

Installation Manual

ADF-T-12C Automatic Direction Finder System

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I.B. 2012

May 1969



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Division**

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INSTALLATION

1. PRELIMINARY INSPECTION

Perform a preliminary inspection and test of the ADF-T-12C system before installation. Preliminary procedures are as follows:

a. Unpack the equipment and check it against installation requirements for correct model and part numbers of all components.

b. Visually inspect for any damage that may have occurred during shipment.

c. Perform test procedures outlined in the Maintenance Manual to ensure proper operation before installation.

2. SYSTEM CONFIGURATION

The ADF-T-12C system consists of three principal components: the receiver, servo amplifier-indicator, and fixed loop antenna. The method of electrical connection between the system components is provided in figure 1.

Figures 11 and 12 illustrate schematically the electrical interconnection for the ADF-T-12C system. All servo amplifier-indicators are wired for top mounted, fixed loop and sense antennas. Any change in either or both antenna mounting positions may require a cabling reversal, as noted in Note 3 of figures 11, 12 and 13.

3. COMPONENT INSTALLATION PROCEDURES

a. Receiver. The receiver is usually mounted in or underneath the aircraft instrument panel. When mounted in the instrument panel the receiver dust cover is secured to mounting brackets or to mounting flanges in the panel cutout (figure 2). Outline dimensions of the receiver are shown in figure 3.

Installation procedures for the receiver are as follows:

(1) If a 14-volt dc power source is used, disregard steps (2) and (3) and proceed to step (4).

(2) If a 28-volt dc power source is used, a 28-volt lamp must be substituted for the 14-volt lamp installed at the factory.

Slide cover back to expose lamp. Turn unit over, remove sheet metal screw that secures lampholder. Exchange lamps and reassemble.

(3) Remove voltage switch key retained by a sheet metal screw at the rear of the receiver. Position switch to "28" and replace voltage switch key to lock switch in position.

(4) Fasten connector mounting bracket with attached interconnect cable assembly to rear of receiver dust cover with the three screws supplied.

(5) Secure connector cover to rear of receiver dust cover with the four screws.

(6) Attach the receiver mounting brackets (not supplied) to each side of the receiver dust cover with four 6-32 x 3/8 inch machine screws and applicable washers and nuts. See figure 2.

(7) Drill two holes on each side of instrument panel cutout.

(8) Place receiver dust cover, with attached mounting brackets, behind panel cutout so that mounting holes in the bracket align with holes in the instrument panel.

(9) Secure receiver dust cover to instrument panel with four 6-32 x 3/8 inch screws and applicable washers and nuts.

(10) If found necessary, secure the rear of the receiver dust cover with a suitable supporting bracket. Support bracket must be fabricated in field to meet individual installation requirements.

b. Servo Amplifier-Indicator. Model 551A/C/E indicators are designed for mounting behind the panel. Mounting-hole dimensions are included on the outline drawings, figures 4, 5, and 6.

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Install the servo amplifier-indicators using the appropriate outline drawing as a guide. Cut a dial opening in the panel and drill mounting holes. Allow at least three inches for cable connections and removal passage.

c. Audio Amplifier. The optional audio (speaker) amplifier is designed to be mounted in any convenient location in the aircraft, such as behind the instrument panel, on a shelf, etc. Figure 1 illustrates the unit connected in the system.

Installation procedures for the audio amplifier are as follows:

(1) Drill three holes in the selected mounting surface to the dimensions illustrated in figure 7 and partially insert three screws.

(2) Mount the audio amplifier on the screws by inserting the screw heads through the mounting holes in the flanges.

(3) Slide the unit enough so the screw threads slip in the notches of the mounting holes.

(4) Tighten screws securely.

(5) Wire audio amplifier cable to receiver connector (J1) and connect Amphenol plug to amplifier (see figures 1, 11 and 12).

(6) Mount and connect speaker to shielded lead.

d. Antennas. ADF-T-12C system accuracy depends on proper installation and location of the sense and loop antennas. If accurate over-the-station performance is required, these factors are especially important.

Antenna locations must meet the following requirements:

(1) The two antennas must be mounted exactly on the fore and aft centerline of the aircraft.

(2) When the 54-inch whip is employed as a sense antenna (figure 10), it must be located at least 3 feet from the propeller and mounted in a place having sufficient structural strength to prevent tearing if the antenna vibrates violently under icing conditions.

(3) The fixed loop should be parallel to the ground with the aircraft in its normal flight attitude.

(4) Longwire sense antenna should be 8 to 12 feet long supported at one end with insulated strain relief. Maintain at least a 6-inch spacing between antenna wire and aircraft skin.

Installation procedures for the fixed loop antenna are as follows (see figure 8):

(1) Select mounting location for the fixed loop antenna so that the inherent 6-degree compensation factor of the loop adjusts for the quadrantal error of the aircraft. By trial and error, test the quadrantal error as directed in paragraph f. before proceeding. Start with loop located near the wing trailing edge.

NOTE

Temporarily tape the loop to the outside (underside) of the aircraft during this test. Mount loop upside down for connector clearance. Make loop cable entrance into the aircraft, during test, with drilling entrance holes. Complete the procedure given in paragraph f. and then proceed with the following steps.

(2) Drill five mounting holes at the selected location in the fuselage.

(3) Mount fixed loop in position while doubler plate is being mounted, place two 8-32 binding head screws through mounting holes with flat washers attached to hold loop in position. See figure 9 for installation information.

(4) Place doubler plate in position inside the aircraft so that the mounting nuts on doubler plate align with fixed loop mounting screws. Apply ECO-801 Type A sealer between doubler plate and aircraft skin.

(5) Remove loop from aircraft.

(6) Insert loop cable connector through doubler plate and aircraft skin from inside the aircraft. Apply ECO-801 Type A sealer between doubler plate and cable connector.

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NOTE

If the loop being installed was supplied with a compressible gasket ring, insert this between the loop connector and doubler plate.

(7) Secure cable connector and doubler plate to aircraft skin with two 6-32 screws placed in mounting holes from outside of aircraft.

(8) Place loop in position so that loop and loop cable connectors mate. Apply ECO-801 Type A sealer between loop gasket and aircraft skin.

(9) Secure loop to aircraft skin with two 8-32 binding head screws placed from outside aircraft to match with elastic stop nuts on doubler plate. Loop gasket must be compressed to approximately 1/32-inch at loop centerline.

e. Interconnect Cabling. Use only approved cables, furnished with the basic interconnecting cabling kits, available to meet installation requirements for various aircraft.

f. Quadrantal Error Compensation. To provide an inherent 6-degree quadrantal error factor, the cross-wound coils for the fixed loop antenna are of different dimensions. When installing the fixed loop, a position should be selected where the quadrantal error caused by the physical presence of the aircraft is nearly cancelled by the 6-degree compensation of the loop. This is normally near the wing trailing edge, but is determined by a trial and error process.

The ground compensation procedure for quadrantal error is as follows:

(1) Install the ADF-T-12C in the aircraft, but do not secure the fixed loop.

(2) Select approximate location for fixed loop on fore-and-aft line of aircraft.

(3) If a ground compass rose design is available, position the aircraft on the design. If no design is available, use an alternate method to determine angles and degrees.

NOTE

Make certain there are no metal hangers, phone wires, buried cables, etc., near the aircraft that might cause bearing error.

(4) Locate a radio station of known position. Use the ADF to take a bearing on the station. The station should be at least 20 miles from the aircraft, and free from static and fading.

NOTE

The direction of bearing indications on the servo amplifier-indicator will be reversed with the loop mounted upside down. Compute the bearing differences accordingly.

(5) Rotate the aircraft on the compass rose until the nose of the aircraft is pointing directly at the transmitting station. The servo amplifier-indicator must now read zero.

(6) Set the aircraft's directional gyro to zero degree in agreement with the servo amplifier-indicator reading.

(7) Rotate the aircraft counterclockwise around the compass rose in 15-degree increments. Compare the directional gyro and servo amplifier-indicator readings at each increment. Chart the results. The difference between the two instrument readings is the quadrantal error. Maximum errors will be at 45, 135, 225, and 315 degrees.

(8) Repeat steps (4) through (7) until a loop position is found where the 6-degree loop compensation reduces the quadrantal error to a minimum. Secure loop in this location.

g. Sense Antenna Adjustment. After the ADF-T-12C system is installed, adjust trimmer capacitor C-22 for optimum performance. Trimmer capacitor C-22 is located on underside of r-f shield cover. Adjustment procedures are as follows:

(1) Remove receiver chassis from dust cover.

(2) Connect lap adapter cable between receiver connector J1 and receiver dust cover connector P1. Lap adapter cable, Bendix part number 2V011-01.

(3) Set the receiver function switch to REC and the bandswitch to the 190-440 kHz position.

(4) Tune in a station as close to 440 kHz as possible.

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(5) Adjust trimmer capacitor C-22 for maximum audio level in headset using suitable tool.

(6) Remove lap adapter cable and replace receiver chassis in dust cover. Rotate retaining screw on front panel to secure receiver to dust cover.

NOTE

If tuning meter other than the one supplied is used to adjust trimmer capacitor C-22, set scale for a 0-1 milliamperes deflection.

h. Pre-Flight Checkout. Before take-off, perform the following checkout procedures to determine if the ADF-T-12C system is operating properly.

