INSTRUCTION BOOK

for

ANTENNA COUPLER CU-277/URT

GENERAL ELECTRIC COMPANY
SYRACUSE, NEW YORK

U.S. COAST GUARD TREASURY DEPARTMENT

UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDANT
U.S. COAST GUARD
HEADQUARTERS
WASHINGTON 25, D.C.

EEE-2

ELECTRONIC FIELD CHANGE BULLETIN

TYPE 1 F.C. NO. 4 to CU-277/URT LORAN-A TRANSMITTING ANTENNA COUPLER
T.M. CU-277/URT

PURPOSE:

The purpose of this field change is to modify the CU-277/URT Loran-A Transmitting Antenna Coupler in order to improve the accuracy of antenna current readings.

DESCRIPTION:

a. The inductive pick-up R.F. ammeter presently used is replaced with a direct-reading meter with internal thermocouple, connected in series with the output lead of the coupler. A switch, S-402, is installed in parallel with this meter. The arrangement of these components permits a momentary reading of antenna current.

b. The meter, M-402, supplied in the field change kit will be either a 0-5 amp, 0-8 amp, or 0-10 amp, depending upon the power of the station and antenna used.

c. Approximately 6 man-hours are necessary to accomplish this field change.

EQUIPMENT AFFECTED:

This field change is applicable to all CU-277/URT Antenna Couplers. There will be no change in nomenclature as a result of this field change.

MATERIALS REQUIRED BY INSTALLING ACTIVITY:

All materials required for this field change will be issued in the kit for Field Change #4 to the CU-277/URT Antenna Coupler.

PROCEDURE:

Step by step instructions for accomplishment of this field change will be furnished with the kit.

ROUTINE INSTRUCTIONS:

1. The Technical Manual for the Antenna Coupler, CU-277/URT, shall be

ELECTRONIC FIELD CHANGE BULLETIN
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T.M. CU-277/URT

amended as follows:

a. Insert and log this field change in the front of the technical manual for Antenna Coupler, CU-277/URT, upon completion of the change.

b. Add the new meter (M-402) and switch (S-402) data to the Spare Parts List in the appropriate numerical order.

2. RECORD OF ACCOMPLISHMENT:

a. Personnel making this field change shall record the completion data of this field change on the Electronic Equipment History Card - NAVSHIPS 536 and on the Record of Field Change Card - NAVSHIPS 537.

b. Completion of Field Change #4 shall be noted on Form CG-2899 for the month the field change is completed.

3. DISPOSITION OF REPLACED MATERIAL:

Return the original meter, M-402, to spare parts.

4. DISPOSITION OF FIELD CHANGE BULLETIN:

Maintenance support facilities shall maintain a library copy of this Field Change Bulletin. Holders of equipment shall insure that this Field Change has been accomplished, the equipment tested, and the applicable manuals, drawings, charts, and identification plates have been corrected or replaced.

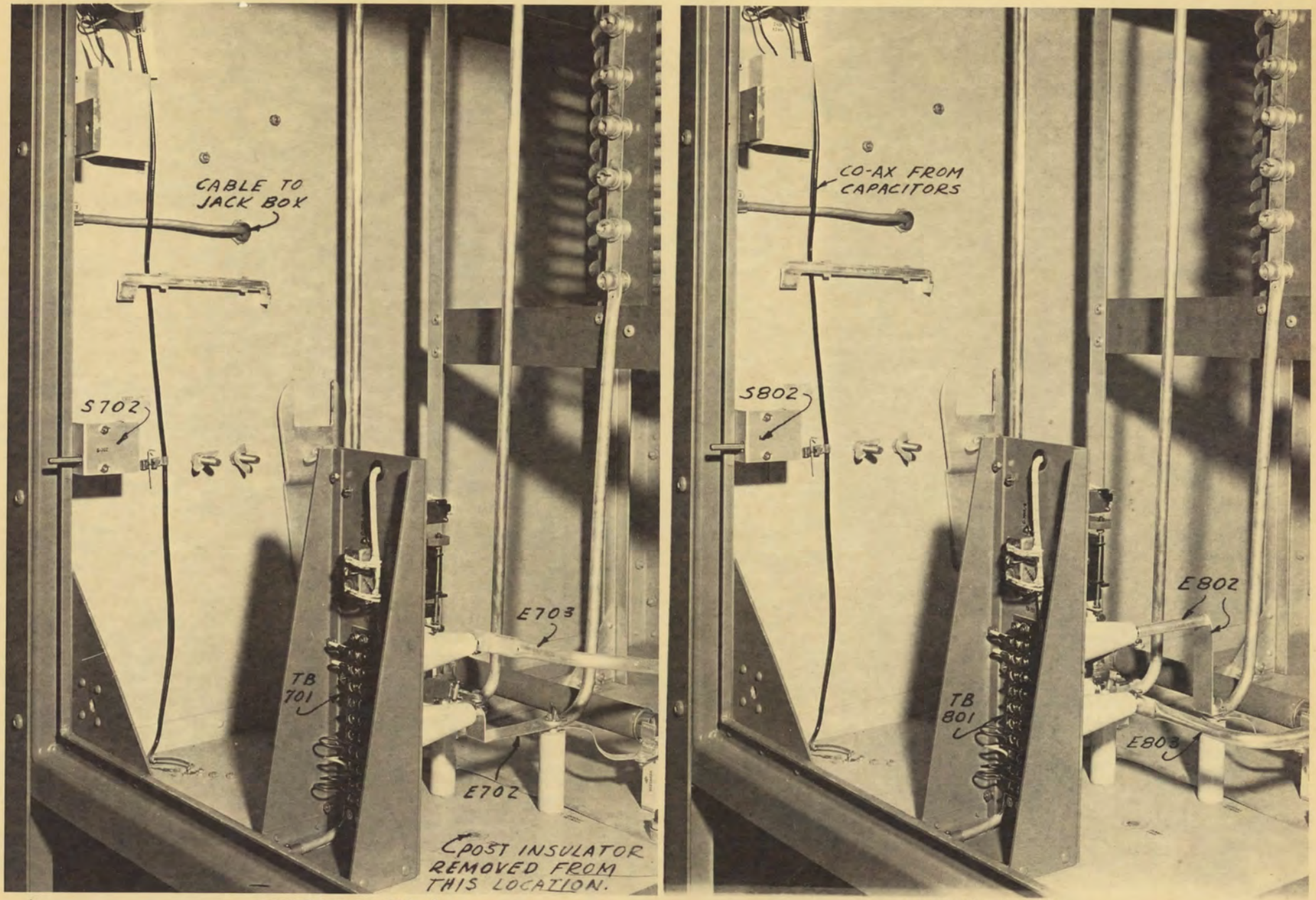
5. ACTION REQUIREMENTS:

All units having installed Antenna Couplers, CU-277/URT, shall comply with Routine Instructions Paragraphs 1, 2, and 3. A field change kit will be provided for each unmodified equipment by Commandant (EEE) without further Unit or District action.

J. A. ALGER, JR.
Chief, Office of Engineering

DIST (SDL NO. 74)

A: None
B: b,c,d,g,l(4); p(2); i(200)
C: l(4)
D: a,e,(4)
25149 TREAS. CGHQ. WASH, D. C.



COUPLER NO. 1 COUPLER NO. 2

FIG. 16

FRONT-RIGHT OBLIQUE VIEW — ANTENNA COUPLER CU-277/URT SHOWING DIFFERENCES BETWEEN NO. 1 & NO. 2 COUPLER INSTALLATIONS

INSTALLATION INSTRUCTIONS FOR ACCOMPLISHING R.F. AMMETER FIELD CHANGE TO MODEL CU-277/URT ANTENNA COUPLING UNIT (FIELD CHANGE #4)

Before proceeding with this installation read and familiarize yourself with these instructions.

A. Installation of new access cover and modification of access hole previously made by Field Change #1.

1. Before proceeding with this modification remove all R.F. input from the coupler being modified.

2. Remove cover and gasket providing access to L-403 tuning control.

3. Remove figure 1 from these installation instructions. Place the template furnished so that the existing hole indicated on the template is directly over the access hole in the coupler door. Carefully align the edges so that the template is straight up and down. Tape the template to the door to prevent movement.

4. You may find that the top three Dzus fasteners installed in Field Change #1 are not spaced as shown on the template. This makes it necessary to spot the three holes at the bottom of the template first. Spot and punch these holes and their associated Dzus spring fastener rivet holes. Do not drill.

5. The position of the holes for Dzus fasteners installed in Field Change #1 should now be accurately marked on the template (these markings may or may not be in agreement with the holes shown above line "A-A" on the template). These markings on the template will be used later for drilling the holes for the Dzus fasteners in the access cover plate.

6. Locate point "B" at the bottom of the template. Spot this point with the center punch. Do not drill.

7. Carefully remove template. Open door of coupler.

8. With a circle cutter adjusted to 1½ inches, center the cutter on punch mark made at point "B" on template (if a circle cutter is not available proceed to step 9). Cut out this portion of door. Cut remaining material out with a hack saw staying within hole dimensions shown on template. Use a file to smooth the edges of the hole.

9. If a circle cutter is not available proceed as follows. With a compass adjusted to 1½ inches center the compass on the mark which was made at point "B" on template. Draw a circle using point "B" as a center. With a ruler lain tangent with the existing 2½ inch hole and the 1½ inch circle just drawn draw a line connecting the two (refer to the template). Center punch a number of spots ¼ inch within the line of the piece to be cut out spacing them approximately ½ inch apart, using a 3/8 inch drill bit to drill these holes. Using a hacksaw blade with one end wrapped with tape, cut through the metal between the holes. File the remaining portion smooth with a file.

10. Drill the lower holes in the door (these were spotted in step 4) using the 13/32 inch drill bit for the larger holes and a #12 drill bit for the rivet holes. Countersink the rivet holes (on front side of door) to a depth of approximately 1/16 inch X 110 degrees (to receive rivet flare), refer to figure #1. A 5/16 inch drill bit may be used for this purpose.

11. Before installing the Dzus springs the hole in the spring used for the rivet must be slightly enlarged. A center punch or starting punch will accomplish this. Using a hammer drive the punch through the opening until it is large enough to accept the body of the rivet. Approximately 3/16 inch of the rivet body should now be cut off in order to reduce the amount of filing necessary (in next step).

12. Install the Dzus springs and rivets keeping the springs and rivet head on the back side of the door. Use a block of metal held against the rivet head and flatten the rivet body. File the flattened end so that it is flush with the outside surface of the door.

13. The access cover plate is furnished as a blank. All holes in this plate are to be drilled in accordance with the following instructions. This is done to insure that the cover plate will properly fit for each individual installation. Lay the template (figure 1) over the new access cover plate. Center punch all holes needed to install the Dzus fasteners. NOTE: No rivet holes are necessary on the cover plate. Holes above line "A-A" must agree exactly with those marked on template in the accomplishment of step 5. Drill Dzus fastener holes in the cover plate with a 5/16 inch drill bit. Using the cover plate as a template mark the holes to be cut in the neoprene rubber gasket. Cut out these holes. Install Dzus fasteners through the cover plate. Using the cement provided, evenly apply cement to one side of the rubber gasket. Work rapidly when applying this cement as it sets quickly. Place the gasket over the cover plate and allow to dry.

B. Preparation of Meter (M-402)

1. Mount the three stand-off insulators furnished on the face of the R.F. ammeter supplied. Use the 6-32 screws and lockwashers on the insulators. The brass pillar on these insulators should be between the insulators and meter flange. When completed the insulators should extend outward from the face of the meter.

C. Installation of Switch (S-402)

1. Remove the link between the top stud on L-403 and bowl insulator E-403. Do not remove strap feeding the R.F. pickup capacitors (field change #3) from this stud.

2. The switch is to be installed on the inner panel supporting the meters and tuning controls. From a point centered under tuning control "b" (L-403) measure up $3\frac{1}{2}$ inches from the bottom of the panel (refer to figure #2). Spot and drill a 5/16 inch hole.

3. Using the switch as a template pass the plunger shaft through the 5/16 inch hole from the outside of the panel. Align the switch so that it is square with the panel and the copper tubing mounting straps are pointing down. Spot and drill the two mounting holes using a #11 drill bit.

4. Mount the switch inside of the coupler extending the shaft through the front panel. Use the 10-32 X 5/8 inch screw, lockwashers and nuts provided to secure the switch in position.

5. Install the knob on the switchshaft.

D. Installation of the Meter.

1. Remove the original meter M-402. Remove the gasket under the meter flange. Return this meter to spare parts.

2. Drill out the tapped holes which were used to secure original meter with a #28 drill bit.

3. Install the meter behind the panel. Use the #6 fibre washers between the panel and the insulators. Butt the insulators against the panel and carefully tighten the 6-32 X 5/8" screws to avoid cracking the insulators.

4. During installation of the copper tubing all reference to "left" and "right" will be made with the technician facing the coupler. Refer to figure #3 for the descriptions of the copper tubings and to figure #4 for locations. Connect tubing length #1 from the top of L-403 to the left mounting strap on the switch with a ¼-28 screw, lockwasher and nut provided. Do not tighten. Connect length #2 from the left side of the meter (M-402) to the left mounting strap on the switch. Connect length #3 from the right side of the meter to the right mounting strap of the switch. Connect length #4 from the right mounting strap to the bowl insulator E-403. NOTE: The copper tubing on the meter is secured between the two flat washers. This is accomplished by removing the outer ¼-28 nut, lockwasher, and flatwasher and placing the copper tubing over the meter stud. After replacing the flatwasher, lockwasher and nut adjust on stud so that the outer nut is approximately flush with the stud. This is done to insure that the copper tubing does not come in contact with the thermocouple terminals and nuts which protrude through the rear of the meter case. Tighten all connections.

5. Using the phenolic plate furnished, center under the switch shaft on the inner panel and 3/16 inches up from the lower edge (refer to figure #2). Center punch the two holes. Drill these holes using a #31 drill bit. Mount and secure the plate with the 4-40 screws, lockwashers, and nuts provided.

6. Check all connections for tightness and see that installation is in agreement with the schematic diagram and location diagram (refer to figure #4 & #5). Place access cover plate in position on coupler door. Secure coupler door and test by applying R.F. input to antenna coupler.

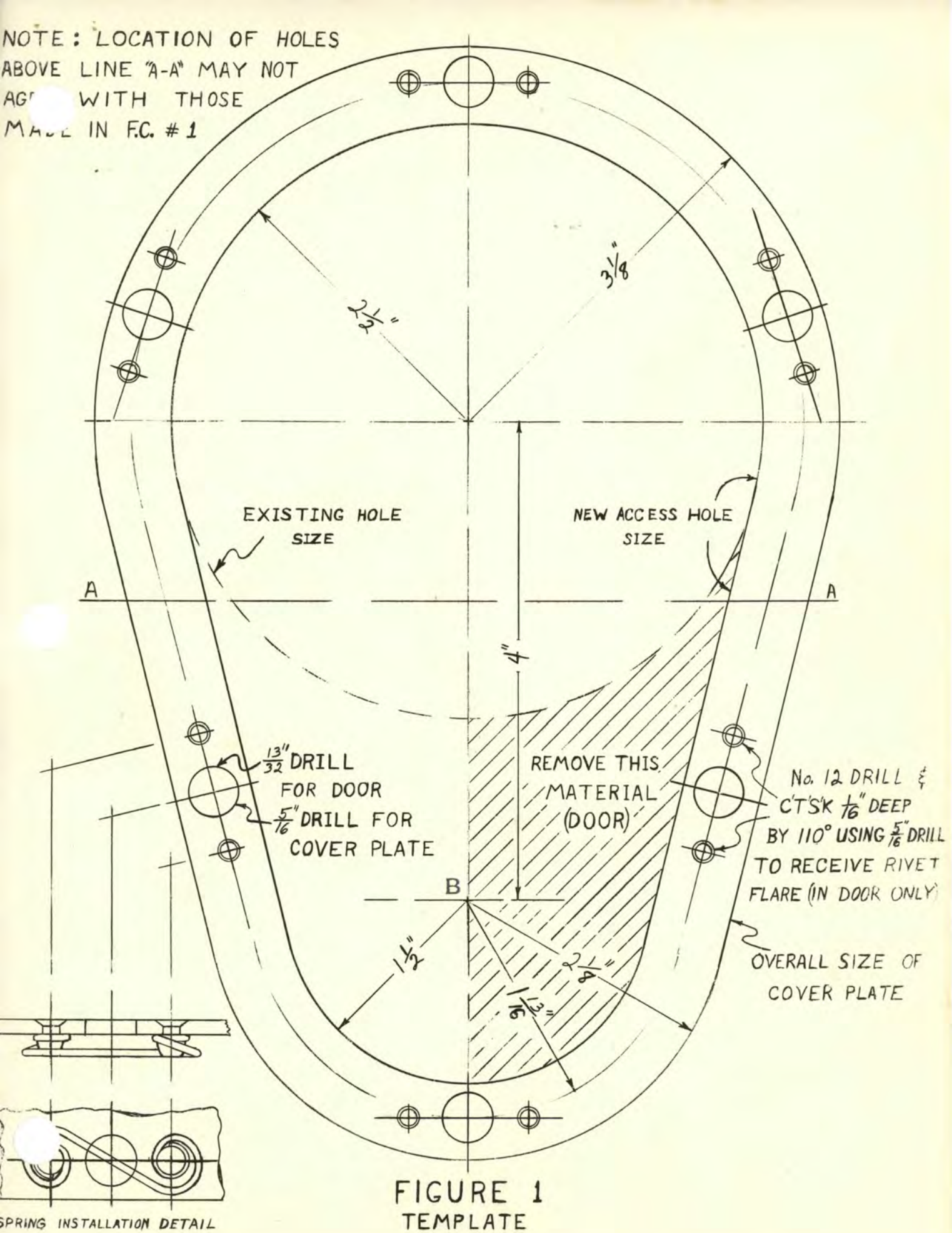
7. This completes the R.F. ammeter modification.

BILL OF MATERIALS REQUIRED FOR ACCOMPLISHING R.F. AMMETER MODIFICATION FIELD CHANGE TO CU-277/URT ANTENNA COUPLING UNIT (FIELD CHANGE #4)

METER, R. F. ammeter, internal thermocouple type. Range 0-5 amp, 0-8 amp, or 0-10 amp (depending upon power of station) Supplied with 4 each $\frac{1}{4}$-28 nuts, 4 each $\frac{1}{4}$" flatwashers, 2 each $\frac{1}{4}$" lockwashers.	each	1
SWITCH, push SPST, double break, shorting type, momentary, normally closed.	each	1
SPACER, aluminum, $2\frac{1}{2}$" X 1" X $\frac{3}{16}$", used between switch and back of pannel.	each	1
SPRAY CAN, CRC corrosion inhibitor No. 6.66 for use on corrosive parts of S-402.	can	1
KNOB, for switch S-402.	each	1
INSULATORS, ceramic, 2 15/16" X 1/2" dia. supplied with 2 each 6-32 X 5/8" screws, 2 each #6 lockwashers, and 1 each brass pillar.	each	3
COVER, access, cover plate with neoprene rubber gasket.	each	1
BRUSH, varnish brush, for application of cement to neoprene rubber gasket.	each	1
CEMENT, neoprene, 4 oz.	bottle	1
STUDS, Dzus.	each	6
SPRING CLIPS, Dzus.	each	6
RIVETS.	each	12
RETAINING RING, Dzus.	each	6
COPPER TUBING, $\frac{1}{2}$" dia., silver plated (refer to figure #3).	pieces	4
PHONELIC INSTRUCTION PLATE, inscribed "Antenna Current Meter Switch Push to Read".	each	1
SCREW, chrome plated brass, binding head, 10-32 X 5/8".	each	2
SCREW, chrome plated brass, binding head, 1/4-28 X 1/2".	each	2
SCREW, nickel plated brass, binding head, 4-40 X 1/2".	each	2
NUTS, chrome plated brass, 10-32.	each	2
NUTS, chrome plated brass, 1/4-28.	each	2
NUTS, nickel plated brass, 4-40.	each	2
LOCKWASHER, #10, internal tooth.	each	2
LOCKWASHER, 1/4" internal tooth.	each	2

LOCKWASHER, #4, nickel plated brass.	each 2
FLAT WASHER, 1/4",nickel plated brass.	each 2
FIBRE WASHER, #6, O.D. 3/8"	each 3
INSTALLATION INSTRUCTIONS	set 2

NOTE: LOCATION OF HOLES ABOVE LINE "A-A" MAY NOT AGREE WITH THOSE MADE IN F.C. # 1



SPRING INSTALLATION DETAIL

FIGURE 1
TEMPLATE

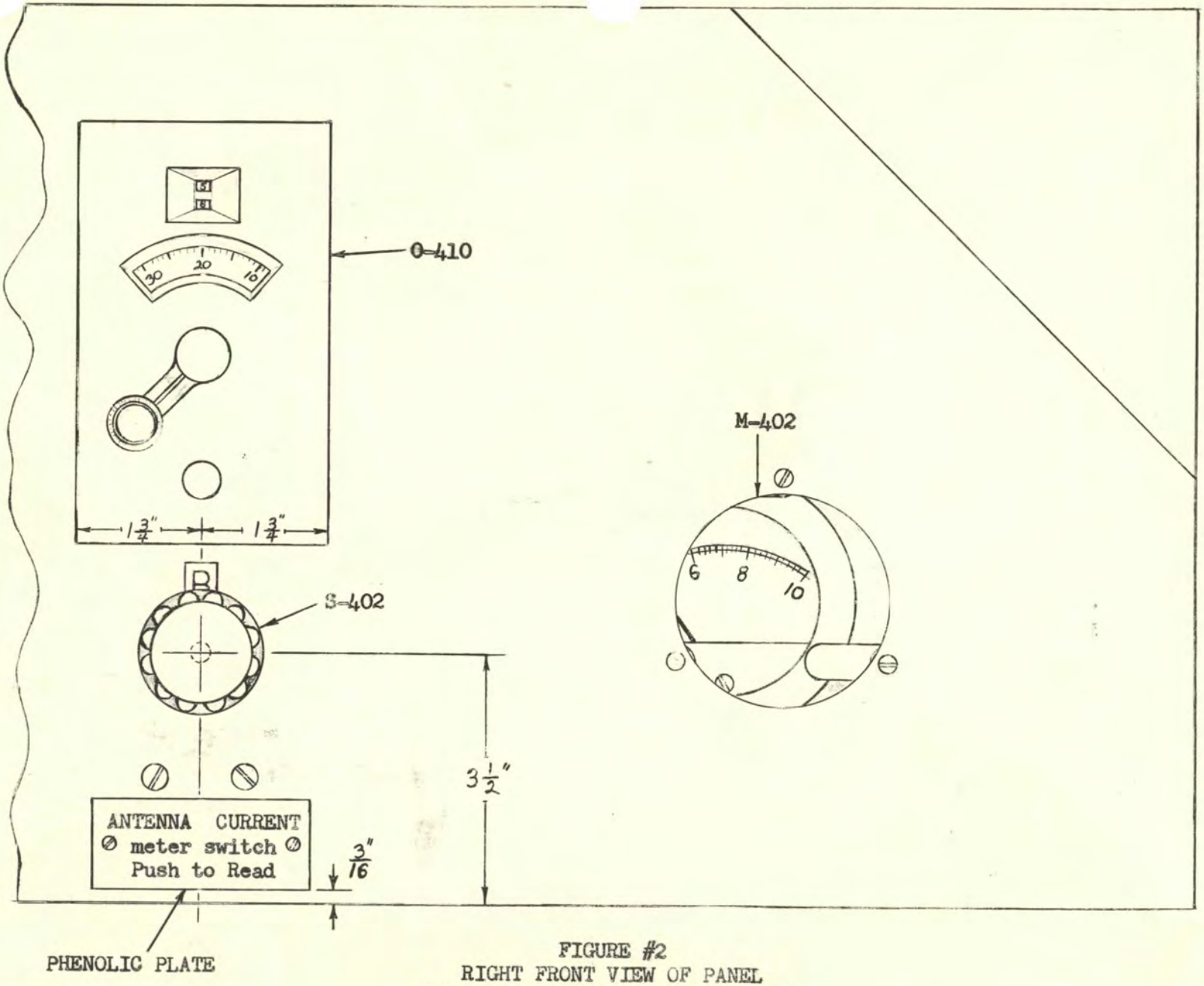


FIGURE #2
RIGHT FRONT VIEW OF PANEL
SHOWING POSITIONS FOR MOUNTING
"PUSH TO READ" SWITCH S-402 AND
ITS ASSOCIATED PHENOLIC PLATE.

