

INCH-POUND

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SUPERSEDING  
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## MILITARY SPECIFICATION

HOWITZER, MEDIUM, SELF-PROPELLED, 155-MM:  
M109, M109A1, M109A1B, M109A2, M109A3, AND M109A5

This specification is approved for use by the U.S. Army Armament, Munitions and Chemical Command, and is available for use by all Departments and Agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers Howitzer, Medium, Self-Propelled, 155-mm: M109 Series.

### 2. APPLICABLE DOCUMENTS

#### 2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Armament, Munitions and Chemical Command, Attn: SMCAR-BAC-S, Picatinny Arsenal, New Jersey 07806-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A

FSC 2350

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## SPECIFICATIONS

## FEDERAL

VV-F-800 -Fuel Oil, Diesel

## MILITARY

MIL-P-514 -Plates, Identification, Instruction and Marking, Blank  
 MIL-R-3065 -Rubber, Fabricated Products  
 MIL-M-45212 -Mount, Gun; Mount, Howitzer  
 MIL-C-45525 -Cannon, 155mm Howitzer: M126A1  
 MIL-C-45964 -Cannon, 155mm Howitzer: M185  
 MIL-C-46168 -Coating, Aliphatic Polyurethane, Chemical Agent Resistant  
 MIL-M-46312 -Mount, Telescope: M146  
 MIL-T-46313 -Telescope, Panoramic: M117  
 MIL-M-46314 -Mount, Telescope: M145  
 MIL-Q-46315 -Quadrant, Fire Control: M15  
 MIL-T-46316 -Telescope, Elbow: M118 Series and T176E4  
 MIL-H-46709 -Howitzer, Medium, Self-Propelled: 155-mm, M109A2, M109A3, M109A4, and M109A5; Processing for Storage and Shipment of  
 MIL-T-50782 -Telescope, Panoramic: M117A2  
 MIL-C-53072 -Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection  
 MIL-T-60895 -Telescope, Panoramic: M117A1  
 MIL-T-63359 -Telescope, Elbow, M118A2  
 MIL-M-63988 -Mount, Howitzer, M178  
 MIL-M-70821 -Mount, Howitzer, M182  
 MIL-C-70822 -Cannon, 155mm Howitzer: M284

## STANDARDS

## MILITARY

MIL-STD-130 -Identification Marking of U.S. Military Property  
 MIL-STD-210 -Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment  
 MIL-STD-248 -Welding and Brazing Procedure and Performance Qualification  
 MIL-STD-461 -Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference  
 MIL-STD-642 -Identification Marking of Combat and Tactical Transport Vehicles  
 MIL-STD-882 -System Safety Program Requirements  
 MIL-STD-1246 -Product Cleanliness Levels and Contamination Control Program

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(Unless otherwise indicated, copies of Federal and military specifications, standards, and handbooks are available from the DODSSP-Service, Standardization Documents Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.)

2.1.2 Other Government drawings. The following other Government drawings form a part of this document to the extent specified herein. Unless otherwise specified (see 6.2), the issues are those cited in the solicitation.

## DRAWINGS

8449200	-Howitzer, Medium, Self-Propelled: 155mm, M109A1
8736372	-Howitzer, Medium, Self-Propelled: 155mm, M109
8736916	-Howitzer, Medium, Self-Propelled: 155mm, M109A1B
11747268	-Installation Instructions for Mounting M140 Alignment Device, Direct Fire Telescope
11747269	-Installation Instructions for Mounting M140 Alignment Device, Indirect Fire Telescope
12012100	-Howitzer, Medium, Self-Propelled: 155mm, M109A2
12012200	-Howitzer, Medium, Self-Propelled: 155mm, M109A3
12910870	-Howitzer, Medium, Self-Propelled: 155mm, M109A5 - Modification
12940800	-Howitzer, Medium, Self-Propelled: 155mm, M109A5 - Production

(Copies of specifications, standards, and other Government documents required by contractors with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Non-Government publication. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issue of the document which is DOD adopted is that listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issue of the document not listed in the DODISS is the issue of the document cited in the solicitation (see 6.2).

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D2000	-Classification System for Rubber Products in Automotive Applications
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(Application for copies shall be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications,

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specification sheets, or MS standards), the text of this specification shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Preproduction model. When specified (see 6.2), a preproduction model(s) of the complete vehicle to be furnished under this specification shall be produced prior to the manufacture or fabrication of vehicles in quantity. The vehicle(s), when complete, shall be submitted to the Government for examination and tests to determine conformance to the requirements of this specification. Vehicle(s) submitted by the contractor shall be fully representative of vehicles proposed to be supplied by the vehicle manufacturer from production facilities and tooling under the supply contract.

3.2 First production vehicles. The vehicles selected shall be fully representative of vehicles proposed to be furnished under the contract, and shall be submitted to the Government for inspection to determine conformance to the requirements of this specification.

#### 3.2.1 Reliability. See 6.4.2.

3.2.1.1 Automotive. The vehicle(s) mean miles between mission failures (MMBMF) shall not be less than 375 miles during the first 4000 miles of operation consisting of 25% hard-surface roads, 50% secondary roads, and 25% cross-country operation.

3.2.1.2 Armament. The armament system shall exhibit a mean round between failure (MRBF) of not less than 625 rounds.

#### 3.2.2 Durability.

3.2.2.1 Automotive. The vehicle, with rated payload, shall have a 0.50 probability of completing the first 400 operation hours without replacement, rebuild, or overhaul of power train components (engine, transmission, and final drive) for failures chargeable to hardware.

#### 3.2.3 Maintainability.

3.2.3.1 Automotive. The total scheduled and unscheduled maintenance excluding driver/crew checks and services shall not exceed 200 man-hours during 4000 miles of operation. At an average speed of 10 miles per hour (mph) of operation, this specification yields a maintenance ratio of 0.5. The scheduled maintenance intervals shall not be less than 750 miles or semiannual, whichever comes first. The mean time to repair (MTTR) shall not exceed the hours listed below for each level of maintenance 95% of the time.

Crew	3.52 hours
Organizational	2.93 hours
Direct support	5.25 hours
General support	6.24 hours
Overall	3.64 hours

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3.2.3.2 Armament. The MTTR of the armament system shall not exceed the hours listed below for each organizational level.

Crew	2.76 hours
Organizational	2.76 hours
Direct support	10.81 hours
General support	6.00 hours
Overall	6.65 hours

### 3.3 Materials.

3.3.1 Qualified products. Vehicle manufacturer shall be responsible for ascertaining that all assemblies and component parts which require product qualification in accordance with a specification are listed or qualified for inclusion on the applicable Qualified Products List (QPL). In the instance that a qualified vendor no longer exists on the QPL, the contractor is responsible for selecting a vendor whose product meets the minimum requirements of the specification. The contractor must also submit to the Government, for approval, documentation which confirms the vendor's ability to meet the specification in question. Manufacturer's inspection records shall specifically list such components, name of supplier(s), and number and date of applicable QPL or Government approved vendors not on a QPL.

3.3.2 Ozone resistant. Rubber products procured under requirements of MIL-R-3065 are to be ozone resistant to the degree specified by the C1 requirements of ASTM D2000, unless the component drawing specifically states that ozone resistance is not required.

3.4 Construction. Vehicles, components, subassemblies, and assemblies shall be fabricated and assembled into a complete vehicle in accordance with drawings listed or referenced to in 2.1.2 (8736372 for M109, 8449200 for M109A1, 8736916 for M109A1B, 12012100 for M109A2, 12012200 for M109A3, and 12910870 [Modification] or 12940800 [Production] for M109A5). All parts requiring identification shall be identified in accordance with MIL-STD-130.

#### 3.4.1 Sealing.

3.4.1.1 Sealer. The sealer used to seal a vehicle shall prevent the accumulation of water greater than 1 inch in the bottom of the hull when operating in water up to 42 inches in depth for 15 minutes.

3.4.1.2 Hatches, doors, and periscope seals. With hatches and doors closed, the seals shall prevent the entrance of water into the interior of the vehicle.

3.4.1.3 Turret ring seal. The seal shall prevent the entrance of water into the interior of the vehicle. The turret ring seal installed in the M109A1 vehicle requires inflation to seal.

3.4.2 Special kits. When specified (see 6.2), special kits shall be furnished as follows:

3.4.2.1 Winterization kit. With the winterization kit installed in the vehicle, the engine shall start and perform satisfactorily when the vehicle is operating in ambient air temperatures of zero to -65°F.

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3.4.2.2 Flotation kit. With the flotation kit installed, the vehicle shall perform satisfactorily when operating in water of a depth requiring a flotation kit. The flotation kit is not applicable to the M109A2, M109A3, or M109A5 vehicles.

3.4.3 Carbon monoxide concentration. The exhaust system of the engine, personnel heater, or engine heater, when used individually or collectively, shall prevent carbon monoxide concentration in the occupied portions of the vehicle in excess of 50 parts per million (ppm) under normal operation.

3.4.4 Controls. Controls for the engine, transmission, electrical equipment, permanently mounted fire extinguisher system, armament, and other operating mechanisms shall operate without any interference.

3.4.5 Throttle linkage. With throttle linkage attached to engine, and pedal fully depressed, the throttle shall be at full rack position. With the throttle at full rack position, the pedal shall be in contact with the stop.

3.4.6 Adjustment mechanism. All adjusting mechanisms shall operate without any interference, and shall maintain adjustment settings under all operating conditions.

3.4.7 Fasteners and locks. All fastening and locking devices shall be positive locking. Means for locking vehicle from outside shall be provided.

3.4.8 Fuel system. During engine operation, the fuel system shall maintain fuel supply to the engine when ascending and descending 60% grades in forward and reverse gear, and when vehicle is being operated on 40% side slopes, with each side of vehicle up slope.

3.4.8.1 Fuel tanks. Provisions shall be made to ensure the internal cleanliness of the fuel tanks prior to initial fueling of vehicle. The fuel tanks shall be capable of receiving fuel at a rate of 50 gallons per minute (gpm), and shall be free from leakage after installation and when tanks are filled to capacity.

3.4.8.2 Fuel lines. Provisions shall be made to ensure the internal cleanliness of fuel lines and connections prior to final assembly or initial fueling of vehicle. All fuel lines and connections shall be free from leakage.

3.4.9 Hydraulic reservoir and lines. Provisions shall be made to ensure the internal cleanliness of the hydraulic reservoir, lines, and connections prior to initial filling of the reservoir. The system shall be free from leakage under all conditions of vehicle operation. The hydraulic fluid in the reservoir shall meet the cleanliness requirements of MIL-STD-1246, Level 200 (see 6.4.3).

3.4.10 Electrical system.

3.4.10.1 Generating system voltage (alternator). The generating system output voltage shall remain within  $28.0 \pm 0.7$  volts dc under all conditions of vehicle electrical loading as long as the total system current demand does not exceed 100 amperes and the engine speed does not drop below 1025 revolutions per minute (rpm) (i.e., hydraulic power

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pack pump motor and bilge pump motor must be off for this criteria and the systems batteries must be fully charged).

3.4.10.2 Lights. The internal and external lights, as specified on applicable drawings, shall operate throughout all vehicle operating conditions.

3.4.10.3 Bilge pump. The electrical system shall supply 24 volts dc nominal to the bilge pump motor.

3.4.10.4 Air cleaner blower. The air cleaner motors shall be capable of providing an unrestricted flow of air through each blower outlet. The blower motors shall operate only when the engine is operating.

3.4.10.5 Personnel heater. The system shall provide sufficient voltage to operate the igniter and heater blower motor.

3.4.10.6 Communications equipment electrical service. The communications equipment electrical service shall be capable of delivering 24 volts dc nominal to provide operational capability to the communications equipment at all times.

3.4.10.7 Slip ring. The slip ring and external communications circuits shall maintain continuity without evidence of shorts under continuous 360 degrees of cab rotation.

3.4.11 Welding and weld repairs. All welding and weld repairs shall be in accordance with the vehicle prime contractor's approved joint welding procedure or the current Depot Maintenance Work Requirement (DMWR).

3.4.11.1 Qualification of welders. The contractor is responsible to insure that all welders are qualified per MIL-STD-248. Records shall be kept as a permanent record by the contractor and the results of the qualification test shall be made available to the Government upon request.

3.4.12 Stowed equipment. All on-vehicle equipment (OVE) items shall be stowed (combat loaded) on the vehicle in spaces provided without interfering with vehicle operation in any manner.

### 3.5 Break-in run.

3.5.1 Preparation. Prior to break-in run, except for equipment and component installation and servicing performed by the contractor as a final processing of the vehicle for acceptance, the vehicle shall be completely assembled and all adjustments completed. The vehicle, including all components requiring lubrication, shall be lubricated as specified in production lubrication chart shown on applicable Engineering Parts List. The vehicle shall be supplied with fuel conforming to Grade DF-2 of VV-F-800.

3.5.2 Oil pressure and temperature. Prior to the start of the break-in run, the engine shall be operated at idle speed until lubricating oil is at operating pressure and temperature. If at any time during the break-in run the engine has been stopped for at least 30 minutes, the engine shall again be operated, as above, before continuing break-in runs. Proper oil

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pressure and temperature shall be maintained during operating on level ground, 60% grades (front and rear), and 40% side slope (both sides).

**3.5.3 Distance operated.** Prior to tests, each vehicle shall be given a break-in run on smooth, level, hard-surface roads, except a section of the road shall be as shown in figure 1. The vehicle shall be operated as specified in table I, and over the section of road shown in figure 1, in "a" and "b" division of the break-in run in both directions for the purpose of observing the function and performance of various parts, assemblies, controls, and the suspension system.

TABLE I. Speeds and distance for break-in run.

DIVISION OF RUN	SPEED (MPH)	DISTANCE (MILES)
a	0 to 10	10
b	11 to 20	25
c	21 to 30	5

**3.5.4 Reverse operation.** After each division of the break-in run, the vehicle shall be stopped, the engine allowed to idle for not less than 2 minutes, and the vehicle driven in reverse for a distance of not less than 50 feet.

**3.5.5 Condition after run.** After completion of the break-in run, the engine shall idle smoothly at  $600 \pm 25$  rpm with accessories operating. There shall be no defects indicative of damaged components, or maladjustments that may cause faulty vehicle operation.

**3.6 Performance.** A complete vehicle, combat loaded or loaded with a simulated load of equal weight (see 3.4.12) and serviced, shall perform as specified herein. Ammunition may be simulated in size and weight. Vehicle, serviced (see 3.5.1) and equipped for existing climatic conditions, shall operate as specified without special equipment. Unless otherwise specified (see 6.2), performance shall be demonstrated on smooth, level, hard-surface roads free of loose material, except a section of road shall be as shown in figure 1.

**3.6.1 Environmental.** The vehicle shall operate in ambient air temperature of +115 to 0°F, and with special equipment installed, at temperature ranges of zero to -65°F. The complete vehicle, when in storage, shall withstand climatic extremes as specified in MIL-STD-210, without deterioration that may cause failure of any component part of the vehicle.

**3.6.2 Power package and drive train.** When power package and drive train are installed in accordance with applicable drawings, they shall function throughout all gear and speed ranges without loss of lubricants, and damage that may cause failure of vehicle. The power package and drive train and associated controls shall be capable of operation throughout all speed and steering ranges without binding of linkages, loss of lubricants, grabbing, and chattering or slippage when controls are applied to control, stop, or hold vehicle.

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**3.6.2.1 Cooling system.** The engine water, engine lubricant, and transmission lubricant temperatures shall not exceed those shown in table II when the vehicle is operated under any one or a combination of the following conditions:

- a. Ambient air temperature up to 115°F.
- b. Under full load.
- c. At all speeds down to the track slippage point of the vehicle when operating on smooth, level, hard-surface roads, but not less than 3 mph in first gear or below a transmission speed ratio of 0.56 in other gears.

TABLE II. Operating temperatures.

MAXIMUM WATER TEMPERATURE FROM ENGINE	MAXIMUM ENGINE OIL TEMPERATURE IN SUMP	MAXIMUM TRANSMISSION OIL TEMPERATURE INTO COOLER
230°F	275°F	300°F

**3.6.3 Air cleaners.** With a maximum airflow of 600 cubic feet per minute (cfm), the air cleaner shall be capable of removing not less than 99.8% of dust and other foreign material from the engine intake air.

**3.6.4 Water removal (bilge pump).** The bilge pump installed in accordance with applicable drawings shall remove water from the vehicle at a minimum rate of 40 gpm, with a discharge head of 4-1/2 feet and with pump motor operating on 27.5 volts dc.

**3.6.5 Speeds.**

**3.6.5.1 Speed without towed load.** Vehicles shall be capable of operating at a sustained speed of 30.0 mph and shall be capable of maintaining a minimum of 2.5 mph in lowest gear without towed load. The vehicle shall be capable of obtaining a maximum speed of 35.0 mph. With vehicle traveling from 25.0 mph to maximum speed, the drift from a straight line shall be not more than 2 feet in 100 feet.

**3.6.5.2 Speed with towed load.** The vehicle shall be capable of towing a track-laying, free-rolling vehicle of equal weight at a sustained speed of 15 mph.

**3.6.6 Acceleration.** On dry, smooth, level, hard-surface roads free of loose material, the vehicle shall, from a standing start, be capable of accelerating through a distance of 300 feet in not more than 15 seconds.

**3.6.7 Slope operation.** The vehicle shall be capable of sustained automotive operation on 40% side slope with each side of vehicle up slope.

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3.6.7.1 Engine starting on grades and side slopes. When standing on a 60% longitudinal grade for not less than 2 minutes, with engine operating at idle, the engine shall be stopped for not less than 2 minutes. The engine shall restart in not more than 1 minute when headed up and headed down grade. The same engine starting test shall be conducted on 40% side slope with each side of vehicle up slope.

3.6.8 Braking.

3.6.8.1 Stopping. Vehicle traveling at 20 mph on dry, smooth, level, hard-surface road free of loose material shall be capable of being stopped by service brake application within a distance of 35 feet from point of brake application. Vehicle drift during stopping shall not exceed 3 feet.

3.6.8.2 Holding. Vehicle standing on a 60% longitudinal grade with brakes applied and locked for parking and transmission in neutral shall remain stationary when headed up and down grade. For this operation, vehicle shall be combat loaded or with a simulated load of equal weight.

3.6.9 Turning. The vehicle shall be capable of making continuous 360-degree turns to the right and to the left. With the vehicle in geared steer, the rear point or outer edge of vehicle shall be within a 100-foot-diameter circle at all times. When clutched brake steer is employed, the vehicle's track pattern shall be within a 35-foot-diameter circle at all times.

3.6.10 Fording shallow water and flotation operation.

3.6.10.1 Fording shallow water. Vehicle shall ford hard-bottom salt or fresh water crossings of 42 inches in depth without special equipment. After 4000 miles of system operation, with vehicle operating in water up to 42 inches in depth for 15 minutes without the aid of bilge pumps, the accumulation of water shall be not more than 1 inch in the bottom of the hull.

3.6.10.2 Flotation operation. With flotation kit (see 3.4.2.2) installed, the vehicle shall be capable of floating and operating in calm water of unlimited depth for 15 minutes without the aid of bilge pumps. The accumulation of water shall not exceed a 1-inch depth in the bottom of the hull. The M109A1 and M109A1B vehicles must be capable of operating in calm, unlimited depth water at an average speed of 3.2 mph. The M109 vehicle average water speed requirement is 4.0 mph. The flotation operation is not applicable to the M109A2, M109A3, and M109A5 vehicles.

3.6.10.3 Lubricant contamination. After fording or flotation for 15 minutes, the water contamination content of the transmission, engine, final drives, and suspension system shall not be more than 2% by volume.

3.6.11 Climbing. Vehicle shall climb a prepared 60% longitudinal grade in forward and reverse gear from a standing start on the grade.

3.6.12 Trench crossing. Vehicle shall cross trenches 36 inches in depth and 72 inches in width at low speeds without stalling or damage to vehicle.

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3.6.13 Vertical obstacle. Vehicle shall cross vertical obstacles up to 21 inches in height at low speeds without stalling or damage to vehicle.

3.6.14 Cab control system.

3.6.14.1 Cab ring friction. With the vehicle level within 2 degrees, the cab assembly mounted to the hull, and the cab complete with slip rings but without traverse gear box output pinions installed, the torque required to rotate the cab shall not exceed 750 pound-feet after breakaway.

3.6.14.2 Cab traversing speeds. The cab shall be controllable in traverse at all speeds from 0.5 to 320.0 mils/sec. Tracking speed shall range from not less than 1.0 to not more than 65.2 mils/sec. The cab speed at maximum velocity shall not be less than 266.7 mils/sec. These requirements are applicable to gunner's power controller only.

3.6.14.3 Cab manual traverse effort. With the vehicle level within 2 degrees, the average force applied tangentially to the traverse hand crank to maintain cab movement shall not exceed 20 pounds.

3.6.14.4 Cab manual traverse response rate. One revolution of the traverse hand crank shall rotate the cab 10 mils.

3.6.14.5 Cab slope operation. With the vehicle pitched upward 3 degrees and canted upward 3 degrees, with both power and manual controls, the control system shall be capable of rotating the cab 360 degrees right and left, starting at any azimuth with the gun tube at zero degrees with respect to the vehicle hull.

3.6.15 Weapon control system.

3.6.15.1 Manual elevation effort. With the weapon properly equilibrated, the average force applied tangentially to the hand crank at a uniform rate to maintain gun mount movement shall not exceed 15 pounds, with no individual reading exceeding 20 pounds.

3.6.15.2 Manual elevation response rate. With the weapon at the level position within  $\pm 1$  degree, the weapon shall move at a minimum rate of 4 mils per turn of the hand crank. The hand crank shall be turned at a rate of not less than 10 and not more than 20 rpm to measure response rate.

3.6.15.3 Manual elevation supercharge pressure. For a minimum of 48 hours, the manual elevation hydraulic system shall maintain sufficient supercharge pressure to elevate or depress the weapon without recharging the manual circuit by use of the hand elevation pump.

3.6.15.4 Weapon elevation speeds. The gunner's and assistant gunner's power controls shall control the weapon in elevation and depression at all speeds from 1.0 to 65.0 mils/sec. The transition between these speeds shall be smooth and gradual. The system shall remain stable at all times.

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3.6.15.5 Elevation system limits and protection. There shall be no damage to the control system or any component as a result of positioning the weapon against the elevation and depression stops by power or manual controls. Power and manual control shall be regained instantaneously from this action. The weapon shall engage the weapon stops at elevations from -36 to -54 mils and from +1315 to +1333 mils.

3.6.15.6 Elevation and depression limits. The weapon shall be capable of movement throughout the range of -2 to +74 degrees in elevation for all directions of cab traverse through 360 degrees.