(1) Tune in stations evenly spaced on each band of the receiver. Maximum tuning meter deflection should be obtained at peak signal.

(2) Adjust volume control to desired listening level.

(3) Tune in one station in each band until a clear 1000 hertz signal is heard. The function switch must be in the CW position (Model 201D receiver only).

(4) Position aircraft on a known true heading.

(5) Set receiver switch to ADF and tune in station.

(6) Compare bearing on servo amplifier-indicator with true bearing. Bearings must agree within 4 degrees with little or no "hunting" observed on indicator.

(7) Press TEST button on front panel of receiver and observe indicator pointer. Indicator pointer will rotate away from indicated bearing while TEST button is pressed.

(8) Release TEST button, and observe indicator pointer. Indicator pointer should return to the indicated bearing.

i. Flight Test. Airborne test shall employ the following flight test procedure:

(1) Select a station of average power from a distance of about 50 miles. Using tuning meter, adjust until maximum signal strength is obtained.

(2) Fly toward the station.

(3) Set the equipment for ADF operation.

(4) Note the bearing on the servo amplifier-indicator. Unless the station is weak, there should not be prolonged hunting by the indicator pointer.

(5) Make a 360-degree standard rate turn and observe the servo amplifier-indicator. The indicator pointer should track the turn without "losing" the station.

(6) Select a range station to check the over-the-station performance of the system.

(7) Set the receiver to ADF and home-in on the range station.

(8) Observe the indicator pointer as the aircraft approaches and passes over the station. The pointer should oscillate slightly and as the cone of silence is passed, should abruptly swing to a reading of 180 degrees from the original bearing indication.

(9) When the station is passed and pointer reversal is unsatisfactory, the information in table 1 may help in correcting the trouble. (See table 1, page 5.)

4. INSTALLATION OF CW OSCILLATOR KIT OPTION (Part Number 2V017-01)

Refer to ADF-T-12B/C Maintenance Manual I.B. 2012A for complete instructions.

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TABLE 1. ADJUSTMENT, ERROR CORRECTION

INDICATION	TROUBLE
Reversal before entering cone of silence.	Sense antenna element too far aft.
Reversal after reaching cone of silence.	Sense antenna element too far forward.
Extended area of confusion. Excessive pointer oscillation.	Sense antenna too long or too short.
Excessive quadrantal error.	Loop incorrectly located.

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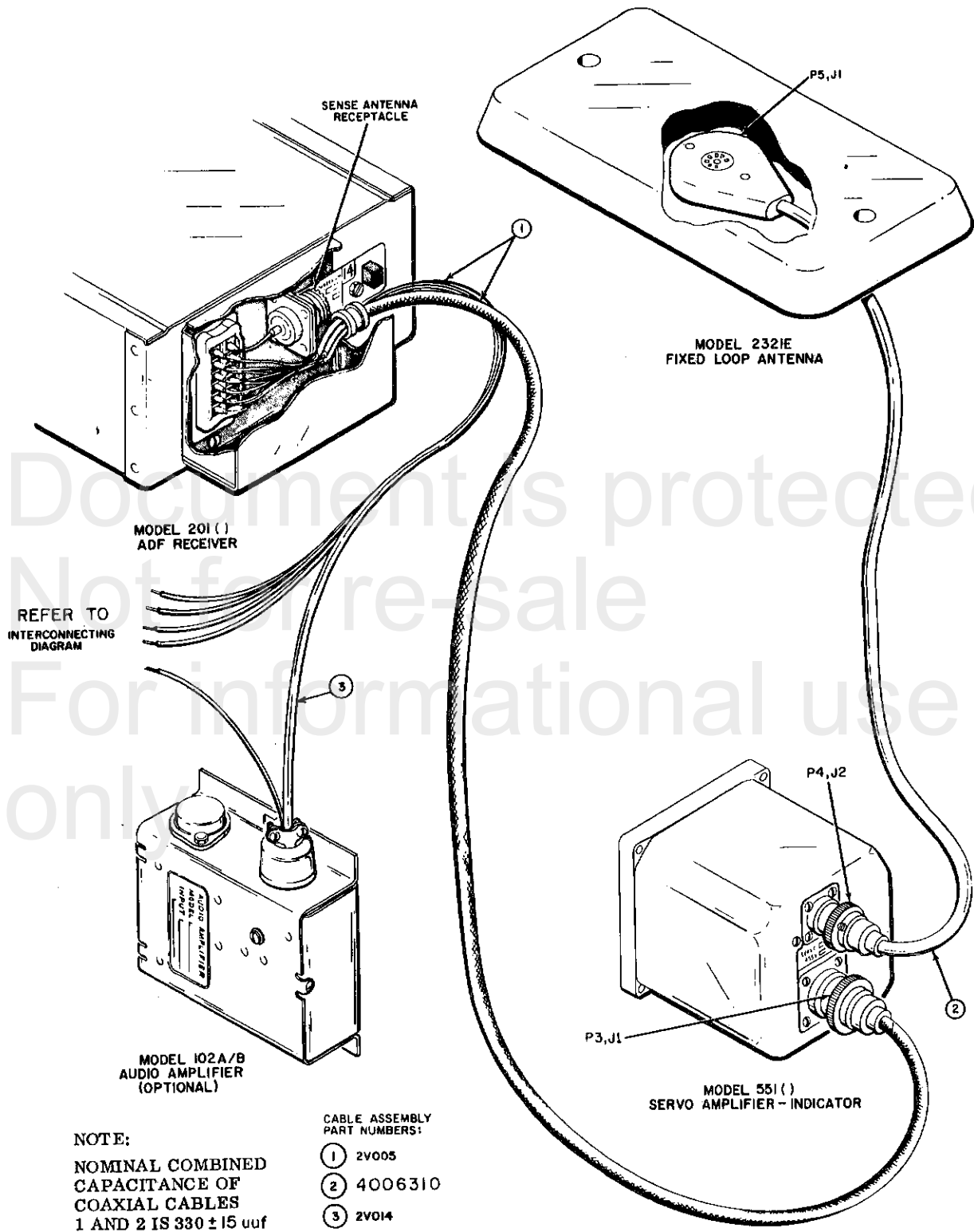


