

MIL-F-25173A(ASG)

16 FEBRUARY 1956

MIL-F-25173(USAF)

4 May 1955

## MILITARY SPECIFICATION

## FASTENER, CONTROL PANEL, AIRCRAFT EQUIPMENT

This specification has been approved by the Department of the Air Force and by the Navy Bureau of Aeronautics.

## 1. SCOPE

1.1 This specification covers one type of control panel fastener.

## 2. APPLICABLE DOCUMENTS

2.1 The following specifications, standard, drawing, and publication, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONSFederal

QQ-A-318	Aluminum Alloy 52S; Plate and Sheet
QQ-A-325	Aluminum Alloy 61S, Bars, Rods, Shapes and Wire, Rolled or Drawn
QQ-M-151	Metals; General Specification for Inspection of Plating, Cadmium (Electrodeposited)
QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-W-470	Wire, Steel, High Carbon, Spring, Bright, Music
QQ-Z-325	Zinc Plating (Electrodeposited)

Military

MIL-D-5028	Drawings and Data Lists: Preparation of Manufacturers' (for Production Aircraft, Guided Missiles, Engines, Accessories, and Other Auxiliary Equipment)
MIL-E-17555	Electronic Equipment and Associated Maintenance Parts; Preservation, Packaging, Packing and Marking of

STANDARDSMilitary

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
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DRAWINGSAir Force-Navy Aeronautical Standard Drawing

AND10398	Metals - Definition of Dissimilar
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FED. SUP CLASS. 5325
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PUBLICATIONSAir Force-Navy Aeronautical Bulletin

No. 143

Specifications and Standards; Use of

(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 fasteners furnished under this specification shall be a product which has been tested and has passed the Qualification tests specified herein.

3.2 Materials.--

3.2.1 Selection of materials.-- In using materials, products, and services not specifically designated herein, applicable specifications and standards shall be selected in accordance with ANA Bulletin No. 143.

3.2.1.1 Metals.-- Metals shall be of the corrosion-resistant type or suitably treated to resist corrosion in fuels, salt spray, or atmospheric conditions to which the fasteners may be subjected when in storage or during normal service use.

3.2.1.2 Dissimilar metals.-- Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Drawing AND10398 defines dissimilar metals.

3.2.1.3 Heat-treating.-- Fastener studs shall be hardened to prevent damage to screwdriver slots, etc. Studs shall be either carburized and surface-hardened to a depth of 0.005 to 0.012 inch and to a Rockwell hardness of 15-N-80 to 15-N-86, or if fabricated of through-hardened steel, shall be heat-treated to a Rockwell hardness of C-30 to C-38.

3.3 Design.-- The fastener shall be of the stud-receptacle strip design such that when the fastener is opened, the stud assembly is retained by the control panel, and the receptacle strip is retained by the aircraft structure support.

3.3.1 Receptacle strip.-- The receptacle strip shall be in accordance with figure 1.

3.3.2 Stud.-- Detail design of the fastener stud is not specified, and shall be accomplished by the fastener manufacturer in accordance with the performance requirements and other requirements of this specification, and in accordance with the dimensional requirements of figure 2.

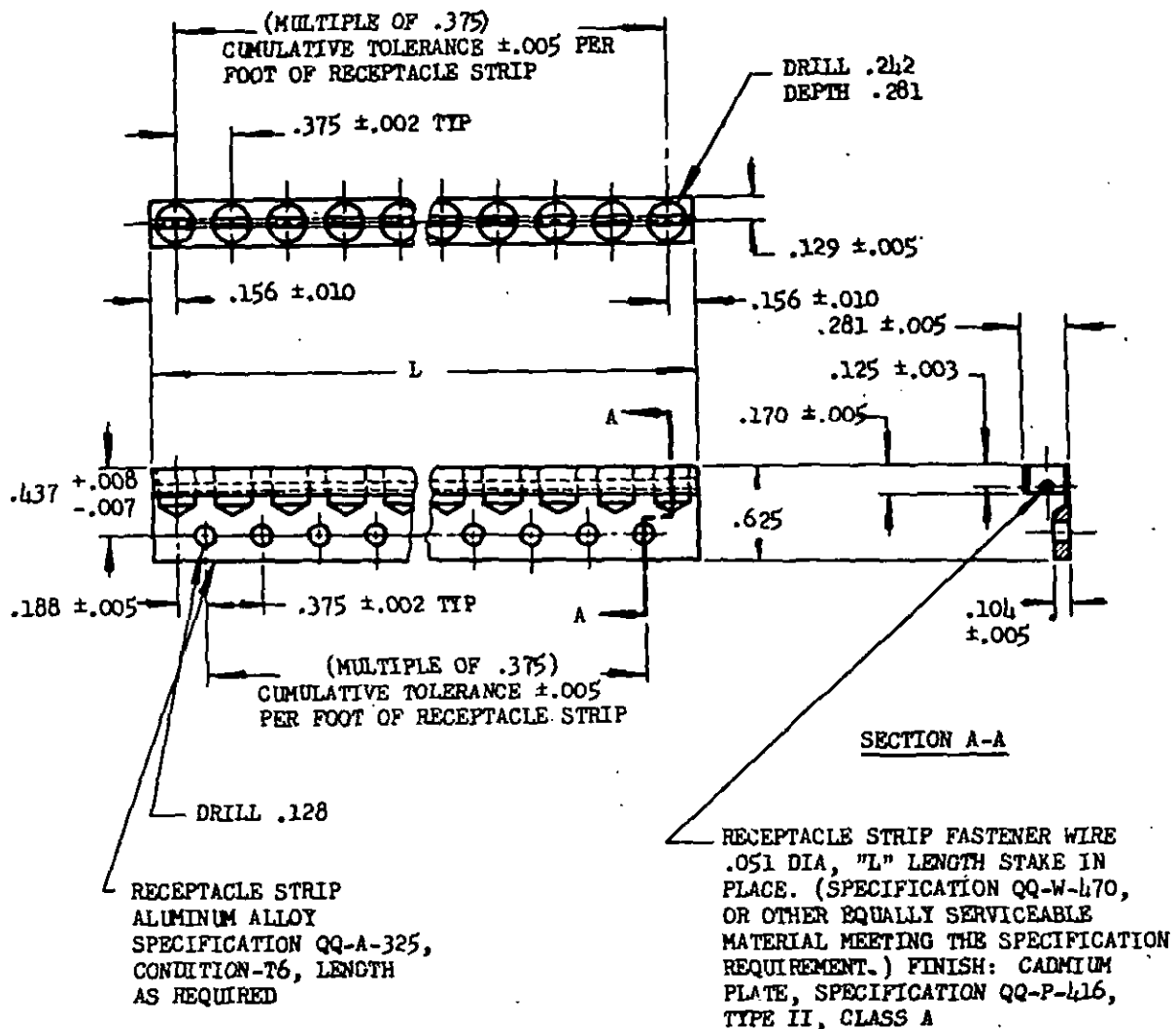
3.3.3 Stud rotation engaging.-- The stud shall engage the receptacle strip within 180 degrees of rotation in the clockwise direction.

