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U.S. Department Of Transportation

Federal Aviation Administration

Specification

PAR-56 LAMPHOLDER

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1. SCOPE

1.1 Scope.

This specification covers the requirements of the Federal Aviation Administration for an aluminum PAR-56 lampholder for use in approach lighting systems.

2. APPLICABLE DOCUMENTS

2.1 FAA documents.

The following FAA specifications, standards, and drawings of the issues in effect on the date for invitation-for-bids or request-for-proposals, form a part of this specification and are applicable to the extent specified herein.

2.1.1 FAA specifications.

FAA-E-2408	Lamps, PAR-56, Incandescent, Aviation Service
FAA-E-2604	Low-Impact Resistant Structures for Medium Intensity Approach Lighting System (MALS)
FAA-E-2702	Low-Impact Resistant Structures
FAA-G-2100	Electronic Equipment, General Requirements
AC 150/5345	Isolation Transformers for Airport Lighting Systems

2.1.2 FAA standards.

FAA-STD-012	Paint Systems for Equipment
FAA-STD-013	Quality Control Program Requirements

2.1.3 FAA drawings.

A-4885-1	High Intensity Approach Lights, Color Screen, 8-Inch Diameter
C-5407-1	Lamps, Incandescent PAR-56
C-6046	Frangible Coupling, Type I and IA, Details
C-21216	Standard Nameplate
D-5870-4	Approach Lighting System, 5-Light Bar, Frangible Mounting, Maximum Mounting Height 6'-0"

D-6071-15 ALSF-2, Approach Lighting System, 6'-10" to 128'-0", Low-Impact Resistant Structures, Types T-4 and T-3, Tee-Assembly Details, Light Mounting Height 6'-0" to 128'-0"

2.2 Military and federal documents.

The following military and federal documents, of the issues in effect on the date of the invitation-for-bids or request-for-proposals, form a part of this specification and are applicable to the extent specified herein.

2.2.1 Military specifications.

MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-E-17555	Electronic and Electrical Equipment, Accessories and Repair Parts, Packaging and Packing of
MIL-S-25043	Steel Plate, Sheet & Strip, 17-7PH
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys

2.2.2 Military standards.

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-130	Identification Marking of U.S. Military Property

2.2.3 Federal standard.

FED-STD-595	Colors
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2.2.4 Federal specification.

QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel
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2.3 Other documents.

ANSI A360.0	Aluminum Die Casting Alloy Data
ASTM A240	Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

ASTM A313	Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire
ASTM B85	Standard Specification for Aluminum-Alloy Die Castings
ASTM B135	Standard Specification for Seamless Brass Tube
ASTM B174	Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
ASTM B534	Standard Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar
UNS C17500	Copper-Cobalt-Beryllium alloy, H04 Temper strip, "Unified Numbering System for Metals and Alloys"

(Copies of applicable FAA specifications, standards, and drawings may be obtained from the Contracting Officer in the Federal Aviation Administration office issuing the invitation-for-bids or request-for-proposals. Requests should fully identify material desired; i.e., specification, standard, or drawing number and date. Requests should cite the invitation-for-bids, request-for-proposal, or contract involved or other use to be made of the requested material.)

(Single copies of military specifications and standards may be obtained from Federal Aviation Administration, Washington, D.C. 20590, ATTN: Contracting Officer. Requests should cite the invitation-for-bids, request-for-proposals, or contract for which the material is needed. Mail requests, if found acceptable, will be forwarded to a military source of supply for filling; hence, ample time should be allowed. Single copies of military specifications, standards, and publications also may be obtained directly from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.)

(Information on obtaining Federal specifications and standards may be obtained from the General Services Administration offices in Washington, D.C.; Atlanta; Boston; Chicago; Denver; Kansas City, Missouri; New York; San Francisco; and Seattle.)

(ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org.)

(American National Standards Institute/American Society for Quality Control (ANSI/ASQC) documents may be obtained from ASQC, 611 East Wisconsin Avenue, Milwaukee, Wisconsin 53202. American National Standards Institute (ANSI) documents can be obtained electronically from http://webstore.ansi.org/ansidocstore/shopper_lookup.asp . Paper standards are available through Global Engineering Documents.)

3. REQUIREMENTS

3.1 General.

The PAR-56 lampholder is part of an elevated low-impact resistant approach lighting system. The types of mountings are depicted on FAA Drawings D-6071-15 and D-5870-4.

3.2 Equipment to be furnished by contractor.

The equipments to be furnished under this specification are:

- (a) PAR-56 lampholder assembly (3.3.1). Quantities shall be as specified in the contract schedule.
- (b) shorting device assembly (3.3.2)
- (c) aiming device (3.3.3)
- (d) instruction sheet (3.12)
- (e) lamp retainer ring

3.3 Functional requirements.

The PAR-56 lampholder shall secure, in the proper operating position, a 300-Watt or a 500-Watt, 20 ampere (A). PAR-56 lamp made in accordance with Specification FAA-E-2408. The PAR-56 lampholder shall also secure the color filter screen, FAA Drawing A-4885-1, using the color screen holder shown on figure 1. The PAR-56 lampholder shall be designed for continuous operation under the environmental conditions specified in 3.4.

3.3.1 PAR-56 lampholder assembly.

The PAR-56 lampholder assembly, figure 2, shall consist of the following parts: a lamp clip assembly, a housing, a mounting assembly, and a lamp connector.

3.3.1.1 Lamp clip assembly.

The lamp clip assembly details, figure 6, shall secure the PAR-56 lamp in place using a minimum of three clips. The lamp clips shall secure the lamp firmly in position with a uniform pressure at 120 degrees points on the periphery of the lamp and lampholder.

3.3.1.2 Color filter clips.

Color filter clips, figure 2, shall be designed in accordance with figure 1 to secure a color filter, FAA Drawing A-4885-1, in front of the PAR-56 lamp. These clips shall be furnished with the lampholder that has 500 Watt lamp. There shall be three clips spaced at 120 degrees around the lamp clip assembly.

3.3.1.3 Housing.

The housing shall consist of a shell with a mounting assembly, a shorting device, and a lamp connector assembly. The housing weight shall not exceed 6 pounds. The housing shall be assembled complete with the lamp clip assembly.

3.3.1.3.1 Shell.

The housing shell, figure 4, shall be formed from aluminum casting A-360, with space provided for a shorting device (3.3.2). The shell shall be able to withstand temperatures in the range of -55 C (-67 F) to 290 C (554 F). A lamp indexing ring shall be provided on the shell. The ring shall be designed to prevent the PAR-56 lamp from being improperly installed. The shell shall retain shape and alignment under the environmental conditions specified in 3.4. The shell shall be capable of operating continuously with a PAR-56, 300-Watt lamp or a PAR-56, 500-Watt lamp. The shell shall not deform, discolor, or show deterioration in continuous operation. All interior and exterior surfaces of the shell shall be smooth and free of pits and marks. An adjustable mounting assembly (3.3.1.4) shall be securely attached to the lampholder shell. Indexing marks shall be provided for aligning the shell. When the indexing mark is placed on the "O" mark on the mounting assembly, the horizontal axis of the shell shall be $90 + 1/2$ to the vertical axis of the support. Indexing markings shall be minimum 1/32 inch (0.79 mm) raised and 3/16 inch (4.7 mm) long. Indexing marks shall be provided from 0 to 25 above horizontal in 5 degree intervals with each 5 degrees labeled. An Underwriter Laboratory (UL) approved grounding lug shall be provided with the shell for a one-conductor number 16 American Wire Gage (AWG) copper grounding wire.

3.3.1.3.2 Lamp connector.

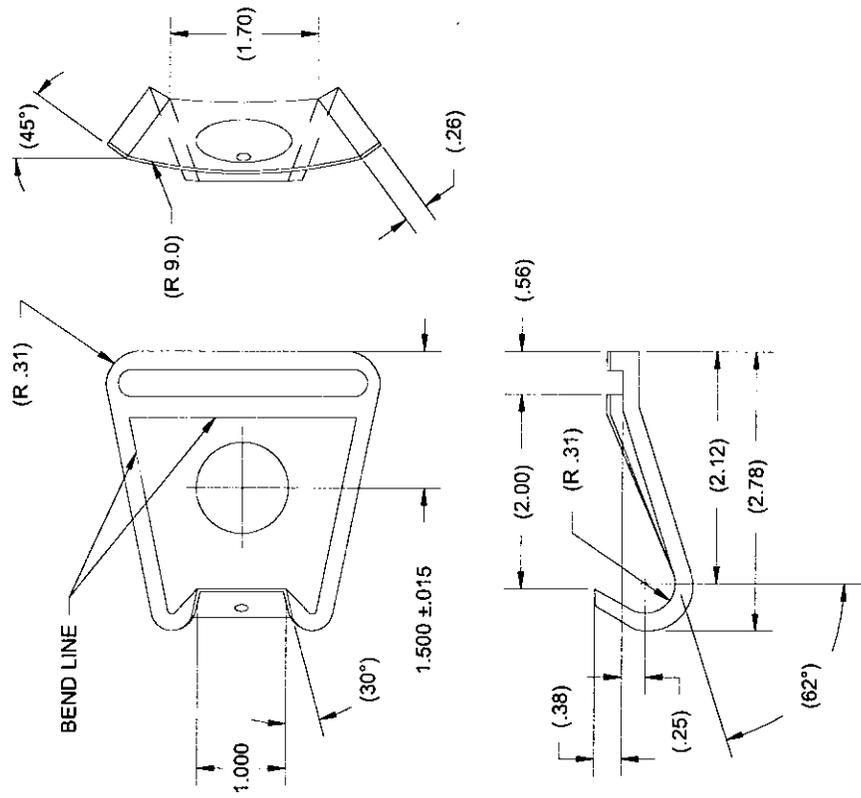
The housing lamp connector made of porcelain, figure 3, shall be rated for at least 750 Watts at 20 A load current and 37.5 Volts (V) rms, 60 Hertz (Hz) working voltage. The lamp connector shall be a push on connector matching the lamp prongs shown on FAA Drawing C-5407-1, with the spring-loaded socket contacts spot-welded to copper leads that are 6 inches (152.4 mm) long, Number 12 American Wire Gage (AWG), 600 Volt teflon insulated, ASTM B174 Class K copper fine-strand, and concentrically wound. Floor lamp connectors connected to shorting devices, the lamp connector leads shall originate from the shorting devices as described in 3.3.2. For other connectors, the lamp connector leads shall be terminated in nylon insulated male connectors that connect directly to matching female connectors of the incoming power leads. The connector contacts shall provide freedom from welding at points of contact with the lamp under continuous duty at 20A. The lamp connector shall provide a strain relief encompassing the conductor insulation as an integral part of the receptacle. The initial pull force necessary to remove a lamp prong, or a prong similar in appearance and physical characteristics to a lamp prong, from each of the connector prong sockets shall be greater than 24 ounces (weight).

3.3.1.3.3 External service entrance.

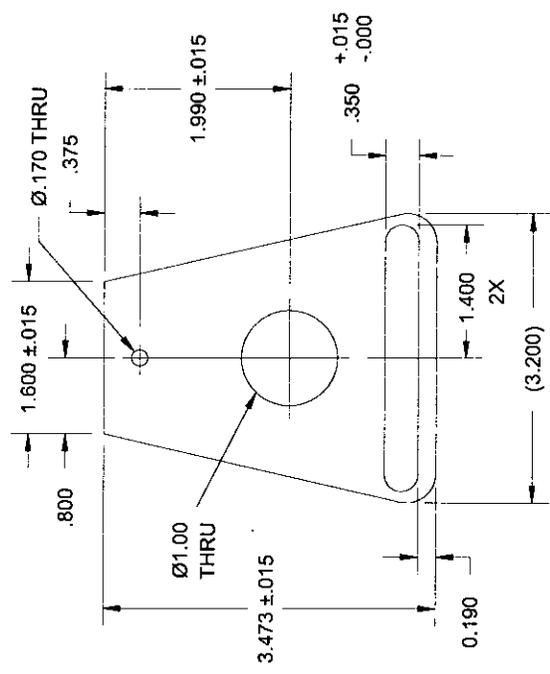
The incoming electrical power leads to the housing shall be through the center of the mounting assembly. The service entrance opening shall provide entrance for three 1-conductor insulated cables, two No. 12 AWG, 600 V, and one No. 12 green ground wire.

