INCH - POUND

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SUPERSEDING
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MILITARY SPECIFICATION

ANTENNA AS-1729/VRC

This specification is approved for use by the 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 one type of center-fed whip antenna intended for use in a vehicular communications system operating over the frequency range of 30.00 to 76.00 MHz and designated as Antenna AS-1729/VRC (see 6.1 and 6.6). The antenna consists of the following units:

Antenna Element AT-1095/VRC (Upper Whip Section).
Antenna Element AS-1730/VRC (Lower Whip Section).
Matching Unit-Base, Antenna MX-6707/VRC (Base Assembly).

1.2 Appendix. - Appendix A (Calibration and Alignment Procedures for the Matching Unit Base Alignment Cavity) forms a part of this specification.

1.3 Antenna Elements. - Quality Assurance requirements in this Specification applicable to antenna elements AT-1095/VRC and AS-1730/VRC spare part acquisitions are listed under paragraph 4.15.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issue of these documents shall be those listed in 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 used in improving this document should be addressed to: Cdr, US Army Communications Electronics Command, ATTN: AMSEL-ED-TD, Fort Monmouth, NJ 07703-5000 By using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5985

SPECIFICATIONS

MILITARY

MIL-T-152	Treatment, moisture and Fungus Resistance of Communication - Electronics equipment
MIL-S-901	Shockproof Equipment, Class HI (High Impact) Shipload
MIL-Q-9858	Quality Program Requirements
MIL-P-11268	Parts, Materials and Processes Used in Electrical Equipment
MIL-M-13231	Marking of Electrical Items
MIL-F-14072	Finishes for Ground Electronic Equipment
MIL-P-15024/6	Plates, Identification, Equipment
DOD-P-15328	Primer (Wash) Pretreatment
MIL-I-17563	Impregnation for Aluminum, Copper, Iron, Magnesium and Zinc Allows
MIL-I-46058	Insulating Compound Electrical (For Circuit Card Assemblies)
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical
MIL-P-53022	Primer, Epoxy Coating
MIL-P-53030	Primer Coating, Epoxy water reducible

STANDARDS

MILITARY

MIL-STD-202	Test Method for Electronic and Electrical Parts
MIL-STD-252	Classification of Visual and Mechanical Defects for Equipment, Electronic, Wired etc
MIL-STD-276	Impregnation of Nonferrous Metal Castings
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-810	Environmental Test Method
MIL-STD-965	Parts Control Program

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

2.1.2 Government drawings. The following Government drawings form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of solicitation.

DRAWINGS

COMMUNICATION - ELECTRONICS COMMAND

SC-A-46439 -	List of Accessories for Package Tester
GL-SC-A-57756 -	Gages for Antenna Element AS-1730/VRC
SC-C-208747 -	Antenna Tie-Down Assembly
GL-SC-323065 -	Gages for Antenna Element AT-1095/VRC
GL-SM-323477 -	Gages for Antenna AS-1729/VRC
SC-DL-415405 -	Antenna Element AT-1095/VRC
SM-D-415406 -	Finish Requirements for AT-1095/VRC
SC-C-446180 -	Antenna Tip Assembly for AT-1095/VRC
SC-DL-542000 -	Antenna Element AS-1730/VRC
SM-D-542001 -	Antenna, AS-1729/VRC Assy
SM-C-542002 -	Antenna Element AS-1730/VRC
SM-D-542009 -	Strain Relief Loop for Mast Section Assy
SM-D-542010 -	Envelope, Mast, Finish - Note 7
SC-DL-542020 -	Matching Unit-Base, Antenna MX-6707/VRC
SM-D-542021 -	Matching Unit-Base, Antenna MX-6707/VRC
SM-B-542023 -	Alignment Specification (11 sheets)
SM-D-542042 -	Cable-Mount Assembly
SM-D-542043 -	RF Cable Assembly
SM-B-542114 -	Base Alignment Test Fixture
SM-B-542115 -	RF Connector Adapter (Whip Admittance)

(Copies of drawings required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Non-Government publications. - The following documents form a part of this document to the extent specified herein.

a. Hewlett-Packard Journal, Volume 15, No. 6 dated February 1964. (This publication can be obtained from Hewlett-Packard Corporation, 1501 Page Mill Road, Palo Alto, California 94304).

b. American Society for Testing Materials (ASTM) can supply Standard No. D 3935, dated December 31, 1987, Plastic Molding Material Polycarbonate. (Copies of this standard can be obtained from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187).

2.3 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. Nothing in this specification shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Construction AS-1729/VRC. - The antenna shall be constructed in accordance with the applicable drawings indicated below:

UNIT	NSN	DRAWING	DATA LIST
Antenna, AS-1729/VRC Assy	5985009859024	SM-D-542001	MIL-A-55288
Antenna Element AT-1095/VRC	5820008562728	SM-D-415406	SC-DL-415405
Antenna Element AS-1730/VRC	5985009859022	SM-C-542002	SC-DL-542000
Matching Unit-Base, MX-6707/VRC	5820009061115	SM-D-542021	SC-DL-542020
Antenna Tie-Down Assy	4020009086416	SC-C-208747	

3.2 First Article. - The contractor shall furnish four (4) First Article samples of Antenna AS-1729/VRC for approval if required in bid request or contract.

3.3 Parts, Materials and Process. - Unless otherwise specified, the Parts Control Program shall conform with the requirements of MIL-STD-965 utilizing Procedure I. The contractor shall use all items specified in the Government furnished Technical Data Package (TDP) or in the Government model. The TDP shall serve as the Program Parts Selection List (PPSL) and MIL-P-11286 shall control the contractor's selection of parts, materials and processes used on this contract when a change must be made in the TDP. The MPCAGs shall review all proposed changes of parts and the PCO shall approve or disapprove these proposed changes prior to the writing of an Engineering Change Proposal to implement the change.

3.4 Castings. - Casting shall conform to requirement 21 of MIL-STD-454. Zinc-alloy, Aluminum-alloy and magnesium-alloy die castings shall be used only when approved by the Contracting Officer for the particular application.

3.4.1 Quality of Die Casting (see 4.4). - Quality of die castings shall be as follows:

(a) Surface condition shall be clean, dry and free from chips.

(b) Cast surface finish shall be of a painting grade which allows some streaks and chill marks which can be covered and hidden by paint.

(c) Flash must be removed by grinding or filing.

(d) The casting after impregnation, shall be air tight, and no leakage shall be allowed when tested in accordance with paragraph 4.7.3 and 4.9.

(e) Flatness shall be as specified in Government-furnished drawings.

(f) Dimensions shall be as specified in the Government furnished drawings.

3.4.2 Impregnation of aluminum castings. - All exterior aluminum castings shall be impregnated in accordance with MIL-STD-276, using Class 3 impregnation material in accordance with MIL-I-17563. Castings which have been impregnated shall be marked "IMP". The impregnation shall be to correct general seepage only and shall not be used to correct poor foundry techniques or significant porosity (see 4.4).

3.5 Plastic material and parts. - When not machined, plastic material and parts shall have the original smooth or polished surfaces. Surfaces that have been sawed, cut, punched or otherwise machined shall be as smooth as practicable in accordance with good manufacturing practice for the intended application. Plastic material and parts shall conform to the following, except that plastic material used for arc resistance shall be limited to the type specified in requirement 26 of MIL-STD-454. During the selection of plastic materials, consideration should be given to the tropicalization requirements of MIL-P-11268.

3.5.1 Thermosetting. - Thermosetting plastic material and parts shall conform to Table II of MIL-P-11268, and unless in hermetically sealed enclosures, the material shall be treated in accordance with Table III of MIL-P-11268.

3.5.2 Thermoplastic. - Thermoplastic material and parts shall conform to Table IV of MIL-P-11268, except that plastic molding material used in the construction of SM-D-542070 shall be unfilled, virgin, polycarbonate molding compound per American Society for Testing Materials Standard No. D 3935. These materials shall not be treated and shall be masked, if necessary, during any treatment of equipment which might result in degradation of the electrical and physical characteristics of the material. Only fungistatic compositions in accordance with requirement 4 of MIL-STD-454 shall be used or compounds modified with fungicides as an ingredient and capable of passing the fungus test, Method 508, of MIL-STD-810.

3.6 Marking. -

3.6.1 General. - Marking shall conform to MIL-M-13231 (see 4.4). Front panel marking shall be group I as described in that specification.

3.6.2 Visibility. - Wherever practicable, parts shall be so mounted that their identification marking will be readily visible with minimum disassembly of the equipment.

3.6.3 Serial numbers. - The Matching Unit-Base, MX6707/VRC shall be serial numbered.

3.6.4 National Stock Number. - The Matching Unit-Base, MX-6707/VRC, the Antenna Element AS-1730/VRC (Lower Whip Section) and the Antenna Element AT-1095/VRC (Upper Whip Section) shall be marked with their applicable National Stock Numbers.

3.7 Service conditions. - The equipment shall meet the following service conditions:

3.7.1 Temperature (see 4.7.1). -

(a) Operating. - Ambient temperature in the range of +150°F. to -40°F. (The 150°F. temperature includes effect of sunload). Exposure at the high temperature extreme not to exceed 4 hours, and at the low temperature extreme not to exceed 72 hours, at any one time. The antenna shall comply with 3.8.3 except that power handling capability shall be performed for only 15 minutes and at one frequency in each subband.