3.3.4 Stud locking.-- The stud shall be positively locked within 85 to 135 degrees of clockwise rotation, after the stud has been engaged.

3.3.5 Stud stop.-- A positive stop shall be provided to prevent the stud from being turned past the position of full lock.

3.3.6 Unlocking.-- The stud shall unlock within 85 to 135 degrees of counterclockwise rotation.

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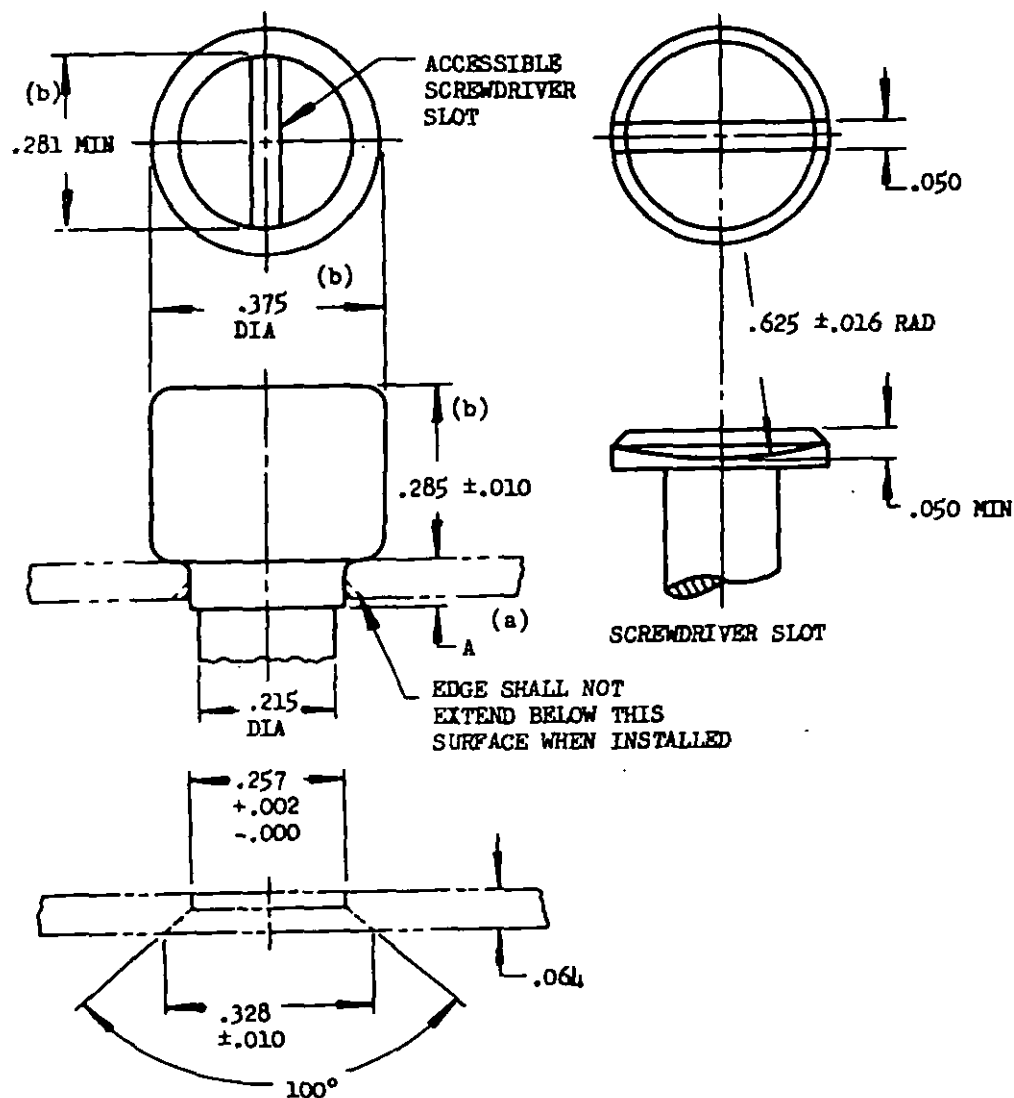


DZUS FASTENER COMPANY, INCORPORATED PART NO. PR 3 1/2-L, OR EQUAL.  
L=LENGTH IN INCHES AND THOUSANDS  
AS  $L=1.437 = 1-7/16$  LONG OR  $L = 4.062 = 4-1/16$  LONG.

DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCES: DECIMALS  $\pm .016$ .

FIGURE 1. Receptacle strip fastener, aircraft equipment control panel

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FASTENER STUD MOUNTING PROVISIONS REF:

- (a) DIMENSION A SHALL BE SUCH THAT INSTALLATION OF THE FASTENER STUD CAN BE MADE INTO THE MOUNTING PROVISIONS AS SPECIFIED.
- (b) DIMENSIONS APPLY AFTER INSTALLATION.

DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCES: ANGLES  $\pm 1^\circ$ , DECIMALS  $\pm .002$ .

FIGURE 2. Stud fastener, aircraft equipment control panel

### 3.4 Construction.-

3.4.1 Fastener stud head.- With the fastener stud unlocked, the top surface of the head shall remain within the outline dimensions as shown in figure 2.

3.4.2 Screwdriver slot.- The screwdriver slot in the fastener stud head shall conform to the dimensions shown in figure 2. With the fastener in the locked position, the screwdriver slot shall be in line with the wire of the receptacle strip.

3.4.3 Stud mounting and removal.- Mounting of the fastener stud shall be in accordance with figure 2, and it shall be possible to remove a damaged fastener stud assembly and suitably install a new one, without damaging the panel, by the use of simple hand tools which shall be designed by the fastener manufacturer.

### 3.5 Performance.-

#### 3.5.1 Locking torque.-

3.5.1.1 Maximum locking torque.- The maximum torque required to lock the fastener shall be 8 pound-inches.

3.5.1.2 Minimum locking torque.- The minimum torque required to lock the fastener shall be 2.5 pound-inches.

3.5.1.3 Absolute maximum torque.- The absolute maximum torque required to lock the fastener shall be 133 percent of the maximum locking torque with the addition of a 0.010-inch shim between the panel and receptacle.

3.5.1.4 Absolute minimum torque.- The absolute minimum torque required to lock the fastener shall be 67 percent of the minimum locking torque.