Figure 1. ADF-T-12() System Installation Pictorial Diagram

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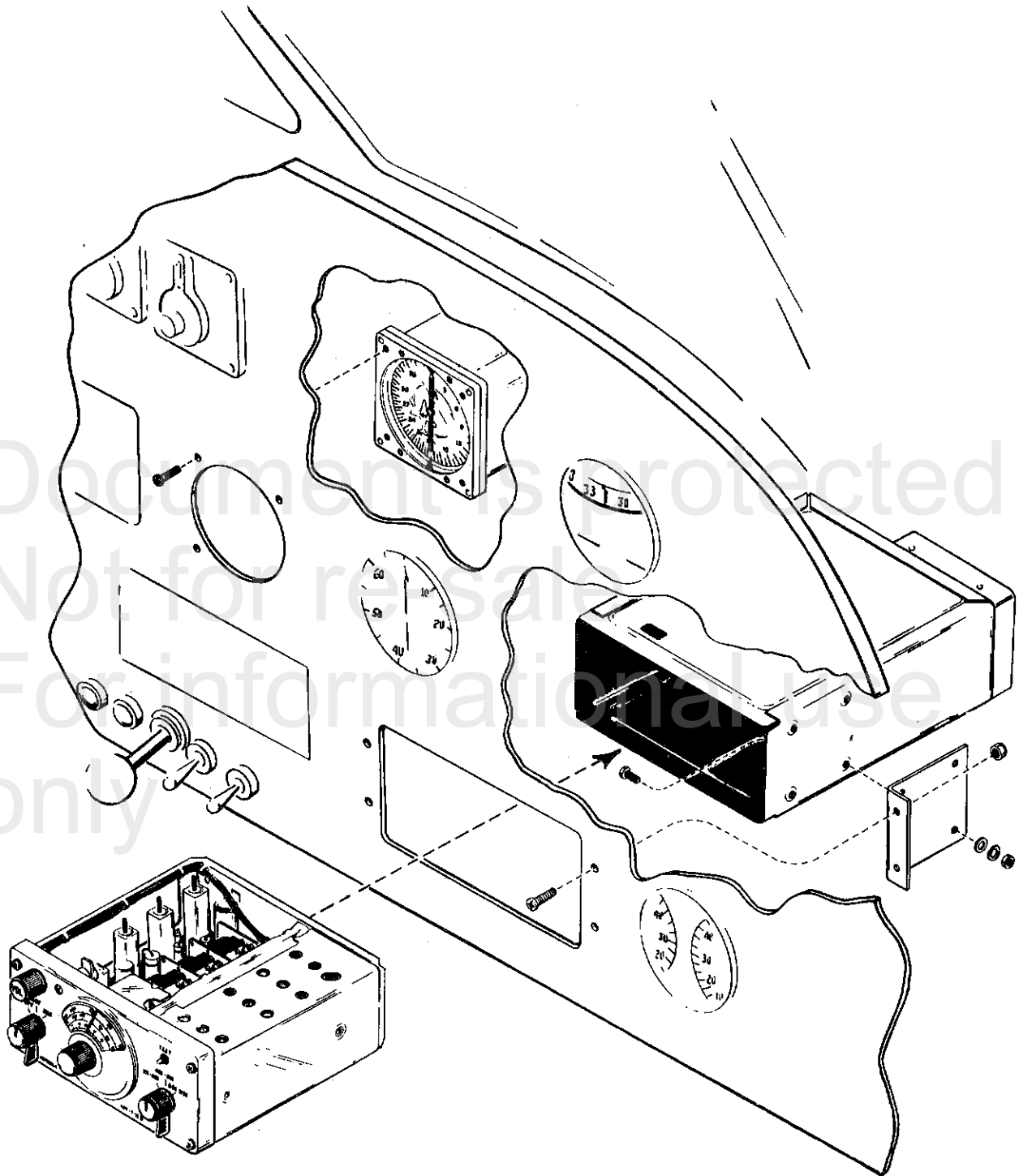
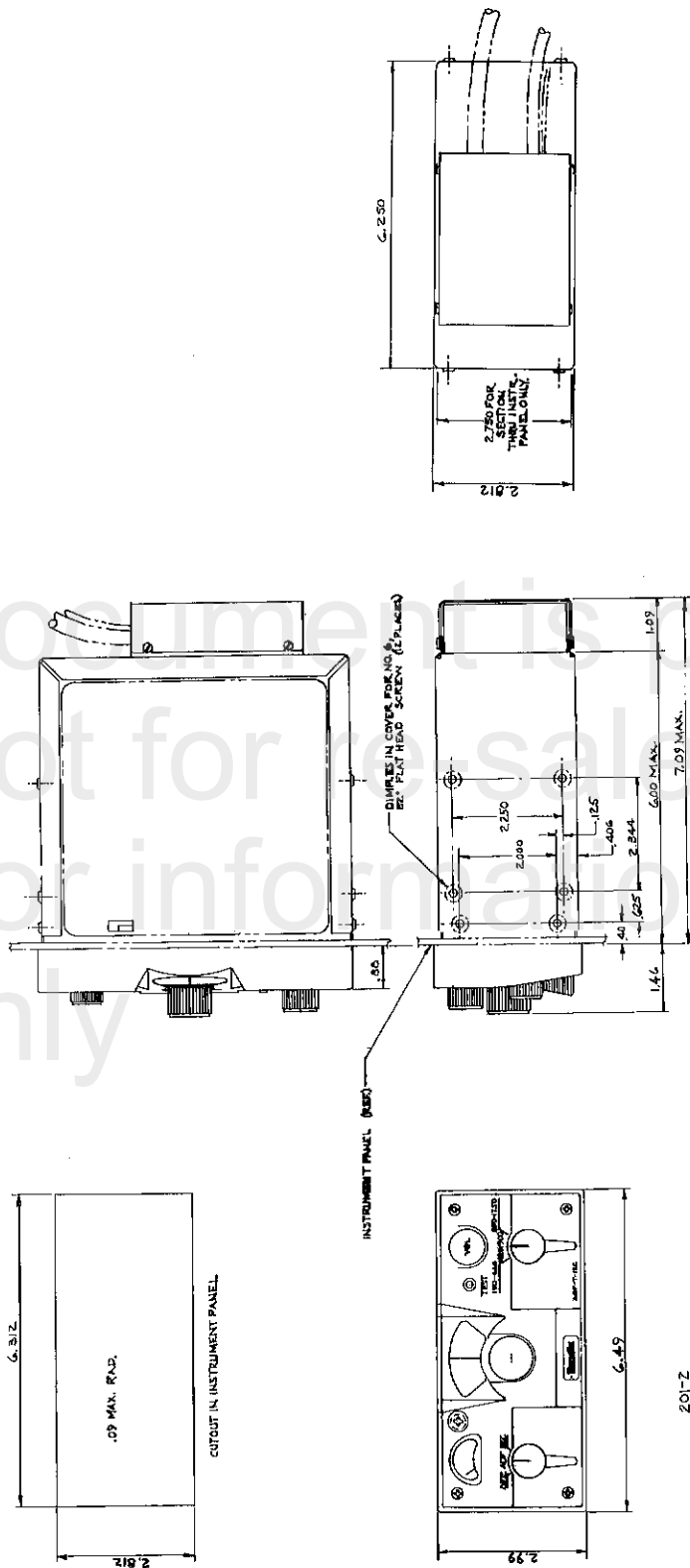


Figure 2. Typical Panel Installation

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- NOTES:
1. DIMENSIONS SHOWN ARE FOR INSTALLATION PURPOSES ONLY
 2. FINAL ASSEMBLY PART NO. IU022
 3. SCHEMATIC DIAGRAM PART NO. 3D225

Figure 3. Model 201() ADF Receiver, Outline Dimensions

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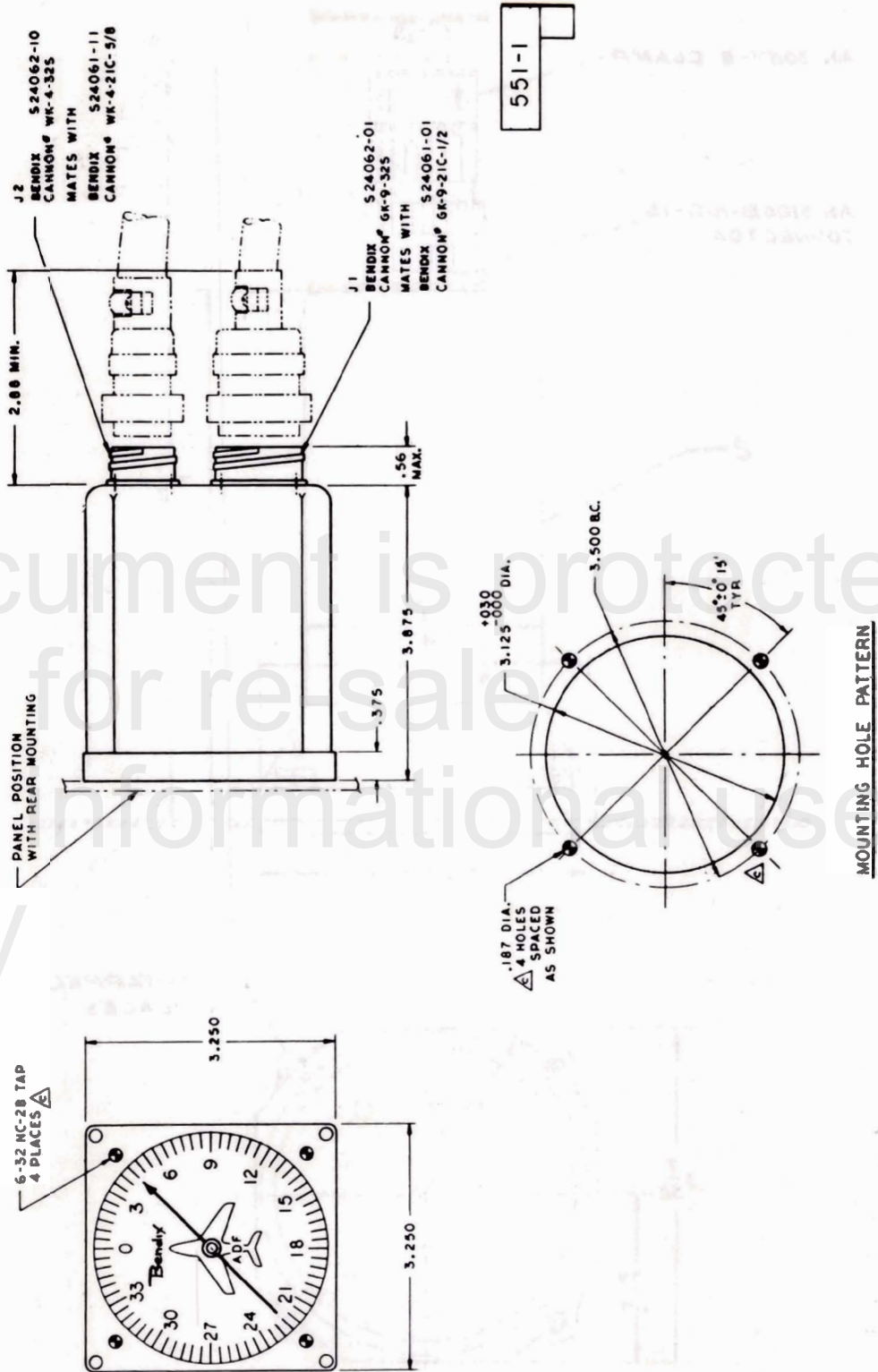


