AN 08-30APS10-2

HANDBOOK OF OPERATING INSTRUCTIONS

for

RADIO SET AN/APS-10

RESTRICTED

(For Official Use Only)

Approved 5 FEBRUARY 1945

Published under joint authority of the United States War and Navy Departments and the Air Council of the United Kingdom.

SECURITY NOTICE

FOR U. S. PERSONNEL: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibted by law. (AR 380-5) (ARTS 75½ & 76, U.S.N. REGS-1920.)

The information contained in restricted documents and the essential characteristics of restricted materiel will not be communicated to the public or to the press, but may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work.

FOR BRITISH PERSONNEL: For Official Use Only—Not to be communicated to anyone outside His Majesty's Service. Not to be published. The information given in this document is not to be communicated, either directly or indirectly, to the press or to any person not holding an official position in His Majesty's Service.

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line, to the left of the text on revised pages, indicates the extent of the revision. This line is omitted where more than 50 percent of the page is revised.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

AAF ACTIVITIES.—In accordance with T. O. No. 00-25-3, base Air Inspector, Technical, will submit requisitions (AAF Form 104B) to Commanding General, Fairfield Air Technical Service Command, Patterson Field, Fairfield, Ohio. Attention: Publications Distribution Branch.
NAVY ACTIVITIES.—Submit requests to the Chief, Bureau of Aeronautics, Navy Department, Washngton, D. C.
BRITISH ACTIVITIES.—Submit requirements on Form 294A, in duplicate, to the Air Publications and Forms Store, New College, Leadhall Lane, Harrogate, Yorkshire, England.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:-

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:-

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

★

Unsatisfactory Report

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54 listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

SAFETY NOTICE

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. ALTHOUGH THIS EQUIPMENT AND ITS ASSOCIATED HIGH-VOLTAGE POWER SUPPLIES INCORPORATE EVERY PRACTICAL SAFETY PRECAUTION, FOLLOW THESE SAFETY RULES.

1. Don't Tamper with Interlocks

Under no circumstances should any interlock switch be removed, short-circuited, or tampered with nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

2. Keep Away from Live Circuits

Do not reach into the interior of the equipment with the power line switches closed. Do not operate the equipment with side shields removed.

3. Don't Service or Adjust Equipment Alone

Never reach inside the cabinets for the purpose of servicing or making adjustments without the immediate presence or assistance of another person capable of rendering aid.

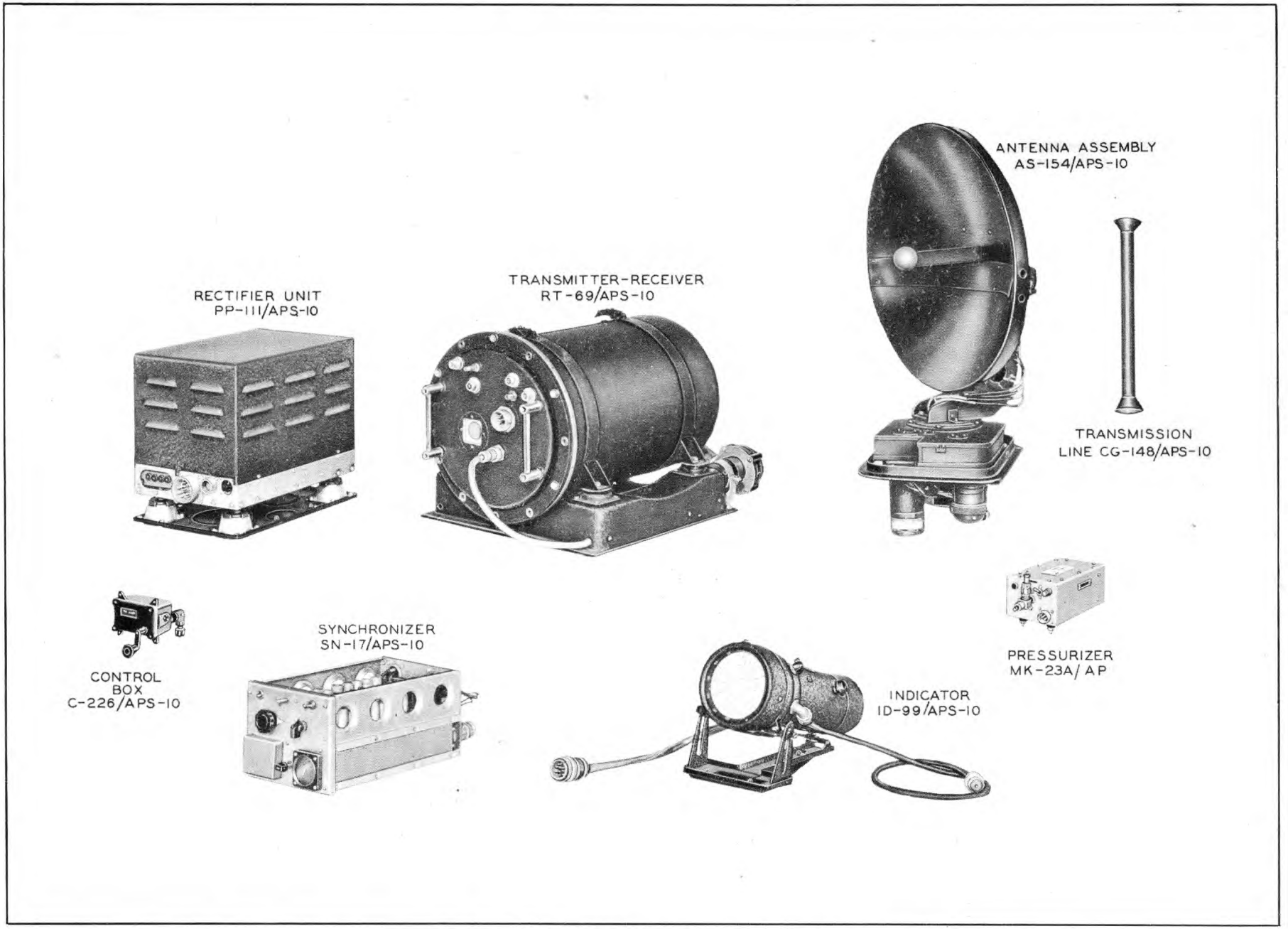


Figure 1-1. Radio Set AN/APS-10—Component Units

SECTION I
GENERAL DESCRIPTION

1. GENERAL.

Radio Set AN/APS-10 is airborne equipment designed to furnish general search and beacon information to the operator* as an aid to navigation. Major assemblies include: Antenna Assembly AS-154/APS-10, Indicator ID-99/APS-10, Rectifier Power Unit PP-111/APS-10 and Transmitter-Receiver RT-69/APS-10. The a-c input power required is approximately 385 watts, ranging from 110 to 120 volts. The equipment will operate with a power frequency of between 380 and 1600 cycles. Approximately 125 watts of d-c power is required at 24 to 29 volts.

* Duplicate information may be furnished to the pilot, if desired, by the addition of a second indicator.

2. EQUIPMENT SUPPLIED.

The following table lists equipment supplied with Radio Set AN/APS-10. Approximate weights include plugs, separable mounting bases, tubes, crystals, and other removable parts.

Quantity per Equipment	*Name of Unit*	*Army Type Designation*	*Overall Dimensions (Inches)*	*Weight (Pounds)*	*Fig. No.*
1	Antenna Assembly	AS-154/APS-10	28 x 18 x 18	21.	1-3, 1-7, 1-8
1	Indicator (with)	ID-99/APS-10	6¾ x 8 x 13½	7.8	1-6
1	Mounting	MT-294/APS-10	½ x 7 x 12	0.3	
1	Rectifier Power Unit (with)	PP-111/APS-10	11½ x 9 x 12	22.4	1-5
1	Mounting	MT-295/APS-10	½ x 9 x 12	0.4	
1	Synchronizer (with)	SN-17/APS-10	9⅝ x 6⅝ x 14⅜	12.8	1-4
1	Mounting	MT-293/APS-10	1⅞ x 7½ x 12⅝	0.8	
1	Transmitter-Receiver (with)	RT-69/APS-10	12⅝ x 12⅝ x 20$^{9}/_{16}$	46.0	1-4
1	Mounting	MT-292/APS-10	13½ x 15$^{11}/_{16}$ x 19	4.0	
1	Control Box	C-226/APS-10	3⅝ x 5⅛ x 4½	2.5	1-12
1	Control Shaft	MX-390/APS-10			
1	Visor	MX-238/APS-10			
1	Flexible Transmission Line		18 (long)	1.0	1-1
1	Flexible Transmission Line		24 (long)	1.25	1-1
1	Rigid Transmission Line	CG-148/APS-10	60 (long)	2.66	1-1
1	Transmission Line Coupling Flange			0.13	
2	Transmission Line Coupling Choke			0.15	

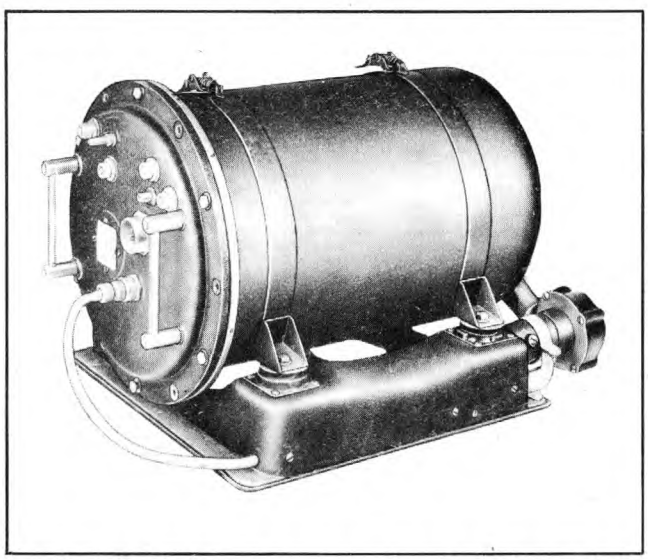


Figure 1-2. Transmitter-Receiver RT-69/APS-10

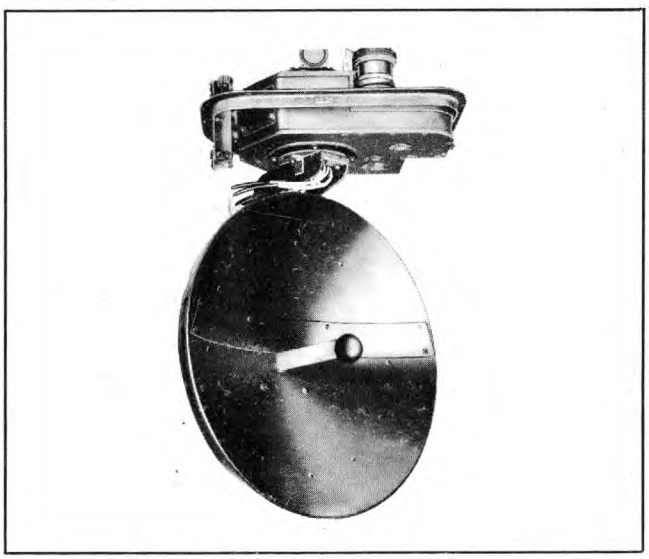


Figure 1-3. Antenna Assembly AS-154/APS-10—Showing Concave Side of Parabolic Reflector

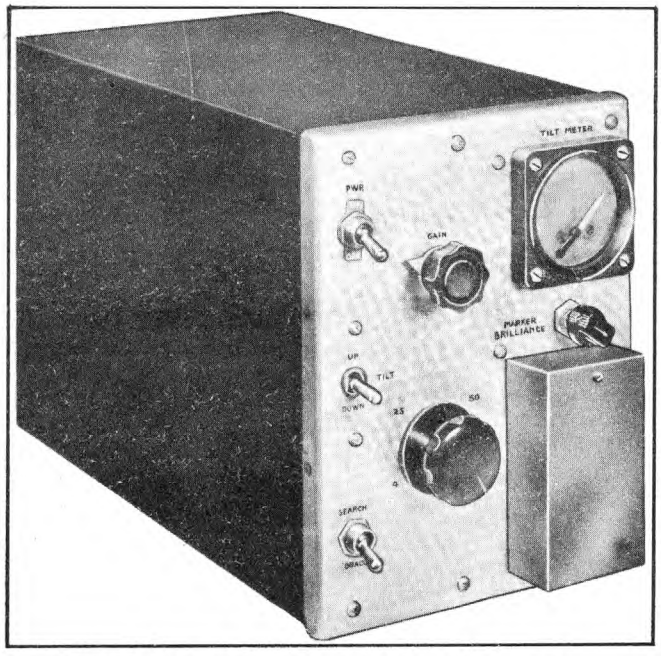


Figure 1-4. Synchronizer SN-17/APS-10

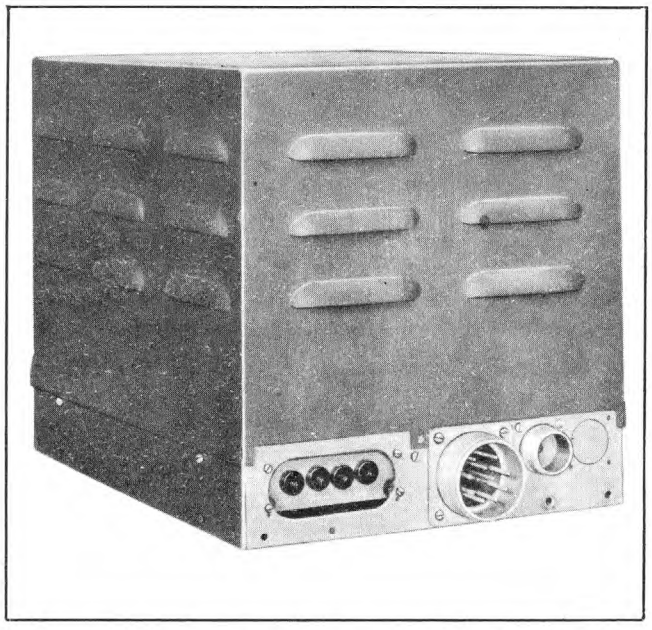


Figure 1-5. Rectifier Power Unit PP-111/APS-10

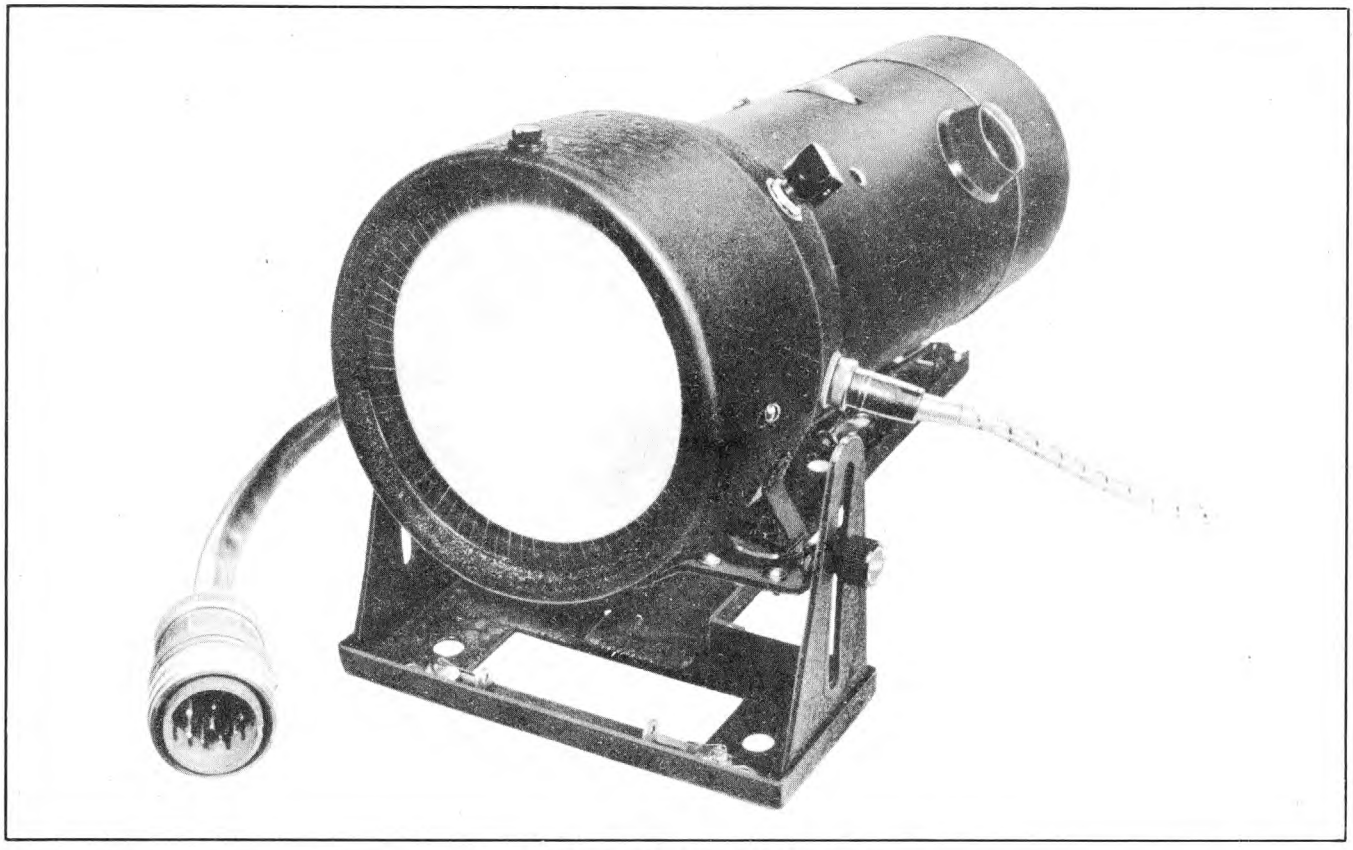


Figure 1-6. Indicator ID-99/APS-10

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

a. GENERAL.

Quantity per Equipment	*Name of Unit*	*Army-Navy Type Designation*	*Required Characteristics*
1	Coupling Nut	AN3054-12	For AN3106-20-14S connector
8	Coupling Nut	AN3054-16	For AN3106-24-( ) and AN3106-28-( ) series of connectors
1	Plug	AN3100-24-20S	To be used with three No. 16 and five No. 20 wires and two Radio Frequency Cables RG-59/U
1	Plug	AN3106-20-14S	To be used with three No. 16 and two No. 12 wires
1	Plug	AN3106-24-20P	To be used with three No. 16 and five No. 20 wires and two Radio Frequency Cables RG-59/U
1	Plug	AN3106-24-21P	To be used with three No. 16 and four No. 20 wires and one Radio Frequency Cable RG-59/U
1	Plug	AN3106-24-21S	To be used with three No. 16 and four No. 20 wires and one Radio Frequency Cable RG-59/U
1	Plug	AN3106-28-8P	To be used with six No. 16 and five No. 20 wires
1	Plug	AN3106-28-8S	To be used with six No. 16 and five No. 20 wires
1	Plug	AN3106-28-9P	To be used with two No. 16 and eight No. 20 wires
1	Plug	AN3106-28-9S	To be used with two No. 16 and eight No. 20 wires
2	Plug Radio Frequency	UG-85/U	To be used with Radio Frequency Cable RG-59/U
1	Flexible Conduit Ferrule	AN3052-8	For AN3106-20-14S connector and ½-inch flexible conduit
1	Flexible Conduit Ferrule	AN3052-10	For AN3106-24-( ) and AN3106-28-( ) connectors and ⅝-inch flexible conduit
Bulk Supply	⅝-inch Flexible Conduit	ANWWC-561	
Bulk Supply	½-inch Flexible Conduit	AN33-C-561	
Bulk Supply	Wire	No. 12	Stranded No. 12 wire with thermo-plastic insulation
Bulk Supply	Wire	No. 16	Stranded No. 16 wire with thermo-plastic insulation
Bulk Supply	Wire	No. 20	Stranded No. 20 wire with thermo-plastic insulation
Bulk Supply	Wire	No. 18	Stranded No. 18 wire with thermo-plastic insulation
Bulk Supply	Radio Frequency Cable	RG-59/U	
2	H-V Connectors	UG-194/U UG-195/U	Dismantle, spring-loaded, 4-kv connector
Bulk Supply	H-V Cable	or UG-184/U UG-193/U	4-kv shielded cable
1	Pressurizer Kit	MK-23/AP	
1	Power Unit	PU-16 or similar	115 volts, 400 to 1600 cycles
1	Control Box	C-226/APS-10	

b. HARDWARE.—The following hardware is required to mount units of Radio Set AN/APS-10 in the airplane.

Note

The hardware will vary both in kind and quantity with different installations. The screw lengths given below will be satisfactory for mounting on material having a maximum thickness of 0.25 inch. For greater thickness, add the thickness of the mounting plate, minus 0.25 inch, to the length of the screw.

Quantity per Unit	*Name*	*Size*	*Unit*
6	Roundhead Machine Screws	#8/32 x 3/4"	Synchronizer
6	Lock Washers	#8	Synchronizer
6	Hex Nuts	#8	Synchronizer
6	Roundhead Machine Screws	1/4/20 x 1"	Transmitter-Receiver
6	Lock Washers	1/4/20	Transmitter-Receiver
6	Hex Nuts	1/4"	Transmitter-Receiver
3	Roundhead Machine Screws	#10/24 or #10/ x 3/4"	Indicator
3	Lock Washers	#10	Indicator
3	Hex Nuts	#10/24 or #10/32	Indicator
6	Roundhead Machine Screws	#10/24 or #10/32 x 3/4"	Rectifier Power Unit
6	Lock Washers	#10	Rectifier Power Unit
6	Hex Nuts	#10/24 or #10/32 x 3/4"	Rectifier Power Unit
4	Roundhead Machine Screws	0.250 x 2"	Antenna Assembly
4	Lock Washers	AN960-416	Antenna Assembly
4	Hex Nuts	0.250	Antenna Assembly
4	Fillisterhead Screws	#8 x 3/4"	Trim Indicator
4	Lock Washers	AN960-8L	Trim Indicator
4	Hex Nuts	#8	Trim Indicator

c. TEST EQUIPMENT.

Quantity per Equipment	*Name of Unit*	*Army-Navy Type Designation*
1	Test Set	TS-62/AP
1	Oscilloscope	TS-34/AP
1	Pressurizing Kit	MK-20/UP
1	Signal Generator	TS-35/AP
1	Voltmeter	IS-185
1	Voltmeter	IS-189

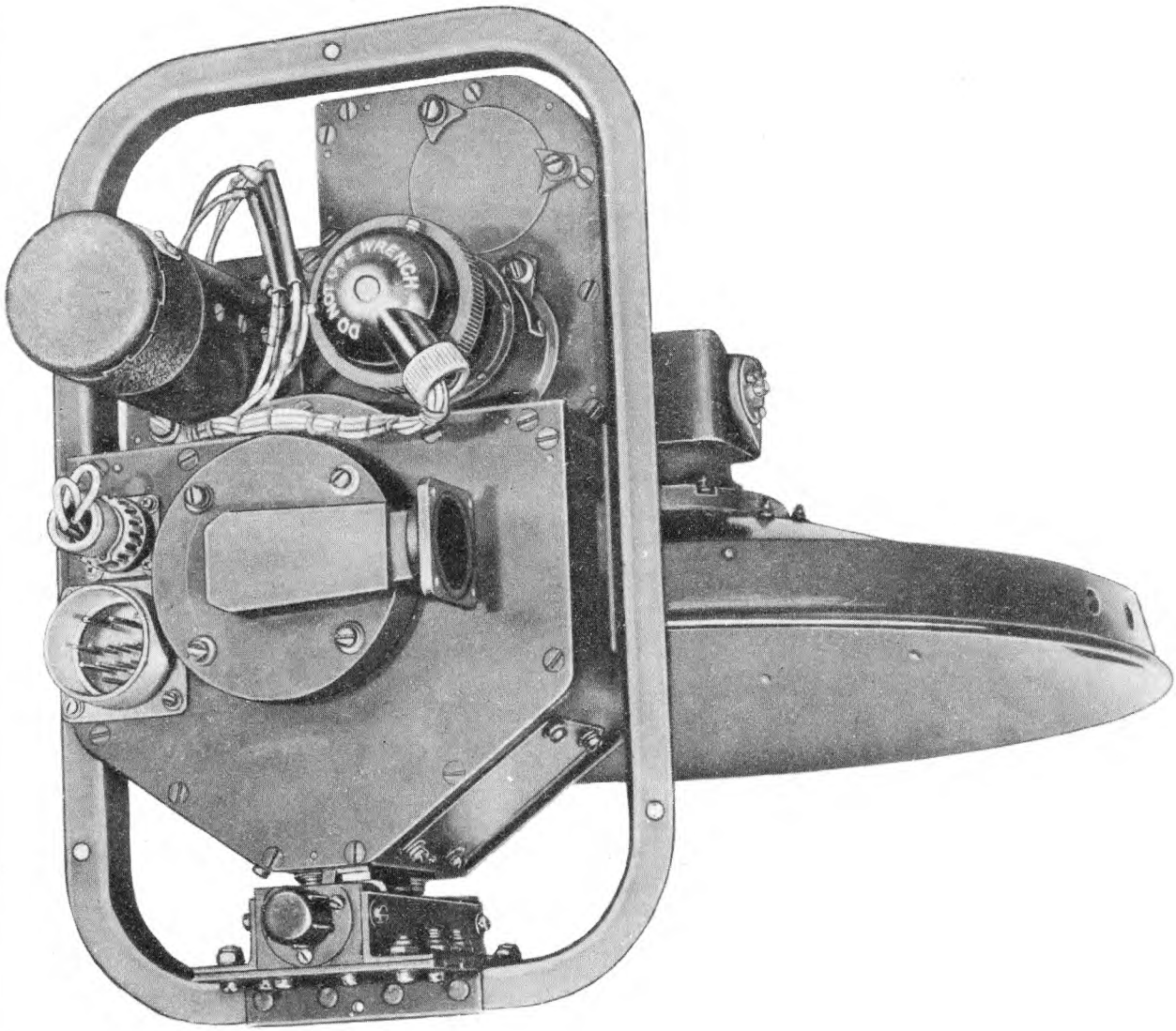


Figure 1-7. Antenna Assembly AS-154/APS-10—Top View

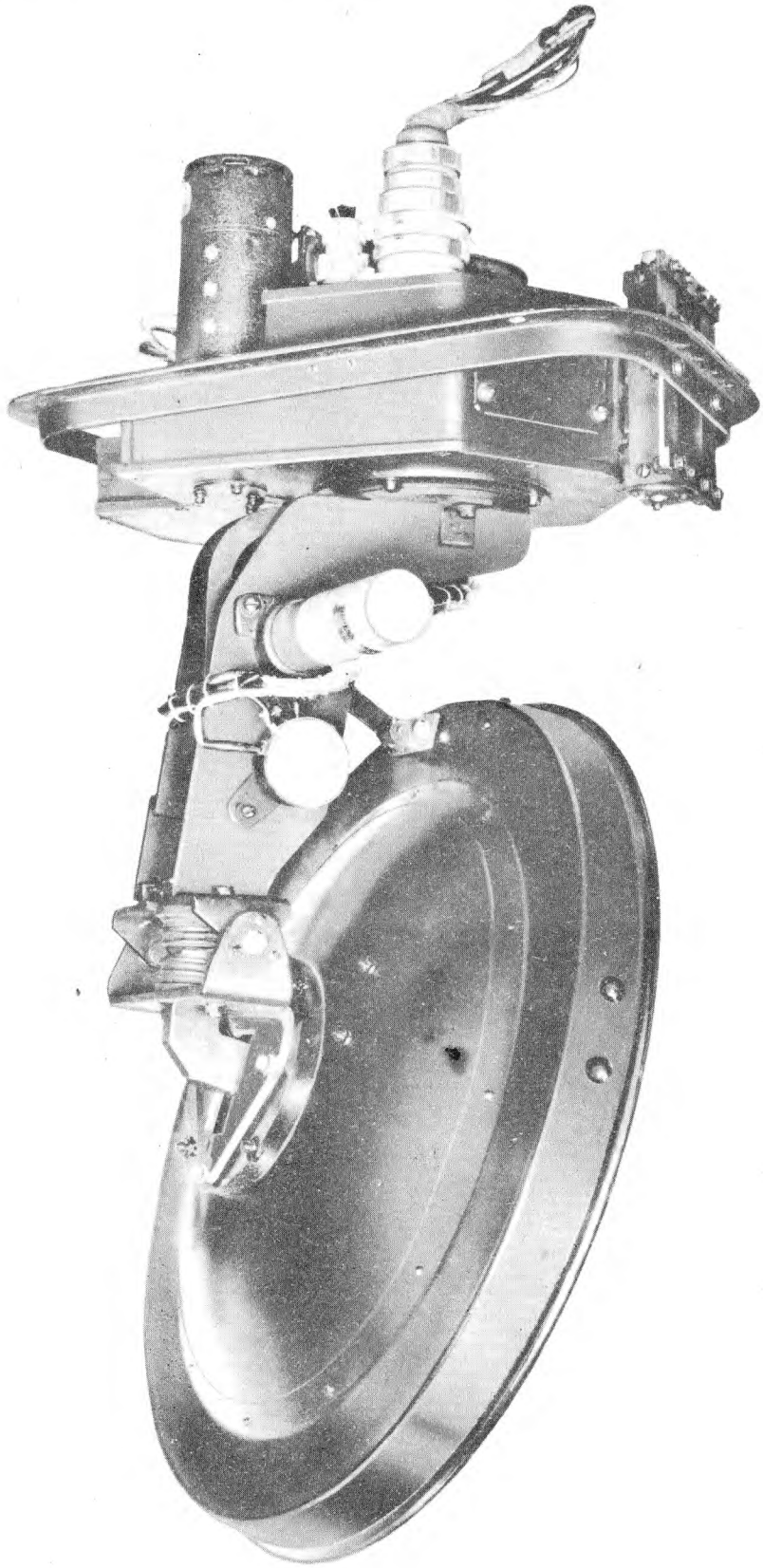


Figure 1-8. Antenna Assembly AS-154/APS-10—Showing Convex Side of Parabolic Reflector and Wave Guide

