BARFIELD

AC2K Digital Fuel Quantity Test Set

USER INSTRUCTION MANUAL
BARFIELD M/N AC2K

Doc. P/N: 56-101-01401
Revision B
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BARFIELD, INC.

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CONTACT INFORMATION

Users are requested to notify the manufacturer of any discrepancy, omission, or error found in this manual. Inquiries should include specific questions and reference the publication title, number, chapter, page, figure, paragraph, and effective date.

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ATTENTION

Although every effort has been made to provide the end user of this equipment with the most current and accurate information, it may be necessary to revise this manual in the future. Please be sure to complete and return the enclosed **OWNER WARRANTY REGISTRATION CARD** to Barfield in order to validate the warranty and to ensure that you will receive updated information when published. You MUST have your name and address on file at Barfield as a registered user of this equipment, to be able to obtain the service covered by the warranty.

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REVISION RECORD

REV.	ECO #	REV. DATE	DESCRIPTION OF CHANGE
		Jul/21/1995	Initial Release
B	260-01067	Nov/17/2014	Updated format and Barfield logo

DISCLAIMER

BARFIELD, INC., neither a vendor nor supplier of fuel quantity indicating systems or an airframe manufacturer, has no control over testing and calibration values and procedures. The Aircraft Maintenance Manual shall be the first source of information regarding testing and calibration values and procedures, taking precedence over this manual. A variant between actual values and procedures and those recommended in this manual may exist. However, the information presented here is correct to the best of our knowledge at time of publication and is presented for reference only.

LIST OF APPROVED REPAIR FACILITIES

The manufacturer of this equipment does not recommend the user to attempt any maintenance or repair. In case of malfunction, contact the manufacturer, to obtain the list of approved repair facilities worldwide, ensuring that this equipment will be serviced using proper procedures and certified instruments. A Return Maintenance Authorization (RMA) number will be assigned during this call, to keep track of the shipment and the service.

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DESCRIPTION

1. PURPOSE OF MANUAL

A. This publication contains the description, identification data, operating procedures for the:

AC-2K DIGITAL FUEL QUANTITY SYSTEM TEST SET, P/N 101-01401, hereinafter referred to as the Test Set.

Manufactured by:
Barfield Inc.; Miami Florida 33142 U.S.A.

B. The manual is developed to address the Test Set which is specifically designed to meet the requirements for servicing three wire guarded AC capacitance type Aircraft Fuel Quantity Systems. The basic manual provides information to operate the AC-2K in TYPICAL sequence.

Each individual Aircraft Fuel Quantity System will require its own particular Adapter Cable(s) and specific instructions.

Contact the Manufacturer for a listing of available Adapter Cables. Complete Fuel Quantity System Test/Calibration Instructions are furnished with most Adapter Cables.

2. GENERAL DESCRIPTION

The Test Set meets or exceeds the range of requirements for WET and DRY tank measurement/calibration, also group or individual tank unit insulation resistance and capacitance measurements may be made.

Accuracy and reliability have been optimized with safety, portability, light weight, and the additional convenience of internal battery or optional AC adapter operation.

The insulation resistance, and DC meter capacitance, indicator current are presented on a 4 1/2 digit **LCD** (**L**iquid **C**rystal **D**isplay).

Two digitally selectable capacitance simulators are provided.

The potentials and currents introduced are limited to meet all safety specifications.

With proper Adapter Cables a wide range of Aircraft Fuel Quantity Systems can be serviced in maintenance testing, troubleshooting, calibration, as well as cockpit or bench testing of the indicators.

Through the FUNCTION switch, three measurement and three calibration functions are provided.

With the exception of Adapter Cables, the Test Set contains the necessary interconnecting accessories for test/calibration of the Aircraft Fuel Quantity System as well as individual components test/calibration.

Most Adapter Cables, specified by Aircraft and or system, from this, as well as other manufacturers, are useable without modification.

Adapter Cable configuration and connections vary considerably to accommodate the wide variety of Fuel Quantity Systems in use.

The user should first become familiar with the Test Set and its Accessory Lead Package as presented in this text.

The actual tests to be performed and the procedures to be followed are dictated by the requirements of the particular Aircraft Fuel Quantity System. Some Adapter Cables have their own set of procedures.

Reference the appropriate Maintenance Manuals for specific procedures and calibration values.

3. PHYSICAL DESCRIPTION OF MAJOR COMPONENTS

A. Carrying Case

(1) Fabricated from drawn aluminum for maximum strength.

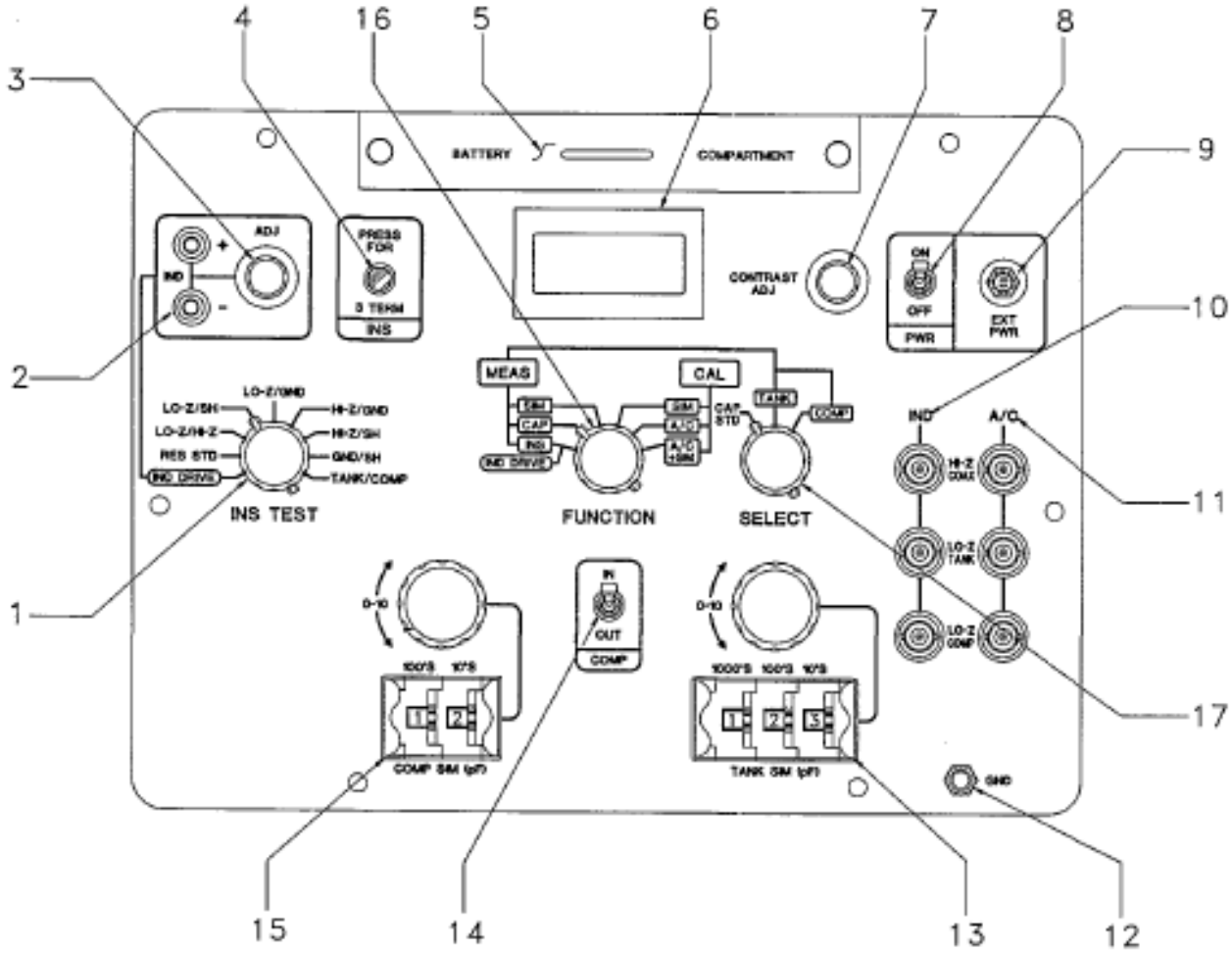
(2) The lower section has been fitted with twin saddle bags for the Accessory Lead Package as well Adapter Cable storage.

(3) The cover is fitted with sliding pin hinges for easy removal, aiding in the ease of operation in limited space situations.

(4) The cover is also fitted with a "keeper bracket" designed to hold the Test Set Instruction Manual with ample space to accommodate the system instructional procedures. Do not use this space for storage of cables, harnesses, or tools.

B. Front Panel And Switching Functions

The parenthetical numbers accompanying the panel callouts reference the Item numbering in Figure 1.



AC-2K FRONT PANEL
Figure 1

(1) The INS TEST (INSulation TEST) switch (1) provides for selection of indicator drive and permits selection of eight different test points across which insulation tests are to be made for insulation leakage, these function as follows:

(a) The IND DRIVE position provides up to 1,500 microamperes of D.C. current at the two IND jacks.

(b) The RES STD (RESistance STanDard) position connects a 1,000 megohm resistance standard to the input of the insulation measurement circuit to verify the resistance measurement accuracy of the Test Set.

(c) The LO-Z/HI-Z (LOw impedance to HIgh impedance) position connects between the Aircraft TANK or COMPensator LOw impedance lead as selected by the SELECT switch (17), and the inner conductor of the HI-Z lead.

(d) The LO-Z/SH (LOw impedance to SHield) position connects between the Aircraft LO-Z lead as selected by the SELECT switch, and the shield of the HI-Z lead.

(e) The LO-Z/GND (LOw impedance to GrouND) position connects between the selected Aircraft LO-Z lead, and Aircraft ground. The GND banana jack (12) provides for connecting the Test Set to the Aircraft ground.

(f) The last four positions of the INS TEST (INSulation TEST) switch are self-explanatory.

(2) The banana jacks, are used for INDICATOR DRIVE tests and for Aircraft indicator monitoring on certain fuel quantity systems.

