

MIL-R-49126A(ER)
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 SUPERSEDING
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MILITARY SPECIFICATION

RADAR SET AN/PPS-15()

This specification is approved for use by the Electronics Research and Development Command, Department of the Army and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for the construction and testing of a light-weight, very short range ground surveillance radar equipment designated Radar Set AN/PPS-15() (see 6.4).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-P-116	- Preservation, Methods Of.
MIL-P-11268	- Part, Materials And Processes Used In Electronic Equipment.
MIL-M-13231	- Marking Of Electronic Items.
MIL-F-14072	- Finishes For Ground Electronic Equipment.
MIL-H-49093	- Headset H-251()/U.

STANDARDS

MIL-STD-105	- Sampling Procedures And Tables For Inspection By Attributes.
MIL-STD-252	- Wired Equipment, Classification Of Visual And Mechanical Defects.
MIL-STD-454	- Standard General Requirements For Electronic Equipment.
MIL-STD-461	- Electromagnetic Emission And Susceptibility Requirement For The Control Of Electromagnetic Interference.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Electronics Research and Development Command, ATTN: DELCS-PE, Fort Monmouth, New Jersey 07703-5304, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of.
- MIL-STD-469 - Radar Engineering Design Requirement, Electromagnetic Compatibility.
- MIL-STD-781 - Reliability Tests Exponential Distribution.
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-1472 - Human Engineering Design Criteria For Military Systems, Equipment and Facilities.
- MIL-STD-1474 - Noise Limits For Army Materiel.

2.1.2 Other Government documents. The following Government documents form a part of this specification to the extent specified herein:

DRAWINGS

ELECTRONICS COMMAND

- DL-SM-B-752200 - Radar Set AN/PPS-15().
- SPI 1G00385 - Special Packaging Instructions.

(Copies of specifications, standards, and drawings required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Description. The Radar Set AN/PPS-15() is a lightweight, coherent doppler, very short range ground surveillance radar (VSRGSR) operating at X-band at a very low power. The radar set provides the capability for locating, and recognizing moving targets such as personnel and vehicles under varying conditions of terrain, visibility, and weather. The radar set is operable from any of four positions; (a) remote operation, (b) tripod operation, (c) pintle mounted on military vehicle, and (d) handheld by operator. Prime power is supplied by Dry Battery BA-4386/PRC-25.

3.1.1 Major components. The radar set shall include the major components listed in table I.

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TABLE I. Components of Radar Set AN/PPS-15().

Nomenclature	Drawing <u>1/</u> of spec.	Data list
Control-indicator C-9353/PPS-15	SM-D-752688	DL-SM-B-752690
Antenna assembly AS-2906/PPS-15	SM-D-865917	DL-SM-B-752310
Drive, antenna AB-1205/PPS-15	SM-D-865920	DL-SM-B-752210
Tripod, radar MT-4800/PPS-15	SM-D-752644	DL-SM-B-752680
Headset H-251()/U (2 each)	MIL-H-49093	
Case, carrying CY-7339/PPS-15	SM-D-865194	DL-SM-B-752604
Case, transport CY-7338/PPS-15	SM-D-752694	DL-SM-B-752260
Cable assembly, power electrical	SM-D-752251	DL-SM-B-752250
Cable assembly, special purpose electrical (9 meter (30 feet))	SM-D-752409	DL-SM-B-752408
Strap, suspension	SM-D-752271	
Battery, dry BA-4386/PRC-25		

1/ Drawings cited in table I are subsidiary to DL-SM-B-752200.

3.1.2 Accessory items. The following accessory items shall be furnished with each Radar Set AN/PPS-15 (), as specified (see 6.2):

TABLE II. Accessories for Radar Set AN/PPS-15().

Nomenclature	Drawing	Data list
Adapter, pintle mount MX-9426/PPS-15	SM-D-752235	DL-SM-B-752234
Cable assembly, special purpose electrical (cold weather)	SM-D-752281	DL-SM-B-752280

3.2 First article. When specified (see 6.2) a sample shall be subjected to first article inspection (see 4.3 and 6.3).

3.3 Material. The material shall be as specified herein and as shown on the applicable drawings. However, when a definite material is not specified, a material shall be used which will enable the radar set to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of the acceptance of the finished product.

3.3.1 Radioactive materials. Radioactive materials shall not be used (eg., luminous dials/markings, electron tubes, surge arrestors and lenses).

3.3.2 Recycled, virgin and reclaimed material. It is encouraged that recycled or reclaimed material, in lieu of virgin materials be used when practical, provided it meets the requirements of this specification.

3.4 Reliability. The equipment shall have a specified (O_0) mean-time-between-failure (MTBF) of 3000 hours. The lower test MTBF (O_1) shall be 1500 hours. The reliability requirements shall be demonstrated in accordance with MIL-STD-781C when operated under the following conditions:

- a. Ambient temperature: $40^{\circ} \pm 5^{\circ}\text{C}$ ($104^{\circ} \pm 9^{\circ}\text{F}$).
- b. Ground mobile environment.
- c. 100% duty cycle.

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3.5 Construction. The radar set shall be constructed in accordance with DL-SM-B-752200, MIL-P-11268, and as specified herein.

3.6 Human factors. The radar set shall conform to the human factors engineering criteria as specified in MIL-STD-1472.

3.6.1 Acoustic noise. The noise level produced by the operation of the radar set shall not be audibly detectable 15 meters (49 ft) from the equipment.

3.7 Safety. All parts which are energized electrically and subject to damage shall be insulated or fully enclosed. Personnel hazards shall be kept to a minimum by compliance with MIL-STD-454 requirement 1.

3.8 Performance characteristics.

3.8.1 System performance. The radar set, from all four positions (remote, tripod mount, pintle mount, and handheld) shall operate as specified in table III (see 4.6.4.1).