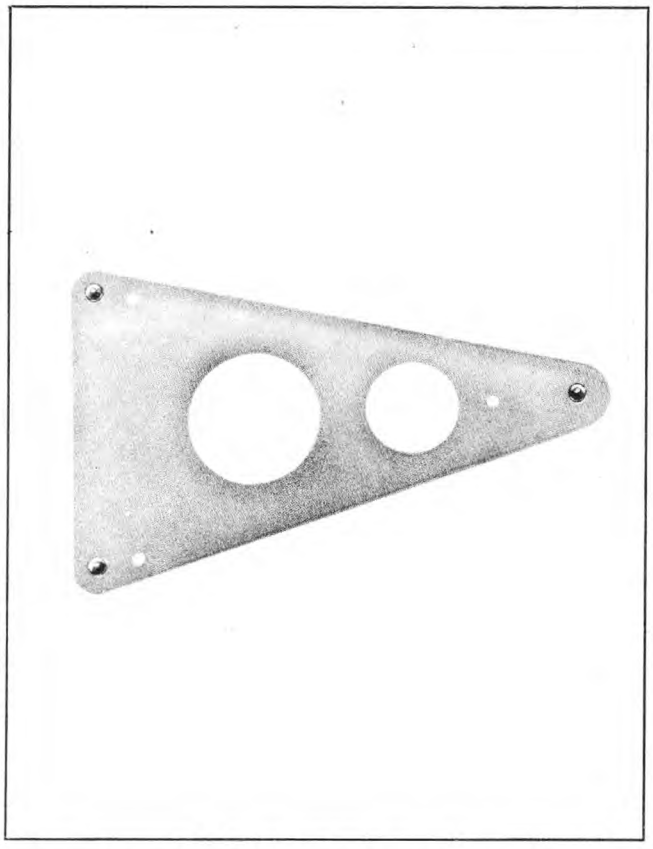


Figure 1-9. Mounting MT-294/APS-10

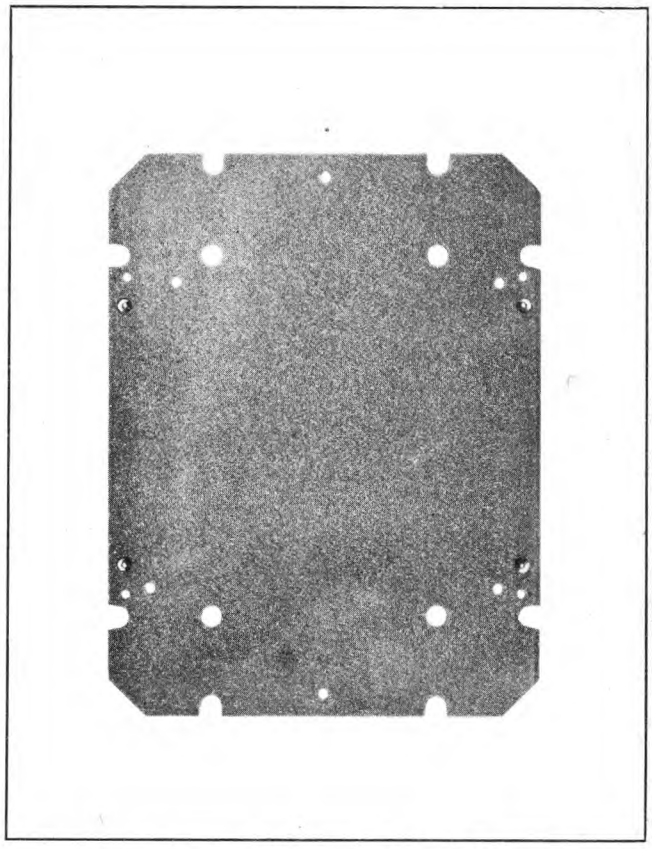


Figure 1-10. Mounting MT-295/APS-10

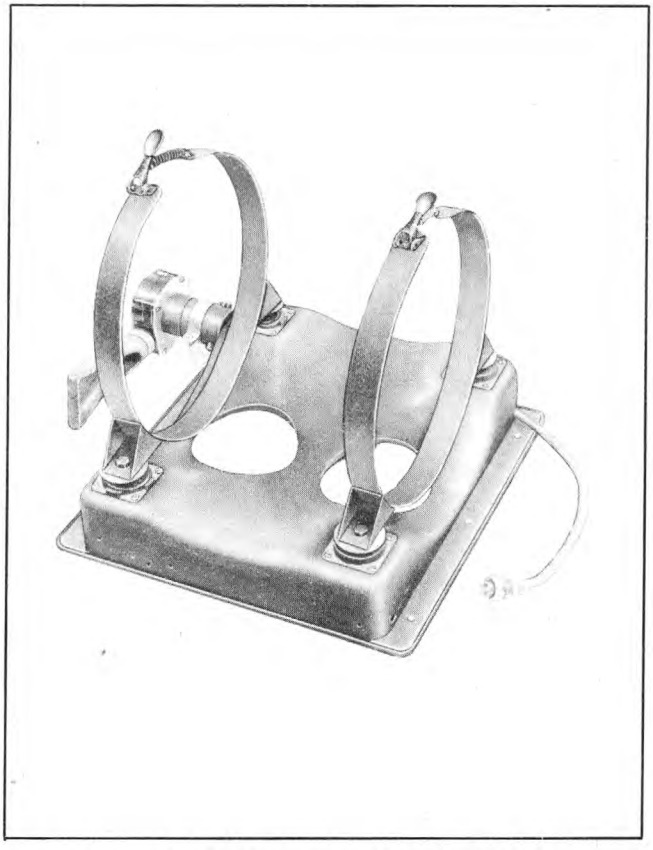


Figure 1-11. Mounting MT-292/APS-10

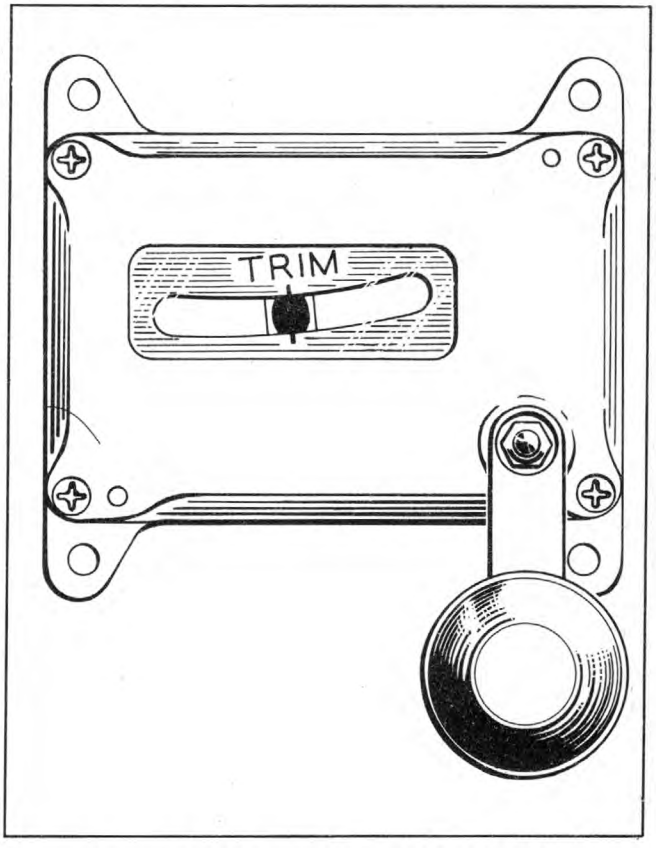


Figure 1-12. Control Box C-226/APS-10

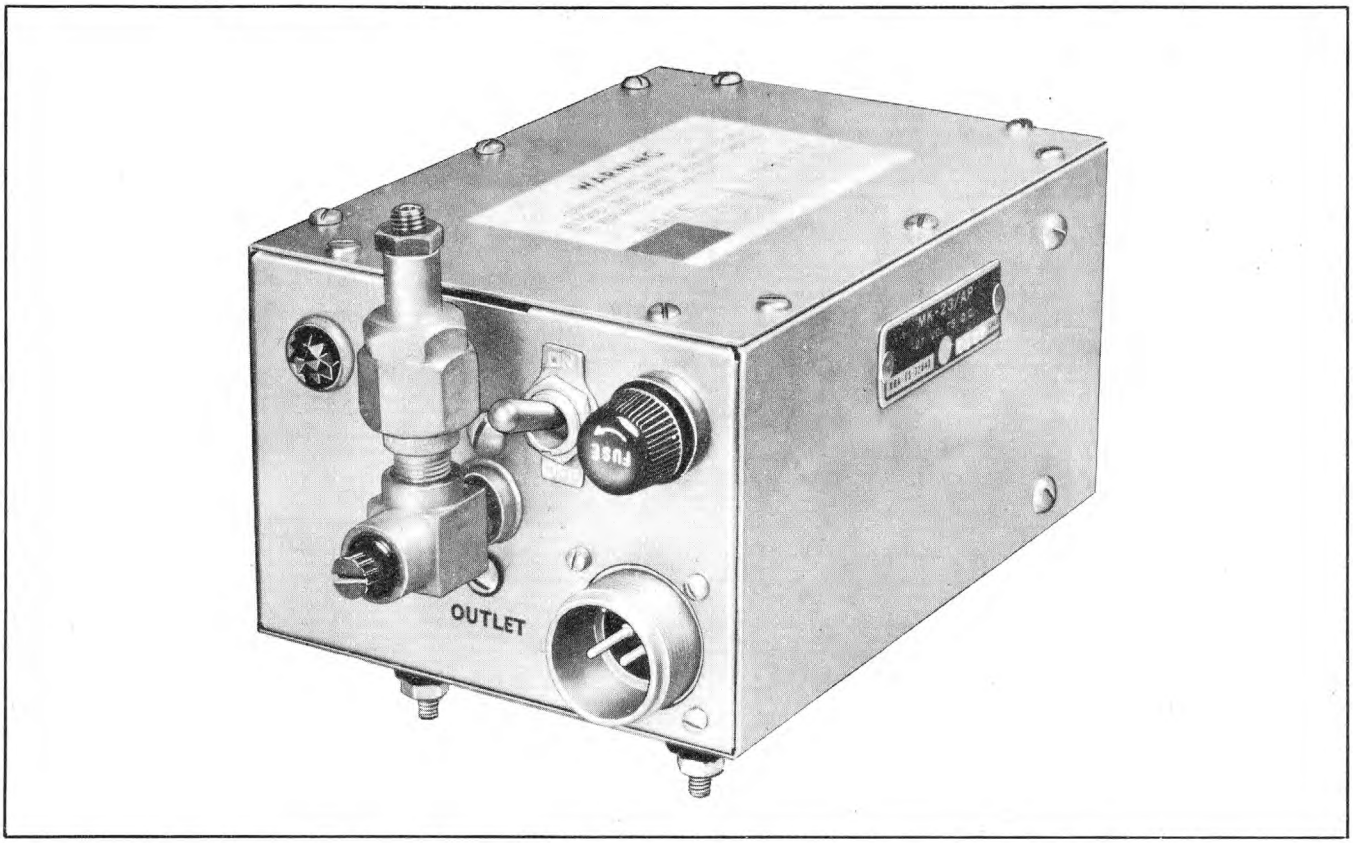


Figure 1-13. Pressurizing Kit MK-23A/AP

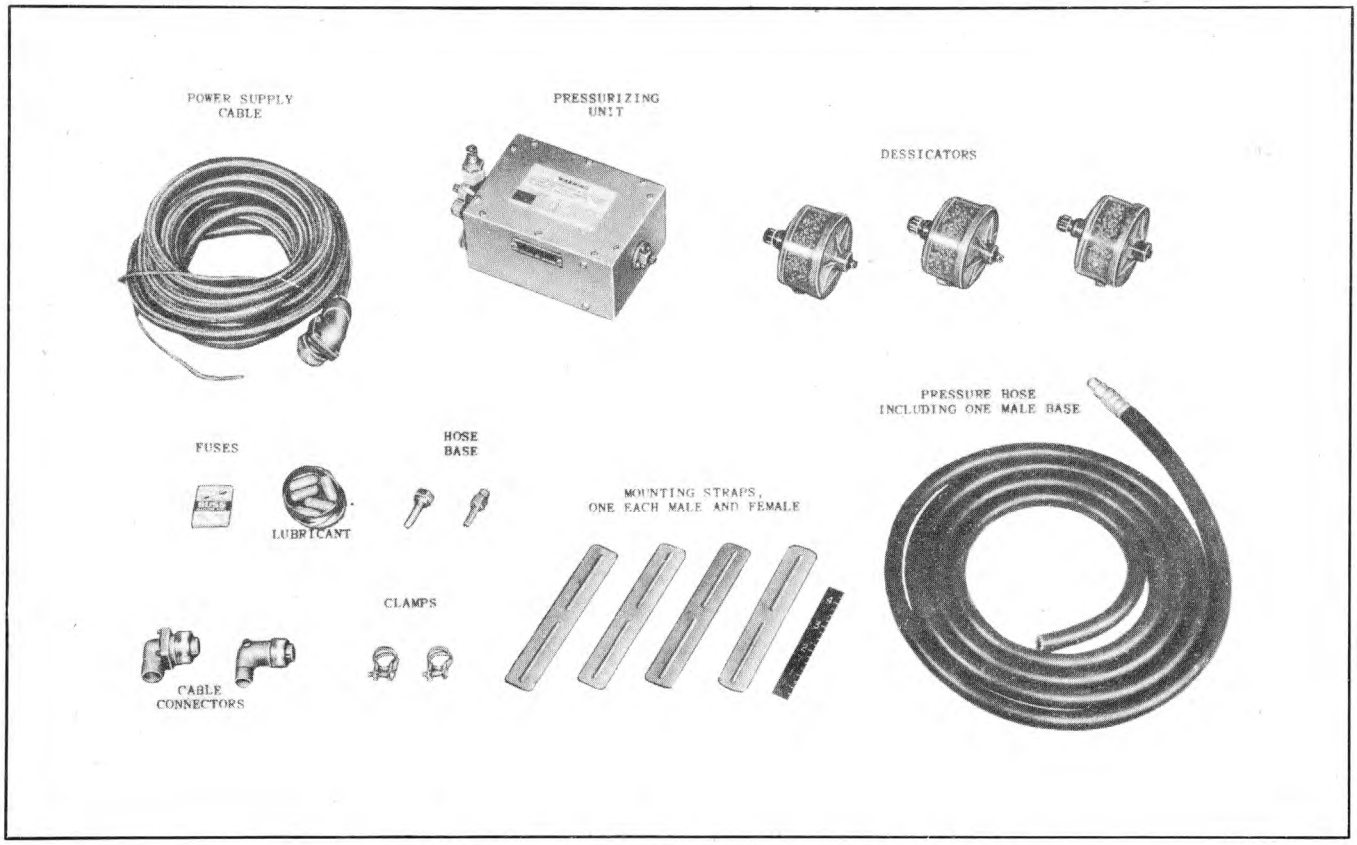


Figure 1-14. Components of Pressurizing Kit MK-23A/AP

SECTION II
INSTALLATION AND ADJUSTMENT

1. INSTALLATION.

a. PRELIMINARY.

(1) UNPACKING.—Major units of Radio Set AN/APS-10 are packed with all tubes in place. Inspect the packing boxes for signs of exterior damage. Be careful when unpacking the units. Remove tape or cords used to secure parts during shipment. Then make a visual inspection to determine that tubes are in place and that no parts have been damaged during shipment. Remove packing debris from the equipment, particularly from the connectors, plugs and receptacles. Inspect all plugs to make certain that none of the prongs have been accidentally bent.

(2) PREINSTALLATION BENCH TESTS. — Connect each unit to the balance of the system when making the checks and measurements. When a working mock-up of a system is available at a service bench, a new system can be tested by interchanging the major units one at a time. The following test equipment is required for bench tests: Echo Box TS-62/AP*, Oscilloscope TS-34/AP*, Signal Generator TS-35/AP*, Voltmeter IS-185*, Voltmeter (Simpson 260) IS-189*.

(a) INDICATOR ID-99/APS-10.—Perform the following checks with the exception of *1* with both positions of the synchronizer "SEARCH-BEACON" switch, using the "SEARCH" position first.

1. PRELIMINARY. *(See figure 2-21.)*

a. Set switch S402 (inside the dust cover of the synchronizer and located near the back of the unit next to the type 6V6-GT/G tubes) to correspond to the number of indicators being tested. If two indicators are utilized in the installation, use both simultaneously in the test setup. If only one indicator is to be used, insert the cap which is attached by a chain, into the unused high-voltage outlet connector on the rectifier power unit.

b. Open the small hinged cover on the front panel of the synchronizer where the "SPINNER ON-OFF" switch, the "50 MILE," "90 MILE," "SWEEP AMPLITUDE" and "CENTER ADJ." screwdriver potentiometers are located.

c. Place the "SPINNER" switch "OFF."

d. Place the "SEARCH-BEACON" switch on "BEACON."

e. Turn the "GAIN" and "BIAS" controls fully counterclockwise.

f. Turn the "RANGE NAUTICAL MILES" switch to the "90 MILE" position.

g. Place the "POWER" switch "ON" and allow about 30 seconds for the tubes to warm up.

h. Turn the "BIAS" control on the indicator until a trace appears on the screen of the indicator tube, and adjust the "FOCUS" control until the trace appears properly focused.

i. Adjust the "SWEEP AMPLITUDE" control until the trace extends to within $\frac{1}{16}$ inch of the edge of the indicator tube and tighten the lock nut. If two indicators are used, adjust the "SWEEP AMPLITUDE" control for maximum amplitude on the indicator tube screens.

j. Place the "SPINNER" switch "ON."

k. Adjust "CENTER ADJ." until the sweep starts from the center of the screen of the indicator tube and tighten the lock nut.

l. Turn the "BRILLIANCE" control, located on the indicator, to approximately the half-way position.

m. Turn the "MARKER BRILL." control until the range mark circles are plainly visible on the screen of the indicator tube.

n. Adjust the "90 MILE" potentiometer until four range circles (not counting the small open center) appear on the screen of the indicator tube and tighten the lock nut.

o. Turn the "RANGE NAUTICAL MILES" control to the "50" position.

p. Adjust the "50 MILE" potentiometer until five range circles (not counting the small open center) appear on the screen of the indicator tube and tighten the lock nut. The fifth circle should again occur near the end of the sweep.

2. VOLTAGES. — Using Voltmeter IS-189, measure the following voltages at the rectifier power unit. Using J607 as ground potential check the following:

J604: +285 d-c, ±15
J605: +150 d-c regulated, ±5
J606: −105 regulated, ±5.

WARNING

Voltages capable of causing instant death are present in the rectifier power unit. Avoid measuring the 4000 volts at J6-1 and J6-2. If tests indicate that there is no high voltage, replace the type 2X2 high-voltage rectifier tube.

3. SWEEP.—Turn the "SPINNER" to "ON" at the synchronizer. Turn the "BIAS" control clock-

*For detailed information, see the handbook of maintenance instructions for the particular unit of test equipment.

wise and observe the indicator tube, noting if sweeps appear.

4. CONTROLS.—Check for focus, bias, centering, brilliance, and gain. Adjust the corresponding controls until, with the "GAIN" control turned down, a faint trace is just visible.

5. RANGE MARKS.—If the results obtained in steps 2-4 are satisfactory, check the range marks.

a. Turn up the "GAIN" control until noise appears, then turn up the "MARKER BRILL.", control.

b. Rotate the "RANGE NAUTICAL MILES" control. This control will select any range between 4 and 25 miles. Beyond 25 miles the control will select only click points, at 50 miles and (beacon only) 90 miles. Range in nautical miles is indicated on the tube by range marks. Up to 12 miles each mark represents 2 miles. Between 12 miles and 15 miles no marks will appear on the tube. At 15 miles there will be one mark, two-thirds of the distance from center to the outer rim of the tube, representing 10 miles. At 25 miles there will be two 10-mile marks at proportionate distances from center. At 50 miles the marks continue to represent 10 miles. At 90 miles (beacon only, regardless of the position of the "SEARCH BEACON" switch) five 20-mile marks will appear on the tube. The open center in the indicator tube is approximately one inch in diameter at 4 miles, decreasing in size as the range increases, until at 90 miles it is merely a small dot. (See figure 5-4.)

(b) ANTENNA ASSEMBLY AS-154/APS-10.

1. MECHANICAL.

a. Set up the antenna in its normal operating position. (A spirit level may be used in determining this. Place the level on the azimuth gear box and adjust the trim mechanism [Control Box C-226/APS-10] until the gear box is horizontal.)

b. Mount Control Box C-226/APS-10 so that when connected to the correctly adjusted antenna the indicator ball will be exactly in the center of the control box indicator.

c. Check that the antenna can be trimmed from approximately +9 to −5 degrees by turning the crank of Control Shaft MX-390/APS-10. At the end of this test adjust the trim mechanism until the indicator ball is again in the center of the control box indicator.

2. ELECTRICAL.

a. Connect the antenna into the system and manually point it straight ahead.

b. Turn the "POWER" switch on the synchronizer to "ON." When the antenna is pointing straight ahead, the sweep on the upper half of the indicator tube should be vertical.

c. Turn the "SPINNER" switch on the synchronizer to "ON." The spinner should rotate clockwise when viewed from above, at approximately 35 revolutions per minute. As the spinner rotates, the sweep should move around the indicator tube in a clockwise direction.

d. Hold the "TILT" switch "UP" and then "DOWN." As the spinner tilts, the antenna tilt indicator will read (to the left as the "TILT" switch is held "UP," and to the right as the "TILT" switch is held "DOWN").

e. Check that the tilt of the antenna can be adjusted by holding the "TILT" switch either "UP" or "DOWN" until the desired angle of tilt, as indicated on the antenna tilt indicator, is reached. Release the switch; the spinner and the reading on the indicator should remain in that position.

Note

Calibration of the tilt indicator for correction of the angle of tilt is possible only at the manufacturer's plant and should not be attempted elsewhere.

f. Turn the spinner to "OFF." Manually point the antenna straight ahead and note the position of the sweep on the indicator tube. If the sweep is not vertical on the upper half of the tube corresponding to the zero indication on the scale, repeat this check using another indicator. If the sweep is still not vertical, replace the antenna and restore the first indicator to the system.

(c) TRANSMITTER - RECEIVER RT-69/APS-10.—Connect the transmitter-receiver to the balance of the system. Test equipment required in checking the transmitter-receiver includes Oscilloscope TS-34/AP, Signal Generator TS-35/AP, Voltmeter IS-189 (Simpson 260), Test Set TS-11/AP and Test Set TS-62/AP.

1. MODULATOR DELAY.—Place the "POWER" switch on the synchronizer to "ON." The modulator should start in not less than two minutes.

2. TRANSMITTER CURRENT.—To measure transmitter current, plug in Voltmeter IS-189 at phone jack J270. The current should be between 2.8 and 3.5 milliamperes on "SEARCH" and 3.8 to 4.5 milliamperes on "BEACON."

3. VOLTAGES.—Using Voltmeter IS - 189, measure the following voltages at the terminal board pins according to the table below:

Pins	*Voltage*	*Allowable Tolerance*
J393	+300	±30 Volts
J394	−300	±30 Volts
J395	+105	±10 Volts
J396	+123	±9 Volts
J397	0 to −8	as "gains" control is varied

4. POWER OUTPUT (SEARCH).—Signal Generator TS-35/AP will be used in making power output measurements for both the search and beacon functions.

a. CONNECTING TEST EQUIPMENT.—While waiting for the two-minute warmup period connect Oscilloscope TS-34/AP and Signal Generator TS-35/AP as follows:

(1) Set the "SPINNER" switch on the synchronizer to "OFF."

(2) Connect the a-c power cord to the signal generator and plug into the 115-volt a-c receptacle. Turn on the "ON-OFF" switch.

Note

Set the two attenuators on the signal generator to the maximum (36) position, turn the "ADJ PWR" knob completely counterclockwise, set the micrometer tuning knob to the end of the scale (20 on the shaft), and set the "DET OUT" and "CHECK" switches to positions so marked.

(3) Plug in the power cord from the oscilloscope to the 115-volt a-c receptable. Turn on the "POWER" switch.

(4) Remove the two spring clips holding the protective cover on the transmission line coupling flange of the signal generator.

(5) Place the choke coupling end of the patch cord against the flange input of the signal generator (long axis parallel to the panel of the set).

(6) Slide the two spring clips into the slot along the edges of the coupling and insert a machine screw in at least one corner to keep the units aligned.

(7) Insert the coaxial plug (at the outer end of the patch cord) into the test panel jack marked "WAVE SELECTOR" (directional coupler).

(8) Connect the "TRIGGER OUT" of the transmitter-receiver unit to "EXTERNAL SYNC" of Oscilloscope TS-34/AP with the adjacent switch in the "EXTERNAL SYNC" position.

(9) Connect the "VIDEO" of the system (video test jack on transmitter-receiver unit) to the "SIGNAL INPUT" of the oscilloscope.

IMPORTANT

The "INPUT IMPEDANCE" must first be set to "HIGH."

b. ADJUSTING TEST EQUIPMENT.

(1) Set the "SYN POLARITY" switch to "POS."

(2) Set the "SWEEP SELECTOR" switch to "START-STOP."

(3) Set the "ATTENUATION" switch to 20 db, or until noise is just apparent.

(4) Set the "IMAGE SIZE" to maximum clockwise position.

(5) Adjust "HORIZONTAL" and "VERTICAL POSITION" controls, "BRIGHTNESS" and "FOCUS" controls until a faint trace appears.

(6) Set "SWEEP SPEED" to "MED."

(7) Adjust "SYNC VOLTAGE" until trace is steady.

c. PROCEDURE.

(1) Place the "SEARCH-BEACON" switch on the synchronizer on "SEARCH."

(2) Set "CHECK ADJ" knob on the signal generator for a meter reading of 100.

(3) Set "DET OUT" and "CHECK" switches each to "NORM."

(4) Set "CW-NORM" and the 0.5 "MW-NORM" switches to "NORM."

(5) Rotate "ADJ O" knob to give a meter reading between 0 and 100.

(6) If a reasonable reading cannot be obtained with the "ADJ O" knob, operate the 0.5 "MW-NORM" switch to the 0.5 MW position. Repeat step *(5)*.

(7) Adjust the meter reading to 0 with the "FINE ADJ O" knob.

(8) Turn the 0.5 "MW-NORM" switch to the "NORM" position.

(a) Turn the "ADJ O" knob one step clockwise. If the meter reading does not go to 100 turn the "ADJ 100" knob until the meter does read 100.

(b) Turn the "ADJ O" knob counterclockwise one step for a meter reading of approximately 0. Readjust the "FINE ADJ O" knob to make the meter reading O if it is not already so.

(9) To turn the 0.5 "MW-NORM" switch to the 0.5 "MW" position follow steps *(8)* (a) and *(8)*(b) above, except that the "ADJ O" knob should be moved two steps clockwise in *(8)*(a) and two steps counterclockwise in step *(8)*(b).

Note

When the meter reads 0 and 100, respectively, in the two positions of the "ADJ O" switch, the change from 0 to 100 represents an increase of 1 milliwatt in the thermistor of the signal generator. Fractions of a milliwatt can be read directly on the meter. Steps *(8)* and *(9)* respectively provide the 1-milliwatt meter setting.

(10) Set "ATT-2" to 0 db and gradually rotate "ATT-1" clockwise until the meter reads 100. "ATT-1" should read between 5 and 11. Replace the transmitter-receiver if the "ATT-1" reading is below 5.

Note

These readings on "ATT-1" assume a 6-db loss in the patch cord. The actual loss in the patch cord will be stamped on it. If it is greater than 6 db, such as 8 db, "ATT-1" should read between 3 and 9, in which case the transmitter-receiver is replaced if the reading is less than 3. If it is less than 6 db, such as 4 db, "ATT-1" should read between 7 and 13, in which case the transmitter-receiver is replaced if the reading is less than 7. In brief,

the 5 and 11 reading on "ATT-1" should be increased or decreased by the amount that the loss in the patch cord is less or greater than 6 db respectively.

