment appears damaged or operates abnormally, protection may be impaired. Do not attempt to operate it. When in doubt, have the equipment serviced.

OPERATING POSITION

Normal operating position is horizontal, on a flat surface.

WARNING This is a Safety Class 1 Product (provided with a protective earth ground incorporated in the power cord). The mains plug shall only be inserted in a socket-outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

SAFETY MAINTENANCE

The operator should check the detachable power supply cord condition. The equipment should not be operated if the mains inlet is cracked or broken. Any obvious damage to the case (from a drop or fall) should be checked by service personnel for loose or damaged parts inside. See individual parts lists for approved replacement parts.

WARNING TO SERVICE PERSONNEL

Ensure that power is disconnected before removal of any covers.

WARNING The Power switch on the Front Panel is not the mains disconnect. Mains disconnect is accomplished by disconnecting the detachable power supply cord at the appliance coupler or at the mains plug. Ensure the power cord is easily accessible and removable, in the event of an emergency, which requires immediate disconnection.

GROUNDING THE EQUIPMENT

The equipment utilizes controlled overvoltage techniques that require the equipment to be grounded whenever ac voltages or transient voltages may occur. The enclosure must be grounded through the grounding conductor of the power cord.

CAUTION This unit is a category I type instrument. Equipment cannot be used for measurements of categories II, III and IV type of measurements. The maximum transient overvoltage permissible of any input is 650V.

CAUTION Except for the mains input, all accessible terminals are rated for +/-15V, except for J1-5, which has a +/-50V input rating.

CAUTION All accessible terminals are rated for ‘BASIC’ INSULATION.

EU DECLARATION OF CONFORMITY

Manufacturer's Name:	Aeroflex – JcAIR Test Systems
Manufacturer's Address:	400 New Century Parkway New Century, KS, 66031-0009 USA

Declares that the products

Product Name:	PSD90-1C Fuel Quantity Tester
Model Number(s):	01-1000-60, 01-1000-61, 01-1000-62
Product Options:	All options associated with listed models are covered

Conform to the following product specifications and carry the CE-marking accordingly.

Low Voltage Directive 73/23/EEC:

EMC Directive 89/336/EEC:

Don Grossman		26-Sept-2005
Printed Name	Signature	Date

Mgr Quality Assurance
Printed Title

REVISION HISTORY BY DRAWING NUMBER

MANUAL: PSD90-1C Universal AC/DC Capacitance Tester

REVISION: 06 – May 11, 2007

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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides operation information for the Aeroflex PSD90-1C Universal AC/DC Capacitance Tester.

The PSD90-1C Universal AC/DC Capacitance Tester is an instrument that permits complete functional checkout and calibration of an AC or DC Fuel Gauging System, on or off the aircraft. The test set can accurately measure the capacitance of Tank Units, Compensators, or entire systems. The test set can also simulate capacitance values for the operation of Indicators, as well as measure the insulation resistance of Tank Units and cabling.

Operation of the test set is essentially automatic (no manual nulling required). To evaluate a particular system, connect it to the applicable input. Panel controls are set to determine what is displayed on the digital display.

A rechargeable Lead Acid sealed battery powers the test set. The battery may be replaced without need of test set recalibration. Battery charge is displayed on the digital readout.

The test set is shipped with a chassis ground cable and power cord. In order to properly test a system, specific aircraft interface cables are required but not furnished with the test set.

The PSD90-1C is available either with or without the F16 Interface Adapter. The standard PSD90-1C Test Set (JPN: 01-1000-61) is supplied only with the base unit (JPN: 01-1000-62). The PSD90-1C Test Set with F16 Interface Adapter (JPN: 01-1000-60) contains both the base unit (JPN: 01-1000-62) and the F16 Interface Adapter (JPN: 55-1000-16). Bills of materials for the above configurations are contained in the PSD90-1C Maintenance Manual (JPN: 06-1000-60 for hard copy, E6-1000-60 for CD-ROM).

1.2 EQUIPMENT DESCRIPTION

Figure 1-1 shows the front panel of the test set. Refer to Table 1-1 for the description and function of each item.

TABLE 1-1

S1	POWER INTERRUPT SWITCH	Turns power off when lid is closed regardless of the position of Power Switch
S204	POWER/TYPE SELECT	Energizes the test set. Also selects between AC and DC capacitance measurement and simulation.

WARNING

The Power switch on the Front Panel is not the mains disconnect. Mains disconnect is accomplished by disconnecting the detachable power supply cord at the appliance coupler or at the mains plug. Ensure the power cord is easily accessible and removable, in the event of an emergency, which requires immediate disconnection.

NOTE

The battery charger is always powered whenever the unit is connected to external power.

S201	FUNCTION SELECT	Used to select function to be performed.
	MEAS EXT/COMP	Sets the unit to measure external COMP capacitance.
	MEAS EXT/TU	Sets the unit to measure external TU capacitance.

	MEASURE INT	Sets the unit to measure internal capacitance from the simulators.
	SIMULATE	Sets the unit to simulate capacitance determined by the position of the SIMULATE SELECT switch.
	MEGGER	Sets the unit to measure insulation resistance determined by the position of the MEGGER SELECT switch.
	DTF	Sets the unit to measure distance to fault capacitance.
S202	SIMULATE SELECT	Used to select simulation/ohmmeter measuring mode to be performed.
	2-WIRE	Sets ohmmeter for 2-wire Ohmmeter measurement. (All other positions are 3-wire.)
	3-WIRE	Sets ohmmeter for 3-wire Ohmmeter measurement. This mode grounds all unused ohmmeter lines not being measured for more accurate high-resistance measurements. In the case where one of the unused lines is connected to a measured line on the aircraft, the 2-wire mode can be used.
	A/C ONLY	Disconnects internal simulator to allow simulation of aircraft only.
	A/C, TU & (COMP)	Connects aircraft and internal TU and COMP simulators to simulate indicator jacks. COMP simulation is added only when the COMP IN/OUT switch is set to the IN position.
	TU & (COMP)	Connects the internal TU and COMP simulators to the SIMULATE TO INDICATOR jacks. COMP simulation is added only when the COMP IN/OUT switch is set to the IN position.
	TU, AUX & (COMP)	Connects the TU, AUX and COMP simulators to the SIMULATE TO INDICATOR jacks. COMP simulation is added only when the COMP IN/OUT switch is set to the IN position.
S203	MEGGER SELECT	Determines the points between which a Megger measurement is made.
S301	COMP IN/OUT	Inserts or removes the COMP capacitance.
DS401	LCD Display	Displays: 1. Capacitance under test, either internal or external. 2. Insulation and continuity resistance of system wiring or unit under test. 3. Voltage of unit under test. 4. Relative charge of the PSD90-1C batteries. 5. Mode of operation.
S401	Calibration Mode Switch	To put the unit in Calibration mode, the screw is removed and the switch beneath the screw hole is held depressed during power up.
P6	INDICATOR LO-Z	Allows connection from test set TU SIMULATOR to aircraft FQGs.