Figure 4. Model 551A Servo Amplifier-Indicator, Outline Dimensions

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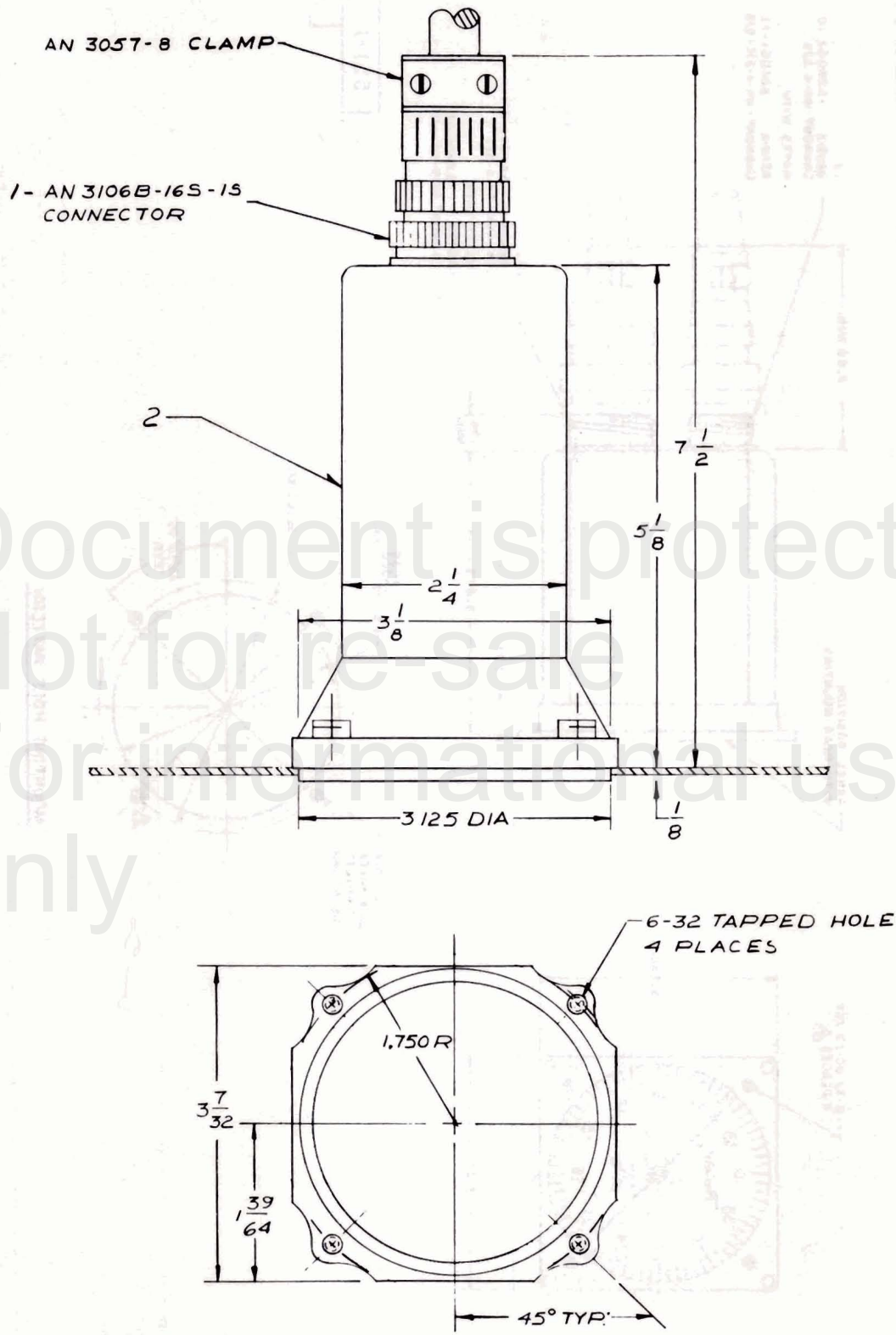


Figure 5. Model 551C Dual ADF Indicator, Outline Dimensions

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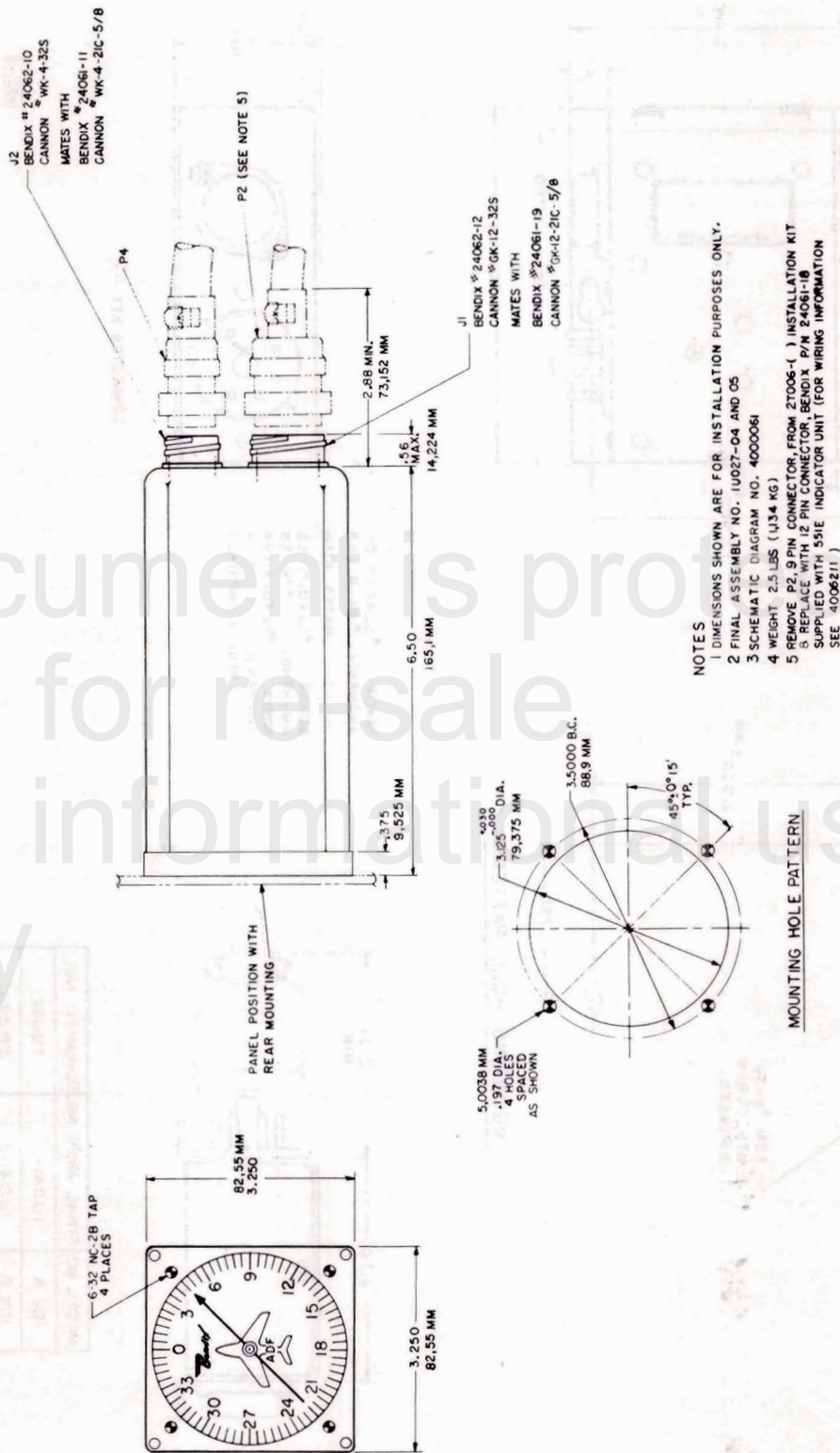