NOTES: UNLESS OTHERWISE SPECIFIED

1. MAT'L: TYPE 304 STAINLESS STEEL PER ASTM A240, .035" THICK.
2. BREAK ALL EDGES .005 - .015
3. FINISH: PASSIVATE PER QQ-P-35.
4. DIMENSIONS ARE IN INCHES



FORMED DIMENSIONS



FLAT DIMENSIONS

Figure 1. Color Screen Holder Detail

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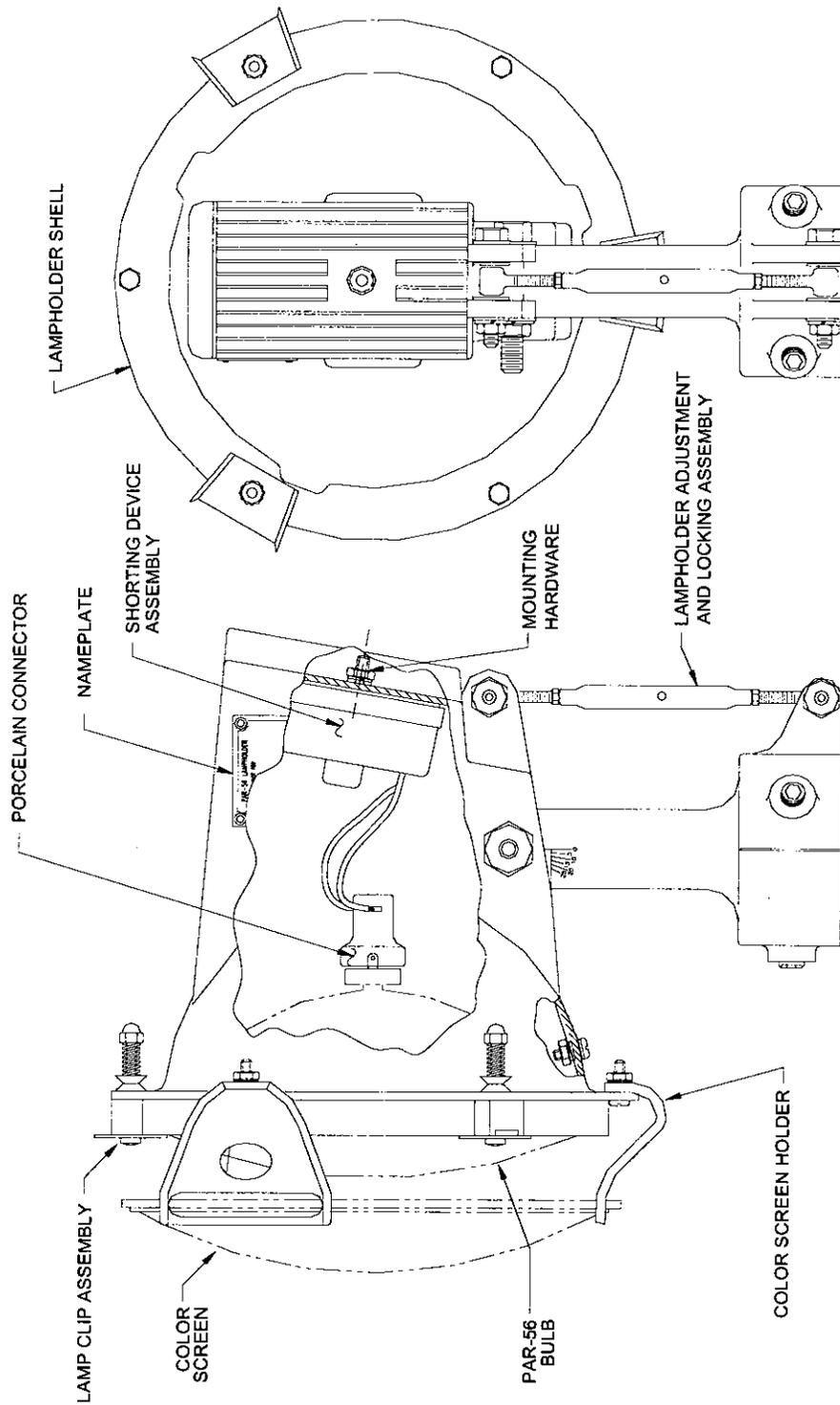


Figure 2. PAR-56 Lampholder Assembly

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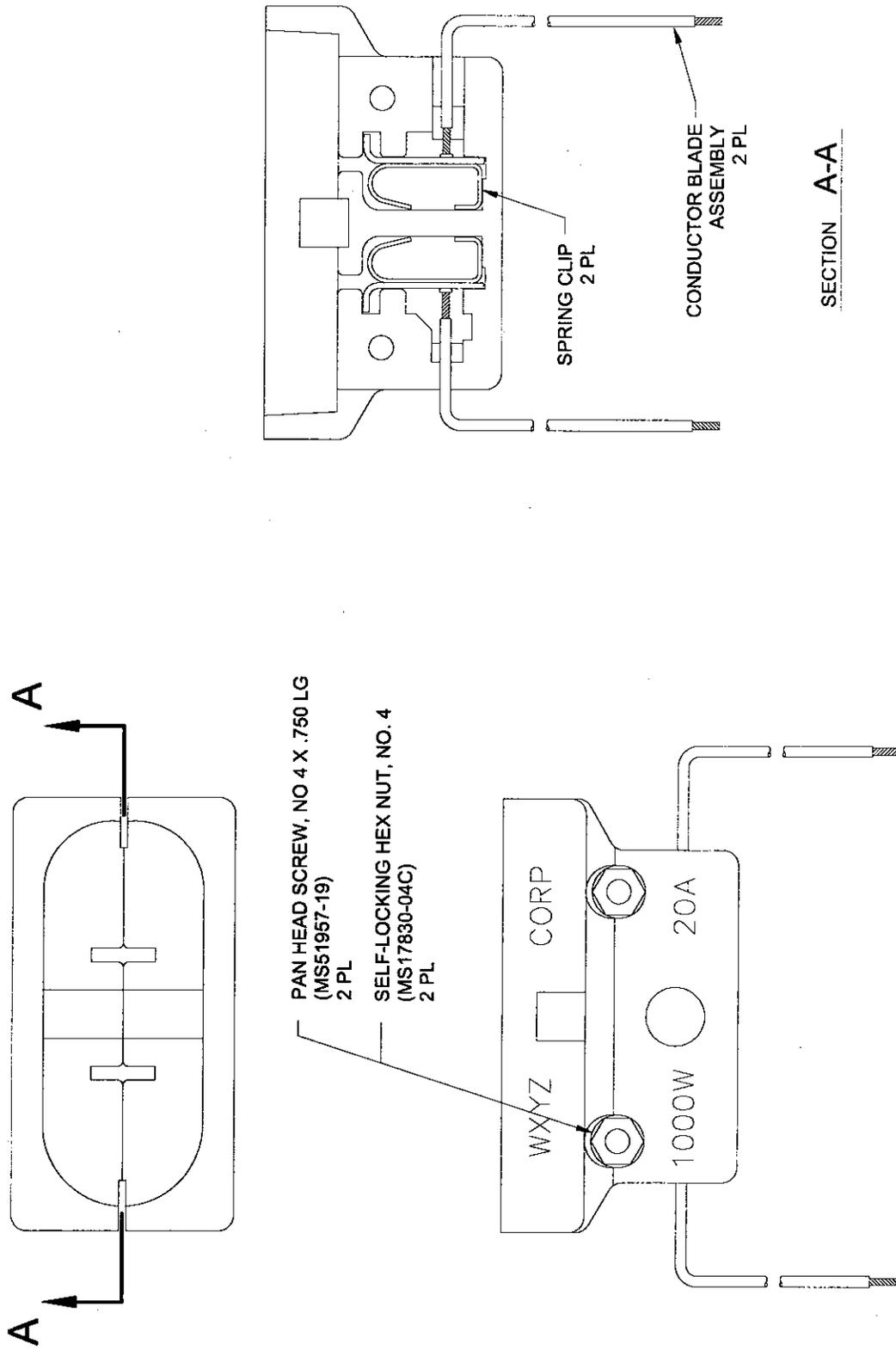


Figure 3. PAR-56 Lampholder, Lamp Connector Detail (Sht 1 of 5)

NOTES: UNLESS OTHERWISE SPECIFIED

- 1. FILLETS: R .02 MAX.
- 2. DIMENSIONS ARE IN INCHES

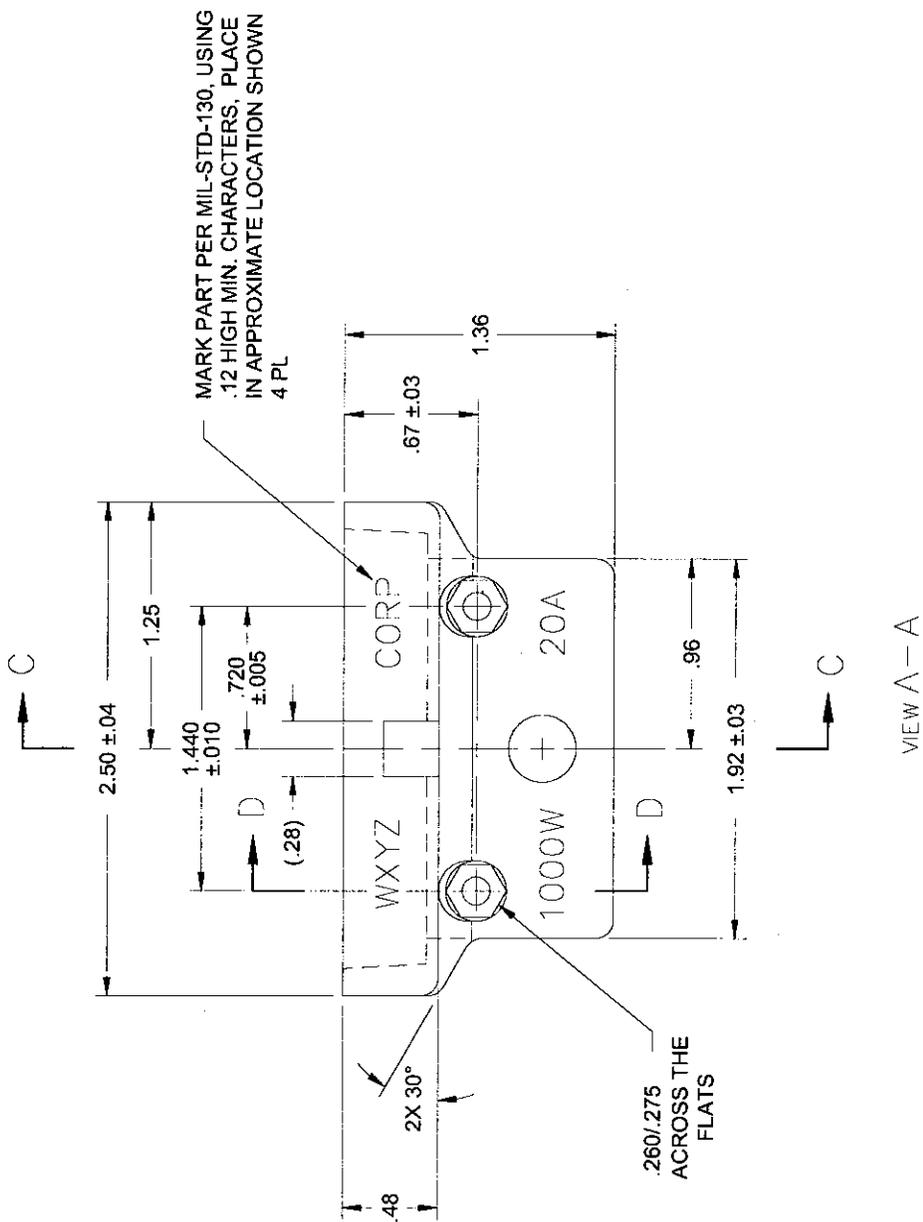
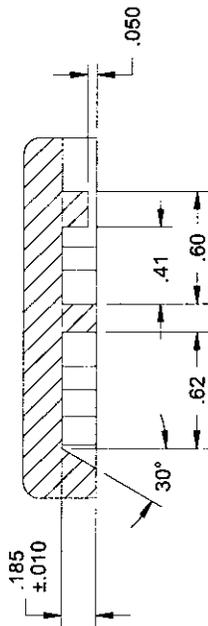


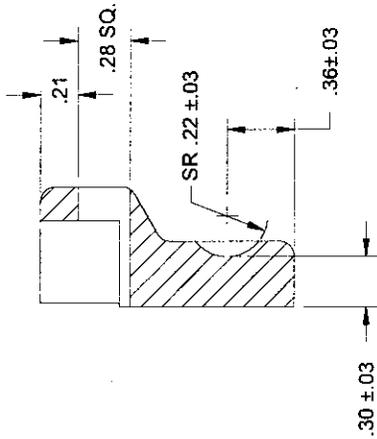
Figure 3. PAR-56 Lampholder, Lamp Connector Detail (Sht 3 of 5)

NOTES: UNLESS OTHERWISE SPECIFIED

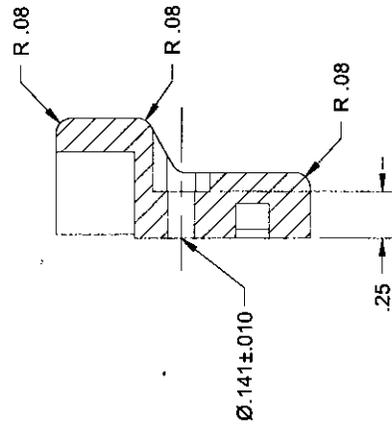
- 1. FILLETS: R .02 MAX.
- 2. DIMENSIONS ARE IN INCHES



SECTION B-B



SECTION C-C



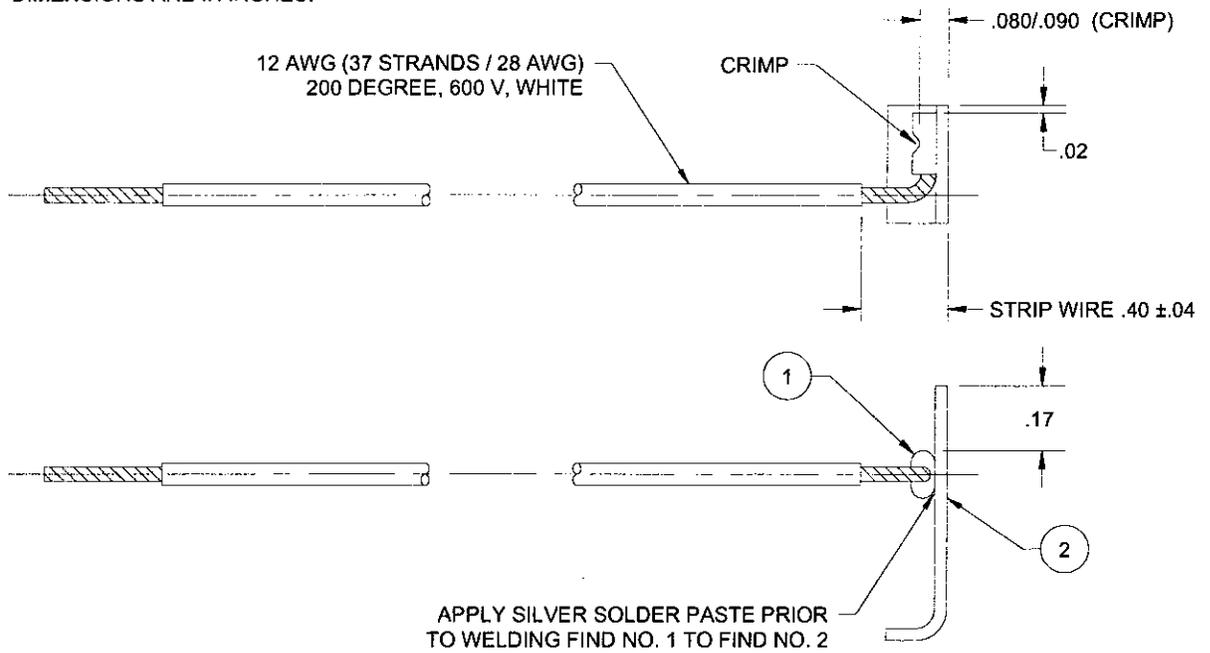
SECTION D-D

2 PL

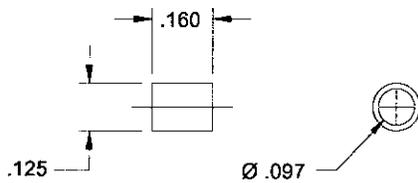
Figure 3. PAR-56 Lampholder, Lamp Connector Detail (Sht 4 of 5)

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.