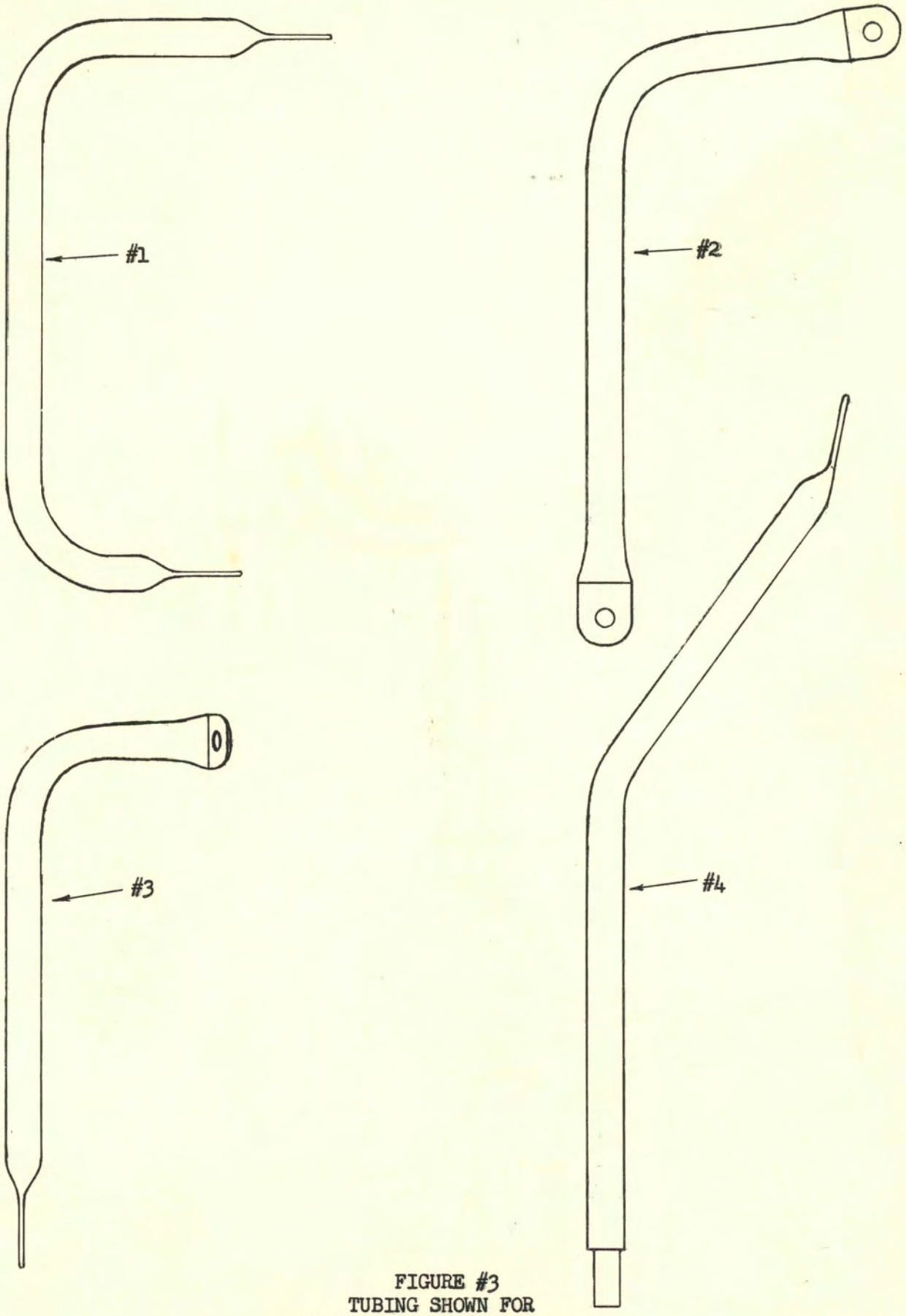


FIGURE #3
TUBING SHOWN FOR
PURPOSES OF IDENTIFICATION

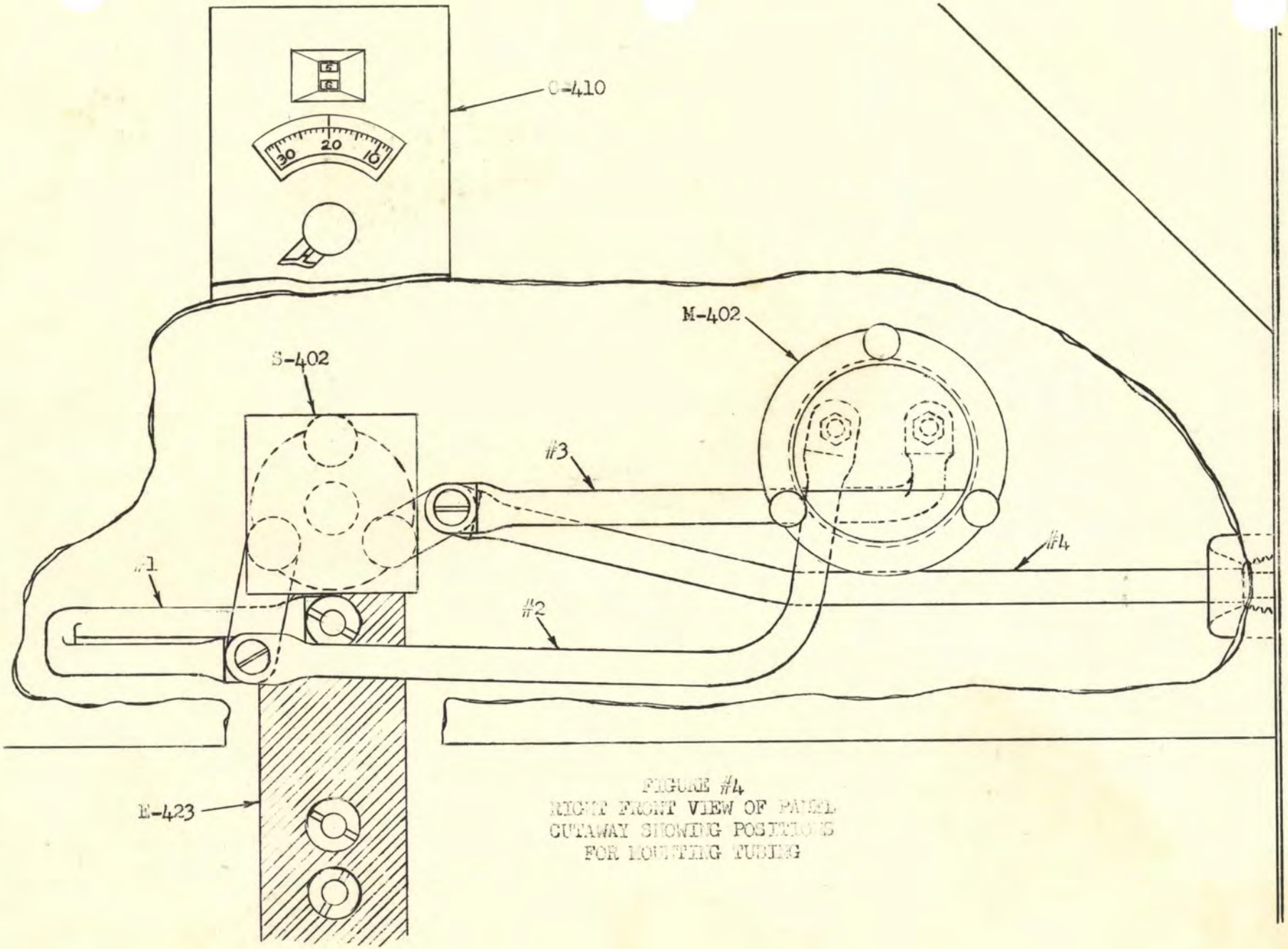


FIGURE #4
RIGHT FRONT VIEW OF PANEL
CUTAWAY SHOWING POSITIONS
FOR MOUNTING TUBING

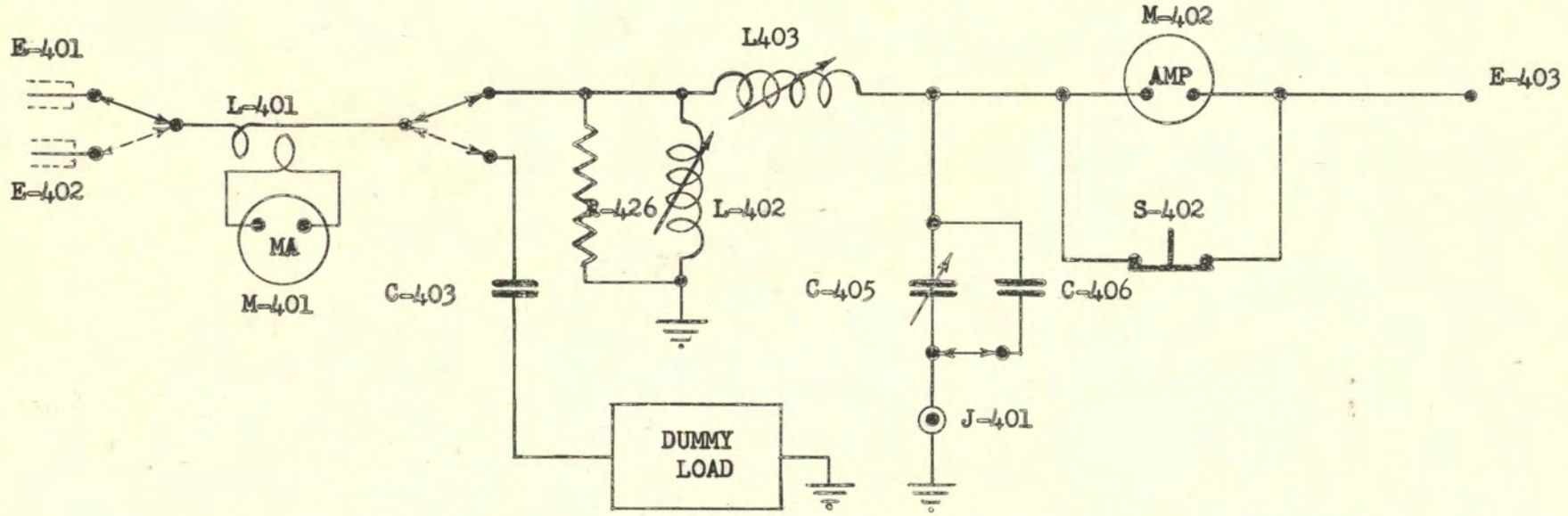


FIGURE #5
SCHEMATIC DIAGRAM SHOWING
ADDITION OF F.C. #4.

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EEE-2
17 January 1961

ANTENNA COUPLER
CU-277/URT

Technical Manual, CU-277/URT
Antenna Coupler, CU-277/URT

Amendment #4
Field Change #3

1. Purpose. The purpose of this Field Change and Technical Manual Amendment is to:

a. Authorize and direct a Field Change to Antenna Coupler, CU-277/URT to provide variable capacitive pickup of monitor RF voltage to afford better sampling of the radiated pulse..

b. Authorize and direct a change to the Technical Manual for Antenna Coupler, CU-277/URT by insertion of this amendment.

2. Publications Amended, Cancelled or Modified. The Technical Manual for Antenna Coupler, CU-277/URT is hereby amended.

3. Materials Required. All materials required are supplied with the Field Change Kit.

4. Modification Procedure. Step by step modification instructions are provided with the Field Change Kit.

5. Adjustments and Settings. The newly installed monitor line pick-up capacitor network consists of a fixed vacuum capacitor, C-406 (75 uuf), in parallel with a variable vacuum-capacitor, C-405 (15-75 uuf). C-406 may be added or removed from the circuit by means of the link provided. The amount of capacity necessary will vary with the power output of the station, the highest capacity being necessary at double-pulsed low power stations and the lowest capacity at single-pulsed high power stations. It is suggested that the lowest capacity (C-406 removed from circuit) be used initially, adjusting upward as necessary, until the positive portion of the pulse covers 25 divisions on the monitor scope with the vertical deflection control set at maximum.

6. Technical Manual Amendment. The Technical Manual for Antenna Coupler, CU-277/URT shall be amended as follows:

a. Delete from text all references to monitor line pick-up loop, L-405.

b. Correct Fig. 2-2 and Fig. 7-3 to reflect changes in Enclosure (1).

c. Add C-405 and C-406 to spare parts list.

7. Applicability of Modification. Field Change #3 is applicable to all CU-277/URT Antenna Couplers which have not been modified for use with AN/FPA-3A Switching Group. Technical Manual Amendment #4 is applicable to all CU-277/URT Antenna Coupler Technical Manuals.

8. Changes in Nomenclature. There will be no changes in nomenclature as a result of this Field Change.

9. Action Requirements.

a. All Loran Transmitting Stations having CU-277/URT Antenna Couplers not previously modified shall perform this Field Change. All Technical Manuals for the CU-277/URT Antenna Coupler shall be amended as indicated herein.

b. The Field Change Kit for this modification will be issued to activities concerned without further unit or District action.

c. Completion of Field Change #3 shall be noted on Form CG-2899 for the month that Field Change is completed.

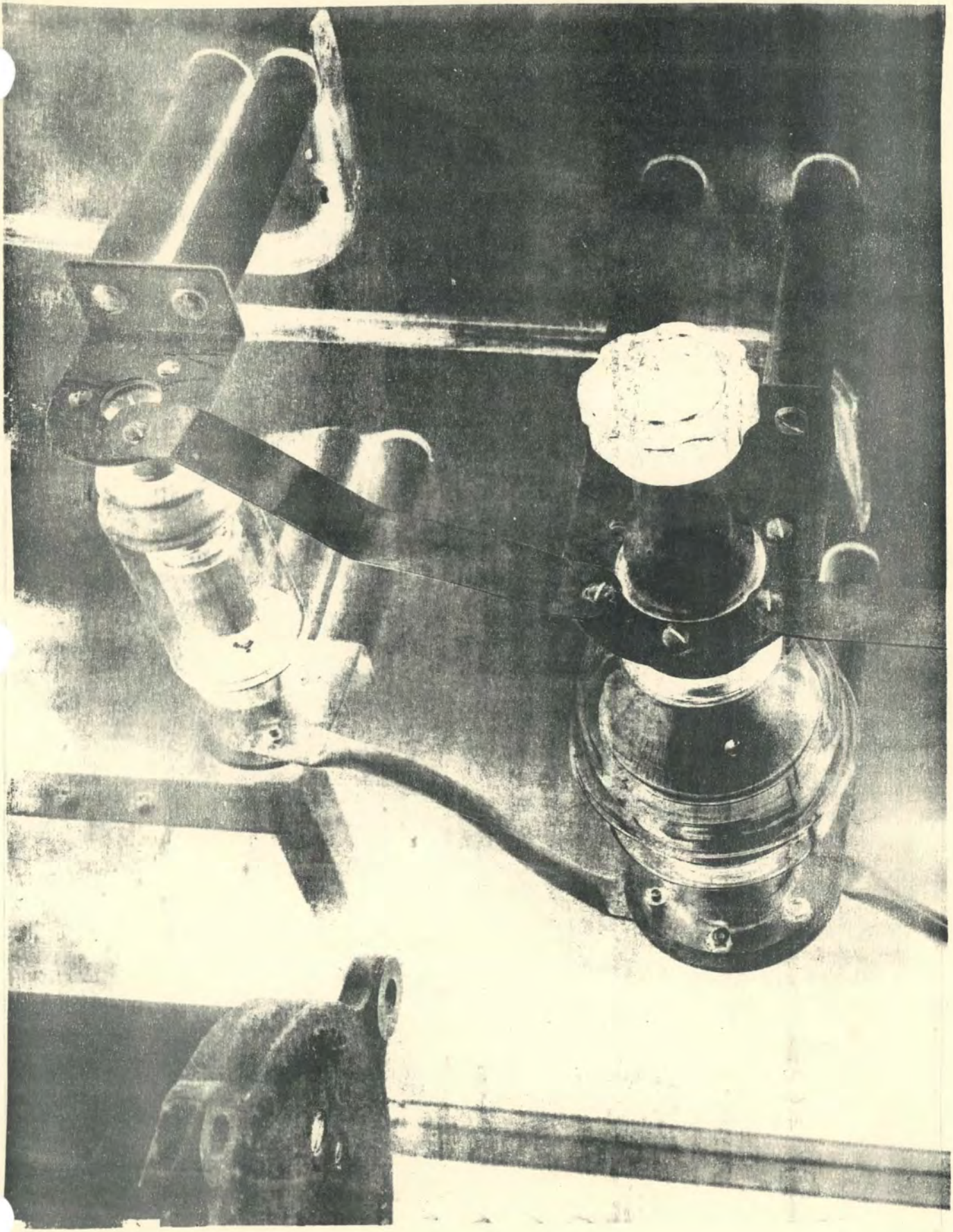
E. H. THIELE
By direction

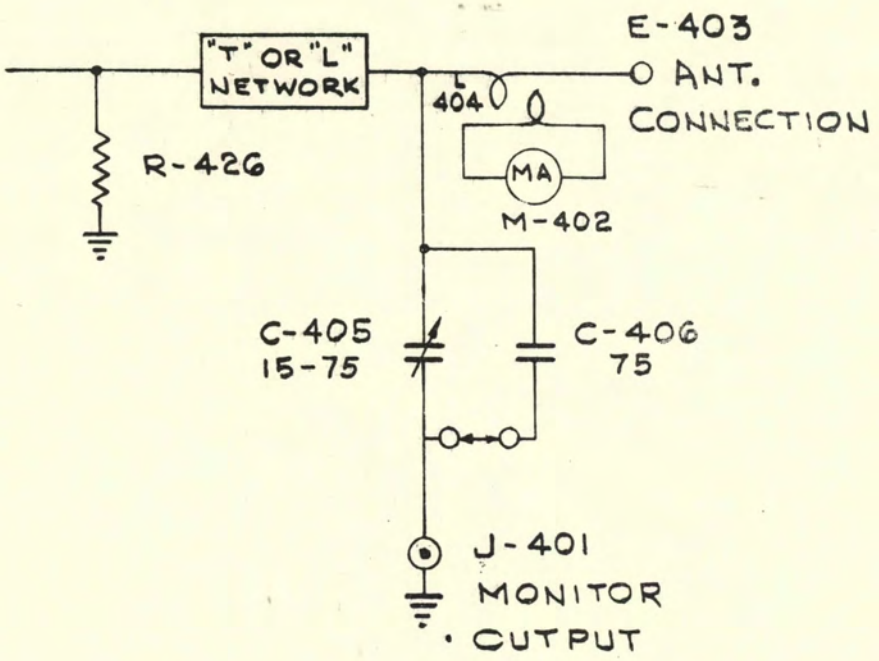
Encl: (1) Schematic drawing of revision for Figs. 2-2, 7-3.
(2) Monitor line pick-up capacitors. (Photograph)

DIST (SDL No. 72)

A: None
B: bcgd(4); i(200) lp(2)
C: l(4)
D: a(2); e(4)
E: l(4)

22596 TREAS. CGHQ. WASH., D.C.





SCHEMATIC DRAWING
OF REVISION FOR FIGS. 2-2, 7-3

Encl: (1)

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EEE-2
10 November 1954
FILE:

ANTENNA COUPLER
TYPE CU-277/URT

Coast Guard Instruction Book Amendment #3

Field Change #2

1. Purpose. The purpose of this amendment and field change is to:

a. Authorize and direct a change in the Instruction Book for Antenna Coupler Type CU-277/URT.

b. Replace the presently installed disposable fibre glass air filter with a permanent type metallic mesh air filter. This filter replacement is made to provide better air filtration and to decrease maintenance costs.

2. Publications Amended, Canceled, or Modified. The Instruction Book for Antenna Coupler Type CU-277/URT, and Instruction Book amendment #1 field change #1 dated 5 January, 1954, are amended hereby.

3. Field Change. When the supply of fibre glass air filters for the Antenna Coupler Type CU-277/URT is exhausted, replacement with a permanent type metallic mesh air filter is to be accomplished. The new allowance is one installed and one spare per equipment. The permanent filter physically is a direct replacement for the presently installed disposable type. The stock description is: CLEANER ELEMENT, air; aluminum mesh, permanent type; 10" x 10" x 1", (SNSN) 17-C-794001-237.

The new filter is permanent in nature. It is constructed with a welded aluminum frame and cloth covered mesh media; the entire assembly is anodized. The cloth flocking is permanent, and increases the filtering ability tremendously as it retains the oil longer than bare wire. A filter of this type of construction increases the percentage of filtration afforded by nearly 100% with only a minute increase in static drop of air flow.

4. Instruction Book Amendment. Amend the Instruction Book for Antenna Coupler Type CU-277/URT as follows:

a. Insert this amendment in the Instruction Book.

b. Section 6: Add Paragraph h below Paragraph g, page 6-3, to read: "AIR FILTER--To remove the air filter, located in the bottom of the housing, slide the filter out of the holder being careful to avoid shaking loose any dust into the housing. Brush off the inside edges of the holder. Clean the filter by

brushing or blowing off all loose accumulated dust and dirt. The filter should be washed in hot water containing soap detergent. When dried, immerse the filter in engine lubricating oil (SAE 20 to 50) and drain by laying along the shortest dimension for run-off. DO NOT USE GASOLINE OR OTHER SUCH SOLVENTS."

c. Section 8: Delete the entry "0-420...Air Cleaner...17-C-794001-109" made in accordance with Instruction Book amendment #1 field change #1; substitute therefor: "0-420...CLEANER ELEMENT, air; aluminum mesh, permanent type; 10" x 10" x 1",...17-C-794001-237".

d. In Instruction Book amendment #1 field change #1 dated 5 January, 1954, change "fibre glass filter(s)" to read "permanent metallic mesh filter(s)"; change the Standard Navy Stock Number from "17-C-794001-109" to "17-C-794001-237"; the changes are to be made where appropriate.

5. Applicability of Field Change. The above described field change is applicable to all units having installed Antenna Coupler Type CU-277/URT.

6. Changes in Nomenclature. There will be no change in nomenclature caused by this field change.

7. Action Requirements. All units having Antenna Coupler Type CU-277/URT shall comply with Paragraphs 3, 4, and 5. An allowance of new filters will be provided by the Commandant (EEE) without further Unit or District action. The amendment to the Instruction Book for Antenna Coupler Type CU-277/URT shall be recorded on the sheet provided.

K. K. COWART
By direction

Dist. (SDL. NO. 59)

A: NONE
B: i (250); g (25); c (11);
f (9); m (6); d l (2)
C: l v (4)
D: e (6); a (1)
E: g s v (4)

7361 TREASURY, USCGHQ, WASH.,D.C.

UNITED STATES COAST GUARD

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HEADQUARTERS
WASHINGTON 25, D.C.

EEE-2
12 May, 1954
FILE:

ANTENNA COUPLER, TYPE CU-277/URT

Coast Guard Instruction Book Amendment #2

Field Change Number: none

1. Purpose. The purpose of this amendment is to:

a. Promulgate to all holders of the Instruction Book for Antenna Coupler, Type CU-277/URT, the General Electric Company's Change #1 to the Instruction Book.

2. Publications Amended, Canceled, or Modified. Publications amended, canceled, or modified are:

a. Instruction Book for Antenna Coupler, Type CU-277/URT, is amended.

3. Field Change. There will be no field change caused by this amendment.

4. Instruction Book Amendment. Amend Instruction Book for Antenna Coupler, Type CU-277/URT, by:

a. Insertion of this amendment in the Instruction Book.

b. Insertion of Change #1 for Instruction Book for Antenna Coupler, Type CU-277/URT, in the Instruction Book. Change #1 is not included with this amendment but will be supplied to those units concerned without further unit or District action. Superseded pages in the Instruction Book shall be removed and destroyed.

5. Applicability of Amendment. The above described amendment is applicable to all units having installed Antenna Couplers, Type CU-277/URT.

6. Change in Nomenclature. There will be no change in nomenclature caused by this amendment.

ANTENNA COUPLER, TYPE CU-277/URT
Coast Guard Instruction Book Amendment #2
Field Change Number: none

7. Action Requirements. All units having Antenna Couplers, Type CU-277/URT, shall comply with paragraphs 4 and 5. Change #1 for Instruction Book for Antenna Coupler, Type CU-277/URT, will be issued to the activities concerned without further unit or District action. This amendment to the Instruction Book shall be recorded on the sheet provided.

K. K. COWART
By direction

DIST: (SDL. NO. 57)

A: NONE
B: i (250); g (50); c (11);
f (9); m (6); d l (2)
C: l v (4)
D: e (6); a (1)
E: g s v (4)

5901 Treasury CGHQ Wash., D.C.

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EEE-2
5 January 1954
FILE:

ANTENNA COUPLER
TYPE CU-277/URT

Coast Guard Instruction Book Amendment #1

Field Change #1

1. Purpose. It is the purpose of this Field Change to modify the Antenna Coupler, Type CU-277/URT:

a. To improve poor electrical contact between brush and coil of the variable inductors by replacing the contact plunger with an improved type.

b. To provide for filtering intake air by installing a holder and a fiber-glass filter element.

c. To provide external access to the tuning cranks with door closed.

d. To provide CAUTION HIGH VOLTAGE nameplate for front door.

e. To provide lightning protection with a spark-gap assembly.

2. Publications Amended, Canceled, or Modified. The Instruction Book for Antenna Coupler CU-277/URT is hereby amended.

3. Field Change. (REMOVE ALL RF POWER TO THE UNIT.)

a. Replacement of contact plungers:

(1) Remove the leads from each contact plunger in the wiper arms.

(2) Remove cotter pins and contact plungers. Replace with improved type plungers provided in the modification kit (Figure 1, Item 5) using the new cotter pins provided, if necessary.

(3) Set the tuning cranks to zero. Place the wiper arms on the top loop of each coil. Rotate the cranks to their limits to insure that the wiper arms will make good contact without binding.

b. Installation of air filter assembly:

(1) Remove the eight screws securing the screen over the air vent in the bottom of the housing.

(2) Install the air filter holder (Figure 1, Item 10) over the vent, in the position shown in Figure 2. Use new screws provided and original nuts.

(3) Insert the fibre-glass air filter unit (Figure 1, Item 11) in the holder. The air filter is identical to the Cleaner Element, Circuit Symbol O-111-1 used in T-137A Loran Transmitter, which facilitates future replacements.

c. Modification of Door to provide external access to tuning cranks.

(1) Open up door, and remove the crank handles from the A and B Antenna Tuning Controls.

(2) Place centering tool (Figure 1, Item 8) on A Tuning Control Shaft, and close front door against the point to mark the center of the access hole to be cut.

(3) Center mark the B Tuning Control in like manner.

(4) Remove the Centering Tool from the shafts, and drill a small pilot hole (1/8" or less) through the door at the two center marks.

(5) Set Circle Cutting Tool (Figure 1, Item 9) for 2½ inch radius and use with a brace to cut out the two holes as centered above. Make certain that the diameter of the holes will not be greater than 5 inches.

(6) Smooth off rough edges and burrs.

(7) Cut out the templates from the two additional copies of Figure 3 provided as enclosures to the field change and place over access holes. Accurately mark, drill and countersink holes as shown on the templates.

(8) With rivets provided, install Dzus Fastener springs (Figure 1, Items 3 and 4) on back of the door as shown in Figure 3.

(9) Install cover plates with rubber gaskets (Figure 1, Items 1 and 2).

(10) The finished installation appears in Figures 4 and 5.

d. Installation of CAUTION HIGH VOLTAGE nameplate.

(1) Center nameplate (Figure 1, Item 6) as shown in Figure 5 and mark mounting holes.

(2) Drill holes and secure plate with screws provided.

e. Installation of Spark Gap Assembly (Figure 1, Item 7).

(1) Refer to Figure 6. Remove output primary metering loop, and slide collar of spark gap assembly over tubing of output bushing as shown.

(2) Reinstall metering loop.

(3) Install other half of assembly under the output bushing mounting nut, as shown in Figure 6.

(4) Using a pair of inside calipers, or an improvised space gauge, set the gap spacing as follows:

Type T-137 Series Transmitters - 3/8 inch.
Type T-138 Series Amplifier - 1 inch.

(5) Securely tighten all nuts and set screws. The rods and balls must be adjusted to obtain maximum clearance between the assembly mounted on the RF side and any other mounting hardware.

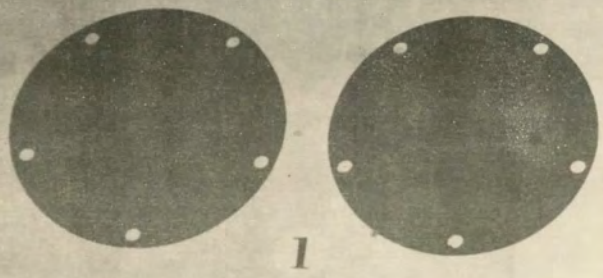
(6) If arcing occurs with normal RF voltages impressed across the gap at the above settings, then the gap spacing shall be increased slightly beyond the point at which arcing ceases.