3.6.15.7 Elevation and depression time limits. With power control operating the weapon, it shall be capable of moving from zero mil elevation to the upper stop and from the upper stop to zero mil elevation in not more than 20 seconds in each direction.

3.6.16 Cab and weapon system.

3.6.16.1 Hydraulic pressure limit switch. When power traversing the cab at a rate not to exceed 65 mils/sec., the hydraulic system pressure switch shall actuate the hydraulic control power pack motor at a control system pressure of 880 to 970 pounds per square inch (psi). With the gunner's and assistant gunner's power and manual controls in neutral position, the hydraulic pressure switch shall deactivate the hydraulic power pack motor at a control system pressure as indicated on the gage from 1150 to 1500 psi. (The left weapon control operator is designated as the assistant gunner.)

3.6.16.2 System backlash. The system backlash with cab power switch off shall not exceed 1.0 mil movement of the cab in traverse and 1.0 mil in elevation when a force of 70 pounds is applied at the muzzle end of the weapon. The force shall be applied in a horizontal plane and at right angles to the weapon centerline with the weapon positioned in horizontal  $\pm 1$  degree. The backlash shall be the angular movement of the weapon in traverse and elevation when the force at the end of the weapon is reversed and applied in an opposite direction.

3.6.16.3 Control transfer. Control shall be selective at the gunner's position and shall be instantaneously operative when selector switch is actuated. The gunner shall have power control for elevating and traversing. When selected, the assistant gunner shall have control of the elevation only. With the gunner's and assistant gunner's power controls in neutral position, and with accumulator charged to within its operating pressure, there shall be no movement of the weapon or cab caused by turning the cab control switch on or off.

3.6.16.4 Control system dead spot. The gunner's and assistant gunner's control handle shall not exceed 7 degrees movement from neutral position in any direction to initiate cab and weapon movement. The neutral position shall be defined as the handle position which divides the initial free handle movement in half. The dead spot angles on each side of the neutral position in both elevation and traverse must be equal within 2 degrees.

3.6.16.5 Traverse and elevation stability. With the cab control power switch turned on or off and without recharging the manual elevation system, the gun shall not move more than 1.5 mils under steady state condition, in traverse, elevation, or depression, from target position in 1 hour, exclusive of hull movement.

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**3.6.16.6 Hydraulic control system leakage.** With the hydraulic control system fully charged and power control handles in the neutral position, there shall be no evidence of system pressure loss during a 10-minute period (observed at the system pressure gage).

**3.6.16.7 Hydraulic fluid.** When all the requirements of the cab and weapon control system specified herein have been met, the hydraulic fluid in the hydraulic system shall contain not more than 500 ppm water and not more than 50 ppm solvent content. The fluid shall meet the cleanliness requirements of MIL-STD-1246, Level 200 (see 6.4.3). The contractor shall maintain a permanent record by vehicle serial number with the results of this test for further use and reference by the Government.

**3.6.16.8 Hydraulic accumulator.** When all requirements of the cab and weapon control system specified herein have been met and with all hydraulic fluid discharged from the 2-gallon accumulator, the precharge nitrogen gas pressure in the 2-gallon accumulator shall be equal to the initial charged gas pressure corrected for permissible leakage and temperature change. Leakage from initial precharge condition shall be not more than 2% in 24 hours and 1 psi per degree of temperature change. When measuring the final precharge pressure with the control handle in neutral position and the cab and weapon control system pressure gage stabilized at a zero pressure setting, the system pressure gage needle shall show no visible movement for a period of 3 minutes.

**3.6.17 Weapon fire control.** The M146 Telescope Mount shall conform to MIL-M-46312. The M117 Panoramic Telescope shall conform to MIL-T-46313. The M145 Telescope Mount shall conform to MIL-M-46314. The M15 Fire Control Quadrant shall conform to MIL-Q-46315. The M118 Elbow Telescope shall conform to MIL-T-46316. The M117A1 Panoramic Telescope shall conform to MIL-T-60895. The M117A2 Panoramic Telescope shall conform to MIL-T-50782. The M118A2 Elbow Telescope shall conform to MIL-T-63359.

**3.6.17.1 Gun elevation, plumb travel.** The elevating trunnions of the carriage shall be leveled by having the cannon track a plumb line from zero elevation to maximum. Maximum elevation is to be at least 800 mils.

**3.6.17.2 Vehicle level retention.** The vehicle shall be leveled fore and aft so that at 1.00 mil gun tube elevation the gun tube will remain at 1.00 mil within 0.20 mil when the turret is traversed 30 degrees to the right and 30 degrees to the left.

**3.6.17.3 Alignment of panoramic telescope.** The vertical cross hair of the telescope reticle shall not deviate from the target point more than 0.5 mil.

**3.6.17.4 Horizontal deflection of panoramic telescope.** The deflection of the vertical cross hair relative to the aiming point shall be not more than 0.30 mil for zero cant and zero elevation and 1.75 mils for zero cant and 1100.00 mils elevation.

**3.6.17.5 Accuracy of elevation counter.** The settings entered into the elevation of the telescope mount and elevation quadrant shall not deviate more than 0.5 mil from the weapon elevation at zero setting and 1.0 mil at any other weapon elevation.

**3.6.17.6 Backlash.** The backlash shall not be more than 0.5 mil at any elevation counter reading.

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3.6.17.7 Boresight adjustment of direct fire telescope. Lateral boresight adjustment and vertical boresight adjustment ranges shall be within  $\pm 0.5$  mil of the target aiming point.

3.6.17.8 Boresight retention. The panoramic telescope line of sight shall maintain its original setting with respect to the weapon in azimuth within  $\pm 0.3$  mil. The direct sighting telescope shall maintain the original setting with respect to the tube within  $\pm 0.3$  mil in azimuth and  $\pm 0.3$  mil in elevation.

3.6.17.9 Alignment device. The alignment device shall be mounted in accordance with installation instructions and procedures in drawings 11747268 and 11747269 and held to within 0.25 mil subsequent to boresighting the M117 Panoramic Telescope and the M118 Elbow Telescope.

3.6.18 Mount. The M178 Weapon Mount shall conform to MIL-M-63988. The M182 Weapon Mount shall conform to MIL-M-70821. All other mounts shall conform to MIL-M-45212.

3.6.19 Radio suppression. Complete vehicle shall be radio interference suppressed in accordance with tactical vehicle requirements of MIL-STD-461.

3.6.20 Rammer system. The rammer system, when installed in a vehicle, shall be capable of operation under all vehicle operating conditions. Prior to installation in the vehicle, each rammer shall be tested as follows:

<u>VEHICLE</u>	<u>DRAWING</u>	<u>TEST PROCEDURES</u>
M109	K11643729	C11604929
M109A1	K11643728	C11604929
M109A1B	K8449184	C11604929
M109A2	K12012186	C12012207
M109A3	K12012425	C11604929
M109A5	K12012186	C12012207

### 3.6.21 Fire extinguishers.

3.6.21.1 Fixed. In ambient air temperature, the maximum effort required to discharge the system, either internally or externally, shall not be more than 55 pounds.

3.6.21.2 Portable. The portable fire extinguisher, when installed in accordance with applicable drawings, shall be readily accessible for servicing and use.

3.6.22 Cannon. The M126A1 155-mm Howitzer Cannon shall conform to MIL-C-45525. The M185 155-mm Howitzer Cannon shall conform to MIL-C-45964. The M284 155-mm Howitzer Cannon shall conform to MIL-C-70822.

### 3.6.23 Nuclear, Biological, and Chemical (NBC) filtration system.

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**3.6.23.1 Hoses and protective masks.** Any leakage of water or debris into the interior of the air distribution system is unacceptable. With all stations of the protective masks connected to the "mushroom" end connectors, the airflow to the protective masks shall be checked at each individual station. Airflow shall be from 2.0 to 4.7 inches of water (3.0 to 4.5 cfm).

**3.6.23.2 Heaters.** When heater switches are turned to the "ON" position, all heater lights shall be illuminated. With all stations of the protective masks connected to the "mushroom" end connectors, the temperature to the protective masks shall be checked at each individual station. Air temperature shall be a minimum of 10°F greater than ambient temperature within 5 minutes after heater switches are turned "ON."

**3.7 Finishing, marking, and data plates.**

**3.7.1 Finishing.** Unless otherwise specified (see 6.2), the exterior and interior of cab and hull components, assemblies, subassemblies, and parts that require finishing shall be prepared and finished in accordance with applicable drawings and standards. MIL-C-46168 shall dictate camouflage paints to be used for exterior coatings of cab and hull; paint shall have color, gloss, and infrared reflectance in accordance with stated specification. Application and inspection of Chemical Agent Resistant Coating (CARC) shall be in accordance with MIL-C-53072.

**3.7.2 Marking.** Marking shall be in accordance with MIL-STD-642.

**3.7.3 Name, shipping, and identification data plates.** Data plates shall be photographic aluminum plate (sensitized). The plates shall have the photosensitive silver components imbedded within the oxide layer; after photographic pressing, the letters, numbers, and all other characters shall be sealed in the oxide layer by suitable chemical treatment of the layer. The plates shall have a black background, with white letters and letter blanks, except that caution and warning plates shall have red letters and letter blanks. The size of the plate, type and size of lettering, and the information to be included shall be in accordance with applicable drawings or as specified by the procuring activity. Thickness of the plates shall be 0.030 inch minimum. The plates shall meet the performance requirements of MIL-P-514.

**3.8 Workmanship.** Workmanship shall be of a quality to assure the vehicle and components are free of defects resulting from improper manufacturing or assembly practices and shall conform to requirements herein specified.

**4. QUALITY ASSURANCE PROVISIONS**

**4.1 Responsibility for inspection.** Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

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**4.1.1 Responsibility for compliance.** All items shall meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

**4.1.2 Contractor quality control system.** Unless otherwise specified by the procuring activity (see 6.2), the contractor shall provide and maintain an effective inspection and quality control system acceptable to the Government covering the supplies under the contract. A current written description of the system shall be submitted to the contracting officer prior to initiation of production. The contractor will not be restricted to the inspection station or to the method of inspection listed provided that an equivalent limitation is included in the approved quality control procedure. The contractor shall notify the Government and obtain approval for any change to the written procedure that might affect the degree of control required by this specification or other applicable documents referenced therein.

**4.1.3 Parts and components.** Parts, components, and assemblies shall be inspected in accordance with drawing 8736372 for the M109, 8449200 for the M109A1, 8736916 for the M109A1B, 12012100 for the M109A2, 12012200 for the M109A3, and 12910870 (Modification) or 12940800 (Production) for the M109A5.

**4.1.4 Inspection equipment.** Inspection equipment drawings referenced by numbers herein are details of Master List of Inspection Equipment Drawings EL 8736372 for M109, 8449200 for M109A1, EL 8736916 for M109A1B, EL 12012100-1 for M109A2, EL 12012200 for M109A3, and 12910870 (Modification) or 12940800 (Production) for M109A5 as applicable. Inspection equipment drawings listed thereon will serve as standards for determining the adequacy of contractor's inspection equipment (see 6.5).

**4.1.5 Qualified products.** The contractor's inspection records shall be checked to determine contractor's conformance to 3.3.1.

#### **4.2 Preproduction and first production inspection.**

**4.2.1 Preproduction inspection.** A preproduction vehicle (see 3.1), when furnished, shall be inspected to ascertain vehicle conformance with requirements of this specification. Inspection shall be performed at a location approved by the Government. Failure of the preproduction model to comply with any of the requirements specified shall be cause for refusal by the Government to conduct a retest until corrective measures satisfactory to the Government have been taken.

#### **4.2.2 First production inspection.**

**4.2.2.1 Special process inspection.** A special process inspection will be conducted by the Government representatives during fabrication of the first production vehicle (see 3.2)

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to evaluate conformance of materials and workmanship with drawing and specification requirements.

**4.2.2.1.1 Review and evaluation.** Review and evaluation of records for processing procedure, inspection systems, and plan of quality control will be conducted on the following: e.g., material, welding, surface hardening, heat treating, and protective finishes.

**4.2.2.1.2 Hull inspection.** The hull shall be inspected prior to covering the weldments with paint or other pertinent components or assemblies.

**4.2.2.2 Complete vehicle inspection.** The first vehicle, when complete, shall be inspected by the Government subsequent to contractor's inspection at the contractor's plant to determine conformance to contract and specification requirements.

**4.2.2.3 Production vehicle test.** After completion of the first vehicle inspection, a second vehicle shall be selected from the first month's production or 1 of the first 10 shall be subjected to examination (see 4.4) and tests as specified in 4.5a and 4.5b. Subsequent to examination and tests, the selected vehicle shall be subjected to the 4000-mile test specified in table III. These tests shall be performed by the Government, at a site approved by the Government. Delays caused by vehicle breakdown due to poor quality or workmanship or material, or failure of the contractor to comply with specifications or drawing requirements shall not be the basis for adjustment of the contract performance dates or delivery schedule or contract price. Under separate contractual authority, the contractor will expeditiously furnish repair parts, as required, to adequately support the above tests. Delays caused by vehicle breakdown and failure of the contractor to adequately support the vehicle with parts during the tests shall not be the responsibility of the Government.

TABLE III. 4000-mile test, combat loaded or simulated load  
(Government proving grounds).

COURSE	MILEAGE AND SPEED
Hard-surface roads	1000 miles at varying speeds up to maximum
Gravel and dirt roads	2000 miles at varying speeds up to maximum with 300 miles of this distance over hilly conditions
Level cross-country	600 miles at varying speeds up to maximum
Hilly cross-country	400 miles at varying speeds up to maximum

**4.2.3 Test failure.** Failure of the vehicle to comply with any of the requirements specified or any deficiency of a workmanship or materials nature found on the vehicle during or as a result of the 4000-mile test will be cause for rejection of the vehicle. Further, the Government will refuse to continue acceptance of production vehicles until evidence has been provided by the manufacturer that corrective action has been taken to eliminate the deficiency. Any deficiency found during or as a result of the 4000-mile test shall be prima facie evidence that all vehicles already accepted prior to completion of the 4000-mile

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test are similarly deficient, unless evidence satisfactory to the contracting officer is furnished by the contractor that they are not similarly deficient. Such deficiencies on all vehicles shall be corrected by the contractor at no cost to the Government.

**4.2.3.1 Reliability verification.** To determine conformance to 3.2.1, reliability requirement will be verified as a point estimate while the vehicles are subjected to production vehicle test. The mean miles/rounds between failure shall not be less than specified.

**4.2.3.2 Durability verification.** To determine conformance to 3.2.2, the durability requirements will be verified as a point estimate while the vehicle is subjected to production vehicle test.

**4.2.3.3 Maintainability verification.** To determine conformance to 3.2.3, the maintainability requirement will be verified during production vehicle test.

**4.3 Break-in run, track.** To determine conformance to 3.5.1, 3.5.2, and 3.5.3, each vehicle shall be lubricated and serviced prior to the break-in run. The run shall be on smooth, level, hard-surface roads, and for the distance specified in table I. The vehicle shall be operated in reverse after each division as specified in 3.5.4. The undulating portion of the test shall be accomplished twice in each direction at speeds from 5.0 to 10.0 mph during division "a" and from 11.0 to 14.5 mph during division "b."

**4.3.1 Simulated break-in run.** To determine conformance to 3.5.1, 3.5.2, and 3.5.3, a simulated break-in run (see table IV) may be accomplished, with the skid-type dynamometer, 8752238 and 8752262, in lieu of the run specified in 4.3. Prior to the break-in run, each vehicle shall be lubricated, serviced, and warmed up for not less than 20 minutes. Records shall be kept of the vehicle instrument readings. The final 10 miles of the total break-in run shall be on smooth, level, hard-surface roads. During this 10-mile test, the vehicle shall be subjected to undulation operation, in accordance with 3.5.3, by being operated over the section of road conforming to figure 1. After completion of divisions "b" and "d" of table IV, the vehicle shall be operated in reverse as specified in 3.5.4. The undulation portion of the test shall be accomplished twice in each direction at speeds from 5.0 to 10.0 mph during division "b" and from 11.0 to 14.5 mph during division "d." The results of the break-in runs on the first 20 vehicles that meet all requirements will serve as a standard for the evaluation of the balance of production.

TABLE IV. Dynamometer and test track.

DIVISION OF RUN	SPEED (MPH)	MILES OF TEST	TEST CONDITIONS
a	0 to 10	10	Dynamometer
b	11 to 20	15	Dynamometer
c	Maximum	5	Dynamometer
d	10 to maximum	10	Track (road)

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**4.3.2 Condition after run.** After the break-in run, the vehicle shall be inspected to determine conformance to 3.5.5.

**4.4 Inspection provisions.** Visual, dimensional, and primary functional examination shall consist of examination of each vehicle for conformance to the applicable drawings and this specification. Examination shall be performed against the defects shown in table V. The following constitutes a part of the defects (see 6.4.1):

- a. Any drip constitutes a defect when the vehicle has been standing idle and the components are at ambient temperature.
- b. Any leak that occurs at a static fit, metal, or gasket combination that results in the formation of a droplet shall constitute a defect.

TABLE V. Defects.

COMPONENT	DEFECTS	METHOD OF INSPECTION
a. Engine	Malfunction, leaks (see 6.4.1), mounting improper, damage, improper component assembly or installation	Visual and functional
b. Engine governors	Improper setting, malfunction, missing or defective seals	Functional
c. Power train	Malfunction, improper mounting, damage, leakage (see 6.4.1), improper component assembly or installation	Visual and functional
d. Fuel system components	Malfunction, damage, leaks (see 6.4.1), improper assembly, installation, or clearance	Visual and functional
e. Fuel and oil lines, valves	Defective, improper clearance, malfunction, leaks (see 6.4.1), improper assembly or installation	Visual and functional
f. Cooling system components (engine and transmission)	Malfunction, damage, leaks (see 6.4.1), improper assembly or installation	Visual and functional
g. Exhaust system components	Damage, leaks, improper assembly or installation	Visual and functional
h. Electrical system components, lights (includes wiring and instrumentation)*	Malfunction, damage, improper assembly, installation circuit identification, clearance or protection, illumination of reticle and cant connection level vial	Visual and functional

\*NOTE: Filament failures are not to be classified as a major or minor defect.

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TABLE V. Defects—continued.

COMPONENT	DEFECTS	METHOD OF INSPECTION
i. Suspension system components	Damage, tire or track pad separation, improper clearance or alignment, welding defects, leaks (see 6.4.1), malfunction, improper assembly, installation, bolt or nut torque, or track tension	Visual
j. Hull	Structure or welding defect	Visual
k. Control and adjusting mechanisms	Malfunction, improper clearance, improper assembly or installation, welding defects	Visual and functional
l. Doors, fenders, grills, panels, ducts, stowage, brackets, boxes, racks, and stops	Malfunction, torque spring and hold-open devices, improper fit, adjustment assembly, or installation	Visual and functional
m. Drain valves	Improper valve seating, improper assembly, installation, or control adjustment	Visual
n. Cushions, seats, rests, and crash pad hatch seals	Seat control malfunction, damage, leakage (see 6.4.1), improper assembly or installation, adhesion damage	Visual and functional
o. Howitzer travel lock	Locking lug malfunction, damage, improper assembly or installation	Visual and functional
p. Traversing and elevating mechanisms	Improper clearance, component damage, improper assembly, installation, or chain adjustment	Visual and functional
q. Recoil mechanism, replenisher, and lines	Component damage, indicators or lines defective, improper assembly or installation, improper fluid level or type	Visual and functional
r. Main armament	Component damage, improper assembly or trunnion cap bolt torque	Visual and functional
s. Breech operating mechanisms and controls	Malfunction, bind, improper assembly or installation	Visual and functional

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TABLE V. Defects—continued.

COMPONENT	DEFECTS	METHOD OF INSPECTION
t. Weapon control system (includes panels, solenoids, switches, wiring, and other components)	Component damage, defective wiring, improper clearance, assembly, or installation, circuit identification, protection markings	Visual and functional
u. Miscellaneous items accessories	Malfunction, damage, missing or improper assembly or installation	Visual and functional
v. Fire extinguisher systems components	Seals missing or defective, data card incomplete, improper assembly or installation	Visual
w. Speed	Nonconformance	Functional
x. Acceleration	Nonconformance	Functional
y. Turning ability and steering	Nonconformance, wander, side pull, unusual noise	Functional
z. Braking ability (parking and service brakes)	Nonconformance, grade holding or stopping distance, improper equalization, unusual noise	Functional
aa. Fording (shallow)	Water leakage excessive	Visual
ab. Paint protective and anti-skid coatings	Improper application, coverage, or materials	Visual
ac. Lube fittings and lubrication	Fittings missing, defective, or improperly installed, improper lubrication	Visual
ad. Decals, markings data, and instruction plates	Incomplete data, missing, improper location or size, illegible	Visual

4.5 Classification of tests.

- a. Acceptance tests: 4.5.1.1 through 4.5.1.26.
- b. Control tests: 4.5.2 through 4.5.2.12.
- c. Inspection Comparison Tests (ICTs): 4.5.3 through 4.5.3.15.

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**4.5.1 Acceptance tests.** To determine conformance to 3.6, after the break-in run (see 3.5), each vehicle shall be operated for a distance of 8 miles or more and shall be inspected as specified in 4.4. These acceptance tests will be conducted at the place of manufacture (see table VI). Vehicles shall be completely assembled and serviced, with fuel and lubricants, and tested as specified in 3.5.1. For these tests, vehicles shall be operated on roads as specified. The acceptance tests for the automotive and cab control and gun control system and fire control system may be run simultaneously where applicable. After the tests, the vehicle shall be examined for evidence of fuel and lubricant leakage, or other deficiencies.

**4.5.1.1 Test failure.** If a vehicle fails to pass any acceptance test specified herein, the Government inspector shall stop acceptance until evidence has been provided by the contractor that the corrective action has been taken.

TABLE VI. Location for tests.

TEST	PARAGRAPH NUMBER	PLACE OF MANUFACTURE	GOVERNMENT PROVING GROUNDS
Sealing and seals check	4.5.1.2	X	X
Controls and throttle linkage checks	4.5.1.3	X	X
Adjustment mechanism check	4.5.1.4	X	X
Fasteners and locks check	4.5.1.5	X	X
Fuel system leakage check	4.5.1.6	X	X
Hydraulic reservoir and lines check	4.5.1.7	X	X
Generating system voltage (alternator) check	4.5.1.8	X	X
Lights check	4.5.1.9	X	X
Bilge pump electrical check	4.5.1.10	X	X
Air cleaner blower electrical check	4.5.1.11	X	X
Personnel heater electrical check	4.5.1.12	X	X
Communications equipment and slip ring electrical check	4.5.1.13	X	X
Welding and weld repairs check	4.5.1.14	X	X

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TABLE VI. Location for tests—continued.

