EXHIBIT B
PSK Transmitter Specification

PERFORMANCE/DESIGN

AND

PRODUCT CONFIGURATION

REQUIREMENTS

PSK TRANSMITTER

FOR

APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE (ALSEP)

Prepared By: S. Smith
Project Engineer

Approved By: D. Douthat
Central Station Electrical Design

Effectivity: ALSEP Array E
Contract No: NAS 9-5829
Subcontract: SC-935
Transmitter Part No: 2352877
Transmitter Serial No: 40 & Up
1.0 SCOPE

This specification establishes the requirements for performance, design, test and qualification of a high reliability PSK transmitter which will provide at least a 1.0 watt S-band output while operating for 2 years in a space environment.

2.0 APPLICABLE DOCUMENTS

The following documents, of exact issue shown, form a part of this specification to the extent specified herein. In the event of conflict, this specification has precedence over documents referenced here.

MILITARY

MIL-E-5272C (1) (Section 3.0 only) Environmental Testing, Aeronautical and Associated Equipment, General Specification for (Section 3.0 only)


MIL-STD-130C Identification Marking of U.S. Military Property

MIL-STD-310B Environmental Test Methods for Aerospace and Ground Equipment

MIL-STD-889 Dissimilar Metals
**EXHIBIT B**

PSK Transmitter Specification

**OTHER PUBLICATIONS**

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teledyne MEP-27</td>
<td>Manufacturing Engineering Procedure</td>
</tr>
<tr>
<td>Bendix 2346217, Rev. A</td>
<td>Source Control Drawings, Connectors, Electrical, Rectangular, High Density, Removable Contact</td>
</tr>
<tr>
<td>Bendix ATM-241, Rev. E</td>
<td>Acceptable Parts List</td>
</tr>
<tr>
<td>Bendix ATM-242, Rev. E</td>
<td>Approved Materials List</td>
</tr>
<tr>
<td>NASA-NHB5300.4(1B) (April 1962)</td>
<td>Quality Program Provisions for Aeronautical and Space System Contractors</td>
</tr>
<tr>
<td>NASA-LSPO #1</td>
<td>Apollo Spacecraft Program Office Reqmts. for Environmental Acceptance Testing</td>
</tr>
<tr>
<td>NASA-NHB-5300.4 (3A) (May 1968)</td>
<td>Quality Requirements for Hand Soldering of Electrical Connections</td>
</tr>
<tr>
<td>Bendix Memo 9712-56 (10/15/70)</td>
<td>Array E Subpack 1 S/S Dynamic Environment</td>
</tr>
<tr>
<td>Bendix Memo 9712-14' (1/7/71)</td>
<td>ALSEP Vibration Requirements</td>
</tr>
</tbody>
</table>

**NASA/MSC CRITERIA AND STANDARDS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS-1</td>
<td>System Accessibility for Maintenance</td>
</tr>
<tr>
<td>DS-3</td>
<td>Electrical Connectors - Keying</td>
</tr>
<tr>
<td>DS-4</td>
<td>Separation of Redundant Paths</td>
</tr>
<tr>
<td>DS-5</td>
<td>Transistors - Selection of Types</td>
</tr>
<tr>
<td>DS-13</td>
<td>Electrical and Electronic Devices - Protection from Reverse Polarity and/or Other Improper Electrical Inputs</td>
</tr>
<tr>
<td>DS-37</td>
<td>Corona Suppression (2-71-66)</td>
</tr>
<tr>
<td>PS-5</td>
<td>Protection of Electrical/Electronic Assemblies from Moisture Damage</td>
</tr>
<tr>
<td>PS-6</td>
<td>Ultrasonic Cleaning Electrical and Electronic Assemblies</td>
</tr>
</tbody>
</table>
NASA/MSC CRITERIA AND STANDARDS (CONT)

PS-8 Application of Previous Qualification Tests
PS-10 Protective Covers for Electrical Plugs
PS-11 Direct Procurement of Parts

3.0 REQUIREMENTS

3.1 Performance. - This transmitter shall provide phase modulation of the carrier for a split phase modulated input (while providing negligible AM at the output). The primary carrier source shall be a crystal controlled oscillator. Appropriate filtering shall be provided at the inputs and outputs to minimize spurious radiation and to meet the EMI requirements.