4. Instruction Book Amendment. All holders shall amend the Instruction Book for the Antenna Coupler CU-277/URT as follows:

a. Insert this amendment in the Instruction Book.

b. Add the following items to Section 8, Table 8-4 Combined Parts and Spare Parts List on the appropriate pages:

SYMBOL DESIGNATION	NAME OF PART AND DESCRIPTION	STANDARD NAVY STOCK NUMBER
E-485	Electrode w/end formed into ring	17-E-27088-7896
E-486	Electrode, w/brass ring on end	17-E-27088-7899
O-420	Air Cleaner	17-C-794001-109



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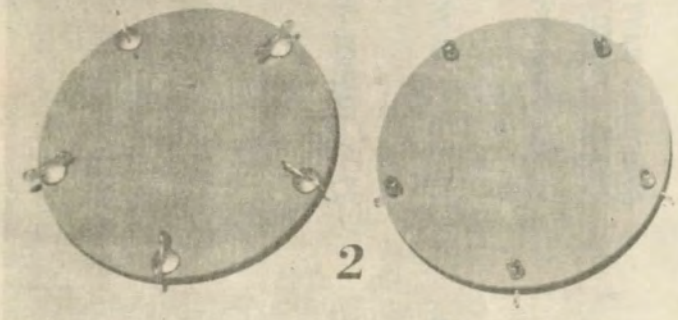

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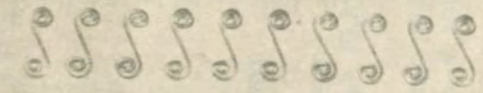

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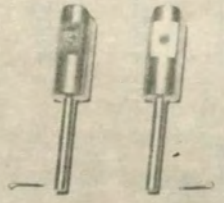

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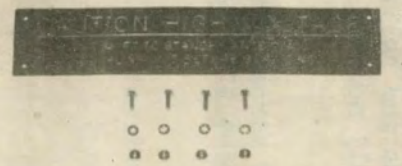

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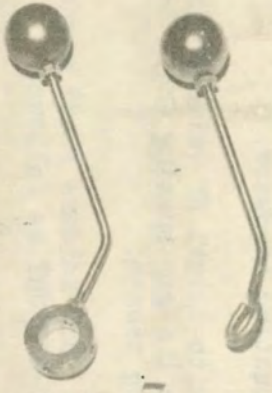

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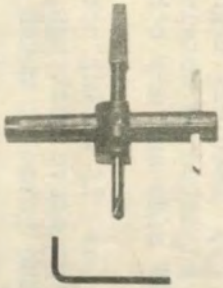

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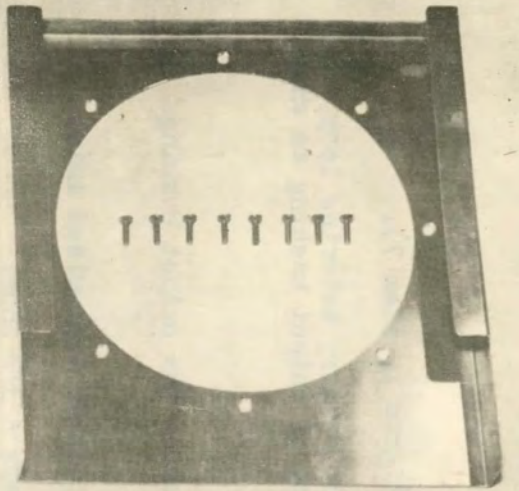

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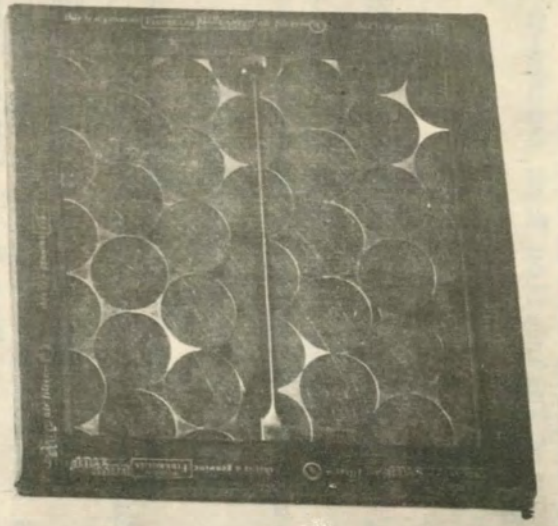

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FIG.

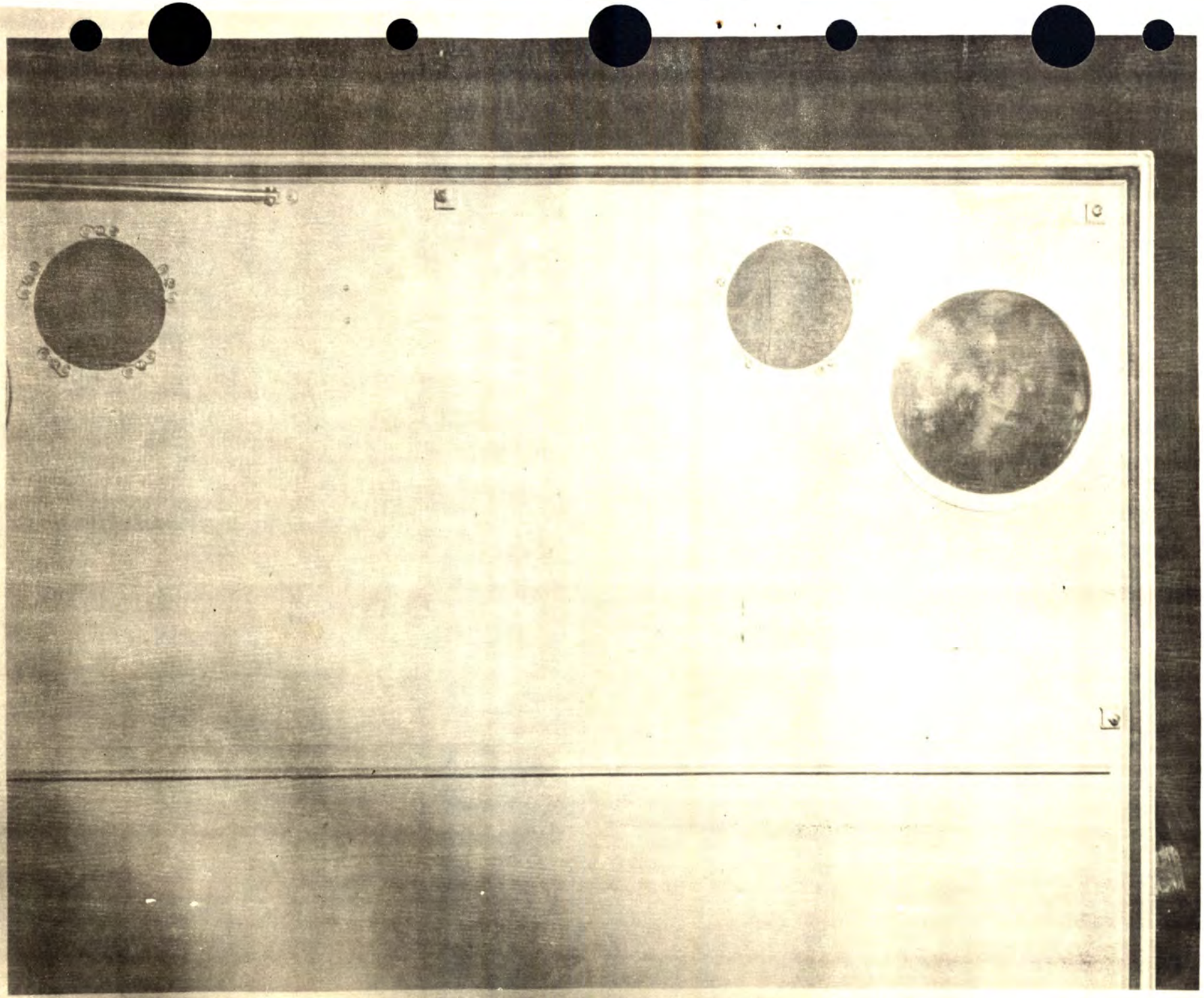

FIG. 4

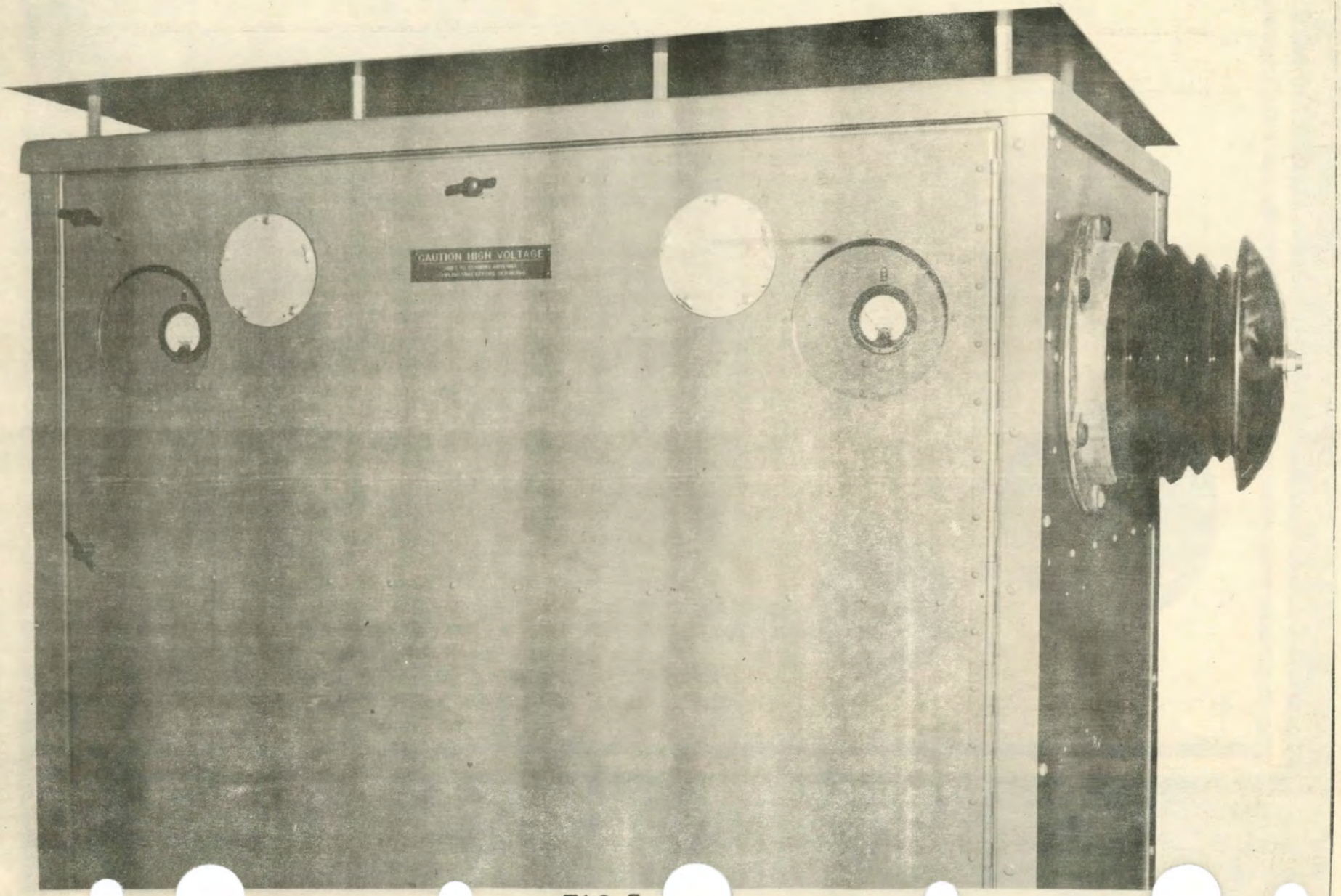

FIG. 5

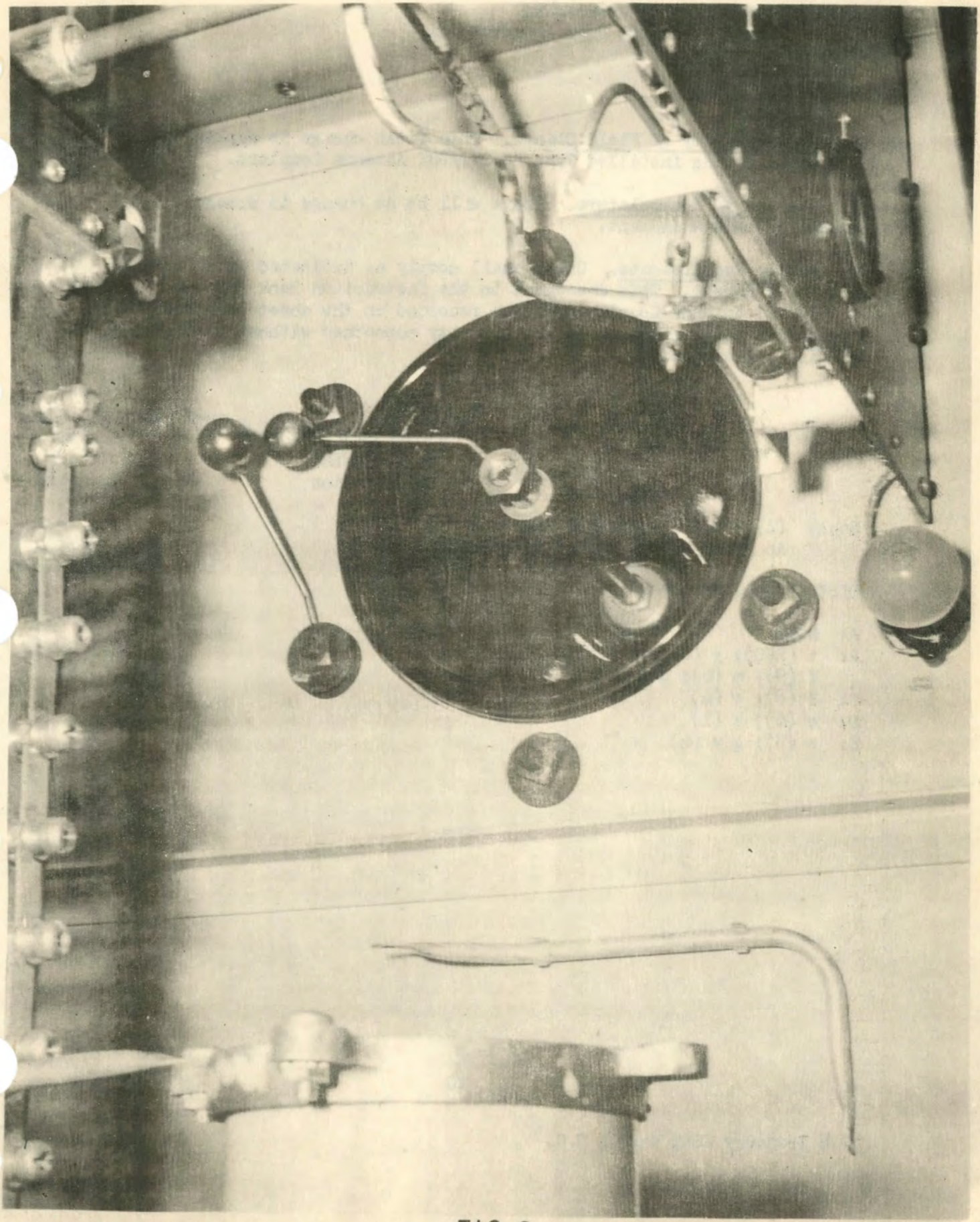

FIG. 6

5. Applicability of Field Change. This field change is applicable to all units having installed Type CU-277/URT Antenna Couplers.

6. Changes in Nomenclature. There will be no change in nomenclature caused by this amendment.

7. Action Requirements. Units shall comply as indicated in paragraphs 3,4 and 5 herein. This amendment to the Instruction Book for the Type CU-277/URT Antenna Coupler shall be recorded on the sheet provided. Field Kits will be issued to the activity concerned without further unit or District action.

K. K. COWART
By direction

Encl: (1) Two (2) copies of Figure 3
to Field Change #1 for CU-277/URT

DIST: (SDL. NO. 56)

A: NONE
B: i (250); g (25); c (11);
f (9); m (6); d l (2)
C: l (8); v (4)
D: e (6); a (1)
E: s (8); g v (4)

4974 Treasury CGHQ Wash., D.C.

INSTRUCTION BOOK

for

ANTENNA COUPLER CU-277/URT

GENERAL ELECTRIC COMPANY

SYRACUSE, NEW YORK

U.S. COAST GUARD TREASURY DEPARTMENT

Contracts: TCG-37784 (CG-13680-C) 29 March 1949
TCG-38017 (CG-15801-C) 29 December 1949
TCG-38096 (CG-16546-C) 5 May 1950
TCG-38354 (CG-18356-C) 18 January 1950

Approved by C.G. Headquarters:
3 March 1952

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title page	Original	3–0 to 3–15	Original
A and B	Original	5–0	Original
i to iv	Original	6–1 to 6–3	Original
1–0 to 1–3	Original	7–0 to 7–5	Original
2–0 to 2–1	Original	8–i to 8–22	Original
		i-1 to i-3	Original

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION
1	UNKNOWN	Modified Before Installed At this unit
3	4/5/61	R.C. Stuck ET1

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LIST OF ILLUSTRATIONS

LIST OF TABLES

GUARANTEE

The Contractor guarantees that at the time of delivery thereof the articles provided for under this contract will be free from any defects in material or workmanship and will conform to the requirements of this contract. Notice of such defect or nonconformance shall be given by the Government to the Contractor within two years of the delivery of the defective or nonconforming article, or within one year of the date it is placed in service, whichever expires first. To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item. If required by the Government the Contractor shall with all possible speed correct or replace the defective or nonconforming article or part thereof. When such correction or replacement requires transportation of the article or part thereof, shipping costs, not exceeding usual charges, from the delivery point to the Contractor's plant and return, shall be borne by the Contractor; the Government shall bear all other shipping costs. This guaranty shall then continue as to corrected or replacing articles or, if only parts of such articles are corrected or replaced, to such corrected or replacing parts, until one year after redelivery. If the Government does not require correction or replacement of a defective or nonconforming article, the Contractor, if required by the Contracting Officer within a reasonable time after notice of defect or nonconformance, shall repay such portion of the contract price of the article as is equitable in the circumstances.

INSTALLATION RECORD

Contract Number TCG-38017	Date of Contract, 29 December 1949
Contract Number TCG-38096	Date of Contract, 5 May 1950
Contract Number TCG-38354	Date of Contract, 18 January 1950
Contract Number TCG-37784	Date of Contract, 29 March 1949

Serial number of equipment.....
Date of acceptance by the Coast Guard.....
Date of delivery to contract destination.....
Date of completion of installation.....
Date placed in service.....

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Commandant via channels in accordance with current instructions using form CG-2643 (revised). The report shall cover all details of the failure and give data of installation of the equipment.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Standard Navy Stock Number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL 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 firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

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!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual* or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection, but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE.

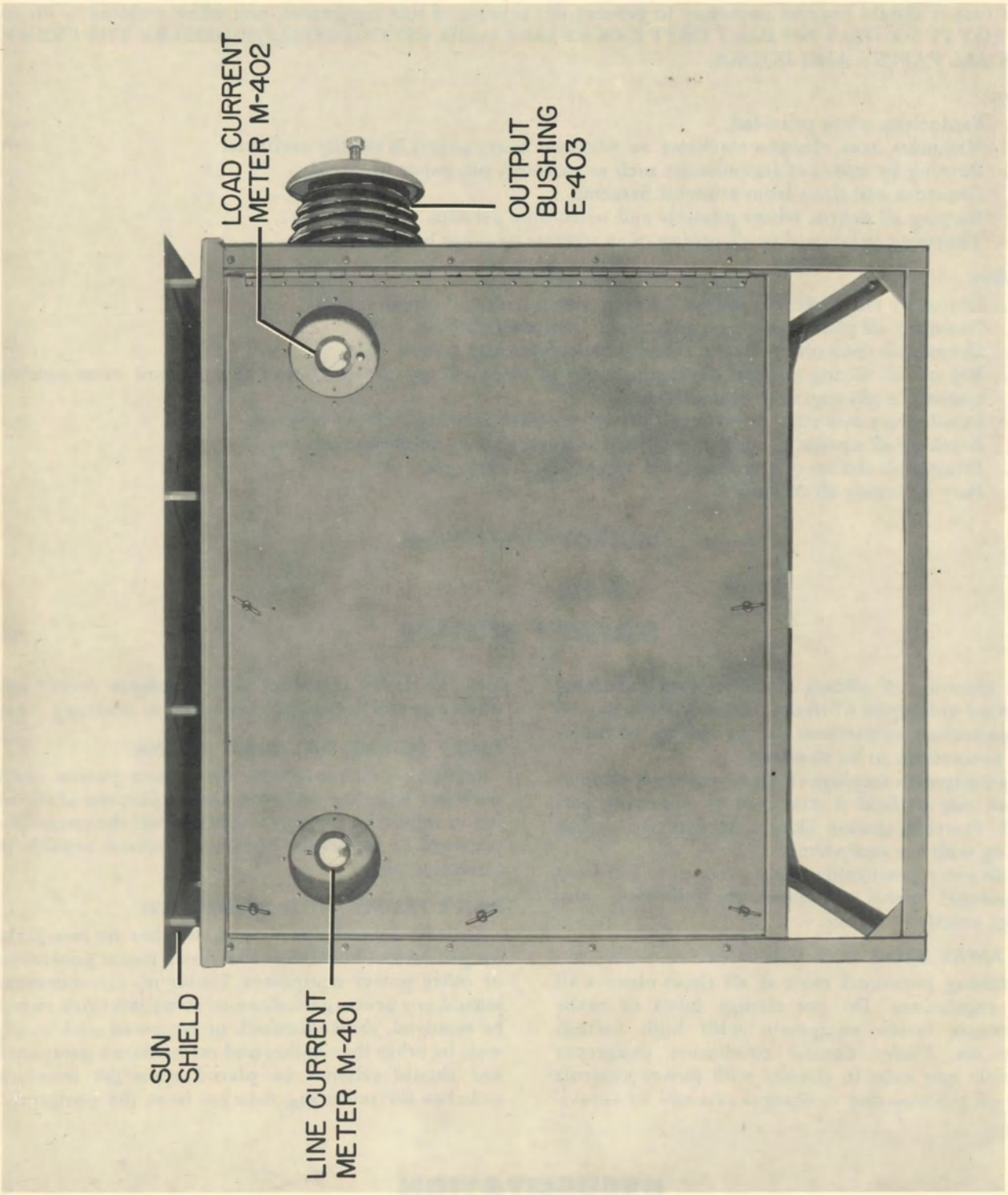


Figure 1-1. Front View of Antenna Coupler CU-277/URT

SECTION 1
GENERAL DESCRIPTION

1. INTRODUCTION

Antenna Coupler CU-277/URT is designed to couple a loran transmission line to a loran antenna system.

This instruction book describes the theory, installation and maintenance of the Antenna Coupler only. Additional information on the associated units of the loran station can be found in the instruction books for Loran Transmitter T-137, Loran Amplifier T-138-A, Loran Timer, Navy Model UE-1, and Loran Switching Equipment, Navy Model UM.

2. ANTENNA COUPLER CU-277/URT.

a. FUNCTION.—The Antenna Coupler transforms a wide range of antenna impedance to match a 50-ohm transmission line. In addition it provides a built-in 50-ohm dummy load and a monitoring pick-up loop.

b. DESCRIPTION.—The Antenna Coupler is contained in a weatherproof aluminum housing 62¼" high, by 61¼" wide by 41¼" deep, exclusive of projecting insulator and sunshield. (See figure 1–1.) A hinged door on the front of the housing permits access to the control panel and the interior. (See figure1–2.)

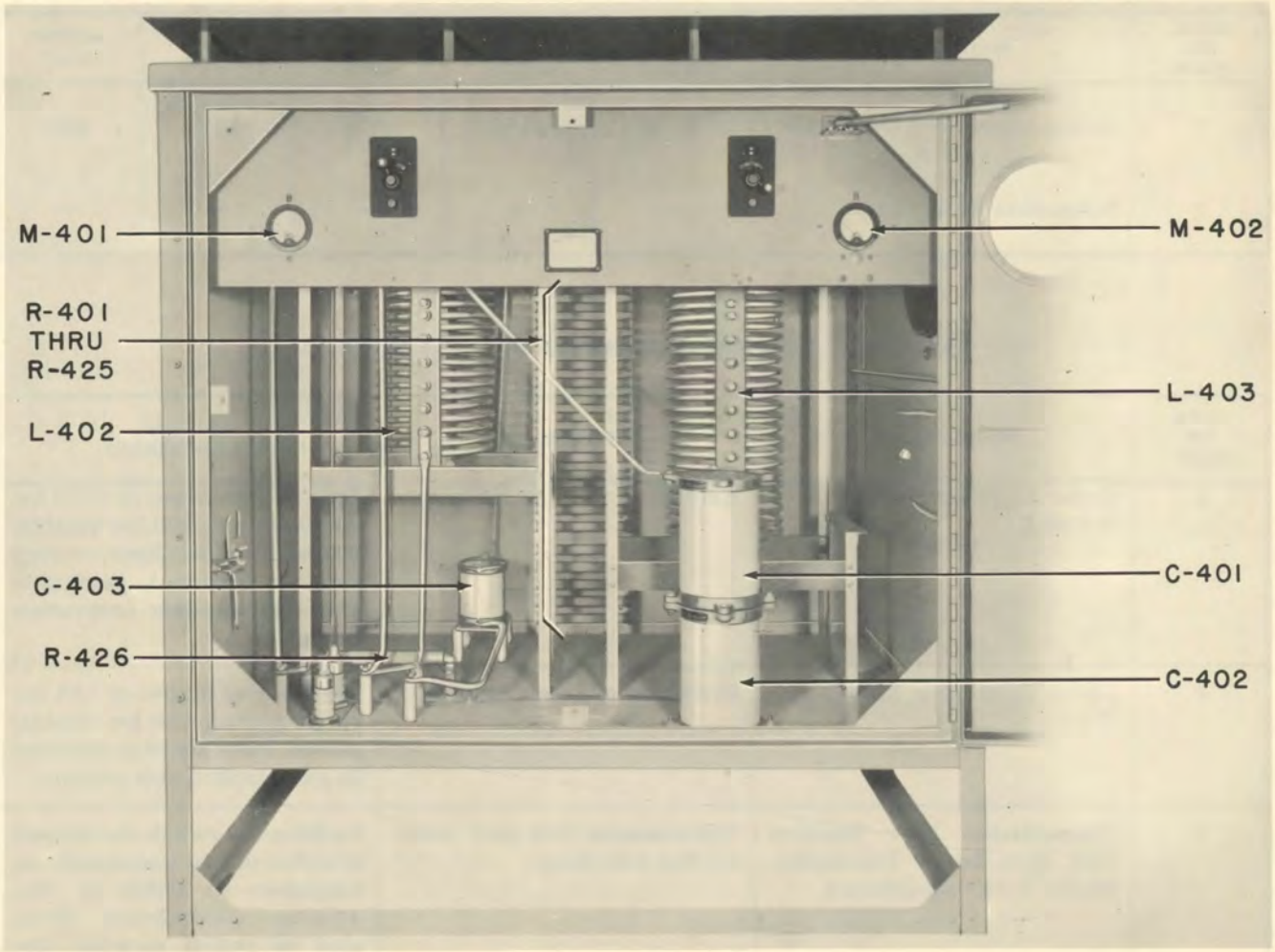


Figure 1–2. Front View of Antenna Coupler CU-277/URT with door open.

Two circular windows in the access door permit reading of the line and antenna current meters without opening the door. To facilitate reading of the meters in poor natural light, internal illumination is provided. This illumination is controlled by a switch located on the left-hand side of the unit. The switch plate also contains a 110 V AC convenience outlet.

The RF cables and power conduit are suitably terminated in the bottom of the enclosure, which is elevated from the ground to permit the proper bending radius of the cables.

3. REFERENCE DATA

a. NOMENCLATURE: Antenna Coupler CU-277/URT.

b. CONTRACT NUMBERS AND DATES: TCG-38096, 5 May 1950; TCG-37784, 29 March 1949; TCG-38017, 29 December 1949; TCG-38354, 18 January 1950.

c. CONTRACTOR: General Electric Company, Syracuse, New York, U.S.A.

d. COGNIZANT COAST GUARD INSPECTOR: Inspector of Electronic Material, U. S. Coast Guard Supply Center, 345 Warren St., Jersey City 2, N. J.

e. NUMBER OF PACKAGES PER COMPLETE EQUIPMENT: Five

f. TOTAL CUBICAL CONTENT: 202,065 cu. in.

g. TOTAL WEIGHT: Crated—900 lbs.
Uncrated—665 lbs.

h. OPERATING FREQUENCIES: 1750 kc, 1800 kc, 1850 kc, 1900 kc, 1950 kc.

i. INPUT IMPEDANCE: 52 ohms from Loran Amplifier Model T-138-A.

j. OUTPUT IMPEDANCE: Variable to match any load within the following limits: 25 to 150 ohms resistive, −300 to +150 ohms reactive.

k. POWER REQUIREMENTS: 115 volts, 60 cycles, single phase.

l. HEAT DISSIPATION: 300 watts.