5. POWER OUTPUT (BEACON). — The power output for beacon operation should be measured without changing the adjustments outlined in subparagraph *4* except as noted below:

a. Change the "SEARCH-BEACON" switch to "BEACON."

b. The power output, as read on "ATT-1," should be higher than for search operation. If a reading of between 6 and 12 is not obtained, carefully repeat the settings and adjustments of subparagraph *4* with the "SEARCH-BEACON" switch or "BEACON."

6. FREQUENCY.—Frequency will be measured with the "SEARCH-BEACON" switch on "SEARCH," and with the use of Signal Generator TS-35/AP.

a. Rotate "ATT-1" counterclockwise until the meter reads between 50 and 100.

b. Rotate the frequency micrometer head clockwise slowly with the "TUNING" knob until the meter reading is reduced. Continue to rotate the micrometer until the meter reading reaches a minimum and starts to increase. Rotate the micrometer back and forth several times to obtain the exact minimum reading. Read and record the micrometer setting. (The actual frequency can be obtained from the "Calibration of Frequency Meter" table in the manual for Signal Generator TS-35/AP.)

7. RECEIVER SENSITIVITY (SEARCH).— Oscilloscope TS-34/AP and Signal Generator TS-35/AP will be used in measuring receiver sensitivity for both the search and beacon functions.

a. Place the "SEARCH-BEACON" switch on "SEARCH."

b. Rotate the frequency micrometer head counterclockwise several revolutions.

c. Set the "CW-NORM" switch to the "CW" position.

d. Rotate "ADJ PWR" knob clockwise until a meter reading between 50 and 100 is obtained.

e. Maximize the meter reading by turning the "FINE TUNING" knob. If the meter reading is over 100, turn the "ADJ PWR" knob counterclockwise until the meter reads between 50 and 100. Maximize the meter reading by turning the "FINE TUNING" knob. Repeat until the maximum meter reading is 100.

f. Rotate the frequency micrometer head clockwise until the meter reading starts to decrease. Continue to rotate the micrometer until the meter reading reaches a minimum and starts to increase. Rotate the micrometer back and forth several times to obtain the exact minimum reading. Read and record the micrometer setting.

g. If the micrometer reading is not the same as obtained in 6b, this page, rotate the "TUNING" knob clockwise or counterclockwise.

Note

Rotating the "TUNING" knob clockwise lowers the frequency reading (smaller micrometer reading); rotating the "TUNING" knob counterclockwise raises the frequency (large micrometer reading).

h. To adjust the "TUNING" knob a small amount, rotate it in the desired direction (as indictated in 7g, above). Maximize the meter reading with the "FINE TUNING" knob.

i. Check the frequency by repeating f above.

j. Repeat 7h and 7f, this page, on a step-by-step basis until the frequency micrometer reading is *identical* to that obtained in 7b.

Note

The oscillator in the signal generator is now generating cw power at the same frequency as the system transmitter.

k. Check the zero setting of the meter by repeating steps *4a*(5) and *4a*(7).

Note

All switches should be in the "NORM" position except the "CW-NORM" switch, which is in the "CW" position. Turn the "POWER ADJ" knob as far counterclockwise as it will go, and turn "ATT-1" and "ATT-2" to give maximum attenuation.

l. Rotate the "ADJ PWR" knob until the meter reading is raised from 0 to 100. Maximize the meter reading at 100 with the "FINE TUNING" knob. If the meter reading cannot be maximized at 100 with the "FINE TUNING" knob, rotate the "ADJ PWR" knob counterclockwise slightly until the meter reading can be maximized at 100 with the "FINE TUNING" knob.

Note

The oscillator is now generating 1 milliwatt to the input of the attenuator in the transmission line.

m. Set the "CW-NORM" switch to "NORM." The meter reading should be between 20 and 30, indicating the r-f output of the oscillator is being pulsed.

n. Measure the frequency of the pulsed r-f by repeating step 6b. The micrometer reading obtained should be approximately the same as that obtained in 6b and 7j. If it is different, repeat 7b by making a very slight adjustment in the desired direction and repeat 6b. Repeat the process until the micrometer reading is *identical* to that obtained in 6b.

o. Maximize the meter reading at 100 with the "FINE TUNING" knob. If this cannot be done, repeat procedure outlined in l.

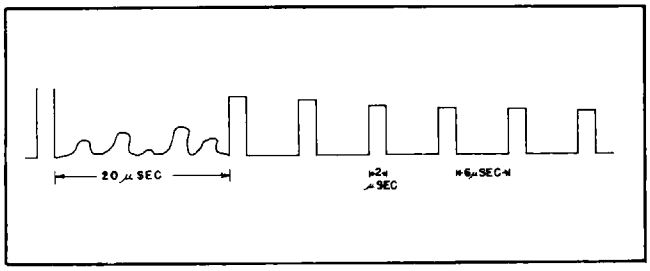


Figure 2-1. Signals from Signal Generator Appearing on Oscilloscope TS-34/AP

p. Signals from the signal generator should appear on the oscilloscope.

Note

Rotate the "IMAGE SIZE" knob of the oscilloscope counterclockwise until the signals are of suitable magnitude. The signals from the signal generator will appear on the oscilloscope as follows: No signals from the signal generator appear for a short time after the transmitter pulse appears, although radar signals may be present; then there is a train of pulses. (See figure 2-1.) Be sure that the frequency of the signal generator (normal position) is identical to the transmitter frequency.

q. To measure receiver sensitivity of the transmitter-receiver, rotate "ATT-1" and "ATT-2" both to the 36-mark position. The signals should be just barely discernible in the noise on the oscilloscope. If the sum of the readings on the "ATT-1" and the "ATT-2" is less than 67, replace the transmitter-receiver.

8. RECEIVER SENSITIVITY (BEACON).

a. With the "SEARCH-BEACON" switch on "BEACON" repeat steps 7b through 7f, this section.

Note

The reading of the micrometer obtained in performing f. for this application, however, should be the reading opposite BE on the "Frequency Calibration Card" on the panel of the signal generator.

b. Repeat 7g through 7p, noting in each *step where required that the desired micrometer reading is that opposite BE on the "Frequency Calibration Card" on the panel of the signal generator.*

c. Repeat 7r. If the sum of the readings on "ATT-1" and "ATT-2" is less than 61 the transmitter-receiver unit should be replaced. It is assumed that the patch cord loss is 6 db. If the loss is less than 6 db, the difference should be added to attenuator reading which is required.

b. PROCEDURE.

(1) GENERAL.—Details of installation and the exact locations of units are dependent upon the design of the particular plane in which Radio Set AN/APS-10 is to be installed. (See figures 2-1 to 2-11.) There are, however, certain instructions which must be followed in all types of installation.

(a) Allow sufficient clearance around each unit to make cable connections and to permit insertion or removal from mountings.

(b) Take care to provide adequate ventilation around all units since proper operation depends upon proper dissipation of heat.

(c) In selecting locations of each unit, allow for motion due to shock-mounts, so that the unit will not strike structural parts of the plane during vibration.

(d) Make interconnecting cables sufficiently flexible so that the effectiveness of the shock mountings will not be impaired.

(2) ANTENNA ASSEMBLY AS-154/APS-10.—Mount the antenna (see figures 1-6, 1-7, and 1-8) to a solid structure in the belly of the plane with the reflector beneath and with the rectangular support or mounting bracket parallel to the flight axis of the ship. (This may vary with special installations.) Tighten the bolts of the mounting bracket, so that no damage can result from contact with parts of the airplane during vibration. Make certain the pressurized antenna housing is air-tight and manually adjust the antenna straight ahead before the radome is installed. Drill a small hole in the floor of the plane to permit visual checks of spinner movement.

Note

Allow ample space for full rotation and tilt of the spinner. (See figure 5-1.) The minimum distance between the center of the antenna and the belly of the plane must be determined to prevent distortion of the r-f pattern.

(3) TRANSMITTER-RECEIVER RT-69/APS-10. Mount the transmitter-receiver (see figure 2-9) in a location near the antenna so that the connecting cables will be as short as possible. Mounting dimensions are given on figure 5-2. Bolt Mounting MT-292/APS-10 to a solid structure in the plane, making certain that the base is horizontal in normal flight attitude, since the mounting is most effective in this position.

Note

When installing the transmitter-receiver in the inverted position, modify Mounting MT-292/APS-10 by reversing the shock buttons. (See figure 5-3.)

Slide the unit into the mounting and clamp in place by means of the two snap clamps on the mounting.

(4) INDICATOR ID-99/APS-10.—The indicator (see figure 2-10) must be located in a position near

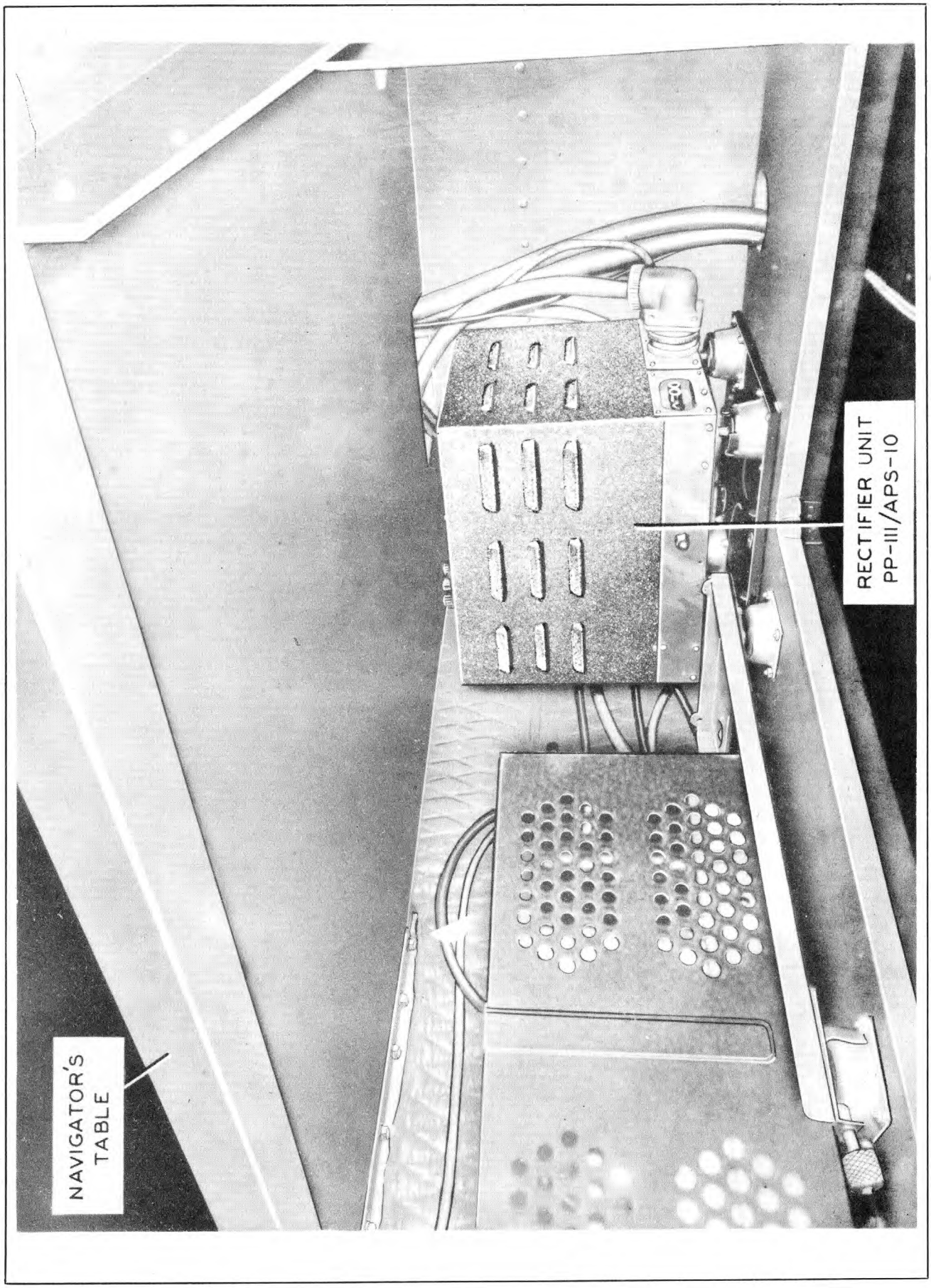


Figure 2-4. Radio Set AN/APS-10—Installation (C-47) Navigator's Compartment, Under Table

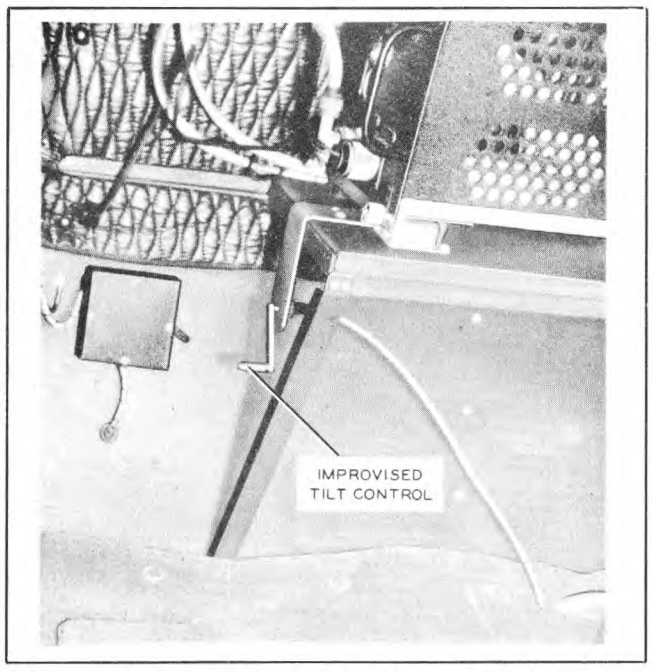


Figure 2-5. Radio Set AN/APS-10—Installation (C-47) Navigator's Compartment, Left Side

the operator of the equipment, since the fact of the cathode-ray tube must be observed during operation. Allow space on each side of the unit (see figure 5-4) to make adjustments to the controls during flight. Bolt Mounting MT-294/APS-10 to a solid structure in the plane.

Note

This unit may also be installed in the inverted position; the shock buttons of the mounting are reversed according to figure 5-5. Place the indicator upon the mounting and fasten the three snap-slide fasteners.

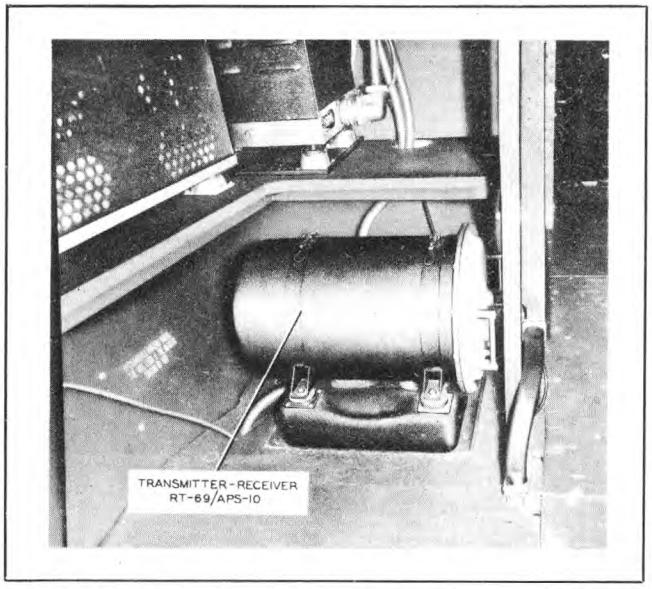


Figure 2-6. Radio Set AN/APS-10—Installation (C-47) Navigator's Compartment, Floor

A duplicate Indicator ID-99/APS-10 may be installed near the pilot's position for duplicated cathode-ray tube presentations if desired. Follow the instructions given above for general installation procedure, making such adaptations as space conditions may require.

(5) SYNCHRONIZER SN-17/APS-10.—Because the majority of the controls to be adjusted during flight are located on the synchronizer, this unit (see figure 2-1) must be installed in the position most convenient to the operator. Note from figure 5-6 that the unit may be installed with the control panel either horizontal or vertical. Bolt Mounting MT-293/APS-10 to a solid portion of the airplane structure by means of six 8/32 x 3/4-inch round head machine screws, allowing ample space for connecting cables at the bottom or rear of the unit.

(a) If the synchronizer is to be mounted with the control panel in the horizontal position, drop the rear of the unit through the mounting until the pins on the angle mounted to the case engage the snap slide fasteners on the mounting. Close the fasteners.

(b) To install the synchronizer with the control panel in a vertical position, place the unit on the mounting so that the snap slide fasteners on the mounting engages the pins or the botton plate of the synchronizer. Close the fasteners.

(6) RECTIFIER POWER UNIT PP-111/APS-10. This unit (figure 2-12) may be installed in any loca-

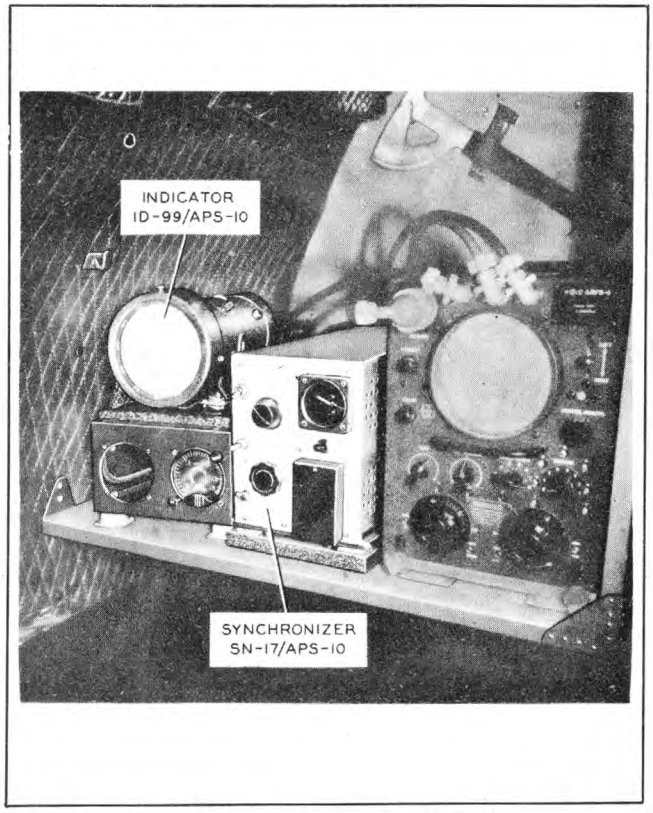


Figure 2-7. Radio Set AN/APS-10—Installation (C-47) Navigator's Compartment, Shelf