3.1.1 Operational characteristics.

3.1.1.1 Transmitter output frequency. - The transmitter output frequency shall be adjustable to fixed frequencies in the range of 2275 MHz to 2280 MHz. Frequency adjustment may be accomplished by replacement of crystal or a pre-tuned crystal oscillator module. Frequency adjustment within the above mentioned frequency range shall not deteriorate transmitter frequency stability, phase stability, spurious AM, output power, frequency response, carrier deviation, or any other characteristic, beyond those limits set forth in this specification.

The specific frequency allocations for the output frequencies are:

Channel 1 = 2276.5 MHz (Universal Spare)
3 = 2275.5 MHz (Array E)
5 = 2278.0 MHz (Array A-2)
6 = 2276.0 MHz (Array D)
3.1.1.2 Frequency stability and accuracy. - The transmitter frequency stability and accuracy shall be better than ± 0.0025 percent, for all conditions including the recommended stability allocations below:

a) Accuracy of frequency setting
   ±0.0005%
   -0.0005%

b) Aging frequency drift per 2 year period
   ±0.0005%
   -0.0005%

c) Environmental frequency drift (Thermal, etc.)
   ±0.0020%
   -0.0020%

3.1.1.3 Carrier phase stability. - The S-band output phase stability shall be better than 0.1 radian RMS as measured in a phase coherent receiver with a phase-lock loop bandwidth of $B_L = 50$ Hz. This measurement shall be made at the carrier level at which the Loop Bandwidth of the test receiver is 50 Hz. The transmitter shall meet this requirement during EMI susceptibility and power line ripple environments.

3.1.1.4 Spurious Amplitude modulation. - Spurious Amplitude modulation at the S-band output shall be 3.0 percent or less as a result of the EMI susceptibility environments, power line ripple environment, and input modulation signal.

3.1.1.5 Output power. - The transmitter output power shall be one watt minimum at the output of the transmitter R.F. connector when operating into the following load characteristics:

Characteristic Impedance: 50 ohm nominal
VSWR: 1.30:1 maximum (at any phase angle)

3.1.1.6 Primary power supply. - The primary supply voltage shall be 28 to 30 VDC. The supply voltage ripple is less than 141 mVrms (400 millivolts peak-to-peak) from 265 Hz to 250 MHz. The DC current (at 29 VDC) required shall not exceed 345 milliamps (10.0 watts) over the Qual temperature range.

3.1.1.7 Deleted.

3.1.1.8 Phase modulation. - Binary data is first split phase encoded before being supplied to the transmitter. The type of encoding is known as Biphase-Level or split phase, Manchester 11 + 180°. The transmitter phase modulator shall phase modulate the carrier with the split phase encoded binary voltage provided.
3.1.1.9 Carrier deviation. - For a split-phase encoded binary voltage input of 0 to 0.4 volts, a reference phase of 0 shall be assumed. For a split-phase encoded binary voltage input of +2.5 to +5.5 volts a positive carrier phase shift of +2.5 radians +5% will result at the transmitter S-band output.

3.1.1.10 Frequency response. - Binary data bit rates are 530 b/s, 1060 b/s, or 10,600 b/s. The equivalent split-phase encoded binary voltage repetition rates will range from 265 Hz to 10,600 Hz. The transmitter phase modulator frequency response shall be compatible with the above.

3.1.1.11 Phase switching time. - The 10% to 90% switching time for the split-phase encoded binary voltage supplied is a maximum of 0.1 microsecond. The resulting carrier phase 10% to 90% switching time shall be a maximum of 1.0 microsecond. The transmitter frequency response shall be compatible with the above.

3.1.1.12 PSK tolerance. - The 2.5 radian phase period shall be within 2% of the "ON" time of the binary modulating voltage.