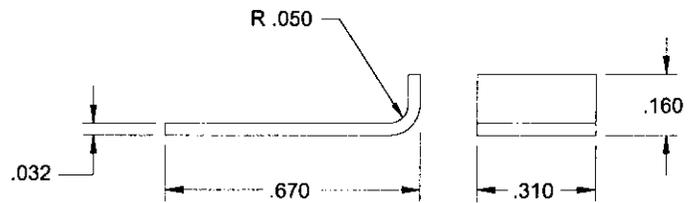


CONNECTOR BLADE ASSEMBLY



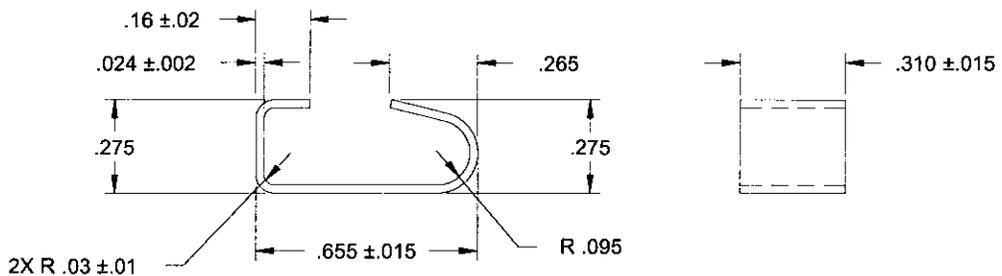
MATERIAL: HARD DRAWN BRASS TUBING PER
ASTM-B-135-91, ALLOY C33000.

1 CRIMP RING DETAIL



MATERIAL: BERYLLIUM COPPER PER UNS C17500
ASTM B534 .25 HARD MINIMUM.

2 CONNECTOR BLADE DETAIL



SPRING CLIP DETAIL

MATERIAL: .024 THK (24 GA) 17-7 PH STAINLESS STEEL

Figure 3. PAR-56 Lampholder, Lamp Connector Detail (Sht 5 of 5)

NOTES: UNLESS OTHERWISE SPECIFIED

1. FILLET RADII .06 MIN. INSIDE, .10 MIN. OUTSIDE.
2. CORNER RADII .03 MIN.
3. CORNERS SHOWN SHARP TO .03 MAXIMUM BREAK.
4. REMOVE BURRS, GATES, FINIS, ETC., FLUSH WITH CONTOUR $\pm .03$.
5. SURFACE BLEMISH (DISCONTINUITY) NOT TO EXCEED .010.
6. MATERIAL: ALUMINUM - ALLOY ANSI A360.0 PER ASTM B85.
7. FINISH: CONVERSION COATING PER MIL-C-5541, CLASS 3, YELLOW. PAINT OUTSIDE OF SHELL, OVER SPRAY PERMISSABLE WITH NO PRIMER, PAINT USING POWDER COATING, SMOOTH, HIGH GLOSS, COLOR ORANGE NO. 12197 PER FED-STD-595.
8. DIMENSIONS ARE IN INCHES.

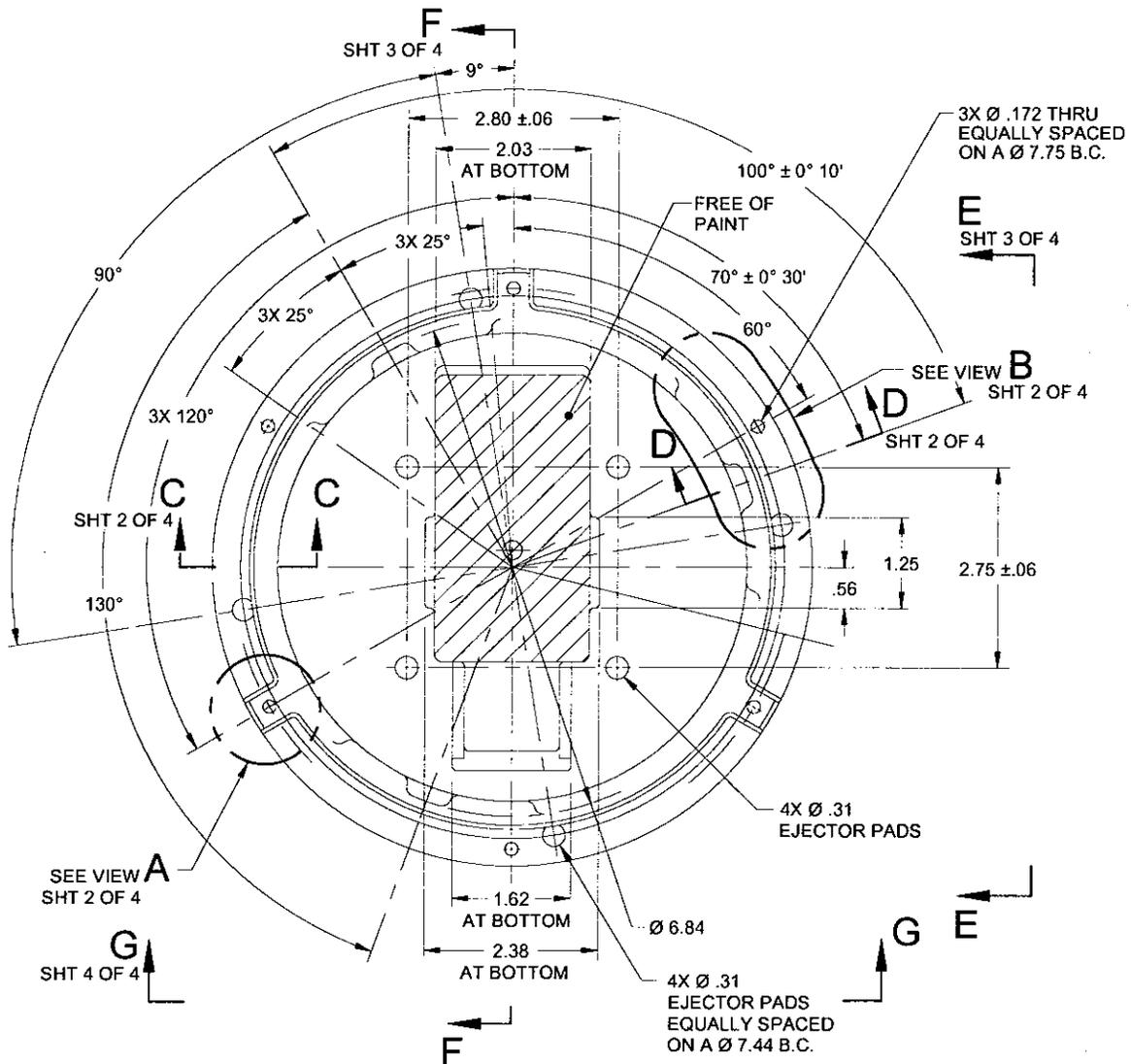
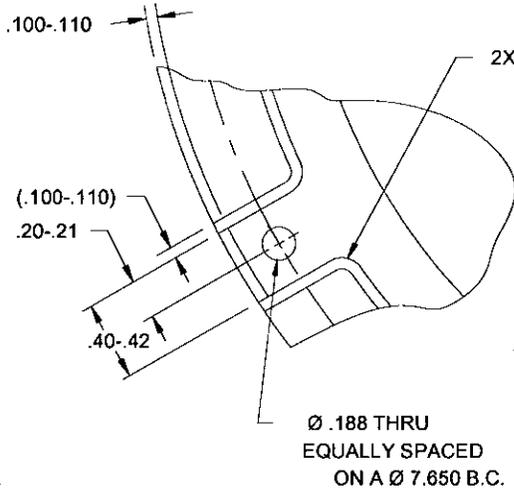


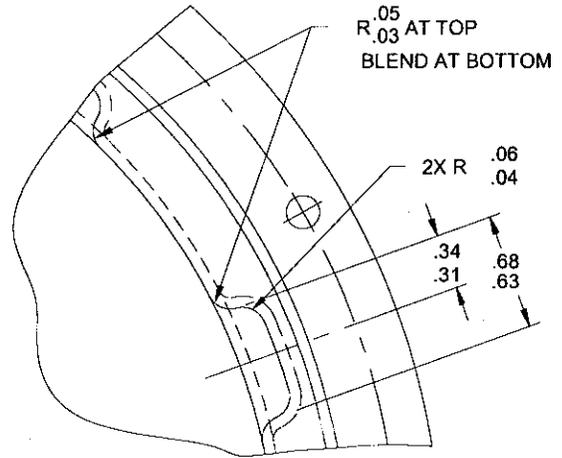
Figure 4. PAR-56 Lampholder Shell (Sht 1 of 4)

NOTES: UNLESS OTHERWISE SPECIFIED

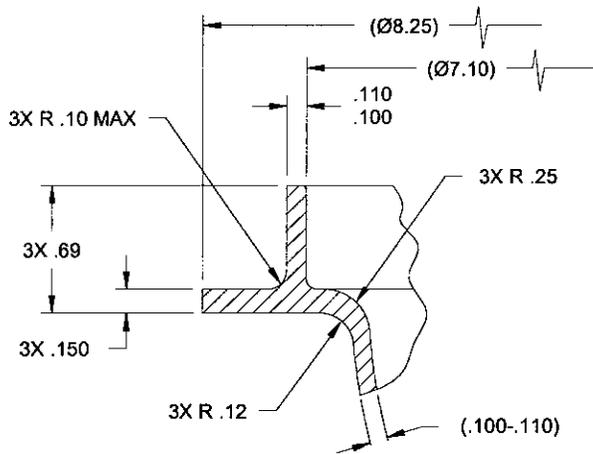
1. DIMENSIONS ARE IN INCHES.



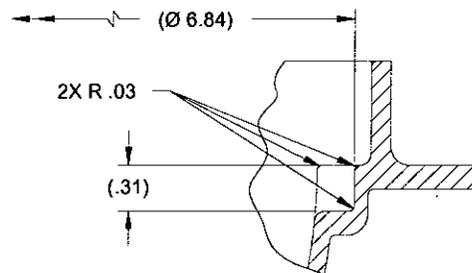
VIEW A
3 PL



VIEW B
3 PL



SECTION C-C



SECTION D-D
ROTATE 20° CW
3 PL

Figure 4. PAR-56 Lampholer Shell (Sht 2 of 4)

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.

