MIL-S-38449C(USAF)
11 June 1976
SUPERSEDING
MIL-S-38449B(USAF)
15 August 1973

MILITARY SPECIFICATION

SIGNAL AND SIGNAL/INTERCOMMUNICATION AMPLIFIERS, UNIVERSAL, AERIAL REFUELING

This specification is approved for use by the Department of the Air Force and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers the requirements for universal aerial refueling signal and signal/intercommunication amplifiers for use on tanker and receiver aircraft utilizing the flying boom aerial refueling system.

* 1.2 Classification. The amplifiers shall be of the following classes:

Class 1	Standard electrical receptacle without intercommunication, PN M38449-1
Class 2	Miniaturized electrical receptacle without intercommunication, PN M38449-2
Class 3	Miniaturized electrical receptacle with intercommunication, PN M38449-3
Class 4	Miniaturized electrical receptacle with intercommunication and push-to-talk, PN M38449-4

2. APPLICABLE DOCUMENTS

2.1 Issue of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
QQ-A-250/5	Aluminum Alloy Alclad 2024, Plate Sheet
QQ-A-250/8	Aluminum Alloy 5052, Plate and Sheet
QQ-S-766	Steel Plates, Sheets, and Strip - Corrosion Resisting
TT-P-1757	Primer Coating, Zinc Chromate, Low-Moisture Sensitivity
PPP-B-636	Boxes, Shipping, Fiberboard

MILITARY

MIL-P-116	Preservation-Packaging, Methods of
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-R-5757	Relays, Electrical (For Electronic and Communication Type Equipment), General Specification For

MIL-A-8625	Anodic Coatings, For Aluminum and Aluminum Alloys
MIL-W-16878/4	Wire, Electrical, Type E, 200°C and 260°C, 600 Volts, (Insulated, High Temperature)
MIL-R-27521	Receptacle, Flying Boom, Aerial Refueling
MIL-C-83723/75	Connector, Electric, Plug, Bayonet Coupling, Crimp Socket Contact, Class R
MIL-C-83723/80	Connector, Electric, Receptacle, Solder Flange Mount, Bayonet Coupling, Solder Pin Contact, Class H

STANDARDS

FEDERAL

FED-STD-151	Metal, Test Methods
FED STD-595	Colors

MILITARY

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of US Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-461	Electromagnetic Interference Characteristics Requirements for
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-701	List of Standard Semiconductor Devices
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of
MIL STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
MS3106	Connector, Plug, Electric, Straight, Solder Contacts, AN Type
MS24266	Connectors, Plug, Electrical, Straight, Miniature
MS25231	Lamps, Incandescent, Center Contact, Miniature Bayonet Base (T-3-1/4 Bulb)
MS27034	Connector, Receptacle, Electrical Insert, Cylindrical, Miniature, Hermetic, Solder Mount

AIR FORCE - NAVY AERONAUTICAL

AN117001	Screw - Oval Fillister Head, .164-32

PUBLICATION

MILITARY HANDBOOK

MIL-HDBK-217	Reliability Stress and Failure Rate Data for Electronic Equipment

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

3. REQUIREMENTS

3.1 Qualification. The signal and signal/intercommunication amplifiers furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

* 3.2 Components. Each class of signal and signal/intercommunication amplifiers (class 1, 2, 3, or 4) shall comprise a single, assembled unit. The assembled unit, showing maximum dimensions, tolerances, mounting provisions, and electrical receptacle location, is shown on figure 1.

3.3 Selection of standards and specifications. Standards and specifications for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-113.

* 3.4 Materials. Materials and processes used in the amplifiers shall be of high quality, shall be suitable for the purpose, and shall conform to applicable Government specifications. Mating bearing surfaces of the case and mounting base shall be of corrosion resisting steel, class 301 in accordance with QQ-S-766 or suitably treated to resist corrosion due to fuels, hydraulic fluids, salt fog, or atmospheric conditions likely to be met in storage or service, or these surfaces shall be of hard aluminum alloy in accordance with QQ-A-250/4, QQ-A-250/5, or QQ-A-250/8. Heat-treatable aluminum alloys shall not be left in the "0" condition.

3.4.1 Metals. Metals (other than current-carrying parts) shall be of the corrosion-resistant type. The use of any protective coating that will crack or scale with age or extremes of climatic and environmental conditions shall be avoided. Metals shall be inspected in accordance with FED-STD-151. The use of magnesium or any alloy thereof shall be prohibited.

3.4.1.1 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals shall be as defined in MIL-STD-889.

* 3.5 Design. Each class of amplifier shall perform as an electronically settable three-position switch that advances one position each time an input signal of characteristics specified herein is received and returns to a READY position when power is removed. The three positions are: (1) READY, (2) CONTACT, and (3) DISCONNECT. For each position, electrical circuits of the unit shall provide output power to pin connections as specified in table I. Valid input signals which advance the unit from READY to CONTACT or CONTACT to DISCONNECT may be generated by either aircraft. When a valid signal condition occurs, the signal must pass from one aircraft to the other by means of the mated aerial refueling hardware, which contains an electrical link of induction coils and associated air gap. The induction coils transform the electrical signal to a characteristic time voltage function as defined herein. The class 3 and 4 units shall also provide half-duplex voice intercommunication capability between the tanker and receiver aircraft over the same 2-wire circuit used to transmit or receive the READY, CONTACT, and DISCONNECT signals, on a mutually noninterfering basis.

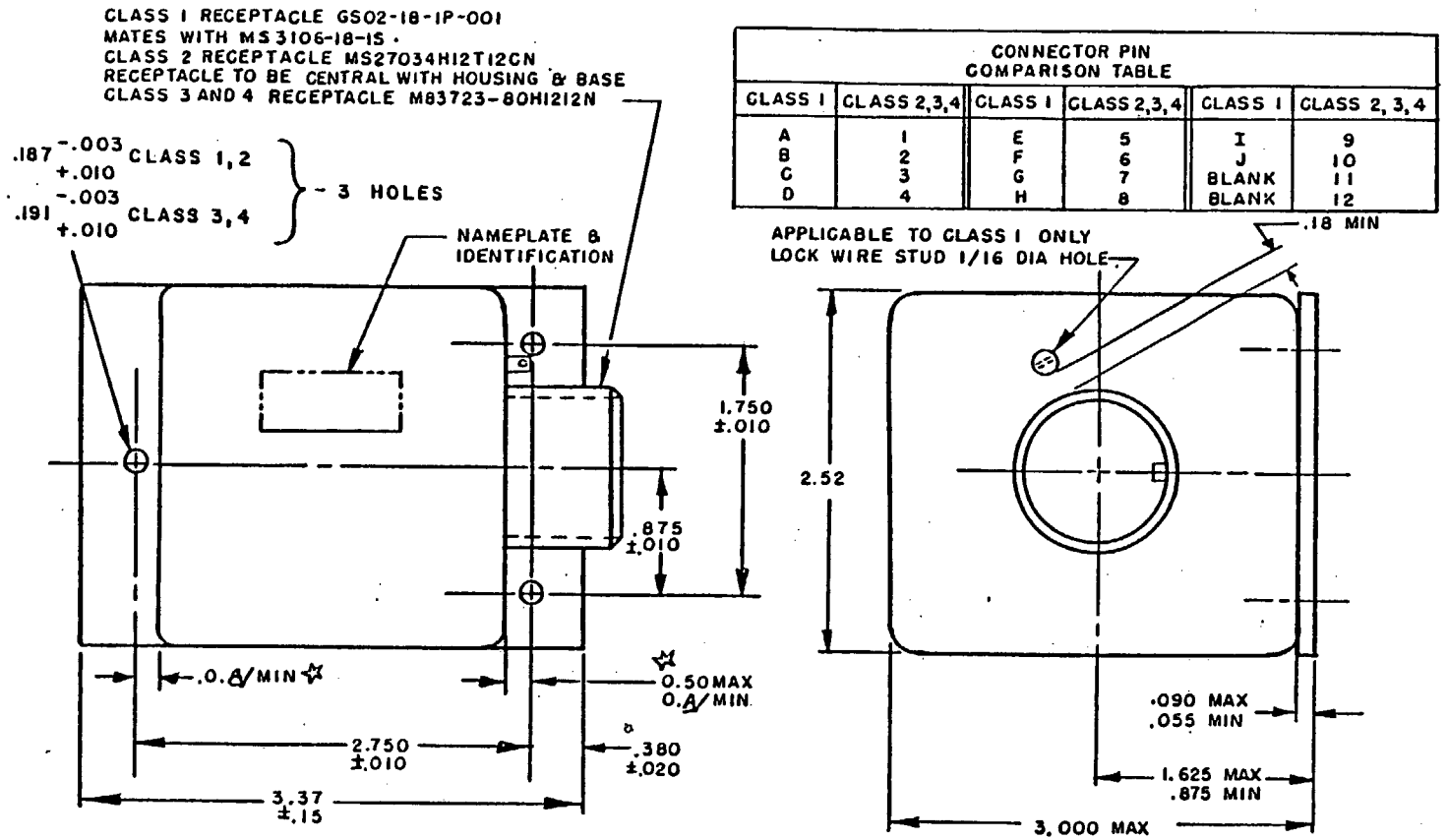
* 3.5.1 Intercommunication amplifier design (classes 3 and 4 only)

* 3.5.1.1 Signal pulse sensitivity. The signal pulse sensitivity shall be as shown on figure 2 for the classes 3 and 4 units.