3.1.1.13 Modulator Interface. - The modulator input shall be TTL (54L) and DTL (5041) compatible and shall present a maximum of one (1) unit load as specified in the Texas Instruments Logic Handbook for SN54L00 logic gates. The modulator shall always be driven by a TTL (54L) gate during all tests to protect the modulator input from voltages in excess of 5.5 volts and to demonstrate interface compatibility.

3.1.1.14 On/Off operation. - All circuits, and drive levels shall be so designed that reliable on/off operation can be maintained under all operational environmental conditions.

3.1.1.15 Output Conducted Spurious RF Signals. - An output filter shall be provided so that all spurious output signals transmitted to the interfacing diplexer shall be less than the level shown below.

<table>
<thead>
<tr>
<th>Output Frequency (GHz)</th>
<th>Maximum Spurious Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 2.60 GHz</td>
<td>0 dBm</td>
</tr>
<tr>
<td>2.00 to 2.45 GHz</td>
<td>-50 dBm</td>
</tr>
<tr>
<td>2.45 to 4.60 GHz</td>
<td>0 dBm</td>
</tr>
<tr>
<td>4.60 to 10.00 GHz</td>
<td>-10 dBm</td>
</tr>
</tbody>
</table>
3.1.1.16  **Telemetry Outputs.** - All telemetry points shall provide a 2.5 volts nominal (5 volt maximum) readout. All telemetry points shall have an output impedance of less than 50 K ohms. Calibration curves shall be required for all telemetry points. Calibration accuracy shall be within ±5%. All telemetry points shall be designed such that any type of failure within the TM amplifier, etc. shall not cause degradation in the transmitter operation or overload of the power supply. Also, in the event of TM circuit or transmitter failure the TM output voltage shall be limited to +12 VDC maximum in order to prevent damage to the interfacing multiplexer. Telemetry readouts are:

a) Final transistor hot-spot temp*  
b) Case temperature*  
\[\text{Calibrate at Flt temp.} \]  
(0 to 5V range shall be for -50°F to +200°F)  

c) 23 volt regulator output (2.5 VDC Nom)  
d) 17 volt regulator output (4.5 VDC Nom)

3.1.1.17  **Test Points.** Test points shall be provided where necessary to perform test and alignment of this transmitter. The requirements of DS-1 apply.

3.1.1.13  **Power Distribution Variation.** - Power distribution voltage of 10 percent above nominal operating voltage shall not damage this equipment, even though power dissipation may exceed maximum specified. Power distribution voltage below the nominal operating voltage shall not damage this equipment.
3.1.2 Operability.

3.1.2.1 Reliability. Reliability shall be a prime consideration in design, development, and fabrication. Redundancy may be utilized in achieving the reliability goal. The design will provide maximum resistance to single point catastrophic failures. As a goal, the transmitter (exclusive of telemetry circuits) shall have a 0.9800 probability of successful operation for a period of 2 years in the environment specified in paragraph 3.1.2.4 herein. The requirements of DS-4 shall apply where applicable.

3.1.2.2 Maintainability. Equipment arrangements, accessibility and interchangeability features shall be incorporated into the design to allow efficient preflight servicing and maintenance. The requirements of DS-1 are applicable here.

3.1.2.3 Useful life. - The transmitter shall be capable of performing as specified herein for a period of 2 years after a maximum earth storage period of 2 years provided that the environmental conditions specified in 3.1.2.4 are not exceeded.

3.1.2.4 Environment. The transmitter shall be capable of performing as specified herein during, or after, as applicable, being subjected to the most severe environmental conditions shown herein or any logical combination of these environments applied simultaneously. Appropriate levels are given for design, qualification testing and acceptance testing. Testing shall be in accordance with Specification MIL-F-5272C (1) (Section 3.0 only) and Standard MIL-STD-810 as applicable.