(b) Nonoperating. - Exposure in the range of +160°F. to -80°F.; exposure at the higher temperature extreme not to exceed 4 hours, and at the low temperature extreme not to exceed 24 hours, at any one time. When returned to room temperature, the antenna shall comply with 3.8.1 and 3.8.2.1 and 3.8.3 with the exception of (a) above.

3.7.2 Relative humidity (see 4.7.2). - Antenna shall meet the requirements of 3.8.1, 3.8.2 and 3.8.4 when tested in accordance with 4.7.2.

3.7.3 Immersion (see 4.7.3). - The equipment shall show no evidence of leakage after being immersed in three feet of water for two hours. The antenna shall meet the requirements of 3.8.4.3 after the immersion test.

3.7.4 Vibration. -

3.7.4.1 Vibration; internal, Matching Unit-Base, Antenna MX-6707/VRC (see 4.7.4.1). - When vibrated in accordance with 4.7.4.1, the amplitude of any part, subassembly or structural member of the antenna base assembly shall not exceed twice the amplitude of the vibration applied to the assembly at any frequency between 10 and 55 cycles per second.

3.7.4.2 Vibration, whip assembly (see 4.7.4.2). - The whip assembly shall be capable of being vibrated at the natural frequency which produces the greatest amplitude for a period of 2 hours without electrical or mechanical failure.

3.7.5 Bounce and shock. - The equipment shall be capable of meeting the requirements of Table I.

TABLE I - Bounce and Shock

Requirement Paragraph	Inspection Paragraph	Performance After Test
Bounce	4.7.5	Specified performance (Note A)
Shock ballistic	4.7.6	No physical damage. Specified performance (Note A) No physical damage.

Note A - The equipment shall meet specified performance for the following requirements: Base assembly resonance (3.8.1); VSWR-free space (3.8.2.1).

3.7.6 IMPACT (see 4.7.7). - The antenna shall be capable of meeting the requirements of paragraphs 3.8.1, 3.8.2.1 and 3.8.4 after subjection to the test of 4.7.7. Physical damage, if any, shall be limited to minor surface abrasions
at the impact point, no deeper than 0.005 inch.

3.7.7 Flexibility (see 4.7.8). -The antenna shall withstand the flexing tests of 4.7.8 without electrical or mechanical damage.

3.7.8 Fungus (see 4.7.9). - The antenna, with matching unit case (SM-D-542066) open, shall provide no fungus nutrients in the material, coating or contaminant form and shall not support fungal growth when tested. After being tested the antenna shall show no more than six unrelated spots, each no greater than 0.015 square inch in area, of microbial growth (see 6.10) as evidenced by growth colonization (which includes branching and sporulation on or within each cubic foot, or fraction thereof, of antenna volume. Isolated instances of partial tubular germination shall not be included in this evaluation.

3.7.9 Salt fog (See 4.7.10). - Equipment and assemblies shall show no evidence of corrosion as evidenced by any visible degradation that can be attributed to flaky, pitted, blistered or otherwise loosened finish or metal surface and shall meet specified performance for the following requirements: Whip measurements (3.8.4) and Base assembly resonance (3.8.1).

3.8 Electrical Requirements. -

3.8.1 Base assembly resonance (see 4.8.2). - The base assembly (less cable assembly SM-D-542042) when subjected to the test specified in 4.8.2 shall resonate within frequency limits specified in Table II.

Table II - Base Assembly Resonance Values

Subband	Resonance Frequency (MHZ)
1	39.80 ± 0.40
2	39.75 ± 0.65
3	39.95 ± 0.45
4	40.10 ± 0.50
5	39.80 ± 0.80
6	39.60 ± 0.60
7	39.60 ± 0.60
8	40.30 ± 1.00
9	39.90 ± 1.40
10	39.75 ± 1.25

3.8.2 Voltage standing wave ratio (VSWR). -

3.8.2.1 VSWR free space (see 4.8.1.2). - The VSWR of Antenna AS-1729/VRC as measured in free space at the r.f. input connector of the base assembly shall meet
the requirements in Table III.

3.8.3 Power handling capability (see 4.8.3). - Antenna AS-1729/VRC shall be capable of continuous operation with an input r.f. power of 70 watts for one hour, without any damage to the antenna or any of its components. During this power handling capability test, the reflected and forward power shall be monitored and readings taken at the start of the test and at 5-minute intervals. The reflected power shall not change more than + 1.5 watts through out the test.

Table III VSWR Values
Voltage Standing Wave Ratio (VSWR)

Subband	Frequency (MHz)	Maximum VSWR In Each Subband. See Note 1
1	30.0	3.0
1	33.0	3.0
2	33.0	3.0
2	37.0	3.0
3	37.0	3.4
3	42.0	3.4
4	42.0	3.0
4	47.5	3.0
5	47.5	3.0
5	53.0	3.0
6	53.0	3.0
6	56.0	3.0
7	56.0	3.2
7	60.0	3.2
8	60.0	3.2
8	65.0	3.2
9	65.0	3.2
9	70.5	3.2
10	70.5	3.0
10	75.95	3.0

Note 1 - When measured as specified herein, maximum VSWR values listed include tolerances of test equipment and load terminations used during measurements.

3.8.4 Whip measurements. -

3.8.4.1 Top Whip Section (see 4.8.4.1). - When tested in accordance with 4.8.4.1, there shall be no visible effects or evidence of dielectric breakdown due to an applied voltage of 15,000 VRMS.

3.8.4.2 Lower whip section (see 4.8.4.2). - The lower whip section, when subjected to the same test described in 4.8.4.1, shall show no evidence of

dielectric breakdown. Also, when tested to 4.8.4.2, the lower whip section shall show impedance of 50 Ohms ± 2.0% for the lower portion of the coaxial conductor, and 125 ohms ± 2.0% for the upper portion of the coaxial conductor.

3.8.4.3 Whip assembly (see 4.8.4.3). - The whip assembly admittance shall be measured at 75 MHz. The susceptance (jB) shall be 3.1 ± 4.0 millimhos and the conductance (G) shall be 27.0 ± 5.0 millimhos

3.8.5 Control cable voltage (see 4.8.5). - The rotary solenoid switch operating voltages at the base assembly shall be as stated in Table IV. The manual/automatic band switch shall operate satisfactorily and index correctly when the d-c voltage present on the band switch pins is as stated in Table IV. The input voltage is to be 24 VDC.

Table IV - Control Cable Voltage

Band Segment	Freq. MHz	AN/VRC-12 Band	Voltages at pin						
			N	A	D	E	F	H	J
1	30-33	1	24	24	24	0	0	0	0
2	33-37	1	24	24	0	24	0	0	0
3	37-42	1	24	24	0	0	24	0	0
4	42-47.5	1	24	24	0	0	0	24	0
5	47.5-53	1	24	24	0	0	0	0	24
6	53-56	2	24	0	24	0	0	0	0
7	56-60	2	24	0	0	24	0	0	0
8	60-65	2	24	0	0	0	24	0	0
9	65-70.5	2	24	0	0	0	0	24	0
10	70.5-76	2	24	0	0	0	0	0	24

NOTE: Pin C is Ground - All Voltages DC.

3.9 Bounce preconditioning. - The MX-6707/VRC shall be capable of meeting the requirements specified herein, without subsequent processing, after subjection to the bounce preconditioning of 4.6 (also see 4.5).

3.10 Air seal. - When the antenna is tested as specified in 4.9, there shall be no decrease in vacuum.

3.11 X-Ray. - When the AS-1730/VCR is tested as specified in 4.11, the internal assembly and dimensions above the stainless steel ferrule shall be observed to determine that the strain relief loop at top of AS-1730/VRC is in accordance with Drawing SM-D-542009, and that there is continuity at the 50 to 125 ohm junction.

3.12 Interchangeability. - Like units, assemblies, subassemblies and replaceable parts shall conform to requirement 7 of MIL-STD-454 (see 4.12).

3.13 Workmanship (see 4.13). - The equipment shall be manufactured and assembled in accordance with requirement 9 of MIL-STD-454 and the applicable portion of the following paragraphs:

(a) In MIL-P-11268:

Paragraph	Subject	Reference
3.4.1	Parts Control Program	MIL-STD-965
3.10.10	Controls	Req 28 of MIL-STD-454
3.10.35	Fastener Hardware	Req 12 of MIL-STD-454
3.10.46	Wires, Hookup, Internal	Req 20 of MIL-STD-454
3.11.2	Brazing	Req 59 of MIL-STD-454
3.11.3	Cleaning (Workmanship)	Req 9 of MIL-STD-454
3.11.4	Finish, protective	MIL-F-14072
3.11.5	Marking	MIL-M-13231, MIL-P-15024/6
3.11.6	Riveting	Req 12 of MIL-STD-454
3.11.7	Soldering	Req 5 of MIL-STD-454
3.11.8	Fungus Proofing Treatment	MIL-T-152
3.11.9	Structural Welding	Req 13 of MIL-STD-454
3.11.10	Internal Wiring Practices,	Req 69 of MIL-STD-454

(b) In this specification:

3.4	Castings
3.5	Plastic materials and parts
3.6	Marking

3.14 Finish (see 4.14). - The Antenna AS-1729/VRC or the Matching Unit-Base, or the Antenna Elements (Upper Whip Section, Lower Whip Section) when ordered separately shall be finished with Chemical Agent Resistant Coating (CARC) in accordance with procedures specified in paragraph 4.14. The finishing requirements as shown on Drawings SM-D-415406, Notes 1.8, 7 and 10 and SM-D-542010 Note 7, or else where, are suspended and replaced by CARC.

