

INCH-POUND

A-A-59928B

18 MAR 2016

SUPERCEDING

A-A-59928A

18 JUL 2013

COMMERCIAL ITEM DESCRIPTION**METER, FUEL FLOW, PORTABLE**

The General Services Administration has authorized the use of this Commercial Item Description for all federal agencies.

1. SCOPE.

This Commercial Item Description (CID) describes a portable fuel flow meter unit comprising of eight test cables. The Fuel Flow Meter Test Set (here in referred to as test set or flow meter) is a support equipment test set which is used for depot and flight line test of fuel flow meter system components. The test set conforms to Class 1 of MIL-PRF-28800 (Test Equipment for Use with Electrical and Electronic Equipment, General Specification for) and is used to test flow meter transmitters, indicators of the second harmonic type, total summation indicators, individual summation indicators, and system power supplies.

2. SALIENT CHARACTERISTICS.

2.1 Components. The test set shall consists of a high brightness display, master transmitter assembly, linear transmitter, multi-meter, test selector switch, and cables as referenced in the following tables. Drawings of manufactured cables shall be provided. All cables and manuals shall fit within the carrying case (see 2.3).

TABLE I. Components.

Component	Military Specification	Item Type
Electric, Circular Connector	MIL-DTL-38999	
Indicator, Individual Rate	MIL-I-25906	EFU-3/A

Comments, suggestions, or questions on this document should be addressed to: AFLCMC/WNZEC, Robins AFB GA 31098-1813 or emailed to SPEC99@us.af.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil> .

AMSC N/A

FSC6680

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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TABLE I. Components – Continued.

Component	Military Specification	Item Type
Transmitter	MIL-T-8249 MIL-T-25905 MIL-T-26298	MB-2 TRU-7/A TRU-6/A
Performance Specification	MIL-PRF-28800	
Indicator, Individual Summation	MIL-I-25324 MIL-I-25907	MA-7A, MA-7 EFU-4/A
Indicator, Total Summation	MIL-I-25325 MIL-I-25908	MA-8 EFU-5/A

TABLE II. Cable Assembly.

Cable Assembly	Part Number	Commercial And Government Entity (CAGE) Code	Length
	5796297G700	See MIL-T-26298	
TJ-49,TJ-51	9172332-10	98750	10 inches
DJ-71	9172332-30	98750	10 inches
DJ-72	9172332-50	98750	10 inches
DJ-64	9172332-70	98750	10 inches
TJ-50	9172332-110	98750	22 feet
Main	9172332-130	98750	5 feet 5 inches
TJ-51E	9172332-150	98750	10 inches
GND-1	9172332-170	98750	10 feet
DJ-71A	9172332-190	98750	10 inches
TBD*	Used to drive all 8 fuel flow indicators (FFIs) at the same time – B-52 requirement		
TBD*	Used to test indicators from engine connector – B-52 requirement		

* 1. Cable assemblies that are labeled “TBD” have not been designed and shall be defined by the vendor during execution of the contract.

TABLE III. Function Selector/Switch.

Function Selector/Switch	Function
Function Switch	Allows test set to perform: Self-Test; 4Hz Power Supply Check; Transmitter; Individual, Linear and total indicator.
Mode Switch	Allows display in DEGREES, 12,000 pound per hour (PPH), 15,000 PPH, LINE FREQ
Master XMTR	Sets master transmitter to desired settings
Linear XMTR PPH X 100	Checks scale error and operation of Type 8DJ72 total summation indicators

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2.2 Functional requirements. This test set shall be, at minimum, capable of:

- a. Testing the output signals of flow-meter transmitters of the second-harmonic type.
- b. Generating a calibration signal used to test flow-meter indicators of the second- harmonic type.
- c. Measuring the output voltage of individual summation indicators.
- d. Generating a calibration voltage used to test total summation indicators.
- e. Checking output continuity of flow-meter system power supplies.
- f. Measuring output frequency of flow-meter system power supplies.
- g. Isolating the malfunction of a defective system component through substitution of individual components.
- h. Identify the failed components.

