

**COLLINS**

SPECIFICATION 568 0216 00

COLLINS RADIO COMPANY  
CEDAR RAPIDS, IOWA, U. S. A.  
EQUIPMENT SPECIFICATION

FOR

345A-2

SENSING UNIT

PROJECT ENGINEER

*Y P Kammerer*

APPROVED BY

GROUP HEAD

*J D Rector*

DATE

*9 May 55*

DEPARTMENT HEAD

*E. H. Fritz*

DATE

*9 May 55*

ENGINEERING DIVISION

*J H. [unclear]*

DATE

*16 May 55*

SALES DIVISION

DATE

*6-13*

2	6-10-57	R54505			
1	7-6-56	R47236			
0	6-23-55				
No.	Date	Rev. No.	DESCRIPTION OF CHANGE		
			REVISIONS		
			Eng. App.	Sales App.	

SPECIFICATION NO. 568 0216 00

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# 1. SCOPE

This specification covers the Type 345A-2 Sensing Unit, Part No. 522 0227 003, which is part of the Type AP-101 Automatic Pilot System.

## 2. APPLICABLE SPECIFICATIONS, OTHER PUBLICATIONS, AND DRAWINGS

Where the requirements of this specification and the following specifications conflict, the requirements of this specification shall govern.

### 2.1 Specifications:

345A-2 Production Test Requirements, Part No. 569 0287 00.  
 345A-2 Type Test Requirements, Part No. 570 0166 00.  
 Rate Gyroscope Component Specification, Part No. 229 0060 00.  
 AP-101 Equipment Specification, Part No. 568 0219 00.

### 2.2 Publications:

AP-101 Pilots Guide, Part No. 520 5349 00.  
 AP-101 Instruction Book, Part No. 520 5351 00.  
 CAA Technical Standard Order, TSO C9b

### 2.3 Drawings:

345A-2 Final Assembly, Drawing No. 522 0227 003.  
 345A-2 Outline Drawing, No. 541 0286 003.  
 345A-2 Schematic, Diagram No. 541 0287 003.

### 2.4 Photographs:

345A-2 Front View, Photo No. 534 1226 00.

## 3. GENERAL CHARACTERISTICS

3.1 Type and Function of Equipment: The Type 345A-2 Sensing Unit consists of a Yaw Rate Gyroscope and a relay box. The gyroscope provides yaw rate information to the rudder channel of the Type 562C-1 Computer-Amplifier and controls the operation of relays in the relay box. When a preset rate of turn has been reached, the relays operate interrupting the power to the Vertical Gyroscope erection motors.

### 3.2 Power Source:

27.5 VDC, nominal (From 562A-4 Steering Computer).  
 115 Volts, 400 cps. (From 562A-4 Steering Computer).

3.3 Type of Service: Continuous Duty.

3.4 Certification or Licensing Requirements: CAA Technical Standard Order, TSO-C9b.

## 4. DETAILED CHARACTERISTICS

### 4.1 Physical and Mechanical Characteristics:

Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
REVISION	0	6-23-55	3		6	
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- 4.1.1 Size: 8-1/2" long X 6-3/4" wide x 3-5/8" high.
- 4.1.2 Weight: 3.3 lbs.
- 4.1.3 Type of Mounting: May be placed in a position best suited for its use in each installation.
- 4.1.4 Connections: One 19 pin connector AN 3102A-22-14P.
- 4.1.5 Exterior Finish: Black wrinkle.
- 4.2 Service Conditions:
- 4.2.1 Ambient Temperature Range:  
-55°C to +70°C Operating  
-65°C to +70°C Non-operating
- 4.2.2 Ambient Humidity Range: 0 to 95% at 32°C.
- 4.2.3 Altitude: -1000 to 55,000 feet.
- 4.2.4 Vibration: .010 inches (.020 total excursion) in any direction at frequencies from 10 to 55 cps.
- 4.3 Electrical Characteristics: The Rate Gyroscope motor and the relays are excited from the Type 562A-4 Steering Computer providing erection cutout for the Vertical Gyroscope with or without the operation of the Type 562C-1 Computer-Amplifier. The Yaw Rate Potentiometer is excited from the Type 562C-1 Computer-Amplifier and provides yaw rate information.
5. EQUIPMENT INCLUDED, ASSOCIATED EQUIPMENT AND ACCESSORIES
- 5.1 Equipment Included: Type 345A-2 Sensing Unit, Part No. 522 0227 003.
- 5.2 Associated Equipment and Accessories: The Type 345A-2 Sensing Unit is designed for use with the Type AP-101A, B, C, or D Automatic Pilot System.
6. CUSTOM MODIFICATIONS

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Tolerance Unless Otherwise Specified:		Fractional: ±	Decimal: ±	Angle: ±	Scale:	Detail:
REVISION	0	6-23-55	3		6	
	1	R-17236 7-6-56	4		7	
	2	P-14546 4-11-57	5		8	



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# COMPONENT SPECIFICATIONS COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

PART NAME VERTICAL GYRO SPECIFICATION & PART NUMBER/S 229 0137 00  
TYPE 332B-8 APPROX. WT. 7.5 lb. max.  
DESCRIPTION Vertical Gyro with synchro pickoffs, cageable. CLASSIFICATION 2  
ASSOCIATED DATA

1. APPLICATION: The unit is to be used as an airborne vertical reference providing three-wire synchro attitude information.
2. REFERENCES: In addition to the requirements of this specification, the unit shall conform to applicable standards of the following documents:
  - 2.1. CAA TSO C4b.
  - 2.2. ARINC Synchro System Manual.
  - 2.3. SAE ARP 461.
3. CAA APPROVAL: It shall be the responsibility of the vendor to furnish a written statement of conformance to applicable portions of TSO C4b.
4. STANDARD TEST CONDITIONS: Unless otherwise stated, all performance requirements are given for the conditions of rated voltage at room temperature, sea level pressure, and the prevailing humidity, with the unit mounted on a  $\pm 0.5^\circ$  Sparsby table oscillating at 4 to 7 cycles per minute.
5. GYRO MOTOR:
  - 5.1. Power Source: 115 volts rms, 400 cps, single phase, 50 watts maximum starting 20 watts maximum running power.
  - 5.2. Rotor Speed: 21,000 rpm, minimum.
  - 5.3. Rotor Angular Momentum:  $6.33(10)^6$  gm-cm<sup>2</sup>/sec., minimum.
  - 5.4. Run-Down Time: 5 minutes to standstill, minimum.
6. GENERAL FREEDOM:
  - 6.1. Roll: The spin axis shall have  $\pm 360^\circ$  of mechanical freedom about the roll axis (unlimited).

\* WHEN PART NUMBER APPEARS AS 229 0137 009 MILITARY INSPECTION IS REQUIRED.

Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
MANUFACTURER		MFG. TYPE	MFG. CAT. NO.		COLLINS SAMPLE NO.	
Minneapolis-Honeywell		3053A-1				

ENGINEER E. J. Girard APPROVED E. J. Chodner CHECKED wablan DATE 4-25-57

REVISION	0	1	2	3	4	5	6	7	8
		6-22-57							
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6.2. Pitch: The spin axis shall have  $\pm 85^\circ$ , approximately, of mechanical freedom about the pitch axis (limited by processing pins).

7. ERECTION SYSTEM:

- 7.1. Power Source: 126 volts rms, 400 cps, single phase, 8 watts maximum total power.
- 7.2. Rates:  $1^\circ$  to  $3^\circ$  per minute in both roll and pitch with the rotor at operating speed when the spin axis is less than  $3^\circ$  to  $5^\circ$  from vertical. The rate shall be  $4^\circ$  to  $6^\circ$  per minute beyond this range.
- 7.3. Erection Cutout: Provisions shall be made to allow external switching of erection power to each axis.
- 7.4. Accuracy: Shall conform to paragraph 10.
- 7.5. Initial Erection: With the plane of the base of the unit inclined at an angle of  $10^\circ$  to the horizontal plane, the spin axis shall align to within  $1^\circ$  of vertical within 3 minutes after simultaneous application of power to the motor, caging mechanism, and erection system under Standard Test conditions.

8. CAGING MECHANISM:

- 8.1. Power Source: 28 volts d-c, 1.5 amp. maximum average current for uncaging, 3.3 amp. maximum holding current.
- 8.2. Caging Time: 10 seconds, maximum, after caging delay period.
- 8.3. Uncaging time: 3 seconds, maximum.
- 8.4. Caged Position: With the rotor at rated speed, the erection system on, and the base level within 5 minutes of arc, caging of the gyro shall not cause the pitch and roll signals to change by more than one degree.
- 8.5. Accuracy: The caging mechanism shall be capable of returning the spin axis to within 0.3 degrees of a predetermined position relative to the base.
- 8.6. Caging Delay: The gyro shall include a thermal delay device heated from the 28  $\pm 10\%$  DC uncaging circuit which shall delay initiation of the mechanical caging sequence after opening of an external switch. Under standard conditions the caging delay time shall range from a minimum of one second (provided that the gyro has been uncaged for 1.75 minutes) to not more than 1.5 minutes (provided that the gyro has been uncaged for 5 minutes.)

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Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
REVISION	0	6-12-57	3		6	
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CHANGES

- 8.7. Caging-Uncaging Cycling: With the base level and with rated voltage applied to the rotor, erection system, and pickoffs, the unit shall be capable of operating for between 100 and 120 caging-uncaging sequences without failure. Sequence: 5 minutes caged, 5 minutes uncaged.
- 8.8. Uncaging Overload Protector: The unit shall contain a thermal delay device which functions as follows: In the event of a malfunction resulting in sustained current flow in the stepping solenoid for more than  $10 \pm 5$  sec., the delay device shall de-energize the uncaging circuit in such a way as to allow the mechanism to return to its initial position. After an additional  $10 \pm 5$  sec. the device shall again energize the uncaging circuit. This cycle shall be repeated as often as a malfunction occurs. The performance of the device shall be tested on a sampling basis.
9. POWER INTERRUPTION: After the normal warm-up period, interruption of all power to the unit for a period of 3 seconds or less shall not cause an interruption of accurate attitude information for longer than the period of power interruption. The error introduced by such a condition shall not exceed  $0.25^\circ$  with the gyro base either stationary or rotating about its pitch and roll axes.
10. ACCURACY: With the rotor at rated speed, the erection system on, and the base level within one minute of arc, the attitude signals shall read within  $0.5$  degrees of vertical. The pitch and roll signals shall remain within this limit as the unit is rotated  $360$  degrees in azimuth at the rate of  $180$  degrees per minute, minimum.
11. FREE DRIFT: With the spin axes vertical, shall not exceed  $0.4$  degrees per minute after correction for apparent drift due to the earth's rotation.
12. PICKOFFS:
  - 12.1. Power Source: 26 volts rms, 400 cps, single phase, 325 milliamps maximum total current, when loaded as in paragraph 12.2.
  - 12.2. Loads: Each pickoff shall be capable of driving two servoed Kearfott R1000 synchro control transformers, or their equivalent.
  - 12.3. Type: Control transmitter.
  - 12.4. Maximum Output Voltage:  $11.8 \pm 0.6$  volts rms at rated excitation and loaded as in paragraph 12.2.
  - 12.5. Static Accuracy:  $\pm 6$  minutes of arc, in a range from  $0^\circ$  to  $360^\circ$  when loaded as in paragraph 12.2. Accuracy shall be measured by the Proportional Voltage Method of ARP 461.
  - 12.6. Time Phase Shift:  $10^\circ$  maximum between input and output voltages when loaded as in paragraph 12.2.
  - 12.7. Null Voltage:

CAL CHANGE

Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
REVISION	0	6-12-57	3		6	
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	2		5		8	

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SPECIFICATION 229 0137 00

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- 12.7.1. Total: 40 millivolts, maximum as measured on a true rms voltmeter with no load applied.
- 12.7.2. Minimum Fundamental Component: 75% of value of paragraph 12.7.1.
- 12.8. Impedances: ZRO =  $29 \pm 15\% + j165 \pm 10\%$  ohms.  
ZRSS =  $47 \pm 15\% + j16 \pm 10\%$  ohms.  
ZSO =  $7.6 \pm 15\% + j26 \pm 10\%$  ohms.
- 12.9. Phasing: Synchro leads shall be connected to the X, Y, Z, H and C terminals (page 6, ARINC DESIGNATION) so that with the unit mounted as in paragraph 13.4 the following phasing is obtained:
- 12.10.1. Roll: With the unit tilted to simulate a right bank the synchro output shall correspond to increasing positive angles on a standard synchro as defined in Table 2-1, Voltage Relations in a Standard Synchro, of the ARINC Synchro System Manual.
- 12.10.2. Pitch: With the unit tilted to simulate a climb, the synchro output shall correspond to increasing positive angles on the standard of paragraph 12.10.1.
13. MOUNTING:
- 13.1. Shockmount: The unit shall not require a shockmount.
- 13.2. Mounting Holes: Holes shall be provided for three-point base mounting.
- 13.3. Mounting Surface: Construction of the surface shall be such that minimum deformation of the base will result from mounting directly upon a flat surface without the aid of spacers, washers, standoffs, etc.
- 13.4. Attitude: In normal use the unit will be installed with the base horizontal and the connector aft.
- 13.5. Line of Flight Arrow: A prominent single headed line of flight arrow shall be provided on the cover of the unit to insure installation in the attitude of paragraph 13.4. Words "line of flight" shall clearly identify the arrow.
14. SEALING: The unit shall be enclosed by a cover which is dust sealed by a resilient gasket. The cover shall not be removed under environmental conditions which are not suitable for gyro assembly and maintenance.
15. DIMENSIONS: 7.75" long x 6.25" wide x 5.125" high, maximum envelope, excluding connector.
16. CONNECTOR: American Phenolic Company part number 165-27-X (Mating part 165-26-X-1000).
17. ENVIRONMENTAL REQUIREMENTS:
- 17.1. Temperature: The unit shall meet the requirements of TSO C4b for operation in uncontrolled temperature areas.
- 17.2. Radio Interference: The unit shall produce no objectionable radio interference.
- 17.3. Fungus: Fungus inert materials shall be used wherever feasible in the construction of the unit. Other materials shall receive a fungus resistant treatment.

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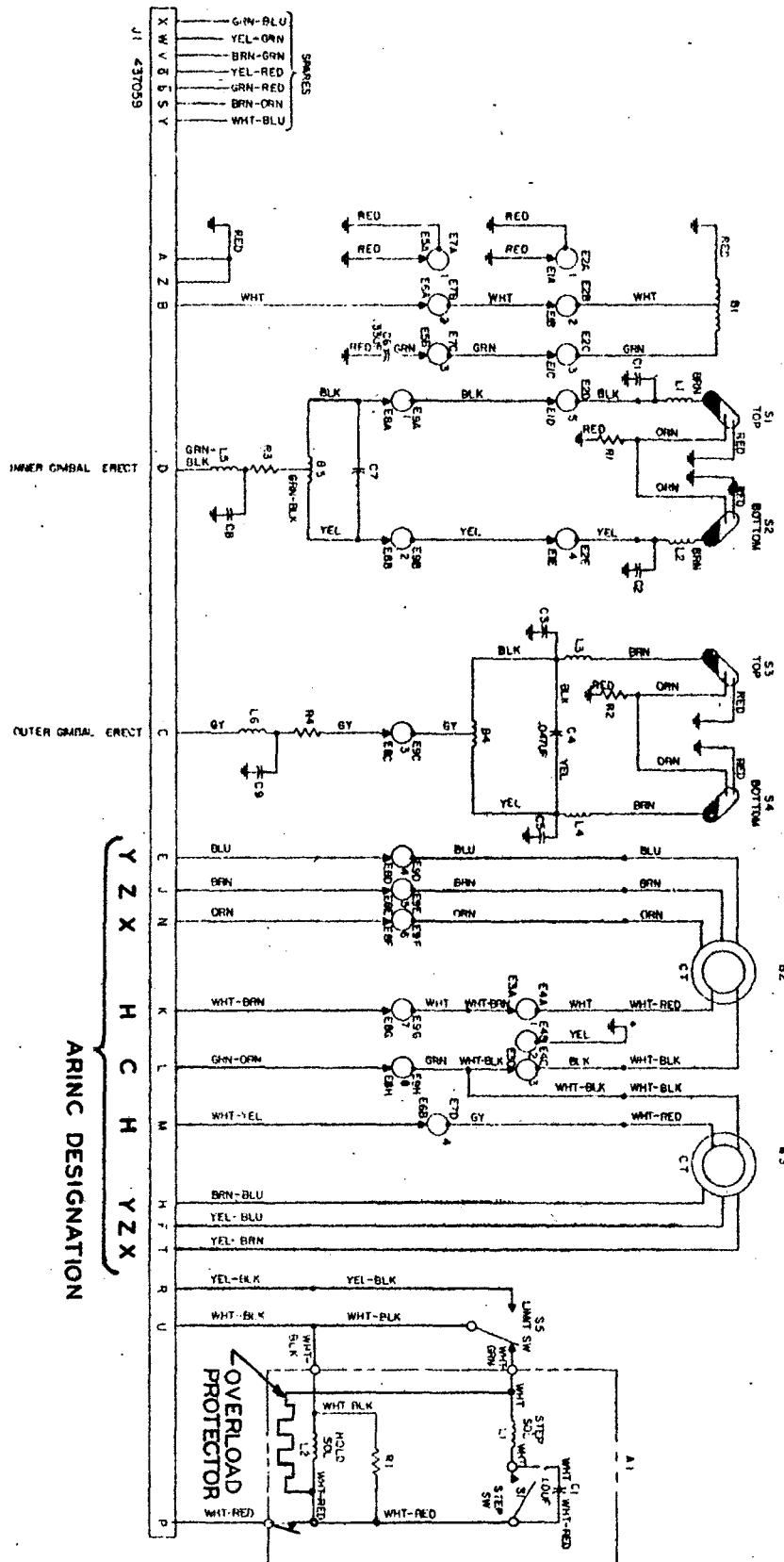
Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
REVISION	0	6-12-57	3		6	
	1	R57092 10-8-57	4		7	
	2		5		8	000025



- 17.4. **Vibration:** The unit shall conform to vibration requirements of CAA TSO chb.
- 17.5. **Altitude:** The unit shall function and shall not be adversely effected by pressures equivalent to 41000 to +70,000 feet altitude.
- 17.6. **Life:** The design goal shall be 1000 hours of operation without maintenance.
18. **NAMEPLATE:** The following information shall be contained on the nameplate:  
 Vertical Gyro  
 Type Number 332D-8  
 CAA TSO Number  
 Weight  
 Manufacturer's Number  
 Manufacturer's Series  
 Serial Number
19. **MODIFICATION:** The vendor shall supply written notification of any changes made in the parts list for the unit and of the serial numbers effected to Collins Radio Company, Research and Development Division. When a change in the instruction book is involved, a reproducible copy suitable for addition to the book shall be supplied.
20. **INSTRUCTION BOOK:** After the unit has been approved for production the vendor shall supply a reproducible copy of a suitable instruction book.

CAL CHANGE	Tolerance Unless Otherwise Specified: Fractional: $\pm$ Decimal: $\pm$ Angle: $\pm$ Scale: Detail:					
	0	6-12-57	3		6	
	1	R57092 10-8-57	4		7	
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Tolerance Unless Otherwise Specified: Fractional:  $\pm$  Decimal:  $\pm$  Angle:  $\pm$  Scale: Detail:

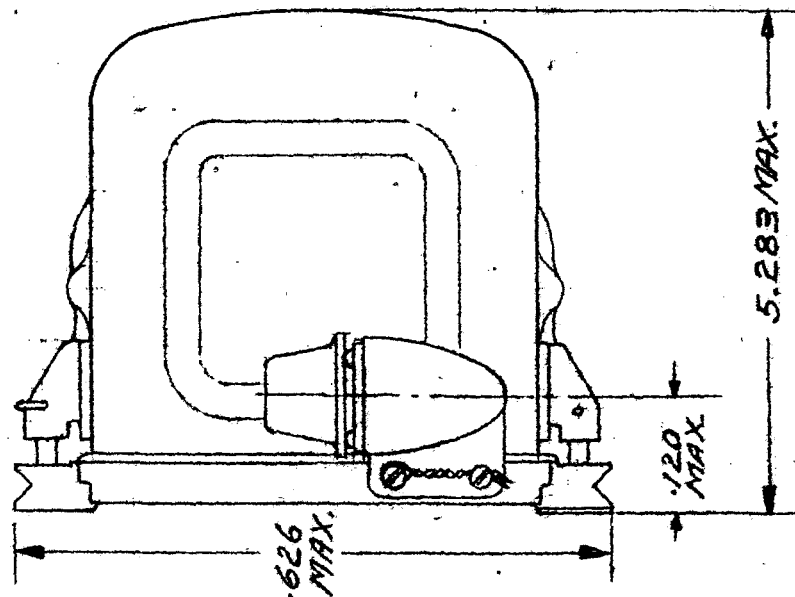
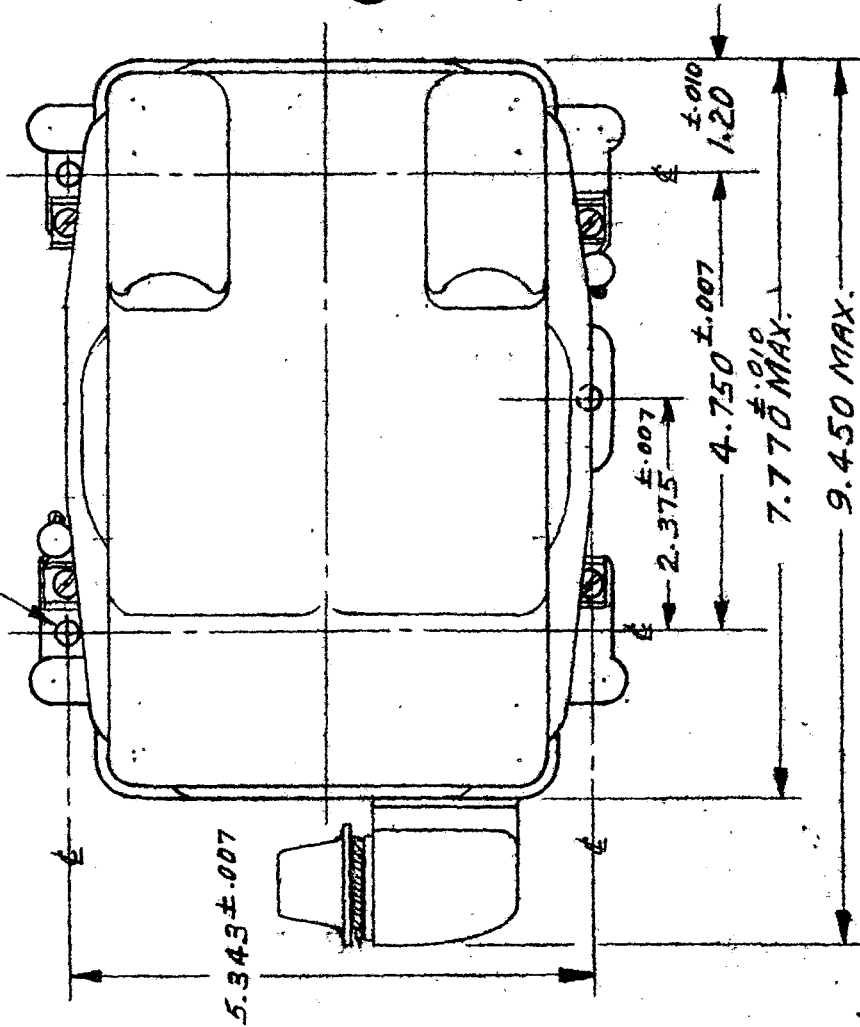
REVISION	0	6-12-57	C6657	3
	1	R57092	10-8-57	4
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Tolerance Unless Otherwise Specified:		Fractional: ±	Decimal: ±	Angle: ± / °	Scale:	Detail: HAD
REVISION	0	6-12-57	3		6	
	1	R.57092 10-8-57	4		7	
	2		5		8	

# FOR REFERENCE ONLY



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## COMPONENT SPECIFICATIONS

COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

PART NAME CLAMP SPECIFICATION & PART NUMBER S 139 1418 00

TYPE \_\_\_\_\_ APPROX. WT. \_\_\_\_\_

DESCRIPTION 3-7/8" square instrument clamp for  
front mounting a 6.0 lb. unit with a C.G.