4. QUALITY ASSURANCE PROVISIONS

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

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 the submission of defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspection. - Inspections shall be classified as follows:

(a) First article inspection. (Does not include packaging see 4.3).

(b) Inspection covered by subsidiary documents (see 4.4).

4.3 - First Article Inspection. - This inspection shall consist of the inspection specified in the subsidiary documents covering the item listed in 4.4, and the inspection specified for Group A, Group B and Group C (see Tables V, VI and VII respectively). Order and quantity of equipment to be subjected to environmental testing shall be as specified in Table V. Requirements for replenishment parts may differ from these requirements. See the acquisition documents for specific requirements.

Table V - Order of Environmental Tests

Test	Unit 1	Unit 2	Unit 3	Unit 4
Non-damaging tests				
Temperature (4.7.1)	1			
Immersion (4.7.3)		1		
Potentially Damaging Tests				
Impact (4.7.7)	2			
Flexing (Spring) (4.7.8)	3			1
Vibration (4.7.4)		2		
Bounce (4.7.5)		3		
Shock, Ballistic (4.7.6)		4		
Humidity (4.7.2)	4			
Fungus * (4.7.9)			1	
Salt Fog * (4.7.10)				2

* The equipment shall be thoroughly washed, cleaned, dried and refurbished, if necessary, before proceeding with subsequent tests.

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

Item	Paragraph
Parts, Materials and Processes used in:	
Electronic Equipment	3.3 Castings
3.4	
Marking	3.6

4.5 Quality conformance inspection of equipment before packaging. - Each unit of each lot of equipment shall be subjected to bounce preconditioning (see 3.9) prior to inspection. The contractor shall perform the inspection specified in 4.4 and 4.5.1 through 4.5.3.2. 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. Failure to meet any requirement as a result of bounce precondition shall be classified as a defect and recorded as such. The Government will review and evaluate the contractor's inspection procedure and examine the contractor's inspection records. In addition, the Government - at its discretion - may perform all or any part of the specified inspection, to verify the contractor's compliance with specified require-requirements (see 6.7). Test equipment for Government verification inspection shall be made available by the contractor. Each unit which will be subjected

to Group A, Group B, Group C or first article inspection shall be preconditioned after final assembly (see 4.6).

4.5.1 Group A Inspection. - Each unit of each lot of equipment shall be inspected for conformance to all the inspection and test requirements of Table VI. Group A inspection shall be performed in any order which is satisfactory to the Government, except that the air seal (4.9) shall be last.

Table VI - Group A Inspection

Inspection	Rqt. Para	Insp Para
Visual and mechanical:	3.13	4.10
Antenna Element AT-1095/VRC Antenna Element AS-1730/VRC Matching Unit-Base, Antenna MX-6707/VRC Antenna AS-1729/VRC		
Electrical:		
Matching Unit-Base, Antenna MX-6707/VRC		
Base assembly resonance	3.8.1	4.8.2
Control Cable Voltage	3.8.5	4.8.5
Antenna Whip Elements		
Top Whip Section	3.8.4.1	4.8.4.1
Lower Whip Section	3.8.4.2	4.8.4.2
Whip Assembly	3.8.4.3	4.8.4.3
Matching Unit-Base, Antenna MX-6707/VRC		
Air Seal	3.10	4.9

4.5.2 Group B Inspection. - Group B inspection shall be performed on lots that have passed Group A inspection. This inspection shall consist of the inspections listed in Table VII. Each lot shall be subjected to sampling inspections in accordance with Table VIII. Lots in which samples exhibit any failures shall be screened for that failure prior to units within the lot being subjected to Group C inspection.

4.5.2.1 Order of inspection within group B. - Group B inspection shall be performed in any order which is satisfactory to the Government.

Table VII - Group B Inspection

Inspection	Req. Para	Insp Para
Electrical		
Antenna Element AS-1730/VRC		
X-Ray	3.11	4.11
Antenna AS-1729/VRC		
Immersion	3.7.3	4.7.3
Interchangeability	3.12	4.12

4.5.3 Group C Inspection. - This inspection shall consist of the tests specified in Table IX and shall be performed on sample units that have been subjected to and met Group A and Group B inspections. Sample units shall be selected in accordance with paragraph 4.5.3.1.

TABLE VIII - Sampling plan for group B inspection

Lot Size	Sample Size
2 to 8	2
9 to 15	2
16 to 25	3
26 to 50	5
51 to 90	5
91 to 150	6
151 to 280	7
281 to 500	9
501 to 1200	11
1201 to 3200	13
3201 and over	15

1/ The acceptance number in all cases is zero.

Table XI - Group C Inspection

Inspection	Req. Para	Insp Para
	Subgroup I (see 4.5.3.1.1)	
Impact	3.7.6	4.7.7
	Subgroup II (See 4.5.3.1.2)	
Temperature	3.7.1	4.7.1
Flexing	3.7.7	4.7.8
Vibration - whip assembly	3.7.4.2	4.7.4.2
Bounce	3.7.5	4.7.5
Power Handling Capability	3.8.3	4.8.3
	Subgroup III (See 4.5.3.1.3)	
Humidity	3.7.2	4.7.2
Shock, Ballistic	3.7.5	4.7.6
	Subgroup IV (See 4.5.3.1.4)	
Fungus	3.7.8	*4.7.9
Salt Fog	3.7.9	*4.7.10

* This test shall be performed on a separate sample.

4.5.3.1 Sampling for inspection of equipment. - Units selected for each Group C inspection shall be selected without regard to their quality in accordance with the following:

4.5.3.1.1 Subgroup I. - For this subgroup, two units for the first 50 production units shall be selected for this first Group C inspection. For subsequent Group C inspections, two units from each successive 250 or two per month if less than 250 are produced monthly, shall be selected.

4.5.3.1.2 Subgroup II. - For this subgroup, two units from the first 50 production units shall be selected for this Group C inspection. For subsequent Group C inspections, two units from each successive 500, or two every two months, if less than 500 are produced during a two month period.

4.5.3.1.3 Subgroup III. - For this subgroup, two units from the first 50 production units shall be selected for the first Group C inspection. For subsequent Group C inspections, two units shall be selected from each successive 600, or two every three months, if less than 600 are produced during this three months period.

4.5.3.1.4 Subgroup IV. - For this subgroup, two units from the first 50 production units only shall be selected. Subsequently, 2 units shall be tested every six (6) months until completion of production.

4.5.3.2 Noncompliance. - The contractor shall immediately report in writing each Group C failure occurrence, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and further report the results of investigation and details of the proposed corrective action on (1) the process and material, as applicable, and (2) all units of production which were manufactured under the same conditions and which the Government considers subject to the same failure. Reports shall be forwarded to the responsible technical activity designated in the contract through the Quality Assurance Representative for evaluation. After corrective action has been taken, additional sample units shall be subjected to Group C inspection (all inspections or the inspections which the sample failed, at the option of the Government) and Groups A and B Inspection may be reinstituted; however, final acceptance and shipment will be withheld until the Group C re reinspection results have shown that the corrective action was effective (see 6.4).

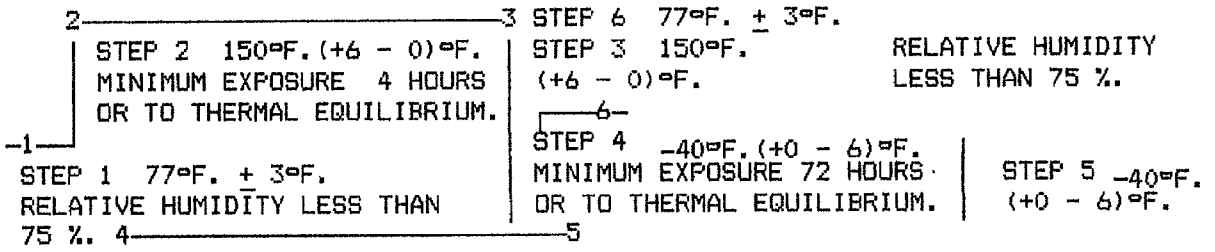
4.5.4 Reinspection of conforming Group C sample unit. - Unless otherwise specified, sample units which have been subjected to and passed Group C inspection may be accepted on the contract or order provided all damage is repaired and the sample units are resubjected to and pass Group A and B inspections.

4.6 Bounce preconditioning. - The antenna base assembly shall be placed in its normal operation position on the table of the Package Tester, Type 1000-SC, as made by the L.A.B. Corporation, Skaneateles, New York, or equal. The package tester, shafts in phase, shall have a speed such that it is just possible to insert a 1/32-inch strip of material under one corner or edge of the unit to a distance of 3 inches as the unit bounces. The unit shall be subjected to this preconditioning for 1 minute. After bounce preconditioning the unit shall not be repaired, aligned, cleaned or otherwise changed prior to subjection to acceptance inspection.

4.7 Service condition tests. -

4.7.1 Temperature test (see 3.7.1). - The Antenna AS-1729/VRC shall be subjected to the temperature cycle shown in MIL-STD-169 and in the temperature graph in 4.7.1.1.