The PSK Transmitter shall meet or exceed the following environmental specifications:

(i) Temperature (operating)

<table>
<thead>
<tr>
<th></th>
<th>Qualification Testing:</th>
<th>Acceptance Testing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>(See Thermal-Vacuum Qual Test)</td>
<td>(-10^\circ F to +146^\circ F)</td>
</tr>
<tr>
<td>Qualification Testing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance Testing:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Temperature (non-operating)

<table>
<thead>
<tr>
<th></th>
<th>Design:</th>
<th>Qualification Testing:</th>
<th>Acceptance Testing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification Testing:</td>
<td>(-65^\circ F to +200^\circ F)</td>
<td>Not Required</td>
<td></td>
</tr>
<tr>
<td>Acceptance Testing:</td>
<td>Not Required</td>
<td></td>
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</tr>
</tbody>
</table>
EXHIBIT B
PSK Transmitter Specification

(c) Acceleration (non-operating)
(Three axes, both directions)
Design: 14.0 G's along each of three axes, steady state, for 1 minute
Qualification testing: Not required
Acceptance testing: Not required

(d) Shock (non-operating)
Qualification testing: 20G-peak/11 msec sawtooth per MIL-STD-810B
Acceptance testing: Not required

(e) Sinusoidal Vibration (non-operating)
Qualification testing: See Figure 1
Acceptance testing: Not required

(f) Random Vibration (non-operating)
Qualification testing: See Figure 2
Acceptance testing: Not required

(g) Defect Detection Random Vibration (operating)
Qual test: See Figure 3
Acceptance test: See Figure 3

(h) Humidity
Design: 95% humidity at 158°F for 1 cycle per MIL-STD-810 (equipment non-operating)
Qualification testing: Not required
Acceptance testing: Not required
General testing: 59% Relative Humidity (maximum)
EXHIBIT B

PSK Transmitter Specification

(i) Thermal-vacuum (operating)

Design: $-22^\circ F$ to $+158^\circ F$ at less than $1 \times 10^{-12}$ mm of Hg

Qualification testing: $-22^\circ F$ to $+158^\circ F$ at less than $1 \times 10^{-5}$ mm of Hg. Operate for 5 hours at temp. extremes & during intermediate temp.

Acceptance testing: Operate over temperature range of $-10^\circ F$ to $+146^\circ F$ at $10^{-5}$ mm of Hg.

(j) Corona test (operating)

Design Verification Test on Eng. Model: Operate from ambient pressure to $10^{-5}$ torr in a time interval of 15 to 30 minutes. No permanent degradation to transmitter is allowed.

Qual Test: Not required

Acceptance test: Not required

NOTE: Figure 4 shows axis definition for vibration testing.

3.1.2.5 Hazard proofing. The design of the transmitter shall minimize the hazard of fire, explosion and toxicity to the crew, launch area personnel and facilities. The hazards to be avoided include accumulation or leakage of combustible gases, the hazard of spark or ignition sources including static electricity discharge, and toxicity due to inhalation or spillage of volatile or poisonous expendables.

3.2 Interface requirements. Transmitter interfaces are shown in Figure 4, and Figure 5.

3.3 Design and construction. The transmitter electronics shall be all solid state and only silicon semiconductors shall be used, except where reliability is enhanced by doing otherwise. Appropriate de-rating of all transistors and diodes shall be required for reliability considerations. Construction shall be lightweight and rugged enough to meet the environmental requirements. Maximum semiconductor junction temperatures shall be $140^\circ C$.

3.3.1 Operation Constraints.
3.3.1.1 RF Output Load. The transmitter shall not be operated without a 50 ohm 2 watt minimum load.

3.3.1.2 Thermal Control. Heat dissipation and transmitter thermal control shall be by thermal conduction through the transmitter mounting surface only. The transmitter shall not be operated without a heat sink.

3.3.1.3 Power Supply Protection. All power supplies used for testing flight equipment shall provide protection against transients, overload, etc. to eliminate the possibility of detected or undetected damage to this equipment during test performance.

3.3.1.4 Voltage Polarity Reversal. Power supply cables and connectors used for testing flight equipment shall be designed to eliminate the possibility of damage to this equipment by reversal of primary voltage polarity. The requirements of DS-13 shall apply.

3.3.1.5 Corona Suppression. The transmitter shall be designed to operate in a vacuum of 10^{-5} to 10^{-12} mm of Hg for 2 years. Adequate venting or other methods shall be provided to meet the corona suppression requirements of MSC Criteria DS-37.