CLASSIFICATION 12

ASSOCIATED DATA \_\_\_\_\_

L-13/16" from the front surface of the  
panel; C.G. located at center lines of  
instrument.

Materials: See sheet 2.

Finish: Clamp to be anodized or chromate dipped. Screws to have a dull black oxide or similar finish per MIL-57-0-2C Type III Class A.

### SERVICE CONDITIONS:

Ambient Temperature Range: -65°C to +85°C.

Ambient Humidity Range: 0 to 100% at 32°C.

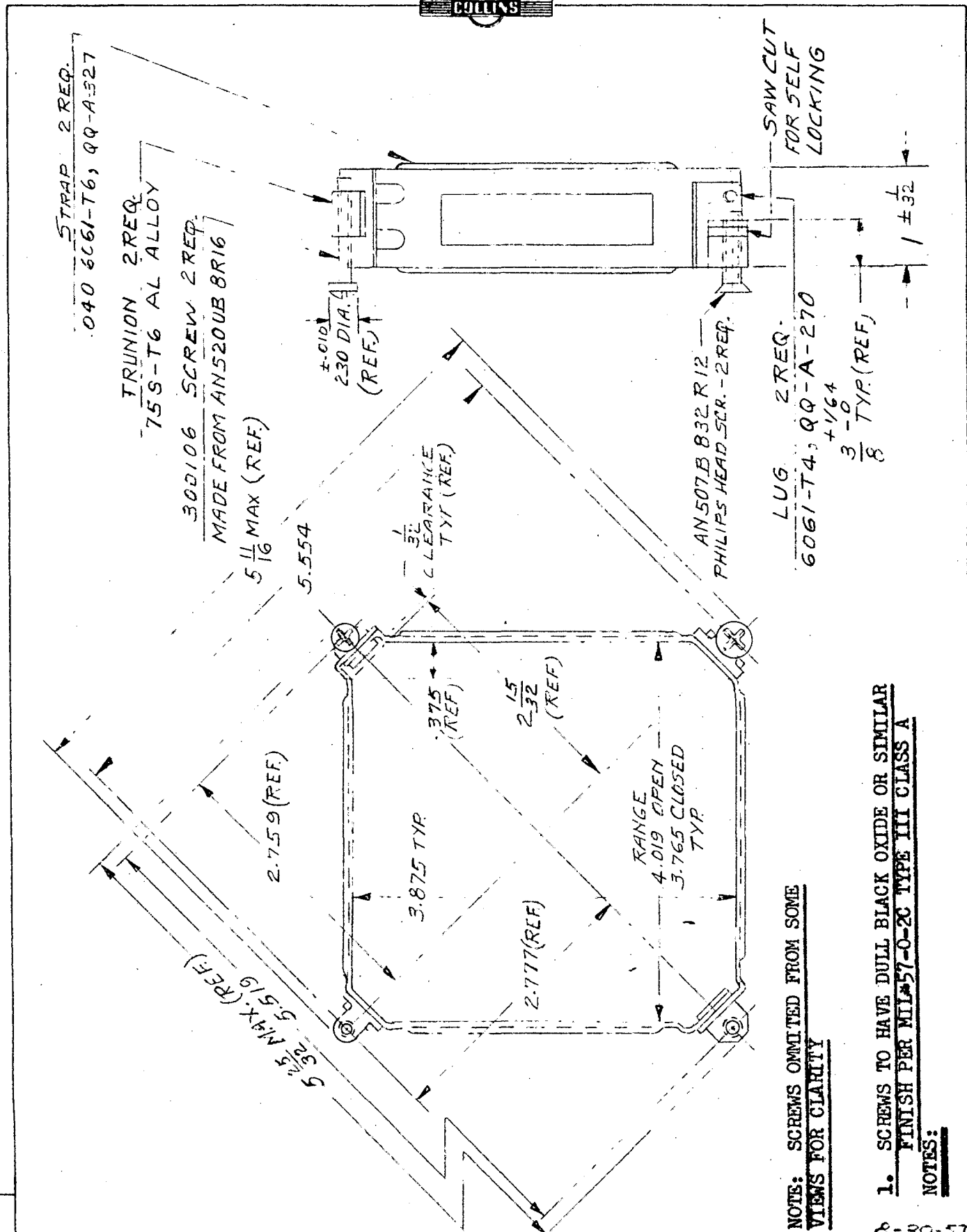
Vibration: 5 - 500 cps at max. double amplitude of 0.036" or 2 g, whichever is the limiting value, in any direction when supporting instrument.

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Tolerance Unless Otherwise Specified: Fractional: *		Decimal: *		Angle: *		Scale:		Detail:	
MANUFACTURER		MFG. TYPE		MFG. CAT. NO.		COLLINS SAMPLE NO.			
Marman Products Co., Inc.				Dwg. No. 50021					
ENGINEER <u>Bubler</u> APPROVED <u>J. E. [Signature]</u> CHECKED <u>[Signature]</u> DATE <u>9-6-57</u>									
REVISION	0	9-11-57		3		6			
	1			4		7			
	2			5		8			

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**COLLINS**



NOTE: SCREWS OMITTED FROM SOME  
VIEWS FOR CLARITY

1. SCREWS TO HAVE DULL BLACK OXIDE OR SIMILAR FINISH PER MIL-57-0-2C TYPE III CLASS A

## NOTES:

8-30-57

Tolerance Unless Otherwise Specified: Fractional:  $\pm 1/32$  Decimal:  $\pm .010$  Angle:  $\pm 1^\circ$  Scale:  Detail: *HAT*

REVISION	0	9-11-57	3	6	
	1		4	7	
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COMPONENT SPECIFICATIONS  
COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

REFERENCE ONLY

PART NAME VERTICAL GYRO SPECIFICATION & PART NUMBER/S 229 0137 00 \*  
TYPE 332D-8 APPROX. WT. 7.5 lb. max.  
DESCRIPTION Vertical Gyro with synchro pickoffs, CLASSIFICATION 2  
cageable. ASSOCIATED DATA

1. APPLICATION: The unit is to be used as an airborne vertical reference providing three-wire synchro attitude information.
2. REFERENCES: In addition to the requirements of this specification, the unit shall conform to applicable standards of the following documents:
  - 2.1. CAA TSO C4b.
  - 2.2. ARINC Synchro System Manual.
  - 2.3. SAE ARP 461.
3. CAA APPROVAL: It shall be the responsibility of the vendor to furnish a written statement of conformance to applicable portions of TSO C4b.
4. STANDARD TEST CONDITIONS: Unless otherwise stated, all performance requirements are given for the conditions of rated voltage at room temperature, sea level pressure, and the prevailing humidity, with the unit mounted on a  $\pm 0.5^\circ$  Scorsby table oscillating at 4 to 7 cycles per minute.
5. GYRO MOTOR:
  - 5.1. Power Source: 115 volts rms, 400 cps, single phase, 50 watts maximum starting 20 watts maximum running power.
  - 5.2. Rotor Speed: 21,000 rpm, minimum.
  - 5.3. Rotor Angular Momentum:  $6.33(10)^6$  gm-cm<sup>2</sup>/sec., minimum.
  - 5.4. Run-Down Time: 5 minutes to standstill, minimum.
6. GIMBAL FREEDOM:
  - 6.1. Roll: The spin axis shall have  $\pm 360^\circ$  of mechanical freedom about the roll axis (unlimited).

\* WHEN PART NUMBER APPEARS AS 229 0137 009 MILITARY INSPECTION IS REQUIRED.

CAL CHANGE 4-26-57	Tolerance Unless Otherwise Specified: Fractional: $\pm$ Decimal: $\pm$ Angle: $\pm$ Scale: Detail:			
	MANUFACTURER	MFG. TYPE	MFG. CAT. NO.	COLLINS SAMPLE NO.
	Minneapolis-Honeywell	GG53A-1		
ENGINEER <u>E. J. Girard</u> APPROVED <u>E. J. Girard</u> CHECKED <u>not blank</u> DATE <u>4-25-57</u>				
REVISION	0	6-12-57	3	6
	1	R 5709 10-8-57	4	7
	2	R 60296 2-13-58	5	8

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6.2. Pitch: The spin axis shall have  $\pm 85^\circ$ , approximately, of mechanical freedom about the pitch axis (limited by precessing pins).

7. ERECTION SYSTEM:

- 7.1. Power Source: 26 volts rms, 400 cps, single phase, 6.5 watts maximum power for each motor
- 7.2. Rates:  $1^\circ$  to  $3^\circ$  per minute in both roll and pitch with the rotor at operating speed when the spin axis is less than  $3^\circ$  to  $5^\circ$  from vertical. The rate shall be  $4^\circ$  to  $6^\circ$  per minute beyond this range.
- 7.3. Erection Cutout: Provisions shall be made to allow external switching of erection power to each axis.
- 7.4. Accuracy: Shall conform to paragraph 10.
- 7.5. Initial Erection: With the plane of the base of the unit inclined at an angle of  $10^\circ$  to the horizontal plane, the spin axis shall align to within  $1^\circ$  of vertical within 3 minutes after simultaneous application of power to the motor, caging mechanism, and erection system under Standard Test conditions.

8. CAGING MECHANISM:

- 8.1. Power Source: 28 volts d-c, 1.5 amp. maximum average current for uncaging, .33 amp. maximum holding current.
- 8.2. Caging Time: 10 seconds, maximum, after caging delay period with gyro stationary.
- 8.3. Uncaging time: 3 seconds, maximum.
- 8.4. Caged Position: With the rotor at rated speed, the erection system on, and the base level within 5 minutes of arc, caging of the gyro shall not cause the pitch and roll signals to change by more than one degree.
- 8.5. Accuracy: The caging mechanism shall be capable of returning the spin axis to within 0.3 degrees of a predetermined position relative to the base.
- 8.6. Caging Delay: The gyro shall include a thermal delay device heated from the  $28 \pm 10\%$  DC uncaging circuit which shall delay initiation of the mechanical caging sequence after opening of an external switch. Under standard conditions the caging delay time shall range from a minimum of one second (provided that the gyro has been uncaged for 1.75 minutes) to not more than 1.5 minutes (provided that the gyro has been uncaged for 5 minutes.)