J7	INDICATOR HI-Z	Allows connection from test set SIMULATOR HI-Z line to aircraft FQGs.
P8	INDICATOR COMP	Allows connection from test set COMP SIMULATOR to aircraft FQGs.
P3	TANK UNITS LO-Z	Allows connection from test set excitation circuits to aircraft tanks for measurement and connects aircraft tanks to SIMULATE TO INDICATOR jacks in A/C mode.
J4	TANK UNITS HI-Z	Allows connection from test set measurement circuits to aircraft tanks for measurement and connects aircraft tanks to SIMULATE TO INDICATOR jacks in A/C mode.
P5	TANK UNITS COMP	Allows connection from test set excitation circuits to aircraft tanks for measurement and connects aircraft tanks to SIMULATE TO INDICATOR jacks in A/C mode.
J32	CHASSIS	Access to PSD90-1C chassis ground. Normally required to connect PSD90-1C to aircraft ground.
S2	COARSE	Rotate for coarse adjustment of simulation capacitance. Push to select between TU, COMP, and AUX. Used to make manual range selection. Also used to calibrate unit.
AC719	TU FINE	Rotate for fine adjustment of TU simulation capacitance.
BC719	COMP FINE	Rotate for fine adjustment of COMP simulation capacitance.
CC719	AUX FINE	Rotate for fine adjustment of AUX simulation capacitance.
J1		1. DVM Mode Selection 2. DVM Connection 3. Battery Connection 4. RS232 Connection
J2		Allows for AC Mains connection to recharge the battery.

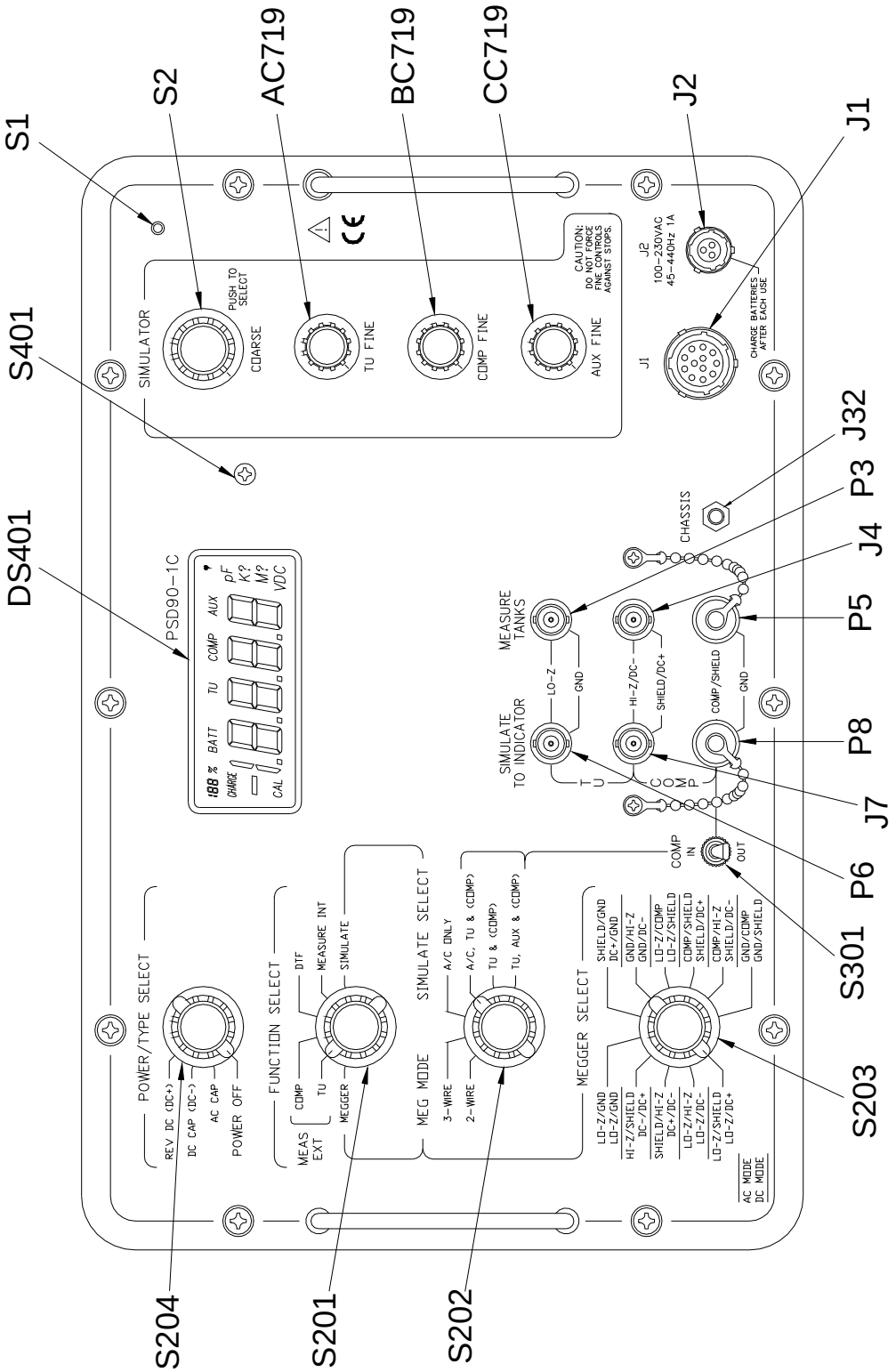

S1
S2
AC719
BC719
CC719
J2
J1
S401
DS401
J32
P3
J4
P5
P8
J7
P6
S301
S203
S204
S201
S202
SIMULATOR
PUSH TO SELECT
COARSE
TU FINE
COMP FINE
AUX FINE
CAUTION: DO NOT FORCE FINE CONTROLS AGAINST STOPS.
J2 100–230VAC 45–440Hz 1A
CHARGE BATTERIES AFTER EACH USE
PSD90–1C
CHARGE
CAL
BATT
TU
COMP
AUX
CHASSIS
MEASURE TANKS
SIMULATE TO INDICATOR
LO–Z
GND
HI–Z/DC–
SHIELD/DC+
COMP/SHIELD
GND
COMP
IN
OUT
POWER/TYPE SELECT
REV DC (DC+)
DC CAP (DC–)
AC CAP
POWER OFF
FUNCTION SELECT
MEAS EXT
COMP
TU
MEGGER
DTF
MEASURE INT
SIMULATE
MEG MODE
3–WIRE
2–WIRE
SIMULATE SELECT
A/C DNLY
A/C, TU & (COMP)
TU & (COMP)
TU, AUX & (COMP)
MEGGER SELECT
LO–Z/GND
LO–Z/GND
HI–Z/SHIELD
DC–/DC+
SHIELD/HI–Z
DC+/DC–
LO–Z/HI–Z
LO–Z/DC–
LO–Z/SHIELD
LO–Z/DC+
SHIELD/GND
DC+/GND
GND/HI–Z
GND/DC–
LO–Z/COMP
LO–Z/SHIELD
COMP/SHIELD
SHIELD/DC+
COMP/HI–Z
SHIELD/DC–
GND/COMP
GND/SHIELD
AC MODE
DC MODE