TABLE III. Performance characteristics.

Characteristic	Parameter	Units
Operating frequency	Tuneable 10.197 to 10.403	GHz
Radiated power	30 to 94	Milliwatts
Min. discernible signal ^{1/}		
Signal-to-noise ratio ^{1/}		
(all range mode)		
Sector scan rate ^{2/}	82 to 98	Mil/sec
Sector scan width ^{2/}		
Narrow	800 (+200 or -0)	Mils
Wide	1600 (+400 or -0)	Mils
Sector center ^{2/}	Not less than (NLT) +3200	Mils
Prime power (current drain)		
10.0 Vdc (search & range modes)	Not more than (NMT) 580	Milliamperes
16.0 Vdc (search & range modes)	NMT 380	Milliamperes
External power 24.0 VDC	NMT 750	Milliamperes
Receiver noise figure		
Search mode	NMT 12	dB
Range mode	NMT 10	dB
Range control		
Full CCW	50 +10	Meters
Full CW	NLT 3000	Meters
Built-in test		
Battery test		
10 Vdc	10 +0.3	Volts
16 Vdc	16 +0.5	Volts
External power	NLT 10	Volts
Transmitter Test	NLT 5	Dots

^{1/} In accordance with the limits specified in the applicable test procedures of SM-A-752203.

^{2/} Not applicable in handheld mode.

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3.8.2 Range performance. The radar set shall operate in the field as specified below:

3.8.2.1 Detection range. The radar set, with operator, shall detect, locate, and recognize the following targets from a range of not less than 50 meters (55 yds):

a. A 0.5 square meter (5.4 sq.ft.) echoing area (one man) for any radial velocity equal to or greater than 0.5 miles per hour (mph) (0.8 km/h) to a range of 1500 meters (1640 yds.).

b. A single crawling man (0.05 square meter (0.54 sq. ft.) echoing area) for any radial velocity equal to or greater than 0.5 mph (0.8 km/h) to a range of 500 meters (547 yds).

c. A 10 square meter (108 sq.ft.) echoing area (moving vehicle) to a range of 3000 meters (3281 yds) for any radial velocity of the target between 1.0 and 35 mph (1.6 and 56 km/h).

These capabilities are required under varying conditions of terrain, natural clutter (with winds from 0-25 mph (0-40 km/h), and visibility. The radar set shall detect simultaneously all moving targets at a particular azimuth setting by means of its all-range capability. Detection performance shall be achieved with not less than 80 percent probability of detection and a false alarm rate of not more than two per hour (see 4.6.4.3).

3.8.2.2 Range and azimuth accuracy (see 4.6.4.4).

a. Azimuth. The azimuth error of the radar system shall be not more than +10 mils for targets specified in 3.8.2.1 at any point in range when the radar is tripod mounted.

b. Discrete range. The range error of the radar system in the discrete mode shall be not more than +20 meters (22 yds) at any point in range when the radar is tripod mounted.

3.8.2.3 Resolution (see 4.6.4.5).

a. Range. The radar shall be capable of resolving two individual personnel targets in range when these targets are separated by 35 meters (38 yds).

b. Azimuth. The radar shall be capable of resolving two individual personnel targets in azimuth when the targets are separated by 100 mils at 500 meters (547 yds).

3.8.2.4 Automatic alarm circuit (see 4.6.4.6). The automatic alarm circuit shall detect moving targets under the conditions described below with 80 percent (single scan) probability of detection while maintaining a false alarm rate of not more than one false alarm in 10 hours. (Note: "False alarm" refers to the detection of blowing foliage only and not the detection of unwanted real targets, eg., deer, rabbits, birds, etc.)

a. Condition A.

- (1) Target: Walking man.
- (2) Target velocity: 0.5 mph (0.8 km/h) (radial).
- (3) Target range: 1500 meters (1640 yds).
- (4) Wind velocity: less than 3 mph (5 km/h).
- (5) Clutter: Approximately 50 percent of resolution cell filled with wind blown foliage.

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b. Condition B.

- (1) Target: Walking man.
- (2) Target velocity: 2.0 mph (3.2 km/h) (radial).
- (3) Target range: 1000 meters (1094 yds).
- (4) Wind velocity: 10-15 mph (16-24 km/h).
- (5) Clutter: Same as condition A.

c. Condition C.

- (1) Target: Moving vehicle.
- (2) Target velocity: 5 mph (8 km/h) (radial).
- (3) Target range: 2500 meters (2734 yds).
- (4) Wind velocity: 16-25 mph (26-40 km/h).
- (5) Clutter: Same as condition A.

3.8.2.5 Power source. The prime power source shall be the Dry Battery BA-4386/PRC-25. The power source shall operate the radar set for not less than 12 hours of continuous operation at 40°F (4.4°C). The external cable provides operation from a 24 volt vehicular electrical system (see 4.6.4.7).

3.8.2.6 Unit performance. Each unit, module, and assembly shall perform as specified on the applicable test procedure drawing (see 4.6.4.8).

3.9 Environmental.

3.9.1 Low temperature. The radar set shall be capable of operating at -50°F (-45.6°C), using the external power cable (SM-D-752251) and operating at 40°F (4.4°C) using battery BA-4386. (A warm-up period of not more than two minutes is acceptable.) The radar set shall withstand storage at -70°F (-56.7°C) without damage or degradation.

3.9.2 High temperature. The radar set shall be capable of operating at 160°F (71°F).

3.9.3 Thermal shock. The equipment shall be capable of operating after exposure to the thermal shock test specified in 4.6.5.3.

3.9.4 Rain. The equipment shall be capable of operating during and after exposure to rain, when tested in accordance with 4.6.5.4.