Figure 6. Model 551E Servo Amplifier-Indicator, Outline Dimensions

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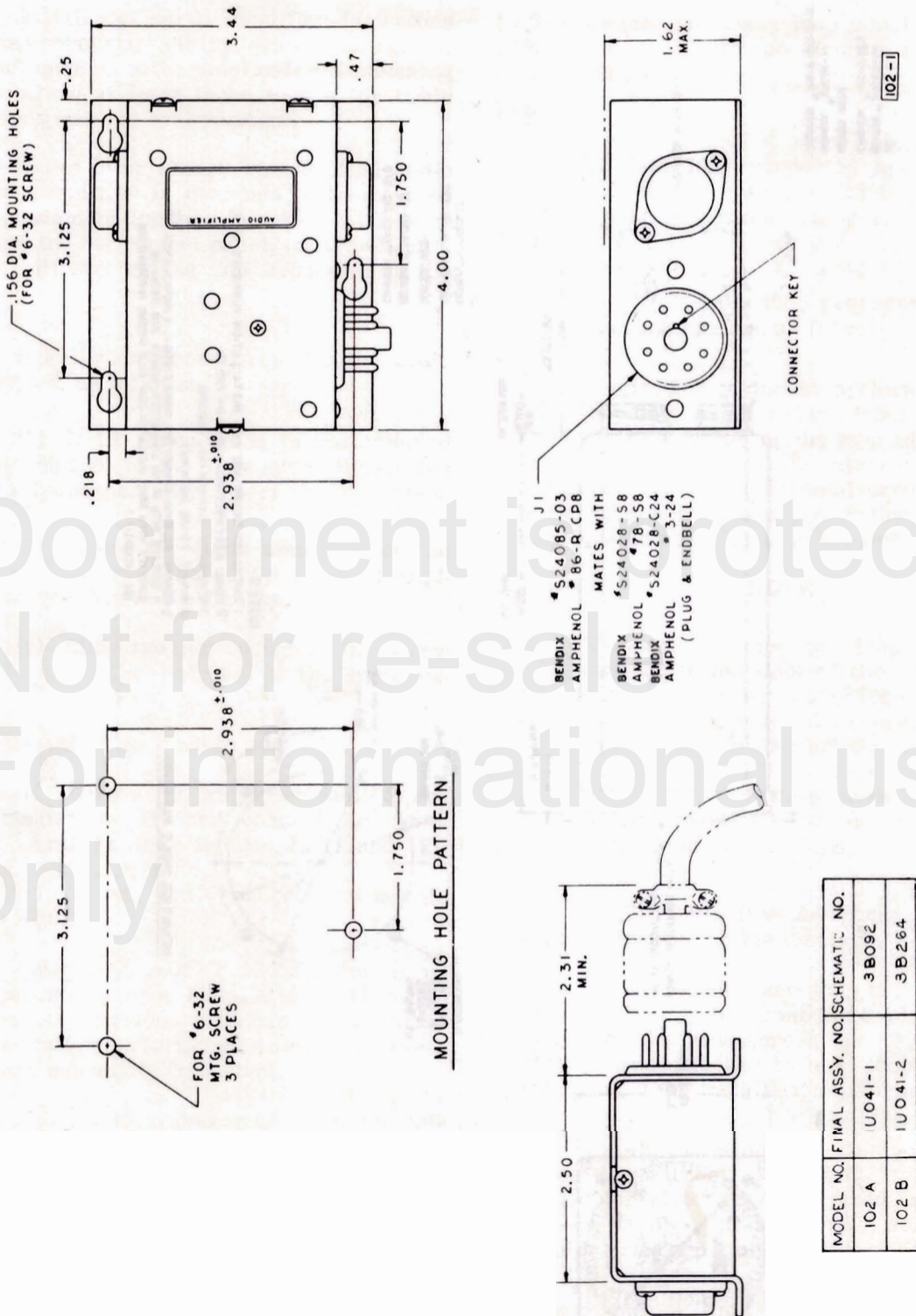
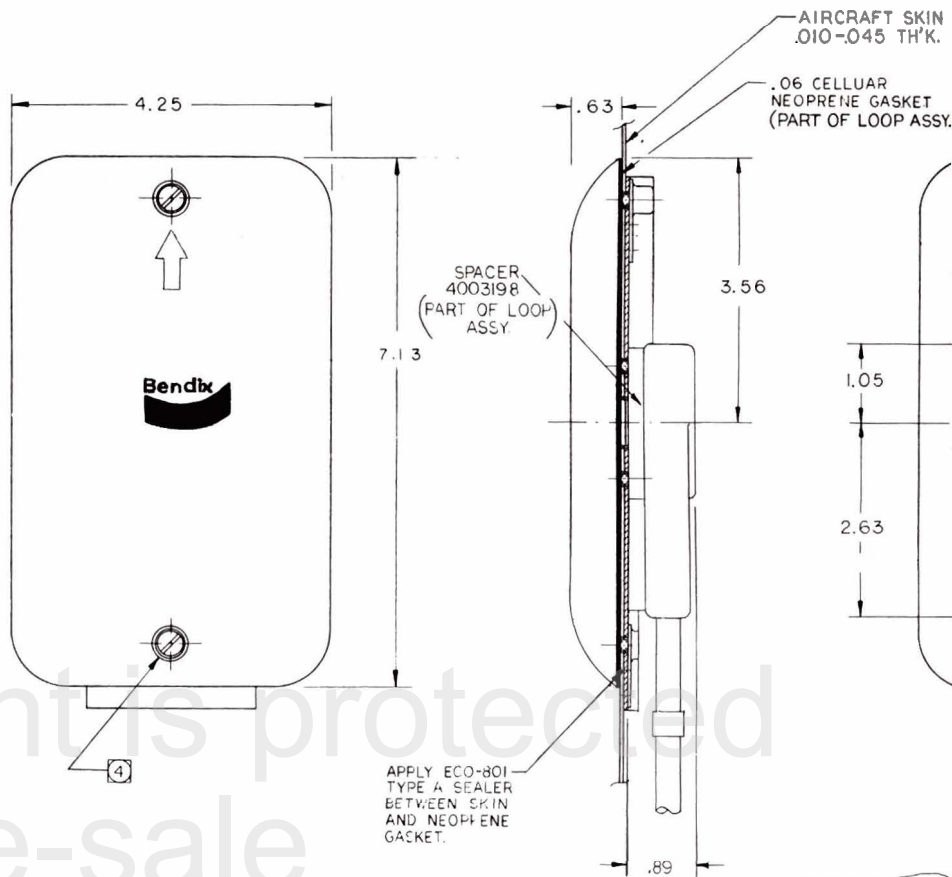


Figure 7. Model 102A/B Audio Amplifier, Outline Dimensions

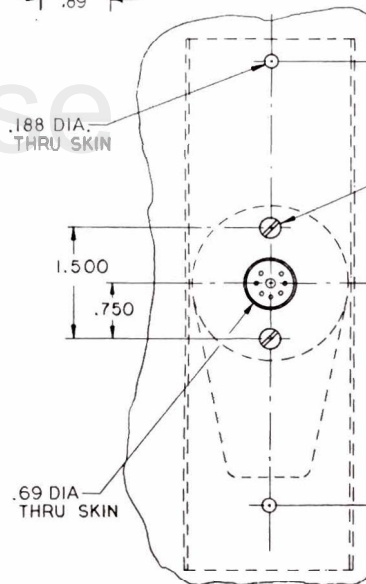
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- ⑥ TOP SURFACE OF CABLE CONNECTOR MUST NOT PROTRUDE BEYOND OUTSIDE SURFACE OF AIRCRAFT SKIN AND MUST NOT BE MORE THAN .080 BENEATH OUTSIDE SURFACE OF AIRCRAFT SKIN. SHIM CONNECTOR AS REQ'D.
- 5. CONNECTOR & LOOP CABLE AND DOUBLER PLATE NOT INCLUDED AS PART OF MODEL 2321E AND ARE SHOWN FOR REF. ONLY.
- ④ MOUNT LOOP TO AIRCRAFT WITH (2) *8-32 BINDER HEAD SCREWS WITH FLAT WASHERS PARALLEL TO LONGITUDINAL AXIS.
- 3. FOR SCHEMATIC DWG. SEE 716164.
- 2. FOR ASSEMBLY DWG. SEE 715730.
- 1. DIMENSIONS SHOWN FOR INSTALLATION PURPOSES ONLY.

NOTES:



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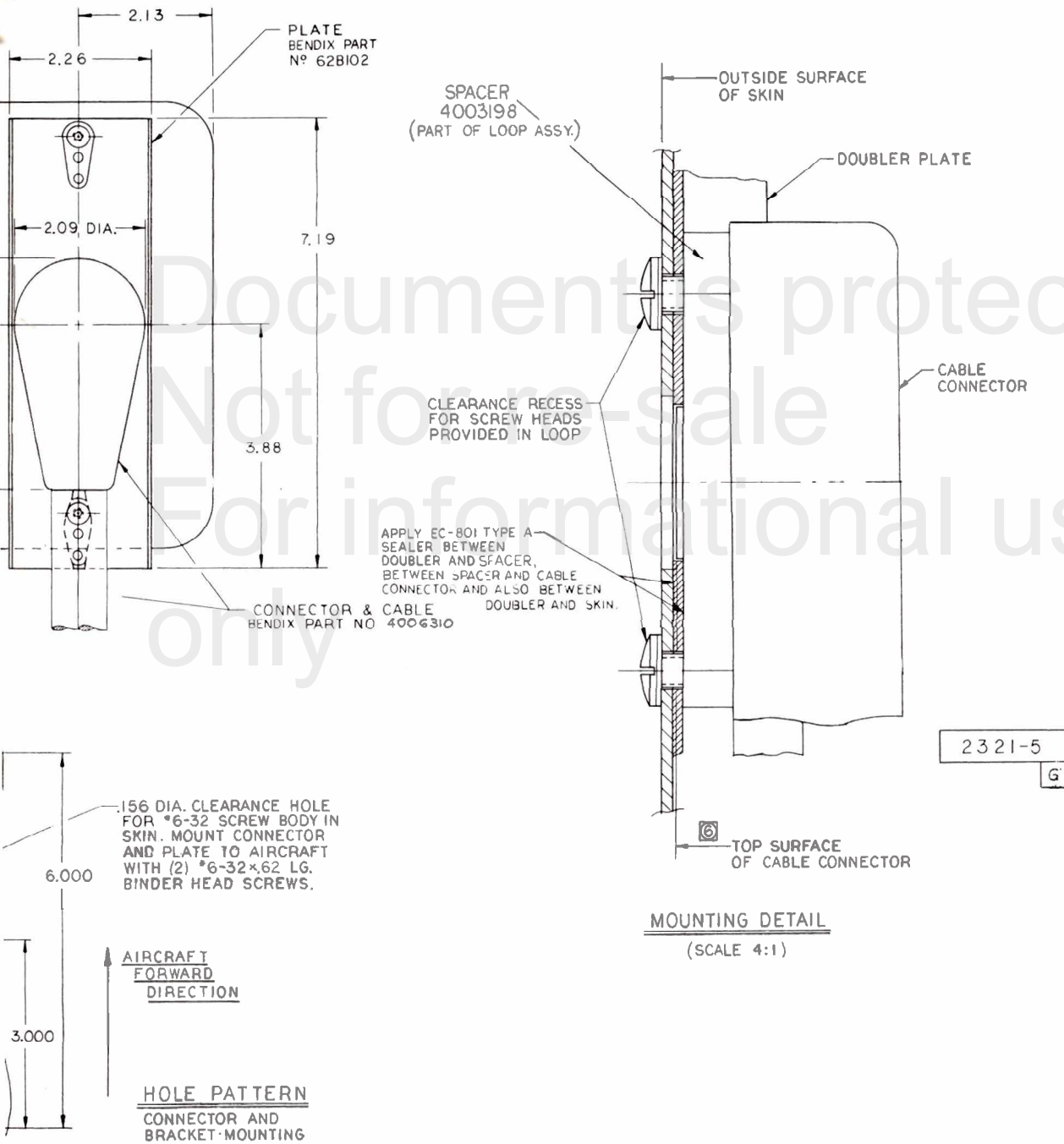


Figure 8. Model 2321E Fixed Loop Antenna, Outline Dimensions

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-99 HOLE SCHEDULE	
HOLE QTY	DESCRIPTION
A 1	.625 DIA. THRU
B 2	.156 DIA. THRU
C 2	.188 DIA. THRU
D 4	.098 ±.005 DIA. THRU C'SINK FAR-SIDE 100° x .190 ±.010 DIA.