TABLE 1-1. EQUIPMENT SUPPLIED

QUAN. PER EQUIP.	NAME OF UNIT	OVER-ALL DIMENSIONS (INCHES)			VOLUME (cu. ft.)	WEIGHT (lbs.)
		HEIGHT	WIDTH	DEPTH		
1	Antenna Coupler CU-277/URT	62¼	61¼	41¼	117	665
2	Instruction Book	—	—	—	—	—

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUAN. PER EQUIP.	NAME OF UNIT	REQUIRED USE	REQUIRED CHARACTERISTICS
2	Loran Amplifier Model T-138-A	Amplification of exciter output	Peak power output of 1000 kw single-pulsed, 800 kw double-pulsed. Detailed characteristics listed in Section 1, paragraph 4 of the amplifier instruction book.
2	Loran Transmitter Model T-137	Excitation of Loran Amplifier	Peak power output of 160 kw single-pulsed, 128 kw double-pulsed. Pulse shape as specified in paragraph 4, this section.
1	Transmission Line Junction Unit (p/o Loran Transmitter Model T-137 equipment).	Transmission line and monitor line switching.	Facilities to switch the outputs of either of two transmitters or amplifiers to either of two antenna transmission lines; also to switch monitor line from antenna unit to either of two transmitters.

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED (Concluded)

QUAN. PER EQUIP.	NAME OF UNIT	REQUIRED USE	REQUIRED CHARACTERISTICS
4 2	Loran Timer Navy Model UE-1 Double-pulsed operation; 2 operating, 2 spares. Single-pulsed operation; 1 operating, 1 spare.	Source of 100 kc RF signal for transmitter and repetition rate trigger pulse for transmitter and amplifier pulse sections.	100 kc and pulse outputs as specified in paragraph 2, Section 2 of transmitter instruction book.
1	Loran Switching Equipment, Navy Model UM (modified for use with Loran Transmitter Model T-137).	Input switching.	Switching facilities to allow connection of any one of four timers to any one of four transmitter exciters.
	RG-19/U Cable (supplied with Loran Transmitter Model T-137 equipment).	Interconnection of units	As specified in JAN-C-17A.
	RG-19/U Cable with special Coast Guard armor (supplied with Loran Transmitter Model T-137 equipment).	Interconnection of units	In accordance with Coast Guard specifications.
	RG-8/U Cable	Interconnection of units	As specified in JAN-C-17A
	RG-8/U Cable with special Coast Guard armor.	Interconnection of units.	In accordance with Coast Guard specifications.

TABLE 1-3. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVER-ALL DIMENSIONS			VOLUME (CU. FT.)	WEIGHT (LBS)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
7	Antenna Coupler 2 Capacitors	CU-277/URT	71½	57½	74	158.0	1140
8	1 Insulator		43	24½	30¼	11.0	145
9	2 Coil Mounts		21½	33½	40½	38.2	295

SECTION 2
THEORY OF OPERATION

1. ANTENNA COUPLER

a. FUNCTION.—The Antenna Coupler provides a means of matching the antenna impedance to the 52-ohm transmission line from the amplifier. It also provides a dummy load for test purposes as well as metering and monitoring facilities. The unit will match any antenna having a resistance between 25 and 150 ohms and a reactance between −200 and +150 ohms.

b. POWER CIRCUIT.—A 115-volt power line is brought into a combination switch S401 and convenience outlet J402, which are located on the left-hand side shield near the front. The switch controls the lamps I401 and I402, which provide illumination for the meters and the interior of the housing.

c. RF CIRCUIT.— The matching network may be either T-connected or L-connected. The T-connected network will match any of the antenna impedances specified in paragraph *a.* above. When L-connected it will match any antenna having a resistive component between 25 and 45 ohms and a reactive component between −300 and −75 ohms.

(1) T-CONNECTION.—The schematic diagram for the T-connection is shown in figure 2–1. These are two input cables, one terminating in E401 and the other in E402. Either cable may be used by connecting the link to the desired one. The line to the primary inductance L402 is bent into a loop which serves as the primary of a metering transformer. The secondary of the metering transformer is another loop, L401, which is connected to the Line Current meter M401. By varying the coupling between these two loops the ratio of the transformer may be set to either 10 or 20. An identical arrangement consisting of loop L404 and ammeter M402 is used on the output side to measure antenna current. In addition, a monitoring pick-up loop L405 is placed close to this output current transformer.

The network itself consists of primary inductance L402, secondary inductance L403, and the mutual impedance or midshunt capacitors C401 and C402. The secondary inductance L403, which is in series with the antenna, is tuned so that the impedance across the midshunt capacitors is 52 ohms resistance plus a capacitive reactance. The reactive component is then tuned out by the primary inductance L402.

For loads in the vicinity of 25 + j150 it is necessary to use the modified T-Connection. (See figure 2–1.) This connection raises the capacitive reactance of the midshunt branch by shunting C401 and C402 with part of L403 to form a circuit that approaches parallel resonance.

For loads in the vicinity of 150 + j150 it is necessary to use the T-Connection with C404. (See figure 2–1.) In this connection the capacitive reactance of the midshunt branch is increased by connecting C404 in series with C401 and C402.

(2) L-CONNECTION.—The schematic diagram of the L-connection is shown in figure 2–2. The network consists of L403 in series with the antenna to ground and L402, which shunts this combination. By adjusting L402 and L403 the entire circuit can be tuned to parallel resonance. If the ratio of L402 to L403 is properly adjusted, the low antenna resistance can be stepped up to 52 ohms across the input line.

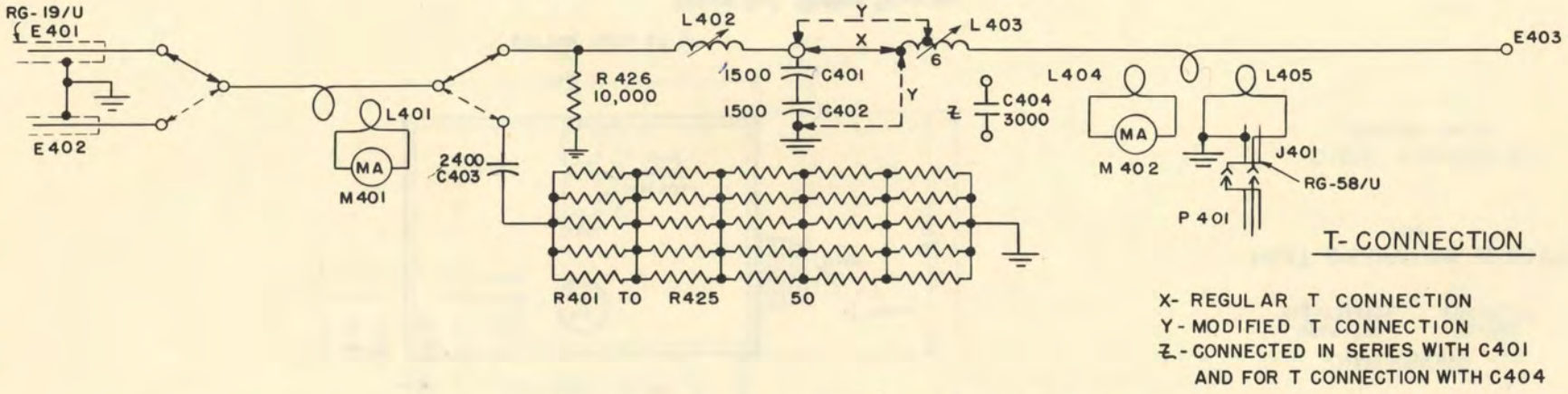


Figure 2–1. Schematic Diagram for T-Connection and Variations.

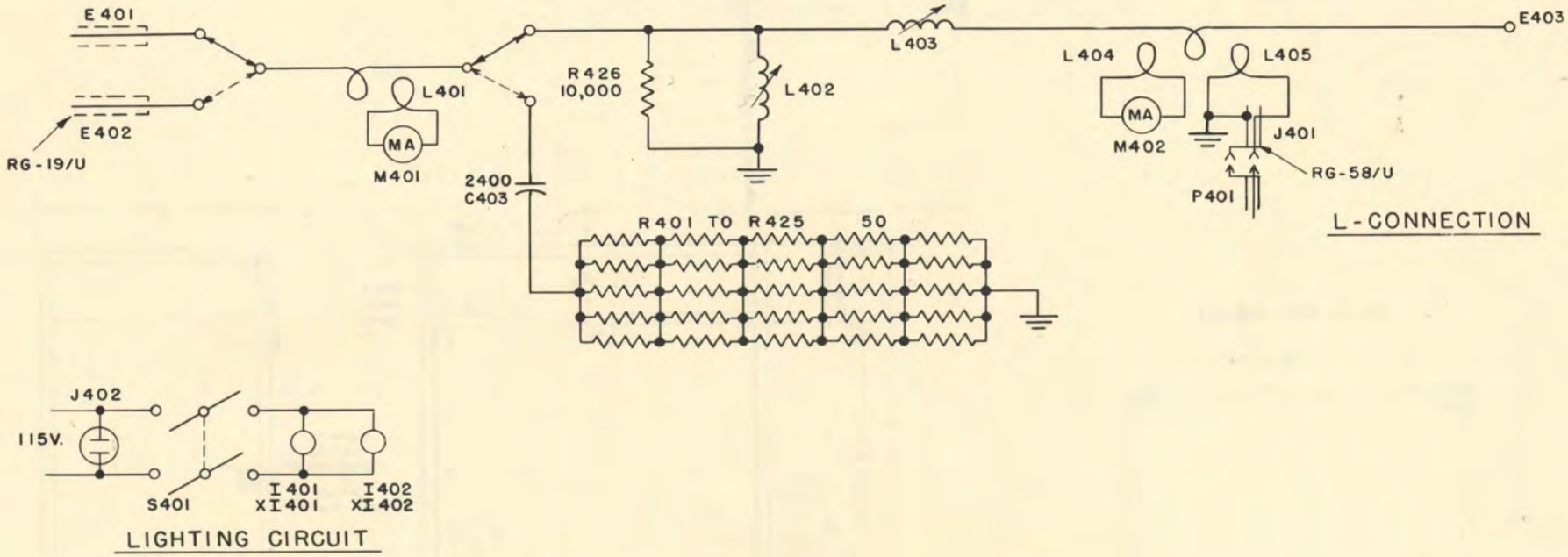


Figure 2–2. Schematic Diagram for L-Connection.

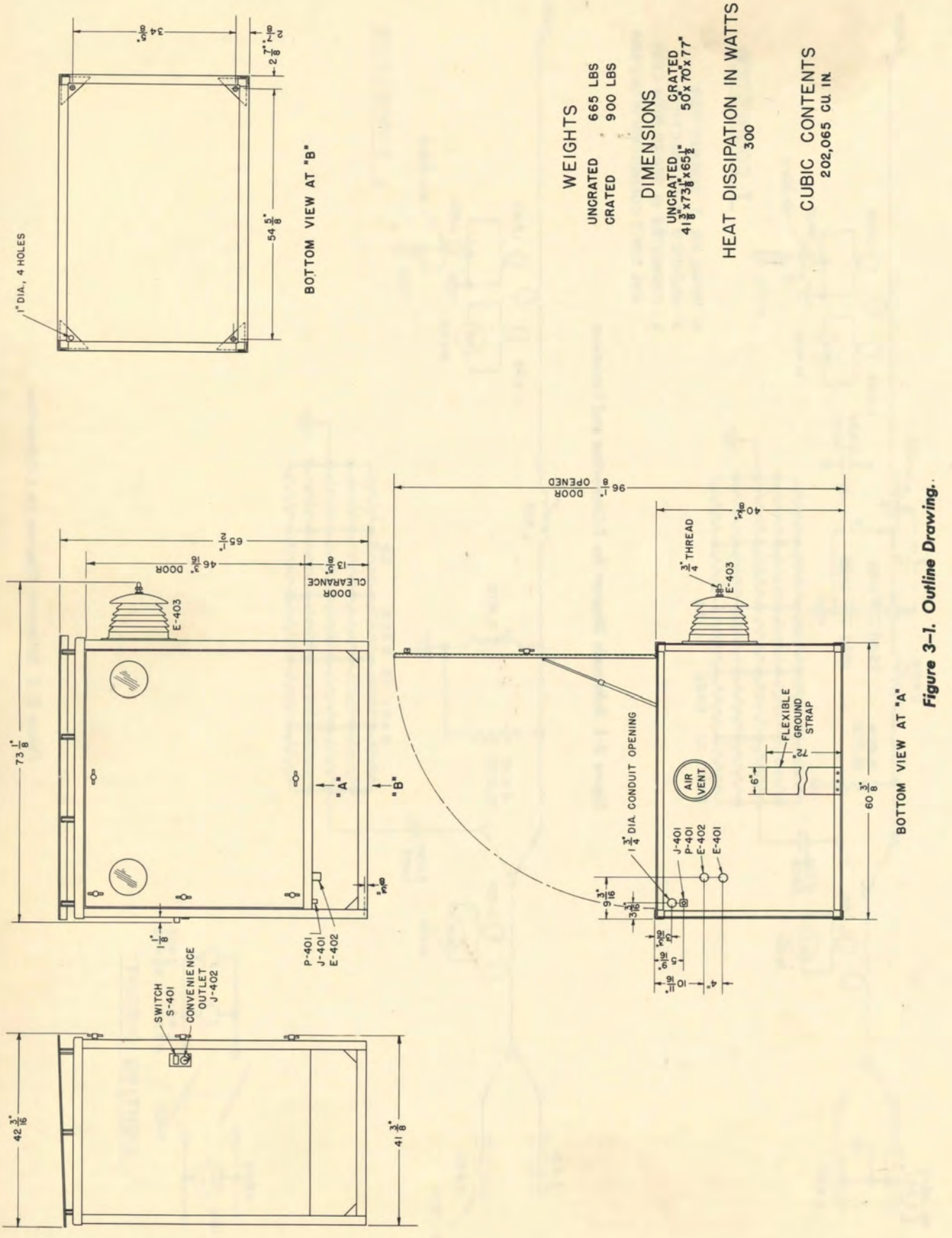


Figure 3-1. Outline Drawing.

SECTION 3

INSTALLATION AND INITIAL ADJUSTMENT

1. INTRODUCTION.

Antenna Coupler CU-277/URT is but one of the units which make up a complete loran installation. It is the purpose of this section to describe only the installation of the Antenna Coupler. Information on the installation and interconnection of the other units will be found in the instruction books supplied with those equipments. This section covers unpacking, setting up, connecting and initial adjustment of the Antenna Coupler CU-277/URT only.

2. UNPACKING.

The major units of the Antenna Coupler CU-277/-URT are packed in separate boxes as listed in table 1-3. Special care should be taken in unpacking these units to prevent damage to the equipment. Be certain all boxes are kept upright as indicated by the arrows on the side of the box. Check the weights marked on the outside of the box and be sure that lifting and transporting gear of sufficient capacity is available.

CAUTION

A nail-puller should be used to remove nails. Do not use a pinch bar or claw hammer.

3. PRELIMINARY INSTALLATION PROCEDURE.

a. GENERAL.—The units should be brought as close as possible to their final locations before removing them from their crates. Certain items that are especially heavy or delicate (capacitors and coils) have been removed from the units prior to crating. These components are to be reinstalled after the coupling unit has been set up. Instructions for the installation of these components are covered in the subparagraphs to follow.

Uncrating of the unit should be treated as a disassembly procedure; that is, the shipping crate should be taken apart layer by layer rather than "broken open." Careful disassembly of the shipping crate will preclude the possibility of damage to the equipment.

b. POSITIONING.—The specific location of the Antenna Coupler will depend upon the layout of the particular station. In general, however, the unit should be located as close as possible to the antenna into which it will be working. The coupler must also be located so that it can be reached by the trenchwork which accommodates the transmission lines. The unit should be set up on footings designed to support its weight. The outline drawing of the Antenna Coupler (figure 3-1) gives all dimensions pertinent to positioning the unit.

c. REMOVAL OF INTERNAL PACKING.—After the coupling unit is positioned, open the access door and remove all shoring, blocking and bracing inside the unit. *Remove internal packing carefully to avoid damaging components.* Remove any tape, cord, wire, etc., used to protect the equipment in transit. Make a careful, detailed inspection of all mechanical and electrical components and connections to determine if any part or parts were damaged in shipment.

d. REINSTALLATION OF ANTENNA COUPLER COMPONENTS.

NOTE

Since the T-Connection is the most commonly used matching network, the instructions given below assume that the T-Connection will be used. If one of the other network variations is to be used, some connections will have to be changed. Instructions for making the necessary changes are given in subsequent paragraphs of this section.

(1) COIL L402.—Coil L402 mounts on the left side of the unit as shown in figure 3-2. Before installing the coil, make certain the rotor arm assembly is free of all securing tape. Turn the "A" tuning crank and check to see that the wiper arm turns freely and smoothly. Allow the wiper arm to hang down until the coil is installed. Install the coil so that the slots in the base of the coil frame line up with the slots in the floor of the unit. Insert the hardware in the slots and finger tighten the nuts. Set the "A" tuning crank to zero. Place the wiper arm on the top loop of the coil. Rotate the crank to its limit, so that the wiper arm covers approximately three turns of the coil. Adjust the position of the coil so that the wiper arm makes good contact throughout all three revolutions. When

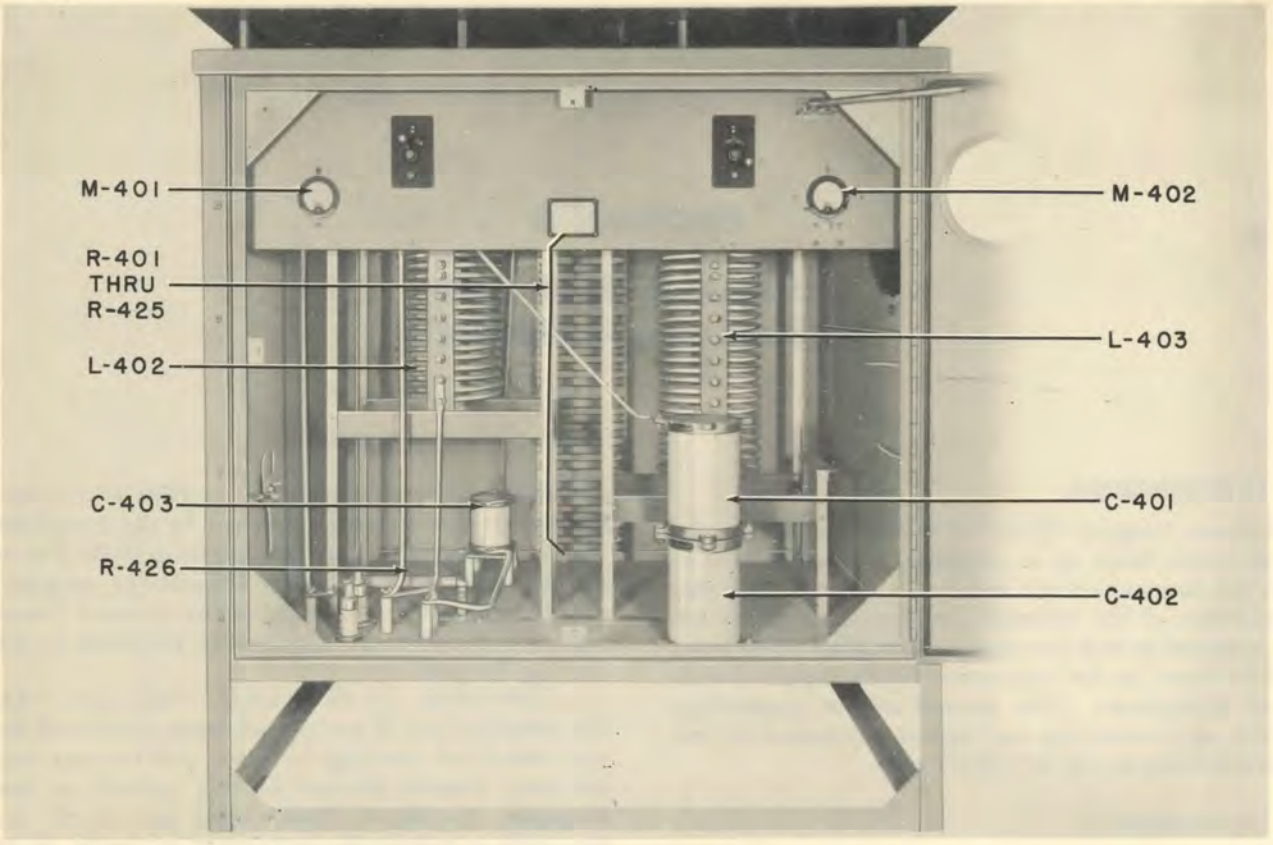


Figure 3–2. Antenna Coupler CU-277/URT, with Door Open

the coil is accurately positioned, the wiper arm will make good contact without binding. When the coil has been properly set, tighten the mounting nuts. Tighten diagonally opposite nuts in sequence.

(2) COIL L403.—Coil L403 mounts on the right side of the unit as shown in figure 3–2. The mounting procedure for L403 is exactly the same as that given for L402 in the preceding paragraph.

(3) CAPACITORS C401 AND C402.—These two capacitors mount on the floor of the cabinet as shown in figure 3–2. Position them over the holes in the floor and secure them in place with the hardware provided. Make certain the ground strap is secured under the rear mounting screw of C402. Connect copper tubing between C401 and the top of L402.

(4) OUTPUT PRIMARY METERING LOOP.—The output primary metering loop mounts at the top of coil L403 and is fastened to the output bushing. To obtain proper coupling the loop must be mounted vertically. Take particular care not to bend the loop while mounting it.

(5) OUTPUT BUSHING.—To replace the output bushing, position it over the holes in the cabinet. Make certain the collet fits over the end of the output coupling loop inside the unit. When properly positioned, secure it in place with the hardware provided. When the bushing is mounted, tighten the collet nut until the bushing and loop are firmly connected. Do not use excessive pressure when tightening the nut.

e. DRYING OUT THE EQUIPMENT.—After all components and tubes have been installed, open the front and rear doors of the coupler. Place lamp banks at the front and rear of the unit to evaporate any condensation of moisture. The lamps should be capable of dissipating at least 200 watts, and should be left on continuously until power is applied to the unit.

f. INTERCONNECTION OF UNITS.

CAUTION

The greatest care must be used when handling the RG-8/U and RG-19/U coaxial cables in the high voltage circuits. Never bend RG-8/U into a radius less than six inches or RG-19/U less than 18 inches or subject it to temperatures excessive to touch (e.g., 180 degrees F.). The reason for these precautions is that sharp bending or heat will separate the dielectric from the center conductor. Corona will develop at these points due to the high RF voltages and the cable will eventually fail.

The scope of this instruction book is limited to interconnection data covering the Antenna Coupler. Interconnection information for the other units of the loran station are covered in the respective instruction books supplied with those equipments. For interconnection details, see figure 3–3. Figure 3–4 shows how armored and unarmored RG-8/U and RG-19/U cable is terminated at the end seals.

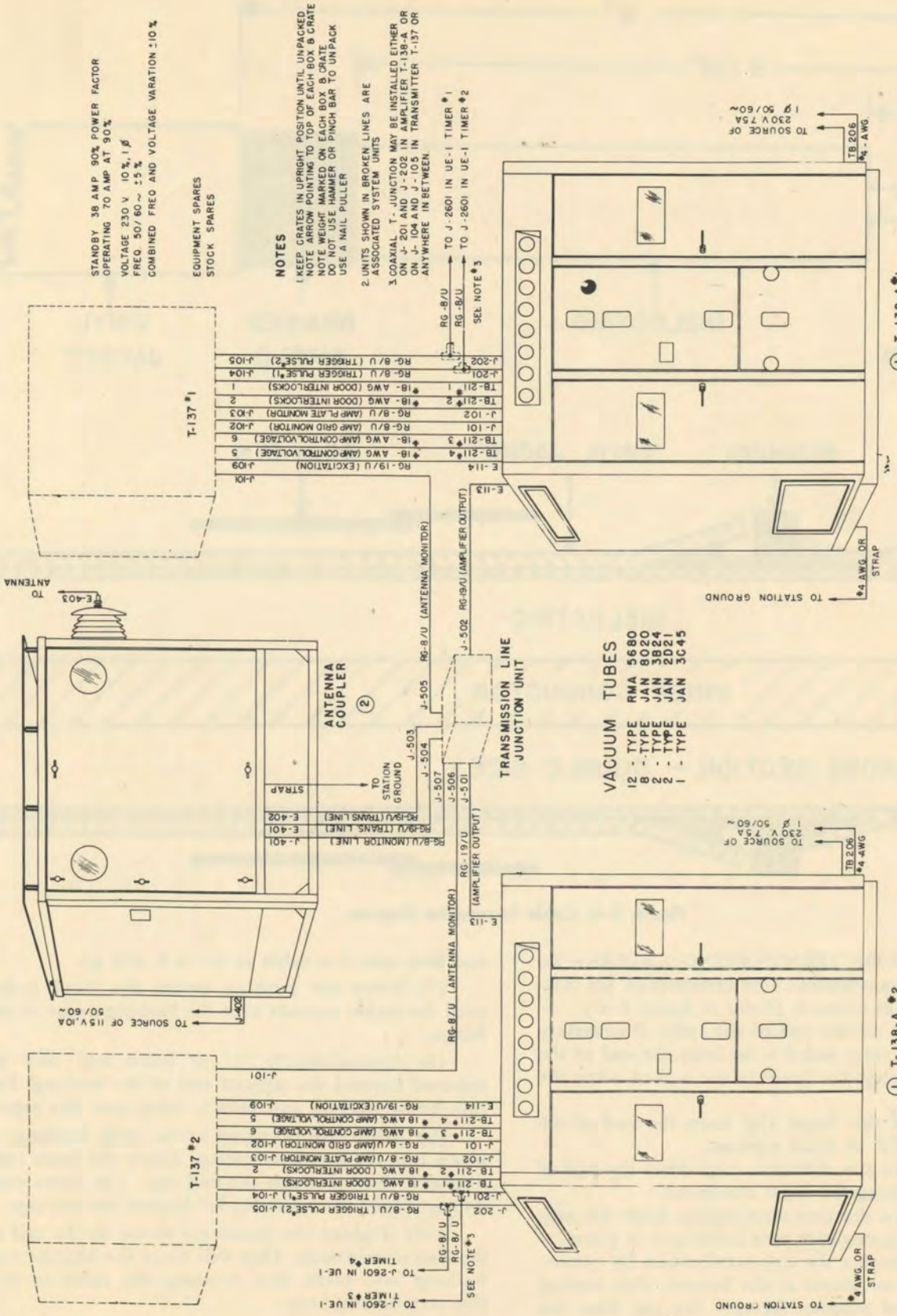


Figure 3-3. Loran Interconnection Diagram.