4.7.1.1 Extreme temperature cycle. -



a. RATE OF TEMPERATURE CHANGE: AS RAPIDLY AS POSSIBLE.
b. WHEN MEASUREMENTS ARE TAKEN ON ANY STEP, PRACTICAL THERMAL EQUILIBRIUM SHALL FIRST BE OBTAINED. PRACTICAL THERMAL EQUILIBRIUM IS ATTAINED WHEN THE TEMPERATURE OF ANY SELECTED SURFACE OF THE EQUIPMENT CHANGES LESS THAN 1°F DURING A 1/2 HOUR PERIOD WHILE THE AMBIENT TEMPERATURE IS STEADY.
c. HUMIDITY IS UNCONTROLLED, EXCEPT ON STEPS 1 AND 6. 4.7.1.2 Temperature tests(See 3.7.1). - The following measurements shall be made on Antenna AS-1729/VRC before and after the temperature test cycle:

Test	Paragraph
Free space VSWR	4.8.1.2
Power handling	4.8.3
Base Assembly Resonance Test	4.8.2

The MX-6707 shall be subjected to the test of 4.8.3 at 150°F and at minus 40°F to determine compliance with 3.8.3 except the 70 watt operation shall be for a 15 minute period at each temperature extreme and at one frequency in each subband, and a dummy load shall be used in lieu of the antenna test chamber.

4.7.2 Humidity test (see 3.7.2). - The antenna AS-1729/VRC shall be tested in accordance with Method 507, Procedure II of MIL-STD-810 with the following exceptions:

(a) The equipment shall be removed from the humidity chamber for measurements which shall be made at ambient temperature and humidity.

(b) The measurements shall be made as rapidly as possible after removal from the test chamber.

(c) The seal on the antenna base assembly shall be broken for all five cycles by removal of the MX-6707/VRC matching unit case; however, the case shall also be subjected to the humidity cycles.

4.7.2.1 Performance. - Measurements made and specified performance shall be as follows. The antenna shall meet full specification performance before, during and after the test cycles, except voltage standard wave testing shall be performed only at Steps 4 and 8.

Test	Req Par	Test Para
Base assembly antenna resonance		3.8.1 4.8.2
Free space VSWR	3.8.2.1	4.8.1.2
Whip antenna test	3.8.4	4.8.4

4.7.2.2 Failure. - If any equipment fails to meet the performance specified in 4.7.2.1 during cycling, it shall be realigned or readjusted once. If the equipment then fails to meet 4.7.2.1 or fails subsequently during cycling, it does not pass the test. In addition, if the equipment fails to meet full specification requirements after condition, as specified in 4.7.2.1, it does not pass the test.

4.7.3 Immersion test (see 3.7.3). - The antenna AS-1729/VRC shall be tests in accordance with Method 512 Procedure I, of MIL-STD-810.

4.7.4. Vibration. -

4.7.4.1 Test for internal vibration (see 3.7.4.1). - Internal vibration testing of the antenna base assembly shall be in accordance with the following procedure:

a. Secure the equipment directly to a vibration table that can be controlled within 10% of the specified amplitude. To facilitate observation and measurement of amplitude of vibration, the equipment should be tested, provided it is secured to the vibration table in a manner similar to that used to mount the Antenna Base Assembly.

b. Vibrate the equipment successively in each of three mutually perpendicular directions over the frequency range of 10 to 55 cycles per second. The total excursion of the vibration shall be not less than 0.030 inch. In each of the three perpendicular directions, change the frequency in discrete steps of one cycle per second and maintain each frequency for at least 10 seconds.

c. At the completion of the test, the base assembly resonance test, 4.8.2, shall be performed to determine compliance with paragraph 3.8.1.

4.7.4.2 Vibration, whip assembly (see 3.7.4.2). - The whip assembly shall vibrated to determine its natural frequency exhibiting the highest vibration amplitude, and then the whip assembly shall be vibrated for two hours at this natural frequency. At the completion of the test, the whip antenna test of paragraph 3.8.4 shall be performed to determine compliance with paragraph 4.8.4. The total excursion of the applied vibration shall be not less than 0.030 inch.

4.7.5 Bounce Test (see 3.7.5). - The Antenna AS-1729/VRC shall be tested on a package tester, type 1000-SC, as made by the L.A.B. Corporation, Skaneateles, New York or equal. Accessories shall be selected from those listed on Drawing SC-A-46439. The test shall be as follows:

(a) Secure the equipment to the 48- by 48-inch vehicular adapter plate, in the same manner as it would be mounted in a vehicle. The adapter plate shall be free of cracks and broken welds, and all unused holes except the 2-inch breather holes shall be plugged. No part of the mounted surface shall be less than 7 inches from the edge of the adapter plate.

(b) Cover the tester bed with a panel of 1/2-inch plywood, with the grain parallel to the drive chain. Space sixpenny nails, with heads below the surface, at 6-inch intervals around all four edges and at 3-inch intervals in a 6-inch square in the center.

(c) Place the adapter plate on the bed of the package tester. Limit the lateral motion, by wooden fences, to not more than 3 inches and not less than 1 inch. Additional barriers may be used to safeguard personnel, provided that the fore-and aft motion of the adapter plate against the backstop is not restrained.

(d) Operate the package tester, shafts in phase, for a total of 3 hours at 283 $\pm$ 1 rpm. Turn the adapter plate 90 degrees at the end of each 45 minute, each time in the same direction.

(e) During the final 15 minutes of bounce testing, the antenna is to be energized by a 1000 cycle modulated RF carrier of minimum power in the frequency range from 30 to 75.95 megahertz. A Government-approved communi cation type receiver located a minimum of 100 feet from the antenna under test shall be tuned to the frequency of the AS-1729/VRC under test. The received signal shall be clear with no interruptions.

(f) At the completion of three hours of bounce testing, the equipment shall be tested to 4.8.1.2 and 4.8.2 to demonstrate compliance with 3.8.1 and 3.8.2.1

4.7.6 Shock test, ballistic (see 3.7.5). - The test shall be conducted on the "Shock Testing Machine for Light Weight Equipment" shown in MIL-S-901. The antenna shall be secured in its normal operating position to the steel test plate by means of the same fasteners used for vehicular installation of the

equipment. The test shall consist of a total of 9 blows. The sequence of the test blows is to be: (1) 1-foot, and 5-foot blows on the back; (2) 1-foot, 3-foot and 5-foot blows on the top; and (3) 1-foot, 3-foot and 5-foot blows on the side. As an alternative to reorienting the test plate for the blows on the side of the plate, equivalent rotation of the equipment under test is permissible. At the completion of the 9 blows, the antenna shall be tested to 4.8.2 and 4.8.4 to demonstrate compliance with 3.8.1 and 3.8.4.

4.7.7 Impact (see 3.7.6). - The Antenna AS-1729/VRC, secured on a vehicle in a normal operating position, shall be subjected to 25 repeated blows in any direction, against a 4-inch x 4-inch oak beam, when the vehicle is traveling at a rate of 25 miles per hour. The point of impact shall be at the mid-point of the whip assembly. The oak beam shall be stationary at the point of impact. After being subjected to this test, the antenna shall meet the Whip Antenna test of 4.8.4 and the X-Ray test of 4.11.

4.7.8 Flexing test (see 3.7.7). - One base assembly spring shall be flexed 40,000 cycles with each cycle consisting of a deflection of the top of the spring +30° from the unflexed position, to -30°, and return to normal. The 40,000 cycles shall be accomplished by rotating and cycling the spring approx imately 13,333 cycles at each of three (3) 120° positions. A second spring shall then be flexed 5,000 cycles, with one cycle consisting of a deflection of +90° from the unflexed position, to -90°, and return to normal. The 5,000 cycles shall be accomplished by rotating the spring approximately 1,666 cycles at each of three (3) 120° positions. The test shall be performed at a temperature of -40°F. The flexing rate shall be 10 plus or minus one cycle per minute. Tests of springs shall be performed with RF Cable SM-D-542043 assembled in it in Holders SM-D-542060 and SM-C-542059 or equivalent fixtures. The RF cable shall be tested for continuity before and after the flexing procedure.

4.7.9 Fungus (see 3.7.8). - The antenna shall be tested in accordance with method 508 procedure I of MIL-STD-810. The antenna matching unit case (SM-D-542066) shall be opened, the AT-1095/VRC and AS-1730/VRC elements shall not be connected to each other or the MX-6707/VRC base, the parts and materials of the antenna internal assembly, the interior of the case, the interior surfaces of the cable mount assembly (SM-D-542042), as well as the exterior of the antenna shall be sprayed with the spore suspension. The antenna shall be subjected to the test in this open condition. There shall be abundant growth colonization (see 6.10) on 50 percent or more of the control items after 7 and 28 days. The inability of the antenna to meet the requirements of 3.7.8 shall constitute failure of this test.

4.7.10 Salt fog (see 3.7.9). - The equipment and assemblies shall be exposed in their operating configuration to salt fog in accordance with Method 509 of MIL-STD-810 for 48 hours. Equipment and assemblies shall not be opened or operated during the test cycle. Immediately before and after the test cycles, the equipment and assemblies shall be tested for compliance with the requirements specified in Paragraph 3.7.9.