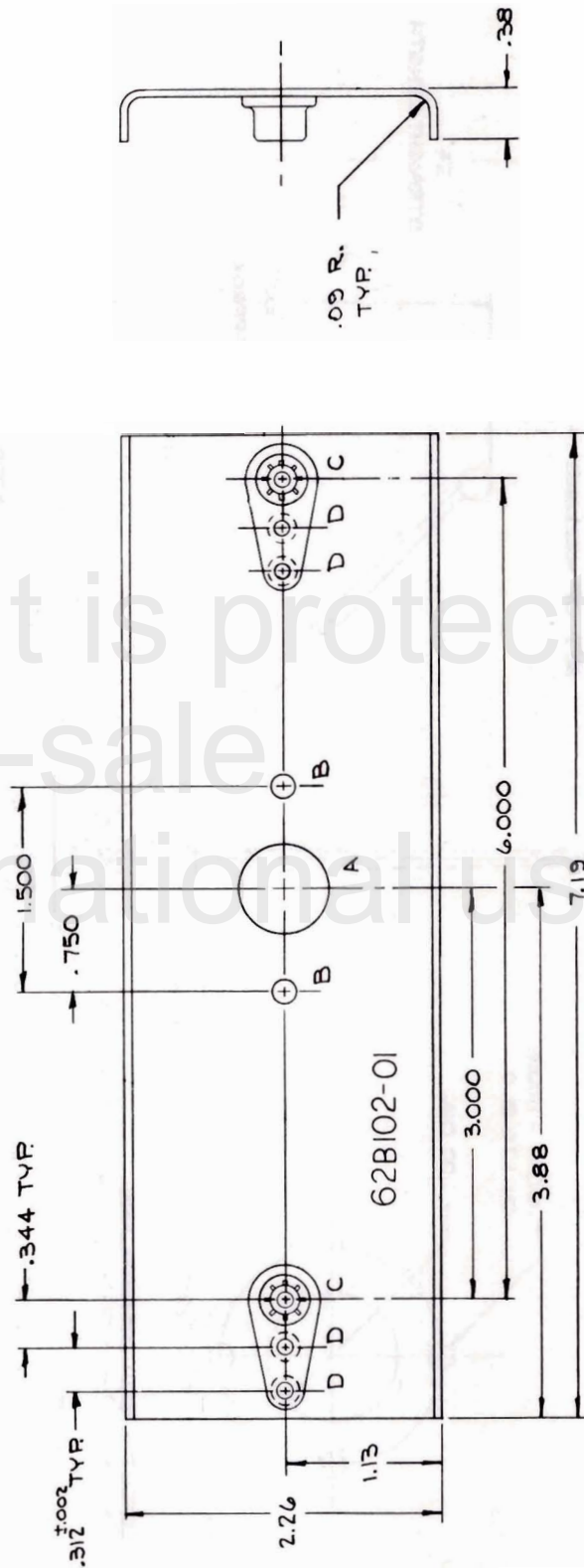


Figure 9. Doubler Plate, Loop Mounting Installation

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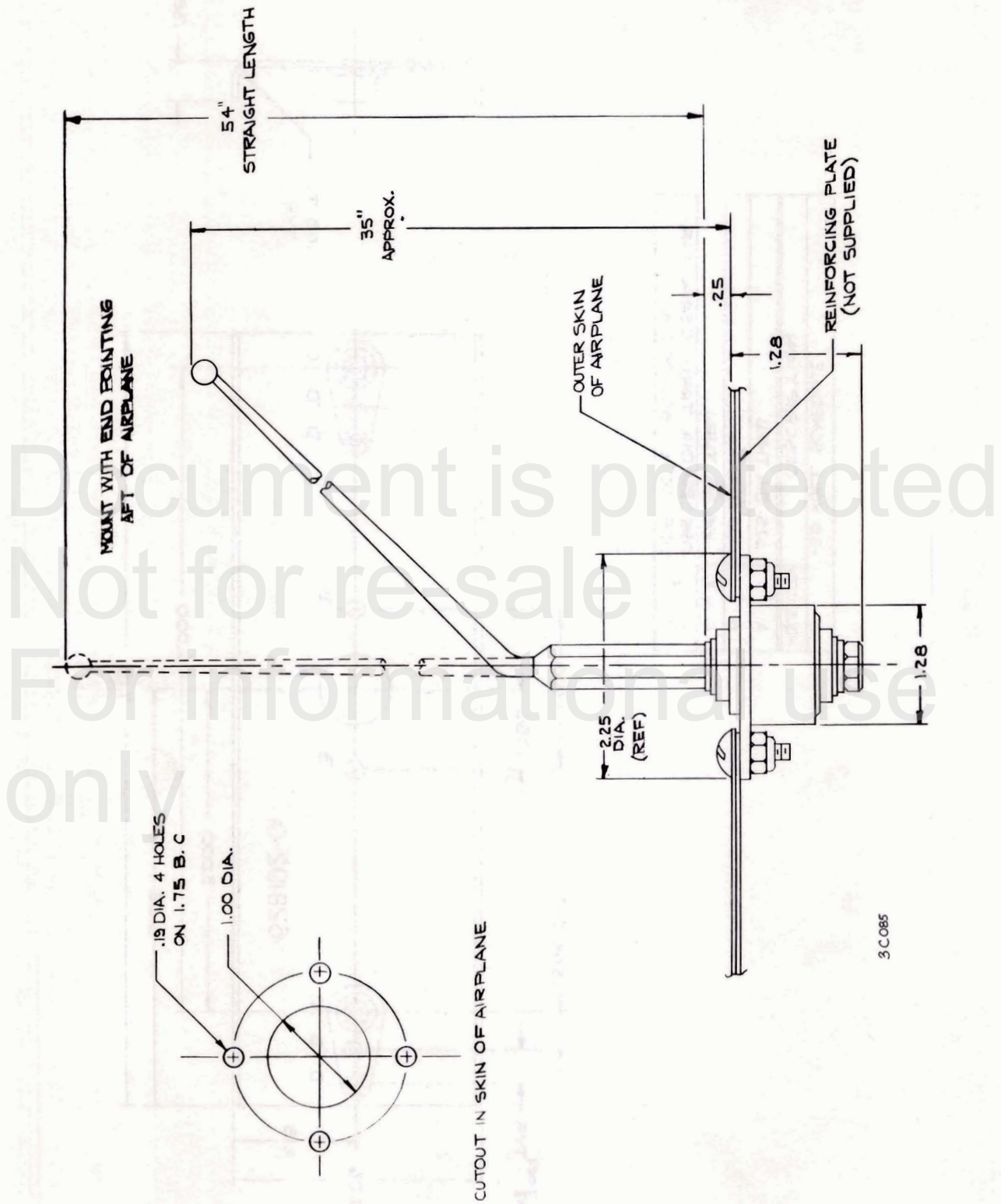
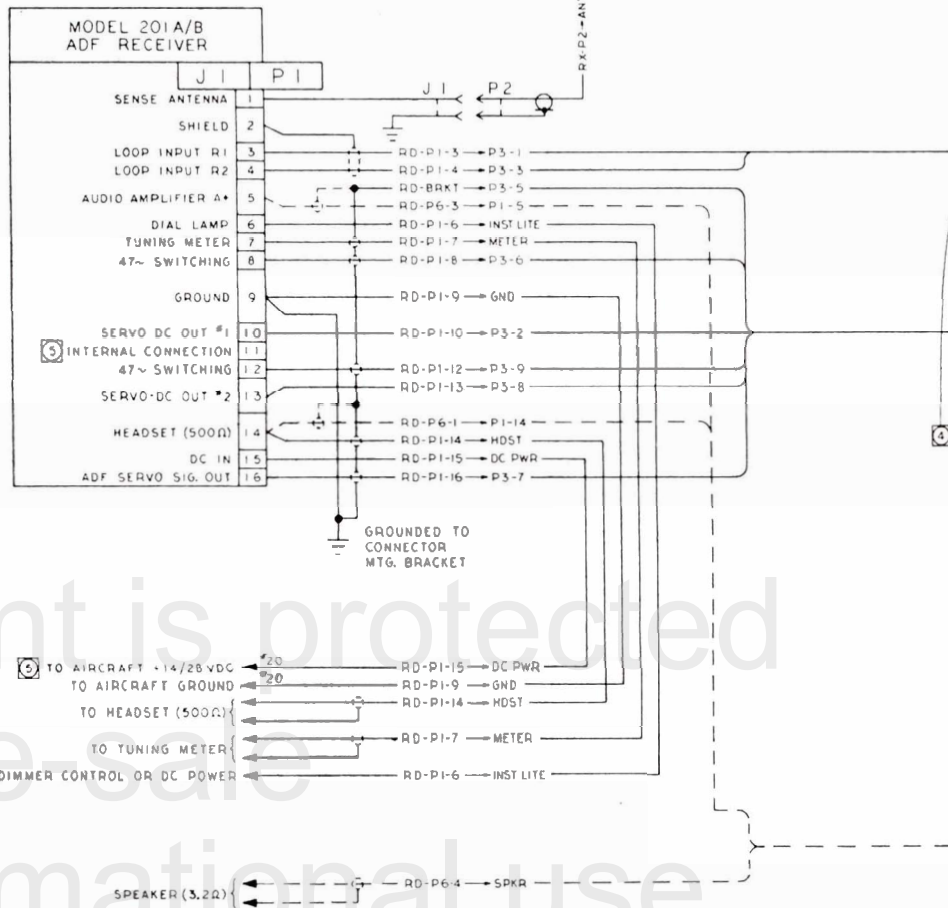