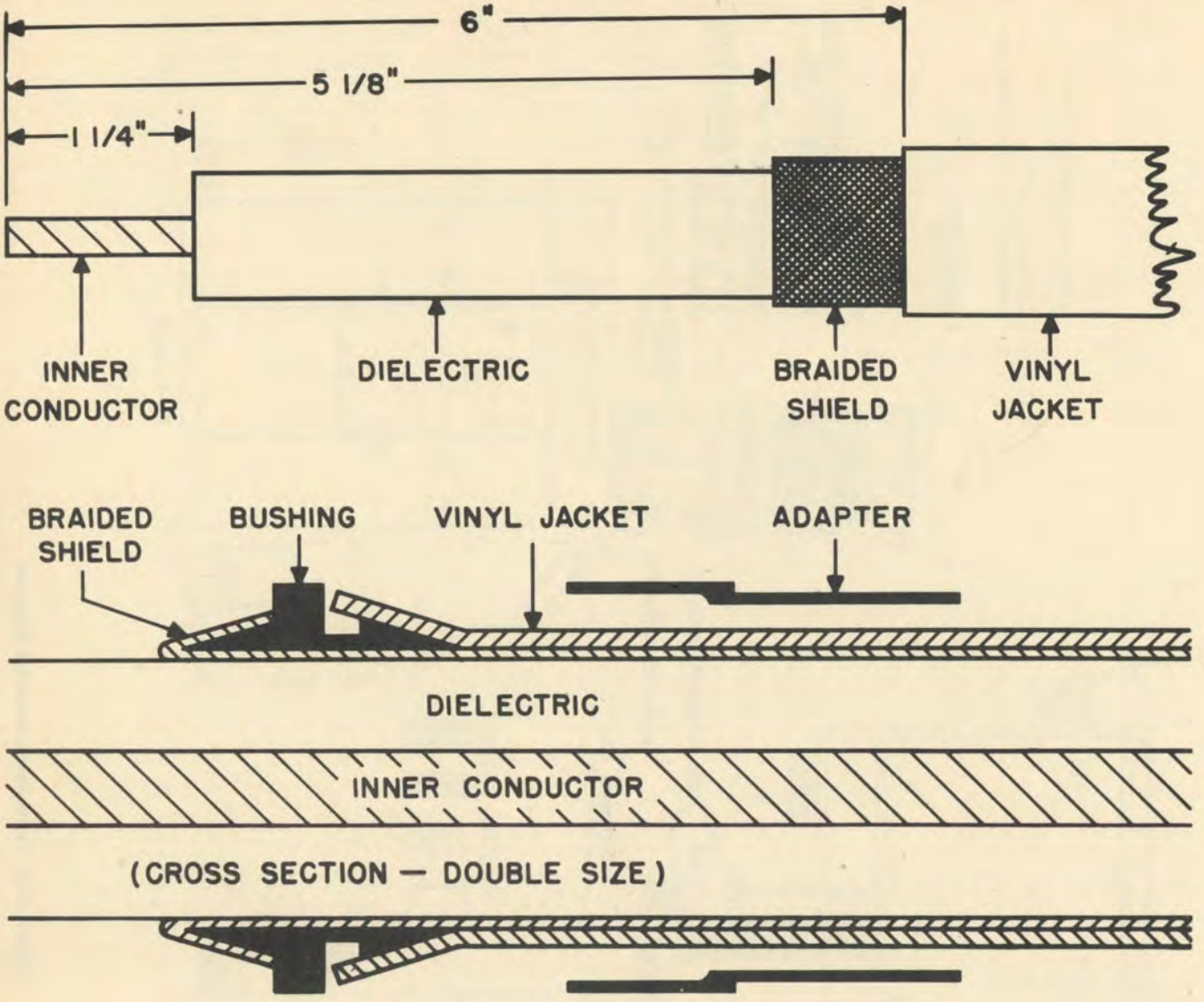


Figure 3–4. Cable Termination Diagram.

g. METHOD OF TERMINATING CABLES.—To assemble the transmission line termination for RG-19/U, proceed as follows: (Refer to figure 3–4.).

(1) Square off the end of the cable if necessary and cut off the vinyl jacket 6 in. from the end of the cable. Make certain the braid is not nicked when the jacket is cut.

(2) Cut off the braid 5⅛" from the end of the cable, leaving ⅞" of braid exposed.

(3) Remove the dielectric 1¼" from the end of the cable, exposing the inner conductor.

(4) Remove the line termination from the unit by removing the two lock nuts holding it in place.

(5) Disassemble the line termination by removing the connector sleeve at the bottom, thus freeing the bushing and adapter. Remove the cap from the top of the unit.

(6) Slide the connector sleeve and the adapter onto the prepared cable. Slide the bushing, grooved end first, onto the cable as far as it will go.

(7) Force the bushing under the vinyl jacket until the jacket extends over the bushing as far as the flange.

(8) Approximately ½" of braid will now be exposed beyond the tapered end of the bushing. Fan this braid slightly and fold it back over the taper.

(9) Insert the prepared cable, with bushing in place, into the line termination. Allow the inner conductor to feed through the end cap. The inner conductor should extend about ¼" beyond the end cap.

(10) Tighten the connector sleeve on the end of the line termination. This will force the adapter and bushing into place thus securing the cable in the line termination unit.

(11) Trim off the inner conductor flush with the top edge of the end cap. Heat the end cap with a soldering iron and allow solder to flow into the cap

between the wall of the cap and the inner cable conductor.

(12) Screw one lock nut in place and insert the line termination through the hole in the floor of the unit. Screw the other lock nut in place from the inside of the cabinet. Tighten both lock nuts. The installation is now complete.

b. 110-VOLT CONNECTION.—A hole in the left front corner of the cabinet floor is provided to terminate the 110-volt conduit. The 110-volt line is then connected to the terminals provided on the J402 con venience outlet assembly. When this connection has been made, and power applied to the line, switch S401 completes the circuit to lights I401 and I402.

4. FINAL INSTALLATION PROCEDURE.

a. ANTENNA COUPLER MATCHING NETWORK ADJUSTMENT.—Before power is applied to the antenna for the first time, the antenna coupling network must be adjusted to provide a proper match between the transmission line and antenna at the operating frequency. (See Section 2.) The general steps of the adjustment procedure are:

(1) Determination of antenna resistance and reactance at the operating frequency.

(2) Selection of correct antenna coupling unit network.

(3) Arrangement of the antenna coupling unit as the proper network.

(4) Preliminary setting of the tuning control.

(5) Accurate adjustment of the tuning controls.

(6) Operational checks.

For convenience in explanation it may be considered that there are two basic procedures for carrying out steps (1) through (5). In one case, radio frequency bridge measurements and calculations are used to determine network arrangements and both the preliminary and accurate dial settings required. In the other procedure, network arrangements and preliminary dial settings are read directly from a table and final accurate settings are accomplished by observing transmitter meter readings. The second procedure is possible only if the antenna used is one of the three types whose characteristics are covered in table 3–1.

It should be noted that these procedures are not restrictive. Portions of one may be interchanged with portions of the other if such a combination is best suited to the information and instruments at hand. For example, if the antenna to be used is one of those listed in table 3–1, the table can be used for network information and preliminary settings. Accurate settings may be obtained by means of an RF bridge rather than the alternate method.

WARNING

DE-ENERGIZE THE TRANSMITTER AND AMPLIFIER AND GROUND ALL RF CIRCUITS BEFORE TOUCHING ANYTHING IN THE ANTENNA COUPLER. "TAG" THE MAIN SWITCHES ON THE TRANSMITTER AND AMPLIFIER SO THAT NO ONE WILL ENERGIZE THE EQUIPMENT WHILE PERSONNEL ARE WORKING ON THE ANTENNA COUPLER.

TABLE 3–1

ANTENNA COUPLER

LINK SETTINGS AND APPROXIMATE CONTROL SETTINGS

FOR THREE ANTENNA SYSTEMS

FREQUENCY	IMPEDANCE	L402 LINK SETTING*	L403 LINK SETTING*	"A" CONTROL SETTING	"B" CONTROL SETTING
300 Foot Vertical					
1750 KC	$R_L = 98$ $X_L = -210$	10	20	240	320
1800 KC	$R_L = 80$ $X_L = -180$	10	18	200	240
1850 KC	$R_L = 70$ $X_L = -150$	10	16	190	160
1900 KC	$R_L = 61$ $X_L = -125$	10	14	320	130

TABLE 3-1

ANTENNA COUPLER

LINK SETTINGS AND APPROXIMATE CONTROL SETTINGS

FOR THREE ANTENNA SYSTEMS

(Concluded)

FREQUENCY	IMPEDANCE	L402 LINK SETTING*	L403 LINK SETTING*	"A" CONTROL SETTING	"B" CONTROL SETTING
1950 KC	$R_L = 55$ $X_L = -100$	10	12	320	0
120 Foot Vertical					
1750 KC	$R_L = 31$ $X_L = -2$	12	10	80	80
1800 KC	$R_L = 34$ $X_L = +10.5$	10	10	160	240
1850 KC	$R_L = 37.5$ $X_L = +23$	12	8	360	160
1900 KC	$R_L = 41.5$ $X_L = +35.5$	10	10	80	280
1950 KC	$R_L = 46$ $X_L = +48$	10	8	240	240
T-Type 74-foot Flat Top 60-foot Lead-in					
1750 KC	$R_L = 23.2$ $X_L = -67.5$	16	10	280	160
1800 KC	$R_L = 25.3$ $X_L = -47$	12	12	80	280
1850 KC	$R_L = 26.7$ $X_L = -27$	12	10	240	80
1900 KC	$R_L = 28.1$ $X_L = -7$	12	10	280	280
1950 KC	$R_L = 30$ $X_L = +13$	10	8	80	100

*This column indicates the shorting links to be *removed.*

Before proceeding with the adjustment of the coupling network, check the 115-volt lighting circuit and the convenience outlet. Switch S401 which controls power to the lights and convenience outlet is located on the left side of the unit near the front.

b. DETERMINATION OF ANTENNA RESISTANCE AND REACTANCE AT OPERATING FREQUENCY.—To be able to select the proper circuit in the antenna coupling unit, it is necessary that the antenna resistance and reactance be known with a reasonable degree of accuracy.

The best method of determining the antenna impedance is to measure it with a suitable RF bridge.

NOTE

If an RF bridge is not available for measurement of antenna characteristics, and the information is not available from some other source, refer to paragraph *g* and table 3–1 for an alternate method.

A typical measuring set-up would consist of a General Radio Type 916A RF bridge, a General Radio Type 605B Signal Generator, and a good communications receiver covering the frequency range 1,750 kc to 1,950 kc for use as a bridge detector. For detailed information on operation and connection of these units, refer to the instruction books for the respective equipments.

To determine the antenna characteristics perform the following steps with the RF bridge equipment:

(1) Disconnect the antenna lead from the Antenna Coupler and connect it to the ungrounded "UNKNOWN" terminal of the bridge.

(2) Connect the grounded "UNKNOWN" terminal of the bridge to the ground strap of the coupling unit by means of a short lead.

(3) Adjust the signal generator output, supplied to the bridge, to the operating frequency.

(4) Determine the resistive and reactive components of the antenna impedance by means of the bridge and identify the reactive component as inductive or capacitive.

c. SELECTION OF NETWORK TO MATCH ANTENNA CHARACTERISTICS.—Four network variations are possible with the antenna coupling unit. They are: "T" connection, which will match any load having a resistive component between 25 and 150 ohms and a reactive component between +150 and −300 ohms; "L" connection, which will match any load having a resistive component between 25 and 45 ohms and a reactive component between −75 and −300 ohms; a modified "T" connection which *may* be required to match loads close to 25 ohms resistive and +150 ohms reactive; and the "T" connection with C404 which *may* be required to match loads close to 150 ohms resistive and +150 ohms reactive.

The antenna coupling unit is shipped from the factory with the "T" connection installed. The "T" connection will match virtually all loads which are likely to be encountered. It is suggested that "T" connection matching be attempted for all loads. If the "T" does not provide a match, and it may not under certain circumstances, either the modified "T" or the "T" with C404 should be used, according to the characteristics of the particular load. The "L" connection may be used if desired for loads as described above.

d. CHANGES FOR OTHER NETWORK CONNECTIONS.—To change to the "L" connection, remove the lead from the top of L402 to C401 and the lead from the bottom of L403 to C401. Two additional leads are clipped to the back panel of the cabinet. These leads are to be used to make the "L" connection. One of the leads connects the top of L402 to the ground stud near the base of L402. The other lead connects the bottom of L402 to the bottom of L403.

To change to the modified "T" connection remove the lead from the bottom of L403 to C401. The two additional leads required for the modification are clipped to the right side panel of the cabinet. One of these leads connects C401 to shorting link number 6 on L403. The other lead connects the bottom of L403 to the ground stud near the base of L402.

To change to the "T" connection with C404 remove the lead from C401 to the bottom of L403 and disconnect the lead from C401 to L402 at the capacitor end only. Capacitor C404 and its mounting plate will be found bolted to the rear of the front panel in the middle. Remove the mounting bolts and use them to bolt C404 and mounting plate to the top of C401. Connect the lead from L402 to the top of C404. Connect the lead that formerly connected C401 to L403 between the top of C404 and terminal 18 on L403.

e. PRELIMINARY CONTROL SETTINGS.—It is assumed that the antenna impedance has been determined as described in paragraph *b* above. It is also assumed that the desired network has been connected in the antenna coupling unit as described in paragraph *d* above. The charts of resistance and reactance given in figures 3–5 to 3–9 are used to determine the number of shorting links to be removed from coils L402 and L403 and the approximate settings for the A—ANTENNA TUNING and B—ANTENNA TUNING controls.

To determine the approximate settings of the coils and controls, first select the tuning chart (figures 3–5, 3–6, 3–7, or 3–8) that applies to the network being used. Next find the antenna resistance value along the horizontal scale of the chart. Move up, first to the solid line (marked X_L402) for the frequency at which the equipment is to operate. Then read over to the left scale (reactance). This will give the reactance in ohms of L402. Note that curves are provided only for the frequency limits of 1750 kc to 1950 kc. If the operating frequency is some frequency other than the two shown, it will be necessary to interpolate between the curves along the perpendicular of resistance value. When the value for L402 has been determined, read up to the dotted curve and over to the reactance scale to find the *total* reactance of L403 *plus the antenna reactance.* From the value determined for L403 plus the antenna reactance, subtract the antenna reactance to find the reactance of L403 alone. The subtraction is, of course, an algebraic subtraction. That is, if both reactances are positive the result is obtained by simple subtraction; if the total reactance is positive and the antenna reactance is negative, the reactance of L403 alone will be the sum of the two reactances.

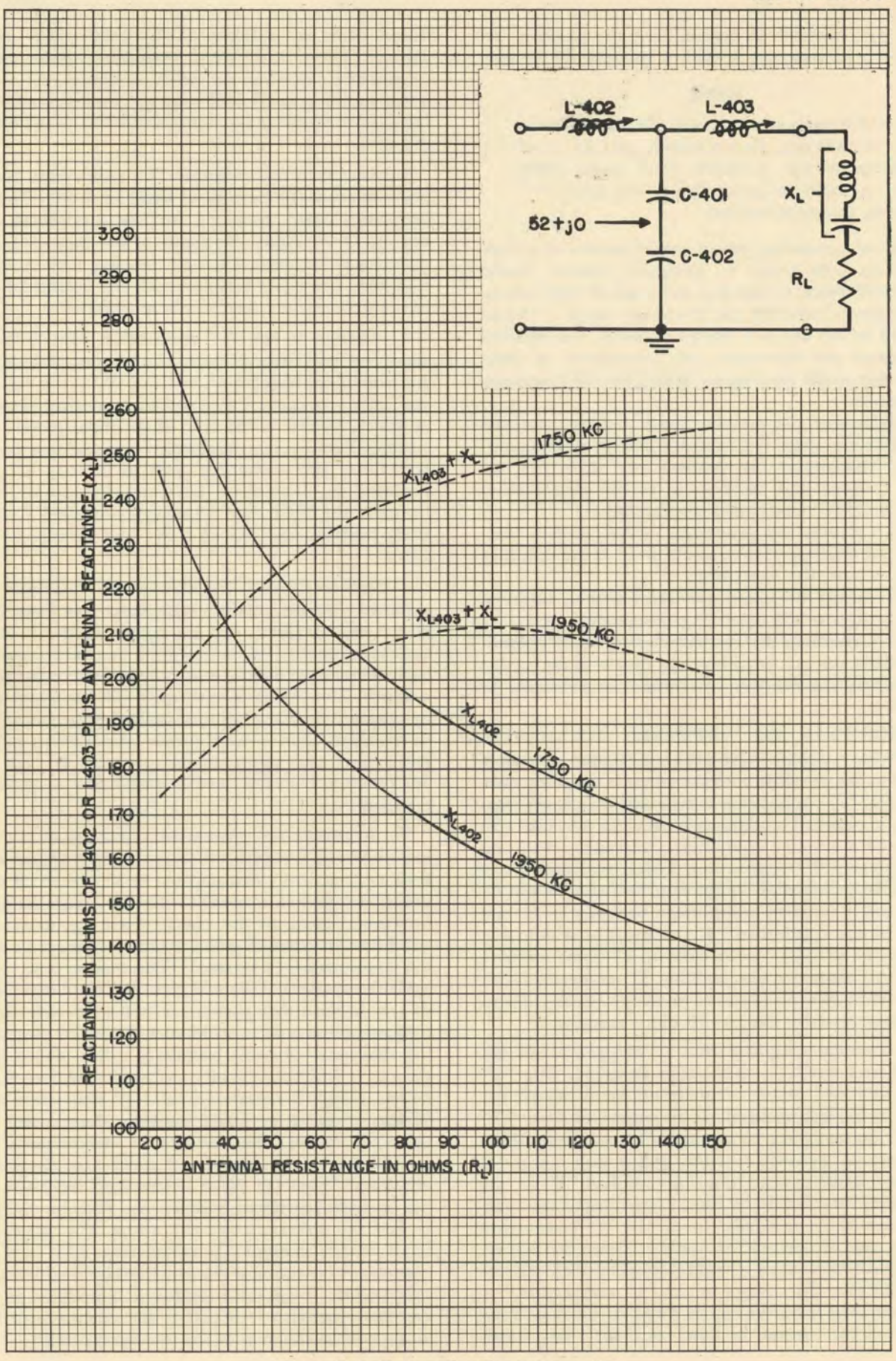


Figure 3–5. Tuning Chart for T-Connection.

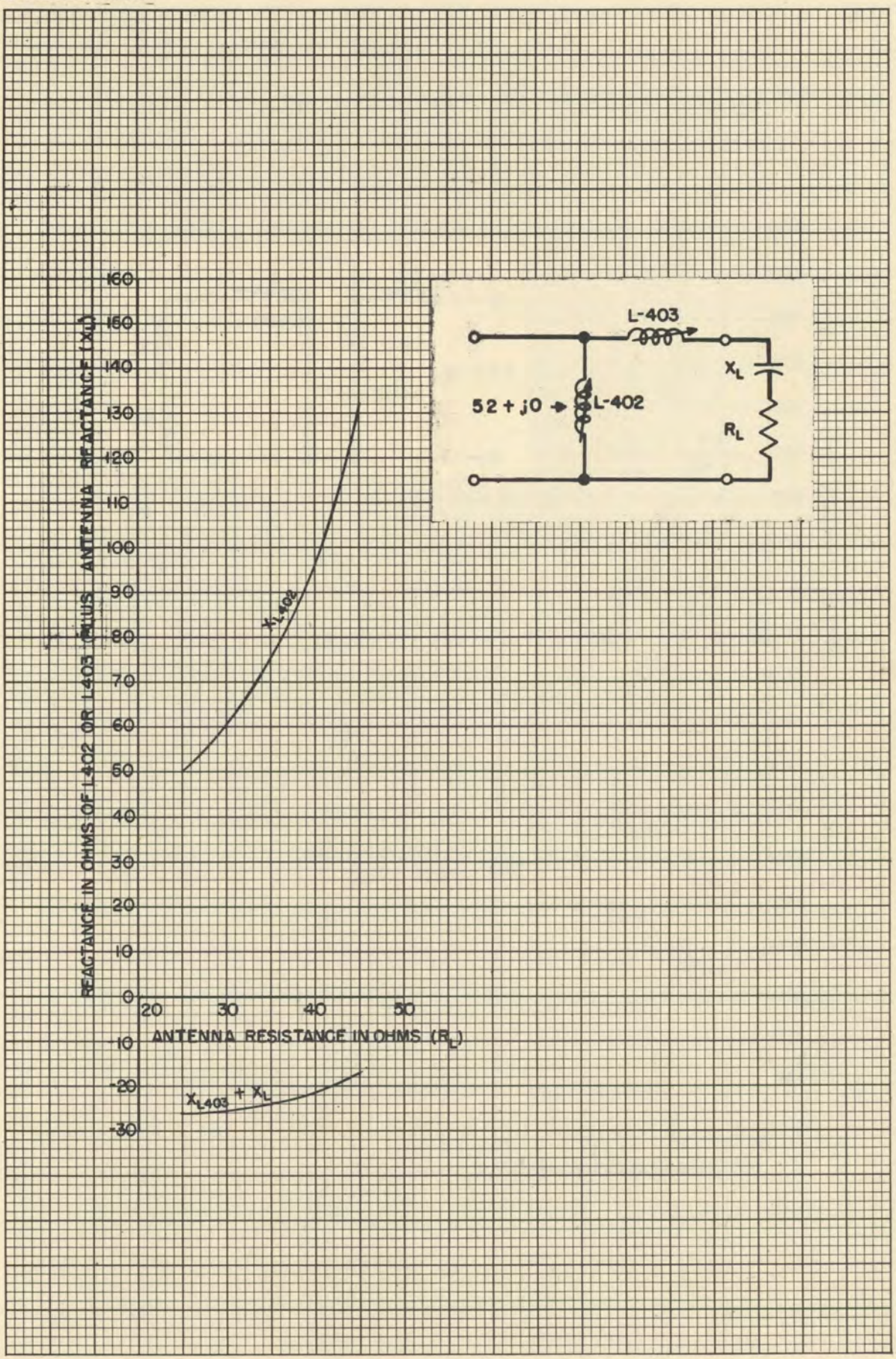


Figure 3–6. Tuning Chart for L-Connection.

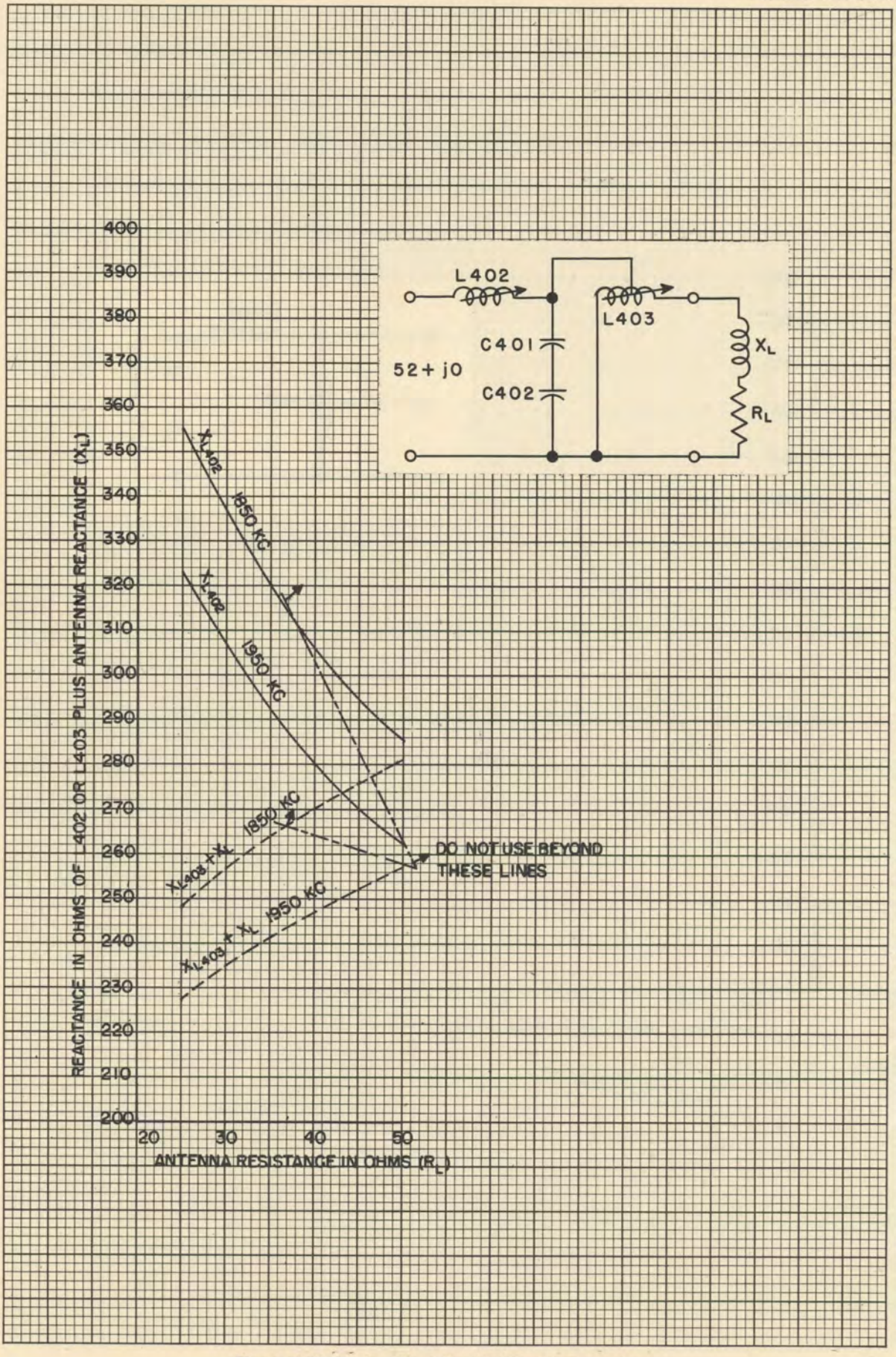


Figure 3–7. Tuning Chart for Modified I-Connection.