4.8 Electrical tests. -

4.8.1 Voltage standing wave ratio (VSWR). -

4.8.1.1 Standard test condition. - All electrical free space measurements, unless otherwise specified, shall be made in a reflection free environment. The test setup shall be located in an area that is away from any structure or geographical feature which would produce reflections and measurably alter the free space impedance. The antenna under test shall be elevated sufficiently to minimize the effects of terrain and all tests shall be performed over a ground plane consisting of a solid 10 foot by 10 foot copper sheet ground plane. Input impedance shall be referred to 50 ohms and the frequency of the source shall be accurate to within ± 0.1 mc. The magnitude of r.f. leakage in any of the test equipment plus any subassembly of the AS-1729/VRC Antenna shall be sufficiently low so that it cannot introduce errors into any electrical measurement.

4.8.1.2 Free space VSWR test (see 3.8.2.1). - The entire AS-1729/VRC Antenna with its permanent dust cover in place shall be mounted over a ground plane and under the conditions of 4.8.1.1 above. The VSWR shall be measured by any commercially standard means acceptable to the Government to determine compliance with 3.8.2.1.

4.8.1.3 Data and correlation records. - Measurement procedures for all electrical tests made shall conform to the requirements of this specification. An up to date file describing equipment and procedures shall be maintained by the contractor. Included in the contractor's file, as a minimum, shall be:

(a) Design and engineering drawings of all special equipment, including all electrical values and mechanical details and all production test proced ures for piece parts, subassemblies, and the complete item on order.

(b) A complete test layout for all electrical tests performed including complete details regarding type and length of cables used, type of connectors used, construction and adjustment test or positioning fixtures used, any wire and cable dress and routing, and any critical dimensions and adjustments that must be adhered to.

(c) Complete step-by-step method of operation of the test equipment and methods of computation.

(d) Calibration records on all test equipment used in taking measurements.

(e) Records showing equivalency to devices specified contractually when an "or equal" device is permitted by the Government. All of the data listed above shall be available for review by Government personnel when requested. All disputes regarding the accuracy or adequacy of the contractor's records shall be referred to the procuring activity for resolution.

4.8.2 Base assembly resonance test (see 3.8.1).- The base assembly (less cable-mount assembly SM-D-542042) when tested in accordance with the following Base Assembly Resonance Test Procedure shall resonate within frequency limits given in 3.8.1.

Base assembly resonance test procedure -

(a) Set up the equipment as shown in Figure 2 (see Appendix A).

(b) Insert MX-6707/VRC (less cable mount assembly SM-D-542042) into Matching Unit-Base Alignment Cavity and secure with grounding pins.

(c) Connect control cable from Alignment Cavity Control to connector J2 of MX-6707/VRC under test.

(d) Turn on equipment and allow to warm up for a minimum of 30 minutes.

(e) Set the Align Cavity Control subband selector switch to subband 1.

(f) Depress 10 MHz sweep width switch on Sweep Generator.

(g) Adjust the Sweep Generator variable sweep width control to maximum (initially).

(h) Set the Sweep Generator sweep mode/time switch to .01 seconds.

(i) Set the counter measurement interval switch to .01 seconds.

(j) Adjust the sweep generator variable sweep width control for approx imately 4 MHz display bandwidth on oscilloscope with applicable Table II subband resonance frequency at center of oscilloscope. Adjust center frequency control as necessary.

(k) Adjust the Sweep Generator variable amplitude control for approx iametly full vertical display on oscilloscope.

(l) Adjust the Sweep Generator dot position control until dot is displayed at the peak of the response curve. Read and record the frequency displayed on the Counter.

(m) Adjust the Alignment Cavity Control subband selector switch to next subband.

(n) Repeat step j, k, and l.

(o) Repeat steps m and n until all subbands have been measured.

NOTES:

(1) The Matching Unit Case (SM-D-542066) shall be on the MX-6707/VRC under test.

(2) For each Matching Unit Base Alignment Cavity, the contractor shall establish and maintain a Standard MX-6707/VRC in accordance with paragraph 30.1 of Appendix.

(3) The contractor maintained standard MX-6707/VRC unit shall be used at the beginning of each work day, or whenever there are questionable readings to verify that the Matching Unit Base Alignment Cavity is operating satisfactorily.

4.8.3 Power handling capability test (see 3.8.3). - All power handling capability tests shall be performed using the antenna test chamber. Measurements shall be made at one frequency in each subband of Table II for a total of ten (10) frequencies. The power handling test time for each frequency selected shall be one (1) hour. Each operating hour shall be followed by a non-operating one-half hour for purpose of cooling. Frequencies selected for these tests should exhibit approximately the same VSWR in the chamber as is required by Table III.

4.8.4 Whip antenna test. -

4.8.4.1 Top whip section test (see 3.8.4.1). - The test shall be performed in accordance with MIL-STD-202, Method 301, to determine compliance with 3.8.4.1.

(a) The test voltage shall be 15,000 volts RMS.

(b) The test voltage shall be applied along the full length of the upper whip section, and along the lower whip section from a point one inch above the stainless steel ferrule to a point an inch below the metallic captivating pin.

4.8.4.2 Lower whip section test (see 3.8.4.2). -Measurements shall be made to determine the characteristic impedance of the 50 ohm and 125 ohm cables within the whip section using the 'Time Domain Reflectometry' test method as outlined in Hewlett-Packard Journal, Volume 15, No. 6, dated February 1964.

4.8.4.3 Whip assembly test (see 3.8.4.3). - For the purpose of this test, the whip assembly shall consist of:

(a) Antenna Element, AT-1095/VRC, **upper section.**

(b) Antenna Element, AS-1730/VRC, **lower section.**

(c) The Base Spring.

This whip assembly shall be mounted on a 10 -foot by 10-foot copper sheet (see Fig. 1). The admittance (normalized to 20 millimhos) of the assembly shall be measured at the end of a 27 inch length of RG-58C/U coaxial cable connected to the "r.f. Connector-Adaptor, SM-B-542115", at 75.0 MHz. For admittance information see Appendix A.

4.8.5 Control cable voltage (see 3.8.5. - The Matching Unit-Base, Antenna MX-6707/VRC antenna control connector J2, pin voltages, and manual/automatic band switch indexing shall be measured for compliance with Table IV.

4.9 Air-seal test (see 3.10). - The equipment shall be opened and closed again in such a manner as to break and remake the seal. Immediately thereafter, the equipment as field transported shall be subjected to a vacuum of 1 pound per square inch (1 pound per square inch less than the atmospheric pressure surrounding the equipment) applied to the interior of the equipment enclosure. The vacuum then shall be valved-off and the interior pressure measured during the ensuing period of 2 minutes. During this 2-minute period, there shall be no decrease in vacuum. The gage used for measurement of vacuum shall be of such accuracy that any decrease in vacuum can be readily determined.

4.10 Visual and mechanical inspection (see 3.13). - The equipment shall be examined for the defects listed in MIL-STD-252.

4.11 X-Ray (see 3.11. - The AS-1730/VRC Antenna Element shall be X-Rayed along the entire area above the stainless steel ferrule to determine compliance with paragraph 3.11.

4.12 Inspection of interchangeability. - The dimensions listed below shall be gaged or measured to determine conformance to the physical interchangeability requirement of 3.12. When a listed dimension is not within specified or design limits, it shall be considered a major defect.

(a) External and internal dimensions of case, 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 connectors, locking pins, fasteners, slides, and mountings which receive mating parts of plug-in assemblies or major units; and location of mating parts on the plug-in assembly or major unit.
(d) Size and form of special threads.
(e) Conformance of AT-1095/VRC and AS-1730/VRC to drawing GL-SM-B-323477

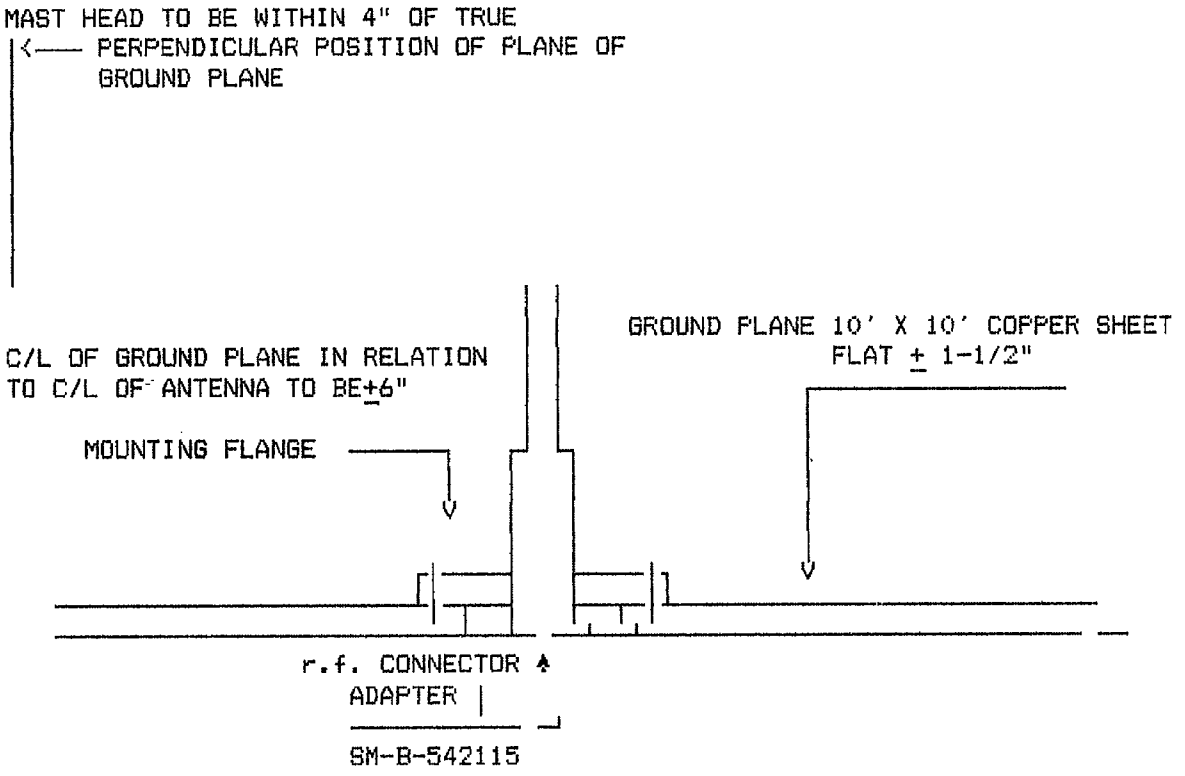


Figure 1. Antenna assembly under test
Ground plane and mast located in reflection free environment