3.9.5 Altitude (elevation). When tested as specified in 4.6.5.5, the radar set shall be capable of operating at an altitude of 15,000 feet (4572m) and being exposed to an altitude of 40,000 feet (12,192m) without degradation.

3.9.6 Leakage. The Receiver/Transmitter group (consisting of the Control Indicator C-9353/PPS-15 and Antenna Assembly AS-2906/PPS-15) shall be submersion-proof to a covering depth of three feet of water for not less than two hours, with no evidence of leakage. The transport case (CY-7338/PPS-15), with contained equipment, shall also meet this requirement (see 4.6.5.6).

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3.9.7 Dust. When tested as specified in 4.6.5.7 the radar set shall exhibit no fouling of moving parts, inoperative relays, corrosion, malfunction or degradation of performance.

3.9.8 Humidity. When tested as specified in 4.6.5.8 the radar set shall exhibit no physical damage, such as corrosion, rust, blistering, swelling or deterioration of parts and materials.

3.9.9 Fungus. The radar set shall withstand, in operating and non-operating configuration, prolonged exposure to fungi encountered worldwide without any physical damage or degradation of performance. Materials used in the manufacture, fabrication, construction and treatment of the radar set shall comply with MIL-STD-454, requirement 4.

3.9.10 Salt fog. The radar set shall withstand exposure to marine atmospheres and salt fallout over land areas without any physical damage or degradation of performance.

3.9.11 Shock. When tested as specified in 4.6.5.11, the radar set shall exhibit no physical damage or degradation of operation. The receiver/transmitter group and the antenna drive unit shall sustain the shocks normally encountered during servicing.

3.9.12 Vibration. The equipment shall be capable of operating without degradation after being subjected to the vibration tests specified in 4.6.5.12.

3.10 Electromagnetic interference. The radar set shall meet the emission and susceptibility requirements of MIL-STD-461, Notice 4 as defined and modified below:

CE01	CS01	RE01(c)	RS01
CE04	CS02(b)	RE02(a)	RS02
CE06(a)	CS06	RE02.1(a)	RS03(d)
		RE03(a)	

The following subparagraphs refer to the above listings:

a. The radiated emission electric field (RE02 and RE02.1) requirement of MIL-STD-461, Notice 4 shall be modified to include the CE06 and RE03 requirements of the military standard. The test shall be performed with the antenna installed. It shall cover the frequency range of 0.014 to 21,000 MHz, excluding a band ± 5 percent around the fundamental (f_0) frequency. The broadband limits shall be as specified in the military standard over the 0.014 to 1000 MHz and shall be a constant 70 dBu V/m/MHz over the 1.0 to 21 GHz frequency range. The narrow band limit shall be as specified in the military standard with the following modifications:

- (1) Relax the MIL-STD-461, Notice 4 limit by 17 dB over the 0.035 to 0.190 MHz range.
- (2) Relax the MIL-STD-461, Notice 4 limit by 6 dB over the 0.191 to 0.265 MHz range.
- (3) The limit shall be a constant 60 dBu V/m over the 10,000 to 21,000 MHz with a maximum allowable emission level at the second harmonic ($2f_0$) of 70 dBu V/m.

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- b. The radar set shall not be susceptible when subjected to one volt from a 50 ohm source applied to the equipment power input terminals (excluding power cable). The requirement is also met if the equipment is not susceptible to the voltage developed by a one watt source of 50 ohm impedance.
- c. The radiated emission magnetic field (RE01) requirement of MIL-STD-461 Notice 4 shall be modified to control the field strength at a radius (distance) of 50 centimeters (cm) from the radar rather than the 7 cm specified in the standard.
- d. The radiated susceptibility electric field (RS03) requirement shall be performed in an open area. The radar set shall detect a target simulated to represent 10 m² at a range of 3 km without any degradation of performance while the set is immersed in electric fields of the following intensity over the specified frequency range:

<u>Frequency range</u>	<u>Intensity</u>
0.014 to 30 MHz	1 volt/meter
30 to 75 MHz	10 volt/meter
75 to 15,000 MHz	1 volt/meter

The interfering signal shall be modulated with a 400 Hz sine wave at 50 percent. Degradation of performance shall be defined as change in range readout, activation of the alarm, or change in the audio level at the headset.

3.10.1 Radar EMC. The MIL-STD-469 limits for the following parameters shall apply unless otherwise stated:

- a. Radar transmitter frequency tolerances.
- b. Maximum allowable radar emission bandwidth.
- c. Radar receiving system:
 - (1) The radar receiving system acceptance bandwidth shall not exceed 26.3 MHz at the 60dB points and 645 MHz at the 80 dB points.
 - (2) Radio frequency preselection shall be employed except where broadband front end are requisite operationally.
 - (3) The stability of the receiver shall be commensurate with that of the associated transmitter.

3.10.2 Bonding and grounding. All panel mounted components and connectors shall be free of non-conductive finishes and provide bonding and grounding with mating connectors and equipment chassis. The bonding impedance for all connectors and panel mounted components shall be not greater than 2.5 milliohms. The bonding impedance between connectors and shields on shielded cables shall be not greater than 2.5 milliohms.

3.11 Volume. The total volume of the antenna assembly, antenna drive unit, and control-indicator shall be not more than 750 cubic inches (0.123cu.m).

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3.12 Weight. The total weight of the radar set, less the transport case, carrying case and electrical power cable assembly shall be not more than 25 pounds (11kg).

3.13 Preconditioning (burn-in). The radar set shall perform as specified herein without subsequent processing after the preconditioning/burn-in specified in 4.6.9.

3.14 Interchangeability. Like units, assemblies, subassemblies, and replaceable parts shall conform to MIL-STD-454 requirement 7.