TEST	PARAGRAPH NUMBER	PLACE OF MANUFACTURE	GOVERNMENT PROVING GROUNDS
Power package and drive train test	4.5.1.15	X	X
Speed tests without towed load	4.5.1.16	X	X
Acceleration test	4.5.1.17	X	X
Engine starting on grades and side slope tests	4.5.1.18	X	X
Stopping test	4.5.1.19	X	X
Holding test	4.5.1.20	X	X
Turning test	4.5.1.21	X	X
Shallow water fording test	4.5.1.22.1	X	X
Flotation test*	4.5.1.22.2	X	X
Cab traversing speeds test	4.5.1.23.1	X	X
Cab manual traverse effort check	4.5.1.23.2	X	X
Cab manual traverse response rate check	4.5.1.23.3	X	X
Cab slope operation check	4.5.1.23.4	X	X
Manual elevation effort check	4.5.1.24.1	X	X
Manual elevation response rate check	4.5.1.24.2	X	X
Weapon elevation speeds check	4.5.1.24.3	X	X
Elevation system limits and protection check	4.5.1.24.4	X	X
Elevation and depression limits, and time limits check	4.5.1.24.5	X	X

\*NOTE: Flotation test not applicable to M109A2, M109A3, or M109A5 vehicles.

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TABLE VI. Location for tests—continued.

TEST	PARAGRAPH NUMBER	PLACE OF MANUFACTURE	GOVERNMENT PROVING GROUNDS
Hydraulic pressure limit switch test	4.5.1.24.6	X	X
System backlash check	4.5.1.24.7	X	X
Control transfer check	4.5.1.24.8	X	X
Control system dead spot check	4.5.1.24.9	X	X
Hydraulic control system leakage check	4.5.1.24.10	X	X
Hydraulic accumulator test	4.5.1.24.11	X	X
Equipment	4.5.1.25.1	X	X
Preliminary checks and adjustments	4.5.1.25.2	X	X
Alignment of panoramic telescope test	4.5.1.25.3	X	X
Horizontal deflection of panoramic telescope test	4.5.1.25.4	X	X
Accuracy of elevation counter check	4.5.1.25.5	X	X
Backlash check	4.5.1.25.6	X	X
Boresight adjustment check of direct fire telescope	4.5.1.25.7	X	X
Boresight retention test	4.5.1.25.8	X	X
Mount check	4.5.1.25.9	X	X
Rammer system check	4.5.1.25.10	X	X
CARC tests	4.5.1.26	X	X
Frequency	4.5.2.1	X	X

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TABLE VI. Location for tests—continued.

TEST	PARAGRAPH NUMBER	PLACE OF MANUFACTURE	GOVERNMENT PROVING GROUNDS
Contamination test	4.5.2.3	X	X
Fuel system slope test	4.5.2.4	X	X
Fuel tanks and lines test	4.5.2.5	X	X
Stowed equipment test	4.5.2.6	X	X
Flotation operational test	4.5.2.7	X	X
Cab ring friction test	4.5.2.8	X	X
Manual elevation supercharge pressure check	4.5.2.9	X	X
Traverse and elevation stability check	4.5.2.10	X	X
Reservoir hydraulic fluid test	4.5.2.11	X	X
Fire extinguisher test	4.5.2.12	X	X
Winterization equipment test	4.5.3.2		X
Carbon monoxide concentration test	4.5.3.3		X
Communications equipment test	4.5.3.4		X
Temperature operational tests	4.5.3.5		X
Cooling system tests	4.5.3.6		X
Air cleaner operational check	4.5.3.7		X
Water removal (bilge pump) test	4.5.3.8		X
Speeds with towed load test	4.5.3.9		X
Slope operation test	4.5.3.10		X
Climbing operation test	4.5.3.11		X

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TABLE VI. Location for tests—continued.

TEST	PARAGRAPH NUMBER	PLACE OF MANUFACTURE	GOVERNMENT PROVING GROUNDS
Trench crossing test	4.5.3.12		X
Vertical obstacle tests	4.5.3.13		X
Radio suppression tests	4.5.3.14		X
Alignment	4.5.3.15		X
NBC filtration hoses and protective masks check	4.5.3.16	X	X
NBC filtration heaters check	4.5.3.17	X	X

4.5.1.2 Sealing and seals check. To determine conformance to 3.4.1 through 3.4.1.3, hatch, door, periscope, and turret ring seals shall be checked for leakage of water into the hull.

4.5.1.3 Controls and throttle linkage checks. To determine conformance to 3.4.4 and 3.4.5, all controls and throttle linkage shall be operated and checked for functional requirements.

4.5.1.4 Adjustment mechanism check. To determine conformance to 3.4.6, all adjustment mechanisms shall be checked for proper adjustment and functional requirements.

4.5.1.5 Fasteners and locks check. To determine conformance to 3.4.7, all fastening and locking devices shall be operated and checked for positive fastening and locking.

4.5.1.6 Fuel system leakage check. To determine conformance to 3.4.8.1 and 3.4.8.2, prior to engine installation, the fuel system shall be pressurized with dry air at a pressure of 3 to 4 psi for a minimum of 5 minutes; fittings, lines, and fuel tank seals shall be checked for leaks by applying soapy water or equivalent.

4.5.1.7 Hydraulic reservoir and lines check. To determine conformance to 3.4.9, prior to initial operation of the hydraulic system, the reservoir and lines shall be checked for leaks and cleanliness.

4.5.1.8 Generating system voltage (alternator) check. To determine conformance to 3.4.10.1, prior to performance tests, the generating system voltage shall be checked with master voltmeter, and the voltage shall be within  $28.0 \pm 0.7$  volts dc with all vehicle lights turned on. An ammeter placed in Circuit 2 between the rectifier assembly and voltage regulator can be used to measure the total systems current demand for instances when the

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voltage falls out of the above limits to ensure that the current load limit of 100 amperes is not being exceeded.

4.5.1.9 Lights check. To determine conformance to 3.4.10.2, all lights shall be operated during and after break-in run throughout all stages of operation, and checked for functional requirements.

4.5.1.10 Bilge pump electrical check. To determine conformance to 3.4.10.3, the bilge pump electrical controls shall be turned on and the pump checked for operation.

4.5.1.11 Air cleaner blower electrical check. To determine conformance to 3.4.10.4, the air cleaner electrical controls shall be turned on and the blower checked for operation and airflow.

4.5.1.12 Personnel heater electrical check. To determine conformance to 3.4.10.5, the personnel heater electrical controls shall be turned on and the heater checked for operation.

4.5.1.13 Communications equipment and slip ring electrical check. To determine conformance to 3.4.10.6 and 3.4.10.7, the electrical circuits supplying current to the communication equipment and slip ring shall be checked at all points to ensure continuity.

4.5.1.14 Welding and weld repairs check. To determine conformance to 3.4.11, all welding and weld repairs shall be examined for possible defects and repairs accomplished in accordance with approved procedure.

4.5.1.15 Power package and drive train test. To determine conformance to 3.6.2, the vehicle shall be operated throughout all gear and speed ranges; the power plant, power train, final drives, tracks, suspension system, and applicable controls shall be checked for functional requirements.

4.5.1.16 Speed tests without towed load. To determine conformance to 3.6.5.1, the vehicle shall be operated at specified speeds and checked for functional requirements.

4.5.1.17 Acceleration test. To determine conformance to 3.6.6, the vehicle shall be accelerated from a standing start to the required speeds and the time shall be checked.

4.5.1.18 Engine starting on grades and side slope tests. To determine conformance to 3.5.2 and 3.6.7.1, the engine shall start, and oil pressure and temperature shall be maintained when operating on specified grades and slopes. The 60%-grade test may be conducted in conjunction with brake-holding test.

4.5.1.19 Stopping test. To determine conformance to 3.6.8.1, the vehicle shall be operated on a dry, level, hard-surface road free of loose material, and checked for functional requirements.

4.5.1.20 Holding test. To determine conformance to 3.6.8.2, the vehicle shall be driven up a specified grade, service brakes applied, and the vehicle observed for movement; then, with parking brakes locked, the vehicle shall be observed for movement. During this

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test, vehicle shall be combat loaded or a simulated load of equal weight shall be placed on the vehicle in a position that will not restrict the flow of engine air (intake or exhaust).

4.5.1.21 Turning test. To determine conformance to 3.6.9, the vehicle shall be operated and turned to right and left as specified and checked for radius of turns.

4.5.1.22 Shallow water fording and flotation test.

4.5.1.22.1 Shallow water fording test. To determine conformance to 3.6.10.1, after 4000 miles of system operation the vehicle shall be driven into water of specified depth, without special equipment. Water accumulation shall not exceed specified depth in hull bottom after 15 minutes of fording operation. The engine shall idle at 1000 rpm for 15 minutes, be stopped, and shall restart in not more than 3 minutes with all accessories functioning satisfactorily during and after fording.

4.5.1.22.2 Flotation test. To determine conformance to 3.6.10.2, at the conclusion of the break-in run the vehicle shall be driven into water of a depth to ensure that vehicle flotation requirements are met. After acceptance of the first production vehicle, all subsequent vehicles shall be tested in accordance with 4.5.2.1. Flotation test is not applicable to the M109A2, M109A3, and M109A5 vehicles.

4.5.1.23 Cab control system tests.

4.5.1.23.1 Cab traversing speeds test. To determine conformance to 3.6.14.2 by use of the gunner's and commander's power controls, the cab shall be traversed clockwise and counterclockwise as specified, and the transition, maximum velocity, and stability of cab observed. The accumulator shall be fully charged prior to beginning the maximum speed test. Maximum traverse speed shall be measured after allowing the cab to accelerate approximately 400 mils from stop. The first revolution of the cab after this acceleration shall be accomplished at the specified rate.

4.5.1.23.2 Cab manual traverse effort check. To determine conformance to 3.6.14.3, with the specified average force applied tangentially to the traverse hand crank the effort shall not exceed that specified.

4.5.1.23.3 Cab manual traverse response rate check. To determine conformance to 3.6.14.4, the response shall not exceed that specified.

4.5.1.23.4 Cab slope operation check. To determine conformance to 3.6.14.5, the vehicle shall be checked at the specified side slope without combat load for functional requirements.

4.5.1.24 Weapon control system tests.

4.5.1.24.1 Manual elevation effort check. To determine conformance to 3.6.15.1, with the specified average force applied tangentially to the hand crank, the effort to maintain weapon movement shall not exceed that specified.

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4.5.1.24.2 Manual elevation response rate check. To determine conformance to 3.6.15.2, with the gun horizontal within  $\pm 1$  degree, the response rate shall not exceed that specified.

4.5.1.24.3 Weapon elevation speeds check. To determine conformance to 3.6.15.4, when elevating and depressing the gun, the speeds shall be controllable as specified.

4.5.1.24.4 Elevation system limits and protection check. To determine conformance to 3.6.15.5, with the weapon driven against stops, the control system shall be checked for damage.

4.5.1.24.5 Elevation and depression limits, and time limits check. To determine conformance to 3.6.15.6 and 3.6.15.7, the weapon shall be operated throughout elevation and depression ranges and checked for specified limits. (The correction procedures of 4.5.1.25.2f shall apply.)

4.5.1.24.6 Hydraulic pressure limit switch test. To determine conformance to 3.6.16.1, the cab shall be traversed as specified and the system pressure gage observed for specified pressure as the power pack motor cuts in. With power pack motor running and the controls in their neutral position, the power pack motor shall cut out at the specified system pressure.

4.5.1.24.7 System backlash check. To determine conformance to 3.6.16.2, with the power off and specified force applied to muzzle end of gun, the backlash shall not exceed that specified.

4.5.1.24.8 Control transfer check. To determine conformance to 3.6.16.3, the controls shall be operated as specified and the gun and turret observed for functional response as selected. There shall be no movement of the gun or cab when the cab control switch is turned on or off not less than three times, with the controls in neutral position, and the accumulator charge as specified.

4.5.1.24.9 Control system dead spot check. To determine conformance to 3.6.16.4, with the system fully charged, the pressure drop shall not be less than that specified.

4.5.1.24.10 Hydraulic control system leakage check. To determine conformance to 3.6.16.6, with the system fully charged, the pressure drop shall be not less than that specified.

4.5.1.24.11 Hydraulic accumulator test. To determine conformance to 3.6.16.8, with the elevation and traverse power switch off and the cab lock engaged, all oil shall be discharged from the main accumulator by actuating the cab power shutoff solenoid button and moving the power traverse handle to extreme right or left until the system pressure gage is stabilized at a zero pressure setting. Leakage and psi change per degree of temperature change from initial precharge condition shall be not more than that specified. With the specified nitrogen pressure on the gas gage, the controls in neutral position, and the oil pressure at zero, the test shall be continued by observing the oil gage for a period of 3 minutes with no gage movement.

4.5.1.25 Fire control system tests.

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4.5.1.25.1 Equipment. The following fire control test equipment shall be used:

- a. Mechanical jacks or a leveling platform. These items shall be used for leveling the vehicle.
- b. A plumb line 1/16 inch in diameter suspended less than 1 foot from the muzzle of the weapon. The line shall be shielded from wind currents and the plumb bob shall be immersed in a container of oil to act as a dampener.
- c. A boresight retention and checking target constructed of non-warping and non-shrinking material and designed as shown in figure 2. The target shall be placed at a distance of not less than 50 feet from the center of the weapon trunnions in a plane perpendicular to the weapon bore at zero weapon elevation. The reference line on the target shall be plumb. The height of the target above ground shall be such that at zero weapon elevation the centerline of the weapon bore shall fall on the weapon aiming point within  $\pm 1/8$  inch.
- d. An approved borescope. This shall be a telescope with a cross hair reticle mounted in a self-aligning fixture to be inserted in the breech of the weapon so that the cross hairs of the telescope fall on the centerline of the bore. The telescope shall have a separate focus for reticle and field and be adjustable from 5 to 5000 yards. The reticle of the telescope shall be centered with respect to the outside diameter of the adapter within 0.1 mil. The telescope shall have a magnification of 20X or higher.
- e. Parallax shields with a centrally located 1/16-inch maximum diameter hole. Shields shall be placed over the eyepiece of the telescope to eliminate parallax.
- f. An M117A2 Master Panoramic Telescope and an M118A2 Master Direct Sighting Telescope. A master telescope is defined as a scope with line of sight mixed in correct relation to the mounting surfaces.
- g. An M1A1 Calibrated Gunner's Quadrant. A calibrated gunner's quadrant is defined as a quadrant that has been checked on a sine plate at each of the elevations for which the quadrant will be employed during the test and the deviation from true elevation recorded in a table which will be furnished with the quadrant. The readings of the quadrant shall be corrected accordingly when checking specification tolerances.

4.5.1.25.2 Preliminary checks and adjustments. The following preliminary checks and adjustments shall be made:

- a. Prior to installing the M15 (Elevation) Quadrant, the keys of the quadrant support bracket shall be checked for parallelism with respect to the zero reference of the weapon within the prescribed tolerance of 0.2 mil.
- b. The mounts shall be inspected for tight mechanical installation.

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- c. No interference shall exist between or with components of fire control components and components of the vehicle or between the maximum limits of elevations.
- d. All level vials shall be illuminated for a minimum of 5 minutes prior to their use. Unless otherwise specified (see 6.2), the level vials of the fire control instruments shall be construed to be level when the bubble in the vial is centered within the width of the graduation line.
- e. The vehicle shall be cross-leveled so that the weapon will track the plumb line within the thickness (1/16 inch) of the line. This shall be done by using the borescope (see 4.5.1.25.1d) inserted in the breech and setting the muzzle cross wires on the plumb line at zero weapons elevation. The vehicle shall be leveled fore and aft and cross-leveled to meet the requirements of 3.6.17.1 and 3.6.17.2. The above shall be checked with a calibrated gunner's quadrant on the breech pads of the weapon. Cross-leveling of the vehicle shall be checked periodically throughout the test.
- f. With regard to true elevation, all elevation setting readings indicated by an M1A1 Gunner's Quadrant placed on the quadrant pads of the breech ring shall be in accordance with the zero elevation established. Therefore, the mil correction value imbedded on the breech ring shall be added or subtracted from the reading on the gunner's quadrant; plus corrections shall be added, minus corrections shall be subtracted from the M1A1 Quadrant to achieve a specified tube elevation. Zero elevation shall be established with the muzzle brake assembled on the gun tube.
- g. The M140 Alignment Device mounting bracket shall be installed in accordance with 3.6.17.9.

4.5.1.25.3 Alignment of panoramic telescope test. The master panoramic telescope shall be placed in the socket and locked in place. A parallax shield shall be placed over the eyepiece. The cross-leveling mechanism shall be adjusted until cant vial is level. With elevation and pitch vials level, the vertical cross hair of the panoramic telescope shall be placed on the aiming point. The weapon shall be elevated from zero to 1100 mils and checked for conformance to 3.6.17.3.

4.5.1.25.4 Horizontal deflection of panoramic telescope test. A gradual pressure of 20 pounds shall be applied to the telescope mount socket, tangentially to the right and perpendicular to the axis of the telescope and then gradually released. While sighting through the telescope, place the vertical cross hair on the center of the panoramic telescope aiming point. Repeat procedure specified in first sentence above and sight through the telescope to ascertain that the vertical cross hair of the telescope has not moved off the aiming point. A 20-pound pressure shall then be applied in the opposite direction and gradually released. The deflection of the vertical cross hair relative to the aiming point shall be checked for conformance to 3.6.17.4.

4.5.1.25.5 Accuracy of elevation counter check. A calibrated gunner's quadrant shall be placed on the breech pads of the weapons and the difference between counter reading and

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weapon elevation shall be checked and noted. The check point shall include zero, 100, 250, 500, 600, 750, 1000, and 1100 mils counter elevation. At each elevation counter setting, the weapon shall be laid in elevation utilizing a calibrated gunner's quadrant placed on the breech pads and elevating the weapon from low to high to exclude backlash. The elevation vial in the mount and elevation quadrant shall then be leveled and the counter reading noted for conformance to 3.6.17.5. The elevation correction counters shall be set to zero and the pitch and cant vials leveled prior to performing this test.

4.5.1.25.6 Backlash check. The elevation counter indexes shall be coincident when laying the weapon from low to high and reading weapon elevation by use of the gunner's quadrant. The elevation counter indexes shall again be coincident when laying the weapon from high to low and again reading the gunner's quadrant. The difference between the two readings is the backlash at the given elevation and shall be noted for conformance to 3.6.17.6.

4.5.1.25.7 Boresight adjustment check of direct fire telescope. The weapon shall be placed on its aiming point on the boresight retention and checking target. With the master telescope locked in place, the line of sight shall be adjusted on its aiming point. Lateral and vertical boresight adjustment screws shall be rotated for conformance to 3.6.17.7.

4.5.1.25.8 Boresight retention test. Prior to the 8-mile road test specified herein, the cross hairs of the panoramic telescope and direct sighting telescope shall be placed on the center of their respective aiming points shown in figure 2 after laying the weapon exactly on the center. Following the 8-mile road test, the vehicle shall be returned to the place from which the original settings were made. Approaching the weapon aiming point from the same direction as before the test, the weapon shall be boresighted at proper aiming point on the target and observation shall be made through the panoramic telescope and the direct sighting telescope to ascertain conformance to 3.6.17.8.

4.5.1.25.9 Mount check. To determine conformance to 3.6.18, the mount shall be checked for proper installation and any damage that may cause failure.

4.5.1.25.10 Rammer system check. To determine conformance to 3.6.20, the rammer system shall be operated and observed for functional requirements.

4.5.1.26 CARC tests. To determine conformance to 3.7.1, inspection and testing shall be performed in accordance with the Quality Assurance Provisions outlined in MIL-C-53072.

4.5.2 Control tests. Control tests for maintaining control of those requirements whose inspection would be of duration too long to be included under acceptance tests shall be conducted by the manufacturer as specified herein.

4.5.2.1 Frequency. The first vehicle off the production line, or 1 of the first 10 vehicles produced, and thereafter 1 per month, shall be checked in accordance with the control tests.

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**4.5.2.2 Test failure.** If a vehicle fails to pass any control test specified herein, the Government inspector shall stop acceptance until evidence has been provided by the contractor that corrective action has been taken.

**4.5.2.3 Contamination test.** To determine conformance to 3.6.10.3, the vehicle (after the water fording and flotation test) shall be examined for contamination of lubricants of the transmission, engine, final drives, and roadwheels 2, 3, 4, 5 and one of their corresponding arms on each side of the vehicle. Contamination shall not exceed that specified (see 4.5.1.22.2).

**4.5.2.4 Fuel system slope test.** To determine conformance to 3.4.8, headed up and down a 60% longitudinal slope and each side up a 40% slope, vehicle shall be checked for functional requirements.

**4.5.2.5 Fuel tanks and lines test.** To determine conformance to 3.4.8.1 and 3.4.8.2, the fuel tanks shall be filled to capacity at a rate of not less than 50 gpm. The tanks and lines shall be checked for leaks before and after a 2-mile road test on smooth, level, hard-surface roads.

**4.5.2.6 Stowed equipment test.** To determine conformance to 3.4.12, all manufacturer and depot installed OVE shall be stowed (combat loaded) on the selected vehicle. The equipment shall be removed after the test. The OVE shall be made available to the contractor, and the contractor shall be permitted to unpackage and repackage for domestic shipment only the equipment used for test.

**4.5.2.7 Flotation operational test.** To determine conformance to 3.6.10.2, the vehicle shall be operated in water of specified depth and checked for performance requirements. Flotation test is not applicable to M109A2, M109A3, and M109A5 vehicles.

**4.5.2.8 Cab ring friction test.** To determine conformance to 3.6.14.1, 1 vehicle in 20 shall be selected. The turret assembly shall be rotated throughout the 360-degree rotation, with a tangential force of 50 pounds applied at the end of the gun tube parallel to plane of rotation. The torque required to maintain rotation shall be measured, and checked for functional requirements.

**4.5.2.9 Manual elevation supercharge pressure check.** To determine conformance to 3.6.15.3, with the manual elevation hydraulic system supercharged, the system shall maintain supercharge pressure as specified.

**4.5.2.10 Traverse and elevation stability check.** To determine conformance to 3.6.16.5, with the cab control switch turned on or off, the gun movement shall not exceed that specified. Prior to performing the stability test, equilibrate the gun tube at 266 mils elevation. Test shall be conducted at elevations from 500 to 600 mils.

**4.5.2.11 Reservoir hydraulic fluid test.** To determine conformance to 3.6.16.7, the hydraulic oil in the control power pack shall be tested for water contamination and cleanliness. Obtain oil sample in the following manner:

- a. Cycle rammer five times.