3.5.2 Unlocking torque.- The torque required to unlock the fastener shall not exceed the torque required to lock that particular fastener by more than 30 percent, and shall be not less than 1.25 pound-inches.

3.5.3 Locking stop strength.- The fastener mounted as shown in figure 3, after being locked and contacting the stop, shall withstand, without damage to the stud or receptacle strip, a minimum torque of 30 pound-inches for a duration of at least 5 seconds.

#### 3.5.4 Receptacle strip fastener wire staking strength.-

3.5.4.1 Axial slippage.- The fastener wire in a 6-inch length of receptacle strip shall not slip with a minimum of 150-pound pull applied to the fastener wire in the length direction.

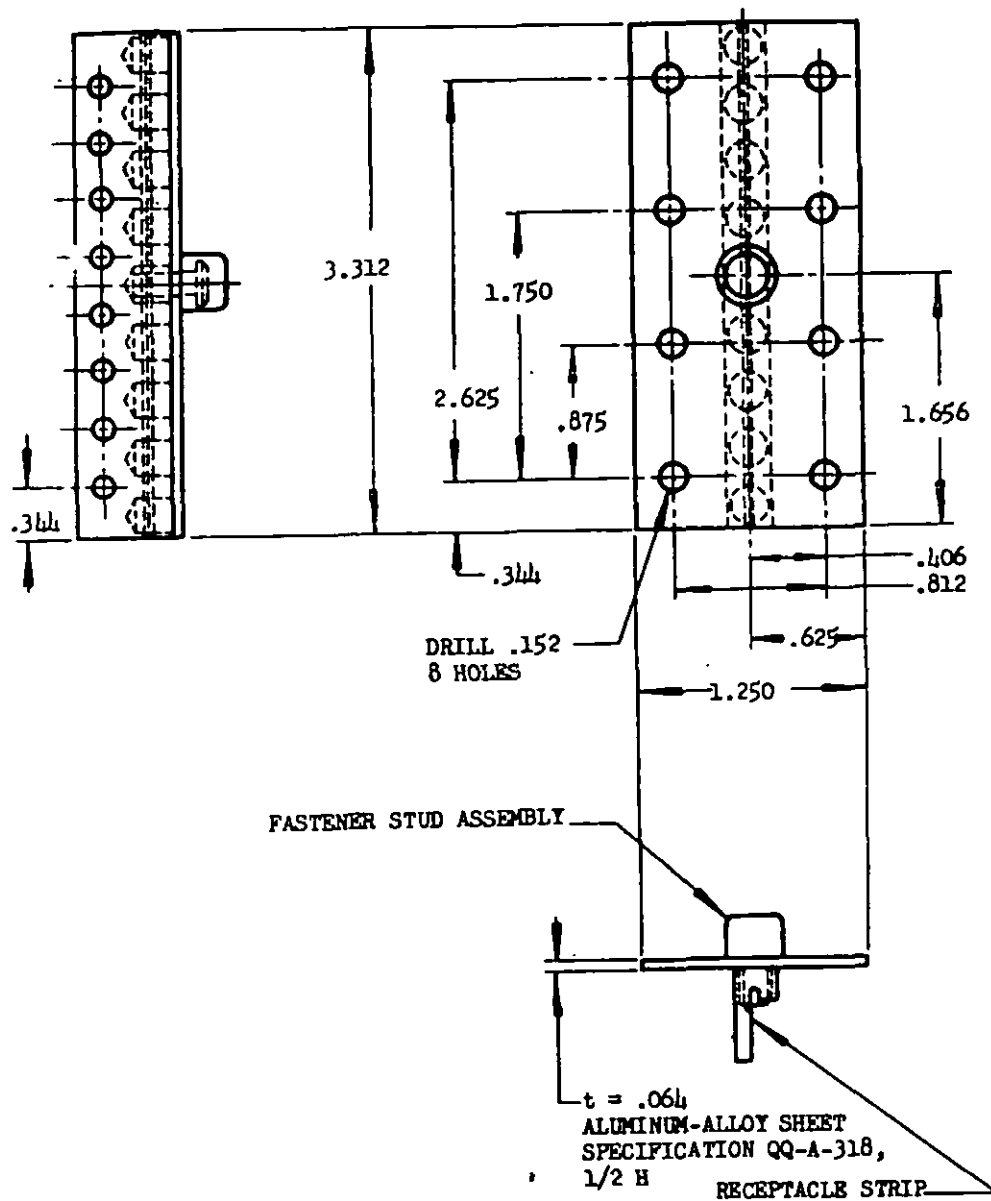
3.5.4.2 Staking brakeout.- The fastener wire shall not be dislocated from its staked-in position nor forced from the receptacle strip when a minimum load of 150 pounds is applied to the wire in the direction perpendicular to the axis of the wire.

#### 3.5.5 Tensile load.-

3.5.5.1 Rated tensile load.- The rated tensile load for the fastener shall be 200 pounds.

3.5.5.2 The torque required to lock the fastener shall not have changed in excess of the maximum nor less than the minimum values as a result of the application of the rated tensile load, five successive times, each of 5 seconds duration.

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DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE: DECIMALS  $\pm .016$ .

FIGURE 3. Typical tension and torque specimen

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3.5.5.3 Initial tension.-- The initial tension (bearing pressure), measured in accordance with the procedure specified herein, shall be not less than 15 pounds.

3.5.5.4 Panel and receptacle strip separation.-- The panel and receptacle separation shall not exceed  $3/64$  inch when the fastener is subjected to the Rated tensile load test as specified in 4.3.2.8.

3.5.5.5 Tensile overload.-- The fastener shall withstand without failure any tensile load up to 150 percent of rated tensile load, five successive times, each of 5 seconds duration.

### 3.5.6 Shear load.--

3.5.6.1 Rated shear load.-- The rated shear load for the fastener shall be 200 pounds.

3.5.6.2 The torque required to lock the fastener shall not have changed in excess of the maximum nor less than the minimum values as a result of the application of the rated shear load, five successive times, each of 5 seconds duration.

3.5.6.3 Shear overload.-- The fastener shall withstand without failure any shear load up to 150 percent of the rated shear load, five successive times, each of 5 seconds duration.

3.5.7 Vibration.-- The fastener shall withstand the Vibration test as specified in 4.2.2.1 without evidence of damage or impairment. This requirement shall apply for any feasible attitude of mounting of the panel, that is, vertical, horizontal, or oblique.

3.5.8 Endurance.-- The fastener shall withstand, without failure, 5,000 locking and unlocking operational cycles at approximately 110 cpm.