2.3 Carrying case. The carrying case shall be 24 X 14 X 22 inches or less. A handle for carrying the test set shall be attached to the case. A mechanism for locking the test set shall be provided. The weight of the test set including the carrying case and the test cables shall be 35 pounds or less. The case shall be airtight and a mechanism will be added for equalizing air pressure within the enclosure, when the enclosure is sealed. The mechanism provided shall not protrude beyond the enclosure.

2.4 Interface. An interface shall be provided. It shall display settings and test values in degrees, flow rate in pounds-per-hour(PPH), input voltage, the scale error of the flow meter indicators of the second-harmonic type, the scale error and operation of total summation indicators, output voltage of individual summation indicators, frequency and output of the flow meter power supply, and test selector positions.

2.5 Tested items. The test set shall test the following transmitters and indicators which were built according to the military specifications:

TABLE IV. Test items.

Component	Military Specification	
Indicator, Individual Rate	MIL-I-25906	
Indicator, Individual Summation	MIL-I-25324	MIL-I-25907
Indicator, Total Summation	MIL-I-25325	MIL-I-25908
Transmitter	MIL-T-8249	MIL-T-25905
Performance Specification	MIL-PRF-28800	

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2.5.1 Testing transmitters. The test set shall be capable of testing transmitters designated type MB-2, TRU-7/A, and TRU-6/A. Info on such parts can be found in MIL-T-8249 (Transmitter, Rate of Flow, Fuel Type MB-2), MIL-T-25905 (Transmitter, Rate of Flow, TRU-7/A Fuel, 0-15,000 PPH), and MIL-T-26298 (Transmitter, Rate of Flow TRU-6/A, 0-5,000 PPH) respectively.

The test set shall be powered from the aircraft through a cable assembly from MS33678-14S-7P (part number (P/N) 9172332-130, CAGE 98750), or from 120 volts alternating current (VAC), 60 Hertz (Hz) power supply. MS33678-14S-2P, P/N 9172332-110, CAGE 98750, shall be used for connection to the flow rate indicator. For bench testing, the test set shall use wall voltage.

As the flow through the transmitter is increased and decreased by operating the engine, or through a controlled environment, the test set shall be used to verify that the transmitter is functioning and that the voltage output varies when the fuel flow rate changes.

The test set shall have a function transmitter (XMTR) that shall be used to check the operation of flow meter transmitters when installed in a flow meter system or to check transmitter accuracy when mounted on a test stand. The harmonic modulated outputs of the flow meter transmitter shall be demodulated by the master indicator circuit on the test set. Data shall be displayed in degrees to two decimal places or in PPH for 12,000 PPH and 15,000 PPH systems as selected by the user from the mode switch.

2.5.2 Testing indicators of the second-harmonic type. The test set shall be capable of testing indicators designated type EFU-3/A. Info on such part can be found in MIL-I-25906 (Indicator, Rate of Flow EFU-3A, Fuel, 0-15,000 PPH).

The test set shall be powered from the aircraft through a cable assembly from MS33678-14S-7P (P/N 9172332-130, CAGE 98750), or from wall voltage, 120VAC, 60Hz power supply and connected through cable assembly P/N 9172332-70, CAGE 98750 to the indicator and is energized with 115VAC, +/- 1VAC, 400 Hz, which shall be verified by the user on a volt meter and frequency meter.

The test set shall be capable of selecting 12,000 PPH or 15,000 PPH from a mode switch, as required by type of system on aircraft. The test set shall be capable of selection range from 200 to 15,000 PPH from the "Master Transmitter", labeled "Master XMTR", to test the indicator. When the indicator is checked, readings at each setting shall be the same as the corresponding flow rates with tolerances +/-150 PPH.

With the function switch set to "individual indicator" (INDIV. IND), the master XMTR shall be used to check the scale error of flow meter indicators of the second harmonic type. The transmitter shall have a capability to be set to any desired value. Internal calibration data shall be sent to the indicators. Data shall be displayed in degrees to two decimal places or in PPH for 12,000 PPH and 15,000 PPH systems as selected by the user.