3.5.1.2 Coupling. The intercommunication amplifier circuitry shall be alternating-current coupled to the coil intercommunication circuits to prevent unwanted direct-current bias voltages from appearing in either circuit.

3.5.1.3 Intercom loading. At 1,000 Hz, output pins 9 and 12 (audio and audio common) shall accept any source impedance from 100 ohms to 700 ohms without causing a loading effect on the aircraft intercom of greater than 1 dB.

3.5.1.4 Protection from "talk-off". Design of the intercommunication amplifier shall be such that no intercommunication signal of any amplitude up to 50V peak can cause false switching from the READY to CONTACT, or from the CONTACT to DISCONNECT positions of the signal amplifier.



NOTES: ☆ A MINIMUM CLEARANCE OF 0.030 SHALL BE MAINTAINED BETWEEN THE MOUNTING SCREW HEAD AND THE BODY OF THE AMPLIFIER.

A/ .17 FOR CLASS 1, 2, 3. CLASS 4 IS .16.

THE KEYWAY FOR ALL CLASSES OF CONNECTORS SHALL BE LOCATED IN THE 6 O'CLOCK POSITION AS SHOWN.

RADIUS ALL SHARP CORNERS TO 0.06 UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE IN INCHES AND ARE MAXIMUM UNLESS OTHERWISE NOTED.

* FIGURE 1. Signal amplifier envelope, mounting and connector.

* Table I. Pin voltages in the three signal amplifier status.

	Step Sequence		1	2	3	4
	Pin		READY	CONTACT	DISCONNECT	RESET
Pin Function	Class 1	Classes 2, 3 and 4	4/			
Input (pwr)	A	1	28V dc	28V dc	28V dc	0
Ground (Gnd)	B	2	Gnd	Gnd	Gnd	Gnd
Outputs 9/	C	3	28V dc	0	0	0
Outputs 9/	D	4	0	28V dc	0	0
Outputs 9/	E	5	28V dc	0	0	0
Signal input 1/	F	6	6/ , 7/	6/ , 7/	0	0
Outputs 9/	G	7	0	0	28V dc	0
Outputs 9/	H	8	28V dc	28V dc	0	0
Outputs 2/ 9/	I	9	0	28V dc	28V dc	0
Outputs 8/ 9/	J	10	0	28V dc	0	0
Input 3/		11	28V dc	28V dc	28V dc	28V dc
Audio(classes 3 and 4 only)		12	Audio Comm	Audio Comm	Audio Comm	Audio Comm

1/ In classes 3 and 4, pin 6 also carries the audio intercommunication signals to and from the induction coils.

2/ Conditions are for class 1 and 2 units only. Pin 9 is used for the intercommunication (audio) input for the classes 3 and 4.

3/ Voltage is applied in the override mode to pin 11 in classes 3 and 4 only.

4/ Initial application of power sets the amplifier to READY.

5/ Momentary interruption of input power to pin A/1 resets the amplifier to READY.

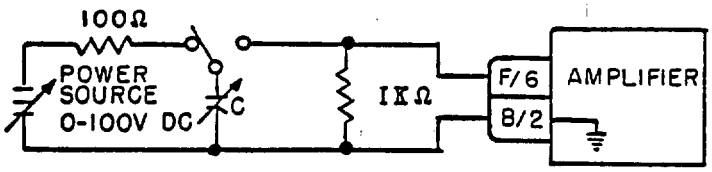
6/ Closing an external circuit between pin F/6 and pin E/5, or applying the first input pulse to pin F/6 shall cause amplifier to go to the CONTACT state.

7/ With the amplifier in the CONTACT position, closing an external circuit between pin F/6 and pin D/4 or applying a signal pulse to pin F/6 shall cause the amplifier to go into DISCONNECT.

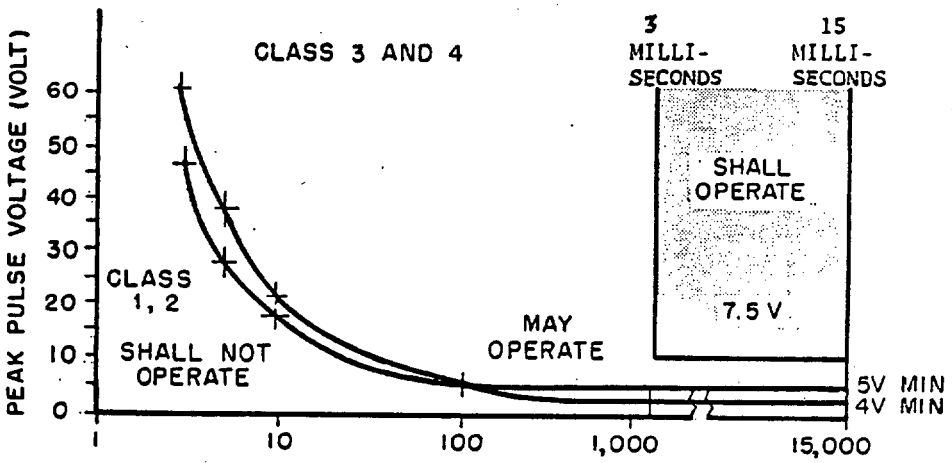
8/ Pin 10 is for push-to-talk for class 4 only (see 3.5.1.8).

9/ Reverse voltage protection (diodes) shall be provided internally on all applicable outputs for class 3 and 4. Class 1 and 2 shall use external reverse voltage protection.

(A) TRANSIENT SENSITIVITY TEST SETUP



(B) OPERATING SIGNAL CHARACTERISTICS



TIME CONSTANT MICROSECONDS	CLASSES 1, 2 (VOLTAGE)	CLASSES 3, 4 (VOLTAGE)
15,000	5.0	4.0
1,000	5.0	4.0
100	5.0	5.0
10	17.0	22.5
5	27.0	36.0
3	45.0	60.0

* FIGURE 2. Sensitivity test schematic and operating characteristics.

* 3.5.1.5 Frequency response. When driving the boom coils or when being driven by another intercommunication amplifier through the boom coils, the intercommunication amplifier frequency response shall be flat to within ±3 dB over the frequency range of 400 to 3 kHz.

3.5.1.6 Transmitter. The intercom transmitter shall meet the following requirements:

* 3.5.1.6.1 Attack level. The attack level shall be 0.33V rms, ±3 dB (-7.4 dBm, ±3 dB) from 400 Hz to 3 kHz when pin 11 is grounded. With pin 11 connected to 28V dc, the attack level shall be 0.110V rms, ±3 dB (-16.9 dBm, ±3 dB).

* 3.5.1.6.2 Gain. The gain from 400 Hz to 3 kHz shall be as described in table II.

* Table II. Transmitter gain.

Condition	Input (Pins 9-12)	Output (Pins 6-12)	Load (Pins 6-12)
Pin 11 to Gnd	0.7 rms (-1 dBm)	0.51V rms, ±3 dB (-3.6 dBm, ±3 dB)	100K
Pin 11 to 28V dc	0.25V rms (-10 dBm)	0.575V rms, ±3 dB (-2.6 dBm, ±3 dB)	100K

3.5.1.6.3 Transmitter limit level. The transmitter output, when loaded with 100K (pins 6-12), shall be limited to a 3.5V peak with respect to pin 12 (Gnd).