CAL CHANGE	Tolerance Unless Otherwise Specified: Fractional: $\pm$ Decimal: $\pm$ Angle: $\pm$ Scale: Detail:						
	REVISION	0	6-12-57	3		6	
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		2	R60296 2-13-58	5		8	

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- 8.7. **Caging-Uncaging Cycling:** With the base level and with rated voltage applied to the rotor, erection system, and pickoffs, the caging mechanism shall be subjected to a reliability test of 50 caging-uncaging cycles. Sequence: 5 minutes on, 5 minutes off. If more than two failures occur the unit is unacceptable. In the event of a failure the uncaging overload protector shall function as in paragraph 8.8.
- 8.8. **Uncaging Overload Protector:** The unit shall contain a thermal delay device which functions as follows: In the event of a malfunction resulting in sustained current flow in the stepping solenoid for more than 100  $\pm$ 30 sec. at 25°C, the device shall de-energize the uncaging circuit in such a way as to allow the mechanism to return to its initial position. After an additional 10  $\pm$ 5 sec. at 25°C the device shall again energize the uncaging circuit. The cycle shall continue at a 10  $\pm$ 5 sec. on, 10  $\pm$ 5 sec. off cycle at 25°C as long as the malfunction is present. The device shall furnish protection against burnout of the stepping solenoid at all temperature in operating range of the unit.
9. **POWER INTERRUPTION:** After the normal warm-up period, interruption of all power to the unit for a period of 3 seconds or less shall not cause an interruption of accurate attitude information for longer than the period of power interruption. The error introduced by such a condition shall not exceed 0.25° with the gyro base either stationary or rotating about its pitch and roll axes.
10. **ACCURACY:** With the rotor at rated speed, the erection system on, and the base level within one minute of arc, the attitude signals shall read within 0.5 degrees of vertical. The pitch and roll signals shall remain within this limit as the unit is rotated 360 degrees in azimuth at the rate of 180 degrees per minute, minimum.
11. **FREE DRIFT:** With the spin axes vertical, shall not exceed 0.4 degrees per minute after correction for apparent drift due to the earth's rotation.
12. **PICKOFFS:**
- 12.1. **Power Source:** 26 volts rms, 400 cps, single phase, 325 milliamps maximum total current, when loaded as in paragraph 12.2.
- 12.2. **Loads:** Each pickoff shall be capable of driving two servoed Kearfott R1000 synchro control transformers, or their equivalent.
- 12.3. **Type:** Control transmitter.
- 12.4. **Maximum Output Voltage:** 11.8  $\pm$ 0.6 volts rms at rated excitation.
- 12.5. **Static Accuracy:**  $\pm$ 6 minutes of arc, in a range from 0° to 360° when loaded as in paragraph 12.2. Accuracy shall be measured by the Proportional Voltage Method of ARP 461.
- 12.6. **Time Phase Shift:** 0° to 10° leading between input and output voltages when loaded as in paragraph 12.2.
- 12.7. **Null Voltage:**

CAL CHANGE

Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
REVISION	0	6-12-57	3		6	
	1	R57092 10-8-57	4		7	
	2	R60296 2-3-58	5		8	000033

SHEET 4 of 7 SHEETS  
SPECIFICATION 229 0137 00

CONFIDENTIAL

FOR REFERENCE ONLY

- 12.7.1. Total: 40 millivolts, maximum as measured on a true rms voltmeter with no load applied.
- 12.7.2. Maximum Fundamental Component: 75% of value of paragraph 12.7.1.
- 12.8. Impedances: ZRO =  $43 \pm 15\% + j155 \pm 10\%$  ohms.  
ZRSS =  $43 \pm 15\% + j30 \pm 10\%$  ohms.  
ZSO =  $12 \pm 15\% + j30 \pm 10\%$  ohms.
- 12.9. Phasing: Synchro leads shall be connected to the X, Y, Z, H and C terminals (page 6, ARINC DESIGNATION) so that with the unit mounted as in paragraph 13.4 the following phasing is obtained:
- 12.10.1. Roll: With the unit tilted to simulate a right bank the synchro output shall correspond to increasing positive angles on a standard synchro as defined in Table 2-1, Voltage Relations in a Standard Synchro, of the ARINC Synchro System Manual.
- 12.10.2. Pitch: With the unit tilted to simulate a climb, the synchro output shall correspond to increasing positive angles on the standard of paragraph 12.10.1.
13. MOUNTING:
- 13.1. Shockmount: The unit shall not require a shockmount.
- 13.2. Mounting Holes: Holes shall be provided for three-point base mounting.
- 13.3. Mounting Surface: Construction of the surface shall be such that minimum deformation of the base will result from mounting directly upon a flat surface without the aid of spacers, washers, standoffs, etc.
- 13.4. Attitude: In normal use the unit will be installed with the base horizontal and the connector aft.
- 13.5. Line of Flight Arrow: A prominent single headed line of flight arrow shall be provided on the cover of the unit to insure installation in the attitude of paragraph 13.4. Words "line of flight" shall clearly identify the arrow.
14. SEALING: The unit shall be enclosed by a cover which is dust sealed by a resilient gasket. The cover shall not be removed under environmental conditions which are not suitable for gyro assembly and maintenance.
15. DIMENSIONS: 7.75" long x 6.25" wide x 5.125" high, approx. envelope, excluding connector.
16. CONNECTOR: American Phenolic Company part number 165-27-X (Mating part 165-26-X, Collins part number 371 0134 00).
17. ENVIRONMENTAL REQUIREMENTS:
- 17.1. Temperature: The unit shall meet the requirements of TSO C4b for operation in uncontrolled temperature areas.
- 17.2. Radio Interference: The unit shall produce no objectionable radio interference.
- 17.3. Fungus: Fungus inert materials shall be used wherever feasible in the construction of the unit. Other materials shall receive a fungus resistant treatment.

Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
REVISION	0	6-12-57	3		6	
	1	R57092 10-8-57	4		7	
	2	R60296 2-13-58	5		8	

000034

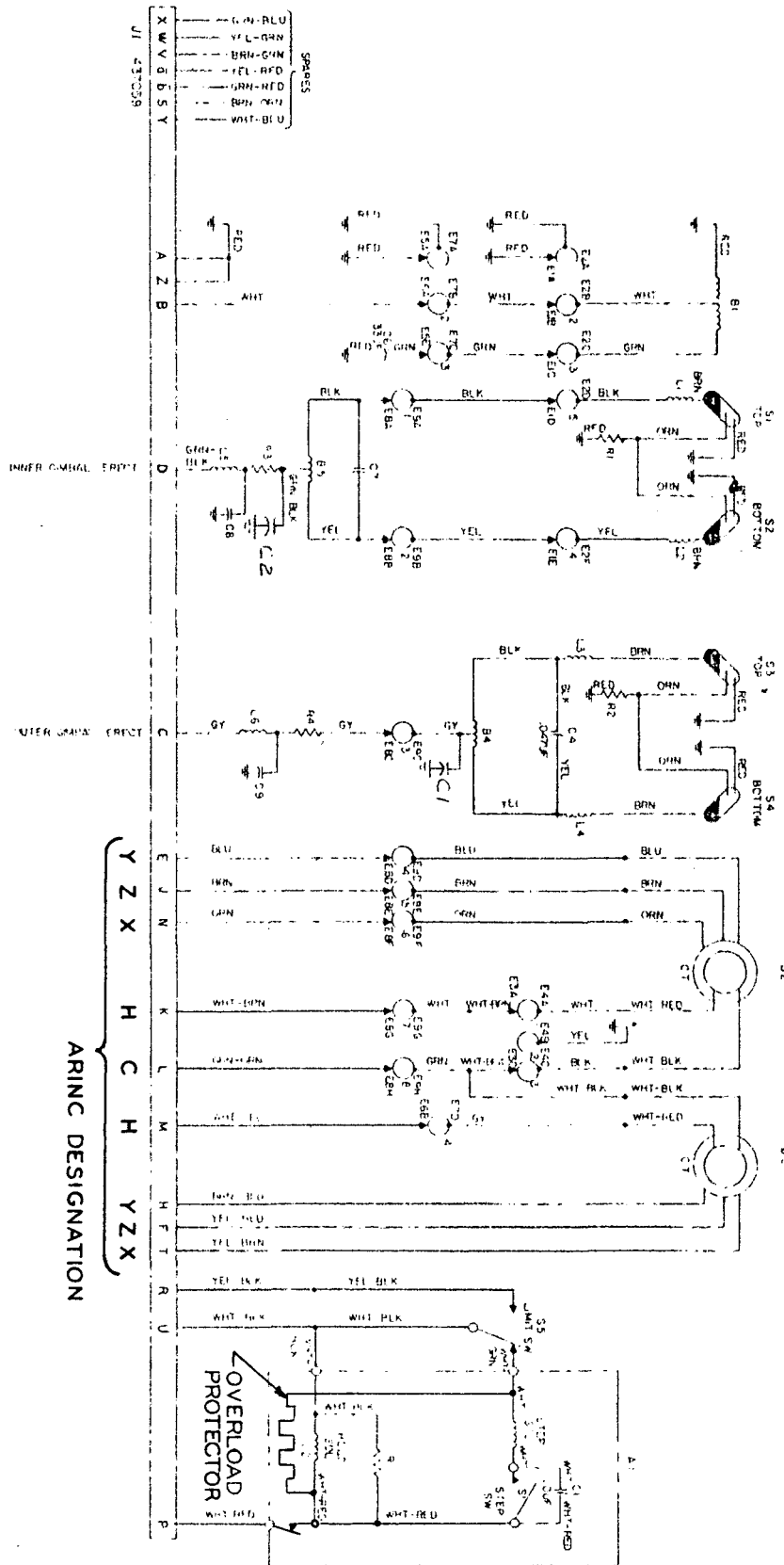
**FOR** COLLINS **SHEET 5 OF 7 SHEETS**  
**SPECIFICATION 229-0167-001 Y**

- 17.4. **Vibration:** The unit shall conform to vibration requirements of CAA TSO C4b.
- 17.5. **Altitude:** The unit shall function and shall not be adversely effected by pressures equivalent to -1000 to +70,000 feet altitude.
- 17.6. **Life:** The design goal shall be 1000 hours of operation without maintenance.
18. **NAMEPLATE:** The following information shall be contained on the nameplate:
  - Vertical Gyro
  - Type Number 332D-8
  - CAA TSO Number
  - Weight
  - Manufacturer's Number
  - Manufacturer's Series
  - Serial Number
19. **MODIFICATION:** The vendor shall supply written notification of any changes made in the parts list for the unit and of the serial numbers effected to Collins Radio Company, Research and Development Division. When a change in the instruction book is involved, a reproducible copy suitable for addition to the book shall be supplied.
20. **INSTRUCTION BOOK:** After the unit has been approved for production the vendor shall supply a reproducible copy of a suitable instruction book.