4.13 Workmanship(see 3.13). - The workmanship used in the manufacturing of Antenna AS-1729/VRC or portions thereof shall be in accordance with Requirement 9 Of MIL-STD-454. Other paragraphs of MIL-STD-454, other MIL-STDs and MIL-SPECs listed in 3.13 shall apply as they are applicable to this antenna.

4.14 Finish and Pretreatment

1. Where technical drawings and the equipment specification specify Olive Drab finish for piece parts, subassemblies, and assemblies, these shall not be finished with the lusterless Forest Green paint conforming to film designation "V" in MIL-F-14072(EL) "V", but shall be finished with the Chemical Agent Resistant Coating (CARC) per MIL-C-46168(ME). Finish pretreatment shall be in accordance with MIL-T-704.

2. Requirements are as follows:

(a) Finish: Finish pretreatment and finishes of external surfaces shall be in accordance with MIL-T-704 and MIL-C-46168(ME) respectively.

(1) For ferrous metals, primer is to be in accordance with MIL-P-52192. Thickness of primer 0.0010 to 0.0015 inches.

(2) For non-ferrous metals, primer is to be in accordance with MIL-P-23377. Thickness of primer 0.0006 to 0.0009 inches. (3) In order to paint the Lexan Base with CARC a primer is required. The USA Belvoir Research and Development Center recommends using either primer MIL-P-53022 or DOD-P-15328 listed in specifications MIL-T-704 and MIL-C-46168(ME) respectively. The color of the part as molded (prior to painting) shall be as close as possible to Green 383 by pre-mixing the material with color pigment.

(4) Final finish coating shall be Type II Green 383 in accordance with MIL-C-46168(ME). Final finish is applied at a minimum of 0.0018 inches dry in two coats.

(5) Antennas: Finish coat on signal radiating or receiving elements where specified on drawings, must be TYPE II, Green 383 in accordance with MIL-C-46168(ME).

(b) Color: Color of external surfaces shall be TYPE II Green 383 in accordance with MIL-C-46168(ME). 3. The equipment shall be marked with the word "CARC" in close proximity to the ID nameplate or N.S.N., stencilled per MIL-M-13231, Group II using black ink, one-half inch high, one-quarter inch high may be used on whip assembly.

4.15 Quality Assurance Requirements In This Specification Applicable For Antenna Elements AT-1095/VRC and AS-1730/VRC

PARAGRAPH TITLE

4.1 Responsibility for Inspection
4.2 (a) and (b) Classification of Inspection
4.4 Inspection covered by Subsidiary Documents
4.5 Quality Conformance
4.7 Service Conditions Test
4.7.1 Temperature Test - Unit shall be tested in accordance with 4.8.4.3 only.

4.7.2 Humidity Test - An MX-6707/VRC shall not be included in the humidity chamber. Under 4.7.2.1 units shall be tested for performance in accordance with 4.8.4.3 only.

4.7.4.2	Vibration, Whip Assembly
4.7.7	Impact
4.7.9	Fungus
4.7.10	Salt Fog
4.8	Electrical Tests
4.8.4	Whip Antenna Test
4.8.4.1	Top whip section test voltage 15,000 VRMS.
4.8.4.3	Whip Assembly Test
4.10	Visual and Mechanical Inspection
4.11	X-Ray
4.12	Interchangeability
4.13	Workmanship
4.14	CARC Paint Finish

5 PACKAGING

5.1 Packaging requirements. - The packaging requirements for the desired level(s) of protection shall be as specified by the acquisition activity in the contract or purchase order.

6. NOTES

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

6.1 Intended use. - Antenna AS-1729/VRC is intended for use with and is automatically tuned by Radio Sets AN/VRC-12, AN/VRC-43 through AN/VRC-49, AN/VRC-53, AN/GRC-125, AN/GRC-160 and AN/GRC-163. In addition, the manual band selector switch provided in this antenna permits Antenna AS-1729/VRC to be used with any radio set capable of operating between 30 and 76 megahertz provided its output power does not exceed 70 watts.

6.2 Acquisition requirements. - Acquisition documents shall specify the following:

(a) Title, number and date of this specification.

(b) Issue of DODISS to be cited in solicitation, and if required, the specific issue of individual documents referenced.

(c) Production pack(s) as follows:

Makeup of pack(s).

Number of each kind of pack to be submitted.

Inspection to be performed thereon.

(d) Marking and shipping of samples.

(e) Place of final inspection.

6.3 Color. - The color chip furnished by the acquisition agency will be color chip No. 24087, may be obtained upon request to Commanding Officer, US Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, PA 19120

6.4 Group C Inspection. - Approval to ship may be withheld at the discretion of the Government, pending the decision from the Contracting Officer on the adequacy of corrective action (see 4.5.3.2)

6.5 Location of air-seal test. - It is desirable that the air-seal test (4.9) be performed at a location that will minimize handling (which might

cause damage to the equipment) after this inspection is completed. Any preparation for shipment which would require breaking of equipment seal should be accomplished prior to the air-seal test so that the seal may remain intact thereafter. It is recommended that the entire lot (including all previously inspected sample units) be sampled and inspected immediately prior to packaging.

6.6 Nomenclature. - The contractor should apply for nomenclature in accordance with the applicable clause in the contract (see 1.1).

6.7 Verification inspection. - Verification by the Government will be limited to the amount deemed necessary to determine compliance with the contract and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractor's quality system and the quality history of the product.

6.8 Theory of operation. - Antenna AS-1729/VRC is electrically equivalent to a vertical dipole of constant length whose current distribution throughout the operating band is optimized by a preselected termination within the base assembly unit. The upper element of the dipole is a straight-forward conductor. The lower element of the dipole is the outside surface of a coaxial cable which is terminated, at the bottom end, against ground in a controlled admittance. The location near the center of the whip, where the upper element joins the inner conductor of the coaxial cable, is referred to as the feed-point. The coaxial cable making up the lower element has two additional functions. It serves to supply rf energy to the feed-point and also serves as a coaxial transformer section grouping the input impedance with a 3:1 VSWR. The termination within the base assembly unit is a ferrite core r.f. choke whose susceptance to ground is changed (in ten subbands) by alternately shunting nine of the subbands with present variable components. Subband number two is controlled by the base choke alone and is not adjustable. The shunting is accomplished by a step-action rotary solenoid driven switch, which is controlled by a master wafer built into Radio Set AN/VRC-12. A manual override knob serves to indicate the subband in operation and provides a capability for manual selection of the desired subband when the antenna is used with a radio set other than those listed in 6.1.

6.9 Antenna Test Chamber - The antenna test chamber is used to facilitate indoor electrical testing of Antenna Matching Unit-Base MX-6707/VRC during production. The chamber is a twelve inch diameter tube, six feet long, the interior contains either ferrite tile or ferrite rings. A modified lower whip section is mounted axially within the chamber. A nine inch copper disk with a short stub at the center that has been tailored to electrically represent the top whip section, screws into the top end of the modified lower whip section. The chamber provides a unique correlation between the impedance of an antenna within the chamber and the same antenna over a reference ten feet by ten feet ground screen in free space. Because the antenna impedance in the chamber at

some frequency in each subband is within the VSWR requirements of this specification, meaningful r.f. power tests on the MX-6707/VRC can be accomplished in the chamber.

6.10 DEFINITIONS -

6.10.1 Branching. - Branching is a connected arrangement of filaments (hyphae) formed by shoots or secondary stems growing from the main stem or filament (Hypha).

6.10.2 Growth Colonization. - Growth colonization is a mass of individual plants, generally of one species, living together; or a group of hyphae which is formed from one spore or cell and may be one individual plant. Coloniza tion which completely covers the surface of the nutrient material constitutes abundant growth.

6.10.3 Microbial Growth. - Microbial growth is the growth of very minute organisms. Such organisms when present in large numbers may provide a colony visible to the naked eye.

6.10.4 Sporulation. - Sporulation is the formation of minute unicellular reproductive or dorment bodies, called spores.

6.10.5 Tubular Germination. - Tubular germination is partial growth by the production of hyphae, which are tubular shaped fungal filaments. Tubular germination constitutes restricted individual spore growth not proceeding to colonization.