3.5.1.7 Receiver gain. The output at 1,000 Hz under the following condition shall be 0.26V rms, ±3 dB (-9.5 dBm, ±3 dB):

Condition	Input (Pins 6-12)	Load (Pins 9-12)
Pin 11 to Gnd	0.05V rms (-24 dBm)	150 ohms

* 3.5.1.8 Push-to-talk option. The class 4 amplifier shall have the ability to drive the audio section into either transmit or receive mode by impressing a signal onto pin 10. A positive 28V dc level shall put the amplifier into the receive mode, and a ground shall put the amplifier into the transmit mode. With no signal impressed onto pin 10, the amplifier shall behave as a class 3 unit, except that there will be no output from pin 10. The input impedance at pin 10 shall exceed 10K ohms.

3.5.2 Reliability

* 3.5.2.1 Signal pulse amplifier (all classes). The signal pulse amplifier section, which shall be capable of sustaining the cyclic operating conditions specified herein without malfunction or failure, shall have a minimum calculated mean-time-between-failures (MTBF) of 34,000 hours. For purposes of this calculation, the failure rate data of MIL-HDBK-217 shall be used and a component ambient temperature of 70°C shall be assumed.

* 3.5.2.2 Intercommunication amplifier (classes 3 and 4 only). The intercommunication amplifier section shall have a minimum calculated MTBF of 25,000 hours when the calculation is performed as specified in 3.5.2.1.

3.5.3 Maintainability. No adjustments or maintenance shall be required for the life of either signal pulse or intercommunication amplifier sections.

3.6 Construction. The unit shall be hermetically sealed; all electrical components shall be solid-state where applicable. No vacuum tubes shall be used. Unit construction shall preclude the possibility of any parts working loose in service. The unit shall withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation, and service use.

3.6.1 Mounting. The unit shall be mountable in any position to a solid frame. Vibration isolators or shock mounts shall not be used. Three AN117001 screws, oval fillister head, 0.164-32NC-2 (Phillips recess), or commercial equivalent, having a maximum head diameter of 0.27 inch, shall be used for mounting the unit to the airframe. Mounting holes shall be as shown on figure 1.

3.7 Performance. The amplifiers shall satisfy the following performance requirements:

3.7.1 Function. The unit shall meet the following requirements which shall be demonstrated by tests herein, as required during the qualification testing. The pulse used throughout the functional tests shall be typical of the output pulse of the induction coils. The induction coils necessary for defining this pulse are in accordance with 3.7.2.

3.7.1.1 Input voltages. The unit shall sequence through each position as specified in table I over any supply voltage from 18.0 to 30.0V dc and with input signal characteristics described in 3.7.1.2, 3.7.1.3, 3.7.1.4, and B of figure 2.

* 3.7.1.2 Signal sensitivity (advance). The unit shall advance one position from either READY to CONTACT or from CONTACT to DISCONNECT when a minimum pulse amplitude of 7.5 volts is applied to pin F/6. This pulse shall be applied for not less than 3 milliseconds nor more than 15 milliseconds. (See Figure 2.) The area defined as "May Operate" shall not be used for system design considerations.

* 3.7.1.3 Signal sensitivity (no advance). A signal input of 5.0V or less (classes 1 and 2) and 4.0V or less (classes 3 and 4) applied to pin F/6 shall not advance the signal pulse amplifier position (see figure 2).

3.7.1.4 Signal sensitivity (fire thru). The unit shall advance from READY through CONTACT to DISCONNECT with a steady input signal voltage of 7.5V dc or greater on pin F/6.

* 3.7.1.5 Reset. The amplifier shall be reset whenever the voltage is removed from pin A/1 for 50 milliseconds or longer. The presence of a steady dc voltage of up to 4.5V for classes 1 and 2 or 3.5V for classes 3 and 4 on signal input circuit pin F/6 shall not prevent reset.

3.7.1.6 Response time. Upon receipt of a single input pulse as described in 3.7.1.2, the required change in output (table I) shall occur within 50 milliseconds maximum. Upon receipt of a fire-thru signal, the unit shall advance from the READY to DISCONNECT condition in not less than 50 milliseconds and not more than 200 milliseconds under all operating conditions. These time requirements shall be met over the supply voltage range noted in 3.7.1.1. This is demonstrated during the high- and low-voltage functional tests in accordance with 4.5.3.

* 3.7.1.7 False operation. The unit shall incorporate circuitry in the signal input for damping coupling coil oscillations. The circuit shall prevent multiple sequencing from a single pulse command. Signal output lines (C/3, D/4, E/5, G/7, H/8, and J/10) shall be protected against application of reverse polarity voltages. Protection devices shall be rated at 3 amperes or greater. The signal output diodes shall be tested during production for their proper characteristics (pin 10 has no output for class 4; see 3.5.1.8).

3.7.1.8 Current consumption. A current consumption of 175 milliamperes under no-load conditions shall not be exceeded with the input voltage ranging from 18 to 30V under any of the operating conditions specified herein.

* 3.7.1.9 Alternate power supply (classes 3 and 4). Circuitry shall be provided so that, when power is removed from pin 1 and applied to pin 11, the intercommunication amplifier shall be energized and the signaling amplifier shall be de-energized.

3.7.2 Compatibility. The units shall function properly when coupled together by induction coils, with maximum misalignments and air gaps as specified by the paragraph entitled, Induction Coil, of MIL-R-27521. Construction of coils shall be as shown on figure 3 or as approved by the procuring activity.

3.7.3 Interference control. The units shall meet the requirements of MIL-STD-461; however, the relays shall be exempt from the requirements.

3.7.4 Dielectric strength. During manufacture and prior to connecting circuit ground to the chassis, the units shall be capable of withstanding application of 1,000V ac (rms) 60 Hz between all pins (tied together) and the case for a period of 1 minute. Leakage current of 500 microamperes or greater shall constitute failure.

3.7.5 Transients and high frequency noise susceptibility

3.7.5.1 Transients. The units shall be capable of withstanding voltage transients in accordance with the paragraph entitled, Voltage Transients, and figure entitled, Transient Surge DC Voltage Step Function Loci Limits for Category C Equipment, of MIL-STD-704. The transient may consist of a positive pulse applied to the power input terminals of 80V dc for a duration of 0.04 second, or an equivalent voltage and time function, and as specified herein.

3.7.5.2 Transient sensitivity. The units shall not advance from READY to CONTACT or from CONTACT to DISCONNECT when subjected to voltage and corresponding time factors in the "shall not operate" range of figure 2.

3.7.5.3 High frequency noise susceptibility. The units shall not advance from READY to CONTACT or from CONTACT to DISCONNECT when the power and signal leads are subjected to high-frequency noise bursts (broad band RF) for a maximum time duration of 1 millisecond and a minimum voltage amplitude of 200V peak-to-peak. These bursts are generally associated with the actuation of reactive solenoids.

3.7.6 Ripple. The units shall be capable of proper operation as specified herein when subjected to the ripple specified in MIL-STD-704, paragraph entitled, Ripple.

3.7.7 Life. The unit shall be capable of being cycled 50,000 times in accordance with 4.5.8 without malfunction or failure of any type.

3.7.8 Environmental. The amplifier shall withstand the following environmental conditions as specified in Section 4 and MIL-STD-810 with no deterioration, deformation, leakage, corrosion, or malfunction:

a. High temperature

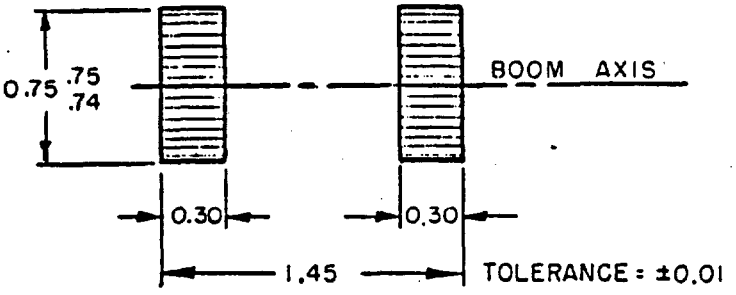
b. Low temperature

c. Fungus

(A) TANKER COIL DESIGN

1. The coil shall be made of 2,300 turns #38 B and S Formex magnetic wire or equivalent with the resistance of 333 to 432 ohms.