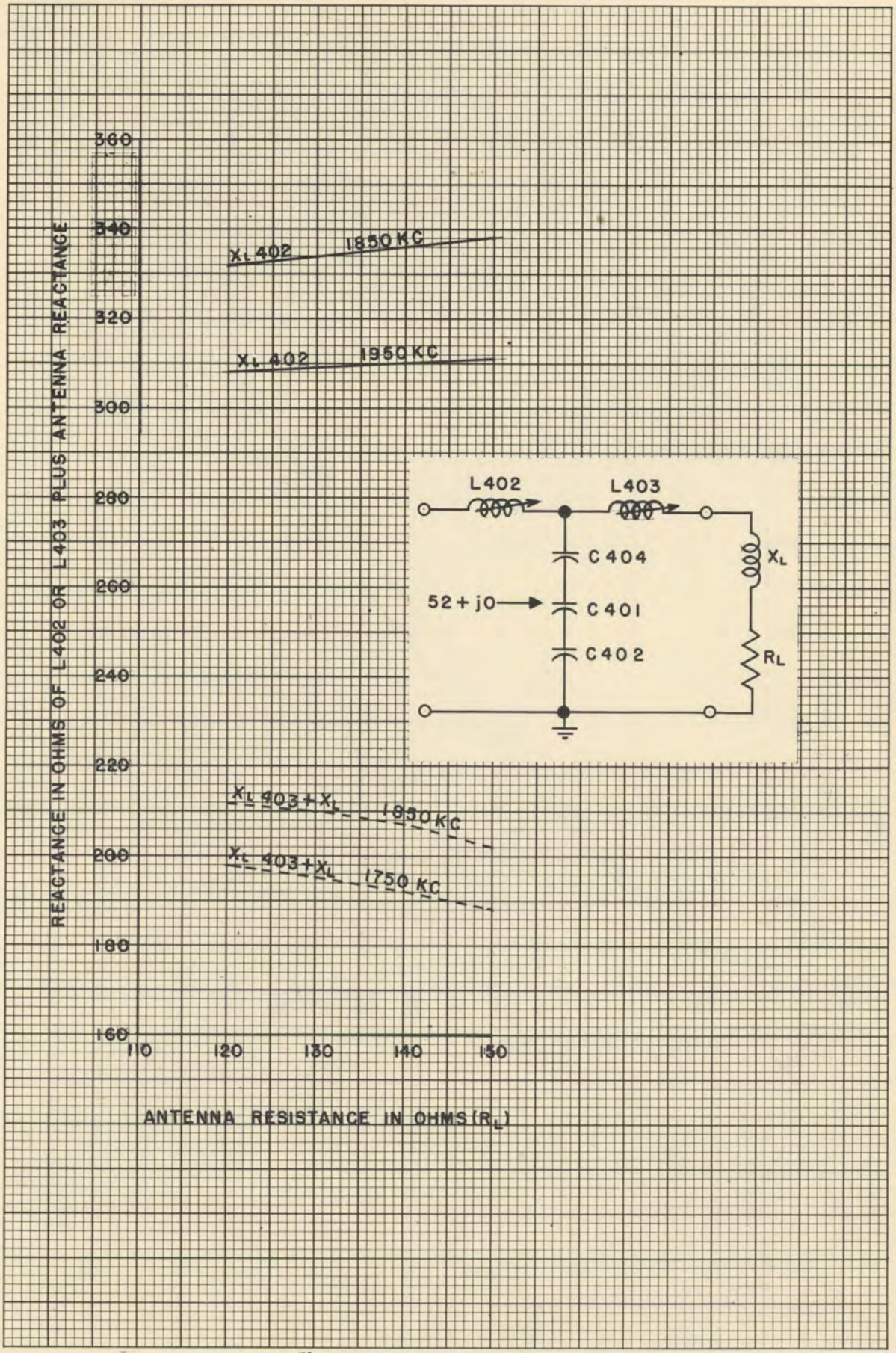


Figure 3–8. Tuning Chart for T-Connection with C404.

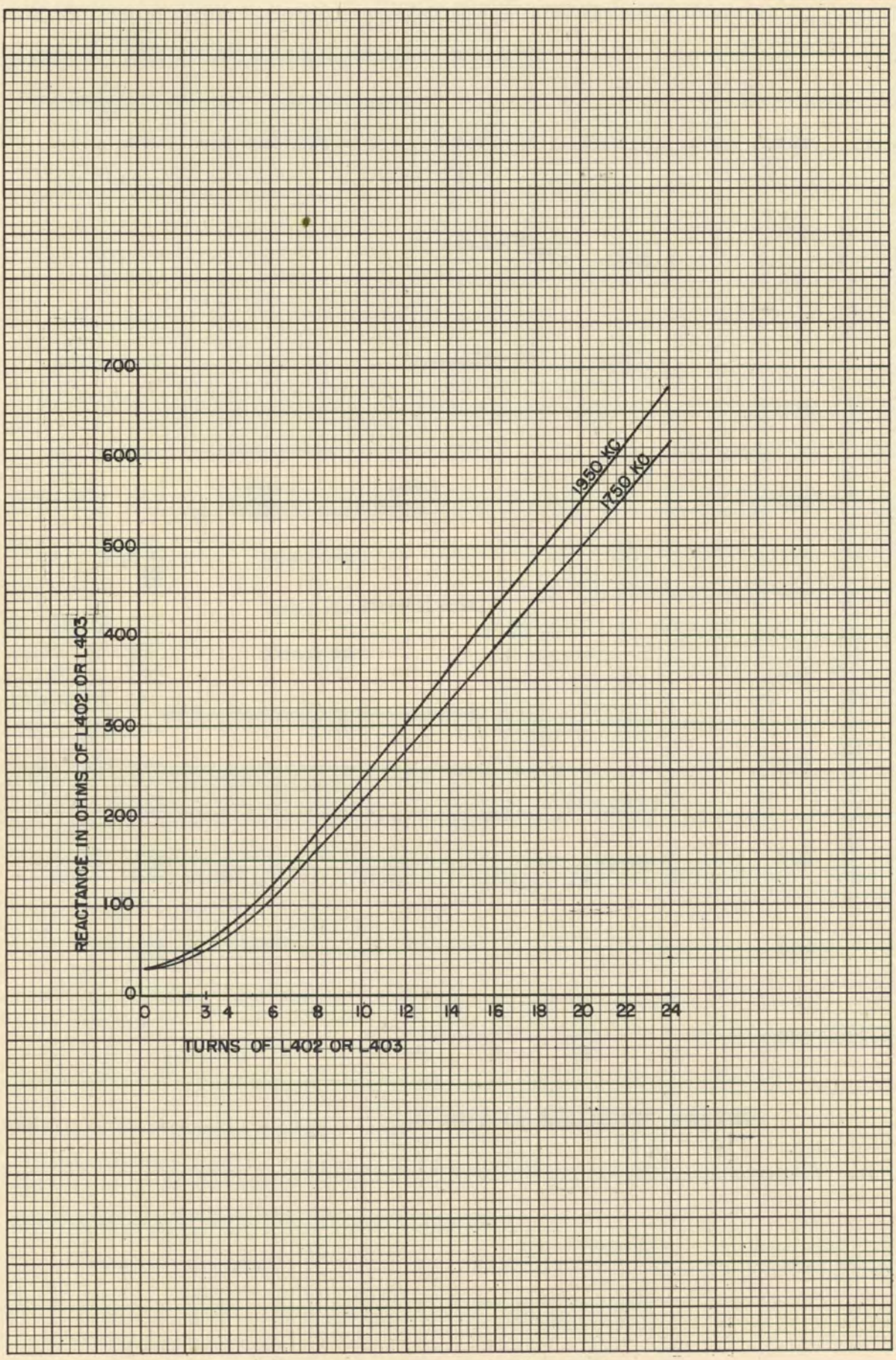


Figure 3–9. Tuning Control Calibration Chart.

After this operation has been performed the reactance of L402 and L403 for a given network at a given frequency will be known. It is next necessary to convert these known reactances into physical settings of the coils themselves. This information can be obtained from figure 3-9 Tuning Control Calibration Chart.

Note that on figure 3-9 the horizontal scale is calibrated in turns of L402 or L403 and the vertical scale is calibrated in reactances. Find the value of L402 on the vertical scale; read over to the frequency curve (again it will be necessary to interpolate if the operating frequency is a frequency other than the upper or lower equipment limit); after determining the proper point of intersection, read down to the turns scale. When the point of intersection on the turns scale is found, make note of two points for each coil. First, note the exact number of turns required, and second, note the next higher increment on the scale. The reason for noting two scale points for each coil is related to the mechanical construction of the coils.

Mechanically, the coil settings are made as follows: L402 has a total of 16 turns; shorting links covering two coil turns each (except for the first link which shorts only one turn) allow any amount of L402 from turn number 3 to turn number 16 to be shorted out. Obviously, the links alone cannot provide a perfect matching impedance since they cannot be set to single turn or fractional turn values. To provide these fine adjustments, L402 has a rotating shorting arm mechanically linked to the counter and crank control on the front panel marked A—ANTENNA TUNING. Rotating the crank to its limit will short out slightly less than 3 full coil turns. Two hundred units on the counter equal one full turn of L402. Coil L403 is identical to L402 except L403 contains a total of 24 turns and, therefore, requires four additional shorting links.

The two scale points for each coil, which were determined from the tuning chart as described above, correspond to the link setting and the rotor arm setting for each coil. The next higher scale increment indicates the number of turns which will be shorted out by means of the links. The difference between the link setting and the exact setting indicates the preliminary setting for the rotor arm crank. When the preliminary setting procedure has been completed as described above, a certain number of shorting links will be removed from L402 and L403, and the two crank controls, A—ANTENNA TUNING and B—ANTENNA TUNING, will be set to a close approximation of the matching point. Final adjustment of the crank controls will be made with the aid of the RF bridge and the matching procedure will be completed.

As an aid to understanding the reactance and tuning charts, a specific example is given below.

Assume that the antenna, or load, impedance has been measured with the RF bridge and has been found to be:

Resistance of the load (R_L) = 80 ohms.
Reactance of the load (X_L) = −180 ohms.

The operating frequency will be assumed to be 1800 kc and the "T" network will be used.

Since the "T" network is to be used, turn first to figure 3-5, Tuning Chart for T-Connection. The load, or antenna, resistance has been measured as 80 ohms. This value determines the point along the horizontal axis (Antenna Resistance In Ohms) at which the reactance curves will be read. Using the solid curves first it is found that the reactance of L402 at 1750 kc would be 197 ohms. The operating frequency in this instance, however, is 1800 kc. Interpolation will be necessary to find the correct reactance. Note that the difference in the reactance of L402 at the upper and lower frequency limits is 25 ohms. (Reactance at 1950 kc is 172 ohms, reactance at 1750 kc is 197 ohms, difference is 25 ohms.) The total frequency difference between the upper and lower limits is 200 kc. The operating frequency, 1800 kc, will therefore have a reactance which is one-fourth of the difference between the limits, or approximately 6 ohms. Subtracting this value from the reactance at 1750 kc will give the reactance at the operating frequency. The reactance of L402 at 1800 kc is, therefore, 191 ohms.

Next, read up at the 80 ohm line to find the reactance of L403 *plus the load reactance.* Again it will be necessary to find the reactance at the upper and lower frequency limits and interpolate as was the case with L402. Reading the curves for these values shows the reactance at 1750 kc to be 241 ohms and the reactance at 1950 kc to be 209 ohms. The reactance at 1800 kc will, therefore, be 233 ohms.

Note that 233 ohms is the reactance of L403 plus the load reactance. The reactance of L403 alone can be found by algebraically subtracting the load reactance from the total reactance. The load reactance was found to be −180 ohms. Therefore:

$X_L403 = 233 - (-180)$
$X_L403 = 413$ ohms

With the reactance of L402 and L403 known, it is next necessary to find the physical setting of the coils which will give the required reactance. This can be determined from figure 3-9, Tuning Control Calibration Chart.

First find the point on the vertical, or reactance axis, that corresponds to the reactance of L402 which was found to be 191 ohms. Then read over to the right to the point of intersection with the curves given. Again the curves are given for the upper and lower frequency limits and it will be necessary to interpolate to find the correct coil setting for 1800 kc. After interpolation, read on the horizontal axis the exact number of turns required. In the case of L402 with a reactance of 191 ohms, the turns setting will be found to be exactly 9.00. Note that the next *higher* turns point given on the scale is 10.

Following a similar procedure for L403 will show that the exact number of turns is 16.80 and the next higher value on the scale is 18.

It was necessary to note the next higher scale value in each case because that indicates the number of links that must be removed from the coils. The difference between the link setting and the exact setting indicates the number of turns which must be shorted out by means of the rotor arm to give the exact setting.

In the case of L402, the exact setting is 9.00 and the next higher value is 10. Therefore, all the links up to turn number 10 will be removed and one full turn of the rotor arm will short out an additional turn giving the desired result.

The rotor arm dials are so calibrated that a reading of 200 on the dial equals one full turn removed. For L402, therefore, the A—ANTENNA TUNING control should be set to 200. In this position, there are exactly 9.00 turns of L402 in the circuit.

The setting for L403 was found to be 16.80 and the next higher value was 18. Shorting links up to turn 18 will be removed. The difference between this setting and the exact value is 1.20 turns. Multiplying this value by 200, the dial setting equal to one full turn, gives 240. B—ANTENNA TUNING control should, therefore, be set to 240.

When the links have been removed and the rotor arm cranks set to the correct point, the preliminary adjustments are complete. Next it is necessary to adjust the rotor arm controls to the exact matching point by means of the RF bridge.

f. FINAL CONTROL SETTINGS.—It is now necessary to adjust the A—ANTENNA TUNING and B—ANTENNA TUNING controls so that an impedance of exactly 52 ohms resistive is presented to the transmission line which runs to the Loran Amplifier Model T-138-A. Here, as in the case of determining the antenna impedance, the recommended procedure requires the use of an RF bridge such as was described in paragraph *c* above.

Using the RF bridge, perform the following steps to determine the precise settings of the controls.

WARNING

MAKE CERTAIN THE TRANSMITTER AND AMPLIFIER ARE INOPERATIVE BEFORE OPENING THE COUPLING UNIT DOORS. GROUND ALL COMPONENTS WITH THE CAPACITOR DISCHARGE ROD. OBSERVE ALL SAFETY PRECAUTIONS. "TAG" BOTH THE TRANSMITTER AND AMPLIFIER SO THAT THEY WILL NOT BE ENERGIZED DURING THE FOLLOWING OPERATION.

Make certain the antenna lead is securely connected to the stand-off insulator on the right side of the Antenna Coupler, and that the coupling unit ground strap is connected to the antenna ground or counterpoise system.

(1) Open the front door of the Antenna Coupler. Make certain the link that switches the amplifier output to either the antenna system or the dummy load is connected so that the antenna system is in the circuit and the dummy load is out. (See figure 3–10.) Disconnect the link that ties the transmission line to the antenna system. (This link is located on the floor of the cabinet on the left side.)

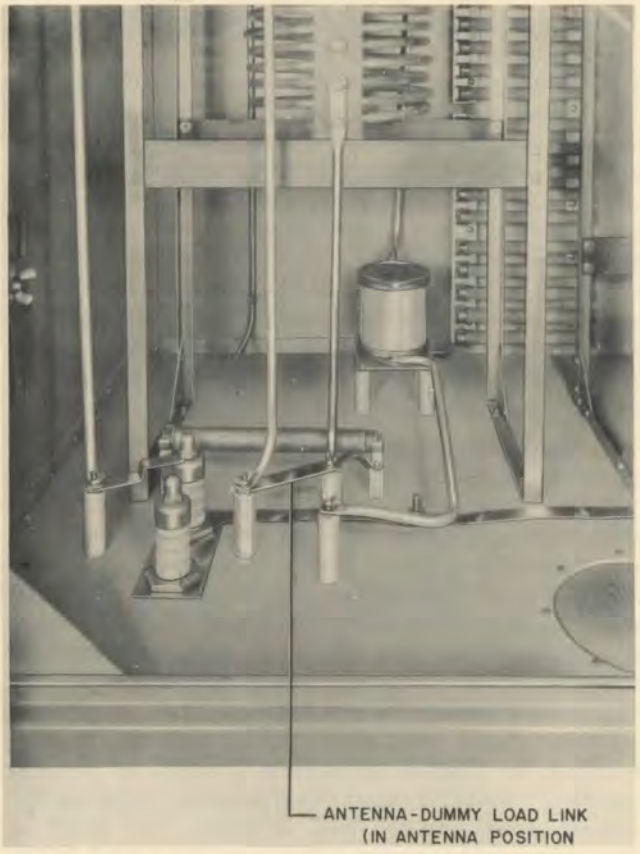


Figure 3-10. Close-up View of Lower Left Corner of Antenna Coupler CU-277/URT, Showing Antenna-Dummy Load Link.

(2) Connect the grounded UNKNOWN terminal of the bridge to the ground strap of the coupling unit by means of a short lead. Connect the ungrounded UNKNOWN lead to the link that was removed from the transmission line in the step above.

(3) Set the RF bridge so that if the unknown impedance were 52 ohms resistive and zero ohms reactive, a balance would be obtained. Tune the signal generator output to the desired frequency.

(4) While listening to the bridge detector output, adjust the A—ANTENNA TUNING and then the B—ANTENNA TUNING controls for the best signal null. The first adjustment will probably not result in a perfect null since the controls are interdependent. It will be necessary to readjust each control perhaps several times until no further reduction in signal is possible. When neither control can be moved without increasing the detector signal, the optimum match has been obtained.

(5) Disconnect the RF bridge and replace the link removed in step (2) above.

g. ADJUSTMENT OF THE MATCHING NETWORK WITHOUT USING AN RF BRIDGE.—The best method of adjusting the matching network is with an RF bridge as described above. However, if that method cannot be used, a reasonably satisfactory match can be obtained by the process described below.

Table 3–1 gives the approximate link and control settings for three common types of antenna systems at the five operating frequencies. This information provides preliminary settings for the controls. Final adjustment of the controls is made by comparing the readings obtained on meters M105 LOAD CURRENT and M401 LINE when operating into the dummy load, with readings obtained when operating into the antenna system. The step-by-step procedure is as follows:

(1) From table 3–1 obtain the link and control settings that apply to the antenna system and the operating frequency that are to be used.

(2) Using the values obtained from table 3–1, adjust the Antenna Coupler as previously described. (Note that the "T" network is used for all three antennas.)

(3) Open the door of the Antenna Coupler and connect the transmission line to the dummy load. (See figure 3–2.)

(4) With the Antenna Coupler closed, energize the transmitter and amplifier. With the transmitter-amplifier in normal operating condition, working into the Antenna Coupler dummy load, record the exact readings on the Amplifier LOAD CURRENT meter M105 and the Antenna Coupler LINE meter M401.

(5) Turn off the transmitter and amplifier. Open the door of the Antenna Coupler and change the link (which was connected to the dummy load in step (3) above) so that the transmission line is connected to the antenna system.

(6) Turn on the transmitter-amplifier again. If the coupling network is too far out of adjustment, arcing may occur. If this happens, reduce the PLATE VOLTAGE on the amplifier until the units operate without arcing.

(7) Note the reading on the antenna coupling unit ANTENNA meter M402. Change the B—ANTENNA TUNING control in a series of 20-division increments in both directions. At each new setting of control B, adjust the A—ANTENNA TUNING control for maximum ANTENNA current. From this operation, determine the combination of settings which gives the maximum reading on the ANTENNA current meter M402.

(8) If the amplifier PLATE VOLTAGE control was lowered in step (6) above, adjust it for normal operating voltage (15.5 kv).

(9) Adjust the A—ANTENNA TUNING and B—ANTENNA TUNING controls, as necessary to make the readings on the amplifier LOAD CURRENT meter M105 and the Antenna Coupler LINE meter M401 essentially the same as they were when the amplifier was operating into the dummy load (steps (3) and (4) above) making certain that these comparisons are made with the same PLATE VOLTAGE. Throughout these adjustments the GRID TUNING and PLATE TUNING of the amplifier should be checked for proper adjustment. The reading of M105 should be essentially the same as that of M401.

5. TESTING.

The Antenna Coupler has been adjusted at the factory for proper operation when set up and matched as described in this section. After the equipment has been installed the output waveform should be monitored. If the waveform deviates from the desired limits, some adjustment or corrective procedure is required.

Adjustments and corrective procedures for the Antenna Coupler are covered in Section 7 of this book. The instruction books supplied with the associated units of the loran system will describe corrective procedures and adjustments for other units.

SECTION 4
OPERATION

1. GENERAL.

When Antenna Coupler CU-277/URT has been properly adjusted to work into a particular antenna network at a particular frequency, the unit requires no further attention of an operational nature. If either the antenna system or the operating frequency is changed, the Antenna Coupler will have to be readjusted to provide a match under the new conditions. The readjustment procedure is covered in detail in Section 3 of this instruction book.

SECTION 5
OPERATOR'S MAINTENANCE

1. GENERAL.

Since Antenna Coupler CU-277/URT contains no vacuum tubes or fuses, the operator has no maintenance duties. However, both of the meters on the unit should be logged at regular intervals when the logging operations are performed for the transmitter and the amplifier. Any sudden, appreciable change in meter readings, or any gradual but continuous change, should be brought to the attention of maintenance personnel. In addition, there should be a provision in the station schedule for a daily visual inspection of the unit.

SECTION 6

PREVENTIVE MAINTENANCE

1. GENERAL.

a. INTRODUCTION.—This section is designed to provide operating personnel with a general minimum schedule of preventive maintenance routines as outlined in table 6–1. The schedules and routines included here should serve mainly as a guide to station personnel in setting up a schedule of preventive maintenance which will be best suited to a particular installation. Station operating times and the time-sharing schedule will determine, largely, the ideal preventive maintenance schedule.

Careful attention to preventive maintenance is essential to satisfactory operation of Antenna Coupler CU-277/URT. The equipment is, of course, designed for long, trouble-free operation. However, the nature of electronic equipment makes some component failure inevitable. Maintenance personnel will find replacement of worn out or defective components is greatly simplified if preventive maintenance procedures are conscientiously followed.

The routines described herein will prevent or materially postpone many component failures and will enable maintenance personnel to anticipate other troubles so that corrective measures can be taken before interaction damages associated components.

The techniques involved in preventive maintenance include periodic cleaning, inspection, adjustment and lubrication; the keeping of records or logs of such operations is an equally important aid.

TABLE 6–1

ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
	Daily	
Meter Readings	Log all meter readings at both the Amplifier and the Antenna Coupler at least twice daily.	Be sure to log cathode current with meter M103 with the CATHODE SELECTOR switch S102 in all 12 positions.
	Weekly	
Cabling	Check all external cables and connectors.	See paragraph 1*d*.
	Monthly	
Terminal Blocks	Visual inspection.	If connections must be removed, make certain they are replaced correctly.
	Quarterly	
Capacitors	See paragraph 1*b*.	USE CAPACITOR DISCHARGE ROD TO GROUND CAPACITORS BEFORE TOUCHING THEM.

TABLE 6–1

ROUTINE MAINTENANCE CHECK CHART (Concluded)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Resistors	See paragraph 1*c*.	
Meters	See paragraph 1*e*.	When tightening loose connections, hold retaining nut while tightening outer nut.
Bushings and Insulators	Check visually; tighten if necessary.	Do not use excessive pressure when tightening. Ceramic materials may be damaged.
Semi-Annually		
Switch	Check operation.	Clean or replace as necessary.

b. CAPACITORS.—

(1) Inspect capacitor cases for leaks and discoloration. If any such defect is noted, replace the capacitor if an identical spare is available. Inspect the terminals for corrosion and loose connections. Use fine sandpaper to remove corrosion. Blow the equipment clean with compressed air after using sandpaper. Tighten loose connections carefully to avoid breakage of internal connections and insulators.

(2) When necessary, clean the case of the capacitor, the insulating bushings and the connections. Use a dry cloth or a cloth moistened with solvent.

c. RESISTORS.

(1) FIXED RESISTORS.—Fixed resistors are of the wire-wound type. They are mounted by means of metal clips (ferrule type).

Inspect the coating of ceramic resistors for signs of cracks and chipping, especially at the ends. Examine the bodies of resistors for blistering, discoloration and other indications of overheating. Overheating or overloading of a resistor may be caused by a defect elsewhere in the circuit.

Check all resistor mountings for looseness.

Clean the ends of ferrule resistors with a cloth or brush moistened with cleaning solvent. If necessary, use fine sandpaper to brighten the ends of the resistors. Mounting clip tension may be increased by pressing the clips together with the fingers or pliers. Wipe the ends of the resistors with a dry cloth before replacing them.

d. CABLES, RECEPTACLES AND PLUGS.—Inspect cables for cracks, deterioration, fraying and broken insulation at the connecting and supporting points. Make certain the cable is free of kinks and improper supports which place the cable under strain. Clean cable connections when they are dirty or corroded. Scrub dirty connections and plugs with a brush dipped in cleaning solvent. Dry connections thoroughly after cleaning. Do not attempt to remove individual prongs from plugs or receptacles. To remove corrosion, use fine sandpaper and polish the surface after cleaning.

If a cable or plug must be replaced, examine the existing component and replace it with an exact duplicate, if possible.

e. METERS.—Inspect the meter leads and connections. Look for loose, dirty or corroded connections. Also check for cracked or broken cases or cover glass and loose mounting screws. Clean meter cases with a dry cloth. Use cleaning solvent if necessary. Clean dirty connections with a small brush or cloth moistened with dry cleaning solvent. Use fine sandpaper to clean corroded connections and wipe with a clean cloth.

Tighten all loose connections. Be careful not to crack the meter case when tightening connections. To prevent breakage, hold the retaining nut which makes contact with the meter case and do not allow it to turn while the outside nut is tightened. This permits tightening the connection without increasing the pressure of the stud head against the inside of the meter case.

When the equipment is de-energized, all meters should return to zero. If they do not, first tap the meter case lightly with the finger. If the needle still does not return to zero, rotate the zero-adjusting screw until the pointer is exactly at zero.

f. SWITCHES.—Inspect the mechanical action of each switch, and while doing so, look for signs of dirt or corrosion on all exposed elements. Make certain all mounting and connecting screws are tight. Where the contacts are enclosed and not accessible, such as on toggle switches, check the operation of the switch

by flipping the toggle or pressing the button. Check for free movement and firm spring tension. Examine wafer type switches to see if the contacts are clean. Do not pry the leaves of the switches apart. The movable blade should make good contact with the stationary member. As the blade makes contact, there should be a noticeable spreading of the contact leaves.

When necessary, clean the exterior surface of switches with a stiff brush moistened with cleaning solvent. Clean corroded surfaces with fine sandpaper. If serious binding is evident in the switch action, apply a drop of light machine oil to the bearing surface with a toothpick. Do not let oil run into the electrical contacts.

g. MECHANICAL INSPECTION.—A systematic mechanical inspection should be made of all units. All nuts, bolts and screws should be checked and tightened. Check the weathersealing and note any evidence of leakage. Except in the case of serious cabinet corrosion, replacement of the weatherseal or caulking with waterproof compound should correct the trouble. More serious cabinet breaks should be brought to the attention of the officer in charge. Check all convenience outlets, terminal boards, ground leads and clamps.

2. RE-TROPICALIZATION.

a. GENERAL.—When equipment has been subjected to conditions of extreme humidity over a long period of time, re-tropicalization may be necessary in order to keep the surfaces, terminals and connections moisture-proof.

The coating should be applied to all surfaces, circuit elements (resistors, capacitors, coils, and so on) and surfaces supporting circuit elements, as well as interconnecting wiring and connectors, unless such application will interfere with the operation of the equipment.

Meters are to be coated on the outside of the case. Do not open or treat the inside of the case. Do not coat the contact portions of the binding posts, connectors, fuses, jacks, keys, plugs; or the rubbing points of bearings contact fingers, potentiometers, shafts, shields, variable transformers or relays. Also avoid coating mechanical parts such as bearing surfaces, gear teeth, springs, and so forth.

b. MATERIALS USED.—Use Varnish Tuf-on 74S, as supplied. If thinning is necessary for special applications, use Tuf-on 74M thinner.

(1) Where the above varnish might impair the physical properties of the material, as with felt, cloth or cordage, use the following solution:

Shirlon A	2%
Aridex WP	6%
Tap Water	92%

To apply, submerge the article in the solution until saturated. Drain without squeezing and dry.

c. PREPARING SURFACES.—Clean surfaces so they are free from dirt, oil, grease, or other foreign matter. When the equipment or parts are wet or damp or when humidity conditions are unusually severe, preheat the equipment before applying the protective coating. Do not use a temperature higher than 60 degrees C (150 degrees F). Apply heat until the equipment is dehydrated, but never for longer than three hours.

d. APPLICATION OF VARNISH.—Apply the varnish coating to the assembled equipment or to subassemblies prior to installation in the assembled equipment, provided fixed electrical connections are subsequently coated. Apply by spraying, brushing and/or dipping, in such fashion as to leave a clear smooth finish free from bubbles, wrinkles, filaments or spray dust.

e. FINAL DRYING.—The equipment should be air dried and sufficient time should be allowed for the coating material to become dry before handling.

f. ADJUSTING AND TESTING.—Following treatment, adjust the equipment, if necessary, for optimum operating characteristics.

g. MARKING OF EQUIPMENT.—Mark each unit of the equipment with a stamp or tag reading MFP. (Add date of re-tropicalization treatment.)