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- b. Traverse the turret in any direction for a total of 720 degrees.
- c. Elevate from lowest quadrant elevation to highest quadrant elevation five times.
- d. Immediately thereafter, but not longer than 5 minutes, drain approximately 1 quart from the reservoir (drain at oil level gage).
- e. Take an additional 100 ml at the same location as referenced in (d) above; this 100 ml will be the hydraulic fluid test sample.

Test the sample in accordance with the requirements of MIL-STD-1246, Level 200 (Paragraph 5.1.2 and Table 1A).

**4.5.2.12 Fire extinguisher test.** To determine conformance to 3.6.21.1 and 3.6.21.2, the fixed fire extinguisher system shall be functionally tested both inside and out (subsequent tests of 1 in each 50 testing alternately).

**4.5.3 ICTs.** The Government may select vehicles at any time during the contract production period and subject vehicles to tests listed in table VI and table VII to reveal deficiencies of manufacture or design that may reduce the effective operation of these items in the field and to compare existing quality with previous standards. These tests shall be conducted at Government laboratories or proving grounds designated by the contracting officer. Selection of vehicles shall be done on a spot-check basis. Comparison test vehicles shall be combat loaded with all OVE stowed in their applicable spaces to conform to 3.4.12. Vehicles selected shall not include any vehicles previously tested for conformance to control tests (see 4.5.2).

**4.5.3.1 Test failure.** Failure of any vehicle tested as specified in 4.5.3 to comply with any of the requirements specified in the contract, or any deficiency of a workmanship or materials nature occurring during, or as a result of the test, may be cause for refusal to continue acceptance of vehicles by the Government until evidence has been provided by the manufacturer that corrective action has been taken to eliminate the conditions.

TABLE VII. 2000-mile test, combat loaded or with a simulated load  
(Government proving grounds).

COURSE	MILEAGE AND SPEED
Hard-surface roads	200 miles at varying speeds up to maximum
Gravel and dirt roads	500 miles at varying speeds up to maximum, with 75 miles of this distance on hilly conditions
Level cross-country	650 miles at varying speeds up to maximum
Hilly cross-country	650 miles at varying speeds up to maximum

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4.5.3.2 Winterization equipment test. Winterization equipment shall be installed in accordance with applicable drawings and specifications. The vehicle, properly serviced and equipped, shall be stabilized and then subjected to respective ambient temperature of zero to -65°F. The engine shall satisfactorily start and operate and the personnel heaters shall function as specified in 3.4.2.1.

4.5.3.3 Carbon monoxide concentration test. To determine conformance to 3.4.3, the crew compartment shall be checked for carbon monoxide concentration.

4.5.3.4 Communications equipment test. To determine conformance to 3.4.10.6, communications system equipment shall be installed, subjected to tests, and checked for functional requirements.

4.5.3.5 Temperature operational tests. To determine conformance to 3.6.1, the vehicle, properly serviced and equipped, shall be subjected to the applicable tests in high and low temperatures.

4.5.3.6 Cooling system tests. To determine conformance to 3.6.2.1, the vehicle shall be operated as specified and cooling system checked for functional requirements.

4.5.3.7 Air cleaner operational check. To determine conformance to 3.6.3 during and after operation, the air cleaners shall be checked for functional requirements.

4.5.3.8 Water removal (bilge pump) test. To determine conformance to 3.6.4, the vehicle shall have sufficient water in hull to operate bilge pump and check the rate of water removal with the specified discharge head.

4.5.3.9 Speeds with towed load test. To determine conformance to 3.6.5.2, the vehicle shall be operated towing specified vehicle at indicated speeds for a distance of not less than that required to meet performance requirements.

4.5.3.10 Slope operation test. To determine conformance to 3.6.7, the vehicle shall be operated as specified on applicable slopes and checked for performance requirements.

4.5.3.11 Climbing operation test. To determine conformance to 3.6.11, the vehicle selected shall be driven in forward and reverse gear up approved 60% grade.

4.5.3.12 Trench crossing test. To determine conformance to 3.6.12, the vehicle selected shall be driven without stalling over trenches as specified and then examined for damage.

4.5.3.13 Vertical obstacle tests. To determine conformance to 3.6.13, the vehicle selected shall be driven without stalling over obstacles and then examined for damage as specified.

4.5.3.14 Radio suppression tests. To determine conformance to 3.6.19, the vehicle shall be subjected to a radio interference suppression test.

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4.5.3.15 Alignment. To determine conformance to 3.6.17.9, the alignment device shall be mounted in accordance with drawings 11747268 and 11747269.

4.5.3.16 NBC filtration hoses and protective masks check. To determine conformance to 3.6.23.1, hoses and protective masks shall be checked for airflow and leakage of water and debris into the system.

4.5.3.17 NBC filtration heaters check. To determine conformance to 3.6.23.2, heaters shall be checked for desired outlet system temperature.

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-H-46709.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The vehicle is intended for use by the Armed Forces as a combat vehicle.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Applicable drawings.
- c. Issue of DODISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.1.1, 2.1.2, and 2.2).
- d. If preproduction model is required (see 3.1).
- e. If special kits are required (see 3.4.2).
- f. If road conditions shall be other than as specified (see 3.6).
- g. If finishing requirements shall be other than as specified (see 3.7.1).
- h. If responsibility for inspection shall be other than as specified (see 4.1).
- i. If inspection and quality control requirements shall be other than as specified (see 4.1.2).
- j. If level vials of fire control instruments shall be construed other than as specified (see 4.5.1.25.2d).
- k. If inspection equipment shall be other than as specified (see 6.5).

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**6.3 Safety precautions.** Caution should be exercised in handling carbon dioxide fire extinguisher cylinders. Cylinders should not be dropped, permitted to strike each other, or handled roughly. Extreme care should be exercised during reinstallation to avoid tripping fire extinguisher control system, since physical injury is highly probable.

**6.4 Definitions.**

**6.4.1 Leaks.** The following definitions shall be used for the classification of defects for leaks:

- a. **Weep**            -Slight loss of fluid which causes staining or discoloration of surfaces (usually dry to the touch).
- b. **Seep**            -Any recurring evidences of fluid beyond the seal that do not result in formation of a droplet (usually moist to the touch).
- c. **Droplet**        -Any evidence of fluid beyond the seal that results in the formation of a droplet.
- d. **Drip**            -Any evidence of fluid beyond the seal where droplet forms and falls.

**6.4.2 Reliability.** For the purpose of assessing reliability, a failure is defined as any malfunction which the operator/crew cannot or is not authorized to remedy by adjustment, repair, or replacement action within 5 minutes, using controls, Basic Issue Items (BII), Items Troop Installed or Authorized (ITIA), and parts authorized to the crew, and which causes or could cause the loss of any mission essential function; a critical or catastrophic hazard to personnel or equipment as defined by MIL-STD-882. This shall pertain only to those failures chargeable to hardware. For related malfunction, only the primary malfunction will be counted against reliability.

**6.4.3 Hydraulic fluid cleanliness.** A contamination control plan shall be submitted to the procuring activity in accordance with MIL-STD-1246, Section 4.1.4.

**6.4.4 Recovered materials.** "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.4.5).

**6.4.5 Solid waste.** "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, mining, commercial, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Clean Water Act (33 U.S.C. 1342 *et seq.*), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (24 U.S.C. 2011 *et seq.*) (source: Federal Acquisition Regulations, Section 23.402).

**6.5 Inspection equipment calibration and inspection.** In inspecting the supplier's inspection equipment, the Government Inspector will determine that the supplier has

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available, and utilizes correctly, gaging, measuring, and test equipment of the required accuracy and precision. Except as otherwise specified (see 6.2), the supplier will have available a set of master gages, standards, and appropriate instruments for regularly scheduled calibration of his inspection equipment. Records of such regularly scheduled calibration will be maintained by the supplier and made available for review by the Government. The calibration of gages, standards, and instruments will be periodically checked by authorized Government personnel and the Government reserves the right to verify any gages, standards, or instruments it feels are improperly calibrated.

6.6 Drawings. Drawings listed in Section 2 of this specification and prepared by U.S. Army Armament Research, Development and Engineering Center (ARDEC) may also include drawings prepared by and identified as Edgewood Arsenal, Frankfort Arsenal, Rock Island Arsenal, Picatinny Arsenal, or ARRADCOM. Drawings and technical data originally prepared by these activities are now under the cognizance of ARDEC.

6.7 Subject term (key word) listing:

- Alignment device
- Aluminum armor
- Cannon
- Elbow telescope
- Fire control quadrant
- Gun mount
- Panoramic telescope
- Tracked vehicle

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

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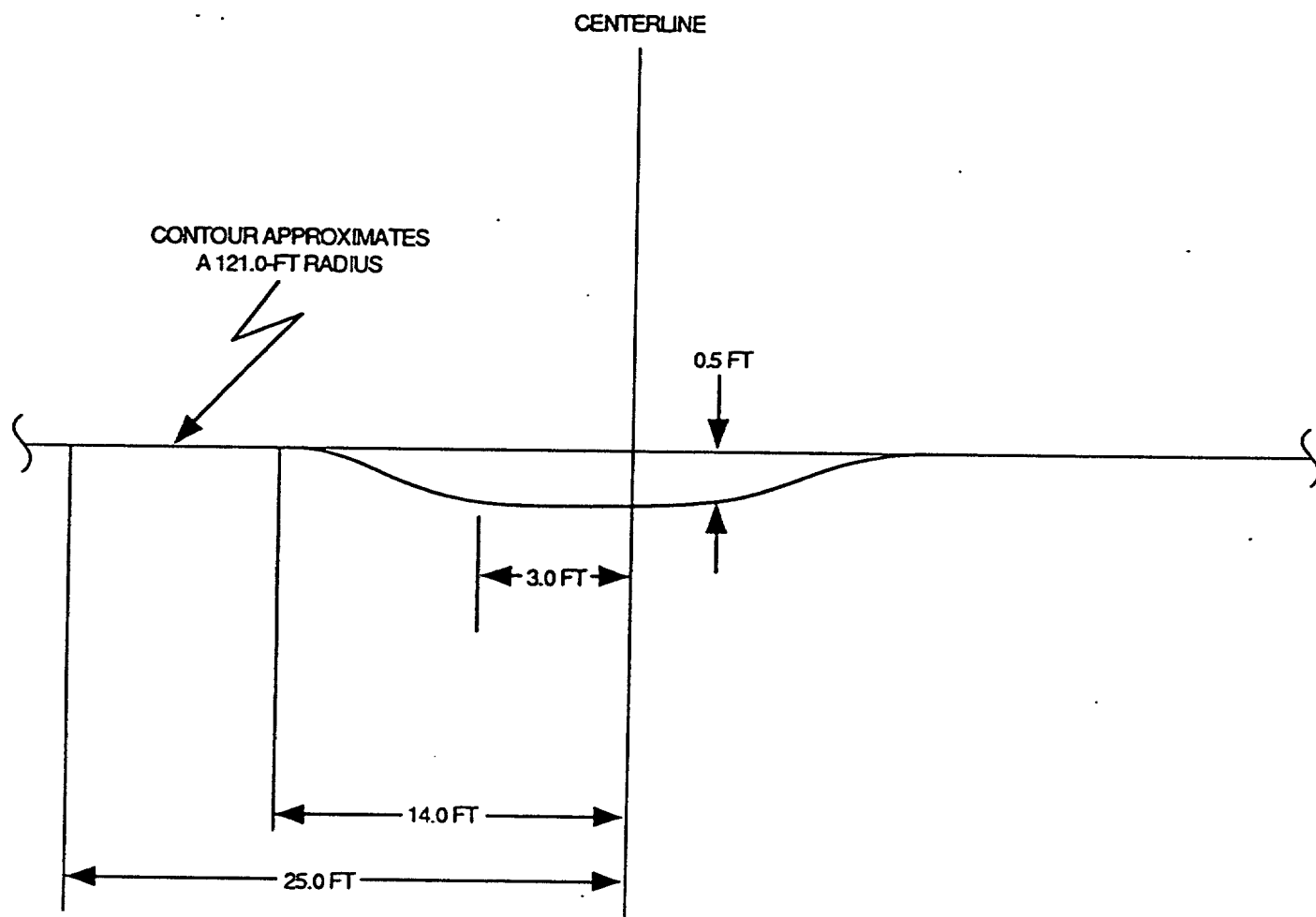


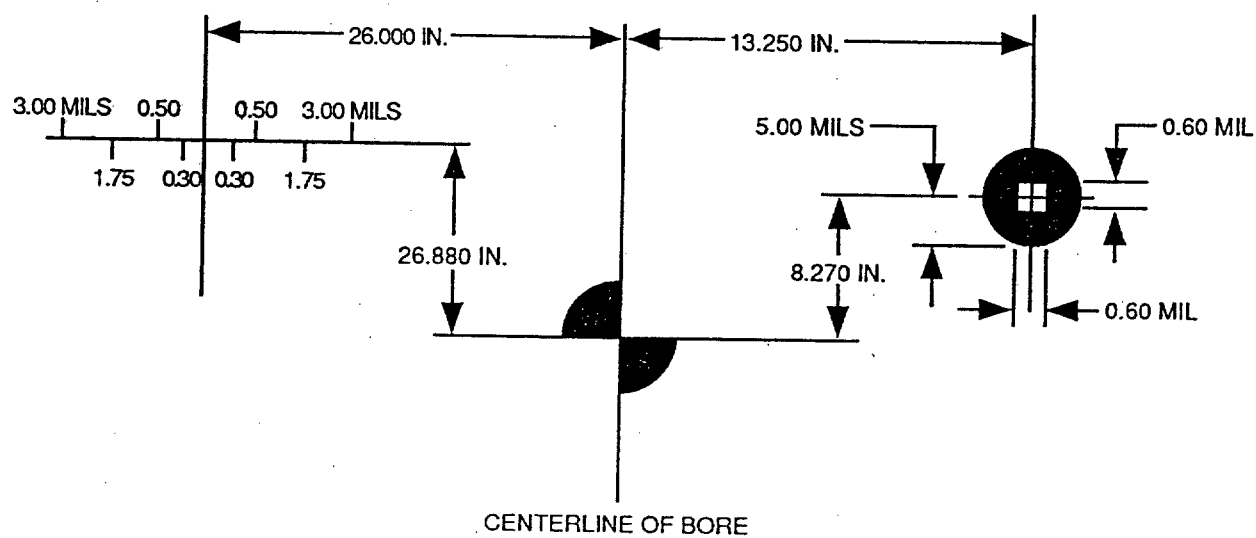
FIGURE 1. Profile of test track.

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VEHICLE	A
M109A5	M118A2
M109A3	M118A2
M109A2	M118A2
M109A1B	M118A2
M109A1	M118A2
M109	M118

PANORAMIC TELESCOPE

DIRECT FIRE TELESCOPE A



TOLERANCES:

INCHES  $\pm .005$ MILS  $\pm .01$ 

FIGURE 2. Boresight retention and checking target for self-propelled vehicles, M109 series.

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## APPENDIX

## FINAL INSPECTION RECORD (FIR)—M109A2 &amp; M109A5

## 10. SCOPE

10.1 Scope. This appendix details the procedure for submission and use of the FIR. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

## 20. APPLICABLE DOCUMENTS

20.1 Government documents.20.1.1 Specifications and standards.

## SPECIFICATIONS

## FEDERAL

A-A-870	-Antifreeze/Coolant, Engine: Ethylene Glycol, Inhibited Concentrated
PPP-T-97	-Tape, Packaging/Industrial, Filament Reinforced
VV-F-800	-Fuel Oil, Diesel

## MILITARY

MIL-P-116	-Preservation, Methods of
MIL-C-450	-Coating Compound, Bituminous Solvent Type, Black (For Ammunition)
MIL-L-21260	-Lubricating Oil, Internal Combustion Engine, Preservative and Break-In
MIL-T-22085	-Tapes, Pressure-Sensitive, Adhesive, Preservation and Sealing
MIL-T-37402	-Tester, Antifreeze Solutions
MIL-P-46002	-Preservative Oil, Contact and Volatile Corrosion-Inhibited
MIL-H-46709	-Howitzer, Medium, Self-Propelled: 155-mm, M109A2, M109A3, M109A4, and M109A5; Processing for Storage and Shipment of
MIL-D-81298	-Dye, Liquid for the Detection of Leaks in Aircraft Fuel Systems

## STANDARDS

## MILITARY

MIL-STD-129	-Marking for Shipment and Storage
MIL-STD-1246	-Product Cleanliness Levels and Contamination Control Program

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20.1.2 Other Government drawings.

DRAWINGS

12012100	-Howitzer, Medium, Self-Propelled: 155mm, M109A2
12940800	-Howitzer, Medium, Self-Propelled: 155mm, M109A5
	- Production

30. SUBMISSION AND USE

A completed FIR shall be included with each M109A2 and M109A5 delivered. In addition, a duplicate FIR for each delivered M109A2 and M109A5 shall be retained by the contractor for future reference, as necessary.

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**FINAL INSPECTION RECORD (FIR)****FOR**

**HOWITZER, MEDIUM, SELF-PROPELLED, 155-MM: M109A2**  
**HOWITZER, MEDIUM, SELF-PROPELLED, 155-MM: M109A5**

**MILITARY SPECIFICATION**  
**MIL-H-45374E(AR)**

**ARMY DRAWINGS 12012100 (M109A2), 12940800 (M109A5)**

CONTRACT NO. \_\_\_\_\_

USA REG. NO. \_\_\_\_\_ ARMY VEH. SER. NO. \_\_\_\_\_

CONTRACTOR INSP. \_\_\_\_\_ DATE \_\_\_\_\_

GOVERNMENT INSP. \_\_\_\_\_ DATE \_\_\_\_\_

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**ROAD TEST AND FINAL INSPECTION**

Mfg. Cab Serial No. \_\_\_\_\_ USA Registration \_\_\_\_\_

Gun Mount No. \_\_\_\_\_ Army Serial No. \_\_\_\_\_

Gun Breech No. \_\_\_\_\_ Mfg. Vehicle Serial No. \_\_\_\_\_

M145 Telescope Mount \_\_\_\_\_ Mfg. Hull Serial No. \_\_\_\_\_

M146 Telescope Mount \_\_\_\_\_ Engine Model \_\_\_\_\_

M15 Quadrant Fire Control \_\_\_\_\_ Engine Serial No. \_\_\_\_\_

Transmission Model \_\_\_\_\_

Transmission Serial No. \_\_\_\_\_

Mileage before acceptance test \_\_\_\_\_

Mileage after acceptance test \_\_\_\_\_

**INSTRUCTIONS FOR COMPLETION OF THE FIR**

A. Inspection will be accomplished to determine conformance to military characteristics as specified in specifications and drawings representing the vehicle design. The inspector shall use the FIR as a guide (in-line or final acceptance) in conducting his inspection of the vehicle areas and components individually or collectively.

B. Conformance or nonconformance of items and items not applicable will be indicated by the appropriate symbol in the space provided. Deficiencies disclosed during this inspection shall be delineated on the deficiency sheet(s) which will then be attached to the FIR to become a permanent part of the inspection record.

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**C** Where a definite performance value is required, the actual results must be recorded in the space provided.

**D** Inspection and tests need not be conducted in the order in which they are referenced in the FIR unless otherwise noted. The vehicle areas and components subjected to inspection prior to submission to the Government inspector for acceptance may be sanctioned in the FIR as submitted to final inspection by the production department. However, all inspection characteristics in Areas 2 through 8 must be completed prior to road test. (See Preparation for Vehicle Road Test Inspection.)

**E** Deficiencies delineated on the deficiency sheet(s) shall be identified with the pertinent FIR item number, not with a sequential listing of entry.

**F** Defective vehicles (complete or in-process) shall be returned to the proper source for repair of defects or replacement of defective parts. Corrective action taken shall be noted in the proper column and the vehicle resubmitted for acceptance inspection of the listed deficiencies.

**G** The inspector shall reinspect the listed deficiencies for correction and initial each entry on the deficiency sheet(s) if found to be in compliance. The inspector will then circle the deficiency symbol in the appropriate block in the FIR and initial that entry.

**H** Each section lists the characteristics to be inspected, the applicable installation drawing or specification paragraph number, and the method of inspection. The items are numbered to identify their respective areas: For example, Area 1 will be numbered 101 thru 199; Area 2 will be numbered 201 thru 299, etc.

**EXAMPLE:** Your deficiency entry may list 302 as defective. This is readily interpreted as the second item of Area 3 as being defective.

**INSTRUCTIONS FOR BREAK-IN RUN**

**A Break-In Run:** The vehicle shall be operated in each division of the break-in run for the purpose of observing the function and performance of various parts, assemblies, controls, and the suspension system. After completion of the break-in run, the vehicle shall be rechecked to determine that there is no damage or malfunction to the vehicle and that adjustments are as required.

**B Reverse Operation:** The vehicle shall be checked for reverse operation after each division of the break-in run.

**C Lights:** Internal and external lights shall be checked for operation before, during, and after break-in run.

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**PREPARATION FOR VEHICLE ROAD TEST INSPECTION**

After the vehicle has been released to the inspector for road test and final inspection, the inspector will determine its readiness for inspection by adhering to the following procedure:

- A. Review Areas 2 thru 8 of the FIR for any item not signed off by responsible inspection personnel. The inspector will also review the deficiency sheet(s) to verify corrective measures taken for listed deficiencies. If any item is not signed off, do not road test vehicle until item has been reinspected to determine conformance and signed off.
  - B. Secure all operating hatches, doors, etc. in either open or closed position as required.
  - C. Secure gun travel lock and cab traverse lock.
  - D. Check fixed fire extinguisher for secure mounting, accessibility of operating handles, and connections made to operate.
  - E. Check suspension system for:
    - a. Proper track tension.
    - b. Oil levels.
    - c. Leaks.
    - d. Lubrication.
    - e. Torque.
  - F. Before starting engine, check oil levels in engine and transmission units. Oil levels must be in "safe to start" graduation of dipstick level.
  - G. Before starting engine for warm-up period:
    - a. Set parking brake.
    - b. Place transmission shift lever in neutral (N) position.
    - c. Check fuel indicator gage for fuel supply.
    - d. Set throttle control lever forward to run engine at proper idler speed.
- CAUTION: DO NOT operate starter over 30 seconds at a time. If engine does not start, allow 1-minute cool-off period before pressing starter switch. If engine does not start after four cranking periods, notify immediate supervisor.
- H. During warm-up period:
    - a. Observe engine oil pressure and temperature lights.

CAUTION: If engine oil pressure light does not go out within 15 seconds, pull fuel shutoff control handle.

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- b. Observe transmission temperature and pressure indicator.
- c. Observe engine coolant temperature gage.
- d. Observe generator indicator light.