CAL CHANGE	Tolerance Unless Otherwise Specified: Fractional: $\pm$ Decimal: $\pm$ Angle: $\pm$ Scale: Detail:									
	REVISION	0	6-12-57	3		6				
		1	R57092 10-8-57	4		7				
		2	R60296 2-13-58	5		8				

FOR SHEET 6 OF 7 SHEETS  
SPECIFICATION 229 0137 007 7

COILS



CAL CHANGE

Tolerance Unless Otherwise Specified:		Fractional: $\pm$	Decimal: $\pm$	Angle: $\pm$	Scale:	Detail:
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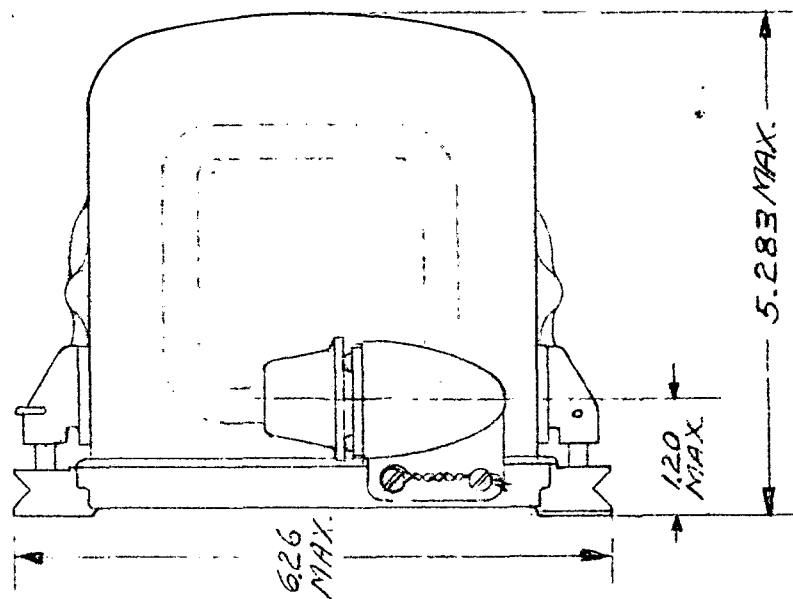
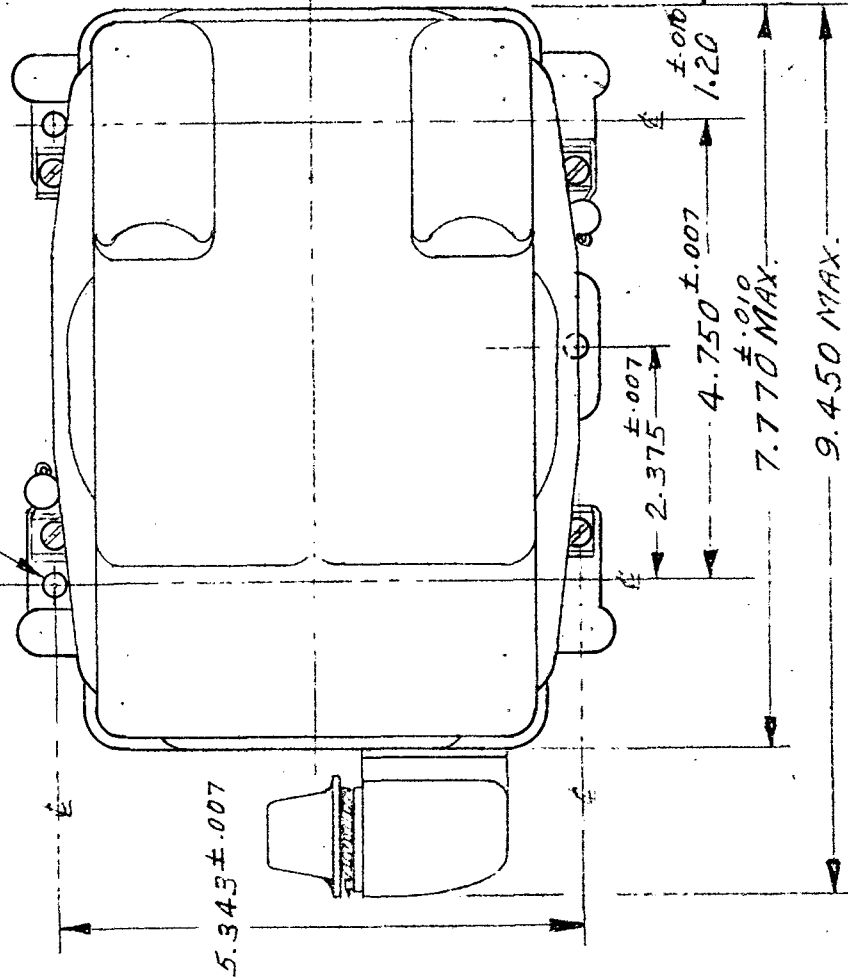
000036

SHEET 7 OF 7 SHEETS  
SPECIFICATION 229 0137 00

ENCLOSURE

REFERENCE ONLY

.302 DIA. 3 HOLES



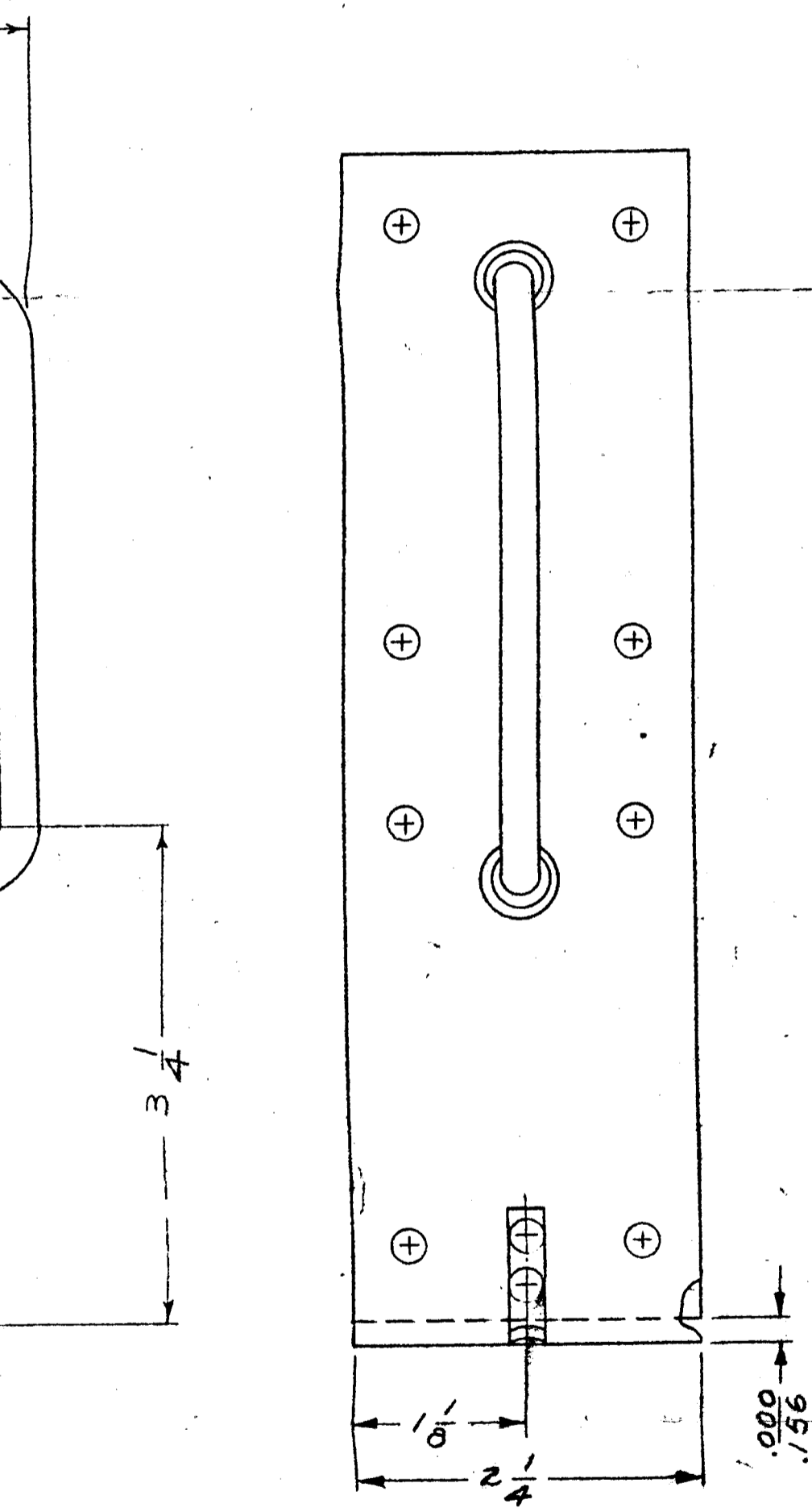
CAL CHANGE

Tolerance Unless Otherwise Specified: Fractional:  $\pm$  Decimal:  $\pm$  Angle:  $\pm$  / ° Scale: — Detail: *HAD*

REVISION	0	6-12-57	3		6	
	1	R 57092 10-8-57	4		7	
	2	R 60296 2-13-58	5		8	

QUAN- TITY	ITEM NO.	QUANTITIES ARE FOR ONE ASSEMBLY			PART NAME
		COLLINE PART NO.	MFG PART NO.	GOVT PART NO.	