Figure 10. Sense Whip Antenna 2V008

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UNIT #1



3D045 K

8 MODEL 551A SERVO AMPLIFIER INDICATOR FOR INSTRUMENT PANEL MOUNTING.
MODEL 551B REMOTE SERVO AMPLIFIER: FOR REMOTE MOUNTING.
MAY BE USED TO DRIVE INSTRUMENT PANEL MOUNTED INDICATORS.

7 SINE WAVE GENERATOR IS RECOMMENDED. (14V), 102B(28V)

6 AUDIO AMPLIFIER, MODEL 102A (14V), 102B (28V)

5 FOR EMERGENCY OPERATION THIS UNIT MAY BE CONNECTED TO DRY CELL BATTERIES. SEE 30081 FOR CONNECTIONS.

4 TOTAL LENGTH OF BOTH CABLES MUST PROVIDE A CAPACITANCE OF 330UF ± 15 UF.

3. WHEN THE FIXED LOOP IS BOTTOM MOUNTED, CONNECTIONS 1 & 2 ARE REVERSED AT P4. WHEN THE SENSE ANTENNA IS BOTTOM MOUNTED, CONNECTIONS 3 & 4 ARE REVERSED AT P1.

2. WIRING SHOWN IS FOR FIXED LOOP AND SENSE ANTENNA MOUNTED ON TOP OF AIRCRAFT.

1. ALL WIRES ARE #22 GAUGE.

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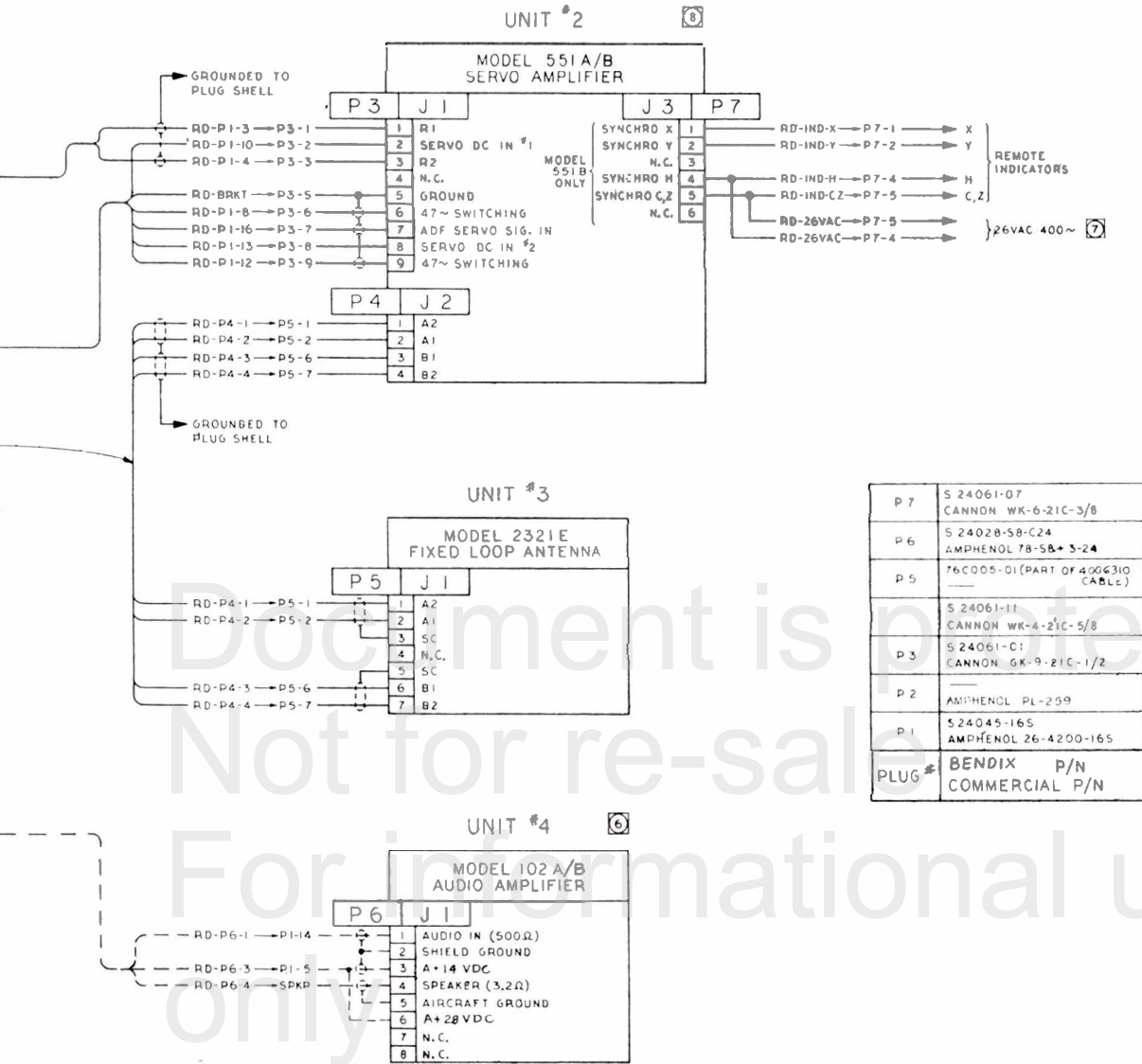


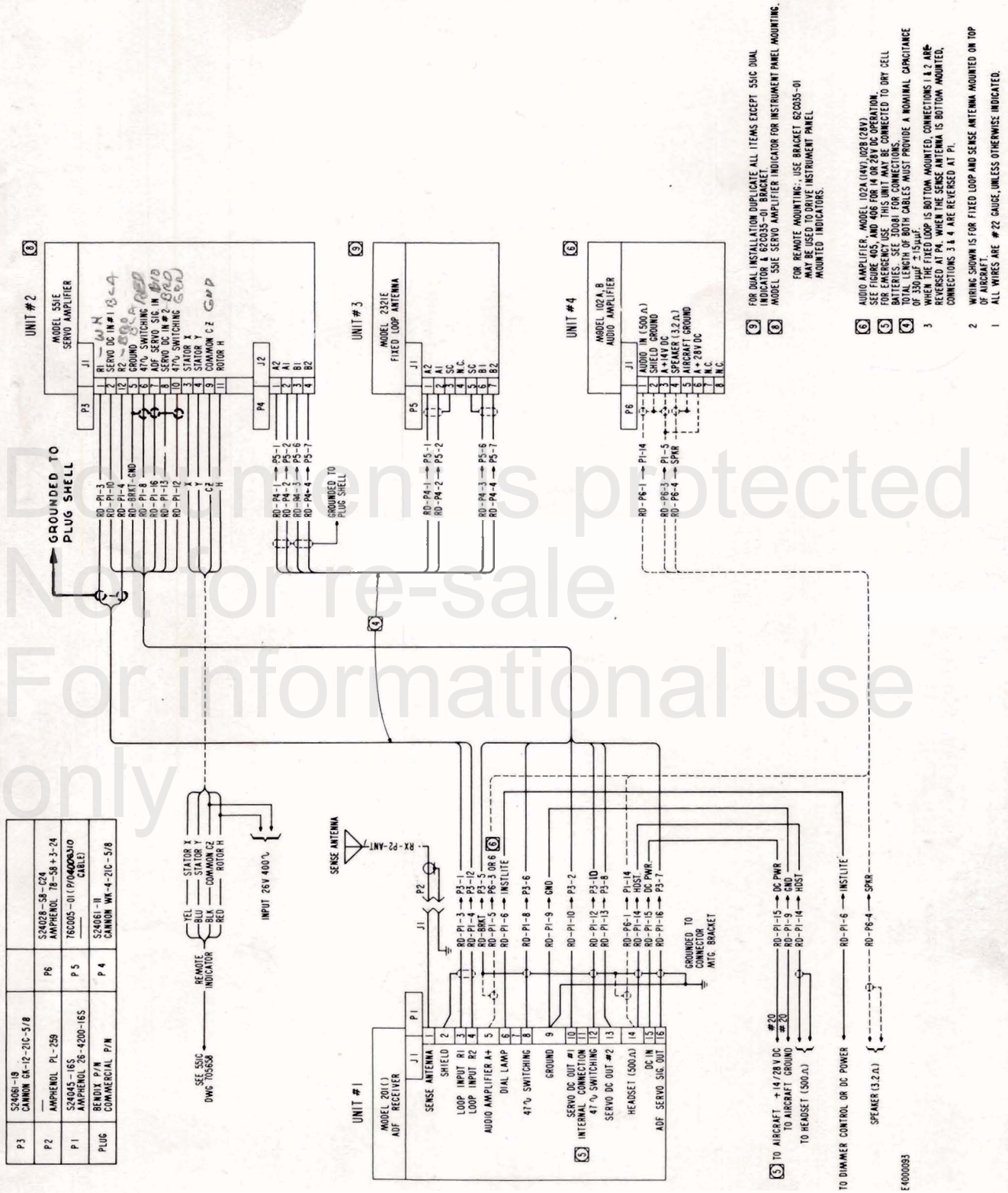
Figure 11. ADF-T-12C System Interconnecting Diagram with 551A