3.5.9 Receptacle strip spacing tolerance.-- The fastener studs shall satisfactorily engage and disengage the receptacle strip, and shall operate into the locked and unlocked positions without exceeding the absolute maximum or being less than the absolute minimum torque values when subjected to the Receptacle strip spacing tolerance test as specified in 4.3.3.4.

3.6 Interchangeability.-- All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of Specification MIL-D-5028.

3.7 Finish.-- The exterior, normally exposed surfaces of the stud fastener assembly, shall be cadmium plated (class B, type II, black) in accordance with Specification QQ-P-416 or zinc plated (black) in accordance with Specification QQ-Z-325.

3.8 Workmanship.-- All details of workmanship shall be in accordance with high-grade aircraft manufacturing practice for this type of fastener.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests.-- The inspection and testing of the fasteners shall be classified as follows:

- (a) Qualification tests: Qualification tests are those tests performed on samples submitted for approval as qualified products.
- (b) Acceptance tests: Acceptance tests are those tests performed on individual lots which have been submitted for acceptance under contract.

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#### 4.2 Qualification tests.-

4.2.1 Sampling instructions.- The Qualification test samples shall consist of four lengths of receptacle strip as shown in figure 1, each 2 feet long; 12 sets of fasteners (unassembled) as shown in figure 2, four specimens as shown in figure 3, four specimens as shown in figure 4, four as shown in figure 5, and two specimens each as shown in figures 3, 4, and 5, mounted on sheets having a total thickness of 0.010 inch less than the total nominal thickness specified for each. Samples submitted for qualification testing shall be accompanied by two complete sets of detail manufacturing drawings of each fastener item submitted for test. Samples shall be identified with the manufacturer's own part number and any additional information required by the authorizing letter (see 6.4).

4.2.2 Tests.- The Qualification tests shall consist of all the Acceptance tests specified herein and the following tests. The Qualification tests may, at the option of the procuring activity, be supplemented with tests under actual service conditions.

4.2.2.1 Vibration.- Fasteners shall be assembled with a test panel as shown in figure 5. The assembly shall be loaded and attached to the test jig as shown in figure 6. The base of the test jig shall be vibrated at a frequency varying between 10 and 55 cps at an amplitude of 0.06-inch total excursion, the frequency varying uniformly from 10 to 55 cps and returning to 10 cps in approximately 1 minute. The fasteners shall be subjected to 90 minutes of continuous vibration in each of three mutually perpendicular directions.

4.2.2.2 Corrosion resistance.- The fastener shall be subjected to salt spray in accordance with Specification QQ-M-151 for 100 hours.

4.3 Acceptance tests.- The Acceptance tests shall consist of all the tests listed under Sampling plans A, B, and C, 4.3.1, 4.3.2, and 4.3.3, respectively. In addition, the fastener shall be subjected to any other tests which the Inspector considers necessary to determine compliance with the requirements of this specification.

4.3.1 Sampling plan A.- Sample fasteners, selected at random from a lot manufactured under essentially the same conditions and submitted for acceptance at substantially the same time, shall be visually examined for workmanship, finish, and conformance to approved design and materials in accordance with the "Single sampling plans," of Standard MIL-STD-105.

4.3.1.1 Critical defects.- One critical defect found in the sample fasteners shall be cause for rejection of the lot. Production shall be stopped until cause of the critical defects can be found and corrected.

4.3.1.2 Major defects.- If one major defect is found in the sample fasteners, the lot shall be rejected.

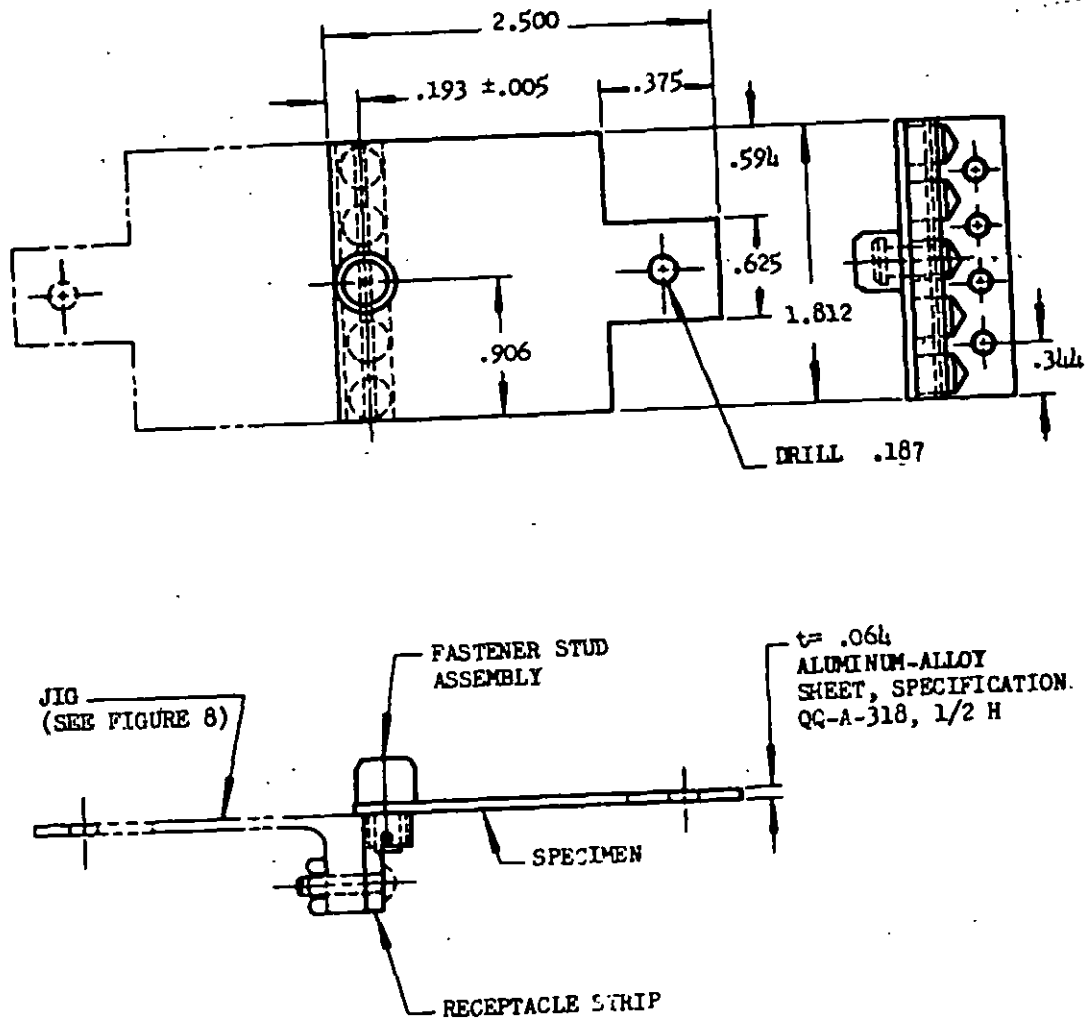
4.3.2 Sampling plan B.- Five fasteners shall be selected at random from each lot of 500, or fraction thereof, and subjected to the following tests. The receptacle strips and specimens necessary for the tests shall be prepared as specified herein.