(3) The **IND ADJ** control is used to adjust the current supplied to the indicator under test in the IND DRIVE function.

(4) The INS (INSulation) pushbutton alters the INS function from two to three terminal configuration when depressed. (The third terminal "guards" the measurement from secondary leakage paths through by-passing circuitry.)

(5) The **BATTERY COMPARTMENT** provides storage for the batteries.

(6) The LCD display provides readings of insulation resistance in megohms, capacitance values in picofarads, or DC current in microamperes.

(a) Insulation resistance is displayed in a single range of 2,000 megohms with 1 megohm resolution.

(b) Capacitance measurements are displayed in a single range of 2,000 pF with .1 pF resolution.

(c) DC current is displayed in the range of 20,000 microamperes with 1 µA resolution. (Scaling may be changed by certain adapter Harnesses.)

(d) The greatest value that can be displayed is 1999.9 (19999 For microamperes). When the measured value exceeds full scale the single digit "1" will appear on the left of the display.

(e) When the battery voltage drops to a point where errors may be introduced into the test results, a LOW BATTERY warning will appear in the upper left corner of the LCD.

(7) The CONTRAST control provides for varying the LCD display intensity. The LCD may reveal "ghost" digit segments or annuciator images when viewed from certain angles. Reducing the contrast setting will help to reduce these ambiguos displays.

(8) The **PWR** (**P**o**W**e**R**) switch, in the **ON** position applies battery power for all Test Set functions.

(a) In the event the operator should forget to return the **PWR** switch to **OFF** after use, a "sleeper" timer automatically removes the battery supply from the circuitry after about ten minutes.

When the timer removes the battery power the **LCD** display will go blank.

(b) To return battery power to the circuitry, momentarily switch to power OFF then return to ON.

CAUTION: Always return PWR switch to OFF after completing tests. A small battery drain continues after the timer shuts off. Failure to switch the Test Set OFF will eventually drain the battery.

(9) The **EXT PWR** receptacle allows the user to connect either 115 VAC 50-400Hz (P/N 101-00704) or 230 VAC 50-400Hz (P/N 101-00705) power supply. The battery is automatically disconnected from the load when the external power plug is inserted into the **EXT PWR** receptacle. To disengage the "sleeper" timer fuction, remove one or more of the batteries.

(10) The **IND** BNC receptacles **HI-Z COAX** (**HI**gh impedance **COAX**), **LO-Z TANK** (**LO**w impedance **TANK**), and **LO-Z COMP** (**LO**w impedance **COMP**ensator) provide for connecting the aircraft indicator wiring to the Test Set.

(11) The **A/C** BNC receptacles **HI-Z COAX**, **LO-Z TANK**, and **LO-Z COMP** provide for connecting the aircraft probe wiring to the Test Set.

(12) The **GND** receptacle provides for grounding the Test Set to a suitable Aircraft ground. The Test Set **MUST** be grounded for **ALL** tests.

(13) The **TANK SIM** thumbwheels and 0-10 knob are used to set the tank capacitance to be simulated over a range of 10 to 2,000 pF. The 0-10 knob provides a fine vernier of about 300 degrees and more than three turns of course vernier thereafter.

The values selected by the thumbwheels are approximate. Use the LCD to set the exact value.

(14) The **COMP** switch is used to switch the Compensator Simulator, IN or OUT.

(15) The **COMP SIM** thumbwheels and 0-10 knob are used to set the compensator capacitance to be simulated in approximate increments of 100's, and 10's of picofarads over a range of 10 to 400 pF. The 0-10 knob provides a fine vernier of about 300 degrees and more than three turns of course vernier

The minimum value obtainable is approximately 10 pF thereafter.

The values selected by the thumbwheels are approximate. Use the LCD to set the exact value.

(16) The **FUNCTION** switch configures the Test Set for the following functions:

(a) The **MEAS INS** (**MEAS**ure **INS**ulation) position is used to measure insulation as selected by the **INS TEST** switch, or to display the current supplied an indicator when the **INS TEST** switch is in **IND DRIVE** position.

(b) The MEAS CAP (MEASure CAPacitance) position is used to measure Aircraft or internal reference capacitance as selected by the SELECT switch.

(c) The MEAS SIM (MEASure SIMulator) position is used to measure the simulator capacitance settings as selected by the SELECT switch. (CAP STD is inoperative in the MEAS SIM position of the SELECT switch.)

(d) The CAL SIM (CALibration SIMulator) position permits testing of the indicator using the Test Set simulators only.

(e) The CAL A/C (CALibration AirCraft) position connects the aircraft probe system only to the aircraft indicator.

The Test Set is passive in this function and does not affect the Aircraft indicator readings.

(f) In the CAL A/C+SIM (CALibration AirCraft plus SIMulator) position the Test Set simulated capacitance is summed with the aircraft system capacitance and supplied as input to the aircraft indicator.

(g) If the aircraft indicator is connected to the IND panel jacks (2), the LCD will display the resultant indicator current for certain systems when any of the CAL positions of the FUNCTION switch is selected.

(17) The **SELECT** switch operates as follows:

(a) **CAP STD** (**CAP**acitance **ST**an**D**ard). When the **FUNCTION** switch is in the **MEAS CAP** (MEASure CAPacitance) position, an internal 1000.0 pF precision capacitance standard is connected to the capacitance measurement circuit to verify the accuracy of the Test Set.

(b) TANK connects the MEAS INS LO-Z, or CAP LO-Z input to the A/C LO-Z TANK jacks according to the FUNCTION switch setting. It also selects the TANK SIM when the FUNCTION switch is set to MEAS SIM.

(c) COMP connects the MEAS INS or CAP LO-Z input to the A/C LO-Z COMP jack depending upon the FUNCTION switch setting. It selects the COMP SIM when the FUNCTION switch is set to MEAS SIM.

C. Battery Installation/Replacement And Maintenance

The user must ensure that only batteries of the proper type (EVEREADY SIZE AA 1.5 VOLT ALKALINE NO. E91 or equivalent) are used and that satisfactory battery condition is maintained. Whenever the LOW BATTERY legend appears on the LCD, the batteries **MUST** be replaced.

Before battery installation test each battery individually to assure maximum battery life.

(1) Installation

(a) Unscrew the two captive knurled screws from the BATTERY COMPARTMENT panel.

(b) Carefully withdraw the assembly from the Test Set.

(c) Observing polarity, install ten 1.5 AA batteries.

(d) Replace the assembly and secure with the two captive knurled screws.

D. Accessory Lead Package

The Accessory Lead Package, P/N 101-01411, stored in the right saddle bag, provides all the following accessories:

(1) One set (three), color coded TEE adapters: P/N UG-274/U (31-008), one each RED/WHITE/BLACK.

(2) One set (three), color coded STRAIGHT adapters: P/N UG-914/U (31- 219), one each RED/WHITE/BLACK.

(3) Two each Adapter Assembly, Polarized to STD. BNC: P/N 112-00007.

(4) Two each Cap, Shorting Plug (without chains): P/N 310-00004.

(5) One each Lead, Ground Clip: P/N 101-01007, alligator clip to stackable banana plug, both ends BLACK.

(6) One set (three) Leads, Insulation and Capacitance (HI-Z/LO-Z) Test: P/N 101-01023, alligator clip to BNC plug, one each RED/BLACK/WHITE.

(7) Three each Cable, Shielded BNC to BNC: P/N 101-01008 one each RED/WHITE/BLACK.

(8) One each indicator test leads pair: P/N 101-01000

(9) One each banana leads pair: P/N 101-01010.

OPERATION

1.PRELIMINARY

A. GENERAL

The user should first become completely familiar with Test Set and Accessory Lead Package as presented in 1-1 of this Manual. A sound knowledge of the system to be tested or calibrated is essential. Read the instructions supplied with the Adapter Cable and the specific system test and calibration procedures.

The actual tests to be performed and the calibration procedures to be used are dictated by the requirements of the particular Fuel Quantity System. Operating instructions for use with specific systems and components are to be derived from appropriate Maintenance or Systems Manuals. Special attention must be given to **WARNINGS** and **CAUTIONS** therein.

Adapter Cable configurations vary considerably to accommodate the many Fuel Quantity Systems in use. Figures 1, 2 and 3 illustrate some typical configurations and interfacing.

The components of the System should be tested and their integrity proven before attempting calibration.

There are two methods of Fuel Quantity System calibration.

(1) Method 1, PREFERRED (Dry Tank), is accomplished without fuel in the tanks or sumps with the tank probes dry. This method provides greater accuracy because the indicator zero reading is adjusted to the actual empty tank condition. A simulated "ADD FOR FULL" capacitance value, supplied by the Test Set, is substituted for an equivalent quantity of fuel to adjust the indicator for FULL.

(2) Method 2, ALTERNATE (Wet Tank), is accomplished with fuel in the tanks. Accuracy is sacrificed by the necessity of using simulated values for the empty tank condition of the aircraft. If correct, up-to-date, dry tank capacitance values are available for the Aircraft by SERIAL NUMBER, that value should then be used for indicator EMPTY adjustment, and add the ADD FOR FULL value to this for the FULL adjustment.

For optimum accuracy, Method 1 should be performed whenever possible. However, if time or facilities do not permit, Method 2 may be performed only as a TEMPORARY measure and Method 1 performed at the next opportune time.

2.TEST SET CONFIDENCE TESTS

A. Insulation Measurement Test

(1) Place the **PWR** switch **ON**.

(2) Rotate the FUNCTION switch to MEAS INS.

(3) Rotate the **INS TEST** switch to **RES STD**.

The LCD display should be between 980 and 1020 Megohms.

B. Capacitance Measurement Test

(1) Rotate the FUNCTION switch to MEAS CAP.

(2) Rotate the SELECT switch to CAP STD.

The LCD display should be between 999.0 and 1001.0 pF.

(3) Place the **PWR** switch to OFF.

3.DC METER INDICATOR SYSTEMS TESTS

This test set includes provisions for testing DC meter type indicators and for substituting an LCD current display for the aircraft indicator. (These tests are dedicated to two terminal DC meter type indicators only.)

A. Indicator Testing

(1) Refer to Section 9.