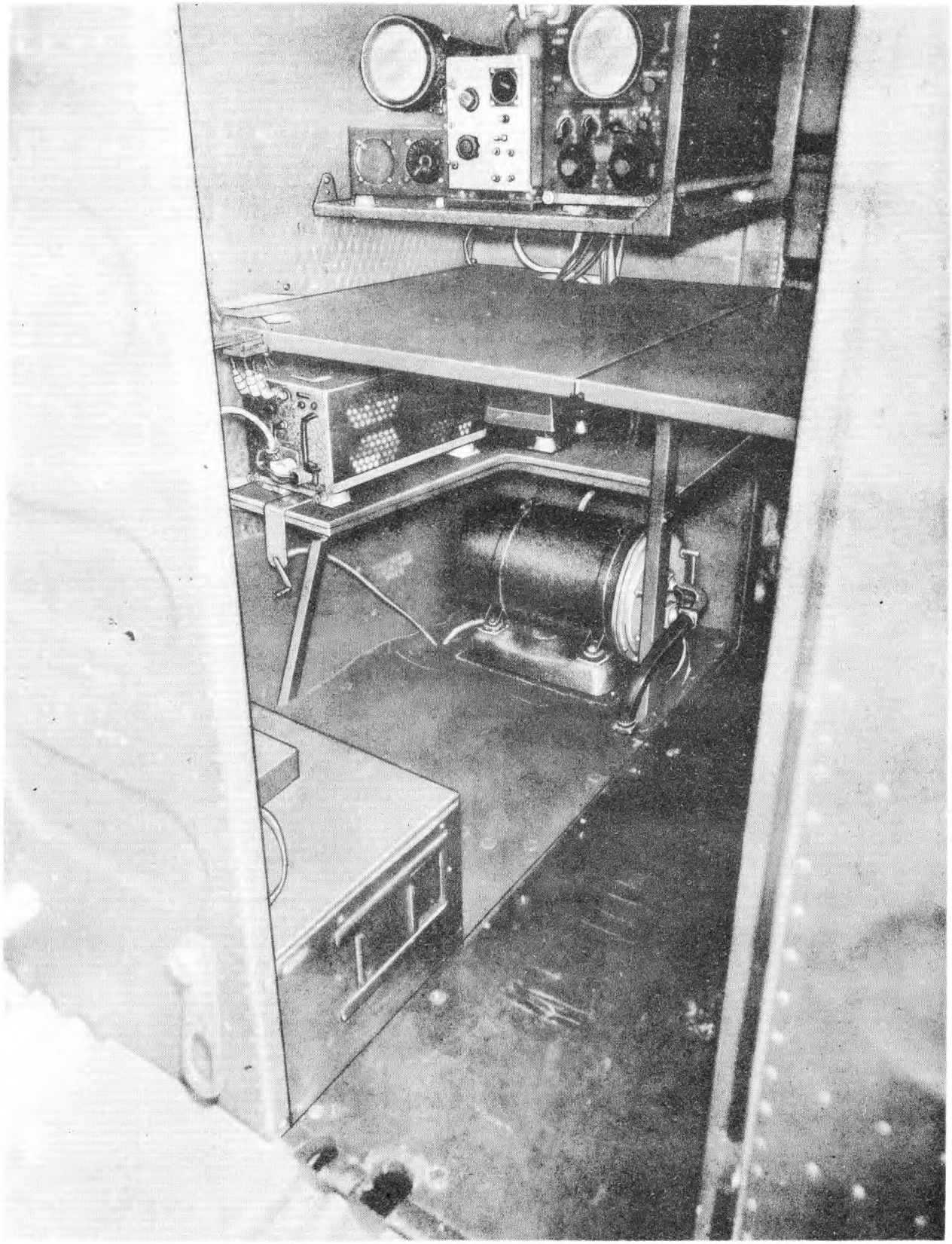


Figure 2-8. Radio Set AN/APS-10—Installation (C-47) Navigator's Compartment

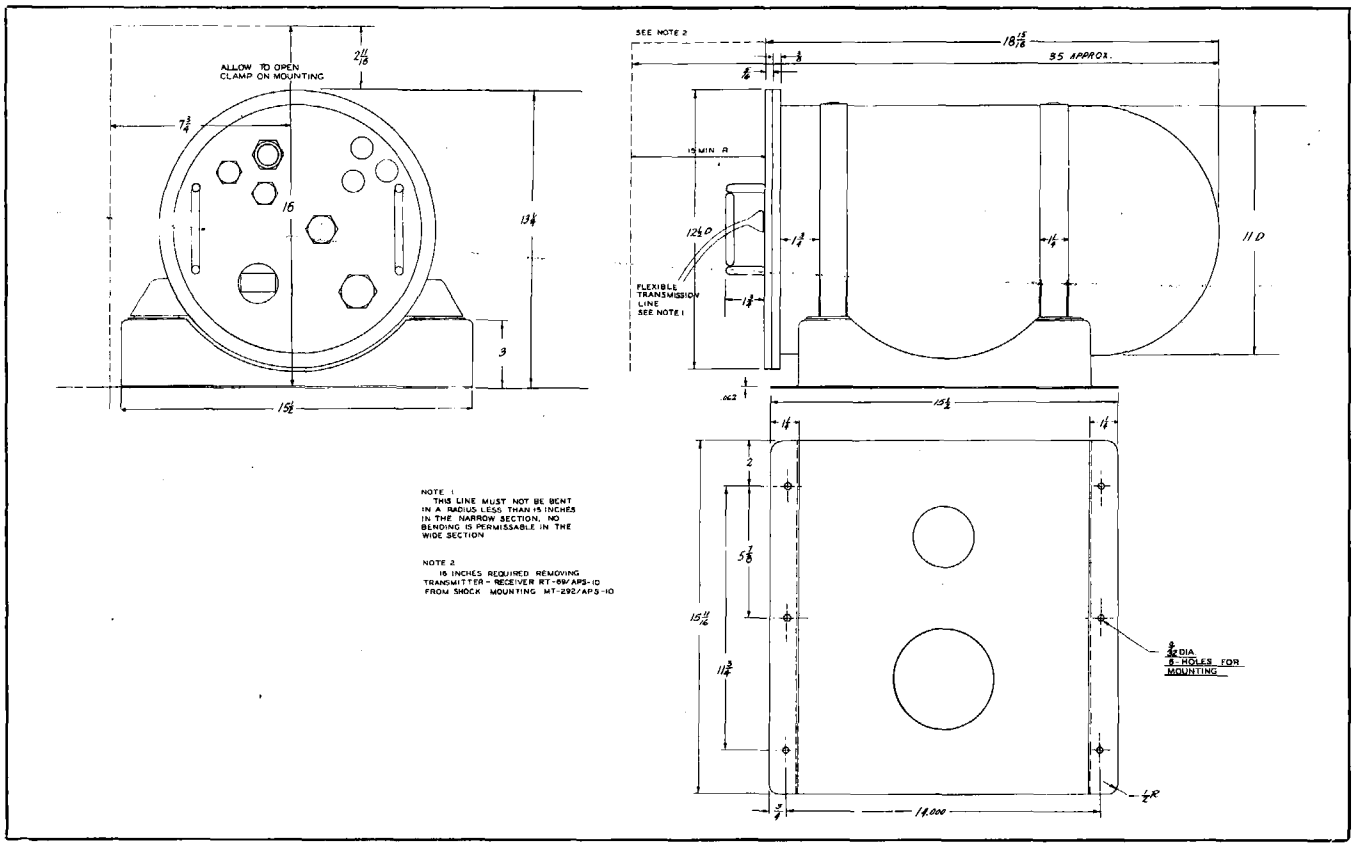


Figure 2-9. Transmitter-Receiver RT-69/APS-10—Outline Dimensions

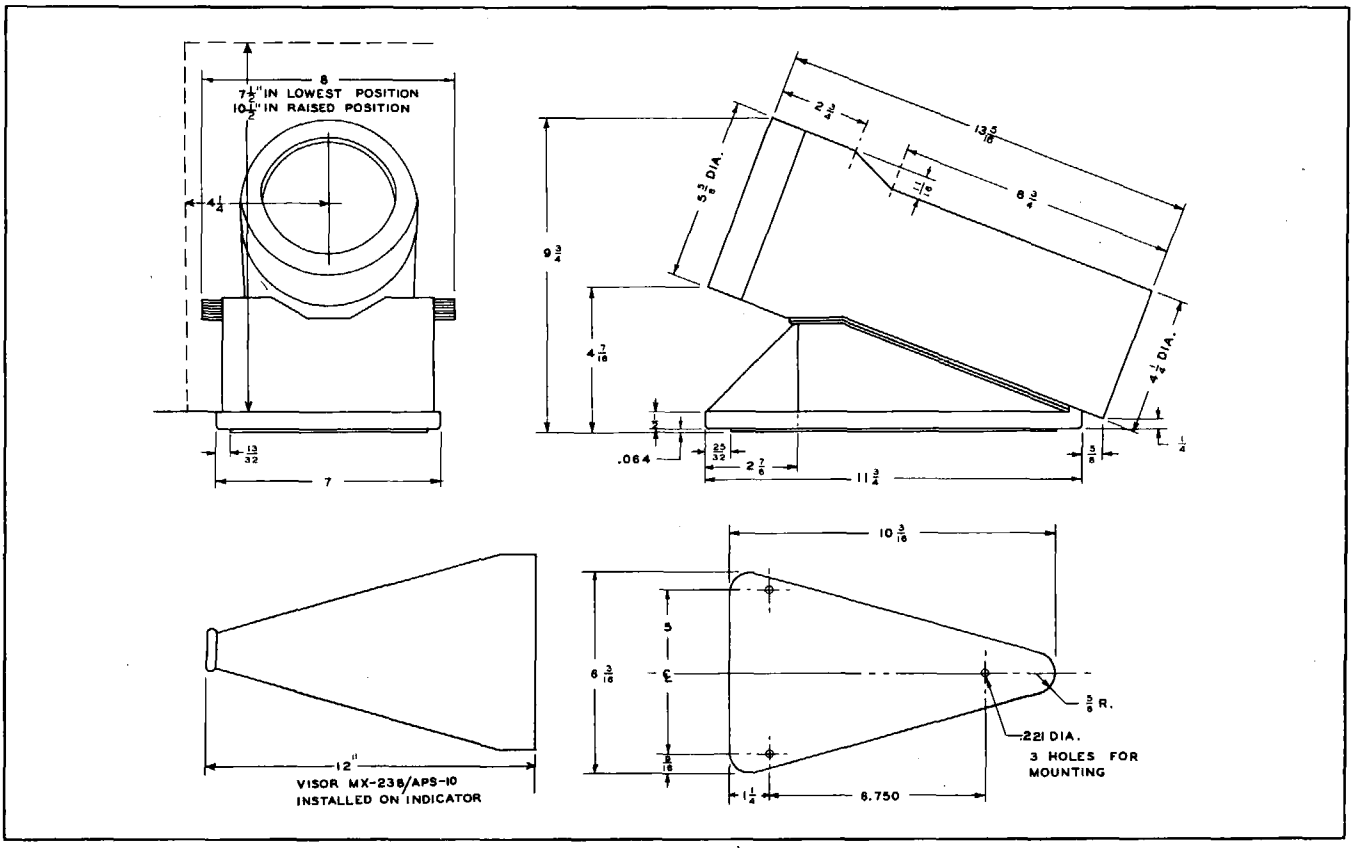


Figure 2-10. Indicator ID-99/APS-10—Outline Dimensions

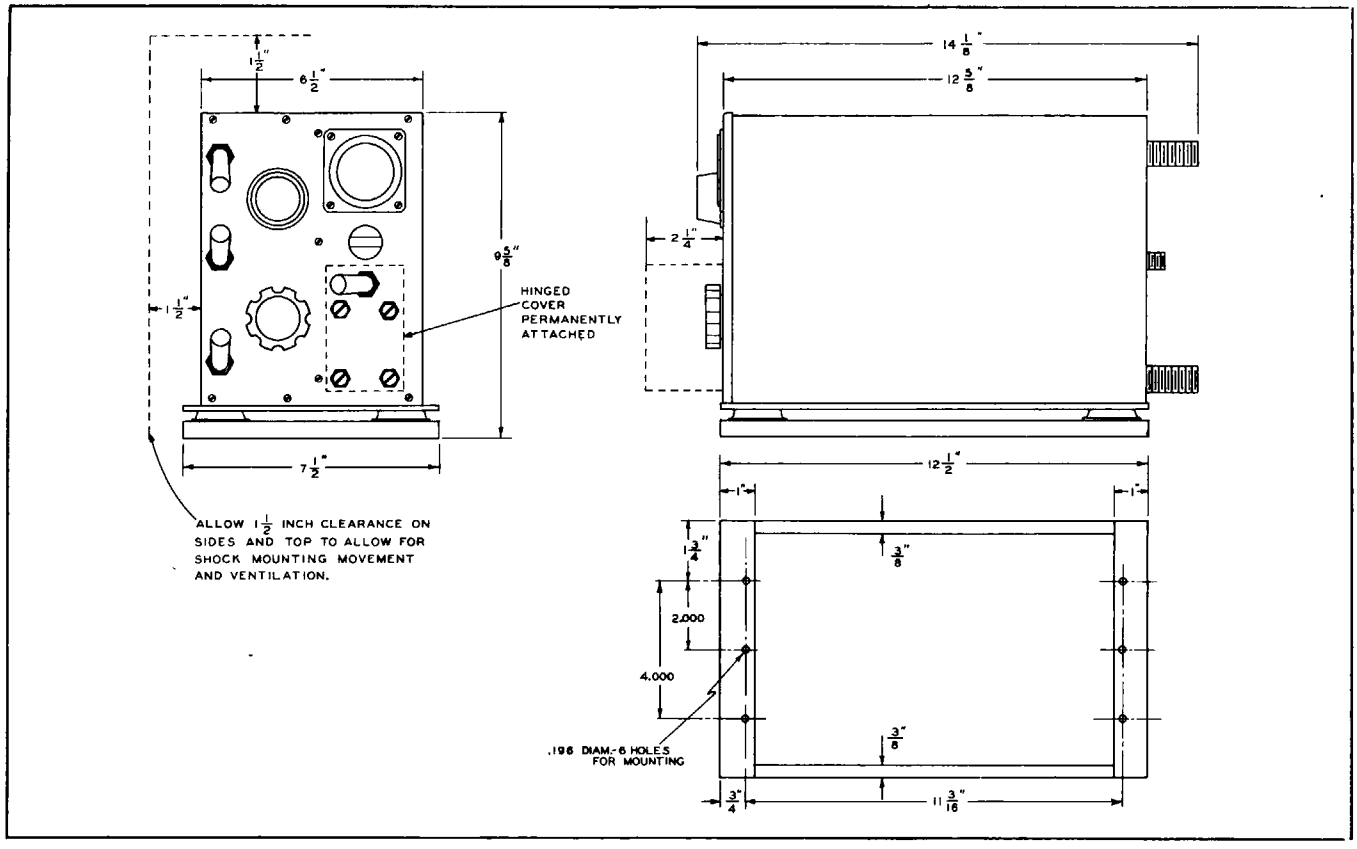


Figure 2-11. Synchronizer SN-17/APS-10—Outline Dimensions

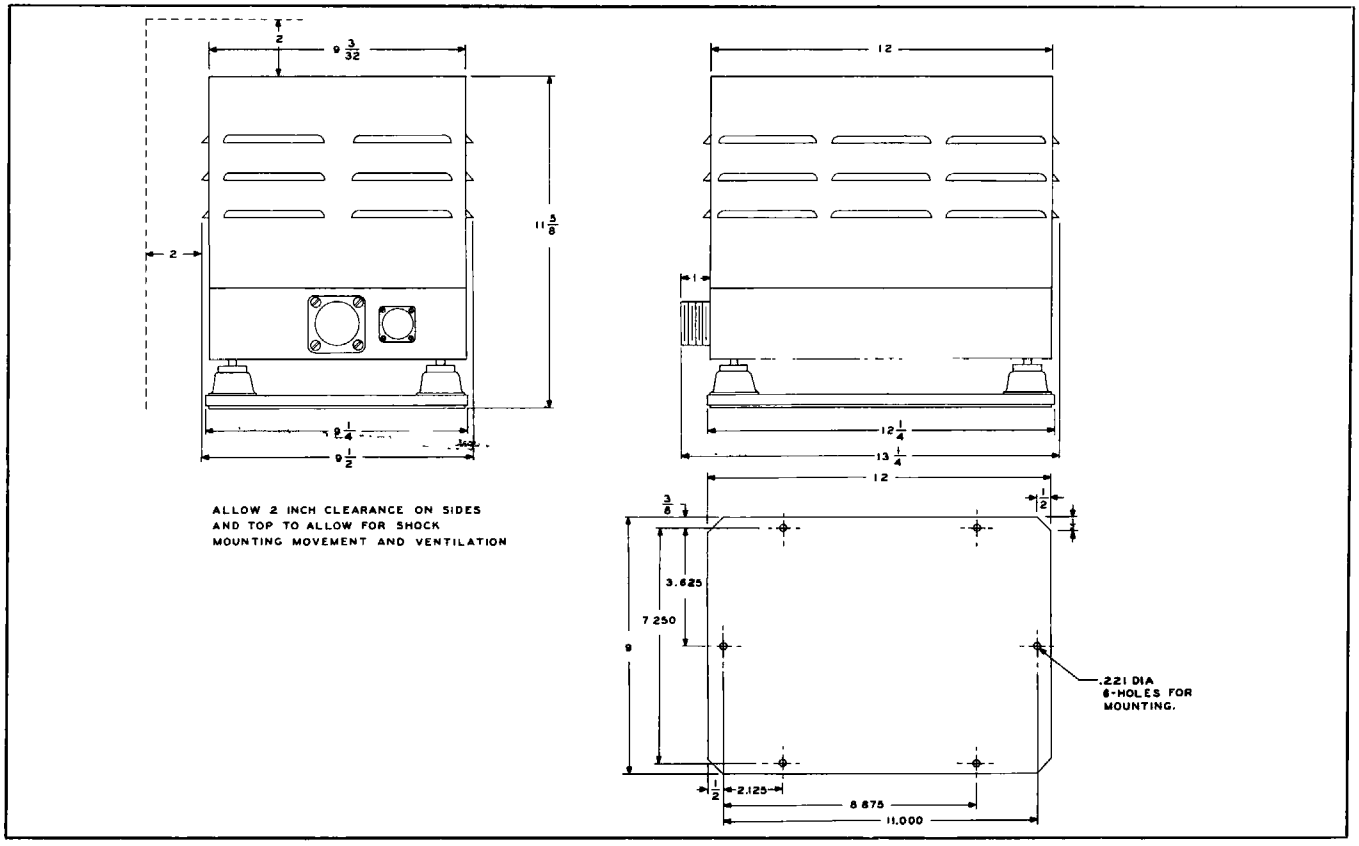


Figure 2-12. Power Unit PP-111/APS-10—Outline Dimensions

tion where space conditions permit, since it has no controls or adjustments. (See figures 2-12, 5-7). It is recommended, however, that it be located in proximity to the rest of the equipment so that an excessive voltage drop will not develop from an unnecessarily long cable. Bolt Mounting MT-295/APS-10 to a solid structure in the plane by means of six $^{10}/_{32}$ x $^{3}/_{4}$-inch round head machine screws. Place the rectifier on the mounting so that the four mounting pins engage the corresponding snap slide fasteners on the unit. Close the fasteners.

(7) VISOR MX-238/APS-10.—The visor is used, particularly in daylight flights, when excessive illumination on the face of the cathode-ray tube makes it difficult to read indications. Loosen the strap screw, place the hole in the edge of the visor around the indicator window and press the visor into place. Tighten the strap screw.

(8) CONTROL BOX C-226/APS-10.—(See figure 5-8.) Since the operator will occasionally use the control box during flight to compensate for the attitude of the plane, mount it near the synchronizer and indicator. Place it in such a position that when the plane attitude is level, the indicator ball will be in its center position, reflecting that the spin axis of the spinner is perpendicular to the zero flight angle. Be sure to allow ample space for full rotation of the hand crank on Control Shaft MX-390/APS-10.

Tighten the four size 8 x $^{3}/_{4}$-inch screws. Connect the flexible cable from the trim indicator to the trim mechanism on the rectangular frame of the antenna.

(9) PRESSURIZER MK-23A/AP.—Install the dehydrator as near as possible to the antenna equipment and the face plate of the transmitter-receiver.

c. CABLE CONNECTONS.

(1) FABRICATION OF CABLES.—The length of the following cable assemblies is determined by circumstances of installation. Follow the recommended procedure outlined below, referring to the cabling diagram, figure 2-19, and the cable assembly drawings. figure 2-13 through figure 2-18, inclusive. All numbered wires should be of approved type and insulation covered.

Note

Check all cables for continuity and for short circuits to other wires and ground before installing them.

(a) CABLE W801.—This cable connects between the synchronizer and the inverter, and is made up in the following manner. (See figure 2-14.)

1. Cut three pieces of No. 16 wire and two pieces of No. 12 wire to the required length. Cut a shorter length (about two inches less) of ½-inch (amphenol No. 9733-8) and attach a two step ½-inch ferrule (AN3052-8) at one end.

2. Feed the wires through the conduit and the ferrule. Remove one-quarter inch of insulation ex-

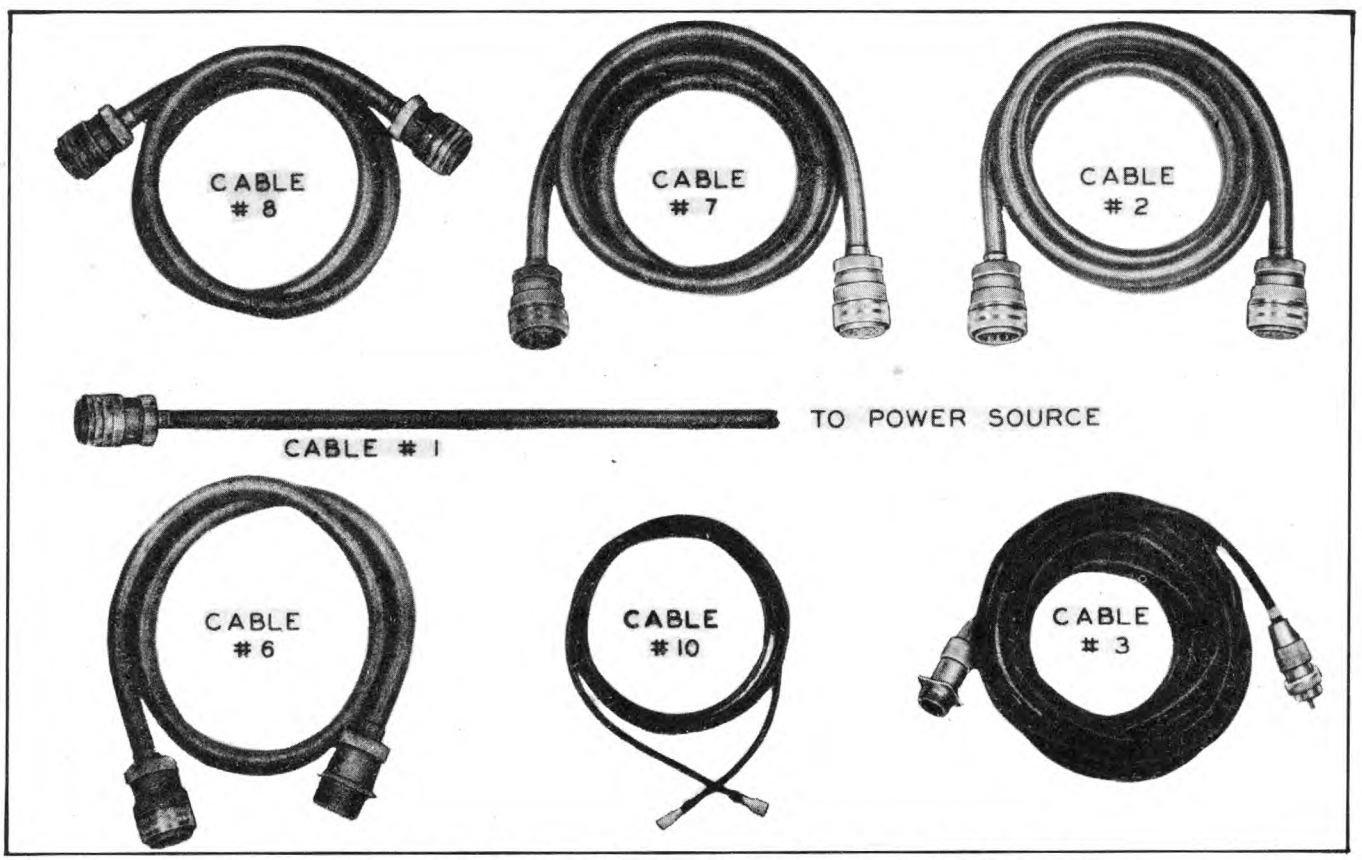


Figure 2-13. Radio Set AN/APS-10—Cables No. 1, 2, 3, 6, 7, 8, and 10

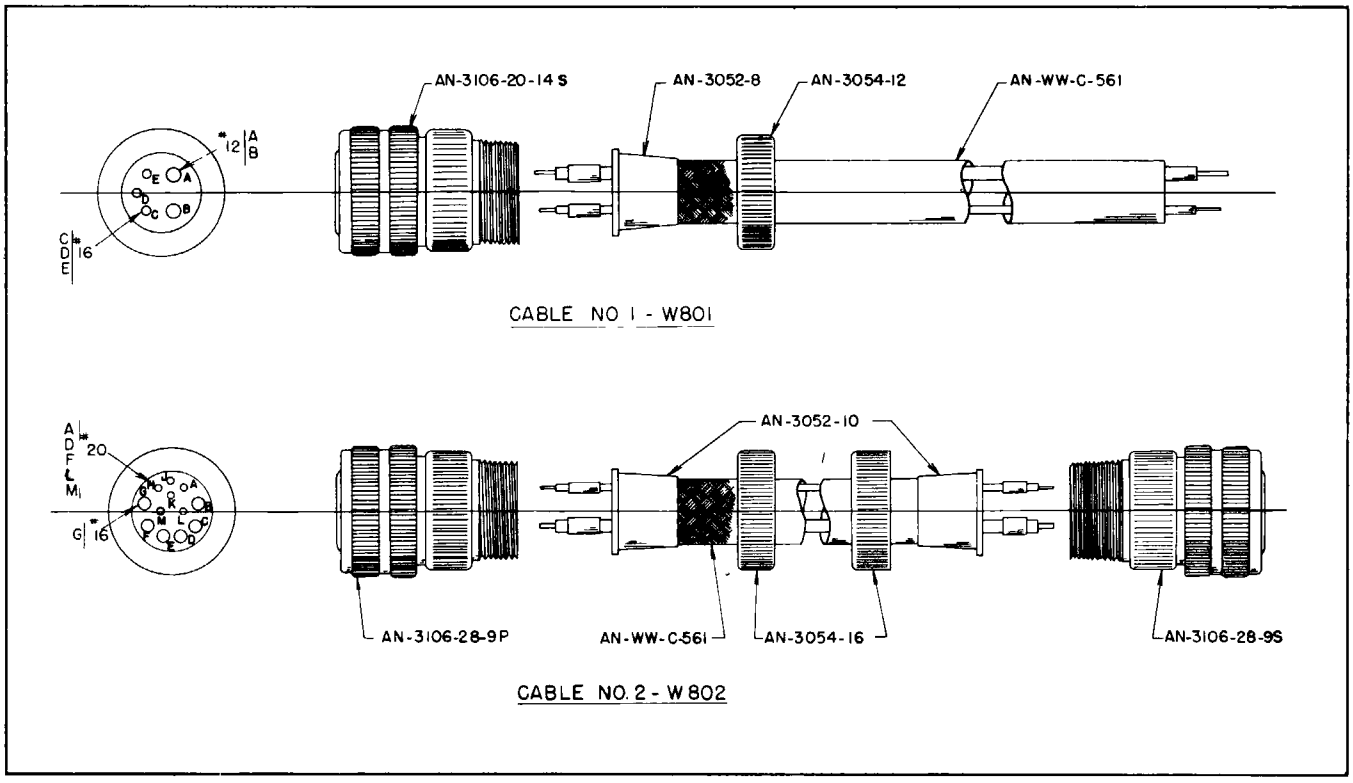


Figure 2-14. Cable Assembly—Cables No. 1 and 2

posing the center conductor of the wires. Tin the conductors.

3. Slip a piece of spaghetti over each wire. Solder each wire to its proper pin on the connector (AN3106-20-14S) as shown in figure 2-19, then push the spaghetti over the soldered joints.

4. Slide a ½-inch conduit coupling nut (AN3054-12) over the conduit and fasten to the connector (AN3106-20-14S).

5. At the inverter end, prepare the cable in the same way if a similar amphenol socket connector exists on the inverter. If not, prepare the cable in any approved manner.

(b) CABLE W802.—This cable connects between the synchronizer and rectifier power unit, and is made up in the following manner: (See figure 2-14.)

1. Cut five pieces of No. 20 wire and one piece of No. 16 wire to the required length. Cut a shorter length (about two inches less) of ⅝-inch ANWWC-561 flexible aluminum electrical conduit (amphenol No. 9733-10). Slide two ⅝-inch amphenol coupling nuts (AN3054-16) with shoulders directly inwardly over the conduit. Attach at each end a two-step ⅝-inch amphenol ferrule (AN3052-10).

2. Feed the wires through the conduit and remove one-quarter inch of insulation from both ends, exposing the center conductors. Tin the conductors.

3. Slip a piece of spaghetti over each wire at both ends. Solder each wire to its corresponding proper pin on the connectors (AN3106-28-9P and AN3106-28-9S) as shown in figure 2-19, then push the spaghetti over the soldered joints.

4. Slide the ⅝-inch conduit coupling nuts over the conduit and fasten to the connectors.

(c) CABLE W803.—This cable connects between the indicator and the rectifier power unit.

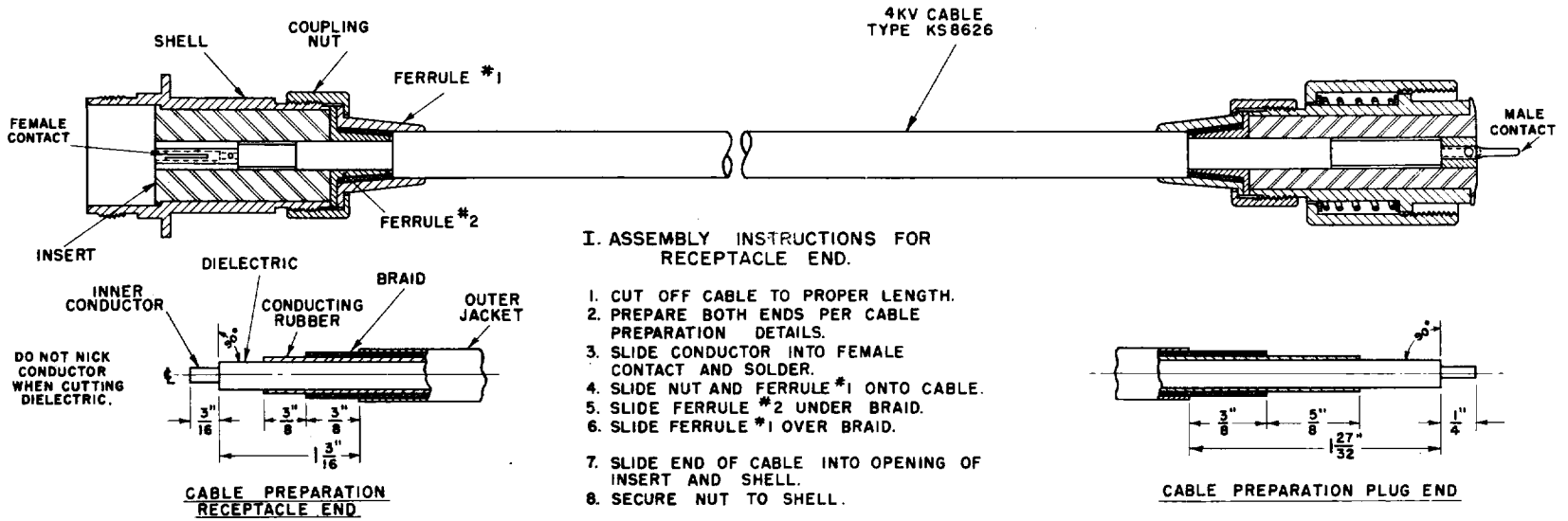
1. Cut a piece of 4-KV cable to the proper length and prepare in accordance with the instructions given in figure 2-15.

(d) CABLE W804 (Required when using two indicators).—This cable connects between the rectifier power unit and indicator number 2. Cut the cable to the length required and prepare it in accordance with the instructions given in figure 2-15.

(e) CABLE W806.—This cable connects between the synchronizer and indicator (see figure 2-16) and is made up in the following manner:

1. Cut two pieces of Radio Frequency Cable RG-59/U, three pieces of No. 20 wire, three pieces of No. 18 wire, one piece of No. 16 wire, and two pieces of No. 12 wire to the required length. Cut a shorter length (about two inches less) than the above length of ⅝-inch ANWWC-561 flexible aluminum electrical conduit (amphenol No. 9733-10). Slide two ⅝-inch coupling nuts (AN3054-16) with shoulders directed inwardly on the conduit, and attach at each end a two step ⅝-inch ferrule (AN3052-10).

2. Feed the wires and cables through the conduit, and at both ends of all wires remove one-



I. ASSEMBLY INSTRUCTIONS FOR RECEPTACLE END.

1. CUT OFF CABLE TO PROPER LENGTH.
2. PREPARE BOTH ENDS PER CABLE PREPARATION DETAILS.
3. SLIDE CONDUCTOR INTO FEMALE CONTACT AND SOLDER.
4. SLIDE NUT AND FERRULE #1 ONTO CABLE.
5. SLIDE FERRULE #2 UNDER BRAID.
6. SLIDE FERRULE #1 OVER BRAID.
7. SLIDE END OF CABLE INTO OPENING OF INSERT AND SHELL.
8. SECURE NUT TO SHELL.

II. ASSEMBLY INSTRUCTIONS FOR PLUG END

ASSEMBLY OF PLUG END SIMILAR TO RECEPTACLE END EXCEPT MALE CONTACT TO BE USED INSTEAD OF FEMALE CONTACT.

CABLE NO. 3- W803
CABLE NO. 4- W804

Figure 2-15. Cable Assembly—Cables No. 3 and 4

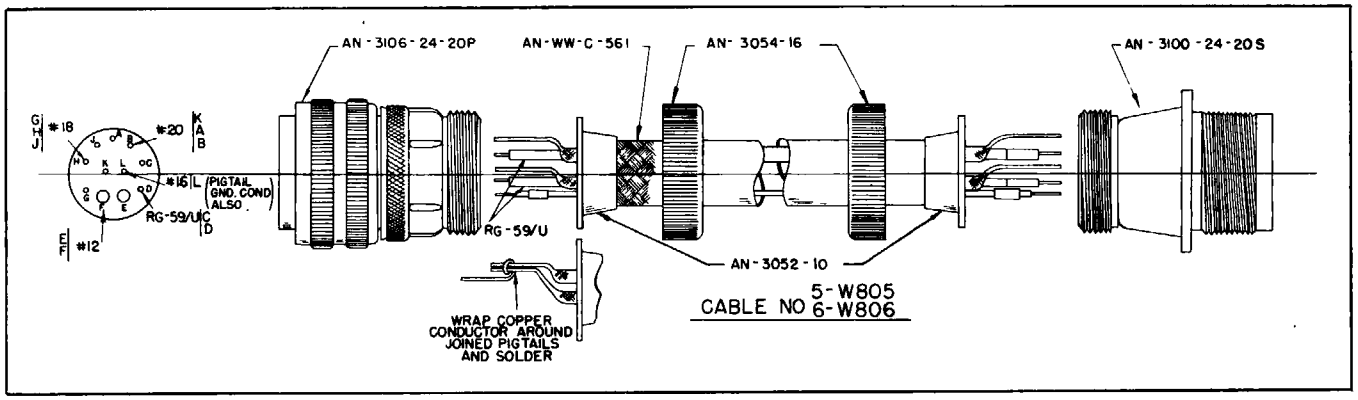


Figure 2-16. Cable Assembly—Cables No. 5 and 6

quarter inch of insulation exposing the center conductors. Tin the conductors.

3. Slip a piece of spaghetti over each wire at both ends.

4. To prepare the two Radio Frequency Cables RG-59/U, remove all insulation and braid for about one-half inch, exposing the center conductor. Tin the center conductor.

5. Remove three inches of the outer covering from the ends of the cables, being careful not to nick the braid. At the point where the outer covering has been cut, make a small hole and remove the conductor and inner insulation through this hole.

6. At each end of Radio Frequency Cable RG-59/U wrap the pigtails of both cables around a formed loop of copper conductor and solder.

7. Solder the wire conductors to the proper pins of the plugs (AN3106-24-20P and AN3100-24-20S) at each end in accordance with figure 2-19. Solder the copper conductors attached to the braid to the proper pins in accordance with figure 2-19.

8. Push the spaghetti over the soldered joints of the wires.

9. Slide the 5/8-inch conduit coupling nuts over the conduit and fasten to the connectors.

(f) CABLE W805.—(Required when using two indicators.) This cable connects between the synchronizer and indicator No. 2 and is made up in exactly the same manner as Cable W806. The only difference may be in the length.

(g) CABLE W807.—This cable connects between the antenna assembly and the synchronizer, and is made in the following manner: (See figure 2-17.)

1. Cut two pieces of No. 20 wire and nine pieces of No. 16 wire to the required length. Cut a shorter length (about two inches less than the above length) of 5/8-inch ANWW-C-561 flexible aluminum electrical conduit (amphenol No. 9733-10). Slide two 5/8-inch coupling nuts (AN3054-16) with shoulders directed inwardly over the conduit. Attach at each end a two-step 5/8-inch ferrule (AN3052-10).

2. Feed the wires through the conduit and remove one-quarter inch of insulation from both ends, exposing the center conductors. Tin the conductors.

3. Slip a piece of spaghetti over each wire at both ends. Solder each wire to its proper pin on the connectors (AN3106-28-8S and AN3106-28-8P) as shown in figure 2-19, then push the spaghetti over the soldered joints.

4. Slide the 5/8-inch conduit coupling nuts over the conduit and fasten to the connectors.

(h) CABLE W808.—This cable connects between the transmitter-receiver and the synchronizer, and is made up in the following manner: (See figure 2-17.)

1. Cut two pieces of No. 20 wire, five pieces of No. 16 wire, and one piece of Radio Frequency Cable RG-59/U to the required length. Cut a shorter length (about two inches less) of 5/8-inch ANWW-C-561 flexible aluminum conduit (amphenol No. 9733-10). Slide two 5/8-inch coupling nuts (AN3054-16) with shoulders directed inward over the conduit. Attach a two step 5/8-inch ferrule (AN3052-10) at each end.