2. Laminations shall be 0.01 thick commercial quality transformer steel with core loss not exceeding 0.72 watt per pound. The minimum lamination cross-sectional area shall be 0.09 in^2 with the pole face dimensions as shown below.



(B) RECEIVER COIL DESIGN

1. The coil shall be made of 2,300 turns #36 B and S Formex magnetic wire or equivalent with a resistance of 396 to 484 ohms.

2. Laminations shall be 0.01 thick commercial quality transformer steel with core loss not exceeding 0.72 watt per pound. The minimum laminations cross-sectional area shall be 0.204 in^2 with the pole face dimensions as shown below.

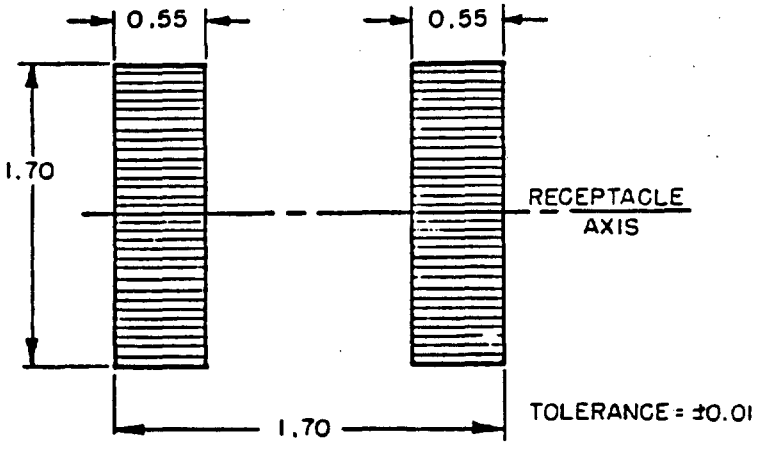


FIGURE 3. Tanker/Receiver coil design.

d. Salt fog

e. Humidity

f. Shock

g. Immersion (leakage)

h. Vibration.

3.7.9 Operating conditions

* 3.7.9.1 Temperature altitude conditions. The following are the operating conditions under which the amplifier must function:

a.	Temperature	-54° to +71°C
b.	Altitude	0 to 50,000 feet.

* 3.7.9.2 Nonoperating conditions. The following are nonoperating conditions which the amplifier shall withstand with no evidence of adverse effects or malfunctions:

a.	Temperature ambient air	-62° to +130°C
b.	Altitude	0 to 100,000 feet.

3.8 Electrical components and material

* 3.8.1 Receptacle, electrical. The electrical receptacles shall meet the following requirements:

a. Class 1 - The electrical receptacle shall mate with an MS3106-18-1S connector. Connector and keyway shall be located as shown on figure 1.

b. Class 2 - The miniature receptacle shall be in accordance with MS27034H12T12CN. Connector and keyway shall be located as shown on figure 1 and mate with MS24266R12T12SN.

c. Classes 3 and 4 - The miniature receptacle shall be in accordance with M83723-80H1212N and shall mate with M83723-75R1212N or MS24266R12T12SN (see 6.1.1c). The connector and keyway shall be located as shown on figure 1.

3.8.2 Semiconductors. All semiconductors shall be of a silicon material and in accordance with the requirements of MIL-STD-701. Use of nonstandard semiconductor components as defined in MIL-STD-701 shall be specifically approved by the procuring activity.

3.8.3 Wiring. All internal wire shall be No. 22 AWG (minimum cross-section) in accordance with MIL-W-16878/4, type E.

3.8.4 Relays. The relays shall be hermetically sealed, balanced armature, crystal can type in accordance with MIL R-5757, and listed on the associated QPL-5757. Relay contacts shall be rated at 5 amperes resistive and 2.5 amperes inductive.

* 3.8.5 Input resistance. The unit shall have an input resistance greater than 85K ohms for positive voltages on pin F/6 for all classes.

3.9 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.9.1 Interchangeability. The amplifier shall be functionally interchangeable with in-service, tube-type signal amplifiers.

3.10 Weight. The total weight of the amplifier shall be not greater than 1 pound.

3.11 Identification of product. The unit shall be marked for identification in accordance with MIL-STD-130. The identification shall be permanent and shall not peel off, crack, or loosen with age and environmental conditions.

3.12 Finish

3.12.1 Anodizing. All aluminum alloy parts not otherwise protected by suitable plating or painting shall be anodized in accordance with MIL-C-5541 or MIL-A-8625.

* 3.12.2 Paint. The unit shall be primed with one coat of epoxy primer in accordance with MIL-P-24441/1 and painted with one coat of black epoxy in accordance with MIL-P-24441/4.

3.13 Workmanship. All details of workmanship shall be of sufficiently high grade to insure satisfactory operation and service life. Particular attention shall be given to neatness and thoroughness of soldering, brazing, welding, wire routing that prevents chafing; wiring in accordance with schematic; freedom from blemishes, defects, burrs, sharp edges, loose chips, dirt, or other foreign matter; alignment of parts; and tightness of wire routing, screws, bolts, et cetera.

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 examination and testing of the amplifier shall be classified as follows:

a. Qualification inspection

b. Quality conformance inspection.

4.3 Qualification inspection (see 6.3)

4.3.1 Test samples. The test samples shall consist of four amplifiers of the particular class being tested. The samples shall be identified with the manufacturer's part number and information as required by the qualifying activity.

* 4.3.2 Test report and test samples. When tests are conducted at a location other than the laboratory of the qualifying activity, the following shall be furnished to that activity in accordance with contract requirements (see 6.2):

a. Test report - A report in accordance with MIL-STD-831

b. Test samples - The samples that were tested

c. Drawings - Two complete sets of outline and electrical schematics identifying all electrical components and values, such as resistor, 2 ohms, et cetera.

4.3.3 Qualification examinations and tests. A qualification test outline, as well as procedures and test setups, shall be submitted to the qualifying activity for the amplifier being tested. Upon receipt of written approval from the qualifying activity, the manufacturer may then proceed with the testing portion of qualification. The qualification inspection shall consist of all the examinations and tests described under 4.5 and shall be conducted in the sequence listed below (see 6.2):

	Amplifier Unit No. 1	Paragraph
a.	Examination of product	4.5.1
b.	Dielectric strength	4.5.2
c.	Functional test	4.5.3
d.	Ripple test	4.5.4
e.	Transient sensitivity	4.5.5
f.	Transient and noise susceptibility	4.5.6
g.	High temperature	4.5.7.1
h.	Low temperature altitude	4.5.7.2
i.	Fungus	4.5.7.3
j.	Salt fog	4.5.7.4
k.	Humidity	4.5.7.5
1.	Shock	4.5.7.6
m.	Immersion (leakage)	4.5.7.7
	Amplifier Unit No. 2	
a.	Examination or product	4.5.1
b.	Dielectric strength	4.5.2
c.	Functional test	4.5.3
d.	Ripple test	4.5.4

e.	Transient sensitivity	4.5.5
f.	Transient and noise susceptibility	4.5.6
g.	Vibration	4.5.7.8
h.	Life	4.5.8
i.	Radio frequency interference	4.5.9

Amplifier units No. 3 and No. 4 shall be provided to the qualifying activity for flight evaluation as specified in 4.6. Units No. 3 and No. 4, prior to submission, shall have successfully completed the individual inspections as specified in 4.4.1.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the individual inspections described below.

* 4.4.1. Individual Inspections. Each amplifier shall be subjected to the following examination and tests as described under 4.5:

a. Examination of product (4.5.1)

b. Dielectric strength (4.5.2)

c. The following functions tests of 4.5.3 as specified in table III:

(1) High voltage - steps 1 through 8 only

(2) Low voltage - steps 1 through 8 only of the high voltage test

(3) False operation (diode) test

(4) Current consumption

(5) Transmitter tests (classes 3 and 4 at 1,000 Hz only)

(6) Receiver test (classes 3 and 4 at 1,000 Hz only)

(7) Intercom loading (classes 3 and 4 at 1,000 Hz only).

d. Noise susceptibility (4.5.6.2)

e. Immersion (leakage) (4.5.7.7)

TABLE III. Functional test.