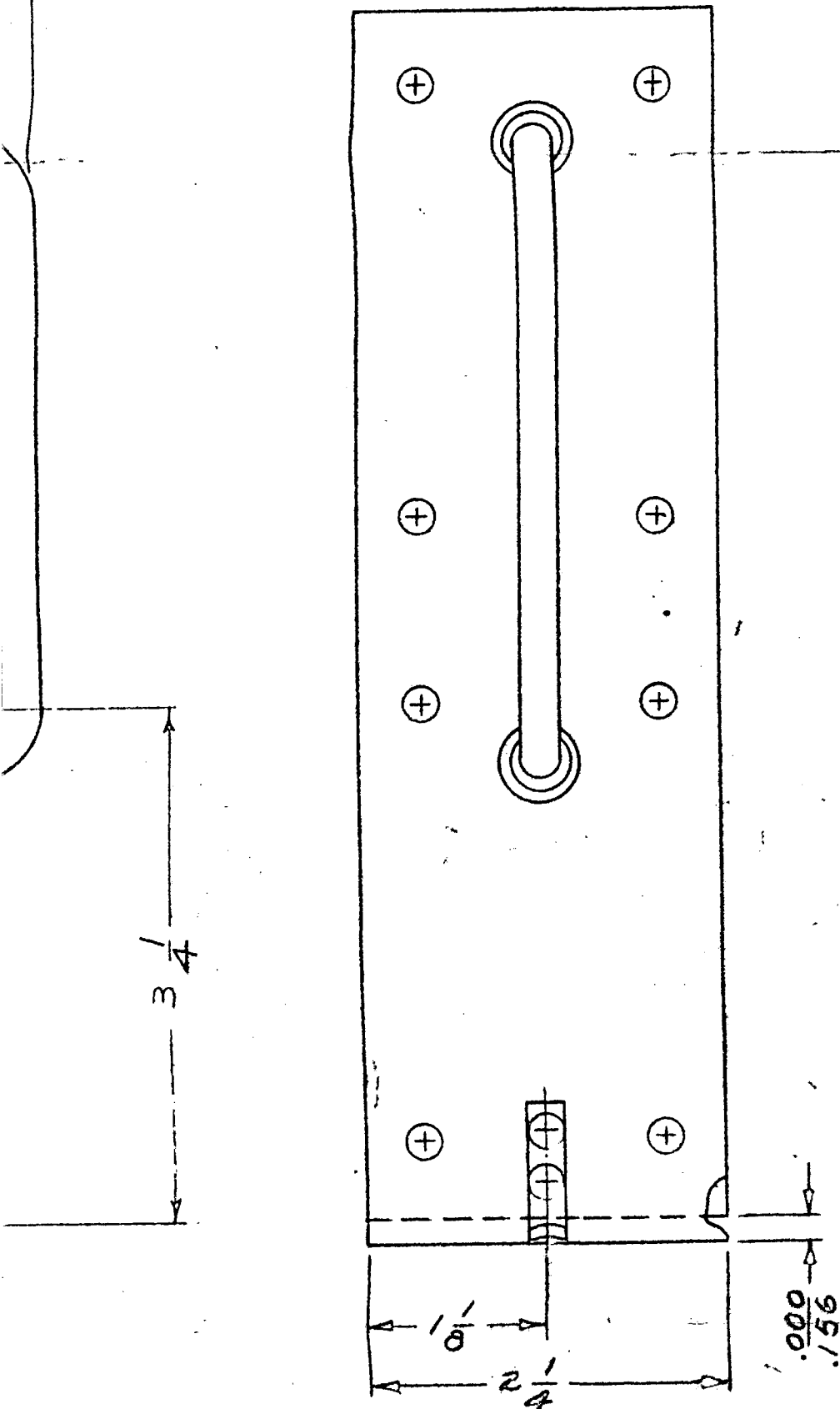
542 7058 004



542 7058 004

3239 DIA 001A 1 A

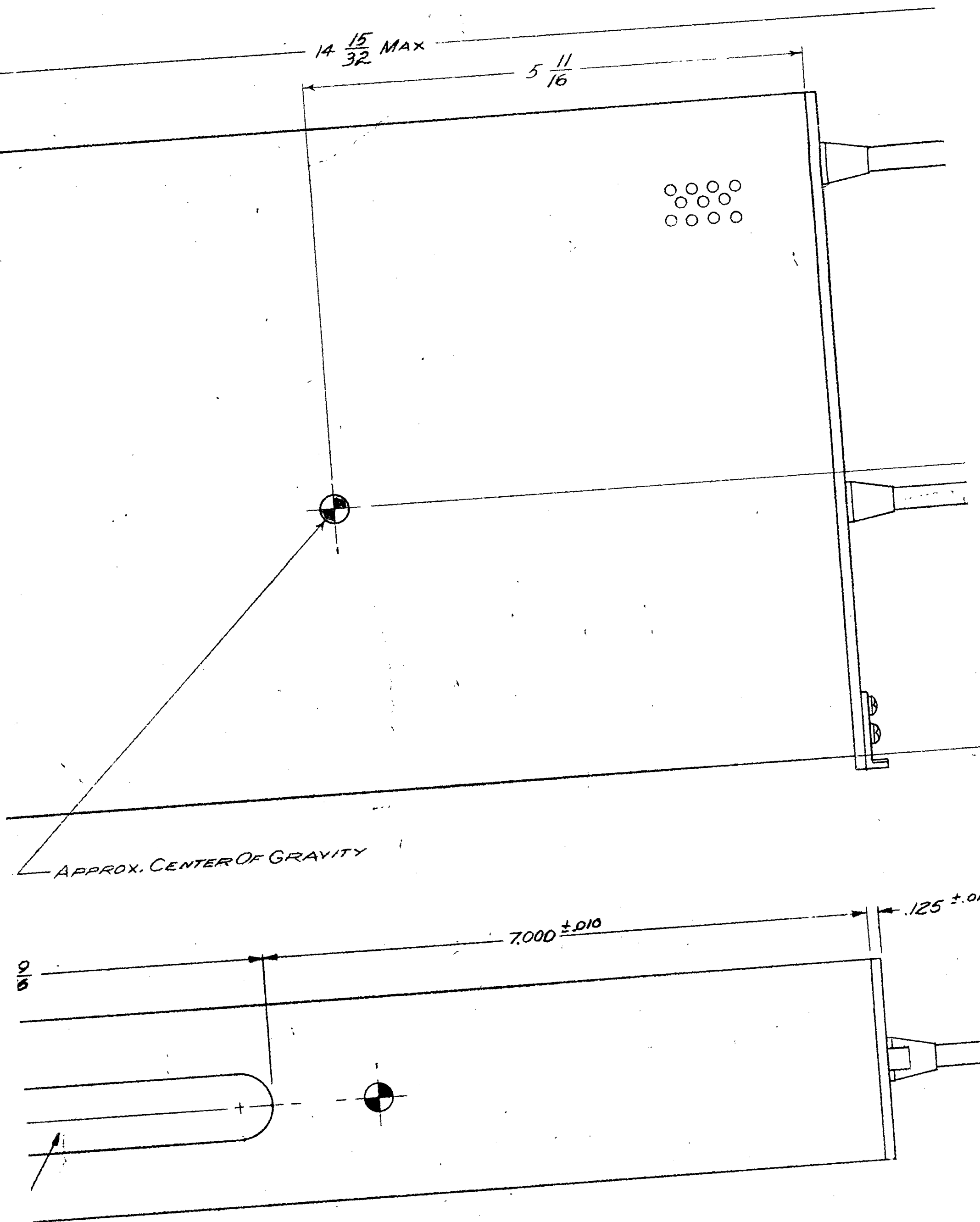
FOR REFERENCE ONLY



5427058 004  
3239 D1A 001 A 1 A

FOR REFERENCE ONLY

522 0894 004		REF 562A-5	
GOV'T NO.	COLLINS NO.	QTY	TYPE
USED ON ASSEMBLY			
WEIGHT		MATERIAL	
7.0			
UNLESS OTHERWISE SPECIFIED: DECIMAL DIMENSIONS INCLUDING HOLE SIZES MAY VARY $\pm .003$ FRACTIONAL DIMENSIONS INCLUDING HOLE SIZES MAY VARY $\pm 1/64$ MACHINED ANGLES MAY VARY $\pm 1^\circ$ CREASED ANGLES MAY VARY $\pm 3^\circ$ ROUNDED ANGLES MAY VARY $\pm 1^\circ$ ECCENTRICITY BETWEEN ANY DIAMETERS ON THE SAME CENTERLINE SHALL NOT EXCEED .010 TOTAL INDICATOR READING. ALL DIMENSIONS ARE FINISH DIMENSIONS INCLUDING APPLIED FINISH AND ARE GIVEN IN INCHES.			
NO.		DESCRIPTION	AUTHORITY
1		ADD .875, .500, .6875 2.368 DIM'S, ADD B.	Y 12-10 5.7
R52764		REVISION NO.	
ALTERATIONS			
COLLINS RADIO COMPANY CEDAR RAPIDS, IOWA			
MATERIAL			
APPLIED FINISH			
DRAWN BY MOSHER			
APPROVED BY YHK			
CHECKED BY JH			
DATE 8-31-50			
TITLE OUTLINE DRAWING-STEERING COMPUTOR 562A-5 SERIES			
GOV'T PART NO.		COLLINS PART NO. 5427058 004	

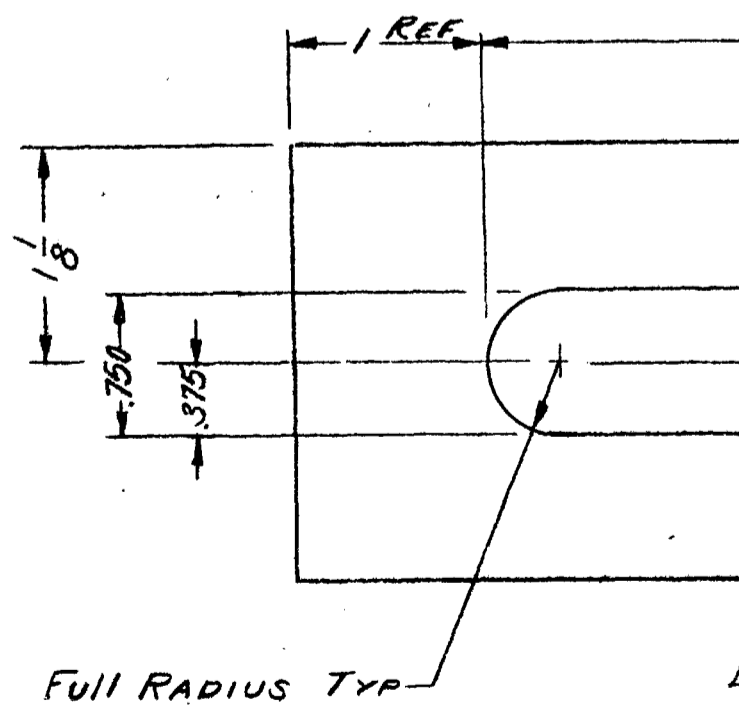
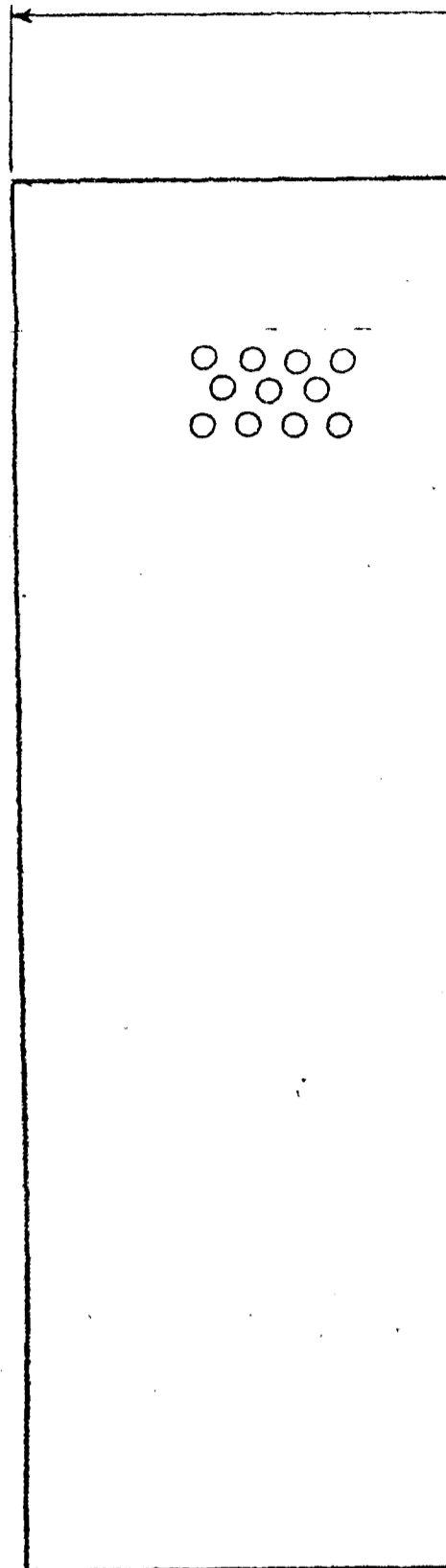
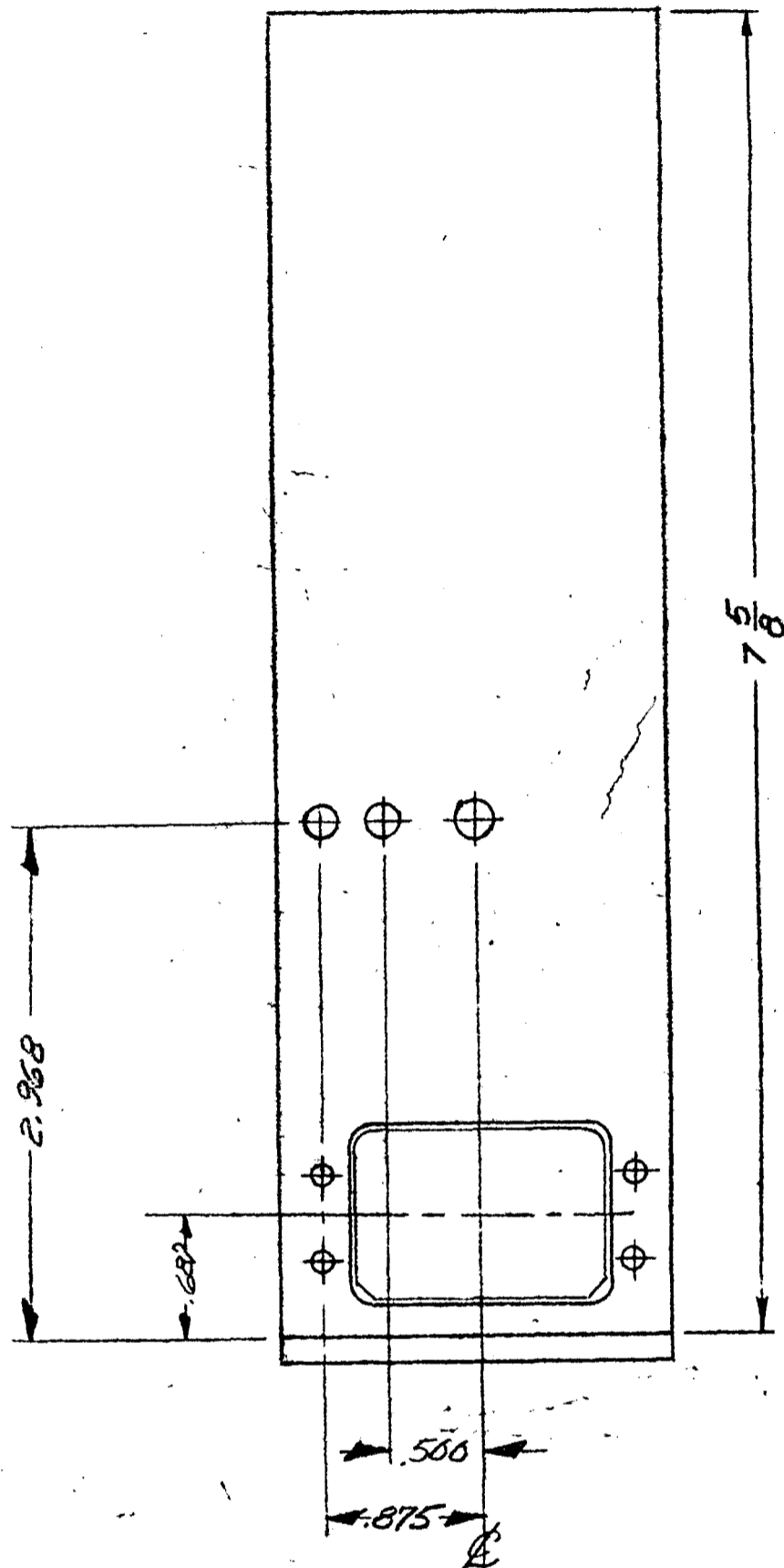


