

INCH-POUND

A-A-59579
07 June 2004

COMMERCIAL ITEM DESCRIPTION

TEST SET, FUEL CONTROL SYSTEM - AC/DC QUANTITY

The General Services Administration has authorized the use of this commercial item description, for all federal agencies.

1 SCOPE

1.1 SCOPE. This Commercial Item Description (CID) describes an AC/DC Fuel Quantity Test Set (ADFQTS) based on Bridge Capacitance/Resistance Test Set (BC/RFGTS) technology. This CID describes the minimum requirements for the ADFQTS for which only those manufacturers that meet or exceed the requirements herein are qualified per this CID. The ADFQTS will be capable of 1) measuring fuel tank resistance, capacitance and voltage, 2) simulating tank unit capacitance, 3) simulating the compensator capacitance for testing with dry fuel tanks, and 4) being utilized as a standard to calibrate the fuel measurement systems and compensator capacitance.

2. SALIENT CHARACTERISTICS

2.1 General. The equipment shall be capable of operation and be bid sample tested within the accuracies, limits, and specifications herein. Equipment covered by this CID shall be commercially available equipment and may be modified to the extent necessary to meet the following description. The equipment shall be Class 3, in accordance with MIL-PRF-28800.

2.2 Order of Precedence. In the event of a conflict between the text of this CID and the references cited herein (except for associated detail specifications, specification sheets or MS standards) the text of this CID shall take precedence. Nothing in this CID, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

2.3 Safety. The equipment shall be UL (Underwriters Laboratories) listed and approved and/or shall comply with the safety requirements of MIL-PRF-28800 for the classification stated herein.

2.3.1 Intrinsic Safety. Current shall be limited to 7.5 milliamperes (ma) in all modes. Capacitive discharge energy shall be limited to 1 micro-joule at 0.02 uf for all modes of operation.

2.3.2 Leakage Current Protection. Protection shall be provided from leakage current in excess of 3.5 ma rms (AC and DC) from any accessible conductive parts of equipment (such as control

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shafts with knobs broken or removed and recessed calibration or adjustment controls) to either pole of the power source for any position of the power switch.

2.4 Power Consumption. Aggregate power consumption of all components shall not exceed 200 VA.

2.5 Electrical Power Sources. The ADFQTS, when re-charging from external power sources, shall re-charge from nominal commercial, military, and shipboard power sources over the following ranges.

2.5.1 Single-Phase, 120 Vrms. The ADFQTS shall re-charge using 120 Vrms, single-phase at frequencies of 50 Hz, 60 Hz, and 400 Hz in accordance with the MIL-PRF-28800F Steady-State Conditions, Transient-State Conditions, and Interruption of Power Source requirements.

2.5.2 Single-Phase, 240 Vrms. The ADFQTS shall re-charge using 240 Vrms, single-phase at frequencies of 50 Hz and 60 Hz in accordance with the MIL-PRF-28800F Steady-State Conditions, Transient-State Conditions, and Interruption of Power Source requirements.

2.6 DC Internal Power Source. The ADFQTS shall operate from a DC internal power source in accordance with MIL-PRF-28800F. The DC internal power source shall be replaceable with widely available or preferred stock listed (NSN 6140-01-213-0199) battery.

2.7 Operating Temperature. The ADFQTS shall meet its performance and accuracy requirements in an operating environment of -20°C to +55°C.

2.8 Nonoperating Temperature. The ADFQTS shall meet its performance and accuracy requirements in a non-operating environment of -51°C to +71°C.

2.9 General Specifications. The ADFQTS shall provide a means to determine the serviceability of Air Force aircraft employing a variety of AC capacitance fuel gauging systems. It shall consist of a single integral unit incorporating a transportable case, direct current (DC) electrical resistance measuring circuitry, capacitance and DC voltage measuring circuitry, capacitance substitution circuitry (simulates tank unit and compensator capacitance), switches, wiring, cable assemblies, and accessories. The ADFQTS shall operate from an external AC power source and DC internal power source and shall be capable of operating while the internal power source is being charged. The structure and feature relating to calibration shall provide for lowest cost, simplicity, accuracy and reasonable convenience in use.

2.9.1 ADFQTS Functions. The ADFQTS shall contain four basic types of circuitry. Each type shall perform a separate function as described.

2.9.1.1 Capacitance Measurement. The ADFQTS shall have AC and DC capacitance measurement capability to determine the serviceability of Air Force aircraft capacitance type fuel quantity gauging systems. The ADFQTS shall automatically display the measured capacitance, i.e., no necessary manual computation of the tank unit and the compensator. The capacitance measurement system shall have a minimum range of 0.01 pF to 39,990 pF. AC capacitance

readings shall have an accuracy of the greater of $\pm 0.1\%$ of the reading or 0.05 pF. DC capacitance readings shall have an accuracy of the greater of $\pm 0.2\%$ of the reading or 0.05 pF. The resolution shall be at least 0.005% of the range selected.