FIGURE 1-1

1.3 UNPACKING AND INSPECTING EQUIPMENT

Exercise care when unpacking the unit. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. When the equipment has been unpacked, return all the packing material to the container for future use in storing or shipping of the equipment.

1.4 SPECIFICATIONS

Physical Characteristics

Size:	10.6" X 14" X 6.5" (26.9 cm X 35.6 cm X 16.5 cm)
Mass (Weight):	13 lbs. (5.9 Kg)

AC and DC Capacitance Range 0.00ρF to 39.99KρF

Range	Measurement Range	Range Resolution	Range Accuracy
Extra Low (Manual Mode Only)	0.000ρF – 19.999ρF	0.001ρF	Greater of ± 0.1% of reading or 0.1ρF
Low	0.00ρF – 199.99ρF	0.01ρF	
Medium	200.0ρF – 1999.9ρF	0.1ρF	
High	2000ρF – 19999ρF	1ρF	
Extended	20.00KρF – 39.99KρF	10ρF	

DTF Capacitance Range 0ρF to 39.99KρF

Range	Measurement Range	Range Resolution	Range Accuracy
Low	0ρF – 19999ρF	1ρF	Greater of ± 0.2% of reading or 1ρF
High	20.00KρF – 39.99KρF	10ρF	

Resistance Measurement Range 0 mΩ to 19,999 MΩ

Range	Measurement Range	Range Resolution	Range Accuracy
Low Voltage/ Low Current (Manual Mode Only)	0.000Ω – 19.999Ω	0.001Ω	Greater of ± 5% of reading or 0.1Ω
Low Ohm	0.00Ω – 199.99Ω	0.01Ω	Greater of ± 2% of reading or 0.1Ω
Medium Ohm	200.0Ω – 1999.9Ω	0.1Ω	
High Ohm	2.000KΩ – 19.999KΩ	1Ω	
Extended Ohm	20.00KΩ – 199.99KΩ	10Ω	
Low Mohm	200.0KΩ – 1999.9KΩ	100Ω	
Medium Mohm	2.000MΩ – 19.999MΩ	1KΩ	
High Mohm	20.00MΩ – 199.99MΩ	10KΩ	
Extended Mohm	200.0MΩ – 1999.9MΩ	100KΩ	
High Extended Mohm	2000MΩ – 19990MΩ	10MΩ	± 20%
Mhos (Manual Mode Only)	0.0000nS – 1.9999nS	0.0001nS	± 20%

NOTE: Conductivity is displayed on the PSD90-1C in Siemens. 1 Siemen = 1 Mho = 1/Ohm.

Voltage Measurement Range ±50.00 V

Range	Measurement Range	Range Resolution	Range Accuracy
Low	-50.00VDC – +50.00VDC	0.01VDC	Greater of ± 1% of reading or 0.02VDC

Capacitance Simulation Range

Simulation	Simulator Range	Range Resolution	Range Accuracy
TU COMP AUX (TU Connection)	0ρF – 11990ρF 0ρF – 1190ρF 0ρF – 11990ρF	Coarse adjustment in10ρF increments with a fine tune capacitor 10ρF	Greater of ± 0.3% of reading or 0.3ρF from 300Hz to 9600 Hz

Environmental Specifications
The Environmental Specifications are as follows:

Operating Temperature: -40 °C to +55 °C.

Storage Temperature: -51 °C to +71 °C.

Relative Humidity (Non-Condensing) 90% maximum for 0 °C to 28 °C
80% maximum to 31 °C, decreasing linearly to 50% at 40 °C

Operating Altitude: 15000 ft. (4600 m) maximum

Storage Altitude: 60000 ft (18000 m) maximum

IEC Overvoltage Category II

Pollution Degree I

Charger Operating Temperature -20°C to +55°C

Power Requirements:
External Power 100VAC – 230VAC
45Hz - 440Hz
1 A maximum

Battery Power 1 rechargeable Lead Acid sealed battery

WARNING

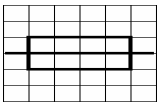
Equipment has recharging circuitry for a rechargeable lead-acid battery. Replace only with a 12 V dc, 2.9 Ah lead-acid battery (NSN: 6160-01213-0199).

Hours Of Operation 12 hours Continuous at 25°C

Charge Time 8 hours (Max) with the unit off at 25°C

Warm Up Time 1 minute

Fuses



The equipment uses the following fuses:
Charger Board: 250 V 315 mA Slo-Blo 5 x 20 mm
Main Board: 250 V 0.5 A Fast-Blo 5 x 20 mm
EMI: 250 V 5A Pico Fast Acting

The fuses should only be replaced by qualified service personnel. The fuses are not operator replaceable.

Documentation In Accordance With.

Manual to intent of ATA Specification 101.
Graphic symbols from IEC 60617 (IEEE Std 315 and 315A).
Class letters from IEEE Std 315.
Reference designations from IEC 61346.

Operator Safety

The PSD90-1C complies with EN 61010-1.

Intrinsic Safety

The PSD90-1C has been designed to comply with the Intrinsic Safety requirement of Boeing Specification 10-61959 Rev. H. The PSD90-1C test set maximum test terminal conditions are an open circuit voltage of +/-15 Volts, short circuit current of +/- 10 mA, and discharge energy less than 2 µJ into 0.016 µF.

Explosive Atmosphere

The PSD90-1C has been tested to MIL-STD-810F Method 511.4 Explosive Atmosphere and found to comply when operated from the internal battery only.

WARNING

When using in hazardous environment locations, the PSD90-1C test set should only be operated from the internal battery. Do not operate on external power in a hazardous environment.