SECTION 7
CORRECTIVE MAINTENANCE

1. GENERAL.

Corrective maintenance is largely a matter of localizing the source of trouble. Once a defective component has been detected, repair or replacement is a relatively simple operation. It is important to detect and correct component failures as soon as possible to prevent other components from being damaged by interaction.

It is important to remember that the units comprising a loran station are to a greater or lesser extent interdependent. This instruction book is concerned solely with the Antenna Coupler CU-277/URT. Maintenance personnel should familiarize themselves with the operation and maintenance of the station units, as described in the respective instruction books, so that they can diagnose and localize troubles with maximum accuracy in a minimum amount of time.

2. ANTENNA COUPLER CU-277/URT.

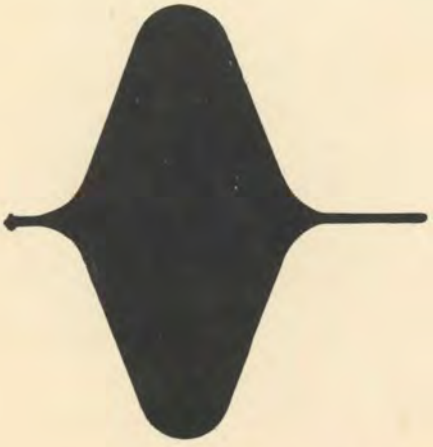
Antenna Coupler CU-277/URT is basically uncomplicated and should present no difficulties in maintenance. Generally speaking, a visual inspection will be sufficient to localize troubles in the unit. Meter readings, as recorded in the station log, will frequently indicate the source of trouble. In addition, this section contains aids which will be of value to maintenance personnel. The maintenance aids contained in this section include:

a. Output waveform (figure 7–1).
b. Schematic diagrams (figures 7–2 and 7–3).
c. Specific corrective maintenance procedures as outlined in the paragraphs below.

3. CORRECTIVE MAINTENANCE PROCEDURES.

a. GENERAL.—The information contained in the paragraphs below applies mainly to operation using the "T" connection. Generally, the indications of component failure will be approximately the same no matter what network is used. However, specific indications will vary. Component failure or deterioration will become evident first in distortion of the output waveform. If the Antenna Coupler has been properly matched, and the other station units have been eliminated as the source of trouble, the components listed below should be checked.

b. COILS L402 and L403.—The physical construction of these coils will make it quite simple to spot any defects. Check the wiper arm for good contact and smooth operation. If the wiper arm has become disengaged or does not make good contact, check the positioning of the coil assembly. Note that there are slots in the cabinet floor and in the coil assembly which allow the coil to be accurately centered under the rotor assembly. Adjust the coil assembly as necessary for smooth operation. After adjustment, check the Antenna Coupler for proper tuning as described in Section 3 of



MONITORED CIRCUIT: OUTPUT EXT. AMP. or ANTENNA
VIDEO ATTENUATION: OFF
VERTICAL DEFLECTION: 2/3
SWEEP LENGTH: 100-A
PLATE VOLTAGE: ON

Figure 7–1. Output Waveform.

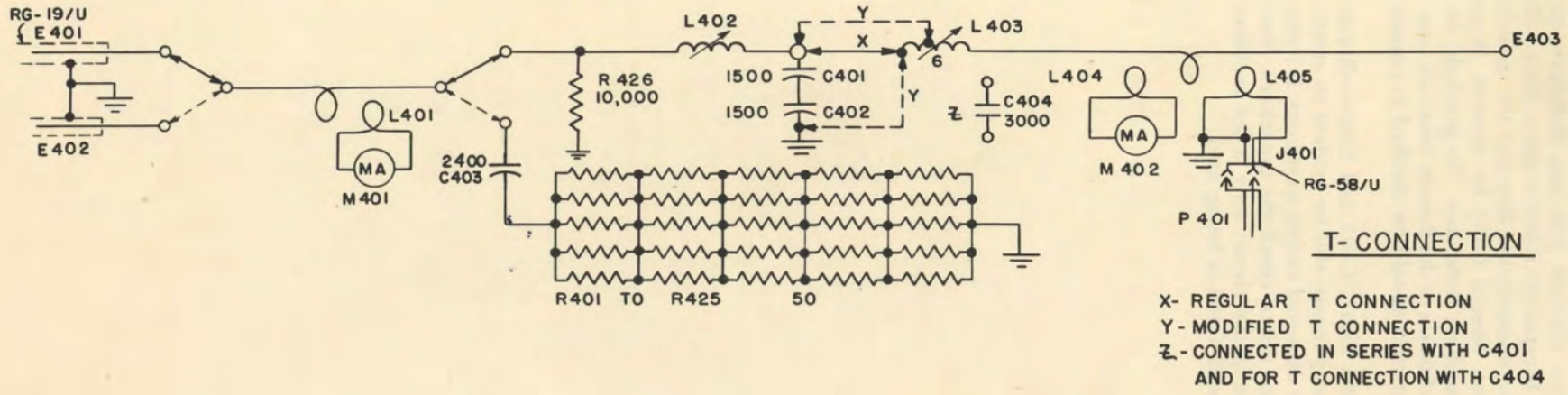


Figure 7–2. Schematic Diagram for T-Connection.

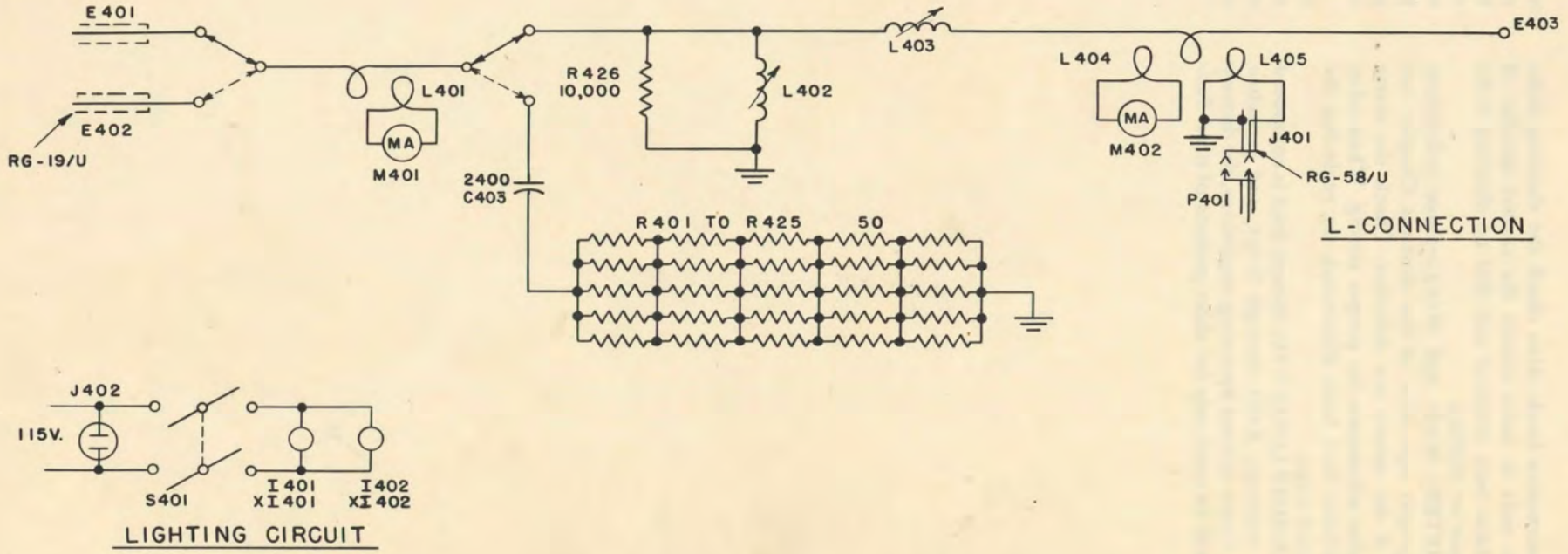


Figure 7–3. Schematic Diagram for L-Connection.

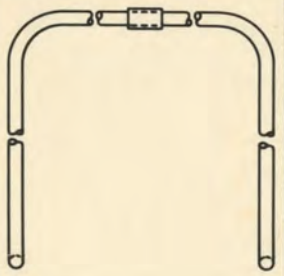
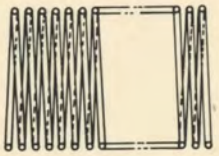
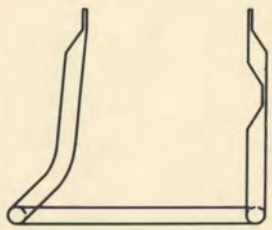
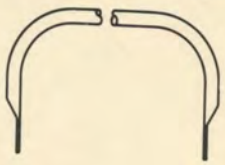
this instruction book. Also check the shorting links on the coils to make certain the correct number of links have been removed and that no shorting links are loose or missing.

c. METERS M401 and M402.—False indications of improper operation of the Antenna Coupler can result if the meters are defective. Check the meter multiplier adjustment for proper setting. When other possibilities have been eliminated, try replacing the suspected meter.

d. DUMMY LOAD.—The dummy load is composed of 25 resistors, R401 through R425, and capacitor C403. Under normal operating conditions, the dummy load will be used only for short periods of time. Failures in the resistor network will not, therefore, be readily apparent. If capacitor C403 is open, there will be no load on the transmission line and the trouble should be obvious. Should C403 be shorted, there would be no immediate indication. To preclude the possibility of breakdown of the dummy load, the components in the network should be checked at regular intervals.

e. CAPACITORS C401, C402 and C404.—Breakdown of these components will be evident in erratic meter readings or distorted output waveform. If either of these conditions exists, check the capacitors. Note that C404 will be in the circuit only if the modified "T" connection with C404 is being used.

TABLE 7-1. COIL WINDING DATA

SYMBOL DESIG.	G.E. DWG. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RESIST. IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
L-401	B-7410573		Copper Tubing	¼" O.D.x .032" wall	1 full turn				Sleeve: 3/8" O.D. x .062" wall
L-402	T-7602820		Copper Tubing	½" O.D. x .035" wall	16 turns at 1" pitch (variable by means of rotor arm and shorting links)				Air core
L-403	T-7602820		Copper Tubing	½" O.D. x .035" wall	24 turns at 1" pitch (variable by means of rotor arm and shorting links)				Air core (identical to L-402 except for number of turns)
L-404	B-7408899		Copper Tubing	½" O.D. x .035" wall	1 turn				Air core
L-405	A-7013256		Copper Tubing	¼" O.D. x .035" wall	1 turn				Air wound loop

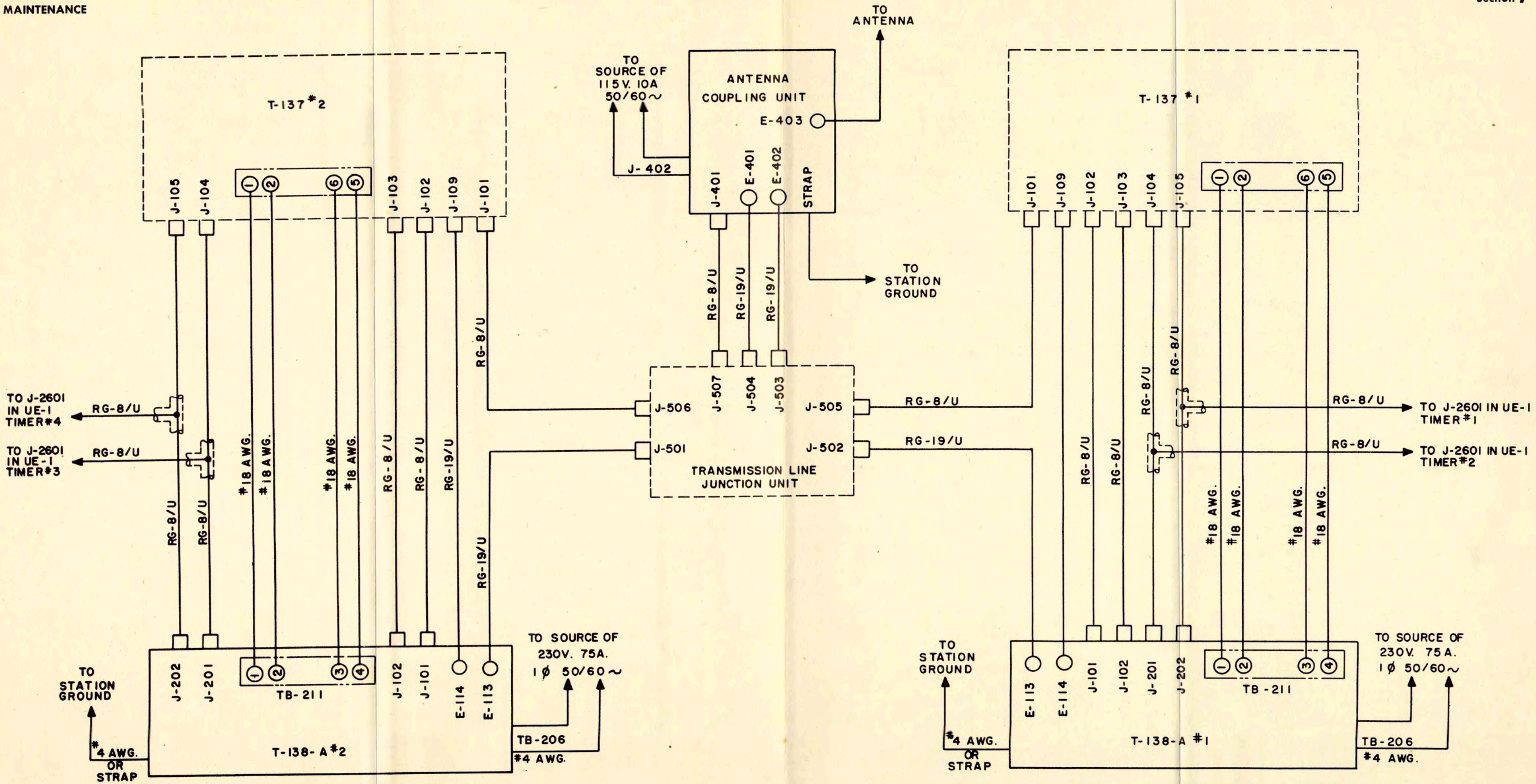


Figure 7–4. Loran System Intercabling Diagram.

SECTION 8
PARTS AND SPARE PARTS LIST (AND MISCELLANEOUS TABLES)

SECTION 8
PARTS LIST

NOTE

The spare parts quantities shown in tables 8-1, 8-2, and 8-4 apply only on Contract TCG-37784.

TABLE 8-1. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES					
SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME (FT 3)	WEIGHT (LB)
	HEIGHT	WIDTH	DEPTH		
1	36"	Drum -	24" diam	9.4	65
2	25"	25	16	5.8	151

TABLE 8-2. SHIPPING WTS. AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES						
SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME (FT3)	WEIGHT (LB)
		HEIGHT	WIDTH	DEPTH		
	1	39"	27"	27"	15.9	82
	2	28"	26½"	17"	7.7	186

TABLE 8-3.
LIST OF MAJOR UNITS

QUANTITY	NAME OF MAJOR UNIT	TYPE DESIGNATION	GROUP SYMBOL
1	Antenna Coupler	CU-277/URT	401 - 499

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYM-BOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIG-NATION	CON-TRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG-NATIONS INVOLVED	TOT. NO. PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
C-401	CAPACITOR, fixed: mica; 1500 mmf ± 5%; 35,000 peak VDCW; temp coef letter B; 10"h x 6-3/4" diam approx; ceramic case; four 13/32" diam mtg holes on radius 4" equally spaced.	Midshunt capacitor	CM95B152J	16-C-31511-3326			C-401,C-402	2	1	1		2
C-402	Same as C-401.	Midshunt capacitor								–		–
C-403	CAPACITOR, fixed: mica; 2,400 mmf ± 5% 20,000 peak VDCW; temp coef letter B 5-3/4" thk x 5" OD; ceramic case; two 3/8" diam mtg holes on 5-3/4" mtg/c.	Load tuning	CM90B242J	16-C-31985-6143	Sangamo Elec.		C-403	1	1	–		–
C-404	CAPACITOR, fixed: mica 3000 mmf ± 5%; 8000 peak VDCW; temp coef letter B; 3"lg x 3-1/2" OD; phenolic case; two 17/64" diam mtg holes on 4-1/4" mtg/c.	Auxiliary mid-shunt capacitor	CM80B302J	16-C-32195-8116	Cornell-Dubilier		C-404	1		1		1
E-401	CONNECTOR, receptacle; 1 round female contact; straight type; approx 7-7/16"lg x 1-5/8" body diam x 2-1/4" hex, o/a cylindrical brass body, silver pl; cable opening approx 1.188" diam: bushing mtd 15/16"lg x 1-3/4"-16 thd; two 2-1/4" brass hex nuts 1-3/4"-16 thd.	Input		17-C-73121-6362	GE	GE part/dwg #ML7766999G3	E-401,E-402	4	3	1		8
E-402	Same as E-401.	Input								–		–

3 mH 51.5 ohms
Q=.6

E-403	INSULATOR, feed thru; conical shape porcelain grade L-2 chocolate glaze, brass and rubber; 15-1/2"h; 16"OD, 6 mtg holes 11/16" diam equally spaced on 14-5/8" diam.	Entrance insulator		17-I-59697-8320	Lapp Insulator Co.	GE part/dwg #M7405174P1	E-403	1	4	1		2
E-404	Not used.											
E-405	CONTACT: coil, brass; silver plated; 3-7/16"lg x 0.746"diam overall; one 0.055"diam mtg hole approx 1/8" from end.	Contact brush for L-402		17-C-78320-6671	GE	GE part/dwg #K7005275P1	E-405,E-406	2	3	4		12
E-406	Same as E-405.	Contact brush for L-403								–		–
E-407	INSULATOR, standoff: round post shape; porcelain with brown glaze, Grade L-2; 10"lg x 1-3/4" diam overall; four 10-32 tapped holes 1/2"lg equally spaced on 1-1/4" bolt diam on both ends.	Stand-off insulator		17-I-69279-5601	Locke Insulator Corp #25510	GE part/dwg #K7005453P1	E-407,E-408, E-409,E-410, E-413,E-452, E-458,E-459	8	3	4		16
E-408	Same as E-407.	Standoff Insulator								–		–
E-409	Same as E-407.	Standoff insulator								–		–
E-410	Same as E-407.	Standoff insulator								–		–
E-411	INSULATOR, bushing: round shape; mykroy #38; 5/8"thk x 1-7/8"OD x 0.625"ID; four 0.169" diam holes equally spaced on 1-3/8" diam bolt circle.	Insulation ring on rotor arm		17-I-57978-6151	GE	GE part/dwg #K7005296P1	E-411,E-412	2	3	1		4
E-412	Same as E-411.	Insulation ring on rotor arm								–		–
E-413	Same as E-407.	Standoff insulator								–		–
E-414	MOUNTING, coil: mykroy #31; 29" lg x 2-1/2"wd x 3/8"thk; 13 holes 13/32"diam spaced thru center of strip four mtg holes 9/32"diam on 1-1/2" x 27-1/2" mtg/c.	Coil support for L-403		16-M-61662-3751	GE	GE part/dwg #K7005362P1	E-414	1	8	1		2

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOT. NO. PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
E-415	MOUNTING, coil: mykroy #38; 21-1/2" lg x 2-1/2" wd x 3/8" thk overall; 6 mtg holes 9/32" diam, four on 1-1/2" x 20-3/4" mtg/c; other two 1-1/2" apart in center of strip; has 1" diam hole located 8-1/2" x 1-1/4" c from one end.	Coil support		16-M-61660-2001	GE	GE part/dwg #K7005361P1	E-415, E-416	2	8	1		4
E-416	Same as E-415.	Coil support								–		–
E-417	MOUNTING, coil: mykroy #38; 21-1/2" lg x 2-1/2" wd x 3/8" thk overall; 6 mtg holes 9/32" diam, four on 1-1/2" x 20-3/4" mtg/c other two 1-1/2" apart in center of strip.	Coil support		16-N-61660-1851	GE	GE part/dwg #K7005361P2	E-417, E-418, E-419, E-420, E-421, E-422	6	8	3		12
E-418	Same as E-417.	Coil support								–		–
E-419	Same as E-417.	Coil support								–		–
E-420	Same as E-417.	Coil support								–		–
E-421	Same as E-417.	Coil support								–		–
E-422	Same as E-417.	Coil support								–		–
E-423	MOUNTING, coil: mykroy #31; 29" lg x 2-1/2" wd x 3/8" thk; 8 holes 13/32" diam spaced thru center of strip; four mtg holes 9/32" diam on 27-1/2" x 1-1/2" mtg/c.	Coil support for L-403		16-M-61662-3701	GE	GE part/dwg #K7005363P1	E-423	1	8	1		2
E-424	MOUNTING, coil: mykroy #38; 21" lg x 2-1/2" wd x 3/8" thk; 9 holes 13/32" diam spaced thru center of strip; 4 mtg holes 9/32" diam on 19-1/2" x 1-1/2" mtg/c.	Coil support for L-402		16-M-61659-9053	GE	GE part/dwg #K7005375P1	E-424	1	8	1		2

E-425	MOUNTING, coil: mykroy #38; 21" lg x 2-1/2" wd x 3/8" thk; 6 holes 13/32" diam spaced thru center of strip; 4 mtg holes 9/32" diam on 19-1/2" x 1-1/2" mtg/c.	Coil support for L-402		16-M-61659-9101	GE	GE part/dwg #K7005376P1	E-425	1	8	1		2
E-426	INSULATOR, standoff: square post type; steatite, white glaze, grade L-4; 1" lg 1" sq. both ends have 2 tapped holes #8-32, 3/8" d, located 0.375" c/c on 0.530" diam for mtg.	Insulator mtg post	NS4W1408	17-I-70281-6221	GE	GE part/dwg #K7106963P1	E-426,E-427	2	3	1		4
E-427	Same as E-426.	Insulator mtg post								–		–
E-428	INSULATOR, standoff: square post shape; steatite, white glaze, grade L-4; 1" lg; 3/4" sq, tapped both ends with #10-32, 3/8" d mtg holes	Insulator mtg post	NS4W1208	17-I-70266-9511	GE	GE part/dwg #K7106961P1	E-428	42	3	1		84
E-429	SHAFT: for drive shaft assembly; mykroy #38; 11" lg x 0.625" diam; two 0.127" diam holes one in each end for mtg.	Drive shaft		16-S-21059-3976	GE	GE part/dwg #K7005381P2	E-429,E-430	2	3	1		4
E-430	Same as E-429.	Drive shaft								–		–
E-431	INSULATOR, standoff: round post shape; steatite, white glaze, grade L-4; 5" lg; 1" OD, tapped both ends with 1/4"-20, 5/8" d mtg holes.	Insulator mtg post	NS4W0440	17-I-69237-9516	GE	GE part/dwg #K7106956P7	E-431	13	3	1		26
E-432	INSULATOR, standoff: round post shape; steatite white glaze, grade L-4; 3" lg; 1" OD, tapped both ends with 1/4"-20, 5/8" d mtg holes.	Insulator mtg post	NS4W0424	17-I-69233-9541	GE	GE part/dwg #K7106956P5	E-434,E-435, E-481,E-482, E-483,E-484	42	3	4		44
E-433	Same as E-432.	Insulator mtg post										
E-434	Same as E-432.	Insulator mtg post										
E-435	Same as E-432.	Insulator mtg post										

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYM-BOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIG-NATION	CON-TRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG-NATIONS INVOLVED	TOT.NO.PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
E-436	INSULATOR, standoff: square post shape; steatite, white glaze, grade L-4; 1-1/2"lg; 3/4" sq, tapped both ends with #10-32, 3/8" d mtg holes.	Insulator mtg post	NS4W1212	17-I-70267-9401	GE	GE part/dwg #K7106961P3	E-436,E-437, E-438,E-439, E-440,E-441, E-442,E-443, E-444,E-445, E-446,E-447, E-448,E-449, E-450,E-451	16		8		58
E-437	Same as E-436.	Insulator mtg post										
E-438	Same as E-436.	Insulator mtg post										
E-439	Same as E-436.	Insulator mtg post										
E-440	Same as E-436.	Insulator mtg post										
E-441	Same as E-436.	Insulator mtg post										
E-442	Same as E-436.	Insulator mtg post										
E-443	Same as E-436.	Insulator mtg post										
E-444	Same as E-436.	Insulator mtg post										
E-445	Same as E-436.	Insulator mtg post										
E-446	Same as E-436.	Insulator mtg post										
E-447	Same as E-436.	Insulator mtg post										
E-448	Same as E-436.	Insulator mtg post										
E-449	Same as E-436.	Insulator mtg post										
E-450	Same as E-436.	Insulator mtg post										
E-451	INSULATOR, standoff: square post shape; steatite, white glaze, grade L-4; 2"lg; 3/4" sq, tapped both ends with #10-32, 3/8" d mtg holes.	Insulator mtg post	NS4W1216	17-I-70268-9101	GE	GE part/dwg #7106961P4	E-451,E-480	2		1		6

E-452	Same as E-407.	Standoff insulator										
E-453	INSULATOR, standoff: round post shape; steatite, white glaze, grade L-4; 2" lg; 1" OD, tapped both ends with 1/4"-20, 5/8" d mtg holes.	Insulator mtg post	NS4W0416	17-I-69231-9541	GE	GE part/dwg #K7106956P3	E-453	1		1		14
E-454	INSULATOR, standoff: round post shape; steatite, white glaze, grade L-4; 2" lg; 1/2" OD tapped both ends with #8-32, 3/8" d, mtg holes.	Insulator mtg post	NS4W0216	17-I-69185-7111	GE	GE part/dwg #K7106954P6	E-454, E-455, E-456, E-457	4		2		44
E-455	Same as E-454.	Insulator mtg post										
E-456	Same as E-454.	Insulator mtg post										
E-457	Same as E-454.	Insulator mtg post										
E-458	Same as E-407.	Standoff insulator										
E-459	Same as E-407.	Standoff insulator										
E-460	WASHER, flat: mycalex; round 3/8" ID x 5/8" OD x 1/8" thk.	Coil terminal spacer		17-I-77259-4451	GE	GE part/dwg #A7008606P1	E-460, E-461, E-462, E-463, E-464, E-465, E-466, E-467, E-468, E-469, E-470, E-471, E-472, E-473, E-474, E-475, E-476, E-477, E-478, E-479	20	3	10		40
E-461	Same as E-460.	Coil terminal spacer								—		—
E-462	Same as E-460.	Coil terminal spacer								—		—
E-463	Same as E-460.	Coil terminal spacer								—		—
E-464	Same as E-460.	Coil terminal spacer								—		—
E-465	Same as E-460.	Coil terminal spacer								—		—
E-466	Same as E-460.	Coil terminal spacer								—		—