COOLED COOLING AIR SHALL PASS THROUGH  
 HOLES IN THIS AREA. ENTRANCE HOLES IN THIS  
 AREA SHALL HAVE A MAXIMUM DIAMETER OF .125

Technical drawing of a mechanical part. The drawing shows a rectangular block with a horizontal slot. The slot has a width of  $1 \frac{9}{16}$  and a depth of  $1 \frac{1}{8}$ . The slot is centered vertically, with a distance of  $1 \frac{1}{8}$  from the top edge to the top of the slot and  $1 \frac{1}{8}$  from the bottom edge to the bottom of the slot. The slot has rounded ends with a radius of  $1 \frac{1}{8}$ . A dimension of  $7.000 \pm .010$  is shown at the bottom, indicating the overall width of the part. A cross-section symbol is located on the right side of the drawing.

↳ FORCED COOLING AIR SHALL PASS THROUGH HOLES IN THIS AREA. ENTRANCE HOLES IN THIS AREA SHALL HAVE A MAXIMUM DIAMETER OF .125

000041



4. 562A-5 SCHEMATIC: P/N 542 7059 004  
 3. 562A-5 WEIGHT: 6.7 LB  
 2. INDEX PIN CODE NO. 7  
 1. PLUG IS INVERTED DPA-32-34 P  
 REF: ARINC SPEC No. 404, DATED MAY 1, 1956  
 NOTES:

### STOCK DISPOSITION SYMBOLS

**REWORK**

**2 SCRAP**

**3 NONE**

## REVISIONS

DISP.

**REASON**

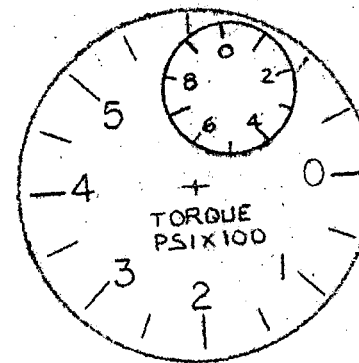
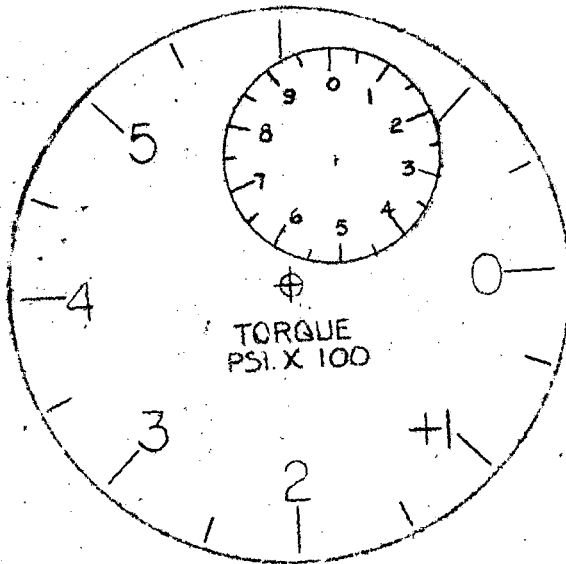
EFF.

**CLASS**

**APPROVAL**

DES.	STR.	WT.
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NG



REFERENCE ONLY  
THIS DOCUMENT WILL  
NOT BE KEPT UP TO DATE

GRADUATIONS WOULD BE FURTHER  
SUB DEVIDED IF SECOND POINTER WAS DELETED <sup>USA</sup>

RH		LH	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NOREQ/ASSY						CANADAI R LIMITED • MONTREAL						
HEAT TREAT			TOLERANCES EXCEPT AS NOTED ANGLE ± 1/2° DECIMALS 2PLACES ± .03 3PLACES ± .010	DRAFT								
			✓ SURFACE ROUGHNESS PER NAS N° 30	CHECK								
FINISH SPEC.			UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE 125 ✓	GR.LDR								
DRAWING SIZE A				STRESS								
				WEIGHT								
				SECTION CHIEF								
				APPR.								
				APPR.								
						- 100 TO 600 PSI						
						DSG						
						SECTION NO.						
						000043						

## STOCK DISPOSITION SYMBOLS

1 RWORK

2 SCRAP

3 NONE

## REVISIONS

DISP.

REASON

EFF.

CLASS

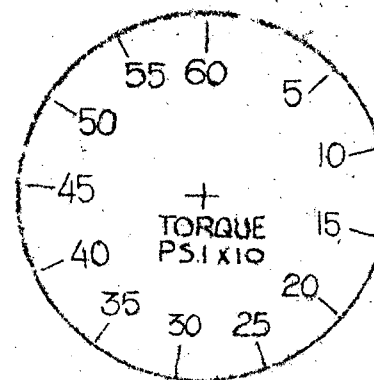
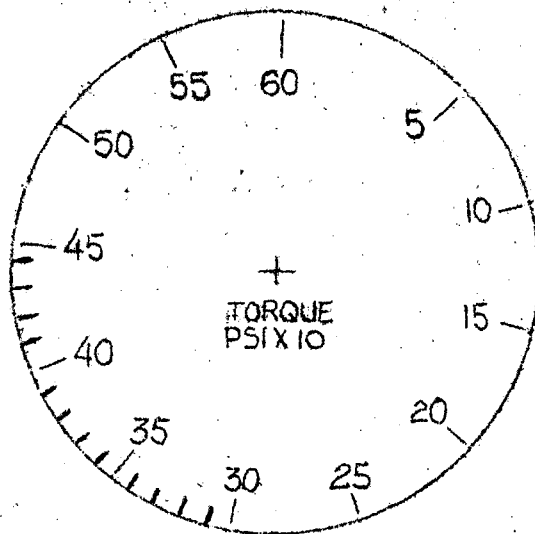
APPROVAL

DES.

STR.

WT.

NC



REFERENCE ONLY  
THIS DOCUMENT WILL  
NOT BE KEPT UP TO DATE

Bendix

R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NO REQ/ASSY		TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2 PLACES $\pm .03$ 3 PLACES $\pm .010$		DRAFT	CANADAIR LIMITED - MONTREAL		50 - 600		SECTION NO.		000044
HEAT TREAT		SURFACE ROUGHNESS PER NAS N° 30		CHECK							
FINISH SPEC.		UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE		GR. LDR							
DRAWING SIZE A		D W G SCALE		STRESS							
				WEIGHT							
				SECTION CHIEF							
				APPR.							
				APPR.							

BENDIX

F.7617 A REV.12/53

# STOCK DISPOSITION SYMBOLS

☐ 1 REWORK

☐ 2 SCRAP

☐ 3 NONE

## REVISIONS

DISP.

REASON

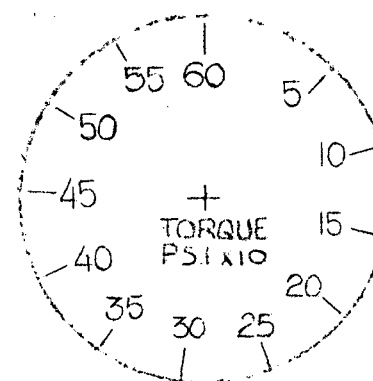
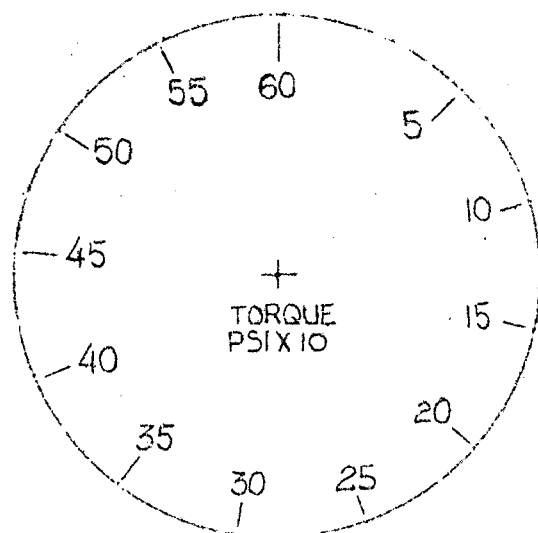
EFF.

CLASS

APPROVAL

DES. STR. WT.

NC



BENDIX

R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NOREQ/ASSY	HEAT TREAT										
FINISH SPEC.		TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2 PLACES $\pm .03$ 3 PLACES $\pm .010$ <input checked="" type="checkbox"/> SURFACE ROUGHNESS PER NAS N° 30 UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE $125 \sqrt{\text{ }}$		DRAFT	CANADAIR LIMITED - MONTREAL			SECTION NO.			
DRAWING SIZE A		D W G SCALE		CHECK							
				GR LDR	50.-600			BENDIX			
				STRESS							
				WEIGHT							
				SECTION CHIEF							
				APPR.							
				APPR.							

000045

# STOCK DISPOSITION SYMBOLS

☐ 1 REWORK

☐ 2 SCRAP

☐ 3 NONE

## REVISIONS

DISP.