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2.5.3 Testing individual summation indicators. The test set shall be testing indicators designated types:

- Type MA-7 which provides an auxiliary summation output signal.
- Type MA-7A which is the same as MA-7, except it does not provide summation output signal. Both are described in MIL-I-25324 (Indicator, Rate of Flow, Fuel, 0-12,000 PPH).
- Type EFU-4/A is described in MIL-I-25907 (Indicator, Rate of Flow, EFU-4/A, Fuel Totalizing, 500-15,000 PPH).

For B-52 testing, the test set shall have the capability of driving eight EFU-4/A type indicators simultaneously using TBD test cable harness(es) such that the single test set generated signal can be used and read on each of the indicators simultaneously. The purpose of this test requirement is to have the ability to check the aircraft fuel flow totalizer summation accuracy using inputs from one to eight indicators.

For B-52 testing, the test set shall have the capability to test individual EFU-4/A type indicators either at the indicator location inside the aircraft cockpit or at the engine transmitter location outside the aircraft.

The test set shall be powered from the aircraft through a cable assembly from MS33678-14S-7P (P/N 9172332-130, CAGE 98750, or 120VAC and 60Hz power supply and 9172332-190, CAGE 98750) for connection to the flow rate indicator. The flow rate indicator is energized with 115VAC, +/- 1VAC, 400 Hz which shall be verified by the user.

The test set shall be capable of selecting 12,000 PPH or 15,000 PPH from a mode switch, as required by type of system on aircraft. The test set shall be capable of selection range from 200 to 15,000 PPH from the "Master Transmitter" to test the indicator. The total summation indicator on the aircraft shall display the same flow rate as the individual indicator and the test set with tolerances +/-150 PPH.

The linear indicator (LIN ID) position on the function switch shall be used to check the output voltage of individual summation indicators. The MASTER XMTR and the LINEAR XMTR PPH X 100 shall be used in conjunction with the display. The MASTER XMTR shall be used to simulate a flow rate to the summation indicator. The LINEAR XMTR shall be used to null the output voltage from the summation indicator. When the summation indicator is working properly, the display shall indicate near zero. A positive display shall indicate output of summation indicator is greater than output of the LINEAR XMTR.

2.5.4 Testing total summation indicators. The test set shall be testing total summation indicators designated type MA-8, and EFU-5/A. Info on such part can be found in MIL-I-25325 (Indicator, Rate of Flow, Fuel Totalizing, 0-1000,000 PPH, Type MA-8) and MIL-I-25908 (Indicator, Rate of Flow, EFU-45A, Fuel Totalizing, 0-120,000 PPH) respectively.

The test set shall be powered from the aircraft through a cable assembly from MS33678-14S-7P (P/N 9172332-130, CAGE 98750, or 120VAC and 60Hz power supply and 9172332-50, CAGE 98750) for connection to the flow rate indicator.

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With the function switch set to Total, LINEAR XMTR PPH X 100 shall be capable of transmitting flow rates from 200 to 100,000 PPH. Indicator readings shall be the same as LINEAR XMTR settings within tolerances +/-500 PPH.

The LINEAR XMTR shall be used to check scale error and operation of total summation indicators. The transmitter output shall be a linear voltage, 0-100VAC, which corresponds to flow rates of zero to 100,000 PPH. Accuracy of the linear transmitter is +/- 0.3VAC or +/-300 PPH.

The test set shall have a user selectable switch, either soft-key or hard-key, that shall turn ON/OFF a 4 Hz pulse feature required to accurately simulate B-52 aircraft system functionality. This pulse feature is defined as imparting a 4 Hz, 66 percent (%) duty cycle modulation to the test set signal which feeds the fuel flow totalizer under test. This duty cycle is further defined as being on or connected 66% of the pulse period and off or disconnected for 33% of the pulse period. When in the 33% disconnected state, the physical signal wire to Pin G of the EFU-5/A totalizer shall be open circuited and not grounded, thus accurately simulating aircraft operation.