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOT. NO. PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
E-467	Same as E-460.	Coil terminal spacer								–		–
E-468	Same as E-460.	Coil terminal spacer								–		–
E-469	Same as E-460.	Coil terminal spacer								–		–
E-470	Same as E-460.	Coil terminal spacer								–		–
E-471	Same as E-460.	Coil terminal spacer								–		–
E-472	Same as E-460.	Coil terminal spacer								–		–
E-473	Same as E-460.	Coil terminal spacer								–		–
E-474	Same as E-460.	Coil terminal spacer								–		–
E-475	Same as E-460.	Coil terminal spacer								–		–
E-476	Same as E-460.	Coil terminal spacer								–		–
E-477	Same as E-460.	Coil terminal spacer								–		–
E-478	Same as E-460.	Coil terminal spacer								–		–
E-479	Same as E-460.	Coil terminal spacer								–		–
E-480	Same as E-451.	Insulator mtg post								–		–

E-481	Same as E-432.	Insulator mtg post								–	–	
E-482	Same as E-432.	Insulator mtg post								–	–	
E-483	Same as E-432.	Insulator mtg post								–	–	
E-484	Same as E-432.	Insulator mtg post								–	–	
E-485		Electrode w/ end formed into Ring			17-E-27088-7896							
E-486		Electrode w/ Brass Ring on End			17-E-27088-7899							
H-401	PIN, taper: stainless steel; taper pin #5/0; 0.094" diam x 1/2" lg.	Taper pin		42-P-14141-136	GE	GE part/dwg #M7461888P4	H-401,H-402, H-403,H-404, H-463,H-464, H-465,H-466, H-467,H-468, H-469	11	3	2		19
H-402	Same as H-401.	Taper pin								–		–
H-403	Same as H-401.	Taper pin								–		–
H-404	Same as H-401.	Taper pin								–		–
H-405	PIN, cotter: stainless steel; 0.047" diam x 1/2" lg overall.	Cotter pin		42-P-6504	GE		H-405,H-406	2	3	1		2
H-406	Same as H-405.	Cotter pin								–		–
H-407	PIN, straight: for rotor arm assembly; stainless steel; 1-3/4" lg x 0.1562" diam, 1/64" x 45° chamfer both ends.	For rotor arm		42-P-12746	GE	GE part/dwg #K7005316P1	H-407,H-408	3	3	1		2
H-408	Same as H-407.	For rotor arm								–		–
H-409	PIN, taper: stainless steel; taper pin #4/0; 0.109" diam x 9/16" lg.	Taper pin		42-P-14141-220	GE	GE part/dwg #M7461888P10	H-409,H-410	2	3	1		2
H-410	Same as H-409.	Taper pin								–		–
H-411	PIN, taper: stainless steel; taper pin #4/0; 0.109" diam x 11/16" lg.	Taper pin		42-P-14141-228	GE	GE part/dwg #M7461888P12	H-411,H-412, H-413,H-414, H-441,H-442	6	3	1		6
H-412	Same as H-411.	Taper pin								–		–
H-413	Same as H-411.	Taper pin								–		–
H-414	Same as H-411.	Taper pin								–		–

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOT.NO.PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
H-415	PIN, retaining: stainless steel; 1-1/16" lg x 3/8" diam approx overall; 7/8" lg x 0.250" diam shaft, one 0.055" diam hole approx 3/16" from end.	For rotor arm		42-P-3494-325	GE	GE part/dwg #K7005289P1	H-415,H-416	2	3	1		2
H-416	Same as H-415.	For rotor arm								–		–
H-417	PIN, taper: stainless steel; taper pin #3/0; 0.125" diam x 7/8" lg.	Taper pin		42-P-14142-100	GE	GE part/dwg #M7461888P21	H-417,H-418, H-419,H-420, H-421	5	3	1		5
H-418	Same as H-417.	Taper pin								–		–
H-419	Same as H-417.	Taper pin								–		–
H-420	Same as H-417.	Taper pin								–		–
H-421	Same as H-417.	Taper pin								–		–
H-422	PIN, cotter: stainless steel; 1/16" diam x 3/4" lg overall.	Cotter pin		42-P-6512	GE		H-422,H-423, H-424,H-425, H-426	5	3	1		5
H-423	Same as H-422.	Cotter pin								–		–
H-424	Same as H-422.	Cotter pin								–		–
H-425	Same as H-422.	Cotter pin								–		–
H-426	Same as H-422.	Cotter pin								–		–
H-427	PIN, locking: for drive shaft assembly; brass; 1-1/8" lg x 0.125" diam.	For shaft		42-P-11607-501	GE	GE part/dwg #K7005381P4	H-427,H-428, H-429,H-430	4	3	1		4
H-428	Same as H-427.	For shaft								–		–
H-429	Same as H-427.	For shaft								–		–
H-430	Same as H-427.	For shaft								–		–

H-431	SCREW, set: Bristo multiple-spline drive; headless; chrome nickel steel, cadmium plate; #8-32; 1/8" lg; cup point.	Set screw		43-S-19021-6050	Bristol Co.	GE part/dwg #K7876450P4	H-431,H-432, H-433,H-434, H-435,H-436, H-437,H-438, H-439,H-440, H-455,H-456, H-457,H-458, H-459,H-460, H-461,H-462, H-472,H-473, H-478,H-479, H-480,H-481	24	3	3		40
H-432	Same as H-431.	Set screw								—		—
H-433	Same as H-431.	Set screw								—		—
H-434	Same as H-431.	Set screw								—		—
H-435	Same as H-431.	Set screw								—		—
H-436	Same as H-431.	Set screw								—		—
H-437	Same as H-431.	Set screw								—		—
H-438	Same as H-431.	Set screw								—		—
H-439	Same as H-431.	Set screw								—		—
H-440	Same as H-431.	Set screw								—		—
H-441	Same as H-411.	Taper pin								—		—
H-442	Same as H-411.	Taper pin										
H-443	PIN, taper: steel; #2; 0.193" diam x 1" lg.	Taper pin		42-P-13300			H-443,H-444	2		1		2
H-444	Same as H-443.	Taper pin										
H-445	SCREW, set: Bristo multiple-spline drive; headless; chrome nickel steel, cadmium finish; #8-32; 3/16" lg; cup point.	Set screw		43-S-19021-6505	Bristol Co.	GE part/dwg #K7876450P1	H-445,H-446, H-447,H-448, H-449,H-450, H-451,H-452, H-470,H-471	10		1		19
H-446	Same as H-445.	Set screw										
H-447	Same as H-445.	Set screw										
H-448	Same as H-445.	Set screw										

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOT. NO. PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
H-449	Same as H-445.	Set screw										
H-450	Same as H-445.	Set screw										
H-451	Same as H-445.	Set screw										
H-452	Same as H-445.	Set screw										
H-453	SCREW, set: Bristo multiple-spline drive; headless; chrome nickel steel, cadmium plate; #8-32; 1/4" lg; cup point.	Set screw		42-S-19021-6510	Bristol Co.	GE part/dwg #K7876450P3	H-453,H-454	2		1		7
H-454	Same as H-453.	Set screw										
H-455	Same as H-431.	Set screw										
H-456	Same as H-431.	Set screw										
H-457	Same as H-431.	Set screw										
H-458	Same as H-431.	Set screw										
H-459	Same as H-431.	Set screw										
H-460	Same as H-431.	Set screw										
H-461	Same as H-431.	Set screw										
H-462	Same as H-431.	Set screw										
H-463	Same as H-401.	Taper pin										
H-464	Same as H-401.	Taper pin										
H-465	Same as H-401.	Taper pin										
H-466	Same as H-401.	Taper pin										
H-467	Same as H-401.	Taper pin										
H-468	Same as H-401.	Taper pin										

H-469	Same as H-401.	Taper pin										
H-470	Same as H-445.	Set screw										
H-471	Same as H-445.	Set screw										
H-472	Same as H-431.	Set screw										
H-473	Same as H-431.	Set screw										
H-474	SCREW, set: Bristo four-spline drive; headless; beryllium copper; #6-32; 0.138" diam x 3/16" lg; cup point.	Set screw		43-S-16488-195	Bristol Co.	GE part/dwg #K7871266P2	H-474,H-475, H-476,H-477	4		1		10
H-475	Same as H-474.	Set screw										
H-476	Same as H-474.	Set screw										
H-477	Same as H-474.	Set screw										
H-478	Same as H-431.	Set screw										
H-479	Same as H-431.	Set screw										
H-480	Same as H-431.	Set screw										
H-481	Same as H-431.	Set screw										
I-401	LAMP, incandescent: 115 v, 25 W; 260 approx lumens; bulb A-19 inside frosted; 3-15/16" lg o/a; med. screw base; burn any position.	Illumination		17-L-2990	GE	Mazda 25A	I-401,I-402	2	3	8		12
I-402	Same as I-401.	Illumination								—		—
J-401	CONNECTOR, receptacle: one round female contact; straight type; 1" square x 1-1/16" lg; cylindrical brass body, silver pl; bakelite insert; 4 mtg holes 0.120" diam spaced 23/32" x 23/32" c to c.	Monitor jack		17-C-73108-5890	Amphenol Cat #83-1R	GE part/dwg #K7887469P1	J-401	1		1		10

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYM-BOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIG-NATION	CON-TRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG-NATIONS INVOLVED	TOT. NO. PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
J-402	Part of S-401.	Outlet jack								1		1
L-401	COIL, RF: loop for antenna coupling unit; unshielded; 7-3/16" lg x 6-5/8" wd x 5-3/4" d o/a; copper tubing 1/4" OD x 0.032" wall for coil; for sleeve copper tubing 3/8" OD x 0.062" wall; 2 mtg holes 0.169" (#18) diam; 6-5/8" mtg/c; 2 term also serving as mtg holes one one ach end of loop; sleeve included.	Meter transformer secondary			GE	GE part/dwg #PL7410573G1	L-401	1		0		0
L-402	COIL, RF: single winding; unshielded; 16 turns 1" pitch 1/2" OD copper tubing; 16-1/2" lg x 14-1/4" diam approx overall dimen; air core; fifteen holes 0.136" diam for terms for mtg, 9 studs on front 3/8" x 16 thd x 2-1/16" lg, 6 studs on back 3/8" x 16 thd x 1-9/16" lg.	Input tuning		16-C-72218-1208	GE	GE part/dwg #ML7602820G1	L-402	1		0		0
L-403	COIL, RF: single winding; unshielded; 24 turns 1" pitch 1/2" OD copper tubing; 24" lg x 14-1/4" diam approx overall; air core; 21 holes 0.136" diam for terms for mtg 13 studs on front 3/8" x 16 thd x 2-1/16" lg 8 studs on back 3/8" x 16 thd x 1-9/16" lg.	Output tuning		16-C-72369-9713	GE	GE part/dwg #ML7602820G2	L-403	1		0		0
L-404	COIL, RF: loop for antenna coupling unit; unshielded; 9-1/2" lg x 8-3/8" wd x 4-3/16" d; copper tubing 1/2" OD x 0.035" wall; 3 mtg holes, 2 holes 0.169" (#18) diam, 1 hole 0.116" (#32) diam, 6-5/8" and 2-1/2" mtg/c; 3 terms also serving as mtg holes one on each end, the other 3" from 1 end.	Meter transformer secondary			GE	GE part/dwg #B7408899P1	L-404	1		0		0

L-405	COIL, RF: loop for antenna coupling unit; unshielded; 13-1/4"lg x 2-7/16"wd x 1/4"OD x 0.035" wall; copper tubing; 2 mtg holes 0.070"(#50) diam 13-1/4"mtg/c; 2 term also serving as mtg holes, one on each end of loop.	Monitoring loop			GE	GE part/dwg #A7013256P1	L-405	1		0		0
M-401	METER, ammeter: thermo RF; 0-500 MA; round plastic flush mtg case; 3-1/2"diam flange x 2.8" diam body x 1.66" D behind flange; accuracy ± 2%; thermal movement; resistance of 0.02 ohms; calibrated for use on non-magnetic panel only; white background with black markings and pointer self-contained; three 0.150"diam mtg holes equally spaced on 1.58"radius on flange; 2 stud terminals 1/4"-28 thd, 0.69"lg spaced 1"c to c.	Line current		17-M-18171-3983	GE type 8 DO-44	GE part/dwg #P7765840P6	M-401,M-402	2	6	1		2
M-402	Same as M-401.	Antenna current								–		–
O-401	SPRING, flat type: for contact spring; 0.026"thk beryllium copper; 2-17/32"lg x 1"wd overall; two 0.196"diam holes in one end for mtg.	Contact spring for L-402		17-C-78180-3637	GE	GE part/dwg #K7005304	O-401,O-402	2	6	2		10
O-402	Same as O-401.	Contact spring for L-403								–		–
O-403	WRENCH: double open end; 0.094" across flats; 1.0627"lg x 0.7971" wd approx overall; alloy steel, cadmium pl, "L" shape; for #8 Bristo set screw.	Bristol wrench #8-32		41-W-2460-10	Bristol Co.	GE part/dwg #K7876451P1	O-403	1		1		4
O-404	WRENCH: double end: Bristol set screw; 1-27/32"lg x 0.075"diam o/a; alloy steel, cadmium pl; 21/32"offset from handle; "L" shape; for #6-40 Bristol set screw.	Bristol wrench #10-32		41-W-2460	Bristol Co.	GE part/dwg #K7871267P1	O-404	1		1		6

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYM-BOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIG-NATION	CON-TRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG-NATIONS INVOLVED	TOT. NO. PER EQ.	BOX NO.	QUAN.	BOX NO	QUAN.
O-405	COUPLING, flexible: stainless steel, cadmium pl; 1-1/2" lg x 1/2" diam o/a; 1/4" bore both ends; two #8-32 tapped holes located 3/16" from each end.	Metal coupling		17-C-98373-3751	Boston Gear Works Cat #C-642B	GE part/dwg #A7010770P1	O-405,O-406, O-407,O-408	4		0		8
O-406	Same as O-405.	Metal coupling								1		1
O-407	Same as O-405.	Metal coupling								1		1
O-408	Same as O-405.	Metal coupling								1		1
O-409	COUNTER, mechanical: direct drive; aluminum, black wrinkle finish; 3-1/2" lg x 5-7/8" h x 4-9/32" D overall; 2 digits; non-self resetting; clockwise rotation; subtracts in opposite direction; 3 mtg screws #10-32 2 on bottom on 3" mtg/c, other one on top on 2-3/8" x 1-1/2" mtg/c.	Tuning control for L-402.		16-D-46586-5901	Jas. Millen Co. CJA-C-10031	GE part/dwg #M7405182P1	O-409,O-410	2		0		5
O-410	Same as O-409.	Tuning control for L-403										
O-411	GEAR ASSEMBLY: bevel type, for rotor arm assembly drive; c/o a pair (gear & pinion); brass; straight teeth 24 pitch 9/32" straight face on both gear & pinion; 2-3/8" lg x 2-1/16" wd x 1-7/8" h approx o/a dimen; #8-32 tapped hole thru hub 1/8" from end of hub for set screw for mtg;	For rotor arm assembly drive		16-G-505001-118	Boston Gear	GE part/dwg #M7405055P1	O-411,O-418	2		0		2
O-412	SPRING, helical: for rotor arm assembly contact; 0.046" diam music wire; 1.125" min 1.141" max lg; x 0.500" OD; approx 6 turns; wind either hand; squared ends.	Spring for rotor arm assembly contact		17-S-46661-6311	GE	GE part/dwg #K7005277P1	O-412,O-413	2		2		10

O-413	Same as O-412.	Spring for rotor arm assembly contact										
O-414	WRENCH: double open end; 2-1/4" opening one end opposite end 3/4" opening; 9-5/8"lg x 3-13/16"wd x 0.180"thk approx o/a; steel cadmium finish; straight type; flat straight handle.	Wrench for line termination unit		16-W-920001-159	GE	GE part/dwg #7405271P1			1		4	
O-415	GASKET: window; rubber; 9 holes; round 9-1/4"OD x 8"ID x 0.063" thk.	Window in antenna coupling unit		17-G-164731-986	GE	GE part/dwg #K7005877P1	O-415,O-416	2	2		8	
O-416	Same as O-415.	Window in antenna coupling unit										
O-417	GASKET: door seal; sponge rubber; 5/8"OD x 16 ft 8 inches lg.	Door seal on antenna coupling unit		17-G-199944-252	Sponge Rubber Prod. Co. Derby, Conn.		O-417	1	1		4	
O-418	Same as O-411.	For rotor arm assembly drive										
O-419	SCREWDRIVER: offset: for slot drive; 25/32" blade, both ends; 7-1/2"o/a lg; 1/4"diam round shank; bit 1/16"approx thk.	Offset screwdriver		41-S-1397-23	Snap-on Tool Corp. Cat. 060	GE part/dwg #A7010630	O-419	1	1		2	
O-420	AIR CLEANER			17-C-794001-109								
P-401	CONNECTOR, plug: one round male contact; straight type; 1-1/2" lg x 13/16"diam approx overall dimen; cylindrical brass body, silver pl; bakelite insert.	Monitor plug		17-C-71412-8709	American Phenolic Cat #83-1-SP	GE part/dwg #K7887473P1	P-401	1	1		10	

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
									EQUIP		STOCK	
SYM-BOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIG-NATION	CON-TRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG-NATIONS INVOLVED	TOT.NO.PER EQ.	BOX NO.	QUAN.	BOX NO.	QUAN.
R-401	RESISTOR, fixed: 50 wire wound; non-inductive type; 50 ohms ± 10%; 116 W at 275° C max continuous operating temp; 8-5/8" lg x 1-5/16" diam body dimen; ceramic glaze coating; resistant to humidity; 2 ferrule type terms 1-1/8" diam x 1/2" lg.	Dummy load		16-R-61384-2995	Sprague Elec.	GE part/dwg #M7472962P18	R-401,R-402, R-403,R-404, R-405,R-406, R-407,R-408, R-409,R-410, R-411,R-412, R-413,R-414, R-415,R-416, R-417,R-418, R-419,R-420, R-421,R-422, R-423,R-424, R-425	25		25		270
R-402	Same as R-401.	Dummy load										
R-403	Same as R-401.	Dummy load										
R-404	Same as R-401.	Dummy load										
R-405	Same as R-401.	Dummy load										
R-406	Same as R-401.	Dummy load										
R-407	Same as R-401.	Dummy load										
R-408	Same as R-401.	Dummy load										
R-409	Same as R-401.	Dummy load										
R-410	Same as R-401.	Dummy load										
R-411	Same as R-401.	Dummy load										
R-412	Same as R-401.	Dummy load										
R-413	Same as R-401.	Dummy load										

R-414	Same as R-401.	Dummy load										
R-415	Same as R-401.	Dummy load										
R-416	Same as R-401.	Dummy load										
R-417	Same as R-401.	Dummy load										
R-418	Same as R-401.	Dummy load										
R-419	Same as R-401.	Dummy load										
R-420	Same as R-401.	Dummy load										
R-421	Same as R-115.	Dummy load										
R-422	Same as R-115.	Dummy load										
R-423	Same as R-115.	Dummy load										
R-424	Same as R-115.	Dummy load										
R-425	Same as R-115.	Dummy load										
R-426	RESISTOR, fixed: wire wound; 10,000 ohms ± 5%; 140 w at 275° C max continuous operating temp; 10-7/16" lg x 1-5/16" diam approx body dimen; ceramic glaze coating, resistant to humidity; 2 ferrule terms 1-1/8" diam x 1/2" lg.	Static drain	RW10F103	16-R-62073-8235	Ward-Leonard	GE part/dwg #P3R56P71	R-426	1		1		5
S-401	SWITCH SUB-ASSEMBLY: toggle switch, complete with cover and plate gaskets & outlet J-402; switch, DP, 125V-10 amp, 250 V-10 amp; outlet, parallel slots, 125V-15 amp, 250V-10 amp; 4-1/2" lg x 2-3/4" wd x 2-1/2" thk overall; two slots for #6 screw located on 3-9/32" mtg/c; weatherproof.	Illumination switch		17-C-76101-1001	Pass & Seymour Inc.	GE part/dwg #M7405254P1	S-401	1		1		1

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

PARTS								SPARE PARTS				
SYM-BOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY STOCK NUMBER	MFGR. & MFGR'S DESIG-NATION	CON-TRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG-NATIONS INVOLVED	TOT. NO. PER EQ.	EQUIP		STOCK	
									BOX NO.	QUAN.	BOX NO.	QUAN.
W-401	WIRE, electrical: bare; #4 AWG approx; SD, copper, tinned; stranded 7/7/37/0.005; 9-1/2" lg.	Copper pig tail cable		17-L-62682-3286	GE	#B11Y3C17	W-401,W-402	2		1		2
W-402	Same as W-401; except 8" lg.	Copper pig tail cable								1		2
XI-401	LAMPHOLDER: medium screw isolantite body; 660 w, 250 V AC; 2-3/8" diam x 1-5/8" thk approx overall; two 7/8" diam mtg holes on 1-3/4" mtg/c.	Lamp socket		17-L-51192-7355	GE	GE part/dwg #K7118447	XI-401, XI-402	2		1		2
XI-402	Same as XI-401.	Lamp socket										

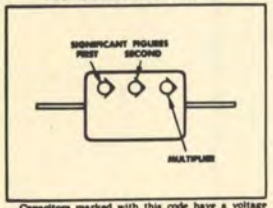
TABLE 8-5 CROSS REFERENCE PARTS LIST

JAN DESIGNATION	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
CM80B302J	C-404	16-C-72218-1208	L-402	16-R-62073-8235	R-426	17-I-59697-8320	E-403	41-S-1397-23	O-419
CM95B152J	C-401	16-C-72369-9713	L-403	16-S-21059-3976	E-429	17-I-69279-5601	E-407		
NS4W1408	E-426	16-G-505001-118	O-411			17-I-70281-6221	E-426	42-P-3494-325	H-415
RW10F103	R-426			17-C-76101-1001	S-401	17-I-77259-4451	E-460	42-P-6504	H-405
		16-M-61659-9053	E-424	17-C-78180-3637	O-401	17-L-2990	I-401	42-P-6512	H-422
STANDARD NAVY STOCK NUMBER	KEY SYMBOL	16-M-61659-9101	E-425	17-C-78320-6671	E-405	17-L-51192-7355	XI-401	42-P-11607-501	H-427
		16-M-61660-2001	E-415			17-L-62682-3286	W-401	42-P-12746	H-407
		16-M-61662-3701	E-423	17-G-164731-986	O-415			42-P-13300	H-443
		16-M-61662-3751	E-414	17-G-169944-252	O-417	17-M-18171-3983	M-401	42-P-14141-220	H-409
16-C-31511-3326	C-401							42-P-14141-228	H-411
16-C-32195-8116	C-404	16-N-61660-1851	E-417	17-I-57978-6151	E-411	17-S-46661-6311	O-412	42-P-14142-100	H-417

Table 8–6. Applicable Color Codes and Miscellaneous Data

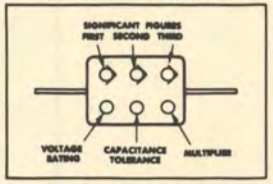
CAPACITOR COLOR CODES

RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

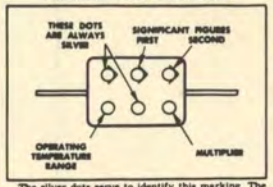


Capacitors marked with this code have a voltage rating of 500 volts.

RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

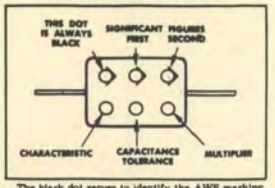


AWS 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



The silver dots serve to identify this marking. The sixth dot shows whether the capacitor has a maximum operating temperature of 167°F (black) or 185°F (brown).

AWS 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

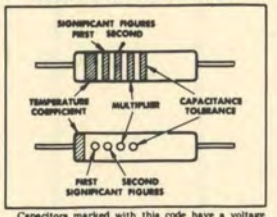


The black dot serves to identify the AWS marking. Capacitors marked with this code are rated at 500 volts, except the following. AWS type CM35 capacitors with capacitances of 6,800, 7,500, and 8,200 micromicrofarads, and AWS type CM40 capacitors with capacitances of 9,100 and 10,000 micromicrofarads are rated at 300 volts.

RMA: *Radio Manufacturers Association*
AWS: *American War Standard (American Standards Association)*

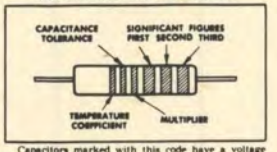
NOTE: These color codes give all capacitances in *micromicrofarads*.

AWS COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



Capacitors marked with this code have a voltage rating of 500 volts.

RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



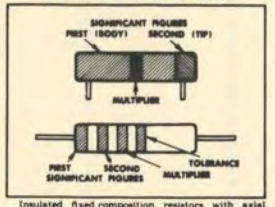
Capacitors marked with this code have a voltage rating of 500 volts.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER: RMA MICA- AND CERAMIC-DIELECTRIC; AWS MICA- AND PAPER-DIELECTRIC	MULTIPLIER: AWS CERAMIC-DIELECTRIC	VOLTAGE RATING (VOLTS)	CHARACTERISTIC (AWS MICA-DIELECTRIC)	CAPACITANCE TOLERANCE: RMA & AWS MICA- AND PAPER-DIELECTRIC (PERCENT)	CAPACITANCE TOLERANCE: RMA CERAMIC-DIELECTRIC (PERCENT)	CAPACITANCE TOLERANCE: AWS CERAMIC-DIELECTRIC GREATER THAN 10 MMF (PERCENT)	CAPACITANCE TOLERANCE: AWS CERAMIC-DIELECTRIC LESS THAN 10 MMF (MMF)	TEMPERATURE COEFFICIENT OF CAPACITANCE x10⁻⁶ MMF/MMF/°C
BLACK	0	1	1		A	20	20	20	2.0	0
BROWN	1	10	10	100	B	1	1	1		− 30
RED	2	100	100	200	C	2	2	2		− 80
ORANGE	3	1000	1000	300	D	3	3	2.5	0.25	−150
YELLOW	4	10,000		400	E	4	4			−220
GREEN	5	100,000		500	F	5	5	5	0.5	−330
BLUE	6	1,000,000		600	G	6	6			470
VIOLET	7	10,000,000		700		7	7			750
GRAY	8	100,000,000	0.01	800		8	2.5			+ 30
WHITE	9	1,000,000,000	0.1	900		9	10	10	1.0	Not specified
GOLD		0.1		1000		5				
SILVER		0.01		2000		10				
NO COLOR				500		20				

Ⓐ

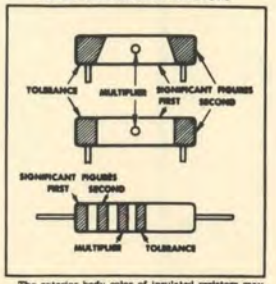
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



Insulated fixed composition resistors with axial leads are designated by a natural tan background color. Non-insulated fixed composition resistors with axial leads are designated by a black background color.

AWS COLOR CODE FOR FIXED COMPOSITION RESISTORS



The exterior body color of insulated resistors may be any color except black. The usual color is natural tan. The exterior body color of uninsulated resistors with axial leads may be either black or white. The exterior body color of uninsulated resistors with radial leads may be black or it may be the color of the first significant figure of the resistance value.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1000	
YELLOW	4	10,000	
GREEN	5	100,000	
BLUE	6	1,000,000	
VIOLET	7	10,000,000	
GRAY	8	100,000,000	
WHITE	9	1,000,000,000	
GOLD		0.1	5
SILVER		0.01	10
NO COLOR			20

Ⓑ

RMA: *Radio Manufacturers Association*
AWS: *American War Standard (American Standards Association)*