3.15 Finish. The radar set shall be finished in accordance with MIL-F-14072 and as specified on the drawings.

3.16 Marking. The marking shall conform to MIL-M-13231.

3.16.1 Visibility. Wherever practicable, parts and assemblies shall be so mounted that their identification markings will be readily visible with minimum disassembly of the radar set.

3.16.2 Serial numbers. The entire set, each nomenclatured item, and each assembly, shall be serial numbered except cable assemblies.

3.17 Workmanship. The radar set shall be manufactured and assembled in accordance with MIL-STD-454, requirement 9 and the applicable portions of the following paragraphs of MIL-P-11268:

Plastic material and parts.
Wiring and cabling, including:
Slack.
Protection.
Support.
Clearance.
Splicing and stretching.
Connections, general.

Grounding.
Shielding on wire and cable.
Soldering and brazing.
Cleaning.
Welding.
Controls.
Screws, other threaded
devices, and related parts.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Inspections covered by subsidiary documents (see 4.4).
- c. Quality conformance inspection (see 4.5).
- d. Packaging inspection (see 4.7).

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4.3 First article.

4.3.1 First article inspection. The first article inspection shall consist of the inspection specified in subsidiary documents covering the areas listed in 4.4, and the inspections specified for group A, group B, group C and group D. Inspections shall be performed in the order shown in table IV. After completion of group C environmental tests, conforming units shall be reinspected and shall pass all group A inspections. Failure of any inspection shall be cause for rejection.

4.3.2 First article units. The contractor shall furnish 14 first article units of the complete equipment. The samples shall be representative of the units proposed to be furnished under the contract.

TABLE IV. First article inspection.

Inspection ^{1/}	Require para	Test method paragraph	Order of inspection ^{2/}				
			Unit 1	Unit 2	Unit 3	Unit 4	Units 5 thru 14
1. Inspections covered by subsidiary documents		4.4	Inspection to be performed on all units.				
2. Preconditioning/ burn-in	3.13	4.6.9					
3. Group A inspection	(See Table V)		Tests to be performed on all units.				
4. Group B inspection	(See Table VI)						
5. Group C inspection	(See Table VII)						
Range Tests	3.8.2	4.6.4.2	1				
EMI	3.10	4.6.6		1			
<u>ENVIRONMENTAL</u>	3.9	4.6.5					
Low temperature	3.9.1	4.6.5.1			1		
High temperature	3.9.2	4.6.5.2			2		
Thermal shock	3.9.3	4.6.5.3			3		
Rain	3.9.4	4.6.5.4			4		
Altitude	3.9.5	4.6.5.5		2			
Leakage	3.9.6	4.6.5.6					1,4
Dust	3.9.7	4.6.5.7	2				
Humidity	3.9.8	4.6.5.8			5		
Fungus ^{3/}	3.9.9	4.6.5.9					5
Salt fog ^{3/}	3.9.10	4.6.5.10		4			
Shock, drop	3.9.11	4.6.5.11					2
Vibration	3.9.12	4.6.5.12					3
Acoustic noise	3.6.1	4.6.2.1	3				
6. Group D inspection	(See Table VIII)						1

^{1/} The inspections 1 through 4, in the order shown, shall be performed on all first article units before subjecting these units to any other inspection requirements specified in the table.

^{2/} The order of test and number of units may be varied if approved by the contracting officer.

^{3/} The equipment shall be thoroughly washed, cleaned, dried and refurbished after the fungus and salt fog tests before proceeding with subsequent inspection.

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4.4 Inspection covered by subsidiary documents. The following shall be inspected under the applicable subsidiary documents as part of the inspection requirements:

<u>Item</u>	<u>Where required</u>
Headset H-251 ()/U	3.1.1
Parts, materials, and processes	3.3
Finish	3.15
Marking	3.16

4.5 Quality conformance inspection.

4.5.1 Preconditioning. Every radar set shall be subjected to the preconditioning/burn-in procedure specified in 4.6.9 prior to conformance inspection. Failure to conform to any requirement specified herein as a result of this preconditioning shall be classified as a defect.

4.5.2 Inspection. Quality conformance inspection shall be as specified in 4.4 and 4.5.3 through 4.5.6.2. This does not relieve the contractor of his responsibility for performing any additional inspection which is necessary to control the quality of the product and to assure compliance with all specification requirements.

4.5.3 Group A inspection. Each unit shall be subjected to the inspections specified in table V. Discrete lots shall be formed from units that pass this inspection. Factors of lot composition not defined, or as specified herein, shall be in accordance with MIL-STD-105.

TABLE V. Group A inspection.

Inspection	Requirement paragraph	Test paragraph	AQL (percent defective)	
			Major	Minor
Visual and Mechanical				
Antenna Assembly AS-2096	3.17	4.6.11	1.5	6.5
Antenna Drive AB-1205	3.17	4.6.11	1.5	6.5
Control Indicator C-9353	3.17	4.6.11	1.5	6.5
Tripod MT-4800	3.17	4.6.11	1.5	6.5
Pintle Adapter MX-9426	3.17	4.6.11	1.5	6.5
Case, Transport CY-7338	3.17	4.6.11	1.5	6.5
Case, Carrying CY-7339	3.17	4.6.11	1.5	6.5
Operational and Electrical				
System Performance AN/PPS-15()	3.8.1	4.6.4.1	1.0	<u>1/</u>

1/ All defects shall be considered major.

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4.5.3.1 Group A lot sampling. Sampling of group A lots shall be in accordance with MIL-STD-105, inspection level II, (sample size 8 and code letter D). AQL shall be as specified in table V.

4.5.3.2 Order of inspection within group A. Group A inspection shall be performed in any order satisfactory to the Government.