**CAUTION:** If at any time during engine or vehicle operation, warning lights come on, stop engine immediately.

**I. After engine warm-up:**

- a. Stop engine and recheck engine and transmission for operating oil levels and leaks.
- b. Retorque hose clamp bolts to 40–60 lb-in. (4.5–6.8 N•m) per drawing 11635586.

**GENERAL REQUIREMENTS FOR VEHICLE PERFORMANCE TESTS**

**A. Combat Loaded or Equivalent:** To determine conformance to requirements, the vehicle need not be combat loaded except for the holding test on a 60% slope. For this test, the vehicle shall be combat loaded or a simulated load in weight placed on the vehicle.

**B. Fasteners and Locking Devices:** To determine conformance to requirements, a check shall be made of fasteners and locking devices for operation of their intended function prior to 8-mile (12.9-km) road test. After the 8-mile (12.9-km) road test, the fasteners and locking devices shall be physically handled or ascertained by the most applicable method to be secure.

**C. Electrical System:** To determine conformance to requirements, the switches, when actuated, shall cause the respective function to start, stop, and operate during all phases of vehicle operation as applicable. Indicator lights, warning lights, and gages shall be observed for performance of their respective function during start, stop, and operation of vehicle. Malfunction of the indicators or value readings not in conformance with requirements shall be cause for discontinuation of testing until fault has been ascertained and corrective measures taken.

**D. Power Train and Associated Controls:** To determine conformance to requirements, the vehicle shall be operated for a distance of 8 miles (12.9 km) or more on a smooth, level, hard-surface road. The power package and train shall demonstrate proper function throughout all gear and speed ranges without grabbing, chattering, or slippage when controls are applied to operate, control, stop, and hold the vehicle. Proper pressure and temperatures must be maintained during all phases of operation.

**SYMBOLS**

It is recommended that the following designated symbols be placed opposite the item or characteristic listed to indicate the inspection results.

(✓) Acceptable

(X) Unacceptable

(O) Not Applicable

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## VEHICLE TEST

SECTION   A  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   1  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
	<p style="text-align: center;"><b>ELECTRICAL SYSTEM</b></p> <p>Actuating the switches shall cause the respective function to start, stop, and operate during all phases of vehicle operation as applicable. Indicator lights, warning lights, and gages shall be observed for performance of their respective functions during start, stop, and operation of vehicle. Malfunction of the indicators or value readings not in conformance with requirements shall be cause for discontinuation of testing until fault has been ascertained and corrective measures taken.</p>	Par. 4.5.1.3	
101	<p><b>DRIVER'S INSTRUMENT PANEL CHECK</b></p> <p>Master Switch _____</p> <p>Starter Switch _____</p> <p>Blackout (BO)-Infrared Selector Switch _____</p> <p>Bilge Pump Switch _____</p> <p>Fuel Tank Gage Selector Switch _____</p> <p>NBC Switch _____</p> <p>Starter Protection Device _____</p> <p>Combat Override Switch _____</p> <p>Light Switch:</p> <p>    Unlock _____</p> <p>    Panel Bracket _____</p> <p>    On _____</p> <p>    Off _____</p> <p>    Park _____</p> <p>    Service Drive _____</p> <p>    Stop Light _____</p> <p>    Off _____</p> <p>    BO Marker _____</p> <p>    BO Drive (Left side only) _____</p> <p>Par. 3.4.4, 3.4.10.2 &amp; 3.4.10.3</p>	<p><b>VISUAL AND FUNCTIONAL</b></p> <p>Par. 4.5.1.3 Par. 4.5.1.9 Par. 4.5.1.10</p>	

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FIR ITEM NO:	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
102	<p>ENGINE INDICATOR PANEL CHECK</p> <p>Gages:</p> <p>Water Temperature _____</p> <p>Engine Oil Pressure _____</p> <p>Fuel Level Indicator _____</p> <p>Transmission Oil Pressure _____</p> <p>Transmission Oil Temperature _____</p> <p>Battery-Generator Indicator _____</p> <p>Par. 3.5.2</p>	VISUAL AND FUNCTIONAL	
103	<p>ACCESSORY CONTROL BOX CHECK</p> <p>Heat Selector Switch:</p> <p>Low _____</p> <p>Off _____</p> <p>High _____</p> <p>Heat Emergency Switch _____</p> <p>Ventilation Blower Switch:</p> <p>Intake _____</p> <p>Off _____</p> <p>Exhaust _____</p> <p>Par. 3.4.4, 3.4.10.4 &amp; 3.4.10.5</p>	<p>VISUAL AND FUNCTIONAL</p> <p>Par. 4.5.1.11 Par. 4.5.1.12</p>	
104	<p>CONTROLS LIGHT SWITCH CHECK</p> <p>Parking Brake Warning Switch _____</p> <p>Stop Light Switch _____</p> <p>Dimmer Switch _____</p> <p>Par. 3.4.10.2</p>	<p>VISUAL AND FUNCTIONAL</p> <p>Par. 4.5.1.9</p>	
105	<p>DOME LIGHT ASSEMBLY CHECK (DRIVER'S)</p> <p>Operation _____</p> <p>Par. 3.4.10.2</p>	<p>VISUAL AND FUNCTIONAL</p> <p>Par. 4.5.1.9</p>	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
106	<div>ADJUSTMENT MECHANISM CHECK</div> <div><div>ADJUSTMENT</div><div>ADJUSTMENT RETENTION</div></div> <div>Acceleration Brake Shift Steering Voltage</div> <div>_____</div> <div>_____</div> <div>_____</div> <div>_____</div> <div>_____</div> <div>Faulty vehicle and/or assembly operation caused by loss of adjustment retention shall be readjusted and retested to prove operation and retention conformance.</div> <div>Par. 3.4.6 &amp; 3.4.10.1</div>	FUNCTIONAL        Par. 4.5.1.4 Par. 4.5.1.8	
106A	<div>VOLTAGE CHECK</div> <div>Voltage (28.0 ± 0.7 volts dc)</div> <div>_____</div> <div>Par. 3.4.10.1</div>	MEASURE   Par. 4.5.1.8	
106B	<div>COMMUNICATIONS EQUIPMENT ELECTRICAL SERVICE CHECK</div> <div>Voltage (24 volts dc nominal)</div> <div>_____</div> <div>Par. 3.4.10.6</div>	MEASURE   Par. 4.5.3.4	
106C	<div>COMMUNICATIONS EQUIPMENT CONTINUITY CHECK</div> <div>Continuity: Communications System</div> <div>_____</div> <div>Par. 3.4.10.6</div>	FUNCTIONAL   Par. 4.5.1.13	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
	<p><b>POWER TRAIN AND ASSOCIATED CONTROLS</b></p> <p>The vehicle shall be operated throughout all gear and speed ranges and the power train and associated controls checked for capabilities to control, stop, and hold vehicle when controls are applied.</p>	Par. 4.5.1.15	
107	<p><b>ENGINE PERFORMANCE CHECK</b></p> <p>Acceleration _____</p> <p>Deceleration _____</p> <p>Sustained Speeds _____</p> <p>Idle _____</p> <p>Par. 3.4.4 &amp; 3.4.5</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.3</p>	
108	<p><b>TRANSMISSION PERFORMANCE CHECK</b></p> <p>Acceleration _____</p> <p>Deceleration _____</p> <p>Sustained Speeds _____</p> <p>Idle _____</p> <p>Par. 3.4.4</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.3</p>	
109	<p><b>REVERSE OPERATION CHECK</b></p> <p>Shift Control _____</p> <p>Brake Affect _____</p> <p>Engine Operation _____</p> <p>Transmission Operation _____</p> <p>Par. 3.4.4</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.3</p>	
110	<p><b>SERVICE BRAKE OPERATION CHECK</b></p> <p>Operation:</p> <p>Chatterfree _____</p> <p>No Linkage Binding _____</p> <p>No Grabbing _____</p> <p>Par. 3.4.4</p>	<p>AUDITORY AND FUNCTIONAL</p> <p>Par. 4.5.1.3</p>	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.																																				
111	STEERING OPERATION CHECK  Operation: Chatterfree _____ No Linkage Binding _____ No Grabbing _____  Par. 3.4.4	AUDITORY AND FUNCTIONAL  Par. 4.5.1.3																																					
112	SUSPENSION SYSTEM CHECK  <table><tr><td></td><td>RIGHT</td><td>LEFT</td></tr><tr><td>Track</td><td>_____</td><td>_____</td></tr><tr><td>Roadwheels</td><td>_____</td><td>_____</td></tr><tr><td>Idler Wheels</td><td>_____</td><td>_____</td></tr><tr><td>Final Drives</td><td>_____</td><td>_____</td></tr><tr><td>Shock Absorbers</td><td>_____</td><td>_____</td></tr><tr><td>Arm and Hubs</td><td>_____</td><td>_____</td></tr><tr><td>Track Adjusters</td><td>_____</td><td>_____</td></tr><tr><td>Track Tension</td><td>_____</td><td>_____</td></tr><tr><td>Torque</td><td>_____</td><td>_____</td></tr><tr><td>Lubricant Leaks</td><td>_____</td><td>_____</td></tr><tr><td>Overheating</td><td>_____</td><td>_____</td></tr></table>		RIGHT	LEFT	Track	_____	_____	Roadwheels	_____	_____	Idler Wheels	_____	_____	Final Drives	_____	_____	Shock Absorbers	_____	_____	Arm and Hubs	_____	_____	Track Adjusters	_____	_____	Track Tension	_____	_____	Torque	_____	_____	Lubricant Leaks	_____	_____	Overheating	_____	_____	VISUAL AND FUNCTIONAL	
	RIGHT	LEFT																																					
Track	_____	_____																																					
Roadwheels	_____	_____																																					
Idler Wheels	_____	_____																																					
Final Drives	_____	_____																																					
Shock Absorbers	_____	_____																																					
Arm and Hubs	_____	_____																																					
Track Adjusters	_____	_____																																					
Track Tension	_____	_____																																					
Torque	_____	_____																																					
Lubricant Leaks	_____	_____																																					
Overheating	_____	_____																																					
113	THIS SPACE NOT USED.																																						
114	ENGINE COMPARTMENT CHECK  Engine Oil Level _____ Transmission Oil Level _____ Radiator Coolant Level _____ Leaks: Fuel _____ Lubricant _____ Coolant _____	VISUAL																																					

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
115	<b>FASTENERS AND LOCKS CHECK</b>  Positive Locking _____  Par. 3.4.7	<b>FUNCTIONAL AND TACTILE</b>  Par. 4.5.1.5	
116	<b>ACCELERATION CHECK</b>  From a standing start through 300 ft (91.44 m) in seconds. _____  Req'd: Not more than 15 seconds.  Par. 3.6.6	<b>MEASURE</b>  Par. 4.5.1.17	
117	<b>SPEED CHECK (WITHOUT TOWED LOAD)</b>  Maximum Speed                      mph (km/h) _____ Req'd: Not less than 35.0 mph (56.3 km/h). Drift _____ Req'd: Not more than 2 ft in 100 ft (0.61 m in 30.48 m) at a speed rate from 25.0 mph (40.2 km/h) to maximum speed. Sustained Speed: 30.0 mph (48.3 km/h) _____ 2.5 mph (4.0 km/h) (Lowest Gear) _____  Par. 3.6.5.1	<b>MEASURE AND FUNCTIONAL</b>  Par. 4.5.1.16	
118	<b>STOPPING DISTANCE CHECK</b>  From point of brake application at 20 mph (32.2 km/h).                      ft (m) _____ Req'd: Within 35 ft (10.67 m).  Drift during stopping less than 3 ft (0.91 m) to right or left. _____  Par. 3.6.8.1	<b>MEASURE</b>  Par. 4.5.1.19	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
119	<div>TURNING CHECK</div> <div><div>360° turns in a geared steer within a 100-ft- (30.48-m-) diameter circle.</div><div>360° turns with clutched brake applied within a 35-ft- (10.67-m-) diameter circle.</div><div>Par. 3.6.9</div></div> <div><div>RIGHT</div><div>LEFT</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div></div>	<div>FUNCTIONAL</div> <div>Par. 4.5.1.21</div>	
120	<div>60%-GRADE CHECK</div> <div><div>Forward Position:</div><div>Climb</div><div>Service Brake Hold</div><div>Parking Brake Hold</div><div>Engine Operation</div><div>Engine Restart</div><div>Oil Pressure</div><div>Oil Temperature</div><div>Fuel System Operation</div><div>Reverse Position:</div><div>Climb</div><div>Service Brake Hold</div><div>Parking Brake Hold</div><div>Engine Operation</div><div>Engine Restart</div><div>Oil Pressure</div><div>Oil Temperature</div><div>Fuel System Operation</div><div>Par. 3.4.8, 3.5.2, 3.6.7.1, 3.6.8.2 &amp; 3.6.11</div></div> <div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div><div>_____</div></div>	<div>VISUAL AND FUNCTIONAL</div> <div>Par. 4.5.1.18 Par. 4.5.1.20 Par. 4.5.3.11</div>	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
121	<p>40%-SLOPE CHECK</p> <p>Right Side Up:</p> <p>Engine Operation _____</p> <p>Engine Restart _____</p> <p>Oil Pressure _____</p> <p>Oil Temperature _____</p> <p>Left Side Up:</p> <p>Engine Operation _____</p> <p>Engine Restart _____</p> <p>Oil Pressure _____</p> <p>Oil Temperature _____</p> <p>Par. 3.4.8, 3.5.2, 3.6.7 &amp; 3.6.7.1</p>	<p>VISUAL AND FUNCTIONAL</p> <p>Par. 4.5.1.18 Par. 4.5.3.10</p>	
122	<p>FORDING CHECK</p> <p>Engine Operation _____</p> <p>Engine Restart _____</p> <p>Accessories Function _____</p> <p>Leaks in Hull _____</p> <p>Par. 3.4.1.1 &amp; 3.6.10.1</p> <p>NOTE: Water level shall not exceed 1 inch (25.4 mm) in 15 minutes.</p>	<p>VISUAL AND FUNCTIONAL</p> <p>Par. 4.5.1.22.1</p>	
122A	<p>LEAKAGE CHECK</p> <p>Hull _____</p> <p>Hatches _____</p> <p>Doors _____</p> <p>Seals _____</p> <p>Sub Floor Drains (M109A5) _____</p> <p>Par. 3.4.1.2 &amp; 3.4.1.3</p> <p>NOTE: No leakage allowed, when subjected to 5 minutes of continuous water spray from low- pressure hose.</p>	<p>VISUAL</p> <p>Par. 4.5.1.2</p>	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.												
122B	<p>NBC FILTRATION (M109A5)</p> <p>Hoses:</p> <p>Leaks _____</p> <p>Splits _____</p> <p>Abrasions _____</p> <p>Protective Masks:</p> <p>Airflow _____</p> <p>Par. 3.6.23.1</p> <p>NOTE: Water or debris in the air distribution system is unacceptable.</p> <p>Heaters:</p> <p>Indicator Light _____</p> <p>Air temperature shall be a minimum of 10°F (5.6°C) greater than ambient temperature within 5 minutes after heater switches are turned "ON." _____</p> <p>Par. 3.6.23.2</p>	<p>VISUAL AND FUNCTIONAL</p> <p>CALIBRATED TESTER</p> <p>Par. 4.5.3.16</p> <p>VISUAL AND MEASURE</p> <p>Par. 4.5.3.17</p>													
	CAB AND WEAPON PERFORMANCE TEST														
123	<p>BORESIGHT RETENTION CHECK</p> <table><tr><td></td><td>BEFORE</td><td>AFTER</td></tr><tr><td>Telescope Setting:</td><td></td><td></td></tr><tr><td>Panoramic</td><td>_____</td><td>_____</td></tr><tr><td>Direct Sight</td><td>_____</td><td>_____</td></tr></table> <p>Prior to 8-mile (12.9-km) road test, the lines of sight shall be centered on a target and elevation and azimuth position noted. After 8-mile (12.9-km) road test, the vehicle shall be returned to proper aiming point and boresight retention checked for conformance. Original settings shall be maintained within ± 0.3 mil in azimuth and elevation for both units.</p> <p>Par. 3.6.17.8</p>		BEFORE	AFTER	Telescope Setting:			Panoramic	_____	_____	Direct Sight	_____	_____	<p>MEASURE</p> <p>Par. 4.5.1.25.8</p>	
	BEFORE	AFTER													
Telescope Setting:															
Panoramic	_____	_____													
Direct Sight	_____	_____													

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
124	<p>ELEVATION AND DEPRESSION TIME LIMITS CHECK.</p> <p>Elevation Sec. _____ Depression Sec. _____</p> <p>Req'd: Not more than 20 seconds from zero mil elevation to the upper stop and from the upper stop to zero mil elevation.</p> <p>Par. 3.6.15.7</p>	<p>MEASURE</p> <p>Par. 4.5.1.24.5</p>	
125	<p>ELEVATION AND DEPRESSION LIMITS CHECK</p> <p>Weapon range of movement from -2° depression to +74° elevation throughout 360° of cab traverse.</p> <p>CLOCK-WISE (CW) _____ COUNTER-CLOCKWISE (CCW) _____</p> <p>Par. 3.6.15.6</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.24.5</p>	
126	<p>CAB TRAVERSING SPEEDS CHECK</p> <p>Controllable in traverse at all speeds from 0.5 to 320.0 mils/sec. Tracking speed shall range from not less than 1.0 mil/sec. to not more than 65.2 mils/sec. The cab speed at maximum velocity shall not be less than 266.7 mils/sec.</p> <p>Not more than 24 sec./rev left. _____ Not more than 24 sec./rev right. _____</p> <p>NOTE: Requirements apply to gunner's power control only.</p> <p>Par. 3.6.14.2</p>	<p>MEASURE AND FUNCTIONAL</p> <p>Par. 4.5.1.23.1</p>	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
127	<p>CAB SLOPE OPERATION CHECK</p> <p style="text-align: center;">C W                      C C W</p> <p>360° Rotation</p> <p>Manual Control                      _____</p> <p>Power Controls                      _____</p> <p>NOTE: With the vehicle pitched upward 3° and canted upward 3° and gun tube at zero elevation in relation to the hull, both power and manual controls of the control system shall be able to start at any azimuth and rotate the cab 360° in both directions.</p> <p>Par. 3.6.14.5</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.23.4</p>	
128	<p>HYDRAULIC SYSTEM LEAKAGE CHECK</p> <p>No Leakage                      _____</p> <p>The cab hydraulic system shall be checked after conducting performance tests to determine that the system is free from leakage.</p> <p>Par. 3.4.9</p>	<p>VISUAL</p> <p>Par. 4.5.1.7</p>	
129	<p>SLIP RING CONTINUITY CHECK</p> <p>Continuity: Slip Ring                      _____</p> <p>Par. 3.4.10.7</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.13</p>	

## MIL-H-45374E(AR)

# INSTRUCTIONS FOR COMPLETION OF THE FIR FOR VISUAL, DIMENSIONAL, AND PRIMARY FUNCTIONAL EXAMINATION

A. The vehicle shall be subjected to a visual, dimensional, and primary functional examination to determine conformance to the applicable drawings and MIL-H-45374E(AR). Inspection and tests need not be conducted in the order in which they are referenced in the FIR; however, all inspection characteristics in Areas 2 thru 8 must be completed prior to road test.

B. Conformance or non-conformance of items and items not applicable will be indicated by the appropriate symbol in the space provided. Specific values will be used only where specified or as agreed by Government and Contractor representatives.

C. Deficiencies disclosed during this inspection will be delineated on the deficiency sheet(s) and will contain sufficient description to enable the Government inspector and the Contractor's representative to classify the deficiency in accordance with the classification of defects in table V of MIL-H-45374E(AR). The deficiencies will be identified with the pertinent FIR Item No., not with a sequential listing of entry. All deficiency sheets used in the inspection of the vehicle will be attached to the FIR to become a permanent part of the FIR.

D. The following characteristics are common to most items and are to be considered as part of each where applicable. They are defined in general in this section to eliminate their repetition; however, they must be reviewed visually and/or functionally in each item and delineated on the deficiency sheet(s) when found deficient. Reference to these requirements will be made by inserting the applicable paragraph number(s) in the Method of Inspection block.

- (1) **Mounting:** Completeness of assembly with all mounting devices and hardware as required per installation drawing. Any evidence of parts being incomplete and/or improperly secured will be cause for rejection.
- (2) **Connections:** All wiring harnesses, water, fuel, hydraulic, and air lines, operating linkages (cable or shaft), and conduits must be properly routed, secured, and attached as per their respective installation drawings. Sufficient clearance between these and adjacent parts must be maintained to insure that there can be no interference. Physically handle the item to verify that it is secure.
- (3) **Operation and Locking Action:** Component or assembly items which require movement and/or positioning shall be physically manipulated as required to prove operational acceptance. For primary functional testing, actuate proper switches or control devices as required and note response through warning or indicator lights or actual operation of the unit being tested.

E. Defective vehicles (complete or in-process) shall be returned to the proper source for repair or replacement of defective parts. Corrective action taken will be noted in the proper column of the deficiency sheet(s). The deficiency will be reinspected for conformance to requirements and/or repair procedures.



## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
203	FINAL DRIVE SPROCKET AND HUB  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span><span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Mounting</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Torque</span><span>_____</span><span>_____</span> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	
204	SHOCK ABSORBER ASSEMBLY AND BRACKET ASSEMBLY BUMP STOP  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span><span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Mounting</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Torque</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Cushion</span><span>_____</span><span>_____</span> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	
205	ROADWHEEL ARM AND HUB ASSEMBLY SUSPENSION COMPLETE  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span><span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Mounting</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Torque</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Torsion Bar Plugs</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Fittings</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Lubricated</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-around;"> <span>Window Condition</span><span>_____</span><span>_____</span> </div> <div style="display: flex; justify-content: space-between;"> <span>Roadwheel</span> <span>#1</span><span>#2</span><span>#3</span><span>#4</span><span>#5</span><span>#6</span><span>#7</span> </div> <div style="display: flex; justify-content: space-between;"> <span>Right</span> <span>—</span><span>—</span><span>—</span><span>—</span><span>—</span><span>—</span><span>—</span> </div> <div style="display: flex; justify-content: space-between;"> <span>Left</span> <span>—</span><span>—</span><span>—</span><span>—</span><span>—</span><span>—</span><span>—</span> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
206	ROADWHEEL ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span> <span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <div>Mounting</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Torque</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Roadwheel</div> <div>#1</div> <div>#2</div> <div>#3</div> <div>#4</div> <div>#5</div> <div>#6</div> <div>#7</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Right</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Left</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> <div>—</div> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	
207	IDLER ARM AND HOUSING ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span> <span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <div>Mounting</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Torque</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Lube Fittings</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Lubricated</div> <div>_____</div> <div>_____</div> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	
208	IDLER WHEEL ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span> <span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <div>Mounting</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Torque</div> <div>_____</div> <div>_____</div> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	
209	HYDRAULIC TRACK ADJUSTER ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <span>RIGHT</span> <span>LEFT</span> </div> <div style="display: flex; justify-content: space-around;"> <div>Mounting</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Torque</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Bleeder Plug</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Filler Plug</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Pressure Fitting</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-around;"> <div>Leaks</div> <div>_____</div> <div>_____</div> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	

## MIL-H-45374E(AR)

## ENGINE COMPARTMENT

SECTION   B  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   3  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
	BEFORE ENGINE INSTALLATION		
301	<p>FUEL TANK ASSEMBLY AND FUEL LINES</p> <p>Mounting:</p> <p>Upper Fuel Tank _____</p> <p>Lower Fuel Tank _____</p> <p>Hose Connections _____</p> <p>Leaks _____</p> <p>The fuel system shall be pressurized with dry air at a pressure of 3-4 psi (21-28 kPa) for a minimum of 5 minutes and the fittings, lines, and fuel tank seals checked for leaks by applying soapy water or equivalent.</p> <p>Dwgs.: 10925757, 12260292 &amp; 12268119</p> <p>Par. 3.4.8.1 &amp; 3.4.8.2</p>	<p>FIR Par. D(1) (2)</p> <p>PRESSURE TEST</p> <p>Par. 4.5.1.6</p>	
302	<p>FUEL TANK HEAT SHIELDS, INSTALLATION</p> <p>Mounting _____</p> <p>Condition _____</p> <p>Dwg. 11636316</p>	<p>FIR Par. D(1)</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
303	BILGE PUMP ASSEMBLY, INSTALLATION  Mounting _____ Hose Connections _____ Electrical Connections _____ Outlet _____  Dwg. 10921038	FIR Par. D(1) (2)	
304	FIRE EXTINGUISHER (FIXED), INSTALLATION  Discharge Head Mounting _____ Tube Connections _____ Routing _____ Secure _____  Dwg. 10922732	FIR Par. D(1)	
305	ENGINE MOUNTING BASE ASSEMBLY  Mounting _____ Torque _____  Dwg.: 12268501 & 7527607	FIR Par. D(1)	
306	HARNESS ASSEMBLY  Routing _____ Secured _____  M109A2 Dwg.: 12260257 & 10922337 M109A5 Dwg.: 12389512 & 10922337	FIR Par. D(2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
	AFTER ENGINE INSTALLATION		
307	POWER PLANT INSTALLATION  Engine and Transmission Mounting _____ Fuel Line Connections _____ Electrical Connections _____ Oil Lines Connections _____  M109A2 Dwgs.: 12268103, 10913330, 12268119 & 12268501 M109A5 Dwgs.: 12389515, 10913330, 12268119 & 12268501	FIR Par. D(1) (2)	
308	UNIVERSAL JOINT ASSEMBLY  Mounting _____ Torque _____ Lubrication _____ Lockwire _____  Dwgs.: 10898058 & 7404047	FIR Par. D(1)	
309	REGULATOR ASSEMBLY—VOLTAGE  Mounting _____ Electrical _____  M109A2 Dwg. 12260259 M109A5 Dwg. 12389517	FIR Par. D(1) (2)	
310	MASTER RELAY ASSEMBLY (10894808)  Mounting _____ Electrical Connections _____  M109A2 Dwg. 12260259 M109A5 Dwg. 12389517	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
311	ALTERNATOR ASSEMBLY  Mounting _____ Electrical Connections _____  M109A2 Dwg. 12268103 M109A5 Dwg. 12389515	FIR Par. D(1) (2)	
312	RECTIFIER  Mounting _____ Electrical Connections _____  M109A2 Dwgs.: 11593625 & 12260259 M109A5 Dwgs.: 12268306 & 12389517	FIR Par. D(1) (2)	
313	SPEEDOMETER SHAFT ASSEMBLY INSTALLATION  Mounting _____ Electrical Connections _____  Dwg. 10919009	FIR Par. D(1) (2)	
314	TACHOMETER SHAFT ASSEMBLY INSTALLATION  Mounting _____ Electrical Connections _____  Dwg. 10919009	FIR Par. D(1) (2)	
315	INSTALLATION, SHIFT CONTROL  Mounting _____ Connections _____ Interference _____ Adjustment _____  Dwg. 10920679	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
316	BRAKE CONTROL, INSTALLATION  Mounting _____ Connections _____ Interference _____ Adjustment _____  Dwg. 10921479	FIR Par. D(1) (2)	
317	INSTALLATION STEERING CONTROL  Mounting _____ Connections _____ Interference _____ Adjustment _____  Dwg. 10920691	FIR Par. D(1) (2)	
318	INSTALLATION, THROTTLE AND ACCELERATOR  Mounting _____ Connections _____ Interference _____ Adjustment _____  Dwg. 10920731	FIR Par. D(1) (2)	
319	ENGINE COOLANT SYSTEM INSTALLATION  Radiator Mounting _____ Surge Tank Mounting _____ Shroud Mounting _____ Hose Connections _____  Dwg. 12260279	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
320	EXHAUST INSTALLATION, ENGINE  Mounting _____ Insulation Mounting _____ Lockwire _____  Dwg. 12260212	FIR Par. D(1)	

## MIL-H-45374E(AR)

## HULL EXTERIOR

SECTION   B  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   4  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
401	INSTALLATION, HEADLIGHTS  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Electrical Connections Lens Condition           </div> <div style="text-align: center;">             RIGHT _____ _____ _____           </div> <div style="text-align: center;">             LEFT _____ _____ _____           </div> </div> Dwg. 10922311	FIR Par. D(1) (2)	
402	FENDER ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <div>             Mounting: Front Rear           </div> <div style="text-align: center;">             RIGHT _____ _____           </div> <div style="text-align: center;">             LEFT _____ _____           </div> </div> Dwg. 10930741	FIR Par. D(1)	
403	INSTALLATION, SPADE  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Pedal Latch Secure Operational Fit           </div> <div style="text-align: center;">             RIGHT _____ _____ _____ _____ _____           </div> <div style="text-align: center;">             LEFT _____ _____ _____ _____ _____           </div> </div> Dwg. 10920734	FIR Par. D(1) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.															
404	<p>RATIONS STOWAGE BOX ASSEMBLY</p> <table><tr><td></td><td>RIGHT</td><td>LEFT</td></tr><tr><td>Mounting</td><td>_____</td><td>_____</td></tr><tr><td>Seal</td><td>_____</td><td>_____</td></tr><tr><td>Cover Operation</td><td>_____</td><td>_____</td></tr><tr><td>Locking Action</td><td>_____</td><td>_____</td></tr></table> <p>M109A2 Dwgs.: 12268143 &amp; 11643994 M109A5 Dwgs.: 12389513 &amp; 11643994</p>		RIGHT	LEFT	Mounting	_____	_____	Seal	_____	_____	Cover Operation	_____	_____	Locking Action	_____	_____	<p>FIR Par. D(1) (3)</p>	
	RIGHT	LEFT																
Mounting	_____	_____																
Seal	_____	_____																
Cover Operation	_____	_____																
Locking Action	_____	_____																
405	<p>DOOR AND TOWING PINTLE INSTALLATION, HULL REAR</p> <table><tr><td>Mounting</td><td>_____</td></tr><tr><td>Seal</td><td>_____</td></tr><tr><td>Operation</td><td>_____</td></tr><tr><td>Locking Action</td><td>_____</td></tr><tr><td>Hold-Open Latch Operation</td><td>_____</td></tr><tr><td>Pintle Mounting and Operation</td><td>_____</td></tr><tr><td>Telephone Cable Reel and Guard</td><td>_____</td></tr></table> <p>Dwgs.: 10921180 &amp; 12268151</p>	Mounting	_____	Seal	_____	Operation	_____	Locking Action	_____	Hold-Open Latch Operation	_____	Pintle Mounting and Operation	_____	Telephone Cable Reel and Guard	_____	<p>FIR Par. D(1) (3)</p>		
Mounting	_____																	
Seal	_____																	
Operation	_____																	
Locking Action	_____																	
Hold-Open Latch Operation	_____																	
Pintle Mounting and Operation	_____																	
Telephone Cable Reel and Guard	_____																	
406	<p>TAILLIGHT ASSEMBLY</p> <table><tr><td>Mounting</td><td>_____</td></tr><tr><td>Lens Condition</td><td>_____</td></tr></table> <p>M109A2 Dwg. 12260257 M109A5 Dwg. 12389512</p>	Mounting	_____	Lens Condition	_____	<p>FIR Par. D(1)</p>												
Mounting	_____																	
Lens Condition	_____																	
407	<p>EXHAUST GRILLE ASSEMBLY</p> <table><tr><td>Mounting:</td><td></td></tr><tr><td>Grille Assembly</td><td>_____</td></tr><tr><td>Exhaust Deflector</td><td>_____</td></tr></table> <p>Dwg. 12260247</p>	Mounting:		Grille Assembly	_____	Exhaust Deflector	_____	<p>FIR Par. D(1)</p>										
Mounting:																		
Grille Assembly	_____																	
Exhaust Deflector	_____																	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
408	RADIATOR FAN ACCESS DOOR ASSEMBLY  Mounting _____ Cap Access Door Mounting _____ Operation _____ Locking Action _____  Dwg. 12260247	FIR Par. D(1) (3)	
409	AIR INTAKE GRILLE ASSEMBLY  Mounting _____ Operation _____ Support Arm Mounting _____ Locking Action _____  Dwg. 12260247	FIR Par. D(1) (3)	
410	ENGINE DIPSTICK ACCESS DOOR ASSEMBLY  Mounting _____ Operation _____ Locking Action _____  Dwg. 12260247	FIR Par. D(1) (3)	
411	BATTERY ACCESS DOOR ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <div></div> <div>UPPER</div> <div>LOWER</div> </div> Mounting _____ Seal _____ Operation _____ Locking Action _____  Dwg. 12260247	FIR Par. D(1) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
412	TRANSMISSION ACCESS DOOR ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Seal Operation Locking Action           </div> <div>             RIGHT _____ _____ _____ _____           </div> <div>             LEFT _____ _____ _____ _____           </div> </div> Dwg. 12260247	FIR Par. D(1) (3)	
413	HATCH INSTALLATION, PERISCOPE COVER AND DRIVER'S  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Door Operation Hold-Open Latch Operation           </div> <div>             _____ _____ _____           </div> </div> Dwg. 12260262	FIR Par. D(1) (3)	
414	INSTALLATION, GUN TRAVEL LOCK  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Lining Secure Hold-Down Clamp           </div> <div>             _____ _____ _____           </div> </div> Dwg. 12012107	FIR Par. D(1) (3)	
415	TRACK ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <div>             Proper Installation Torque Tension           </div> <div>             RIGHT _____ _____ _____           </div> <div>             LEFT _____ _____ _____           </div> </div> Dwg. 12260265	FIR Par. D(1)  TORQUE WRENCH	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
416	<p data-bbox="280 338 764 369">EXTERNAL POWER RECEPTACLE</p> <p data-bbox="305 411 1052 506"> Mounting _____  Electrical Connections _____  Cover Secure _____ </p> <p data-bbox="280 548 781 611"> M109A2 Dwgs.: 11674728 &amp; 12260276  M109A5 Dwgs.: 11682345 &amp; 12389512 </p>	<p data-bbox="1154 405 1276 468">FIR Par. D(1)</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
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## MIL-H-45374E(AR)

## DRIVER'S COMPARTMENT

SECTION   B  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   5  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
501	RELAY ASSEMBLY  Mounting _____ Electrical Connections _____  M109A2 Dwgs.: 12260257 & 7357485 M109A5 Dwgs.: 8762321, 12389512 & 7357485	FIR Par. D(1) (2)	
502	DRIVER'S INSTRUMENT PANEL ASSEMBLY  Mounting _____ Electrical Connections _____ Operation: _____ Switches _____ Indicator Lights _____  M109A2 Dwgs.: 12260257 & 12260289 M109A5 Dwgs.: 12352884 & 12389512	FIR Par. D(1) (2) (3)	
503	PORTABLE INSTRUMENT PANEL ASSEMBLY  Proper Fit _____ Electrical Connections _____  M109A2 Dwgs.: 12260257 & 12260288 M109A5 Dwgs.: 12352999 & 12389512	FIR Par. D(2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
504	CIRCUIT BREAKER ASSEMBLY  Mounting _____ Electrical Connections _____  M109A2 Dwg. 12260257 M109A5 Dwg. 12389512	FIR Par. D(1) (2)	
505	SLAVE RECEPTACLE ASSEMBLY  Mounting _____ Electrical Connections _____ Cover Secure _____  M109A2 Dwgs.: 12260257 & 11674728 M109A5 Dwgs.: 12389512 & 11674728	FIR Par. D(1) (2)	
506	DOME LIGHT ASSEMBLY  Mounting _____ Operation _____  M109A2 Dwg. 12260257 M109A5 Dwg. 12389512	FIR Par. D(1) (2)	
507	DIMMER SWITCH ASSEMBLY  Mounting _____ Electrical Connections _____ Operation _____  M109A2 Dwg. 12260257 M109A5 Dwg. 12389512	FIR Par. D(1) (2) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
508	HARNESS ASSEMBLY  Routing _____ Secured _____  M109A2 Dwgs.: 12260257, 12260287 & 12268104 M109A5 Dwgs.: 12389512, 12260287 & 12268104	FIR Par. D(2)	
509	INSTALLATION, AIR CLEANER  Mounting _____ Electrical Connections _____  Dwgs.: 12260267 & 12260272	FIR Par. D(1) (2)	
510	INSTALLATION, DRIVER'S SEAT  Mounting _____ Positioning: _____ Vertical _____ Horizontal _____ Occupancy _____ Stowage _____ Cover Condition _____  Dwg. 10897974	FIR Par. D(1) (3)	
511	STOPLIGHT SWITCH ASSEMBLY  Mounting _____ Electrical Connections _____ Operation _____  Dwg. 10921479	FIR Par. D(1) (2) (3)	

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## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
515	INSTALLATION, SHIFT CONTROL  Mounting _____ Electrical Connections: _____ Neutral Safety Switch _____ Operation _____ Linkage: _____ Connections _____ Interference _____ Adjustment _____ Operation _____  Dwg. 10920679	FIR Par. D(1) (2) (3)	
516	HATCH INSTALLATION, PERISCOPE COVER AND DRIVER'S  Mounting _____ Seal _____ Operation _____ Cover Stop _____ Locking Action _____  Dwg. 12260262	FIR Par. D(1) (3)	
517	FIRE EXTINGUISHER FIXED DISCHARGE HANDLE (INTERIOR)  Mounting _____ Linkage: _____ Connection _____ Interference _____ Adjustment (See Note) _____ Operation (See Note) _____  NOTE: Operation and adjustment of fire extinguisher handle for acceptance testing should be made only after ascertaining that attachment to the fire bottle <u>has not been</u> completed.  Dwg. 10922732	FIR Par. D(1) (2) (3)	

MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
518	<p data-bbox="300 325 933 378">FUEL SHUT-OFF CONTROL INSTALLATION</p> <p data-bbox="316 388 1063 619">           Mounting _____            Linkage: _____              Connection _____              Interference _____              Adjustment _____              Operation _____         </p> <p data-bbox="284 630 487 672">Dwg. 10922245</p>	<p data-bbox="1128 430 1339 504">FIR Par. D(1) (2) (3)</p>	

## MIL-H-45374E(AR)

## CREW COMPARTMENT

SECTION   C  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   6  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
601	<p>ACCESSORY CONTROL BOX ASSEMBLY</p> <p>Mounting _____</p> <p>Electrical Connections _____</p> <p>Operation _____</p> <p>M109A2 Dwgs.: 12260257 &amp; 12268109</p> <p>M109A5 Dwgs.: 12389512 &amp; 12268582</p>	<p>FIR</p> <p>Par. D(1) (2) (3)</p>	
602	<p>INSTALLATION, PERSONNEL HEATER ASSEMBLY &amp; AIR DUCTS</p> <p>Mounting:</p> <p>Personnel Heater _____</p> <p>Fuel Pump _____</p> <p>Strainer _____</p> <p>Connections:</p> <p>Electrical _____</p> <p>Fuel Lines _____</p> <p>Leaks _____</p> <p>Operation _____</p> <p>Air Ducts Mounting _____</p> <p>M109A2 Dwgs.: 10955480 &amp; 10920688</p> <p>M109A5 Dwgs.: 11669489-1, 11669490-1 &amp; 10920688</p>	<p>FIR</p> <p>Par. D(1) (2) (3)</p>	
603	<p>FIRE EXTINGUISHER</p> <p>Mounting _____</p> <p>Locking Action _____</p> <p>M109A2 Dwg. 12268143</p> <p>M109A5 Dwg. 12389513</p>	<p>FIR</p> <p>Par. D(1) (3)</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
604	INSTALLATION, AIR CLEANER AND BLOWER ASSEMBLY  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Electrical Connections Hoses Secure Operation           </div> <div style="text-align: center;">             RIGHT _____ _____ _____ _____           </div> <div style="text-align: center;">             LEFT _____ _____ _____ _____           </div> </div> Dwgs.: 10905010 & 12260272	FIR Par. D(1) (2) (3)	
605	NBC CONTROL BOX ASSEMBLY (M109A5)  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Electrical Connections Operation           </div> <div style="text-align: center;">             _____ _____ _____           </div> </div> Dwgs.: 9399004 & 9399008	FIR Par. D(1) (2) (3)	
606	FIRE EXTINGUISHER (FIXED) INSTALLATION  <div style="display: flex; justify-content: space-around;"> <div>             Mounting Linkage:   Connections   Routing (Conduit)   Interference Bottles Secured Bottles Sealed Data Tag Complete           </div> <div style="text-align: center;">             _____ _____ _____ _____ _____ _____ _____ _____           </div> </div> Dwg. 10922732	FIR Par. D(1) (2) (3)	
607	INSTALLATION, AMMUNITION RACKS (HULL)  <div style="display: flex; justify-content: space-around;"> <div>             Mounting:   Front   Rear           </div> <div style="text-align: center;">             RIGHT _____ _____           </div> <div style="text-align: center;">             LEFT _____ _____           </div> </div> Dwg. 11665382	FIR Par. D(1)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
608	THIS SPACE NOT USED.		
609	<p>WORKMANSHIP (HULL ASSEMBLY, COMPLETE)</p> <p>Burrs and Sharp Edges _____</p> <p>Miscellaneous components not specifically referenced:</p> <p>    Proper Installation _____</p> <p>    Missing _____</p> <p>Interference _____</p> <p>Torque _____</p> <p>Damage _____</p> <p>Paint and overspray on bearing and sealing surfaces _____</p> <p>Electrical Wire Chafing _____</p> <p>Hydraulic Tube Chafing _____</p> <p>NOTE: Use of this FIR item number should be limited to those characteristics considered general to complete the Hull Assembly and not referenced in specific installations. Noted deficiencies should contain sufficient information for positive identification.</p>	VISUAL AND AS REQUIRED	