B. Indicator Substitution

(1) Connect adapter cable box to test set IND jacks (2) with banana lead pair.

(2) Proceed as prescribed in appropriated maintenance manual or literature supplied with test harness.

4. AIRCRAFT INSULATION TEST

A. Aircraft Preparation

CAUTION: TANK UNIT INSULATION TESTS ARE NOT TO BE CARRIED OUT UNTIL FUEL TANKS HAVE BEEN EMPTIED AND PURGED. REFER TO APPROPRIATE AIRCRAFT MAINTENANCE MANUALS FOR PROPER FUELING/DEFUELING PROCEDURES OBSERVING PRECAUTIONS THEREIN.

(1) Defuel the Aircraft.

CAUTION: FUEL QUANTITY, REFUEL, AND DEFUEL POWER MUST BE OFF WHILE ACCESSING AND BEFORE ANY HARNESS, CABLE, OR CONNECTOR IS REMOVED. POWER MUST REMAIN OFF UNTIL CONNECTIONS ARE MADE AS SPECIFIED AND UNTIL POWER REQUIREMENT IS CALLED OUT.

(2) Open appropriate Fuel Quantity System circuit breaker(s).

CAUTION: REFERENCE APPROPRIATE MAINTENANCE MANUAL FOR ACCESSING PROCEDURES, FOLLOW ALL PRECAUTIONS THEREIN.

(3) Gain access to the appropriate Fuel Quantity System electrical connector(s) necessary for this procedure.

(4) Disconnect the appropriate Fuel Quantity System electrical connector(s).

(5) Connect the specified Adapter Cable between the Aircraft Wiring removed from the Indicator, and the Indicator Receptacle(s). Reference Figure 1, 2, or 3.

B. Test Set Configuration

(1) Locate the equipment conveniently for the following procedures.

(2) Connect the Adapter Cable, as specified, to the Test Set. Reference Figure 1, 2, or 3.

(3) Connect the ground lead from the Test Set GND receptacle to a good airframe ground.

(4) Rotate the FUNCTION switch to MEAS INS.

(5) Rotate the INS TEST switch to LO-Z/HI-Z.

(6) Rotate the SELECT switch to TANK.

(7) Depress INS pushbutton if a 3 TERM test is desired. (Most manuals do not specify, but assume a 2 TERM configuration.) Use 3 TERM if specified, or for a more comprehensive test.

C. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and values.

(1) Place the Test Set PWR switch to ON.

(2) Observe the LCD display until it displays its highest value, or a value exceeding the minimum specified. The test is considered satifactory if the minimum is reached. With the INS pushbutton depressed (The rate at which the display settles depends on the capacitance of the system under test.)

(3) Perform the following, observing the LCD display to react as before for each position:

(a) Rotate the **SELECT** switch to **COMP**.

(b) Rotate the INS TEST switch to LO-Z/SH.

(c) Rotate the SELECT switch to TANK.

(d) Rotate the INS TEST switch to LO-Z/GND.

(e) Rotate the SELECT switch to COMP.

(f) Rotate the INS TEST switch to each of the remaining four positions.

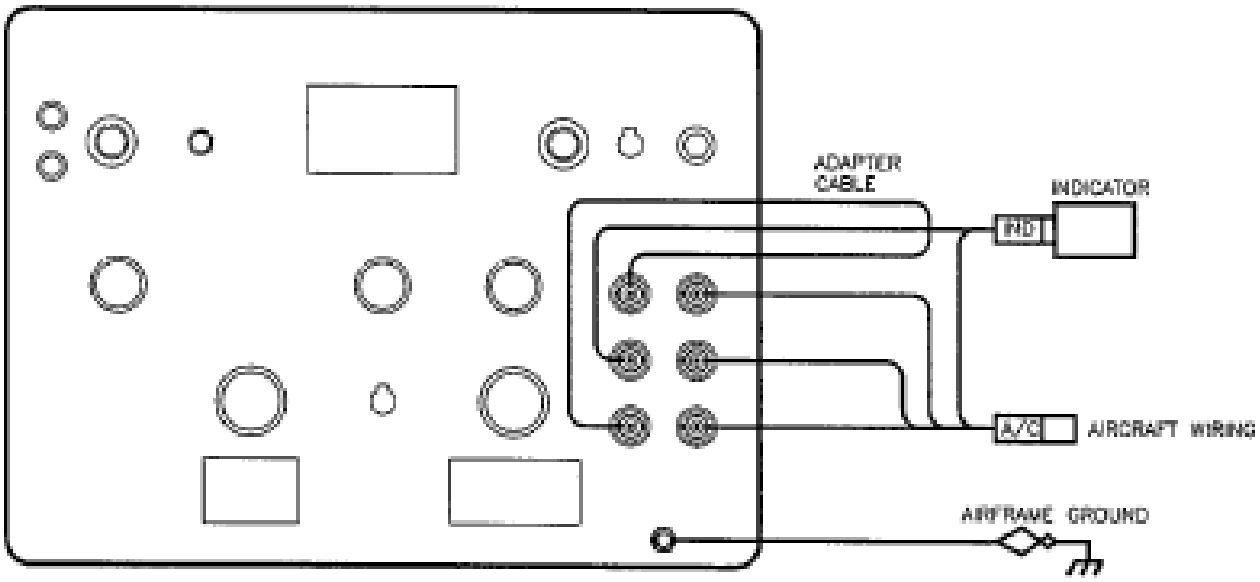
(4) This completes the AIRCRAFT INSULATION TEST.

Place the Test Set **PWR** switch to **OFF**.

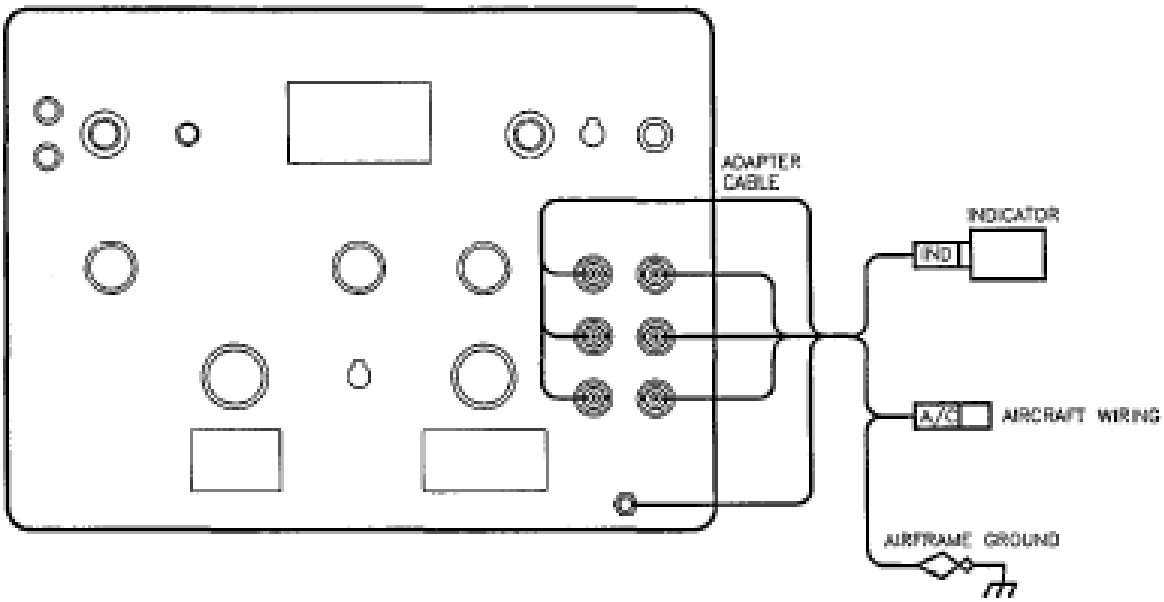
If no further tests are to be accomplished, proceed as in steps (5) and (6).

(5) Disconnect all test equipment.

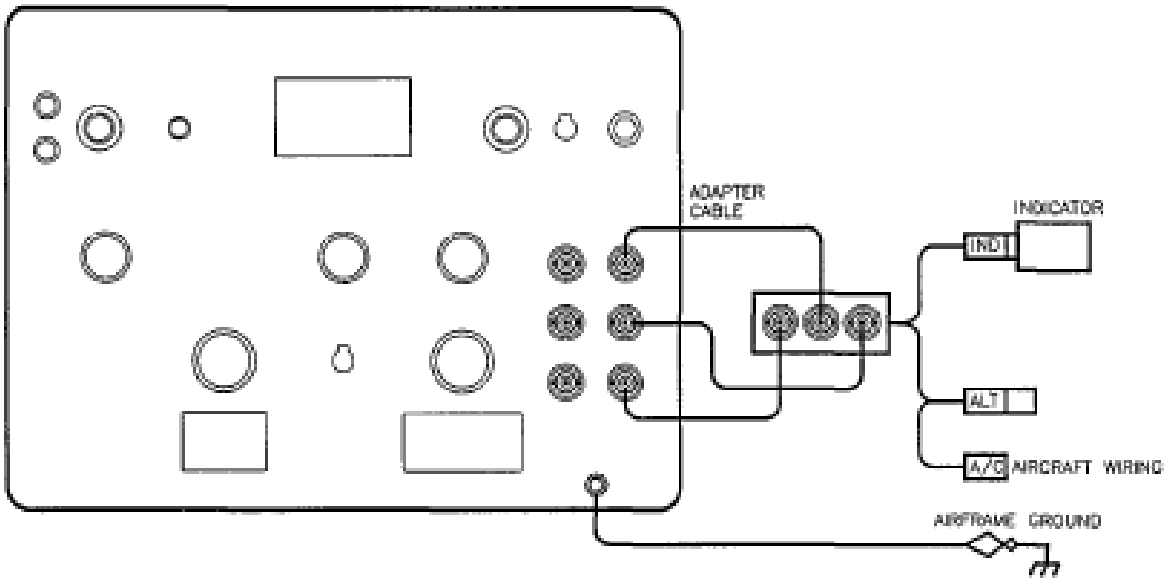
(6) Return the Aircraft to its original configuration.