Test	Control or Switch Positions	Observation 1/ 2/
HIGH VOLTAGE	Set power supply to 30 +0, -.5V dc S5 in DC position S6 in OFF position	
1. READY Condition	No switches activated	Lamps A, C, E, & H ON-- All others OFF
2. CONTACT Condition	Momentarily close S1	Lamps A, D, H, I, & J ON-- All others OFF
3. DISCONNECT Connection	Momentarily close S2	Lamps A, G & I ON-- All others OFF
4. RESET	Momentarily open S3	Lamps A, C, E, H ON-- All others OFF
5. FIRE THRU	Momentarily close S4	Lamps A, G, & I ON-- All others OFF
6. RESET	Momentarily close S3	Lamps A, C, E, & H ON-- All others OFF
7. SENSITIVITY (NO ADVANCE)	Set S5 to PULSE position and signal level control to 5.0 +0, -.1V (classes 1 and 2); 4.0 +0, -.1V (classes 3 and 4)	
(a) Steady signal	Close S6 and reopen	Lamps A, C, E, &H remain ON--All others OFF
8. SENSITIVITY (ADVANCE)	Set signal level control to 0V	
(a) Steady signal	Close S6 and slowly increase voltage	Unit shall fire thru (Lamps A, G, & I ON) between 5.1 & 7.5V (classes 1 and 2); 4.1 & 7.5V (classes 3 and 4) Record value.
	Adjust control for signal level of 4.5 +.1, -0V (classes 1 and 2); 3.5 -.1, -0V (classes 3 and 4) Reset using S3	Lamps A, C, E, & H ON
(b) Pulse, 3 ms	Open S6 and set control for 7.5 +0, -.1V Close S7 momentarily Close S7 momentarily again	 Lamps A, D, H, I, & J ON Lamps A, G, & I ON
(c) Pulse, 15 ms	Reset using S3 Close S8 momentarily Close S8 momentarily again RESET	Lamps A, C, E, & H ON Lamps A, D, H, I, & J ON Lamps A, G & I ON

TABLE III. Functional test. - Continued

Test	Control or Switch Positions	Observation 1/ 2/
9. RESPONSE TIME	Set S5 to DC position Connect timer or counter with start input on TP 1 and stop input on TP 2. With unit in RESET condition, momentarily close S1.	Timer shall indicate less than 50 ms response time between input (start) signal on TP 1 and output at TP 2. (Pin J)
10. DELAY TIME	Connect timer or counter with start input on TP 1 and stop input on TP 3. With unit in RESET condition momentarily close S4. RESET	Timer shall indicate a duration of from 50 to 200 ms. Lamps A, G, & I ON Lamps A, C, E, & H ON
LOW VOLTAGE	Set power supply to 18 +.5, -0V S5 in DC position S6 on OFF position Repeat steps 1 through 10 of High Voltage Test in this table.	Results and limits are identical to High Voltage test.
FALSE OPERATION	Insulate amplifier from bench ground. Adjust supply 30 ±0. -.5V With unit in RESET condition operate S9.	Observe and measure the voltage across lamp G to be greater than 20 dc
CURRENT CONSUMPTION	Actuate S13 and measure and record the no-load of READY, CONTACT, and DISCONNECT current consumption of the unit at room temperature unless otherwise specified. Adjust the supply voltage to 18 +.5, -0V and hold for 2 seconds minimum Repeat for a supply voltage of 30 +0, -.5V	Current draw shall not exceed 150 milliamperes for either relay position (classes 1 and 2); 175 milliamperes (classes 3 and 4)
TRANSMITTER TEST (Classes 3 and 4)	See 4.5.6.3.1.	See 3.5.1.6.
RECEIVER TEST (Classes 3 and 4)	See 4.5.6.3.2.	See 3.5.1.7.
INTERCOM LOADING (Classes 3 and 4)	See 4.5.6.3.3.	See 3.5.1.3.

1/ Lamp I does not come ON when testing a class 3 or 4 unit.

2/ Lamp J does not exist for class 4 units.

4.5 Inspection methods

4.5.1 Examination of product. Each amplifier shall be subjected to inspection for dimensional requirements as shown on figure 1 and shall be examined to determine conformance to the requirements of this specification with respect to materials, design, interchangeability, weight, finish, identification, workmanship, construction, and the electrical receptacle. The above shall be noted and recorded.

4.5.2 Dielectric strength. The dielectric strength test shall be conducted prior to sealing the unit. The ground connection between the case of the unit and circuit ground (Pin B/2), including radio frequency interference bypass components if applicable, shall be opened. One thousand volts ac, 60 Hz shall be applied between all pins (tied together) and the case of the unit for a period of 1 minute. Evidence of breakdown, arc-over, or current flow that is transient, fluctuating, steadily increasing, or evidence of leakage current of 500 microamperes or more shall constitute failure.

4.5.3 Functional test. The tests of table III shall be performed when required during qualification testing as specified and at the conclusion of the tests of 4.5.6.1, 4.5.7.1, 4.5.7.2, 4.5.7.8, 4.5.8, 4.5.7.3, 4.5.7.4, 4.5.7.7, 4.5.7.6, and 4.5.7.5. The test shall be conducted using a test circuit similar to that shown on figure 4 and as specified in 3.7.1. Instrument accuracy shall be demonstrated by repeating instrument readouts per test. All tests results shall be recorded.

4.5.4 Ripple test. This test shall be conducted in accordance with the paragraph entitled, Ripple, and figure entitled, Frequency Characteristics of Ripple in 28 Volt DC Electric System, of MIL-STD-704. The specified voltage levels and frequencies shall be inductively coupled in series with the positive power input terminals. The unit shall be functionally tested as specified in 4.5.3 during application of the specified ripple voltages.

* 4.5.5 Transient sensitivity. Transient sensitivity shall be performed as shown on figure 2(A). Capacitor C shall be charged to the supply voltage and switched to the amplifier input. The supply voltage shall be varied, and the minimum peak voltage required to trigger the amplifier shall be determined. The minimum voltage at each of the following time constants shall be plotted. Figure 2(B) depicts the minimum allowable voltage the unit shall operate in the "may operate range" and the "shall operate" range.

a. 3 microseconds (usec)

b. 5 usec

c. 10 usec

d. 100 usec

e. 1,000 usec

f. 15,000 usec

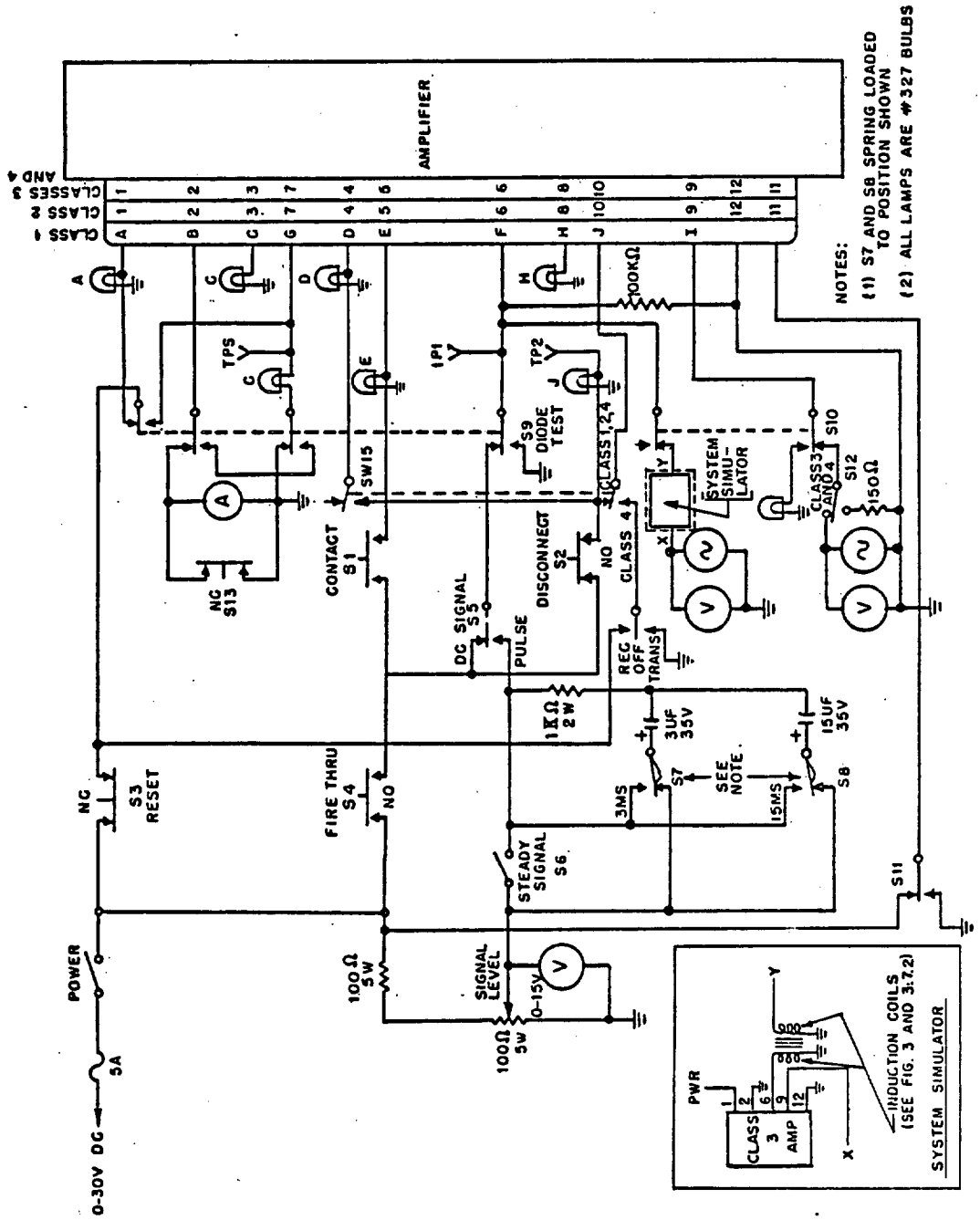
4.5.6 Transient and noise susceptibility tests