4.3.2.1 Dimensions.- The dimensions shall be measured with an accuracy sufficient to determine compliance with the dimensions and tolerances specified on the applicable drawings or figures.

4.3.2.2 Hardness of studs.- The hardness of the studs shall be checked on the face of the stud on either side of the screwdriver slot. Case-hardened surfaces shall be tested on the 15-N, Rockwell superficial scale. The heat-treated, through-hardened studs shall be tested on the Rockwell C scale.



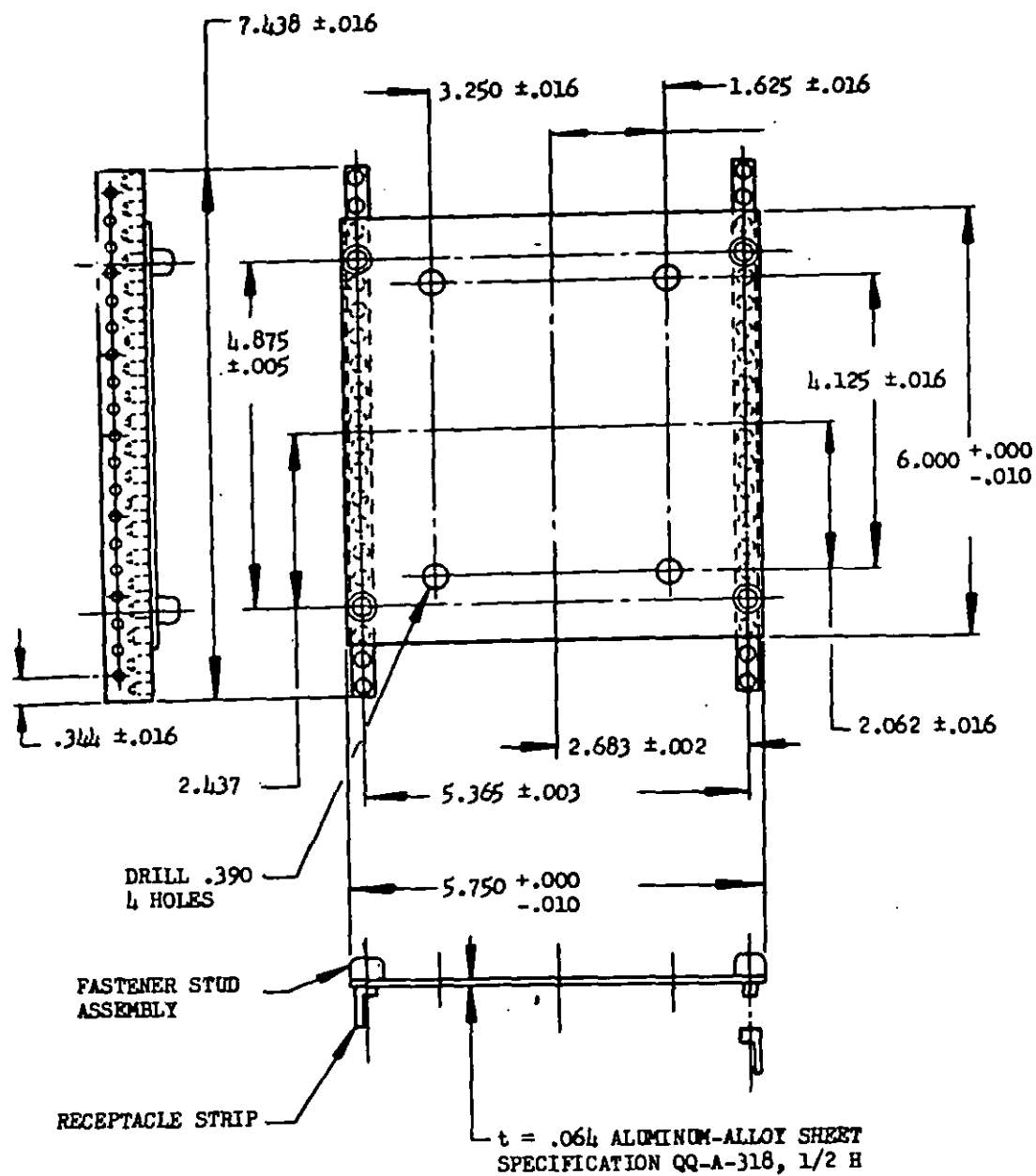
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DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE: DECIMALS  $\pm .016$ .

FIGURE 4. Typical shear specimen

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DIMENSIONS IN INCHES.