AIRCRAFT INSULATION TEST CONFIGURATION 1
Figure 1



AIRCRAFT INSULATION TEST CONFIGURATION 2
Figure 2



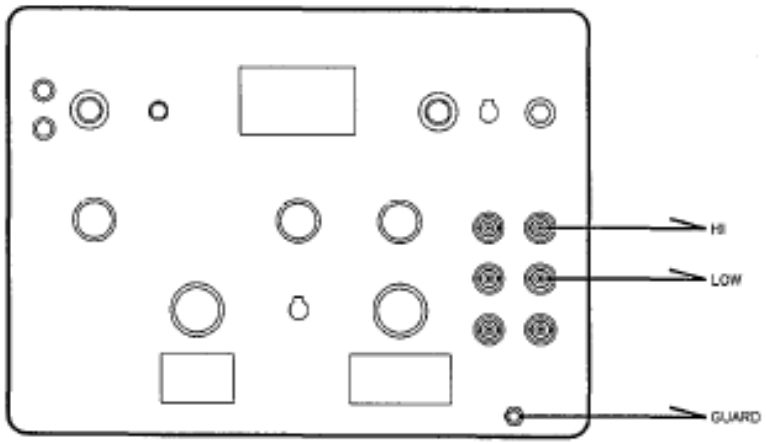
AIRCRAFT INSULATION TEST CONFIGURATION 3
Figure 3

5.EXTERNAL INSULATION TEST

A. Test Set Configuration

Assure there is **NO POWER** applied to the circuit under test.

(1) Connect the Test Set as shown in Figure 4.



EXTERNAL INSULATION TEST CONFIGURATION
Figure 4

(2) Rotate the FUNCTION switch to MEAS INS.

(3) Rotate the INS TEST switch to LO-Z/HI-Z.

(4) Rotate the SELECT switch to TANK.

(5) If 3 TERM configuration is to be used, the Test Set GND jack must be connected to all points to be guarded from measurement, and the INS pushbutton must be depressed.

B. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and values.

(1) Place the PWR switch to ON.

(2) Observe the LCD display until it reaches its highest value or until the reading exceeds the minimum specified.

(3) This completes EXTERNAL INSULATION TEST.

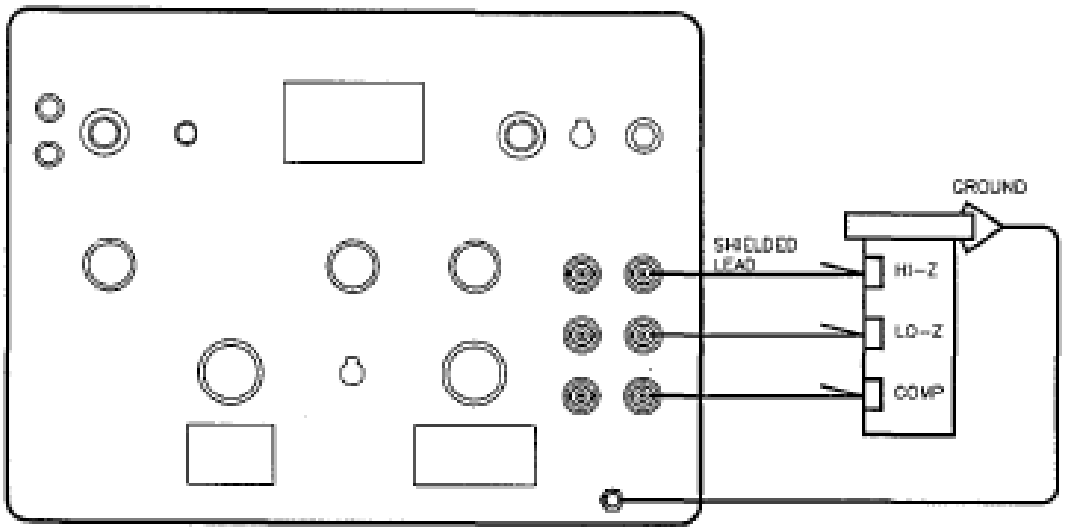
Place the **PWR** switch to **OFF**.

(4) Disconnect all test equipment. If no further tests are to be accomplished in this configuration, disconnect test leads.

6.INDIVIDUAL PROBE INSULATION TEST

A. Test Set Configuration

(1) Connect the Test Set as shown in Figure 5.



INDIVIDUAL PROBE INSULATION TEST CONFIGURATION
Figure 5

(2) Rotate the FUNCTION switch to MEAS INS.

(3) Rotate the INS TEST switch to LO-Z/HI-Z.

(4) Rotate the SELECT switch to TANK.

(5) Depress INS pushbutton if a 3 TERM test is desired.

B. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and values.

(1) Place the PWR switch to ON.

(2) Observe the LCD display until it reaches its highest value or until the reading exceeds the minimum specified.

(3) Perform the following, observing the LCD display to react as before for each position:

*(a) Rotate the SELECT switch to COMP.
*Required for compensator probe only.

(b) Rotate the INS TEST switch to LO-Z/SH.

(c) Rotate the SELECT switch to TANK.

(d) Rotate the INS TEST switch to LO-Z/GND.

(e) Rotate the SELECT switch to COMP.

(f) Rotate the **INS TEST** switch to each of the remaining four positions.

(4) This completes the PROBE INSULATION TEST.

(5) Place the PWR switch to OFF.

(6) If no further tests are to be accomplished in this configuration, disconnect test leads.

7.AIRCRAFT CAPACITANCE TEST

A. Aircraft Preparation

CAUTION: TANK UNIT CAPACITANCE TESTS ARE NOT TO BE CARRIED OUT UNTIL FUEL TANKS HAVE BEEN EMPTIED AND PURGED. REFER TO APPROPRIATE AIRCRAFT MAINTENANCE MANUALS FOR PROPER FUELING/DEFUELING PROCEDURES OBSERVING PRECAUTIONS THEREIN.

(1) Defuel the Aircraft.

CAUTION: FUEL QUANTITY, REFUEL, AND DEFUEL POWER MUST BE OFF WHILE ACCESSING AND BEFORE ANY HARNESS, CABLE OR CONNECTOR IS REMOVED. POWER MUST REMAIN OFF UNTIL CONNECTIONS ARE MADE AS SPECIFIED AND UNTIL POWER REQUIREMENT IS CALLED OUT.

(2) Open appropriate Fuel Quantity System circuit breaker(s).

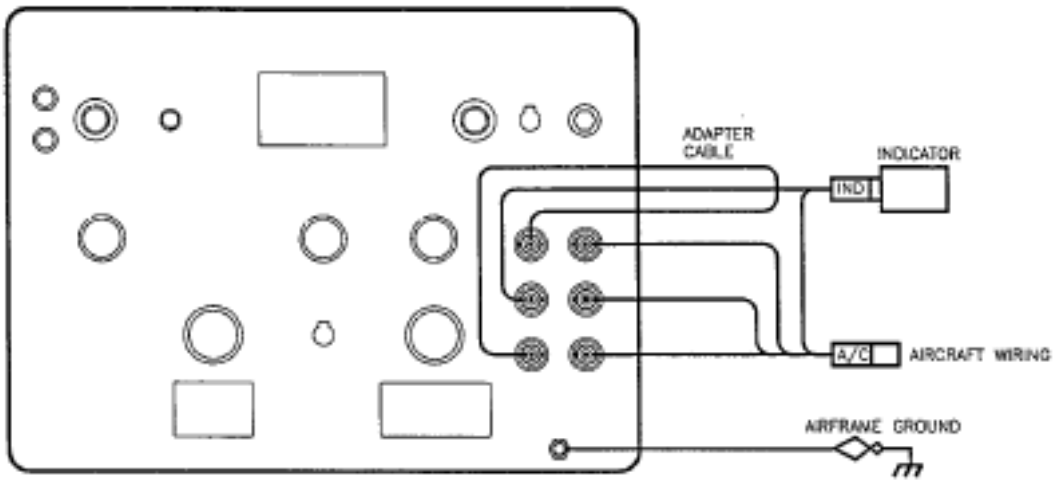
CAUTION: REFERENCE APPROPRIATE MAINTENANCE MANUAL FOR ACCESSING PROCEDURES, FOLLOW ALL PRECAUTIONS THEREIN.

(3) Gain access to the appropriate Fuel Quantity System electrical connector(s) necessary for this procedure.

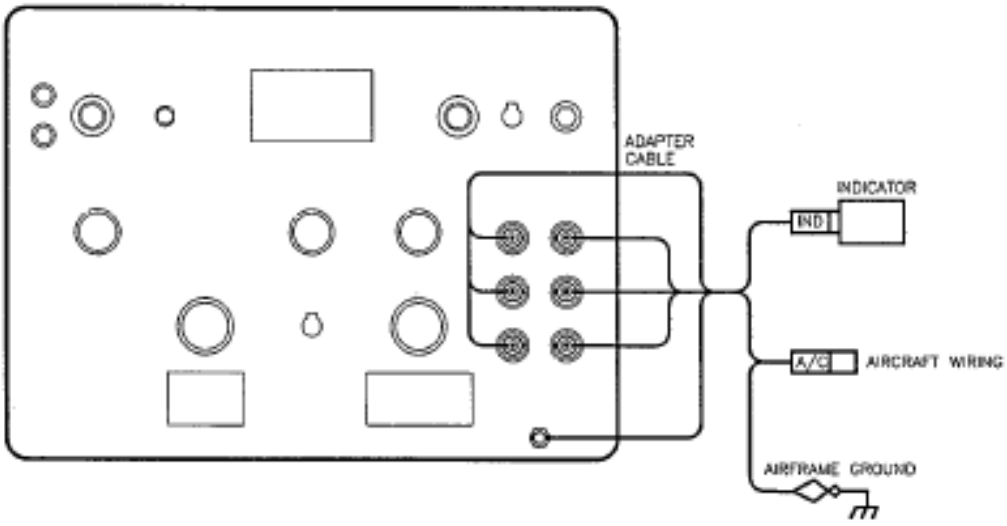
(4) Disconnect the appropriate Fuel Quantity System electrical connector(s).