2. Feed the wires and cable through the conduit and remove one-quarter inch of insulation from both ends of the wires, exposing the center conductors. Tin the conductors.

3. Slip a piece of spaghetti over each wire at both ends.

4. To prepare Radio Frequency Cable RG-59/U remove all insulation and braid for about one-half inch, exposing the center conductor. Tin the center conductor.

5. Remove three inches of the outer covering from the ends of the cable, being careful not to nick the braid. At the point where the outer covering has been cut make a hole and remove the conductor and inner insulation through this hole.

6. After steps 4 and 5, there are two separate parts of Radio Frequency Cable RG-59/U, a braid pigtail and conductor with insulation. Make this preparation on both ends of the cable, then tin both parts.

7. Solder the wire conductors of Radio Frequency Cable RG-59/U and the pigtail into the proper

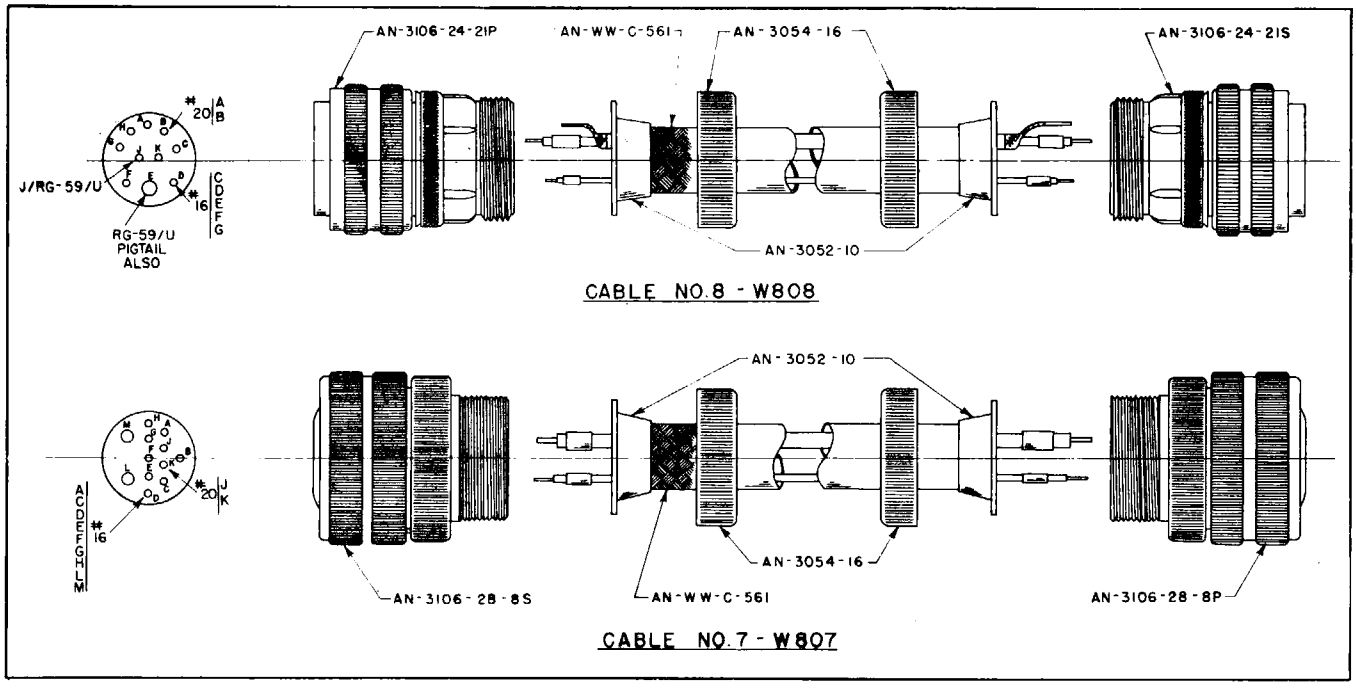


Figure 2-17. Cable Assembly—Cables No. 7 and 8

pins on the plugs (AN3106-24-21S and AN3106-24-21P) in accordance with figure 2-19.

8. Push the spaghetti over the soldered joints of the wires.

9. Slide the 5/8-inch conduit coupling nuts over the conduit and fasten to the connectors.

(i) CABLE W809 (Required only when using two indicators).—This cable connects between the two indicators, and is made up in the following manner: (See figure 2-18.)

1. Cut a piece of Radio Frequency Cable RG-59/U to the required length.

2. Prepare the ends and attach Radio Frequency Plug UG-85/U at each end in accordance with the instruction in figure 2-18.

(j) CABLE W810.—This cable connects between the transmitter-receiver and the indicator and, using the required length of Radio Frequency Cable RG-59/U, is made up in exactly the same manner as cable W809. (See figure 2-18.)

(k) TRANSMISSION LINE CG-148/APS-10.—The transmission line connects between the antenna assembly and the transmitter-receiver. It is furnished in one rigid piece, 5 feet in length, and in two flexible pieces, one 18 inches long and the other 24 inches long. The line must be terminated at each end by a flexible section.

1. Allowing 3½ feet for prefabricated flexible section, cut the required length of rigid section for the balance of the installation.

2. Braze a Choke UG-40/U to each end of the rigid line. (To distinguish between a choke and a flange, remember that a choke has a groove, the flange does not.)

3. Attach the rigid line to the two flexible pieces by fitting the choke to the flange on the flexible section and tightening the four screws which hold the two pieces together.

(2) INTERCONNECTION OF UNITS.

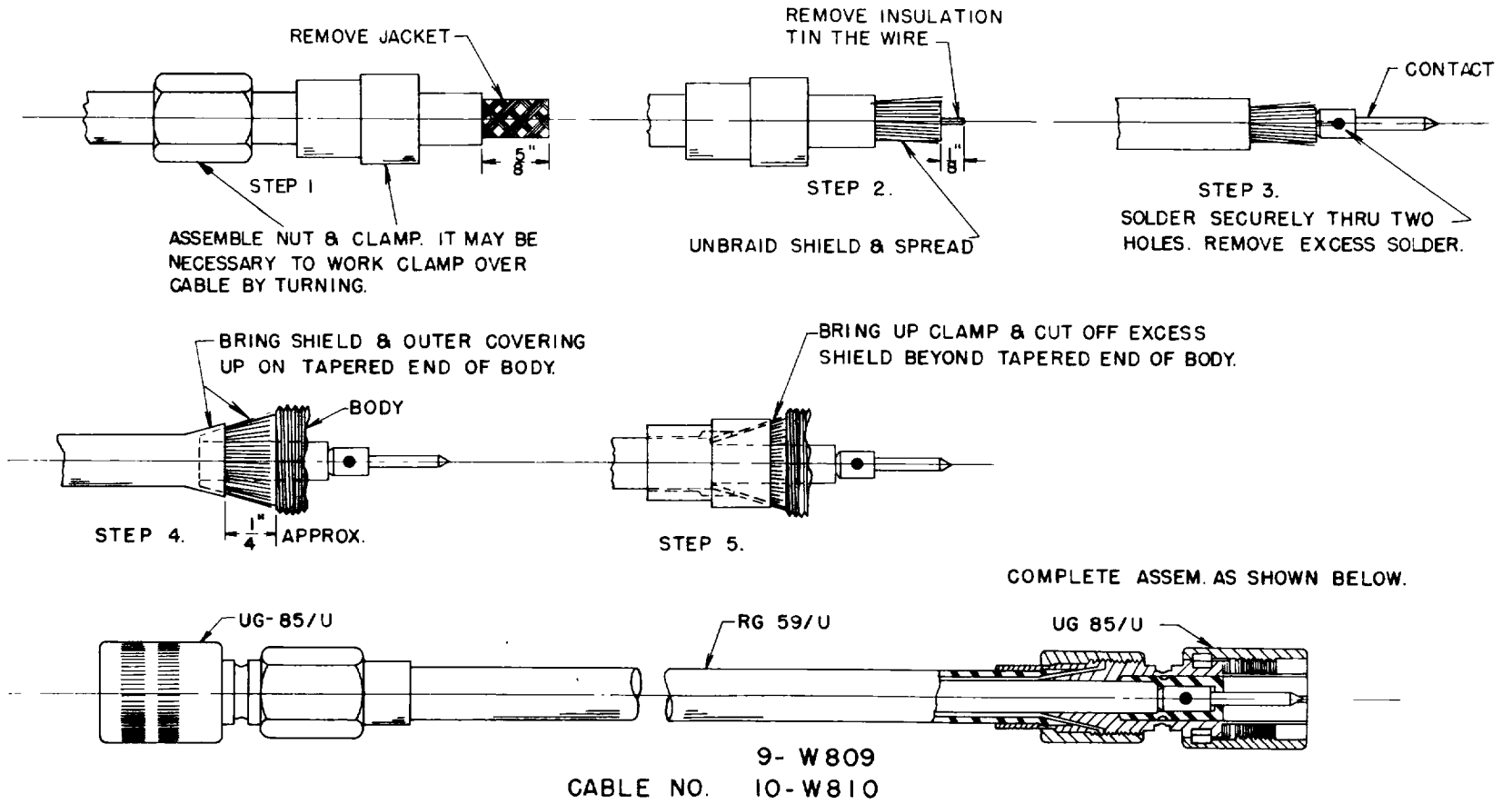
(a) GENERAL.—The following cables are used with Radio Set AN/APS-10.

Cable No.	*Connecting Between*	
	Unit	*Unit*
W801	Synchronizer	Inverter*
W802	Synchronizer	Rectifier Power Unit
W803	Indicator (No. 1)	Rectifier Power Unit
W804†	Indicator (No. 2)	Rectifier Power Unit
W805†	Indicator (No. 2)	Synchronizer
W806	Indicator (No. 1)	Synchronizer
W807	Synchronizer	Antenna Assembly
W808	Synchronizer	Transmitter-Receiver
W809†	Indicator (No. 1)	Indicator (No. 2)
W810	Indicator (No. 1)	Transmitter-Receiver
Transmission Line	Transmitter-Receiver	Antenna Assembly
Flexible Trim Cable	Trim Indicator	Antenna Assembly

* G-E Equipment.
† For installation using two indicators.

Note

Take care that interconnecting cables are made sufficiently flexible so that the effectiveness of the shock mountings will not be impaired.



NOTE:

A. THE ASSEMBLY SHALL BE CAPABLE OF WITHSTANDING A 500 A.C. BREAKDOWN TEST FOR AT LEAST 1/4" SEC. WHEN TESTED AS DESCRIBED IN A.S.T.M.-470-41, PAR. 11 & 13. THE TEST SHALL BE MADE BETWEEN SHIELD & CENTER CONDUCTOR.

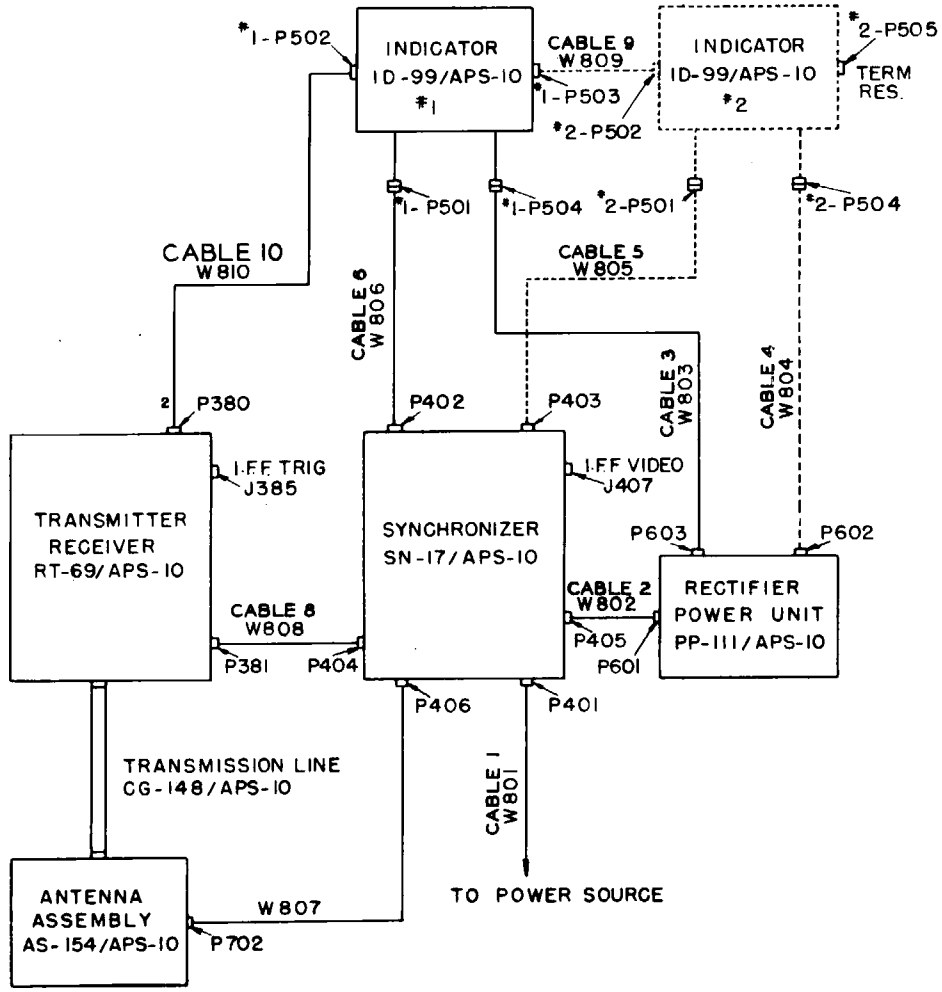
Figure 2-18. Cable Assembly—Cables No. 9 and 10

WIRE TABLE

CABLE NO.	PIN	WIRE SIZE ON TYPE	MAX RESISTANCE
W801	A	12	0.10 OHM
	B	12	0.10
	C	16	0.20
	D	16	0.20
	E	16	0.20
W802	A	20	0.40
	B		
	C		
	D	20	0.40
	E		
	F	20	0.40
	G	16	0.30
	H		
	J		
	K		
	L	20	0.40
	M	20	0.40
W803			2.00
W804			2.00

CABLE NO.	PIN	WIRE SIZE ON TYPE	MAX. RESISTANCE
W805	A	20	0.40 OHM
	B	20	0.40
	C	RG-59/U	0.50
	D	RG-59/U	0.50
	E	12	0.05
	F	12	0.05
	G	18	0.25
	H	18	0.25
	J	18	0.25
	K	20	0.40
	L	16	0.20
W806		SAME	
W807	A	16	0.20
	B		
	C	16	0.20
	D	16	0.20
	E	16	0.20
	F	16	0.20
	G	16	0.20
	H	16	0.20
	J	20	0.40
	K	20	0.40
	L	16	0.20
	M	16	0.20

CABLE NO.	PIN	WIRE SIZE ON TYPE	MAX. RESISTANCE
W808	A	20	0.40 OHM
	B	20	0.40
	C	16	0.20
	D	16	0.20
	E	16	0.20
	F	16	0.20
	G	16	0.20
	H	SPARE	
	J	RG-59/U	0.50
	K	SPARE	
W809		RG-59/U	0.50
W810		RG-59/U	0.50



FOR INSTALLATIONS USING TWO INDICATORS

1- ADD
   (A) INDICATOR *2
   (B) CABLES W809, W805 & W804
2- PLUG *1-P505 ON TO *1-J503

CONNECTOR AND CONDUIT TABLE

CABLE NO	CONDUIT TYPE AND SIZE	CABLE END NO 1				CABLE END NO 2			
		CONNECTOR SYMBOL	CONNECTOR TYPE	CONDUIT FERRULE	CONDUIT COUPLING NUT	CONNECTOR SYMBOL	CONNECTOR TYPE	CONDUIT FERRULE	CONDUIT COUPLING NUT
W801	1/2" - AN-WW-C-561	P401	AN-3106-20-14S	AN-3052-8	AN-3054-12		TO POWER SOURCE		
W802	5/8" AN-WW-C-561	P405	AN-3016-28-9P	AN-3052-10	AN-3054-16	P601	AN-3106-28-9S	AN-3052-10	AN-3054-16
W803	NONE	P603				*1-P504			
W804	NONE	P602				*2-P504			
W805	5/8" AN-WW-C-561	P403	AN-3106-24-20P	AN-3052-10	AN-3054-16	*2-P501	AN-3100-24-20S	AN-3052-10	AN-3054-16
W806	5/8" AN-WW-C-561	P402	AN-3106-24-20P	AN-3052-10	AN-3054-16	*1-P501	AN-3100-24-20S	AN-3052-10	AN-3054-16
W807	5/8" AN-WW-C-561	P702	AN-3106-28-8S	AN-3052-10	AN-3054-16	P406	AN-3106-28-8P	AN-3052-10	AN-3054-16
W808	5/8" AN-WW-C-561	P404	AN-3106-24-21P	AN-3052-10	AN-3054-16	P381	AN-3106-24-21S	AN-3052-10	AN-3054-16
W809	NONE	*1-P503	UG-85/U			*2-P502	UG-85/U		
W810	NONE	*1-P502	UG-85/U			P380	UG-85/U		

Figure 2-19. Radio Set AN/APS-10—Cabling Diagram

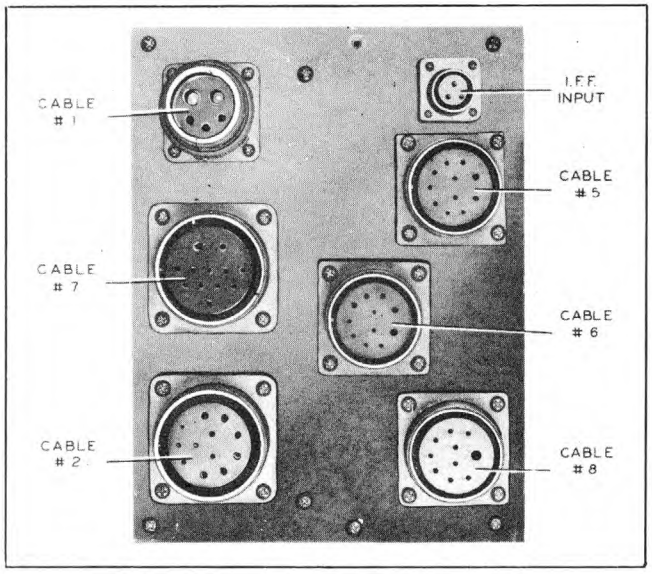


Figure 2-20. Synchronizer SN-17/APS-10—Rear View

(b) CABLING.
(See figure 2-19.)

1. Examine the transmission line for dirt. Remove any foreign matter from the interior with a clean rag soaked in an approved cleaning solvent. The transmission line must be dry before installing. Connect one end of Transmission Line CG-148/APS-10 to the Transmission Line Choke UG-40/U on the antenna assembly, and the other end to Transmission Line Choke UG-40/U on the face plate of the transmitter-receiver.

2. If the trim indicator cable was not installed at the installation of the trim indicator, attach it between that unit and the antenna assembly.

3. Connect cable W807 between the antenna assembly and the synchronizer (see figure 2-20), inserting plug P702 (AN3106-28-8S) into jack J702 on the antenna, and plug P406 (AN3106-28-8P) into jack J406 on the synchronizer.

4. Connect cable W808 between the synchronizer and the transmitter-receiver, inserting plug P404 (AN3106-24-21P) into J404 on the synchronizer, and plug P381 (AN3106-24-21S) into jack J381 on the transmitter-receiver.

5. Connect cable W802 between the synchronizer and the rectifier power unit, inserting plug P405 (AN3106-28-9P) into jack J405 on the synchronizer, and plug P601 (AN3106-28-9S) into jack J603 on the rectifier.

6. Connect cable W806 between the synchronizer and the indicator, inserting plug P402 (AN3106-24-20P) into jack J402 on the synchronizer, and plug P501 (AN3100-24-20S) into jack J501 on the indicator.

7. Connect cable W810 between the transmitter-receiver and the indicator, inserting plug P380 Radio Frequency Plug (UG-85/U) into jack J380 on the transmitter-receiver, and plug P502 (UG-85/U) into jack J502 on the indicator.

8. Connect cable W803 between the indicator and the rectifier, inserting plug P504 into jack J504 on the indicator, and plug P603 into jack J601 on the rectifier.

9. Connect cable W801 between the synchronizer and the inverter, inserting plug P401 (AN3106-20-14S) into jack J401 on the synchronizer, and the plug at the other end of the cable into the appropriate inverter jack.

2. ADJUSTMENTS.

a. PRELIMINARY.

(1) Make certain that all tubes are securely fastened in their sockets and that shields are properly installed.

(2) Set switch S502 (inside the dust panel of the synchronizer and located near the back of the unit next to tube JAN 6V6-GT/G to correspond to the number of indicators connected to the synchronizer.

(3) Check the cap (attached to the chassis by a chain) on the unused high-voltage outlet connector on the rectifier power unit to see if it is in place.

(4) Make certain that all plugs are securely fastened. Bend cables at the plugs to make certain that they have not been broken.

(5) Examine the wave guide between the transmitter-receiver and the antenna for dents and check the wave guide couplings for broken soldering. Make certain the grooves in the couplings are clean.

(6) Check that the bolts holding the transmitter-receiver cover in place are tight.

(7) Make certain that the 27.5 and 115-volt fuses in the airplane fuse box are undamaged and are of the proper size.

(8) Check that the d-c voltage is between 24 and 29 volts and that the a-c voltage is between 110 and 120 volts. These voltages may be checked at the airplane fuse box using Voltmeter IS-189 (Simpson 260).

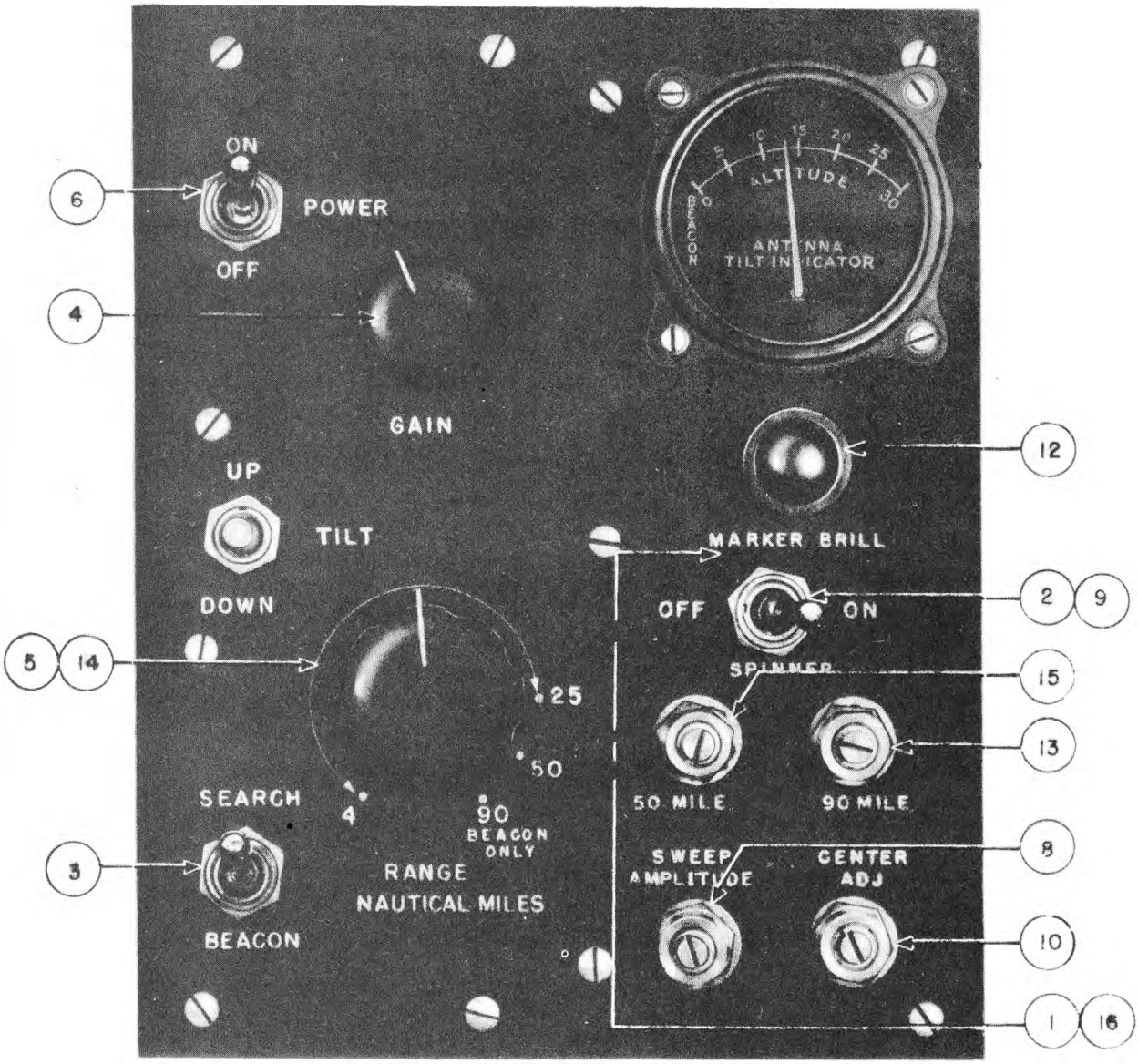
(9) Make certain that the terminating plug P505 with inclosed resistor is connected to the output video connector J503 on the indicator. For installation, using two indicators, make certain that the corresponding plug is in place on the second indicator.

WARNING

Operation of this equipment involves the use of high voltages which are dangerous to life. Personnel must observe all safety regulations at all times.

b. PROCEDURE.—The equipment is prepared for operation as follows (see figures 2-21 and 2-22):

(1) Open the small hinged cover on the front panel of the synchronizer where the "SPINNER-ON" switch, the "50 MILE," "90 MILE," "SWEEP AMPLITUDE," and "CENTER ADJ" screwdriver potentiometers are located.



NOTE: Encircled numbers correspond with subparagraph numbers in paragraph 2b, this section.

Figure 2-21. Synchronizer SN-17/APS-10—Front View

(2) Set the "SPINNER" switch to "OFF."

(3) Set the "SEARCH-BEACON" switch to "BEACON."

(4) Turn the "GAIN" control fully counterclockwise (minimum sensitivity).

(5) Turn the "RANGE NAUTICAL MILES" switch to the "90" position.

(6) Set the "POWER" switch "ON" and allow about 30 seconds for the tubes to warm up.

(7) Turn the "BIAS" control on the indicator until a trace appears on the screen of the indicator tube, and adjust the "FOCUS" control until the trace appears properly focused.

(8) Adjust the "SWEEP AMPLITUDE" control until the trace extends to within $\frac{1}{16}$ inch of the edge of the indicator tube and tighten the lock nut. If two indicators are used, adjust the "SWEEP AMPLITUDE" control for maximum amplitude on the indicator tube screens.

(9) Set the "SPINNER" switch to "ON." The antenna should rotate in a clockwise direction when viewed from above, and the sweep on the indicator tube should rotate in the same direction.

(10) Adjust "CENTER ADJ" until the sweep vector starts from the center of the screen of the indicator tube and tighten the lock nut.

(11) Turn the "BRILLIANCE" control, located on the indicator, to approximately the half-way position.

(12) Turn the "MARKER BRILL." control until the range mark circles are plainly visible on the screen of the indicator tube.

(13) Adjust the 90-mile potentiometer until four range circles (not counting the small open center) appear on the screen of the indicator tube and tighten the lock nut. The total sweep length should be 90 miles.

(14) Turn the "RANGE NAUTICAL MILES" switch to the "50" position.

(15) Adjust the 50 mile potentiometer until five range circles (not counting the small open center) appear on the screen of the indicator tube and tighten the lock nut. Again the fifth circle should occur near the end of the sweep.

(16) Close and fasten the hinged cover on the front panel of the synchronizer. The controls under this cover will not be adjusted during operation.

c. AFTER-INSTALLATION CHECK.

(1) GENERAL.—After the equipment is installed in the plane and before the first flight, make several preliminary tests to determine that the set is in proper working order. Use Oscilloscope TS-34/AP, Signal Generator TS-35/AP, and Voltmeter IS-189.

(2) INDICATOR ID-99/APS-10.

(a) PRELIMINARY.—Turn the "BIAS" control to zero to prevent possible damage to the tube. Turn on the "POWER" switch on the synchronizer panel.