4.5.6.1 Transient test. This test shall be in accordance with the paragraph entitled, Voltage Transients, and figure entitled, Transient Surge DC Voltage of Step Function Loci Limits for Category C Equipment, of MIL-STD-704. A rectangular pulse, 0.04 second in duration, rising from 24V to 80V dc shall be applied to the input power terminals. The functional test specified in 4.5.3 shall be conducted during application of transients.

4.5.6.2 Noise susceptibility. The unit shall be subjected to a test in accordance with the steps outlined below and figure 5, or an equivalent test meeting the requirements set forth in 3.7.5.3:

a. Power supply shall be set for 28V dc.

b. Switch S2 shall be closed, and amplifier shall come ON in READY position, with DS1 lighted.



* FIGURE 4. Functional test schematic.

c. Switch S3 shall be closed for approximately 2 seconds during which time L1 shall oscillate, the amplifier shall not advance, and DS1 shall remain lighted.

d. Switch S4 (momentary) shall be closed; the amplifier shall advance to the CONTACT position, DS1 shall be extinguished, and DS2 shall be lighted.

e. Switch S3 shall be closed for approximately 2 seconds during which time L1 shall oscillate, the amplifier shall not advance, and DS2 shall remain lighted.

* 4.5.6.3 Intercommunication amplifier tests (classes 3 and 4 only)

* 4.5.6.3.1 Transmit gain and attack level. The unit shall be tested as follows (reference figure 4):

a. Replace the system simulator with a 100K-ohm fixed carbon resistor connected, in parallel with a vacuum tube voltmeter (VTVM), or equivalent, between pins 6 and 12.

b. An audio oscillator operating at 1 kHz shall be connected across pins 9 and 12, and its output set to less than 25 millivolts rms (-30 dBm).

c. With pin 11 grounded to pin 2, oscillator output shall be slowly increased until the VTVM provides an indication.

d. The VTVM shall be disconnected from pins 6 and 2 and connected across the oscillator. The indicated voltage level shall be recorded as the attack level (0.33V rms, ±3 dB; -7.4 dBm, ±3 dB).

e. Oscillator output shall be set to 0.7V rms (-1 dBm, 1,000 Hz), and the output voltage across pins 6 and 2 (0.51V rms, .3 dB; -3.6 dBm, ±3 dB) shall be checked. This shall be repeated at frequencies of 400 Hz and 3,000 Hz. The output across pins 6 and 2 shall be within 3 dB of the 1,000 Hz level.

f. Steps a through e shall be repeated with pin 11 connected to 28V dc except that:

(1) Attack level shall be 0.11V rms ±3 dB (-16.9 dBm, ±3 dB).

(2) Oscillator output shall be set to 0.25V rms (-10 dBm).

(3) Output noted across pins 6 and 2 shall be 0.575V rms, ±3 dB (-2.6 dBm, ±3 dB).

g. With pin 11 connected to 28V dc, oscillator output shall be increased to 4V rms. Using an oscilloscope the peak output across pins 6 and 2 shall be checked and shall be less than 3.5V.

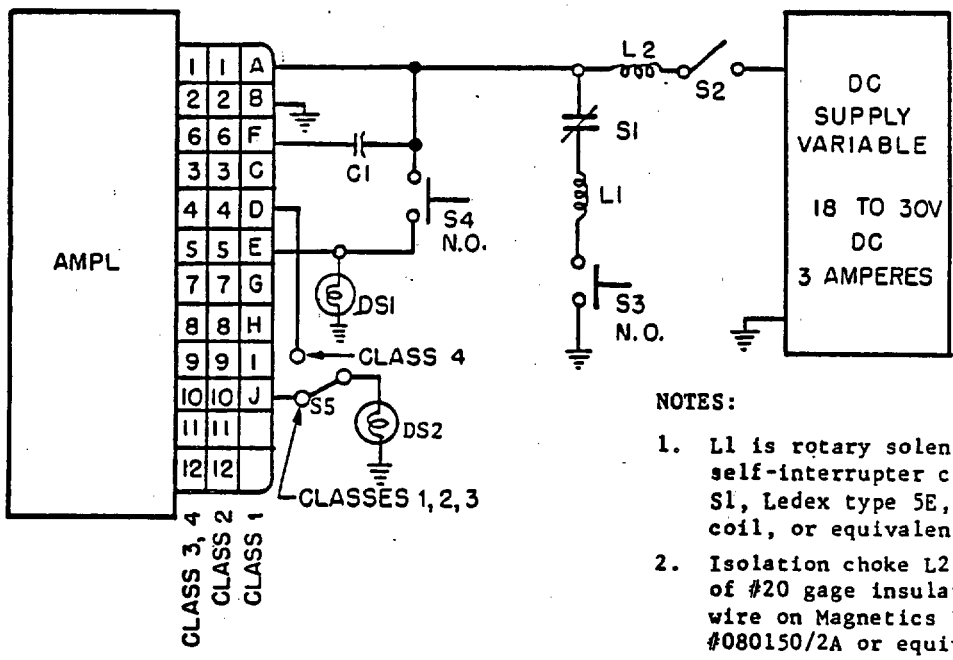
* 4.5.6.3.2 Receive gain. The unit shall be checked as follows:

a. Pin 11 shall be connected to 28V dc, and a 150-ohm fixed carbon resistor shall be connected across pins 9 and 12.

b. An audio oscillator operating at 1 kHz shall be connected to a system simulator and the voltage between pins 6 and 2 set to 0.05V rms (-24 dBm).

c. The voltage at pins 9 and 12 (0.26V rms, ±3 dB; -9.5 dBm, ±3 dB) shall be measured.

d. Without changing the voltage level output of the oscillator, repeat step c at output frequencies of 400 Hz and 3,000 Hz from the oscillator.



NOTES:

1. L1 is rotary solenoid with self-interrupter contact, S1, Ledex type 5E, 33 ohms coil, or equivalent.
2. Isolation choke L2-30 turns of #20 gage insulated magnet wire on Magnetics Inc Coil #080150/2A or equivalent. The coil shall have a permeability of 160 and the following dimensions: ID 0.509 ±.005 inch; OD 0.80 ±.010 inch; and height of 0.250 ±.010 inch.
3. C1 - .01 microfarads, 600V disc ceramic
4. Lamps - Type 313
5. All leads shall be as short as possible and have a minimum of capacity to ground. No radio frequency suppressor components shall be used.

* FIGURE 5. High frequency noise susceptibility test schematic.

4.5.6.3.3 Intercom loading. The output of an oscillator (600-ohm source impedance) shall be adjusted for an open-circuit voltage of 0.7V rms (0 dBm). Terminated with the intercom (pins 9 and 12), output shall change by no more than 1 dB.