(5) It may be necessary to position an aircraft tank select switch and or an Adapter Cable select switch for this procedure.

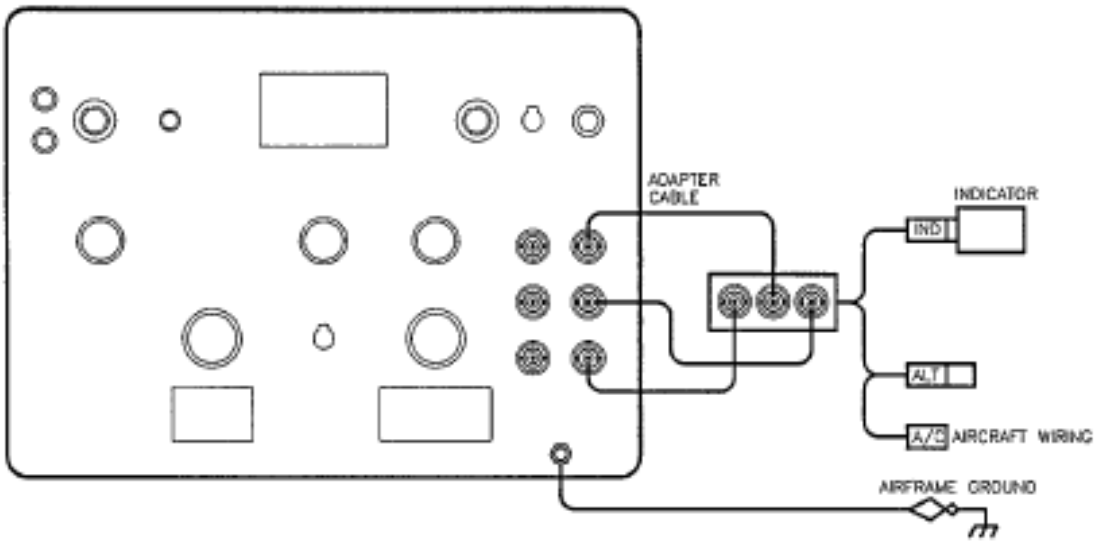
(6) Connect the specified Adapter Cable between the Aircraft wiring removed from the Indicator, and the Indicator receptacle(s). Reference Figure 6, 7, or 8.



AIRCRAFT CAPACITANCE TEST CONFIGURATION 1
Figure 6



AIRCRAFT CAPACITANCE TEST CONFIGURATION 2
Figure 7



AIRCRAFT CAPACITANCE TEST CONFIGURATION 3
Figure 8

B. Test Set Configuration

(1) Rotate the **FUNCTION** switch to **MEAS CAP**.

(2) Rotate the **SELECT** switch to **TANK**.

(3) Connect the Adapter Cable to the Test Set. Reference Figure 6, 7, or 8.

(4) Connect the ground lead from the Test Set **GND** receptacle to a good airframe ground.

C. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and calibration values.

(1) Place the Test Set **PWR** switch to **ON**.

TANK capacitance will be displayed on the LCD in pF.

(2) Rotate the **SELECT** switch to **COMP**.

COMP capacitance will be displayed on the LCD in pF.

This completes the AIRCRAFT CAPACITANCE TEST.

(3) Place the Test Set **PWR** switch to **OFF**.

If no further tests are to be accomplished, proceed as in steps (4) and (5).

(4) Disconnect all test equipment.

(5) Return the Aircraft to its original configuration.

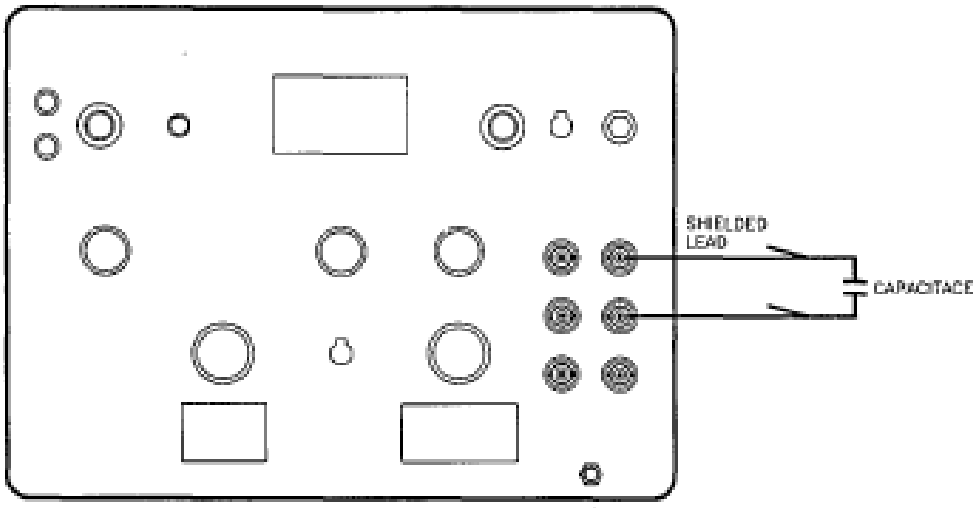
8.EXTERNAL CAPACITANCE TEST

A. Test Set Configuration

(1) Connect the Test Set to the external capacitance as shown in Figure 9.

(2) Rotate the FUNCTION switch to MEAS CAP.

(3) Rotate the SELECT switch to TANK.



EXTERNAL CAPACITANCE TEST CONFIGURATION
Figure 9

B. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and values.

(1) Place the **PWR** switch to **ON**.

Probe capacitance will be displayed on the LCD in pF.

This completes the EXTERNAL CAPACITANCE TEST.

(2) Place the PWR switch to OFF.

(3) If no further tests are to be accomplished in this configuration, disconnect test leads.

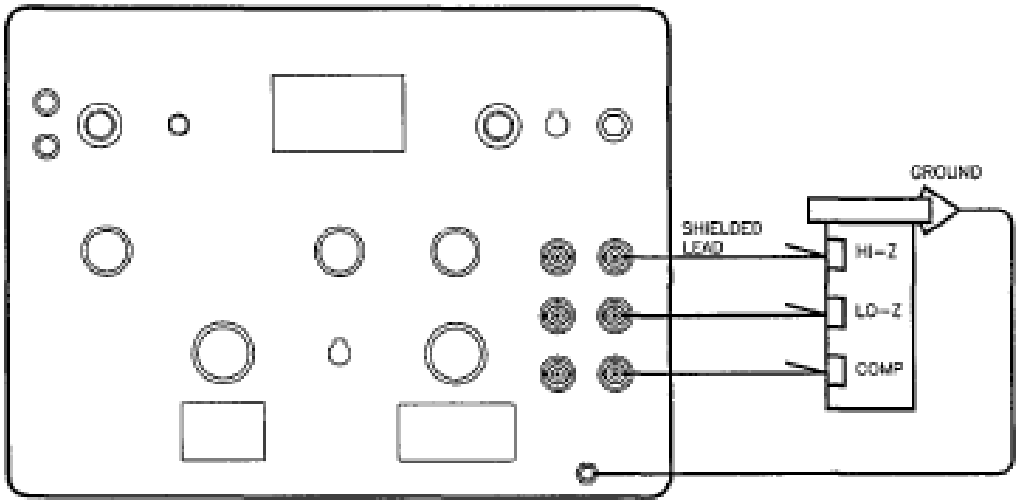
9.INDIVIDUAL PROBE CAPACITANCE TEST

A. Test Set Configuration

(1) Rotate the FUNCTION switch to MEAS CAP.

(2) Rotate the **SELECT** switch to **TANK**.

(3) Connect the Test Set to the probe as shown in Figure 10.



INDIVIDUAL PROBE CAPACITANCE TEST CONFIGURATION
Figure 10

B. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and values.

(1) Place the **PWR** switch to **ON**.

Probe capacitance will be displayed on the LCD in pF.

(2) If the probe under test has no compensator section, skip step (3).

(3) Rotate the SELECT switch to COMP.

Compensator capacitance will be displayed on the LCD in pF.

This completes the INDIVIDUAL PROBE CAPACITANCE TEST.

(4) Place the PWR switch to OFF.

(5) If no further tests are to be accomplished in this configuration, disconnect test leads.

10.INDICATOR TEST (DC Meter Type Only)

A. Bench Test Configuration

(1) Connect paired indicator test lead plugs to corresponding colored test set IND jacks (2).

(2) Connect lead contact inserts to respective pins of indicator receptacle. (Refer to applicable drawings in maintenance manual.)

(3) Operate the test set as in steps C.

B. Aircraft Test Configuration

(1) Disconnect aircraft plug from the indicator and proceed as in A. (1).

(a) (Some adapter harnesses provide for connection to test set through aircraft wiring using the banana lead pair.)

C. Test Procedure

(1) Turn IND ADJ fully counterclockwise.

(2) Set FUNCTION to IND DRIVE.

(3) Set PWR switch ON.

(4) Adjust IND ADJ knob to compare fuel gauge reading with μA indications on LCD as listed in maintenance manual.

Lightly tap indicator while testing and operate through full scale range to observe any possible erratic behavior. (Other test set meter ranges may be provided through shunts or multipliers within the adapter. Refer to literature supplied with test harness.)

11. INDICATOR TEST

The Fuel Quantity Indicator may contain all the system measurement circuitry or a major portion may be contained in separate units referred to as signal conditioners or amplifiers. The procedure is similar, only the location of the units and their adjustments will be affected.

A. Aircraft Preparation

CAUTION: FUEL QUANTITY, REFUEL, AND DEFUEL POWER MUST BE OFF WHILE ACCESSING AND BEFORE ANY HARNESS, CABLE, OR CONNECTOR IS REMOVED. POWER MUST REMAIN OFF UNTIL CONNECTIONS ARE MADE AS SPECIFIED AND UNTIL POWER REQUIREMENT IS CALLED OUT.

(1) Open appropriate Fuel Quantity System circuit breaker(s).