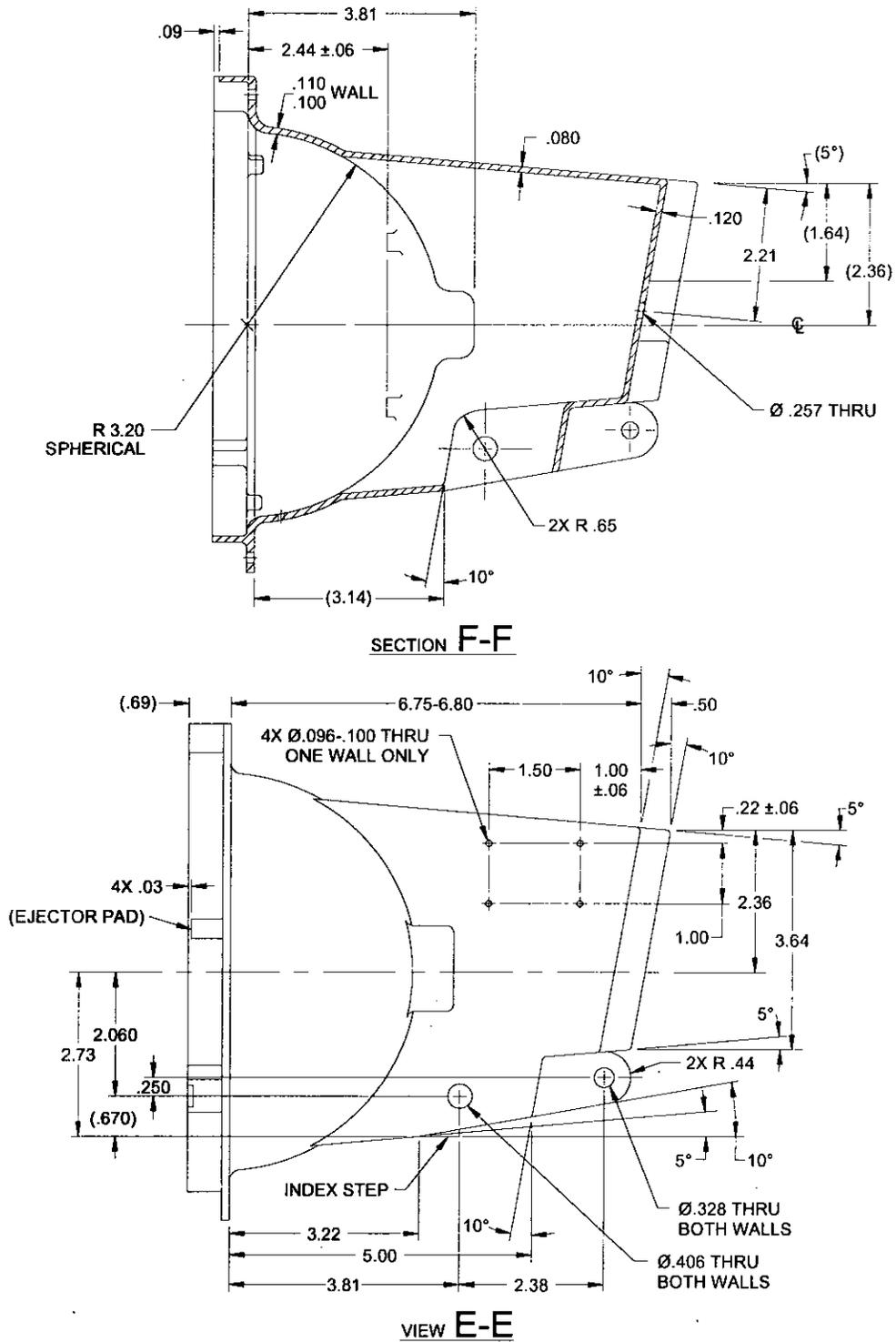


Figure 4. PAR-56 Lampholder Shell (Sht 3 of 4)

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.

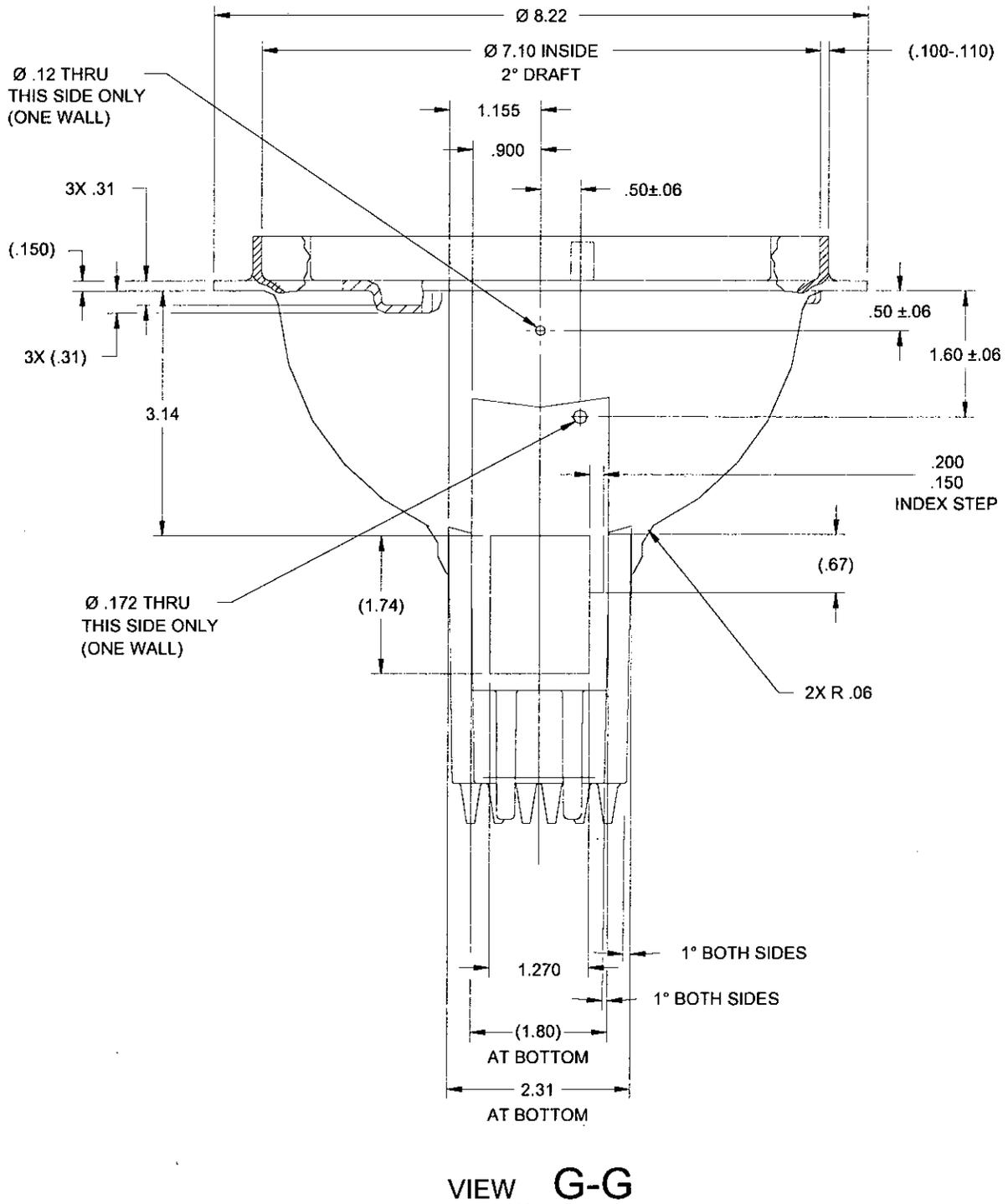


Figure 4. PAR-56 Lampholder Shell (Sht 4 of 4)

3.3.1.3.4 Finish.

The exterior finish of the housing shall be aviation orange in accordance with Federal Standard 595, Color No. 12197. After cleaning, apply chemical conversion coating per MIL-C-5541, Class 3, Yellow. Paint shall be applied according to FAA-STD-012 on all metal surfaces of the shell, mounting assembly and lamp retaining ring.

3.3.1.4 Mounting assembly.

An adjustable mounting assembly (slip filter), figure 5, shall be furnished to secure the lampholder to the support structure. The support structure will be a 2-inch (50.8 mm) frangible coupling, or a 2-inch electrical metallic tubing (emt). The external service entrance shall be through a 1/2 inch (12.7 mm) minimum diameter hole in the center of the assembly. No cable shall be visible once the lampholder is mounted on the structure. The top of the lampholder shall not exceed 14 inches (355.6 mm) above the ground plane when installed on a 2-inch frangible coupling (FAA Drawing C-6046). The 14-inch measurement shall be made with the lampholder aimed at 10 degrees elevation.

3.3.2 Shorting device assembly.

The shorting device assembly, figure 7, shall mount in the rear of the lamphousing shell. The shorting device assembly shall consist of:(a) a shorting device and (b) a lamp connector. The shorting device shall be electrically parallel to the terminals of the PAR-56 lamp when the lamp burns out. The shorting device shall load the 20 ampere (A) circuit with no more than a 3-Watt circuit loading when the lamp is burning. The shorting device shall be mounted within the shell. The device shall maintain the integrity of the 20 A series circuit when a PAR-56 lamp burns out with circuit current varying from 20 A to 8.5 A. Two pairs of wires shall be provided for each shorting device. One pair of wires shall be used to receive the incoming power, and the other pair shall be used to transfer power to the lamp through the attached lamp connector. One pair of wires shall be connected to the incoming power leads by means of a male connector, and the other pair shall be connected to the attached lamp connector by means of a beryllium copper female disconnect. The incoming power leads shall be terminated in female connectors that match the male connectors on the shorting device power leads. Wires leaving the shorting device shall be teflon insulated. The device shall be capable of a minimum of 1,000 operations. An operation is defined as one activation of the device. The shorting device circuit shall be capable of withstanding voltage transients up to 4000 V (peak). The shorting device shall withstand a 10 kV, dc, insulation resistance test voltage applied to the primary of the isolation transformer with the secondary connected to the shorting device input terminals and the mounting lug grounded.

3.3.3 Aiming device for PAR-56 lampholder.

The aiming device, figure 8, shall be designed for use on the PAR-56 lampholder. The aiming device shall be mounted firmly in place on the lampholder. The aiming device shall permit field aiming of the lamp axis perpendicular to the horizontal plane at any angle for 0° to + 25° above the horizontal. The device shall be capable of remotely aiming the PAR-56 lamp when mounted on low impact resistant structures that conform to FAA-E-2604 or FAA-E-2702. Starting with the structure in the elevated position, the device shall permit an individual to accurately aim the

lamp from the ground after lowering the structure a maximum of two times regardless of the tilting direction of the structure.

The aiming device also shall be capable of aiming PAR-56 lamp unit mounted on a frangible coupling (FAA Drawing C-6046). The aiming angle shall be indicated on a scale calibrated in 1° intervals and shall be accurate to within +1/2° of the actual aiming angle with the device attached. The final aimed angle of the lamp with the device unattached shall be accurate within 1° of the actual angle.

3.3.4 Lamp retainer ring.

In addition to the PAR-56 lamp clips required by 3.3.1.1 an additional PAR-56 Lamp Retainer Ring shall be designed that will retain the PAR-56 lamp within the lampholder under lampholder vibration. The Lamp Retainer Ring shall be painted the same color as the Lampholder. The back side of the ring shall be marked with the manufacturers name and part number.

3.4 Environmental conditions.

The PAR-56 lampholder shall be designed to operate under the following environmental conditions.

3.4.1 Temperature.

Any ambient temperature between -55° C (-67° F) to +70° C (158° F) (4.5.1.1).

3.4.2 Humidity.

Exposure to atmosphere of 100 percent relative humidity (4.5.1.2).

3.4.3 Sand and dust.

Exposure to windblown sand and dust particles that may be encountered in an arid region (4.5.1.3).

3.4.4 Salt spray.

Exposure to atmosphere containing salt laden moisture (4.5.1.4).

3.4.5 Rain.

Exposure to windblown rain (4.5.1.5).

3.4.6 Temperature shock.

Exposure to extreme thermal changes while under operation (4.5.1.6).

3.4.7 Solar radiation.

Exposure to accelerated fading, thermal, and radiation effects when exposed to solar radiation (4.5.1.7).

3.4.8 Vibration.

The PAR-56 lampholder assembly shall be capable of withstanding vibrations in the frequency range of 10 to 2,000 hertz (4.8).

3.5 Interchangeability.

All parts of the lampholder shall be interchangeable with other similar parts of another identical unit, except for those items that may be permanently bonded to the lampholder housing.

3.6 Repairs and adjustments.

The design shall permit repairs and adjustments in the field using only an open-end wrench and slotted-head screwdriver.

3.7 Structural integrity.

The lampholder shall be able to withstand, without damage, jars and vibrations normally experienced during shipment, installation, and service.

3.8 Materials.

Material for parts shall be as specified herein and in Specification FAA-G-2100. All aluminum parts shall be anodized to 0.0005 inch (0.0127 millimeter (mm)) of thickness in accordance with Specification MIL-A-8625, Type II, Class 1.

3.9 Workmanship.

Workmanship shall be in accordance with the quality control program of FAA-G-2100. All parts shall be assembled so that they will not vibrate or become loose during normal operation. Surfaces shall be smooth and free of pits and marks. All corners and edges within wireway shall be rounded to prevent cutting of wire insulation.

3.10 Hardware.

The screws, nuts, bolts, and washers used in the assembly and mounting of the lampholder shall be stainless steel or materials that shall withstand the environmental requirements.

3.11 Nameplate.

A nameplate shall be fastened with Type 430 or 18-8 stainless steel drive screws or aluminum rivets to the back of the lampholder. The nameplate shall be constructed, in accordance with FAA Drawing C-21216, of aluminum or nickel silver material, and shall contain at least a description noun, type number, contract number, and manufacturer's name and address.

3.12 Instruction sheet.

When the end product is furnished individually, not as a part of a system, an instruction sheet shall be furnished with each PAR-56 lampholder containing brief instructions for assembling, installing, aiming, relamping, and maintaining the unit. An exploded or composite view shall identify all parts and list them in a parts list, showing each part's name, manufacturer's name, contractor's catalog number, quantity per light unit, space for National Stock Number, and unit cost for each part.

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NOTES: UNLESS OTHERWISE SPECIFIED

1. CORNERS SHOWN SHARP TO .03 MAXIMUM BREAK.
2. REMOVE BURRS, GATES, FINS, ETC., FLUSH WITH CONTOUR ±.03.
3. ALL THREADED HOLES TO BE FREE OF PAINT.
4. MATERIAL: ALUMINUM ALLOY ANSI A360.0 PER ASTM B85.
5. FINISH: CONVERSION COATING PER MIL-C-5541, CLASS 3, YELLOW. PAINT USING POWDER COATING, SMOOTH HIGH GLOSS, COLOR ORANGE NO. 12197 PER FED-STD-595.
6. DIMENSIONS ARE IN INCHES.