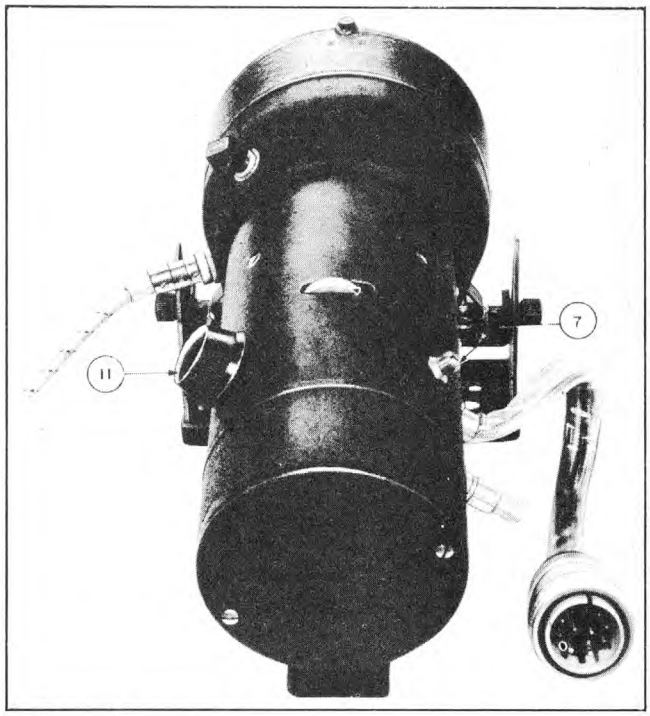


Figure 2-22. Indicator ID-99/APS-10—Rear View

(b) VOLTAGES. — Using Voltmeter IS-189, measure the following voltages at the rectifier power unit:

Pins	*Volts*	*Tolerance*
J604	+285 d. c.	±15 volts
J605	+150 d. c. regulated	± 5 volts
J606	−105 d. c. regulated	± 5 volts

(c) SWEEP.—Turn the spinner on at the synchronizer. Increase the bias and observe the indicator tube, noting if sweeps appear.

(d) CONTROLS.—Check for focus, bias, centering, brilliance, and gain. Adjust the corresponding controls until, with the "GAIN" control turned down, a faint trace is just visible.

(e) RANGE MARKS.—Turn up the "GAIN" control until noise appears, then turn up the "MARKER BRILL." control. Rotate the "RANGE NAUTICAL MILES" control, counting the range marks appearing at different ranges selected by the control. (See figure 5-4.)

(3) TRANSMITTER-RECEIVER RT-69/APS-10.

(a) PRELIMINARY.—Turn the "BIAS" control on the indicator to zero. Turn the "POWER" switch on the synchronizer on.

(b) MODULATOR DELAY.—The modulator should start not less than two minutes after turning on the power.

(e) CONNECTING TEST EQUIPMENT.

1. Set the "SPINNER" switch on the synchronizer to "OFF."

2. Connect the a-c power cord to the signal generator and plug into the 115-volt a-c receptacle. Turn on the "ON-OFF" switch.

Note

Set the two attenuators on the signal generator to the maximum (36) position. Turn the "ADJ PWR" knob completely counterclockwise. Set the micrometer tuning knob to the end of the scale (20 on the shaft) and set the "DET OUT" and "CHECK" switches to positions so marked.

3. Plug in the power cord from the oscilloscope to the 115-volt a-c receptacle. Turn on the "POWER" switch.

4. Remove the two spring clips holding the protective cover on the coupling flange of the signal generator.

5. Place the choke coupling end of the patch cord against the flange input of the signal generator (long axis parallel to the panel of the set).

6. Slide the two spring clips into the slot along the edges of the coupling and insert a machine screw in at least one corner to keep the units aligned.

7. Insert the coaxial plug (at the other end of the patch cord) into the test panel jack marked "WAVE SELECTOR" (directional coupler).

8. Connect the "TRIGGER OUT" of the system to "EXTERNAL SYNC" of the oscilloscope, with the adjacent switch in the "EXTERNAL SYNC" position.

9. Connect the "VIDEO" of the system (on the test panel) to the SIGNAL INPUT of the oscilloscope.

Note

The "INPUT IMPEDANCE" must *first* be set to HIGH.

(d) ADJUSTING TEST EQUIPMENT.

1. Set the "SYNC POLARITY" switch to "POS."

2. Set the "SWEEP SELECTOR" switch to "START-STOP."

3. Set the "ATTENUATION" switch to 20 db, or until noise is just apparent.

4. Set the "IMAGE SIZE" to maximum clockwise position.

5. Adjust "HORIZONTAL" and "VERTICAL POSITION" controls and "BRIGHTNESS" and "FOCUS" controls until a faint trace appears.

6. Set "SWEEP SPEED" to "MED."

7. Adjust "SYNC VOLTAGE" until the trace is steady.

(e) POWER OUTPUT (SEARCH). — Signal Generator TS-35/AP will be used in making power output measurements for both the search and beacon functions.

1. Set the "SEARCH-BEACON" switch on the synchronizer to "SEARCH."

2. Set "CHECK ADJ" knob on the signal generator for a meter reading of 100.

3. Set "DET OUT" and "CHECK" switches each to "NORM."

4. Set "CW-NORM" and the 0.5 "MW-NORM" switches to "NORM."

5. Rotate "ADJ O" knob to give a meter reading between 0 and 100.

6. Adjust the meter reading to 0 with the "FINE ADJ O" knob.

7. For the 0.5 "MW-NORM" switch in the "NORM" position:

a. Turn the "ADJ O" knob one step clockwise. If the meter reading does not go to 100, turn the "ADJ 100" knob until the meter does read 100.

b. Turn the "ADJ O" knob counterclockwise one step for a meter reading of approximately 0. Readjust the "FINE ADJ O" knob to make the meter reading 0 if it is not already so.

Note

When the meter reads 0 and 100, respectively, in the two positions of the "ADJ O" switch the change from 0 to 100 represents an increase of 1 milliwatt in the thermistor of the signal generator. Fractions of a milliwatt can be read directly on the meter. Step 7 provides the 1-mw meter setting.

8. Set "ATT-2" to 0 db and gradually rotate "ATT-1" clockwise until the meter reads 100. "ATT-1" should read between 5 and 11. Replace the transmitter-receiver if the "ATT-1" reading is below 8.

Note

These readings on "ATT-1" assume a 6-db loss in the patch cord. The actual loss in the patch cord will be stamped on it. If it is greater than 6 db, such as 8 db, "ATT-1" should read between 3 and 9, in which case the transmitter-receiver is replaced if the reading is less than 3. If it is less than 6 db, such as 4 db, "ATT-1" should read between 7 and 13, in which case the transmitter-receiver is replaced if the reading is less than 7. In brief, the 5 and 11 reading on "ATT-1" should be increased or decreased by the amount that the loss in the patch cord is less or greater than 6 db respectively.

(f) POWER OUTPUT (Beacon).—The power output for beacon operation should be measured without changing the adjustments outlined in subparagraph *(e)* except as noted below:

1. Change the "SEARCH-BEACON" switch to "BEACON."

2. The power output, as read on "ATT-1," should be higher than for search operation. If a read-

(2) Set the "SPINNER" switch to "OFF."

(3) Set the "SEARCH-BEACON" switch to "BEACON."

(4) Turn the "GAIN" control fully counterclockwise (minimum sensitivity).

(5) Turn the "RANGE NAUTICAL MILES" switch to the "90" position.

(6) Set the "POWER" switch "ON" and allow about 30 seconds for the tubes to warm up.

(7) Turn the "BIAS" control on the indicator until a trace appears on the screen of the indicator tube, and adjust the "FOCUS" control until the trace appears properly focused.

(8) Adjust the "SWEEP AMPLITUDE" control until the trace extends to within $\frac{1}{16}$ inch of the edge of the indicator tube and tighten the lock nut. If two indicators are used, adjust the "SWEEP AMPLITUDE" control for maximum amplitude on the indicator tube screens.

(9) Set the "SPINNER" switch to "ON." The antenna should rotate in a clockwise direction when viewed from above, and the sweep on the indicator tube should rotate in the same direction.

(10) Adjust "CENTER ADJ" until the sweep vector starts from the center of the screen of the indicator tube and tighten the lock nut.

(11) Turn the "BRILLIANCE" control, located on the indicator, to approximately the half-way position.

(12) Turn the "MARKER BRILL." control until the range mark circles are plainly visible on the screen of the indicator tube.

(13) Adjust the 90-mile potentiometer until four range circles (not counting the small open center) appear on the screen of the indicator tube and tighten the lock nut. The total sweep length should be 90 miles.

(14) Turn the "RANGE NAUTICAL MILES" switch to the "50" position.

(15) Adjust the 50 mile potentiometer until five range circles (not counting the small open center) appear on the screen of the indicator tube and tighten the lock nut. Again the fifth circle should occur near the end of the sweep.

(16) Close and fasten the hinged cover on the front panel of the synchronizer. The controls under this cover will not be adjusted during operation.

c. AFTER-INSTALLATION CHECK.

(1) GENERAL.—After the equipment is installed in the plane and before the first flight, make several preliminary tests to determine that the set is in proper working order. Use Oscilloscope TS-34/AP, Signal Generator TS-35/AP, and Voltmeter IS-189.

(2) INDICATOR ID-99/APS-10.

(a) PRELIMINARY.—Turn the "BIAS" control to zero to prevent possible damage to the tube. Turn on the "POWER" switch on the synchronizer panel.

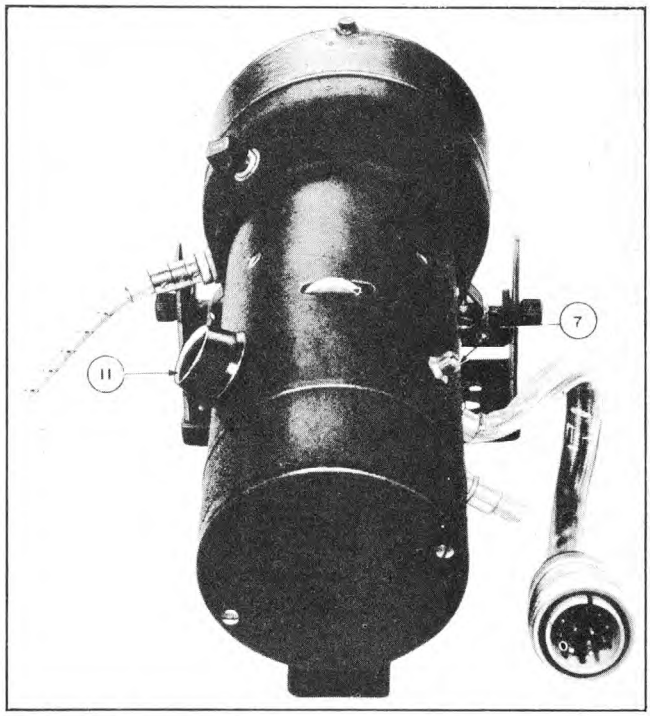


Figure 2-22. Indicator ID-99/APS-10—Rear View

(b) VOLTAGES. — Using Voltmeter IS-189, measure the following voltages at the rectifier power unit:

Pins	*Volts*	*Tolerance*
J604	+285 d. c.	±15 volts
J605	+150 d. c. regulated	± 5 volts
J606	−105 d. c. regulated	± 5 volts

(c) SWEEP.—Turn the spinner on at the synchronizer. Increase the bias and observe the indicator tube, noting if sweeps appear.

(d) CONTROLS.—Check for focus, bias, centering, brilliance, and gain. Adjust the corresponding controls until, with the "GAIN" control turned down, a faint trace is just visible.

(e) RANGE MARKS.—Turn up the "GAIN" control until noise appears, then turn up the "MARKER BRILL." control. Rotate the "RANGE NAUTICAL MILES" control, counting the range marks appearing at different ranges selected by the control. (See figure 5-4.)

(3) TRANSMITTER-RECEIVER RT-69/APS-10.

(a) PRELIMINARY.—Turn the "BIAS" control on the indicator to zero. Turn the "POWER" switch on the synchronizer on.

(b) MODULATOR DELAY.—The modulator should start not less than two minutes after turning on the power.

(e) CONNECTING TEST EQUIPMENT.

1. Set the "SPINNER" switch on the synchronizer to "OFF."

2. Connect the a-c power cord to the signal generator and plug into the 115-volt a-c receptacle. Turn on the "ON-OFF" switch.

Note

Set the two attenuators on the signal generator to the maximum (36) position. Turn the "ADJ PWR" knob completely counterclockwise. Set the micrometer tuning knob to the end of the scale (20 on the shaft) and set the "DET OUT" and "CHECK" switches to positions so marked.

3. Plug in the power cord from the oscilloscope to the 115-volt a-c receptacle. Turn on the "POWER" switch.

4. Remove the two spring clips holding the protective cover on the coupling flange of the signal generator.

5. Place the choke coupling end of the patch cord against the flange input of the signal generator (long axis parallel to the panel of the set).

6. Slide the two spring clips into the slot along the edges of the coupling and insert a machine screw in at least one corner to keep the units aligned.

7. Insert the coaxial plug (at the other end of the patch cord) into the test panel jack marked "WAVE SELECTOR" (directional coupler).

8. Connect the "TRIGGER OUT" of the system to "EXTERNAL SYNC" of the oscilloscope, with the adjacent switch in the "EXTERNAL SYNC" position.

9. Connect the "VIDEO" of the system (on the test panel) to the SIGNAL INPUT of the oscilloscope.

Note

The "INPUT IMPEDANCE" must *first* be set to HIGH.

(d) ADJUSTING TEST EQUIPMENT.

1. Set the "SYNC POLARITY" switch to "POS."

2. Set the "SWEEP SELECTOR" switch to "START-STOP."

3. Set the "ATTENUATION" switch to 20 db, or until noise is just apparent.

4. Set the "IMAGE SIZE" to maximum clockwise position.

5. Adjust "HORIZONTAL" and "VERTICAL POSITION" controls and "BRIGHTNESS" and "FOCUS" controls until a faint trace appears.

6. Set "SWEEP SPEED" to "MED."

7. Adjust "SYNC VOLTAGE" until the trace is steady.

(e) POWER OUTPUT (SEARCH). — Signal Generator TS-35/AP will be used in making power output measurements for both the search and beacon functions.

1. Set the "SEARCH-BEACON" switch on the synchronizer to "SEARCH."

2. Set "CHECK ADJ" knob on the signal generator for a meter reading of 100.

3. Set "DET OUT" and "CHECK" switches each to "NORM."

4. Set "CW-NORM" and the 0.5 "MW-NORM" switches to "NORM."

5. Rotate "ADJ O" knob to give a meter reading between 0 and 100.

6. Adjust the meter reading to 0 with the "FINE ADJ O" knob.

7. For the 0.5 "MW-NORM" switch in the "NORM" position:

a. Turn the "ADJ O" knob one step clockwise. If the meter reading does not go to 100, turn the "ADJ 100" knob until the meter does read 100.

b. Turn the "ADJ O" knob counterclockwise one step for a meter reading of approximately 0. Readjust the "FINE ADJ O" knob to make the meter reading 0 if it is not already so.

Note

When the meter reads 0 and 100, respectively, in the two positions of the "ADJ O" switch the change from 0 to 100 represents an increase of 1 milliwatt in the thermistor of the signal generator. Fractions of a milliwatt can be read directly on the meter. Step 7 provides the 1-mw meter setting.

8. Set "ATT-2" to 0 db and gradually rotate "ATT-1" clockwise until the meter reads 100. "ATT-1" should read between 5 and 11. Replace the transmitter-receiver if the "ATT-1" reading is below 8.

Note

These readings on "ATT-1" assume a 6-db loss in the patch cord. The actual loss in the patch cord will be stamped on it. If it is greater than 6 db, such as 8 db, "ATT-1" should read between 3 and 9, in which case the transmitter-receiver is replaced if the reading is less than 3. If it is less than 6 db, such as 4 db, "ATT-1" should read between 7 and 13, in which case the transmitter-receiver is replaced if the reading is less than 7. In brief, the 5 and 11 reading on "ATT-1" should be increased or decreased by the amount that the loss in the patch cord is less or greater than 6 db respectively.

(f) POWER OUTPUT (Beacon).—The power output for beacon operation should be measured without changing the adjustments outlined in subparagraph *(e)* except as noted below:

1. Change the "SEARCH-BEACON" switch to "BEACON."

2. The power output, as read on "ATT-1," should be higher than for search operation. If a read-

ing of between 6 and 12 is not obtained, carefully repeat the settings and adjustments of subparagraph *(e)*, with the "SEARCH-BEACON" switch on "BEACON."

(g) FREQUENCY.—Frequency will be measured with the "SEARCH - BEACON" switch on "SEARCH," and with the use of Signal Generator TS-35/AP.

1. Rotate "ATT-1" counterclockwise until the meter reads between 50 and 100.

2. Rotate the frequency micrometer head clockwise slowly until the meter reading is reduced. Continue to rotate the micrometer until the meter reading reaches a minimum and starts to increase. Rotate the micrometer back and forth several times to obtain the exact minimum reading. Read and record the micrometer setting.

Note

The actual frequency can be obtained from the "Calibration of Frequency Meter" table in the Manual for Signal Generator TS-35/AP.

(h) RECEIVER SENSITIVITY (SEARCH).—Oscilloscope TS-34/AP and Signal Generator TS-35/AP will be used in measuring receiver sensitivity for both the search and beacon functions.

1. Set the "SEARCH-BEACON" switch to "SEARCH."

2. Rotate the frequency micrometer head counterclockwise several revolutions.

3. Set the "CW-NORM" switch to the "CW" position.

4. Rotate "ADJ PWR" knob clockwise until a meter reading between 50 and 100 is obtained.

5. Maximize the meter reading by turning the "FINE TUNING" knob. If the meter reading is over 100, turn the "ADJ PWR" knob counterclockwise until the meter reads between 50 and 100. Maximize the meter reading by turning the "FINE TUNING" knob. Repeat until the maximum meter reading is 100.

6. Rotate the frequency micrometer head clockwise until the meter reading starts to decrease. Continue to rotate the micrometer until the meter reading reaches a minimum and starts to increase. Rotate the micrometer back and forth several times to obtain the exact minimum reading. Read and record the micrometer setting.

7. If the micrometer reading is not the same as obtained in *(g)2* above, rotate the "TUNING" knob clockwise or counterclockwise.

Note

Rotating the "TUNING" knob clockwise lowers the frequency reading (smaller micrometer reading); rotating the "TUNING" knob counterclockwise raises the frequency (larger micrometer reading).

8. Adjust the "TUNING" knob by a small amount by rotating it in the desired direction (as indicated in 7 above). Maximize the meter reading with the "FINE TUNING" knob.

9. Check the frequency by repeating *6* above.

10. Repeat *8* and *6* above on a step-by-step basis until the frequency micrometer reading is *identical* to that obtained in *(g)2.*

Note

The oscillator in the signal generator is now generating cw power at the same frequency as the system transmitter.

11. Check the zero setting of the meter by repeating steps *(e)5* and *(e)6.*

Note

All switches should be in the "NORM" position except the "CW-NORM" switch which is in the CW position.

12. Rotate the "ADJ PWR" knob until the meter reading is raised from 0 to 100. Maximize the meter reading at 100 with the "FINE TUNING" knob. If the meter reading cannot be maximized at 100 with the "FINE TUNING" knob," rotate the "ADJ PWR" knob counterclockwise slightly until the meter reading can be maximized at 100 with the "FINE TUNING" knob.

Note

The oscillator is now generating 1 milliwatt to the input of the attenuator in the transmission line.

13. Set the "CW - NORM" switch to "NORM." The meter reading should be between 20 and 30, indicating the r-f output of the oscillator is being pulsed.

14. Measure the frequency of the pulsed r-f by repeating step *(g) 2.* The micrometer reading obtained should be approximately the same as that obtained in *(g)2* and *(h)10* above. If it is different, repeat *8* above by making a very slight adjustment in the desired direction and repeat *(g)2.* Repeat the process until the micrometer reading is *identical* to that obtained in *(g)2.*

15. Maximize the meter reading at 100 with the "FINE TUNING" knob. If this can not be done, repeat *12.* above.

16. Signals from the signal generator should appear on the oscilloscope.

Note

The "IMAGE SIZE" knob of the oscilloscope should be rotated counterclockwise until the signals are of suitable magnitude. The signals from the signal generator will appear on the oscilloscope as follows: No signals from the signal generator appear for a short period after the transmitter pulse (although radar signals may be present); then there is a train of pulses.

17. To measure receiver sensitivity of the transmitter-receiver, rotate "ATT-1" and "ATT-2" both to the 36-mark position. The signals should be just barely discernible in the noise on the oscilloscope. If the sum of the readings on the "ATT-1" and the "ATT-2" is less than 67, replace the transmitter-receiver.

(i) RECEIVER SENSITIVITY (BEACON).

1. With the "SEARCH-BEACON" switch on "BEACON" repeat steps *(h)2* through *(h)6* above.

Note

The reading of the micrometer obtained in performing 6 for this application, however, should be the reading opposite BE on the "Frequency Calibration Card" on the panel of the signal generator.

2. Repeat *(h)7* through *(h)17, noting in each step where required that the desired micrometer reading is that opposite BE on the "Frequency Calibration Card" on the panel of the signal generator.* If the sum of the readings on positions "ATT-1" and "ATT-2" is less than 61, replace the transmitter-receiver unit.

d. ANTENNA ASSEMBLY AS-154/APS-10.

(1) Turn the "POWER" switch on the synchronizer "ON." When the antenna is pointing straight ahead, the sweep on the upper half of the indicator tube should be vertical.

(2) Turn the "SPINNER" switch on the synchronizer "ON." The spinner should rotate clockwise, when viewed from above, at approximately 35 rpm. As the spinner rotates, the sweep should move around the indicator tube, also in a clockwise direction.

(3) Hold the "TILT" switch up and then down. As the spinner tilts, the antenna tilt indicator will read to the left as the "TILT" switch is held up and to the right as the "TILT" switch is held down.

(4) Check that the tilt of the antenna can be adjusted by holding the "TILT" switch either up or down until the desired angle of tilt, as indicated on the antenna tilt indicator, is reached. Release the switch. The spinner and the reading on the indicator should remain in that position.

SECTION III
OPERATION

1. GENERAL FUNCTION.

Radio Set AN/APS-10 will show ground characteristics on "SEARCH" operation and coded signals on "BEACON" operation. By producing vital navigational information under even the worst flying conditions it will help perform many of the functions which formerly required good visibility.

2. GENERAL OPERATING PROCEDURE.

a. Check that power is on and properly adjusted.

b. Place the "POWER ON-OFF" switch "ON." (The indicator tube will light, and after a few seconds the sweep line and range marks will appear.)

c. An automatic time delay will produce a 2 to 4 minute lapse before the transmitter-receiver comes on. During this time make preliminary adjustments of the "DIAL LIGHT" and "FOCUS" (refer to para. 4).

d. Select the range to be covered and set the "RANGE NAUTICAL MILES" knob to the proper position.

e. Turn the "GAIN" control as high as it will go, fully clockwise.

f. Push the "SEARCH-BEACON" toggle switch in the direction of the operation desired, "BEACON" for coded signals from ground stations within range and "SEARCH" for studying ground characteristics within range.

g. Push the "TILT" switch up or down until the "TILT INDICATOR" reads the proper medium position. (For search this will be the altitude in thousands of feet, for beacon it will read "BEACON."

h. When the transmitter-receiver automatically switches on, a bright circle will appear at the inside of the sweep, near the center of the indicator tube.

i. Adjust the "GAIN" control to reduce any unwanted echoes or clutter on the indicator tube.

j. Check the antenna trim (refer to sec. V, par. 6*d*) for equal coverage, forward and back. A climb or dive changes the aspect of the plane and will require different antenna trim from level flight.

3. SPECIFIC OPERATING PROCEDURE.

Operation of Radio Set AN/APS-10 is divided into several definite classifications. These are covered here individually, leaving the operator to combine them to suit his immediate needs. Each specific procedure is possible after the general operating procedure (par. 2) has been carried out.

a. MAPPING OR LAND PAINTING.—This is a function of Radio Set AN/APS-10 whenever the course includes flying over both land and water.

(1) Place the "SEARCH-BEACON" switch on "SEARCH."

(2) Set the "RANGE NAUTICAL MILES" to 25.

(3) Turn the "GAIN" control fully clockwise (maximum setting).

(4) Move the antenna "TILT" switch "UP" or

"DOWN" to obtain concentrated ground echo from the center out to maximum range.

(5) If the information on the indicator tube is too concentrated or saturated to observe coastline data, lakes, rivers, bays, etc., reduce the "GAIN" until good contrast between land and water is obtained.

(6) Compare the radar information with your charted course.

b. DISTANT RADAR FIXES.—These are an important part of navigation by dead reckoning. Cities, mountains, and islands can be checked just as visual fixes are checked in contact flying.

(1) Place the "SEARCH-BEACON" switch on "SEARCH."

(2) Set the "RANGE NAUTICAL MILES" selector to "50."

(3) Turn the "GAIN" control fully clockwise.

(4) Move the "TILT" switch "UP" until the "TILT INDICATOR" reads approximately half the altitude, or until echoes of maximum range are obtained.

(5) Adjust the "GAIN" control if noise and clutter are present on the indicator tube.

(6) Remember that radar detects only to the horizon, so that at low altitudes the range may be shortened by the curvature of the earth.

(7) Compare the range and bearing of radar fixes with your approximate position on the chart. Double check to identify positively each fix in relation to others.

c. NEARBY DETAIL.—This can be studied on the indicator tube, using the shorter ranges.

(1) Place the "SEARCH-BEACON" switch on "SEARCH."

(2) Select the short radius to be studied and turn the "RANGE NAUTICAL MILES" control until the desired number of two-mile markers show on the indicator.

(3) Turn the "GAIN" control to the right or left to improve ground return and to reduce excessive clutter.

(4) Adjust the antenna tilt so that the "TILT INDICATOR" reads approximately twice the altitude, or until the pattern on the indicator tube fills the screen evenly from the center out.

(5) At very low altitudes it may be necessary to "TILT" the antenna "UP" to eliminate saturated return on the indicator tube. (In this case the "TILT" switch has the same effect as reducing "GAIN."

(6) Compare the ground pattern as shown on the indicator tube with your position on the charted course.

d. DISTANT BEACONS.—These may be identified by code number. They serve as check points for navigating any course within their range. (Range is a function of altitude because of the curvature of the earth.)

(1) Place the "SEARCH-BEACON" switch on "BEACON."

(2) Set the "RANGE NAUTICAL MILES" to 90 ("BEACON ONLY") or 50.

(3) Turn the "GAIN" control clockwise to its maximum setting.

(4) Press the "TILT" switch up until the "TILT INDICATOR" shows the antenna tilt at "BEACON."

(5) Normally the four steps above should produce any beacons which are within range on the indicator tube. It may be necessary to "hunt" with the antenna "TILT" switch to get maximum return from a distant beacon. Tilt the antenna down a little at a time, watching the indicator tube for beacon traces.

e. NEARBY BEACONS.—These are helpful for "homing" or for checking position or drift angle. Remember that they have a "cone of silence" above them like a radio beacon. If it is important to follow a beacon all the way in, it must be done at low altitude. The "cone of silence" extends outward. The greater the altitude, the greater the radius of "silence" where a beacon cannot be observed. (It amounts to roughly a mile for each thousand of feet in altitude.)

(1) Place the "SEARCH-BEACON" switch on "BEACON."

(2) Set the "RANGE NAUTICAL MILES" to the selected range.

(3) Turn the "GAIN" control fully clockwise.

(4) Move the "TILT" switch up until the "TILT INDICATOR" shows the antenna tilt at "BEACON."

(5) It may be necessary to tilt the antenna down slightly, more nearly in the direction of the beacon. Do this by pressing the "TILT" switch down a little at a time, watching the indicator tube until beacon traces are observed.

f. ESTIMATING DISTANCE FROM THE EARTH.—The nature of radar places the nearest echo toward the center of the indicator tube. The nearest echo is always from the ground directly under the plane, so that the distance to the earth in nautical miles can be easily read.

(1) Place the "SEARCH-BEACON" switch on "SEARCH."

(2) Turn the "GAIN" control clockwise to its maximum setting, or until ground echoes are strong enough for sharp contrast.

(3) Press the "TILT" switch down until the "TILT INDICATOR" reads at least double the altitude.

(4) Set the "RANGE NAUTICAL MILES" to "4."

(5) Read the indicator tube. The distance from the bright trace nearest the center to the first range mark is two nautical miles. The distance from this same bright trace to the first ground signal is your height. Read it in relation to the range mark which is two miles (12,000 feet).

4. CORRECTIVE MEASURES.

In the course of operation Radio Set AN/APS-10 may fail to give adequate performance for one reason or another. There are some symptoms of bad adjustment and inferior performance which can be identified easily. They can be corrected quickly in flight as soon as the trouble is recognized.

a. ONE-WAY LOOKING.

(1) The indicator shows only what is ahead of the plane or what is behind it. This is caused by the plane tipping forward or back.

(2) Adjust Control Box C-226/APS-10 until the antenna is in proper relation to the ground. The antenna should revolve in a circle which is level with the surface of the earth (refer to sec. V, par 6*d*).

b. LOPSIDED VIEW.

(1) One side of the indicator tube shows up better than the other. This is caused by dipping either wing of the plane.

(2) This is unavoidable when banking for a turn. However, if it happens in even flight, the pilot can trim the plane and correct the trouble.

c. SIZE OF PATTERN.