3.3.2 Materials and Protective Coatings.

3.3.2.1 Materials. Materials used in the fabrication of all components shall be of the highest quality compatible with design requirements specified herein. All materials shall be suitable for application in a space vehicle exposed to a hard vacuum. Materials shall remain stable and shall not off-gas corrosive or toxic ingredients. Other requirements are:

a) Zinc cadmium, and mercury shall not be used
b) Plastic materials shall be non-burning or self-extinguishing
c) No material shall be a fungus nutrient
d) Metal parts shall be corrosion resistant or treated to resist corrosion
e) Dissimilar metals shall not be in direct contact with each other
f) Materials which outgas to an extent which would cause corona shall not be used

3.3.2.2 Approved Materials. Materials used are to be selected from ATM-242, Approved Materials for ALSEP Equipment. Non-listed materials require Bendix non-standard material approval.
3.3.2.3 Non-Standard Materials Approval. A Non-Standard Parts Approval Request (Bendix Form BS-106) shall be submitted to Bendix for materials not on the approved list.

3.3.2.4 Protective Treatment. All materials used which are not inherently corrosive-resistant shall be treated to resist any corrosive effects resulting from environmental conditions specified herein. Protective coatings shall not crack, chip, peel, or scale with age when subject to the environmental extremes specified. The requirements of PS-5 shall apply prior to protective treatment.

3.3.2.5 Moisture and Fungus Resistance. Materials which are not nutrients for fungus shall be used whenever possible. The use of materials which are nutrients for fungus shall not be prohibited in hermetically sealed assemblies and in other accepted and qualified uses such as paper capacitors and treated transformers. If it is necessary to use fungus nutrient materials in other than such qualified application, these materials shall be treated with a process which will render the resulting exposed surface fungus resistant.

3.3.2.6 Corrosion of metal parts. Metals shall be corrosion resistant type or suitably treated to resist corrosive conditions likely to be met in storage or normal service. Unless suitably protected against electrolytic corrosion, dissimilar metals, as defined in Standard MIL-STD-889, shall not be used in direct physical contact.

3.3.3 Welding and soldering.

3.3.3.1 Soldering. NHB-5300.4 (3A), May 1968 Edition, shall be used, as modified by MEP-27.

3.3.3.2 Welding. Resistance welding (spot and seam) shall conform to Specification MIL-W-6858C.

3.3.4 Parts and Electronic Assemblies.

3.3.4.1 Parts. Electrical and electronic parts shall be procured from qualified vendors in accordance with high-reliability specifications including 100% burn-in and screening. Mechanical parts such as fasteners shall be procured to MS or NAS standards and shall be corrosion resistant steel, or if electrical conduction is required shall be of brass, nickel-plated. Solder terminals may be tin or silver plated.
3.3.4.2 **Acceptable Parts.** Acceptable parts are as listed in Bendix ATM-241. Use of parts not included in this list requires the approval of Bendix Reliability Department.

3.3.4.3 **Non-Standard Parts Approval.** A non-standard parts approval request (Bendix Form BS-106) shall be submitted to Bendix for all parts not on the approved list.

3.3.4.4 **Transistors.** The requirements of DS-5 shall apply.

3.3.4.5 **Ultrasonic cleaning.** The requirements of PS-6 shall apply.

3.3.4.6 **Standardization.** Maximum economic standardization of parts and components shall be provided. Where identical or similar functions are performed in more than one application within the Transmitter, effort shall be made to use only one item design for all applications.

3.3.5 **Electrical Connectors.** The electrical connector to be used for telemetry, power, and data inputs/outputs and the respective returns shall be the Hughes WST 0014M20BVH00 procured in accordance with Bendix Aerospace Syst. Div. SCD #2346217. The RF connector to be used shall be the Omni-Spectra OSM204CC, or equivalent. Documents DS-3 and PS-10 shall apply.

3.3.6 **Parts Procurement.** The requirements of PS-8 and PS-11 shall apply. (Serialization requirements of PS-11, Part C, do not apply to parts where lot traceability is available.) However, modules, sub-modules, tuned assemblies, or specially fabricated electronic assemblies shall be serialized.