FIGURE 5. Typical Vibration and Endurance test specimen

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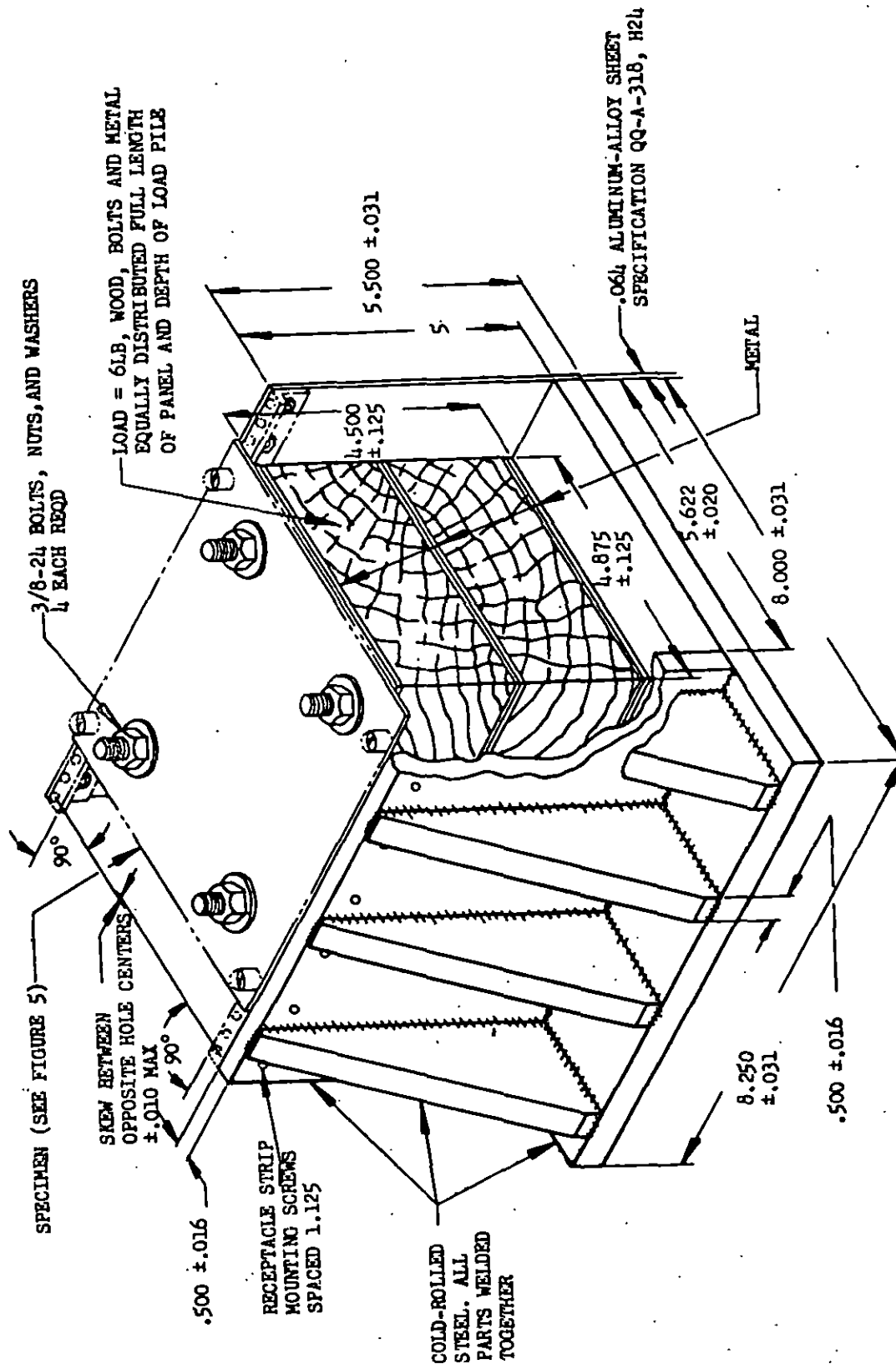


FIGURE 6. Typical Vibration and Endurance test jig

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**4.3.2.3 Locking torque.-** The maximum, minimum, and absolute maximum torques required to lock the fasteners shall be measured on unlubricated fasteners mounted on specimens fabricated to the nominal thickness of panel as shown in figures 3, 4, and 5. The absolute minimum locking torque shall be measured on fasteners mounted on specimens having a total thickness of panel of 0.010 inch less than the total nominal thickness shown in figures 3, 4, and 5.

**4.3.2.4 Unlocking torque.-** The torque required to unlock the fastener shall be determined on the samples which have been subjected to the Locking torque test as specified in 4.3.2.3.

**4.3.2.5 Locking stop strength.-** The fastener shall be mounted as shown in figure 3. After the fastener has been locked and has contacted the locking stop, a minimum torque of 30 pound-inches shall be applied at the fastener through a screwdriver bit for a duration of at least 5 seconds. The torque shall be applied in such manner as to force the fastener against the locking stop. The width and thickness of the bit shall not exceed 75 percent of the width and thickness, respectively, of the screwdriver slot. The stud and receptacle strip shall be inspected for any damage or mechanical impairment after the application of the torque.

**4.3.2.6 Receptacle strip fastener wire staking strength.-**

**4.3.2.6.1 Axial slippage.-** The test specimen shall be prepared in such manner that at least 3/16 inch of the fastener wire is extending free of a staked position on one end, and a sufficient length is free on the other end for attachment to a test fixture. The aluminum-alloy member of the test specimen shall be 6 inches in length. A minimum force of 250 pounds shall be applied in the length direction of the fastener wire, and the aluminum member shall be held stationary. Any visible slippage shall be noted.

**4.3.2.6.2 Staking breakout.-** With the aluminum member of the receptacle strip held stationary, a minimum load of 250 pounds shall be applied perpendicular to the axis of the fastener wire through any one of the receptacle strip fastener stud holes. The fastener wire staking shall be inspected for any visible deformation. The load shall be applied to the fastener wire through a 3/16-inch flat-end pin positioned perpendicular to the fastener wire, and so directed that the load tends to force the fastener wire past the staking.

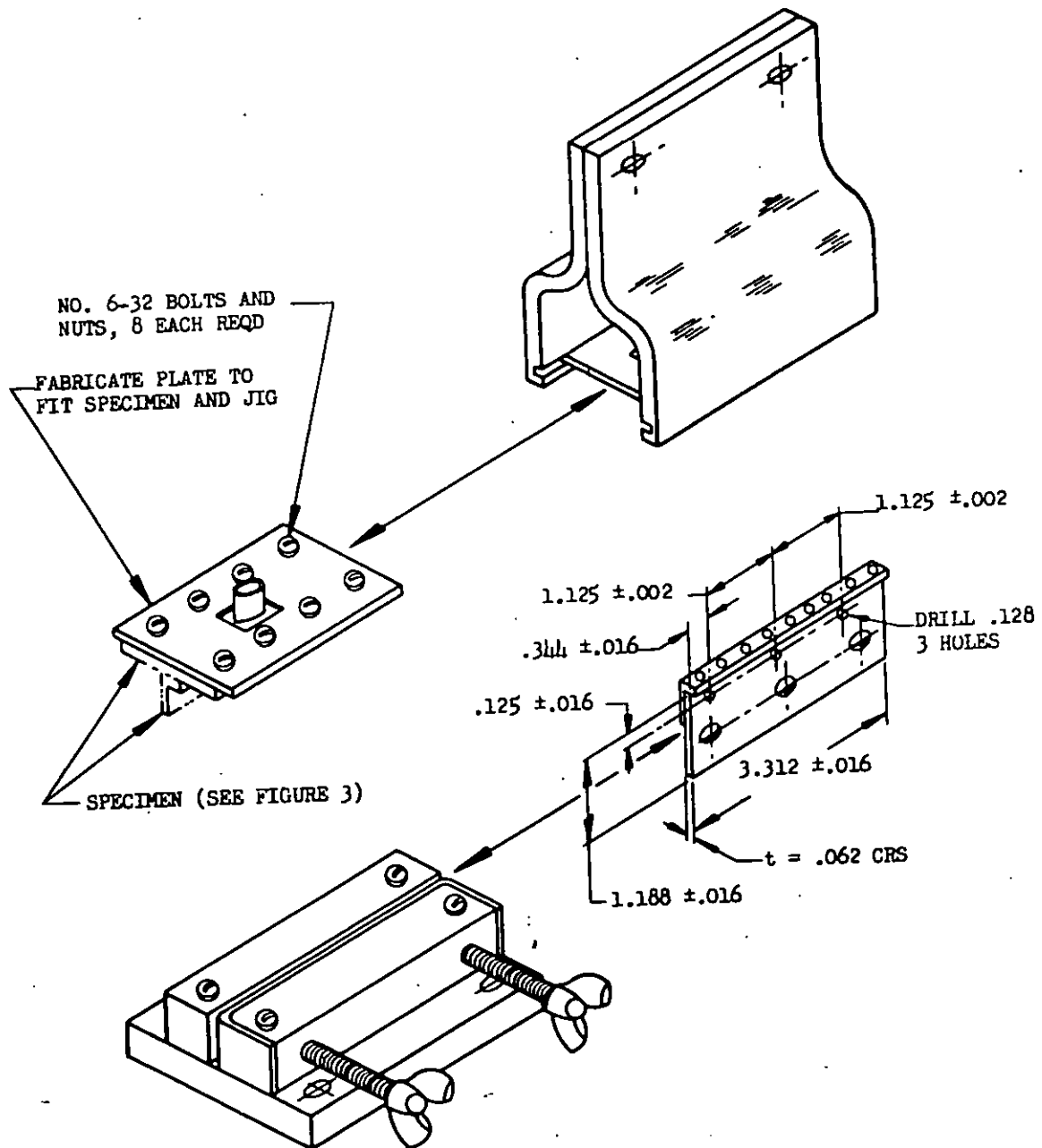
**4.3.2.7 Initial tension.-** The initial tension shall be established by determining the tensile load that produces a separation of 0.003 inch between the panel and receptacle strip at the area immediately around the fastener. A typical tension test jig is shown in figure 7.