## MIL-H-45374E(AR)

## CAB ASSEMBLY

SECTION   C  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   7  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
	PRE-ASSEMBLY LINE		
701	<p>CAB ASSEMBLY (MACHINING &amp; WELDING)</p> <p>Welding _____</p> <p>Weld Repair _____</p> <p>Stowage Brackets and Pads _____</p> <p>Finished Surfaces _____</p> <p>Tapped Holes _____</p> <p>Chemical Conversions Coating _____</p> <p>The cab assembly shall be examined for proper welding and weld repair, location of brackets and pads, possible damage to finished surfaces, tapped holes, proper application of coating, and for any other defects detrimental to acceptance.</p> <p>M109A2 Dwgs.: 12012103 &amp; 12012104</p> <p>M109A5 Dwgs.: 12940802 &amp; 12940809</p> <p>Par. 3.4.11</p>	<p>VISUAL</p> <p>Par. 4.5.1.14</p>	
	CAB EXTERIOR		
702	<p>INSTALLATION CAB SIDE DOOR ASSEMBLY (EXTERIOR)</p> <p>Mounting                      RIGHT                      LEFT</p> <p>   _____                      _____</p> <p>Dwgs.: 12012125(-1 &amp; -2)</p>	<p>FIR</p> <p>Par. D(1)</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
703	DOOR, INSTALLATION, BUSTLE (EXTERIOR)  <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">             RIGHT              Mounting _____              Fit _____              Hold-Open Wire, Cable Snap _____           </div> <div style="text-align: center;">             LEFT              _____              _____              _____           </div> </div> Dwgs.: 12012283, 12012295, 12012300 & 12012321	FIR Par. D(1) (3)	
704	THIS SPACE NOT USED.		
705	COMMANDER'S CUPOLA COVER ASSEMBLY (EXTERIOR)  Mounting: Hinge and Spring _____ Hold-Open Latch _____ Pintle Lock Operation _____  M109A2 Dwgs.: 12012102 & 11593719 M109A5 Dwgs.: 12940808 & 11593719	FIR Par. D(1) (3)	
706	INSTALLATION, GUNNER'S ESCAPE HATCH DOOR ASSEMBLY (EXTERIOR)  Mounting _____  M109A2 Dwgs.: 12012102 & 11594249 M109A5 Dwgs.: 12940808 & 11594249	FIR Par. D(1)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
707	THIS SPACE NOT USED.		
708	WEATHER COVER INSTALLATION  Proper Tension, 4 CCW Turns _____ Properly Secured _____ No Tears, Cracks, or Damage to Curtain _____  Dwgs.: 12012150 & 12012166	FIR Par. D(1) (3)	
709	ELEVATING MECHANISM CONTROL ASSEMBLY  Mounting _____ Oil Line Connections _____ Leaks _____  M109A2 Dwgs.: 12012148 & 10956157 M109A5 Dwgs.: 12940803 & 10956157	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
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## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
710	<p>ACCUMULATOR ASSEMBLY, MANUAL CONTROL</p> <p>Mounting _____</p> <p>Oil Line Connections _____</p> <p>Leaks _____</p> <p>M109A2 Dwgs.: 12012148 &amp; 7974982</p> <p>M109A5 Dwgs.: 12940803 &amp; 7974982</p>	FIR Par. D(1) (2)	
711	<p>SELECTOR VALVE ASSEMBLY</p> <p>Mounting _____</p> <p>Connections: _____</p> <p>Oil Lines _____</p> <p>Electrical _____</p> <p>Leaks _____</p> <p>M109A2 Dwgs.: 12012148 &amp; 10921566</p> <p>M109A5 Dwgs.: 12940803 &amp; 10921566</p>	FIR Par. D(1) (2)	
712	<p>PRESSURE SWITCH ASSEMBLY</p> <p>Mounting _____</p> <p>Connections: _____</p> <p>Oil Lines _____</p> <p>Electrical _____</p> <p>Leaks _____</p> <p>M109A2 Dwgs.: 12012148 &amp; 11590942</p> <p>M109A5 Dwgs.: 12940803 &amp; 11590942</p>	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
713	<p>ACCUMULATOR ASSEMBLY, POWER PACK</p> <p>Mounting: _____</p> <p>Accumulator _____</p> <p>Oil Level Gage _____</p> <p>Pressure Gage _____</p> <p>Oil Line Connections _____</p> <p>Leaks _____</p> <p>M109A2 Dwgs.: 12012148 &amp; 10905300</p> <p>M109A5 Dwgs.: 12010724, 12940803 &amp; 10905300</p>	FIR Par. D(1) (2)	
714	<p>POWER PACK ASSEMBLY MAIN ACCUMULATOR ASSEMBLY</p> <p>Mounting _____</p> <p>Connections: _____</p> <p>Oil Lines _____</p> <p>Electrical _____</p> <p>Leaks _____</p> <p>M109A2 Dwgs.: 12012148 &amp; 12010620</p> <p>M109A5 Dwgs.: 12940803 &amp; 12010620</p>	FIR Par. D(1) (2)  TORQUE WRENCH	
715	<p>EQUILIBRATED ELEVATING MECHANISM ASSEMBLY</p> <p>Mounting _____</p> <p>Oil Line Connections _____</p> <p>Leaks _____</p> <p>M109A2 Dwgs.: 11636282 &amp; 12012148</p> <p>M109A5 Dwgs.: 12576115 &amp; 12940803</p>	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
716	HYDRAULIC LINES  Mounting _____ Routing _____ Secure _____ Leaks _____  M109A2 Dwg. 12012148 M109A5 Dwg. 12940803	FIR Par. D(1) (2)	
717	THIS SPACE NOT USED.		
718	THIS SPACE NOT USED.		
719	FLASHLIGHT HOLDER ASSEMBLY  Mounting _____  Dwg. 12012117	FIR Par. D(1)	
720	DOME LIGHT ASSEMBLY  Mounting _____ Electrical Connection _____ Operation _____  M109A2 Dwg. 12012105 M109A5 Dwg. 12940807	FIR Par. D(1) (2) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
721	<p>PERISCOPE (SPARE) BOX ASSEMBLY</p> <p>Mounting _____</p> <p>Cover Operation _____</p> <p>Pads Secure _____</p> <p>Locking Action _____</p> <p>M109A2 Dwg. 12012117</p> <p>M109A5 Dwg. 12940804</p>	FIR Par. D(1) (3)	
722	THIS SPACE NOT USED.		
723	<p>CAB SIDE DOOR ASSEMBLY (INTERIOR)</p> <p>Seal RIGHT LEFT</p> <p>Operation _____</p> <p>Locking Action _____</p> <p>Open-Position Lock _____</p> <p>Dwgs.: 12012125(-1 &amp; -2)</p>	FIR Par. D(1) (3)	
724	<p>STOWAGE BOX ASSEMBLY</p> <p>Mounting RIGHT LEFT</p> <p>Cover Operation _____</p> <p>Locking Action _____</p> <p>M109A2 Dwg. 12012117</p> <p>M109A5 Dwg. 12940804</p>	FIR Par. D(1) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
725	<p>POWER RELAY BOX ASSEMBLY</p> <p>Mounting _____ Electrical Connections _____</p> <p>M109A2 Dwg. 12012105 M109A5 Dwgs.: 9363711 &amp; 12940807</p>	FIR Par. D(1) (2)	
726	<p>INSTALLATION, COMMANDER'S SEAT ASSEMBLY</p> <p>Mounting _____ Positioning: _____ Occupancy _____ Stowage _____</p> <p>Dwg. 10925649</p>	FIR Par. D(1) (3)	
727	<p>INSTALLATION, PROJECTILE STOWAGE RACK</p> <p>Mounting _____ Retainer Locking Action _____ Pads _____</p> <p>Dwgs.: 11829140 &amp; 12012322</p>	FIR Par. D(1) (3)	
728	<p>TELESCOPE STOWAGE BOX ASSEMBLY</p> <p>Mounting _____ Cover Operation _____ Pads Secure _____ Locking Action _____</p> <p>M109A2 Dwg. 12012117</p>	FIR Par. D(1) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
729	TRAVERSE MECHANISM ASSEMBLY  Mounting _____ Connections: _____ Oil Lines _____ Electrical _____ Leaks _____  M109A2 Dwgs.: 11635993, 12012102 & 12012148 M109A5 Dwgs.: 9363710, 12940803 & 12940808	FIR Par. D(1) (2)	
730	BOX ASSEMBLY, GUNNER'S SELECTOR SWITCH  Mounting _____ Electrical Connections _____  M109A2 Dwg. 12012105 M109A5 Dwg. 12940807	FIR Par. D(1) (2)	
731	CONTROL ASSEMBLY ELEVATION  Mounting _____ Connections: _____ Electrical _____ Oil Lines _____ Leaks _____  M109A2 Dwgs.: 12012148 & 10956157 M109A5 Dwgs.: 10922902, 12940803 & 10956157	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
732	BY-PASS VALVE ASSEMBLY  Mounting _____ Connections: _____ Electrical _____ Oil Lines _____ Leaks _____  M109A2 Dwgs.: 12012148 & 10921563 M109A5 Dwgs.: 12940803 & 10921563	FIR Par. D(1) (2)	
733	PISTON ACCUMULATOR ASSEMBLY  Mounting _____ Oil Line Connections _____ Leaks _____  M109A2 Dwg. 12012148 M109A5 Dwg. 12940803	FIR Par. D(1) (2)	
734	PUMP ASSEMBLY, EQUILIBRATOR, HAND  Mounting: Pump Assembly _____ Reservoir Assembly _____ Handle Retaining Clip _____ Oil Line Connections _____ Leaks _____  M109A2 Dwgs.: 7382992 & 12012148 M109A5 Dwgs.: 9398982 & 12940803	FIR Par. D(1) (2)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
735	HOWITZER MOUNT AND CANNON ASSEMBLY  Mounting _____ Connections _____  M109A2 Dwgs.: 11643806(-3) & 12012127 M109A5 Dwgs.: 12910872 & 11643806(-3)	FIR Par. D(1) (2)	
736	SUPPORT, PANORAMIC SIGHT  Mounting _____  M109A2 Dwgs.: 12012102 & 12012151 M109A5 Dwgs.: 12940808 & 12012151	FIR Par. D(1)	
737	PANORAMIC TELESCOPE COVER ASSEMBLY (INTERIOR)  Sealing Compounds _____ Operation _____ Locking Action _____  M109A2 Dwgs.: 12012102 & 11635752 M109A5 Dwgs.: 12940808 & 11635752	FIR Par. D(1) (3)	
738	COMMANDER'S CUPOLA ASSEMBLY  Mounting: Ring Assembly _____ Shock Pads _____ Seal _____ Cover Assembly, Operation _____ Cupola Azimuth Operation _____ Locking Action _____  M109A2 Dwgs.: 12012102 & 11593719 M109A5 Dwgs.: 12940808 & 11593719	FIR Par. D(1) (3)	

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## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
743	<p>TURRET LOCK ASSEMBLY</p> <p>Mounting _____</p> <p>Operation _____</p> <p>M109A2 Dwgs.: 12012102 &amp; 10888000</p> <p>M109A5 Dwgs.: 12940808 &amp; 10888000</p>	FIR Par. D(1) (3)	
744	THIS SPACE NOT USED.		
745	<p>RAMMER VALVE ASSEMBLY</p> <p>Mounting _____</p> <p>Connections: _____</p> <p>Oil Lines _____</p> <p>Leaks _____</p> <p>Dwgs.: 12012186 &amp; 12012187</p>	FIR Par. D(1) (2) (3)	
746	<p>RAMMER HYDRAULIC COMPLETED (WEAPON MOUNTED)</p> <p>Mounting _____</p> <p>Connections: _____</p> <p>Oil Lines _____</p> <p>Leaks _____</p> <p>Positioning: _____</p> <p>Operational _____</p> <p>Stowage _____</p> <p>M109A2 Dwgs.: 12012187 &amp; 12012186</p> <p>M109A5 Dwgs.: 12940808 &amp; 12012186</p>	FIR Par. D(1) (2) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.									
747	<div>MOUNT INSTALLATION, HOWITZER</div> <table><tr><td></td><td>RIGHT</td><td>LEFT</td></tr><tr><td>Torque Bolts 425 + 25 lb-ft (576 + 34 N•m)</td><td>_____</td><td>_____</td></tr><tr><td>Application of Safety Wire</td><td>_____</td><td>_____</td></tr></table> <div>M109A2 Dwgs.: 12012127 &amp; MS33540 M109A5 Dwgs.: 12910872 &amp; MS33540</div> <div>Par. 3.6.18</div>		RIGHT	LEFT	Torque Bolts 425 + 25 lb-ft (576 + 34 N•m)	_____	_____	Application of Safety Wire	_____	_____	<div>TORQUE WRENCH</div> <div>VISUAL</div> <div>Par. 4.5.1.25.9</div>	
	RIGHT	LEFT										
Torque Bolts 425 + 25 lb-ft (576 + 34 N•m)	_____	_____										
Application of Safety Wire	_____	_____										

MIL-H-45374E(AR)

## CAB AND WEAPON CONTROL SYSTEM

SECTION   C  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   8  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
801	<b>MANUAL TRAVERSE EFFORT CHECK</b>  Average Force _____ Req'd: Not more than 20 lb (89 N) average to maintain movement.  Par. 3.6.14.3	<b>FORCE MEASURING EQUIPMENT</b>  Par. 4.5.1.23.2	
802	<b>MANUAL TRAVERSE RESPONSE RATE CHECK</b>  One revolution of hand crank rotates cab 10 mils. _____  Par. 3.6.14.4	<b>MEASURE</b>  Par. 4.5.1.23.3	
803	<b>MANUAL ELEVATION EFFORT CHECK</b>  Average Force _____ Req'd: Average force to maintain weapon movement shall not exceed 15 lb (67 N), with no individual reading to exceed 20 lb (89 N).  Par. 3.6.15.1	<b>FORCE MEASURING EQUIPMENT</b>  Par. 4.5.1.24.1	
804	<b>MANUAL ELEVATION RESPONSE RATE CHECK</b>  Weapon movement not less than 4 mils per turn of hand crank at a rate of not less than 10 rpm and not more than 20 rpm. _____  Par. 3.6.15.2	<b>MEASURE</b>  Par. 4.5.1.24.2	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
805	<p>CAB AND WEAPON SYSTEM BACKLASH CHECK</p> <p>Elevation _____            Traverse _____</p> <p>Backlash shall not exceed 1.0 mil in either traverse or elevation when a force of 70 lb (311 N) is applied at muzzle end of gun in plane of rotation, then reversed and applied in the opposite direction. Cab power switch shall be off.</p> <p>Par. 3.6.16.2</p>	<p>FORCE GAGE AND MEASURING</p> <p>Par. 4.5.1.24.7</p>	
806	<p>CONTROL SYSTEM DEAD SPOT CHECK</p> <p>Handle displacement to initiate cab movement:            Gunner: CW _____ CCW _____ DIFF. _____</p> <p>Handle displacement to initiate gun movement:            Gunner: CW _____ CCW _____ DIFF. _____            No. 1 Man: CW _____ CCW _____ DIFF. _____</p> <p>Req'd: Dead spot angle shall not exceed 7 degrees each side of neutral center and must be equal within 2 degrees.</p> <p>Par. 3.6.16.4</p>	<p>MEASURE</p> <p>Par. 4.5.1.24.9</p>	
807	<p>ELEVATION SYSTEM LIMITS &amp; PROTECTION CHECK</p> <p>Weapon stops adjustment for:            Depr.: From -36 to -54 mils _____            Elev.: From +1315 to +1333 mils _____</p> <p>Instantaneous control after limit switch contact by:            Power: Elev. _____ Depr. _____            Manual: Elev. _____ Depr. _____</p> <p>Par. 3.6.15.5</p>	<p>MEASURE AND FUNCTIONAL</p> <p>Par. 4.5.1.24.4</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
808	<p><b>HYDRAULIC PRESSURE LIMIT SWITCH CHECK</b></p> <p>Power pack actuated at 880–970 psi (6068–6688 kPa) at not more than 65 mils/sec. power traverse of cab. _____</p> <p>Power pack deactivated from 1150 to 1500 psi (7929 and 10,343 kPa) with gunner's and No. 1 man's power and manual controls in neutral position. _____</p> <p>Par. 3.6.16.1</p>	<p><b>FUNCTIONAL AND SYSTEM PRESSURE GAGE</b></p> <p>Par. 4.5.1.24.6</p>	
809	<p><b>CONTROL TRANSFER CHECK</b></p> <p>No movement of cab or gun when control switch is turned on or off. _____</p> <p>Gunner's instant selective control for elevation and traverse when switch is actuated. _____</p> <p>No. 1 man's control for elevation only. _____</p> <p>Par. 3.6.16.3</p>	<p><b>VISUAL AND FUNCTIONAL</b></p> <p>Par. 4.5.1.24.8</p>	
810	<p><b>WEAPON ELEVATION SPEEDS CONTROL CHECK</b></p> <p>Speeds control:  Gunner's Control _____  No. 1 Man's Control _____  Stability _____</p> <p>Req'd: Speed transition from 1.0 to 65.0 mils/sec. with power controls shall be smooth, gradual, and stable.</p> <p>Par. 3.6.15.4</p>	<p><b>FUNCTIONAL</b></p> <p>Par. 4.5.1.24.3</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
811	<p>HYDRAULIC CONTROL SYSTEM LEAKAGE CHECK</p> <p>No Leakage _____</p> <p>Req'd: With system fully charged and power control handles in neutral position, there shall be no system pressure loss during a 10-minute period.</p> <p>Par. 3.6.16.6</p>	<p>SYSTEM PRESSURE GAGE</p> <p>Par. 4.5.1.24.10</p>	
812	<p>HYDRAULIC ACCUMULATOR CHECK</p> <p>No movement of pressure gage needle for a period of 3 minutes when measuring final precharge pressure after testing gun control system. _____</p> <p>Par. 3.6.16.8</p>	<p>SYSTEM PRESSURE GAGE</p> <p>Par. 4.5.1.24.11</p>	
813	<p>RAMMER SYSTEM CONTROL</p> <p>Hydraulic Operation _____</p> <p>Dwgs.: 12012186 &amp; 12012207</p> <p>Par. 3.6.20</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.1.25.10</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
	<p align="center"><b>WEAPON FIRE CONTROL</b></p> <p>To determine conformance to weapon fire control requirements, the following conditions and equipment shall apply:</p> <p>a. Cab assembly cross-leveled so that the weapon will track a plumb line (1/16" [1.6 mm] thick) suspended 1 ft (305 mm) maximum from muzzle.</p> <p>b. The vehicle shall be leveled fore and aft and cross-leveled to meet the requirements of 3.6.17.1 and 3.6.17.2.</p> <p>Par. 3.6.17</p>	<p>APPROVED BORESCOPE PLUMB LINE (1/16" DIA) TARGET GUNNER'S</p> <p>QUADRANT (M1A1) TEST STAND OR VEHICLE</p> <p>Par. 4.5.1.25</p>	
814	<p><b>GUN ELEVATION, PLUMB TRAVEL CHECK</b></p> <p>The elevating trunnions shall be leveled by having the cannon track a plumb line from zero elevation to at least 800 mils. The vertical cross hair of the borescope must remain within the thickness of the plumb line throughout the elevation.</p> <p>Par. 3.6.17.1</p>	<p>MEASURE</p> <p>Par. 4.5.1.25.2</p>	
815	<p><b>VEHICLE LEVEL RETENTION CHECK</b></p> <p>The vehicle shall be leveled fore and aft within 0.20 mil, when turret is traversed 30° to the right and 30° to the left at 1.00 mil weapon elevation.</p> <p>Par. 3.6.17.2</p>	<p>MEASURE VISUAL</p> <p>Par. 4.5.1.25.2</p>	
816	<p><b>ALIGNMENT OF PANORAMIC TELESCOPE CHECK</b></p> <p>Deviation from target point does not exceed 0.5 mil from zero to 1100.0 mils elevation.</p> <p>Par. 3.6.17.3</p>	<p>MASTER PANORAMIC TELESCOPE</p> <p>Par. 4.5.1.25.3</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.																											
817	<p>HORIZONTAL DEFLECTION OF PANORAMIC TELESCOPE CHECK</p> <p>Deflection of vertical cross hair relative to aiming point does not exceed 0.30 mil for zero cant and zero elevation and 1.75 mils for zero cant and 1100.00 mils elevation.</p> <p>Par. 3.6.17.4</p>	<p>MASTER PANORAMIC TELESCOPE</p> <p>Par. 4.5.1.25.4</p>																												
818	<p>DIRECT FIRE TELESCOPE BORESIGHT ADJUSTMENT</p> <p>Vertical _____ Lateral _____</p> <p>Req'd: Boresight adjustment ranges shall be within ± 0.5 mil of target aiming point.</p> <p>Par. 3.6.17.7</p>	<p>TARGET AND FUNCTIONAL</p> <p>Par. 4.5.1.25.7</p>																												
819	<p>ACCURACY OF QUADRANT (M15) COUNTER INDEX CHECK</p> <p>Not more than 0.5 mil at 0° and not more than 1.0 mil at any other setting.</p> <table><tr><td>QUADRANT (M15) COUNTER INDEX</td><td>GUNNER'S QUADRANT</td><td>DEVIATION</td></tr><tr><td>0</td><td>_____</td><td>_____</td></tr><tr><td>100</td><td>_____</td><td>_____</td></tr><tr><td>250</td><td>_____</td><td>_____</td></tr><tr><td>500</td><td>_____</td><td>_____</td></tr><tr><td>600</td><td>_____</td><td>_____</td></tr><tr><td>750</td><td>_____</td><td>_____</td></tr><tr><td>1000</td><td>_____</td><td>_____</td></tr><tr><td>1100</td><td>_____</td><td>_____</td></tr></table> <p>Par. 3.6.17.5</p>	QUADRANT (M15) COUNTER INDEX	GUNNER'S QUADRANT	DEVIATION	0	_____	_____	100	_____	_____	250	_____	_____	500	_____	_____	600	_____	_____	750	_____	_____	1000	_____	_____	1100	_____	_____	<p>GUNNER'S QUADRANT (M1A1)</p> <p>Par. 4.5.1.25.5</p>	
QUADRANT (M15) COUNTER INDEX	GUNNER'S QUADRANT	DEVIATION																												
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## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.																											
820	<p>ACCURACY OF QUADRANT (M145) COUNTER INDEX CHECK</p> <p>Not more than 0.5 mil at 0° and not more than 1.0 mil at any other setting.</p> <table><tr><td>QUADRANT (M15) COUNTER INDEX</td><td>GUNNER'S QUADRANT</td><td>DEVIATION</td></tr><tr><td>0</td><td>_____</td><td>_____</td></tr><tr><td>100</td><td>_____</td><td>_____</td></tr><tr><td>250</td><td>_____</td><td>_____</td></tr><tr><td>500</td><td>_____</td><td>_____</td></tr><tr><td>600</td><td>_____</td><td>_____</td></tr><tr><td>750</td><td>_____</td><td>_____</td></tr><tr><td>1000</td><td>_____</td><td>_____</td></tr><tr><td>1100</td><td>_____</td><td>_____</td></tr></table> <p>Par. 3.6.17.5</p>	QUADRANT (M15) COUNTER INDEX	GUNNER'S QUADRANT	DEVIATION	0	_____	_____	100	_____	_____	250	_____	_____	500	_____	_____	600	_____	_____	750	_____	_____	1000	_____	_____	1100	_____	_____	<p>GUNNER'S QUADRANT (M1A1)</p> <p>Par. 4.5.1.25.5</p>	
QUADRANT (M15) COUNTER INDEX	GUNNER'S QUADRANT	DEVIATION																												
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821	<p>ALIGNMENT DEVICE CHECK</p> <p>Mounted and held to within 0.25 mil.</p> <p>Dwgs.: 11747268 &amp; 11747269</p> <p>Par. 3.6.17.9</p>	<p>VISUAL</p> <p>Par. 4.5.3.15</p>																												
822	<p>VARIABLE RECOIL MECHANISM CHECK</p> <p>The first time the gun tube is elevated, observe that Shaft Assembly, P/N 10953696 (shown on Variable Recoil Assembly, dwg. 12910875 [M109A5] or dwg. 12012130 [M109A2]) is rotating.</p> <p>M109A2 Dwgs.: 10923022, 12012127 &amp; 10923031 M109A5 Dwgs.: 10923031, 12576069 &amp; 12910872</p>	<p>VISUAL</p>																												