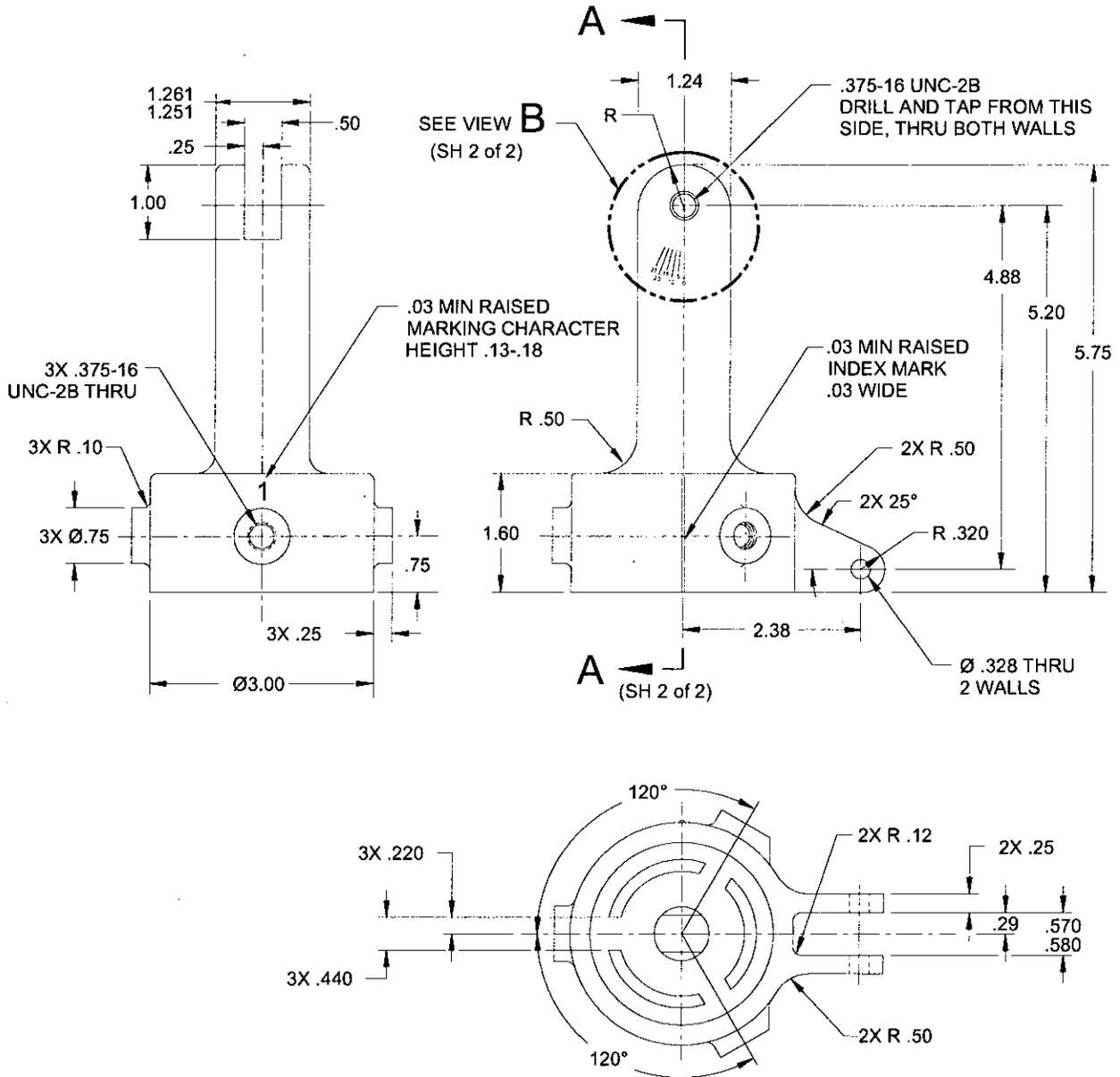
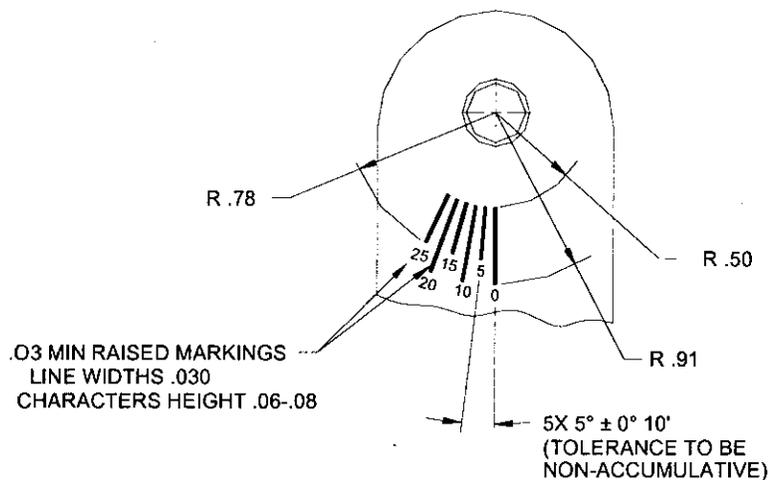


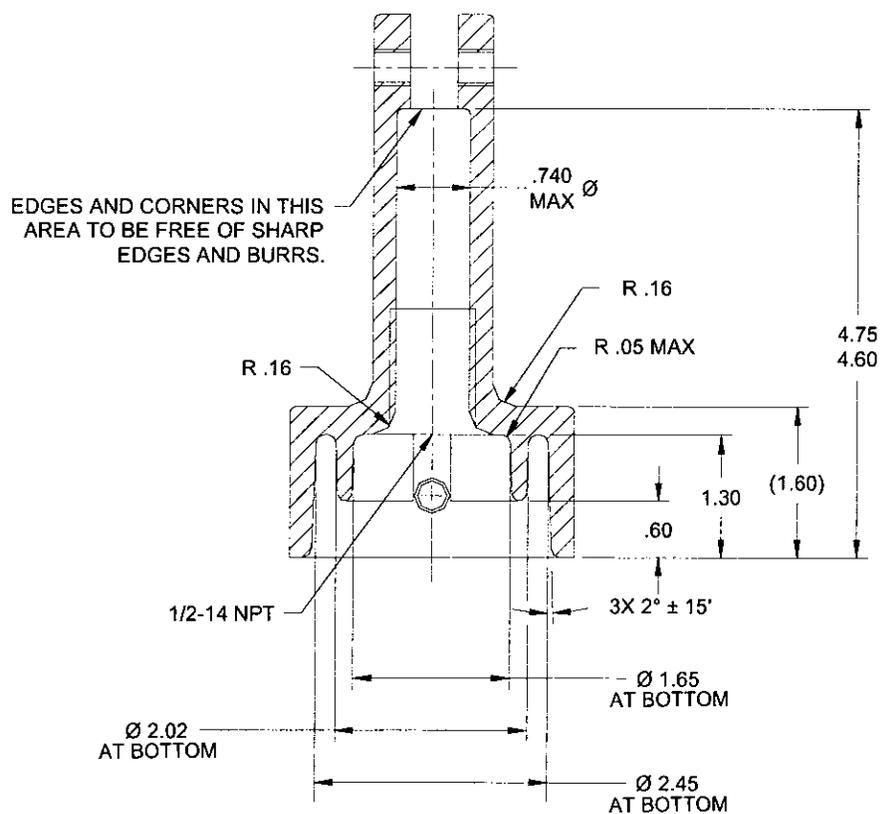
Figure 5. PAR-56 Lampholder Slip Fitter Mounting (Sht 1 of 2)

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.

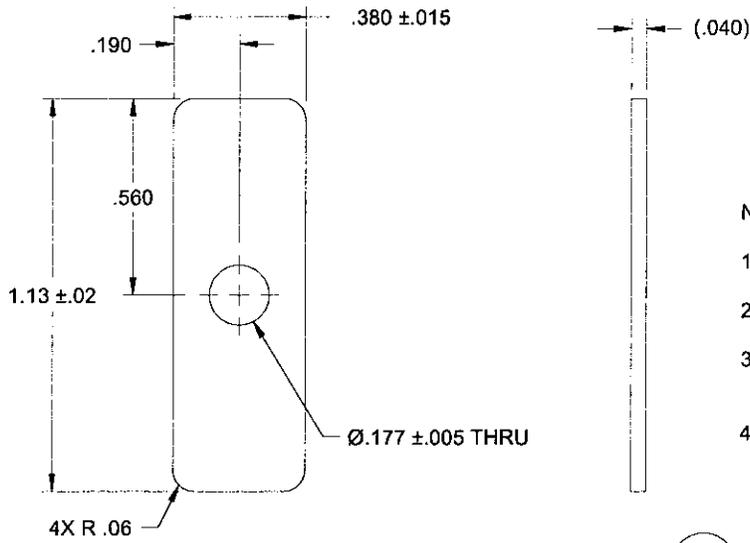


VIEW B



SECTION A-A

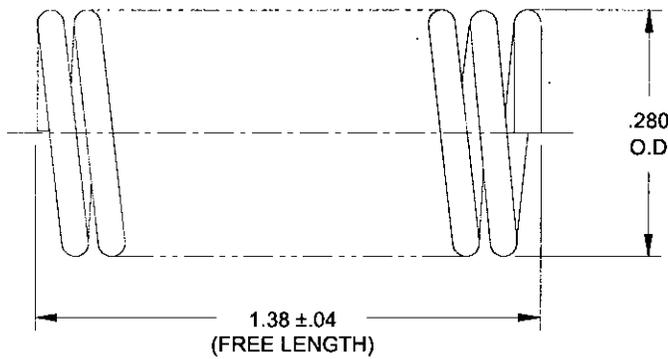
Figure 5. PAR-52 Lampholder, Slip Fitter Mounting (Sht 2 of 2)



NOTES:

1. REMOVE ALL BURRS AND SHARP EDGES.
2. FINISH: PASSIVATE PER QQ-P-35.
3. MATERIAL: 304 STAINLESS STEEL PER AMS 5513, .040 THK (20 GA.).
4. DIMENSIONS ARE IN INCHES.

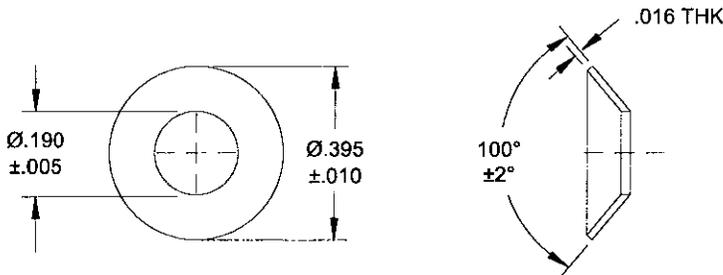
LAMP CLIP (1)



NOTES:

1. REMOVE ALL BURRS AND SHARP EDGES.
2. FINISH: PASSIVATE PER QQ-P-35.
3. MATERIAL: TYPE 302 SST PER ASTM-A313, Ø.030±.0015, SPRING RATE 6.48 LB/IN.
4. CONSTRUCTION:
TOTAL COILS - 12
ACTIVE COILS - 10
ENDS-CLOSED NOT GROUND
DIRECTION OF WIND OPTIONAL.
5. DIMENSIONS ARE IN INCHES.

SPRING (2)



NOTES:

1. REMOVE ALL BURRS AND SHARP EDGES.
2. FINISH: PASSIVATE PER QQ-P-35.
3. MATERIAL: 300 SERIES STAINLESS STEEL.
4. DIMENSIONS ARE IN INCHES.

CUP WASHER (3)

Figure 6. PAR-56 Lampholder Clip, Spring, and Cup Washer Details.

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NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.