(1) Often the fixes which apparently should make large patterns on the indicator turn out to be smaller and vice versa. Radar detects patterns differently than a map or camera shows them.

(2) Experience alone can compensate for this peculiarity of radar. However, the operator can cross check and verify the fixes seen on the indicator tube.

d. TARGET HIDE-AND-SEEK.

(1) A husky echo may show up on the edge of the indicator tube, then fade out as the plane approaches it. This is caused by the pattern the radar beam makes on the earth.

(2) Usually, tilting the antenna down a little will pick up the lost signal. Then follow the signal in by tilting the antenna more nearly in the direction of the fix.

e. NEAR-SIGHTEDNESS.

(1) Sometimes short-range objects show up well on the indicator tube, but distant objects are weak or do not show at all. This is probably a sign that the antenna is set for nearby looking.

(2) Push the antenna "TILT" switch up. Raise the antenna a little at a time until distant targets appear. Watch the "TILT INDICATOR." Do not let it read less than half the altitude.

f. FAR-SIGHTEDNESS.

(1) Distant objects may be seen on the indicator tube when nearby do not show up well. This is just the opposite of near-sightedness.

(2) Push the antenna "TILT" switch "DOWN," pointing the beam lower to cover nearby areas. The "TILT INDICATOR" will read more than the altitude for detailed study of short ranges.

g. DISAPPEARING BEACONS.

(1) On beacon operation the signal may disappear as it is approached. This is caused by the shape of the beacon beam. Radar beacons have a "cone of silence" above them like radio beacons.

(2) If it is important to follow a beacon in, it is necessary to fly lower. The greater the altitude, the wider the "cone of silence" where the beacon cannot be seen.

h. LIGHT BLINDNESS.

(1) When flying at night a bright indicator tube will interfere with dark adaptation because the tube may be brighter than the objects the operator may want to see from the plane.

(2) Turn the "BRILLIANCE" knob to the left until the echoes are barely visible. This reduces only the brightness of each signal, not the number of signals on the tube (refer to par. 4, this section).

i. POINT OF VIEW.

(1) A familiar fix may look different when approached from a new angle. Radar echoes depend on the aspect of the target as well as the size.

(2) There is no remedy for this condition except previous knowledge of the fact. If the operator realizes it, he will be prepared to confirm the bearing and range of an anticipated fix.

j. PANACEA.

(1) If Radio Set AN/APS-10 fails to function, it can be caused by misalignment somewhere along the circuits.

(2) Occasionally a fresh start will correct this. Turn the "POWER" switch "OFF," then turn it "ON" again and wait until the set warms up.

SECTION IV
EMERGENCY OPERATION AND REPAIR

1. EMERGENCY OPERATION.

Radar Set AN/APS-10 has no provisions for emergency operation.

2. EMERGENCY REPAIR.

The following table is designed to effect quick repairs of the equipment if it should become inoperative during flight. If these simple remedies for trouble fail to bring results, try jarring the unit giving trouble. This will often correct temporarily a shorting tube or bad connection.

Fault	*Remedy*
Entire system dead	Replace fuses in aircraft fuse box.
	Check cables and connectors by wiggling them to see whether system can be made to operate. If an intermittently open connection is found, make an emergency splice if time permits. If not, try to wedge the cable so that a temporary connection is made.
Dial light on indicator does not light	Replace rectifier power unit fuse (115-volt a-c) located in aircraft fuse box.
	Replace bulb of light at top of indicator.
Blower on transmitter-receiver or inside synchronizer does not run	Replace 27.5-volt d-c fuse located in aircraft fuse box.
Signals are erratic	Check cables and connectors by wiggling them to see whether connection can be made. If an intermittently open connection is found, make an emergency splice if time permits. If not, try to wedge the cable so that a temporary connection is made.
Sweep on indicator tube not rotating	Replace 27.5-volt fuse located in aircraft fuse box.
	Check SPINNER ON - OFF switch inside small hinged door on synchronizer to see if antenna is turned on.

SECTION V
SUPPLEMENTARY DATA

1. TWO-INDICATOR INSTALLATION.

a. EQUIPMENT REQUIRED. — The following tables list additional equipment required with Radio Set AN/APS-10 for an installation using two indicators.

(1) The following are the major components required.

Quantity per Equipment	*Name of Unit*	*Army Type Designation*	*Overall Dimensions (Inches)*	*Weight (Pounds)*
1	Indicator	ID-99/APS-10	6¾ x 8 x 13½	7.8
1	(with) Mounting	MT-294/APS-10	½ x 7 x 12	0.3

(2) The following are the accessories required.

Quantity per Equipment	*Name of Unit*	*Army-Navy Type Designation*	*Required Characteristics*
1	Plug	AN3100-24-20S	To be used with three No. 16 and five No. 20 wires and two Radio Frequency Cables RG-59/U.
1	Plug	AN3106-24-20P	
2	Plug	UG-85/U	To be used with Radio Frequency Cable RG-59/U.
2	Coupling Nut	AN3054-16	For AN3106-24-( ) series of connectors.
2	Flexible Conduit Ferrule	AN3052-10	For AN3106-24 connector and ⅝-inch flexible conduit.
2	H-V Connectors	UG-194/U UG-195/U	Dismantable, springloaded 4-kilovolt connector.

Quantity per Equipment	*Name of Unit*	*Army-Navy Type Designation*	*Required Characteristics*
Bulk Supply	H-V Cable		4-kilovolt shielded cable
Bulk Supply	Wire	No. 12	Stranded No. 12 wire with thermoplastic insulation.
Bulk Supply	Wire	No. 16	Stranded No. 16 wire with thermoplastic insulation
Bulk Supply	Wire	No. 18	Stranded No. 18 wire with thermoplastic insulation.
Bulk Supply	Wire	No. 20	Stranded No. 20 wire with thermoplastic insulation.
Bulk Supply	Coaxial Cable	RG-59/U	
Bulk Supply	5/8-inch Flexible Conduit	ANWW-C-561	

b. PROCEDURE TO FOLLOW IF SECOND INDICATOR ID-99/APS-10 IS USED.—Connect the cables as outlined in section II, paragraph 1*c*, and make the following additional connections.

(1) Connect cable W804 between the second indicator and the rectifier power supply, inserting plug P504 into jack J504 on the indicator, and plug P602 into jack J602 on the rectifier.

(2) Connect cable W805 between the second indicator and the synchronizer, inserting plug P501 (AN3100-24-20S) into jack J501 on the indicator, and plug P403 (AN3106-24-20P) into jack J403 on the synchronizer.

(3) Connect cable W809 between the two indicators, inserting plug P503 (UG-85/U) into jack J503 on the operator's indicator, and plug P502 (UG-85/U) into jack J502 on the pilot's indicator.

2. TUBE COMPLEMENT.

The tube complement of Radio Set AN/APS-10 is as follows:

Stock No.	*JAN Number*	*Quantity*
2J42	Tube 42	1
2J3C45	Tube 3C45	1
2J1B35	Tube 1B35	1
2J6AL5	Tube 6AL5	3
2J3B24	Tube JAN 3B24	2
2J2D21	Tube JAN 2D21	1
2J6AG5	Tube JAN 6AG5	9
2J6AK5	Tube JAN 6AK5	11
2J6AS6	Tube JAN 6AS6	1
2J6C4	Tube JAN 6C4	19
2J6X5GT	Tube JAN 6X5GT (VT-126-B)	4
2J723-A/B	Tube 723-A/B	2
2J9006	Tube JAN 9006	1
2J1B24	Tube 1B24	1
2J1N23A	Tube 1N 23A (Crystal Rectifier)	2
2J1N23B	Tube 1N 23B (Crystal Rectifier)	1
2V5FP7	Tube JAN 5FP7	1
2J6V6GT	Tube JAN 6V6GT (VT-107-A)	2
2J2X2	Tube JAN 2X2 (VT-119)	1
2J5R4GY	Tube JAN 5R4GY	1
2J6Y6G	Tube JAN 6Y6G (VT-168-A)	1
2J6SH7	Tube 6SH7GT/G	1
2J0C3/VR105	Tube 0C3/CR105 (VT-200)	1

3. GENERAL FUNCTIONS.

Radio Set AN/APS-10 will show ground characteristics on search operation and coded signals on beacon operation. By producing vital information under even the worst flying conditions it will help a navigator perform many of the functions which formerly required good visibility.

a. GROUND PAINTING.—By showing coastline and recognizable ground features Radio Set AN/APS-10 can help make landfall at the desired point when visibility is poor.

b. DRIFT ANGLE.—Regardless of weather conditions, the drift angle can be computed from radar intelligence.

c. GROUND SPEED.—Radio Set AN/APS-10 makes it possible to follow a track through darkness or overcast and compute ground speed.

d. WIND DATA.—With information obtained from the Radio Set, the operator can check wind velocity and direction without leaving the course.

e. BEACON HOMING.—Radio Set AN/APS-10 is equipped to give range and bearing of radar beacons, making it simple to "home" or navigate by coded beacon signals anywhere within their range.

f. DISTANCE FROM GROUND.—The very nature of radar makes it possible to interpolate the distance to the nearest ground under the plane.

g. SPOT A FIX.—Many of the navigating functions which are possible with visible fixes may now be done with the radio set through 10/10 clouds and at night. Constant practice, even when radar assistance is not needed, is recommended.

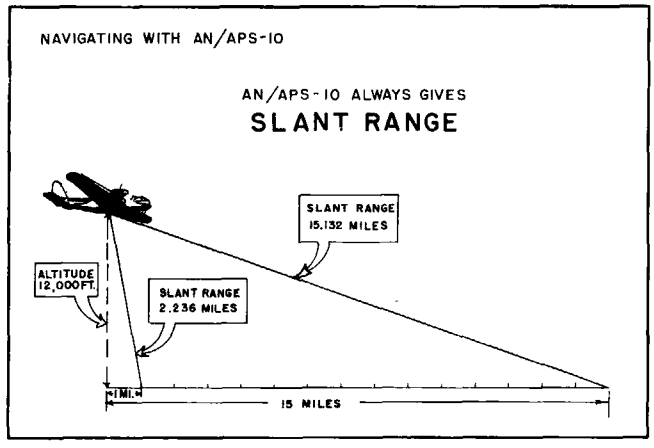


Figure 5-1. Slant Range

4. GENERAL LIMITATIONS.

Radio Set AN/APS-10 is subject to certain definite limitations. Familiarity with these limiting conditions will enable the operator to make the most of its capabilities.

a. OPERATION AT HIGH ALTITUDES.—The radio set was designed and built for reliability and ease of operation at medium altitudes. Best results will be obtained up to 15,000 feet. Data may still be observed up to 30,000 feet, but operation will not be as simple or as reliable at the higher altitudes.

b. CURVATURE OF THE EARTH.—Because of the fact that radar signals travel practically in a straight line, this equipment cannot look over the horizon. Therefore, ranges, especially beacon, may be better at greater altitudes.

c. RESOLUTION.—Radio Set AN/APS-10 cannot give separate indications for more than one target, if they are too near each other. Two or more ships may look like one large vessel; two islands may appear to join into one.

d. NO TRANSMISSION THROUGH WATER.—Radar signals cannot travel through water. They are absorbed by it and reflected from it. Unless objects are on the surface, they will not be detected by Radio Set AN/APS-10.

e. DEPENDENCE ON STANDARD EQUIPMENT. This equipment is an addition rather than a replacement. It is used to secure additional data, and to verify information obtained from other sources.

f. SLANT RANGE.—The nature of radar is such that ranges are always the distance from the plane to the target, not ground range from a point under the plane to the target. (See figure 5-1.) Whenever the range in miles is less than the altitude in thousands of feet it is important to convert slant range to ground range for accuracy. Refer to the computer chart, figure 5-2.

g. NAUTICAL MILES.—The range marks on INDICATOR ID-99/APS-10 are designed to show nautical miles. In reading ranges, remember that a mile is considered 6000 feet, or 2000 yards, and corresponds to a minute of latitude. If statute miles are needed for a navigating problem, a computer (E-6B) must be used to translate radar ranges.

Not available at time of publication.

Figure 5-2. Conversion of Slant Range to Ground Range

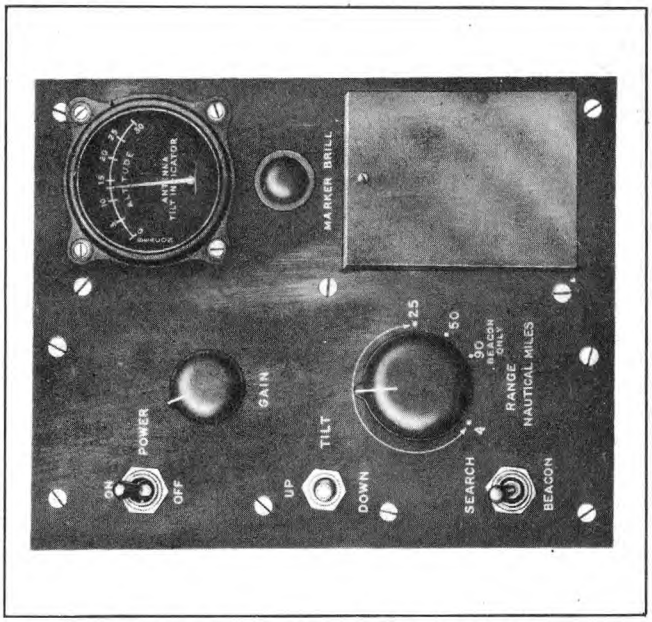


Figure 5-3. Synchronizer SN-17/APS-10—Operator's Controls

b. RELATIVE BEARINGS.—The indicator dial is marked in azimuth angles which are relative to plane heading. Thus, 360 degrees is always straight ahead, and 180 degrees is always directly behind the plane. In other words, Radio Set AN/APS-10 *sees* fixes as a navigator sees them when flying contact. Bearings shown on the indicator tube must be converted from relative to true for direct chart comparisons.

i. OPERATOR'S RESPONSIBILITY.—The efficiency of this equipment depends largely upon the skill of the operator. However, no amount of skill can make up for lack of proper maintenance. It is the operator's responsibility to report any poor performance and to see that the equipment has been properly ground-tested before each flight.

5. FUNCTION OF CONTROLS.

(See figure 5-3.)

a. "POWER ON-OFF."—This switch turns on power for the entire radio set system. An automatic time-delay allows from two to four minutes warm-up period before the transmitter-receiver cuts in and information appears on the indicator.

b. "GAIN."—This knob, like a volume control, increases or decreases the echoes seen on the indicator. Turn it clockwise to bring in weak and distant echoes. Turn it counterclockwise to reduce clutter and unwanted echoes.

c. "TILT" INDICATOR.—This dial indicates the tilt of the antenna at any moment. It is calibrated in altitude (thousands of feet) and gives a medium position for a given height. The settings will be changed in flight to suit operation. It should never read less than half the altitude and will often read more than the altitude. The normal position for beacon operation is marked by "BEACON" at the left of the indicator.

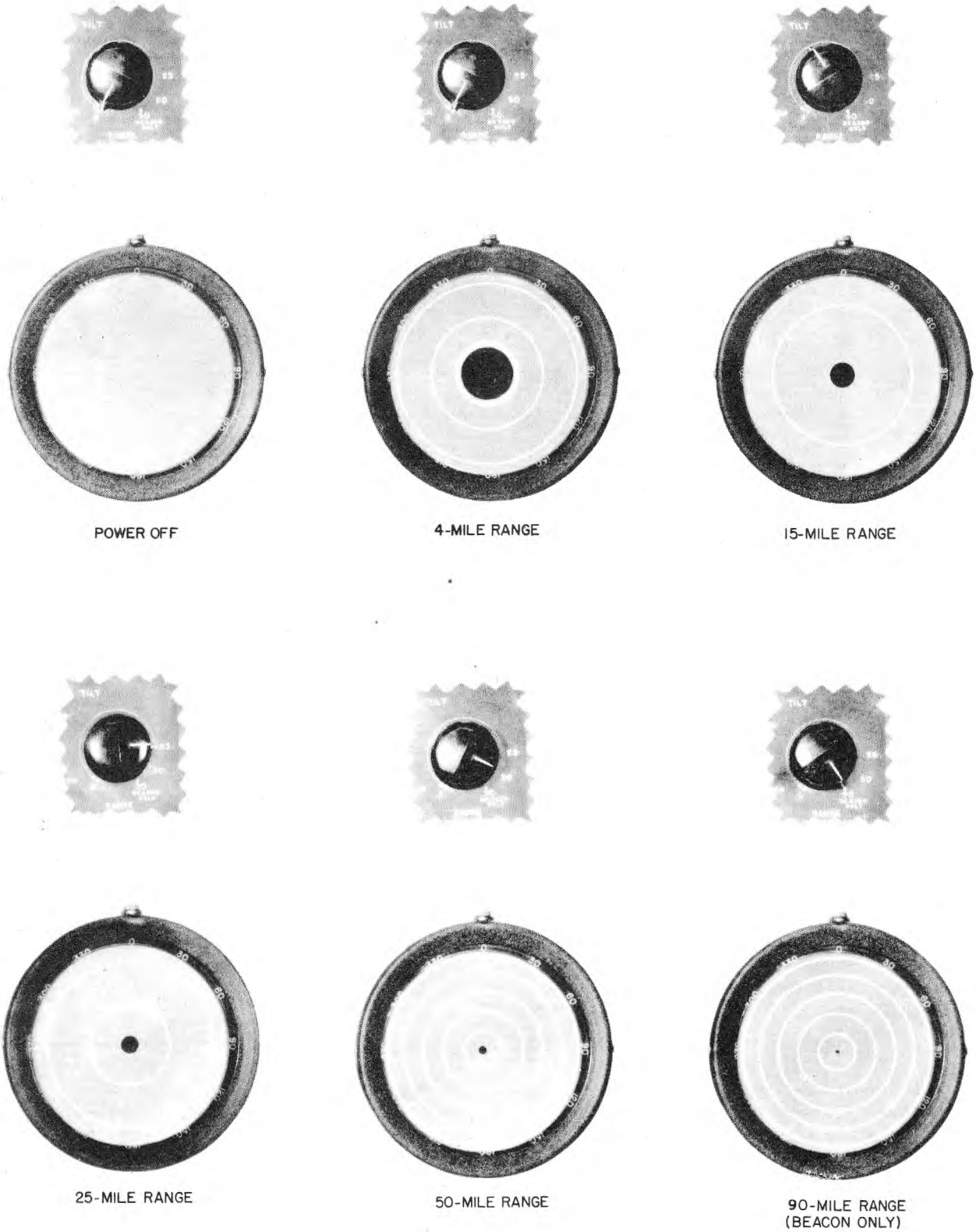


Figure 5-4. Comparison of Ranges

d. "TILT UP-DOWN."—This switch rests in the middle position automatically. Push it up to raise the antenna and down to lower it. Change the tilt to suit operation, reading the position of the antenna on the "TILT" indicator. Much depends on the antenna position. Raising it may have the same effect as decreasing the "GAIN." When it is too low, it is possible to see directly below the plane, resulting in a picture similar to a doughnut.

e. "RANGE NAUTICAL MILES."—This control is calibrated in nautical miles and controls the radius of coverage shown on the indicator. Turn it to the right for increasing the range. Turn it back for closer coverage. The circular range marks on the indicator tube expand automatically as the range is shortened. (See figure 5-4 for comparison of ranges.)

Note

On the first models of Radio Set AN/APS-10 the "50" and "100" positions of the "RANGE NAUTICAL MILES" control will give only 40 and 80-mile ranges, each indicated by four range mark circles. The operator of a particular set will be able to determine whether his set is of this type or whether the change-over to actual 50 and 100-mile range has been made.

f. "MARKER BRILL."—This small knob varies the brightness of the range marks on the indicator. Turn it clockwise to make the markers brighter, and counterclockwise to reduce marker brilliance.

g. "SEARCH-BEACON."—There are two ways to use Radio Set AN/APS-10. One is called "SEARCH" and produces echoes from land objects. The other is called "BEACON" and produces only coded beacon signals from ground stations. This switch selects one or the other. Push the switch to "BEACON" for beacon operation and to "SEARCH" for studying ground characteristics.

6. FUNCTION OF ADJUSTMENTS.

Radio Set AN/APS-10 does not require knowledge of electrical circuits for operation. All preflight adjustments are made by trained maintenance personnel with test equipment. It is the operator's responsibility to see that these adjustments are made. Thus, when the set is approved for flight by the maintenance crew, it is ready to operate. There are four adjustments which the operator may make as a matter of choice.

a. "DIAL LIGHT."—The screen over the indicator tube is marked in azimuth angles relative to plane heading. This dial is illuminated. The amount of light on this bearing scale may be adjusted to suit the individual operator by turning the "DIAL LIGHT." (See figure 5-5.) Turn to the right to increase the illumination, to the left to reduce it.

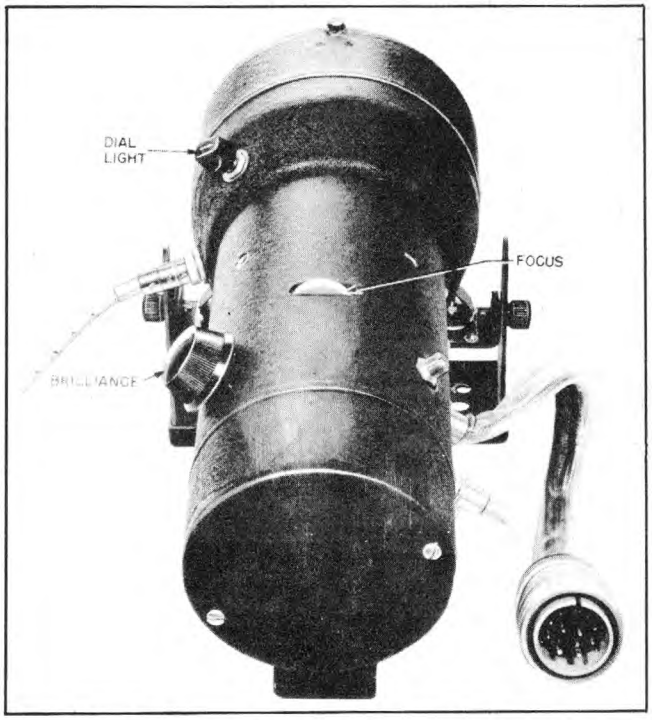


Figure 5-5. Indicator ID-99/APS-10—Operator's Adjustments

b. "FOCUS."—The indicator should be in sharp focus at the beginning of each flight, since it has been adjusted accurately by the maintenance man. If an adjustment is needed, turn the "SPINNER OFF" switch to off at the synchronizer and rotate the knurled wheel "FOCUS" on the indicator frame. (See figure 5-5.) Turn it back and forth until the sweep line and range marks are sharp and clear.

c. "BRILLIANCE."—The knob near the back of the indicator (figure 5-5) is for individual adjustment, governing the overall brightness of the presentation on the indicator tube. Too much will blur, like looking at the sun. Too little will prevent echoes from showing at all. Turn it to the right to increase brilliance, to the left to reduce it. (A normal setting may be produced by turning the "GAIN" all the way down and adjusting "BRILLIANCE" until the sweep line is just visible.)

d. ANTENNA TRIM.—Control Box C-226/APS-10 is the only adjustment control which is not mounted either on the indicator or the synchronizer. Turn this lever to level the antenna with respect to ground for even coverage front and back. Use a spirit level, if desired, but make the final check with respect to coverage on the indicator. (Check it on search operation only with the antenna tilted all the way to "30" on the "TILT INDICATOR." The indicator tube should show a round doughnut-like return near the center. (A bulge at the top or bottom means improper trim.)

Not available at time of publication.

Figure 5-6. Antenna Assembly AS-154/APS-10—Installation Drawing

RESTRICTED
AN 08-30APS10-2

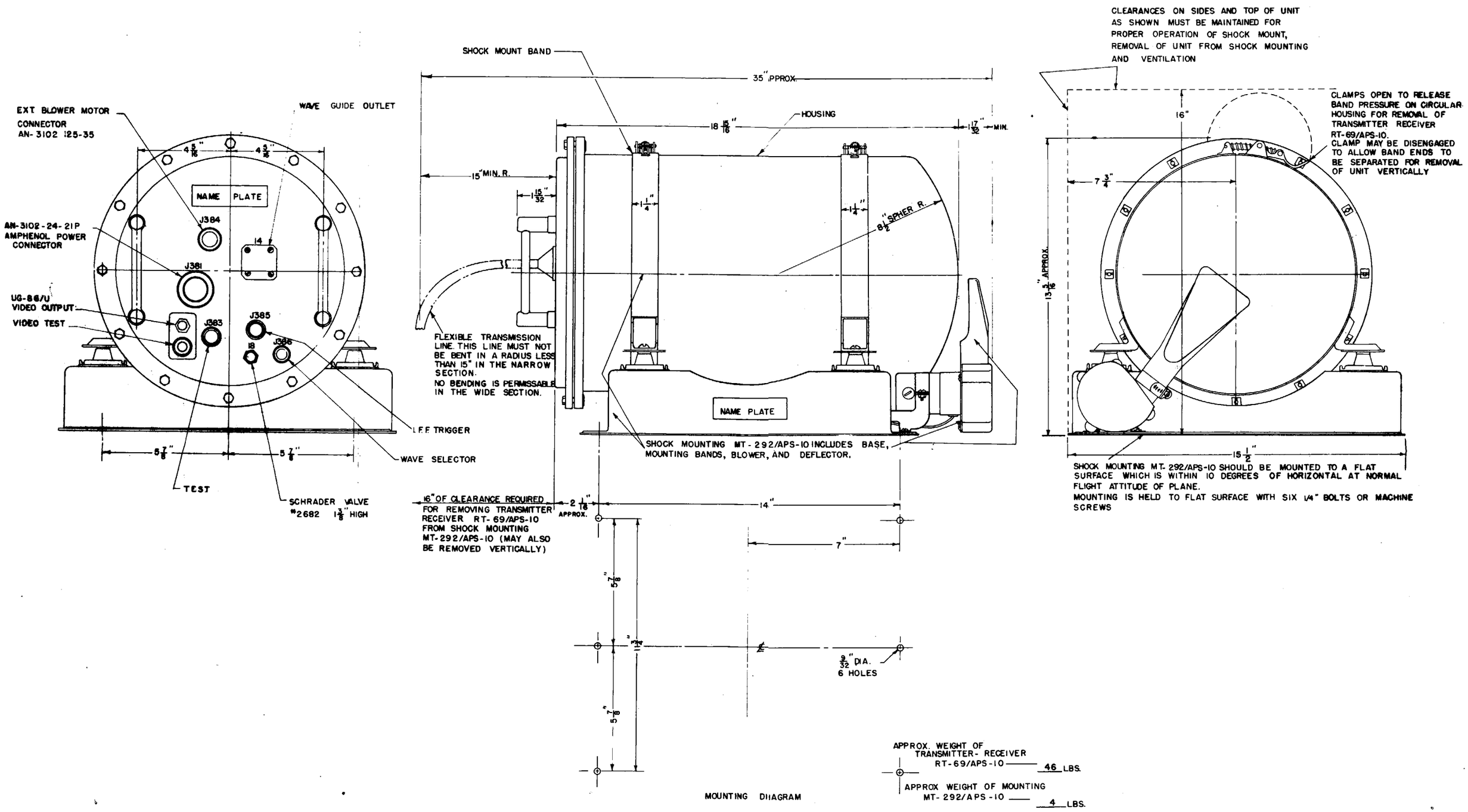


Figure 5-7. Transmitter-Receiver RT-69/APS-10—Installation Drawing

RESTRICTED

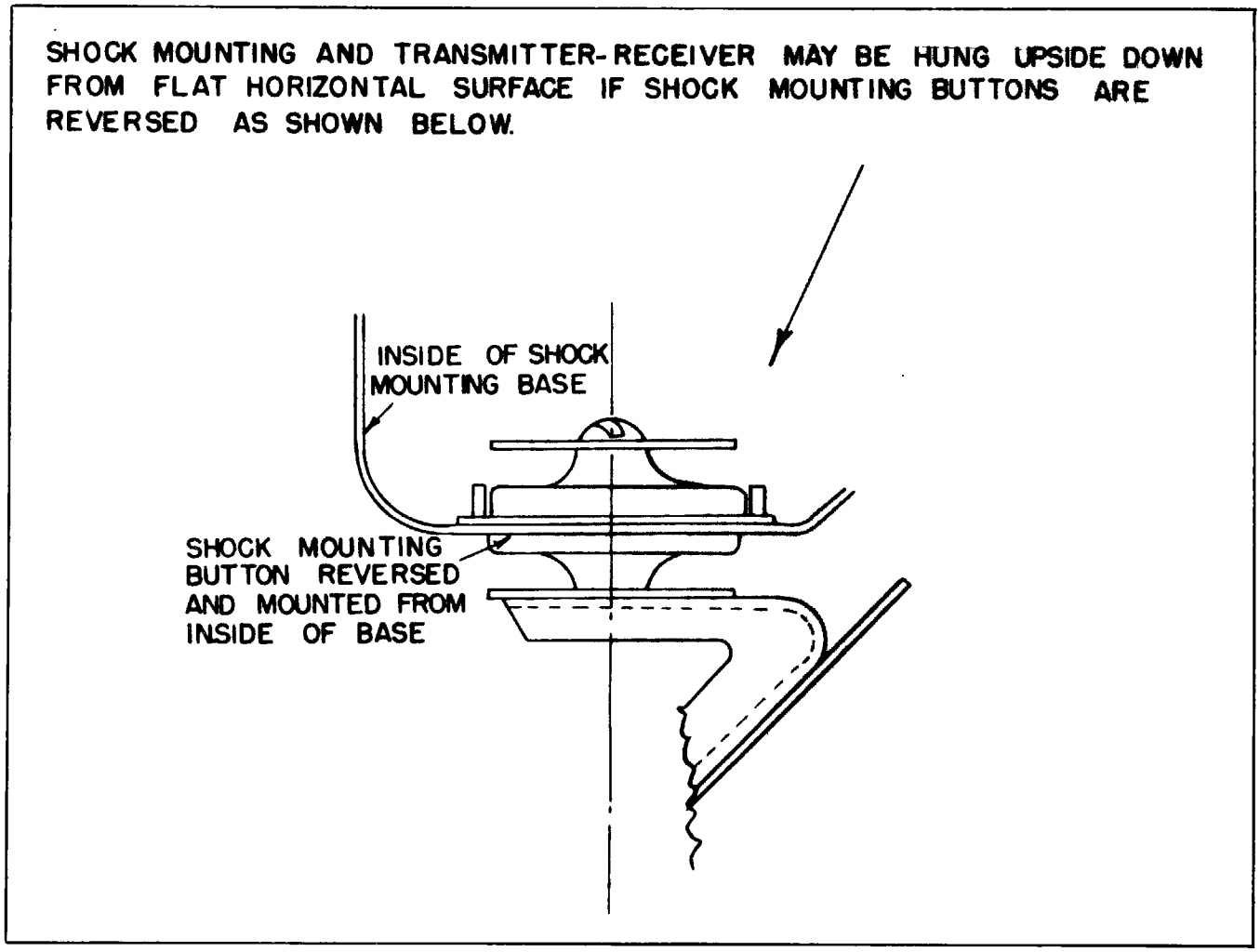


Figure 5-8. Procedure for Reversing Shock Buttons on Transmitter-Receiver Mounting