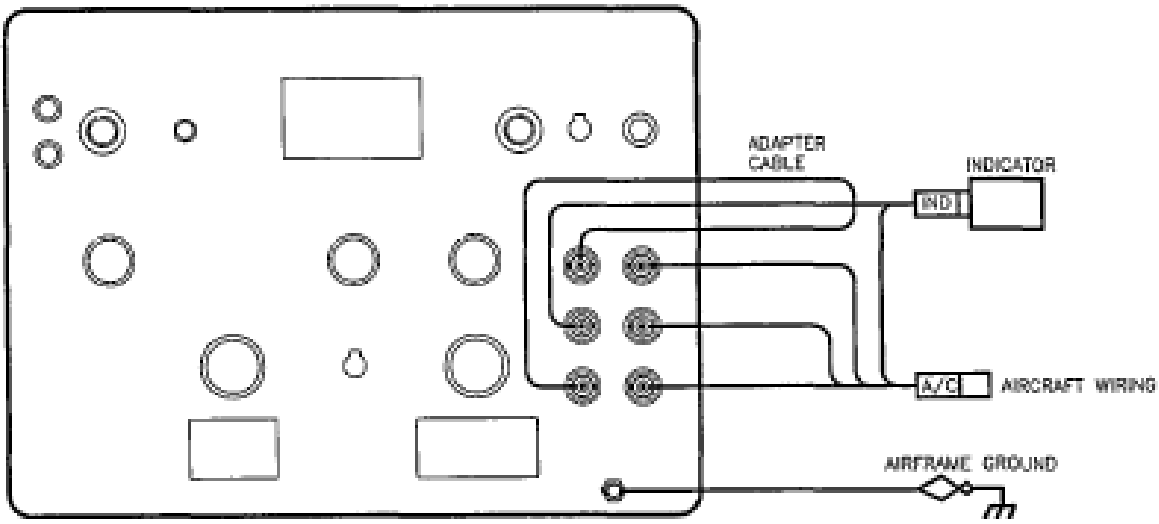
CAUTION: REFERENCE APPROPRIATE MAINTENANCE MANUAL FOR ACCESSING PROCEDURES, FOLLOW ALL PRECAUTIONS THEREIN.

(2) Gain access to the appropriate Fuel Quantity System units and or electrical connector(s) necessary for this procedure.

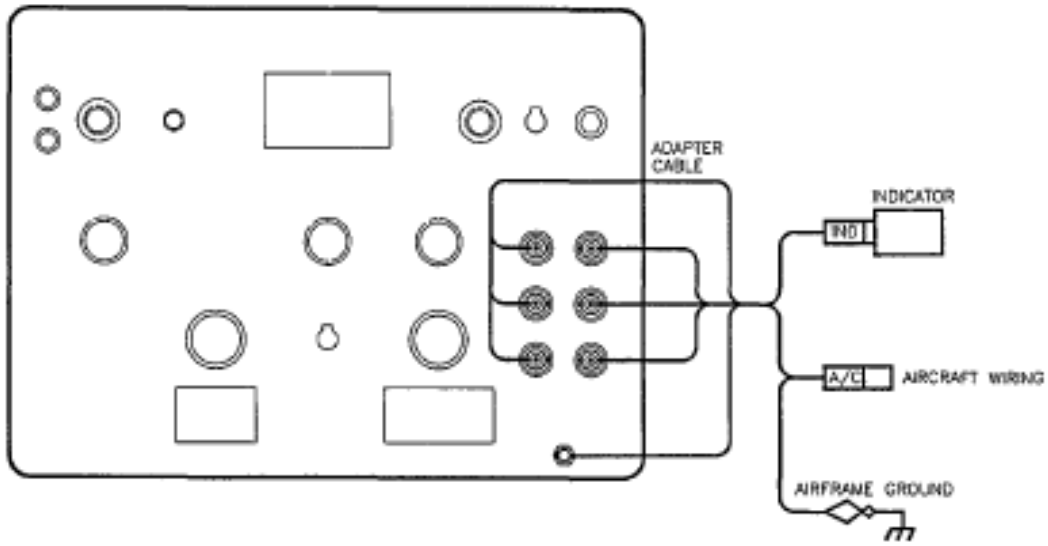
(3) Disconnect the appropriate Fuel Quantity System electrical connector(s).

(4) Locate the test equipment conveniently for the following procedure.

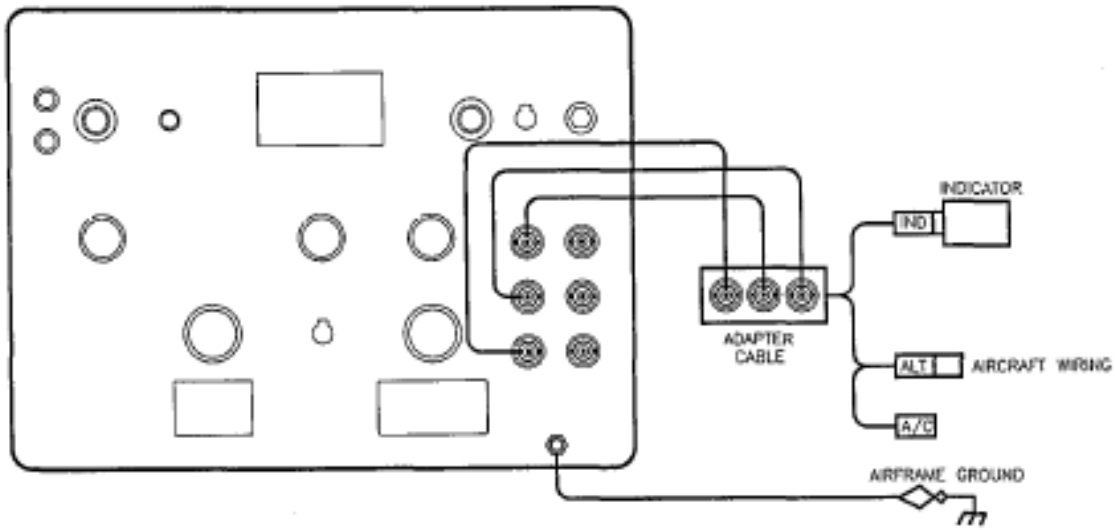
(5) Connect an appropriate Adapter Cable between the Fuel Quantity indicator and the indicator plug. Reference Figure 11, 12, or 13.



AIRCRAFT INDICATOR TEST CONFIGURATION 1
Figure 11



AIRCRAFT INDICATOR TEST CONFIGURATION 2
Figure 12



AIRCRAFT INDICATOR TEST CONFIGURATION 3
Figure 13

B. Test Set Configuration

(1) Connect the Adapter Cable to the Test Set as shown in Figure 11, 12, or 13.

(2) Connect the ground lead from the Test Set GND receptacle to a good airframe ground.

(3) Place the PWR switch to ON.

(4) Rotate the FUNCTION switch to MEAS SIM.

(5) Through manipulation of the TANK SIM thumbwheels and the 0-10 control knob, adjust for a display of the EMPTY (DRY) tank capacitance value for the Aircraft under test.

If the system uses a compensator perform (6) through (8).

If the system does not use a compensator proceed to **C**.

(6) Rotate the SELECT switch to COMP.

(7) Through manipulation of the COMP SIM thumbwheels and the 0-10 control knob, adjust for a display of the empty COMP capacitance value for the Aircraft under test.

(8) Place the COMP switch to IN.

C. Test Procedure

Reference the appropriate Maintenance Manuals for specific procedures and values.

(1) Rotate the FUNCTION switch to CAL SIM.

(2) Close appropriate Fuel Quantity System circuit breaker(s).

(3) Adjust the Empty adjustment screw for a ZERO or EMPTY indicator reading.

(4) Rotate the FUNCTION switch to MEAS SIM.

(5) Rotate the SELECT switch to TANK.

(6) Through manipulation of the TANK SIM thumbwheels and the 0-10 control knob, adjust for a display of the FULL tank capacitance value to be simulated.

(7) If the compensator FULL capacitance value is the same as its EMPTY value, proceed to step (10).

(8) Rotate the SELECT switch to COMP.

(9) Through manipulation of the COMP SIM thumbwheels and the 0-10 control knob, adjust for a display of the compensator capacitance value to be simulated for **FULL**.

(10) Rotate the FUNCTION switch to CAL SIM.

(11) Adjust the Full adjustment screw to achieve a correct indicator reading.

Reference the appropriate Maintenance Manuals for capacitance values, between **E**mpty and **F**ull, to verify indicator linearity.

(12) Perform the following for each value,

(a) Rotate the **FUNCTION** switch to **MEAS SIM**.

(b) Through manipulation of the **TANK SIM** thumbwheels and the 0-10 control knob, adjust for a display of the capacitance value to be simulated.

(c) Rotate the **FUNCTION** switch to **CAL SIM**.

The indicator should respond in kind to the simulated value.

The **TANK SIM 0-10** control knob may be adjusted over a small range to test the indicator for friction or sensitivity.

This completes the INDICATOR TEST.

(13) Place the Test Set PWR switch to OFF.

If no further tests are to be accomplished, proceed as in step (14) through (16).

(14) Open appropriate Fuel Quantity System circuit breaker(s).

(15) Disconnect all test equipment.

(16) Return the Aircraft to its original configuration.

12.SYSTEM CALIBRATION, PREFERRED (DRY TANK)

Insulation, capacitance, and all components of the system should be tested and their integrity proven before attempting system calibration.

A. Aircraft Preparation

If time or facilities do not permit draining of the tanks the alternate method may be used in most instances.

(1) Defuel the Aircraft.