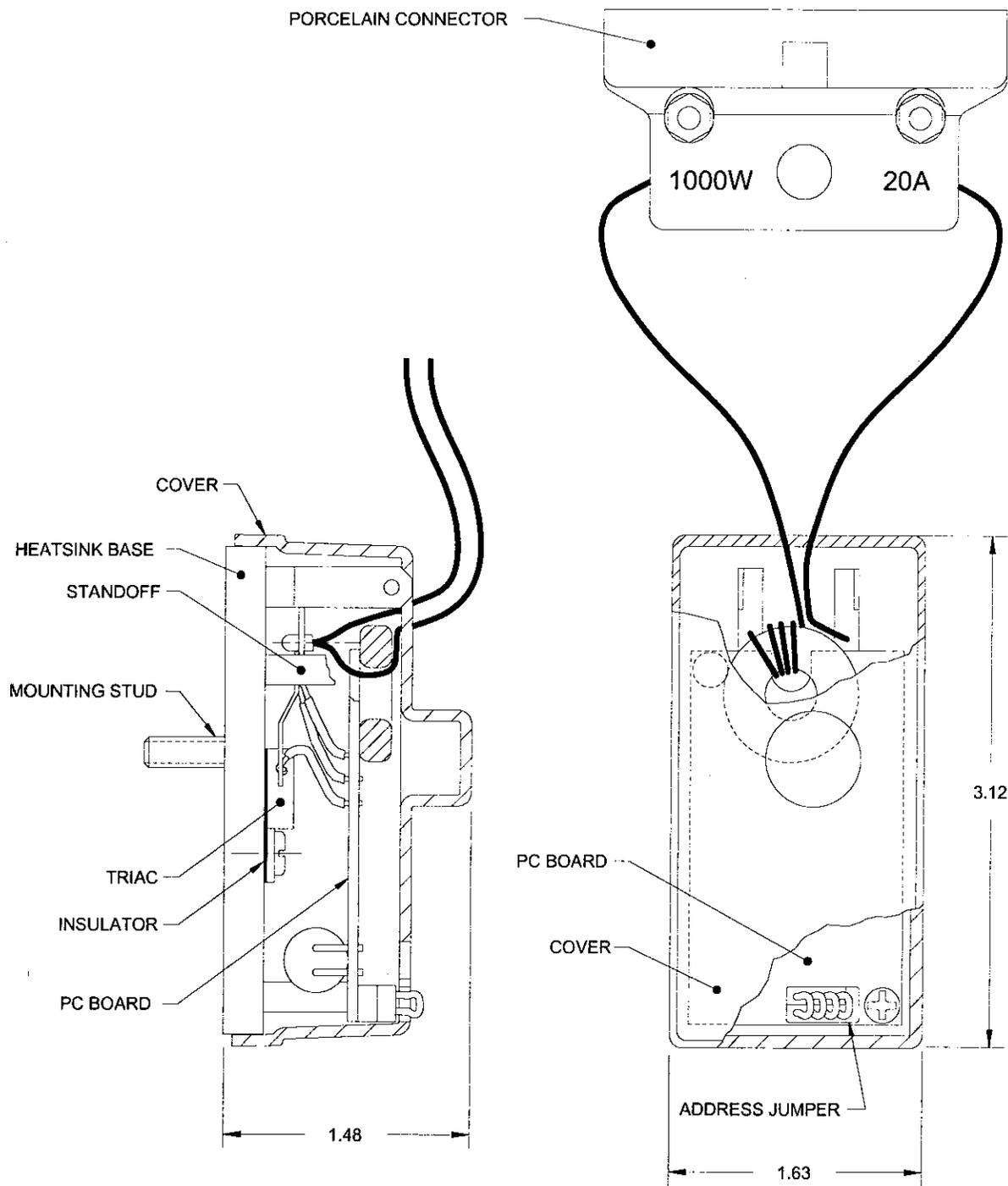


Figure 7. Shorting Devices Assembly

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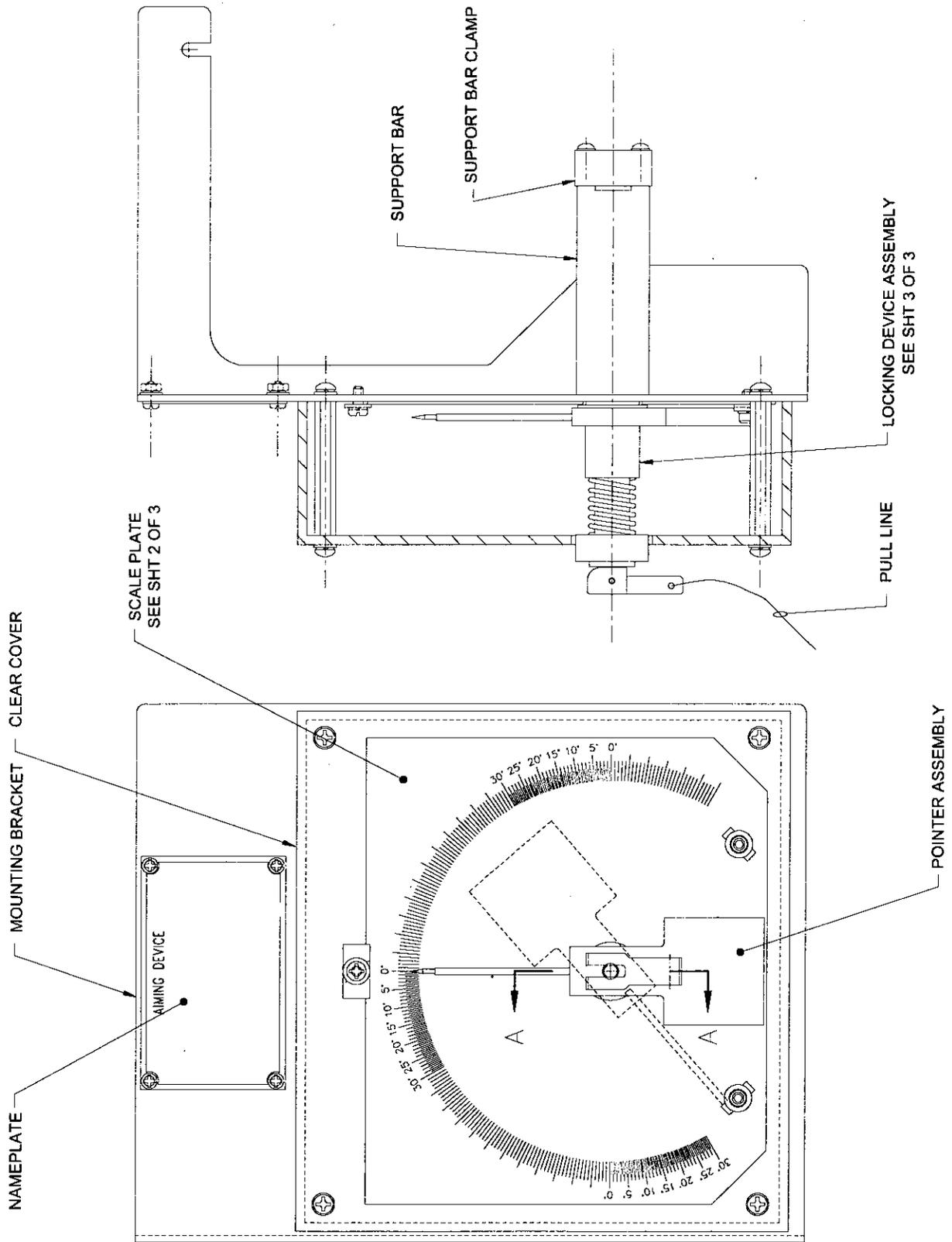


Figure 8. PAR-56 Lampholder, Aiming Device (Sht 1 of 3)

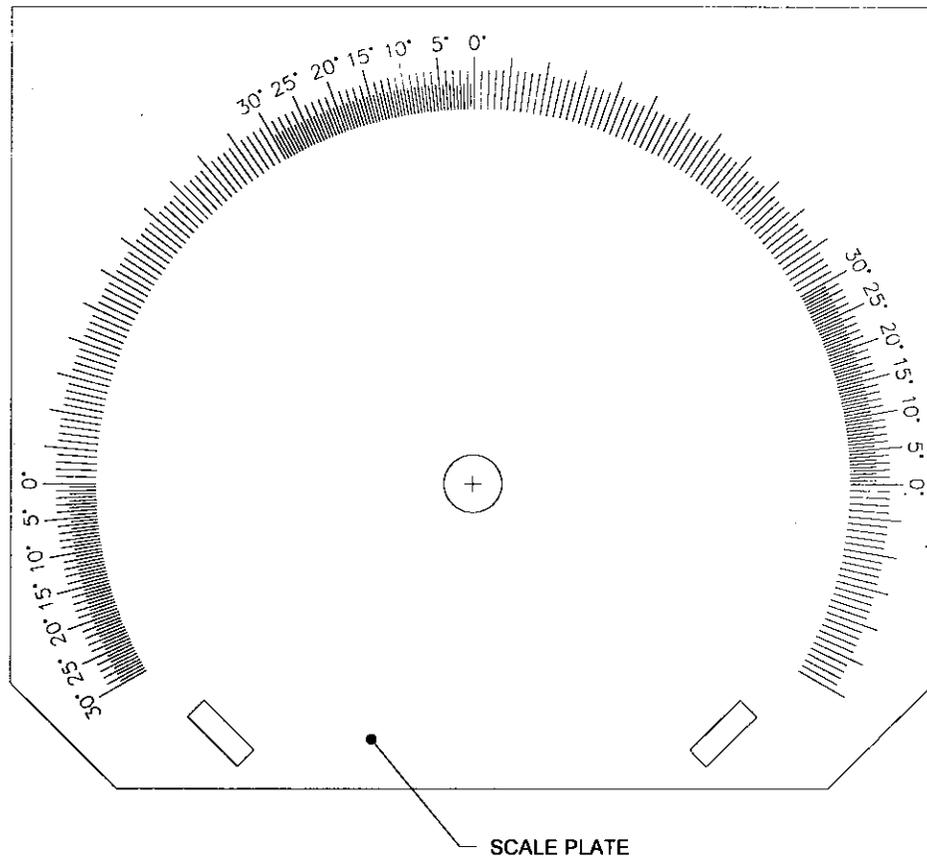


Figure 8. PAR-56 Lampholder, Aiming Devie (Sht 2 of 3)

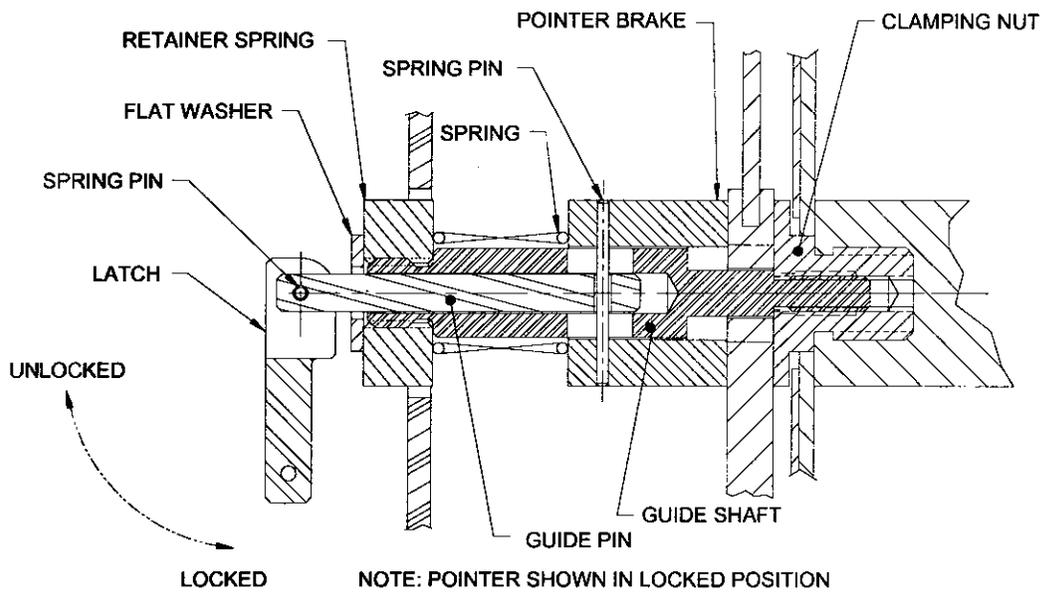


Figure 8. PAR-56 Lampholder, Aiming Device (Sht 3 of 3)

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4. QUALITY ASSURANCE PROVISIONS

4.1 Quality control program.

The contractor shall provide and maintain a quality control program in accordance with FAA-STD-013. All tests and inspections made by the contractor shall be subjected to government inspection. The term "government inspection", as used in this specification, means that an FAA representative will witness the contractor's testing and inspection, and will carry out such visual and other inspection as deemed necessary to assure compliance with contract requirements.

4.2 Notification of readiness for inspection.

After receipt of approval of test procedures (4.5.1) and test data forms (FAA-STD-013), the contractor shall notify the Contracting Officer in writing that he is ready for Government inspection. Such notification shall be given in time to reach the Contracting Officer not less than 5 work days before the contractor desires inspection to start. All testing described herein shall be performed at the contractor's expense at the contractor's facility or at an FAA approved location or independent testing laboratory.

4.3 Invoice submission.

Prior to the first inspection, the contractor shall submit to the FAA representative three copies of invoices covering the shipment of all items from the supplier's plant to the contractor. A vendor's certification of each item supplies shall meet the requirements of this specification and it shall be traceable to any quantitative tests for the item. This certification does not constitute FAA acceptance of the equipment or release the contractor from any acceptance tests once the item is incorporated into the equipment.

4.4 Test methods.

Testing of the equipment shall be performed as follows:

4.4.1 Production model test.

The first five units of production of each component are designated as the production models. The production models shall be subjected to the tests as specified in 4.5, 4.6.1, 4.6.2, 4.6.3, and 4.7 through 4.10, and in this sequence.

4.4.2 Production unit tests.

Testing of the production units shall commence after the acceptance of the production model. Tests on the production units shall be as specified in 4.6.1, 4.6.4, 4.7.1, and 4.9, and in this sequence.

4.5 Environmental tests.

4.5.1 Test procedure.

The environmental tests, as specified in paragraphs 3.4.1 through 3.4.8, shall be conducted on the production model. All test data shall be forwarded to the Contracting Officer upon completion of the tests.

4.5.1.1 Temperature.

The high temperature test shall be in accordance with Procedure II, Method 501.3, extreme induced conditions, of MIL-STD-810, except the temperature shall be constant, +70° C (158° F), and maintained for 6 hours. The low temperature test shall be in accordance with Procedure II, Method 502.3, of MIL-STD-810, except the temperature test shall be constant, - 55° C (-67° F), and maintained for a period of 6 hours. The temperature sensors shall be installed around the production model in the test chamber. A 2-hour shorting device test (4.6.3) shall be performed after temperature stabilization on the lamp and shorting device.

4.5.1.2 Humidity.

The humidity test shall be in accordance with Procedure II, Method 507.3 of MIL-STD-810, except that a total of three complete 24-hour cycles (72 hours) shall be required (Table 507.3-I (cycle 5)). The maximum temperature shall be +70° C (158° F) and the highest relative humidity shall be 100% instead of 75%.

4.5.1.3 Sand and dust.

The sand and dust tests shall be in accordance with Procedures I and II, Method 510.3, of MIL-STD-810. The air velocities used in the sand and dust tests shall be 29 m/s (5700 ft/min) and 8.9 m/s (1750 ft/min) respectively. The test duration shall be 6 hours, and the equipment shall be rotated twice during the conduct of the test.

4.5.1.4 Salt Spray.

The salt spray test shall be in accordance with Procedure I, Method 509.3, of MIL-STD-810. The equipment shall be exposed for a period of 72 hours, followed by a 48-hour drying period. At the conclusion of the test, salt buildup may be removed with tap water.

4.5.1.5 Rain.

The rain test shall be in accordance with Procedure I, Method 506.3, of MIL-STD-810. The wind velocity shall be 18 m/s (40 mph), and the rainfall rate shall be 10 cm/h (4 in/h). The test item temperature shall be at least 10° +3° C (50°+37° F) higher than the rain temperature at the beginning.