* 4.5.6.3.4 Push-to-talk function (class 4 only). With SW15 in the class 4 position, move SW14 to the (REC), (OFF), and (TRANS) positions. In each position confirm proper operation of the audio section.

4.5.7 Environmental tests

* 4.5.7.1 High temperature. This test shall be conducted in accordance with MIL-STD-810, Method 501.1, procedure I except that, at the conclusion of the functional test at 71°C and with the unit nonoperating, the internal temperature of the chamber shall be raised from 71°C to 130°C and stabilized at 130°C. Upon conclusion of the 15-minute period, the temperature shall be returned to room temperature and the unit shall be functionally tested in accordance with 4.5.3. The unit shall then be temperature cycled for a 24-cycle period, each cycle consisting of the following:

a. The unit shall be placed in the chamber which has previously been stabilized at 130°C; the unit shall remain in the chamber at 130°C for 15 minutes (unit nonoperating).

b. The unit shall be removed from the chamber and allowed to remain at room temperature for 15 minutes.

c. The functional test as specified in 4.5.3 shall be performed after 8, 16, and 24 temperature cycles.

* 4.5.7.2 Low temperature altitude. This test shall be conducted in accordance with MIL-STD-810, Method 502.1, procedure I, except that the chamber pressure shall be reduced to that equivalent to 50,000 feet altitude during the last 21 hours of the test. The unit shall be functionally tested as specified in 4.5.3. An altitude at 100,000 feet shall be demonstrated or adequately proven under nonoperating conditions, The remaining 12 hours of the above 24 hour test may be substituted by a 100,000 foot-altitude equivalent pressure and conducting the functional test (4.5.3) upon returning pressure to sea level.

* 4.5.7.3 Fungus. The unit shall be tested in accordance with MIL-STD-810, Method 508.1. This test may be omitted if the parts and materials of the unit contain no nutrients for fungus growth.

* 4.5.7.4 Salt fog. The unit shall be tested in accordance with MIL-STD-810, Method 509.1.

* 4.5.7.5 Humidity. The unit shall be tested in accordance with MIL-STD-810, Method 507.1, procedure I.

* 4.5.7.6 Shock. The unit should be tested in accordance with MIL-STD-810, Method 516.2, procedure I using a terminal-peak-sawtooth pulse configuration with a peak value of 20g for a duration of 11 milliseconds. During the shock test, normally closed contacts shall be monitored for momentary opening; an opening time of 0.5 milliseconds or greater shall constitute failure of the unit.

* 4.5.7.7 Leakage (immersion). The unit shall be subjected to the leakage test in accordance with MIL-STD-810, Method 512.1, procedure I.

* 4.5.7.8 Vibration. The vibration test shall be performed in accordance with MIL-STD-810, Method 514.2, procedure I, curve D except that the 10g acceleration shall be extended to 1,000 Hz.

a. Each resonant and cycling period shall be divided into four equal parts; the first part being conducted at -54°C, the second part at room temperature, the third part at 71°C, and the fourth at -54°C (nonoperating).

b. During the vibration, the unit shall be load cycled using a 3-ampere load and sequencing described in the life test (4.5.8) except at -54°C in the fourth part the unit shall be in a nonoperating condition.

c. During vibration; the normally closed relay contacts shall be monitored for momentary opening. An opening time of 0.5 millisecond or greater shall constitute failure of the unit. The device used to detect opening of a closed contact for more than the specified time shall lock in an alarm condition. When a fault occurs, the alarm shall sound and shall not cease if the fault ceases. Manual reset shall be the only way to clear the alarm.

d. The test unit shall be functionally tested (4.5.3) at intervals of 500 load cycles. The number of load cycles shall be recorded and may apply toward the life test completion.

e. During the fourth part at -54°C, the vibration levels shall be as follows:

10-50 Hz	±0.050 inch DA (double-amplitude)
50-80 Hz	±6g
80-105 Hz	±0.018 inch DA
105-190 Hz	±10g
190-270 Hz	±0.0054 inch DA
270-2,000 Hz	±20g

* 4.5.8 Life. The unit shall be load cycled at room temperature connected in the test circuit of figure 6 or a circuit approved by the qualifying activity. The unit shall be functionally tested as specified in 4.5.3 at intervals of 5,000 load cycles. The number of load cycles accumulated during vibration testing may be added to the number of cycles required during life test, to total 50,000 cycles. One cycle shall consist of:

a. READY for 1 ±0.1 second. 28V dc shall be applied to pin A/1 and returned to pin B/2.

b. CONTACT for 1 ±0.1 second. Unit shall be placed in CONTACT by applying a 28V dc to 30V dc, 3- to 15-millisecond pulse to pin F/6.

c. DISCONNECT for 1 ±0.1 second. The unit shall be placed in DISCONNECT by applying a second 28V dc to 30V dc, 3- to 15-millisecond pulse to pin F/6.

d. OFF for 1 ±0.1 second. Power shall be removed from pin A/1.

e. In addition for classes 3 and 4 amplifiers only, an oscillator (set to -1 dBm, 1 kHz) shall be connected to pins 9 and 12; output pins 6 and 2 shall be terminated with 2.4K-ohm load.

4.5.9 Radio frequency interference. The amplifier shall be subjected to the following tests in accordance with MIL-STD-461 and MIL-STD-462. Noise resulting from actuation of the relay contacts shall be excluded from the measurements.

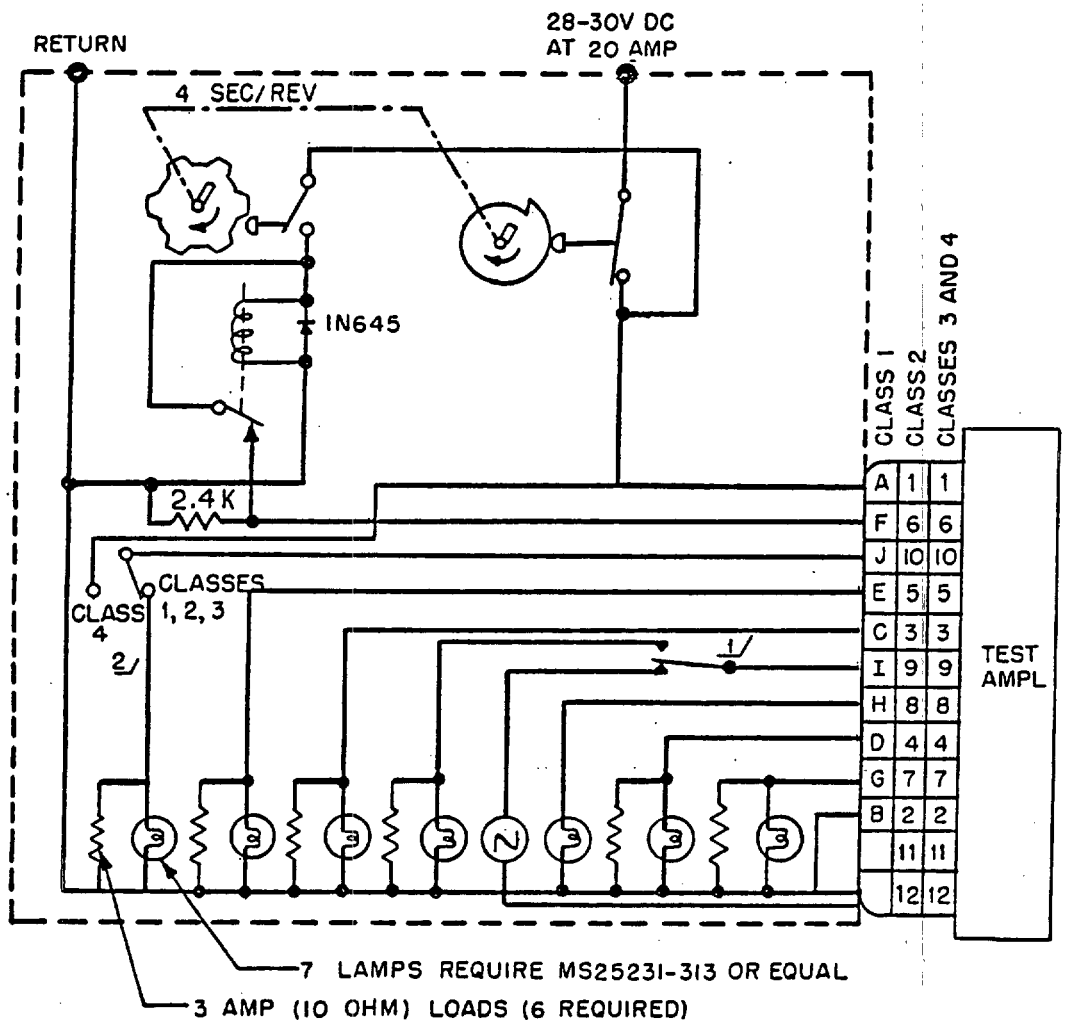
a. Conducted interference (30 Hz to 14 kHz)

b. Conducted interference (14 kHz to 100 mHz)

c. Radiated interference (14 kHz to 400 mHz)

d. Conducted susceptibility (30 Hz to 150 kHz)

e. Conducted susceptibility (150 kHz to 400 mHz)



1/ ACTUATE SWITCH TO LOAD POSITION FOR CLASSES 1 AND 2 ONLY

2/ ACTUATE SWITCH TO LOAD POSITION FOR CLASS 4 AND NOTE THAT LAMP DOES NOT ILLUMINATE.