REASON

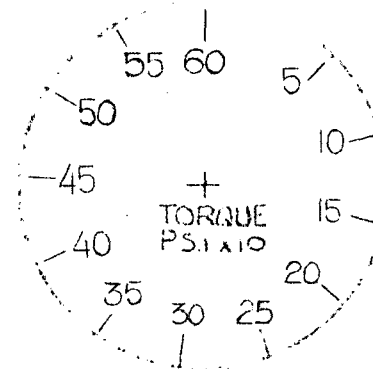
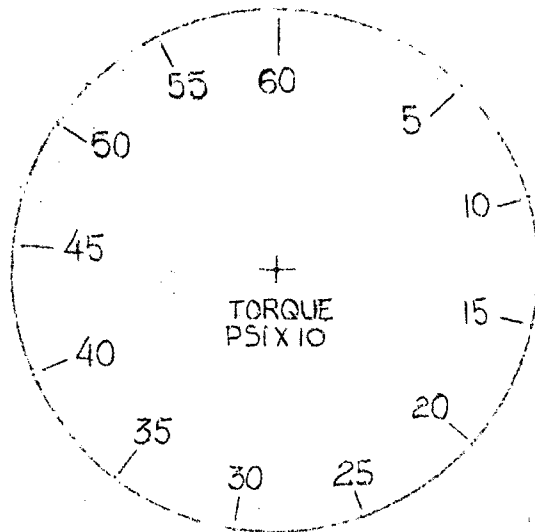
EFF.

CLASS

APPROVAL

DES. STR. WT.

NC



Bendix

R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NOREQ/ASSY											
HEAT TREAT		TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2 PLACES $\pm .03$ 3 PLACES $\pm .010$		DRAFT	CANADAIR LIMITED - MONTREAL			SECTION NO.			
FINISH SPEC.		UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE $125\sqrt{\phantom{x}}$		CHECK							
				GR. LDR							
				STRESS							
				WEIGHT							
DRAWING SIZE A		D W G SCALE		SECTION CHIEF	50 - 600			BENDIX			
				APPR.							
				APPR.				000046			

F.7617 A REV.12/55

# STOCK DISPOSITION SYMBOLS

☐ 1 REWORK

☐ 2 SCRAP

☐ 3 NONE

REVISIONS

DISP.

REASON

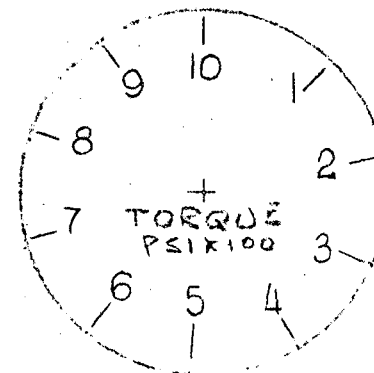
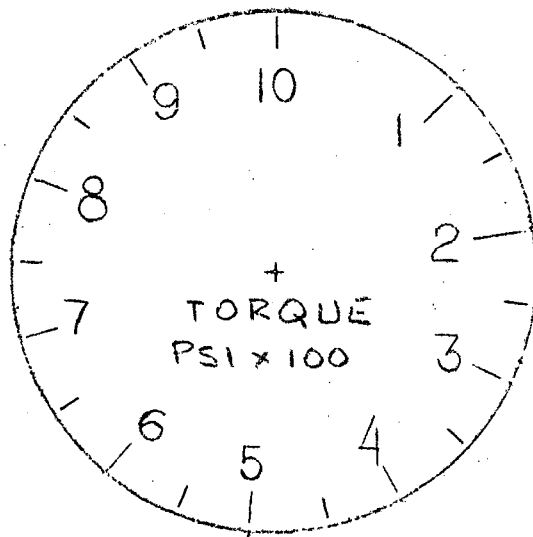
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CLASS

APPROVAL

DES. STR. WT.

NC



R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NOREQ/ASSY											
HEAT TREAT		TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2PLACES $\pm .03$ 3PLACES $\pm .010$		DRAFT			CANADAIR LIMITED - MONTREAL				
				CHECK							
				GR.LDR							
				STRESS							
				WEIGHT							
FINISH SPEC.		UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE $125\sqrt{\phantom{x}}$		SECTION CHIEF			0 - 1000 PSI				
				APPR.							
DRAWING SIZE A		D W G SCALE		APPR.			SMITHS				000047

F.7617 A REV.12/55

# STOCK DISPOSITION SYMBOLS

☐ 1 REWORK

☐ 2 SCRAP

☐ 3 NONE

## REVISIONS

DISP.

REASON

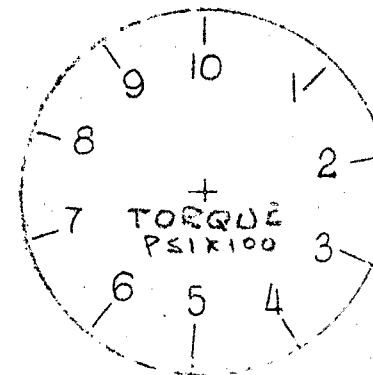
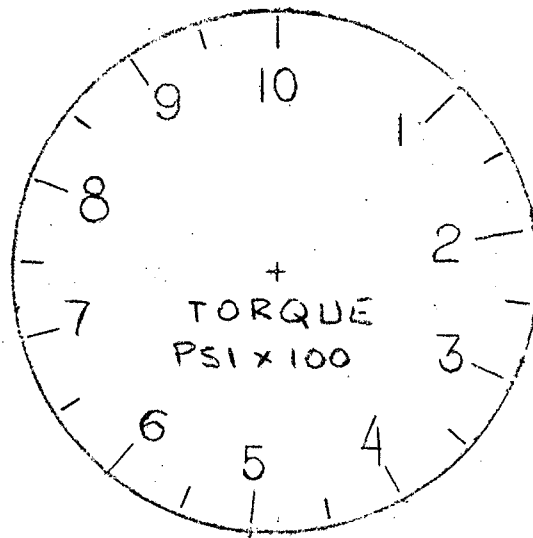
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CLASS

APPROVAL

DES. STR. WT.

NC



R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NOREQ/ASSY											
HEAT TREAT		TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2 PLACES $\pm .03$ 3 PLACES $\pm .010$		DRAFT	CANADAIR LIMITED - MONTREAL			SECTION NO.			
		UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE $\sqrt{125}$		CHECK							
				GR. LDR							
				STRESS							
				WEIGHT							
FINISH SPEC.				SECTION CHIEF	0-1000 PSI						
				APPR.							
DRAWING SIZE A		D W G SCALE		APPR.	SMITHS			000048			

F.7617 A REV.12/55

# STOCK DISPOSITION SYMBOLS

**1** REWORK

**2** SCRAP

**3** NONE

## REVISIONS

DISP.

REASON

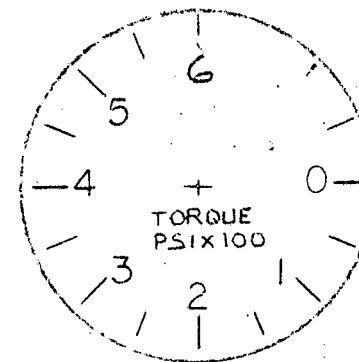
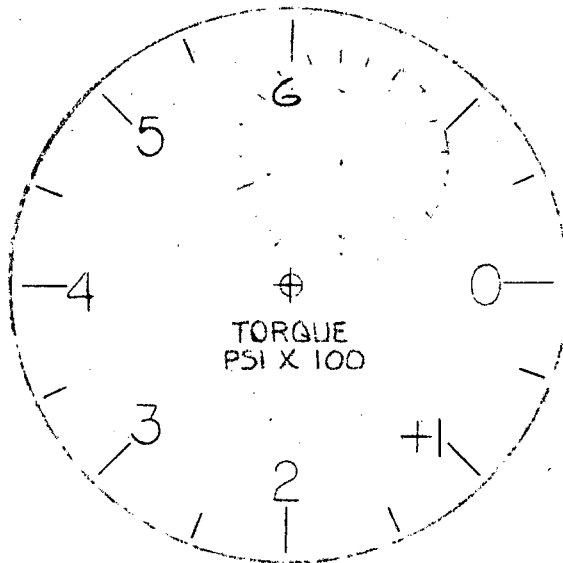
EFF.

CLASS

APPROVAL

DES. STR. WT.

NC



R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NO.REQ/ASSY											
HEAT TREAT	TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2 PLACES $\pm .03$ 3 PLACES $\pm .010$		DRAFT		CANADAIR LIMITED • MONTREAL				SECTION NO.		
FINISH SPEC.	<input checked="" type="checkbox"/> SURFACE ROUGHNESS PER NAS N° 30  UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE $125 \sqrt{\text{ }}$		CHECK								
DRAWING SIZE <b>A</b>	D W G SCALE		GR. LDR		- 100 TO 600 PSI  USG						
			STRESS								
			WEIGHT								
			SECTION CHIEF								
			APPR.								
			APPR.								

000049

F.7617 A REV.12/55

# STOCK DISPOSITION SYMBOLS

**1** REWORK

**2** SCRAP

**3** NONE

## REVISIONS

DISP.

REASON

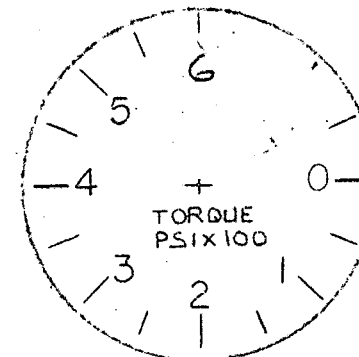
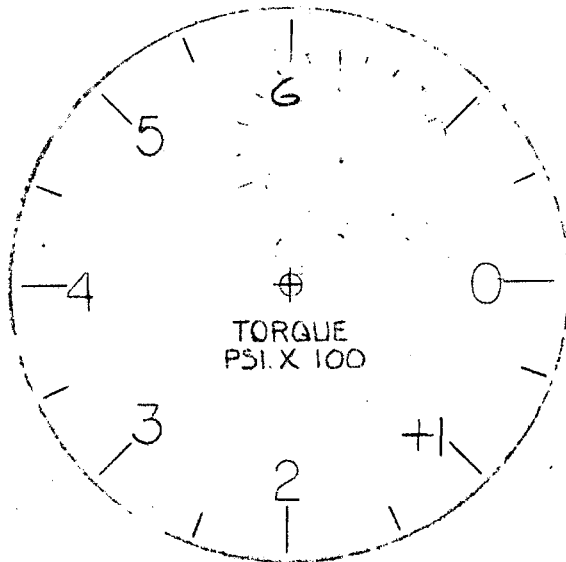
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CLASS

APPROVAL

DES. STR. WT.

NC



USG 70500

R.H.	L.H.	PART NUMBER	DASH NO.	DESCRIPTION	SIZE	ZONE	MATERIAL SPEC.	UNIT WEIGHT	NEXT ASSEM	QTY PER A/C	MODEL
NOREQ/ASSY											
HEAT TREAT	TOLERANCES EXCEPT AS NOTED ANGLE $\pm 1/2^\circ$ DECIMALS 2PLACES $\pm .03$ 3PLACES $\pm .010$		DRAFT		CANADAIR LIMITED - MONTREAL			SECTION NO.			
FINISH SPEC.	7 SURFACE ROUGHNESS PER NAS N° 30		CHECK								
DRAWING SIZE <b>A</b>	UNLESS OTHERWISE NOTED ALL MACHINE FINISH TO BE 125		GR.LDR		-100 TO 600 PSI			000050			
			STRESS								
			WEIGHT								
			SECTION CHIEF								
			APPR.		USG						
			APPR.								