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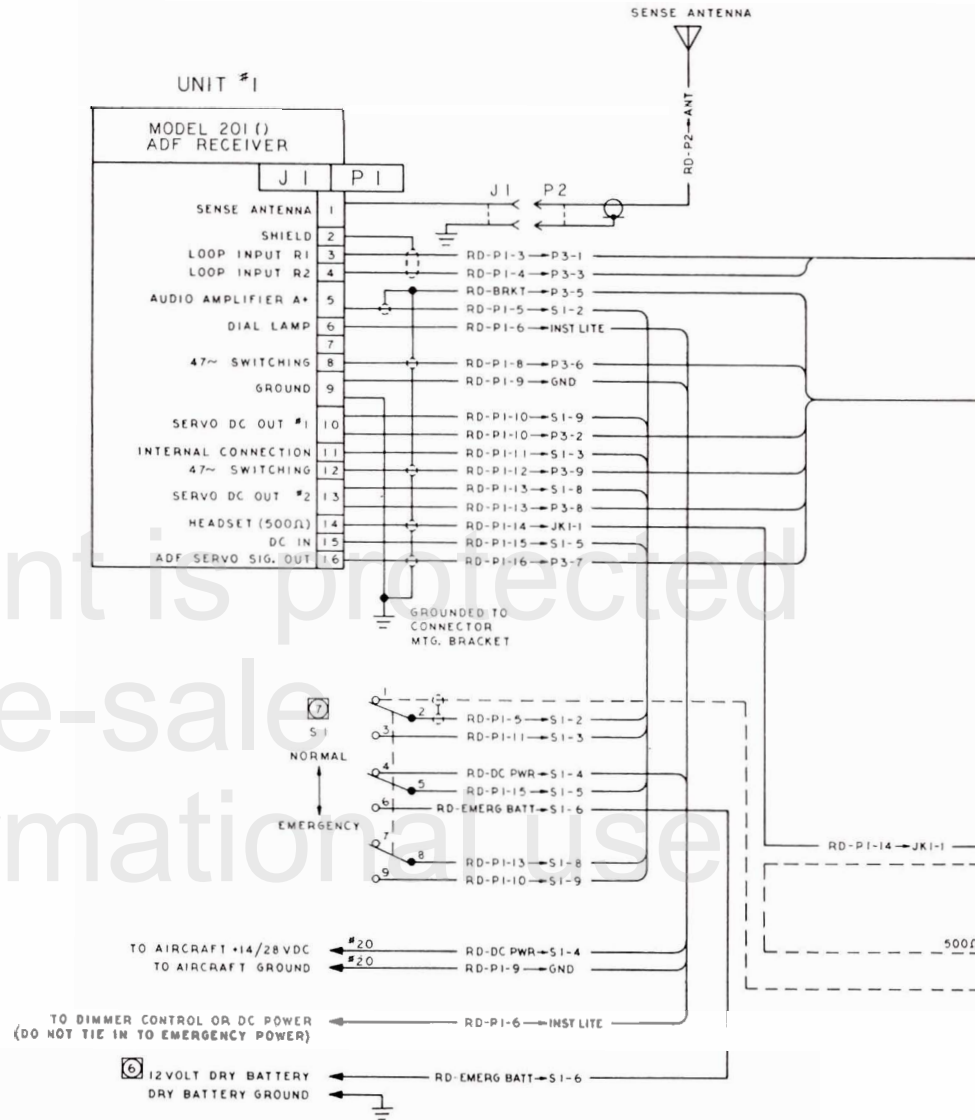
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- ⑦ S1 TO BE NON SHORTING TYPE.
- ⑥ TWO 6VOLT SERIES CONNECTED BATTERIES - EVEREADY #510S OR EQUIVALENT (APPROX. 3HRS LIFE ON ADF).
- 5. FOR STANDARD INTERCONNECTION REFER TO DWG. 3D045.
- ④ TOTAL LENGTH OF BOTH CABLES MUST PROVIDE A CAPACITANCE OF 350UF ± 15UF.
- 3. WHEN THE FIXED LOOP IS BOTTOM MOUNTED, CONNECTIONS 1 & 2 ARE REVERSED AT P4.
 WHEN THE SENSE ANTENNA IS BOTTOM MOUNTED, CONNECTIONS 3 & 4 ARE REVERSED AT P1.
- 2. WIRING SHOWN IS FOR FIXED LOOP AND SENSE ANTENNA MOUNTED ON TOP OF AIRCRAFT.
- 1. ALL WIRES ARE #22 GAUGE.

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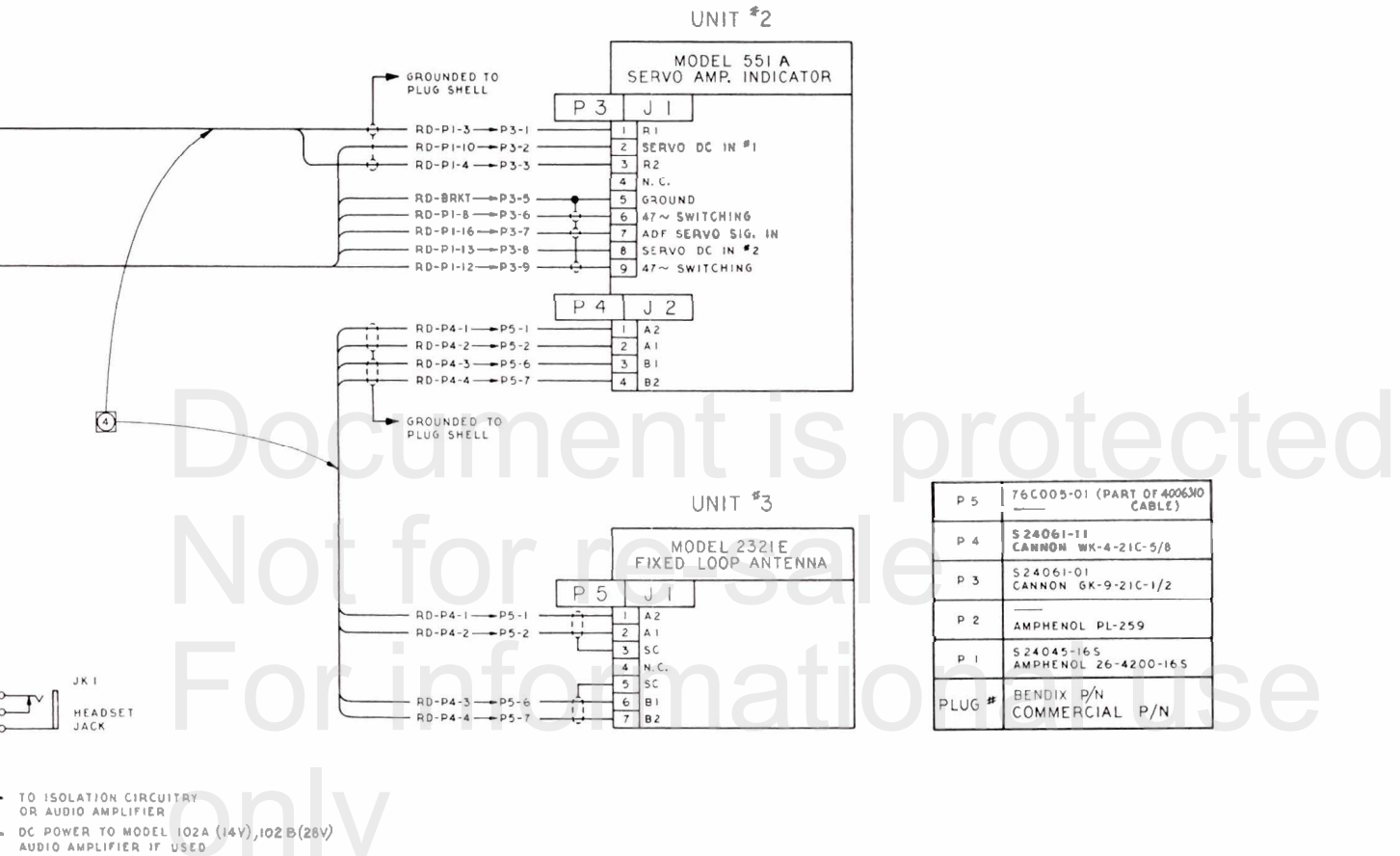


Figure 13. ADF-T-12C System, Emergency Battery Operation Data

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