2.5.5 Self-test. There shall be a self-test capability that tests the test set's internal circuitry and tells the user if something is wrong. The self-test shall test the 400Hz power supply to indicate that the power supply output is correct.

2.6 Alternate current (AC) multi-meter. A 0-300VAC, 400Hz multi-meter shall be provided and connected across the switch controlled input power line. Incoming power shall come from either the aircraft power supply through the MAIN cable (P/N 9172332-130) or from an external source through the 120VAC, 60 Hz and GROUND terminal posts. Adjusting the line voltage shall be set to 115VAC, 400Hz, as indicated on the VOLTS AC multi-meter, ensuring correct line voltage and frequency for the test set and component being tested.

2.7 Function and mode selector.

The function selector shall have the following positions:

TABLE V. Mode selector function.

Position	Function
INDIV. IND	Connects test-set MASTER TRANSMITTER, LINEAR INDICATOR, and LINEAR XMTR into circuit being tested.
NULL CHECK	Connects test-set LINEAR INDICATOR to grounded input discriminator circuit.
TOTAL IND	Connects test-set LINEAR XMTR into circuit being tested.
XMTR	Connects test-set MASTER INDICATOR into circuit being tested.

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The mode selector shall have the following positions:

TABLE VI. Mode selector position.

Position	Function
DEGREES	Test set indicates flow rate angle
12K PPH	Test set indicates flow rate of 12,000 flow meter
15K PPH	Test set indicates flow rate of 15,000 flow meter

- A MASTER XMTR shall be capable of transmitting from 0 to 15,000 PPH based on desired settings.
- A LINEAR XMTR PPH X 100 shall be capable of checking scale error and operation of type 8DJ72 total summation indicators.

Front panel display indicators shall be designed to present change-of-state information to the operator and shall be distinguishable at a distance of 39.37 inches (in) in a maximum ambient light level of 100 foot-candles (fc) and a minimum light level of 1 fc. All display indicators shall be discernible at viewing angles from 0 degrees to 45 degrees.

2.8 Connectors, electric. Provisions shall be made to ensure that connectors are mated only with the appropriate counterparts. Where design considerations require close proximity of connectors of similar configuration, the mating connectors shall be suitably coded or marked. The live or hot side of unmated connectors shall be protected against shorting.

2.9 Wiring, internal. Internal wiring practices shall be such that the wiring is not damaged during normal maintenance and calibration.

2.10 Self-test capability. The test set shall be capable to provide automatic diagnostic self-test information. The information provided shall indicate whether the equipment is operating within the performance specification. If the equipment exceeds the performance specification bounds, the information provided by the self-test shall identify the associated lowest replaceable unit (LRU) failure causing the malfunction.

2.11 Preventive maintenance. The recommended preventive maintenance interval (PMI) shall be at least 1500 operating hours.

2.12 Additional requirements. The following are additional requirements for B-52 test set application:

- a. Lexan or equivalent protective shield over glass tester screen shall be used.
- b. Mouse and switch configuration for tester operation to replace touch screen functions shall be used.
- c. Non-standard Universal Serial Bus (USB) port and external device shall be used for tester updates to replace current Air Force (AF) wide banned thumb drives.

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- d. Circular power input connector shall be used as computer type adapter. MIL-DTL-38999 (Connectors, Electrical, Circular) series connector shall be used.
- e. Input power markings shall be used to include frequency values.
- f. WARRANTY: The pressure indicating system and related parts shall carry a one year, parts and labor, warranty from the date of purchase.
- g. Tester shall have a turn-dial with corresponding digital read-out. PPH test points shall be programmed in to allow up/down arrow to each PPH setting. The following PPH test points shall be used:

TABLE VII. PPH test points.*

Indicator Test Points	Totalizer Test Points
500 PPH	2,000 PPH
1,000 PPH	5,000 PPH
1,500 PPH	10,000 PPH
2,000 PPH	16,000 PPH
2,500 PPH	20,000 PPH
3,000 PPH	25,000 PPH
4,000 PPH	30,000 PPH
6,000 PPH	40,000 PPH
9,000 PPH	50,000 PPH
12,000 PPH	60,000 PPH
15,000 PPH	70,000 PPH
	80,000 PPH
	90,000 PPH
	100,000 PPH

*1. In addition to the programmed PPH test settings above, the existing feature that allows the PPH to be input manually to any PPH number shall be included.