4.5.4 Group B inspection. Group B inspection shall normally be performed on inspection lots that have passed group A inspection and on samples selected from units that have been subjected to and met the group A inspection. This inspection shall conform to table VI.

TABLE VI. Group B inspection.

Inspection	Requirement paragraph	Test paragraph	AQL (percent defective)
Volume	3.11	4.6.7	6.5
Weight	3.12	4.6.8	6.5
Interchangeability	3.14	4.6.10	6.5

4.5.4.1 Group B sampling. Sampling for group B shall be in accordance with MIL-STD-105, inspection level S-4, (sample size 8 and code letter D). AQL shall be as specified in table VI.

4.5.4.2 Order of inspection within group B. Group B inspection shall be performed in any order satisfactory to the Government.

4.5.5 Group C inspection. Group C inspection shall be performed on units that have passed group A and group B inspection. The inspection shall consist of the inspection specified in table VII.

4.5.5.1 Sampling for group C inspection. Four sample units shall be selected at random for each subgroup of inspections in table VII from every 150 units, or fraction thereof produced. The first sample selected shall be at the start of the contract from the first quality conformance inspection production lot.

4.5.5.2 Order of inspection within group C. Group C inspection shall be performed as specified in table VII.

4.5.5.3 Group C failures. Action required relative to group C failures shall be as specified in the contract.

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TABLE VII. Group C inspection.

Inspection	Requirement paragraph	Test paragraph
<u>Subgroup 1</u>		
Range tests	3.8.2	4.6.4.2
Dust	3.9.7	4.6.5.7
<u>Subgroup 2</u>		
EMI	3.10	4.6.6
Altitude	3.9.5	4.6.5.5
Salt fog <u>1/</u>	3.9.10	4.6.5.10
Acoustic noise	3.6.1	4.6.2.1
<u>Subgroup 3</u>		
Low temperature	3.9.1	4.6.5.1
High temperature	3.9.2	4.6.5.2
Thermal shock	3.9.3	4.6.5.3
Rain	3.9.4	4.6.5.4
Humidity	3.9.8	4.6.5.8
<u>Subgroup 4</u>		
Leakage	3.9.6	4.6.5.6
Shock, drop	3.9.11	4.6.5.11
Vibration	3.9.12	4.6.5.12
Fungus <u>1/</u>	3.9.9	4.6.5.9

1/ The test item(s) shall be thoroughly washed, cleaned, dried and refurbished after this inspection before proceeding with subsequent inspection.

4.5.6 Group D inspection. Group D inspection shall be performed on units that have passed group A and group B inspection. The inspection shall consist of the inspection specified in table VIII.

4.5.6.1 Sampling for group D inspection. Not more than 12 sample units, nor less than 6 shall be selected at random for inspection from every 250 units, or fraction thereof produced. The first samples selected shall be from the first quality conformance inspection production lot.

TABLE VIII. Group D inspection

Inspection	Requirement paragraph	Test paragraph
Reliability	3.4	4.6.1

4.5.6.2 Group D failure. Action required relative to group D failures shall be as specified in the contract.

4.6 Methods of inspection.

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4.6.1 Reliability. Using an upper test MTBF (θ_0) of 3,000 hours and lower test MTBF (θ_1) of 1,500 hours, the radar set shall be tested as specified herein, with "accept" and "reject" criteria in accordance with MIL-STD-781, test plan VIII C. Not less than 6 units nor more than 12 units shall be randomly selected for each reliability test. The test units shall have successfully completed group A, and group B tests and the preconditioning/burn-in specified in 4.6.9. Continue testing until either an "accept" or "reject" decision is reached. A failure is defined as any malfunction which causes or may cause one or more of the following.

- a. Failure to commence operation, cessation of operation, or degradation of performance below the designated levels.
- b. Serious damage to the system.
- c. Serious personnel safety hazards.

4.6.1.1 Test procedure. The tests shall be conducted under ambient laboratory conditions, without temperature, humidity, or vibration cycling. Equipment shall be energized at the primary power input specified herein. Operation shall be continuous throughout the test. The parameters to be measured shall be as specified in 4.6.1.2. Parts or components of known limited life, such as batteries, shall have a life stipulated prior to test. Failures of these parts occurring after the end of the stipulated period are nonrelevant, but any dependent failures caused thereby are counted as relevant. Failures chargeable to workmanship deficiencies shall be counted as relevant.

Redundant elements, such as indicator lamps shall not be repaired nor counted as a failure until the radar set has failed to perform its intended function. Preventive maintenance procedures specified for the equipment during normal operation shall be performed during the tests. No additional preventive maintenance shall be permitted during the tests.

4.6.1.2 Parameters measurement. The following parameters shall be measured. Each unit shall have its load current and audio output level monitored continually and recorded periodically during the reliability test. The signal-to-noise ratio, ambient temperature, load current, and audio output shall be measured and recorded each day. Once each week, the range accuracy, range resolution, and maximum range shall be measured and recorded.

4.6.1.3 Failure criteria. Nonconformance to 3.4 shall constitute failure of this test.

4.6.1.4 Failure definition. A failure is defined as the inability of the equipment to perform its required function. This includes any event which causes departures from the performance as required by this specification.

4.6.2 Human factors. The human factors requirements shall be evaluated during testing. Nonconformance to 3.6 shall constitute failure of this test.

4.6.2.1 Acoustic noise. The radar set shall be tested in an anechoic chamber in accordance with MIL-STD-1474 (aural non-detectability paragraph). Nonconformance to 3.6.1 shall constitute failure of this test.

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4.6.3 Safety. The radar set shall be evaluated for safety requirements throughout testing as specified in 4.6. Nonconformance to 3.7 shall constitute failure of this test.