4.5.1.6 Temperature shock.

The temperature shock test shall be in accordance with Procedure I, Method 503.3, of MIL-STD-810. The test temperature extremes shall be 70° C (158° F) and -55° C (-67° F), and the test item response temperature shall be 40° C (104° F).

4.5.1.7 Solar radiation.

The solar radiation test shall be in accordance with Procedure II, Method 505.3 of MIL-STD-810. Step 5 shall be conducted for a total of two cycles.

4.6 Other tests.

4.6.1 Visual inspection.

All components shall be visually inspected for conformance with this specification.

4.6.2 Operational tests.

Five lampholder assemblies (including shorting devices) shall be operated continuously for 240 hours with 500-Watt, PAR-56 lamps with green filter lenses. This test shall be performed with a 60 Hz current maintained at $20\text{ A} + 0.5\text{A}$ through the lampholder input terminals. Any deformation, discoloration, deterioration, or malfunction of the lampholder will be cause for rejection.

4.6.3 Shorting device test.

After the 240-hour operational test, each of the lighting loops in Procedures I, II, and III, complete with isolation transformers, PAR-56 lamps, and lamp monitors/shorting devices, shall withstand being disconnected from the Constant Current Regulator output and 10k Vdc applied to the lighting loop and ground for at least one minute after the meter reading has stabilized on the 10k Vdc test instrument. During the 10k Vdc test each lampholder shall be connected to the same ground as the test instrument. After the 10k Vdc test, perform the test procedures described below. An open lamp filament (lamp failure) may be simulated by opening an electrical contact in series with the lamp filament, or by removing a PAR-56 lamp from the lampholder. Any malfunction or intermittent operation of the shorting devices during the conduct of this test shall be cause for rejection.

4.6.3.1 Procedure I.

Set up nine PAR-56 lampholders with shorting devices and lamps as shown in figure 9, and proceed as follows.

- (a) Turn the 30/50 kiloWatt (Kw) Constant Current Regulator(CCR) on to supply a 20 ampere (A) output current to the test circuit; all lamps shall be burning.
- (b) Turn the CCR off.
- (c) Remove the PAR-56 lamps from lampholders 1, 4, and 7 to simulate lamp failures.
- (d) Turn the CCR on; lamps 2, 3, 5, 6, 8, and 9 shall be burning.
- (e) Turn CCR off.
- (f) Remove the PAR-56 lamps from lampholders 2, 5, and 8 to simulate lamp failures. Turn CCR on. lamps 3, 6, and 9 shall be burning.
- (g) Turn CCR off. Replace lamps into lampholders 1, 4, and 7.
- (h) Turn the CCR on; lamps 1, 3, 4, 6, 7, and 9 shall be burning.
- (i) Turn the CCR off.
- (j) Replace lamps into lampholders 2, 5, and 8.

- (k) Repeat steps (a) through (j) four more times.
- (l) Turn the regulator off.

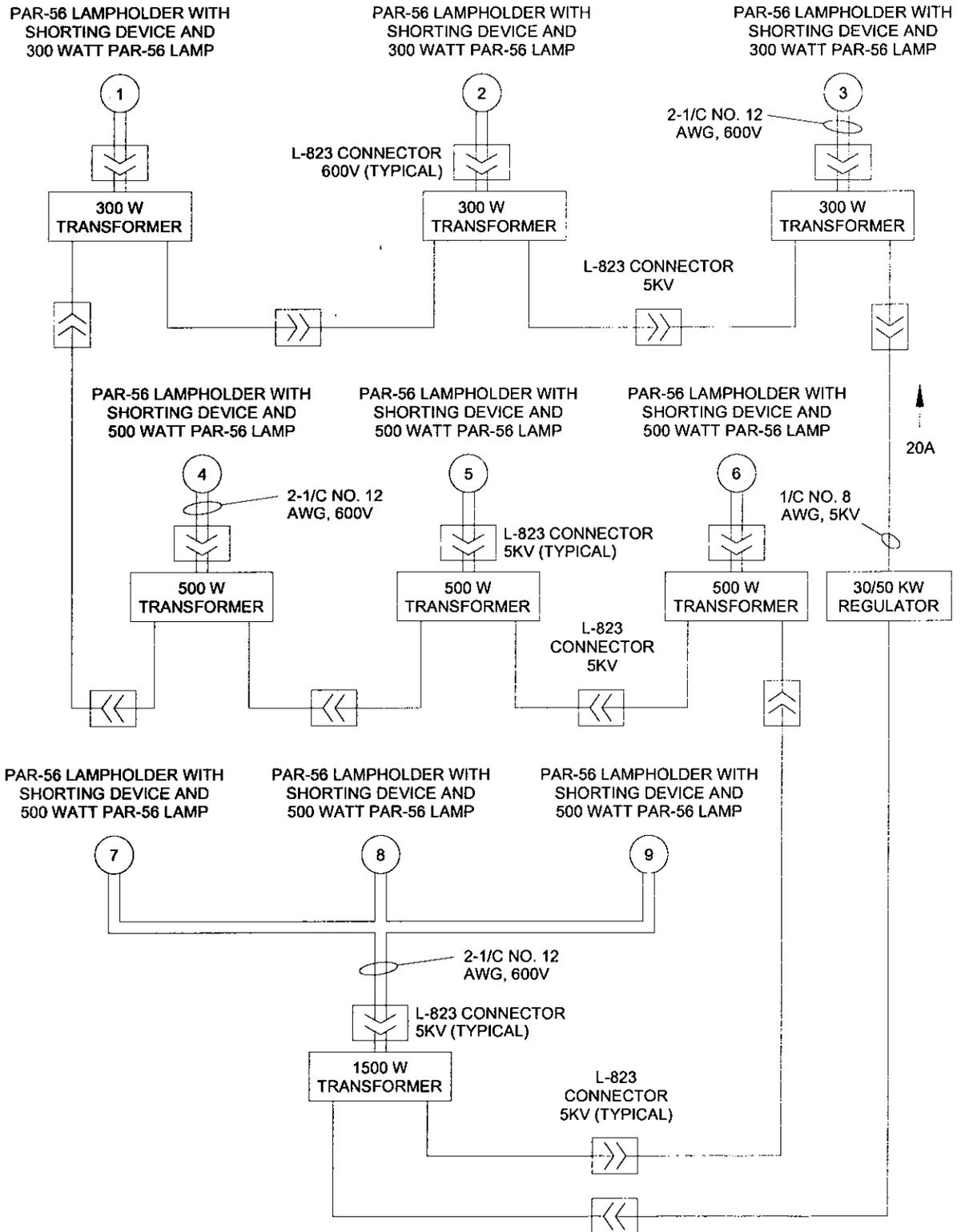


Figure 9. Layout for Test Procedure I

4.6.3.2 Procedure II.

Connect six PAR-56 lampholders with shorting devices and lamps as shown in figure 10, then perform the following steps:

- (a) Measure the insulation resistance to ground of all the shorting device leads with a 500 Volt insulation tester. The minimum acceptable insulation resistance shall be 50 megohms.
- (b) Turn the 30/50 Kw Constant Current Regulator (CCR) on to provide a 20 A output current to the test circuit; all lamps shall be burning.
- (c) Turn the CCR off and remove the PAR-56 lamps from lampholders 1 and 4 to simulate lamp failures.
- (d) Inject 4000-Volt peak, 120 hertz (Hz) voltage pulses across the line side of each shorting device in lampholders 1 and 4 for a minimum of one second. The pulse width shall be a minimum of two milliseconds at ten percent of amplitude.
- (e) Replace lamps into lampholders 1 and 4.
- (f) Turn on the CCR to provide a 20 A output current to the test circuit; all lamps shall be burning.
- (g) Turn off CCR and remove the PAR-56 lamps from lampholders 1 and 4 to simulate lamp failures.
- (h) Operate CCR at 20 A for 72 hours.
- (i) Measure the wattage of the shorting device in lampholders 1 and 4 with 20 A applied. Each shorting device in the shorted state shall load the 20 A circuit with 30 Watts or less.
- (j) Turn off the CCR.
- (k) Measure the insulation resistance to ground of all the shorting device leads with a 500 Volt insulation tester. The minimum acceptable insulation resistance shall be 50 megohms.
- (l) Replace lamps into lampholders 1 and 4.
- (m) Turn on the CCR at 8.5 A output; all lamps shall be burning.
- (n) Turn off the CCR and remove the PAR-56 lamps from lampholders 1 and 4 to simulate lamp failures. Turn on the CCR, lamps 2, 3, 5, and 6 shall be burning.

- (o) Turn off the CCR and remove the PAR-56 lamps from lampholders 2 and 5 to simulate lamp failures. Turn on the CCR, lamps 3 and 6 shall be burning.
- (p) Turn off the CCR and remove the PAR-56 lamps from lampholders 3 and 6 to simulate lamp failures.
- (q) Turn on the CCR and verify that the shorting devices in lampholders 3 and 6 are shorted.
- (r) Turn off the CCR.

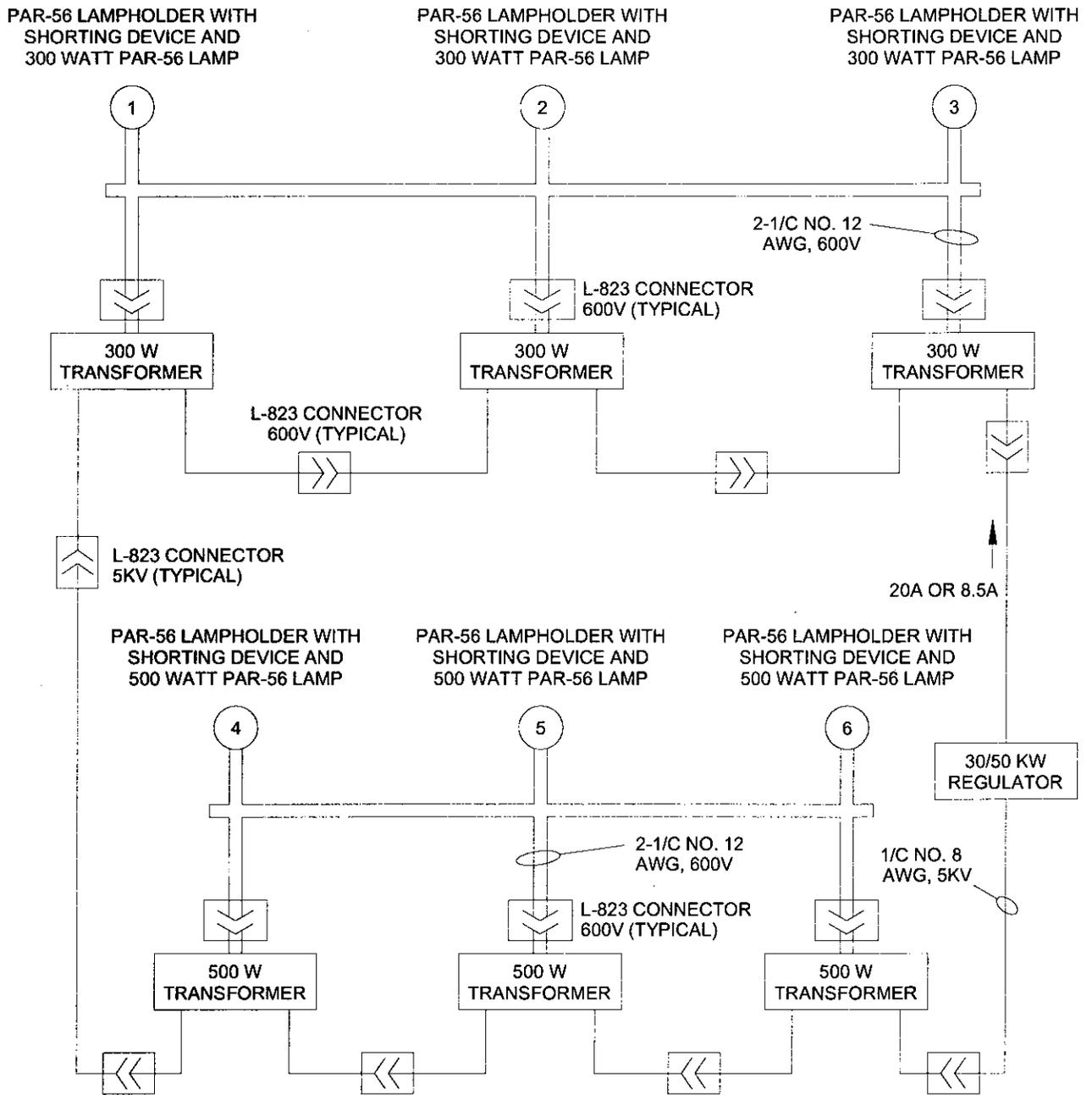


Figure 10. Layout for Test Procedure II

4.6.3.3 Procedure III.

Using the same PAR-56 lampholders with shorting devices as used in Procedure II, replace lamps and set up the six lampholders as shown in figure 11, then perform the following steps:

- (a) Turn the 30/50 kw Constant Current Regulator (CCR) on with a 20 A output; all lamps shall be burning.
- (b) Turn off the CCR and Remove the PAR-56 lamps from lampholders 1 and 4 to simulate lamp failures.
- (c) Remove the PAR-56 lamps from lampholders 2 and 5 to simulate lamp failures.
- (d) Remove the PAR-56 lamps from lampholders 3 and 6 to simulate lamp failures.
- (e) Inject 4000-Volt peak, 120 Hz voltage pulses across the line side of each shorting device in lampholders 1, 2, 3, 4, 5, and 6. The pulse width shall be a minimum of 2 milliseconds at 10 percent of amplitude.
- (f) Replace lamps into lampholders 1, 2, 3, 4, 5, and 6.
- (g) Turn on the CCR to provide an output of 20 A to the test circuit. All lamps shall be burning.
- (i) Turn off the CCR and remove the PAR-56 lamps from lampholders 1 and 4 to simulate lamp failures.
- (j) Remove the PAR-56 lamps from lampholders 2 and 5 to simulate lamp failures. Turn the CCR on, Lamps 3 and 6 shall be burning.
- (k) Measure the wattage of the shorting devices in lampholders 1, 2, 4, and 5 with 20 A applied. Each shorting device, in the shorted state, shall load the 20 A circuit with 30 Watts or less.
- (l) Turn off the CCR.
- (m) Measure the insulation resistance to ground of all the shorting device leads with a 500 Volt insulation tester. The minimum acceptable insulation resistance shall be 50 megohms.
- (n) Replace lamps in lampholders 1, 2, 4, and 5.
- (o) Turn on the CCR to provide an 8.5 A output current to the test circuit; all lamps shall be burning.