**4.3.2.8 Rated tensile load.-** After the fastener specimen shown in figure 3 has been subjected to the Locking torque test as specified in 4.3.2.3, the rated tensile load shall be applied normal to the test panel and tending to pull the fastener apart, five successive times, each of 5 seconds duration. The fastener shall then again be subjected to the Locking torque test as specified in 4.3.2.3. The torque required to lock the fastener shall be measured.

**4.3.2.9 Panel and receptacle strip separation.-** The fastener shall be loaded at its rated tensile load. The panel and receptacle separation at the area immediately around the fastener shall be measured.

**4.3.2.10 Tensile overload.-** After the Initial tension, Rated tensile load, Locking torque, Unlocking torque, and the Locking stop strength tests (4.3.2.7, 4.3.2.8, 4.3.2.3, 4.3.2.4, and 4.3.2.5, respectively) have been made, the fastener shall be subjected to a tensile load of 150 percent of the rated value in accordance with the procedure indicated for the Rated tensile load test as specified in 4.3.2.8. Upon completion of the Tensile overload test, the fastener shall be inspected for any damage or mechanical impairment.

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DIMENSIONS IN INCHES.

FIGURE 7. Typical tension and torque test jig

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4.3.3 Sampling plan C.- Five fasteners shall be selected at random from each lot of 10,000, or fraction thereof, and shall be subjected to the following tests. The receptacle strips and specimens necessary for the tests shall be prepared as specified herein.

4.3.3.1 Rated shear load.- The fastener shall be mounted as shown in figure 4 and tested with the test jig shown in figure 8. The rated shear load shall be applied parallel to the test panel five successive times, each of 5 seconds duration. The fastener shall then again be subjected to the Locking torque test as specified in 4.3.2.3. The torque required to lock the fastener shall be measured.

4.3.3.2 Shear overload.- After the Rated shear load test as specified in 4.3.3.1, the fastener shall be subjected to a shear load of 150 percent of the rated value in accordance with the procedure specified for the Rated shear load test as specified in 4.3.3.1. Upon completion of the Shear overload test, the fastener shall be inspected for any damage or mechanical impairment.

4.3.3.3 Endurance.- The fastener shall be subjected to 5,000 locking and unlocking operational cycles at approximately 110 cpm.

4.3.3.4 Receptacle strip spacing tolerance.- A test panel shall be fabricated as shown in figure 5. The assembled test panel shall be tried for fit and fastener operation with a test jig as shown in figure 9. The fastener studs shall be engaged and disengaged with the receptacle strip and shall be operated into the locked and unlocked positions for any spacing of the receptacle strips within  $\pm 0.020$  inch of the nominal value, with a skew between opposite hole centers up to 0.010 inch and a difference between the top surface levels up to 1/16 inch.

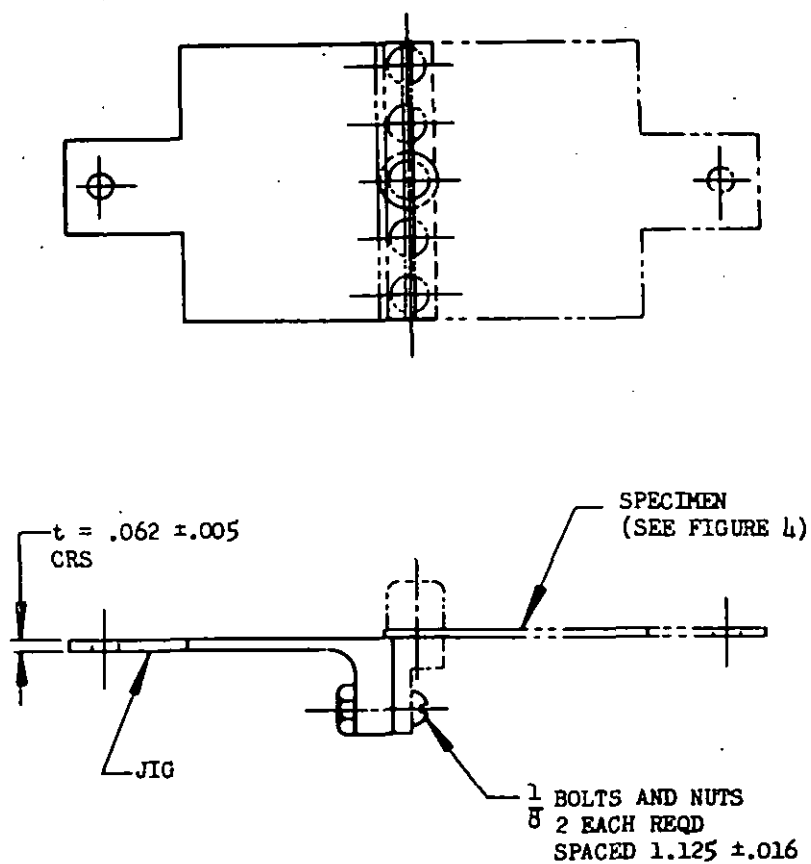
4.3.4 Degrees of inspection.- Normal, tightened, or reduced inspection in accordance with Standard MIL-STD-105 shall be determined by the procuring activity.