2.9.1.1.1 Rectified wave (DC) Capacitance Measurement. The ADFQTS shall have an additional capability for capacitance measurement of peculiar aircraft fuel measurement systems where in-line diodes are used in the tank units. The ADFQTS shall automatically display the measured capacitance, i.e., no necessary manual computation of the tank unit and the compensator.

2.9.1.1.2 Simulated Tank Unit Capacitance. The ADFQTS shall be able to simulate tank unit capacitance in the range from 0 to 9,990 pF or greater. The capacitance simulation shall have an accuracy of at least $\pm 0.2\%$ or 0.2 pF whichever is larger.

2.9.1.1.3 Simulated Compensator Capacitance. The ADFQTS shall be able to simulate Compensator capacitance in the range from 0 to 990 pF or greater. The capacitance simulation shall have an accuracy of at least $\pm 0.2\%$ or 0.2 pF whichever is larger.

2.9.1.1.4 Simulated Auxiliary (Aux) Capacitance. The ADFQTS shall be able to simulate Aux capacitance across the minimum range of 0 to 990 pF (+ Tank Unit capacitance). The capacitance simulation shall have an accuracy of at least $\pm 0.2\%$ or 0.2 pF whichever is larger.

2.9.1.1.5 Insulation and Tank Resistance Measurement. The resistance measurement capability shall have a minimum range of 0.1 Ω to 20,000 M Ω . The accuracy shall be at least 2% of reading or 0.1 ohm whichever is larger. The accuracy above 2,000 M Ω shall be no more than $\pm 5\%$ of reading. The AC voltage applied across the circuit shall not exceed 50 volts and the short circuit current, when the output receptacles are shorted together, shall not exceed 10 ma.

2.9.2 Performance Characteristics. Unless otherwise specified, when all vernier controls are in the calibrated position, all performance requirements shall apply with or without test leads, after a 5-minute warm-up period.

2.9.3 Test Measurement Sample Rate. The ADFQTS design shall minimize Re-Test OK (RTOK) of the Unit Under Test (UUT) while measuring fuel tank resistance and capacitance. The ADFQTS data acquisition measurement sample rate shall not be continuous but at intervals so as to minimize RTOK and Can Not Duplicate (CND) type of diagnostic errors. The sample rate shall be at a minimum of five (5) but no more than 10 (maximum) per second.

2.10 Calibration. The ADFQTS shall have a calibration interval of at least 180 days and meet the requirements for calibration in MIL-PRF-28800F. Use of an external power source shall not void or require calibration of the ADFQTS.

2.11 Power Requirements. The ADFQTS shall meet all voltage and frequency requirements as set forth in MIL-PRF-28800F and herein. A DC internal power source shall provide operating power when power is not available (i.e., flight line use). The ADFQTS is required to operate from two (2) internal DC power sources (one at a time): 1). The Rechargeable DC internal

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power source shall be ruggedized (remain operational after exposure to high altitudes of up to 60,000 ft) and able to supply power for a minimum of 8 hours of continuous ADFQTS operation; 2). The non-rechargeable DC internal power source shall be required to provide a minimum of 40 hours continuous operation and shall be commercially available.

2.12 Cables and Connector Types. Universal cabling and adapters shall be used wherever practical. Relocation of cables shall not be required when changing modes of operation (i.e., from capacitance to resistance).

2.12.1 Grounding. A means for grounding the ADFQTS to the aircraft and measuring external resistance shall be provided.

2.12.2 Aircraft Tank. All aircraft tank unit and indicator cable connectors shall be BNC type. All cables currently in inventory for use with the PSD90-1M, GTF-6 and PSD60-1AF shall be completely compatible with ADFQTS mating connectors.

2.12.3 Cable. A power cable shall be provided for charging of the battery and/or bench top use if external power is utilized.

2.12.4 Provided Cables. If required for adapting to existing aircraft specific interface, the manufacturer shall supply test cables or adapters with new units that are delivered to the Air Force. The cables shall be two matched pairs; one pair with type BNC(m-type) connectors and the other pair with type BNC(f-type). The test cables shall be 10 feet (nominal) in length. These cables shall be optional for services other than the Air Force.

2.13 Indicators. All measurements shall be displayed on a 4.5-digit (minimum) lighted indicator with floating decimal point. The indicator shall be visible in bright sunlight and meet all requirements of Class 2 of the MIL-PRF-28800F.