- h. Display scan feature shall be programmed to stop at individual prescribed PPH settings, just the high/low limits. The test set shall have a rotary knob to tune up and down, which shall allow scanning and checking for "holes" as tuning up or down. If using a touch screen display, this function shall require that the upper and lower limits (and scan speed) be input by the user. Individual PPH test points shall be displayed as buttons, and slow and fast scan buttons shall be included, where the user will choose between "fast scan" or "slow scan" followed by a low and high PPH buttons. The test set shall scan between these limits continuously going up and down at the prescribed scan rate.
- i. A real-time update oscilloscope display function shall be used.

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3. REGULATORY REQUIREMENTS.

3.1 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with 23.403 of the Federal Acquisition Regulation (FAR). However, used, rebuilt, or refurbished items shall not be provided.

3.2 Green Procurement Program. Green Procurement Program (GPP) is a mandatory federal acquisition program that focuses on the purchase and use of environmentally preferable products and services. GPP requirements apply to all acquisitions using appropriated funds, including services and new requirements. FAR 23.404(b) applies and states the GPP requires 100% of Environmental Protection Agency (EPA) designated product purchase that are included in the Comprehensive Procurement Guidelines list that contains recovered materials, unless the item cannot be acquired: a) competitively within a reasonable timeframe; b) meet appropriate performance standards, or c) at a reasonable price. The prime contractor is responsible for ensuring that all subcontractors comply with this requirement.

4. PRODUCT CONFORMANCE PROVISIONS.

4.1 Contractor certification. The contractor shall certify and maintain substantiating evidence that the product offered meets the salient characteristics of this CID, and the product conforms to the producer's engineering drawings, specifications, standards, and quality assurance practices. The Government reserves the right to require proof of such conformance prior to first delivery and thereafter as may be otherwise provided for under the provisions of the contract.

4.2. Internal cooling. The equipment shall be capable of operating without interruption for at least 24 hours at the maximum operating temperature for the class that it is designed.

4.3 Test set operating voltage. The test set shall operate at 120 volts root mean square (Vrms) single-phase 50 Hz or 60 Hz power source (see Table 1 of MIL-PRF-28800). Alternate power source requirements that may be required for the test set are specified in a through c.

- a. 50 Hz, 60 Hz, and 400 Hz single-phase 120 Vrms.
- b. 50 Hz, 60 Hz, and 400 Hz single-phase with voltage selectable from a 100/120/220/240 Vrms range.
- c. 50 Hz, 60 Hz, and 400 Hz single-phase 120/240 Vrms (see 3.5.1.2.4 of MIL-PRF- 28800).

The test set shall be designed to operate from both external and internal power sources and shall conform to specified performance and accuracy requirements when operated from the external source with the internal battery removed. There shall be an external indication of the selected power range.

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4.4 Environmental requirements. Environmental performance requirements shall be as specified in 3.8.1 through 3.8.13 and Table 2 of MIL-PRF-28800 for Class I equipment. The test set shall conform to the specified performance requirements when subjected to the environmental conditions of this specification. Combinations of environments beyond those covered by the specified test procedures (see 4.5 of MIL-PRF-28800) shall be as specified in the CID. Unless otherwise specified, the equipment shall comply with the specified performance requirements after a 20-minute warm-up period preceded by a 2-hour not operating temperature stabilization period, or as specified in the applicable test method.