EMC Environment

The PSD90-1C has been tested to EN61326-01 Radiated and Conducted Emissions tests Group 1, Class A, and found to comply. Details and results for each test are:

The PSD90-1C has been tested to EN61000-4-2 ESD and meets immunity criteria “C”. ESD discharge to the shields of BNC connectors may cause disruption of operation requiring turning off and restarting the unit to resume normal operation. It is recommended to discharge cable shields to the chassis before connecting to the isolated connectors.

The PSD90-1C has been tested to EN61000-4-3 Radiated RF and meets immunity criteria “B” when tested at 10 V/m. If excessive radiated RF energy is present the reading will exhibit a random variation instead of a steady reading. During this test standard coaxial cables were used to simulate the cable environment, and the reading accuracy was found to be degraded at fields above 3 V/m and frequencies between 80 MHz and 200 MHz. If unstable readings occur, increase the separation between the test site and RF generating devices or utilize cables with additional shielding.

The PSD90-1C has been tested to EN61000-4-6 Conducted RF and meets immunity criteria “B”. During this test standard coaxial cables were used to simulate the cable environment, and the reading accuracy may be degraded and will be indicated by a random variation in the reading. If this occurs, increase the separation between the test site and RF generating devices, or utilize cables with improved shielding.

The PSD90-1C has been tested to EN 61000-4-4 Burst/EFT Immunity, Class 3, EN6100-4-5 Surge Immunity, Class 3, EN61000-4-8 Power Frequency Magnetic Field, and EN61000-4-11 Voltage Dips and found to comply with criteria “A”. During these tests no degradation of operation was observed.

SECTION II
OPERATION

2.1 GENERAL INFORMATION

The PSD90-1C is a general purpose test set and must be used in conjunction with an aircraft specific interface cable in order to gain access to the aircraft fuel quantity system. Manufacturers of test sets historically have made or specified cables which best utilize their particular test set. Contact Aeroflex for interface cabling information on specific systems.

The following precautions should be observed at all times:

WARNING Connect the PSD90-1C chassis jack to airframe ground before making other connections and keep connected during all test set operations (measurement and simulation) unless otherwise specified in aircraft-specific procedures. Disconnect chassis jack only after all other connections have been disconnected.

WARNING When using in hazardous environment locations, the PSD90-1C test set should only be operated from the internal battery. Do not operate on external power in a hazardous environment.

WARNING Only connect the PSD90-1C to external power in dry non-hazardous locations.

WARNING Power cord connection (P2) to Front Panel connector (J2) must be clean and dry before attaching. Replace protective cap on J2 whenever power cord is not connected.

The PSD90-1C battery should be recharged prior to first use and after every subsequent use. For maximum battery life, the battery should be charged at least once every three months.

2.2 SELF-TEST

The following tests will be performed on power-up and the appropriate error codes will be set:

1. A/D Function Test
2. EEPROM Checksum Tests
3. Switch Board Tests
4. Control Relay Data Test
5. Simulator Control Relay Data Test
6. Simulator Relay Data Tests
7. Display Test
8. Software Version Test
9. Serial Number Test
10. Capacitance Self-test
11. Ohmmeter Self-test

2.2.1 A/D FUNCTION TEST

This test verifies that the A/D converter is set-up correctly

2.2.2 EEPROM CHECKSUM TESTS

This test verifies all of the checksums stored in EEPROM are correct.

2.2.3 SWITCH BOARD TESTS

This test verifies that all of the select switches are in a valid position.

2.2.4 CONTROL RELAY DATA TEST

This test verifies that the control relay data path is functioning correctly.

2.2.5 SIMULATOR CONTROL RELAY DATA TEST
This test verifies that the simulator control relay data path is functioning correctly.

2.2.6 SIMULATOR RELAY DATA TESTS
This test verifies that the simulator relay data paths on each of the simulator boards are functioning correctly.

2.2.7 DISPLAY TEST
This test allows the user to verify that all of the segments on the display are functioning.

2.2.8 SOFTWARE VERSION TEST
This test allows the user to verify the software version.

2.2.9 SERIAL NUMBER TEST
This test allows the user to verify the serial number.

2.2.10 CAPACITANCE SELF-TEST
This test verifies that the capacitance measurement circuitry is working correctly by measuring a known capacitance.

2.2.11 OHMMETER SELF-TEST
This test verifies that the ohmmeter measurement circuitry is working correctly by measuring a known resistance.

2.3 RESISTANCE MEASURMENT

2.3.1 LOW VOLTAGE RESISTANCE MEASUREMENT MODE
In some instances aircraft wiring connections can be corroded (fritted). The corrosion can interrupt an electrical connection and cause a failure. Using test equipment with a higher voltage can temporarily break through this corrosion and make the electrical connection. This new electrical connection is temporary and may fail in the future. The Low Voltage Resistance Measurement Mode does not break through the corrosion. To use the Low Voltage Resistance Measurement Mode, the following procedure needs to be followed in order to not destroy the corrosion.

1. Connect CHASSIS jack (J32) to Airframe.

2. Do not connect the PSD90-1C to the Aircraft Interface.

3. Turn POWER/TYPE SELECT switch to REV DC (DC+), DC CAP (DC-), or AC CAP, depending on the system under test. Allow one minute for the test set to stabilize.

4. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

5. Turn the FUNCTION SELECT switch (S201) to MEGGER.

6. Place the unit in Low Voltage Manual Range. See 2.3.3, Resistance Manual Range Selection.

7. Connect TANK UNITS LO Z, HI Z and COMP connectors (P3, J4, and P5) to the aircraft interface with the appropriate interface cables.

8. Select the type of measurement to be performed 2-wire or 3-wire using the MEG MODE SIMULATE SELECT switch (S202).

9. Install a jumper at the far end of the cable to be measured. The jumper is to be installed between the cable being measured and any other cable that can supply a return path to the PSD90-1C.

10. Using the MEGGER SELECT switch (S203), select the two points at which the jumper is installed. Example: If the LO-Z cable is being measured and ground is the return path, then select the LO-Z/GND position.

11. The resistance between the points selected will be displayed in ohms on the test set display.

2.3.2 RESISTANCE MEASURMENT MODE

1. Connect CHASSIS jack (J32) to Airframe.

2. Turn POWER/TYPE SELECT switch to REV DC (DC+), DC CAP (DC-) or AC CAP, depending on the system under test. Allow one minute for test set to stabilize.

3. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

4. Connect TANK UNITS LO Z, HI Z and COMP connectors (P3, J4, and P5) to the aircraft interface with the appropriate interface cables.