- (p) Turn off the CCR and remove the PAR-56 lamps from lampholders 1 and 4 to simulate lamp failures. Turn on the CCR. Lamps 2, 3, 5, and 6 shall be burning.
- (q) Turn off the CCR and remove the PAR-56 lamps from lampholders 2 and 5 to simulate lamp failures. Turn the CCR on. Lamps 3 and 6 shall be burning.
- (r) Turn off the CCR and remove the PAR-56 lamps from lampholders 3 and 6 to simulate lamp failures.
- (s) Turn on the CCR. Verify that the shorting devices in lampholders 3 and 6 are shorted. Turn off the CCR.

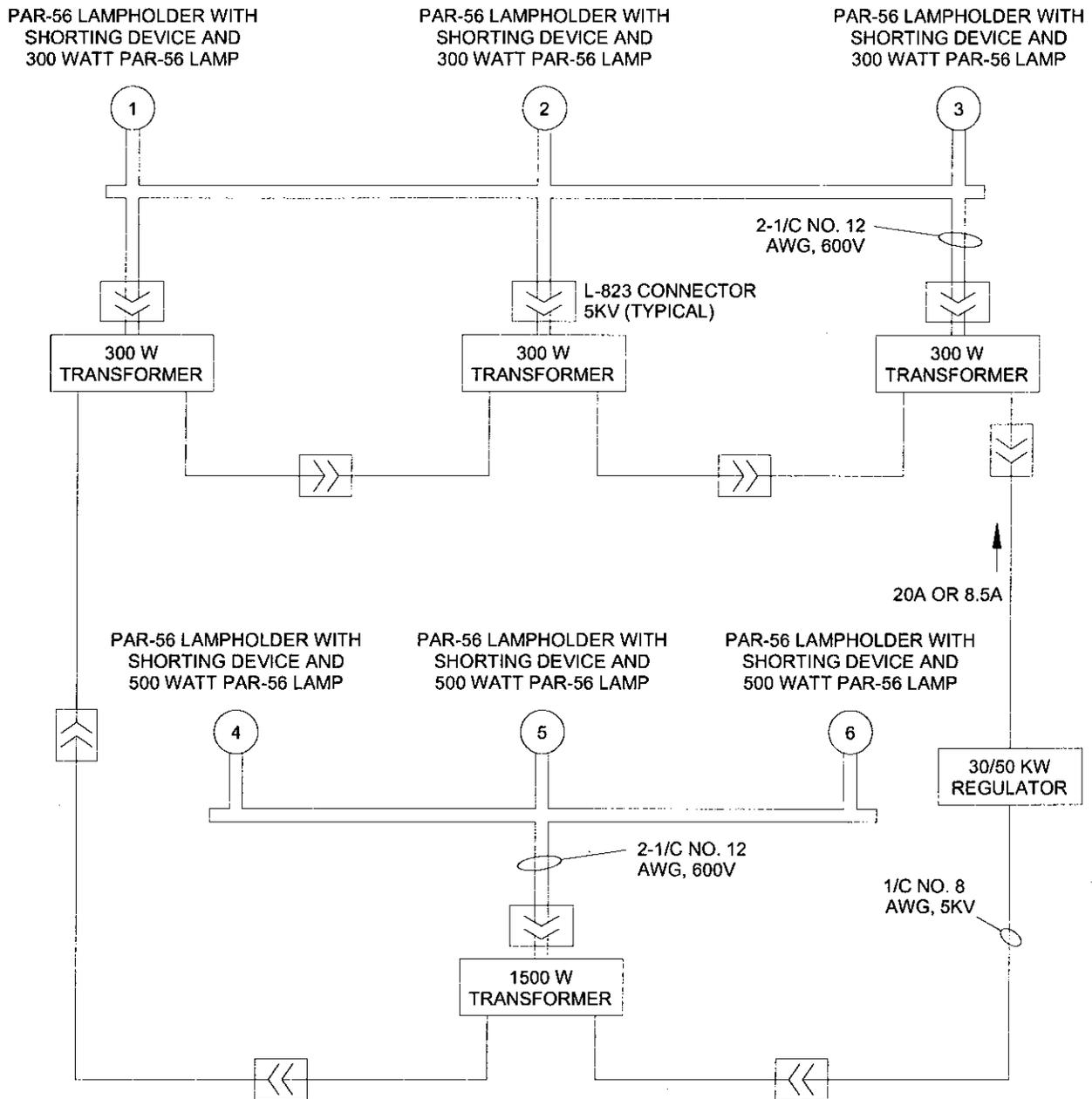


Figure 11. Layout for Test Procedure III

4.6.4 Shorting device production unit operational test.

This test shall demonstrate that the shorting device operates with 8.5 A and 20 A circuit current. A minimum of three 500-Watt PAR-56 lamps shall be installed in three lampholder assemblies, powered and connected as described in 4.6.3. The following steps shall be exercised.

- (a) Energize the circuit with a 20 A constant current source. The lamp shall be burning.
- (b) Turn off power to the circuit.
- (c) Remove one PAR-56 lamp to simulate an open filament.
- (d) Turn on power to the circuit.
- (e) Repeat steps (a) through (d) until one PAR-56 lamp remains in the circuit. Perform step (c), install the remaining lamp in the adjacent lampholder assembly. Repeat steps (a) through (d).
- (f) Reinstall all the lamps previously removed and repeat steps (a) through (e) 10 times.

The same test shall be conducted with an 8.5 A + 0.5 A constant current source. Any malfunction or intermittent operation of the shorting devices leading to the opening of the circuit shall be cause for rejection.

4.7 Lamp connector operational test.

Five 500-watt PAR-56 lamps shall be installed in lampholder assemblies equipped with green filters. The lampholder assemblies mounted on 2-inch (5.08 cm) frangible couplings shall be connected in series and energized by a 20 A constant current source for a period of 720 hours. At the conclusion of the 720-hour continuous operation test, the lamp connectors shall be checked to verify that they are not welded to the PAR-56 lamp prongs. The pull force to remove a lamp prong, or a prong similar in appearance and physical characteristics to a lamp prong, from each of the connector prong sockets shall be greater than 48 ounces (weight) after the 720-hour operational test. The pull force to overcome the static friction between a prong similar to a lamp prong and each connector prong socket shall be measured at zero velocity. The pull force shall be measured on each of the connector prong sockets. The scale used to measure the pull force shall have a maximum force indication until the scale is reset. The lamp prong or similar prong shall be cleaned with alcohol and dried before each test measurement.

4.7.1 Lamp connector test.

The initial pull force to remove a lamp prong, or a prong similar to a lamp prong, from each of the connector prong sockets shall be greater than 48 ounces (weight). The method of measurement shall be as described above in 4.7. Ten lamp Connectors selected from each group of 100 connectors shall be tested for initial pull force. If any of the 10 selected lamp connectors

has less than 48 ounces (weight) initial pull force, then all 100 units shall be measured for compliance with the specification.

4.7.2 Lamp connector temperature rise test.

The temperature rise of each PAR-56 lamp connector shall be 18 degrees centigrade or less when determined by measuring the difference between the ambient temperature and the lamp connector prong socket temperature with a wire test lead installed and the connector is carrying 20 amperes. The test ambient temperature shall be as specified in paragraph 3.4.1.

Construct a wire test lead by soldering a test lamp prong (the prong being of the same dimensions, tolerances, and characteristics as described in specification FAA-E-2408) onto one end of a five inch long 12 AWG wire. Insert the prong end of the test lead into one of the PAR-56 lamp connector sockets to a depth of .500 plus or minus .035 inch. Attach a thermocouple of small gauge wire (22 to 32 AWG) onto the side of the current carrying metal parts of the socket containing the prong.

WARNING:

The thermocouple is connected to a live circuit, therefore do not connect the thermocouple to a grounded meter.

Connect one side of the power source to the input lead of the shorting device and the other side to the other end of the test lead constructed above so as to provide a constant 20 amperes of current flow through one lamp connector socket. Temperature measurements shall be made at 30 minute intervals until three consecutive readings establish a temperature stabilized to within plus or minus two degrees centigrade. The difference between this stabilized temperature and the ambient temperature shall not be greater than 18 degrees centigrade. Repeat the process for the other lamp connector socket.

4.8 Vibration.

The vibration test shall be conducted on six shorting devices installed in PAR-56 lampholders (figure 11). At least two good lamps and two green filters shall be mounted in two of the six lampholders (i.e., lamps 2 and 5 in figure 11) The test circuit shall be operated at 20 A and the test assemblies shall be vibrated in the following three planes:

- (a) Perpendicular to the vibration table (vertically)
- (b) Horizontally, parallel to the light beam axis.
- (c) Horizontally, at right angles to the light beam axis (side)

4.8.1 Vibration levels.

The vibration levels are shown in table I. The duration of each sweep shall be 10 minutes. A sweep is the vibration of a unit throughout a given frequency range. Observe the two good lamps throughout the test. If one or two of the good lamps cease to operate, discontinue the test and test the lamp(s) terminals for continuity. If the lamp(s) are in good condition, the shorting

device(s) is malfunctioning. If the lamp(s) are burned out, stop the test and place a new lamp in one of the lampholders. The new lamp should be burning. Continue test. If the lamp is not burning, one or more of the shorting devices is malfunctioning. Any malfunction of the shorting device(s) shall be cause for rejection.

4.9 Aiming device test.

The contractor shall provide an aiming platform for mounting the lampholder assembly and for testing each aiming device. The platform shall be calibrated to the same tolerances specified for the aiming device and shall permit verification of the angular readings taken from the mounted aiming device from 0 to 25 in 2 increments.

Table I. Vibration Test Levels

FREQUENCY RANGE, (HERTZ)	ACCELERATION IN GRAVITIES		
	VERTICAL AXIS	LIGHT BEAM AXIS	SIDE AXIS
10-70	0.020 inch double amplitude (displacement)		
70-200	5	5	5
200-500	5	10	10
500-2,000	5	10	5

4.10 Lamp retainer ring test.

Install a PAR-56 lamp into a PAR-56 lampholder with lamp clip assembly 3.3.1.1. Install the assembled fixture and lamp onto a 2 inch diameter electrical metallic tube (EMT) that is 6 foot long. Pin connect the opposite end of the EMT to a bench. Support the lampholder end of the EMT three inches away from the lampholder slipfitter. The EMT shall be in a horizontal position three feet above the floor with the PAR-56 lamp facing the floor. Place soft material on the floor to catch the lamp so it does not break. Start at horizontal and raise the lampholder in 10 degree increments and release the lampholder. Increase the height in 10 degree increments and release until the lamp ejects from the lampholder. Then install the lamp retainer ring with the lamp in the lampholder and increase the height 10 degrees more and release the lampholder. The PAR-56 lamp shall be retained in the lampholder to pass the test.

5. PREPARATION FOR DELIVERY

5.1 General.

The equipment shall be prepared for delivery in accordance with the following subparagraphs.

5.1.1 Packaging.

Packaging shall be in accordance with Specification MIL-E-17555, Method III. The lampholder assembly and the shorting device assembly shall each have separate packaging.

5.1.2 Packing.

Packing shall be in accordance with Specification MIL-E-17555. level B.

5.1.3 Marking.

Packages shall be durably and legibly marked with the following information and MIL-STD-129:

N.S.N.	_____	
Type	_____	Spec. No. _____
Cage & P/N	_____	
Description	_____	
Qty.	_____	SerNo _____
Contract Number	_____	
Packaging Level	_____	Mo/Yr _____
Weight	_____	CU _____
Mfr's Name	_____	
Address	_____	

6. NOTES

The contents of the subparagraphs below are only for the information of the Contracting Officer. They are not contract requirements, and are not binding on either the Government or the contractor, except to the extent that they may be specified elsewhere in the contract as such. Any reliance placed by the contractor on the information is wholly at the contractor's own risk.

6.1 Deliverable items.

The quantity of the following items shall be called out in the contract documents as deliverable items under this specification. Lampholders destroyed during testing shall not be considered as deliverables under this specification. It is recommended that the Lamp Retainer Ring design be submitted for contracting officer approval.

- (a) PAR-56 Lampholder assembly
- (b) Shorting device with lamp connector assembly
- (c) Aiming device
- (d) Instruction sheet
- (e) Lamp retainer ring

6.2 Government furnished equipments.

The following items are government furnished equipments under this specification.

- (a) Five 300-Watt transformers
- (b) Five 500-Watt transformers
- (c) One 1,500-Watt transformer
- (d) One 30 Kw constant current regulator
- (e) 12 each, PAR-56, 300-Watt 20A Lamps
- (f) 12 each, PAR-56, 500-Watt 20A Lamps
- (g) 9 each, PAR-56 Lampholders (when buying only shorting device assemblies)
- (h) 9 each, green filters

6.3 Test results.

All test results shall be delivered to the Contracting Officer.