* FIGURE 6. Life test schematic.

f. Spike susceptibility 1/

g. Radiated susceptibility (14 kHz to 10 gHz) 1/

h. Radiated susceptibility, induction field.

1/ Spike susceptibility and radiated susceptibility may be omitted provided adequate proof of more severe tests can be shown or adequate proof that the amplifier is not affected by the tests.

4.6 Flight test. Ground or flight tests may be conducted by the qualifying activity to demonstrate compatibility of the unit with the aircraft system it is being incorporated into and the associated tanker or receiver aircraft as applicable. A minimum of 25 hookups shall be required for any combination of aircraft or amplifiers. A malfunction of the test unit shall be considered a failure.

* 4.6.1 Reliability. Satisfactory compliance with all tests specified herein and a table citing failure rate data calculations for all components of the amplifier, stating quantity, stress level failure rate, and total parts failures resulting in an MTBF of 34,000 hours or greater (25,000 hours or greater for the intercom section of the classes 3 and 4 amplifiers) will demonstrate satisfactory reliability. Failure rate data will be obtained as specified in 3.5.2.1.

4.7 Inspection of preparation for delivery. Inspection of preparation for delivery requirements shall be in accordance with Section 5.

* 5. PACKAGING

5.1 Preservation and packaging. Preservation and packaging shall be level A, B, or C, as specified (see 6.2).

5.1.1 Levels A and B. The amplifiers shall be preserved and packaged in accordance with MIL-P-116, Method 1A8 (no preservative compound), one each in a weather-resistant unit container in accordance with PPP-B-636.

5.1.2 Level C. The amplifiers shall be preserved and packaged in a manner that will afford adequate protection against corrosion, deterioration, and physical damage during shipment from supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice, provided the latter meets the requirements of this level.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A. The amplifiers preserved and packaged as specified in 5.1.1 shall be packed in weather-resistant type shipping containers in accordance with PPP-B-636. Insofar as practicable, shipping containers shall be of uniform shape and size, of minimum cube and tare consistent with the protection required, and shall contain identical quantities. The gross weight of each shipping container shall not exceed the weight limitation of the specification. Containers shall be closed and strapped in accordance with the specification and appendix thereto.

5.2.2 Level B. The amplifiers preserved and packaged as specified in 5.1.1 shall be packed in domestic type shipping containers in accordance with PPP-B-636. Shipping containers shall be of minimum cube and tare consistent with the protection required. Insofar as practicable, shipping containers shall be of uniform shape and size and contain identical quantities. The gross weight of each shipping container shall not exceed the weight limitation of the specification. Containers shall be closed and strapped in accordance with the specification and appendix thereto. Shipping containers in accordance with PPP-B-636 shall meet the special requirements table as applicable.

5.2.3 Level C. The amplifiers shall be packed in a shipping container which will be acceptable to the carrier at lowest rates and insure safe transportation to the point of delivery. Containers shall comply with Uniform Freight Classification Rules and Regulations, or regulations of other carriers as applicable to the mode of transportation.

5.3 Marking. Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The signal and signal intercommunication amplifiers covered by this specification will be used in receiver and tanker aircraft employing aerial refueling boom or receptacle equipment and in the ground support equipment necessary for these applications. Care should be taken to insure the use of the proper class of unit in a given installation.

* 6.1.1 Installation instructions (general). The following are general installation instructions:

a. Mounting interface

(1) To replace a D7A/B signal amplifier with an M38449-1, -2, -3, or -4, remove the D7A/B and drill three holes in the electrical connector end of the mount base (MT70) in accordance with figure 1 herein and the applicable technical orders. The electrical connectors of the M38449-1, -2, -3, 4 shall be oriented in the same direction as the D7A/B connector and shall be centered on the base within 0.75 inch from the connector end of the base.

(2) To replace an A20-1A/B signal amplifier with an M38449-1, -2, -3, or -4 remove the A20-1A/B and mount tray (base) and install the replacement signal amplifier using the same three mounting holes and screws.

NOTE: The M38449-1, -2, -3, and -4 amplifiers are directly interchangeable with the exception of the electrical connector (see b.(2) below).

b. Electrical connector interface

(1) D7A/B and A20-1A/B signal amplifiers are directly interchangeable with the M38449-1.

(2) Replacing D7A/B and A20-1A/B signal amplifiers with M38449-2, -3, or -4 units requires changing the aircraft connector plug to a M83723-75R1212N, or using an adapter supplied with the signal amplifier.

c. Air vehicle intercom interface (For Information Only)

(1) Replacing D7A/B, A20-1A/B, M38449 1, or M38449-2 signal amplifiers with an M38449-3 or -4 unit requires connecting pin 9 to the audio portion of the aircraft intercom system and, when the aircraft is so equipped, pin 12 to audio common. Pin 11 shall be connected to 28V dc for tanker-receiver intercom operation when the signal amplifier override mode of operation is used. For aircraft not having an override mode, check the appropriate technical orders for termination of pin 11. CAUTION: Once an M38449-3 or -4 signal amplifier has been installed, it must not be replaced with an M38449-1 or -2 without disconnecting pin 9. If this is not done, 28V dc will be applied to the aircraft intercom system since this is a normal output from pin I/9 of M38449-1 and -2 signal amplifiers during the contact and disconnect modes. In addition, pin 10 on class 4 units provide a push-to-talk feature. This pin should be connected to the push-to-talk microphone switch directly for push-to-talk operation only, or through a diode for both push-to-talk and voice operated switching operation. This information does not constitute authorization to perform a modification to an aircraft. Authorization shall be made only by technical orders or contract directive.

NOTE: All diodes contained in the aerial refueling signal circuitry external to the signal amplifier must be removed prior to M38449-3 and -4 installation since the M38449-3 and -4 amplifier is equipped with a special diode for voice communications. M38449-1 and -2 amplifiers also contain standard diodes and do not require external aircraft-mounted diodes to protect the signal circuitry.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification

a. Class required (see 1.2)

c. Level of packaging and packing desired (see 5.1 and 5.2)

d. Data requirements (DD 1423)

e. Delivery requirements.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Aeronautical Systems Division, ATTN: ASD/ENFEF, Wright-Patterson Air Force Base, Ohio 45433 and information pertaining to qualification of products may be obtained from that activity.

6.4 Definitions

6.4.1 Contact. Contact is the second amplifier relay position. This position may also be referred to as "latched", however, the word "latched" more accurately describes the tanker and receiver aerial refueling hardware in the mated and locked position.

6.4.2 D7A/B. This series of signal amplifiers were very early versions which perform the same function as the M38449 series of amplifiers but are very large volume and are equipped with vacuum tubes and telegraph relays. This amplifier is not equipped with signal circuitry diodes.

6.4.3 A20-1A/B. This series of signal amplifiers is a later version of the D7A/B with the same function, but a smaller envelope and is a hermetically sealed unit. The /B version is equipped with an internal diode to protect the unit from misfiring due to stray signal voltages.

6.5 Identification of changes. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodian:
Air Force - 11

Reviewing activity:
Air Force - 99

Preparing activity:
Air Force - 11

Project No. 1680-F367