5. Turn the FUNCTION SELECT switch (S201) to MEGGER.

6. Select the type of measurement to be performed 2-wire or 3-wire using the MEG MODE SIMULATE SELECT switch (S202).

7. Select desired points to be measured using the MEGGER SELECT switch. (S203)

8. The resistance between the points selected will be displayed in ohms on the test set display.

2.3.3 RESISTANCE MANUAL RANGE SELECTION

1. Setup for resistance measurement using the RESISTANCE MEASUREMENT MODE procedure.

2. Push the SIMULATOR COARSE switch (S2) to select manual range selection. Rotate the SIMULATOR COARSE switch (S2) to select the range. The following table identifies the display indication and the measurement range.

Resistance Range Description	Display Indication	Resistance Measurement Range
Auto	Auto Ω/MΩ	0.00 Ω – 19990 MΩ (9 Ranges)
Low Voltage	19.999 Ω	0.000 Ω – 19.999 Ω
Low Ohm	199.99 Ω	0.00 Ω – 199.99 Ω
Medium Ohm	1999.9 Ω	0.0 Ω – 1999.9 Ω
High Ohm	19.999 KΩ	0.000 KΩ – 19.999 KΩ
Extended Ohm	199.99 KΩ	0.00 KΩ – 199.99 KΩ
Low Mohm	1999.9 KΩ	200.0 KΩ – 1999.9 KΩ
Medium Mohm	19.999 MΩ	0.200 MΩ – 19.999 MΩ
High Mohm	199.99 MΩ	0.20 MΩ – 199.99 MΩ
Extended Mohm	1999.9 MΩ	0.2 MΩ – 1999.9 MΩ
High Extended Mohm	19999 MΩ	0 MΩ – 19990 MΩ
Mhos	1.9999 nS	.0000 nS – 1.9999 nS

NOTE: Conductivity is displayed on the PSD90-1C in Siemens. 1 Siemen = 1 Mho = 1/Ohm.

3. To select the range, rotate through the display indication screens until the screen that is to be selected is displayed. After 2 seconds that range will be selected. If AUTO is selected, step 2 needs to be redone to change back to the manual range. While in manual range, rotating the SIMULATOR COARSE switch (S2) can select a new range at any time.

2.4 CAPACITANCE MEASUREMENT

2.4.1 AC CAPACITANCE MEASUREMENT

1. Connect CHASSIS jack (J32) to Airframe.

2. Turn POWER/TYPE SELECT switch to AC CAP, depending on the system under test. Allow one minute for test set to stabilize.

3. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

4. Connect TANK UNITS LO Z, HI Z and COMP connectors (P3, J4, and P5) to the aircraft interface with the appropriate interface cables.

5. Turn FUNCTION SELECT switch (S201) to MEASURE EXT/COMP or MEASURE EXT/TU.

6. The capacitance of the system's TU or COMP is measured and displayed in pF on the test set's display.

2.4.2 AC CAPACITANCE MANUAL RANGE SELECTION

1. Setup for AC capacitance measurement using the AC CAPACITANCE MEASUREMENT procedure.

2. Push the SIMULATOR COARSE switch (S2) to select manual range selection. Rotate the SIMULATOR COARSE switch (S2) to select the range. The following table identifies the display indication and the measurement range.

Capacitance Range Description	Display Indication	Capacitance Measurement Range
Auto	Auto ρF	0.00 ρF – 39.99 KρF (4 Ranges)
Extra Low	19.999 ρF	0.000 ρF – 19.999 ρF
Low	199.99 ρF	0.00 ρF – 199.99 ρF
Medium	1999.9 ρF	0.0 ρF – 1999.9 ρF
High	19999 ρF	0 ρF – 19999 ρF
Extended	39.99 KρF	0.00 KρF – 39.99 KρF

3. To select the range, rotate through the display indication screens until the screen that is to be selected is displayed. After 2 seconds that range will be selected. If AUTO is selected, step 2 needs to be redone to change back to the manual range. While in manual range, rotating the SIMULATOR COARSE switch (S2) can select a new range at any time.

2.4.3 DC CAPACITANCE MEASUREMENT

1. Connect CHASSIS jack (J32) to Airframe.

2. Turn POWER/TYPE SELECT switch to DC CAP (DC-) or REV DC (DC+) , depending on the system under test. Allow one minute for test set to stabilize.

3. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

4. Connect TANK UNITS LO Z, HI Z and COMP connectors (P3, J4, and P5) to the aircraft interface with the appropriate interface cables.

5. Turn FUNCTION SELECT switch (S201) to MEASURE EXT/COMP or MEASURE EXT/TU.

6. The capacitance of the system's TU or COMP is measured and displayed in pF on the test set's display.

2.4.4 DC CAPACITANCE MANUAL RANGE SELECTION

1. Setup for DC capacitance measurement using the DC CAPACITANCE MEASUREMENT procedure.

2. Push the SIMULATOR COARSE switch (S2) to select manual range selection. Rotate the SIMULATOR COARSE switch (S2) to select the range. The following table identifies the display indication and the measurement range.

Capacitance Range Description	Display Indication	Capacitance Measurement Range
Auto	Auto ρF	0.00 ρF – 39.99 KρF (4 Ranges)
Extra Low	19.999 ρF	0.000 ρF – 19.999 ρF
Low	199.99 ρF	0.00 ρF – 199.99 ρF
Medium	1999.9 ρF	0.0 ρF – 1999.9 ρF
High	19999 ρF	0 ρF – 19999 ρF
Extended	39.99 KρF	0.00 KρF – 39.99 KρF

3. To select the range, rotate through the display indication screens until the screen that is to be selected is displayed. After 2 seconds that range will be selected. If AUTO is selected, step 2 needs to be redone to change back to the manual range. While in manual range, rotating the SIMULATOR COARSE switch (S2) can select a new range at any time.

2.5 CAPACITANCE SIMULATION

1. Connect CHASSIS jack (J32) to Airframe.

2. Turn POWER/TYPE SELECT switch to REV DC (DC+), DC CAP (DC-) or AC CAP, depending on the system under test. Allow one minute for test set to stabilize.

3. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

4. Turn FUNCTION SELECT switch (S201) to MEASURE INT.

5. Connect INDICATOR LO Z, HI Z, and COMP connectors (P6, J7, and P8) to the aircraft interface with the appropriate interface cables.

6. Push the SIMULATOR COARSE switch (S2) to select TU, COMP, or AUX. Adjust approximately to desired capacitance value.

7. Adjust corresponding TU FINE (AC719), COMP FINE (BC719), or AUX FINE (CC719) knob to desired capacitance value.

8. Turn FUNCTION SELECT switch (S201) to SIMULATE. This connects the simulators to the SIMULATE TO INDICATOR connectors (P6, J7, and P8).

9. Turn the MEG MODE SIMULATE SELECT switch (S202) to either A/C, TU & (COMP); TU & (COMP); or TU, AUX & (COMP) to simulate the appropriate conditions.