4.3.5 Rejection and retest.- When sampling tests are specified on a number of items that are selected from a production lot, and one or more of this number fails to meet the specified test(s), acceptance of all items still on hand and subsequently produced will be withheld until the extent and cause of failure are determined. For operational reasons, Acceptance tests may be continued pending investigation of a sampling test failure. However, final acceptance of the items on hand and subsequently produced is contingent upon the Inspector's decision regarding the over-all conformance of the product to specification requirements. When corrective action has been accomplished, all necessary tests shall be repeated. If investigation indicates that the defects may exist in items previously accepted, full particulars concerning the defects, including recommendations for correction, shall be furnished to the contracting officer.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing, and marking for shipment shall be in accordance with Specification MIL-E-17555. Method I shall be used for extended storage packaging. The shipment marking nomenclature shall be as follows: Stock No. or other identification as specified in the purchase document\*, "Fasteners, Control Panel, Aircraft Equipment."

\*NOTE: The contractor shall enter the Federal Stock No. specified in the purchase document or as furnished by the procuring activity. When the Federal Stock No. is not provided or available from the procuring activity, leave space therefor and enter the Stock No. or other identification as provided by the procuring activity.



DIMENSIONS IN INCHES.

FIGURE 8. Typical shear test jig

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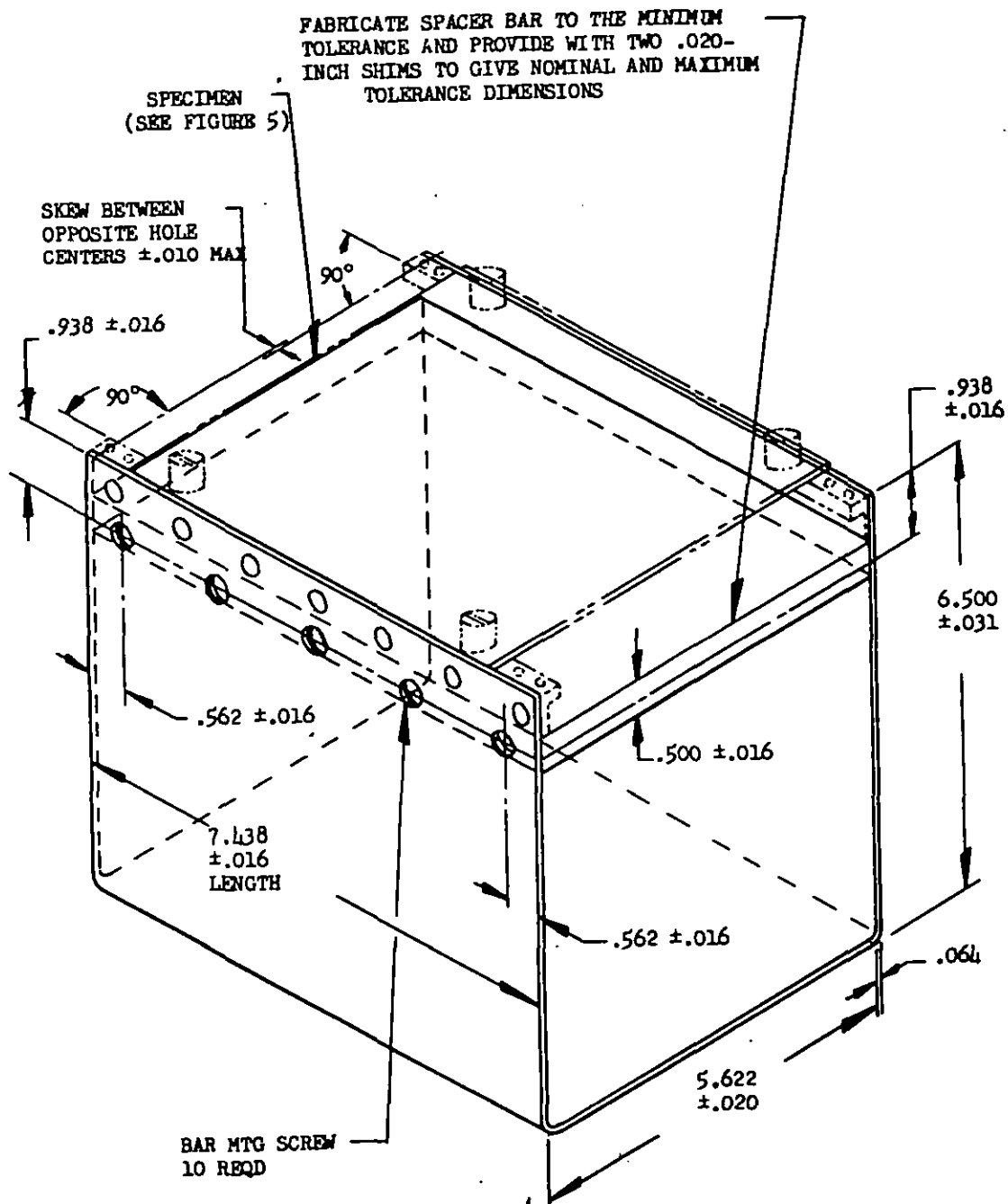


FIGURE 9. Typical operation test jig



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## 6. NOTES

6.1 Intended use.- The aircraft equipment control panel fastener covered by this specification is intended for attaching equipment control panels to the aircraft structure.

6.2 Ordering data.- Procurement documents should specify title, number, and date of this specification, and whether domestic or overseas packing is required.

6.3 Definitions.-

6.3.1 Critical defect.- A critical defect is a defect that judgment and experience indicate could result in hazardous or unsafe conditions for individuals using or maintaining the fastener.

6.3.2 Major defects.- A major defect is a defect, other than critical, that could result in failure or materially reduce the usability of the fastener for its intended purpose.

6.3.3 Minor defect.- A minor defect is a defect that does not materially reduce the usability of the fastener for its intended purpose, or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

6.4 Provisions for Qualification tests.- In the procurement of products requiring qualification, the right is reserved to reject bids on products that have not been subjected to the required tests and found satisfactory for inclusion on a Qualified Products List. The attention of 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. Requests for information pertaining to qualification of products covered by this specification should be addressed to the Commander, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, the activity responsible for qualification, with a copy to the Bureau of Aeronautics, Navy Department, Washington 25, D. C.

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