3.3.7 **Interchangeability and Replaceability.** Interchangeability and replaceability shall be compatible with the requirements of paragraph 3.1.2.2 herein. Items of equipment with the same part numbers shall be physically and functionally interchangeable.

3.3.8 **Workmanship.** The transmitter shall be constructed, finished, and assembled in accordance with subcontractor's published workmanship standards.

3.3.9 **Electromagnetic Interference (EMI).**
3.3.9.1 **Operation.** The operation of the transmitter shall not be adversely affected by interference voltages and fields reaching it from external sources and also shall not, in itself, be a source of interference which might adversely affect the operation of other equipments. These general criteria ensure that the Transmitter will meet the requirements of the overall system acceptance criteria. In addition to these general requirements, the transmitter shall satisfy the requirements of NASA Specification MSC-IESD-19-3 except as noted in paragraph 3.3.9.

3.3.9.2 **Transient Interference.** Transient or short duration interference resulting from the operation of electrical or electromechanical devices shall not compromise the post test performance capabilities as specified herein. Paragraph "4.3.4.1.3 Transient conducted" of MSC-IESD-19-3 is not applicable as written. The transient voltage shall be reduced to ±25% of the supply voltage (+7 volt positive transient only required). The test duration shall be two minutes. The pulse repetition and shape are to be in accordance with MSC-IESD-19-3.

3.3.9.3 **Interference-free design.** Interference control shall be considered in the basic design of the transmitter. The design shall be such that, before interference control components are applied, the amount of interference internally generated and propagated shall be the minimum achievable. The application of interference control components (e.g., filtering, shielding, bonding) shall conform to good engineering practice and, wherever practical, shall be an integral part of the component.

3.3.9.4 **Power & Signal Grounding.** - Power and signal grounding shall meet the intent of para. 3.2.6.1 and 3.2.6.5 of MSC/IESD 19-3A except that case (external chassis) may be used as a single point ground to enhance reliability by deleting the requirement for additional DC/DC converters and LMI filters on return lines. However, at the component interface the modulation signal return, DC power return, and TM return shall be furnished separately, even though they may be common within the component. A single common telemetry return shall be used for all DC telemetry outputs. Additionally, the coaxial microwave signal return shall be grounded to the component chassis. (Also, refer to Figure 5).
3.3.9.5 Filtering. Filters shall be provided at the component or module interface, as required, to prevent internally generated electrical interference signals being conducted out of the component or module and vice versa.

3.3.9.6 Conductor shielding. Shielding, as necessary, shall be grounded to the basic structure or chassis at one or both ends as required for each continuous length of shielded wire except for coaxial cables. A coaxial cable being employed as an r.f. transmission line shall use the outer conductor connector grounded.

3.3.9.7 Spurious RF Signals and Antenna Conducted Emanation. Antenna conducted emanations are to be in accordance with paragraph 3.1.1.15 of this specification. Therefore, paragraph 4.3.3 of MSC-IESD-19-3 is to be used as a guide for testing and test setup purposes only.

3.3.9.8 Single Point Ground. All interference and susceptibility test setups shall use a single point ground located at the transmitter. The power return as well as the chassis ground shall be connected to this point. A line stabilization network need not be used in the power return line.

3.3.9.9 Audio and RF conducted susceptibility. Paragraph 4.3.4.1 of MSC-IESD-19-3 requirements are modified as follows: (NOTE: See paragraph 3.1.1.6, power supply requirements).

a) 50 Hz to 265 Hz use 200 mV rms (perform test for information only)
b) 265 Hz to 250 MHz use 141 mV rms (unit must pass test)
c) 250 MHz to 10 GHz using 100 mV rms (test may be deleted if analysis shows it is not necessary)
d) Use 1000 Hz RF signal modulation where applicable