10. The SIMULATOR COURSE switch (S2) will still adjust the TU, COMP or AUX simulators while in simulate mode. The corresponding TU FINE (AC719), COMP FINE (BC719), or AUX FINE (CC719) knobs still adjust the simulators. The display will indicate DVM voltage measurement.

NOTE: Connecting test harnesses and interface boxes should not add capacitance to the system. However, if the cable is suspect, connect only the cable to P6, J7, and P8 and read its capacitance per measurement procedure. If cable capacitance is less than 1 pF above displayed reading with no cables connected to test set, subtract its capacitance from the amount being simulated. If over 1 pF, repair cable; shields are probably improperly terminated.

NOTE: The AIRCRAFT ONLY position disconnects all internal simulators. This is used when delta values are simulated and actual dry aircraft tanks are used for empty.

2.6 DTF MEASURMENT

2.6.1 DTF MEASURMENT MODE

1. Connect CHASSIS jack (J32) to Airframe.

2. Turn POWER switch to REV DC (DC+), DC CAP (DC-) or AC CAP. Allow one minute for test set to stabilize.

3. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

4. Connect TANK UNITS LO Z, HI Z and COMP connectors (P3, J4, and P5) to the interface box with the appropriate interface cable.

5. Without the aircraft interface connected to the airplane, place the function select switch (S201) in DTF mode.

6. When the unit nulls all stray capacitance, 0pF will be indicated on the units display.

7. Connect the interface to the airplane and read the capacitance indicated on the units display.

8. Divide the displayed capacitance by the capacitance per foot of the specific coax measured. This number will yield the length of the coax, or the distance to the fault of the coax.

2.7 DVM MEASURMENT

2.7.1 DVM MEASURMENT MODE

1. Connect CHASSIS jack (J32) to Airframe.

2. Turn POWER switch to REV DC (DC+), DC CAP (DC-) or AC CAP, depending on the system under test. Allow one minute for test set to stabilize.

3. Check battery condition. If "% CHARGE" on the digital display is 10% or less, recharge batteries.

4. Connect to DVM LO (J1-6) and DVM HI (J1-5) to the interface box with the appropriate interface cable.

5. Turn the FUNCTION SELECT switch (S201) to SIMULATE or ground the DVMSEL line in the J1 connector (J1-1 shorted to J1-7).

6. The DC voltage between the DVM HI (J1-5) and DVM LO (J1-6) will be displayed in VDC on the test set display.

2.8 ERROR CODES

All of the error codes can be categorized by calibration errors, board errors, user correctable errors. Calibration errors are present when the calibration data is not present or corrupted. Calibration errors are identified with the CAL indicator illuminated. Board errors are present when there is an error present on a board. Board errors are identified by an error number and a letter following the number. The number represents the number of the board the failure occurs on. The letter represents the portion of the board that the error occurred on. User correctable errors are errors the can be corrected by the user. Typical errors of this type are low battery, shorted cables, or range errors. The following table describes what the display indicates when the given error is present.

Battery Display	Reading Display	Error Represented
Lo BATT	Display Blank	Battery to Low
Er		Errors are Bypassed
	-Or-	Value to big to be displayed for that range
	-Ur-	Value to small to be displayed for that range
	-SH- ρF	Lo-Z shorted
	-SH- Ω	Ohmmeter drive signal shorted
	CAL –Er-	EEPROM checksum corrupted
Sn	CAL –Er-	Serial number corrupted
	CAL –Er- Ω	Ohm calibration values corrupted
	CAL –Er- MΩ	Meg Ohm calibration values corrupted
	CAL ErAC ρF	AC capacitance calibration values corrupted
	CAL ErdC ρF	DC capacitance calibration values corrupted
	CAL –Er- VDC	Voltmeter calibration values corrupted
	Er1A	ADC malfunctioning
	Er1b	Control relay data malfunctioning
	Er1C	Ohmmeter self-test fail
	Er1d	Capacitance self-test fail
	Er2A	TYPE SELECT switch invalid position
	Er2b	FUNCTION SELECT switch invalid position
	Er2C	MEG MODE SIMULATE SELECT switch invalid position
	Er2d	MEGGER SELECT switch invalid position
	Er5	Simulator control data malfunctioning
	Er6b	TU Simulator data malfunctioning
	Er6A	TU HI / AUX Simulator data malfunctioning
	Er6C	COMP Simulator data malfunctioning

SECTION III
THEORY OF OPERATIONS

3.1 GENERAL THEORY OF OPERATIONS

3.1.1 Main Board

The main board performs the following functions:

a) Master Oscillator

The master oscillator produces the master clock at a frequency of 8.192 MHz.

b) LO-Z Generator

The master clock is fed to a binary up/down counter. The binary output feeds a DAC to create the LO-Z triangle wave. The output of the DAC is then buffered and amplified to drive the LO-Z line.

c) LO-Z Detector

The LO-Z detector sets up the reference voltage for capacitance measurement.

d) HI-Z Detector

The HI-Z detector operates similar to the LO-Z detector and measures the return current of the unknown capacitance being measured.

e) DC Stray Capacitance Nuller

This circuit inserts “negative capacitance” to the input of the HI-Z detector circuit. This circuit has the capability to null approximately 8000 pF of AC stray capacitance.

f) A/D Converter

The A/D Converter measures the capacitance, resistance, and voltage readings and converts them to a digital value.

g) Ohmmeter

The ohmmeter section is capable of measuring resistance from 0 to 20,000 Megohms in 11 ranges and operates in two different modes. From 0 to 200k ohms, the ohmmeter operates in the constant current mode by applying a constant current to the unknown resistance. For resistances greater than 200K ohms, the ohmmeter changes modes to a constant voltage type ohmmeter.

h) Main Controller

U122 is the main microcontroller of the unit. Its functions include doing all math operations required, updating the display board, reading function switches, and activating relays and ranges.

3.1.2 Switch Board

The main function of the switch board is the routing of signals and sending the switch position to the processor.

3.1.3 Display Board

The display board performs two main functions. The first is to display all data. The second function of the board is the power supply. It generates the unit's supply voltages of +5 and ± 15 VDC.

3.1.4 Simulator Control Board

The simulator control board routes all the signals required for the simulator board.

3.1.5 Simulator Boards

There are three simulator boards to simulate AC and DC capacitance.

3.1.6 Simulator Logic Boards

U1 and U2 are serial to parallel converters used to drive relays of the Simulator Boards.

3.1.7 Charger Board

The Charger Board is a universal 100-230 VAC, 45-440 Hz Lead Acid Gel Cell battery charger. Its output current is set at 0.5A until the batteries are fully charged. The charger will charge the battery to approximately 14.6 V and displays "charge" on units display. When the charge current is < 40mA the battery is fully charged (the "charge" indicator will extinguish). The charger circuit is active whenever external power is applied.