6.11 Matching Unit Base Alignment Cavity. - This cavity (see Appendix) is a recent development of the U.S. Army Communication - Electronics Command and is considered to be a significant improvement in MX-6707/VRC alignment and test test method.

6.12 Subject term (keyword) listing. -
Aerial
Vehicular antenna,
Whip antenna.

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

APPENDIX A

CALIBRATION AND ALIGNMENT

PROCEDURES FOR THE MATCHING

UNIT-BASE ALIGNMENT CAVITY

10.0 Scope. - This appendix describes the procedures for calibrating the Matching Unit-Base Alignment Cavity and using the Matching Unit-Base Alignment Cavity to align the MX-6707/VRC units during production. This appendix is a mandatory part of this specification.

20.0 Description - The Machine Unit-Base Alignment Cavity was developed to facilitate electrical alignment and testing of Antenna Matching Unit-Base MX-6707/VRC during production. The cavity is a rectangular shaped aluminum unit approximately ten inches by seven inches by six inches with a three and one half inches diameter hole in the top for insertion of inverted MX-6707/VRC (less cable-mount assembly SM-D-542042). The cavity contains a step-action rotary solenoid driven switch, adjustable circuit elements (capacitors and/or inductors, and an r.f. detector circuit.

30.0 Calibration procedure for the Matching Unit-Base Alignment Cavity. -

30.1 Standard MX-6707/VRC. - A standard MX-6707/VRC shall be established in accordance with the following procedure:

a. Select a MX-6707/VRC from preproduction or first production units in which variable shunt elements C8 and L3 through L10 have been aligned on a Wayne-Kerr Admittance Bridge Model B-801 as close as possible to the target values specified in Table 1 of Drawing SM-B-542023.

b. Select a whip assembly (Antenna Elements AS-1095/VRC, AS-1730/VRC and Cable-Mount Assembly SM-D-542042) which meets the susceptance and conductance requirements as specified in paragraphs 3.8.4.3 and 4.8.4.3 of this specification.

c. Assemble the MX-6707/VRC (aligned per paragraph 30.1a) and the Whip Assembly (selected per paragraph 30.1b to form an Antenna AS-1729/VRC.

d. Position the AS-1729/VRC Antenna in an area which meets the standard test conditions delineated in paragraph 4.8 of this specification. Figure 3 of this Appendix is a blockdiagram showing a typical free-space test arrange ment for measuring the impedance of the antenna.

e. Fine tune variable shunt element C8 and L3 through L10 of MX-6707/VRC at the upper and lower frequencies in each subband listed in Table III of this specification until the impedance (Z,O) values obtained yield equal VSWR values at the measured frequencies which are within the limits specified in Table III of this specification.

f. Remove the AS-1730/VRC, AT-1095/VRC and Cable-Mount Assembly SM-D-542042 from the AS-1729/VRC and perform admittance testing per Drawing SM-B-542023 on the MX-6707/VRC which has been fine tuned for VSWR on ground ground plane per e. above to assure that it still meets the admittance values specified in Table I of Drawing SM-B-542023. (Table IX of this specification).

g. The MX-6707/VRC which has been tested in accordance with paragraph a through f above shall be used as Standard MX-6707/VRC for calibration of Matching Unit-Base Alignment Cavity.

h. Whenever design changes are incorporated into the AS-1729/VRC antenna, the contractor shall perform the procedure per paragraphs a through f above on redesigned units and shall use the resulting new Standard MX-6707/VRC to recalibrate the Matching Unit-Base Alignment Cavity.

APPENDIX A

Table IX Admittance Alignment Values
Extracted from SM-B-542023

SUB BAND	FREQ MHZ	VARIABLE SHUNT COMPONENT	SUSCEPTANCE/2πf PICOFARADS			MAXIMUM CONDUCTANCE MILLIMHOS
			MIN	TARGET	MAX	
1	30.0*	CB	+19.4	+21.4	+22.9	.08
1	33.0	-	+20.8	+23.9	+25.4	.09
2	33.0	NONE	+ 8.6	+10.6	+12.6	.09
2	37.0	-	+10.2	+12.2	+14.2	.09
3	37.0*	L4	0.0	+ 1.7	+ 5.2	.11
3	42.0	-	+ 3.2	+ 5.7	+ 6.3	.13
4	42.0	-	- 6.4	- 1.4	+ 1.0	.11
4	47.5*	L6	- 1.9	+ 3.0	+ 5.3	.15
5	47.5*	L5	- 7.5	- 3.6	- 3.0	.12
5	53.0	-	- 1.0	+ 0.3	+ 2.0	.13
6	53.0*	L3	- 8.8	- 2.8	- 1.8	.14
6	56.0	-	- 8.0	- 1.0	+ 0.8	.14
7	56.0	-	-10.0	- 6.0	- 5.0	.14
7	60.0*	L8	- 7.4	- 3.0	- 1.8	.16
8	60.0	-	-16.0	-10.5	- 9.3	.20
8	65.0*	L9	-12.0	- 7.4	- 6.2	.20
9	65.0	-	-21.4	-12.1	-10.5	.20
9	70.5*	L10	-17.8	- 8.8	- 7.8	.25
10	70.5	-	-21.2	-14.3	-12.8	.25
10	75.95*	L7	-18.1	-11.4	-10.4	.30

* = ADJUSTMENT FREQUENCY

NOTES:

1. When aligning base assembly, the variable shunt component shall be adjusted to obtain Susceptance/2πf values as close as possible to above indicated target values.

2. The Base Alignment Test Fixture SM-B-542114 shall be used in place of Matching Case SM-D-542066 during the calibration of the Matching Unit Base Alignment Cavity.

3. For each Matching Unit-Base Cavity the contractor shall establish and maintain a Standard MX-6707/VRC in accordance with paragraph 30.1 of this Appendix.

4. The contractor maintained Standard MX-6707/VRC unit shall be used at the beginning of each work day, and whenever there is a questionable reading, to verify that the Matching Unit-Base Alignment Cavity is operating satisfactorily.

APPENDIX A

30.2 Calibration Procedures. -

a. Set up the equipment as shown in Figure 2.

b. Insert standard MX-6707/VRC (less cable-mount assembly SM-D-542042) into Matching Unit-Base Alignment Cavity and secure with grounding pins.

c. Connect control cable from Alignment Cavity control to connector J2 of standard MX-6707/VRC unit.

d. Turn on equipment and allow to warm up for a minimum of 30 minutes.

e. Set the Alignment Cavity control subband selector switch to subband 1.

f. Depress 10 MHz marker switch on sweep generator.

g. Depress 10 MHz sweep width switch on sweep generator.

h. Adjust the sweep generator variable sweep width control to maximum (initially).

i. Set the sweep generator sweep mode/time switch to .01 seconds.

j. Set the counter measurement switch to .01 seconds.

k. Adjust the sweep generator marker size control for easily observable marker display on oscilloscope.

l. Adjust the sweep generator variable sweep width control for approxi mately 4 MHz display bandwidth on oscilloscope with 40 MHz marker at center. Adjust center frequency control as necessary.

m. Adjust the sweep generator variable amplitude control for approxi mately full vertical screen display on the oscilloscope.

n. Adjust variable component inside Matching Unit-Base Alignment Cavity corresponding to subband control switch position to position the 40MHz marker at the peak of the response curve.

o. Advance the Alignment Cavity control subband selector switch to next subband.

p. Repeat step n.

q. Repeat steps o and p until all subbands have been adjusted.

NOTE:

1. The Base Alignment Test Fixture SM-B-542114 shall be used in place of Matching Unit Case SM-D-542066 during calibration of the Matching Unit Base Alignment Cavity.

40.0 Production procedure for alignment of MX-6707/VRC Antenna Matching Unit-Base.

a. Set up equipment as shown in Figure 2.

b. Insert untuned production MX-6707/VRC (less cable mount assembly SM-D-542042) into Matching Unit-Base Alignment Cavity and secure with grounding pins.

c. Connect control cable from the Alignment Cavity control connector J2 of MX-6707/VRC.

d. Turn on equipment and allow to warm up for a minimum of 30 minutes.

e. Set the Alignment Cavity Control subband selector switch to subband 1.

f. Depress 10 MHz marker switch on sweep generator.

g. Depress 10 MHz sweep width switch on sweep generator.

h. Adjust the sweep generator variable sweep width control to maximum (initially).

i. Set the sweep generator sweep mode/time switch to .01 seconds.

j. Set the counter measurement interval switch to .01 seconds.

k. Adjust the sweep generator marker size control for easily observed marker display on oscilloscope.

l. Adjust the sweep generator variable sweep width control for approxi mately 4 MHz display bandwidth on oscilloscope with 40 MHz marker at center. Adjust center frequency control as necessary.

m. Adjust the Sweep Generator variable amplitude control for approxi mately full vertical screen display on oscilloscope.

n. Adjust variable component inside MX-6707/VCR corresponding to subband control switch position (see Table X) to position of the 40MHz marker at the peak of the response curve.

TABLE X - MX-6707/VRC Variable Components

Subband	Variable Component
1	C 8
2	NONE
3	L 4
4	L 6
5	L 5
6	L 3
7	L 8
8	L 9
9	L 10
10	L 7

o. Advance the Alignment Cavity Control subband selector switch to the next subband.

p. Repeat step n.

q. Repeat steps o and p until all subbands have been adjusted.