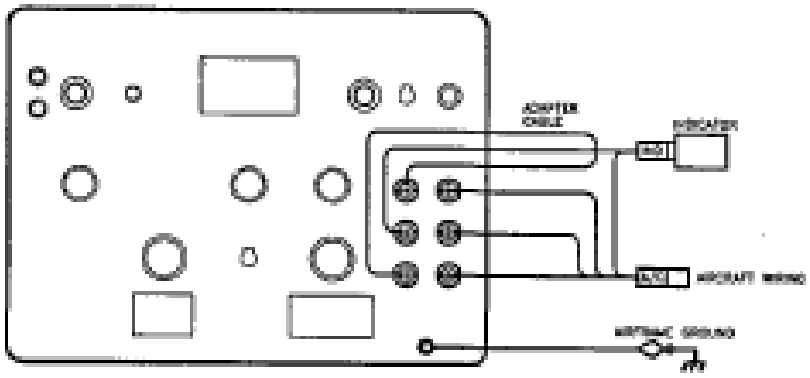
CAUTION: FUEL QUANTITY, REFUEL, AND DEFUEL POWER MUST BE OFF WHILE ACCESSING AND BEFORE ANY HARNESS, CABLE, OR CONNECTOR IS REMOVED. POWER MUST REMAIN OFF UNTIL CONNECTIONS ARE MADE AS SPECIFIED AND UNTIL POWER REQUIREMENT IS CALLED OUT.

(2) Open appropriate Fuel Quantity System circuit breaker(s).

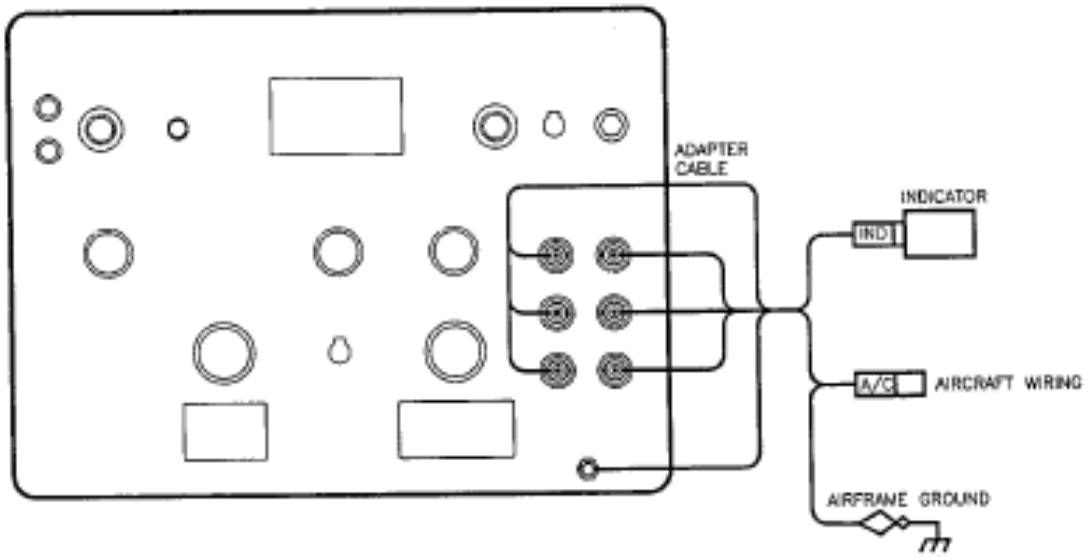
CAUTION: REFERENCE APPROPRIATE MAINTENANCE MANUAL FOR ACCESSING PROCEDURES, FOLLOW ALL PRECAUTIONS THEREIN.

(3) Gain access to the appropriate Fuel Quantity System electrical connector(s) necessary for this procedure.

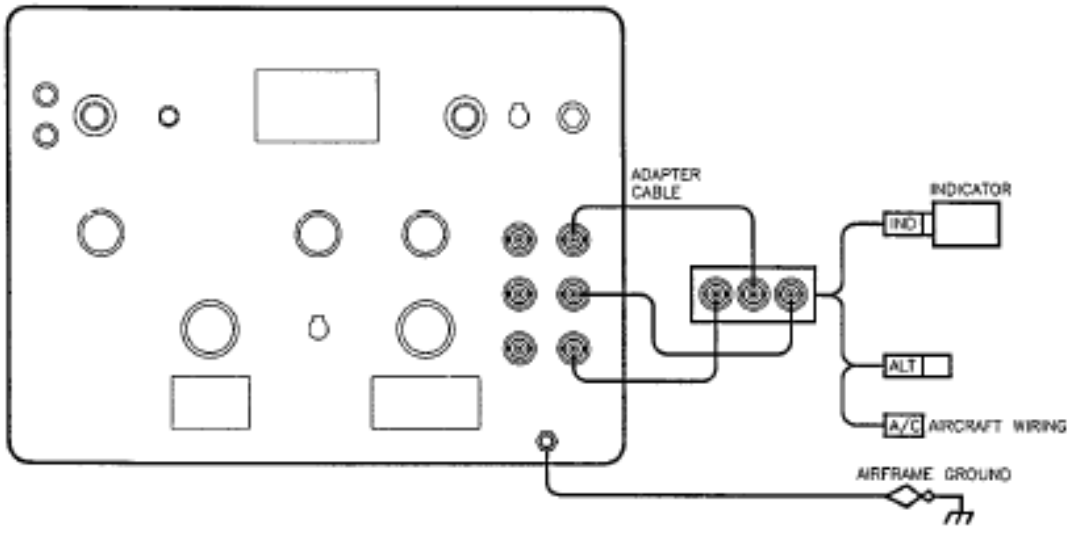
(4) Disconnect the appropriate Fuel Quantity System electrical connector(s).



SYSTEM CALIBRATION, PREFERRED CONFIGURATION 1
Figure 14



SYSTEM CALIBRATION, PREFERRED CONFIGURATION 2
Figure 15



SYSTEM CALIBRATION, PREFERRED CONFIGURATION 3
Figure 16

(5) Locate the test equipment conveniently for the following procedure.

(6) Connect the appropriate Adapter Cable between the Aircraft Fuel wiring removed from the Indicator, and the Indicator receptacle(s). Reference Figure 14, 15, or 16.

It may be necessary to position an aircraft tank select switch and/or an Adapter Cable select switch for this procedure.

B. Test Set Configuration

(1) Connect the Adapter Cable, as specified, to the Test Set. Reference Figure 14, 15, or 16.

(2) Connect the ground lead from the Test Set GND receptacle to a good airframe ground.

(3) Rotate the FUNCTION switch to MEAS SIM.

(4) Rotate the SELECT switch to TANK.

(5) Place the Test Set PWR switch to ON.

(6) Through manipulation of the TANK SIM thumbwheels and the 0-10 control knob, adjust for a display of the ADD FOR FULL capacitance value specified.

If the system uses a compensator perform (7), and (8).

If the system does not use a compensator proceed to **C**.

(7) Rotate the SELECT switch to COMP.

(8) Through manipulation of the COMP SIM thumbwheels and the 0-10 control knob, adjust for a display of the add for FULL COMP capacitance.

C. Calibration Procedure

Reference the appropriate Maintenance Manuals for specific procedures and calibration values.

(1) Rotate the FUNCTION switch to CAL A/C.

(2) Close appropriate Fuel Quantity System circuit breaker(s).

(3) Place the COMP switch to OUT.

(4) Adjust the Empty adjustment screw for a ZERO or EMPTY indicator reading.

(5) If instructions specify adding capacitance to dry compensator for FULL, place the COMP switch to IN.

(6) Rotate the FUNCTION switch to CAL A/C+SIM.

(7) Adjust the Full adjustment screw to achieve an indicator reading of FULL.

(8) Repeat appropriate steps of (1) through (7) until no further improvement can be achieved.

This completes the SYSTEM CALIBRATION, PREFERRED (DRY TANK).

(9) Place the Test Set **PWR** switch to **OFF**.

If no further tests are to be accomplished in this configuration, proceed as in steps (10) through (12).

(10) Open appropriate Fuel Quantity System circuit breaker(s).

(11) Disconnect all test equipment.

(12) Return the Aircraft to its original configuration.

13.SYSTEM CALIBRATION, ALTERNATE (WET TANK)

The tanks may have any amount of fuel. This procedure yields a limited accuracy and should be followed by the Preferred calibration at the next opportune time.

The Fuel Quantity Indicator may contain all the system measurement circuitry or a major portion may be contained in separate units referred to as signal conditioners or amplifiers. The procedure is similar, only the location of the units and their adjustments will be affected.

A. Aircraft Preparation

CAUTION: FUEL QUANTITY, REFUEL, AND DEFUEL POWER MUST BE OFF WHILE ACCESSING AND BEFORE ANY HARNESS, CABLE, OR CONNECTOR IS REMOVED. POWER MUST REMAIN OFF UNTIL CONNECTIONS ARE MADE AS SPECIFIED AND UNTIL POWER REQUIREMENT IS CALLED OUT.

(1) Open appropriate Fuel Quantity System circuit breaker(s).

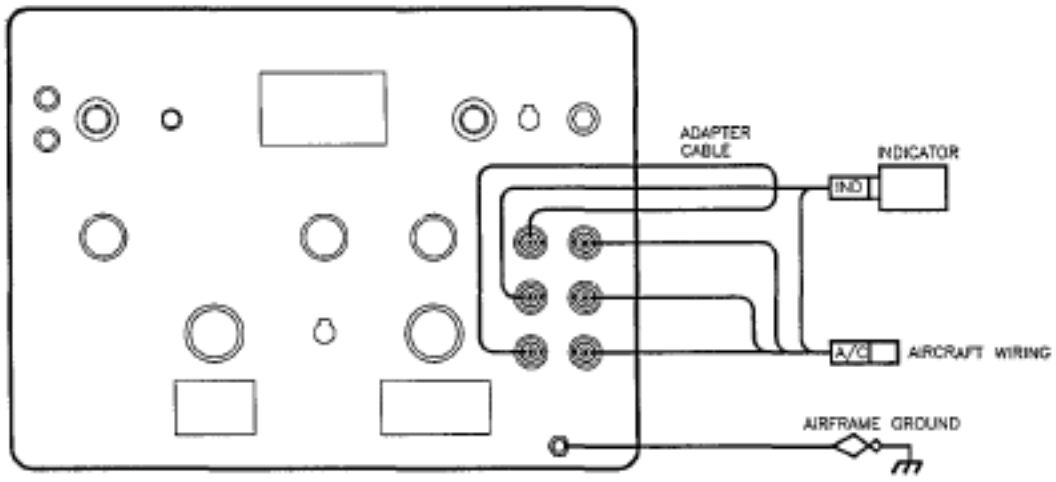
CAUTION: REFERENCE APPROPRIATE MAINTENANCE MANUAL FOR ACCESSING PROCEDURES, FOLLOW ALL PRECAUTIONS THEREIN.