SECTION IV
MAINTENANCE

4.1 INTRODUCTION

Due to International Traffic in Arms Regulations (ITAR) and Export Administration Regulation, (EAR), product drawings and maintenance, troubleshooting, and calibration information is not provided in this manual. This information is provided in the PSD90-1C Maintenance Manual (JPN: E6-1000-60 for CD manual, 06-1000-60 for hard copy), available separately from JcAIR..

WARNING The PSD90-1C is a safety-critical device. Improper calibration, repair, or parts substitution may create a hazardous condition that could result in PERSONAL INJURY or DEATH.

APPENDIX A
RS-232 COMMANDS

1.1. RS-232 SETUP

The PSD90-1C uses a standard non-return-to-zero (NRZ) format (1 START bit, 8 DATA bits, No PARITY, 1 STOP) at a BAUD rate of 9600 for its RS232 communication.

1.2. BT Command

This command returns the current battery type.

Command Format
BT

Reply Format
BT, Battery Type

Example Reply
BT,GEL CELL

1.3. CT Command

This command returns the current self-test calibration values.

Command Format
CT

Reply Format
CT, Test Cap Low, Test Cap Mid, Test Cap Hi, Test Res Low, Test Res Hi

Example Reply
CT,199.74,199.8,199,198.88,200.3

1.4. D Command

This command returns the current display.

Command Format
D

Reply Format
D, Charge Status, Percent Battery Display, CAL Status, TU Status, COMP Status, AUX Status, Reading Display

Example Reply
D,,033%BATT,,,COMP,, 0.00ρF

1.5. DB Command

This command returns the current battery display.

Command Format
DB

Reply Format
DB, Charge Status, Percent Battery Display

Example Reply
DB,,033%BATT

1.6. DBC Command

This command returns the current battery display and transmits when a new battery display is available. This command toggles on and off.

Command Format
DBC

Reply Format
DB, Charge Status, Percent Battery Display

Example Reply
DB,,033%BATT

1.7. DC Command

This command returns the current display and transmits when a new display is available. This command toggles on and off.

Command Format
DC

Reply Format
D, Charge Status, Percent Battery Display, CAL Status, TU Status, COMP Status, AUX Status, Reading Display

Example Reply
D,,033%BATT,,,COMP,, 0.00ρF

1.8. DR Command

This command returns the current reading display.

Command Format
DR

Reply Format
DR, CAL Status, TU Status, COMP Status, AUX Status, Reading Display

Example Reply
DR,,,COMP,, 0.00ρF

1.9. DRC Command

This command returns the current reading display and transmits when a new reading display is available. This command toggles on and off.

Command Format
DRC

Reply Format
DR, CAL Status, TU Status, COMP Status, AUX Status, Reading Display

Example Reply
DR,,,COMP,, 0.00ρF

1.10. EBO Command

This command toggles between error bypass mode and returns from error bypass mode.

Command Format
EBO

Example Reply
ERROR BYPASS ON
ERROR BYPASS OFF

1.11. IT Command

This command returns the current temperature value in degrees C.

Command Format
IT

Reply Format
IT, Temperature °C

Example Reply
IT, 20 C

1.12. ITC Command

This command returns the current temperature value and transmits when a new temperature value is available. This command toggles on and off.

Command Format
ITC

Reply Format
IT, Temperature °C

Example Reply
IT, 20 C

1.13. MA20 Command

This command sets the AC capacitance manual 19.999ρF range.

Command Format
MA20

Example Reply
AC CAP 20

1.14. MA200 Command

This command sets the AC capacitance manual 199.99ρF range.

Command Format
MA200

Example Reply
AC CAP 200

1.15. MA20K Command

This command sets the AC capacitance manual 19999ρF range.

Command Format
MA20K

Example Reply
AC CAP 20K

1.16. MA2K Command

This command sets the AC capacitance manual 1999.99ρF range.

Command Format
MA2K

Example Reply
AC CAP 2K

1.17. MA40K Command

This command sets the AC capacitance manual 39.999KρF range.

Command Format
MA40K

Example Reply
AC CAP 40K

1.18. MAA Command

This command sets the AC capacitance to auto range.

Command Format
MAA

Example Reply
AC CAP AUTO

1.19. MD20 Command

This command sets the DC capacitance manual 19.999ρF range.

Command Format
MD20

Example Reply
DC CAP 20

1.20. MD200 Command

This command sets the DC capacitance manual 199.99ρF range.

Command Format
MD200

Example Reply
DC CAP 200

1.21. MD20K Command

This command sets the DC capacitance manual 19999ρF range.

Command Format
MD20K

Example Reply
DC CAP 20K

1.22. MD2K Command

This command sets the DC capacitance manual 1999.99ρF range.

Command Format
MD2K

Example Reply
DC CAP 2K

1.23. MD40K Command

This command sets the DC capacitance manual 39.999KρF range.

Command Format
MD40K

Example Reply
DC CAP 40K

1.24. MDA Command

This command sets the DC capacitance to auto range.

Command Format
MDA

Example Reply
DC CAP AUTO

1.25. MO20 Command

This command sets the ohmmeter manual 19.999Ω range.

Command Format

MO20

Example Reply
OHM 20

1.26. MO200 Command

This command sets the ohmmeter manual 19.999Ω range.

Command Format
MO200

Example Reply
OHM 200

1.27. MO200K Command

This command sets the ohmmeter manual 199.99KΩ range.

Command Format
MO200K

Example Reply
OHM 200K

1.28. MO200M Command

This command sets the ohmmeter manual 199.99MΩ range.

Command Format
MO200M

Example Reply
OHM 200M

1.29. MO20G Command

This command sets the ohmmeter manual 19.999GΩ range.

Command Format
MO20G

Example Reply
OHM 20G

1.30. MO20K Command

This command sets the ohmmeter manual 19.999KΩ range.

Command Format
MO20K

Example Reply
OHM 20K

1.31. MO20M Command

This command sets the ohmmeter manual 19.999MΩ range.

Command Format
MO20M

Example Reply
OHM 20M

1.32. MO2G Command

This command sets the ohmmeter manual 1999.9MΩ range.

Command Format
MO2G

Example Reply
OHM 2G

1.33. MO2K Command

This command sets the ohmmeter manual 1999.9KΩ range.

Command Format
MO2K

Example Reply
OHM 2K

1.34. MO2M Command

This command sets the ohmmeter manual 1999.9KΩ range.

Command Format
MO2M

Example Reply
OHM 2M

1.35. MOA Command

This command sets the ohmmeter to auto range.