4.5 Operating temperature. Test test set shall conform to the specified performance and accuracy while being operated at temperatures specified for the applicable class in 3.8.2.2.1 to 3.8.2.2.4. per MIL-PRF-28800:

- Temperature Class 1 - Class 1 test equipment shall be subjected to operating temperatures in the range from -40 to 131 degrees Fahrenheit, test equipment shall operate at maximum temperature for 24 hours. Class 1 test equipment shall be required to operate for 20 minutes (see 6.5.2.16 of MIL-PRF-28800), at 159.8 degrees Fahrenheit.

4.6 Storage temperature. Test set shall be subjected to storage temperatures in range from -40 to 131 degrees Fahrenheit.

4.7 Altitude. Test set shall operate at any given airport altitude.

4.8 Blowing rain. Test set shall be watertight, test set shall be submerged at a depth of no more than 3 ft. Test set shall be splash-proof, and drip-proof. Test set shall be Class 1 design per MIL-PRF-28800.

4.9 Solar Radiation. Test set shall not be adversely affected by full time exposure to solar radiation, such as those conditions encountered in desert environments. Test set shall be Class 1 design per MIL-PRF-28800.

4.10 Fungus. Test set shall be fungus resistant or shall be suitably treated to resist fungus. Materials treated for fungus resistance shall retain their original electronic and physical properties, shall not present toxic hazards, and treatment shall last for the entire service life of the part. Test set shall be suitable for operation and storage in conditions encountered in a tropical environment. Test set shall be Class 1 design per MIL-PRF-28800.

4.11 Salt laden moisture. Test set shall be exposed for 48 hours sea salt air. shall be capable of storage and operation in high temperature, high humidity, salt laden, sea coast environments without damage or deterioration of performance. Test set shall be Class 1 design per MIL-PRF-28800.

4.12 Sand and dust. Test set shall be capable of storage and operation during exposure to wind-blown sand or dust without damage or deterioration of performance.. Test set shall be Class 1 design per MIL-PRF-28800.

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4.13 Humidity. The test set shall conform to the specified performance and accuracy requirements for conditions where the relative humidity is from 5 to 95±5% in the temperature range of 50 to 86 degrees Fahrenheit, and as specified, for the applicable class in 3.8.2.3.1 to 3.8.2.3.2 of MIL-PRF-28800. At temperatures below 50 degrees Fahrenheit, the humidity is uncontrolled, but the test set shall conform to the specified performance requirements (after the specified warm-up period) and shall withstand the effects of humidity up to 100 %.

- Humidity Class 1 - Class 1 test equipment shall be subjected to conditions where the relative humidity is from 5 to 85±5% in the temperature range of 86 to 104 degrees Fahrenheit, and where the relative humidity is 5 to 60±5 % in the temperature range above 104 degrees Fahrenheit.

4.14 Vibration. The test set vibration requirements shall be per Tables 3 and 4 for random and sinusoidal Class 1 equipment requirements of MIL-PRF-28800. The test set vibration requirements shall be per Tables 3 and 4 for random and sinusoidal Class 1 equipment requirements of MIL-PRF-28800.

4.15 Testing requirements. The test set testing requirements shall be per Table 2 of MIL-PRF-28800 for Class 1 equipment.

5. PACKAGING.

5.1 Preservation, packing, and marking shall be as specified in the contract or order.

6. NOTES.

6.1 Source of documents.

6.1.1 Military Specifications, Standards, and Handbooks referenced herein may be obtained at <http://quicksearch.dla.mil/> or available from the Standardization Documents Order Desk, 700 Robbins Ave, Bldg 4, Section D, Philadelphia, PA 19111-5094.

6.1.2 FAR may be obtained from the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. Electronic copies of the FAR may be obtained from <https://www.acquisition.gov/far/>.

6.1.3 National Stock Number (NSN). The following is a list of NSN's assigned that correspond to this CID. The list may not be indicative of all possible NSN's associated with this CID.

NSN
6680-01-620-6780
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7.0 Key words.

Depot System Components
Flight Line System Components
Summation Indicator
Support Equipment
Transmitter Tester

7.1 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Concluding material:

Custodians:
Air Force – 184

Preparing Activity:
Air Force – 184

Reviewers:
Air Force – 99

Agent:
Air Force – 99

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.