2.14 Display Update Rate. Digital displays shall have a minimum update rate of 2 per second. Analog displays, if applicable, shall have an update rate of at least 20 times per second.

3. REGULATORY REQUIREMENTS.

3.1 Recovered Material. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR)

4. PRODUCT CONFORMANCE PROVISIONS.

4.1 Product Conformance. The ADFQTS provided shall meet the salient characteristics of this commercial item description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial market. The government reserves the right to require proof of such conformance.

4.2 Reliability. The ADFQTS shall be subjected to such tests as appropriate to eliminate early failures. The description of such tests shall be provided. The manufacturer shall provide information on methods, procedures, practices, and projected failure rates utilized to determine reliability. Mean-time-between-failures (MTBF) and mean-time-to-repair (MTTR) shall also be provided. The preferred method of MTBF and MTTR calculations are from actual data collection, calculated values may be provided if actual data is not available.

4.3 Mean Time Between Failures (MTBF). The ADFQTS Mean Time Between Failures (MTBF) goal shall be 2,000 hours. The lower test MTBF shall be 2,000 hours and the upper test MTBF shall be 4,000 hours.

4.4 Pre-conditioning Requirement. Each deliverable ADFQTS shall be capable of being subjected to the environmental screening effects of burn-in and thermal cycling, with thermal cycling being accomplished in the sample-testing phase.

4.5 Calibration. The ADFQTS shall meet the requirements of MIL-PRF-28800F for calibration.

4.5.1 Calibration Procedure. The design of the system shall provide for readily accessible calibration adjustments and maintenance adjustments. These adjustments shall be provided by variable value components that are adjustable by the use of simple means. The calibration by substitution of selected components or parts is unacceptable unless specifically approved. The calibration adjustments, wherever possible, shall be accessible without removal of the instrument chassis or modules. The manufacturer shall provide a calibration procedure for evaluation to determine the acceptability by Air Force metrology facilities. Unusual calibration ADFQTS and or procedures shall be identified. When Built-In-Test (BIT) is provided and built-in references are employed, a method of test or measurement shall be identified or, if not required, a narrative justification shall be provided.

4.6 Environmental Changes. Changes in environmental conditions within the operating range of the ADFQTS will not require additional calibration, except for internal calibration procedures and signal path compensation, to meet performance requirements.

4.7 Warranty. The ADFQTS shall offer as a minimum, a five (5) year warranty on parts and labor to repair these instruments, should they experience a fault that is not obviously due to abuse or irresponsible actions. A label shall be affixed to the ADFQTS providing the shipping address for warranty service and the period of the warranty by date. A note shall be on the label stating, "Return shipping address must be enclosed".

5. PACKAGING

5.1 Packaging. The preservation, packaging, packing, labeling, and marking shall be as specified in the contract or order.

6. NOTES.

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6.1 Technical Proposal. This is a document that describes the methods, procedures, and techniques to meet the requirements of this CID.

6.2 Bid Samples. Two (2) each of the ADFQTS offered shall be delivered in accordance with directives provided under Part I, BID SAMPLES.

6.2.1 Submitted Products. The ADFQTS submitted for bid sample testing shall be representative of the commercial off the shelf product. All features, performance, and environmental protection of the product tested during bid sample testing shall be provided under any resulting contract or purchase order.

6.3 Metric Products. Products manufactured to metric dimensions will be considered on an equal basis with those manufactured using inch-pound units, provided they fall within the tolerances specified in their corresponding inch/pound units. A request should be made to the contracting officer to determine if the product is acceptable if the manufacturer elects to use metric dimensions as the basis upon which they derive or base a mechanical design feature. The contracting officer has the option of accepting or rejecting the product. If a product is manufactured to metric dimensions and those dimensions exceed the tolerances specified in the inch/pound units, a request should be made to the contracting officer to determine if the product is acceptable.

6.4 Manuals. Each ADFQTS shall be delivered with an operator's maintenance and parts manual that has been approved by WR-ALC. The manufacturer shall also provide a list of all different types of cable configurations/options available, as well as ordering information.

6.5 Publications. MIL-PRF-28800 is available from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

6.6 Known Acceptable Products. The following product(s) are known to have previously met the requirements of this PD and need not resubmit bid samples or certification. All other manufacturers must meet the requirements of this PD and submit to bid testing and certification as required.

Manufacturer	CAGE	Model
JcAir Test Systems	41364	PSD90-1C

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Custodian:
Air Force - 99

Preparing Activity:
Air Force – 84

Agent Activity:
Air Force – 99

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