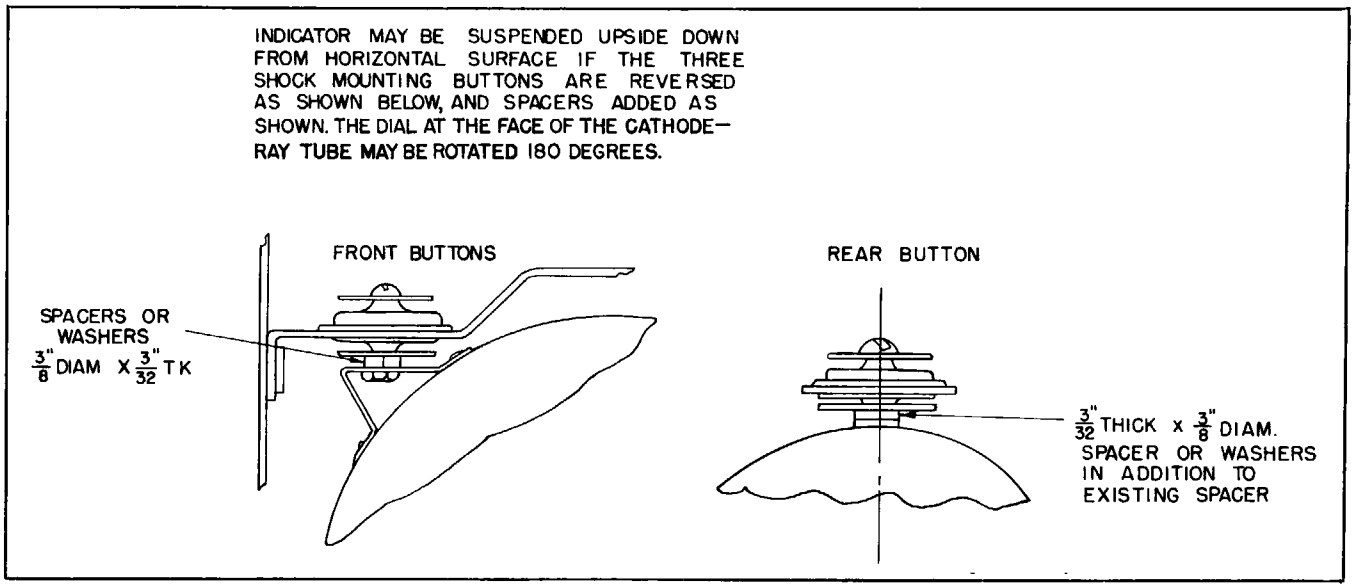


Figure 5-9. Procedure for Reversing Shock Buttons on Indicator Mounting

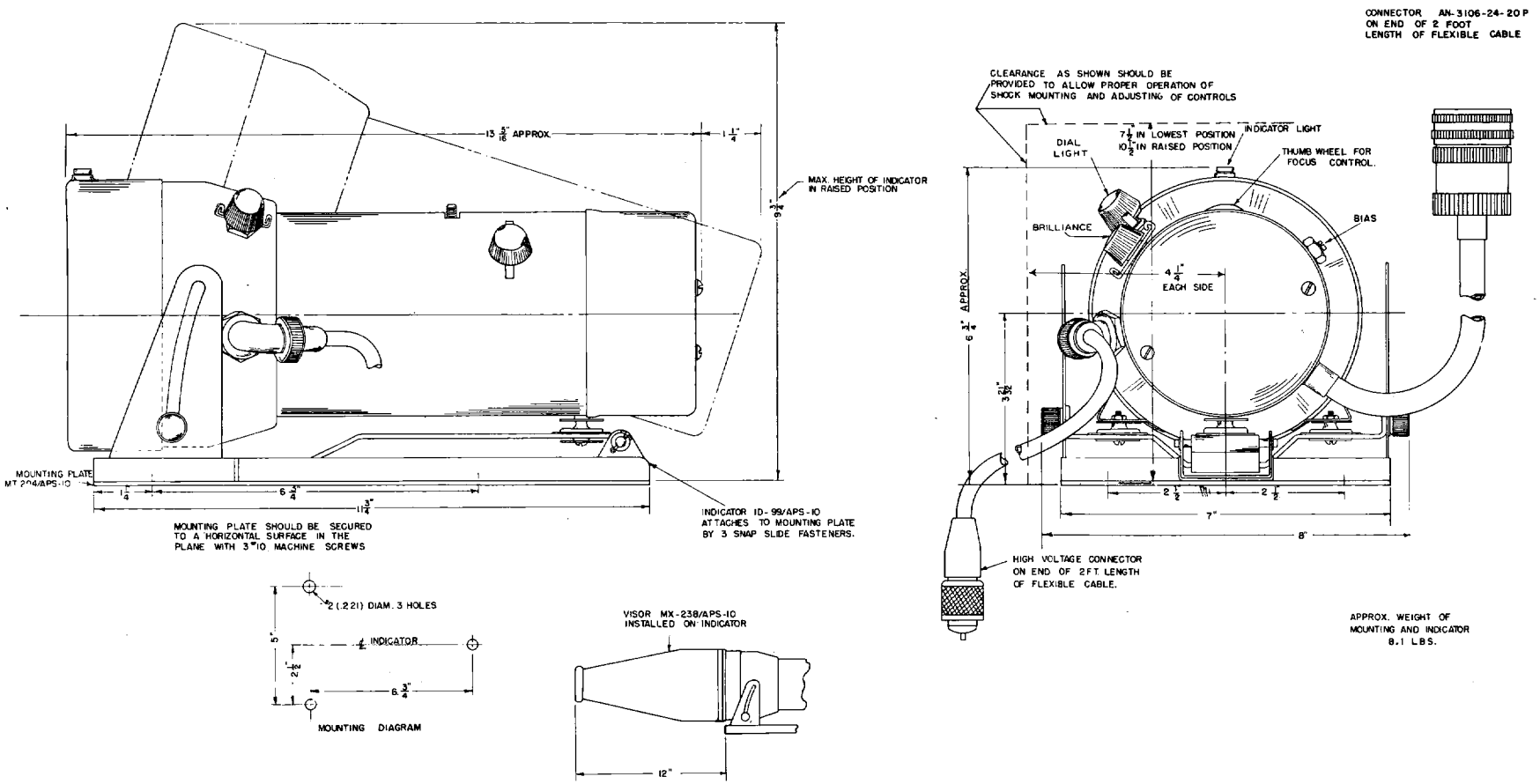
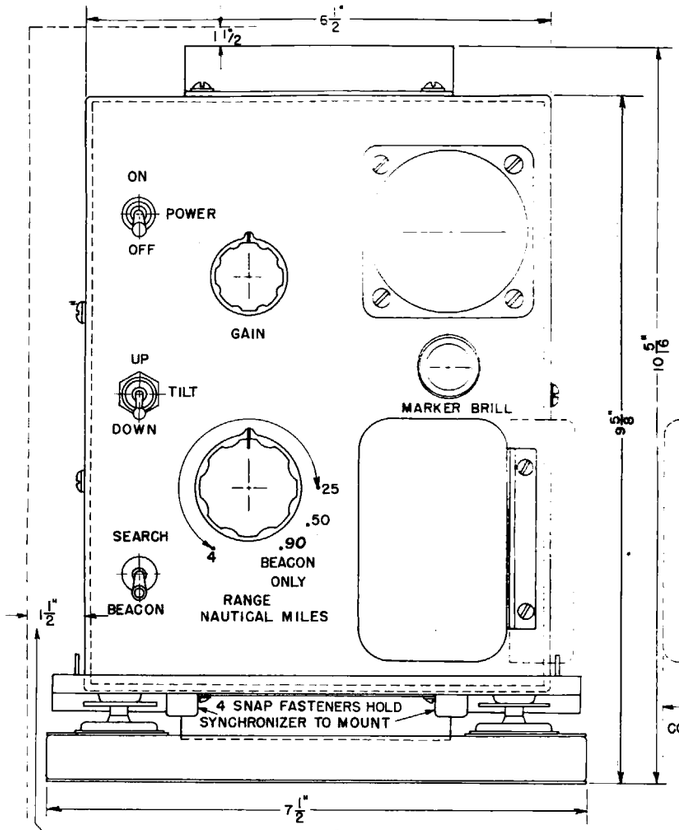
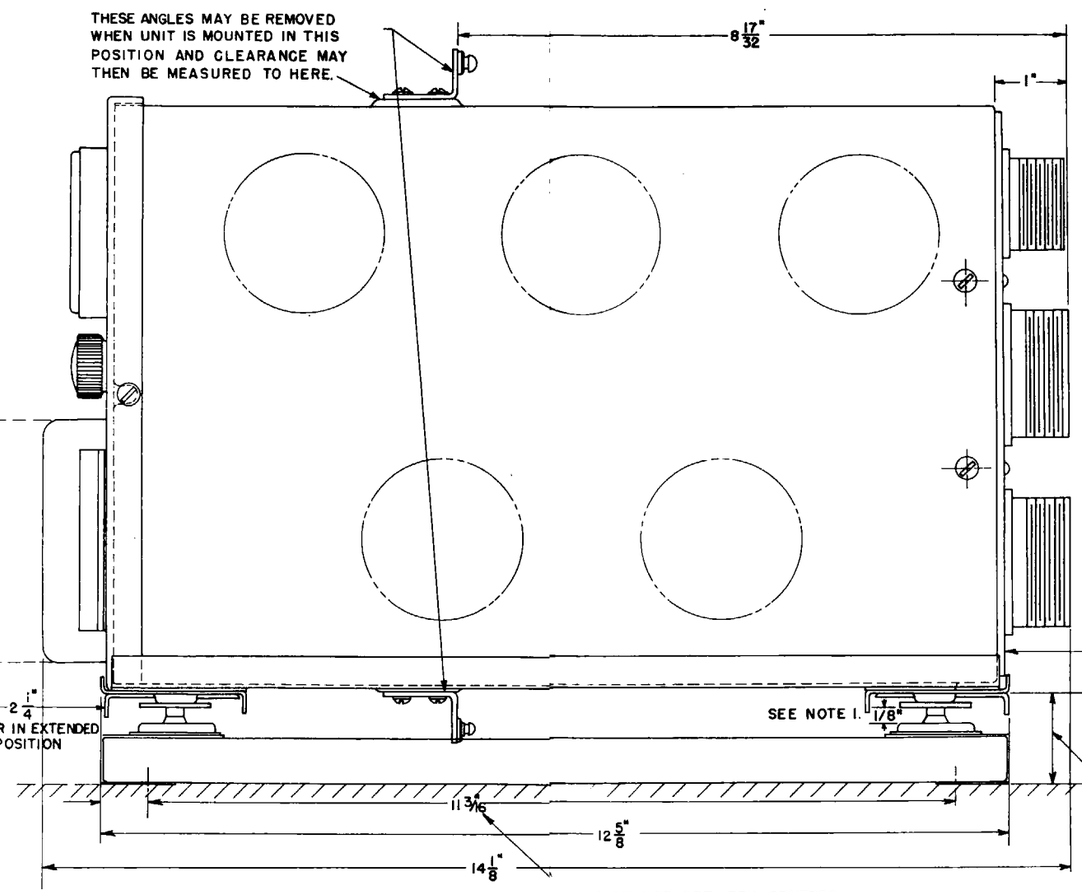
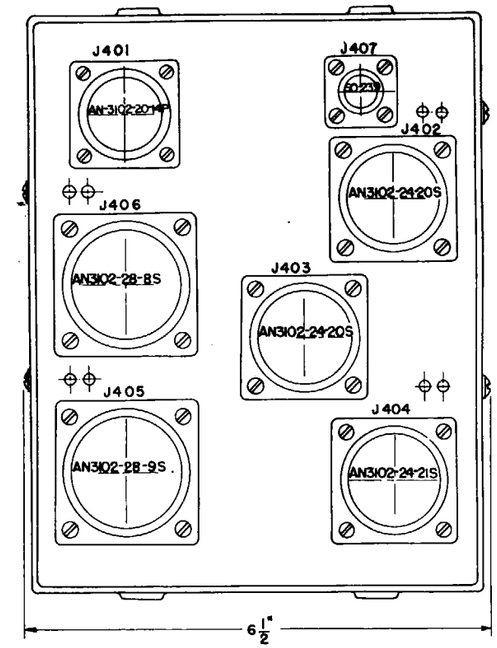


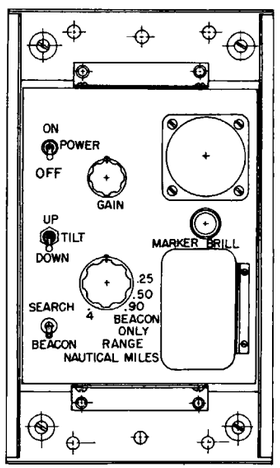
Figure 5-10. Indicator ID-99/APS-10 Installation Drawing

RESTRICTED
AN 08-30APS10-2



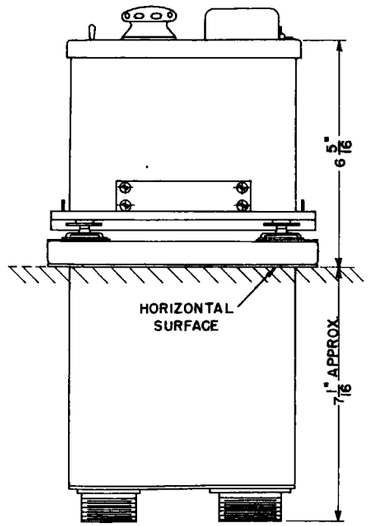






TOP-VIEW

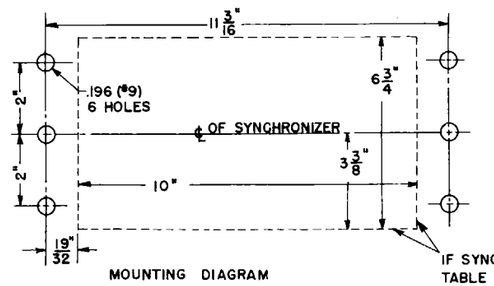
ALTERNATE METHOD FOR MOUNTING SYNCHRONIZER WITH PANEL VERTICAL.



SIDE-VIEW

NOTE 1.

TO INSURE PROPER OPERATION OF SHOCK MOUNT, IT IS NECESSARY THAT CABLES CONNECTING TO THIS UNIT BE AS FLEXIBLE AS POSSIBLE AND DRESSED SO THAT NO EXCESS PRESSURE IS EXERTED ON THE UNIT TO OVERLOAD THE SHOCK MOUNTS. UNDER NORMAL CONDITIONS OF LOADING, THE DISTANCE BETWEEN THE RUBBER BUMPER OF THE SHOCK MOUNT AND THE BUFFER WASHER SHOULD BE 1/8".



MOUNTING DIAGRAM

IF SYNCHRONIZER IS MOUNTED ON TABLE WITH PANEL HORIZONTAL, CLEARANCE HOLE THRU TABLE AS SHOWN MUST BE ALLOWED.

APPROX. WEIGHT OF SYNCHRONIZER AND MOUNTING 13.6 LBS.

Figure 5-11. Synchronizer SN-17/APS-10—Installation Drawing

RESTRICTED

RESTRICTED
AN 08-30APS10-2

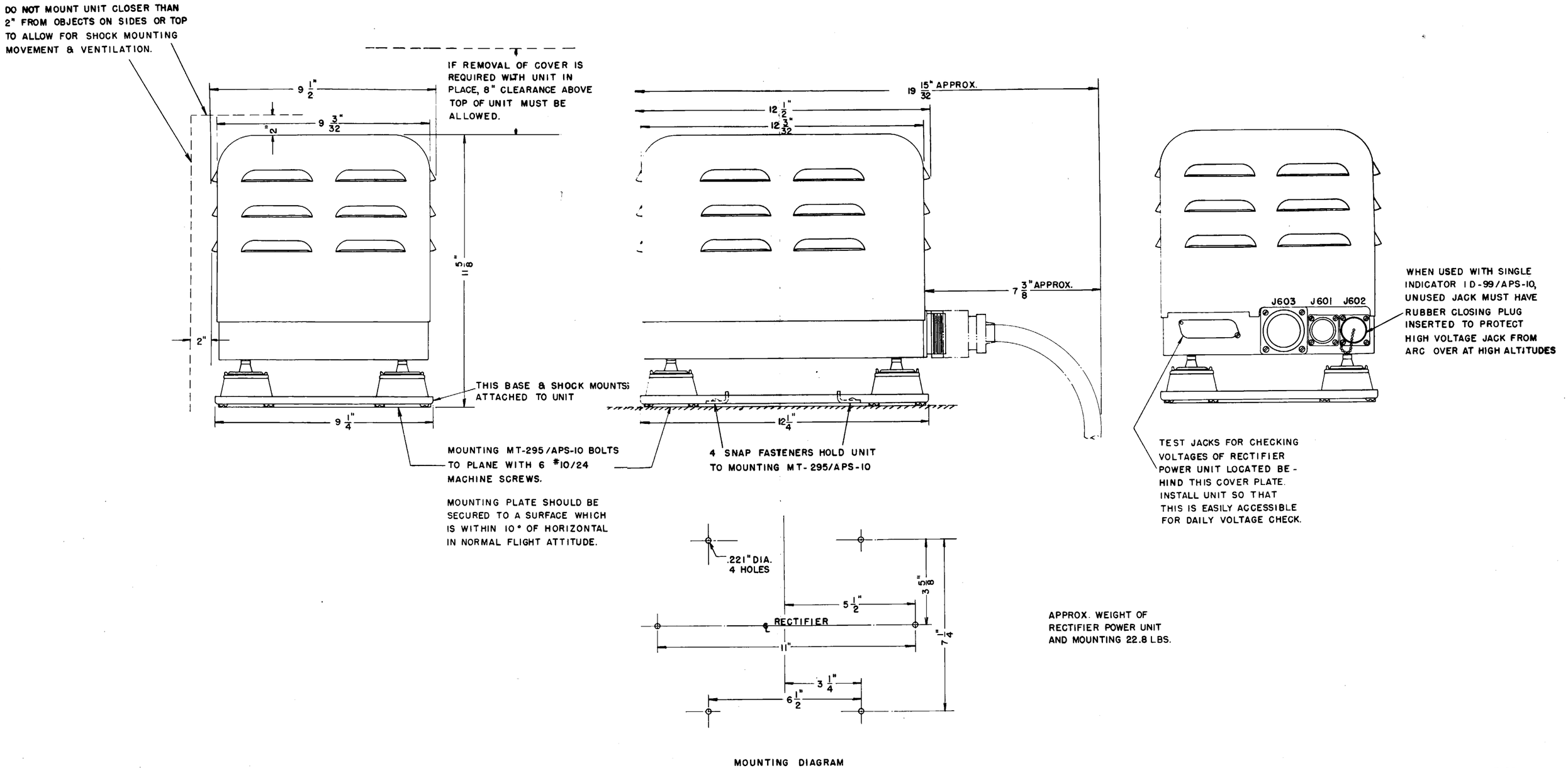


Figure 5-12. Rectifier Power Unit PP-111/APS-10—Installation Drawing

RESTRICTED

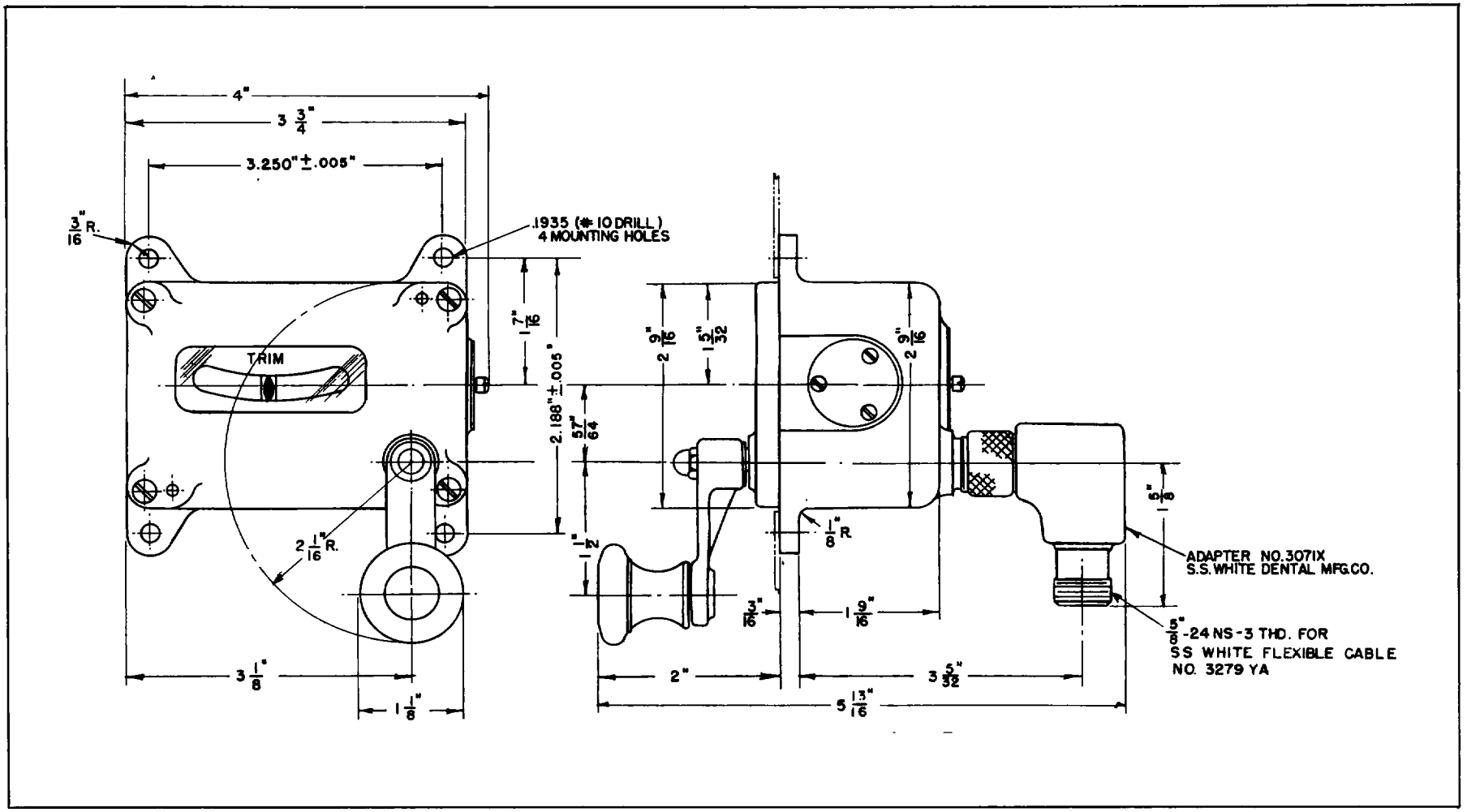


Figure 5-13. Control Box C-226/APS-10—Installation Drawing

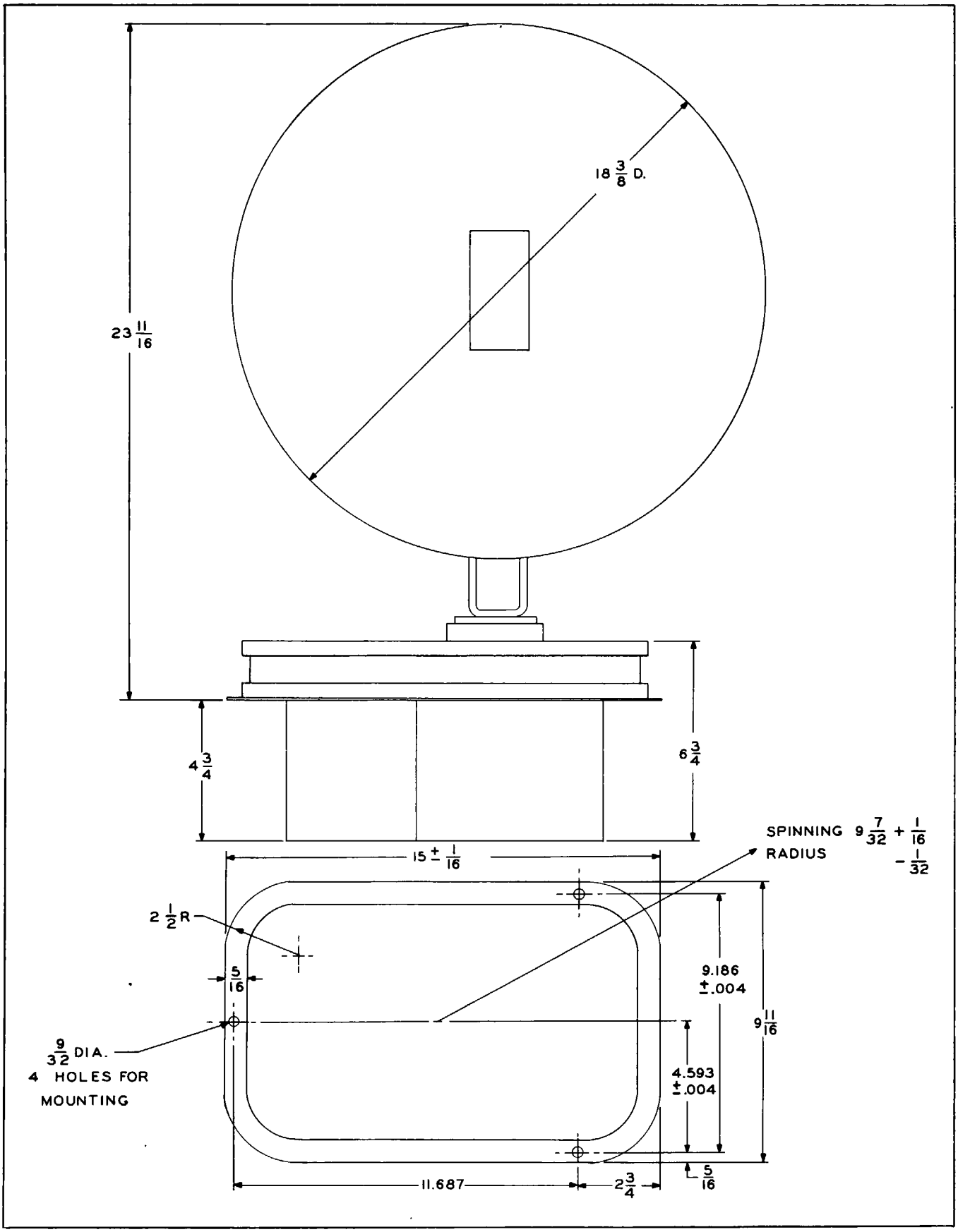


Figure 5-14. Antenna Assembly AS-154/APS-10—Simplified Installation Drawing