4.6.4 Performance tests.

4.6.4.1 System tests. System testing in accordance with SM-A-752203, Final Test Procedure for AN/PPS-15, shall be performed to determine compliance with the requirements of 3.8.1.

4.6.4.2 Range tests. Range tests shall be conducted at test sites having surveyed target lanes along azimuth and range directions. The test sites shall be as follows:

Test Site 1A. Flat clear terrain with 1800 mils unobstructed field of view and operational ranges of 50 to 3000 meters (55 to 3281 yds).

(Test site 1A will be used unless otherwise specified.)

Test Site 1B. Same as Test Site 1A except with an area containing 50 percent wind blown foliage.

4.5.4.3 Detection range.

a. Walking man and moving vehicle detection. The radar shall be tested in the AUTO SEARCH mode at Test Site 1B. Two moving targets shall be used. One shall be a man walking at various speeds between 0.5 mph (0.8 km/h) and 5.0 mph (8 km/h) and the other a 1/4-ton vehicle moving at various speeds between 1.0 mph (1.6 km/h) and 35.0 mph (56 km/h). The two test targets shall start at various points down range beyond the respective maximum ranges and move toward the radar for no less than 10 trials for each target. The true coordinates and the indicated coordinates shall be recorded for each trial. The number of targets detected, targets missed and false alarms shall also be recorded. This test shall also be conducted using the headset and repeated using the automatic alarm. Nonconformance to 3.8.2.1 shall constitute failure of this test.

b. Crawling man detection. The radar shall be tested in the AUTO SEARCH mode using NARROW SCAN. A man shall crawl toward the radar at a speed not less than 0.5 mph (0.8km/h). He shall start at a point beyond 500 meters (547 yds) from the radar. The test shall be repeated for 10 trials. The true coordinates and indicated coordinates shall be recorded for each trial. The number of targets detected, targets missed and false alarms shall also be recorded. The test shall also be conducted using the headset and shall be repeated using the automatic alarm.

c. Minimum and maximum range. The radar shall be tested in the RANGE GATE mode. A man shall start walking away from the radar from 1400 meters (1531 yards). The maximum detection range shall be recorded. The man shall start walking toward the radar from 100 meters (109 yds) and the minimum detection range shall be recorded. A man shall start crawling away from the radar from 450 meters (492 yds), and the maximum detection range shall be recorded. The man shall start crawling toward the radar from 100 meters (109 yds) and the minimum detection range shall be recorded. A vehicle shall start moving away from the radar at 2000 metes (2187 yds), and the maximum detection range shall be recorded. The vehicle shall start moving toward the radar, and the minimum detection range shall be recorded. Nonconformance to 3.8.2.1 shall constitute failure of this test.

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4.6.4.4 Range and azimuth accuracy. Moving target simulators of 10 square meters (12 sq. yds.), adjusted to a radial velocity of 35 mph (56km/h); and 0.5 square meters (0.6 sq. yds.), adjusted to a radial velocity of 2.0 mph (3km/h) shall be used. For each trial, targets shall be placed in a uniformly random manner at points within the test site unknown to the operator. At least 10 trials to detect each target shall be made. The true coordinates and indicated coordinates shall be recorded for each trial. The range and azimuth probable error shall not exceed the limits of 3.8.2.2a and b.

4.6.4.5 Range and azimuth resolution.

a. Range resolution. The radar shall be tested in the RANGE GATE mode, with the radar aligned on two 0.5 square meter (0.6 sq. yds.), moving target simulators. The simulators shall be placed 3 meters (3.3 yds) apart, equidistant at 500 meters (547 yds) from the radar. The volume control shall be adjusted for 0.50 VDC audio output. The targets shall be moved apart, increasing the range to one and decreasing the range to the other by 17.5 meters (19 yds) each, until the targets are separated by 35 meters (38 yds) and equidistant from their original location. The radar shall be tested three times and the average value of the audio output voltage shall not be greater than 0.35 VDC.

b. Azimuth resolution. The radar shall be tested in the MANUAL SEARCH mode, aligned on two 0.5 square meter (0.6 sq.yds), moving target simulators. The simulators shall be placed 500 meters (547 yds) from the radar and no more than 4 meters (4.4 yds) apart, in azimuth. The volume control shall be adjusted for 0.50 VDC audio output. The two targets shall be moved apart, increasing the azimuth separation to 50 meters (55 yds). The radar shall be tested three times and the average value of the audio output voltage shall not be greater than 0.35 VDC. Nonconformance to 3.8.2.3 shall constitute failure of this test.

4.6.4.6 Detection probability. The number of targets detected, targets missed and false alarms recorded for tests specified in 4.6.4.3 shall be used to determine compliance with 3.8.2.4.

4.6.4.7 Power sources.

a. Battery. The radar shall be operated with an input of 10.0 Vdc in the search and range modes. The built-in Battery Test shall read 10 \pm 0.2 Vdc, and the current drain shall be measured and shall be not greater than 580 milliamperes. The test shall be repeated using an input of 16.0 Vdc. The Battery Test shall read 16.0 \pm 0.3 Vdc, and the current drain shall be not greater than 380 milliampres.

b. Vehicular. The radar shall be operated with the external power cable connected to a 24 Vdc, vehicular electrical system with vehicle not running. Current drain shall be not greater than 750 milliamperes. The radar shall be checked in accordance with 4.2.5 thru 4.2.8 of SM-A-752203. The vehicle shall be started and the test repeated.

4.6.4.8 Unit tests. Each unit module and assembly shall be tested as specified in the detailed test procedures of the drawing package. These tests shall be conducted independently of any other unit of the radar set.

4.6.5 Environmental. The radar set shall be subjected to the following series of tests and the conditions specified in SM-A-865928 shall be met at the conclusion of each separate test. Conduct a complete system performance test in accordance with SM-A-752203 at the start and completion of each test series on each unit.