3.3.10 Identification and marking. The PSK Transmitter shall be marked for identification in accordance with Standard MIL-STD-130C.
3.3.10.1 Nameplate Data. The nameplate shall include but not be limited to the following data:

a) Item nomenclature  
b) Item part number (Bendix & Subcontractor part numbers)  
c) Item serial number  
d) Subcontract and prime contract numbers  
e) Item Frequency in MHz

3.3.11 Storage. The transmitter shall have a shelf life of 2 years. Shelf life is defined as a storage period in a controlled environment of 50°F to 80°F and a relative humidity of no more than 50 percent following acceptance and prior to flight use.
4.0 QUALITY ASSURANCE PROVISIONS

4.1 Design Verification. The following sub-paragraphs specify the requirements for and methods of formally verifying that each requirement of this specification has been satisfied.

4.1.1 Inspection. The following requirements of the specification shall be verified by inspection of the transmitter assembly and sub-assemblies utilizing an inspection system that meets the requirements of NHB 5300, 4(1B).

3.2 Interface Requirements
3.3.2 Materials and Protective Coatings
3.3.3 Welding and Soldering
3.3.4 Parts and Electrical Assemblies
3.3.5 Electrical Connectors
3.3.6 Parts Procurement
3.3.8 Workmanship
3.3.10 Identification and Marking
3.3.11 Storage

4.1.2 Reliability Analysis. The following requirements of this specification shall be verified by review of analytical data prior to qualification testing.

3.1.2.1 Reliability Prediction
3.1.2.3 Useful Life
3.3.11 Storage

4.1.3 Maintainability Analysis. The following requirements of this specification shall be verified by analysis (or demonstration) prior to qualification testing.

3.1.2.2 Maintainability
3.1.2.5 Hazard Proofing
3.3.7 Interchangeability and Replaceability
4.1.4 Qualification Tests. The following requirements of this specification shall be verified during the qualification program.

4.1.4.1 Functional Tests.

3.1.1 Operational Characteristics
3.2 Interfaces

4.1.4.2 Environmental Tests. Environmental tests will be conducted to verify that the requirements of paragraph 3.1.2.4 of this specification are met.

4.1.4.3 Electromagnetic Interference Tests. Testing to assure that the equipment meets the EMI and Power Supply Ripple Requirements of this specification shall be accomplished in accordance with applicable EMI test requirements.

4.1.4.4 Visual Inspection. Perform Post-Qual visual inspection.

4.1.5 Flight Acceptance Tests. The following requirements of this specification shall be verified during each flight equipment acceptance test.

4.1.5.1 Functional Tests.

3.1.1 Operational Characteristics
3.2 Interfaces

4.1.5.2 Environmental Tests. The Flight Acceptance Environmental tests of paragraph 3.1.2.4 are required.
SINUSOIDAL VIBRATION (Non-Operating)

Axis: X, Y, and Z

Sweep Rate: 3 octaves per minute, 1 cycle-increase and decrease

Tolerance: ±10.7 g-peak

Notes: (1) Non-operating sine vibration derived from BxA memorandum 9712-56 and 9712-147.
RANDOM VIBRATION SPECTRUM (Non-operating)
Axis: X, Y, and Z
Duration: 13.5 minutes per axis
PSD Tolerances: Above 20Hz = +3dB, -1.5dB
Below 20Hz = ±6 dB

Note 1: The subcontractor shall specify analyzer filter bandwidths in his QUAL test plans and procedures.

Note 2: Non-operating random vibration derived from BxA memorandum 9712-56 and BxA memorandum 9712-147.
DEFECT DETECTION RANDOM VIBRATION (Operating)

Axis: X, Y, and Z

Duration: QUAL = 5 minutes per axis
FLIGHT = 1 minute per axis

PSD Tolerances: QUAL = +3dB, -1.5dB
FLIGHT = +1.5dB, -3dB

Note(1): Operate monitoring power lines for short or open circuit and monitor output for any interruptions during vibration. Incidental phase modulation due to vibration is acceptable.

Note(2): The subcontractor shall specify analyzer filter bandwidths in his QUAL and FLIGHT test plans and procedures.