(2) Gain access to the appropriate Fuel Quantity System electrical connector(s) necessary for this procedure.

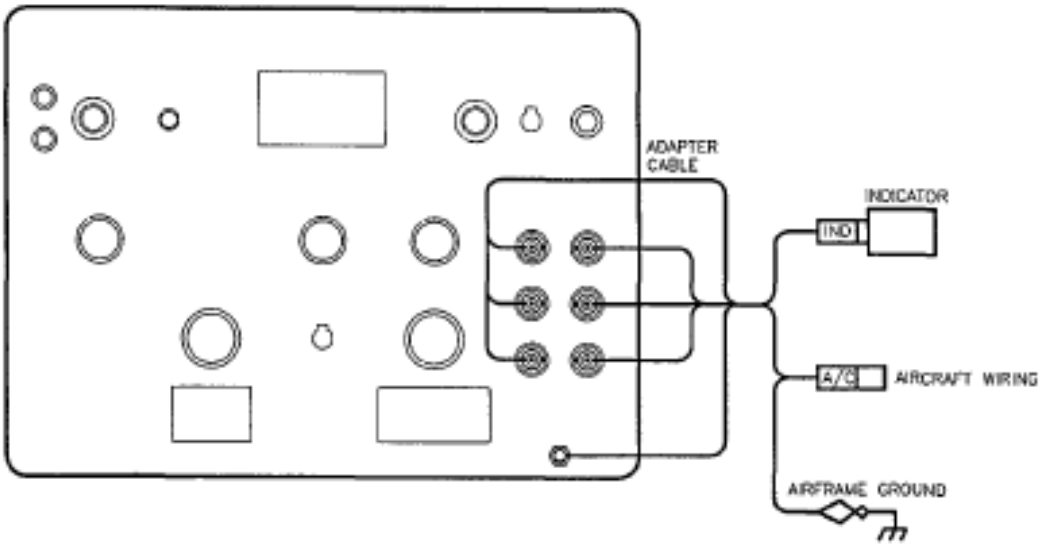
(3) Disconnect the appropriate Fuel Quantity System electrical connector(s).

(4) Locate the test equipment conveniently for the following procedure.

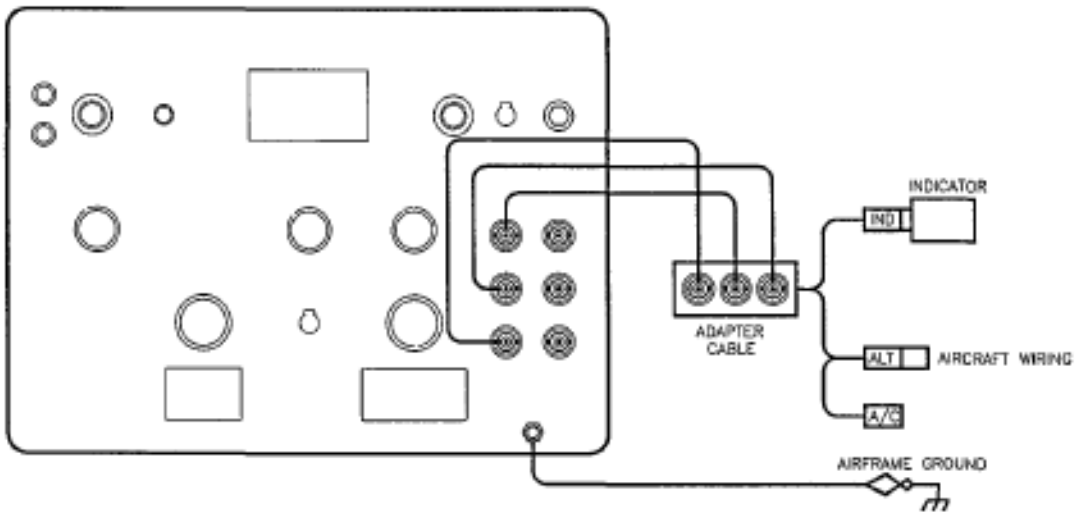
(5) Connect the appropriate Adapter Cable between the Aircraft Fuel wiring removed from the Indicator, and the Indicator receptacle(s). Reference Figure 17, 18, or 19.



SYSTEM CALIBRATION, ALTERNATE WET TANK CONFIGURATION 1
Figure 17



SYSTEM CALIBRATION, ALTERNATE WET TANK CONFIGURATION 2
Figure 18



SYSTEM CALIBRATION, ALTERNATE WET TANK CONFIGURATION 3
Figure 19

B. Test Set Configuration

(1) Connect the Adapter Cable to the Test Set as shown in Figure 17, 18, or 19.

(2) Connect the ground lead from the Test Set GND receptacle to a good airframe ground.

(3) Rotate the FUNCTION switch to MEAS SIM.

(4) Place the **PWR** switch to **ON**.

If the actual **up-to-date** dry tank capacitance value for the particular Aircraft, by **SERIAL NUMBER** is known, substitute that value for the EMPTY value to be simulated.

(5) Through manipulation of the **TANK SIM** thumbwheels and the 0-10 control knob, adjust for a display of the EMPTY (DRY) tank capacitance value for the Aircraft under test.

If the system uses a compensator perform (6) through (7) and (8).

If the system does not use a compensator proceed to **C**.

(6) Rotate the SELECT switch to COMP.

If the actual **up-to-date** dry compensator capacitance value for the particular Aircraft, by **SERIAL NUMBER** is known, substitute that value for the EMPTY value to be simulated.

(7) Through manipulation of the **COMP SIM** thumbwheels and the 0-10 control knob, adjust for a display of the COMPENSATOR capacitance value for the Aircraft under test.

(8) Place the COMP switch to IN.

C. Calibration Procedure

Reference the appropriate Maintenance Manuals for specific procedures and calibration values.

(1) Empty Adjust

(a) Rotate the **FUNCTION** switch to **CAL SIM**.

(b) Close appropriate Fuel Quantity System circuit breaker(s).

(c) Adjust the **E**mpty adjustment screw for a ZERO or EMPTY indicator reading.

(2) Full Adjust

(a) Rotate the FUNCTION switch to MEAS SIM.

(b) Rotate the SELECT switch to TANK.

If the actual **up-to-date** dry capacitance value for the particular Aircraft, by **SERIAL NUMBER** is known, add to this the ADD FOR FULL capacitance to substitute for FULL.

(c) Through manipulation of the TANK SIM thumbwheels and the 0-10 control knob, adjust for a display of the FULL tank capacitance value to be simulated.

If the compensator FULL capacitance value is different from its EMPTY value, proceed as in steps (d) through (f).

(d) Rotate the SELECT switch to COMP.

(e) Through manipulation of the COMP SIM thumbwheels and the 0-10 control knob, adjust for a display of the compensator capacitance value to be simulated.

(f) Rotate the FUNCTION switch to CAL SIM.

(g) Adjust the Full adjustment screw to achieve an indicator reading of FULL.

This completes the SYSTEM CALIBRATION, ALTERNATE (WET TANK).

This procedure yields a limited accuracy and should be followed by Preferred Dry Tank calibration at the next opportune time.

(3) Place the Test Set **PWR** switch to **OFF**.

If no further tests are to be accomplished, proceed as in steps (4) through (6).

(4) Open appropriate Fuel Quantity System circuit breaker(s).

(5) Disconnect all test equipment.

(6) Return the Aircraft to its original configuration.

CHARACTERISTICS, SPECIFICATIONS AND CAPABILITIES

1.CHARACTERISTICS

Portable, rugged all metal case with space in the cover for Operation Manuals, also twin accessory storage saddlebags for Adapter Cables.

Complete AC Fuel Quantity System **WET** and **DRY** Calibration.

Group or individual tank probe insulation resistance and capacitance measurement.

Cockpit or bench testing of indicators.

Through panel switching, with proper Adapter Cable, all cockpit test functions may be accomplished with one interfacing.

2.SPECIFICATIONS

A. Power Requirement

(1) 15VDC supplied by ten 1.5 volt AA Alkaline Batteries.

(2) External power supply adapter (optional).

(a) 115VAC 50-400 Hz.

(b) 230VAC 50-400 Hz.

B. Physical Data

(1) Depth - 9.75 in. (24.8 cm)

(2) Width - 15.5 in. (38.1 cm)

(3) Height - 7 in. (17.8 cm)

(4) Weight - 8.5 lbs. (18.7 kg)

3. CAPABILITIES

A. Insulation Resistance Measurement

(1) Range: Indicated directly in a single range from 1 to 2,000 Megohms.

(2) Accuracy: ± 5% of reading or 1 megohm whichever is greater.

(3) Excitation: 6VDC Maximum, 4 mA Maximum.

B. Capacitance Measurement

(1) Range: Indicated from 0 to 2,000 pF in 0.1 pF increments.

(2) Accuracy: ± .05% of Full Scale ± 1 count.

C. Capacitance Simulation

(1) Tank Range: 10 to 2000 pF continuously variable.

(2) Compensator Range: 10 to 400 pF continuously variable.

(3) Accuracy: ± .05% of Full Scale ± 1 count.

D. DC Meter Indicator Current

(1) Range: 0 to 20,000 microamperes.

(2) Accuracy: ± 20 microamperes.

SHIPPING

1.RECEIVING

No special unpacking procedures are necessary. It is recommended that the factory shipping container and packing materials be retained should it become necessary, for any reason, to reship the Test Set.

It is also recommended that the Test Set and its carrying case be carefully inspected for damage. If damaged, immediately notify the carrier and the manufacturer.

2.SHIPPING

Use standard delicate electronic equipment packaging procedures when packing the Test Set for reshipment.

STORAGE

1.PROCEDURE

A. Remove the Batteries and store separately.

B. Place a four ounce bag of desiccant inside the container.

C. Close and latch the cover.

D. Store in a cool dry place.

Should the Test Set become exposed to moisture or very high humidity dry as soon as possible, and temporarily store in a dehumidified area.