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4.6.5.1 Low temperature. Conduct the low temperature test in accordance with method 502.1, procedure I of MIL-STD-810, storage temperature -70°F (-56.7°C); operating temperature -50°F (-45.6°C) using the external power cable, or 40°F (4.4°C) using battery BA-4386/PRC-25. Acceptable warm-up time shall be not more than two minutes.

4.6.5.2 High temperature. Conduct the high temperature test in accordance with method 501.1, procedure II of MIL-STD-810. Highest operating temperature shall be 160°F (71°C).

4.6.5.3 Thermal shock. The equipment shall be tested in accordance with method 503.1, procedure I of MIL-STD-810.

4.6.5.4 Rain. The equipment shall be tested in accordance with method 506.1, procedure I of MIL-STD-810. The radar set shall be operated in the auto search mode during the last 10 minutes of each 30-minute test period.

4.6.5.5 Altitude (elevation). Conduct the low pressure (altitude) test in accordance with method 500.1, procedure I of MIL-STD-810. The operating altitude shall be 15,000 feet (4,572 m) and the nonoperating altitude shall be 40,000 feet (12,192m).

4.6.5.6 Leakage. The receiver/transmitter group (consisting of the Control Indicator C-9353/PPS-15 and Antenna Assembly AS-2906/PPS-15), and the Transport Case CY-7338/PPS-15), shall be tested in accordance with method 512.1, procedure I of MIL-STD-810. The control indicator and antenna assembly shall be contained in the transport case, the transport case closed and immersed in three feet (.9m) of water for a period of not less than two hours.

4.6.5.7 Dust. The receiver/transmitter group and antenna drive (tripod mounted), cable assemblies, and pintle mount shall be subjected to test method 510.1, procedure I of MIL-STD-810. The equipment shall operate in step 4 immediately after turning off the chamber controls. Accumulated dust may be removed from the test item(s) prior to operation. Following return to standard ambient conditions, the test item(s) shall again be operated. The orientation of the equipment shall be changed every 1.5 hrs in step 1 so that each of the four sides of the equipment will in turn face directly into the dust stream. Step 2 conditions shall be held for 16 hours.

4.6.5.8 Humidity. The equipment shall be tested in accordance with method 507.1, procedure II of MIL-STD-810. Perform operational test procedure once during the last five hours of each cycle.

4.6.5.9 Fungus. The complete radar set (or selected components of the radar set, as appropriate) shall be tested in accordance with method 508.1, procedure I of MIL-STD-810. Test items selected shall be representative of materials, finishes, vendor items, hardware, surface treatments, coatings, and manufacturing processes used in the design and construction of the radar set. Failure criteria shall be as follows: Following fungus testing, test item(s) which show corroded, etched, stained, or otherwise degraded areas as a result of this test (as determined by certified laboratory examination) which constitute more than 10 percent of the test item(s) surface area shall have failed this test. Those items whose design and construction make it difficult or impossible to

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determine the extent of degradation shall be disassembled as necessary and the above failure criteria shall then apply to each disassembled piece. If only one such piece is found to have more than 10 percent of its internal or external surface area degraded, the entire assembled test item shall have failed this test. The entire radar set may be tested, but no operation shall be required following the test; however, the above failure criteria shall apply.

4.6.5.10 Salt fog. The complete radar set (or selected components of equipment) shall be tested in accordance with method 509.1, procedure I of MIL-STD-810. Test item(s) selected shall be representative of materials, finishes, vendor items, hardware, surface treatments, coatings, and manufacturing processes used in the design and construction of the radar set. No electronic operation shall be required but test items(s) having moving parts not sealed against the outside atmosphere shall be operated through their full range of movement and adjustment. Test item(s) unable to perform the intended function, movement, or adjustment shall have failed the test. In addition, test item(s) which obviously show flaked, pitted, blistered, delaminated, or otherwise loosened or corroded base material, surface finish or treatment of internal or external surfaces shall have failed the test.

4.6.5.11 Shock. The radar set shall be tested as follow:

- a. The radar set in its transport case shall be subjected to test method 516.2, procedure II, of MIL-STD-810.
- b. The receiver/transmitter group shall be subjected to test method 516.2, procedure II, of MIL-STD-810. The antenna assembly and control indicator shall be assembled (close coupled) for the transit drop test and dropped from a height of 48 inches (1.2m) for a total of 26 drops.
- c. The receiver/transmitter group shall be subjected to test method 516.2, procedure V, of MIL-STD-810.

4.6.5.12 Vibration. The radar set shall be tested as follows:

- a. The receiver/transmitter group and the antenna drive shall be subjected to the test of method 514.2, procedure X of MIL-STD-810.
- b. The radar set, in its transport case shall be subjected to the test of method 514.2, procedure XI, Part 2 of MIL-STD-810. The vibration level shall be in accordance with table 514.2-VII, and curve AW (figure 514.2-7).

4.6.5.13 Failure criteria. Nonconformance to 3.9 shall constitute failure of these tests.

4.6.6 Electromagnetic interference. The equipment shall be tested for compliance with the requirements of 3.10 using the approved measurement techniques of MIL-STD-462, notice 3. Prior to commencing EMI tests, compliance with the bonding and grounding requirement of 3.10 shall be ascertained. The bonding impedances shall be measured from connector to chassis and from connector to shield using an approved milliohm meter. The bonding impedance data shall be recorded for inclusion in the EMI test report. All tests shall be performed with the radar operated in its normal acquisition mode. The test configuration shall utilize the external power cable and the 9 meter (30ft) remote cable. The sector scan shall be operated for all emission tests except as noted below.