NOTES:

1. The Base Alignment Test Fixture SM-B-542114 shall be used in place of Matching Unit Case SM-D-542066 during alignment of MX-6707/VRC.

2. All MX-6707/VRC production units shall be aligned in accordance with the above alignment procedure.

3. For each Matching Unit-Base Alignment Cavity the contractor shall establish and maintain a Standard MX-6707/VRC in accordance with paragraph 30.1 of this Appendix.

4. The contractor maintained Standard MX-6707/VRC unit shall be used at the beginning of each work day, or whenever there is a questionable reading, to verify that the Matching Unit-Base Alignment Cavity is operating satisfactorily.

APPENDIX A

50.0 Test equipment required for Figure 2. -

Description	Manufacturer and Model Number
Matching Unit-Base (Contractor Furnished) Alignment Cavity	
Alignment Cavity Control (Contractor Furnished)	
Main Frame	Textronix TM 504 option 7
Sweep Generator	Textronix SW 503
Oscilloscope	Tektronix SC 502
Counter	Tektronix DC 502 option 7

NOTE 1: No equivalent to the specified test equipment will be permitted unless authorized by the contracting officer.

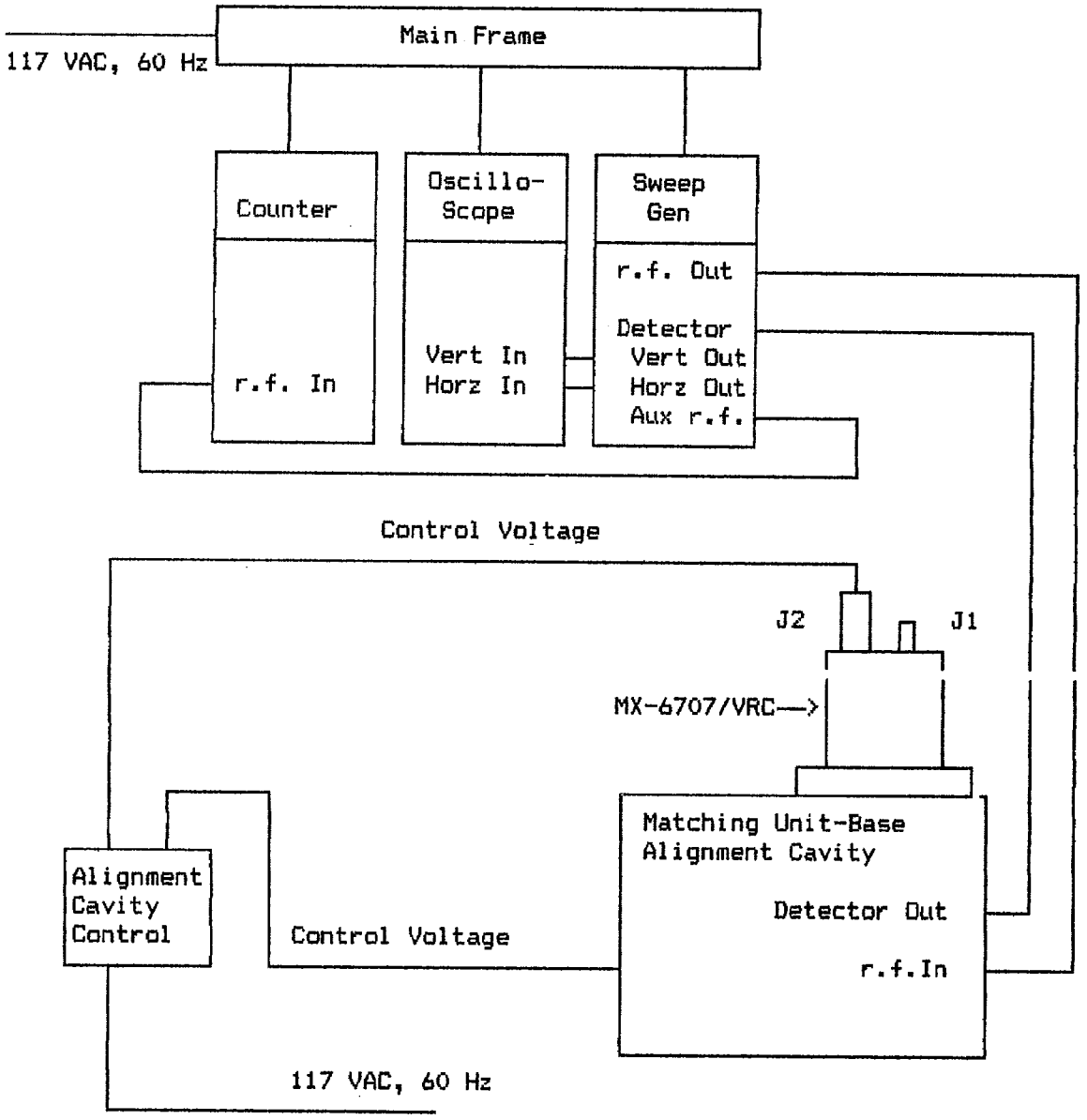


Figure 2 Test setup for use of Matching Unit-Base Alignment Cavity

APPENDIX A

60.0 Test Equipment required for Figure 3. -

Description	Manufacturer and Model Number
Vector Impedance Meter	Hewlett-Packard 4815A(H0-1)
Frequency Counter	Hewlet-Packard 5381A
DC Power Supply	Hewlett-Packard 6290A
Band Selector Test SWitch	See Dwg SM-B-542023

Note 1: No equivalents to the specified test equipment will be permitted unless authorized by the contracting officer.

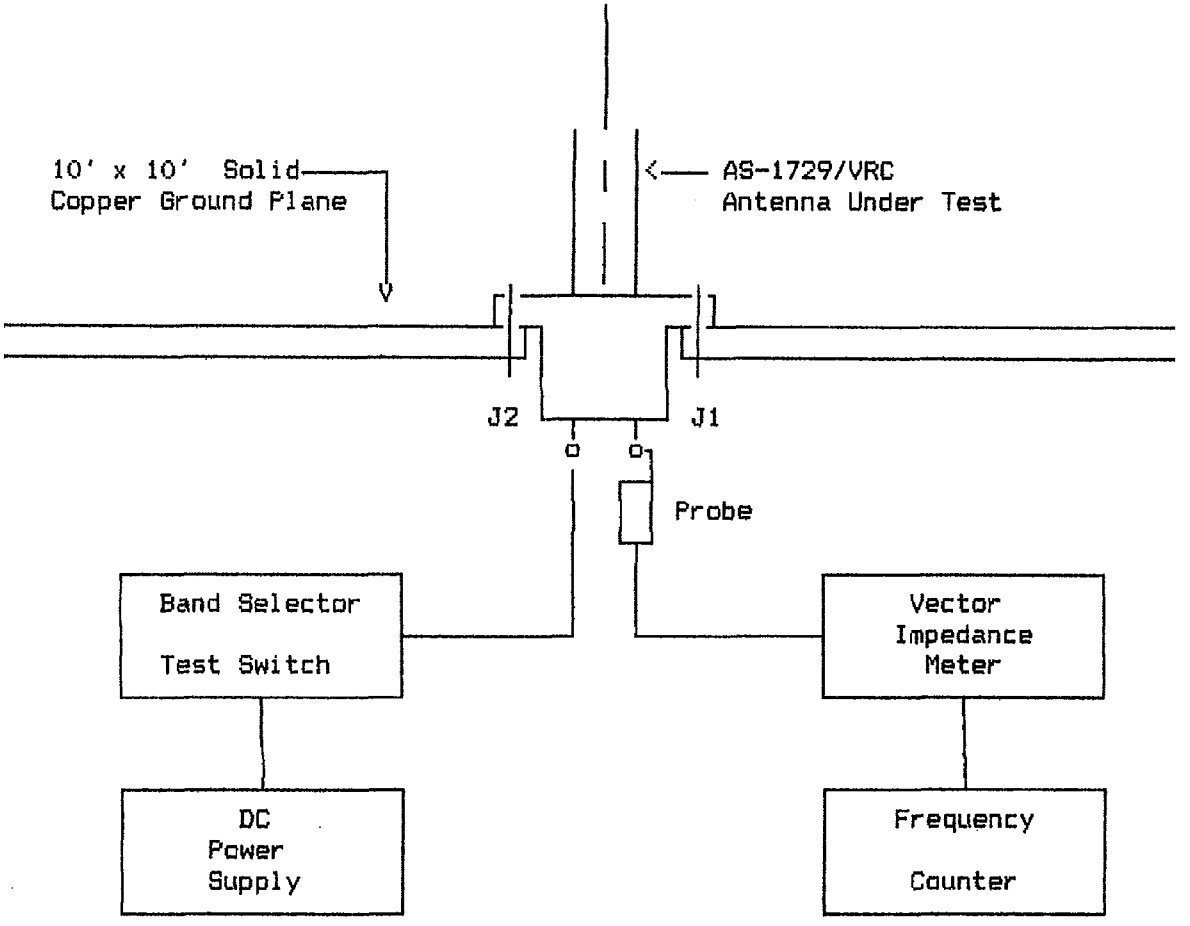


Figure 3 Test Setup for Measuring Impedance of AS-1729/VRC Antenna on Ground Plane

Custodian:
Army - CR

Review activity:
Army - MI

User activity:
Navy - MC

Preparing activity:
Army - CR
(Project 5985-A600)