Note(3): Operating vibration requirements were derived from LSPO#1.
1. Weight = 1.50 pounds max
2. Surface Finish = Gold Plate per MIL-G-45204
3. Mounting Hole Tolerance: To be controlled by Bendix supplied tool
4. Exterior Edges to be Smooth

#8-32 UNC-2B
Insert - Self-Locking 6 Places (L = 1.5 DIM)
.25 x 45° - 2 Places

MOUNTING SURFACE

.005 TIR

1.50 max

14 Pin Connector
Bx A Part No = 2346217-6
(Hughes Conn PN = WST 0014 M20 BVH00)
FLT Model Pins
Bx A, 2346217-31
(Hughes, WPZZY2CC005)

Effectivity Table

<table>
<thead>
<tr>
<th>Bendix PN</th>
<th>Bendix SN</th>
<th>Alsep</th>
</tr>
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<tbody>
<tr>
<td>2362877</td>
<td>40 &amp; UP</td>
<td>AREA E</td>
</tr>
</tbody>
</table>
## Exhibit B

### PSK Transmitter Specification

#### Figure 5 - Electrical Interfaces

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency</th>
<th>Modulation</th>
<th>Power</th>
<th>Load Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coaxial RF Output</td>
<td>Carrier: 2275 to</td>
<td>PSK</td>
<td>1 Watt Min.</td>
<td>50 Ω Nom.</td>
</tr>
<tr>
<td></td>
<td>2280 MHz</td>
<td></td>
<td>(430dBm)</td>
<td>Load VSWR 1.35:1 Any Phase Angle</td>
</tr>
</tbody>
</table>

### J201

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Voltage</th>
<th>Current or Impedance</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+29 VDC</td>
<td>28-30 VDC</td>
<td>345 mA Max</td>
<td>Power = 10 Watts</td>
</tr>
<tr>
<td>2</td>
<td>29V Return</td>
<td></td>
<td></td>
<td>Common with Chassis</td>
</tr>
<tr>
<td>3</td>
<td>+29 VDC</td>
<td></td>
<td></td>
<td>Common with Pin #1</td>
</tr>
<tr>
<td>4</td>
<td>SPARE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CHASSIS GND.</td>
<td></td>
<td></td>
<td>Common with All Returns</td>
</tr>
<tr>
<td>6</td>
<td>SPARE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Modulation</td>
<td></td>
<td></td>
<td>Common with Pin #11</td>
</tr>
<tr>
<td>8</td>
<td>TM RETN.</td>
<td></td>
<td></td>
<td>Return for all TM</td>
</tr>
<tr>
<td></td>
<td>(TM, RET)</td>
<td></td>
<td></td>
<td>Common with Chassis</td>
</tr>
<tr>
<td>9</td>
<td>Hot Spst Temp.</td>
<td>0 to 5 VDC</td>
<td>≤ 50 KΩ</td>
<td>12V Max Limited</td>
</tr>
<tr>
<td>10</td>
<td>Case Temp.</td>
<td>0 to 5 VDC</td>
<td>≤ 50 KΩ</td>
<td>12V Max Limited</td>
</tr>
<tr>
<td>11</td>
<td>Modulation</td>
<td>0 to 0.4V = Logic &quot;0&quot;</td>
<td>2.4 to 5.5V = Logic &quot;1&quot;</td>
<td>TIL545 and DTL Compatible</td>
</tr>
<tr>
<td>12</td>
<td>Mod. Retn.</td>
<td></td>
<td></td>
<td>Common with Chassis</td>
</tr>
<tr>
<td>13</td>
<td>(23 VDC) TM</td>
<td>0 to 5 VDC</td>
<td>≤ 50 KΩ</td>
<td>12V Max Limited</td>
</tr>
<tr>
<td>14</td>
<td>(19 VDC) TM</td>
<td>0 to 5 VDC</td>
<td>≤ 50 KΩ</td>
<td>12V Max Limited</td>
</tr>
</tbody>
</table>

### Effectivity Table

<table>
<thead>
<tr>
<th>Bendix PN</th>
<th>Bendix SN</th>
<th>ALSEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2342877</td>
<td>40 &amp; Up</td>
<td>ARRAY E</td>
</tr>
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