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- a. RE02. Above 10,000 MHz the radar shall be operated in the fixed position with the antennas aligned in both azimuth and elevation. Standard gain horns shall be utilized for emission measurements in the 10,000 to 21,000 MHz frequencies.
- b. RS0-3. For radiated susceptibility tests the antennas shall be aligned in both azimuth and elevation for frequencies above 1000 MHz. The same antennas utilized for RE0-2 tests shall be employed for RS03 tests.

4.6.6.1 Radar EMC. The equipment shall be tested for compliance with the requirements of 3.10.1 using the measurement techniques of MIL-STD-469.

4.6.6.2 Failure criteria. Disapproval of the EMI test report shall constitute failure of these tests.

4.6.7 Volume. The antenna assembly, antenna drive unit, and control indicator displaced volume shall be measured and the volume computed. Nonconformance to 3.11 shall constitute failure of this test.

4.6.8 Weight. The components of the radar system shall be weighed and the total weight determined. Nonconformance to 3.12 shall constitute failure of this test.

4.6.9 Preconditioning (burn-in). Each radar set shall be subjected to the preconditioning and burn-in requirements specified in Drawing SM-A-752203. Nonconformance to 3.13 shall constitute failure of this test.

4.6.10 Inspection for interchangeability. The radar set shall be inspected in accordance with MIL-STD-454, requirement 7. In addition, the dimensions listed below shall be gaged or measured to determine conformance to the physical interchangeability requirements of 3.14. When a listed dimension is not within specified or design limits, it shall be considered a major defect.

- a. External and internal dimensions of cases, covers and insertable assemblies, when such dimensions affect mating of parts.
- b. Dimensions of cavities, when such dimensions affect insertion of items.
- c. Location of hinges and fasteners on separable parts of assemblies which must mate, such as cases, covers and mountings.
- d. Location of connector, locking pins, fasteners, slides, and mountings which receive mating parts of plug-in assemblies and major units.
- e. Size and form of special threads.
- f. Dimensions of major components.

4.6.11 Visual and mechanical inspection. The radar set shall be examined for the requirements of 3.7 and for the defects listed in MIL-STD-252. Nonconformance to 3.7 or 3.17 shall constitute failure of this test.

4.7 Packaging inspection. Packaging inspection requirements specified herein are classified as follows:

- a. First article inspection of packaging.
- b. Quality conformance inspection of packaging.

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4.7.1 First article inspection of packaging. Unless otherwise specified in the contract, first article inspection of packaging shall be in accordance with the unit pack design validation requirements of MIL-P-116.

4.7.2 Quality conformance inspection of packaging.

4.7.2.1 Materials inspection. All materials to be used in packaging shall be inspected in accordance with the applicable material specification.

4.7.2.2 Preservation inspection. Inspection of preservation and interior markings shall be in accordance with group A and B quality conformance inspection requirements of MIL-P-116. Lot formation and sampling procedures shall be specified therein.

4.7.2.3 Packing inspection. Inspection of packing and the marking for shipment and storage shall consist of the examinations specified in table IX, "Packing inspection provisions". Lot formation shall consist of all packs made of the same materials during an identifiable period and submitted at one time for acceptance. Sampling procedures shall be in accordance with MIL-STD-105, using a single sampling plan and acceptable quality level of 4.0 percent defective.

TABLE IX. Packing inspection provisions.

No.	Characteristic	Method of Inspection
101	Intermediate container not as specified.	Visual
102	Improper closure of intermediate container.	Visual
103	Shipping containers not in accordance with specification.	Visual
104	Excessive cube.	Visual
105	Improper blocking and bracing	Visual
106	Closure not in accordance with specification.	Visual
107	Weight and size exceed container limitations.	Weight & measure
108	Strapping not in accordance with specification, incorrectly applied or omitted.	Visual
109	Marking omitted, incorrect, or illegible.	Visual

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with SPI 1G00385.

6. NOTES

6.1 Intended use. The radar set is used for short-range ground surveillance for locating and recognizing targets (crawling or walking personnel or moving vehicles) within a range of 3000 meters (3281 yds).

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6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Accessories required (see 3.1.2).
- c. When a first article is required for inspection and approval (see 3.2).
- d. Group C and D failure action (see 4.5.5.3 and 4.5.6.2).
- e. Level A or B preservation and packing (see section 5).
- f. When first article inspection rough handling tests are not required.
- g. When first article packaging inspection test reports require acquisition activity approval prior to production unit packing.

6.3 First article. When first article inspection is required, the item will be tested and should be a preproduction model. The first article should consist of one or more units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations test, and approval of first article.

6.4 Nomenclature. The parentheses in the nomenclature will be deleted or replaced by a letter identifying the particular design, for example AN/PPS-15W. The contractor should apply for nomenclature in accordance with the applicable provision in the contract (see 1.1).

6.5 Level B preservation. When level B preservation is specified, this level of protection will only be used under known favorable conditions during transportation, storage and handling.

6.6 Environmental. Environmental pollution prevention measures are contained in the packaging material specification referenced herein. Refer to material specifications or preparing activity for recommended disposability methods.

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

Custodians:
Army - ER

Preparing activity:
Army - ER
Project 5840-A210

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-R-49126A(ER)		2. DOCUMENT TITLE RADAR SET AN/PPS-15()	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION <i>(Mark one)</i> <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER <i>(Specify):</i> _____	
b. ADDRESS <i>(Street, City, State, ZIP Code)</i>			
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER <i>(Last, First, MI) - Optional</i>		b. WORK TELEPHONE NUMBER <i>(Include Area Code) - Optional</i>	
c. MAILING ADDRESS <i>(Street, City, State, ZIP Code) - Optional</i>		8. DATE OF SUBMISSION (YYMMDD)	