Command Format
MOA

Example Reply
OHM AUTO

1.36. MODEL Command

This command returns the current model.

Command Format
MODEL

Reply Format
MODEL,UNIT MODEL

Example Reply
MODEL,PSD90-1C

1.37. MOM Command

This command sets the ohmmeter manual mhos range.

Command Format
MOM

Example Reply
MHOS

1.38. QCCW Command

This command remotely turns the SIMULATOR COARSE knob counter-clockwise.

Command Format
QCCW

Example Reply
QCCW

1.39. QCW Command

This command remotely turns the SIMULATOR COARSE knob switch clockwise.

Command Format
QCW

Example Reply
QCW

1.40. QSW Command

This command remotely presses the SIMULATOR COARSE knob switch.

Command Format
QSW

Example Reply
QSW

1.41. RESET Command

This command remotely resets the unit.

Command Format
RESET

1.42. SA Command

This command returns the current AUX simulator value.

Command Format
SA

Reply Format
SA, AUX Simulator Value

Example Reply
SA,00030

1.43. SAC Command

This command returns the current AUX simulator value and transmits when a new AUX simulator value is available. This command toggles on and off.

Command Format
SAC

Reply Format
SA, AUX Simulator Value

Example Reply
SA,00030

1.44. SC Command

This command returns the current COMP simulator value.

Command Format
SC

Reply Format
SC, COMP Simulator Value

Example Reply
SC,0020

1.45. SCC Command

This command returns the current COMP simulator value and transmits when a new COMP simulator value is available. This command toggles on and off.

Command Format
SCC

Reply Format
SC, COMP Simulator Value

Example Reply
SC,0020

1.46. SN Command

This command returns the current serial number value.

Command Format

SN

Reply Format
SN, Serial Number

Example Reply
SN, 0001

1.47. SPA Command

This command returns the current switch positions.

Command Format
SPA

Reply Format
SPA, Type Select Switch Position, Function Select Switch Position, Simulate Select Switch Position, Megger Select Switch Position

Example Reply
SPA,AC CAP,MEAS EXT COMP,A/C ONLY,HI-Z/DC- SHIELD/DC+

1.48. SPAC Command

This command returns the current switch positions and transmits when new switch positions are available. This command toggles on and off.

Command Format
SPAC

Reply Format
SPA, Type Select Switch Position, Function Select Switch Position, Simulate Select Switch Position, Megger Select Switch Position

Example Reply
SPA,AC CAP,MEAS EXT COMP,A/C ONLY,HI-Z/DC- SHIELD/DC+

1.49. SPF Command

This command returns the current function select switch position.

Command Format
SPF

Reply Format
SPF, Function Select Switch Position

Example Reply
SPF,MEAS EXT COMP

1.50. SPFC Command

This command returns the current function select switch position and transmits when a new function select switch position is available. This command toggles on and off.

Command Format
SPFC

Reply Format
SPF, Function Select Switch Position

Example Reply
SPF,MEAS EXT COMP

1.51. SPM Command

This command returns the current megger select switch position.

Command Format
SPM

Reply Format
SPM, Megger Select Switch Position

Example Reply
SPM,HI-Z/DC- SHIELD/DC+

1.52. SPMC Command

This command returns the current megger select switch position and transmits when a new megger select switch position is available. This command toggles on and off.

Command Format
SPMC

Reply Format
SPM, Megger Select Switch Position

Example Reply
SPM,HI-Z/DC- SHIELD/DC+

1.53. SPS Command

This command returns the current simulate select switch position.

Command Format
SPS

Reply Format
SPS, Simulate Select Switch Position

Example Reply
SPS,A/C ONLY

1.54. SPSC Command

This command returns the current simulate select switch position and transmits when a new simulate select switch position is available. This command toggles on and off.

Command Format
SPSC

Reply Format
SPS, Simulate Select Switch Position

Example Reply
SPS,A/C ONLY

1.55. SPT Command

This command returns the current type select switch position.

Command Format
SPT

Reply Format
SPT, Type Select Switch Position

Example Reply
SPT,AC CAP

1.56. SPTC Command

This command returns the current type select switch position and transmits when a new type select switch position is available. This command toggles on and off.

Command Format
SPTC

Reply Format
SPT, Type Select Switch Position

Example Reply
SPT,AC CAP

1.57. SSA Command

This command sets the AUX simulator value.

Command Format
SSA(0 to 11990 in increments of 10)

Example Command
SSA30

Example Reply
SSA,00030

1.58. SSC Command

This command sets the COMP simulator value.

Command Format
SSC(0 to 1190 in increments of 10)

Example Command
SSC20

Example Reply
SSC,0020

1.59. SST Command

This command sets the TU simulator value.

Command Format
SST(0 to 11990 in increments of 10)

Example Command
SST10

Example Reply
SST,00010

1.60. STC Command

This command returns the current self-test capacitor values.

Command Format
STC

Reply Format
STC, Test Cap Low Reading, Test Cap Mid Reading, Test Cap High Reading

Example Reply
STC,199.74,199.8,199

1.61. STCA Command

This command returns the current TU, COMP, and AUX simulator values.

Command Format
STCA

Reply Format
STCA, TU Simulator Value, COMP Simulator Value, AUX Simulator Value

Example Reply
STCA,00010,0020,00030

1.62. STCAC Command

This command returns the current TU, COMP, and AUX simulator values and transmits when new TU, COMP, and AUX simulator values are available. This command toggles on and off.

Command Format
STCAC

Reply Format
STCA, TU Simulator Value, COMP Simulator Value, AUX Simulator Value

Example Reply
STCA,00010,0020,00030

1.63. STO Command

This command returns the current self-test resistor values.

Command Format
STO

Reply Format
STO, Test Resistor Low Reading, Test Resistor High Reading

Example Reply
STO,198.91,200.3

1.64. STU Command

This command returns the current TU simulator value.

Command Format
STU

Reply Format
STU, TU Simulator Value

Example Reply
STU,00010

1.65. STUC Command

This command returns the current TU simulator value and transmits when a new TU simulator value is available. This command toggles on and off.

Command Format
STUC

Reply Format
STU, TU Simulator Value

Example Reply
STU,00010

1.66. TCO Command

This command toggles the test capacitor for measurement.

Command Format
TCO

Example Reply
TEST CAPACITOR ON
TEST CAPACITOR OFF

1.67. TRO Command

This command toggles the test resistor for measurement.

Command Format
TRO

Example Reply
TEST RESISTOR ON
TEST RESISTOR OFF

1.68. VER Command

This command returns the current software version.

Command Format
VER

Reply Format
VER, Software Version Number

Example Reply
VER,1.00