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
823	PANORAMIC TELESCOPE BALLISTIC COVER ASSEMBLY (EXTERIOR)  Mounting _____  M109A2 Dwgs.: 11635752 & 12012103 M109A5 Dwgs.: 12940808 & 11635752	FIR Par. D(1) (3)  TORQUE WRENCH	
824	TELESCOPE MOUNTING ASSEMBLY, M146  Mounting _____  Dwg. 10897695	FIR Par. D(1)	
825	QUADRANT FIRE CONTROL ASSEMBLY, M15  Mounting _____  Dwg. 10897695	FIR Par. D(1)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.																																																																								
826	<p><b>BACKLASH</b></p> <p>No more than 0.5 mil at any setting.</p> <p><b><u>M15 Quadrant</u></b></p> <table> <tr> <th>GUNNER'S QUADRANT INDEX</th><th>LOW TO HIGH</th><th>HIGH TO LOW</th><th>BACKLASH</th></tr> <tr><td>0</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>100</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>250</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>500</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>600</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>750</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>1000</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>1100</td><td>_____</td><td>_____</td><td>_____</td></tr> </table> <p><b><u>M145 Mount</u></b></p> <table> <tr> <th>GUNNER'S QUADRANT INDEX</th><th>LOW TO HIGH</th><th>HIGH TO LOW</th><th>BACKLASH</th></tr> <tr><td>0</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>100</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>250</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>500</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>600</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>750</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>1000</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>1100</td><td>_____</td><td>_____</td><td>_____</td></tr> </table> <p>Par. 3.6.17.6</p>	GUNNER'S QUADRANT INDEX	LOW TO HIGH	HIGH TO LOW	BACKLASH	0	_____	_____	_____	100	_____	_____	_____	250	_____	_____	_____	500	_____	_____	_____	600	_____	_____	_____	750	_____	_____	_____	1000	_____	_____	_____	1100	_____	_____	_____	GUNNER'S QUADRANT INDEX	LOW TO HIGH	HIGH TO LOW	BACKLASH	0	_____	_____	_____	100	_____	_____	_____	250	_____	_____	_____	500	_____	_____	_____	600	_____	_____	_____	750	_____	_____	_____	1000	_____	_____	_____	1100	_____	_____	_____	<p>GUNNER'S QUADRANT (M1A1)</p> <p>GUNNER'S QUADRANT (M1A1)</p> <p>Par. 4.5.1.25.6</p>	
GUNNER'S QUADRANT INDEX	LOW TO HIGH	HIGH TO LOW	BACKLASH																																																																								
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## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
902	<b>FUEL TANKS AND LINES TEST</b>  Fifty gal/min (189 L/min) (or equivalent) minimum fuel intake rate. _____ No leakage when tanks are filled to capacity. _____  Par. 3.4.8.1 & 3.4.8.2	<b>VISUAL AND MEASURE</b>  Par. 4.5.2.5	
903	<b>FUEL SYSTEM SLOPE TEST</b>  During engine operation, the fuel system shall maintain fuel supply on:  60% Grades                      ASCEND                      DESCEND _____                      _____  40% Side Slope                      RIGHT UP                      LEFT UP _____                      _____  Par. 3.4.8	<b>FUNCTIONAL</b>          Par. 4.5.2.4	
904	THIS SPACE NOT USED.		
905	<b>LUBRICANT CONTAMINATION TEST</b>  Not more than 2% by volume: Transmission                      _____ Engine                      _____  Final drive                      RIGHT                      LEFT Roadwheels and Arms                      _____                      _____ #2                      _____                      _____ #3                      _____                      _____ #4                      _____                      _____ #5                      _____                      _____  Par. 3.6.10.3	<b>TEST EQUIPMENT</b>          Par. 4.5.2.3	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
906	<p>CAB RING FRICTION TEST</p> <p>Torque required to rotate cab 360° not more than 750 lb-ft (1017 N•m) after breakaway with traverse gear box output pinions removed. _____</p> <p>Par. 3.6.14.1</p>	<p>TEST EQUIPMENT</p> <p>MEASURE</p> <p>Par. 4.5.2.8</p>	
907	<p>TRAVERSE AND ELEVATION STABILITY TEST</p> <p>With vehicle in steady state condition, movement of gun during 1-hour period not more than 1.5 mils in:</p> <p>Elevation _____</p> <p>Depression _____</p> <p>Traverse CW or CCW _____</p> <p>Par. 3.6.16.5</p>	<p>MEASURE</p> <p>Par. 4.5.2.10</p>	
908	<p>MANUAL ELEVATION SUPERCHARGE PRESSURE TEST</p> <p>Sufficient pressure maintained during 48-hour period without manual recharging to elevate or depress weapon. _____</p> <p>Par. 3.6.15.3</p>	<p>FUNCTIONAL</p> <p>Par. 4.5.2.9</p>	
909	<p>RESERVOIR HYDRAULIC FLUID TEST</p> <p>The hydraulic oil in the reservoir shall be tested for water content, solvent content, and cleanliness to meet requirements of MIL-STD-1246, Level 200 in accordance with a contamination control plan per MIL-STD-1246, Par. 4.1.1.</p> <p>Obtain oil sample in the following manner:</p>	<p>TEST EQUIPMENT</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.												
909 cont.	<p>1) Cycle rammer five times.</p> <p>2) Traverse the turret in any direction for a total of 720 degrees.</p> <p>3) Elevate from lowest quadrant elevation to highest quadrant elevation five times.</p> <p>4) Immediately thereafter, but not longer than 5 minutes, drain approximately 1 qt (0.95 L) from the reservoir (drain at oil level gage).</p> <p>5) Take an additional 100-ml sample at same location as referenced in 4) above. This 100-ml sample must meet the following requirements:</p> <p>Water content of hydraulic fluid shall not exceed 500 ppm per dwg. 12940803 (M109A5) or dwg. 12012148 (M109A2).</p> <p>Solvent content of hydraulic fluid shall not exceed 50 ppm per dwg. 12940803 (M109A5) or dwg. 12012148 (M109A2).</p> <p>The hydraulic fluid shall be free of foreign materials within the following limits:</p> <table><tr><td>RANGE</td><td>QUANTITY</td></tr><tr><td><u>SURFACE AND FLUIDS</u></td><td><u>OF PARTICULATES</u></td></tr><tr><td>15</td><td>4190</td></tr><tr><td>25</td><td>1240</td></tr><tr><td>50</td><td>170</td></tr><tr><td>100</td><td>16</td></tr></table> <p>Par. 3.6.16.7</p>	RANGE	QUANTITY	<u>SURFACE AND FLUIDS</u>	<u>OF PARTICULATES</u>	15	4190	25	1240	50	170	100	16	Par. 4.5.2.11	
RANGE	QUANTITY														
<u>SURFACE AND FLUIDS</u>	<u>OF PARTICULATES</u>														
15	4190														
25	1240														
50	170														
100	16														

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
910	<p data-bbox="277 338 667 369"><b>FIRE EXTINGUISHER TEST</b></p> <p data-bbox="302 411 1065 506">Alternating inside and outside controls of 1 in each 50 vehicles or less, actuating forces to discharge system not more than 55 lb (245 N).</p> <div data-bbox="350 548 1049 621"> <p data-bbox="350 548 553 579">Inside Control</p> <p data-bbox="350 579 570 611">Outside Control</p> <div data-bbox="927 569 1049 621"> <hr/> <hr/> </div> </div> <p data-bbox="302 653 821 684">Apply symbol (0) to control not tested.</p> <p data-bbox="277 747 570 779">Par. 3.6.21.1 &amp; 3.6.21.2</p>	<p data-bbox="1114 411 1317 506"><b>FUNCTIONAL AND MEASURE</b></p> <p data-bbox="1130 747 1292 779">Par. 4.5.2.12</p>	

MIL-H-45374E(AR)

**PREPARATION FOR DELIVERY,  
CLEANING (LEVEL A & B), ASSEMBLY, AND INSTALLATION**

MIL-H-46709E(AT)

SECTION   E  

MFG. VEH. REG. NO. \_\_\_\_\_

AREA   10  

MFG. HULL SER. NO. \_\_\_\_\_

MFG. CAB SER. NO. \_\_\_\_\_

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1001	RECORDS  DISASSEMBLY  MATCH MARKING  Par. 3.4.1 & 3.4.1.1	    VISUAL	
1002	INTERIOR OF VEHICLE  Cleansed and Dried Items Damaged by Liquids  NOTE: Water or other liquid under pressure or steam cleansing shall not be used.  Par. 3.4.1.2.1	    VISUAL AND TACTILE   Par. 4.6.3	
1003	BATTERY SUPPORTS, RETAINERS, AND INSTALLATION  Cleansed Coating, Coverage Mounting Electrical Connections  Par. 3.4.1.2.1.1  Dwg. 12389517	    VISUAL  FIR Par. D(1) (2)  Par. 4.6.3	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1004	BACKRESTS AND SEATS  Cleaned, Dried, and Protected with Paper, Secured with Tape.  Par. 3.4.1.2.1.2 & 3.4.1.3.8	VISUAL   Par. 4.6.3	
1005	FIRE CONTROL ITEMS  Exposed Optical Glass Cleaned and Protected with Lens Tissue.  Par. 3.4.1.2.1.3	VISUAL	
1006	EXTERIOR OF VEHICLE  Cleaned of any Foreign Matter, Rinsed, and Dried.  NOTE: No water or steam to enter Driver's, Crew, or Engine Compartments.  Par. 3.4.1.2.2	VISUAL AND TACTILE   Par. 4.6.3	
1007	CANNON  Cleaned and Dried (MIL-P-116, C-3 and D-4).  Par. 3.4.1.2.2.1	VISUAL   Par. 4.6.3	
1008	INSTALLATION, LOADER'S SEAT  <div><div>Mounting Positioning: Open Stowage</div><div><div>RIGHT</div><div>_____</div><div>_____</div><div>_____</div></div><div><div>LEFT</div><div>_____</div><div>_____</div><div>_____</div></div></div> <div>Dwg. 12389514</div>	FIR Par. D(1) (3)	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER		METHOD OF INSPECTION	MFG. INSP. INT.
1009	BASKET ASSEMBLY & BOX ASSEMBLY, STOWAGE		FIR Par. D(1) (3)	

MIL-H-45374E(AR)

**PRESERVATION AND PACKAGING  
(LEVEL A & B, UNLESS OTHERWISE NOTED)**

MIL-H-46709E(AT)

SECTION   E  MFG. VEH. REG. NO.                     AREA   11  MFG. HULL SER. NO.                     MFG. CAB SER. NO.                     

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1101	<b>RELUBRICATION</b>  After Cleaning and Drying, Vehicle Relubricated, Including Oil Can Points.  Par. 3.4.1.3.2.1 & 3.4.1.3.2.2	VISUAL	
1102	<b>TRANSMISSION AND FINAL DRIVE</b>  Filled to Operating Level with Lubricating Oil (MIL-L- 21260).  DD Form 1397 annotated to indicate grade of preservative oil used.  Par. 3.4.1.3.3  NOTE: Transmission and Final Drive Must Not Contain a Mixture of Lubricating Oil and Operating Oil.	VISUAL AND TACTILE	
1103	<b>ENGINE CRANKCASE</b>  Filled to Operating Level with Lubricating Oil (MIL-L- 21260).  DD Form 1397 annotated to indicate grade of oil used.  Par. 3.4.1.3.4	VISUAL AND TACTILE	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1104	<p><b>COOLING SYSTEM</b></p> <p>Cooling System Filled to Capacity with a Clean Solution of Equal Parts of Antifreeze (A-A-870) and Water.</p> <p>Engine Operated for a Sufficient Length of Time to Thoroughly Mix Water and Antifreeze Solution.</p> <p>Tested as Specified, Coolant Shall Show Protection to -40°F (-40°C).</p> <p>Par. 3.4.1.3.5</p>	<p><b>VISUAL AND SURVEIL- LANCE</b></p> <p>MIL-T-37402</p> <p>Par. 4.6.3</p>	
1105	<p><b>ENGINE PRESERVATION (FIR ITEMS 1106-1110)</b></p> <p><b>PRESERVATION LEVEL A</b></p> <p>Preservation in accordance with paragraphs 3.4.2.1.1 through 3.4.2.1.1.2 without interruption.</p> <p>Par. 3.4.2.1.1</p>	<p><b>VISUAL AND SURVEIL- LANCE</b></p>	
1106	<p><b>FUEL TANK</b></p> <p><b>PRESERVATION LEVEL A</b></p> <p>a) Access Cover and Fuel Drain Plug Removed. Maximum Amount of Fuel Drained From Tank.</p> <p>b) Fuel Tank Cap and Filler Screen Removed and Coated with Lubricating Oil (MIL-L-21260).</p> <p>c) Five Gallons of Lubricating Oil (MIL-L-21260) Poured into Fuel Tank.</p> <p>d) Fuel Drain Plug, Access Cover, Filler Screen, and Fuel Tank Cap Reinstalled.</p> <p>Par. 3.4.2.1.1a</p>	<p><b>VISUAL AND SURVEIL- LANCE</b></p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1107	<p data-bbox="289 338 493 365"><b>FUEL SYSTEM</b></p> <p data-bbox="289 407 662 434"><b>PRESERVATION LEVEL A</b></p> <p data-bbox="313 476 1036 611">a) Selector Valve Positioned to "OFF." Preservative (MIL-P-46002) and, If Required, Dye (MIL-D-81298) Added to One Compartment. Second Compartment Reserved for Deprocessing.</p> <p data-bbox="313 648 1040 747">b) Fuel Supply Line Disconnected from Fuel Filter at Inlet Adapter. Preservative Container Assembly Connected to Fuel Filter.</p> <p data-bbox="313 785 1065 919">c) Fuel Return Line Disconnected at Quick Disconnect Coupling. Preservative Recovery Line Connected to Vehicle's Quick Disconnect Coupler. End of Recovery Line Inserted into Recovery Container.</p> <p data-bbox="313 957 935 1020">d) Selector Valve Positioned on Preservative Container Assembly for Flow of Preservative.</p> <p data-bbox="313 1058 1068 1192">e) Engine Started and Ran Until Diesel Fuel is Flushed from Fuel Lines and Engine is Using Preservative as Fuel. Continue Until 9 Quarts Collected from Recovery Line in Recovery Container.</p> <p data-bbox="289 1230 464 1257">Par. 3.4.2.1.1b</p> <p data-bbox="289 1299 656 1327"><b>PRESERVATION LEVEL B</b></p> <p data-bbox="313 1369 1045 1432">Fuel System Prepared for Vehicle Operation. Fuel Tank Filled with 40 Gallons of Diesel Fuel (VV-F-800).</p> <p data-bbox="289 1470 444 1497">Par. 3.4.2.2.1</p>	<p data-bbox="1125 476 1321 575">VISUAL AND SURVEIL- LANCE</p> <p data-bbox="1125 1369 1321 1467">VISUAL AND SURVEIL- LANCE</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1108	<p>ENGINE COMBUSTION CHAMBERS</p> <p>PRESERVATION LEVEL A</p> <p>a) Engine Cooled Approximately 6 Hours.</p> <p>b) Airflow Restricted to Engine. Hose Removed at Air Inlet Housing. Air Restrictor Plate Secured Over Opening on Air Inlet Housing. Engine Cranked for 20 Seconds ONLY. Starter Allowed to Cool for 10 Minutes. Repeat Three Times or Until Approximately 1 Quart of Preservative Oil is Collected in Recovery Container.</p> <p>c) Selector Valve of Preservative Container Assembly Positioned to "OFF." Preservative Container Assembly Disconnected from Fuel Filter. Fuel Supply Line Reassembled to Fuel Filter.</p> <p>d) Preservative Recovery Line Disconnected at Quick Disconnect Coupling and Fuel Return Line Reassembled.</p> <p>e) Air Restrictor Plate Removed.</p> <p>Par. 3.4.2.1.1c</p>	VISUAL AND SURVEIL- LANCE	

120

121

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1115	<p>PANORAMIC TELESCOPE BALLISTIC COVER</p> <p>The Ballistic Cover Disassembled from Vehicle, Cleaned, Packaged, Packed, and Stowed Securely in Crew Compartment.</p> <p>Unpainted Surfaces Coated with Preservative.</p> <p>The Opening Closed with Plywood Cover.</p> <p>Par. 3.4.1.3.6.2</p>	<p>VISUAL</p> <p>TACTILE</p>	
1116	<p>CANNON</p> <p>a) Bore and Chamber Coated with Preservative Oil.</p> <p>b) VCI Carrier Material Inserted in Bore and Chamber.</p> <p>c) Cannon in Battery, Cannon Tube Secured in Travel Lock Position.</p> <p>Par. 3.4.1.3.7.2</p>	<p>VISUAL AND TACTILE</p>	
1117	<p>MUZZLE PLUG</p> <p>a) Plug Properly Installed and Secured.</p> <p>b) Polyolefin Bag Properly Installed and Secured.</p> <p>c) Joint Between Bag and Tube Properly Sealed.</p> <p>Par. 3.4.1.3.7.2.1</p>	<p>VISUAL AND TACTILE</p>	
1118	<p>BREECH MECHANISM</p> <p>All Unpainted Surfaces, Including Phosphated Surfaces, Coated with Grease. Breech Block Closed.</p> <p>Par. 3.4.1.3.7.2.2</p>	<p>VISUAL AND TACTILE</p>	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1119	<p><b>MUZZLE BRAKE</b></p> <p>a) Removed from Cannon When Required per 3.4.1.1.1.1.</p> <p>b) Cleaned.</p> <p>c) All Unpainted Surfaces, Including Threads, Coated with Preservative.</p> <p>d) Muzzle Brake Stowed in Crew Compartment (When Required per 3.4.1.1.1.1) and Secured in Place.</p> <p>Par. 3.4.1.1.1.1 &amp; 3.4.1.5.1</p>	VISUAL	
1120	<p><b>EXERCISING OF RECOIL MECHANISM</b></p> <p>Exercise Recoil Mechanism for Three Cycles, with a Minimum Stroke of 6 Inches (152.4 mm).</p> <p>Enter Record of Exercising on DA Form 2408-4.</p> <p>Enter Record of Proof Testing Weapon on DA Form 2408-9.</p> <p>Par. 3.4.1.3.7.1</p>	VISUAL AND SURVEIL- LANCE	
1121	<p><b>RECOIL MECHANISM PRESERVATION</b></p> <p>a) Accessible Machined Metal Surfaces of Cannon Immediately Forward of Recoil Mechanism Coated with Grease.</p> <p>b) Inaccessible Machined Metal Surfaces Fogged with Preservative Oil.</p> <p>c) The Surface of Recoil Mechanism Immediately Forward of Breech Ring Coated with Grease, Overwrapped with Barrier Material, Sealed with Tape.</p> <p>Par. 3.4.1.3.7.3</p>	VISUAL	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1122	<p>COUNTER RECOIL MECHANISM</p> <p>Exposed Unpainted Machined Surfaces Cleaned, Dried, and Coated with Grease.</p> <p>NOTE: Do Not Disassemble Counter Recoil Mechanism.</p> <p>Par. 3.4.1.3.7.4</p>	VISUAL	
1123	<p>EXERCISING OF REPLENISHER</p> <p>Replenisher Assembly Exercised Coincidentally with Recoil Mechanism.</p> <p>Par. 3.4.1.3.7.1</p>	VISUAL	
1124	<p>BORE EVACUATOR</p> <p>Front and Rear Joints of the Bore Evacuator to the Gun Tube Sealed with Tape.</p> <p>Par. 3.4.1.3.7.3.1</p>	VISUAL	
1125	<p>ELEVATING MECHANISM</p> <p>Exposed Unpainted Surfaces of Elevating Pinion and Rack and Hand Crank Shaft Coated with Grease.</p> <p>Par. 3.4.1.3.7.5</p>	VISUAL	
1126	<p>TRAVERSING MECHANISM</p> <p>Exposed Unpainted Surfaces of Traversing Gear Pinion and Hand Crank Shaft Coated with Grease. Cannon Travel Lock and Cab Lock Secured.</p> <p>Par. 3.4.1.3.7.6</p>	VISUAL AND TACTILE	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1127	THIS SPACE NOT USED.		
1128	<p>RAMMER, WEAPON MOUNTED</p> <p>Exposed Unpainted Surfaces Coated with Grease.</p> <p>Par. 3.4.1.3.7.7</p>	VISUAL	
1129	<p>HYDRAULIC SYSTEMS</p> <p>Filled to Operating Level with Hydraulic Fluid.</p> <p>Par. 3.4.1.3.2</p>	VISUAL AND TACTILE	
1130	<p>SPADES</p> <p>Ends of Hinge Pins Coated with Grease.</p> <p>Par. 3.4.1.3.2.2</p>	VISUAL	
1131	<p>HATCHES AND DOORS</p> <p>Rubber Seals Around Hatches and Doors Uniformly Coated with Talc.</p> <p>Hatches and Doors Locked From Inside, except that, for Shipment, Commander's Hatch and Rear Door Shall be Secured Using an Approved Railroad Type Seal Placed through Locking Ring.</p> <p>Par. 3.4.1.3.9 &amp; 3.4.1.8.3</p>	VISUAL AND TACTILE	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1132	MISCELLANEOUS PRESERVATION  Vehicle Interior, Vehicle Exterior Coated.  Par. 3.4.1.3	VISUAL	
1133	OVE  Packaging, Identification.  Par. 3.4.1.3, 3.4.1.4 & 3.4.1.5	VISUAL	
1134	RECORD FORMS  Documentation, Packaging, Location.  Par. 3.4.1, 3.4.1.3.7.1, 3.4.1.3.10, 3.4.1.8.1, 3.4.1.8.2 & 3.4.2.1.1.1	VISUAL AND TACTILE	
1135	VEHICLE CLOSURE  Fabrication, Assembly, Installation.  Par. 3.4.1.8.1	VISUAL AND TACTILE	
1136	VENTILATION  Access Covers and Gaskets Removed (Driver's and Transmission Compartments). Exposed Unpainted Surfaces Coated. Stenciling on Exterior of Vehicle. Covers and Gaskets Packed, Identified, and Stowed Securely within Vehicle.  Par. 3.4.1.8.2	VISUAL AND TACTILE	

## MIL-H-45374E(AR)

FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1137	<p>SCREENS (VENTILATION KIT)</p> <p>Screens Installed and Secured.</p> <p>Par. 3.4.1.8.2</p>	VISUAL AND TACTILE	
1138	<p>FIRE EXTINGUISHERS</p> <p>Charged to 90% of Full Capacity. Seals Intact. Exterior Emergency Handles Taped. Completed DA Form 253 Attached.</p> <p>Par. 3.4.1.3.10</p>	VISUAL AND TACTILE	
1139	<p>OVE CONTAINERS</p> <p>DOMESTIC SHIPMENT</p> <p>Containers Blocked, Braced, and Anchored. Corner Protectors Installed Under Strapping.</p> <p>Par. 3.4.1.7 &amp; 3.4.1.7.1</p> <p>OVERSEAS SHIPMENT</p> <p>Wooden Boxes Mounted on OVE Rack and Securely Blocked and Strapped. Corner Protector Installed Under Strapping.</p> <p>Par. 3.4.1.7 &amp; 3.4.1.7.2</p>	<p>VISUAL</p> <p>VISUAL</p>	
1140	THIS SPACE NOT USED.		

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
1141	<p>TOW HOOKS</p> <p>Tow Hooks and Related Hardware Removed from Vehicle for Shipment, Boxed, Stowed in Vehicle.</p> <p>Par. 3.4.1.4.1</p>	VISUAL	
1142	THIS SPACE NOT USED.		
1143	<p>LOADING</p> <p>Vehicle Loaded in Compliance with Applicable Requirements.</p> <p>Par. 3.4.1.9 &amp; 3.4.1.9.2.1</p>	VISUAL	
1144	THIS SPACE NOT USED.		
1145	<p>MARKING</p> <p>Closure Marking, Closure Disposition Marking, Depot OVE Box Marking, Vehicle Marked Per MIL-STD-129.</p> <p>Par. 3.4.1.6</p>	VISUAL	

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FIR ITEM NO.	CHARACTERISTIC & DRAWING NUMBER	METHOD OF INSPECTION	MFG. INSP. INT.
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**Preparing activity:**  
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**(Project 2350-A461)**